5

JOHNSON'S NEW UNIVERSAL CYCLOPÆDIA:

A

SCIENTIFIC AND POPULAR TREASURY OF USEFUL KNOWLEDGE.

ILLUSTRATED WITH MAPS, PLANS, AND ENGRAVINGS.

EDITORS-IN-CHIEF.

FREDERICK A. P. BARNARD, S.T.D., LL.D., L.H.D., M.N.A.S.,
PRESIDENT OF COLUMBIA COLLEGE, NEW YORK;

ARNOLD GUYOT, PH.D., LL.D., M.N.A.S.,
PROFESSOR OF GEOLOGY AND PHYSICAL GEOGRAPHY, COLLEGE OF NEW JERSEY.

ASSOCIATE EDITORS.

MARTIN B. ANDERSON, LL.D.,
President of the University of Rochester, N. Y.;

JOHN G. BARNARD, A.M., LL.D., M.N.A.S.,
Col. U. S. Engineers, Bvt. Major-Gen. U. S. A.;

LORIN BLODGET,
Formerly Assistant Secretary of the U. S. Treasury;

CHAS. F. CHANDLER, PH.D., M.D., LL.D., M.N.A.S.,
Prof. Anal. Chem., School of Mines, Columbia College;

AARON L. CHAPIN, S.T.D.,
President of Beloit College, Wisconsin;

HENRY DRISLER, LL.D.,
Jay Professor of Greek, Columbia College;

THEODORE W. DWIGHT, LL.D.,
Professor of Municipal Law, Columbia College;

CALEB G. FORSHEY, A.M., C.E.,
Formerly Prof. of Math. and Civ. Eng. in Jefferson Coll., Miss.;

OCTAVIUS B. FROTHINGHAM, A.M.,
Pastor Third Unitarian Society, N. Y. City;

THEODORE GILL, A.M., M.D., PH.D., M.N.A.S.,
Late Senior Assistant Librarian of the Library of Congress;

ASA GRAY, M.D., LL.D., M.N.A.S.,
Fisher Professor of Natural History, Harvard University;

HORACE GREELEY, LL.D.,
Founder of the New York Tribune;

SAMUEL S. HALDEMAN, A.M., LL.D., M.N.A.S.,
Prof. of Comparative Philology in the Univ. of Penn.;

WILLIAM T. HARRIS, A.M., LL.D.,
Ed. of The Journal of Speculative Phil., St. Louis, Mo.;

JOSEPH HENRY, LL.D., M.N.A.S.,
Secretary of Smithsonian Institution;

ROSWELL D. HITCHCOCK, S.T.D., LL.D.,
Washburn Prof. of Ch. Hist., Union Theo. Sem., N. Y.;

CHARLES P. KRAUTH, S.T.D., LL.D.,
Vice-Provost of the University of Penn.;

JOHN LE CONTE, M.D.,
President of the University of California;

GEORGE P. MARSH, LL.D., M.N.A.S.,
Envoy Extr. and Minis. Plenipo. of U. S. at Rome, Italy;

JOHN S. NEWBERRY, M.D., LL.D., M.N.A.S.,
Prof. of Geology and Palæontology, Columbia College;

FOXHALL A. PARKER, U. S. N.,
Commodore and Chief Signal Officer of the U. S. Navy;

WILLARD PARKER, M.D., LL.D.,
Professor of Surgery, Columbia College, Med. Dept.;

PHILIP SCHAFF, PH.D., S.T.D., LL.D.,
Baldwin Prof. of Sacred Lit., Union Theo. Sem., N. Y.;

JULIUS H. SEELYE, S.T.D., LL.D.,
President of Amherst College, Mass.;

ALEXANDER H. STEPHENS, LL.D.,
Of Georgia, Member 43d Congress, U. S. A.;

ABEL STEVENS, A.M., LL.D.,
Formerly Editor of The Methodist, New York;

THOMAS O. SUMMERS, S.T.D., LL.D.,
Professor of Syst. Theol., Vanderbilt Univ., Tenn.;

WILLIAM P. TROWBRIDGE, A.M., M.N.A.S.,
Higgin Prof. of Dynam. Engineering, Yale Coll., Conn.;

THEODORE D. WOOLSEY, S.T.D., LL.D.,
Ex-President of Yale College, Conn.

ASSISTANT EDITORS.

PORTER C. BLISS, A.M., LINUS P. BROCKETT, A.M., M.D., CLARENCE COOK,
CLEMENS PETERSEN, A.M., JOHN N. POMEROY, LL.D., HENRY WURTZ, A.M.

WITH NUMEROUS CONTRIBUTIONS FROM WRITERS OF DISTINGUISHED EMINENCE IN EVERY DEPARTMENT OF LETTERS AND SCIENCE IN THE UNITED STATES AND IN EUROPE.

Not to Exceed Four Volumes, including Appendix.

VOLUME III.

LICHFIELD—R.

(TESTIMONIALS ON LAST PAGES OF THE FIRST VOLUME.)

A. J. JOHNSON & SON,
11 GREAT JONES STREET, NEW YORK.
W. D. CUMMINGS, PITTSBURG, PA. H. D. WATSON, SAN FRANCISCO, CAL.
MDCCCLXXVII.

ELECTROTYPED BY
Westcott & Thomson,
Philadelphia.

PRINTED BY
S. W. Green, 18 Jacob Street,
New York.

ENGRAVINGS PRINCIPALLY BY
Redman & Kenny,
New York.

PAPER MANUFACTURED BY
S. D. Warren & Co.,
Boston, Mass.

BOUND BY
James Somerville,
New York.

PREFACE TO VOLUME III.

IN presenting to the public the Third Volume of JOHNSON'S UNIVERSAL ILLUSTRATED CYCLOPÆDIA, the Editors-in-Chief respectfully ask of their patrons a careful comparison of this volume with the two that have preceded it, in the full confidence that it will be found more than to sustain the favorable judgment which has already been formed of those. From the commencement of the work, the Editors, so far from at any time relaxing effort, have been constantly exerting themselves more and more strenuously to accomplish in the most thorough manner the design originally proposed to themselves, of making the most complete, comprehensive, and at the same time compendious, book of general reference which has yet been produced. In this effort they have been nobly sustained by the Publishers, who have not hesitated at any expense which the prosecution of this very formidable undertaking has seemed to make necessary.

Without such liberality, indeed, the execution of the work would have been impossible. In order to secure the co-operation of the more than five hundred eminent writers who have contributed articles upon subjects in which their special studies and investigations have made them authorities, an expenditure has been required which is without any precedent in the history of such publications. The Publishers, however, have never doubted that whatever outlay should be found to add to the intrinsic value of the work would be amply compensated by the increased demand for it on the part of an appreciative public; and the subscriptions hitherto taken, over 15,000, when only two of the four volumes were published, have fully justified this belief.

A comparison of the three volumes published with the promise of the original prospectus will show that, while all the distinctive features of the plan have been preserved throughout, the promise has, in several respects, been more than fulfilled. Important subjects have been treated with much greater fulness than is necessary in a mere compendium of facts; the lives of the more conspicuous personages of history are given in larger detail than was at first intended; the scope of the whole work has been extended to embrace several thousand more titles than are to be found in any other work of its class; and great care has been taken that no topic of especially American interest should pass unnoticed. Of this latter class of topics, the number which have first found place in this work, and which are as yet to be found in no other, amounts to many hundreds.

The principle of division of labor in the supervision of the work during its progress, introduced in the beginning, has been gradually extended. The Editors-in-Chief have from time to time added to the number of their associates, until they feel justified in claiming that no work of this description has ever before appeared which has united in its production so numerous or so eminently competent an editorial staff. It should, moreover, be known that not only are these Associate Editors active in contributing or providing articles in their several distinct departments, but also that all the proof-sheets of the entire work are submitted to every one of them, and subjected to their criticism before final publication.

The present volume makes its appearance, according to promise, abundantly within the year 1876. The fourth and final volume is already very far advanced toward completion, and will probably be ready for the press before the 1st of March next. It will be delivered to subscribers early in 1877.

F. A. P. BARNARD, } *Editors-in-Chief.*
ARNOLD GUYOT, }

NEW YORK, *August, 1876.*

ORGANIZATION OF THE EDITORIAL STAFF.

⁂ The following statement shows the subjects to which the different members of the editorial staff have severally given their more particular attention, not only in themselves preparing articles relating to those subjects, but also in securing contributions from others, and in carefully scrutinizing all such contributions with a view both to ensure accuracy and to exclude anything which might seem objectionable.

DIRECTING EDITOR-IN-CHIEF:

FREDERICK A. P. BARNARD.

ADVISORY EDITOR-IN-CHIEF:

ARNOLD GUYOT.

DEPARTMENTS

(see Title-Page for honorary degrees and positions):

Public Law, Intercourse of Nations, etc.	THEODORE D. WOOLSEY.
Municipal, Civil, and Constitutional Law, etc.	THEODORE W. DWIGHT.
English and Foreign Literature, etc.	GEORGE P. MARSH.
Grecian and Roman Literature, etc.	HENRY DRISLER.
Presbyterian Church—History, Doctrine, Biographies, etc.	ROSWELL D. HITCHCOCK.
Philosophy, Psychology, etc.	WILLIAM T. HARRIS.
Comparative Philology and Linguistics	SAMUEL S. HALDEMAN.
Social Science, Political Economy, etc.	AARON L. CHAPIN.
American History, Southern Geography, Statistics, etc.	ALEXANDER H. STEPHENS.
The Fine Arts, Liberal Christianity, Biographies, etc.	OCTAVIUS B. FROTHINGHAM.
Ecclesiastical History and Biblical Literature	PHILIP SCHAFF.
Meteorology, Electricity, and Magnetism	JOSEPH HENRY.
General Physics, Statistics of the Pacific Coast, etc.	JOHN LE CONTE.
Mathematics, Applied Science, Protestant Episcopal Church, Education, etc.	FRED. A. P. BARNARD.
Physical Geography, Foreign Geography, Climatology, etc.	ARNOLD GUYOT.
Military Engineering, Science and Material of War, Biographies, etc.	JOHN G. BARNARD.
Zoology, Comparative Anatomy, and Animal Physiology	THEODORE GILL.
Naval Affairs, Naval Construction, Navigation, Biographies, etc.	FOXHALL A. PARKER.
Mechanics, Mechanical Engineering, etc.	WILLIAM P. TROWBRIDGE.
Manufacturing and Agricultural Industry, Commerce, etc.	LORIN BLODGET.
Chemistry, its Applications, etc.	CHARLES F. CHANDLER.
Botany and Vegetable Physiology	ASA GRAY.
Geology and Palæontology	JOHN S. NEWBERRY.
Civil Engineering, Hydrography, etc.	CALEB G. FORSHEY.
Medicine, Surgery, the Collateral Sciences, etc.	WILLARD PARKER.
American History, Statistics, Agriculture, etc.	HORACE GREELEY.*
Baptist Church—History, Doctrine, Biographies, etc.	MARTIN B. ANDERSON.
Congregational Church—Ethical Science, Biographies, etc.	JULIUS H. SEELYE.
Philosophical and Church Dogmatics; Lutheran Church—Biographies, etc.	CHARLES P. KRAUTH.
Methodist Church, South—History, Doctrine, Biographies, etc.	THOMAS O. SUMMERS.
Methodist Church, North—History, Doctrine, Biographies, etc.	ABEL STEVENS.

ASSISTANTS:

PORTER C. BLISS, LINUS P. BROCKETT, CLARENCE COOK,
CLEMENS PETERSEN, JOHN NORTON POMEROY, HENRY WURTZ.

* The latest labors of Mr. Greeley's life were given to this work, to which he contributed largely. It is with justice, therefore, that his name is preserved in the list of its Editors.

CONTRIBUTORS TO THE THIRD VOLUME

OF

JOHNSON'S ILLUSTRATED UNIVERSAL CYCLOPÆDIA, ETC.

The following list comprises the names of the eminent specialists who have written for this volume, but it does not include the names of the many resident editors of newspapers and distinguished citizens who have especially contributed succinct and accurate accounts of their respective cities, towns, and villages to be found herein, with each writer's name attached to his article.

Abbe, Prof. Cleveland, Washington, D. C.,
Meteorologist, Weather-Signal Office.

Abbot, Henry L., M. N. A. S., Willetts Point, N. Y.,
Maj. U. S. Eng., Bvt. Brig.-Gen. U. S. A., Bvt. Maj.-Gen. Vols.

Adams, Col. Julius W., C. E., New York,
Ex-President of the American Society of Civil Engineers.

Agnew, Cornelius R., M. D., New York.

Alexander, Prof. Stephen, LL.D., Princeton, N. J.,
Professor of Astronomy in the College of New Jersey.

Anderson, Rev. Rufus, S. T. D., LL.D., Boston, Mass.,
Formerly Secretary of the A. B. C. F. M.

Andrews, George L., West Point, N. Y.,
Prof. of the French Language in the U. S. Military Academy.

Andrews, Rev. Israel W., S. T. D., Marietta, O.,
President of Marietta College.

Arnold, John W. S., M. D., New York,
Prof. of Physiology in the N. Y. University Medical College.

Aucaigne, Prof. Félix, A. M., LL.B., New York,
Foreign Editor of New York Com. Advertiser.

Austin, Coe F., Esq., Closter, N. J.

Axon, William E. A., Esq., Manchester, England.

Bailey, William W., Esq., A. M., Providence, R. I.

Barnes, P., Esq., New York.

Bellows, Rev. Henry W., S. T. D., LL.D., New York,
Pastor of the Church of All Souls, Fourth Avenue.

Bergh, Henry, Esq., New York,
Pres. of the N. Y. Society for Prevention of Cruelty to Animals.

Bermingham, Edward J., M. D., New York.

Betts, Rev. Beverley R., A. M., New York,
Librarian of Columbia College.

Birch, Samuel, LL.D., F. S. A., London, England,
Keeper of Oriental Antiquities British Museum, President Society of Biblical Archæology.

Birch, W. D., Esq., London, England.

Bishop, J. B., Esq., New York,
Of the Ed. Staff of the New York Tribune.

Bittle, Rev. D. F., S. T. D., Roanoke, Va.,
President of Roanoke College.

Blake, Prof. William P., A. M., Ph. B., New Haven, Conn.,
Former Prof. of Mineral. and Geology, College of California.

Blunt, George W., Esq., New York,
Member of the Board of Commissioners of Pilots.

Brace, Rev. Charles L., New York,
Secretary Children's Aid Society.

Brackett, Col. Albert G., U. S. Army, Fort Saunders, Wyoming Territory.

Brand, Rev. William F., A. M., Emmorton, Md.,
Rector of St. Mary's Church, Emmorton.

Brewer, Thomas M., M. D., Boston, Mass.,
Ed. of the History of North American Birds.

Briggs, Rev. Charles A., New York,
Provisional Professor of Hebrew and the Cognate Languages, Union Theological Seminary.

Brown, Rev. S. Gilman, S. T. D., LL.D., Clinton, N. Y.,
President of Hamilton College.

Buck, Gurdon, M. D., New York.

Buckalew, Hon. Charles R., Pa.,
Late U. S. Senator from Pennsylvania.

Bullen, A. H., Esq., London, England.

Burgess, John W., LL.B., Amherst, Mass.,
Professor of History and Political Science in Columbia College.

Butler, Capt. J. G., U. S. Ordnance Corps.

Caldwell, R. C., M. R. A. S., London, England.

Cameron, Henry C., Ph. D., Princeton, N. J.,
Professor of Greek in the College of New Jersey.

Chadbourne, Rev. P. A., S. T. D., LL.D., Williamstown, Mass.,
President of Williams College.

Chase, George, LL.B., New York,
Assistant Professor of Municipal Law in Columbia College.

Church, Prof. John A., E. M., New York,
Associate Editor Army and Navy Journal, New York.

Clark, Alonzo, M. D., New York,
Professor of Pathology and Practical Medicine, Medical Department, Columbia College, N. Y.

Clarke, Col. A. R., F. R. S., Southampton, England,
Member of the Academy of Imperial Science, and also Corresponding Member of the Ordnance Survey Office.

Comstock, Gen. Cyrus B., U. S. Engineers.

Cope, Prof. Edward D., A. M., M. N. A. S., Haddonfield, N. J.

Cornwall, Henry B., E. M., Princeton, N. J.,
Professor of Analytical Chemistry, Mineralogy, etc., College of New Jersey.

Croes, J. James R., New York,
Civil and Topographical Engineer to the Dept. of Public Parks.

Cummings, Joseph, S. T. D., LL.D., Middletown, Conn.,
Former President of Wesleyan University.

Curtis, Edward, M. D., New York,
Professor of Materia Medica and Therapeutics, Medical Department of Columbia College, N. Y.

Daly, Judge Charles P., LL.D., New York,
President of the American Geographical and Statistical Society.

Dana, Richard H., Jr., LL.D., Boston, Mass.,
Author of Two Years before the Mast.

Darby, J. N., London, England.

Davids, T. W. Rhys, Esq., London, England,
Oriental Department, British Museum.

Davidson, Thomas, A. M., Cambridge, Mass.

Day, Edward C. H., F. G. S. (London), New York,
Prof. of Geology and Physiology in the New York Normal School.

Delafield, Francis, M. D., New York.

Dixon, W. J., Esq., London, England.

Ellis, Alexander J., F. R. S., F. S. A., London, England.

Emerson, George B., LL.D., Boston, Mass.,
Late President Boston Society of Natural History.

Engelmann, George, M. D., M. N. A. S., St. Louis, Mo.

Ernst, Capt. Oswald H., U. S. Engineers, West Point, N. Y.,
Instructor in Practical Military Engineering, etc., in the U. S. Military Academy.

Eve, Paul F., M. D., Nashville, Tenn.,
Prof. of Operative and Clinical Surgery Univ. of Nashville.

Fairfield, Prof. Francis Gerry, New York.

Farlow, Prof. William G., M. D., Cambridge, Mass.,
Assistant Professor of Botany in Harvard University.

Farnham, C. H., Esq., New York.

Fisher, George P., S. T. D., New Haven, Conn.,
Professor of Ecclesiastical History, Yale College.

Fiske, John, LL.B., Cambridge, Mass.,
Assistant Librarian, Harvard University.

Flint, Austin, M. D., New York,
Prof. of Principles and Practice of Medicine in Bellevue Hospital Medical College.

Folwell, Wm. A., A. M., Minneapolis, Minn.,
President of the State University of Minnesota.

Fox, Hon. Gustavus V., Lowell, Mass.,
Late Assistant Secretary of the Navy.

Frizell, Joseph P., C. E., Boston, Mass.

Garrison, William Lloyd, Esq., Boston, Mass.

Gibbons, Rev. A. S., A. M., M. D., San José, Cal.,
President University of the Pacific.

Gardiner, Frederick, S. T. D., Middletown, Conn.,
Prof. of the Literature and Interpretation of the Old Testament, Berkeley Divinity School.

Gifford, George, Esq., New York.

Gillmore, Quincy A., New York,
Lt.-Col. U. S. Engineers, Bvt. Maj.-Gen. U. S. A.

Gilmore, Joseph H., A. M., Rochester, N. Y.,
Prof. of Logic, Rhetoric, etc., in the University of Rochester.

Godet, Rev. Frédéric, S. T. D., Neufchâtel, Switzerland,
Professor of Theology.

Goodale, George L., A. M., Cambridge, Mass.,
Assistant Prof. of Vegetable Physiology in Harvard University.

Greene, Charles W., A. M., M. D., North Andover Dépôt, Mass.

Gubernatis, Prof. Angelo de, Ph. D., Florence, Italy,
Professor of Sanskrit in the University of Florence.

Hagner, Gen. Peter V., U. S. Ordnance, Watervliet Arsenal, West Troy, N. Y.

Haines, Col. Peter C., Washington, D. C.,
U. S. Engineers.

Haldeman, Miss Elisa J., Chickies, Pa.

Hamilton, Allan McLane, M. D., New York.

Harding, George, Esq., Philadelphia, Pa.

Hayden, Ferdinand V., M. D., M. N. A. S., Washington, D. C.,
U. S. Geologist for the Territories.

Helbig, Prof. W., Rome, Italy.

Herrick, Rev. J. R., S. T. D., South Hadley, Mass.

Herrick, Mrs. S. B., Baltimore, Md.,
Associate Editor of the Southern Review.

Hilgard, Julius E., M. N. A. S., Washington, D. C.,
Assist. Superintendent of the U. S. Coast Survey.

Hodge, Archibald A., S. T. D., Allegheny City, Pa.,
Professor of Theology in Allegheny Seminary.

Hogg, John W.,
Chief Clerk, Navy Department.

Holder, J. B., M. D., New York,
Curator of the Museum of Natural History, Central Park.

Holley, Alexander L., C. E., Brooklyn, N. Y.,
President of the Am. Association of Mining Engineers.

Hough, Prof. George W., LL.D., Albany, N. Y.,
Director of the Dudley Observatory.

Howard, Benjamin, M. D., New York,
Professor of Surgery in the University of Vermont.

Hubbard, Gardiner G., Esq., Cambridge, Mass.

Hudson, E. Darwin, Jr., M. D., New York,
Prof. of the Principles and Practice of Medicine, Woman's Medical College of the New York Infirmary.

Humphrey, Rev. Zephanias M., S. T. D., Cincinnati, O.,
Professor in Lane Theological Seminary.

Hurst, John F., S. T. D., Madison, N. J.,
President of Drew Theological Seminary.

Jacobi, Abraham, M. D., New York,
Clinical Prof. of the Diseases of Children, School of Medicine, Columbia College.

Johnson, Oliver, Esq., New York,
Managing Editor Christian Union.

Johnston, Keith, Esq., London, England,
Late Librarian to the Royal Geographical Society.

Jordan, Gen. Thomas, New York.

Kroeger, A. E., Esq., St. Louis, Mo.

Kzarge, Prof. Joseph, Princeton, N. J.

Lanciani, R., Rome, Italy.

Lanman, Charles, Esq., Georgetown, D. C.,
American Secretary Japanese Legation.

Leland, Charles G., Esq., London, England,
Author of Hans Breitmann's Ballads.

Lewis, Tayler, LL.D., L. H. D., Schenectady, N. Y.,
Nott Prof. of Oriental Languages in Union University.

Linderman, H. R., Esq., Philadelphia, Pa.,
Director of the Mint of the U. S.

Luce, Capt. Stephen B., U. S. Navy.

Lynde, Hon. William P., Milwaukee, Wis.,
Member of the Forty-fourth Congress.

McCormick, Lieut.-Com. Alexander H., U. S. Navy, Annapolis, Md.

McCosh, James, S. T. D., LL.D., Princeton, N. J.,
President of the College of New Jersey.

McCurdy, Prof. J. F., Princeton, N. J.

Marsh, Mrs. Caroline C., Rome, Italy,
Wife of Hon. George P. Marsh, LL.D.

Marsh, Othniel C., A. M., M. N. A. S., New Haven, Conn.,
Professor of Palæontology in Yale College.

Mayer, Alfred M., Ph. D., M. N. A. S., Hoboken, N. J.,
Professor of Physics, Stevens Technological Institute.

Merrick, Rev. Frederick, Delaware, O.,
Former President of Ohio Wesleyan University.

Merrick, Prof. J. M., Boston, Mass.

Merrill, Col. William E., U. S. Engineers.

Meyer, John Francis, Esq., New York.

Mitchell, Weir, M. D., M. N. A. S., Philadelphia, Pa.

Morgan, Hon. Lewis H., LL.D., M. N. A. S., Rochester, N. Y.

Munde, Paul F., M. D., New York.

Murray, Rev. Thomas C., Baltimore, Md.,
Professor in Johns Hopkins University.

Newcomb, Simon, M. N. A. S., Washington, D. C.,
Professor of Astronomy, U. S. Naval Observatory.

Newton, Hubert A., LL.D., M. N. A. S., New Haven, Conn.,
Professor of Mathematics, Yale College.

Niemann, August, Gotha, Saxony,
Ed. for Genealogy and Diplomatics of the Almanach de Gotha.

O'Hara, C. E., Esq., New York.

Packard, Alpheus S., Jr., M. D., M. N. A. S., Salem, Mass.,
Director of the Peabody Academy of Science.

Palmer, Prof. E. H., LL.D., Cambridge, England,
Prof. of Persian Literature in the University of Cambridge.

Parrott, Capt. Robert P., Cold Spring, N. Y.,
Superintendent West Point Foundry.

Parsons, Theophilus, LL.D., Cambridge, Mass.,
Late Dane Professor of Law in Harvard University.

Paterson, David, Esq., New York.

Paterson, William Sleigh, Esq., New York.

Peabody, Miss Elizabeth P., Cambridge, Mass., Author of Spiritual Culture, etc.

Peck, William G., LL.D., New York, Professor of Mathematics and Astronomy, Columbia College.

Peirce, Prof. Benjamin, LL.D., F. R. S., M. N. A. S., Cambridge, Mass., Late Superintendent U. S. Coast Survey.

Peirce, J. M., Cambridge, Mass., Professor of Mathematics in Harvard University.

Phelps, William F., M. A., Winona, Minn., President of the National Educational Society.

Porter, Noah, S. T. D., LL.D., New Haven, Conn., President of Yale College.

Post, Truman M., S. T. D., St. Louis, Mo.

Powell, Major J. W., Washington, D. C., In charge of Second Div. of Geological Government Survey.

Proctor, Richard A., B. A., F. R. A. S., London, Eng., Secretary of the Royal Astronomical Society.

Pryor, Hon. Roger A., Brooklyn, N. Y.

Pumpelly, Prof. Raphael, M. N. A. S., St. Louis, Mo., Late State Geologist of Missouri.

Ralston, W. R. S., Esq., London, England, Assistant Librarian British Museum.

Reclus, Elisée, Canton de Vaud, Switzerland, Author of La Terre, etc., Member of the Geographical and Meteorological Societies of Paris.

Rendall, Rev. J. N., S. T. D., Lower Oxford, Pa., President of Lincoln University.

Ridgeley, James L., Esq., Baltimore, Md.

Riley, C. V., M. D., Ph. D., St. Louis, Mo., State Entomologist to the State of Missouri.

Riley, Rev. Isaac, Buffalo, N. Y.

Rives, G. L., Esq., New York.

Ross, Theodore A., Esq., Baltimore, Md.

Rougemont, Frédéric de, Neufchâtel, Switzerland.

Sargent, C. S., Brookline, Mass., Director of Arnold Arboretum and Botanic Garden.

Schurz, Hon. Carl, LL.D., St. Louis, Mo., Late U. S. Senator from Missouri.

Schweinitz, Edmund De, Bethlehem, Pa., President Moravian Theo. Seminary.

Scott, Capt. Robert N., Oswego, N. Y., U. S. Artillery.

Seguin, Edward C., Jr., M. D., New York, Lecturer on Pathological Anatomy, Med. Dept. Columbia Coll.

Shaler, Prof. N. S., S. B., Cambridge, Mass., Professor of Palæontology in Harvard University, and Director of the Geological Survey of Kentucky.

Shields, Charles W., S. T. D., Princeton, N. J., Professor of History in the College of New Jersey.

Shreve, Samuel H., C. E., New York.

Silliman, Benjamin, M. D., M. N. A. S., New Haven, Conn., Professor of Chemistry in Yale College.

Simmons, George C., Esq., New York, Clerk U. S. Board of Engineers.

Sloane, J. R. W., S. T. D., Allegheny City, Pa., Prof. of Theology, Reformed Presbyterian Theol. Sem.

Smith, E. Munroe, Esq., Brooklyn, N. Y.

Smith, George, Esq., London, England, Assyrian Department British Museum.

Smith, Hamilton L., LL.D., Geneva, N. Y., Prendergast Prof. of Astron. and Nat. Philos. in Hobart Coll.

Smith, J. Lawrence, M. D., LL.D., M. N. A. S., Louisville, Ky., Late Prof. of Chemistry, Medical School Univ. of Louisville.

Smith, Richard S., U. S. Naval Academy, Professor of Drawing in the U. S. Naval Academy.

Smyth, Richard, M. P., Manchester, England.

Spooner, Alden J., Esq., Brooklyn, N. Y., Late Editor of Long Island Star.

Staunton, Rev. William, S. T. D., New York.

Stevens, John Austin, Esq., New York, Late Secretary Chamber of Commerce.

Sully, James, Esq., London, England.

Taylor, W. B., Esq., Washington, D. C., Examiner U. S. Patent Office.

Thayer, Hon. M. Russell, Philadelphia, Pa.

Thomas, Prof. Joseph, M.D., LL.D., Philadelphia, Pa., Author of Dictionary of Biography and Mythology.

Thompson, R. E., Philadelphia, Pa., Prof. of Political Econ. in the University of Pennsylvania.

Thurston, Robert H., C. E., Hoboken, N. J., Prof. of Mechanical Engineering in the Stevens Techn. Inst.

Tuckey, Miss Janet, London, England, One of the Authors of English Gypsy Poetry.

Turner, Hubert B., Esq., New York.

Tyler, William S., S. T. D., LL.D., Amherst, Mass., Williston Prof. of the Greek Lang. and Lit., Amherst College.

Tylor, Edward Burnett, LL. D., F. R. S., Wellington, Somerset, Eng., Author of Primitive Culture, etc.

Valentine, Rev. M., S. T. D., Gettysburg, Pa., President of Pennsylvania College.

Van Amringe, J. Howard, A. M., New York, Professor of Mathematics in Columbia College.

Vanderpoel, S. Oakley, M. D., New York, Health Officer, Port of New York.

Van der Weyde, Prof. P. H., Ph. D., M. D., N. Y., Editor of the Manufacturer and Builder.

Vaux, W. S. W., A. M., F. R. S., London, England, President of the London Numismatic Society.

Vere, Prof. Schele de, Charlottesville, Va., Prof. of Modern Languages in University of Virginia.

Verrill, Addison E., A. M., M. N. A. S., New Haven, Conn., Professor of Zoology, Yale College.

Vinton, Francis L., E. M., New York, Prof. of Civil and Mining Eng. School of Mines, Columbia College.

Waldo, Leonard, Esq., Cambridge, Mass., Assist. in the Astronomical Observatory of Harvard University.

Waller, Elwyn, Esq., E. M., New York, Assist. to the Prof. of Anal. Chem. School of Mines, Columbia College.

Washburn, Hon. Charles A., A. M., Oakland, Cal., Late U. S. Minister Resident in Paraguay.

Webster, David, M. D., New York.

Westcott, Thompson, Esq., Philadelphia, Pa.

Wheeler, Rev. Francis B., Poughkeepsie, N. Y.

Whitford, Rev. W. C., A. M., Milton, Wis., President of Milton College.

Whitney, Prof. James A., New York, President of the Society of Practical Engineering, New York.

Whittlesey, Fred. A., Esq., Rochester, N. Y.

Wilson, T. D., Esq., Portsmouth, N. H., Naval Constructor U. S. Navy.

Wilson, William D., LL.D., L. H. D., Ithaca, N. Y., Prof. of Moral and Intellectual Philosophy in Cornell Univ.

Wines, Rev. Enoch C., S. T. D., LL.D., New York, Secretary of the International Prison Congress and of the National Prison Society of New York.

Yule, Maj.-Gen. Henry, C. B., London, England, Late of the Royal Engineers, Bengal.

Zinsser, Frederick, M. D., New York.

Lich'field, city of Staffordshire, England, county and municipal and parliamentary borough, has carpet manufactories, etc., a fine cathedral, and a grammar school where were educated Addison, Johnson, and Garrick. Pop. 7380.

Lich'tenburg (GEORG CHRISTOPH), b. July 1, 1744, at Oberramstadt, Hesse-Darmstadt; studied at the University of Göttingen; became professor there in 1770. His satirical writings made a great sensation and are still much read. His *Ueber Physiognomik wider die Physiognomen* (1778) is directed against Lavater; *Ueber die Pronunciation der Schöpse des alten Griechenland* (1782) against Voss. The greatest general interest, however, is in his *Ausführlichen Erklärung der Hogarthschen Kupferstiche,* which first appeared in the *Göttingschen Almanach,* of which Lichtenburg was the founder and editor. D. Feb. 24, 1799.

Lick, tp. of Jackson co., O. Pop. 3746.

Lick (JAMES), b. at Fredericksburg, Lebanon co., Pa., Aug. 25, 1796; received a common-school education, and in 1819 obtained employment in a piano manufactory in Philadelphia; a year later started in the same business for himself in New York City, but failing to succeed for want of capital, went soon after to Buenos Ayres, South America; for ten years was engaged in piano-making, and amassed a small fortune; in 1832 returned to Philadelphia, and after a few months again went to Buenos Ayres, thence to Valparaiso, devoting himself to his business for four years, and then to different places in Peru, remaining there for eleven years, and in 1847 arrived in San Francisco, where he has since lived. He brought with him from South America about $30,000, which he invested in real estate in San Francisco, and its rapid advance in value made him wealthy. In 1874 he placed his entire property in the hands of seven trustees, to be devoted to public and charitable purposes. The bequests then made he changed in some respects in May, 1875, leaving them as follows: for constructing a suitable observatory, and erecting therein a telescope superior to and more powerful than any before made, $700,000, the same to be connected with the University of California; to the San Francisco Protestant Orphan Asylum, $25,000; to build a non-sectarian orphan asylum at San José, Cal., $25,000; to the Ladies' Protection and Relief Society in San Francisco, $25,000; to the Mechanics' Institute of San Francisco, $10,000; to the San Francisco Society for the Prevention of Cruelty to Animals, $10,000; for the erection of suitable monuments over the graves of his mother, father, grandfather, and sister, $5000 each, or $20,000; to found an Old Ladies' Home in San Francisco, $100,000; for the erection of free public baths in San Francisco, $150,000; for the erection of a monument to Francis Scott Key, author of *The Star-Spangled Banner,* in Golden Gate Park, San Francisco, $60,000; for the erection in the City Hall of San Francisco of a group of bronze statuary which shall represent by appropriate designs and figures the history of California, $100,000; to found and endow an institution to be called the California School of Mechanical Arts, $540,000. For himself he reserved $500,000, gave his son $150,000, and each of his relatives sums varying from $2000 to $5000. J. B. BISHOP.

Lick Creek, tp. of Little River co., Ark. Pop. 361.

Lick Creek, tp. of Davis co., Ia. Pop. 1246.

Lick Creek, tp. of Van Buren co., Ia. Pop. 1199.

Lick'ing, county of Central Ohio. Area, 670 square miles. It is watered by the Licking River and its affluents. It is quite level, very fertile, and is well cultivated. Live-stock, grain, and wool are staple products. Carriages, leather, lumber, and saddlery are leading manufactures. Coal and building-stone are obtained. Traversed by Ohio Canal, Sandusky Mansfield and Newark and Pittsburg Cincinnati and St. Louis R. Rs. Cap. Newark. Pop. 35,756.

Licking, tp. of Crawford co., Ill. Pop. 1625.

Licking, tp. of Blackford co., Ind. Pop. 2185.

Licking, tp. of Licking co., O. Pop. 850.

Licking, tp. of Muskingum co., O. Pop. 992.

Licking, tp. of Clarion co., Pa. Pop. 1218.

Licking Creek, tp. of Fulton co., Pa. Pop. 925.

Lick'inghole, tp. of Goochland co., Va. Pop. 3430.

Lick'ing River rises in the mountains of Floyd co., Ky., and flows some 180 miles in a north-westerly course, reaching the Ohio opposite Cincinnati. At high water light-draught steamboats can ascend to Falmouth, some 60 miles. The principal tributaries are the N. and S. forks.—Another LICKING RIVER rises near the centre of Ohio, and joins the Muskingum River opposite Zanesville, O.

Lick Mountain, post-tp. of Conway co., Ark. Pop. 518.

Lick Prairie, tp. of Wabash co., Ill. Pop. 527.

Lico'dia Euke'a, town of Sicily, province of Catania, on the site of the ancient *Eubœa* (destroyed 468 B. C.), many vestiges of which are still found. Pop. in 1874, 5656.

Lic'tors [Lat. *ligare,* to "bind"], officers whose duty it was to attend upon the magistrates of ancient Rome, to bear the FASCES (which see), to administer punishment to citizens, and to perform other public functions. They were originally plebeians, and afterward freedmen.

Lid'dell (HENRY GEORGE), D. D., b. in England in 1811, studied at the Charter-house; graduated at Christ Church, Oxford, in 1833, with the highest honors; was head-master of Westminster School; chaplain extraordinary to the queen (1862); became dean of Christ Church 1855, and vice-chancellor in 1870; translated (with Dean Scott) Passow's *Greek Lexicon,* and wrote a *History of Rome from the Earliest Times to the Establishment of the Empire* (1855).

Lid'don (HENRY PARRY), D. D., b. in England in 1830; graduated at Christ Church, Oxford, in 1850; was vice-principal of the theological college, Cuddesdon, 1854–59; published a volume of *Lenten Sermons* (1858); became a prebendary in Salisbury cathedral in 1864. His Bampton lectures for 1866, on *The Divinity of our Lord,* greatly extended his fame. In 1870 he was installed canon residentiary of St. Paul's, London, and was appointed professor of exegesis at Oxford.

Lie'ber (FRANCIS), b. at Berlin, Prussia, Mar. 18, 1800. His father, Frederick William Lieber, who was engaged in commercial pursuits, had suffered heavy losses during the war, and, having a large family, great economy was necessary. Young Lieber was an ardent student and a favorite with his teachers. In 1815, when the war was renewed by the escape of Napoleon Bonaparte from Elba, he volunteered with two of his brothers for the army, and was in the fight at Ligny, and severely wounded at the battle of Namur. At the close of the Waterloo campaign he returned to his studies and joined the Berlin gymnasium. These gymnasia became the seats of liberal and patriotic sentiments; Jahn was arrested upon the charge of hostility to the government, and because Lieber was considered his favorite pupil he also was arrested. He remained in prison several months, beguiling the tediousness of his confinement by diligent study and reading. After his discharge without a trial, he was prohibited from studying at the Prussian universities. He consequently went to Jena, where he took his degrees in 1820. Hence he went to Halle to continue his studies, but being there subjected to constant surveillance, his position became so irksome that he took refuge in Dresden. While living there the Greek revolution broke out. He instantly resolved to abandon his country and to take part in the war of independence. He made his way, chiefly on foot, to Marseilles, where he embarked for Greece. The history of that brief and unfortunate struggle is well known. His own experience is recorded in his *Journal in Greece,* written at Rome and published at Leipsic in 1823. After suffering great hardships, he embarked at Missolonghi in 1822 in a small vessel bound to Ancona. One scudo and a half was all that remained in his purse after paying his passage. From Ancona he went to Rome, where Barthold George Niebuhr, then Prussian ambassador to the papal see, took so great an interest in him that he invited him to become one of his family as the tutor of his son Marcus. He passed a year of unalloyed happiness in Rome, living in the family of the great historian, sharing his confidence and affection, the daily companion of his walks and conversation. Niebuhr quitted the embassy at Rome in 1823, and Lieber returned to Berlin, Niebuhr having previously obtained a promise from the king of Prussia that he should not be molested. But he had hardly arrived in Berlin when he was again arrested upon the old charges of enmity to the government, entertaining republican sentiments, and belonging to a secret association, and was cast into the state prison at Koepnick. After some months he was liberated through Niebuhr's pressing solicitations. While at Koepnick he wrote a little volume of poems, *Wein und*

Wonne Lieder, which was published in Berlin under the name of "Arnold Franz." Fearing renewed persecution, he took refuge in England. He arrived in London in 1825, and resided there for a year, writing for German periodicals and giving lessons in the languages for his support. In 1827 he came to the U. S. with warm recommendations from Niebuhr, who retained the strongest affection for him, and corresponded with him up to the time of the historian's death in 1831—an affection which was fully returned by Lieber, who embalmed his love and gratitude to his friend and benefactor in his *Reminiscences of Niebuhr*, published first in America, republished in England by Bentley, and translated into German by the son of Hugo the Civilian. Lieber arrived at New York June 20, 1827, and proceeded thence to Boston, where he took up his residence. There he commenced his laborious work, the *Encyclopædia Americana*, in 13 vols., which he completed in five years. In 1832 he removed to New York, where he published a translation of De Beaumont and De Tocqueville's work on the penitentiary system. While in New York he received from the trustees of Girard College, Philadelphia, then just founded, the honorable commission of preparing a plan of education and instruction for that institution. This brought him to Philadelphia in 1833, where he remained two years, and published, besides his plan of education, his *Letters to a Gentleman in Germany*. In 1835 he was appointed to the professorship of history and political economy in South Carolina College; he remained in that position at Columbia more than twenty years, during which period he wrote and published the great works upon which his fame chiefly rests. The three principal of these are his *Manual of Political Ethics* (2 vols., 1838), *Legal and Political Hermeneutics, or the Principles of Interpretation and Construction in Law and Politics* (1 vol., 1839), and his *Civil Liberty and Self-Government* (2 vols., 1853). It is impossible within the limits prescribed for this article to convey an adequate idea of the weight and value of these great works. They were positive additions of the greatest importance to the knowledge previously possessed upon these subjects. They embodied in a profound, original, and comprehensive system the principles upon which human society and government repose. They traced to their sources all the social and governmental relations, and expounded their reasons, their history, their distinctions, and their philosophic significance and results, with a clearness of exhibition, a force of argument, a wealth of learning, a power of illustration, and a high moral purpose never before seen in the same field. Everywhere among learned and scientific men these works produced a profound impression, and they have received the highest commendations from the most distinguished publicists of Europe and America. In 1856, Dr. Lieber resigned his professorship in South Carolina College. In 1857 he was elected to a similar professorship in Columbia College, New York, and subsequently to the chair of political science in the law school of the same institution. He continued in the discharge of the duties of that position to the time of his death, which occurred at his house in New York, Oct. 2, 1872. Besides the works which have been already mentioned, Lieber wrote many minor works of great value, among the principal of which may be mentioned *The Origin and Development of the First Constituents of Civilization, Great Events described by Great Historians, Essays upon Property and Labor, The Laws of Property, Penal Laws and the Penitentiary System, On Prison Discipline, The Relation between Education and Crime, The Pardoning Power, International Copyright, The Character of the Gentleman, The Study of Latin and Greek as Elements of Education, Laura Bridgman's Vocal Sounds*, on *Anglican and Gallican Liberty*, on *The Post-office and Postal Reforms*, on *The Independence of the Judiciary*, on *Two Houses of Legislature*, on *Nationalism*, on *Guerilla Parties considered with Reference to the Laws and Usages of War, What is our Constitution—League, Pact, or Government?* and a large number of small tracts and publications. He wrote also many able articles on public questions, which appeared in the New York *Evening Post* and other papers over the signature of "Americus." He also contributed valuable papers to the *Revue de Droit international*. During the civil war in the U. S. Dr. Lieber rendered valuable service to the government and the country. As early as 1851, in an address delivered in South Carolina, he had warned the South of the ruin with which the doctrine of secession threatened it and the whole country. During the war his pen was constantly at work supporting the government and upholding the Union. He was frequently summoned to Washington by telegraph by the secretary of war for consultation and advice upon the most important subjects. Upon the requisition of the President of the U. S. he prepared a code of war, which was officially promulgated to the army in general orders of the war department (No. 100, 1863), as *Instructions for the Government of the Armies of the United States in the Field*—a work which added to his great reputation. Dr. Lieber was a firm believer in the Christian religion. He was a Protestant, and a zealous defender of religious as well as civil liberty. He was a laborious student, and had a most extensive and accurate knowledge of historical as well as political subjects. He was of a gracious and cheerful disposition, possessed a sprightly imagination, and his conversation was replete with instruction and wit. Nature gave him a robust frame. He was short in stature, compact, and muscular. He was fond of athletic exercises. In his younger days he was noted for his strength. When he arrived at Boston in 1827 he established a swimming school and gave lessons in that art. His head was massive, his eyes deep set beneath a brow broad and noble. His countenance indicated the thoughtful repose and conscious power of a great mind. His writings constitute a distinct landmark in the history of public law and political science. The saying of which he was the author, and which he adopted as a motto in his later years, may be taken as the keynote of all his political writings: "No right without its duties—no duty without its rights." He was a member of the French Institute, and of many learned and scientific societies in Europe and America. M. RUSSELL THAYER.

Lieber (OSCAR MONTGOMERY), b. in Boston Sept. 8, 1830, son of Dr. Francis Lieber; was educated as a chemist and mineralogist at the universities of Berlin and Göttingen and the School of Mines at Freiberg, Saxony; was appointed State geologist of Mississippi in 1850; wrote *The Assayer's Guide* (1852), *The Analytical Chemist's Assistant* (1852), *Geology of Mississippi* (1854), and many articles in the *Mining Magazine*. In 1854–55 was engaged in the geological survey of Alabama, and from 1856 to 1860 was mineralogical, geological, and agricultural surveyor of South Carolina, in which capacity he published four annual reports; in 1860 went as geologist to Labrador with an astronomical expedition; entered the Confederate army in 1861; was mortally wounded at the battle of Williamsburg, and d. at Richmond, Va., June 27, 1862.

Lie'big, von (JUSTUS), BARON, b. at Darmstadt May 12, 1803; received his earliest education in the gymnasium of his native city; from 1819 to 1822 studied natural science and chemistry at the universities of Bonn and Erlangen, and from 1822 to 1824 in Paris. A paper on fulminic acid which he read before the French Institute introduced him to Alexander von Humboldt, and by his influence he was appointed professor of chemistry at the University of Giessen, Hesse-Darmstadt, in 1824. At Giessen he resided from 1824 to 1852; established a laboratory for practical chemistry, the first of its kind in Germany; founded, together with Geiger of Heidelberg, the *Annalen der Pharmacie;* and made in a short time his lecture-room the centre of the study of chemistry, to which students gathered in great numbers, and from which issued many great scientific discoveries, and a flood of new and most valuable practical ideas with respect to the application of chemistry. In 1852 he removed to Munich as professor of chemistry at the university and director at the chemical laboratory. In 1860 was chosen president of the Academy of Sciences at Munich, and in 1861 foreign member of the Academy of Sciences at Paris. D. Apr. 18, 1873, generally acknowledged as the greatest chemist of his time. Besides a great number of articles in the *Annalen der Pharmacie* and the *Handwörterbuch der Chemie* (9 vols., 1837-64), which he compiled together with Poggendorff of Berlin, he wrote *Die organische Chemie in ihrer Anwendung auf Agricultur* (1840), translated into English by Dr. Lyon Playfair under the title *Chemistry in its Application to Agriculture and Physiology; Grundsätze der Agricultur Chemie* (1855), *Theorie und Praxis der Landwirthschaft* (1856), *Naturwissenschaftliche Briefe über die moderne Landwirthschaft* (1859); and in another line, *Die Thierchemie oder organische Chemie in ihrer Anwendung auf Physiologie und Pathologie* (1842), translated into English by William Gregory under the title *Animal Chemistry, or Chemistry in its Application to Physiology and Pathology; Chemische Untersuchungen über das Fleisch und seine Zubereitung zum Nahrungsmittel* (1847), *Die Ursachen der Säftebewegung im thierischen Organismus* (1848). That of his writings which has made him most popular, and contributed most to introduce chemical truths among educated people and spread sound views with respect to their importance in every-day life, is his *Chemische Briefe* (1844), translated into English under the title *Familiar Letters on Chemistry and its Relations to Commerce, Physiology, and Agriculture.* On practical life he probably exercised a greater influence than any chemist before him; new methods were introduced by him in agriculture, pharmacy, the manufacture of vinegar, glass, etc., the preparation of food, etc. His meat extract is now extensively used, and so is his *Suppe für Säuglinge* ("baby soup"). In science he ranks as one of the founders of organic chemistry, and his

researches concerning the application of chemistry to physiology and pathology are invaluable.

Liech'tenstein, the smallest principality of the German confederation, comprising an area of 60 square miles, with 8320 inhabitants, and situated between Tyrol and the canton of the Grisons, Switzerland, on the upper Rhine. It is mountainous, but fertile, producing wheat, wine, and fruits. The prince lives in Vienna. The capital, Vaduz, has 1000 inhabitants.

Liege [Flem. *Luyk;* Ger. *Lüttich*], the easternmost province of Belgium. Area, 1106 square miles. Pop. 592,177, of whom nine-tenths speak French, and one-tenth Flemish. The southern part of the province is hilly, consisting of rocks covered with heath or woods, but rich in coal and iron. The northern part, the so-called *Herveland*, is more level, exceedingly fertile, and cultivated like a garden. The valley of the Meuse is very beautiful, and affords excellent pasturage for cattle.

Liege [Fr. *Liége;* Dutch, *Luyk;* Ger. *Lüttich*], town of Belgium, the capital of a province of the same name, and the centre of one of the most enterprising and prosperous manufacturing regions of the country, is situated in a beautiful valley on both sides of the Meuse, at its junction with the Ourthe, and defended by a strong citadel on the summit of Sainte Walburge to the N. W., and by several detached forts—Cornillon to the N., and Chartreuse to the E. The older part of the city consists of narrow and crooked streets, lined with tall, gloomy, and dirty houses; the more recent parts, the many public squares, and the quays along the rivers, which are crossed by a number of elegant bridges, are very fine. The most remarkable of the public buildings are the cathedral, built in the thirteenth century; the church of St. Martin, which was burnt in 1312, but was rebuilt in 1542; the church of St. Jacques, one of the richest specimens of the ogival Gothic; the Palais de Justice, built in Renaissance style 1508–26, and formerly used as residence by the prince-bishop. The university was founded in 1817, during the union with the Netherlands, and is now a flourishing institution; it has a mining school, a polytechnic school, and a botanical garden connected with it. The whole region around Liege is very rich in coal and iron; the mines are run even under the city and the river. These natural riches, in connection with the favorable situation of the city at the junction of two navigable rivers, very early gave rise to an extensive commerce and manufacturing industry, which, in spite of many violent interruptions, have gone on increasing through several centuries. The products are very varied—cotton goods, cloths, straw hats, chemicals, etc.—but iron, especially as guns, cannon, and machinery, is the principal branch of manufactures in Liege, and is carried to perfection. In the seventh century the city existed as a village of the name of *Leodium;* in the eighth it became the seat of a bishop; in the tenth it was surrounded with walls and fortified. During the wars with the French republic the bishop of Liege, who was an independent prince of the German empire, was expelled and his territory incorporated with France. In 1815 the city came to Holland, and in 1830 it was one of the first places which rose in rebellion against the unnatural union. Pop. 106,442.

Lieg'nitz, town of Prussia, in the province of Silesia, at the confluence of the Katzbach and the Schwartzwasser. It is a neat and thriving town, with many good educational institutions and large manufactures of cloth, leather, and tobacco. It was formerly a fortress, but its fortifications have been transformed into gardens and promenades. Noted for the battle of Aug. 15, 1760, in which Frederick II. defeated the Austrians. Pop. 23,134.

Li'en [Fr., "bond"]. The word *lien*, as a legal term, is used in so many unlike senses at the present day that it is difficult, if not impossible, to frame a single definition which shall accurately apply to all particular instances. In one class of cases it is simply a right to retain possession of a chattel until some debt or demand, generally incurred in respect of it, is paid by the owner to the person thus detaining. In all other classes it is a charge or incumbrance upon either lands or chattels which are not retained in the possession of the creditor, as a security for the payment of some debt or demand, with power to enforce the claim by a judicial proceeding resulting in a sale of the thing and a payment of the demand from the proceeds. There is, therefore, no real legal identity between these different classes of rights. That first described is of purely a common-law origin: the others may be easily traced to doctrines and rules of the Roman law. A lien is never, in any of its phases, an estate or property in the thing over which it extends; it is at most an incumbrance upon the thing, the property in which belongs to another, and a right to regard and treat the thing as a special fund from which the payment of the debt may be enforced. Liens exist either as the result of some general rule of the law, and are then the incidents of a prior transaction or legal relation entered into by the parties, or they may arise from the stipulations of an express agreement. Those which are created by the law operating upon the acts or omissions of the parties are separated into the following generic classes: I. Common-Law Liens; II. Equitable Liens; III. Maritime or Admiralty Liens; IV. Statutory Liens.

I. *Common-Law Liens.*—The particular instances of liens which fall within this division were created or recognized as existing by the common-law courts, and the rules which govern them were established at a very early day in the history of English jurisprudence. They are entirely different in their nature and effects from those which belong to the other classes, having, in fact, little in common with them except the name. The essence of the common-law lien is the *possession* of the thing over which it extends. It consists in the right of the creditor, under the circumstances in which it arises, to retain in his own possession the goods and chattels of another until some debt or demand is paid by their owner. In order that the right should arise at all, the possession must be lawful and valid; that is, the person who delivers the articles into the custody of the one asserting the lien must have authority to make such a disposition of them, for the common law admitted no lien upon goods as against their rightful owner which would result from the unlawful or unauthorized acts of another. Exceptions to this rule have been created by statute in a few instances in the interests of trade, but the rule remains, as a general doctrine of the law, in full force. There can also be no lien when the possession was fraudulently or tortiously obtained by the creditor. As possession is the very essence of the common-law lien, as it consists solely in the continued retention of possession, it follows as a necessary consequence that when possession of the goods is voluntarily surrendered the lien thereon is at once and for ever gone. If, however, a number of articles have been received at the same time and as one transaction, and the creditor afterwards delivers to the owner a portion thereof, the lien for his entire demand in respect of the whole amount remains good against the balance still left in his hands. For example, if 100 barrels of some commodity were deposited as one lot with a warehouseman to be kept for hire, and he should from time to time permit the owner to withdraw 90 barrels without receiving payment for their storage, he could retain the remaining ten until paid his charges for the whole number deposited. Common-law liens are either *ordinary* (sometimes called special) or *general*. In the case of the *ordinary* or *special* lien the debt or demand must be due for services rendered to or about the very articles themselves which are subject to it; while in that of the *general* lien the debt or demand may be for a general balance due for former services of a similar character, rendered in respect of other goods of the same owner. The former is the rule, the latter is the exception; in fact, a general lien is permitted only in a very few instances.

As a general proposition, the common-law lien thus described arises whenever goods and chattels are received into the possession of a person, in order that he may render some service in respect of them to the owner, upon an express or implied contract for compensation therefor. The service may consist either in the mere care and custody of the articles, or in work and labor expended upon them, or in the advancement of money upon their credit. This description includes all cases of bailments for hire, and also certain other employments which, though not strictly bailments, require that the articles in connection with which the service is rendered should come into the possession of the person employed. The following are the most important and familiar instances of persons who are thus entitled to a lien upon the goods and other articles which come into their possession in the course of their respective employments as a security for the compensation due therefor: warehousemen and wharfingers; innkeepers on the goods of their guests; boarding-house keepers are not entitled to any lien at the common law, but it has been given to them by statute in several States; common carriers; all bailees for hire, who receive the goods of their employers and perform work and labor upon their construction and repair, including tailors and mechanics of every kind under the circumstances thus described; auctioneers, factors, and commission-merchants for their charges, expenses, and advances on goods consigned for sale, and on the proceeds thereof when sold; venders of goods sold for cash for their price; bankers, on the securities of their customers for any advances made upon the credit thereof; attorneys on the papers of their clients, and also at the common law on judgments recovered by them. There are other instances in which a lien exists, but these examples are fully sufficient to illustrate the

general rule. As already stated, the common-law lien only allows the holder thereof to retain possession of the articles until his demand is paid.

II. *Equitable Liens.*—The liens which belong to this class were created, and are exclusively enforced, by courts of equity. They differ in every respect from those already described, since possession is not an essential, nor even an ordinary, element of their existence, and payment of the demand secured can be directly enforced by their means. An equitable lien is therefore a charge or incumbrance, cognizable in equity, upon property, generally land, not in the possession of the creditor, as security for the payment of a debt or demand, and it may be enforced by an action and a decree made therein, ordering a sale of the subject-matter and payment of the debt out of the proceeds. The following are the most important cases in which such lien exists: (1) Whenever land is sold or conveyed, and the price remains unpaid, and is secured in no other manner than by the purchaser's own verbal or written promise, the vender or grantor has a lien on the land as security for such unpaid price. (2) When lands are contracted to be sold, but are not conveyed, and remain in the possession of the vender, the vendee has a lien thereon for the purchase-price which he has prepaid. (3) If land is conveyed or devised subject to a charge upon it for the payment of debts or legacies, a lien arises upon it in favor of the creditors or legatees as a security for the payment of their demands. (4) A deposit of title-deeds as a security for the loan of money creates a lien in favor of the lender upon the land described in the conveyances. (5) According to the equitable doctrine which now prevails in many and perhaps most of the States, the right and interest of the mortgagee in an ordinary mortgage of lands is simply a lien on the premises as a security of the mortgage debt.

III. *Maritime or Admiralty Liens.*—The liens of this class are created by the law which is administered in courts of admiralty, and they result as incidents from various species of maritime contracts and torts. In their general nature they resemble the equitable liens, both in not requiring possession of the subject-matter by the creditor, and in being enforceable by a judicial proceeding. They constitute a charge upon the thing, even though in the custody of its owner, and often follow it into other countries and into the hands of subsequent purchasers. These liens may attach to the vessel, to the cargo, or to the proceeds of each, and to the freight earned by the ship. The most important cases are—(1) That of seamen for their wages on the ship and freight, or their proceeds. (2) That of material-men under certain circumstances on the vessel for repairs made or supplies furnished. (3) That of the ship-owner on the cargo for the freight earned in its transport. This is, however, not in its full extent a maritime lien, for it is lost if the goods are voluntarily delivered without payment. (4) That of the shipper on the vessel for the value of his goods shipped. (5) That created on the vessel by the execution of a bottomry bond, which is a peculiar form of security given by a master or other agent for money borrowed by them under certain special circumstances upon the credit of the ship. (6) That of salvors on the ship, cargo, or freight which they have rescued from loss by marine perils. (7) In case of a collision the owners of the injured vessel have a lien on the one in fault for the damages caused by the tort. Purely maritime liens are enforceable by a judicial proceeding in a court of admiralty, which results in a sale and payment out of the proceeds.

IV. *Statutory Liens.*—In addition to the foregoing there are various other liens entirely created or regulated by statute. One or two of the most important need only be mentioned. In many of the States, and probably in most, a lien is given by statute to mechanics, builders, and furnishers of materials upon the buildings constructed or repaired by them, in order to secure the cost of the materials furnished and the price of the work and labor done. The statutes conferring these liens greatly differ in their details, but they all authorize a judicial proceeding for their enforcement analogous to that for the foreclosure of mortgages. Judgments are made liens upon the lands of the debtors therein, but the provisions of the statutes in reference to their commencement and duration, and the lands to which they apply, are so various and conflicting that no attempt will be made to enumerate them.

Nothing has been said in respect to those liens which are created by express agreements, because their nature and extent must depend entirely upon the stipulations which the parties see fit to enter into, and they are therefore subject to no general rules, and admit of no general classification. JOHN NORTON POMEROY.

Lierre', town of Belgium, in the province of Antwerp, on the Nethe. It has large manufactures of lace, cotton, woollen, and silk fabrics, and extensive breweries and distilleries. Pop. 14,791.

Lieuten'ant [Fr., literally, "holding the place"], one who acts as the representative of another. In the U. S. army and marine corps a lieutenant is a commissioned officer below the rank of a captain. There are two grades, called first and second lieutenants. The latter are the lowest in rank of commissioned officers. The first and second lieutenants take rank with masters and ensigns in the navy. A lieutenant of the U. S. navy takes rank with a captain in the army. His office is next higher than that of master, and next below that of lieutenant-commander. A lieutenant-general in the army ranks next below a general and next above a major-general. His rank is equivalent to that of a vice-admiral. Lieutenant-colonels in the army rank next below colonels and next above majors; their rank corresponds with that of commanders in the navy. Lieutenant-commanders in the navy rank next below commanders and next above lieutenants; their office corresponds with that of majors in the army.

Life. See BIOLOGY, by PROF. THEODORE GILL, M. D., PH. D.

Life Assurance is the guarantying of money contingently on human life. The guaranty is given by an association or corporation called a *life assurance company,* and is contained, with its conditions, in a written instrument termed a *policy of assurance;* the person on whose life or death payment of the sum assured is made dependent is the *person whose life is assured,* and the one to whom or his representatives the payment is to be made on the happening of the contingency, and who is responsible to the company for the premiums, is the *assured* or *policy-holder;* the consideration to be paid the company for assurance is the *premium;* the chance of death or life in any given year, to the person whose life is assured, is the *risk.*

A life assurance company may be *proprietary, mutual,* or *mixed.* A *proprietary* or stock company is one formed by a number of persons who subscribe a capital (and thus become proprietors) adequate to pay expenses and cover the contingency of early losses before the premiums have sufficiently accumulated. It is organized for dealing in life contingencies as other mercantile companies are for trading in goods. Policy-holders have no voice in the management and do not participate in any profits which may accrue. A *mutual* company is an association of persons, each of whom is an assurer as well as assured. Policy-holders exercise control through their votes for managers, and are entitled to all the profits or dividends of the society. A *mixed* company is one formed upon a combination of the principles of the two preceding. A cash capital is raised by a number of subscribers, who agree to assume responsibility for the first expenses and early losses, and at stated intervals to divide among the assured a certain proportion or the whole of the accumulated surplus or profits.

Policies of assurance are of various kinds. The chief of them are—whole life, endowment, endowment assurance, term, joint life, annuity, survivorship annuity. Other varieties are obtained from these by modification or combination of conditions.

Policies which are to be paid on the death of an individual are, in theory, not payable till the end of the year in which the given life fails; but in practice they are usually paid in sixty or ninety days after due proofs of death have been furnished. In other kinds of policy the time of payment is specified in the contract. Whatever the kind of policy, the premium to be paid for it by the holder depends upon the liability of death or life, in any given year, of the person whose life is assured, and on the rate of interest on money. The chance of life or death, "the risk," is determined from a

Table of Mortality.—This is a table which shows, for each year of life from birth to the highest age attainable, how many persons out of a given number alive at the beginning of any year die by the end of it.

Dr. Price's Northampton Table was the first one known to have been used to determine rates of premium for life assurance. (*Walford.*) It had many defects, as might reasonably be expected from the crude state, at the time, of the science of vital statistics. It has been practically superseded in England, and has never been much used in the U. S., except for certain purposes in courts of law. The tables which have been computed since, and which have been used to any extent in business, differ materially from the Northampton, but, with due allowance for such variations as might be expected from the circumstances attending their construction, corroborate each other in a remarkable manner. Since they were prepared by different persons from different data, their general coincidence forms strong proof of their essential accuracy. Two tables largely used in this country by companies and for State supervisory purposes are the Actuaries' or Combined Experience, and the American Experience. They are here inserted, with the expectation of life as deduced from each:

	Actuaries' Table.			American Experience Table.			
Age.	Number of living.	Number of deaths.	Expectation, years.	Number of living.	Number of deaths.	Expectation, years.	Age.
10	100000	676	48.36	100000	749	48.7	10
11	99324	674	47.68	99251	746	48.1	11
12	98650	672	47.01	98505	743	47.4	12
13	97978	671	46.33	97762	740	46.8	13
14	97307	671	45.64	97022	737	46.2	14
15	96636	671	44.96	96285	735	45.5	15
16	95965	672	44.27	95550	732	44.9	16
17	95293	673	43.58	94818	729	44.2	17
18	94620	675	42.88	94089	727	43.5	18
19	93945	677	42.19	93362	725	42.9	19
20	93268	680	41.49	92637	723	42.2	20
21	92588	683	40.79	91914	722	41.5	21
22	91905	686	40.09	91192	721	40.9	22
23	91219	690	39.39	90471	720	40.2	23
24	90529	694	38.68	89751	719	39.5	24
25	89835	698	37.98	89032	718	38.8	25
26	89137	703	37.27	88314	718	38.1	26
27	88434	708	36.56	87596	718	37.4	27
28	87726	714	35.86	86878	718	36.7	28
29	87012	720	35.15	86160	719	36.0	29
30	86292	727	34.43	85441	720	35.3	30
31	85565	734	33.72	84721	721	34.6	31
32	84831	742	33.01	84000	723	33.9	32
33	84089	750	32.30	83277	726	33.2	33
34	83339	758	31.58	82551	729	32.5	34
35	82581	767	30.87	81822	732	31.8	35
36	81814	776	30.15	81090	737	31.1	36
37	81038	785	29.44	80353	742	30.4	37
38	80253	795	28.72	79611	749	29.6	38
39	79458	805	28.00	78862	756	28.9	39
40	78653	815	27.28	78106	765	28.2	40
41	77838	826	26.56	77341	774	27.5	41
42	77012	839	25.84	76567	785	26.7	42
43	76173	857	25.12	75782	797	26.0	43
44	75316	881	24.40	74985	812	25.3	44
45	74435	909	23.69	74173	828	24.5	45
46	73526	944	22.97	73345	848	23.8	46
47	72582	981	22.27	72497	870	23.1	47
48	71601	1021	21.56	71627	896	22.4	48
49	70580	1063	20.87	70731	927	21.6	49
50	69517	1108	20.18	69804	962	20.9	50
51	68409	1156	19.50	68842	1001	20.2	51
52	67253	1207	18.82	67841	1044	19.5	52
53	66046	1261	18.16	66797	1091	18.8	53
54	64785	1316	17.50	65706	1143	18.1	54
55	63469	1375	16.86	64563	1199	17.4	55
56	62094	1436	16.22	63364	1260	16.7	56
57	60658	1497	15.59	62104	1325	16.1	57
58	59161	1561	14.97	60779	1394	15.4	58
59	57600	1627	14.37	59385	1468	14.7	59
60	55973	1698	13.77	57917	1546	14.1	60
61	54275	1770	13.18	56371	1628	13.5	61
62	52505	1844	12.61	54743	1713	12.9	62
63	50661	1917	12.05	53030	1800	12.3	63
64	48744	1990	11.51	51230	1889	11.7	64
65	46754	2061	10.97	49341	1980	11.1	65
66	44693	2128	10.46	47361	2070	10.5	66
67	42565	2191	9.96	45291	2158	10.0	67
68	40374	2246	9.47	43133	2243	9.5	68
69	38128	2291	9.00	40890	2321	9.0	69
70	35837	2327	8.54	38569	2391	8.5	70
71	33510	2351	8.10	36178	2448	8.0	71
72	31159	2362	7.67	33730	2487	7.6	72
73	28797	2358	7.26	31243	2505	7.1	73
74	26439	2339	6.86	28738	2501	6.7	74
75	24100	2303	6.48	26237	2476	6.3	75
76	21797	2249	6.11	23761	2431	5.9	76
77	19548	2179	5.76	21330	2369	5.5	77
78	17369	2092	5.42	18961	2291	5.1	78
79	15277	1987	5.09	16670	2196	4.8	79
80	13290	1866	4.78	14474	2091	4.4	80
81	11424	1730	4.48	12383	1964	4.1	81
82	9694	1582	4.18	10419	1816	3.7	82
83	8112	1427	3.90	8603	1648	3.4	83
84	6685	1268	3.63	6955	1470	3.1	84
85	5417	1111	3.36	5485	1292	2.8	85
86	4306	958	3.10	4193	1114	2.5	86
87	3348	811	2.84	3079	933	2.2	87
88	2537	673	2.59	2146	744	1.9	88
89	1864	545	2.35	1402	555	1.7	89
90	1319	427	2.11	847	385	1.4	90
91	892	322	1.89	462	246	1.2	91
92	570	231	1.67	216	137	1.0	92
93	339	155	1.47	79	58	0.8	93
94	184	95	1.28	21	18	0.6	94
95	89	52	1.12	3	3	0.5	95
96	37	24	0.99				96
97	13	9	0.89				97
98	4	3	0.75				98
99	1	1	0.50				99

The manner of reading such a table is apparent. According to the Actuaries' Table, of 100,000 persons alive at age ten, 676 will die before reaching age eleven; upon their next year will then enter the difference between 100,000 and 676, or 99,324, of whom 674 will die before attaining age twelve; etc. At age ten the expectation of life is 48.36 years; at age eleven, 47.68 years, etc.

By the "expectation of life" at any age is meant the mean after-lifetime remaining to persons of that age.

The determination of the expectation of life may be of interest to the general reader, but it is of little or no practical value in assurance business proper. The real use of the mortality table in an assurance office is to find the average chance of death or life in any year of persons of a given age. To obtain the average chance of death, take, for example, a person aged 40. The American table shows that of 78,106 persons alive at that age, 765 died during the succeeding year, or about 98 in 10,000; the chance that *any one* of them will die is expressed by 765 divided by 78,106, or, approximately, by $\frac{98}{10000}$; and similarly for any age in the table. If it is desired to find the average chance that a person aged 40 will survive 41 and die before reaching 42, the process is equally simple. Thus, of 78,106 persons aged 40, 774 survive the year immediately following, and die before reaching 42, or about 99 in 10,000; the chance that *any one* of them will do so is therefore expressed by 774 divided by 78,106, or, nearly, by $\frac{99}{10000}$; and so for each succeeding year. The chance of *life* for successive years is also easily deducible. Since a person aged 40 has 98 chances in 10,000 of *dying* during the year, he must have 10,000 *diminished* by 98 chances, or nearly 99 chances in 100, of *living* through the first year; since he has 99 chances in 10,000 of surviving the first and *dying* the second year, he must have 9901 chances in 10,000, or about 99 chances in 100 of *surviving* the second year.

In addition to the chance of life or death in any given year, as determined from the mortality table, the premium for assurance depends also, in part, upon the rate of interest on money. The premium is not to be locked up in a company's safe and left unproductive. It is expected to earn interest, and thus assist the policy-holder in carrying out his design. One great function of company officers is to see that the premium does its full share of the work. It is of the first importance, therefore, to determine at the outset how much assistance this matter of interest can be safely counted upon to render—not this year nor next year alone, but always. In mutual companies of the U. S. the rate generally assumed is 4 per cent.; in proprietary companies it is somewhat higher. The rate of interest being fixed and a mortality table selected, the determination of the premium for any kind of policy is simple in principle.

The full or *office* premium in any case consists of two parts—the pure or *net* premium, as it is termed, and a certain addition thereto called the *loading*. The loading and (consequently) expenses and contingencies of business will for the moment be disregarded, and the net premium alone considered. The general method of determining the premium is the same whatever the amount of the policy, the age of the assured, the kind of company selected, the rate of interest, and table of mortality.

I. A *whole-life policy* is a contract in which the company agrees to pay the representatives of the assured a specified amount of money at the end of the year in which he may die. The net premium may be paid in several ways. First, in one single payment in advance, known as the *net single premium*. It will be observed that while the premium is paid at once, the amount of the policy is not due till the *end* of the year in which the given life fails. If it had *certainly* to be paid at the end of the first year, the premium necessary would be $1000 discounted for a year at 4 per cent. (*i. e.* such a sum as, invested at 4 per cent., would amount to $1000 at the end of the year)—that is, $961.54 nearly; but it has to be paid only on *condition* that the assured shall die during the year. The chance of his death is found from the mortality table (as before explained) to be ninety-eight ten-thousandths of certainty, and hence the net premium for the first year should be $\frac{98}{10000}$ths of $961.54, or $9.42. In the same way, if the policy had certainly to be paid at the end of the second year, the premium for this would be $1000 discounted for *two* years at 4 per cent. compound interest—that is, $924.56; but the average chance that a person aged 40 will survive 41 and die before attaining 42 was found to be ninety-nine ten-thousandths of certainty, and therefore the proper premium for the second year is $\frac{99}{10000}$ths of $924.56, or $9.15. The net charge being, then, $9.42 for the first year and $9.15 for the second, it will for both be the sum of these, or $18.57. Calculate in like manner the requisite premium for the third year, the fourth year, and for every separate year up to and including the last year of life as given in the table, which is 95: add the results for all the separate years together, and the sum will be found to be $367.58, which is the net single premium required for the policy considered.

The net single premium, being comparatively large, may for various reasons be inconvenient or undesirable. A plan has therefore been devised by which a series of *equal annual* payments, continued for life, may effect the same object. These annual premiums, which are made at the beginning of each year, must have a *present value* equal to the net

single payment, for the latter is just sufficient. The present value of a series of equal payments, each of given amount, to be made at stated periods for a specified length of time (money bearing a certain rate of interest), is that sum of money which, invested at the given rate of interest, will produce the given amount at the successive periods for the whole of the time. To obtain the equal annual payment required, find, first, the present value of *one dollar* paid at the beginning of each year by a person aged 40 as long as he shall live. The first payment, being made at once and subject to no contingency, is worth one dollar; the second, due a year after the first, would, if *certain* to be received, be worth one dollar discounted for a year at 4 per cent.—that is, 96 cents; but its receipt depends on a person's being alive to pay it, the chance of which, as before shown, being ninety-nine hundredths of certainty, the second payment is worth $\frac{99}{100}$ths of 96 cents, or 95 cents; the third payment, due two years after the first, would, if certain, be worth one dollar discounted for *two* years at 4 per cent., compound interest—that is, 92 cents; but the chance of its reception being ninety-nine hundredths of certainty, it is worth $\frac{99}{100}$ths of 92 cents, or 91 cents: the three payments are together worth the sum of these, or $2.86. Continue thus to estimate the contingent value of the payment for each successive year of life up to and including 95; add all the results together, and the sum, $16.44, is the present value in one payment of one dollar paid annually in advance for life by a person aged 40. Since, then, $16.44 is the present value of *one dollar* paid as described, $367.58 must be the equivalent of an annual payment made in like manner by the same person, found by dividing $367.58 by 16.44—that is, $22.35, which is the net annual premium sought.

To explain the function of the net premium, let it be assumed at first that the payments for a policy are in equal annual premiums continued for life. The same explanation will serve, *mutatis mutandis*, when payments are otherwise made. The net annual premium being invariable in amount, and the risk of death to the assured increasing from year to year, such premium must accomplish two purposes. It must, in the first place, pay year by year what is technically called the *cost of assurance*. This expression, as used by an actuary, means something quite different from what a policy-holder means by it. To the latter it is the premium; to the former it is the part which that premium must contribute to the death-claims in any year. On the hypothesis that the mortality table is exact (and all the calculations must be made on this supposition), a certain number of policies will annually become claims by death. These must be paid, and as the company is supposed a mutual one, and has no capital beyond what has been and is contributed by the policy-holders, each premium must contribute its just proportion to meet the obligations. Thus, of 10,000 persons, aged 40, assured in a company, 98 will die the first year, and, each policy being for $1000, $98,000 will have to be paid. As provision is made at the *beginning* of the year, and the policies are not payable till the *end* of it, $98,000 discounted for a year at 4 per cent., or $94,230, will be sufficient, which for each of the 10,000 would, if each paid *just enough* to raise the necessary fund, be $9.42 apiece. But each pays a net premium of $22.35, and hence pays $12.93 *more* than is necessary for the current obligations; therefore, each of those who die contributes to his own claim $12.93, which for the 98 amounts to $1267, leaving the real amount to be provided by the company the difference between $94,230 and $1267, or $92,963: this for each of the 10,000 is $9.29. This $9.29 is the cost of assurance for the first year, and is actually paid out by the company if the table-mortality is experienced. It is the contribution which each of the premiums under consideration must make for the benefit of the representatives of those of the co-assured who do not survive the year.

The second function of the net premium is to provide a deposit to the credit of each policy at the end of the year. The necessity of this deposit is apparent. If each year's cost of assurance, and that only, were paid each year, the charge to the assured would be lighter in the first years of the policy than under the equal-annual payment system, but it would grow steadily heavier with advancing time, and finally become an intolerable burden. To prevent this, he pays more at first than the risk is worth, that at a later date he may pay less. Entering at 40, and paying each year by itself, his net premium on a policy of $1000 for the first year would be $9.42; at 58, it would be $22.05; at 70, $59.61; at 95, $961.54; and these charges a company would be compelled to make to be entitled to confidence; yet under the equalized system it is no more at any time than $22.35. It is evident from this that the excess of the payments in the earlier years must be rigorously set aside as a fund, which, with the interest accumulated upon it, will suffice to make good the inadequacy of those of later years. The method of determining the amount of the necessary deposit has just been illustrated. In the case considered the deposit on each policy in force at the end of the first year is $13.58; at the end of the second year it is $27.64; and similarly for each succeeding year. If the assured who entered at age 40 were just entering at 41, his net annual premium would be $23.19; yet he pays but $22.35—84 cents less—because he has on deposit $13.58,* which (4 per cent. interest being assumed) is the present value in hand of 84 cents paid annually in advance for life by a person aged 41. If he were just entering at 42, his net annual premium would be $24.08; but he pays $1.73 less, because his deposit of $27.64* is the present value of $1.73 paid annually in advance for life by a person aged 42: at the end of ten years the deposit to his credit must be $157.29, the present value of $11.35—the difference between the net premium $22.35, which he pays, and $33.70, which he would be required to pay if he were just taking his policy at age 50. The amount of the deposit on a policy paid for by equal annual premiums, continued for life, must always be the present value of the difference between the net premium paid and that which would be requisite if it were taken by the same person at his then increased age at the beginning of the year next succeeding.

It is evident, from what has preceded, that when a life policy is paid for by annual premiums continued for life, the deposit or reserve is accumulated to *aid* the assured in continuing his assurance from year to year; that when paid for by a single premium such deposit is intended to *effect* his continued assurance; and that when paid for by annual premiums continued for a limited number of years only, the deposit is to aid the policy-holder until the expiration of the given number of years, at which time it must be sufficient to effect the continued assurance.

II. A *term* policy is a contract in which the company agrees to pay the representatives of the assured a specified amount of money at the end of the year in which he may die, provided his death should occur within a certain number of years named in the policy.

III. An *endowment* policy is one in which the company agrees to pay a specified amount to the assured himself at a certain future period (stated in the contract) if he should then be alive to receive it. The net premium may be paid at once or at stated intervals, as may be agreed.

Children's Endowment Policies.—These are promises to pay, on a child's attaining the age of 18, 21, or 25 years, as may be stated, a certain specified amount. In case of the child's death before the age specified, the premiums paid may be retained or returned, according to agreement. If they are to be returned, the policy is of a mixed character, consisting of a pure endowment for which a certain premium, either single or annual, must be paid, and a term assurance on the child's life of an amount which varies with the premiums paid before the policy becomes a claim, for which an additional premium must be paid.

IV. An *endowment assurance* (commonly called an *endowment*) policy is a combination of a pure endowment with a term policy. By it the company agrees to pay a stipulated sum of money at a certain future period in case the person on whose life assurance is made should then be alive, or at his death if that should happen before the expiration of the period.

V. A *joint-life* policy is a contract to pay a certain amount on the death of one of two or more persons named, on the joint continuance of whose lives assurance is made. There are not usually more than two persons named, though there may be three or more.

VI. *Annuity.*—This is a contract in which a company agrees to pay a given sum annually, either during the remainder of life, or for a specified number of years if the person on whose life assurance is made should live so long, in consideration of a gross sum paid at once by the *annuitant.*

VII. A *survivorship annuity* is an agreement to pay a specified annuity to a nominee during his survivorship of the person on whose life assurance is made.

The policies which have been briefly explained are the chief and fundamental ones. Other varieties are obtained by variations of conditions as to forfeiture, to mode and time of paying premiums, to distribution of surplus, etc. But one such variety will be treated of here, viz.:

Tontine Dividend or Savings Fund Policy.—This is an ordinary life policy, or an endowment assurance policy with from ten to twenty years or more to run, in which the tontine principle is applied to dividends. The distinctive features of it are—the holders of such policies constitute a class by themselves; they do not participate in profits till

*Each of these amounts is, in consequence of the fractions disregarded in the calculation, slightly in error; but here, as in other examples given, accuracy of result is made to yield to simplicity of illustration.

after the lapse of a certain number of years (ten, fifteen, or twenty), specified in the policy; in case of death before the dividend period begins, the representatives of the assured will receive the sum secured by the policy and no more; no surrender value will be allowed to any one who may relinquish his policy, and no dividend will be credited to such policies as may become claims before the dividend period arrives; all profits accruing from every source within the class are reserved till the arrival of the specified dividend period; the accumulated dividends are then to be equitably divided, on the contribution plan, among such policies as are then actually in force.

Reserve.—Upon each policy issued a deposit must accumulate in each successive year of its currency, upon the same general principles and for the same reasons as were given under life policies. It may in general be stated that the deposit on a policy at the end of any year must be the present value of the difference between the net premium paid by the assured and that which would be required from him if he were just taking, at his then increased age, a policy of like kind and amount terminable at the period specified in the policy. The sum-total of all the deposits held, with their accumulated interest at the assumed rate, is known as the *reserve.* It is also called *reserve for reinsurance,* inasmuch as it is the amount with respect to each policy which a company, in transferring or reinsuring its individual risks, would be obliged to pay another company to make it safe for the latter to undertake them. (As to general reinsurance or amalgamation of companies, see *N. Y. Ins. Report,* 1874.)

Registered Policies.—In several of the States life companies authorized to transact business therein are permitted by law to make with the State insurance department a special deposit of securities for the protection of certain policies. The policies thus protected are duly registered in proper books kept in the department for that purpose. The securities so deposited must always be kept equal in value to the net present value of the registered policies. The State makes itself responsible for the safe-keeping and proper application of the reserve fund on the registered policies of a company (and on these only), but does not guaranty the payment of such policies at maturity.

Loading.—The premiums so far considered are *net* premiums; that is, premiums calculated with mathematical exactness, on certain assumptions of mortality and interest, to accomplish the payment of the assured sum or sums at the time agreed upon, and nothing else. If the assumptions on which the calculations are made should accord with the facts experienced in a company, nothing would be left for expenses and other necessities of the business. The net premium must be increased by a sum sufficient to provide for expenses and contingencies. This additional sum, obtained by taking a percentage of the net premium, is called the loading; and it, added to the net premium, forms the full or *office* premium. The expenses of conducting the business are many and large. The chief of them is that of agents. Nearly all the business of a life company is obtained through agents, who devote their time to soliciting custom and securing the prompt payment of premiums. For their services they are paid chiefly by "commission," which is a certain percentage of the premiums on policies obtained through their instrumentality. The commission is not uniform, but varies according to the practice and standing of each company. If an agent has an interest in more than one premium paid on a policy, he may dispose of such interest to the company, as he sometimes does, for a gross sum in hand, called in the company's reports a "commuted commission." Besides the agents, a company must pay its general officers and other employés, taxes, bills for advertising and printing, legal fees, etc. etc.

Forfeiture or Lapse.—In all kinds of policy, in which the continuance of life is of pecuniary advantage to a company, there are certain conditions imposed upon the assured, violation of which will work a forfeiture to the company of the policy and of all payments made thereon. Such conditions are with reference to limits of travel and residence, to certain hazardous occupations, to death by suicide or in consequence of the violation of law, to the accuracy of the statements and declarations made in the application for the policy, and to the prompt payment of the premiums on or before the day or days on which they fall due. With respect to the condition in the policy that if the assured shall "die by his own hand" the policy shall be void, there appears to be some diversity of opinion in the courts. The law is well settled in England, and in the States of Massachusetts and New York, that in the event of suicide the representatives of the assured can only recover upon proof that the act of self-destruction was not his voluntary and wilful act, and was committed at a time when he had not sufficient power of mind and reason to understand the physical nature and consequences of his act, without reference to his capacity at the time to appreciate its moral character. The Supreme Court of the U. S., however, in a late case, reported in the 15th of *Wallace's Reports,* has laid down the following rule, the precise effect of which is not very clear, since it includes several conditions that can hardly coexist: "If the death is caused by the voluntary act of the assured, he knowing and intending that his death shall be the result of his act, but when his reasoning faculties are so far impaired that he is not able to understand the moral character, the general nature, consequences, and effect of the act he is about to commit, or when he is impelled thereto by an insane impulse which he has not the power to resist, such death is not within the contemplation of the parties to the contract, and the insurer is liable." It further appears from the case just referred to that "there is no presumption of law, *primâ facie* or otherwise, that self-destruction arises from insanity," and that it devolves on the claimant to prove such insanity on the part of the decedent, at the time of the commission of the suicidal act, "as will relieve the act of taking his own life from the effect which, by the general terms used in the policy, self-destruction was to have—namely, to avoid the policy." For travel or residence beyond the limits assigned in the policy and for hazardous occupations special permits must be obtained from the company; and the extra risk involved in such travel, residence, or occupation will not be covered until the company has agreed in writing to accept it. For violation of the remaining conditions of a policy, forfeiture is in general absolute, though special arrangements or provisions are sometimes made with respect to the payment of premium. The premium should, however, always be paid promptly when due. All the calculations are based upon such payments, which are the very life of a policy, and could not be waived to any extent by a company without danger to all interested in it. The premiums should, moreover, be paid in *cash,* and not partly in cash and partly in promissory notes. The "note" system is a fallacious one, and many companies which adopted it at first are relinquishing it as fast as possible.

Surrender.—After a certain number of payments have been made by a policy-holder, companies will in general, if he apply in time and surrender his policy, grant him a sum of money called the *surrender* value. The equitable surrender value of a policy is a matter much in dispute among actuaries and others interested in the business, and is much misunderstood among the assured. Its small amount as compared with the premiums paid astonishes the policy-holder, and leads him to think he has been imposed upon. But it must be remembered that a part of the premium is consumed every year in the payment of cost of assurance and expenses; all that remain are the deposit or reserve, and in mutual companies any dividends which may have accrued. The deposit, called sometimes the "net value" of a policy, is contributed by the policy-holder, and accumulated to aid in his continued assurance; dividends arise chiefly from the over-payments of the assured, and in mutual companies belong to them. So far, therefore, as it can be mathematically determined, the surrender value of a policy at any time is in proprietary companies the deposit on the policy at the time, and in mutual companies the deposit added to dividends credited to the policy.

Surplus, Profits, or Dividends.—Each of the assumptions made in calculating the *net* premium gives rise to surplus. That premium is estimated on the supposition that the death rate in the company will be that called for by the mortality table, and that but 4 per cent. interest will be realized on money. No properly managed company experiences the assumed death rate. The "new business" furnishes every year a number of carefully selected lives, which, being better for some years than the average, diminish the company's mortuary rate. The ratio of the estimated to the actual mortality varies in different companies and in different years, and depends in great measure upon the skill and care with which the risks are selected. It is safe to say, further, that the companies get *six* instead of *four* per cent. on their investments; some of them obtain over *seven.* The *loading,* added to the net premium for expenses, also provides surplus. The average loading is about 33⅓ per cent. of the net premium. The average expense of management does not exceed 18 per cent. of the gross premium receipts.

The above-enumerated sources of surplus or dividends are the chief, and are likely to be the enduring ones. There is another, however, which is mainly due to instability of purpose or of fortune on the part of policy-holders—viz. *surrender* and *lapse* of policies.

Distribution of Surplus.—In proprietary companies the surplus belongs to the stockholders, and is their profit. In mutual companies it belongs to the policy-holders, from

whose necessary overpayments it chiefly arises, and represents to them, not profit, but *savings*. The proper mode of its distribution in mutual companies is a somewhat vexed question, upon which many opinions have been expressed. A comparatively few companies in the U. S. use the "percentage" plan of division; that is, the share of each policy-holder is determined by taking a certain percentage of the amount of premiums paid. By this method the age of the assured is not considered, and the origin of the surplus is ignored. Most companies have, however, adopted the "contribution plan," devised in 1862 by Messrs. Sheppard Homans and D. Parks Fackler, who were at the time actuaries of the Mutual Life Insurance Company of New York. The design of this plan is to divide the surplus among the policy-holders in proportion to their individual overpayments or contributions to the surplus fund.

The method of determining these "proportions overpaid" is, briefly and without the use of equations, as follows (it is assumed that the policy is a whole-life one, paid for by equal annual premiums): At the *beginning* of the year, the company had to the credit of the policy the deposit or reserve upon it at the end of the preceding year and the full annual premium then just paid. From the annual premium must be taken the proportion of actual expenses properly chargeable to the policy; the remainder, added to the reserve, must then be increased by interest at the rate actually received by the company. From the amount thus obtained must be taken—1st, the actual cost of assurance for the year; 2d, the reserve necessary to be held at the close of the current year: the remainder is the contribution to surplus. This contribution, added to the policy's share in the "miscellaneous profits," if any, constitutes the estimated dividend in favor of the policy. The total surplus is not in mutual companies distributed. A portion of it is retained as a contingent fund or temporary reserve.

Modes of Applying Dividends.—There are in common use two ways of applying the dividend credited to a policy—viz. to the purchase of an additional amount of assurance, and as cash in payment of premium. Assume, for illustration, a life policy of $5000 taken out at age 30, and paid for by an equal annual premium of $113.50; and further, that after it has run four years a dividend of $64.17 has been credited to it. The holder may use the dividend—*First*, to purchase an addition to the amount of the policy. At age 34, to which the assured has then attained, the net single premium for a policy of $1000 is $321.86: the dividend of $64.17 will therefore purchase an addition of $199.37, no expense or commissions being charged to the dividend. This addition, sometimes called a "reversionary dividend," of $199.37 is a paid-up policy for that amount, and earns dividends: it is payable with the original policy, and is in general subject to its terms. *Second*, as cash, to diminish by $64.17 the premium then just due. Other methods of application have been and are still employed; such as to the purchase (the assured being in sound health at the time) of a temporary assurance for one or more years; to the reduction of all subsequent premiums for which the assured is liable; to limit the number of premiums required; but the two first given are the chief and grow in favor every year.

Government Supervision.—A few of the U. S. have no laws regulating life companies further than may be necessary for purposes of taxation. The most of them, however—and all of them in which the business has grown to be of any importance—have made special provisions for the protection of policy-holders and the supervision of companies by a State officer. The following brief abstract of the insurance law of New York, taken from Walford's *General Insurance Statutes of the U. S.* (1871), and the *Supplement* thereto (1872), will well illustrate the kind of supervision exercised and of protection afforded to policy-holders. In New York a State superintendent of insurance has supervision of companies; a life company is prohibited from taking any risks other than such as are connected with or appertain to making assurance on life and the granting, purchasing, and disposing of annuities; before commencing business each such company must have a capital of at least $100,000 paid in and invested in stocks or treasury notes of the U. S. or of the State of New York, or in bonds and mortgages on improved and unincumbered real estate within the State of New York worth 75 per cent. more than the amount loaned thereon, exclusive of farm buildings thereon, or in such stocks and securities as now are or may hereafter be receivable by the bank department—such securities, to the amount of $100,000 in U. S. or New York State stocks, to be deposited with the superintendent, and held by him for the security of policy-holders; a company chartered by another State and wishing to transact business in New York must have the same amount of actual capital securely invested as companies chartered by New York; the superintendent being satisfied of a company's compliance with the law will issue it a certificate of authority to commence business; each company chartered by the State must invest its funds or accumulations in bonds and mortgages on unincumbered real estate within the State of New York, or outside of the said State and within fifty miles of the city of New York, worth 50 per cent. more than the sum loaned thereon, or in stocks of the U. S., stocks of the State, or of any incorporated city of the State if at or above par, and any stocks created under the acts of the State that shall be at the time of such investment at a market price in the city of New York at or above par; a detailed statement, on blanks furnished by the superintendent, must be made of its affairs by each company transacting business in the State on the first day of January in each year, or within sixty days thereafter—such statement to contain a particular account of the company's assets, liabilities, income, and expenditures during the year, the number, kind, and amount of its policies in force at the commencement and at the end of the year, the number, kind, and amount of new policies issued by it and of policies terminated, with the mode of termination, during the year; the information obtained from the annual reports of the companies must be arranged and tabulated by the superintendent and presented by him, with such remarks and recommendations as he may deem proper, to the legislature in his annual report; the superintendent must make at least once in every five years, and may make annually in his discretion, valuations of all outstanding policies and other obligations of every American life company doing business in the State—the valuation of the policies to be made according to the American Experience Table of mortality and an assumed rate of interest at 4½ per cent.; the superintendent is empowered to address inquiries to any company on any matter connected with its transactions, reply to which must be promptly made in writing under penalty of a revocation of the company's authority to transact business; whenever the superintendent has reason to suspect the correctness of any annual statement, or that the affairs of a company making such statement are in unsound condition, he must cause an examination of its affairs to be made, and for purposes of such examination must have free access to the books of the company, and is authorized to examine officers and agents under oath, the penalty for refusing the requisite facilities for the examination being the forfeiture of the company's charter or the revocation of its authority to transact business in the State—the result of the examination to be published in the newspaper in which State notices are published whenever the superintendent shall deem it for the public interest to do so; if it shall appear from examination that a company chartered by the State has assets insufficient to reinsure its outstanding risks, the superintendent must communicate the fact to the attorney-general of the State, who must thereupon present the company in the supreme court, and after a full hearing the court will, if the assets are found insufficient, decree a dissolution of the company and a distribution of its effects, including the securities deposited with the superintendent; a company chartered by another State and transacting business in New York will, under the like circumstance of insufficient assets, have its certificate of authority for the transaction of business in the State revoked, and be compelled to cease business therein; when a company intends to discontinue business it must give notice to the superintendent, who will cause notice of such intention to be published in the paper in which State notices are inserted at least twice a week for six months, and after the superintendent, upon full examination of the affairs of such company, is satisfied that all the liabilities of the company are fully met, he is then, and not before, to deliver up to the company the securities held by him for the protection of the policy-holders of the company.

Statistics.—There were in Great Britain and her dependencies, Jan. 1, 1871, 136 life companies, which had in force 1,243,439 policies, assuring £301,213,144. In Germany (including Austria and Switzerland), there were at the same date 36 companies, which had in force 424,922 policies, assuring 401,032,407 thalers. In France the business has, in consequence of strong prejudices and enactments which early prevailed against it, and have but recently begun to give way, made but slow progress; and there were, Dec. 31, 1871, but 97,841 existing policies, assuring 973,000,000 francs.

In 1859 the insurance department of the State of New York was created by act of the legislature and was organized in Jan., 1860. Massachusetts had a few years previously established a department of supervision, and subsequently other States followed the example. The healthful influence exercised by State laws in shaping and developing the business, the public confidence begotten of State supervision and the publication of detailed annual reports, the activity

produced by the personal solicitations of numerous agents, extensive advertising through newspapers, circulars, and pamphlets, the unsettled state of monetary values in the country near the close of and after the war of the rebellion, together with the intrinsic value of the institution itself, caused the business to grow with great rapidity, and to assume in a few years astounding proportions. In 1868 there were fifty-seven companies represented in New York State, which together issued more new policies in that one year than the total number of policies issued by all American companies combined for the seventeen years from 1843–1859.

At the end of the year 1871 there were 91 life companies in the U. S., which had in force 841,728 policies, assuring $2,195,545,013; the income of the companies for the year from premiums and other sources was $102,211,611; their expenditures for the payment of policy and other claims were $61,468,945, and their assets were $319,560,509. In the year 1873 a number of the principal life companies of the U. S. formed an association called the Chamber of Life Insurance, for the purpose of securing unity of policy and action in all matters in which their interests are common. The chamber has its head-quarters in the city of New York, but includes the chief companies chartered by the States of Massachusetts, Connecticut, Pennsylvania, Wisconsin, Missouri, as well as the principal New York companies. It is the source of information and medium of conference among these institutions in relation to their mortality experience, to the State laws regulating and taxing the business, to the principles on which fraudulent practices should be met and suppressed, and to various other subjects in which all respectable companies can have but the one aim of elevating the character and increasing the security of the business.

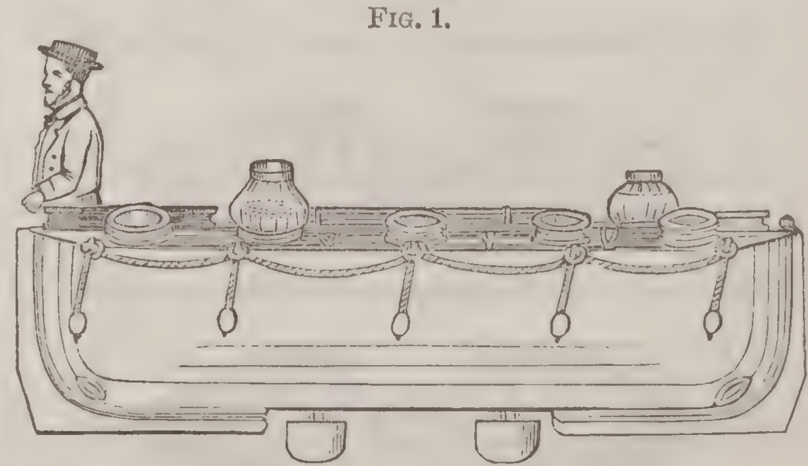
(For a list of works upon assurance the reader is referred to the *New York Insurance Report of 1868*. In addition to such as are there given may be mentioned Barnes's condensed ed. of the *New York Insurance Reports*, the official reports of the several State insurance departments or bureaus, and the proceedings of the National Insurance Convention of the U. S., held in New York City in 1871.)

J. H. Van Amringe.

Lifeboats, boats constructed especially for the escape of persons from vessels wrecked or in jeopardy. As long ago as 1777, M. Bernières of Paris projected a vessel for inland and short sea-voyages, and his experimental craft showed such resistance to capsizing that it must have embraced some of the leading features of the modern lifeboat. The inventor of the latter was Lionel Lukens, who on Nov. 2, 1785, secured an English patent on his improvements; and as his name has been obscured by the success of the person who appropriated his system, tardy justice to his memory may be fitly done by quoting verbatim the abridgment of his specification, as follows: "To the outsides of boats and vessels of the common or of any other form are projecting gunnels sloping from the top of the common gunnel in a faint curve towards the water, so as not to interrupt the oars in rowing, and from the extreme projection (which may be greater or less according to the size and use the boat or vessel is intended for) returns to the side in a faint curve at a proper distance above the water-line. These projecting gunnels may be made solid, of any light materials that will repel water, or hollow and watertight, or of cork, and covered with thin wood, canvas, leather, tin, or any other light metal, mixture, or composition." Lukens also proposed that "the spaces under the seats be made watertight or filled with cork, and a false metal keel fitted." Like many another meritorious invention, this was neglected and disregarded by the public, and it is not known that the inventor ever received one word of appreciation or one shilling of reward for an improvement that has saved thousands of lives during the nine-tenths of a century that has elapsed since then. It is a rule of almost universal application that popular attention is seldom successfully called to any means of saving life or securing personal safety except through some dire calamity; and the adoption of lifeboats was no exception. In Sept., 1789, the Newcastle ship Adventure stranded on the sands in Tynemouth Haven, England, "in the midst of tremendous breakers," but at only 300 yards from the shore; and in full sight of multitudes unable to assist, the crew dropped from the rigging, one by one, into the waters below. In the consequent excitement of public feeling a meeting was called, a reward offered for a lifeboat, and a committee appointed to examine plans. The committee adopted the plan presented by Henry Greathead, who in all essential respects copied Lukens's invention, and who has been proclaimed far and wide as the inventor of a lifeboat which does not appear to embrace a single important element devised by him, while the expense of its construction was borne by the committee aforesaid. Greathead's boat was constructed with cork floats arranged in and around the sides and gunnels, and appears to have been extremely well proportioned for its work. It was double-banked for ten oarsmen, and carried a steersman at each end, the craft being a "double-ender" or pointed at each extremity. It was thirty feet long, ten wide, and three feet three inches deep, contained 700 pounds of cork, and had oars of fir, better, in the rough water, than the more pliant and elastic ash. In the old *Cyclopædia* of Dr. Rees (1806–11) is a description of Greathead's boat which would almost serve the purpose of a working specification, and this old-time craft, where modern sheet-metal lifeboats cannot be conveniently obtained, would still be of utility and value. Greathead's boat was first tried at South Shields in Jan., 1790, where it brought off the crew from a stranded ship. In less than twenty years thereafter it had saved the lives of more than 200 persons that could not otherwise have been rescued. Greathead received gold medals from the Humane Society and the Society of Arts, a diamond ring from the emperor of Russia, 100 guineas from the Lloyds, and £1200 sterling from Parliament. The Lloyds gave £2000 to encourage the building of lifeboats along the British coast, and hence their use became established. About 1805, Christopher Wilson proposed to make the gunnels hollow and to divide them into compartments, so that injury to one portion would leave the other intact. This addition to Lukens's invention was a judicious adaptation of the Chinese system of forming a vessel in a number of watertight chambers. The same principle is embraced in the American lifeboats of Joseph Francis, which are made of sheet-metal, and are adopted at the twenty-four life stations on our coasts. It is also embraced in the boat of the British Lifeboat Institution. This craft is a double-banked, flat-bottomed boat, thirty feet in length, and eight feet wide, with its ends two feet higher than its central portion. It has, like previous boats, an iron keel. This keel weighs 800 pounds. On each side are airtight chambers. The floor of the boat is about coincident with the water-line, and the space between it and the bottom is filled with cork, etc. It is stated that from the year 1824 to 1865 not less than 14,980 persons were saved by lifeboats on the English coast. The Francis lifeboat is peculiar in the method of its construction, being formed of two pieces, each brought to shape in dies operated by hydraulic power, the two halves being afterwards firmly secured together. The material is sheet copper; it is corrugated by the dies, so as to give longitudinal strength and stiffness; the boat is provided with a number of watertight air-chambers or compartments to ensure its buoyancy. This is the boat now in use. Mr. Francis's original idea, brought forward about 1839, was to construct the craft of copper cylinders firmly bound side by side by metal bands, and the whole furnished with an iron keel.

Of course very many alleged improvements in lifeboats have been brought forward, but few or none appear to have practical utility beyond those just described. An illustration of each of the more noticeable varieties of these may, however, be of interest. For example, Fackrell's lifeboat,

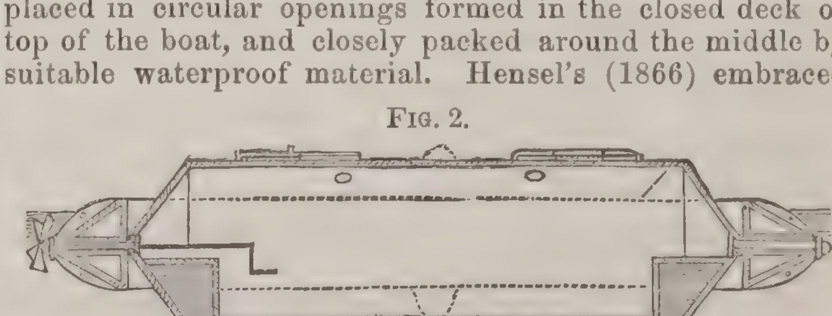
Fig. 1.



Fackrell's lifeboat.

projected during the past year (1874), embraces the principle of the Greenlander's kyack, the passengers being placed in circular openings formed in the closed deck or top of the boat, and closely packed around the middle by suitable waterproof material. Hensel's (1866) embraced

Fig. 2.

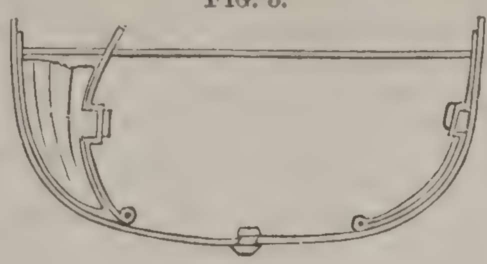


Hensel's lifeboat.

an oblong annular raft having a closed cabin suspended longitudinally on gudgeons or spindles within the central space of the raft, and provided with a screw propeller at each end worked by a crank attached to the end of the

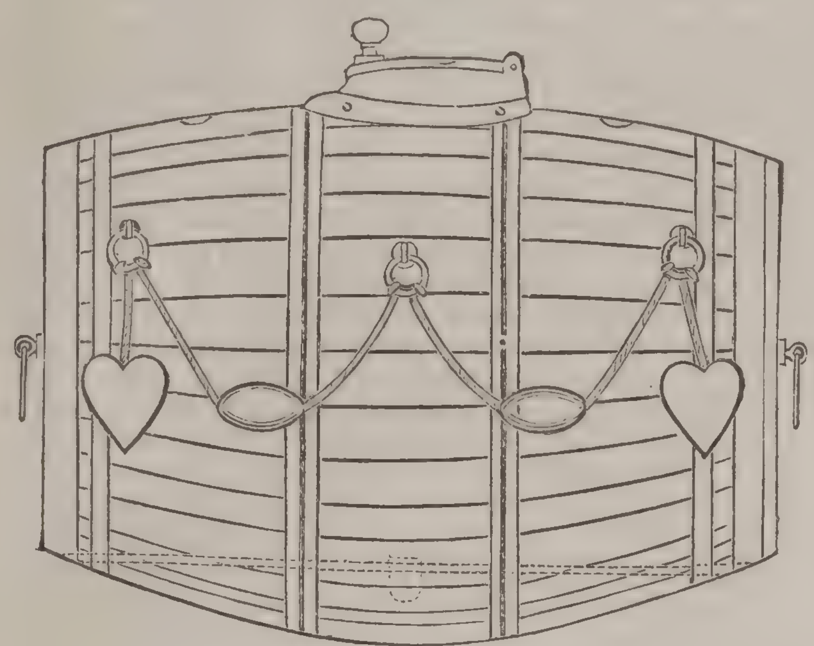
propeller shaft extended within the cabin for the purpose. Legros (1858) made the outer sides of his boat of metal, "while the top and unexposed surfaces are of rubber or other airproof flexible material." W. N. Clark in 1859 proposed a novel combination of water-cask, boat, raft, and life-float all in one, the merit of which is hardly commensurate with its unique character. He simply made one side of the cask on a curve somewhat approximating that of the keel of a boat, and provided the other with a covered

Fig. 3.



Legros' lifeboat.

Fig. 4.



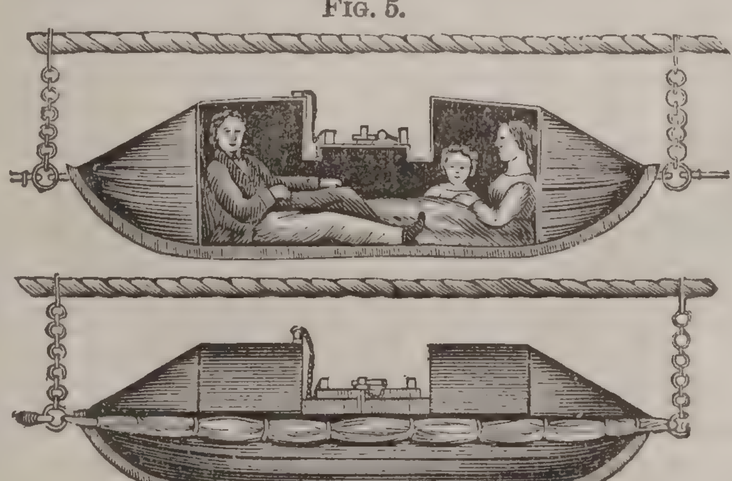
Clark's cask-lifeboat.

opening, which, being unclosed, was to admit the lower extremities of the passenger, while the upper projected above as in the kyack.

In cases of emergency an ordinary ship's boat may have its buoyancy very much increased, and be thereby fitted for use as a lifeboat, by tying empty casks at the sides, which serve in a rude way the same purpose as the cork floats or empty chambers in the gunnels of regularly constructed lifeboats. Spars or any other buoyant material may be lashed in place in the same way, and will serve the same purpose in proportion to their lightness.

The life-car is a kind of boat, closed in on top, and designed to be drawn through the surf between the vessel and the shore. In order to do this a hawser is stretched from one point to the other; the car is attached to the hawser by rings provided on the free ends of suspending chains fixed to the ends of the car. A line attached to each extremity of the car enables it to be drawn to and fro. The life-car

Fig. 5.



Francis's life-car.

used in this country was devised by Mr. J. Francis, the inventor of the Francis lifeboat previously referred to. (For life-saving apparatus in which the principle of the raft is substituted for that of the boat, see Life-Rafts.)

James A. Whitney.

Life Estate. See Estate, Dower, Jointure, Emblements, Estovers.

Life Insurance. See Life Assurance, by Prof. J. H. Van Amringe, A. M.

Life-Preserver, a small buoy designed for attachment to the person, and made either of canvas or other fabric stuffed with cork, or of india-rubber and inflated with air. The former is open to the objection of being bulky and occupying considerable room when not in use; the latter, to that of being liable to injury from punctures, and also of requiring more or less intelligent manipulation before, in the hurry of emergencies, it can be made ready and attached for use. Add to this that india-rubber is rapidly destroyed by contact with oils, grease, etc., and it is manifest that, all things considered, for most forms of life-preservers cork is to be preferred. Many different varieties of life-preservers have been devised, among which the following are the most important.

Annular Life-preservers.—These are simply large rings, either of inflated rubber or cork-stuffed canvas, the hole in the centre being large enough to receive the waist of the wearer, the device being worn beneath the arms. This is a clumsy form, and, although calculated to keep the head and shoulders above water, must materially interfere with any freedom of movement of the arms.

Block Life-preservers.—Commonly made of blocks of cork enclosed in canvas, two blocks being hinged together by a sewn joint in the fabric. These may be used as simple buoys. A more elaborate construction makes the space of fabric between the blocks large enough for a hole through which the head may be thrust, the fabric resting on the shoulders of the wearer, and the blocks, one on the breast and one at the back, being held close to the body by suitably arranged strings.

Life-floats.—Hollow drums, provided with straps and buckles for attaching the apparatus to the person; the more complete have receptacles for saving papers, socket for staff of a signal flag, etc.

Fig. 1.

Peck's life-preserving mattress.

Life-preserving Mattresses.—There have been many of these. In one the mattress has the usual wooden side-pieces, but is constructed with an upper and lower thickness of canvas-cased cork, between which are placed one or more air-filled mattresses. Such an apparatus would doubtless be of utility if kept intact, but it would have to be (as has been proposed) made in several sections if to serve in the manner of an ordinary life-float, or if not sectional in structure would provide simply a small though extremely buoyant raft. Another and smaller mattress (J. F. Peck's, 1874) is designed to be folded upon the front and back, with the ends held in place by straps passing over the shoulders of the wearer.

Life-preserving Jackets.—These may be of either inflated india-rubber or cork. Air-filled jackets were known as

Fig. 2.

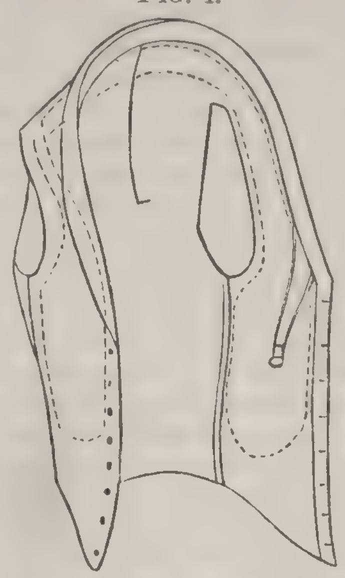
Fig. 3.

Mrs. Cogswell's life-preserving jacket.

long ago as 1724, and cork jackets were used by the Romans, but both varieties have been much improved in mod-

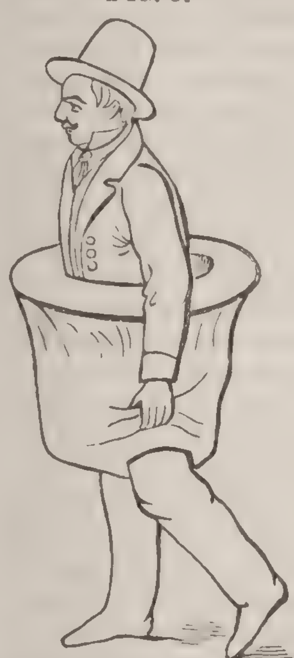
ern times. The simplest are made without sleeves, and button around the upper part of the body. The best are of strong fabric stuffed with granulated cork, and quilted in ribs or corrugations to prevent the displacement of the stuffing from different parts of the jacket. The cork jacket invented by Mrs. E. R. Cogswell of New York (1873) is constructed with supplemental floats at front and back, which depend like the skirts of a coat except when the wearer is in the water, when the floats rise by their own buoyancy against the breast and behind the shoulders, and thereby assist the usual jacket-portion in their flotative action; a belt stuffed with granulated cork is attached to the waist of the jacket, and the arms and collar are also filled with the same material, quilted in to keep it in place.

FIG. 4.



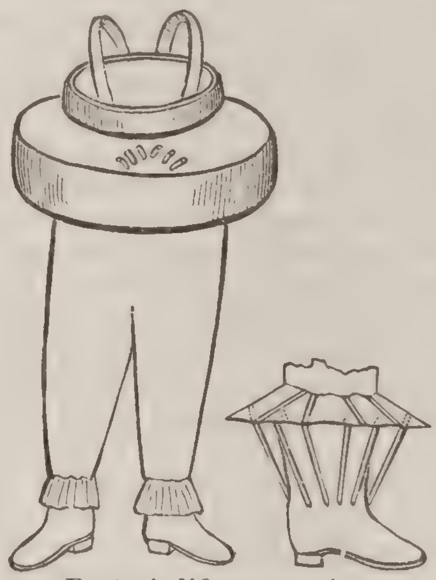
Nelson's life-preserving vest.

FIG. 5.



Macintosh's life-preserving trousers.

FIG. 6.



Porter's life-preserving trousers.

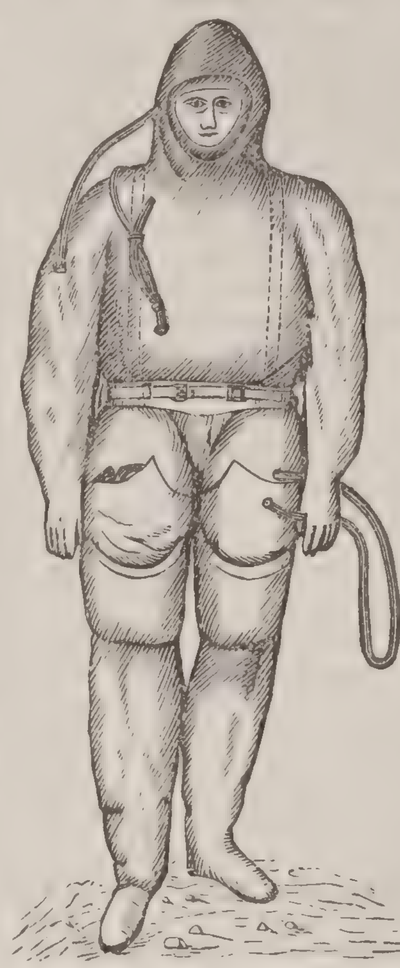
Various rubber vests, to be inflated with air through a tube and mouthpiece, like the rubber float, have been devised. In R. L. Nelson's invention, made as long ago as 1854, flat but expansible rubber sacks were fitted within the lining of an ordinary vest in such manner as to be easily worn under ordinary conditions, but furnished with the tube and mouthpiece for inflation when required.

FIG. 7.

Paul Boyton at sea.

Life-preserving Trousers.—These comprise trousers, boots, and annular life-preserver, all in one, and the first projector of them appears to have been Mr. J. Macintosh, whose patent was dated Nov. 11, 1837. The wearer, placing his feet and legs in a pair of sack-like pantaloons closed at the lower extremities, brought the air or cork-stuffed annulus up beneath his armpits, his trunk being enclosed within a sack-like body connecting the annulus to the trousers. In 1840 one R. Porter, emulous of Mr. Macintosh, added to the feet-portions of the device a pair of feathering or duck's-foot propellers, to enable the wearer to swim ashore with greater ease.

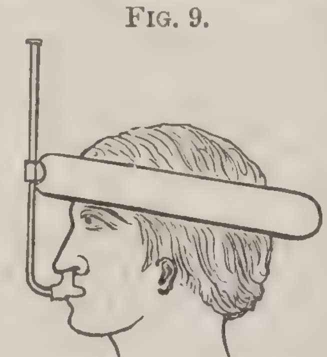
FIG. 8.



Merriman's life-preserving suit.

Life-preserving Suits.—The recent success of Capt. Paul Boyton in crossing the British Channel in an air-filled waterproof dress has given to this variety of life-preservers a prominence never before attained. Although Boyton's first attempt, during which he was fifteen hours in the water, was a failure, his subsequent success proved the great utility of such apparatus when properly constructed and applied. The apparatus used by Boyton was that patented by Clark S. Merriman of Vallisca, Ia., July 16, 1872, and its object, as set forth by the inventor, "is to provide a waterproof life-preserving dress sufficiently inflated with air to sustain the weight required, while the limbs are allowed full freedom of action in swimming; and the vital heat is retained in the body, the intervention of a stratum of air between the body and the dress acting as a non-conductor of heat." The dress is made of india-rubber, and comprises a head-dress, jacket, and trousers, the whole so connected as to form an airtight suit which can be inflated, like an ordinary india-rubber life-preserver, with the breath. Boyton is stated to have attached a sail to the suit to assist his progress while at sea.

FIG. 9.



Schofield's life-preserver.

Life-preserving Buckets are made buoyant with cork. So also are stools, or the latter may be made hollow and tight merely, and air-filled. Among the curiosities of life-preservers may be mentioned Schofield's (1863), in which an annular float is provided for attachment to the head, the float carrying a mouthpiece and pipe, through which the wearer is expected to breathe when entirely submerged. JAMES A. WHITNEY.

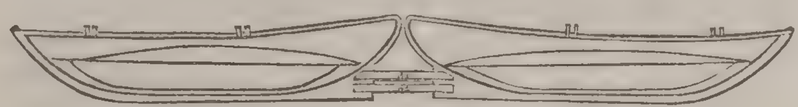
Life-Rafts. In the absence of boats, a raft made of spars, doors, etc. is the oldest craft of the shipwrecked. As rafts are presumed to be less expensive, in proportion to carrying capacity, than boats, and moreover occupy less space when not in use, very many plans for their improved construction have been proposed. The most feasible of these are such as combine some ordinary use, as that of a mattress, settee, bench, or the like, with those of a life-preserver on a large scale. A life-preserving mattress, weighing 17 pounds, capable of sustaining in the water

FIG. 1.

H. B. Mountain's life-raft.

284 pounds, was manufactured some years ago in London. It was designed more as a simple life-preserver than as a raft, yet the combination of two or more of them would appear to provide an efficient variety of the latter. This combination of distinct mattresses to form a raft is an old idea, but has been the subject of successive improvements. Among the most recent of these is that of H. B. Mountain (1873), in which a waterproof canvas sack has its lateral edges secured along the centres of two mattresses in such manner as to provide an open chamber between them capable of holding several persons, while the downward strain upon the mattresses being exerted centrally and longitudinally thereon, ensures their retention in a horizontal position. Mr. Silver's mattresses were composed of waterproof tubes distended with horsehair or cocoanut fibres, the tubes forming sections independent of each other, so that the failure of one would not affect the other. These tubes apparently owed their buoyancy mainly to their contained air, on which account they would, like air-filled life-preservers, be to some extent objectionable. On the other hand it is not easy to find a material that will be best for buoyancy and at the same time best for comfort to the occupant of the mattress during its normal use. The best buoyant material is undoubtedly cork soaked in linseed oil, the oil preventing the absorption of water by the cork, which rapidly reduces the flotative power of the material to a degree estimated at 40 per cent. On the other hand, the oil is found to rot the canvas. A fabric which will be at the same time water and oil proof would add very much to the utility of this class of apparatus.

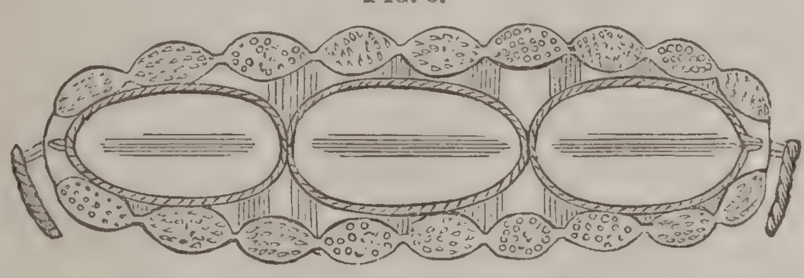
Fig. 2.



Van Zille, Griffin & Dey's life-raft and settee.

Another idea, that of a bench, is shown in the invention of Van Zille, Griffin & Dey (1855), which has the form of a boat divided in vertical longitudinal sections, with longitudinal flotative seats, two adjacent ends being hinged together. When the apparatus was opened out it presented the appearance of two settees ranged in line, and could be used as such. When folded together and fastened, a boat was formed, needing only the addition of thwarts and oars to be ready for use.

Fig. 3.

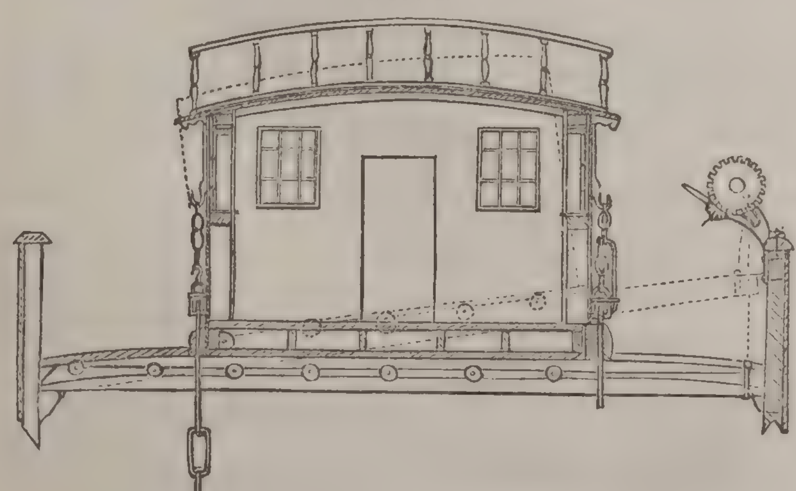


Simonds' life-raft.

Of rafts to be carried on deck, there have been numerous modifications. Among these is that of Simonds (1857), in which a number of air-filled floats are surrounded by an outer casing of cork, enclosed in canvas, ribbed or corrugated to form the cork into sections.

A favorite plan with projectors, though seldom or never adopted by shipbuilders, is that of so constructing the cabins of a vessel that they may be readily detached in case of accident to the hull. An example is found in W. R. Jackson's plan of 1855. He claimed "the construction of

Fig. 4.



W. R. Jackson's detachable cabin.

a deck or saloon cabin of a steam or other vessel so that it shall admit of being separated from the hull, and form itself into an escape or lifeboat." He also provided a system of devices for readily detaching and launching the cabin from the hull. Less feasible than this is the idea of making the upper deck itself detachable; the deck requiring a firmness of fixation to strengthen the vessel inconsistent with its ready and hurried detachment.

Life-buoys are made circular in form and flat, and are provided centrally with an elevated light provided by chemicals, the combustion of which is not extinguished by water. They are provided with pendent or free-ended ropes, by which persons may grasp and climb upon the buoy. Circular life-rafts have also been constructed with a mast and sail and other conveniences, and some have given excellent results in long experimental trips, but do not appear to have been adopted to the extent that their merits, apparently, would warrant.

The above are life-saving rafts, manufactured as adjuncts of a vessel, and designed as parts of its permanent outfit; but in cases of emergency very efficient apparatus may be improvised from spars, canvas, and empty casks, according to Cook's invention, which consisted of a square frame with canvas nailed across it, and with a closely-buoyed cask lashed at each corner. In tolerably smooth water ten men may be supported by a large cask provided with ropes for holding on. The drawback to a raft made on the just-indicated principle is that, made in the hurry and confusion of a storm or wreck, it can hardly be expected to have strength or permanence in a heavy sea or for more than a short time. It has been sensibly suggested, however, that it would be well for every vessel on the occurrence of danger to have all empty casks well stoppered and tied with loose-lying ropes, for use in event of disaster. The catamaran, used on the Madras coast, on the coast of South America, and other places, is formed of three logs lashed side by side, the middle log being the larger, and the entire raft being from twenty to twenty-five feet long, and from thirty inches to three feet and a half in width. Where no lifeboat is available, a rude raft of this kind might in some cases serve the purpose of one, as the catamaran is said to be more easily managed than any other form of craft. JAMES A. WHITNEY.

Lig′ament [Lat. *ligamentum*, a "binding"], a name given to many structures in the animal organism whose function it is to hold other organs in their places. The *articular* ligaments are found in most of the movable joints. They consist in most cases of white fibrous tissue, which is very flexible, tough, and inelastic. Some, like a part of the ligaments of the vertebræ, are partly of yellow fibrous tissue, which is very elastic. Articular ligaments are *capsular* when they invest a joint on all sides; *fascicular*, when they are flat bands of fibrous tissue passing from bone to bone; *funicular*, when they are rounded cords. Many of the viscera (as the liver, mammary gland, uterus, bladder, etc.) have ligaments holding them in place. Some are *suspensory*, receiving the weight of the organ; others are *lateral*, acting as guys or stays to prevent lateral displacement. Folds of peritoneum, aborted fœtal vessels, or slips of fascia, are made to serve as ligaments for the viscera.

Li′gan [Lat. *ligare*, to "bind," to "tie;" *ligamen*, "band"], goods belonging to a vessel's cargo which by reason of the vessel's being shipwrecked, or because they are thrown overboard in order to avoid the danger of wreck or other disaster, are sunk in the sea, but are tied to a cork or buoy in order to be found again. By the common law, goods of this kind, when found by any person other than the owner, belong to the Crown or state, unless the owner appears to claim them, when he is entitled to recover the possession. He cannot be deprived of his right of ownership in goods lost or sacrificed at sea which are not attached to a buoy, if he asserts his title to them. *A fortiori* is this the case when he has used this special means of designating the position of the goods, and thereby indicated his purpose of recovering them and retaining them as his property. (See FLOTSAM, JETSAM, WRECK.)

GEORGE CHASE. REVISED BY T. W. DWIGHT.

Lig′ature [Lat. *ligare*, "to bind"], in music, the black line or band which connects the stems of quavers, semiquavers, etc., and forms them into groups. In ancient ecclesiastical music several *minims* also are frequently linked together in groups by the same means, the general rule being that of a note or group of notes for each syllable of the words.

Light (Rev. GEORGE C.), b. in Westmoreland co., Va., Feb. 28, 1785; joined the Western M. E. conference in 1806, and labored extensively and efficiently in Tennessee, Ohio, Kentucky, Missouri, and Mississippi; was several years agent of the Colonization Society. He was a man of great pulpit ability. D. in Vicksburg, Miss., Feb. 28, 1860. T. O. SUMMERS.

Light [Ger. *licht;* Lat. *lux;* Gr. λευκός; Sans. *lôk*, to "look" or "see"], the medium of vision and the subject of the science of optics. Two theories have been maintained in regard to the nature of light, either of which is supported

by the authority of very illustrious names. According to the first of these, light is a material emanation thrown off by the luminous body, and its particles constantly traverse and fill the entire illuminated space, so long as the source continues unexhausted. According to the second, there is no transfer of *matter* from the source of light to the surrounding region, but there *is* a transfer of *force* through the medium of an elastic fluid which fills all space, and whose molecules in contact with the luminous body, being disturbed by that body, transmit the disturbance to those more remote by means of undulations which succeed each other uninterruptedly until the cause which produced them ceases to act. The first of these two hypotheses seems to have been of very early origin. It received the sanction of Newton, and was made by him the basis of his reasonings in regard to optical phenomena. It is hence commonly called the Newtonian theory. Until an advanced period in the present century it may be said to have been the generally accepted theory. Laplace, in his great work on celestial mechanics, has founded all his investigations in regard to aberration and astronomical refraction upon it. Yet it must be admitted by its advocates—if there remain any who adhere to it still—that it presents, even before we follow it into its applications to the explanation of the phenomena which attend it, many serious difficulties. In the first place, if light consist of material particles, these particles must be of inconceivable minuteness, or their living force would be sufficient to destroy every structure, no matter how solid or how tenacious it might be, which they should encounter in their flight. A single grain of matter moving with the velocity of light would have a quantity of motion equal to that of a cannon-ball of 100 pounds weight moving with the velocity of 1500 feet per second. But since destructive power is proportioned not to the quantity of motion, but to the *living force*, which varies as the square of the velocity, a single grain of matter moving with the velocity of light would have a destructive power equal to that of a mass of 3350 tons moving with the velocity of 1500 feet. If light be material, therefore, its particles must be many millions of times less in weight than a single grain. We have no instruments sufficiently delicate to detect a weight so minute. Still, it would be possible, by optical arrangements, to concentrate many millions of particles upon a single point. Attempts have been made to test the question by the use of such expedients. Dr. Priestley, in his history of light and colors, describes an experiment in which he directed the light of the sun, by means of a concave mirror having four square feet of surface, upon a balance of exceeding delicacy, without producing any sensible impression. Dr. Priestley does not consider that in such an experiment it is the moment, and not the weight, of the particles of light that would be measured. The amount of inertia in any balance, however delicate, is sufficient to render it an instrument not very well adapted to the purpose in view. The presence of the air is also a disadvantage, both on account of its own resistance to motion, and on account of the currents created by the heat which attends the direction of the solar focus upon any solid. The following experiment by Mr. Bennet avoids these objections. This brief account is taken from Prof. Lloyd's *Essay on the Undulatory Theory*, edition of 1857: "A slender straw was suspended horizontally by means of a single fibre of the spider's thread. To one end of this delicately suspended lever was attached a small piece of white paper, and the whole was enclosed within a glass vessel from which the air was withdrawn by the air-pump. The sun's rays were then concentrated by means of a large lens, and suffered to fall upon the paper, but without any perceptible effect." These results are negative, it is true, but it must be admitted that they are such as to render the truth of the material theory of light in the highest degree improbable.

Another difficulty in the way of this theory is found in the uniformity of velocity with which light reaches us from distances all but infinitely unequal, and from luminous bodies of every magnitude. This equality of velocity in the propagation of the light of the stars is evinced in the universality of the law of aberration. But it might be inferred from the equality of the refraction which all light, whether natural or artificial, undergoes in passing from medium to medium. Now, if light be material, it must be regarded as subject, like all other projectiles, to retardation by the gravitating power of the body from which it is emitted. And, moreover, it is a phenomenon inconceivable that so perpetual a shower of projectiles, so infinite in number, should all be thrown with the same initial velocity, and that this initial velocity should be the same for every source. The only hypothesis upon which it is possible to meet this last objection is to assume, according to a suggestion of M. Arago, that the eye is insensible to luminous impressions except for a certain definite velocity of the luminiferous particles, or for that narrow range of variation of velocity within which are embraced the velocities to which we attribute the different colors in refracting media.

In regard to the retardation of the particles by the attracting power of the luminous body itself, it may be observed that with our present means of measurement this would not be appreciable for distances so small as that which separates us from the sun, or even for distances no greater than the extreme dimensions of the solar system; at least, without supposing an enormous increase in the mass of the luminous body beyond that of any aggregated form of matter known to us. An attracting body can destroy, in a projectile thrown from it, no greater amount of velocity than it can impart to a material mass falling toward it. And this limit is reached if we suppose the falling body to commence its motion at an infinite distance. Now, the velocity acquired by a body falling from an infinite distance to the sun's surface, under the influence of solar attraction, would be less than 400 miles (399.7 miles) per second; and of this velocity about fourteen-fifteenths (372.5 miles) would be acquired after passing the limit of the earth's orbit. But the body would be twenty-seven and a half days in reaching the sun after passing this limit, while light is only eight minutes and thirteen seconds in traversing the same immense space. The effect of an accelerating or retarding force being as its time of action, and in this case the two times to be compared being in the ratio of about 1 to 480, it may easily be shown that the retardation of light by solar attraction during its transit from the sun to the earth could not be so much as a mile per second in its velocity.

But the light of stars coming from distances so vast as to require years, and many years, to reach us must undergo such retardation as to render aberration a phenomenon exceedingly variable, unless we admit M. Arago's assumption just mentioned in regard to the sensibility of the retina. Moreover, in cases in which the rays, in their long travel, had become reduced to velocities comparatively moderate, the gravitating power of heavy bodies near which they might pass ought to produce a sensible deflection of their course, and modify in a remarkable manner the phenomena of occultations. Nothing of this kind is observed. It is here assumed that there may be suns much more massive than ours.

Laplace has examined the question, What ought to be the mass of a luminous body in order that its gravitating power may be great enough to destroy the velocity of the particles of light entirely at some distance less than infinite, the initial velocity being assumed to be that which observation has determined in the sunlight as it reaches us? The expression for the velocity acquired in falling from an infinite distance to the sun's surface, his mass being assumed to be unaltered, is $v = \sqrt{\frac{2mgr^2}{R}}$, in which m is the sun's mass, that of the earth being unity; g is the measure of the force of gravity at the earth's surface, being the velocity it is capable of imparting in one second, or 32.2 feet; r is the earth's radius, and R the radius of the sun, both expressed in feet. If we put $v = 187{,}000$ miles (reduced to feet), and make m indeterminate, we shall find that the mass must be increased more than two hundred thousand times, or to 78,000,000,000 times that of the earth, to be capable of creating, and therefore of destroying, a velocity equal to that of light. This supposes the bulk of the sun to be unaltered. But if the mass is increased without altering the density, we shall have

$$v = \sqrt{\frac{2mgr^2x^2}{R^3}},$$

in which x is the radius of the sun under its supposed enlargement; whence

$$x = \frac{vR^{\frac{3}{2}}}{r\sqrt{2mg}}.$$

Replacing the symbols by their values, we find that the sun must be enlarged to nearly 470 times his present diameter in order to possess the power of entirely arresting the progress of light, considered as material, at any distance. The surface of such a sun would extend nearly 60,000,000 miles beyond the orbit of Mars. That there may be bodies in the universe so large as this is possible, but we may esteem it hardly probable. If there are, and if light is material, they may be invisible to us.

A final objection to the material theory of light is found in the phenomena of refraction and reflection. This, though it seems to have been overlooked, is really the most serious of all. We have seen that the effect of the immense power of solar gravitation is insufficient to produce more than an inappreciable variation in the velocity of light during the nearly eight minutes and a quarter which is occupied in its

passage over the space between us and the sun; and yet if the hypothesis we are considering be true, there is a force residing in the superficial stratum of transparent bodies—a stratum so thin that no attempt has ever been made or can be made to measure it—which is capable of instantaneously doubling, and in some instances almost tripling, this velocity. Thus, light which has passed the surface of glass of antimony or chromate of lead must, if this theory is true, have its velocity raised in the instant of passing from 187,000 miles to 557,000 miles per second. In common glass the velocity becomes 280,000 miles. In ordinary reflection, also, the reflecting force has first to destroy the original velocity, and then to impart an equal velocity in the opposite direction. This is more easily conceivable than the acceleration produced by refraction, as it corresponds with the ordinary phenomena of elasticity. But refraction, on the theory we are considering, is only explicable on the hypothesis of attraction; and the immensity of an attracting force which is capable of accomplishing in so short a time what gravity is totally unequal to in a time greater beyond measure, is totally inconceivable.

But, if objections of this weighty description to the material theory of light did not exist, the impossibility of finding in it any satisfactory explanation of the remarkable phenomena which have presented themselves in the later progress of optical discovery, would be conclusive against it; while the opposing theory finds in these very phenomena its strongest recommendation to acceptance. (See OPTICS, COLOR, DIFFRACTION, DISPERSION, POLARIZATION, RAINBOW, REFLECTION, REFRACTION, SPECTROSCOPE, SPECTRUM, THIN PLATES (COLORS OF), UNDULATORY THEORY OF LIGHT, PHOTOGRAPHY, etc.) F. A. P. BARNARD.

Light'er, a capacious but shallow barge or other vessel used for discharging the cargoes or landing the passengers of larger vessels at ports where ships of considerable draught cannot reach the landing.

Light'foot (JOHN), D. D., b. at Stoke-upon-Trent, England, in 1602; educated at Christ's College, Cambridge; took orders in the Church of England; became chaplain to Sir Rowland Cotton; was minister at Stone in Staffordshire and at Ashley; was identified with the Presbyterians during the civil war; was a member of the famous "Assembly of Divines" at Westminster (1643); became in the same year master of Catharine Hall, Cambridge; in 1653 rector of Much-Munden, Hertfordshire; and in 1655 vice-chancellor of the University of Cambridge. At the Restoration he was deprived of his mastership, but it was subsequently restored to him, and he also obtained a canonry at Ely, where he d. Dec. 6, 1675. Dr. Lightfoot was probably the most learned Hebrew scholar that England has ever produced, and his great work, *Horæ Hebraicæ et Talmudicæ* (1658; new edition 1859), is still a standard authority for the illustration of the Gospels by means of the Talmud and Midrash. He contributed much to Walton's *Polyglot Bible*, Castell's *Heptaglot Lexicon*, and Poole's *Synopsis Criticorum*, but with all his learning was not entirely free from an uncritical acceptance of traditions, which detracts from the value of his work; *e. g.* he maintained the inspiration of the vowel-points in the Hebrew Bible. His miscellaneous works were after his death collected in two volumes (1684), and were several times reprinted, the best edition being that of Pitman (London, 13 vols., 1822–25).

Lightfoot (JOSEPH BARBER), D. D., b. at Liverpool, England, in 1828; graduated at Trinity College, Cambridge, in 1851 with high honors in classics; became a fellow in 1852, tutor in 1857, Hulsean divinity professor in 1861, and canon of St. Paul's in 1871. His commentaries on the Pauline Epistles display great learning and ability; they comprise Galatians (1869), Philippians (1870), and Colossians (1875), each with a revised Greek text. He has also published the *Two Epistles to the Corinthians of St. Clement of Rome* (1869), an essay *On a Fresh Revision of the English New Testament* (1871), besides philological and critical articles in magazines, of which the most notable were directed against the anonymous author of a work on *Supernatural Religion* (1875).

Light'house Board of the U. S. Previous to 1852 the lighting, as well as the buoyage of the sea-coast and harbors of the U. S., was under the control and management of a single individual, the fifth auditor of the treasury. By act of Congress approved Aug. 31, 1852, the lighthouse board was organized, and the control and management of all lights, buoys, beacons, etc. was placed under its charge. The U. S. lighthouse board (as constituted by law) consists of eight persons—viz. two officers of the navy of high rank, two officers of the corps of engineers, and two civilians of high scientific attainments, whose services may be at the disposal of the President of the U. S., an officer of the navy and an officer of the corps of engineers, who are also the secretaries. The board, thus constituted, is attached to the office of the secretary of the treasury, who is ex-officio president of it. A chairman is elected by the members from one of their number, who presides at the meetings in the absence of the secretary of the treasury. From the organization till 1870 this office was held by the late Admiral Shubrick; Prof. Joseph Henry has since been chairman. The board is required to meet four times a year for the transaction of general and special business, and the secretary of the treasury is empowered to convene it whenever in his judgment the exigencies of the service require it. It actually meets nearly every week. The coast and waters of the U. S. are divided into districts, to each of which an officer of the army or navy is assigned as lighthouse inspector. Engineer officers are also assigned to duty under the board for the purpose of preparing plans, specifications, drawings, and estimates of cost of all illuminating and other apparatus, and constructing and repairing of towers, buildings, etc. connected with the lighthouse establishment.

For the more efficient transaction of business, "standing committees," consisting each of two or three members and (ex-officio) the secretaries, are constituted on "finance," "engineering," "floating aids to navigation," "lighting," "experiments." To these committees every important matter is referred for investigation, discussion, and report before action is taken by the board. Thus, to the committee on engineering are referred all matters relating to plans and methods of construction, preservation of sites; in other words, all engineering questions. The committee on experiments is required to test the value of oils and other illuminating materials, of lighting apparatus, of the relative value of *signals* by sound or sight, etc., etc. In this last category the matter of FOG-SIGNALS (see that head) is assuming great importance, and has been the subject of recent experiment by Prof. Tyndall of the Trinity House, England, and by Prof. Henry for the U. S. board. The two secretaries (engineer and naval) perform all routine and general administrative duties of the lighthouse board office under the orders and regulations of the board, or of the chairman if he be present, each having his special functions; the naval secretary keeping the journal of proceedings, and having charge of the office and its business except so much as may be assigned to the engineer secretary. J. G. BARNARD.

Lighthouse Construction. "A sea-light," says Mr. Alan Stevenson, "may be defined as a light so modified and directed as to present to the mariner an appearance which shall at once enable him to judge of his position during the night, in the same manner as the sight of a landmark would do during the day." That it shall be seen by the mariner at considerable distances demands (its luminous range supposed adequate, see LIGHTHOUSE ILLUMINATION) a certain elevation, depending upon the rotundity of the earth. The following table gives heights in feet* corresponding to distances in nautical miles:

Height, in feet.	Distance, in nautical miles.	Height, in feet.	Distance, in nautical miles.	Height, in feet.	Distance, in nautical miles.
15	4.443	50	8.112	100	11.47
20	5.130	60	8.886	150	14.05
25	5.736	70	9.598	200	16.22
30	6.283	80	10.26	250	18.14
40	7.255	90	10.88	300	19.87

As the mariner's eye is usually assumed to be 15 feet above the sea-level—corresponding to a distance of 4.443 miles—we must add this distance to that corresponding to the elevation of the light, to ascertain its range of visibility. Hence, a light 100 feet high would have a range of $11.47 + 4.44 = 15.91$, or, say, 19 nautical miles. *Vice versâ*, if it be required that a light be visible 16 miles, it must have an elevation above the sea-level of 100 feet. Should the light be established upon low ground or upon a submerged rock or shoal, this elevation can only be attained by means of a solid material structure as a *light-bearer*. Such structures take naturally the form of towers, made of the usual building materials—timber, stone, or brick—to which in modern times is added iron.

The first light-bearing tower of which we have record (built by Ptolemy Philadelphus, B. C. 300, about) figures as one of the Seven Wonders of the World of the ancients. Taking the name, Φάρος, of the small island in the bay of Alexandria on which it was built, it has originated the generic name (Lat. *pharus*; Fr. *phare*; It. and Sp. *faros*), in the classical languages, for "lighthouse;" and even in English the word *pharo* was once used. The ruined tower called

* The rule for this determination is that of the English astronomer, Mr. Vince. It is (in logarithms):
Log. dis. in *statute* miles = ½ log. height in feet − 0.1215. The statute miles thus calculated may be reduced nearly enough to nautical miles by subtracting one-seventh.

"Cæsar's Altar" in Dover Castle is delineated in Major Elliot's report on *European Lighthouse Systems*, and thus mentioned: "The antiquity of this lighthouse, which has not probably been used as such since the Conquest, no doubt exceeds that of any lighthouse in Great Britain, and it is supposed to have been built in the reign of the emperor Claudius, about A. D. 44. Upon it burned for many years those great fires of wood formerly maintained on several towers still standing on the coasts of Great Britain. These earliest guides to mariners at length gave way to reflectors; they, in their turn, being replaced in the year 1819 by that great triumph of scientific skill, the Fresnel lens." Mr. A. Stevenson, however, states that this and the ruins of Tour d'Ordre at Boulogne are conjectured on "somewhat doubtful grounds" to have been ancient lighthouses.

During the Middle Ages, when "the use of the compass was not general, and vessels sailed slowly and tediously along the coast; when the sea-voyage from the Mediterranean (whence, subsequent to the Crusades, came the rich fabrics of the East) to the winter-frozen ports of the Baltic, too long to be accomplished in one season, rendered an intermediate rendezvous welcome," the "aids to navigation," however much needed, were meagre indeed, and the earliest tower which claims attention, and which in point of architectural grandeur is said to be the noblest edifice of the kind in the world, is the Tour de Cordouan, built (1584–1610) on a reef at the mouth of the Garonne, and serving "as a guide to the shipping of Bordeaux and the Languedoc Canal, and of all that part of the Bay of Biscay." The tower, 197 feet high, of imposing architectural design, is surrounded at its base by a high sea-wall on a periphery of 134 feet in diameter, along the inner face of which are the *keeper's apartments*, somewhat in the style of the casemates of fortifications.

The allusion just made to "keeper's apartments" reminds us of other essentials to the tower besides that of *light-bearing*—viz. that the light be accessible to the "keeper" for replenishment and repair, lighting and extinguishing, and that there be "apartments" not only for the keeper's residence, but for preserving the supplies for his needs and for the sustenance of the light. The earlier lighthouse constructions were confined exclusively to convenient locations on the *land*, prominent points or headlands being naturally selected. For such sites the essentials are easily fulfilled. A simple hollow tower (generally of brick or rubble masonry, though sometimes of wood) bears on its summit the "lantern" and the illuminating apparatus. An internal stairway, of wood or stone, very commonly winding, as a helix, around a central axis, constitutes the means of access, while the lower portion of the tower furnishes space for storage of oil and other supplies, the keeper's dwelling being usually a detached building. Such were the early lighthouses of this country. In their construction the science of the "engineer" was little called for.

The greater number of our earlier lights were on enclosed waters or sounds, aids to *coasting* rather than to *ocean* navigation, for which great height of tower was not necessary. For the few sea-coast lights, properly so called, elevated headlands were of course selected wherever they were available. Great height of tower was therefore seldom required, and it is only where, through the element of height, there is question of the stability of the structure, as depending on the bearing power of the soil, the strength of the walls, and the resistance to wind-force, etc. that it becomes really one of *engineering*. The height of 120 feet furnishing an effective sea-range of 17 nautical miles, and that range increasing so slowly with greater elevations, it is only for lights of exceptional importance that greater height of tower is given.* A masonry tower of such limited height, and of otherwise sufficient diameter, is always amply stable in relation to wind-force, however violent. The preparation of adequate foundation, however, for these high structures is one of paramount importance, and will be referred to hereafter.

Even in the earlier periods of open-sea navigation it became apparent that there were dangers which constructions on terra-firma could not palliate. Isolated rocks or sunken reefs distant from the mainland are such. The most noted case is that of the Eddystone, in which was first developed and applied the high art of the engineer to establishing on this contracted rock, buried by the high tides and exposed to the fullest force of storm-and-wave violence, a stable tower and a permanent beacon. At a locality where the mere process of construction was so difficult, and at a period when the destructive power of sea-waves had not been measured, it is not strange that timber was resorted to, nor that the first of two successive structures was carried away. Sounder engineering principles prevailed in the construction of the second by Rudyerd. The external shell, a frustum of a slightly tapering cone, was of heavy timbers, fitted together as are the staves of a brewer's vat, and fastened down by strong iron dovetail ties leaded into the rock. The interior of the tower was loaded to half its height, nearly, with well-fitted stones, solid for one-fifth the height, and leaving (to above limit) only space for staircase *well* above the solid part. This work stood for forty-seven years, and finally owed its destruction, not to the sea, but to fire (1775). Then, at last, the task was taken up in its true aspect of a great *engineering* problem,† with the clear perception of which Mr. Smeaton pronounced *stone*, both from its weight and other qualities, to be the proper material. "On Apr. 5, 1756, Mr. Smeaton first landed on the rock, and made arrangements for erecting a lighthouse of stone, and preparing the foundations by cutting the surface of the rock into regular horizontal benches, into which the stones were carefully dovetailed or notched. The first stone was laid June 12, 1757, and the last Aug. 24, 1759. The tower measures 68 feet in height and 26 feet in diameter at the level of the first entire course, and the diameter under the cornice is 15 feet. The first 12 feet of the tower form a solid mass of masonry, and the stones are united by means of stone joggles, dovetailed joints, and oak trenails." The light (that of *tallow candles*) was first exhibited Oct. 16, 1759.

The history of the "Eddystone" has been so often given, both for the popular eye and for the use of the engineer (Mr. Smeaton's own work on the subject being still extant), that no more detailed account is deemed necessary. It furnished to engineers a type and model for future works in such localities. The subsequent structures of "Bell Rock" (1808–11), situated in the channel-way to the entrance to the Friths of Forth and Tay, and "Skerryvore" (1838), off the western coast of Argyllshire, Scotland, built by Robert and Alan Stevenson respectively, are only inferior to the Eddystone in fame.

"The great merit of Mr. Stevenson, as architect of the Bell Rock lighthouse, lies in his bold conception and unshaken belief in the possibility of erecting a tower of masonry on a reef twelve miles from the nearest land and covered by every tide—a situation undoubtedly much more difficult than that of the Eddystone." (Article "Lighthouse," by Alan Stevenson, *Encyc. Brit.*) The Bell Rock tower is 100 feet high, 42 feet in diameter at base, and 15 at top.

"The design for the Skerryvore lighthouse was given by Mr. Alan Stevenson, and is an adaptation of Smeaton's Eddystone tower to the peculiar situation and the circumstances of the case at the Skerryvore, with such modifications in the general arrangements and dimensions of the building as the enlarged views of the importance of lighthouses which prevail in the present day seemed to call for. The tower is 138 feet 6 inches high, and 42 feet in diameter at the base and 16 feet at the top. It contains a mass of stonework of about 58,580 cubic feet, or more than *double* that of the Bell Rock, and not much less than *five times* that of the Eddystone." (*Ibid.*) The site of this work is above high water, and the difficulties of construction less than at Bell Rock or the Eddystone.

Other "rock lighthouses," all, with one exception, more recent, deserve mention; *e. g.*, "Bishop Rock" (1853), off the Scilly Islands; "The Small's Rocks," entrance to Bristol Channel; "Hanois Rocks" (1862), Island of Alderney; "Barges d'Olonne" (1861), W. coast of France; "Héaux de Bréhat" (1835), N. coast of France; "Wolf's Rock" (1869), off Land's End, England; and "Alguada Reef" (1865), Bay of Bengal. The Bishop Rock is mentioned by Findlay (*Lighthouses of the World*) as "probably the most exposed lighthouse in the world." The force of the waves is supposed to surpass even the measure registered at Skerryvore (see HARBOR); *i. e.* 6000 pounds per square foot. "On Jan. 30, 1860, a storm-wave shook this tower, and tore away the bell, weighing 3 hundredweight, from its support at the top of the tower, more than 100 feet above the sea. . . . Therefore, if these sea-beaten towers were not at least equal in weight to a solid block of granite

* The lighthouse tower of Genoa is 218 feet high; that of Cordouan, 197 feet; that of Belle-Isle (France), 180 feet. These have been subjected to calculation in reference to resistance to wind-force. (See article in *Annales des Ponts et Chaussées*, 1832, translated by the U. S. lighthouse establishment, where the subject, in connection with other remarkable towers and chimneys, is discussed.) The highest tower of the U. S. is that of Hatteras, 189 feet, after which comes that of Pensacola, 160 feet, and then those of "Fire Island," "Great West" (both on S. coast of Long Island), Barnegat, Capes Lookout and Romain, and Morris Island, all of 150 feet, and Cape May, 145 feet, etc.

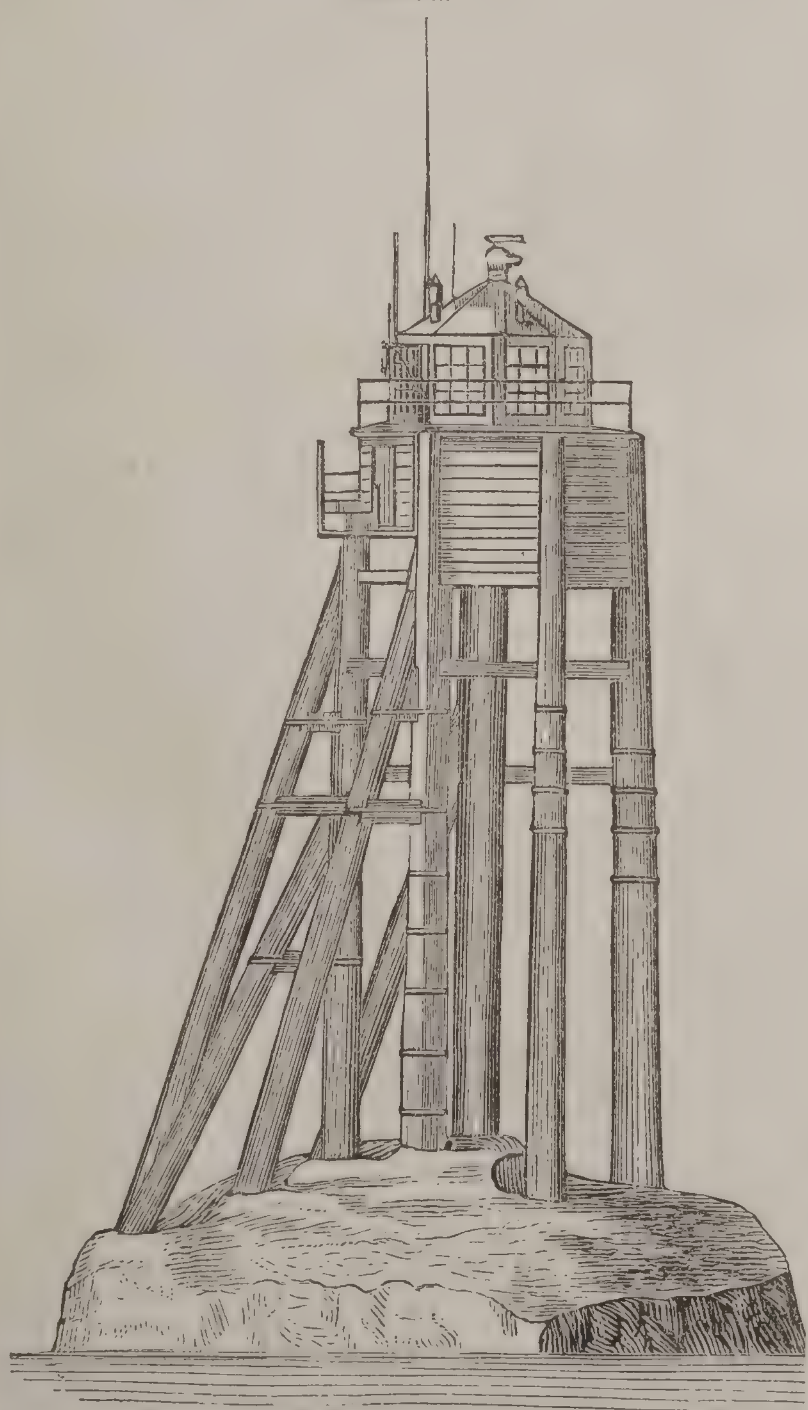
† No disparagement is meant to the work of Rudyerd, which was truly a work of engineering, and a *successful* one, so far as comported with the perishable nature of his principal material, wood.

of 60 or more feet in height, they would not be able to withstand the waves." (*Findlay.*)

The Wolf Rock, "perhaps the most elaborate and difficult of erection" on the British coast, as likewise the most recent, is on a rock 17 feet above low water, but submerged at high tide (which rises 19 feet), and of which the area scarcely exceeds the base of the tower; while the immediately surrounding depths reach 20 fathoms. The tower is 41 feet 8 inches diameter at base, 116 feet high, and solid from base to a height of 39 feet, or to the door of the lighthouse. The thickness of the walls at the doorway is 7 feet 9½ inches, and at the top, which is 17 feet in diameter, it is 2 feet. The shaft is a concave elliptic frustum, the generating curve of which has a major axis of 236 feet and a minor axis of 40 feet. "The stones are laid in offsets to the level of 40 feet above the rock, with a view of breaking the sea, and above that height the surface is smoothly cut. Each face-stone is dovetailed vertically and horizontally into the adjoining stones, and every stone is bolted to the course below it by two 2-inch bolts—of yellow metal for the exterior, and galvanized steel for the interior stones. The dovetailing was adopted not only for increase of strength, but to prevent displacement by the sea during construction, before the superincumbent weight of the additional courses could be obtained, and to protect the cement mortar of the joints from being washed out before it could be set." (*Elliot.*)

The high engineering problem involved in the designing of a structure which shall resist such forces, as well as the engineering difficulties involved in their erection, is made sufficiently obvious by these European examples. It is not strange that with the modern development of iron fabrication the notion should suggest itself of substituting for solid and costly masses of masonry, which resists mainly by its weight, structures constituted of wrought-iron posts, which, secured in the rock, offer but trifling area for the wave to impinge upon and oppose the enormous tensile strength of forged iron. A remarkable wooden lighthouse, erected in 1778 and still standing in 1850, on Small's Rock, coast of Wales (Fig. 1), in "a more exposed position than the Eddystone," is interesting in this connection.

Fig. 1.



Lighthouse on Small's Rock, coast of Wales.

"The height was 56 feet from the top of the rock, and it consisted of nine oak piles, secured to the rock in a nearly vertical position, with four raking shores against the easterly pillars, forming the main support of the building during the westerly storms. Although it was exposed to the whole force of the Atlantic, it had stood for upwards of sixty years, and indeed the wooden standards were affected so little that the erection was now quite as secure as it had been for some years past." (*Proc. Inst. C. E.*, vol. ix.) In 1800, Mr. Robert Stevenson proposed for the Bell Rock a structure of iron shafts inserted into the rock. The first attempt (1849) to build on Bishop Rock, a site more exposed than the Eddystone, was on this plan. "The local difficulties, and a due regard to economy, induced the trial of such a structure as should present the least possible obstruction to the waves. It consisted of six hollow cast-iron columns 16 inches in diameter, sunk to a depth of 5 feet into the rock, where they form a hexagon of 30 feet diameter, tapering upwards to the height of 100 feet. . . . A bar of wrought iron 4 inches diameter is dovetailed into the rock, and carried up inside to the top of each column, where it is screwed down, thus attaching the columns to the rock. The space between the inside of each cast-iron column and the internal wrought-iron rods is to be filled up solid with a heavy metal and cement concrete. In the centre of the hexagon is a cast-iron tube, 3 feet in diameter, forming the upright and principal support of the structure. The lower part of this tube, to a height of 14 feet above high water, being the part most exposed to the force of the seas, is to be filled up solid." (*Proc. Inst. C. E.*, vol. ix.) The storms of winter (1849) came on before the centre column had been filled, and in that of Feb. 5, 1850, the whole was swept away; "all the cast-iron columns and the internal wrought-iron rods had been broken off at different heights, varying from 1 foot to 6 feet from the surface of the rock; but all the points of attachment remained uninjured, and the rock itself was not torn up."

The essential principle of this plan of construction was lost sight of by the admission of the central cast-iron tube, *3 feet in diameter;* moreover, the six columns which formed the hexagonal skeleton had the large diameter of 16 inches, while all their tensile strength was derived from "wrought-iron bars of but 4 inches diameter."

Soon after the destruction of this inchoate work the stone tower already alluded to was built by the same engineer, Mr. J. Walker, engineer to the Trinity board, at whose desire he had attempted the iron construction, of the plan of which, however, he is to be regarded as the author.

A somewhat similar history connects itself with our own Minot's Ledge lighthouse. Capt. W. H. Swift, U. S. Engineers, strongly impressed by the successful application of Mitchell's mooring screws to the forcing of iron posts into the sands as a framework to iron skeleton lighthouses, built the first work of the kind in the U. S.—an iron beacon at the entrance of Black Rock Harbor, Conn., which is yet existing. He then designed and erected a more important structure, of which the following account is taken from his own official report (Nov., 1848).

"Minot's Rocks—or, as they are generally designated, 'the Minots'—lie off the south-eastern *chop* of Boston Bay. . . . These rocks or ledges, with others in their immediate vicinity, are also known as the 'Cohasset Rocks,' and have been the terror of mariners for a long period of years; they have been, probably, the cause of a greater number of wrecks than any other reefs or ledges upon the coast, lying as they do at the very entrance to the second city of the U. S. in point of tonnage, and consequently where vessels are continually passing and repassing. The Minots are bare only at three-quarters ebb, and vessels bound in, with the wind heavy at north-east, are liable, if they fall to the leeward of Boston light, to be driven upon these reefs. The rock selected for the site of the lighthouse is called the 'Outer Minot,' and is the most seaward of the group. At extreme low water an area of about 30 feet in diameter is exposed, and the highest point in the rock is about 3½ feet above the line of low water. It is very rare, however, that a surface greater than 25 feet in diameter is left bare by the sea. The rock is granite, with vertical seams of trap rising through it.

"Observations, made at Boston lighthouse from June 7 to Oct. 27, 1847, furnish the following results:

Rise of highest tide	14 ft. 7 in.
Mean rise and fall of tides	9 " 4 "
" " " spring tides	10 " 8 "
" " " neap	8 " 3 "

"The form of the lighthouse frame is an octagon, of 25 feet diameter at base. The structure is formed of eight heavy wrought-iron piles or shafts, with one also at the centre. These piles were forged in two pieces each, and are connected together by very stout cast-iron or gun-metal sockets, 3 feet long, the interior of which is bored, and the pile-ends are turned and secured to the sockets by means of large steel keys passing through the piles and the sockets. Above and below the joints or sockets, and connecting the middle

pile with each outer pile, there extends a series of wrought-iron braces; and the outer shafts are connected together by similar braces extending from one to the other; and thus the whole structure is tied together. At each of the angular points in the octagon and at the centre, a hole 12 inches in diameter and 5 feet in depth is drilled in the rock, the outer holes with the inclination or batter given to the outer piles, and the middle hole vertical. The surface of the rock being irregular, and the holes in each case 5 feet deep, the lengths of the piles (below the sockets) vary from $35\frac{1}{4}$ to $38\frac{3}{4}$ feet. The piles in the upper series are of uniform length—viz. 25 feet each; the inclination or

Fig. 2.

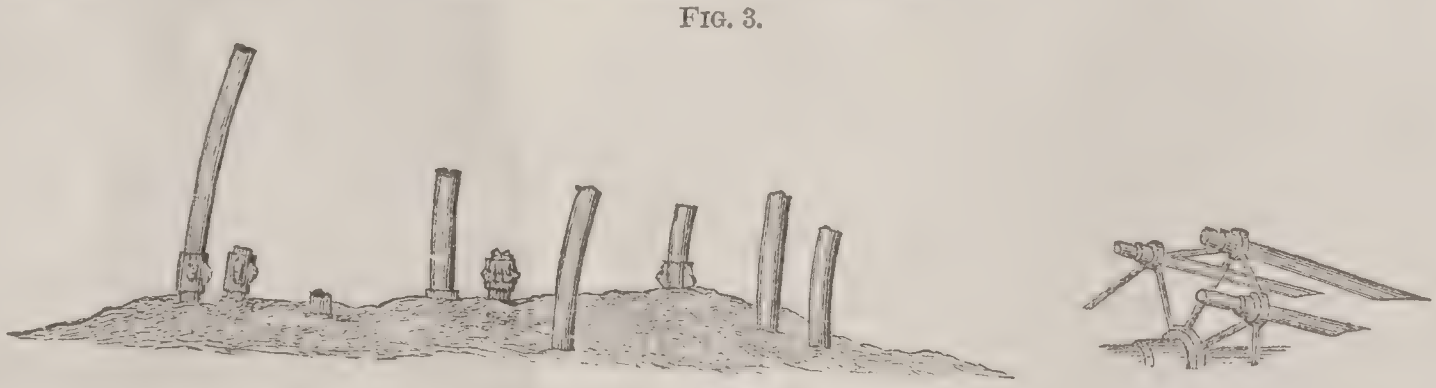
Minot's Ledge Lighthouse.

batter of the piles towards the centre is such as to bring the heads of the upper piles within the periphery of a circle of 14 feet diameter, and there, at an elevation of 60 feet above the base of the middle pile, or 55 feet above the highest point of the rock, the pile-heads are secured to a heavy casting or cap, to the arms of which they are securely keyed and bolted. The middle shaft is 8 inches in diameter at foot and 6 inches at top, and the outer shafts are 8 inches at foot and $4\frac{1}{2}$ inches at top. All of these are forged 10 inches in diameter, at the point where they leave the surface of the rock, and taper uniformly to 8 inches diameter in both directions. The lower braces, placed 19 feet above the rock, are $3\frac{1}{2}$ inches in diameter; the second series, $19\frac{1}{2}$ feet above the first, or $38\frac{1}{2}$ feet above the rock, is 3 inches diameter; and a third series, introduced $8\frac{1}{4}$ feet below the cast-iron cap to form the support of the floor of the store-room, is made of $2\frac{1}{2}$-inch square iron. The outer piles being inclined towards the centre, and the piles and the braces being inflexible, it is clear that so long as the braces remain in place the pile cannot be withdrawn from the hole, for the whole structure acts as an immense *lewis;* either the braces must be ruptured or the rock itself must yield before a pile can be displaced."

In that exposed situation, where the sea was so continually breaking over the rock, the drilling of holes of the required magnitude could only be done by machinery elevated above the reach of the sea. The operation consumed the greater part of two seasons. The erection of the tower was comparatively less difficult. This work, commenced in 1847, was finished in Nov., 1848. "In addition to the horizontal braces, there was introduced in the summer of 1849 a series of wrought-iron vertical tie-rods between the first and second series of braces; these ties, 32 in number, of $1\frac{1}{2}$-inch round iron, extended between each pair of contiguous piles, and between the middle pile and each outer pile, crossing each other in a diagonal direction, like the brace and counter-brace of a bridge. The object of these ties was to stiffen the piles, and to prevent, in as great a degree as practicable, the tendency to vibration which there necessarily would be at the top of piles 60 feet high, howsoever well braced they may be. It was intended to place another series of these ties, arranged in the same manner, between the foot of the piles at the rock and the first or lower series of horizontal braces."

This structure was carried away in Apr., 1851. "On Monday night, Apr. 14, the wind, which had been easterly for several days, gradually increased. On Tuesday it had become a severe gale from the N. E. It continued to blow with the utmost violence through Tuesday night, Wednesday, Thursday, and even Friday; but the height of the storm was on Wednesday, the 16th, and at that time it was a perfect hurricane: . . . it was in fact unprecedented." The light on the Minot was last seen from Cohasset on Wednesday night at 10 o'clock; at 1 o'clock Thursday morning, the 17th, the lighthouse bell was heard on shore, $1\frac{1}{2}$ miles distant; and this being the hour of high water, or rather the turn of the tide, when from the opposition between the wind and the tide—the former blowing on shore and the latter receding from the shore—it is supposed that the sea was at its very highest mark; and it was at that hour, it is generally believed, that the lighthouse was destroyed; at daylight nothing of it was visible from the shore, and hence it is most probable it was overthrown at or about the hour named." Fig. 3 exhibits the appearance when the site was visited Apr. 22, with this qualification, that the *wreck* of the overthrown structure, instead of being closely contiguous, lay in reality at a considerable distance from the stumps of the shafts.

Fig. 3.



Site of Minot's Ledge Lighthouse.

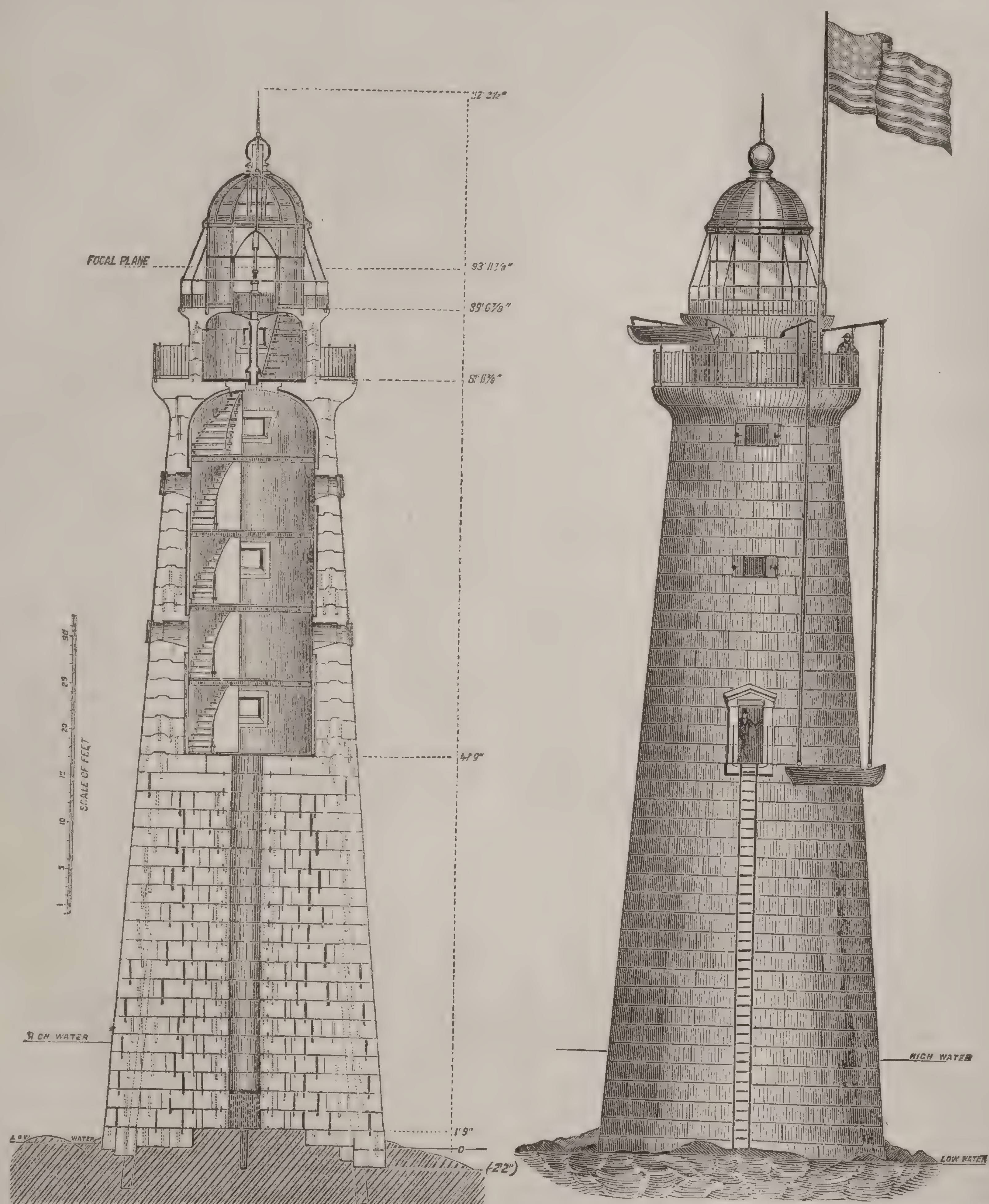
It has been noticed in the description of the work that there was a series of horizontal braces (the second) $38\frac{1}{2}$ feet above the rock. "Upon these braces the keeper had improperly built a sort of deck or platform, upon which was placed a quantity of heavy articles, such as fuel, water-barrels, etc., all of which should have been in the store-room, the place designed for their reception. The deck, in addition to the weight placed upon it, was fastened together and secured to the piles and braces, thus offering a large surface for the sea to strike against. In addition to this, the keeper had attached a $5\frac{1}{2}$-inch hawser or guy to the lantern-deck 63 feet above the rock, and anchored the other end of the hawser to a granite block weighing, according to his own account, seven tons, placed upon the bottom at a distance of some 50 fathoms from the base of the light. The object of this was to provide means for running a box or landing-chair up and down; but it is very clear that so much surface exposed to the moving sea had the same effect upon the lighthouse as would have been produced by a number of men pulling at a rope attached to the highest part of the structure with the *design* of pulling it down. . . . At 4 o'clock on Wednesday afternoon, the 16th, or ten hours before the light fell, the platform above mentioned came ashore at Cohasset. As this was 43 feet above the line of low water, and 28 feet above high water, spring tides, the sea had at that time reached within 7 feet of the base of the store-room of the lighthouse. Without undertaking to speculate upon the probable shock that the structure must have received from the effect of the sea upon a platform fastened to the piles 40 feet above the rock, it is enough to know that the sea had reached within 7 feet of the body or solid part of the structure. Still increasing, it required but a slight increase in the height of the wave after having reached the deck, to bring it in contact with the main body of the structure. When this took place it is plain to perceive that such a sea, acting upon the surface of the building at the end of a lever 50 or 60 feet long, must be wellnigh irresistible, and I doubt not that the lighthouse was thus destroyed." (*Official Rep. of Capt. Swift.*)

The case of Minot's Ledge is a very interesting one, for skeleton iron structures in great numbers have since been built; and owing to their lightness and comparative cheap-

ness, are a desideratum for that class of wave-exposed sites where stone is too costly, or on treacherous soils where foundations for stone would be difficult or impracticable.

In this isolated case of the destruction by wave-violence of a completed structure there can be little doubt that the engineer's conclusions are correct. The "main body" (*i. e.* the keeper's dwelling and store-rooms) should never be attainable by waves: all appurtenances, such as scaffoldings (which keepers are so apt to make) and attached hawsers, should be prohibited. A further remark should be made. In judging of this work it must be borne in mind that it was built at a date when the large grants of money necessary for great engineering works of lighthouse construction were with difficulty attainable from Congress;* at a date, too, when the newly-invented method of skeleton iron construction for lighthouses was in its infancy. A comparison of the engineering details with those of the almost contemporaneous, though later, structure on a site of even more destructive sea-exposure —Bishop Rock—will make evident their great superiority. *There*, a central shaft presenting to the waves a mass 3 feet in diameter violated fundamental principles, while, instead of the *solid* 10-inch *skeleton* shafts, carefully forged of the highest qualities of iron, hollow 16-inch cylinders of cast iron were held to the rock *only* by internal wrought-iron stems of but 4 inches diameter. The

Fig. 4.



Vertical section.

Elevation.

Minot's Ledge Lighthouse, Mass.

real defect of the Minot iron tower was *want of magnitude*. It should have had *at least* a 40-foot base and a height of 100 feet. The keeper's dwelling and store-rooms could then have been placed beyond the reach of storm-waves, the enlarged base affording requisite stability for the increased height. The limited means at the disposal of the engineer forbade such dimensions. The difficulties of drilling the shaft-holes were, as we have seen, very great, even where the most available parts of the rock were chosen. The enlarged tower, which we *now* know to be necessary, would have cost three times the sum at the command of the engineer.

In the *Civil Engineer and Architect's Journal* of Sept., 1867 (vol. xxx.), will be found a discussion by Lieut.-Col. Fraser, R. E., of the applicability of screw-pile lighthouses, in which Mr. Alan Stevenson's *dictum* is quoted: "A primary inquiry as to towers in exposed situations is the question whether their stability should depend upon their strength or their weight, or in other words, on their cohesion, or their inertia;" with the author's own statement on the subject as follows: "My own experience (and no living engineer has more on these points) goes altogether to confirm the experience of the above celebrated lighthouse engineer as to the value of the iner-

* The "Minot" cost less than $40,000.

tia over strength for lighthouses in exposed situations." He further adds: "The value of the non-resistance of the *pile* is, in a great measure, done away with when the foundation on which they stand creates the force we wish to avoid in structures dependent for their stability not on their weight, but on their strength; and such structures are quite unfit for situations such as the Bell Rock, the Eddystone, Skerryvore, the Alguada Reef, the Great Bassas off Ceylon, and the Prongs,* forming the S. W. extremity of the north-western side of Bombay harbor."

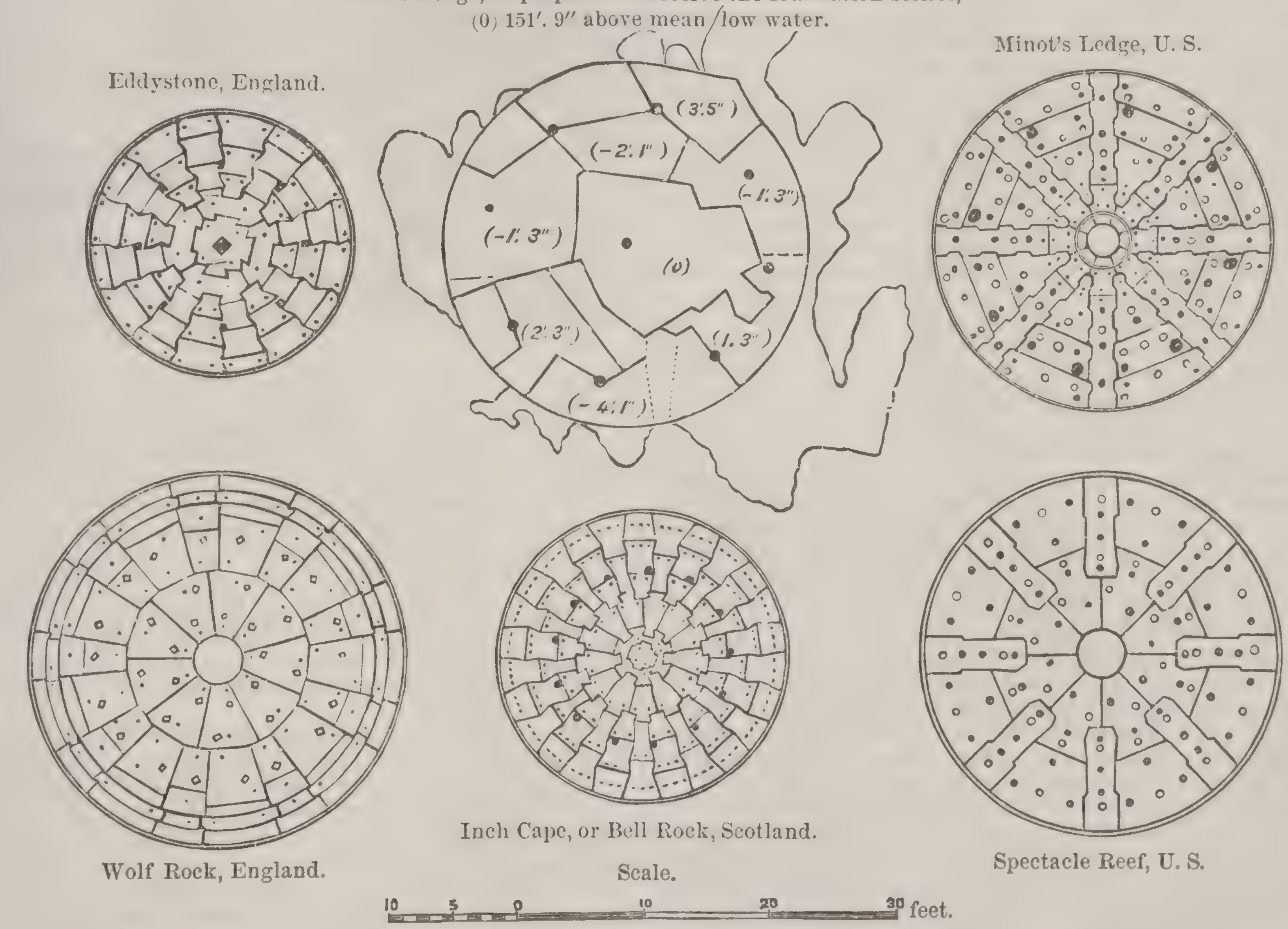
No engineer can maintain that solid stone structures are not intrinsically far preferable, but the enormously high wave-action observed at such works (see Bishop Rock, *supra;* a common pictorial representation of the "Eddystone" represents a wave-jet rising above and passing over the lantern)† is doubtless in great measure due to the "inertia" of the abruptly opposing masses of the structure themselves, and is not to be taken as conclusive evidence in all cases that skeleton iron towers would not stand. Another objection to iron skeleton towers, found in liability to destruction by collision of wrecks or entanglement of heavy spars, has had no practical illustration in the actual carrying away of a completed structure during a quarter of a century's experience;‡ and it applies to *all* submerged sites as forcibly as to the category of sites for which iron-pile towers are "ruled out" in the above *dictum* of Col. Fraser. After this digression on the abstract question of the use of iron skeletons, we return to Minot's.

Not only the commercial interests of the country, but humanity demanded that the Minot's Ledge rocks should be relighted, and Congress promptly made an appropriation for this purpose, stipulating that the tower should be erected on the Outer Minot, and confiding its construction to the Topographical bureau. This bureau, having publicly advertised, received sixteen distinct proposals, but finally recommended, in view of the difficulties to be overcome and the fearful fate of its predecessor, that it should be located on one of the inner rocks. Before further action had been taken the whole subject, both as to location and mode of construction, fell into the hands of the newly-created lighthouse board. To the late chief engineer of the U. S., Gen. J. G. Totten, a member of the board, is due mainly the project for the new structure. The unprecedented difficulties of the *original* site upon the "Outer Minot" did not deter him from advocating and designing a work for this formidable position more difficult to accomplish than anything which had ever preceded it. The plans were drawn under his directions; for the execution, he selected Capt. (now Brevet Brig.-Gen.) Barton S. Alexander, of the corps of engineers—an officer whose experience, energy, boldness, and self-reliance eminently fitted him for the task.

The difficulties of the work will be best appreciated from the following statement of the engineer: "It was a more difficult work of construction than either the Eddystone, the Bell Rock, or the Skerryvore, for the Eddystone was founded all above low water, part of its foundation being up to high-water level. The foundation of the Bell Rock was about 3 feet above low water, while the Skerryvore had its foundation above high-water level; whereas a good part of the foundation of the Minot's light was below low water. There had to be a combination of favorable circumstances to enable us to land on the Minot rock at the beginning of that work—*a perfectly smooth sea, a dead calm, and low spring tides.* This only could happen about six times during any one lunation—three at full moon and three at the change. Frequently, one or the

FIG. 5.

Minot's Ledge, as prepared to receive the foundation-stones, (0) 151'. 9" above mean low water.



other of the necessary conditions would fail, and there were at times months, even in summer, when we could not land there at all. Our working *season* was from Apr. 1 to Sept. 15. Work was prosecuted with all possible diligence for more than three years before a single stone could be laid. *The* difficulty was to cut the foundation rock into the proper shape to receive the foundation stones, and then to lay these stones." (See diagram of Fig. 5.) The work, commenced July 1, 1855, was finished Sept. 15, 1860, and cost about $300,000. Both an elevation and a vertical section are given in Fig. 4. The shaft is seen to be purely conical, the limited bottom area forbidding the expansion required for the *tree-like* spread to the base—an engineering pedantry of useless expense, and founded on a false analogy.

The structure is solid (around a central well) up to the level of the entrance-door. Above that there is a hollow cylindrical space 14 feet in diameter, arched over at the level of the cornice. This space is divided into five stories by four iron floors. These five compartments, and a sixth, immediately under the lantern, constitute the keeper's rooms, store-rooms, etc. In Fig. 5 is a section showing the "bond"

* It does not appear that towers have been built at either this or the Great Bassas. Findlay (1870) shows a "light-vessel" at the latter locality; and his supplements down to 1872 show no change.

† After a heavy storm the waves and spray not infrequently "bury" the Minot's tower and lantern completely out of sight from the shore, $1\frac{1}{2}$ miles distant, though a powerful telescope be used.

‡ A temporary iron scaffold at Minot's, consisting of nine wrought-iron shafts ten inches in diameter at the lower ends, inserted into the holes of the first iron lighthouse, was (Jan., 1857) carried away by the bark New Empire, loaded with cotton, thrown against it during a heavy N. E. gale. The shafts were broken very much as those of the iron light-tower had been. The case of the "Tongue Bank" iron piles is mentioned on a subsequent page.

of the stonework of the solid parts, also that of the Eddystone, Bell Rock, Wolf Rock, and Spectacle Reef towers. There is also shown a plan of the Minot rock as prepared to receive the foundation stones, in which the numbers (with the plus or minus sign) indicate the *level* of the respective areas—*e. g.* (—1′ 3″) indicates 1 foot 3 inches *below* the *zero;* which, however, is itself 1′ 9″ above mean low water. The small black points mark the sites of the iron shafts of the old structure. In these, continuous dowels were inserted, which ascended as far as the twelfth masonry course. In the horizontal section the gun-metal dowels are marked by which each course of the solid part was secured to the one above or beneath. The courses of the shell above the solid part were *joggled* by a middle annulus with the course above. The following details are given for reference:

The first blow was struck on the ledge Sunday morning at sunrise, July 1, 1855:

Hours worked on ledge in excavating foundation pit during 1855	130 hours.
Hours worked on ledge in excavating foundation pit during 1856	157 hours.
Hours worked on ledge in excavating or laying four stones during 1857	130 h. 21 m.
Hours worked on ledge in excavating pit and in laying six courses during 1858	208 hours.
Hours worked on ledge in laying twenty-six courses of stone during 1859	377 hours.
	1102 h. 21 m.

No. tons of rough stone	3514
No. tons of hammered stone	2367
No. stones in lighthouse	1079

The first stone was laid July 9, 1857; the lowest stone was laid July 11, 1858.

Whole height from bottom of lowest stone to top of pinnacle	114′ 1″
Height of focal plane above lowest point	96′ 1″
" " " " mean high water	84′ 7″
Diameter of third (or first full) course	30′
" of top of twenty-second course (solid part)	23′ 6″

From the "Minots" we naturally turn to another (and the *only* other) specimen of what are significantly termed "rock lighthouses" of the U. S. It stands upon a reef in the northern part of Lake Huron, off the eastern end of the Straits of Mackinac. It is built upon the southern extremity of the most northerly of two shoals (limestone rock *in situ*, covered with a layer of about two feet in thickness of boulders), so situated with reference to each other as to suggest the name, "Spectacle Reef." The least depth of water on the shoal is about 7 feet, but at the site selected for the lighthouse the rock was found at a depth of 11 feet. The nearest land is the south-easterly point of Bois Blanc Island, distant 10½ miles. The greatest exposure to waves is to the south-eastward, from which direction the seas have a range of about 170 miles. Were there no other destructive agency, sufficient stability would have been easily secured. But, under certain meteorological conditions, currents having a velocity of from 2 to 3 miles per hour are developed here, which during the inclement season serve to move to and fro ice-fields which frequently have an area of thousands of acres and a thickness of two feet. This ice, formed in fresh water, is of great solidity, and when moving in the mass, and with the velocity named, has a "living force" which is almost irresistible. The aim was to oppose to it a structure against which the impinging ice would be crushed and packed till it should ground upon the shoal itself, and form a barrier against subsequent action. To give some idea of the necessity for this, it may be mentioned that in the spring of 1875 the ice was piled up against the lighthouse to a height of 30 feet above the water, or 7 feet above the sill of the doorway, which is 23 feet above the lake, and when the keepers went to the station to exhibit the light (not in operation during the winter), they were able to obtain entrance to the tower only by first cutting a passage through the pile of ice referred to.

The first step was to surround the site of the proposed tower with a "pier of protection"—a crib-work (filled with ballast stone) 92 feet square, enclosing an interior opening 48 feet square. This furnished a landing-stage and area for quarters for workmen, and secured still water in which to place the coffer-dam. The coffer-dam was cylindrical in form, 36 feet in diameter (exterior), and made of staves 4 inches thick, 6 inches wide, and 14 feet long. These staves, carefully jointed, were held together by three iron bands or hoops on the outside, and to enable it to withstand the pressure from the outside, when empty, the dam was braced and stayed in the strongest manner against a centre-post the axis of which was coincident with the axis of the cylinder. The details by which the coffer-dam was built at the surface of the water, lowered, and, by then driving down individual staves wherever necessary, fitted to the irregular bottom and the joint calked, cannot here be given.* After exhausting the water, levelling the bottom, and laying the first course, the annular space between it and the inside of the cylinder was filled with concrete, thus making an artificial bottom which was perfectly watertight. The exterior of the tower (see Fig. 6) is a frustum

Fig. 6.

Lighthouse at Spectacle Reef, Lake Huron (in an ice-floe).

of a cone, 32 feet in diameter at the base and 18 feet at the spring of the cornice 80 feet above the base. The cornice is 6 feet high, and the parapet 7 feet. The focal plane is 4 feet 3 inches above the top of the parapet. Hence the entire height of the masonry above the base is 93 feet, and of the focal plane 97 feet 3 inches. The base is 11 feet below the surface of the water, and the focal plane 86 feet 3 inches above the same surface. The tower is solid to a height of 34 feet. Above this it is hollow, and divided into five stories or rooms, each 14 feet in diameter. The courses (of uniform thickness of 2 feet) are *bonded* as represented in Fig. 4; they are dowelled where solid and joggled where annular, very much as at Minot's, which work, indeed, served as a model.

The light was first exhibited June 1, 1874, work having been commenced May 1, 1870. The aggregate *working* time was really less than twenty-four months; cost, $375,000.

On a preceding page allusion has been made, preliminary to a description of the first ill-fated Minot's Ledge structure, to the substitution of skeleton structures of iron for such "costly masses of masonry." Such structures were suggested by Mr. Alexander Mitchell, inventor of the "screw-pile," for submerged sandbanks; which is described by him as "a project, contemplated by the author, for obtaining a much greater holding-power than was possessed by any pile or mooring then in use; the former being nothing more than a pointed stake of considerable size, easily either depressed in or extracted from the ground. . . . The plan which appeared best adapted for obtaining a firm hold of soft ground or sand was to insert to a considerable distance beneath the surface a bar of iron having at its lower extremity a broad plate or a disk of metal in a spiral or helical form, on the principle of the screw, in order that it should enter the ground with facility, thrusting aside any obstacles to its descent, without materially disturbing the texture of the strata it passed through, and that it should at the same time offer an ex-

* The engineer, Gen. O. M. Poe, a member of the lighthouse board, is engaged in preparing for publication by the board a full account of this work.

tended base, either for resisting downward pressure or an upward strain." (See Fig. 5 of article FOUNDATION.)

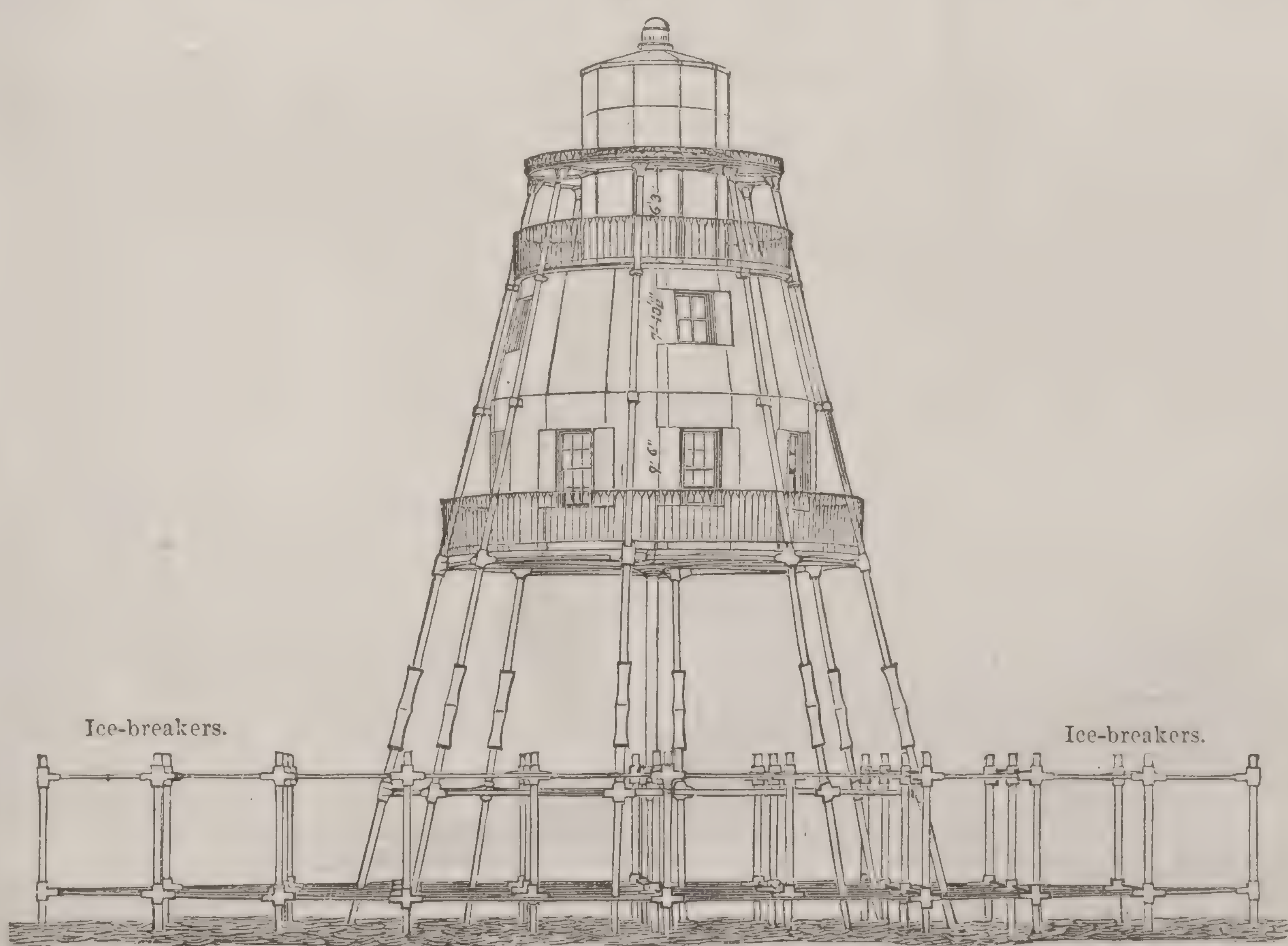
FIG. 7.

Maplin Sand Lighthouse.

In the year 1838 the inventor, associated with his son, laid for the corporation of Trinity House the foundation of the lighthouse on Maplin Sand, at the mouth of the Thames. This, the *first* screw-pile lighthouse,* is fully described in vol. vii. of *Proceedings of the Institution of Civil Engineers*. Two other screw-pile structures were subsequently erected by the same engineers—the Chapman Head (1849) and Gunfleet (1850) off the mouth of the Thames; the latter is in the most exposed position, but the sea even there is never anything like as violent as at the Wolf or Bishop Rock. The Maplin and Chapman are in very sheltered situations. The same engineers constructed screw-pile lights at Fleetwood on the Wyre and Belfast Lough, Carrickfergus Bay, Ireland. The former is on a shifting sandbank, bare at low tide, but covered with 30 feet of water by spring tides. The latter is in a depth varying from 9 to 21 feet, low and high water spring tides. Another was attempted on the Kish Bank, the northern extremity of a line of sandbanks stretching from Dublin Bay to Waterford, parallel to the coast, from which it is 8 or 10 miles distant, and extremely dangerous. "The structure was commenced in the summer of 1842, and had been proceeded with as far as putting down the nine supporting piles, but none of the angle-bracing was attached, when on Nov. 15 a storm came on from the eastward which lasted for three days, raising a tremendous sea, and removing the surface of the bank, at the spot around the piles, to a depth of 10 feet, leaving a depth of 24 feet at low water where there had previously been only 14 feet. Notwithstanding this shifting of the bank, the work would not have been disturbed if the angle-bracing had been applied; but the progress of the work had been retarded by foul weather and various unforeseen causes, and it had not been possible to take all the necessary precautions. Several of the piles were therefore laid prostrate, and the others were, after considerable labor, drawn from the bank." (*Proc. Inst. C. E.*, vol. vii.)

"The design to raise a beacon of screw piles on the eastern end of the Tongue Bank (mouth of the Thames) also proved abortive; but, as in the case of the structure on the Kish Bank, from no inherent defect in the piles themselves. Shortly after it was put up it was discovered that three of the piles were broken off short, and the other two bent. The stumps of the broken piles and the lower parts of the bent piles were found perfectly upright, and the sand around them undisturbed; showing the structure failed from no fault of the *hold* they had taken of the ground. . . . The conclusion arrived at at the time, and no doubt the correct one, was, that a vessel had passed over it—a conclusion in a measure confirmed by finding the copper of a vessel attached to the top of one of the bent piles." (*Rep. of Major Bache, Top.*

FIG. 8.



Screw-pile lighthouse at Delaware Bay, Md.

Eng., on project for a lighthouse on New South Shoal, Nantucket.) Other works of less importance—*e. g.* beacons, shore-lights, etc.—have been erected in Great Britain, but the foregoing completes the category of important ones.

The first screw-pile light of the U. S. was erected by the late Col. Hartman Bache, U. S. E., near the mouth of Delaware Bay, 8 miles from the ocean, and very much exposed,

* This is true, literally, as regards the *screw-pile foundations*, but the Fleetwood was actually *completed* before the Maplin.

on a shoal covered with 6 feet low water spring tides, but over which rise spring tides 13½ feet and storm tides 18 feet. A lighthouse built here in 1827–28 by Mr. Strickland

FIG. 9.

Lighthouse at Ship Shoal, Gulf of Mexico.

of Philadelphia (plan not known to writer) was very soon "demolished by action of the sea." A design was then proposed in the bureau of topographical engineers for a work built "on a mole of breakwater-stone." This was abandoned, because the superstructure, "being built upon breakwater stone thrown at random on the bottom, would by unequal settling be liable to fracture; and it was doubted whether heavy masses of masonry, raised upon such a base, ever proved entirely satisfactory;" and some progress was made (1839) in the collection of stone and the building of a caisson, by means of which a masonry foundation was to be started from the bottom. This plan, too, was abandoned, and in the years 1847–50 the existing lighthouse was erected, which stands yet in good condition, though not without having required reinforcement to its ice-breaker. A peculiarity distinguishing it from all other screw-pile structures is due to its exposure to the powerful action of ice borne to and fro by the violent ebb or flood currents. The light-tower proper is surrounded by an *ice-breaker;* itself an iron screw-pile structure having no connection with the lighthouse, though the two *seem* to form one building. (See Fig. 8. The *ice-breaker* has since this delineation been much enlarged, and its top floored over so as to form an esplanade.)

In connection with the Brandywine construction it is interesting to note that the engineer, Major Bache, presented in 1851 an elaborate report with plans for a lighthouse or beacon on the South Shoal of Nantucket. The work was authorized by a law of Congress of Mar. 3, 1849, appropriating $25,000 "for a screw-pile beacon or lighthouse on the South Shoal of Nantucket, lately discovered by the survey of the coast," etc. The Nantucket Shoals extend from 6 to 20 miles seaward from the island of Nantucket. They are of "hard sand," with depths of 6 to 18 feet, scattered over an area of 375 square miles. The South Shoal is the most seaward, and is 20 miles distant from the island. It is composed of fine white sand, quite hard and compact; the least depth (tide rising 3½ feet) being 8 feet low water. The constructions, estimated to cost from $235,000 (beacon) to $323,000 (lighthouse), were never attempted, and the New South Shoal is now believed to be of a shifting character; but the discussions contained in Major Bache's report are not the less interesting.

For the numerous sand-shoals in the great bays or off the southern coast of the U. S., which needed to be marked by lights, the screw-pile system, thus introduced, seemed especially applicable, and its extension has been very rapid; more than fifty such structures now exist, some of great magnitude and importance, but far the greater number for harbor or bay lights. Sand Key (1853), Carysfort (1857), Sombrero (1857), Alligator Reef (1873), all "first-order," have been successively erected on what is called the Florida Reef. Except the first mentioned (on an island), the piles are *solid* wrought-iron, driven (without screws) into the coral rock which forms the substance of this reef.

FIG. 10.

Craighill Channel range-light, Chesapeake Bay: the lower light.

The tower of Alligator Reef may be considered typical of these structures. It is erected in a very exposed position upon the N. E. extremity of Alligator Reef, in five feet of water, but within 200 yards of the deep water of

the Gulf. The nearest land, Indian Key, is 4 miles to the westward. A temporary platform was erected upon this site, supported on mangrove piles shod with iron, and driven five feet into the bottom in partially indurated coral rock. A small landing-wharf or jetty for receiving materials was also built in connection with this platform. The platform being completed, the nine heavy cast-iron foundation-disks were accurately placed at the centre and angles of the octagon, the surface of the coral rock being first smoothed and levelled for each disk. By an ingenious system of gauges the disks were set in their positions, with their proper relative distances—a work of very great difficulty. The foundation-piles pass through the centres of the disks, and rest by shoulders upon them. These piles are of solid wrought iron, 26 feet long and 12 inches in diameter, and pointed at their lower ends, the upper ends being lathe-turned and cut off square. The pile-driver used in driving them carried a hammer of 2000 pounds, which was hoisted by a portable steam-engine. The piles were kept accurately vertical during the driving by purchases attached to their heads. The penetration into the coral at each blow of the hammer, with an average fall of 18 feet, varied from $\frac{1}{2}$ inch to $1\frac{1}{2}$ inches, and about 120 blows brought the shoulder of the piles into contact with the disks, giving them a depth in the coral-limestone rock of 10 feet. The piles being driven, their tops were cut off to a horizontal plane 11 feet above the water, and the cast-iron sockets which fit on their heads were put in their places. The second series, consisting of nine solid wrought-iron pillars 10 inches in diameter, was inserted in these sockets, etc.

The work differs in *appearance* from Fig. 9 only in having a square one-story keeper's dwelling in place of the cylindrical two-story dwelling of that figure. A very similar work is now (1875) about to be commenced on the Fowey Rocks, the northern end of the Florida Reef, and off Cape Florida, the existing light of which will be extinguished.

Ship Shoal and Trinity Shoal, Gulf of Mexico, are submerged sandbanks lying dangerously in the way of navigation between the mouth of the Mississippi and Galveston. A screw-pile structure (Fig. 9) was erected 1858–59 under the direction of the late W. H. Stevens, then an officer of engineers. Situated (lon. 91.04° W., lat. 28° 55′) about 5 nautical miles from the nearest land, in 15 feet of water, this work has thus far resisted the force of the sea and of the wind (sometimes amounting to hurricanes). Some trouble has been caused from the erosion of the bottom, and a covering of quarry-stone is now being applied over a considerable area. A similar work on Trinity Shoal was commenced in 1873, but the preliminary staging which had been erected was carried away in a severe gale, and the work has not been resumed.

Iron skeleton towers are sometimes resorted to for important land-sites, where the soil offers no adequate support for a masonry structure. A conspicuous instance is the new lighthouse at the S. W. Pass of the Mississippi River. The soil, recent alluvium, made up of the sedimentary deposit of the river, is of clay, very fine sand, and vegetable matter; very yielding (*i. e. plastic*, and in that sense "compressible"), and hence incapable, by itself, of bearing a heavy superstructure. But that the site is not *quite* so mere a quagmire as may be supposed, the erection on a grillage, in former years, of a brick tower is proof. This, it is true, had settled greatly,* but its abandonment had otherwise become imperative through encroachments of the sea. This beacon should be the prominent landmark of this portion of the Gulf, and a first-order light, 128 feet above sea-level, was designed. A commencement was made by driving wooden piles over an area 60 feet in diameter, $3\frac{1}{2}$ feet apart, in rows of like distance, to a depth of fifty feet. Then another series of piles in the centre of each square thus formed. The first series was cut off at 2′ 6″ below low water, and the second series at 1′ 6″ below. A reticulation of grillage timbers was laid on the heads of the first series and carried up for four or more thicknesses, the intervals or free space being packed with concrete, then concrete alone, to make a thickness of about 8 feet. On the surface of this were secured, or bolted, the iron socket-disks from which start the nine (eight external and one central) shafts of the skeleton. The general appearance of the *tower* itself is so similar (except that it rises from the *land*) to that of works delineated (Fig. 9) that no further pictorial exhibition is needed. The light was first exhibited in the beginning of 1873, two or three years having been occupied in the construction.

FIG. 11.

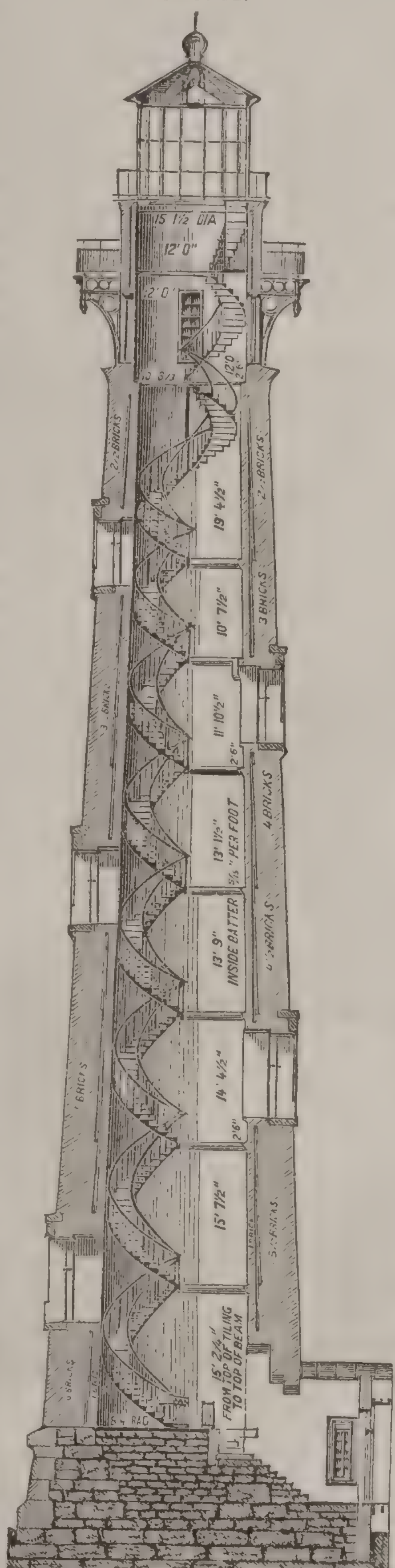
Lighthouse at Race Rock, eastern entrance to Long Island Sound.

For many subaqueous sites, where the difficulties of building might be obviated by a resort to the screw-pile or skeleton iron towers, the prevalence of floating ice during the winter months is inimical to such structures. For such sites (especially) Maj. G. H. Elliot, when engineer-secretary of the lighthouse board, designed what he calls "tubular iron" structures. Fig. 10 represents the "Craighill Channel" lower range-light (approach to Baltimore harbor), described as follows: "The cast-iron tube, between high and low water and for at least 2 feet above and below the space included between those limits, is 2 inches thick, the other portions to be $1\frac{1}{4}$ inches thick. The tube consists of two parts, the lower portion, for a height of 12 feet, being in the form of a frustum of a cone 30 feet in diameter at the base, 24 feet at the top; the upper portion is a cylinder of

*Besides great vertical settlement, the tower is said to have *leaned* $2\frac{1}{2}$ feet. It must have been built between 1840 and 1850.

the same diameter as the top of the frustum of the cone to which it is joined. The tubing is cast in sections, each section being divided into twenty-four parts, joined together through flanges by wrought-iron bolts. The lower section of the tubing is bolted to a grillage or flooring consisting of four layers of timber each 12 inches thick, forming a caisson, which is sunk in position below the bottom of the bay by filling it with concrete. It was found that for a depth of 22 feet the soil is the softest kind of mud—so soft, in fact, that an ordinary pile on end would penetrate 20 feet under the action of its own weight. Below this alternate thin layers of sand, mixtures of sand, mud, and shell, were found to a depth of 20 feet more, with no signs of a solid foundation within 60 feet of the water's surface. It was therefore determined to drive a cluster of piles, cut them off at a level of 27 feet below the surface of the water, and lower the caisson on to them by filling it with concrete; and in order to protect the lighthouse from lateral vibration and the scour of the tides to build a riprap wall of loose stone around it."

Fig. 12.



Lighthouse at Body's Island, sea-coast of North Carolina.

A structure of the same kind, resting likewise upon piles driven into a sand and clay bottom, has been placed on Ship John Shoal, Delaware Bay. Another, resting upon rock 11 feet below low-water mark, the site having been first surrounded by an annular riprap and then levelled with a bed of concrete laid by the diver, upon which the successive iron rings were set up by the same agency and then filled with concrete, is now (1875) nearly finished at the South-west Ledge, New Haven harbor, Conn.

Race Rock presents yet another aspect of the problem of subaqueous foundations. "The Race" is applied to what may be called the eastern water-gate to Long Island Sound, lying between the N. E. extremity of Long Island and Fisher's Island (off New London, Conn.). Little Gull Island, the Long Island *gate-post*, is marked by a light. The other gate-post (to maintain the simile) was Race Rock, three-fourths of a mile from the S. W. point of Fisher's Island, an isolated submerged rock, or rather a huge boulder, surrounded by depths of 12 or 15 feet low water, with 3 feet additional at high water. The tides (hence "The Race") flow with excessive violence, with but brief intervals of slack-water. From the E. and S. E. the ocean-wave finds no barrier save Block Island, and therefore violent wave-action was apprehended; moreover, *ice* from New London harbor and the marginal waters of the Sound is to be feared in winter. Hence to form a riprap embankment (*à pierre perdue*) of oval form, 100 by 150 feet, well protected on its margins by blocks of 8 or 10 tons weight, was decided upon as the first step. This would be not only an immediate means of getting at the site, but a future protection against wave and ice violence. The interior of this embankment was then removed (better to have left it vacant in the first place), and the foundation of concrete (retained in form externally by circular bands of sheet iron each about 2 feet high) was brought up from the bottom by aid of the diver, who first accurately placed each successive band. It should be remarked that the natural bottom is of boulders compacted with gravel and sand, and therefore very firm. Fig. 11 represents the work as it will be, the superstructure being now (1875) in progress (the riprap embankment being invisible at high tide).

A work similar in design and appearance, but less costly and of less difficult construction, has been commenced on the Stratford Shoals, off Bridgeport and in the middle of Long Island Sound.

Little space can be afforded for the lights of *terra firma*, which seldom present any decided "engineering" features. The following historical notes are given: "It appears that immediately after the formation of our government, and prior to the year 1789, the few lighthouses then existing were maintained at the expense of the States in which they were situated. By an act of Congress passed in 1789 the expense of their maintenance was assumed by the U. S., and their management confided to the treasury department, with which it has ever since remained. The first lighthouse erected by the general government was that upon Cape Henry in 1791, and from that date to the year 1800 eight new lights were established, making the total number sixteen. They were placed upon the most frequented and dangerous points of the north-eastern and middle portions of the Atlantic coast. Prior to the year 1812 the number of lighthouses had increased to forty-nine, and their establishment extended along the southern coast of Louisiana. Up to the year 1822 the number of lighthouses had increased to seventy. At the commencement of 1838 there were in operation upon the sea-coast and the shores of the great inland waters of the U. S. 204 lighthouses, together with 28 light-boats, which are placed near dangerous reefs and shoals where it is difficult or impossible to procure a secure foundation for a permanent building." The actual numbers (1875) of lights, signals, etc., under charge of the U. S. lighthouse establishment are given in the last paragraph of Lighthouse Illumination, below.

The light-towers of terra firma, even (if the site be elevated) for the most important lights, require only so much elevation as will prevent obscuration by surrounding objects, and in general present no features of engineering interest. If, however, the site be very low, a light of the first order demanding an elevation of at least 150 feet, the structure appeals to the engineer not only for accurately calculated elements of stability, but for well-devised interior arrangements. One of the most recent of these structures, Body's Island lighthouse, N. C., is exhibited in Fig. 12. "A secure foundation was obtained by excavating until a bottom of hard clear sand was reached at 7 feet below the surface. On this was laid a grillage of timbers 6″ by 12″, placed at right angles to each other in two

Fig. 13.

Second-order lighthouse at Hunting Island, S. C.

layers. Then followed one course of dimension stone 18″ thick; over this coursed rubble laid in large blocks, thoroughly breaking joints, and all grouted with 1 part Port-

land cement and 2 of sharp sand. From this foundation rises the base of the tower, the frustum of an octagonal pyramid with plinth and cornice. The interior 'well' of the tower is lighted by five windows. Access to the watch-room is had by eight sets of spiral stairways, the first seven of which make half the revolution of a spire, the eighth an entire revolution. These stairways are not attached to the tower-walls, but are supported by the landings—semi-circular iron plates resting on I-beams and a corbelling projecting from the interior face of the tower. There is a hand-rail on each side, and the entire system of stairs belonging to each flight is kept rigid by making the carriers of such a form that each baluster firmly bolts together three contiguous ones." The arrangement of the stairs, by which the encumbrance of a central shaft containing a winding stair is avoided, the interior better lighted, and room gained, is an improvement introduced by Major Elliot, when engineer-secretary of the lighthouse board.

A peculiar case is presented at Hunting Island, S. C., where a second-order light was needed. The N. point of the island is undergoing abrasion by wave-action. The objects the light should subserve fixed the location *within* the possible future range of this abrasion. Hence it was determined to make a tower which can be taken down and removed in case of necessity, though the contingency was not deemed probable. The lighthouse is shown in Fig. 13. "The 12-hundredweight iron panels of each horizontal section were cast of exactly the same size, so that each might occupy any position in its own section. The panels of the shell vary in thickness from $1\frac{1}{2}$ inches (lowest section) to $\frac{3}{4}$ inch (highest). The flanges serving to connect the several tiers of plates and the plates of each tier with each other are smooth and true-planed surfaces. The holes in the flanges are drilled, and the bolts turned to neatly fit them. The base of the first tier of panels consists of a flange 3 feet wide. Of this flange the width of 1 foot 4 inches extends beyond the outside of the tower. This part contains the holes for the foundation-bolts, which are strengthened by bosses and vertical knees extending upward to the top of castings. The top flange is 6 inches by $1\frac{3}{4}$ inches. The lower flange of the second section is 1 foot 2 inches wide. The top flange of this tier and the flanges of the third section are 6 inches by $1\frac{3}{4}$ inches. The flanges of succeeding sections are similar, with some slight variation of dimensions. The side flanges correspond in size with the top flange of each panel. All the horizontal flanges have strengthening knees on each panel, 2 feet high and $1\frac{1}{2}$ inches thick, at equal distances apart. An interior lining of brick 9 inches thick is built in between the lower flanges. The whole structure rests on a concrete foundation 8 feet thick, to which the lower iron section is secured by thirty-six anchor bolts built into the concrete. The work (June, 1875) is not completed.

Highly dangerous shoals, whether off shore (*e. g.* Nan-

FIG. 14.

First-class light-ship, with steam fog-signal.

tucket Shoals off the coast of Massachusetts, or the Frying-pan Shoals off the entrance to Cape Fear River, N. C.) or in closed bays (*e. g.* Stratford Shoal, L. I. Sound, Cross Ledge Shoal, Delaware Bay), where permanent structures cannot be or have not been erected, can only be lighted by light-ships, so many of which (see LIGHTHOUSE ILLUMINATION) are employed. These vessels are specially designed and built for the particular object they are designed to subserve. Furnished with the strongest and most approved holding-gear, and provided with many months' supplies of fuel, oil, and food, they ride out unharmed the gales of winter. Like sentinels, ever at their posts, they, unlike them, warn *friendly* comers of the ambushed foe. Fig. 3 of LIGHTHOUSE ILLUMINATION (which see) portrays the illuminating apparatus employed. Besides these essential "sight" signals, many light-ships are also provided with "sound"—*i. e.* steam fog—signals. The design and construction of these vessels belong rather to the naval constructor than to the engineer.

J. G. BARNARD.

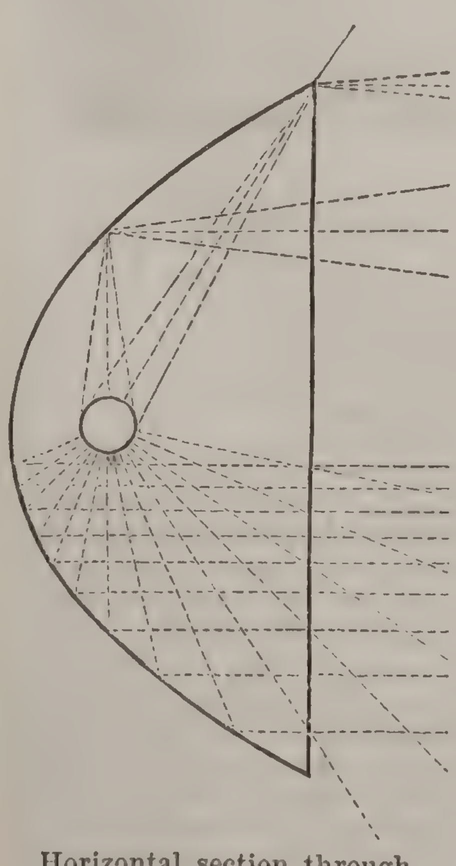
Lighthouse Illumination. For many years, indeed for centuries, the only means employed to warn the mariner at night of his approach to land was the maintenance of simple wood or coal fires on the summits of prominent headlands. Sometimes these fires were established on towers of greater or less elevation, but the number of lights was small, as the entrances to ports and the mouths of navigable rivers were the only places at which, for a long time, they were regarded as necessary. The Pharos of Alexandria at the mouth of the Nile, the tower of Dover and that of Boulogne on opposite sides of the English Channel, the Isle of May lighthouse in Scotland, were all illuminated by simple wood or coal fires. The tower of Cordouan at the mouth of the Gironde River, coast of France, regarded as the noblest edifice of its kind even at the present day, was illuminated until the year 1782 by a coal-fire exposed in an open chauffer. Indeed, the only exception to the rule previous to the latter part of the eighteenth century seems to have been the Eddystone lighthouse, which for about half a century was illuminated by twenty-four tallow candles, the light from which was inferior to the coal or wood fires generally in use, but were resorted to doubtless from necessity, as it was scarcely practicable to supply a station with such limited capacity for storage, with sufficient coal or wood to last through a long period of stormy weather, during which time no intercourse could be held with the mainland.

The first real advance made in lighthouse illumination was in the introduction of oil lamps and reflectors. The lamps had flat wicks, and gave a poor light at best;

the reflectors were segments of spheres, and merely reflected without parallelizing the rays; consequently, the change in the system at first met with little favor. The new system was introduced at the Cordouan light in 1782, and at the isles of Ré and Oléron about the same time. The light, however, was so feeble at the Cordouan (though not less than eighty reflectors were used) that mariners complained of its inefficiency, and asked a return to the previous system of coal-fires. M. Teulère, engineer of the district of Bordeaux, in which the Cordouan tower is situated, was accordingly charged by the minister of marine with the duty of examining into the defects of the system, and devising remedies therefor. The results of his studies were published in a memoir dated May 26, 1783. He proposed three important improvements: *First*, in the reflector itself, by making it paraboloidal, instead of spherical, and placing the flame of the lamp in its focus. From the most reliable data we have at the present day, it seems that Teulère was the first to propose the simple application of the principle of the parabola to the subject of lighthouse illumination, though the knowledge of the property possessed by the paraboloid of parallelizing by reflection the rays of light proceeding from a luminous source at its focus, was well known. Indeed, the subject had been discussed in a memoir as early as 1775 by Lavoisier, but only with reference to the lighting of the streets of a great city. As a *second* improvement he proposed to use lamps with cylindrical wicks, supplying air to the interior of the flame as well as to the outside. This is without doubt the most important improvement suggested, but there seems to be some doubt as to the real inventor. The burner is universally known as the *Argand burner*, and Ami Argand of Geneva is almost universally regarded as its inventor. Whether the idea originated with Teulère or with Argand, or was the result of their joint efforts, the invention was a most valuable one, and Teulère deserves great credit for first suggesting its application to lighthouse illumination. The *third* improvement proposed was in the use of flashing or eclipse lights. This was to be accomplished by placing several lights with their reflectors on the outside of a polyhedral frame, and revolving the latter about its vertical axis by clockwork. The appearance then to an observer at a distance would be that of a light which at regular intervals would suddenly come into view, increase in intensity until it attained its maximum brilliancy, then die out, and be followed by a period of darkness. This character of light, formerly called *revolving*, is now known as the *flashing* light. Teulère had no claim to priority in this, as such a light, consisting of three spherical reflectors attached to a triangular polyhedral frame, had been established at Marstrand, Sweden, previous to the publication of his memoir.

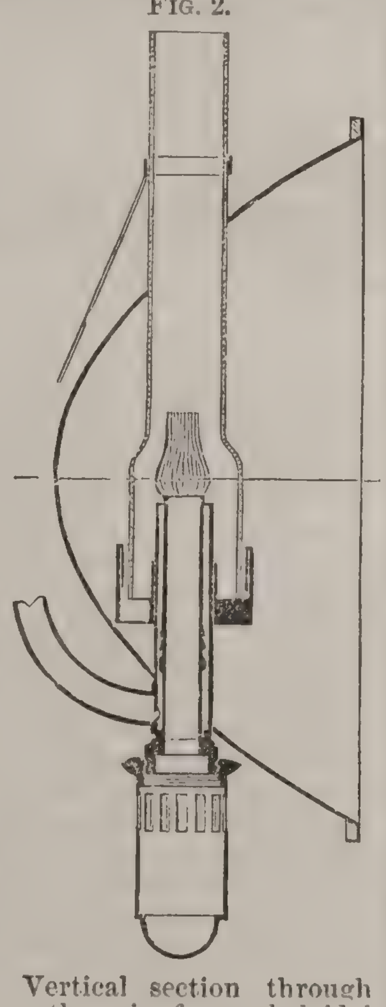
The new system was not fairly introduced until 1790, when an apparatus constructed by M. Lenoir, under the direction of M. Borda, was placed on the tower of Cordouan, after having been satisfactorily tested at Versailles.

FIG. 1.



Horizontal section through the axis of a paraboloidal reflector.

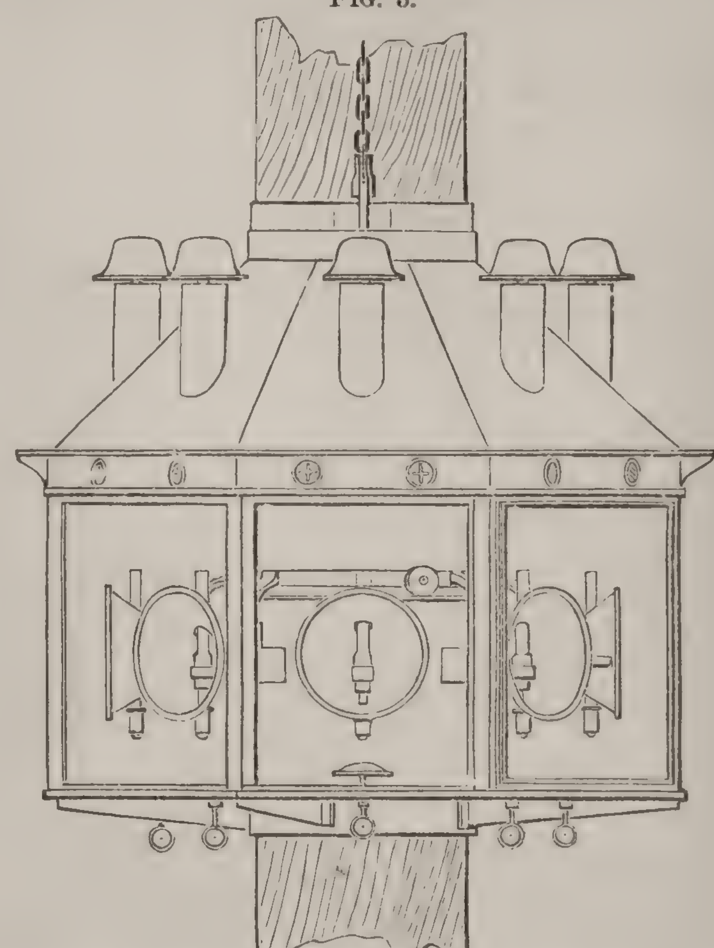
FIG. 2.



Vertical section through the axis of a paraboloidal reflector.

This apparatus, the largest of its kind ever constructed for lighthouse purposes, consisted of three groups of four reflectors each, supported on a triangular polyhedral frame, to which rotary motion about its axis was given by means of clockwork. The reflectors at first used were lined with small facets of silvered glass; at a later period hammered copper plates were moulded to the proper form and silvered on the inside: the latter are still used wherever the catoptric system of lighthouse illumination is adhered to. Figs. 1 and 2 represent horizontal and vertical sections through the axis of a paraboloidal reflector. The burner is so adjusted that the centre of the most brilliant horizontal section of the flame shall be coincident with the focus of the reflector; strictly speaking, therefore, the number of rays reflected parallel to the axis forms but a small portion of the whole. The greater portion of the reflected rays diverge more or less according to the diameter of the opening of the reflector, its focal distance, and the dimensions of the flame. A certain amount of divergence is obviously necessary, otherwise the duration of the flashes of a flashing light would be too short to enable the mariner to take his bearings from it. Fig. 3 represents an apparatus for a floating light, such as is in use at the present time on board the light-ships in the service of the U. S.:

FIG. 3.



Illuminating apparatus for light-ships in the service of the U. S.

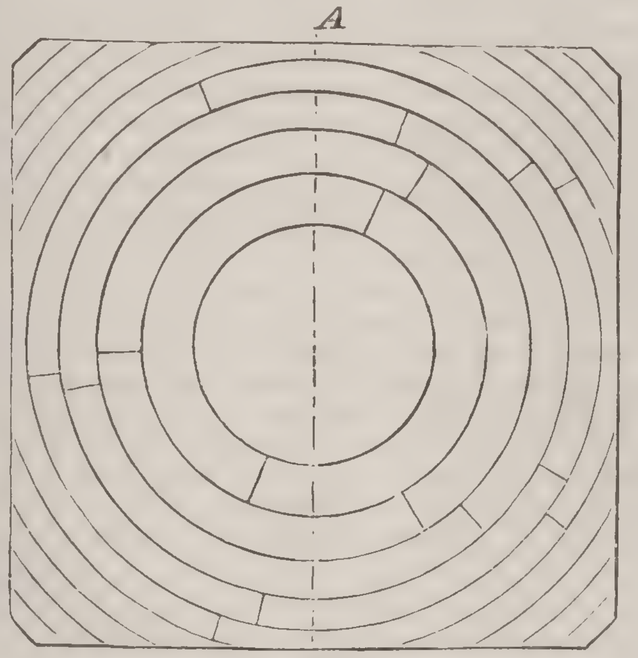
It is enclosed in a lantern, which is hoisted to a mast-head at night, and lowered to the deck of the vessel during the day. In the latter position it is covered by a small house built around the mast, where it can be cleaned and prepared for night-service.

The system of Teulère marks the first real advance in the improvement of the illumination of lighthouses, and after a practical demonstration of its advantages it was eagerly adopted by all civilized maritime nations, and continued in use until the later invention of the lenticular system of Fresnel. To some extent it is still adhered to. The majority of the Canadian lights on the lakes of North America are of this system; it is used in all countries extensively for range-lights, and almost exclusively for floating lights, it being well adapted for the service of the latter. This system of lighthouse illumination being based on the reflection of light by means of metallic surfaces, though far superior to anything previously known, still had serious inherent defects. It had been found by experiment that rays of light reflected from metallic surfaces, though polished in the most perfect manner, lost not less than one-half their intensity by absorption. The loss being so great under the most favorable circumstances, it is readily imagined that in practice it will be vastly increased on account of the impracticability of maintaining the reflectors in a perfect state while under the charge of light-keepers. Considerable loss is also occasioned by inaccuracy of workmanship; by the lamp itself, which by its position necessarily obstructs the passage of a portion of the reflected rays; and by divergence above and below the plane in which the axis of the reflector lies. The rays which diverge below are not entirely useless, as they serve to light the waters in close proximity to the lighthouse; but the upward-diverging rays, which constitute a large portion, are lost in space. It is thus evident that a large amount of available light is lost through the imperfection of the means of utilizing it. These defects became more apparent, and the

necessity for a still better system evident, as the number of lighthouses and the demands of an increasing commerce multiplied. The problem was, how with safety and economy to produce a single flame of great brilliancy, but of small dimensions, and to so manipulate the globe of rays that the loss of useful effect should be reduced to a minimum. This was satisfactorily solved by Augustin Fresnel in the year 1822, and the Fresnel or dioptric system—that is, a system based on the refraction of light—was the result.

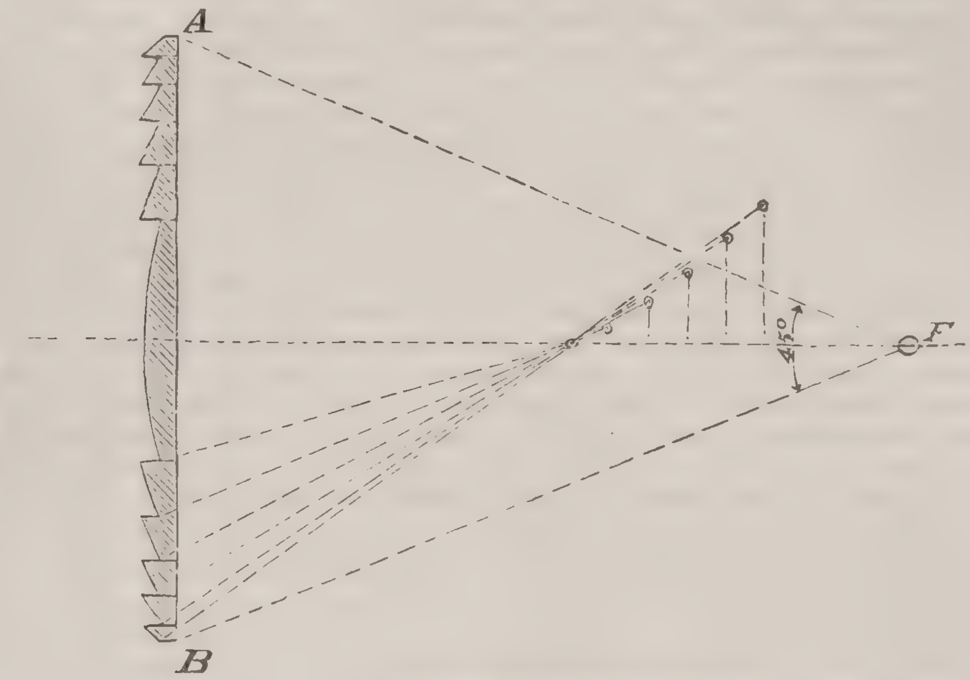
Although Buffon as early as the middle of the last century had proposed to grind solid convex lenses into steps or concentric zones, and Condorcet in 1773 to build up lenses in separate pieces in order to constitute large burning-glasses, Augustin Fresnel was the first to propose and put in successful operation the lens or dioptric system as a means of illuminating lighthouses. His system is based on the optical principle of the convex lens, that rays of light emitted from a luminous point at its principal focus, striking the lens, are refracted in passing through it, and but for the effects of spherical aberration would emerge in a direction parallel to its axis. In the previous system of Teulère the rays of light had been approximately parallelized by reflection. Fresnel proposed to accomplish the same end by means of refraction. For obvious reasons he decided to use the plano-convex form of lens for this purpose. To carry out his ideas required the construction of lenses of large size, and as it was necessary to make them of short focal distance, one constructed in the ordinary way—that is, with a plane on one side and a single convex surface on the other—would have required so great a thickness of glass that the loss of light by absorption and from dispersion by spherical aberration, to say nothing of other manifest defects, would have alone been a sufficient reason for discarding it. Without being aware of what had been written by either Buffon or Condorcet in regard to the construction of large burning-glasses, he conceived the idea of constructing lenses in the manner suggested by the latter; that is, with concentric annular prisms (*en échelon*), the exterior surfaces of the prisms being zones of curved surfaces with different radii of curvature. By this means the thickness of the refracting medium may be reduced to a minimum, and by generating the exterior surfaces of the annular prisms with curves of proper radii, the effect of spherical aberration may be almost entirely corrected. Fig. 4 represents an elevation, and Fig. 5 a section through the axis of such a lens:

FIG. 4.



Elevation of a lens.

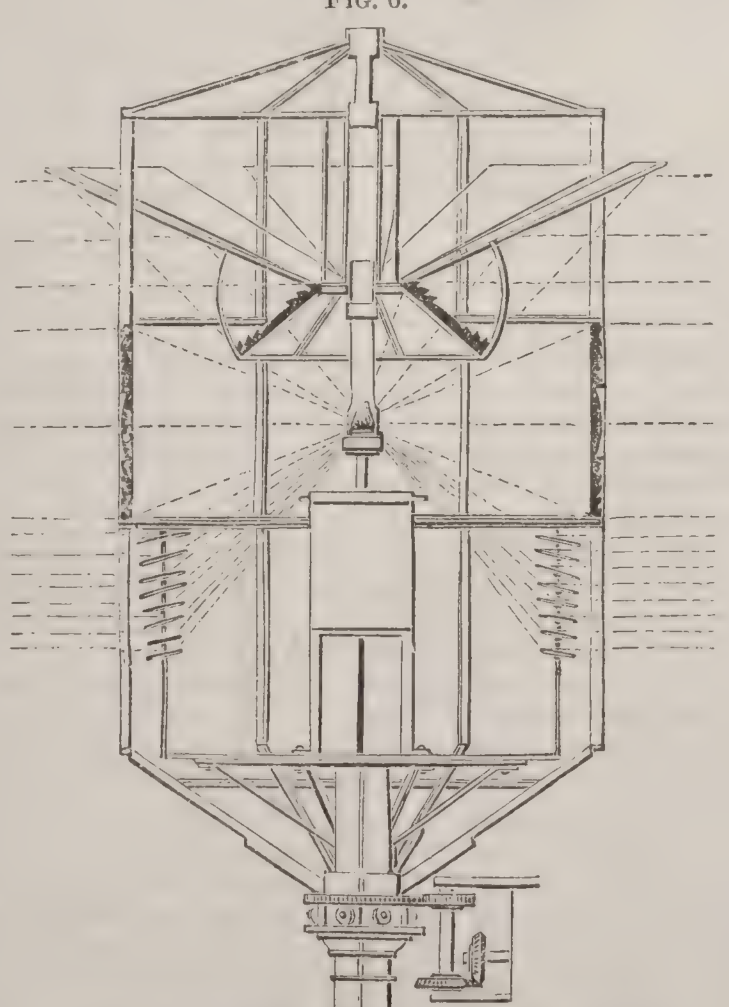
FIG. 5.



Section through the axis.

He also decided to use the crown glass of St. Gobain in the construction of his lenses, though it had a faint green tinge, rather than a clearer glass having in it more oxide of lead, the latter when moulded in large masses being of less uniform density and more liable to *striæ*. The idea of using as the refracting medium water, spirits of wine, or

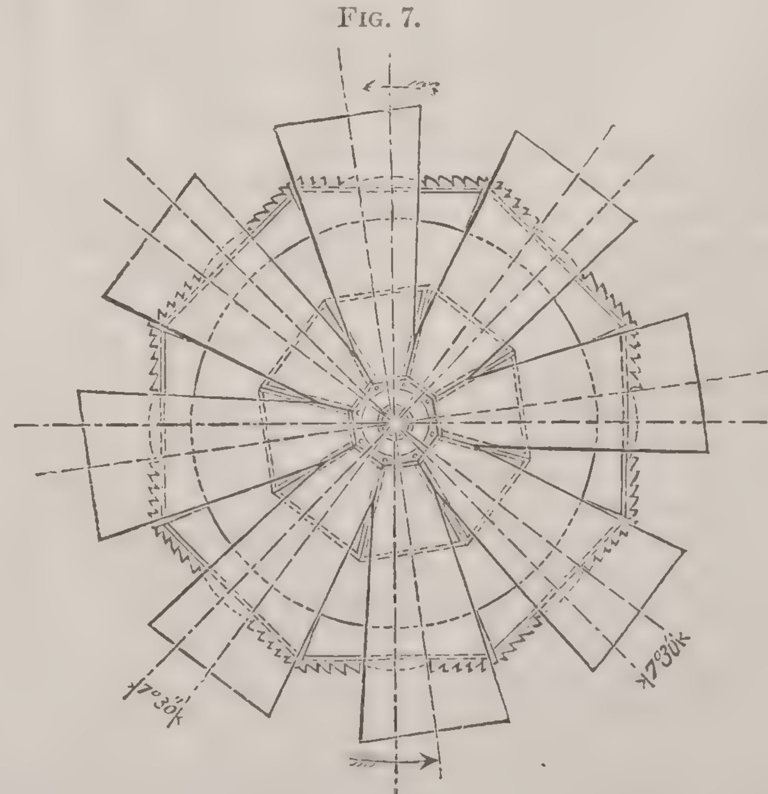
FIG. 6.



Fresnel's apparatus, designed for the Cordouan.

some other liquid that would absorb little light in its passage through it, by confining it in glass cases shaped like lenses, had not escaped him, but was given up after careful consideration. Mechanical difficulties at first stood in the way of the realization of his original ideas. The work requiring new and expensive machinery, he found it necessary to modify his plans, making his first lens with polygonal instead of annular prisms, the exterior surfaces of which, instead of being zones of surfaces generated by curves of proper radii, were segments of spherical surfaces. It was necessary to have at the focus of the lens a powerful light, of such dimensions that the divergence below the axis of the lens would be sufficient to light up all the surface of the sea from a point comparatively near the tower to the most distant horizon, and lateral or horizontal divergence sufficient to enable the mariner at the limit of the range to see the flashes long enough to take his bearings. This led to the no less important invention

FIG. 7.



Plans of the Fresnel apparatus designed for the Cordouan.

of the four-wick mechanical lamp, which Fresnel, with his characteristic modesty, says was the combined work of himself and Arago, though the latter disclaims all credit

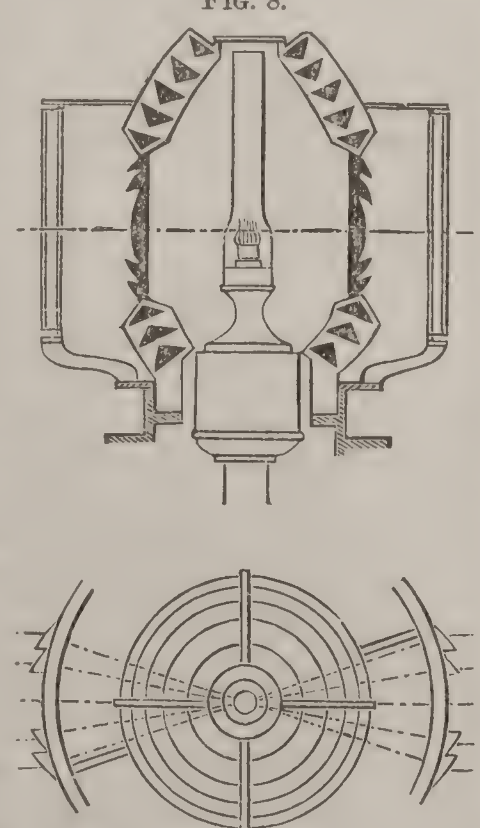
in connection with it, and gives the honor to his friend alone.

A trial having been made, under the supervision of the commission des phares, of a lens constructed by Fresnel, and the advantages of his system clearly demonstrated, he was directed to undertake the construction of an apparatus to take the place of the reflectors on the Cordouan. Figs. 6 and 7 represent the apparatus devised by him for this tower, where it was placed in the year 1823. This was the first complete lenticular apparatus ever constructed for lighthouse purposes. It consisted of eight lenses, of 50 centimètres (about 19½ inches) focal distance, united at their edges by a light armature of brass, forming a polygonal band or drum. A four-wick mechanical lamp was placed in the axis of the latter, with the top of the burner a little below the common focus of the lenses. Rotary motion about the axis of the apparatus was given by means of clockwork machinery, so that it made one complete revolution in eight minutes. In this manner a succession of brilliant flashes were thrown out on all points of the maritime horizon at regular intervals of one minute. In order to utilize the rays which would otherwise pass out above the top of the drum and be lost, he had constructed eight smaller lenses, and arranged them on the faces of a truncated pyramid, so that planes through their centres and the axis of the apparatus would make with corresponding planes through the centres of the large lenses angles of 7½ degrees, the effect of which was to increase the duration of the flashes. Above the upper edge of each he placed an inclined mirror to reflect the rays in a horizontal direction after they were made parallel by passing through the lenses. The rays that pass below the edge of the drum were rendered horizontal by small silvered reflectors arranged like the leaves of a venetian blind, as shown on Fig. 6; so that at a distance of not more than about 10 miles they produced the effect of a dim fixed light, which could be seen between the flashes. After a short practical test of the new system, it was definitively adopted by the commission des phares for the illumination of the lighthouses on the coasts of France.

The apparatus just described gathers the divergent rays of light proceeding from the flame into eight distinct beams. The necessity for having one that would distribute its rays equally around the entire horizon, thus producing a fixed light, was soon recognized by Fresnel. Such an apparatus was therefore constructed under his direction and presented to the Academy in May, 1824. The central drum in this case was to have been cylindrical. Owing, however, to the impossibility of having his original designs practically carried out, he had to modify them, so that the central dioptric drum, instead of being a cylinder, as it ought to have been, was a polyhedron of sixteen sides. He afterwards increased the number to thirty-two sides.

Another apparatus constructed by Fresnel was that which produced a fixed light varied by flashes at regular intervals. This he made by establishing on the outside of an ordinary fixed light apparatus a subsidiary one which revolved around the other. It had two dioptric panels composed of vertical prisms held in a frame, by means of which portions of the light diverging uniformly over the horizon were united into beams of parallel rays. Fig. 8 represents a plan and section of this apparatus.

Fig. 8.

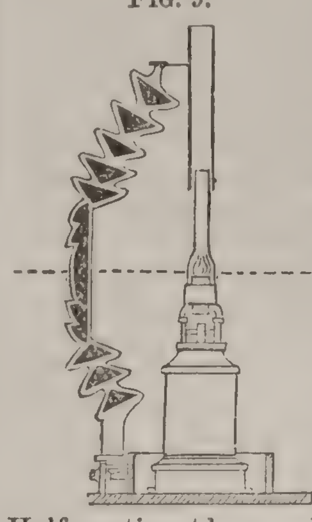


Fresnel's apparatus for a light fixed, varied by flashes.

The apparatus first devised by Fresnel had above and below the central dioptric drum metallic reflectors for utilizing the light which would otherwise be lost. Shortly before his death he conceived the idea and commenced the execution of a fourth-order apparatus, embodying a most important improvement for parallelizing these rays. He did this by means of totally reflecting catadioptric rings, three of which he arranged below and five above the central drum; the latter formed a dome, through the upper part of which the lamp-chimney passed. Fig. 9 represents a half-section through the vertical axis of this apparatus.

The system of lighthouse illumination which bears the name of Fresnel was not at the time of his death brought to the high state of perfection which it has since attained. But it was brought to such a condition that, though adopted by almost every civilized nation, no essential modifications in the principles of his constructions have been found necessary; and few improvements have been suggested which had not already been carried out on a small scale or described in his writings.

Fig. 9.



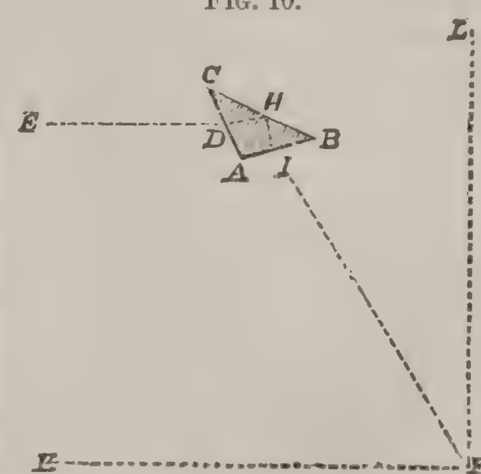
Half-section through Fresnel's fourth-order catadioptric apparatus.

For want of proper facilities, it seems that the construction of the central dioptric drum of the first-order apparatus as a cylinder was not attempted until 1836, though it was well known that the cylindrical form was the only one that would cause an equal distribution of the rays. In that year this improvement was successfully accomplished, at the suggestion of Mr. Alan Stevenson, engineer to the commissioners of northern lights, Scotland, by Messrs. Cookson of Newcastle-on-the-Tyne, and with such precision that the useful effect of the light was increased one-fourth.

The rays that pass above and below the central dioptric drum in all first-order apparatus were rendered horizontal by means of metallic reflectors until the year 1843. In that year a first-order fixed-light apparatus was constructed, in which these reflectors were replaced by totally reflecting prisms, similar to those in the fourth-order lens, the construction of which had been commenced by Fresnel just previous to his death. From observations made at the Royal Observatory at Paris it was found that the illuminating effect of the cupola of prisms, or that part above the dioptric drum, as compared with the tier of reflecting mirrors which they replaced, was as 140 to 87; that of the prisms below, as compared with their reflectors, as 74 to 46; the total relative effect being 214 to 133.

Let the triangle A B C (Fig. 10) represent a section of one of these rings; F, the focus of the illuminating apparatus; F L, the vertical, and F K, the horizontal axis; F I, the course of a ray of light incident to the surface of the prism at I, at which point it is refracted to H, where, according to a well-known law of optics, it is totally reflected to D, and is again refracted in the direction of E. If the section A B C be revolved about the vertical axis F L, a horizontal prismatic ring will be generated, and the light which passes through it will be distributed equally around the entire horizon. The ring in this case forms an element of a fixed-light apparatus. If the same section be revolved around the horizontal axis F K, a vertical ring will be generated, and the light in passing through it will be emitted in a horizontal cylindrical beam. In this case it forms an element of a revolving or flashing light apparatus. These rings are called catadioptric, from the fact that the light in passing through them undergoes both reflection and refraction.

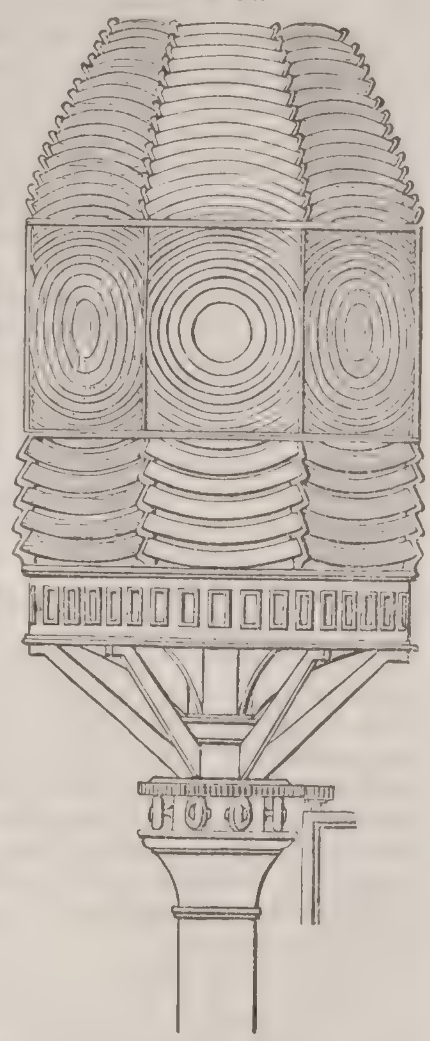
Fig. 10.



The application of the vertical rings to the flashing-light apparatus is the basis of the holophotal system of Thomas Stevenson; and though prisms formed in both ways were made use of by Fresnel during his lifetime in the construction of the small apparatus designed for lighting the quays of the St. Martin Canal, Paris, still the vertical rings used in this case were not applied to lighthouse illumination. The first proposal to use them in connection with the revolving-light apparatus seems to have come from Thomas Stevenson in 1849. Up to that time the flashing-light apparatus had been constructed either with metallic reflectors or horizontal catadioptric rings above and below the central dioptric drum. These reflectors and catadioptric rings produced a fixed light more or less dim, which could be seen between the flashes, so that, in fact, the light had the same appearance as that of a fixed light varied by flashes. Stevenson's object seems to have been to do away with the metallic reflectors and horizontal totally reflecting rings, and to increase the intensity of the flashes by concentrating all the available light in the flash itself. Hence the name holophotal. The first apparatus of this kind ever constructed was for a lighthouse at Horsburgh in the

Straits of Singapore, India, where it was lighted Oct. 15, 1851. Fig. 11 represents a first-order holophotal apparatus. In 1852 a first-order apparatus was constructed on this principle for the light at North Ronaldsay, Scotland, and about the same time another was made for the lighthouse at Ailly, France. Thomas Stevenson also devised an improved method of producing a fixed light varied by flashes by using, in the place of one or more of the ordinary fixed-light panels, corresponding holophotal panels. In this case the whole apparatus revolves, but the portion of the apparatus through which a fixed light is seen does not change its appearance on account of the motion. As each flash panel crosses in front of the eye of the observer, a brilliant flash is seen, followed by the more feeble fixed light.

Fig. 11.



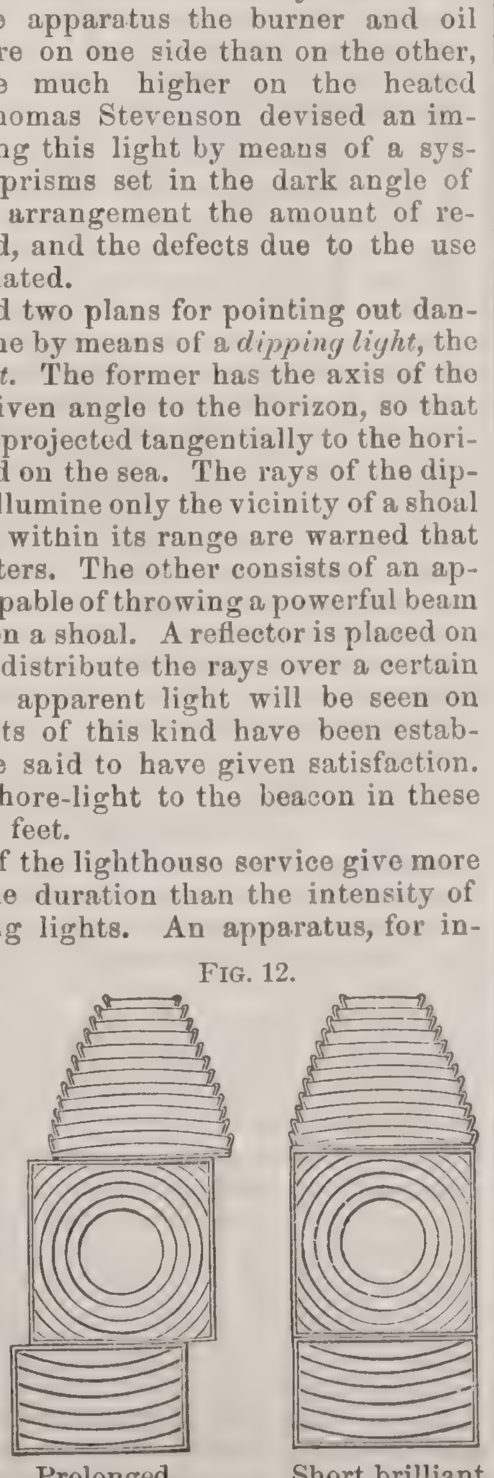
First-order holophotal catadioptric apparatus.

If in the ordinary lenticular apparatus it be not required to illumine the entire horizon, the dark sector is left blank; or, if desirable, a spherical reflector may be placed in it, to return to the source of light, and through it to the lenses, the rays which would otherwise be lost. The objection to the use of this reflector is, that it inverts the image of the flame, and reflects the heat as well as the light, so that unless it is set with its centre considerably above the level of the focus of the apparatus the burner and oil will be heated much more on one side than on the other, and the flame will rise much higher on the heated side in consequence. Thomas Stevenson devised an improved method of utilizing this light by means of a system of totally reflecting prisms set in the dark angle of the apparatus. By this arrangement the amount of reflected light was increased, and the defects due to the use of metallic reflectors obviated.

Stevenson also proposed two plans for pointing out dangerous rocks or shoals—one by means of a *dipping light*, the other by an *apparent light*. The former has the axis of the apparatus inclined at a given angle to the horizon, so that the rays, instead of being projected tangentially to the horizon, are thrown downward on the sea. The rays of the dipping light being made to illumine only the vicinity of a shoal or danger, vessels coming within its range are warned that they are in dangerous waters. The other consists of an apparatus placed on shore capable of throwing a powerful beam of light to a beacon built on a shoal. A reflector is placed on the latter to receive and distribute the rays over a certain arc. Within this arc an apparent light will be seen on the beacon. Several lights of this kind have been established in Europe, and are said to have given satisfaction. The distance from the shore-light to the beacon in these cases does not exceed 600 feet.

The French engineers of the lighthouse service give more attention to increasing the duration than the intensity of the flashes of the flashing lights. An apparatus, for instance, composed of eight lenticular panels revolves about the luminous source with a certain velocity, each panel condensing one-eighth of the effective light. The light from each may be so concentrated that at a certain distance it will give the appearance of a flash of great brilliancy, but of short duration, or one of less brilliancy, but of longer duration. This is done in the manner shown in Fig. 12. In the one case, the light through the central dioptric part of the apparatus, and that through the corresponding catadioptric prisms above and below it, comes into view simultaneously, and being concentrated in a single powerful beam gives a short brilliant flash. In the other case the lower catadioptric prisms are set slightly in advance, and the upper ones slightly in rear (with reference to the direction of motion) of the dioptric part. The light through the lower prisms is therefore seen first, then that through the central dioptric part comes into view, and it is followed by the light through the upper prisms. In this case the effect is a prolonged flash.

Fig. 12.



Prolonged flash. Short brilliant flash.

In order that lights on the same or adjacent coast may not be mistaken one for another, and thus lead the mariner into danger, their appearance in different places is varied, so that when one is seen the mariner may determine his position by consulting the chart and the lighthouse list. In the U. S. the following characteristic distinctions are made use of—viz. 1, fixed white; 2, fixed red; 3, flashing white; 4, flashing red; 5, flashing alternately white and red; 6, fixed white, varied by white flashes; 7, fixed white, varied by red flashes; 8, fixed white, varied by alternate red and white flashes; 9, multiple lights. The fixed light is one that does not change in its appearance. The white light is one of the natural color. The flashing lights include all those that show alternately a bright flash and a total eclipse, though the interval between the flashes may vary from five seconds to one and a half minutes. For obvious reasons, this interval is rarely made longer than one minute. When it is only five seconds, the light has a very characteristic appearance, and is called scintillating. There are several first-order lights with this characteristic on the coast of the U. S. The fixed light varied by flashes is described by its name, and is susceptible of further distinctions by varying the intervals between the flashes, which in this kind of light seldom follow each other at shorter intervals than thirty seconds nor longer than three minutes. Multiple lights, as a distinctive characteristic, are now seldom used, except for light-ships, though there are several places on the coast of the U. S. where double, and one where triple lights are maintained. The latter distinction is a remnant of the old system, which has been retained merely because all unnecessary changes in the appearance of old light-stations long familiar to seamen should be avoided.

The mode of distinguishing lights by color was at first condemned in the most emphatic manner, because the coloring-matter absorbs a large percentage of light, and in certain atmospheric conditions a red light can scarcely be distinguished from one of the natural color. There are only two colors that can be used to advantage as a means of distinguishing lights—the *red* and *green*. They are produced by interposing glasses of those colors between the flame and the observer. The red light is most distinct, and it has been found by experiment that its brilliancy is less impaired in its passage through the atmosphere than light of the natural color. In other words, of two lights, one red and the other white, but of the same intensity measured by the usual photometric process, the red will be visible farther than the white. Experiment has also shown that the reverse of this is the case with the green light; it diminishes much more rapidly in intensity than the white as the distance increases. It also suffers great diminution in brilliancy in receiving its color; hence green is not a suitable color for distinguishing the lights of lighthouses, though it may be, and sometimes is, used for interior harbor-lights.

A system for distinguishing sea-coast and other lights was proposed some years ago by Charles Babbage of London. It consisted in giving to each lighthouse a certain number, and by means of occultations to cause it to repeat its number continually during the night. This was to be accomplished by enclosing the upper part of the glass chimney in a thin tube of brass or tin, which was to descend slowly over the flame, and then to suddenly start back. The motion of the screen was to be regulated by clockwork in such manner as to cause occultations of the light at proper intervals, which would indicate its number. This subject was carefully investigated by the lighthouse board of the U. S. in 1854, and while certain advantages were conceded to the system, it was found that there were disadvantages which prevented its adoption.

The lenticular apparatus are classed according to their sizes in orders, as shown in the following table:

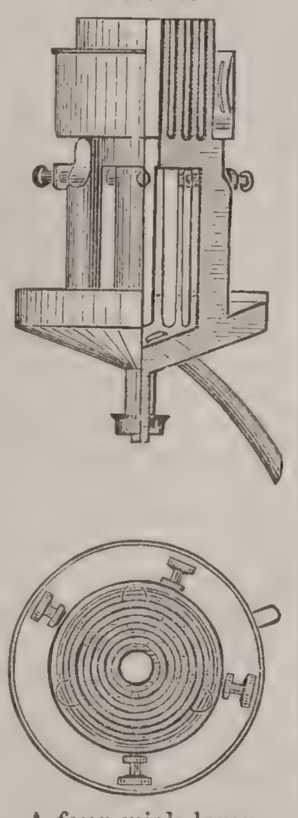
Order of apparatus.	Interior diameter of the central drum.	Height of the different parts. Lower catadioptric part.	Central drum.	Upper catadioptric part.	Total height of apparatus, not including pedestal.
	Inches.	Inches.	Inches.	Inches.	Inches.
First order	72.44	21.22	38.58	39.40	101.96
Second order	55.12	14.88	33.62	31.88	81.45
Third order	39.37	10.94	25.98	23.34	62.05
Fourth order	19.68	5.66	11.81	10.16	28.42
Fifth order	14.76	4.13	8.90	7.71	21.39
Sixth order	11.81	3.30	7.08	6.18	17.04

In the French service they have only four orders of apparatus, the third and fourth being classed as large and small models of the third, and the fifth and sixth as large and small models of the fourth. An apparatus is sometimes made of 27.56 inches diameter, called the $3\frac{1}{2}$ order. First-order lights are sometimes called sea-coast or landfall lights, and are generally established on prominent headlands or capes, the distances between them being so arranged that their circles of illumination shall overlap each other, in order that the mariner may not approach within dangerous proximity to the coast, in clear weather, without seeing at least one of them. Sometimes, however, the configuration of the coast is such that the first-order lights are too far apart to fulfil this condition. In this case the dark space between them is illumined by establishing one or more lights of a lower order. The second-order lights mark the secondary points or headlands along the coast and the approaches to bays and sounds. The third-order lights are used in bays of considerable width and intricacy and for the principal lights of lake-coasts. The fourth, fifth, and sixth order lights mark the prominent points, headlands, and shoals in large bays or sounds or obstructions in rivers. They are also used to mark pier-heads and wharves.

It is of great importance that the lights of the first order, and those which on some particular points fulfil the necessary requirements of sea-coast lights, should be very marked in their appearance, so that the mariner may be unmistakably apprised of his true position, and enabled to rectify any errors of "reckoning" before he shall have approached the coast too near for safety. But it is not necessary that each light should have a different characteristic. It will be sufficient that the distances between those of the same characteristic, on the same and adjacent coasts, exceed any error of position which might result under ordinary circumstances of weather and navigation.

A most important feature in the Fresnel lenticular apparatus is the lamp. It has already been stated that Argand is generally credited with the invention of the double-current-of-air burner. Count Rumford is supposed to be the first who used lamps with multiple wicks, but it appears that Guyton de Morveau made a lamp with three concentric wicks as early as 1787. It was not a success, however, as he failed to devise the means of supplying oil with sufficient rapidity to prevent the destruction of his burner by the intense heat developed. Carcel at a later period invented a mechanism of clock-machinery, which pumped the oil up with sufficient rapidity to cause a constant overflow, and thus to keep the burner cool. The lamps generally used in the higher orders of apparatus, which are required to illumine the entire horizon, are the result of the studies of Fresnel and Arago, and combine the principles of the double-current-of-air burner, multiple concentric wicks, and the mechanism of pumps worked by clock-machinery for supplying a superabundant quantity of oil. Other lamps have come into use, but they are all constructed on the same general principles, except in the manner of supplying the oil to the burner. Fig. 13 represents a burner of a four-wick lamp. The first one used in the Fresnel lenticular apparatus was made by M. Wagner, a clockmaker of Paris, from whom the lamp takes its name.

FIG. 13.



A four-wick lamp-burner.

Lamps are classed according to the order of the apparatus to which they belong. The lamp of the first-order apparatus has a burner with four wicks; that of the second order has three wicks; those of the third and fourth orders have two wicks each; and those of the fifth and sixth orders have but one wick each. The following lamps are in use in the lighthouse service of the U. S.—viz. Wagner's mechanical lamp, Lepauté's mechanical lamp, the moderator lamp, Meade's hydraulic lamp, Franklin's pneumatic lamp, Funck's hydraulic float lamp.

The luminous intensity of a light is measured by means of a photometer, the unit of measurement in some countries being the light of a Carcel lamp consuming a certain quantity of oil per hour, and in others a sperm candle of fixed dimensions, which consumes a certain number of grains per hour. In neither case, however, is this unit a perfectly invariable quantity, but it depends on elements that are variable and difficult to accurately estimate. The French unit, a Carcel burner, is consequently variously estimated at from 9 to $11\frac{1}{2}$ sperm candles, the latter being the American and English unit.

In the first-order lenticular apparatus the flame of a four-wick burner has a diameter of about $3\frac{1}{2}$ inches and a height of about 4 inches when in its normal state. The top of the burner is placed so that it will be about 1 inch below the focus of the apparatus; in this position the focus coincides with the centre of the horizontal section of greatest brilliancy of the flame. Until within a few years lamps with four wicks were the largest in general use for first-order lights; recently in the English service they have been made with as many as six wicks. They are arranged so that a less number may be burned at a time if required, producing a light which may be varied in intensity. This is considered an advantage, as it enables a saving to be made in the consumption of oil during the long twilight of summer and at other times when the maximum intensity is not required. The maximum intensity of a light from a six-wick burner is estimated at 722 candles, while that from one of four wicks is 328 candles.

The distance at which a light may be seen is termed its "range;" and were it not for the spheroidal form of the earth its value would depend entirely upon the intensity of the light and the degree of transparency of the atmosphere. The form of the earth's surface introduces another element, however, in the problem of determining the value of the range—that of the height of the light above the level of the sea. We thus have the theoretical or luminous range, and the practical or geographical range. The following table gives the intensities of four orders of lights, the luminous ranges in a clear atmosphere corresponding to each, and the geographical ranges corresponding to the heights at which they are ordinarily placed. The flashes of the flashing lights are those from a lenticular apparatus of eight panels:

Order and character of apparatus.	Intensity of the unassisted light in Carcel burners.	Intensity of light in Carcel burners after concentration by the apparatus.	Luminous range in clear weather (in nautical miles).	Geographical range (in nautical miles) corresponding to ordinary height of light above the sea-level.
1st order, fixed light......	23	630.	39	$18\frac{1}{2}$ to $20\frac{1}{2}$
1st " flashing light....	23	5075.	59	$18\frac{1}{2}$ to $20\frac{1}{2}$
2d " fixed light......	15	335.	34	17 to 19
2d " flashing light....	15	2550.	52	17 to 19
3d " fixed light......	5	90.	24	$14\frac{1}{2}$ to 17
3d " flashing light....	5	845.	42	$14\frac{1}{2}$ to 17
4th " fixed light......	1.6	30.	17	11 to 15
4th " flashing light...	1.6	275.	32	11 to 15

The apparatus of a first-order light is made for an elevation of about 150 feet above the level of the sea, and the rays from it are directed so that the brightest part of the beam shall be tangent to the sea-horizon. On account of the rotundity of the earth and the effects of atmospheric refraction the point of tangency of one of these rays is at a distance from the tower of 14.05 nautical miles. A mariner in observing the light is supposed to stand on the deck of a vessel, and his eye is assumed to be at least 15 feet above the level of the sea. Hence, in computing the distance at which a first-order light is visible the above distance (14.05 nautical miles) should be increased by 4.4 nautical miles, which is the distance from the point of tangency to where the ray produced would strike a point 15 feet above the sea-level. The distance at which a first-order light is visible is therefore generally set down at about $18\frac{1}{2}$ nautical miles. The elevation of a first-order light should not exceed 200 feet above the level of the sea. Geographical range in this case is given at about $20\frac{1}{2}$ nautical miles. It is not advisable, except in extraordinary cases, that a greater elevation should be given to a light than 150 feet. In fact, too great an elevation is a decided disadvantage, especially in thick and foggy weather, since fog-clouds frequently maintain themselves at a sufficient height above the sea to envelop the light when it is clear below. In some places, on account of the precipitous character of the shore, it is difficult, and sometimes impossible, to place the light low enough. An arrangement is sometimes made in such cases to lower another light called a fog-light to a position nearer the level of the sea.

Range or leading lights, as the name implies, consist of two or more lights at some distance from each other, but in prolongation of the axis of a channel through which they are intended to serve as a guide. They are used also to guide clear of dangerous places and to mark turning-points. They are of great value in crossing the bars at the entrances to harbors. The difference in elevation of the lights should be such that the visual angle subtended by them at any point of the range should in all cases be large enough to make them appear distinct and separate,

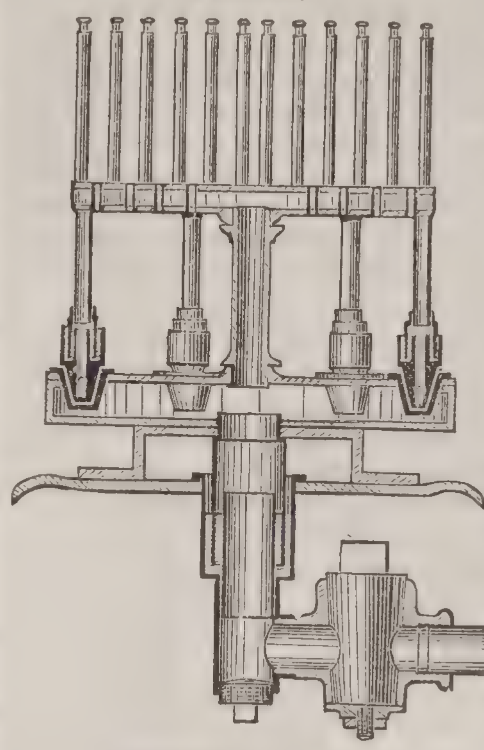
and obviate the tendency to blend. With lights of the smaller orders this angle should not be less than about four minutes, and should be somewhat larger for those of higher orders. Their horizontal distance apart should be made to depend on the narrowness and length of the channel they mark. In cases where the channel is very narrow and long this distance should not be less than one-fourth of the distance of the front light from the point where the mariner first begins to use them as a guide. In ordinary cases it may be reduced to one-sixth or even less.

In order to protect the illuminating apparatus the lighthouse tower is surmounted by a lantern, in which the light is placed, the size of which is determined by the order of the light. The base, uprights, and dome are generally made of copper or iron, and the sides are glazed with heavy plate glass. It is important that it should be well ventilated, in order to supply an abundance of air to the flame of the lamp and prevent the deposit of moisture on the glass. Notwithstanding the thickness of this glass, it is sometimes broken by wild ducks or geese flying against it. In places where this is likely to occur the exterior of the lantern should be protected by a netting of copper wire.

The oil first generally used as fuel for lighthouse lamps was the sperm oil of commerce. In France and some other countries of Europe colza, a vegetable oil extracted from the seed of a species of wild cabbage (*Brassica oleracea colza*), has long been used, both for domestic purposes and lighthouse illumination. In other countries olive and hempseed oils have been and still are used to some extent. Colza gives a clearer and purer flame than sperm oil, and remains fluid at a lower temperature. Various other vegetable oils have been tested in France with a view to their introduction into the lighthouse service, but none of them were found to have the advantages of colza. Until within a few years sperm oil was exclusively used in the lighthouse service of the U. S. The rapid falling off in supply, and consequent increase in cost, caused an attempt to be made some twenty years ago to introduce the cultivation of the colza-plant in the U. S., and small quantities of oil were actually produced from it in some of the Western States. It was found, however, that the cost of its production was too great to enable it to be sold with profit at reasonable rates; the culture of the plant was accordingly discontinued. It therefore became evident that unless some other material of native production could be found, the U. S. in a short time would become dependent upon foreign countries for a lighthouse illuminant. After a series of careful experiments by the lighthouse board it was found that winter-strained lard oil could be used in the place of sperm, and would not require any change in the lamps. Its illuminating power was found to be greater than that of the sperm, and to differ little, if any, from that of colza. Lard oil was thus introduced into the lighthouse service of the U. S. to the exclusion of other materials. Recently, careful experiments have been made in Europe with a view to the introduction of mineral oil in the place of the vegetable and animal oils formerly used. Mineral oil is not injuriously affected by the severest cold; it is more cleanly than lard oil, is more readily lighted, does not require to be trimmed during the longest nights, and the cost is very much less. It was found that it could be used with safety by selecting a refined article and making a slight modification in the lamp-burner, so as to give a double outer current of air to the flame, and maintain the level of the oil below the top of the burner. France was the first to adopt the new illuminant, and other maritime nations are gradually following its example. The French experiments commenced in 1856, but it was not until 1873 that mineral oil was definitively adopted for the largest order of apparatus. The oil used in the French service is known as Scotch paraffine, and is extracted from a kind of cannel coal found in Scotland.

Gas, though it has been used for many years for domestic purposes and for lighting the streets of cities, has never been used to any great extent for lighthouse illumination. Only to a few small lights located near cities has gas been applied in the U. S., and to them gas is supplied from the general reservoirs. Ireland seems to have taken the lead in the use of gas for lighthouse illumination, and uses it in several first-order lights. An ingenious contrivance for a burner, invented by Mr. J. R. Wigham, is represented in Fig. 14. This burner consists of a group of 108 jets arranged in concentric circles, so that the intensity of the light can be regulated by using 28, 48, 68, 88, or 108 jets at a time, the illuminating powers of the flame alone being equal to that of 330, 668, 1002, 1667, and 2577 candles respectively. In clear weather the lamp is designed to burn 28 jets, the diameter of the flame being in this case about the same as that of the first-order four-wick burner. In case the atmosphere becomes hazy, exterior circles of 20 jets each can be turned on until the entire number is put in operation. There is no chimney surrounding the flame, but above it a chimney of mica is suspended, into which the flame is carried by the draught through the cowl of the lantern. The diameter of the flame when the full number of jets is burning is 10½ inches. The heat developed when the lamp is burning with its full power, though very great, does not injure the lenticular apparatus nor cause any discomfort to the keepers.

Fig. 14.

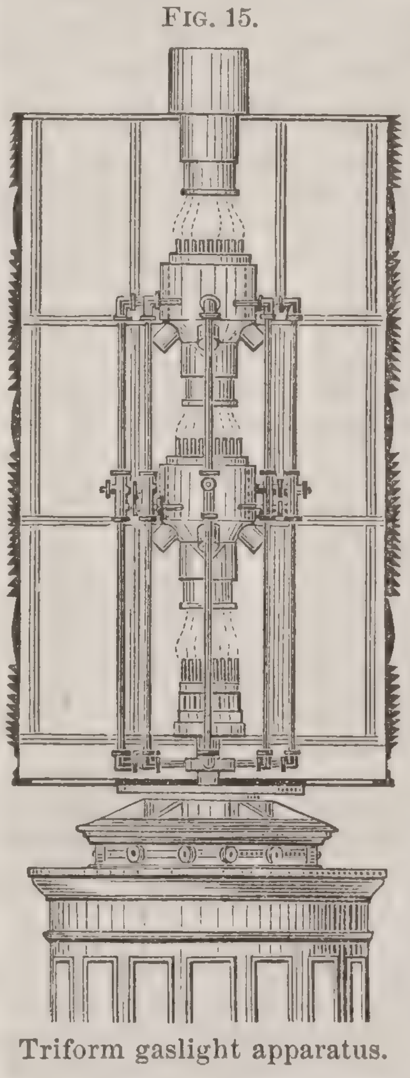


Wigham's gas-burner.

An intermittent light is produced by the opening and shutting of a gas-valve, which cuts off the supply of gas for any required period. This valve is worked by clock-machinery. A by-pass is provided to supply a small quantity of gas to the burner when the valve is closed; the light in this case is so dim that it is not visible at a short distance, but it is sufficient to relight the gas when the valve is opened.

A very powerful light can be produced by what is known as the triform gaslight apparatus. This consists of three burners like that just described, placed vertically over each other in a single lantern, each being enclosed in a dioptric drum of similar construction to the central drum of an ordinary Fresnel apparatus. (See Fig. 15.) The upper burners are surrounded by air-chambers for supplying fresh and carrying off foul air from that below. The consumption of gas in this form of apparatus is three times that of the one with the single burner; but the light is said to be more than three times as intense. This is supposed to result from the manner in which heated air is supplied to the upper burners. The triform apparatus may be used to produce a fixed or flashing light. The intensity when arranged for a fixed light is estimated at 147,914 candles, and the flashes from a similar flashing apparatus of eight panels are said to have an intensity of 1,686,228 candles.

Fig. 15.



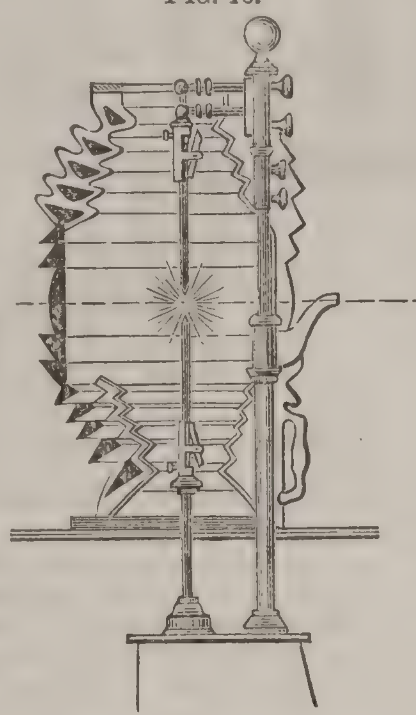
Triform gaslight apparatus.

The advantages of the use of gas as an illuminant for lighthouses are—its cleanliness, the ease with which the light can be managed, its steadiness during the entire night, and the ability to produce with it a light of almost any intensity required. The disadvantages are that considerable space is required for the works, reservoirs, etc., which restrict its use to localities only where ample space can be had; the first cost of establishing such a station is considerably greater than one where oil is used, and the cost of repairs must also be large; there is some personal danger attending the manufacture and storage of gas, even when done by competent workmen, and this danger is manifestly greater when this work is managed by unskilful light-keepers.

The application of the electric light to lighthouse illumination has been the subject of investigation, particularly in France, for some years. Currents produced by voltaic piles were first tried, but did not prove satisfactory. The system based on induction currents gave better results, so that in 1863 it was decided that one of the two lighthouses of La Hève (this station being one having double lights) should be illuminated provisionally by the electric light as an experiment. This experiment proved successful, and the other lighthouse in 1865 was illuminated in the same manner. Since then electric lights have been maintained at both. The currents are produced by magneto-electric

machines worked by steam-engines, and are carried by conducting cables to the regulators or electric lamps used to regulate the separation of the carbon points between which the light is produced. These points are manufactured from the residuum contained in gas-retorts. The optical apparatus of the electric light is about one foot in diameter. The catadioptric rings are symmetrical, both above and below the central drum, on account of the form of the points and the luminous centre. The latter being of very small dimensions, the lantern should have no sash-bars, as they would obscure portions of the light, but as the lenticular apparatus is small, this is easily managed. Fig. 16 represents a catadioptric electric apparatus. It is indispensable that the luminous point should remain exactly in the focus of the apparatus, as a vertical displacement of one-fifth of an inch would raise or lower the luminous beam two degrees. As the light is too intense to be viewed with the naked eye, the correct position of the luminous centre is assured by means of an image of the points thrown on a screen at the opposite end of the room. Up to this date (1875) electric lights have been established at no less than eight places on the coasts of England, France, Russia, and Egypt. The range is sensibly increased in foggy weather, though for the same intensity the space-penetrating power of the electric light is somewhat less than the oil light. The intensity of the former as compared with the latter, however, is approximately as 3 is to 20. The improvements that have been introduced have overcome the objection of want of steadiness in the light, and accidents have been rare. There are some disadvantages inherent in the system, which necessarily limit its application to a few important places. Considerable space is required for machinery and supplies; the repairs require special workmen, not generally found in the vicinity of lighthouses; and the cost of establishment and maintenance is considerably increased.

Fig. 16.



Electric-light apparatus.

The following table gives the total number of aids to navigation in position on the coasts and waters of the U. S. Jan. 1, 1875:

Lighthouses and lighted beacons	610
Light-ships in position	23
Fog-signals operated by steam or hot-air engines	42
Fog-bells	113
Day or unlighted beacons	346
Buoys actually in position	2900

The above list does not include the aids to navigation which are of a more temporary character that have been established on the Mississippi, Ohio, and Missouri rivers.

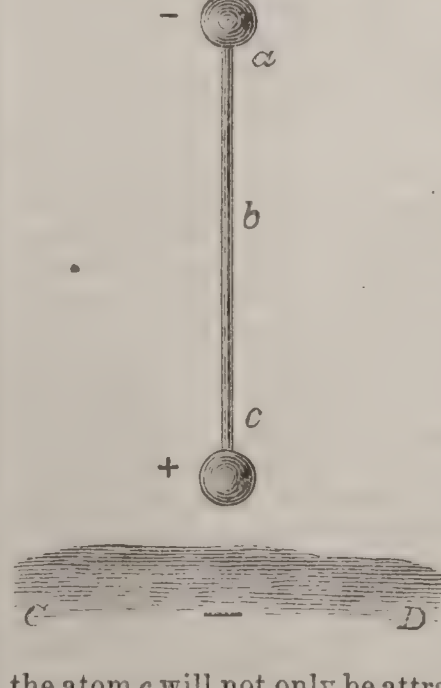
Peter C. Hains.

Lightning. Lightning consists in an electrical discharge between cloud and cloud, or between a cloud and the earth, and sometimes between the upper and lower parts of the same cloud. To explain the phenomena of lightning on the established principles of electrical action, it is necessary to first treat of atmospheric electricity, and we shall under the present head give a brief exposition of the facts which have been established, and the hypotheses which have been advanced, in regard to this branch of electricity.

It is well established that the air is almost continuously in a state of electrical excitement differing from that of the earth. To account for this fact various hypotheses have been advanced. Among them that which considers the electricity of the atmosphere as due to the friction of the winds on each other and on the surface of the earth; but it has been shown by decisive experiments that the friction of air on itself, or on solids or liquids, does not develop electricity. Another hypothesis refers the electricity of the air to the evaporation of water, but electricity is only evolved in the evaporation of water under a clear sky; and this result is best explained by the inductive action of the electricity of the atmosphere itself; and hence we should consider the electricity produced by the evaporation of water as a consequence, and not a cause, of the electricity of the air. The accidental discovery of a great amount of electricity evolved in blowing off steam from the boiler of an engine appeared at first to afford a ready explanation of the electrical condition of the atmosphere, which was then attributed to the condensation of invisible vapor. Faraday, however, conclusively proved that the electricity developed in this case was due entirely to the friction of the water which escapes with the steam, and that in the act of condensation of invisible vapor no electricity is evolved. Another hypothesis refers the electricity of the atmosphere to thermal action. If the lower end of a bar of iron be plunged into a source of heat while the upper end remains cool, the positive electricity of the conductor will be repelled, as it were, from the heated to the cold end, the former becoming minus electrified, and the latter plus. A column of air resting on the surface of the earth and extending to the height of the atmosphere is in a similar condition as to heat, and is similarly electrified. It is, however, difficult to see how this explanation can apply to the air, which is a non-conductor of electricity.

After an attentive study of these hypotheses we have been obliged to reject them all as insufficient, and are compelled in the present state of science to adopt the theory of Peltier, which appears to offer a logical explanation of all the phenomena in question. This theory refers them not to an original excitement of the air, but to the *induction of the earth primarily electrified.* That the earth, as a whole, is a great insulated conductor charged with free negative electricity, is a fact in accordance with analogy. Since the earth is known to be a great magnet having attracting and repelling poles, and as magnetism and electricity are co-ordinate powers, we might almost infer *a priori* that it would also be charged with free electricity. The existence of this condition of the earth, however, does not rest on mere analogy, but is established by direct experiments made at points on the surface of the globe widely separated from each other. Since electricity repels similar electricity, the free charge of a body electrified must exist at the surface, and in a greater degree at salient points on that surface. Now, when the spray which is blown from the top of a high fountain is caught on the plate of an electrometer, it is always found, in clear weather, to be negatively electrified; and also when an insulated globe is touched to the top of any high projecting body, and then brought down to the level of the earth, it is found to be electrified negatively. Hence we infer that the earth itself is negatively charged with electricity, and, moreover, that this charge is of great intensity, since the manifestations of electricity in the cases above mentioned are merely the difference in intensity of the electricity of the globe and that of a salient point on its surface. Again: if during clear weather we elevate a kite in the string of which a fine wire is entwined, and from the upper side of which metallic points project, powerful sparks of electricity may be obtained, even when not the slightest cloud can be seen. This result, which flows directly from the inductive action of the electricity of the earth, would be produced were the air in a neutral condition, since the electricity of the earth would tend to render the upper part of the wire highly negative, and consequently it would attract to itself the positive electricity of the particles of the atmosphere previously in a neutral condition. The electricity of the earth may be considered as acting on each particle of the wire throughout its whole length, and hence the greater the perpendicular height of the kite the greater will be the action. A similar result may be shown by means of a balloon by letting down a long wire, having a metallic ball at the end, from an insulated reel. The upper end of this wire will indicate negative electricity, while the ball itself, could it be inspected, would show positive electricity. In this experiment the natural positive electricity of the wire is drawn down by the attraction of the earth, leaving the upper end minus while the lower end is plus. This condition is exhibited in Fig. 1, in which C D represents a portion of the surface of the earth negatively charged, and *a b c* a perpendicular conductor terminated above and below by a bulb. In this condition the negative electricity of C D, or, rather, of the whole globe, will act upon each atom of the fluid in the conductor, and tend to draw it down to the lower bulb; the atom *c* will not only be attracted downward by the action of the earth on itself, but also pressed downward by the attraction of the earth on all the atoms above it; and hence

Fig. 1.

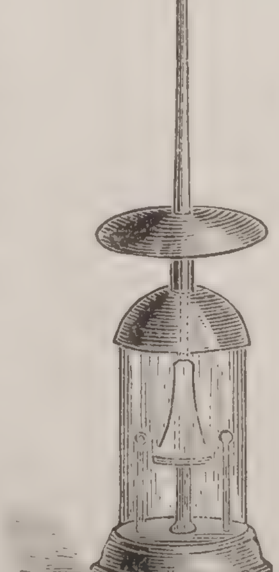


the intensity of the lower part of the conductor will be increased by an increase in the perpendicular length of the rod. Now, if we connect the lower bulb of the rod with the earth by means of a good conductor, the redundant electricity of the lower end will be drawn off into the earth, and will no longer react by its repulsion on the electricity of the rod to drive it back into the upper bulb, but the whole will become negative. If, while the conductor is in this condition, we should touch the upper ball with an electrometer, and then bring the latter down to the general level of the earth, it would exhibit a negative charge. If we remove the upper ball, leaving a point in its place, and the positive electricity be drawn off from the lower ball in the form of a spark, the whole will become negative for a moment, and the point, strongly attracting the positive electricity of the air, will receive a new charge and be ready to give off another spark, and so on continuously. Such is the explanation of the result of the experiment with the kite.

For studying the electricity of the atmosphere we may use a long wire galvanometer, but to render this instrument effective the number of turns around the needle must be very great, at least 50 to 100, and the wire well insulated with waxed silk to prevent the passage of electricity from spire to spire, instead of passing continuously through the wire. To ensure connection with the earth, one end of this galvanometer should be placed in connection with the gas or water pipes of the city, and the other attached to an insulated wire supported on a tall mast, a tower, or church-steeple, and terminating above in a tuft of fine wire. The difficulty in using this apparatus, however, consists in keeping the insulation perfect, especially during rain; the brackets by which it is attached to supports should be of glass enclosed in hollow tubes, slanting downward to shed the water. But the apparatus may be used with effect in studying the electrical condition of the atmosphere in clear and dry weather.

The instrument employed by Saussure consisted of an electrometer formed of two wheat straws, at the upper end of each of which was a loop of fine wire attached to a metallic stem passing through the neck of a bell-glass, as shown in Fig. 2. On the top of this was screwed a pointed rod, to the lower end of which was attached a convex plate of metal to shed the rain. A scale was attached to the instrument to indicate the degrees of divergency of the two straws, and in order to determine the quantity of electricity indicated by the degrees of this divergency a series of preliminary experiments were made. The rod and rain-screen being removed, the knob of the electrometer was touched by a ball suspended from a silk thread and previously electrified, and the degree of divergence was noted. This ball was then touched with another ball, of an equal size and similarly insulated, in its neutral condition, which reduced the quantity of electricity one-half. The electrometer having been previously discharged, its knob was again touched by the ball thus reduced in intensity, and the divergency in this case again noted; a charge of only one-half that of the previous trial was indicated. If the second ball were reduced to neutrality and again touched the first ball, the quantity of electricity of the latter would be reduced to one-fourth, and the degree of divergency in this case, whatever it might be, would indicate one-fourth the original charge. From these experiments a table could be formed by interpolation which would give approximately the value of the several degrees of divergency in relative measures. To use this instrument in measuring the quantity of electricity from day to day, Saussure attached a small leaden ball to the end of a fine wire, the lower end of which rested upon the knob. He threw this perpendicularly upward, carrying the fine wire with it, and finally detaching it from the electrometer. As the lead bulb rose in the atmosphere by the induction of the earth, it became negatively electrified, or, in other words, the positive electricity of the leaden bulb was drawn down into the electrometer, the leaves of which diverged with positive electricity. But the method most generally employed by Saussure was that of affixing to the top of the electrometer a pointed rod, as shown in Fig. 2, and to the top of this again a burning match. When this instrument was held above the head, it scarcely ever failed in clear and dry weather to indicate an electrical excitement. The *rationale* of the burning match is not difficult to understand on the theory of induction. Let us suppose a series of hollow pointed cones placed on the top of the rod and thrown off upward one by one through some explosive agency; each cone as it left the rod would leave its positive electricity behind it, on account of the attraction of the earth below, and each would therefore impart an additional quantity of electricity to the rod, which would be indicated by the divergency of the electrometer. The heated air and smoke which continue to arise from the match, since they are partial conductors, would perform the same office as the cones. Another way of using the same instrument consists in placing a polished ball, say six inches in diameter, on the end of a glass rod which is held in the hand. If this be elevated by ascending a step-ladder, say eight or ten feet, but generally less, and touched by the hand or a metallic conductor in its position of greatest elevation, then brought down to near the level of the earth in an insulated condition, and applied to the knob of the electrometer, the pointed wire being removed, the stems will diverge with negative electricity. The attraction of the negative electricity of the earth will draw the positive electricity of the ball to its lower surface, and when this is touched will pass through the body of the observer to the earth. The greater the divergence of the stems of the electrometer, the greater will be considered the positive electricity of the atmosphere, although a similar effect might be produced by a change in the electrical condition of the earth.

Fig. 2.



But a more convenient form of arrangement for studying the electrical condition of the atmosphere is that invented by M. Dellman, and shown in Fig. 3. A is a brass ball supported on a glass tube and passing through corks of gum-shellac. The apparatus is fastened to the upper end of a pole which is elevated by a windlass or the hand above the top of a house. When at the height intended the wire k, connected with the earth below, is pulled; the end of the bent metallic lever $g\ h$, pivoted at l, is depressed, and the fork i brought into contact with the stem of the globe, and thus a metallic connection is formed between the ball and the ground. The wire k is then released, the lever falls back, and the ball, the connection of which with the earth is severed, is brought down and applied to an electrometer. Another instrument, perhaps still more simple, was introduced by Sir William Thompson. It consists in allowing a fine stream of water to flow from an insulated metallic vessel through a pipe which projects below, but without touching, the sash of a window, which is raised a few inches for the purpose, or through some other aperture in the wall of the house. This apparatus, which is called "the water-dropping collector," is represented in Fig. 4. A is the metallic can containing water, which can be discharged through the pipe cd by turning a tap. It is supported on a glass stem at b, which is surrounded without contact by a cylinder of pumice-stone moistened with sulphuric acid. The pumice-stone is separated from the metal by a coating of gutta-percha. The acid needs renewal only once in about two months, and by absorbing the moisture produces an excellent insulation; e is a shelf on which the apparatus is supported, f the window-sash. As this instrument is insulated, any increase or diminution in the inductive action of the earth or in the electricity of the air will be manifested by a change in its electrical state, since as the drops

Fig. 3.

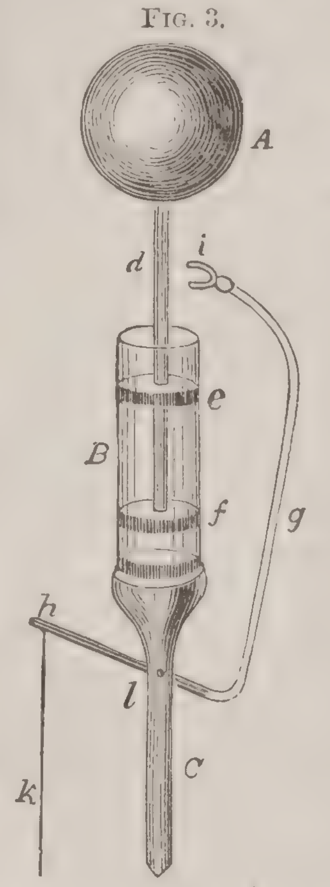
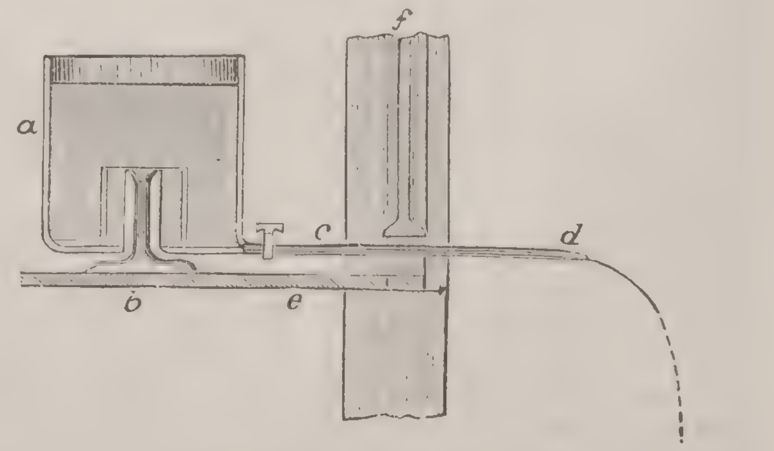


Fig. 4.



flow off they carry with them the electricity of that point. The operation of this instrument may be understood by considering that the stream of water which flows from the nozzle is the upper end of an insulated conductor, which, breaking off, carries away with it the negative electricity, leaving the upper part of the stream, as well as the insulated reservoir connected with it, positive. An electrometer in the same room with the reservoir will be in a neutral condition, since it is, as it were, below the surface of the earth, the exterior of which is the roof of the house. The reservoir being touched with a carrier ball—that is, a globe of metal an inch or two in diameter suspended by a silk thread—and this again brought in contact with the knob of the electrometer, the divergency of the stems gives the quantity of electricity. During cold weather, when the water would be frozen, a burning match may be attached to the end of the spout with the same results as the dripping of the water. This match or fuse is made by rolling up into a cylindrical form a slip of blotting-paper previously saturated with a solution of nitrate of lead, and afterward dried.

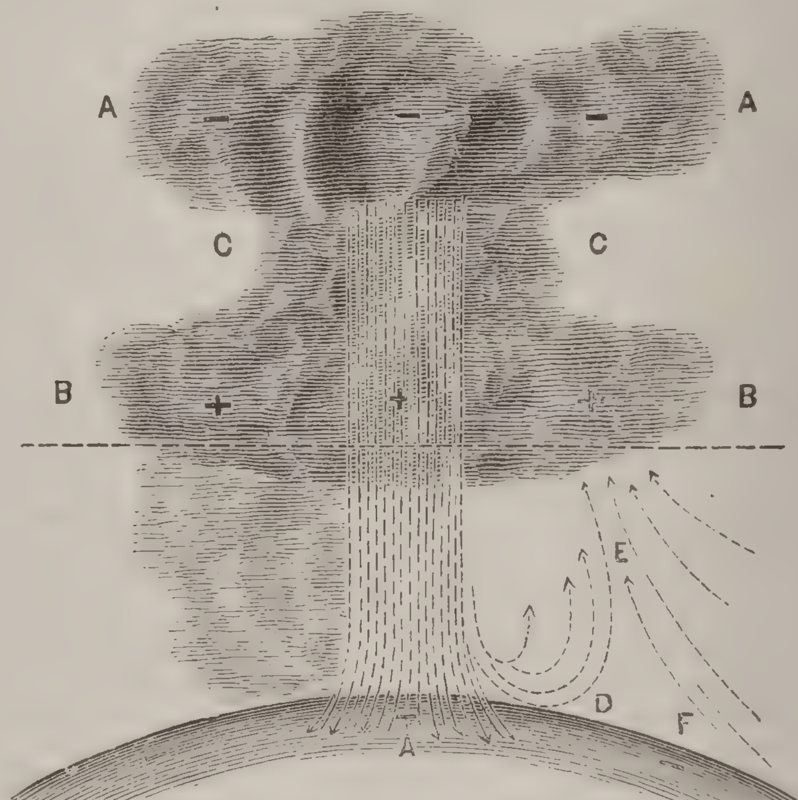
The electrometer generally used with the instrument of Dellman is that of Peltier, and that used with the dripping collector is the electrometer of Thompson (both of which are described in the first volume, under the head of ELECTRICITY), but either, or the electrometer of Saussure, may be employed. When observations are carefully made with these instruments, a change is observed in the electrical indications from day to day, from hour to hour, and in some cases even at shorter intervals in clear weather, while by a series of observations continued through the year, monthly and daily maxima and minima are established. In cloudy weather, and especially during thunderstorms, the excitement will sometimes entirely cease, and then again reverse its sign. These variations are intimately connected with the quantity of moisture in the atmosphere. This is seen from observations made at Brussels by M. Quetellet, and also at the Kew Observatory by Prof. Stewart, from which it appears that the minimum quantity of electrical excitement above the earth in clear weather occurs in the hottest part of the year, and the maximum in the coldest. We can explain this phenomenon on the supposition that the air when charged with a great amount of vapor becomes a partial conductor, and permits the negative electricity of the earth to extend higher up into the atmosphere, and thus, as it were, partially neutralizes the positive tendency of the air. The diurnal changes may also be influenced by the greater or less quantity of moisture in the atmosphere, but it is not impossible that they may be the result of changes in the electrical condition of the earth itself; for since the sun and moon are known to influence the magnetism of the earth, it is not improbable that they also affect inductively the distribution of its electricity. We think if the air were entirely devoid of moisture, its normal condition would be that of neutrality, but through the partial conducting property of the moisture by the induction of the earth the atmosphere as a whole becomes electrified.

The Electrical Phenomena of Thunderclouds.—What we have thus far stated relates to the electrical phenomena above the earth during clear weather. From the effect produced by elevating above the surface of the earth a comparatively small metallic conductor, we may readily conclude that the suspension in the atmosphere of even a partial conductor, such as a cloud of comparatively great magnitude, would exhibit electrical excitement of commensurate intensity and quantity. Let us suppose a warm, dry day in midsummer, with a high dew-point, and consequently the lower stratum of the atmosphere in an unstable condition, too light for its present position, and ready to rush up into a higher and colder station; and let us further suppose that the equilibrium is disturbed in a given spot by greater heat or by the configuration of the ground, and that a column actually begins to ascend. As soon as its top reaches the elevation at which the temperature is below the dew-point, condensation of a part of the invisible vapor will begin, and a cloud will be formed which will continue to elongate upward until the latent heat is all evolved and the vapor condensed. Let us suppose for a moment that the rushing up of moist air ceases, and consider the electrical condition of the cloud which has been formed. It is evident from what has been said that the upper part will tend to become negative and the lower part positive by the attraction of the negative electricity of the earth on the natural electricity of the vapor. This distribution of electricity will not take place instantaneously or gradually, but by a series of discharges between the upper and lower part of the cloud. On one occasion the writer of this article watched at a distance the flashes which took place between the upper and lower portions of a high cumulus cloud, and observed that after five or six flashes between the top and bottom had taken place, a single intense discharge passed between the base of the cloud and the earth.

We have supposed in this case that the ascent of moist air ceased after the first formation of the column, but this is not the case. A new cloud is constantly being formed, from which rain continues to fall. The inductive effects we have described are constantly repeated, and hence a thundercloud, the base of which is enclosed in a space of perhaps two or three miles in diameter, will pass several hundred miles over the surface of the country, continually pouring down rain and giving out discharges of lightning. It is in this way that the cloud does not exhaust itself, the rain which falls from it being due to the condensation of vapor which a few minutes before existed at or near the surface of the earth in an invisible state, and the lightning which it continues to discharge being produced by the natural electricity of the condensed vapor developed by the induction of the negative electricity of the earth. We need not be surprised at the quantity and intensity of the electrical discharge when we consider the effect produced by the elevation of so small a conductor as the metallic string of a kite during perfectly clear weather.

We have given in Fig. 5 an ideal representation of a typical electrical cloud in a stationary condition, in which

FIG. 5.



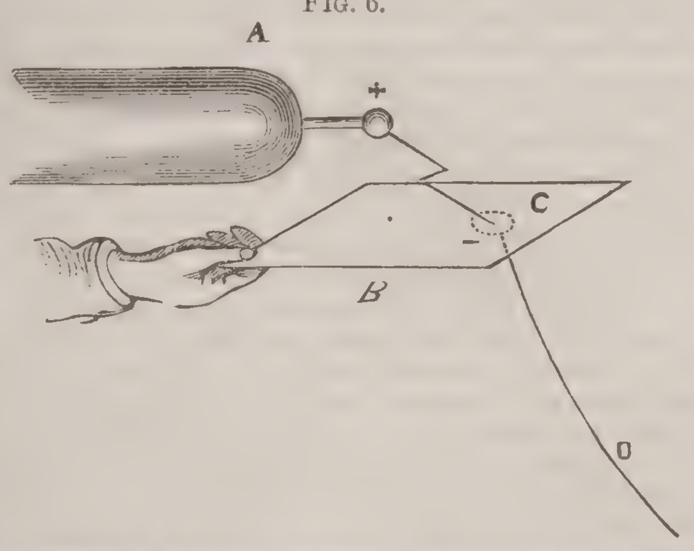
we have endeavored to exhibit the remarkable currents of air which are observed during a thunder-storm below the cloud. The particles of the upper and lower cloud, being charged with free electricity, tend to repel each other, and hence the cloud will spread out horizontally above and below. The greatest amount of condensation will be produced in the centre of the uprising column, and hence the rain will pour down through the axis of the cloud. As it begins to descend it will be negatively electrified, but passing through the lower portion of the cloud its electricity will be diminished, become neutral, and finally positive. As it falls it tends to bring down the air with it, thus producing a wind at the surface of the earth outward in every direction from the axis of the storm, less perhaps on the western side on account of the eastern movement of the cloud and the exhaustion of the aqueous vapor on that side. The intensity of this wind will depend not upon the depth of rain at any one point, but upon the quantity which falls on the whole area covered by the rain. This wind is met by a current in the opposite direction rising up under the base of the cloud, and hence a conflict is produced having an upward resultant, which is represented by the arrows in the sketch. This motion of the wind is not a mere deduction from a hypothesis, but an actual representation of facts. During thunder-storms, as the writer has frequently observed them at Washington, the first appearance is that of a dark cloud in the W., with perhaps a gentle wind blowing from the opposite quarter. As the cloud approaches a curtain of dust will be seen to arise almost to the base of the cloud. At this time at the position of the observer there is an entire stillness of the air. A few minutes afterwards this stillness is broken by a violent wind from the W., provided the axis of the storm is approaching the point of observation. This wind, though moving perhaps at the rate of 50 miles an hour, is not felt a few hundred rods to the E.; in fact, the small portion of it which passes over the observer may be considered as revolving through the arc of a cylinder the axis of which is horizontal. After this the rain continues for a

while, and gradually ceases, with a mistiness on the western portion of the storm. These phenomena are definitely represented in the figure. The violent wind rushing out at the base of the falling current of rain is checked and turned upward by the wind drawn in under the base of the cloud. While the storm is passing from D to F there will be a calm; the wind at the surface blowing outward catches the dust, which is carried upward in the resultant direction of the two opposing currents, as at E. The cloud is fed with vapor principally on its eastern side, since in its passage eastward it exhausts, as it were, the moist air on its western border. The cloud therefore not only moves eastward—probably on account of the prevailing current from the W. in the higher regions—but it also grows in that direction, if we may use the expression, by the ascent of fresh vapor, while it diminishes on the opposite side. After the upward rush of vapor has ceased, and the cloud is left insulated in the atmosphere, its upper part will in some cases dissolve away, on account of the greater dryness of the air above, and a partial conductor will remain charged with positive electricity, which by induction will materially affect the electricity of the earth as indicated by the electrometers previously described.

If the compound cloud of which we have given a description in its course passes over a mountain-peak or gives a discharge to the earth without receiving a new access of vapor, it may then as a whole become negatively electrified, and in this condition would exert an opposite influence upon the instruments. An electrified cloud will also produce an effect upon the air immediately around, especially if it contains a certain degree of moisture, not enough to render it a perfect conductor. In this case a stratum of negative electricity will exist around the cloud, and around this an outer cloud of positive electricity. This condition of the atmosphere is often exhibited by the indications of the electrometers, which as the cloud approaches the zenith of the observer shows first positive, then negative, and again positive electricity, the same phenomena in a reversed order appearing as the cloud passes away.

Effects of Lightning.—Since a lightning discharge is, in reality, an immense electrical spark, the effects which it produces differ only in degree from those which are manifested by the electrical machine. In a discharge from the cloud the electricity traverses the line of least resistance, and therefore frequently deviates much from a straight line, its course being marked out by the induction of an opposite condition in the material through which it is to pass. If on the lower side of a thin board B (Fig. 6), a foot or

Fig. 6.



more in extent, a plate of metal C, an inch or two in diameter, is fastened, and to the lower surface of this again is soldered a wire D, leading down to the earth, and sparks from the knob of the prime conductor of an electrical machine be thrown upon the upper surface of this board, they will always strike it in a point immediately above the plate of metal. In like manner, if a good conducting material exist beneath the surface of the ground at any place, such as metal, water, or damp earth, the induction of the cloud will render it negative, and a strong attraction will arise between the two, and a discharge will sometimes take place, when if such a conductor did not exist the air would not be ruptured. If a thundercloud highly charged with positive electricity project over a given place, the earth underneath will become abnormally negative, and the body of any animal standing under the cloud will partake of this influence. If in this condition a discharge takes place from a distant edge of the cloud, the restoration of the equilibrium will be so sudden and violent—or, to use the language of hypothesis, the fluid will rush up into the body with such force—as to produce death. Accidents of this kind are referred to what is called the principle of the return stroke, of which many examples are given in the books. Dynamical effects are also produced in the vicinity of the path of the discharge; instantaneous currents are excited in all conductors; sparks are frequently seen in various parts of a house between isolated pieces of metal or other conductors in the vicinity of a powerful discharge; and persons are shocked, although the discharge has traversed an adjacent tree or passed innoxiously down a lightning-rod. The dynamic effect of a lightning discharge at a distance is perhaps best shown by soldering one end of a copper wire to the tin roof of a house, and the other end to the water or gas pipe in a lower story. A break in this wire, the two ends of which terminate in small balls brought within a short distance of each other, will exhibit a spark at the instant of a discharge, although it may be at a considerable distance. If the break in the conductor be closed by a spiral consisting of many turns of insulated fine wire, and a sewing needle be placed in its axis, it will become magnetic by the discharge, and the polarity of it may be determined by a toy compass, such as is used on a watch-chain, consisting of a needle of half an inch in length. To render the sewing needle more manageable, the sharp end is stuck into a small cork, which serves as a handle. With an arrangement of this kind the writer of this article has obtained inductive effects from a discharge of lightning at a distance of eight or ten miles. A similar effect has been produced by the writer from machine electricity. For this purpose a wire several hundred yards in length was stretched horizontally between the upper stories of two buildings, across a campus, the two ends terminating in plates of metal which dipped into a well at each extremity. A second wire was stretched between two poles parallel to the first, its ends terminating in metallic plates buried in the earth. Inductive effects were obtained by this arrangement from the discharge of a battery of nine Leyden jars, each of the capacity of a gallon, when the two wires were separated from each other at least 150 yards, a long building intervening. Effects might probably have been obtained at a greater distance had the parallel portions of the wires been of greater length. This dynamic induction frequently produces accidents in the telegraph-office, and a peculiar arrangement is necessary to transmit the induced current to the earth.

When the electrical discharge from a Leyden battery is transmitted through a small brass wire, the atoms of the component metals are separated, in a metallic state, into an impalpable powder, and may be made to impress a metallic stain on glass. This effect, therefore, is not due primarily to heat, but to the repulsive energy communicated to the atoms. Similar effects produced by lightning are recorded by the older electricians under the name of cold fusion. In like manner, when a discharge of lightning takes place in the atmosphere a tremendous repulsive energy is excited in the particles of air in the line of its path, and to this action we attribute many of the mechanical effects exhibited by atmospheric electricity. In one instance which fell under our observation a powerful discharge of lightning took place between two chimneys of a house, traversing the space under the rafters called the cockloft; such was the repulsive energy given to the air that the whole roof was lifted off. We attribute to the same action the throwing off of the clapboards of a house when the discharge takes place between them and the interior plastering. A similar effect takes place when a discharge from a Leyden jar is passed between two bulbs in a tube filled with water: the glass is broken into pieces. An analogous effect has been observed when a discharge of lightning has passed through a conduit-pipe of stoneware transmitting a current of water. The intensity of the repulsive energy appears to be greatest in the line of the axis of the discharge, and at the place of rupture of a conductor, or, in other words, at its two ends, the most energetic effects are manifested. This is illustrated by the old experiment of passing the discharge of a Leyden jar through a card, a burr being raised on both sides. A tree is sometimes found broken transversely about the middle of the trunk, as if pulled asunder or the parts separated by a violent repulsion in the direction of the axis. Trees are, however, generally splintered longitudinally, and the parts thrown off to a considerable distance laterally. This effect is generally attributed to the sudden evaporation of the sap, but it may also be a direct result of the repulsive action of the particles of wood. In the case of a discharge of lightning between a cloud and the surface of the earth covered with a pavement, the stones are frequently found thrown out so as to form a hole like an inverted cone. When the discharge passes through a wall a conical hole is produced on both sides. Cases are on record of a row of boys on a bench in school, in which only the two extreme ones were killed by a discharge which passed through the row. This is an illustration of the fact previously mentioned, that the effect is greatest at the points where the electricity enters and leaves a conductor.

It is probable that the noise of thunder is due to the repulsive energy with which the air is thrown apart along the path of the discharge of lightning. Were the discharge

to take place in a perfect circle, the ear being in the centre, a single explosion would alone be heard. But inasmuch as the discharge is approximately in a right line, if the ear be placed near one end of this a series of sound-waves will reach it in succession from points at different distances, and hence a prolonged sound will be the result. The increase in the loudness of the report which is sometimes observed towards the end of the sound is probably due to the greater consolidation of the discharge as it leaves the cloud, which frequently afterward branches out into various streams. JOSEPH HENRY.

Lightning-Rods. The utility of the invention of our illustrious countryman, Dr. Franklin, for the protection of buildings from lightning has sometimes been called in question, but no one who has studied the subject, and is capable of a proper appreciation of scientific principles, can doubt its importance. An edifice supplied with lightning-rods of a proper character—that is, embracing all the requisites indicated by a scientific knowledge of the laws of electrical action—may be considered as entirely protected from the disastrous effects of discharges of lightning; but in order to this the conductor must be constructed on definite scientific principles, and not on loose analogies or untenable hypotheses, as is too frequently the case with the products of the vendors of improved lightning-conductors.

The perfect lightning-rod is one which attracts the descending bolt to itself, and transmits the discharge harmlessly to the earth. (1) To ensure this quality the rod should terminate above in a single point, and to preserve this from the weather, as well as to prevent its being melted by a slight discharge, it should be encased in a hollow cone of platinum. One point is found by experiment to attract electricity from a charged conductor at a greater distance than a number, for several points projecting from the same stem near each other approximate in action a spherical surface, and by interference each lessens the effect of the other. (2) The rod should consist of round iron not less than three-fourths of an inch in diameter; a larger size is preferable to a smaller one. Iron is preferred, because it can be readily procured, is cheap, a sufficiently good conductor, and, when of the size mentioned, cannot be melted by a discharge from a cloud. The conductor should be round—or, in other words, cylindrical—because electricity repels itself, and tends to escape into neighboring bodies from points or sharp edges; and, as we shall see, the rod at the moment that the discharge is passing through it is in the condition of a charged conductor; hence flat or twisted rods are imperfect conductors, as they tend to give off lateral sparks from the sharp edges during the passage of the discharge, which might, in some cases, set fire to very combustible materials. A rod may be formed of ordinary gas-pipe, since it is a well-established fact that electricity passes at the surface, unless the charge be exceedingly large in reference to the capacity of the rod. If a discharge of electricity be sent through a wide ribbon of copper or iron placed in a horizontal position, and over the surface of which at intervals pieces of sewing needles of a quarter of an inch in length are placed at right angles to its length, it will be found that only those pieces of needle which are near the edge are magnetized, while those near the middle remain unaffected. This experiment conclusively proves that electricity repels itself while in transmission, as well as in a statical condition, and shows the absurdity of substituting for a cylindrical form of rod that of a twisted ribbon. (3) The rod throughout its whole length should be in perfect continuity; for this purpose it should, if possible, be made of one piece of iron; and when joinings are unavoidable the parts should be firmly screwed together by a coupling ferule. (4) To secure it from rust the rod should be covered with a coating of black paint, which will not sensibly interfere with its power of conduction. (5) The shorter and more direct the rod is in its course to the earth the better; acute angles made by bending the rod at any point along its course should be avoided. (6) In case of powder-houses, where extreme precaution is required against sparks of induction within the edifice, several rods should be used, and these supported on masts at some distance from the four sides of the building. But in case of a dwelling-house, where inductive action of this kind could scarcely ever produce serious consequences, the rod may be fastened to the side of the house by iron eyes, driven or screwed into the wall; the extreme point of these eyes, being buried in non-conducting masonry or wood, will not tend to give off electricity at the time of a discharge. The rod may be insulated by glass cylinders intervening between it and the eyes, but we do not attribute much importance to this insulation, since it is immediately destroyed by the rain. (7) The lower end of the rod should be connected with the earth in the most perfect manner possible; and in cities nothing is better for this purpose than to unite it in good metallic connection with the gas-mains or water-pipes in the street; and, indeed, such a connection is absolutely necessary if the house is furnished with gas and water. If a cloud highly charged with positive electricity be floating over a city, the gas and water pipes will become highly negative, and therefore strongly attract the electricity of the cloud, and may thus induce a discharge which would not otherwise take place. If in such a case a proper conductor is not provided on the outside of the building to transmit the discharge to the earth, a serious accident might ensue. In the country, where gas and water pipes are not accessible, the rod should terminate below the surface of the water in a well, or, if this is impossible, it should be extended out from the house under ground for fifty to sixty feet, and then sunk perpendicularly till it reaches, if possible, moist earth. The perpendicular as well as horizontal part of the excavation may be filled advantageously with scraps of metal from the shop of the tinman or with powdered charcoal, to render the connection with the earth more perfect. To afford a still better connection with the earth, in some cases the rod is made to terminate in a number of branches, each buried as above described; but the necessity of branches will depend upon the degree of dryness of the earth. The mistake should not be made, as has frequently been done, of terminating the end of the rod in a cistern, the water of which may be considered as insulated from the earth by the lining of cement. (8) If within the house there are masses of metal, such as iron girders, water-tanks, or bathing-tubs, they should be placed in metallic connection with each other and with the rod by slips of iron or copper, otherwise they are liable to emit sparks by induction during the instant of a discharge, and, though serious effects are not often produced by this action, it serves at least to alarm the inmates of the house. As an example of this, if in any case a water-pipe approaches within an inch or two of a gas-pipe, a spark will usually be seen to traverse the space, accompanied by a loud report, when an electric discharge passes down the rod. (9) The rod should be placed in preference on the W. side of the house, since the thundercloud usually comes from a western direction; but for a stronger reason it should be placed on the side of a chimney from which a current of heated air ascends during the summer season; the ascent of warm and rarefied air tends, as we have seen, to intensify the action of the conducting soot of the chimney. (10) In case of a small house a single rod may suffice for protection, provided its point be sufficiently high above the roof; the rule being observed that the elevation of the point should at least be half of the distance to which its protection is intended to extend. Thus, the point of a rod on a house the ridge of the roof of which is fifty feet in length, should have an elevation of twelve and a half feet, which is half the radius of the circle of protection. This rule is derived from experiment; but it is safer, where several points are erected on the same house, that they should be nearer than this rule would indicate; and indeed there is no objection to an indefinite number of rods, provided they are placed in good metallic connection with each other on the sides of the building or at the surface of the earth. A building entirely enclosed, as it were, in a cage of rods intimately connected with the earth and each other would be safe from discharges of electricity, whatever might be its energy. (11) When the house is covered with a metallic roof, it should be connected with the lightning-rod, or the perpendicular pipes conveying the water down from the gutter at the eaves may be made to act the part of a rod. In this case the roof must be connected with the gutter by strips of copper or iron, and the lower end of the spout with the gas or water pipes, if in the city, by the same means; or in the country with the earth, after the manner we have mentioned. In addition to this, a pointed rod should be elevated above the roof, especially at the chimneys; but in arranging this care must be taken to join the rod in good metallic connection with the roof, the foot of the former being soldered to the surface of the latter.

The foregoing rules may serve as a general guide in erecting lightning-rods on ordinary buildings, but in large, complex structures a survey should be made, and the best form of protection in accordance with scientific principles adopted.

One effect of the lightning-rod deserves especial notice—namely, the effect it has upon the air in the vicinity of the point; during the passage of a thundercloud the point is frequently seen illuminated by a glow of light. During a violent thunderstorm at night, while flashes of lightning were passing from cloud to cloud near the zenith, the author of this article stood in the trapdoor on the top of the high tower of the Smithsonian Institution, within about ten feet of the top of the lightning-rod. At every flash of lightning a jet of light at least five or six feet

in length issued from the point of the rod with a hissing noise. The top of this rod is about 155 feet above the earth. The electricity thus passing from the rod was of an opposite character from that of the cloud, and would tend to electrify a globe of air surrounding the point of which it was the centre. If the cloud was positive, this globe would be negative, and in case of a discharge from the cloud to the rod, the electricity of this globe would be neutralized; and in the act of this neutralization the intensity of the discharge would be considerably modified. This result was probably connected with the peculiarity of the sound of the discharge heard in several cases in which lightning was transmitted through a rod of the institution. The sound in these cases consisted in at first a hiss, followed in a moment after by a loud explosion. The Smithsonian building being situated on a plain in an isolated position, and furnished with a number of high towers and pinnacles, is evidently, from theoretical considerations, in a condition especially liable to be struck by lightning. And as an evidence of the truth of this inference, as well as of the utility of lightning-rods, we may mention that it is certain that within the last twenty-five years at least as many as four discharges have been harmlessly conveyed to the earth through the conductors with which the building is provided. In two of these cases the evidence of the occurrence of the discharge rests upon the melting of the platinum points, and the others on the nearness of the explosion and the peculiar sound previously mentioned. In one of the first cases the author himself was within six feet of the rod, with a wall of masonry of about two feet intervening. He felt no shock, but a person in the same room, either from fright or a nervous affection, fell upon his knees, devoutly making the sign of the cross on the instant.

The mode of protecting ships from lightning generally consists in suspending a light chain from the lower end of a pointed rod attached to the upper yard-arms, the lower extremity of the chain being immersed below the surface of the ocean. These chains are not unfrequently destroyed by heavy discharges, though in the act of being broken they serve, in most cases, to protect the vessel from injury. Sir Snow Harris of England has introduced another plan into the British navy, which consists in letting into a groove down the mast a ribbon of thick copper, so as not to interfere with the hoisting of the sails. The upper end of this rod terminates above the mast in a platinum point, and the lower part, continued down along the mast through the decks to the bottom of the vessel, terminates in the copper sheathing. We do not consider this plan as safe, especially in ships loaded with cotton, as that in which the copper ribbon is continued across the deck in a groove, and over the side of the vessel until it reaches the copper sheathing.

It has been shown by the author of this article, from conclusive experiments, that in the transmission of a positive charge, for example, the different points of the rod are excited in succession along its length by two adjacent waves, as it were, of electricity—a positive one, preceded by a negative wave. To illustrate this point, the following experiment may be mentioned. Sparks from the prime conductor of an ordinary electrical machine were thrown on the upper part of a lightning-rod as it projected above a tower, and although the lower end of the rod was intimately connected with the earth by the most approved method, yet at each discharge of the prime conductor a spark could be drawn from every point of the rod throughout its whole length, down to within a foot of the ground. With these sparks a gas-pistol was exploded and the fibres of combustible substances ignited. These sparks, though in some cases half an inch long and apparently very intense, failed to affect in the slightest degree a delicate gold-leaf electrometer—an evidence that they consisted of two sparks in momentary succession, the one plus and the other minus.

In regard to the safest position during a thunderstorm, especially in a house not well protected by a lightning-rod, we would advise a position in the middle of the room, and a horizontal one rather than a vertical. Windows, either open or shut, and chimneys should be avoided, but in a house not protected by rods no place can be considered as entirely safe. When in the open air trees should be avoided, since the trunk being a bad conductor of electricity, the discharge will leave it and pass through the body of a man or animal which may be near it, this being the path of least resistance previously marked out by the inductive action of the descending bolt.

We have thought it necessary to dwell upon this subject of lightning-rods because innumerable patents have been granted in this country for improved rods, most of which have been devised by persons ignorant of the principles of electricity. JOSEPH HENRY.

Light'wood Creek, tp., Lexington co., S. C. Pop. 28.

Ligne (CHARLES JOSEPH), PRINCE OF, b. May 12, 1735, at Brussels, descended from one of the wealthiest and most powerful Belgian families; entered the Austrian army in 1752, distinguished himself in the Seven Years' war, and commanded the vanguard in the Bavarian war of succession. Under the reign of Joseph II. he held the highest military and diplomatic positions, and the elegance of his manners and the brilliancy of his conversation made him a favorite with all European courts. But under Leopold he fell into disgrace, partly on account of his son's participation in the Belgian insurrection (1790), and he was never again employed in active service. He lived in retirement at Vienna, engaged in literary pursuits, and d. there Dec. 13, 1814. Of his *Mélanges militaires, littéraires et sentimentaires* (34 vols., 1795–1811), Malte-Brun has given a selection, *Œuvres choisies*, in 2 vols. His letters and memoirs have considerable historical interest.

Lig'nine [Lat. *lignum*, "wood"], a synonym of CELLULOSE. (See article under this head, by PROF. C. F. CHANDLER, PH. D., M. D., LL.D.)

Lig'nite [Lat. *lignum*, "wood"], the name originally given to bitumenized wood, but now applied to most coals which occur in the more recent geological formations; the term is therefore synonymous with brown coal. As stated in the article on COAL, lignite has no definite formula of composition, but different specimens vary much in physical and chemical character, shading into unchanged vegetable fibre above and true coal below. The chemical composition of wood-fibre, according to Bischoff, is carbon 49.1, hydrogen 6.3, oxygen 44.6. When this is buried in water or earth, it immediately commences to decompose by the combination of its constituents, and the absorption of external oxygen, forming carburetted hydrogen, carbonic acid, carbonic oxide, water, petroleum, etc., which escape, and leave a solid diminished in volume, increased in density, and darkened in color. Ultimately it becomes black, though having a brown streak, with a glistening, pitchy fracture. In this stage it is called *lignite*, and when chemically examined is found to have lost perhaps one-third of its carbon, one-half of its oxygen, and more or less of its hydrogen, the relative percentage of carbon being therefore greater in lignite than in wood. Lignites or brown coals are found chiefly in the Cretaceous and Tertiary formations. Here they occur in deposits which rival in area and thickness the coal-beds of the Carboniferous system. In general terms, it may be said that the lignites occupy an intermediate position, both in date and composition, between the peat which is now forming and true coals of Palæozoic age, and represent a stage in the progressive distillation vegetable tissue passes through when buried, and which results in the formation as residual products of —1st, peats; 2d, lignite; 3d, bituminous coal; 4th, anthracite; 5th, graphite. No sharp lines of demarcation separate these groups, however, as we find them shading into each other by all possible intermediate phases. Since they are successively derivatives one from the other, the series is necessarily continuous. It should also be said that the name *lignite* is applied to woody tissue in which the process of bitumenization has begun, however modern it may be; and among the forms of recent and superficial bitumenized vegetation that which has been derived from the decomposition of mosses, grasses, etc.—generally a porous, spongy substance—is called peat, while changed wood is called lignite.

The mode of formation of the great beds of so-called lignite of the Cretaceous and Tertiary systems seems to have been similar to that in which peat is now accumulating, and in which coal was found in the marshes of the Carboniferous age. In some instances they are underlain by strata of fireclay, and are overlain by shales, sandstones, and limestones, precisely as the coal-strata are; and it is evident that they have a common origin and history, except that in the lignites that history has not reached as far as in the coals. It not unfrequently happens, however, that beds of lignite have by local causes been changed to the condition corresponding to bituminous coal, or even anthracite. Such instances are furnished by some of the best lignites of Colorado, Utah, and Alaska, which have reached the condition of bituminous coal, and by the anthracites of Placer Mountain, near Santa Fé, and that of Queen Charlotte's Island. In the last two cases beds of Cretaceous lignite have been, by local volcanic action, converted into anthracite as bright, hard, and useful as that of Pennsylvania. As the deposits of carbonized vegetation formed in the Tertiary and Cretaceous systems are classed as lignites, all the so-called coals of the great areas underlain by these formations come into this category, and it will probably be found that these modern coals exceed in the extent of their development, and rival in their value to man, the true coal-strata which are recognized as constituting the basis of all the great indus-

tries of civilization and the richest source of the wealth of nations.

It happens that the most important deposits of mineral fuel in Europe and Eastern America are found in the Carboniferous systems, but it is not known that any important deposits of true coal exist in other parts of the world. So far as we know, all the great coal-fields of China, India, Borneo, and Western America are of Mesozoic or Tertiary age. Deposits of lignite are also known to exist in Greenland, Arctic America, and in Central and South America. The economic value of lignites is, as a general rule, considerably less than that of true coals. This is due both to their chemical composition and physical characters. They usually contain from 12 to 20 per cent. of oxygen and 10 to 12 per cent. of water. Their heating power is therefore usually from one-half to two-thirds that of bituminous coal. The different ingredients mentioned sometimes constitute as much as one-third of the mass—a third which probably contributes nothing to the heating power, the water even absorbing some portion of the energy of the combustible material in its vaporization. The calorific power of pure carbon being estimated at 8000 units, and that of our best coals, in which the hydrogen is mainly neutralized by the oxygen, at from 7000 to 7500, the calorific power of lignite may be said to vary from 4000 to 5000. It should be said, however, that this is only a general rule. The calorific power of some of our Carboniferous coals hardly exceeds 6000 units, and some of the best lignites reach and even pass this point. The physical character of lignites also frequently impairs their economic value. They are usually somewhat tender, and the waste in mining and transporting them is greater than in the bituminous coals. They are apt, also, to crack badly, and frequently on exposure fall into a multitude of angular fragments. It rarely happens that they are capable of producing good coke. They are usually open-burning—*i. e.* do not adhere in the fire—and the proportion of volatile matter to fixed carbon is large. When this is driven off the residual coke is spongy and pulverulent. To this rule there are, however, exceptions which will be mentioned farther on.

In Europe the lignites or brown coals have been mined and used for many years, and the practical tests to which they have been subjected have accurately determined their value. The Bovey Tracey brown coal of England and most of the modern coals of France, Switzerland, Spain, Germany, Greece, India, etc. exhibit the characters here recorded. In some localities, however, especially in Austria and Italy, lignites are not only employed for household fuels and the generation of steam, but for locomotives and in furnaces. The following table shows the composition of a series of foreign lignites:

	Carbon.	Hydrogen.	Oxygen.	Nitrogen.	Waste.	Ashes.
Tasmania........	59.90	4.66	15.99	1.08	13.43	4.64
France...........	70.49	5.59	18.00	.93	......	4.99
"	63.88	4.58	17.10	1.00	......	13.43
Switzerland....	70.02	5.20	20.50	1.27	......	3.01
Greece...........	61.20	5.00	23.50	1.28	......	9.02
Bohemia.........	73.79	7.46	12.79	1.00	......	4.96
Germany........	70.12	3.19	7.59	1.00	3.63	15.47
"	60.83	4.36	23.50	1.14	9.07	2.43
Persia............	63.55	6.68	26.00	1.93	......	3.05
Siberia...........	47.46	4.50	32.00	1.03	......	14.95

All the coals found in the western half of the U. S. are of modern age, and are classed as lignites. These occur in both the Cretaceous and Tertiary formations, but chiefly in the former; and although their extent and value have been but imperfectly determined, it is known that very extensive deposits of this kind occur in New Mexico, Colorado, Wyoming, Utah, Nevada, California, Oregon, and Alaska. The lignites of New Mexico all belong to the Cretaceous formation, and are chiefly found in the lower portion of this series. They underlie a large area, including the northern portion of this Territory and Arizona, and on the San Juan River form strata altogether similar in appearance to our coal-beds, showing many miles of outcrop, and sometimes attaining a thickness of over thirty feet. These great beds, however, are not homogeneous, but consist of layers of a better quality interstratified with those that are shaly and impure. The lignite beds of Colorado and Wyoming occupy a broad belt along the flanks of the Rocky Mountains, extending N. across the Missouri and reaching far into Canadian territory. It is not known how large an area in this belt is underlain by workable beds of lignite, but it would probably not be extravagant to estimate that at least 50,000 square miles will prove to be productive coal area. The strata here vary in thickness from a few inches to twenty and even thirty feet. In Colorado and along the line of the Union Pacific R. R. these beds have been opened in many places, and are now extensively mined. The most important mines now worked are located at Trinidad, Cañon City, Golden, Carbon Station, Evanston, etc., and the coal is not only generally used by the resident population, but is largely consumed for locomotives on the railroad, and is exported in considerable quantities to San Francisco. The lignites of Colorado have much the character of the best-known varieties used in the Old World, and hold about the same rank in comparison with the Carboniferous coals. Here, however, as in other countries, there are some localities which furnish fuels of superior character; for example, the coal of Trinidad can be coked, and is probably capable of being successfully used in forging and smelting. The same may be said of the San Pete coal, which is found in Utah, S. from Salt Lake City. The geological age of the lignites of Colorado has been much discussed, but there is little doubt that they are for the most part Cretaceous. There are, however, Tertiary lignites in this region, and a part at least of those so extensively exposed along the Missouri River are of Miocene age. Nevada and California are not so well supplied with mineral fuel as Colorado, Wyoming, and Utah, but beds of lignite have been found in both at many places. In California they have been quite largely mined on the flanks of Mount Diablo, and the market of San Francisco is partially supplied from this source. The coal of this locality is Cretaceous. On the coast of Oregon the Coose Bay coal has been mined for many years. This is of Tertiary age, and may be taken as a typical example of Tertiary lignite. Its composition will be seen from the table given below. In physical character it is, when first mined, hard, bright, and pitchy, but on desiccation is prone to break up into small fragments. Vancouver's Island is well supplied with coal, and has been a source from which a large part of the coal used on the Pacific coast has been derived. This is of Cretaceous age; it has precisely the appearance of some varieties of bituminous coal, and has a higher heating power and bears exposure and transportation better than most of the western coals. From Alaska two varieties of lignite have been brought, both of which are reported to exist in large quantities. Of these, one (No. 7 of table) resembles closely the Coose Bay coal, and may be suspected, both from its composition and associated fossils, to be of Tertiary age. The other has been subjected to local metamorphism, and is much harder and more valuable.

The localities which have been mentioned are by no means all in which lignite is known to exist in the far West, and there is every reason to believe, so far as quantity is concerned, that the deposits in this region are capable of fully supplying all the wants of its future population. In quality, however, these coals are not fully equal to the Carboniferous coals of the Eastern States. For the most part, they have decidedly less calorific power, are unfit for the manufacture of gas, and are not adapted for smelting purposes by any system of treatment yet adopted. There is little doubt, however, that they are capable of much more

Analyses of American Lignites, by H. S. Munroe, N. Y. School of Mines.

	Carbon.	Hydrogen.	Oxygen.	Nitrogen.	Sulphur.	Water.	Ash.
1. Mount Diablo, California............Cret...	59.724	5.078	15.697	1.008	3.916	8.940	5.637
2. Weber River, Utah..................... ? ...	64.842	4.336	15.518	1.288	1.602	9.415	2.999
3. Echo Cañon, " .... ? ...	69.840	3.897	10.990	1.932	.768	9.170	3.403
4. Carbon Station, Wyoming...........Cret ..	64.992	3.762	15.199	1.736	1.066	11.565	1.680
5. " " " .... " ...	69.144	4.362	9.539	1.246	1.025	8.065	6.619
6. Coose Bay, Oregon.....................Tert...	56.244	3.379	21.815	.420	.810	3.285	4.047
7. Alaska... " ...	55.789	3.264	19.004	.608	.632	16.520	4.183
8. " .... ? ...	67.674	4.658	12.804	1.582	.920	3.075	9.287
Lignitic Anthracites.							
9. Santa Fé, New Mexico...............Cret...	74.372	2.583	8.712	1.764	.727	3.190	6.052
10. Los Bronces, Sonora...................Trias.	84.103	.852	2.137	.280	.229	5.191	7.204

extensive and successful application than has yet been reached in their use. As their heating power is considerably greater than that of wood, they constitute a store of fuel of greater intrinsic value, and far exceeding in amount that which would be supplied by the densest forest-growth covering the entire area where they are found. They can-

not fail, therefore, to play an important part in the future history of the West. Whether they can ever be made fully to take the place of our Carboniferous coal is doubtful, but the results attained in Austria and in the Val d'Arno, Italy, in the use of similar fuels afford good ground for the hope that they will be made to accomplish much more than has been done with them. By the introduction of the stair grate, and especially through the use of the Siemens regenerator, they may be made to produce a degree of heat sufficient for all metallurgic processes; and it may be confidently expected that by coking those which are capable of being coked, and by some method of combustion similar to those now suggested, they may be made to accomplish all the purposes served by other varieties of mineral fuel.

The foregoing table of analyses will show the composition of typical examples of the lignites of Western America.

The material called *jet*, and so largely used for ornaments, is a variety of lignite, which is chiefly obtained from the Lias at Whitby, England. Lignite of similar character occurs in Texas, Alaska, and Colorado, but none has yet been found in this country which in quality is quite equal to the English jet. J. S. NEWBERRY.

Lig'num Rho'dium [Lat., "rosewood"], a commercial name for Canary Island rosewood (see ROSEWOOD), which yields the so-called oil of rhodium; also for the wood of *Amyris balsamifera*, a tree of the West Indies, which yields an oil used as a substitute for that just mentioned. The name is also given to other fragrant woods.

Lignum Vitæ. See GUAIACUM.

Ligonier', post-v. of Noble co., Ind., on the Elkhart River and the Air-line division of the Lake Shore and Michigan Southern R. R., midway between Toledo and Chicago, has 2 school-houses, 4 churches, 2 banks, 1 newspaper, 2 wagon and carriage factories, 1 foundry, 1 flour-mill, 2 planing and saw mills, 1 furniture-factory, 1 hotel, a steam-elevator, and some stores; is situated in a fine grain-raising section. Principal occupation, farming. Pop. 1514. J. B. STALL, ED. "NATIONAL BANNER."

Ligonier, post-b. and tp. of Westmoreland co., Pa., on Loyalhanna Creek, 12 miles S. E. of Latrobe, in a region rich in excellent bituminous coal. Pop. of b. 317; tp. 2434.

Lign'y, a v. of Belgium, in the province of Namur, noted for the great battle of June 16, 1815, two days before that of Waterloo, in which Napoleon attacked and defeated the Prussians under Blücher.

Liguo'ri, de' (ALFONSO MARIA), SAINT, a doctor of the Church of Rome, b. at Naples, Italy, Sept. 27, 1696, of a noble family; became a lawyer when sixteen years old; entered a monastery in 1722, and was ordained priest in 1726; devoted himself to the religious instruction of the poor; founded in 1732, at Villa Scala, the order of REDEMPTORISTS (which see), which received papal approbation in 1749, when Liguori was confirmed as its superior-general; declined the archbishopric of Palermo; was bishop of Sant' Agatha 1762–75, when he resigned and devoted himself to theological studies and writing, giving up even his generalship of the Redemptorists. D. at Nocera dei Pagani Aug. 1, 1787; was declared venerable 1796; beatified in 1816; canonized in 1839, and declared a doctor of the Church in 1871. Among his many works are *Theologia Moralis* (1755), *Homo Apostolicus* (1782), *Institutio Catechetica* (1768), highly esteemed by Roman Catholics.

Liguorians. See REDEMPTORISTS.

Ligu'ria, in ancient geography, a district of Northern Italy, the land of the Ligures, the boundaries of which were not accurately defined until the time of Augustus. According to his division of Italy, it comprised the territory from the Ligurian Sea across the Maritime Alps to the Padus (Po) in the N. and from the Varus in the W. to the Macra in the E. When first mentioned in history, the Ligures (or, as the Greeks called them, Ligyes or Ligystini) occupied a much larger territory, extending far into Gaul, on the western side of the Rhone. They were a warlike, quick-witted, and enterprising people, whose true descent was and is entirely unknown; they were neither Celts nor Siculians, but may have been related to the Iberians. In the period between the first and second Punic wars the first encounter took place between them and the Romans, and about 125 B. C. they were wholly subjugated. Large numbers of them were brought to Samnium and settled there, while Roman colonists took their place. Liguria formed the first nucleus of the Roman province of Gaul. The name was renewed by Napoleon, June 6, 1797, when the republic of Genoa was transformed into the Ligurian republic. (See GENOA.)

Li'lac [Turk. *leilâk*], the popular name of shrubs of the genus *Syringa*, order Oleaceæ. The best known is the common lilac, *S. vulgaris*, a native of Central Asia, half naturalized in Europe and America. Its early-blooming flowers are commonly of the tint called *lilac*, but often are white or dark purple. *S. Persica*, *S. Chinensis*, with other species and their hybrids, are common in cultivation. Their bark has decided febrifugal powers. The "wild lilacs" of the Pacific coast are beautiful shrubs of the genus *Ceanothus* (order Rhamnaceæ).

Lil'burne (JOHN), b. at Thickney Puncharden, Durham, in 1618; imbibed in youth opinions extremely hostile to the Church of England, and having circulated pamphlets against the bishops, was condemned in 1637 to pay £500, to receive 500 lashes, to stand in the pillory, and be remanded to prison. In 1641 he received a handsome compensation (£3000) for his sufferings from the Long Parliament. He fought in the Parliamentary army at Edgehill, Brentford, and Marston Moor, and was thrown into Newgate for libelling the Presbyterians. He afterwards aided in organizing the "Levellers;" accused Cromwell and Ireton of designs upon the sovereignty; was in 1649 tried for sedition and acquitted; took refuge in Holland; returned in 1653; joined the Quakers, and d. in 1657.

Liles'ville, post-v. and tp. of Anson co., N. C., on the Carolina Central R. R. Pop. 1715.

Lilia'ceæ [Lat. *lilium*, "lily"], a large order of petaloideous endogenous plants, characterized by a regular complete perianth, free from the three-celled ovary, and six stamens. They are mainly herbaceous, and with the six divisions of the perianth colored alike and the leaves parallel-veined; but to all these characters there are exceptions. Many have bulbs, others tubers or root-stocks. A few are arborescent, such as the larger yuccas, and especially dragon trees (*Dracæna*). The famous dragon tree of Orotava, Teneriffe, described and figured by Humboldt, and which succumbed only a few years ago, was regarded as one of the oldest trees in existence. As now received, the order comprises not only the Asphodeleæ and the Asparagineæ, but also the Melanthaceæ, which were generally regarded as distinct orders. To the lily family proper belong the tulips, lilies, crown-imperial, calochortus, and most of the well-known and highly-prized ornamental plants of the order, as also the hyacinth and the onion tribe. To the Asparagineæ, represented in cultivation by asparagus and by a popular conservatory climber, *Myrsiphyllum* (falsely called *Smilax*), are also referred *Convallaria* (the lily-of-the-valley), *Polygonatum* (Solomon's seal), and its allies, and even the dragon trees. To the colchicum family belongs not only the medicinal and ornamental *Colchicum* (meadow saffron, so-called from a resemblance to *Crocus*), but also *Veratrum*, the white hellebore and its allies, which furnish *veratrine*, all having very active acrid-poisonous roots or corms. Such properties are not wholly absent from the proper lily family, as, for instance, in the bulbs of *Gloriosa* and of crown-imperial. Those of squills are likewise very active, while those of garlics and leeks are well-known condiments, and those of onions and the young shoots of asparagus are staples of food. The bitter juice of one or two species of *Aloë* furnishes aloes, a common purgative. One of the strongest of fibres is New Zealand flax, from the leaves of *Phormium tenax*. The order is widely distributed over the world, but is most abundant in warm-temperate climates. ASA GRAY.

Lille, or **Lisle** [Flem. *Ryssel*], town of France, the capital of the department of Le Nord, is situated in a fertile and well-cultivated plain on the Deule, and communicates by canals and railways with the sea and all the large commercial places of Northern France and Belgium. It is the head-quarters of the third military division, and is one of the strongest fortresses of Europe. Its fortifications were erected in the eleventh century; by Vauban they were thoroughly reconstructed, and they have received great improvements again in this century. The city is well built, with broad and regular streets and numerous squares, but of its public buildings none are very remarkable. It has a lyceum, an academy of design with a celebrated collection of drawings—among which are 86 by Raphael and about 200 by Michael Angelo—a botanical garden, several literary societies, and many scientific and educational institutions. Its principal importance, however, it derives from its manufactures. Much flax is grown in the vicinity, and the linen manufactures of Lille, especially those of table-cloths, are very extensive; the whole neighborhood is covered with bleaching-grounds. No less important is its cotton-spinning industry; about 36 large establishments are in operation. The tobacco manufactory of the government produces annually about 11,000,000 pounds. Beetroot sugar, rapeseed oil, gloves, and gunpowder are also manufactured in large quantities, and a very extensive trade is carried on. Lille was founded in the ninth century, belonged alternately to France or to the counts of Flanders, came into the possession of the house of Burgundy at the end of the

fourteenth century, passed from Burgundy to Austria and Spain, but was conquered in 1667 by Louis XIV., since which time it has been a French city. Pop. 158,177.

Lil'lo (George), b. at London, England, in 1693; was a jeweller who produced several dramas, two of which were successful and celebrated—*George Barnwell* (1731) and *Fatal Curiosity* (1737). D. in London in 1739. His *Dramatic Works* were published in 1755, with a memoir.

Lillebonne' [Lat. *Juliobona*], town of France, in the department of Seine-Inférieure, noted for the vast quantities of Roman remains recently found, including marble and bronze statuary and a magnificent theatre in good preservation. In its vicinity stands the palace of Harcourt, built by William the Conqueror, one of the most remarkable edifices of Normandy. Pop. 5126.

Lillers', town of France, in the Pas-de-Calais, on the Nave, noted as the place where the first artesian well was dug in the twelfth century. It has some manufactures. Pop. 5973.

Lil'lian, tp. of Goodhue co., Minn. Pop. 489.

Lil'lington, tp. of Harnett co., N. C. Pop. 699.

Lilly (John). See Lyly.

Lil'ly (William), b. at Diseworth, Leicestershire, England, May 1, 1602; commenced the study of astrology in 1632, and in 1644 began the publication of an annual almanac, *Merlinus Anglicus Junior*, which contained some wonderful predictions, and was eagerly read by all parties. He instructed many pupils in his art, and practised medicine in combination therewith. In his *Monarchy or No Monarchy* (1651) appeared two hieroglyphical figures which were subsequently claimed to refer to the plague and the great fire in London in 1666. He wrote an *Introduction to Astrology*, a *Grammar of Astrology*, and *Tables of Nativities*, and d. at Walton-upon-Thames June 9, 1681, leaving an *Autobiography*, which was first published in 1715.

Lil'y [Lat. *lilium*], the popular name of the leading genus of the order Liliaceæ (which see), comprising some of the commonest and most valued of hardy ornamental bulbiferous plants, natives of the northern temperate zone. Several are indigenous to the U. S., the more showy and common ones being *Lilium Philadelphicum*, with an upright flower, and *L. Canadense* and *L. superbum*, with nodding ones; these orange and orange-red. Related species of California are now coming into cultivation, as well as one or two with white or rose-colored blossoms. *L. candidum*, the common white lily of the gardens, came from the Levant and Caucasus. The large and choice Japanese lilies, white or partly so, came from *L. longiflorum*, with long and narrow flowers, and *L. Japonicum*, *L. speciosum*, and *L. auratum*, with very broad and open ones. In the scarlet-flowered *L. Chalcedonicum*, abounding in Palestine, we "behold the lilies of the field" of Scripture. The Martagon lily, *L. Martagon* of the Old World, answers nearest to our *L. superbum*. The tiger and bulblet-bearing lilies of cultivation, all natives of the Old World, and producing bulblets in the axils of the leaves, belong to *L. tigrinum*, *L. croceum*, and *L. bulbiferum*, the last two known by their erect flowers. Finally, the name of lily is extended in popular use to various other lily-like flowers of this and related orders, and even to some of the exogenous class, as, for example, the water-lily, *Nymphæa*. Asa Gray.

Lily, or **Lilly** (William), b. at Odiham, Hampshire, England, about 1466; was educated at Oxford; travelled in Asia Minor; studied Greek five years at Rhodes, and in 1509 opened a classical school in London, in which Greek was first taught by an Englishman in his own country. The following year he was appointed master of St. Paul's School, just founded by Colet, and in 1513 he brought out his celebrated *Latin Grammar*, which was the standard textbook in England for two centuries, of which the last edition was published in 1817. Colet, Erasmus, and Wolsey bore a part in this production, which bears the title *Brevissima Institutio, seu Ratio Grammatices Cognoscendæ*. D. of the plague in London Feb., 1523.

Lilybæ'um, the modern *Marsala*, was built by the Carthaginians in 397 B. C. on the westernmost promontory of Sicily, and was their last possession on the island. After a siege of ten years it was abandoned to the Romans in 241 B. C., after which it became the basis for their attacks on Africa. At the fall of the Roman empire it was still a flourishing place, and the Saracens valued its port so highly that they called it *Marsa Allah*, "the port of God," whence its present name.

Lily-of-the-Valley, the *Convallaria majalis*, a plant of Europe and Asia, also sparingly indigenous in the Alleghany Mountains, prized in garden and green-house cultivation for its beauty and fragrance. It is used by perfumers as the basis of *eau d'or*.

Lima. See Limidæ.

Li'ma, the capital of the republic of Peru, is situated at the foot of the Cordillera, in a fertile plain on the Rimac, 6 miles from Callao, its port on the Pacific. It is regularly built, the streets crossing each other at right angles, and has many churches with double towers. The streets are long and narrow, and the houses mostly of one story and built of sun-dried brick, which material suffices, as heavy showers never occur; the rains which fall frequently between May and November, called *garuas*, are little more than heavy dews. Among the thirty-three public squares, the Plaza Mayor or Principal is the most important, embracing nine acres in the centre of the city, and being surrounded on three sides by a covered colonnade. On the fourth side stands the cathedral, one of the most beautiful churches in South America, founded by Pizarro, the conqueror of Peru, destroyed in 1746 by an earthquake, but rebuilt by the viceroy, Count Superunda. It has two towers, a large, beautiful portal, reminding of the Moorish style, and in the interior rich altars, good pictures, and a splendid organ. In the centre of the richly ornamented plaza is a circular garden, surrounded by an iron fence and provided with a fountain and statues. Facing the entrance from the principal square to the Callejon de Petateros ("Mat-maker's Alley") is the front gate of Pizarro's palace, now used for government offices, and containing official apartments for the president. In the centre of the Plaza de la Independencia stands an equestrian statue of Bolivar, modelled by Tadolini and cast in bronze at Munich. Here also is the royal and pontifical university of San Marcos, founded by royal decree in 1551, the walls of which constitute a mass of the most elaborately carved woodwork. The place contains furthermore the senate-house, formerly the palace of the inquisition, from which the square was called Plaza de la Inquisicion. One of the finest buildings of the city is the exhibition palace, commenced Jan. 1, 1870, opened July 1, 1872—commenced by Don Manuel Fuentes, built by the Italian Leonardo, and situated on the south-western side of the city, on a square 225 mètres long and 172½ mètres broad. In the vicinity of this building most of the old, now useless, city walls were pulled down in 1873, and an elegant boulevard laid out, called, after its designer, Meiggs's boulevard. The marble statue of Columbus, which formerly stood on the Alameda, on the other side of the Rimac, has been transferred to the open space between the boulevard and the exhibition palace. Among the sixty or seventy churches only that of San Pedro is noteworthy, as containing the national library of Peru. Remarkable among the other public buildings are the penitentiary, very commodious and safe in its construction, eight national colleges, an ecclesiastical seminary, a college for the study of medicine and the accessory sciences, another for secondary instruction, a normal school, a naval and military institute, an industrial municipal school, two theatres, and a circus for bull-fights, the largest in the world. The population of Lima, numbering 160,056 in 1871, is very varied—whites, blacks, Indians, and Chinese of all shades. The sanitary state of the city is not good, on account of the poor drinking-water and the bad system of sewage; the *gallinazas* (carrion-vultures), which here swarm by the hundred, are of great benefit as scavengers. The city is connected by railways with Callao and the bathing-place Chorillos. Lima, generally styled *Ciudad de los Reyes* ("the City of the Kings"), was founded by Pizarro in 1535. Most extravagant records exist of its former wealth; thus, in 1683 the merchants are said to have paved the streets with silver bars on occasion of the arrival of a new viceroy. The greatest danger to Lima is that from earthquakes. The severest occurred in 1630, 1687, 1746, 1806, and 1828, of which that of Oct. 28, 1746, was the most destructive. August Niemann.

Lima, post-v. and tp. of Adams co., Ill., 15 miles N. of Quincy, on the Mississippi River, contains Lima Lake. Pop. of v. 285; of tp. 1462.

Lima, tp. of Carroll co., Ill. Pop. 531.

Lima, post-v. and tp. of La Grange co., Ind., on Grand Rapids and Indiana R. R. Pop. of v. 419; of tp. 1371.

Lima, post-v. and tp., Washtenaw co., Mich. Pop. 1052.

Lima, post-v. and tp. of Livingston co., N. Y., 4 miles from New York Central R. R., is the seat of Genesee Wesleyan Seminary, the oldest institution of the kind in this part of the State, and has 4 churches, 1 bank, 1 weekly newspaper, and a number of stores. Pop. of v. 1257; of tp. 2912. Deal & Drake, Eds. "Lima Recorder."

Lima, post-v., cap. of Allen co., O., on the Cincinnati Hamilton and Dayton, the Lake Erie and Louisville, and the Pittsburg Fort Wayne and Chicago R. Rs. It has 2 weekly newspapers. Pop. 4500.

Lima, tp. of Licking co., O. Pop. 1642.

Lima, a v. (North Lima P. O.) of Beaver tp., Mahoning co., O. Pop. 160.

Lima, tp. of Grant co., Wis. Pop. 1085.

Lima, tp. of Pepin co., Wis. Pop. 477.

Lima, tp. of Rock co., Wis. Pop. 1136.

Lima, tp. of Sheboygan co., Wis. Pop. 2190.

Limac'idæ [from *Limax*, the typical genus], a family of the class Gasteropoda and order Pulmonata, distinguished by the elongated semi-cylindrical body, which is not distinguishable from the foot, the absence of any visceral sac, and the consequently rudimentary or shield-like character of the shell, which is concealed by the mantle; the mantle is anterior, moderate, and oval; the respiratory orifice near the right posterior margin of the mantle; the anus close in front of the respiratory orifice; the head has oculigerous as well as inferior tentacles; the jaws are ribless; the teeth of the radula in numerous rows, the central and inner "lateral" tricuspid, the "uncini" or outer lateral aculeate. The family thus defined embraces the well-known slugs of the gardens, and includes a number of species which have been differentiated by some authors into about half a dozen genera; the best known, however, is *Limax*, and the most conspicuous species, in at least the sea-coast towns of the U. S., are two species introduced from Europe—viz. *Limax agrestis* and *L. flavus*. These are found in moist places under boards, stones, etc. They are herbivorous, and are frequently quite injurious to succulent young plants. They emit, when handled, a milky secretion, and are even capable of secreting a mucus which, like a thread, suspends them from the point to which it has been attached. Besides the introduced species, there is an indigenous form which is quite widely distributed in the U. S.—*Limax campestris*, Binney. THEODORE GILL.

Limatula. See LIMIDÆ.

Li'maville, post-v. of Lexington tp., Stark co., O., on the Cleveland and Pittsburg R. R. Pop. 204.

Lima-wood. See BRAZIL-WOOD.

Limb. In angular instruments, the plate that bears the principal graduated arc is called the *limb* of the instrument; the secondary arc concentric with the first, and used for subdividing the divisions on the limb, is called the *vernier*. In the theodolite there are two limbs—one for measuring horizontal angles, called the *horizontal limb*, and one for measuring vertical angles, called the *vertical limb*. The term limb is often applied to a straight rod which is graduated; thus, in the levelling-rod the staff on which the principal graduation is placed is called the limb, the graduated line on the vane being called the vernier. W. G. PECK.

Lim'bo [Lat. *limbus*, a "border," because it is on the border of hell], in the theology of the Roman Catholics, a place upon the borders of hell for the souls of those who have neither merited hell by their sins nor are entitled to behold the beatific vision in heaven. There are two limboes—one the *limbus patrum*, the limbo of the Fathers, designed for the saints of the Mosaic dispensation. Since the atonement of Christ these Fathers have ascended to heaven, and this limbo is generally believed to be empty. The other is the *limbus infantum*, designed for the souls of unbaptized infants, who are eternally sorrowful, but not tormented. Some writers suggest a third limbo, for righteous men who have not the true faith.

Lim'borch, van (PHILIPPUS), b. June 19, 1633, at Amsterdam; studied theology under his uncle, Episcopius, and was appointed in 1657 minister of the Remonstrant congregation at Gonda, and in 1667 professor of theology at the Remonstrant college of Amsterdam, where he d. Apr. 30, 1712. His *Theologia Christiana* (1686) gives a comprehensive and systematic exposition of the doctrines of Arminius.

Lim'burg, or **Limbourg,** a territory extending along both sides of the river Meuse, which alternately belonged to the Netherlands, Belgium, France, and Austria, until it was finally divided between Belgium and the Netherlands in 1839. Along the Meuse the region is very fertile, affording excellent pasturage for large herds of cattle, but the rest of the country is sterile, the soil being either marshy or sandy. Brewing and distilling are the principal branches of industry pursued here. *Dutch Limburg* comprises an area of 856 square miles, with 225,702 inhabitants, of whom nine-tenths are Roman Catholics; the principal towns are Maestricht and Roermond. *Belgium Limburg*, which contains some iron and coal mines, comprises an area of 929 square miles, with 200,336 inhabitants. Principal towns, Hasselt, St. Trond, and Tongres.

Lime [Fr.; from Ind. *leemoo*], the fruit of *Citrus acida* and *C. Limetta* (the last called sweet lime), both probably mere varieties of *Citrus medica*, the citron tree. The lime grows upon a dwarfish tree or shrub, and is a native of Asia, but cultivated in nearly all warm regions. Limes are in no wise inferior to lemons, for which they are used as a substitute. Pickled limes are prized as a condiment. Lime-juice is extensively employed in ships' stores as an antiscorbutic. Citric acid is largely manufactured from it. Lime is the usual English name of *Tilia*, the linden tree.

Lime, one of the alkaline earths, chemically the protoxide of calcium, symbol CaO. It forms the base of limestones, marbles, marls, and the shells of mollusks, where it is in combination with carbonic acid, forming the carbonate of lime. By the application of heat the carbonic acid is driven off, and the lime is left in the condition of "caustic" or "quick" lime. Lime is usually white, light-gray, or cream-colored, porous and soft. It rapidly absorbs water, uniting with it chemically, with the evolution of much heat. This process is called slaking or slacking. Pure or "fat" limes when slaked swell very much, and ultimately fall into a snow-white powder. If more water is added, what is called the "milk of lime" is formed. The lime is now in the condition of a hydrate, and if exposed to the action of the air it absorbs carbonic acid, and is again converted into the carbonate of lime. In the preparation of mortar, sand is added according to the richness or "fatness" of the lime—that is, according to the fineness and uniformity of the powder into which it falls when slaked. Where the powder is very fine, it makes with water a fluid paste which will penetrate the interstices between the grains of sand, however closely they may be crowded. The thinner the film of paste between the grains of sand the stronger their adhesion will be. Hence, the value of a lime is roughly measured by the quantity of sand it will serve to unite. Lime is largely used in agriculture as a dressing on soils which require calcareous matter, in the manufacture of bleaching-powder (chloride of lime), in tanning, as a flux in smelting iron, etc. etc. Lime is extremely infusible, and cylinders of this substance are commonly used in the oxyhydrogen or calcium light, a jet of the ignited gases being thrown upon a piece of lime, which when intensely heated emits a light so bright as to be almost unbearable to the eye.

The great consumption of lime, however, is in the production of mortar, and for this purpose it has been used in construction by all modern and most ancient civilized nations. In the earliest masonry of which any remains have been found, as the Etruscan, that of the island of Cyprus, and ancient Troy, walls were laid up with large stones without mortar ("Cyclopean" masonry), or with smaller ones packed in clay, but by the Egyptians, Hebrews, Greeks, and Romans the use of lime for mortar was universal. In the manufacture of mortar from lime, as has been stated, the hydrate of lime is formed by the addition of water to quicklime. This is, in part, chemically combined with the lime, and produces the first "setting" of mortar. Subsequently, by the absorption of carbonic acid, it is converted into the hydrated carbonate. In process of time a combination is also formed between the lime and some of the silica of the sand with which it is associated, and silicate of lime is produced. By this the strength of the mortar is still further increased. This progressive change has been ascertained by careful analysis of many samples of older and newer mortars. These have shown that in the older mortars—which in some instances are as hard as the stones they join—the percentage of silicate of lime is much greater than in those more recently made.

The notion is commonly entertained by architects and masons that the best lime is produced from the purest carbonate of lime, and statements to that effect will be found in many books which treat of this subject. This theory, however, has been abundantly proved to be a fallacy, for it has been shown that nearly all the most extensively used and highly esteemed limes contain a large percentage of magnesia. Magnesian limes are preferred by masons, because, as they say, they are "cooler" and set more slowly. The pure lime is, in their language, too "hot" and "quick." This is illustrated by the high reputation in New York of the lime from Smithfield, R. I., and that made from the white marble along the Hudson River, both of which are highly magnesian. The following analyses show the composition of the Westchester marble, so much used for lime:

	1.	2.
Carbonate of lime	55.40	54.20
" " magnesia	43.28	44.80
Silica	0.20	0.10
Alumina and iron	0.60	0.80

It will be seen from these analyses that this rock is a typical dolomite, and yet the lime made from it is as highly esteemed and takes as much sand as any other used in the Atlantic States. In Ohio, where this subject has attracted special attention in connection with the geological survey, it has been found that all the most esteemed limes are highly magnesian. At Cincinnati, which is surrounded by hills

composed of limestones which are nearly pure carbonate of lime, all the quicklime used is brought from distant localities, where it is manufactured from the Niagara limestone, there a dolomite, containing nearly as much magnesia as lime. The cities of Northern Ohio and Michigan are supplied with lime from the Niagara and Water-lime groups, both of which are dolomites, and from the Corniferous limestone, which contains from 15 to 21 per cent. of magnesia. A considerable portion of magnesia in quicklime causes it to slake and set more slowly, but the mortar is quite as white as that made from pure lime, and becomes much harder by age.

A similar fallacy prevails in regard to the use of magnesian limestones for fluxes in metallurgy. It is generally believed that pure limestones make much the best fluxes, but this is a mistake, as abundant experience has shown that magnesian limestones are quite as well adapted to this use as those which contain the carbonate of lime only.

Lime is manufactured from limestone, marbles, or shells by calcination, which expels the carbonic acid. This is effected in kilns of various kinds. Formerly, lime-burning was done in kilns having the form of an inverted beehive, with a single opening at the bottom. In these the fuel and stone were mixed, the fire being lighted below. At the end of three or four days, the fuel having been consumed and the limestone calcined, the charge was allowed to cool partially, and was then drawn out at the bottom. Now, lime-burning is nearly all done in what are called *perpetual* kilns. These are square or round towers 25 to 30 feet in height, having a cylindrical cavity within, 5 or 6 feet in diameter. These kilns have usually two furnaces, one on either side, situated at about one-third of the height from the bottom. In these the fires are kept perpetually burning, and are fed with wood or soft coal, the flame and heat from which, passing up through the limestone, calcine it so that when it has descended to the level of the furnaces it is deprived of all its carbonic acid. From time to time the limestone is charged at the top and the calcined lime drawn out below. As limestones vary much in the facility with which they are burned, the time required for calcination and the amount of fuel consumed will depend much on the kind of stone used. Something will also depend upon the excellence of the fuel and the pattern of kiln employed. The best results attained are the production of 300 bushels of lime every twenty-four hours with the consumption of four cords of wood. Where coal is used, as is the case in most foreign localities and many in the U. S., a considerable economy of fuel is obtained; but in some places where our bituminous coals have been tried the quality of the lime is said to have been impaired. This, if true, was possibly the effect of an unusual amount of sulphur in the coal, or it may have been the result of a want of adaptation of the furnaces to mineral fuel. The experience of the lime-burners abroad and in certain localities on the Atlantic coast of our own country has conclusively proved that lime can be burned more rapidly and cheaply with a fair quality of coal than with wood, and this without any impairment of quality.

When mortar freshly made from quicklime is placed in water, it softens and loses its form; but the lime made from certain limestones which contain a large percentage of silica and alumina, on the contrary, hardens under water and forms what is known as hydraulic cement. When calcined, these hydraulic limestones yield a yellow or brown lime which does not slake or heat much on the application of water. From its hardness it must be ground in a mill before it can be used for mortar. (Further particulars in regard to this class of lime will be found in the articles CEMENT, HYDRAULIC LIMES, etc. See also Vicat *On Mortars* and Vicat's *Treatise on Mortars and Cements;* Pasley's *Limes, Mortars, and Cements;* Burnell's *Mortars, Limes, Cements, and Concretes;* and Gilmore's *Limes, Mortars, and Cements*, 2d ed.) J. S. NEWBERRY.

Lime, Medicinal Uses of. *Quicklime* is a powerful caustic, but is little used for this purpose except in the form of the officinal *potassa cum calce* or "Vienna caustic," which consists of equal parts of the two alkalies, mixed to form a powder. For application this powder is made into a paste with a little alcohol. *Chlorinated lime* is a valuable desiccant and disinfectant. *Lime-water* (a saturated solution of lime in water) and *calcium carbonate* (in the form of prepared chalk and prepared oyster-shell) are used in medicine for a variety of purposes. They are valuable antidotes in sulphuric and oxalic acid poisoning, as they form insoluble precipitates with those acids, and have no poisonous properties of their own. They are among the best of alkalies for neutralizing the undue acidity generated in the alimentary canal in certain forms of dyspepsia, especially when, as is often the case, there is also diarrhœa; for, being somewhat astringent, they tend to check the discharge. Being of low diffusion power, they are but little absorbed, and hence cannot be used for alkalizing the blood like the alkaline compounds of sodium and potassium. Lime-water is also used as an alkaline wash in many skin diseases, and mixed with equal parts of linseed oil forms the so-called "Carron oil," a favorite application to burns. Lime-water rapidly dissolves the false membranes of croup and diphtheria, and is accordingly sometimes applied locally to the throat in those diseases by means of the spray-apparatus. But in this dilute form it is doubtful if it exercises much useful solvent power. Mixed with ice-cold milk, in the proportion of 1 to 1 or 2, lime-water has a remarkable effect in allaying nausea and vomiting; and the same mixture thus furnishes an invaluable means of conveying nourishment in cases of obstinate vomiting when all the usual forms of food are rejected. EDWARD CURTIS.

Lime, tp. of Blue Earth co., Minn. Pop. 744.

Lime, Chloride of, or **Bleaching-Salt.** See HYPOCHLOROUS ANHYDRIDE and HYPOCHLORITES, by PROF. HENRY WURTZ.

Lime Creek, tp. of Washington co., Ia. Pop. 1333.

Lim'erick, county of Ireland, in the province of Munster, separated N. by the Shannon from the county of Clare. Area, 1061 sq. m. The ground is an undulating plain, with a subsoil of limestone, trap, and sandstone, watered by the Moigne, Deel, and Mulcair, and rising into mountains in the southern parts, where are found a fine reddish marble and coal of an inferior quality. The central part, a tract called the Golden Vale, is very fertile. Pop. 191,936.

Limerick, city of Ireland, capital of the county of Limerick, province of Munster, on both sides of the Shannon, which is crossed by five bridges and lined with docks. It has distilleries, tanneries, flour-mills, flax-spinning and weaving factories, and lace manufactures. It was the last place in Ireland which surrendered to William III., on which occasion a treaty was signed (1691) granting certain rights to Roman Catholics. Pop. 49,670.

Limerick, post-tp. of York co., Me. Pop. 1425.

Limerick, post-v. and tp., Montgomery co., Pa. P. 2600.

Limerick Station, post-v. of Limerick tp., Montgomery co., Pa., on Schuylkill River and on Reading R. R.

Lime Ridge, post-v. of Lower Saucon tp., Northampton co., Pa., on Lehigh River and on Lackawanna and Bloomsburg R. R. Limestone is here quarried and burned.

Lime Rock, post-v. of Salisbury tp., Litchfield co., Conn., has a blast furnace and car-wheel factory.

Lime Springs, post-v. of Howard co., Ia., on the Chicago Milwaukee and St. Paul R. R., 130 miles S. of St. Paul, has 1 school, 3 churches, and some stores. Pop. about 1000. E. L. HOWE, ED. "LIME SPRINGS HERALD."

Lime'stone, a sedimentary rock composed chiefly of the carbonate of lime, the calcareous deposit of the sea wherever the mechanical sediments—sand and clay, the wash of the land—do not reach. The lime of limestones is for the most part derived from the hard parts of marine organisms, the shells of Foraminifera and mollusks, the skeletons of polyps (corals), etc. By the formation of limestone carbonic acid is drawn from the atmosphere, and fixed beyond the reach of all natural agents except heat sufficient to calcine the limestone. As the causes which produce the ordinary metamorphism of rocks, converting limestones into marbles, though rendering them more crystalline and often discharging all organic colors and leaving them pure white, does not drive off the carbonic acid, it may be supposed that the carbonic acid which is absorbed in the formation of limestone is, for the most part, permanently withdrawn from the atmosphere. As Prof. Henry Wurtz has suggested, this process has probably caused a great diminution of the carbonic acid contained in the primeval atmosphere, and should it continue with no other compensating action than such as we now know, it must result in the extinction of all life on the globe. J. S. NEWBERRY.

Limestone, county of Alabama, bounded N. by Tennessee and S. by the Tennessee River. Area, 650 square miles. The N. is hilly, the S. more level. Cotton, corn, and live-stock are largely produced. The county is traversed by the Nashville and Decatur and the Memphis and Charleston R. Rs. Cap. Athens. Pop. 15,017.

Limestone, county of Central Texas. Area, 900 square miles. It is fertile, well-timbered and watered, and produces corn, cotton, and live-stock. Traversed by Houston and Texas Central R. R. Cap. Springfield. Pop. 8591.

Limestone, tp. of Franklin co., Ark. Pop. 240.

Limestone, tp. of Kankakee co., Ill. Pop. 840.

Limestone, tp. of Peoria co., Ill. Pop. 2302.

Limestone, tp. of Aroostook co., Me. Pop. 263.

Limestone, tp. of Buncombe co., N. C. Pop. 688.

Limestone, tp. of Duplin co., N. C. Pop. 709.

Limestone, post-tp. of Clarion co., Pa. Pop. 1375.

Limestone, tp. of Lycoming co., Pa. Pop. 1256.

Limestone, tp. of Montour co., Pa. Pop. 710.

Limestone, tp. of Union co., Pa. Pop. 880.

Limestone, tp. of Warren co., Pa. Pop. 848.

Limestone, tp. of Spartanburg co., S. C. Pop. 2463.

Lime Tree. See LINDEN.

Lim'idæ [from *Lima*, the principal genus], a family of monomyarian conchiferous mollusks, resembling, in some, the scallops (Pectinidæ), but with the mouth bordered by tentacular filaments; the mantle destitute of ocelli; an oval tube developed and cylindrical in form; and the foot compressed. The family has numerous recent as well as fossil (Secondary and Tertiary) species, which have been grouped by Adams into two genera—viz. *Lima* (with the sub-genera *Radula* restricted, *Ctenoides*, *Mantellum*, *Acesta*, and *Limatula*) and *Limæa*. Of the latter, only one species was known from Norway and the Mediterranean. THEODORE GILL.

Lim'ington, post-tp. of York co., Me. Pop. 1630.

Lim'it [Lat. *limes*]. The *limit* of a varying quantity is that value *towards* which the first may be made under the law by which it varies to approach, *from* which it may be made to differ by less than any assignable quantity of the same kind, and *with* which it may be made to coincide by a particular supposition. Thus, the quantity $2ax + h^2$ varies with h; if we suppose h to diminish numerically, the value of the expression will approach towards that of $2ax$; by making h sufficiently small the value of the expression is made to differ from $2ax$ by less than any assignable quantity; and finally, by supposing h equal to 0, the value of the expression becomes $2ax$; hence, $2ax$ is the limit of $2ax + h^2$ with respect to h.

The method of limits has been made the basis of a system of differential calculus. To explain this system let us assume the general equation—

$$y = f(x) \quad . \quad . \quad . \quad . \quad . \quad . \qquad (1)$$

if we increase x by a positive but variable increment, h, and denote the corresponding value of y by y', it may be shown (Courtenay's *Calculus*, art. 4) that the new state of the function can always be expressed by the formula,

$$y' = f(x + h) = f(x) + Ah + Bh^2 + Ch^3 + \text{etc.}; \quad . \quad . \quad . \quad . \quad (2)$$

in which A, B, C, etc. depend on x, but are independent of h. Subtracting (1) from (2), and dividing through by h, we have

$$\frac{y' - y}{h} = A + Bh + (\text{etc.})h^2 \quad . \quad . \quad . \quad . \qquad (3)$$

The first member of (3) is a symbol to express the ratio of the increment of the variable to the corresponding increment of the function, and the second member is the value of that ratio. If, now, we suppose h to approach 0, the value of the ratio will approach A, and when h becomes equal to 0 the value of the ratio becomes equal to A; hence, A is the limit of the ratio in question. This limiting value is called the differential coefficient of the function, and is denoted by the symbol $\frac{dy}{dx}$; if this result is multiplied by the differential of the variable, dx, the product, denoted by the symbol dy, is called the differential of the function, and we have

$$dy = Adx.$$

If we suppose h to be a constant infinitesimal, denoted by dx, the difference between y' and y will be the difference between two consecutive values of the function; this difference is the differential of the function, and it may be denoted by the symbol dy. Subtracting (1) from (2), and in the result making $y' - y$ equal to dy, and h equal to dx, we have

$$dy = Adx + Bdx^2 + Cdx^3 + \text{etc.};$$

rejecting from the second member all terms involving dx to a higher power than the first, as infinitesimal in comparison with the first, we have, as before,

$$dy = Adx.$$

This result shows that the expression for the differential of the function is always the same, whether it is found by the *method of limits* or by the *method of infinitesimals*, inasmuch as the function that we have used is perfectly general. The latter method is far simpler than the former, and is therefore better adapted to *practical* investigations.

The method of limits is immediately applicable to the theory of tangents. We may define a tangent to a plane curve at a given point to be the limit of the secant through that point. If a secant is drawn through the given point and any other point of the curve, we may conceive the second point to approach the first, and finally to coincide with it; at this instant the secant becomes a tangent. If, now, we suppose the second point to pass the first, continuing to move in the same direction, we shall have a secant cutting the curve on the other side. There is but one position in which a secant becomes a tangent, and that is its limiting position. At this point the slope of the tangent is equal to the limit of the ratio of the *increment of the abscissa* to the corresponding *increment of the ordinate;* that is, to the differential coefficient of the ordinate taken at the point of contact. A tangent plane to a surface at any point is the limit of all the secant planes that can be passed through the point.

The method of limits is used in deducing properties of geometrical magnitudes of one and two dimensions. Let a regular polygon be inscribed in a circle, and suppose the number of sides to be indefinite. As the number of sides increases, the area of the polygon approaches that of the circle, and finally, when the number of sides becomes infinite, the two areas coincide; hence, we say that the circle is the limit of a regular inscribed polygon. It is also the limit of a regular circumscribed polygon. The circumference of a circle is, in like manner, the limit of the perimeters of the inscribed and circumscribed polygons. The surface and volume of the cone and the cylinder are limits of the surface and volume of regular inscribed pyramids and prisms. In all such cases it is assumed that whatever is true for all states of a varying magnitude is true for its limit.

A limit of the roots of a numerical equation is a number greater or less than any of the real roots of the equation. In this sense there must be an infinite number of limits, but it is understood that the superior limit is the smallest and that the inferior limit is the largest whole number that will satisfy the conditions of a limit. W. G. PECK.

Limita'tion, Statutes of, are statutes limiting or prescribing particular periods of time within which civil actions or suits or criminal prosecutions must be instituted or certain legal rights enforced. Various statutes of this kind have been enacted in England at different periods of English history, but those which were first adopted were narrow in scope, applying only to actions relating to real property. The first statute to be enacted of a comprehensive character, applying to civil actions in contract and in tort, as well as to actions concerning real estate, was passed in the reign of James I. (21 James I. ch. 16). This has been superseded, so far as it relates to real property, by the statute 3 and 4 Will. IV. ch. 27, but its remaining provisions are still substantially in force, though they have been to some extent modified by subsequent enactments. Upon this statute, so far as it relates to actions upon contract, the various statutes of limitation enacted by the different States of this country have been chiefly based, its principal provisions having been frequently adopted with but slight if any modification; and a consideration of its terms, of the interpretation which it has received, and of its effect upon legal procedure will exhibit the principles of law upon this subject as established in England and generally in the U. S. The rules relating to actions of tort and to actions concerning real property, as well as the statutes of limitation which have been enacted with reference to suits in courts of equity and to criminal prosecutions, may with most convenience and advantage be considered separately.

I. *Actions upon Contract.*—It is provided by the statute of James that "all actions of account and upon the case, other than such accounts as concern the trade of merchandise between merchant and merchant, their factors, or servants, all actions of debt grounded upon any lending or contract without specialty, all actions of debt for arrearages of rent, shall be brought within six years next after the cause of such actions, and not after." Before the enactment of this statute there was no limit to the period within which an action upon contract might be instituted. It was a maxim of the common law that a "right never dies," and it could therefore not be barred or extinguished by any lapse of time, unless it were a right of action in tort, in which case the action was then required (though there are now important exceptions to this rule) to be brought within the lifetime of the parties. The object sought to be attained by the enactment of these provisions limiting the right of action to a specific and comparatively brief period was to relieve debtors from the undue embarrassment and hardship naturally attendant upon harassing litigation at remote periods of time, when vouchers and other instruments of evidence are likely to be lost or destroyed, or it has become unreasonably difficult or impossible to procure the necessary testimony. The statute is in furtherance of the principle that "the law favors those who are vigilant, not those who sleep upon their rights," and aims to promote the diligence of creditors in enforcing their claims while an adequate defence, if any can be made, is reasonably practicable. The limit of time assigned is necessarily arbitrary, though it was undoubtedly fixed upon with ref-

erence to two important considerations: first, that the creditor should not be forced to undue haste in bringing action before time was given to collect all necessary testimony, to employ other means of effecting a settlement, or to wait until an impoverished debtor might become capable of satisfying the claim; and, secondly, that the debtor should not be unwarrantably prejudiced in his interests by the creditor's excessive delay. For these reasons the statute is commonly termed in law a statute of repose, because its purpose and effect are to quiet old and stale claims, to extinguish causes of litigation, and to relieve debtors from oppressive suits. There has been, however, no little conflicting adjudication in the courts as to whether it should be deemed a statute of repose or one of presumption. The decisions sustaining the latter doctrine proceed upon the ground that a creditor's claim is not to be enforced at the expiration of the prescribed period, because it is then presumed in law that it has been satisfied. This contrariety of opinion led to important consequences in regard to the necessity of a new promise by the debtor to revive a liability affected by the statute, which will be again referred to. It is now to be considered as the generally established rule that the statute is one of repose, founded upon principles of expediency and public policy, and not of legal presumption. The phraseology of the statute has reference to the technical forms of action upon contract employed in common-law procedure, instead of to various kinds of contracts. The nature and objects of these various actions are explained under the topics ACCOUNT, CASE, and DEBT (which see). The "action upon the case," as the phrase is used in this connection, includes the action of assumpsit. (See ASSUMPSIT.) It may be briefly stated as the substance of the statute that it requires actions upon simple contracts (*i. e.* contracts not under seal) to be brought within six years after the cause of action accrues, with the single exception of merchants' accounts, which concern the trade of merchandise. The time when the cause of action accrues, and from which the six years are to be reckoned, is the time when the creditor could have commenced his action. Thus, if credit be given, the statute begins to run when the term of credit expires. If a bill of exchange be payable at sight, the six years are computed from the date of presentment. But a note payable on demand is due at any time, and the statute runs from the making of the note. If, however, the note be drawn payable a certain time after demand, a demand must be made to fix the commencement of the period of limitation. If a bill or note have days of grace, the statute runs from the time of their expiration. If a debt be payable by instalments, the statute begins as to each instalment from the time when it becomes due; there may, however, be an agreement that upon default in paying any instalment the whole debt shall become payable, and in that case the six years are reckoned as to the entire debt from the time of default. The statute begins to run when the plaintiff could bring his action, and not when he knew he could, if these two periods of time do not coincide. If the claim be for breach of contract, the statute runs from the time of breach, and not from the time when loss or injury was sustained by the plaintiff in consequence. If money be payable upon the happening of a contingent event, the period of limitation will be reckoned from the time of its occurrence. The statute provides that the suit "shall *be brought* within six years." It therefore becomes important to determine what steps will be sufficient to constitute the bringing or commencing of an action, for if suit be brought even upon the last day of the six years the terms of the statute will be satisfied, even though the action may be prolonged beyond that limit. It was the rule at common law that the suit was commenced by the first act performed in the institution of legal proceedings, such as filling out and completing the original writ or the summons, which were the initiatory steps requisite. At the present day the same general rule remains true, though different forms of process have been established in England and the States of this country as the prescribed mode of beginning legal proceedings. It is provided in some States that the action shall be deemed begun as to any defendant when the first process, as a summons, is served on him or on a co-defendant, but that an attempt to commence it by delivering the summons to the sheriff to be served shall be equivalent to an actual service. This is the case in New York and in other States which have adopted its code of civil procedure.

It is a general principle applicable to statutes of limitation that they do not apply to actions brought by the Crown or State, unless there be an express provision in the statute to that effect. It was a maxim of common law that "time does not run against the king." Special provisions are generally adopted at the present day barring the right of the State to recover real property after a certain specified interval; but the rule as applicable to actions upon contract is not so frequently changed. The statute also provides that actions upon contracts under seal or specialties shall not be included within the prescribed period of limitation. But in analogy with the provisions of the statute an artificial presumption was established at an early period that payment of a debt upon specialty had been made when it had been unclaimed and without recognition for the period of twenty years. This, however, did not operate as an absolute bar, but was merely a disputable presumption, which might be rebutted by any evidence sufficient to satisfy the jury that the debt still remained due. The same presumption was also made in reference to claims upon simple contract when the statute was not pleaded by the defendant, since it was a rule that a defendant could not take advantage of the statute of limitations, though he might be able to do so, unless he made it the basis of a special plea. But it is now provided in England, by statute 3 and 4 Will. IV. ch. 42, that actions upon specialties shall be commenced within twenty years after the accruing of the cause of action. Similar statutes have been enacted in a number of the U. S.

No special provision is made in the statute of James with reference to mutual, open, and current accounts between the parties to an action; but the rule was established at an early date in England by the adjudications of the courts, and has been generally sustained in the American States, that such accounts, if they contain items on both sides within the period of limitation, are not barred by the statute. The last item is said to draw to itself the other items, and its date is deemed the date of the entire account. These accounts are to be distinguished from "merchants' accounts," which are provided for by the statute. These may exist between parties who are not merchants. The reason generally given for this rule is that the items within six years are clearly an admission of an unsettled account, and equivalent to evidence of a new promise which operates to remove the bar of the statute. It is indispensable that the accounts be mutual in order that the rule may apply. If the items be entirely upon one side, only those which are within six years will be valid claims. It has been held in some States that an item upon either side will be sufficient to take the whole account out of the statute. Mere statements of successive credits on one side of an account and of debits on the other do not make an account mutual. There must be reciprocal demands, mutual rights of action. The account must also be "open and current" in order to be referred to the time of each successive item. If a balance be struck, and acquiesced in by the debtor, thus making the account what is technically termed an "account stated," the balance constitutes a definite and specific debt, against which the statute begins to run from the time it is ascertained and settled. A balance thus found may, however, be embodied in a new account current as its first item, and thus be drawn out of the operation of the statute. But the rule in regard to mutual accounts has been changed in England by statute 9 Geo. IV. ch. 14, commonly termed Lord Tenterden's act. This provides that the existence of items within six years shall not operate to prevent the previous items of the account from being barred. This provision has been declared anew by statute 19 and 20 Vict. ch. 97. In this country, however, the previously existing common-law rule has been established by statute in a number of the States. The exception as to "merchants' accounts" in the statute applies only to such "accounts as concern the trade of merchandise;" *i. e.* to those which arise from the buying and selling of goods. The existence of mutual debits and credits merely is not sufficient. A "merchant," within the meaning of this provision, is one who is engaged in traffic in merchandise as a regular business. It was finally decided in England before this exception was there abolished that it applied only to actions of account, technically so called, and perhaps to actions on the case for not accounting. (See ACCOUNT.) In those States of this country, however, where this provision of the statute has been adopted, other forms of action based upon matter of account have been held to be included within its terms. In some of the States the phraseology was changed, so as to read, "other than such *actions* as concern the trade of merchandise," etc. The adjudications of the courts as to the meaning and effect of this exception have been conflicting. On the one hand, it has been maintained that such accounts cannot be barred by the statute, although all the items which they contain are beyond the limit of six years; while, on the other hand, it has been contended that they will be barred unless they contain items within six years, which may serve to draw after them the antecedent items in the same way as in "mutual accounts." The former doctrine became settled in England, and is sustained by the weight of authority in the U. S. But, though such accounts are held not to be within the statutory bar, the presumption of payment after twenty years would apply to them in the

same way as to specialties. In a number of the U. S. this exception as to "merchants' accounts" has not been retained, and the statutes as to "mutual accounts" which have been adopted are applicable to these accounts also. In England the exception has been done away with by the act 19 and 20 Vict. ch. 97, and such claims are to be sued within six years.

The bar of the statute may be removed in any case by a new promise to pay the debt or by a part payment of its amount made within six years before action is brought for its recovery. The statute begins to run anew from the time of the promise or payment. This is true whether the six years have wholly or partially expired. The new promise may be either express or implied. It will generally be implied from an unconditional and unqualified acknowledgment of the existence of the debt, if unaccompanied by any refusal to pay or by any declarations showing an intention to rely upon the statute as a defence. In former times, when the statute was generally held to be a statute of presumption, very slight and trivial admissions of the debtor from which the existence of a debt could be inferred were fastened upon by the courts as sufficient evidence of a new promise, because they served to repel the presumption of payment. It was even generally held that the debtor would be liable though his admission were accompanied by a refusal to pay. But when the statute came to be regarded as a statute of repose the natural deduction was that the debtor might take advantage of the statute, unless he voluntarily waived it by an express promise or by an acknowledgment so full and unequivocal as to be equivalent to a new promise; and this is now the established rule. If, notwithstanding the admission, an intention be expressed to take advantage of the statute, no inference of a new promise will be made. The acknowledgment must in every case refer definitely to the debt which is the cause of action, though it need not state the amount payable thereon. This may be proved by extrinsic evidence. But an acknowledgment of a more general indebtedness will not be sufficient. If the admission be accompanied by terms or conditions of any kind, a recovery cannot be had unless they are fulfilled. The promise or acknowledgment must be voluntary, and not extorted by duress. Part payment is held to take a debt out of the statute, on the ground that it amounts to an acknowledgment of a present subsisting debt which the debtor is liable and willing to pay. But this may also be accompanied by a refusal to pay the residue, and the statutory bar will not then be removed. A payment of interest upon any debt is sufficient to render payable the principal and the residue of the interest. If a debtor owes several debts to the same creditor, some of which are barred and some are not, and makes a general payment without appropriating it to any specific claim, it has been held that the creditor may appropriate it to any claim that is barred, but cannot thereby take the residue of such claim out of the statute. It is not yet definitively settled whether the same rule prevails if all the debts are barred, though the tendency of judicial opinion is in this direction. (See APPROPRIATION OF PAYMENTS.) It is now provided in England by Lord Tenterden's act that no promise or acknowledgment shall be sufficient to take a debt out of the operation of the statute unless it be contained in some writing to be signed by the party chargeable thereby. This act, however, it is declared, shall not alter the effect of any payment of principal or interest. Similar statutes have been adopted in a number of the U. S. It was the rule in England until the passage of Lord Tenterden's act that a new promise or part payment by one of several joint debtors would revive the obligation as to all, and take the debt out of the statute. But this act provides in substance that the promise or admission of a single co-debtor shall be binding upon himself only. In some of the U. S. the course of adjudication at common law has established the former doctrine, while in others, as in New York, it has established the same rule as is declared by this statute. Some of the States have also enacted statutes similar to the English act. A new promise or acknowledgment, it is generally held, must be made to the creditor or his authorized agent, and not to some third person.

The statute of James provides that if the plaintiff be under certain disabilities at the time when the cause of action accrues, he may bring his action within six years after the disability ceases or is removed. The disabilities enumerated are minority, coverture or marriage, imprisonment, unsoundness of mind, or absence beyond the seas. It has been held under this provision that if any of these causes of disability does not exist when the statute begins to run, but arises subsequently, the operation of the statute will not be arrested. If the disability exists when the cause of action accrues, but is afterwards removed, though only temporarily, the statute will begin to run from the time of removal, and will not be discontinued because the disability returns. If several disabilities coexist when the right of action accrues, they must all be removed before the statute will commence to run. The expression "beyond seas" means beyond the four seas surrounding Great Britain, and therefore is equivalent to "out of the realm or country." The same phrase, as contained in statutes of limitation in this country, has been usually interpreted to mean "out of the State," though in some States it has been held to mean "out of the U. S." In some of the State statutes this phraseology has been changed, and the words "out of the State" substituted. This disability applies not only to citizens who are temporarily absent from a State or country, but also to foreigners who do not reside within its limits; and they have six years within which to commence action after coming into the State. It was also provided by the statute 4 Anne, ch. 16, that if the *defendant* in any action shall at the time when the cause of action accrues be "beyond seas," the action may be brought against him within six years after his return. It has been generally held under this statute that the return must not be clandestine, and with an intent to set the statute in motion, and then depart without giving the creditor an opportunity to enforce his claim. It must be so public and made under such circumstances of notoriety as to render it presumable that the creditor might by ordinary diligence have acquired information of the return and placed the debtor under arrest. This exception is also usually held to apply to foreigners as well as non-resident citizens, and they may be sued within six years after coming within a State, even though the debt may be barred by the statute of their own State. For it is a general principle in reference to statutes of limitation that they are controlled in their operation and effect by the *lex fori*, or the law of the place where a suit is brought to enforce a legal demand. (See LEX FORI; INTERNATIONAL LAW (PRIVATE).) Similar exceptions and disabilities are usually included in the statutes of limitation in force in the U. S. There is very great weight of authority in this country that when fraud has been committed by the defendant under such circumstances as to conceal from the plaintiff all knowledge of the fraud, and prevent him from asserting his right, the bar of the statute may be avoided in courts of law, and the six years computed from the discovery of the fraud. It is undoubtedly the rule that a court of equity would interfere in such a case and prevent the statute from operating to the plaintiff's detriment. It is provided by statute in some States that the cause of action shall not be deemed to accrue in such a case until the discovery of the facts constituting the fraud. The statutes of some of the States—*e. g.* New York—confine this rule to actions *solely* cognizable in courts of equity.

The statute of limitations is held to affect the plaintiff's remedy, but not his right. Hence, though the remedy be lost by the expiration of the prescribed time, any lien which the creditor may have will not be extinguished. So a promissory note may be barred, while a mortgage given as security for its payment may be enforced by foreclosure after the six years have terminated. Moreover, it is held that the enactment by a State of a statute of limitations barring a right of action after the lapse of a certain interval, and operating prospectively, is not in violation of that clause of the U. S. Constitution which provides that "no State shall pass any law impairing the obligation of contracts," since the "obligation" of the contract still subsists, though the creditor is deprived of the regular legal means of enforcing it. But a reasonable time must be given after the enactment of the law for the enforcement of claims included within its terms, for it is equally well settled that the act by a State of depriving a creditor substantially of his remedy amounts practically to an impairment of the "obligation of the contract."

II. *Actions of Tort.*—The periods of limitation prescribed by the statute of James with reference to actions of tort are as follows: in actions of trespass for injuries to real or personal property, in actions of trover, of detinue, of replevin, and of case (except for slander), six years after the cause of action accrues; in actions of trespass for assault, battery, or false imprisonment, four years; and in actions for slander, two years. (See TRESPASS, TROVER, CONVERSION, DETINUE, REPLEVIN, CASE.) These are the periods still established in England. In the States of this country similar statutes generally exist, applying to the same forms of action or the same classes of tortious injuries, though there is no such general agreement among the various States in regard to the periods of limitation prescribed in these actions as in relation to actions upon contract. In determining the time from which the statute begins to run, it is important to distinguish between tortious acts which are wrongful in themselves, and for which an action may be maintained without proof that actual damage has been sustained, and those cases where the injury is consequential, and the right of action is founded on the special damages suffered by the plaintiff. In the former class of cases the

period of limitation runs from the time when the act was committed, without regard to any loss or damage resulting from it; while in the latter it is reckoned from the time when the special damage was sustained. Thus, in an action for slander on account of defamatory statements charging the commission of a felonious offence, the statute runs from the time when the words were spoken; but when slander is actionable only by reason of the pecuniary damage resulting, as in slander of title, it runs from the time the damage occurs. The reason of the rule in the last two cases is, that there is *no cause of action at all* until the special damage has accrued. (See SLANDER.) In trover the period is reckoned from the time of conversion of the goods. In actions for official or professional negligence the cause of action is deemed to be founded upon the breach of duty, and not upon the resulting damage, and the former determines the period from which the statutory period is computed. Thus, if an attorney were sued for neglect of professional duty, the time when the neglect occurred would mark the commencement of the period of limitation.

III. *Actions relating to Real Property.*—By the statute of James it was further provided that no person should make entry into lands, tenements, or hereditaments but within twenty years after his right should first accrue. This provision controlled the right to bring an action of ejectment, since this is founded upon a right of entry, and operated to make an uninterrupted adverse possession for twenty years a complete bar to such an action. (See EJECTMENT.) And now, under 3 and 4 Will. IV. ch. 27, it is declared that no person shall make an entry or distress, or bring an action to recover any land or rent, but within twenty years next after the time at which the right to make such entry or distress or to bring such action shall have first accrued to some person through whom he claims or to himself. Persons under the disabilities of infancy, lunacy, coverture, or beyond seas, and their representatives, are to be allowed ten years from the termination of the disability or death to enforce their rights, but no action can be brought by such parties after forty years. Statutes of a similar character exist in the various States of this country, and though they differ much in details and comprehensiveness of scope, the period of twenty years is almost invariably fixed upon as the time of limitation. A person, therefore, who is deprived of the possession of his land by an adverse occupant for the space of twenty years is prevented from recovering it, and is in fact divested of his ownership. It is important in this connection to distinguish between prescription and limitation as relating to interests in real property. Prescription applies properly only to incorporeal hereditaments, such as a way or watercourse, a right of common, etc., and does not relate to land or corporeal property. (See INCORPOREAL HEREDITAMENTS.) It depends upon a legal presumption that a grant of the property has been made after an enjoyment continued for a sufficient period of time, and was not a doctrine originally established by statute. But the theory of limitation was wholly created by positive statute, and applies only to corporeal property, such as land, houses, etc. The subject of prescription is now, however, in England, governed by statute (3 and 4 Will. IV. ch. 71). The adverse possession of land which under the statute of limitations is sufficient to constitute a bar to the assertion of a legal title by the owner of it, or by one against whom the adverse occupant brings an action of ejectment, must be an actual, continued, visible, notorious, distinct, exclusive, and hostile possession. It must be with an intention to claim title to the land occupied in opposition to any other claimant. In order that the possession may be *actual*, the adverse occupant must make an entry upon the land, so that an ouster may be effected. By this means the owner is disseized if possession be taken under claim of right. (See DISSEIZIN.) Taking a deed is not sufficient to constitute adverse possession. The possession must be *continued* during the entire period of limitation, either by actual residence or cultivation, or by such use and occupation of the premises as they are capable of, with claim of ownership. But successive periods of adverse possession by different occupants cannot be united so as to make up the full statutory period, unless there is a privity of estate between the successive occupants by purchase or descent. Such a privity exists between ancestor and heir, grantor and grantee, devisor and devisee, etc. But in some States the right to unite successive possessions is denied. The possession must, moreover, be *visible, notorious,* and *distinct.* It must be continued under such circumstances of notoriety that the owner may be presumed to have notice of it and of its extent. There are two modes of possession which the law deems sufficiently notorious and distinct to constitute adverse possession under the statute. The first mode is where one enters, not asserting a right of ownership derived from a deed or written instrument of title, but merely taking possession with claim of right. In this case the disseizin extends only to the premises actually enclosed, cultivated, improved, or otherwise occupied. The other mode of possession is where one enters under color of title derived from a deed or other instrument, and occupies, cultivates, or improves the land, either in whole or in part. In this case his legal possession will be deemed generally to extend to the boundaries or limits of the property prescribed in the instrument of title, even though this be of no legal validity in conveying a title. These principles may be considered as generally established by the adjudications of the different States, though with various degrees of modification and a somewhat different extent of application. In some of the States rules embodying this distinction are declared by statute; this is the case in New York. The possession must also be *exclusive* during the entire period, and *hostile* or *adverse.* If the occupancy be begun and continued under the owner's permission, it is not hostile, but in recognition of his title. So when the parties were in privity with each other, and the possession was originally taken in recognition of and acquiescence in the right of the real owner, a positive disclaimer of holding in subserviency to such title must be made before the possession can become adverse. The question whether the possession is adverse or in recognition of the owner's title is to be determined by the jury, but what is sufficient to constitute adverse possession is a question of law for the court. One tenant in common may occupy the common premises in adverse possession against his cotenant if there be sufficient evidence of an exclusive claim. This would be the case if he should exclude the other from occupying the premises, and should appropriate the profits to himself under a claim of exclusive right. But mere occupancy of the premises by one tenant alone would not be sufficient. The statute of limitations as applying to land does not run against the State unless there be an express provision to that effect. The same general principles prevail in regard to the disabilities enumerated in the statute as have been already stated in reference to actions upon contract.

IV. *Suits in Courts of Equity.*—The statutes of limitations which have been thus far considered were not enacted with reference to proceedings in equity, but only applied to actions in courts of law. In equitable procedure there was therefore no binding obligation to enforce their provisions. It became, however, the practice in equity to act in obedience to these statutes in all causes of action which came specifically within their provisions, and also to extend their application to other analogous cases. This was done in furtherance of the equitable principle that laches and remissness are to be discountenanced and disfavored. But courts of equity refuse to apply the statute of limitations when this would enable fraud to be committed or would result in manifest injustice. Other rules and principles in relation to the subject of the limitation of suits in equity are stated in the article upon LACHES (which see). In a number of the U. S. positive statutes have been enacted prescribing a fixed period of limitation for equitable suits.

V. *Criminal Prosecutions.*—There have been several statutes of limitation enacted in England at different periods applying to prosecutions for certain crimes. Thus, by statute 7 Will. III. ch. 3, it was provided that no prosecution shall be had in cases of high treason whereby corruption of blood may ensue, except for an attempt to assassinate the king, unless the bill of indictment be found within three years after the offence was committed. So by the statute 31 Eliz. ch. 5, prosecution by information upon a penal statute was limited to a prescribed period. In New York it is provided that indictments for murder may be found at any time after the death of the person killed; in all other cases indictments are to be found within five years after the commission of the offence, but the time during which the defendant shall not have been an inhabitant of the State, or usually resident therein, shall not constitute any part of this period. Statutes of an analogous character exist in other States.

VI. Statutes of limitations have also been enacted in many of the States applying to parties occupying particular official positions, as sheriffs or other officers, or to actions of a peculiar character, as for the recovery of penalties or forfeitures under a statute, etc. These need only be referred to for the sake of completeness. The statutes of the various States must be specially consulted. It will have been seen from this discussion that the legislation upon the subject of limitations depends largely upon a principle of public policy. Its aim is to quicken the diligence of creditors and prevent delay in the enforcement of even righteous claims. It seeks to shield one charged with crime from the consequences of a long postponement of a prosecution, as he may then lose the means of making a just defence. The justice and expediency of these rules is well illustrated by a practice now becoming common with persons liable to encoun-

ter much litigation, at the time they enter into a contract to stipulate that an action for its breach must be brought within a brief period, say sixty or ninety days, or perhaps a year. Although this agreement is not a limitation in the sense of being imposed by law, yet it is valid, and if reasonable becomes a part of the contract, and will be enforced by the courts. Such stipulations are almost regularly found in insurance policies and in the receipts of express and telegraph companies. (Consult on this general subject the works of Parsons and Chitty *On Contracts;* Angell *On Limitations;* Wilkinson *On Limitations;* Washburn *On Real Property;* Cruise's *Digest;* Greenleaf *On Evidence*, vol. ii.; Smith's *Leading Cases*, index.)

George Chase. Revised by T. W. Dwight.

Limoges′ [anc. *Lemovices*], city of France, capital of the department of Haute-Vienne, on the Vienne River, 250 miles S. of Paris. It is one of the seven places in which Christianity was planted about the middle of the third century; has a famous breed of horses, and is noted for its porcelain manufacture, a very fine white porcelain-earth having been discovered in its neighborhood in 1768; and it has also some cotton and woollen-mills.

Lim′onite [Gr. λειμών, "meadow"], the hydrated sesquioxide of iron, often called brown hæmatite, one of the commonest and most important ores of iron. The deposits of limonite are peculiarly local and irregular in character. They are never found forming continuous strata, but are (1) either the superficial deposits of chalybeate waters, filling fissures or cavities or encrusting slopes or accumulating in concretionary or botryoidal masses in sand, clay, or gravel; or (2) they are produced by the oxidation, at and near the surface, of beds of the carbonate of iron or iron pyrites. From their mode of formation the deposits of limonite are less extensive and reliable than those of other ores of iron, and their irregularities have often been a cause of disappointment and loss; but some of them are of great extent, and they are so numerous in many countries that they have always constituted one of the great sources from which the supply of iron has been derived. In the U. S. valuable deposits of limonite are found in a great number of localities. They occur perhaps in the greatest abundance in a belt which extends along the eastern flank of the Alleghanies from New England to Georgia. Here they rest on rocks of various kinds, such as gneiss, serpentine, crystalline limestone, slate, etc. From Pennsylvania southward their association with the lower Silurian limestones and slates is such that they have by some writers been represented as holding a definite geological position in that series of rocks. It is quite certain, however, that they are altogether superficial in position, and form no part of the stratification of this or any other formation. It is probable, as suggested by Prof. Frederick Prime, that some of the brown hæmatites of Pennsylvania are formed from the decomposition of pyrites along the outcrops of pyritous slates; but some of the most important deposits of this belt are so far removed from the metamorphosed Palæozoic rocks of the Alleghanies that they can have had no connection with them—such as the limonites of Roxbury, Amenia, and Staten Island. In the latter locality the iron ore occurs at the N. end of the island in superficial cavities in serpentine; at the southern end, in concretionary masses scattered through Cretaceous clays, with which they are evidently contemporaneous. The truth seems to be that these deposits of limonite have been forming from the drainage of all the ferruginous rocks of the E. flank of the Alleghanies since the beginning of the Cretaceous age. In Alabama and Tennessee deposits of limonite of great extent and purity are found along the outcrops of the Lower Carboniferous limestone. In Missouri a belt of superficial limonite encircles the district which contains the great deposits of specular iron in the central part of the State, and may be supposed to have been formed from the ferruginous drainage of this district. The limonites which are formed by the oxidation of the stratified carbonates are best seen in Southern Ohio and Eastern Kentucky, where some of the calcareous ore-beds of the coal-measures are oxidized along their outcrops, and are more or less deeply converted into the hydrated sesquioxide.

Bog-iron ore is a spongy and usually impure limonite which accumulates in marshes from the leaching of surrounding beds of sand, gravel, etc. which contain iron. *Lake ore* is the name given to limonite which gathers at the bottom of lakes and ponds which receive the drainage of ferruginous strata or soils. In some of the Swedish lakes this ore is dredged up periodically, the deposit being reproduced at intervals of one or several years.

The *modus operandi* of the deposition of limonite is as follows: The sesquioxide of iron is insoluble, but the protoxide is soluble. When organic matter is buried with peroxide of iron, the carbon of the organic matter takes from the iron ore one equivalent of oxygen. It is now dissolved by atmospheric water, and is carried into any reservoir that receives the drainage. Here the iron is oxidized by contact with the air, and falls to the bottom as the hydrated sesquioxide. If it finds there decomposing organic matter, it imparts to it a portion of its oxygen to form carbonic acid, and floats off to gather more oxygen. As long as any organic matter remains the iron oscillates between the surface and bottom of the water; when it has all been oxidized, it accumulates as bog or lake ore. Thus, iron becomes a carrier of oxygen in the aqueous circulation of the globe, as it does in the hæmal circulation of animals. The iridescent film so frequently seen on pools of water is limonite formed in the manner described above.

Chalybeate springs throw down a yellow or brownish precipitate in the channels or reservoirs through which their waters flow when they come in contact with the air, and the iron they contain is oxidized. This precipitate is limonite. If it remains as a powder, it is called yellow ochre; if it is brown it contains manganese, and is known as "umber" or "Spanish brown." It may, however, form concretionary masses with a radiated structure or successive layer of solid limonite many feet in thickness. It is supposed that most of the great limonite beds found along the flanks of the Alleghanies and elsewhere have accumulated in this way.

Pure limonite contains 60 per cent. of metallic iron, but it often contains 10 to 20 per cent. of foreign matter, so that its average yield of iron does not reach 50 per cent. The quality of the iron made from it is sometimes excellent, as is attested by the good repute of the Roxbury and other limonite irons. It generally contains too much phosphorus, however, to be successfully used for the manufacture of steel. From their fusibility the brown hæmatites are very useful adjuncts in the smelting of the more refractory magnetites and specular ores, and their employment in this connection has caused them to be largely mined and highly valued. J. S. Newberry.

Limousin′, a former province of Central France, comprised the present departments of Corrèze, Creuse, Dordogne, and Vienne. Its capital was Limoges. It gave name to a mediæval dialect which prevailed through much of Southern France, and had a considerable poetic and romantic literature.

Limoux′, town of France, in the department of Aude, stands on both sides of the Aude in a fertile valley which produces much grain and the famous wine of Blanquette de Limoux, and has extensive manufactures of woollen cloth, yarn, and articles of iron and brass. Pop. 7600.

Lim′pet [Gr. λεπάς], a name applied loosely to many gasteropod mollusks, but appropriately belonging to the Patellidæ, of which *Patella* is the typical genus. The species are very numerous, but are less frequent on our Atlantic coast than in most others. *Patella vulgaris*, the common European limpet, is extensively used for fish-bait and for human food. Many species are fossil. The living shells adhere to rocks by atmospheric pressure. They slowly bore into wood or chalk to which they are attached. The Calyptræidæ are called bonnet or cup limpets. The keyhole limpets are *Fissurellæ*. The *Parmophori* are called duck's-bill limpets. The genus *Ancylus* includes the river limpets. The limpets of tropical shores have in many species extremely beautiful shells. Many of them are edible.

Lin′acre, or **Lynacer** (Thomas), M. D., b. at Canterbury, England, about 1460; studied at Oxford and on the Continent; became fellow of All Souls′, Oxford, in 1484, and afterwards professor of physic; was an associate of Colet, Erasmus, and Lily in introducing into England a knowledge of Greek, from which language he made elegant translations of Galen into Latin; studied theology, and in 1518 became a prebendary of York; founded the College of Physicians at London (1518), was its president for life, and was physician to Henry VIII. and his family. D. in London Oct. 20, 1524. His translation of Galen's *De Sanitate Tuenda* appeared in 1517, the *Methodus Medendi* in 1519, and the *De Temperamentis* in 1521. He published in 1524 a treatise on the rules of Latin prose composition, *De Emendata Structura Latini Sermonis, lib. vi.*

Lina′res, town of Spain, province of Jaen, is well built and flourishing. It owes its prosperity chiefly to the rich copper and lead mines in the vicinity. Pop. 10,567.

Linck′laen, post-tp. of Chenango co., N. Y., has 4 cheese-factories. Pop. 926.

Linc′oln, a fertile county of Ontario, Canada, bounded on the N. by Lake Ontario, and on the E. by the river Niagara. Cap. St. Catharines. Pop., including Niagara Town, 24,365.

Lincoln, or **Lincolnshire**, county of England, extending along the North Sea from the Wash to the Humber. Area, 2776 square miles. Pop. 412,246. The ground

is very low along the coast; in some places it must be protected by dikes against inundations of the sea. But from the coast it gradually rises until it swells into high chalk hills in the north-western part of the county, the so-called *Wolds*. The soil is generally very fertile and cultivated with great care. Large crops of wheat and oats are raised, and fine breeds of horses, short-horned cattle, and long-woolled sheep are reared. Immense flocks of geese are fed on the fens along the shore.

Lincoln, city of England, the capital of the county of Lincoln, on the Witham. It is an old city, with a fine cathedral, built in the thirteenth century, 524 feet long, 250 feet wide, and one of the finest church-buildings in England; large foundries and manufactures of hardware, and an extensive trade in corn and wool. Pop. 26,762.

Lincoln, county of S. E. Arkansas. Area, 680 square miles. It is bounded N. E. by the Arkansas River, S. W. by Saline River, and is bisected by Bayou Bartholomew. It is well wooded, and produces cotton, grain, and hay. Cap. Star City. It was formed after the census of 1870.

Lincoln, county of S. E. Dakota. Area, 800 square miles. Its E. border is washed by the Big Stone River, which separates it from Iowa. It contains much fertile land. Cap. Canton. Pop. 712.

Lincoln, county of N. E. Georgia, bounded N. E. by South Carolina, from which it is separated by the Savannah River. Area, 260 square miles. It is hilly, but generally fertile. Gold, iron, novaculite (hone-stone), and granite are found. Grain and cotton are staple products. Flour is the chief manufacture. Cap. Lincolnton. Pop. 5413.

Lincoln, county of Central Kansas. Area, 720 square miles. It is traversed by the Saline River and its affluents. The county contains saline marshes. The soil is adapted to grazing and grain-culture. Cap. Pottersburg. Pop. 516.

Lincoln, county of E. Central Kentucky. Area, 350 square miles. It is a beautiful blue-grass region, with a diversified surface and a fertile soil. Grain and live-stock are leading products. The county is traversed by the Knoxville branch of the Louisville and Nashville R. R. Cap. Stanford. Pop. 10,947.

Lincoln, parish of N. W. Louisiana, formed in 1873 from parts of Union, Jackson, Claiborne, and Bienville. Area, 550 square miles. Cap. Vienna.

Lincoln, county of S. Maine, partly bounded on the W. by the Kennebec River. Area, 550 square miles. It has a deeply indented coast-line, with numerous good harbors. The soil is good. Live-stock and wool are leading products. Lumber, cooperage, and brick are manufactured. Shipbuilding and maritime pursuits are important interests. The county is traversed by the Knox and Lincoln R. R. Cap. Wiscassett. Pop. 25,597.

Lincoln, county of S. Central Minnesota. Area, 432 square miles. Pop. not reported in census of 1870.

Lincoln, county of S. W. Mississippi. Area, 540 square miles. It is an undulating and fertile region. Cotton and corn are staple products. The county is traversed by the New Orleans Jackson and Great Northern R. R. Cap. Brookhaven. Pop. 10,184.

Lincoln, county of Missouri, bounded E. by the Mississippi River. It is uneven, but very fertile, especially in the valleys. Area, 648 square miles. Products, tobacco, wool, live-stock, and grain. Cap. Troy. Pop. 15,960.

Lincoln, county of S. W. Nebraska. Area, 2592 square miles. It is traversed by the Platte River and its forks, and by the Union Pacific R. R. Cap. North Platte. Pop. 17; largely increased since census of 1870.

Lincoln, county of S. E. Nevada. Estimated area, 13,600 square miles. Cap. Pioche. Pop. 2985.

Lincoln, county of New Mexico, bounded E. by Texas. Area, about 13,000 square miles. The E. part is a portion of the Llano Estacado. The W. is broken by mountain-ranges. The county contains large Indian reservations and considerable arable land. Some grain is produced. The county is traversed by Pecos River. Pop. 1803.

Lincoln, county of S. W. Central North Carolina, bounded E. by the Catawba River, and traversed by the Little Catawba. Area, 250 square miles. It is hilly, but generally fertile. It abounds in valuable iron ore. Grain is the chief product. Cap. Lincolnton. Pop. 9573.

Lincoln, county of Tennessee, bounded S. by Alabama. Area, 580 square miles. It is uneven, but very fertile, producing cotton, grain, tobacco, wool, and live-stock in large quantities. Leather is the chief article of manufacture. The county is traversed by the Winchester and Alabama R. R. Cap. Fayetteville. Pop. 28,050.

Lincoln, county of W. West Virginia. Area, 380 square miles. It is very fertile and beautifully diversified. Coal and iron abound. Corn and tobacco are produced. It is traversed by Guyandotte River. Cap. Hamlin. Pop. 5053.

Lincoln, tp. of Fayette co., Ala. Pop. 252.

Lincoln, post-v. of Placer co., Cal., on the Oregon branch of the Central Pacific R. R.

Lincoln, tp. of Sierra co., Cal. Pop. 616.

Lincoln, post-v. of Cedar Creek hundred, Sussex co., Del., on the Junction and Breakwater R. R. Pop. 130.

Lincoln, post-v., cap. of Logan co., Ill., 28 miles N. E. of Springfield, on the Chicago and Alton, the Indianapolis Bloomington and Western, and the Toledo Wabash and Western R. Rs., contains a college, 5 schools, 13 churches, a library, a coal-shaft, 3 flouring-mills, a manufactory of smut-mills, 1 foundry, a carriage and 2 wagon shops, 3 banks, 4 weekly newspapers, and a large number of stores. Principal occupation, agricultural pursuits. Pop. about 4450. SMITH & MILLS, EDS. "HERALD."

Lincoln, tp. of Hendricks co., Ind. Pop. 1502.

Lincoln, tp. of La Porte co., Ind. Pop. 558.

Lincoln, tp. of St. Joseph co., Ind. Pop. 1063.

Lincoln, tp. of Adair co., Ia. Pop. 531.

Lincoln, tp. of Adams co., Ia. Pop. 170.

Lincoln, tp. of Appanoose co., Ia. Pop. 586.

Lincoln, tp. of Black Hawk co., Ia. Pop. 462.

Lincoln, tp. of Calhoun co., Ia. Pop. 427.

Lincoln, tp. of Cerro Gordo co., Ia. Pop. 279.

Lincoln, tp. of Clay co., Ia. Pop. 299.

Lincoln, tp. of Dallas co., Ia. Pop. 213.

Lincoln, tp. of Grundy co., Ia. Pop. 206.

Lincoln, tp. of Harrison co., Ia. Pop. 88.

Lincoln, tp. of Iowa co., Ia. Pop. 394.

Lincoln, tp. of Madison co., Ia. Pop. 954.

Lincoln, tp. of Mitchell co., Ia. Pop. 493.

Lincoln, tp. of Monona co., Ia. Pop. 308.

Lincoln, tp. of Montgomery co., Ia. Pop. 195.

Lincoln, tp. of Page co., Ia. Pop. 645.

Lincoln, tp. of Plymouth co., Ia. Pop. 440.

Lincoln, tp. of Poweshiek co., Ia. Pop. 658.

Lincoln, tp. of Ringgold co., Ia. Pop. 205.

Lincoln, tp. of Scott co., Ia. Pop. 1038.

Lincoln, tp. of Story co., Ia. Pop. 243.

Lincoln, tp. of Tama co., Ia. Pop. 220.

Lincoln, tp. of Union co., Ia. Pop. 560.

Lincoln, tp. of Winneshiek co., Ia. Pop. 822.

Lincoln, tp. of Crawford co., Kan. Pop. 1490.

Lincoln, tp. of Dickinson co., Kan. Pop. 398.

Lincoln, tp. of Lincoln co., Kan. Pop. 516.

Lincoln, tp. of Linn co., Kan. Pop. 2012.

Lincoln, tp. of Neosho co., Kan. Pop. 745.

Lincoln, tp. of Washington co., Kan. Pop. 1533.

Lincoln, tp. and post-v. of Penobscot co., Me., on the European and North American R. R. and on the Penobscot River, has 3 hotels and manufactures of lumber. Pop. 1530.

Lincoln, post-tp. of Middlesex co., Mass., on the Fitchburg R. R., has a high school, 2 churches, and milk-dairying and market-gardening are principal pursuits. Pop. 791.

Lincoln, tp. of Berrien co., Mich. Pop. 1188.

Lincoln, tp. of Isabella co., Mich. Pop. 672.

Lincoln, post-v. and tp., cap. of Mason co., Mich., on Lake Michigan and Little Sable River. Pop. of tp. 165.

Lincoln, tp. of Midland co., Mich. Pop. 322.

Lincoln, tp. of Osceola co., Mich. Pop. 334.

Lincoln, tp. of Blue Earth co., Minn. Pop. 495.

Lincoln, tp. of Andrew co., Mo. Pop. 2680.

Lincoln, tp. of Caldwell co., Mo. Pop. 589.

Lincoln, a v. (Kenton P. O.) and tp. of Christian co., Mo. Pop. of v. 81; of tp. 1440.

Lincoln, tp. of Clarke co., Mo. Pop. 1100.

Lincoln, tp. of Dallas co., Mo. Pop. 943.

Lincoln, tp. of Daviess co., Mo. Pop. 736.

Lincoln, tp. of Douglas co., Mo. Pop. 209.

Lincoln, tp. of Harrison co., Mo. Pop. 555.

Lincoln, tp. of Nodaway co., Mo. Pop. 1042.

Lincoln, tp. of Putnam co., Mo. Pop. 1057.

Lincoln, post-v., cap. of Nebraska and of Lancaster co., at the junction of the Atchison and Nebraska, the Burlington and Missouri River, and the Midland Pacific R. Rs. It

has a handsome capitol building, State University, and insane asylum, a high school, government post-office building, 21 churches, 2 theatres, the usual charitable and secret orders, penitentiary, a State intelligence agency, 9 newspapers, 5 banks, 6 hotels, 3 flouring-mills, machine-shops, saltworks, soap-factory, a fire department, gasworks, and the usual stores. Pop. 2441.

WILLIAM C. CLOYD, ED. "NEBRASKA STATE REGISTER."

Lincoln, tp. of Washington co., Neb. Pop. 276.

Lincoln, tp. of Grafton co., N. H., among the Franconia Mountains, 21 miles from Plymouth, is a place of summer resort, and has one hotel. Pop. 71.

Lincoln, tp. of Lincoln co., N. C. Pop. 886.

Lincoln, tp. of New Hanover co., N. C. Pop. 1359.

Lincoln, tp. of Morrow co., O. Pop. 915.

Lincoln, tp. of Allegheny co., Pa. Pop. 1399.

Lincoln, tp. of Huntingdon co., Pa. Pop. 532.

Lincoln, tp. of Providence co., R. I., contains many important manufacturing villages. Pop. 7889.

Lincoln, tp. of Darlington co., S. C. Pop. 1845.

Lincoln, post-tp. of Addison co., Vt., 9 miles N. E. of Middlebury, has 4 churches and extensive manufactures of lumber and wooden wares. Pop. 1174.

Lincoln, tp. of Braxton co., W. Va. Pop. 1642.

Lincoln, tp. of Lewis co., W. Va. Pop. 1164.

Lincoln, tp. of Marion co., W. Va. Pop. 2127.

Lincoln, tp. of Pocahontas co., W. Va. Pop. 1015.

Lincoln, tp. of Tyler co., W. Va. Pop. 1645.

Lincoln, tp. of Wayne co., W. Va. Pop. 1559.

Lincoln, tp. of Adams co., Wis. Pop. 433.

Lincoln, tp. of Eau Claire co., Wis. Pop. 911.

Lincoln, post-tp. of Kewaunee co., Wis. Pop. 680.

Lincoln, tp. of Monroe co., Wis. Pop. 1137.

Lincoln, tp. of Polk co., Wis. Pop. 287.

Lincoln, tp. of Trempealeau co., Wis. Pop. 822.

Lincoln, tp. of Wood co., Wis. Pop. 229.

Lincoln (ABRAHAM), the sixteenth President of the U. S., b. Feb. 12, 1809, in Larue (then Hardin) co., Ky., in a cabin on Nolin Creek, 3 miles W. of Hodgensville. His parents were Thomas and Nancy Hanks Lincoln. Of his ancestry and early years the little that is known may best be given in his own language: "My parents were both born in Virginia, of undistinguished families—second families, perhaps I should say. My mother, who died in my tenth year, was of a family of the name of Hanks, some of whom now remain in Adams, and others in Macon co., Ill. My paternal grandfather, Abraham Lincoln, emigrated from Rockbridge co., Va., to Kentucky about 1781 or 1782, where a year or two later he was killed by Indians—not in battle, but by stealth, when he was laboring to open a farm in the forest. His ancestors, who were Quakers, went to Virginia from Berks co., Pa. An effort to identify them with the New England family of the same name ended in nothing more definite than a similarity of Christian names in both families, such as Enoch, Levi, Mordecai, Solomon, Abraham, and the like. My father, at the death of his father, was but six years of age, and he grew up literally without education. He removed from Kentucky to what is now Spencer co., Ind., in my eighth year. We reached our new home about the time the State came into the Union. It was a wild region, with many bears and other wild animals still in the woods. There I grew up. There were some schools, so called, but no qualification was ever required of a teacher beyond *readin', writin', and cipherin'* to the rule of three. If a straggler supposed to understand Latin happened to sojourn in the neighborhood, he was looked upon as a wizard. There was absolutely nothing to excite ambition for education. Of course, when I came of age I did not know much. Still, somehow, I could read, write, and cipher to the rule of three, but that was all. I have not been to school since. The little advance I now (1859) have upon this store of education I have picked up from time to time under the pressure of necessity. I was raised to farm-work, which I continued till I was twenty-two. At twenty-one I came to Illinois, and passed the first year in Macon co. Then I got to New Salem, at that time in Sangamon, now in Menard co., where I remained a year as a sort of clerk in a store. Then came the Black Hawk war, and I was elected a captain of volunteers—a success which gave me more pleasure than any I have had since. I went the campaign, was elated; ran for the legislature the same year (1832), and was beaten, the only time I ever have been beaten by the people. The next and three succeeding biennial elections I was elected to the legislature; I was not a candidate afterwards. During this legislative period I had studied law, and removed to Springfield to practise it. In 1846 I was once elected to the lower house of Congress; was not a candidate for re-election. From 1849 to 1854, both inclusive, I practised law more assiduously than ever before. Always a Whig in politics, and generally on the Whig electoral tickets, making active canvasses, I was losing interest in politics when the repeal of the Missouri Compromise aroused me again. What I have done since then is pretty well known."

The early residence of Lincoln in Indiana was 16 miles N. of the Ohio River, on Little Pigeon Creek, 1½ miles E. of Gentryville, within the present township of Carter. Here his mother died Oct. 5, 1818, and next year his father married Mrs. Sally (Bush) Johnston of Elizabethtown, Ky. She was an affectionate foster-parent, to whom Abraham was indebted for his first encouragement to study. He became an eager reader, and the few books owned in the vicinity were many times perused. He worked frequently for the neighbors as a farm-laborer, was for some time clerk in a store at Gentryville, and became famous throughout that region for his athletic powers, his fondness for argument, his inexhaustible fund of humorous anecdote, as well as for mock oratory and the composition of rude satirical verses. In 1828 he made a trading voyage to New Orleans as "bow-hand" on a flatboat; removed to Illinois in 1830; helped his father build a log house and clear a farm on the N. fork of Sangamon River, 10 miles W. of Decatur, and was for some time employed in splitting rails for the fences—a fact which was prominently brought forward for a political purpose thirty years later. In the spring of 1831 he, with two of his relatives, was hired to build a flatboat on the Sangamon River and navigate it to New Orleans; the boat "stuck" on a mill-dam, and was got off with great labor through an ingenious mechanical device which led some years later to Lincoln's taking out a patent for "an improved method for lifting vessels over shoals." This voyage was memorable for another reason—the sight of slaves chained, maltreated, and flogged at New Orleans was the origin of his deep convictions upon the slavery question. Returning from this voyage, he became a resident for several years at New Salem, a recently settled village on the Sangamon, where he was successively a clerk, grocer, surveyor, and postmaster, and acted as pilot to the first steamboat that ascended the Sangamon. Here he studied law, interested himself in local politics after his return from the Black Hawk war, and became known as an effective "stump-speaker." The subject of his first political speech was the improvement of the channel of the Sangamon, and the chief ground on which he announced himself (1832) a candidate for the legislature was his advocacy of this popular measure, on which subject his practical experience made him the highest authority. Elected to the legislature in 1834 as a "Henry Clay Whig," he rapidly acquired that command of language and that homely but forcible rhetoric which, added to his intimate knowledge of the people from which he sprang, made him more than a match in debate for his few well-educated opponents. Admitted to the bar in 1837, he soon established himself at Springfield, where the State capital was located in 1839, largely through his influence; became a successful pleader in the State, circuit, and district courts; married (1842) a lady belonging to a prominent family in Lexington, Ky.; took an active part in the Presidential campaigns of 1840 and 1844 as candidate for elector on the Harrison and Clay tickets, and in 1846 was elected to the U. S. House of Representatives over the celebrated Peter Cartwright. During his single term in Congress Lincoln did not attain any prominence. He voted for the reception of anti-slavery petitions, for the abolition of the slave-trade in the District of Columbia, and for the Wilmot proviso, but was chiefly remembered for the stand he took against the Mexican war. For several years thereafter he took comparatively little interest in politics, but gained a leading position at the Springfield bar. Two or three non-political lectures and a eulogy upon Henry Clay (1852) added nothing to his reputation. In 1854 the repeal of the Missouri Compromise by the Kansas-Nebraska act aroused Lincoln from his indifference, "like a fire-bell in the night," and in attacking that measure he had the immense advantage of knowing perfectly well the motives and the record of its author, Stephen A. Douglas of Illinois, then popularly designated as the "Little Giant." The latter came to Springfield in Oct., 1854, on the occasion of the State Fair, to vindicate his policy in the Senate, and the "Anti-Nebraska" Whigs, remembering that Lincoln had often measured his strength with Douglas in the Illinois legislature and before the Springfield courts, engaged him to improvise a reply. This speech, in the opinion of those who heard it, was one of the great efforts of Lincoln's life, certainly the most effective in his whole career. It took the audience by storm, and from that moment it was felt that

Douglas had met his match. Lincoln was accordingly selected as the Anti-Nebraska candidate for the U. S. Senate in place of Gen. Shields, whose term expired Mar. 4, 1855, and led in several ballots, but Trumbull was ultimately chosen. The armed conflict on the soil of Kansas, which Lincoln had predicted, soon began; the result was the disruption of the Whigs and the formation of the Republican party. At the Bloomington State convention in 1856, where the new party first assumed form in Illinois, Lincoln made an impressive address, in which for the first time he took distinctive ground against slavery in itself. At the national Republican convention at Philadelphia (June 17), after the nomination of Fremont, Lincoln was put forward by the Illinois delegation for the Vice-Presidency, and received on the first ballot 110 votes against 259 for William L. Dayton. He took a prominent part in the canvass, being on the electoral ticket. In 1858, Lincoln was unanimously nominated by the Republican State convention as its candidate for the U. S. Senate in place of Douglas, and in his speech of acceptance used the celebrated illustration of a "house divided against itself" on the slavery question, which was perhaps the cause of his defeat. The great debate carried on at all the principal towns of Illinois between Lincoln and Douglas as rival Senatorial candidates resulted at the time in the election of the latter, but being widely circulated as a campaign document, it fixed the attention of the country upon the former as the clearest and most convincing exponent of Republican doctrine. Early in 1859 he began to be named in Illinois as a suitable Republican candidate for the Presidential campaign of the ensuing year; and a political address delivered at the Cooper Institute, N. Y., Feb. 27, 1860, followed by similar speeches at New Haven, Hartford, and elsewhere in New England, first made him known to the Eastern States in the light by which he had long been regarded at home. By the Republican State convention which met at Decatur, Ill., May 9 and 10, Lincoln was unanimously endorsed for the Presidency. It was on this occasion that two rails, said to have been split by his hands thirty years before, were brought into the convention, and the incident contributed much to his popularity. The National Republican convention at Chicago, after spirited efforts made in favor of Seward, Chase, and Bates, nominated Lincoln for the Presidency, with Hannibal Hamlin for Vice-President (May 18), at the same time adopting a vigorous anti-slavery platform. The Democratic party having been disorganized and presenting two candidates, Douglas and Breckenridge, and the remnant of the "American" party having put forward John Bell of Tennessee, the Republican victory was an easy one, Lincoln being elected Nov. 6 by a large plurality, comprehending nearly all the Northern States, but none of the Southern. The secession of South Carolina and the Gulf States was the immediate result, followed a few months later by that of the border slave States and the outbreak of the great civil war. The life of Abraham Lincoln became thenceforth merged in the history of his country. None of the details of the vast conflict which filled the remainder of Lincoln's life can here be given; they will be found under more appropriate headings. Narrowly escaping projected assassination by avoiding Baltimore on his journey to the capital, he reached Washington Feb. 23, and was inaugurated President of the U. S. Mar. 4, 1861. Lincoln called to his cabinet his principal rivals for the Presidential nomination, Seward, Chase, Cameron, and Bates; secured the co-operation of the Union Democrats, headed by Douglas; called out 75,000 militia from the several States upon the first tidings of the bombardment of Fort Sumter (Apr. 15); proclaimed a blockade of the Southern ports (Apr. 19); called an extra session of Congress for July 4, from which he asked and obtained 400,000 men and $400,000,000 for the war; placed McClellan at the head of the Federal army on Gen. Scott's resignation (Oct. 31); appointed Edwin M. Stanton secretary of war (Jan. 14, 1862), and on Sept. 22, 1862, issued a proclamation declaring the freedom of all slaves in the States and parts of States then in rebellion from and after Jan. 1, 1863. This was the crowning act of Lincoln's career —the act by which he will be chiefly known through all future time—and it decided the war. On Oct. 16, 1863, President Lincoln called for 300,000 volunteers to replace those whose term of enlistment had expired; made a celebrated and touching, though brief, address at the dedication of the Gettysburg military cemetery, Nov. 19, 1863; commissioned Ulysses S. Grant lieutenant-general and commander-in-chief of the armies of the U. S. Mar. 9, 1864; was re-elected President in November of the same year by a large majority over Gen. McClellan, with Andrew Johnson of Tennessee as Vice-President; delivered a very remarkable address at his second inauguration, Mar. 4, 1865; visited the army before Richmond the same month, entered the capital of the Confederacy the day after its fall, and upon the surrender of Gen. Robert E. Lee's army (Apr. 9) was actively engaged in devising generous plans for the reconstruction of the Union, when on the evening of Good Friday, Apr. 14, he was shot in his box at Ford's theatre, Washington, by John Wilkes Booth, a fanatical actor, and expired early on the following morning, Apr. 15, 1865. Almost simultaneously a murderous attack was made upon William H. Seward, the secretary of state. At noon on the 15th, Andrew Johnson assumed the Presidency, and active measures were taken which resulted in the death of Booth and the execution of his principal accomplices. The funeral of President Lincoln was conducted with unexampled solemnity and magnificence. He was buried at Oak Ridge Cemetery, near Springfield, Ill., on May 4, and his remains were placed in an appropriate tomb, surmounted by a statue, Oct. 15, 1874. The leaders and citizens of the expiring Confederacy expressed genuine indignation at the murder of a generous political adversary; foreign nations took part in mourning the death of a statesman who had approved himself a true representative of American nationality; the freedmen of the South almost worshipped the memory of their deliverer; and the general sentiment of the great nation he had saved awarded him a place in its affections second only to that held by Washington. The characteristics of Abraham Lincoln have become familiarly known throughout the civilized world. His tall, gaunt, ungainly figure, homely countenance, and his shrewd mother-wit, shown in his celebrated conversations overflowing in humorous and pointed anecdote, combined with an accurate intuitive appreciation of the questions of the time, are recognized as forming the best type of a period of American history now rapidly passing away. (See biographies by Dr. J. G. Holland (1865), J. N. Arnold (1868), and Ward H. Lamon (1872).) PORTER C. BLISS.

Lincoln (Gen. BENJAMIN), b. at Hingham, Mass., Feb. 3, 1733; was a farmer in his native town at the outbreak of the Revolution; had been a local magistrate, a colonel of militia, and several times a representative in the colonial legislature and the provincial congress, and was secretary of the latter body and member of its committee of correspondence in 1774, when, having taken an active part in organizing and training the Continental soldiery, he was appointed major-general of the State troops. He obtained the favor of Washington during the siege of Boston; commanded an expedition which in June, 1776, cleared Boston harbor of British vessels; led a body of Massachusetts militia at the battle of White Plains and in the ensuing engagements (1776); brought a new levy of militia to the aid of Washington at Morristown, N. J., in Feb., 1777; was appointed by Congress, at Washington's request, a major-general in the Continental service Feb. 19; was surprised and nearly captured at Bound Brook Apr. 13; co-operated with Schuyler in the summer campaign against Burgoyne, for which he raised a fresh body of New England militia; joined Gates as second in command Sept. 29; was severely wounded at the battle of Bemus Heights, near Saratoga, Oct. 8, and disabled from active service until Aug., 1778, when he joined, and was in September appointed to the chief command of the Southern army. Arriving at Charleston Dec. 4, he was chiefly occupied for several months in warding off the several demonstrations made by the British general Prevost against that city after the fall of Savannah; lost one-fourth of his forces by the defeat of Gen. Ashe at Brier Creek Mar. 2, 1779; unsuccessfully attacked the enemy's works at Stone Ferry June 20; joined D'Estaing in September in his fruitless siege of Savannah, and after the bloody repulse of Oct. 9 returned to Charleston, which in the spring of 1780 was besieged by Sir Henry Clinton and Gen. Arbuthnot with greatly superior forces. The defence was skilfully and strenuously conducted, but Lincoln was obliged to capitulate May 12, and was allowed to go to his home at Hingham on parole. Exchanged in the spring of 1781, he joined Washington on the Hudson, took part in the siege of Yorktown, and was deputed to receive the sword of Cornwallis on his surrender. Elected by Congress secretary of war in Oct., 1781, he held that office three years, after which he retired to his farm at Hingham. In 1786–87 he commanded the Massachusetts militia in the suppression of Shays's rebellion; was elected lieutenant-governor of Massachusetts in 1787; was appointed collector of the port of Boston in 1789, and held that office for twenty years. He was one of the commissioners who in 1789 made a treaty with the Creek Indians, and in 1793 was employed in an unsuccessful negotiation with the Ohio Indians. In his habits he was a model of temperance and morality, was deeply religious, and for many years a deacon in the church of his native town. D. at Hingham May 9, 1810. (See his *Life*, by Francis Bowen, in Sparks's *American Biography*, 2d series, vol. xiii.)

Lincoln (ENOCH), b. at Worcester, Mass., Dec. 28, 1788, a son of Levi Lincoln (1749–1820); studied at Harvard

College; became a lawyer in 1811; settled at Fryeburg, Me., the scenery of which beautiful forest-town he described in a poem entitled *The Village*, and in 1819 removed to Paris, Me.; was a member of Congress 1818–26, and governor of Maine 1827–29. He delivered a poem at the centennial celebration of the Lovewell's Pond fight, was a warm friend of the Indians, and left valuable historical manuscripts, some of which were published in the first volume of the *Maine Historical Collections*. D. at Augusta, Me., Oct. 8, 1829.

Lincoln (John Larkin), b. at Boston, Mass., Feb. 23, 1817; graduated at Brown University in 1836; studied theology at Newton Seminary; was tutor at Brown University 1838–40; and after passing some years in Europe was elected professor of Latin in the same institution 1844. He has edited *Selections from Livy* (1847), the *Works of Horace* (1851), and Cicero's *De Senectute* (1872).

Lincoln (Levi), b. at Hingham, Mass., May 15, 1749; graduated at Harvard in 1772; became a lawyer of Worcester, Mass., in 1775, a judge of probate in 1776; was in the constitutional convention of 1780; and after holding many important offices was a Jeffersonian member of Congress 1799–1801; attorney-general of the U. S. 1801–05; lieutenant-governor of Massachusetts 1807–08, acting governor 1809. He declined a judgeship in the U. S. Supreme Court. D. at Worcester, Mass., Apr. 14, 1820.

Lincoln (Levi), LL.D., b. at Worcester, Mass., Oct. 25, 1782, son of Levi Lincoln (1749–1820); graduated at Harvard in 1802; became in 1805 a lawyer; member of the constitutional convention of 1820; was often in the State legislature, of which he was Speaker in 1822, and president of the senate 1845; lieutenant-governor of Massachusetts 1823, governor 1825–34; was in Congress 1835–41; a judge of the State supreme court 1824; collector of the port of Boston 1841–43; first mayor of Worcester in 1848. D. at Worcester, Mass., May 29, 1868.

Lincoln Centre, post-v., cap. of Lincoln co., Kan., contains the county buildings, a school-house, 1 hotel, 5 stores, 2 newspapers, a blacksmith and other minor shops. Pop. about 150. P. Barker, Ed. "Lincoln County News."

Lincoln Creek, tp. of Hamilton co., Neb. Pop. 41.

Lincoln Creek, tp. of York co., Neb. Pop. 217.

Lincoln Plantation, tp. of Oxford co., Me. Pop. 30.

Linc'olnton, post-v., cap. of Lincoln co., Ga., 20 miles N. E. of Washington. Pop. 92.

Lincolnton, post-v., cap. of Lincoln co., N. C., on the Carolina Central R. R. and the South Fork and Catawba rivers, has 2 schools, 5 churches, 2 paper-mills, 1 cane-seat chair-factory, 1 cotton and tobacco factory, 1 steam saw-mill, 3 wagon and carriage shops, 2 tanneries, 1 sash, door, and blind factory, 2 hotels, 1 newspaper, and stores. Pop. about 1200. M. Seagle, Ed. "Progress."

Lincoln University, Chester co., Pa., originated from the Ashman Institute, whose first president was Rev. J. P. Carter, and whose name was changed in 1866 to that of Lincoln University. It comprises preparatory, collegiate, theological, law, and medical departments, has seven professors—of whom five live at the university, one in Philadelphia, and one at Oxford—and is attended by 180 students; 18 graduated in 1873. It owns real estate worth $125,000, and an endowment fund of $100,000. Its buildings consist of four professors' houses, three large halls for dormitories, and a university hall, in which are recitation-rooms and chapel. I. N. Rendall.

Linc'olnville, post-tp. of Waldo co., Me., on the W. side of Penobscot Bay, 11 miles S. of Belfast, is a summer resort, and manufactures lime and leather. Pop. 1900.

Lind, post-tp. of Waupacca co., Wis. Pop. 1017.

Lind (Jenny), "The Swedish Nightingale," b. in Stockholm Oct. 6, 1821, of humble parentage; her father was a teacher, and poor. Her precocious talent attracted the notice of Mme. Lundberg, a retired actress, who introduced her to Crælius and Berg, famous teachers in music, and to Lindblad, the composer. The manager of the court theatre procured for her admission to the musical academy, where her progress was rapid. She acted and sang in children's parts till she was twelve years of age, when her voice failed her. Four years later it returned on occasion of a public concert, and she sang the part of Alice in Meyerbeer's *Robert le Diable* with a brilliancy that ensured her success. She soon became the operatic star of Stockholm, and sang with applause in the chief cities of Sweden and Norway. In 1841, ambitious of perfecting herself in her art, she went to Paris and took lessons of Garcia. There she was introduced to Meyerbeer, who took a deep interest in her, and obtained from M. Pillet an opportunity to sing in opera. But she caused no enthusiasm, and in her chagrin turned her back on Paris. Her next opportunity, also due to Meyerbeer, was in Berlin in 1845. There her success was distinguished. Previous to this she had tasted once more the friendliness of Stockholm, and had sung in Dresden. At Vienna she repeated her triumphs in *Norma*, the *Camp of Silesia*, and the *Daughter of the Regiment*. Her first appearance in London was in May, 1847. In *Robert le Diable*, *Puritani*, *Sonnambula*, she more than justified her claims as an artist, and covered herself with honors. In 1848 she sang for the first time in oratorio, *Elijah*, at Exeter Hall, to found musical scholarships in memory of Mendelssohn. Henceforth this was to be her chosen field. In 1850 she came to the U. S., under contract with Mr. P. T. Barnum to give 150 concerts. The enthusiasm was unbounded, the profits were enormous, but the toil and irksomeness were excessive, and in June, 1851, after singing 95 times, the contract was terminated by Jenny Lind. In 1852 she married Otto Goldschmidt, soon after returned to Europe, and passed several years in Dresden, appearing only occasionally in public, and then for charitable purposes only. In 1858 she took up her residence in England, where she still lives. Jenny Lind's voice was a light soprano of remarkable sweetness, flexibility, and charm of expression, and she threw into it the feeling of a passionate soul. She sang out of a heart full of goodness. In the U. S. she was as well known for her charities as for her genius; they amounted to many tens of thousands of dollars; in England, Sweden, and Germany they have been equally munificent. Her private life and character are blameless. She is no less honored and beloved as a woman than admired as an artist. O. B. Frothingham.

Lin'da, tp. of Yuba co., Cal. Pop. 401.

Lin'dau, town of Bavaria, situated on an island in the Lake of Constance, manufactures musical and chirurgical instruments, and trades in wine, corn, cheese, and fish. It was a free city till 1803. Pop. about 5000.

Lin'de (Samuel Bogumil), b. in 1771 at Thorn, Prussia, of Swedish descent; studied at Leipsic; resided for some time in Dresden and Vienna, and became in 1803 director of the lyceum of Warsaw, where he d. Aug. 8, 1847. He published a valuable *Dictionary of the Polish Language* (6 vols., 1807–14).

Lin'den [Ang.-Sax. *lind*], the lime tree, *Tilia Europæa* (order Tiliaceæ), a large European forest tree, closely related to the Basswood (which see) of the U. S. Its wood is soft, but valued by carvers and turners and used in making charcoal. Its bark makes the bass matting so extensively imported from Russia. Its flowers afford valuable bee-pasture. It has many varieties, some of which are well known in cultivation in the U. S.

Linden, post-v., cap. of Marengo co., Ala., 95 miles W. of Montgomery, contains county buildings, 1 church, Masonic lodge, 1 hotel, and several stores. Pop. of v. 300; of tp. 1927. Richard H. Clarke.

Linden, post-v. of Genesee co., Mich., on the Detroit and Milwaukee R. R. Pop. 565.

Linden, post-tp. of Brown co., Minn. Pop. 457.

Linden, a v. and tp. of Christian co., Mo. Pop. of v. 81; of tp. 1440.

Linden, post-v. and tp. of Union co., N. J., near the New Jersey R. R., 17 miles from New York, is inhabited by persons doing business in New York, and has some fine residences. Pop. 1396.

Linden, post-v., cap. of Perry co., Tenn., 12 miles N. E. of Decaturville. Pop. 149.

Linden, post-v., cap. of Cass co., Tex., 35 miles N. of Marshall.

Linden, post-tp. of Iowa co., Wis. Pop. 2054.

Lindi'na, tp. of Juneau co., Wis. Pop. 1065.

Lind'ley, tp. of Mercer co., Mo. Pop. 1519.

Lindley, tp. of Steuben co., N. Y., on the Tioga River, has manufactures of lumber, leather, flour, etc., is traversed by the Blossburg and Corning R. R., and contains Lindleytown (P. O.). Pop. 1251.

Lindley (John), Ph. D., M. D., F. R. S., F. L. S., b. at Catton, Norfolk, Feb. 5, 1799, was the son of a nurseryman; began early to write upon botany, assisting in preparing Loudon's *Encyclopædia;* became in 1829 professor of botany in University College, London; was appointed in 1860 examiner in botany in the London University; edited the *Gardener's Chronicle* 1841–65. D. near London Nov. 1, 1865. His botanical writings are of the first importance. Among them are *Introduction to the Natural System* (1830), *Structure and Physiology of Plants* (1832), *Vegetable Kingdom* (1846), *Flora Medica* (1838), *Fossil Flora* (with Hutton, 1831–37), *Pomologia Britannica* (1841), *Orchidaceous Plants* (1837–38), *Folia Orchidacea* (1852), *Theory of Horticulture* (1840), etc.

Lind'say, capital of Victoria co., Ont., Canada, is on the Canada Midland Railway and on the navigable Scugog River. It has an extensive trade in lumber, grain, and flour. It has manufactures of castings, lumber, beer, sash, blinds, hemlock extract, etc. The town contains the county buildings, several churches and schools, and other fine edifices. It is mostly built of brick. It has 2 weekly newspapers. Pop. of sub-district, 4049.

Lindsay, BARONS and EARLS, a distinguished family in the Scottish peerage, descended from Sir Walter de Lindsay, an Englishman of Norman descent, who in the reign of David I. acquired Ercildoun and Luffness in East Lothian. In the twelfth century the lands of Crawford in Clydesdale came into possession of the family by an intermarriage with the royal line of Scotland. Sir James Lindsay of Crawford was distinguished at the battle of Otterburn. His nephew and heir, Sir David, married a sister of King Robert III., and was made by that monarch earl of Crawford, while Sir William, younger brother of the earl, became ancestor of the Lords Lindsay of the Byres, Haddington, and, through a natural son, was also ancestor of the celebrated poet, Sir David Lindsay of the Mount. In the fifteenth century the earls of Crawford were among the wealthiest, proudest, and most influential of the Scottish nobility, and took a large part in the civil warfare of that agitated period. David, the fifth earl, a trusted minister of James III. was made duke of Montrose in 1488—a title never before bestowed in Scotland except upon princes. In 1644 the tenth Lord Lindsay of the Byres was created earl of Lindsay, and soon afterward obtained also, by a new creation, the earldom of Crawford, extinct in the elder line. John, fourth earl of Lindsay and Crawford, b. in Oct., 1702, was a distinguished general in the Russian service, in the German campaign 1743–45, and the suppression of the movement of the Pretender in Scotland in 1746. D. in London Dec. 25, 1759. The present earl of Crawford and Lindsay has written *The Lives of the Lindsays* (1849), a valuable and interesting work.

Lindsay (Sir DAVID), OF THE MOUNT, b. about 1490, either at Garmylton, East Lothian, or at the Mount, Fifeshire, Scotland, on the estate from which his title was derived; is believed to have studied at the University of St. Andrew's (1505–09), and to have travelled in Italy in 1510. In the following year he is mentioned as an amateur actor in a play performed at the court of James IV. of Scotland, and in 1512 was appointed "keeper" or tutor to the infant prince, who succeeded to the throne as James V. a few months later (Sept., 1513). His important duties were discharged with an affectionate care, which the young king rewarded in 1528 with an appointment as king's herald, and in 1530 with knighthood and the office of "Lord Lyon king-at-arms," in which capacity he accompanied embassies to the courts of England, France, Spain, and Denmark, and is introduced into Scott's poem of *Marmion*. He represented Cupar in Parliament (1542–43), contributed to the success of the Reformation, and d. at an unknown place and date before May, 1555. As a poet Lindsay takes high rank, and his satires against the clergy are credited with having been the most efficient preparation for the labors of John Knox. His principal works were *The Dreme* (1528); *Satyre of the Thrie Estaitis*, played at court in 1539; *Historie of Squyer Meldrum* (1548); and *The Monarchie* (1553). The first collective edition of his works was printed at Copenhagen in 1553, and nearly twenty have since appeared in Scotland. The best edition is that of the Early English Text Society (1865–71), in 5 parts.

Lindsay (JOHN WESLEY), D. D., b. Aug. 20, 1820, at Barre, Vt.; graduated at Wesleyan University 1840; studied theology in Union Seminary, New York City; entered the Methodist ministry; was tutor 1847, and professor of Latin and Hebrew in his *alma mater* 1848–60; president of Genesee College 1864–68; became in 1868 professor of exegetical theology in what is now Boston University.

Lindsay (WILLIAM SCHAW), b. in Ayrshire, Scotland, in 1816; went to sea at the age of fifteen years as cabin-boy in a West India ship; became second mate 1834, chief mate 1835, took command of a merchantman 1836, became agent for the Castle-Eden Coal Company 1841; was influential in opening the port of Hartlepool and providing it with docks and wharfs; went to London 1845: became in a few years one of the "merchant princes" of that city; was twice defeated in his candidacy for Parliament 1852; elected for Tynemouth and North Shields Mar., 1854, and again without opposition Mar., 1857; elected for Sunderland Apr., 1859; distinguished himself in Parliament by zealous attention to commercial, and especially shipping, interests; took an active part in the formation of the Administrative Reform Association. He has published many pamphlets on mercantile and political topics, a volume entitled *Our Navigation, Mercantile, and Marine Laws considered* (1853), a treatise on *Our Merchant Shipping* (1860), and in 1874, 2 vols. of an elaborate work, *The History of Merchant Shipping*. For many years he has been prevented by feeble health from accepting a seat in Parliament.

Linds'borg, post-v., cap. of McPherson co., Kan., on the Smoky Hill River, 19 miles S. of Salina.

Lind'sey, post-v., cap. of Ottawa co., Kan. It has 1 newspaper.

Lindsey, tp. of Benton co., Mo. Pop. 1383.

Lindsey (CHARLES), b. in 1820 in Lincolnshire, England; came in 1842 to Canada West and became an editor; was 1846–52 connected with the Toronto *Examiner*, and in 1852 became editor of the Toronto *Leader;* has since been city registrar; has published *Clergy Reserves*, *The Maine Law*, and *Prairies of the Western States.*

Lind'seyville, post-v. of Worcester co., Md., 8 miles E. of Newtown. Pop. 54.

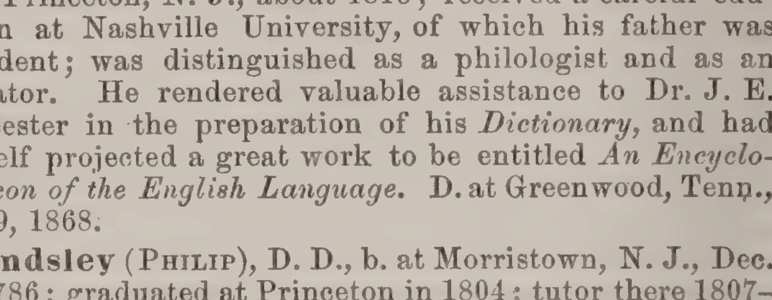
Lind'sley (JOHN BERRIEN), M. D., D. D., b. at Princeton, N. J., Oct. 24, 1822; educated in Nashville, Louisville, Philadelphia, and Paris; was elected in 1856 professor of chemistry and dean of faculty of the medical department of the University of Nashville; in 1855 was made chancellor of that university, which for several years before the war had classes of 600 students. After the death of his preceptor, the celebrated Dr. Troost, from whom he imbibed the love of the sciences, he became the curator of his splendid cabinet, which in 1874 was purchased by the Kentucky Library Association and thrown open to the public; has contributed papers on education to the press, also to the *Theological Medium*, the quarterly of the Cumberland Presbyterian Church, and is (1875) engaged in writing the medical annals of Tennessee. PAUL F. EVE.

Lindsley (NATHAN LAWRENCE), LL.D., son of Philip, b. at Princeton, N. J., about 1816; received a careful education at Nashville University, of which his father was president; was distinguished as a philologist and as an educator. He rendered valuable assistance to Dr. J. E. Worcester in the preparation of his *Dictionary*, and had himself projected a great work to be entitled *An Encyclo-Lexicon of the English Language*. D. at Greenwood, Tenn., Oct. 9, 1868.

Lindsley (PHILIP), D. D., b. at Morristown, N. J., Dec. 21, 1786; graduated at Princeton in 1804; tutor there 1807–09 and 1812; professor of languages 1813; vice-president 1817, at which time he was ordained in the Presbyterian Church; between 1820 and 1839 was offered the presidency of ten different colleges; in 1824 accepted that of the University of Nashville, which he resigned in 1850, after a most successful career as an instructor. He was afterwards professor of archæology and church polity in the Presbyterian Theological Seminary at New Albany, Ind. D. at Nashville, Tenn., May 25, 1855. His complete works, consisting of sermons, educational, miscellaneous, and religious discourses and essays, were published in 3 vols., with a memoir by Leroy J. Halsey (Philadelphia, 1865).

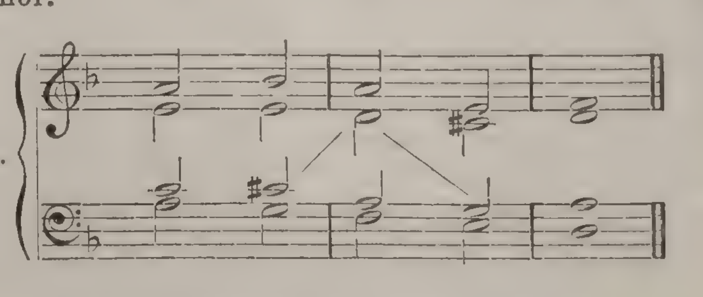
Line [Lat. *linea*]. In music, lines are used not only in the formation of the stave and its extension by ledger-lines, but also for several other purposes. In a figured bass a long unbroken line after a figure signifies the continuation or holding of the note indicated by the figure, while broken or short lines imply repeated strokes of a note, or sometimes the repetition of the same figure over the several notes of a moving bass. See Ex. 1:

Ex. 1.



A line drawn across a figure thus, 4̸ or 4̶, 5̸ or 5̶, 6̸ or 6̶, etc., is equivalent to a ♯, and such figures stand for a sharp fourth, a sharp fifth, etc. When, in a condensed score, one part crosses another, its course is frequently marked by a slanting line, to avoid confusion or to explain an *apparent* false progression. See Ex. 2, where the crossing of the tenor and alto is pointed out by lines connecting the notes of the tenor.

Ex. 2.



In modern music for the organ, curved or straight perpendicular lines, with arrow-heads, are often used to mark the exact place where a change is to be made from loud to soft, or the reverse, or from one stop or set of keys to another. Instances of this are given in Ex. 3:

Ex. 3.

Two diverging or converging lines placed over a series of notes imply an increase or decrease of loudness, as otherwise expressed by the words *crescendo* or *diminuendo*, or their abbreviations, *cres.* and *dim.* WILLIAM STAUNTON.

Line [Lat. *linea*], a geometrical magnitude which has length, but neither breadth nor thickness. We may regard a line as the path of a moving point, in which case the nature of the line will depend upon the law of motion of the point. Two positions of the generating point are said to be *consecutive* when the distance between them is infinitesimal, and the corresponding portion of the line is called an *element*. We may suppose the point to move so that the elements shall be equal, or so that the projections of these elements on a given straight line shall be equal: the former is the method of plane geometry, and the latter is the method of analytical geometry and of the calculus. Lines may be either straight or curved. A *straight* line is a line whose elements all lie in the same direction; that is, it is a line whose direction is the same at every point; a *curved* line is one in which no two consecutive elements lie in the same direction. A *plane curve* is a curve all of whose elements lie in the same plane; a *curve of double curvature* is a curve in which no three consecutive elements lie in the same plane. In all cases the prolongation of any element in the direction of the motion of the generating point is a tangent to the curve; hence, we say that a tangent to a curve is a straight line drawn through two consecutive points of the curve. Of these points the first in order of generation is the *point of contact* or the *point of tangency*.

In analysis, lines are classed as algebraic and transcendental. An *algebraic line* is one whose rectilineal equation may be expressed by the ordinary operations of algebra; that is, by addition, subtraction, multiplication, division, formation of powers denoted by constant exponents, and extraction of roots indicated by constant indices; a *transcendental line* is one whose equation cannot be expressed by the ordinary operations of algebra. Algebraic lines are divided into *orders* according to the degrees of their equations. Lines of the first order are those whose equations are of the first degree, lines of the second order are those whose equations are those of the second degree, and so on. Algebraic lines of the first order are straight lines, and those of the second order are conic sections. Transcendental lines are sometimes classed, according to the relation between their co-ordinates, as, *logarithmic curves, curve of sines*, etc., but as yet no systematic classification of this class of lines has been made. W. G. PECK.

Line [Lat. *linea*], the twelfth part of an inch in English measurement.

Lin′en [Ang.-Sax. *lîn*, "flax"] is one of the earliest of textile manufactures. Its origin is lost in the cloudland of history. Pieces are still in existence which were woven 4000 years ago. In the days of Herodotus it was an article of Egyptian export. The mummies are wrapped in cerecloths of this material. Sir Gardner Wilkinson has fully described the linen manufacture of Egypt. The term *linen* is a generic name for cloths woven from the fibres of the flax-plant and hemp. The raw material of linen proper is the flax-plant (*Linum usitatissimum*), which thrives in latitudes ranging from Egypt to Russia. From the seed is expressed the linseed oil so much used in commerce. Cloth made from the hemp-plant was worn by the Thracians. This plant is extensively grown in various parts of Europe, and has been cultivated in Bengal from remote ages. It is esteemed there both for its fibre and for the narcotic *bhang* secreted by its leaves. The use of hemp in the linen manufacture is smaller now than formerly. JUTE (which see) may also be commercially considered as a sort of linen, as it affords a cheap substitute for flax, the cultivation of which has not kept pace with the requirements of the makers. Of other substitutes which have been employed with varying degrees of success, we may name the nettle, china-grass, rheea, New Zealand flax, and Manila hemp (*Musa textilis*). The garments of the Hebrew priests were chiefly of linen, and in the Bible we have many allusions which show the esteem in which this fabric was held. In Proverbs there is an oft-quoted passage which vividly portrays ancient methods of manufacture. "She seeketh wool and flax," says the wise king in his description of the virtuous woman, "and worketh willingly with her hands. She layeth her hands to the spindle, and her hands hold the distaff. All her household are clothed with scarlet. She maketh herself coverings of tapestry, her clothing is silk and purple. *She maketh fine linen and selleth it*, and delivereth girdles unto the merchants." In Homer we read of ladies working in this manner. The mother of Nausicaa in the early dawn spun by the hearth soft fleeces dyed with red purple. In many parts of the ancient world the manufacture of linen—chiefly, it may be presumed, carried on by the women as a household occupation—was common. Some parts of Spain and Italy were celebrated for the culture of flax and its subsequent conversion into textile fabrics. Linen has been made in England from an early date. The garments of the Anglo-Saxons were linen and woollen. The daughters of Edward the Elder were famous for their skill in spinning, weaving, and embroidering. The Bayeux tapestry is a linen cloth, with designs worked in wool. Although the flax-plant had been cultivated by the Saxons, it is not found in a list of tithable produce drawn up in 1070. Fine linen is said to have been first made in Wilts and Sussex in 1253. In 1272, Irish linen was used at Winchester. Flemish weavers were introduced into England in 1331, and in 1386 a guild of linen-weavers was established in London, but does not seem to have been very prosperous. Indeed, the manufacture was still in its infancy in the reign of Charles II. Yarranton, writing in 1677, proposed the establishment of spinning-schools, such as were then common in Germany. In these places perhaps 200 girls from six years old upwards were assembled under the supervision of a woman who sat in a pulpit, and with a long white wand "tapped" any of the little workers who flagged in their attention. If this were not sufficient, she rang a bell and the offender was taken away and chastised. This was done in silence, and Yarranton thought it would be good discipline for the maids of England, who were much given to chatting. From the introduction of the cotton manufacture until about 1773, whilst the weft was of cotton the warp was of linen yarn. Arkwright's invention changed this. In Ireland its history is mixed up with that of sectarian feeling, for the woollen manufacture of the popish S. and W. was ruined by heavy export duties, whilst the Protestant interest of Ulster was protected in 1699 by the act for the encouragement of the linen trade. A board was constituted which held sovereign sway over the trade until 1828, when its obsolete regulations and procedure led to its extinction. As early as the eleventh century linen was woven in Ireland, but it was Louis Crommelin, a refugee driven from France by the Revocation of the Edict of Nantes, who set it on a firm footing. The duke of Ormonde in 1711 ordered linen hatbands and scarfs to be used for funeral purposes; fourteen years later machinery began to be used. Improvements in bleaching were introduced by Dr. Ferguson in the middle of the century. It was not until 1828 that flax-spinning machinery was started at Belfast. The pioneers were Messrs. Mulholland. For eighteen years there was a society for the promotion of the growth of flax in Ireland, but it came to an end in 1859. Linen was made in Scotland, but on a very small scale and in a rude style, in the reign of Charles I. In 1688, Morer styles it the most noted and beneficial manufacture of the kingdom. As showing the unfriendly feeling between North and South, it may be mentioned that the Scotch packmen who travelled into England to sell linen were, about 1684, sometimes whipped as malefactors and obliged to give bonds that they would discontinue their traffic.

On the Continent traces of the use and manufacture of linen are found at early dates. Charlemagne, who dressed after the manner of the Franks, had linen under-clothes. In mediæval Italy it was an important article of commerce. In Spain the Moors paid great attention to textile manufactures, and linen was exported to India and Constantinople. In the fifteenth century Seville had 16,000 looms; a century later they had diminished to 300. Flanders, Brabant, and some of the German towns were notable for their linen manufactures in the eleventh century. Louvain had 150,000 linen and woollen weavers in the fourteenth century. In Flanders by the middle of the thirteenth century the manufacture was very flourishing, and its products were largely exported to England and other countries. Ypres, which dates from 960, has left its impress in the word *diaper* (*i. e.* d'Ypres, cloth of Ypres), still used for table-linen. The soil of France is suitable for flax-growing, and since the time of the Roman rule linen has been made in that country. In 1394 it is said the king sent fine linen of Rheims to the sultan in ransom of some noble prisoners who had fallen into the hands of the paynims. The Revocation of the Edict of Nantes was disastrous in

its effects on French industry, and the linen trade suffered in common with all others from the loss of the Huguenots, driven by religious persecution to take their peaceful arts to countries where they might worship God without fear of "conversion" by dragonnades. Russia has long been the greatest flax and hemp growing country of the world.

There are more linens used in the U. S. in proportion to the population than in almost any other country.

We turn now to the history of the processes of the linen manufacture. The flax-fibre is made up of a number of smaller filaments bound together. The primary operation in their separation was termed heckling. The heckle is a many-toothed steel comb which removes the coarser fibres of the tow and partially divides the filaments of the flax. The fineness of the flax depends upon the number of hecklings it receives by instruments of increasing delicacy. Machine heckling is now most commonly used, and there are various patented inventions for this purpose. The fibres require to be united into a continuous thread before they are capable of being woven. The earliest method of doing this was by the spindle. One was found at Thebes by Sir Gardner Wilkinson which had still some linen thread upon it. They were about fifteen inches in length, usually of wood, with a circular head of gypsum or composition. They were bulbous near one end, tapering to a point, whilst the other end lengthened into a handle. The thread was attached to the handle; and the spindle resting upon the right thigh, the right hand was drawn quickly over it, causing it to revolve or spin like a top. To this was afterwards added the distaff, a piece of wood round which the flax to be spun was wrapped. The spinning-wheel was the next step forward. One was invented at Brunswick in 1553. That called Saxon had on the spindle a bobbin round which the thread was wound, a flier going round faster than it, giving the requisite twist to the thread. The flax was loosely wrapped round a distaff or rock above the spindle. A treadle moved by the foot gave a rotatory motion to the wheel. It was only by slow degrees that this supplanted the older instrument, and a two-spindled wheel had not been very long in use when Arkwright's cotton-spinning machinery must have turned attention to the possibility of a similar revolution in other branches of human labor. In 1787, John Kendrew and Thomas Porthouse, both of Darlington (Durham), took out a patent for this purpose. Various mills in Scotland were worked under licenses from the patentees. It was long before the hand-made yarn was superseded by the machine-made article. In 1788, Alexander Robb invented a loom to be driven by water, and in 1810, Joseph Crompton of Dundee one to go by water or steam, but it is doubtful if they were brought into use. The first manufactory for weaving flax by power was set up in London about 1812 by Charles Turner & Co.

According to the modern method of treatment, the fibres are first *scutched* or combed; *broken* into three pieces, the inner section being the best; *heckled*, now usually done by a rotatory machine, the flax placed on the periphery being drawn through or against a series of teeth; the short fibres *drawn* into one continuous thread; after having been *roved* it is *spun*. The flax, however, has to be kept wet during this process, for which purpose warm water is now used. The spun yarn is used either for thread or for weaving. The quantity of *leas* (300 yards) contained in a pound is the method of indicating the quality of the yarns. (For information as to the processes of SPINNING, WEAVING, and BLEACHING linen those articles should be consulted.)

The principal varieties of linen are: *Lawn* (Fr. *linon*), very fine qualities of which are now made in Ireland, although it was once an exclusively French manufacture. Common sheetings and towellings are made in Scotland, and also ducks, huckabacks, osnaburgs, crash, and tick. Some sorts of velvet and velveteen are made from flax at Manchester. Diapers (the origin of the name has been incidentally mentioned) are fabrics with patterns of geometrical regularity, such as are produced by the kaleidoscope. Dowlas is a strong but coarse linen, formerly much used by workpeople for shirts. A good deal is now exported from Britain to Spain and Spanish America. Damasks are fabrics with figures of fruit and flowers, and free-hand ornament as opposed to the geometrical severity of diaper. The name is supposed to be taken from Damascus, an ancient seat of the art, which until the introduction of the Jacquard machine (see LOOM) was a mystery confined to a few localities. Damasking has been applied to silks, etc., but table-linens are fabrics in which it is chiefly used. The town of Dunfermline produces as much of this article as all Europe besides. It is used on the Continent for upholstery purposes. It is said that America uses as much British damask as all other parts of the world together. Courtrai and Liege in Belgium are famed for this kind of work. Cambric, which takes its name from Cambrai, once famous for its production, is the finest and thinnest of linen fabrics. The handkerchiefs vary in price from 4*s.* to 70*s.* per dozen. The so-called Scotch cambric is a cotton fabric with the fibre twisted very hard. Linen is used for shoe-lining, and coarse linens have been brought largely into consumption as hessians (bale-cloth) and beetlers; the last being converted into tarpauling and used for packing and other purposes. "French canvas" is a coarse variety much used by tailors for stiffening, etc. The evil of over-bleaching has lessened the durability of linen, but the price is 50 per cent. less also. For a time the rapid increase of the cotton manufacture endangered the prosperity of the linen-trade, and to some extent they are antagonistic. Although it has not had the same rapid increase as its cheaper rival, it has exceeded its former proportions as one of the great staple industries of the world.

The exports from Great Britain in 1873 were 28,734,212 of linen yarn, 208,123,476 pieces of linen manufacture, and 2,302,354 pounds of thread for sewing. The home consumption would represent a similar quantity. The value of linen yarn was £1,976,830, and of manufactured linen was £7,306,153, in each case a decrease on the preceding year. The fullest history of the trade is Warden's *Linen Trade, Ancient and Modern* (1864). W. E. A. AXON.

Lines'ville, a b. (Lineville Station P. O.) of Pine tp., Crawford co., Pa., on Erie and Pittsburg R. R. It has 1 newspaper. Pop. 434.

Line'ville, post-v. of Wayne co., Ia., on the south-western division of Chicago Rock Island and Pacific R. R., has 1 newspaper.

Ling. See HEATH.

Ling [Ang.-Sax. *lang*, "long"], the *Lota molva*, a sea-fish of the cod family extensively caught in Europe. It is eaten fresh or salted and dried. Its flesh is also preserved in air-tight cans; its sounds are used for isinglass and for food; its roe is a good fish-bait; its liver yields a valuable oil. The ling of the American coast is *Lota compressa*, a small fish. Thousands of barrels are taken annually in the Gulf of St. Lawrence. There are several other fishes called ling, both in the U. S. and in Great Britain.

Ling (PETER HENRIK), b. Nov. 15, 1776, at Ljunga, in the province of Småland, Sweden; led as a young man a rather adventurous life, travelling through Germany and France; became in 1805 fencing-master at the University of Lund, in 1813 teacher in fencing at the military school of Carlsberg, and in 1816 director of the gymnastic institute of Stockholm, where he d. May 3, 1839. Ling represents the same movement in Sweden as Turnvater Jahn in Germany. His poetical productions, *Gylfe* (1812) and *Asarne* (1816–26), were intended to awaken among the Swedes that heroism of feeling and thinking which characterized the ancient pagan Scandinavians; and his gymnastic exercises were at first simply a means of developing and strengthening the body. But by the thought and study which Ling bestowed on his profession he developed the simple gymnastic practices into a medical cure, the so-called movement cure, which has proved very effective in many chronic diseases, and has been introduced into many countries.

Lin'ga, the emblem of divine creative power amongst Hindus. It may be termed the phallic emblem of India. The *linga* holds a very high place amongst objects of adoration in India, and is especially an object of S'aiva worship. In Sanskrit *linga* means, primarily, a sign or emblem, but it is only used to signify the emblem of male creative power, the *yoni* being the representative of the female. The most common form in which the *linga* is worshipped is that of a round, perpendicular stone, rising out of an oval stone representation of the *yoni*. But pistils of flowers, etc. etc. are held to be likenesses of the mystic symbol. The S'aiva sect (see S'AIVA) is extremely numerous in India, and *lingas* are conspicuous in all their temples, from the Himalayas to Cape Comorin. Regarding the *linga*, Balfour says: "There is not apparent to any eye the faintest resemblance to the organs of which they are deemed the symbols or types." This view has also been held by a large number of scholars, but it is founded on very limited personal experience of Indian shrines. The writer has with his own eyes seen *lingas* in the great temples of Southern India, elaborately carved and painted, which are a public insult to common decency. It is true that thousands and thousands of *lingas* are to be met with which are simply upright pieces of stone, of great age, and often wind or wave worn, the peculiar emblematical significance of which, as objects of worship, is only known to the pundit or priest. But there are other lingas before which multitudes of men and women worship, at which the first glance of the eye is sufficient to show the worshipper exactly what it is he is worshipping. *Lingas* are frequently—perhaps most frequently—constructed of marble or granite. They are treated by their votaries just as idols are: offerings

are placed before them, flowers are strewn, and they are anointed with oil and smeared with ashes. According to Balfour (who has an interesting article on the *linga* in the *Cyclopædia of India*, vol. iii.), "Sonnerat says the lingam may be looked upon as the phallus or the figure representing the virile member of Atys, the well-beloved of Cybele, and the Bacchus whom they worshipped at Hieropolis. The Egyptians, Greeks, and Romans had temples dedicated to Priapus, under the same form as that of the lingam. The Holy Scriptures inform us that Asa, son of Roboam, prevented his mother Maacha from sacrificing to Priapus, whose image he broke. The Jews caused themselves to be initiated in the mysteries of Belphegor, a divinity like the lingam, whom the Moabites and Midianites worshipped on Mount Phegor, and which worship, in all appearance, they received from the Egyptians. When 'Judah did evil in the sight of the Lord, and built them high places, and images, and groves, on every high hill and under every green tree,' the object was Baal, and the pillar, the lingam, was his symbol. According to Col. Tod, the lingam is identical with the Arabic idol Lat or Alhat. The worship reached France, doubtless with the Romans, and the figure of the lingam is still to be seen on the lintel which surrounds the circus at Nîmes, as well as on the front of some of their ancient churches, particularly on that of the cathedral of Toulouse and on some churches at Bordeaux. Plutarch says that the Egyptian god Osiris was found everywhere with the priapus exposed." With our latter-day notions of religion and morality, it comes to be a question whether the British government should allow the more indecent of these phallic emblems to stand in public places in India. Great Britain has resolved on being perfectly neutral in all matters of *religion* amongst Hindus, but still public breaches of *morality* are punishable in India by law, and are thus constantly punished. For instance, the sale of photographs of an indecent character has been rigorously put a stop to, but Sakti-worship is still allowed to be practised; temple-harlots exist, not as of personal choice on the part of the poor dancing-girls, but as a caste, of necessity; and these grossly indecent *lingas* are there allowed to stand "on every high hill and under every green tree." Of old, pious Hindus who spiritualized their religion, even the grossest forms of it, *linga*-worship included, were not lacking. For instance, the great Tamilian poet, Sivavâkkiar, writes as follows (see the *Indian Antiquary*, Bombay, Apr., 1872, first paper on "Tamil Popular Poetry," by the writer):

"My thoughts are flowers and ashes,
In my breast's fane enshrined;
My spirit, too, therein is
A *linga* unconfined."

Here the sage speaks of his body as a metaphorical temple (using language similar to that employed in the New Testament, "Ye are *temples* of the Holy Ghost"); then he likens his thoughts to flowers and ashes, which are used in the services of temples; lastly, he declares that his breath or spirit—which as a part of universal life has no bound or limit—is the true *linga*, creative, and a part of the creation, of his own being. But, even though many may think in the present day like Sivavâkkiar, yet the majority of Hindus have no such spiritual notions. Their religion is materialistic, and in parts of it is yearly becoming grosser. Linga-worship is, in the case of the majority of Hindus, merely sensual idolatry. R. C. Caldwell.

Lin'gan, a coal-mining district of Cape Breton Island, on the coast, 15 miles E. of Sydney. (See Bridgeport.)

Lingan (Gen. James Maccubin), b. in Maryland about 1752; took part in the Revolutionary war, rising to the rank of brigadier-general; was one of the prisoners at Fort Washington; kept for a long time in the prison-ship; was after the war collector of the port of Georgetown, Md. (now D. C.); resided in Baltimore in 1812, and was killed by a mob while gallantly defending the printing-office of the *Federal Republican*, July 28, 1812.

Lin'gard (John), D. D., LL.D., b. at Winchester, England, Feb. 5, 1771; studied at Douai, and was ordained a Roman Catholic priest in 1795; was afterwards connected with the seminary at Ushaw, near Durham; was (1811–51) parish priest of Hornby, Lancashire; declined a cardinal's hat soon after the publication of his great work, the *History of England* (1819–25). This work is one of great ability and excellence, though colored by the religious views of the writer, and recent Ultramontanists find it tainted with Gallicanism. Author of a *History and Antiquities of the Anglo-Saxon Church* (1806) and an English version of the New Testament (1836). D. at Hornby July 13, 1851.

Lingayen', town of Luzon, Philippines, situated on the northern coast of that island. Pop. 18,000.

Linguaglos'sa, town of Sicily, in the province of Catania, beautifully situated on a very fertile slope of Mount Etna, about 30 miles N. of the city of Catania, has good churches and conventual buildings, and better popular instruction than is usual in Sicily. Pop. in 1874, 8822.

Lingu'lidæ [from *lingula*, diminutive of *lingua*, "tongue"], a family of the class Brachiopoda and order Lyopomata (which see), distinguished by the more or less linguiform shape of the shells, the slightly unequal valves, the want of articulating apophyses, and the development of a long vermiform peduncle which passes between the apices of the valves; the shell is composed for the most part of phosphate of lime and horny laminæ, and has rather the appearance of horn than of true shelly matter; there are perforations; the brachia or "arms" are subspiral and destitute of any calcareous apophyses. By Dall the family is divided into two sub-families: (1) Lingulinæ, in which the posterior adductor scar is median and single, and the shell more or less elongate; and (2) Obolinæ, in which there are two posterior adductor scars, more or less separated from the median line, and the shell is inclined to an orbicular form. The family is very interesting, being one of the very few which have survived in comparatively unaltered forms from the Lower Silurian epoch, some of the types of the earliest period being scarcely generically distinct from the living Lingulæ, although the apparent slight differences may be the result of the simplicity of the shell. The living species have been differentiated by Dall into two genera: (1) *Lingula*, containing ten nominal species, the type of which is *L. aratina*, the species confined to the Moluccan, Australian, and Polynesian seas; and (2) *Glottidia*, with five doubtful species, the chief of which are *G. pyramidata* of the southern coast of the U. S. and *G. albida* of California, all of whose representatives are American. In *Lingula* the neural valve is smooth within; in *Glottidia* the neural valve has two internal ridges or lamellæ diverging forward from the beak, and apparently serving as fulcra for the post-parietal muscles. The embryology of *G. pyramidata* has recently been studied by Prof. E. S. Morse.
Theodore Gill.

Lin'iment [Lat. *linimentum*], in pharmacy, an oily preparation for external application, but thinner in consistence than the ointments. Some are stimulant oily compounds (ammonia-soaps), while others are medicated with powerful drugs, designed to act after absorption.

Link [Sw. *länk*, "ring"], a unit of measure used in land surveying. The length of a link is 7.92 inches; a square link is equal to .0001 of an acre.

Lin'köping, or **Linkjöping,** old but well-built town of Sweden, 100 miles S. W. of Stockholm. Pop. 6138.

Linlith'gow, or **West Lothian,** county of Scotland, bordering N. on the Frith of Forth, E. and S. on the county of Edinburgh. Area, 120 sq. m. Pop. 41,191. In the southern part the soil is swampy; elsewhere it is generally fertile, producing wheat, barley, and oats. Horses, cattle, sheep, and swine are reared. Linlithgow, the principal town, has interesting monuments, among which is the castle in which Mary Queen of Scots was born. Pop. 3689.

Linn, county of E. Iowa. Area, 720 sq. m. It is level, fertile, and well watered. Traversed by Wapsipinicon and Cedar rivers and by railroads centring at Cedar Rapids. Products, cattle, grain, and wool. Manufactures, saddlery and carriages. Cap. Marion. P. 31,080.

Linn, county of Kansas, bounded E. by Missouri. Area, 600 sq. m.; is fertile, and has coal and water-power. Is traversed by Marais des Cygnes and by Missouri River Fort Scott and Gulf R. R. Products, cattle, grain, and wool. Cap. La Cygne. P. 12,174.

Linn, county of N. Missouri. Area, 648 sq. m. It is a rolling prairie region, well watered, with wooded valleys, abounding in coal and building-stone. Staples, tobacco, grain, cattle, and wool. Traversed by Hannibal and St. Joseph R. R. Cap. Linnæus. P. 15,900.

Linn, county of Oregon, extending W. from Cascade range to Willamette River. Area, 1900 sq. m. The W. part is fertile; the E. part mountainous. Products, cattle, grain, lumber, and wool. Cap. Albany. P. 8717.

Linn, tp. of Cedar co., Ia. Pop. 521.

Linn, tp. of Dallas co., Ia. Pop. 762.

Linn, tp. of Linn co., Ia. Pop. 1083.

Linn, tp. of Audrain co., Mo. Pop. 300.

Linn, tp. of Christian co., Mo. Pop. 309.

Linn, tp. of Dent co., Mo. Pop. 403.

Linn, tp. of Moniteau co., Mo. Pop. 1948.

Linn, post-v. and tp., cap. of Osage co., Mo. It has 1 newspaper. Pop. 1757.

Linn, tp. of Walworth co., Wis. Pop. 895.

Linn (John Blair), D. D., son of William, b. at Shippensburg, Pa., Mar. 14, 1777; removed in childhood to

New York; entered Columbia College at the age of thirteen; graduated in 1795; entered the law-office of Alexander Hamilton, and published anonymously two small volumes of miscellanies in prose and verse. In Jan., 1797, he brought out at the John Street Theatre a "serious drama, interspersed with songs," entitled *Bourville Castle, or the Gallic Orphan*, which was represented three nights, but did not succeed in winning public favor. Shortly afterwards he abandoned the law, studied theology under Rev. Dr. Romeyn at Schenectady, was ordained in 1798, and in June, 1799, became assistant pastor of Rev. Dr. Ewing's Presbyterian church at Philadelphia. In 1800 he wrote an Ossianic poem on the *Death of Washington*, and in 1802 published his principal production, *The Powers of Genius*, a poem of some 600 lines, smoothly written and scholarly, but destitute of the "powers" it commemorated. It was, however, well received, soon reached a second edition, and was reprinted in England. In 1803 he engaged in a theological polemic with Dr. Priestley, occasioned by the latter's comparison of Socrates with Christ, publishing two able pamphlets which elicited replies from Priestley, and procured for the young divine the degree of D. D. from the University of Pennsylvania. D. of consumption at Philadelphia Aug. 13, 1804. In the following year his brother-in-law, the novelist, Charles Brockden Brown, gave to the world, with a brief memoir, *Valerian*, a narrative poem, incomplete, but extending to 1500 lines of blank verse, treating of the early struggles of Christianity against paganism.

Linn (Lewis Fields), M. D., b. near Louisville, Ky., Nov. 5, 1795; successfully engaged in medical practice at St. Geneviève, Mo., in 1815, and was a U. S. Senator 1833–43. He labored zealously for the interests of Oregon and the West generally. D. at St. Geneviève, Mo., Oct. 3, 1843. (See his *Life*, by E. A. Linn and N. Sargent, 1857.)

Linn (William), D. D., b. near Shippensburg, Pa., Feb. 27, 1752; graduated at Princeton 1772; studied divinity with Rev. Dr. Cooper of Middle Spring, Pa., and in 1775 was licensed to preach by the Donegal presbytery. He served as a chaplain in Gen. Thompson's regiment early in the war of the Revolution, taught in an academy in Somerset co., Md., became pastor of a church at Elizabethtown, N. J., 1786, and a few months later became one of the pastors of the Collegiate Dutch Reformed church in New York, where he remained until 1805, when he retired on account of his health, and d. at Albany Jan. 8, 1808. He published *Discourses on Scripture History* (1791), *The Signs of the Times* (1794), a series of essays in favor of the French Revolution, and (1800) a *Funeral Eulogy of Gen. Washington*, delivered before the Society of Cincinnati, besides many sermons separately printed. Dr. Linn was celebrated for his eloquence. He had a vivid imagination, a fine command of language, and a picturesque style—qualities which made him very successful as a revivalist, but sometimes betrayed him into exaggerations for which he was severely criticised.

Linnæ'a, a genus of plants containing but a single species, *L. borealis*, the twin-flower, of the honeysuckle family, found by Linnæus in Lapland in 1732, and named by Gronovius. It is a small trailing evergreen herb, with round leaves occurring in pairs, as do also the flowers, which are bell-shaped, of a pinkish color, and very fragrant. It abounds in the more northern regions of Europe, Asia, and North America, where it occurs as far S. as Maryland.

Linnæ'us, the Latinized name of Carl von Linné, the father of modern botany, b. May 12, 1707, at Råshult, in Småland, Sweden, the son of a Lutheran vicar, who, we are told, on account of poverty, apprenticed his son to a shoemaker, but at ten years old sent him to Wexiö to school, where his fondness for natural science made him so careless of his other studies that his teachers advised the father to put him to some trade; but Rothman, the good doctor of the place, took the boy into his house and gave him books upon botany and medical science to read; sent him in 1727 to Lund, where he read books of botany under Prof. Stobæus, and whence in 1728 he went to Upsala, attracted by the fame of Rudbeck, professor of botany. But the young Linné suffered much from hunger and cold, and being without money or friends began to despair, when Olaf Celsius, professor of divinity, met him by accident, gave him congenial employment upon his *Hierobotanicon*, took him into his own house, and introduced him to Rudbeck, whose assistant he became. In 1732 he explored Lapland under the patronage of the Academy of Sciences, and gathered material for his *Flora Lapponica* (1737). In 1735 he took the degree of M. D. at Harderwyk, in the Low Countries; resided at Hartecamp 1735–38, under the patronage of George Cliffort, a banker of Amsterdam; published his *Systema Naturæ* (1735), *Fundamenta Botanica* (1736), *Bibliotheca Botanica* (1736), *Critica Botanica* (1737), *Hortus Cliffortianus* (1737), *Genera Plantarum* (1737), *Classes Plantarum* (1738); returned in 1738 to Sweden; was appointed in 1739 physician to the king and professor of botany at Stockholm; became in 1740 professor of medicine at Upsala, and was professor of botany there 1741–78, giving the university a worldwide fame and attracting thither large numbers of students from foreign lands; was ennobled in 1757, and d. at Upsala Jan. 10, 1778, after some months in which his mental powers were lost or in abeyance, the result of apoplectic strokes. Besides the works above mentioned, his principal writings are *Philosophia Botanica* (1751), *Fauna Suecica* (1746), and *Flora Suecica* (1746); works on materia medica (1747–50); and above all the *Species Plantarum*. It would be hard to over-estimate the importance of the work of Linnæus in the establishment of natural science upon its modern basis. Not only in botany, his specialty, but in all departments of zoology, he was the foremost man of his time. He introduced the binomial nomenclature of species, an apparently obvious, but a most important step. His artificial system of plant-classification, though now discarded, was simple and easily followed, and greatly promoted the study of botany in its day. It is too often forgotten that Linnæus only designed this arrangement as a key to the diagnosis of species, and that he at the same time foresaw the importance and final prevalence of the natural system, and labored on the foundations of it.

Linn Creek, post-v., cap. of Camden co., Mo., has 2 newspapers. Pop. 132.

Lin'net [Fr. *linot*, from Lat. *linum*, "flax," its general food], a name given to various birds of the family Fringillidæ (finches), but proper to those of the genus *Linota*, of which *L. cannabina*, the common European linnet, is the typical species. These birds are remarkable for the changes which take place in their plumage during the breeding season. North America has several birds generally referred to this genus, though some class them in other genera.

Linne'us, post-tp. of Aroostook co., Me., 8 miles S. W. of Houlton. Pop. 1008.

Linneus, post-v., cap. of Linn co., Mo., on the Burlington and South-western R. R., has 1 public school, 4 churches, 1 bank, 1 flouring and planing mill, 1 newspaper, 2 hotels, and stores. Principal occupation, farming. Pop. about 1200. J. B. Wilcox, Ed. "Linneus Bulletin."

Linn'ville, post-v. of Bowling Green tp., Licking co., O. Pop. 100.

Lino'leum [Lat. *linum*, "cloth," and *oleum*, "oil"] is simply a manufacturer's name for oil-cloth, applied to heavy floor-cloths, made of canvas and painted with linseed oil. (See Floor-cloth.)

Lin'seed Oil [Ang.-Sax. *līnsæd*], the oil of flaxseed, is extensively used for all kinds of painting, for making oil-cloths, oil-silks, printer's ink, etc., its manufacture being among our most important industries, and the parent of many others. The oil-mills not only consume the greater part of the seed raised in this country, but large quantities are imported, especially from the East Indies. The seed is crushed and submitted to very great pressure in hydraulic presses, by which means the oil is for the most part removed. When the seed is not heated the oil is light colored, and is called *cold-pressed* oil. When, however, the seed-paste is heated after grinding, and pressed while still hot, the oil is of a little darker color, but it is much more rapidly and thoroughly removed. The paste in this operation is heated by steam, and brought to a temperature not much higher than that of boiling water. It is placed in strong cloths or bags of equal size and holding equal quantities, which are placed in iron cases and laid up under the presses, where they are subjected to a gradually increasing pressure, equivalent at length to a weight of 300 to 800 tons. The cakes from cold-pressed oil are reground and heated with the rest. (See Oil-cake and Oil of Linseed.)

Lins'ley (James Harvey), b. at Northford, Conn., May 5, 1787; graduated at Yale College 1817, and became a Baptist clergyman, but on account of ill-health left the pulpit and devoted his leisure to the study of natural history. In vols. xliii. and xlv. of Silliman's *American Journal of Science* may be found catalogues of Mammalia and birds from his pen. D. at Stratford, Conn., Dec. 26, 1843. (See *Memoir*, by his daughter, Hartford, 1845.)

Linsley (Joel Harvey), D. D., b. at Cornwall, Vt., July 15, 1790; graduated at Middlebury College 1811; was tutor there three years; studied law, and practised at Middlebury until 1822, when he was licensed as a Congregational preacher; went to South Carolina as a missionary; was pastor of the South Congregational church at Hartford, Conn., 1824–32, and of Park street church, Boston, 1832–35, when he was elected president of Marietta College, O., which post he held ten years, raising a considerable fund for that institution; became pastor of the Second Congre-

gational church at Greenwich, Conn., 1847, and remained there until his death, Mar. 22, 1868. Dr. Linsley was a man of genial disposition and of great mental activity and industry, of which his few published sermons and addresses afford a very inadequate specimen.

Lin'ton, tp. of Vigo co., Ind. Pop. 1437.

Linton, tp. of Allamakee co., Ia. Pop. 712.

Linton, tp. of Coshocton co., O. Pop. 1600.

Linton (Eliza Lynn), wife of W. J. Linton, b. at Keswick, Cumberland, England, in 1822; published a novel, *Azeth, the Egyptian* (1846), *Amymone, a Romance of the Days of Pericles* (1848), and *Realities*, a romance of modern life (1851). She has since been connected with the press, especially the *Saturday Review*, in which her papers on *The Girl of the Period* attracted great attention. Among her later novels are *Lizzie Lorton of Greyrigg* (1866), *Sowing the Wind* (1866), *The True History of Joshua Davidson, Christian and Communist* (1872), and *Patricia Kemball* (1874). The two latter works have been the most popular of her writings.

Linton (William James), b. in London, England, in 1812; was apprenticed to G. W. Bonner, and in 1842 became partner with Orrin Smith; was first engaged on the *Illustrated London News*, and did the work of illustrating Jackson's *History of Wood Engraving*, published by the proprietors of that journal. His hand is seen in *The Lake Country* and in the book of *Deceased British Artists*, issued in 1860 by the London Art Union. Mr. Linton, though eminent as an engraver, is still better known as the author of a *Life of Paine, Claribel and Other Poems, The English Republic*, and papers in the *Westminster Review, Examiner, Spectator*, mainly on social topics. In youth a zealous Chartist, he was interested in the revolutionary plans of his time, was a friend of Mazzini, entered heartily in later years into the cause of the English and European workingmen, and was a defender of the French Commune against the accusations of its enemies. Since 1867, Mr. Linton has resided in the U. S. His present home is New Haven, Conn. O. B. Frothingham.

Lintz, city of Austria, the capital of the province of Upper Austria, on the Danube. It is fortified by thirty-two bombproof towers, connected with each other by subterranean alleys, a method of fortification invented by Archduke Maximilian of Este, but superseded by recent improvements in artillery. It is the seat of the provincial government and of a bishop, has a theological seminary, some manufactures of cloth, carpets, silk, leather, gold-lace, and paper, and a considerable trade on the Danube. By the treaty concluded here Dec. 13, 1645, religious liberty was granted by the emperor Ferdinand to Hungary. Pop. 30,519.

Li'num [Lat., "flax"], a genus of plants of which the common Flax (which see) is the most important. It includes several flax-plants not cultivated for fibre, but sometimes grown in gardens for ornamental purposes. Among these are *L. perenne*, or perennial flax, found in the Western U. S. and growing 18 inches high, which forms tufts of slender stems with delicate blue flowers; *L. grandiflorum*, a beautiful annual found in Algiers, with abundant scarlet flowers; *L. flavum*, a greenhouse species, and *L. Berlandieri*, growing in Texas, both of which have yellow flowers.

Li'nus (2 Tim. iv. 21), tradition says, was the first bishop of Rome after St. Peter, but it is doubtful whether he succeeded the apostle, or whether St. Peter consecrated him bishop, perhaps long before his own martyrdom. The dates of his life are uncertain, some giving the year of his death as 80; others, as 78 or 67.

Lin'ville, tp. of Mitchell co., N. C. Pop. 347.

Linville, post-v. of Matagorda co., Tex. Pop. 40.

Linville, post-tp. of Rockingham co., Va. Pop. 3536.

Lin'wood, post-tp. of Pike co., Ala. Pop. 292.

Linwood, tp. of Tippecanoe co., Ind. Pop. 548.

Linwood, tp. of Portage co., Wis. Pop. 388.

Linwood Station, post-v. of Lower Chichester tp., Delaware co., Pa., on the Delaware River and the Philadelphia Wilmington and Baltimore R. R. The village proper (called also Marcus Hook) is on the river, about half a mile from the station.

Li'odon [Gr. λεῖος, "smooth," and ὀδούς, a "tooth"], a genus of extinct marine reptiles from the Cretaceous formation. (See Mosasaurus, by Prof. O. C. Marsh.)

Li'on [Gr. λέων], (*Felis leo*), the largest and most powerful of the Felidæ or cat family. Two very marked varieties are known—one, a tawny, full-maned creature, called the Barbary lion, inhabiting the wilds of Africa; and a nearly maneless, yellow variety, found in Asia. Other varieties are seen in both countries, having less distinctive marks. The lioness is smaller than the male, and has no mane. She is said to go with young about five months, and to produce but one brood in the year. The young are from two to four in number. They are spotted at birth, and remain so until more than half grown. The mane and tuft of a lion are not fully developed till the animal is six or seven years old. The natural period of its life is considered to be a little over twenty years, though authors have recorded its age as in "some instances that of man." A lion of the largest size was found to measure eight feet from nose to tail, the tail being four feet more. The carnivorous propensities of this beast are well known, the general prey being the larger herbivorous quadrupeds. Some ancient authors, including Didymus of Alexandria, have laid great stress upon the uses of a certain "prickle" which is found at the end of the tail of the lion. For a time this was considered as unimportant, and its existence was even denied. Investigation has shown, however, that there is a corneous claw-like appendage about a third of an inch in length, sharp at the apex, and hollowed at the base. Its function has been thought to be connected with lashing the tail for the purpose of stimulating anger, but it is now more properly regarded as a means for dressing the hair or matted portions of the mane. Except when pressed for food, the lion is rather a lazy and indolent beast. He remains at rest during the day, and preys during the night. The testimony of the famous hunters who have written of the lion is that he is rather timid than courageous, and that he entertains great fear of man. Dr. Livingstone gives a singular account of the roar of the lion. He says, comparing it with the voice of the ostrich, "In general, the lion's voice seems to come deeper from the chest than that of the ostrich, but to this day I can distinguish between them with certainty only by knowing that the ostrich roars by day, and the lion by night." J. B. Holder.

Lipan' Indians, a warlike tribe of aborigines of Mexico, Texas, etc., and are quite uncivilized. Upon the reservation of the Mescalero Apaches in New Mexico 350 Lipans were reported in 1872.

Lip'ari [anciently *Meligunis*], one of the Æolian Islands, situated near the N. coast of Sicily. It was a volcano, as appears from Aristotle, but the period of its extinction is unknown. With the exception of certain very precipitous and rocky portions, this island is most fertile, and its fruits and wines are excellent.—II. A town on the above island, situated on a rocky eminence protected by a fort. It is an old town, and many interesting antiquities exist in the neighborhood. Not long since some ancient baths, mentioned by Polybius, and containing fine mosaics, were excavated, but they have been reburied by the present proprietor to escape the annoyance of visitors. The modern town, which has suffered severely from earthquakes, is not well built, but it has a handsome cathedral and some respectable public buildings. The inhabitants are skilful sailors, and carry on an active commerce with Sicily, etc. The port affords good anchorage, though a mole is required to make it secure. Pop. in 1874, 12,020.

Lipetsk', town of European Russia, in the government of Tambov, on the Voronezh. It was founded in 1700 by Peter the Great, but it derives its chief importance from the mineral springs in its vicinity, which were discovered in the present century, and now attract a large number of visitors during the summer. The bathing establishment, with its park and promenades, is very beautiful. The manufactures of woollens and cloths are not unimportant. Pop. 14,239.

Lip'pa, town of Hungary, on the Maros. Pop. 6782.

Lip'pard (George), b. near Yellow Springs, Chester co., Pa., Apr. 10, 1822; author of several romances once quite popular. D. at Philadelphia in 1854.

Lip'pe, or **Lip'pe Det'mold,** a small principality of Germany, between Hanover, Brunswick, and Westphalia, and comprising an area of 438 square miles. It is hilly, but very fertile, well wooded, and watered by the river Werre, an affluent of the Weser. The southern part is covered by the Teutoburger Wald, famous as the place where Arminius destroyed the Roman legions under Varus. The inhabitants, numbering 111,135, belong to the Reformed Church, and enjoy a high reputation for their good education and intelligent industry. The principal town is Detmold.

Lip'pi (Fra Filippo), an Italian artist who flourished between 1412 and 1469. Of his personal history little is known. In 1452 he was chaplain to the nuns of S. Giovannino in Florence, and in 1457 rector of S. Quirico at Legnaja. The best of his pictures are in Florence, though all the large European galleries contain works from his hand. They are remarkable for richness of color, vitality of feeling, and excellence of drawing. D. at Spoleto, and was buried in the cathedral. O. B. Frothingham.

Lip'pincott (Sara Jane Clarke), b. at Pompey, N. Y., Sept. 28, 1823; educated at Rochester, N. Y., and removed

in 1843 to New Brighton, Pa. She wrote verses at an early age, and in 1844 began to contribute to the New York *Mirror* under the *nom de plume* of "Grace Greenwood," by which she has been long favorably known to American readers. In 1853 she was married to Leander K. Lippincott of Philadelphia, and made an extended tour in England and on the Continent. Among her works are *Greenwood Leaves* (2d series, 1850), *History of my Pets* (1850), *Poems* (1851), *Haps and Mishaps of a Tour in England* (1854), *Merrie England* (1855), *Stories from Famous Ballads* (1860), *Records of Five Years* (1867), and *New Life in New Lands* (1873). She has taken a considerable part in the anti-slavery and other reform movements by means of lectures, and has been frequently engaged as correspondent of leading New York papers, in which capacity she has several times visited the Pacific States, and resided for a time in Colorado. In 1875 she undertook a second European tour as correspondent of the New York *Times*.

Lipp'stadt, town of Prussia, in the province of Westphalia, on the Lippe. Pop. 7404.

Lips'comb (ANDREW A.), D. D., LL.D., b. in Georgetown, D. C., Sept. 6, 1816; his father's family went to Virginia, and in 1842 he moved to Montgomery, Ala., and attained great distinction as a minister of the Methodist Protestant Church; in 1860 was elected chancellor of the State University of Georgia, which position he held until 1874, when he resigned, to prepare for the press a more extended work, then in hand, than any of his previous publications. He has recently (Aug., 1875) accepted a professorship in the Vanderbilt University, Nashville, Tenn. A. H. STEPHENS.

Lip'sius (RICHARD ADELBERT), b. at Gera (Reuss), Germany, Feb. 14, 1830; studied at Leipsic, where in 1859 he became professor of theology; in 1861 at Vienna, and in 1865 at Kiel. He has published *The Pauline Doctrine of Justification* (1853), *The First Epistle of Clement of Rome* (in Latin, 1855), *On Gnosticism* (1860), *On the Sources of the Writings of Epiphanius* (1865), *The Catalogue of Popes in Eusebius* (1868), *Chronology of the Bishops of Rome to the Middle of the Fourth Century* (1869), and numerous articles in the *Zeitschrift für wissenschaftliche Theologie*.—His father, KARL HEINRICH ADELBERT (1805–61), was a professor at Leipsic, author of a valuable work, *Grammatical Studies on Biblical Greek*.—His brother, JUSTUS HERMANN, b. at Leipsic May 9, 1834, became in 1866 rector of a gymnasium in that city, and has published critical remarks on *Sophocles* (1860 and 1867) and *Lysias* (1864).

Liqueur' [Fr., "liquor"], a name given to various highly-flavored alcoholic or strong vinous liquids. There are many kinds, most of which are drunk in small quantities after dinner. The best known kinds are *curaçoa*, strongly flavored with orange-peel and various spices; *absinthe*, from wormwood and anise; *anisette*, from aromatic seeds; *kirschwasser* and *maraschino*, from cherries; *cassis*, from black currants; *kümmel*, from caraway, etc.; *noyau*, etc., from bitter almonds.

Liq'uid [Lat. *liquere*, to "melt"], a consonant formed by a closure of the vocal organs greater than the closer vowels require, but less than that of the remaining (mute) consonants. The liquids are *w, l, r, y*. They are subject to whispered aspiration, as *w* in *when* or *wh-w-en*, *y* in *hew* or *yh-y-oo*, and *ll, rh* in Welsh. The consonants *m, n, ng* are not liquids, but nasal mutes. S. S. HALDEMAN.

Liquidamber. See GUM TREE.

Liq'uids, Chemical and Physical Nature and Properties of ["liquids," from Lat. *liquere*, to "melt"].

1. *Change from the Liquid to the Solid State, and the Converse.*—The *liquid* state is one of the three states in which it is generally believed that all matter is capable of existing, and is intermediate between the solid and the gaseous states. Considered as that state of matter which forms a large part of living animals, as well as the bulk of mobile and changing nature, the importance to man of its study needs no explanation. In solids the molecules are maintained in certain relative positions with reference to one another, and generally in reference to certain lines called axes, which stand, in the same substance, in certain fixed angular positions and bear certain fixed relations of length to one another. Hence *crystalline* constitution. Liquids are formed from these solids by exposure to a higher temperature, by melting or fusion by heat, also by *solution* in some existing liquid; sometimes, also, by contact with some other solid, with which a new liquid chemical compound ensues. In all cases of change from the solid to the liquid or from the liquid to the solid condition, change of temperature occurs, sometimes to lower and sometimes to higher temperatures; but so far no case is known with certainty in which simple heating has changed a liquid into a solid, or simple cooling a solid into a liquid. It is often, indeed, generally held that, as the general effect of heat on all bodies is *expansion*, so expansion should generally follow the effect of heat in converting a solid to a liquid, and, *vice versâ*, that *contraction* should accompany the solidification of a liquid by cold. This principle holds probably for *most*, though not for all, of the *metals* when undergoing fusion, but its adoption as a universal principle would unquestionably mislead, and the student desirous of acquiring insight into the real system of nature should carefully avoid adopting it as such. That substance which performs the most important functions in nature of all, certainly of all in animated nature, *water*, departs so widely from the principle of continuous expansion by heat that when solid water, or ice, melts into liquid, 1000 volumes or measures contract or condense into 918, or about 8 per cent. less in bulk. This is the more remarkable when we consider that in the melting an amount of heat-force becomes "latent," or inactive upon the thermometer, which would raise the temperature of the water, *after melting*, to 176° F., and would expand the 918 volumes to 945. This heat-force continues acting to keep up the liquidity of the water—to keep it condensed, in fact; and when we deprive the water of just this amount of heat again, it *expands* back again into ice, through the action, as we may admit, of the crystallizing forces, whatever these may be. Among other cases in which liquefaction takes place with contraction of volume are many cases of solutions of solid bodies. In liquids the forces still exist that produce crystallization in solids, but they are modified in their mode of action into *radial* forces, acting equally in all directions from the centre of the mass of the liquid; so that a small body or *drop* of a liquid assumes a spherical form when free to do so; as in a drop of rain, for example. When resting on a surface or contained in a vessel, the weight of the liquid presses it out of the spherical form, but a curvature of the surface always shows that they still act, their resultant being what is known as the "contractile force" of liquids. The perfect spherical form of a bubble is due to this radial or contractile force. (See further under head of SOLUTION.)

2. *Change from the Liquid to the Gaseous State.*—Every liquid body is believed to be capable, at a sufficiently high temperature, of passing into the third state of matter, the gaseous or vaporous condition. The difference between substances, however, in this respect is so great that while we have bodies whose boiling-points are so low that no degree of cold ever produced could condense them into liquids, like the gases that chiefly make up the atmosphere, there are other bodies, like some of the metals, which, while convertible into liquids readily by heat, boil, or become vapors only with difficulty at the most violent heats that are producible in the laboratory. In all operations of ebullition or vaporization, as in those of fusion, certain amounts of heat-energy or motion, variable with the substance, become "latent," or are needed to keep the body in the vapor form, thus expending their force in this way, so that the change of state is itself the only, though sufficient, evidence of the existence of the force or motion thus engaged. This is called "latent" *heat of gasifaction* or *vaporization*, the word "latent" being an objectionable one, because such heat-energy is sufficiently manifested by the *work* it does in keeping the liquid in a gaseous form. *Heat of gasifaction* simply is a sufficiently comprehensive term. Thus, water, the typical liquid, kept at 212° F.—that is, so disposed as to prevent all loss through radiation, or enveloped in a medium also at 212° F.—is in a *condition of energy*, as compared with ice, represented by the sum of the 212° and the 176° of *heat of fusion* indicated above; that is, of 388°. If it be now exposed to a still higher temperature, gaseous water or steam will be evolved, and this steam will require, as *heat of gasifaction* (though its own temperature will be not one degree higher than 212°, that of the water from which it is formed), enough heat to raise its own weight of cooler water through 998° F. (or so nearly 1000° that it is usually so stated in round numbers). This same amount of heat-energy, thus required to do the work of making the steam and keeping it in the form of steam, would even heat this same steam, if already previously formed, through 2076.5°, by reason of the far lower *specific heat* of steam.

The heats of gasifaction of other liquids, so far as yet known, are never so high as in the case of water. The figures for a few of the commoner liquids, taken at random as examples, are here given, water being, as above, 998° F.:

Latent Heats of Vaporization of Liquids at their Boiling-Points: Fahr. Degrees.

Alcohol	408°	Tetrachloride of tin	117°
Ether	196°	Terchloride of phosphorus	153°
Oil of turpentine	282.5°	Wood spirit	527°
Acetic acid	216°	Fusel oil	414°
Bisulphide of carbon	189°	Acetic ether	310°
Bromine	114°	Butyric acid	239°

(See further on vaporization and ebullition under the head of STEAM.)

3. *Change from the Gaseous to the Liquid State.*—This kind of change plays very important parts in the operations of both nature and art. In nature all the liquid circulation of the earth, without which no life could be maintained, is kept up by the continual condensation to the liquid form of gaseous water from the atmosphere that has been previously vaporized by the solar heat. (See articles CLIMATE and WINDS, by PROF. ARNOLD GUYOT.) In art the operations of distillation and condensation furnish important illustrations, among which the recent stupendous expansion of the refining of mineral oils constitutes the most remarkable example. (See PETROLEUM, by PROF. CHANDLER.) The distillation of *alcohol* and of *spirits* generally, of *quicksilver*, of *coal-tar* products, of *acetic* and *nitric acids*, *ether*, *chloroform*, *bisulphide of carbon*, and many other chemical arts, may be cited as further examples of recovery of liquids from vaporous forms. (See article DISTILLATION.) Of the greatest interest to science is the obtaining of liquids from gaseous substances which are not condensable by refrigeration alone, a result which is accomplished by the application of enormous pressures. Sometimes this pressure is applied to the gas directly by means of powerful pumps, but in more frequent cases in the laboratory such liquid-condensed gases are procured by causing them to be evolved from solid compounds in one part of a closed apparatus of great strength, in another part of which they are condensed by their own force of elastic compression into liquid forms. Among the gases which have been thus condensed are *chlorine*, *cyanogen*, *ammonia*, *carbonic* and *muriatic acids*, *laughing gas*, and *olefiant gas*. Some gases, such as *air*, *carbonic oxide*, *marsh-gas*, *nitric oxide*, and *hydrogen*, refuse to liquefy at any pressure yet obtained. Some of these may nevertheless exist in liquid form at the enormous pressures that must prevail naturally in the interior parts of some rocks—*marsh-gas*, for example—possibly between the laminæ of some coal-beds, which evolve enormous volumes of it in the form of the terrible "fire-damp."

Another important mode of producing liquids from gases is by causing water or other liquids to take them up into solution. Water dissolves nearly if not quite all gaseous bodies, even those not liquefiable by cold and pressure, though these latter in very small proportion at ordinary pressures. The oxygen of the atmosphere, for example, is taken up by water in what appears but a small quantity, according to Bunsen but 3 per cent. of its volume at the normal temperature of 60° F.; yet this small proportion is of immense importance in nature. It is through this oxygen that the respiratory organs of fishes are supported. Without this oxygen also from the atmosphere, all standing fresh waters, and even many moving rivers, would quickly putrefy and poison the earth and air. This 3 per cent. of oxygen is the universal scavenger, by virtue of which alone the otherwise death-diffusing process of putrefaction is converted into one of *eremacausis*, and water thus enabled to become a purifying and life-sustaining agent. *Icy* water absorbs 4 per cent. of oxygen from the air. The manufacture of artificial mineral and aërated waters, so extensively practised at this day, is an instance of a practical application of the conversion of gases into liquid forms by combined solution and pressure.

4. *Relations of Liquids to Gravitation.*—Under this head comes the consideration of *densities* of liquids. These vary greatly, the heaviest known liquid—at normal temperature—being *quicksilver*, 13.5 times as heavy as water; and probably the lightest, the *hydruret of butyle*, C_4H_{10}, of Pelouze and Cahours, obtained from petroleum, which is only just six-tenths as heavy as water at the freezing-point of the latter. All the figures ever determined for the densities or specific gravities of all chemical compounds will be found in the invaluable publication of the Smithsonian Institution, called the *Constants of Nature*, compiled by Prof. F. W. Clarke of Cincinnati, who in this work has rendered a supreme service to science. The densities of liquids, which are inversely as their volumes, vary of course with their temperatures, and the amount of this variation of volume for each thermometric degree is called the *coefficient of dilatation*. This varies usually somewhat with the temperature, and must therefore, when required accurately, be computed from an algebraic expression, or formula of interpolation, as it is called. These formulæ are all calculated for the centigrade scale. As an example may be given the formula for the calculation of the density of water between the freezing-point and 25° C. Calling the temperature $t°$, the volume is equal to

$$1 - .000061045t° + .0000077183t°^2 - .00000003734t°^3.$$

Between 4.08° C. and the freezing-point this formula will give, instead of a continuous contraction by cooling, as above 4.08°, a negative contraction, or *positive expansion*, a peculiarity of water among liquids. On reaching 0° this expansion by cold may undergo, if the water freezes, a sudden and immense increase, as has been already explained. It is through this property of water, of expanding just before freezing, and thus *floating to the top* as a surface layer, that only the surface of water solidifies, and not its whole mass. Were it not for this, but a narrow tropical zone of the earth would be habitable, and indeed it is probable that almost all the water of the globe would in that case have accumulated at the poles as two enormous ice-caps. The temperature 4.08° C. = 39.33° F., at which the coefficient of dilatation of water by heat changes its sign from negative to positive, and which is the temperature of shallow waters under ice in winter, is generally deemed the most important fixed or *standard* point of temperature in nature, from which everything should be calculated. *Densities* are therefore referred to the density of water at this *point of maximum density*. The writer believes this an error, and that conclusive reasons exist why zero Centigrade, or 32° F., the melting-point of ice, is the real standard and initial temperature of chemical action and change in nature.

5. *Relations to Heat.*—(For *specific heats* of liquids see article upon HEAT.) *Expansion of Liquids.*—In addition to what has already been said under densities bearing upon this, it should also be remarked that *thermometers* are based upon the expansion of liquids by heat. (See articles THERMOMETRY and PYROMETRY.)

6. *Diffusion and Transpiration of Liquids.*—(For diffusion, see articles DIALYSIS and ENDOSMOSE, by PROF. CHANDLER.) *Transpiration.*—This term refers to the rates at which liquids pass through minute orifices or capillary tubes under pressure. The following principles were arrived at by Poiseuille with the same liquid: 1. The flow is directly proportional to the pressure; 2. In equal times, with tubes of equal diameters, it is inversely as the length; 3. With equal lengths it is as the fourth powers of the diameters. Heat increases the flow greatly. At 113° F. the flow of water is 2.5 times as rapid as at 41°. Alkalies all retard the flow. Other chemical subtances dissolved have important influences. The application of these investigations in physiology and to the flow of the blood through the veins is very important. It is believed also to have an important bearing in the study of molecular structure. HENRY WURTZ.

Liq'uorice, or **Licorice** [a corruption of the Gr. γλυκύρριζα, "sweet root"], the dried extract of the roots of *Glycyrrhiza glabra* and *echinata*, leguminous herbs of Southern Europe, Africa, and Asia, largely cultivated in Central Europe. The extract is a hard, black mass, containing a large percentage of an uncrystallizable sugar called glycyrrhizine. It is prepared very extensively in Spain, Italy, and Russia, and to some extent in France, England, Germany, and the U. S. It is a valuable demulcent and expectorant medicine, and is extensively employed in flavoring chewing tobacco, as well as in pharmacy as an excipient in pill-masses. The hard, woody root is also used in medicine and in porter and stout breweries. *Glycyrrhiza lepidota* of the Western States has the flavor of true liquorice, as have *Galium circæzans*, *G. lanceolatum*, etc., rubiaceous herbs of the U. S., which are used in domestic medicine and called "wild liquorice."

Li'ria, town of Spain, in the province of Valencia, in a rich and beautiful plain, which produces large quantities of wine, fruit, grain, and vegetables. Pop. 8920.

Lisaine', a small river of France, rises at the southern termination of the Vosges, flows W. of the fortress of Belfort, and enters the Savoureuse, an affluent of the Doubs, at Montbéliard. It became famous by the battle which in 1871 raged here for three days, between the Germans and the French. The German general Von Werder retreated before the French army under Bourbaki (which pushed on towards Belfort), and occupied a position to the W. of this fortress, along the Lisaine, in order to prevent the French from attacking the German troops besieging Belfort or from making an invasion into Southern Germany. Von Werder had with him about 43,000 men, 48 battalions, 30 squadrons, and 126 pieces, besides 37 heavy guns which he had taken from the siege artillery before Belfort; and with this force he held a distance of about ten miles along the left bank of the Lisaine, which commands the right bank. The villages of Héricourt, Bussurel, Montbéliard, Frahier, and others were barricaded. On Jan. 15, 1871, Bourbaki attacked the German position with 120,000 men, endeavoring to break through its centre at Bussurel. He succeeded in taking this place, and penetrated to Montbéliard, but further the French did not come, and the German line remained unbroken. A furious artillery contest took place at Héricourt and Luze. On Jan. 16, Bourbaki tried to surround the right German wing, which was rather weak, and he actually threw it back, taking the villages of Frahier and Chenebier. But the Germans took positions

farther back, and could not be surrounded. It grew dark, and Bourbaki had not reached his aim. He then attempted a night attack on the centre, but without success. On the morning of Jan. 17 the Germans attacked at Frahier and Chenebier, and the fight lasted the whole day without decision. On all the other points the French renewed the fight, but with no better result than on the previous days. Thus, Bourbaki began to retreat on the 18th, and Von Werder undertook to pursue him. The Germans had 81 officers and 1847 men wounded and dead; the French about 6000. AUGUST NIEMANN.

Lis'bon [Port. *Lisboa;* anc. *Olisipo*], capital of Portugal and residence of its king, one of the most important commercial centres and one of the most beautiful harbors on earth, with a population of 224,063 (according to the census of 1864, and including the suburbs of Belem and Olivaes), lies amphitheatrically on the northern shore of a bay, Rada de Lisboa, 4 miles broad, formed by the Tagus at its influx into the Atlantic Ocean. Built on the declivities of seven hills, with numerous white cupolas and magnificent monumental buildings towering above the mass of 43,000 houses, interspersed with lovely terraces, Lisbon offers, when approached from the sea, an aspect at once charming and imposing. The bay forms a harbor large enough to accommodate at the same time all the fleets of Europe, and so deep that the largest ships can anchor up immediately at its docks. The entrance to this harbor is defended by several forts, of which one, consisting of an interesting old Moorish tower called Torre de Belem, is situated on a sandbank in the bay. The city is 10 miles in circuit, and is divided into four quarters—Alhama, Rocio, Bairro Alto, and Alcantara—besides several extensive suburbs. The old city, especially the quarter of Alhama, has irregular, narrow, and dark streets. The newer parts, built since the great earthquake (Nov. 1, 1755), which did not reach Alhama, are more regular and beautiful, and contain many palace-like buildings. The finest part is the quarter of Rocio, extending along the river and containing many splendid buildings and open places. Among the squares, Praça do Commercio is the most remarkable, situated on the Tagus, containing in the centre the equestrian statue of Joseph I., and surrounded with magnificent buildings, the exchange, the royal library, the custom-house; also the market-place is noteworthy, and the immense place of Dom Pedro in the northern part of the quarter of Rocio, bordered on one side by the monastery of S. Domenico and the buildings formerly belonging to the Inquisition. Still farther to the N. stretches the public promenade. The most beautiful streets are Rua Augusta, which is the business-centre and contains many fine jewelry shops, Rua do Oura, and Rua da Prata. The city has 64 churches and about 200 chapels; the former monasteries, mostly magnificent buildings, situated at the most elevated points, are now used for public purposes. The monastery of Belem is perhaps the most remarkable building of the city. It was founded in 1499 by King Emanuel the Great, on the spot where Vasco da Gama had embarked two years before, and its style is a mixture of Moorish, Byzantine, Norman, and Gothic elements. The material is white limestone, which has now become yellowish like old ivory. Its decoration is exceedingly rich in sculpture; especially splendid are the carvings in Pallisander-wood, a kind of ornamentation which is of frequent occurrence in Portugal. The least beautiful part of the building is the church, whose nave is in the Italian style. The whole building is now used as a hospital for foundlings and orphans. The monastery of the Heart of Jesus is also an interesting structure, founded in 1770 and provided with a splendid cupola of white marble, an imitation of the church of St. Peter in Rome; furthermore, the church of the Patriarchs, with its gigantic cupola, situated to the N. E. of Monte do Castello; the marble church of S. Roque; the basilica of S. Maria; the church of Carmo, in Gothic style; and the church of S. Vincent de Flora, the largest of the city, and the burial-place of the dynasty of Braganza. The most remarkable palaces are the royal palace of Ajuda, the palace of Nossa Senhora das Necessidades, and the palace of Bemposta. Other noteworthy buildings are the theatre of S. Carlos; the national theatre, which was formerly the palace of the Inquisition; the arsenal, the custom-house, the corn-market, and the polytechnic school. The scientific institutions are very numerous; there are schools of every kind, an academy of science, a geographical academy, a museum of natural history, etc. The city receives its water through the Alcantara aqueduct, a truly magnificent work, constructed by Emanuel de Maya. The main stream comes from the village of Canassas, 2½ miles from Lisbon, and traverses the valley of Alcantara on thirty-five arches, of which the largest has a height of 230 feet and a diameter of 107 feet. The promenade on the top of the aqueduct offers a most beautiful view. The Gallegos (Spaniards from Galicia), who carry the water from the various fountains throughout the city, form a corporation of their own and number about 30,000. A great nuisance are the unowned dogs, which swarm through the streets to the number, it is said, of 20,000. The hilly surroundings and the mountain-region of Cintra are full of charming valleys, interesting peaks, and beautiful locations for churches, monasteries, and mansions. The industry of the city is not considerable. Gold and silver ware is manufactured; spinning and weaving establishments, iron-foundries, and manufactures of chemicals, paper, soap, and steel are in operation. But the commerce is very considerable. To all sides—E. through the Straits of Gibraltar into the Mediterranean; N. along the whole coast of Europe; S. along the western coast of Africa; and W. to the countries of America—the sea opens up to Lisbon its splendid roads of commerce. Lisbon had existed as a Roman *municipium* under the name of *Felicitas Julia;* later on it was taken by the Alanes and by the Moors. When Alfonso, at the head of the crusaders, conquered and Christianized the city, it was called Lisboa. In 1580 the duke of Alva occupied it for Philip II. of Spain, but in 1640 the Spaniards were expelled and the dynasty of Braganza ascended the throne of Portugal. Nov. 1, 1755, an earthquake destroyed the greatest part of the city and killed 30,000 persons. In 1807, during the wars of Napoleon, the French held the city for a short time, but since a long period of peace has greatly promoted its prosperity. AUGUST NIEMANN.

Lisbon, tp. of New London co., Conn., 6 miles N. of Norwich, is traversed by the Norwich and Worcester and the Hartford Providence and Fishkill R. Rs., and has important manufacturing interests. Pop. 502.

Lisbon, post-tp. of Kendall co., Ill. Pop. 1150.

Lisbon, post-v. of Allen tp., Noble co., Ind., on the Grand Rapids and Michigan R. R. Pop. 142.

Lisbon, post-v. of Franklin tp., Linn co., Ia., on the Chicago and North-western R. R., has 1 newspaper and 1 national bank.

Lisbon, post-tp. of Androscoggin co., Me., on the Androscoggin River and R. R., 8 miles from Auburn, includes the important manufacturing village of Lisbon Falls, and has 5 churches, 2 hotels, an incorporated library, a large water-power, an active trade, and manufactures of boots, shoes, lumber, woollens, cottons, etc. Pop. 2014.

Lisbon, post-v. and tp. of Howard co., Md. Pop. 2492.

Lisbon, post-tp. of Grafton co., N. H., on the Boston Concord and Montreal R. R., 105 miles by rail N. N. W. from Concord, and on the lower Ammonoosuc River, has 5 churches, a good trade, and manufactures of starch, lumber, and wooden wares. Pop. 1844.

Lisbon, post-tp. of St. Lawrence co., N. Y., on the St. Lawrence River below Ogdensburg, embraces Gallop Island in the river, and contains 9 churches and several villages. The station is on the Ogdensburg and Lake Champlain R. R., 9 miles E. of Ogdensburg. Pop. 4475.

Lisbon, tp. of Sampson co., N. C. Pop. 1389.

Lisbon, post-tp. of Bedford co., Va. Pop. 3175.

Lisbon, tp. of Juneau co., Wis. Pop. 1670.

Lisbon, tp. of Waukesha co., Wis. Pop. 1384.

Lisbon Falls. See LISBON, Me.

Lis'burn, town of Ireland, in the county of Antrim, on the Lagan, is celebrated for its manufactures of damasks and fine linen stuffs, which branch of industry was established by a settlement of Huguenots after the Revocation of the Edict of Nantes. Pop. 7484.

Lis'comb, post-tp. of Marshall co., Ia., on the Central Iowa R. R. Pop. 836.

Lisieux' [anc. *Noviomagus* or *Lexovium*], town of France, in the department of Calvados, on the Tongue, with large linen and woollen manufactures and a brisk trade in corn, hemp, and cider. Pop. 13,121.

Lisle, post-v. and tp. of Dupage co., Ill., on the Chicago Burlington and Quincy R. R., 22 miles W. of Chicago. Pop. 1270.

Lisle, post-v. and tp. of Broome co., N. Y., 23 miles N. of Binghamton, on the Syracuse and Binghamton R. R., has 2 churches, 1 weekly newspaper, a hotel, a foundry, a gun-factory, and several large stores. Pop. about 700; of tp. 2525. EUGENE DAVIS, ED. "GLEANER."

L'Islet', county of Quebec, Canada, extending from the S. bank of the St. Lawrence to the State of Maine. Area, 1220 square miles. It is traversed by the Grand Trunk Railway. Cap. St. Jean Port Joli. Pop. 13,517.

L'Islet, post-v. of L'Islet co., Quebec, Canada, on the S. shore of the St. Lawrence, and on the Grand Trunk Railway, 62 miles below Quebec, has an academy and large lumber trade, and an extensive shipyard. Pop. about 1000.

Lis′pan Springs, a v. in Bexar district, Tex. Pop. 21.

Lis pen′dens. By this expression is meant in general a rule prevailing in courts of equity that all persons are supposed to be acquainted with the fact that an action is pending, and to hold any rights acquired during its pendency in the subject which the action affects in subordination to its results. The legal maxim in its Latin form is thus more fully stated: *Pendente lite, nihil innovetur* ("While an action is pending there must be no change in the existing state of things"). By a legal fiction every one who acquires the property affected by the suit while it is pending has a "constructive" or theoretical notice of the litigation, which he cannot gainsay or deny.

The true scope of this rule has been frequently misunderstood. It has been supposed by some that it was based mainly on the idea just referred to, that every one must be understood to have knowledge of all that is transpiring in a court of justice, and accordingly to be affected by the refined ideas prevailing in courts of equity concerning constructive notice. (See Notice.) This, however, is not the real ground of the rule. The true view of it is not merely that it is notice, but that it is necessary to the correct administration of justice that a decision of the cause should be binding not only on the litigating parties, but also on those who derive title from them during the course of the action, whether with notice of the suit or not. The object of such a rule is to bring litigation to an end, to prevent new suits, and to lead the existing controversy to a close. It will be thus seen that a principle of public policy enters largely into the case. The theory of the rule is well expounded in the case of *Bellamy* v. *Sabine*, 1 De Gex and Jones's Reports (English), 566.

As would be expected from the form of the maxim, it only has application while the action is pending. After the decree has been obtained, the ends of public policy have been subserved. As long ago as the time of Lord Chancellor Hardwicke it was said, "There is no such rule in this court [equity] that a [final] decree made here shall be an implied notice to a purchaser after a cause is ended; but it is the pendency of the suit that creates the notice, for as it is a transaction in a sovereign court of justice, it is supposed all people are attentive to what passes there, and it is to prevent a greater mischief that would arise by people's purchasing a right under litigation and then in contest."

This doctrine is peculiarly applicable to litigations concerning real estate. It does not appear to have been resorted to in England to affect the title to personal property. There are some cases in the courts of this country which have extended it to that class of interests: if it is to be applied to these, it would seem clear that commercial paper and corporate stocks should be exempted from its operation. Such appears to have been the view of Chancellor Kent, for while in his judicial character he applied the rules of *lis pendens* to a contested title to a mortgage, which is not the subject of ordinary commerce, he remarked that he was not prepared to extend it to commercial paper not due. It is plain that there could be no safety in commercial dealings if it were necessary, in the rapidity with which such transactions are ordinarily and almost necessarily conducted, to inquire whether an action concerning title to the property dealt in were pending in some court of equity. The rule is a hard and harsh one in some of its aspects. It is undoubtedly beneficial in its relation to real estate, but no element of public policy can be found as a reason for extending it to commercial transactions. On these general grounds it has, in reference to stocks and notes, been rejected in the appellate courts of New York and of some other States. It should be added that a purchaser is not bound by the rule to take notice of an equitable action or suit pending in the courts of another State or country.

To alleviate the harshness of the "constructive notice" fastened upon a purchaser by force of this rule, it is common to regulate it by statute as far as real estate is concerned. The substance of the legislation is, that written notice of the pendency of the action is to be filed in a designated office, giving sufficient information of the names of the litigants, the property affected, and the object of the litigation. Constructive notice is given from the time of the filing. (Consult for further information the statutes of the respective States, and the treatises of Story, Adams, and Willard on *Equity Jurisprudence*.) T. W. Dwight.

Lis′sa, an island in the Adriatic, in lat. 43° 10′ 11″ N., lon. 33° 51′ E., between Italy and Dalmatia, and belonging to the latter. The fortifications of its two harbors —especially of that upon the E. side, near the small town of Lissa—are so strong that they almost rival those of Malta. This island was an important naval station under the Romans, a stronghold of corsairs during the Middle Ages, an emporium of contraband English merchandise during the wars of Napoleon, and has recently attracted attention from the defeat sustained here by the Italian squadron in the war of 1866. Pop. about 4000.

Lissa, town of Prussia, in the province of Posen, has large liqueur, wax, and tobacco factories, a celebrated bell-foundry, and extensive manufactures of woollen and linen stuffs. In the sixteenth century it was the chief seat of the Bohemian Brethren. Pop. 10,026.

List (Friedrich), b. Aug. 6, 1789, at Reutlingen, in Würtemberg; was appointed professor in political economy at the University of Tübingen in 1817, but gave up this position in 1819, in order to work in a more direct and practical way for the development of German industry and commerce. Having been elected a member of the diet of Würtemberg, he exposed in a petition to the government the vices of the administration, and was condemned in 1822 to ten months' imprisonment. He fled, and lived for some time in Switzerland and Alsace, but returned home in 1824, and was put in Asperg. As he declared that he wished to emigrate to America, he was pardoned after a short time, and he now settled in Pennsylvania, where he soon attracted the attention of the most prominent men by his work, *Outlines of a New System of Political Economy* (1827), in which he attacked the ideas of Adam Smith, and advocated an economical development on an exclusively national basis. Having discovered a rich deposit of anthracite on his grounds, he founded the two towns of Tamaqua and Port Clinton, and returned in 1833 to Europe in possession of an independent fortune; settled first in Hamburg, then in Leipsic, and at last in Augsburg, and began to agitate for the formation of a system of railway lines as the only suitable means of transportation. His writings, *Ueber das sächsische Eisenbahnsystem* (1833), *Ueber ein deutsches national Transportsystem* (1838), besides a large number of minor articles in the papers, were by no means without influence, but his ideas were too new and too far advanced to be fully appreciated; and as his negotiations in England for the establishment of a comprehensive commercial alliance between that country and Germany failed, he was seized with melancholy, and shot himself at Kupstein, in Tyrol, Nov. 30, 1846. (*Gesammelten Scriften*, 3 vols., 1850–51.)

Lis′ton (John), b. in London, England, 1776; was educated in Dr. Barrow's school, and became second master of St. Martin's school, whence he was expelled for taking part in stage-plays with the pupils. He then went upon the stage, and became one of the best comic actors in England during the first third of the present century. His fame is celebrated by Lamb, Hood, and all the wits of the period. His reign at the Haymarket began in 1805, at Drury Lane in 1823, and at the Olympic in 1831. He left the stage in 1837, and d. Mar. 22, 1846.—His wife (Miss Tyrer), though of almost dwarfish stature, was a favorite actress as well as singer.

Liston (Robert), F. R. S., b. at Ecclesmachan, Scotland, 1794; studied medicine in Edinburgh and London; practised at Edinburgh 1818–35; was lecturer on anatomy and surgery and surgeon to the infirmary; became professor of clinical surgery at University College, London, 1835; surgeon to the North London Hospital in 1843; examiner to the College of Surgeons 1846. D. Dec. 7, 1847. Dr. Liston was one of the ablest and most successful of operative and clinical surgeons, and wrote several able professional treatises.

Listow′ell, a v. of Perth co., Ont., Canada, on the Maitland River, is a very important trading centre, and ships large quantities of grain. It has 1 weekly and 1 monthly publication. Pop. of sub-district, 976.

Liszt (Franz), b. at Raiding, in Hungary, Oct. 22, 1811. His father, an accountant or steward of Prince Esterhazy, but of musical taste sufficient to appreciate the astonishing talent of his son, put him to the piano at six years of age. At nine he gave a concert, and so much interested certain noblemen that he was sent for instruction to Vienna. There he studied for eighteen months with Czemy and Salieri, making such progress that he gave a public concert in Vienna; emboldened by brilliant success, his father in 1823 took him to Paris; refused admission to the Conservatoire as a foreigner, he gave concerts and played before the duke of Orleans till the musical world was wild with enthusiasm. Flattery might have spoiled him had not his father held him severely to his work, compelling him, it is said, to execute daily twelve fugues of Bach, transposing them in different keys. In 1824–25 the boy achieved triumphs in the provinces and in England. At this time (1825) he composed an opera, *Le Château des Amours*, which has disappeared. Again in Paris, he took lessons in composition of Reicha. In 1827 his father died, and Franz fell into a morbid state, gave himself up to ro-

mantic fancies and religious enthusiasms, became a St. Simonian, and in 1830 composed a *Symphonie revolutionnaire*, which was never published. This condition lasted two or three years. The playing of Paganini revived his passion for art, and made him resolve to be the Paganini of the pianoforte. His labors were renewed, and his triumphs also. He astonished Europe with his mastery of the instrument and the ease with which he executed the most difficult works of Bach, Handel, Beethoven, and Weber. His gift at improvisation was as wonderful as his power of execution. As a pianist he is reputed the greatest. In 1848 he was made Kapellmeister at Weimar. Honors came thick upon him. The cities of Odenburg and Pesth presented him with the rights of citizenship; the Hungarian nobles gave him a sword of honor; the king of Prussia made him a member of the order of Merit; the faculty at Königsberg created him doctor of music; the grand duke of Saxe-Weimar appointed him chamberlain; in 1845 he was decorated with the Legion of Honor, and in 1861 was raised to the rank of commander. On Apr. 25, 1865, Liszt received the clerical tonsure in the chapel of the Vatican, and is now an *abbé*. His devotion to the Church is entire; in 1869 it was reported that he had presented to the pope 20,000 francs, the proceeds of a concert at Ratisbon. His art is now consecrated to religion. Grand masses of his composition, of the modern rather than of the ancient style, have been performed in the churches of France, Germany, and Hungary. Liszt was an admirer, patron, and friend of Richard Wagner, to whom he gave one of his two daughters in marriage; the other, wife of Émile Ollivier, is dead. The works of the artist consist of *Fantasias, Poemes Symphoniques* (12 in number), *Faust*, and the *Divina Commedia*, grand symphonies, two oratorios, *Die Heilige Elizabeth* and *Christus*, and *variations* innumerable. He is a writer as well as a musician, and in the department of literature as well as of art. In the *Gazette Musicale* he carried on a controversy with Thalberg; in 1852–54 published a *Life* of Chopin and essays on the *Tannhäuser* and *Lohengrin* of Wagner; in 1859 a dissertation on *Bohemians and their Music in Hungary*. Though a facile composer, Liszt has preferred playing other music than his own at concerts. He is a man of ardent impulses and lavish generosity. His instrumental music has more tumult than grace, more force and noise than delicacy, and often only the mastery of instrumentation saves it from the reproach of being grotesque and fantastical. His vocal compositions have little reputation. For several years Liszt resided in Rome, but since 1871 his home has been at Pesth, in his native land, where he enjoys a pension of £600 a year and a noble position.

O. B. FROTHINGHAM.

Lit'aker, tp. of Rowan co., N. C. Pop. 1508.

Lit'any [Gr. λιτανεία, "supplication"], in the liturgical services of the Christian churches a name applied to various supplicatory acts addressed to God or to the saints, or both, but applied especially to solemn prayers in which the people take responsive parts. The principal litany of the Roman Catholic Church is the Litany of the Saints; the Anglican churches have a service called the Litany and Suffrages; the Lutherans and some other Protestants have litanies. On some occasions the Greeks and Roman Catholics and some Anglican parishes intone the Litany during a procession of the people.

Litch'field, the north-westernmost county of Connecticut. Area, 900 square miles. It is broken by the Green and Taconic mountain-ranges, here represented by hills, among which are the highest points in the State. The valleys afford very fine pasturage, and are generally fertile. Dairy products, live-stock, wool, grain, and tobacco are the staples. Carriages, flour, lumber, iron, metallic wares, agricultural tools, hardware, clothing, leather, cutlery, and edge tools are extensively manufactured. The Housatonic, the Naugatuck, and other streams afford abundant water-power. Iron ore is extensively mined. The county is traversed by the Connecticut Western, the Naugatuck, and the Housatonic R. Rs. Cap. Litchfield. Pop. 48,727.

Litchfield, post-v. and tp., cap. of Litchfield co., Conn., on the Naugatuck R. R., 30 miles W. of Hartford, between the Naugatuck and Shepaug rivers, is situated on high ground near a beautiful lake, the outlet of which affords excellent water-power. The town contains five post-villages—Bantam Falls, East Litchfield, Litchfield, Milton, and Northfield. The central village is the northern terminus of the Shepaug R. R., has the county buildings, 4 churches, 3 hotels, 2 banks, 2 weekly newspapers, several schools, a private lunatic asylum, paper-mill, oil-mill, satinet-factory, and furnaces for smelting and refining nickel ores, which are found in the vicinity. The scenery in the vicinity is eminently picturesque, and the village is shaded with ancient elms. It was from 1784 to 1838 the seat of the most celebrated law-school in America, founded by Judge Tapping Reeve, and conducted after his death (1823) by his associate, Judge James Gould, by whose name it was generally known during its later existence. It was also the seat of the first ladies' seminary in America. Litchfield has two parks, one of which contains a fine soldiers' monument. Pop. of tp. 3113.

Litchfield, city and tp. of Montgomery co., Ill., 47 miles N. E. of St. Louis, Mo., and 42 miles due S. of Springfield, at the intersection of the Indianapolis and St. Louis and the Toledo Wabash and Western R. Rs., on the western edge of the Shoal Creek basin, has 6 churches, 2 banks, 2 weekly newspapers, 2 hotels, 3 flouring-mills, 3 grain-elevators, a foundry and machine-shop, extensive car manufactory and repair-shop, a coal-mine, an Ursuline convent, flourishing public schools, and a Holly system of waterworks. It derives its prosperity from its manufactures, its production of coal, and large grain-trade. Founded 1854, incorporated 1859. Pop. of city, 3852; of tp., exclusive of city, 1746. H. A. COOLIDGE, ED. "MONITOR."

Litchfield, post-v., cap. of Grayson co., Ky., on the Elizabethtown and Paducah R. R. Pop. 314.

Litchfield, post-tp. of Kennebec co., Me., 14 miles S. W. of Augusta, has 4 churches, an academy, and manufactures of farming tools, bricks, carriages, etc. Pop. 1506.

Litchfield, post-tp. of Hillsdale co., Mich., has 1 newspaper. Pop. 1946.

Litchfield, post-v. and tp., cap. of Meeker co., Minn., 78 miles W. of St. Paul, on the main line of the St. Paul and Pacific R. R., has 5 churches, 1 weekly newspaper, 3 hotels, 1 bank, a steam flouring-mill, a furniture-factory, good schools, and a U. S. land-office. The village is only four years old, is rapidly growing, has fine water-power, and is the centre of a rich, well watered, and wooded agricultural district, noted for fine stock. Pop. of v. 353; of tp. 841. FRANK DAGGETT, ED. "NEWS-LEDGER."

Litchfield, tp. of Hillsborough co., N. H., on the E. bank of the Merrimack River, 14 miles below Manchester. Pop. 345.

Litchfield, post-tp. of Herkimer co., N. Y., has several mineral springs, of which the Columbian Springs are best known. Pop. 1384.

Litchfield, post-tp. of Medina co., O. Pop. 860.

Litchfield, post-tp. of Bradford co., Pa. Pop. 1256.

Li'tchi, or **Li'chi** (*Nephelium litchi*), a fruit of the family SAPINDACEÆ (which see), found only in China and Cochin China. It grows in clusters upon a small tree resembling a horse-chestnut, is globular, about an inch and a half in diameter, and contains a sweet edible pulp with the arillus enclosing the solitary seed. This fruit is highly valued by the Chinese, who dry it for preservation, in which form it is often found in the stores in small quantities. The *longan* and *rambutan*, fruits much prized in China, but not exported or found elsewhere, are of the same family.

Lit'erary Prop'erty. This is a general expression used to set forth the ownership which an author has in his works, without reference to the point whether he claims it under a copyright or not. It accordingly includes the ownership of unpublished or manuscript works, letters, and, by analogy, pictures and statues. Inventions adapted to some practical use are not embraced in this article under this head. (See PATENTS. For the invention of a designation of property which may itself become the subject of ownership, see TRADE-MARKS.) A convenient arrangement is to treat the subject of "literary property" under two principal divisions: I. Rules of the common law as to ownership in unpublished manuscripts and subjects of a kindred nature; II. Statutory rights (or copyright).

I. It cannot be successfully disputed that if a person composes a literary work, and does not choose to publish it, he has as complete an ownership in it as if he had produced a watch or other chattel. Conceding that he has no vested right simply in his ideas, he does have a title to them considered in reference to the outward form in which they are clothed. Accordingly, the regular legal remedies for the violation of rights of property would be applicable, and the usual incidents of property would attach. Still, for special reasons, unpublished writings cannot be taken by creditors in payment of debts. (*Bartlett* v. *Crittenden*, 5 McLean, 32.) A decree of Louis XV. of France of May 21, 1749, in favor of the French tragic poet, Crebillon (the produce of whose play while acting at the theatre was taken for his debts), declaring that the productions of the mind are not among effects seizable by creditors, is noticed by the elder Disraeli as a high honor to literature. (*Curiosities of Literature*, ii. 192.) An owner of this kind of property can sell it or dispose of it by will, or it may pass

to his representatives at his death in the ordinary course of succession. The effect of the act of addressing a letter by an author to a correspondent has been frequently considered by courts of justice. The result of the discussions is, that while the author parts with the paper on which the letter is written, he still retains an ownership in the sentiments and expressions. By this divided ownership the receiver is entitled to the letter considered as an autograph, while if he publishes the contents he may be pursued by an action in court. The ownership of the receiver is corporeal, that of the author is incorporeal. The same result would happen if one should address in writing a poem or other literary work to a friend. A distinction between the ownership of the paper and of the poem would immediately spring up. Some jurists have confined the applicability of this rule to letters having a literary character. It is, however, believed that this distinction is not maintainable, and that in general a letter cannot be published by its receiver or any other person without the consent of the author, unless it may be to vindicate the receiver's character or to subserve the ends of public justice.

One of the most important instances, in the practical administration of justice, of this form of literary property is an unpublished play. A composer of such a work may keep it absolutely to himself, and make it as completely his own as any other species of property. So he may by appropriate acts cause it to become common property and wholly abandon ownership. In such a case he is said to "dedicate" it to the public. The act of dedication must be distinct and unequivocal, and cannot be presumed from the fact that he permits it to be exhibited on the stage in the ordinary manner. The most that can be claimed from such an exhibition is, that any person having the right to attend upon it may carry away with him as much as he is able from his unassisted memory, and may thus by means of his memory reproduce the play upon the stage. As to the last branch of this proposition, even, there would seem to be some doubt, since it may be plausibly maintained that all that the author intends to concede to the hearer is the right to the personal enjoyment or instruction of the occasion. However this may be, it is clear that there is no implied license to the audience to take notes, and by this means obtain sufficient knowledge of the play to represent it. If an actor becomes himself the author of a play, his performance of it in public, or that of a theatrical company, with his consent, for a compensation, cannot be regarded as any evidence of his abandonment of the manuscript to the public or to the profession of actors. Such a special use of an unpublished work for the author's benefit is perfectly consistent with the continuance of an ownership in it.

Rights of this kind appertain to aliens as well as citizens, having nothing to do with the statutes of copyright, and are accordingly of great consequence to foreign and non-resident authors, who, being unable by our laws to acquire a statutory copyright in their works, may still, by virtue of their ownership of an unpublished play, maintain an exclusive right to represent it upon the stage. Similar suggestions may be made as to lectures, whether written or oral. The act of delivering them before an audience confers no right upon the hearers to put copies of them on sale without the author's consent. Property in lectures is protected in England by a special statute (5 and 6 Will. IV. c. 65). The author in this country must rely upon general principles of law, and may resort to an injunction or action for damages. So the exhibition of a statue or a picture gives no license to a spectator to multiply copies and place them upon sale. These rules do not admit of evasion by the unauthorized production of abridgments of manuscripts or copies of works of art reduced in size.

Notwithstanding what has been said, it is clear that an author of a manuscript, etc. may absolutely lose all proprietary right in it by unequivocal acts of dedication to the public; as, *e. g.*, by placing printed copies of it on sale without obtaining copyright, or by obtaining a copyright in a foreign country and selling the work there.

Literary property may, in the stage of ownership now under consideration, be assigned, so that a distinction will spring up between an author and a mere proprietor. The sale of a manuscript will in general give the purchaser all the rights which the author of it, considered as an owner of an unpublished work, would possess. Whether he could take out a copyright or not could not be determined as a mere matter of reasoning, but would depend on the special provisions of the copyright statutes.

A question of some difficulty has arisen as to the point whether any legal protection can be given to a literary unpublished work which is unsound on the score of morality or contains doctrines subversive of public policy. This question must not be confounded with one which may arise under copyright statutes, as the considerations in the two cases are quite different. In the latter case there is sometimes a distinct provision that the copyright shall not protect an immoral or libellous publication. As to the case of a manuscript, it would appear that the following distinction should be made: no protection should be given to the author by the courts which would enable him to make his immoral work the source of gain or profit. On the other hand, if he simply desires to retain his right of property—*e. g.* to prevent others from publishing it altogether, as well as to refrain himself—every consideration of justice and expediency requires that he should be permitted to do so. Suppose that a person while in the immaturity of his powers composes a work extravagant or immoral in its views of the rights of society or of individuals, but that in later life his opinions are changed, and he comes to view with abhorrence doctrines that he once warmly approved, and he finds that some person against his consent has obtained possession of his manuscript and is about to publish it; shall he be prevented by law from suppressing such a publication? Great jurists have answered this question in the affirmative, on the theory that there *can be no property* whatever in such a manuscript. Their reasoning is unsatisfactory and inconclusive, and the true view would seem to be that the author is still the owner of the work, considered merely as an item of property, but cannot invoke the aid of the courts to enable him to make profit from that which is inherently vile and base.

The remedies for the violation of the proprietary rights of an author being given by the common law, may be sought in the State courts, notwithstanding a U. S. statute allows an action against a person who publishes a manuscript without the consent of the author or proprietor, such author, etc. being a citizen of the U. S. or a resident therein. It will be observed that the terms of this statute are not so comprehensive as the rule of the common law, as it confines the remedy to a "citizen or resident," and it appears to have been enacted for the benefit of those persons only who are entitled to the statutory copyright. Remedies, so far as this act extends, are cumulative, and may be sought either in the U. S. or State courts.

II. *Statutory Copyright.*—By this term is meant an exclusive right given by statutory law to an author or proprietor to multiply copies of his work and place them on sale, and in the case of a play the additional exclusive right of representation on the stage. Without this statutory protection the act of publication would be regarded by the courts as a dedication of the work to the public, and accordingly destructive of the author's right of property. The policy of the copyright law is to give the author, etc. protection in the sale of his work for a specified period, and then to throw its publication open to all. This theory is marked out in the U. S. Constitution, which gives power to Congress to secure to authors the exclusive right to their works for "limited times." The whole subject is under the control of Congress, and any legislation of a State affecting copyright would be inoperative and void. The result is, that if an author does not choose to publish his right to his manuscript is perpetual, and may be vindicated in courts of law on general principles of justice; if he prefers to publish, he brings himself within the purview of the law of Congress, must have his right only for such time as the statute prescribes, and must seek his remedies exclusively in the U. S. courts.

In general, any thing may be copyrighted which is the subject of literary ownership. More specifically, the term "copyright," as used in the existing enactments of Congress, applies to books, maps, charts, dramatic or musical compositions, engravings, cuts, prints, photographs and their negatives, paintings, drawings, chromos, statues, statuary, and models or designs intended to be perfected as works of the fine arts. The words "engraving," "cut," or "print," as here used, are to be applied only to works connected with the fine arts or to pictorial illustrations, and are not to be extended to prints or labels designed to be used for other articles of manufacture. These last may be registered in the patent office. In determining whether one of the above-named subjects can in a particular case be copyrighted, it is necessary to consider how far it must be original with the professed author. There are some compositions of such a high and elevated character that the question of originality cannot be successfully raised. It is conceded by all mankind. On the other hand, that there are other works of a much humbler sort, but still of a highly meritorious and useful nature, in which all the materials are existing in literature, and are well known to intelligent men, and open for resort to any one, and the only original feature is found in the selection, arrangement, or combination of materials. Instances of this kind are works on grammar, arithmetic, or geography, maps, charts, etc. etc. These, so far as they are the result of the work of the compiler or "author," are the subjects of copyright. He has no claim, however, to the materials which he did not originate. Any

other person may resort to them and prepare a work from them, but he must not make use of the copyrighted book as a mode of collecting his materials. His correct course is to resort to the original sources of information. An illustration of these principles may be found in the case of a law reporter. He can have no copyright in the opinions of the judges, as of these he is not the *author*, while he might lay claim to a statement of the facts of the case, as well as to an abstract of the decision prepared by himself. A translator of a foreign work not the subject of a copyright here may have a copyright, as he is for practical purposes an "author." Any other person may translate the same work, and have himself a copyright. It was even held under the former law that a person might have a copyright in the translation of a work copyrighted here, though such translation were made without the author's consent. This rule was applied to an unauthorized translation into German of Mrs. Beecher Stowe's well-known work, *Uncle Tom's Cabin*. This anomaly has been corrected by a recent change in the law which permits an author in taking out a copyright to reserve the right of translation as well as of dramatization of his own works. So in the case of music, the composition of a new air or melody is sufficiently original, but it must be substantially a new work, and not a copy of a piece already in existence, with only such variations as any skilful composer can make. Under these rules there can be no copyright in a subject, but only in a particular mode of treating it. For example, one cannot obtain in this way an exclusive right to make maps of the city of New York, though he might acquire one in the results of his own labors and surveys. Any other person may make a like map from his own independent labors and surveys.

The word "book," as used in this class of laws, has a wide meaning. It is not restricted to volumes, but may include a single sheet. It has even been decided that for this purpose a sheet of paper containing diagrams representing a system of taking measures for and cutting ladies' dresses, with instructions for practical use, is a "book." There can be no copyright in a mere title as unconnected with a book. Where, however, a title is used to designate a work, particularly a periodical, it may become of great value, which will be administered by the courts under the law applicable to the "good-will" of trade in analogy to the rules appertaining to "trade-marks." (See TRADE-MARKS.)

There is a peculiarity to be noticed in the case of a copyright of a dramatic composition. In this case it is not merely an exclusive right to multiply copies for sale, but also to publicly perform or represent the play upon the stage. The term "dramatic composition," as thus used, includes all the parts which go to make up a scene in a theatrical representation; *e. g.* gestures, spoken words, etc. A character in a play who, according to the part assigned to him, goes through with a series of events without speaking, making use of motions and gestures, is as much an actor as one who uses his voice, and the one part must be regarded as embraced within the expression "dramatic composition" as well as the other. The only difference in the two parts is, that the one addresses the eye, and the other the ear of the spectator.

Under the existing law of the U. S. an author is not entitled to a copyright here unless he is a citizen of the U. S. or a resident. The same rule is extended to a proprietor, though a citizen, etc., who acquires the title of a foreign and "non-resident" author. In order to be a resident within the meaning of the statute, the foreign author must have formed an intention, at the time of recording in the proper office the title of his work, to make this country his permanent home. If an author entitled to a copyright dies before taking the benefit of the statute, his representatives are placed in his position. So an assignee of a manuscript has a right equivalent to that of the author.

The property in a copyright is of an incorporeal nature. It cannot, for example, be seized by a sheriff in the exercise of his common-law powers and sold on an execution. (See EXECUTION.) Should the sheriff, for instance, sell in this way a copperplate on which a copyrighted map was engraved, the purchaser would only acquire a title to the copperplate considered as a corporeal thing, with no right to print maps from it. The incorporeal right to publish maps could only be obtained in such a case through the action of a court of equity. It should, however, be remarked that under the existing bankrupt law a copyright passes to the assignee in bankruptcy as part of the debtor's assets.

An applicant for a copyright in this country must before publication deposit in the mail a printed copy of the title of the book, etc., or a description of the painting, drawing, etc., addressed to the librarian of Congress at Washington, and within ten days from the publication must also deposit two copies of the book itself, or in case of a painting, drawing, etc., a photograph of the same. Without these deposits the author or proprietor is not entitled to the copyright. A subsequent section of the law provides under a penalty that two copies of the *best* edition must be supplied, and that when any substantial change is made in a subsequent edition a copy of that must also be deposited. It is made by law the duty of the librarian of Congress, on payment of a fee, to make up and register as prescribed by law a formal statement (termed a "record") of the name of the book and the fact of the required deposit. No action can be maintained by a proprietor against an infringer unless the former has caused to be printed on the title-page or succeeding page of each copy of a book, or on the face of a map or photograph, a statement in a form prescribed by law of the fact of the entry in the librarian's office. The following brief statement may be used as an equivalent: "Copyrighted 18— by A. B." The regulations on this subject were much simplified by an act of Congress in 1870, the former law having required the record to be made in the district court of the U. S. of the district of the author's or proprietor's residence. A single office under the present law takes the place of a large number under the former system.

The term for which the copyright is granted in the first instance is twenty-eight years. If the author be then living, or be dead leaving a widow or children then living, there may be a renewal on complying with certain prescribed rules, for fourteen additional years. A copyright may be assigned by an instrument in writing. The assignment should be recorded within sixty days after its execution, or it will be void as against a subsequent assignee or mortgagee for a valuable consideration without notice. A simple assignment of an existing copyright does not carry with it the right of renewal.

The leading questions in the law of copyright concern infringement. The fact that a copyright is of an exclusive nature necessarily gives the proprietor a cause of action against one who infringes his right by placing copies on sale or reproducing on the stage his "dramatic composition." Infringement is a very plain matter when the copyrighted work is simply reproduced. It becomes a complicated and difficult question when only extracts or quotations are made, or when resort is had to the book to make the public acquainted with its contents or to criticise its style or the substance of its thought. It has long been established that the identity of a literary work consists in its ideas and its language. The thought is so associated with the form in which it is expressed that a copyright does not protect an author against the use of his thoughts in a substantially different form. It is for this reason that by general rules of law the unauthorized translation into another language or the dramatization of a copyrighted work is no infringement. Though the sentiment remains, the form is changed. On similar grounds a true abridgment, though made against the author's consent, is no infringement. This consists in a condensation of the author's language, and is substantially a different work. Where there is no such change it is an abuse of language to call the new work an "abridgment." The law as above stated has recently been modified by the express statutory provision, before referred to, allowing an author, if he see fit, to reserve the right of translation or dramatization. Dismissing these special cases of change of form from further consideration, it remains to inquire how far extracts or quotations may be made. When, for example, such quotations are made for the purpose of a review, the main inquiry is whether the act is a reasonable one as calculated to show the character of the original work. The critic must not go so far as to substantially publish the copyrighted work. The question thus becomes one of the *value* of the extracts made. This must be determined by the facts of each case. It has sometimes been thought that the true inquiry was whether there was an *intent* to infringe or steal. This is not satisfactory. The real point is, Has the author sustained substantial injury? The same general rule must be applied to other cases where extracts are made. There is a marked distinction in this branch of the law between a true abridgment and a compilation. In the former, as has been seen, there is a real and substantial condensation of the materials, and this has been made with intellectual labor and judgment. In a compilation there is the act of taking the very words of the author, or with such slight changes as to show servile imitation. The law at most tolerates the condensation, and does not permit the copying of the author's words to such an extent as to do him substantial injury. Compilation is to some extent permitted in dictionaries, gazetteers, cyclopædias, guidebooks, etc., where the main design and execution of the work are novel. In works of this class the materials must to a considerable extent be the same. Novelty and improvement in them in general consists in abridgment, changes in arrangement, more modern information, the correction of errors, etc. etc. It is scarcely necessary to add that an infringement may take place by

publishing but a small portion of a work, if that be a vital part and cause a substantial injury to the proprietor.

The remedies for the violation of a copyright are, as has been shown, to be sought in the Federal courts, the circuit court under the acts of Congress having original jurisdiction. An appeal may be taken to the Supreme Court without reference to the amount in controversy. The regular remedies are an action for damages or an injunction from a court of equity preventing the continuance of the acts of infringement. As incidental to this relief, the court may direct an account to be taken of the profits realized by the infringer. The courts will not grant relief for an infringement in case the work copyrighted is immoral or libellous. This is expressly provided by the act of Congress, and the same doctrine without such a provision would be administered as a regular branch of equity jurisprudence. Where an infringement consists in making use of part of a copyrighted work in connection with other matter, the injunction will be so granted as to prevent the publication of that portion of the infringer's book which is open to objection, without reference to the fact that the order of the court may make the book, thus shorn of a portion of its contents, valueless. Severe penalties and forfeitures are also imposed by statute law upon persons who knowingly violate the provisions of the copyright acts. (For details the statutes should be consulted.)

Legislation upon the subject of copyright is found, in general, in European countries. It would swell this article beyond reasonable limits to state the rules prevailing there. As to England, reference may be made to the statutes of 8 Anne, c. 19, to 54 Geo. III. c. 36, and to 5 and 6 Vict. c. 45. In France this branch of the law is founded on the republican decree of July 19, 1793, and on the imperial decree of Feb. 5, 1810. The German confederation, by a decree of June 19, 1845, gave protection to literary property in general, and by a still earlier regulation (Aug. 22, 1841) prevented for a limited time the performance of musical compositions and the representation of dramatic pieces against the authors' consent.

It will have been observed that under our laws no copyright is granted to an author unless he be a citizen of the U.S. or a resident therein. Much complaint has been made of the injustice and inexpediency of this rule. As early as in the year 1838 an offer was made by the English Parliament to give the benefit of international copyright to authors in foreign countries whose governments would accord a similar right to English authors. Conventions have, under the terms of this statute, been made by England with a number of nations. The liberal disposition shown by England has not been reciprocated in this country. As the law now stands, an American author is more favored by English legislation than an English author by ours. Under the construction given by the English courts to their copyright acts, an American author who at the time of first publication of his work is within the British dominions, and publishes there, is entitled to their protection. No residence of an American author is necessary. His simple presence at some point within the British dominions is enough to give him protection throughout their entire range. While this rule requires that there must be no prior publication of the work beyond English limits, it will not be infringed if the publication at home and abroad takes place on one and the same day, nor will a fraction of a day be regarded. Some leading English jurists have gone still further, holding that protection is awarded by the law to a foreign author who makes his publication first in England, even though he does not go through the form of being actually present there, or in some part of the British dominions, at the time of publication. Such a narrow distinction seems useless and inconvenient, and the high example set by England would be still more beneficial if the broad doctrine could be enunciated that every author, no matter where he might reside or might happen to be, who published his work in England, either at or before the time of publication elsewhere, should be entitled to a copyright. (The leading decisions bearing upon this point are *Jeffreys* v. *Boosey*, 4 House of Lords' Cases, 815, A. D. 1854; *Routledge* v. *Low*, Law Reports, 3 House of Lords' Cases (English and Irish Appeals), 100, A. D. 1868; and *Low* v. *Ward*, Law Reports, 6 Equity, 415.) It is much to be desired that mutual arrangements may soon be made between the various nations whereby the subject of international copyright may be placed on a substantial foundation. The inherent justice of an author's claim should have universal acknowledgment, while at the same time due safeguards should be provided for the protection of society. No wiser scheme can be adopted than that which has met with general acceptance in the local law of the respective civilized nations. This is, to give an author an exclusive right for a limited time, and then make the work public. The next step forward is to have this local rule become one of general recognition, and have it take its place among settled and approved doctrines of private international law. The class interests of a portion of the community should not be allowed to stand in the way of this great act of justice, as well as of the highest and most far-sighted expediency.

Reference for further information may be made to Maugham *On Literary Property;* Shortt's *Law of Works relating to Literature and Art;* Curtis *On Copyright;* Law's *Digests of the Law of Patents and Copyrights;* Morgan's *Law of Literature* (1875); to the decisions of the Federal courts, and to Abbott's *Nat. Digest* and Brightly's do. (For the statutes of copyright see the *Revised Statutes of the U. S.*, § 4948–71, both inclusive.) T. W. Dwight.

Litharge. See Lead, by Prof. Henry Wurtz.

Lith'gow (William), b. in Lanark, Scotland, in 1583; traversed on foot Central Europe, Italy, Greece, and the Turkish empire, including Egypt and Palestine, whence he brought a collection of relics for James I. and his queen; visited in a second tour the northern states of Africa, returning through Hungary and Poland; and set out in 1619 upon a third journey, bearing royal letters addressed to all kings, princes, and potentates he might encounter. Arrested at Malaga on suspicion of being a spy, he was subjected to frightful torture; obtained his liberty with great difficulty through the British consul, and returning to England, was presented at court reclining on a feather bed. He published a volume of *Adventures* (1614) and a *History of the Siege of Breda* (1637). D. at Lanark in 1640.

Lith'ic Ac'id Diath'esis, a name given to that condition of the general system which favors the production of lithic acid or its salts in the urine. It has been, and still is by many, regarded as a peculiar diseased state in which the acid or its salts are produced in the blood, and separated therefrom by the kidneys; but those taking an opposite view—and we think this class embraces by far the majority of intelligent physicians—hold that the salts are formed in the urine, either in the pelvis of the kidney or the bladder, but *always* after it has been excreted; also, that the peculiar condition of the system favoring it is one of mal-assimilation. Lithic or uric acid occurs in the urine as small crystals of an amber color, varying in diameter from $\frac{1}{5000}$th to $\frac{1}{100}$th of an inch; they are usually either lozenge or drum shaped. It may also exist in combination with ammonia, soda, or lime, forming the urates of those bases. The urates form the sediment generally found in the urine in nearly all acute inflammations, fevers, gout, rheumatism, diseases of the liver, etc., and they indicate a highly acid condition of the fluid, by which they are precipitated from those substances which should hold them in solution. When deposited in any part of the urinary tract they may form into gravel or stone, and thus give rise to serious trouble. The treatment of the lithic acid diathesis should be directed to a correction of that condition of the general economy which has given rise to it. It is not a disease, but merely a symptom, showing that the aliment has not been properly distributed, and in four cases out of five we must look to abuses at the table for the source of the trouble. The practice of treating this condition by the administration of alkalies is now altogether out of vogue. Edward J. Bermingham.

Lith'ium and Lith'ia [Gr. λίθος, "stone"]. The alkali lithia, which is the oxide of the metal lithium, was discovered by Arfvedson in the laboratory of Berzelius in the year 1817, and in the mineral called *petalite.* It is now known to occur in *lepidolite, spodumene, amblygonite, triphylite,* some *tourmalines,* and other mineral species, and to be a frequent constituent, in small proportions, of mineral waters. The mineral amblygonite, which occurs at Hebron and Paris in Maine, contains more lithia than any other mineral—over 9 per cent. Spodumene, however, which contains some 5 per cent. of lithia, is a much more plentiful mineral, and has a number of American localities. Norwich, Mass., is one place among several where this is abundant; and this mineral might be made a considerable source of lithia in this country for medicinal and other uses. The elemental metal lithium was first obtained by electrolysis of the fused chloride by Bunsen. It is a silver-white metal, somewhat softer than lead, and lighter than any other known solid body, having a density of only .5835; so that it floats even on petroleum and naphtha. It has also the smallest equivalent weight of any element except hydrogen, this weight being only 7. *Hydrate of lithia,* corresponding to the hydrates of potash and soda, is a strongly caustic alkaline body like these, but is not deliquescent in the air, nor is it volatile at intense heats. It is obtained by igniting spodumene or other lithia-silicate in admixture with twice its weight of quicklime, dissolving in muriatic acid, adding sulphuric acid to precipitate most of the lime, then ammonia and oxalate of ammonia to throw down the rest, evaporating, igniting, redissolving out the sulphate of

lithia, and decomposing this with a solution of baryta, which throws down the sulphuric acid and leaves in solution hydrate of lithia. The smallest traces of lithia are detectable by means of the spectroscope, which gives with pure lithia a spectrum consisting entirely of two lines—one a brilliant intense crimson, and the other a faint yellow. Lithia imparts to flame this beautiful crimson tint, and, were it cheap enough, would be a valuable agent in fireworks. An interesting practical application of the characteristic flame-color of lithia has been made of late years. In cases of suspicion that a well or cistern is being poisoned by percolation from a privy or drain, as happens often, a little lithia may be put into the supposed source of contamination. In case of percolation it will soon be easily detectable with the spectroscope, with chemical certainty, in the water of the well. *Chloride of lithium*, corresponding to common salt, the chloride of sodium, is easily prepared. It crystallizes in regular octahedra, which taste like common salt. It is, however, deliquescent, unlike the chlorides of sodium and potassium, and is more soluble than these. *Carbonate of lithia* is peculiar, as compared with the corresponding sodic and potassic carbonates, in being sparingly soluble in water, requiring a thousand times its weight of the latter. *Phosphate of lithia* likewise is but little soluble in water.

Cæsium and Rubidium.—When the spectroscope had been perfected by the illustrious Bunsen, one of its first achievements was the immediate discovery of two new alkali-metals, which occur in nature in minute quantities, generally associated with lithium. These are *cæsium* and *rubidium*. (See Cæsium, by Prof. Chandler.) The best source yet discovered of these two very rare and curious metals is the American lithium-locality, Hebron in Maine, where a variety of lepidolite or lithia-mica occurs which contains considerable cæsium and rubidium. Profs. Allen and Johnson of Yale College have made some admirable investigations of these metals from this source. Henry Wurtz.

Lith'ium, Medicinal Uses of. *Lithium carbonate* and *citrate* are sometimes used in medicine as alkalies, and have been specially recommended in gout, because of their forming an easily soluble salt with uric acid. But their advantage over the alkaline potassium preparations for this purpose is perhaps not fully assured. The citrate is preferable to the carbonate, medicinally, from being more soluble and less disagreeable to the taste. Edward Curtis.

Lithod'omus [Gr. λιθοδόμος, "building with stone"], a genus of stone-boring mollusks belonging to the family Mytilidæ or mussels. The type of the genus is the *Mytilus lithophagus* of Linnæus. The genus is recognized from the Jurassic formations upward.

Lithog'raphy [Gr. λίθος, "a stone," and γράφειν, to "write"] is, as the name implies, the art of writing or drawing upon stone for the purpose of reproduction through the press. When stone is employed simply as a substitute for metallic plates, upon which to produce etchings, the process does not essentially differ from Engraving (which see), of which it is a branch, and does not present any considerable advantage. Another process, more analogous to modern lithography, was invented as early as 1728 by Dufay, a member of the French Academy. As described by him, it consisted in executing a drawing with varnish upon stone, and employing an acid to eat down the unprotected parts, thus leaving the lines in relief. A process identical in principle was accidentally rediscovered at Munich in 1796 by Alois Senefelder, and by the application of a chemical principle became the germ of the modern art. Senefelder was a young dramatic author, who, being too poor to print his plays, conceived the idea of engraving them himself on the calcareous limestone which abounds in Bavaria. Not knowing the composition of the ordinary covering-varnish used by engravers, he devised as a rude substitute a compound of 3 parts of wax with 1 of soap, adding a small quantity of lampblack as coloring-matter. In a work published many years later (*Course of Lithography*, London, 1819) Senefelder thus related the curious incident which at this stage of his preparations supplied him with the key to a useful discovery: "I had just succeeded in my little laboratory in polishing a stone plate which I intended to cover with etching-ground to continue my exercise in writing backward, when my mother entered the room and desired me to write her a bill for the washerwoman, who was waiting for the linen. I happened not to have even the smallest slip of paper at hand, as my little stock of paper had been entirely exhausted by taking proof impressions from the stones, nor was there even a drop of ink in the inkstand. As the matter would not admit of delay, and we had nobody in the house to send for a supply of the deficient materials, I resolved to write the list with my ink prepared with wax, soap, and lampblack on the stone, which I had just polished, and from which I could copy it at leisure. Some time after this I was just going to wipe this writing from the stone when the idea all at once struck me to try what would be the effect of such a writing with my prepared ink if I were to bite in the stone with aquafortis. I at once hastened to put this idea in execution, and mixing 1 part of aquafortis and 10 parts of water, which I left standing five minutes on it, I found the work elevated the one-twentieth part of an inch. I now found that I could charge the lines with printing ink and take a number of impressions." Thus far, Senefelder had but repeated the experiment described by Dufay seventy years before, and employed upon copper plate by William Blake, the English painter and poet, in 1788. It was not until two years later that his increased knowledge enabled him to utilize in behalf of his process the ancient feud subsisting between oil and water. Thus perfected, the art of lithography depends upon three principles—the absorbent affinity of calcareous stone to water, its adhesive affinity to resinous and oily substances, and the chemical affinity of those substances to each other, combined with their repulsion of water. Hence, a drawing made upon a polished stone surface with a resinous or oily crayon or ink adheres so firmly thereto as to be irremovable except by mechanical means, and while water poured thereon is absorbed by the remaining parts of the stone, it is repelled by the crayon. When upon a surface thus prepared a colored oily or resinous substance is applied, it adheres by chemical affinity to the drawing, and not to the moist stone. In practice, a solution of vitriolic, nitric, or muriatic acid is first poured upon the stone, to neutralize the alkali of the crayon (technically called "chalk"), harden it, and also to slightly eat away the unprotected surface, preparing it to absorb more freely a weak gum-water in which it is next submerged to close its pores and keep it moist. The lithographic ink is then applied with balls or rollers, as in ordinary printing. After becoming thoroughly dry the stone is ready for the press, and must be wetted and inked for each impression. From 500 to 1500 perfect copies of crayon drawings may be obtained from the same block, 5000 or 6000 copies of fine ink drawings, and as many as 70,000 from those in coarser lines, the last print being nearly as good as the first. The economy of time as compared with copperplate printing is considerable, and the expense is much less than in any other method of artistic reproduction.

Chromo-Lithography is simply a combination of a number of stones prepared in the manner above described, each being employed for a separate color, and representing a portion of the drawing or painting which it is intended to reproduce in fac-simile. The process is nearly the same as that described in Calico-Printing (which see). As many as thirty stones are frequently requisite to copy a single painting, the utmost exactness being necessary in the adjustment of each in its proper place, as a variation of a fiftieth of an inch would mar the effect.

Zincography (which see) is in its methods entirely analogous to lithography, of which it would be a branch were it not that the difference of the essential material would render such classification a misnomer. The latest and most interesting application of Senefelder's discovery is Photo-Lithography, which will be described under that head.

Porter C. Bliss.

Lithol'ogy [Gr. λίθος, "a stone," and λόγος, "science"], the science which treats of the characteristics and classification of rocks. (See Geology and Mineralogy.)

Lith'omarge [Gr. λίθος, "stone," and Lat. *marga*, "marl"], a hydrated silicate of alumina, constituting a fine clay allied to kaolin.

Lith'ophane [Gr. λίθος, "stone," and φανός, "clear"], a sort of ornamental porcelain transparency, to be used as a window-piece or for lamp-shades and fireside screens. The porcelain when soft is pressed with a raised stamp, which impresses figures upon the clay. Transmitted light brings out a variety of groups and figures, often nicely shaded and very pleasing.

Lithop'olis, post-v. of Bloom tp., Fairfield co., O. Pop. 394.

Lithot'omy and **Lithot'rity.** Urinary calculi are composed most frequently of substances existing in a state of solution in healthy human urine, such as uric acid, urate of ammonia, and the phosphates of lime and magnesia. Sometimes, however, they are composed of substances met with only in morbid urine, such as oxalate of lime, cystine, etc. Besides these ingredients, of which they mainly consist, calculi always contain more or less animal matter, such as dried blood, vesical mucus, etc. Occasionally, they are found to consist almost entirely of a single ingredient, but more frequently of two or more different constituents arranged in irregular concentric layers. In certain conditions these ingredients solidify and form con-

cretions. The initial process in their formation commonly takes place in the kidneys; the product then descends along the ureter (a fleshy tube for conveying the urine) into the bladder, from which it is often expelled in urinating, and thus got rid of. If, however, it remains in the bladder, it becomes a nucleus upon the surface of which successive deposits of solid matter take place, until a calculus is formed, which in process of time may attain a formidable size—too great, in fact, to admit of its safe removal by any surgical operation. Any foreign substance introduced accidentally or intentionally into the cavity of the bladder will also become a nucleus upon which incrustations of solid matter will take place. Instances have occurred where bullets, fragments of surgical instruments, and other foreign bodies have formed the nuclei of stone in the bladder. Calculi may exist single or multiple in the bladder; where multiple, there may be two or more of nearly equal size, or there may be a large number of every variety of size from a pin's head to a horse-chestnut. When there is but a single calculus, it is more generally of a flattened, ovoid shape, or globular, though sometimes it may resemble an hour-glass in shape, or have any irregular form. Its surface is sometimes smooth, sometimes rough, uneven, and studded with pointed eminences. When two or more are found in the same bladder, their surfaces are marked by smooth facets, produced by their contact with each other. If a concretion remains permanently in the cavity of the kidney, it may in the process of its growth become moulded into the shape of the cavity. Calculi are met with in both sexes, though more frequently in males than females, owing in part to the greater facility with which the nucleus concretion can be expelled from the female than from the male bladder. No age is exempt from this malady; it has been met with in the infant at birth, and at all subsequent periods of life up to the most advanced age. Certain localities have been regarded as favoring the production of this malady by the properties of the drinking-water in use among the population.

The question of vital interest in connection with this subject is, By what means sufferers from this distressing malady can obtain relief? At all times there have been remedies advocated as possessing the property of dissolving the stone in the bladder, and patients afflicted with the disease, naturally shrinking as they do from the alternative of a surgical operation, have been too ready to give credence to the vaunted efficacy of such remedies, and by long perseverance in their use have lost precious time. The stone has thus been allowed to increase in size, and the danger from a surgical operation has thereby been enhanced, while the chances of recovery have been diminished. The removal of a stone by a surgical operation is the only reliable means of cure, and the earlier it is resorted to the better the chance of recovery.

Lithotomy and *lithotrity* are the terms which define the two surgical operations by means of which the extraction of a stone from the bladder is effected. *Lithotomy* (λίθος, "stone," and τέμνειν, to "cut") is a cutting operation by which an opening is made from the surface of the body into the cavity of the bladder at certain points where this organ lies nearest to the surface. Through the opening thus made an instrument (forceps) is introduced into the bladder, the stone seized and brought away. This operation has been in use since the earliest period in the history of surgical art. The operation is performed according to two principal methods: 1st. The hypogastric or supra-pubic method, by means of which the cavity of the bladder is reached through an opening made at the lowest point of the abdomen, exactly in the median line of the body. 2d. The perineal or sub-pubic method, by which the bladder is reached through an incision made in front of the anus, between it and the scrotum, in the space known as the perineum. This method is most frequently employed, as the safest and the one of widest application. It admits of three varieties in its mode of execution, distinguished from each other by the different directions in which the incisions required for its performance are made. First variety, known as the median operation, in which the incision is made exactly in the median line of the perineal space between the anus and scrotum. Second variety, termed the lateral operation, in which the incision, commencing at a point in the median line in front of the anus, is carried obliquely outward and backward to the left side of the anus. Third variety, known as the bilateral operation, in which the incision extends in a curved line across the perineal space in front of the anus, and to an equal distance on either side of the median line. Each of these varieties has had able and zealous advocates, who claim for them special advantages; the choice of operative methods must, however, be determined by a judicious discrimination of the conditions of each case that comes under consideration.

Lithotrity (λίθος, "stone," and τείρειν, to "break down") or *lithotripsy* (λίθος, "stone," and τρίβειν, to "grind") is a bloodless operation by which a stone in the bladder is reduced to fragments small enough to be expelled through the natural canal in urinating. Though some traces of a conception of this method are found at an earlier period in the history of surgery, it was not till the second decade of the present century that Civiale of Paris undertook his experiments which resulted in the development of the method now in use, and which is ranked among the acknowledged resources of surgical art. On Mar. 22, 1824, a commission of the Academy of Medicine of Paris reported upon it as follows: "Desirous of avoiding, on the one hand, the enthusiasm which exaggerates everything, and on the other that prejudice which seeks to depreciate everything, we consider the new method proposed by Dr. Civiale for destroying stone in the bladder without the use of lithotomy as alike creditable to French surgery, honorable to the author, and consolatory to humanity; that, notwithstanding its insufficiency in some particular cases, and the difficulty of its application in others, it cannot fail to establish an epoch in the healing art, and to be regarded as one of the most ingenious and salutary resources." After a test of fifty years the expectations expressed in this report have been fulfilled, and lithotrity now holds an honorable rank among the resources of surgical art. The operation consists essen-

The lithotrite: *a*, *b*, jaws; *c*, stone; *d*, screw; *e*, spring catch.

tially in the introduction of an instrument known as a lithotrite, of adapted shape and size, through the natural canal into the bladder. With it the stone is seized and crushed by pressure exerted with the hand alone, or with a screw-power that may be applied at pleasure at the handle of the instrument. Another mode of crushing the stone is by percussion applied at the handle of the instrument by means of a hammer. A portion of the finer débris resulting from the crushing may be brought away in the jaws of the instrument. Unless the stone is quite small, the operation requires to be repeated at regulated intervals till the whole calculus is reduced to fragments small enough to be expelled with the urine. In his early experiments Civiale directed his efforts, after the seizure of the stone, to perforating its substance in different directions with drills, and thereby diminishing its resistance and facilitating its being crushed by pressure. Straight instruments alone could be employed for this purpose, and hence greater difficulty was encountered in their introduction into the bladder. These instruments, moreover, were complicated in their construction, and required a varied manipulation in their use, and were therefore more liable to injure the bladder and occasion serious accidents. These objections led to the early abandonment of the perforating process, and the substitution of the crushing process alone. This latter process is effected by means of curved instruments, which in their form more nearly resemble the catheters and sounds in common use among surgeons. The operation of lithotrity is particularly adapted to patients of adult age, in whom the expulsion of fragments is facilitated by the greater calibre of the urinary canal. In early life, under the age of fifteen years, and especially under ten years, the operation of perineal or sub-pubic lithotomy is successful in so large a proportion of the cases operated on that we scarcely need a better resource, especially as we now have the aid of anæsthetics by which patients are spared the pain of the operation. The descent of a concretion from the kidney into the bladder is accompanied by an attack, usually violent, of kidney colic. Its presence in the bladder itself is characterized by disturbance of its functions, such as frequent calls to urinate, sudden arrest of the outflowing stream, pain felt on the close of the act, and referred to the neck of the bladder and end of the penis, pain also from the jolting of a vehicle, and the appearance of blood in the urine. A practical injunction should be borne in mind by patients suffering from symptoms of

stone in the bladder: to wit, that in the early stage of the disease, while the stone is of small size, its removal by the operation of lithotrity may be regarded as almost entirely without danger, and sometimes can be accomplished by a single operation. Hence the importance of having its presence ascertained by a skilful exploration of the interior of the bladder at the earliest period of its existence. If patients suffering from this malady would early avail themselves of lithotrity, which has none of the terrors of a bloody operation, much suffering might be averted and many lives saved. GURDON BUCK.

Lithua'nia [Lith. *Letura;* Pol. *Litwa;* Ger. *Litauen*] formed in the Middle Ages an independent and powerful state, comprising those large tracts of mostly low and level land which extend from the Baltic to the Black Sea, between the Niemen and the Düna in the N. and the Don and the Bug in the S. In the eleventh century the Lithuanians were tributary to the Russians, but in the twelfth they threw off the yoke. In 1235, Ringold formed the country into a grand duchy. In 1320, Gedemin conquered Volhynia, Kiev, and Tchernigov from Russia. In 1386, Jagellon united Lithuania with Poland, having married Hedwig, a daughter of King Lewis of Poland and Hungary. By the division of the Polish kingdom one small part of Lithuania came to Prussia, forming the present government of Gumbinnen, while the rest was incorporated with the Russian crown, forming the present governments of Vilna, Grodno, Moheelev, Vitebsk, and Minsk. The Lithuanians in race and language belong to the Lettic group (see LETTIC RACE), and for a full comparison of their interesting language with the cognate branches of the Indo-European stock see Bopp's great *Comparative Grammar* (3d ed., 1857).

Lit'iz, post-v. of Warwick tp., Lancaster co., Pa., on the Reading and Columbia R. R., 8 miles N. of Lancaster, has a celebrated Moravian school, Litiz Academy, for boys, and another, Linden Hall, for young women, and is the seat of Sunnyside College for ladies, and of another school for boys. Litiz was founded in 1756 by the Moravians. The N. part of the village is called Warwick. The town was named in honor of the barony of Litiz in Bohemia, an ancient refuge of the Bohemian Brethren. It has 1 newspaper, is a place of summer resort, and has a large and very fine spring.

Lit'mus, or **Lacmus,** a coloring-matter obtained from *Lecanara tartarea* and other lichens, which are powdered, mixed, and decomposed with ammoniacal urine. Alum, lime, and potash are mingled with the mass, and the whole is dried with powdered chalk. It is used for coloring litmus-paper, an invaluable test in the chemical laboratory, becoming blue when wet with a liquid containing free alkalies, or red if acids be present.

Litre, the French standard measure of capacity in the decimal system. The litre is a cubic decimètre—that is, a cube each of the sides of which is 3.937 English inches; it contains 61.027 English cubic inches. Four and a half litres are very nearly equivalent to the English imperial gallon.

Lit'ta (POMPEO), COUNT, b. Sept. 27, 1781, at Milan; entered the military service in 1804; fought with distinction at Ulm, Austerlitz, and Wagram, and became chief of a battalion, but retired after 1814 into private life, devoting himself exclusively to the study of history. In 1848 he took charge of the ministry of war in the provisional government for a short time. D. at Milan Aug. 17, 1852. In 1819 appeared the first number of his splendid work, *Famiglie celebri d'Italia,* opening with the history of the Sforzas. At his death the work comprised the history of fifty-three families, and several more have been added since by Odorici and Passerini. The work, which was published by subscription only, and never brought into the general market, is magnificently printed, and enjoys a great reputation, both on account of the richness and accurateness of its information and its elegant style.

Lit'tell (ELIAKIM), b. at Burlington, N. J., Jan. 2, 1797; in 1819 began to publish and edit at Philadelphia the *National Recorder,* afterwards the *Saturday Magazine;* in 1822 established the *Museum of Foreign Literature,* and in 1844 founded *Littell's Living Age* at Boston, Mass. He drew up the Clay compromise tariff of 1833. D. at Brookline, Mass., May 17, 1870.—His brothers, JOHN STOCKTON and SQUIER, were writers of some note, the former having edited Alexander Graydon's *Memoirs of his Own Times* (1846) and Garden's *Anecdotes of the American Revolution;* and the latter having published a learned work on *Diseases of the Eye* (1837), and edited Dr. H. Walton's *Treatise on Operatic Ophthalmic Surgery* (1853).

Lit'tle (Capt. GEORGE), b. at Marshfield, Mass., in 1754; commanded the armed vessel The Boston, belonging to the State of Massachusetts, at the beginning of the Revolution; was first lieutenant on The Protector in 1779, when he was captured by a British frigate; escaped from prison at Portsmouth, England; took command of the sloop-of-war Winthrop, and cruised successfully during the remaining years of the war; commanded the national frigate Boston in 1798; was made captain in U. S. navy Mar. 4, 1799; captured several French ships, one of them, Le Berceau, after a severe conflict; retired in Oct., 1801, to his farm at Weymouth, Mass., where he d. July 22, 1809. He wrote *The American Cruiser* and *Life on the Ocean.*

Little (Gen. LEWIS HENRY), b. at Baltimore, Md., in 1818; graduated at West Point in 1839; entered the 5th Infantry; was distinguished in the Mexican war at the battles of Monterey and Cerro Gordo; became captain Aug., 1847; resigned from the army May 7, 1861, to enter the Confederate service; became adjutant-general of Missouri forces on the staff of Gen. Price; was made brigadier-general for gallantry at the battle of Elk Horn; became commander of a division, and was killed at the battle of Iuka, Miss., Sept. 19, 1862.

Little Beaver, tp. of Lawrence co., Pa. Pop. 1072.

Little Black, tp. of Randolph co., Ark. Pop. 2710.

Little Britain, post-tp., Lancaster co., Pa. Pop. 1586.

Little Canada, post-tp., Ramsey co., Minn. Pop. 789.

Little Christians, a sect in Russia which in 1868 seceded from the national Church. They originated in the bishopric of Tsaritsin. Originally few in numbers, they have rapidly increased. They practise immersion, after which they assume a new name; they have no priests, no worship of saints, no holy oil, no images, no altar-pieces, no bread and wine in the Eucharist, but worship the sacred bread, and profess to have received a divine revelation.

Lit'tle Cohar'ie, tp., Sampson co., N. C. Pop. 1235.

Lit'tle Comp'ton, post-tp. of Newport co., R. I., on the sea-coast. Pop. 1166.

Lit'tle Crab'tree, tp. of Yancy co., N. C. Pop. 483.

Little Creek, hundred of Kent co., Del. Pop. 1892.

Little Creek, hundred of Sussex co., Del. Pop. 3770.

Lit'tle Egg Har'bor, tp. of Burlington co., N. J., on the Atlantic coast, in the bay of that name. Pop. 1779.

Little Falls, post-v. and tp., cap. of Morrison co., Minn., on the E. bank of the Mississippi River. It has 1 weekly newspaper. Pop. 457.

Little Falls, post-v. and tp. of Passaic co., N. J., on the Morris Canal and the Passaic River, 4 miles above Paterson. Pop. 1282.

Little Falls, post-v. and tp. of Herkimer co., N. Y., on the New York Central R. R., midway between Albany and Syracuse, and 22 miles E. of Utica, built against the sides of an abrupt declivity which rises some 500 feet and overlooks the Mohawk River, which falls at this point 45 feet within half a mile, forming a series of picturesque cascades and rapids, from which the name is derived. It has 7 churches, 2 banks, 3 newspapers (2 weekly and 1 semi-monthly), 2 woollen, 1 cotton, 3 paper, 2 knitting, and 2 grist mills, 1 foundry and machine-shop, 1 carriage-factory, the "Warrior" mower-factory, an excellent fire department, and 2 public parks. It is the largest cheese-market in the U. S. Pop. of v. 5387; of tp. 5612.
CHAPPLE & TOZER, EDS. "HERKIMER CO. NEWS."

Little Falls, tp. of Monroe co., Wis. Pop. 621.

Little Glace Bay, coal-mining settlement of Cape Breton Island and co. (N. S.), 15 miles E. of Sydney. Pop. about 400.

Little Grant, post-tp. of Grant co., Wis. Pop. 813.

Little Hum'boldt River, the most important tributary of the Humboldt River, Nev., flows W. and then S. through Paradise Valley in Humboldt co. It has some 35,000 acres of excellent bottom-land, and 90,000 of bench-lands of the best character. The small brooks abound in trout. The elevation is some 4500 feet. There are abundant means for easy irrigation.

Lit'tlejohn (ABRAM NEWKIRK), D. D., b. in Montgomery co., N. Y., Dec. 13, 1824; graduated at Union College in 1845; received deacon's orders in the Protestant Episcopal Church in 1848; officiated at Amsterdam, N. Y., Meriden, Conn., and Springfield, Mass.; took priest's orders in 1850; rector of St. Paul's, New Haven, 1851–60, and since then of Holy Trinity church, Brooklyn, N. Y. He was for ten years lecturer on pastoral theology in the Divinity School at Middletown, Conn. In 1868 he was consecrated bishop of Long Island, and in 1874 undertook the charge of the American Episcopal churches on the continent of Europe. He is author of *The Philosophy of Religion,* a series of lectures, and has written largely for the *Church Review,* and published many sermons and addresses.

Lit'tle Kanaw'ha River rises in Upshur co., W. Va., and flows in a generally N. W. course, joining the Ohio at Parkersburg. It flows through the oil-region, and has wide and fertile bottom-lands. The Little Kanawha Navigation Co., by building three dams, have made it navigable 38 miles to Burning Springs. Great numbers of logs are floated to market upon its waters.

Little Lake, post-v. and tp. of Mendocino co., Cal., 15 miles N. of Ukiah, the county-seat. Pop. 946.

Lit'tle Mack'inaw, tp., Tazewell co., Ill. Pop. 1256.

Little Mahanoy', tp. of Northumberland co., Pa. Pop. 269.

Little Mead'ows, post-b. of Apolacon tp., Susquehanna co., Pa., on Apolacon Creek, near the New York line. Pop. 133.

Little Moose Lake, tp. of Carlton co., Minn. Pop. 24.

Little North Fork, tp. of Marion co., Ark. Pop. 303.

Lit'tle Prai'rie, tp. of Pemiscot co., Mo. Pop. 492.

Lit'tle Riv'er, county of Arkansas, bounded S. by Texas and W. by the Indian Territory. Area, 500 square miles. The Red River washes its S., and the Little River its N. boundary. It is well timbered and diversified. The valleys are especially fertile. Cotton and corn are staple products. Cap. Rocky Comfort. Pop. 3236.

Little River, tp. of Monroe co., Ala. Pop. 748.

Little River, post-tp. of Little River co., Ark. Pop. 160.

Little River, tp. of Mississippi co., Ark. Pop. 54.

Little River, post-v. of Mendocino co., Cal., on the Pacific. Pop. 158.

Little River, tp. of Pemiscot co., Mo. Pop. 120.

Little River, post-tp. of Alexander co., N. C. Pop. 635.

Little River, tp. of Caldwell co., N. C. Pop. 888.

Little River, tp. of Montgomery co., N. C. Pop. 415.

Little River, tp. of Orange co., N. C. Pop. 1553.

Little River, tp. of Transylvania co., N. C. Pop. 403.

Little River, tp. of Wake co., N. C. Pop. 1315.

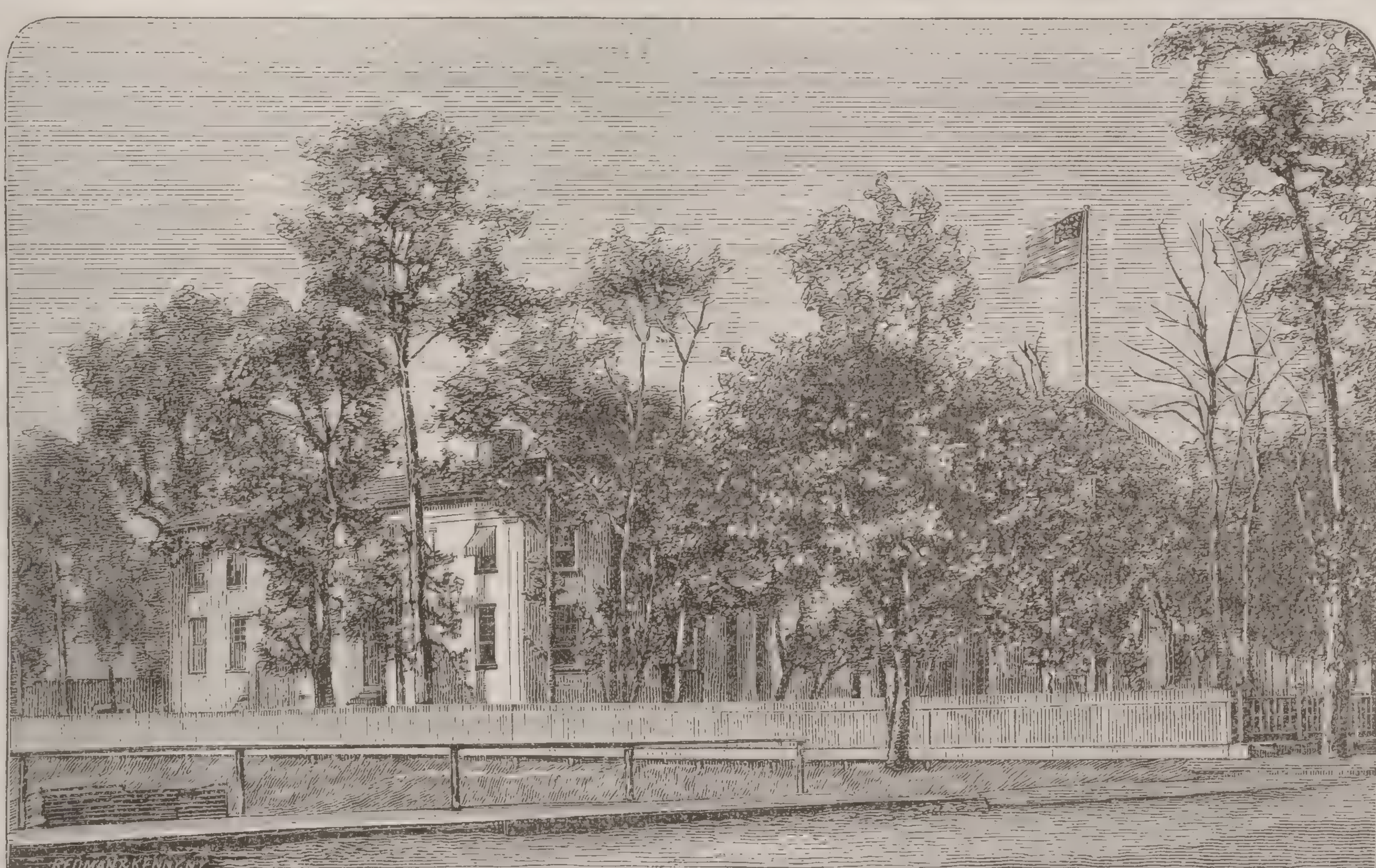
Little River, tp. of Lawrence co., Pa. Pop. 1072.

Little River, post-v. and tp. of Horry co., S. C. Pop. 951.

Little River, post-tp. of Floyd co., Va. Pop. 1879.

Little Rock, city, cap. of Arkansas and of Pulaski co., situated near the centre of the State, on the S. bank of the Arkansas River, 250 miles above its mouth, and on the Little Rock and Fort Scott, the Memphis and Little Rock, and the St. Louis Iron Mountain and Southern R. Rs., 125 miles S. W. of Memphis, built upon the first highland reached by ascending the river, which is here 400 yards wide, and navigable eight months of the year for large steamboats, smaller ones plying to Fort Smith on the border of Indian Territory, 300 miles above. The rocky cliff on which the city stands, and from which it takes its name, is not more than 50 feet above the river, while the Big Rock, commencing 2 miles above, is a precipitous range rising abruptly some 500 feet. Little Rock is a commercial city, having few manufactures, though possessing every facility for their establishment, its business connections being largely with Texas and the S. W. generally; has 15 churches, 3 banks, 2 daily, 4 weekly, and 2 monthly newspapers, 1 public library, 1 male and 1 female college, the former embracing military studies and being under the control of the Masonic order, the latter under that of the Methodist Church, South; a convent and academy of Sisters of Charity, numerous public and private schools, U. S. arsenal, land-office, and courts, State Capitol building, prison, and asylums for deaf-mutes and blind, and a State library with 12,500 volumes. Railroads connecting with Helena and New Orleans are being constructed, and street-cars provide means of communication within the city. The situation is dry and healthy, and the place has never been visited by an epidemic. Pop. in 1870, 12,380.

E. N. Hill, Ed. "Sunday Republican."



State Capitol, Little Rock, Ark.

Little Rock, post-tp. of Kendall co., Ill. Pop. 1843.

Little Rock Creek, tp. of Mitchell co., N. C. Pop. 397.

Little Sauk, post-tp. of Todd co., Minn. Pop. 202.

Little Sioux, post-v. and tp. of Harrison co., Ia., on the Sioux City and Pacific R. R. and the Missouri River, at the mouth of the Little Sioux River. Pop. 644.

Little Sioux, tp. of Woodbury co., Ia. Pop. 900.

Little Sisters of the Poor, a Roman Catholic sisterhood devoted to works of charity, and especially to the care of those who are old and poor; first established at St. Servan, France, in 1840 by M. Le Pailleur. They have a number of houses in the U. S.

Lit'tlestown, post-b. of Germany tp., Adams co., Pa., 3 miles N. of the Maryland line and 10 miles S. E. of Gettysburg, has 6 churches, 1 bank, 4 hotels, and several mercantile establishments, and is the terminus of two short railroad branches. Principal business, farming. Pop. 847.

P. O. Good, Ed. "Littlestown News."

Lit'tle Suam'ico, tp. of Oconto co., Wis. Pop. 542.

Lit'tleton, post-v. of Arapahoe co., Col., on the S. Platte River, and on the Denver and Rio Grande R. R., has a large flouring-mill and a hotel.

Littleton, post-tp. of Schuyler co., Ill. Pop. 1140.

Littleton, post-tp. of Aroostook co., Me., 6 miles N. of Houlton. Pop. 700.

Littleton, post-tp. of Middlesex co., Mass., on the Fitchburg R. R., 31 miles N. W. of Boston. Milk is the leading agricultural product. Pop. 983.

Littleton, post-v. and tp. of Grafton co., N. H., on the Ammonoosuc River and the Boston Concord and Montreal R. R., 114 miles N. of Concord and 28 miles from the base of Mount Washington, White Mountains, in which it is the most important town, and a usual point of departure for tourists. It is a farming town, largely engaged, however, in manufacturing, lumbering, and providing accommodations for summer boarders; has 3 churches, 3 hotels, 2

banks, 1 weekly newspaper, 1 good high school, 40 or 50 stores, 1 woollen mill, a scythe and axe factory, and 2 manufactories of stereoscopic views, doing a large business. Pop. 2446.

H. H. METCALF, ED. "WHITE MOUNTAIN REPUBLIC."

Littleton, post-v. of Halifax co., N. C., on the Raleigh and Gaston R. R., 78 miles N. E. of Raleigh.

Littleton (ADAM), D. D., b. at Hales-Owen, Shropshire, England, Nov. 8, 1627; was educated at Christ Church, Oxford, taking high rank in the classics; became rector of Chelsea, chaplain to King Charles II., and prebendary of Westminster 1674. D. at Chelsea June 30, 1694. Dr. Littleton was a fine Oriental scholar, and formed a library of rare books and manuscripts, so extensive that it brought him to bankruptcy. He wrote much on mystic numbers and other recondite subjects, and published many sermons; but his great work was the *Dictionary of the Latin, Greek, Hebrew, and English Languages* (1678; frequently reprinted). He was a descendant of Sir Thomas Littleton. (See Wood's *Athenæ Oxonienses*, vol. ii., and the preface to Ainsworth's *Latin Dictionary*.)

Littleton, or **Lyttleton** (Sir THOMAS), b. in Devonshire, England, early in the fifteenth century; studied at Cambridge and at the Inner Temple, where he became a lecturer on law. Under Henry VI. he was steward of the king's household and king's sergeant (1455), performing the duties of judge of assize in the northern circuit. On the accession of the house of York to the throne of England, Edward IV. confirmed Littleton in his offices, appointed him one of the judges of the court of common pleas (1466), and a knight of the Bath (1475). D. at Frankley, Worcestershire, Aug. 23, 1481. He was buried in Worcester cathedral, where a marble tomb and statue were placed over his remains. Littleton's great work on tenures (*Les Tenures*) was written in Norman French, the first edition being without date, but supposed to be of 1481, translated into English in 1539, and given to the world with the authoritative commentary of Coke in 1628, since which time the editions have been innumerable, and the treatise has become the "Bible of the law" of England. It has often been printed with the French and English texts in parallel columns. The original name of Littleton was WESTCOTE, which he exchanged for that of his maternal grandfather.

Littleton (EDWARD), LORD. See LYTTELTON.

Lit'tle Trav'erse, post-v. and tp., cap. of Emmet co., Mich., on the N. side of Little Traverse Bay. Pop. 294.

Lit'tle Tur'tle (*Me-che-cun-na-qua*), a Miami chief of great reputation for intelligence, shrewdness, and valor in warfare; is supposed to have received some education in Canada. He commanded in the battles which resulted in the defeat of Gen. Harmar on the Miami (Oct. 22, 1790) and of Gen. St. Clair at St. Mary's, Nov. 4, 1791; was present, though not in command, at the battle of Fallen Timbers or Maumee Rapids, Aug. 20, 1794, in which the Indians were defeated by Gen. Wayne; was one of the signers of the treaty of Greenville, Aug., 1795, which ended the war and conveyed to the whites an extensive region in Ohio, and visited Pres. Washington at Philadelphia in 1797, on which occasion he had an interview with Count Volney, the French philosopher, and received a pair of elegantly mounted pistols from Kosciuszko. D. at Fort Wayne., Ind., July 14, 1812.

Lit'tle Val'ley, post-v. and tp., cap. of Cattaraugus co., N. Y., on Little Valley Creek near the Alleghany River, on the Erie R. R., 8 miles N. of Salamanca and 40 miles E. of Dunkirk, has 2 churches, 3 hotels, new county buildings, 1 bank, 1 weekly newspaper, several steam-mills, and a large number of stores and shops. Principal business, farming and dairying, the latter interest having been stimulated by the introduction of cheese-factories. Rock City, a singular geological configuration of conglomerate rocks, arranged in regular blocks, with sharp angles and perpendicular sides, presenting the appearance of squares, court-yards, and streets, stands on a hill within the township, 2000 feet above tide-water, 400 feet above the valley, and covers 100 acres. (For a scientific description of this interesting phenomenon see Prof. Hall's *Geology of New York*.) First settlement made here in 1807; township erected in 1818. Pop. 1108.

A. W. FERRIN, ED. "CATTARAUGUS REPUBLICAN."

Little Wolf, post-tp. of Waupacca co., Wis. Pop. 716.

Little York, post-tp. of Nevada co., Cal. Pop. 868.

Little York, a v. (FOWLER P. O.) of Fowler tp., St. Lawrence co., N. Y. Pop. 117.

Little York, post-v. of Butler tp., Montgomery co., O. Pop. 111.

Littora'le [Ger. *Küstenland*], province of the Austro-Hungarian monarchy, extends along the northern shore of the Adriatic from Venetia to Croatia, bounded N. and E. by Carinthia and Carniola. It consists of the counties of Görz and Gradisca, the margraviate of Istria, and the district of Trieste, and comprises an area of 3085 square miles, with 600,525 inhabitants, mostly of Slavic descent.

Littré (MAXIMILIEN PAUL ÉMILE), b. at Paris in 1801; studied medicine and the Semitic languages; from 1830 to 1851 was one of the editors of the liberal journal the *National*, and in 1854 the principal contributor to the *Journal des Savants*. He translated from the German the *Life of Jesus* by Strauss, wrote some works on medicine and on positive philosophy, being a prominent disciple of Auguste Comte. His principal work is the *Dictionary of the French Language* (4 vols., 1863–73), which is a kind of condensed encyclopædia. In 1871 he was elected to the National Assembly, and chosen a member of the Academy in the place of Villemain. FÉLIX AUCAIGNE.

Lit'trow, von (JOSEPH JOHANN), b. Mar. 13, 1781, at Bischof-Teinitz, in Bohemia; studied at the University of Prague; became professor of astronomy at Cracow in 1807; removed in 1810 to Kazan, in 1816 to Buda, and in 1819 to Vienna, where he d. Nov. 30, 1840. Under his direction the observatory of Vienna was much improved, and his lectures drew great audiences. His most prominent writings are *Die Wunder des Himmels* (1834), often republished; *Theoretische und praktische Astronomie* (3 vols., 1822–26), and *Atlas des gestirnten Himmels*.—His son, KARL LUDWIG, b. at Kazan, Russia, July 18, 1811, was his assistant in the Vienna Observatory from 1831; made important discoveries on the revolution of Venus and on eclipses; became director in 1842; published valuable astronomical registers, and was employed in 1847, with M. Struve, to connect Austria and Russia by triangulation.

Lit'urgy [λειτουργία, "a public service;" in the LXX., what belongs to the office of priest or of Levite; in the New Testament, ministry of any kind, and also priestly service, equivalent to ἱερατεία], in a general sense a prescribed form of public worship; in a stricter ecclesiastical sense is confined to that service which was probably the only stated service peculiar to the first Christians in Jerusalem—viz. "the breaking of bread," that highest act of Christian worship, which the Lord Jesus instituted as a perpetual memorial of the one propitiatory sacrifice of himself by himself, and as a means of bestowing himself to the faithful in holy communion. In a short time this service must have become, in some respects, fixed. In the breaking of the bread and in the blessing of the cup they who had witnessed the first consecration could not but have repeated the words and acts which they had heard and seen—words and acts deemed so important that they were by revelation imparted to the apostle "born out of due time." And soon around this nucleus were clustered common prayers and praises and ritual observances; not always the same in every country to which the apostles bore the blessings of Christ's body and blood, but naturally becoming fixed as the repetition of wants and feelings which do not often vary. Did the apostles commit to writing one or more forms of the eucharistic service? A precomposed service is not perforce written. The teachings and rites of other religions have been communicated orally; and it has long been asserted that the early Church had not any written service of the altar. The chief reason for this opinion is the historic fact that when the sacred books were demanded in times of persecution no liturgy was ever delivered up, although portions of the Scriptures were often seized. But, on the other hand, Tertullian seems to assert plainly the existence of such books, "which many accidents put into the hands of those who are not of us." And so soon as the Church became dominant memory was not trusted, but written forms used, and this without mention of change of custom. That written liturgies were used by the apostles, and that vestments appropriate to the service were worn by them, some writers think to be made more than probable by scriptural intimations of ordinances delivered to the churches, and especially by St. Paul's care to have brought to him "the cloak left at Troas, and the books, especially the parchments." Such confirmation of previous conviction may provoke a smile on the part of one who doubts. But not so with the criticisms of late liturgiologists. Besides recognized quotations from heathen authors, there are found in the Epistles passages introduced with the words, "And so it is written," and the like. Where are they written? Certainly not all in the older Scriptures. Some may have been parts of hymns and spiritual songs, for they have a rhythmical measure; others are found in the primitive liturgies—the very words. Can it be that the scriptural writer quoted from these? If so, more is suggested than an answer to our present question. It is possible that these passages in the liturgies

may be taken from the Scriptures, as very many texts are; and so it has been often asserted. But when we come to examine the collocation, the contrary becomes probable; the conviction seems forced on us that the apostles, writing to the churches, find their thoughts naturally clothed in language with which all are familiar from their constant use in the divine service. (The reader is referred to Neale's *Essays on Liturgiology and Church History.*)

Although in the many liturgies which have come down to us from former ages there are many differences, yet there is a similarity, if not identity, in parts which enable the critic to trace them all back to few sources. There are five principal families: (1) That of St. James, or Jerusalem; (2) of St. Mark, or Alexandria; (3) of St. Thaddeus, or the East; (4) of St. Peter, or Rome; (5) of St. John (with whose name that of St. Paul is associated), or of Ephesus. And these primitive liturgies, by their common structure, apart from all else, suggest a common origin. At various times the tendency to divergence has been checked, but in earlier ages no attempt was made to produce uniformity. At the time of the Reformation each bishopric seems to have been entitled to its own use, all being variations of that formed by Augustine, probably from those of the ancient British and French churches, which were of Ephesian origin. A common "order" was afterwards imposed throughout England, and it was even made penal to have in one's possession a copy of one of the old service-books. We have no MS. of a primitive liturgy of a date earlier than the tenth or ninth century, but in substance more than one can be traced to about the date of the oldest of MSS. of the Bible. W. F. BRAND.

Livadi'a, town of Greece, in the district of Attica and Bœotia, on the Hercyna. In its vicinity is the cave of Trophonius, so celebrated in ancient times for its oracle. Pop. 5000.

Live'ly (EDWARD), D. D., professor of Hebrew and divinity in the University of Cambridge, England, was a learned Orientalist and one of the translators of King James's version of the Bible. He published *Annotations* on several of the minor prophets (1587), and *Chronologia of the Persian Monarchie* (1597). D. 1605. (See Rev. A. W. McClure's *Translators Revived.*)

Liv'engood's, tp. of Cabarrus co., N. C. Pop. 662.

Live Oak, county of S. W. Texas. Area, 1200 square miles. It is traversed by the Nueces River and many smaller streams, along whose banks are fine bottom-lands. The remainder of the county is a broken and elevated cattle-range, covered with fine mesquite-grass, and devoted chiefly to stock-raising. Cap. Oakville. Pop. 852.

Live Oak, post-v., cap. of Suwanee co., Fla., on the Jacksonville Pensacola and Mobile at its junction with the Atlantic and Gulf R. R., 83 miles E. of Tallahassee, has 3 churches, 1 weekly newspaper, 1 large hotel, 3 free schools, a new court-house, 3 cotton-gins and presses, 2 grist-mills, 1 furniture-factory, a turpentine distillery, and 12 stores. It is connected with Jessup by a branch railroad, is a new town, having considerable trade in cotton and sugar, and is the seat of Brown University and of Bethlehem College. W. W. KEEP, JR., ED. "TIMES."

Liv'er [Gr. ἧπαρ; Lat. *jecur;* Ger. *Leber;* Fr. *foie*]. The liver is the largest gland in the body; it is appended to the alimentary canal, and is now known to have several distinct functions. The weight is about five pounds, and the specific gravity one and a half greater than water. This organ is situated in the abdomen in the right hypochondriac region, extending across the epigastrium to the left hypochondrium. It reaches, superiorly, the sixth rib, while its anterior border inferiorly approaches the lower margin of the thorax. The form is flattened, broad and thick towards the right extremity, and thinner and narrower towards the left. The superior surface is convex, while the inferior surface is irregularly concave. Upon the posterior border the liver is thick and rounded, with a thin and sharp anterior border. In the abdomen the position is oblique; in the erect posture the convex surface is directed upward and forward, with the concave downward and backward. The diaphragm, covering the superior convex surface, separates the liver from the under surface of the right lung and from the heart. Anteriorly, it is in relation with the diaphragm and transversalis muscle, and at the epigastrium with the sheath of the rectus muscle and linea alba. The inferior concave surface is in relation with the stomach anteriorly, a portion of the duodenum, transverse colon, and right kidney, and by its left extremity with the upper end of the spleen. The diaphragm intervenes between the vertebral column and posterior border of the liver, while the anterior border is free, and in relation with the transversalis muscle and round ligament at the notch. The liver possesses five ligaments, by means of which it is retained in place, called the broad, the coronary, the two lateral, and the round ligament. By five fissures, named longitudinal, fissure for the ductus venosus, transverse fissure, fissure for gall-bladder, and fissure for vena cava, the liver is divided into five lobes; these lobes are designated right and left lobe, lobus quadratus, lobus Spigelii, and lobus caudatus. The liver is covered by the peritoneum externally; the folds of this membrane as it passes from the surface of the organ form four of the ligaments above enumerated. The round ligament is the result of the obliteration of the umbilical vein of the fœtus. The proper coat of the liver is a dense and thin fibrous membrane, very adherent to the substance of the organ, and in intimate relation with the peritoneum. Attached to the liver, in the shallow fossa upon the under surface of the right lobe, lying parallel with the longitudinal fissure, is a membranous sac, the gall-bladder. The gall-bladder is divided into a body, fundus, and neck. The body is the middle portion; the fundus the expanded extremity which approaches the notch in the free border; the neck, the portion which, narrowing, enters the right extremity of the transverse fissure and forms the *cystic duct.* The cystic duct is about one and a half inches in length, and has the diameter of a crow's quill. At the transverse fissure the duct unites with the excretory duct of the liver, *the hepatic duct,* forming by this junction the *ductus communis choledocus.* The ductus communis choledocus, with a length of three inches, passes through the right border of the lesser omentum, and opens into the duodenum, passing obliquely between its coats. (For the minute anatomy of the liver and gall-bladder see HISTOLOGY.)

The Physiology of the Liver.—The liver as a gland stands alone in the economy, on account of the complexity of function which it possesses. The physiology of glands in general points to but one function for each; in the case of the liver, however, may be enumerated (1) the secretion of bile (which is both a secretion and an excretion), and (2) the glycogenic or sugar-producing property. Under the head of bile is included both a secretion of importance to digestion—in fact, necessary for life—as well as an important excretion.

How is the Bile secreted?—According to the views of some physiologists, there are two distinct systems in the liver—one for the secretion of bile, accomplished by the little racemose glands* attached to the gall-duct as it ramifies in the substance of the gland, and one for the production of sugar, the hepatic or liver cells. This theory, however, does not seem to be correct, as there are animals, as the rabbit, in which the small glands above referred to do not exist, at the same time that both bile and sugar are produced by its liver. We are therefore obliged to consider that there is no anatomical or physiological evidence that the bile is secreted anywhere but in the lobules or acini by means of the hepatic cells. At this point the small bile-capillaries take up the material and carry it to the gall-bladder, where it is stored up for future use. A question of interest arises as to whether the bile be formed from venous or arterial blood. The hepatic artery has been tied, and bile was secreted still. From the experiments of Oré it is shown that when the portal vein is obliterated bile continues to be formed from the blood of the hepatic artery. Hence we conclude that bile may be formed from either venous or arterial blood.

Quantity of Bile.—From experiments on animals, with a fistula in the gall-bladder and the ductus communis choledocus tied, it has been estimated that the quantity of bile secreted in twenty-four hours in a healthy man weighing 140 pounds is $2\frac{1}{2}$ pounds.

Flow of the Bile.—During the period in which the digestive functions are inactive the gall-bladder is constantly receiving bile from the liver. As soon, however, as stomach digestion is completed, and the food passes into the duodenum by means of the distended condition of the surrounding organs, a sufficient amount of pressure is exerted upon the walls of the gall-bladder to force out the bile, through the ductus communis choledocus, into the small intestine. The flow of bile continues during the period of intestinal digestion, after which no more passes into the duodenum; the gall-bladder still receives this fluid from the liver, and in this manner it is stored up for future use. The bile, then, is constantly formed by and discharged from the liver. This peculiarity belongs to the liver, for it is a well-established fact that *secreting* glands are only active at certain times, their functions not being constantly required.

Properties of the Bile.—As the bile flows from the hepatic duct directly, it is a somewhat viscid fluid, which,

* The function of these glands is undoubtedly to form mucus, which is always found in the bile as it comes from the hepatic duct.

after remaining in the gall-bladder, has its viscidity increased by the further admixture with mucus. The color of the bile varies greatly with the animal from which it is obtained, being in the human subject, when procured immediately after death, of a dark golden brown. Pig's bile is clear yellow; dog's, dark brown; ox bile has a green color. The specific gravity of human bile varies from 1018 to 1026. The reaction of fresh healthy bile is alkaline. There is no characteristic odor, but it readily undergoes putrefaction, giving forth a most offensive stench. The taste is extremely bitter. When shaken the bile becomes frothy, owing to its mucous and saponaceous constituents. The composition of human bile may be seen from the following table:

Composition of Human Bile.

Water	915.00	to	819.00
Taurocholate or cholate of soda	56.50	"	106.00
Glycocholate or cholate of soda (?)	traces.		
Cholesterine	1.60	to	2.66
Coloring-matter, bilirubin	14.00	"	30.00
Lecithine, margarine (?), oleine, and traces of soaps	3.20	"	31.00
Choline	traces.		
Chloride of sodium	2.77	to	3.50
Phosphate of soda	1.60	"	2.50
" " potassa	0.75	"	1.50
" " lime	0.50	"	1.35
" " magnesia	0.45	"	0.80
Salts of iron	0.15	"	0.30
Salts of manganese	traces.		
Silicic acid	0.03	to	0.06
Mucosine	traces.		
Leucine, tyrosine, xanthine	3.45	to	1.21
	1000.00		1000.00

The ingredients of the bile which possess the greatest amount of interest are what are termed *biliary salts*, first known under the name *biliary matter* (Berzelius) and *picromel* or *biliary resin* (Thénard), to whose original papers, mentioned below, the reader is referred. Most of our present knowledge has been obtained from the investigations of Strecker, Lehmann, and Dalton.

Coloring-matter of the Bile.—Chemistry, so far, has shown us that there are two principal biliary coloring-matters—viz. *bilirubine* and *biliverdine*. Both substances are nitrogenous: the first of a reddish-yellow color and crystallizable; the second imperfectly crystallizable, and of a green hue. Besides these two coloring-matters, we may mention biliphæine, bilifuscine, and biliphrasine, which, however, are simply modifications or derivatives of bilirubine and biliverdine.

The Physiology of the Liver.—We have already referred to the functions of this organ, and have seen that it secretes bile and forms sugar. Let us first consider the functions of the bile. There are two distinct functions of the biliary fluid. In the first place, it is a secretion formed from the blood by the liver, and discharged into the alimentary canal for purposes of digestion. Here, after modifying the digestive process, a part is absorbed into the system, and a part (cholesterine) passes out of the economy. That the bile is necessary to life we have seen, for when this fluid is allowed to escape through a fistula an animal will die of inanition in from twenty-seven to thirty-eight days. Physiologists are not yet acquainted with the exact action of the bile as a digestive fluid; some considering that it is for the purpose of causing the movements of the intestine (peristaltic action), others that it supplies alkalinity to the absorbing vessels of the villi, which hastens the introduction of fat into the blood; while, on the other hand, it has been claimed that the bile forms an emulsion with fats to a great extent, and in this manner aids the secretion from the pancreas, so as to completely digest fatty materials. We can only state that the bile performs some part in the digestive process; what it may be is at present unknown. The biliary salts, with certain other constituents of the bile, are absorbed in the intestine, as they cannot be found in the fæces, and are not seen to accumulate in the blood when the liver is diseased or extirpated.

The Bile as an Excretion.—Although it is well known that cholesterine is found in small quantity in the crystalline lens and spleen, by far the larger amount is met with in the brain and nervous system. A series of experiments have shown that the blood acquires cholesterine in passing through the brain and nerves of the extremities, and therefore there can be no doubt but that the blood takes up this substance from the nervous system generally; the cholesterine representing the wornout nerve-tissue, as urea does that of muscle. By a further series of observations by Prof. Flint, Jr., the fact is established that in cases where there is paralysis, or any form of disease which interferes with nerve-function, the blood coming from the part or parts affected contains little or no cholesterine. Furthermore, when the liver becomes affected (which would prevent its separating the cholesterine from the blood) the cholesterine collects or accumulates in the blood to such an extent as to produce a poisoning called *cholesteræmia*. We have already alluded to the fact that although cholesterine is discharged into the intestines in order to be thrown out of the system, before it reaches the external world it becomes changed into *stercorine* in the alimentary canal, and is found as such in the fæces. In cases where the function of the liver is interfered with by disease the fæces contain no stercorine. As yet no exact chemical relations have been established between cholesterine and stercorine.

The Glycogenic or Sugar-forming Function of the Liver.—In 1848, Bernard, the illustrious French physiologist, showed that the blood coming from the liver contained sugar of the variety found in the urine of persons suffering from *diabetes mellitus*. When an animal is fed exclusively upon animal food, which contains no sugar, and the blood going to the liver is examined carefully, no sugar is to be found in it; but when the blood coming from the liver is analyzed, sugar is always present, even though the time were chosen when the digestive function was quiescent; in fact, in starving animals the blood of the hepatic veins always contains sugar. These experiments point to the fact that the blood acquires sugar in its passage through the liver. Bernard further examined the blood from various parts of the body, made extracts of all the tissues, and found sugar only in the tissue and blood of the liver. As the blood passes from the hepatic veins it becomes mingled with that of the venæ cavæ, and in its passage through the lungs the sugar either entirely or in great part disappears. We can then conclude that the liver, unlike any other gland in the body, is a secreting as well as an excreting organ, and, like the ductless glands, it forms a substance (sugar) which is delivered directly into the blood.

Literature.—Oré, *Inférence de l'Oblitération de la Veine porte sur la Sécrétion de la Bile, Comptes Rendus* (Paris, 1856); Longet, *Traité de Physiologie* (Paris, 1869); Robin, *Leçons sur les Humeurs* (Paris, 1867); Bidder und Schmidt, *Die Verdauungssäfte* (Leipsic); Dalton, *Treatise on Human Physiology* (Philadelphia, 1871); Bernard, *Liquides de l'Organisme* (Paris, 1859); Robin et Verdiel, *Traité de Chimie anatomique* (Paris, 1853); Lehmann, *Physiological Chemistry* (Philadelphia, 1855); Bérard, *Cours de Physiologie* (Paris, 1851); Milne Edwards, *Leçons sur la Physiologie* (tom. 7, Paris, 1862); Flint, Jr., *The Physiology of Man* (New York, 1867–70); Pettenkofer, *Notiz über eine neue Reaction* (auf.); Galle und Zucker, *Annalen der Chemie und Pharmacie* (Heidelberg, 1844); Bernard, *Leçons de Physiologie expérimentale* (Paris, 1855); Ib., *De l'Origine du sucre dans l'Economie animale, Archives général de Médecine* (Paris, 1848); Ib., *Sur les Effets des Substances toxiques et médicamenteuses* (Paris, 1857); Ib., *Recherches sur une nouvelle Fonction du Foie* (Paris, 1853); Frerichs, *Verdauung*, Wagner's *Handwörterbuch der Physiologie* (Braunschweig, 1846); Strecker, *Untersuchung der Ochsgalle, Annalen der Chemie und Pharmacie* (Heidelberg, 1848); Todd, *Cyclopædia of Anatomy and Physiology* (London, 1839–47, vol. iii.); Sanderson, *Handbook for the Physiological Laboratory* (Philadelphia, 1873); Bennett, *Text-book of Physiology* (Philadelphia, 1873); Dalton, *Spectrum of Bile, N. Y. Medical Journal* (1874). J. W. S. ARNOLD.

Livermore, post-v. of Alameda co., Cal., on the Central Pacific R. R., 48 miles E. of San Francisco, has 1 weekly newspaper.

Liv'ermore, post-v. of McLean co., Ky., on the navigable Green River and on the Owensboro' and Russellville R. R. Pop. 302.

Livermore, post-tp. of Androscoggin co., Me., 20 miles N. of Auburn, on the W. bank of the Androscoggin River, opposite East Livermore. Pop. 1467. Native place of the celebrated Washburne family and other distinguished persons.

Livermore, post-b. of Derry tp., Westmoreland co., Pa., on the West Pennsylvania R. R. Pop. 211.

Livermore (ABIEL ABBOT), b. in Wilton, N. H., Oct. 30, 1811; educated at Exeter; graduated at Harvard College 1833, and at the Divinity School 1836; settled in Keene, N. H., 1836, in Cincinnati 1850; in 1857 removed to Yonkers and became editor of the *Christian Inquirer*, a Unitarian paper in New York; since 1863 has been president of the Theological School at Meadville, Pa. Mr. Livermore has been a contributor to magazines, and is the author of several works: *A Commentary on the Four Gospels* (2 vols., 1841–42), *A Commentary on the Acts of the Apostles* (1844), *Lectures to Young Men* (1846), *The Marriage Offering*, a prize essay on the Mexican war (1850), *Discourses* (1854), *A Commentary on Romans* (1854). He was also one of the compilers of the book of hymns known as the *Cheshire Collection* (1845). O. B. FROTHINGHAM.

Livermore (GEORGE), b. at Cambridge, Mass., July 10, 1809; educated at the public schools; was carefully

trained for a mercantile life, and after some experiences at different places entered into business at Boston as a wool commission-merchant, in which he became, and remained through life, one of the prominent business-men of that city, taking pride in being known in that capacity. Early in life he began to devote his leisure to historical and antiquarian researches, in which he became a recognized authority, and in the specialty of editions of the Bible in different languages his collection was probably the finest in America. He was fond of large-paper copies and illustrated editions, in which his library was very rich. He was in 1849 honored with an election to the Massachusetts Historical Society, of which he was an active and influential member, as also of the American Antiquarian Society, the American Academy of Arts, and the Boston Athenæum, of all which he was often an officer. He frequently wrote for the newspapers and reviews upon subjects of a bibliographical or historical character, all his contributions being marked by a pure and vigorous style and displaying extensive research. Among these papers may be mentioned those in the *Cambridge Chronicle* on the *New England Primer* (1849), in the *North American Review* on *Public Libraries* (1850), and his important essay, *An Historical Research respecting the Opinions of the Founders of the Republic on Negroes as Slaves, as Citizens, and as Soldiers*, read before the Massachusetts Historical Society Aug. 14, 1862, printed in the *Proceedings* of that society, and separately in four other editions on superior paper, making a volume of 215 pages. Mr. Livermore was a liberal contributor of his time, strength, and money to the Union cause during the civil war, was instrumental in securing for the Historical Society the invaluable library of Mr. Dowse, and was beloved by all his acquaintances as a high-minded Christian gentleman and scholar. D. at Cambridge Aug. 30, 1865. Beautiful tributes to his memory were paid—by Rev. E. E. Hale in his sermon entitled *The Public Service of a Private Man*, and by Hons. R. C. Winthrop and Charles Deane in addresses before the society which he had adorned.

Livermore (Mary Ashton), b. at Boston, Mass., Dec. 19, 1821, daughter of Timothy Rice and wife of D. P. Livermore, a Universalist minister; has written largely for periodicals, labored with much ability in behalf of the Sanitary Commission during the civil war, and has taken a prominent position as a writer and public speaker upon woman suffrage and various social and religious questions. In 1870 she established *The Woman's Journal* at Boston, Mass.

Livermore Falls, post-v. of East Livermore tp., Androscoggin co., Me., on the Androscoggin R. R. and on the E. bank of the Androscoggin River, has 3 churches and manufactures of lumber, condensed milk, ploughs, etc.

Liv'erpool, next to London the largest city, and without any exception the largest seaport, of the United Kingdom of Great Britain and Ireland, is situated in lat. 53° 24′ 6″ N., lon. 2° 59′ 5″ W., on the estuary of the Mersey, 4 miles from the Irish Sea, one hour's distance by railway from Manchester, six hours' from London and Edinburgh, and eight hours' by steam from Dublin. In 1647 it was made a free port, and in 1697 it was declared an individual parish, but it had at that time only about 5000 inhabitants, and its shipping numbered only about 80 vessels. Its growth began in the eighteenth century, and became very rapid in the latter part of it. In 1760 its population had increased to 25,700 souls, and its shipping to 1245 vessels, and in 1800 to 77,700 and 5000 respectively, and it has since gone on increasing. Its population in 1851 was 375,955; in 1861, 443,938; in 1871, 493,346. In 1866 there cleared from its port 12,685 vessels of 4,464,445 tons burden, of which 3267 were British vessels, of 2,345,658 tons, 1361 foreign, of 620,810 tons, and 8157 belonging to the coast-trade—namely, 4418 sailing vessels and 3639 steamers; to the port itself belonged 2998 ships—namely, 2569 sailing vessels, of 1,326,317 tons, and 429 steamers, of 205,664 tons. In 1873, 15,104 vessels of 6,339,376 tons entered the harbor, and 15,006 cleared it; of the entering vessels, 7923 were sailing vessels and 7083 steamers; 4042 were foreign and 9408 employed in the coast-trade. To the port itself belonged 1866 sailing vessels of 990,867 tons and 563 steamers of 412,464 tons. The development of this gigantic traffic, which is surpassed only by that of the port of New York, is partly due to the growth of the manufacturing industry of the neighboring inland towns and the establishment of perfect means of communication between these places and Liverpool. The Bridgewater Canal, connecting the Trent and the Mersey, was opened in 1773; the railway to Manchester in 1830, to Birmingham in 1837, to London and Preston in 1838. Thus Liverpool became the chief port of exportation from Great Britain; nearly one-half of all British exports are shipped from its docks. The value of British produce and manufactures exported in 1873 from Liverpool amounted to £93,925,396. The principal items were—cotton manufactures, £34,794,989; cotton yarn, £4,631,045; woollen manufactures, £11,299,679; linen manufactures, £4,648,362; iron, £11,350,312; hardware and cutlery, £2,626,994; haberdashery and millinery, £2,282,083. But another and perhaps still greater influence on the development of the commerce of Liverpool was derived from the rise of the U. S. About four-fifths of all the traffic which takes place between North America and Great Britain is carried on through the port of Liverpool: 1509 vessels from the U. S. entered its port in 1873; and 1324 cleared it for the U. S. Of the 2,840,981 bales of cotton which in 1873 were exported from the U. S., 1,807,584 went to Liverpool. The abolition in 1833 of the monopoly of the East India Company, which gave Liverpool a chance of participating in the trade with the East, and the rise of the Australian colonies, have also contributed to make it the most important place of importation in the United Kingdom. Half of all the grain, bacon, hams, lard, madder, palm oil, etc. which is imported to England is received here, and here is held the largest cotton-market in the world, and soon probably it will have the largest wool-market. Of the 13,639,252 cwts. of cotton which were imported to England in 1873, 12,570,632 came through this port. In addition to this tremendous importation and exportation, an important manufacturing industry is carried on in the city. Its sugar-refineries and soap-factories are very extensive; its shipbuilding establishments are also in very active operation. It was one of the first branches of industry started here, and it was largely developed in the latter part of the eighteenth century; from 1777 to 1782, 15 vessels of war were launched here, ranging from 16 to 50 guns; in 1873, 29 vessels were built here, of 31,806 tons burden.

Liverpool is the most densely peopled city in England. In 1868 it contained 96 persons to an acre, while Manchester contained only 81, Birmingham 44, and London 40. A generation ago it was also one of the filthiest and unhealthiest cities in Europe, and in the beginning of this century certain of its quarters were world-famous as the most frightful haunts of vice, crime, and misery. But in these respects great improvements have been made and are still making, and Liverpool is now fairly on the way to become a magnificent city. Its accommodations for traffic are most splendid. The docks, stretching along the Mersey 5 miles on the Liverpool side and 2 miles on the Birkenhead side, are unsurpassed by any in the world. They cost £10,000,000 to construct, and are masterpieces of engineering art. A full description of them will be found in the article on Docks. Three railway lines cross the city from the docks in huge tunnels under the houses, while the Lancaster and Yorkshire Railway is carried above the houses on a splendid viaduct to Tithebarn street, where stands one of the largest dépôts in the world, its glass roof covering an area of 84,000 square feet. The public buildings more recently erected are on a grand and magnificent scale, such as St. George's Hall, with Corinthian columns 40 feet high, and a hall for public meetings, concerts, etc. 161 feet long and 75 feet wide; the exchange, forming the three sides of a square, with the town-hall on the fourth, and the Nelson monument in the centre; the Free Library and Museum, etc. Broad and handsome streets have been run through several of the most crowded parts of the city; it has been amply provided with good water and gas; numerous hospitals, asylums, and other institutions for the relief of the sick, poor, and destitute have been founded; good educational institutions, from the elementary school to the scientific association with its library, observatory, botanical garden, etc., have been established; dignified and beautiful places of worship and decent and elegant places of amusement have been built, and an effective police has been procured. Clemens Petersen.

Liverpool, seaport of Nova Scotia, cap. of Queen's co., has considerable trade in fish and lumber. The town is well built and attractive. It has a good harbor, into which flows the river Mersey. It has 1 weekly newspaper, a bank, and a lighthouse on Coffin's Island; lat. 44° 3′ N., lon. 64° 36′ W. Pop. of sub-district, 3104.

Liverpool, post-v. and tp. of Fulton co., Ill., between the Illinois River and Thompson's Lake, 8 miles N. E. of Havana. Pop. 1336.

Liverpool, post-v. of Salina tp., Onondaga co., N. Y., on the E. shore of Onondaga Lake, 4 miles N. of Syracuse, on the Oswego Canal and Syracuse Northern R. R., has 4 churches, 7 hotels, 1 weekly newspaper, an academy, 2 cigar-factories, several large mills, and an extensive manufacture of willow baskets. The leading industry, however, is the manufacture of salt in a large number of works. Pop. 1555. John J. Hallock, Ed. "The Times."

Liverpool, tp. of Columbiana co., O. Pop. 2907.

Liverpool, a v. (ROSEDALE P. O.) of Pike tp., Madison co., O. Pop. 67.

Liverpool, post-tp. of Medina co., O. Pop. 1425.

Liverpool, post-b. and tp. of Perry co., Pa., on the W. bank of the Susquehanna, 30 miles above Harrisburg. The railroad station is E. of the river, in Dauphin co., on the Northern Central R. R. Pop. of b. 823; of tp. 859.

Liverpool (CHARLES JENKINSON), FIRST EARL OF, b. in Oxfordshire, England, May 10, 1727; educated at Oxford; entered Parliament, and became under-secretary of state in 1761; was joint secretary of the treasury in 1763; lord of the admiralty in 1766; lord of the treasury in 1767; vice-treasurer of Ireland and privy councillor in 1772; master of the mint in 1776; and secretary of state for the war department in Lord North's administration from 1778 to 1782, in which capacity he had much to do with determining the course of military operations in the U. S. during the closing years of the American war of independence. On retiring from the latter office he enlisted in the political circle which was grouping itself around the younger Pitt, by whom he was appointed in 1784 president of the board of trade, and held that post during the whole seventeen years of Pitt's first administration. He was created Baron Hawkesbury in 1786, and earl of Liverpool June 1, 1796, and d. in London Dec. 17, 1808. He published a *Collection of all the Treaties of Peace between Great Britain and Other Powers from 1648 to 1783* (3 vols., 1785).

Liverpool (ROBERT BANKES JENKINSON), SECOND EARL OF, b. in London June 7, 1770; educated at Oxford; entered Parliament in 1790, before attaining his majority; took rank as a ready debater; went on a special mission to Coblentz in 1791; succeeded (by courtesy) to the title of Lord Hawkesbury in 1796; was appointed secretary of state for foreign affairs in the Addington cabinet, and negotiated the Treaty of Amiens in 1801; became home secretary under Pitt in 1805, and again in 1807; and succeeded to the earldom of Liverpool in Dec., 1808. On the death of Pitt (1806), and again on the fall of the Fox and Grenville administration (1807), he had refused the premiership, but accepted it on the assassination of Mr. Perceval (May 11, 1812), with the title of first lord of the treasury, and remained at the head of the administration fifteen years, until an attack of paralysis (Feb. 17) occasioned his resignation in Apr., 1827. D. Dec. 4, 1828. His term of office was longer than that of any British premier of the present century, and was marked by a decided opposition to the emancipation of the Catholics, the abolition of slavery, parliamentary reform, and all other measures of a liberal character, while the introduction of a bill of pains and penalties against Queen Caroline, as well as the measures for the repression of internal disturbances, brought upon him a popular odium which was not conciliated by the admitted blamelessness of his private character.

Livery of Seizin. See FEOFFMENT.

Liverworts. See HEPATICÆ.

Liv'ia Drusil'la, a daughter of L. Livius Drusus Claudianus (who committed suicide after the battle of Philippi in order to escape the vengeance of the triumvirs), b. in 56 B. C. and married early to Tiberius Claudius Nero, to whom she bore two sons, Tiberius and Drusus. While pregnant with the latter she made the acquaintance of Augustus, and fascinated him so much by her beauty and the elegance and dignity of her manners that he compelled her husband to cede her to him, while at the same time he divorced his own wife, Scribonia. Their marriage, which followed immediately, was very happy; Livia retained the tenderness and confidence of Augustus to his death. But behind the bland reserve of her appearance she concealed a plan of enormous ambition and cruelty, and she pursued it without scruple. As the years passed away all the members of the large and brilliant family of Augustus were ruined one after the other, and the old emperor at last found himself alone in the palace with Livia and her son Tiberius, whom he adopted and made his heir. All Rome execrated the empress, Augustus himself suspected her, and her own son feared and hated her. She survived Augustus fifteen years, but she soon lost her influence under the reign of Tiberius; it is even said that he retired to Capri in order to escape from her presence. She d. at Rome in 29 A. D., and her son refused to visit her on her deathbed, and took no part in the funeral rites.

Liv'ingston, county of N. E. Central Illinois. Area, 1026 square miles. It is level and fertile; coal, limestone, and sandstone are found. Cattle, grain, and wool are staple products. The county is traversed by Vermilion River and by the St. Louis Alton and Chicago, the Fairbury Pontiac and North-western, the Toledo Peoria and Warsaw, and other railroads. Cap. Pontiac. Pop. 31,471.

Livingston, county of W. Kentucky, bounded on the N. and W. by the Ohio River, on the S. by the Tennessee, and on the E. partly by the Cumberland, which afterwards bisects the county. Coal and iron abound. The soil is good, producing much corn and tobacco. Area, 275 square miles. Cap. Smithland. Pop. 8200.

Livingston, parish of S. E. Louisiana. Area, 560 square miles. It is bounded W. by the navigable Amité River, and S. by the Amité River and Lake Maurepas. It is traversed by the river Tickfaw. It is level and generally fertile. Cotton, rice, and live-stock are the staples. Cap. Springfield. Pop. 4026.

Livingston, county of Central Michigan. Area, 576 square miles. It is level and fertile. Cattle, grain, and wool are staple products. Carriages and wagons are leading articles of manufacture. The county is traversed by the Detroit Lansing and Lake Michigan R. R. Cap. Howell. Pop. 19,336.

Livingston, county of N. Missouri. Area, 540 square miles. It is a fertile rolling prairie region, with well-timbered bottom-lands. Coal is found. Tobacco, cattle, grain, and wool are staple products. The county is traversed by Grand River and its numerous tributaries, and by the Hannibal and St. Joseph and the Northern Missouri R. Rs. Cap. Chilicothe. Pop. 16,730.

Livingston, county of W. Central New York. Area, 655 square miles. It is hilly in the S. and rolling in the N. portion. It is all arable and very fertile. Live-stock, wool, dairy products, grain, hay, fruit, and broom-corn are leading products. Building and flagging stone is quarried. There are manufactures of carriages, flour, farming tools, lumber, cooperage, lime, castings, harnesses, clothing, etc. The county is traversed by the Genesee River and Canal, and by the New York Central, the Buffalo division of the Erie, the Avon Geneseo and Mt. Morris, and the Erie and Genesee Valley R. Rs. Cap. Geneseo. Pop. 38,309.

Livingston, post-v. and tp., cap. of Sumter co., Ala., on the Alabama and Chattanooga R. R., has 1 weekly newspaper. Pop. of v. 500; of tp. 2320.

Livingston, post-v. and tp. of Essex co., N. J. Pop. 1157.

Livingston, post-tp. of Columbia co., N. Y., on the E. bank of the Hudson River, 7 miles below Hudson, and on the Hudson River R. R., 107 miles above New York, has several churches and villages and some manufacturing interests. Pop. 1938.

Livingston, post-v., cap. of Overton co., Tenn., 100 miles E. of Nashville and 18 miles E. of the Cumberland River, on the line of the proposed South-western R. R., has 2 churches, 1 academy, 6 dry goods and 1 drug store, and some shops. Principal business, farming and stock-raising. Pop. 240. W. C. HART, LATE ED. "JOURNAL."

Livingston, post-v., cap. of Polk co., Tex., 100 miles N. N. E. of Galveston.

Livingston, tp. of Spottsylvania co., Va. Pop. 2213.

Livingston (BROCKHOLST), LL.D., b. in New York Nov. 25, 1757, son of William Livingston; left Princeton College to join Gen. Schuyler's staff in 1776; served on Arnold's staff, and attained the rank of colonel; was private secretary to John Jay in Spain in 1779; was admitted to the bar in 1783; became a judge of the New York supreme court in 1802, and was from 1806 to 1823 an able, upright, and accomplished judge of the U. S. Supreme Court. D. at Washington, D. C., Mar. 19, 1823.

Livingston (EDWARD), b. at Clermont, Columbia co., N. Y., May 26, 1764, a son of Judge Robert R. Livingston (1719–75); graduated at Princeton in 1781, and began the practice of law in New York; was a Jeffersonian member of Congress 1795–1801; in 1802 was U. S. district attorney; was twice chosen mayor of New York (1801 and 1802), and at the same time was a judge of a municipal court; in 1803 became involved in pecuniary difficulties, and in 1804 removed to New Orleans, and attained a most brilliant reputation as a lawyer; in 1808 became involved in a lawsuit with regard to lands in New Orleans claimed by the general government, but ultimately won the case. At the battle of New Orleans he acted as aide to Gen. Jackson. Mr. Livingston spent many years in preparing civil and criminal codes for Louisiana—labors which won for him a wide fame in Europe and in Spanish America. He was a member of Congress 1823–29; U. S. Senator 1829–31; secretary of state 1831–33; minister to France 1833–35. He was made a member of the French Academy of Moral and Political Sciences. He afterwards fixed his residence at Rhinebeck, N. Y., where he d. May 26, 1836. His chief works are *Judicial Opinions* (1802), *Report of the Plan of the Penal Code* (1822), *Penal Law for Louisiana* (1826), and *Penal Law for*

the U. S. (1828). His *Complete Works on Jurisprudence* were published in New York in 1873. The revision of the civil code of Louisiana (1824) was the joint work of Livingston and M. Moreau-Lislet, though chiefly from the pen of the former. (See his *Life*, by C. H. Hunt, 1864; *Recollections of Livingston*, by M. Davezac.)

Livingston (Gen. Henry Beekman), son of Judge R. R. Livingston (1719–75), b. at Livingston Manor, N. Y., in 1750; raised a military company in Aug., 1775, with which he accompanied Gen. Montgomery's expedition to Canada, and for distinguished gallantry at the capture of Chambly was voted a sword of honor by Congress. He became aide-de-camp to Gen. Schuyler Feb., 1776, and colonel of the 4th battalion New York Vols. Nov., 1776, but resigned in 1779. Bred to the law, he attained successively the posts of attorney-general, judge, and chief-justice of the supreme court of his native State, was president of the New York Society of the Cincinnati, and appointed a brigadier-general in the war of 1812. D. at Rhinebeck, N. Y., Nov. 7, 1831.

Livingston (John Henry), D. D., b. at Poughkeepsie, N. Y., May 30, 1746; graduated at Yale College in 1762; began the study of law, but afterwards studied theology at Utrecht, Holland; was ordained at Amsterdam 1770; became pastor of the Dutch church in New York; preached at Albany, Kingston, and Poughkeepsie during the war; was appointed professor of divinity 1784; opened a seminary at Bedford, L. I., in 1795, which was discontinued two years later, and became in 1807 president and professor of theology at Queen's (now Rutgers) College, New Brunswick, N. J., where he d. Jan. 20, 1825. He published *Psalms and Hymns* and some religious writings, and was considered the father of the Reformed Dutch Church in America.

Livingston (Philip), a signer of the Declaration of Independence, b. at Albany, N. Y., Jan. 15, 1716; graduated at Yale in 1737; became a prosperous merchant and official of New York City; was Speaker of the house of the colonial legislature in 1768, a member of the Continental Congress 1774–78, and president of the provincial Congress 1775. He was one of the founders of the New York Chamber of Commerce and of the Society Library, and materially aided Yale and Columbia colleges. D. at York, Pa., June 12, 1778.

Livingston (Robert R.), b. in New York State in 1719; became a distinguished lawyer; was judge of the admiralty court 1760; justice of the New York supreme court 1763; representative in the assembly 1759–68, and commissioner in 1767 and 1773 to locate the boundary-line between New York and Massachusetts. D. at Philadelphia Dec. 9, 1775.

Livingston (Robert R.), LL.D., known as "Chancellor" Livingston, b. at New York Nov. 27, 1747, a son of Judge R. R. Livingston and a brother of Edward Livingston; graduated at King's (now Columbia) College in 1765; became a successful lawyer; was recorder of New York 1773–75; a member of the Continental Congress 1775–77 and 1779–81; was on the committee which reported the Declaration of Independence, but was prevented by circumstances from signing it; was secretary of foreign affairs 1781–83; chancellor of New York 1777–1801; was instrumental, while U. S. minister to France (1801–04), in effecting the purchase of Louisiana; was the assistant of Fulton in perfecting steam-navigation; was one of the introducers of merino sheep into the U. S., and held with great efficiency various public positions. D. Feb. 26, 1813.

Livingston (William), LL.D., a brother of Philip, b. at Albany, N. Y., in 1723; graduated at Yale in 1741; became a prominent lawyer and journalist; removed in 1773 to Elizabethtown, N. J.; was elected in 1774 and 1775 to the Continental Congress; became in 1775 brigadier-general of militia; was governor of New Jersey 1776–90; was a member of the convention which in 1787 drew up the Federal Constitution. He was a writer of considerable ability, though he published nothing but occasional pamphlets. D. at Elizabethtown, N. J., July 25, 1790.

Liv'ingstone (David), M. D., LL.D., b. at Blantyre, near Glasgow, Scotland, Mar. 19, 1813. His parents were very poor, and could give him no aid to acquire a scholarly education. His religious enthusiasm, however, in connection with a passion for travelling in foreign countries, created early the idea of a missionary life in his mind; and first by attending an evening school while employed during the day in the cotton-mills, and later on by working hard during the summer and studying during the winter, he contrived to prepare himself thoroughly for his task. In 1840 he offered his services as a missionary to Africa to the London Missionary Society, and shortly after was ordained and proceeded to Port Natal in South Africa. Here and on several other mission-stations he worked for nine years, together with Robert Moffat, whose daughter he married, but, although at that time preaching and not exploration was his chief aim, yet he sent much valuable information to the Geographical Society of London and to Petermann's *Geographische Mittheilungen*, in Gotha. In 1849 he made his first journey of exploration in search of Lake Ngami, which he discovered Aug. 1 same year, and whose borders and outlet he explored. In 1853 he crossed the continent from the Zambesi to the Congo, whence he proceeded to Loando, the capital of Angola, where he arrived in June, 1854, after eighteen months' travelling. In September he returned, crossing the continent once more, this time from Loando to Quilimane, on the Indian Ocean, where he arrived May 20, 1856. He then made a visit to England, where in 1857 he published his *Missionary Travels and Researches in South Africa*, which made his name popular not only in England, but in all Europe. In 1858 he returned to Africa, and, supported by the government and accompanied by several scientific associates, he started from Quilimane on an exploring journey up the Zambesi, which lasted five years, and during which his wife, who accompanied him, died at Shupanga, Apr. 27, 1862. In 1864 he returned to England, and in 1865 published *A Narrative of an Expedition to the Zambesi.* Shortly after he again left England, starting on his third great journey, but more than one year elapsed before any communications were received from him. It was then rumored that he had been killed by the natives near Lake Nyassa, and an expedition under the command of Mr. Young went out in search of him. Mr. Young did not find him, but later on letters from him arrived dated July, 1868, and May, 1869. Again more than one year elapsed without any communications, until the New York *Herald* sent out Mr. Henry M. Stanley in search of him, who found him in Ujiji in the autumn of 1871. As it was Livingstone's idea to remain in Africa and continue his explorations one more year, the Royal Geographical Society of London sent out early in 1873 a relief expedition under the command of Lieut. Cameron. When this expedition reached Unyanyembe (Aug. 4), one of Livingstone's associates met it with the report that he had died at Chitambo's village, Ulala, on May 1, 1873. On Oct. 16 his corpse reached Unyanyembe, whence it was brought to England and buried in Westminster Abbey, where a memorial tablet marks his resting-place. His *Last Journals* were published in 2 vols. in London in 1874, edited by Rev. Horace Waller. (See Stanley's *How I Found Livingstone*, 1873.) Clemens Petersen.

Liv'ius Androni'cus lived in the third century before our era, and was b. at Tarentum, a slave of Greek descent. He received his liberty from M. Livius Salinator, and began to represent tragedies and comedies (which he composed after Greek models) in Rome in the middle of the century. He also translated the *Odyssey* into Latin, and contributed much to make the Romans acquainted with Greek literature. In the time of Horace his compositions were still used in the schools, and his works were extant in the fourth century of our era, but only a few insignificant remnants have come down to our time, edited by Düntzer (Cologne, 1835) and by Ribbeck, *Trag. Lat. Rell.*

Liv'nee, or **Livny,** town of Russia, in the government of Orel, on the Sosna. Pop. 8202.

Livo'nia [Ger. *Liefland*], government of Russia, bordering on the Gulf of Livonia, and comprising, together with the island of Oesel, an area of 17,801 square miles, with 990,784 inhabitants. The surface is low, flat, and often marshy, dotted with numerous lakes, and covered with forests. Rye, barley, oats, buckwheat, flax, and hemp are raised, and many cattle reared. In the towns the inhabitants are mostly of German descent, mixed with Russians, Poles, and Jews; in the country they are of Finnish origin. Cap. Riga. The country was a Swedish possession from the Peace of Oliva (1660), when it was conquered from Poland, to the Peace of Nystadt (1721), when it was ceded to Russia.

Livonia, post-v. and tp. of Wayne co., Mich., on the Detroit Lansing and Lake Michigan R. R. Pop. 1679.

Livonia, tp. of Sherburne co., Minn. Pop. 263.

Livonia, tp. of Livingston co., N. Y., on the Rochester division of the Erie R. R. Livonia Centre (Livonia P. O.) (pop. 193) and Livonia Station, a manufacturing and post-village (pop. 399), are in this township. Total pop. 2705.

Livonia Centre, a v. of Livingston co., N. Y. Pop. 193.

Livonia Station, post-v. of Livingston co., N. Y. Pop. 399.

Livor'no, town of Italy, in the province of Novara, about 8 miles S. W. of Vercelli. It is mentioned in ecclesiastical history under the name of *Liberone* as early as the fifth century. Pop. in 1874, 5797.

Livre [Fr. for "pound;" Lat. *libra*], the former French standard unit of weight, was to the pound avoirdupois as 17.267 to 16. Also, a former French coin, superseded in 1795 by the franc, which is to the *livre Tournois* (the old standard) as 81 to 80, the Parisian livre being to these figures nearly as 100. Still other livres were in use.

Liv'y (Titus Livius), b. at Patavium in Northern Italy in 59 B. C., lived chiefly in Rome, where he enjoyed the favor of Augustus and maintained intimate intercourse with the young Claudius, but returned in his old age to his native city, and d. there in 17 A. D. He was married, had at least one son and one daughter, and enjoyed great celebrity among his contemporaries, but nothing further is known of his personal life. According to Seneca, he wrote several dialogues and essays on philosophy, which have been lost, but the work by which he won a lasting fame was his *Annales*, containing the history of Rome from the foundation of the city to the death of Drusus, 9 B. C. It consisted originally of 142 books, and the short introductions with which the first, twenty-first, and thirty-first open seem to indicate that it was divided into groups of ten books or *decades*, each decade comprising an independent epoch. But of these 142 books only 35 have come down to us—namely, the entire first decade, i.–x., embracing the period from the foundation of Rome to the year 294 B. C.; the entire third decade, xxi.–xxx., embracing the period from 219 B. C. to 201 B. C.; the entire fourth decade, and one half of the fifth, xxxi.–xlv., embracing the period from 201 B. C. to 167 B. C. Of the rest only a few and inconsiderable fragments are still extant; all the so-called *epitomes*, however, short extracts of or indexes to each book, have been preserved. The first printed edition (Rome, 1469) contained only 29 books, namely—i.–x., xxi.–xxxii., xxxiv.–xl. The remaining six books were discovered in fragments in 1518, 1531, and 1616, and for more than two centuries the whole learned world was put into general commotion every now and then by a rumor that the entire work had been discovered, until in the seventeenth century all libraries had been ransacked in vain, and all hope of the recovery of the lost treasure was given up. The best modern editions are by Drakenborch (Leyden, 1738–46, and Stuttgart, 1820–28), Twiss (Oxford, 1840–41), Madvig (Copenhagen, 1861 *seq.*), and Weissenborn (Berlin, 1861 *seq.*). There are English translations by Philemon Holland (1600), Baker (1797), John Hayes (1744), and in Bohn's *Classical Library* (1850). Considered as a work of science, modern scholars have not given the highest praise to the *Annales*; the studies on which the representation rests are generally not exhaustive, and often not accurate. Nor can great praise be given to the book considered as a work of art. Its general character is that of a fluent narrative, which interests on account of the great importance of its contents, and pleases because it has no very striking peculiarities. Its most prominent feature is a strong feeling of the greatness of the Roman people; but with the author this feeling is a vanity rather than an inspiration, and in his work it is a means of flattery rather than a means of moral elevation. Thus, while the historical value of the *Annales* cannot be over-estimated on account of the scarcity and in many cases the absolute lack of other historical documents, the educational and æsthetic worth of the book is somewhat limited. Clemens Petersen.

Lixivia'tion and **Lixivium** [Lat. *lix*, "ley"; *liquid* and *liquor* are affiliated words]. Lixiviation is the method of extracting ingredients soluble in water from porous substances, like ashes or earth, by placing the latter in some receptacle, through which the water may be made to percolate. It is distinguished from another chemical method of accomplishing this called Decantation. (See this word.) The vessel for lixiviation usually has a perforated bottom, upon which straw or coarse gravel is first spread, and then the material to be lixiviated is filled in. All our American potash is thus obtained from wood-ashes, and much of the saltpetre of commerce thus from nitrous earth. Much economy is often arrived at by a construction which enables the first water poured on the mass to remain in it for some time until it has finished its solvent action, and then drawing off at the bottom. Sometimes then, on pouring through fresh water, it will be found soon to run through nearly pure. Concentrated leys are thus obtained without boiling down. The second water is not allowed to mix with the first, but kept to pour through a fresh mass of material. H. Wurtz.

Lixu'ri, town of Cephalonia, one of the Ionian Islands, is well built, manufactures coarse carpets and cotton fabrics, and carries on a considerable trade and shipping business. Pop. 6000.

Liz'ard [Lat. *lacerta*], a name commonly used by authors as synonymous with *saurian reptile* (the order Saura), a term exclusive of the loricate reptiles, the amphisbæna tribe, and the serpents. Popularly, it is often made to embrace some other true reptiles, and a large number of tailed batrachians. The order embraced many immense animals now extinct, whose remains are found by the geologist. The living species are all scaly; generally have four visible legs (a few are serpentine in shape), all are produced from eggs (some few species are hatched before birth), and none, it is believed, are truly poisonous. They are far more common in hot than in cool regions, and (in species) in the Old than in the New World. The typical genus, *Lacerta*, is of the family Lacertidæ. These families, as now estimated, are very numerous; that of the Ameividæ may perhaps be assumed as a typical one for America. This family includes the variegated lizard (*Teius Teguexin*), six feet long. It is a bold, active, carnivorous creature, fierce in self-defence, inhabiting South America. Its flesh is eaten. (See also Monitor, Gecko, Chamæleon, Iguana, and the names of the more important genera.)

Lizard, tp. of Pocahontas co., Ia. Pop. 955.

Lizard's Tail. See Saururaceæ.

Llama. See Lama.

Llanel'ly, town of South Wales, 16 miles S. E. of Caermarthen, has manufactures of copper, tin, and iron wares, which are sent to Liverpool, and a considerable trade in coal. Pop. 15,208.

Lla'no, county of W. Central Texas, bounded E. by the Colorado and traversed by the Llano River. Area, 900 square miles. It is somewhat broken, and rather dry and rocky. It has some timber and much building-stone, and abounds in rich iron ore. Gold, silver, lead, antimony, salt, and asphaltum have also been found. Stock-raising is the chief pursuit. Cap. Llano. Pop. 1379.

Llano, post-v., cap. of Llano co., Tex., 75 miles N. W. of Austin. Pop. 188.

Lla'no Estaca'do [Sp., "staked plain," so called from the stake-like boles of a yucca-plant which grows there], an elevated plateau of N. W. Texas and S. E. New Mexico, having an area of 44,000 square miles and an elevation of from 3200 to 4700 feet, the general slope being northward. It has very few streams and water-holes, and a sparse coating of grass in the wet season. Its scanty shrubs have enormous roots, which afford the best attainable supply of fuel. In 1852, Lieut. (since Brig.-Gen.) Pope, U. S. A., sunk artesian wells at various points upon the Llano, with a view to developing a water-supply for a railroad to the Pacific, but without very encouraging results.

Lla'nos [Sp., from Lat. *planus*, "level"], the name of those vast plains or steppes in the northern part of South America which surround the lower and middle course of the Orinoco. In the dry season they are scorched by the sun and nearly transformed into a desert, and the large herds of wild horses and cattle which inhabit these plains become almost crazy from thirst, and run furiously along, tortured by poisonous insects and raising immense clouds of dust. In the wet season the plains are mostly inundated, and become an immense sea where the herds swim from hill to hill carrying their young ones on their backs to protect them against the alligators. In spring and fall, or rather during the period which separates the dry and the wet season, the llanos present the most luxuriant pasturages, and are a true paradise for cattle.

Llan'quihue, a southern province of Chili, lying between Valdivia, the Andes, the Gulf of Ancud, and the Pacific Ocean. Area, 8350 square miles. Pop. 43,342. It is a plain slightly elevated above the sea, covered with forests, diversified by several beautiful lakes, and watered by the river Maullin. The soil is extremely fertile, the climate healthy. Coal is abundant. A large part of the population consists of Germans, who are prosperous agriculturists, fruit-growers, and cattle-farmers. The roads are good, and there are 50 public schools. Cap. Puerto Montt.

Llere'na, a walled town of Spain, in the province of Badajos. Pop. 6196.

Llewel'yn ap Grif'fith, prince of Wales, succeeded David in 1246; revolted from his allegiance to the English crown 1256; ravaged the frontier 1262; was joined by De Montfort 1263; defeated Mortimer 1264; made peace with Henry III. 1268; was summoned to attend Parliament at Westminster by Edward I., but refused to appear, 1274 and 1276; unsuccessfully offered a ransom for his bride, Eleanor de Montfort, who had been captured by English vessels in the Channel, 1275; resisted a formidable invasion of the English, but finally submitted; was taken to Westminster and surrendered his territories 1277; returned to Wales and married Eleanor 1278; was reconciled to his brother David, and renewed the war with the English 1282, but was surprised and killed by Mortimer Dec. 11, 1282.

Lloren'te (Juan Antonio), b. at Rincon del Soto, near Calahorra, Spain, Mar. 30, 1756; studied theology at Tarragona and Madrid; was ordained priest (1779); became doctor in canon law, advocate in the royal councils, vicar-general of the bishopric of Calahorra (1782), chancellor of the University of Toledo, member of the principal academies, commissary (1785), and secretary-general of the Inquisition (1789). His intentions in accepting that post were of a reformatory character, and two unsuccessful attempts were made by him to correct the inveterate abuses of the Inquisition, the latter of which occasioned his imprisonment for a short time, and the exile of his friend and protector, the minister of justice, Jovellanos. In 1806 he was employed by the favorite Godoy to write a work in opposition to the traditional privileges claimed by the Basque provinces—*Noticias historicas sobre las tres provincias Bascongadas* (3 vols., 1806–08). Llorente adhered to the French intervention; was made a councillor of state by King Joseph, and director-general of national estates (1808), in which capacity he was charged with the suppression of the convents. On the extinction of the Inquisition its papers were placed in his hands, with a commission to prepare its history. Charged with embezzlement of immense sums, he was removed from his offices, but reinstated; was exiled on the return of Ferdinand VII. in 1814; resided for a time in England, and afterwards in Paris, where in 1817–18 he published both in Spanish and French his celebrated *Critical History of the Inquisition in Spain* (4 vols.), *Historical Memoirs on the Spanish Revolution* (3 vols., 1815–19), a brief autobiography (1818), *Critical Observations on the novel Gil Blas* (1822), *Complete Works of Las Casas* (2 vols., 1822), and *Political Portraits of the Popes* (1822); the latter work obliged him to leave Paris and return to Madrid, where he was well received, and d. Feb. 3, 1823. Llorente was a writer of considerable talent, and his works were once very popular with the anti-Catholic element in Europe; but they cannot be trusted for the accurate statement of facts, and have consequently fallen into comparative discredit. His sentiments and conduct were time-serving, and by no means patriotic, nor can he be considered a conscientious advocate of liberal principles. Porter C. Bliss.

Lloyd, post-tp. of Ulster co., N. Y., on the W. bank of the Hudson, contains many fine residences. Pop. 2658.

Lloyd (Thomas), b. at Dolobran, North Wales, in 1649; educated at Oxford, but became a Quaker, and suffered much persecution as a preacher; accompanied Wm. Penn to America in 1684, and became acting governor, with the title of president of the council, of Pennsylvania 1684–86, and 1690–91, and deputy-governor 1691–93. D. July 10, 1694.

Lloyd (William), D. D., b. at Tilehurst, Berkshire, England, Aug. 18, 1627; was educated at Oriel and Jesus colleges, Oxford; became a fellow 1646; took holy orders 1656; was prebendary of Ripon, Salisbury, and St. Paul's; chaplain to Charles II.; vicar of St. Mary's, Reading, and archdeacon of Merioneth; became bishop of Exeter 1676, of St. Asaph 1680, of Lichfield 1692, and of Worcester 1699, and d. at Hartlebury Castle Aug. 30, 1717. Bishop Lloyd took an active part in the troubles occasioned by the so-called "Popish plot" of 1678, and was one of the celebrated seven bishops who protested against the Declaration of Indulgence to Romanists and dissenters by James II., for refusing to publish which they were committed to the Tower, tried, and acquitted. He was almoner to William III. and to Queen Anne; wrote *Considerations touching the True Way to Suppress Popery* (1684), a *History of the Government of the Church of Great Britain* (1684), a *Dissertation on Daniel's Seventy Weeks*, a *System of Chronology* (1712), a *Harmony of the Gospels*, and other theological works, and furnished valuable materials to Bishop Burnet for that prelate's *History* of his own times.

Lloyd's, the name by which the first floor of the London Exchange is known, being the centre where the business of maritime insurance is transacted, and where the earliest shipping intelligence from all parts of the world is posted for the information of subscribers, whether merchants, shippers, or underwriters. The board of underwriters have rooms here, and receive reports from their agents in every port throughout the world visited by the ships they insure. The system is so arranged that the individual underwriters risk no more than £100 to £150 on any single vessel. Their concerns are administered by a committee of twelve members. There is a vast "merchants' room," provided with newspapers from all parts of the world, and a "captains' room," where ship-auctions are held and convivial gatherings frequently meet. The establishment derives its name from Lloyd's coffee-house, which was originally the head-quarters of the board of underwriters; the name is now applied generically to similar institutions elsewhere, the most celebrated of which are the Austrian Lloyd at Trieste (established 1823 by Baron Bruck) and the North-German Lloyd at Bremen. *Lloyd's List* was printed as a weekly from 1716 to 1800, since which time it appears daily, with the fullest shipping intelligence. The Austrian Lloyd has a *giornale*, established in 1834.

Llumayor, or **Lluchmayor,** an inland town of the island of Majorca. Pop. 8526.

Loach [Fr. *loche*], a name given to fishes of the family Cobitidæ, which is related to the carp family (Cyprinidæ). There are no representatives of the group in America. In England there are two species—*Cobitis tænia* and *Nemachilus barbatulus*. The *Nemachilus barbatulus* or common loach, a European fish of the family Cobitidæ, is sometimes used as food. It lives at the bottom of clear streams. The lake loach (*Misgurnus fossilis*) of Central Europe buries itself in mud, and has a bad flavor. The name "four-eyed loach" has been very improperly attached by some popular writers to the *Anableps tetrophthalmus* of British Guiana.

Load'stone [Ang.-Sax. *lædan*, to "lead"], the natural magnet, a mineral consisting essentially of magnetic iron ore, which is a compound of the peroxide and protoxide of iron. It strongly attracts the magnetic needle, but does not itself always possess polarity.

Loam [Ang.-Sax. *lam*, "clay"], a mixture of sand and clay. A loamy soil is intermediate in character between sandy and clayey soils, and is that best adapted to general agriculture. It is lighter and warmer than a clay soil, stronger and more retentive than a sandy one.

Loam'i, post-v. and tp. of Sangamon co., Ill., 15 miles S. W. of Springfield. Pop. 1470.

Loan [Ang.-Sax. *læn*, from *lihan*, "to lend"]. This term has in law two diverse though closely analogous significations. In one sense it denotes a delivery of money or of a chattel by one person to another for the use of the latter, for which an equivalent is to be returned at a future day; as if, for example, railroad stock is lent to be replaced by other stock of the same kind of an equivalent value, or if money be loaned, for which the same sum is to be repaid, either with or without interest. The equivalent need not, however, be of the same kind as the article lent, for stock or money or other article loaned may be repaid by money or by any article of the same value, if the parties so agree. In the other sense, loan denotes a delivery of an article to another for his temporary use, on condition that this identical article, and not merely its equivalent in value, shall subsequently be returned to the lender. In this latter sense, though not in the former, a loan is a species of bailment. The popular use of the word is quite similar to its legal use. Thus, it is common to speak of lending money or of lending a book or other article, though in the one case it is understood that an equivalent sum of money, and not the identical fund lent, is to be repaid, and in the other that the book itself or other article is to be returned. The rules of law relating to these two different classes of loans are so dissimilar that it will be necessary to consider each class by itself.

I. If the loan be of the first kind, making the borrower responsible for the return of an equivalent in value, and the thing loaned be not money, but some article of personal property, the lender may bring an action in a court of law for the recovery of damages equal to its value, or of the sum agreed to be given in return, if default be made in rendering the equivalent at the time appointed, according to the terms of the agreement. But the thing itself to be given in return cannot be obtained by action in such a court, unless it be a sum of money. Interest will usually be recoverable upon the value of the article from the time of default. In courts of equity, however, a suit may sometimes be maintained for the specific performance of such a contract, and a decree obtained requiring the delivery of the article to be given as an equivalent. Thus, a contract to replace stock which has been loaned by other stock of the same kind may be specifically enforced in equity when such stock is of uncertain value and not always readily obtainable in the market. But the general rule is that contracts for the delivery of personal property will not be specifically enforced, since the recovery of damages usually affords a complete and satisfactory remedy. Even a contract for the delivery of stock will not be enforced in equity when the shares are at any time procurable, so that the recovery of damages would enable the plaintiff to purchase them. Whenever an award of damages will enable the plaintiff to supply himself with the article to be delivered, an action at law will be alone maintainable. (See Specific Performance.) Loans of this kind are sometimes made with intent to evade the laws against usury. The English statute of usury, from which those in this country have been usually copied in their general outlines, applies to loans "of any moneys, wares, merchandise, or other commodities whatsoever." If, therefore, the intent of the

parties to a loan of a chattel and the effect of the transaction are to violate the usury laws, the same penalties will be incurred as in the case of a loan of money. Thus, in a loan of stock the agreement of the parties may require the return of an amount of stock whose value shall not only be equal to that of the stock loaned, but include also a higher rate of interest than the law allows. But it has been held that a loan of stock to be replaced by the same number of shares will not be usurious, though the value of the stock may be subject to great fluctuations. (See USURY.) But the most common loans of the class under consideration are loans of money to be repaid in money. The contract for repayment may be either express or implied. It is commonly the practice in making an express contract to evidence it by a promissory note, bill of exchange, bond, duebill, or other written obligation, though this is not to be deemed necessary. The time of repayment and the rate of interest may be determined at the pleasure of the parties, provided the usury laws be not infringed. The statute of limitations will begin to run in favor of the defendant, and interest will be computable as damages in favor of the plaintiff, from the expiration of the term of credit agreed upon, if default be then made in repayment. If it be agreed that the debt shall bear interest, but no rate is fixed upon, the legal rate will be computed from the date of the loan. (See LIMITATIONS, STATUTE OF; INTEREST.) The loan establishes the relation of debtor and creditor between the parties, and not that of bailor and bailee. The same is true of loans with implied contract for repayment. The law presumes that when money is loaned to and received by another without any express agreement for its repayment, a lawful debt is created which may be recovered by action. Interest is computable from the time of the loan at the legal rate. The statute of limitations also begins to run from the same period. The action for "money lent" is one of the so-called actions upon the "common counts." It will not be sufficient to sustain this action merely to prove that the plaintiff delivered money to the defendant, for this *prima facie* is only evidence of payment by the plaintiff of his own debt. It must be shown that the transaction was in reality a loan of money. It is not necessary to prove that the defendant requested the loan to be made, for the receipt by him of the money is sufficient to establish his obligation to make repayment.

II. The second variety of loans constitutes that class of bailments technically termed in law *commodatum* (Lat., "thing lent"). (See BAILMENT.) The article lent is delivered to the borrower or bailee exclusively for his own use and benefit, no reward or compensation being payable to the lender for such use, and is itself to be returned to the lender. The bailor, as in other cases of bailment, remains the general owner of the property, while the bailee acquires a special or qualified right of ownership while it remains in his possession, and is thus enabled to maintain an action against any person other than the lender who does injury to the property or converts it to his own use. The bailor may also maintain an action in such cases, but a recovery by either bailor or bailee will bar the other's right of action. As the bailment is entirely for the advantage of the bailee, he is bound to use great diligence in caring for the article loaned, and will be responsible even for the slightest negligence if it be thereby lost or injured or impaired in value. But if the injury or loss be occasioned by inevitable accident, sudden disaster, theft, burglary or other cause which could not be anticipated nor provided against, the bailee will incur no liability, but the bailor must bear the loss. The article may be used by the borrower for the purpose for which it was loaned, but he must not exceed the privilege given him. For any loss or deterioration resulting from its ordinary and reasonable use he will not be responsible, but if the injury be occasioned by his recklessness or remissness he must make good the loss. The property is to be returned in the same condition in which it was delivered, subject to ordinary wear and tear. A gratuitous loan creates a trust that is strictly personal, and the thing loaned can be used only by the bailee, in the absence of any special agreement to the contrary, or of a license by the owner that some other person may use it. Thus, it has been held that the loan of a horse to a person for him to ride did not justify him in allowing his servants to ride. The degree of care which the bailee is to exercise will vary with the nature of the property loaned and the circumstances under which the loan is made. Greater diligence and precaution are requisite in keeping secure and protecting from injury articles of great value than in caring for those of comparatively little worth. In like manner, greater care would be necessary in times of special danger or in lawless districts, where property is particularly exposed to injury, than in times when little or no danger is to be apprehended or in orderly and law-abiding communities. What shall be considered "slight negligence" in any particular instance must depend upon the special facts of the case. The property loaned is to be returned to the owner at the expiration of the time agreed upon for the continuance of the bailment, or, if no such stipulation be made, at the expiration of a reasonable time. If after the termination of the bailment the borrower refuses to deliver up the property after proper demand has been made, although it still remains in his possession, he is guilty of conversion, and may be sued in an action of trover for the value of the goods or in an action of replevin for the recovery of the goods themselves. (See CONVERSION, TROVER, REPLEVIN.) He cannot detain the property as a pledge for any demand he may otherwise have against the bailor. (See the works of Story and Edwards on *Bailments*; also treatises on *Contracts*.)

GEORGE CHASE. REVISED BY T. W. DWIGHT.

Loan and Building Associations, incorporated companies which during the last twenty years have assumed considerable importance in the cities and large towns of the U. S., especially in Philadelphia. The following account of their mode of organization and operation is derived from an article in the Philadelphia *Public Ledger* of Mar. 5, 1874: "They are ordinarily organized by a few friends, who subscribe for shares, and then induce others to join them, all agreeing to pay the sum of one dollar per month until the value of each share shall be $200, when a division of the funds will be made, and the society dissolved. Not more than 2500 shares can be subscribed for, and ordinarily there are from 1500 to 2000 shares. The directors, who are elected annually by the stockholders, conduct the business of the association. At each monthly meeting the money on hand after the collection of the dues is loaned to the stockholder who offers to give the highest premium, which sometimes amounts to 35 or 40 per cent. where the amount of the premium is deducted from the amount of the loan. The stockholder who borrows the money is required to give security, generally real estate, for the payment of his monthly dues and the interest on the whole amount of the loan, including the money actually received and the premium. The interest on the money loaned, with the double interest on premiums (which are really twice loaned), and the fines for non-payment of dues, are the sources of profit. Thus, all the money which a society divides at the end of its term is paid in by the stockholders. There are no sources of revenue *outside* of the society itself. If a society with 2000 shares runs out in ten years, there has been paid on each share $120, taking no account of fines. If 1500 shares have been borrowed on, their owners have paid not only $80 more on each of these shares than the non-borrowers who hold 500 shares, but have also paid an amount of interest sufficient to give $80 on each share to the non-borrowers. Apparently, the non-borrowers receive all the profits, but it must be remembered that the borrower has paid no more 'dues' on his stock than the non-borrower, but has had the use of his money for from one to ten years, and then the only question as to his profits is, whether he has paid an excessive rate for the use of that money. If without capital he has been enabled to buy a home for himself and pay for it in monthly instalments, the chances are that the borrower has obtained a fair return for his investment. If he bought wisely, and his property, during the time he was paying for it, largely increased in value, his profits may be larger than those of the non-borrower, for the latter has not these incidental sources of profit. Finally, however high a premium he may have paid, if he did not exceed the *average* of premiums, he did not pay a high rate of interest, because when the average premium is high the society runs out sooner and less money is paid on each share for 'dues.'

"There are many different systems under which building societies are worked. In some, the premium is deducted from the loan; in others, the premium is not deducted, but is paid with interest in monthly instalments; in some, only one series of stock is issued, all the members going out at the same time; in others, new series are issued at regular intervals, bringing in new borrowers and thus keeping up the demand for money. In a 'series society,' which is one of the latter kind, the premiums are usually high, and each series winds up its affairs in a correspondingly shorter time, sometimes within seven years and six months. In the latter event the non-borrower only pays $90 and receives $200, while the borrower makes heavier monthly payments for a smaller number of months than he would in the single series society. But whatever the system may be, the cardinal principle underlying all is the same. In all building societies there is the incidental advantage that a member having once commenced to save a few dollars a month is compelled to keep up the good habit or else relinquish a part of the profits which he would otherwise obtain. But if through misfortune or carelessness he is obliged to withdraw, he still gets reasonably good interest on his money, and sometimes a share (but not a full share) of the profits.

Still greater advantages are, that there are comparatively few members in each society, so that the management in case of necessity can be more readily changed than in most mutual corporations, and that the officers never have enough money on hand at any one time to tempt them to dishonesty, nor to cause serious loss in the event of a defalcation."

Loan'go, kingdom of Western Africa, extending along the shore of the Atlantic from the equator to the river Congo. The coast is flat, but fertile, the interior unknown. The inhabitants are a rude and barbarous race. Their religion is idolatry and superstition; their morals allow the slave-trade and polygamy, a man's wives being transferable with his other property; their political institutions consist in an absolute despotism. But they have some skill in the manufacture of baskets, colored mats, and grass-cloth; and some trade in palm oil, wax, and ivory is carried on in their two principal towns—Loango, situated in lat. 4° 39′ S., and Kabinda, on the N. bank of the river Congo. The former of these towns is said to have 20,000 inhabitants.

Lö'bau, town of Germany, in the kingdom of Saxony, noted for rock-crystals called "Löbau diamonds," and for the mineral springs in its vicinity. Pop. 5721.

Lobau, an island in the river Danube, 6 miles below Vienna, taken by Napoleon I. May 19, 1809, occupied by the French army after the battle of Aspern, May 22, was the place whence the invading forces were concentrated in June, and where the celebrated passage of the Danube was made July 4 and following days, 1809. This island gave the title of count to Gen. Mouton, one of the French heroes of the campaign.

Lobau', de (GEORGES MOUTON), COUNT, b. Feb. 21, 1770, at Phalsbourg, France; enlisted as a volunteer in the army in 1792; became aide-de-camp to Meusnier in 1793, to Joubert in 1798, to Napoleon in 1805; and was made a general of division in 1807, after the battle of Friedland. His title of count of Lobau he received after the battle of Aspern. He was rough and blunt, but courageous and firm. After the Russian campaign he was at the head of the organization of a new French army, and in the battle of Waterloo he commanded the sixth army corps on the right wing. After the Restoration he was banished from France, and not allowed to return until 1818. In 1828 he was elected a member of the Chamber of Deputies, and he took a prominent part in the revolution of 1830, assumed the command of the national guard instead of La Fayette, was made a peer and marshal in 1831, and put down with great success the insurrections of 1832 and 1834. D. at Paris Nov. 21, 1838.

Lobe'ira, de (VASCO), b. in Portugal about 1360; was distinguished in the military service of Ferdinand IV., king of Castile, and wrote the celebrated romance of *Amadis de Gaul.* He was knighted by John I. of Portugal after the battle of Aljubarrota, 1386, and d. at Elvas, Portugal, in 1403.

Lobel' (MATTHEW), best known under the Latinized form LOBELIUS, b. at Lille, Flanders, in 1538; studied medicine at Montpellier; practised his profession at Antwerp and Delft after travelling through Switzerland, Germany, and Northern Italy; became physician to the prince of Orange, and was employed by the States General; settled in England before 1570; made extensive botanical collections in England; devoted himself especially to vegetable physiology and the correction of errors made by Dioscorides; published *Stirpium Adversaria Nova* (London, 1570), containing nearly 1300 species, with 272 small figures; *Plantarum seu Stirpium Historia* (Antwerp, 1576), *Icones Stirpium* (Antwerp, 1581), and a treatise on *Balsams* (London, 1598). Lobel accompanied an English embassy to Denmark in 1592, returned to England, became botanist to James I., and d. at Highgate Mar. 2, 1616. A fragment of a vast botanical cyclopædia projected by Lobel was edited by J. Parkinson in 1655. The idea of natural families may be found in Lobel's works, and an important botanical genus was called *Lobelia* in his honor.

Lobe'lia [named by Plumier in honor of Matthew *Lobel*, botanist to King James I.], a genus of plants of the natural order Lobeliaceæ, of which the most important species is the *Lobelia inflata*, or "Indian tobacco," as it is commonly called. This is a very common indigenous annual or biennial herb, growing wild in waste spots throughout Canada and the U. S. It has a fibrous root, and a solitary straight hairy stem rising about a foot high. The flowers are small and of a light blue color; the leaves oval, serrated, and hairy. The entire herb, dried, is used in medicine under the name *lobelia.* Its properties depend on an alkaloid, *lobelina*, which is a thick, oily, transparent, volatile fluid, with a pungent taste resembling tobacco. Lobelia is a powerful nauseating emetic, producing in full dose an effect like that of tobacco—namely, long-continued, distressing nausea and vomiting, with purging, copious sweating, and great muscular relaxation. In overdose it is a potent acronarcotic poison. Lobelia is too severe an emetic to be used to produce vomiting, and its medicinal employment is in non-emetic doses as a relaxing agent in asthma and allied spasmodic diseases. EDWARD CURTIS.

Lobelia Cardinalis, the cardinal flower, so named from the intense red color of the blossoms, is the most showy of our indigenous species, and is prized in cultivation. The low and bright-blue-flowered lobelia, largely used as a bedding-plant, is *L. Erimus*, from the Cape of Good Hope.

Lobelina. See LOBELIA.

Loblolly Bay. See GORDONIA.

Lo'bo (JERONIMO), b. at Lisbon about 1595; entered the order of the Jesuits in 1609, and went in 1622 as a missionary to Goa, whence he proceeded to Abyssinia in 1624. Here he worked with great success, but was at last expelled in 1634, and returned to Portugal to persuade the Christian powers to make a crusade against Abyssinia. Having failed in this, he went once more to Goa in 1640, whence he returned in 1656, and d. at Lisbon Jan. 29, 1678. His *Historia de Ethiopia* (Coimbra, 1659) made a great sensation and was translated into many foreign tongues—into French in 1674, into English by Dr. Johnson (1735).

Lo'bos Islands [Sp. *lobo*, "seal"], or **Seal Islands,** three small islands in the Pacific Ocean, 12 miles off the coast of Peru, to which country they belong, in lat. 6° 29′ S., lon. 80° 53′ W., form the gathering-place for innumerable seals, and contain large deposits of guano.

Lob'ster [supposed to be cognate with the later *langusta*, the name of a distantly related form (*Palinurus*) of the Mediterranean and European seas generally], a name especially applied to crustaceans of the species of the genus *Homarus*, but also extended to several other kinds of very different groups. The typical lobsters, or *Homari*, are closely related to the fresh-water crawfishes (*Astacus* and *Cambarus*) of the northern hemisphere, and with them and some other genera (*Astacoides*, *Paranephrops*, *Chæraps*, *Engæus*, *Nephrops*, and *Nephropsis*) constitute the family of Astacidæ. They differ especially from the crayfishes in the rostrum, which is straighter and denticulated, or armed with many teeth on each side; the union by soldering of the last ring of the thorax with the penultimate; the transformations which it undergoes in its progress from the egg to maturity; the marine habitat; and the larger size of the species; and these characters are associated with a number of anatomical peculiarities. The eyes are orbicular; there are nineteen pairs of gills. They become red when subjected to the action of boiling water or acids, this being due to a change in the pigmentary matter. In the stomach at the pyloric position are three movable chitinous pieces, instrumental in digestion, which, from a supposed resemblance to a seated female, is known as "lady;" it is shed with the shell. In connection with the outer wall of the intestine, the liver is developed as a greenish organ with a mixture of fat-cells, and this is called by the lobstermen "tow alley." The female chiefly spawns in spring or early summer, and carries her eggs (which number from about 2000 to 12,000, according to the size of the mother) under the abdomen or tail, conglomerated by a viscid secretion; they are globular, and when unimpregnated red, but when impregnated and maturing almost blackish. The young emerge from the egg as small and actively-swimming "schizopods," or animals very different in appearance from the adults. After several months they assume the form as well as habits of the adult.

Three well-determined species represent the genus in different seas—viz. (1) *Homarus gammarus* or *vulgaris*, the common European lobster, abundant in Northern Europe, and especially Norway; (2) *Homarus Americanus*, the common American lobster, very nearly related to the preceding, abundant from New Jersey northward, and particularly, in the U. S., on the coast of Maine; and (3) *Homarus Capensis*, a small lobster found at the Cape of Good Hope. The northern species are much larger, the American, when adult, varying between one and two feet, and weighing two to fifteen pounds, and the European generally from eight to ten inches, although occasionally rivalling the American in size, and exceptionally, it is *supposed*, exceeding three feet in length. They live, in warm weather, near the coast, by preference on rocky bottoms and where algæ thrive, but the American species, S. of Cape Cod, is also to be found on sandy and gravelly bottoms. In the winter they retire into deeper water, descending as low as sixteen to twenty fathoms on steep coast-slopes. They swim freely, but not strongly. They

feed on the roe of fish, dead fish, and such other animals as they are able to catch. The food is caught by them when on the ground, and is eaten at leisure and in a state of rest. Although voracious, they are able to live for some time without food. They shed their shells periodically in the warm months, like the crabs.

Lobsters are very generally esteemed as an article of food, and their capture employs a large amount of capital and many men in this country as well as Europe. In this country they are almost exclusively caught in "lobster-pots," or baskets constructed on the plan of some rat-traps, having funnel-shaped ends, with a hole in the middle through which the animal may enter, but from which he is precluded from departing by the extension of his claws. These are baited generally with fish of little or no value, and sunk by means of stone to the bottom, their locations being indicated by floats. Similar traps are used in Europe, but formerly, on the coast of Norway, they were caught entirely with wooden tongs of about twelve feet in length. In other places (*e. g.* Heligoland) a bag-net with an iron hoop, called "plumpers," is used, a long line being attached to it and moved at the top by a piece of wood. No precise statistics have been collected respecting the number of lobsters caught and consumed in the U. S., but it is very large, and has been vaguely estimated at "several millions" annually. "In Boston the number of lobsters sold annually cannot be much short of 1,000,000," according to Capt. Atwood, an experienced fisherman. In Boston the male lobster is preferred, and the supply is chiefly furnished from the northern shore of Massachusetts and the Maine coast, while in New York the females are the most salable, and the stock is chiefly derived from the contiguous coasts up to Cape Cod, that place being the chief market of export for New York after June. The size being the same, the females furnish the most meat. The sexes are nearly equal in number, according to Mr. S. I. Smith, although the males are supposed to greatly preponderate by the fishermen. In Long Island Sound and Southern New England the fishery season commences towards the end of March or early in April, and about the middle of the latter month they are sent to the markets in large numbers, while towards the North the season is later. In winter the supply is principally derived from Maine, and they are found at that season in the comparatively deep water. The proper breeding-season varies with circumstances, as well as with the latitude and temperature of the water, but it commences in the southern waters in April or May. It, however, extends through several months, and in Vineyard Sound, it seems, about "one in twenty" has eggs even as early as December. Complaints have lately been loud that the fisheries are being impoverished, and demand a close season and other regulations. In Massachusetts the minimum salable limit is $10\frac{1}{2}$ inches.

Norway is the great source of supply in Europe of the lobster, and from it are exported large numbers to England and Holland. Originally, it seems to have been despised by the natives, and the fisheries were first developed in the Norse waters by the Dutch. Their vessels commenced to visit Norway for lobsters in the seventeenth century, chiefly, and at first exclusively, sailing from Zierikzee. From Flækkefiord lobsters were exported as early as 1660, and in 1674 ten lobster-vessels filled from it; from 1690 the Dutch regularly visited Karmö, and the following places gradually became lobster-ports: viz., "Mandal, Flække-fiord, Egersund, Tananger or perhaps Stavanger, Akre in the island of Karmö, and Leervig in the island of Stordö." The Dutch also introduced the lobster-baskets, and at the commencement of their operations, by donations to the clergy, interested them in their behalf. At first the price was one skilling (about a cent) each, but afterwards it was raised to two and more. Originally, the export trade was carried on entirely in Dutch bottoms, but gradually the English took a share, and after the war which broke out between Holland and England in 1776 the trade was entirely wrested from the Dutch and taken by the English, who still hold it almost exclusively.

The number of lobsters exported from Norway has fluctuated according to circumstances. Between 1815 and 1818, the annual export ranged between 512,780 and 680,300. "The number of lobsters exported in 1821 and 1822," says Boeck, "amounted to over 1,000,000 a year, and increased still more during the following years, although it was not so large in 1823 and 1824, on account of the unfavorable weather. From 1825 to 1830 the average number of lobsters exported annually was 1,268,000, and in 1827 and 1828 the highest number was reached—viz. 1,500,000. These large numbers, however, were caused not by the fisheries being just as productive, or more so, in the old lobster-stations, but by the circumstance that new English companies, seeing the great profit to be derived from this trade, commenced to export lobsters from places from which they had never been exported before." "The exports from Staranger and Egersund meanwhile decreased very much, having been reduced to 67,000 per annum in the latter place in 1827, when the exports from the whole of Norway amounted to 1,429,703. After 1830 the exports began to decrease even in the new districts, so that the annual average quantity of lobsters exported during the five years 1831–35 was only 640,000. The only places that kept the lobster-trade alive were the new districts, while all the old ones decreased rapidly, some of them to such a degree that, according to the governors' reports, the lobster-trade must be considered almost extinct in 1835."

Farseeing men had feared the results of the excessive and unregulated fisheries, and the fishermen and all others interested became at length alarmed. Laws were from time to time (*e. g.* 1830, 1838, 1845) proposed and discussed in the "Storthing" or Norwegian parliament, parliamentary inquests were also held, and the aid of experienced naturalists was invoked; but for a long time a close season was opposed by the fishermen and traders, who hoped for a revival of the trade, and contended that the depression was only temporary. Gradually, however, almost all became convinced that legal restrictions of the fisheries as to time and size of lobsters taken were necessary; and finally, in 1848, laws were passed regulating the fishery. It was provided (1) that lobsters should not be caught or sold from the fifteenth of July till the end of September; (2) that the king, however, at the request of local authorities, might remit time before or after August, which must always remain a close month; (3) a penalty of twenty-four skillings for every infraction of the law was provided for; (4) it was provided that the police courts should have jurisdiction of the cases; and (5) a period of eight days after the periods designated was added for the exportation of lobsters. The result of this law was that much fewer were exported in 1849 and 1850 than in previous years, but afterwards the number increased, and, although fluctuating, the gain continued, till in 1865 nearly 2,000,000 (1,956,276) were exported. The law also became so popular with the dealers that they were even inclined to go to the other extreme, and desire a still longer close season. Now that alarm is being felt respecting the lobster fisheries of this country, the experience thus referred to may be of use. Several documents respecting the subject may be found in the *U. S. Commission of Fish and Fisheries Reports,* to be soon published.

The name, in combination with a qualifying prefix, is also popularly applied, in addition to other marine species of Astacidæ, to species of the families Palinuridæ and Scyllaridæ. THEO. GILL.

Lobworm. See ANNELIDES.

Local Preachers, an order of lay preachers in Methodism, much more numerous than its regular or "itinerant" ministry throughout the denomination. In the U. S. they number about 22,000. The order was established by Wesley early in the history of the Methodistic movement, and its members have become historically important as the founders of the denomination in the U. S., Canada, Nova Scotia, Australia, and Africa. They are laymen, engaged in secular life, but having natural or acquired gifts for public discourse, and devoting their Sundays to preaching, mostly in poor or incipient churches. In large cities, especially in England, their weekly appointments are systematically arranged and published quarterly on a printed plan. They are formally "licensed," and many of them are ordained, in order that they may assist the regular clergy in the administration of the sacraments, and they are all amenable to the quarterly and district conferences of the Church. They have, in most countries, "local preachers' associations." In England they publish *The Local Preachers' Magazine.* In the U. S. many local preachers have been eminent for talent and usefulness. The regular or travelling ministry has always been recruited from their ranks; in fact, no candidate can be admitted to the annual conference on the regular pastorate unless first licensed as a local preacher. ABEL STEVENS.

Loca'na, town of Italy, in the province of Turin, situated in a strikingly wild valley of the same name. Pop. in 1874, 5784.

Lochapo'ka, post-v. and tp. of Lee co., Ala., on the Western R. R. Pop. 3456.

Loches, town of France, in the department of Indre-et-Loire, on the Indre. Its castle was the royal residence of several kings of France, and was used by Louis XI. as a state prison, and witnessed as such the most horrible atrocities. It is now a departmental prison. Near it, in 1409, Agnes Sorel was born, and her tomb is in the chapel of the sub-prefecture. Pop. 5267.

Lochlev'en, a castle on an island in Lake Leven, Fifeshire, Scotland, noted as the place where Mary queen of Scots was imprisoned from July, 1567, until her escape, May 2, 1568.

Lochleven, post-tp. of Lunenburg co., Va. Pop. 1681.

Loch'nain, tp. of Brown co., Kan. Pop. 914.

Loch'rane (Osborne A.), b. at Middletown, Armagh, Ireland, Aug. 22, 1829. While pursuing his academic course in 1846 he indulged in a popular assembly in such violent denunciations against the English authorities that his father thought it advisable to place him beyond the reach of prosecution, and accordingly sent him to New York, where he arrived Dec. 21, 1846. Not tarrying there long, he made his way to Athens, Ga. The elegance and eloquence of a temperance address delivered by him won the admiration of the late Joseph Henry Lumpkin, chief-justice of the State, who urged the boy-orator, then a clerk in a drug store, to study law, promising him assistance. By dint of labor at night he soon mastered his task, and was admitted to the bar at the fall term of 1849. With a few books and scanty means he opened an office at Savannah Mar., 1850, and in October of the same year he moved to Macon, where he formed a professional connection with Henry G. Lamar, an able and prominent lawyer, whose daughter he had married. His rise at the bar was rapid and brilliant. In Sept., 1861, he was promoted to the bench of the Macon circuit, to which position he was twice afterwards elected by the legislature, but resigned in 1865. He then removed to Atlanta, and in Aug., 1870, upon the request of the bar, was appointed judge of that circuit; in Jan., 1871, was appointed chief-justice of the supreme court of the State, but resigned in December of the same year, and resumed practice at the bar. Many of his speeches, addresses, and orations have been published in pamphlet form, generally circulated, and greatly admired for their classic taste and beautiful imagery in illustration. A. H. Stephens.

Lock [from the Ang.-Sax. *loc*], a piece of machinery provided with a spring and bolt for receiving and corresponding to a key, the two together serving to fasten doors, chests, drawers, and the like. That locks and keys were used by the ancients is attested by many writers. The Egyptians, according to Sir Gardner Wilkinson, used wooden locks and iron keys; a specimen of the latter he picked up among the tombs at Thebes. It is described as a straight shank five inches long, with a bar at right angles with it, on which were three or more projecting teeth. At the upper extremity was a ring which served as a handle. So far back as the commencement of Jewish history keys are mentioned, and in Judges iii. 23–25, where the residence of Eglon, king of Moab, is described, we find that the doors of the summer parlor were locked by Ehud, and that subsequently the servant took a key and opened them. The most remarkable lock of ancient times was the Egyptian pin-lock, which consisted of a wooden case fastened to a door, having a bolt passing horizontally through a cavity within it. In that part of the case immediately above the bolt were several small cells, each containing a pin, and in the top of the bolt under these pins was an equal number of holes. The effect of the construction was that when properly arranged the pins fell into the holes in the bolt and fastened it in the lock-case. In the exposed end of the bolt was a cavity, extending slightly beyond the holes occupied by the pins, into which the key was thrust. The latter was a piece of wood with pins arranged so as to correspond with those in the lock, and projecting upward as far as the upper surface of the bolt. So, when the key was put into the cavity and pressed upward, its pins filled the holes in the bolt, and by so doing pushed up those which had fallen from the upper part of the lock-case. Thus, the bolt could be withdrawn, as the pins were raised into their cells and all obstruction was removed. Locks of the same kind have been in use in the Faröe Islands for centuries. The Romans not only had locks and keys, but it is evident, from specimens in the British Museum and elsewhere, that warded locks were known to them; many keys whose construction points to this conclusion have been discovered both at Herculaneum and Pompeii. The Chinese have shown considerable aptitude for lockmaking, and some of their wooden constructions embody the principle on which the celebrated Bramah lock was made about 100 years ago.

A modern lock to be of practical service needs to be a masterpiece of mechanical art. As inventions of new complication of tumblers or wards or springs have appeared, so has the ingenuity of man discovered the means of triumphing over the obstacles, or, in other words, of picking almost every lock that has been invented. The qualifications of a perfect lock are numerous and not easy to define. An authority on the subject, Mr. Nicholson, has, however, summed them up succinctly in the following order: (1) that certain parts of the lock should be variable in position through a great number of combinations, one only of which should allow the lock to be opened or shut; (2) that this last-mentioned combination should be variable at the pleasure of the possessor; (3) that it should not be possible, after the lock is closed and the combination disturbed, for any one, not even the maker of the lock, to discover by any examination what may be the proper situation of the parts required to open the lock; (4) that trials of this kind should not be capable of injuring the lock; (5) that it should absolutely require no key, and be as easily opened in the dark as in the light; (6) that the opening and shutting be done easily, and by a process as simple as a common lock, either with or without a key, as may be desired; (7) that the keyhole be defended, concealed, or inaccessible; (8) that the key may be used by a stranger without his knowing, or being able to discover, the adopted combination; (9) that the key be capable of adjustment to all the variations of the lock, and yet be simple; (10) that the lock should not be liable to be taken off and examined, whether the receptacle be opened or shut, except by one who knows the adopted combination.

Into an explanation of all the terms applied by locksmiths to their wares it is unnecessary to enter. The chief distinctions between the best-known locks, however, are not out of place. Locks for drawers, chests, and the like are constructed to open on one side only, and are fitted with keys made with a pipe to slip on and turn on a pin called the *drill-pin*. But what are called *inside* and *outside* locks, fixed to doors which have to be locked sometimes on one side and sometimes on the other, have solid keys with stems thicker than the flat part, so as to form an axis fitting into the upper part of the keyhole. Keys for this kind of lock must be symmetrical, or alike on each side of a line through their middle, in order to fit the lock either way. Locks placed on outer doors are generally known as *stock* locks; those on chamber doors are called *spring* locks, and when a lock is hidden in the thickness of the wood to which it is fastened it is called a *mortice* lock. Locks on the outside of doors are known as *iron-rim locks* and *brass-case locks*. The locks that are most used nowadays are variations on the old warded and tumbler locks, the puzzle or letter locks being almost entirely out of date. The latter attracted much attention before the invention by Mr. Bramah was effected, and as early as the days in which Beaumont and Fletcher flourished mention is made of letter locks in the play of the *Noble Gentleman*. These locks could only be opened by setting a number of rings to a certain combination of letters, so that no one who was not in possession of the secret was able to open the lock; hence the term *puzzle-lock*. This combination was at first fixed and could not be changed. Subsequently, the rings were made double, the inner one having the notch in it which the bolt had to pass, and the outer one capable of being fitted on to the inner in any position, by unscrewing some part of the lock, so that the rings might be set to any combination at pleasure. Locks of this kind are insecure, because the pressure of the bolt can be felt on some of the rings more than on the others, and our own countryman, Mr. Hobbs, has declared that wherever that is the case the lock can be picked. The same gentleman opened a dial lock at Liverpool in a few minutes, and at the Great Exhibition in London in 1851, he opened a French lock and set it to a new combination, so that the exhibitor himself was unable to open it. The reasons for the unpopularity of the puzzle, letter, or dial locks, which are all three akin, are obvious: they are difficult to handle, and the danger of forgetting the word which sets the combination is always imminent. The unfortunate Louis XVI. of France took great delight in experimenting on locks of this kind and others, whence the saying, "He is a capital locksmith, but a very bad king."

In ordinary locks the bolt shoots out to catch in some kind of staple or box, or a staple enters a hole in the edge of the lock, and is then acted upon by the bolt. The key enters its receptacle, and the shaft acts as a pivot around which the web or flat part of the key may move. Thus, the web acts upon the bolt; the key impels it one way, certain springs act upon it in another, and the balance between the two forces determines the locking or unlocking of the bolt. In order to render the opening of the lock difficult without the right key, pieces of metal are secured to the inner surface of the lock to obstruct the progress of the key unless the latter be provided with open spaces which will cause the key to clear the obstruction. These pieces of metal are called *wards*. The shape of these wards is not, however, difficult to discover. The insertion into the hole of a blank key—that is, a key without wards—covered with wax, and the subsequent filing of the key where the obstructions in the lock have made marks in the wax, are sufficient for the provision of a key capable of opening the securest of warded locks. Moreover, what are

known as *skeleton keys*, used by burglars with considerable profit, are sufficient for the opening of locks of this kind. These *skeletons* are not cut into the form of the wards, but have simply a blank space through which the wards may pass, the only part of the key that does any work being the edge farthest from the pipe. This is the theory of the *master key*, by which one key may be made to open any number of locks variously warded, such as is used by the superintendent in large manufactories, asylums, and hospitals.

The most conspicuous feature in the formation of our best modern locks is the *tumbler* or *lever*, which falls into the bolt and prevents it from being shot until it has been raised or released by the action of the key. The *single-tumbler* lock has a tumbler turning on a pivot with a square pin, which drops into a notch in the bolt when it is either open or shut, so that before the bolt can move the tumbler must be lifted by the key. The origin of the *tumbler* has never accurately been traced, but more than a century ago it is clear that the system was known in France; however, in the year 1778 was patented Barron's lock, which may be justly described as the foundation of all the modern improvements in lockmaking. In the ordinary tumbler locks the lock could be opened if the tumbler were raised sufficiently high to allow the bolt to work, but Barron's lock rendered the bolt immovable if the tumbler were raised either not sufficiently high or too high. Moreover, the lock possessed two tumblers, instead of one, which added greatly to the security of the structure. The bolt has in its middle a "gating," or open slit, notched on both edges, the notches being fitted for the reception of studs fixed to the tumblers. If the studs of the tumblers rest in the lower notches, they require to be elevated to the general level of the gating before the bolt can be moved; whilst if the tumblers are raised too high, the studs will enter the upper notches and prevent the shooting of the bolt. The lower edge of each tumbler is acted on by the steps of the key during its circular movement, the leverage of the key being so adjusted as to raise the tumbler to the desired height. Ten years after the patenting of Barron's lock, Mr. Joseph Bramah, the inventor of the hydraulic press, brought out a lock which differed very considerably from those which had gone before it. Its chief peculiarities are a barrel or cylinder, the absence of fixed wards and of tumblers working on a pivot at one end, and the introduction of a system of sliders. The body of a Bramah, according to Mr. Hobbs, may be considered as consisting of two barrels, the outside one fixed, and the inner rotating within it. The inner barrel has a projecting stud, which, while the barrel is rotating, comes in contact with the bolt in such a way as to shoot or lock it. Thus, the stud serves the same purpose as the bit of an ordinary key, rendering the construction of a bit to the bramah unnecessary. When the barrel is made to rotate to the right or left the bolt can be locked or unlocked, and the rotation is effected by means of *sliders* which correspond to the *tumblers* of Barron's invention. Mr. Bramah published a treatise in which he modestly declared that his lock entailed such security that it was not within the range of art to produce a key or other instrument by which a lock on his principle could be opened. However, in 1851, Mr. Hobbs of Boston proved the fallacy of this declaration by picking a Bramah by means of the tentative process, which will be described immediately. The Bramah lock, in its improved form, however, is one of the safest locks that can be used, though it must be remembered that as the patent has expired years ago, many imitations are in the market which may be picked as easily as the old warded lock. The principles of the invention may be briefly worded: Mr. Bramah rejected the use of fixed wards, using instead movable guards or sliders. The number of these sliders varied from four to six and eight. As no wards were used, the key was smaller and easier to be carried, and moreover the smallness of the keyhole contributed in no small degree to the safety of the lock. In 1818, Mr. Chubb of London patented his celebrated lock, which ever since that date has enjoyed great popularity. It consists of Barron's *tumblers* more or less numerous, with few or no fixed wards, and without false notches. It contains at least six double-acting tumblers, all of which must be raised to a certain height before the bolt can pass. The most captivating point about Chubb's locks was, however, the *detector*, consisting of a lever which, if any undue elevation was given to the tumblers in an attempt to pick the lock by means of a false key, caught in and detained the bolt until with a twist of the proper key it could be released. This *detector* as at first constituted, however, was utilized by Mr. Hobbs of Boston as a means of picking the lock by the "tentative" process described in the *Encyclopædia Britannica* many years ago, but entirely forgotten until revived by American locksmiths. The process consists of moving one tumbler at a time by means of some instrument, and ascertaining by touch when the stump is opposite the "gating." As Mr. Hobbs proved, the fact is easily made known, and as each tumbler is held in its place until the whole number are free, the bolt is at last easily moved. At the date of the invention Chubb's locks enjoyed considerable notoriety, especially after the attempt made by a convict at Portsmouth dockyard to pick a lock made by the firm. The convict had been a lockmaker, and he was offered a free pardon from the government and £100 from Mr. Chubb if he succeeded in opening the lock. The necessary tools were supplied him, but after three months' trial, during which the detector was constantly overlifted, he gave up the attempt, stating that Chubb's were the securest locks he had seen, and it was impossible for any man to pick them with false instruments. The convict, however, was beaten in his own work by Mr. Hobbs, who used the *detector* to indicate just the necessary height to which each tumbler must be raised.

In the year 1831 a system of clockwork was introduced as a feature in lockmaking by a Mr. Rutherford, a bank agent of Jedburgh, Scotland. The clockwork regulated the interval which must elapse before the lock could be opened by its key. The object was to ensure the safety of the lock during a journey or until the bag or box was conveyed to a certain locality. When the lock is used for boxes or anything portable, the clockwork must be regulated by a spring; when it is fixed to safes and the like, a descending weight and pendulum can be used. The bolt is prevented from moving by a circular stop-plate fixed with a notch in its rim. The stop-plate works round by clockwork, and until the notch is opposite to the bolt the latter cannot be shot backward or forward. The plate may be made to rotate either slowly or quickly, so that a lock may be regulated so as to open so many hours or minutes after it has been locked. In 1836, Mr. Meighan invented an alarum lock, in which the bell was placed inside the lock itself, but the invention does not appear to have attained any great degree of popularity. It was not until the year 1841 that an invention in this country created a stir in the art of lockmaking. In that year Dr. Andrews of Perth Amboy, N. J., brought out an instrument afterwards known as the "permutation" lock. The principle of this invention consists in the use of rings attached to the key, which may cause an almost endless variety of changes. When the bolt is turned the lock may not be moved except by the same combination of rings upon the key. The advantages of the system are obvious; the internal mechanism of the lock is changeable at pleasure, so that even if the key be obtained possession of for a few minutes, and an impression taken, the owner subsequently may be able by a fresh adjustment of the rings to change the whole construction of the key. The lock is furnished with tumblers and a detector. On the same principle Mr. Newall of New York invented a "permutation" lock of a rather more complicated nature, with two sets of tumblers, instead of a twofold movement to each tumbler. These tumblers were called primary and secondary, and effectually doubled the capacities of the keys. Dr. Andrews's lock succumbed to Mr. Newall's picking, and the last-mentioned lock was picked by Mr. Pettit, who accepted Mr. Newall's offer of $500 to any one who could pick his lock. By no means discouraged, the inventor went to work to find out how to keep the interior of the lock from view and the insertion of delicate instruments, and the result, not without many suggestions and additions, however, was the patenting of the famous lock concealed from view called the "Parautoptic." This famous and complicated piece of mechanism went through various stages, in one of which it was picked by the "smoke" process. A smoky flame introduced into the lock will leave a smutty deposit on the outer edges of the tumblers, which will be removed by the bits of a key if inserted immediately afterwards. A light is then thrown into the lock by means of a mirror, the key-marks become visible, and a false key may easily be made. In 1847 the Parautoptic in its completed form was exhibited in Vienna, where it gained for its owners the honor of a gold medal, and in 1851 the lock was patented in England, and was introduced to the commercial world by Mr. Hobbs. That year was famous in the history of lockmaking, and Mr. Hobbs was undoubtedly the hero of the hour. At the Great Exhibition in Hyde Park he declared to several scientific men that all locks manufactured up to that date in England were easy to pick, and to prove his words he opened one of Chubb's detector locks in a few minutes. As the fairness of the experiment was called into question, Mr. Hobbs made another trial on a Chubb lock in a private house before a number of gentlemen, and picked the lock in the space of twenty-five minutes. Having vanquished Chubb, Mr. Hobbs now turned his attention to Bramah, which firm had exhibited for many years in their establishment a patent padlock with the offer of 200 guineas to

the artist who could make an instrument which would open it. Arbitrators were appointed, and Mr. Hobbs commenced operations on July 24, and on Aug. 23 exhibited the lock open to the arbitrators. Having accomplished this feat, Mr. Hobbs offered the same reward to any one who would pick Newall's Parautoptic, and the challenge was accepted by Mr. Garbutt of London, who, however, failed to accomplish his purpose within the period prescribed, thirty days. Thus the supremacy of American locks was fully established at that date, although in 1855 Mr. Linus Yale, Jr., of Philadelphia, succeeded in picking the Parautoptic, by means of the impression process. That gentleman declared that as long as the key is of "winged" form, and in its use rubs an impression on the tumblers, all the parautoptic locks can be picked. Previous to this date Mr. Yale had invented an instrument called the "magic" lock. In this extraordinary invention the bits of the key are attached to the shaft, and seem to be part of the same piece; when, however, the key is thrust into the lock, they are picked up by a pin which enters the centre of the shaft through them. When the shaft is turned, a number of wheels are set in motion which separate the bits from the shaft, and carry them into the interior of the lock, at the same time the wheels close up the keyhole with a solid block whilst the bits are arranging the tumblers for the drawing of the bolt. Neither the "tentative" nor the "smoking" nor the "impression" process has succeeded in picking the "magic" lock, which has received well-merited praise from English locksmiths.

Perhaps the best English lock is that invented by Mr. E. B. Denison, Q. C., which Mr. Hobbs declared to be the only lock of English invention secure against any known method of picking. This lock appeared in 1852, but was not patented, as the inventor held that patents are an obstruction to the progress of science, and waste on the whole more than they gain for real inventors. The advantages of the Denison lock are obvious. It has large and strong works, with a keyhole so narrow that no instrument strong enough to injure the lock can be introduced, nor a reflector to observe the bellies of the tumblers. The bolt is not only shot by turning a handle, but also locked without using a key. It cannot, however, be opened without a key. Notwithstanding its many virtues, however, the Denison lock has never found great favor in England, as the improved Chubb locks still hold their popularity. Since Mr. Hobbs proved that the *detector* in a Chubb lock afforded guidance to a person attempting to pick it, the English firm has obviated the difficulty by giving the tumblers an unequal bearing, so that if a lock-picker feels the obstruction of the detector he cannot tell whether the tumbler which he is lifting be raised too high or too low. Since the year of the lock-controversy (1851) American locksmiths have sustained the reputation gained at that era so memorable in the history of lockmaking; but, although the number of patents taken out since that date is great, the inventions are not of sufficient novelty to need detailed description. Since the year 1851 no less than 270 locks have been patented in London alone. W. J. Dixon.

Lock'bourne, post-v. of Hamilton tp., Franklin co., O., 11 miles S. E. of Columbus, on the Ohio and Erie Canal. Pop. 281.

Locke, post-v. and tp. of Elkhart co., Ind. Pop. of v. 167; of tp. 882.

Locke, post-tp. of Ingham co., Mich. Pop. 1115.

Locke, post-v. and tp. of Cayuga co., N. Y., on the Southern Central R. R., 21 miles S. of Auburn, has manufactures of importance. Pop. 1077.

Locke, tp. of Rowan co., N. C. Pop. 1119.

Locke (David Ross), better known under his *nom-de-plume* of "Petroleum V. Nasby," b. at Vestal, Broome co., N. Y., Sept. 20, 1833; learned printing in the office of the Cortland *Democrat;* was successively editor and publisher of the Plymouth (O.) *Advertiser*, the Mansfield (O.) *Herald*, the Bucyrus *Journal*, and the Findlay (O.) *Jeffersonian*, and editor of the Toledo *Blade*. In 1860 he began to publish his "Nasby" letters, several series of which have appeared in book-form. He is the author of many political pamphlets. His latest production is *The Morals of Abou ben Adhem* (1875).

Locke, and his Philosophy. I. The distinguished English philosopher, John Locke, was b. at Wrington, Somersetshire, Aug. 29, 1632. His first studies were pursued at Westminster College, London. In 1651 he became a member of Christ's College, Oxford, where he resided till 1664. Here his mind received that bent which gave him his subsequent renown as a philosopher. It was partly from the reading of Descartes, whose clearness of exposition Locke, without accepting his views, greatly admired, so in contrast with the crude instructions of the university, and who must thus receive the merit of preparing against himself his most noted adversary. But it was in part, and directly, the influence of a discussion with five or six students in his rooms at Oxford, when, as he says, the thought came to his mind that the only sure ground of harmony in judgment must be found in a preliminary determination of the possibilities of the human mind. This "thought," which became the *Essay*, was taken up and laid aside, and written upon at intervals through a period of more than twenty years, and only finished in 1687. In 1664, Locke was secretary of legation at Berlin; in 1667 he became acquainted with Lord Ashley, afterwards earl of Shaftesbury, who, in gratitude for medical advice thought to have saved his lordship's life, received the young philosopher as a member for a number of years of his family. During this time he directed the education of Shaftesbury's son, and that of his grandson, who became the elegant philosophical writer in Queen Anne's reign. Locke was brought, through his friend and patron, into the society of Buckingham, Halifax, and other distinguished men. When Shaftesbury became lord chancellor he gave to him the office of the presentation of benefices. But both soon fell into disfavor, and from 1675 to 1679, Locke was in France, mainly at Montpellier with Herbert, later earl of Pembroke, and to whom he dedicated his *Essay*, having also free intercourse with men of eminence at Paris. From 1683 to 1688, on account of the state of his own country, he deemed it wise again to reside abroad. The revolution of 1688 enabled him to return from Holland to England, where he filled several civil offices, and had others proffered, which on account of age and ill health he declined. His last years were spent in the study of the Scriptures, and ministered to by Lady Masham, a daughter of Ralph Cudworth. D. at Oates, a firm believer in the Christian religion, Oct. 28, 1704.

II. The Philosophy of Locke.—1. *Reasons for its Great Popularity and Influence.*—The *Essay on the Human Understanding*, which contains Locke's system, did not appear in London until 1690. But four editions, revised by the author, were issued before his death, and a fifth, with his last emendations, the year after, a tenth in 1731, and the thirteenth in 1748. Meantime it was translated into French, then becoming the universal language of Europe; and this translation, made in 1700, passed through five editions in fifty years. It was also translated into Latin—into Dutch and German several times, and since into modern Greek. These various editions and translations indicate the popularity and extensive influence of the *Essay*. As *reasons* for this may be mentioned—first, the author's public and social position, coupled with the clearness and assurance, if not always the self-consistency, of his utterances. Although wanting the condensation and philosophic exactness of such writers as Kant, his English would rank among the best prose of his time; and his familiar style, derived from the refined society in which he moved, was a help to his popularity, as his public life was already an introduction to his authorship. Secondly, his adherence to the cause of civil and religious liberty. In his work on *Civil Government* he advocated the rights of the people against the arbitrary rule to which they were being subjected. In 1684, and by order of His Majesty, he was expelled from his benefice at Oxford, and was an exile on account of his too free opinions. He might have met with Sir Philip Sidney's fate if, instead of being secreted in Holland, he had fallen into the power of the king. On the accession of James II., William Penn proposed to procure for him a pardon, but the philosopher's noble reply was, "There is no need of pardon where there is no crime or fault." But the above reasons, however powerful as auxiliaries, would not suffice but for the third—that the times favored such a work. The psychological field was not much explored, and in attempting it Locke showed an independence which drew attention to him. At the same time, good men, especially in England, were disposed to accept of what was regarded as authority, and to assume that religion could find its support in faith, without any help from philosophy, or even against it. And unchristian thinkers found a support for their favorite theories in the current and accepted philosophy of Locke. Hence, "towards 1750," says Cousin, "the principles of Locke were spread through Europe; they were developed everywhere else, as well as in England." This would seem to declare the time of its appearance favorable to *such* a system as that enounced by Locke. "Placed between the seventeenth and eighteenth centuries, he forms the transition from one to the other. In fact, run over all the sensualistic philosophers of the eighteenth century, there is not one who does not invoke the authority of Locke; and I do not speak merely of metaphysicians, but of moralists, publicists, and critics. Locke is the chief, the avowed master of the sensualistic school of the last century." (*Cousin.*)

2. *What the Lockian Philosophy is.*—Its aim is "to inquire into the original certainty and extent of human knowledge." With this in view, the author strives to show (bk. i.) that there are no "innate ideas"—ideas being used for whatever is in the mind. If any of these are innate, then the expression of them—for example, "whatever is, is," or "it is impossible the same thing should be and not be"—must be accepted by all human beings, not a child or savage excepted. But, it is said, idiots, children, and savages do not accept them, therefore they cannot be innate. Such is the reasoning. The obstacles thus removed, the origin of knowledge is discussed (bk. ii.). Fortunately for us, the author's positions can be given concisely almost in his own words: "Let us suppose the mind to be, as we say, white paper, void of all characters, without any ideas; how comes it to be furnished? Whence has it all the materials of reason and knowledge? To this I answer, in one word, from experience; in that all knowledge is founded, and from that it ultimately derives itself." Again he says—and the passage is a fundamental postulate of this philosophy—"Our observation, employed either about external, sensible objects, or about the internal operations of our own minds, perceived and reflected on by ourselves, is that which supplies our understandings with all the materials of thinking. These two are the fountains of knowledge from whence all the ideas we have, or can naturally have, do spring." These are called "sensation" and "reflection." And it is important to observe that the latter must wait on the former. "I see no reason to believe that the soul thinks before the senses have furnished it with ideas to think on." That is, the mind can only act upon what is given to it from without, furnishing nothing original from itself. In the last analysis the materials of knowledge are "ideas" of sensation due to perception.

3. *Criticism of this Philosophy.*—The first valid objection to it is its faulty *method.* The primary and essential work of the psychologist is to examine all the facts of consciousness, and to present no theory not sustained by these. Instead of this true method, Locke lays down a hypothesis of the origin of knowledge which the facts of consciousness do not sustain. Then in his treatment of innate ideas he virtually assumes rational intuitions as elements of knowledge to be the same as a conscious recognition of propositional truth; *e. g.* if one has an idea of existence, he must know the import of "whatever is, is." And there is a constant want of distinguishing between the condition and the cause—between the chronological condition for the development of rational truth, and the real cause of its existence at all in the mind; the former being our sensible connection with the external world; the latter, the original constitution of the soul—*i. e.* the reason itself. So in the *matter* of it this philosophy has no support for substance and real being. Locke's ontology needs what his system, carefully guarded in its leading postulates, will not allow. Certain of his statements, indeed, taken by themselves, must involve intuitive truth. Some of the consequences deduced from his hypothesis Locke would deplore as much as any one. But his immediate followers, instead of exposing and correcting his radical defect, proceeded to make a rigorous application of his theory of the origin of ideas, and what he calls sensation and reflection becomes, consistently with his own position, sensation only. And so, after it has helped Berkeley to eliminate the external world from the sphere of reality, it enables Hume to say that it is vain to look for reality either within or without; according to the accepted philosophy, all is phantasm, and we cannot reach substance by any possibility of thought. The legitimate tendency of the system must be, and has been to a greater or less extent, skepticism in religion, utilitarianism in morals, and materialism in philosophy.

J. R. Herrick.

Locke's Island, seaport of Shelburne co., Nova Scotia, on Ragged Island Bay, has considerable West India trade and fisheries. Pop. about 400.

Lock'hart, tp. of Pike co., Ind. Pop. 1829.

Lockhart, post-v., cap. of Caldwell co., Tex., 30 miles from Austin, has 4 churches, a newspaper, flourishing schools, 2 hotels, steam saw and grist mill, a saddle manufactory, and 16 mercantile establishments. The celebrated Lockhart Springs are located here. Principal business, farming and stock-raising. Pop. 560.

Steel & Bridges, Eds. "News Echo."

Lockhart (John Gibson), D. C. L., b. at Cambusnethan, Lanarkshire, Scotland, in 1797; studied at Glasgow University 1807–10; graduated from Baliol College, Oxford, in 1817 as bachelor of law; passed advocate at Edinburgh 1816; became in 1817 a contributor to *Blackwood,* in which his articles were remarkable for vigor and scholarship; married in 1820 the daughter of Sir Walter Scott; was editor of the *Quarterly Review,* London, 1826–53; received in 1843 the sinecure auditorship of the duchy of Cornwall; was one of the writers of the *Noctes Ambrosianæ.* D. at Abbotsford, then the seat of his daughter, Lady Hope Scott, Nov. 25, 1854. His principal works are *Valerius* (1821), *Adam Blair* (1822), *Reginald Dalton* (1823), and *Matthew Wold* (1824), novels; *Don Quixote,* with notes (1822), *Spanish Ballads* (1824), *Life of Burns* (1825), of *Bonaparte* (1829), and of *Scott* (1837–39).

Lock Ha'ven, city, cap. of Clinton co., Pa., on the Philadelphia and Erie and the Bald Eagle R. Rs., and on the right bank of the West Branch of the Susquehanna River, equidistant between Philadelphia and Erie, has 13 churches, 7 school-houses, including a State normal school, 3 newspapers, 2 national banks, good waterworks, several extensive machine-shops and iron-foundries, and is lighted by gas. The principal industry is the manufacture of lumber, there being in the city limits 9 saw-mills and 4 large planing-mills. An excellent boom for the staying of logs floating in the river is here located. About 35,000,000 feet of lumber are annually shipped from this point. Pop. 6986.

J. B. G. Kinsloe, Ed. "Clinton Republican."

Lock'ington, post-v. of Washington tp., Shelby co., O., near the Great Miami River and on the Miami Canal. Pop. 214.

Lockjaw. See Tetanus.

Lock'land (Lockland Station P. O.), a v. of Hamilton co., O., in Springfield and Syracuse tps., on the Cincinnati Hamilton and Dayton and the Cincinnati and Springfield R. Rs., and the Miami Canal, 12 miles N. of Cincinnati. Pop. 1299.

Lock'port, post-v. and tp. of Will co., Ill., on the Chicago Alton and St. Louis R. R. and the Illinois and Michigan Canal, 33 miles from Chicago, has 9 churches, 1 hotel, 2 banking-houses, 2 warehouses, etc., and the principal business is farming. Pop. of v. 1772; of tp. 3584.

W. H. Cook, Ed. "Courier."

Lockport, post-v. of Adams tp., Carroll co., Ind., on the Wabash River and Canal. Pop. 176.

Lockport, post-v. and tp. of St. Joseph co., Mich., on the Michigan Air-line R. R. Pop. of v. 1553; of tp. 3456.

Lockport, city and tp., cap. of Niagara co., N. Y., on the New York Central R. R. and on the Erie Canal, 65 miles W. of Rochester, 18 miles from Niagara Falls, 25 miles from Buffalo, and 8 miles, air-line, from Lake Ontario. It derives its name from a double tier of five locks, of 12 feet lift each, by which boats are passed up and down the "mountain-ridge," a height of 60 feet. Some 35,000 cubic feet of water pass this point every minute during the season of navigation, only one-fifth of which on account of lockages, the four-fifths in some part turning machinery before reaching the canal-level below. Lockport is located near the geographical centre of one of the most profitable grain and fruit growing counties in the State. There is received for apples alone from $1,000,000 to $1,750,000 annually. It has important manufacturing interests, including the Holly Company, which employs 300 skilled mechanics in constructing the Holly waterworks, now in use in more than 60 cities and villages in the Union; also manufactures of engines and steam-dredges, self-centring turning-lathes, tackle-blocks, bran-duster and smut-machines, window-sash, doors, cornices, etc., patent medicines, shirt bosoms, etc., and large quarries of blue limestone. It contains 17 churches, a union school system, embracing the entire corporation, with an imposing central structure wherein are taught collegiate branches, and costly houses in each ward for primary instruction, all free to actual residents of the city; 3 daily and 6 weekly (1 German) newspapers, 4 banks, 1 savings bank, 2 homes for the friendless, and several other benevolent organizations, and a fine opera-house, capable of seating 1500 people. Pop. of city, 12,426; of tp. 3032.

R. M. Skeels, Ed. "The Daily Union."

Lockport, a v. of Goshen tp., Tuscarawas co., O., on the Ohio Canal. Pop. 250.

Lockport (Platea P. O.), a b. of Girard tp., Erie co., Pa., on the Erie Extension Canal, 21 miles S. W. of Erie. Pop. 405.

Lockport (Lockport Station P. O.), a v. of Fairfield tp., Westmoreland co., Pa., on Conemaugh River, and the Pennsylvania R. R. and Canal, 10 miles E. of Blairsville. It has fine beds of coal.

Lockridge, tp. of Jefferson co., Ia. Pop. 1680.

Locks'burg, post-v., cap. of Sevier co., Ark., 81 miles S. W. of Little Rock.

Lockville, post-v. of Violet tp., Fairfield co., O., on the Ohio Canal, 12 miles N. W. of Lancaster. Pop. 131.

Lock'wood's, tp. of Brunswick co., N. C. Pop. 874.

Lock'yer (Joseph Norman), F. R. S., b. at Rugby, England, May 17, 1836; educated chiefly on the Continent; was clerk in the war-office in 1857; became skilled in mathematics and astronomy by private study; edited the *Army Regulations* (1865); was for a time connected with the royal commission on instruction; became a fellow of the Royal Astronomical Society 1866; F. R. S. 1869; editor of *Nature*, etc.; was Rede lecturer at Cambridge 1871–73, and chief of the eclipse expedition to Sicily in 1870; has written valuable papers on the sun and the planet Mars, *Lessons in Astronomy*, *The Spectroscope*, etc., and various reports and memoirs, chiefly upon astronomy and physics.

Lo'cle, town of Switzerland, in the canton of Neufchâtel, on the Bied. Its manufactures of clocks and watches are very celebrated. Pop. 9301.

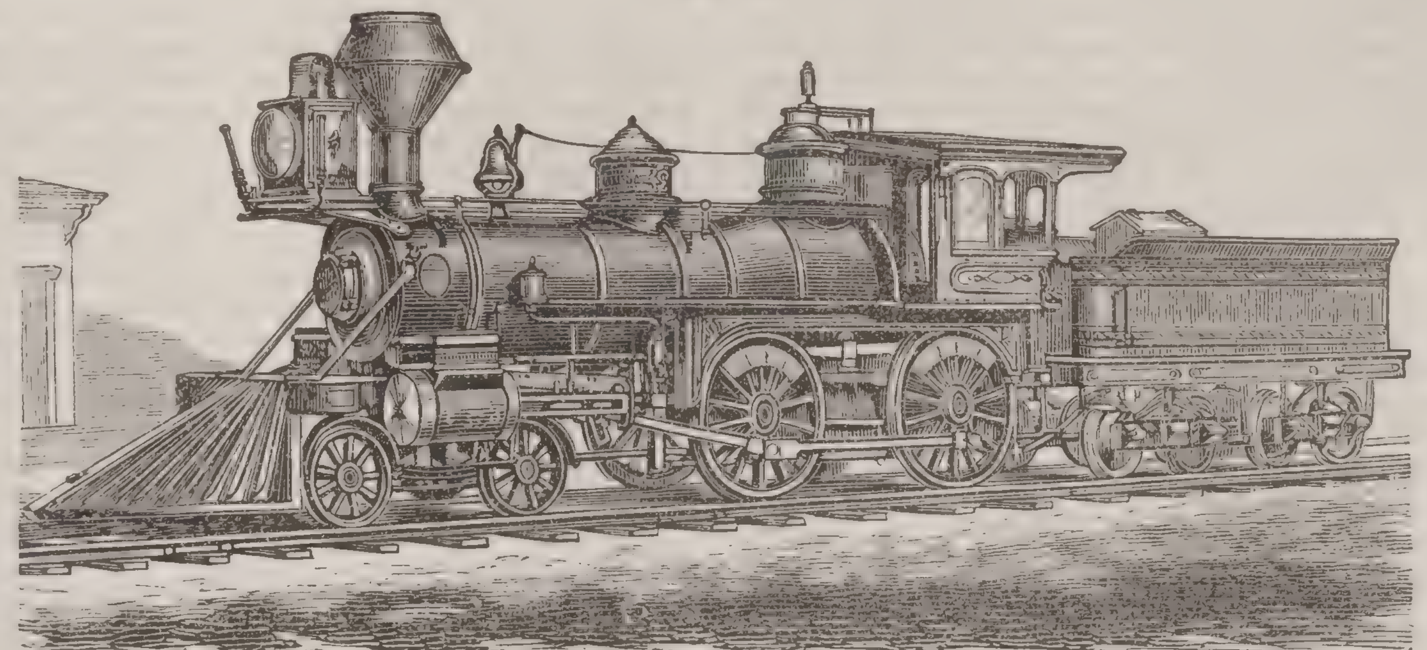
Lo'cock (Sir Charles), Bart., M. D., F. R. S., b. at Northampton, England, Apr. 21, 1799; studied at the University of Edinburgh, where he graduated in medicine 1821; established himself in his profession in London, and in 1840 was appointed, on the recommendation of Sir James Clarke, physician accoucheur to the queen, by whom, in recognition of his services, he was created a baronet Apr. 14, 1857, at which time he retired from the active practice of his profession. In the same year he was chosen president of the Royal Medical and Chirurgical Society, and became in 1863 honorary president of the Obstetrical Society. He was a magistrate and deputy-lieutenant for Kent, and in 1865 was an unsuccessful candidate for Parliament in the Conservative interest. D. at Binstead Lodge, Ryde, July 25, 1875.

Locomotion of Animals. See Mechanics, Animal, by Prof. W. P. Trowbridge, A. M.

Locomo'tive [Lat. *locus*, "place," and *movere*, *motum*, "to move"]. The form of engine shown in the engraving represents quite accurately a very large proportion of the locomotives found upon American railroads. Other varieties, some differing widely from this, are used both upon our own roads and in other parts of the world, but in all their essential elements they may be compared with it. The principal parts are the boiler, containing within itself the firebox or furnace; the frame, the steam-cylinders, the valve-gear, the driving-wheels, and the truck-frame with its wheels.

The body of the boiler is cylindrical, and to it, at the back end, between the driving-wheels, the rectangular outer firebox is riveted. The fire-grate is placed at the bottom of the inner firebox, and the heated gases pass from the burning fuel through the tubes, which extend forward through the body of the boiler to the front end. The water is contained in the spaces around the outside of the tubes, and also in the water-leg or space between the inner and outer fireboxes. A dome is placed upon the top of the boiler to give a larger internal steam-space, and also in order that the mouth of the pipe through which the steam is led to the cylinders may be raised up within it as high as possible above the surface of the water. The parallel sides of the outer and inner fireboxes are held to each other by stay-bolts, which are screwed in through both plates. The top or crown-sheet of the inner firebox is nearly flat, and it is stayed by deep bars which reach across it from side to side. To these bars the sheet is held up by numerous bolts or rivets, and the bars themselves are supported partly by resting at their ends upon the side-sheets or plates of the inner firebox, but chiefly by sling-stays, which hang down from the shell of the boiler above the crown-sheet. The shell of the boiler is extended forward about three feet beyond the front end of the tubes, forming the smoke-box, within which the waste gases collect after passing through the tubes, and upon which is placed the chimney through which they escape into the air. Near the top of the chimney a deflector is placed to break up the coarser cinders that may be projected against it by the force of the draft, and a wire netting fine enough to prevent their escape into the air. On wood-burning locomotives this netting is so fine that a medium-sized pin cannot be thrust through the mesh. Directly under the chimney is placed the draft-pipe, by which uniformity in the flow of gases is secured from the lower as well as the upper tubes into the chimney. Beneath the draft-pipe a nozzle is placed upon the end of the exhaust-pipes, and through it the waste steam of the cylinders is discharged. By this means a draft is induced through the tubes and through the fire, and by this intermittent discharge into the chimney of the steam from the cylinders the well-known puff of the locomotive is produced.

Fig. 1.



Locomotive.

The throttle-valve, by which the admission of the steam to the cylinders, and thus the starting of the engine, is controlled, is placed at the entrance to the steam-pipe, close beneath the cover of the dome, which can be readily removed to give access to the interior of the boiler. The steam-pipe extends down and forward through the front end of the boiler into the smoke-box. Two separate pipes then lead to the steam-nozzles on the cylinder, through which the steam passes into the steam-chest. The cylinders are placed outside of and close against the frames, being bolted directly to them, and also by the flanges of an intermediate saddle-piece to the smoke-box, or front end of the boiler. The steam-chest, containing the slide-valve, is placed on the upper side of the cylinder, in which the ports are so cast that the steam may pass into the chest from the steam-pipe, out of it to either end of the cylinder, and also out to the exhaust-pipe in its final escape, the distributing passages being alternately covered by the slide-valve. The motion of the piston in the cylinder is transmitted through the piston-rod to the cross-head, and then by the connecting-rod to the crank-pin, which is fitted into the driving-wheel. The piston is made of cast-iron, and runs steam-tight in the cylinder by means of iron packing-rings and a set of steel springs, which press the rings radially outward against the walls of the cylinder. Rings made of square steel wire are often used, the rings being bent to a circle a little larger than the diameter of the cylinder, and then sprung into grooves which are turned in a solid piston to receive them. By their own elasticity the wires are kept close against the cylinder. The cross-head is held by a key to the outer end of the piston-rod, and it is guided in its reciprocating motion by four steel slide-bars which are set parallel with the centre line of the cylinder. The connecting-rod is attached at one end to a wrist in the cross-head, and at the other end to the crank-pin in the driving-wheel; and it thus transmits the pressure upon the piston to the wheel, and to the point of contact or of resistance upon the rail. This rod, and the parallel rod which connects the two driving-wheels, are fitted at both ends with brass boxes and tapered keys, by which they are held close upon the crank-pins in the wheels. The rocker is placed close behind the slides, and through it is transmitted the reciprocating motion of the eccentrics upon the driving-axle to the slide-valve, by means of the eccentric rods, the reversing link, and the valve-stem.

The iron frame-bars are placed one on each side of the boiler, and they are attached to it rigidly near the forward end. A cross-beam of oak holds them to each other at the extreme front, and to this beam is attached the pilot or

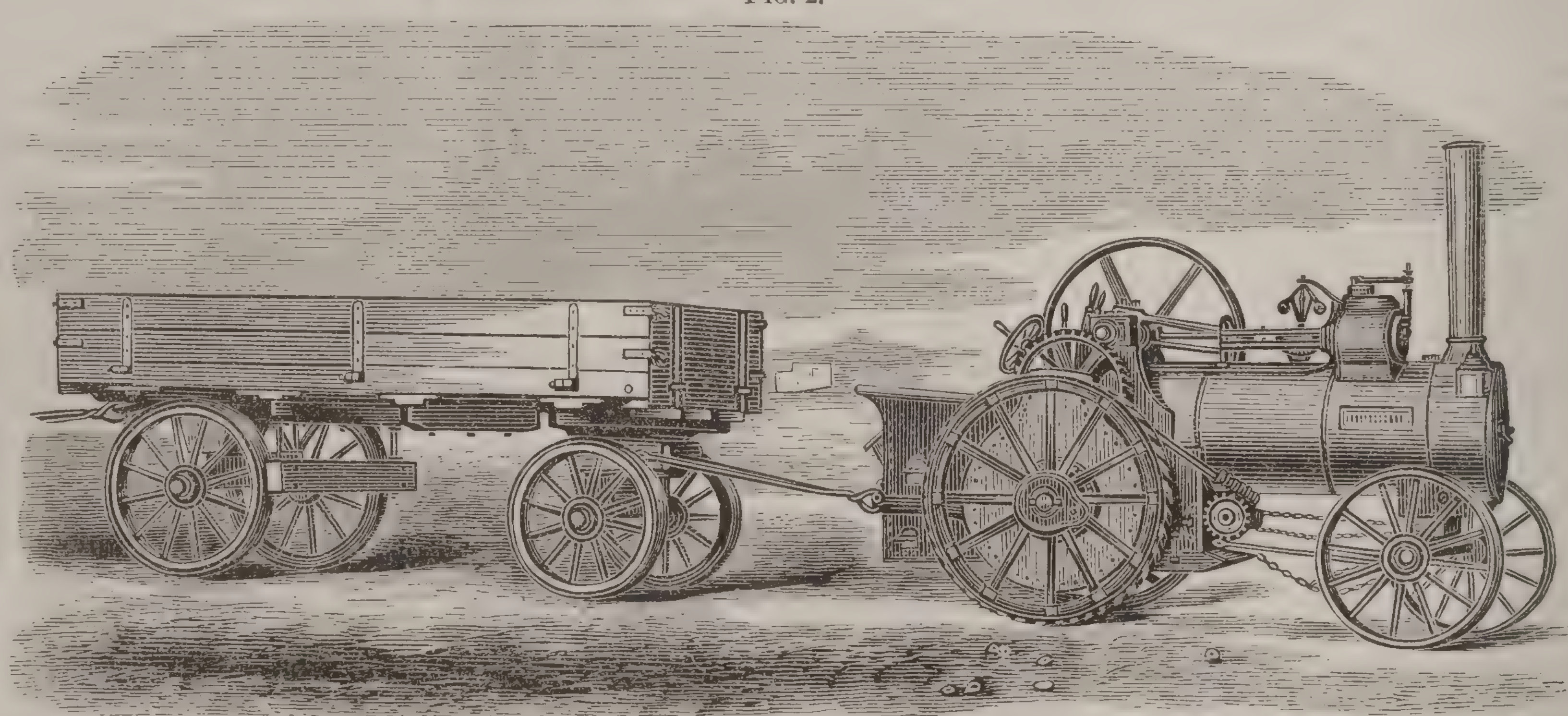
cow-catcher, which aids in clearing the track of obstructions. The saddle to which the cylinders are attached serves as the means of fastening the frames to the boiler, as it rests upon them, and is held to them and to the smoke-box by bolts which are driven solid into accurately drilled holes. The jaws of the frame which hold the driving axle-boxes are forged solid with the long side-bars, which lie close on each side of the outer firebox. The frames are held rigidly to the firebox laterally, but clasps are put round them, so that the whole body of the boiler may expand backward from the front end as it becomes heated. At the back end of the frames a cast-iron plate is put in between them, which serves both in holding them to each other and also in coupling on the tender. The axleboxes of the driving-wheels are free to slide vertically in the jaws of the frame, so that the wheels may yield more perfectly to the inequalities of the road. The weight of the engine over the driving-wheels rests upon the spring-hangers, which draw directly upon the ends of the springs. These bear, in the centre of their length, upon the top of the axlebox, so that the jar due to the striking of the wheel upon any inequality in the rail-surface is lessened in violence by passing thus through the spring. An equalizing lever is placed on each side, between the driving-wheel springs, and to this lever one end of each spring is hung, so that the jar brought against one wheel is in part transmitted to the spring of the other wheel, and thus the elasticity of both springs is utilized for the relief of each wheel. On each side of the axleboxes are placed vertical wedges which bear against the jaws of the frame, and by tightening them any looseness due to the wearing of the moving faces may be compensated for. The axlebox has a brass or white-metal lining, which bears upon the axle, and on the top of it is formed an oil-cup for the lubrication of the rubbing surfaces. Underneath the axle is an oil-box filled with a compressed sponge, which retains the oil and presses it constantly against the bearing surface of the axle.

The driving-wheels are bored to a close fit upon the axles, and are forced on by a powerful hydraulic press. They are held from turning on the axle by a square key, which is driven into a recess or key-way cut half in the axle and half in the wheel. The steel crank-pin is forced in the same way into a hole bored in the crank-boss, which is an enlargement of two of the spokes of the wheel. The driving-wheels of American locomotives are invariably made of cast iron, and are encircled with a steel band or tire, which bears upon the rail and has a flange or lip at its inner edge by which it is kept laterally upon the rail. Many methods of holding the tires in place upon the wheel have been employed. In one of these oak blocks are driven with great force into recesses which are left under the tire in the rim of the wheel. In another the tire is turned out true on its inner circumference, and the wheel is turned slightly larger than this inner diameter of the tire. The latter is heated until by its expansion it will slip on to the wheel, and by the tension due to its cooling it is held in place. The forward or truck-wheels are made of cast iron, with a hard tread or bearing surface. They are pressed on to the axles without keys, and are placed under the engine in the truck-frame. Upon this frame is placed a centre-bearing, upon which the weight of the forward part of the engine rests, and around which the frame can rotate slightly in following the curvature of the track over which the engine may be passing, and thus the resistance due to the side-pressure of the flanges against the rails in passing curves is greatly lessened. The direction of the motion of the engine may be changed by the action of the reverse lever, in bringing into gear with the slide-valve, by means of the reversing link, one or the other of the eccentrics upon the driving-axle.

The feed-pump by which the supply of water is forced into the boiler is driven by one of the cross-heads, the pump-plunger being attached directly to it. The pump-valves are made of the hardest brass, and so that they may be easily examined or repaired. An injector is usually fitted for the supply of the boiler when the engine is standing. The water is led to the pump and to the injector by pipes which are connected to the tender by a flexible hose. It is delivered to the boiler through pipes which enter near the front end, and a check-valve is fitted close to the side of the boiler to prevent the return of the heated water to the pump. The tender, which accompanies nearly all American locomotives, is provided with a water-tank enclosing a space for fuel, and the whole, resting upon a timber platform, is placed upon two truck-frames which are fitted with the requisite wheels and axles.

The weight of an engine of this class, without the tender, may be taken at thirty-two tons when filled with water and ready for work. Of this weight, twenty-one tons rest upon the driving-wheels. The cost of operation and maintenance per mile run is about 19 cents, the proportion due to repairs being $3\frac{7}{10}$ cents, to fuel $5\frac{6}{10}$ cents, to stores $\frac{5}{10}$ cent, to miscellaneous $2\frac{5}{10}$ cents, and to attendance of all kinds $6\frac{5}{10}$ cents. It is certain that the secret of the most successful practice in the designing and construction of locomotives has lain in the observance of the most rigid simplicity of detail in every part, and also that the improvements of the future will lie chiefly in the adaptation of new materials, rather than new methods of construction.

Fig. 2.



Road Locomotive.

Road Locomotive.—The engraving shows a well-approved form of engine by Aveling & Porter of Rochester, England. Very little has been done in this country in bringing such engines into actual use, though several excellent designs for them have been put forward. In this engine the boiler is of the common locomotive form. On the top of it, near the front end, the steam-cylinder is placed, and the crank-shaft, fly-wheel, and driving-gear are directly behind it. The driving pinion upon the crank-shaft is connected, with one intermediate shaft, to a heavy gear upon the driving-axle, and thus a high speed of the fly-wheel may be maintained at an ordinary speed of the locomotive, and an ample power developed even with a small steam-cylinder. The driving-wheels, upon which about eight-tenths of the whole weight of the engine rests, have very broad rims, with thin oblique strips riveted upon them, and they thus have a slightly greater hold upon the ground than would be afforded by an entirely smooth surface. The front wheels are pivoted, by a centre-pin in their axle, so as to allow the engine to move in a curved path. This turning of the engine is controlled by side-chains, which are drawn up by a hand-wheel placed near the driver. The wheels are made with an internal wrought-iron rim and arms. A cast-iron external rim or tire is used, and between these two rims, in a closed recess, are placed blocks of rubber, which by their elasticity afford sufficient relief to the machinery from the jarring of rough roads, and which are at the same time protected from injury. The weight of a medium-sized engine of this kind may be taken at about eight tons, and the cost of operation and maintenance at from four to six cents per mile run.

P. Barnes.

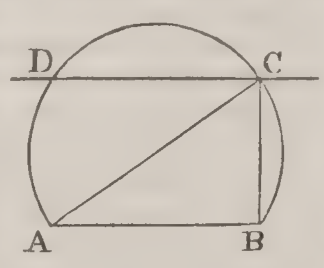
Locoroton′do, town in Southern Italy, in the province of Bari, about 26 miles N. of Taranto. Pop. in 1874, 7189.

Lo′cri, or **Locri Epizephy′rii,** an ancient city of Magna Græcia or Southern Italy, in the subsequent Roman province of Bruttium or Calabria Ultra, now Reggio. It was founded probably as early as 710 B. C. (according to Strabo) as a colony from the Grecian Locris, but whether from the eastern or western country of that name is uncertain. The original settlement was on Cape Zephyrium (Capo di Bruzzano), near the S. E. point of the Calabrian peninsula, whence the name given to distinguish the colony from the mother-country. Ultimately, the settlement was removed 15 miles farther N. Locri was celebrated as the first Greek state to adopt a *written* code of laws, the authorship of which was ascribed to a half-mythical legislator, Zaleucus. The people were said to be skilful and courageous in war, and addicted to poetry, philosophy, and music. The Locrians were long in hostility with Rhegium and Crotona, and in alliance with Syracuse. The younger Dionysius seized upon the citadel at Locri on his expulsion from Syracuse (356 B. C.), and carried on a despotic government until expelled six years later. During the wars of the Romans with Pyrrhus and with the Carthaginians, Locri alternately favored all the contending parties, and consequently suffered by turns from all, especially from the Romans, who were finally victorious, and followed the example of Pyrrhus in plundering the famous temple of Proserpine. From this time Locri sunk into insignificance; its very existence for many centuries is known only by passages in geographical treatises. Destroyed probably by the Saracens, its site had become unknown until the present century, when the remains of the walls of the two famous citadels and the foundations of the temple of Proserpine have been discovered 5 miles from the modern town of Gerace. (See description by the duke de Luynes in *Ann. d. Inst. Arch.*, vol. ii.)

Loc′rians [Λοκροί], a people of ancient Greece, reputed to be descendants of the Leleges, divided into eastern and western tribes. Those on the E. coast, and N. of the Phocian city Daphnus, were called Epicnemidii (named from Mount Cnemis), while those farther S. were Opuntii, so called from Opus, their chief town. On the N. of the Corinthian Gulf dwelt the Ozolæ, a semi-barbarous tribe.

Lo′cus [Lat.]. The locus of a point is the line generated by that point when moving according to a fixed law. Thus, if a point moves in a plane in such manner that the sum of its distances from two fixed points is always equal to a given distance, its locus is an ellipse. The locus of a line is the surface generated by that line when moving according to a fixed law. Thus, if a straight line moves in such a manner as to touch three other straight lines, no two of which are parallel, its locus is a hyperboloid of one nappe. To find the equation of a locus we have only to express the law of motion by one or more indeterminate equations.

The following example illustrates the method of solving geometrical problems by the principles of loci: Let it be required to construct a triangle whose base is equal to a given line, whose area is equal to a given area, and whose vertical angle is equal to a given angle. Draw a line AB equal to the given base; on it, as a chord, construct an arc of a circle capable of containing the given angle; draw a line DC parallel to AB, and at a distance from it equal to the quotient of the given area by half the line AB; and from either point in which this line intersects the arc, as C, draw CA and CB; then will ACB be the required triangle. For, DC is the locus of the vertices of all the triangles whose common base is AB and whose areas are equal to the given area, and the arc ACB is the locus of the vertices of all the angles whose sides pass through A and B, and which are equal to the given angle; hence, the points of intersection are the vertices required. If DC cuts the arc in two points, there are two solutions; if it is tangent to the arc, there is but one solution; if it does not intersect the arc, and is not tangent to it, the solution is impossible. W. G. PECK.



Lo′cust [Lat. *locusta*]. By this name may be denoted the migratory locust of the Old World (*Œdipoda migratorium*) and the locust of Western North America (*Caloptenus spretus*). The term "locust" is often wrongly applied to the cicada or seventeen-year locust. The transformations of the locust, as in all the grasshoppers, are very slight, the larva differing from the adult chiefly in wanting wings; but in this state even they are said by African travellers to travel great distances. The eggs are large, long, cylindrical, and laid late in the summer in packets of about seventy-five, resembling cocoons, in holes bored in the ground by means of their stout horny ovipositors. The voracity of the locust, and of grasshoppers generally, may be explained by the anatomy of the alimentary canal, which is highly developed, the gizzard being provided with from six to eight rows of horny denticulated plates situated on ridges, the whole number of teeth in some species amounting to 270. The stomach and salivary glands are highly developed, the large jaws further adapting it for its vegetable diet. The air-tubes (tracheæ) dilate into numerous large air-reservoirs, which assist it in taking its long-sustained flights. The ears of the locust are two vesicles situated at the base of the hind-body or abdomen, each supplied by an auditory nerve sent from the third thoracic ganglion. The stridulating noise this and many other grasshoppers make is produced by rubbing the thighs against the wings. The migratory locust of the Old World is widely distributed, being found all over Africa, in Western Asia, and Southern Europe, sometimes occurring in Belgium and England. It is said to travel about sixteen miles a day. It moults five times, at intervals of about six weeks. The locust is eaten and relished by the natives of the country in which it is found as nutritious food.

The locust of North America is the widely distributed red-legged "grasshopper" (*Caloptenus femur-rubrum*, Harris, Fig. 1, *b*) with its allied species (*Caloptenus spretus*, Uhler, Fig. 1, *a*), which inhabits the U. S. west of the Mississippi River, though occasionally found in New England. The eastern species does the most damage in Northern New England and Canada. The western species (*spretus*) breeds most abundantly in the elevated portions of Colorado and northward, and migrates to the plains below; it also breeds abundantly in Iowa and Minnesota, and is so voracious as to drive farmers from their lands. The young of the *spretus* are hatched in March and April and early in May in Texas, Colorado, and Kansas, and at once begin their ravages. Late in the season, by the last of June, they acquire wings, becoming fearfully destructive, though most destructive before acquiring their wings. They are more active by night than by day. Late in summer so abundant do they become that an observer in Texas has seen "the whole surface of the earth so broken up by their borings that every inch of ground contained several patches of eggs." A. S. PACKARD, JR.

FIG. 1.

Red-legged Grasshopper, and its long-winged Western variety.

Locust, tp. of Christian co., Ill. Pop. 825.

Locust, tp. of Columbia co., Pa. Pop. 1534.

Lo′cust Bay′ou, post-tp. of Calhoun co., Ark. Pop. 608.

Locust Creek, tp. of Linn co., Mo. Pop. 2398.

Locust Dale, tp. of Madison co., Va. Pop. 3484.

Locust Grove, tp. of Searcy co., Ark. Pop. 524.

Locust Grove, tp. of Jefferson co., Ia. Pop. 1486.

Locust Grove, post-v. of Franklin tp., Adams co., O. Pop. 103.

Locust Grove, tp. of Floyd co., Va. Pop. 1991.

Locust Hill, post-tp. of Caswell co., N. C. Pop. 1781.

Locust Tree [Lat. *locusta*]. The locust tree is named *Robinia*, in honor of John Robin, herbalist to Henry IV. of France, and of his son Vespasian, who first cultivated the tree in Europe. The beautiful genus received its name from Linnæus, and belongs to the sub-order Papilionaceæ of the order Leguminosæ. The five-toothed calyx is short and slightly two-lipped. The standard is large and rounded, turned back, and scarcely longer than the wings and keel. The stamens are in two bundles—*i. e.* diadelphous. The style is bearded next the free stamen; the pod linear, flat, several-seeded, margined on the seed-bearing edge, and with thin flat valves. Leaves odd-pinnate, with stipels at the base of the leaflets. The flowers are very showy, in pendulous racemes, and in the common locust are exceedingly fragrant. *Robinia Pseud-acacia*, the common locust, is called false acacia from the resemblance it bears to the true acacia. It has prickles at the base of the leaves, which are smooth and rarely retain dust. The roots do not bury themselves deep in the soil, but spread out just beneath the surface, and cause the young tree to grow with extreme rapidity during the first years of its life. When more mature, and the roots have exhausted the

nourishment about them, the growth is slower. It has been recommended to be planted on the borders of pastures, as its droppings enrich the soil. Cattle are fond of the sweet leaves. The tree never attains great size in the Eastern States, but reaches its perfection in Kentucky and Tennessee, where it sometimes exceeds four feet in diameter, and grows to a height of eighty feet. When the land where it grows is cleared it produces abundant crops of Indian corn for several years in succession without manuring. It has been suggested that exhausted soil may be restored to fertility by a growth of the locust, its leaves soon becoming converted into mould.

The wood of the locust is close-grained and compact. Its medullary rays are closer and more numerous than in any other tree. The color varies, but the reddish-tinted is the most valued for timber. According to Emerson, there is a black variety in the Western States. The wood is remarkable for its strength and durability, and for its stiffness, hardness, elasticity, and weight. Fence-posts, railway sleepers, and trenails in naval architecture are made of it. It is considered as durable as the live-oak. It is used to some extent in cabinetmaking, but only slightly in housebuilding. For mill-cogs it is very valuable. The celebrated Cobbett in 1823, after a residence of some time in America, returned to England, and by his writings, in which he claimed superlative virtues for this tree, produced a remarkable interest in it. It was soon found that he had much exaggerated the useful properties of the tree. Valuable as the wood is for many economic purposes, graceful as is the aspect and foliage of the tree, and beautiful as are the flowers, the locust is yet so infested by many varieties of insects as to make it objectionable. Where it is grown for timber it is advised to plant it in groves, as then the trees on the margin only seem to be affected. All parts of the tree—leaves, bark, wood, and seeds—are subject to insect ravages, almost threatening its extermination. The branches are easily broken, moreover, by winds. It is easily propagated by the suckers which spring up from the roots, and still more readily by the seed, which is best preserved in the pod. It prefers a rich, loamy soil, and the young plants will often grow from two to three feet in the first season. There are two species of *Robinia* found in cultivation besides the *pseud-acacia*—viz. the *Robinia viscosa* and the *Robinia hispida*. The latter—a mere shrub—is known as the rose acacia, and is distinguished by its rose-colored, inodorous blossoms and hairy stems. It is too apt to spread and become troublesome. The so-called honey locust belongs to the kindred genus *Gleditsia;* it has doubly pinnate leaves, and is horrid with thorns. It is a highly ornamental tree, but its foliage is too light and delicate to afford deep shade. W. W. Bailey.

Lo'da, a v. (Oakalla P. O.) and tp. of Iroquois co., Ill., on the Illinois Central R. R., in the Grand Prairie, a fine region for agriculture, and has a large trade. Pop. 1921.

Lodève, town of France, department of Hérault, at the confluence of the Ergue and Soulandres, at the foot of the Cevennes. Pop. 11,864.

Lodge (Edmund), F. S. A., b. in London, England, June 13, 1756; served in the army in his youth, and afterwards devoted himself to antiquarian pursuits, especially genealogy. He became a member of the Heralds' College; was promoted to the office of Lancaster Herald 1793, Norroy King-of-Arms 1822, and Clarencieux King-of-Arms 1838. D. at London Jan. 16, 1839. He published *Illustrations of British History, Biography, and Manners in the Reigns of Henry VIII., Edward VI., Mary, Elizabeth, and James I.* (3 vols., 1791), *Peerage and Baronetage of England*, an annual publication, and *Portraits of Illustrious Personages of Great Britain* (4 vols. folio, 1821–34).

Lodge (Thomas), b. in Lincolnshire, Eng., about 1555; entered Oxford University in 1573; was a law-student at Lincoln's Inn in 1584; was for some time an actor; was a soldier in the expeditions of Clarke and Cavendish; studied medicine at Avignon, and practised at London, where he d. of the plague in Sept., 1625. He was the author of *Rosalynde; Euphue's Golden Legacie* (1590), a novel which was the basis of Shakspeare's *As You Like It; True Tragedies of Marius and Sylla* (1594), a drama; *A Margarite of America* (1596), a tale supposed to have been written during his voyage with Cavendish; a *Treatise of the Plague* (1603); and translations of *Josephus* (1602) and *Seneca* (1614). In connection with Greene he wrote *A Looking-Glass for London and England* (1594).

Lo'di, town of N. Italy, in the province of Milan, in lat. 45° 18′ 35″ N., lon. 27° 09′ 67″ E. It lies 20 miles S. of Milan, on the right bank of the Adda, which is here crossed by a bridge, the river being navigable for large boats until it reaches the Po. Lodi was the theatre of one of the most daring and brilliant exploits of the French under Bonaparte. On May 10, 1790, Napoleon, after the terrible passage of the long and narrow bridge under the full fire of the Austrian batteries, won the memorable victory which secured him the possession of Lombardy. The streets and piazzas of Lodi are, for an old town, broad, spacious, well paved, and clean, and many of the public buildings are worthy of notice. The cathedral dates from the twelfth century, and other churches contain fine marbles, bronzes, frescoes, and especially wood-carvings of much merit. The educational and charitable institutions of Lodi are numerous, and recent co-operative associations have proved very successful. The trade and industry of the place are remarkable. Its *majolica* has a high reputation; also its silk and linen, but the chief article of the Lodi market is the famous Parmesan cheese, which is made in immense quantities in the neighborhood. Pop. in 1874, 19,088.

Lodi, tp. of Washtenaw co., Mich. Pop. 1344.

Lodi, post-v. and tp. of Bergen co., N. J., 15 miles N. of Jersey City, on the New Jersey Midland R. R., and the terminus of a branch of the Erie R. R. Pop. 3221.

Lodi, post-tp. of Seneca co., N. Y., on Seneca Lake, contains several fine cataracts, of which the best known is Lodi Falls on Mill Creek, which leaps 125 feet down into an irregular cañon. Pop. 1825.

Lodi, tp. of Athens co., O. Pop. 1551.

Lodi, post-v. of Harrisville tp., Medina co., O., 14 miles S. W. of Medina, has a national bank.

Lodi, post-v. and tp. of Columbia co., Wis., on the Chicago and North-western R. R., has 1 weekly newspaper. Pop. of v. 725; of tp. 1566.

Lodi Station, post-v. of Virgil tp., Kane co., Ill., on the Chicago and North-western R. R.

Lo'di Vec'chio [anc. *Laus Pompeia*], an old town about 5 miles from Lodi, founded, Pliny says, by the Boii and colonized by the father of Pompey. Its mediæval vicissitudes, together with those of the more modern town, are of much interest. Pop. in 1874, 3500.

Lodome'ria was the Latin name for the former principality of Vladimir, which on the division of Poland went to Austria, and now forms part of the province of Galicia.

Lodomil'lo, tp. of Clayton co., Ia. Pop. 1002.

Lodz, city of Russian Poland, in the government of Warsaw, is well built, and has very extensive manufactures of woollens and linens. Pop. 34,328.

Lo'ess [Ger. *lösz*, from *lösen*, "to loosen"], arenaceous, calcareous clay deposited in the valleys and at the mouths of rivers, the sediment by which their waters are rendered turbid at the time of floods. This is deposited on the overflowed bottom-lands and in the still water of the basins into which they flow. The most extensive accumulations of loess known are those of the Terrace epoch—the last epoch of the Drift period—of which the loess of the Rhine may be taken as an example. This is yellowish-gray loam, mostly unstratified, containing terrestrial and fluviatile shells, and sometimes attaining a thickness of several hundred feet. It seems to have been deposited when, after the Rhine Valley had been excavated, a large part of it was filled with still water, which caused the deposition, far above its mouth, of the sediment transported by the upper river. Similar beds of loess are found in the valleys of the other great rivers of Europe, and they afford proof of a general subsidence of the continent at a comparatively recent date. As the land rose again, or the sea-level was depressed, the rivers cut deeply into these ancient deposits, so that they now in places form high banks on one or both sides of them. Prof. Bischoff has shown by chemical analysis that the sediment that fills the lower valley of the Nile has the same composition as the loess of the Rhine. In the valley of the Mississippi a deposit of loess is found similar in character and history to that described above. It occupies the region about the junction of the Missouri and Mississippi, and underlies the surface over a large part of the prairie country of Illinois, Iowa, and Indiana. In some places it has once nearly filled the old valley of the Missouri River, and where partially cut out by the stream forms abrupt or precipitous bluffs which have given it the name of the *Bluff formation*, generally applied to it in that region.

The loess of the Mississippi Valley is for the most part the silt or sediment of the Missouri River. This is a peculiarly turbid stream, as it flows through a country underlain by soft and easily eroded rocks, and it now carries into the Mississippi a large amount of yellow sediment precisely like the loess in character. In the geological period immediately anterior to the present the sea stood considerably higher on the shores of this continent than now, and the waters of the Gulf of Mexico reached up the valley of the Mississippi nearly to the sources of that stream. At this

time all the region about the junction of the Missouri and Mississippi was covered with water, forming a kind of inland sea. Into this sea the Missouri discharged, and the sediment brought down from the great area it drained was spread over its bottom, filling more or less completely the old valleys of the rivers that in a former age had flowed through it, just as they now do, and covering a wide adjacent area. Subsequently, the water of this inland sea was drained away, and the valley of the lower Missouri has been since mostly cleared of the silt that obstructed it. Where it remains it forms the bluffs of loess which have been referred to. These seem in places to be the true boundaries to the Missouri Valley, but they are in fact only a facing to its rocky walls, which reach down far below the present stream, and are the product of ages of erosion long anterior to the epoch of the loess ages, when the continent was higher than now and the drainage was more free. J. S. NEWBERRY.

Lofo'den, or **Lofo'ten,** a group of islands situated between lat. 67° 30′ and 69° 30′ N., and stretching along the north-western coast of Norway. The largest are Andöen, Langöen, Hindöen, East Vaagen, West Vaagen, and Flagstadöe. They are high and rocky, presenting wild, rugged, and deeply-indented coasts, and rising in some places of the interior to the height of 4000 feet, at which elevation the snow does not melt during summer. The inhabitants number about 4000, partly of Norwegian, partly of Finnish descent. Along the coasts of the fiords a little barley, oats, and potatoes can be cultivated, but the islands derive their importance from the immensely rich fisheries, which each summer employ nearly 30,000 men, and form a source of national wealth to Norway. Early in spring cod is caught to the number of nearly 20,000,000, a large portion of which is sold fresh, the rest producing about 9000 tons of dried fish, 22,000 barrels of oil, and 6000 barrels of roe. When the cod-fishing is over, at the end of April, the herring-fishing begins and continues the whole summer; also great numbers of lobsters are caught. But this fishing is not without its dangers. The currents around and between the islands are so rapid and tortuous, and subject to such violent changes from ebb and flood, that during spring and fall, when hard weather sets in, these waters often become perfectly unnavigable. Even whales are sometimes dashed to pieces against the rocks of the coasts. (See MAELSTROM.)

Lof'tus (WILLIAM KENNETT), b. at Rye, Sussex, England, about 1820; was educated at Cambridge, where he distinguished himself in geology under Prof. Sedgwick; was from 1849 to 1852 a member of a commission for determining the boundary between Turkey and Persia, becoming familiar with the regions on the Tigris and Euphrates, which he explored in 1853–54 under the auspices of the Assyrian Society, making numerous important excavations and discoveries, especially upon the site of Warka, the biblical Erech. He published in 1857 a valuable work, *Travels and Researches in Chaldea and Susiana*, was appointed a member of the geological survey of India, and d. at sea from the effects of sunstroke, while returning to England, Nov., 1858.

Lo'gan, county of Central Dakota, on the Coteau du Missouri. It is dry and elevated, and very sparsely settled.

Logan, county of Central Illinois. Area, 574 square miles. It is level and fertile, and abounds in coal. Cattle, wool, and grain are staple products. The leading manufactures are of carriages, flour, saddlery, and harnesses. The county is traversed by various railroads. Cap. Lincoln. Pop. 23,053.

Logan, county of Kentucky, bounded S. by Tennessee. Area, 600 square miles. It is undulating and fertile. Tobacco, wool, cotton, and grain are largely produced. The leading manufacture is that of carriages. The county is traversed by the Memphis Clarksville and Louisville R. R. Cap. Russellville. Pop. 20,429.

Logan, county of W. Central Ohio. Area, 415 square miles. Greatest elevation, 1335 feet. It is undulating and fertile, producing live-stock, wool, and grain in great amounts. There are manufactures of carriages, lumber, harnesses, flour, furniture, cooperage, etc. It is traversed by the Cincinnati and Sandusky and the Cleveland Cincinnati and Indianapolis R. Rs. Cap. Bellefontaine. Pop. 23,028.

Logan, county of West Virginia, bounded S. W. by Kentucky, which is separated by the Tug Fork of the Big Sandy. It is traversed by the Guyandotte River. Area, 825 square miles. It is very hilly, but fertile. Corn is the principal crop. The county abounds in coal and iron, with indications of salt and petroleum. Cap. Logan Courthouse, or Arrocoma. Pop. 5124.

Logan, tp. of Peoria co., Ill. Pop. 1065.

Logan, post-tp. of Dearborn co., Ind. Pop. 832.

Logan, tp. of Fountain co., Ind. Pop. 2608.

Logan, tp. of Pike co., Ind. Pop. 921.

Logan, post-v. of Harrison co., Ia., on the Bayes River and the Chicago and North-western R. R., 30 miles from Council Bluffs, has excellent water-power, and limestone and hard-wood timber in abundance, and carries on farming and stock-raising. Pop. about 500.
GEORGE MURGRAVE, EX. PUB. "WESTERN STAR."

Logan, tp. of Marshall co., Ia. Pop. 273.

Logan, tp. of Reynolds co., Mo. Pop. 910.

Logan, tp. of Wayne co., Mo. Pop. 1057.

Logan, tp. of Auglaize co., O. Pop. 900.

Logan, post-v., cap. of Hocking co., O., on the Hocking Canal and the Columbus and Hocking Valley R. R., 51 miles from Columbus and 24 miles from Athens, has 5 churches, 2 banks, 3 weekly newspapers, 1 furnace, 2 flouring-mills, 1 foundry, 1 woollen-factory, 1 furniture manufactory, and a large trade with the mining-regions in the vicinity. Pop. 1827. LEVI GREEN, ED. "SENTINEL."

Logan, tp. of Blair co., Pa. Pop. 2422.

Logan, tp. of Clinton co., Pa. Pop. 823.

Logan, post-v., cap. of Cache co., Ut., on the Utah Northern R. R., is a Mormon town. Pop. 1757.

Logan, tp. of Logan co., W. Va. Pop. 1220.

Logan, b. about 1720, the son of a Cayuga chief who lived at Shamokin, in Pennsylvania. He bore the name of Tah-gah-jute, but took also the name of James Logan, acting governor of Pennsylvania, his friend. He was a man of fine physical and mental powers, and was always friendly to the whites until 1774, when a party of ruffians murdered his wife and all his children. He then lived near the Ohio River, having removed in 1767. After this for six years Logan and his followers kept the whole West from Detroit to the Holston in terror, and slaughtered great numbers of settlers. A well-known and eloquent speech which Logan sent to the whites by an interpreter a few months after the murder of his family is preserved in Jefferson's *Notes;* but its authenticity, and still more the accuracy of its statements, are open to serious question. Logan attacked a party of friendly Indians at Detroit in 1780 while intoxicated, and was killed in the affray by one of his own relatives. A granite monument was erected to his memory at Fair Hill cemetery, near Auburn, Cayuga co., N. Y.

Logan (CORNELIUS A.), b. at Baltimore, Md., in 1800, of Irish stock; educated at St. Mary's College, and went several times as supercargo to Europe; was afterwards a journalist in Baltimore and New York; became an actor, and produced several successful plays. His poem, *The Mississippi*, is one of his best-known productions. In 1840 he removed to Cincinnati, O. His daughters, OLIVE, ELIZA (Mrs. Geo. Wood, 1830–72), and CECILIA, were known as actresses.

Logan (GEORGE), M. D., grandson of James Logan, b. at Stenton, near Philadelphia, Sept. 9, 1753; studied medicine in Edinburgh; returning to the U. S. in 1779, served in the Pennsylvania legislature for several terms, and was a warm partisan of Jefferson and the Republican party under the administration of John Adams. In 1798, during the imminent peril of war between the U. S. and France, he went to Paris as a volunteer peacemaker, and was denounced for so doing by the Federalists, who procured the passage by Congress of the so-called "Logan act," making it a high misdemeanor for a private citizen to take part in a controversy between the U. S. and a foreign power. Dr. Logan was a member of the U. S. Senate 1801–07; went to England in 1810 in the hope of contributing to preserve peace with that country; was a member of the Philosophical Society and of the board of agriculture, and author of valuable experiments in scientific farming. D. at Stenton Apr. 9, 1821.

Logan (GEORGE), M. D., b. at Charleston, S. C., Jan. 4, 1778; studied medicine in Philadelphia under Profs. Caldwell and Hartshorn; for half a century practised his profession in Charleston, where he was hospital surgeon to the navy-yard, and was one of the oldest surgeons on the naval list; was author of a popular work on diseases of children. D. at New Orleans Feb. 13, 1861. PAUL F. EVE.

Logan (JAMES), b. at Lurgan, Ireland, Oct. 20, 1674, of Scotch Quaker stock; was well educated, and became a merchant; went in 1699 with Penn to Philadelphia; was long in public life as provincial secretary, chief-justice, etc. of Pennsylvania; was president of the council and acting governor 1736–38; author of *Experimenta de Plantarum Generatione* (Leyden, 1739), a translation of Cicero's *De Senectute* (1744, printed by Franklin), and other works in

Latin and in English prose and verse; was the founder of the Loganian Library. D. at Stenton, near Germantown, Pa., Oct. 31, 1751.

Logan (John), b. near Edinburgh, Scotland, in 1748; studied at the University of Edinburgh; took orders, and became a minister at Leith in 1773. He had formed at the university a friendship with Michael Bruce, a young poet who d. in 1767, and whose poems he edited in 1770, adding some of his own. The *Ode to the Cuckoo* and several hymns contained in this volume having become very popular, Logan claimed them as his own composition, and thus gave rise to a literary controversy which has been warmly maintained ever since, though the balance of evidence seems to support the claims of Bruce. Logan wrote for the stage, delivered lectures on the philosophy of history, and was in 1780 an unsuccessful candidate for the professorship of history at Edinburgh. He lost his ecclesiastical position through alleged intemperance, and devoted himself in London to literature, publishing a volume of poems in 1781, *Runnamede*, a tragedy, in 1783, and several historical treatises. D. at London Dec. 28, 1788. Two posthumous volumes of *Sermons* (1790–91) were so popular as to reach an 8th ed. in 1822.

Logan (John A.), b. in Jackson co., Ill., Feb. 9, 1826; received a limited common-school education, and on the outbreak of the war with Mexico enlisted as a private in the 1st Illinois Vols., of which regiment he became quartermaster with the rank of first lieutenant. Returning at the close of the war, he was elected clerk of the court of his native county in 1849; in 1852 graduated at the Louisville University, and was admitted to the bar, attaining popularity and success in his profession; was elected to the State legislature in 1852, 1853, 1856, and 1857, and was prosecuting attorney 1853–57; was elected to the U. S. Congress in 1858, and again in 1860, resigning his seat to enter the army; in Sept., 1861, was appointed colonel of the 31st Illinois Vols., which he led at the battle of Belmont in November; at Fort Donelson in Feb., 1862, was wounded, and the following month appointed a brigadier-general of volunteers; engaged at Pittsburg Landing in April, and in the West until Nov., 1862, when he was promoted to be major-general; throughout the Vicksburg campaign was in command of a division of the 17th corps, and was distinguished at Port Gibson, Champion Hills, and in the siege and surrender of Vicksburg; in Oct., 1863, was placed in command of the 15th corps, which he led with great credit until the death of McPherson, when he succeeded to the command of the Army of the Tennessee, where, in the language of Gen. Sherman, he "nobly sustained his reputation;" he was, however, shortly after relieved by Gen. O. O. Howard, and returned to the command of his corps, which he led until the fall of Atlanta, when the eventful political crisis, involving the choice of a President, demanded his voice and influence at home, and consequently he did not rejoin his corps until the arrival of Sherman's army at Savannah, after its famous "march to the sea;" when, resuming his command, he retained it through the subsequent march through the Carolinas, and in May, 1865, succeeded Gen. Howard in command of the Army of the Tennessee. Resigned from the army Aug., 1865, and in November following was appointed minister to Mexico, but declined; was subsequently elected to the 40th and 41st Congresses, and in 1871 to the U. S. Senate from his native State. G. C. Simmons.

Logan (Olive). See Sykes (Olive Logan).

Logan (Thomas Muldrup), M. D., b. in Charleston, S. C., Jan. 31, 1808; graduated M. D. in Charleston Medical College, S. C., 1828; was co-editor to a surgical compendium, has contributed largely to medical science, and is a member of several foreign and domestic societies; is the author of *Topography of California*, and contributed largely to the *Transactions* of the American Medical Association; president of the American Medical Association in 1873; is now (1875) secretary to the board of health of California, and resides in Sacramento. Paul F. Eve.

Logan (Sir William Edmond), LL.D., F. R. S., F. G. S., b. at Montreal, Canada, Apr. 23, 1798; graduated at the University of Edinburgh in 1817, and in 1818 became partner in a mercantile house in London; was 1829–38 manager of a coal-mining and copper-smelting enterprise at Swansea, Wales, and prepared geological maps and sections of that region for the ordnance survey; in 1841 became the head of the geological survey of Canada, from which time he published valuable annual reports and many important scientific papers; represented Canada in the Expositions of 1851 and 1862 at London, and in 1855 at Paris; was made a knight of the Legion of Honor in 1855, a knight bachelor by Queen Victoria 1856, and received several valuable medals and other distinctions. D. in Wales June —, 1875.

Logan Court-house (or **Arrocoma**), post-v. of Logan tp., cap. of Logan co., West Va., 50 miles S. W. of Charleston.

Logan Creek, tp. of Dodge co., Neb. Pop. 723.

Log and Line, a contrivance for measuring the velocity of a ship at sea. It consists of a wooden float, weighted on one side so that it will float upright, and having a line attached to it in such manner as to bring the flat side of the float so as to offer the greatest resistance to a force tending to drag it through the water. The attached line is about 150 fathoms in length, and when not in use is wound on a light running reel. The line is divided into equal parts, each of which is equal to $\frac{1}{120}$ of a nautical mile, the points of division being marked by *knots*, formed by passing pieces of twine between the strands of the line, and leaving the free ends to project on each side of the line. The first knot is placed at a considerable distance from the *float* or *log*, and is very prominently marked. The part of the line between the log and the first knot is called the stray line; its use is to allow the log to become settled before the count is commenced. To use the log and line, the log is thrown over from the lee quarter of the vessel, and the line is then unwound from the reel as fast as the vessel sails. At the instant the first point of division passes from the reel a half-minute sand-glass is inverted, and when the last sand falls the reel is stopped. The number of equal spaces that have been unwound indicates the number of nautical miles the ship is sailing per hour, inasmuch as a half minute bears the same relation to an hour that one of the divisions of the line does to a nautical mile. The log is thrown from time to time, and the results are recorded in a book called the *logbook*. To secure accurate results, the line should be so prepared as to prevent stretching. To guard against variations of length due to hygrometric changes, the line is usually saturated with oil. If it is found that the line has changed in length, a correction must be applied to the measured rate of the vessel, and the line must be graduated anew. W. G. Peck.

Logania′ceæ [from *Logania*, one of the genera], a natural order of exogenous trees, shrubs, and herbs, mostly tropical, but having a few representatives in the U. S. It is remarkably allied to the Rubiaceæ, Scrophulariaceæ, the Gentianiaceæ, and the Apocynaceæ, and is briefly characterized by its regular gamopetalous flowers, along with opposite leaves and interposed stipules. It contains a large number of poisonous plants. Strychnine, curare, etc. are among its deadly principles. Spigelia and gelsemium, both active poisons and valuable medicines, are our most important native Loganiads.

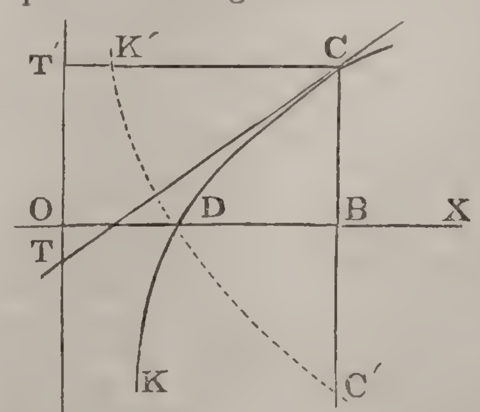
Logansport, city, cap. of Cass co., Ind., at the junction of the Wabash and Eel rivers, on the Detroit Eel River and Illinois, the Logansport Crawfordsville and South-western, the Pittsburg Cincinnati and St. Louis, and the Toledo Wabash and Western R. Rs., is surrounded by a fine agricultural country, with splendid timber and excellent building-stone. The aggregate of its water-power from the rivers above named and the Wabash and Erie Canal, improved and unimproved, is estimated at 500 horse-power, and the manufacturing establishments give employment to over 1000 operatives, and their products amount to above $5,000,000 per annum. It has well-paved streets, fine residences and business houses, is very healthy, and has 14 churches, 2 daily and 4 weekly newspapers, 1 national and 2 private banks, public-school buildings and property valued at $250,000, and a Universalist college. Pop. 8950. J. T. Bryer, Ed. "Logansport Journal."

Logan's Store, post-tp. of Rutherford co., N. C. Pop. 1597.

Lo′gansville, post-b. of Springfield tp., York co., Pa., 8 miles S. of York. Pop. 256.

Lo′ganville, a b. (Sugar Valley P. O.) in Greene tp., Clinton co., Pa. Pop. 414.

Logarith′mic Curve, a curve that may be referred to a pair of rectangular axes such that the ordinate of any point shall be equal to the logarithm of its abscissa. When so referred, its equation may be written



$y = \log x$, or $a^y = x$; in which the symbol *log* denotes a logarithm taken in any system; that is, in a system whose base is a. Thus, in the figure we have $CB = \log OB$. The axis of x is called the axis of numbers, and the axis of y the axis of logarithms. There are as many logarithmic curves as

there are systems of logarithms, but they have certain general properties in common, some of which we subjoin.

1st. The curve always cuts the axis of x at a point D, whose distance from the origin is equal to 1.

2d. If the base of the system, a, is greater than 1, the curve takes the position KDC, having the axis of y for an asymptote at the point $(0, -\infty)$; the curve is everywhere concave downward, and as x increases it continually approaches parallelism with the axis of x.

3d. If the base of the system, a, is less than 1, the curve takes the position $K'DC'$, having the axis of y for an asymptote at the point $(0, +\infty)$; the curve is everywhere concave upward, and as x increases it continually approaches parallelism with the axis of x.

4th. If a tangent is drawn to the curve at any point of either class of logarithmic curves, as at C, the subtangent TT', taken on the axis of logarithms, is constant and equal to the modulus of the corresponding system of logarithms.

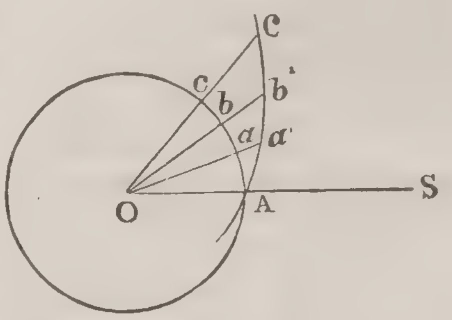
5th. If $a = 1$, the curve reduces to a straight line through D parallel to the axis of y. This line limits and separates the two classes of curves referred to in suppositions 1st and 2d.

6th. If $AB = 2$, the area $ODCT'$ is equal to the entire area between the part DK of the curve, the axis of x, and the axis of y; and furthermore, each is equal to the modulus of the corresponding system of logarithms. W. G. Peck.

Logarith'mic Spiral, a spiral whose equation may be reduced to the form,

$$\log r = v, \text{ or } r = \log^{-1} v;$$

in which the *pole* is at the *eye* of the spiral. It is very closely related to the logarithmic curve, from which it may be constructed as follows: Let O be the eye or pole, OS the initial line, and let a circle be described about O as a centre with a radius $OA = 1$, which call the directing circle. From A lay off on the circumference of the directing circle a distance equal to any ordinate of the logarithmic curve; then from O draw a radius vector through the extremity of this distance, making it equal to the corresponding abscissa; the extremity of the line thus constructed is a point of the curve. If the ordinate is positive, it is to be laid off in the direction from A towards c; if negative, it is to be laid off in the opposite direction. The curve proceeding outward from A has an infinite number of continually diverging spires; proceeding inward from A, it has an infinite number of converging spires. If any number of radii vectores are drawn making equal angles with each other, they will form a continued proportion; thus, if $Aa = ab = bc$, etc., we have



$$OA : Oa' :: Oa' : Ob' :: Ob' : Oc' \ldots \text{etc.}$$

This principle enables us to construct the curve when we know its pole and two points on the same spire. The curve everywhere makes a constant angle with the radius vector, and is therefore closely analogous to the Loxodromic Curve (which see). The involute of the curve is an equal logarithmic spiral. Newton showed (*Principia*, b. i., prop. 9) that if the force of gravity had varied inversely as the cubes of the distances, the planets would have receded from the sun, and that their paths would have been logarithmic spirals. The modulus of the spiral in each case would have depended upon the initial velocity of projection. This curve is sometimes called the *logistic spiral.*
W. G. Peck.

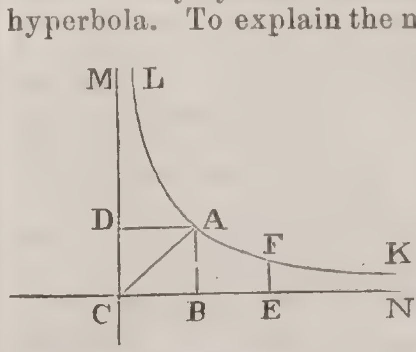
Log'arithms [Gr. λόγος and ἀριθμός]. The logarithm of a number is the exponent of the power to which it is necessary to raise a fixed number to produce the given number. The fixed number is called the *base*. Thus, in the equation $10^3 = 1000$, 3 is the logarithm of 1000, the base being 10. Any positive number except 1 may be taken as a base, and for each base there is a corresponding *system of logarithms;* there is therefore an infinite number of systems of logarithms, but only two of them are in general use—the *Napierian* and the *common* system. The Napierian system, named after its inventor, Baron Napier, is the system whose base is 2.718281828 . . .; the common system is the system whose base is 10. In what follows we shall designate Napierian logarithms by the symbol l, and common logarithms by the symbol *log*.

Uses.—Napierian logarithms are mostly employed in the higher branches of analysis and in scientific investigations. Common logarithms are used in practical computations, where they serve to convert the operations of multiplication and division into the simpler ones of addition and subtraction. In trigonometric computations their use is almost indispensable. Computations by means of logarithms are made in accordance with the following principles: 1st, the logarithm of the product of any number of factors is equal to the sum of the logarithms of the factors; 2d, the logarithm of a quotient is equal to the logarithm of the dividend diminished by that of the divisor; 3d, the logarithm of any power of a quantity is equal to the logarithm of the quantity multiplied by the exponent of the power; and 4th, the logarithm of any root of a quantity is equal to the logarithm of the quantity divided by the index of the root. In applying these principles the logarithms needed are taken from tables called tables of logarithms. The method of forming these tables will be explained hereafter.

General Properties of Logarithms.—In the exponential equation $a^x = n$ we may regard a as the base of any system of logarithms, in which case x will be the logarithm of n taken in that system. The discussion of this equation indicates the following general properties: 1st, the logarithm of 1 in any system is equal to 0; 2d, the logarithm of the base of any system, taken in that system, is 1; 3d, in any system whose base is greater than 1 the logarithms of all numbers greater than 1 are positive, the logarithms of all numbers less than 1 are negative, the logarithm of 0 is $-\infty$, and the logarithm of ∞ is $+\infty$; 4th, in any system whose base is less than 1 the logarithms of all numbers greater than 1 are negative, the logarithms of all numbers less than 1 are positive, the logarithm of 0 is $+\infty$, and the logarithm of ∞ is $-\infty$; 5th, there are no real logarithms of negative numbers in any system. These general properties are used in analytical investigations.

Relations between Different Systems.—Every logarithm is composed of two factors. The first factor is constant for the same system, and depends for its value on the base of that system; the second factor is independent of the base of the system, but is dependent on the particular number in question, and changes with it. The constant factor corresponding to any system is called the *modulus* of that system. The modulus of the Napierian system is 1, that of the common system is .4342945, and that of any system is equal to the reciprocal of the Napierian logarithm of the base of that system. Since the Napierian logarithms of all numbers less than 1 are negative, and of all numbers greater than 1 are positive, it follows that the modulus of a system whose base is less than 1 is negative, and that the modulus of a system whose base is greater than 1 is positive. A modulus may have any value from $-\infty$ to $+\infty$; it is to be observed that the modulus decreases algebraically as the base increases. If we multiply the Napierian logarithm of any number by the modulus of any system, the product is the logarithm of the same number in that system. This principle enables us to find the logarithm of any number in any system when we have a table of Napierian logarithms.

Geometrical Relations.—Napierian logarithms are sometimes called hyperbolic logarithms, on account of their relation to the equilateral hyperbola; there is, however, no good reason for this distinction, inasmuch as the same relation that exists between the logarithms of this system and a particular equilateral hyperbola exists also between those of any system whatever and some other equilateral hyperbola. To explain the nature of this relation, let LAK be one branch of an equilateral hyperbola, whose equation, when referred to its asymptotes, CN and CM, is $xy = m$; let A be the vertex and let F be any point on the curve; and let CB and CE be the abscissas of A and F, the latter being called the *terminal* abscissa. The square described on the co-ordinates of A is equal to m, as may be shown from the equation of the curve. Now, it may be proved by means of the calculus that the area $CDAB$ is to the area $BAFE$ as 1 is to the Napierian logarithm of CE. Denoting the area $BAFE$ by A, and CE by x, we have



$$m : A :: 1 : lx, \quad . \; . \; . \quad \therefore A = mlx; \quad . \; . \; . \; (1).$$

Hence the area between an equilateral hyperbola and one of its asymptotes, estimated from the ordinate of the vertex up to any other ordinate, is equal to the logarithm of the terminal abscissa taken in a system whose modulus is the square described on the co-ordinates of its vertex. If we take the conjugate of the hyperbola LAK, whose equation is $xy = -m$, equation (1) will become

$$A = -mlx \quad . \; . \; . \; (2).$$

The numerical value of m in equations (1) and (2) depends upon the value of CB; by giving suitable values to CB, m may be made to have any value from 0 to $+\infty$; that

is, $\pm mlx$ may be made to represent the logarithm of x in any system whatever. If we make $CB = 1$, we have $m = 1$, and equation (1) becomes $A = lx$, a result that conforms to the Napierian system. The value of the area A may be expressed by an infinite series in terms of x, and this series may be used as a means of computing a table of logarithms. Such a series was originally employed for this purpose, but its use has been superseded by other and more convenient ones.

Tables of Logarithms.—Tables of logarithms are tables from which we may find the logarithm corresponding to any number, or the number corresponding to any logarithm, within certain limits. Every logarithm consists of two parts—an entire part, called the *characteristic*, and a decimal part, called the *mantissa*. Either of these parts may be 0, and the characteristic may be either positive or negative, but the mantissa is always positive. The characteristic may be found by a very simple rule, and for this reason it is not given in the ordinary tables; the decimal point is also omitted in writing the mantissa. The manner of arranging the tables, as also the manner of using them, will be best learned from the explanations which precede each collection of tables; and to these the reader is referred for all information of that nature. In addition to the logarithms of natural numbers, the tables usually contain the logarithms of the principal circular functions, such as the sine and cosine, the tangent and cotangent, from 0° to 90°. In these tables the inconvenience of negative characteristics is avoided by adding 10 to each logarithm; an allowance is made in the final result for each 10 thus added. The same device is employed in using the logarithms of ordinary decimals.

Logarithms were invented by Baron Napier, who published an account of the same in 1614 in a work bearing the title *De mirifici Logarithmorum Canonis Constructione.* The first table of common logarithms was published by Briggs in 1624 under the title of *Arithmetica Logarithmica.* He calculated the logarithms of all numbers from 1 to 20,000, and also from 90,000 to 100,000, carrying out his figures to 14 decimal places. In 1628, Adrian Vlack supplemented the work of Briggs by publishing a book bearing the same title, *Arithmetica Logarithmica*, in which he supplied the logarithms of the numbers from 20,000 to 90,000, but at the same time he reduced the number of decimal places to 10. Vlack included in his work the logarithms of the sines, tangents, and secants for each minute of arc from 0° to 90°. Five years later the same author published a table of the logarithms of sines and tangents, for every *hundredth* of a degree from 0° to 90°, which had been computed by Briggs. In 1797, Vega published an edition of Vlack's tables, but the work is out of print and the copies are difficult to be found. Probably the best accessible tables are those of Callet. These are carried to 7 places of decimals, and include logarithmic sines, cosines, tangents, and cotangents for every second of arc from 0° to 90°. An American edition of these tables was published in 1830 by Hassler, who was at that time chief of the U. S. Coast Survey. These are probably the best American tables, but unfortunately they are very scarce and difficult to obtain. In addition to these, several collections of tables have been published in Germany, of which the most noted is Hulsse's *Sämmelung Mathematischen Tafeln*, published in Leipsic in 1840. Besides those above mentioned, several six-place tables have been published, which for most purposes of computation are sufficiently accurate. Five-place tables have also been published, which for auxiliary computations are of great utility. To this class we may refer Lalande's five-figure table, which was republished in 1839 by the Society for the Diffusion of Useful Knowledge.

The computation of logarithmic tables is effected by means of rapidly converging series, of which a great number have been deduced. It is to be observed that it is only necessary to compute the logarithms of prime numbers, inasmuch as the logarithms of composite numbers may be found by taking the sum of the logarithms of their prime factors. The following series and its applications are taken from Hackley's *Treatise on Algebra*, p. 274, to which the reader is referred for greater detail. The series referred to is as follows:

$$l(P+1)=lP+2\left\{\frac{1}{2P+1}+\frac{1}{3(2P+1)^3}+\frac{1}{5(2P+1)^5}+\cdots\right\} \quad (1),$$

in which P stands for any whole number, and $P+1$ for the next higher whole number. Making P equal to 1, 2, etc., we have, since $l1 = 0$,

$$l2 = 0 + 2\left\{\frac{1}{3}+\frac{1}{3.3^2}+\frac{1}{5.3^5}+\frac{1}{7.3^7}+\dots\right\} = 0.6931472$$

$$l3 = l2 + 2\left\{\frac{1}{5}+\frac{1}{3.5^3}+\frac{1}{5.5^5}+\frac{1}{7.5^7}+\dots\right\} = 1.0986123$$

$$l4 = l2 + l2 = 2 \times l2 \ldots\ldots\ldots\ldots = 1.3862944,$$

etc. etc. etc. etc.

In the same way we may compute the Napierian logarithms of the natural numbers from 1 to any number whatever. Then, to find the common logarithms of the same numbers, we have simply to multiply each logarithm thus found by the modulus of the common system, .4342945.

General Logarithms.—If we denote the base of the Napierian system by e, we may write the equation

$$e^y = x \quad \ldots \quad (1);$$

in which y is the Napierian logarithm of x. Heretofore we have only considered the real values of y, which correspond to *arithmetical* logarithms. There is, besides these values, an infinite number of imaginary values of y which satisfy equation (1), and which may be called algebraic *logarithms*. The arithmetical and the algebraic logarithms, taken together, constitute what may be termed *general logarithms*. (See De Morgan's *Calculus*, p. 126.)

Antilogarithms.—An antilogarithm is the number corresponding to a given logarithm. Thus, 100 is the antilogarithm of 2 in the common system. Antilogarithms, in the common system, are denoted by the symbol $\log^{-1}$. Thus, $\log^{-1}2 = 100$ is equivalent to the expression, the number whose logarithm is 2 is equal to 100. W. G. Peck.

Log'arithms, Logis'tic [λογιστική]. The logistic logarithm of a number less than 3600 is equal to the common logarithm of 3600 diminished by the common logarithm of that number. Thus, the logistic logarithm of 16*m*. 24*s*., or 984*s*., is equal to log 3600 − log 984, or to 0.5633. A table formed in this way for all numbers from 1 to 3600 is called a table of logistic logarithms, and is used in solving proportions in which the terms are *hours* and *minutes, degrees* and *minutes*, or *minutes* and *seconds*, the first term being 1 *hour*, 1 *degree*, or 1 *minute*. The method of using the table may be illustrated by the following example: When the moon's hourly motion is 30′ 12″, what is her motion in 16*m*. 24*s*.? We have the following proportion:

$1h : 16m.\,24s. :: 30'\,12'' : x$; or, $3600 : 16m.\,24s. :: 30'\,12'' : x$;

from which we readily deduce the equation

$$\frac{3600}{x} = \frac{3600}{30'\,12''} \times \frac{3600}{16m.\,24s.}$$

Denoting logistic logarithms by the symbol L, we may write the above equation as follows:

$$Lx = L\,30'\,12'' + L\,16m.\,24s.$$

From the logistic tables we have

$$\begin{array}{l} L\,30' \quad 12'' = 0.2981 \\ \underline{L\,16m. \quad 24s. = 0.5633} \\ L\,x \qquad\quad = 0.8614;\ \therefore x = 8'\,15''.\ \textit{Ans.} \end{array}$$

A table of logistic logarithms will be found in Norton's *Astronomy*, p. 111 of tables, with a full explanation of its use on p. 320 of the main work. Logarithms of this kind are sometimes called *proportional logarithms*. Tables of this kind are often extended to 3*h*., or to 10,800, to correspond with the moon's tabulated changes given in the *American Nautical Almanac*, pp. xiii.–xviii. (See *Am. Naut. Al. for 1875*, pp. 256, 257.) W. G. Peck.

Log'ic [Gr. λόγος, "speech," "reason"] is the science of reasoning. By reasoning in this connection we understand all those mental acts and processes that occur between the observation of facts and the most remote deductions and the broadest generalizations. Among the acts indirectly implied there may be insight, consciousness, imagination, and memory. But the mental acts that are directly in the line of reasoning are analysis, abstraction, synthesis or judgment, generalization, and inference. Hence, all *knowledge* rests on either (1) observation or (2) reasoning. *Belief* is a different affair, and may rest on testimony, or even on a voluntary acceptance of dogmas for convenience' or policy's sake, with little or no regard to their truthfulness. At the time of the observation of an object there is doubtless some insight into its nature; there is an analysis (logical analysis) of its properties, an abstraction and an objectification of its properties, so that we give them and call them by names, as whiteness, solidity, etc. etc. After this affirmation or judgment follows, by which we say, "This paper is white," etc. etc. There is also a grouping of similar objects into classes, genera, and species; hence, general terms or common nouns. There is also inference, so that from two propositions, as A is B and B is C, we infer that A is C. In the first instance we have propositions of four kinds: (1) identical propositions, in which the subject and the predicate denote the same thing, as "Common salt is chloride of sodium;" (2) the subject is an individual term, and the predicate is an adjective, as "This paper is white;" (3) the subject is an individual term, and the predicate a common noun, as "This horse is a quadruped;" and (4) the subject is a common noun, and the predicate is an adjective, as "Horses are fourfooted," the predicate denoting some obvious property of the subject.

For anything beyond this there must be a process of reasoning which may be either (1) demonstration, (2) induction, or (3) deduction. The word *demonstration* is used somewhat vaguely, but for our purposes it denotes that process in which, by analysis of any subject, displaying, as of course the analysis will, its *nature*, we make manifest properties which were not so before. Mathematical reasoning is of this kind. We reason from the nature of a triangle—expressed by its definition—and prove all the properties of a triangle that we know in either our geometry or in our trigonometry. And in all reasoning something of demonstration from the very nature of the thing we are talking about, forms an indispensable element. This reasoning is, however, to a large extent, instinctive, a matter of insight and tact, subject to no special forms, though of course it may be reduced to recognized formulæ, and is, or should be, self-evident alike in the axioms it assumes, in the steps it takes, and the results at which it arrives.

The word *induction* is also used vaguely and variously, but in this connection it must be understood to indicate that process in which, by the bringing in and examination of facts or individual instances, we generalize a proposition up to the point of its greatest comprehension, when it becomes the statement of a universal act, or, as it is more commonly called, a universal law. For successful induction the first step is the collection of facts, either such as occur of themselves or by experimentation producing them at will. Then follow an analysis and a classification of these facts on the basis of some common but important property; the property on which we base our classification may be regarded as *formal*, or as being a cause. Thus, vertebrates are classified in reference to the important fact of a spinal column, the ruminants by reference to the peculiar construction of their stomach, the cat family with reference to their claws, the dog family with reference to the structure of their teeth, etc. etc. All these formal properties are found to be connected with some *modal* property; that is, with something in the history, mode of life, etc. of each of the animals in the class. Thus, all cats are predacious or leap on their prey; all dogs chase theirs down; all ruminants chew the cud, etc.

When objects are thus properly classified, we know that there is a relation—constant and implied in the laws of nature—between the formal property on which as a differentia the classification is based, and the modal property which we affirm as a predicate of all the objects in the class. Thus, when we say that "All Canidæ are carnivorous" and "All ruminants chew the cud," we do but give expression to a law of nature, the knowledge of which has been obtained by induction. The certainty of the law thus obtained depends upon this connection of properties. Without it we may indeed often obtain a wide generalization of facts, as in the case of the electric properties of all the resins. And when a fact is thus obtained, it creates a strong presumption in favor of its universality, and leads to the very confident expectation of some connection as of cause and effect not yet discovered. And when the connection has been discovered, the law is considered as established, and is reckoned as one of the triumphs of science. But until this connection has been discovered, any announcement of the general fact as a universal law of nature would be regarded as premature and liable to modification.

In these ways we demonstrate from a few definitions, and by the aid of a few self-evident axioms, the whole of abstract science, including mathematics, logic, etc., and from the observed facts in nature we establish by induction all the general laws and principles of concrete and practical science. And having established in these ways the general laws or truths, we proceed by *deduction* to establish by means of them many particular facts and subordinate truths, which are, for the most part, as a matter of fact, though by no means necessarily so, such as are not or cannot be readily subjected to the test of observation and experiment. In some cases they can never be so tested, and in others the inference must be made before the test can be applied. Thus, the statesman and the physician are often obliged to reason from general principles and obvious facts to the results of the measures they would adopt before the trial of them, although, of course, in these cases the testing of them by experience is but a result of their reasoning. And it is in this way that, by reasoning from general principles obtained by induction from existing plants and animals to objects and facts discovered in the strata of the earth's crust, we have obtained much the largest part of the science of geology and palæontology. These facts and phenomena are such as cannot now be subjected to observation.

The first proposition enunciating the general principle or most comprehensive truth is called, technically, the major premise; the other, "this measure," etc., is called the minor premise; and the two, together with the inference or conclusion drawn from them, constitute what is called a syllogism. And of these three parts all syllogisms consist. But for the most part we have in practice either (1) an omission of one of the premises, as A is B, therefore A is C, in which case we call the abridged form an enthymeme, or (2) several premises following each other in some regular order, and only one conclusion drawn from them, as A is B, B is C, C is D, therefore A is D; this is called a sorites. In such cases we have, in fact, two or more syllogisms condensed into one formula by the omission of some of the propositions that would have appeared if each of the syllogisms had been stated in full, each with its own premises, and the conclusion to each pair distinctly stated as such in due order. Thus, in the example just given, we have, in fact, (1) B is C, A is B, therefore A is C; (2) C is D, A is C, therefore A is D; that is, the second premise of the sorites becomes the major premise of the first syllogism; the first is the minor premise, and the conclusion is a proposition that did not appear in the sorites at all. Then for the second syllogism the third premise of the sorites is used for major premise, and the conclusion of the first syllogism is used for minor premise, and so on until we come to a syllogism that has for its conclusion the same proposition as the sorites itself. In the case of the enthymeme one premise is omitted for the most part, because it is a part of the common sense or the acknowledged science of mankind, and therefore needs no repetition or explicit statement. It is, however, a part of the syllogism or argument as truly and as really as though it were expressed, since without it no conclusion can be drawn from any proposition which would contain any term that was not contained in the proposition used as a premise itself. Hence, the means by which we can find the suppressed or omitted premise is one of the most important parts of logic in a practical point of view.

Syllogisms are of four different kinds, as they arise from one or another of the four relations which the objects in nature sustain to each other. (1) Individuals in a class, and classes considered as species included in a higher and more comprehending class, considered as a genus. Thus, John, Henry, Thomas, etc. are Englishmen (a species), and Englishmen, Frenchmen, etc. are Indo-Europeans (the genus). Or, again, Indo-Europeans, Shemites, etc. are men, and constitute the genus *Homo*, or man. On this relation is based what are called categorical propositions. They simply assert that an object is or is not in a class, or that a class is or is not in a higher class, as S is P, or S is not P; P are Q, or are not Q, etc. With two categorical propositions for premises we have a categorical syllogism. (2) Every object sustains some relation of quality to others. It is above or below, longer or shorter, harder or softer, whiter or blacker, etc. than some other. Or it may be simply equal to another. From these relations there arise comparative propositions, and with one or more comparative propositions in a syllogism it is called a comparative syllogism, as A is greater than B, B is equal to C, therefore A is greater than C. (3) Most if not all objects in nature are related to some others as cause and to others as effect. An effect is always proof of the existence of a cause, and is some indication of its character and attributes. So, too, every cause is a means of judging of the nature of the effect it will produce. A good work of any kind is proof of a good workman, and the goodness of the workman is to some extent a guaranty for the goodness of his work. But in logic we call every argument a cause also. It is a logical cause, or cause of belief, and conviction. Hence, when one premise is so connected with a conclusion that if that premise is assented to the conclusion will be accepted as true or proven, we often state the two, the premise and the conclusion, as what is called a conditional or hypothetical proposition, as, "If A is B, C is D;" "If the workman is skilful, his work will be good." This mode of stating the major premise constitutes what we call a conditional syllogism. (4) In the fourth place, every object in nature is a part of some collective or physical whole. An atom of hydrogen is a part of a molecule or particle of water; a leaf is part of a book; a paragraph is part of a chapter; a word is part of a sentence; a letter is part of a word; the nose is part of the face; the hand is a part of the body; each citizen is part of the state; the earth is part of the solar system, and each star is part of "the heavens." Hence, we can and do reason to some extent both from the nature of the parts to that of the whole, and conversely from the nature of the whole to that of the parts. For example, we reason from the letters in a word to the sound and meaning of the word itself, and likewise from the nature of a word to the letters, and we are thus able to detect false spelling if a word should happen to be spelled wrong. Now, it so happens that what is included in any whole must be in some one of the parts into which it is divisible,

and also that whatever is in one part cannot be in another when the division is what is called a complete division. But in what is called a "cross" division we sometimes have one individual in more than one part. Suppose we divide literary men into poets, philosophers, historians, and one man, as Southey, be both a poet and a philosopher or historian. From this relation of objects there arises what are called disjunctive propositions, as, "Either A is B or C is D;" which implies that if the first (A is B) is not true, the second (C is D) is. When one premise, which is always the major premise, is disjunctive, the syllogism itself is called disjunctive.

Of comparative syllogisms we need say no more in this place, because most of them are so simple in their construction that their validity or their fallacy is obvious at sight, and the others are so complicated that we could not discuss them intelligibly in this place. Most treatises on logic do not even so much as mention them. The fullest discussion that is known to us is to be found in Dr. Wilson's *Text of Logic*, published at Ithaca, N. Y., 1872. In the case of conditional syllogisms it is to be noted, in the first place, that they imply another premise, and are therefore virtually enthymemes stated hypothetically. Thus, "If A is B, A is C," implies a proposition called the sequence—namely, "B is C." But in the second place it should be noted that if we affirm the antecedent we prove the consequent, and *vice versâ* if we deny the consequent we disprove the antecedent. Thus,

If A is B, C is D.

A is B,	C is not D,
Therefore C is D.	Therefore A is not B.

Any other mode of completing the syllogism would be fallacious. This will be obvious from a simple example: "If John has a fever he is sick. John has a fever, therefore he is sick;" "John is not sick, therefore he has not a fever." This is right. But if we say, "John has not a fever, therefore he is not sick," or if we say, "He is sick, therefore he has a fever," it would be manifestly wrong.

In a disjunctive syllogism it is always safe to deny one of the parts or propositions as a means of proving the other, as "A is either B or C; A is not B, therefore A is C; or A is not C, therefore A is B." Polypes are either plants or animals: they are not plants, therefore they are animals. But the other method of completion, offering one proposition to disprove the other, is not always valid. Thus, "Coleridge is either a poet or a philosopher; he is a philosopher, therefore he is not a poet." In this case poets and philosophers are not what are called co-ordinate parts or species, for a man may be both a poet and a philosopher at the same time.

But both conditional and disjunctive syllogisms may be regarded for logical purposes as categorical syllogisms stated as enthymemes (though comparative syllogisms cannot be so stated). In the case of the conditional syllogisms the enthymeme has one affirmative premise, as "A is B," and an affirmative conclusion, "A is C;" that is, "If A is B, A is C." But the disjunctive syllogism has (apparently) a negative premise, A is not B, with an affirmative conclusion, therefore A is C; that is, "Either A is B or A is C;" or again, "If A is not B, A is C." Here the premise is apparently negative, while the conclusion is affirmative. But we shall have to consider this again in order to explain the apparent violation of a fundamental law in relation to the formulæ of inference.

It is manifest, therefore, that the utmost importance attaches to the nature and construction of categorical syllogisms, to the consideration of which we shall now proceed. Categorical propositions may differ in *quality*, and be either affirmative or negative, as A is B or A is not B. Again, they may differ in *quantity*, and be either general or partial, or particular as they are sometimes called, as "All A are B" or "Some A are B." Combining the two, we have four varieties of propositions, called universal affirmative, "All S are P;" universal negative, "No S are P;" partial affirmative, "Some S are P;" and partial negative, "Some S are not P." These four kinds of propositions have been called, for the sake of convenience, by the four vowels A, E, I, and O. Now, it is manifest that with A for major premise we may have either A, E, I, or O for minor, and thus four pairs of premises, A A, A E, A I, and A O, and with each pair we can have either A, E, I, or O for a conclusion; and thus sixteen syllogisms differing from each other in what is called the mood of the syllogism. And in like manner we may have sixteen with either E, I, or O for major premise, making in all sixty-four moods. Thus, for an example of A A A, we have, "All S are M, all M are P; therefore all S are P;" of E E E, "No S are M, no M are P; therefore no S are P." The former is at once seen to be valid, and the latter is about as obviously invalid or fallacious, actually proving nothing.

In the above example I have used S to denote the subject of the conclusion, which is therefore called the minor term, and is found only in the minor premise. I have used P for the predicate of the conclusion. It is therefore called the major term, and is found only in the major premise. M stands for what is called the middle term. It is found in both premises, but not in the conclusion. It may, however, occupy either of four positions in the premises, as (1) subject of the major premise and predicate of the minor; (2) predicate in both; (3) subject in both; or (4) the inverse of the first, predicate of the major premise, and subject of the minor. These varieties of position constitute what is called the figure of the syllogism. And as each of these positions of the middle term may be found in either of the sixty-four moods, we may have 256 different categorical syllogisms.

But most of these 256 syllogisms are invalid—not only worthless, but actually delusive. Hence, the discovery of some rules and practical tests of validity is of the utmost importance. Fallacies may be of two kinds—either (1) in form or (2) in diction. A fallacy is said to be in form when it is obvious on the mere inspection of the form of the syllogism, without considering or knowing the meaning of the propositions, or of its terms even; as, "M are not P, S are M; therefore S are P." But when there is no fallacy in form, there may be one in diction, which renders the reasoning worthless. This can be discovered and exposed only by a consideration of the meaning of the several propositions considered separately. Thus, "Light comes from the sun, feathers are light; therefore feathers come from the sun." In this case the form is faultless, but the diction is fallacious. The word "light" is ambiguous, and means one thing in one premise and something else in the other.

Besides these two classes of what are called logical fallacies there are one or two others, called extra-logical fallacies, of which we shall say a word in conclusion. Considering the limits to which we are confined in this article, it will be better to suggest the tests of fallacy, leaving the reader to take all syllogisms to be valid that do not offend against one or another of the rules that are given. And first we shall speak of fallacies in form:

(1) There may be no more than three real terms. There may be any number of words, for nouns will often have several adjectives and modifying clauses. But for the purposes of logic a noun with all its adjectives may be considered as one word. As an example of the "fallacy of many terms," as it is called, we have the following: "My hand touches the pen, the pen touches the paper; therefore my hand touches the paper." Here, as we see on a careful analysis, we have four terms, four different things really spoken of: (1) my hand, (2) that which "touches the pen," (3) "the pen," and (4) that which "touches the paper;" and the syllogism *implies*, though it does not state, that whatever touches the pen is the pen, which is of course absurd. It will sometimes happen, however, that what is thus implied is not only not absurd, but is in fact quite true. In that case the apparent fallacy is only an abridged form of the sorites, of which we shall say more below.

(2) If both premises are negative, there can be no conclusion. Thus, "S are not M, M are not P." After these premises we can have no conclusion. "Horses are not men, men are not birds." It is true that horses are not birds, but if we say "Horses are not men, and men are not quadrupeds," we can have no conclusion, although we know otherwise that horses are quadrupeds. It will sometimes happen, however, that there is an appearance of two negative premises when one or both of them is really affirmative. Thus, "No one who has not enough can be called rich, but no miser has enough; therefore no miser can be called rich." Here two of the negatives virtually correct each other, making for the middle term "person not having enough," and the inference is as valid as though the middle term were positive, "persons having enough," or "No S is M" (which is equivalent to "S is not M"). "Whatever is not M is P" (equivalent to "All not M is P"), "therefore S is P."

(3) It is found to be necessary that the middle term should be used once at least, as either the subject of a universal proposition or the predicate of a negative one. The failure to fulfil this condition constitutes what is called an undistributed middle. It would be impossible within the limits to which I am here restricted either to demonstrate this law *a priori* or to prove it by an examination in detail of all the cases in which an undistributed middle may occur. One or two illustrations, therefore, must suffice. Thus, "Horses are animals, foxes are animals; therefore horses are foxes." But horses and foxes are co-ordinate species of animals, and therefore cannot be predicated of each other. Even this fact, however, is not proved by the premises, for we may have "Dogs are animals, spaniels are animals."

Spaniels are a species or variety of dogs, so that in this case the major and the minor terms are subordinate rather than co-ordinate, and may be predicated of each other affirmatively.

(4) Neither the minor nor the major term may be used in the conclusion as subject of a universal proposition, or as predicate of a negative one, unless it had been used in one or the other of these ways in the premises. The violation of this condition constitutes what is called "illicit process," and the fallacy is called illicit of the minor when the minor term is used in violation of this law. But when the major term is so used, the fallacy is called illicit of the major. Here, again, the demonstration of the law would require more space than can be spared to it. As an example of illicit process of the minor term we may have the following: "Horses are quadrupeds, and horses are useful animals; therefore *all* quadrupeds are useful animals." It would be legitimate to say either "Some quadrupeds are useful animals," or "*Some* useful animals are quadrupeds." Then, for an example of illicit of the major, we have, "Negroes have black skins, the Arabs are not negroes; therefore the Arabs have not black skins." Here the negative term "black skins" is predicate of a negative conclusion, whereas it was not used as either subject of a universal or as predicate of a negative premise. It was predicate of an affirmative proposition in the major premise.

There are several other convenient rules known to the expert logician, but they are too abstruse and technical to admit of being given here. Besides this, they accomplish nothing that is not equally well accomplished by the application of one or another of these four. There are, however, two that may be given that are of great practical value, though resulting from the application of the preceding four: (1) After two partial premises there can be no conclusion, for it is found that in all such cases a conclusion would involve either an undistributed middle or an illicit process. (2) After one partial premise there can be no universal conclusion, for the same reason as that just given in regard to any conclusion after two partial propositions. (3) It is also found that after one negative premise there can be no affirmative conclusion. We have seen that after two negative premises there can be no conclusion whatever. But if one of the premises be negative, any affirmative conclusion involves a violation of the fundamental conditions of validity.

It is seldom the case, however, that both of the premises of any syllogism are expressly stated. In some cases one of them is so well known, and so universally assented to, that it would appear like a piece of mere pedantic formality to repeat it. At other times the real major premise, though really assumed, has not been so distinctly thought out and considered as to admit of express statement. For this and for other reasons it becomes very important to know how to find and put into explicit statement the assumed premise. This can always be done by means of the principles and rules already laid down. But for the purpose now before us another set of rules is more immediately applicable. Of course we have in the enthymeme the conclusion and one premise. We have therefore all the terms that can be used, and the problem is to find the other and assumed premise, such in character as that it will complete the syllogism without violating any of the rules above laid down. The four rules are as follows: (1) If the conclusion be universal affirmative, both premises must be affirmative, and the minor and the middle term must be distributed. (2) If the conclusion be partial affirmative, both premises must be affirmative, and only the middle term need be distributed. (3) If the conclusion be partial negative, one premise must be negative, and the middle and the major term must be distributed. (4) If the conclusion be universal negative, one premise must be negative, and all three of the terms must be distributed.

But it is necessary to pass to the consideration of fallacies in diction. Logic assumes that the words in any argument, like the letters in an algebraic equation, shall denote each one and the same thing throughout the argument or solution, and that language for the most part shall be used literally, each word describing its object or event as it is, and that no proposition shall have, either expressly stated or necessarily implied, two propositions in one, one of which may be true, while the other is false. Thus, if I say, "A man has ceased to be a liar," I *imply* that he has been a liar, and I *assert* that he is not one now. But of course either of these assertions may be true, while the other is false, and they may therefore be both true at the same time. Subject to these conditions, all the fallacies in diction may be referred to four classes. (1) *Ambiguous Middle.*—In this one term (usually the middle term) is used to denote one thing in one proposition and something else in another. Thus, in the example already cited, "*Light* comes from the sun, feathers are *light*," here both premises may be true separately if we shall take the word *light* to mean different things in each of them, but not otherwise. (2) *Variation.*—This may be in quantity, condition, etc. Thus, "Money will buy whatever is for sale; a ten-cent piece is money," etc. Here the word "money" is not used ambiguously; it means the same thing in each premise, but it is used with reference to different quantities in each premise, and the premises will be assented to only as we so understand the words. (3) *Division and Composition.*—This fallacy consists in using a word (usually the middle term) as a collective term in one place and as a general in the other. Some words are always collective when used in the singular form, as family, army, church, state, congress, etc. etc. But many words may be either general or collective, according to the nature of the proposition in which they are used. Thus, "The Romans conquered Carthage." The word "Romans" is used as general, but here it must be collective, as no *one* Roman performed the act here ascribed to them. But in the proposition, "The Romans spoke Latin," "Romans" must be general, because the act is one which each Roman did individually and for himself. If, now, we should say after the first, "Cicero was a Roman, therefore he conquered Carthage," our fallacy would be one of division. But if the word is first used as general, and then as collective, the fallacy takes the form which is called composition. (4) *Substance and Accidents.*—A property may be accidental in one premise, and yet used so as to make it essential in the other or in the conclusion. Or it may be affirmed with regard to some property, mode, or accident in a premise, and then affirmed in reference to its substance in the conclusion, and *vice versâ.* This constitutes what is called the fallacy of substance and accidents. Thus, the example usually given is, "We eat what we buy in the market; we buy raw meat in the market; therefore we eat raw meat," or eat our meat raw. We buy our meat not because it is raw, but rather because it is meat; the "rawness" is merely accidental to the act of purchasing and to the premise, but in the conclusion it is so placed as to make it untrue, and is thus essential to its meaning. This is called the fallacy of accidents. But if we should say of a certain man, in reference to his pecuniary responsibility, "He is good," and should thus infer by means of a major premise that he is a good "man," we should have the fallacy in the other form, applying what is said in reference to some accidental mode, property, or attribute to the substance itself. This is called the fallacy *a dicto secundum quid ad dictum simpliciter.* Of all the fallacies in diction, those belonging to this class are the most subtle and difficult of detection and exposure.

It will often happen, indeed, that an argument may contain fallacies both in form and in diction. And it will often happen in practice, also, that one is in doubt to which of the classes or kinds of fallacies he should refer a formula. It is, however, of but very little consequence, so far as refutation is concerned, to which class he refers it, since they are all alike, and equally fatal to any validity in the conclusion.

But it is time to say a few words of the extra-logical fallacies in conclusion. These are rather faults in rhetoric than fallacies in logic. Extra-logical fallacies are of two kinds—fallacies in matter and fallacies in method. Whoever undertakes to prove any proposition that is not assented to by those to whom he addresses his argument, necessarily assumes what is called the *onus probandi,* or the burden of proof. He has to consider the state of mind and of heart or will—that is, the intelligence, the knowledge, the prejudices, and feelings—of those whom he would address. And while arguments may be considered as conclusive in themselves—that is, that they will satisfy any one who understands and appreciates them—yet it is often found that the arguments that are really the best for those who can understand them fail entirely of effect on those to whom they are addressed. But in order to success anywhere consideration must be taken with regard to both the matter of the argument and the method of presenting it.

In regard to the matter, there are several forms of fallacy that are to be noted. The first is what is called *non vera pro vera*—the using a premise that is untrue as though it were true. And this applies as well to those propositions that are implied, and can be formed only in the ways of completing imperfect formulæ already spoken of, as to those that are expressly stated as premises. Of course when a premise that is false is used as a real premise the argument fails to prove anything, and will be so regarded by all persons that know its falsity. Then, again, we have what is called *non causa pro causa,* which consists in using as a premise a proposition which, though true enough, is not a premise to the conclusion. For example, it is true enough that it is raining at the present moment, but that fact could not be used as proof of a proposition in Euclid or of the guilt of Mary queen of Scots. A proposition occurring in the course of an argument is always irrelevant, or

non causa, when it cannot be connected with the rest as one in a series that make a sorites by having one of its terms in common with the preceding proposition and the other common to it and the succeeding proposition. Thus, if we have "A is B, B is C, C is D, ∴ A is D," the propositions follow in logical order, and are logically connected. But if amongst them there should occur "C is H or M is P," we could not connect such a proposition with the other premises, and although true it would be no premise to A is D.

The fallacies in method may also be of several kinds. First, we have what is called a begging of the question, or *petitio principii*. As a general rule, one of the premises is so evidently true that it may be assumed without proof and without remark, while all effort at proof should be directed to the other. But if an orator assumes as true or as conceded that which his auditors expect or desire to have proved, they accuse him of begging the question; that is, of assuming the very thing they want to have proved before they will assent to his proposition. Logically, both premises should be proved, but rhetoric requires that we should spare ourselves the labor and the audience the annoyance of listening to proof of what nobody doubts. In some cases this begging of the question takes the form of reasoning in a circle—*curriculum nefas*. Suppose we have three propositions, 1, 2, and 3, and we use 1 and 2 as premises to prove 3, and then use 1 and 3 to prove 2, or 2 and 3 to prove 1, we are in such a case reasoning in a circle; that is, we first deduce a conclusion from premises, and then use that conclusion as a premise to prove one or the other of its premises—that is, its own premises.

The other recognized form of fallacy in method is called mistaking the issue, or *ignoratio elenchi*. One first mistakes the real proposition that is to be proved, and then, seeking proof for his supposed conclusion, does not find the proof that is required for the real conclusion which should be established; and he is said to be ignorant of the proof or to have mistaken the proof, because he had first mistaken the proposition to be proved. A case is cited from Greek history: The Athenians were deliberating whether to put Mitylenians to death. One orator had tried to show that it was *justice* to do so. Another replied that that was not the proposition to be proved; it did not answer the question, for the question really was whether it was *expedient* to do so: nobody doubted the justice of the measure.

The textbooks on logic are so numerous that it would be impossible to enumerate them. The most popular and the best known of all is that of Whately. I should also mention that of Prof. Bowen of Harvard University as deserving of special consideration, from the fact that it presents Sir William Hamilton's theory of syllogisms, together with the Aristotelian. Thompson's *Outlines of the Laws of Thought* is a book in extensive use and has many admirable qualities. Prof. Wilson's book, already referred to, professes to give a more ample view of both the valid syllogisms and the fallacies than has hitherto been given, and in the third part, or "Practical Application," he has attempted a classification of the methods of argumentation with reference to the kinds of propositions one may have occasion to prove. W. D. WILSON.

Log'os [Gr. λόγος, which means "reason" and "word," *ratio* and *oratio*, both being intimately connected] has a peculiar significance in Philo, St. John, and the early Greek Fathers, and is an important term in the doctrine of Christ.

(1) Philo, a Jewish philosopher of Alexandria, who endeavored to harmonize the Mosaic religion with Platonism (d. about 40), derived his Logos view from the Solomonic and later Jewish doctrine of the personified *Wisdom* and *Word* of God, and combined it with the Platonic idea of *Nous*. The Logos is to him the embodiment of all divine powers and ideas (the ἄγγελοι of the Old Testament, the δυνάμεις and ἰδέαι of Plato). He distinguished between the Logos inherent in God (λόγος ἐνδιάθετος), corresponding to reason in man, and the Logos emanating from God (λόγος προφορικός), corresponding to the spoken word which reveals the thought. The former contains the ideal world (the κόσμος νοητός); the latter is the first-begotten Son of God, the image of God, the Creator and Preserver, the Giver of life and light, the Mediator between God and the world, also the Messiah (though only in an ideal sense—as a theophany, not as a concrete historical person). Philo wavers between a personal and impersonal conception of the Logos, but leans more to the impersonal conception. He has no room for an incarnation of the Logos and his real union with humanity. Nevertheless, his view has a striking resemblance to the Logos-doctrine of John, and preceded it as a shadow precedes the substance. It was a prophetic dream of the coming reality. It prepared the minds of many for the reception of the truth, but misled others into Gnostic errors. *Literature*.—Gfrörer, *Philo und die Alexandrinische Theosophie* (1831); Dähne, *Jüdisch-Alexandrinische Religionsphilosophie* (1834); Grossmann, *Quæstiones Philon.* (1841); Keferstein, *Philo's Lehre von dem Göttlichen Mittelwesen* (1846); Langen, *Das Judenthum zur Zeit Christi* (1867); and especially Emil Schürer, *Lehrbuch der Neu-Testamentlichen Zeitgeschichte* (1874, pp. 648 *seq.*).

(2) St. John uses Logos (translated *Word*) four times as a designation of the divine, pre-existent person of Christ, through whom the world was made, and who became incarnate for our salvation (John i. 1, 14; 1 John i. 1; v. 7 (spurious); Rev. xix. 13). Philo may possibly have suggested the use of the term (although there is no evidence that John read a single line of Philo), but the idea was derived from the teaching of Christ, and from the Old Testament, which makes a distinction between the hidden and the revealed being of God, which personifies the Wisdom of God and the Word of God, and ascribes the creation of the world to the Logos (Ps. xxxii. 6, Sept.). There is an inherent propriety in this usage in the Greek language, where Logos is masculine and has the double meaning of thought and speech. Christ as to his divine nature bears the same relation to God as the word bears to the idea. The word gives shape and form to the idea, and it reveals the word to others. The word is thought expressed (λόγος προφορικός), thought is the inward word (λόγος ἐνδιάθετος). We cannot speak without the faculty of reason, nor think without words, whether uttered or not. The Christ-Logos is the Revealer and Interpreter of the hidden being of God, the utterance, the reflection, the visible image of God, and the organ of all his manifestations to the world (John i. 18; comp. Matt. xi. 27). The Logos was one in essence or nature with God (θεὸς ἦν, John i. 1), yet personally distinct from him, and in closest communion with him (πρὸς τὸν θεόν, John i. 1, 18). In the fulness of time he assumed human nature, and wrought out in it the salvation of the race which was created through him (i. 14). *Literature.*—See the commentaries of Lücke, De Wette, Olshausen, Hengstenberg, Meyer, Godet, Lange (Schaff's ed.), and Alford on the Prologue of John's Gospel; also M. Stuart, *Examination of John i. 1–18*, in *Bibliotheca Sacra* for 1850 (pp. 281–327); Röhricht, *Zur Johanneischen Logoslehre*, in the *Theol. Studien und Kritiken* for 1868 (pp. 299–315); and H. P. Liddon, *Bampton Lectures on the Divinity of Christ* (London, 1867, lect. v., pp. 310–411). On the ecclesiastical development of the Johannean Logos-doctrine by Justin Martyr, Origen, etc., see especially Dorner, *History of Christology*. PHILIP SCHAFF.

Logroñ'o, province of Spain, situated between Alava, Navarre, Aragon, and Soria, belongs to the basin of the Ebro, and produces an abundance of corn, wine, fruits, and vegetables; it is also very rich in ores and mineral springs. Area, 1945 square miles. Pop. 182,941.

Logroño, town of Spain, cap. of the province of the same name, on the Ebro, is a well-built town, with several good educational and literary institutions, and a brisk trade in wine, olive oil, and fruits. Pop. 11,239.

Log'town, a v. of Hancock co., Miss. Pop. 160.

Log'wood [named from being imported in *logs*], the *Hæmatoxylon Campechianum*, a middle-sized leguminous tree of Mexico and Central America, naturalized to some extent in the West Indies. It prefers wet land. It is the most important dyewood known. Its yellow sap-wood is hewn away, and the red heart-wood is exported in great quantities. It makes many shades from black to red and lilac, according to the mordant employed. The "extract" or inspissated juice is largely prepared in its native countries, and is exported. In medicine, logwood is a mild astringent, from the presence of tannic acid.

Lö'her, von (FRANZ), b. Oct. 15, 1818, at Paderborn, Westphalia; studied law, history, natural science, and art at Halle, Munich, Freiburg, and Berlin; made extensive travels in Europe, Canada, and the U. S. (1846–47); took an active part in the political movements in Germany in 1848; founded the *Westphalische Zeitung*; was imprisoned by the Prussian government for political agitation, but shortly after acquitted by the court; became assessor at the court of appeal in Paderborn in 1849, professor at the University of Göttingen in 1853, and was called to Munich in 1855 as secretary of the academy and professor at the university. His writings are partly juridical—*Das System des Preussischen Landrechts* (1852); partly historical—*Fürsten und Städte zur zeit der Hohenstaufen* (1846), *Geschichte der Deutschen in America* (1848), and *Jakobæa von Baiern* (1861); partly sketches of travel—*Land und Leute in der Alten und Neuen Welt* (3 vols., 1857–58) and *Neapel und Sicilien* (2 vols., 1864).

Loigny', Battle of, Dec. 2, 1870. The grand duke of Mecklenburg, commander of the right wing of the army of Prince Frederick Charles, stood opposed to Gen. Chanzy, who commanded the left wing of the French army of the

Loire. Between these two parties a contest took place at Loigny. On the morning of Dec. 2 the grand duke concentrated his troops on the line of Tanon-Baigneaux, and was about attacking the French when the latter, consisting of the 16th corps in the first line, the 17th in the second, and parts of the 15th as reserve, assumed the offensive at 9.30 A. M. The Germans had the 1st Bavarian corps and the 4th cavalry division on their right wing, the 17th infantry division in the centre, and the 22d infantry division with the 2d and 6th cavalry divisions on their left wing. The village of Loigny stood midway between the two lines of battle. The French attacked first the Bavarians, defeated them, and occupied Loigny. The grand duke then sent the 4th cavalry division to aid them, and ordered the 17th infantry division under Gen. von Treskow to wheel inward. The 17th infantry division threw itself with such force on the flank of the French that they had to abandon Loigny, which they were not able to retake, in spite of repeated attacks. The 17th infantry division occupied Loigny, and, pushing forward in connection with the 4th cavalry division, forced the French back to Terminiers and Gommiers. At noon two French divisions of the 15th corps, stationed at Artenay, moved northward through Poupry against the left wing of the grand duke, but they were met by the 22d infantry division and driven back through Poupry to Artenay. The Germans lost in this battle 3000 men killed and wounded; the French nearly twice as many, besides 3000 prisoners and 7 guns. AUGUST NIEMANN.

Loir [anc. *Lidericus*], a river of France, rises in the hills of Orleannais and joins the Sarthe, an affluent of the Loire, 5 miles N. of Angers, after a course of about 150 miles, of which the lower half is navigable.

Loire, a department of France, comprising the old province of Forez and portions of Beaujolais and Lyonnais, including part of the basin of the upper Loire and spurs of the Cevennes and Forez mountains. Area, 1805 square miles. Pop. 550,611. In 1857, 12,116 children out of 34,030 of school-age received no school instruction. Iron is mined, marble, granite, porphyry, and flint are quarried, and there are extensive manufactures of silk, iron, steel, and flint glass, and rich coal-beds. Cap. Montbrison.

Loire [anc. *Liger*], the largest river of France, rises in the Cevennes and flows in a north-western and western direction through the centre of France to the Bay of Biscay, receiving from the right the Loir, and from the left the Allier, Cher, Indre, and Vienne rivers. It is navigable 450 miles from its mouth, and is lined with high embankments, and a lateral canal completed in 1838 along its lower course, as it is liable to rise considerably, occasioning destructive inundations. Its fertile basin is called "the garden of France," of which it comprises one-fourth the area. In several wars carried on within the boundaries of France it formed an important strategical element; *e. g.* in the wars against the English invasion in the fifteenth century, in the wars of 1814, and in the war of 1870–71 against the Germans. In the latter instance the Loire formed the boundary between the territory occupied by the Germans and those parts of France which remained unharmed by the invaders. It put a check to the German operations, though a few minor expeditions penetrated farther S., and it formed the basis for the French operations during the closing period of the war. It obtains this importance partly from the surface-formation of Central France, partly from the road and railway systems which divide France into two different fields of operation, a northern and a southern. The river itself is so broad that its passages become very important military positions. AUGUST NIEMANN.

Loire-Inférieure, department of France, situated on both sides of the mouth of the Loire. Area, 2595 square miles. Pop. 602,206. In 1857, 19,450 children out of 65,200 of school-age received no school instruction. The surface is low, containing extensive lagoons, but the soil is generally fertile. Wine and wheat are produced. Fine horses, good sheep, and many bees are reared. Cap. Nantes.

Loiret', department of France, situated between the Seine and the Loire, and consisting of a low, sandy, and unproductive tract on both sides of the Loire, and a more elevated and fertile plain called the plateau of Orleans. Area, 2551 square miles. Pop. 353,021. In 1857, 5142 children out of 44,693 of school-age received no school instruction. The principal products are grain, wine, hemp, saffron, timber, and apples. Sheep and cattle, both of good breeds, poultry and bees, are reared. Cap. Orleans.

Loir-et-Cher, department of France, situated on both sides of the Loire, and traversed by several of its affluents, which form extensive lagoons. Area, 2389 square miles. Pop. 268,801. In 1857, 8088 children out of 29,275 of school-age received no school instruction. The surface is low and level, but the soil is generally fertile. Wheat, hemp, and vines are extensively cultivated; sheep, horses, poultry, and bees are reared, and some woollens, cottons, leather, and glass are manufactured. Cap. Blois.

Lo'ja, an inland city of Ecuador, cap. of a province of the same name, 250 miles S. of Quito, near the Peruvian frontier, is situated in a fertile valley 7000 feet above the sea, regularly and neatly built, with several public buildings, churches, and high schools. In the immediate vicinity are mines of gold, quicksilver, and coal and quarries of beautifully-veined marble. The chief article of commerce is the cinchona or quinine bark, which was first found in this district. Pop. about 10,000.

Loja, or **Loxa,** town of Spain, province of Granada, on the Genil River, situated on the slope of a hill crowned by a magnificent Moorish castle, and in the Moorish wars considered the key to Granada. There are considerable Roman remains and woollen manufactures. Pop. 17,128.

Lo'keren, town of Belgium, province of East Flanders, on the Darme, is a handsome and well-built town, with numerous schools and many benevolent institutions, and has important manufactures of linen goods, damasks, and laces. Pop. 17,100.

Lokman', an Arabian fabulist of very early times, concerning whose real epoch and life the traditions are conflicting and untrustworthy. His fables were published at Leyden by Erpenius in 1615, with a Latin translation, and they have since been one of the commonest textbooks for learning the Arabic language—a distinction they by no means merit either on the score of elegance or of originality, as most of them may be traced through the Syriac to a Greek original. Among modern editions those of Caussin de Perceval (Paris, 1818), Helot (Paris, 1847), and Dernburg (Berlin, 1850) may be mentioned.

Lo'la, tp. of Cherokee co., Kan. Pop. 650.

Loligin'idæ [from *Loligo*, the chief genus], a family of dibranchiate cephalopods of the sub-order Sepiophora, with the eyes covered by skin; the internal shell horny and lanceolate; the body oblong, and with a more or less pointed latero-terminal fin; the mantle with three internal cartilages, one dorsal and two ventral; the siphuncle attached to the head by a double superior medial band; the head free from the front of the mantle; and the teeth of the radula are in seven regular longitudinal rows, the median and inner lateral teeth being broad and fringed, and the outer long and fang-like. To it belong the most common "squids" of the eastern American coast. Three species have been recognized as inhabitants of the New England and New York seas—viz. *Loligo Pealii*, *L. punctata*, and *L. pallida*. Among other genera are *Gonatus*, an Arctic or Greenland type, and *Teuthis*, a European and East Indian genus. The gigantic cuttle-fishes of the North Atlantic (*Architeuthis*) are nearly allied, but differ greatly in the teeth of the radula. THEODORE GILL.

Lol'lards [probably from Ger. *lallen*, "to sing in a murmuring strain," and *hard*, an affix, signifying "to sing the praises of God or funeral dirges and the like"], a term of reproach applied at first to a half-monastic sect which originated in 1300 at Antwerp. It was designed to furnish ministrants for the care of the sick. In 1374 and 1377, they were under the protection of Gregory XI. In 1472, Pope Sixtus IV. recognized them as a religious order. Their proper designation is *Cellites* or *Alexians*. A few Alexian houses still exist in Europe. But the name was afterwards especially applied to the English and Scottish followers of Wycliffe, who were sorely persecuted during the reigns of Henry IV. and Henry V. in England, and in the same and somewhat later times in Scotland, where they were called "Lollards of Kyle."

Lombard' (PETER), [*Petrus Lombardus*], b. near Navara in Lombardy in the beginning of the twelfth century; studied theology at Bologna and Rheims, and in Paris under Abelard, and was appointed in 1159 bishop of Paris, where he d. in 1164. He was one of the founders of the scholastic theology of the Middle Ages. His principal work, *Sententiarum Libri IV.*, from which he received the title of *Magister Sententiarum*, is a collection of passages from the Fathers, with accompanying commentaries, bearing on the various doctrines of Christianity. It was first printed in Venice (1477); an edition was published in Paris (1841). Up to the time of the Reformation it was the most common handbook used in all theological schools.

Lombard Architecture. When Christianity became the religion of the Roman empire, Roman architecture came to an end. It had excelled in the construction of temples, theatres, circuses, baths, palaces, basilicas, triumphal arches, etc., but for buildings of these descriptions there was no further use, for it was not only the Roman empire which broke into pieces; it was the Roman civilization which crumbled into dust, and the new life which Christianity came to plant among the ruins of ancient paganism had other needs, which it now became the task of architec-

ture to supply. The character of this earliest Christian architecture is singularly mixed. There are new wants to satisfy, but there is as yet no new model to follow. There is a new spirit in demand, but there is as yet no new principle in construction. The first Christian architects took the old Roman buildings, blotted out such features as reminded too plainly of paganism, and changed or modified the architectural arrangement only so much as was necessary in order to make the building answer the new purposes. Even when they had to erect entirely new buildings they borrowed the fundamental plan and the constructive principle from the old ones, and thus the Roman basilica became the model of the Christian church. Soon, however, the new spirit began to remodel all the details of the old construction and shape them after its own image, and by degrees it turned from the details to the fundamental forms, which at last it succeeded in rebuilding on an entirely new principle of construction and with an entirely new æsthetic character; thus producing an entirely new style of architecture. But it took several centuries to transform the Roman basilica into the Gothic cathedral. The transformation began in the fifth century, and was not accomplished until the twelfth; and this period of the history of architecture is generally called the Romanesque, to indicate the peculiarly mixed character of Roman forms and Christian spirit which it exhibits throughout.

As the Christian religion was truly universal in its spirit, it was capable of becoming truly national in its life; and thus we see the Romanesque architecture, though it everywhere arose from the same type and strove after the same ideal, develop differently in Italy, Spain, France, England, Germany, and Scandinavia under the influence of a variously developed national spirit. Nowhere, however, is this phenomenon more interesting to observe than in Italy. Here, when Rome had perished, there was no more nationality; all the nations came and sat down around the corpse of the one great nation. Italy, which had once been the centre whence all influences radiated over the world, had now become a focus into which all the influences of the world were gathered back. It exhibits four distinct groups of Romanesque architecture. In Central Italy the classic type was kept purest. In Rome, the churches of S. Martino in Monti, S. Giovanni in Laterano, and S. Maria in Aracœli, all from the ninth century, and those of S. Crisogono and S. Maria in Trastevere, from the twelfth century; in Pisa, the cathedral (1063), the baptisterium (1153), and the belfry (1174); in Lucca, the churches of S. Michele and S. Frediano; in Florence, the baptisterium and the church of S. Miniato, both from the twelfth century,—show a decided adherence to the classical taste, both in their plans, which are simple and clear, and in their ornaments, which are elaborate, delicate, of the finest materials, and of antique design. In Venice, which maintained extensive and brisk commercial relations not only with the Byzantine empire, but with the whole Levant, a strong Oriental influence is visible in the church of S. Marco as it rises like a wonder from the sea, with its mighty arches resting on long rows of columns, and lifting an immense profusion of cupolas and spires, the whole covered with a most gorgeous ornamentation. In Sicily and Lower Italy, which alternately belonged to the Byzantine empire, the Moors, and the Norsemen, the cathedrals of Palermo, Salerno, Amalfi, Monreale, Ravello, etc. show a combination of the old basilica plan with the Byzantine dome and ornamentation, the Arabic horseshoe arch, and the belfry or front tower, which was a feature of Northern taste.

The most interesting group of Romanesque architecture in Italy is the Lombard, not so much on account of the grandeur and magnificence of its monuments, as on account of the superiority of their construction; they come nearest to the Gothic style. To this group belong the cathedral of Modena, commenced in 1099, but not finished until 1184; the churches of S. Zeno in Verona, S. Michele in Pavia, and S. Ambrogio in Milan, all from the eleventh century; the cathedral of Novara from the eleventh, and the cathedral of Parma from the twelfth century. Earlier examples of this style of architecture are found in Switzerland, but there they are generally on a small scale. The most prominent feature of the Lombard style is the general introduction and artistic development of the vault. The old basilica was generally open. On its transformation into a Christian church it had generally been covered with a flat wooden roof. As this roof was liable to catch fire, and many buildings had been destroyed or injured in this way, it had in some cases been replaced by a tunnel vault of masonry. But the tunnel vault never became generally used, and it exercised no influence either on the æsthetic character or on the technical construction of the building. As it pressed with equal weight on every point of the side-wall, which it touched, it simply demanded that the whole wall should be built stronger. Not so with the cross-vaulting employed by the Lombards. It pressed only on those four points of the wall on which the ends of the cross-arches rested, and it demanded only that these four points should be supported. This occasioned the application of buttresses, which later on in the Gothic style became so conspicuous a part of the construction and of the compound pier. The side-walls which enclosed the nave rested on columns, which separated the nave from the aisles. When now the cross-vaulting was suspended over the nave, those points of the side-walls on which the ends of the cross-arches rested had to be strengthened, and thus the column which stood immediately under such a point was replaced by a whole bundle of columns, of which each had its own capital and its own pedestal—a compound pier which was carried up through the wall till it reached the point which ought to be supported, and showed on the wall as wall-shafts and wall-arches. The spaces of the wall between these piers needed no particular strength; on the contrary, they could conveniently be broken through by triforiums between the vaultings and the roof of the aisles, and by windows; and thus the dead, bare walls of the basilica type became vividly diversified, and began to show signs of that living organization which is the charm of the Gothic cathedral. A beautiful example of the manner in which the Lombards attempted to diversify the wall-masses give the arcades or arched string-courses, which generally are carried along the upper part of the apse, and sometimes along the whole side elevation of the building.

Another characteristic feature of the Lombard architecture is the tower. In the Gothic architecture the towers became the most prominent part of the front façade. In the Lombard architecture they are still insulated pieces of decoration, sometimes placed before the main entrance of the nave, sometimes only loosely and inorganically connected with the building. But their mere presence announces a Northern influence. The tower was a Gotho-Germanic invention. Still more striking is the manifestation of this spirit in the ornamentation of the details. The classical designs are almost wholly given up and replaced by either fantastic or realistic devices, such as please the Gotho-Germanic taste. The materials employed by the Lombards are generally brick, sometimes coated with marble, but whether they used this material from economy or because it is more pliable and allows of a richer and more complicated construction than marble, cannot be decided. CLEMENS PETERSEN.

Lombardi'ni (ELIA), b. Oct. 11, 1794; graduated at the University of Pavia, and devoted himself to the study of fluviatile hydrology; in 1847 was appointed director-general of the public works in Lombardy, and held that position for nine years; in 1860 was nominated senator of the kingdom, and is still living. Among his numerous and highly important professional writings, most of which have appeared in scientific journals, we may mention—*Cenni Idrografici; Memoria sull' Importanza degli studii sulla Statistica dei Fiumi; Memoria sui cangiamenti nell' idraulica Condizione del Po; Sulle Inondazioni avvenute nella Francia; Dell' origine e del progresso della Scienza Idraulica in Italia; Saggio Idrologico sul Nilo; Studii sul grande estuario Adriatico*; several essays on the hydrology of the Po and the Tiber, and the very valuable *Guida allo Studio dell' Idrologia fluviale e dell' Idraulica pratica*, published separately in 1870.

Lom'bards, a family of the Suevic or Suabian branch of the great Teutonic race. The word *Lombard*, though derived by Vassius from *langepart*, or *barte*, a long hatchet (*e. g.* halbert), probably comes, as Paulus Diaconus, himself a Lombard, asserts, from nearly the same words, signifying a "long beard." They are first mentioned 5 A. D. In 17, led by Marbodius, they joined the Cherusci, and established Italicus as king. In 548 they appear as Arian Christians led by Andouin. Under his son Alboin the Lombards became a wealthy and powerful race, ruling Pannonia. Having conquered the Gepidæ and killed their king with his own hands, Alboin married his daughter Rosamond. At a great feast the Lombard king gave to his chiefs Italian fruits and wines, and so inflamed their imaginations with an account of the southern country that ere long his entire nation, with their women and children, appeared in Northern Italy. They were accompanied by 20,000 Saxons, a race as fierce as themselves. Their appearance caused a general panic, and it was by the immense number of fugitives who took refuge in the swamps and on the islands of Venice that this city was chiefly founded. The principal cities of Northern Italy were soon conquered by the energetic Lombards, who to great skill in war added administrative capacity and adaptability to law and culture. Pavia was taken by them after three years' siege (A. D. 568), Alboin was proclaimed king of Italy in Milan, and the Lombard kingdom was founded.

Their great victories were due to the numbers of other Northern tribes who joined them during their struggles, for, like the Normans, they were, though a ruling race, never a large one. Ravenna under its exarch remained Greek, but the remainder of the country was divided into duchies. Alboin at the height of his power, while intoxicated at a grand orgy, compelled his wife to drink wine from her father's skull. She revenged herself by inducing two soldiers to murder him during his sleep. He was succeeded by Cleph (573), who during his short reign of eighteen months greatly extended his dominion. For ten years the Lombards under thirty dukes ravaged the greater part of Italy, when they chose Antheric for king. Under this truly great leader the Lombard empire was greatly extended, though during his reign Chilperic, king of the Franks, seized Milan. Freed from these invaders, Antheric (584) organized a powerful federal kingdom. After his death (591) his widow, Theodelinda, married Agilulf. Under his rule the Lombards became orthodox Catholics. Adaloald, who succeeded him (615), was deposed by the dukes, or peers, who elected Ariovald of Turin, his brother-in-law. Rotharis (636) crushed the turbulent aristocracy, which threatened the stability of the empire, extended his dominions, and became famous by the compilation of the great code of Lombard laws, nearly 400 in number. "Augmented and continued by different kings until Didier or Desiderius (756–774), these laws not only survived the ruin of the Lombard kingdom, but became the basis of the revival of the study of jurisprudence in the Middle Ages, especially in Germany." From the reign of Rotharis the royal succession presents the usual scenes of murder, debauchery, intrigue, and dethronements common to all governments of the time under weak monarchs, until the accession of the great Luitprand (712). He united the kingdom by subduing the refractory aristocracy, and would have united Italy but for the intrigues of the Church of Rome, which then, as at all subsequent periods, opposed the union of Italy. Aided by Popes Gregory II. and III., the Lombards were successively attacked by Pepin and Charlemagne. Ratchis, who succeeded Luitprand (744), was so far influenced by the pope as to become a monk. Astolofo, his brother, who became king in 749, endeavored to carry out the old Lombard ideas, but was checked by Pepin. Desiderius or Didier, his successor, had for co-regent Ratchis, who was taken from the cloister. Getting rid of Ratchis, Desiderius ruled alone. His daughter, Hermengilda, married Charlemagne, but as soon as the latter was on the throne he divorced his wife and sent her back to her father. For revenge, Desiderius supported the claims of the children of Carloman, Charlemagne's brother, and marched upon Rome, which had supported the outrage committed by Charlemagne, leaving his throne in charge of his son, Adelchis. Charlemagne invaded Italy (773) and conquered Adelchis, who fled to Constantinople. Desiderius, who was made prisoner, ended his days as a monk in the monastery of Corbia. In 776 the Lombard government of dukes was replaced by that of the Franks, and in 803, by treaty between Nicephorus, the emperor of the East, and Charlemagne, all of Lombardy, with the greater part of Italy, was transferred to the former. Thus perished the Lombard rule after a duration of 206 years. The Lombard laws and architecture, art and culture, were of a high order, and no race of the Transition or Romanesque period developed greater energy or originality, or exercised a greater influence upon the Teutonic races of Europe.

The name *Lombards* also was given during the Middle Ages to a vast number of shrewd and intelligent Italians, principally from Lombardy, who abounded in London and Paris during the twelfth century. They were principally brokers, bankers, and usurers, who advanced money on all kinds of securities. Lombard street in London derived its name from them, and there is in Paris another, once entirely occupied by Lombards, which bears the same designation. That of London still is, what the Lombard street of Paris was, the great financial centre of the country. Both in France and England the Lombards were regarded, though in less degree, like the Jews, as a despised race, and were accordingly oppressed by the sovereigns of those countries. CHARLES G. LELAND.

Lom'bardy, a territory of Northern Italy, extending from the Alps to the Po, and from Lago Maggiore and the Ticino, which separate it from Piedmont, to Lago di Garda and the Mincio, which separate it from Venetia. It consists of an alpine region to the N. covered with picturesque mountain-ranges and containing beautiful valleys, and a large and exceedingly fertile plain to the S., extending along the Po, and watered by the Ticino, Lambro, Adda, Oglio, and Mincio. This plain, with its rich soil and mild climate, is not only one of the most fertile, but also one of the best cultivated and most prosperous parts of the kingdom of Italy. Large crops of wheat, maize, rice, and millet are raised. Melons, oranges, figs, citrons, peaches, olives, and mulberry trees are extensively cultivated; also vines, though the wine produced is of inferior quality. The principal industry is dairy-farming, which annually produces about 50,000,000 pounds of excellent cheese. The principal manufacture is silk, which is produced in large quantities and of excellent quality; the annual value of this single product is estimated at $15,000,000. The hilly region is rich in beautiful marbles. The territory, comprising an area of 9085 square miles, with a population of 3,460,824, does not form a political unit at present, but is divided into the provinces of Bergamo, Brescia, Como, Cremona, Milan, Pavia, and Sondrio. It received its name from the LOMBARDS (which see), who in 569 conquered Northern and Central Italy and established an independent kingdom, which flourished till 774, at which time it was incorporated with the Carlovingian empire. By the treaty of Verdun in 843, Lombardy, together with a long but narrow strip of country situated between France and Germany, and inhabited by Frankish tribes, was formed into a kingdom under a ruler of the Carlovingian house, and it remained a Frankish possession till the death of Charles the Fat, in 888. After this time several independent duchies arose in the eastern portion of the old Lombardian dominions, and in 961 the western and central parts, Lombardy proper, fell under the feudal authority of the German empire. In the beginning of the eleventh century it succeeded in separating itself from Germany, and a number of small republics, generally consisting of one city only, with a dependent territory, were formed. This period of its history, which lasted to the middle of the sixteenth century, is perhaps the most interesting and prosperous. Twice united into powerful leagues, the Lombard cities defeated Frederic Barbarossa in 1176 and Frederic II. in 1225; and after the dissolution of the league Milan still remained a power which commanded some respect under the sway of the VISCONTIS and SFORZAS (which see). In 1540, Spain subdued the North Italian republics, and held the country to 1706, when it fell to Austria. During the wars between France and Austria at the end of the eighteenth and the beginning of the nineteenth centuries, Lombardy successively belonged to the Cisalpine republic, the Italian republic, and the kingdom of Italy, but in 1815 it was restored to Austria, which ceded it to the king of Sardinia in 1859 by the treaty of Villafranca.

Lombok', one of the group of the Sunda Islands, in the Malay Archipelago, situated between Bali and Sumbawa, and belonging to the Netherlands. Its area is estimated at 1850 square miles; its population at 250,000, all Mohammedans. Its coasts are mountainous, containing several active volcanoes; the interior is a low and fertile plain, in which rice and cotton are extensively cultivated, as cotton on the hillsides. The capital is Mataram; the seaport Ampanam, much frequented to obtain provisions.

Lom'briz [Sp., "intestinal worm"], an epizootic disease destroying multitudes of young sheep in Texas and Mexico. The sheep has in its stomach and flesh multitudes of long, reddish, hair-like worms. It is best prevented by liberal feeding and good care for the breeding ewes and the young lambs, since well-fed sheep throw off the parasites early. The administration of salt water, or of salt, sulphur, and copperas in equal parts, in a few small doses, will, it is asserted, destroy the worms without harming the sheep.

Loménie, de (LOUIS LÉONARD), b. in 1818 at St. Yrieix, department of Haute-Vienne, France; studied at Avignon; began in 1840 in Paris the publication of the *Galerie des Contemporains illustres, par un Homme du Rien* (10 vols., finished in 1847), which attracted much attention; was appointed professor in French literature at the Collége de France in 1845, and at the École Polytechnique in 1864. Another series of biographies, *Hommes de '89*, has not been finished. In 1855 he published *Beaumarchais et son Temps* (2 vols.), rich in original researches, and republished in the U. S.

Lomi'ra, post-tp. of Dodge co., Wis. Pop. 1905.

Lo'mond, Loch, the largest lake of Scotland, 21 miles long, comprising an area of 40 square miles, and situated between the counties of Stirling, Perth, and Dumbarton. It receives the Endrick, Luss, and Fruin, and sends its waters through the Leven to the Frith of Clyde. It is studded with islands and surrounded by grand and beautiful scenery.

Lom'za, town of Russia, in the government of Augustowo, on the Narev, a tributary of the Vistula. It has a college, a gymnasium, and was formerly one of the most important towns of Poland, but was destroyed by the Swedes, and never recovered. Pop. 10,340.

Lonacon'ing, post-v. and tp. of Garrett co., Md., on George's Creek, and on the Cumberland and Pennsylvania R. R., has beds of excellent semi-bituminous coal. It has 1 weekly newspaper. Pop. 3983.

Lona'to, town of Northern Italy, in the province of Brescia. This town, of Roman origin, after being again and again desolated by war and pestilence during the Middle Ages, has been in modern times the scene of two great battles between the French and Austrians—one in 1706, and the other in 1796, in both of which the French were victorious. Pop. within the municipal limits in 1874, 6462.

Lon'don, the metropolis of Great Britain, is situated on both sides of the Thames, 60 miles from its mouth, in lat. 51° 30′ 48″ N., lon. 0° 5′ 48″ W. (the dome of St. Paul's cathedral). Its size is somewhat indefinite. The postal district covers an area of 250 square miles. The police district extends still farther, covering an area of 687 square miles, and including (in 1871) a population of 3,883,092. On the other hand, the parliamentary London is much narrower. It consists of ten boroughs, of which the city of London, although the smallest (having 74,732 inhabitants in 1871), is represented by four members, on account of its commercial and financial importance, while each of the other nine, although larger, is represented only by two: Westminster, 246,413; Chelsea, 258,011; Marylebone, 477,555; Hackney, 362,427; Finsbury, 443,316; Tower Hamlets, 391,568; Lambeth, 379,112; Southwark, 207,335; Greenwich, 167,632. But together these ten boroughs represent only a population of about 3,000,000, and the remainder of the inhabitants of the city belong to non-metropolitan electoral districts. Generally, however, the size of the city is determined by the area under the operation of the Metropolis Local Government act, which is also adopted by the registrar-general for the census. According to this definition, London covers an area of 122 square miles, forming parts of the counties of Middlesex, Surrey, and Kent, with about 3,400,000 inhabitants in 1874, and consists of the following divisions, for which the population is given according to the census of 1871:

Parts of Middlesex.	
West Districts.	
Kensington	283,153
Chelsea	71,689
St. George, Hanover Square	155,936
Westminster	51,181
North Districts.	
Marylebone	159,254
Hampstead	32,281
St. Pancras	221,465
Islington	213,778
Hackney	124,951
Central Districts.	
St. Giles's	53,556
Strand	41,339
Holborn	163,491
London City	75,983
East Districts.	
Shoreditch	127,164
Bethnal Green	120,104
Whitechapel	76,573
St. George-in-the-East	48,052
Stepney	57,690
Mile End, Old Town	93,152
Poplar	116,376
	2,286,568
Parts of Surrey.	
South Districts.	
St. Saviour } Southwark	175,049
St. Olave } Southwark	122,398
Lambeth	208,342
Wandsworth	125,060
Camberwell	111,306
	742,155
Parts of Kent.	
Greenwich	100,600
Lewisham	51,557
Woolwich	73,380
	225,537

Thus, the total population was 3,254,260 in 1871, of which 41,029 were born in Scotland, 91,171 in Ireland, 20,324 in the colonies and India, 5170 in the islands of the British seas, and 1205 on ships at sea; 66,101 were foreigners.

In its course through the city the width of the Thames varies from 700 to 1200 feet. It is spanned by a great number of magnificent bridges, of which the most remarkable are London Bridge, 900 feet long, of stone, daily crossed by 25,000 vehicles; Waterloo Bridge, 1240 feet long, consisting of nine elliptical arches; Westminster Bridge, 1200 feet long, consisting of seven iron arches resting on stone piers, etc. Several tunnels under the river connect the two banks. The Thames Tunnel, two miles below London Bridge, was opened Mar. 25, 1843, and consists of two arched passages, 1200 feet long, 14 feet wide, and 16½ feet high, separated by a brick wall 4 feet thick. In 1865 the tunnel was bought by the East London Railway Company to connect the railways N. of the Thames with those on the southern side, and July 19, 1869, it was closed as a public footway. The Thames Subway, carried 25 feet below the bed of the river, was opened in the beginning of 1870, and two others are under construction. At London Bridge the Thames has sufficient water to admit vessels of 800 tons, and between this point and Bigsby's Hole, 6½ miles farther down, opposite Blackwall, extends the port of London, with its twenty-eight magnificent wet docks. The most remarkable of these are the East India, West India, St. Katharine's and London docks, with the famous wine-vaults; and on the other side the Surrey and Commercial docks, mostly for the timber and corn trades. 1993 sailing vessels of 694,218 tons, and 846 steamers of 447,839 tons, were registered as belonging to the port on Jan. 1, 1874. The total number of vessels entering during the year 1873 was 38,810, of 7,843,041 tons—namely, 11,017 vessels, of 4,547,934 tons, from foreign countries and the British possessions, and 27,793 vessels, of 3,295,107 tons, in the coastwise trade. The total value of imports from foreign countries or the British possessions during this year was estimated at £127,560,447, on which the customs revenue amounted to £10,103,085; that of the exports of British produce at £57,199,098. Shipbuilding yards are situated opposite Greenwich; 29 vessels of 6881 tons were built in 1873. Of other manufactures carried on to a remarkable extent are those of silk, employing about 100,000 persons; clocks, watches, carriages, jewelry, gold and silver ware, etc.; enormous breweries and sugar-refineries are in operation. The manufacturing activity of the city is chiefly carried on in the districts S. of the river; that of carriages, however, is concentrated at Long Acre. The commerce and regular business are carried on in that part of the city which is distinctively called the *City* of London, situated on the northern bank of the river, and forming the centre of the whole hive; it has its own police, and is said to be entered every morning by 700,000 persons, who leave it again in the evening.

The principal thoroughfares run from E. to W., parallel with the river. The western part is the seat of most of the public institutions and the residence of the wealthy and aristocratic classes. A prominent feature in the prospect of the city are the Thames embankments or river-quays. The Victoria embankment, on the northern side, runs from Westminster Bridge to Blackfriars' Bridge, and forms a magnificent public way, 100 feet broad, from the houses of Parliament to St. Paul's cathedral; it was opened in 1870. The Albert embankment, on the southern side, runs from Westminster Bridge to Lambeth Palace, the town-residence of the archbishop of Canterbury. The Chelsea embankment begins at Chelsea Hospital, and presents an excellent roadway 70 feet wide, and lined on the land-side with numerous pleasure-grounds. Of the squares, of which a great number is scattered all over the city, and of which many are planted with beautiful trees and are well cultivated, the largest are Eaton, 1637 by 371 feet; Cadogan, 1450 by 370; Bryanston, 814 by 198; and Montagu Square, 820 by 156; the most fashionable are Belgrave, Grosvenor, St. James's, Hanover, Cavendish, and Trafalgar Squares, with the Nelson Column, the statues of Havelock and Napier, and fine fountains; the most crowded, because situated in the eastern quarters and mostly surrounded by lodging-houses, are Great Ormond, Queen, Brunswick, and Mecklenburg Squares. Soho Square, near Oxford street, one of the gayest points of the city in the days of the prince regent, but afterwards somewhat deserted, has of late been embellished by a beautiful garden. Of the public parks, the most prominent is Hyde Park, comprising an area of about 400 acres between Green Park and Kensington Gardens, and containing a fine sheet of water, the Serpentine, an excellent drive, Rotten Row (*route du roi*), from Apsley House to Kensington Gardens, and the splendid Albert monument, erected on the site of the Crystal Palace of 1851. Remarkable among the other parks are the Regent's Park, comprising 450 acres, and containing a zoological and botanical garden; St. James's (59 acres), extending between St. James's Palace, Buckingham Palace, and the Wellington Barracks; Green Park (60 acres), between Hyde Park and Piccadilly, from which it is entered through a triumphal arch surmounted by an equestrian statue of Wellington; Victoria Park (300 acres), in the north-eastern part of the city; Kensington Gardens, a beautiful piece of ground separated from Hyde Park by the Serpentine; the Kew Botanical Gardens, situated 5 miles from Hyde Park, on the road to Richmond, and comprising 170 acres, etc.

The citadel of London, the Tower, is perhaps the most interesting and most widely known of its public buildings.

It is situated at the eastern extremity of the city, and consists of a bewildering mass of towers, forts, batteries, ramparts, barracks, and storehouses, covering an area of 900 feet by 800. The oldest part of the building is the White Tower, constructed by William the Conqueror, and almost unchanged in the interior, though externally remodelled by Wren. Other remarkable points of the construction are the Bloody Tower, in which the sons of Edward IV. were murdered; Beauchamp Tower, in which Anne Boleyn and Jane Grey were detained; the Bell Tower, in which the constable resides; the galleries of the Horse Armory and Queen Elizabeth Armory, containing fine collections of arms; the Jewel Room, in which the regalia of the English crown is kept, etc. As a fortress the Tower is not of great consequence, but it contains vast stores of war-materials. Of the royal palaces, none is very remarkable; they are more distinguished for vastness of dimensions than for elegance of architecture. Buckingham Palace was begun by George IV. and finished by William IV. It forms an immense quadrangle, contains a fine collection of pictures, a magnificent ball-room, capable of receiving 2000 persons, a splendid staircase of white marble, etc.; but it is only used on great occasions. The queen resides, when in town, in Kensington Palace, and holds her drawing-rooms in St. James's. Marlborough House, in Pall Mall, was built by Wren for the duke of Marlborough, and bought in 1817 by the Crown; it is now the residence of the prince of Wales. The new Westminster Palace, or the houses of Parliament, stands on the left bank of the Thames, between the river and Westminster Abbey, on the site of the old palace, which was destroyed by fire in 1834. It is a vast construction, covering an area of 8 acres, containing 2 miles of corridors, 100 staircases, and 1100 apartments, among which are the House of Lords, 100 feet by 45, the House of Commons, 60 feet by 45, and the famous Westminster Hall, 290 feet long, 110 high, and 68 wide, in which the highest law courts of England are held. It is built in Gothic style, very elaborate in its details, and rich, even gorgeous, in its interior decoration.

Next to the Tower in historical interest, and far superior to it in architectural respects, is Westminster Abbey. The oldest parts of the present building, the choir and the transepts, were erected in the thirteenth century by Henry III., the nave and the aisles in the fourteenth and fifteenth centuries by the abbots, the western front and the great window by Richard III., the famous chapel at the eastern extremity by Henry VII., who also completed the interior, and the upper part of the western towers by Wren. The present structure is 511 feet long, 203 across the transepts, 79 across the nave and aisles; the height of the nave is 102 feet; of the towers, 225. From the time of Edward the Confessor the kings of England have been crowned here, and most of them, after Henry VII., lie buried or have their monuments here. An interesting spot of the building is called "Poets' Corner," in the eastern aisle of the southern transept, in which the most illustrious men of English science, literature, and art are buried or have their monuments. The cathedral of the see of London is the church of St. Paul, built by Wren between 1675 and 1710. It is 500 feet long, 180 wide, 222 high; the height of the dome is 365 feet, the diameter 145. It is the fifth largest church in Europe. The oldest church of London is St. Bartholomew the Great, West Smithfield, built in 1102 and restored 1865–67. In all, the city contains about 1500 places of worship—600 belonging to the Established Church, 400 to the Wesleyan and other Methodists, 300 to the Baptists, 150 to the Congregationalists, 100 to the Roman Catholics, about 25 to the English and other Presbyterians, 20 synagogues, etc. The British and Foreign Bible Society of London distributes annually 4,000,000 Bibles in 200 languages. London has a large number of hospitals and over 1000 charitable institutions, with an annual income of about £5,000,000, half of which is disbursed for food and clothing alone. By the Elementary Education act of 1870 the city was divided into ten school districts, represented in the central school board by 49 members. This board is authorized to provide new schools and compel the attendance of children between five and twelve years of age. The school funds are raised from parents, public taxes, and local funds. Before the enactment of this law, in the year 1869–70 there were within the space of a square mile in the eastern part of the city 40,000 children, of whom 30,000 received no instruction. The schools for the middle class have been sufficient in number and good for a long period back, and those for higher or special educations, commercial, industrial, artistic, military, etc., are excellent. First among all educational institutions of London stands the British Museum (which see), but the city has besides about 50 large libraries accessible to the public, excellent collections illustrative of industry and art in the Kensington Museum, the National Gallery of Paintings of all schools in Trafalgar Square, and a great number of private collections. The number of theatres amounts to about 40, but since the age of Shakspeare the English stage has never occupied a prominent position. With respect to music, although England has produced no great composer, nowhere can better music be heard than in London, and musical institutions and associations are very numerous.

London (*Londinium, Augusta Trinobantum*) first appears in history as a Roman station in the reign of Claudius; under Constantine the Great it was fortified. After the departure of the Roman troops it became the capital of the East Saxon kingdom, and in the ninth century, under Egbert, the capital of the united Saxon kingdoms. William the Conqueror granted it a charter, which was renewed and enlarged by Henry I. in 1100. From this time, and up to our days, the city has always been most intimately connected with the history of the country. There is hardly any great event or any great character in the English history and literature of which some trace cannot be found in London. The kings were often very jealous of its privileges and power, and favored Westminster, where they resided, and which at that time was a separate city. Even Elizabeth, although she contributed much to the prosperity of London by suppressing the privileges of the Hanseatic League, feared that it would grow too big. In the latter part of the seventeenth century it suffered severely—first, by the plague in 1665, which cost the lives of 65,000, while the total population was only about 200,000; and the following year by a great conflagration, which destroyed about five-sixths of the whole city. It soon recovered, however, and made immense progress, especially in this century; between 1801 and 1871 its population increased from 958,863 to 3,254,260. It is now one of the great centres of modern civilization, and more especially the centre of the commerce of the world; every enterprise of any great magnitude looks to it for capital. And as a place of elegance, comfort, and safety it stands in the foremost rank among cities, its police, fire departments, means of conveyance and communication, relief and sanitary institutions, etc., being models in their respective lines. Clemens Petersen.

London, city and port of entry, capital of Middlesex co., Ont., Canada, on the river Thames, and on the Great Western Railway, 61 miles E. of Sarnia, is the N. terminus of the London and Port Stanley Railway and the S. terminus of a branch of the Grand Trunk. It is surrounded by a very fertile and well-timbered district, has 5 banks, a board of trade, and 17 churches, is the seat of a Roman Catholic bishop and of the Anglican bishop of Huron, has numerous benevolent societies, a convent, a well-regulated school, fire and police departments, and is the seat of Hellmuth College, Hellmuth Ladies' College, and of Huron College, all flourishing institutions. There are 2 literary and several religious societies, 3 monthly, 5 weekly, 1 tri-weekly, and 2 daily newspapers, an orphan asylum, a hospital, and an insane hospital. London is well laid out, and is lighted by gas; has a large number of machine-shops, breweries, oil-refineries, foundries, and other manufacturing establishments. The public buildings, bridges, streets, squares, markets, etc. are for the most part named after those of London in the mother-country. Many of the public buildings are architecturally very fine. Pop. of the city in 1871, 15,826; of London township, exclusive, 10,991.

London, tp. of Fayette co., Ill. Pop. 1186.

London, post-v., cap. of Laurel co., Ky., near Knoxville branch of Louisville and Nashville R. R. Pop. 165.

London, post-tp. of Monroe co., Mich. Pop. 1031.

London, tp. of Freeborn co., Minn. Pop. 311.

London, post-v., cap. of Madison co., O., on the Pan-Handle and Short Line R. R., 25 miles W. of Columbus, has 5 churches, 3 newspapers, 3 banks, and a number of shops, mills, stores, etc. Stock sales have been held here the first Tuesday of each month for the past twenty-five years. Pop. 2066. John Wallace, Ed. "Enterprise."

London, tp. of Kanawha co., West Va. Pop. 2792.

Lon′don Brit′ain, tp. of Chester co., Pa. Pop. 663.

London Clay, a series of argillaceous strata, in places from 500 to 600 feet in thickness, forming the most important member of the Lower Eocene of England and the northern extremity of France, and underlying the city of London. The remains of mammals (*Hyracotherium, Lophiodon, Coryphodon*), of birds (*Halcyornis, Lithornis*, and some others), of a sea-snake (*Palæophis*), and of marine turtles and at least eighty species of fish, have been found in these beds, which also abound in shells (upwards of 250 species have been recorded), and have also yielded a great variety of plant remains (palm fruits, etc.) of tropical or sub-tropical aspect. The fauna and flora thus indicate to us that these strata were deposits in a delta or in a limited

sea receiving waters flowing from a torrid region of the earth.

Lon'donderry, county of Ireland, in the province of Ulster, bordering on the Atlantic. Area, 810 square miles. The surface is mostly hilly and rugged, with fertile tracts along the rivers Bann, Foyle, Faughan, Roe, and Mayola, with their numerous affluents. Oats, barley, potatoes, and flax are the common crops; linen is the principal manufacture. Pop. 173,905, of whom 34,339 are unable to read or write. From 1851 to 1872, 49,664 persons emigrated from this county. A great part of the ground is held by the inhabitants by lease under the Irish Society and the twelve London companies, to which it was granted by James I.

Londonderry, city of Ireland, capital of the county of Londonderry, on the Foyle, which is crossed by an iron bridge 1200 feet long, is built on a hill, on whose top stands the cathedral of Derry, and was formerly fortified, has many breweries and distilleries, and considerable manufactures of linen and ropes. The salmon fisheries of Lough Foyle are very productive. Pop. 25,241.

Londonderry, post-tp. of Rockingham co., N. H., on the Manchester and Lawrence R. R., 6 miles S. E. of Manchester, has manufactures of shoes. Pop. 1405.

Londonderry, post-v. and tp. of Guernsey co., O. Pop. of v. 69; of tp. 1313.

Londonderry, a v. (GILLESPIE P. O.) of Liberty tp., Ross co., O. Pop. 163. London Station (Vigo P. O.) is on the Cincinnati and Marietta R. R., 1 mile from Londonderry. Pop. 57.

Londonderry, tp. of Bedford co., Pa. Pop. 1255.

Londonderry, post-tp. of Chester co., Pa. Pop. 714.

Londonderry, tp. of Dauphin co., Pa. Pop. 1935.

Londonderry, tp. of Lebanon co., Pa. Pop. 2212.

Londonderry, post-v. and tp. of Windham co., Vt., 15 miles E. of Manchester. The village has an academy, and manufactures of woollens, lumber, furniture, etc. South Londonderry (post-v.) also has an academy, and manufactures of lumber, chair-stock, leather, and various other articles. Pop. 1252.

Londonderry (CHARLES WILLIAM **Stewart Vane**), THIRD MARQUIS OF, b. at Dublin, Ireland, May 18, 1778; served on the Continent both as a soldier and a diplomatist during the wars of the French Revolution; aided in suppressing the Irish rebellion of 1798; accompanied Abercrombie to Egypt in 1801, in which year he entered Parliament; became colonel, aide-de-camp to the king, and under-secretary for the war department in 1803; distinguished himself at the head of a brigade of hussars under Sir John Moore in Spain (1808–09); was adjutant-general to Sir Arthur Wellesley (1809–13), distinguishing himself at Talavera and other battles, for which he received the thanks of Parliament and the order of the Bath; went as ambassador to Berlin in 1813, to Austria in 1814, and was a member of the Congress of Vienna in 1815; was made privy councillor, lieutenant-general, and Baron Stewart in 1814; assumed the surname of Vane in 1819 on his marriage with the heiress of that title; succeeded his half-brother Robert as marquis of Londonderry in 1822; was made Earl Vane and Viscount Seaham in 1823, general in 1837, colonel of lifeguards in 1843, knight of the Garter in 1852. D. in London Mar. 6, 1854. Under his original name of Stewart he was author of a *History of the Peninsular War* (1808–13), and as marquis of Londonderry he edited the *Correspondence* of his brother, Lord Castlereagh (1850). In developing the vast estates of his wife in Durham he constructed at his own expense the harbor of Seaham.

Londonderry, SECOND MARQUIS OF. See CASTLEREAGH, EARL OF.

London Grove, post-tp. of Chester co., Pa. Pop. 1804.

London Pride (*Saxifraga umbrosa*), a perennial evergreen plant, a native of Southern Europe, frequently found in England and in Ireland, where it is called St. Patrick's cabbage, from its thick cluster of leaves. The stem grows a foot high, and bears small pink flowers with darker spots. Being unaffected by smoke, it grows well in the English cities, especially in London, whence its name.

London Station. See LONDONDERRY, Ross co., O.

London, University of, originally incorporated in 1825, was reorganized in 1836, the former university taking the name of University College, and a new university then received a charter, which has been amended in 1837, 1850, and 1858. The university proper consists of a senate and a board of examiners. It does not instruct, but examines, confers degrees, certificates, and prizes, and sends one member to Parliament. There are several colleges and schools in various parts of the kingdom affiliated with the university. Those at London are University College, King's College, and New College. If the London University is less distinguished for the eminence of its graduates in classical learning and pure mathematics than the old English universities, it is certain that in the natural and physical sciences and the professions of law and medicine its diplomas are not less valued than those of either Oxford or Cambridge. In theology it confers no degrees and makes no examinations.

Lone Hill Valley, in Humboldt co., Nev., has some 100,000 acres of grazing and tillage land, at an elevation of 4800 feet.

Lone Oak, post-tp. of Bates co., Mo. Pop. 1360.

Lone Pine, post-tp. of Inyo co., Cal. Pop. 458.

Lone Rock, post-v. of Richland co., Wis., on the Milwaukee and St. Paul R. R., 1 mile E. of Wisconsin River, has large manufactures of cheese.

Lone Tree, post-v., cap. of Merrick co., Neb., on the Union Pacific R. R., 132 miles W. of Omaha, 1½ miles from the Platte River, and near the centre of a fine agricultural district in the Platte Valley, has a large brick court-house, 2 churches, a large school-house, a weekly newspaper, a fine dépôt, 2 telegraph-offices, a bank, a hotel, a steam grist-mill, a steam grain-elevator and warehouse, and a number of stores and shops. Pop. about 450.

GEO. A. PERCIVAL, ED. "LONE TREE COURIER."

Long, in music. See LARGE.

Long (Gen. ARMISTEAD L.), b. in Virginia in 1826; graduated at the U. S. Military Academy in the class of 1850; entered the artillery as brevet second lieutenant, and did good service on the frontier, particularly in Kansas. In June, 1861, after serving four months on the staff of Gen. Sumner in the defences of Washington, he resigned to follow the fortunes of his native State. He attained the rank of brigadier-general, and was killed at the battle of Peach Tree Creek, July 20, 1864.

Long (Gen. ELI), b. in Woodford co., Ky., June 16, 1837; graduated at Frankfort (Ky.) Military School in 1855, and in 1856 was appointed a second lieutenant of cavalry in the U. S. army; prior to 1861 he served with his regiment, mainly against hostile Indians; on May 24, 1861, he attained the rank of captain. Throughout the civil war he was actively engaged in the West, at Perryville, Murfreesboro', Chickamauga, and in the Atlanta campaign, as colonel of the 4th Ohio cavalry since Feb., 1863, but in command of a brigade most of the time prior to his appointment as brigadier-general in Aug., 1864. In Apr., 1865, he led his division of cavalry in the charge upon the intrenchments which resulted in the capture of Selma, Ala., being himself severely wounded in the head; for these services he was brevetted brigadier and major general, and in 1867 was retired upon the full rank of major-general.

Long (GEORGE), b. at Poulton, Lancashire, England, in 1800; educated at Macclesfield School and at Trinity College, Cambridge, where he was elected to the Craven scholarship at the same time with Macaulay; graduated in 1822 as first chancellor's medallist, and obtained a fellowship. Two years later (1824) he was appointed professor of ancient languages in the University of Virginia, then being organized by the care of Thomas Jefferson, and, along with Prof. T. H. Key and other English scholars, spent two years at Charlottesville, Va. Returning to England in 1826, he was professor of Greek in London University until 1831, when he devoted himself to the literary enterprises of the Society for the Diffusion of Useful Knowledge, editing for that association the *Quarterly Journal of Education* (1831–35), the *Biographical Dictionary* (1842–44), and the *Penny Cyclopædia* (1833–46). He was called to the bar at the Inner Temple in 1837, became professor of Latin at University College, London (1842–46), lecturer on jurisprudence and civil law at the Middle Temple (1846–49), and professor of classical literature in the Proprietary College at Brighton from 1849 to 1871, receiving in 1873 a royal pension of £100. He was general editor of a *Bibliotheca Classica;* published an analysis of *Herodotus* and a *Classical Atlas*, and a valuable edition of Cæsar's *Gallic War* and of *Sallust*. He translated *Select Lives from Plutarch, The Thoughts of the Emperor Marcus Aurelius,* contributed largely to Dr. Smith's *Classical Dictionaries*, wrote geographical treatises on England and Wales and on America, *History of France* (1849), and *The Decline of the Roman Republic* (5 vols., 1864–74). He is now (1875) employed on a new translation of *Epictetus*.

Long (STEPHEN HARRIMAN), b. in Hopkinton, N. H., Dec. 30, 1784; graduated at Dartmouth College 1809; was teaching school at Germantown, Pa., in 1814, where he met Gen. Swift, then chief of engineers, who procured his appointment in the army as second lieutenant of engineers Dec., 1814, and in the spring of 1815 Long was placed on

duty at the Military Academy as assistant professor of mathematics. In Apr., 1816, he was appointed topographical engineer, with the brevet rank of major, and was brevetted lieutenant-colonel in 1826; on the organization of the topographical engineers as a separate corps in 1838 he became major of that body, and in 1861 chief of topographical engineers, with the rank of colonel. For nearly half a century Col. Long was actively engaged in the service of his country, and with the early engineering works of his time his name is known in connection. His exploration of the Illinois and Arkansas rivers in a flatboat or canoe as early as 1816 was considered quite a feat in its day, and led to his subsequent expedition to the Rocky Mountains, which extended over a period of nearly five years, and embraced the country between the Mississippi River and the Rocky Mountains, one of the loftiest peaks of which great chain received and still bears his name. An account of this expedition was published in 1823 by E. James, and in 1824 W. H. Keating published in two volumes the history of Long's exploration of the sources of the Mississippi, both works being largely from notes of Col. Long. When the great undertaking of the Baltimore and Ohio R. R. was commenced, Col. Long was placed at the head of the board of engineers having in charge the surveys and construction of this road; he was one of the earliest and most efficient in introducing in a practical manner great improvements in the construction of timber bridges for railroad purposes; and it was while acting in his capacity of chief engineer that he devised and patented the bridge now known by his name. (See BRIDGE.) Besides these important works, he was engaged in the survey and construction of numerous railroads in different sections of the country and in a great variety of professional duty. In the improvement of Western rivers and harbors he had a long experience, and devised valuable plans for the removal of obstructions. After serving on a board for the improvement of the lower Mississippi, he was in 1856 placed in charge of that work, and under his supervision the contracts for deepening the mouths of this river were conducted prior to the civil war. Shortly after the merging of his corps into the U. S. corps of engineers Col. Long was retired (June, 1863) from active service, but continued charged with important duties until his death, which occurred at Alton, Ill., Sept. 4, 1864.

G. C. SIMMONS.

Long Acre, tp. of Beaufort co., N. C. Pop. 1651.

Longa'cre (JAMES BARTON), b. in Delaware co., Pa., Aug. 11, 1794; served an apprenticeship with the eminent engraver Murray at Philadelphia, and from 1819 was engaged for many years in illustrating American works. With James Herring he prepared the *National Portrait Gallery of Distinguished Americans* (4 vols., 1834–39), a valuable work, in which many portraits are from drawings by Longacre. In 1844 he became engraver to the U. S. mint, and retained that position until his death at Philadelphia Jan. 1, 1869. He designed the modern gold coinage of the U. S., and superintended for the government of Chili the remodelling of the entire coinage of that country.

Long Bar, tp. of Yuba co., Cal. Pop. 519.

Long Branch, post-v. of Ocean tp., Monmouth co., N. J., 11 miles S. of Sandy Hook and 30 miles S. of New York, one of the principal watering-places of the U. S., is situated on the Atlantic coast, and takes its name from a brook which forms a branch of South Shrewsbury River, and was formerly a fishery of the Indians, who held the lands until about the middle of the eighteenth century. Long Branch proper is the "village," 1 mile from the sea, but the corporate limits embrace also the suburban villages of Branchport, Branchburg, Atlanticville, and the "Shore," all lying within a radius of two miles. Communication with New York both by steamer and by rail is easy, a direct railroad having been opened to the public in July, 1875. The *Shore,* where are situated the hotels, boarding-houses, and cottages, has a beach which may vie with the most celebrated in the world, having an open sea-front of more than 5 miles of high commanding bluff, without the intervention of inner bays. Branchport is the nearest landing-place for schooners upon the South Shrewsbury River. Atlanticville on the Shore turnpike is the principal head-quarters of fishermen, and East Long Branch is on the street which connects the Shore with the village. There are post-offices both at East Long Branch and at the village. Among the hotels, Lelands' Ocean, the Metropolitan, the Mansion House, United States, Howland's, East End, and West End are of dimensions to accommodate numerous summer visitors, and there are many of lesser size. There are 6 churches, 1 weekly newspaper (daily during July and August), 1 banking-house, several manufactories, and an abundance of stores. The drives are very fine. The summer population sometimes exceeds 30,000. Resident pop. about 5000, and rapidly increasing. J. STULTS, ED. "NEWS."

Long Branch, post-tp. of Franklin co., Va. Pop. 1877.

Long Cain, tp. of Abbeville co., S. C. Pop. 1400.

Long Cane, a v. of Troup co., Ga., on the Atlantic and West Point R. R. Pop. 560.

Long Creek, tp. of Boone co., Ark. Pop. 214.

Long Creek, tp. of Carroll co., Ark. Pop. 452.

Long Creek, tp. of Macon co., Ill. Pop. 1372.

Long Creek, post-tp. of Decatur co., Ia. Pop. 714.

Long Creek, post-tp. of Mecklenburg co., N. C. Pop. 1457.

Long Eddy, post-v. of Fremont tp., Sullivan co., N. Y., on the Delaware River, Basket Creek, and the Erie R. R. (Basket Station), has a great water-power and important manufactures.

Longet' (FRANÇOIS ACHILLE), b. in 1811 at St. Germain-en-Laye, department of Seine-et-Oise, France; studied medicine, and especially physiology; gained twice the Montyon prize of physiology at the Academy of Sciences; was professor of physiology in the faculty of medicine at Paris; member of the Academy of Medicine, and consulting physician to Napoleon III., and d. at Bourdeaux in 1871. His principal works are *Traité d'Anatomie et de Physiologie du Système nerveux* (1842) and *Traité complet de Physiologie* (1850–59), besides a great number of original researches concerning the effects on the nervous system of electricity, of the inhalation of ether, etc., and concerning the general excitability of the nerves and irritability of the muscles, published partly in book-form and partly as contributions to various medical periodicals.

Longev'ity [Lat. *longævitas*], a subject which has raised a number of curious questions, to which, however, science has not yet been able to give more than preliminary or approximative answers. Most people have a vague impression that plants live longer than animals, and animals longer than men; and although this notion breaks down even on the most cursory survey of the actual state of affairs, it is, nevertheless, not altogether a delusion, as there certainly are plants which are still young and vigorous at an age at which even the most longevous animals must die; and the same relation reappears when men and animals are compared. Although the life of many species of plants lasts only one or two years, the age which certain species of trees attain, such as the baobab, the chestnut, the cypress, the yew, the oak, the palm, etc., is almost fabulous. With many species of trees it is easy to compute the age of an individual with tolerable certainty. Thus, the spruce sets a new system of branches every year, and even when all the lower branches wither away from want of air and light, strongly-marked scars remain on the bark; but the longevity of the spruce is not very great. The age of several kinds of palm trees is indicated by rings visible externally on the rind, each ring denoting the growth of one year; and by counting these rings from the base to the top of the stem the age of certain Brazilian cocoanut-palms has been computed to between 600 and 700 years. The Arabs generally ascribe a longevity of 200 or 300 years to the date-palm, but on what they base this supposition is not known. A horizontal cut of an oak trunk shows a series of often very strongly-marked concentric circles, each of which, like the rings on the rind of the palm tree, denotes one year's growth; by counting these circles the age of an individual oak is found. In England many oaks have been felled whose trunks showed between 300 and 400 such circles, and by comparing the diameters of these trunks with that of a living oak, an estimate is obtained of the age of the latter. Thus, Wallace's oak at Ellersley, near Paisley, Scotland, is believed to be more than 700 years old. The celebrated eight olive trees on the Mount of Olives at Jerusalem are known from authentic documents to have existed when the Seljook Turks conquered the city in 1099; and similar historical testimonies can be produced concerning the age of many other trees. At Ankerwyke House, near Staines, Middlesex, England, stands a yew which dates from before the meeting of the barons at Runnymede in 1215, and the yews at Fountain Abbey, Yorkshire, England, were old trees when the abbey was built in 1132. But the age of the *Sequoia gigantea* in the Mariposa grove of California, 90 feet in circumference and more than 300 feet high, ranges certainly farther back; and farther still ranges that of the sweet chestnut trees on Mount Etna, Sicily, of which one measures 160 feet in circumference; of the Oriental plane near Constantinople, 150 feet in circumference, etc. Adanson computed the age of certain baobab trees in Africa at more than 5000 years; De Candolle, that of the deciduous cypress at Chapultepec, Mexico, still higher; and Humboldt calls the *Dracæna draco* at Orotava in Teneriffe one of the oldest inhabitants of the earth.

In the animal kingdom we know that the longevity of

insects is very small, ranging from a few hours to a few weeks, but that of reptiles is considerable. The toad lives about fifteen years, and a tortoise which was placed in the garden of the palace of Lambeth, London, in 1633, perished by accident in 1753. Several species of fishes may attain a high age. Buffon says of the carps in the pond of the count de Maurepas at Pontchartrain that they are proved to be more than 150 years old, and Gesner tells of a pike which was caught in a lake near Heilbronn, Suabia, in 1497, and which, according to a brass ring attached to it, had been placed in the lake in 1230. Common river-trout have lived confined in wells between 30 and 50 years. Of birds, the gallinaceous families live only between 12 and 15 years; the goose is more longevous, and the swan is known to have lived more than a century. Fontenelle tells us that the grand duchess de la Rovère d'Urbino, when she came to Florence in 1633 to marry the grand duke Ferdinand, brought with her a paroquet which she called the oldest member of her family, and which consequently must have been over twenty years old; it afterward lived in Florence for nearly a century. In Northern Germany and Denmark the peasants mark on the gable, below the year in which the house was erected, the year in which the stork built its nest on the ridge, and a record is kept of the annual arrivals of the bird. In many cases these records exceed one century; and as a nest is never taken possession of by a foreign stork unless it has been vacant for two or three years, and after the performance of certain very curious ceremonies by the new occupants, it may be considered as well proved that it is the same couple of storks which has lived in the nest during this period. Birds of prey are believed to be still older, though there are no proofs of their longevity. The experiment of the old woman who bought a raven to see whether it was true that it could live 1000 years led to no result. Of mammals, the age of the domesticated animals is well known; the camel lives 40 years, the horse 30, the ox 20, the dog 12, the cat 10, the sheep 9, the rabbit 8, the guinea-pig 7, etc. The age of a horse can at any time be determined with tolerable certainty from the appearance of its teeth; that of the ox from the rings on its horns, counting the smooth part for three years and each of the rings around the base for one. The horse gets its foal or milk teeth about 15 days after birth, and at the age of 2½ years the middle pair of these milk-teeth drops, and is replaced by a pair of permanent nippers; at 3½ years the next pair, one of each side, changes; and at 4½ years the last pair. After this time the age can still be determined for several years by the degree in which the circular hollow pit in the centre of each tooth has become effaced by the wearing down of the tooth. Later on, the age is determined by the shape of the tushes or canine teeth. But of non-domesticated animals our knowledge is small and vague, with the exception of a very few cases. In the deer kind the age may be computed from the horns, the number of the antlers, the size of the palms, and the thickness of the burrs. The common stag gets its pricket in its second year; its fork, a pricket with one antler, in its third year, etc. Generally, it seems to be a rule among mammals that their longevity increases with their size. But the age of the elephant, rhinoceros, hippopotamus, etc. is not known. Aristotle says that the elephant lives 200 years, the East Indians say 300; one elephant, whose age was not known when it was captured, lived 130 years in captivity. The age of the whale is computed by the laminæ of whalebone in its jaws; if this computation is correct, it attains at least 400 years. It seems, however, as if among mammals the relation between their longevity and their time of gestation is more constant than that between their longevity and their size.

With respect to the longevity of man, this term must not be confounded with that of the average duration of life. The former refers to the question, How long can the human organism last when, undisturbed by any merely temporary, local, or individual influences, it is allowed to run through its natural course and exhaust its inherent vitality without any merely incidental break or jar? The latter, on the contrary, refers to the question, How long does the human organism actually last under certain given influences of profession, climate, diet, etc.? or, Why do people live longer as agriculturists than as dry-polishers, longer in the valleys of Norway than in the plains of the Wolga, longer in France than in the U. S., etc.? The Bible puts down as the natural term for human life "threescore and ten," and history seems during its whole course to have confirmed this term. When a man dies at 50, he is and always was said to have died early, and when a man lives to 90, he is and always was said to have lived long. The Bible tells us that the patriarchs before the Deluge all lived from six to eight centuries, but the expressions are open to some doubt with respect to their true meaning. But when the Bible tells us that Abraham was 175 years old when he died, Isaac 180, Jacob 147, and Joseph 110, such exceptional prolongations of human life still occur. Cases of longevity exceeding one century are frequently recorded. Two of the highest are Peter Czartan, a Hungarian peasant, 185 years old—b. in 1539, d. in 1724; and Thomas Parr, a native of Shropshire, England, who died of an accident when 169 years old. Charles I. wished to see him; he went to the court, was feasted, ate too much, took a fit of indigestion, and died; but Harvey, who dissected him, declared that but for this accident he could have lived on for many years. These instances of exceptional longevity are not so rare as commonly believed. Thus, from the census taken during the reign of the emperor Vespasian, Pliny enumerates no less than 54 persons who had reached the age of 100 years; 14, 110; 20, 125; 40, 130; 40, 135; and 30, 140; and all these instances are taken exclusively from the region between the Apennines and the Po. They have given rise to some very curious speculations. While the average duration of life everywhere has sunk far below the natural term, and philanthropists, educational and hygienic boards, and governments in general are active to repress the most obvious causes of this alarming state, certain philosophers have directed their attention to the question whether it is possible to prolong the natural term itself, and move the barrier from seventy to one hundred. Haller and Buffon declared that they saw in the nature of the human organism no reason why it should be the rule for man to die at seventy, and not at one hundred. As yet, however, these speculations have not extended beyond good intentions.

Long'fellow (Henry Wadsworth), LL.D., D.C.L., son of Stephen, b. at Portland, Me., Feb. 27, 1807; entered Bowdoin College at fourteen, and graduated in 1825 in a class which included Nathaniel Hawthorne, George B. Cheever, John S. C. Abbott, and several other persons afterwards known in literature. During his college days he distinguished himself in modern languages, and wrote several short poems, published chiefly in the *United States Literary Gazette* at Boston; one of these was the well-known *Hymn of the Moravian Nuns*. After graduation he entered the law-office of his father, but in the following year accepted the professorship of modern languages at Bowdoin, with the privilege of spending three years in Europe in preparation for that post. After studying in France, Spain, Italy, and Germany, he entered upon his professorship in 1829, and began to publish the results of his careful researches into European languages and literature, both mediæval and modern. His first volume was a small *Essay on the Moral and Devotional Poetry of Spain* (1833), which included translations of the *Coplas de Manrique* and of several sonnets of Lope de Vega. A volume of prose sketches of travel appeared in 1835 under the title *Outre Mer, a Pilgrimage beyond the Sea*, and numerous essays and critiques on literary topics were contributed to the *North American Review*. In 1835 he was elected to the chair of modern languages and literature at Harvard University, as successor to George Ticknor, and spent a year in European travel and study, especially in Denmark, Sweden, and Switzerland, cultivating a knowledge of early Scandinavian literature. Entering upon his professorship in 1836, he soon became a resident in the historic Cragie House (Washington's head-quarters), which he afterward purchased and made his home. In 1839 he published *Hyperion, a Romance*, and *Voices of the Night*, his first volume of original verse, comprising the selected productions of nearly twenty years; it procured him immediate recognition as a poet, and the *Psalm of Life* took rank as a popular favorite. *Ballads and Other Poems* and a small volume of *Poems on Slavery* appeared in 1842; *The Spanish Student*, a drama in three acts, in 1843; *The Belfry of Bruges* in 1846; *Evangeline, a Tale of Acadie*, in 1847, the latter being a spirited introduction of hexameter verse, and generally considered as Longfellow's masterpiece. In 1845 he published a large volume of *The Poets and Poetry of Europe;* in 1849 *Kavanagh, a Tale* (in idyllic prose); in 1850 *The Seaside and the Fireside;* in 1851 *The Golden Legend;* in 1855 *The Song of Hiawatha;* in 1858 *The Courtship of Miles Standish;* in 1863 *Tales of a Wayside Inn;* in 1866 *Flower de Luce;* in 1867–70 a masterly poetical translation of *Dante;* in 1869 *New England Tragedies;* in 1871 *The Divine Tragedy;* in 1872 *Three Books of Song;* in 1874 *The Hanging of the Crane;* and in 1875 *Morituri Salutamus*, a poem read at the fiftieth anniversary of his class at Bowdoin College. Prof. Longfellow resigned his chair at Harvard in 1854, but has continued to reside at Cambridge; he travelled in Europe in 1841–42 and 1868–69, on which latter occasion he received the degree of D. C. L. from the University of Oxford, and in 1874 received a large complimentary vote for the lord rectorship of the University of Edinburgh. Some of his poetical works have been translated into many

languages; complete editions have enjoyed wide circulation, not only in the U. S., but in an equal degree in England, where their popularity rivals that of the best modern English poetry. PORTER C. BLISS.

Longfellow (SAMUEL), b. at Portland, Me., June 18, 1819, brother of H. W. Longfellow; graduated at Harvard College 1839, and Divinity School 1846; was first settled in Fall River in 1848; in 1853 became pastor of the Second Unitarian church in Brooklyn, N. Y.; resigned his pulpit in 1860, and went abroad. For years past his residence has been in Cambridge, Mass. Mr. Longfellow still preaches, though he has no parish, and writes, but his publications are not numerous, his health not permitting severe professional labor. In 1846, in association with Rev. Samuel Johnson, he compiled *A Book of Hymns*, which was afterwards revised and called *Hymns of the Spirit;* and in 1859 he published a book of *Hymns and Tunes for Congregational Use*, and a small volume for the vesper service which he instituted. Mr. Longfellow is a poet, and has written many hymns which have a place in other collections than his own. His best essays were printed in the *Radical*, 1866–71. O. B. FROTHINGHAM.

Longfellow (STEPHEN), LL.D., b. at Gorham, Me., June 23, 1775; graduated at Harvard College 1798; studied law; was admitted to the bar 1801; practised successfully at Portland, Me.; was a delegate to the Hartford convention 1814, a member of Congress 1823–25, and became president of the Maine Historical Society 1834. D. at Portland Aug. 2, 1849.

Long'ford, county of Ireland, in the province of Leinster, bounded by the counties of Leitrim, Westmeath, and Roscommon. Area, 420 square miles, with a level or slightly hilly surface, and a fertile soil suited both for tillage and grazing. Some linens and coarse woollens are manufactured. The inhabitants numbered 115,495 in 1841, 82,350 in 1851, 71,694 in 1861, and 64,501 in 1871, of whom 25,972 are unable to read or write. From 1851 to 1872, 31,368 emigrated from this county. Principal town, Longford.

Lon'ghi (GIUSEPPE), b. at Monza, Lombardy, Oct. 13, 1766; studied the art of engraving, partly in Milan and partly in Rome; was appointed professor of the school of engraving in Milan in 1797, and d. there Jan. 2, 1831, celebrated as one of the greatest engravers who ever lived. His most famous works are the *Vision of Ezekiel* and *Sposalizio*, after Raphael; *Magdalena*, after Correggio; *Galatea*, after Albano; and the portraits of Napoleon, Washington, and Dandolo of Venice.

Longi'nus (DIONYSIUS CASSIUS), b. about 213 A. D., probably at Athens; made extensive travels; studied at Alexandria under Plotinus and Ammonius Saccas, and taught philosophy, rhetoric, and grammar in Athens, acquiring great celebrity. The last part of his life he spent at Palmyra, at the court of Zenobia, whose political adviser he was, as well as her teacher in Greek literature. It was partly on his instigation that the queen undertook the famous war against the Romans, and after her defeat Longinus was put to death, in 273 A. D., by the command of Aurelian. Of his numerous writings only fragments are extant, with the exception of his treatise *On the Sublime*, of which the larger part has come down to us, though in a somewhat mutilated condition. The first printed edition was given by Robortello (Bâle, 1554), and it has been often republished; the latest editions are those by Egger (Paris, 1837), Bake (Oxford, 1849), Spengel (Leipsic (1853), and Otto Jahn (1867). It was translated into French by Boileau in 1694, into German by Schlosser in 1781, and into English by William Smith in 1739. It is remarkable, both on account of the subtlety and acuteness of its single remarks and its noble and elevated taste; it has also exercised considerable influence on modern criticism and æsthetics in France, England, and Germany.

Longipen'nes [Lat. *longa*, "long," and *penna*, wing"], a group (sometimes called an order) of Natatores or swimming-birds, including the gulls, terns, albatrosses, and petrels. They are remarkable for their long and often very narrow wings and their great powers of flight. They are also good swimmers, are usually pelagic, but as a rule do not dive under water.

Long Island, the extreme south-eastern portion of the territory of the State of New York, is bounded on the N. by Long Island Sound, E. and S. by the Atlantic Ocean, W. and N. W. by the Narrows, New York Bay, and the estuary called the East River, which connects that bay, through the strait called Hell Gate, with Long Island Sound. The U. S. Coast Survey maps define its situation as between the parallels of 40° 34′ and 41° 10′ N. lat., and its longitude as from 71° 51′ to 74° 02′ W. from Greenwich. The distance from the Narrows (lat. 40° 37′ N., lon. 74° 02′ W.) to Montauk (lat. 41° 04′ N., lon. 71° 51′ W.), which forms its greatest length, is 118½ statute miles. The general distance of this line is N. 74¾° E., or S. 74¾° W., true on the middle meridian.* In shape it strikingly resembles a fish, with its head immediately opposite New York City. In breadth it gradually increases from the Narrows for about 40 miles, reaching its greatest width of 23 statute miles. It then decreases, its least width of 12 statute miles being near the head of Peconic Bay. Its eastern part has a deep indentation, formed by this bay, of about 22 miles in length. Gardiner's, Fisher's, and Plumb islands belong to its political divisions.

Geology, Soil, Climate.†—The geological structure of Long Island is simple, it being composed chiefly of glacial drift. Underneath the drift there probably exists a deep deposit of clay of Tertiary or Cretaceous age, or perhaps of both. The outcrop of the clay occurs at many points along the N. side of the island through upwards of 50 miles, and in many sections is worked with profit. These beds must be distinguished from others of value which occur in depressions upon the surface, but are of recent formation. The bed-rock of the island is probably the same as is visible along the Connecticut shore, but is seen on the Long Island side only at and near Hell Gate. There it is a dark micaceous gneiss. The drift is composed of pebbles and boulders in a matrix of fine material. The boulders are of the same rock found on the mainland northward from where they lie, and the matrix is the same, only finely broken. The boulders are all more or less worn on their surfaces; none have sharp angles or edges; many are covered with glacial scratches; some of them are of immense size, one near Manhasset being 54 feet long, 40 feet wide, and 16 feet high above the surface of the ground. On the S. side of Long Island the drift deposit has been exposed to the action of the ocean, consequently it has been ground to sand, and the fine portions, as of clay, washed out. The sands and gravels thus formed occur in layers, and extend from the foot of the hills in a gentle uniform slope to the present sea-margin, which slope continues from 60 to 75 miles seaward. The process of disintegration is now going on along the shore of Montauk. The central ridge of hills, which extends nearly the length of the island, is of unmodified drift, and the beautiful undulating country northward to the Sound is of the same material, with local deposits of sand and gravel. A peculiarity of the drift is the many bowl-shaped depressions which occur upon the surface. On Montauk and elsewhere many are filled to their brim with clear water; Ronkonkoma and Success ponds are of this kind.

The soil of much of the S. side of the island is sandy, but is easily cultivated; portions, like that of the great Hempstead Plains, are covered with a thick accumulation of organic matter, and are very fertile. The soil of the unmodified drift is loam, rich, productive, retentive of moisture, and of vegetable nutrition.

The climate of Long Island will appear from the following tables:

At East Hampton, for 24 Years ending 1850.

Mean annual temperature.........	48.74°
Highest "	95°
Lowest "	–8°
Rainfall, mean.........................	38.60 inches.
Average date of earliest frost, Oct. 23.	
Mean of clear days each year	246
" cloudy " "	119

At Erasmus Hall, Flatbush, 24 Years.

Mean annual temperature..............	51.62°
" rainfall.....................	42.74° inches.
Highest temperature.....................	96°
Lowest "	–4°

Union Hall, Jamaica, 25 Years.

Mean temperature..........................	49.87°
Highest "	100°
Lowest "	–7°
Annual rainfall.............................	39.07 inches.

The Great South Bay and other bays extend along its southern border within the outer beach, being about 90 miles long by from 2 to 5 wide, supplied by inlets from the sea, and navigable by small craft. These bays are of vast service to the island in their large supplies of scale and shell fish and seaweed for manures. An act exists to connect and improve these bays by a canal. The coast on the N. side is indented with bays of greater depth, affording safe harborage for vessels of the largest size. Fine sporting is to be had at the proper seasons, as numerous varieties of wildfowl and some deer yet inhabit the forests and thickets of Suffolk county. The Sound is a superb ex-

*Memoranda of C. A. Schott, Esq., of the Coast Survey.
†From data furnished by Elias Lewis, Jr.

panse of water, affording fine prospects from the cliffs of the N. side, and bearing upon its bosom at all times an immense fleet of shipping. Its channel is suited to vessels of the largest draught, and when cleared of the rocky obstructions at Hell Gate by the operations so far successfully executed by Gen. Newton (see HELL GATE, EXCAVATIONS AT) will afford the safest entrance and widest harborage for the commerce of New York. Fifteen lighthouses and thirty life-boat-stations guard property and life on the sea and Sound.

The island is as well timbered as at the time of its discovery, notwithstanding the large clearings of settlers and the ravages of desolating fires from the sparks of the locomotives. The unmodified drift has forests of oak, hickory, and chestnut, and the sandy tracts bear pines of several species. A range of hills runs through the island. Of these, Hempstead Harbor Hill, at Roslyn, is the highest, being 384 feet above the sea; West Hills in Suffolk is 384 feet; elevation at Wheatley, 335 feet; at Reuland's, near Coram, 340 feet; Fort Pond at Montauk is 194 feet. On the S. side, Coney Island, Rockaway, Quogue, Southampton, and Easthampton are popular watering-places, much frequented in the heats of summer. Steamboats ply to all navigable points. Large tracts of land, held for two centuries past in their wild state, have recently been thrown open to improvement. The plain lands of Hempstead, comprising about 12,000 acres, have been sold to Alexander T. Stewart, who has founded thereon a city called Garden City, with a fine hotel and a large number of residences. Through this the Central R. R. passes to Hempstead and Babylon. The common lands of Huntington and others embraced in the Nicolls patent in Suffolk county have been opened. Upon these are founded the villages of Brentwood, Lakeland, Holbrook, and Breslau.

Counties, Towns, and Population.—Long Island is divided into three counties, Kings, Queens, and Suffolk. The following table gives the population of each county and the population of the towns of which it is composed. It should be remarked that an effort is now (1875) making for the organization of a new county from portions of Queens and Suffolk. The entire population of the island in 1870 was 540,225, and its entire area 927,900 acres—viz. Kings, 48,800 acres; Queens, 253,100; Suffolk, 626,000.

County.	Population in 1870.	County.	Population in 1870.	County.	Population in 1870.
KINGS	419,497	QUEENS	73,803	SUFFOLK	46,924
Cities and Towns:		*Cities and Towns:*		*Towns:*	
Brooklyn	396,105	Flushing	14,650	Brookhaven	10,159
Flatbush	6,309	Hempstead	13.999	East Hampton	2,372
Flatlands	2,286	Jamaica	7,745	Huntington	10,704
Gravesend	2,131	Long Island City }	20,274	Islip	4,597
New Lots	9.800	Newtown }		Riverhead	3,461
New Utrecht	3,296	North Hempstead	6,540	Shelter Island	645
		Oyster Bay	10,595	Smithtown	2,136
				Southampton	6,135
				Southhold	6,715

Principal Cities and Villages.—Aside from Brooklyn, the capital of Kings co., which had in 1870 a population of 396,105, and in 1875, 512,000, the only other considerable villages in Kings co. were East New York in the town of New Lots, and Flatbush in the town of Flatbush. The population of each was between 7000 and 10,000 in 1875. In Queens co., Long Island City, with perhaps 15,000 inhabitants; Flushing, with about 8000 or 9000; College Point, with somewhat over 5000; Jamaica, with 5000 or 6000; Hempstead, with about 3500; Garden City, Woodside, and Whitestone—are the principal cities and villages. In Suffolk co. there are no cities; the principal villages are—Huntington, Greenport, Sag Harbor, Bridghampton, Riverhead, Babylon, Bay Shore, Sayville, and Northport.

Railroads.—The following table gives the railroads, with their length, cost, etc.:

Railroad.	Length in miles.	Cost per mile.	Capital stock.	Floating and funded debt.
		$	$	$
Long Island, with branches	174	31,191	3,000,000	1,625,000
North Shore	11	48,088	193,445	141,000
Southern, late South Side	68	51,560	1,000,000	2,636,781
Flushing and Central (A. T. Stewart's)	42	66,356	223,280	1,116,598
Flushing and North Side	22	103,044	281,000	1,382,227
Smithtown and Port Jefferson	16	111,737	196,350	600,000
New York and Rockaway	14	....	100,000	250 000
Newtown and Flushing	6	....	8,540	150,000
Bay Ridge Hempstead and Jerusalem	16	unfin.		
Brooklyn and Newtown	15.5	41,157	400,000	208,829
Brooklyn and Jamaica	11.75	33,668	175,800	84,332
Brooklyn and Canarsie	10			
Brooklyn and Coney Island	10.2	64,736	500,000	262,593
Brooklyn Bath and Coney Isl.	7	30,340	....	80,000

There are in Brooklyn nearly thirty city railroads, and others projected for rapid transit, and in several of the towns of Kings and Queens cos. there are also street railways.

The island has an Indian, Dutch, and English history. Its Dutch name was "Lange Eylandt," converted into Long Island by the English, who in 1693 by law changed it to the "island of Nassau," which latter name never came into popular use. Its Indian names were Paumanacke, Sewanhacky, Wamponomon, and Matouwacks, the last term applied to the region of Montauk. After the Dutch discovery in 1609, James I. in 1620 granted to the Plymouth Company all the land between 40° and 48° N. lat., extending through from the Atlantic to the Pacific. This includes Long Island and the adjacent islands. By request of Charles I., the Plymouth Company granted a patent to Alexander, Earl Stirling, of the island and the adjacent islands, and appointed James Farret his attorney to sell, mortgage, or lease the lands. The earl died in 1640. His son and heir in 1640 surrendered the patent to the duke of York. Actual settlements began at the E. and W. nearly at the same time—at Gowanus (Brooklyn), Kings co., in 1636; Gardiner's Island, Southhold, and Southampton in 1640; Hempstead in Queens in 1643. The island was occupied by about fifteen tribes or settlements of Indians, and was a great manufactory of wampum from the abundance of the quahog or hard-shell clam. All of these have passed away, except some 200 Shinnecocks, a mixed breed of blacks and Indians in Southampton, and a few families of Montauks (who yet claim to elect a king) on the Indian reservation at Montauk. While there is proof that the island was coasted and the bay of New York visited by the Florentine navigator Verrezzano in 1524, and that some of his sailors penetrated to its interior (see J. C. Brevoort's *Verrezzano*, p. 41), Coney Island, part of its shore and sandy beach, is more clearly indicated as the first point at which a boat's crew from Hendrick Hudson's yacht, Half-Moon, went ashore on his memorable voyage in 1609, which opened the region to settlements. These began in 1611, when New Amsterdam was made a trading-post by the Dutch. They extended over upon the opposite shore of Long Island as soon as the settlers felt justified in quitting the fort at the Battery, which protected them from Indian forays. The first land-grant on Long Island was by purchase from the Indians by Jaques Bentyn and Adrianse Bennet in 1636 of a tract of 930 acres in the S. part of the present city of Brooklyn, along Gowanus Cove to the New Utrecht line. The first house known to have been erected on Long Island was that of Adrianse Bennet upon this tract, probably just after its purchase, as in 1643 it was burnt by the Indians in the war of that time. In 1637, George Jansen de Rapalje made a purchase also from the Indians, at the Wallabout, of a tract of 325 acres, which he did not, however, occupy till 1654. The statements of his earlier residence, and that his daughter Sarah was the first female child born upon Long Island, have been proven incorrect by modern research, as she was born at New Orange (Albany) prior to her removal to New Amsterdam, and thence to Brooklyn. The first male child born in the New Netherlands was Jean Vigne, born at New Amsterdam 1614. The first female child born in Suffolk co. was Elizabeth, daughter of Lyon Gardiner, on Gardiner's Island, Sept. 14, 1641.

This island, being the natural outwork and gateway against invasion, bore the brunt of the first strategic or pitched battle of the Revolution, the battle of Brooklyn or Long Island. (See Stiles's *Brooklyn*.) This battle was fought on the 26th, 27th, and 28th Aug., 1776, with 17,000 British and Hessians against 6000 Americans, and resulted in the defeat of the Americans. Washington, however, saved the army by his masterly retreat in boats to New York, in the face of the enemy, screened by a thick fog. The island suffered greatly by incursions from the main land, by British vessels, and the occupation by troops till the peace. In the recent civil war the three counties sent their full quotas and took an active and patriotic part. A. J. SPOONER.

Long Island, an island of Suffolk co., Mass., in the harbor of Boston. Pop. 64.

Long Island City, city of Queens co., N. Y., on the East River, opposite the upper part of New York City, Blackwell's Island lying between, has 14 churches, 3 weekly newspapers, 4 public schools, and numerous manufactures, hotels, and stores; was recently a part of Newtown, but was incorporated in 1870, and now comprises Hunter's Point, Ravenswood, Astoria, Blissville, and Dutch Kills. It is the terminus of the Long Island, the Flushing, and the North Side R. Rs., has 2 post-offices, waterworks, and a county court-house in construction. Pop. 3867, increased since the census. RANDOLPH BOTTS, ED. "NEWS."

Long Island Plantation, tp. of Hancock co., Me. Pop. 177.

Long Island Sound, an arm of the Atlantic Ocean between Long Island and the State of Connecticut, 115 miles long and generally 20 or 25 miles wide. A chain of small islands extends N. E. from Long Island across the Sound to the S. W. of Rhode Island. The Sound is an important thoroughfare for steamers and coasting vessels, and when the channel of the East River at Hell Gate shall have been sufficiently improved, the largest ships will be able to reach New York harbor with ease and safety through the Sound. It has important fisheries.

Lon'gitude, Terrestrial [Lat. *longitudo*, "length"]. The longitude of a point on the earth is the angle between the meridian plane through that point and the meridian plane through some other point, taken for the origin of longitudes. This angle is measured by the part of the equator intercepted by the meridians, and may be expressed in angular measure or in time, as we suppose the equator divided into 360° or into 24 hours. The origin oftenest used by English-speaking peoples is the Greenwich Observatory. Any plane through the earth's polar axis cuts out of the celestial vault (supposed spherical and very distant) an hour-circle. If it passes through a point on the earth's surface, it is the meridian plane of that point, and cuts the earth's surface and the celestial vault in the terrestrial and celestial meridians. The latter, moving with the earth's rotation, sweeps from W. to E. over the heavens every twenty-four hours. The angle included at any instant between the plane of the meridian at a place and the plane of an hour-circle through any point of the heavens is the hour-angle of that point. If the point be the vernal equinox, its hour-angle expressed in time at any place at a given instant is the local sidereal time; while if the point were one called the mean sun (which starts from the vernal equinox with the true sun, and moves in the equator with his mean motion), its hour-angle is the local mean solar time.

From these definitions it follows that at any instant the difference of local times at two places is their difference of longitudes, since each difference is the angle between the meridian planes of the two places. The problem of terrestrial longitudes is then to find at any instant of absolute time the difference of the local times of two places. It requires, first, the determination of the local time at each place; second, the comparison of those local times at some instant.

There are many methods of determining local time, but as they will be considered elsewhere, only the one which is theoretically simplest will be given here. As already indicated, it is 0*h.* 0*m.* 0*s.* sidereal time when the vernal equinox crosses the meridian, and a clock so adjusted as to work 0*h.* 0*m.* 0*s.* at that instant, and to count twenty-four hours between two such crossings, is a sidereal clock. Such a clock will at any instant give the hour-angle of the vernal equinox. Now, the angle between an hour-circle through any point in the heavens, and the hour-circle through the vernal equinox counted eastward from the equinox, is called the right ascension of the point. Hence, if the sidereal clock is perfectly correct, when a star crosses the meridian the clock-time will be its right ascension, since the latter is then equal to the hour-angle of the vernal equinox. The *Nautical Almanac* gives for every tenth day in the year the right ascensions of a number of stars. If the instant by the sidereal clock at which one of these stars crosses the meridian be noted, the difference between that time and the star's tabular right ascension is the error of the clock.

The ordinary method of determining the time a star crosses the meridian is by a transit instrument. This is a telescope so mounted that its line of sight is perpendicular to an axis about which it turns. That axis has supports which can be so adjusted that it is perpendicular to the plane of the meridian; then the line of sight, marked in the telescope by spider lines, will move very nearly in the plane of the meridian. Its small deviations from that plane can be measured and allowed for. Hence, an observer looking through the transit instrument can determine the precise clock-time a star crosses his meridian, and the error of his clock; and by adding the clock-error to the clock-time he has the local sidereal time. The precision of these time determinations is astonishing; the probable error in a time determination from one star with a good instrument should be but about a tenth of a second, and when several stars are observed it should be but a few hundredths of a second.

One of the many methods of determining local time having been briefly sketched, the problem proper of terrestrial longitudes may be next considered. As already stated, it is to determine at the same instant of absolute time the difference of local times at two places.

A. If observers at different places note by their clocks the occurrence of some instantaneous phenomenon visible at the same instant to both, the difference of the clock-times corrected for clock-errors is the difference of longitude. (*a*) Thus, two observers many miles apart may determine with precision by star transits the errors of their timepieces, and then observe repeatedly at night the instant some powder is flashed on a hill visible to both. From many flashes the difference of longitude can be obtained with great accuracy. In the work of the U. S. Lake Survey flashes made with a pound of powder have been observed for longitude at a distance of 100 miles. (*b*) When in a lunar eclipse the moon passes into the earth's conical shadow, and again emerges, the phenomena are seen at the same time by all persons to whom they are visible. Unfortunately, it is difficult to fix the instant when the moon enters or leaves the shadow, as the earth's shadow is not sharply defined on the moon, and the errors in estimating the time may amount to a minute. The eclipses of Jupiter's satellites are seen by all observers at the same instant, and that of the first, which has a rapid motion, is best fitted for precise observation. But, as in the case of the moon, though to a less degree, the gradual disappearance of the satellite makes it difficult to observe the time of disappearance with precision. That time varies with the power of the telescope used. The Washington times of immersion and emersion are given in the *American Nautical Almanac*. Shooting stars have also been proposed as signals to be observed for difference of longitude.

B. There are several methods of determining differences of longitude, depending on the fact that the moon has a relatively rapid motion among the stars. If observers at two points determine some co-ordinate of the moon's position as seen from the centre of the earth, and also their local times, the change in this co-ordinate in passing from one meridian to the other is determined; and from this change and the known rate of change the time required for so much change can be computed. This time is the difference of longitude. It may be said here that while two observers are constantly spoken of, in practice one observer, supposed to be stationed at a fixed observatory, is replaced by a nautical almanac, giving the results he should obtain in all cases save those in which the highest accuracy is required. (*a*) If at two places observers note the sidereal time of the moon's transit, thus determining the moon's right ascension at those transits, then from the difference of the right ascensions and the moon's known rate of change in right ascension the time required for so much change, which is the difference of longitude, can at once be found. To avoid trusting the clock for several hours, it is usual to observe the transits also of several well-determined stars near the moon, deducing the moon's right ascension from theirs by applying the differences of times of transit to the right ascensions of the stars. This is the method of *lunar culminations*. The moon's average change of right ascension is about one second of time in twenty-seven seconds, so that an error of 0.1*s.* in its observed right ascension would give 2.7*s.* error in the resulting longitude. Prof. Peirce estimates the limit of accuracy of this method, no matter how great the number of observations, at (1*s.*) one second of time. Instead of determining the moon's right ascension by meridian transits, it may be obtained from transits across a near vertical circle, or by observing its altitude or azimuth. (*b*) Another method depends on the moon's whole motion, instead of on that in right ascension alone. The *Nautical Almanac* gives for every three hours Greenwich time the distance of the moon from several fixed stars, some of the planets, or the sun as seen from the earth's centre. If an observer at any point measures one of these angular distances with a sextant, and also the altitudes of the two bodies, he can compute their distance at the moment of observation as seen from the centre of the earth. Should this corrected distance agree with one in the *Nautical Almanac*, the corresponding time in the *Almanac* is the Greenwich time of his observation, and the difference of that time from his local time is the longitude. Should his observed distance fall between two tabular distances, he can find the corresponding Greenwich time by interpolation. This is the method of *lunar distances*.

C. If at any place on the earth whose position is approximately known the phases of a solar eclipse be observed, the corresponding time at a known meridian can be computed, thus giving the difference of longitude. The same is true of occultations of stars by the moon. The data for both are given in the *Nautical Almanac*. Occultations of Jupiter's satellites by the planet, their transits across his disk, and the transits of their shadows are similar phenomena, and may be used in determining longitudes.

D. Another method of determining differences of longitude is that by transportation of chronometers. The error of a chronometer is the amount by which it is fast or slow of true time, and its rate is the amount it gains or loses in twenty-four hours. A perfect timekeeper is one whose rate is constant. If a perfect timekeeper were compared with the true time at Greenwich, and then taken to any other part of the world, from its error and rate at Greenwich before starting the true Greenwich time at any instant could be computed, and its difference from the local time of the traveller's position would be the difference of longitude. So important is this method to sailors that the English Parliament gave $100,000 to Harrison, who first made chronometers with a tolerably steady rate. But as no rate is perfectly constant, and as a travelling rate usually differs from the rate when at rest, when the greatest accuracy is required the chronometer is carried back to the starting-point, so that its travelling rate becomes known. By using many chronometers and making many trips accuracy can be obtained if the distance is not too great. Struve found the difference of longitude of Pulkova and Altona to be 1*h*. 21*m*. 32.52*s*., with a probable error of only 0.04*s*. by seventeen trips of 81 chronometers. Bond determined (1849) the difference of longitude of Liverpool and Cambridge, Mass., from 175 chronometers, and again (1855) from 52. The results differed by 1.23*s*. An idea of the accuracy of timepieces may be obtained from the following: Of 42 chronometers submitted to the six months' trial before purchase at Greenwich in 1871, on taking the average of the daily rates for each week it was found that for the best 5 chronometers out of the 42, the greatest difference of the average rates was for any consecutive weeks 0.7*s*., and for any weeks whatever in the six months, 1.7*s*. In 1870 for the best 5 out of 35 these quantities were 0.9*s*. and 1.9*s*. The rate of the Kessel's clock of the Washington Observatory from Aug. 24, 1871, to Dec. 27, 1871, varied between 0.22*s*. losing and 0.39*s*. gaining.

E. Of all methods of determining differences of longitude, that by telegraphic signals, especially over long lines, is the most precise. The following is the simplest form of the method. Every one understands that a telegraph operator by pressing on a key can make a click on an instrument at a distant station. If the local time of pressing on the key at the first station and of the click at the second station (supposed to be produced instantly) be observed, the difference of those local times is the difference of longitude. It takes a few thousandths of a second for the signal to travel to a distant station, and a few thousandths of a second to make the click, so that if the second station is W. of the first the resulting difference of longitude is too small by these small quantities. But if, retaining the same adjustments and equal battery strength, signals be sent from W. to E., the resulting longitude will be as much too large, and the mean of the two values will be correct. This simple method, requiring, first, the precise determination of local times, second, their comparison (which should be repeated several times) by the telegraph line, gives a higher precision over long lines than any of the preceding. It involves, however, the estimation of fractions of a second by the ear in receiving signals which may be sent in coincidence with the beats of the timepiece. The difficulty may be avoided by using a mean solar timepiece at one station and a sidereal at the other. The sidereal gains on the mean solar a second in about six minutes, and so often the beats will coincide. As the time of perfect coincidence can be determined within ten or fifteen seconds, the error in comparing the timepieces is only 15 seconds divided by 360, or $\frac{4}{100}$ths of a second. Still higher precision is reached by causing the timepiece to make or break the circuit at each beat, instead of requiring the observer's finger to do it. It is effected by causing the pendulum in a clock or a wheel in a chronometer to lift a small piece of metal through which the circuit passes, thus breaking it once a second. The method becomes perfect when in addition each timepiece is made to write its own record of time, thus avoiding the necessity of noting signals received by the ear. Recording is accomplished in the simplest way by the Morse register. Every one has seen the long strips of paper on which by dots and dashes telegraphic messages were formerly written. These strips of paper were made to move by clockwork uniformly, under a point that could from time to time be dropped upon them (by the operator at a distant station), making a mark. Replacing the operator by a clock which sends signals once a second, there can be made a series of points on the paper one second apart in time. If the observer at either station wishes to record any intermediate event, such as a star transit, he taps his key, and a dot intermediate to the seconds dots is made; the corresponding time can be read with a scale from the paper strip to 0.02*s*. Such an instrument for recording a time-scale is called a chronograph. If while the timepiece at the first station is writing its beats on the chronograph at the second the observer at the second makes his clock write its record on that chronograph, the difference of times of the two clocks can at once be read from the paper. Reading off these differences in many places, correcting them for clock-errors, and using signals sent from both stations, the mean result will be the difference of longitude. The form of chronograph which has been most used in this country is that of Bond. A sheet of paper is wrapped around a horizontal cylinder turned on its axis by clockwork once in a minute. A pen on a carriage moves slowly along this cylinder, tracing thus a spiral on it. Clock or other signals demagnetize a magnet connected with the pen, so that a spring can move the pen for an instant at right angles to the spiral when the signal is sent, thus writing it on the chronograph sheet. Steadiness of movement is obtained by an ingenious device called the spring governor.

By the telegraphic method differences of longitude can be determined so precisely that their probable errors do not exceed a few hundredths of a second of time. When two stations are not too far apart, so as to require long use of the telegraph line and steady clock-rate for hours, each observer may register on the chronograph all his star transits, the same stars being used at both stations. After correction the interval between such transits of the same star on the chronograph sheet is the difference of longitude, free from any error in the right ascensions of the stars used.

Different observers differ in their estimate of the time a star crosses a spider-line, whether the observation is chronographic or by eye and ear, the difference sometimes amounting to a second for the latter method. Hence, before comparing clocks whose errors have been found by different observers, this difference, called *personal equation*, must be taken into account. It appears to arise from different habits of observing, physiological conditions, character of telescope, rate of star's motion, etc., and is not entirely constant for the same two observers.

To show the errors which may still remain in longitudes determined from many observations and with great care by other methods than the telegraphic one, the following values of the longitude of the Naval Observatory, Washington, are given. The telegraphic value is undoubtedly very nearly correct, having been obtained by the Coast Survey by three routes, whose results agree closely:

Longitude of Washington.

Telegraphic..............................		5*h*. 08*m*. 12.39*s*.
Moon culminations........	1846–60,	5*h*. 08*m*. 11.6*s*.
" "	1862–63,	5*h*. 08*m*. 9.8*s*.
Bond, 175 chronometers.	1849,	5*h*. 08*m*. 12.26*s*.
" 52 "	1855,	5*h*. 08*m*. 13.49*s*.
Occultations of Pleiades.	1856–61,	5*h*. 08*m*. 13.13*s*.

References.—Loomis's *Practical Astronomy;* Chauvenet's *Astronomy; Coast Survey Reports*, 1856–67; Bruhns, *Langen-Differenz* (Bonn-Leiden); Plantamour, *Différence de Longitude entre Righi-Kulm et Neuchatel.* C. B. COMSTOCK.

Long Lake, tp., Grand Traverse co., Mich. Pop. 333.

Long Lake, tp. of Watonwan co., Minn. Pop. 225.

Long Lake, post-tp. of Hamilton co., N. Y., in the Adirondack region. Pop. 280.

Long Marsh, tp. of Clarke co., Va. Pop. 1423.

Longmead'ow, post-tp. of Hampden co., Mass., on the E. bank of the Connecticut River, and on the New York New Haven and Springfield R. R., 4 miles S. of Springfield, is a beautiful and fertile town, producing large quantities of tobacco, hay, and grain, and has 4 churches and large quarries of red sandstone. Pop. 1342.

Long'mont, post-v. of Boulder co., Col., on the St. Vrain River and the Golden and Julesburg R. R., 40 miles N. of Denver and 17 miles N. E. of Boulder City, was laid out in 1871, since which time it has rapidly increased in population, being in the midst of a fine agricultural region. It is well built, having broad streets, good buildings, 3 churches, 2 schools, 1 hotel, 1 banking-house, a public library; and the projected railroads will make it a central and important point of Colorado. Pop. in 1875, about 1000.

Longobards. See LOMBARDS.

Long Point, post-v. and tp. of Livingston co., Ill., on Long Point Creek and the Chicago Pekin and South-western R. R. Pop. 970.

Long Prairie, post-v., cap. of Todd co., Minn., 25 miles W. of Little Falls. Pop. of tp. 643.

Long Prairie, tp. of Mississippi co., Mo. Pop. 697.

Long'street (Augustus Baldwin), LL.D., b. in Augusta, Ga., Sept. 22, 1790, son of William; prepared for college under Rev. Moses Waddell, D. D., at his school at Willington, S. C.; graduated at Yale College in 1813; studied law under Judges Reeve and Gould at their law-school at Litchfield, Conn., and was admitted to the bar in Richmond co., Ga., in 1815, but established himself in Greensboro', Ga., where he soon rose to eminence in his profession; was in 1821 elected to the general assembly of the State, and promoted to the bench in the Ocmulgee judicial circuit in 1822, which he soon resigned, removing to Augusta; continued the practice of the law and established the Augusta *Sentinel*, consolidated in 1838 with the Augusta *Chronicle*, taking the title of the *Chronicle and Sentinel*, which is still (1875) a leading political journal. Entering the ministry, he joined the Methodist Episcopal conference in 1838, and was assigned to the church at Augusta for the next year. During this period of his ministerial duties Augusta was severely afflicted with yellow fever, but he, with his associates, Rev. Caleb W. Key and Rev. Father Barré of the Catholic church, remained at his post, faithfully ministering to the spiritual and the physical wants of the sick and the dying; in 1839 was elected to the presidency of Emory College at Oxford, Ga., which position he filled with great ability until 1848, when he accepted a similar post in Centenary College, La., and shortly afterwards in Mississippi University at Oxford, Miss. He became president of the South Carolina College in 1857, and just before the war returned to the presidency of the University of Mississippi. He attended the General Conference of the Methodist Church of the U. S. in New York in 1844, and acted a conspicuous part in that body in the discussions of the case of Bishop Andrew, which ended in the rupture of the Church. With his most devout piety, Judge Longstreet was always a decided politician. Reared in the Jeffersonian school of strict construction and State Rights, he adhered inflexibly to those principles in all that he wrote or spoke until the time of his death. He also possessed a wonderful taste for humor, of which the marked exhibitions that contributed to his fame were so delicately done, and with such a moral tone, as not to detract in the least from his clerical office. This was one of the most striking features in his varied and extraordinary character. His *Georgia Scenes* (1840) and *Master William Mitten, or the Youth of Brilliant Talents who was Ruined by Bad Luck* (1858), stand among the first works of American wit and humor. Among his graver writings may be mentioned his sermon on *Infidelity* before the Young Men's Christian Association, *Letters from Georgia to Massachusetts*, *Letters to Clergymen of the Northern Methodist Church*, and *A Review of the Decision of the Supreme Court of the U. S. in the case of McCulloch* v. *The State of Maryland*. His pen was never idle. Up to the time of his death he was a regular contributor to a number of periodical publications. Many of his valuable unpublished manuscripts were destroyed with his library during the war. D. at his home, Oxford, Miss., after only a few days' illness, Sept. 9, 1870.
A. H. Stephens.

Longstreet (Gen. James), b. in South Carolina in 1820; removed at an early age with his parents to Alabama, from which State he was appointed to the U. S. Military Academy in 1838; graduated in 1842, entering the army as lieutenant of infantry, and after a few years of routine life in garrison and on the frontier in the South-west, the threatened troubles with Mexico called him into more active service. From the occupation of Texas he was engaged in all the principal battles of the war up to the storming of Chapultepec, where, in the assault upon the castle, he received severe wounds. For Contreras and Churubusco he was brevetted captain, and major for Molino del Rey. As adjutant of his regiment he served mostly on duty at frontier posts in Texas (1847–52), when he was appointed captain, but remaining in Texas until transferred to the staff in 1858 as paymaster, with the rank of major. In June, 1861, Longstreet resigned to join the Confederacy, and commanded a brigade at Bull Run the following month. Promoted to be major-general in 1862, he thereafter bore a conspicuous part and rendered valuable service to the Confederate cause. In command of the rear-guard of the army falling back from Yorktown, he had passed through Williamsburg May 5, 1862, when he was called back to oppose the hastily advancing Union forces, a battle lasting nearly nine hours resulting, thus allowing the escape of the main army to Richmond, himself following rapidly under cover of night. At Seven Pines he directed the main attack, and in the subsequent fighting at Gaines's Mill, Frazier's Farm, Malvern Hill, etc. his division fought bravely, losing nearly one-half its numbers in killed and wounded. At the second battle of Bull Run he skilfully made the passage of the Thoroughfare Gap, and on the second day held the right of the line and contributed largely to the success of the day. At Antietam he commanded the right wing; the left at Fredericksburg, where the assault was so fatal to the Federal army. After the latter battle he was temporarily detached with three divisions of his corps to operate below the James, and in April attacked Gen. Peck at Suffolk, Va., which place he invested until recalled by Gen. Lee after the battle of Chancellorsville. In the organization of the army with which it was designed to invade the North, Longstreet was assigned to the command of one of its three corps, with the rank of lieutenant-general, and in the ensuing battle of Gettysburg commanded the right of the line during the second and third days of the fight. The importance of impending operations in the West caused Lee, who felt secure against attack, to again detach Longstreet, and on this occasion the change was timely and precious, for he arrived with his corps in time to decide the fortunes of the day at Chickamauga. The following month Bragg assigned Longstreet to lead a movement against Burnside in East Tennessee, and in November he compelled that officer to seek the intrenchments of Knoxville with his army, which place Longstreet beleaguered, but was compelled to abandon the siege upon Grant's victory at Chattanooga, and hastily moved eastward to Virginia, where he rejoined the army of Gen. Lee; in the ensuing campaign he was severely wounded by his own troops in the Wilderness battle (May 6), and disabled for months. Returning to duty in October, he commanded the defences of Richmond N. of the James, and was partially engaged in the action around Petersburg the day of evacuation. The war ended, Gen. Longstreet accepted the result, and having renewed his allegiance to the general government, has labored earnestly to obliterate all traces of war, and promote an era of good feeling between all sections of the country. Taking up his residence in New Orleans, he was appointed (in 1869) surveyor of the port, and has been a school commissioner. In 1875 he settled in Georgia. G. C. Simmons.

Longstreet (William), b. in New Jersey in 1760, but in early life moved to Augusta, Ga. He was by nature a genius, and but for the want of means might have won the laurels which the more fortunate Fulton secured in the application of steam to the propulsion of boats on navigable waters. As early as Sept. 26, 1790, he addressed a letter to Thomas Telfair, governor of Georgia, stating that his plan was completed, and expressing his "thorough confidence in its success" if he had means to perfect it. These he asked of the governor or the legislature, to which the matter was submitted. No action, however, was taken. This was three years before Fulton's letter to the earl of Stanhope announcing his ideas "respecting the moving of ships by the means of steam." Longstreet's plan was very different from Fulton's. Failing in obtaining public aid at the time, several years afterwards he procured funds from private sources, which enabled him to put his boat in operation on the Savannah River, and it moved against the current of the stream at the rate of five miles an hour a few days after Fulton's like success on the Hudson in 1807. He also invented and patented the "breast roller" of cotton-gins, which was of incalculable value to the growers of the long staple or sea-island cotton. D. in Georgia in 1814. A. H. Stephens.

Long Swamp, tp. of Berks co., Pa. Pop. 2910.

Long'ton, town of England, county of Stafford, in the district called "the Potteries," on an affluent of the Trent, has 19,748 inhabitants, mostly engaged in the manufacture of china and earthenware.

Longton, post-v. of Howard co., Kan., on Elk River, 30 miles W. of Morehead Station. It has 1 newspaper.

Longueil, post-v. cap. of Chambly co., Quebec, Canada, on the S. side of the St. Lawrence, 3 miles from Montreal, connected by steam-ferry with Hochelaga. Pop. 2083.

Lon'gus, a Greek Sophist of the fourth or fifth century of our era, but of whose personal life nothing is known, was the author of a small erotic novel, *Daphnis and Chloe*, which has come down to us. It was first printed at Florence (1598) by Columbianus. One of the latest and best editions is that by Hercher (Leipsic, 1835). It was translated into English by G. Thornley (London, 1657).

Long Valley, post-tp. of Lassen co., Cal. Pop. 135.

Long Valley, a v. of Washoe co., Nev. Pop. 45.

Long'view, post-tp. of Ashley co., Ark. Pop. 432.

Longview, post-v. of Gregg (formerly Upshur) co., Tex., situated at the junction of the Texas and Pacific with the International and Great Northern R. R., on the Sabine River, 66 miles W. of Shreveport, in one of the richest,

best-timbered, and most healthful regions of the State, has 4 churches, 2 weekly newspapers, 1 banking-house, several schools, and nearly 40 saw-mills in the vicinity, from which, with the cotton crop, it derives its prosperity. It is a shipping-point of recent growth, incorporated in 1871. Pop. about 2000. E. M. RAGLAND, ED. "REPORTER."

Long'worth (NICHOLAS), b. at Newark, N. J., Jan. 16, 1782; settled in 1803 in Cincinnati, and studied law with Jacob Burnet; after twenty-five years' legal practice left the bar, having become wealthy, chiefly by the rise in value of his lands; devoted himself with great ultimate success to the wine-manufacture. His still and sparkling catawba wines acquired much reputation. He was widely known as an observer and writer upon the growth of the strawberry, was somewhat eccentric in his habits, and took especial pleasure in bestowing charities upon vagabonds, whom he called "the devil's poor." His estate at his death was valued at $15,000,000. D. at Cincinnati Feb. 10, 1863.

Long'year (JOHN W.), b. in Shandaken, Ulster co., N. Y., Oct. 22, 1820; was educated at Lima, N. Y.; removed in 1844 to Mason, Ingham co., Mich., where he was admitted to the bar 1846; settled at Lansing 1847, and gradually acquired an extensive practice; was a member of Congress 1861–65, a delegate to the Loyalist convention at Philadelphia 1866, a member of the State constitutional convention of Michigan 1867, and was appointed judge of the district court of Michigan May, 1870. His decisions in that capacity, especially those in admiralty and bankruptcy cases, were extensively quoted, and regarded as very able and judicious. D. at Detroit Mar. 10, 1875.

Loni'go, a considerable town in Northern Italy, in the province of Vicenza. Its trade is chiefly in wheat and horses. At the annual fair in March 2000 horses are sometimes brought to market. Pop. in 1874, 9185.

Lönn'rot (ELIAS), M. D., b. Apr. 9, 1802, at Sammatti, Finland; apprenticed first to a tailor, then to a druggist; commenced in 1822 the study of philology and natural science at the University of Åbo, then that of medicine at the University of Helsingfors in 1827; took his degree in 1832; began practice as a physician at Kajuna in 1833, and was appointed professor of the Finnish language and literature at the University of Helsingfors in 1853. By his rare talents and still rarer energy he not only rendered great service to linguistic science in general, but made the Finnish, which had been relegated to the lower classes of the people, a literary language, displaying an individual civilization. Travelling on foot from the Gulf of Finland to the White Sea, he gathered the songs and tales which lived among the Finns without ever having been written down, and the results were the *Kalevala*, the *Kanteletar*, and two large collections of proverbs and enigmas. (See FINNISH LANGUAGE AND LITERATURE.) He also gave a Swedish-German-Finnish dictionary (1847), founded Finnish monthly and weekly periodicals, and wrote a number of valuable essays on subjects relating to the Finnish, Lappish, and kindred languages.

Lonoke', county in E. Central Arkansas, formed in 1873 from portions of Prairie and Pulaski cos., bounded N. by Cypress Bayou. It is a fine agricultural and well-timbered region, traversed by the St. Louis Iron Mountain and Southern and the Memphis and Little Rock R. Rs. Cap. Lonoke.

Lonoke, post-v. and tp., cap. of Lonoke co., Ark., on the Memphis and Little Rock R. R., 23 miles E. of Little Rock, in a beautiful plain, was first settled in 1869; has 2 churches, 1 weekly newspaper, a collegiate institute, Masonic hall, steam flouring-mill, a cotton-gin, over 30 business-houses, and ships over 5000 bales of cotton annually. Pop. 371. JOHN C. ENGLAND, ED. "DEMOCRAT."

Lons'dale, a flourishing manufacturing and post-v. of Lincoln tp., Providence co., R. I., on the Providence and Worcester R. R., 7 miles N. of Providence.

Lonsdale (HENRY), M. D., b. at Carlisle, England, in 1816; studied at Edinburgh and Paris; became lecturer on anatomy at Edinburgh; made important discoveries in the histology of nerve-tissues; became in 1845 physician to the Cumberland Infirmary, Carlisle; has written much and ably upon sanitary questions; and published several volumes of biographical and other literature, notably the *Worthies of Cumberland* (6 vols.), containing *Lives* of the Howards, Sir James Graham, M. P., the Loshes, Addison, and other celebrities.

Lons-le-Saulnier', town of France, department of Jura, beautifully situated among vine-clad hills at the confluence of the Seille, Vallière, and Solman, has a celebrated salt-well, discovered in the fourth century, from which 20,000 quintals of salt are annually drawn. It was the birthplace of Rouget de Lisle, the composer of the "Marseillaise." Pop. 9862.

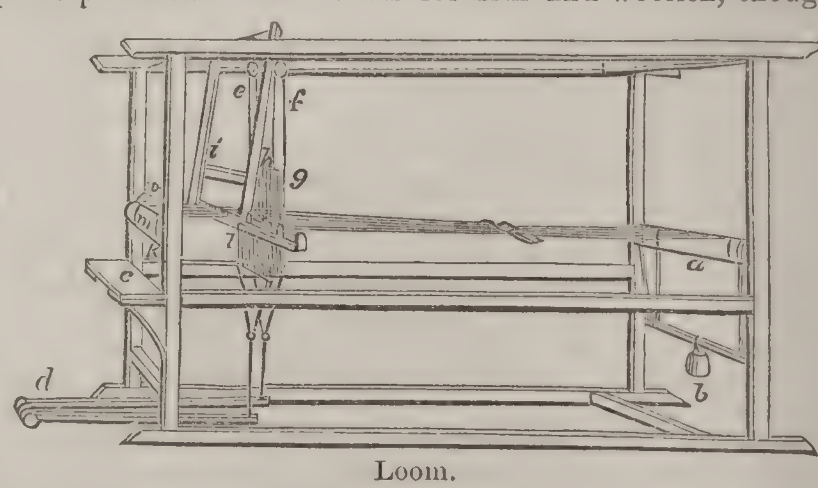
Lonyay, COUNT, a Hungarian statesman, b. in 1822, descended from an influential Magyar family; was elected a member of the diet in 1843, and afterward appointed a secretary in the ministry of finance; fled in 1849 when the Hungarian rebellion was put down, and lived in London and Paris; returned in 1850 in consequence of a general amnesty, and devoted himself to questions of political economy and the relations of the Church to the schools in Hungary. He was one of the most prominent members of the diet of 1865; was very active in 1866 and 1867 for the settlement between Hungary and Austria accomplished by Beust, and accepted the ministry of finance in the Hungarian cabinet which Andrássy formed in 1867. He was very successful in his financial policy, but fell out with Andrássy, retired in May, 1870, and entered then the imperial cabinet as minister of finance. When Andrássy became president of the imperial cabinet instead of Beust (Nov. 16, 1871), Lonyay was appointed president of the Hungarian cabinet, but (Nov. 18, 1872) he was accused by his adversaries in the lower house, especially by Deputy Csernatony, of having misused his official position for personal purposes, in consequence of which he gave in his resignation Dec. 2, 1872. AUGUST NIEMANN.

Loo-Choo', or **Lew-Chew,** a chain of thirty-five small islands stretching from Japan to Formosa, 400 miles off the coast of China. They are very imperfectly known, as foreigners are not allowed to visit them, but they seem to be very fertile, well cultivated, and densely peopled. The inhabitants are a mixture of Japanese and Chinese, the former element being the predominant one. The Japanese are the only foreigners who are allowed to live on the islands; and although a number of young natives are annually sent to China to be educated, yet the Chinese are treated with the same suspicion and inhospitality as the Europeans. The religion is Booddhism blended with the doctrines of Confucius.

Loodia'nah, district of British India, on the eastern bank of the Sutlej, and comprising an area of 750 square miles, with 527,722 inhabitants. Its capital, of the same name, lies in lat. 30° 55′ N. and lon. 75° 54′ E., has large manufactures of shawls of an inferior quality, and carries on a considerable banking business and transit trade. Pop. 47,900.

Loogootee', post-v. of Perry tp., Martin co., Ind., on the Ohio and Mississippi R. R. Pop. 748.

Loom [Ang.-Sax. *lóma*], the machine by which weaving is effected. In its simpler forms it is probably one of the earliest of human inventions. The Indian native fabrics, notwithstanding their extreme delicacy, are wrought upon looms of the rudest description, sometimes two trees serving for the frame, and bamboo sticks and string completing the mechanism by which silks unequalled for splendor are perfected. The object of WEAVING (which see) is the making of cloth by the intersection of materials. The portions running lengthwise are called the warp, or chain, and those across, the woof or weft. There is no variation in principle between the looms for silk and woollen, though



Loom.

their relative strength is of course widely different. In describing the hand-loom we shall be able to indicate the principles upon which every loom, even the most complicated, is constructed. The framework consists of four uprights, with three horizontal beams at the top, centre, and base. The only object of these is to keep the more important working parts in position. At one end is the beam or yard-roll (a) on which the threads of the warp are wound, passing through the heald, a sort of comb (l), and extending to the cloth-beam or breast-roll (m) at the other extremity of the loom. Round the latter the fabric is rolled as it is woven. It is kept tight by weights suspended from the yard-roll (b). The treadles (d) are pressed by the feet; one is connected with the harness or heddle (e) and the other with h, g, f. The alternate depression and elevation of the treadle causes a corresponding movement in the harness to which it is attached. The harnesses are each formed of two horizontal bars, connected by many small

cords of varying lengths, and united by a rope and pulley, so that the depression of the one necessitates the elevation of the other. Where the harnesses are intersected by the warp (*o*) there are loops or metallic eyes. Each separate thread is passed through the cords of one or other of the harnesses in regular order, so that the alternate warp-threads go through the loops of one heddle, whilst the intermediate threads are passed through the cords of the one and the loops of the other harness. When the treadle-action lowers one harness, all the warp-threads passing through its loops will be depressed, whilst the other harness, with all the intermediate threads, will by the same motion be raised, thus leaving between the two divisions a space for the passage of the shuttle, which carries the thread of the weft. As soon as it passes the action is reversed. The reed (*i*), sometimes made of small portions of split reed, but usually of flattened wires, drives the threads tightly after each intersection. The wires are fixed like comb-teeth in a frame which rests upon the shuttle-race, the warp-thread passing through the interstices. At the top is a cover with a groove along its lower side, known as the lay-cap. The weaver's seat (*c*), being hung by rounded ends, accommodates itself to the various movements of the body required by the various operations described. The movement of the batten is produced by the hand of the weaver.

Such is a description of the simplest form of loom, and the highly complex machines now employed are identical in principle, although their action is now automatic in place of depending upon human motive-power. The first suggestion of a power-loom appears to be one contained in a paper by M. de Gennes, an officer of the French navy, which was printed in the *Journal des Savants* in 1678 (No. xxvii.). It was quite impracticable. In the summer of 1784, Dr. Edward Cartwright happened to meet some Manchester gentlemen, who remarked that when Arkwright's patent ran out there would not be sufficient hands to weave all the cotton that would be spun. Cartwright replied to Arkwright, "We must then invent a weaving-mill." This the "practical" men declared impossible. The subject recurred to Cartwright's mind. He had never seen any weaving done, but considering that "there could only be three movements, which were to follow each other in succession," there would be little difficulty in producing and repeating them. He constructed a loom which did produce cloth: although "the warp was placed perpendicularly, the reed fell with the weight of at least half a hundredweight, and the springs which threw the shuttle were strong enough to have thrown a Congreve rocket." When he had obtained a patent and seen weaving he was astonished at the greater ease of the usual operations. The details of the power-loom were modified in his successive patents, but the principle has remained unchanged until now. Ninety years of mechanical ingenuity have been expended upon the perfection of this machine, and the number of patents for its improvement is truly marvellous. One great difference between the hand-loom and the power-loom is the mechanical arrangement by which the shuttle is thrown in the latter. At each side of the loom, and in a line with the *shed*, is a groove. Along these *shuttle-races* the shuttle flashes, impelled by a leather and strap arrangement acting on the principle of a sling. The warp unwinding from a beam passes round a roller above it, passes through the two leaves of the heddles, thus forming the *shed* through which the shuttle flies, the weft is then pressed up by the batten, and the finished cloth results.

In weaving figured fabrics two persons were formerly necessary. In 1779, William Cheape patented a mechanical "draw-boy," as the assistant was called. This, with sundry improvements, continued in use until it was superseded by the famous Jacquard machine. Joseph Marie Jacquard was a native of Lyons, the son of a weaver, but following the trade of a straw-hat maker. Having heard of the premium offered by the Society of Arts for a machine to weave nets, he conceived the possibility of earning it. He produced a machine-made net, but not meeting with any encouragement from his fellow-citizens, he threw the project aside and gave the net to a friend. By some means it got to the hands of the authorities in Paris, and when Jacquard himself had forgotten the matter he was required by the prefect of the department to make a net-weaving machine. When it reached Paris the emperor ordered the inventor's arrest, which was done so suddenly that he was not allowed to go home to prepare for the journey. He was placed in the Conservatoire des Arts, and reconstructed the machine in the presence of inspectors. He was presented to Napoleon, who put the characteristic question: "Are you the man who pretends to do what God Almighty cannot do—to tie a knot in a stretched string?" He was then shown Vaucanson's loom, on which from 20,000 to 30,000 francs had been expended for making fabrics for Bonaparte's use. He determined to achieve the object of this complicated machine by a simpler process, and the result was the Jacquard frame. The silk-weavers of Lyons were indignant with him for contriving a labor-saving apparatus; he was thrice exposed to the danger of assassination; the Conseil des Prudhommes broke up his loom in the public square, in the same place where his statue now stands. His patent-rights were purchased by a municipal pension authorized by the emperor, who also decorated him with the cross of the Legion of Honor. There are varying versions of the earlier part of his career as an inventor, some attributing to Carnot the phrase about tying a knot in a stretched string.

The Jacquard frame can be adapted to nearly all looms, its object being to direct the movements of the warp-threads which produce the pattern. Although the principle is beautifully simple, the arrangements for carrying it into practice depend on delicate mechanical adjustments which bewilder the eye of the uninitiated. The warp-threads are passed through loops in the lifting-threads, so as to be raised by the action of the treadles upon the lifting-bars. This is precisely the same as in common weaving, but in the Jacquard apparatus the lifting-threads hang on wires terminating in a hook. In the ordinary course this hook catches upon a projection on the lifting-bar, but fails to do so if thrown out of the perpendicular. Each wire passes through a horizontal needle at right angles; the needle is furnished with a loop for this purpose. It moves freely through at one side, and at the other extremity is looped on to another rod ending in a spring-box. When pushed back into this box, it presses upon a spiral spring, which restores it to its former position immediately the pressure ceases. When pressure is exerted upon any wire it is thrown out of the perpendicular, and so fails to catch upon the projection in the lifting-bar; the wires not so acted upon reach the bar, drawing the threads of the warp attached to them. It will be evident from this that by regulating the pressure upon the horizontal needles any variation of thread can be effected. For this purpose a square roller is used, with its four sides pierced with holes corresponding to the number of threads in the warp, in the same way as the wires and needles. A row of needles fit into a row of perforations, and each row of the latter is brought in succession against the needles by a motion received from the machinery. In the ordinary course the simple effect would be that all the wires would act, and all the warp-threads be hooked upon the projections in the bar. In order to produce the variations in the arrangement of threads required for the production of the pattern, this roller is masked with what are known as pattern-cards. These are perforated in accordance with the desired pattern, the holes, where there are any, corresponding with those of the rollers they cover. Where not perforated the card resists the action of the needle, pressing it back upon the spring, and so throwing the lifting-bar out of the perpendicular, and preventing the lifting of the warp-thread to which it is attached. The cards are looped together at the corners, and act as an endless chain, their perforations indicating the pattern.

The simplicity of the Jacquard has been improved by Vincenzi of Modena, who, in addition to a great saving of bulk, has rendered the needle-action so delicate that in place of thick cardboard for the pattern-card, paper can be used, and thus a pattern can be reproduced without extra trouble. It was thought Signor Bonelli's electric loom would displace the Jacquard, but that beautiful piece of mechanism has not yet come into much practical use. The pneumatic loom (Harrison) is intended to lessen the waste of power caused by the shock of throwing the shuttle. In place of the picker a jet of compressed air is discharged from the shuttle-box on to the end of the shuttle at each stroke. There are many minor annoyances which the application of graduated air-pressure is expected to obviate. (For descriptions of the mechanical arrangements of looms the *Abridgment of Specifications of Patents* (English) *relating to Weaving* should be consulted.) W. E. A. Axon.

Loo'mis (Elias), LL.D., b. in Tolland co., Conn., in Aug., 1811; graduated at Yale College in 1830; was for several years tutor in that institution (1833–36); made important researches in astronomy, magnetism, and meteorology, both in the U. S. and at Paris, where he resided in 1836–37, attending lectures; became professor of natural philosophy in Western Reserve College 1837, Columbia College, N. Y., 1844, the University of New York 1853, and in Yale College 1860. He has made many contributions to the exact sciences, most of which were communicated to the American Philosophical Society and to the *American Journal of Science*, and published a series of textbooks in the higher mathematics, comprising *Plane and Spherical Trigonometry* (1848), *Recent Progress of Astronomy* (1850 and 1856), *Analytical Geometry and Calculus* (1851), *Elements of Algebra* (1851), *Elements of Geometry and Conic Sec-*

tions (1851), *Tables of Logarithms* (1855), *Natural Philosophy* (1858), *Practical Astronomy* (1855), *Elements of Arithmetic* (1863), *Treatise on Meteorology* (1868), *Elements of Astronomy* (1869), and a genealogical work, *The Descendants of Joseph Loomis* (1870).

Loomis (Gen. Gustavus), b. at Thetford, Vt., Sept. 23, 1789; graduated from the U. S. Military Academy in 1811; entered the army as second lieutenant of artillerists, and after a service of two years in garrison in New York harbor was ordered to the Niagara frontier, and was engaged in the capture of Fort George, U. C., May 27, 1813, and made prisoner at the surprise of Fort Niagara, N. Y., Dec. 19, 1813. Subsequently to the close of the war he served on the varied duty of an artillery, infantry, and staff officer, and in all sections of the country—in Texas and Florida against hostile Indians; on similar duty on the Western frontier; in command of department and on quartermaster, ordnance, and coast survey duty; transferred to the infantry as captain 1st Regiment in 1821, he was successively promoted to be colonel 5th Infantry in 1851. During the civil war he served on court-martial and recruiting duty, and as mustering officer; retired from active service June 1, 1863; brevet brigadier-general Mar. 13, 1865. D. at Stratford, Conn., Mar. 5, 1872.

Loomis (Justin Rolph), LL.D., b. Aug. 10, 1810, at Bennington, Wyoming co., N. Y.; graduated at Brown University 1835; professor of natural sciences in Colby University (Waterville, Me.) 1836–52, and held the same position in the university at Lewisburg, Pa., 1853–58, since which time he has been president. Author of *Elements of Geology* and *Elements of Physiology*.

Loon, or **Great Northern Diver,** the *Colymbus glacialis*, a swimming bird of the family Colymbidæ, found in both hemispheres. It is a large solitary bird, 32 inches long, very difficult to shoot. It is a fine diver, perfectly at home in air or water, but by no means so on the land. Its loud startling cry is a very familiar sound in the woods of North America.

Loo'ney, tp. of Polk co., Mo. Pop. 1750.

Looney's Tavern, tp. of Winston co., Ala. Pop. 222.

Lo'pes, or **Lopez** (Fernão), b. about 1380, in Portugal, was made chief archivist of the kingdom by King Dom João I., and devoted his life to the collection and study of materials for the history of his country and the composition of chronicles of several of her kings. Like Froissart, he also personally visited the scenes of battles and of other important events, and conferred much with eminent soldiers and statesmen who had participated in the wars and other public affairs of Portugal. The chronicles of Lopes possess great literary and critical value, and are probably surpassed in merit by no historical works of the century in which they were written. The field of action and the period of time embraced by the narratives of Lopes are narrower than those covered by the immortal work of Froissart; and doubtless this is one of the reasons for the much greater accuracy of Lopes in point of date, detail, and attending circumstances. The style of Lopes is generally less picturesque than that of Froissart, but in some cases—as, for instance, in the description of the battle of Aljubarota, known in Portuguese history as "*the* battle," fought in the year 1386 on ground which is now the site of the renowned monastery and church of Batalha —the Portuguese writer has a decided superiority over the French chronicler. Lopes is always animated with a patriotism which much enlivens his annals, but is altogether wanting in the *borderer* Froissart, who is never quite French or quite English. The works of Lopes are—*Chronica do Senhor Rei Dom Pedro I.; Chronica do Senhor Rei Dom Fernando*, both printed in vol. iv. of the *Collecção de Livros Ineditos de Historia Portugueza* (Lisbon, 1816), and the very rare and important *Chronica del Rey Dom João I.* (Lisbon, 1644, 2 parts, folio), with a third part or continuation by Gomes Eannes d'Azurara.

George P. Marsh.

Lo'pez (Carlos Antonio), b. at Asuncion, Paraguay, Nov. 4, 1790; was educated at the ecclesiastical seminary of that city, and became better versed in civil and canon law than any of his contemporaries. To escape persecution by the dictator, Dr. Francia, he resided many years in an obscure village; returned to Asuncion on the death of Francia in Sept., 1840; was appointed secretary of the military junta then in power; was elected one of the two consuls in 1841; president for ten years in 1844; re-elected for three years in 1854, and again for ten years in 1857, with power to appoint a successor by will. He governed despotically, convoking a congress only at intervals of many years, and allowing it liberty only to sanction his edicts. He opened the country to foreign commerce, constructed a railway, sent a considerable number of Paraguayan youth to Europe for education, especially in mechanics, provided abundant war-material, bought several steamers as the foundation of a navy, levied and maintained under strict discipline a considerable army, built an arsenal, foundries, and fortifications, asserted a government monopoly for tobacco and *yerba mate*, the most important products of the country, made an unsuccessful attempt to establish a French colony in the Grand Chaco, made treaties with foreign powers, engaged in desultory warfare with the dictator Rosas of Buenos Ayres, was involved in diplomatic controversies with France, England, Brazil, and the U. S., narrowly escaping hostilities with the three latter powers, and successfully labored for the material prosperity of Paraguay, bequeathing his power to his son, Francisco Solano, on his death, which occurred at Asuncion Sept. 10, 1862.

Lopez (Francisco Solano), b. near Asuncion, Paraguay, July 24, 1826 or 1827, was the eldest son of Carlos Antonio Lopez, president of Paraguay from 1844 to 1862. Though his early education during the dictatorship of Francia had been almost entirely neglected, Francisco was at the age of nineteen years made general and commander-in-chief of the Paraguayan army, then engaged in hostilities with the dictator Rosas of Buenos Ayres, who refused to recognize the independence of Paraguay or to concede the right of navigation on the Parana. Young Lopez spent some months in the Argentine province of Corrientes, then in rebellion against Rosas, and probably derived some rudimentary ideas about war from his Mentor, the Argentine general Paz, though he saw no actual engagements. Returning to Asuncion in the following year, he was successively entrusted by his father with all the more important offices of the state, with a view to prepare the way for his succession to the presidency. In 1853 he was sent to Europe, accredited as minister to the courts of London, Paris, and Turin for the ratification of treaties concluded the previous year, and spent eighteen months in European capitals, attended by a suite of forty persons. He engaged the services of numerous engineers, bought steamers, contracted for the building of a railroad and the establishment of a French colony, and purchased large quantities of arms and materials of war. He also acquired some knowledge of French and of the condition of European affairs, and made the acquaintance of the celebrated Madame Lynch, who followed him to Paraguay, became his mistress, and had an important influence upon his later career. In 1855, Lopez became minister of war under his father, and the successive difficulties with the U. S., England, France, and Brazil (see Paraguay) stimulated his already formed resolution to make Paraguay a military power which at a future time should humble the surrounding countries, wrest from them their frontier provinces, and perhaps lay the foundations of a vast inland empire. In 1862, on the death of his father (Sept. 10), Lopez assumed the executive power by virtue of a nomination as vice-president made in the will of the former, according to a singular power previously conferred upon him, and convoked a congress by which he was elected (Oct. 16) president for ten years. He now hastened his preparations for war, secretly procuring from Europe immense stores of arms and ammunition; and in Sept., 1864, believing himself ready for the struggle, availed himself of the fact of Brazilian intervention in a civil war then existing in Uruguay to declare himself the protector of the "equilibrium" of the La Plata regions. He summoned Brazil to abstain from the hostilities already commenced in Uruguay, and as that empire paid no attention to his challenge, he inaugurated hostilities in Nov., 1864, by seizing treacherously and without warning in the port of Asuncion a Brazilian merchant-steamer, which in conformity with treaty-right was on its way to Matto Grosso, conveying the president of that province, who with his suite was thrown into a prison from which none of them ever emerged. In the following month, before news of this proceeding could reach Brazil, Lopez sent a force to occupy the vast province of Matto Grosso, situated to the N. of Paraguay, and early in the following year despatched another large force across the Argentine territory into the southern Brazilian province of Rio Grande do Sul. The refusal of the Argentine government to consent to this passage of troops afforded Lopez a pretext for hostilities against that country. Hastily summoning a "congress" composed of his own nominees, in Mar., 1865, Lopez procured therefrom the ratification of his previous acts, a formal declaration of war against Brazil and the Argentine Republic, and the military grade of marshal for himself, with extraordinary war-powers. The Argentine merchant-steamers in port were detained and subsequently confiscated, and an expedition was sent to the Argentine province of Corrientes which seized the capital and two men-of-war (Apr. 14) before the declaration could be known in Buenos Ayres. On May 1 a triple alliance against Paraguay, offensive and defensive, between Brazil, the Argen-

tine Republic, and Uruguay was signed at Buenos Ayres, and a war of gigantic proportions for South America was thenceforward carried on for five years. (For the outline of the military operations reference must be made to the article PARAGUAY.) Early in 1866 the allies had recovered their own provinces and invaded Paraguay, where they were kept at bay for years before the fortifications of Humaitá, Tebicuarí, and Angostura, until nearly the whole male population of Paraguay had been impressed into military service and had perished in the trenches or by famine and pestilence. Lopez possessed no knowledge of military science; he was even deficient in personal courage, and never participated in a battle but from a safe distance; through the employment of a vast system of terrorism and espionage he coerced a reluctant people to sacrifice itself for his ambition. Always cruel, unscrupulous, passionate, and morbidly suspicious, his evil qualities were stimulated by a long succession of military failures, by the ruin of his ambitious hopes, the certainty of impending downfall, and by increasing habits of intemperance, until in 1868 they culminated in the arrest, torture, and execution of several hundreds of Paraguayans and foreigners on an absurd charge of conspiracy against his government and life. From July to Dec., 1868, scarcely a day passed without the execution of new batches of prisoners in his camp, among whom were included all his brothers, brothers-in-law, cabinet ministers, judges and prefects, and nine-tenths of the civil employés of every grade. The bishops and priesthood shared a similar fate, as did most of the higher military officers, and more than 200 foreigners, embracing all except about a score, whose services in various capacities were indispensable. Several members of the scanty diplomatic and consular corps were among these victims; the minister-resident of the U. S., Hon. Charles A. Washburn, was charged with complicity with the alleged treasonable plot, and only escaped with his life by the opportune arrival of the U. S. gunboat Wasp, which came to take him away, he having resigned his office some months before. Two members of the American legation were seized in the streets of Asuncion, Sept. 10, 1868, while on their way with the minister to embark for the U. S., and subjected for three months to the same system of starvation and torture as their more hapless companions, until in December of the same year they were surrendered to the squadron commanded by Admiral Charles H. Davis. Driven by successive defeats to the northern extremity of Paraguay, his forces being reduced to a few squadrons, Lopez was surprised and killed by a Brazilian force on the banks of the river Aquidaban, Apr. 1, 1870, along with his eldest son, a boy of sixteen years, who ranked as a colonel. He was buried near the spot, and Mrs. Lynch was allowed to go to Europe with her children. PORTER C. BLISS.

Lopez (Gen. NARCISO), b. in Venezuela in 1799; entered the military service of Spain at an early age; was engaged in the war against the independence of his native country, attaining the rank of colonel in 1822; settled in Cuba after the withdrawal of the Spanish army from Venezuela; engaged in military operations against the Carlists in Northern Spain, and became governor of Madrid and senator for Seville, but resigned those posts in consequence of the illiberal policy of the court towards Cuba. Returning to Cuba, he became an exile, and led three filibustering expeditions to Cuba from American ports in 1849, 1850, and 1851, all of which were unsuccessful, the last resulting in his capture and execution by the *garrote* in Havana Sept. 1, 1851.

Lophi'odon [Gr. λόφος, "crest," and ὀδούς, "tooth"], an extinct genus of Tertiary mammals, first described by Cuvier from remains occurring in the Eocene of France. These animals were allied to the tapir. They derive their name from the structure of the true molars or grinding teeth, which have their crowns crossed transversely by two crests or ridges of dentine covered with a layer of enamel. The last lower molar has also a small posterior lobe. The premolars are more simple in structure, and compressed, resembling the first premolar of the tapir. The upper molars also resemble those of the tapir, but approach in some respects those of the rhinoceros. The diastema or toothless interval between the canine and molar teeth was much shorter than in the tapir. Several species of *Lophiodon* are described from the Eocene of France and England, but little is really known of the skull or skeleton. The species of tapiroid mammals formerly referred to this genus from the early Tertiary deposits of America are now regarded as belonging to other genera, and no true *Lophiodon* is yet certainly known from this country. O. C. MARSH.

Lophobranchii. See APPENDIX.

Lo'quat, the *Eriobotrya Japonica*, a handsome fruit-bearing shrub of the order Rosaceæ, a native of Japan, cultivated in parts of the U. S. Its fruit is very early, has a bright yellow color, a pleasant flavor, and is as large as a gooseberry.

Lorain', county of Ohio, bounded N. by Lake Erie. It has a level, fertile surface of clay loam. Live-stock, grain, fruit, wool, hay, butter, and cheese are leading products. Among the manufactures are cheese, lumber, carriages, clothing, harnesses, furniture, and metallic wares. The county is traversed by the Lake Shore and Michigan Southern, the Lake Shore and Tuscarawas Valley, the Cleveland and Toledo, and the Cleveland Columbus and Cincinnati R. Rs. Cap. Elyria. Pop. 30,308.

Loraine, tp. of Henry co., Ill. Pop. 577.

Loraine (Sir LAMBTON), BART., b. in England Nov. 17, 1838; succeeded to the baronetcy (which dates from 1664) July 11, 1852. In 1868 he attained the rank of commander in the British navy, and in 1873, while in command of the Niobe steam-sloop, gallantly rescued the survivors of the *Virginius* affair, while stationed off the coast of Cuba.

Lor'amie, tp. of Shelby co., O. Pop. 1707.

Lo'ran, post-tp. of Stephenson co., Ill. Pop. 1200.

Lo'rance, tp. of Bollinger co., Mo. Pop. 2872.

Lor'ca [anc. *Eliocroca* or *Ilorcum*], city of Spain, province of Murcia, on the Sangonero, is an old but well-built and prospering place, situated among beautiful surroundings, and containing several interesting buildings, among which is a Moorish castle. In the vicinity are important lead-mines, and large manufactures of soap, dyestuffs, leather, and paper are carried on. Pop. 40,000.

Lord (ELEAZAR), LL.D., b. at Franklin, Conn., Sept. 9, 1788; studied at Andover, Mass.; removed in 1809 to New York; entered the Presbyterian ministry in 1812; was one of the founders of the American Education Society, the New York Sunday-school Union (of which he was corresponding secretary 1818–26 and president 1826–36), and of various home and foreign missionary and other benevolent societies; engaged in 1818 in banking; founded the Manhattan Insurance Co., and was its president 1821–34; was also the first president of the Erie R. R.; in 1836 removed to Piermont, N. Y.; was one of the strongest friends of the University of New York, and aided in founding the theological seminaries at East Windsor (now at Hartford), Conn., and at Auburn, N. Y. D. at Piermont, N. Y., June 3, 1871. Among his works are *Principles of Currency* (1829), *Geology and Scriptural Cosmogony* (1843), and several other books, mostly theological; also republished (1825) Lemprière's *Biographical Dictionary*, with copious additions.

Lord (JOHN), LL.D., b. at Portsmouth, N. H., Dec. 27, 1810; graduated at Dartmouth College in 1833, and was agent of the American Peace Society; afterwards preached at New Marlboro', Mass., and Utica, N. Y., but subsequently withdrew from his pastorate and gave himself to historical study and lecturing. Commencing his career in England and Scotland, he returned to the U. S. in 1846, and since then has lectured with frequency and success upon purely historical topics in most of the larger Northern cities and towns of the U. S.; has published historical works and schoolbooks, but his literary reputation will rest on his lectures, some sixty of which have been written with great elaboration.

Lord (NATHAN), D. D., LL.D., b. at South Berwick, Me., Nov. 28, 1793; graduated at Bowdoin College in 1809, and at Andover Seminary in 1815; was two years instructor at Phillips Academy, Exeter, N. H.; was pastor of a Congregational church at Amherst, N. H., 1816–28, and president of Dartmouth College 1828–63. He published several pamphlets, addresses, reviews, and sermons, two of which, the *Letters on Slavery* (1854, 1855), excited much comment in the North, for Dr. Lord maintained the lawfulness of that institution. D. at Hanover, N. H., Sept. 9, 1870.

Lord's Day, a name for the first day of the week, derived from Rev. i. 10. The rendering "Lord's Day" is Wycliffe's (1380). In all of the editions of Luther's New Testament previous to his revision of 1541 he renders *Am Sontage*, and Tyndale (1526–34), Coverdale (1534), Cranmer (1539), follow him, and translate "on a Sondaye." The Æthiopic renders it "the first day." The word κυριακός is found also in 1 Cor. xi. 20: "*the Lord's* supper." The day of our Lord's resurrection was observed in the apostolic times, and the title "Lord's Day" is applied to that day in Ignatius, Irenæus, the Clementine Constitutions, and Tertullian, and at a later period universally. (Suicer, *Thesaurus Ecclesiast. Ed. Sec.*, 1728, ii. 184. See SABBATH and SUNDAY.) C. P. KRAUTH.

Lords, House of. See PARLIAMENT.

Lord's Supper. See EUCHARIST.

Lords'town, post-v. and tp., Trumbull co., O. Pop. 858.

Lore'lei, The, an imposing cliff on the right bank of the Rhine, half a mile above St. Goar. It is 447 feet high, and is now penetrated by a railway tunnel. At its foot is a whirlpool and a famous salmon-basin. The tradition is that a cave in the rock is the abode of the Lorelei, a wicked siren, whose beauty and sweet song attracted hither the boatmen, whom she wrecked in the whirlpool. Here is a famous echo, sometimes repeated fifteen times, but not audible from the steamer.

Lorencez, de (CHARLES FERDINAND **Latrille**), COUNT, b. in France May 23, 1814, grandson of Marshal Oudinot; received a military education at St. Cyr; entered the army in 1832; rose to a colonelcy in Algeria; was made brigadier-general for gallantry at the first assault upon the Malakoff (June 11, 1855) in the Crimean war, and in Jan., 1862, was sent to Mexico in command of the French army of invasion; was made general of division Mar. 20; commenced hostilities in April on the rupture of the treaty of Soledad; occupied Orizaba Apr. 20; forced the pass of Aculcingo Apr. 28, and marched upon Puebla, where he was repulsed with great loss in an attempt to carry Forts Guadalupe and Loreto; retreated to Orizaba; at his own request was recalled to France in Nov., 1862, since which time he has not figured prominently in military affairs.

Lo'renz (OTTOKAR), b. at Iglau, Moravia, in 1832; studied at Vienna in 1851, and was appointed professor of history at the university in 1860; in 1857 had received an appointment in the office of the secret archives, but this position he had to give up in 1865, on account of some indiscreet publications against the cabinet of Schmerling. The most prominent of his writings are *Deutsche Geschichte in 13 und 14 Jahrhundert* (2 vols., 1863–67) and *Geschichte des Elsass* (1871, together with Scherer).

Lore'to, city of Italy, in the province of Ancona, about 20 miles S. W. of the city of Ancona. The chief interest of this place is the magnificent sanctuary of Our Lady of Loreto, which draws hither thousands of pilgrims yearly. This vast building, designed by Bramante, is said to contain the house in which the Holy Family dwelt at Nazareth. According to the legend, this humble dwelling was borne through the air by angels, who would not leave it to be desecrated by the infidels, and deposited first near Fiume on the Croatian coast; then, after several other translations, it was finally set down at Loreto. This last removal, it is asserted, took place on May 29, 1299, during the pontificate of Boniface VIII. The *Santa Casa*, or Holy House, stands in the centre of the Latin cross which forms the interior of the church, and over it rises an octagonal cupola decorated with exquisite frescoes. The original building, of reddish stone and consisting of a single square room, is entirely encased in sculptured marbles, the bas-reliefs being the work of some of Italy's best artists. Rich lamps of silver are suspended all around the interior, the most costly hanging before an image of the Virgin said to be carved by St. Luke out of the cedar-wood of Lebanon. The treasury of this sanctuary is—or at least was—one of the richest in the world, but it was heavily drawn upon by some of the popes, especially by Pius VI.; then it suffered severely from the cupidity of the French during the Bonaparte occupation; and more recently, if common report is to be believed, those who should be the most faithful sons of the Church have not scrupled to lay sacrilegious hands on the priceless gems which were once its pride. Pop. of city in 1874, 8083.

Lore'to Apruti'no, town of Southern Italy, in the province of Teramo. This town has but one school for boys and one for girls, though its population in 1874 was 5568.

Loreto, Sisters of, or "Friends of Mary at the Foot of the Cross," a Catholic religious order for females, founded in 1812 in Kentucky by Charles Nerinckx (1761–1824), a priest, have many establishments in the Western States, and devote themselves to the cause of education and the care of destitute orphans.

Lorette', post-v. of Quebec co., Canada, 9 miles from Quebec, is a beautiful place, resorted to for the view of its waterfall, and has some manufactures of paper and flour. The inhabitants are partly Huron Indians. At this place are waterworks for the supply of Quebec. Pop. about 1200.

Loret'to, post-v. of Marion co., Ky., 57 miles from Louisville, near the Knoxville branch of the Louisville and Nashville R. R. Pop. 42.

Loretto, post-b. of Alleghany tp., Cambria co., Pa., 6 miles E. N. E. of Ebensburg, is the seat of St. Francis College, Roman Catholic.

Lorica'ta [Lat. *lorica*, "cuirass"], a term applied to those reptiles which are "loricated" or furnished with a coat of mail, formed by an epidermal exoskeleton of bony scales, as in the crocodiles, or of bony plates, as in the Chelonians. The term is, however, generally used in reference to the Crocodilians.

Lorient', or **L'Orient,** town of France, department of Morbihan, at the mouth of the Scorf, in the Bay of Biscay, was founded in the middle of the seventeenth century by the French East India Company, whence its name, Port de l'Orient, and had an immense trade, which, however, has declined. In 1770 it was made one of the four stations of the French navy, and has a capacious and safe harbor lined with handsome quays, and protected with strong fortifications at its entrance. Its dockyards and arsenals are extensive, and its manufactures of all kinds of naval equipments are very important. Pop. 35,462.

L'Orignal', cap. of Prescott co., Ont., Canada, on the Ontario River, 59 miles E. of Ottawa, has 1 weekly paper. Pop. about 800.

Lor'ikeet, a name applied to the very numerous species of parrots of Australia and the Eastern Archipelago, belonging to the genus *Trichoglossus*, and having the tongue covered with bristly hairs, with which the birds collect honey from flowers. They are showy birds and fly in great flocks, sometimes containing more than a thousand birds.

Lo'ring (CHARLES GREELEY), LL.D., b. at Boston, Mass., May 2, 1794; graduated at Harvard in 1812; was for many years an eminent lawyer of Boston; was 1857–67 actuary of the Hospital Life and Trust Co.; author of *Neutral Relations of the U. S. and England* (1863) and a *Life of William Sturgis* (1864), besides published addresses, etc. D. at Beverly, Mass., Oct. 8, 1867.

Loring (FREDERICK W.), b. at Newtonville, Mass., in 1846; studied at Phillips Academy, Andover; graduated at Harvard College in 1870, and made a brilliant *début* as an author in the pages of the *Atlantic, Old and New, Every Saturday*, the *Independent*, and *Appletons' Journal*. His verses and serial stories were of unusual promise, and a novel, *Two College Friends*, displayed high powers. Joining the party of Lieut. Wheeler for the exploration of Arizona in the capacity of literary correspondent, he was murdered by the Indians near Wickenburg, Arizona, Nov. 5, 1871.

Loring (GEORGE BAILEY), M. D., b. at North Andover, Mass., Nov. 8, 1817; graduated at Harvard College 1838, and at the Harvard Medical School 1842; was physician to the Chelsea Marine Hospital for some years; has devoted himself since 1850 entirely to scientific agriculture and the pursuits of public life, being almost constantly occupied in the preparation and delivery of speeches, lectures, and occasional addresses upon political, historical, scientific, educational, and agricultural topics, and the writing of reports and essays on similar subjects. He took up his residence at Salem; represented that city for several terms in the Massachusetts house of representatives and senate; was for three years president of the latter body, and for many years president of the State Agricultural Society, and was a member of the Republican national conventions of 1868 and 1872. Dr. Loring enjoys a wide reputation as an orator, and has been frequently invited to deliver addresses upon memorial occasions, as at the dedication of memorial tablets at Bolton, Mass. (1866), at the bi-centennial anniversaries of the settlement of Dunstable (1873), and of Sherborn (1874), of the massacre at Swanzey by King Philip (1875), and the centennial of the resistance to the British at the North Bridge, Salem (1875). Among his speeches in the Massachusetts senate, that on scientific education in behalf of Prof. Agassiz (1873), that in defence of Senator Sumner's position on the "regimental colors question" (1874), and that on the railway policy of Massachusetts (1874), were published in pamphlet form. An address at the opening of the scientific course of the American Institute, New York, 1870, was widely copied. He has contributed largely to Flint's *Agricultural Reports*, to Murray's work *On the Horse*, and is now (1875) engaged upon a serial for the Boston *Globe*, called *The Farmyard Club of Gotham*, dealing with New England life and modes of thought. PORTER C. BLISS.

Loring (Gen. WILLIAM W.), b. in North Carolina about 1815; entered the U. S. army as second lieutenant in command of a detachment of mounted volunteers, and served in the Florida war 1835–42; became captain of mounted rifles 1846, major in Feb., 1847; commanded a regiment in the battles in the Valley of Mexico; was brevetted lieutenant-colonel for gallantry at Contreras and Churubusco, and colonel for gallantry at Chapultepec; lost an arm at the Belen gate of Mexico; commanded an expedition on the Gila River, New Mexico, 1857, where he fought the Mogollan Indians; resigned his colonelcy May 13, 1861; became a brigadier-general, and subsequently a major-general, in the Confederate army, serving in West Virginia

1862, at Vicksburg 1863, and with Gen. Bragg at Chattanooga and in the ensuing campaign. Afterward went to Egypt, and became chief of staff of the khedive in the army.

Lor'inser (Karl Ignaz), b. July 24, 1796, at Nimes, in the Bohemian Mountains; studied medicine at Prague and Berlin, where he took his degree in 1817; held several medical offices in Prussia, from which he retired to private life in 1850, and d. Oct. 2, 1853, at Patschkau in Silesia. His *Untersuchungen über den Rinderpest* (1831) proved on several occasions of great benefit to the farmers; and his *Zum Schutze der Gesundheit auf Schulen* (1836), which caused a long and vehement controversy, occasioned the re-establishment of *turn-places* at the Prussian schools.—His son, Franz Lorinser, b. at Berlin Mar. 12, 1821, has acquired a name as a Roman Catholic theologian, and as well versed in Spanish literature, from which he has made several successful translations.

Lo'ris (the indigenous name), a genus of prosimian mammals of the lemur family (sub-family Nycticebinæ). There are two species—the slender loris (*L. gracilis*) of Ceylon and the Indian Peninsula, and the lazy loris, or slow lemur (*L. tardigradus*), of the Eastern Archipelago. They are slow-moving, nocturnal, arboreal, mostly carnivorous, with a rich fur, and are not much larger than rats.

Lorraine' [Ger. *Lothringen*], a territory between the rivers Rhine, Saône, Meuse, and Scheldt, and forming a plateau from 500 to 800 feet high, which leans against the Vosges with a northern and north-western inclination. (See Elsass-Lothringen.) It derived its name from Lothaire II., son of the emperor Lothaire I., who received this territory at the division of his father's dominions, and called it *Lotharii Regnum* (Lotharingia). Under the Carlovingian dynasty the country was an object of perpetual strife between France and Germany. After the extinction of the Carlovingian house the emperor Otho I. gave it to his brother Bruno, archbishop of Cologne, who divided it into two parts—Upper Lorraine, between the Rhine, Saône, and Meuse, and Lower Lorraine, between the Rhine, Meuse, and Scheldt. The latter received the name of the duchy of Brabant, became a part of Burgundy, fell to the house of Austria, and is now incorporated with Belgium. Upper Lorraine was ruled for centuries by a dynasty of its own, subject, however, either to French or to German authority. But in 1733, in the Polish war of succession, it was conquered by the French, and in 1737 the legal heir, Frantz Stephan IV., the husband of Maria Theresa, exchanged it for the grand duchy of Tuscany, and it was given to Stanislaus, the ex-king of Poland and father-in-law to Louis XV., at whose death in 1766 it fell to France. The inhabitants, however, although they became very much attached to France, remained German in language and customs in the eastern and northern districts, and this part of the country, with the fortress of Metz, was ceded to Germany May 10, 1871.

Lorraine, post-tp. of Jefferson co., N. Y., produces large quantities of butter and cheese. Pop. 1377.

Lorraine (Claude). See Gelée (Claude).

Lort'zing (Gustav Albert), b. at Berlin Oct. 23, 1803; educated for the stage; led an errant life as actor, singer, composer, and orchestra-leader in different theatres of second rank in Germany, and d. at Berlin Jan. 21, 1851. Of his many operas, the *Zar und Zimmermann* (1837) and *Der Wildschütz* (1842) were received with much applause, and are still successfully performed.

Lo'ry [Hind. *lûri*], a name given to various birds of the parrot family, but especially to those of the genus *Lorius* or *Domicella,* whose head-quarters are the islands of the Sunda-Moluccan Archipelago and Polynesia. (See Trichoglossinæ.)

Los An'geles, county of S. California. Area, 2125 square miles. It is bounded S. and S. W. by the Pacific Ocean. The N. part is dry and sandy. Among the coast mountains are many fine valleys. The better soils are rich sandy, open loams or stiff black adobe clays. There are good facilities for irrigation. Live-stock, wool, grain, oranges, lemons, grapes, almonds, English walnuts, and olives are grown successfully, the climate having a remarkable semi-tropical character. Brandy and wine are extensively produced. It is traversed by the Los Angeles and San Pedro R. R. Cap. Los Angeles. Pop. 15,309.

Los Angeles, city and tp., cap. of Los Angeles co., Southern California, and centre of the region known as "semi-tropical California," on the W. bank of the Los Angeles River, 30 miles from its mouth, and 350 miles S. S. E. of San Francisco, occupies an area of about 6 miles square and has railroad communications in five directions. The Southern Pacific R. R. is completed more than 30 miles both N. and E., and will shortly afford connection with San Francisco and San Bernardino. The roads to Anaheim Colony, 28 miles S. E., and to the new seaport, Wilmington, 23 miles S., are finished, and a narrow-gauge line to the nearest point on the coast, 14 miles, is in progress. The town was founded Sept. 4, 1781, by soldiers discharged from service at the neighboring mission of San Gabriel; it was made a city and capital of California by the Mexican Congress in 1836, and was the seat of the last government, 1844–46. In the latter year it was captured by the combined forces of Com. Stockton and Gen. Kearny, after the sharp battles of San Gabriel and La Mesa. It is unsurpassed throughout the world for its delightfully equable and healthful climate, the fertility of its soil, the abundant products of its vineyards, groves of oranges and tropical fruits, and adaptability to the varied pursuits of agriculture and stock-raising. The first discovery of gold in California was made here by Abel Stearns, who came from Boston in 1829, and in 1833 sent gold-dust to the mint at Philadelphia, where it was coined for him. Los Angeles has 9 churches, 3 banks, 4 hotels, 3 daily, 1 semi-weekly (Spanish), and 5 weekly (1 German) newspapers, a fine public school, an academic institute, a Catholic college, a female seminary directed by the Sisters of Charity, 2 hospitals, 3 benevolent associations, 11 lodges of secret societies, a street railroad, a chamber of commerce, good water-supply, daily stage communication with all the neighboring counties, and 4 lines of daily travel towards San Francisco, besides frequent communication by steamer. The scenery of the neighborhood is superb, dotted with thriving villas, vineyards, and fruiteries. The city has since 1868 become practically a new one, hundreds of elegant commercial and private edifices having been built, and more are projected or in progress. The full name is *Pueblo de la Reina de los Angeles* ("Town of the Queen of the Angels"). Pop. of city, 5728; of tp., exclusive of city, 2776.

Ben. C. Truman, Ed. "Daily Star."

Loskiel (George Henry), b. in Courland, Russia, Nov. 7, 1740; entered the Moravian ministry; wrote a *History of the Mission of the United Brethren to the Indians of North America,* from the accounts of the missionaries Gottlieb Spangenburg and David Zeisburger (Eng. trans. by C. J. Latrobe, London, 1794); became bishop at Hernhutt Mar. 14, 1802, and came to the U. S. in the same year as superintendent of the Moravian churches and pastor at Bethlehem, Pa. D. Feb. 23, 1814.

Los Nie'tos, post-tp., Los Angeles co., Cal. Pop. 1544.

Los'sing (Benson John), LL.D., b. at Beekman, Dutchess co., N. Y., Feb. 12, 1813; was employed as a watchmaker in Poughkeepsie from 1826 to 1835; was next a journalist at that place for several years, and in 1838 became a wood-engraver in New York, where he edited the *Family Magazine,* an illustrated periodical. He conducted *The Young People's Mirror* (1848–49), and in 1872 established the *American Historical Record.* His principal works are an *Outline History of the Fine Arts* (1841), *Lives of the Signers of the Declaration of Independence* (1848), *Pictorial Field-Book of the Revolution* (1850–52), *History of the U. S.* (1854–56), *Our Countrymen* (1855–57), *Life of Philip Schuyler* (1860–62), *Life of Washington, Lives of the Presidents, Pictorial Field-Book of the War of 1812* (1868), *The Civil War in America* (3 vols., 1866–68), *History of the U. S. for Children,* and another work illustrating American progress from 1776 to 1876 (1875). Most of his works are adorned with numerous illustrations by himself. He now resides at Dover, Dutchess co., N. Y.

Lossi'ni [Ger. *Lussin*], an island in the Gulf of Quarnero, an inlet of the Adriatic Sea, belonging to the government of Triest, Austria, 19 miles long and 3 miles broad, with 10,600 inhabitants, mostly engaged in agriculture, fishing, and commerce. The principal town is Lossini Piccolo, a thriving place, with 5200 inhabitants, an excellent harbor capable of receiving the largest men-of-war, and an active trade in wheat, wine, olive oil, fruits, and fish.

Lo'stant, post-v. of La Salle co., Ill. It has 1 newspaper.

Lost Creek, tp. of Vigo co., Ind. Pop. 1914.

Lost Creek, tp. of Newton co., Mo. Pop. 1093.

Lost Creek, tp. of Miami co., O. Pop. 1367.

Lost Grove, tp. of Webster co., Ia. Pop. 119.

Lost River, tp. of Martin co., Ind. Pop. 899.

Lost River, post-tp., Hardy co., West Va. Pop. 1301.

Lot, a river of France, rises in Mont Lozère, in the Cevennes, becomes navigable at Entraigues, and joins the Garonne at Aiguillon after a course of 270 miles.

Lot, department of France, on both sides of the river Lot. Area, 2004 square miles. The surface is elevated and mountainous, traversed by a range of hills, the sides of which are covered with vines, while they abound in wheat,

hemp, tobacco, and fruits. Some iron is mined. Pop. 281,404. Of 35,980 children of school-age, 13,495 received no school education in 1857. Cap. Cahors.

Lotbinière, county of Quebec, Canada, on the S. side of the St. Lawrence. Cap. St. Croix. Pop. 20,606.

Lotbinière, post-v. of Lotbinière co., Quebec, Canada, on the S. bank of the St. Lawrence, 45 miles above Quebec, has 2 large iron-foundries and a spacious convent. Pop. of sub-district, 2129.

Lot-et-Garonne′, department of France, extending along the Lot and the Garonne, and comprising an area of 2027 square miles. The soil is exceedingly fertile in the river-basins; hemp here reaches an extraordinary height; the wine is strong and rich, and capable of being transported across the sea without losing its fine qualities; more wheat is raised than used. But outside of the river-basins the soil consists of a ferruginous clay or of sandy tracts which are entirely unproductive. Much iron is manufactured in this department. Pop. 319,289. Of 31,806 children of school-age, 7840 received no school education in 1857. Cap. Agen.

Lothaire′ I., Roman emperor from 840 to 856, b. about 796, a son of Louis le Débonnaire; shared, together with his two younger brethren, Pepin and Louis, in the government of the empire during the latter part of the reign of his father, whom he succeeded in 840. On the death of Louis war immediately broke out between the three brothers, and Lothaire was defeated in the battle of Fontenay June 25, 841. But in 843 the famous treaty of Verdun was concluded between them, according to which Lothaire retained the imperial title and dignity, Italy, and a strip of land between Germany and France, stretching from the Mediterranean to the North Sea, and extending between the Rhine on the one side and the Rhone, Saône, Meuse, and the Scheldt on the other. Lothaire was a weak, violent, and treacherous character, and utterly unable to defend and govern his land. The Saracens attacked him in Italy, the Norsemen in the Netherlands, while the clergy, the dukes, and his own sons filled the interior with violence and bloodshed. After dividing the country between his sons he retired to the monastery of Prüm in the Ardennes, where he d. a few weeks afterward, Sept. 29, 855.

Lothaire II., THE SAXON, king of Germany and Roman emperor from 1125 to 1137, b. in 1075 of a family not very conspicuous; married in 1100 Richenza, the heiress of the wealthy house of Brunswick, and received in 1106 Saxony as a fief of Henry V. At the death of this prince in 1125, Lothaire was elected king of Germany, chiefly through the intrigues of Bishop Adalbert of Mentz, who hated and feared the Hohenstaufen house. His reign was vigorous and fortunate. Bohemia was again brought under German authority; the refractory dukes, especially Duke Frederick of Suabia, were compelled to submit; the two Italian campaigns undertaken in defence of Innocent II. against the antipope Anicletas were successful. Nevertheless, he bought his crown and the assistance of the Church by surrendering the right of investiture almost wholly to the pope, and in order to retain Henry the Proud of Bavaria and other dukes in his party, he allowed the principle of heredity to establish itself with respect to the fiefs of the Crown. But thus he weakened the royal power, and made it incapable of consolidating and governing Germany. D. near Trent on his return from his second Italian campaign, Dec. 3, 1137.

Lo′throp (SAMUEL KIRKLAND), D. D., b. at Utica, N. Y., Oct. 13, 1804; graduated at Harvard in 1825; ordained at Dover, N. H., in 1829, and in 1834 became pastor of the Brattle street church, Boston, Mass.; wrote the *Life of Samuel Kirkland*, his grandfather, for Sparks's collection of biographies, a *History of the Brattle Street Church* (1851), and occasional addresses and other papers; received the degree of D. D. from Harvard University in 1852.

Lothrop (Capt. THOMAS), b. probably in England; was a freeman of Salem, Mass., in 1634, where he resided many years, and was representative in "general court" 1647, 1653, and 1664. He afterwards settled at Beverly, founded a church there, represented that town four years, and on the breaking out of King Philip's war was chosen captain of a fine company of militia, celebrated in New England as the "flower of Essex," nearly all of whom were surprised and killed by the Indians, with Captain Lothrop, at Bloody Brook, Deerfield tp., Sept. 29 (new style), 1675. A marble monument was placed over the remains of Captain Lothrop and his companions in 1838.

Lotoph′agi, or **Lotus-eaters** [Gr. Λωτοφάγοι], are first mentioned by Homer as a people who fed upon the sweet fruit of the lotus, of which the quality was such that all who ate of it immediately forgot their native land and all desire of return, and chose rather to dwell there and eat of the lotus still. The ancient geographers placed the lotus-eaters on what is now the coast of Eastern Tripoli, near the Great Syrtis. At the present day the cave-dwellers on that coast subsist upon jujubes, and drink a syrup made of that fruit, perhaps the lotus wine of the ancients. (See LOTUS.)

Lot′tery, a game of chance in which prizes are drawn by lots. The word is directly derived from the Italian *lotteria*. The root, however, is Germanic: Gothic, *hlauts;* Icelandic, *hlutr;* Anglo-Saxon, *hlot*. As an institution in modern society the lottery is an Italian invention, but the decision by lot, although by no means entirely unknown to the Romans and Greeks, was a specific feature in the life of the ancient Germanic tribes, and formed a prominent element in the working of all their social, political, and religious institutions; gambling with dice was also one of the most conspicuous vices of many Germanic tribes. Two kinds of lottery are generally distinguished—the class or Dutch lottery, and the numerical or Genoese—but both originated in Italy. In the early Middle Ages it was quite common among the Italian merchants to dispose of their goods by lot—a custom which is generally put in connection with the so-called *sortes conviviales* invented by Augustus. When he made a popular feast, each guest received a sealed packet, and each packet contained a present. The packets were all alike, but the value of the presents differed immensely, some packages containing only a pea-bean, which had no other value than that which the superstition of the receiver might ascribe to it, others containing a diamond of immense value; some only an order for a measure of wine, others a deed of a whole vineyard, etc.: chance decided. Earlier, the magistrates who presided over the distribution of the *congiaria* in Rome had found out how to relieve the monotony of this institution and revive the interest of the people by introducing chance in the distribution. Some of the tickets contained orders for larger quantities of corn, wine, and oil, and chance decided into whose hands these tickets should fall. The invention of Augustus was afterward much improved by his successors, and the taste of the Italian people for all kinds of chance-decisions, and for the excitement which they occasioned, was soon so far developed that merchants were able to utilize it in selling their goods. From Italy the custom spread to other countries, showing itself remunerative everywhere; and in the sixteenth and seventeenth centuries governments generally adopted it with some modifications as a method of procuring money. The simplest and most common organization of these state enterprises was as follows: A certain value was divided into a certain number of unequal prizes; and then a certain number of lots, each lot giving a chance of winning one of the prizes, was sold for a certain price. If all the lots were sold, the profits of the lottery were generally enormous; if not, the lottery diminished its risks by playing the unsold numbers itself and retaining the prizes which might fall on them. From a machine called the "wheel of fortune" as many numbers were drawn as there were prizes, and the prizes were drawn from another similar machine, the order in which they came out determining to what lot they should belong. This is the origin and fundamental organization of the so-called class or Dutch lottery; the numerical or Genoese lottery has more the character of a wager, and originated also as a wager. At Genoa the five members of the great council were elected by throwing the names of ninety candidates into a wheel of fortune, from which then the names of the five elected were drawn. Bets were made both on the names which would come out and on the order in which they would appear. Afterward, numbers were substituted for names, prizes were calculated according to the doctrine of probabilities, and a regular lottery was thus established under the supervision of the government. When five numbers out of ninety are drawn, there is a chance of 1 to 18 that a certain number will come out, and the managers of the lottery generally agree to pay the stake placed on the number sixteen times; the chance of two numbers, an *ambe*, is only 1 to 400, and that of four numbers, a *quarterne*, is 1 to 511,038; but as the chance of winning decreases the rate of the prize increases; in the Austrian lottery a *quarterne* is paid 60,000 times, and in the Bavarian 64,500 times, the stake placed on it. The interest which this kind of lottery excited was enormous. It was introduced into nearly all European countries, and was generally drawn two or three times a week. But thereby the evil consequences connected with all kinds of lotteries became more apparent, and led finally to their abolition in most countries. In the large cities in which the lotteries were drawn a great portion of the population lived in a perpetual excitement, which made men unfit for serious business, and generally ended by thoroughly demoralizing them. The poorer classes left their regular

habits of working and saving, and gave themselves up to idleness and misery, deceived by these prospects of winning a fortune in the next hour which were held out to them by the government.

In England the first lottery was instituted in 1569. The prizes were plate, and the profits were devoted to the repair of the harbors of the kingdom and to other public works: 400,000 tickets were sold at ten shillings each, and the drawing took place at the W. door of the old cathedral of St. Paul in London. In 1612 a lottery was instituted for the benefit of the English colonies, by which the Virginia Company especially profited. During the seventeenth century, however, lotteries, especially private, multiplied in such a degree, and were often organized on such fraudulent principles, that Parliament felt compelled to look into the matter, and by an act in 1709 all private undertakings of this kind were prohibited. From this period and up to 1823 a state or Parliamentary lottery was annually licensed by act of Parliament under various regulations. The prizes were often paid in terminable or perpetual annuities. Thus, in 1746 a loan of £3,000,000 was raised on 4 per cent. annuities, and a lottery of 50,000 tickets at £10 each; and in the following year £1,000,000 was raised by the sale of 100,000 tickets at £10 each, the prizes in which were founded on perpetual annuities at the rate of 4 per cent. per annum. The British Museum was founded, the Westminster bridge was built, from the proceeds of such lotteries. But although in this way the profits of the lotteries were generally employed for some internal improvement of national interest, the abuses practised under cover of the law by the contractors, and the general demoralization which accompanied this kind of gambling, caused Parliament in 1778 to demand an annual license of £50 from every one who kept a lottery-office, whereby the number of such offices was reduced from 400 to 41, and finally in 1826 entirely abolished the whole institution. In France, the lottery was introduced in 1539, and it soon became a popular passion. It was generally some modification of the Genoese form, and private; a tax was paid to the government on every lot. But in 1798 the government forbade all private and foreign lotteries, and took the whole institution into its own hands. The so-called *loteries nationales* were established in all the large cities, and drawn two or three times a week; between 1816 and 1828 they yielded an annual revenue to the state of 14,000,000 francs. Nevertheless, here as everywhere their demoralizing influence on the population, especially on the lower and poorer classes, which are most strongly attracted by them, soon became very apparent, and in 1836 all kinds of lotteries were prohibited; in the next year the deposits in the savings banks of Paris alone increased by 425,000 francs. In Germany, the first lottery was established in 1699 in Nuremberg. It was a class lottery, and various forms of this kind of lottery soon became very popular, and are still in existence in Prussia, Saxony, Brunswick, Hamburg, and Mecklenburg. Lotteries, especially with prizes consisting of goods, not of money, are very common in Germany. Every day in every city some kind of lottery is drawn by which an estate, a set of diamonds, a piece of art, a coach, a pianoforte, or perhaps only a Christmas cake, is sold. In 1870, Prussia derived an income of 1,339,500 thalers from its lotteries; Saxony, 800,000 thalers. About 10,000 persons are engaged in the business throughout the country. There is, nevertheless, very little real gambling passion in Germany proper, while in the German division of Austria, where the Genoese lottery flourishes as a government institution, the influence on the population is very apparent. In 1868, Austria derived a revenue of 5,777,958 florins from the lotteries in its German territories alone, and whenever the question has been raised by the Diet of abolishing the institution, the answer of the government has always been that it cannot afford to lose the revenue. Some very ingenious arguments have been heard there in defence of the institution.

In the U. S. lotteries were formerly very commonly resorted to as a means of raising money for some public improvement—the foundation of colleges and hospitals, the building of roads, bridges, ferries, etc.—though they were denounced as early as 1699 by an assembly of ministers at Boston as "cheats," and their agents as "pillagers of the people." In 1833 appeared at Philadelphia Job R. Tyson's *A Brief Survey of the Great Extent and Evil Tendencies of the Lottery System of the United States*, and a society was formed in Pennsylvania with the purpose of working for the abolition of the institution. It was indeed abolished in Pennsylvania and Massachusetts in the very same year, in Connecticut in 1834, in Maryland in 1836, etc. At present it exists only in Kentucky and Louisiana as a State institution, and in most of the other States, though not in them all, the sale of tickets for foreign lotteries is prohibited by law, and to advertise them has been made a penal offence. In the U. S., as well as in England and France, a lottery is often instituted by the so-called art-unions, under the authorization of the government, for the purpose of disposing of pictures or statuary. But it may be doubted whether this method affords any real encouragement to art—indeed, whether it is not a degradation.

CLEMENS PETERSEN.

Lotts'burg, post-tp. of Northumberland co., Va. Pop. 1777.

Lott's Creek, post-v. in Humboldt and Delano tps., Humboldt co., Ia. Pop. 291.

Lott's Creek, tp. of Ringgold co., Ia. Pop. 709.

Lo'tus, or **Lotos** [Gr. λωτός], a name applied in literature to many widely different plants: (1) To the *Zizyphus Lotus,* a kind of jujube tree of Barbary (order Rhamnaceæ), whose fruit is extensively gathered as food. It is the subject of much Arabic poetry. (See JUJUBE.) It is probably the tree whose fruit beguiled the LOTOPHAGI (which see). (2) The *Melilotus Messinensis,* a valuable forage-plant of the Levant (see MELILOT), and of the order Leguminosæ. (3) The ebenaceous date-plum or pishamin (*Diospyros Lotus*) of Europe and Asia, much resembling our persimmon, and producing a valuable fruit. (4, 5) The fragrant blue and white Nilotic water-lilies (*Nymphæa cærulea* and *N. Lotus*), which were greatly honored by the Egyptians, and were everywhere worshipped. They were mystically connected with their mythology. The stalks and roots furnished food. (6) The *Nelumbium speciosum,* or sacred Egyptian bean, another beautiful pink water-lily, mystically honored in China and India, as well as in ancient Egypt. Its large seeds and roots were, and are still, eaten. This is the lotus-flower (*padme,* "lily-pad") of India. (7) A North African and European hackberry tree, *Celtis australis,* whose wood is prized by carvers and whose fruit is edible. Most of the above, with other trees, have been claimed as the source of the food of the fabled lotus-eaters. (8) There is a large genus of clover-like leguminous plants called *Lotus* by Linnæus, and still bearing that name. It includes the bird's-foot trefoils and other Old-World plants, which are in Europe cultivated as forage-herbs. The pods of some kinds are used as food; others are well known as garden flowers. (9) Recent American writers speak of the *Nelumbium luteum* as the lotus. It is one of our finest native water-plants (closely resembling No. 6 of this article). It is known as the water-chinquapin, and its seeds and roots, if cultivated, would yield a valuable supply of food. Many writers believe that the Homeric lotus was *Nitraria tridentata,* a thorny shrub of doubtful affinity.

Lou'den, tp. of Carroll co., O. Pop. 831.

Lou'don, county of Tennessee, in the beautiful valley of the Holston River. Area, 350 square miles. It is very fertile and rather uneven, producing much grain and live-stock. It is traversed by the East Tennessee and Georgia R. R. Cap. Loudon. The county has been formed since the U. S. census of 1870.

Loudon, county of Virginia, separated from Maryland on the N. E. by the Potomac River and from West Virginia on the N. W. by the Blue Ridge. It is finely diversified and very productive. Cattle, grain, and wool are staple products. Flour is the chief article of manufacture. The county is traversed by the Kittoctan Mountains and by the Washington and Ohio Railroad. Area, 825 square miles. Cap. Leesburg. Pop. 20,929.

Loudon (LOWDEN P. O.), a v. of Springfield tp., Cedar co., Ia., on Chicago and North-western R. R. Pop. 486.

Loudon, tp. of Seneca co., O. Pop. 3133, includes FOSTORIA (which see).

Loudon, post-v. of Peters tp., Franklin co., Pa., on the Southern Pennsylvania R. R. Pop. 315.

Loudon, post-v. and tp., cap. of Loudon co., Tenn., 30 miles S. of Knoxville, on the Little Tennessee River and East Tennessee Virginia and Georgia R. R., has a flourishing college, 4 churches, 2 hotels, 1 weekly newspaper, 1 steam saw-mill, and 15 stores and shops. Before the recent erection of Loudon co. it belonged to Roane co.

W. C. NELSON, ED. AND PROP. "LOUDON TIMES."

Loudon (JOHN CLAUDIUS), b. at Cambuslang, Lanarkshire, Apr. 8, 1783; was educated at Edinburgh University; became a landscape gardener near London 1803; travelled extensively as an observer and student of horticulture, and became a practical instructor in the art. The best of his numerous works are the *Encyclopædias*—of Gardening (1822), of Agriculture (1825), of Plants (1829), of Architecture (1832)—and the *Arboretum et Fruticetum* (1838); was editor of the *Gardener's Magazine* (1826–43), of the *Magazine of Natural History* (1828–36). D. Dec. 14, 1843.—His wife, JANE WEBB LOUDON, b. near Birming-

ham in 1808, was married in 1831, and d. July 13, 1858. She was an able and pleasing writer, chiefly upon botanical and horticultural subjects.

Loudon Ridge, post-v. of Loudon tp., Merrimack co., N. H., 12 miles N. E. of Concord, partly in the town of Loudon and partly in Gilmanton, on the Suncook River, with abundant water-power, has a literary periodical (monthly), a public library, 2 churches, a large carriage manufactory, a tannery, and a number of mills, shops, and stores. Pop. of tp. 1282.

Isaac S. French, M. D., Ed. "Household Messenger."

Lou'donville, post-v. of Ashland co., O., has 1 newspaper. Pop. 811.

Lou'doun, post-v. of Loudon co., Va.

Lough'borough, town of England, county of Leicester, on the Soar. Its manufactures of cottons and woollens, especially of the so-called patent Angola hosiery, are important. Pop. 11,588.

Loui'na, post-tp. of Randolph co., Ala. Pop. 1159.

Louis le Débonnaire, or the Pious, Roman emperor from 814 to 840, b. at Casseneuil in 778, a son of Charlemagne by his third wife, Hildegard. His elder brothers having died, he succeeded his father Jan. 28, 814, and the first years of his government were quite successful. But in 817 he yielded to the wishes of his sons, and gave each of them a share in his dominions, and hence arose complications which he was utterly incapable of managing, and from which resulted the dissolution of the empire. Lothaire received Austrasia and the title of emperor; Pepin, Aquitania; and Louis, Bavaria, Bohemia, and the Avarian districts on the eastern frontier. Bernard, a nephew of Louis, who had inherited Italy after his father, received nothing, and revolted, but the emperor allured him to Chalons, took him prisoner, put out his eyes, and gave Italy to Lothaire. As soon as done the abominable atrocity of the deed struck the mind of the emperor with horror; he went to the Church to be comforted, and from this period he was merely a tool in the hands of the clergy. In 819 he married a second wife, Judith of Bavaria. In 823 she bore him a son, Charles, who later received the surname of *the Bald*, and in 829 he proposed to undertake a new division of the empire in favor of his youngest son. The three elder brothers were unwilling to lose anything, and a war broke out which, often stilled, always reopened, and lasted to the death of the emperor. Twice the father was defeated, taken prisoner, deposed, and subjected to various indignities by his three sons, but both times the avarice and ambition of Lothaire, who wished to reign alone, disunited the brothers, and Louis and Pepin again raised the father to the throne. Pepin d. in 838, and the emperor now proposed to give his dominions to Charles the Bald, thus excluding his sons from their inheritance; but when he at the same moment gave Italy and Austrasia to Lothaire and nothing to Louis, the latter revolted immediately, together with the sons of Pepin. During this war the unhappy emperor d. at Ingelheim, near Mentz, June 20, 840, and was buried at Metz.

Louis II., Roman emperor from 855 to 875, b. in 822, the eldest son of Lothaire I. After the death of Louis le Débonnaire, the empire was divided between his three sons, Lothaire I., Louis the German, and Charles the Bald, by the treaty of Verdun. This division of the empire of Charlemagne was carried still further on the death of Lothaire I., his part being subdivided between his three sons, Louis, Lothaire, and Charles. Louis II. received Italy and the title of emperor; Charles, Provence and Lyons; and Lothaire II., the territory between the Rhine, Saône, Meuse, and Scheldt, called Lotharingia (Lorraine). Louis II. fought successfully against the Saracens in Italy, defeated them at Benevento in 848, and expelled them from Bari. He also understood how to vindicate his authority over the great Italian families, of which many steadily conspired with the Byzantine empire. Charles d. without children in 863, and Louis II. and Lothaire II. divided his dominions; but when in 869 Lothaire II. also d. childless, Charles the Bald and Louis the German took advantage of the emperor's being implicated in a new and less successful war with the Saracens in Italy, and divided Lothaire's dominions between themselves. Louis II. d. at Brescia Aug. 13, 875, and as he left no male issue his two uncles seized his possessions, of which Lorraine fell to Germany.

Louis III., the Child, Roman emperor from 908 to 911, b. in 893, a son of Arnulf, and raised to the throne of Germany on his father's death in 899 by Duke Otto of Saxe, Margrave Luitpold of Austria, and Archbishop Hatto of Mentz, who wished to govern the country during his minority. But the state of Germany while under their rule was miserable; the Hungarians invaded the country, and devastated it as far as Thuringia. In 908, Louis assumed the title of Roman emperor, but he d. in 911, and with him the Carlovingian dynasty became extinct in Germany.

Louis IV., the Bavarian, emperor of Germany from 1314 to 1347, b. in 1286, a son of Duke Louis the Severe of Bavaria and Matilda of Hapsburg. On the death of Henry VII. of Luxemburg in 1313 he was chosen emperor by a majority of the electors, while a minority chose his cousin, Frederick III. of Austria. A long and devastating war commenced between the two emperors, but Frederick was at last defeated in the battle of Mühldorf, Sept. 28, 1323, taken prisoner, and compelled to renounce his claims. Having supported the Viscontis in Milan against Pope John XXII., a quarrel arose between the pope and the emperor. Louis IV. was excommunicated, but went in 1327 with an army to Italy, was crowned in Milan and Rome, deposed John XXII., and established Nicholas V. as antipope. In spite of his success, he was soon compelled to leave Italy, and John XXII. and his successors, supported by French intrigues, continued to oppose and harass him; Germany was placed under interdict. A diet at Reuse on the Rhine (July 15, 1338) declared that an emperor legally chosen by a majority of the electors needed no confirmation from the pope, nor was he in any way subject to his authority. Thus supported by the German princes, and having strengthened his position by large acquisitions of personal property, the emperor prepared for a new campaign against the pope, when he suddenly d. at Fürstenfeld, near Munich, Oct. 11, 1347.

Louis, the name of eighteen kings of France: (1) Louis I., le Débonnaire, Roman emperor, 814–840 (which see).—(2) Louis II., le Bègue (877–879), b. in 846, a son of Charles the Bald.—(3) Louis III. (879–882), b. in 864, a son of Louis II., divided the country with his brother Carloman, who inherited the whole after his death.—(4) Louis IV., d'Outremer (936–954), b. in 921, a son of Charles the Simple, was educated at the court of King Athelstane of England, a brother to his mother, Ogive. In 936, on the death of Raoul of Burgundy, he was called to the French throne by Hugh of Paris and William of Normandy, but his reign was only a series of contests with these two vassals, who in the war with Otho I. of Germany even allied themselves with the enemy.—(5) Louis V., le Fainéant (986–987), b. in 966, a son of Lothaire and Emma, was the last king of the Carlovingian dynasty.—(6) Louis VI., le Gros (1108–37), was b. in 1078, a son of Philip I. The possessions of the French king were at that time the cities of Paris, Orleans, Étampes, Melun, and Compiègne, with their territories, and the kingship itself was a rank rather than a power, but Louis VI. declared that his royal precedence among the princes of France involved a public charge, and he began to act according to this idea. Under him the *oriflamme* was first used as a national banner, and a feeling of national unity became prevalent in the population.—(7) Louis VII., le Jeune (1138–80), b. in 1119, a son of Louis VI., married Eleanor of Aquitaine, thereby uniting this large territory to the possessions of the Crown, but after the unfortunate crusade (1147–49) Eleanor demanded and obtained a divorce, because her "husband was a monk and not a man," and she then married Henry Plantagenet, who already possessed Anjou, Maine, and Touraine, and soon also Normandy and England.—(8) Louis VIII., Cœur le Lion (1223–26), b. in 1187, a son of Philip Augustus, was stopped by the pope in his progress against the English, who at this time were nearly driven out of France. He made a crusade against the Albigenses, which contributed much to the development of the royal power by assembling the vassals under the royal banner.—(9) Louis IX., Saint (1226–70), b. in 1215, a son of Louis VIII., was only eleven years old when his father died; during his minority the country was governed by his mother, Blanche of Castile, a lady of great energy, sagacity, and virtue. In 1236, Louis assumed the throne himself, and shortly after the count of Marche rose in insurrection, supported by Henry III. of England. But Louis defeated them at Taillebourg and Saintes in 1242, and after the victory he treated the rebellious count with so much magnanimity that he won not only the respect, but the good-will, of all his vassals. The most prominent trait in the character of St. Louis was his piety. His conscience, and not his ambition, governed his will. Religious enthusiasm was the motive-power in most of his actions. When the massacre of the Christian inhabitants of Jerusalem in 1244 became known in Europe, St. Louis took the cross in spite of all the remonstrances of his mother and councillors, and in August, 1248, he departed with an army of 80,000 men from Aigues-Mortes on the Mediterranean for the island of Cyprus. In June,

1249, he landed in Egypt and took Damietta, but when, after five months' postponement, he began to push forward to Cairo, he was stopped by the Egyptians in the battle of Mansoorah, and on Apr. 5, 1250, was compelled to surrender himself and his whole army, whose number meanwhile had been reduced to about 30,000. After paying a large ransom he was liberated and sailed for Syria, where he remained several years laboring to do something for the cause of Christianity in these regions. In 1254 he returned to France with about 500 followers. The following fifteen years of his reign were marked with many wise and vigorous reforms, such as "La Quarantaine de Roi," by which a truce of forty days was established from the committal of an offence, during which term the case was tried by the royal courts, and any attempt at private revenge was prohibited; "La Pragmatique Sanction," by which it was forbidden to levy money in France for the pope without the consent of the king, and those cases were defined in which ecclesiastics were to be tried by the secular courts; the foundation of the Sorbonne, of the library of Paris, etc. In June, 1270, the king embarked with an army of 60,000 men for a new crusade. He landed in Tunis, and formed a camp near the ruins of Carthage; but the plague broke out in the army, and he d. Aug. 25. His son Philip led the army home.—(10) Louis X., le Hutin (1314–16), b. in 1289, a son of Philip IV.—(11) Louis XI. (1461–83), b. in 1423, a son of Charles VII., was personally one of the most hideous characters to be met with in history—suspicious, faithless, cruel, and superstitious—but a man of great talent as a ruler. He consolidated the territory of France and the authority of the French crown in this territory, and he founded numerous institutions which were of great benefit to the public in general. But the means by which he curbed the feudal houses of France and brought them into absolute dependency on the Crown were detestable. The count of Armagnac was murdered in 1473; the duke of Alençon died in prison in 1474; the count of Luxembourg was beheaded in 1475; the duke of Nemours was kept for years in an iron cage, and beheaded in 1477; in all, he is said to have put about 4000 persons to death, most of them secretly. By intrigues of the vilest kind he came into possession of Provence, Maine, Anjou, Perpignan, etc., but his principal acquisition was the inheritance of Charles the Bold. Charles was a member of the league which was formed against Louis in the beginning of his reign by all the principal vassals of the French crown, among whom was the king's own brother, the duke of Berry. After the battle of Mont l'Héry in 1465, Louis made great concessions to all the members of the league, but having succeeded in disuniting some of the associates, he had the whole treaty annulled in 1466 by the States General of Tours, and recommenced the quarrel. He now invited Charles to an interview at Peronne, and while this took place he incited the citizens of Liege to revolt against him. As soon as Charles heard of this treachery he seized the king, and liberated him only on very hard conditions. Louis now allied himself with the duke of Lorraine and the Swiss, and when Charles fell in the battle of Nancy (in 1477) he at once incorporated Champagne, Artois, Picardy, and parts of Flanders with France, and managed to keep them in spite of the protest of Charles's heirs. In his internal policy he favored the lower and middle classes, especially the cities, encouraged learning, art, manufactures, and trade, improved public roads and canals, established the first post-system, made the administration of justice regular and cheap, etc.; nevertheless, he was feared and hated, not only by the feudal lords, but by all, and he spent the last years of his life in the fortress of Plessis-les-Tours, surrounded by soldiers and half crazy for fear that somebody should murder him.—(12) Louis XII. (1498–1515), b. in 1462, a son of Duke Charles of Orleans, succeeded Charles VIII. As a descendant of Valentina Visconti he laid claim to Milan, and in 1500 conquered the city and took Ludovico Sforza prisoner. In connection with Ferdinand of Aragon he soon after conquered Naples too, but disagreeing about the partition of their conquest, war broke out between the two allies, and in 1503, Gonsalvo de Córdova expelled the French from Southern Italy. In 1508, Pope Julius II. formed the League of Cambray between Ferdinand of Aragon, Louis XII., and the emperor of Germany against the republic of Venice; but Venice having satisfied the pope by ceding several towns to him, and the pope having become much alarmed at the progress of the French in Italy, the league was suddenly dissolved, and a new one, the so-called "Holy League," was formed between the pope, the emperor, Venice, Ferdinand of Aragon, and Henry VIII. of England against France. Defeated at Novara, the French were driven out of Italy in 1513. At the same time Henry VIII. landed in France with an army of 45,000 men, and having joined the imperial army pushing forward from the Netherlands, he defeated the French at Guinegate. Thus hard pressed on all sides, Louis began to negotiate, and succeeded in escaping from the difficult situation without any great loss.—(13) Louis XIII. (1610–43), b. in 1601, a son of Henry IV. and Marie de Médicis. His education was much neglected. During his minority the country was governed by his mother and her favorite, Concini, who was made a marshal and marquis of Ancre, but the government was only a mixture of weakness, violence, and intrigue. After the murder of Concini in 1617, Albert de Luynes, a favorite of the king, who was made a duke and peer of France, grasped the reins, but his government was in nowise better. After his death in 1624, Cardinal Richelieu (which see) entered the council, and from this moment it was he who ruled France with almost absolute power. The king lived mostly in seclusion, occupied in hunting, drawing, and quiet social enjoyments. He stood in awe of his minister; he had a dread of business; he hated his own family; and Richelieu always understood how to calm down his jealousy when now and then it awakened.—(14) Louis XIV. (1643–1715), b. at St. Germain-en-Laye Sept. 5, 1638, a son of Louis XIII. and Anne of Austria. During his minority his mother and Cardinal Mazarin (which see) governed the country, and brought to a final close the contest between the royal power and the wealthy and ambitious aristocracy, represented at this period by the league of the Fronde. Mazarin d. Mar. 9, 1661, and the next day, when the chiefs of the different departments of the administration asked the king to whom they had to address themselves in the future on questions of business, he answered, "To me." He was from this moment his own prime minister, and in the despatch of business he developed, besides an almost Asiatic despotism, great energy and much sound judgment. He believed that a king was something divine, and he acted on this belief. He surrounded his person with a most magnificent splendor, and guarded his dignity with the most minute forms of etiquette. But his haughtiness did not offend people; it dazzled them. And while his brilliant personal gifts fascinated all who came in contact with him, and attracted to his court all that was eminent in France, the extraordinary prosperity of his government during the first half of his reign made him the idol of the nation. Colbert brought order not only in the finances, but in the whole internal administration, and under his leadership great enterprises were undertaken with signal success. The harbors and shipyards of Brest, Rochefort, Lorient, Havre, Dunkirk, Cette, and Toulon were constructed and fortified; the canal of Languedoc, uniting the Atlantic with the Mediterranean, was built, and other canals and public roads were improved; commercial treaties were concluded with Holland and Italy; manufactures of different kinds were established; and while the people arose from poverty to affluence, the revenues increased immensely and the king grew rich. No less successful was Louis XIV. in the organization and development of the spiritual life of the French people. The Academy of Inscriptions and Belles-Lettres was founded in 1663, the Academy of Sciences in 1666, the Academy of Painting and Sculpture in 1667; nineteen new professorships were founded at the Royal College; the Royal Library was greatly increased; an observatory was built at Paris; and all these institutions were not only amply supported with means of subsistence, but the interest the king showed for them gave their social position dignity and influence. A new taste was created—not in the sense of a new fashion, but of a new ideal of beauty—and this taste was actually imposed on the whole civilized world by Racine, Molière, Boileau, Fénelon, Bossuet; by Lebrun, Poussin, Claude Lorraine; by Perrault, Mansard, Blondel; by Le Notre and others. To these successes it must be added that Louvois, Vauban, and the duke of Beaufort created a powerful army and navy, which under the leadership of Turenne, Condé, Luxembourg, Vendôme, Duquesne, Tourville, and others made any movements of the king with respect to his foreign policy most effective. It has been said of Louis XIV. that he aspired at a universal kingdom, and dreamt the same dream as Charles V. and Napoleon. But for such an idea his mind was too small. His ambition was fired by his imagination, not by any passion. The theatrical effect satisfied him; he was vain only. His first wars were sensible, however. They seem to have had for their principal purpose the establishment of a safe frontier to the N. and N. E., and France certainly needed a reconstruction of her boundaries on these sides. They are blamable, nevertheless, on account of the arrogance and entire disregard of all international rights with which they were commenced, and the almost unexampled barbarity with which they were conducted. In 1665, Philip IV. of Spain died, and Louis, who in 1660 had married his daughter, Maria Theresa, now claimed the Spanish possessions in the Netherlands, and overran the country with a

large army. A triple alliance was formed between England, Holland, and Sweden for the purpose of establishing peace between France and Spain, but by the treaty of Aix-la-Chapelle (May 2, 1668) Louis obtained the so-called French Flanders, besides a number of places along the frontier. His first object after the peace was to separate England from Holland, and, a master in intrigue, he completely succeeded in seducing the weak Charles II., and when in 1670 he began the war against Holland, England was his ally. In Holland, William of Orange was appointed stadtholder and commander-in-chief, and by his diplomatic skill a new league was formed against France between Holland, Brandenburg, the emperor of Germany, and Spain. By the Peace of Nymwegen (in 1678) Louis nevertheless obtained the whole Franche Comté and Alsace. Not content, however, with that which he gained by actual wars, he now began to seize cities and territories during time of peace and under the most futile pretexts. Thus, in 1681 he took Strasbourg, in 1684 Luxemburg, and so on. In order to put an end to such proceedings, a league was formed at Augsburg in 1686 between Holland, Austria, Spain, Bavaria, and Savoy, but although the king opened the war with his usual energy, overrunning the Palatinate and transforming this beautiful country into a desert, and although his armies gained one brilliant victory after the other, yet the victories proved sterile, and by the Peace of Ryswick (Sept. 20, 1697) he had to give up all the conquests he had made during the war, make considerable commercial concessions to Holland, and, what was most humiliating to his pride, recognize William III. as king of England. A great change had taken place during this period in Europe, in France, and in Louis himself. The accession of William III. to the throne of England indicates the turning-point of the fortune of Louis XIV. William was his equal in diplomatic craftiness, and far his superior in statesmanship. In France, Colbert d. Sept. 6, 1683, Louvois July, 1691, and the government passed into the hands of Madame Maintenon, whom the king married secretly in 1685. The Revocation of the Edict of Nantes (Oct. 22, 1685) threw the whole internal development of the country into a most disastrous confusion. The building of Versailles and the expensive armaments for the re-establishment of James II. in England completely exhausted the finances; and while the means of realization became more and more limited, the plans of the king became more and more arrogant. His pride and egotism assumed the most odious forms. He maintained a bloody war along the whole frontier merely for the whims of his vanity. He banished, persecuted, and ruined his own subjects merely because they did not hold the same creed. He sanctioned by his example crimes utterly destructive of the very foundation of civilized society, merely because they suited his passions. And at last he dragged the exhausted and already suffering people into misery for a mere dynastic purpose. At the end of the war of the SPANISH SUCCESSION (which see) the state of France was nearly desperate. The public debt amounted to over 3,000,000,000, and seven-eighths of the whole population were utterly impoverished. All business and industry was in many places entirely destroyed, and famine began to show itself. No actual insurrection took place, though confusion and disorder reigned everywhere, but when the old king d. (Sept. 1, 1715) the whole nation felt it as a liberation.—(15) LOUIS XV. (1715–74), a great-grandson of Louis XIV., b. at Versailles Feb. 15, 1710. During his minority the country was governed by the duke of ORLEANS (which see). After the death of the duke in 1723, Cardinal Fleury, who had been the teacher of the young king, became prime minister, and his parsimony restored some order to the finances, which had been brought to the very verge of bankruptcy by the prodigality of Louis XIV. and the wild schemes of the regent. The young king, who had married in 1725 Maria Leszczynski, a daughter of Stanislaus, ex-king of Poland, seemed to be a noble and honest man, and the war with Saxony, Russia, and Austria, which France commenced in 1733 for the purpose of reinstating Stanislaus on the Polish throne, was conducted with success, and brought the country the beautiful province of Lorraine by the Peace of Vienna (1738). But these encouraging prospects were soon changed in the saddest manner. During the Austrian war of succession Cardinal Fleury d. in 1743, and in the mean time the frivolous and corrupted court had succeeded in seducing the young king, whose profligacy and dissipation soon assumed an extent and openness hitherto unheard of. Châteauroux was succeeded by Pompadour, Pompadour by Du Barry, and besides the official mistresses the king maintained a harem, the so-called Parc-aux-Cerfs, whose story belongs to the most revolting pages of history. The finances ran rapidly into ruin; Dubarry was allowed to squander 180,000,000 in five years. On Pompadour's instigation, France took part in the SEVEN YEARS' WAR (which see), but she lost her colonies, her fleet was destroyed, her armies were beaten one after the other, and to the immense material losses and sufferings was added national disgrace. The king was conscious of the perilous state of affairs, but he thought, "Apres nous le déluge," and went on. The popular opposition to the horrible abuses of the royal authority began to show itself through the Parliament of Paris, whose privilege it was to countersign the royal tax-edicts, but which refused to do so. The resistance, however, was curbed with violence. The Parliament was broken up, its members punished and replaced by more willing tools, and the king was allowed to rot in peace. When he died at Versailles on the afternoon of May 1, his corpse, a heap of "confluent smallpox" and other still more loathsome diseases, was carried away to St. Dénis in the evening in a hurry, without ceremonies, unaccompanied by any even of his nearest kinsmen or servants, but reviled with the execrations of all passers-by.—(16) LOUIS XVI. (1774–93), a grandson of Louis XV., b. Aug. 23, 1754, was a good-natured, well-meaning, honest man, of pure morals, and capable of making a sacrifice for the public weal, but his will was weak and his intellect narrow. He was unable to comprehend the situation, and he was entirely destitute of political instincts. Thus he hastened the approach of the Revolution. The finances, burdened by a new debt of 1,500,000,000, contracted by the participation of France in the American war of independence, formed the point of issue. The annual budget showed a deficit of 140,000,000. There were two remedies—restriction of the expenses, which the queen and the court opposed, and taxing the privileged classes, which the Parliament opposed. The king, a good printer and an ingenious locksmith, but incapable of deciding in such a dilemma, hoped to find a third expedient by appealing to the people; and thus it came to pass that he himself appealed to the Revolution. (See FRANCE—*History*.)—(17) LOUIS XVII., a son of Louis XVI. and Marie Antoinette, b. at Versailles Mar. 27, 1785; shared at first the imprisonment of his parents in the tower of the Temple, but was after the decapitation of his father separated from his mother, and died of ill-treatment and neglect in his cell (June 8, 1795). A number of impostors pretended to be Louis XVII., and excited some attention, but their claims were easily disproved.—(18) LOUIS XVIII. (1814–24), b. at Versailles Nov. 17, 1755, a brother of Louis XVI., received at his birth the title of count of Provence. In 1791 he fled, and lived in Coblentz, Verona, Mitau, and England. After the death of Louis XVII. he assumed the title of king of France, but his pretensions elicited generally only a smile, and the court of emigrants he assembled around him often excited disgust. Nevertheless, after the fall of Napoleon he was called to the French throne. Both the French people and the foreign powers wished peace, and the re-establishment of the Bourbons was considered its only safe guaranty. There was, however, only one fraction of the French people with which the king was in full harmony—namely, the old emigrants, who hoped through him to get not only restitution, but also vengeance; and even these partisans he was compelled to disappoint in order to preserve his throne. His reign was a time of confusion and dulness, and in the actual process of restoration and reorganization, which went on silently and instinctively, he took no part. Personally, he was indolent, apathetic, good-humored, and shrewd in a small way.

CLEMENS PETERSEN.

Louis the German [Ger. *Ludwig der Deutsche*], b. about 805, a son of the emperor Louis le Débonnaire, received by the first division of the empire of Charlemagne (in 817) Bavaria and the Slavic countries on the eastern frontier, but by the treaty of Verdun in 843, which ended the war between the heirs of Louis le Débonnaire, he obtained the whole territory W. of the Rhine, and became the founder of the German empire. Invited by the discontented vassals of Charles the Bald, he broke into France in 858, and conquered the country, but the difference between the Eastern and Western Franks—that is, between the Germans and the French—were at this period so great that a union of the two tribes proved impossible, and Louis was compelled to give up his conquests. Against the Bulgarians in the S. E. and the Normans in the N. W. he fought with valor, though not always with success; the bishopric founded at Hamburg in 834 he was compelled to remove to Bremen in 858, as the pagans burnt down the former city. After his death in 876 his sons divided the empire between them.

Louis the Great, king of Hungary from 1342 to 1382, a son of Charles Robert of Anjou, was one of the most successful of the elective monarchs of that country. Although he failed in his expeditions to Naples for the purpose of avenging his brother Andrew, who had been murdered by his wife Joanna, queen of Naples, he extended the boundaries of Hungary to the S. E., and united Poland to it on

the death of Casimir the Great in 1370. He expelled the Jews, but by decreasing the duty on merchandise he greatly encouraged the commerce of the country. On the general development of civilization in his realm he exercised great influence. He founded a rich college in Fünfkirchen, and Buda became one of the most splendid capitals of Europe.

Louis Napoleon. See NAPOLEON III.

Louis Philippe, king of the French from the revolution of July, 1830, to that of Feb., 1848, b. at Paris Oct. 6, 1773, the eldest son of Duke Louis Philippe Joseph of Orleans, generally known under the name of Philippe Égalité; educated by the famous Madame de Genlis; received in 1785 the title of duke of Chartres. The example of his father and the ideas of his governess made him an enthusiastic adherent of the Revolution. He entered the national guard and the club of the Jacobins, renounced his titles, and assumed the name of Citizen Égalité; fought in the armies of the republic, and distinguished himself greatly in the battle of Jemappes, Nov. 6, 1792; and the edict which banished the Bourbon family from France exempted him and his father. Nevertheless, after the unfortunate battle of Neerwinden (Mar. 18, 1793), in which he commanded the centre under Dumouriez, his position became very difficult, the more so as the commander-in-chief was suspected by the Convention of intriguing to place him on the throne. Orders of arrest were issued both against him and Dumouriez, and on Apr. 4, 1793, they fled across the Austrian frontier. For more than twenty years he was an exile, often fighting against very hard circumstances, as shortly after his flight his father was executed, his mother banished from France, and all the property of the family confiscated. He lived for some time in Switzerland, teaching mathematics in a school; for some time in Scandinavia, where he travelled as far as the North Cape; from 1796 to 1800 in the U. S.; from 1800 to 1807 at Twickenham near London; and after 1809 at the court of Ferdinand I. of Sicily, whose daughter, Marie Amélie, he married. He twice attempted to join the adherents of the Bourbon family in Spain, but was both times foiled by the English diplomacy. After the fall of Napoleon he returned to Paris, was reinstated in the possession of the immense property of the Orleans family, and took up his residence in the Palais Royal; but although a reconciliation had taken place between him and the elder line of the Bourbon family, the king, Louis XVIII., disliked, suspected, and feared him. The duke of Orleans, as was now the title of Louis Philippe, was a man of great gifts and of great attainments, eloquent, accomplished, fascinating, with vivid instincts and large views, shrewd in his judgment of persons and sound in his judgment of things. Alexander of Russia marked him out as the most prominent member of the whole family, and although he lived in a rather retired manner in Paris, and took very little part in politics, he soon became very popular. On the outbreak of the revolution of July, 1830, the Chamber of Deputies, after deposing the king, chose him lieutenant-general of the realm, and Charles X. recognized him as such, hoping through him to preserve the throne for the count of Bordeaux. Whether this could have been done is doubtful; the crown was offered to Louis Philippe by the Chamber of Deputies, and he accepted it, though henceforth he was considered a traitor by the legitimists. His reign lasted eighteen years, but although it is very interesting when studied in detail in the books of Lemoine, Louis Blanc, Regnault, and Guizot, it is singularly destitute of striking events. A number of attempts at assassination, from which the king escaped in a wonderful manner; a series of sometimes bloody, sometimes ridiculous, but always abortive, insurrections in Paris, Lyons, the Vendée, Strasbourg, Boulogne, etc.; a whir of brilliant debates in the Parliament, resulting in monthly, sometimes weekly, modifications of the cabinet,—that is about all. There was no relation between the government of Louis Philippe and the two principal elements of the character of the French people—its instinct of progress, since 1789 every now and then excited into revolutionary fever, and its ambition of greatness, since the days of Napoleon often allured into bravado. Louis Philippe was a shrewd administrator, but towards the close of his reign it became evident that the administration was corrupt; corruption had crept even into the ministries. The people demanded an extension of the elective franchise. The king refused, and immediately the Revolution broke out with irresistible fury. The king fled to England, where he d. at Claremont, near London, Aug. 26, 1850. CLEMENS PETERSEN.

Louis (PIERRE CHARLES ALEXANDRE), M. D., b. at Aï, Marne, France, in 1787; graduated in medicine at Paris in 1813, and became connected with the Charité Hospital, and afterwards with the Pitié and the Hôtel Dieu; he acquired a worldwide fame as a diagnostician, pathologist, and clinical observer. He was the first to distinguish properly the difference between typhus and the so-called typhoid or enteric fever; became in 1826 a member of the Academy of Medicine. His *Recherches sur la Phthisie* (1825), *Recherches sur la Fièvre typhoïde* (1828), and other works had an extensive and valuable influence. Louis was one of the fathers of the modern methods of clinical observation. D. at Paris Sept., 1872.

Louisa, county of S. E. Iowa, bounded E. by the Mississippi River. Area, 400 square miles. It is generally level and fertile, with broad bottom-lands. Cattle, grain, and wool are leading products. The county is traversed by the Iowa River and by the Burlington Cedar Rapids and Minnesota R. R. Cap. Wapello. Pop. 12,877.

Louisa, county of E. Central Virginia. Area, 460 square miles. Its soil was naturally excellent. Its surface is pleasantly varied. Tobacco and grain are staple products. Flour is the chief article of manufacture. The county is traversed by the Chesapeake and Ohio R. R. Cap. Louisa Court-house. Pop. 16,332.

Louisa, post-v., cap. of Lawrence co., Ky., on Big Sandy River. Pop. 425.

Louisa Court-house, post-v. and tp., cap. of Louisa co., Va., on the Chesapeake and Ohio R. R. Pop. 2559.

Lou'isburg, a famous fortress built by the French soon after the Peace of Utrecht (1713) upon the eastern coast of Cape Breton Island, in lat. 45° 53′ 30″ N., lon. 60° W., receiving its name in honor of Louis XIV. The works constructed here were of the heaviest and most complete description, and were built of stone. A large and well-built town of some 3000 inhabitants sprang up, favored by the spacious and excellent harbor. Since the existence of so strong a place threatened the colonial and English fisheries, it was determined in 1745 by the legislature of Massachusetts Bay (France and Great Britain being then at war) to strike a blow at the town. Accordingly, a force of colonists consisting of 3250 Massachusetts militia, aided by 516 men from Connecticut and 304 from New Hampshire, set sail in 100 vessels, and landed near the town Apr. 30, 1745. An active but irregular siege (though the men were without tents and the proper means of conducting such operations) was terminated June 17, 1745, by the capitulation of the French under Duchambon—an event that caused the greatest joy throughout the British empire. But the Peace of Aix-la-Chapelle (1748) gave back all Cape Breton to France. The town was invested in 1758 by Gen. Amherst with 14,000 British troops, 20 line ships, 18 frigates and other vessels. After a tremendous bombardment, which quite destroyed the town and breached the walls badly, the garrison and French fleet surrendered, July 26, 1758. The defence was very spirited. The number of prisoners was 5637. The English overthrew the fortifications at an expense of $50,000. The first cost was one hundred times that sum. The ruins still remain. There are at present about 300 inhabitants, mostly fishermen. There is a lighthouse. The village is in Cape Breton co., N. S., and is 24 miles S. E. of Sidney.

Louisburg, post-v. of Miami co., Kan., on the Missouri Kansas and Texas R. R. (Osage division), 13 miles E. of Paola.

Louisburg, post-v. and tp., cap. of Franklin co., N. C., on Tar River, 10 miles E. of Franklinton and 31 miles N. E. of Raleigh, has 3 churches, 1 weekly newspaper, 15 stores, several shops, flouring-mills, steam saw-mills, 2 steam cotton-gins, 1 bakery, 1 drug store, 1 female seminary, and is an important centre for purchase and sale of cotton. Pop. of v. 750; of tp. 2542. GEO. S. BAKER, ED. "COURIER."

Louis d'Or ("Louis of gold"), a French gold coin, first struck in 1641 under Louis XIII., not coined since 1795, but the name is often given to the twenty-franc piece or gold Napoleon, and to certain German five-thaler pieces. The value of the louis fluctuated considerably, but may be roughly stated to be about five dollars in Federal money.

Louisia'na, one of the Gulf States of the American Union, situated wholly within the Mississippi Valley, and the greater part of it comprised in the delta of the Mississippi River. It is situated between the meridians of 89° and 94° W. lon. from Greenwich, and between the parallels of 28° 56′ and 33° N. lat. Its extreme length from E. to W. is 298 miles, and its extreme breadth from N. to S. about 280 miles. Its area, according to the census and land-office reports, is 41,346 square miles, or 26,461,440 acres. Its form is very irregular, although a part of its boundaries are parallels and meridians. On the N. its boundary is along the 33d parallel, which divides it from Arkansas, as far E. as the Mississippi River, and from the mouth of the Red River to the Pearl River on the 31st parallel, which divides it from Mississippi; on the E. the Mississippi River separates it from the State of Mississippi as far as to the mouth of the Red River, and the Pearl

River from the 31st parallel to Lake Borgne forms the boundary between it and the same State; on the S. and S. E. the Gulf of Mexico and several sounds and estuaries

Seal of Louisiana.

from the Gulf form its boundary; on the W. the Sabine River and Lake separate it from Texas to the point where that river crosses the 32d parallel, and thence northward of the 33d parallel the boundary runs along the 94th meridian.

Face of the Country.—The N. and N. W. portions of the State rise into low hills not exceeding 240 feet in height, and from these the land slopes gradually both toward the Mississippi and the Gulf. A large portion of the delta of the Mississippi, especially below New Orleans, is marshy, and actually below the river at high water. In all, about 8450 square miles, or one-fifth of the area of the State, is subject to inundations, though not all of it annually. Along the Mississippi River much of the land is below the surface of the river at the spring freshets, and is protected from overflow by levees or artificial embankments. These levees extend 120 miles above New Orleans and 43 miles below it. They are sometimes worn and broken through by the floods, and the "crevasses" thus produced cause the submergence of hundreds of thousands of acres. Local topographers classify the lands of the State as "good uplands;" "pine hill lands," usually not very fertile; "alluvial tracts;" "Bluff or Loess regions;" "marsh lands;" "the prairie regions;" and "the pine flats." The whole alluvial region of the delta is very fertile, and its deep black loam will yield enormous crops; the hilly country, on the contrary, is not very productive, and some portions of it are sandy barrens.

Rivers, Lakes, Sounds, and Bays.—The Mississippi River has a course of about 590 miles in the State, and is navigable for the largest steamers throughout its whole extent. (See Mississippi River.) The Red River, the second in size of the great tributaries of the Mississippi, enters the State in the N. W., and crosses it diagonally to the 31st parallel, where it enters the "Great River." Its principal affluents in the State are the Washita, with its two large branches, the Tensas, and the Bœuf: the Dugdemona, the Sabine Bayou, and the Bistineau River and Lake. The Sabine River forms a part of the western boundary of the State, and the Calcasieu and Mermenteau are considerable streams, the latter having several tributary bayous or sluggish streams. The Pearl River, having Bogue Chitto for a tributary, the Tangipahoa, Tickfaw, and Amite are the principal streams E. of the Mississippi. There are besides these several large bayous or estuaries, which are really outlets or secondary mouths of the Mississippi, which in flood-time convey a large portion of its waters to the Gulf, and at other times drain the greater part of Southern Louisiana. The principal of these are Atchafalaya Bayou, with its series of lakes, Vermilion Bayou, Bayou Teche, which connects with it, Bayou de Large, Bayou la Fourche, and the estuaries, lakes, and bayous which debouch into Barataria Bay. The distinction between lakes, sounds, and estuaries in this State is not very marked. Lake Pontchartrain is perhaps a lake in the sense of being surrounded by land, except at its outlets, but its waters are salt, and rise and fall with the tide; Lake Borgne is only a sound or bay; Lake Maurepas is closely connected with Pontchartrain; Sabine Lake, Calcasieu Lake, Lake Mermenteau, Grand Lake, Marsh Lake, Lake Charles, Grand Chenière, Caillou, Lake Washa, etc. are all estuaries connected with rivers or bayous. In Northern Louisiana there are ten or twelve lakes, which are expansions either of the Red River or its tributaries. Some of these are of considerable extent. Along the coast there are—Chandeleur and Isle au Breton Sounds, Bay Ronde, Garden Island Bay, East and West Bays, Timbalier, Terre Bonne, Caillou, Atchafalaya, Côte Blanche, and Vermilion Bays.

Geology.—The geological formations of Louisiana, so far as the superficial strata are concerned, are very simple. The Mississippi and Red River basins, the Mississippi delta, and the Bluff or Loess region, which includes most of Calcasieu, St. Landry, and Lafayette parishes, and a long but narrow strip E. of the Mississippi River, which together comprise three-fifths of the State (the Mississippi delta proper extending over eighteen of the largest parishes and more than 12,000 square miles) are alluvial and diluvial, the deposits of the delta being from 40 to 60 feet in depth and of marvellous fertility; these deposits are constantly making, and the delta extending out into the Gulf every year slowly or rapidly as the freshets of the upper river and its tributaries are destructive or of slight amount. Of the remaining two-fifths of the State, the N. W. and W. N. W. portions and a small tract on the W. side of the Pearl River, extending to the Loess, are Tertiary, and in the nomenclature of the Southern geologists are classified as belonging to the Grand Gulf, Vicksburg, and Jackson strata, which seem to be subdivisions of the Eocene. In the N. W., W., and central parts of the State occasional small outcrops of Cretaceous strata are found rising above the Tertiary. These Cretaceous rocks are mostly limestone, gypsum, and salt-bearing strata. The Tertiary tract in the N. W. lies N. of a line drawn from the junction of the Neches and Sabine rivers, eastward to the vicinity of Harrisonburg, Catahoula parish, and contains deposits of some useful minerals. Brown coal (lignite) of fair quality, though not the best, is found here in considerable quantity. Iron is somewhat abundant in this region, and salt springs and salt deposits, which were extensively utilized during the late civil war; that on Petit Anse Island has been mined to a depth of 60 feet below the level of the Gulf, 58 feet through solid rock-salt of the purest quality. Ochre, marl, gypsum, lead, sulphate of soda, sulphate of iron, and a very pure carbonate of lime occur in considerable quantities. Below the alluvium and Tertiary in the southern part of the State there are deposits of sulphur, and at one point between the Calcasieu and Sabine rivers artesian wells have been bored and shafts sunk which demonstrate that, beginning at a point about 428 feet below the surface, there is a deposit of sulphur 112 feet in thickness, and which yields from 60 to 96 per cent. of pure sulphur. The more superficial strata at this point contained petroleum, but not in sufficient quantity to be worked with profit. Copper has also been found in several parishes of the State. Among the minerals not of economic value found in the State are quartz-crystals, jasper, agates, carnelians, sardonyx, onyx, feldspar of fine quality, and meteoric stones. Fossils of various kinds have also been discovered at different points. Most of these minerals have been found in the Tertiary.

Soil and Vegetation.—The entire alluvial deposits furnish a soil of extraordinary permanence and fertility. The delta lands are unsurpassed for the culture of sugar-cane, cotton, rice, wheat, barley, and buckwheat, sweet potatoes and figs. The islands produce sea-island cotton equal to the best, though for the most part the cotton produced in Louisiana is the upland or short-stapled variety. The orange flourishes quite as well in Southern Louisiana as in Florida. The Tertiary region has not so rich a soil, but with proper culture yields good crops. Indian corn does better there than in the alluvium. Cotton grows everywhere in the State. A portion of the Tertiary region is covered with heavy though not dense pine forests, and though healthful is not productive. About one-fifth of the area of the State is too swampy and marshy for cultivation, and much of it is covered with lofty cypress trees, from which the Spanish moss hangs in graceful festoons. The other forest trees of the alluvial portion of the State are ash, sweet gum, hickory, black walnut, magnolia, live-oak, Spanish, water, black, chestnut, white, and post oaks, tulip tree, Florida anise, linden, lance-leaved buckthorn, four or five species of acacia, wild cherry, pomegranate, holly, black walnut, arbor vitæ, tillandsia, lime, pecan, sycamore, white and red cedar, and yellow pine, and in the Tertiary, sassafras, mulberry, poplar, hackberry, red elm, maple, honey locust, dogwood, tupelo, box elder, black locust, prickly ash, persimmon, etc. Along the rivers the cottonwood, willow, basket elm, palmetto, wild cane, papaw, and wild orange are found. Of fruit trees, the peach, quince, plum, fig, orange, papaw, and olive do well; the apple and pear do not succeed so well. The grazing in the uplands generally is excellent; in the Attakapas country, along the Atchafalaya, and Bayou Teche the pasturage is unsurpassed in quality. Louisiana, like Florida, is a land of flowers, and the flowers yield the richest of perfumes. The fragrance of its orange-blossoms, its magnolias, jessamines, camellias, oleanders, virgin's bower, and its luxuriant roses, as well as the thousands of other semi-tropical flowers which grow wild on its prairies

and broad bottom-lands, make it for the greater part of the year an earthly paradise.

Zoology.—In addition to the wild animals, reptiles, and birds common to the Gulf States, Louisiana has some which are peculiar to her territory, or at least only found W. of the Mississippi. In the forests black bears and wolves, and in the cypress swamps panthers of large size and great ferocity, are occasionally met with; while the wild-cat, raccoon, polecat, opossum, otter, squirrel, two or three species of rat, mouse, dormouse, and mole, are abundant. The alligator inhabits all the bayous, and is often destructive to cattle, and sometimes to the human subject. There are several species of turtle; lizards, horned frogs, many species of toad, the gecko, and chameleon; while rattlesnakes, vipers, moccasin, horned, and other snakes are very common. The birds of most note are the bald and the gray eagle, the king vulture, the turkey-buzzard, and other vultures, kites, hawks, owls, gulls, the pelican (which is rarely or never found in its natural haunts, E. of the Mississippi), cranes, herons, wild-turkeys (not as plenty now as formerly), pigeons, partridges, wild-geese, brant, and wild-ducks generally in great abundance, and a great variety of smaller birds, many of them of brilliant plumage. The fish are generally those common to the Gulf.

Climate.—The climate of New Orleans and the lower portion of the delta is to some extent malarious, from its slight elevation, the heat, moisture, and vegetable decay which is so prevalent. Bilious and congestive fevers are very prevalent, and the worst forms of intermittent not uncommon. The yellow fever may be considered endemic in New Orleans, though of late years, owing to the careful precautions of the authorities to keep the city in a good sanitary condition, it has not made such ravages as formerly, and is not epidemic oftener than once in seven or eight years. Western and North-western Louisiana is perhaps as healthy a region as any part of the U. S. There is little or no malaria, and pulmonary patients are greatly benefited by a residence there. The cold N. winds (called "northers" in Texas) occasionally lower the temperature and produce a degree of cold which causes much suffering. The average temperature of the year is not as high (as will be seen by the accompanying table) as in other States and countries in the same latitude; this results from the action of these cold N. winds. The following table gives the maximum, minimum, and mean monthly and annual temperature, rainfall, barometrical pressure, and prevalent winds at the points indicated:

	New Orleans: lat. 29° 58′ N.; lon. 90° 07′ W.; altitude, 25 feet above the sea.	Shreveport: lat. 32° 30′; lon. 93° 45′; altitude, 228.5 feet above the sea.	Benton: ab. lat. 32° 40′ N.; lon. 93° 35′ W.; altitude, 234 feet above the sea.
Highest temperature of the year	98°	95°	92°
Lowest " " "	17°	18°	15°
Mean " " "	67.5°	63.91°	64.37°
Range of thermometer during the year	81°	77°	77°
Highest temperature in January	81°	74°	75°
Lowest " " "	25°	17°	15°
Mean " " "	49.5°	42.2°	41°
Rainfall " "	5.06	3.13	3.10
Highest temperature in February	......	79°	78°
Lowest " " "	......	23°	21°
Mean " " "	69.5°	52°	45.1°
Rainfall " "	1.93	7.47	7.38
Highest temperature in March	83°	83°	82°
Lowest " " "	53°	30°	33°
Mean " " "	60.4°	58.9°	61.6°
Rainfall " "	5.10	2.67	2.71
Highest temperature in April	82°	85°	84°
Lowest " " "	46°	44°	47°
Mean " " "	66.9°	64.8°	65.4°
Rainfall " "	1.74	1.94	1.89
Highest temperature in May	......	91°	90°
Lowest " " "	......	56°	58°
Mean " " "	73.7°	72.9°	69.8°
Rainfall " "	18.68	4.58	4.61
Highest temperature in June	92°	92°	91°
Lowest " " "	79°	64°	68°
Mean " " "	80.1°	79.6°	81.4°
Rainfall " "	6.68	7.94	7.85
Highest temperature in July	98°	95°	92°
Lowest " " "	74°	73°	74°
Mean " " "	82.4°	81.6°	83.8°
Rainfall " "	6.27	3.31	3 34
Highest temperature in August	93°	94°	92°
Lowest " " "	78°	71°	72°
Mean " " "	81.2°	81.7°	82.1°
Rainfall " "	8.30	1.59	1.53
Highest temperature in September	89°	90°	89°
Lowest " " "	72°	48°	50°
Mean " " "	78.7°	75.7°	75.0°
Rainfall " "	3.19	2.31	2.28
Highest temperature in October	86°	83°	82°
Lowest " " "	60°	40°	42°
Mean " " "	68.4°	65.5°	65.9°
Rainfall " "	3.18	3.41	3.39
Highest temperature in November	79°	81°	80°
Lowest " " "	42°	26°	28°
Mean " " "	57.4°	50°	51.2°
Rainfall " "	7.43	1.39	1.43
Highest temperature in December	72°	78°	76°
Lowest " " "	32°	16°	18°
Mean " " "	51.4°	42°	44.9°
Rainfall " "	5.25	7.03	7.08
Total rainfall for year	72.81	46.77	43.78
Monthly mean pressure of barometer for January	30.115	30.100	
" " " " " February	30.085	30.058	
" " " " " March	30.158	30.116	
" " " " " April	30.020	29.972	
" " " " " May	29.923	29.894	
" " " " " June	30.002	29.962	
" " " " " July	30.063	30.039	
" " " " " August	30.038	30.045	
" " " " " September	30.016	30.042	
" " " " " October	30.077	30.083	
" " " " " November	30.039	30.139	
" " " " " December	30.200	30.213	
Annual mean pressure of barometer	30.069	30.055	
Prevailing winds for winter	S. E. & N.	N. E., N. W.. & S. E.	N. N. W., N., & S.
" " " spring	S. E. & S.	S. W. & S.	S. & S. E.
" " " summer	S. E., S., & S. W.	Calm, S. E., E., & S.	Calm, S. E. & S.
" " " autumn	E., N. E., & N.	Calm, N. E., S. E., & N.	Calm, N. E., N., & S. E.

Agricultural Products.—The principal agricultural products of Louisiana are sugar (from the sugar-cane), cotton, rice, wheat, and other cereals, figs, oranges, Indian corn in moderate quantity, sweet potatoes, tobacco, and a great variety of market-garden products. Large numbers of cattle are reared for slaughter and exportation. The production

of sugar from the cane has been for more than fifty years a favorite industry in the State; the canes are grown from layers, not from the seed, and it has been supposed that the quality of the cane has deteriorated materially from this mode of propagation. In 1853 the sugar crop amounted to 439,324 hogsheads of 1000 pounds each; in 1861, to 459,410 hogsheads. During the late civil war the production was very small, only 6000 hogsheads being reported in 1864; since the war it has gradually been recovering, though with some adverse years. In 1870 it was 144,881 hogsheads; in 1871, 128,461; in 1872, 108,520; in 1873, 89,498; in 1874, 102,923 hogsheads, and about 90,000 hogsheads of molasses. Cotton in 1870 was grown to the extent of 350,832 bales; in 1872, of 501,000 bales; in 1873, of about 450,000 bales; in 1874, of 495,000 bales. The report of the production of Indian corn was in 1859 (census of 1860), 16,853,745 bushels; in 1869 (census of 1870), 7,596,628 bushels; the report of the department of agriculture was in 1870, 18,000,000 bushels (probably excessive); in 1871, 8,100,000 bushels; in 1872, 10,125,000 bushels; in 1873, 9,112,000 bushels; in 1874, 8,110,000 bushels. Corn is not a productive or profitable crop in Louisiana, seldom yielding over fifteen bushels to the acre. Wheat is not largely cultivated, though it is increasing in importance every year; 41,000 bushels were raised in 1869, and over 100,000 bushels in 1874. In the rich lands of the delta it yields 20 to 30 bushels to the acre. Rice is a staple product of the State, and ought to be grown ten times more abundantly than it is. In 1873 the crop was 12,007,380 pounds. Of the other cereals, 35,000 bushels of oats were reported in 1873, and a considerable increase in 1874; barley is not largely cultivated, though it is becoming a profitable crop. Of potatoes (probably sweet), 60,000 bushels only were reported in 1873, and about 54,000 bushels in 1874. Tobacco is not a large crop, 35,000 pounds only being reported in 1873, and but 15,541 in 1870, but its quality is excellent. Hay is increasing as a crop, the Hungarian grass being cultivated (as well as other grasses) for this purpose; 8776 tons were cured in 1870; 13,100 tons in 1873, and 13,500 tons in 1874. The number of horses and mules is increasing; in 1870 there were 62,584 horses in the State; in Jan., 1874, 75,700; in Jan., 1875, 75,000. In 1870 the number of mules and asses was 61,338; in Jan., 1874, it was 78,400; in Jan., 1875, 79,980. Other domestic animals are decreasing; in 1870 the number of milch cows was 102,076; in Jan., 1874, it was 90,700; in Jan., 1875, 87,070. In 1870 the number of working oxen and other cattle was 233,185; in Jan., 1874, the agricultural department reported 173,900 (probably an under-estimate); in Jan., 1875, 168,650. In 1870 the number of sheep was reported as 118,602; in Jan., 1874, as 64,600; in Jan., 1875, 63,100. In 1870 the number of hogs was 338,326; in Jan., 1874, 247,100; and in Jan., 1875, 210,035. The total value of live-stock in 1870 was $15,929,188; in 1874, $19,730,255.

Manufacturing and Mining Industry.—Louisiana is not largely engaged in manufactures. In 1870 she had 2557 manufacturing establishments, including the sugar-mills on the plantations. The motive-power of these establishments, mostly steam-engines, equalled 25,066 horse-power; 30,071 persons were employed, of whom 23,637 were men, 4210 women, and 2224 children; the capital invested was reported as $18,313,974; the wages paid, $4,593,470; the raw material used, $12,412,023; and the product, $24,161,905. But of this total product, $10,341,858 was of raw sugar, which is an agricultural rather than a manufactured product. Refined sugar was produced to the amount of $643,085; lumber, planed and sawed, $1,516,632; bread, ship-bread, and other bakery products, $875,261; iron castings, $552,470; tobacco and cigars, $417,010; clothing, $424,173; flouring-mill products, $731,395; cars, freight and passenger, were produced to the extent of $368,730; machinery, steam-engines, and boilers, $412,900; cotton-seed oil, $324,700; shipbuilding, etc., $326,230; malt liquors, $250,920. Sugar-refining has increased since 1870, but most of the other branches of manufacture have languished. The mining industry of the State consists of some coal-mines, rather inefficiently worked, a little iron mined, the salt-mine of Petit Anse Island, and a sulphur-mine at Calcasieu Springs.

Railroads.—The following table, compiled principally from Poor's *Railroad Manual* for 1874–75, gives the condition of the railroads of the State at or near Jan., 1874:

Names of Railroads.	Length.		General Liabilities.				Cost of railroad, equipment, etc.	Gross Earnings.				Earnings less operating expenses.
	Main track and br'ches.	All other tracks.	Capital stock.	Funded debt.	Floating debt.	Total stock, bonds, and debt.		From passengers.	From freight.	All other.	Total amount.	
	Miles.	Miles.	$	$	$	$	$	$	$	$	$	$
Morgan's Louisiana and Texas..	97.25	27.33	3,980,000	....	....	3,980,000	3,980,000	150,000	300,000	......	*450,000	180,000
New Orleans Jackson and Great Northern	249.40	35.00	4,734,000	8,000,000	1,176,020	12,910,020	15,279,042	444,434	1,231,071	114,984	1,790,489	803,250
New Orleans Mobile and Texas..	203.00	30.00	7,275,000	9,275,000	....	17,550,000	11,500,000	200,000	300,000	......	*500,000	100,000
Total........................	549.65	92.33	15,989,000	17,275,000	1,176,020	34,440,020	30,759,042	794,434	1,831,071	114,984	2,740,489	1,083,260

On the 1st of Jan., 1875, the number of miles in operation had increased to 657.28, but the cost of roads and equipments differed very slightly from the figures of the above table.

Levees.—The people of Louisiana have built and now maintain in repair more than 1500 miles, or 51,000,000 cubic feet of levees within the State limits. But for these the greater part of the delta would be a hopeless and slimy swamp. The cost of these levees was about $17,000,000, and to perfect the system and complete the work where it is still needed will require about as much more. About half a million dollars is expended annually on the repair and building of levees, but this is entirely inadequate for the protection of the plantations near the rivers.

Commerce.—Louisiana is the second State in the Union in the amount of its commerce, New York alone exceeding it in the amount of domestic and foreign exports; while in its imports it is also below Massachusetts, Maryland, Pennsylvania, and California. Its exports of domestic products in 1866 were $89,002,141; in 1872, $95,970,592; in the year ending June 30, 1874, $93,478,513. The re-exportation of foreign goods in the last-named year was $456,411. The imports of the year 1866 were $10,878,365; the imports of 1872, $20,006,363, and those of 1874, $14,548,056. The coastwise trade was still larger, the inward-bound cargoes to New Orleans in 1872 being valued at $160,000,000, and the cargoes to coast and river ports from New Orleans to about $90,000,000. In round numbers, the coastwise and foreign commerce of Louisiana is not far from $400,000,000. In 1871 the registered, enrolled, and licensed vessels belonging to the State were 255, measuring 51,535 tons. In 1874, 2928 vessels entered the ports of the State, having an aggregate tonnage of 1,640,676 tons, and manned by 51,864 men and boys; the same year 3042 vessels cleared from the same ports, having an aggregate tonnage of 1,743,312 tons, and manned by 49,956 men. This includes the coastwise as well as the foreign navigation.

Finances of the State.—The assessed valuation of the State in 1870, both of real and personal property, was $253,371,890, and the estimated true valuation of the U. S. marshals was $323,125,666. In 1874 the assessed valuation of the State for purposes of taxation was $228,666,653.62. The State debt is of large but uncertain amount. On Dec. 25, 1873, the nominal amount was reported by a board of examiners appointed by Gov. Kellogg to be $53,621,545.67, but of this the board contended that from several causes $30,646,649 was void, illegal, or lapsed, leaving about $23,000,000, on which the annual interest was about $1,500,000. A part of this is of doubtful legality, and they recommended partial repudiation, reducing the debt to $12,000,000, but even on this, neither principal nor interest is paid, from gross mismanagement, though the taxes are very high and difficult of collection. The political troubles of the State have greatly affected its commercial and financial condition.

Banks.—On Nov. 1, 1874, there were in the State 11 national banks, of which 4 were closing and only 7 in operation. These had a capital paid in of $4,450,000; bonds on deposit, $2,984,000; circulation issued, $4,607,320; circulation redeemed, $1,204,845; circulation outstanding, $3,402,475. There were also in Dec., 1874, 7 State-chartered banks in operation, having an aggregate capital of $4,967,000; 4 savings banks, 3 of which had an aggregate capital of $810,000; and 11 private banking-houses. There were at the same time 20 fire insurance companies, having an aggregate capital of $10,306,650, and aggregate assets of $11,382,000; and one life insurance company, with $100,000 capital and $400,000 assets.

Population.—The following table gives the population of the State at different periods, the percentage of increase, the number of whites, free colored, and slaves, of natives and foreigners, and of whites and free blacks of school, military, and voting ages:

* Estimated.

Census year.	Total population.	Percentage of increase.	Whites.	Free colored.	Slaves.	Natives.	Of foreign birth.	Of school age, 6–18.	Of military age, 18–45.	Of voting age, 21 years and upwards.
									Males.	Males.
1810	76,556	....	34,311	7,585	34,660					
1820	152,923	100.39	73,383	10,476	69,064					
1830	215,529	40.63	89,231	16,710	109,588	....	....	‡31,903		
1840	352,411	63.35	158,457	25,502	168,452	....	....	‡51,904		
1850	517,762	46.92	255,491	17,462	244,809	448,848	68,233	‡84,283	‡72,009	‡86,590
1855§	587,774	13.52	301,764	22,843	263,167					
1860*	708,002	36.74	357,456	18,647	331,726	627,027	80,975	‡122,141	‡85,750	‡98,143
1870*	726,915	2.67	362,065	364,210	None.	665,088	61,827	226,114	136,753	†174,187

Education.—Prior to the late civil war, owing to the sparseness of the population in the parishes away from the cities, the conflict of races, and the easy-going habits of the French, Spanish, and Creole portions of the inhabitants, no public-school system had ever proved a success in Louisiana. As a consequence, the amount of illiteracy was frightful: 183,895 of the inhabitants over twenty years of age, or two-thirds of the whole number, could not read or write in 1870; while of those over ten years of age who were illiterate the number was still greater. The changes resulting from the war led to a renewed effort to establish a good common-school system, but the first and second attempts did not prove successful. The public-school system adopted in 1870, with several important modifications made in 1872 and 1874, gives better promise of overcoming the difficulties which environ it. Mixed schools are not regarded with much favor, and very few of them are attempted; but there is now no opposition to giving the advantages of education to the colored man, as freely as to the white, when he is disposed to avail himself of them. The following figures from the report of the State superintendent of schools give their condition in 1873–74: There is one normal school at Jackson, of which we have no particulars, though it is to be inferred that it has about 20 pupils; a normal department at Minden, connected with the public high school, having 193 students; the Peabody Normal Seminary, sustained by the Peabody fund, and having 8 teachers and 120 students; normal departments of Straight University, Thompson Biblical Institute, and Leland University, all in or near New Orleans. There are 483 school districts in the State; 101 new school-houses were erected during the year; the value of the school-houses of the State was $573,510; the number of pupils enrolled in the schools, 57,433; number of male teachers, 865, and of female teachers, 611; the average salaries of the teachers are the same in both sexes—$42.50 per month; the amount of the State school fund was $1,050,000; the number of illiterate children, 92,105; the legal school age, 6 to 21 years; the average cost of schooling for each scholar, $12.81½; the total receipts for school purposes, $678,473.52; total expenditures, $579,502.26. New Orleans has had good and efficient schools for its white population for many years, and the colored people are now generally provided with them. (See NEW ORLEANS.) Of schools of secondary instruction there are—the Boys' Central High School and the two high schools for girls in New Orleans, all admirably conducted; St. Joseph's School for boys, St. Aloysius' Academy, also for boys, both at New Orleans and under the charge of Roman Catholics; and St. Vincent's Academy at Fairfield, under the care of the Daughters of the Sacred Heart (Catholic); three conventual schools, at New Orleans, Marksville, and Monroe; a Hebrew school of high character, and St. Simeon's Academy, at New Orleans. The Silliman Female Collegiate Institute at Clinton, La., is a collegiate school for girls of high grade, under the care of the Presbyterians. The following table shows the names and condition of the universities, colleges, and professional schools of the State in 1873–74:

Name of college or university.	Date of founding.	Location.	Denomination.	Number of professors and teachers.	Students.		Value of buildings, grounds, etc.	Amount of endowment.	Income from productive funds.	Annual receipts from all other sources.	Volumes in library.
					Preparatory.	Collegiate.					
Centenary College	1825	Jackson	M. E. Sou.	6	100	24	$100,000	....	....	$10.000	5.000
Leland University	1870	New Orleans	Baptist.	6	.....	80	50,000	$ 25,000	....	8.000	200
New Orleans University	1873	" "	M. Epis.	6	210	.....	40,000	....	....	3.000	300
Louisiana University	1860	Baton Rouge.	State.	7	82	58	55,700	138,000	$8,280	15,694	11,000
St. Charles College	1837	GrandCoteau.	R. C.	14	8	74	....	....	....	....	4,000
St. Mary's Jefferson College	1834	St. James	R. C.	15	130	112	40,000				
Straight University	1869	New Orleans.	Congrega.	4	28	11	36,000	....	....	....	2,500
THEOLOGY:											
Thompson Biblical Institute	1870	New Orleans.	M. Epis.	3	.....	23	40,000				
LAW:											
New Orleans Law School (Law Depart. Univ. of Louisiana)	1847	New Orleans.	State.	4	.....	39	Apparatus.				
MEDICINE:											
Medical Department University of Louisiana	1834	New Orleans.	State.	10	.....	136	200,000	....	....	....	2,500
New Orleans Dental College	1867	" "	"	11	.....	43	1,000	....	....	1,600	
SCHOOLS OF SCIENCE:											
Agricultural and Mechanical College of Louisiana.	1873	Not yet fully organized.									

Libraries.—The census of 1870 reports 2332 libraries, public and private, in the State, of which 480 were public, having an aggregate of 263,266 volumes. Of these, 2 were State libraries, having 64,000 volumes; 1 a city library, with 10,000 volumes; 61 court and law libraries, with 31,583 volumes; 34 school and college libraries, with 37,050 volumes; 356 Sunday-school and church libraries, with 100,233 volumes; 26 circulating libraries, with 20,400 volumes; and 1852 private libraries, with 584,140 volumes.

Newspapers.—In 1870 there were reported 92 newspapers of all classes in the State, issuing annually 13,755,690 copies, and having a circulation of 84,165. Of these, 7 were dailies (in 1872 there were 9 dailies), 1 tri-weekly (2 in 1872); 8 semi-weeklies (3 in 1872); 75 weeklies (71 in 1872); 1 monthly (3 in 1872, and 2 quarterlies in 1872). Of these, 1 was agricultural, with 3000 circulation; 2 commercial and financial (1 weekly and 1 daily), with 3000 circulation, 1 weekly and 1 monthly literary; 85, including most of the dailies, were political, with a circulation of 76,715; in 1874 there were 2 religious papers, with a circulation of 9600.

Denominations.	Churches, societies, or parishes, 1870.	Church edifices, 1870.	Sittings, 1870.	Church property, 1870.	Associations, presbyteries, or conferences, 1873–74.	Churches, societies, or parishes, 1873–74.	Church edifices, 1873–74.	Clergy or preachers, 1873–74.	Members or communicants, 1873–74.	Sunday schools, 1873–74.	Teachers and scholars, 1873–74.
Baptists	227	208	56,140	$346,500	21	371	309	252	20,734	254	20,541
Christians	1	1	800	3,000	...	3	2	3	350		
Congregationalists	9	9	4,650	56,200	1	12	11	13	933	12	1,135
Protestant Episcopal Ch.	36	32	17,100	160,800	1	44	34	31	4,351	......	3,654
Jews	5	5	2,200	75,000	...	6	5	5	1,350		
Lutherans	3	3	1,650	28,000	...	5	5	6	610		
Presbyterians	37	34	14,100	185,450	4	43	40	44	5,342		
Reformed (German)	2	2	800	2,000	...	3	2	3	285		
Roman Catholics	103	102	62,280	3,001,400	2 dioceses.	124	114	192	ab. 200,000		
Unitarians	1	1	1,000	3,000	...	1	1	1	178		
Methodists	213	202	52,990	351,775	2 confs.	255	221	233	23,271	187	10,514

* In 1860 there were 173 Indians in the State; in 1870, 569 Indians and 71 Chinese. † The number of citizens or actual voters was 159,001. ‡ Whites only. § State census.

Churches.—The foregoing table shows the condition of the different religious denominations in 1870 and 1873 or 1874, so far as they can be ascertained. The census in 1870 reported 638 church organizations of all denominations, 599 church edifices, 213,955 sittings, and $4,048,525 of church property, distributed as shown in the table. There is also one congregation of the New Jerusalem Church (Swedenborgian).

Constitution, Courts, Government, and Representation in Congress.—The present constitution of the State was adopted and ratified by the people in Apr., 1868. The executive officers of the State are a governor, lieutenant-governor, secretary of state, auditor, treasurer, superintendent of education, and attorney-general, all elected for four years by the people. The legislative power is vested in the general assembly, consisting of a senate and house of representatives. The senate has 36 members, elected for four years, one-half biennially, and the house of representatives 101 members, elected biennially. The sessions are limited to 60 days each, except by vote of two-thirds of all the members elected to both houses. The senators and representatives receive $8 for each day of attendance and for time spent in going and returning. Every male person of the age of 21 years or upwards, born or naturalized in the U. S. (except criminals, insane, or idiotic persons), who has resided in the State for a year next preceding an election, and for the last ten days in the parish in which he offers to vote, is to be deemed an elector. All persons, without regard to race, color, or previous condition, born in or naturalized in the U. S., and subject to the jurisdiction thereof, and residents of the State for one year, are citizens of the State. The judicial power is vested in a supreme court, district courts, parish courts, and justices of the peace. The supreme court consists of one chief-justice and four associate justices, appointed by the governor with the advice and consent of the senate for the term of eight years. They must be citizens of the U. S., have practised law for five years, the last three in the State. The court has appellate jurisdiction only, except in some specified cases. There are 18 judicial districts, in each of which a judge is chosen by the qualified electors. These courts have original jurisdiction in all criminal cases, and in civil cases of over $500, and appellate jurisdiction in cases of over $100. The parish courts are presided over by a single judge chosen for two years by the people. The justices of the peace are also elected for two years. Louisiana is entitled to six members of Congress under the apportionment of 1872.

Counties or Parishes.—Louisiana is divided into 57 parishes, answering to the counties of the other States. The following table gives the number of male and female inhabitants of each in 1870, the total population of each in 1870 and 1860, and its valuation according to the census of 1870:

Parishes.	Male inhabit., 1870.	Female inhabit., 1870.	Total inhabit., 1870.	Total inhabit., 1860.	Valuation, 1870.
Ascension	5,921	5,656	11,577	11,484	$2,589,685
Assumption	6,706	6,528	13,234	15,379	2,938,474
Avoyelles	6,638	6,288	12,926	13,167	3,000,209
Bienville	5,282	5,354	10,636	11,000	1,066,065
Bossier	6,639	6,036	12,675	11,348	3,168,062
Caddo	11,079	10,635	21,714	12,140	3,813,850
Calcasieu	3,528	3,205	6,733	5,928	1,227,130
Caldwell	2,387	2,433	4,820	4,833	868,249
Cameron	807	784	1,591	....	321,100
Carroll	5,152	4,958	10,110	18,052	3,194,035
Catahoula	4,201	4,274	8,475	11,651	1,233,562
Claiborne	10,194	10,046	20,240	16,848	1,663,667
Concordia	4,983	4,994	9,977	13,805	3,920,974
De Soto	7,378	7,584	14,962	13,298	2,260,788
E. Baton Rouge	9,013	8,803	17,816	16,046	3,697,904
E. Feliciana	6,635	6,864	13,499	14,697	1,899,368
Franklin	2,495	2.583	5,078	6,162	784,477
Grant	2,243	2,274	4,517	....	918,324
Iberia	4,622	4,420	9,042	....	3,063,793
Iberville	6,297	6,050	12,347	14,661	5,266,624
Jackson	3,906	3,740	7,646	9,465	944,372
Jefferson	9,292	8,475	17,767	15,372	17,627,306
Lafayette	5,222	5,166	10,388	9,003	1,177,440
Lafourche	7,481	7,238	14,719	14,044	3,381,038
Lincoln	New	parish.			
Livingston	2,068	1,958	4,026	4,431	654,886
Madison	4,318	4,282	8,600	14,133	1,309,209
Morehouse	4,774	4,613	9,387	10,357	2,659,082
Natchitoches	9,211	9,054	18,265	16,699	3,983,404
Orleans	90,279	101,139	191,418	174,491	185,625,187
Ouachita	5,856	5,726	11,582	4,727	4,681,546
Plaquemines	5,845	4,707	10,554	8,494	2,930,966
Point Coupée	6,642	6,339	12,981	17,718	1,396,000
Rapides	9,035	8,980	18,015	25,360	4,016,648
Red River	New	parish.			
Richland	2.635	2,475	5,110	....	1,136,765
Sabine	3,205	3,251	6,456	5,828	503,320
St. Bernard	1,922	1,631	3,553	4,076	1,295,483
St. Charles	2,527	2.340	4,867	5,297	2,368,566
St. Helena	2,644	2,779	5,423	7,130	720,029
St. James	5,226	4,926	10,152	11,499	$4,251,570
St. John the Bapt.	3,485	3,277	6,762	7,930	3,217,236
St. Landry	12,866	12,687	25,553	23,104	4,363,973
St. Martin	4,802	4,568	9,370	12,674	4,747,378
St. Mary	7,312	6,548	13,860	16,816	4,114,761
St. Tammany	2,848	2,738	5,586	5,406	447,698
Tangipahoa	4,021	3,907	7,928	....	2,200,000
Tensas	6,293	6,126	12,419	16,078	2,887,117
Terrebonne	6,406	6,045	12,451	12,091	4,193,117
Union	5,770	5,915	11,685	10,389	1,480,028
Vermilion	2.279	2,249	4,528	4,324	1,240,221
Vernon	New	parish.			
Washington	1,657	1,673	3,330	4,708	226,690
W. Baton Rouge.	2,526	2,588	5,114	7,312	3,916,616
W. Feliciana	5,135	5,364	10,499	11,671	1,440,290
Webster	New	parish.			
Winn	2,477	2,477	4,954	6,876	1,091,384

Principal Towns.—New Orleans, the commercial metropolis, and since the war the political capital of the State, in 1870 had 191,418 inhabitants, and has not probably greatly increased since. (See New Orleans.) Of the other cities and towns of the State, Baton Rouge, the former capital, is the largest, having in 1870, 6498 inhabitants, and perhaps 7000 now; Shreveport has probably about 5000; Thibodeaux, Monroe, Donaldsonville, and Opelousas, about 2000; New Iberia, Natchitoches, and Plaquemines, about 1800; and Franklin, Alexandria, St. Martinsville, and Minden, not far from 1500.

History.—Louisiana was first visited by Europeans in 1541, when De Soto with his followers, exploring the region W. of Florida, came to the Mississippi River, and visiting the shores along both its banks in the vicinity of the present city of New Orleans, sickened, died, and was buried in the waters of the Great River the following year. In 1673, Father Marquette and his Canadians descended the Mississippi to its mouth, but established no colony. In 1682, La Salle again descended the Mississippi, and took possession of the country in the name of Louis XIV., giving it the name of Louisiana. It is doubtful, however, whether any colony was planted before 1699, when Iberville with a considerable number of colonists attempted a settlement at Biloxi. He died soon after, and his successor in command, Bienville—a man of great daring and courage, the most skilful woodsman of his time—after he and his fellow-colonists had endured the greatest sufferings and privations, led them to a somewhat sunken spot on the river-bank, and there defiantly unfurling the flag of France, made his last stand. This was about 1706, and the new location was on the present site of New Orleans. The colony languished, but Bienville kept up a stout heart. Louis XIV. granted to Anthony Crozat, a wealthy merchant of Paris, Sept. 14, 1712, the exclusive privilege for fifteen years of trading in all this vast territory of Louisiana, of sending a ship once a year to Africa for negro slaves for his new territory, of owning and working all mines in the colony, reserving one-fourth of all their proceeds for the king, and of importing one shipload of slaves to every two shiploads of independent colonists. In 1713, Bienville was displaced from the governorship, and Cadillac, a rude, brutal, quarrelsome man, installed in his place. Bienville did not quit the colony, and Cadillac's temper soon caused his downfall. Others were appointed to succeed him; meanwhile, Crozat had in 1717 relinquished the colony as unprofitable, and the province of Louisiana fell into the hands of John Law, the gigantic speculator, and the Mississippi bubble expanded to vast dimensions—and burst. In 1718, Bienville was again appointed governor, and built up the town whose site he had selected twelve years before. In 1723 the capital of the colony was removed from New Biloxi to New Orleans, as the thriving settlement was called in honor of the duke of Orleans. The "Western Company" or "The Company of the Indies," as Law's organization was known, remained in existence for ten years or more after the failure and escape of Law, but in 1730 it surrendered its grant to the Crown, by whom the colony was managed until 1762, when the whole province was secretly ceded by France to Spain, and for thirty-eight years was under the control of that power—years of oppression and iron rule. In 1800 it was restored by the treaty of Ildefonso to France, and in 1803 it was sold to the U. S. by Napoleon Bonaparte, then First Consul of France, for the sum of 60,000,000 francs, or $11,250,000, and the assumption of the claims of citizens of the U. S. against France, known as the "French spoliation claims." These were assumed to amount to $3,750,000, so that the price of this vast territory, comprising nearly all of the present States of Louisiana, Arkansas, Missouri, Iowa, Minnesota, Dakota Territory, Nebraska, most of Kansas, and the Indian Territory, part

of Colorado, most of Wyoming, and the whole of Montana, Idaho, Oregon, and Washington Territory, was purchased for $15,000,000, and one-fourth of the purchase-money has never been paid by the national government. The motive which led to this sale was the concentration of British squadrons in the Gulf, and the evident intention of the British government to take possession of the Mississippi River. In 1804 the southern portion of this vast tract was erected into a separate Territory, as the Territory of Orleans, and a governor, appointed by the President, placed over it. In 1810 that portion of the State lying between the Mississippi and the Amite and the Pearl River, which had been ceded by Spain, was annexed to the Territory, and in Apr., 1812, the Territory of Orleans was admitted into the Union as the State of Louisiana. Within three years—viz. on Jan. 8, 1815—was fought the great battle of New Orleans, between the British forces under Pakenham and the Americans under Jackson, for the possession of New Orleans. In this battle the British were signally defeated and with heavy loss. The subsequent progress of the State up to 1860–61 was very rapid; her constitution, which was adopted in 1812, had been materially modified by the amendments of 1845 and 1852; New Orleans had become the second port in the U. S. in the amount of its commerce, and the fertile lands of the delta were yielding large crops of sugar, rice, and cotton. Having a large interest in slavery, her slave population nearly equalling the free, Louisiana promptly took a position in favor of secession. The ordinance of secession was passed in convention Dec. 23, 1860, by a vote of 117 to 113; March 21, 1861, the same convention adopted the "Confederate" constitution, without submitting it to the people, and passed amendments in their State constitution to conform it thereto. A State government in sympathy with the Confederacy was maintained during the war, but had only a nominal existence for some time, as most of the State was in the hands of the Unionists. Some of the first acts of resistance against the supremacy of the Federal government were committed in the State, and some of the earliest reprisals were made there. In Apr., 1862, the squadron under Farragut's command ascended the Mississippi, and after a sharp engagement passed and silenced Forts St. Philip and Jackson, and appeared before New Orleans on the 25th of April, and demanded and received its surrender. It was subsequently handed over to the land-forces, and was successively governed and controlled by Gens. Butler and Banks, and after numerous conflicts in July, 1863, all the strongholds of the Confederates on the Mississippi were conquered, the river-towns captured, and the navigation of the Mississippi from St. Paul's to the Gulf was secured to the national government. In 1863, Gen. Banks had made an excursion into the Attakapas country (the region lying along the Bayou Teche), and had brought that rich and fertile region into subjection to the U. S. government; in the spring of 1864, with a large force and numerous gunboats, he ascended the Red River, a co-operating force moving by way of the Sabine River. The campaign into the Red River region met with but partial success, in consequence of the mismanagement of some of the commanding officers, and its final retreat after two or three severe battles was disastrous. In Apr., 1864, a convention formed a new constitution for the State, preparatory to its readmission to the Union. This constitution was ratified by the people in Sept., 1864, and State officers were elected under it, but it was not recognized by Congress, and a second convention was called in Dec., 1867, and its constitution, submitted to the voters under the provisions of that act, was adopted Mar. 7, 1868. Under this constitution (that under which the State is now governed) Louisiana was again admitted into the Union on condition of her ratification of the fourteenth amendment to the Constitution of the U. S. On July 9, 1868, this ratification was accomplished, and on the 13th the government was transferred by the military to the civil authorities. The adoption of the first constitution in 1864, by a comparatively few individuals, representing only a small portion of the State, gave rise to serious disturbances, and during the whole period of four years of military occupation which followed, there were discord and turmoil, owing to the temporary disfranchisement of many of its citizens who had sympathized with the Confederacy, and the large number of aspiring citizens of other States, who cared more for power and plunder, than for the good of the State. After the adoption of the second constitution in 1868, the legislature was largely composed of negroes, simple-minded and uneducated, who became the tools and prey of demagogues, and in the strife and greed of these for office and power, the most exalted positions have been held by bribery and corruption, the purity of the highest courts dishonored, the laws trampled upon, and the peace of the State repeatedly imperilled. Riots, murders, deadly rencontres, and assassinations have not been infrequent, and in consequence the prosperity and good name of the State have suffered. Such great evils work their own cure, and it may be hoped that in the near future, disorders will be quelled, honesty and integrity will prevail, and the State, whose natural advantages are surpassed by none, will be restored to more than its old prosperity.

Governors of the State.—

TERRITORY OF ORLEANS.

William C. C. Claiborne..1804–12

STATE.

William C. C. Claiborne..1812–16
Jaquez Villere..............1816–20
Thomas B. Robertson....1820–22
H. S. Thibodeaux (act'g)..1822–24
Henry Johnson.............1824–28
Peter Derbigny.............1828–29
A. Bauvais (acting)........1829–30
Jacques Dupre (acting)..1830–30
André B. Roman...........1830–34
Edward D. White...........1834–38
André B. Roman...........1838–41
Alexander Mouton........1841–45
Isaac Johnson...............1845–50
Joseph Walker..............1850–54
Paul O. Hebert..............1854–56
R. C. Wickliffe...............1856–60
Thomas O. Moore..........1860–62
George F. Shepley.........1862–64
Michael Hahn................1864–65
James M. Wells.............1865–67
Benjamin F. Flanders....1867–68
Joshua Baker.................1868–68
Henry C. Warmouth.....1868–72
John F. McEnery (claimant)..........................1872–
William Pitt Kellogg (de facto)...........................1872–

Electoral and Popular Votes for President and Vice-President.

Elect. year.	Successful candidates.	Elect. vote.	Popular vote.	Opposition candidates.	Popular vote.	Opposition candidates.	Popular vote.
1812	James Madison P.; Elbridge Gerry V.-P.	3	By legislature.	De Witt Clinton P.; Jared Ingersoll V.-P.	By legislature.		
1816	James Monroe P.; D. D. Tompkins V.-P.	3	"	Rufus King P.; Various V.-Ps	"		
1820	James Monroe P.; D. D. Tompkins V.-P.	3	"	John Quincy Adams P.; Various V.-Ps.	"		
1824	John Quincy Adams P.; Andrew Jackson P.; J. C. Calhoun V.-P.	5	"	William H. Crawford P.	"	Henry Clay P.	By legislature.
1828	Andrew Jackson P.; J. C. Calhoun V.-P.	5	4,605	John Quincy Adams P.; R. Rush V.-P.	4,097		
1832	Andrew Jackson P.; Martin Van Buren V.-P.	5	4,049	Henry Clay P.; John Sergeant V.-P.	2,528	William Wirt P.	no record.
1836	Martin Van Buren P.; R. M. Johnson V.-P	5	3,653	W. H. Harrison P; Francis Granger V.-P.	3,383	Hugh L. White P.; J. Tyler V.-P.	no record.
1840	W. H. Harrison P.; John Tyler V.-P.	5	11,296	Martin Van Buren P.; R. M. Johnson V.-P.	7,617		
1844	James K. Polk P.; George M. Dallas V.-P.	6	13,782	Henry Clay P.; T. Frelinghuysen V.-P.	13,083		
1848	Zachary Taylor P.; Millard Fillmore V.-P.	6	18,217	Lewis Cass P.; W. O. Butler V.-P.	15,370		
1852	Franklin Pierce P.; W. R. King V.-P	6	18,647	Winfield Scott P.; W. A. Graham V.-P.	17,255		
1856	James Buchanan P.; J. C. Breckenridge V.-P.	6	22,164	John C. Fremont P.; W. L. Dayton V.-P.	not reported.	Millard Fillmore P.; A. J. Donelson V.-P.	20,709
1860	J. C. Breckenridge P; Joseph Lane V.-P.	6	22,681	John Bell P.; Edward Everett V. P.	20,204	Stephen A. Douglas P.; Herschel V. Johnson V.-P.	7,625
1864	No vote.			No vote.			
1868	Horatio Seymour P.; Francis P. Blair, Jr., V.-P.	7	80,225	Ulysses S. Grant P.; Schuyler Colfax V.-P.	33,263		
1872	Ulysses S. Grant P.; Henry Wilson V.-P.	8	71,663	Horace Greeley P; B. Gratz Brown V.-P.	57,029	Charles O'Conor P.	no record.

L. P. BROCKETT.

Louisiana, tp. of Chicot co., Ark. Pop. 1059.

Louisiana, city of Pike co., Mo., on the Mississippi River, 115 miles above St. Louis, on the Chicago and Alton R. R., which here crosses the river, has 10 churches, 2 weekly newspapers, 1 college, 1 public library, 2 foundries, a fine public school, paid fire department, public gasworks, noted tobacco manufactories, and is the distributing point of a fruit-growing region and an extensive lumber business. Pop. 3639. LEWIS LAMKIN, ED. "JOURNAL."

Louis'ville, post-v., cap. of Jefferson co., Ga., 110 miles N. W. of Savannah, on the Georgia Central R. R., in the centre of a fine cotton and grain producing section, has 2 churches, 1 weekly newspaper, a female seminary, an academy, lodges of Masons and Knights of Pythias, county buildings, and several commercial houses. Pop. of v. 356. ROBERTS BROS., EDS. "NEWS AND FARMER."

Louisville, post-v. and tp., cap. of Clay co., Ill., on the Little Wabash River and the Springfield and Illinois Southern R. R., has 3 churches, 2 weekly newspapers, good county buildings, a fine school edifice, and several large business-houses. Pop. of v. 529; of tp. 1200. H. R. MILLER, ED. "CLAY CO. TRIBUNE."

Louisville, post-v. and tp., cap. of Pottawattamie co., Kan., 3 miles N. of Wamego, on the Kansas Pacific R. R., has fine water-power supplied by Rock Creek, 1 church, 1 weekly newspaper, 2 hotels, 1 flouring-mill, and carries on farming and stock-raising principally. Pop. of v. 344; of tp. 2409. E. BARNES, PUB. " KANSAS REPORTER."

Louisville, the commercial capital and largest city of Kentucky, and seat of justice of Jefferson co., is situated at the falls of the Ohio River, from which it obtains its name of "The Falls City." It is in 38° 3′ N. lat., 85° 30′ W. lon., and remarkable for the salubrity of its climate, the ratio of deaths to the population being less, perhaps, than any city on the continent. The city is situated on an elevated plateau 70 feet above low water, and with but little variety of surface for miles, and occupies an area of 12½ square miles. It has a population of 100,753, according to the census of 1870, but this is probably much below the real figure. Taking the last city directory as a basis, giving four inhabitants for each name therein, the population would be 165,984. It is safe to estimate that a mean between these two would approximate the real population. The streets are laid out at right angles, varying in width from 60 to 120 feet, clean and well paved. The business parts of the city are on the streets nearest the river, the southern portion being occupied by private residences, which are notable for beauty and elegance. These are almost without exception surrounded by large gardens, while all the residence avenues are bordered by long lines of trees, which give to the city its distinguishing appearance. Until the last few years but little attention had been paid to the appearance of the business streets; since 1870, however, a number of the handsomest business-blocks in the country have been erected on Main, Market, Fourth, Fifth, and adjoining streets. Over 1000 buildings were constructed during the year ending June, 1875, the operations during the year exceeding in cost and extent any similar period in the city's history.

Louisville was settled in 1775, and has since steadily increased in prosperity and commercial importance. Its business is of the most stable character; there have been remarkably few failures in its history, and its business operations have been largely conducted on home capital. Wealth is quite equally divided among the richer classes, while the poorer and laboring classes are, in the largest measure, thrifty and in comfortable circumstances. The outlying level country, and the facility with which the city may be extended in any direction, has made property in the suburbs very cheap, and the working people have built thousands of little homes in all of these localities. In 1870 the assessment of the city as a basis for taxation was, in round numbers, $71,000,000; in 1874 it was $78,000,000, showing a large and steady increase in wealth and prosperity. The committee of the board of trade, to which was referred the compilation of statistics for presentation to the committee on transportation appointed by the U. S. Senate in 1874, made a careful revision of the records of the board, and gave the business of Louisville during the twelve months theretofore as amounting to $250,000,000. The bank system of Louisville is made up of 9 national banks and 14 State banks. The aggregate capital and surplus amount to about $11,500,000, and at the last general statement there were $15,000,000 in outstanding discounts. The most important staples of commerce are leaf and manufactured tobacco, provisions and breadstuffs, Kentucky whiskies, and various products of local manufacture. Being in control of the only southern railroad between Evansville on the W. and Baltimore on the E., a longitudinal distance of about 700 miles, Louisville has an extensive trade as a distributing centre between the East and the cotton States for miscellaneous merchandise, the present statistics of which are not readily obtainable. As the centre of trade in a State (Kentucky) which produces about 40 per cent. of the total tobacco product of the U. S., Louisville controls a larger tobacco trade than any other three forwarding markets. Here the agents of foreign governments and large houses are located for the purchase of tobacco. The city is also the centre of the Kentucky whisky trade. It is the fifth largest pork-packing city in the U. S. The specialties in manufacturing industry are various: iron manufactures, oak sole leather, cement, gas and water pipes, tobacco, malt liquors, agricultural implements, bagging, woollen goods, etc. Five railroads centre in Louisville; there are 11 lines of street railway, and 4 steam and horse railways connecting the city with adjoining localities; particularly that running to the Louisville Jockey Club grounds, one of the most successsful racing-tracks in the country. Louisville is noted for the excellence of its public schools, the system having been pronounced, for thoroughness and efficiency, only second to that of Boston. The school buildings proper number 27, constructed in the most substantial and even elegant style. The new female high school was built at a cost of $120,000, and a new male high school is projected on the same scale. Three handsome colored school buildings are among the number named, one of which cost $28,000. Louisville is one of the great centres for medical education in the U. S. The medical department of the University of Louisville, founded forty years ago, has embraced among its professors some of the most distinguished physicians and surgeons in the country, and its alumni are scattered over every State in the Union. The Louisville Medical College, the Hospital Medical College, a department of Central University, and the Kentucky School of Medicine have each large corps of instructors and a widely distributed list of students. The private schools and seminaries of the city number 55, making a total of 84 public and private schools. The University of the Public Schools of Louisville embraces three departments—the academic, medical, and law. The total number of scholars enrolled in the public schools is over 16,000; cost of conducting the schools in 1874, $247,354; total value of the public-school property, nearly $1,000,000.

The public buildings of Louisville are costly and of unusual architectural beauty. Among the most prominent are the new city hall, U. S. custom-house and post-office, almshouse, female high school, Kentucky school for the blind, public library of Kentucky, the court-house, the Louisville Industrial Exhibition, city hospital, U. S. marine hospital, eruption hospital, and the male and female houses of refuge. There are 98 churches in Louisville, several of them exceptionally large and elegant. Among these are the Catholic cathedral, Dominican church, Dr. Stuart Robinson's church, Calvary church, the Jewish synagogue, and church of the Messiah. The church buildings are divided as follows: Roman Catholic, 19; Baptist, 13; Christian, 4; Episcopal, 12; German Evangelical, 7; Israel, 2; Methodist Episcopal (South), 15; Methodist Episcopal (North), 9; Presbyterian (North and South), 16; Unitarian, 1. This does not include chapels and convents attached to the various churches. The list of charities attached to the various churches and orders is large. Prominent among these are the new Masonic Widows' and Orphans' Home, the largest in the country; St. Mary's and St. Elizabeth's Hospital, St. Joseph's Industrial School, St. Vincent's Orphan Asylum, all Catholic; the Baptist Orphans' Home, and the German Baptist Orphan Asylum. The Public Library of Kentucky is a free institution, with some 70,000 books, an extensive museum, and a fine collection of pictures and statuary. Louisville has 28 lodges of Freemasons; 24 lodges of Odd Fellows; 10 lodges of Knights of Pythias; 11 Temperance lodges and societies; 10 lodges of the Harugari; 6 of the order of Red Men; 5 of the U. A. O. D.; 7 Hebrew societies, and a large number of other social and benevolent societies. Of the cemeteries, Cave Hill, situated on a hill back of the city, is said to be the most beautiful and best arranged in the West. There are 26 newspapers published in the city—5 daily (3 in English and 2 in German). There are 4 theatres and 1 opera-house. Among the notable private buildings are the Galt House, the Lithgow Building, Thomas Block, Hamilton Building, and many others recently erected on Main street and Broadway. The future of Louisville seems assured. Located on the great highway between the North and the South, her position will always make her the great distributing-point between the two sections. With an admirable climate, the outlying country favoring almost any expanse, the centre of two large industries, the metropolis of a State constantly increasing in wealth, with thousands of acres teeming with undevel-

oped minerals, now first beginning to be worked, her railroad system being enlarged every year, her business energies based on a substantial and enduring basis, the elements of prosperity are many, varied, and certain.

BALLARD SMITH, ED. "COURIER-JOURNAL."

Louisville, tp. of Scott co., Minn. Pop. 358.

Louisville, post-v., cap. of Winston co., Miss., 30 miles W. of Macon, on the Mobile and Ohio R. R., has 5 churches, 1 weekly newspaper, 2 hotels, 12 stores, and several mechanical establishments. It is centrally situated at the junction of four projected railroads. Pop. 385.

JAMES S. HARRISON, ED. "BANNER."

Louisville, post-tp. of Cass co., Neb., on the Burlington and Missouri River R. R., and near the river Platte, has 1 church. Pop. 636.

Louisville, post-tp. of St. Lawrence co., N. Y., on the St. Lawrence and the Grass River, the latter affording good water-power. Pop. 2132.

Louisville, post-v. of Nimishillen tp., Stark co., O., on the Pittsburg Fort Wayne and Chicago R. R., 7 miles N. E. of Canton.

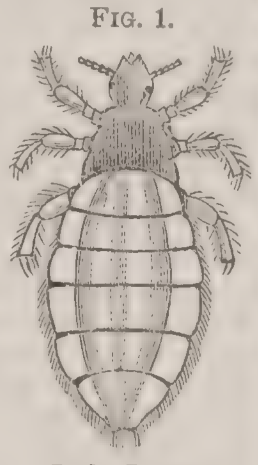
Loule′, town of Portugal, in the province of Algarve, beautifully situated, and surrounded with walls of the times of the Moors. Pop. 8245.

Loup City, post-v., cap. of Sherman co., Neb., founded in 1873 as the last trading-point on the N. line of the State, has 1 weekly newspaper, 1 hotel, 1 free school, 1 brick manufactory, several large stores, and is the trading-point for settlers and trappers N. and W. The settlers are energetically developing the resources of this region. Pop. about 250.

E. S. ATKINSON, ED. "NEWS."

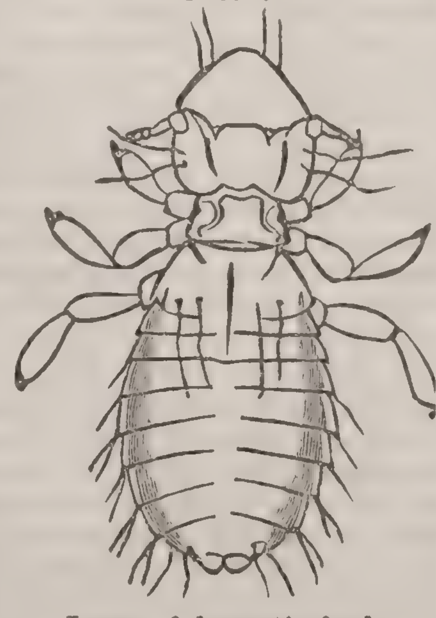
Louse [Ang.-Sax. *lûs;* Goth. *liusan*, to "devour"]. With the same mode of development as the Hemiptera—*i. e.* the bed-bug, chinch-bug, etc.—the louse differs chiefly in being wingless, with a small, indistinctly jointed thorax, while the abdomen is large, oval, and made up of nine segments. The minute antennæ are filiform, five-jointed. The eyes are minute and nearly simple. The eggs are cylindrical and attached to the hairs of its host. Schiödte has best observed the structure of the beak or proboscis of the louse. It is formed of the elongated mouth-parts, on the same plan as the beak of the bed-bug, except that the parts are softer and the labium is capable of being retracted into the upper part of the head, which therefore presents a little fold, which is extended when the labium is protruded. At the base of the soft tube, which is strengthened by the long chitinous ribbon-like mandibles, is a series of hooks by which the louse is anchored to the skin of its host. In order to see how the louse obtains its food, Schiödte placed one of these insects on his hand and observed its movements through a microscope. After the creature had fixed its beak in his hand, he noticed that "at the top of the head, under the transparent skin, between and a little in advance of the eyes, a triangular blood-red point appears, which is in continual movement, expansion and contraction alternating with increased rapidity. Soon this pulsation becomes so rapid that several contractions may be counted in a second. Meanwhile, the whole digestive tube is now in the most lively peristaltic movement, filling itself rapidly with blood, as is easily observed; the long œsophagus is particularly agitated, throwing itself from one side to another inside the neck, bending itself so violently as to remind one of the coiling of a rope when being shipped on deck." The louse of the head is *Pediculus humanus capitis* De Geer, while the body louse is *Pediculus corporis* De Geer (Fig. 1). In dealing with the louse we should remember that the creature breathes by means of a series of holes in the side of the body, in connection with the air-tubes within. By the use of soap, oil, or any other fatty substance the breathing-holes (stigmata) may be closed and the creature smothered to death. The species of true sucking lice are few, but the *Mallophaga* or bird lice, in which the mandibles are well developed and of use in breathing, are very numerous, each species of bird having one, and sometimes two or even more, species parasitic upon it. The hen (Fig. 2, *Goniocotes Burnettii* Pack., louse of domestic fowl), cat, dog, and sheep are sorely afflicted by these pests.

FIG. 1.



Body Louse.

FIG. 2.



Louse of domestic fowl.

A. S. PACKARD, JR.

Louth, town of England, in the county of Lincoln, on the Ludd, has large oil-mills, tanneries, and iron-foundries, and carries on a considerable trade in corn and coal. Pop. 10,560.

Louth, county of Ireland, in the province of Leinster, bounded E. by the Irish Sea and S. by the Boyne. Area, 315 square miles. The surface is mostly level or slightly undulating, except in the northern part, where it is traversed by a mountain-range ending in Mount Carlingford, 1935 feet high. Wheat, oats, barley, and potatoes are raised, and cattle of a good breed are reared. Pop. 128,180 in 1841, 107,657 in 1851, 90,713 in 1861, and 84,021 in 1871, of whom 32,255 were unable to read or write. Principal towns, Drogheda and Dundalk.

Lou′tre, tp. of Audrain co., Mo. Pop. 1003.

Loutre, tp. of Montgomery co., Mo. Pop. 1835.

Louvain′ [anc. *Lovania;* Flem. *Leuven;* Ger. *Löwen*], city of Belgium, in the province of Brabant, on the Dyle. In the fourteenth century it had 200,000 inhabitants, and was one of the largest manufacturing cities in the world, employing 15,000 workmen in cloth manufacturing alone. But its attempt to vindicate its independence with the other towns of Flanders was defeated, and it lost most of its wealth and importance. In the sixteenth century its university, attended by 6000 students, was one of the first scientific institutions in Europe, celebrated especially for its department of Roman Catholic theology. But during the French Revolution the university was suppressed for a long time, and although it has since been restored, it has not regained its past glory. Many buildings attest the former splendor of the city; as, for instance, the hôtel de ville, one of the richest existing structures of Gothic architecture, the cathedral, etc. But, generally speaking, Louvain has now become a quiet place, chiefly noted for its immense breweries and distilleries. Pop. 33,731.

L'Ouverture. See TOUSSAINT (FRANÇOIS DOMINIQUE).

Louvet′ de Couvray′ (JEAN BAPTISTE), b. at Paris June 11, 1760; received a very insufficient education, and was clerk in a bookseller's store when his romance, *Les Aventures du Chevalier Faublas* (13 vols., 1787–89), suddenly made him famous. In 1790 followed another romance, *Emilie de Varlmont*, less frivolous than *Faublas*, though more radical. Under the ministry of Roland he began the publication of a periodical, *La Sentinelle*, noted for its violent attacks on royalty. Having been elected a member of the Convention, he proved one of the greatest orators of that assembly. He attacked Robespierre with eminent courage as the originator of the September massacre, but after the defeat of the Girondists, his allies, he was compelled to flee and to hide himself till the fall of his great antagonist. He then returned to the Convention, and was member of the Council of Five Hundred, but the defects of his education, which he did not know how to conceal, and his marriage with the beautiful Lodoiska, caused him many troubles and vexations, and ended by making him the laughing-stock of Paris. D. Aug. 25, 1797. His wife, who was much devoted to him, attempted to poison herself, but was saved.

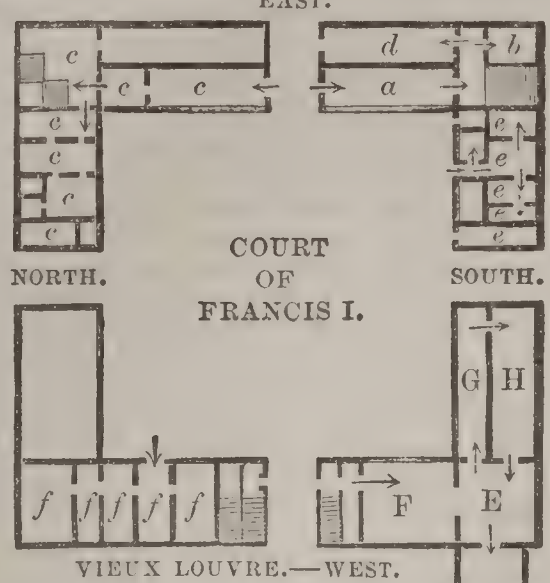
Louviers′, town of France, department of Eure, on the river of the same name, was formerly fortified, but is now most noted as the centre of a cloth-manufacturing industry which employs about 9000 operatives. Pop. 11,707.

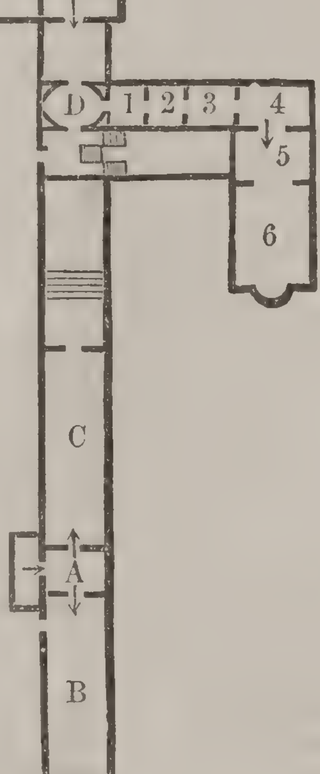
Louvois′, de (FRANÇOIS MICHEL LE TELLIER), MARQUIS, b. in Paris, France, Jan. 18, 1641; bought in 1654 the right of succeeding his father in the office of secretary of war; applied himself with great energy and assiduity to the study of all the details of the business, and took charge of the whole department in 1666; in a few years created the largest, most effective, and most brilliant army modern Europe had seen, introduced perfect discipline, established regular grades of rank in the command, and gave each of the different arms its perfect development by founding separate schools of engineering, artillery, and cavalry. His genius showed itself still more brilliantly when this army came to be used in war. All its movements were accomplished with an order, rapidity, and precision which doubled its effect and led to astonishing successes. But he was extremely ambitious; to keep himself in office, and to make his office the most important in the kingdom, was his sole aim, and the advice, political and military, which he offered in the king's council was exclusively governed by this aim, often to the great detriment of the country. Still more detestable were the means he applied. The devastation of the Palatinate, one of the greatest barbarities of modern times, was his plan, as also the idea of using

the dragoons for converting the Huguenots, with all the horrors resulting from it. After the death of Colbert in 1683 he also assumed the administration of the finances, but knowing no other expedients than extortions and loans, he soon ruined the finances and exhausted the country. The last years of his life were spent in great anxiety. He had become very exacting and overbearing, and the king, who was easily irritated by any want of submission, treated him coldly and even slightingly; and had just made up his mind to throw him into the Bastile when he d. suddenly, July 16, 1691.

Louvre, Palace of the [Fr. *Palais du Louvre*], a famous building in Paris, on the right bank of the Seine, between the river and the Rue de Rivoli. It faces the church of St. Germain les Auxerrois on the E. and the site of the now destroyed palace of the Tuileries on the W. The origin of the name is not known, nor has any probable explanation of its meaning been given. King Dagobert is said to have built a castle on a portion of the site of the present building for a hunting-seat. About the year 1200, Philip Augustus converted this castle into a fortress, but it was not until the end of the fourteenth century that it was included within the walls of the city. In 1866 the foundations of this feudal structure were uncovered by the

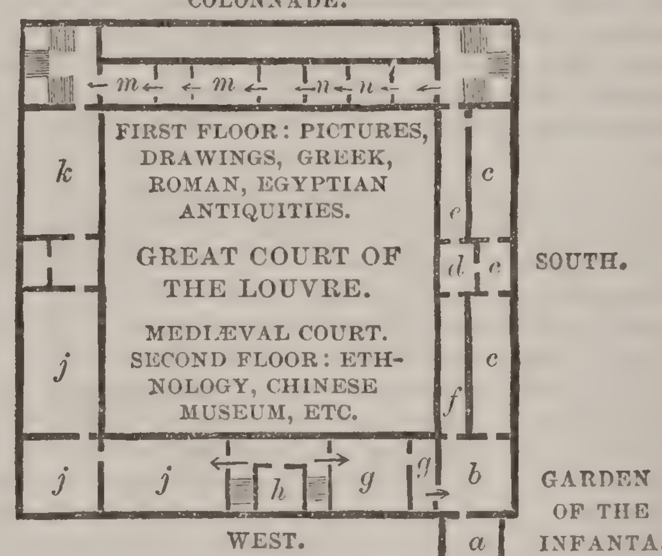
PLAN I. *Louvre—Ground Floor.*

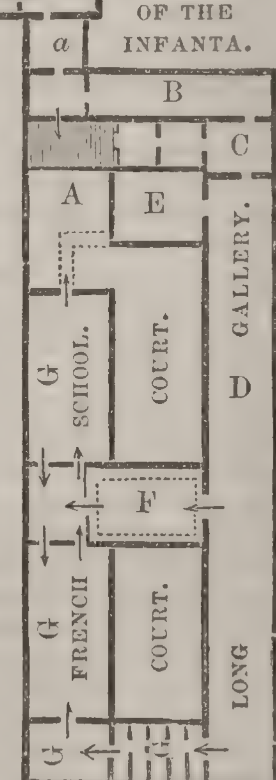




permission of the municipality, and it was found that the two towers flanking the principal gateway stood near the middle of the present court. The masonry of the foundations was of excellent execution and well preserved, though only covered with about a foot of soil. These foundations extended to the Seine in the direction of the Pont des Arts and parallel to the river, passing under the Tour de l'Horloge (Pavillon Sully). The principal lines of the old plan may now be seen marked out on the pavement. Charles V. made many additions to the castle to fit it for a royal residence. Francis I. pulled down the old fortress-palace, and began the present building in 1528. The oldest portion is the southern half of the western side of the court. It was built after the designs of Pierre Lescot. The successors of Francis in turn added to it. His son, Henry II., carried the western front to completion (now called the Vieux Louvre) and built the wing containing the Galérie d'Apollon. The sculptures of this portion of the building were the work of Jean Goujon and other distinguished artists of the day. In this part of the building the marriage of Margaret of Valois with Henry of Navarre (afterward Henry IV.) was celebrated in 1572. Five days later came the massacre of St. Bartholomew, when Charles IX. fired from the window of the same palace upon the Huguenots, most of whose chiefs had been present at the wedding. The window from which the king fired was in a part of the building afterward pulled down by Louis XIII. The one sometimes pointed out is in a part of the building not constructed till long after the year 1572. Henry IV. began the Long Gallery to connect the Louvre with the Tuileries, and completed it so far as to be able to walk through it before his death. Under Louis XIII. the central portion of the western front and the lower story of the northern side were built, both after the designs of Lemercier. Louis XIV., by the advice of Colbert, determined to complete the palace, and a public competition of architects was opened in order to procure designs. Those of a physician, Claude Perrault, were chosen, but jealousies and rivalries interfered with their execution, and Bernini, then greatly in favor in Rome, was sent for and the work put into his hands. Louis XIV. laid the first stone of the eastern front, but Bernini made so many enemies by his insolence and conceit that he returned to Italy, and in 1666, Perrault was allowed to carry out his original design. He built the eastern front, with its famous colonnade of twenty-eight twin Corinthian columns flanking the grand gateway toward the church of St. Germain les Auxerrois. He also built the southern or river front, and he left at his death designs for three sides of the great court (Cour François I^{er}.). Each side of this court is 408 feet in length. Want of money, however, and the determination of the king to erect a palace at Versailles, put a stop to further work upon the Louvre. The palace was neglected, almost abandoned, until the end of the last century, and indeed until so late as 1802 the greater part of the building was without a roof. Up to this time the Louvre and the Tuileries were separate buildings, the space between them being occupied by a mass of houses threaded by narrow, irregular streets. In one of the streets

PLAN II. *Louvre.—Collections of First Floor.*





that ran through this quarter, the Rue Ste. Nicaise, Cadoudal's "infernal machine," intended to destroy Napoleon I. on his way to the opera, exploded Dec. 24, 1800. It is possible that the attempt upon his life may have determined Napoleon to clear the region about the palaces, but, from whatever motive, he went vigorously to work, and made a solid beginning of those improvements which, carried still farther by Louis Philippe, were brought to completion by Napoleon III. Napoleon I. finished the Louvre and cleared the surrounding streets and a large portion of the Place du Carrousel. He began the Rue de Rivoli, and carried it from the Place de la Concorde to a little beyond the Tuileries. Napoleon III. continued the street by cutting through the thickest masses of houses from the Place du Palais Royal to the Hôtel de Ville, thus setting the whole vast palace clear in light and air. The internal arrangements and decorations of the Louvre were principally effected by Charles X. and Louis Philippe. Napoleon III. repaired and restored the fronts toward the place named after himself, and he completed the edifice by raising the vast pile of building connecting the Louvre with the Tuileries. Thus, before the destruction of the Tuileries by the Commune in 1871 the Louvre and the Tuileries made one edifice, of which the complete circuit could be made on the second floor. The continuity of the ground floor was of course broken by the archways which permitted ingress and egress to the interior courts and to the building itself. Although the additions to each building, which were finally to unite and make them virtually one, were begun, as has been shown, at a very early period, it was thus not until our own immediate time that they were completed. Nor had the finishing touches, internal and external, been put to it when the war between France and Germany broke out, which not only prevented further work upon the building, but had for one of its sequences the complete destruction of the greater part of the Tuileries and of the most

splendid of the pavilions (Pavillon de Richelieu) of the Louvre. This pavilion contained the very valuable Bibliothèque du Louvre, the private library of the emperor Napoleon III., which library was utterly destroyed; and indeed the Commune would have destroyed the whole Louvre if the Versailles troops had not prevented it. The most valuable of the pictures and other art-treasures of the museum had been carefully packed and removed to Brest at an early period in the war, when the advance of the Prussians upon the city was feared. It was never looked for that one of the chief possessions of France would be in danger at the hands of Frenchmen.

The greater part of the Louvre is occupied with the collections of pictures, statues, and antiquities that constitute the Musée du Louvre. It would be impossible within the limits of an article like this to give anything more than the briefest summary of its contents. The works in sculpture—statues, busts, vases, and inscriptions—are distributed in five collections.

(1) *Ancient Greek and Roman Marbles.*—This collection occupies the lower part of the S. W. wing of the Louvre palace, a part of the ground floor of the Louvre gallery, and two large halls. Entering the building by the Pavillon Denon, the visitor finds himself in a vestibule (A) between these two halls (B and C), which extend to the right and left. The marbles they contain are of little importance, being chiefly antique, but of not the highest quality, placed on pedestals to relieve the otherwise barren look of these long apartments. Turning to the left on entering, the visitor finds at the end of the long hall C a room called the Rotonde (D). The five rooms of this suite (1, 2, 3, 4, 5) are devoted to works of Greek and Roman sculpture, but none of these are very remarkable. A new room (6) has been added; it is at a right angle with the rest, and contains, among other marbles, a respectable statue of Augustus in a niche at the western end. Returning to the Rotonde and turning to the right, the visitor enters a suite of rooms forming a part of the old Louvre. First in order comes the Salle de Diane (E), and on leaving this we see before us a long hall lined with statues on either hand, and at the end the celebrated *Venus of Milo*. Before entering this gallery, however, it is well to turn to the left and visit the Hall of the Caryatides (F), so called from four colossal caryatides by Jean Goujon, a sculptor of whom the French are justly proud, and to whom this noble apartment may be considered a funeral monument, since he was shot here while at work during the infamous massacre of the Huguenots. These caryatides support a gallery on which is a bas-relief of *Diana Reposing*, a copy of the original by Cellini, designed for a fountain at Fontainebleau. Most of the decorations of this room are by Jean Goujon or his scholars. Leaving this room, the visitor returns to the Long Hall, one of a suite of apartments decorated nearly as we see them for Catharine de' Medici. The Long Gallery contains few remarkable works, and indeed everything in it yields perforce to the *Venus of Milo*, which fills the visitor's eye, standing by itself, admirably lighted, and seen from the moment of entering. A door covered by a curtain leads from the hall of the *Venus of Milo* to another long hall (H) parallel with the first, by which the visitor returns on his steps and comes again to the Salle de Diane. The principal statue in this second long hall is the colossal *Melpomene*. Other statues here worthy of notice are the *Borghese Gladiator*, the *Venus of Arles*, the *Huntress Diana*.

(2) *The Egyptian Museum.*—That portion of the rich Egyptian collections of the Louvre which consists of statues, sphynxes, sarcophagi, and in general of the larger and more cumbrous specimens of Egyptian art, is contained in two halls (a, b), on the ground floor, occupying nearly the whole of the southern end of the eastern side of the quadrangle. The Collection of Smaller Egyptian Antiquities (Musée Champollion) is on the floor above. The Egyptian rooms on the ground floor are entered from the gateway opposite the church of St. Germain les Auxerrois. This is a very rich collection, and contains, besides fine specimens of the ordinary class of Egyptian sculpture, such as are met with in other European museums, many the like of which are not to be found out of Egypt and the new museum founded by Mariette Bey at Boulâq.

(3) *The Assyrian and Phœnician Museum* fills six rooms in the northern half of the eastern side of the quadrangle and a vestibule on the northern side (c). This museum contains valuable specimens of Assyrian sculpture discovered at Nineveh by M. Botta. Other rooms of this suite contain Phœnician sarcophagi, and in others there are curious sculptures, inscriptions, urns, etc., chiefly from Asia Minor. One of the rooms is called Salle du Vase de Pergame, from the fine vase with sculptured bas-reliefs discovered at Pergamus.

(4) *The Algerian Museum.*—In a narrow gallery (d) parallel to the Egyptian Hall, and looking out upon the Place du Louvre, is a collection of inscriptions, sculptures, and mosaics of the Roman period, discovered principally in Algeria and on the northern coast of Africa, including Egypt.

(5) *The Museum of Sculpture of the Middle Ages and of the Renaissance* is arranged in five halls (e) in the eastern half of the southern side of the quadrangle, facing the river. The collection consists of several monuments, chiefly sepulchral, which were rescued from churches destroyed in the Revolution, and of works by Goujon, Michel Angelo, Cellini, Mino da Fiesole, Jean Cousin, Pilon, Michel Colomb, and others. The chief treasure is the two statues called *The Prisoners*, executed by Michel Angelo for the tomb of Julius II.

(6) *Museum of Modern Sculpture.*—This collection is arranged in five halls (f), filling the northern half of the western side of the quadrangle. It consists chiefly of the works of artists of the French school, though there are a few by foreign artists. Here are Puget's *Milo of Croton devoured by the Lion*, *Psyche* by Pajou, and statues by Clodion, Houdon, Pradier, and others. Here also is Canova's well-known *Cupid and Psyche*.

All these collections are on the ground floor. The oldest of them is the one first described—"Ancient Greek and Roman Marbles"—(Musée des Marbres Antiques). It dates from 1797, and in 1803 was opened to the public as the Musée Napoléon. Napoleon I. first conceived the idea of converting the palace into a national museum, and caused to be collected here not only all the art-treasures of France, but added to these the spoils of all the principal galleries of Europe, especially of Italy, the trophies of his victorious campaigns. The transporting the cases in which these famous statues and paintings were packed across the Alps, through France, and finally through the streets of Paris, was managed in the theatrical way in which Napoleon delighted. As the procession passed through Paris, the immense cases inscribed in large letters with the names of their contents, *La Vénus de Médicis*, *La Transfiguration*, etc., and drawn by gayly-caparisoned horses, it resembled a Roman triumph, and was hailed with exultation by the whole city that poured forth in holiday attire to meet it. The opening of the gallery to the public attracted swarms of visitors from England and Germany, and indeed from all parts of Europe. But in 1815 the pictures and statues were restored by the allies to their original owners. In 1869 the Musée des Marbres Antiques contained 240 statues, 230 busts, 215 bas-reliefs, and 235 vases, altars, etc.—in all, 920 objects.

The collections on the first floor are reached by a spacious double staircase at the end of the long gallery entered from the Pavillon Denon (Plan II. A). At the head of the stairs we enter the Rotonde, a spacious vestibule handsomely paved with mosaic which gives access to two different series of museums: the one makes the complete circle of the old Louvre palace; the other fills the whole first floor of that wing of the new Louvre which extends along the river and makes the southern side of the Place Napoléon III. Turning to the right on entering the Rotonde, we pass, by two gates of wrought steel of the time of Henry II., into the Galérie d'Apollon (Plan II. B). This was an addition to the Louvre originally begun by Charles IX. and completed by Henry IV. Destroyed by fire in the time of Louis XIV. (1661), it was rebuilt in the same year, but shared in the neglect that the whole palace suffered during the building of Versailles. It was afterward divided up into apartments where the royal academies, especially those of painting and sculpture, had their sittings. Finally, it was restored by Louis Philippe, and opened to the public in 1851 by Louis Napoleon, then president of the republic. The room is 184 feet long by 28 broad. It has twelve windows looking out upon the Garden of the Infanta. This fine room contains a rich collection of Palissy ware, vases of agate, jasper, and other precious materials, Japanese objects, jewelry, etc. A door at the southern end of the western side opens into the Salon Carré (Plan II. C), in which are the choicest specimens the Louvre contains of pictures by artists of the Italian, Flemish, Spanish, and French schools. Here are Veronese's magnificent *Marriage in Cana*; Murillo's *Immaculate Conception*; Holbein's portraits of Erasmus, Anne of Cleves, Sir Thomas More; Raphael's *La Belle Jardinière*, *Virgin of Francis I.*, *St. Michael subduing Satan*; Titian's *Entombment*, *Titian and his Mistress*; Leonardo da Vinci's *Portrait of Mona Lisa* (La Joconde), *La Vierge aux Rochers*; Giorgione's *Concert*. These are perhaps the chief glories of the collection.

Leaving the Salon Carré, we enter the famous Great Gallery (Plan II. D), Musée des Tableaux des Écoles Italiennes et Flamandes. This gallery was formerly 1322 feet in length and 42 in width, but owing to the improvements going on it has provisionally lost two-thirds of its length. It formerly contained the pictures of the French

school, but these have been removed to other rooms. Immediately on entering the Great Gallery a door to the right opens into a room (Plan II. E) containing important pictures by Italian masters. Here are Mantegna, the celebrated *Madonna della Vittoria;* Palma Vecchio, a *Holy Family;* Sandro Botticelli, a *Holy Family;* Raphael, *Portrait of Joanna of Aragon, Portrait of a Young Man,* the so-called *Raphael and his Fencing-master, Portrait of Balthazar Castiglione;* Leonardo da Vinci, *La Belle Ferronière* and *St. John Baptist;* with others by Titian, Perugino, Cima da Conegliano, Bonifazio, and Carpaccio.

In the Great Gallery, to which the visitor returns from this room, the Italian and Spanish pictures will be found on the walls at the eastern end. The most notable of these are Cimabue's *Virgin and Child;* Giotto's *St. Francis receiving the Stigmata;* Fra Angelico da Fiesole's *Coronation of the Virgin;* with others by Perugino, Veronese, Ghirlandajo, Murillo, etc. In the centre of the northern wall of the Great Gallery a door opens into the noble Salle des États (Plan II. F), once filled with paintings, but in the later days of the Second Empire devoted to state ceremonials. It is over 137 feet long, about 69 wide, and 53 in height. It is lighted by three rows of windows, the upper one being circular in shape. A gallery supported on gilded columns runs round the greater part of it. The western half of the Great Gallery is devoted to the Flemish, Dutch, and German schools. Here are some very fine Van Dycks, *The Children of Charles I.;* Holbein, *Portraits of Nicholas Kratzer* and *William Wareham;* Rubens, *The Kermesse;* with others by Denner, Bol, Quentin Matsys, Paul Potter, Metzu, Teniers, Philippe de Champagne. The most striking contents of the Flemish collection are the twenty-one large paintings by Rubens and his pupils representing events in the life of Maria de' Medici from her birth, and of her husband, Henry IV., from their marriage. They were painted to decorate the gallery of the Luxembourg.

At the western end of the Great Gallery a door to the right opens into a suite of rooms (G) overlooking the Place du Carrousel and the Place Napoléon III., in which have been hung the paintings of the French school. In the first of these rooms are some interesting works of the sixteenth century; then follow two rooms devoted to the pictures of Lesueur. In the next two rooms are Joseph Vernet's *Views of the Ports of France* and other works by the same artist, with battle-pieces by Vandermeulen. All these rooms face the Place du Carrousel, but the visitor now enters a large hall, the first of a suite facing the Place Napoléon III., parallel to the Great Gallery, and containing pictures by French artists of the seventeenth and eighteenth centuries. Here are pictures by Poussin, Claude, Watteau, Joseph Vernet, Vanloo, Greuze, Gérard, bringing the history of French painting down to the early part of the present century. These pictures are arranged in two large galleries separated by the Salon Denon, sometimes called the Salle le Brun, from the paintings it contains representing the battles of Alexander the Great and his triumphal entry into Babylon, by Le Brun.

At the end of the second gallery of French paintings is a door opening upon the landing-place of the great staircase. The visitor now returns to the Rotonde, by which he entered the Salle d'Apollon, and, leaving it by a door on the E. side, begins his survey of the second series of museums on this floor. The room first entered is the Salle des Bijoux (Plan II. *a*), containing a portion of the Campana collection, consisting of Etruscan, Greek, and Roman jewelry. The next room is the Salle des Sept Cheminées (Plan II. *b*). This room has been constructed by throwing into one the several rooms into which it was once divided. The chimney-pieces of the original rooms remain, and give the room its name. It was beautifully fitted up by Louis Philippe to receive the paintings of the great artists of the revolutionary and imperial periods. Here are some of the best works of David, Gérard, Prudhon, Gros, Girodet, Guérin, Géricault—David, *Portrait of Pius VII., The Rape of the Sabines;* Gérard, *Belisarius, Cupid and Psyche;* Girodet, *The Burial of Atala, Endymion, The Deluge;* Prudhon, *Crime pursued by Vengeance;* Géricault, *The Wreck of the Medusa.*

From the Salle des Sept Cheminées three suites of rooms are entered. A door in the S. E. corner gives access to the Musée Napoléon III. (Plan II. *c*), containing a portion of the Campana collection, with antiquities from Syria, Macedonia, Thessaly, and the N. of Asia Minor. They are arranged in nine rooms, subdivisions of one long gallery overlooking the Seine. (N. B. In the Plan all these are thrown into one.) A door from the last of these rooms leads to a suite parallel to the Musée Napoléon III., and looking upon the court of the Louvre—Cour François I[er]. This suite consists of eight rooms, four on each side of a larger central hall called the Salle du Trône (Plan II. *d*), or the Salle des Colonnes, from the fine Corinthian marble columns that support its ceiling. This suite of rooms has been called, from the reign in which it was erected, the Musée du Charles X. (N. B. In the Plan all these have been thrown into one.) The eastern half of the suite contains the Museum of Smaller Egyptian Antiquities (Plan II. *e*), and the four rooms entered on crossing the Salle du Trône, and forming the other half of the suite (Plan II. *f*), constitute the Museum of Smaller Greek, Roman, and Etruscan Antiquities. The last room of this museum opens into the Salle des Sept Cheminées. A door in the northern side of the room (Salle des Sept Cheminées) admits to the Salle Henri II. (Plan II. *g*), in which the Musée Napoléon III. is continued, and which serves as a vestibule to the Salle des Séances, a vast saloon of Corinthian architecture roofed with dulled glass, and with a gallery on all four sides. It is richly gilded, and contains another portion of the Musée Napoléon III. The same valuable collection is continued in the Salle des Bronzes (Plan II. *h*), which is entered from the landing of the grand staircase in the Pavillon Sully. The Campana collection, purchased from the papal government, and now arranged in various rooms of the Louvre under the name of Musée Napoléon III., comprises 11,835 articles, of which the metal portion only is exhibited in this room, together with various Gallo-Roman antiquities.

On the other side of the grand staircase a door, answering to the one that leads to the Salle des Séances, admits to the Musée des Dessins (Plan II. *j*), a collection of drawings and designs by the old masters. It consists of fourteen rooms (N. B. In the Plan these are reduced to three), and comprises 36,000 specimens of the great masters of nearly all the schools. The first four halls on the western side of the palace contain (1) drawings by masters of the Roman and Florentine schools; (2 and 3) the same, with Lombard and Venetian; (4) the Bolognese school. Beyond these is a large hall forming the north-western angle of the palace and looking out upon the Rue de Rivoli. Here are drawings by the Dutch, Flemish, and German schools. Turning to the right, we enter a series of nine rooms, in which the collection of drawings is continued, and devoted to artists of the French school. The first room is a small apartment from which a staircase leads to the Ethnographical, Chinese, American, and Marine Museums on the floor above. The second contains works by Lesueur, N. Poussin, and Claude. The third contains works by Lesueur. The fourth is filled with drawings by Le Brun, Vandermeulen, Jouvenet, and Coypel. The fifth shows us Watteau, Boucher, Fragonard, and Greuze. In the sixth is the cartoon of David's celebrated picture, *Le Serment du Jeu de Paume,* with works by Girodet, Gérard, Granet, Gros, and Prudhon. In the seventh room are paintings on porcelain and miniatures. In the eighth are crayon portraits by French painters of the early sixteenth century. The ninth, which forms the centre of this side of the Louvre, is devoted to works in distemper, chiefly portraits by Maurice, Latour, Chardin, and Nanteuil.

Six rooms in the other half of this northern side of the Louvre (Plan II. *k*) are devoted to the very precious mediæval collections, the greater part consisting of the Musée Sauvageot, formed by the gentleman whose name it bears, and who left it to the Louvre by will in 1856. It consists of furniture, wood-carvings, miniatures, Venetian glass and enamels, bronzes, etc. In other rooms of the suite are admirable collections of Palissy ware and other specimens of French pottery; two rooms devoted to Italian faïence or majolica, with Della Robbia reliefs. At the end of this very interesting suite a door leads to the great staircase in the north-eastern angle. The visitor turns to the right and enters the Galérie de la Colonnade (Plan II. *m*), a name given to three fine halls looking upon the eastern colonnade of the Louvre. Beyond the Galérie de la Colonnade is the Musée des Souverains (Plan II. *n*). This museum, which has now been suppressed, formerly consisted of five halls filled with relics of the sovereigns of France. The last room opens upon the great staircase of the south-eastern angle. From the landing a door gives access to the great colonnade. It was by this door that the insurgents of 1830 obtained admission to the Louvre after a desperate fight with the Swiss guards. The visitor can leave the Louvre by descending these stairs and passing through the Egyptian Museum, or he can return to the Rotonde and so out by the Pavillon Denon.

With the exception of the neither very important nor very interesting museums on the second floor of the Louvre, we have now briefly catalogued the riches of this magnificent museum. The Musée de la Marine occupies eleven rooms. It contains models of Oriental boats and vessels, and of the apparatus used in removing the Obelisk of Luxor, now in the Place de la Concorde; also plans in relief of several of the French ports, models of cannon, of a war-steamer, etc. Be-

yond this museum is the Musée Ethnographique, a collection of articles of domestic use and of manufacture of uncivilized nations, together with Chinese manufactures and objects from India, etc. There is also an American Museum, consisting of antiquities discovered in Peru, Bolivia, Mexico, Yucatan, etc.; and in another part of this story three rooms containing Chinese objects, mostly the plunder of the emperor's summer palace at Pekin.

The official catalogues of the Louvre, sold in the building, though valuable as books of reference, are too bulky and too many to be of much use to the transient visitor. He must depend upon the excellent guidebooks of Galignani and Murray, although even these are not absolutely necessary, since the titles of all the pictures in each room, with their respective numbers, are inscribed on tablets hung upon the walls. Much assistance in writing this article has been obtained from Murray's *Guide to Paris*, from which our plans have been reduced. The most important information upon the sculpture of the Louvre is contained in Clarac's work, *Musée de Sculpture antique et moderne, ou Description historique et graphique du Louvre et de toutes ses Parties, des Statues, Bustes, Bas-reliefs et Inscriptions, etc. etc.*, 6 vols. gr. in-8vo de texte, et 6 vols. in 4to, avec 1136 planches (Paris, 1841–53). An interesting book is Bayle St. John's *The Louvre, or the Biography of a Museum* (8vo, London, 1858). CLARENCE COOK.

Lovat (SIMON **Frazer**), LORD, b. in Scotland about 1676, grandson of the ninth and cousin of the tenth lord, by whose will he succeeded to the title and estates; but in order to strengthen his title he endeavored to get possession of the sister of the late lord, and failing in the attempt seized upon the widow, whom he compelled to marry him. These daring acts provoked reprisals, and Lord Lovat was for several years obliged in self-defence to maintain an attitude of insurrection against the constituted authorities. On the accession of Queen Anne he was outlawed and forced to flee to the Continent, where he led a mysterious life for twelve years. On the outbreak of the Jacobite insurrection of 1715 he was invited by his clansmen to espouse that cause, but preferred to take the opposite course, inducing them to follow his guidance, for which service he was restored to his estates. In the insurrection of 1745 he sent his clan under command of his son to fight for the Pretender, while he protested his own loyalty to the house of Brunswick. This double game was unsuccessful, and made him especially obnoxious to the government, which brought him to trial for treason, resulting in his execution on Tower Hill Apr. 9, 1747.

Love-Apple, a name once given to the *Lycopersicum esculentum*, or TOMATO (which see).

Love-feast, a modern restoration of the ancient AGAPÆ (which see). The Moravian Brethren, the various denominations of Methodists, and some other bodies of Christians observe this custom. In some places the love-feast is a simple meal, at which prayer, singing, and religious conversation are in order. Generally, among the Methodists, bread and water alone are used, and all members of the church are allowed to participate. The Sandemanians have a weekly love-feast, eaten on Sunday.

Love'joy, a v. and tp. of Iroquois co., Ill., on the Chicago Danville and Vincennes R. R. Pop. 240.

Lovejoy (ELIJAH PARISH), b. at Albion, Me., Nov. 9, 1802; graduated at Waterville College in 1826; became in 1827 a teacher and in 1828 an editor at St. Louis, Mo.; studied theology at Princeton, N. J., and in 1833 was ordained a Presbyterian minister; in 1836, while editor of the St. Louis *Observer*, attacked slavery in its columns, and was in consequence compelled by a mob to remove to Alton, Ill.; here his printing-press was twice destroyed by a mob, and on a third attack, on the night of Nov. 7, 1837, he attempted to defend his property, and shot one of the attacking party, whereupon he was himself shot dead. Mr. Lovejoy had some reputation as a poet. (See his *Life*, by O. and J. C. Lovejoy, 1838.)

Lovejoy (OWEN), brother of Elijah P., b. at Albion Me., Jan. 6, 1811; educated at Bowdoin College, and removed to Alton, Ill.; was present when his brother was killed, and thereafter conducted many antislavery meetings, often subjecting him to fines and imprisonment; he was a Congregational minister of Princeton, Ill., 1838–54, and member of Congress 1856–64. D. at Brooklyn, N. Y., Mar. 25, 1864.

Love'lace (RICHARD), b. at Woolwich, England, in 1618; graduated at Oxford in 1636; became courtier of Charles I., and colonel in the royal army during the great rebellion; served also in the French army; was twice imprisoned in England, and solaced his lonely hours by the composition of amatory verses, of which two volumes were published, and which have given him a place in the collections of minor poets. D. in London in 1658. An edition of his *Poems* was published by J. Russell Smith in 1864.

Lovelace's, tp. of Wilkes co., N. C. Pop. 627.

Love Lady, tp. of Burke co., N. C. Pop. 597.

Love'land, post-v. of Clermont co., O., on the Little Miami River, and on the Marietta and Cincinnati and the Little Miami R. Rs.

Lov'ell, post-tp. of Oxford co., Me., 25 miles W. of Paris, has 3 churches, some manufactures, and a fire insurance company. Pop. 1018.

Lovell, tp. of Muskegon co., Mich. Pop. 167.

Lovell (Gen. CHARLES S.), b. in Massachusetts about 1810; enlisted as private soldier in the army in 1831; appointed second lieutenant of infantry in 1837, first lieutenant 1838, captain 1846, major 1861, lieutenant-colonel 1863, and colonel 1865; in the war with Mexico served with his regiment at Churubusco, Molino del Rey, Chapultepec, and capture of the city of Mexico; in the civil war served throughout the Virginia Peninsular campaign; at the second battle of Bull Run, Antietam, Fredericksburg, etc., most of which time was in command of a brigade. Retired Dec., 1870, and d. at Louisville, Ky., Jan. 3, 1871.

Lovell (JAMES), son of "Master Lovell," b. at Boston, Mass., Oct. 31, 1737; graduated at Harvard 1756; was usher of the Latin School under his father 1757–75; delivered the official address before the city authorities Apr. 2, 1771, in commemoration of the first anniversary of the "Boston massacre," thus inaugurating a custom which has continued to the present time. He was imprisoned by Gen. Gage after the battle of Bunker Hill; exchanged in Nov., 1776; was a member of the Continental Congress Dec., 1776–82; receiver of taxes 1784–88; collector of the port of Boston 1788–89, and naval officer 1790–1814. He was at one time master of the North Grammar School, Boston, and published some tracts. D. at Windham, Me., July 14, 1814.—His son, MAJ. JAMES LOVELL, b. July 9, 1758; graduated at Harvard 1776; was adjutant in Jackson's Massachusetts regiment 1776–79, and of Lee's Legion in the Southern campaign. He participated in many of the battles of the Revolution from Lexington to Eutaw Springs. Some of his letters are printed in the *Life of Arthur Lee* (1829). D. at St. Matthew's, S. C., July 10, 1850.

Lovell (JOHN), b. at Boston, Mass., June 16, 1710; graduated at Harvard 1728; became usher of the Boston Latin School 1729, and was its master from 1734 to its suppression by the siege of Boston Apr. 19, 1775. During this long period "Master Lovell" was the instructor of many men eminent in the Revolutionary annals, but his own opinions were so decidedly loyalist that he embarked with the British troops Mar. 14, 1776, for Halifax, N. S., where he d. in 1788. He was an excellent classical scholar, and, though rigid in discipline, was popular for his genial disposition. He delivered the address on the dedication of Faneuil Hall, Mar. 14, 1743, and wrote various miscellaneous publications. His portrait by Smibert is in the gallery of paintings of Harvard College.

Lovell (JOSEPH), M. D., son of James, b. at Boston, Mass., Dec. 22, 1788; graduated at Harvard 1807; studied medicine, was appointed surgeon of the 9th Infantry in 1812; served on the Niagara frontier, and in 1818 became surgeon-general of the U. S. army. D. at Washington, D. C., Oct. 17, 1836.

Lovell (Gen. MANSFIELD), son of Joseph, b. at Washington, D. C., Oct. 20, 1822; graduated at West Point 1842, and entered the artillery; served under Gen. Taylor in the war with Mexico, and was wounded at Monterey; transferred to the army of Gen. Scott, he was chief of staff of Quitman's division, and severely wounded in the assault on the city of Mexico; resigned from the army in 1854, settled in New York, and was (1858–61) deputy commissioner, and for a time acting commissioner, of public works; in the civil war served as major-general of the Confederate army, and was in command of the department of the South at the time of the capture of New Orleans; subsequently served in the North Mississippi and Georgia campaigns; at the close of the war was in command in South Carolina.

Lov'er (SAMUEL), b. at Dublin in 1797; early attained some distinction as a painter, poet, and singer; his earliest work, excepting contributions to the journals, was *Legends and Songs of Ireland;* in 1828 became a member of the Royal Hibernian Academy, giving successful attention to portraits and miniatures. His *Rory O'More* (1837), *Handy Andy* (1842), and *Treasure Trove* (1844), comic Irish tales, widely extended his fame. *Songs and Ballads* (1839), *Lyrics of Ireland* (1858), *Metrical Tales* (1859), and several successful dramatic works were written by him. He also

gave public exhibitions and lectures in Great Britain, Ireland, and America with much success. D. July 6, 1868.

Lov'ettsville, post-v. and tp. of Loudon co., Va. Pop. of v. 155; of tp. 3020.

Love'well (Capt. JOHN), b. at Dunstable, N. H., near the close of the seventeenth century, was son of John Lovewell, an ensign in Cromwell's army, who d. at the reputed age of 120 years. He was engaged as captain of volunteers in several successful expeditions against the Indians in 1724–25, but was killed at the head of his company, May 8, 1725, by a body of Indians under the chief Paugus. This battle, which gave name to Lovewell's Pond, N. H., was long famous as "Lovewell's Fight," chiefly through the popularity of a "long and mournful ballad" which commemorated the incidents of the conflict. (See Drake's *Book of the Indians* and the *Expeditions of Capt. Lovewell*, by F. Kidder, 1865.)—A brother, ZACCHEUS LOVEWELL, b. at Dunstable July 24, 1701, was colonel of a New Hampshire regiment in the French war, and d. Apr. 12, 1772.

Lov'ingston, post-v. and tp., cap. of Nelson co., Va., on the Washington City Virginia Midland and Great Southern R. R. Pop. 5511.

Lov'ington, post-v. and tp. of Moultrie co., Ill., at the crossing of the Paris and Decatur and the Bloomington and Ohio River R. Rs. Pop. 1588.

Low (ABIEL A.), b. at Salem, Mass., Feb. 7, 1811; after receiving a common-school education, turned his attention to commercial pursuits; moved early in life to New York City and became a prominent merchant; was a member of the chamber of commerce in 1846, and elected its president in 1863, holding that position till 1867.
J. B. BISHOP.

Low (FREDERIC F.), b. at Frankfort, Me., Jan. 30, 1828; went to California in 1849; was first a miner, then a merchant in San Francisco; became a banker at Marysville 1855; was a Republican member of Congress 1861–63, collector of the port of San Francisco 1863–64, governor of California 1864–68, and minister to China 1869–72.

Lowden, Iowa. See LOUDON.

Lowe, tp. of Moultrie co., Ill. Pop. 786.

Lowe (Sir HUDSON), b. at Galway, Ireland, July 28, 1769; entered the army; served in the expedition to Egypt, in the Peninsular war, in Naples, and Sicily; aided in the conquest of the Ionian Islands; became their first governor; was employed in secret missions to Portugal and Sweden; was present at the battle of Bautzen, and carried to London the news of the abdication of Napoleon, to which fortunate circumstance he was perhaps indebted for the honor of knighthood and promotion to the rank of major-general; served during the following year as quartermaster-general of the army of the Netherlands, until removed by the duke of Wellington; is now remembered chiefly as governor of the island of St. Helena during the whole imprisonment of Napoleon; afterward served in India; became lieutenant-general in 1820; published a defence of his conduct at St. Helena (in French, 1830), and d. in London July 10, 1844. A *History of the Captivity of Napoleon from his Journal* was published in 1853.

Lowe (ROBERT), D. C. L., LL.D., b. at Bingham, Nottinghamshire, England, in 1811; graduated at Oxford in 1833; became a fellow of Magdalen 1835, and private tutor 1836; was admitted to the bar, and settled in Australia in 1842, and soon took a prominent part in the politics of that colony; returning to England with a considerable fortune in 1851, he entered Parliament as a Liberal, and rose to high office, becoming chancellor of the exchequer in the second Gladstone ministry 1868–73, and home secretary 1873–74.

Low'ell, tp. of Chambers co., Ala. Pop. 848.

Lowell, post-v. of Lake co., Ind., near the N. W. corner of the State, on Cedar Creek, 10 miles S. of Crown Point, the county-seat, has 4 churches, 1 weekly newspaper, 2 hotels, a good public-school building, several dry goods and drug stores, and a fine water-power, which is utilized by a flouring-mill and a manufacturing company. Pop. about 1000. E. R. BEEBE, ED. "STAR."

Lowell, post-v. and tp. of Cherokee co., Kan., 3 miles from Baxter Springs, on Spring River, which furnishes a fine water-power, employed in mills. Pop. 1612.

Lowell, post-tp. of Penobscot co., Me., 48 miles N. E. of Bangor. Pop. 448.

Lowell, city of Middlesex co., Mass., the leading seat of the cotton manufacture in the U. S., situated on the Merrimack River near the mouth of the Concord River, and is 26 miles N. W. of Boston. Six railroads centre in the place. Its territory comprises only 2587 acres. The first cotton-mill was erected in 1822–23, when the then almost uninhabited territory now comprising the city was East Chelmsford. Portions of Dracut and Tewksbury have been annexed, and the city was incorporated in 1836. There are twelve incorporated manufacturing companies, mostly engaged in the manufacture of cotton goods; 11 private companies are engaged in the manufacture of textile fabrics of various kinds. The capital stock employed by the 12 incorporated companies is $16,000,000; number of mills, 80; spindles, 678,521; looms, 15,189; females employed, 10,000; males, 6000; yards cotton cloth made per week, 2,660,000; woollen cloth, 60,000; yards of carpeting, 37,000; shawls, 2500; dozens hosiery made per week, 16,800. The most important iron-works are the Lowell Machine-shop (incorporated), employing 1250 hands; American Bolt Co.; Swaine Turbine Co.; R. Kitson's Cotton-machinery Manufactory. Dr. J. C. Ayer & Co. are extensive manufacturers of patent medicines, and print in their establishment about 10,000,000 almanacs annually. The city has 7 national banks, with an aggregate capital of $2,350,000, and 6 savings banks; 3 daily and 4 weekly papers; 2 hospitals; 26 churches; an electric fire-alarm; a complete system of public water-works—deriving the supply from the Merrimack River—completed in 1873 at a cost of $1,500,000; 2 public libraries; an orphan asylum (Catholic), an old ladies' home, a young women's home, and other charitable institutions. There is a horse railroad through the principal streets. The business and larger portion of the city is on low land, but on the outskirts the land is elevated and very well adapted for residences, of which there are some fine ones. The city has some finely shaded streets, and the scenery along the Merrimack is picturesque, while from the most elevated points within the city many distant mountains, including the Grand Monadnock, are visible. Pop. 40,928.
E. T. ROWELL, ED. "COURIER."

Lowell, post-v. and tp. of Kent co., Mich., situated at the junction of the Grand and Flat rivers, on the Detroit and Milwaukee R. R., 139 miles W. of Detroit and 15 miles W. of Ionia, has 3 churches, 1 national bank, 1 weekly newspaper, 3 hotels, a union school, 2 planing-mills, 2 saw-mills, 2 flouring-mills, axe, chair, and furniture factories, and several large stores. A North and South R. R. is now in process of construction. Pop. of v. 1503; of tp. 3086. JAMES W. HINE, ED. "JOURNAL."

Lowell, post-v. of Kearney co., Neb., on the Platt River and Burlington and Missouri River R. R. (Nebraska extension), 121 miles W. of Lincoln, and 4 miles E. of Fort Kearney, has 1 weekly newspaper, several churches, schools, and business-houses.

Lowell, post-v. of Westmoreland tp., Oneida co., N. Y., 6 miles S. W. of Rome. Pop. 171.

Lowell, post-tp. of Orleans co., Vt., 38 miles N. of Montpelier, has 3 churches and manufactures of lumber, starch, etc. Pop. 942.

Lowell, post-v. and tp. of Dodge co., Wis., on the Milwaukee and St. Paul R. R., 139 miles from Milwaukee. The Beaver Dam River affords water-power, extensively employed in the lumber manufacture. Pop. 2415.

Lowell (CHARLES), D. D., b. in Boston Aug. 15, 1782, son of Judge John Lowell; educated at Andover; graduated at Harvard College in 1800; studied law, and afterwards theology; went abroad; studied in Edinburgh, and travelled in Europe; on Jan. 1, 1806, was settled over the West Congregational church in Boston. He was not a man of distinguished learning or intellectual power, but remarkable for the sweetness and benevolence of his heart. In the controversies of his time he took no active part, refused to assume any sectarian name, and, though Unitarian in opinion, discountenanced the separation from the orthodox communion. He published two volumes of sermons (Boston, 1855) and occasional discourses. Dr. Lowell was the father of J. R. Lowell, the essayist and poet. D. in Cambridge Jan. 20, 1861. O. B. FROTHINGHAM.

Lowell (Gen. CHARLES RUSSELL), b. in Boston in 1835, son of Rev. Charles Lowell; educated at the Boston Latin School and at Harvard University, graduating in 1854 with the highest honors; after a time passed in European travel and study, returned to the U. S. and engaged in business pursuits; at the outbreak of the civil war was superintendent of iron-works in Maryland; immediately tendering his services to the government, he was appointed (May, 1861) a captain in the 6th U. S. Cavalry, serving with his company in the Peninsular campaign in Virginia, and subsequently in Northern Virginia and Maryland on the staff of Gen. McClellan; on the recruitment of the 2d Mass. Cavalry was appointed its colonel, and stationed in the vicinity of Washington, and afterward assigned to command a brigade, and rendered valuable service against

Mosby's guerilla bands, and in the repulse and subsequent pursuit of the Confederate army under Gen. Early from before Washington, 1864; assigned to Gen. Sheridan's command, his military services in the Shenandoah Valley were conspicuous and brilliant in all the engagements of that army, including the battle of Cedar Creek, where he was wounded while in advance of Getty's division, but would not leave his command, remaining until the final attack was made, in which he was mortally wounded at the moment of victory. In recognition of his services he was appointed brigadier-general of volunteers, to date Oct. 19, 1864. D. at Middletown, Va., Oct. 20, 1864.

G. C. SIMMONS.

Lowell (FRANCIS CABOT), b. at Newburyport, Mass., Apr. 7, 1775, son of John (1743–1802); graduated at Harvard College in 1793; became a leading merchant at Boston, and was a pioneer in cotton manufacturing in the U. S., and one of the principal founders of the manufacturing interests of Waltham and Lowell, which city was named in his honor. D. at Boston Aug. 10, 1817.

Lowell (JAMES RUSSELL), D. C. L., LL.D, son of Rev. Charles, b. at Cambridge, Mass., Feb. 22, 1819; graduated at Harvard College in 1838 as class poet, and at Harvard Law School in 1840; commenced practice in Boston, but soon devoted himself entirely to literature. He printed in 1841 a small volume of poems entitled *A Year's Life;* edited with Robert Carter in 1843 *The Pioneer, a Literary and Critical Magazine* (monthly), which reached only three numbers; published in 1844 volume of *Poems;* in 1845 *Conversations on Some of the Old Poets;* in 1848 another volume of *Poems,* containing several directed against slavery, *The Vision of Sir Launfal, A Fable for Critics,* and *The Biglow Papers,* the latter satirical essays in "dialect poetry" directed against slavery and the war with Mexico, which acquired wide popularity both at home and in England. In 1851–52 he travelled in Europe, residing for a considerable time in Italy; delivered in 1854–55 a course of lectures on the British poets before the Lowell Institute, Boston; succeeded Longfellow in Jan., 1855, as professor of modern languages and literature at Harvard College, and spent another year in Europe, chiefly at Dresden, in qualifying himself for that post. From 1857 to 1862 he was editor of the *Atlantic Monthly,* and from 1863 to 1872 of the *North American Review* (quarterly), in both of which many of his miscellaneous writings appeared. He published in 1864 *Fireside Travels;* in 1867 a new series of *Biglow Papers;* in 1868 *Under the Willows,* with which was included his noble *Commemoration Ode* in honor of the alumni of Harvard who had fallen in the civil war; in 1869 *The Cathedral;* in 1870 two volumes of essays, *Among my Books* and *My Study Windows.* He travelled in Europe 1872–74, receiving in person the degree of D. C. L. at Oxford and LL.D. at the University of Cambridge, England. A new volume of essays was announced for 1874, but did not appear. Mr. Lowell's collected poetical works enjoy great popularity, both in the U. S. and in England.—His wife, MARIA WHITE LOWELL, b. July 8, 1821, d. Oct. 27, 1853, wrote verse of considerable merit, specimens of which were privately printed at Cambridge in 1855.

Lowell (JOHN), LL.D., b. at Newbury, Mass., June 28, 1743; graduated at Harvard College in 1760; was admitted to the bar in 1762, and removed to Boston in 1777; was a member of the Continental Congress 1782–83; judge of the court of appeals 1783–89; of the U. S. district court 1789–1801; and a justice of the U. S. circuit court 1801–02. He was the author of the clause in the Massachusetts Bill of Rights which abolished slavery. D. at Roxbury, Mass., May 6, 1802.

Lowell (JOHN), LL.D., b. at Newburyport, Mass., Oct. 6, 1769, son of John (1743–1802); graduated at Harvard College in 1786; was admitted to the bar in 1789; became a successful lawyer; author of many papers and pamphlets upon a great variety of subjects, and was active in the founding of many of the public institutions of Boston, but would never accept office. D. at Boston Mar. 12, 1840.

Lowell (JOHN), b. in Boston May 11, 1799, son of F. C. Lowell; was educated at Harvard College and in Edinburgh, and had fine scholarly tastes. He spent much time in foreign travel. D. at Bombay, India, Mar. 4, 1836, and left $250,000 to found the Lowell Institute in Boston.

Lowell (ROBERT TRAILL SPENCE), D. D., b. in Boston, Mass., Oct. 9, 1816, son of Rev. Charles Lowell; graduated at Harvard College in 1833. In 1842 he took orders in the Church of England; was bishop's chaplain at Bermuda and at St. John's, Newfoundland; held rectorships at Bay Roberts, Newfoundland, Newark, N. J., and Duanesburg, N. Y., and was afterwards principal of St. Mark's School at Southborough, Mass. He published a novel, *The New Priest of Conception Bay* (1863), *Fresh Hearts and other Poems* (1860), and a novel, *Antony Brade* (1874).

Low'ellville, post-v. of Poland tp., Mahoning co., O., 7 miles S. E. of Youngstown, on the Mahoning River, the Mahoning division of the Pittsburg Fort Wayne and Chicago R. R., and the Pennsylvania and Ohio Canal. It has large iron-works. Pop. 722.

Lo'wenthal (ISIDOR), b. at Posen, Prussian Poland, in 1827, of Jewish parents; became familiar with Hebrew at an early age; exhibited an extraordinary aptitude for philological studies, and at the age of seventeen years had mastered more than the usual course of a liberal education. He then became a mercantile clerk and member of a liberal club, and on account of a poem published in a newspaper was obliged to flee; embarked at Hamburg and reached New York in the autumn of 1846. He was soon reduced to such destitution as to adopt the business of a street-peddler, but having by good fortune attracted the attention of Rev. S. M. Gayley of Wilmington, Del., his accomplishments became known, and he obtained a situation as teacher of French and German at Lafayette College, Easton, Pa., where he also entered the senior class as a student, graduating in 1848, after which he became a teacher of languages at Mount Holly Collegiate School, N. J. Having become a Christian in 1851, he entered Princeton Seminary in 1852; took high rank in philology, contributed learned articles to the *Biblical Repository;* was in 1855 tutor at the College of New Jersey, and in Aug., 1856, went to India as a missionary of the American Presbyterian Board to the Afghans. He soon learned Persian, Cashmiri, Hindostanee, Arabic, and the Afghan language (Pushtoo), into which he translated the New Testament, and had nearly completed a dictionary of that language when he was accidentally killed at Peshawur, Apr. 24, 1864. He was an intense student, sleeping but four hours daily, and was admitted to have a better knowledge of India than any other foreigner.

Löwenthal (JOHN JACOB), b. at Buda-Pesth, Hungary, in July, 1810; became known about 1841 as one of the best analytical chessplayers in Europe, and was thereafter usually the victor in matches with the most renowned champions of the game. In 1849 he left Hungary for political reasons; came to the U. S., where he contributed to the *Book of the First American Chess Congress;* went to London to engage in the chess-tournament of 1851; became a resident of that capital and editor of the chess department of the *Era,* the *Illustrated News,* the *Weekly Dispatch, Land and Water,* and other papers; edited the *Chessplayers' Magazine* (1865–67) and several books on the same subject; became in 1852 secretary of the St. George's Chess Club, and in 1857 president of the St. James's Chess Club. In 1867–69 he published *Transactions of the British Chess Association.*

Low'er, tp. of Franklin co., Ark. Pop. 960.

Lower, tp. of Cape May co., N. J., contains Cape May City. Pop. 1783.

Lower, tp. of Richland co., S. C. Pop. 307.

Lower (MARK ANTONY), F. S. A., b. at Chiddingly, Sussex, England, in 1813; became a teacher at Lewes, and attained distinction as an archæologist. He has written *English Surnames* (1842), *Curiosities of Heraldry* (1845), *The Chronicle of Battel Abbey* (1851), *Patronymica Britannica* (1860), a dictionary of family names, *The Worthies of Sussex* (1865), *Compendious History of Sussex* (1870), and *Wayside Notes in Scandinavia* (1874).

Lower Al'len, tp. of Cumberland co., Pa. Pop. 1336.

Lower Al'loway Creek, tp. of Salem co., N. J. Pop. 1483.

Lower Augus'ta, tp. of Northumberland co., Pa. Pop. 1802.

Lower Burgeo, port of entry on the S. coast of Newfoundland, 330 miles by steamer from St. John's. Pop. 620.

Lower Chance'ford, tp. of York co., Pa. Pop. 2306.

Lower Chich'ester, tp. of Dauphin co., Pa. Pop. 1129.

Lower Cone'to, tp. of Edgecombe co., N. C. Pop. 2000.

Lower Creek, tp. of Burke co., N. C. Pop. 750.

Lower Creek, tp. of Caldwell co., N. C. Pop. 1092.

Lower Fishing Creek, tp. of Edgecombe co., N. C. Pop. 1629.

Lower Fork, tp. of Burke co., N. C. Pop. 616.

Lower Hei'delberg, post-tp. of Berks co., Pa. Pop. 2480.

Lower Hom'iny, tp. of Buncombe co., N. C. Pop. 1215.

Lower Lafave′, tp. of Yell co., Ark. Pop. 457.

Lower Lake, post-v. of Lake co., Cal., at the S. E. end of Clear Lake, 23 miles S. E. of Lakeport. Pop. 692.

Lower Macun′gie, tp. of Lehigh co., Pa. Pop. 3662.

Lower Mahanoy′, tp. of Northumberland co., Pa. Pop. 1790.

Lower Make′field, tp. of Bucks co., Pa. Pop. 2066.

Lower Mer′ion, post-tp. of Montgomery co., Pa., includes Merion Square and other villages near Philadelphia. Pop. 4886.

Lower Mil′ford, tp. of Lehigh co., Pa. Pop. 1505.

Lower Mount Beth′el, tp. of Northampton co., Pa. Pop. 3641.

Lower Naz′areth, tp. of Northampton co., Pa. Pop. 1086.

Lower Ox′ford, tp. of Chester co., Pa., contains several villages, and is the seat of Lincoln University (Presbyterian). Pop. 1449.

Lower Pax′ton, tp. of Dauphin co., Pa. Pop. 1623.

Lower Peach Tree, post-tp. of Wilcox co., Ala. Pop. 1831.

Lower Penn's Neck, tp. of Salem co., N. J. Pop. 1472.

Lower Prov′idence, post-tp. of Montgomery co., Pa. Pop. 1572.

Lower Sal′ford, tp. of Montgomery co., Pa. Pop. 1645.

Lower Sau′con, post-tp. of Northampton co., Pa. Pop. 4991.

Lower St. Clair, tp. of Allegheny co., Pa., is in the suburbs of Pittsburg, on the S. W. of the Monongahela River. Pop. 5322.

Lower Swata′ra, tp. of Dauphin co., Pa. Pop. 1290.

Lower Towamen′sing, tp. of Carbon co., Pa. Pop. 1552.

Lower Town Creek, tp. of Edgecombe co., N. C. Pop. 937.

Lower Tur′keyfoot, tp. of Somerset co., Pa. Pop. 1264.

Lower Uwch′lan, tp. of Chester co., Pa. Pop. 794.

Lower Wind′sor, tp. of York co., Pa. Pop. 2429.

Low′estoft, town of England, county of Suffolk, on the German Ocean, much visited during the summer for its excellent sea-bathing, and carries on some shipbuilding and fishing of herrings and mackerel. Pop. 10,663.

Low Hill, post-tp. of Lehigh co., Pa. Pop. 997.

Lo′wicz, town of Russia, in the government of Warsaw, on the Bzura. It has several good educational institutions, an old palace with a beautiful park, and six annual much-frequented fairs. Pop. 5046.

Lowndes, county of S. Central Alabama, bounded N. by the Alabama River. Area, 750 square miles. It is well watered and very fertile, and is traversed by the Alabama Central and the Mobile and Montgomery R. Rs. Cotton and corn are leading products. Cap. Hayneville. Pop. 25,719.

Lowndes, county of Georgia, bounded S. by Florida. Area, 375 square miles. It contains large pine forests, with much level and fertile land. The Withlacoochee forms part of the W. and the Allapaha River part of the E. boundary. Corn, rice, pork, and cotton are staple products. The county is traversed by the Atlantic and Gulf R. R. Cap. Valdosta. Pop. 8321.

Lowndes, county of Mississippi, bounded E. by Alabama. It has a varied surface, and is very productive. Cotton and corn are the principal crops, and flour the leading article of manufacture. The county is traversed by the Tombigbee River and the Mobile and Ohio R. R. Cap. Columbus. Pop. 30,502.

Lowndes, tp. of Colleton co., S. C. Pop. 1850.

Lowndes (RAWLINS), b. in the British West Indies in 1722; removed in childhood to Charleston, S. C., and became an able lawyer; in 1766 was appointed one of the crown judges; was an early friend of colonial independence; in 1778 became president of South Carolina; was for a time a prisoner in the hands of the British; after the war most vigorously opposed the Federal Constitution, and as ardently defended the African slave-trade. D. at Charleston, S. C., Aug. 24, 1800.

Lowndes (THOMAS), b. at Charleston, S. C., in 1765, son of Rawlins; was well educated, and possessed fine talents and eloquence, of which he gave proof as a member of Congress 1800–05. D. at Charleston, S. C., July 8, 1843.

Lowndes (WILLIAM JONES), LL.D., b. at Charleston, S. C., Feb. 7, 1782, son of Rawlins; studied in England, and graduated at Charleston College; admitted to the bar in 1804; member of Congress 1810–22, and held other important positions; was a son-in-law of Thomas Pinckney. D. at sea Nov. 27, 1822.

Lowndes (WILLIAM THOMAS), b. in England about 1800; published *The Bibliographer's Manual of English Literature* (London, 1834, 4 vols.) and *The British Librarian, or Book-Collector's Guide* (11 parts, 1839, incomplete), two works which enjoy the highest reputation among bibliophilists. The author, a bookseller of London, became deranged through pecuniary embarrassment, and d. in 1843.

Lowndes′boro′, post-v. and tp. of Lowndes co., Ala. Lowndesboro' R. R. Station, 6 miles N., is on the Western R. R., 31 miles E. of Selma. Pop. 4882.

Lowndes′ville, post-v. and tp. of Abbeville co., S. C. Pop. 2480.

Low′ry (REIGART B.), U. S. N., b. in South America July 14, 1826; entered the navy as midshipman Jan. 21, 1840; became passed midshipman in 1846, lieutenant in 1855, commander in 1866, captain in 1871; was in several engagements on the Potomac River in 1861, and on the coast of Louisiana and Texas in 1862 and 1863; served as executive officer of the U. S. S. Brooklyn at the battle of New Orleans, and is thus spoken of by his commanding officer, Capt. Thomas T. Craven: "I have to congratulate myself on being so ably assisted by my executive officer, Lieut. R. B. Lowry. He was everywhere, inspiring both officers and crew with his own zeal and gallantry."

FOXHALL A. PARKER.

Lowth (ROBERT), D. D., b. Nov. 28, 1710, at Winchester, England, where his father, Rev. William Lowth, a distinguished theologian (1661–1732), was chaplain to the bishop and prebendary in the cathedral; graduated at New College, Oxford, in 1737; took holy orders; in 1741 became professor of poetry at Oxford, and delivered a course of lectures on the *Sacred Poetry of the Hebrews*, the foundation of his later work on the same subject; after filling numerous minor benefices became bishop of St. David's in 1766; was translated to the see of Oxford the same year, and was appointed bishop of London in 1777; declined the archbishopric of Canterbury in 1783. D. at Fulham Palace, London, Nov. 3, 1787. His principal works were *Prælectiones de Sacra Poesi Hebræorum* (1753) and a poetical *Translation of Isaiah* (1778), both much esteemed and frequently reprinted.

Low′ville, post-v. and tp., cap. of Lewis co., N. Y., 1½ miles W. of Black River, on the Utica and Black River R. R., has 6 churches, 2 banks, 2 weekly newspapers, 6 hotels, a noted academy founded in 1808, a foundry, numerous manufactories, mills, stores, and shops; was settled in 1797, incorporated in 1847, and is surrounded by a rich agricultural region, producing chiefly butter and cheese. Within the township are West Lowville (P. O.) and Stow's Square. Pop. 2805.

A. V. SMILEY, ED. "JOURNAL AND REPUBLICAN."

Lowville, post-tp. of Columbia co., Wis. Pop. 879.

Loxodon′ta [Gr. λοξός, "oblique," and ὀδούς, "tooth"], or **Loxodon**, a genus proposed by F. Cuvier for the African ELEPHANT (which see), and containing also a few fossil Indian and European species. The name has reference to the lozenge-shaped tracts of dentine, enclosed by a ridge of enamel, upon the grinding surface of the molar teeth, this structure being intermediate between that found in the Indian elephant and the extinct genus *Stegodon*. (See MASTODON.) O. C. MARSH.

Loxodrom′ic Curve [Gr. λοξός, "oblique," and δρόμος, "running"], a curve traced on the surface of a sphere by a point moving in such a manner as to cut all the meridians at the same angle. In navigation the loxodromic curve is the same as a *rhumb;* that is, it is the path of a ship sailing on a given course. If we refer the curve to the prime meridian and the north pole of the earth by means of spherical polar co-ordinates, its differential equation is

$$a dl = \frac{d\phi}{\sin\phi}, \quad . \; . \; . \; (1)$$

in which l is the longitude of any point, ϕ the polar distance of that point, and a is a constant depending on the value of the angle under which the curve cuts the different meridians. Integrating equation (1),

$$al = \log \tan \tfrac{1}{2}\phi,$$

which is the equation of the loxodromic curve. This equation is similar in form to that of the logarithmic spiral, and its discussion shows that the curve approaches the pole by an infinite number of converging spherical spires. If the loxodromic curve is projected stereographically on the

plane of the equator, the projection is a logarithmic spiral. W. G. PECK.

Loxoloph′odon [Gr. λοξός, "oblique," λόφος, "crest," and ὀδούς, "tooth"], a name given to an extinct genus of Tertiary mammals. (See TINOCERAS.)

Loy′al, post-tp. of Clark co., Wis. Pop. 543.

Loyalhan′na, tp. of Westmoreland co., Pa. Pop. 813.

Loy′alsock, post-tp. of Lycoming co., Pa. Pop. 1475.

Loyo′la (IGNATIUS), b. in Guipuzcoa, Spain, in 1491, in the castle of Loyola, whence his surname; his original name was INIGO LOPEZ DE RECALDE; was of a noble Spanish family, and the youngest of eleven children; in his youth served as a page in the court of Ferdinand the Catholic; afterwards entered the military service, remaining till his thirtieth year, always giving proof of a valorous, chivalric, and adventurous spirit; having been wounded in the leg at the siege of Pamplona by the French in 1521, and being feeble and suffering, read a life of Christ and various sacred legends (among them probably that of St. Francis d'Assisi, the beginning of whose history is very like that of Loyola), and by degrees the man of the world found himself transformed into the Christian disciple, and, scarcely recovered, divided his goods among the poor, made a pilgrimage to a shrine of the Virgin Mary, to whom he dedicated his armor, declaring himself at the same time *her knight*, and retired to the hospice of Manresa. There, and in the neighboring caves, he so macerated his body that one day he was found insensible. Ten months later he embarked from Barcelona for Palestine, but being maltreated by the guardian of the Sepulchre, the provincial of the Franciscans, he returned in 1524, by way of Venice, to Barcelona, where he applied himself to the study of the Latin grammar. Two years afterwards, having entered the superior schools, he prepared himself for giving popular instruction. Being accused of witchcraft before the Inquisition, he was arrested; on his release, in 1528, he went to Paris to study theology. There in 1534, together with several more, both Frenchmen and Spaniards, such as Laynez, Bobadilla, Rodriguez, Pierre Lefèvre, and others, he formed the project of founding a new Catholic religious order. Some of his companions not having finished their studies, he returned to Spain and waited for them. In 1537 the company met again in Venice, and thence Ignatius made his first journey to Rome to obtain permission to establish the new order and receive a blessing upon it. According to some legends, Ignatius was favored at Storta, near Rome, with a vision, in which Christ, bearing a banner, appeared to him and said, "Fear not! I will befriend thee in Rome." Others state, more simply, that Loyola, as he was drawing near to the Eternal City, and in uncertainty as to the reception that awaited him, felt his heart fail him. Stopping before an old chapel which stood by the wayside, he entered it and implored the Divine protection; after which, full of courage, he said to his companions, "Truly, dear brethren, I know not how God may see fit to dispose of us—whether we shall be hung, tortured, or in any other way suffer martyrdom in Rome—but what I can tell you certainly is, that Christ Jesus will be gracious and merciful to us in whatsoever straits we may be." He and his friends resumed the pilgrim's staff, and with their books of theology on their shoulders and huge rosaries about their necks continued their journey, and finally reached Rome. Pope Paul III., "thinking that the pious zeal of these Fathers for the general good of souls would be of no small advantage and honor to the harassed Church," received them with kindness, and on Sept. 27, 1540, gave to Ignatius and his companions the provisory, and in 1543 the definitive, approbation of the order of Jesuits. Loyola was named first general of the order in 1541, although his fellow-worker, Laynez, had not been less efficient in founding it. The head of the new company soon gave himself to the religious training of the young, and he was very successful in bringing Jews over to the Christian faith and in reforming lost women. He died on the 31st of July, 1556, was beatified in 1599, and canonized by Pope Gregory XV. in 1622. His feast is celebrated by Roman Catholics on the 31st of July, the anniversary of his death. Although Loyola met with much persecution in his own time from bad men whose faith he strove to quicken and whose morals he tried to reform, yet posterity has never questioned the sincerity of his professions nor the purity of his life. Still, it must be admitted that in his doctrine of implicit and unquestioning obedience to the superior, in the *secret* vows which the members of the society were permitted to take, and in the unlimited power granted to it by Pope Paul III. to modify and add to its statutes at its own pleasure and without consulting the head of the Church, lie the fatal germs whence have sprung all the bitter fruits of later Jesuitism. He wrote two small works in Spanish—*The Constitution of the Order of Jesus* and *Spiritual Exercises.* His *Life* has been written many times, but those of Rosweide, Maffei, and Bouhours are specially quoted. ANGELO DE GUBERNATIS.

Lozère, department of France, comprising an area of 1965 square miles, and consisting mainly of an elevated plateau resting on the Cevennes, whose central mass, the so-called Margaride Mountains, cover the whole southern and western part of the department, and whose highest peak, Mount Lozère, rises 4884 feet. These mountains are rich in iron, lead, silver, copper, and antimony, and their southern slopes are covered by vines, mulberry, and olive trees. But generally the soil is not fertile or suited to tillage; sheep and goats are extensively reared, and large quantities of chestnuts are raised. Pop. 135,190. Education is better provided for than in many other departments; of 20,817 children, only 2296 grew up without receiving school education in 1857. Cap. Meude.

Lüb′ben, town of Prussia, province of Brandenburg, on an island of the Spree, has some manufactures of cloth, linen, and tobacco. Pop. 5593.

Lubbock (Sir JOHN), BART., M. P., F. R. S., F. S. A., son of Sir John W. Lubbock, b. in London Apr. 30, 1834; educated at Eton; became a banker in London, honorary secretary to the London bankers, and introduced improvements into the system of banking, especially the "country clearing" and the publication of the clearing-house returns; became early interested in ethnology, physics, and natural science; was one of the first scholars who elucidated the significance of the lacustrine dwellings of Switzerland and the "kitchen-middens" of the Danish coast, concerning which he wrote several articles in the reviews about 1860; succeeded to the baronetcy on his father's death in 1865, in which year he published *Pre-historic Times, as Illustrated by Ancient Remains and the Manners and Customs of Modern Savages* (3d ed. revised, 1870), a work which was translated into many languages, republished in America, and which was truly characterized as "epoch-making" in the anthropological sciences. In 1870 he issued the complement of the former work, *The Origin of Civilization and the Primitive Condition of Man*, which had a similar popularity, and made good its author's claims to be regarded as one of the chief exponents of the great modern science of which it treats. It is not alone in anthropology, however, that Sir John Lubbock has rendered distinguished services to science; his *Origin and Metamorphoses of Insects* (1874), *On British Wild Flowers considered in Relation to Insects* (1874), and *Monograph on the Thysanura and Collembola,* and more than 50 memoirs in the *Transactions* of various learned societies, bear witness to the versatility of his researches. He has been president of the Ethnological and Entomological societies, and of the Anthropological Institute, vice-president of the British Association and of the Royal and Linnæan societies, is an active member of the Society of Antiquaries and the Geological Society, and of the commissions on international coinage, public schools, and the advancement of science, and is vice-chancellor of the University of London. In 1865 and 1868 he was an unsuccessful candidate for Parliament in the Liberal interest; was elected for Maidstone in 1870; has spoken on financial and educational topics, and procured the passage of several important acts, one of which, the Bank Holiday bill, added four statute holidays to the two previously existing.—Lady Lubbock (ELLEN FRANCES HORDERN) participates in the scientific tasks of her husband, and has written admirable articles in the scientific and literary periodicals, especially the *Academy*. PORTER C. BLISS.

Lub′bock (Sir JOHN WILLIAM), BART., F. R. S., b. in London Mar. 26, 1803; graduated M. A. at Trinity College, Cambridge, in 1825; became F. R. S. in 1829; came to the baronetcy by inheritance in 1840; was a successful banker and sheriff and lieutenant of Kent; but his principal fame was won by astronomical researches; wrote many valuable papers upon lunar and planetary perturbations, upon tides, eclipses, etc., and also published *Researches on Physical Astronomy* (1830), *Classification of Branches of Human Knowledge* (1838), *Theory of the Moon* (1833), *Treatise on Tides* (1831–37), and other works. D. June 20, 1865.

Lu′bec, post-v. and tp., seaport of Washington co., Me., 3 miles S. W. of Eastport, has a good harbor, and its people are chiefly engaged in fisheries and other maritime pursuits. Argentiferous lead ores are found here. Pop. 2136.

Lu′beck [Ger. *Lübeck*], a free Hanse-town and an important commercial port of the German empire, is situated on the Trave, 10 miles from its entrance into the Baltic, and has 39,743 inhabitants, according to the census of 1871. It is almost wholly surrounded with water. To the W. and N. the Trave makes a large curve, forming an extensive harbor; to the S. and E. runs the Wakenitz, joining the Trave to the S. of the city. It is still partly sur-

rounded with walls, and contains many old-fashioned houses and churches, which remind one of the Middle Ages. It is egg-shaped in its ground-plan, and divided into four quarters—that of Jacobi to the N. E., of Maria Magdalena to the N. W., of Maria to the S. W., and of Johannis to the S. E. These suburbs, consisting of separate groups of houses, stand on the other side of the rivers. The most important place is the market-place, situated in the centre of the city. Here stands the town-house, a large structure built of red and black glazed brick, with five towers, finished in 1517. This building contains the Hanse-hall, in which in olden times, when Lubeck stood at the head of the Hansa, the representatives from eighty-five German cities held their assemblies, but which is now divided into a number of smaller rooms: and the town-cellar, built in 1443 and stocked with excellent wine. Among the churches (9 Lutheran, 1 Reformed, and 1 Roman Catholic) the Lutheran Marienkirche is the most striking, built between 1286 and 1310, in a grave Gothic style, with three naves and two tall belfries. The whole structure is 354 feet long and 197 feet broad; the middle nave is 134 feet high, the towers 430 feet. It contains a very ingenious clock and several remarkable chapels, one with a *Dance of Death* (1463), and another of black marble (1607). The cathedral, built between 1170 and 1341, the Jacobikirche of the thirteenth century, and the Petrikirche from the beginning of the twelfth, are interesting. The Catharinenkirche, built in the earliest Gothic style, is not used now for worship, but contains a collection of art and antiquities. Noteworthy among the other buildings are the house of the Merchants' Company, with excellent wood-carvings; the hospital of the Holy Ghost, with a beautiful chapel in the earliest Gothic style; the theatre, the lunatic asylum, the Katharineum, an educational institution, the school of navigation, the mercantile academy, etc. The industry is very lively. Breweries, manufactures of tobacco, cloth, and linen, cotton, and silk weaving factories are in operation. Still more important is the commerce, on account of the location of the city, between Hamburg and the Baltic: 2844 vessels, of 295,216 tons burden, entered and cleared the harbor in 1873. The principal items of importation are wood, potash, tar, hemp, copper, and tallow from Russia; timber, iron, copper, and steel from Sweden; corn and spirits from Prussia; wine from France; the wine trade is very important.

Lubeck has a democratic constitution. Its government consists of a senate of 14 members and a municipality of 120. This government rules a territory of 114 square miles, with 52,158 inhabitants, which forms a separate state, an independent member of the German empire. The city of Lubeck has a budget of 2,272,214 marks, and a debt of 22,319,303 marks. It carried on an important commerce as early as the beginning of the twelfth century, and the culmination of its prosperity falls between 1200 and 1500. The emperor Frederick II. made it a free city of the realm in 1226. It waged successful wars against the Danes, and defeated them in 1227, 1234, and 1249. It was the head of the Hansa, and its fleets swept the Baltic during the thirteenth, fourteenth, and fifteenth centuries. But its power decreased with the Hansa. The burgomaster Wullenweber succumbed when he tried in 1530 to restore to Lubeck its old influence in the affairs of the Scandinavian countries. From 1563 to 1570 it waged its last war, against Sweden. The Thirty Years' war almost crushed it. In 1806 the French took it and sacked it. In 1810 it was incorporated with the French department of the Bouches d'Elbe. In 1813 the Russians expelled the French, but the French returned once more, and held it for a short time, until Bernadotte, the crown-prince of Sweden, liberated it. During the period of peace since 1815 its prosperity has developed once more. In 1866 it sided with Prussia, and sent one battalion to the army of the Main. On June 27, 1867, it concluded a military convention with Prussia. May 15, 1868, it entered the Zollverein, and in 1871 the German empire. August Niemann.

Lu'beck, post-v. and tp. of Wood co., W. Va., 3 miles S. W. of Parkersburg. Pop. 2009.

Lübke (Wilhelm), b. at Dortmund, Westphalia, Jan. 17, 1826; studied at Bonn and Berlin; published in 1853 *Die mittelalterliche Kunst in Westfalen,* and in 1855 *Geschichte der Architektur;* was appointed professor of architecture at the Building Academy of Berlin in 1857; travelled in 1858–60 through Italy, France, and Belgium, and became professor of art-history at Zurich in 1861, and at Stuttgart in 1866. His *Grundriss der Kunstgeschichte* ("Outline of the History of Art") (1861) and *Geschichte der Plastik* (1863) have been often republished, and are very useful handbooks, clear, correct, and comprehensive. He also wrote the text to the picture-albums published by G. Schauer at Berlin.

Lu'blin, town of Russia, government of Lublin, on the Bistritza, is an old town, and, next to Warsaw, the handsomest and most important in Poland. Among its buildings are notable the church of St. Nicholas, founded in 986; the Sobieski palace, the cathedral, and the town-hall. A considerable trade in corn and Hungarian wines is carried on, and three annual fairs are kept, each lasting one month. Also some woollens and linens are manufactured. Pop. 19,054.

Lu'bricants [Lat. *lubricare,* "to make smooth"], or **Unguents,** are of many kinds. As a solid lubricant, plumbago, graphite, or black lead is the only material in common use. It is carefully prepared for use by the removal of all earthy or other foreign substances, and is usually applied mixed with tallow or oil. It is best adapted for lubrication of bearings moving slowly under very heavy pressures. Tallow alone, or mixed with plumbago or with red or white lead, is an excellent lubricant under similar conditions. Lard is sometimes applied in such cases. All of the animal and vegetable non-drying oils are good unguents. The best of the oils for heavy pressures is summer-strained sperm; winter-strained sperm oil is also a good lubricant. Lard oil, although not capable of withstanding such extreme pressures as the preceding, is excellent for the bearings of machinery, and its comparative cheapness has brought it into common use. Neat's-foot oil is occasionally used as an unguent. Of the vegetable oils, olive is one of the best, and is very extensively used in European countries, and sometimes has been imported into the U. S. for this purpose. Colza and rapeseed oils are good lubricants. The siccative, or drying, oils, of which linseed oil is an example, cannot be used as unguents. Mineral oils are now coming into extensive use as lubricants. They have less "body" than the best vegetable, and particularly than the best animal oils, but have enough for ordinary purposes, and possess the great advantage of neither drying like the siccative vegetable oils, nor absorbing oxygen from the atmosphere and becoming gummy like the other animal as well as vegetable oils. They are now prepared especially for this purpose, and are found exceedingly well adapted to the application. They are frequently mixed with the heavier lubricants, and the resulting compound is often found better adapted than either of its constituents to the use for which it has been prepared, possessing at the same time the required body and the necessary lubricity, and the power of retaining its properties indefinitely in the presence of oxygen. The best mineral lubricating oils are those which, having been subjected to fractional distillation at high temperature, have been freed from all of the more volatile constituents. These are at the same time the safest illuminating oils. Crude petroleum is a good unguent under light pressures. The majority of the lubricating oils sold under trade names or trade-marks are mixtures of oils having a good body with others of less value. A mixture of mineral and lard oils is commonly used, and is a good lubricator. A solid unguent, composed of 3 parts tallow, 3 parts palm oil, ½ pound caustic soda, and a gallon of water, thoroughly mixed at a temperature of 140° F., is recommended for car-axles. A mixture of 2 parts paraffine, 1 of lard, and 3 of lime-water is said to work well under heavy pressures in rolling-mills.

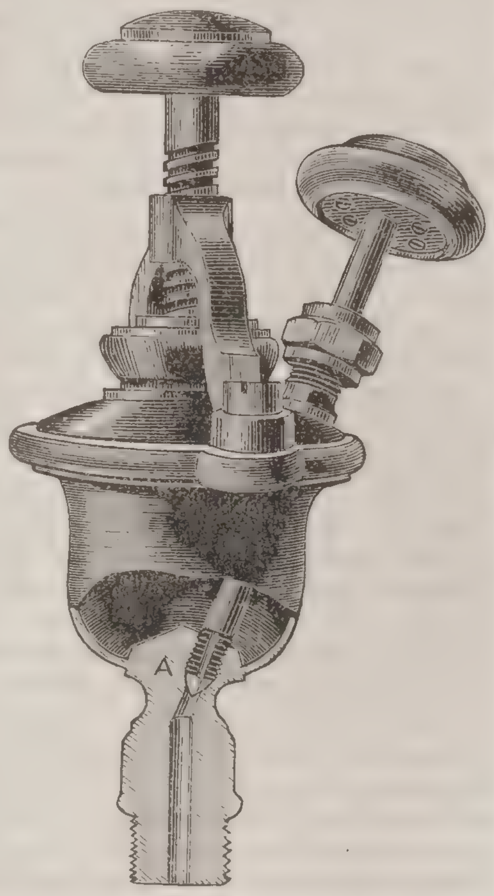
The oils are, by some authorities, distinguished as those fatty bodies which are liquid at ordinary temperatures; concrete oils or butters, as those which are soft at about 85° F., and melt at about 95° F.; and greases and tallows, as those which remain solid up to nearly 100°. Some waxy substances belong to the same class of bodies, and are softened only at about 100° F., and melt at about 150°. The vegetable oils are usually expressed from seeds; animal oils are found most abundantly in cavities in the cellular tissue under the skin, at the surface of the muscles, around the base of the heart, and among the intestines. In the herbivorous animals they are more solid and have less odor than in the carnivorous. Grease from birds is pure, soft, unctuous, and readily melted; in the fishes it is usually almost liquid, and has a strong odor. Fats which are white and abundant in young animals become yellow and less in quantity in old age. Oils are derived from fatty matters by exposing them to sufficient pressure to break up the cellular tissue and set free the liquid grease. Nuts contain one-half their weight of oil; seeds contain from one-fifth to one-half. In expressing both animal and vegetable oils heat is frequently found to assist thorough extraction.

The oils of commerce frequently contain traces of the acids used in their purification. When this is the case, they are likely to injure delicate machinery if applied as a lubricant. They may be purified by chemical treatment, or they may be clarified by placing in the vessel containing them a quantity of rusty iron or of other neutral absorbent of acids. Soap is used as an unguent between surfaces of

wood; water may answer a good purpose in dissolving any glutinous or mucilaginous substance, but it is not itself a true unguent. (See METALINE.) R. H. THURSTON.

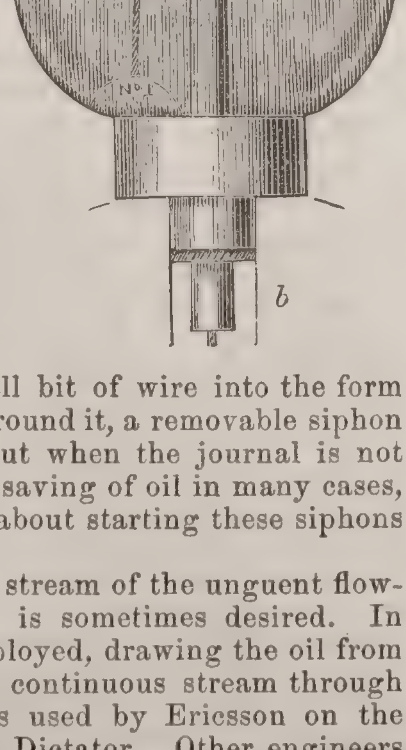
Lu'bricators [Lat. *lubricare*, "to make smooth"], apparatus by means of which lubricating materials are applied to rubbing surfaces in machinery. As lubricants are sometimes solid, sometimes semi-fluid, and sometimes liquid, lubricators are of several kinds. Those intended for applying solid lubricants, such as tallow, lard, or axle-grease, consist frequently of a simple box supported above the part to be lubricated, with a hole of a size which is greater or less according to the greater or less viscosity of the material employed and the freedom with which it is desired to apply it, leading down to the "bearing," through which the lubricant gradually finds its way. With hard tallow it is sometimes found advisable to apply a plate above the mass, which, being pressed down by a spring, forces the lubricant downward more rapidly; as, for example, in the "Weston box." On car-axles, where a peculiar compound of grease and lime-water is used, the latter form is not required. In open boxes the tallow is often laid directly upon the journal, and where care is taken to secure a good quality of hard lubricant this is a moderately economical method of lubricating. It is often practised with the gudgeons of vertical water-wheels. A plain "tallow-box," with a small "oil-hole," answers for an unguent of slight viscosity. Fig. 1 exhibits a simple form of lubricator in which it is intended to use tallow or suet. The cock at A is used as a means of adjusting the rate of supply. This is only used upon steam cylinders, where the heat of the steam melts the unguent.

FIG. 1.



For the animal and vegetable oils, which are the most common lubricating materials, an entirely different style of lubricator is used. For ordinary journal bearings the usual form consists of a brass or glass vessel (Fig. 2) of a capacity varying from less than a gill to sometimes a quart. It is screwed upon the cap of the journal-box or otherwise conveniently attached. At the bottom is a hole of from one-eighth to a quarter of an inch in diameter, into which is secured a vertical tube rising nearly or quite to the top of the "oil-cup." A channel of proper size leads from the cup down to the bearing to be oiled. The cup is filled with oil, and a "leader" (A) made of loosely twisted lampwick is inserted partly in the vertical tube, and the remainder is allowed to fall into the oil within the cup. This wick thus acts as a siphon, drawing the oil up, and leading it then down into the tube, from which it finds its way to the bearing. This is the most generally used form of lubricator. By bending a small bit of wire into the form of a ∩, and lapping the wick around it, a removable siphon is made, which, being taken out when the journal is not moving, permits a considerable saving of oil in many cases, as on marine engines. When about starting these siphons are quickly reinserted.

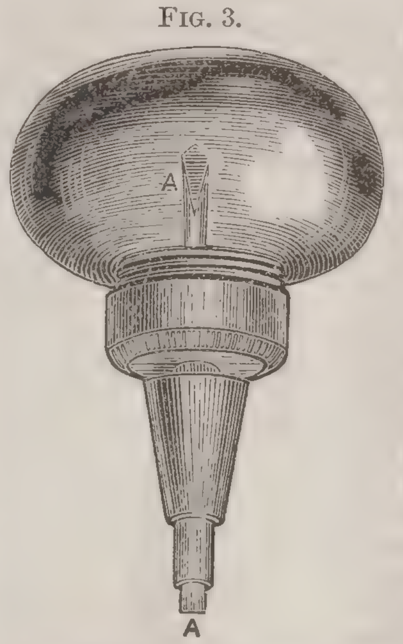
FIG. 2.



Continuous lubrication, by a stream of the unguent flowing over the rubbing surface, is sometimes desired. In such cases, an oil-pump is employed, drawing the oil from a reservoir and forcing it in a continuous stream through the journal. This device was used by Ericsson on the thrust-bearing of the iron-clad Dictator. Other engineers have attached to the revolving shaft a piece of mechanism operated by the movement of the shaft itself, which by means of small spoons dips up the oil and pours it upon the bearing. In both of these arrangements a reservoir is required, from which the oil may be taken, and to which it may return as it drips from the bearing. It is generally thought, however, by engineers, that a current of the lubricant, by keeping the surfaces washed perfectly clean, permits rapid wear, where, with less freedom of supply, the gummy, viscous, and adhesive compound formed by the mixture of the unguent with the impalpable powder worn off the metal not only forms a more perfect lubricant, but protects the surfaces from wear by ensuring a more complete separation; thus, under heavy pressures and with slow motion a limited supply of oil is often found to be more effective in preventing heating than a continuous and rapid flow.

Many ingenious, and some very useful, devices have been invented, having for their object the convenient and economical distribution of the lubricant. In the crank-pin lubricator of Howe the oil-cup is screwed into the strap of the connecting-rod from beneath; a wick is carried up to the surface of the pin, and kept in contact with it by a small wire or stick, around which it is wound, and which is held up against the bearing by a spring. The oil is drawn up by capillary force, and, reaching the bearing, lubricates it freely; the excess flows back into the oil-cup. In the needle oil-cup of Dreyfus (Fig. 3) there is no inner tube, but a small rod or needle (A) is inserted into the hole through which the oil descends, fitting it so closely that no oil can flow past it when at rest. Whenever the machinery is in motion, however, the jar and the friction of the shaft, against which the needle bears at its lower end, causes a slight but a sufficient tremor of the needle, and the oil is fed to the bearing uniformly and unceasingly as long as the machinery continues to move. Whenever the motion of the shaft ceases the vibration of the needle is stopped also, and no oil can then flow. The amount of unguent delivered to the journal is determined by the closeness of the fit of the needle, which is filed away when a more copious supply is required, or a larger one is inserted when the flow is found to be excessive.

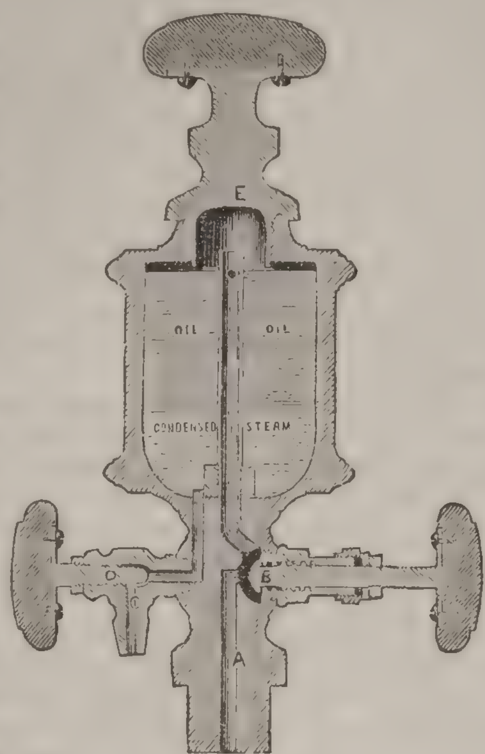
FIG. 3.



For lubricating the interior of the cylinders of steam-engines, where the unguent must be forced in against the pressure of the steam, two classes of lubricators are largely used. One consists of a small force-pump, sometimes with, and sometimes without, an attached reservoir. In the first case the pump has sufficient capacity to contain the full charge which it is desired to force into the cylinder at one time; in the other case the pump draws from the reservoir one or more charges as may be required. The pump is always some form of force-pump, but the varieties of style are very numerous. Nearly every large dealer in such "engineers' supplies" has a form peculiar to himself. The second kind of lubricator for steam cylinders consists merely of a reservoir for oil, connected at the top by a small-sized pipe with the steam-pipe, and at the bottom by another pipe with the steam-pipe or the steam-chest below it. Each small pipe is provided with a cock, which may be used to close the communication with the steam-pipe. These cocks being closed, the reservoir is filled with oil, and the cocks are then again opened. Steam pressure then comes upon both top and bottom of the oil in the cup, but no motion of the fluid takes place, as the lower pipe is at its highest point on a level with the surface of the oil. Gradually the steam condenses in the upper part of the reservoir, and, being of greater specific gravity than the oil, it settles to the bottom, displacing it and slowly filling the cup. It raises the oil until the latter flows out at the top of the reservoir through the pipe provided for that purpose, and trickles down into the steam-chest. This is a very simple form of lubricator, and is used extensively. On condensing steam-engines, where there exists alternately an outward and an inward pressure, a cup of convenient size is frequently screwed into the cylinder-head, and being filled with oil or melted tallow, the cock between it and the cylinder is opened at the moment when the piston is making its stroke toward that head, and atmospheric pressure drives the lubricating material out of the cup into the cylinder. Fig. 4 represents a simple form. The channel A leads to the steam-cylinder, and is closed by the plug B when required. The passage C being opened by withdraw-

ing the plug D, the contents of the cup may be drawn off. Closing this channel, the top E of the cup is removed, and it is filled with oil. The top is replaced and the cock B is opened. Steam now rises into the upper portion of the cup, and, condensing, the water settles down beneath the lighter fluid. This process is a very gradual one, and may be checked by the use of the cock B.

Fig. 4.



The amount of lubricant used will evidently depend principally upon the character and adjustment of the lubricator. As the cost of lubricants is usually a very serious item of the expense of maintaining machinery, a good lubricator is a very valuable instrument. As in using all lubricators of the classes above described the oil which has passed through the journal is lost, many attempts have been made to secure economy by using the oil repeatedly until it is entirely unfit for further use. The oil-pump and the mechanism using spoons, already described, illustrate such attempts with large bearings. On shafting "reservoir boxes" are sometimes used. These "self-oiling boxes," as they are also called, have a reservoir formed within the journal-box, in which is placed a considerable quantity of oil. On the shaft is a collar which dips into the oil, and as the shaft turns takes up a portion, and this, trickling back over the shaft, produces a constant lubrication of the rubbing surfaces. These boxes only require filling at long intervals, as the oil is present in considerable quantity, and is used over and over again. It does not follow, however, that they are more economical than carefully managed oil-cups of the ordinary kinds. An exceedingly small quantity of oil may be made to suffice when properly applied. A well-known firm writes: "We have in our machine-shop 565 bearings, oiled twice each week, and 45 fluid ounces are used at each oiling—an average of 17 drops to each bearing. The quantity of oil used in six months is 2340 ounces. If put into a self-oiling box, and expected to last six months, it would be but $4\frac{1}{10}$ ounces to each journal." This is equal to about a gill of oil, a quantity which would in most cases be insufficient to fill a box. In a French device, the "*Palier Glissant*," the journal is arranged with pipes leading from a force-pump to the surface of contact between the journal and the box. Through this pipe water is forced, and the shaft is borne upon a fluid cushion, revolving without contact and free from friction with the metal of the bearing. In other cases, as where "metaline" is used, the journal is supported upon some peculiar composition, which is so nearly frictionless and so good a conductor of heat that the useless work there converted into heat is not sufficient to produce serious heating of the journal.

Fig. 5.

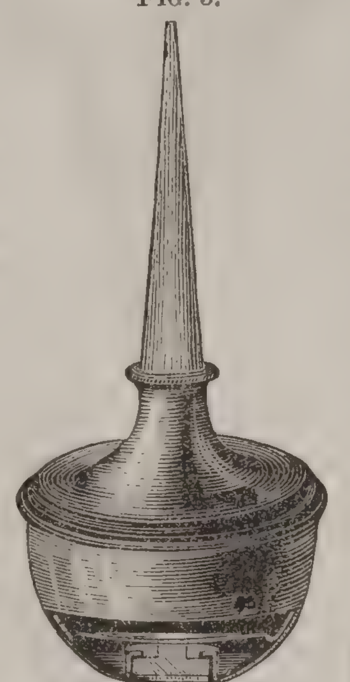
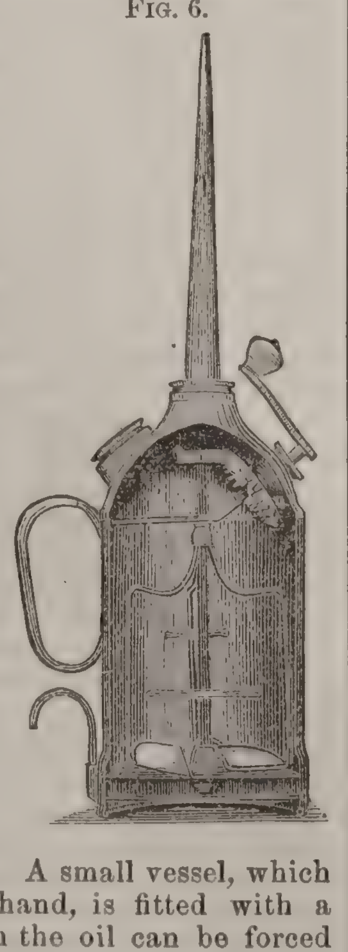


Fig. 6.



Where such lubricators as are above described cannot be conveniently attached, or where they do not supply as much as is needed, oil-cans are used to supply the oil by hand. One of these "spring-oilers" is shown in Fig. 5. A small vessel, which can be conveniently held in one hand, is fitted with a slender conical tube, through which the oil can be forced out by the thumb of the hand holding the oiler, which forces in the thin metal bottom of the cup. This bottom is elastic, and resumes its normal shape when the pressure is removed. The issuing oil spurts in a jet, which is skilfully directed to the spot where the oil is needed. When a journal exhibits a tendency to heat, a mixture of oil and plumbago (black lead) is sometimes used. This mixture separates when left undisturbed, the plumbago settling to the bottom. An oiler like Fig. 6, provided with a set of vanes by means of which the lubricant may be stirred up when needed, is made for this case. R. H. Thurston.

Lu'can, post-v. of Biddulph tp., Middlesex co., Ont., Canada, on the Grand Trunk Railway, 16 miles from London, has an active trade in grain and cattle, and 1 weekly newspaper. Pop. about 1000.

Lucan (George Charles Bingham), G. C. B., third earl of, b. in London Apr. 16, 1800; educated at Westminster; entered the army in 1816; accompanied the Russian army as a volunteer in the Turkish war of 1828–29; succeeded to the title and large estates in Ireland in 1839; became a representative peer in 1840; was commander of a cavalry division in the Crimea, and made himself memorable by his connection with the "charge of the light brigade" at Balaklava, Oct. 25, 1854. He became lieutenant-general in 1858 and general in 1865.

Luca'nia, an ancient division of Magna Græcia, extended from the Tarantine Gulf in the E. to the Tyrrhenian Sea in the W. The most remarkable of its cities were Sybaris, Heraclea, and Pæstum. It now corresponds to the provinces of Basilicata and Principato Ultra.

Luca'nus (Marcus Annæus), b. at Cordova, Spain, in 39 A. D., a nephew of the philosopher Seneca; came early to Rome; received an excellent education; distinguished himself by his poetical talent, and became a favorite with Nero, but happened to excite his jealousy, and was forbidden to recite in public. Thus stopped in the midst of a brilliant career, he joined the conspiracy of Piso, was betrayed, turned informer in order to save his own life, and began by denouncing his own mother; but was nevertheless ordered to be put to death by the emperor, and committed suicide in 65 A. D. Of his works, only *Pharsalia*, a heroic poem in 10 books, is still extant, but it is either unfinished or incomplete; it treats of the civil wars between Cæsar and Pompey, and begins with the passage of the Rubicon, but breaks off abruptly in the midst of the Alexandrian war. The tone is very unequal, first flattering and then reviling the emperor, and the style seems to indicate that it wanted a last revision by the poet. The first book was translated into English by Christopher Marlowe in 1600; the whole by Rowe, in verse, and by Riley in 1853. There are French and German translations in verse and prose, and the poem has found warm admirers. The best edition is that by C. Fr. Weber (Leipsic, 1828–31, 3 vols.).

Lu'cas, county of S. Central Iowa. Area, 432 square miles. It is generally level and fertile, and is traversed by Chariton River and by the Burlington and Missouri River R. R. Cattle, grain, and wool are leading products. Coal is found. Cap. Chariton. Pop. 10,388.

Lucas, county of Ohio, bounded N. by Michigan, E. partly by Lake Erie, and S. E. partly by the Maumee River, whose lower course is in this county. It is level, fertile, and well timbered. Cattle, grain, and wool are staple products. The manufactures include cooperage, lumber, carriages, etc. It is traversed by the various railroads centring at Toledo, the capital. Pop. 46,722.

Lucas, tp. of Crittenden co., Ark. Pop. 190.

Lucas, tp. of Effingham co., Ill. Pop. 592.

Lucas, post-v. of Monroe tp., Richland co., O., on the Pittsburg Fort Wayne and Chicago R. R. Pop. 312.

Lucas, post-tp. of Dunn co., Wis. Pop. 317.

Lucas (John B. C.), b. in 1762 in Normandy; studied law at the University of Caen; came to the U. S. in 1784, and became a farmer near Pittsburg, Pa., and in 1792 was elected to the legislature; was a judge of the common pleas; a member of Congress 1803–05; in 1805 was appointed judge of the U. S. courts at St. Louis, Mo., and held that office until 1820; was also (1805–12) a commissioner of land-titles. D. near St. Louis Sept., 1842.

Lucas (Paul), b. at Rouen, France, Aug. 31, 1664, son of a goldsmith; visited Greece, Asia Minor, Syria, and Egypt as a dealer in precious stones; engaged in the naval service of the Venetians; participated in the siege of Negropont 1688; became captain of an armed vessel which cruised against the Turks; returned to France 1696; sold a fine collection of medals and curiosities to the royal cabinet; again visited Egypt, and ascended the Nile 1700; went by sea to Tripoli; joined a caravan which traversed Armenia and Persia; was robbed at Bagdad; taken prisoner by a Dutch privateer; reached Paris 1703; published

his adventures under the title *Voyage au Levant* (1704); travelled again in the East, collecting inscriptions and making plans of edifices in Palestine, Syria, Cyprus, Egypt, and the Barbary states; published a second volume of his travels 1714; was sent by the government on new antiquarian expeditions to the East 1714 and 1723; went to Spain 1736; was employed by Philip V. in arranging his cabinet of antiquities, and d. at Madrid May 12, 1737. Besides his principal work he published a *Voyage dans la Grèce, etc.* (1710), a *Voyage dans la Turquie, etc.* (1719), and left a MS. account of his last journey. His works have a considerable value, but are not entirely reliable.

Lucas (Gen. Robert), b. at Shepherdstown, Va., Apr. 1, 1781, a descendant of William Penn; in 1800 went to Ohio; served in the war of 1812–15 as captain, and afterward a lieutenant-colonel U. S. army, and brigadier-general of Ohio militia on the frontier; was president of the convention which nominated Jackson for President in 1832; governor of Ohio 1832–36; governor of Iowa Territory 1838–41. D. at Iowa City, Ia., Feb. 7, 1853.

Lucas (Samuel), b. at Bristol, England, in 1818; graduated at Queen's College, Oxford, in 1842, gaining the Newdegate prize for a poem and the chancellor's prize for an English essay; was called to the bar of the Inner Temple in 1846; became editor of the *Press* in 1853, and literary editor of the *Times* in 1854; republished several volumes of critical essays from the columns of the *Times*—*Eminent Men and Popular Books* (1859), *Biography and Criticism* (1860), and *Mornings of the Recess* (1861–64). He edited *Once a Week* from 1859 to 1865, when he started the *Shilling Magazine*. He edited a volume of *Charters of the Old English Colonies* (1850), and reprinted from the quarterly reviews in 1862 a series of scholarly essays entitled *Secularia, or Surveys on the Main Stream of History*. In politics he acted with the Conservative party, and was the reputed author of several able pamphlets, chiefly on Indian and colonial topics. D. at Eastbourne, Sussex, Nov. 27, 1868.

Luc'ca, formerly a duchy, which at some periods formed an independent republic and at others was given as a kind of pension to royal or semi-royal persons. It is now a province of the kingdom of Italy, comprising an area of 516 square miles, with 280,399 inhabitants, and keeping exactly its old boundaries between Tuscany, Modena, Massa, and the Gulf of Genoa. Its soil is exceedingly fertile, and probably better cultivated than any other part of Italy. The principal products are wine, oil, and silks. Paper, glass, linens, and cottons are extensively manufactured. Cap. Lucca.

Lucca, city of Central Italy, the chief town of the province of Lucca (see Italy), lying on the Serchio, about 15 miles N. E. of Pisa. Lucca is situated in a most fertile plain, surrounded, except on the E., by spurs of the Apennines, and the views from the ramparts of the town are charming. The streets, generally narrow and crooked, are well paved, and the private dwellings are often spacious and elegant. The public buildings, highly interesting in themselves, contain many choice works of art, especially pictures by Fra Bartolomeo and other great masters. The cathedral was erected in the eleventh century, the rich façade having been added in 1204. The town is supplied with water by a superb aqueduct, about 3 miles in length, begun in 1823 and finished in 1834. Lucca, originally Etruscan, passed first to the Ligurians, then to the Romans (about 180 years B. C.); it was governed by a duke under the Lombards, became a free state in 1055, was again under a duke (the renowned Castruccio Castracani) in 1327, and in 1370 once more recovered its liberty. Its territory then embraced a great part of what was the late duchy of Lucca—namely, the very fertile district, abounding in grain, grapes, olives, chestnuts, etc., lying between Modena on the N., Tuscany on the E. and S., and the sea on the W. Though for the most part an independent republic until 1556, the history of Lucca during the Middle Ages is intimately connected with that of Pisa and Florence. In 1805, Napoleon made it a principality for the benefit of his sister Eliza, who had married a Bacciocchi, and in 1815 it fell to Maria Theresa of Spain, whose son ceded it to Tuscany. In 1860 it was annexed to Sardinia, and is now one of the fairest portions of the new kingdom of Italy. Silk was manufactured here as early as the latter part of the eleventh century. In 1300 the republic had her emporiums of silken stuffs at Paris, Lyons, Bruges, etc., and somewhat later 30,000 of the inhabitants of Lucca, already known as the *Industriosa*, were said to live by this manufacture. Even to this day the silk and olive oil of Lucca are especially prized. Beautiful villas abound in the neighborhood, and the celebrated Bagni di Lucca, about 15 miles farther up the valley of the Serchio, in the midst of the most picturesque scenery, though no longer much frequented for medicinal purposes, are still a favorite summer resort for foreign residents in Italy. Pop. in 1874, 68,204.

Lucca (Pauline), b. at Vienna Apr. 25, 1842. The original name was Lucas. Her parents were Jews of humble origin and condition. She owed her musical instruction to the kindness of a professional singer; made her first engagement at the Kärnthner Thor Theater, and assisted in the choir at the Karls Kirche. In 1859 she appeared at the Olmütz theatre as Elvira in the opera of *Ernani*, and at once became famous. At Prague she appeared as Norma, and as Valentine in the *Huguenots*. Meyerbeer finding in Lucca an artist competent to fill the part of heroine in *L'Africaine*, she went to Berlin. In 1863 and 1865 she was in London, a star of the first magnitude. In Nov., 1865, she married Baron von Rohden, who was killed in the Franco-Prussian war of 1870, and thenceforth divided her time between London and Berlin. In Sept., 1872, Lucca appeared in New York at the Academy of Music, and continued in the New World the triumphs she had achieved in the Old. O. B. Frothingham.

Luce, tp. of Spencer co., Ind. Pop. 2381.

Luce (Stephen Bleecker), U. S. N., b. at Albany, N. Y., Mar. 25, 1827; entered the navy as midshipman Oct. 19, 1841; became passed midshipman in 1847, lieutenant in 1855, lieutenant-commander in 1862, commander in 1866, captain in 1872; in action several times in 1864 and 1865, while commanding the iron-clad Nantucket and the steamer Pontiac of the South Atlantic blockading squadron, and noted for "the skill with which he manœuvred his vessel." He is the author of a work on seamanship which has been adopted as a textbook at the Naval Academy. Foxhall A. Parker.

Luce'na, city of Spain, in the province of Cordova, is well built and beautifully situated, has manufactures of soap, earthenware, delft, and glass, and trades much in wine, olive oil, and brandy. It is famous for its beautiful horses. Pop. 20,988.

Luce'ra [*Luceria*], a large town of Southern Italy, in the province of Foggia, overlooking the vast and fertile plain of Apulia, with a semicircle of the Apennines dotted with villages on the N. The old walls have been demolished, the Troian gate of the time of the Swabian Frederick II. alone remaining. The public and private buildings are handsome. The cathedral, erected by Charles II. on the ruins of a splendid Saracen mosque, is a fine Byzantine-Gothic church containing rich and rare marbles. Little remains of the mediæval castle built on the foundations of the old Roman fortress, and communicating with the city by a subterranean passage. Ancient mosaics, coins, and inscriptions of interest are often found here, many of which are in the national museum at Naples. Lucera is an industrious and commercial town, the trade in home products being very active. Considerable provision is made for public instruction, and the town possesses a large library containing some rare books. *Luceria* was a town before the Pelasgic immigration; was at times the ally of Rome in the Samnite war; was publicly commended by the senate for its heroic resistance against Hannibal, and under the Cæsars was made one of the four quæstorial provinces. At that time it contained magnificent temples of Apollo, Ceres, Hercules, etc. It retained its importance under the Lombards, the Greek emperors, and the Normans; and under Frederick II., who brought thither the Saracens from Sicily, its population rose to 77,000. It continued to flourish even after Charles of Anjou drove out the Saracens, but Charles V. destroyed the prosperity of the town. Pop. in 1874, 14,014.

Lu'cern [Fr. *luzerne*], or **Purple Medick,** the *Medicago sativa*, a leguminous forage-plant, a native of Europe, where, as in America and other regions, it is extensively sown. It should be planted in drills, and hoed to keep down the weeds. There is considerable care requisite in the early stages of its growth, but when well established, if sown on good but light soil, it will produce a greater amount of green forage than almost any other plant, and the quality is unsurpassed. It is perennial, and cut several times in the season. In California it is known by the Spanish name of *alfalfa*, and is much prized.

Lucerne', canton of Switzerland, situated nearly in the centre, bordering on the Lake of Lucerne and traversed by the Reuss. It comprises an area of 474 square miles, and is covered with mountains, which, however, rise only to the height of 6900 feet. The soil is generally fertile, and much grain and more fruit are produced, but rearing of cattle is the main industry of the inhabitants, and is carried on to a greater extent in this canton than in any other part of Switzerland. Pop. 132,338, most of whom are of German descent and speak the German language; they are Roman Catholics.

Lucerne [Ger. *Luzern* or *Lucern*], city of Switzerland, capital of the canton of the same name, on the Reuss. In the middle of the city rises an old tower which is believed to have been once a lighthouse, *lucerna*, and given name to the town. Remarkable are its churches and the celebrated monument called the lion of Lucerne, carved in the solid rock after a model of Thorwaldsen, in remembrance of the Swiss guard butchered in Paris Aug. 10, 1792. A very brisk transit trade is carried on here. Pop. 14,524.

Lucerne, Lake of [Ger. *Vierwaldstädter See*, "Lake of the Four Forest Cantons"], a lake of Switzerland, enclosed by the cantons of Uri, Unterwalden, Schwytz, and Lucerne. It is 22 miles long, from ½ to 2 miles broad, and perhaps the most beautiful sheet of fresh water in Europe.

Luci'a, St., one of the British West India Islands, of the windward division of the Caribbees, situated between Martinique and St. Vincent. Area, 270 square miles. Pop. 31,811, of whom 911 are white. The island is of volcanic origin, very mountainous, extremely fertile, and presenting a series of landscapes whose brilliancy of color, originality of outlines, and romantic beauty cannot be surpassed. But it is exceedingly unhealthy, and infested with poisonous serpents and insects; it is a common saying among the natives that those who do not die of the fever die of the serpent. The sugar-cane is extensively cultivated. In 1866 were exported 109,427 cwts. of sugar, 147,200 gallons of molasses, and 5981 gallons of rum. Cap. Castries, a town of 3500 inhabitants.

Lu'cian, Saint, b. at Samosata in Upper Syria about 250; became a Christian teacher at Edessa and Antioch, inculcating a doctrine similar to that afterwards known as Arianism; was three times excommunicated as a heretic; ultimately retracted his heterodox doctrines, and d. a martyr at Nicomedia in the persecution of Maximin, about 310. He was the author of a revision of the Septuagint much valued by the Eastern churches.

Lucia'nus, a Greek humorist (or rather satirist) of first rank, b. at Samosata in Syria in the first half of the second century of our era. The exact dates and circumstances of his life are not known, but from his own writings can be gleaned that he was first apprenticed as a sculptor, but left his profession in order to devote himself to literature, philosophy, and rhetoric; that he travelled through Asia Minor, Greece, Italy, and Gaul, studying and teaching, and afterwards settled in his native city, where he wrote those works which have made him one of the most celebrated authors of the later Greek literature. In his old age he received a lucrative position as procurator of a part of Egypt from the emperor Commodus, which he probably held to his death. His works, although several of them have been lost, are still very numerous, and of a miscellaneous character, poetical, critical, biographical, rhetorical, etc. The most remarkable are his dialogues, treating, generally in a satirical though sometimes in a serious way, subjects of mythology, philosophy, and life; as the most striking examples may be mentioned *Deorum Dialogi*, *Vitarum Auctio*, and *Timon*. Collected editions of his works have been given by Hemsterhuis and Reitz (Amst., 1743, 4 vols. 4to), by W. Dindorf (1840), and by Fr. W. Fritzsche (1865). There is an excellent translation into German by Wieland, and into English by Thomas Francklin (1781).

Luc'ifer [Lat. "light-bearer"], primarily signifies the planet Venus, as the morning star. By an error of the commentators the name has been often applied to Satan. The prophet Isaiah (xiv. 12) addresses the Babylonian king as the morning star, and commiserates him on his fall. Some of the early Christian writers imagined that reference was had to the fall of Satan, whence the error.

Lucifer, bishop of Cagliari, Sardinia, appeared at the Council of Milan in 354 as the legate of Pope Liberius, but opposed the Arians in so violent a manner that the emperor Constantius, much offended, threw him into prison and carried him from place to place for several years. After the death of Constantius he was liberated, and took up his residence in Syria, but here too he deepened, instead of healing, the controversy which took place in the Church of Antioch between the Roman Catholic Church and the Arians. Disapproved by his own former friends, he left Antioch and retired to Sardinia, where he founded the sect of the Luciferians, and d. about 370. He held, in opposition to the Synod of Alexandria (352), that no bishop who had in any way yielded to the Arians could enter the bosom of the Church without forfeiting his ecclesiastical rank, even though he repented and confessed his errors; and that all who admitted the claims of such persons to a full restoration of their privileges became themselves tainted and outcasts. The Luciferians, never numerous, died out soon.

Lucifer Matches. See Matches.

Lucil'ius (Caius), b. at Suessa of the Aurunci in 148 B. C.; served in the Numantine war under Scipio; lived on familiar terms with Africanus and Lælius, and d. at Naples in 103 B. C. He was the founder, if not the inventor, of the *satira*, that peculiarly Roman form of poetry, in which Horace, Persius, and Juvenal excelled, and was highly appreciated in olden times; but of his 30 books of *Satiræ* only 800 small fragments, mostly consisting of single lines, have come down to us. They were collected by the Stephenses in 1564, in *Fragmenta Poetarum Veterum Latinorum*.

Luci'na, the goddess of light, hence by a special metaphorical application the goddess of childbirth, was generally identified either with Juno or Diana. Her festival was celebrated on March 1 by the matrons adorning her temples with flowers and offering up prayers for a numerous and prosperous posterity.

Lucin'idæ [from *Lucina* and *-idæ*], a family of lamellibranchiate Mollusca, represented by *Lucina* as the typical existing genus. Fossils of this family are met with in Palæozoic strata.

Luck, post-tp. of Polk co., Wis. Pop. 68.

Lück'e (Gottfried Christian Friedrich), D. D., b. at Egeln, near Magdeburg, in the Prussian province of Saxony, Aug. 23, 1791; studied theology at Halle and Göttingen, and became professor at Bonn in 1818, and in 1827 at Göttingen, where he d. Feb. 14, 1855. His most prominent works are *Grundriss einer neutestamentlichen Hermeneutik* (1817) and *Commentar über die Schriften des Evangelisten Johannes* (4 vols., 1820–32), which latter work has been translated into English under the title *Commentary on the Epistles of St. John* (Edinburgh, 1837). His fine theological library was purchased for Harvard College.

Luckenwal'de, town of Prussia, in the province of Brandenburg, on the Nuthe, has some manufactures of paper, cloth, and linens. Pop. 11,620.

Luck'ner (Nicolaus), b. in 1722 at Kampen, Bavaria; adopted very early a military career, and served first in the Bavarian army, then in the Prussian army, distinguishing himself very much in the Seven Years' war, especially in the battle of Rossbach, and at last in the French, which he entered in 1763 as a lieutenant-general; in 1791 was made a marshal of France, and in Feb., 1792, was appointed commander, first of the army of Alsace, then of that of the north. In June he took Menin and Courtray, but retired then suddenly to Lille, none understood why. In July he was appointed commander-in-chief of the corps of Biron and La Fayette, and fought successfully against the Austrians at Longwy (Aug. 19), but a few days afterwards he was replaced by Kellermann, for reasons unknown, and called before the bar of the Convention, because he had not punished General Jarry, who, when evacuating Courtray, had set fire to the city. He was ordered not to leave the city, and lived quietly for some time, but in Sept., 1793, the payment of his pension of 36,000 francs was suspended, and when he made inopportune demands for his money, he was dragged before the revolutionary tribunal, convicted, and guillotined, Jan. 3, 1794.

Luck'now [Hind. *Laksmanavate*], city of British India, the capital of the province of Oude, is situated in lat. 26° 53′ N., lon. 80° 58′ E., on the Goomty, an affluent of the Ganges, 610 miles from Calcutta, at an elevation of 360 feet above the sea. At some distance the city presents a magnificent aspect, but it disappoints on a nearer approach. The whole central part of it consists of narrow and crooked streets, sunk several feet into the ground, and lined with huts of mud or bamboo, thatched with straw or palm-leaves. The commercial part of the city along the river, which here is 100 yards wide, navigable for large boats, and crossed by three bridges, is better built; it has brick houses surrounded with gardens. In the east quarters are several mosques and palaces, among which the Imambara is the most remarkable; it is an extensive structure, containing a mosque, the sepulchre of Asof-ud-Dowla, a college, etc.; but several parts of it are of a most beautiful architecture. The buildings erected under the auspices of Claude Martin, a Frenchman who came to India as a poor soldier, but arose to great power in the former kingdom of Oude, such as the Constantia, Martinière, etc., are very gorgeous. From 1775, and to the incorporation of the kingdom of Oude with the British dominions, Lucknow was the capital of the country. The mutiny of 1857 broke out at Lucknow early in May, and from the 1st of July to Sept. 25 the feeble garrison of European forces under Sir Henry Lawrence withstood the large besieging party of mutineers, during which time Sir Henry was killed. On the latter date they were relieved by the forces under Gens. Outram and Havelock, who cut their way in, but were in turn themselves besieged by the still greatly superior force of the natives; and it was not until Nov. 17

that Sir Colin Campbell arrived to their relief with reinforcements. The city, however, could not be held, and was secretly evacuated on the 22d. Three days later Gen. Havelock died of dysentery. It was not until Mar. 19, 1858, and after much hard fighting, that the city, which had been fortified by the insurgents, was repossessed by the British. Pop. 284,799.

Lu'çon, town of France, department of Vendée, is connected by a navigable canal with the Bay of Aiguillon, and has a theological seminary, a communal college, and manufactures of porcelain. Pop. 6603.

Lucre'tia, a daughter of Spurius Lucretius Tricipitinus, and the wife of Lucius Tarquinius Collatinus, was celebrated as much for her virtue as for her beauty. Sextus Tarquinius, a son of Tarquinius Superbus, the king of Rome, and a kinsman of her husband, became passionately enamored of her, and once, having been hospitably received in her house during the absence of Collatinus, he entered her bedchamber in the night with a drawn sword, threatened to lay a slave with his throat cut beside her, and say that he had killed him in order to avenge her husband's honor, and thus he forced her to yield to his wishes. But as soon as he had departed she sent for her father and husband, told them what had happened, made them swear to avenge her, and then stabbed herself. When the infamous deed became known it aroused the indignation of the whole people, and Lucretia's funeral became the occasion of a general revolution, by which the Tarquins were expelled from Rome and the republic was established.

Lucre'tius (Titus Lucretius Carus), b., according to Jerome (in the *Eusebian Chronicle*), in the year 95 B.C., and d., according to Donatus, 55 B. C., or, according to others, 52 B. C. His death seems to have been sudden, and is supposed to have been by suicide, through derangement occasioned by the effects of a philter administered to him. (For the current theory on the motives of this, see Tennyson's poem, *Lucretius*.) Very little is known in regard to his education, career, residence, or fortunes. He was a Roman citizen of noble extraction, and probably studied at Athens, and obtained there his intimate acquaintance with the Greek poets and philosophers. His poem, *De Rerum Naturâ*, which received Cicero's revision, has come down to us entire, although apparently unfinished by its author. It has been called the greatest of didactic poems, on account of the scientific precision and clearness of its statements, and the grandeur and beauty of its poetic dress. The poem contains six books, with upwards of 7000 lines in all, and is dedicated to C. Memmius, prætor 58 B. C., as a personal friend of the author. It is regarded as the completest exposition of the physical system of Epicurus, and embodies the theories of Democritus, together with the hedonic doctrine of Aristippus. Lucretius was the representative apostle of *éclaircissement* in the ancient world, and he has remained the favorite poet of rationalism to this day. His great object was to free mankind from the fear of death, arising, as he thought, from superstition inherent in the popular religion. He fills with poetic fire the dry atomistic physics of his master, and quite naturally there arises an inconsistency between his scientific conviction and the form of his exposition. This has been pointed out by Bayle, Montaigne, and others. He denies all design in nature, and accounts for the universal prevalence of law and arrangement in the universe through the so-called "theory of natural selection": "Atoms wrought on by impulse and gravity, and excited in every mode to cohere, and having been tried in all possible aggregations, motions, and relations, *fell at last into those that could endure*." His sublime poetic feeling, however, led him on from the use of trope and metaphor to the employment of mythological machinery and allegory. He apostrophizes Venus as the personification of nature, but does not forget her mythological relation to the Roman people. He also recognizes the other gods as existing, although different from the popular representation of them. The following brief analysis of his poem will indicate to the reader his chief views: Book I. opens with an invocation of Venus, and is followed by an invective against superstition; the logical consequence of his doctrine is the destruction of mythology and allegory—in fact, of all sensuous embodiment of ideas. The principles of his cosmogony are (*a*) nothing comes from nothing; (*b*) matter is eternal; (*c*) its elements are the atom and the void; he repudiates Heraclitus with his doctrine of fire, and also Empedocles and Anaxagoras. Book II. treats of atoms, their form, number, and development into life and generation, growth and decay. Book III. treats of the soul, making it to be identical with the body, explicitly denying immortality, and offering his consolations thereon. Book IV. treats of sensations and perceptions, explaining their origin in physical emanations from bodies, causing images to arise in the sensory of the one who perceives; sleep, dreams, and love are explained. Book V. gives his views of the origin of the world, and of the rise of the institutions of human civilization: (*a*) marriage and the family, (*b*) society, (*c*) the state, (*d*) religion, (*e*) music and poetry. This book is the most impressive part of his poem, inasmuch as it deals with human relations. Book VI. treats of meteorology, phenomena attributed directly to the agency of the gods being shown to have a natural cause; *e. g.* thunderbolts, instead of being the weapons of Jove, are developed by the friction of clouds, and the thunder is the noise occasioned by their (*i. e.* the clouds') flapping together, etc. A poetical rendering of the story of the plague at Athens, as told by Thucydides, closes his work. Lucretius was greatly admired in the fifteenth and sixteenth centuries, and traces of his influence are found in the works of the best English poets; for example, Spenser in the fourth book of his *Faerie Queene* paraphrases the address to Venus already mentioned. His influence upon Giordano Bruno was extraordinary; also upon Immanuel Kant, notwithstanding the contrast between the ethical theory of Kant and that of Epicurus. The edition of this poem with notes by H. A. J. Munro is to be mentioned. Among English translations may be named those of John Mason Good, and of J. S. Watson, published in "Bohn's Library;" that of Thomas Busby, and that of Charles Frederick Johnson (New York, 1872). William T. Harris.

Lucul'lus, the surname of a plebeian family of the gens Licinia, which first appears in history at the close of the Second Punic war. The most famous member of this family was Lucius Licinius Lucullus, the conqueror of Mithridates. The exact dates of his birth and death are not known, but he was quite a young man when he distinguished himself in the Social war and gained the favor of Sulla, whom he accompanied as quæstor to Greece and Asia on the breaking out of the First Mithridatic war, in 88 B. C. In this war Fimbria, a partisan of Marius, succeeded in expelling Mithridates from Pergamus, and shut him up in Pitane, where he would have been compelled to surrender himself if Lucullus had supported Fimbria with his fleet; but Lucullus preferred the party interests of Sulla to the welfare of his country, refused to co-operate with the Marian general, and Mithridates escaped. Years afterwards his own brilliant career came to an unsatisfactory end, and another man gathered the fruits of his talents and exertions by a similar base party manœuvre. After being consul in 74 B. C., together with Cotta, Lucullus received Cilicia as his province, and Cotta received Bithynia. Mithridates invaded Bithynia, defeated Cotta, and besieged him at Chalcedon; but Lucullus, who in an astonishingly short time had reorganized and thoroughly disciplined his army, hastened to the support of his colleague, threw Mithridates back into Pontus, routed his army at Cabira in 72 B. C., and his fleet at Tenedos in 71 B. C., took Eupatoria, Amisus, and Sinope, compelled the king to seek refuge with his son-in-law, Tigranes, king of Armenia, and brought his country under Roman authority. But the reforms which he now introduced in the administration of Asia came into collision with the interests of the Roman nobility. The revenues of the provinces were generally farmed out, and the measures of Lucullus were intended for the defence of the taxpayers against the extortions of the farmers. But tax-farming and extortion were to many aristocratic families in Rome the only source of their wealth, and at the head of the aristocratic party stood at this time a man, Pompey, who bore a personal hatred to Lucullus, on account of the preference which Sulla always had shown him. The intrigues against Lucullus began. Emissaries from Rome appeared in his army. The bond between the soldiers and their general was loosened. After the great victory in 68 B. C. over Mithridates and Tigranes at the river Arsanias, the legions declined to follow Lucullus farther, and he had to lead them into winter quarters in Mesopotamia. Next year Mithridates reopened the war with some successes over Triarius, the Roman legate in Pontus, but when Lucullus wished to lead his army against him, the soldiers, seduced by Glabrio, deserted him, and Pompey earned the glory of having brought the Mithridatic wars to a final close. Disgusted, Lucullus returned to Rome, retired into private life, and spent his time in luxurious indolence. He was enormously rich, and the magnificence of his dinners became proverbial. D. about 57 B. C.

Clemens Petersen.

Lu'den (Heinrich), b. at Loxstedt, near Bremen, Apr. 10, 1780; studied theology, philosophy, and history at Göttingen, and was appointed professor of history in 1806 at Jena, where he d. May 23, 1847. His *Ansichten des Rheinbunds* (1808) attracted much attention, and exercised some influence on public opinion in Germany concerning Napoleon's policy. His later and larger works, *Allgemeine Geschichte des Alterthums* (1814), *Allgemeine Geschichte des Mittelalters* (1821–22), and *Geschichte des*

deutschen Volks (12 vols., 1825–37, reaching only to 1237), have also not been without influence, though the views which they propound have led to much controversy.

Lü'denscheid, town of Prussia, in the province of Westphalia, is noted for its manufactures of jewelry and galvano-plastic goods, and has rich calamine-mines in the vicinity. Pop. 6216.

Lü'ders (Alexander Nicolajevich), Count, b. in 1790 of a German family; settled in Russia; entered the Russian army in 1807; was made a brigadier-general in 1826; distinguished himself in 1831 at the storming of Warsaw; fought in the Caucasus from 1843 to 1845; put down the revolution in Roumania in 1848; fought in Hungary in 1849; was commander-in-chief in the Crimea when Sevastopol was taken, and was appointed lieutenant-general of Poland in 1861, but was recalled in 1862, on account of his too severe disposition. Before he left Poland an attempt was made to assassinate him, but he only received a severe wound. He retired from service, was made a count, and d. at St. Petersburg in 1874.

Lu'dewig (Hermann Ernst), b. at Dresden, Saxony, Oct. 14, 1809; received a careful education; came to the U. S. in 1842; practised law in New York; printed for private distribution *The Literature of American Local History* (1846), and a supplement relating entirely to the State of New York (1848); wrote several erudite articles on American history, philology, libraries, and bibliography for French and German magazines, and prepared a valuable work, *Bibliotheca Glottica, or Literature of American Aboriginal Languages* (1856), which appeared in London a few days after his death at Brooklyn, N. Y., Dec. 12, 1856.

Lu'dington, post-v. of Mason co., Mich., on Lake Michigan, at the outlet of Père Marquette Lake and River, is the western terminus of the Flint and Père Marquette R. R., 84 miles from Milwaukee, with which it is connected by two lines of steamers; has a fine harbor on the lake, 2 banks, 2 newspapers, 8 hotels, a number of stores, 7 saw-mills, a shingle and a planing mill, a foundry and machine-shop, and carriage and other shops. Pop. about 4000.
Clayton & Hopkins, Eds. "Mason Co. Record."

Lud'low, town of England, in the county of Salop, at the confluence of the Corve and Teme. Its castle, formerly an important stronghold against the Welsh, was the residence of Henry VII. (1485–1509), and of Mary Tudor before her accession to the throne, and is still more memorable as the scene of the representation of Milton's *Comus*. It was held for Charles I. (1646), but surrendered to the Parliamentary forces, soon after fell into decay, and is now a ruin. Pop. 6033.

Ludlow, post-v. and tp. of Champaign co., Ill., on the Illinois Central R.R. The v. is also called Pera. Pop. 920.

Ludlow, post-tp. of Allamakee co., Ia. Pop. 1038.

Ludlow, tp. of Aroostook co., Me., 7 miles N. W. of Houlton. Pop. 371.

Ludlow, post-tp. of Hampden co., Mass., on the Chicopee River and the Springfield Athol and North-eastern R. R., 7 miles E. by N. of Springfield, has 3 churches, manufactures of jute, wadding, bags, etc., and a valuable red sandstone quarry. Pop. 1136.

Ludlow, tp. of Washington co., O. Pop. 1082.

Ludlow, post-v. and tp. of Windsor co., Vt., in the Black River Valley, on the Rutland division of the Central Vermont R. R., 25 miles E. of Rutland and 70 miles S. of Montpelier, has 4 churches, an academy, 1 newspaper, woollen mills, a tannery, toy, carriage, harness, and scythe-stone manufactories, 2 machine-shops, a foundry, and 19 stores. Pop. 1827. R. S. Warner, Ed. "Gazette."

Ludlow (Gen. Edmund), b. at Maiden-Bradley, Wiltshire, England, in 1620; educated at Oxford; entered the Parliamentary army as a volunteer on the outbreak of the civil war; became a colonel of cavalry; was one of the members of the high court which condemned Charles I.; protested against Cromwell's assumption of the protectorate, and agitated against him in favor of a republic; retired to Switzerland at the approach of the Restoration, and spent the remainder of his life there, only returning to England for a brief period in 1688; resided at Vevay, where he wrote his valuable *Memoirs* (3 vols., 1698–99), and d. in 1693.

Ludlow (Fitzhugh), b. at Poughkeepsie, N. Y., in 1837; commenced writing for the New York press in 1855; wrote in 1857 *The Hasheesh Eater*, describing the pleasures and pains attending the use of that drug, to which he had been addicted; published in *Harper's Magazine* a series of short stories which enjoyed popularity, and were reprinted under the title of *Little Brother and Other Tales;* subsequently wrote *The Heart of the Continent*, a record of Western travels, and *The Opium Habit*, giving his personal experience with opium. D. in Switzerland Sept. 13, 1870.

Ludlow (Roger), b. in the W. of England, of good family; settled at Dorchester, Mass., 1630; was assistant governor of the colony 1630–34; went to Connecticut 1635, where he was for nineteen years a magistrate or deputy governor, and was appointed one of the commissioners of the United Colonies; settled at Fairfield 1639. Ludlow was a brother-in-law of Gov. John Endicott, author of the Connecticut code of laws (first printed 1672). He removed to Virginia with his family 1654. The place and time of his death are unknown.

Lud'lowville, post-v. of Lansing tp., Tompkins co., N. Y., on Salmon Creek, 9 miles N. of Ithaca, has 3 churches and several manufactories. Pop. 376.

Ludol'phus (Job), b. Jan. 15, 1624, at Erfurt, in the Prussian province of Saxony; studied languages in his native place and at Leyden; travelled in 1647 in France and England; accompanied Queen Christina of Sweden in 1649 to Rome, where he made the acquaintance of some Abyssinians, by whose aid he studied the Ethiopic language; visited Sweden and Denmark; settled in 1652 in Gotha, and d. Apr. 8, 1704, at Frankfort. He wrote a *Historia Æthiopica*, gave grammars and dictionaries of the Ethiopian and Amharic languages, and was the founder of the study of Ethiopic in Europe.

Lud'wick, a b. of Westmoreland co., Pa. Pop. 533.

Lud'wig II., king of Bavaria, b. Aug. 25, 1845, succeeded his father, King Maximilian II., Mar. 10, 1864. He is a man of genius, of romantic nature, an artist, with very fantastic ideas of his personal dignity as a king, and rather capricious opinions concerning political questions. In the affairs of Germany, however, he has played an important and noble part. At the outbreak of the Franco-German war in 1870 he sided immediately with Prussia, and during the negotiations concerning the new organization of Germany he spoke with enthusiasm for the establishment of the German imperial throne. Also in the internal Bavarian politics he has shown himself master of the situation. He looks through the plans of the different parties, and suffers himself to be governed by none of them. But he dislikes to devote himself steadily and with consistency to the daily business of governing. He interferes from momentary impulses. He shows himself very seldom to his people, and public festivities are disagreeable to him. He lives mostly in solitude in his magnificent palaces, of which he seems to prefer Hohenschwangau, situated amidst beautiful mountain-scenery; and here he busies himself with art, especially with music. On account of this passion for music the composer Richard Wagner gained a considerable influence over him during the first years of his reign, but the result was that there broke out among the people frequent riots against Wagner, and in 1866 the king was compelled to send the composer from the court. Another peculiarity is his enthusiasm for Louis XIV. After the war with France he visited Paris and Versailles in order to study their works of art, and especially the remembrances they contain of Louis XIV. He also sometimes arranges great theatrical performances in the most expensive style, at which he himself is the sole spectator. He is unmarried. August Niemann.

Ludwig (Karl Friedrich Wilhelm), b. at Witzenhausen, in Hesse, Dec. 23, 1816; studied medicine at Marburg and Erlangen, and was appointed professor of comparative anatomy at Marburg in 1846, and of physiology at Zurich in 1849, at Vienna in 1855, at Leipsic in 1865. His *Lehrbuch der Physiologie des Menschen* (2 vols., 1852–56) and his numerous minor essays in scientific periodicals, among which is *Bemerkungen über den Stoss und den ersten Ton des Herzens* (1869), contain many original and comprehensive physiological researches.

Ludwig (Otto), b. at Eisfeld, in the principality of Saxe-Meiningen, Germany, Feb. 11, 1813; studied music at Leipsic under Mendelssohn-Bartholdy, but was compelled by ill-health to give up his career; devoted himself to literature, and settled in 1855 at Dresden, where he d. Feb. 25, 1865. His tragedies, *Der Erbförster* (1853), *Die Makkabæer* (1854), and *Agnes Bernauer* (1857), were well received; also his tales, *Zwischen Himmel und Erde*, etc., but he belongs to that class of authors, very common in modern German literature, which mistakes training for talent, philosophical speculations for poetical intuitions, and imagination for inspiration. Clemens Petersen.

Lud'wigsburg, town of Würtemberg, 8 miles from Stuttgart, with an immense palace, beautiful parks and promenades, a military academy, and barracks. Pop. 11,201.

Lud'wigshafen, town of Germany, in Rhenish Bavaria, on the left bank of the Rhine, opposite Mannheim, was founded in 1843 by Louis I. of Bavaria; has direct railway communication with Paris, Mentz, and Frankfort. Pop. 7850.

Lud'wigslust, town of Germany, in the grand duchy of Mecklenberg-Schwerin, has an elegant palace with a beautiful park, some breweries, distilleries, and manufactures of tobacco and straw plaitings. Pop. 5271.

Luga'no, town of Switzerland, in the canton of Ticino, on the northern shore of the Lake of Lugano, whose southern part stretches into Italy, is one of the three alternating capitals of the canton, and carries on a considerable transit-trade between Switzerland and Italy. Pop. 5397.

Lugano, Lake of, situated on the frontier between Switzerland and Italy, and between Lago Maggiore and Lago di Como. It is of a very irregular shape, 20 miles long, but nowhere more than 1½ miles broad. The surrounding scenery is grand and wild, but of a somewhat gloomy character. Through the river Tresa it sends its waters into Lago Maggiore, which lies 200 feet lower.

Lugan'skoe, or **Looganskoe,** town of Russia, in the government of Yekaterinoslav, with large coal and iron mines in its vicinity. Pop. 8501.

Lugard (Sir Edward), b. 1810; educated at Sandhurst (England) Military College; appointed an ensign in the army 1828; served for many years with distinction in India—in the Afghan war of 1842, in the campaign on the Sutlej as assistant adjutant-general, as adjutant-general of the queen's forces in India from the battle of Sobroan to the end of the campaign, and throughout the Punjaub campaign 1848–49; as chief of staff of the Persian expedition in 1857 (K. C. B.), and for services at the capture of Lucknow, where he commanded a division, was promoted to be major-general; became lieutenant-general 1865, general 1872; colonel 31st Foot since 1862; permanent under-secretary of war 1861–71; president of the army purchase commission since 1871; G. C. B. 1867, and since 1871 member of the privy council.

Lug'ger, a lug-rigged sailing vessel. The lug sail is square or quadrilateral, and attached above to a yard so slung that two-thirds of its length is on the leeward side of the mast. A lugger can sail well close to the wind, and is easily handled, but the rig is not adapted to large vessels.

Lu'go, town of Italy, in the province of Ravenna, about 14 miles W. of the city of Ravenna. It lies in a very fertile plain between the Senio and the Santerno, and good roads connect it with the chief towns of the Romagna. It is tolerably well built, and the great square of the Padiglione presents a very lively appearance during the annual September fair, when dealers from every part of the Romagna collect here to trade in grain, wine, cattle, hemp, silk, etc. In 1867 a mutual aid society was organized here, also a savings bank, and the town library, partly composed of books from the suppressed convents, now amounts to 14,000 volumes. Public schools are multiplying, and it is to be hoped that this town and neighborhood will soon have a better reputation as to security of life and property than it has possessed. Its mediæval vicissitudes were numerous, and in 1796 it was sacked by the French. Pop. in 1874, 24,895.

Lugo, province of Spain, bordering N. on the Atlantic, comprises an area of 3484 square miles, with 475,836 inhabitants. The northern part is mountainous, rich in iron and lead, and covered with forests; the southern part is a large and fertile plain, producing wheat, wine, fruits, etc.

Lugo, city of Spain, the capital of the province of Lugo, on the Miño, is an old but regularly and substantially built town, with a fine cathedral of the twelfth century, and celebrated sulphur springs. Pop. 8054.

Lugol's Solution. See Iodine.

Lu'gos, town of Hungary, on the Temes, has a well-frequented weekly fair and considerable trade in wine. Pop. about 11,000, of whom one-fifth are Germans.

Lui'ni, or **Lovini** (Bernardino), b. at Luino on Lago Maggiore, some say in 1460, others say later. Nearly everything concerning this artist has been in dispute—the time of his birth, the time of his death, his relation to Leonardo da Vinci, the genuineness of his works. Of late it has been customary to ascribe more merit to him than formerly. Out of Italy his pictures had been attributed to Leonardo; but the *Christ disputing with the Doctors* in the British National Gallery, formerly assigned to Leonardo, is now given to Luini. The same is the case with the *Herodias* in Florence, the *Infant Baptist* in the Ambrosian Gallery at Milan, a *Madonna* in the Esterhazy Gallery in Vienna, and *Vanity* and *Modesty* in the National Gallery, London. His finest work, both in oil and fresco, is in Milan, Saronno, Como, and Lugano. O. B. Frothingham.

Luitprand. See Lombards.

Lu'itprand, b. in 922 at Pavia; went in 949 as ambassador from King Berengarius to Constantinople; moved in 955 to Germany, where he lived in Frankfort; accompanied Otho I. in 961 to Italy; went in 968 as his ambassador to Constantinople, and died in 970. His *Antapodosis*, in six books, comprising the period from 886 to 948, *De Rebus gestis Ottonis Magni Imperatoris*, and *De Legatione Constantinopolitana*, edited by Pertz in his *Monumenta Germaniæ Historica*, iii. (1839), are of importance for the study of the history of Germany and Italy.

Luke, Saint. *Life.*—Only one author of Gentile descent has had the honor of taking part in the composition of Holy Scripture—namely, Luke. In the Epistle to the Colossians (iv. 10–14) Paul distinguishes him, together with Epaphras and Demas, from all his assistants of Jewish descent, Aristarchus, Marcus, and Justus. An old tradition, stated by Eusebius and Jerome, maintains that he was from Antioch, the capital of Syria, where for the first time Christianity took root in a heathen country, and which became the cradle of the mission to the Gentiles. It has been assumed, though unjustly, that this tradition was only a misunderstanding of Acts xiii. 1, in which a certain *Lucius*, with whom Luke might have been confounded, is mentioned as one of the prophets and teachers of Antioch. But Eusebius and Jerome must have written rather carelessly in order to confound the name of Luke (Lucas, abridged from *Lucanus*) with that of Lucius (derived from *lux*), and still more so in order to conclude from a passage in which Lucius is mentioned as descending from *Cyrene*, that Luke was from Antioch. The narrative of the foundation of the church of Antioch (Acts xi. 19–26) is written with so much vividness and freshness that we seem to recognize the emotion of a personal remembrance; and it is quite remarkable that in a work of the second century, which probably still contains some authentic traditions, "The most excellent Theophilus," to whom the two writings of Luke are dedicated, is mentioned as a man living in Antioch: "Thus Theophilus, the most powerful man of the city, consecrated to the worship and under the name of a church the palace which he inhabited." Paul calls Luke (Col. iv. 14) "the beloved physician." This expression is not without importance. It proves that Luke belonged to the lettered class of the people, and was possessed of a certain amount of scientific knowledge. It is, indeed, certain that at this epoch there existed in the empire a medical superintendence quite severe. A supreme authority, *collegium archiatrorum*, awarded the diploma of medicine, and examined in every city those who exercised the medical art. The cures were rigorously scrutinized, and grave mistakes were punished by the loss of the right of practising. Of all Paul's companions, Luke was probably the only one who was possessed of a scientific and literary education.

At what period ought we to place his conversion? Some old writers maintain that he had been a disciple of Jesus, and was one of the seventy disciples whom the Lord sent to the places of Galilee in order to prepare for his own visit (Luke x. 1 *seq.*). But the introduction to the Gospel is not in favor of this supposition. In i. 2 Luke ranks himself among those who owe their knowledge of the gospel history to the teachings of eye-witnesses; which proves that he was not an eye-witness himself. But it is not impossible that, in accordance with an old supposition, he was one of the two disciples whom Jesus accompanied to Emmaus on the day of his resurrection. The one of them is mentioned by name, Cleopas. The anonymity of the other may indicate that he is the author himself; and this circumstance would correspond well with the dramatic character of the whole narrative, and especially with the following words, which seem to refer to a personal experience: "Did not our heart burn within us, while he talked with us by the way, and while he opened to us the Scriptures?" (Luke xxiv. 32). If, as the whole tradition testifies, Luke is the author of the Acts, and if he always speaks of himself in this book when he says "we," we meet him for the first time at the moment when Paul, having arrived at Troas on his second missionary voyage, prepares himself to cross over to Europe and undertake a missionary travel through Greece, beginning with Macedonia (Acts xvi. 10): "And after he had seen the vision, immediately we endeavored to go into Macedonia." It has been found improbable that Luke thus should have placed himself as immediately co-operating with the mission from the very beginning, and the supposition has been made that the author of the Acts here inserts a fragment of a journal of one of the companions of Paul; as, for instance, Timotheus or Silas. But is it probable that the author of the Acts, who shows himself an able writer in both his books, should have committed such an awkwardness as to insert in his own work a passage from a foreign work in this way, though it would be so very easy for him to change the "we" to "they"? No; he who speaks thus in this passage is evidently the same as he who calls himself "I" in the first words of the book: "The former treatise have

I made, O Theophilus" . . . . (Acts i. 1). And the objection raised falls by itself if we admit that Luke was originally from Antioch, a member of the church of that city and long acquainted with St. Paul. It seems as if, after the foundation of the church in Philippi, Luke remained in that city, probably in order to take care of the young church, while Paul, Silas, and Timotheus continued their journey; for the "we" disappears in the narrative of the mission from this moment, and until the epoch when towards the end of his third journey St. Paul passed once more through Philippi on his way to Jerusalem. At this point it reappears. "These going before," it reads in the Acts xx. 5, with reference to the deputies of the churches of Greece and Asia who accompanied Paul to Jerusalem, "tarried for *us* at Troas." The "we" then continues until the arrival at Jerusalem; and as it recommences at the moment when Paul, after two years' imprisonment at Cæsarea, departs for Rome, it is natural to conclude that Luke remained with him during the two years of his captivity. And it was during this time that he gathered on the very theatre of the evangelical history the information and the materials of which he composed his two works. He alludes himself to this information in his Gospel (i. 1–4). After these two years he went with Paul to Rome, and participated in the shipwreck, which he has described in a most graphic manner in Acts xxvii.; he arrived at Rome with the apostle in the spring of 62. In the Epistles to the Colossians and to Philemon, which probably are the first letters written by Paul from Rome, he addresses salutations which prove that Luke lived with him during the first period of that captivity, with which the book of the Acts ends. The Epistle to the Philippians, written towards the close of these two years, contains no salutation from Luke to this church, with which he was so closely connected; from which circumstance we must infer that he had left Paul and returned, for the time being, to the Orient. We find him once more in company with Paul and as a prisoner in the Second Epistle to Timothy (iv. 11), where the apostle says of him, "Only Luke is with me." The second captivity is probably here referred to, which Paul suffered in the year 66 or 67, having been liberated in the beginning of 64, and which terminated with his martyrdom. According to a tradition stated by Jerome, Luke preached the gospel in Achaia and Bœotia. Gregory Nazianzen speaks first of his martyrdom, and Nicephorus Callistus in the fourteenth century tells that he was hung on an olive tree in Greece at the age of eighty years. From the testimony of Jerome it seems certain that his ashes, as well as those of Andrew, were brought from Achaia to Constantinople by orders of Constantius in 356. Thus we can consider Luke as an educated Greek, and as one of St. Paul's most faithful assistants among the Gentiles of Greek nationality.

Works.—Two books are ascribed to Luke by Christian antiquity—the third of the canonical Gospels and the Acts of the Apostles. As these writings have never borne the name of any other author than that indicated by the title given them by the primitive Church, there is no reason for doubting the tradition. As Luke is one of the most conspicuous and most frequently mentioned of Paul's companions, one might perhaps think that on this point the Church has proceeded by way of supposition. This is not so, however; even the obscurity of the name of Luke in the writings of the New Testament speaks in favor of the truth of the tradition. It is equally incontestable that the author of the third Gospel and the Acts must be sought among the assistants of St. Paul. To prove this the striking analogy suffices between the form of the institution of the Lord's Supper in Luke and in Paul (1 Cor. xi.). There is furthermore the closest relation between the enumeration of the appearances of Jesus after the resurrection in Luke (xxiv.) and in Paul (1 Cor. xv.). And the whole history of Jesus by Luke, what is it but a demonstration of the reality of those two great principles which form the basis for all St. Paul's preaching—namely, the universality of the salvation and its entire gratuity? That is the reason why Luke traces the genealogy of Jesus to Adam, the father of mankind, and not only to Abraham, the father of the Jews, as Matthew does; why he loves to tell the parables of grace (ch. xv., the lost sheep; the piece of silver; the prodigal son) and other narratives of a similar bearing, as, for instance, the forgiven sinner (ch. vii.) and the Pharisee and the publican (ch. xviii.); why, furthermore, he has completed the narrative of the Gospel by a picture of the foundation of the Church by the apostles, especially by St. Paul, whose grand missionary labor among the Gentiles he follows until his arrival at Rome, the centre of the empire. From the fact that the writings of Luke enforce the ideas of Paul it has been inferred that in several points he has perverted history in favor of his particular views. But that is to lower the intention of the sacred writer in a strange manner. In his two writings he defends a cause much higher than that of St. Paul: he pleads the cause of God himself. In chs. ix. and xi. of the Epistle to the Romans we are told that the Jews even claimed that God had not the right to withdraw the salvation from them and give it to the Gentiles, since he had bound himself to them by inviolable promises. The aim of the whole work of Luke is to demonstrate that God has accomplished faithfully his promises, by the apostles preaching first to the Jews and then to the Gentiles, and that, consequently, it is not God who has broken his engagements with his people, but the people who have rejected their God.

Among all the assistants of St. Paul, Luke the physician was probably the only one who was able to write such a work. The introduction, contained in the four first verses of ch. i., presents a striking analogy to the introductions of the great Greek historians; as, for instance, Herodotus and Thucydides. The style of these verses is classical. But from verse 5 Arameanisms abound, which show from this point that the author is reproducing certain documents in that language, and reproducing them with scrupulous exactness. The personal style of the author does not reappear until the second part of the book of the Acts, where it comes in quite naturally, as at this point he begins to narrate what he has seen and heard himself. All these traits correspond perfectly with the character designated by tradition—a friend of Paul, a Greek, and a Greek of classical education. The period at which Luke composed this work cannot be far from the time when St. Paul preached, as it was intended as an auxiliary to the preaching. This circumstance also proves the purity of the traditions which are given here, and which in no point resemble those legends which we meet even in the Fathers from the beginning of the second century; as, for instance, in Papias. Most admirable is the manner in which Luke knows how to place the words of Jesus so as to make them strike—a quality which proves the exactness of the information he had gathered concerning the circumstances under which the words were spoken. Clemens of Alexandria places the composition of the Gospel of Luke even before that of the Gospel of Mark, according to a tradition due to the ancient presbyters. With respect to the locality in which the composition took place, we have only a tradition stated by Jerome, according to which it was in the countries of Achaia and Bœotia. But this tradition has nothing certain; Macedonia or Antioch would be as probable a supposition, as Greek literature and language reigned in both countries. The question has often been raised why Luke ends the book of the Acts with the two years' captivity of St. Paul in Rome. Why did he not relate the martyrdom of the apostle if thus his captivity terminated, or if not, then his liberation? To these questions it has been answered that he may have treated this subject in a third book, which has not come down to us, or that he died himself before finishing his work. More generally it has been supposed that the reason why he did not continue his narrative further was that he finished his book just at the same time as the imprisonment of the apostle terminated. This supposition is the least improbable. It is nevertheless not certain. The idea of the book of the Acts is by no means to give the biography of Peter or Paul, or any other man. Like the whole Scripture, the book refers to the great subject of the *reign of God*. It contains the history of the apostolical foundations—the foundation of the Church among the Jews by St. Peter (i.–v.); the providential preparation for the preaching among the Gentiles (vi.–xii.); the foundation of the Church among the Gentiles by St. Paul (xiii.–xxviii.); and these foundations were no doubt accomplished at the end of St. Paul's first captivity, with which the Acts end. Thus, the plan of the two works is—from Nazareth to Capernaum; from Capernaum to Jerusalem; from Jerusalem to Antioch; and from Antioch to Rome. And as a true historian Luke traces the progress of the faith in Christ from the individual to the Church, and from the Church to the centre of the world's scene.

FREDERIC GODET.

Lu'kin, tp. of Lawrence co., Ill. Pop. 1755.

Lull (EDWARD P.), U. S. N., b. in Vermont Feb. 23, 1836; graduated at the U. S. Naval Academy in 1855; became a master in 1858, a lieutenant in 1860, a lieutenant-commander in 1862, a commander in 1870; served on board the Brooklyn at the battle of Mobile Bay, Aug. 5, 1864, and is thus honorably mentioned in the official report of his commanding officer, Capt. James Alden: "To my executive officer, Lieut.-Com. E. P. Lull, my thanks are especially due, not only for his cool, steady bearing in the fight, but also for the efficient training of the crew." In 1872–74 he commanded the expedition which surveyed a route for a ship-canal across the Isthmus of Nicaragua.

FOXHALL A. PARKER.

Lull (RAMON), Latinized RAIMUNDUS LULLIUS, b. at Palma in Majorca, or, as Amat thinks, more probably at Barcelona, in 1235; d. at Bougiah in Algeria in 1315. Lull's early education was neglected, and he led a dissolute life till the age of thirty, when he suddenly renounced the world, bestowed his goods upon the poor, and thenceforth devoted himself to philosophy and religion. Most authorities say that he became a minor brother of the Franciscan order, but the grand inquisitor Eymeric, who, as himself a Catalan born soon after the death of Lull, was probably well informed on this point, expressly says that he was a *mercator laicus*. After many distant pilgrimages, Lull established himself in a hermitage on Mount Roda, near Barcelona, and spent nine years in repairing the deficiencies of his education by diligent study of the Latin and Arabic languages and literature, and apparently of Hebrew and Chaldee also, as well as of theology and philosophy. In this retreat he formed his system of religious and philosophical belief, and produced his first literary compositions, though no doubt most of his numerous writings in Latin, Arabic, and Catalan were composed at a later period. Many of his Latin works were collected and printed at Mentz, in 10 vols. fol., in 1721–42, but whether the seventh and eighth volumes were ever actually published is disputed. His works in Catalan are very voluminous, but we do not know that any of them have ever been printed, except a few minor poetical compositions and a curious apologue, *Reynard the Fox*, designed for the political instruction of rulers, but wholly different from the Dutch and French fables with the same title. This is extracted from an immense volume, containing 365 fables, and entitled *Libre de Maravelles*, of which the Royal Library at Munich possesses two copies. The tale of *Reynard* covers about forty quarto pages, and was published by Konrad Hofmann at Munich in 1872. The religious romance or allegory, *Evast and Blanquerna*, printed at Barcelona in the fifteenth century, was written in Latin, and the Catalan translation is not by Lull himself. Critics divide Lull's Latin works into four parts: those composing or expounding his philosophical system, *Ars Magna* or *Lulliana*, and which form an encyclopædia of the knowledge of the age; those relating to religion; polemical treatises against Averrhoes and his followers; and writings of a more or less autobiographical character. The great influence of Lull on his own age was perhaps due rather to his fervent zeal and indefatigable activity in the propagation of his opinions, by personal instruction and public lectures at Paris and other seats of mediæval learning, than to the circulation of his writings. He seems to have passed the latter half of his life as an itinerant apostle of philosophical and religious truth. He even made several voyages to Moorish Africa, where he convoked the leading Moslem doctors, and exposed in public discourses the fallacies of Averrhoes and the hollowness of the pretensions of Mohammed. In the last of these missions, while he was on his return from a pilgrimage to Jerusalem and Egypt, at the age of eighty, he was put to death at Bougiah by a mob as an enemy to the religion of the Prophet, though on former occasions he had been treated with respect by the Mohammedan priesthood. Lull's cardinal principle, the unity of all knowledge or the supremacy of reason, permeates all his writings, and he aimed to show not only that Christian doctrine was not irreconcilable with philosophy, but might be demonstrated by it. Hence, he was a true reformer, and it is to be regretted that his works have fallen into unmerited obscurity. He was also enlightened in his views of education, and labored zealously for the introduction of the study of Hebrew, Chaldee, and Arabic into the university courses of instruction.

It is not strange that such disorganizing doctrines as these should have excited the hostility of the ferocious bigot, Eymeric. The inquisitor's opinion of the literary character of Lull, whom he characterizes as *phantasticus, imperitus, qui quamplures libros ediderat in vulgari Catalanico quia totaliter grammaticam ignorabat*, and which has not been cited by any of Lull's biographers whom the present writer has been able to consult, is one of the most remarkable passages in that astounding volume, the *Directorium Inquisitorum*. Eymeric boasts that he examined the works of Lull with great labor, and presented to Pope Gregory twenty volumes in which he pointed out 500 errors. These, upon the report of more than twenty doctors in theology, were condemned by the pope as heretical. Eymeric specifies 100 of the condemned propositions *in extenso*. The character of Lull's philosophico-religious heresies may be inferred from the second in Eymeric's list: *In divinis essentia non est otiosa et natura naturificat, bonitas bonificat, et infinitas infinitificat, et æternitas æternificat*. The 77th heresy, found in Lull's essay on the education of children, might very naturally be unacceptable to an inquisitor: *Quod sine charitate non possumus habere aliquam virtutem, sicut sine oculis non possumus videre;* but Lull's most pestilent theological errors are those numbered 96, 97, and 98, teaching that the articles of faith, the sacraments of the Church, and the power (*potestas*) of the pope are all matters of proof *per rationes demonstrativas;* that though the uncultivated and ignorant must accept religious doctrines *per fidem*, the *homo subtilis* is to be convinced of them rather by reason than by faith; and finally that faith may err, while reason is infallible. *Fides*, as used by Lull, often means submission to human authority, or, in other words, the authority of the Church. Of course, if the dogmas of the Church are dependent upon logical proof, they may be susceptible of logical disproof, and the infallibility of reason being proclaimed, the spiritual authority of the papacy falls to the ground. Most of the summaries of the papal dogmatic definitions—as, for example, Denzinger's—omit all Lull's heresies except the three just cited, and the others are not readily found except in Eymeric. (See *Biographie Générale* (Hoefer), article LULLE or LULL; Helfferich *Raymond Lull und die Anfänge der Catalonischen Literatur* (Berlin, 1858); Nicolai Eymerici, *Directorium Inquisitorum* (Romæ, 1578, pp. 190 *seq.*).) The manuscript autobiography of Lull said to exist in the library of the Sapienza at Rome is not now to be found in that collection.—RAMON LULL, the author of a number of works on alchemy, often confounded with the theologian, is a different person, of whose biography little is known. GEORGE P. MARSH.

Lully' (JEAN BAPTISTE), b. at Florence in 1633; went early to Paris as scullion in the household of the princess of Montpensier; made himself noticed by his skill on the violin; received some regular instruction by the aid of the princess, and obtained a place in the orchestra of Louis XIV., the famous *bande de vingt-quatre*. Having gained the favor of the king by some airs he composed, a new orchestra, *les petits violons*, was organized and placed under his direction, and he managed it so well that it soon entirely eclipsed its elder rival. He was made director of music at the court, composed all the ballets, a sort of entertainment for which Molière often wrote the text, and in which the king himself often performed, and gained such an ascendency over the taste of the king that no other music was heard at the court than his. In 1672 he obtained the privilege of opening an opera theatre at Paris, Académic Royale de Musique, and by the success of this enterprise he became the founder of the French opera. He wrote nineteen large operas, to which Quinault generally furnished the text, and for nearly a century—that is, up to the time of Gluck—he was considered the greatest opera composer. At present, however, his music is never heard—not because it lacks genuine musical inspiration, but because the technics of the art have developed so much since the days of Lully that his manner of instrumentation, harmonizing, etc. would now appear awkward. D. at Paris Mar. 22, 1687, leaving an immense fortune.

Lumba'go [Lat.], or **Crick in the Back**, is a subacute rheumatism, often very severe, and seated in the lumbar region. Strong liniments, rubbing with the hand, the application of the electrical brush, and cupping are all useful. A mild diaphoretic often affords relief.

Lum'ber, tp. of Cameron co., Pa. Pop. 674.

Lumber Bridge, tp. of Robeson co., N. C. Pop. 1075.

Lumber City, post-b. of Penn tp., Clearfield co., Pa., on the Susquehanna River. Pop. 230.

Lum'berland, post-tp. of Sullivan co., N. Y., on the Delaware River and the Delaware and Hudson Canal, contains many small lakes, and great quantities of blue flagstone are here quarried. Pop. 1065.

Lum'berton, post-v. and tp. of Burlington co., N. J., 3 miles S. of Mount Holly, is on the S. branch of Rancocus Creek, at the head of navigation, and has considerable trade and some manufactures. Pop. 1718.

Lum'berton, post-v. and tp., cap. of Robeson co., N. C., 65 miles W. of Wilmington, 80 miles S. of Fayetteville, and 150 miles E. of Charlotte, on Lumber River and on the Carolina Central R. R., has 1 newspaper, several mills and shops, 4 churches, 3 hotels, and several stores. Principal business, farming, turpentine, tar, and ton timber. Pop. of v. 615; of tp. 1339.

W. WALLACE MCDIARMID, ED. "ROBESONIAN."

Lum'ber Trade, the commerce in timber, especially in that which is sawed for market, including in its widest sense laths, shingles, shooks, pickets, clapboards, railroad ties, ship-timber, deals, planks, scantling, etc. It is one of the most important industries of the U. S. Among foreign countries, Norway, Russia, and North Germany are extensively engaged in this business, Riga, Memel, Dantzic, and the fiords of Norway being the principal lumber-ports. France grows and cuts considerable fine timber. The tropical countries supply great quantities of dyewoods, veneer-

stuff, etc. Such timber as mahogany, locust, lance-wood, green-heart, snake-wood, and the like comes from the West Indies. India exports much teak and other ship-timber. Australia, New Zealand, etc. furnish spars and other timber to British commerce. But the Ottawa region, New Brunswick, and British Columbia are far more productive lumber-regions than any of the foregoing. In the U. S., Maine, Northern New York, Michigan, Illinois, Minnesota, Wisconsin, Indiana, Pennsylvania, North and South Carolina, Georgia, Florida, the southern parts of Alabama and Mississippi, the S. E. of Texas, the "cross-timbers" of Northern Texas, Northern California, Western Oregon, and the Puget Sound region, are among the most important lumber tracts; but nearly all the other States have important lumber interests. Chicago, and the other lake ports, Albany, Bangor, Boston, Wilmington, Savannah, Brunswick, Ga., and Pensacola are important centres of the lumber-trade. The Puget Sound lumber-trade has increased rapidly of late. According to the U. S. census of 1870, the States employing the most capital and men in this industry were (in the order of the relative value of the products), Pennsylvania, Michigan, New York, Wisconsin, Illinois, Ohio, and Maine, each producing over $10,000,000 worth of sawed lumber annually. The number of establishments in the U. S. (including saw and planing mills, and manufactories of staves, shooks, and headings) was 26,945; there were 12,052 steam-engines employed, with 340,522 horse-power; 16,755 water-wheels, of 330,432 horse-power; number of hands employed, 163,637; capital, $161,500,273; wages paid, $46,231,328; materials were used valued at $132,071,778; and the total value of products was put at $252,339,029. Of this vast product almost all parts of the world finally share. Even the tropical regions, which often have abundant timber supplies of their own, import largely from us, because their scanty capital is generally invested in agricultural pursuits. The consequence is, that the U. S. are rapidly becoming disforested for the benefit of other nations. (For a fuller consideration of the important question of the effect of this state of things upon the climate of the country, see ARBORICULTURE. The different kinds of timber and their uses will be discussed under TIMBER and TIMBER TREES.)

Lump-Fish, or **Lump Sucker** (*Cyclopterus lumpus*), a marine fish of North American and North European seas, of clumsy shape, and having its ventral fins formed into a sucker, by means of which it can cling to any solid substance so firmly that it can with difficulty be removed. Its flesh is edible at certain seasons, and in England is esteemed by some.

Lump'kin, county of N. Georgia, bounded N. W. by the Blue Ridge, is hilly and abounds in fine scenery. Gold, iron, lead, copper, silver, and other metals have been found. Area, 250 square miles. Corn is the staple product. Cap. Dahlonega. Pop. 5161.

Lumpkin, post-v., cap. of Stewart co., Ga., 36 miles S. of Columbus, has a fine court-house, several churches, a Masonic female college and male academy, 1 weekly newspaper, 2 hotels, and a number of stores. Pop. 778.

W. H. HARRISON, ED. "INDEPENDENT."

Lumpkin (JOHN H.), son of Wilson, b. in Oglethorpe co., Ga., June 13, 1812; educated partly at the State University; graduated at Yale College in 1832; studied law, and was admitted to the bar in 1834, locating at Rome, Ga.; became a member of the State legislature in 1835; in 1838 was elected solicitor-general of his judicial circuit; was a member of Congress 1843–51, then went upon the circuit court bench. D. at Rome, Ga., in 1860. A. H. STEPHENS.

Lumpkin (JOSEPH HENRY), LL.D., b. in Oglethorpe co., Ga., Dec. 23, 1799; educated partly at the State University, but graduated at Princeton with high honor in 1819; studied law; was admitted to the bar in Oct., 1820, and opened an office in Lexington, Ga.; in 1825 was a member of the legislature in the heat of the controversy between Gov. Troup and the Federal authorities growing out of the conflicts between the "old" and the "new" treaty, as they were termed, with the Creek Indians. With eloquence unusual in legislative halls he sustained the governor and maintained the rights of Georgia. Having become a member of the Presbyterian Church in 1826, he frequently made public addresses upon temperance, Sunday schools, and Bible societies while on the circuit, and even in his speeches before juries and judges he never omitted a proper occasion for illustrating and enforcing great moral truths. His career as a lawyer and orator from 1820 to 1843 was never equalled by that of any other Georgian. His health now failing, he went to Europe, and returned in 1845, greatly improved, and without his solicitation or knowledge was elected chief-justice of the State supreme court, which then for the first time organized. The term of office was six years, but receiving three successive re-elections without opposition, he continued to hold this position as long as he lived. He was for many years a trustee of the State University, and organized the Phi-Kappa, a literary society which is attached to the institution. He also founded the Lumpkin Law School, connected with the university. In 1860 he was elected chancellor of the university, but declined this position from his strong attachment to the supreme court, over which he had so long presided. In personal appearance Judge Lumpkin was one of the finest specimens of his race. His eye, brow, and his entire facial features, with his general physique, were all of the most striking and impressive character. No one ever graced the bench with greater dignity. His voice was clear, full, and sonorous. His decisions, delivered orally from the bench, were always distinct, methodical, and eloquent. D. at Athens, Ga., June 4, 1867. A. H. STEPHENS.

Lumpkin (WILSON), brother of Joseph Henry, b. in Pittsylvania co., Va., Jan. 14, 1783. His father moved to Oglethorpe co., Ga., soon after; when a little over twenty-one years of age was elected to the State legislature, and re-elected several times; he was a member of Congress from 1815 to 1817, and again from 1827 to 1831; in 1823 was a U. S. commissioner to mark the boundary-line between Georgia and Florida; in 1831 was elected governor of Georgia, and re-elected in 1833; was U. S. Senator from 1838 to 1841, and was for many years one of the trustees of the State University. D. at Athens, Ga., Dec. 28, 1870. A. H. STEPHENS.

Lums'den (MATTHEW), b. at Clora, Aberdeenshire, Scotland, in 1777; went to Calcutta in 1794; was employed in the administration of criminal justice; became professor of Persian and Arabic at the College of Fort William (1805), Persian translator to the East India Company, superintendent of the Mohammedan college at Calcutta, and director of the *Gazette*. He published esteemed grammars of Persian (1810) and Arabic (1813), and editions or translations of several Oriental works. D. in London in Mar., 1835.

Lu'na, the Latin name for the moon, and in the Roman mythology the goddess of the moon. Her worship is said to have been introduced in Rome in the time of Romulus, but although she had several sanctuaries in the city—among others a temple on the Palatine, which was lighted up every night—she was never reckoned among the great deities. (See SELENE.)

Lunacy. See INSANITY, by W. A. HAMMOND, M. D.

Luna, de (ALVARO), b. in Spain about 1390; was educated with the infant king, John II., with whom he escaped from the custody of the infante of Aragon in 1418; headed a successful revolution in behalf of the rights of the Crown; was made constable of Castile 1423; received ample endowments, and became the favorite minister of the king; was temporarily driven from court in 1426, and again in 1439, by the efforts of his enemies; was victorious in a war against the infantes of Aragon 1445, and was rewarded with the grand-mastership of Santiago, which he held in addition to the dukedom of Truxillo and the lordship of sixty towns and fortresses. The powerful favorite was at last overthrown by means of intrigue, condemned to death, and executed at Valladolid in June, 1453. He was a patron of letters, and wrote poetry and plays. (See his history by an anonymous writer, *La Cronica del Condestable Don Alvaro de Luna*, 1546.)

Luna, de (PEDRO), antipope. See BENEDICT XIII.

Lunalil'o, cousin to Kamehameha IV. and V. (their mothers having been half-sisters), was unanimously elected sovereign of the Hawaiian Islands Jan. 8, 1873, by the legislative assembly, as provided in the constitution of the kingdom. He had been educated in the same school with his cousins, and had shown fair abilities, but soon after leaving school became dissipated to that degree that his cousins could not place him in offices of trust and honor; and hence he came to the throne comparatively ignorant of business and political affairs. But for his unfortunate habits, his predecessor, Kamehameha V., would have appointed and proclaimed him as his successor, because he was his nearest male relation of suitable rank. He was fine-looking, kind-hearted, and anxious to be popular. In political affairs he was timid and vacillating, and in all business matters disposed to procrastinate. His tendencies were to great liberality in government—greater than the intelligence and general condition of his people fitted them for. Soon after the establishment of his administration his health failed, and he became indisposed to give much attention to important business. He was popular with his people, and desired to be a kind and paternal king. D. Feb. 3, 1874, at the age of 39 years, without an heir and without appointing a successor. CHARLES R. BISHOP.

Lunar Caustic. See NITRATE OF SILVER.

Lunar Cycle. See CALENDAR, by F. A. P. BARNARD.

Lund, city of Sweden, province of Gothland, has a fine cathedral of the eleventh century, and a university attended by about 500 students. Pop. 8412.

Lun'dy (BENJAMIN), b. in Hardwich, Suffolk co., N. J., Jan. 4, 1789. His parents, as also their ancestors, were members of the Society of Friends, and came originally from England and Wales. His mother died when he was in early childhood, but his father two years afterward married again. A limited period was allowed for his scholastic education, which comprised only reading, writing, and a smattering of arithmetic; but he had an unquenchable thirst for knowledge, which stimulated him to the acquisition of every kind of intelligence that might prove useful to himself or serviceable to others. He served an apprenticeship at the saddler's trade in Wheeling, Va., then a thoroughfare for the traffickers in human flesh; and it was the frequent spectacle of slave-coffles driven through the place that impelled him to consecrate his life to the work of abolishing chattel slavery throughout the land. After his marriage at Mount Pleasant, O., to Esther, the eldest daughter of Henry Lewis, he settled in St. Clairsville, O., where he pursued his trade as a saddler for a little more than four years, accumulating a competency for his growing family (ultimately numbering five children), and with bright pecuniary prospects. But the wrongs of the hapless bondmen at the South continued to destroy his peace of mind, and powerfully impressed upon him the duty of consecrating his powers more directly for their deliverance. He accordingly formed, with the assistance of five others, a "Union Humane Society," which in a few months enrolled nearly 500 members. This was followed by an appeal from his pen to the philanthropists of the U. S. on the subject of slavery, recommending the formation of kindred societies for mutual conference and action; and it elicited a favorable response in various quarters. Soon afterward he became a contributor of original and selected anti-slavery articles to a paper published at Mount Pleasant entitled *The Philanthropist*. In the fall of 1819 he took his entire business-stock to St. Louis, Mo., that by its sale he might give himself to the humane cause which he had so disinterestedly espoused, but he lost by the venture nearly all the property he had accumulated. It was at that time that the famous "Missouri question" was agitating the nation, and he devoted himself to an exposition, in the newspapers of Missouri and Illinois, of the evils of slavery, in order to avert the impending calamity. Returning to St. Clairsville, he removed to Mount Pleasant, and there commenced a monthly publication, *The Genius of Universal Emancipation* (Jan., 1821), then the only anti-slavery periodical in the country. It was afterward transferred to Jonesborough, Tenn., and thence (in 1824) to Baltimore, Md., assuming a weekly form. In the latter part of 1825, Mr. Lundy visited Hayti to make arrangements with the Haytian government for the settlement of such manumitted slaves as might be sent thither. In 1828 he made a pedestrian tour to the Middle and Eastern States, partly to increase his subscription-list, and especially by lecturing to awaken an interest in behalf of the oppressed. In the winter of 1828–29 he was brutally assaulted and nearly killed in Baltimore by one Austin Woolfolk, a notorious slave-dealer, for an editorial reproof of his conduct. In the spring of 1829 he went a second time to Hayti, taking with him a number of slaves emancipated for that purpose. On his return he invited William Lloyd Garrison to act in a joint-editorship of the *Genius*, but the ensuing spring the latter was incarcerated in the city jail for denouncing the domestic slave-trade and its abettors; and as it was found impracticable to continue the weekly issue of the paper, the connection was dissolved and Mr. Lundy restored the *Genius* to its monthly form, making Washington, D. C., the nominal place of its publication, but printing it as opportunity presented in divers places while travelling. The next winter he visited the Wilberforce colony of fugitive slaves in Canada, and then went to Texas to provide a similar asylum under the Mexican flag, renewing his visit in 1833; but he was baffled by the events that led to the annexation of Texas. In 1836 he started a weekly anti-slavery journal in Philadelphia entitled *The National Enquirer*. In 1837 he relinquished the charge of the *Enquirer*, intending to go West; but previous to his leaving Philadelphia all his papers, books, clothes, etc., deposited in one of the rooms of Pennsylvania Hall, were destroyed by the burning of that building—an act of pro-slavery incendiarism. In a letter written to a friend the next morning, he said: "Well! my papers, books, clothes, everything of value except my journal in Mexico, etc., are all, all gone—a total sacrifice on the altar of universal emancipation. They have not yet got my conscience, they have not taken my heart; and until they rob me of these they cannot prevent me from pleading the cause of the suffering slave.

> The tyrant may hold the body bound,
> But knows not what a range the spirit takes.'

I am not disheartened, though everything of earthly value in the shape of property is lost. Let us persevere in the good cause. We shall assuredly triumph yet." In the winter of 1838–39 he removed to Lowell, La Salle co., Ill., intending to publish the *Genius* in that locality, but on the 22d of the ensuing October his versatile and eventful life was suddenly terminated by death. The world was thus deprived of one of its most intrepid, devoted, self-sacrificing philanthropists, who deserves to be ranked among the most distinguished advocates of negro emancipation on either side of the Atlantic. In the truest sense he remembered those in bonds as bound with them, and was ready at all times to run any risk for their liberation; yet he strongly discountenanced every insurrectionary attempt on their part, not merely on account of his peace principles as a Quaker, but with reference to the disastrous consequences that would inevitably follow. Alluding to the Nat Turner outbreak in Southampton co., Va., he wrote: "Nothing can be more fatal to our hopes, nothing better calculated to retard our philanthropic operations, than such frenzied proceedings. We have stated, over and over, that the work of emancipation must be conducted in this country entirely on moral, pacific principles. In this way it can be effected, and in no other."

His moral courage and persistence rose with the perils which encompassed him. When threatened with an indictment by a Washington grand jury, he wrote: "I shall not slacken my exertions for the moral and political salvation of my country, and the freedom and safety of every class of its inhabitants, while the vital spark shall animate this bosom; and if I must submit even to martyrdom in the cause of freedom and justice, it will be some consolation to lay down my life beside the tomb of Washington. The thoughtless creatures who call me a fanatic I despise—the tyrants who persecute me I scorn and detest. To *the people* I look for protection, for the cause I advocate is theirs. . . . If they are, notwithstanding, disposed to sacrifice me on the altar of prejudice, ignorance, and tyranny under the shining rays of their Christian profession and beneath the gilded dome of their republican edifice, they may prepare the pile and the fagots. I shall be ready for them."

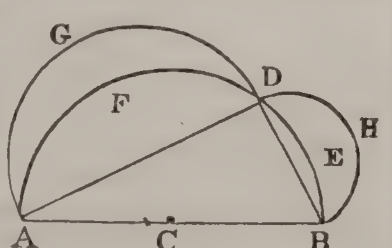
Benjamin Lundy was as modest concerning what he had been called to endure and the arduous labors he had performed for the slave's sake as he was dauntless in confronting whatever dangers might lie in his pathway. But it sometimes falls to the lot of the reformer to say with an apostle, "If I have boasted anything, I am not ashamed; but as we spoke all things to you in truth, even so our boasting is found a truth." So on one occasion this unassuming philanthropist alluded to himself as follows: "I do not wish to speak boastingly of what I have done, or essayed to do, in advocating the question of African emancipation, and I detest the idea of making a cringing appeal to the public for aid in my undertakings. I am willing to work, and can support myself and family by my own labors. But after a ten years' struggle to promote the cause to the best of my humble abilities and in every possible manner, it may not be amiss to inform those who take an interest in this publication (*The Genius of Universal Emancipation*) that I have (within the period above mentioned) sacrificed several thousand dollars of my own hard earnings; have travelled upward of 5000 miles on foot, and more than 20,000 in other ways; have visited nineteen States of this Union and held more than 200 public meetings with the view of making known our object; and in addition to this, have performed two voyages to the West Indies, by which means the liberation of a considerable number of slaves has been effected, and I hope the way paved for the enlargement of many more. What effect this work has had in turning public attention to the subject of the abolition of slavery it would not become me to say. . . . But I am fully persuaded that something of this kind is greatly needed, and may be instrumental in doing much good; and, viewing the matter in this light, I shall persevere in my efforts while the means of doing it are afforded, or until more efficient advocates of the cause shall make themselves known. I will neither be cajoled by the smiles nor awed by the frowns of any to a dereliction of principle or an abandonment of the cause. My humble exertions shall be directed to the one great end; my whole self shall be devoted to the holy work; my march shall be steadily onward; nor shall persecution from 'the powers that be,' or that may be, turn me to the right hand or to the left." This extract will suffice to reveal the

whole man in his quenchless zeal, his sublime courage, his unfaltering determination, his martyr spirit; but it utterly fails to convey an idea of the far-reaching influence he exerted in the tremendous and long-protracted struggle to "break every yoke and let the oppressed go free." To him belongs, primarily, the credit of setting in motion all the instrumentalities subsequently brought into use to this beneficent end, whether of a religious, moral, or political nature. Ten weary years he stood conspicuously alone in his persistent endeavors to "create a soul under the ribs of death," and arouse the nation to a sense of its guilt; ridiculed and scorned as a fanatic; subjected to privations and hardships; in perils in the city, in the wilderness, in the sea, among false brethren, and by his own countrymen; maintaining his post against fearful odds on slaveholding soil; and deriving strength and comfort mainly from a good conscience and an unshaken faith in an overruling Power. He lived to witness a mighty change in public sentiment, but died in the midst of the conflict, true and fearless to the end.

Wm. Lloyd Garrison.

Lundy's Lane, Battle of. About noon of July 25, 1814, intelligence reached Gen. Brown, commanding the American forces then encamped at Chippewa, that the British general, Drummond, had reached Fort George the night previous with reinforcements, and that a movement was being undertaken against our dépôt of supplies at Fort Schlosser. In order to divert the enemy from his purpose, Gen. Scott, with his brigade and Towson's artillery, was ordered to advance upon the enemy's posts at Queenstown. In pursuance of this plan, Scott had advanced some two miles when he observed a small party of the enemy, which, however, retired on his approach. Continuing his advance, Scott learned that in rear of a narrow belt of woods which faced him the enemy, under Gen. Rial, were posted in strong force upon an eminence near Lundy's lane, supported by a battery of nine guns. Sending back information to this effect to head-quarters, and detaching Maj. Jesup with the 25th regiment to operate on the left flank of the enemy, Scott advanced through the woods; a severe struggle, lasting upwards of an hour, ensuing, in which both sides suffered considerably. Meantime, Jesup had discovered an unoccupied road, by which he advanced to a position from which he turned the left of the enemy's line, capturing some prisoners, and, continuing to occupy the road, Gen. Rial and his staff were soon added to his list of captives. Continuing to move cautiously in the increasing darkness, he succeeded in placing himself on the right of Ripley's brigade, which, with Hindman's artillery and Porter's volunteers, had now arrived, with Gen. Brown in command in person. Drummond had also arrived with reinforcements to the enemy, who still maintained a galling fire upon Scott's brigade. It was finally determined to dislodge the enemy from his strong position if possible, and an assault was ordered, which, led by the 21st regiment, supported by the 23d, drove the British from their guns, which were now turned against them, and the hill occupied in force and held against three desperate attempts of the enemy to regain their lost pieces and ground. The struggle was finally terminated at midnight by the withdrawal of the British, their leader, Gen. Drummond, being wounded. During these desperate charges Gens. Brown and Scott had both received severe wounds, and the command devolved upon Gen. Ripley, who at once withdrew the army to its old encampment on the Chippewa. But the Americans were forced to abandon the trophies of their valor for lack of means of transportation, and thus the dearly-captured cannon were soon again in possession of the British. The battle is also known as that of Bridgewater and of Niagara.

Lune [Lat. *luna*], in spherical geometry, the portion of a spherical surface included between two great semicircles. The two semicircles are the sides of the lune, and the angle of the lune is the angle between the planes of its sides. This angle may have any value between 0° and 360°. In plane geometry a lune is the portion of a plane included between the arcs of two circles that intersect. The lune of Hippocrates is famous as being the first curvilinear space whose area was exactly determined. The construction of the lune of Hippocrates is as follows: On a line AB as a diameter describe a semicircle ADB, and in it inscribe a right angle ADB; then on the sides AD and DB as diameters describe the semicircles AGD and DHB. The two figures AGFD and DHBE are lunes, and the sum of their areas is equal to the area of the triangle ADB. For the areas of any two semicircles are to each other as the squares of their diameters, and from the right-angled triangle ADB we have $\overline{AB}^2 = \overline{AD}^2 + \overline{DB}^2$; hence, the sum of the semicircles on AD and DB is equal to the semicircle on AB; diminishing both members of this equality by the sum of the segments AFD and DEB, we have the sum of the lunes equal to the triangle. If we make AD = DB, the lunes will be equal to each other, and the triangle will be equal to half the square on either.



W. G. Peck.

Lü'neburg, town of Prussia, Hanover, on the left bank of the Ilmenau, an old town, surrounded with walls and containing many characteristic old buildings, was once an important member of the Hanseatic League, and has still a considerable trade; 300,000 cwts. of salt are yearly manufactured from its salt-springs. Gypsum is found in large quantities in its vicinity. Pop. 15,691.

Lunel', town of France, in the department of Hérault, on the Vidourle, has a brisk trade in muscatel wine and raisins, and large distilleries. Pop. 6737.

Lu'nenburg, county of Nova Scotia, bounded on the S. E. by the Atlantic. Its coast-line is broken by deep bays and sheltered by islands. Cap. Lunenburg. Pop. 23,834.

Lunenburg, a thriving seaport, cap. of Lunenburg co., N. S., handsomely situated on Lunenburg Bay. Lat. of lighthouse, 44° 20′ N., lon. 64° 7′ W. It was settled by Germans in 1753, and many of its inhabitants are of German stock. It exports fish and lumber, and has considerable West India trade. Its harbor is very deep, capacious, and well sheltered. Gold is found in the vicinity. Pop. about 1500.

Lunenburg, county of S. Virginia. Area, 380 square miles. It is bounded N. by the Nottoway and S. by the Meherrin River. It is undulating and generally productive. Tobacco and corn are the principal crops. Cap. Lunenburg Court-house. Pop. 10,403.

Lunenburg, post-v. and tp. of Worcester co., Mass., 18 miles N. of Worcester and 4 miles E. of Fitchburg, traversed by the Fitchburg R. R., has a public library, and manufactures of shoes, lumber, etc. Pop. 1121.

Lunenburg, post-tp. of Essex co., Vt., on Connecticut River, 45 miles N. E. of Montpelier, has 3 churches, and manufactures of leather, lumber, and starch. Pop. 999.

Lunenburg Court-house (called also **Lewiston),** post-v., cap. of Lunenburg co., Va., 90 miles S. W. of Richmond.

Lu'néville, town of France, in the department of Meurthe, at the confluence of the Vezouse and the Meurthe, is one of the largest cavalry stations of France; the former palace of the dukes of Lorraine has been transformed into cavalry barracks. It is historically notable from the Peace of Lunéville (Feb. 8, 1801), by which the Rhine became the frontier of France. It has an extensive trade in corn, wine, brandy, and hemp. Pop. 15,528.

Lungri'o [anc. *Ungarum* or *Lungrium*], town of Southern Italy, province of Cosenza, beautifully and healthfully situated on a mountain-slope in a very fertile district, with a salt-mine in its neighborhood. Pop. in 1872, 5724.

Lungs [Ang.-Sax. *lunge*], the organs by which, in air-breathing vertebrate animals, the blood is aërated and certain gaseous impurities are removed from it. In the Invertebrata and fishes and the larvæ of Batrachia the lungs are functionally represented by Gills (which see) and by other analogous organs. In many fishes there is in addition to the gills a "swim-bladder," which structurally represents the lungs, and which, in a few species, appears to share in the function of the true respiratory organs. In the perennibranchiate batrachians we find both gills and lungs. The true reptiles all have sacculated lungs, and many of them breathe by gulping down a large quantity of air by a kind of swallowing process not much like the breathing of mammals. The left lung of serpents is either wanting or very rudimentary. In birds the respiratory function appears to be shared by the lining membranes of the extensive air-chambers in the bones, etc. The lungs of all the Mammalia are in plan much like those of man. The human lungs (*pulmones, pneumones*) are two, one being placed in each of the lateral cavities of the thorax, and they are separated from each other by the mediastinum and its contents. The apex of each lung extends above the first rib. The right lung is larger, broader, and shorter than the left. It has three lobes—the left but two. The blood-vessels, air-tubes (bronchi), nerves, lymphatics, etc. enter each lung at a point called the *hilum;* and these structures, with the connective tissue, constitute what is called the *root* of the lung, a part of the mediastinum. The lungs are of light, spongy texture. The *outer* covering is

a reflection of the pleura, and is a *serous* membrane. The *inner* membrane of the air-passages and cells is embryologically derived from the alimentary canal, and hence is a *mucous* membrane. The substance of the lungs is composed of a parenchyma consisting of lobules, each containing a branch of the bronchial tube and a cluster of air-vesicles or *alveoli*. The function and minute structure of the lungs are further illustrated in the article RESPIRATION (which see).

Lung'wort (*Pulmonaria officinalis*), a perennial herb of the borage family, found chiefly in Europe. It derives its name from a fancied resemblance of the spotted leaves to diseased lungs, for which reason, upon the doctrine of signatures, they were formerly employed as a remedy in pulmonary diseases. It is cultivated in gardens, has a creeping root and rose-colored flowers changing to blue.

Lunt (GEORGE), b. at Newburyport, Mass., Dec. 31, 1803; graduated at Harvard University in 1824; studied law, and was admitted to the bar in his native town. He was several times elected to both branches of the State legislature, and was from 1849 to 1853 U. S. district attorney for Massachusetts. He published a small volume of poems in 1839, and other volumes in 1843, 1851, and 1854. In 1857 he became editor of the Boston *Journal*, a Democratic paper, which he directed for several years. Besides two novels, he has written *Three Eras of New England* (1857), *Radicalism in Religion, Philosophy, and Social Life* (1858), and *Origin of the Late War* (1866).

Lunt (WILLIAM PARSONS), D. D., b. in Newburyport, Mass., Apr. 21, 1805; was educated in Boston; graduated at Harvard College in 1823; taught school for a year at Plymouth; studied law a short time in Boston; entered Cambridge Divinity School in 1825; was ordained in 1828 pastor of the Second Congregational Unitarian society of New York; became associate pastor of the Unitarian church in Quincy, Mass., in 1835, and there remained till his death, which occurred on a visit to the Holy Land, at Akabah, on the Red Sea, Mar. 20, 1857. Dr. Lunt was author of biographical and historical discourses, pamphlet sermons, reviews, and articles in various periodicals, hymns, poems, and odes for public occasions. He compiled a book of hymns, *The Christian Psalter*. A small volume of his writings, entitled *Gleanings*, has been edited by his daughter and published by his son. Dr. Lunt was much esteemed as a writer and preacher. O. B. FROTHINGHAM.

Luperca'lia [Lat.], a great festival anciently held in Rome and other Italian towns on the 15th of February, in honor of the god Lupercus. At Rome the Lupercalia were celebrated at a place called the Lupercal. The original design was to propitiate the god and secure fertility to the flocks and fields. The festivities had an indecent, rude, and savage character.

Lu'pine [Lat. *lupinus*, from *lupus*, a "wolf"; Ger. *Wolfsbohne*, "wolf-bean"], a name given to the herbs and shrubs constituting the large genus *Lupinus* of the order Leguminosæ. The U. S. have very numerous species, chiefly found W. of the Rocky Mountains. These species are mostly prized in cultivation for their handsome papilionaceous flowers. Many of the Old-World species are cultivated as forage-plants, and their seeds are used as food for man. The cultivation of the lupine in Portugal (*Lupinus albus*) has proved a national blessing, and regenerated great tracts of worn-out land. It is fed to cattle, and also ploughed into the ground as a fertilizer.

Lupuline, or **Lupulite.** See HOPS.

Lu'pus [Lat. "wolf"], a disease of the human subject, most commonly attacking the face, and beginning in nodules in the skin. Sometimes this disease is observed in syphilitic or scrofulous patients, but in many cases no predisposing diathesis can be found. It usually attacks the young after puberty, and is rare after the age of forty. It is roughly divided into *lupus exedens*, or devouring lupus, and *lupus non exedens*, in which there is no ulceration; but in this last form there are sometimes neoplastic growths in the integument, which degenerate and shrink away, horribly distorting the face. There are many minor varieties known to the surgeon. True lupus, if neglected, becomes one of the most dreadful of diseases, destroying the tissues as completely, and often far more rapidly, than cancer. Happily, it is commonly a much less painful disease, and it is so far local that if thoroughly destroyed by caustics there is room for hope of permanent recovery. If the disease should return, the application of the caustic must be repeated. Cod-liver oil, iodine applications, and general tonics are often useful.

Lu'ra, tp. of Blue Earth co., Minn. Pop. 433.

Lura, tp. of Faribault co., Minn. Pop. 621.

Luray', tp. of Henry co., Ind. Pop. 66.

Luray, a v. of Union tp., Licking co., O., 2 miles W. of Hebron. Pop. 55.

Luray, post-v. and tp., cap. of Page co., Va., in a rich and picturesque valley 136 miles N. W. of Richmond and 15 miles E. of New Market. It has 1 female seminary, 1 male academy, a newspaper, and a number of stores, shops, etc. Pop. of tp. 2144. EDITOR "PAGE COURIER."

Lurch'er [Welsh, *llerch*, "lurking"], a variety of dog, chiefly bred in Europe for the service of poachers. It is strongly marked with greyhound characters, but has far greater sagacity and far better scent than any greyhound, and is distinguished by great fidelity. It is very swift, and is voiceless when coursing.

Lur'gan, town of Ireland, county of Armagh, is a neatly built town, with extensive manufactures of linens, muslins, and damasks. Pop. 7766.

Lurgan, tp. of Franklin co., Pa. Pop. 1326.

Lur'ky, tp. of Sampson co., N. C. Pop. 1167.

Lu'satia [Ger. *Lausitz;* Fr. *Lusace*], an ancient territory of Germany, bounded by Bohemia, Saxony, Brandenburg, and Silesia. Originally it formed two independent margraviates, Upper and Lower Lusatia, which in 1635 came into the possession of Saxony, but by the Congress of Vienna in 1815 the greatest part of the territory was transferred to Prussia, Saxony retaining only the portion which forms the present circle of Bautzen.

Lush'ington (STEPHEN), D. C. L., b. in London, England, Jan. 16, 1782; was second son of Sir Stephen Lushington, Bart.; educated at Eton and Oxford; called to the bar at the Inner Temple in 1806; admitted advocate at Doctors' Commons in 1808; appointed judge of the consistory court in 1828, and of the high court of admiralty in 1838. He sat in Parliament many years between 1807 and 1841, in the liberal interest; was counsel for Queen Caroline in 1820, and legal adviser of Lady Byron on the occasion of her separation from her husband the poet. He retired from the bench in 1867, and d. Jan. 2, 1873. He is not to be confounded with his relative, Stephen Rumbold Lushington, D. C. L., governor of Madras, b. 1775, d. Aug. 5, 1868.

Lusita'nia, the name of the south-westernmost of the three provinces into which the Iberian peninsula was divided by the Romans, comprising the present Portugal S. of the Douro and large parts of the adjacent provinces of Spain. It derived its name from the Lusitani, who dwelt between the Tagus and the Douro, and were a fierce, turbulent, and warlike people. The most remarkable of its cities were Olisipo, the modern Lisbon, and Emerita Augusta, the modern Merida.

Lustra'tion [Lat. *lustratio*], in ancient Greece, and more especially in ancient Rome, a ceremonial purification by water, fire, or the blood of sacrificial victims. Among the Romans and Italians, towns, cities, fields, flocks, armies, navies, temples, altars, private persons, and even the whole people, were the frequent subjects of lustration. The people underwent a great lustration at the end of every *lustrum*, when the censor laid down his office in the Campus Martius. There were yearly lustrations in February and April. Every army underwent lustration before a battle. The fields were lustrated after sowing, and again before reaping. The sheep were lustrated in April at the *Palilia*, and the whole city and people also were purified at the same time. Special lustrations also followed every great public calamity.

Lus'tre [Lat. *lucere*, "to be light"]. The property of reflecting light, as displayed by minerals, is described by mineralogists, with regard to the *manner* in which it is reflected, under the head of kinds of lustre, and with regard to the amount of light reflected or the degrees of lustre. Six kinds of lustre are recognized by mineralogists: metallic (*e. g.* steel), vitreous or glassy (quartz), pearly (talc), silky (asbestos), resinous (amber), and adamantine (diamond). The degrees are four: splendent, if a perfect image is given; shining, if the image is indistinct; glistening, when there is a general reflection of light, but insufficient to give an image; glimmering, when the reflection appears to be limited to points on the surface.

EDWARD C. H. DAY.

Lus'trum, a religious ceremony for the purification of the whole people of ancient Rome, performed upon the Campus Martius once every five years by one of the censors. Hence the period of five years is often called a *lustrum*. The lustrum took place after the general census. In Vespasian's time the last lustrum was performed in 74 A. D.

Lute [It. *liuto*, from Arab. *al ûd*], an ancient instrument consisting of a table, a body, a neck (for fingering) with frets, a head with screws for tuning, and a bridge on which

ran the strings, from six to twenty-four in number. The frets were touched with the left hand, the strings with the right. It was long a favorite instrument in nearly all parts of Europe.

Lutes [Lat. *luto*, to "daub;" *lutum*, "clay"]. This term applies to a class of compositions used for two purposes—the one being the making gas-tight or vapor-tight joints in apparatus used for holding or conveying gases or vapors, as in processes of distillation; and the other the coating externally of fragile vessels that are to be exposed to high heats. For the first use modern chemists are enabled to substitute almost altogether tubes, bands, and sheets of india-rubber, so that luting compositions are seldom used. There is one highly important case, however, in the arts in which they are still employed. This is for the lids of gas-retorts. (See GAS-LIGHTING.) In the laboratory, in cases in which the heat to be applied is below 400° or 500° F., *linseed meal* is much used; with water it makes a very plastic adhesive mass; with *glycerine*, instead of water, this mass will not dry and crack. If pressure is to be resisted, the composition may be applied in some mass to the joint, a band of cotton cloth rolled around it, and the whole then bound around with twine. Clay and glycerine make a useful lute also. Great numbers of similar compositions are known in the laboratory, which would occupy too much space. (We may refer to the *U. S. Dispensatory* of Wood and Bache, pp. 928, 929, for comprehensive and reliable information on this head.) H. WURTZ.

Lutes'ville, post-v. of Bollinger co., Mo., on the St. Louis Iron Mountain and Southern R. R., 133 miles S. of St. Louis. It has a large stove-factory, an iron furnace, a newspaper, and a number of stores. Iron is the principal interest. Pop. about 500.

THOMAS M. JOHNSON, ED. "HERALD."

Lu'ther (MARTIN), b. Nov. 10, 1483, at Eisleben, whence his parents, a mining family in humble circumstances, removed shortly after to Mansfeld. The father was a man with a very warm heart, but of somewhat harsh ideas; in bad weather he would carry the boy to school in his arms, but for the least inadvertency he would whip him till the blood came. The mother was a woman of great virtue and loveliness, and the education at home early imbued the soul of the boy with that veracity and uprightness which in after years, when stormy events gathered around him, gave his character its heroic cast, and kept his mind sound, though so many turbulent passions and gnawing anxieties passed through it. In 1497 he went to Magdeburg, and next year to Eisenach, in order to frequent a Latin school, making his way in these places—as poor men's sons used to do at those times—by begging his meals in rich people's houses, and earning a little money for lodging and clothes by singing in the choir of the cathedral. In 1501 he entered the University of Erfurt. His plan was to study law, but first he had to go through a course of *literæ humaniores*, to which also belonged scholastic philosophy and theology. In 1503 he graduated as a master of arts, and next year began to give lectures on the physics and ethics of Aristotle. But a violent sickness which befell him, the death of his friend Alexius, and, more than anything else, the incidental acquaintance he made with the Bible, of which he found an unabridged copy in the library, threw his mind into such anxieties concerning sin and punishment that on July 17, 1505, he retired to the Augustine convent of Erfurt, and became a monk. The heaviest penance, however, and the severest asceticism brought his soul no comfort, and he found consolation only when another brother of the order called his attention to what the Bible says of forgiveness of sin by God's grace through faith in Christ—a doctrine which was almost entirely forgotten in the Roman Catholic Church. Restored to peace with himself, he continued his theological studies, reading the Bible, Augustine, and the Fathers, Tauler and the mystics, and on May 2, 1507, received the consecration as priest. Next year (1508) he was appointed professor of philosophy at the University of Wittenberg, and in 1510 he made a pilgrimage to Rome. He was at that time, as he calls himself, "a most insane papist." Although he saw in Rome the depravity and vices of the Roman Catholic clergy, he never doubted either the authority of the pope or the doctrines of the Church. On Oct. 19, 1512, he took the degree of doctor of divinity, and in 1516 was appointed preacher at the town church of Wittenberg. In both positions, as professor and preacher, he attracted great attention and made a deep impression. Large audiences gathered to hear him, and all felt that a new spiritual source was opened. His words had a most wonderful vitality, and his ideas soon became visible in the lives of his hearers. But as yet nobody suspected, least of all did he himself, that there was a difference between him and the established Church which one day would produce a most fatal rupture. His ideas of salvation by the grace of God were not heretic by themselves; they only became so by a close application of them to the practice of the Roman Catholic clergy. His warnings against the abuse of "indulgences" referred to the frailty of the congregation rather than to any fault of the Church. The whole difference, as far as it was felt, seemed to be one of talent only, or, in the highest, of method. The scholastic philosophy had become dead and empty to the eyes of Luther, and what polemics this earlier part of his life contains was directed against Thomas Aquinas, Petrus Lombardus, Bonaventura, etc., and not against the pope or the Church. In 1517 the situation entirely changed when the Dominican friar John Tetzel approached the Saxon boundary, selling indulgences. The pope, Leo X., was much in need of money for the erection of St. Peter's church in Rome, and emissaries were sent out in the most shameless manner through all Roman Catholic countries to gather it by selling indulgences. Like other mountebanks, they established their shops in the market-places, and for eggs, butter, corn, or cash people bought forgiveness, not only for sins they had committed, but also for sins they would like to commit. Against this scandal Luther drew up his ninety-five theses, the pith of which is that the pope has no power at all to forgive sin, and nailed them (Oct. 31, 1517) on the church-door in Wittenberg. The sensation which this proceeding caused was immense. Tetzel had to flee, and the commotion spread with incredible rapidity over all Germany. Luther was summoned to Rome, but refused to go. Cardinal Cajetan arrived in Germany and demanded that he should retract, but this, too, he refused. Meanwhile, the papal envoy to the Saxon court, Miltitz, succeeded in persuading him to be silent about the matter for the future, and a reconciliation seemed possible, when the famous disputation between Karlstadt and Eck, held in Leipsic from June 27 to July 16, 1519, once more drew Luther into the conflict. The pope sent a bull of anathema against him June 15, 1520, but the professors and students of the University of Wittenberg burnt the bull outside the Elster gate; and now followed, in the same year, his two celebrated writings—*Address to the Christian Nobles of Germany* and *Præludium de Captivitate Babylonica Ecclesiæ*—in which he openly and with great precision defined his position both to the Church and to its doctrines. On Apr. 5, 1521, Charles V. opened at Worms the first diet which he held in Germany, and Luther was ordered to attend. All his friends endeavored to persuade him from going, but in spite of the imminent danger connected with such a step he determined to obey the order, and on Apr. 17 he appeared before the diet. The impression which he produced was most powerful, and it became evident to his adversaries that "this man must perish or the Roman Catholic Church will be lost in Germany." In order to withdraw him from the violence of his enemies, a troop of soldiers belonging to the elector of Saxony took him prisoner on his return from Worms, and brought him to the castle of Wartburg, where he spent nearly a year (from May 4, 1521, to Mar. 7, 1522) in concealment. During his residence here he accomplished a work of paramount importance for the success of the Reformation—namely, the translation of the Bible, of which the New Testament appeared in 1522. But when he heard of the excitement which reigned in Wittenberg, and the disturbances which took place there under the leadership of Karlstadt, he immediately left his place of safety and repaired thither. Karlstadt was a man of talent and integrity, but he was hot-tempered and entertained very radical ideas. Under his hands the Reformation fell into extravagances, and it needed all Luther's patience and energy to control the commotion. He preached a whole week daily, almost without interruption, and at last succeeded in calming down the excitement. He now developed a most astonishing practical activity, reorganizing the Saxon Church, laying out a new liturgy, providing new books for the schools, both for the teacher and the pupils (the Great and the Little Catechism), preaching several times each week, and all the while keeping up a most extensive correspondence both in Latin and German with the scholars and princes of his country about the most important subjects. But in all this business he appears everywhere great. His views are broad and lofty; his sympathy is quick, and still quicker is his eye; in the most delicate or entangled affairs he always knows where to find the right issue. No less pleasant is the impression which his private life makes, such as it appears in his *Table-talk*. On June 13, 1525, he married Catharina von Bora, a nun, and the marriage proved exceedingly happy; they had six children. He was a kind and careful husband and father, and in every-day life was a man of humor—a little coarse, perhaps—and with a taste for poetry and music; some of his hymns are among the most beautiful, at once the most sublime and the most touching which Christianity has called forth.

Quite otherwise he appears in his polemics. But the explanation of this singular fact seems to be this: he was an eminently practical man, not only in his talent as a reformer, but in the whole cast of his mind. He appreciated an idea only through its reflex in reality, and only with its evil consequences in the real world he understood how to grapple. The theoretical idea he was afraid of, and with respect to all religious views which had no palpable, practical bearing he occupied a most conservative position. He d. at Eisleben Feb. 18, 1546, and was buried in the castle church of Wittenberg. CLEMENS PETERSEN.

Lutheran Church (LUTHERANISM). I. *Definition and Name.*—The result of the union of the conservative with the progressive in reformation, as distinct from revolution, was the Lutheran Church, whose essential characteristics constitute *Lutheranism.* Lutheranism is the system of faith and life taught in God's word and confessed in the Augsburg Confession and in the creeds consonant with it. The Lutheran Church has been distinctively called Protestant and Evangelical, and (in the *Formula of Concord*) "Reformed." In the *Book of Concord* the title of the confessors is "electors, princes, and states of the *Augsburg Confession.*" It has never by any general official act taken the name Lutheran. Art, history, and popular usage have practically determined its title as "the Evangelical Lutheran Church." "If," said the marquis of Brandenburg when ridiculed as a Lutheran—"If I be asked whether with heart and lip I confess that faith which God has restored to us by Luther as His instrument, I have no scruple, nor do I feel a disposition to shrink from the name Lutheran. Thus understood, I am, and shall to my dying hour remain, a Lutheran." This is the only sense in which any Lutheran tolerates the name.

II. *Distinctive Characteristics of Lutheranism and of the Lutheran Church.*—The distinctive characteristics of Lutheranism, as over against the Church of Rome, belong to PROTESTANTISM (which see). A searching analysis of the elements which characterize it over against the Reformed or Calvinistic portions of Protestantism has been made by both friend and foe in recent times, in consequence of the reconciling spirit of the age and the efforts of various governments to unite the two communions in one state Church.

The points of distinctive character leading to diversity may, for the sake of convenience, be stated and numbered thus:

1. The material principle or foundation of the matter of Lutheran Protestantism is the saving truth of Christianity as it lies centred in the doctrine of justification for Christ's sake alone (*propter . . . um willen*), by faith alone (*per . . . durch*).

2. The formal principle, that which prescribes the form in accordance with which the material is shaped, is the sole authority of Holy Scripture as the rule of faith and guide of life.

3. The Lutheran method of using the rule of faith is historical. The pure Church catholic, or Christian Church, is the living witness of the truth.

4. The doctrines of God's word, the means of establishing which Holy Scripture contains within itself, and of which the Church is witness, shape the individual assurance of faith and the confession of the Church, and originate and develop her polity, worship, and practical life.

5. The Protestantism of the Reformed or Calvinistic churches, on the other hand, has laid as its fundamental doctrine the absolute and sole primary causality of God. In it there is but one real cause of whatsoever comes to pass, the foreordination of God. All other causes are also effects, and no more than phenomena of the final cause. As the pantheism of substance makes the seeming substances no more than phenomena of the one sole substance, so Calvinism, as the pantheism of the divine will, makes all finite volitions but phenomena, at last, of the one sole free-will. Election is therefore the material principle, and justification is secondary and dependent. "The Lutheran doctrine," says Schneider, "comes, through the gospel, to God—the Reformed, through God to the gospel."

6. While Calvinistic Protestantism holds with the Lutheran Church that Holy Scripture is normative, it has yet isolated the Scriptures from the historic development of the Church, and subjected its interpretation far more to an undefined subjectivism and rationalizing tendency. "The German Reformation is more objective and historical, the Swiss more subjective and radical; the one springs from the heart, the other from the understanding. The Lutheran Reformation will, with freedom—and almost more than freedom itself—have unity; Zwinglianism tolerates variety, and strives by pre-eminence for freedom; the one is more compact, the other more varied in forms." (Ullmann (mediating Lutheran) epitomized in Weber, *Lehrb. d. Weltgesch.*, 1859, § 472.)

7. "In Reformed Protestantism the formal principle is controlling—in Lutheranism, the material. In the Reformed system Scripture is regarded more as the exclusive source of doctrine—in the Lutheran system, as the norm of the doctrine, which grows out of the analogy of faith. In consequence of this, a pure tradition" (involving the handing down of truth in the Church) "possesses in Lutheranism a greater validity." (Goebel (Reformed), *Die relig. Eigenthümlichkeit*, 1837; Nitzsch (Consensus), *Prakt. Theolog.*, 1847, i. § 74 *seq.*; Heppe (Melanchthonian Reformed), in *Studien u. Kritiken*, 1853, 3.)

8. "Lutheran Protestantism is the antithesis to the Judaism of the Roman Church, and thereby the doctrine obtained a Gnosticizing character; the Reformed is the antithesis to the paganism of the Romish Church, and thus the doctrine received a Judaizing ethical character." (Herzog (Reformed).)

9. "Reformed Protestantism is the protestation against all deification of the creature. Hence it emphasizes the absoluteness of God and the exclusiveness of His will—its material principle—with which coheres the exclusive emphasizing of Scripture as the positive normal principle." (Schweizer (Mediating Reformed), *Glaubenslehre*, 1844.)

10. "The material principle of Zwingli is the glory of God; his formal principle is the Scripture, yet in such sense that he explains that the internal word is independent of the external, and denies all creaturely causality on the part of the creature in salvation." (Dorner (Mediating Lutheran), *Prinzip.*, 1841; *History of Protestant Theology*, 1867.)

11. "The Reformed system begins at the top, and goes downward; the Lutheran begins below, and ascends." "The ground of the diverging tendencies lay far deeper than in the diverse apprehension of the doctrine of the sacraments. . . . The centre of gravity in the one was the objective, in the other the subjective. . . . Calvinism is the proper Protestant counterpart of Catholicism. The whole system of the dependence of the individual on a power which absolutely determines him in his willing and doing, the system which is set up by Catholicism in its doctrine of the Church, is bound up by Calvinism in its absolute decree. In the one everything saving and salutary lies in the Church; in the other, it lies in the decree. The Lutheran system, with its faith reposing on the historical fact of the redemption, holds the mean between Calvinism and Romanism—between the transcendent idealism of the one, the external realism of the other" (*Baur, F. C.*).

12. "The distinction between the systems consists not in the predominance of theology or of anthropology, of the absolute idea of God or of the subjective consciousness of salvation, but in the diverse form of the consciousness itself, of salvation, as the result of which the Reformed theology goes back to the eternal decree; the Lutheran is satisfied with justification by faith." (*Schneckenburger*, (Mediating Reformed).)

13. Stahl (Lutheran), approximating to the view of Schweizer, finds in the "sole causality" which is the notion of Godhead, the controlling principle of the Reformed doctrine, and its character he finds in "modes of thinking averse to mysteries." "The whole Reformed Church structure is on the one side determined by this motive of opposition to mysteries, which tends to a denial of all instrumental distribution of grace—and this it derives from Zwingli—and on the other side it is distinguished by the evangelical theocratical motive, the glorifying of God in the Church; and this it derives from Calvin. (Stahl, *Lutherische Kirche u. d. Union*, 2d ed., 1860; answered by Thomas, 1860, Schenkel, and others.)

14. "All these diverse presentations," says Luthardt, "have as their basis the common supposition that the difference is not merely an external one, is not one which turns merely on particular doctrines—as, for example, the Lord's Supper—but pervades the systems and is a difference in principle. The essential part of the difference hinges upon the elements of the Reformed doctrine, which reciprocally condition each other: the absolute causality and the sole primary causality of God, which excludes means of grace in the strict sense, on the one side, and on the other side an assurance of a state of salvation, grounded in an inscrutable decree—an assurance reached by the individual actual life as the result of the divine operation." (Hundeshagen, *Der Deutsche Protestantismus*, 1847; 3d ed., 1850; Lücke (*On the True Formulating of the Distinction and Union of the Lutheran and of the Reformed Churches*), *Deutsche Zeitschr.*, 1853, 22–53; Schneckenburger, *Vergleich. Darstell. d. Luther. u. reformist. Lehrbeg.* (Güder), 1855; Baur, F. C., *Lehrb. d. Dogmengesch.*, 2d ed., 1858, § 92, 284; Seiss, *Ecclesia Lutherana*, 1868; Krauth, *Conservat. Reform.*, 1871, 122–128; Luthardt, *Komp. d. Dogmat.*, 4th ed., 1873, § 11; Kurtz, *Lehrb. d. K. G.*, 7th ed., 1874, § 140; Kahnis, *Innere Gang d. Deutsch. Protestant-*

ism., 3d ed., 1874, i. 26–39; Do., *Principien*, 1865; Do., *Christenthum u. Lutherthum*, 1871.)

III. *Rise and Early History of the Lutheran Church.*—The beginning of the struggle of the religious life of the Germanic races against Romish corruption was the birth-throes of the Reformation, whose history is the history of the rise of the Lutheran Church. Her earliest annals are interwoven with the personal and official history of Luther. His internal conflicts, his theses, the meetings with Cajetan and Miltitz, the Leipsic disputation, the attraction of Melanchthon into his mighty orbit, his era of storm and pressure (1520–21), the bull, the efforts of Charles V. at repression, the Diet of Worms, the hiding at the Wartburg, the outbreak of radicalism at Wittenberg under Karlstadt (1522–25), the Peasant war and Anabaptist sedition (1529), the controversies with Henry VIII. and Erasmus (1523–26),—all had within them potencies for the future of the Church, on which Luther's name, in the face of his protest, was to be fixed by malice, till in the light of history it became a crown of glory. The Lutheran Reformation showed its unfolding strength in the empire at the Diet of Nuremberg (1522–23); in the extension of the evangelical doctrine (1522–24); at the second Diet of Nuremberg (Jan. 14, 1524); at the convention of Ratisbon (1524), called to resist it; in the growing decision of the evangelical states (1524); in the Torgau confederacy (1526). With the year 1526 the estates began to use the right, successfully claimed at the Diet of Spires, to regulate ecclesiastical matters in their own territories. In the years following (1526–29) a number of the Lutheran state churches began to be established and organized. Electoral Saxony, by Luther's advice, began with a thorough visitation of the churches. The church constitution and Luther's two catechisms (1529), which grew out of this visitation, became guides in the organization and training of other state churches. The Church of Hesse was organized 1526–28, under Lambert. The organization of the Church in Prussia and in other parts of Germany, and in the cities of Lower Germany, took place between 1524 and 1531. Nor was the blood of martyrs wanting to hallow the work of brave confession (1523–29). The first martyrs were two young Augustinian monks of Antwerp (1523), whose memory is kept green by Luther's hymn. The pure faith reached the palace as well as the humble home, and asserted its power by the very side of persecutors. Elizabeth of Brandenburg (1527), in terror of the threats of her husband, fled, disguised as a peasant-woman, to the protection of her kinsman, the elector of Saxony.

Luther labored with every energy of his nature for the great work of the period. The impress of his character on the Lutheran Church is so mighty that we cannot understand the Church without understanding him. No man of our time has been so much quoted against Luther and the Lutheran Church as the great Catholic scholar Döllinger, who in his *History of the Reformation in the Circuit of the Lutheran Confession* (1846; 2d ed. 1852) has indulged in the most unsparing severity. But twenty years later, in his riper time of reflection, when he had come to know Luther better by knowing Rome better, he spoke of Luther as "the mightiest man, the most completely popular character, whom Germany ever possessed;" and expanding at a later day (1871) on this theme, he says: "It was Luther's overpowering greatness of spirit and amazing many-sidedness which made him the man of his time and of his people. It may be said with truth, Germany never had a man who so profoundly understood his people, and who was so completely comprehended, so absolutely absorbed, if we may use that term, by the nation, as this Augustinian monk of Wittenberg. He controlled the heart and mind of the Germanic race as the hand of the musician wakes at will the strings of his lyre. No other man in the whole Christian era has given to his race as much as Luther gave to his—language, a manual of faith for the people (the Catechism), the Bible, the hymns; and everything which his adversaries tried to put in conflict or in rivalry with him seemed flat and weak and pallid by the side of that eloquence with which he entranced men. His adversaries stammered, Luther spoke. He alone has left the ineffaceable stamp of his own spirit alike upon the German tongue and the German mind. The very men among the Germans who from the depths of their soul abhor him as the terrible heresiarch and the betrayer of religion, are forced to speak in his words and think in his thoughts." (Kurtz, *Lehrb. d. K. G.*, 1874, § 129, 2.)

IV. *Early Ecclesiastical Conflicts.*—The Reformation in German Switzerland, under the leadership of Zwingli, had been advancing with many elements of generic affinity with the work of Luther, and with no few marks of specific diversity from it. It was not the purely personal peculiarities of the two leaders, but the origin and internal tendencies of their systems, which led to the sacramental controversy (1525–29). The Lutheran doctrine of the Lord's Supper is one which depends upon methods of interpretation with whose validity the whole distinctively Lutheran system, and indeed the entire biblical churchly system, stands or falls. The Catholic party hoped at the Diet of Spires (1529) to regain what they had lost three years before. The bitter anger which had been aroused by the affair of Pack (1527–28), the excitement of their fears by the rapid progress of the Reformation, the stimulation of their hopes by the improved political prospects of the emperor—which he largely owed to the Lutherans, to whom he was about to show himself so ungrateful—encouraged them to revoke the decision of the Diet of 1526, and to roll back the wave of Reformation as completely as the new decision of a diet could do it. Against this the evangelical (Lutheran) princes made their solemn protestation (Apr. 19, 1529), which gave them the name of *Protestants*, and appealed to the emperor, to a free council, and an assembly of the German nation. It was signed by the elector of Saxony, the landgrave of Hesse, the margrave George of Brandenburg, the two dukes of Luneburg, and Prince Wolfgang of Anhalt—the names which a year later were subscribed to the Augsburg Confession—and by fourteen of the Oberland cities.

V. *The Augsburg Confession; Prologue and Epilogue.*—Philip of Hesse—an uncongenial element all through—not at all believing that "with might of ours is nothing done," in hope of forming a political coalition, endeavored to bring about an accord between the Zwinglian and the Lutheran theologians by a colloquium held at his castle at Marburg Oct. 1–3, 1529. Fourteen articles stated the agreement of the parties. In the fifteenth the Zwinglians conceded that the body and blood of Christ are in the sacrament, but denied the objective character of the presence. The truth is, the fifteen articles stand or fall together by a common principle of interpretation. The tendency which in its feeble beginnings at Marburg denied one, has, where its logic has been ripe and consistent, ended with denying them all. A convention was held at Schwabach later in the same month, at which Luther presented a confession in seventeen articles, based upon the fifteen of Marburg. Charles V., after his coronation, came to Augsburg, whither he had summoned a diet, and there (June 25) was presented the Augsburg Confession, the first and greatest of the distinctive confessions of the Lutheran Church. To the names of the princes which were attached to the protestation at Spires are added the names of the cities of Nuremberg and Reutlingen. A confutation of the Confession was presented Aug. 3. The defence of the Confession against this paper, the Apology by Melanchthon, is the second of the Lutheran symbols.

VI. *Political and State Movements* (1530–55).—The Protestants now formed a defensive alliance at Schmalkald (1530) to last six years. This aided in bringing about the religious Peace of Nuremberg (July 23, 1532). Würtemberg became Lutheran 1534–35. The Reformation was carried through in Anhalt, Pomerania, and Westphalia in 1532–34. The Schmalkald League was enlarged so as to embrace the new Lutheran states; subscription to the Augsburg Confession was the indispensable condition of reception into the league. Bucer brought the Oberland cities to subscribe. The way for this had been prepared by the Wittenberg Concord (May 25, 1536). Paul III. (1534–49) professed to call that general free council which had been so ardently desired. It was convoked for May 23, 1537, at Mantua. In anticipation of the possibility of a council there or elsewhere, Luther, by order of the elector, drew up certain articles of the points which were not or were to be held above all concession—the Lutheran ultimatum. These were considered at Schmalkald, and take their name from it (Feb., 1537). The Schmalkald Articles form the third of the distinctive confessions of the Lutheran Church. The council was never held, and was never meant to be held. The Nuremberg "Holy League" (July 10) of the Catholic princes might have brought on a bloody war, had not the political difficulties of the emperor made it absolutely necessary that he should conciliate the Protestants. There is no denying that the Turk, who threatened Christendom, was often the best friend Protestantism had on earth. All processes against the Protestants were arrested for eighteen months by the Frankfort Suspension (1539). A profound confidence in the ability of Protestantism to maintain itself began to fill the minds of men. The Reformation in Albertine Saxony had been violently held in check by Duke George (1500–39). On his death without issue, his brother Henry was received with jubilation, and the Reformation swept all before it. The March of Brandenburg and several of the neighboring territories received the Reformation 1539.

All hope of a better understanding, of a possible union between the conflicting parties, had not yet vanished.

Many colloquies were held (Worms 1540, Ratisbon 1541), but they served only to show more clearly the invincible character of the cause of separation. Politically, the prospects of the Lutheran states were very brilliant (1539), but the guilty passions and follies of some of the princes were preparing the way for their own humiliation and for deadly injuries to the cause of truth. Under the lowering of the great storm which was coming Luther d. Feb. 18, 1546. The pope had finally consented to call a general council in Trent, a German city, but as little German as possible. The emperor was earnestly desirous of a Reformation in some important particulars, but was determined that it should be in accordance with his own ideas. He used the rivalry and unholy ambition of some of the Protestant princes to separate them from the Schmalkald confederacy. The power which would have been ample to overthrow him was divided. The war of Schmalkald was sprung upon the Protestants. The campaign on the Donau (1546) left the emperor master of all South Germany. Hermann of Cologne was deposed, and the country of the Rhine was lost (1547). The campaign of the Elbe (1547) ended in the overthrow and imprisonment of John Frederick and the landgrave Philip. Then came the imposition of the humiliating and distracting Interim (1548), and the political prospects of the Lutheran Church in Germany reached their hour of profoundest darkness. At this hopeless crisis deliverance came from the man who more than any other was responsible for the evil. In the heart of the elector Maurice, the betrayer for a time of the Reformation, the slumbering sense of honor was aroused. The German and Protestant feelings to which he had been so treacherous again asserted themselves. He was indignant at the continued confinement of his father-in-law. Breaking from the bonds of the emperor, who had used him as his right hand in the repression of Protestantism, he turned fiercely upon him. Like a hunted fox the emperor fled for his life, in darkness, through drifting rain, on the snow-covered mountains. The treaty of Passau (1552) guarantied the Lutheran states equal rights with the Catholic till a new council should be convened. The religious Peace of Augsburg (Sept. 25, 1555) withdrew the limitation as to time. The Lutheran Reformation had proved itself incapable of repression alike by the arts and arms of Rome, by the sagacity of its foe, and the follies of its friends. (Walch, C. G. F., *Geschichte* (*History of the Ev. Luth. Religion as a Proof that it is the True Religion*), 1753; Koecher, *Wahrheit*, chap. xix., xx. (*Truth and Perfection of the Ev. Luth. Religion*), 1755; Ranke, *Deutsche Geschichte im Zeitalter d. Reformation*, 4th ed., 1867–68, 6 vols. 8vo; Weber, *Das Zeitalter der Reformation*, 1873.)

VII. *The Lutheran Reformation Outside of Germany.*—Had the conflict been one of purely moral means, the Reformation would have triumphed throughout Europe. But even the resources of courts and the terrors of persecution could not prevent its wide acceptance. In Northern Europe, the Lutheran Confession found a home among the Scandinavian races. In Eastern Europe, Lutheranism and Calvinism reached the Slavic and Magyar races together. The causes of the preference for the one or the other type of reformation were partly personal and local, but were far more associated with national, race, and political characteristics, which corresponded with the more radical tendency of Calvinism on the one side, the more conservative character of Lutheranism on the other. The Lutheran Reformation was triumphant in Sweden (1527) under the influence of Gustavus Vasa. In Denmark and Norway the Lutheran organization was confirmed by the Diet of Odense (1539), and by the middle of the century the lands of the Baltic coast and Courland, Livonia, and Esthonia were embraced in the great Lutheran family. (Münter, *Kirchengeschichte v. Dänemark u. Norwegen*, 1834; Fryxell, *Gustav Wasas Leben*, 1831; Weber, *Zeitalter d. Ref.*, 530–573.)

VIII. *Doctrinal Controversies in the Lutheran Church in the Sixteenth Century.*—(See articles ADIAPHORITES, ANTINOMIANS, FORMULA OF CONCORD, CRYPTO-CALVINISTS, KARG, MAJORISTS, OSIANDER, PHILIPPISTS, PREDESTINATION, SAXONY VISITATION (ARTICLES OF).) For literature see Kurtz, *K. G.*, 1874, § 141, and see the works of Dorner (1867), Frank (1862–63), Heppe (1852 s.), Planck (1791–98), Loescher (1722–24), Thomasius (1848), Walch (1730–39), Krauth, *C. Ref.* 147.) The internal questions which agitated the Lutheran Church were determined in the FORMULA OF CONCORD (1577), which closes the collection of the confessions which appeared under the title of BOOK OF CONCORD (1580). (See both these articles.) "There have been those who lamented that it was not conceded to Philippism to speak the final word. But before tendency can impart character it must have character; and this was wanting to Philippism. Nothing but a positive Lutheranism had the theological potencies, the firmness and definiteness of doctrine, the sharpness of boundary, the impress of the consciousness that it is a right in that in which it is distinctive, the energy of witness, the principles on which established churches alone can rest, which was the problem to be solved." (Kahnis, *Innere Gang*, i. 54, 55.)

IX. *Church Polity.*—In her ecclesiastical constitution the aim of the Lutheran Church was to avoid the hierarchical subjection of the State to the Church, and the Cæsareo-papal lording of the State over the Church. The former, which depended on herself, she perfectly secured; in the latter, which was influenced by state plans, she was not always so happy, and in various ways the political complications of the time embarrassed the practical application of her principles. (See CONSISTORY, EPISCOPAL SYSTEM, POLITY (ECCLESIASTICAL).) (See *Die Kirchenordnung* (*The Church Order of the Ev. Lutheran Church of Germany in its First Century*), 1824; Richter, *Geschichte* (*History of the Evangelical Church Polity in Germany*, Leipsic, 1851.)

X. *Worship and Art.*—The worship and the range of art in the Church were meant to meet the wants both of the judgment and of the emotions. A perfect freedom was claimed for the Church in all the purely human regulations of worship. She could add, drop, or change, prudently and in love, according to her judgment of what was best. Her essential unity was that of faith, not of forms. But the spirit of her faith pervaded all her forms. A thorough conservatism was observed. The legitimate results of the historical growth of the Church were treasured. The expressive ornaments of the altar and the innocent usages dear to the people were retained. The Romish perversion of the mass, all rites that taught or insinuated unsound doctrine, were thrown out, and the evangelical mass, the pure communion service, remained. The pulpit became a power. The people took part everywhere in worship, which as of old was responsive. They heard God's word and uttered his praises in their own tongue. The biblical festivals of the Church year were retained. Painting (Cranach, the Holbeins, Dürer) and statuary hallowed their gifts for the sanctuary. (See Jacoby, *Liturgik. d. Reformation*, 1871; Kliefoth, *Ursprüngl. Gottesdienstordnungen in l. K.*, 1847; *Liturg. Abhandlungen*, 1854 *seq.*; Schöberlein, *Ausbau*, 1859; Krauth, *Evangelical Mass and Romish Mass; Sunday Services according to the Liturgies of the Churches of the Reformation; Jubilee Service*, 1867.)

XI. *Hymns.*—The hymns for the people were one of the grandest achievements of the Lutheran Reformation. They are full of simplicity, unction, and divine objectivity. Holy song was as widereaching, as incapable of exclusion, as soft and wooing, as mighty and irresistible, as the air on whose pulsations it spoke heart to heart. Among the greatest hymn-writers are Luther; Speratus, d. 1554; Decius; Eber, d. 1569; Spengler, d. 1534; Mathesius, d. 1565; Alber, d. 1553; Weisse, d. 1540, of the first half of the century; in the latter half we have Ringwaldt, d. 1597; Selnecker, d. 1592; Herberger, d. 1627; Nicolai, d. 1608. "In worship the austere Old Testament psalmody of the Reformed presents a striking contrast with the cordial internality of the Lutheran Church song, gushing from the living spring of the spirit of poesy." (*Baur.*) Koch, *Geschichte* (*History of Hymns and Church Song, especially in the Evangelical Church*), 3d ed., 7 vols., 1866 *seq.*; Wackernagel, *German Hymns from Luther to Hermann*, 1841; *From the most Ancient Times to the Beginning of the Seventeenth Century*, 1867 *seq.*; Mützell, 1855; Palmer, 1865; Kübler, *Historical Notes to the Lyra Germanica*, 1865; Miller, *Singers and Songs of the Church*, 2d ed., 1869.

XII. *Church Music.*—The congregational singing was a revival of the Ambrosian choral over against the priestly Gregorian chant. It was choral, for the people and the choir blended into one in this noble form of song. Among the composers of this era are Luther and his familiar friends Rhaw and Walter. Eccart (d. 1611) did much for church music.

XIII. *Practical Life.*—The Christian life was one of humble, joyous assurance. The clergy were marked by devotion to the pastoral work, and by fidelity in the pulpit and in the religious instruction of the young. Without a severe church discipline they trained the people in the fear of God, in personal honor, and in the domestic and civil virtues. "In the administration of church discipline the Lutheran Church is beyond dispute very much behind the Reformed; on the other hand, the moral life in the Lutheran Church has a character of greater freedom, of more heart and soul, resting more on internal motives." (*Baur.*) That there were painful exceptions is not only the necessary general result of the common infirmities of human nature, but is connected with this fixed law, that the times following great struggles, warfare, and change, even of the most hallowed character, are times of reaction and relaxation. The immediate sequence of a successful war for truth and virtue is a revival of the potency of many elements of falsehood and vice. The storms that give a long purity may work temporary devastation.

When the calm with its happy results had been finally reached, "there came in domestic life a solidity—nay, a hallowing unction—such as had never been before." (F. R. Hasse, *Kirchengesch.*, 1872, 619.)

XIV. *Theological Science.*—The nature of the times gave great prominence to polemic theology. Whatever part of theology was taken up was handled with special reference to its availableness as a means of defence or enlargement of the restored truth. The ploughshares were beaten into swords. Luther, Melanchthon, Flacius, Brentius, Chemnitz, and the co-workers in the *Magdeburg Centuries* are still unforgotten names. The centres of theological culture were the great universities of Wittenberg, Tübingen, Strasbourg, Marburg (1527), and Jena (1557). (See Dorner, Frank, Gass, Heppe.)

XV. *Transitions of Lutheran Established Churches in the Sixteenth Century.*—The Crypto-Calvinistic designs had contemplated a general removal of the Lutheran Church from its first foundations. Crypto-Calvinism was concerned mainly with the sacramental doctrines. It was really farther from what is now considered as by pre-eminence Calvinism than Lutheranism itself had been. It was unionism deriving its special features from the times. Its designs were thwarted, yet the Palatinate under Frederick III. (1560), Bremen (1562), and Anhalt (1597) were transferred by their civil rulers to the Calvinistic communion.

XVI. *The Lutheran Church in the Seventeenth Century.*—1. Hesse Cassel (1604), the earldom of Lippe (1602), the court (but not the people) of the electoral house of Brandenburg (1613), became Calvinistic. Various attempts at union (Leipsic, 1631; Thorn, 1645; Cassel, 1661) accomplished nothing. The ardor for union was so great that its representatives drove Paul Gerhardt and others from their flocks into poverty and exile for declining to treat the distinctive faith of the Lutheran Church as a thing indifferent.

2. The peril of peace is the peril of stagnation. The Lutheran Church had undergone the ordeal of a war of polemics; she was to undergo the trial of a comparative internal repose. She now reached her mediæval period, rich in construction, comparatively poor in origination, not by declension, but by the ordinary law of historic progress. "That it was not an age of spiritual death which succeeded the Reformation has been abundantly shown by Tholuck in his *Evidences of Life in the Lutheran Church.* The great dogmatic works of the Lutheran Church may be regarded, both for their accurate delineation and subtle elaboration of notions, as works of art and models. The one-sidedness into which the Evangelical Church fell was contrary to its own nature. Hence, a reaction could not fail to take place within the Church itself. Among Lutherans it was found on the part of the *intelligence* of the Church, in Calixtus and the Syncretistic controversies, on the part of the religiously inclined *will* in Spener, or the part of *religious feeling* in mysticism and Zinzendorf." (*Dorner.*) Within the determined orthodoxy rose various questions, but in many of them the interest was confined to theologians. The controversy on syncretism originated in the views of George Calixtus. With pietism in its early stages are associated the names of Spener and Francke. "Compared with the Reformed, the Lutheran Church was the subject of a slower, but also of a more united and more consecutive, development. This development was moreover less disturbed by schisms. The dissensions which arose remained within the same ecclesiastical community, hence they were of necessity more thoroughly investigated and understood—a fact which in many instances resulted in the combination of the lawful elements found in opposing parties." (*Dorner.*) "In the Lutheran Church it is the doctrine to the development of which the whole activity is directed; in the Reformed it is the polity, the form of the Church as a communion. In the one the centre is philosophy and speculation; in the other, it is direct reference to practical life. In the one philosophico-theological systems rise and crowd each other out of the way; in the other, it is not systems, but sects, which take shape and struggle for the ground." (*Baur.*)

3. In theological literature are found among the names still treasured, Glassius, Pfeiffer, the Schmidts (Erasmus and Sebastian), Geier, Calovius, Hutter, Gerhard, Quenstedt, Hunnius, and Musæus.

4. The age is brightened also by the works of many of the noblest representatives of a living, internal Christianity. Among them are Arndt (*True Christianity*), Gerhard (*Meditations* and *Schola Pietatis*), Heinrich Müller, Scriver, and Andreæ. The lovers of mysticism and theosophy treasure Jakob Böhme and Gottfried Arnold.

5. The century was rich in hymn-writers. Those of the earlier part were marked by the old objectivity—those of the later, by the growing tendency to subjectivity. There was an intermediate school, whose greatest representative, Paul Gerhardt, harmonizes both tendencies. Church music was nobly represented by the great composers Crüger, d. 1662; Rosenmüller, d. 1686; Hammerschmidt; Ahle, d. 1673.

XVII. *The Lutheran Church in the Eighteenth Century.*—1. *Before "the Illumination."* After the death of Spener (1705) and Francke (1727) pietism degenerated very rapidly. That this mischievous extreme was not the absolute necessary outgrowth of the principles of the great leaders in the pietistic movement is shown by the fact that out of Halle also went forth forces into the Church the beneficence of which is beyond all dispute. There arose a generation of Lutheran divines as pious as the pietists, as orthodox as their opponents—who neither arrayed piety against orthodoxy nor orthodoxy against piety, but showed by pen and life that true piety is orthodox, and that true orthodoxy is pious. "From Calixtus they had learned mildness and equity toward the Reformed and Catholic churches; from Spener they had drawn the impulses to a heart-deep piety, through which streamed the fresh and fructifying life of theological science. Even the one-sidedness of Arnold had taught them that truth is to be followed, though it may take from heretics and sectaries mistaken and distorted shapes. From Calovius and Loescher they inherited a devotion to pure doctrine." (Heinrich Kurtz, *K. G.*, § 166.) Of this school, though not in equal degrees, may be named Hollazius, Starck, Buddeus, Cyprian, J. C. Wolff, Weismann, Deyling, J. G. Carpzov, J. H. and C. B. Michaelis, J. G. Walch, Pfaff, Mosheim, Bengel, and C. A. Crusius. Of the philosophical Leibnitzo-Wolfian school were S. J. Baumgarten, Reinbeck, and Carpov.

2. *Church Polity.*—The (politico-) episcopal system of polity had claimed at first to be simply a necessity. This transmuted itself into the assertion of a principle (Carpzov, 1645). It was supplanted by the territorial system (Thomasius and Böhmer, beginning of the eighteenth century). A third system, the collegial, detached from the political abuse of it, is more in accordance with the original position of the Lutheran Church. It was in its new shape the outgrowth of Spener's views, and found an able exponent in Pfaff (1719). (See POLITY, ECCLESIASTICAL.) (Richter, *Gesch. d. ev. Kirchenfass.*, 1851, 208; Lechler, *Gesch. d. Presbyt. und Synod. Verfassung.*, 1854, 228.)

3. *Worship.*—The hymn-writers of this era show the influence of the spirit of Spener in the earnest piety which is their strength, and in the individualism which is their weakness. The early hymns were hymns for men to sing together—the later hymns were hymns to be sung by men in separateness, and sometimes of the sort that men are not likely to sing at all. The degenerating pietism corrupted the music of the Church. This tendency was met by John Sebastian Bach, who in many of the highest attributes of his art was "the greatest master of all times," the lover and the glorifier of the ancient choral. Handel (d. 1759) gave his ripest years to oratorio, and in his *Messiah* reached by the inspiration of music what Milton had failed to attain in *Paradise Regained.*

4. *Missions.*—The new life of the purer pietism showed itself in establishing missions among the heathen. At the Danish mission at Tranquebar (1704) labored Zeigenbalg (d. 1719). From Halle went forth Schwarz (d. 1790). Callenberg founded at Halle (1728) an institution for the conversion of the Jews. Hans Egede (1721) went to Greenland, and when in 1736 he returned to Denmark and established a mission-seminary for Greenland, his son Paul took his place. (On Lutheran missions see Francke, *Berichte d. dän. Miss. in Ostind.*, 1708–72; Egede, *Descript. of Greenland*, transl. from the Danish, Lond., 1745. Wiggers, *Gesch. d. evang. Miss.*, 2 v., 1845; do., *Statistik*, 2 v., 1842–43; Plitt, *Kurze Gesch. d. luth. Miss.*, 1871; Shoberl, *Present State of Christianity and of the Missionary Establishment*, 2d ed., 1829; Aikman, *Cyclopædia of Christian Missions*, 1860; Newcomb, do., 1860; Brown, Wm., *Propagation of Christianity among the Heathen since the Reformation*, 3d ed., 1864.)

5. *The Rationalistic "Illumination."*—From the middle of this century rationalism, claiming the title of "Illumination," or enlightenment, made rapid progress. Rationalism having its root in the general infirmity and corruption of human reason, abusing the freedom of investigation which is demanded by the nature of Christianity, and is enunciated as a vital principle by Protestantism, has co-existed in some shape with the Church from its first hour to the present. In the eighteenth century it was intensified by causes of wide extent and great potency, and revealed itself in every great communion of Western Christendom. Lutheranism had been charged by Rome with giving undue weight to human reason—not indeed as over against the Word, but as against church authority—and Rome was as-

sailed through the whole Reformation, by both the great Protestant parties, as rationalistic and Pelagian in many of her doctrines. The great leader in the rationalistic criticism of the eighteenth century was the Roman Catholic Oratorian, Simon, who died 1712, nearly ten years before Semler, the father of rationalism in the Lutheran Church, was born. The Reformed tendency was resisted by Lutheranism as unconsciously rationalizing. But the unequivocal tendency had been shown first in Socinianism, and afterwards in the advanced Pelagianism of Arminians of the school of Le Clerc (d. 1736). England contributed her deistic writers. In France, naturalism and atheism became fashionable, and Frederick the Great helped to domesticate them in Germany. Freemasonry as it had been transferred from England in 1733, the Wolfian philosophy, and the perversions of philosophy in general, the later pietism, and the separatism it engendered, aided in the work of mischief. Rationalism is infidelity in various degrees, under the forms of Christianity. The supranaturalism which met it was more or less under the latent influence of the thing it combated, as the English apologetics of the century showed tinges of the deism with which it fought. The higher philosophy and national literature, though in seeming affinity with rationalism on the surface, were yet in their antagonism to its prosy doctrines, its plausible shallowness, emptiness, and self-sufficiency its invincible foes in their deepest and final workings. (See RATIONALISM, SUPRANATURALISM, PHILOSOPHY (GERMAN).)

6. *Opponents of Rationalism.*—In the darkest time some were among the unfaithful faithful found. Imperfect as was the work of the supranaturalists, the best of them did noble provisional service. They at least kept a polar twilight where there might have been a midnight. Outside of the ranks of the theologians, Claudius, Hamann, and Oberlin, the pastor of the Ban de la Roche, are among the unforgotten names. Under a common pressure the faithful hearts of the separate communions were drawn closer to each other.

7. *Influence of Rationalism.*—Under the baleful influence of rationalism every sacred interest declined. The pulpit lost its power; no living hymns were produced, and the old were unsung. In music the ancient beauty and glory of the choral vanished; men sought the concert-room and the theatre, for which the music of the time was better suited than for the church. The oratorio gave way to the opera. The conservatism of Rome itself yielded, and Palestrina's noble school sank before the self-sufficiency of operatic organists and choirs. The liturgies which were offered, too frequently with success, for the historical services of the Church, are beneath the ludicrous. They are too dreary to awaken the smile which their absurdity seems to challenge. Rationalism had shown that its problem is not as between forms of religion, but as between religion and irreligion. (See Walch, C. W. F., *Neueste Religions-Geschichte*, 1771–93; Tittmann, 1824; Pusey, Saintes (transl. 1849), Kahnis, *Innere Gang*, 3d ed., 1874; Tholuck, *Verm. Schr.*, ii., 1839; Gass, vol. iv., 1868; Hurst.)

XVIII. *The Lutheran Church in the Nineteenth Century.*—1. *Reaction of Church Life.*—The revolutionary excesses of France, and the awe-inspiring providences growing out of them by development or counteraction, which marked the fifteen opening years of the nineteenth century, had tended to sober men, to turn their eyes to God, and to show them how poor are the substitutes which had been offered for the simple, deep, and earnest faith of the olden times. All deep thinking tends as a finality against skepticism. Reason is the cure of unreason. Kant, Fries, the Fichtes, Schelling, Hegel, Herbert, Schopenhauer, Ulrici, Lotze, Von Hartmann, in simple virtue of helping to earnest thinking, work in one school. The strata of the extinct help to finish the world. Superficiality is the only incurable vice of mind. The earnest thinking instantly showed itself as a better thinking. Pietism renewed its better youth. The ninety-five theses of Claude Harms (1817, the close of the third centenary of the Lutheran Church) recalled the Reformation to the minds of all, to the hearts of many.

2. *Union and Separation.*—Frederick William III. began in 1817 the movements looking to the union in one state Church of the Lutheran and Reformed. Strong opposition rose on the side of many earnest Lutherans. Among them may be mentioned Scheibel (d. in exile 1843), H. Steffens (1831), Kellner, whose church was opened by military force for the Agenda (1834), Guericke (1835). Frederick William IV. released the clergymen who were imprisoned, and a free Lutheran Church was organized 1841, and received the royal concession 1845. Separation also arose within the separated, on questions affecting the constitution of the Church, in which the distinguished jurist Huschke represented the conservative, Diedrich the radical view. A decision of the general synod of 1859 adverse to the view of Diedrich led to his separation from the synod (1861). A free Lutheran conference of the friends of separation from the unionistic state churches was held Oct. 28, 1874, at Eisenach, the object of which was to promote a better understanding and a more perfect sympathy and mutual support. In the discussion of the questions raised by the union, see Rudelbach, *Reformat. Luth. u. Union*, 1839; Müller, Jul., *Evang. Union*, 1854; Nitzsch, *Urkundenbuch*, 1853; Stier, *Unlutherische Thesen*, 1854; Schenkel, *Unionsberuf*, 1855; Schulz, K., *Die Union*, 1868. See citations under § II. of this article.

3. *Confederations.*—Various confederations attempted to co-operate with or supplement the union, so as to bring into practical co-working the elements which had been joined but not united in it. Among them are the Gustavus Adolphus Association (Oct. 31, 1841), the Evangelical Church Diet (1848), at whose meeting in Berlin (1853) the Augsburg Confession received a qualified recognition as the common confession of Protestant Germany; the Eisenach Conference (1846, 1852).

4. *Distinctive Lutheranism within and without the Union.*—Within the union distinctive Lutheranism still remained a great and active power. Many Lutherans remained within the union to fight the battle for truth there, and to obtain, if possible, a restoration of the solemnly guarantied rights of the Church. The chief organs of this position were Hengstenberg's *Kirchenzeitung* and the *Volksblatt* of Nathusius (d. 1872). Lutheranism outside of the union was represented in the general Lutheran conference (1866, 1868, 1870, 1872), among whose distinguished names are Harless, Kliefoth, and Luthardt. Its organs are the Erlangen *Zeitschrift* (1838) and Luthardt's *Kirchenzeitung* (1868).

5. *Hymns and Music.*—The awaking consciousness of the Church led to noble and successful efforts to correct the wretched state into which the rationalistic Vandalism had brought the hymns, the music (the choral has been the pulse of the Church), the service, and the popular religious literature. Moritz Arndt, Von Raumer, Bunsen, Stier, A. Knapp, Daniel, Layritz, the Eisenach Conference (1853), and Wackernagel have labored in the revival of hymnology. Natorp, Thibaut, Grüneisen (1843), Winterfeld (1843), and V. Tucher (1848) have done valuable service in the restoration of the choral.

6. *The Theology of the Nineteenth Century* could only have risen in a land which had received the ineffaceable impression of Lutheran life and thought. The grandeur of the wildest perversions of this theology and the ruins of its most unsparing destructiveness were only possible on the presupposition of eras of gigantic building. The ancient Lutheran theology, after the storm of war had swept over it, stood like Tadmor in the wilderness. Its ruthless foes could not build, and could only destroy because the greater generations had builded; but they could not perfectly destroy—they could only dismantle what was too massive to be overthrown. The Protestant theology of Germany is represented (1) in the older and in the historico-critical rationalism; (2) in the old supranaturalistic schools, embracing rational supranaturalism, the stricter or suprarational supranaturalism, and the pietistic supranaturalism; (3) the mediating theology whose father is Schleiermacher. Among its representatives from the Lutheran side are Lücke, Bleek, Nitzsch, Jul. Müller, Ullmann, Twesten, Dorner, Liebner, Martensen, Ehrenfeuchter, Beyschlag, and Köstlin; (4) *Lutheran Theologians of the Confession.* The patriarch among these was Claude Harms (d. 1855). Among its representatives in what might be called a first generation are Sartorius (d. 1859), Rudelbach of Denmark (d. 1862), and Guericke. The divines of a second generation show certain divergencies of view on parts of the theory of the ministerial office and of the Church, and on the construction, spiritualistic or realistic, of prophecy, especially on the parts in which Chiliasm is involved. In a first group may be placed Harless, Höfling (d. 1853), Thomasius, Keil, Caspari, Krabbe (d. 1873), Philippi, Dieckhoff, Zöckler, Wuttke (d. 1870), Harnack, Oettingen, and Frank. In a second group, distinguished by its strong views of the Church and ministry, are Löhe (d. 1872), Vilmar (d. 1868), Kliefoth, and Zezschwitz. In a third group, distinguished by its realistic tendency in the interpretation of prophecy, are placed C. K. v. Hofmann, Drechsler (d. 1849), Delitzsch, Luthardt, M. Baumgarten, and Oehler (d. 1872). In their earlier position Kahnis and Thiersch were strictly confessional.

The great jurists Göschel (d. 1862) and Stahl (d. 1861) were also theologians of the Lutheran Confession. The works of the great writers on church polity, Eichhorn (d. 1854), Jakobson, Puchta, Richter (d. 1864), Dove, Bickell, and others, are of great importance in many of the discussions which have been specially characteristic of the Lutheran Church in this century—whose problem is the embodiment of the soul of her doctrine in a sound polity, a

constitution which shall as adequately conform to her common life as her confessions conform to her common faith. (See Baur (1863), Nippold (1867), Kahnis (4th ed., 1874), Hagenbach, *Kirchengeschichte des 18. und 19. Jahrhunderts* (4th ed., 1870–71); Schwarz, *Zur Geschichte der Neuesten Theologie* (3d ed., 1864); Mücke (1867); Lichtenberger, *Histoire des Idées religieuses en Allemagne depuis le milieu de XVIII^e Siècle jusqu'à nos Jours* (Paris, 3 vols., 8vo, 1873); Kurtz, *Lehrbuch* (7th ed., 1874, § 183).)

7. *Practical Life.*—With the reviving doctrinal life came the spirit of missions. The outgrowths of the life of inner missions are so numerous that their names would fill pages. Wichern founded the Rauhe Haus 1833, the institute for girls at Berlin 1858, and has been the father of a great number of beneficent institutions and reforms. With the deaconess institutions are associated the names of Fliedner and Löhe. Among the associations and schools for foreign missions may be mentioned the Society of the Rhein (1829), the North German (1836), Jänekes (1800), and Gossner's, all of which have a predominantly Lutheran character. The Dresden Missionary Society has a positive Lutheran character (1836). It transferred its seminary in 1848 to Leipsic, to give its pupils the advantages of the university. It has taken up again the ancient mission-work of the Lutheran Church in India. All the Lutheran lands have mission societies. The Hermannsburg Mission Institute, under the direction of Louis Harms (d. 1865), has developed an energy almost unexampled. (See MISSIONS, FOREIGN.)

8. *Statistics.*—The total number of Lutherans is probably about forty millions, including the Lutherans in the union churches. The purely *local history* and *statistics* of the Lutheran Church properly belong to the different countries and states in which the Church exists—America (North and South), Anhalt, Austria, Baden, Bavaria, Belgium, Bohemia, Bremen, Brunswick, Carinthia, Carniola, Darmstadt, Denmark, England, France, Hamburg, Hanover, Hesse-Cassel, Holland, Hungary, Iceland, Lippe, Lubeck, Moravia, Mecklenburg, Norway, Oldenburg, Poland, Prussia, Russia, Saxony, Styria, Silesia, Sweden, Thuringia, Transylvania, Westphalia, Würtemberg. In all these the Lutheran Church has a historical record. (For confessions, see CONCORD, BOOK OF, and the creeds there enumerated. For special doctrines and controversies see CONCOMITANCE, CONSUBSTANTIATION, LORD'S SUPPER, SACRAMENT, SYNCRETISM, SYNERGISM, etc. See also POLEMICS, POLITY (ECCLESIASTICAL), PROTESTANTISM, REFORMATION. For the most recent special history, see SEPARATE LUTHERANS OF PRUSSIA, UNION, EVANGELICAL. For divines, see CHEMNITZ, LUTHER, MELANCHTHON, MOSHEIM, etc.; statesmen, ERNEST THE PIOUS, GUSTAVUS ADOLPHUS, etc.; philanthropists, FLIEDNER, FRANCKE, HARMS, OBERLIN. See also EDUCATION, UNIVERSITIES, etc. The literature will be found in this article classified at its several places.) C. P. KRAUTH.

Lutheran Church in the U. S. I. *The Era of Beginnings and Dependence.*—1. The first Lutheran immigration into America was from Holland, and may have been hastened by the troubles, religious and civil, connected with the struggles between the Calvinists and Arminians (1610–19). A little band of Dutch Lutherans came (1621–26) to what was then called New Amsterdam, and is now New York. In 1644 a number of North Germans were added to them, but their worship was conducted in private houses. Strong efforts were made to lead them to conform to the Calvinistic Church of Holland. Stuyvesant forbade their meetings, and fines and imprisonment were imposed for their refusal to obey. They petitioned the Directory of Holland for permission to call a preacher and have public service, but in vain (1653). Götwater was sent by the Lutheran Consistory as pastor (1657), but was not allowed to preach, and, with a promptness checked only by his sickness, was sent back to Holland. The English took the city in 1664, and freedom of religion was accorded the Lutherans. Fabricius, their first pastor, began his labors 1669. A small church was built in 1671, removed by the Dutch in 1673, but another church was built on the same site in 1703. In the same year Falkner became their pastor. Berkemeyer succeeded him in 1725–32 (d. 1751), and Knoll, who resigned in 1750.

2. *The Swedish Lutherans* came next. Gustavus Adolphus had designed to open in America a place of refuge for the persecuted Protestants of Europe, and Oxenstiern attempted after the death of the king to carry out his plan. Fifty Swedish immigrants, with their preacher, landed (1636–37) on Delaware Bay, and bought land of the Indians. Minneuit, the leader of the expedition, who built Fort Christina, died in 1641; Torkillus, the first pastor, died in 1643. Campanius, their next minister, led in the great work of missions among the Indians, and translated into the language of the Virginia Indians Luther's *Catechism*. Stuyvesant seized the colony, then numbering about 1000 souls, and brought it under the Dutch rule. The church at Wicaco was built 1669, and Fabricius, the first pastor of the Dutch Lutherans, took charge of it in 1677 (d. 1692). The appeal in 1693 for preachers from their native land was successful. A church was built in Christina in 1699, and a second one in Wicaco in 1700, in a substantial style which attested the earnestness and liberality of the builders. In our own day a new and immense influx of the Scandinavian nationalities has taken place, making now a population of about a million and a half in our land.

3. *The German Lutherans*, last in coming, were destined to be the mightiest element of the future growth of the Church. *a. In the North.*—They began to settle in Pennsylvania in 1680, soon after the grant of the province to Penn. Emigration began on a large scale in 1710, when between 3000 and 4000 Germans from the Palatinate and Suabia came to New York with Brigadier Hunter. Some of them went to Germantown at once. In 1723 the large body of those who had remained went to Pennsylvania. The congregations in Philadelphia, Providence, and New Hanover sent a deputation in 1733 to beg for ministers and other aid. The petition was regarded with special interest by Ziegenhagen, the Lutheran court-preacher in London, and by C. A. Francke, who ought not to be confounded, as he constantly is, with his illustrious father. The younger Francke, to whom our Western World owes a debt of gratitude it can never pay, sent a man destined to become the patriarch of the Lutheran Church in America, HENRY MELCHIOR MUHLENBERG (which see). First visiting Georgia, he came in 1742 to Philadelphia. Strong in the faith of the Lutheran Church, and full of the earnest piety of the true school of Spener and Francke, he abounded in wise energy which was divinely blessed. In 1744, Brunnholz, Kurtz, and Schaum came from Halle, and in 1748 Handschuh and Hartwig (founder of the seminary), in 1758 Bager, in 1769 Helmuth and Schmidt, in 1770 Kunze. *b. In the South.*—The Salzburgers were driven from their homes in the dead of winter (1731–32) by the Romish archbishop Count Firmian. Aided by English Christians, forty-two families of them came to Georgia with their preachers, Bolzius and Gronau. They gave the name of Ebenezer to the colony they established. Their number was enlarged in 1735. The Salzburger orphan-house was founded in 1738. In 1741 the number of Lutherans in Georgia had reached 1200. Gronau died 1745; Lemke was sent from Halle as his successor. Rabenhorst came with a new band in 1752, and established the first Lutheran congregation in Charleston, S. C. In the early part of the eighteenth century many Germans went from Pennsylvania and other parts of the colonies to North Carolina. In 1730 the Lutheran Church was established in Frederick, Md. In 1735 a settlement of Lutherans was formed in Madison co., Va., where the congregation still continues. The Lutheran church in Winchester, Va., was received into connection with the synod of Pennsylvania in 1762. Immense immigrations in the later era have come from Germany. The German population of this country may be safely estimated at 7,000,000, and the Lutheran is the largest of the religious bodies among which they are divided.

II. *Era of Synodical Organization.*—The labors of Muhlenberg and of his noble co-workers were soon felt, and the Lutheran Church began to come to a consciousness that she was to be a distinct and independent power in the New World. The German Evangelical Lutheran Ministerium of Pennsylvania and adjacent colonies was organized Aug. 14, 1748. With the Pennsylvania ministers at the first meeting were present Hartwig from Rheinbeck, N. Y., and the Swedish pastors, the provosts Sandin and Näsmann. The dates of the formation of the earlier synods are as follows: Synod of New York, 1785; South Carolina, Corpus Evangelicum, 1787; North Carolina, 1803; Ohio and adjacent States, 1818; Maryland and Virginia, 1820; Tennessee, 1820; S. W. Pennsylvania, 1825; Virginia, 1830; Hartwick, 1830; Synod of the West, 1835; English Synod of Ohio, 1840. The present number of synods is about 54. A great event in this era was the organization in 1847 of the Synod of Missouri, Ohio, and other States. It has been by pre-eminence the representative of Lutheran orthodoxy. Its founders were brought by religious convictions to the Western World. They experienced and overcame almost every kind of trial. The "Old Lutherans" from Prussia, forming the Buffalo synod, have fought and endured for the truth's sake, and have revived in our time the intensity of the martyr spirit of the ancient Church, both in testimony and endurance, and the synod of Missouri, composed of Saxon Lutherans originally, has shared in the same spirit of earnestness. This synod has done much for general and theological education, and for Church literature, both periodical and permanent. It has establish-

ed a carefully arranged congregational order and discipline, has testified against all unionistic combinations both in the pulpit and at the altar, and against secret associations and all connivance with error. Its decided views and practices have not been maintained without violent controversies. The Synodical Conference of 1871 is the outgrowth mainly of its work. One of the most persistent of the antagonistic—or rather of the antagonized—bodies has been the Iowa Synod, which was formed in 1854. It is unreserved in the acceptance of the confessions of the Church, but considers them safeguards of its liberty as well as of its purity, and therefore considers the questions left undetermined by them, or which do not involve articles of faith, as open questions. It is distinguished by a large and noble spirit. It has shown great interest in the General Council, but stands only in an advisory relation to that body, because of what it regarded as the indeterminateness of its position on the fellowship of the pulpit and the altar. (See *Denkschrift . . . d. deutsch. E. L. S. v.* Iowa, 1864.)

III. *Efforts at General Organization.*—In 1820–21 the General Synod was organized; in 1863 the General Synod of North America (South); in 1867 the General Council; and in 1872 the Synodical Conference. The General Synod is largely unionistic, but with growing elements of a more churchly character; the General Synod of the South has a larger relative strength of the conservative element; the General Council, strictly Lutheran in confession, has failed to satisfy in the practical application of its principles in discipline on the "four points," the tendency which has found embodiment in the Synodical Conference. The "four points" are pulpit and altar fellowship, Chiliasm, and secret societies. The latest utterances of the General Council (Galesburg Oct. 11, 1875) have been so decided as to preclude all doubt as to its attitude on the two former questions. The work of this body in educating the mind of the Church and developing it has been very great, and in it a practical co-ordination of languages and nationalities almost without a parallel has been established. It embraces Danish, Norwegian, English, and German elements.

IV. *Internal History.*—1. *Pietism.*—The Lutheran Church in America has been throughout its entire history sympathetically affected by the condition of the Church in Germany. The mighty influence of the better Pietism has been felt all through its history, and is felt to this hour. Muhlenberg and the best men of his entire school were of the class of churchly pietists, strong in the faith of the Lutheran Church, and fully believing that the faith they confessed ought to be, and is in its proper nature, a power of regenerate life. They stamped upon the Church in America a spirit of solicitous care in things "indifferent," so far as those things naturally connect themselves with morals. They imparted to it a character of earnest devotion, activity in good works, justice to other Christians, gentleness to brethren. But Pietism here, as elsewhere, has shown its innate dangers, running out sometimes into superficial moralism, officious scrupulosity, laxity in doctrine, fanaticism in feeling, and unchurchliness in practice.

2. *Rationalism.*—The evidence of the presence of scattered rationalistic elements in the Lutheran Church in America in the first quarter of this century is given in the earnest solicitude of its best men to meet it and overthrow it. Rationalism never came to sufficient strength to avow itself, but moved furtively, showing itself rather as a negation or ignoring of the true than as an explicit avowal of the false. The position of those most widely suspected of affinity with it was indeterminate and a matter of dispute. But while the Church as a whole remained true to the orthodoxy which forms the common basis of nominal Protestantism, a great deal of looseness was allowed in regard to the ancient distinctive orthodoxy of historical Lutheranism. Dr. Hazelius wrote (1846), "We are fast verging to the other extreme, in believing that the great spirits of the Reformation scarcely preserved common sense when their deep-thought theories do not square with our superficial view of things." (*Hist. of the Amer. Luth. Church,* p. 250.)

3. *Unionism.*—Partly from pietistic, partly from rationalistic sources, and most largely from the dominant tendencies of the sect-life of America, the unionistic tendency has been shown in some extreme cases, even to the degree of proposing an organic fusion of the Lutheran Church with some other Church. Especially has this feeling been strong towards the German Reformed Church. But the unionism of the parts of the Church in which it is strongest has ordinarily gone no further than the encouragement of great freedom in the exchange of pulpits and in invitations to the Lord's Supper, the placing of a lax, and sometimes of an unfavorable, estimate on the distinctive doctrines of Lutheranism, and an interest in the syncretistic plans of union. Dr. S. S. Schmucker was one of the earliest and ablest advocates of the Evangelical Alliance. The great controversies of the most recent period have turned upon these unionistic tendencies. The General Synod warmly encourages them; the Synodical Conference rigorously opposes them; the General Council also earnestly opposes them, but has allowed within a carefully restricted range the possibility of exceptions to the ordinary mode of applying the rule.

4. *The Growth of Church Consciousness* has been a marked feature of the later life of the Church. This consciousness has never been totally wanting. There have been not only individuals, but synodical organizations, which have embodied it in the darkest hours. The General Synod in 1820, relatively to the laxer tendency, arose from this reviving consciousness, but there were even then bodies to whom its attitude seemed wanting in a clear churchly decisiveness. In the earliest history of the Church in America an unreserved acceptance of the BOOK OF CONCORD (which see) was required, but a special prominence was assigned to the Augsburg Confession. (See Dr. C. F. Schaeffer, *The Confession, etc., Ev. Review,* Oct., 1853.) The intermediate time was one of laxity. In the present an immense majority of the Church in America accepts the entire body of the Confessions *ex animo.* The Augsburg Confession is universally recognized in some shape—not always, however, without reservations which are not clearly defined.

5. *The Literature and Educational Work* of the Church in America have labored under many disadvantages. Her old vernacular is not the vernacular of the country, her ministry has been inadequate in numbers, and has been greatly overworked. She has not had the great denominational publishing agencies of other bodies. Nevertheless, she has names of great lustre in the general departments of science, literature, and theology. The Lutheran Church is an educating Church. From an early period in this country she has aimed at educating her people, and especially her ministers, and the large number of theological seminaries, colleges, and higher schools now under her care shows her earnestness in this great work. The struggle of her various languages has ended in a theoretical coordination of them, but a practical assimilation of them will be the growth of time.

V. *Practical Life.*—In her constitution in this country the Lutheran Church has combined the congregational and synodical elements, but her position is still in many respects unfixed. The powers of congregations, their relations to synods and to the ministry, are among the questions of the hour. The plan of permanent presidencies or of an evangelical superintendency has been recently urged. The preaching in the Lutheran Church is marked in the main by simplicity and power. The young people of the Church who give credible evidence of a desire to live as Christians are carefully instructed in the catechism as one of the preliminaries to being admitted to sacramental communion. Liturgies are in use in various degrees in every part of the Church. Many churches, some of them very noble specimens of architecture, have been reared within a recent period. The Church is growingly active in the work of home and foreign missions and in the various spheres of beneficence. The general integrity in business, the quiet, kindly home-life, the thriftiness, and reliableness of the Lutheran population are widely known, but none but those who are within it can appreciate fully the sterling, unobtrusive qualities of the heart and life which mark it, and which have been nurtured by the great communion of which they are members. The population, already so great, and the influx of such immense numbers of the most valuable classes of emigrants, both the old population and the new marked by a quiet vitality which makes each coming generation stronger than the past, furnish a basis for that great future which seems to await the Lutheran Church in the U. S.

VI. *Statistics.*—The latest reports (1874) show a total of 54 synods, 2568 ministers, 4639 churches, 569,549 communicants. The ratio of increase approaches 30,000 per annum. The total Lutheran population in America is between 3,000,000 and 4,000,000. There are 15 theological seminaries, 33 colleges and high schools; the institutions of benevolence and mercy, embracing orphans' homes, institutions for the deaf and dumb, infirmaries, an asylum for aged pastors, and immigrant homes, are 26; general organizations for beneficiary education, home and foreign missions, and similar objects, 12; principal publication establishments, 6. The periodical publications are in English 18, in German 24, in Norwegian 3, in Swedish 4, in Danish 1, making in all 50.

The following list embraces the most important writings illustrating in some way the history of the Lutheran Church in the U. S.: G. A. Francke, *Nachricht.* (Halle, 1744–85); Urlsperger, *Ausführliche Nachricht von den Salzburgischen Emigranten* (Halle, 1744); *Americanisches Ackerwerk* (Halle, 1754); J. G. Lochman, *History of the Lutheran Church* (1818); D. F. Schaeffer and C. Philip

Krauth, *Lutheran Intelligencer* (1826, 4 vols.); J. A. Probst, *Wiedervereinigung* ("Reunion of the Lutheran and the Reformed," 1826); Braun, *Mittheilungen aus Amerika* (1829); S. S. Schmucker, *Popular Theology* (1834); *Portraiture* (1840); *Retrospect* (1841); *Patriarchs of American Lutheranism* (1845); *American Lutheran Church* (1851); *Lutheran Manual* (1855); *Definite Platform* (1856); *American Lutheranism Vindicated* (1856); *Brown's New Theology* (1857); Rupp, *Denominations in the U. S.* (1844, 370–403); Hazelius, *History of the American Lutheran Church* (1846); Reynolds, C. Philip Krauth, Steover, *Evangelical Review* (1849–70); Matthes, *Kirchliche Chronik* (1855–75); Baird, *Religion in America* (1856, 516–520); Mann, *Plea for the Augsburg Confession* (1856); *Lutheranism in America* (1857); Brown, *The New Theology* (1857); *The General Synod and her Assailants, Ev. Rev.* (Jan., 1867); Hoffmann, *Broken Platform* (1856); Reynolds, *Swedish Churches on the Delaware, Ev. Rev.* (Oct., 1849); *Scandinavians in the North-west, Ib.* (Jan., 1852); *Lutheran Church in the New Netherlands and New York, Ib.* (Jan., 1855); *German Emigration to North America, Ib.* (July, 1861); Richards, *Journal of Mühlenberg, Ib.* (Jan., 1850 *seq.*); Krauth, C. Philip, *Lutheran Church in the U. S., Ib.* (July, 1850; translated into German in Rudelbach and Guericke's *Zeitschrift*, 1851, Heft 2); F. A. Muhlenberg, *Memoir of H. M. Muhlenberg, Ev. Rev.* (Oct., 1851); *Educational Efforts of the Pennsylvania Synod, Ib.* (Oct., 1858; Apr., 1859); S. W. Harkey, *Resources of the Lutheran Church in America, Ib.* (Apr., 1852); *Early History of Lutheranism in Illinois, Ib.* (Oct., 1866); Walter, *Delegation of Missouri Synod in Germany* (1851–52; translated in *Ev. Rev.*, July, 1852 *seq.*); *Lehre u. Wehre* (1854–75); Krauth, Charles P., *Burning of the Old Lutheran Church* (1854); *Lord's Day* (1856); *Christian Liberty in its Relation to the Usages of the Evangelical Lutheran Church* (1860); *Evangelical Mass* (1860); *Conservative Reformation and its Theology* (1871, 150–161); M. L. Steover, *Memoir of H. M. Muhlenberg* (1856); *Memorial of P. F. Mayer* (1859); *Sketch of the Lutheran Church in this Country* (1860); *Discourse before the Historical Society* (1862); *Reminiscences of Deceased Lutheran Ministers*, eighty in all, the last appearing in the *Evangelical Quarterly*, July, 1870. They are by far the most important contributions yet made to the history of the Lutheran Church in America. J. G. Morris, *List of Publications by Lutherans in the U. S., Ev. Rev.* (Apr., 1861, art. v.); *Literature of the Lutheran Church in U. S., Ib.* (July, 1864); Focht, *Churches between the Mountains* (1862); Seiss, *Ecclesia Lutherana* (1868, 199–261); *The Javelin* (1871); Schaeffer, C. W., *Early History of the Lutheran Church in America* (1857); Sprague, *Annals of the American Lutheran Pulpit* (1869); Brown and Valentine, *Quarterly Review* (1871–75); Allibone, *Dictionary of English Literature* (1859–72); Spaeth, *Lutherische K. in Amer.*, in Schem's *D.-A. Conversations Lexicon* (1872, vi. 690); Bernheim, *History of the German Settlements and of the Lutheran Church in North and South Carolina* (1872); Schirmer, *History of the E. L. Synod of South Carolina* (1875). The minutes of synods and of other Church bodies, the hymn-books, liturgies, catechisms, and occasional sermons, also have much that illustrates the history of the Church in America. The periodicals are also of value here, and the almanacs (Brobst, Sheeleigh, Jacobs) are manuals of important information. C. P. Krauth.

Lu'therville, post-v. of Baltimore co., Md., 11 miles N. of Baltimore, on the Northern Central R. R. Pop. 382.

Lüt'ke (Fedor Petrovitch), b. in Russia in 1797; educated in the Russian navy; accompanied Capt. Golownin on his circumnavigation of the earth 1817–19, and undertook from 1821 to 1824 four expeditions to Nova Zembla, of which he published a description in 1828. From 1826 to 1829 he made an exploration of Behring's Strait and the Sea of Kamtchatka, of which he gave a description (1834–36); in 1835 was made an admiral and appointed tutor to the grand duke Constantine; in 1850 made military governor of Revel, in 1853 of Cronstadt, and in 1864 president of the Academy of Science at St. Petersburg.

Lu'ton, town of England, county of Bedford, on the Lea, has a fine Gothic church. Pop. 15,329.

Lu'tra [Lat., "otter"], of the Mustelidæ or weasel family, comprising the common otters. The genus is represented in the U. S. by the American otter of the East (*L. Canadensis*, Sab.), and by a doubtful species on the Pacific slope (*L. Californica*, Gray). Both are closely allied to *L. vulgaris* of Europe.

Lu'trinæ [Lat. *lutra*, "otter"], a sub-family of the Mustelidæ, including the otters. In the U. S. there are two genera—*Lutra*, the otter, and *Enhydra*, the sea-otter of the Pacific coast.

Lutru'ria, a genus of lamellibranchiate mollusks belonging to the family Mactridæ.

Lut'ti (Francesca), b. at Riva di Trento, in the Italian Tyrol, where she still lives, devoted to literature and philanthropy. Her first poems, while giving proofs of her genius, indicated false taste, but an early friendship with the renowned poet Maffei corrected this defect, and she now stands, if not the first, at least among the first, living female poets of Italy. Her works are *Novelle e Liriche* (2 vols., 1862), *Alberto*, a poem in charming *ottave rime* (1867), and *Un Proverbio* (1874).

Lut'tringhausen, town of Rhenish Prussia, manufactures woollen, linen, and cotton fabrics, cutlery, and hardware. Pop. 8660.

Lutz, von (Johann), b. in Bavaria Dec. 4, 1826, a son of a schoolmaster; studied jurisprudence, and was appointed secretary to the cabinet of King Louis II. in 1866. In 1867 he became minister of justice, and Dec. 20, 1869, minister of public education and worship. In this position he rendered great services to the German empire by the energy with which he worked for its establishment in connection with the national party and in opposition to the Particularists and Ultramontanes. He has been very active in the interests of the German people during the organization of the empire. August Niemann.

Lut'zen, small town of Prussia, province of Saxony, famous for the two battles which were fought in its vicinity. On Nov. 10, 1632, the Swedish king, Gustavus Adolphus, fell here in a battle with Wallenstein, the general of the imperial army; the Swedes were victorious. On May 2, 1813, Napoleon defeated the Prussian and Russian armies.

Lüt'zow, von (Ludwig Adolf Wilhelm), Baron, b. May 18, 1782, in the Prussian province of Brandenburg; entered the army in 1795; was a major in 1808, and received in 1813 a commission to form a free corps, which at one time consisted of 2000 infantry and four squadrons of cavalry. His corps never found an opportunity of doing anything striking; and if it took hold of the German imagination in a wonderful degree, this was due to Körner's songs (*Lutzow's wilde, verwegene Jagd*), to Turnvater Jahn's speeches, and to the poetical turn of mind characterizing its members. Lützow was several times wounded and taken prisoner. D. a major-general at Berlin Dec. 6, 1834.

Lu Verne, post-v. of Rock co., Minn., on the W. bank of Rock River, 30 miles W. of the St. Paul and Sioux City R. R. It has 5 school buildings, a newspaper, 2 hotels, 2 land-agencies, and a number of stores, shops, etc. Pop. about 140. Hadley & Kniss.

Luxembourg', de (François Henri de Montmorency-Bouteville), Duke, b. at Paris, France, Jan. 8, 1628, the posthumous son of François de Montmorency, Count de Bouteville, who was beheaded June 27, 1627; was educated by his aunt, the princess of Condé; entered early on a military career under the auspices of the great Condé, and distinguished himself so much in the battle of Lens (Aug. 20, 1648) that Anne of Austria made him a maréchal-de-camp. In the wars of the Fronde he sided with the aristocracy and fought against the court, but after the peace of the Pyrenées (Nov. 7, 1659), which ended these wars, he was pardoned, and through the mediation of the prince of Condé he married (Mar. 17, 1661) the heiress of the house of Luxembourg, whose name he assumed. In the wars against Spain and Holland he fought under Turenne; was made a lieutenant-general, and displayed great military talent, though also a terrible severity. He was one of the eight marshals created after the death of Turenne in 1675, and having received an independent command, captured Valenciennes and Cambrai, and defeated William of Orange at Mont Cassel Apr. 11, 1677, and at St. Denis, near Mons, Aug. 24, 1678. After the Peace of Nymwegen, Louvois, who was jealous of his talent, and still more of his influence, removed him from service, and entangled him in a horrible charge, accusing him of having sold himself to the devil and attempting to poison his wife. The case lasted fourteen months, during which time the marshal was treated with the utmost harshness, and although he was acquitted (May 14, 1680), yet he was banished from the court and from Paris. After nearly ten years of disgrace he was appointed commander-in-chief of the army of Flanders (Apr. 19, 1690), and made three brilliant campaigns, defeating the prince of Waldeck at Fleurus, July 1, 1690, and William III. at Steenkerke, Aug. 3, 1692, and at Neerwinden, July 29, 1693. The campaign of 1694 brought no great results, and on Jan. 4, 1695, he d. at Versailles. With him ceased the victories of Louis XIV.

Luxembourg Palace, in Paris, was built in 1615 for Marie de Médicis, but afterwards much enlarged and beautified. Gaston of Orleans, the duchess of Montpensier, and the count of Provence, afterwards Louis XVIII., lived here. During the Revolution it was for some time a prison.

The Directory made it the seat of the government. Under the Empire the senate held its meetings here; after the Restoration, the chamber of peers. One part of the palace is occupied by a collection of pictures of living artists, which ten years after the death of the artists are brought to the Louvre.

Lux′emburg, a territory situated between Rhenish Prussia, France, and Belgium, and consisting of an elevated tract on the slope of the Ardennes, with a rugged surface often covered with dense forests of oaks, and with a soil not very fertile. The region is rich, however, in minerals; coal, iron, copper, and lead are mined; marble, slate, and freestone are quarried. Tolerably good crops of corn, flax, hemp, hops, and wine are raised, and horses, cattle, and sheep of good breed are reared; cloth, earthenware, nails, and leather are manufactured, and much cheese, oak-bark, and timber exported. This territory formed originally a duchy which alternately belonged to Burgundy, Spain, Austria, France, and Holland. By the Congress of Vienna, in 1815, it was made a grand duchy, and, forming a part of the Germanic confederation, it was given to the king of the Netherlands as a compensation for Nassau. But when (in 1830) Belgium organized itself into an independent kingdom, a large part of the territory was transferred to this kingdom, of which it now forms a province. The Belgian province of Luxemburg contains the three districts of Arlon, Neufchâteau, and Marche, and comprises an area of 1705 square miles, with 205,784 inhabitants, most of whom speak French. The grand duchy of Luxemburg comprises an area of 1228 square miles, with 197,528 inhabitants, most of whom speak German. It is not a province of Holland, but simply united to that kingdom by a personal union, the king of the Netherlands being also grand duke of Luxemburg.

Luxemburg, capital of the grand duchy of Luxemburg, on the Else or Alsette, was formerly the strongest fortress in Europe, next to Gibraltar, and garrisoned by Prussian troops. By the treaty of London in 1867 it was declared neutral ground. It has large manufactures of wax, breweries, distilleries, tanneries, and an extensive trade in gold and silver wares, china, vinegar, and hats. Pop. 14,440.

Luxemburg, post-tp. of Stearns co., Minn. Pop. 237.

Lux′or, a v. of Upper Egypt, on the right bank of the Nile, 1½ miles S. of Karnak, on the site of a part of ancient Thebes, and noted for its architectural remains.

Luynes, de (CHARLES D'ALBERT), DUKE, b. at Pont St. Esprit, department of Gard, France, Aug. 5, 1578, descended from a Florentine family, whose true name was ALBERTI, but which had bought the estate of Luynes in Touraine and assumed its name and title. Having been educated as a page at the court of Henry IV., he became the favorite of the dauphin, afterwards Louis XIII., and it was at his instigation that the young king gave orders for the imprisonment of Marshal d'Ancre and the queen Apr. 14, 1617. After this court revolution Luynes was made a duke and peer of France. He married the daughter of the duke of Montbazon, was made constable and chancellor, and exercised for a short time absolute control over the whole government. He was fortunate enough, however, to die Dec. 15, 1621, before the king became aware of his entire incapacity and mean avarice.—One of his descendants, HONORÉ THEODORIC PAUL JOSEPH D'ALBERT, duke de Luynes, b. at Paris Dec. 15, 1802, d. at Rome Dec. 14, 1867; became celebrated for the liberal and judicious support he gave to science and art, of which he was himself a successful cultivator. He wrote *Metaponte* (1836), *Description de quelques Vases peints* (1840), *Essai sur la Numismatique des Satrapies et de la Phénicie* (1846), *Voyage d'Exploration à la Mer Morte* (published after his death). In 1854 he superintended the publication of the catalogue of the National Library of Paris.

Lu′zenberg (CHARLES ALOYSIUS), M. D., b. in Verona, Italy, July 31, 1805; when only ten years old he entered college by a special act; went to Philadelphia in 1819; attended lectures in the Jefferson Medical College; removed to New Orleans in 1829; was attached to the Charity Hospital; then established one of his own, where he performed some difficult surgical operations; visited Europe in 1832–34; was made corresponding member of the Academy of Paris, and returned to Louisiana in 1834; founded the Society of Natural History in 1839, and the Louisiana Medico-Chirurgical Society in 1843, being the first president of both. D. in Cincinnati, O., July 15, 1848. PAUL F. EVE.

Luzerne′, county of N. E. Pennsylvania. Area, 1400 square miles. Its surface is in part covered with a labyrinth of wooded mountain-ridges, enclosing beautiful and fertile valleys, of which the most celebrated is the great Wyoming Valley, through which flows the Susquehanna River, which receives the Lackawanna, its tributary. The county contains great quantities of anthracite coal, which is extensively mined. It has a larger coal-product than any other county of the U. S. Cattle, grain, and wool are the chief agricultural products. The manufactures include iron, castings, metallic wares, lumber, carriages, flour, furniture, leather, cigars, saddlery, machinery, railroad cars, etc. The county is traversed by numerous railroads. Scranton is the largest city. Cap. Wilkesbarre. Pop. 160,915.

Luzerne, post-v. of Leroy tp., Benton co., Ia., on the Chicago and North-western R. R. Pop. 144.

Luzerne, post-v. and tp. of Warren co., N. Y., on the E. bank of the Hudson River, has important manufactures. Its station, on the Adirondack R. R., 20 miles N. of Saratoga, is on the W. side of the river, in Hadley tp., Saratoga co. Pop. 1174.

Luzerne, tp. of Fayette co., Pa. Pop. 1807.

Luzerne, de la (Chevalier ANNE CÉSAR), LL.D., b. in Paris, France, in 1741; educated for the military service, and was aide-de-camp to his relative, the duke de Broglie, during the Seven Years' war, attaining the rank of major-general of cavalry (1762), with the coloneley of the grenadiers de France. He afterward abandoned the military career for diplomacy; was sent as minister to the court of Bavaria 1776, and to the U. S. as successor to Gerard after the recognition of American independence in 1778. He arrived at Philadelphia Sept. 21, 1779, where he resided four years, giving proofs of prudence and friendship for the struggling colonists which were highly appreciated, and gave him a considerable influence in the direction of affairs. In 1780 he contracted on his own responsibility a loan for the relief of the American army, then suffering the utmost destitution. In 1782 he obtained the postponement of the ratification by Congress of the American treaty of peace until that between England and France should be signed. On his return to France in 1783 he bore with him the most honorable testimonies of esteem from Congress and from individuals. Harvard College conferred upon him the degree of LL.D., and Pennsylvania gave his name to one of her counties. On the organization of the Federal government (1789) the secretary of state, by direction of Washington, addressed a letter to Chevalier Luzerne conveying the thanks of the nation for his services. He d. at London Sept. 14, 1791, being then French minister to the English court.—His elder brother, CÉSAR GUILLAUME, b. July 7, 1738; became bishop of Langres 1770, and cardinal 1817; was a distinguished theological writer, and defender of the liberties of the Gallican Church. D. June 21, 1821.

Luzon′, or **Luçon,** the largest of the Philippine Islands, in the Malayan Archipelago, belonging to Spain, and situated between the Chinese Sea and the Pacific Ocean, between lat. 12° 30′ and 18° 40′ N., and between lon. 119° 45′ and 124° 10′ E. Area, 51,300 square miles. Like all the Philippine Islands, it is of volcanic origin, having several active volcanoes, among which is Mayon; earthquakes are frequent and destructive; the city of Manila was nearly destroyed by one in 1863. The ground is elevated and mountainous, several ranges of a height from 4000 to 7000 feet traversing the island from N. to S. But the soil is of exceeding fertility, and the climate being hot and moist, the luxuriance of the vegetation is almost unequalled. Immense forests of ebony, cedar, gum trees, and iron-wood, interspersed with orange, citron, cocoa, bread-fruit, and tamarind trees, cover the mountains to their very tops. Myriads of climbing plants and parasites wind from tree to tree, cover every twig, and form a forest growing on the forest. Rice, wheat, maize, sugar, cotton, indigo, tobacco, coffee, ginger, pepper, and vanilla are raised in continuous crops without difficulty and in great abundance. Luzon is entirely free from beasts of prey; oxen and buffaloes are employed in agriculture; sheep, goats, and swine are reared. Pheasants, ducks, and brilliantly colored birds swarm all over the island, and fish are abundant both in the rivers and the surrounding sea. Of minerals, gold, iron, copper, coal, and marble are found. Mother-of-pearl, amber, coral, and tortoise-shell are exported, together with rice, sugar, hemp, and tobacco; which last article is a government monopoly and yields a clear annual profit of nearly $5,000,000. The population of Luzon, which numbers 2,500,000, consists partly of negroes, who live as nomades in the interior in a savage state. They are idolaters, and are believed to be the original inhabitants of the island, driven back by the Tagals and Bisayers, two Malayan races which form the bulk of the population. These are Roman Catholics, industrious, hospitable, and open to progress and civilization, and besides being good agriculturists, possess some manufactures; they build ships with which they sail to Spain. Many Chinese have settled here, but comparatively few Spaniards. The trade, which is very considerable and increasing every year, is mostly in the hands of English and American merchants established

at Manila, the principal town of the island. Luzon was discovered by Magallanes in 1521; Manila was built in 1581. (See PHILIPPINES.)

Luzu'la [It. *luciola*, a "glow-worm"], a perennial genus of pseudo-glumaceous plants, commonly called wood-rushes, belonging to the family JUNCACEÆ (which see), and differing from the *Juncus*, or rush proper, in the form of the leaves, which are flat, soft, usually hairy and grass-like, and in the three-seeded capsule. There are numerous species found in the woods of Europe and five in the U. S.: *L. pilosa* and *L. parviflora* or *melanocarpa*, which have the flowers loosely long-peduncled, umbelled, or corymbed; *L. campestris*, *L. arcuata*, and *L. spicata*, having the flowers crowded in spikes or close clusters.

Luzza'ra, town of Italy, in the province of Reggio nell' Emilia, on the right bank of the Po, near Guastalla. Pop. in 1874, 7609.

Luzzat'to (MOSE CHAYIM), called BEN-JACOB, b. at Padua, Italy, in 1707, of Jewish parentage; became a celebrated mystic writer, compiled a second book of *Zohar*, and announced himself as the Jewish Messiah. Excommunicated and forced to leave Italy, he settled at Amsterdam; went in 1744 to Palestine, and d. at Safed May, 1747. His writings are very numerous, and treat of many subjects, poetical, philosophical, moral, and devotional; twenty-eight of his treatises have been published, but twenty-four remain unedited.

Luzzatto (SAMUEL DAVID), b. at Trieste, Italy, in 1800, of Jewish descent; received a brilliant education, and became the most popular historian of his people, bringing to light the forgotten episodes of Jewish history and sufferings in Spain. He was liberal in his views of the Old Testament exegesis, of which science he was professor in the rabbinical school at Padua from 1829 to his death in 1865. He wrote Hebrew, German, French, and Italian with great elegance, and is justly regarded as one of the chief restorers of Hebrew literature. He wrote a *Hebrew Grammar, French Notes on Isaiah* (1834), *Hebrew Notes on the Pentateuch* (1850), and Italian translations of Job (1844) and of Isaiah (1850), with a Hebrew commentary, besides *Dialogues on the Cabala, the Zohar, and the Antiquity of the Vowel-Points and Accents of the Bible* (1852), and a work on the Aramaic version of Onkelos (1830). (See Grätz, *History of the Jews*, vol. xi.)

Lycan'thropy [Gr. λύκος, "wolf," and ἄνθρωπος, "man"], a kind of madness in which the patient fancies that he is a wolf. The old and very widespread belief in the existence of man-wolves possessed of the devil has in many instances led deluded persons to fancy themselves thus possessed; and in not a few instances this fancy has become epidemic, and hundreds of persons have, in their delusion, become cannibals, going upon all fours, living in the forests, and howling like wolves. In 1600 there were hundreds of people executed in the Jura for lycanthropy.

Lyca'on, in Greek mythology, a king of Arcadia. According to one version of the myth, he and his sons, fifty in number, were changed into wolves by Zeus as a punishment for their insolence and impiety. When Zeus visited them they set before him a dish in which they had mixed the entrails of a boy they had murdered, but the god knew it, and avenged himself on them. There are, however, other and very different versions of the myth.

Lycao'nia, a small territory of Asia Minor, situated between Galatia, Cappadocia, Cilicia, and Phrygia. Its principal town was Iconium, the present Konieh. After being conquered by the Romans it was annexed to the province of Cappadocia. Lycaonia was visited by Paul and Barnabas in their first missionary journey. They were at first regarded as divinities, but afterwards Paul was stoned (Acts xiv.). The inhabitants then spoke a peculiar language of unknown affinities.

Lyce'um [Gr. τὸ Λύκειον, named from the neighboring temple of Apollo Lyceus], the largest of the three great gymnasia of ancient Athens. None but well-born youth, whose parentage on both sides was Athenian, were allowed to be trained here. In 335 B. C. Aristotle was allowed to make use of the Lyceum as a place for teaching philosophy. His instructions were given while walking in the groves which surrounded the Lyceum; hence his philosophy was called *Peripatetic* ("walking about"). The Lyceum stood on the E. side of the city, outside the gates, just S. of the Cynosarges, and near the fountain of Panops. It was surrounded by a grove of lofty plane trees.—In France the public schools for secondary instruction have the name of lyceum (*lycée*).

Lych'nis [Gr. λύχνος, a "light" or "lamp"], a genus of annual or perennial plants found in Europe and the U. S., the commonest species of which is the corncockle (*L. githago*). It belongs to the pink family (see CARYOPHYLLACEÆ), and received its name from a scarlet or flame-colored Grecian species. Several species are cultivated as garden-flowers in the U. S., the best known being the scarlet lychnis (*L. Chalcedonica*), sometimes called the Maltese cross, a native of Northern Asia, an elegant garden-flower, the tints of which vary from scarlet to rose-color and white. The common mullein pink or rose-campion (*L. coronaria*) is of this genus. The *L. Sieboldii*, a Japanese flower lately domesticated in the U. S., is thought to be a hybrid. The genus differs from *Silene*, or catchfly, only in having five (rarely four) styles, and a pod opening by as many or twice as many teeth. The corncockle is but too common in wheat-fields, the black seeds being injurious to the quality of the flour.

Lyc'ia [Gr. Λυκία], an ancient region of Asia Minor of small extent, lying on the Mediterranean, between Mounts Taurus on the N., Climax on the E., and Dædala on the W., the adjoining regions across the mountains being Phrygia, Pamphylia, Pisidia, and Caria, the chief rivers, Xanthus, Limyrus, and Glaucus, and the most noted cities, Xanthus, Patara, Pinara, Olympus, Myra, Tlos, and Telmissus. The most ancient name of the country, according to Herodotus, was Milyas, the inhabitants being of two races, Solymi and Termilæ or Tremilæ. Extended accounts of Lycia have been given by the Greek poets, historians, and geographers. It was a favorite region with Homer, who assigns to the Lycian heroes, Glaucus and Sarpedon, the place of honor among the Trojan allies. Apollo was often called Lycian Apollo from his temple at Patara, second in renown only to that at Delphi, and regarded by some as the place of his birth. The Solymi, doubtless the earliest inhabitants and of Semitic stock, were conquered by the Tremilæ, who are said to have come from Crete and took the name of Lycians. They appear as *Leka*, a seafaring people, in the Egyptian inscriptions of the fourteenth century B. C. It is to be noted that the only mention of writing found in the Homeric poems is in connection with the Lycian legend of Bellerophon. The Lycians were conquered by Harpagus, the general of Cyrus, notwithstanding the heroic and memorable resistance of the inhabitants of Xanthus, who burned themselves with their wives, slaves, and treasures in their citadel. They took part in the revolt of the Asiatic Greeks, were subdued and made a satrapy of Persia, and furnished fifty ships to Xerxes for his invasion of Greece. Alexander the Great subdued the country almost at the outset of his Asiatic career; it was afterwards attached to the Syrian empire, and was given to the Rhodians by the conquering Romans. Soon afterward it became independent as a republican confederation of cities, but ultimately became a Roman province, with Myra as the capital. In the great civil war on the death of Cæsar, Lycia espoused the cause of Octavius and Antony, and was conquered by Brutus after a desperate resistance, in which the city of Xanthus repeated its act of self-immolation by fire. In modern times Lycia had fallen into complete oblivion, no traveller had explored it, and the sites of its celebrated cities were unknown, when in 1838 and 1840 it was visited by Mr. (afterwards Sir Charles) Fellows, who found there vast ruins of temples, fortresses, and tombs, and inscriptions in an unknown character. An expedition under his leadership was sent in a British vessel of war 1846, which brought to London the remarkable sculptures now occupying the "Lycian room" of the British Museum. The Lycian language recovered from the inscriptions by Grotefend and Daniel Sharpe, and more recently by Prof. Moritz Schmidt of Jena, is found to belong to the Zendic or Old Bactrian subdivision of the Iranian family; and the date of the chief monuments being ascertained to range only from 530 to 335 B. C.—*i. e.* from the period of the Persian conquest—it is therefore inferred that the language of the inscriptions is not that of the earlier Lycians, but that of colonists introduced from Persia. The numerous coins of Lycia confirm this view. The Lycian alphabet consists of twenty-five single and several double letters. A few of the characters are peculiar; thirteen are identical with the Cypriote in form, and consequently related to the Phœnician, while three were borrowed from the Greek. The inscriptions are chiefly from tombs cut in the rock, the Lycians having been remarkable for the honors shown to the dead, as well as for the cyclopean character of their architecture, which in its later period showed traces of Grecian influence. (See Sir Charles Fellows, *Account of Discoveries in Lycia* (1841) and *Coins of Ancient Lycia* (1855), and Schmidt, *The Lycian Inscriptions, with a Critical Commentary and an Essay on the Alphabet and Language of the Lycians* (Jena, 1868).) PORTER C. BLISS.

Lycom'ing, county of North-east Pennsylvania. Area, 1500 square miles. It is traversed by steep wooded ridges of the Allegheny Mountains and by the W. branch of the Susquehanna River. It has very fertile valleys, producing

cattle, grain, and wool extensively. The manufactures include lumber, carriages, leather, harnesses, flour, furniture, etc. The county contains outlying beds of excellent semi-bituminous coal. It is traversed by the Northern Central and the Philadelphia and Erie and other R. Rs. The county is divided into a rugged mountain region, valuable chiefly for its coal, iron, and noble forests, and a beautiful and fertile valley-tract. The county contains a quarry of fine black marble. The lumber manufacture is enormous. Cap. Williamsport. Pop. 47,626.

Lycoming, tp. of Lycoming co., Pa. Pop. 642.

Lycoperdon, the puff-ball. See FUNGI.

Lyc'ophron, an Alexandrian grammarian and poet, b. at Chalcis in Eubœa, lived at the court of Ptolemy Philadelphus, who entrusted him with the arrangement of the works of the comic poets contained in the Alexandrian library. He wrote an extensive work on comedy, but this, as well as his tragedies, which were very numerous, has been lost. Only his *Cassandra* or *Alexandra*, a monologue of 1474 iambic verses, is still extant, edited by Bachmann (Leipsic, 1828), translated into English by Lord Royston. Even in antiquity this poem was considered obscure.

Lycopo'dium [Gr. λύκος, a "wolf," and πούς, "foot"], a genus of CLUB-MOSSES (which see). It is the typical genus of the order Lycopodiaceæ. The powder called lycopodium is composed of the sporules of *Lycopodium clavatum* (which is common in both the Old and the New World) and of other species. It is extremely inflammable, is used in fireworks for making a white flame, and in theatres for artificial lightning. In pharmacy it is used as a pill-powder, and in the nursery as a dressing powder for infants. The species are evergreen, and two or three are extensively sold for Christmas decoration.

Lycur'gus, the Spartan legislator, lived, according to the most common tradition, in the eighth century B. C., and was a son of King Eunomos; ruled for some time the country during the minority of his nephew, Charilaos, but was afterwards compelled to emigrate; visited Asia Minor, where he became acquainted with the Homeric songs; Crete, where he studied the laws of Minos; Egypt and other countries; and became on his return the founder of those institutions by which was developed in Sparta one of the most striking types of national character which history contains. All details of his life are very uncertain, however, and some modern scholars even consider him a mythical person; but the Spartans themselves had built a temple to his honor, and told that he brought his laws from Crete, and introduced them with the sanction of the Delphic oracle. The most prominent feature of Spartan society was the division into two classes or castes—the slaves, helots, who performed all the labor and had absolutely no rights; and the citizens, Spartans, who were completely exempted from labor, and owned and ruled the land. The most prominent feature of this privileged class was its military discipline. The individual was absolutely subordinate to the state, and lived only for the state. The Spartan had no talent, no passion, no plan of his own; he was merely a tool. Only strong and well-formed children were allowed to live; the weak or deformed were exposed to die on Mount Taygetus. At the age of seven years the boy was taken from his mother and educated by the state, which subjected him to the severest discipline. When he was thirty years old he was allowed to marry, but the state chose his wife, and, although married, he continued to live in garrison till his sixtieth year. By the establishment of this social order (of which more detailed information will be found in the article on the ancient history of GREECE) Lycurgus succeeded in transforming the Spartans from one of the rudest and wildest to the most quiet and dignified of all the Greek peoples, and was worshipped by them as a god.

Lycurgus, an Attic orator, b. at Athens about 396 B. C.; belonged to Demosthenes' party; held several responsible positions in the city, and enjoyed the confidence of his countrymen in a very high degree. When Alexander demanded that the Athenians should deliver him up on account of his opposition to the Macedonian influence, they boldly refused. D. at Athens 323 B. C. Of his orations, fifteen were still extant at the time of Plutarch, but only one has come down to us—that against Leocrates, delivered in 330 B. C., edited by Maetzner (Berlin, 1836).

Lyd'da [Gr. Λύδδα], an ancient town of Palestine, within the tribe of Ephraim, on the road from Jerusalem to Joppa, 9 miles E. of the latter. In the Old Testament it bears the name of Lod, as also in the Apocrypha. It was the scene of Peter's miracle of healing Eneas (Acts ix. 32, 35); was destroyed by Cestius Gallus in his march against Jerusalem, rebuilt as capital of one of the nine toparchies of Judæa, and became the seat of a celebrated Jewish school of the law. Later it received the name of Diospolis, was one of the principal places of Palestine for several centuries, was the seat of a bishopric, and the birthplace of the celebrated martyr St. George, the patron of England. It figured largely during the Crusades, and is still an extensive town under the name of *Lud*.

Lyd'gate (JOHN), b. at Lydgate, Suffolk, England, about 1375; studied at Oxford; travelled in France and Italy, and became the head of a school at Bury St. Edmund's. He wrote several poetical works—*The Fall of Princes, The Storie of Thebes*, and *The Historie, Siege, and Destruction of Troye*—which are chiefly valuable as monuments of the English language in that obscure period. D. at Bury St. Edmund's about 1461.

Lyd'ia, country of Asia Minor, situated between Ionia, Caria, Phrygia, and Mysia. It was very famous for its wealth. Pactolus ran through it, and Crœsus was one of its kings. The inhabitants were noted for the corruption of their morals. The capital was Sardis. The history of the country during the dynasties of the Atyadæ, Heraclidæ, and Mermnadæ is merely fabulous, with very few glimpses of actual truth. On the defeat of Crœsus by Cyrus the country became a dependency of Persia.

Lyd'ian [from *Lydia*], in music, the designation of one of the ancient ecclesiastical modes. Its scale is that of F, and it differs from the modern scale on that letter by having B *natural* instead of B♭.

Lydian Stone, a silicious slate or flinty jasper of a velvet-black color, used as a touchstone for testing the quality of gold and silver. (See JASPER.)

•**Ly'ell** (Sir CHARLES), BART., D. C. L., F. R. S., F. G. S., b. at Kinnordy, Forfarshire, Scotland, Nov. 14, 1797; was educated at Exeter College, Oxford, where he graduated in 1819; studied law, and was called to the bar, but soon devoted himself to scientific researches, especially in geology, in which branch he had become interested through the university lectures of the celebrated Dr. Buckland. His earliest labors consisted in an extensive personal examination of the deposits of Forfarshire, Dorsetshire, and Hampshire, concerning which he published in the *Transactions* of the Geological Society and in Brewster's *Journal of Science* (1826–27) several papers, which displayed great powers of observation, conjoined with remarkable acuteness in detecting the real significance of scientific data—qualities which were exemplified in a still higher degree in his great work, *Principles of Geology* (3 vols., 1830–33), which immediately became the standard authority on the subject. It received large additions in successive editions, which were rapidly called for. In 1838 he published a work embracing the principles set forth in this, which under the titles *Elements of Geology* and *Manual of Elementary Geology* passed through many editions, until in 1870 it was definitely recast into the *Student's Manual of Geology*. In 1832 he was appointed professor of geology at King's College, London; married in the same year the eldest daughter of another eminent geologist, Leonard Horner; became president of the Geological Society in 1836, and again in 1850; delivered a course of geological lectures at Boston, Mass., in 1841, after which he travelled extensively in Canada, Nova Scotia, and the U. S. as far S. as Kentucky, and published his *Travels in North America* (1845), which, though popularly written, contained a better geological map of the U. S. than had previously appeared; made another tour in the U. S. (Sept., 1845–June, 1846), giving especial attention to the Southern States and the Mississippi River, and published *A Second Visit to the United States* (1849), treating at some length of American social life and political aspects. He was knighted in 1848, and created a baronet Aug. 22, 1864. On the appearance of Darwin's celebrated *Origin of Species*, Sir Charles made a careful re-examination of the geological evidences bearing upon the subject thus brought into prominence, and gave his support to the "Darwinian theory" in a learned work, *Geological Evidences of the Antiquity of Man* (1863), revising his earlier books in conformity with these views. All the writings of Sir Charles Lyell give evidence of fine literary as well as scientific ability, are models of clearness and accuracy, and may be read with interest by the public in general. D. in London Feb. 22, 1875. ✓

Lygo'dium [Gr. λυγώδης, "flexible"], a genus of climbing ferns found in New Zealand, Japan, and America. One species only, *L. palmatum*, is found in the U. S., from Massachusetts to the Gulf States. It is much prized for purposes of decoration. One or two species are cultivated in greenhouses.

Ly'kens, post-v. and tp. of Dauphin co., Pa., on the Lykens Valley R. R., a tributary of the Northern Central R. R., 44 miles N. E. of Harrisburg, has a public library, a newspaper, a bank, a savings fund, a building association,

2 foundries, a machine-shop, a steam saw and planing mill, 3 hotels, stores, etc. Principal business, shipping Lykens Valley coal. Pop. 1246. S. M. FENN, ED. "REGISTER."

Ly'kins, tp. of Crawford co., O. Pop. 1140.

Lyle, post-v. and tp. of Mower co., Minn., on the Milwaukee and St. Paul R. R. (Mason City branch). Pop. 480.

Lyles'ville, a v. of Presidio co., Tex. Pop. 124.

Lyl'y, or **Lilly** (JOHN), b. in the Weald of Kent, England, in 1553 or 1554; graduated at Magdalen College, Oxford, in 1573. His *Euphues the Anatomy of Wit* (1579) and *Euphues and his England* (1580) attained great popularity in his own times. (See EUPHUISM.) The former work was edited in 1868 among the Arber reprints. Prof. Rushton of Cork has discovered that *Euphues and his Ephœbus*, the most valued portion of the *Euphues*, is a rather close paraphrase of Plutarch *On Education*. Lyly also wrote nine court-plays, which contain fine passages and songs. He was perhaps the author of *Pap with an Hatchette*, a once famous pamphlet. His life was mostly spent at Elizabeth's court. D. in Nov., 1606.

Ly'man, county of S. Dakota, bounded N. and E. by the Missouri River, intersected by White River. Area, 700 square miles. It has been formed since the census of 1870, and is still very thinly peopled.

Lyman, tp. of Ford co., Ill. Pop. 740.

Lyman, post-tp. of York co., Me., 5 miles E. of Alfred, has 4 churches and manufactures of lumber. Pop. 1052.

Lyman, post-tp. of Grafton co., N. H., 10 miles N. E. of Wells River, has manufactures of starch. Pop. 658.

Lyman (CHESTER SMITH), b. at Manchester, Conn., Jan. 13, 1814; studied astronomy and the kindred sciences in boyhood without a teacher, constructing astronomical and optical apparatus with his own hands, and computed complete almanacs for 1830 and 1831, and tables of eclipses for fifteen years ahead. He graduated at Yale College 1837, taught school at Ellington two years, studied theology at Union Seminary, N. Y., and at New Haven 1840–42; was pastor of a Congregational church at New Britain, Conn., 1843–45; went to the Sandwich Islands on account of failing health in 1845; taught the Royal School, having as pupils four of the recent occupants of the Hawaiian throne; became a surveyor in California 1847; was one of the earliest to send to the Eastern States authentic accounts of the discovery of gold; settled at New Haven 1850, where he engaged in scientific pursuits, and was one of the revisers of Webster's *Dictionary* for the edition of 1864, taking charge of the scientific terms, and became in 1859 professor of industrial mechanics and physics in Yale College, and took an active part in organizing the Sheffield Scientific School, in which he also taught astronomy, both theoretical and practical. Since 1870 his professorship has been that of astronomy and physics. He has published articles in the *Am. Jour. of Science*, *The New Englander*, and elsewhere, and made various useful inventions; *e. g.* his wave apparatus, his pendulum apparatus for acoustic curves, etc. He is an honorary member of the British Association for the Advancement of Science, and fills positions in several scientific bodies in his own country.

Lyman (HENRY), b. in Northampton, Mass., in 1810; graduated at Amherst College 1829, at Andover Theological Seminary 1832, and was one of the first missionaries sent to the East Indian Archipelago by the American Board of Commissioners for Foreign Missions (Congregationalist). With his companion, Rev. Samuel Munson, he labored for two years among the savage Battahs of Sumatra, by whom they were both murdered June 28, 1834. He had published a volume entitled *The Condition of Females in Pagan Countries*.

Lyman (Gen. PHINEAS), b. at Durham, Conn., about 1716; graduated at Yale College in 1738; was tutor there till 1741; became a lawyer at Suffield; was appointed major-general and commander-in-chief of the Connecticut forces in the French war; built Fort Lyman (since called Fort Edward), N. Y.; succeeded Sir William Johnson in command at the battle of Lake George; was engaged in the attack upon Ticonderoga, the capture of Crown Point, the surrender of Montreal, and the expedition against Havana (1762); spent several years in England as agent to solicit lands for a colony in Florida, and d. in West Florida (now Mississippi), near Natchez, in 1775.

Lyman (Gen. THEODORE), b. in Boston, Mass., Feb. 19, 1792; graduated at Harvard College 1810; inherited an ample fortune; visited Europe 1814; wrote a small volume, *Three Weeks in Paris* (1814); studied law, and made a second European tour, on returning from which he published *The Political State of Italy* (1820); delivered the Fourth of July oration at Boston 1820; wrote an *Account of the Hartford Convention* (1823), in defence of that celebrated political demonstration, and published a useful work, *The Diplomacy of the U. S. with Foreign Nations* (1826). He took an active part in politics, served in both branches of the legislature, became brigadier-general of militia, and was mayor of Boston 1832–35. In the latter year he was prominent in disapproval of the early popular meetings of the abolitionists, and incurred obloquy on that account. D. at Boston July 17, 1849. He was a liberal benefactor to the State Horticultural Society and the Farm School, and was the founder of the State Reform School at Westborough, to which he gave $82,000.

Lyman (THEODORE BENEDICT), D. D., b. near Boston, Mass., Nov. 27, 1815; graduated at Hamilton College, Clinton, N. Y., in 1837, and at the General Theological Seminary in the city of New York in 1840; ordained deacon in Christ church, Baltimore, in September of the same year, and early the next month became rector of St. John's church, Hagerstown, Md., where he remained until he entered upon the rectorship of Trinity church, Pittsburg, Pa., in Apr., 1850; continued in charge of that parish until May, 1860, when he went to Europe, and remained nearly ten years. During that time he had charge for a short period of an American church in Florence, and later was for several years rector of the American Episcopal church in Rome. Upon his return to America in 1869, he became rector of Trinity church, San Francisco, and was in charge of that church when elected assistant bishop of North Carolina in May, 1873. He was consecrated to that office in Christ church, Raleigh, Dec. 11, in the same year.

Lyme, tp. of New London co., Conn., on the E. bank of the Connecticut River. Lyme R. R. Station is in Old Lyme tp., on the E. bank of the Connecticut River, near its mouth, and on the Shore Line R. R. Pop. 1181.

Lyme, post-tp. of Grafton co., N. H. Pop. 1358.

Lyme, tp. of Jefferson co., N. Y., on Lake Ontario. It includes the important villages of Chaumont and Three Mile Bay, and has valuable fisheries and limestone quarries. Pop. 2465.

Lyme, tp. of Huron co., O. Pop. 2380.

Lymphatics. See HISTOLOGY, by COL. J. J. WOODWARD, M. D., M. N. A. S.

Lyn, post-v. of Leeds co., Ont., Canada, on the Grand Trunk Railway, has good water-power, and manufactures of cloth, leather, lasts, and rubber goods. Pop. about 750.

Lynch, tp. of Texas co., Mo. Pop. 522.

Lynch (Capt. HENRY BLOSSE), C. B., b. in Castlecarra, Mayo, Ireland, about 1798; entered the British navy in 1823; was employed in surveys of the Persian Gulf; learned Arabic and Persian; became in 1825 lieutenant and interpreter to the squadron; was employed in negotiations with the independent Arab chieftains; was shipwrecked on the Nubian coast of the Red Sea in 1832, and crossed the Desert to the Nile; was appointed in 1834 second in command in Col. Chesney's Euphrates expedition; commanded a squadron of the Indian navy in 1842 off the coast of Scinde, and in 1851 on the Irrawaddy; settled at Paris in 1854, and d. there Apr. 14, 1873. He was a frequent contributor to the *Transactions* of the Royal Geographical Society.

Lynch (PATRICK NILSON), D. D., b. at Cheraw, S. C., Mar. 10, 1817; studied theology in the Catholic seminary at Charleston and in the College of the Propaganda at Rome; was ordained priest in 1840; became rector of the seminary at Charleston, vicar-general of the diocese in 1850, and bishop of Charleston in 1858. He built several churches, including the fine cathedral of St. Michael; founded an Ursuline convent, an orphan asylum, and many schools; and some of these establishments having been destroyed during the war, he has since chiefly devoted himself to their restoration, for which purpose he has made extensive tours through the Northern States, preaching and collecting funds. He has written some theological and scientific essays, and participated in the Vatican Council of 1869–70, supporting the dogma of infallibility.

Lynch (THOMAS, JR.), one of the signers of the Declaration of Independence, b. in Prince George parish, S. C., Aug. 5, 1749; was educated at Eton and Cambridge, England, and studied law in the Temple, London. In 1772 he returned to South Carolina; became in 1775 a captain in the provincial troops; was sent in 1776 to Congress to succeed his father, who died in that year, but his own health failing, he soon left Congress. In 1779 he sailed for the West Indies on account of his health, but the ship was never again heard from.

Lynch (Com. WILLIAM F.), b. in Virginia in 1801; entered the naval service in 1819; became a lieutenant in 1828, and conducted in 1848 an official survey of the Jordan and

Dead Sea, the results of which were given in his *Narrative* (1849). He published in 1851 *Naval Life, or Observations Afloat and on Shore;* became commander in 1849, captain in 1856, resigned in 1861; was commodore in the Confederate service, and d. at Baltimore Oct. 17, 1865.

Lynch'burg, tp. of Mason co., Ill. Pop. 804.

Lynchburg, post-v. of Dodson tp., Highland co., O., on Turtle Creek and on the Marietta and Cincinnati R. R. (Hillsboro' branch). Pop. 476.

Lynchburg, post-v. and tp. of Sumter co., S. C., on the Wilmington and Augusta R. R. Pop. 1598.

Lynchburg, post-v. of Harris co., Tex., 25 miles S. E. of Houston. Pop. 79.

Lynchburg, city of Campbell co., Va., on the S. bank of James River, at the junction of the Washington Virginia Midland and Great Southern with the Atlantic Mississippi and Ohio R. R. The James River and Kanawha Canal connect it with Richmond, distant 90 miles E. by N. Lynchburg is situated on the sides of a hill rising abruptly from the river, and presents a picturesque appearance with its numerous terraces and ornamental villa-residences, which command a splendid view of the Blue Ridge and the celebrated Peaks of Otter, 20 miles distant. It is a central point for an extensive shipping and distributing business, has 40 manufactories of tobacco, several iron-foundries, railway machine-shops, cotton and flouring mills, and enjoys a magnificent water-power, as yet but slightly developed, while in the immediate vicinity vast deposits of coal and iron are found. The reservoir constructed in 1828 is situated 253 feet above the river, from which the water is supplied by a double force-pump worked by a breast-wheel. There are 2 national and 3 savings banks, 10 churches, 3 daily and 3 tri-weekly newspapers, 4 large public-school buildings, several private schools, a hospital, orphan asylum, court-house, and jail. Pop. in 1870, 6825.

Lynch Law, the practice of trying and punishing men for alleged crimes and offences with which they are charged by unauthorized persons, who unjustifiably attempt to administer what they may deem to be justice, without regard to the forms or sanctions of law, and in violation of the right of the proper legal authorities to bring alleged offenders to trial. In times of especial turbulence and disorder, when the duly constituted legal authorities seem powerless or unwilling to enforce the laws, or when the necessity of making a terrible example of offenders in order that the criminal classes may be intimidated is particularly felt, it has sometimes happened in the history of this country, especially in the Western and Southern States, that members of the community have taken the execution of the law into their own hands, and by the organization of so-called "vigilance committees" have endeavored to suppress crime by the vigorous and effective though illegal methods of lynch law. So in communities largely made up of desperadoes, or in those where the orderly methods of civil administration have not become fully established, this form of mob-law, as it has been aptly termed, is wont to be frequently resorted to. Many instances of this kind have occurred in the mining districts of the Western States. Sometimes the methods of lynch law are adopted to mark the popular abhorrence of some particularly atrocious crime, and to ensure the rapidity, certainty, and severity of punishment which are thought necessary, but which may not result from the regular administration of the law if it be suffered to take its due course. While lynch law has been in some instances productive of much advantage in stamping out crime, yet it is ordinarily an unmixed evil. The legal safeguards which serve to protect an innocent man from unjust conviction are almost invariably disregarded, and the excitement and passion under which the self-constituted judges usually labor render conviction almost a certainty in all cases, whether the person accused be innocent or guilty. Moreover, the natural effect is to produce social disorganization by weakening the power and influence of the proper legal tribunals, and by accustoming men's minds to the usurpation of judicial power and the disregard of legal methods of procedure.

The origin of this phrase has been variously accounted for. It is usually derived from a Virginian farmer named Lynch. It is said that in the early history of this State it became the practice in its western districts, by reason of their distance from the courts of law, to refer legal controversies to the leading men of the neighborhood, to try criminal offenders before them, etc., and that this man exercised these unauthorized judicial functions so commonly that he became well known as "Judge Lynch." His name was readily transferred to the illegal method of administering justice which he adopted. Another account of the origin of the phrase is that it is derived from the name of James Fitzstephens Lynch, the mayor of Galway, Ireland, in 1493, who is said to have hanged his son with his own hands out of a window for defrauding a Spaniard and afterwards murdering him in order to conceal the defalcation. Another derivation is from the name of one Lynch, said to have been sent to America in 1687–88 to suppress piracy, and supposed to have received authority to punish summarily such pirates as might be captured, without a formal legal trial. Another explanation is that it is derived from the name of Mr. Lynch, the founder of Lynchburg, Va. The real origin of the term "lynch law" must be considered doubtful. (See Wheeler's *Dictionary of the Noted Names of Fiction*, title "Judge Lynch.")

George Chase. Revised by T. W. Dwight.

Lynch's Ranch, a v. of Stephens co., Tex. Pop. 42.

Lynd, tp. of Redwood co., Minn. Pop. 268.

Lynde (William Pitt), b. at Sherburne, N. Y., Dec. 16, 1817; graduated at Yale College 1838; was admitted to the bar in New York City 1841, and removed the same year to Milwaukee, Wis., where he has since resided; was appointed attorney-general of Wisconsin 1844, U. S. district attorney 1845; was a member of Congress 1847–49, mayor of Milwaukee 1860, member of the State legislature 1866, of the State senate 1868–69, and was again chosen to Congress as a Democrat at the election of 1874.

Lynde'borough, post-tp. of Hillsborough co., N. H., 30 miles S. S. W. of Concord, has manufactures of glass, lumber, and other goods. Pop. 820.

Lyn'den, tp. of Stearns co., Minn. Pop. 270.

Lynden, tp. of Juneau co., Wis. Pop. 479.

Lynden, tp. of Sheboygan co., Wis. Pop. 1552.

Lyn'don, post-v. and tp. of Whiteside co., Ill., on Rock River and the Rockford Rock Island and St. Louis R. R., has a good public school, 2 churches, a newspaper, several large mills, 3 hotels, stores, and good water-power. Pop. 1039.

R. C. Olin, Ed. "Free Press."

Lyndon, post-v. of Osage co., Kan., has 1 newspaper.

Lyndon, post-tp. of Aroostook co., Me., 85 miles N. of Houlton, has 3 churches and some manufactures. Pop. 1410.

Lyndon, tp. of Washtenaw co., Mich. Pop. 823.

Lyndon, tp. of Cattaraugus co., N. Y., has 3 churches. (P. O., Elgin or Rawson.) Pop. 894.

Lyndon, post-v. and tp. of Caledonia co., Vt., on the Connecticut and Passumpsic R. R., 40 miles S. of the Canada line, has 5 churches, a Baptist college, a large academy and graded school, a newspaper, a national bank, 3 hotels, 2 carriage-factories, the offices and repair-shops of the Connecticut and Passumpsic R. R., several large mills, and a number of stores, shops, etc. Pop. 2179.

C. M. Chase, Prop. "Vermont Union."

Lyn'donville, post-v. of Yates tp., Orleans co., N. Y., has 3 churches and some manufactures. Pop. 400.

Lynd'hurst (John Singleton Copley), Baron, b. at Boston, Mass., May 21, 1772, son of the artist J. S. Copley; was carried to England in 1774; graduated with high honors at Trinity College, Cambridge, in 1794, and became a fellow of Trinity; visited the U. S. in company with Volney; was called to the bar at Lincoln's Inn in 1804; became a sergeant-at-law in 1813; chief-justice of Chester 1817; entered Parliament as a Tory in 1818; was knighted and made solicitor-general 1819; was counsel of George IV. in 1820 in the trial of Queen Caroline; became attorney-general in 1823; sat in Parliament for Cambridge University 1826, and was made master of the rolls; opposed Catholic emancipation; was raised to the peerage as Baron Lyndhurst and appointed lord chancellor in 1827, holding that office until 1830, a second time from 1834–35, and again from 1841–46; was chief baron of the exchequer 1830; lord high steward of Cambridge University 1840, and d. in London Oct. 12, 1863.

Lyne'doch (Thomas Graham), Baron, b. at Balgowan, Perthshire, Scotland, in 1748; entered the army; served at Gibraltar and in the defence of Toulon 1793; entered Parliament and raised a Scotch regiment of foot 1794; became colonel 1795; served in the Austrian army in Italy 1796, with the British forces in Minorca and Sicily 1797, at the siege of Malta 1798; was aide-de-camp to Sir John Moore in Spain 1808–09; participated in the defence of Cadiz 1810; became lieutenant-general 1811; defeated the French at Barossa Mar., 1811; served under Wellington at Ciudad Rodrigo and Badajoz 1812; commanded a division at Vittoria June 21, 1813; took San Sebastian Aug. 31, 1813; engaged in the defence of Holland 1814; created Baron Lynedoch May 3, 1814; became general 1821, and governor of Dunbarton Castle 1829. D. in London Dec. 18, 1843.

Lynn, a v. of Henderson co., Ill. Pop. 251.

Lynn, tp. of Henry co., Ill. Pop. 1119.

Lynn, tp. of Knox co., Ill. Pop. 966.

Lynn, tp. of Woodford co., Ill. Pop. 800.

Lynn, tp. of Posey co., Ind. Pop. 1666.

Lynn, tp. of Warren co., Ia. Pop. 1020.

Lynn, city and port for small vessels of Essex co., Mass., on the N. side of Massachusetts Bay, being nearly at what may be called the northern chop of Boston Harbor. The township is sub-triangular in outline, of about 10 square miles; extent along the shore, about 3 miles. The S. half lies on a conglomerate and porphyry formation, and is wholly improved and settled; the N. half is forest and wild pasture, with few dwellings. The W. boundary runs near the Saugus River, which empties into its harbor; the E. line is marked by a chain of basins called the "Lakes of Lynn," the chief of which are Flax, Sluice, and Cedar ponds. The city is built mostly on flat land, with salt marshes in front, but a line of hills runs behind it, about 1½ miles from the shore, one of which, called the Highlands, bends to the S. into the middle of the city, and its southern spur, known as High Rock, rises 185 feet high in the densest part of the place. The harbor is not good, and only used for coastwise trade; it is defended from the sea by the peninsula of Nahant. Lynn lies about 10 miles N. E. from Boston, being furnished with communication by the Eastern R. R., with its two separate routes, and by the Boston Revere and Lynn R. R., now building. Hence it is much used for summer residences. It has an ornamental common, which is very fine, though not large, and one of the most beautiful cemeteries in New England. The waterworks are extensive, drawing their supply from two large artificial ponds, Breed's and Birch, and distributing nearly 2,000,000 gallons per day, with 177 feet reservoir-pressure. The pumping apparatus is considered one of the finest in the country. The city hall is a splendid block of brownstone, costing $311,722, and much admired. The soldiers' monument is also a fine work of art in bronze and granite, cast in Munich from designs by Jackson, and costing $30,000. Lynn has a very good market, and excellent fisheries near by. Its public buildings are many and approved. Music Hall, Odd Fellows' Hall, and Exchange Hall are attractive and commodious. It has an electric fire-alarm and a paid fire department of great efficiency. There are 25 churches, 1 hospital, 1 public library, and a large number of elegant buildings for school purposes. One gas company has works here, and there are extensive mills for lumber, breadstuffs, and spices. Two horse railroads are in operation, one of which extends its route to Boston. Three hotels are kept; 3 companies of infantry are in service, and as many military bands. There are also 3 national banks, 2 savings banks, and 2 insurance companies. The press is represented by 1 semi-weekly and 2 weekly papers, all large and energetic publications. This city is one of the foremost in the country in the manufacture of ladies' boots and shoes, which interest overtops all others in the place. The business was established in 1750, and now employs about $1,000,000 capital and many thousand workmen. Second only to this is the trade in kid and morocco leather, which occupies several large manufactories, and, say, $500,000 capital. It was here that the iron manufacture was first set up in the country; the relics of the old forge still remain. The first fire-engine was made here. Lynn made the first response to the call for troops in 1861, in the memorable despatch, "We have more men than guns: what shall we do?" First settled 1629; incorporated 1850. Pop. (1870), 28,233. Valuation (1875), $28,368,913. Lat. of High Rock, 42° 6′ 27.5″ N., lon. 72° 35° 12″ W.

Cyrus M. Tracy, Ed. "Lynn Transcript."

Lynn, post-tp. of St. Clair co., Mich. Pop. 539.

Lynn, tp. of McLeod co., Minn. Pop. 243.

Lynn, tp. of Cedar co., Mo. Pop. 2670.

Lynn, tp. of Hardin co., O. Pop. 457.

Lynn, tp. of Lehigh co., Pa. Pop. 2375.

Lynn, post-tp. of Clark co., Wis. Pop. 108.

Lynn′field, post-tp. of Essex co., Mass., 13 miles N. of Boston, on the Salem and Lowell, the Danvers and Newburyport, and the Wakefield branch R. Rs., has 3 churches, and produces ice and building-stone. Pop. 818.

Lynn Grove, tp. of Jasper co., Ia. Pop. 1342.

Lynn Re′gis, or **King's Lynn,** town of England, in the county of Norfolk, on the estuary of the Great Ouse, 9 miles from its mouth, is well built, has a good harbor, a fine church of the twelfth century, and beautiful public walks, and carries on a very extensive trade with Spain, the Baltic, and North America. Corn, wine, hemp, and timber are imported; manufactured goods exported. It has also large breweries, iron-foundries, shipyards, and manufactures of tobacco, cork, and rope. Pop. 16,459.

Lynn′ville, post-tp. of Morgan co., Ill. Pop. 643.

Lynnville, tp. of Ogle co., Ill. Pop. 726.

Lynnville, post-v. of Lynn Grove tp., Jasper co., Ia., 12 miles S. of Grinnell.

Lynn′ville (Lynnville Station P. O.), a v. of Giles co., Tenn., on the Nashville and Decatur R. R. Pop. 204. The post-village of Lynnville is 1 mile distant. Pop. 154.

Lynnville, tp. of Burke co., N. C. Pop. 1020.

Lynx [Gr. λύγξ], a genus of the Felidæ or cat family, distinguished from the true cats by wanting the first upper premolar tooth, and by other slight anatomical peculiarities. They have also shorter, abruptly truncated tails. Four species—*L. Canadensis*, the Canada lynx, of the northernmost parts, *L. rufus*, the bay lynx, or common American wild-cat of the States generally, and *L. fasciatus* and *L. maculatus*—are recorded as occurring within the limits of the U. S.

Ly′on, county of N. Iowa. Area, 650 square miles. It has Minnesota and Dakota on the N. and Dakota on the W. Its W. border is washed by the Big Sioux River. Its W. portion abounds in a remarkable kind of stone, the Sioux quartzite. Pop. 221.

Lyon, county of E. Central Kansas. Area, 858 square miles. It is a beautiful and fertile region, adapted to raising stock and grain. It is traversed by the Cottonwood and Neosho rivers and by the Missouri Kansas and Texas and the Atchison Topeka and Santa Fé R. Rs. Cap. Emporia. Pop. 8014.

Lyon, county of W. Kentucky. Area, 400 square miles. It is traversed by the Cumberland River, and bounded W. partly by the Cumberland and partly by the Tennessee River. It is very fertile. Tobacco and corn are leading products. Cap. Eddyville. Pop. 6233.

Lyon, county of Minnesota, bounded W. by Dakota. Area, 1080 square miles. It contains numerous creeks and lakes, and is as yet but sparsely settled.

Lyon, former county of Nebraska, now a part of Cheyenne co. (which see). Pop. in 1870, 78.

Lyon, county of W. Nevada. It is rough and mountainous, and affords silver, gold, borax, salt, etc. The Carson River intersects the county. Its valley affords some good farm and pasture lands. Cap. Dayton. Pop. 1837.

Lyon, tp. of Hamilton co., Ia. Pop. 188.

Lyon, tp. of Cherokee co., Kan. Pop. 378.

Lyon, tp. of Oakland co., Mich. Pop. 1298.

Lyon, tp. of Franklin co., Mo. Pop. 3528.

Lyon, tp. of Knox co., Mo. Pop. 1121.

Lyon, tp. of Lewis co., Mo. Pop. 820.

Lyon, tp. of Preston co., W. Va. Pop. 2612.

Lyon (Caleb), LL.D., b. Dec. 7, 1822, at Lyondale, N. Y., of which his father, who bore the same name, was the founder, whence he was usually called "of Lyondale." He graduated at the Norwich University 1841; travelled extensively in Europe; was appointed by Pres. Polk consul at Shanghai, China; visited Mexico, Brazil, Chili, Peru, and other countries on his return; was in California in 1849; acted as secretary to the constitutional convention and designed the coat-of-arms for that State; made another tour in Europe, visiting Egypt and Palestine, and was identified with the Koszta affair at Smyrna; was elected to the New York assembly, and afterwards to the senate; was a member of Congress 1853–55, and governor of Idaho 1864–66. D. Sept., 1875.

Lyon (George Francis), b. at Chichester, England, Jan. 23, 1795; entered the naval service in 1808; was engaged in the defence of Cadiz in 1810, and in the attack on Algiers in 1816; accompanied the traveller Joseph Ritchie to Fezzan in 1818, and Capt. Parry in his Arctic voyage (1821) as commander of the Hecla; became post-captain in 1823; made another Arctic exploration in 1824, and travelled in Mexico 1826. Of all these travels he published accounts, forming a series of interesting volumes. D. at sea while on a voyage from the U. S. to England, Oct. 11, 1832.

Lyon (Mary), the founder of Mount Holyoke Seminary, b. at Buckland, Mass., Feb. 28, 1797; became a school-teacher at Shelburne Falls, Mass., in 1814; taught 1821–24 in the academy at Ashfield, Mass., 1824–28 in the Female Academy at Londonderry, N. H., and then until 1834 in the ladies' seminary at Ipswich, Mass. Her great work, the founding of the Mount Holyoke Female Seminary at South Hadley, Mass., of which she was principal from 1837 to 1849, is the abiding monument to her practical sagacity, no less than to her unconquerable energy and sublime faith. D. at South Hadley Mar. 5, 1849. (See her *Life*, by Pres. Hitchcock, and *Recollections of Mary Lyon*, by Miss Fiske.)

Lyon (Matthew), b. in Wicklow co., Ireland, in 1746; emigrated to New York in boyhood; worked on a farm in

Connecticut for some years; removed to Vermont; became in 1775 lieutenant in a company of "Green Mountain Boys;" became paymaster-colonel of militia, member of the legislature, and assistant judge; founded the town of Fairhaven in 1783; built saw and grist mills; established a forge; made paper from basswood; manufactured types, and issued a paper called *The Scourge of Aristocracy and Repository of Important Political Truth;* took an active part in politics; was elected to Congress in 1797 as a Jeffersonian; was in Oct., 1798, convicted of libel against Pres. Adams, fined $1000, and imprisoned four months in Vergennes jail, during which time he was re-elected twice; narrowly escaped expulsion, first as a convicted felon, and afterward on account of an altercation on the floor of the House with Roger Griswold of Connecticut, resulting in blows; removed to Kentucky in 1801; was immediately elected to the legislature, and to Congress from 1803 to 1811; built gunboats on speculation for the war of 1812, and became bankrupt; was appointed by Pres. Monroe in 1820 U. S. factor among the Cherokee Indians in Arkansas, from which Territory he was elected delegate to Congress, but before taking his seat d. at Spadra Bluff, Ark., Aug 1, 1822.

Lyon (Gen. NATHANIEL), b. at Ashford, Windham co., Conn., July 14, 1819; graduated at West Point; entered the army as second lieutenant of infantry July, 1841; promoted to be first lieutenant 1847, captain 1851. His first service was a brief campaign against the hostile Indians in Florida, succeeded by four years of garrison-life, when he was called to Mexico by the outbreak of war. From the siege of Vera Cruz to the capture of the city of Mexico Lyon bore an active part, being wounded at the final assault at the Belen Gate; brevet captain for gallantry. Returning to New York at the close of the war, he sailed thence to California, remaining on the Pacific coast some five years; served in Kansas during the political troubles, and remained actively engaged on frontier duty until Feb., 1861, when he was placed in command of the U. S. arsenal at St. Louis, which he not only defended against threatened attack, but on the 10th of May, with Col. Blair, at the head of some 6000 "home guards," surrounded and captured the "State guard" in the vicinity, together with twenty cannon, large numbers of small-arms, and quantities of ammunition. He was now (May 17) appointed a brigadier-general of volunteers, and in June succeeded Gen. Harney in command of the department. Embarking his army (June 13) at St. Louis, he reached Jefferson City on the 15th, to find the place abandoned, and after securing the State archives, he re-embarked the following day, arriving opposite Booneville next morning, where he found an encampment of some 2000 or 3000 State guards, which he easily routed, and continued his march to Springfield, where he was compelled to remain by the superior force of the enemy, who now overran Southern Missouri; after vainly awaiting reinforcements, and being apprised of an advance of the enemy in two columns, he moved out (Aug. 1) from Springfield, hoping to defeat the column from the S. before it could unite with that coming up from the W. The following morning he met and defeated McCulloch at Dug Spring, who retreating now united with the other wing, and the whole body advanced toward Springfield, to which place Lyon had fallen back. Arriving at Wilson's Creek on the 7th, Lyon proposed to surprise them here; which plan, however, failed, and on the 9th he again moved out from Springfield and fought the battle of Wilson's Creek on Aug. 10. This battle is said to have been fought against his own judgment; but the evil to be apprehended from abandoning South-western Missouri without a battle being strongly represented, determined him to risk the engagement, throughout which he displayed the most daring courage, and it was after being twice wounded that, placing himself at the head of a regiment whose colonel had fallen, he was struck by a minie ball and almost instantly killed. His death produced a profound sensation throughout the country. His remains were received with military honors in all the principal cities through which they passed *en route* to Connecticut, where they were interred with great military and civic honors. By will he left almost his entire property to the government to aid in preserving the Union. Congress ordered by resolution that a recognition of his "eminent and patriotic services" be entered upon its records. A series of able letters written by him during and subsequent to the Kansas troubles were published in 1862, entitled *The Last Political Writings of Gen. Nathaniel Lyon.* G. C. SIMMONS.

Lyon King-at-arms (often called **Lord Lyon King-at-arms,** because the office, unlike other heraldships, has been usually occupied by a peer), the chief herald of Scotland. When the office is held by a nobleman certain of its duties must be performed by Lyon Depute, one of his subordinates. The Lyon also appoints messengers-at-arms for the courts and counties of Scotland. He is the chief officer of Lyon Court, the heraldic college of Scotland. His subordinates are the Lyon Depute, the Lyon clerk, Lyon-clerk-depute, the procurator-fiscal; a herald painter, and a macer. The proper heralds and pursuivants of Scotland perform duties which are chiefly ceremonial, and do not relate to the blazoning of arms. These last duties are performed by the Lyon court, and are even more elaborate and formal than those of English heraldry.

Lyonnais', an ancient province of France, which is now divided into the departments of Loire, Haute-Loire, Puy-de-Dôme, and Rhône.

Ly'ons [Fr. *Lyon ;* anc. *Lugdunum*], next to Paris the largest city of France, and without any exception the most important manufacturing place of the country, is situated in lat. 45° 45′ 44″ N., lon. 4° 49′ 43″ E., at the confluence of the Saône and the Rhone; and consists of a central part, covering a peninsula formed by the two rivers, and a number of suburbs scattered over the hills on the right bank of the Saône and on the left bank of the Rhone. It is the capital of the department of Rhône, the head-quarters of the seventh military division of France, and is very strongly fortified. Eighteen detached forts which defend and command it form a circle around it 16 miles in circuit. The quays along the Rhone and the Saône are surprisingly beautiful; they are planted with magnificent trees and lined with elegant houses. Twelve bridges span the Saône, seven the Rhone. Some other quarters of the city and several of the many public squares are also handsome. Place Bellecour is one of the largest squares in Europe; on Place des Terreaux stood the guillotine in 1794; from the summit of the hill of Fourvières, on the right bank of the Saône, where stands the church of Notre Dame de Fourvières, a most magnificent view is presented of the city, the Alps to the one side and the Cevennes to the other. But other parts of the city contain nothing but narrow, crooked streets, lined with tall, gloomy houses, and have a squalid and dismal appearance. Among the public buildings the most remarkable are—the Hôtel de Ville, one of the most interesting and beautiful buildings of its kind in Europe; the Palais des Beaux-Arts, on the Place des Terreaux; the cathedral, on the declivity of the hill of Fourvières, in Gothic style, of the time of Louis XI., and with four towers; the church of St. Nizier, of the fourteenth century, etc. The educational and benevolent institutions of the city are numerous and good. The Royal College was founded in 1519, and enjoys a great reputation. The School of Drawing and the Veterinary School are model establishments. In the Martinière 220 sons of artisans receive gratuitous education. There is a public library with over 100,000 volumes, a botanical garden, several scientific associations, etc. The dye-works, foundries, glass-houses, potteries, tanneries, and breweries of Lyons are very extensive, especially the latter. Its manufactures of jewelry, hats, fine liqueurs, and chemicals are also important, and its trade in its own manufactures and in the produce of the surrounding country, especially in wine, is very brisk; it communicates by canals with Bourdeaux, Paris, Marseilles, Geneva, and the Rhine. But its principal business is its silk manufacture, in which branch of industry it is hardly surpassed by any other place in the world. The average annual value of raw silk imported is estimated at $60,000,000; of manufactured silk exported, at $76,000,000. Silk-weaving was first started here in the reign of Louis XI. by artisans from Florence, Lucca, and Genoa; in the latter part of the seventeenth century between 9000 and 12,000 looms were in operation. But the Revocation of the Edict of Nantes bereft the city of many of its most skilled workmen, and the number of looms decreased to about 4000. In the latter part of the eighteenth century it had risen again to about 18,000, but the Revolution interfered sadly with the industry. At present about 70,000 looms are worked in and around Lyons, employing about 140,000 hands.

The city is very old. The ancient *Lugdunum,* on the hill of Fourvières (*Forum vetus*), was colonized in 43 B. C. by Munatius Plancus. Under Augustus it became the capital of the province of Gaul, and the centre of the different roads which the Romans built in the country. Germanicus, Claudius, Marcus Aurelius, Caracalla, and Geta were born here. During the early Middle Ages it belonged to the archbishop of Lyons, and was very much disturbed by feuds between its municipal council and its ecclesiastical ruler. But in 1307 it was incorporated with the kingdom of France by Philip the Fair, and its prosperity increased very much after that period. During the Revolution it suffered terribly; its insurrection against the Convention was punished by Collot d'Herbois and Fouché with an un-

heard-of cruelty. Again in 1814, 1815, 1830, and 1831 it was much disturbed by riots. These, however, ceased after the completion in 1834 of its fortifications, but it has suffered severely in late years by inundations, especially in 1840 and 1856. Pop. 323,417.

Lyons, post-v. and tp. of Cook co., Ill., 13 miles S. W. of Chicago, on the Des Plaines River and the Chicago and Alton and the Chicago Burlington and Quincy R. Rs. The railroad stations of the two roads are several miles apart. Pop. 2427.

Lyons, city and tp. of Clinton co., Ia., on the Mississippi River and the Midland and Dubuque R. R., and within 2 miles of the North-western, the Western Union, and a branch of the Chicago Burlington and Quincy R. Rs. There is a steam-ferry to Fulton, Ill., and the town is traversed by a horse railroad. It has an excellent wrapping-paper mill, 3 saw-mills, 4 sash-factories, 4 flouring-mills, 2 machine-shops, an oil-can factory, carriage-shops, stores, and shops, a national bank, 2 newspapers, a library of 2000 volumes, 8 churches, Masonic, Odd Fellows, temperance, and other societies; graded public schools, a seminary, and private schools. There are extensive nurseries, and best of land well farmed surrounding. Pop. of city, 4088; of tp. 4477. BEERS & EATON, EDS. "MIRROR."

Lyons, tp. of Mills co., Ia. Pop. 895.

Lyons, post-v. and tp. of Ionia co., Mich., near the head of navigation on Maple River and on Detroit Lansing and Lake Michigan R. R. Pop. of v. 704; of tp. 2855.

Lyons, v. of Vineyard tp., Lawrence co., Mo. Pop. 80.

Lyons, post-v. and tp., cap. of Wayne co., N. Y., on the New York Central R. R. and the Erie Canal, midway between Syracuse and Rochester. It has a good water-power, and its manufactures consist of iron-works, fanning-mills, agricultural implements, and tool handles. It contains 7 churches, a flourishing union school, a musical academy, 2 weekly newspapers, and 3 banks. Lyons is a great peppermint-oil mart. Pop. of v. 3350; of tp. 5115.
WM. T. TINSLEY, ED. "REPUBLICAN."

Lyons, tp. of Orangeburg co., S. C. Pop. 1537.

Lyons, Gulf of, a large bay formed by the Mediterranean on the southern coast of France. It receives the Rhone. Marseilles and Toulon stand on its shores.

Lyons (EDMUND), FIRST BARON LYONS of Christchurch, b. at Burton, Hampshire, England, Nov. 21, 1790, descended from Gov. John Winthrop of Massachusetts; entered the British navy in childhood; became a midshipman in 1803; served in the East Indies; became commander in 1812, and post captain in 1814. In 1828 he was engaged in the blockade of Navarino, Greece, then held by the Turks, and conveyed King Otho to Athens on the formation of the new kingdom; was knighted, and resided there as minister for fourteen years. In 1849, Sir Edmund became minister at Berne, and in 1851 at Stockholm. At the outbreak of the Crimean war he was appointed second in command of the Black Sea squadron, became commander-in-chief in Dec., 1854, and distinguished himself by brilliant services, which procured him a peerage in 1856 under the title of Baron Lyons of Christchurch. D. at Arundel Castle, Sussex, Nov. 23, 1858.

Lyons (RICHARD BICKERTON PEMELL), G. C. B., D. C. L., SECOND BARON LYONS, b. at Lymington, England, Apr. 26, 1817; educated at Winchester School and Christ Church, Oxford; appointed attaché at Athens 1839, at Dresden 1852, at Florence (residing at home) 1853; secretary of legation there 1856, and envoy to Tuscany 1858; was envoy at Washington Dec., 1858–65; ambassador at Constantinople Aug., 1865; at Paris July, 1867. He was sworn a member of the privy council 1865.

Lyra', de (NICHOLAS), b. at Lyre, Normandy, France, about 1270; studied in the Franciscan college at Verneuil and at the University of Paris; became a doctor of theology and an eminent lecturer upon biblical interpretation. His great knowledge of Hebrew led to the erroneous statement that he was a Jew. He held the most eminent posts in the Franciscan order, and his commentaries upon the Scriptures were approved and used by the Reformers, whence the punning couplet—

Si Lyra non lyrasset,
Lutherus non saltasset—

"If Lyra had not piped, Luther would not have danced." His great work was the *Postillæ perpetuæ in universa Biblia*, printed very early at Rome (5 vols. folio, 1471–72), which earned him the title of *Doctor planus et utilis*. It is the only exegetical work of any merit produced by the Middle Ages before the revival of letters. The Schoolmen seldom understood Greek, and never Hebrew; thus, they lacked the very first requisites as exegetical commentators. He also wrote a work *On the Coming of the Messiah* (1309), in reply to the Jews. D. at Paris Oct. 23, 1340.

Lyre [Gr. λύρα], a musical instrument of unknown origin and antiquity, famous in mythology and poetry. Diodorus ascribes its invention to the Egyptian Hermes (Mercury). According to the tradition, the Nile in its subsidence left on its bank a tortoise-shell, the contents whereof were so dried by the sun that the hard-strained cartilage was like stretched catgut. This gave the hint of an instrument. The Greek tradition does not materially differ from the Egyptian. The improvements in the lyre were made by the Greeks, who increased the capacities of the instrument by adding to the number of the strings. The most ancient lyre had three; the lyre of Terpander (B. C. 680) had seven; the lyre of Pythagoras (B. C. 600) had eight. The number was afterwards increased to eleven, and even to thirteen. In its perfected form the lyre consisted of two side-pieces set upright, like horns, connected together near the top by a wooden cross-piece; the strings were attached to this, and stretched perpendicularly, the lower end being fastened to the bottom of the resonant shell. They were struck either with the fingers or a plectrum, a stick of polished wood or ivory. When played, the lyre was held between the knees. The form of the instrument varied slightly, as can be imagined, in different epochs and among different peoples. It was used chiefly as an accompaniment to the voice in passionate, pathetic, and heroic song. For this reason it has given the name *lyric* to a class of poetry that expresses the mood of private and personal emotion. Literature celebrates the lyre of Sappho, the Lesbian lyre, and the lyre of Apollo. The Abyssinians and neighboring peoples of the present day use an instrument of seven strings that closely resembles the lyre of ancient Greece.
O. B. FROTHINGHAM.

Lyre-Bird, a name applied to two birds of Australia from the lyre-shaped outline of the erect tail-feathers of the male. (See MENURIDÆ.)

Lyr'ic Po'etry. Poetry, as defined by Aristotle, is an imitation, the things imitated being chiefly the actions and passions of men. Epic poetry, according to the same authority, imitates by words (ἔπος, "word"); lyric, by words accompanied with music (λύρα, "lyre"); and dramatic, by words accompanied with music and action (δρᾶν, to "act," δρᾶμα, an "act"). Epic and dramatic poetry *can* be sung, and among the Greeks they were in fact sung wholly or in part; but lyric poetry is made to be sung, and *is song* in its nature and essence. According to the etymology of the word, poetry is a creation. In the language and conception of the Greeks, from whom we derive the word, the poet is ποιητής, a "maker." In Old English also poets were called makers. "We Englishmen," says Sir Philip Sidney, "have met with the Greek in calling him (the poet) *maker*." He is a maker of ideas and images, a creator of his own facts and characters, while the historian has all his facts and characters furnished to his hand. The poet is the former and fashioner of an ideal world of men and things, while the historian has to do with men and things only as they exist in the real world. It is only in a very limited sense, however, that any being but God can create. The poet can only make out of his materials, reproduce a world of order and beauty out of the chaos into which our world has fallen. Poets, therefore, are, as Bailey has well expressed it, a kind of "*under*-makers."

Epic poetry is national, general, perhaps universal in its scope. Like history, it tells of the wars of nations, the conflicts of races, the strife and conquest of religions, the struggles of heroes, and the battles of gods. Lyric poetry is individual, personal, perchance wholly emotional and spiritual. Like a meditation, a soliloquy, or a conversation with a friend, it sings of hope and fear, of joy and sorrow, of inward struggles and conflicts. Epic poetry is objective. Quite forgetful of self, the poet is lost in his subject, lives only in the life of his characters, and grieves or exults only in the defeat or triumph of his hero, his country, or his race. Lyric poetry is essentially subjective. Forgetful of everything else, the poet dwells on his own joys or sorrows, exaggerates them, and strives to awaken the sympathy of his hearers. Or if he expresses the sentiments and emotions of others, he is one of them, and he gives utterance to their common feelings and experiences as his own. "He is the *true* lyric poet," says Ulrici, "who portrays not *merely* his own personal subjectivity, but that of the human mind generally, of which his own is but a particular manifestation."

Epic poetry has to do with the past, lives or would fain live in the good old times, and magnifies the achievements of bygone ages and generations into something more than human. Lyric poetry forgets the past in the love or hate of the present and the hope or fear of the future. "It delineates the mental states and impulses out of which events and destinies proceed." (*Ulrici.*) It forecasts fu-

ture events, anticipates or forebodes, perhaps foreshadows and foretells immortal destinies. Epic poetry is commemorative, lyric poetry is prophetic. Epic poetry is near akin to history, lyric poetry is more closely allied to religion. Hence, in that most impressive and instructive group of sculpture which has given name to the Hall of the Muses in the Vatican, Calliope and Clio, the Muse of Epic Poetry and the Muse of History, sit together on the breezy heights of Parnassus, while Erato, the Muse of Lyric Poetry, is grouped with Euterpe, the inspirer of music, and Urania, the heavenly Muse.

Epic poetry resembles sculpture, while lyric is more like music; in other words, epic is the sculpture and lyric the music of poetry. The former stands fixed in sublime dignity and eternal repose, like the unalterable Past, which it represents. The latter, like the Present and the Future, of which it is the expression, is ever changing and *becoming*, ever thrilling with joy or sorrow, trembling with hope or fear, breathing forth its passions and its inspirations, not in solid marble, but on the yielding air—an element as changeful and fleeting as itself. Hence, in the above-mentioned group, while every fold of Calliope's garments exhibits self-forgetfulness and repose, the whole frame of Erato quivers with emotion, and the lips are just ready to break forth in impassioned song.

Of dramatic poetry, we can only say here that in all the respects in which epic and lyric poetry thus contrast with each other, dramatic is a mean between them or a compound of both.

Only nine names, the number of the Muses, are comprised in the Alexandrian list of Greek lyric poets: Alcman, Stesichorus, Alcæus, Sappho, Ibycus, Anacreon, Simonides, Bacchylides, and Pindar. But these are only a fraction of the whole number. Of these, Anacreon and Pindar are the most celebrated, the former surpassing in grace, the latter in sublimity. The chief Latin lyric poets are Lucretius, Catullus, Horace, Tibullus, Propertius, and Ovid, among whom Horace holds the front rank. The greater part of Chinese poetry—"words of the temple," as they call it—is strictly gnomic or didactic, which is a variety of the lyric. Such are the *Five Classics* and the *Four Books*, composed by Confucius and his disciples about the time of the Seven Sages and in the golden age of Greek lyrics. The oldest sacred books of the Hindoos, the Vedas, are partly prose and partly poetry, and that lyrical, consisting of hymns, prayers, praises of the gods, and moral and religious precepts. The Vedas probably date as far back as B. C. 1000. They are anonymous, and were sometimes asserted to be the breath of Brahma, to have issued from his mouth at the creation, or even to have been eternal. The two principal lyric poets of the Persians are Saadi (d. A. D. 1292) and Hafiz (A. D. 1389). Arabic poetry, which is so abundant that the *catalogue* of Arabic poems in the Escurial fills twenty-four volumes, is largely lyric. It belongs, for the most part, to the Mohammedan era, extends over the Middle Ages, and exerted an important influence on the poetry of the modern European nations. The Hebrews had no strictly epic or dramatic poetry. But different forms of lyric poetry, including the didactic, make up the whole Old Testament, exclusive of the history. It begins with Moses, their great lawgiver, and continues a thousand years, till after the return from the Captivity. David, the greatest of their kings, was also the greatest of their lyric poets. Christian psalmody takes its rise, and more or less its form, from the Psalms of David. Petrarch is so pre-eminently the lyric poet of the Italians, that those who succeeded him imitated him, and have often been called Petrarchists, although the epic and dramatic poets of Italy, particularly Ariosto, have also left sonnets and canzoni of scarcely inferior merit. Boscan, Garcilaso, and Mendoza are named as the triumvirate of Spanish lyric poets. But Herrera surpassed them in Pindaric sublimity, and Ponce de Leon in classic elegance. They all belonged to the age of Charles V. The chief lyric poets of France, after the Provençals, are Marot and Malherbe prior to the reign of Louis XIV., La Fontaine and Boileau in that golden age, and Béranger, Lamartine, and Alfred de Musset in the nineteenth century. Of these, Béranger, by his gay and witty songs, has earned the title of "the French Burns." The Minnesingers were the earliest lyric poets of Germany. Klopstock and Wieland, Schiller and Goethe, all composed lyrics of great excellence, although they gained their reputation chiefly in other departments. Tieck, Uhland, and Körner—the last celebrated for his patriotic and war-songs—were more distinctively lyric. Among English poets, Collins, Cowper, and Burns are pre-eminently lyrical. Moore and Crabbe belong to the same category. Dryden and Pope are also lyric rather than epic or dramatic, although they are more properly didactic poets and satirists. Byron may be classed with them under this last title. Scott stands alone as the only recent representative of the ballad. Wordsworth's popularity, not to say his fame, rests chiefly on his odes and sonnets. In hymnology or church lyrics the names of Ephraem of Syria and Gregory of Nazianzen among the early Greek Fathers, St. Ambrose and Hilary of the Latin Fathers, St. Bernard and Thomas à Celano in the Middle Ages, Luther and Gerhard among the Germans, and in English Watts and Doddridge, Newton and Keble, Wesley and Cowper, are particularly deserving of mention. W. S. TYLER.

Lys, a river which rises in France, in the department of Pas-de-Calais, flows in a north-eastern direction into Belgium, and joins the Scheldt at Ghent after a course of 100 miles.

Lysan'der, post-v. (BETTS' CORNERS) and tp. of Onondaga co., N. Y., on Seneca River, contains Baldwinsville and other villages, and has extensive water-power and manufactures. Pop. of v. 268; of tp. 4944.

Lysander, a Spartan general, received in 407 B. C. the command of the Spartan fleet, and defeated the Athenians off the promontory of Notium. His term of command having expired, he was replaced by Callicratidas, but Callicratidas was defeated in 406 B. C. in the battle of the Arginusæ; and as it was against the Spartan laws that the same person could hold an office twice, Aracus was nominally placed at the head of the fleet, while in reality Lysander held the command. His campaigns were very brilliant. He routed and captured the Athenian fleet at Ægospotami, and early in the next year (404 B. C.) took Athens, thus ending the Peloponnesian war. At this moment he was the most prominent man in Greece, but his arrogance and enormous ambition made it impossible for him to hold any office. When, in 395 B. C., he was sent at the head of an army against the Bœotians, during which campaign he was killed while besieging Haliartus, it is said that he was deeply involved in a conspiracy for the subversion of the dynasty of the Heraclidæ in Sparta.

Lys'ias, a Syrian nobleman of the blood-royal, whom King Antiochus Epiphanes, on setting out for Persia, appointed guardian of his son and regent of the kingdom, and as such he waged a formidable war with the Jews. His vast forces were defeated by Judas Maccabæus near Emmaus (B. C. 166); he was himself repulsed near Bethsura in the following year, but took that fortress B. C. 163, and laid siege to Jerusalem, but was forced to treat with the Jews by an insurrection at Antioch. Shortly afterwards Lysias was put to death by the populace of Antioch, who had rebelled in favor of Demetrius Soter.

Lysias, an Athenian orator, b. in Athens in 458 B. C.; educated at Thurii, whence he was expelled in 413; went to Athens, but was imprisoned as an adversary of the oligarchs; escaped to Megara, and returned in 403, after the overthrow of the tyranny of the Thirty, and d. in 378. Of his numerous orations, thirty-five are still extant, edited by Förtsch (1829) and Franz (1831); some of them have been translated into English by Dr. Gillies.

Lysima'chia [Gr. λύσις, "release," and μάχη, "strife," but more probably named from King Lysimachus], a genus of herbaceous perennial plants mostly with yellow flowers, belonging to the primrose family (see PRIMULACEÆ), generally called loosestrife, from an etymology as old as the time of Pliny. The European *L. nummularia*, or moneywort, is an ornamental plant commonly cultivated in gardens.

Lysim'achus, b. at Pella, Macedonia, about 360 B. C.; served as a general in the army of Alexander the Great, and received Thrace on the division of the empire at the death of Alexander in 323. In 306 he assumed the title of king, and having defeated Antiochus in the battle of Ipsus in 301, he united a large part of Asia Minor to his dominions. An expedition he undertook in 292 against the Getæ, N. of the Danube, was very unfortunate; he was taken prisoner with his whole army, and received his freedom only by giving his daughter in marriage to the king of the Getæ. After the murder of his son Agathocles, who was much loved, the population of Asia Minor rose in insurrection, and was supported by Seleucus, and in the battle of Corus (281) Lysimachus was defeated and killed.

Lysip'pus, b. at Sicyon, flourished in the fourth century B. C.; became especially celebrated for his statues of Alexander the Great, he being the only sculptor, as Apelles was the only painter, to whom Alexander would sit. Pliny tells us that Lysippus made about 1500 pieces, but as he always worked in bronze, his works have all perished.

Lysko'vo, or **Liskovo,** town of Russia, in the government of Nizhnee-Novgorod, on the Volga, has considerable trade in potash and dyed mats. Pop. 5216.

Ly'sons (DANIEL), F. R. S., b. at Rodmarton, Gloucestershire, England, in 1760; graduated M. A. at Oxford in 1785; took holy orders, and became vicar of Putney about 1790, rector of Rodmarton 1801; was distinguished as an antiquary; published, under the patronage of Horace Walpole, *The Environs of London, being an Historical Account of the Towns, Villages, and Hamlets within Twelve Miles of that Capital* (5 vols., 1792–1800), and, in conjunction with his brother Samuel, *Magna Britannia, being a Concise Topographical Account of the Several Counties of Great Britain* (6 vols. 4to, 1806–22), a colossal work, left unfinished, containing the counties in alphabetical order up to Derby inclusive. The materials collected for this vast enterprise are now deposited in the British Museum, forming sixty-four MS. volumes. D. at Rodmarton Jan. 3, 1834.—His son, MAJOR-GENERAL DANIEL LYSONS, C. B., b. 1816, is a distinguished officer, who now (1875) commands the northern military district of Great Britain.

Lysons (SAMUEL), F. S. A., b. at Rodmarton, England, May 17, 1763; aided his brother Daniel in the preparation of the *Magna Britannia*, and published several splendid works on British antiquities, among which were *An Account of Roman Antiquities discovered at Woodchester* (1797, colombier folio), *Reliquiæ Britannico-Romanæ, containing Figures of Roman Antiquities discovered in Various Parts of England* (1813–17, folio, with 156 colored plates), and *The History and Antiquities of Devonshire* (2 vols. 4to, 1822), in which he was aided by Dean Buckland, the bishop of Cloyne, and other distinguished archæologists. He was called to the bar in 1798; became keeper of the records in the Tower of London 1803, and vice-president of the Society of Antiquaries 1812. D. at London June 29, 1819.

Lys'tra, an ancient city of Asia Minor, placed by Pliny in Galatia and by Ptolemy in Isauria, while in the Acts of the Apostles it is placed in Lycaonia. It was the native place of Timothy, the scene of Paul's miracle of healing a lame man, of the attempted worship of Paul and Barnabas as Jupiter and Mercurius, and of the stoning of the former (Acts xiv.). The site of Lystra has been disputed by modern travellers, Leake, Arundell, and Hamilton placing it at different localities.

Lythra'ceæ [Gr. λύθρον, "blood"], a natural order or family of herbaceous plants characterized by entire leaves, mostly opposite, no stipules, the calyx enclosing, but free from the many-seeded ovary and membranous pod, and bearing deciduous petals and stamens on its throat. Style one; stigma capitate or rarely two-lobed. Flowers axillary or whorled, rarely irregular, perfect, sometimes dimorphous, or even trimorphous; those on different plants with filaments and style reciprocally longer and shorter. Petals sometimes wanting. Pod with one to four cells, placentæ in the axis. Seeds anatropous, without albumen. Branches usually four-sided. There are four genera—*Ammannia, Lythrum, Nesæa,* and *Cuphea*. Like the *Lysimachia*, from which this family is botanically very distinct, it bears the common name of loosestrife, which properly belongs to the former. Many species are found in the U. S., growing chiefly in marshy ground. Some of them are cultivated on account of their beautiful purple or crimson flowers, and are also employed in materia medica as an astringent. The flowers of an East Indian species, *L. Hunteri*, are used for dyeing. The crape myrtle and the Egyptian henna-plant belong to this order.

Ly'tle (Gen. WILLIAM HAINES), b. at Cincinnati, O., Nov. 2, 1826; graduated at Cincinnati College; studied and practised law; during the Mexican war he served as captain of Ohio volunteers, returning at its close to Ohio and resuming his profession; elected to the State legislature, and soon after chosen major-general of militia, a position which had been previously held by his father and grandfather. Being thus identified with military life, his services were availed of at the outbreak of civil war, first as colonel of the 10th Ohio Vols., in command of which regiment he served in the campaign of 1861 in West Virginia, at Rich Mountain and Carnifex Ferry, commanding a brigade at the latter battle, where he was severely wounded, Sept. 10, 1861. Returning to the field as soon as his wounds would permit, he commanded a brigade under Gen. O. M. Mitchel during the latter's operation in Alabama; at the battle of Perryville, Ky. (Oct. 8, 1862), he was dangerously wounded and made prisoner, but soon exchanged and promoted to be brigadier-general of volunteers Nov., 1862, continuing in active service thereafter in the West, and while gallantly leading a charge at the battle of Chickamauga was killed, Sept. 20, 1863. He also possessed literary ability of a high order. G. C. SIMMONS.

Lyt'telton (EDWARD), D. C. L., BARON, b. at Mounslow, Shropshire, England, in 1589; graduated at Oxford 1609; became chief-justice of North Wales 1621; entered Parliament 1626: recorder of London 1631; solicitor-general and knight 1634; chief-justice of common pleas 1640; lord keeper of the great seal 1641; raised to the peerage Feb. 18, 1641; escaped with the great seal to Charles I. at York May, 1642; required by Parliament to return it or lose his place 1643; first commissioner of the treasury Mar., 1644; commissioned to raise a regiment of foot-soldiers May, 1644. D. at Oxford Aug. 27, 1645.

Lyttelton (GEORGE), FIRST BARON, son of Sir Thomas Lyttelton, Bart., b. at Hagley, Worcestershire, England, Jan. 17, 1709; was educated at Eton and at Christ Church, Oxford; travelled in France and Italy; entered Parliament in 1730; joined the young "Patriots," who eventually drove Walpole from power, and soon figured by the side of Pitt and Pulteney among the most formidable opponents of the ministry; took part in most of the debates, exhibiting great fluency of speech and elegance of expression; wrote *Letters from a Persian in England to his Friend at Ispahan* (1735–36), an imitation of Montesquieu, which had an immediate success; became secretary to Frederick, prince of Wales, when that prince formed his little court as head of the opposition; was intimate with Pope and his literary school, and proved himself the official patron and private benefactor of Thomson, Fielding, and Mallet; married, in 1741, Lucy, sister of Lord Fortescue, and on the fall of Sir Robert Walpole in 1744 became one of the lords of the treasury. He is said to have been a skeptic in early manhood, and in 1747 produced his celebrated *Observations on the Conversion and Apostleship of St. Paul*, which was considered a masterly treatise upon the evidences of Christianity, and as such has been frequently reprinted. The death of his wife, to whom he was tenderly attached, in the preceding year, gave occasion to his pathetic *Monody to the Memory of a Lady lately Deceased* (folio, 1747), considered the best of his poetic efforts. On the death of his father in 1751 he succeeded to the baronetcy and to the vast family estates, when he gave free scope to his artistic tastes, and made Hagley one of the most beautiful seats in England. He became successively cofferer of the king's household, privy councillor, and chancellor of the exchequer (1756), and on the dissolution of the ministry in 1759 was raised to the peerage with the title of Baron Lyttelton of Frankley. In 1760 he published his *Dialogues of the Dead*, and in 1764–67 his *History of Henry II.* (4 vols.), a work upon which he had been engaged more than twenty years, and which was highly commended for accuracy and research, but is now forgotten. D. Aug. 22, 1773. His *Miscellaneous Works* (2 vols.) appeared in 1774, and his *Poetical Works* in 1785.

Lyttelton (THOMAS), LORD, son of the preceding, b. in 1744; exhibited extraordinary precociousness in youth; at the age of sixteen was regarded almost as a prodigy by several of the ablest writers and most erudite scholars in England; became dissipated and dissolute in his habits; lost the favor of his father; an alienation between them ensued; his marriage proved to be unhappy, and a separation followed. He was returned to the House of Commons in 1768; lost his seat on a contest early in Jan., 1769, and on the death of his father in 1773 took his seat in the House of Lords; d. in 1779, under most extraordinary circumstances. From a presentiment he predicted his death three days before it occurred, though he was at the time in good health, and remained so until a few moments before he suddenly expired while conversing with friends. While in the House of Commons as well as in the House of Lords, he was greatly distinguished for vigor of thought, elegance of language, and for the force and power of his speeches. His style, tone of political sentiments, and other points of coincidence have led to the hypothesis, entertained by many, that he was the author of the *Letters of Junius*. A strong article sustaining this view was published in the *London Quarterly* for Dec., 1851. A very important fact, however, in support of the hypothesis was not presented with its due force in that article. It was the fact in the life of Lord Lyttelton that he was voted out of his seat in the Commons by the Tory administration early in Jan., 1769, and just before the appearance of Junius's first letter to the *Public Advertiser*. The deep personal interest Lord Lyttelton had in the questions growing out of his own contested seat might account for that surpassing special knowledge of the parliamentary law of England on such subjects exhibited with such extraordinary effect by Junius in his discussion of the Wilkes and Luttrell case with Sir William Blackstone. The first of Junius's *Letters* which thoroughly attracted the attention of the leading minds of the kingdom, and started an anxious inquiry in the circles of the most intellectual everywhere as to who he could be, were those in which he so completely floored this most eminent jurist and statesman on a question of parliamentary law. He was at that

time a member of the Commons, and, siding with the ministry, justified the action of the House in excluding Wilkes because of his alleged disability, and in seating Luttrell, against whom a majority of the electors had voted. The pointed and wounding strictures of Junius upon this very able and erudite judge's position called forth from him a reply in pamphlet form, that cost him some time as well as labor to prepare, in which he cited the celebrated case of Walpole as a precedent in point. In a very few days his harassing and unknown assailant was upon him again through the columns of the *Advertiser*, utterly demolishing the shelter under which the great commentator had sought refuge, and showing with unquestionable proofs that the precedent cited, so far from sustaining the position for which it had been brought forth, left it without the slightest ground to stand upon. When Junius came back so quickly with his extinguisher upon the "parliamentary precedent directly in point" produced with so much confidence by the recognized "expounder of the constitution and laws of the realm," all England was excited in wonder and amazement as to who this "masked man" could be who had thus with two thrusts so thoroughly harpooned the acknowledged whale of the British law, and sent him spouting cascades of quite a different character from those of the briny element which constituted the amusement of his usual sports. This reply of Junius to Blackstone must have taken even Camden and Chatham by surprise. Neither of them could have been aware of the historic fact brought out by Junius. Chatham had discussed the question in the House of Lords with his greatest vehemence and eloquence. He had said, in speaking of the action of the Commons in voting out Wilkes and voting in Luttrell, as they had done, "A breach has been made in the constitution; the battlements are dismantled; the citadel is open to the first invader; the walls totter. What remains, then, but for us to stand foremost in the breach to repair or perish in it?" But he had not exposed the precedent by which the defenders of the ministry attempted to justify the monstrous deed. It was after this had been done by the hand of the great unknown correspondent of the *Public Advertiser* that Burke in the House of Commons exclaimed, "How comes this Junius to have broken through the cobwebs of the law, and to range uncontrolled, unpunished, through the land? The myrmidons of the court have been long, and are still, pursuing him in vain. They will not spend their time upon me, or you, or you. No; they disdain such vermin when the mighty boar of the forest, who has broken through all their toils, is before them. But what will all their efforts avail? No sooner has he wounded one than he lays another dead at his feet. . . . King, Lords, and Commons are but the sport of his fury."

It is not a little remarkable that none of those who have attributed the *Letters* of Junius to Lord Lyttelton seem to have attached any importance in support of their hypothesis to the fact of his having been ousted of his seat in the House, as stated; especially in connection with the extraordinary triumph of Junius over Blackstone in the matter of the Middlesex election. This was the first great feat of the "mighty boar of the forest," as Burke styled him, which gave him unquestionable position among the master intellects of his time and country. Without intending to espouse the side of any one for whom claims have been set up for the authorship of Junius, it is quite pertinent to this sketch to say that in the opinion of the writer this single fact in the life of Lord Lyttelton, with all its surroundings, bearings, and connections, has more weight in behalf of the Lyttelton hypothesis than any other single fact has in behalf of any other hypothesis suggested, and more than all the facts together in behalf of the Sir Philip Francis hypothesis, taken, as they must be, with their well-known surroundings, bearings, and connections. It is quite pertinent also here to submit some reflections for the consideration of all who are inclined to enter upon an inquiry as to the identity of Junius. The true Junius, when discovered, must fit the outlines of that character and position which are unmistakably stamped upon his writings. "By their fruits ye shall know them." The real author of these productions, for instance, must have been a man of wealth, or with pecuniary resources placing him far above all dependence on subordinate official service for means of support, as clearly appears from his private correspondence with Woodfall, who was imprisoned for publishing the *Letters*, and from his surrender to him of his entire copyright interest in the subsequent publication of them in book-form in 1772. His vast learning and extensive general information very unmistakably appear throughout his productions. He must have been a man of leisure as well as of fortune and culture. He was a Briton to the core, and unsurpassed in his devotion to the liberties of his country as secured in Magna Charta. Intellectually, he certainly had no superior at the time in England. This is clear from the manner in which he disposed of Blackstone in the case of the Middlesex election, and of Mansfield on the rights of juries in all criminal cases whatsoever to be the sole judges of the law as well as the fact. All these conditions, qualities, and essential requisites to fit the true character (to say nothing of others) should be ever borne in mind when the question of the identity of Junius is raised. Is it at all probable that any one filling a clerkship in any of the departments of government could have proved himself such an overmatch for Blackstone and Mansfield on their own elevated arenas of professional learning, or exhibited such extraordinary powers as Burke recognized in Junius? Without pursuing the inquiry further, suffice it to say in conclusion of this sketch that whoever he was, or whatever may have been said or written, or may hereafter be said or written, about the *Letters* of Junius, either in relation to the identity of the author or to the character of their matter, one thing must be conceded by all; and that is, they produced a deeper and more lasting impression upon the popular mind in Great Britain in the cause of liberty than any anonymous writings ever did before or have done since in any age or country. To this it may also be added the probability is that no part of the great work of Junius was better executed than that in which he undertook to be "the sole repository of his own secret." If so, it certainly "perished with" him. His political principles, however, still live, and will live for ever. A. H. STEPHENS.

Lytton (EDWARD GEORGE EARLE **Lytton Bulwer**), FIRST BARON. See BULWER.

Lyt'ton (EDWARD ROBERT **Bulwer-Lytton**), SECOND BARON, son of the eminent novelist, b. in England Nov. 8, 1831; was educated first at Harrow, then under private tutors, and afterwards at Bonn, Germany, where he devoted himself especially to modern languages; entered the diplomatic service in 1849 as attaché and private secretary to his uncle, Sir Henry Bulwer, minister at Washington; was transferred in the same capacity to Florence in 1852, and to Paris in 1854. As paid attaché he was sent to the Hague in 1856, to St. Petersburg in 1858, to Constantinople in the same year, and to Vienna in 1859. He was acting consul-general at Belgrade in 1860, and was employed on a special confidential mission for preventing the renewal of hostilities between the Turks and the Servians (1862). He was in the same year made second secretary of legation, and in Jan., 1863, was sent to Constantinople as first secretary; was chargé d'affaires for brief intervals in 1863 and 1864; secretary of legation at Athens in 1864, and at Lisbon in 1865, where he was chargé d'affaires several times, and at Madrid in 1868; became secretary of embassy at Vienna in the same year; at Paris in 1872, where he acted twice in 1873 as chargé d'affaires; received the appointment of ambassador at Lisbon in Dec., 1874, and in May, 1875, declined the governorship of Madras. He married in 1864 a niece of the late earl of Clarendon, and succeeded to his title as Baron Lytton on the death of his father, Jan. 18, 1873. His first appearance as an author was under the *nom de plume* of "Owen Meredith" with *Clytemnestra and Other Poems* (1855). *The Wanderer, a Collection of Poems in Many Lands* (1859), and *Lucile* (1860), a novel in elegant verse, established his reputation as a popular poet. In 1861 he published anonymously *Tannhäuser, or the Battle of the Bards*, in collaboration with an intimate friend, since deceased, whose biography he wrote in 1871 under the title *Julian Fane, a Memoir*. In 1861 he issued *Serbski Pesme*, a translation of the national songs of Servia; in 1863 a prose romance, *The Ring of Amasis*; in 1868 *Chronicles and Characters*; in 1869 *Orval, or the Fool of Time*, a dramatic poem paraphrased from the Polish, with imitations of authors in several other languages; in 1874 *Fables in Song* (2 vols.) and *Speeches of Edward, Lord Lytton, with some of his Political Writings Hitherto Unpublished, and a Prefatory Memoir*. He is now (1875) understood to be engaged in editing other MSS. left by his distinguished father. In 1867 a collected edition of the *Poetical Works of Owen Meredith* appeared in two elegant volumes, and were republished in the U. S., where most of them had previously appeared. Without attaining the mark of creative genius, all the poems of Lord Lytton are fluently and elegantly written, evincing wide experience of life and a highly-cultured mind. PORTER C. BLISS.

Lyve'den (ROBERT VERNON SMITH), FIRST BARON, b. in London Feb., 1800, nephew of Rev. Sidney Smith; educated at Eton and Christ Church, Oxford; entered Parliament for Tralee in 1829; was member for Northampton in the Liberal interest from 1831 until his elevation to the peerage, July, 1859. He was a lord of the treasury 1830–34, secretary of the board of control 1835–39, under-secretary of state for the colonies 1839–41, secretary at war 1852, and president of the board of control 1855–58. D. in London Nov. 10, 1873.

M.

M, a labial consonant, of the class called liquids. In the Roman notation it stands for *mille,* one thousand. As an abbreviation it represents *mile,* noon (*meridies*), *mètre, Marcus,* the French title *Monsieur,* etc. M̄. stands for 10,000; M' for the Roman name *Manius.* For its usual meanings in combination with other letters, see A. M., H. M., M. C., M. D., M. E., M. P., N. M., P. M., Q. M., R. M., S. M., etc. in the table of ABBREVIATIONS. In music it is often used in the following combinations: M. G., *main gauche,* "the left hand;" M. D., *main droit,* "the right hand." M. M., with a note and certain figures annexed, indicates the minute measure of a bar as shown by Maelzel's metronome. M. F. and M. P., for *mezzo forte* and *mezzo piano* (or *mf* and *mp*), mean, respectively, "rather loud" and "rather soft."

Maabar, a kingdom existing during the Middle Ages on the Coromandel coast of India, occupying nearly the same territories as the modern presidency of Madras.

Maas. See MEUSE.

Mab [Cymric, "a child"], an imaginary being, who in English folk-lore shares with Titania the honor of being queen of the fairies. In Shakspeare's *Romeo and Juliet,* Ben Jonson's *Satyr,* Milton's *L'Allegro,* and other poems of the seventeenth century, her characters are variously set forth.

Mabillon' (JEAN), b. Nov. 23, 1632, at St. Pierremont, in Champagne, France; educated at the theological seminary of Rheims; entered in 1563 the order of the Benedictines, and d. at Paris Dec. 27, 1707. His collections and editions of historical documents, *Vetera Analecta* (4 vols., 1675–85) and *Musæum Italicum* (2 vols., 1787–89), gathered in Germany and Italy, and based on critical researches, are very valuable; and his *De Re Diplomatica* (1681), in which he set forth and defended his method, and which was violently attacked by the Jesuits, exercised a wholesome influence on the study of history. He also wrote *Acta Sanctorum Ordinis S. Benedicti* (9 vols., 1668–1702) and *Annales Ordinis S. Benedicti* (6 vols., 1703–39).

Mably', de (GABRIEL BONNOT), a brother of Condillac, b. at Grenoble, France, Mar. 14, 1709; educated in the college of the Jesuits at Lyons; served for some time as secretary to his relative, the minister-cardinal Teucin, but gave up this position, and lived afterwards in retirement, solely occupied with literary pursuits. D. in Paris Apr. 23, 1785. He was an enthusiastic admirer of the ancient republics of Greece and Rome, as shown by his works, *Observations sur l'Histoire de la Grèce* (1766) and *Observations sur les Romains* (1751), but his understanding of their social and moral order was incomplete, and the conclusions he arrived at with respect to modern societies in his *Parallèle des Romains et des Français* (1740) were very erroneous and superficial. He enjoyed a great reputation, however, with his contemporaries, and he was invited by the Polish diet and the American Congress to write his *Du Gouvernement de Pologne* (1781) and *Observations sur le Gouvernement et les Lois des Etats-Unis d'Amérique* (1784). The singular, often ludicrous, enthusiasm for antique ideas and forms which prevailed during the Revolution was largely due to him, and later philosophers have generally agreed in tracing the rudimentary ideas of modern communism in his *Entretiens de Phocion* (1763), *De la Législation* (1776), and *Principes de Morale* (1784).

Macad'am (JOHN LOUDON), b. at Ayr, Scotland, Sept. 21, 1756; came to New York in 1770 to reside with an uncle; was during the American Revolution a loyalist; made a considerable fortune as agent for the sale of vessels brought into port as prizes, but lost most of it by his forced withdrawal at the peace of 1783; returned to Ayrshire, Scotland; became a magistrate and deputy lord lieutenant of the county, and as trustee of roads introduced the system of roadmaking called by his name. He was engaged for much of the time during many years in travelling at his own expense through Great Britain to examine the condition of the roads; addressed in 1811 a memorial on the subject to the House of Commons, which led to the adoption of his system and to his own appointment as surveyor of roads in the Bristol district, where in 1816 he commenced *macadamizing* the highways. Within a few years he had personally supervised the roadmaking in twenty-eight counties of England, and during his lifetime nearly every travelled route in Great Britain was a monument of his success. No patent was solicited for his system, and no remuneration asked beyond the payment of the expenses of his personal supervision; he declined an offered knighthood, but accepted a testimonial of £2000 voted him by Parliament. D. at Moffat, Scotland, Nov. 26, 1836. He wrote *A Practical Essay on the Scientific Repair and Preservation of Public Roads* (1819), *Remarks on the Present State of Roadmaking* (1820), and *Observations on Roads* (1822).—His son JAMES (d. 1852) accepted knighthood and the office of superintendent of roads for the London district.

MacAdam Junction, post-v. of York co., N. B., at the junction of the European and North American and the New Brunswick and Canada Railways, 82 miles W. N. W. of St. John. Pop. about 400.

McAl'ester (Gen. MILES D.), b. in New York in 1834; graduated at the U. S. Military Academy July, 1856, and entered the army as brevet second lieutenant of engineers; received his full appointment of second lieutenant Dec., 1856; promoted to be first lieutenant May, 1861, captain Mar., 1863, and major of engineers Mar., 1867. His first service was at Fort Taylor, Fla., where he remained a year, whence he was transferred to New York, and at the outbreak of the civil war was engaged in repairing Fort Mifflin, Del. During the Peninsular campaign (1862) he was chief engineer of the 3d corps of the Army of the Potomac, and engaged at Yorktown, Williamsburg, Fair Oaks, and Malvern Hill; in the Maryland campaign at South Mountain and Antietam. In Oct., 1862, was transferred to Ohio as chief engineer of that department, and engaged in fortifying Cincinnati, Newport, and Covington, and in constructing bridge-trains; during the siege of Vicksburg was selected by Gen. Grant to serve under him, and on the surrender of that place was assigned to duty at the Military Academy as assistant professor of engineering; in July, 1864, was transferred to the South, and as chief engineer of the division of West Mississippi participated in the siege and capture of Forts Morgan and Gaines, Ala.; for gallant services during the Peninsular campaign received the brevets of major and lieutenant-colonel, and for highly meritorious services at the siege of Forts Gaines and Morgan that of colonel and brigadier-general. After the close of the war he superintended the defences of Mobile and Pensacola, and subsequently the important work of improving the mouths of the Mississippi River, where he introduced various new methods, and designed a boat especially adapted to the work, which has since been in operation with eminent success. D. at Buffalo, N. Y., Apr. 23, 1869. G. C. SIMMONS.

McAl'lister (HUGH N.), b. in Juniata co., Pa., in June, 1809; graduated at Jefferson College, Canonsburg, Pa., and at the Dickinson College law school; was a prominent citizen of Bellefonte, Pa., the principal founder of the State Agricultural College, and a member of the constitutional convention of 1873. D. at Philadelphia May 5, 1873.

McAllister (MATTHEW HALL), LL.D., b. at Savannah, Ga., Nov. 26, 1800; educated at Princeton College; became a renowned lawyer and politician in his native city, where his father and grandfather had previously practised law with distinction; was appointed in 1827 U. S. district attorney for Georgia; was in 1832 active in opposition to nullification; was several times elected to both branches of the legislature, in which he obtained the establishment of the court for the correction of errors; was some years mayor of Savannah; was a noted protector and friend of the colored people, and was defeated by a very small vote in 1845 as Democratic candidate for the governorship. In 1850 he removed to California with his family; entered upon the practice of law in San Francisco, and was from 1855 to 1862 the first U. S. circuit judge of California. In this capacity he rendered eminent services by his wise decisions upon land-titles, which were then in the utmost confusion, and also by his energetic action in suppressing the "Vigilance Committee" by an appeal to the naval authority. Judge McAllister was a brother-in-law of Dr. J. W. Francis, and like him a courtly gentleman of the old school. He resigned his judgeship from failing health in 1862, and d. at San Francisco Dec. 19, 1865. A volume of his legal opinions was published by one of his sons.

McAllister, Fort, a strong earthwork built by the Confederate engineers on Genesis Point, on the right bank

of the Great Ogeechee River, 6 miles from Ossabaw Sound and 12 miles S. of Savannah, Ga., had three half bastions, two curtains, and twenty-one guns; successfully resisted assaults by the fleet of monitors under Com. Worden Jan. 27, Feb. 1, and Mar. 3, 1863, partially disabling by its fire the Montauk and Passaic. It was taken by assault by Gen. Hazen with the 2d division of the 15th corps, Dec. 13, 1864, with a loss of 90 men. This was the closing military feat of Sherman's "march to the sea," and was a chief cause of the surrender of Savannah, a few days later.

MacAl'listerville, post-v. of Fayette tp., Juniata co., Pa., 10 miles N. of Mifflin.

McAlpine (William J.), b. in New York City in 1812; received a high academic education, and commenced engineering in 1827 under John B. Jervis, with whom he remained until 1839, having been employed upon the Delaware and Hudson Canal and R. R., and upon the State canals and other hydraulic works planned and constructed by that eminent engineer, and incidentally on the St. Lawrence canals, under the late Benjamin Wright. He succeeded Mr. Jervis as engineer of the Erie Canal enlargement, E. D., until 1846, when he was called upon to construct the dry dock at the Brooklyn navy-yard; in 1852 was elected State engineer of New York; in 1854–56 was railroad commissioner of the State, and made a valuable report on the principles and practice of railway construction and management; for two years was acting president and engineer of the Erie Railway, and later engineer of the Galena and Chicago and of the Ohio and Mississippi railways; constructed the Albany and Chicago waterworks, and planned those for Brooklyn, New Bedford, etc.; in 1870 presented plans for the improvement of the cataracts of the Danube ("the Iron Gates"), which were adopted by the Austrian government. His advice has been called for upon important engineering works in this country, and as a writer he has contributed useful and practical information to the engineering profession.

Macanal'ly (David Rice), D. D., b. in Granger co., Tenn., Feb. 17, 1810; ordained a Methodist clergyman in 1831; preached in Tennessee, North Carolina, and Virginia; was president of the East Tennessee Female Institute at Knoxville, Tenn., 1843–51, and became editor of the St. Louis *Christian Advocate* in 1851. He wrote *Martha Laurens Ramsay, a Biography*, and *Life and Times of Mr. William Patton, Sunday-school Manual*, and compiled a hymn-book.

Macao', city and seaport on the coast of China, in the province of Quang-Tong, belonging to Portugal, and situated on a peninsula at the mouth of the Canton River, 40 miles from Hong Kong. The Portuguese established a factory here in 1517, obtained a grant of the place from the Chinese emperor in 1586, and made it the seat of a very extensive trade. But since the establishment of the English at Hong-Kong its commerce has much decreased, though it was made a free port in 1846. The coolie-trade was the chief business until abolished in 1874. Its situation and climate are delightful. Camoens resided here, and wrote his *Lusiad;* an adjacent cave is still pointed out as a favorite place of his. Pop. 100,000, of whom 10,000 are European.

Macapa', town of Brazil, in the province of Para, on the left bank of the Amazon, is situated just below the equator, is well built, has a good harbor, and trades much in timber and ornamental woods. Pop. 7500.

Macaro'ni [It. *maccheroni*], **Vermicelli** ["little worms"], **Fedelini,** and **Italian Paste** are all forms of the same familiar substance, much used for culinary purposes. They are made from very white and glutinous varieties of wheat, such as are grown in Russia, Italy, and California. The wheat is ground by a peculiar process, being first wet and then heated. The flour resulting is very coarse. It is mixed with warm water and carefully worked into a uniform paste. This paste is forced by a press through holes in an iron plate. If the holes are very small, *vermicelli* is thus formed. A still finer and smaller sort is *fedelini.* Large pipe-shaped cylinders of this paste constitute *macaroni.* When the paste is rolled thin and cut into various shapes, *Italian paste* is the result. After moulding the macaroni is partially baked. Italy is the principal seat of this manufacture. France and England produce a considerable quantity, and of late a few firms in the U. S. produce an article not inferior to any of the imported kinds.

Macaron'ic Verse is named from the *Maccaronea* (1521) of Teofilo Folengo (1491–1544), called Merlino Coccajo, a Benedictine, whose work was republished as *Opus Macaronicum* in 1651. The name designates a sort of humorous verse in which Latin and Latinized words are mixed with the vernacular. This sort of literature is far older than Folengo. (See Delepierre, *Macaroneana* (1852), *De la Littérature Macaronique* (1856), and Morgan's *Macaronic Poetry* (New York, 1872).)

MacAr'thur, tp. of Logan co., O. Pop. 1406.

MacArthur, post-v., cap. of Vinton co., O., on the Gallipolis McArthur and Columbus R. R., has numerous iron-furnaces and potteries, 1 bank, 2 flouring-mills, a saw-mill, 1 tannery, marble-works, 2 carriage-factories, a woollen-factory, 3 weekly newspapers, 4 hotels, and a number of stores. Pop. 861. John T. Raper, Ed. "Record."

McArthur (Gen. Duncan), b. in Dutchess co., N. Y., June 14, 1772; removed in childhood to Western Pennsylvania; was a volunteer in Harmar's and the succeeding Indian campaigns in Kentucky and Ohio from 1790 until Wayne's victory (1797), after which he settled near Chillicothe, O., as a surveyor; acquired large property in land; was chosen to the legislature (1805), became major-general of militia (1808), colonel of Ohio volunteers May 7, 1812; was second in command at Hull's surrender; made brigadier-general in the U. S. army Mar. 12, 1813; was second in command of the army of the West under Gen. Harrison, whom he succeeded in 1814, when he projected and partially executed a plan for the conquest of Upper Canada; was joint commissioner with Gen. Cass to treat with the Ohio Indians for the sale of their lands within the State (1816–17); served in the legislature (1815–21), was Speaker (1819); member of Congress (1823–29), and governor of Ohio (1830–32). D. near Chillicothe Apr. 28, 1839.

McArthur (John), b. at Plymouth, England, in 1766; entered the army, and was stationed in Australia in 1790 with the rank of captain, when, perceiving that the country was peculiarly adapted to wool-growing, he procured a small grant of land at Paramatta, near Sydney, brought sheep from India, South Africa, England, and Spain; improved the fleeces by crossing the breeds, and in a few years obtained a quality nearly equal to the genuine merino wool. In 1802 he obtained the patronage of the English government and a grant of 10,000 acres of land; became a grazier on a large scale, and soon afterwards devoted a similar attention to the introduction of suitable vegetable crops into Australia. These labors procured him the reputation of being the "founder of the colony," in which the woollen industry has now reached vast dimensions. D. at Camden, New South Wales, Apr. 10, 1834.

McArthur (Gen. John), b. in Erskine, Renfrewshire, Scotland, Nov. 17, 1826; worked as a blacksmith till twenty-three years of age, then settled at Chicago as a boiler-maker. He entered the Union army in 1861 as lieutenant-colonel of the 12th Illinois Vols.; was soon promoted to colonel, commanded a brigade at Fort Donelson, and was made brigadier-general of volunteers Mar. 21, 1862; was wounded at Shiloh; commanded a division under McPherson in the Vicksburg campaign, and under Gen. A. J. Smith at the battle of Nashville, and for gallantry in that engagement was made brevet major-general.

Macart'ney (George **Macartney**), K. B., first Earl of, b. at Lissanore, near Belfast, Ireland, May 14, 1737; graduated at Trinity College, Dublin, 1757; studied law at the Middle Temple, London; travelled over a great part of Europe; entered Parliament on his return; was sent as envoy to Russia 1765; signed a commercial treaty with that power 1766, which was disavowed by the foreign office; published *An Account of the Russian Embassy* (1767); became chief secretary to the viceroy of Ireland 1769; took a prominent part in the debates of the Irish Parliament for the ensuing period; wrote *A Sketch of the Political History of Ireland* (1773); was appointed governor of the British Antilles 1775; made baron in the Irish peerage 1776; was forced to surrender to the French squadron of Admiral d'Estaing, and carried a prisoner to France 1779; appointed political resident at Madras 1780; governor of that province June 21, 1781; distinguished himself for high administrative qualities at a critical period, when Hyder Ali, the sultan of Mysore, was vigorously assaulting the British posts in the Carnatic; raised money and recruits, repulsed the natives, aided Hastings and Sir Eyre Coote in driving the Dutch from the Coromandel, took Trincomalee in Ceylon, made treaties with the native chiefs, and held Madras against the powerful French squadron, enduring famine until relieved from a perilous situation by the peace of 1783. Involved in a rivalry with Warren Hastings, he was recalled in 1785, but while still at Calcutta was tendered the position of governor-general of Bengal, which he declined, and returned to England 1786. A few years later he was selected as first British ambassador to China; sailed from Portsmouth with a brilliant suite Dec. 26, 1792; was received by Kien-Lung, emperor of China, in Mantchooria, Sept. 14, 1793, and re-

turning to Peking, opened negotiations for a commercial treaty, demanding the right to establish factories at Peking and three other cities, free trade between Macao and Canton, and a fortified post in the latter port. Offended at the pressure put upon him, or perhaps (according to French authorities) acceding to the advice of the Jesuit missionaries, Kien-Lung suddenly broke off the conferences and ordered the British embassy to leave the capital within forty-eight hours. After experiencing some dangers the embassy arrived at Macao in December; sailed for Java in Mar., 1794; sent thence to India tea-plants and other useful Chinese plants, which were soon naturalized there; and reached Portsmouth Sept. 26, 1794. Lord Macartney was made an earl in the Irish peerage Mar., 1794; was sent as minister to Italy 1795; became a baron of the United Kingdom 1796; went as first British governor to the Cape of Good Hope 1797; returned in feeble health 1798, and lived thenceforth in retirement until his death at Chiswick, Surrey, Mar. 31, 1806. An official account of Earl Macartney's embassy to China was published by Sir George L. Staunton, his secretary (2 vols., 1797), and was of great value in diffusing more exact information upon the history, political and natural, and the social condition of the Chinese empire. Macartney's *Journal of the Embassy* and a selection of his other writings was edited by Sir John Barrow, with a memoir (2 vols., 1807).

Macartney Pheasant. See PHEASANT.

Macas'sar, town of Celebes, situated on the southern shore of the island, on the Strait of Macassar, in lat. 5° 10′ S. and lon. 119° 20′ E. It is the capital not only of the government of Macassar, but of all the Dutch possessions in Celebes. The residence of the governor is surrounded by walls and ditches, and defended by Fort Rotterdam. Its harbor is spacious and safe, and its trade, especially in tortoise-shell, edible nests, ebony, sandalwood, rice, and spices, is very brisk. The native inhabitants of the town and government of Macassar are Mohammedans, and are considered the most gifted and civilized tribe of the Malayan race, carrying on agriculture, commerce, and shipbuilding with great success. Pop. of town, 12,000.

Macas'sar, Strait of, separates Borneo from Celebes, and varies in breadth from 50 to 150 miles. Its navigation is somewhat difficult on account of shoals and rocks.

Macau'lay (CATHERINE **Sawbridge**), b. at Ollantigh, Kent, England, in 1733; married in 1760 Dr. George Macaulay, devoted herself to political studies, and published a *History of England, from the Accession of James I. to that of the Brunswick Line* (8 vols., 1763–83), a work written from a republican point of view, and which had great success, though now forgotten. She commenced another *History of England from the Revolution to the Present Time* (1778), of which but one volume, reaching to 1742, was published, and wrote several political and philosophical pamphlets. After the death of Dr. Macaulay she married in 1778 a Mr. Graham. She was a great admirer of Washington, with whom she maintained a correspondence, and visited the U. S. in 1785, chiefly to see him. D. at Binfield, Berkshire, June 22, 1791.

Macaulay (THOMAS BABINGTON), BARON MACAULAY OF ROTHLEY, b. at Rothley Temple, Leicestershire, England, Oct. 25, 1800, son of Zachary Macaulay, eminent as a philanthropist, and grandson of Rev. John Macaulay, a Presbyterian minister at Inverary in the Scotch Highlands, who is mentioned with respect by Dr. Johnson in his *Tour to the Hebrides.* The family was originally from the island of Lewis, the largest of the group of the Outer Hebrides. The mother of Lord Macaulay was Selina Mills, daughter of a bookseller at Bristol, of Quaker descent. His early education was of a religious type, not unmixed with austerity, but this influence was happily modified by frequent visits to the celebrated authoress, Hannah More, who took great interest in the precocious boy, of whose early traits of character and literary tastes she gave valuable notices in her *Letters to Zachary Macaulay* (published in 1860). At the age of twelve years he was placed under the tutorship of a Mr. Preston at Shelford, made surprisingly rapid progress in the classics, and in 1818 entered Trinity College, Cambridge, where he gained the chancellor's medal in 1819 for a poem on *Pompeii*, and again in 1820 for a poem on *Evening;* took the second Craven scholarship in 1821, and bore off the palm at the "Union" debating society from many brilliant competitors, among whom were his intimate friends, W. M. Praed and Nelson Coleridge. Having a distaste for mathematics, he did not compete for honors in scholarship, but the extent and variety of his classical and literary reading while at college was probably never surpassed by any undergraduate. He took his bachelor's degree in 1822, was chosen to a fellowship the same year, and passed his time until 1826 alternately at London and Cambridge, untiringly engaged in adding to his vast stores of miscellaneous information. His début as a writer was made in the columns of the *Quarterly Magazine*, published by Charles Knight, and edited by his college friends Praed and Coleridge, to which he contributed his fine poems *Ivry* and the *Spanish Armada* and several prose articles (1824); but his brilliant essay on *Milton*, published in the *Edinburgh Review* for Aug., 1825, first revealed him to the world as an aspirant for the highest honors in the modern science of criticism. For twenty years thereafter he was a constant writer for the *Review*, chiefly upon subjects involving a wide range of historical knowledge, as well as an almost unexampled mastery of ancient and modern literature; and his essays were soon regarded as the leading feature of a periodical which counted many celebrated names among its contributors. Macaulay took his master's degree in 1825; was called to the bar at Lincoln's Inn Feb., 1826, but seems never to have practised law, and soon devoted all his splendid energy to the service of the Whig party, to whose doctrines he adhered with an unquestioning and fervent conviction which quickly advanced him to a place in its counsels. In 1828 he was appointed by the Whig government a commissioner of bankruptcy, and in 1830 Lord Lansdowne procured his election to Parliament from the "pocket borough" of Calne. His first public appearance as an orator had been made in 1826, at the annual meeting of the Antislavery Society; his first speech in Parliament was in favor of the repeal of the civil disabilities of Jews (Apr. 5, 1830), and his second against slavery in the West Indies (Dec. 13). In the great debates on the Reform bill Macaulay took a very prominent part, making eight speeches on the subject, and in the election to the reformed Parliament was returned for the town of Leeds. As a parliamentary orator he took high rank for real eloquence and for the exhaustive manner in which he treated his subjects, though his delivery was too rapid and monotonous to produce upon the audience the full argumentative effect of his speeches, which was better understood when they appeared in print. In 1833 he was appointed secretary to the board of control, but in 1834 resigned that office and his seat in Parliament to accept the post of legal member of the supreme council of India. He remained at Calcutta nearly three years, chiefly engaged in the preparation of a new penal code, which embodied the most liberal principles. It established in many respects an equality of rights between natives and Europeans, and was therefore unpopular with the latter. This code was published in 1838, but never put in operation, though many of its features have quite recently been adopted with good results. During his residence at Calcutta he continued the main line of his historical studies, writing several of his most brilliant essays upon European topics, his only Oriental essays, those on Lord Clive and Warren Hastings, not having been written until some years later. Returning from India in 1838, he was elected to Parliament from Edinburgh, and was secretary of war in the Melbourne ministry, with a seat in the cabinet (1839–41), taking, as before, a prominent part in the parliamentary debates, but finding leisure to write his *Lays of Ancient Rome* (1842). An imperfect collection of his essays having been printed in the U. S., where they attained an enormous circulation, he issued an authorized edition in 1843, and thenceforth directed his studies to the higher task of a history of his native country. He was an active member of the opposition during the five years of Tory supremacy (1841–46), and on the return of the Whigs to power (1846) received the lucrative post of paymaster of the forces, but having incurred the disfavor of his Edinburgh constituency by his course in support of the Maynooth grant, he was defeated at the election of 1847, and thus involuntarily found himself at leisure to give definite form to his long-projected *History of England*, which was awaited with eager interest. Never perhaps were high expectations better satisfied than by the first two volumes of Macaulay's *History*, which appeared in 1848, and were immediately sold by scores of thousands, both in England and the U. S., and hailed as the great work of the age. The third and fourth volumes did not appear until 1855, when they had an equal success. In 1849, Macaulay was chosen lord rector of the University of Glasgow, and announced his retirement from political life, but was returned to Parliament in 1852 by his former constituency of Edinburgh. Owing to feeble health he took no part in debate. In 1857 he was made a peer of the realm under the title of Baron Macaulay of Rothley, and in the same year received the greater honor of being chosen a foreign associate member of the French Academy of Moral and Political Sciences. Lord Macaulay survived his promotion but a short time. D. at his residence, Holly Lodge, Kensington, Dec. 28, 1859, and was

buried in Westminster Abbey. As he was never married, the title expired with him. A posthumous volume of his *History* brought it down to the death of William III., but the great work was destined to remain a mere fragment of that originally projected, which was to have included the reign of George III. A collection of Lord Macaulay's *Speeches* first appeared in the U. S. in 1853, which led to an authorized edition in 1854. Biographies of Dr. Johnson, Atterbury, Bunyan, and Goldsmith, contributed to the 8th ed. of the *Encyclopædia Britannica* (1857–58), were among the latest productions of Macaulay's pen. His characteristics as a historian are well known, and his interesting volumes will remain one of the English classics; but the view of English history which they present will require constant correction by the perusal of annalists of humbler name, less governed by partisan interests. The mind of this brilliant essayist was so peculiarly constituted, and so devoted to antithesis and paradox, that it is a rare occurrence to find any speculative opinion in his pages which can maintain itself intact against a searching criticism. (See his *Biography*, by his sister, Lady Trevelyan, 1875.) PORTER C. BLISS.

MacAu'ley (CATHARINE E.), b. in Dublin co., Ireland, in 1787; while a child lost her parents; was adopted by Mr. Callahan, and at his death received his fortune; founded in 1827 in Dublin a home for poor women, which was the nucleus of the order of the "Sisters of Mercy," of which she became superior in 1831, and which has since spread widely in Europe and America. D. in 1841. (See *Life of Catharine MacAuley* (1866).)

Macaw', a name given to a large number of tropical American birds of the parrot family (Psittacidæ), constituting a rather well-marked group, and according to some authors a sub-family, called Macrocercinæ. They are easily tamed, but hard to instruct, and seldom become good talkers; but they are large and handsome birds, of very bright plumage, and usually of gentle disposition. The red and blue macaw (*Macrocercus macao*), the blue and yellow macaw (*M. ararauna*), the great green macaw (*M. militaris*), and the great scarlet macaw (*M. aracanga*) are among the best-known species. The parrakeet macaws are of the genus *Conurus*, to which the Carolina parrot belongs. The *Conurus Guianensis*, generally known as the parrakeet-macaw, is the best talker of all the long-tailed parrots.

Macbeth', or **Macbeathad MacFinlegh,** a king of Scotland in the eleventh century, immortalized as the hero of one of Shakspeare's tragedies, but of whom little is positively known. He was the son of Finlegh, a chieftain from whom he inherited the rule of the province of Moray, and married Gruoch MacBoedhe, a granddaughter of King Kenneth MacDuff. In a war with King Duncan MacCrinan, Macbeth defeated and killed that prince at Bothgouanan, near Elgin, in 1039, after which he was proclaimed king of Scotland, probably as a vassal of Thorfinn of Norway. His reign is chronicled as a time of plenty and prosperity. He made grants to the Culdees of Loch Leven, and made a pilgrimage to Rome in 1050. In 1054, Malcolm MacDuncan (or Ceanmore), eldest son of King Duncan, invaded Scotland with a force collected by the aid of Siward, earl of Northumberland, and defeated Macbeth near Dunsinane. He fled N. of the Grampians, and resisted nearly three years longer, until he was killed at the battle of Lumphanan, Aberdeenshire, Dec. 5, 1056, by Malcolm and MacDuff; in consequence of which Malcolm was crowned king at Scone in the following April. Many fabulous circumstances attributed to Macbeth were compiled from early chronicles by the Scottish historian Hector Boece or Boethius (1526), from whose pages they were taken by Holinshed, and thus became known to Shakspeare.

McCabe (JAMES D., JR.), b. in Richmond, Va., about 1840; was educated at the Virginia Military Institute; wrote in early youth for the Abingdon *Virginian;* resided in Richmond during the war, employing his pen in the service of the Confederate cause; wrote three plays upon war-topics 1862–63; edited the *Magnolia Weekly* 1863–64; published a *Life of Lieut.-Gen. T. J. Jackson* (1863), a *Memoir of Gen. A. S. Johnston* (1866), and a *Life and Campaigns of Gen. R. E. Lee* (1867), besides many poems, miscellaneous writings, and nearly 200 short stories. He has since the war resided chiefly at Brooklyn, N. Y., engaged in constant and successful literary work.

McCabe (WILLIAM BERNARD), b. at Dublin, Ireland, Nov. 23, 1801; was engaged as a writer on the Irish press 1824–35; was Parliamentary reporter for the *Chronicle* and *Herald* 1835–51, gaining a high reputation for the accuracy of his reports; was editor of the *Weekly Telegraph*, a Catholic paper in Ireland, 1851–56, and has since been engaged upon magazine essays, novels, and translations from the Greek, German, and Italian. He has published 3 volumes of a *Catholic History of Ireland* (1848–54), embracing the Anglo-Saxon period.

Maccabees. See JEWS, by PROF. FELIX ADLER.

Mac'cabees, Books of, are five in number. Two are received as canonical by the Roman Catholic, and three by the Greek Church. The first two are sometimes printed in Protestant Bibles in the Apocrypha.

THE FIRST BOOK OF THE MACCABEES is now generally received as trustworthy history, and is a work of great value. It narrates in modest and well-chosen language the history of Mattathias and his three most famous sons, comprising the history of the Jews from 175 to 135 B. C., and was probably written in Palestine by a Jew not long after the death of John Hyrcanus. Its original language was Hebrew, but the Hebrew original is lost, and the Jews have never received it as canonical. An ancient Greek version is the oldest text now known.

THE SECOND BOOK OF THE MACCABEES is of later date and smaller value than the first. Its narrative begins some four years earlier than that of the first book, with which it is partly a parallel history. It is a compilation and condensation of matter from different sources, not always harmonious or correct. Its author was apparently a Jew of Palestine, who wrote in Greek at an uncertain date, and professes to follow in the main the narrative of one Jason of Cyrene, an eye-witness of the recorded events. The second book was written with a religious or didactic design, rather than to serve simply as a record of events, and was never received as canonical by Jews or Protestants. It has, however, some value, both as a history and as a record of the religious opinions of the time.

THE THIRD BOOK OF THE MACCABEES (so called) was probably written in Greek by a Jew of Alexandria. It has nothing to do with the Maccabees, but gives a marvellous and distorted account of the sufferings and deliverance of the faithful Jews of Alexandria during the reign of Ptolemy Philopator. It is of little value, though there may be a basis of historic truth underneath the distorted narrative. It has never been received as canonical by the Jews, Roman Catholics, or Protestants.

THE FOURTH BOOK OF THE MACCABEES, written in Greek, probably by a Jew of Alexandria, treats of the philosophy of morals and religion from a Jewish-Stoical standpoint, and contains illustrations derived from the narrative of the second book of Maccabees. It is of no historic value, and is not received as canonical by either Jews or Christians. Still another fourth book of the Maccabees is mentioned by old writers, but it is probably not extant.

THE FIFTH BOOK OF THE MACCABEES was translated into English (1832) by Cotton from the Arabic. It was probably written in Hebrew by a Jew after the destruction of Jerusalem. It is a compilation, and has some historic value. It has never been received as canonical, and has been but little noticed.

McCaine (ALEXANDER), b. in Tipperary, Ireland, about 1775; came to America in 1791; entered the Methodist ministry in 1797; filled many important pulpits until 1821, and was prominent in the movement for lay representation. He was one of the leaders of the Methodist Protestant Church, and published in 1829 his work, *History and Mystery of Methodist Episcopacy*, which called forth Bishop Emory's *Defence of our Fathers*. D. June 1, 1836.

McCall (EDWARD R.), b. at Charleston, S. C., Aug. 5, 1790; entered the navy in 1808 as midshipman; became first lieutenant in 1813, in which year he succeeded to the active command of the Enterprise after Capt. Burrows was mortally wounded in the engagement with the British brig Boxer, which vessel fell into his hands. For this service Congress presented him with a gold medal. Attained a captaincy in 1835. D. at Bordentown, N. J., July 31, 1853.

McCall (Gen. GEORGE ARCHIBALD), b. in Philadelphia Mar. 16, 1802; graduated from West Point, and entered the army as second lieutenant of infantry 1822; first lieutenant 1829, captain 1836, major 1847. In addition to the routine of garrison-life, McCall served for five years (1831–36) on the staff of Gen. Gaines, and in 1836 and 1841–42 was actively engaged in Florida against the Seminoles. In the war with Mexico he won the brevets of major and lieutenant-colonel for gallantry in the battles of Palo Alto and Resaca de la Palma; subsequently served as chief of staff to Gen. Patterson. Appointed inspector-general, with the rank of colonel, in 1850, he resigned from the army in 1853. In the civil war he organized the Pennsylvania Reserve Corps, and was commissioned, May 15, 1861, by the State a major-general of Pennsylvania volunteers. Two days later he was appointed brigadier-general of U. S. volunteers, but retained command of the Reserve Corps, which as a division of the Army of the Potomac held the right of the line of that army before Washington 1861–62, and a portion of which was engaged in the action and occupation

of Dranesville, Dec. 20, 1861. In the Virginia Peninsular campaign of 1862 he was engaged with his command at Mechanicsville, Gaines's Mill, and Frazier's Farm, being taken prisoner at the latter battle, and held until August, when he was exchanged; but his impaired health not permitting his return to the army, he resigned Mar. 31, 1863, and retired to his farm near West Chester, Pa., where he d. Feb. 25, 1868.

MacCal'mont, tp. of Jefferson co., Pa. Pop. 483.

McCalmont (ALFRED B.), b. at Franklin, Venango co., Pa., about 1826; became a lawyer of Franklin, and afterwards of Pittsburg, Pa., where he was made city solicitor in 1855. He was a prominent Democrat, and was assistant attorney-general of the U. S. during the Presidency of Mr. Buchanan. He removed to his native town; was lieutenant-colonel, and afterwards colonel, of the 142d Pennsylvania Vols. in the civil war, and in 1864 became colonel of the 208th Pennsylvania, and in 1865 was brevetted brigadier-general. After the war he resumed the practice of his profession. D. at Philadelphia May 7, 1874.

Maccalub'ba [Arabic], a mud-volcano 6 miles N. of Girgenti, Sicily, rises 147 feet above the plain, and 804 feet above the sea, has numerous small craters, and occasionally casts up stones and mud. Gas is continually pouring out, and there are signs of petroleum. Sulphur, salt, and petroleum are obtained near by. Earthquake-shocks are not unfrequent. Solinus is the earliest extant writer who mentions this remarkable volcano.

MacCam'eron, post-tp. of Martin co., Ind. Pop. 985.

MacCam'ish, tp. of Johnson co., Kan. Pop. 908.

McCan'dless, tp. of Alleghany co., Pa. Pop. 957.

McCann (WILLIAM P.), b. in Kentucky May 4, 1830; entered the navy as a midshipman Nov. 1, 1848; became passed midshipman in 1854, lieutenant in 1855, lieutenant-commander in 1862, commander in 1866. Executive officer of the Maratanya in 1862, and very frequently in battle on the York, James, and Pamunkey rivers, Va.; commanded the Hunchback at the battle of New Berne, Mar. 14, 1863, and is thus highly spoken of by Com. Murray in his official report of that action: "The manner in which Lieut.-Com. McCann handled the battery which the enemy unmasked upon him in the morning was as gratifying to us, and as creditable to him, as it must have been mortifying and vexatious to the enemy." Commanded the Kennebec at the battle of Mobile Bay, Aug. 5, 1864, where he fully sustained his former well-earned reputation for courage and ability. FOXHALL A. PARKER.

MacCar'dle, tp. of Douglas co., Neb. Pop. 440.

McCartee (ROBERT), D. D., b. in New York City Sept. 30, 1791; graduated at Columbia College in 1808; studied law, and practised several years, when he entered the Theological Seminary of the Associate Reformed Church, and was licensed to preach in 1816. In May, 1817, he was installed pastor of the Old Scots' church, Philadelphia; married a daughter of Rev. Dr. Divie Bethune; was very successful in building up his church; became in 1822 pastor of the Irish Presbyterian church in New York, which under his ministrations increased from 30 members to over 1000, and became one of the leading churches in the country. In 1836 ill-health led him to take a less laborious charge at Port Carbon, Pa., where he organized a lyceum of natural history and labored effectually for the education of the mining population. In 1840 he removed to Goshen, N. Y., in 1849 to Newburg, and in 1856 took charge of the Associate Reformed church in 25th street, N. Y. In 1862 he resigned from ill-health, and retired to Yonkers, where he d. Mar. 12, 1865. Dr. McCartee was one of the most earnest, eloquent, and successful preachers of his time.

McCar'thy (DENIS FLORENCE), b. in Ireland about 1820; published in 1850 a volume of *Ballads, Poems, and Lyrics* founded upon the patriotic traditions of the Irish, with translations from several modern languages; issued in 1853 a translation of Calderon's dramas, in 1857 two new volumes of poems, and in 1872 *Shelby's Early Life, from Original Sources.* In recognition of literary merit he received a pension of £100 in 1871, and in Aug., 1875, produced a magnificent poem on the occasion of the centennial anniversary of the birth of O'Connell.

McCarthy (JUSTIN), b. in Cork, Ireland, Nov. 22, 1830; received a liberal education; became connected with a Liverpool newspaper 1853; parliamentary reporter for the London *Star* 1860; was its chief editor 1864–68; spent three years (1868–70) travelling and lecturing in the U. S., where he became editorially connected with the New York *Independent,* and wrote much for the leading magazines, as he had previously done in England. Returning to London, he has again become a radical writer for the daily London press. He has written several novels, of which the most successful were *My Enemy's Daughter* (1869), *Lady Judith* (1871), *A Fair Saxon* (1873), and *Linley Rochford* (1874).

McCaul (JOHN), D. D., LL.D., b. in Dublin, Ireland, in 1807; educated at Trinity College, Dublin, where he became classical tutor and examiner; was appointed in 1838 principal of the College of Upper Canada; became in 1842 vice-president of King's College, Toronto, in 1849 president of the University of Toronto, and in 1853 president of University College and vice chancellor of the University of Toronto. Dr. McCaul has published several volumes of essays and treatises on classical topics, has edited portions of Horace, Longinus, Lucian, and Thucydides as collegiate textbooks, and given special attention to Latin epigraphy. His *Britanno-Roman Inscriptions* and *Christian Epitaphs of the First Six Centuries* were very favorably received.

MacCau'leyville, post-tp., Wilkin co., Minn. Pop. 117.

McCaw (JAMES BROWN), M. D., b. in Virginia in 1772; graduated in Edinburgh 1792; engaged in medical practice with his uncle, Dr. McClurg, and was the leading surgeon of Eastern Virginia for thirty years. He tied the external carotid artery in 1807. He was a man of extraordinary physical power, and at the burning of the Richmond theatre in 1811 he saved the lives of twenty-one women. D. at Richmond in 1846. PAUL F. EVE.

McCaw (JAMES BROWN), M. D., b. at Richmond, Va., 1823; graduated at the University of New York 1844; was editor of the *Virginia Medical and Surgical Journal* twelve years; lecturer, then professor, in the Medical College of Va., which position he still retains (1875). During the war he organized the Chimborazo Hospital at Richmond, the largest on either side, having had admitted into its wards 1861–65 no less than 71,000 patients.

PAUL F. EVE.

McCaw'ley (Col. CHARLES G.), a native of Pennsylvania; entered the marine corps as second lieutenant Mar. 3, 1847; became a first lieutenant in 1855, a captain in 1861, a major in 1864, a lieutenant-colonel in 1867; served with the marine battalion in Mexico, and took part in the storming of Chapultepec and the capture of the city of Mexico; commanded a detachment of marines in the boat-attack upon Fort Sumter, Sept. 8, 1863; twice brevetted "for gallant and meritorious conduct in battle." FOXHALL A. PARKER.

McCheyne' (ROBERT MURRAY), b. at Edinburgh, Scotland, May 21, 1813; studied at the University of Edinburgh, and prepared for the Presbyterian ministry under Dr. Chalmers; was licensed in 1835; preached for some years with great success at St. Peter's, Dundee, until his health failed, when he undertook, with three other ministers, a "mission of inquiry" to the Jews in Palestine, and on his return was engaged as an evangelist in the N. of England until his death by fever, Mar. 25, 1843. He had fine literary tastes, was learned in the sacred languages, and enjoyed a high reputation for zeal and piety in evangelical work. (See his *Life and Remains,* by Rev. A. A. Bonar, N. Y., 1857.)

Macchiavel'li (NICCOLÒ), b. in Florence, Italy, May 3, 1469, in a house belonging to the Macchiavelli family, on the S. side of the Arno, and still standing in the street now called Via dei Guicciardini. His father was Bernardo Macchiavelli, and his mother, Bartolomea Nelli, was a cultivated and amiable woman, the widow of Niccolò Bonizzi. Marcello Virgilio, who was at the head of the Cancellaria dei Dieci, appears to have been his teacher about 1494, and, perhaps through his instrumentality, Macchiavelli was appointed assistant chancellor (June 14, 1498) in the council of the Signoria. On July 14 of the same year he assumed, provisorily, the office of secretary to the Signori Dieci di Libertà e di Pace, an office in which he was afterwards confirmed by a special decree, and which he retained until Nov. 8, 1512, when he was deprived of it. From 1512 to June 22, 1527, the day of his death, Macchiavelli led a private life, devoting himself entirely to study. Little is known of the early years of this distinguished man, and that little is of small interest. The second and third periods, on the contrary, which exhibit the statesman and the author in full activity, merit special consideration. As secretary of the republic for fourteen years and five months, the home and foreign correspondence devolved upon him, also the records of the councils and of the debates of the Signoria, the drafting of public treaties with foreign states and princes, twenty-three foreign legations, and numerous internal missions. He understood magnifying the importance of his office so well that now, when one speaks of the "Florentine secretary," Macchiavelli is always meant. He not only knew how to fulfil his duties ably, but also to carry out by their means his own political ideas and patriotic sentiments with regard to the liberties of the citizen—sentiments that, unfortunately, in his time were not very common in the republic of Florence. In

his office of secretary he always showed himself an eager and jealous defender of popular rights, as is very apparent from his *Legazione* and from his *Lettere*. Finding in the employment of mercenary troops one of the greatest obstacles in the way of freedom, he undertook to organize a national militia, and in a measure succeeded. Apropos of the imbecile gonfaloniere, Pietro Soderini, who had given himself over to the control of the victorious French, he said, "The success of the French has cost us the loss of half the state; their failure will deprive us of our liberty"—an expression that seems a paradox, but that, alas! proved only too true in the case of Florence; for with the diminution of French authority and influence rose the power and importance of the imperial and Medicean party, which was to prove far more fatal to the destiny of the Florentine republic. The triumph of the Medici and of the imperialists naturally brought a change in the government of the republic, and the fall of the gonfaloniere Soderini was followed by that of the secretary Macchiavelli. Not only was Macchiavelli deprived of his office by decree, but he was restricted to the Florentine territory for a year, and forbidden to enter the palace of the Signori. But the Signori afterwards, feeling the need of his services, frequently suspended this prohibition. The fourteen years of Macchiavelli's secretaryship are the purest and most glorious of his life. By what means he may have attained to his office, and by what means, having lost it, he endeavored to ingratiate himself with the Medici, is not clear, and perhaps careful research might make us acquainted with a very different man from the Macchiavelli who between 1458 and 1512 served the republic. The mystery of *Il Principe* remains still unsolved, and, however much critics may endeavor to defend it, that formidable book will always cast a sinister shadow upon the character of Macchiavelli. *Il Principe* has had many apologists and many assailants, but the name of "Macchiavellian," as applied in Italy to malicious craftiness, did not perhaps originate until after the circulation of this work, and the fame of the author will never come forth entirely unspotted. The suspicion will always remain that Macchiavelli, before becoming chancellor of the republic, then freed from the yoke of the Medici, had aspired to become the chief counsellor of a Medicean tyrant. The words of the contemporaneous historian Varchi are very significant: "Macchiavelli dedicated *Il Principe* to Lorenzo, in order that he might make himself absolute master of Florence; and after the revolution in the state—that is, after the driving out of the Medici—he attempted to suppress this work, which was not yet printed." It is possible that Macchiavelli himself was the first to insinuate, during his fourteen years of secretaryship under the republic, that he had written *Il Principe* to bring odium upon the Medici; and that the knowledge of this fact, being brought to the Medici, may have been one of the causes, and perhaps the principal one, for which Macchiavelli was subjected to torture. Perhaps he wrote *Il Principe* in good faith, but in the good faith of a politician of the fifteenth century, with the principles of that century and in an atmosphere wholly averse to popular liberty. Macchiavelli hoped at first by means of his *Principe* to create a position for himself and for his ideal sovereign, whoever he might be. The Medici being driven out and the post of chancellor obtained, his zeal for the liberty of the republic returned, and he served it with all the fervor with which he would have served the prince had the prince succeeded, and had he been made his first counsellor. The third period of Macchiavelli's life, in which he appears essentially as an author, embraces the two preceding, or rather sums up their contradictions. *I Discorsi sopra la prima Deca di Tito Livio*, several passages in his Florentine history, and some letters show us the republican spirit of the Florentine secretary; the new duties accepted from the same Medici who had put him to torture, his gross *Comedie*, and other letters and sayings represent him as the humble servant of princes and the corrupter of public morals. Most powerful in intellect, but neither great nor noble in character, equally capable of good and of evil according to the caprice of his exalted genius, he could find pleasure in boasting that he had at the same time taught princes to be tyrants and the people to exterminate them. Macchiavelli died poor, and was buried in the family tomb in Santa Croce. His death was regretted by none. Nothing marked his resting-place until towards the end of the last century, when the English lord Nassau-Clavering, Earl Cowper, patronized the quarto edition of his works, published in 1782 in 6 vols., and promoted the erection of his monument in Santa Croce, on which is the brief but eloquent inscription: *Tanto nomini nullum par elogium*. In 1869 the fourth centennial anniversary of the birth of Macchiavelli was celebrated in Florence, and a prize of $1000 was offered for the best work on the life and writings of the great secretary. The period allowed for the work having expired in 1873, none of the aspirants obtained the prize, for the two principal competitors, Ruggiero Bonghi and Pasquale Villari, both of whom have been occupied many years with the study of Macchiavelli and the preparation of a work on the subject, did not present themselves. Honorable mention, however, was made of the work of Carlo Gioda published that year, and entitled *Macchiavelli e le sue Opere*. Among the abundant literature treating of the *Principe*, the discourse of P. S. Mancini, *Sulla Dottrina politica del Macchiavelli*, Andrea Zambelli's *Considerazione sul Libro del Principe*, Baldelli's *Elogio del Macchiavelli*, and Artaud's *Machiavel son Génie et son Siècle* deserve special mention. F. A. P. BARNARD.

MacClel'lan, tp. of Newton co., Ind. Pop. 141.

MacClellan, tp. of Doddridge co., W. Va. Pop. 959.

McClellan (GEORGE), M. D., b. at Woodstock, Conn., Dec. 23, 1796; graduated at Yale in 1816; received his medical degree from the University of Pennsylvania in 1819; in 1825 became one of the founders of the Jefferson Medical College, Philadelphia. He also assisted in establishing the medical school at Gettysburg, Pa., in 1839; was professor of surgery in Jefferson Medical College 1826–38; at Gettysburg 1839–43; was an able surgeon and lecturer, and author of a treatise on the *Principles and Practice of Surgery*. D. at Philadelphia May 9, 1847.

McClellan (Gen. GEORGE BRINTON), b. in Philadelphia Dec. 3, 1826, son of Dr. George McClellan; graduated at the University of Pennsylvania 1842; from West Point 1846, and commissioned brevet second lieutenant of engineers; served in the Mexican war at the siege of Vera Cruz and in the battles of Cerro Gordo, Contreras, Churubusco, Molino del Rey, and Chapultepec, winning the brevets of first lieutenant and captain for gallantry. At the close of the war he returned to West Point, where he remained until 1851, when he was assigned to duty in the construction of Fort Delaware; subsequently, in his engineering capacity, accompanied the expeditions to explore the sources of the Red River and the Northern Pacific R. R.; promoted to be captain of cavalry in 1855 in that year, he went to Europe as a member of a military commission to visit the seat of war, and upon his return prepared an official report upon the *Organization of European Armies and Operations in the Crimea*, which was published by order of the government. In 1857 he resigned from the army, and was chief-engineer and vice-president of the Illinois Central R. R. 1857–60, being chosen president of the St. Louis and Cincinnati R. R. in the latter year. On the outbreak of the civil war in 1861 his services were enlisted by the governor of Ohio in organizing the volunteers called for by the first proclamation, and he was placed in command of the department of the Ohio, and commissioned major-general of Ohio volunteers Apr. 23, 1861. On the 14th of May following the President appointed him a major-general in the U. S. army, and directed him to disperse the Confederate force occupying and threatening to overrun West Virginia. By a well-executed movement he met and defeated the enemy, and on the 14th of July reported his task accomplished and West Virginia clear. The thanks of Congress were tendered him for these services, and after the battle of Bull Run he was called to Washington and (July 25) placed in command of a division comprising the department of Washington and department of North-eastern Virginia; three weeks later he was assigned to command the department of the Potomac, and Aug. 20 the Army of the Potomac. Upon the retirement of Lieut.-Gen. Scott the command of the army of the U. S. fell upon him, which he retained until Mar. 11, 1862, when he was relieved from command of all military departments except that of the Potomac. On the 6th of March he had made an advance upon Manassas, only to find the enemy gone, and, returning, embarked his army for Fortress Monroe; the siege of Yorktown lasted until May 5, when followed the disastrous campaign known as the Peninsular campaign, resulting in the retreat of the army to the James July 4–5, 1862, and final withdrawal the following month to the relief of Gen. Pope in North-eastern Virginia, leaving McClellan for a short time without any distinct command. After the defeat of Pope (Aug. 29–30), McClellan was (Sept. 2) placed in command of the capital and the troops for its defence, which latter he reorganized, and followed Lee into Maryland, the battles of South Mountain and Antietam ensuing, Sept. 14–17; the delay which followed again created much dissatisfaction in Washington, and on the 7th of November, just as he had moved into Virginia with apparently a well-devised plan of operations, he was relieved of his command at Warrenton, and Gen. Burnside ordered to succeed him. Proceeding to New Jersey, he took no further part in the war. On Aug. 31, 1864, he received the nomination of the Democratic national convention for the Presidency. The

election occurred on the 8th of November, when Lincoln was almost unanimously re-elected by the States participating, McClellan receiving only the votes of New Jersey, Kentucky, and Delaware. On the day of election he resigned his commission as major-general, and in the spring of 1865 sailed for Europe, where he made an extended stay. Returning in 1868 he superintended the construction of the Stevens floating battery; also of the railway bridge across the Hudson, and in 1870 was appointed chief engineer of the department of docks of New York City, which latter office he resigned in 1872. Author of various military reports, textbooks, and manuals.

G. C. Simmons.

McClel'land (Robert), b. at Greencastle, Pa., in 1807; graduated at Dickinson College; was admitted to the bar in 1831; practised law in Pittsburg, Pa., and Monroe, Mich.; won distinction by his ability in the Michigan constitutional convention of 1835; was Speaker in the State legislature in 1843; a member of Congress 1843–49; governor of Michigan 1852–53; secretary of the interior under President Pierce 1853–57, since which time he has practised law at Detroit.

McClen'achan (Charles Thomson), b. in Washington, D. C., Apr. 13, 1829, nephew of Blair McClenachan; removed to Philadelphia, and was educated at Germantown College; went to New York in 1844, and was instructor in the institute of the blind for six years; was clerk of the board of assistant aldermen for eleven years; quartermaster of the 7th regiment, and present with it during its army operations in 1861; studied law, and was admitted to the bar in 1863; and since 1862 has been chief bookkeeper of the department of public works. Author of *Book of the Ancient Accepted Rite of Freemasonry* (1859); by direction of the city government edited and published *Opinions of the Counsels to the Corporation* (New York City) *from 1849 to 1860* (1860); *Ferry Leases and Railroad Grants affecting the City of New York from 1730 to 1860* (1860); *Laws of the Fire Department* (New York City) *from 1812 to 1860* (1860); and *Report of the Proceedings in Commemoration of the Laying of the Atlantic Cable of 1858* (1863).

McCler'nand (John A.), b. in Breckenridge co., Ky., May 30, 1812; his father dying in 1816, his mother removed to Illinois, and settled at Shawneetown, where the youth, in addition to farming, found time to study law, and was admitted to the bar in 1832. In the Black Hawk war he served as a private, resuming his profession on his return, and in 1835 started the *Democrat;* was elected to the legislature in 1836, also in 1840 and 1842, and to the U. S. Congress from 1843 to 1851. Removing to Jacksonville in 1851, he was sent to Congress from that district in 1859, but resigned on the outbreak of civil war, and returning home engaged actively in raising the brigade which bore his name, and which he commanded at Belmont, having been appointed brigadier-general of volunteers May 17, 1861; at Fort Donelson he commanded the right of the Union lines; promoted to be major-general Mar., 1862, he commanded a division at the battle of Shiloh; in Jan., 1863, relieved Gen. Sherman in command of the expedition for the capture of Vicksburg; commanded the expedition which stormed and carried Arkansas Post; in command of the 13th corps was engaged in the Vicksburg campaign, including the assault on that place, until relieved in July, to date June 18, 1863. Resigned Nov. 30, 1864.

Mac'clesfield, town of England, in Cheshire, on the Bollin, in the beginning of this century rapidly rose to great eminence as a manufacturing town. Its silk fabrics are of the finest quality, and more than 8000 operatives are employed in this branch of industry; its cotton manufactures are also considerable. Its vicinity is rich in coal. Pop. 35,471.

McClin'tock (Sir Francis Leopold), D. C. L., LL.D., F. R. S., b. at Dundalk, Ireland, in 1819; entered the navy at the age of twelve; accompanied Sir James Ross in his Arctic expedition of 1848; was engaged in Captain Austin's expedition of 1850 in search of Sir John Franklin, with the rank of lieutenant, and made a sledge-journey of 760 miles along the N. shore of Parry Sound; was made commander the following year, and sent on the expedition of five vessels under Sir Edward Belcher; rescued Captain McClure from a three years' imprisonment in the ice near Melville Island, but subsequently had to abandon his own ship and three others; returned to England Sept., 1854, and in 1857 took command of the expedition despatched by Lady Franklin which ascertained the fate of her husband (see Polar Research, by I. I. Hayes), for which he received many deserved honors. He was knighted in 1860, employed in 1861 in surveying a route for a North Atlantic telegraph, became a rear-admiral Oct., 1871, and superintendent of Portsmouth dockyard 1872. He published *The Voyage of the Fox in the Arctic Seas to discover the Fate of Sir John Franklin and his Companions* (1860).

McClintock (John), D. D., LL.D., b. at Philadelphia Oct. 27, 1814; graduated at the University of Pennsylvania 1835, in which year he began preaching as an itinerant in the New Jersey conference of the M. E. Church; was elected professor of mathematics (1836) in Dickinson College at Carlisle, Pa., professor of ancient languages 1839; was a thorough and successful instructor for twelve years; aided in translating Neander's *Life of Christ* (1847); prepared (in connection with Prof. G. R. Crooks) several elementary classical textbooks upon the system of "imitation and repetition" which has since become so general; was editor of the *Methodist Quarterly Review* 1848–56, during which time he gave that periodical a high literary and scholarly character; was sent to Europe with Bishop Simpson in 1856 as delegate to the Wesleyan Methodist Conference of England, and to the Evangelical Alliance at its Berlin meeting; was the eloquent and influential pastor of St. Paul's church, New York, 1857–60; became pastor of the American chapel in Paris, France, in 1860; performed excellent service in diffusing a knowledge of the merits of the great American war for the Union by pen, on the platform, and in society, gaining the valuable aid of Count Gasparin and other noted writers, while by his editorial letters published in the New York *Methodist* he kept the American public advised of the fluctuations of European opinion upon the war. Returning to the U. S. in 1864, he was again for a few months pastor of St. Paul's, New York, which he resigned on account of broken health; became in 1866 chairman of the Central Centenary Committee of the M. E. Church, which organized the celebration of the completion of the first century of American Methodism; and upon the foundation by Mr. Daniel Drew of a theological seminary in connection with this anniversary, Dr. McClintock was chosen its first president, and superintended its successful opening at Madison, N. J., in 1867. During the ensuing three years his health rapidly declined, and he d. at Madison, N. J., Mar. 4, 1870. As a preacher Dr. McClintock was very successful. "A fine presence, a rich voice, and a graceful delivery gave effect to the utterances of a well-stored mind." In the management of the *Quarterly Review*, in his *Analysis of Watson's Theological Institutes* (1850), his essay on *The Temporal Power of the Pope* (1851), his *Sketches of Eminent Methodist Ministers* (1863), and his translation of Bungener's *History of the Council of Trent* (1855) he gave proof of that eminently complete and versatile scholarship in which he had no superior within his Church. But the great work of his life, projected as early as 1853, and thenceforth pushed forward in conjunction with the best talent of the M. E. Church, was the *Cyclopædia of Biblical, Theological, and Ecclesiastical Literature*, which he edited with the scholarly co-operation of Dr. James Strong. The first volume was published in 1867, the second in 1868, the third in 1870; two others have since been added, and a sixth is now (1875) understood to be ready for the press. In this vast undertaking Dr. McClintock undertook the treatment of the whole department of systematic, historical, and practical theology; how thoroughly and conscientiously he executed that task his pages will long demonstrate to an admiring Church. He was endeared to a wide circle of friends by his eminent social qualities, swayed the minds of his hearers by his fervid eloquence, and satisfied the understanding by the clearness and scientific precision with which he arranged and set forth the stores of his varied learning. Since his death a volume of Dr. McClintock's sermons has been published, *Living Words* (1870), and a course of *Lectures on Theological Encyclopædia and Methodology.* Other of his writings have been prepared for the press.

Porter C. Bliss.

McClos'key (John), D. D., Cardinal, b. at Brooklyn, N. Y., Mar. 20, 1810; received his early classical training in New York; graduated at Mount St. Mary's College, Emmittsburg, Md.; studied theology in the Roman Catholic seminary connected with the same institution; was ordained a priest in St. Patrick's cathedral, New York, Jan. 9, 1834; spent two years attending lectures at Rome, and another year in France; became on his return assistant pastor, and soon afterwards pastor, of St. Joseph's church, New York; was appointed by Bishop Hughes in 1841 first president of St. John's College, Fordham, N. Y.; returned the following year to his pastoral charge; was appointed coadjutor to Bishop Hughes Nov. 23, 1843; consecrated under the title of bishop of Axiere *in partibus infidelium* Mar. 10, 1844, and on the division of the diocese of New York was installed in Sept., 1847, as first bishop of Albany. He administered that diocese seventeen years with signal ability, erected a splendid cathedral, founded at Troy a well-equipped theological

seminary, built a large number of churches, founded many charitable and religious institutions, and introduced numerous monastic orders and lay communities. On the death of Archbishop Hughes he was appointed his successor, May 6, 1864, and took possession Aug. 21, since which time he has repeated upon a larger scale the activity shown at Albany. To the completion of the magnificent cathedral on Fifth Avenue he has contributed $10,000, and visited Rome in 1874 to procure materials for it. Raised to the princely dignity of cardinal-priest Mar. 15, 1875, he received the *berretta* in May, after which he visited Rome to receive the investiture.

McClung' (Col. ALEXANDER K.), b. in Mason co., Ky., about 1812, was a nephew of Chief-Justice Marshall; enlisted in the navy in youth; studied law, and practised in Mississippi; volunteered in the Mexican war; was dangerously wounded at Monterey, attained the rank of lieutenant-colonel, and was *chargé d'affaires* to Bolivia 1848–51. He was an orator of brilliant powers and wide reputation, but left no public sample of his eloquence except a eulogy on Henry Clay, delivered at the State capital of Mississippi 1852. He committed suicide at Jackson Mar. 23, 1855.

McClung (JOHN ALEXANDER), D. D., brother of Col. A. K. McClung, b. in Washington, Ky., Sept. 25, 1804; studied at Princeton Theological Seminary; was licensed as a preacher in the Presbyterian Church 1828; abandoned the pulpit soon after on account of doubts as to the authenticity of some books of the Bible; was admitted to the bar 1835, and practised with great success until 1849, when he made a fresh study of theology; was again ordained 1851; was pastor of the First Presbyterian church of Indianapolis, Ind., 1841–57; declined the presidency of Hanover College, Ind.; settled as pastor at Maysville, Ky., 1857, and occupied a high position as a learned theologian. He was drowned in the summer of 1859.

MacClure', tp. of Alleghany co., Pa. Pop. 3816.

McClure (ALEXANDER K.), b. in Perry co., Pa., Jan. 9, 1828. After receiving a very meagre education, he was apprenticed at the age of fifteen to the tanning trade, and in 1846 he went to Philadelphia and worked as a journeyman tanner for a few months. Returning to his native county in the fall of the same year, he established the Juniata *Sentinel* at Mifflin. In 1852 he purchased the Chambersburg *Repository*, which he enlarged and conducted with much success. In 1857 he was elected to the lower house of the State legislature; was returned in 1858, and in the following year was chosen State senator. He held many positions of trust in the Republican party during the war; returned again to the legislature in 1864 as representative, and again in 1872 as senator from Philadelphia. In 1874 he ran as Reform candidate for mayor of Philadelphia, but was defeated. In the spring of 1875 he founded the Philadelphia *Times*, an independent daily newspaper which achieved a rapid and unusual success. J. B. BISHOP.

McClure (ALEXANDER WILSON), D. D., b. at Boston, Mass., May 8, 1808, graduated at Amherst College 1827, at Andover Seminary 1830; was pastor of a Congregational church at Malden 1832–43; preached at St. Augustine, Fla. (1841–44); edited for several years the *Christian Observatory* and the *Puritan Recorder* at Boston; preached again at Malden; was three years pastor of the Grand street church, Jersey City; was secretary of the American and Foreign Christian Union and chaplain at Rome, whence he returned a confirmed invalid 1858. He wrote two volumes of the *Lives of the Chief Fathers of New England*, the *Bi-Centennial Book of Malden* (1850), *The Translators Revived* (1853), and several controversial religious treatises. He was a learned scholar, a genuine wit, and a keen polemic. D. at Canonsburg, Pa., Sept. 20, 1865.

McClure (Sir ROBERT JOHN LE MESURIER), C. B., b. at Wexford, Ireland, Jan. 28, 1807; educated at Winchester and Sandhurst; entered the navy as a midshipman; joined the Arctic expedition under Capt. Back (1836) as a volunteer; was appointed lieutenant on his return, and superintendent of the Quebec dockyard; took part in Sir John Ross's Arctic expedition (1848), and took command in 1850 of another exploring expedition, which discovered the North-west passage, for which service he was knighted, received a captaincy and a reward of £5000. From his journals Capt. Sherard Osborne published in 1856 *The Discovery of the North-west Passage*. He afterwards served in the China squadron. D. in London Oct. 14, 1873.

McClurg' (JAMES), M. D., b. at Hampton, Va., in 1747; was a fellow-student with Jefferson at William and Mary College; took his degree in medicine at Edinburgh 1770; pursued his studies in Paris and London, where he published an *Essay on the Human Bile*, so elegantly written that it was translated into several languages. He practised his profession at Williamsburg 1773–83; settled in Richmond when the capital was removed thither 1783, and rose to the head of his profession in Virginia, though the delicacy of his constitution prevented his practising surgery. He was noted for the integrity of his character, his industry, and his varied attainments. He was long a member of the Virginia council of state, and was a member of the convention that formed the Constitution of the U. S. He had considerable skill as a writer of verses, and a pleasing *jeu d'esprit* from his pen (but with some stanzas by Judge Tucker), entitled the *The Belles of Williamsburg* (1777), may be found in Duyckinck's *Cyclop. Am. Lit.*, as also in J. Esten Cooke's novel of the *Virginia Comedians*. Dr. McClurg figures in Cooke's romantic sketch, *The Youth of Jefferson*. His discourse *On Reasoning in Medicine* has been highly commended. Killed at Richmond, Va., by his horses running away, July 9, 1825. One of his granddaughters married the celebrated Benjamin Watkins Leigh. (See his *Memoir*, by Dr. J. W. Francis, in Thacher's *Medical Biography*.)

McClurg (JOSEPH W.), b. in St. Louis co., Mo., Feb. 22, 1818; educated at Oxford College, O.; taught school in Louisiana and Mississippi 1835–37; went to Texas in 1841, and practised law in that republic; settled as a merchant at St. Louis 1844. During the civil war he was colonel of the Osage regiment, and afterwards of a cavalry regiment; was a member of the Missouri State convention 1862, of the Baltimore convention 1864, and delegate to the Philadelphia Loyalist convention of 1866; served in Congress 1863–69, and was governor of Missouri 1869–72.

McColl' (EVAN), b. at Kenmore, Scotland, Sept. 21, 1808; began to write poetry for the *Gaelic Magazine* of Glasgow in 1837; removed in 1850 to Canada, and was employed in the custom-house at Kingston, Ontario. He excels as a song-writer, both in English and Gaelic. His principal publications are *Poems and Songs in Gaelic* and *The Mountain Minstrel*.

MacCo'mas, tp. of Cabell co., W. Va. Pop. 1149.

MacComb', post-v. of Hancock co., O., in Pleasant tp., 11 miles N. W. of Findlay. Pop. 319.

MacCona'tha, tp. of Clay co., Ala. Pop. 972.

MacCon'nell, tp. of Chicot co., Ark. Pop. 1773.

McConnell (JOHN L.), b. at Jacksonville, Ill., Nov. 11, 1826; studied law under his father, Murray McConnell, a prominent politician; graduated at the law school of Transylvania University, Ky.; served in Hardin's regiment in the Mexican war; was twice wounded at Buena Vista; became a captain; has since practised law at his native place, and has written several romances illustrative of Western life and character—*Talbot and Vernon* (1850), *Grahame, or Youth and Manhood* (1850), *The Glenns* (1851), *Western Characters* (1853). He afterwards undertook the preparation of a work to be entitled *History of Early Explorations in America*, with special reference to the labors of the early Roman Catholic missionaries.

MacCon'nellsburg, post-b., cap. of Fulton co., Pa. It has 4 good schools, 4 churches, 1 of the finest court-houses in the State, a machine-shop and foundry, saw and planing mill, 2 tanneries, 3 hotels, and 2 newspapers; its mineral resources are fast being developed. Pop. 552.
P. ELLISON DOWNES.

MacCon'nellsville, post-v. of Vienna tp., Oneida co., N. Y., near Oneida Lake. Pop. 118.

MacConnellsville, post-v., cap. of Morgan co., O., 26 miles S. of Zanesville. It has 5 churches, 1 bank, a building and loan association, the largest tobacco-factory in the State, a foundry, 1 woollen-factory, 3 hotels, 2 newspapers, and the usual stores. Pop. 1646.
J. R. FOULKE, ED. "HERALD."

MacCook', new county in S. E. Dakota, intersected from N. to S. by the Vermilion River, consists of undulating prairie and has a fertile soil. Area, 432 square miles.

McCook (Gen. ALEXANDER McDOWELL), b. in Columbiana co., O., Apr. 22, 1831; graduated at West Point, and entered the army as brevet second lieutenant of infantry in 1852; after a brief term of service in garrison, he was actively engaged against hostile Indians until 1857, when after a year's leave of absence he was assigned as instructor of infantry tactics at West Point. On the outbreak of civil war he was appointed colonel of the 1st Ohio Vols., which regiment he commanded at the first battle of Bull Run. Reorganizing his regiment on the expiration of its term of service, he was recommissioned colonel in August; appointed brigadier-general of volunteers in Sept., 1861, and assigned to the command of a brigade in the department of the Cumberland; commanded a division at the battle of Shiloh and siege of Corinth, and 1st army corps at the battle of Perryville; 20th army corps at Stone

River and Chickamauga, and the troops for the defence of the capital at the time of Early's attack on Washington, July, 1864. Received the various brevets from major to major-general U. S. A. Resigned his commission as major-general Oct., 1865, and in Mar., 1867, was promoted to be lieutenant-colonel of infantry. Gen. McCook is son of Maj. Daniel McCook, b. 1796; killed in battle by Morgan's guerillas near Buffinton Island, O., July 19, 1863. Seven of his brothers took part in the war for the Union, three of whom, like their father, were killed. Four of the eight brothers attained the rank of general. (See McCook, Dan, Edwin Stanton, and Robert Latimer.)

McCook (Gen. Dan), b. in Carrollton, O., July 22, 1834; graduated at Florence College, Ala., 1857; served in the war for the Union as colonel 52d Ohio Vols. and as brigadier-general; was at the battles of Perryville, Chickamauga, Mission Ridge, and in the Atlanta campaign, and was killed at Kenesaw Mountain July 17, 1864.

McCook (Gen. Edward M.), b. in Steubenville, O., in June, 1834; educated in a log school-house; accompanied Gov. Medary to Minnesota as private secretary 1856; went to Pike's Peak 1859; was a member of the Kansas legislature 1860; served in the war for the Union, attaining the rank of brigadier-general Apr. 27, 1864, and brevet major-general in 1865; became celebrated for his cavalry raids in the Atlanta campaign and under Gen. Wilson in Georgia and Alabama; was minister to the Sandwich Islands 1866–69; governor of Colorado Territory 1869–71, and reappointed 1875.

McCook (Gen. Edwin Stanton), fifth son of Maj. Daniel, and brother of Gen. A. McD. McCook, b. in New Lisbon, O., about 1840; took an active part in the war for the Union, attaining the rank of brevet brigadier-general of volunteers; became secretary and acting governor of Dakota Territory; was assassinated at Yankton, Dak., Sept. 11, 1873.

McCook (Gen. Robert Latimer), son of Maj. Daniel, b. in Columbiana co., O., Dec. 28, 1827; studied law at Columbus, O., where he was admitted to the bar in 1849; practised some years at Cincinnati with great success; raised a regiment of Germans for the war in 1861 (9th Ohio Vols.); commanded a brigade in West Virginia under Gen. Rosecrans; distinguished himself at Rich Mountain, Carnifex Ferry, and Mill Spring, where he was wounded; was appointed brigadier-general of volunteers Mar. 21, 1862, and was in command of a division in Thomas's corps of Gen. Buell's army, when he was shot down in cold blood by guerillas while lying sick in an ambulance near Salem, Ala., dying the next day, Aug. 6, 1862. His regiment took a bloody revenge upon the guerillas.

McCook (Roderick S.), b. in Ohio Mar. 10, 1839; graduated at the Naval Academy in 1859; became a lieutenant in 1861, a lieutenant-commander in 1865, a commander in 1873; in various engagements on the James River and in the sounds of North Carolina, and in both the Fort Fisher fights; commanded a battery of naval howitzers at the battle of New Berne, Mar. 14, 1862, where he displayed coolness, sound judgment, and gallantry. Highly commended in the official despatches.

Foxhall A. Parker.

MacCool′, tp. of Perry co., Ark. Pop. 131.

MacCord′, tp. of Bond co., Ill. Pop. 1433.

Maccord′ (David J.), b. in St. Matthew's parish, S. C., in Jan., 1797; graduated at South Carolina College 1816; admitted to the bar 1818, and became in 1822 law-partner of W. C. Preston. In 1825 he was mayor of Columbia, S. C. In 1836 he became president of the State bank. He reported decisions of the courts of equity and of appeals (2 vols., 1827–29); edited the *South Carolina Statutes* (10 vols., 1839), and published also reports in 4 vols. (1822–30) and 2 vols. (1842). He wrote much on political and economic questions, was for a time editor of a law journal, and after 1840 became a planter at Fort Motte, S. C. D. at Columbia, S. C., May 12, 1855.

Maccord (Louisa S. **Cheves**), daughter of Langdon Cheves, b. at Columbia, S. C., Dec. 3, 1810, and was married in 1840 to David J. Maccord; translated Bastiat's *Sophisms of the Protective Policy* (1848); published a volume of poems, *My Dreams* (1848), *Caius Gracchus*, a tragedy (1851), and other works, and ably discussed many political and social questions in the *Southern* and *De Bow's Review*, and the *Southern Literary Messenger*. She resided at Columbia during the civil war, and rendered distinguished assistance in the hospitals and other relief institutions of the Confederate government.

MacCord's, tp. of Coosa co., Ala. Pop. 873.

McCor′mick (Cyrus Hall), b. at Walnut Grove, Rockbridge co., Va., Feb. 15, 1809; removed in 1845 to Cincinnati, O., and in 1847 to Chicago. His father in 1816 invented a reaping-machine. The son invented another in 1831, patented it in 1834, and has since greatly improved it. This invention has won many gold medals and distinctions for Mr. McCormick. In 1859 he established the Theological Seminary of the North-west at Chicago (Presbyterian), and since that time has endowed a chair in Washington and Lee College, Lexington, Va.

McCormick (Richard C., Jr.), b. in New York City 1832; received a classical education; went into business in Wall street in 1850; travelled in Europe and Asia Minor, and published a *Visit to the Camp before Sebastopol* (1855), *St. Paul to St. Sophia*, etc.; trustee of New York public schools 1857–61; became in 1859 editor of the *Young Men's Magazine;* was a war-correspondent of several New York journals; became chief clerk of the department of agriculture 1862; secretary of Arizona 1863; governor of that Territory 1866; was delegate in Congress from Arizona 1869–75.

McCosh (James), D. D., LL.D., b. in Ayrshire, Scotland, in 1811; was educated at the universities of Glasgow and Edinburgh; wrote while a student in the latter an essay on the Stoic philosophy, which obtained for him, on motion of Sir William Hamilton, the honorary degree of M. A.; was ordained a minister of the Church of Scotland at Arbroath 1835; removed to Brechin 1839; took an active part in the questions which brought about the disruption of the Scottish Church and in the organization of the "Free Church" 1843; wrote a work on *The Methods of the Divine Government, Physical and Moral* (1850), which was a skilful theological application of Sir William Hamilton's philosophy, and laid the basis of a wide reputation both in Great Britain and America; was appointed professor of logic and metaphysics in Queen's College, Belfast, 1851, where he was distinguished as a lecturer upon philosophy; wrote, in connection with Prof. G. Dickie, *Typical Forms and Special Ends in Creation* (1856), and published *Intuitions of the Mind inductively investigated, being a Defence of Fundamental Truth* (1860), two works which were applications of his metaphysical system to new orders of reasoning, and which received their argumentative complement in *An Examination of Mill's Philosophy* (1866). He was elected president of the College of New Jersey at Princeton 1868, which post he has since filled with great ability and success; wrote as text-books *The Laws of Discursive Thought* and a treatise on *Logic* (1869); delivered a series of lectures on *Christianity and Positivism* (1871) before the Union Theological Seminary in New York, in which he relegated to the scientists the questions of evolution and the origin of life; published *The Scottish Philosophy, Biographical, Expository, and Critical, from Hutcheson to Hamilton* (1874), a "labor of love" in the popularization of the school of thought he has done so much to enlarge, and a brilliant reply to Prof. Tyndall's celebrated address at Belfast (1875). He has written largely for the *Princeton Review* and other magazines in Great Britain and the U. S.

McCos′kry (Samuel Allen), D. D., D. C. L., b. at Carlisle, Pa., Nov. 9, 1804; studied one year at West Point Military Academy; graduated at Dickinson College; became a successful lawyer, but took orders in the Protestant Episcopal Church; held rectorships in Reading, Pa., and in Philadelphia, and in 1836 was consecrated bishop of Michigan.

MacCrack′en, county in W. Kentucky, bounded E. by the Tennessee and N. by the Ohio River, which separates it from Illinois. Area, 232 square miles. It is intersected by the Paducah and Memphis and the Elizabethtown and Paducah R. Rs., is drained by Clark River and many creeks, has a level surface and a fertile soil. The chief agricultural products are tobacco and corn. Cap. Paducah. Pop. 13,938.

McCracken (J. L. H.), b. in New York about 1813, son of a wealthy merchant engaged in trade with Western Africa; bore a distinguished part in society through his fine literary culture and conversational powers; wrote for the *Knickerbocker*, the *American Monthly*, and other magazines, and published in the *Democratic Review* (1849) a comedy of New York life, entitled *Earning a Living*. One of his sketches, entitled *The Art of Making Poetry, by an Emeritus Professor*, displays very high powers as a humorist and literary essayist. (See an extract in Duyckinck's *Cyclopædia American Literature*, vol. ii. p. 592.) Mr. McCracken d. of a fever at Sierra Leone, West Africa, Mar. 25, 1853.

McCrea (Jane), b. at Leamington, N. J., in 1754; resided at the commencement of the Revolution on the Hudson near Fort Edward; was betrothed to Lieut. David Jones, a loyalist in the British army in Canada; was visiting at Fort Edward in the summer of 1777 when she was

carried off by a party of Indians and murdered (July 27), her scalp being carried to Burgoyne's head-quarters. The usual narrative of her death is that these Indians were hired by Lieut. Jones to bring Miss McCrea to the British camp, and that she was tomahawked in consequence of a quarrel between her captors; but the Indians alleged that she was killed by a shot from some Americans in pursuit. The truth was never known, but the murder, related in many ways, and embellished with romantic additions, caused an immense sensation both in the U. S. and in England, where it was narrated by Burke in the House of Commons as an illustration of the horrors of Indian warfare. Lieut. Jones passed a long life in Canada, and always denied having employed the Indians. Miss McCrea was buried on a hill near Fort Edward, afterwards in the old burying-ground, and in 1874 her remains were removed by a niece to the new Union cemetery between Fort Edward and Sandy Hill, where a monument was placed over them.

McCree'ry (Charles), Doctor, b. in Clark co., Ky., June 13, 1785. Though he probably never heard a medical lecture, as there were neither schools nor professors in his day W. of the mountains, he became a successful physician, secured a widespread reputation, and performed (May 4, 1811) a surgical feat which, when repeated years afterwards by the celebrated Dr. Mott of New York City, was called by him his *Waterloo* operation; this was removing the collar-bone. He was one of the most benevolent of men, warm-hearted, genial in disposition, charitable to all about him, and beloved everywhere. D. Aug. 26, 1826.—A grandson of his, Capt. Daniel, a graduate of Yale College and a lawyer, fell at the battle of Chickamauga. Paul F. Eve.

McCrie (Thomas), D. D., b. at Dunse, Scotland, in Nov., 1772; became pastor of a church in Edinburgh 1795; took a prominent part in the agitations within the Scottish Church; author of an esteemed *Life of John Knox* (1811), and of *The Life of Andrew Melville* (1819), important for the history of the Reformation in Scotland. He also wrote a *History of the Progress and Suppression of the Reformation in Italy* (1827), and a *History of the Reformation in Spain* (1829); wrote lives of several Reformers in the *Christian Magazine* (1802–06); vigorously criticised Sir Walter Scott for his treatment of the Covenanters in *Old Mortality;* published several controversial and political tracts and discourses, and left unfinished a *Life of Calvin.* D. at Edinburgh Aug. 5, 1835. A posthumous volume of *Sermons* appeared in 1836, his *Miscellaneous Writings* in 1841, and his *Works* in 4 vols. in 1855–57.—His *Life* was published in 1840 by his son, Thomas McCrie, Jr., D. D., LL.D., professor of systematic theology in the English Presbyterian college at London, b. at Edinburgh in 1798, who also wrote *Sketches of Scottish Church History* (1841), a *Life of Sir A. Agnew,* and edited *The Provincial Letters of Blaise Pascal, a new Translation, with Historical Introduction and Notes* (1846).

MacCul'loch, an unorganized county of W. Texas, bounded N. by the Colorado River, has Brady's Creek in the southern and the San Saba River in the central part. Area, 915 square miles. The lands on the Colorado are fertile and suitable for farming. The present industry is confined to stock-raising, chiefly on Brady's Creek. Pop. 173.

McCulloch (Ben), b. in Rutherford co., Tenn., 1814; received but brief schooling, his early years being mostly passed in hunting, in which he became very skilful; and being of an adventurous nature proceeded to Texas to join the expedition of Davy Crockett, but arrived after the death of the latter at the Alamo; served as a private in the battle of San Jacinto, and subsequently in the Mexican war commanded a company of Texan rangers, and was greatly distinguished at Monterey, Buena Vista, and final capture of the city of Mexico; appointed U. S. marshal in 1853, and commissioner to Utah 1857. On the outbreak of the civil war he ardently espoused the Southern cause, and, repairing to Texas, received the surrender of Twiggs at San Antonio. Appointed brigadier-general soon after, he commanded in Missouri at Dug Springs and at Wilson's Creek; and in the batttle of Pea Ridge, while in command of a division, was killed Sept. 7, 1862.

McCulloch (Hugh), b. at Kennebunk, Me., in 1811; educated at Bowdoin College; removed to Indiana in 1835; was president of the State bank of Indiana from May, 1855, till May, 1863, when, at the instance of the then secretary of the U. S. treasury, Mr. Chase, he was called to administer the duties of the newly-created bureau in the treasury department as comptroller of the currency; and on the retirement of Mr. Fessenden was appointed his successor as secretary of the U. S. treasury, which portfolio he held until Mar., 1869, when he returned to Indiana. Since 1870 he has been engaged in the banking business in London.

McCulloch (John Ramsay), b. at Whithorn, Scotland, Mar. 1, 1789; became editor of the *Scotsman,* an organ of liberal political opinions at Edinburgh, and one of the editors of the *Edinburgh Review;* wrote the article on political economy in the supplement to the *Encyclopædia Britannica* (1824), in which he anticipated the opinions of the "Manchester school" of advocates of free trade; republished this article in 1825, with additions and modifications, under the title *Principles of Political Economy;* issued in the same year *A Discourse on the Rise, Progress, Peculiar Objects, and Importance of Political Economy;* was professor of that science in the University of London 1828–32; edited Adam Smith's *Wealth of Nations* (1828); published *A Dictionary, Practical, Theoretical, and Historical, of Commerce and Commercial Navigation* (1834); *A Statistical Account of the British Empire* (1836); *A Dictionary, Geographical, Statistical, and Historical, of the Various Countries, Places, and Principal Natural Objects in the World* (1842; revised ed. 1866–67); *The Literature of Political Economy* (1845); and numerous other valuable treatises on economical topics. His great *Dictionaries* were long standard authorities upon their respective subjects. Prof. McCulloch received in 1843 the high honor of an election as one of the eight foreign associates of the French Institute of Moral and Political Sciences. He was appointed in 1838 comptroller of the royal stationery office, and received a pension of £200 for eminent services to literature. D. at Westminster Nov. 11, 1864.

McCul'ly (Jonathan), b. at Nassau, Nova Scotia, July 25, 1809; admitted to the bar in 1835; removed to Halifax in 1849, and became solicitor-general in 1860; was a delegate at the Quebec conferences of 1861 and 1862 on the union of the provinces and the Intercolonial Railway, being chief commissioner of railways for Nova Scotia; was for years connected with the Halifax press, and an influential advocate of colonial union. He was long a member of the legislative bodies both of Nova Scotia and of the Dominion of Canada; was at one time leader of the Liberal opposition in the upper house, and became in 1870 a judge of the supreme court of Nova Scotia.

McCur'dy (Charles Johnson), LL.D., b. at Lyme, Conn., Dec. 7, 1797; graduated at Yale in 1817; became a prominent lawyer; was often in the Connecticut legislature, in which he was Speaker three years; lieutenant-governor 1845–46; U. S. minister to Vienna 1851–52; was 1856–67 upon the bench, first in the superior and then in the supreme court of Connecticut.

MacDan'iel, tp. of Sampson co., N. C. Pop. 843.

MacDon'ald, county in the S. W. corner of Missouri. Area, 475 square miles. It is drained by Elk River, Indian, Buffalo, North Sugar, and other creeks, which afford excellent water-power; has an undulating surface, fertile soil, and abundant timber. Chief productions, grain, tobacco, and butter. Cap. Pineville. Pop. 5226.

MacDonald, tp. of Barry co., Mo. Pop. 509.

MacDonald, tp. of Jasper co., Mo. Pop. 2035.

MacDonald, tp. of Hardin co., O. Pop. 900.

McDonald (Charles J.), b. at Charleston, S. C., July 9, 1793; was reared in Hancock co., Ga.; graduated at Columbia College, S. C., in 1816; was admitted to the bar 1817, and settled in Milledgeville; was elected solicitor-general 1822; judge of the circuit court 1825. Having settled in Macon, he was a member of the legislature from Bibb co. 1834, and a member of the State senate 1837; was elected governor of the State 1839, and re-elected 1841. He was a member of the famous Nashville convention in 1850. In 1857 he was elevated to the bench of the supreme court of the State, which position he held with ability and distinction until his death, which occurred at Marietta, Ga., where he then resided, Dec. 16, 1860. Judge McDonald was reared in the State's rights school of politics, and was a most distinguished statesman. A. H. Stephens.

Macdonald (Étienne Jacques Joseph Alexandre), b. at Sancerre, in the department of Cher, France, Nov. 17, 1765, descended from a Scottish family which came to France with the Stuarts; entered the army in 1784; fought as a colonel at Jemappes in 1792, and became general of division in 1795. Having received the command in Central Italy in 1798, he fought with distinction against the Neapolitans, but was beaten by Suwarow on the banks of the Trebbia, June 17, 1799; was wounded; returned to Paris, and took the side of Napoleon in the revolution of 18th Brumaire, but afterwards lost the confidence of the emperor on account of his staunch defence of Gen. Moreau. In 1809, however, Napoleon again gave him a command, and he distinguished himself so much in the battle of Wagram that he was created duke of Tarentum and made a marshal of France. In the campaigns of 1812–14 he rendered distinguished services, but was defeated by

Blücher at Katzbach Aug. 26, 1813; and adhered firmly and honestly to Napoleon till his abdication. Having taken service with the Bourbons, he refused to accept any office during the Hundred Days, and lived, much honored, though in retirement, during the second restoration. D. Sept. 24, 1840, at Courcelles, near Guise.

Macdonald (FLORA), b. in the island of South Uist, one of the Hebrides, in 1720; became celebrated in 1746 as the heroine of some of the remarkable adventures of Prince Charles Edward, the "young Pretender," whom she assisted in escaping pursuit from South Uist to Skye. She was imprisoned on board vessels of war and at London for several months; released in 1747; married Allan Macdonald in 1750, and settled in Fayetteville, N. C., in 1775. During the Revolutionary war her husband served as a loyalist officer in the British army, and Flora returned to the island of Skye, where she d. Mar. 4, 1790.

MacDonald (GEORGE), b. in Huntley, Scotland, in 1825; was educated at the University of Aberdeen; studied for the ministry at the Independent college, Highbury, London; preached in the counties of Surrey and Sussex for some time, but ultimately devoted himself entirely to literature, settling in London. He published volumes of poems in 1855, 1857, 1864, and 1868. He has published several novels: *David Elginbrod* (1862), *Alec Forbes of Howglen* (1865), *Annals of a Quiet Neighborhood* (1866), *Guild Court* (1867), *Robert Falconer* (1868), *Wilfred Cumbermede* (1871), and *Malcolm* (1874); has written several successful juvenile books, and two theological works. He has been principal of a ladies' seminary in London, and lectured in the U. S. (1872–73).

Macdonald (Sir JOHN ALEXANDER), K. C. B., D. C. L., b. in 1815 in Sutherlandshire, Scotland; removed in 1820 to Kingston, Canada, with his father; was called to the bar 1835; was elected to the provincial Parliament 1844, and successively held the posts of receiver-general and member of the executive council. He was 1847–50 commissioner of crown lands and member of the cabinet. He was 1854–62 attorney-general of Canada, part of the time premier; minister of militia 1862–64; attorney-general 1864–68, holding also from 1865 the ministry of militia. In 1868 he received the title of minister of justice, and became premier 1869, which position he held until Nov. 5, 1873. He is the leader of the conservative party in Canada, and was in 1866 chairman of the commissioners who in London arranged the terms of confederation.

Macdonald (JOHN SANDFIELD), Q. C., b. at St. Raphael, Glengarry co., Ontario, Canada, Dec. 12, 1812; was called to the bar in 1840; was in the provincial Parliament 1841–67, and its Speaker 1852–54; solicitor-general 1849–51; attorney-general of Canada in 1858; and in 1867 became attorney-general of Ontario. D. June 1, 1872.

McDon'nell (Sir RICHARD GRAVES), LL.D., b. at Dublin, Ireland, in 1815; educated at Trinity College, of which his father, Rev. Richard McDonnell, D. D., was provost; called to the bar in Ireland 1838, in England 1840; became chief-justice of the British colony at Gambia, Africa, 1843; governor 1847; conducted several exploring expeditions into the interior of Africa; was governor of St. Vincent 1852, of South Australia 1855, where he zealously promoted the exploration of the interior and the navigation of Murray River; became lieutenant-governor of Nova Scotia Apr., 1864, and was governor of Hong-Kong from Oct., 1865, till 1872.

MacDon'ough, county of W. Illinois. Area, 576 square miles. It is intersected by Crooked Creek, and 3 railroads meet at Bushnell in the N. E.; has an undulating surface, and produces large quantities of grain, wool, and butter. There are several mills and manufactories. Cap. Macomb. Pop. 26,509.

MacDonough, post-v., cap. of Henry co., Ga., is 12 miles E. of Lovejoy's, a station on the Macon and Western R. R. Pop. 320.

MacDonough, post-v. and tp. of Chenango co., N. Y., on the Genegantslet Creek, has important manufactures. Pop. of v. 256; of tp. 1280.

McDonough (Commodore THOMAS), b. in Newcastle co., Del., Dec. 23, 1783; entered the U. S. navy as midshipman in 1800, served in the expedition to Tripoli, under Decatur, 1803–04; became lieutenant 1807, commander July 24, 1813; gained the celebrated victory in Lake Champlain Sept. 11, 1814, over the superior British squadron under Commodore Downie, for which he was promoted to captain; received a gold medal from Congress, and from the State of Vermont an estate on Cumberland Head, in view of the scene of the engagement. While returning from the command of the Mediterranean squadron he d. at sea, Nov. 16, 1825.

McDou'gal (DAVID D.), b. in Ohio Sept. 27, 1809; entered the navy as a midshipman Apr. 1, 1828; became a passed midshipman in 1834, a lieutenant in 1841, a commander in 1857, a captain in 1864, a commodore in 1869; retired in 1871. On July 16, 1863, at Simonaski, Japan, McDougal, in command of the Wyoming, engaged six land-batteries and three Japanese war-vessels, sinking one of the vessels, exploding the boilers of a second, and seriously crippling the third. FOXHALL A. PARKER.

McDou'gall (Gen. ALEXANDER), b. in Scotland in 1731; came to America with his father about 1755, and settled near New York, in which city he engaged in several mechanical avocations; was in 1769 a printer, and imprisoned by the colonial government (1770) for a libellous address. He took an active part in the popular movements preliminary to the Revolution; was appointed colonel of the first New York regiment; brigadier-general Aug., 1776, and major-general Oct. 20, 1777; was engaged in the battles of Long Island, White Plains, and Germantown, and in the New Jersey campaign; commanded the posts on the Hudson 1778–80; was minister of marine for a short time early in 1781; was elected a delegate to Congress from New York in that year, and again in 1784; elected to New York senate 1783. D. in New York June 8, 1786.

McDougall (JAMES A.), b. in Bethlehem, N. Y., Nov. 19, 1817; became in 1837 a lawyer of Pike co., Ill.; attorney-general of Illinois 1842–44; was a civil engineer; went on an exploring expedition to California *viâ* the Rio Grande and the Gila 1849; attorney-general of California 1850; Democratic member of Congress 1853–55; U. S. Senator 1861–67. D. at Albany, N. Y., Sept. 3, 1867.

MacDow'ell, county of W. North Carolina. Area, 550 square miles. It is bounded on the W. by the Black Mountains, a group of the Blue Ridge, some of the peaks of which here attain the highest elevation E. of the Rocky Mountains. The Bald Mountains occupy the S. E. portion of the county, through which flows the Catawba River, rising in the Black Mountains. The soil in the valleys is quite fertile, and produces chiefly Indian corn. Cap. Marion. Pop. 7592.

MacDowell, county of S. W. West Virginia. Area, about 900 square miles. Bounded N. by Alum Mountain, E. and S. by Tug Ridge, whence flow the numerous creeks which form the Tug Fork of Sandy River. Chief productions, Indian corn and butter. Cap. Perryville. Pop. 1952.

McDowell (EPHRAIM), M. D., b. in Rockbridge co., Va., Nov. 11, 1771; attended medical lectures in Edinburgh 1793–94; settled as a physician at Danville, Ky., 1795; became the leading surgical operator of the Western States, and performed the first operation in ovariotomy ever known, at Danville, Ky., Dec., 1809. This with other cases was published in 1816 in the *Eclectic Repertory and Analytic Review* by the operator himself. In general surgery Dr. McDowell was distinguished; he cut thirty-two times for stone in the bladder without losing a case. D. at Danville June 25, 1830. PAUL F. EVE.

McDowell (Gen. IRWIN), b. at Columbus, O., Oct. 15, 1818; educated at the Collége de Troyes, France, and at the U. S. Military Academy, from which latter he was graduated July 1, 1838. Appointed second lieutenant of artillery in the army; adjutant at West Point 1841–45; aide-de-camp to Gen. Wool 1845, as adjutant-general of his division, in the war with Mexico, and subsequently of the army of occupation. At the battle of Buena Vista he gained the brevet of captain, and in May, 1847, was appointed brevet captain and assistant adjutant-general. Served as adjutant-general of various departments until 1861, having been promoted to brevet major in 1856. Ordered to Washington in Feb., 1861, he served until May as inspector of troops, in organizing and mustering volunteers. Appointed brigadier-general May 14, he was three days later assigned to the command of the department of North-east Virginia and the defences of Washington on the Virginia side of the Potomac, and on May 27 to the Army of the Potomac, which he commanded at the battle of Bull Run, July 21. On the accession of Gen. McClellan to command, McDowell was placed in command of a division of the Army of the Potomac, and on the reorganization of that army (Mar., 1862) of the 1st corps of that army, and made major-general of volunteers; of the department of the Rappahannock Apr., 1862; of the 3d army corps (Army of Virginia) Aug., 1862, and during Gen. Pope's campaign in Northern Virginia was engaged at Cedar Mountain, Rappahannock Station, and second Bull Run. In July, 1864, placed in command of the department of the Pacific; of department of California June, 1866, department of the East 1868; promoted to be major-general U. S. A. in Nov., 1872, and in December assigned to the command of the division of the South.

MacDuf'fie, new county of E. Georgia, bounded N. by Little River, and traversed by the Georgia R. R. The surface is undulating and fertile, with abundant timber. Area, about 350 square miles. Cap. Thomson.

McDuffie (George), b. in Warren (then Columbia) co., Ga., in 1788; was in youth a mercantile clerk; graduated at South Carolina College, Columbia, in 1813; was admitted to the bar in 1814, and commenced practice at Edgefield, S. C. In 1818 he was elected to the South Carolina legislature, in 1821 to Congress, and continued in the House of Representatives from 1821 to 1835, during which time he took an active and prominent part in all public questions. In debate, he was distinguished for readiness, fluency, eloquence, and power. His speeches were always extemporaneous; the most famous of these were his denunciations of the protective policy, of which he denied the constitutionality. In submitting this and like questions of doubtful power under the Constitution of the U. S. to the decision of the State courts instead of the Federal consisted the so-called doctrine of nullification. As a popular orator or "stump speaker" McDuffie was highly passionate and exceedingly declamatory. His language was terse and strong, his sentences short, his ideas clear and distinct. In 1835 he became governor of the State; was elected in 1843 to the Senate of the U. S., and took an active part in the proceedings of that body until 1846, when he resigned in consequence of failing health. His early political writings (about 1818), collected in a volume called *The Crisis*, were opposed to the views he maintained at a later period. To Gov. McDuffie was due the credit of the reorganization of the College of South Carolina. He was for many years a major-general in the State militia. D. Mar. 11, 1851.

Mace [Lat. *macis*], the dried arillus or inner coat investing the shell of the nutmeg, which is the kernel of the nut of *Myristica fragrans*, a tree of the Spice Islands (order Myristicaceæ) now naturalized in other hot regions. Mace of inferior quality is also produced by *Myristica fatua* of the same regions. Mace is used as a spice, and as an aromatic stimulant in medicine. It has also the slight narcotic power of the nutmeg, in a milder degree. It yields a volatile oil upon distillation, and a buttery fixed oil when subjected to pressure. The oil of mace of commerce is, however, generally the fixed oil of the nutmeg, which is harder than the true oil of mace. Mace, in the fresh state fleshy and of a beautiful crimson, appears in commerce as a mass of flat, dry branching plates of an orange-brown color, and a taste and smell resembling those of nutmeg, but rather milder and pleasanter.

Macé (Jean), b. at Paris, France, Apr. 22, 1815; educated at the Collége Stanislaus; served in the army 1842–45; was secretary to Theodore Burette 1845–47; editor of *La République* 1849; retired to Alsace after the *coup d'état;* founded in 1864 *Le Magazin d'Education*, and in 1866 a "League of Instruction" after the Belgian model. His *History of a Mouthful of Bread* (1861), *The Servants of the Stomach* (1866), and *Fairy Book* have been translated into English, and found much favor.

Mac'edon, post-v. and tp. of Wayne co., N. Y., on the Erie Canal and New York Central R. R. The township has 5 churches and some manufactures.—Macedon Centre, a post-v., has an academy and 3 churches. Pop. of Macedon v. 451; of tp. 2636.

Macedo'nia, an ancient but at one time very famous kingdom of South-eastern Europe, originated from a small and obscure beginning, and comprised, when it first became known to history, the districts extending between Epirus and Illyria on the W., Pæonia on the N., Thracia, from which it was separated by the river Strymon, on the E., and Thessaly on the S. The country was fertile, rich in gold and silver, and produced excellent wheat, wine, and oil. The capital was Pella. The inhabitants were an Illyrian race, which here met and mingled with Thracian and Greek settlers. Greece had very early planted many flourishing colonies in these regions, as, for instance, Potidæa, a colony of Corinth, Chalcidice of Eubœa, and Amphipolis of Athens. Greek became the prevailing language, and Greek civilization the ruling spirit, but the dominant race was not Hellenic, and the Macedonians were never acknowledged by the Greeks as countrymen. When Xerxes invaded Greece he compelled Alexander, king of Macedonia, to follow him as his vassal, but after the battle at Platæa the country once more became independent. A century and a half later, Philip II. (359–336) conquered Greece, and his son, Alexander the Great (336–323), made Macedonia the most powerful empire of his time. But on the death of Alexander his empire dissolved into four kingdoms, and the splendor of Macedonia declined very rapidly. A quarrel between Philip V. and Athens gave the Romans an opportunity of interfering, and Philip was utterly defeated at Cynoscephalæ in 197 B. C., as was Perseus at Pydna in 168 B. C. After an unsuccessful uprising against the supremacy of the Romans, Macedonia was finally made a Roman province in 146, and included as such parts of Illyria, Pæonia, and Thracia. In the Middle Ages the name gradually went out of use, and in the present administrative division of Turkey it has no place.

Macedonia, post-tp. of Pottawattamie co., Ia. Pop. 321.

Macei'o, a seaport town of Brazil, capital of the province of Alagoas, situated on the Atlantic, in lat. 9° 39′ S. Its harbor is protected N. and E. by a small peninsula and by reefs, but it is open to the S., and unsafe from May to September, when the southern winds prevail. In spite of this disadvantage, the commerce of the port increases rapidly, and some manufactures have been commenced. Pop. about 8000.

Mac'Elroy, tp. of Tyler co., W. Va. Pop. 1316.

McEntee (Jarvis), b. in Rondout, N. Y., July 14, 1828; studied painting with F. E. Church; opened a studio in New York in 1858; has been very successful in Northern (especially mountain) landscapes, and more recently in figure-painting, in both of which branches he ranks high among American artists.

Macera'ta, town of Central Italy, in the province of Macerata, about 30 miles N. W. of Fermo. This town, one of the finest in the Marches, is surrounded by strong walls crowned by thirty-three towers, and at one of its six gates stands a triumphal arch. The aspect of the town itself is striking, and the panorama to be seen from it is very beautiful. On one side stretches a wide horizon of sea, on the other an arc of hills, fertile and populous, gradually rising till they end in a lofty mountain-crest. The public buildings are generally spacious and elegant. Among the churches should be mentioned the cathedral, modern, but containing old mosaics and pictures of interest; Santa Maria delle Vergini, of much architectural merit; Santa Maria della Pace, of the fourteenth century, etc. Here is a palace of the thirteenth century, which is one of the finest specimens existing of the architecture of that age, not to speak of other private dwellings of great richness. Macerata was built about 408 A. D. on the ruins of Recina, a celebrated town of the territory of Piceno. It was generally faithful to the pope during the Middle Ages; in 1797 it opened its gates voluntarily to the French, but two years later, the country people having recovered possession of the place, Gen. Monnier took it by assault and gave it over to be sacked. Murat retired here for a few days in 1815, and here his demoralized troops forsook him. Macerata was among the foremost for popular freedom in 1848–49, and its citizens are distinguished for intelligence. Pop. within municipal limits in 1874, 19,832.

MacEw'ensville, post-b. of Delaware tp., Northumberland co., Pa., on Warren Run, 2 miles E. of Watsontown. Pop. 342.

MacFar'lan, tp. of Hardin co., Ill. Pop. 827.

McFar'land (Francis Patrick), D. D., b. at Franklin, Pa., Apr. 6, 1819; was educated at Emmittsburg, Md.; was ordained to the Roman Catholic priesthood in 1845; held professorships at Emmittsburg, Md., and Fordham, N. Y., and pastorates at various places in the State of New York; was consecrated bishop of Hartford, Conn., in 1858. D. Oct. 12, 1874.

McFarland (John), b. in Pennsylvania Sept. 7, 1841; graduated at the Naval Academy in 1861; became a lieutenant in 1862, a lieutenant-commander in 1866. D. in 1874. Served in the Iroquois at the passage of Forts Jackson and St. Philip and the capture of New Orleans, and in the fights at Vicksburg and Grand Gulf in 1862. Highly spoken of in official reports. Foxhall A. Parker.

Macfar'lane (Charles), b. in England early in the nineteenth century; travelled extensively in the East and resided many years in Italy; wrote, among other works, *Constantinople in 1828–29* (1829), *Our Indian Empire* (1844), *The French Revolution* (1845), *The Pictorial History of Scotland*, with G. L. Craik (8 vols., 1849), *Turkey and its Destiny* (1850), *Memoir of the Duke of Wellington* (1851), *Life of the Duke of Marlborough* (1852), and a *History of British India* (1852). D. in 1858.

Macfarlane (Robert), b. in the Highlands of Scotland in 1734; educated at the University of Edinburgh, and is alleged to have assisted Macpherson in the preparation of *Ossian*. He published a Latin translation of *Temora* (1769), one of the Ossianic epics; wrote vols. i. and iv. of a *History of the Reign of George III.* (4 vols., 1770–96); edited the *Morning Chronicle* and the *Morning Packet;* published an *English and Gaelic Vocabulary* (1795) and *The Poems of*

Ossian in Gaelic, with a Literal Translation into Latin (1807). He was engaged upon a vindication of the genuineness of *Ossian* at the time of his death, which occurred in 1804.

Macfar'ren (GEORGE ALEXANDER), MUS. D., b. in London, England, Mar. 2, 1813; studied at the Royal Academy of Music, where he became professor of harmony in 1838; composed *The Devil's Opera*, produced at the Lyceum Theatre in 1838, and since then has brought out a long series of operas, oratorios, overtures, symphonies, sonatas, cantatas, and anthems, besides some hundreds of songs; wrote the lives of eminent musicians for the *Imperial Dictionary of Universal Biography;* published *Rudiments of Harmony* (1840–60) and *Six Lectures on Harmony* (1867); arranged *Old English Ditties* (13 books, 1857–69), Moore's *Irish Melodies* (1859), and a series of *Scotch Songs*. He has been long connected with the management of the Royal Academy of Music, has lectured on music at the Royal Institution, and was elected Mar. 16, 1875, professor of music at Cambridge University, in place of the late Sir Sterndale Bennett. Prof. Macfarren's songs from Tennyson's *Idyls*, Lane's *Arabian Nights*, Kingsley's *Poems*, and the dramas of Shakspeare have obtained great popularity. He has been blind since the year 1840.

McFer'rin (JOHN BERRY), D. D., b. June 15, 1807, in Rutherford co., Tenn.; was admitted as a preacher into the Tennessee conference of the M. E. Church 1825; spent fourteen years in pastoral work, including two years as missionary to the Cherokee Indians; edited the *South-western Christian Advocate* at Nashville, Tenn., for eighteen years (1840–58); was book-agent of the M. E. Church, South, for eight years (1858–66); became corresponding secretary of the board of missions in 1866, which office he still fills (1875). He has written the *History of Methodism in Tennessee* (3 vols.).

McGee' (THOMAS D'ARCY), b. at Carlingford, Louth, Ireland, Apr. 23, 1825; came in 1842 to Boston, where he wrote for the Boston *Pilot*, and became its chief editor; became London correspondent of the Dublin *Freeman's Journal*, and afterwards was secretary of the Irish confederation and an editor of the *Nation*. In 1848 he fled to New York, where he was 1848–50 editor of the New York *Nation*, and afterwards of the *American Celt*. Displeased with the "Know-Nothing" movement, he went to Montreal, Canada; edited the *New Era*, disavowed republicanism, became an ardent royalist; entered the provincial Parliament in 1857; became in 1864 president of the executive council, and in 1867 minister of agriculture. He denounced the Fenian movement, and was assassinated by James Whelan at Ottawa, Canada, Apr. 7, 1868. His principal works are *O'Connell and his Friends* (1854), *Canadian Ballads* (1858), *Irish Settlers in America* (1851), *Protestant Reformation in Ireland* (1853), *History of Ireland* (1862), *Catholic History of North America* (1854), *Speeches* (1865).

McGeo'ghan (JAMES), b. near Mullingar, Westmeath, Ireland, in 1698; educated for the priesthood at Rheims, France; became chaplain of the renowned Irish brigade in the French service, and wrote in French, at the request of several Irish officers, a *History of Ireland, Ancient and Modern* (1758), of which an English translation by Patrick O'Kelly appeared in 1835, and was reprinted in New York in 1868, with a continuation by John Mitchel. D. in Paris about 1760.

McGill' (JOHN), D. D., b. in Philadelphia Nov. 4, 1809; emigrated in childhood to Bardstown, Ky.; graduated at St. Joseph's College; was admitted to the bar at Bardstown; practised law in New Orleans and in Kentucky; studied theology at Baltimore and Rome, and in 1830 took priest's orders in the Roman Catholic Church at Bardstown, Ky.; preached in Lexington, Ky.; edited the *Catholic Advocate*, and in 1850 was consecrated bishop of Richmond, Va. He took a prominent part in the Vatican Council. D. at Richmond, Va., Jan. 14, 1872. Bishop McGill was an able preacher and a distinguished polemical debater and writer.

McGil'livray (Gen. ALEXANDER), a Creek chief, son of Lachlan McGillivray, a Scotch trader, by the half-breed daughter of a French officer, b. on the Coosa River, near the present city of Wetumpka, Ala., about 1740; was well educated at Charleston, and was for some time engaged in commercial pursuits at Savannah, but preferred to return to his tribe, in which at the time of the Revolution he had become a prominent leader and head of the royalist party. After the war, in which he took little part, he induced the so-called "Muscogee Confederacy," embracing Creeks, Seminoles, and other tribes, to become allies of the Spanish colonial government of West Florida; was the commissary of that government among his countrymen, and concentrated their trade at Pensacola. In 1790 he visited New York by invitation of Washington; was received with honor; signed a treaty ceding to the U. S. the disputed territory on the Oconee River, and by a secret article of the same instrument received the appointment of U. S. agent, with the rank and pay of brigadier-general. D. at Pensacola Feb. 17, 1793. McGillivray was a man of culture and political talent, and exercised a splendid hospitality. He was uncle to the celebrated chief William Weatherford.

McGillivray (WILLIAM), LL.D., b. in the Isle of Harris, Scotland, in 1796; became in 1823 assistant professor of natural history at the University of Edinburgh; was afterwards conservator of the museum of the Royal College of Surgeons in that city, and in 1841 was appointed regius professor of natural history in Marischal College, Aberdeen. He published *Lives of Eminent Zoologists from Aristotle to Linnæus* (1834); *A History of British Birds, Indigenous and Migratory* (5 vols., 1837–62), considered by Audubon the best work on the subject; manuals on geology and botany, and several other useful works. D. at Aberdeen Sept. 5, 1852. He left unfinished a treatise on *The Natural History of Dee-side and Bræmar*, illustrating the vicinity of Balmoral. The manuscript was purchased by Queen Victoria and printed in 1856.

MacGraw'ville, post-v. of Cortlandville tp., Cortland co., N. Y., 4 miles E. of Cortland Village. It has a union school (formerly Central College), a number of manufactories, and 3 churches. Pop. 517.

McGrea'dy (JAMES), b. probably in Pennsylvania about 1760; was educated at Jefferson College; became a Presbyterian minister in North Carolina; removed to South-western Kentucky in 1796, where he directed a remarkable revival of religion which, begun in 1797, lasted for some years, and organized in July, 1800, the first camp-meeting. The religious movement thus begun was carried on by young men who were ordained to the ministry without a regular education in theology. This step gave rise to opposition, and the ecclesiastical difficulties culminated in 1810 in the organization of a new Church, which took name from the region of its origin. (See CUMBERLAND PRESBYTERIAN CHURCH, by PROF. R. BEARD.)

MacGreg'or, post-v., cap. of Clayton co., Ia., on the Chicago Dubuque and Minnesota R. R. It has good schools, 6 churches, carriage, wagon, and other manufactories, several stores, and 2 weekly newspapers. Pop. 2074. JOHN H. ANDRICK, ED. "THE TIMES."

MacGregor (CHARLES), b. Jan. 15, 1843; graduated at the Naval Academy in 1863; became a lieutenant in 1866, a lieutenant-commander in 1868; served in the Juniata at both attacks upon Fort Fisher, and formed one of the storming-party of Jan. 15, 1865. Highly commended for "bravery and coolness." FOXHALL A. PARKER.

MacGregor (JOHN), b. in Stornoway, Ross-shire, Scotland, in 1797; emigrated to Canada in youth, and was long engaged in commercial pursuits; published *A Sketch of British America* (1828), *Emigration to British America* (1829), *My Notebook* (1835), *Commercial and Financial Legislation of Europe and America* (1841), *Commercial Statistics of all Nations* (5 vols., 1844–50), *Progress of America from the Discovery by Columbus to 1846* (2 vols., 1847), *Holland and the Dutch Colonies* (1848), *Germany and her Resources* (1848), and a *History of the British Empire from the Accession of James I.* (2 vols., 1852). Returning to England, he was employed on commercial missions to several European governments; was in 1840 a secretary of the board of trade; advocated free-trade measures; was elected to Parliament for Glasgow 1847; was established governor of the Royal British Bank, on the failure of which he retired to Boulogne, France, where he d. Apr. 23, 1857.

MacGregor (JOHN), b. at Gravesend, England, Jan. 24, 1825; graduated with honor from Trinity College, Cambridge; entered at the Middle Temple 1847; made a tour of Europe, the Levant, Egypt, and Palestine 1849–50; was called to the bar 1851; visited Russia and every country in Europe, as well as Algeria, Tunis, the U. S., and Canada; wrote and sketched for *Punch* and other periodicals; made in 1865 a canoe-voyage, of which in the following year he published the logbook, under the title *A Thousand Miles in the Rob Roy Canoe on Rivers and Lakes of Europe*, followed in later years by other voyages, recorded in the volumes *The Rob Roy on the Baltic*, *The Voyage Alone in the Yawl Rob Roy*, and *The Rob Roy on the Jordan*, all of which have been very popular and have found numerous imitators. Mr. MacGregor is captain of the Royal Canoe Club and a prominent member of the London school board.

McGuf'fey (WILLIAM H.), D. D., LL.D., b. in Washington co., Pa., in 1800; went in youth to Trumbull co., O.; graduated at Washington College in 1825; was a pro-

fessor in Miami University 1836–39; president of Ohio University 1839–45; professor of moral philosophy in the University of Virginia 1845–74. His well-known series of readers and other school-books had an immense sale. D. at Charlottesville, Va., May 5, 1873.

MacGuire, tp. of Marion co., Ill. Pop. 1161.

McGuire (Hugh Holmes), M. D., b. at Winchester, Va., Nov. 6, 1801; graduated in medicine at the University of Pennsylvania 1821; continued his studies under Dr. Physick, and became professor of surgery in the Winchester Medical College from its organization to its destruction during the war. He operated fifteen times for stone in the bladder without losing a case. At the meeting of the American Medical Association at Boston in 1849 he was made a vice-president. D. 1875. Paul F. Eve.

McGuire (Hunter Holmes), M. D., son of Dr. H. H. McGuire, b. in Winchester, Va., Oct. 11, 1835; took his degree of M. D. 1855, and was elected professor of anatomy in the Winchester Medical College, which position he held until 1858. He entered as a private in the Confederate army, was soon promoted to medical director of the 2d army corps of Northern Virginia, and became surgeon to Gen. "Stonewall" Jackson. In 1865 he was elected professor of surgery in the Virginia Medical College at Richmond. Since the war he has performed lithotomy forty-seven times, attended a large general practice, and contributed several valuable articles to the professional journals. Paul F. Eve.

Machæ′rodus [Gr. μάχαιρα, a "sabre," and ὀδούς, a "tooth"], an extinct genus of carnivorous mammals allied to the cats, and distinguished by the enormously developed canines of the upper jaw. These teeth are long, curved, and compressed, with a trenchant and usually serrated edge behind and before, whence the name "sabre-toothed tigers" applied to the group, which has been divided into three genera—*Drepanodon* (from δρεπάνον, a "scimitar"), *Smilodon* (from σμίλη, a "chisel" or "graver"), and *Machærodos*. Many species have been described from the Middle and Later Tertiary and the Quaternary deposits of Europe, Asia, North and South America. *Machærodus primævus*, from the Bad Lands of Dakota, was somewhat smaller than the cougar or American panther, and the skull resembles that of that animal in many respects. The orbit, however, is smaller, as is also the brain-case. The fore part of the lower jaw below the symphysis is prolonged downward for the protection of the projecting upper canines when the mouth was closed. The dental formula is the same as in the cats—viz. incisors, $\frac{3}{3}-\frac{3}{3}$; canines, $\frac{1}{1}-\frac{1}{1}$; premolars, $\frac{3}{2}-\frac{3}{2}$; molars, $\frac{1}{1}-\frac{1}{1}$; 30 teeth in all. The sectorial or flesh tooth is the last premolar in the upper jaw and the true molar of the lower jaw. The true molar of the upper jaw is a tubercular tooth. The lower canines are small. The incisor teeth are larger and longer than in the cats. Another larger species is represented by less perfect remains from the same locality of the Miocene Tertiary. *M. sivalensis* is another Miocene species from the Sewalik Hills, India. *M. cultridens* from the Tertiary of the Val d'Arno is a large species, the upper canines measuring eight and a half inches along the anterior curve. *M. latidens* from the Quaternary of Kent's Hole, England, was scarcely smaller, and equalled the largest living tiger in size, while *M. Neogæus* from the Quaternary of the caverns of Brazil was a still larger species, the canines projecting about eight inches from their sockets. The later species of *Machærodus* were doubtless contemporary with man, but the group became extinct before the beginning of the historic period.
O. C. Marsh.

McHale′ (John), D. D., b. in 1791 at Tubbernavine, Mayo, Ireland; studied for the Roman Catholic priesthood at Maynooth College, where he became professor of theology (1814); was appointed coadjutor bishop of Killala in 1825; became titular bishop in May, 1834, and archbishop of Tuam in August of the same year. He took an active part in the agitation which led to Roman Catholic emancipation, writing two series of letters on the subject; published in 1827 a treatise on the *Evidences and Doctrines of the Catholic Church;* built a cathedral at Ballina; built or rebuilt more than 100 churches; established numerous convents and Roman Catholic parish schools; preached at Rome in 1832 a series of sermons, which were translated into Italian; obtained from the pope in 1848 the condemnation of the "queen's colleges" in Ireland, and in 1869 procured a vote of censure against mixed education from a council of Irish bishops. He did much to revive the literary use of the Irish language, translating in the original metres 60 of Moore's *Irish Melodies*, published Irish translations of six books of the *Iliad* (1861), and of the Pentateuch (1863), to be followed by other books of the Old Testament.

MacHen′ry, new county in N. Dakota. Area, about 1650 square miles, intersected by Cheyenne and Mouse rivers, has a rolling prairie surface, broken by extensive sand-hills and high buttes, and has several small lakes.

MacHenry, county of N. E. Illinois, bounded N. by Wisconsin, traversed by Fox River, and intersected by three branches of the Chicago and North-western R. R. Area, 470 square miles. Limestone rock underlies nearly the whole county, which is level and moderately productive, yielding under careful cultivation large quantities of Indian corn and other grain, and supporting numerous cattle, horses, sheep, and swine. There are some manufactures of carriages, cheese-boxes, and saddlery, and several flouring-mills. Cap. Woodstock. Pop. 23,762.

MacHenry, post-v. and tp. of MacHenry co., Ill., on the Chicago and North-western R. R. (Fox River branch), 8 miles N. of Nunda, and on Fox River, 52 miles by rail N. W. of Chicago. Pop. 1988.

MacHenry, tp. of Lycoming co., Pa. Pop. 309.

McHenry (James), b. in Maryland about 1753; served as A. D. C. to La Fayette, with the rank of lieutenant-colonel; member of the old Congress 1783–86, and one of the framers of the Constitution; was secretary of war under Presidents Washington and Adams. Fort McHenry, one of the defences of Baltimore, was named in his honor. D. at Baltimore May 8, 1816.

Machi′as, post-tp., cap. of Washington co., Me., at the head of navigation of the Machias River, 12 miles from its mouth, contains 5 schools, 4 churches, a savings bank, 2 weekly newspapers, a machine-shop and foundry, sash and blind factory, 3 hotels, a custom-house, court-house, and jail. The people are largely engaged in lumbering and shipbuilding. Pop. 2525. G. W. Drisko, Ed. "Union."

Machias, post-tp., Cattaraugus co., N. Y. Pop. 1170.

Machiasport, tp. of Washington co., Me. Pop. 1526.

Machinactes, a v. of Montgomery co., Pa. Pop. 179.

Machin′ery [Gr. μηχανή; Lat. *machina*]. The study of machinery apart from that of machines has to do solely with the transmission and transformation of movement. It is a term generally applicable to the intermediate organs of machines (see Machines), and as such its perfection in project and establishment consists in reducing passive resistances to a minimum; of these, the most notable are friction and vibratory motions or shocks. In the arts but two principal movements are used—namely, rectilinear translation and circular, or rotation about an axis, each of these being either continuous or intermittent. Combinations of the pulley, the muffle, and also the inclined plane, serve to transmit and modify continuous rectilinear motion. Rectilinear and circular continuous motions are combined by the axle, the screw, the rack and pinion, and rollers. Circular continuous motions are combined by friction-drums, gearing-wheels, belts, and endless screws. Continuous circular and intermittent rectilinear motions are combined by eccentrics, cams, cranks, and connecting-rods, balance-beams, and certain kinds of rack and pinion. Continuous circular and intermittent circular are combined by cams, balance-beams, cranks, and connecting-rods. Circular and rectilinear motions, both intermittent, are combined by balance-beams with counterbalance-beam and parallelogram, or balance-beams with sliding bars, and by cylinders rolling in straps. Besides these transformations there may be mentioned the production of epicycloidal or helicoidal movements, which indeed fall within the combination of the foregoing; and finally, in general, the determination of a movement upon any curve requiring special solutions by means of the artifices of higher kinematics, such as represented by Peaucellier's cell and link-work.

But in practice sixteen or twenty transformations are all that are demanded from machinery to change the form or velocity of motion; and supposing the system so far adapted to this end in the drawing that it works smoothly by geometry, it is further only necessary, in order to reduce the passive resistances to a minimum, that it be arranged so as to equalize, if possible, the plus and minus pressures at all times when they are variable; that it be well centred, firmly established, adequately lubricated; and, if the motor and resisting works cannot at all instants balance, as is usually the case in machines, that a supplementary mass, such as a fly-wheel, be added to regulate the movement, unless it may happen that the rotating parts of the machinery itself are massive enough to render such an addition unnecessary, under which supposition it ought to be dispensed with. F. L. Vinton.

Machines. Machines in their most general definition might be studied from three different points of view: First, by considering forces alone produced in a state of equilibrium, as is done in discussing the wedge, the lever, and

all machines destined rather to exercise great pressure than to entertain movement. Secondly, by considering displacements or transformations of motion only by means of machinery. The first consideration is in the domain of statics, the second in that of geometry. Finally, by studying force and movement at the same time, as is done with regard to all machines calculated for the transmission of work, and in which the economy of the motor is one of the prime conditions to satisfy; this study is in the domain of dynamics, and it alone is at present distinctively called the study of machines. A motor force multiplied by its path is its work, and a machine is a system of material organs destined to transmit and present this work conveniently and economically for the overcoming of certain resistant works. In all cases a machine is composed of several organs, and is submitted to several forces. These last are—first, the motor, such as a steam or water pressure, or an animate motor; second, the useful or industrial resistance, such as the resistance of iron which is to be rolled, grain to be ground; third, the secondary or passive resistances, which are friction of sliding and rolling, stiffness of cordage, resistance of media, and movements of vibration. The organs are—the receptor, which is the locus of application of the motor, such as a piston, a bucket, a bar; next, the intermediate organs or transmitters, such as cranks, connecting-rods, cords, belts, gearing; and finally the operator or tool, shears, millstone, needle. Every machine transmits exactly as much work as it receives, and no more; but as a considerable portion is transmitted no farther than to the points of application of the passive resistances, it follows that in no machine can the industrial work equal the motor work; and finally that the perfection of a machine consists only in the perfection of its organs—such, namely, that the motor be not wasted on the receptor, that the intermediates be arranged so as to reduce the passive resistances to their natural minimum, and that the tool be adapted to the form of resistance which it has to meet. The principal motor machines to which the foregoing applies are water-wheels, water-pressure engines, turbines, steam-engines, hot-air engines, gas-engines, windmills, and powers for man or horse. F. L. VINTON.

Machray′ (ROBERT), D. D., LL.D., b. in England about 1830; graduated at Cambridge 1855; became dean and fellow of Sidney-Sussex College and vicar of Madingley, and in 1865 was appointed bishop of Rupert's Land, a diocese which includes the Hudson's Bay settlements.

Mac′Ilvaine (CHARLES PETTIT), D. D., LL.D., D. C. L., b. at Burlington, N. J., Jan. 18, 1798; graduated at Princeton in 1816; took orders in the Protestant Episcopal Church 1820; officiated at Georgetown, D. C.; was chaplain at West Point, N. Y., and professor of ethics and history 1825–27; became rector of St. Anne's, Brooklyn, N. Y., in 1827; professor of the evidences of revealed religion in the University of the City of New York in 1831; was consecrated bishop of Ohio in 1832; was president of Kenyon College 1832–40, and afterwards president of the theological seminary at Gambier, O. His *Evidences of Christianity* (1832) has gone through many editions. Among his other numerous works are *Oxford Divinity* (1841), *The Holy Catholic Church* (1844), *Valedictory Offering* (1853), *The Truth and the Life* (1855). D. at Florence, Italy, Mar. 12, 1873.

Mac′Indoe's Falls, post-v. of Barnet tp., Caledonia co., Vt., on the Connecticut River and on the Connecticut and Passumpsic Rivers R. R., 13 miles S. of St. Johnsbury. The falls of the Connecticut River here afford great water-power. Lumber is extensively manufactured. The village has an academy.

Mac′Intosh, county of Georgia, bounded E. by the Atlantic Ocean, and S. W. by the Altamaha River. Area, 430 square miles. It embraces a belt of sea-islands and sounds, large and valuable rice-swamps, and noble pine forests. Rice is the most valuable agricultural product. The county is traversed by the Atlantic and Gulf R. R. Cap. Darien. Pop. 4491.

MacIntosh, post v. of Liberty co., Ga., on the Atlantic and Gulf R. R., 32 miles S. W. of Savannah.

McIntosh (Col. JAMES S.), son of Gen. John, b. in Liberty co., Ga., June 19, 1787; entered the U. S. army as lieutenant in Nov., 1812; served on the Canada frontier and through the Creek war; became major 1836, lieutenant-colonel 1839, and brevet colonel for gallantry at Palo Alto and Resaca de la Palma 1846; commanded a brigade in the Valley of Mexico; was distinguished at Churubusco, and mortally wounded at the head of his column in the assault upon Molino del Rey. D. in the city of Mexico Sept. 26, 1847.—His son JAMES, who graduated at West Point in 1849, became a general in the Confederate service, and was killed at the battle of Pea Ridge, Ark., Nov. 7, 1862.

McIntosh (Gen. JOHN), brother of Lachlan, b. in Georgia about 1745; distinguished himself in the war of the Revolution in the Southern States, attaining the rank of lieutenant-colonel; settled in Florida after the war; was imprisoned by the Spaniards at St. Augustine and at Havana, and was major-general of Georgia militia in the service of the U. S. at Mobile 1814–15. D. on his plantation in McIntosh co., Ga., Nov. 12, 1826.

McIntosh (Gen. JOHN B.), b. in Florida about 1838; entered the U. S. army as second lieutenant of cavalry June, 1861; was engaged in the campaign in Virginia, Maryland, and Pennsylvania 1862–65, attaining the rank of brigadier-general July 21, 1864, and brevet major-general 1865; lost a leg at Opequan; was made lieutenant-colonel of the 42d Infantry 1866, and retired with the rank of brigadier-general July 30, 1870.

McIntosh (Gen. LACHLAN), b. at Borlam, near Inverness, Scotland, Mar. 17, 1727. His father, John More McIntosh, the head of the Borlam branch of the clan McIntosh, accompanied Oglethorpe to Georgia in 1736 with 100 of his tribesmen, and settled at New Inverness (now Darien), in what is now McIntosh county. Lachlan had few opportunities for education, but, aided by Gov. Oglethorpe, studied mathematics and surveying; became a clerk at Charleston in the counting-house of his friend Henry Laurens; was afterwards a surveyor in the Altamaha region; studied military tactics; became colonel of the 1st Georgia regiment and brigadier-general in the war of the Revolution (1776); killed Button Gwinnett in a duel May, 1777; commanded the Western department 1778, and led an expedition against the Indians of the Ohio Valley; was actively engaged in the siege of Savannah 1779, and in the defence of Charleston 1780, where he became a prisoner of war. He was a member of the Continental Congress 1784, and commissioner to treat with the Southern Indians 1785. D. at Savannah Feb. 20, 1806.

McIntosh (MARIA J.), grand-niece of Gen. Lachlan, b. at Sunbury, Ga., in 1803; educated at Sunbury Academy; removed to New York in 1835; suffered a reverse of fortune in the financial crisis of 1837, when she determined to earn a support by authorship, and under the *nom-de-plume* of "Aunt Kitty" produced a juvenile story entitled *Blind Alice,* which did not find a publisher until 1841. It immediately became popular, was followed by four other juveniles (1843), and the whole series was issued in 1847 in one volume as *Aunt Kitty's Tales.* By the recommendation of the eminent tragedian Macready they were republished in London, as also her later works. *Conquest and Self-Conquest* (1844), *Woman an Enigma* (1844), *Praise and Principle* (1845), though published as "Aunt Kitty's," were written for maturer readers than the earlier volumes. *Two Lives, or to Seem and to Be* (1846), was the first work bearing her name, and was followed by *Charms and Counter-Charms* (1848), *Evenings at Donaldson Manor* (1849), *Woman in America, her Work and her Reward* (1850), *The Lofty and the Lowly* (1853), *Violet, or the Cross and the Crown* (1857), *Meta Gray* (1858), *Two Pictures* (1863).

McIntosh (Gen. WILLIAM), b. at Coweta, Ga., about 1775, son of Capt. William McIntosh by a Creek Indian woman; was well educated; became a principal chief of his nation, and commanded the friendly Creeks in alliance with the U. S. during the second war with England; was distinguished in the battles of Antossee and Horseshoe Bend under Gen. Floyd, and later in the Florida campaign. Having taken part in the treaty of Indian Springs 1825, which ceded a considerable tract of land to the U. S., he became obnoxious to a party of his own nation, by whom he was murdered at his residence near Coweta Falls, on the Chattahoochee, Apr. 29, 1825.

McIntosh (WILLIAM), b. in Georgia about 1796; was an educated Cherokee Indian, who became a Methodist minister; was one of the best interpreters the Cherokees ever had, and was an efficient missionary. He joined the Arkansas conference in 1841, and was a highly-esteemed member of the Indian mission conference at the time of his death, which occurred at Tahlequah, Ind. T., Dec., 1858. T. O. SUMMERS.

Mac′Intyre, tp. of Lycoming co., Pa. It is traversed by the Williamsport and Elmira R. R. The village of MacIntyre is 1 mile N. E. of Ralston Station, and is connected with it by a gravitation railroad 3800 feet long, rising 680 feet. At MacIntyre there are valuable mines of excellent semi-bituminous coal. The township has noble forests of hemlock and beds of iron ore, and the coal-mines are remarkable for their fine and abundant fossils. Pop. of tp. in 1870, 674, since which it has largely increased.

Mackar′ness (JOHN FIELDER), D. D., b. in England Dec. 3, 1820; educated at Merton College, and became a fellow of Exeter College, Oxford; took holy orders in 1845;

was vicar of Tardebigge, Worcestershire, 1845–55; rector of Honiton, Devonshire, 1855–58; prebend of Exeter 1858; proctor in convocation for the clergy of the diocese of Exeter 1865; favored the disestablishment of the Irish Church, and was appointed in Dec., 1869, bishop of Oxford.—His brother, GEORGE RICHARD MACKARNESS, D. D., late vicar of Ilam, Staffordshire, was consecrated bishop of Argyll and the Isles Mar. 25, 1874.

Mackay′ (CHARLES), LL.D., b. in Perth, Scotland, in 1812; was educated in London, Brussels, and Aix-la-Chapelle; was employed on the staff of the London *Morning Chronicle* 1834–43; editor of the Glasgow *Argus* 1844–47; was long editorially connected with the *London Illustrated News;* founded the *Review* in 1860; lectured in the U. S. in 1858, and was a war-correspondent of the London *Times* in the U. S. 1862–65. Is best known by his songs, some of which were set to music composed by himself. His principal works are—*Songs and Poems* (1834), *History of London* (1837), *The Thames and its Tributaries* (1840), *The Hope of the World* (1840), *Longbeard*, a romance (1840), *Memoirs of Extraordinary Popular Delusions* (1841), *The Salamandrine* (1842), *Legends of the Isles* (1845), *Education of the People* (1846), *The English Lakes* (1846), *Voices from the Mountains* (1847), *Town Lyrics* (1848), *Egeria* (1850), *The Lump of Gold* (1856), *Under Green Leaves* (1857), *A Man's Heart* (1860), *Studies from the Antique* (1864), *Under the Blue Sky* (1871), *Lost Beauties of the English Language* (1874).

McKay (DONALD), b. in Shelburne, Nova Scotia, in 1809; learned shipbuilding in New York; commenced that business at Newburyport, Mass., and in 1845 established a famous shipyard at East Boston, where he constructed many fast clippers for the Australian and California trade. He launched Oct. 4, 1853, the magnificent ship Great Republic, of 4500 tons burden.

McKay (JAMES J.), b. in Bladen co., N. C., in 1793; became a lawyer; was State senator 1815–31; was at one time U. S. district attorney for North Carolina; was a representative in Congress 1831–49; became chairman of the committee of ways and means, and leader of the Democratic party in the House of Representatives, and received the vote of his State delegation in the Baltimore convention of 1848 as candidate for the Vice-Presidency of the U. S. D. at Goldsboro', N. C., Sept. 14, 1853.

MacKean′, county of N. W. Pennsylvania, bordering on New York. Area, about 1000 square miles. The S. W. angle of the county is crossed by the Philadelphia and Erie R. R., and the Buffalo Bradford and Pittsburg R. R. is being constructed southward through the centre. Many of the tributaries of the upper Alleghany River rise in this county, which is extremely mountainous, and still covered in great part with timber. Game is abundant; coal and iron are found in considerable quantities. Lumbering and dairying are the chief industries. Cap. Smethport. Pop. 8825.

MacKean, tp. of Licking co., O. Pop. 990.

MacKean, post-v. and tp. of Erie co., Pa., 10 miles S. of Erie. Pop. 1426.

McKean (THOMAS), LL.D., a signer of the Declaration of Independence, b. at Londonderry, Pa., Mar. 19, 1734; admitted to the bar 1757, and early held important public trusts in Delaware and Pennsylvania. He was sent to the general Congress of 1765, where he took a bold stand for popular rights. He became in 1765 judge of the quarter sessions and the orphans' court, and sole notary and tabellion public for Delaware. In 1771 he was made collector of the port of Newcastle, and was 1774–83 a member of Congress from Delaware, president of Congress in 1781; president of Delaware 1777, although he had for some years been a citizen of Pennsylvania. He wrote the constitution of Delaware in a single night, with no book for reference, and it was adopted unanimously on the following day. He was (1777–99) chief-justice of Pennsylvania, and its governor 1799–1808. He was one of the ablest and most determined of the Revolutionary patriots. D. at Philadelphia June 24, 1817.

MacKee′, tp. of Adams co., Ill. Pop. 1410.

MacKee, post-v., cap. of Jackson co., Ky., 30 miles E. of Stanford.

MacKees′port, post-b. of Alleghany co., Pa., on the Pittsburg Washington and Baltimore R. R., 14 miles from Pittsburg, and on the left bank of the Monongahela and at the mouth of the Youghiogheny River, both of which are navigable for steamboats. It is the centre of an extensive coal-mining district, having several fine schools, 7 churches, 2 banks, 2 loan associations, 1 newspaper, 1 of the largest manufactories of lap-welded iron tubes in the U. S., 3 iron manufactories, 2 foundries, 1 locomotive and car works, 6 steam saw-mills, a window-glass manufactory, 2 marine docks, several fine hotels, and a number of stores and repair-shops. Principal business, mining and manufacturing. Pop. 2523. B. B. COURSIN, ED. "MCKEESPORT TIMES."

McKee′ver (Commodore ISAAC), b. in Pennsylvania Apr., 1793; entered the navy as midshipman in 1809; became a lieutenant in 1814; commanded a gunboat in the flotilla of Lieutenant (afterwards Commodore) Jones; captured by the British on Lake Borgne in Dec., 1814, on which occasion he was severely wounded; became a commander in 1830, a captain in 1838; was in command of the South Atlantic squadron 1851–54, and of the Norfolk navy-yard 1855. D. at Norfolk, Va., Apr. 1, 1856.

MacKel′lar (THOMAS), b. at New York Aug. 12, 1812; entered at the age of sixteen years the printing establishment of the Harpers; while employed as a proofreader obtained a considerable acquaintance with literature, and wrote verses for the periodicals; removed to Philadelphia in 1833; became proofreader in the great stereotype foundry of Lawrence Johnson & Co.; rose to be foreman, and ultimately a partner. He has published three volumes of poetry—*Droppings from the Heart* (1844), *Tam's Fortnight Ramble* (1847), and *Lines for the Gentle and Loving* (1853), which have received high commendation from Willis, Bryant, Duyckinck, and Allibone. He published a typographical manual, entitled *The American Printer*, in 1866.

McKen′dree (WILLIAM), D. D., b. in King William co., Va., July 6, 1757. He early entered the army of the Revolution; was an adjutant and commissary, and witnessed the surrender of Cornwallis. He joined the Methodist itinerant ministry in 1778. In 1801 he was sent over the Alleghanies into Kentucky, and became one of the principal founders of his denomination in the West. His travels were extensive, his labors extraordinary, his eloquence remarkable, his success general, and his endurance of privation and suffering heroic. In 1808 he was elected bishop; his subsequent course embraces a large portion of the history of American Methodism, especially in the West, where he was venerated as one of the most able and saintly men in the annals of his denomination. McKendree College, founded at Lebanon, Ill., in the year of his death, will cause his name to be long remembered. D. near Nashville, Tenn., Mar. 5, 1835. ABEL STEVENS.

MacKen′zie, post-v. of Carroll co., Tenn.

Mackenzie (Sir ALEXANDER), b. at Inverness, Scotland, about the middle of the eighteenth century; came to Canada when young; entered the service of the Northwest Fur Company; passed eight years at Fort Chippewyan on Lake Athabasca, where he formed a project of an exploring expedition to the Northern Ocean; spent a year in England in the study of astronomy and navigation; set out from Fort Chippewyan June 3, 1789, with four canoes and a party of twelve persons; discovered and explored to lat. 69° the great river to which he gave his name; and in a second expedition from Fort Chippewyan, begun in Oct., 1792, reached the Pacific Ocean at Fort Menzies in July, 1793. Returning to England in 1801, he published *Voyages from Montreal through the Continent of North America to the Frozen and Pacific Oceans in the Years 1789 and 1793* (4to, with maps); was knighted in 1802, and d. at Dalhousie, Scotland, Mar. 12, 1820.

Mackenzie (ALEXANDER **Slidell**), originally named SLIDELL, brother of Senator John, b. in New York Apr. 6, 1803; entered the navy in 1815; cruised in the Mediterranean and on other stations; became lieutenant 1825, commander 1841, serving on the West Indian, Brazilian, Pacific, and Mediterranean squadrons, and took in 1837 the name of MACKENZIE in honor of a maternal uncle. In 1842, Com. Mackenzie was placed in charge of the U. S. brig Somers, sent to the W. African coast, manned chiefly by naval apprentices, and on the return voyage an intention of mutiny said to have been discovered on board led, by decision of a council of officers, to the hanging from the yardarm (Dec. 1, 1842) of three young men, one of whom, a midshipman, was a son of the secretary of war, John C. Spencer. This tragical event naturally created a great sensation, and Mackenzie's conduct was severely criticised and warmly defended. Though his conduct was approved by a court of inquiry, and he was acquitted of blame by a court-martial, the difference of opinion was not set at rest, and the affair embittered the subsequent life of Com. Mackenzie. He was ordnance officer at the siege of Vera Cruz during the Mexican war, and commanded the artillery division which stormed the town of Tabasco June 16, 1847. D. at Tarrytown, N. Y., Sept. 13, 1848. Com. Mackenzie had considerable literary ability, and published *A Year in Spain* (1829; revised ed. 1836), *Popular Essays on Naval Subjects* (1833), *The American in England* (1835), *Spain Revisited* (1836), *Life of John Paul*

Jones (1841), *Life of Oliver Hazard Perry* (1841), and *Life of Stephen Decatur* (1846).

Mackenzie (Lieut.-Com. ALEXANDER SLIDELL, JR.), b. Jan. 24, 1842, in New York; graduated at the Naval Academy in 1859; became a lieutenant in 1861, a lieutenant-commander in 1865; served in the Kineo at the passage of Forts Jackson and St. Philip in 1862, and in the Ironsides at the first attack upon Fort Sumter in 1863; commanded the boats of the squadron off Charleston in the joint army and navy expedition of July 10, 1863, which resulted in the capture of the greater part of Morris Island, and fell mortally wounded, June 13, 1867, while leading a charge against the savages of the island of Formosa, China. A tablet in the chapel of the Naval Academy tells the story of his death, but that of his life is recorded in the hearts of his brother-officers, who, knowing him to have been virtuous, courageous, and accomplished, cordially endorse the opinion expressed by Rear-admiral Bell, that "the navy could boast no braver spirit, no man of higher promise, than Lieut.-Com. Alexander S. Mackenzie."

FOXHALL A. PARKER.

Mackenzie (CHARLES FREDERICK), D. D., b. in Peeblesshire, Scotland, Apr. 10, 1825; graduated at Cambridge in 1848; took orders in the Church of England; labored for some time as a parish minister; obtained a fellowship and lectured at Cambridge; went to South Africa in 1854 with Bishop Colenso, and officiated as archdeacon of Natal until 1859, when he returned to England to urge the establishment of other African missions; was consecrated bishop of Central Africa at Cape Town Jan. 1, 1861; sailed for the Zambesi with a corps of missionaries, and commenced operations at a village named Magomero, where the climate soon undermined his constitution, and he d. Jan. 31, 1862.

Mackenzie (Sir GEORGE), b. at Dundee, Scotland, in 1636; educated at the universities of Aberdeen and St. Andrew's; studied law three years at Bourges, France; was admitted to the bar at Edinburgh in 1656, and soon became celebrated as an advocate; warmly but unsuccessfully defended the marquis of Argyle on his trial for treason 1661; became judge of the criminal court, member of Parliament, and king's counsel (1677), in which capacity he maintained the doctrine of passive obedience. His conduct as criminal prosecutor in the persecution of the Covenanters caused him to be stigmatized by the title of "Bluidy Mackenzie." He was also memorable for the witchcraft trials over which he presided. Mackenzie was a friend of Dryden and other poets, was himself an elegant scholar, and one of the first Scotchmen to write the English language correctly. He published *Religio Stoici* (1663), *A Moral Essay upon Solitude* (1665), *Moral Gallantry* (1667), a *Discourse on the Laws and Customs of Scotland in Matters Criminal* (1678), and *Institutions of the Laws of Scotland* (1684), besides *A Vindication of the Government of Charles II.* He was the chief founder of the Advocates' Library at Edinburgh. D. at London May 2, 1691. His complete *Works* were published in 1716.

Mackenzie (HENRY), b. at Edinburgh, Scotland, in Aug., 1745; educated at the university of that city; became an attorney of the Scottish court of exchequer; published anonymously in 1771 a novel, *The Man of Feeling*, which enjoyed great popularity, and led to the composition of a second part, which was issued under the author's name in 1773 as *The Man of the World.* Another novel, *Julia de Roubigné*, appeared in 1777. In 1779–80 Mackenzie edited a weekly literary paper, *The Mirror*, for which he wrote a series of admired essays; in 1785–87 he conducted *The Lounger*, a paper of a similar character; wrote several political tracts espousing Tory principles; made a report to the Highland Society adverse to the genuineness of the Ossianic poems; wrote three tragedies and biographical sketches of Thomas Blacklock, John Home, Lord Abercromby, and William Tytler, besides various minor publications. In 1804 he received the lucrative appointment of comptroller of taxes for Scotland; gave to the world his collected works in 8 vols. (1808), and during his declining years made his house in Edinburgh the centre of the most distinguished literary and political society. His novels and essays, now little read, were highly commended by Scott, Talfourd, Mackintosh, Allan Cunningham, and Wilson. D. at Edinburgh Jan. 14, 1831.

Mackenzie (ROBERT SHELTON), M. D., LL.D., D. C. L., b. at Drew's Court, co. Limerick, Ireland, June 22, 1809; educated at Fermoy; studied medicine in Cork and Dublin; became a school-teacher at Fermoy; was in 1829 an editor in Staffordshire, England; was 1830–52 a highly successful *littérateur* of London; came in 1852 to New York, and was connected with various journals, and became in 1857 the foreign and literary editor of the Philadelphia *Press.* He has published annotated editions of various British and other authors, and is author of *Lays of Palestine* (1829), *Titian*, a novel (1843), *Partnership en Commandité*, a law treatise (1847), *Bits of Blarney* (1855), *Life of Charles Dickens* (1870), *Life of Sir Walter Scott* (1871); edited Sheil's *Sketches of the Irish Bar* (1854), the *Noctes Ambrosianæ* (1854), Curran's *Life*, by his son (1855), and the writings of Dr. W. Maginn (5 vols., 1855–57), besides numerous minor publications.

Mackenzie (RANALD S.), b. in New York Aug., 1840; graduated from the U. S. Military Academy June, 1862, and appointed second lieutenant of engineers; engineer of 9th corps, and wounded at second battle of Bull Run; of Sumner's grand division at Fredericksburg, Dec., 1863; engaged at Chancellorsville and in constructing and laying bridges in advance of the army, following the Confederate forces through Maryland into Pennsylvania, and engaged at the battle of Gettysburg; subsequently in providing bridges for pursuit of Lee, and continuously employed on engineering duty until opening of Richmond campaign, May, 1864, when in command of his company through battles of the Wilderness: wounded before Petersburg June, 1864, while in command of regiment; returning, commanded regiment during Early's attack on Washington, July, 1864, and in command of brigade in subsequent pursuit and battles of Opequan, Fisher's Hill, and Cedar Creek, where again wounded. Appointed brigadier-general of volunteers, and resumed command before Petersburg, Nov., 1864; at Five Forks he commanded a division of cavalry which rendered important service; brevetted from first lieutenant to major-general for gallantry. In Jan., 1866, he returned to duty with his corps, in which he had attained the rank of captain, and in Mar., 1867, was appointed colonel of infantry; transferred to the cavalry 1870, and has been very efficient against depredators along the Mexican frontier.

Mackenzie (WILLIAM LYON), b. at Springfield, Forfar, Scotland, Mar. 12, 1795; became a resident of Toronto, Canada, and afterwards (1824–33) editor of the *Colonial Advocate* of Niagara, where his press was destroyed by a mob in 1826. In 1828 he was sent to the provincial Parliament, whence he was five times expelled, and five times re-elected. He published *Sketches of Canada* (1833). In 1836 he was the first mayor of Toronto. In 1837–38, as leader of the rebellion of Upper Canada, he proclaimed a new provisional government, but was outlawed, and escaped to the U. S., where he was arrested and confined in jail for eighteen months at Rochester, N. Y. He was for a long time after connected with the New York *Tribune*, and for a time published Mackenzie's *Gazette.* In 1845 he published a pamphlet against W. L. Marcy, Jacob Barker, and others, which caused great excitement in New York. In 1850 he was pardoned and returned to Canada, where he again entered public life. D. at Toronto Aug. 26, 1861. His agitation did much for the reform of the government of Canada.

Mackenzie River, one of the largest streams on the globe, rises in Great Slave Lake, and flows in a N. N. W. direction to the Frozen Ocean. It is navigable in the open season from its mouth to Fort Simpson, where there are rapids; above which it is again navigable to Great Slave Lake. Its three great head-streams are the Peace, Athabasca, and English rivers. Its extreme length is 2300 miles; its area of drainage, 590,000 square miles. Lignite-beds occur upon its banks, and a large part of its upper basin is fertile and habitable land.

Mack'erel [Old Eng. *mackerel;* Fr. *maquereau*, a "pander," because it was once believed to bring together male and female fishes of other species], a name of various salt-water fishes of the genus *Scomber* (family Scombridæ). The most important species are the *S. vernalis* of North American Atlantic waters, and *S. vulgaris* of European seas. The above kinds are caught in immense numbers, both by hooks and nets. They are very delicate fishes for the table when fresh, and are also salted in great quantities for market. Gloucester and Yarmouth, Mass., are the great American centres of the mackerel fishery. Their fleets visit all parts of the coast from the Carolinas to the Bay of Chaleurs, according to the season of the year. Spain, Spanish America, and the South and West of the U. S. are the great markets for salted mackerel. The European mackerel is extensively caught in French and English vessels, but with nets more frequently than with the hook, which is more commonly employed in the U. S. (See also SCOMBRIDÆ.)

Mack'ey (ALBERT GALLATIN), M. D., b. at Charleston, S. C., in 1809; graduated in 1832 at the Medical College of South Carolina, where he became demonstrator of anatomy in 1838, but in 1844 devoted himself wholly to literature, chiefly in connection with Masonry. He wrote for several periodicals in Charleston; published a *Lexicon of Free-*

masonry (1845), *The Mystic Tie* (1849), *Principles of Masonic Law* (1856), *The Book of the Chapter* (1858), *Textbook of Masonic Jurisprudence* (1859), *Cryptic Masonry* and *Masonic Ritualist* (1867), *The Symbolisms of Freemasonry* (1868), and *Manual of the Lodge* (1870). He also edited the *Ahiman Rezon, or Book of Constitutions of the Grand Lodge of Ancient Freemasons of South Carolina*. He established a Masonic monthly at Charleston in 1850, a quarterly in 1858; learned several ancient languages by private study; has lectured upon the Middle Ages, and taken an active part in politics since the war. A new and much-enlarged edition of the *Lexicon* appeared in 1875, under the title *Encyclopædia of Freemasonry*.

Mack'ford, tp. of Green Lake co., Wis. Pop. 1251.

Mack'ie (John Milton), b. at Wareham, Mass., in 1813; graduated in 1832 at Brown University, where he was tutor 1834–38; travelled in Europe; published a *Life of Leibnitz* (1845), *Life of Samuel Gorton* in Sparks's *American Biography* (1848), *Cosas de España* (1848), *Life of Schamyl* (1856), *Life of Tai-Ping-Wang* (1857), *From Cape Cod to Dixie* (1864), and has frequently contributed to the columns of the *North American Review*.

MacKim', tp. of Pleasants co., W. Va. Pop. 449.

McKim (James Miller), b. in Carlisle, Pa., about 1810; graduated at Dickinson College, and entered the Presbyterian ministry, but abandoned his pastoral work and devoted his whole time to the antislavery cause. He was a zealous lecturer in favor of emancipation, and was for a time corresponding secretary of the Pennsylvania Antislavery Society, and in later years was connected with the Freedman's Aid Society. Died at Llewellyn Park, Orange, N. J., June 13, 1874.

Mack'inac, county of Michigan, in the E. portion of the N. peninsula. Area, 1100 square miles. It is bounded S. by Lakes Michigan and Huron, and includes several islands. It is mostly a rough region, covered with forests. Lumbering is the chief industry. Cap. Mackinaw. Pop. 1716.

Mack'inaw, post-v. and tp. of Tazewell co., Ill., on Mackinaw River and on the Indianapolis Bloomington and Western R. R., 17 miles W. of Bloomington, Ill. The township is underlaid with coal. Pop. of v. 496; of tp. 1379.

Mackinaw, post-v., cap. of Mackinac co., Mich., is situated on Mackinaw Island in Lake Huron, just N. E. of Mackinaw Strait, which connects it with Lake Michigan. It is 300 miles by water from Detroit. The island is 2 miles wide by 3 in length, and is high, well wooded, and rocky. Here is Fort Mackinaw, a U. S. post, lat. 45° 54′ N., lon. 84° 30′ W. Mackinaw (formerly Michilimackinac) was an important point during the colonial period. It was settled by the French at an early date; became a missionary station in 1669; was captured and its inhabitants murdered by Pontiac in 1763; and was occupied by British troops in 1812. Mackinaw is a delightful summer resort, has a good harbor, and exports large quantities of fish.

MacKin'ley, post-v. and tp. of Marengo co., Ala. Pop. 1481.

MacKinley, tp. of Monroe co., Ala. Pop. 960.

MacKin'ney, post-v., cap. of Collin co., Texas, on the Texas Central R. R. It contains an academy, 3 churches, a bank, extensive flouring-mills, 2 newspapers, 2 hotels, and stores. It is in a rich grain and stock-raising section. Pop. 503. J. H. Bingham, Ed. "Enquirer."

McKin'stry (Commodore James P.), b. in New York Sept. 6, 1809; entered the navy as a midshipman Feb. 1, 1826; became a passed midshipman in 1832, a lieutenant in 1837, a commander in 1855, a captain in 1862, a commodore in 1866. D. in 1873. He commanded the Monongahela at the passage of Port Hudson, Mar. 4, 1863, and was severely injured by "the bridge" on which he was standing being shot away, so that he was thrown with great violence to the deck. Foxhall A. Parker.

Mack'intosh (Sir James), M. D., LL.D., F. R. S., b. at Aldourie, Inverness-shire, Scotland, Oct. 24, 1745; graduated M. A. in 1784 at King's College, Aberdeen, and M. D. at Edinburgh 1787; went to London, and in 1791 published his *Vindiciæ Gallicæ*, an eloquent defence of the French Revolution against the strictures of Burke's *Reflections*, which at once won him the favor of the Whig leaders; supported himself by literary work, and in 1795 was called to the bar at Lincoln's Inn; delivered in 1799–1800 at Lincoln's Inn his brilliant *Lectures on the Law of Nature and of Nations*; won a splendid fame at the bar; was knighted 1809, and was recorder of Bombay 1804–06; judge of admiralty 1806–11; returned to England after a highly honorable career in the East, and entered Parliament in 1813 from Nairn; was professor of law and general politics at Haileybury College 1818–24, still taking an important place in parliamentary business; in 1830 became a commissioner of Indian affairs. D. in London May 30, 1832. Among his more important works are a brief *History of England* (1830), extending only to the reign of Elizabeth, but completed by Wallace and Bell (10 vols.); a *Dissertation on the Progress of Ethical Philosophy* (1830), written for the *Encyclopædia Britannica*; a *Life of Sir Thomas More*, and a great number of miscellaneous articles, chiefly published in the *Edinburgh Review*, containing a mass of valuable criticism, especially regarding questions of psychology and ethics. They have been collected into volumes and published in America in the well-known series of *Modern British Essayists*. He had long projected an extended history of England from the time of James II. to the French Revolution, of which a fragment appeared after his death, comprising an account of the Revolution of 1688. Sir James Mackintosh enjoyed during his later years a literary renown for which the present generation can hardly find sufficient warrant in his extant works. His vast reputation was, however, made up of several very distinct elements, not the least of which was his power as a conversationalist, in which department he has had no equal in the present century. As a parliamentary orator he did not fill the expectations based upon his forensic achievements, among which the memorable defence of Peltier (Feb. 21, 1803) was perhaps the greatest effort of British eloquence at the bar. (See his *Memoirs*, by his son, containing journals, letters, autobiography, and many fragmentary writings (1835).)

MacKnight' (James), D. D., b. at Irvine, Ayrshire, in 1721; studied at the universities of Glasgow and Leyden; became minister of a Scotch church at Maybole, Ayrshire, in 1753, at Jedburgh in 1769, and in Edinburgh in 1772. He published in 1756 a *Harmony of the Gospels*, in 1763 *The Truth of Gospel History*, and in 1795 *A New Translation of the Apostolical Epistles, with Commentary and Notes*. These works, especially the *Harmony*, were long highly esteemed and several times reprinted. D. at Edinburgh Jan. 13, 1800.

Mack'ville, post-v. of Washington co., Ky., 35 miles S. W. of Frankfort. Pop. 180.

Mack von Leiberich (Karl), Baron, b. at Neuslingen, Franconia, Aug. 25, 1752, in humble circumstances; entered the Austrian army; rose rapidly on account of his eminent talents; was ennobled and made a field-marshal-lieutenant in 1794. In 1798 he accepted the command of the Neapolitan army, and fought with success against the French in the Papal States; but being compelled afterwards to retreat, and endangered in his position by an insurrection in Naples, he fled with his German staff to the French army, and was sent as prisoner of war to Paris. In 1800 he escaped, and was made commander in Tyrol. Having been defeated by Napoleon (Oct. 14 and 15, 1805) on the banks of the Iller, he retreated into the fortress of Ulm, but surrendered himself on the following day with an army of 23,000 men and an enormous quantity of war-materials. He was placed before an Austrian court-martial and sentenced to death, but the sentence was commuted to imprisonment for life, and in 1819 he was entirely pardoned. D. at St. Pölten, near Vienna, Oct. 22, 1828.

McLane' (Col. Allen), b. Aug. 8, 1746; removed to Kent co., Del., in 1774. He was present as a volunteer at the Great Bridge fight, near Norfolk, Va., 1775; became a lieutenant in Rodney's Delaware regiment; his large estate in Philadelphia was sacrificed in the war. He was distinguished at Long Island, White Plains, Trenton, Princeton, Monmouth, Paulus Hook, Stony Point, and Yorktown; was afterwards a judge of the common pleas; U. S. marshal 1790–98; collector of the port of Wilmington, 1808-29. D. at Wilmington, Del., May 22, 1829.

McLane (Louis), son of Col. Allen McLane, b. at Smyrna, Del., May 28, 1786; entered the navy as midshipman at the age of twelve years, and cruised a year in the Philadelphia, Com. Decatur; pursued studies at Newark College; studied law with James A. Bayard, and was admitted to the bar 1807; served as a volunteer in 1814 in a company commanded by Cæsar H. Rodney, which marched to the defence of Baltimore from the threatened attack by the British; was Representative in Congress 1817–27, voting against the admission of slavery in Missouri or in the Territories; was chosen Senator 1827; sent by Pres. Jackson as minister to England May, 1829; returned in 1831 to accept the post of secretary of the treasury; was transferred in 1833 to the department of state in consequence of his refusal to sanction the removal of the deposits from the Bank of the U. S.; retired to private life June, 1834, settling in Maryland; was president of the Baltimore and Ohio Railroad during its completion and early management 1837–47; accepted the mission to London to settle the Oregon

difficulty June, 1845; was a delegate to the constitutional convention of Maryland 1850–51, and d. at Baltimore Oct. 7, 1857.

McLane (Robert Milligan), son of Louis, b. in Delaware June 23, 1815; resided with his father at London, 1828–31; studied in colleges at Washington, D. C., and Baltimore, Md.; graduated at West Point Military Academy 1837; served in the army in Florida, in the Cherokee country, and in the North-west; resigned 1843; was admitted to the bar at Baltimore the same year; was a member of the Maryland legislature 1845–47; member of Congress 1847–51; minister to China 1853–55, and minister to Mexico, residing near the government of Juarez at Vera Cruz from Mar., 1859, to Nov., 1860. While in Mexico he negotiated a treaty giving President Juarez the benefit of an American loan and other substantial advantages, and purchasing Lower California for a sum of several millions of dollars. The treaty was never ratified, but the policy of intervention in Mexican affairs was carried out by the U. S. navy in capturing several vessels of war belonging to the reactionary government of Miramon. Since his return from Mexico he has practised at the Baltimore bar.

Maclau'rin (Colin), b. at Kilmadan, Argyleshire, in Feb., 1698; educated at the University of Glasgow; became in 1717 professor of mathematics in Marischal College, Aberdeen, and in 1725 at the University of Edinburgh, where he d. June 14, 1746. He wrote *Geometria Organica* (1720), treatises on *The Percussion of Bodies* (1724), on *Fluxions* (1742), on *Algebra*, and an *Account of Sir Isaac Newton's Discoveries*, the two latter posthumous publications (1748).

McLaws (Lafayette), b. in Georgia Jan., 1821; graduated from the U. S. Military Academy in 1842, and appointed brevet second lieutenant of infantry; served (1845–48) in the war with Mexico; subsequently on frontier duty until 1860, having meanwhile attained the rank of captain; resigned Mar. 23, 1861, to join the Southern Confederacy, being speedily appointed major-general in that service, and throughout the civil war rendered important service as division commander, mainly in Longstreet's corps.

Maclay' (Archibald), D. D., b. at Killearn, Scotland, May 14, 1778; entered the ministry of the National Kirk in 1802; came in 1805 to New York, and until 1808 was pastor of the Presbyterian church in Rose street; became a Baptist, and was founder of the Mulberry street (now Tabernacle) church, and its pastor 1808–37; agent of the American and Foreign Bible Society 1837–50; president of the American Bible Union 1850–56. D. May 2, 1860.

Mac'le [Lat. *macula*, "spot"], a synonym for *chiastolite*, a variety of *andalusite*, which, owing to the presence of symmetrically disposed impurities, shows on sections of the prismatic crystals dark figures (crosses, etc.) on a light ground, or *vice versâ*. The name chiastolite is in allusion to the form of such figures, resembling the Greek letter χ.

MacLean', county of Central Illinois, composed chiefly of prairie-lands watered by affluents of the Illinois River. Area, 1132 square miles. It is a fine farming and dairying region. Seven railroads meet at the cap., Bloomington. Pop. 53,988.

MacLean, county of W. Kentucky, intersected by Green River and traversed by the Owensboro' and Russellville R. R. Area, 320 square miles. The surface is hilly and the soil fertile. Chief productions, tobacco, Indian corn, wool, and butter. Cap. Calhoun. Pop. 7614.

MacLean, post-v. of Mount Hope tp., MacLean co., Ill., on the Chicago and Alton R. R. Pop. 600.

MacLean, tp. of Ramsey co., Minn. Pop. 442.

MacLean, post-v. of Dryden and Groton tps., Tompkins co., N. Y., on Fall Creek, has five churches and a number of manufactories. Pop. 405.

MacLean, tp. of Shelby co., O. Pop. 1309.

McLean (John), LL.D., b. in Morris co., N. J., Mar. 11, 1785; settled with his parents in Warren co., O., in childhood; worked on a farm until the age of sixteen; commenced studying law at Cincinnati in 1803; was admitted to the bar, and began practice in 1807 at Lebanon; served in Congress from 1813 to 1816, when he became a judge of the supreme court of Ohio; was commissioner of the general land-office in 1822, postmaster-general in 1823, associate justice of the U. S. Supreme Court in 1829; was distinguished for the eloquence and ability of his charges to grand juries, of which a notable example was one delivered in Dec., 1838, concerning unlawful combinations against a foreign government, elicited by certain aspects of the Canadian "patriot war." His decision in the celebrated "Dred Scott case" (1857) was given to the effect that slavery has its origin in force, not in right, nor in general law, to which it is opposed, but in local law, which cannot be respected by the national courts. In 1848 his name was brought before the Buffalo "Free Soil" convention as a candidate for the Presidential nomination, and in 1856 he was the leading competitor of Fremont for the Republican nomination at Philadelphia. Many Republicans believe that if Judge McLean had then been nominated he would have been elected, in which case the later history of the U. S. would have been very different from what has been witnessed by the present generation. He again received some votes in the Chicago convention of 1860, and d. at Cincinnati, O., Apr. 4, 1861. He published 2 vols. of *Reports of U. S. Circuit Court* (1829–42).

MacLean (John), D. D., b. at Portsoy, Banffshire, Scotland, in 1828; studied at the University of Aberdeen; became curate at London, Ontario, 1853; archdeacon of Manitoba and professor of divinity in St. John's College in 1866, and bishop of the new diocese of Saskatchewan in 1873.

Maclean (Letitia Elizabeth **Landon**), b. at Brompton, England, in 1802; acquired considerable reputation by a number of poems published in 1820 in the *Literary Gazette* over the signature "L. E. L.," by which she was thenceforth known. She soon became a regular contributor of reviews, essays, poems, and miscellaneous articles to the *Gazette* and other newspapers, and to the annuals, and for fifteen years supported her family by her pen. She published several volumes of poems and four novels, all of which were successful, many having been reprinted in the U. S. In June, 1838, she married Mr. George Maclean, appointed governor of Cape Coast Castle, West Africa, and accompanied him to that place, where she d. Oct. 15, 1838, from an overdose of prussic acid. (See the *Life and Literary Remains of L. E. L.* (1841), by Laman Blanchard.)

MacLeans'boro', post-v., cap. of Hamilton co., Ill., on the Evansville and Shawneetown division of the St. Louis and South-eastern R. R. It has a high school, 3 churches, 3 mills, 1 bank, 2 newspapers, 5 hotels. Principal industry, agricultural pursuits. Pop. 683.

John P. Stelle, Ed. "Golden Era."

MacLel'lan (Isaac, Jr.), b. at Portland, Me., in 1810; graduated at Bowdoin College 1826; engaged in the practice of law at Boston, where he published volumes of poems in 1830, 1832, 1843, and 1844, and a *Journal of a Residence in Scotland* (1834), compiled from the papers of H. B. MacLellan, probably his brother. He ultimately settled on Long Island, and devoted himself to agriculture.

MacLen'nan, county of Central Texas, intersected by Brazos River. Area, 960 square miles. The surface is undulating and partly prairie, the soil very productive, and the river and creek bottoms well timbered, besides which the lower "Cross Timbers" extend into the N. of the county. Cotton, Indian corn, and sweet potatoes are staples. A branch of the Houston and Texas Central R. R. penetrates to the capital, Waco. Pop. 13,500.

MacLeod', county of S. Central Minnesota, watered by Kaniska River and other tributaries of Crow River, and traversed by the Hastings and Dakota R. R. Area, 504 square miles. Lakes are numerous. Grain and dairy products are the staples. Cap. Glencoe. Pop. 5643.

McLeod (Alexander), D. D., b. in the inland of Mull, Scotland, June 12, 1774; emigrated to the U. S. in 1792; graduated at Union College in 1798; became in the following year pastor of the First Reformed Presbyterian church in New York City; wrote *Negro Slavery Unjustifiable* (1802), *Lectures on the Book of Revelation* (1814), *Sermons on the War* (1815), besides several doctrinal treatises, and assisted Dr. John M. Mason in the editorship of the *Christian Magazine*. He was the chief organizer of the American Colonization Society in 1816, and wrote its constitution. D. at New York Feb. 17, 1833. (See his *Memoir*, by Rev. S. B. Wiley, D. D. (1855).)

McLeod (Henry Dunning), b. in Edinburgh, Scotland, in 1821; was educated at Eton and the University of Cambridge; was admitted to the bar in 1849; published *Theory and Practice of Banking* (1856), *Elements of Political Economy* (1858), and a *Dictionary of Political Economy* (1859). He was employed by the British government 1868–70 in the codification of the laws relating to bills of exchange.

McLeod (John Niel), D. D., son of Alexander, b. in New York City Oct. 11, 1806; graduated at Columbia College 1826; studied theology with his father, to whom he became assistant in the pastorate of the First Reformed Presbyterian church 1828, and his successor 1833. Dr. McLeod was for many years the stated clerk of the General Synod of his Church, professor in its theological seminary at Philadelphia, and leader of that part of the Church which was unwilling to unite with other branches of the Scottish Church, cherishing very rigid opinions upon the

subject of singing miscellaneous hymns and membership of secret societies. D. in New York Apr. 27, 1874.

Macleod (Norman), D. D., b. at Campbelton, Scotland, June 3, 1812; educated at Edinburgh, Glasgow, and in Germany; became minister of the National Kirk; parish minister of Loudoun (1838–43), of Dalkeith (1843–51), in Glasgow (Barony parish) 1851, a very large and difficult field; established schools and meetings for the workingmen, and labored with zeal and success; became chaplain to the queen for Scotland; edited the Edinburgh *Christian Magazine* 1850–60, *Good Words* 1860–72; was author of *The Earnest Student* (1847), *Parish Papers* (1862), *Eastward* (1866), and *Peeps at the Far East*, a narrative of travels in India, and several other works. D. at Glasgow June 16, 1872. Dr. McLeod made *Good Words* an important educational organ and a great literary success. He was a man of great breadth and versatility. (See *Memoirs*, by his brother, Rev. Donald Macleod, 2 vols., 1876.)

McLeod (Xavier Donald), son of Alexander McLeod, D. D., b. in New York Nov. 17, 1821; graduated at Columbia College; took orders in the Episcopal Church in 1845; preached for a short time in a country parish; went to Europe in 1850; became a Roman Catholic, and returning to New York in 1852 engaged in literary pursuits; wrote *Lives* of Sir Walter Scott (1852), Mary Queen of Scots (1857), and Fernando Wood (1856); wrote for several magazines; produced some poems of considerable merit and three or four novels; became connected with the *Leader*, a newspaper of St. Louis, in 1857, and in the same year was chosen professor of rhetoric and belles-lettres at Mount St. Mary's (Roman Catholic) College near Cincinnati; was ordained a priest, and was killed in a railway accident near Cincinnati July 20, 1865.

Maclise' (Daniel), b. at Cork, Ireland, Jan. 25, 1811; at the age of sixteen left the bank where he had been placed, and devoted himself to art, in which he early displayed a remarkable versatility of talent, combining the finest gifts of the caricaturist with the grasp of the historical painter and the sentiment of the poet. His first successes were gained by sketches of Irish scenery and life taken on a pedestrian excursion among the peasantry of Wicklow. He studied anatomy in the studio and the dissecting-room. In 1828, Maclise came to London, was admitted to the Royal Academy, gained a medal in the antique school, and was made a member of the life school, where he also gained a medal for the best copy of a painting by Guido; was a contributor of drawings and verses to *Fraser's Magazine;* studied a year in Paris; won the gold medal of the Academy in 1831, by his historical painting, *The Choice of Hercules*, and from that time devoted his pencil mainly to subjects of a blended historical and romantic character—*All-Hallow Eve, Henry VIII. and Anne Boleyn, Francis I. and Diana of Poictiers, Charles I. and Cromwell, Robin Hood and Richard Cœur de Lion, Puck Disenchanting Bottom, Macbeth and Witches, Banquet Scene in Macbeth, Bohemian Gypsies, Gil Blas Dressing as a Cavalier, The Sleeping Beauty, Hunt the Slipper, Origin of the Harp, Alfred in the Danish Camp*, and many others, ranging in size of canvas from six to fourteen feet. But these are only a part, and not the best part, of his work. His sketches, illustrations, caricatures, satirical and humorous drawings are too numerous to mention. They are to be found in annuals, keepsakes, books of design. Bulwer's *Pilgrims of the Rhine* was illustrated by Maclise. His volume of outline portraits of the distinguished literary characters of his day is very interesting. Maclise was elected associate of the Academy in 1835, and academician in 1840. In 1866 he declined the presidency. Previous to his death, which occurred in London Apr. 26, 1870, he was engaged on frescoes for the houses of Parliament.

O. B. Frothingham.

Maclure' (William), b. in Ayr, Scotland, in 1763; visited New York in 1782; settled in London soon after as partner in a commercial house; gained a considerable fortune; emigrated to the U. S. in 1796; was one of the commissioners on the French spoliation claims in 1803; became interested about this time in geology, which he studied in Europe, and conceived the plan of making a geological survey of the U. S., in which undertaking he crossed the Alleghanies fifty times and visited nearly every State of the Union, travelling chiefly on foot. He presented geological memoirs to the American Philosophical Society in 1809 and 1817, the latter accompanied by the first geological map of the U. S., thereby gaining the title of "father of American geology." Settling in Philadelphia, he gave his books and collections to the Academy of Natural Sciences of that city, of which institution he was president from 1817 until his death. He resided in Spain 1819–24; engaged in an unsuccessful attempt to establish a college on an agricultural basis; made an attempt of the same kind at New Harmony, Ind., where he bought a large tract of land and resided several years; went to Mexico for his health in 1827, returned there in 1828, and resided there until his death, which occurred at San Angel, near the city of Mexico, Mar. 23, 1840. He left $20,000 to the Academy of Natural Sciences, besides his library as already mentioned, and was a liberal benefactor of the American Geological Society, of which he was president in 1828. While in Mexico he wrote a work entitled *Opinions on Various Subjects* (2 vols., New Harmony, 1837).

MacMahon', de (Marie Edme Patrice Maurice), duke of Magenta, marshal of France, president of the French republic, b. at the château of Sully, near Autun, June 13, 1808, descending from an Irish family which took refuge in France after the fall of the Stuarts; entered in 1825 the military school of St. Cyr; served in Algeria; returned after the July revolution to France, and was present at the siege of Antwerp. Once more transferred to Africa, he distinguished himself as a captain at the storming of Constantine; received the command first of a battalion, then of a regiment, of the foreign legion; became colonel in 1845, and brigadier-general in 1848. As such he stood at the head of the administration, first of the province of Oran and then of that of Constantine. In 1852 he became general of division, and in 1855 he was recalled in order to assume the command of a division in the Crimean war. He arrived just in time to take part in the storming of Malakof, and distinguished himself so much on this occasion that he was created a senator. In this position he evinced a rare independence of character; he was the only senator who refused to vote for the Safety bill which was proposed in consequence of the Orsini conspiracy (June 14, 1858), and which placed France under an intolerable reign of the bayonet. In 1857 he fought again in Algeria, and in 1859 he made his name famous in the campaign against Austria. He commanded the 2d corps, and led the left wing of the army in the battle of Magenta, June 4, 1859; Napoleon commanded the centre. At the head of the guard the emperor was very hard pressed by the enemy, and there was danger of his being driven into the Ticino, but MacMahon came to his support, and by throwing himself on the right flank of the Austrian corps, which threatened the French centre, he won the battle. For this brilliant exploit the emperor made him on the battlefield marshal of France and duke of Magenta. In the battle of Solferino (June 24, 1859) he also played a conspicuous part. After the war he received the command of the division stationed at Lille, and in 1864 he succeeded Pelissier in the important position of governor-general of Algeria, where great reforms were to be introduced. As far as the reigning system allowed the administration of MacMahon was beneficial. During the famine of 1867–68 he took good care of the poor people, and defended them with great energy against the clergy, who tried to use the aid which was given to the Arabs as a means by which to convert them. At the beginning of the war against Germany in 1870 the marshal received the command of the 1st corps, consisting chiefly of African troops, and forming the right wing of the first line, nearest to the frontier, with headquarters at Strasbourg. When (on Aug. 4) his advanced body, the division of Douay, was defeated at Weissenburg by the crown prince of Prussia, he drew reinforcements from other corps, and occupied an excellent position at Wörth in order to detain the enemy. In spite of his brilliant valor, he was defeated in the bloody battle, and his army was almost completely routed in consequence of the long and obstinate resistance it made. The remnants he gathered at Chalons, and here he formed out of the 1st, 5th, 7th, and 12th corps the army of Chalons, to which the emperor repaired after the defeat at Metz. From the regency in Paris he received repeatedly orders to push on towards Metz by a circuitous way, in order to extricate Bazaine. He understood the futility of this plan, and remonstrated, but at last he obeyed. Soon, however, his army was driven by the Germans out of its direction and towards Belgium, and at Sedan it was compelled to give battle. At the commencement of the contest, in which the French army, together with the emperor, was surrounded and taken prisoner, early in the morning (Sept. 1, 1870), MacMahon was severely wounded in the thigh, and gave up the command. While a prisoner of war in Germany he was almost the only superior officer who was not accused of treason by his countrymen; both the purity of his character and his brilliant valor were generally acknowledged. Immediately after the conclusion of the armistice in the spring of 1871 he was entrusted by Thiers with the command of the army of Versailles, the only organized army of France at that moment. In political respects he enjoyed perfect confidence. He seemed to be nothing but a soldier, indifferent to politics, and without those qualities which make a man

a blessing or a danger to his country. Nevertheless, the events soon raised him to the most important political position. Having put down the revolution of the Commune in Paris in 1871, after which he published *L'Armée de Versailles depuis sa Formation jusqu'à la complète Pacification de Paris*, he became the man on whom those parties of the National Assembly which feared radicalism and revolution rested their hopes, and in May, 1873, the Legitimists, clericals, and Bonapartists agreed in overthrowing Thiers, and MacMahon accepted the presidency of the republic, which was offered him by a deputation from the National Assembly. The hopes, however, which the Bonapartists entertained of a restoration of the dynasty of Napoleon, and the Legitimists and clericals of a complete suppression of all liberty, have as yet (Sept., 1875) not been realized. His government is one of order, aiming at the re-establishment of the power of France; and although the influence conceded to the Church is larger than the liberals consider sound, yet the stability of his own power seems in his eyes the principal means of reaching his aim. On Nov. 19, 1873, his term of office was prolonged by the National Assembly to seven years. AUGUST NIEMANN.

McMahon (WILLIAM), D. D., b. at Dumfries, Va., Dec. 16, 1785 (or 1786); was licensed to preach as an itinerant of the M. E. Church in Indiana in 1801; rose to distinction, and filled important stations in Kentucky, Tennessee, Alabama, and Mississippi. His reputation was great, and so was his success, as thousands were brought into the Church by his instrumentality. He was a revered member of the Memphis conference at his death, which occurred in 1870. T. O. SUMMERS.

McMas'ter (GILBERT), D. D., b. in Ireland Feb. 13, 1778; came in infancy with his parents to Franklin co., Pa.; graduated at Jefferson College in 1803; studied theology; was ordained to the Presbyterian ministry in 1808; was a pastor at Duanesburg, N. Y., thirty-two years, and at Princeton, Ind., 1840–46; published several religious treatises, chiefly doctrinal, many sermons and addresses, and wrote largely for periodicals. D. at New Albany, Ind., Mar. 17, 1854.—His son, ERASTUS D. MCMASTER, D. D., b. in Pennsylvania in 1806; graduated at Union College 1827; was president of South Hanover College, Ind., 1838–45, of Miami University 1845–49, professor of theology in the New Albany Seminary 1849–66, and author of several religious treatises. D. at Chicago Dec. 10, 1866.

MacMath's', tp. of Tuscaloosa co., Ala. Pop. 497.

McMi'chael (MORTON), b. in Burlington co., N. J., Oct. 20, 1807; became a journalist and magazine writer in Philadelphia in 1824, and since 1844 has been editor-in-chief of the *North American*, a successful journal of that city. His poetical talents are highly commended, though he has rarely published verse. As an orator and a politician he enjoys a wide reputation. Was mayor of Philadelphia 1865–68.

MacMil'lan (HUGH), LL.D., b. at Aberfeldy, Perthshire, Scotland, Sept. 17, 1833; educated at the University of Edinburgh; became minister of the Free Church at Kirkmichael 1859, and of St. Peter's, Glasgow, 1864; has written *Bible Teachings in Nature* (1866), which was translated into Danish, Swedish, German, and other continental languages; *First Forms of Vegetation*, *Holidays on Highlands*, *The True Vine*, *The Ministry of Nature*, *The Garden and the City*, and *Sun-glints in the Wilderness*, besides numerous contributions to quarterly reviews and religious and scientific periodicals. He became a fellow of the Royal Society of Edinburgh in 1871.

MacMillan's, tp. of Marion co., S. C. Pop. 1635.

McMil'lin (THOMAS), b. in Kentucky in 1840; was commissioned assistant surgeon U. S. A. Aug. 19, 1862, when twenty-two years of age. During the war he received rapid promotion for meritorious services; was advanced from captain to major, and then lieutenant-colonel. D. Apr. 6, 1873. PAUL F. EVE.

MacMinn', county in S. E. Tennessee, bounded S. by Hiawassee River and intersected by the Tennessee Virginia and Georgia R. R. Area, 480 square miles. Grain and dairy products are staples. Cap. Athens. Pop. 13,969.

MacMinn'ville, post-v. of Yam Hill co., Or., has 1 weekly newspaper. Pop. 388.

MacMinnville, post-v., cap. of Warren co., Tenn., on the MacMinnville and Manchester R. R. It has 3 schools and the MacMinnville Female Academy, 6 churches, 1 iron-foundry, 2 cotton-mills, 1 woollen-mill, 2 jewelry establishments, 1 weekly and 2 monthly newspapers, a tannery, 1 library belonging to Cumberland Female Academy, a city park, and several stores. Pop. of v. 1172.

DAVID F. WALLACE, ED. "MACMINNVILLE NEW ERA.

MacMul'len, county in S. Texas, watered by the Nueces River and its tributary, the Rio Frio. Area, 1250 square miles. Stock-raising is the principal industry. Cap. MacMullen. Pop. 230.

McMur'rogh (DERMOT), became king of Leinster, Ireland, in 1140; was expelled by his subjects in 1168; applied unsuccessfully for aid to Henry II. of England; obtained the services of Richard de Clare, earl of Pembroke (surnamed Strongbow), by whom he was restored to power in 1170. Dermot gave Strongbow his daughter Eva in marriage, and dying in the same year was succeeded by the invader as a vassal to the English king, this being the foundation of the English claim of supremacy in Ireland.

McNab' (Sir ALAN NAPIER), BART., b. at Niagara Feb. 19, 1798; became a midshipman in 1813; served under Sir James Yeo in the naval expedition against Sackett's Harbor and other American ports of Lake Ontario; joined the army as ensign of the 100th regiment; was present at the capture of Fort Niagara and at the battle of Plattsburg; studied law; practised at Hamilton; was journal-clerk to the assembly of Upper Canada; elected a member of that body in 1829; became its Speaker at a later period; commanded the Canadian militia on the Niagara frontier during the insurrection of 1837–38, with the rank of colonel; routed the insurgents near Toronto Dec. 7, 1837; seized, burned, and sent over Niagara Falls the steamer Caroline; was knighted July 14, 1838; became Speaker of the legislature of the united provinces of Canada in 1844; was prime minister 1854–56; made a baronet Feb., 1858, and d. at Toronto Aug. 8, 1862.

McNagh'ten (Sir WILLIAM HAY), BART., b. in Scotland about 1794; accompanied his father to India in 1809; entered the civil service of the East India Company in a diplomatic capacity; acquired a vast experience at the courts of the native princes; accompanied the Afghan expedition of 1838–39 as envoy to the new monarch, Shah Soojah, having virtually in his hands the direction of affairs; was made a baronet for his skilful management in a difficult situation, and was murdered by Akbar Khan, the insurgent prince, at a conference in Cabool Dec. 25, 1841.

McNair' (A. R.), b. in Louisiana Sept. 15, 1839; graduated at the Naval Academy in 1860; became a lieutenant in 1862, a lieutenant-commander in 1866; retired in consequence of physical disability in 1872. Served in the Seminole at the battle of Port Royal, Nov. 7, 1861, and in the Powhatan in both the Fort Fisher fights, and commanded the boats of the latter in the successful attack on Morris Island, Aug. 9, 1863. Commended for "gallantry."

FOXHALL A. PARKER.

McNair (FREDERICK V.), b. in Pennsylvania Jan. 13, 1839; graduated at the Naval Academy in 1857; became a lieutenant in 1861, a lieutenant-commander in 1864, a commander in 1872; served on board the Iroquois at the passage of Forts Jackson and St. Philip and capture of New Orleans, and in most of the battles on the Mississippi in 1862; served as executive officer of the Juniata in both the Fort Fisher fights, and is thus handsomely mentioned in the official report of her commanding officer, Lieut.-Com. Thomas S. Phelps: "Where all behaved so well it seems invidious to make a selection, but I must call your especial attention to the cool, gallant, and able manner in which Lieut. McNair performed his whole duty."

FOXHALL A. PARKER.

MacNair'y, county in S. W. Tennessee, bounded S. by Mississippi, and traversed in the S. W. corner by the Big Hatchie River. Area, 550 square miles. Indian corn, cotton, sweet potatoes, and butter are staples. Cap. Purdy. Pop. 12,726.

McNeil' (JOHN), b. at Hillsboro', N. H., 1784; appointed captain 11th U. S. Infantry in 1812; promoted to be major the following year. At Chippewa (July 5, 1814), on the fall of his colonel, he commanded his regiment, which contributed largely to the success of that day; and again at Lundy's lane (July 25), where he was severely wounded. For these actions he was brevetted lieutenant-colonel and colonel. At the close of the war he was retained as major 5th Infantry, and in 1826 attained a colonelcy, having been brevetted brigadier-general two years previous. In 1830 he resigned, and was appointed surveyor of the port of Boston, which position he held the remainder of his life. D. at Washington, D. C., Feb. 23, 1850.

McNeil (Gen. JOHN), b. in Canada of American parents about 1820; learned the hatter's trade in Boston, and carried on that business in St. Louis, Mo., for twenty years; took an active part in Gen. Lyon's campaign; became colonel of the 19th Missouri Vols. Aug. 3, 1861; took command of a cavalry regiment early in 1862; cleared N. E. Missouri of guerillas, hanging or shooting a number of bridge-burners—an act which created a great sensation at the time, and was denounced by all the sympathizers with the Confederacy, as well as by some staunch Unionists;

defeated Gen. Porter at Kirkeville Aug. 6; was made a brigadier-general Nov. 29, 1862, and was employed during the remainder of the war in the campaigns in Southern Ohio.

McNeile' (Hugh), D. D., b. at Ballycastle, Ireland, in 1795; graduated at Trinity College, Dublin, 1815; entered as a law-student at Lincoln's Inn; took orders in the Church of England 1820; became curate in Donegal, Ireland; rector of Albury, Surrey; minister of St. Jude, Liverpool, 1834; honorary canon of Chester 1845; minister of St. Paul, Prince's Park, Liverpool, 1848; residentiary canon of Chester 1860, and dean of Ripon 1868. Dr. McNeile was celebrated for his eloquence in the pulpit and for his successful evangelical labors in Liverpool. He published several volumes of sermons, lectures, and letters on ecclesiastical topics.

McNeill' (Sir John), G. C. B., D. C. L., b. at Colonsa, Scotland, in 1795; was appointed assistant envoy at the court of Persia in 1831, and envoy in 1836, in which capacity he became prominent through his prediction of aggressive designs on the part of Russia, a subject to which a great part of his career has been devoted, and which he has treated in numerous pamphlets and essays in the English and Indian periodicals, as well as in a volume entitled *Progress and Position of Russia in the East* (1854). Returning from Persia in 1844, Sir John was employed in many civil and military commissions in England and Scotland, and became a member of the privy council (1857) and chairman of the poor-law board.

McNeill (William Gibbs), b. in North Carolina about 1800; graduated at West Point 1817, and entered the artillery, serving on topographical duty until 1823, when transferred to the corps of topographical engineers with rank of brevet captain. His name is intimately identified with the early engineering works of our country, particularly as a pioneer in railroad surveys and construction. He was one of the engineers of the Baltimore and Ohio R. R., and a member of the board of engineers to determine the route of that road; and chief engineer of many other railroads, until in 1837 he resigned from the army to pursue the profession of civil engineer. In this capacity he was prominent in the construction of railroads in all parts of the country; was chief engineer of the dry dock in the Brooklyn navy-yard; president of the Chesapeake and Ohio Canal Co., on the early surveys of which work he was engaged; and was constantly consulted on important public works in this and other countries; was major-general of the Rhode Island militia during the Dorr excitement. D. at Brooklyn Feb. 16, 1853.

MacNeill's, tp. of Moore co., N. C. Pop. 532.

McNev'en (William James), M. D., b. in Galway, Ireland, Mar. 26, 1763; educated at the colleges of Prague and Vienna, graduating in 1784; engaged in revolutionary movements in Ireland as a member of the society of United Irishmen; was imprisoned four years; became captain in an Irish brigade in the French service; came to the U. S. 1804; was professor in the College of Physicians and Surgeons or in the Medical School of Rutgers College more than twenty years; was twice appointed resident physician; was a member of the medical council during the cholera season of 1832, and d. in New York July 12, 1841. He published an *Exposition of the Atomic Theory, Pieces of Irish History* (1807), and other works, and edited Brande's *Chemistry*.

MacNish' (Robert), M. D., b. in Glasgow, Scotland, Feb. 15, 1802; studied medicine in Glasgow and Paris; contributed to *Blackwood* and other magazines over the signature of "A Modern Pythagorean," and published *The Anatomy of Drunkenness* (1827), a remarkable book; *The Philosophy of Sleep* (1830), a *Book of Aphorisms* (1833), and an *Introduction to Phrenology* (1835). D. at Glasgow Jan. 16, 1837.

MacNutt', post-v., cap. of Le Flore co., Miss., 45 miles E. by S. of Bolivar. Pop. 44.

McNutt (Alexander G.), b. in Rockbridge co., Va., in 1801; was educated at Washington College, Va.; removed in 1824 to Jackson, Miss., and afterwards became a lawyer of Vicksburg. In 1835 he was sent to the State senate, and was governor of Mississippi 1837–41. D. in De Soto co., Miss., Oct. 22, 1848.

Macomb', county in E. Michigan, bounded S. E. by Lake St. Clair; watered by Clinton River and its affluents, and intersected by the Grand Trunk R. R. Area, 375 square miles. The surface is level and fertile. Wheat, oats, Indian corn, potatoes, wool, butter, and hay, are staples. There are important manufactures. Cap. Mount Clemens. Pop. 27,616.

Macomb, post-v. and tp., cap. of McDonough co., Ill., on the Chicago and Quincy R. R., 200 miles from Chicago, contains the McDonough Normal College, excellent schools,

a fine court-house, 3 newspapers, 2 banks, 1 foundry, 3 wagon and carriage factories, and a number of stores. Pop. of v. 2748; of tp. 4313.

W. H. Hainline, Ed. "Journal."

Macomb, post-v. and tp. of Macomb co., Mich. Pop. 1805.

Macomb, post-tp. of St. Lawrence co., N. Y., on the S. shore of Black Lake, has limestone, gypsum, and ores of lead and other metals. Pop. 1673.

Macomb (Gen. Alexander), b. in Detroit, Mich., Apr. 13, 1782; appointed a cornet of cavalry in 1799; transferred to the infantry in 1801, and to the engineers in 1802, in which latter corps he attained a lieutenant-colonelcy in 1810, and at the time of the declaration of war with Great Britain (June, 1812) was acting adjutant-general of the army; but preferring active field-service, he was appointed in July colonel of the 3d Artillery, and was distinguished at Fort Niagara and Fort George; promoted to be brigadier-general in Jan., 1814. On Sept. 11, with 1500 men and a small number of militia from New York and Vermont, he fought the battle of Plattsburg, defeating a largely superior force of British veterans under Sir George Prevost, for which service he received the thanks of Congress and a gold medal; was also brevetted major-general and commanded a military department in the North-west 1815–21. Upon the reorganization of the army in the latter year, he was retained as chief engineer of the army, with the rank of colonel. In May, 1828, he succeeded Gen. Brown as major-general in command of the army. D. at Washington June 25, 1841. Author of a *Treatise on Martial Law* and *Courts-Martial as practised in the U. S.* (1809).

Macomb (Commodore Wm. H.), b. in 1820 in Michigan; entered the navy as a midshipman Apr. 10, 1834; became a passed midshipman in 1840, a lieutenant in 1847, a commander in 1862, a captain in 1866, a commodore in 1870. D. at Philadelphia Aug. 12, 1872. While attached to the U. S. S. Plymouth in 1856 he took part in the bombardment and capture by assault of the Barrier Forts, China; was in various actions on the Mississippi in 1863, and in the sounds of North Carolina in 1864, and on Oct. 31, 1864, in command of a squadron of gunboats, captured the town of Plymouth, N. C., after a spirited fight, in making his dispositions for which he displayed decided ability. For this victory Macomb received the thanks of the department, and was advanced ten numbers in his grade; and Rear-admiral Porter in his official report of it says: "This was a very gallant affair, and reflects great credit on the commander of the expedition and all concerned."

Foxhall A. Parker.

Macon' [anc. *Matisco*], town of France, capital of the department of Saône-et-Loire, on the river Saône, which is lined with beautiful quays and crossed by a bridge of thirteen arches, built by Cæsar. Otherwise the town is ill built, with narrow, crooked, and dirty streets, but its trade in timber and Burgundy wine is considerable, as also its manufactures of watches. It is the birthplace of Lamartine. Pop. 18,382.

Macon, county of E. Alabama. Area, 575 square miles. It is bounded N. W. by the Tallapoosa River. The surface is varied, the soil mostly good. There are large forests. Cotton and corn are staple products. The county is traversed by the Western R. R. of Alabama. Cap. Tuskegee. Pop. 17,727.

Macon, county of W. Central Georgia. Area, 370 square miles. It is level and fertile. Cotton and corn are the principal crops. The county is traversed by Flint River and by the South-western R. R. of Georgia. Cap. Oglethorpe. Pop. 11,458.

Macon, county of Central Illinois. Area, 500 square miles. It is a highly fertile prairie region, traversed by the N. fork of Sangamon River. Cattle, grain, and wool are leading products. Carriages and wagons are manufactured quite extensively. The county is traversed by the numerous railroads centring at Decatur, the capital. Pop. 26,481.

Macon, county of N. E. Missouri. Area, 828 square miles. It is traversed by the Chariton and E. Chariton rivers and their numerous branches. The surface is diversified, and it is highly fertile. Cattle, grain, wool, and tobacco are staple products. Lumber, carriages, and flour are manufactured. Coal abounds, and iron and lead are found. The county is traversed by the Hannibal and St. Joseph and the Northern Missouri R. Rs. Cap. Macon City. Pop. 23,230.

Macon, county of S. W. North Carolina, bounded S. by Georgia. Area, 550 square miles. It is surrounded and crossed by mountain-ranges, and is traversed by the Little Tennessee River. The county has very fertile valleys,

fine scenery, and much unexploited mineral wealth. Tobacco and corn are staple products. Cap. Franklin. Pop. 6615.

Macon, county of Middle Tennessee, bounded N. by Kentucky. Area, 250 square miles. It is hilly, but very productive. Live-stock, tobacco, grain, and cotton are the staple products. Cap. Lafayette. Pop. 6633.

Macon, tp. of Hale co., Ala. Pop. 3426.

Macon, city, cap. of Bibb co., Ga., situated at the head of navigation on the Ocmulgee River, 80 miles S. E. of Atlanta, at the junction of five railways, is beautifully located, well laid out with very wide streets lined with shade trees, has a magnificent city park and fair-grounds, important manufactures, iron-foundries and railway machine-shops, 6 banks, 7 churches, and 4 newspapers, and is the seat of Mercer University (Baptist) and of the Wesleyan Female College. Rose Hill Cemetery on the banks of the Ocmulgee, half a mile below the city, is one of the most beautiful in the U. S. Pop. 10,813.

Macon, tp. of Bureau co., Ill. Pop. 839.

Macon, post-v. and tp. of Macon co., Ill., on the Illinois Central R. R., 11 miles S. of Decatur. Pop. 1549.

Macon, post-tp. of Lenawee co., Mich. Pop. 1439.

Macon, post-v., cap. of Noxubee co., Miss., on the Mobile and Ohio R. R., 198 miles N. of Mobile. It has 4 schools, 6 churches, 1 bank, 1 weekly newspaper, the machine-shops of the Mobile and Ohio R. R., and one of the finest court-houses in the State. Pop. 975.
FERRIS & WARD, EDS. "BEACON."

Macon, city, cap. of Macon co., Mo., at the intersection of the Hannibal and St. Joseph with the St. Louis Kansas City and Northern R. R., 170 miles N. W. of St. Louis, has 12 churches, 2 banks, 4 weekly newspapers, 2 fine school-buildings, an academy, an extensive wagon-factory, and a flourishing trade. Pop. 3678.

Macon, tp. of Powhatan co., Va. Pop. 2745.

Macon (NATHANIEL), b. in Warren co., N. C., in 1757; studied at Princeton, and afterwards served as a private soldier of the Revolution under Col. John Macon, his brother; was in the State legislature, 1780–85; opposed the U. S. Constitution, and twice declined the office of U. S. postmaster-general; was in Congress 1791–1815, and was Speaker 1801–06; U. S. Senator 1816–28, being (1825–28) acting president of the Senate. In 1835 he was president of a State constitutional convention, and in 1836 a U. S. elector. He was a warm personal friend of Madison, Jefferson, and John Randolph. Though now nearly forgotten, the number of counties, cities, and towns in the Southern and Western States which bear his name show the extent of his popularity among his contemporaries. His term of consecutive service in Congress, thirty-seven years, exceeds that of any other American statesman. D. in Warren co., N. C., June 29, 1837.

Macou'pin, county of S. W. Central Illinois. Area, 864 square miles. It is undulating and extremely fertile. Cattle, grain, and wool are leading products. Carriages, harnesses, and flour are manufactured. Coal is found in this county, which is traversed by the Indianapolis and St. Louis and the Chicago and Alton R. Rs. Cap. Carlinsville. Pop. 32,726.

Macoy'a, called also **Macahuba Palm** and **Great Macaw Tree,** the *Acrocomia sclerocarpa*, a South American and West Indian palm tree, which yields to commerce a pleasantly perfumed palm oil, used in soapmaking, and in its native regions is employed as an unguent in rheumatism.

MacPhail', former county of Minnesota. (See LAC QUI PARLE.)

MacPher'son, new county in Central Dakota, on the table-land of the Missouri, and drained by several small tributaries of that river.

MacPherson, county of Central Kansas, between the Smoky Hill Fork of the Kansas River and the Little Arkansas. Area, 500 square miles. It consists of rolling prairies, well adapted to stock-raising. Cap. Lindsborg. Pop. 738.

MacPherson, post-v., cap. of MacPherson co., Kansas, 35 miles S. of Salina, has 3 churches, 2 hotels, several flouring-mills, a newspaper, and a number of business-houses. Principal occupation, farming and sheep-raising. Pop. about 500. G. W. MCCLINTICK, ED. "INDEPENDENT."

MacPherson, tp. of Blue Earth co., Minn. Pop. 903.

McPherson (EDWARD), LL.D., b. at Gettysburg, Pa., July 31, 1830; graduated at Pennsylvania College in 1848; was for a time a journalist of Harrisburg, Pa.; was a member of Congress 1859–63; clerk of the U. S. House of Representatives 1863–69; secretary of the Union national committee 1860–64; he has since been a journalist at Gettysburg, Pa. He has published a *Political History of the U. S.* (1864) during the civil war, a *Political Manual*, and other works, including some admirable literary and other papers.

Macpherson (JAMES), b. at Ruthven, Inverness-shire, in the Highlands of Scotland, in 1738; entered King's College, Aberdeen, 1752; studied also at Marischal College, Aberdeen, and at the University of Edinburgh, where he gave evidence of his literary taste by the publication of a "heroic poem" in six cantos entitled *The Highlander* (1758), which is admitted to be beneath criticism. He is said to have studied for the ministry, but was never ordained. After teaching the Ruthven school he became a tutor in the family of Mr. Graham of Balgowan, and made some essays in versification, which he showed to the celebrated John Home as translations of Gaelic poetry which he alleged to be preserved by memory from a remote period by the Highland minstrels. The circumstance was communicated by Home to Drs. Hugh Blair and Alexander Carlyle, and by their advice Macpherson published a small volume of *Fragments of Ancient Poetry collected in the Highlands of Scotland, and translated from the Gaelic or Erse Language* (1760). An enthusiasm on Celtic subjects then pervaded the literary atmosphere of Scotland; the little book met with great success, and a subscription was raised to enable the "editor" to travel through the Highlands and recover all extant remains of early minstrelsy. Thus encouraged by the ready belief of his dupes, Macpherson, whose knowledge of Gaelic was never more than a smattering, produced in quick succession *Fingal, an Ancient Poem in Six Books, together with Several other Poems composed by Ossian, Son of Fingal, translated from the Gaelic Language* (1762), and *Temora, an Ancient Epic Poem, in Eight Books*, etc. (1763), by which he gained £1200 and a European reputation. These so-called "poems" were received with the utmost enthusiasm in Scotland, and even on the Continent they were immediately translated into the chief modern languages, and the mythical bard, Ossian the son of Fingal, at once took his place in biographical dictionaries as the rival of Homer and Virgil. Not long after the English critics began to call for the original Gaelic of Ossian in order to test the correctness of the translation, but it was not forthcoming, and the flimsy excuses put forth for its absence were sufficient evidence to impartial inquirers that, as Dr. Johnson said, the poems "never existed in any other form than that which we have seen." The Scotch enthusiasts, who had staked their reputation upon the genuineness of Ossian, took up the cudgels in behalf of Macpherson, and the battle raged with great bitterness for fifty years; nay, there has appeared in the present year (1875) an elaborate vindication of Ossian's genuineness. Macpherson found it expedient after the publication of *Temora* to absent himself for a time from Scotland, and gladly accepted the post of private secretary to Gov. Johnstone of West Florida, and spent nearly two years at Pensacola and in travelling through the American colonies; took up his residence in London (1766), wrote an *Introduction to the History of Great Britain and Ireland* (1771), and issued a prose translation of the *Iliad* of Homer (1773) cast in Ossianic mould, which was received with coldness by his friends and with contempt by his adversaries. Shortly afterwards Dr. Johnson's uncomplimentary treatment of Ossian in the *Tour to the Hebrides* (1774) led Macpherson to threaten the literary autocrat with personal violence, but only elicited a letter written in terms of withering contempt. In 1775, Macpherson published a *History of Great Britain from the Restoration to the Accession of the House of Hanover* (2 vols. 4to, 1775), in which he attacked the motives of the statesmen who effected the revolution of 1688. The copyright of this work brought Macpherson £3000. He was employed by the government to write a pamphlet, *The Rights of Great Britain asserted against the Claims of the Colonies* (1776), and another entitled *A Short History of the Opposition during the Last Session of Parliament* (1779). Macpherson was an able pamphleteer, and in reward for his services he obtained the lucrative agency for the nabob of Arcot in his negotiations with the government. He wrote several pamphlets on Indian affairs, sat in Parliament for Camelford 1780–90, and built a handsome residence at Belleville, Inverness, where he resided for several years until his death, Feb. 17, 1796. At his own request he was buried in Westminster Abbey, the monument being erected at the expense of his estate. Upon the Ossianic controversy the standard work is that by Malcolm Laing, under the title *The Poems of Ossian, containing the Poetical Works of James Macpherson, with Notes and Illustrations* (1805), in which the memory of Macpherson is handled without gloves by a brother Scotchman. This masterly criticism disposed of the more or less plausible theories of

Blair, Kames, Gregory, *et id omne genus*, but did not prevent Sir John Sinclair from publishing *Ossian in the Original* (1806), from the posthumous papers of the "translator," all of which, however, were in the handwriting of Macpherson himself or of his secretaries. Notwithstanding some modern counter-pleas, the verdict of the Highland Society of London, that no poems of the kind could be found to exist in the memories of the Highlanders, ought to be conclusive. At the same time, candid criticism must admit that a work which elicited the unbounded admiration of such dissimilar minds as Dr. Parr, Sir Walter Scott, Klopstock, and Napoleon Bonaparte must have in it elements of poetic excellence which escaped the prejudiced judgment of Macaulay and Sir James Mackintosh.

PORTER C. BLISS.

McPherson (Gen. JAMES BIRDSEYE), b. in Sandusky co., O., Nov. 14, 1828; graduated at the U. S. Military Academy at the head of his class July 1, 1853, and was appointed brevet second lieutenant corps of engineers; his superior qualifications caused him to be retained at the Academy as assistant instructor of engineering till Sept., 1854, when he was assigned to duty in New York as assistant engineer on the defences of that harbor and of the improvement of the Hudson River; in 1857, having previously (Dec., 1854) been appointed full second lieutenant of engineers, he was placed in charge of the construction of Fort Delaware, and subsequently of the defences on Alcatraz Island, San Francisco harbor, Cal.; in 1858 was promoted to be first lieutenant, and in 1861 was ordered to Boston, Mass., where he was engaged in organizing a corps of engineer troops; in Aug., 1861, he was made captain of engineers, and in November of that year was chosen by Gen. Halleck as aide-de-camp and assistant engineer of the department of the Missouri, with the rank of lieutenant-colonel; in May, 1862, was promoted to be colonel and A. D. C., brigadier-general U. S. volunteers, and major-general in Oct., 1862; his brilliant career from the capture of Fort Henry in 1862 up to the surrender of Vicksburg in 1863 is fittingly told by Gen. Grant in his letter recommending McPherson to be a brigadier-general in the regular army; he says of him: "He has been with me in every battle since the commencement of the rebellion, except Belmont. At Forts Henry and Donelson, Shiloh, and the siege of Corinth, as a staff officer and engineer, his services were conspicuous and highly meritorious. At the second battle of Corinth his skill as a soldier was displayed in successfully carrying reinforcements to the besieged garrison when the enemy was between him and the point to be reached. In the advance through Central Mississippi, Gen. McPherson commanded one wing of the army with all the ability possible to show, he having the lead in the advance, and the rear retiring. In the campaign and siege terminating with the fall of Vicksburg he has filled a conspicuous part. At the battle of Port Gibson it was under his direction that the enemy was driven, late in the afternoon, from a position they had succeeded in holding all day against an obstinate attack. His corps, the advance always under his immediate eye, were the pioneers in the movement from Port Gibson to Hawkinson's Ferry. From the N. fork of the Bayou Pierre to Black River it was a constant skirmish, the whole skilfully managed. From Hawkinson's Ferry to Jackson the 17th army corps marched on roads not travelled by other troops, fighting the entire battle of Raymond alone, and the bulk of Johnston's army was fought by this corps entirely under the management of Gen. McPherson. At Champion Hill the 17th corps and Gen. McPherson were conspicuous. In the assault of the 22d of May on the fortifications of Vicksburg, and during the entire siege, Gen. McPherson and his command took unfading laurels. He is one of the ablest engineers and most skilful generals." Upon this recommendation Gen. McPherson was (Aug. 1, 1863) appointed a brigadier-general in the regular army, and soon after surprised the Confederate camp at Canton, Miss.; in Feb., 1864, he accompanied Gen. Sherman's famous raid to Meridian as second in command, and in March was assigned to command the department and army of the Tennessee, to the reorganizing of which he devoted several weeks, preparatory to the invasion of Georgia; during this famous campaign his services were invaluable; at Resaca, Dallas, and the almost daily severe fighting up to and including Kenesaw Mountain, he was conspicuous and greatly distinguished himself; in the battles before Atlanta he commanded the left grand division, and it was here on the 22d of July, 1864, he was shot, and almost instantly killed.

G. C. SIMMONS.

McRae′ (JOHN J.), b. in Wayne co., Miss., about 1810; graduated at the University of Mississippi in 1834; became a lawyer; served in both branches of the legislature; U. S. Senator 1851; governor of Mississippi 1854–58; was in Congress 1858–61. D. at Belize, British Honduras, May 30, 1868.

Macrauche′nia [Gr. μακρός, "long," and αὐχήν, the "neck"], an extinct genus of ungulate mammals from the tertiary deposits of Southern South America. (See MACRAUCHENIIDÆ.)

Macraucheni′idæ [from *Macrauchenia*—μακρός, "long," and αὐχήν, "neck"—and the family ending], a family of mammals of the order Ungulata, and sub-order Perissodactyli, including a single extinct species from the Eocene pampas deposits of Buenos Ayres and Patagonia. It had the body of a tapir, but a long neck and somewhat horse-like head; the skull had a basi-occipital which was widened forward; the supramaxillary bones were nearly rectilinear above, arched, and approximated to each other in front of the nasal aperture, but separated by the extension upward of a median septum; the nasal bones were rudimentary, and above or behind the orbits; the dental series was almost uninterrupted; the posterior upper molars (M. 2 and 3) had each a shallow valley extending inward from the anterior portion of the inner wall, and two or three deep depressions in the inner half; the lower molars (P. M. 3, M. 3) had two (an anterior and a posterior) crescent-shaped ridges; the canines were small. In these characters the type contrasted with the Palæotheriidæ, which it resembled in the length of the neck. It may also be added that, while belonging to the perissodactyl (or odd-toed) division of the ungulates, it presents, especially in the skeleton, many points of resemblance to the even-toed camels and llamas. Thus, in the elongated cervical vertebræ the canal for the vertebral artery instead of perforating the transverse processes, as in most mammals, is confluent with the neural canal in the posterior part of the vertebræ, and anteriorly perforates the walls of that canal. The zygapophyses closely resemble those of the llama in form, as do also the articular faces of the cervical vertebræ, which are much more flattened than is usual among the ungulates. The radius and ulna are ankylosed together. The bones of the feet resemble those of the odd-toed ungulates, and, as in the rhinoceros, there were three toes both before and (probably) behind. These toes, in the fore feet at least, were nearly equal in size. The femur is long, and has a third trochanter. The fibula is entire, but confluent with the tibia. The astragalus is of the characteristic perissodactyl type, and the facet for articulation with the cuboid is apparently absent. Further evidence of the affinities of these animals with the perissodactyls, and especially the *Palæotherium*, is afforded by the six upper incisors and the nearly continuous dental series. The canines were small. The single known species (*Macrauchenia patachonica*) has been made the subject of an elaborate monograph by Burmeister, who has almost completely restored the skeleton. It was originally described by Prof. Owen from remains brought by the great naturalist Charles Darwin from Patagonia, and on account of peculiarities of the cervical vertebræ compared with the camels. By Burmeister it was supposed to have had quite a long, slender proboscis, but without sufficient reason. The *Macrauchenia* equalled in size the largest hippopotamus, but probably had a less broad and bulky body and the neck was elongated. O. C. MARSH.

Macrea′dy (WILLIAM CHARLES), b. in London, England, Mar. 3, 1793; d. at Cheltenham Apr. 27, 1873. His father, a theatrical manager and lessee, sent his son to Rugby to be liberally educated, but his projected career was cut short by pecuniary embarrassments, and at the age of seventeen the youth essayed the stage, making his first appearance at Birmingham in *Romeo* (June 7, 1810). He first undertook Hamlet in 1811; played with Mrs. Siddons at Newcastle in *The Gamester* and *Douglas;* played at Glasgow, Bath, Berwick, and Dublin; was seen in London at Covent Garden as Orestes (Sept. 16, 1816). His success was slow, but steady, and was due to hard work, rather than to genius. In 1822 his engagement began at Covent Garden, and his reputation rose in parts like Virginius and Mirandola till 1826, when he went to Drury Lane. From this time he took rank with the illustrious of his profession. The same year he visited America; the next year made a continental tour; in 1828 played in Paris; returned to England, and for several years played in London and all the chief cities of the kingdom; revisited America in 1843–44, and made a successful professional tour through the States; made another engagement in Paris, and performed in *Hamlet* at the Tuileries before Louis Philippe; revisited the U. S. again in 1849, during which the Astor Place riot in New York occurred; in 1850 began the long series of "farewells" to the theatres in England, which terminated at Drury Lane Feb. 26, 1851. Till 1860, Mr. Macready lived in retirement at Sherborne, enjoying society, taking an interest in public institutions, and occasionally giving readings. The last years of his

life were spent at Cheltenham. Mr. Macready was one of the last of the great Shakspearean actors, a good scholar, a man of fine literary taste, of high professional ambition, of elevated character, generous, humane, modest, and just. (See *Reminiscences and Diaries*, 1875.)

O. B. FROTHINGHAM.

McRee' (Col. WILLIAM), b. at Wilmington, N. C., 1788; graduated at the U. S. Military Academy 1805, and appointed second lieutenant of engineers; first lieutenant 1806, captain 1808, major 1812, lieutenant-colonel 1818. Prior to 1812 was engaged in the survey and construction of fortifications on the South Atlantic coast; during the war with Great Britain he served as chief of artillery of Gen. Hampton's Northern army, and later, as chief engineer of Gen. Brown's army, achieved distinction at the capture and defence of Fort Erie and the battles of Chippewa and Niagara, winning the brevets of lieutenant-colonel and colonel. At the close of the war, with Major Thayer, he visited Europe, under orders of his government, for professional observation and provided with funds for the purchase of professional works; returning in 1816, he was placed on a board of engineers to prepare a system of defences for the Atlantic coast, on which he continued until 1819, when, sharing with other officers of his corps the feeling of the injustice of the appointment of the French engineer, Gen. Bernard, to the position especially created by Congress for him, that of "assistant engineer of the U. S.," with rank of brigadier-general, he resigned Mar. 31, 1819. In 1825 he was appointed surveyor-general of Illinois, Missouri, and Arkansas, rendering important services. D. of cholera at St. Louis Sept. 10, 1832.

Macri'nus (M. OPELIUS), Roman emperor from Apr., 217, to June, 218, b. in 164 of humble parentage at Cæsarea, in Mauritania; entered the service of Plautianus, the favorite of Septimius Severus; received different appointments in the imperial household; became prefect of the prætorians, and was chosen emperor by them after the assassination of Caracalla. Shortly after his accession he was defeated by the Parthians, and lost his influence with the army. The prætorians rose in rebellion, instigated by Elagabalus, and the emperor fled in disguise, but was discovered and put to death.

Macro'bius (AMBROSIUS AURELIUS THEODOSIUS), a Latin grammarian, flourished in the fifth century, but of his personal life nothing is known. Of his writings are still extant *Saturnaliorum Conviviorum Libri VII.*, containing much valuable historical and mythological information; *Commentarius ex Cicerone in Somnium Scipionis*, a series of philosophical discourses based on Neoplatonic views; and an extract or abridgment of *De Differentiis et Societatibus Græci Latinique Verbi.* Macrobius is the first pagan writer who mentions the massacre of the children of Bethlehem by Herod. The best edition of his works is that by Jan (1848–52). There is no English translation.

Macropod'idæ [from *Macropus*, the typical genus; μακρός, "long," and πούς, "foot," and the family suffix], a family of mammals of the order Marsupialia and sub-order Syndactyli, containing the kangaroos and kangaroo-rats of Australia and New Guinea. They have immensely enlarged hind limbs, by means of which they progress by great leaps, and much reduced fore limbs, while the large thick tail serves as a fulcrum for support, etc.; the head is comparatively small, and somewhat deer-like; the teeth in the full series are as follows: molars, $\frac{5}{5}$; canines, $\frac{0}{0}$ or $\frac{1}{0}$; incisors, $\frac{3}{1}$; the second molar in each jaw in the young is deciduous, and followed by a permanent successor; all except the first are two-ridged; the canines are small or absent in the upper jaw, always absent in the lower; the incisors of the upper jaw $(3 + 3)$ trenchant and nearly vertical, of the lower $(1 + 1)$ large and horizontal; the stomach is large and sacculated, and a long simple cæcum is developed; the marsupial pouch opens forward. The family is peculiar to Australasia and the islands of the Papuan Archipelago, and is quite rich in genera and species. It has been divided by systematists into two families and many genera. (I.) The Macropodinæ are those forms in which the œsophagus enters the stomach near the cardiac end, and embraces the genera (1) *Macropus*, including the typical kangaroos, weighing up to 200 pounds; (2) *Halmaturus*, including the brush-kangaroos or wallabies, weighing from 10 to 50 pounds; (3) *Petrogalea*, or the rock-kangaroos, weighing up to 30 pounds; (4) *Lagorchestes*, or the hare kangaroos, weighing from 6 to 8 pounds; (5) *Onychogalea*, including the silky-haired or rail-tail kangaroos, weighing from 8 to 10 pounds; (6) *Dorcopsis*, or New Guinea kangaroos, weighing 7 or 8 pounds; and (7) *Dendrolagus*, including the tree-kangaroos or wallabies, weighing about 30 pounds. (II.) The Hypsiprymninæ are forms in which the œsophagus enters the stomach near the pyloric end, and embrace the genera (1) *Hypsiprymnus*, or rat-kangaroos, weighing from 4 to 5 pounds; (2) *Bettongia*, or jerboa kangaroos, weighing from 2 to 5 pounds; and (3) *Æprymnus* (Garrod, 1875), until very recently confounded with the bettongs. The *Dendrologi*, or genera *Dendrolagus*, and *Dorcopsis* are represented in New Guinea and Mysol; the *Macropi*, or all the rest, in Australia, Tasmania, Ary, and the Ké Islands. Dr. Kreft, one of the latest writers on the family, admits 44 species as natives of Australia and Tasmania. Prof. Owen has recently (1873) described some gigantic species from late Tertiary caves and other deposits in Australia, some of which, according to Garrod, are most nearly related to the New Guinea types. (See also KANGAROO and MARSUPIALIA.)

THEO. GILL.

MacSher'rystown, post-v. of Conewago tp., Adams co., Pa., 12 miles E. of Gettysburg. Pop. 291.

McSpar'ran (JAMES), D. D., b. in the N. of Ireland about 1695, came to Narragansett, R. I., in 1721, as an Episcopal missionary of the Society for the Propagation of the Gospel in Foreign Parts; was intimate with Berkeley at Newport; visited England in 1736; was an eloquent preacher, and wrote a historical and geographical treatise entitled *America Dissected* (Dublin, 1753), which was reprinted in Updike's *History of the Episcopal Church in Narragansett, R. I.* (1847), in which several of Dr. McSparran's sermons may also be found. He was engaged upon a more extended history of the colonies when he died at South Kingston, R. I., Dec. 1, 1757.

MacTier', tp. of Lexington co., S. C. Pop. 703.

Mac'tra, the typical genus of the family Mactridæ, of the lamellibranchiate mollusks. The Mactridæ appear first in the Mesozoic rocks.

McTyeire' (HOLLAND NIMMONS), D. D., bishop of the Methodist Episcopal Church, South, b. in Barnwell co., S. C.; graduated at Randolph-Macon College, Va.; joined the Virginia conference in 1845; in 1846 took charge of St. Francis street church, Mobile; served the churches at Demopolis, Ala., and Columbus, Miss.; was then transferred from the Alabama to the Louisiana conference, and was stationed in New Orleans; in 1854 was elected editor of the New Orleans *Christian Advocate*; in 1858 was elected editor of the Nashville *Christian Advocate.* During the war he was transferred to the Montgomery conference, and was pastor in Montgomery, Ala., when in 1866 he was elected to the episcopate. He is now (1875) president of the board of trust of the Vanderbilt University. He is the author of several valuable works, among which is a book on church law entitled *Manual of the Discipline*, and one on the *Duties of Masters.* His style is terse and effective. He resides in Nashville, Tenn.

T. O. SUMMERS.

Macun'gie, post-v. of Lehigh co., Pa.; called also MILLERSTOWN (which see).

MacVey'town, post-b. of Mifflin co., Pa., on the Pennsylvania R. R., contains 2 churches, a bank of loan and deposit, 1 newspaper, 2 hotels, and several stores. Principal business, farming, and mining iron ore, of which immense quantities are found in the immediate vicinity. Sand for glassmaking is also found here in large quantities. Pop. 685.

E. CONRAD, ED. "MACVEYTOWN JOURNAL."

McVick'ar (JOHN), D. D., b. in New York Aug. 10, 1787; graduated at Columbia College in 1804; took orders in the Protestant Episcopal Church in 1811; became professor of moral philosophy and rhetoric in Columbia College in 1817, which post he retained nearly half a century, until 1864. Wrote a *Narrative of the Life of Dr. Samuel Bard* (1822), *Outlines of Political Economy* (1825), *Memoir of Rev. E. D. Griffin* (1831), *Early Years of Bishop Hobart* (1834), and *Professional Years of Bishop Hobart* (1836). D. in New York, Oct. 29, 1868. (See his *Life*, by his son, W. A. McVickar, D. D., 1873.)

Mac'wahoc Plantation, tp. of Aroostook co., Me. Pop. 170.

McWhor'ter (ALEXANDER), D. D., b. in Newcastle co., Del., July 15, 1734; graduated at Princeton 1757; studied theology under William Tennent; was installed pastor of the Presbyterian church at Newark; went on a mission to North Carolina in 1764, and was sent there again in 1775 by Congress to persuade the royalists of the western counties to join with their brethren in the Revolution; became in 1778 chaplain of Knox's artillery brigade; accepted in 1779 the pastorate at Charlotte, Mecklenburg co., N. C., and the presidency of Queen's Museum College, then called Liberty Hall; lost his library by the invasion of Cornwallis; returned to Newark 1781; aided in drawing up the constitution of the American Presbyterian Church in 1788; was for thirty-five years a trustee of Princeton College; took a leading part in collecting funds in New

England for rebuilding the college after the conflagration of 1802; published a centennial sermon at Newark in 1800, and two volumes of sermons in 1803. D. at Newark July 20, 1807.

MacWhorter (Alexander), A. M., b. in New York Jan. 1, 1822; graduated at Yale 1842; studied divinity at New Haven 1842–45; was professor of English literature and metaphysics at the University of Troy, N. Y., 1856–60; author of *Yahveh Christ, or the Memorial Name* (1857).

MacWil'liams, tp. of Otoe co., Neb. Pop. 480.

McWil'lie (William), b. near Liberty Hill, Kershaw district, S. C., Nov. 17, 1795; served in the war of 1812 as adjutant to his father, Col. Adam McWillie; graduated at South Carolina College 1817; studied law, and was admitted to the bar 1818; served for many years in both houses of the State legislature; settled in Mississippi as a planter 1845; was member of Congress from that State 1848–51, and governor 1858–60; took an active part in the political agitations of the Confederate movement, and d. at Kirkwood, Miss., Mar. 3, 1869.

Madagas'car, the largest of the African islands, 1030 miles long, 250 miles broad, and comprising an area of about 230,000 square miles, is situated in the Indian Ocean, between lat. 11° 57′ and 25° 42′ S., and between lon. 43° 10′ and 50° 25′ E., and separated from Africa by the Mozambique Channel, 250 miles broad. The coast, much indented on the western side, and, although more regular, affording several good harbors also on the eastern side, is generally low, presenting a belt of sand-plains or swamps, and containing many lagoons and lakes. From the coast the surface rises in the same manner as on the African continent, in terraces, broader and more gently sloping on the western, narrower and divided by wall-like cuts on the eastern side. The interior forms a plateau from 3000 to 4000 feet high, traversed from N. to S. by a mountain-chain whose peaks rise from 6000 to 12,000 feet, and which in the north-eastern part of the island separates into many ranges, and forms mountainous regions of considerable extension. Of the rivers flowing down the eastern slope, none is navigable, but of those descending the western slope, the Tsidsubu (or Menabe) and the Mangooka (or St. Vincent's) are navigable, the former to the foot of the mountains. The climate is very different in the low coast-regions, where the heat is intense and a fever prevails, dangerous not only to Europeans, but even to the natives of the interior; and in the more elevated parts, where the thermometer seldom rises above 85°. The rainy season lasts from December to April. Iron and rock-salt abound; coal is said to exist in some places. Generally the soil is clayey and very productive; the vegetation is exceedingly rich. Peculiar to the country are the ravenala or "traveller's tree" (*Urania speciosa*), whose trunk yields a sweet and wholesome beverage when an incision is made; the zozoro, a kind of papyrus; and a lichen growing in the south-western regions and yielding a powerful dyestuff. Ebony, mahogany, different kinds of gum trees, figs, cocoanuts, bread-fruit trees, plantains, and bananas are frequent. Rice is extensively cultivated, and forms the principal article of food; also yams and arrowroot. The cotton-plant has been introduced from the Feejee Islands, the sugar-cane from Mauritius, and the coffee tree from Java, and they thrive well; the cultivation, however, was started by Europeans, and is still carried on by foreign labor. The silkworm is indigenous, and is reared on the *Tapia edulis;* the cocoon is often used by the natives as an article of food. The aye-aye is peculiar to the island; cattle, both wild and tame, and generally humped as in India; sheep with fat tails and covered with hair, as in the Cape of Good Hope; swine, wild-hogs, dogs and cats, small leopards, monkeys; large but generally not venomous serpents; immense crocodiles, venerated by the natives; excellent oysters, etc. are numerous. The inhabitants, numbering about 5,000,000, fall, ethnologically, into two groups —the black on the western slope, and the olive on the eastern; and politically into four sections—the Hovas, Sakalavas, Betsileos, and Betsimasarakas. Of these, the Hovas are the ruling tribe, a race of middle height, but well proportioned, with black straight or curled hair, and hazel eyes, well gifted and active. The government is a military despotism. The religion is idolatry, and Christianity, although adopted by many, especially among the Hovas, has not succeeded in eradicating certain old customs, such as infanticide and polygamy. The Madagascan language (or Malagasy) belongs to the Malayo-Polynesian family, and is spoken in several dialects. The island was mentioned in the thirteenth century by Marco Polo, but not actually known to the Europeans until the beginning of the sixteenth century, when in 1506 it was visited by Lorenzo de Almeida, the first Portuguese viceroy of India. Not long afterward the Portuguese formed a colony on the river Franchere, in the province of Anosy, on the eastern coast, but the settlers were massacred by the natives. In 1642 the French, and in 1644 the English, planted colonies on the eastern coast, but these too failed, and for a long time Madagascar was known to the Europeans chiefly as the hiding-place of pirates and buccaneers, whom it took considerable force to finally suppress. In 1745 the French East India Company founded a colony on the island of St. Mary, and in 1768 another at Fort Dauphin. These succeeded better, but a lively and efficacious intercourse with European civilization did not begin until the reign of Radama I. (1808–28). He received the British missionaries and artisans well who came to the country. The native language was reduced to writing, the Bible was translated and printed, a large number of the inhabitants were taught to read and converted to Christianity, the slave-trade, infanticide, and polygamy were abolished, at least nominally, etc. Under his successors the progress of civilization was several times stopped, and the people threatened to relapse into paganism and barbarity. Nevertheless, in 1871 there were 150 schools in operation, the number of Christians was estimated at 300,000, and in 1874 the Church of England appointed a bishop for Madagascar. The principal city is Tananarivo, situated in the interior, in the province of Ancova, in lat. 18° 56′ S. It is well built, has manufactures of gold and silver ware, of carpets, etc., and 25,000 inhabitants. Tamatave, situated on the eastern coast, in the province of Batanimena, in lat. 18° 10′ S., carries on trade with Muscat, Zanzibar, and the Cape of Good Hope. The U. S. have a consular agent here. Gum-copal, India-rubber, ebony, beeves and swine, hides and arrowroot, are exported; cotton goods, rum, hardware, firearms, and powder are imported. In 1872, 6 steamers and 99 sailing vessels visited the harbor. (See Rev. William Ellis, *History of Madagascar* (1838); *Three Visits to Madagascar* (1858); *The Martyr Church* (1870); McLeod, *Madagascar and its People* (1865); S. P. Oliver, *Madagascar and the Malagasy* (1866); and J. Sibree, *Madagascar and its People* (1870).) Clemens Petersen.

Mad'alin, post-v. of Red Hook tp., Dutchess co., N. Y., 1 mile E. of Tivoli. Pop. 629.

Madar', or **Mudar,** the *Calotropis* (*Asclepias*) *gigantea,* a large plant of the East Indies, now naturalized in the West Indies also. Its fibre is used for making cloth and cordage, and the bark of its root is employed with apparent advantage in leprosy, elephantiasis, syphilis, etc.

Madawas'ka, post-tp. of Aroostook co., Me., on the river St. John, inhabited by Acadian French settlers, and called Madawaska South, to distinguish it from the Madawaska settlements of New Brunswick, on the N. side of the river. Pop. 1041.

Mad'bury, tp. of Strafford co., N. H., on the Boston and Maine R. R., 4 miles S. of Dover. Pop. 408.

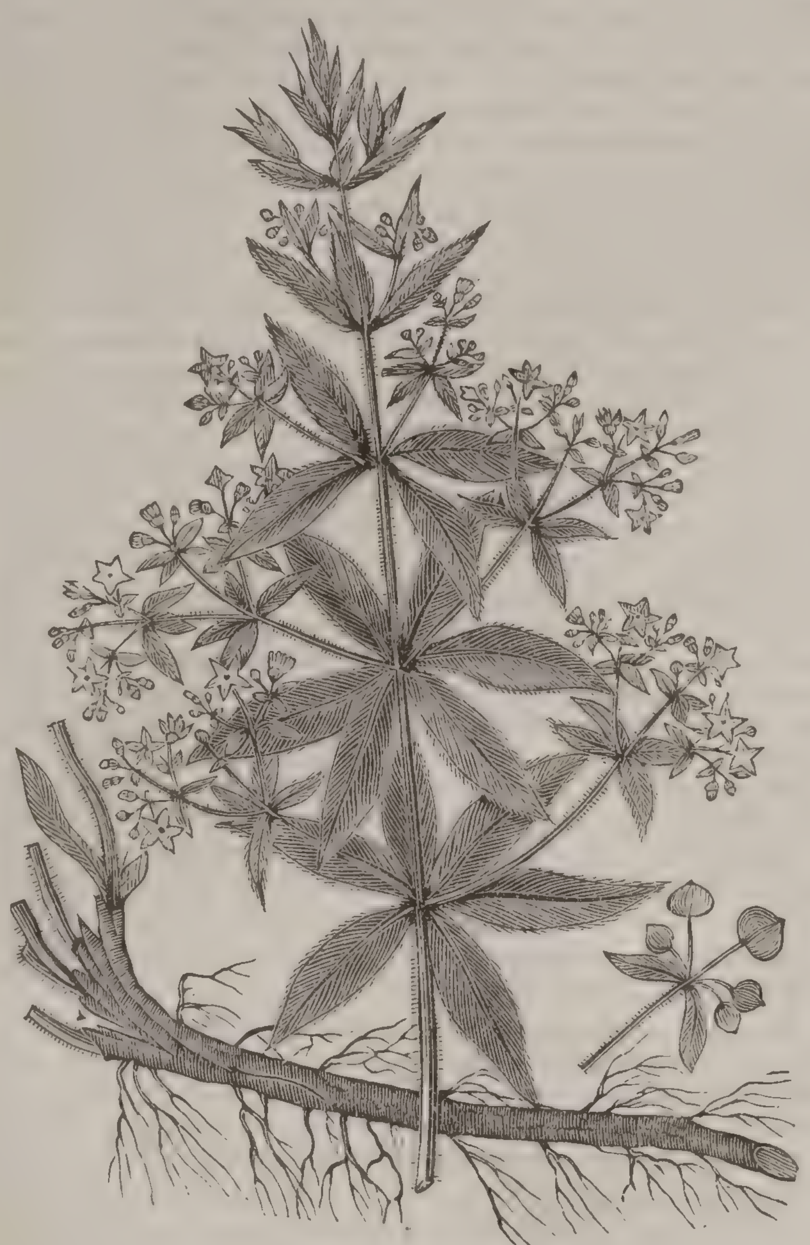
Maddalo'ni (*Magdalonum*), town of Southern Italy, in the province of Caserta, about 18 miles N. from Naples. Its chief interest for the visitor is the grand Carolino aqueduct, built about 1755, which brings the waters of the Tiburno to Caserta (3 miles from Maddaloni), where they form a fine cascade that supplies the lakes and fountains of the royal palace gardens. The whole length of this aqueduct is 30 miles, the tunnels and bridges being very numerous, the latter alone having cost nearly $1,000,000. The longest, the Ponte della Valle, consists of three tiers of arches, the upper of 43 arches; the second, 28; the lower, 19. There is a military school in this town, with about 500 cadets; also the Giordano Bruno Institute for boys, with 100 pupils. It was at Maddaloni that Gen. Bixio in 1860 met the flying Bourbon troops after the battle of Volturno, and drove them into the fortress of Capua. Pop. in 1874, 18,767.

Mad'den (Sir Frederick), F. R. S., b. at Portsmouth, England, in 1801; was from 1826 to 1866 an employé of the British Museum in the library department, to which he rendered good service by his attainments in bibliography; was knighted in 1832; became in 1834 an editor of the *Collectanea Topographica et Genealogica;* published several rare English MSS. illustrating the language, history, and archæology of the fourteenth and fifteenth centuries. D. at London Mar. 8, 1873.

Madden (Richard Robert), M. D., b. at Dublin, Ireland, in 1798; travelled in Turkey, Asia Minor, and Egypt in 1824–27; became a fellow of the Royal College of Surgeons; was sent to Jamaica in 1833 as a special magistrate to supervise the working of the Emancipation act; became superintendent of liberated Africans at Havana in 1835; was commissioner of arbitration in the mixed court of justice at Havana 1836–39; member of the commission of inquiry into the slave-trade on the W. coast of Africa 1840; colonial secretary of Western Australia 1847, and

secretary of the loan-fund board at Dublin Castle 1850. He published some volumes of travels in Turkey and the West Indies, *Lives* of Savonarola (1854) and Galileo (1863), and several works upon Ireland, of which the most important are *The Lives and Times of the United Irishmen* (1842–46; republished 1874), *Historical Notice of the Penal Laws against Roman Catholics* (1865), and *History of the Irish Periodical Literature* (1867).

Mad′der [Sax. *mæddere;* Fr. *garance;* Ger. *Krapp,*



Rubia tinctorum.

Krappwurzel], the root of different species of *Rubia*, chiefly *Rubia tinctorum.* The main supply of commerce is from Holland, though the plant was originally a native of Southern Europe and Asia Minor, where it is still cultivated to a large extent. In Ohio and Delaware, and elsewhere in the U. S., its cultivation has been somewhat followed. Hindoo madder, called *munjeet,* is the root of *Rubia munjista,* and gives the bright colors to the East India chintzes and calicoes. The term *Turkey red,* applied to one of the tints produced from this material, arose out of its importation from the Levant, where a common species, *Rubia peregrina,* has the popular name *alizari,* whence we get our chemical name for the chief tinctorial principle of madder, *alizarine.* (For a full account of the chemistry of ALIZARINE, see under that head, by PROF. CHANDLER.) Next to this valuable principle, *alizarine,* which, as now produced by artificial chemical means from coal-tar, is largely driving madder out of commerce, the most important compound derived from madder is PURPURINE (which will also be treated by itself in its appropriate place).

(For the applications of madder in the arts of DYEING and CALICO-PRINTING, reference may be made to the articles under those heads, by PROF. CHANDLER.) Besides the alizarine and purpurine, there are yellow coloring-matters in madder which are useless or injurious in the operations of dyeing, etc. It has been maintained, however, that under the influence of a peculiar albuminous ferment which is present, a yellow bitter substance, which was called by Schunck—one of the most distinguished investigators of madder—*rubian,* undergoes a gradual change into alizarine, and that thus madder improves in its tinctorial power by age for several years. This rubian seems to bear to alizarine relations approaching to those of a glucoside. In the air it oxidizes to *rubianic acid,* which is an unquestionable glucoside. (See ALIZARINE.) *Garancine* is a commercial product obtained from madder, containing its coloring principles in a more concentrated form. The method consists in boiling with sulphuric acid somewhat diluted, which abstracts much useless material; and the residue constitutes but about one-third of the original madder. There are several varieties of garancine, known by different names. *Madder-Lakes.*—These costly preparations are little used except for pigments by artists. They are prepared by dissolving alum in a solution of madder, and then precipitating with an alkaline carbonate. H. WURTZ.

Mad′dox, tp. of Calhoun co., Ala. Pop. 1280.

Madei′ra, an island belonging to Portugal, and situated in the North Atlantic Ocean, between lat. 32° 36′ and 32° 53′ N., and between lon. 16° 40′ and 17° 20′ W. Area, 345 square miles. The island is of volcanic origin, though earthquakes occur very seldom. The ground is high, the average elevation being 2000 feet, and the surface mountainous. The coasts are steep, precipitous, and affording few harbors. In the interior the land rises still higher until it reaches its greatest height in Pico Ruivo, 6050 feet. But it is everywhere intersected by deep, well-watered, and fertile valleys. The climate is very equable, average heat in the summer being 74° and in the winter 64°. In the valleys tropical plants are grown—rice, sugar, coffee, bananas, pineapples, and oranges; on the more elevated fields vines, chestnuts, and wheat are cultivated, and the tableland is covered with fine forests and extensive pastures. The inhabitants, numbering 118,379, are a mixture of Portuguese, Moors, and negroes, and described as a vigorous, healthy, and industrious race. Since the grape disease in 1852 the vine-cultivation, which formerly made the island celebrated, has declined very much, but the coffee tree has taken the place of the vine, and succeeds very well. The capital is FUNCHAL (which see). Madeira was discovered in 1416, and soon after colonized by the Portuguese.

Madeira, a great navigable river of Brazil, South America, is formed by the confluence of the Beni and Marmora, rising in Bolivia, flows N. E. 700 miles, and enters the Amazon in lat. 3° 25′ S. and lon. 59° 45′ W.

Madeira-nut. See WALNUT.

Madeira Wine. See WINE.

Made′lia, post-v. and tp., cap. of Watonwan co., Minn., on the St. Paul and Sioux City R. R., 23 miles S. W. of Mankato, on the Watonwan River, has 3 churches, 5 school-houses, 1 newspaper, 2 hotels, 18 business-houses, and 1 flouring-mill. Pop. 675.

B. C. SANBORN, ED. "MADELIA TIMES."

Ma′dia [Chilese, *madia*] **Oil,** the fixed oil expressed from the seeds of *Madia sativa,* a composite-flowered annual herb of Chilian origin, now cultivated in Europe. The oil is of excellent quality, is not easily thickened by cold, and is valued as a lubricant. The oil-cake is used as food for live-stock.

Mad′ison, county of Alabama, bounded N. by Tennessee. Area, 790 square miles. The N. part is elevated. The S. is a wide fertile plain, extending to the Tennessee River. Live-stock, grain, and cotton are the staple products. The county is traversed by the Memphis and Charleston R. R. Cap. Huntsville. Pop. 31,267.

Madison, county of N. W. Arkansas. Area, 830 square miles. It is in the Ozark Mountains, and has great forests and mineral wealth. Coal, iron, lead, zinc, and copper have been found. The valleys are very fertile. Corn, cattle, tobacco, and wool are staple products. Cap. Huntsville. Pop. 8231.

Madison, county of Florida, bounded N. by Georgia. Area, 750 square miles. It is for the most part extremely fertile. Corn, cotton, and all the products of the Gulf States are successfully grown. The county abounds in timber, which is manufactured and largely exported. It is traversed by the Jacksonville Mobile and Pensacola R. R. Cap. Madison. Pop. 11,121.

Madison, county of N. E. Georgia. Area, 290 square miles. It is uneven, and in part fertile. Iron, gold, and granite are found. Indian corn is the principal crop raised. Cap. Danielsville. Pop. 5227.

Madison, county of Illinois, bounded W. by the Mississippi River. Area, 740 square miles. It is generally elevated and very fertile. Coal is extensively mined. Live-stock, grain, and wool are leading products. The manufactures include carriages, saddlery, clothing, cooperage, flour, furniture, brick, metallic wares, etc. The county is traversed by various railroads, mostly centring at Alton, the largest town, and at St. Louis. Cap. Edwardsville. Pop. 44,131.

Madison, county of E. Central Indiana. Area, 490 square miles. It is level and fertile. Cattle, grain, and wool are staple products. The manufactures of lumber and carriages are important. It is traversed by the Pittsburg Cincinnati and St. Louis and the Bee-line R. Rs. Cap. Anderson. Pop. 22,770.

Madison, capital of S. Central Iowa. Area, 576 square miles. It is a fertile, well-watered prairie region.

Coal is found. Cattle, grain, and wool are leading products. The county is traversed by a branch of the Chicago Rock Island and Pacific R. R. Cap. Wintersett. Pop. 13,884.

Madison, county of E. Central Kentucky, bounded N. by Kentucky River. It is rolling and hilly, but very fertile. Live-stock, grain, and wool are leading products. Flour and carriages are manufactured. The county is traversed by a branch of the Louisville and Knoxville R. R. Area, 500 square miles. Cap. Richmond. Pop. 19,543.

Madison, parish of N. E. Louisiana, bounded E. by the Mississippi River and W. by the navigable Bayou Tensas. Area, 650 square miles. It is somewhat undulating, fertile, and mostly well wooded. Cotton and corn are staple products. The county is traversed by the North Louisiana and Texas R. R. Cap. Delta. Pop. 8600.

Madison, county of Central Mississippi, bounded N. W. by the Big Black and S. E. by Pearl River. Area, 650 square miles. The surface is diversified, the soil very superior. Live-stock, cotton, and corn are leading products. The county is traversed by the New Orleans Jackson and Great Northern R. R. Cap. Canton. Pop. 20,948.

Madison, county of S. E. Missouri. Area, 440 square miles. It is broken and hilly, with fertile valleys. Iron, lead, copper, and nickel are largely mined, and gold, platinum, silver, and other metals have been found. Corn is the principal agricultural product. The county is traversed by the St. Louis and Iron Mountain R. R. Cap. Fredericktown. Pop. 5849.

Madison, county of Montana, bounded S. by Idaho, from which it is separated by the main range of the Rocky Mountains. Area, 4168 square miles. The county is bounded N. by the Jefferson Fork, and is traversed by the Madison Fork of the Missouri. It has large areas of arable land, but the mining and milling of gold-bearing quartz are the chief industries. Cap. Virginia City. Pop. 2684.

Madison, county in E. Central Nebraska. Area, 576 square miles. It is a beautiful and fertile region, well adapted to wheat and stock raising. It is traversed by the Elkhorn River. Cap. Norfolk. Pop. 1133.

Madison, county of E. Central New York. Area, 670 square miles. Its N. boundary is on Oneida Lake. The N. portion is level, but farther S. it becomes hilly and broken. The soil is very productive. Live-stock, grain, fruit, wool, tobacco, hay, hops, butter, and cheese are largely produced. Carriages, flour, brick, lumber, leather, cider, cooperage, boxes, lime, water-lime, furniture, and metallic wares are among the manufactured articles. Building-stone, gypsum, etc. are quarried. The county is traversed by the Erie and Chenango canals and by six railroads. Cap. Morrisville. Pop. 43,522.

Madison, county of W. North Carolina. Area, 600 square miles. It is bounded N. W. by Tennessee. It is traversed by the beautiful French Broad River, and is situated in a picturesque mountain-region, with fertile valleys and great mineral wealth. Corn is the principal crop raised. Cap. Marshall. Pop. 8192.

Madison, county of Central Ohio. Area, 480 square miles. It has an undulating surface and a fertile soil. Cattle, grain, and wool are leading products. Carriages, wagons, etc. are manufactured quite extensively. It is traversed by the Pittsburg Cincinnati and St. Louis, the Columbus Springfield and Cincinnati, the Little Miami, and other railroads. Cap. London. Pop. 15,633.

Madison, county of W. Tennessee. It is fertile, level and well watered. Live-stock, grain, and cotton are the staples. Flour is the leading article of manufacture. The county is traversed by the Mobile and Ohio and the Mississippi Central R. Rs. Cap. Jackson. Pop. 23,480.

Madison, county of E. Central Texas, bounded E. by the Trinity and W. by the Navasota River. It is level, well timbered, and productive. Grain, live-stock, and cotton are the staples. Area, 336 square miles. Cap. Madisonville. Pop. 4061.

Madison, county of N. W. Virginia, bounded N. W. by the Blue Ridge and S. W. and S. by the Rapidan River. Area, 275 square miles. It is hilly and mountainous, with pleasant scenery and fertile valleys. Tobacco and grain are staple products. Cap. Madison Courthouse. Pop. 8670.

Madison, tp. of Grant co., Ark. Pop. 635.

Madison, post-v., cap. of St. Francis co., Ark., on the Memphis and Little Rock R. R., on the navigable St. Francis River.

Madison, tp. of Sevier co., Ark. Pop. 468.

Madison, tp. and post-v. of New Haven co., Conn., on the Shore Line R. R., and on Long Island Sound, has some manufactures, is the seat of Lee's Academy, and has a fire insurance company. Pop. 1814.

Madison, post-v., cap. of Madison co., Fla., on the Jacksonville Pensacola and Mobile R. R., 56 miles W. of Tallahassee, has 3 churches, 1 newspaper, 1 cotton-mill, 1 grist-mill, 1 saw-mill, and a number of stores. Pop. 924.
A. A. ELLENWOOD, ED. "MADISON RECORDER."

Madison, post-v., cap. of Morgan co., Ga., on the Georgia R. R., 103 miles W. of Augusta and 68 miles from Atlanta, has 1 newspaper, 3 banking-houses, 40 stores, 2 steam cotton-gins, and 1 steam saw-mill. Principal business, the cotton-trade, its annual receipts being about 12,000 bales. Pop. about 2500.
H. C. BILLINGS, ED. "HOME JOURNAL."

Madison, post-tp. of Richland co., Ill. Pop. 1163.

Madison, tp. of Allen co., Ind. Pop. 1278.

Madison, tp. of Carroll co., Ind. Pop. 727.

Madison, tp. of Clinton co., Ind. Pop. 865.

Madison, tp. of Daviess co., Ind. Pop. 1440.

Madison, tp. of Jay co., Ind. Pop. 1279.

Madison, city, cap. of Jefferson co., Ind., on the Ohio River, 90 miles below Cincinnati, the terminus of a division of the Jeffersonville Madison and Indianapolis R. R., regularly laid out and well built, does a large business in pork-packing and the provision-trade, has 3 banks, 15 churches, a daily and 2 weekly newspapers, graded public schools, a library of 4000 volumes, and numerous mills, foundries, machine-shops, tanneries, and breweries. It has daily communication by steamer with Cincinnati and Louisville. Pop. 10,709.

Madison, tp. of Montgomery co., Ind. Pop. 974.

Madison, tp. of Morgan co., Ind. Pop. 1042.

Madison, tp. of Pike co., Ind. Pop. 723.

Madison, tp. of Putnam co., Ind. Pop. 1043.

Madison, tp. of St. Joseph co., Ind. Pop. 1697.

Madison, tp. of Tipton co., Ind. Pop. 1729.

Madison, tp. of Washington co., Ind. Pop. 835.

Madison, tp. of Buchanan co., Ia. Pop. 661.

Madison, tp. of Butler co., Ia. Pop. 293.

Madison, tp. of Clarke co., Ia. Pop. 419.

Madison, tp. of Fremont co., Ia. Pop. 1277.

Madison, tp. of Hancock co., Ia. Pop. 191.

Madison, tp. of Johnson co., Ia. Pop. 800.

Madison, post-tp. of Jones co., Ia. Pop. 1067.

Madison, tp. of Lee co., Ia. Pop. 219.

Madison, tp. of Madison co., Ia. Pop. 1036.

Madison, tp. of Mahaska co., Ia. Pop. 953.

Madison, tp. of Polk co., Ia. Pop. 2626.

Madison, tp. of Poweshiek co., Ia. Pop. 769.

Madison, tp. of Winneshiek co., Ia. Pop. 891.

Madison, post-tp. of Greenwood co., Kan. Pop. 284.

Madison, post-tp. of Somerset co., Me., on the E. side of Kennebeck River, 6 miles N. of Norridgewock, has 4 churches and manufactures of leather, starch, lumber, and other goods. Pop. 1401.

Madison, tp. of Lenawee co., Mich. Pop. 1294.

Madison, tp. of Cedar co., Mo. Pop. 1561.

Madison, tp. of Clarke co., Mo. Pop. 1060.

Madison, tp. of Grundy co., Mo. Pop. 1396.

Madison, tp. of Harrison co., Mo. Pop. 861.

Madison, tp. of Johnson co., Mo. Pop. 3329.

Madison, tp. of Mercer co., Mo. Pop. 2021.

Madison, tp. of Polk co., Mo. Pop. 1361.

Madison, post-v. of Madison co., Neb., on Union Creek, 28 miles N. of the Union Pacific R. R., has 1 church, 1 newspaper, a savings bank, 1 flouring-mill, 2 hotels, a park, and a number of stores. Principal business, farming and stock-raising. THERON M. BLAKELY, ED. "MADISON REVIEW."

Madison, post-tp. of Carroll co., N. H., on the Portsmouth Great Falls and Conway R. R., has manufactures of shoes and other commodities. Pop. 646.

Madison, tp. of Middlesex co., N. J. Pop. 1634.

Madison, post-v. of Chatham tp., Morris co., N. J., 28 miles W. of New York, on the Morris and Essex R. R., finely situated, is largely inhabited by business-men of New York, and is the site of Drew Theological Seminary (Methodist Episcopal), attached to which is a beautiful park of 95 acres. It has a manufactory of screws and other industries.

Madison, post-v. and tp. of Madison co., N. Y., on the Chenango Canal and the Delaware Lackawanna and Western R. R., contains Madison Lake, which has no outlet, and has 5 churches, 2 cheese-factories, 2 vinegar-factories, 2 grist and 2 saw mills. Pop. 2402.

Madison, tp. of Guilford co., N. C. Pop. 840.

Madison, post-v. of Rockingham co., N. C., at the junction of the Dan and Mayo rivers, has 3 churches, 1 weekly newspaper, 8 stores, 2 tobacco-warehouses, 6 tobacco-factories, and carriage and other shops. Pop. 295.
OLIVER & THOMPSON, EDS. "ENTERPRISE."

Madison, a v. and tp. of Butler co., O., on the Great Miami River, opposite Middletown, and on the Cincinnati Hamilton and Dayton R. R. Pop. of v. 158; of tp. 2450.

Madison, tp. of Clark co., O. Pop. 1965.

Madison, tp. of Columbiana co., O. Pop. 1202.

Madison, tp. of Fairfield co., O. Pop. 1292.

Madison, tp. of Fayette co., O. Pop. 1300.

Madison, tp. of Franklin co., O., contains the villages of Groveport and Winchester. Pop. 3440.

Madison, tp. of Guernsey co., O. Pop. 1170.

Madison, tp. of Hancock co., O. Pop. 967.

Madison, tp. of Highland co., O., contains the village of Greenfield. Pop. 3261.

Madison, tp. of Jackson co., O. Pop. 2174.

Madison, post-v. and tp. of Lake co., O., on the Lake Shore and Michigan Southern R. R., 40 miles E. of Cleveland and 4 miles from Lake Erie, has 4 churches, a graded public school and a seminary, a newspaper, 1 hotel, several mills and factories, and a number of shops and stores. Principal pursuit, raising potatoes, the annual yield being from 200,000 to 250,000 bushels. Pop. of v. 757; of tp. 2913.
FERDINAND LEE, ED. "GAZETTE."

Madison, tp. of Licking co., O. Pop. 959.

Madison, tp. of Montgomery co., O. Pop. 2097.

Madison, tp. of Muskingum co., O. Pop. 1072.

Madison, tp. of Perry co., O. Pop. 685.

Madison, tp. of Pickaway co., O. Pop. 883.

Madison, tp. of Richland co., O. Pop. 1521.

Madison, tp. of Sandusky co., O. Pop. 985.

Madison, tp. of Scioto co., O. Pop. 1578.

Madison, tp. of Vinton co., O. Pop. 1623.

Madison, tp. of Williams co., O. Pop. 1532.

Madison, tp. of Armstrong co., Pa. Pop. 1621.

Madison, tp. of Clarion co., Pa. Pop. 1935.

Madison, tp. of Columbia co., Pa. Pop. 1086.

Madison, tp. of Luzerne co., Pa. Pop. 1530.

Madison, tp. of Perry co., Pa. Pop. 1577.

Madison, tp. of Caroline co., Va. Pop. 3682.

Madison, tp. of Charlotte co., Va. Pop. 3222.

Madison, tp. of Cumberland co., Va. Pop. 2752.

Madison, tp. of Orange co., Va., on the Washington and Great Southern R. R. Pop. 3773.

Madison, tp. of Shenandoah co., Va. Pop. 3001.

Madison, post-v., cap. of Boone co., W. Va.

Madison, city, cap. of Wisconsin and seat of justice of Dane co., in lat. 43° 4′ 2″ N. and lon. 89° 21′ W., 75 miles W. of Milwaukee, is located upon an undulating isthmus between Lakes Mendota and Monona, 788 feet above the sea and 210 feet above Lake Michigan. The capitol is beautifully

State Capitol (Madison, Wis.).

situated in a park of 13 acres. All the leading railroads centre here, connecting the city with the important points in every direction. The city contains the State University, a commercial college, and a number of excellent schools, 12 churches, 1 national and 3 State banking-houses, 2 daily, 1 tri-weekly, and 7 weekly newspapers, manufactories of agricultural tools, reapers, ploughs, etc., 1 woollen-factory, an extensive flouring-mill, several carriage and wagon-factories, a stereotype-foundry, good hotels, and several usual shops, stores, etc. Near the city is located an insane asylum. Pop. of city, 9176; of tp. 10,033.
DAVID ATWOOD, ED. "STATE JOURNAL."

Madison (JAMES), D. D., b. near Port Republic, Va., Aug. 27, 1749, was a second cousin of Pres. Madison; graduated at William and Mary College 1768; studied law, and was admitted to the bar, but abandoned that profession for the ministry of the Protestant Episcopal Church. In 1773 he was chosen professor of mathematics in William and Mary College, and became president of that institution in 1777. He visited England in 1775, and again in 1777, where he pursued a course of study at London in several advanced branches of science, kept the college open during the war of the Revolution, became professor of natural and moral philosophy 1784, was consecrated first bishop

of Virginia by the archbishop of Canterbury in Lambeth Palace Sept. 19, 1790, and continued to discharge his duties as collegiate president and professor until his death, Mar. 6, 1812. He published several occasional addresses, a *Eulogy on Washington* (1800), a large map of Virginia, and some papers in Barton's *Journal* and in the *Transactions* of the American Society, vols. ii., iii., and iv.

Madison (James), fourth President of the U. S., b. at Port Conway, Prince George co., Va., the residence of his maternal grandparents, Mar. 16, 1751, was the eldest of the seven children of a wealthy planter, Col. James Madison of Montpelier, Orange co., by his wife, Eleanor Conway; studied Latin, Greek, French, and Italian under the tutorship of the parish minister, Rev. Thomas Martin; entered the College of New Jersey at Princeton in 1769, and graduated in 1771, but remained for several months pursuing a course of reading under the guidance of Pres. Witherspoon. At this time he seriously and permanently injured his health by allowing himself but three or four hours of sleep; returned to Virginia in 1772, and continued for two years an incessant study, nominally directed to the law, but really including extended researches in theology, philosophy, and general literature. His attention was then absorbed by the impending struggle for independence, with which was closely connected in Virginia a local controversy on the subject of religious toleration. The Church of England was the established state religion in the Old Dominion, and other denominations labored under serious disabilities, the enforcement of which was rightly or wrongly characterized by them as persecution. Madison took a prominent stand in behalf of the removal of all disabilities, repeatedly appeared in the court of his own county to defend the Baptist nonconformists, was elected from Orange co. to the Virginia convention in the spring of 1766, and signalized the beginning of his public career by procuring the passage of an amendment to the Declaration of Rights as prepared by George Mason, substituting for the term "toleration" a more emphatic assertion of religious liberty. In the same year he was elected to the Virginia assembly; was chosen in Nov., 1777, a member of the council of state, and in Mar., 1780, took his seat in the Continental Congress, where he first gained prominence through his energetic opposition to the issue of paper money by the States. He was made chairman of the committee on foreign relations, and as such wrote an able memorandum for the use of the American ministers in France and Spain, establishing the claims of the young republic to the territories between the Allegheny Mountains and the Mississippi, and to the free navigation of that river. In 1783 he was chairman of the committee on ways and means, was the principal author of the system of revenue then adopted, and wrote on that subject the address to the States adopted by Congress. As a member of the Virginia legislature 1784–86, Madison rendered important service by promoting and participating in that revision of the statutes which effectually abolished the remnants of the feudal system subsistent up to that time in the form of entails, primogeniture, and state support given to the Anglican Church; and his *Memorial and Remonstrance* on the latter subject was one of his ablest state papers. In Jan., 1786, he took the initiative in proposing a meeting of State commissioners to devise measures for more satisfactory commercial relations between the States; represented Virginia at the Annapolis meeting which issued the call for the national constitutional convention (Sept., 1786); was a delegate to that convention, which met at Philadelphia May, 1787; was one of the chief framers of the Constitution of the U. S., and perhaps its ablest advocate in the pages of the *Federalist*. He was a member of the first four Congresses, 1789–97, in which he maintained a moderate opposition to Hamilton's financial policy; declined the mission to France and the secretaryship of state, and, gradually identifying himself with the Republican party, became from 1792 its avowed leader, and in 1796 was its choice for the Presidency as successor to Washington, but declined to be a candidate. During the stormy administration of John Adams, Madison remained in private life, but was the author of the celebrated "Resolutions of 1798" adopted by the Virginia legislature, in condemnation of the Alien and Sedition laws, as well as of the "Report" (1800) in which he defended those resolutions, which is by many considered his ablest state paper. The great reaction in public sentiment which seated Jefferson in the presidential chair was largely owing to the writings of Madison, who was consequently well entitled to the post of secretary of state, which he filled during the whole administration of his friend with such ability as to make him the natural successor in the chief magistracy. Chosen President by an electoral vote of 122 to 53, Madison was inaugurated Mar. 4, 1809, at a critical period, when the relations of the U. S. with Great Britain were becoming embittered, and his first term was passed in diplomatic quarrels, aggravated by the act of non-intercourse of May, 1810, and finally resulting in a declaration of war, June 18, 1812. In the autumn Madison was re-elected to the Presidency by 128 electoral votes to 89 in favor of George Clinton. The war was prosecuted three years, marked by alternate success and defeat in Canada, by glorious victories at sea, by the burning of the national capitol at Washington, Aug., 1814, by the opposition movement in New England, which culminated in the Hartford convention (1814), and by the celebrated battle won at New Orleans (Jan. 8, 1815) after a peace had been signed at Ghent (Dec. 24, 1814), which left the original cause of dispute in abeyance. Few will maintain at the present day that any real glory was won in the indecisive conflict of 1812–15, and the check received by the Western States in their openly declared intention of annexing Canada by right of conquest might furnish a motive of humiliation, as well as a valuable lesson, had not the popular historians of the war conveniently forgotten to chronicle that original intention. In 1815 a commercial treaty was negotiated with Great Britain, and in Apr., 1816, a national bank was incorporated by Congress, the germ of a financial conflict not yet decided. Madison yielded the Presidency Mar. 4, 1817, to his secretary of state and intimate friend, James Monroe, and retired to his ancestral estate at Montpelier, where he passed the evening of his days surrounded by attached friends and enjoying the merited respect of the whole nation. He took pleasure in promoting agriculture as president of the county society, and in watching the development of the University of Virginia, of which he was long rector and visitor. In extreme old age he sat in 1829 as a member of the convention called to reform the Virginia constitution, where his appearance was hailed with the most genuine interest and satisfaction, though he was too infirm to participate in the active labor of revision. He d. at Montpelier June 28, 1836. James Madison, while not possessing the highest order of talent and deficient in oratorical powers, was pre-eminently a statesman of a well-balanced mind. His attainments were solid, his knowledge copious, his judgment generally sound, his powers of analysis and logical statement rarely surpassed, his language and literary style correct and polished, his conversation witty, his temperament sanguine and trustful, his integrity unquestioned, his manners simple, courteous, and winning. By these rare qualities he conciliated the esteem not only of friends, but of political opponents, in a greater degree than any American statesman of the present century.—He had a worthy helpmate in his wife, Dorothy Payne (b. in Virginia 1767), whom he married at Philadelphia in 1794, she being then Mrs. Todd, a widow lady celebrated in society for beauty and accomplishments. During her long residence at Washington, Mrs. Madison was a conspicuous ornament of the "republican court" over which she ultimately presided; she returned to Washington after her husband's death, survived until July 12, 1849, and is even now (1875) admiringly remembered in Washington as "Dolly Madison."—A valuable diary kept by Madison at the time of the formation of the Federal Constitution was purchased from his heirs for $30,000, and printed by order of Congress as *Reports of the Debates in the National Convention of 1787* (3 vols., 1840); his *Complete Works* have been published in 6 vols. (See his *Life and Times*, by W. C. Rives, 3 vols., 1859–69, unfinished, and the *Letters and other Writings of James Madison*, 4 vols., 1865.) Porter C. Bliss.

Madison Court-house, post-v., cap. of Madison co., Va., 15 miles S. W. of Culpeper Court-house.

Madison Station, post-v. and tp. of Madison co., Ala., on the Memphis and Charleston R. R. Pop. 1647.

Madison University, situated at Hamilton, N. Y., has two distinct corporations—an educational society and a university—which supplement each other; and three schools—an academy, a college, and a theological seminary. It has sent out 2300 pupils, of whom about 1900 are still living.

The Seminary, an institution of the Baptist Church, was opened May 1, 1820, with Prof. Daniel Hascall as teacher in ancient languages and Dr. Nathaniel Kendrick as teacher in theology. In the first class, which graduated in 1822, went out two well-known missionaries—Rev. Jonathan Wade, D. D., and Rev. Eugenio Kincaid, D. D. The present number of professors is five.

Colgate Academy was of a subsequent growth. It was opened in 1832 as a preparatory school, and in 1853 was duly chartered as the "Grammar School of Madison University." It has a drill course of three years in classical and scientific study. It has graduated on an average 25 a year for forty years, or about 1000 in all. It has a principal and four associate teachers. A new academy build-

ing, 100 by 60, three stories high, was opened Oct. 1, 1873, when it took its present title.

The COLLEGE, which by way of eminence is Madison University, was organized in 1832, but was not chartered till Mar., 1846. It has all the usual courses of college study—a classical course for candidates for the degree of A. B., a scientific course for candidates for B. Ph., and eclectic and special courses to meet the wider wants of students. The first class was graduated in 1835, and since then, for forty years, a class has been graduated, averaging 20 per year, or about 800 in all. The removal agitation of 1848–50 much disturbed all departments, and reduced the number of students. But in three years the rebound filled the classes to more than their average number. The class of 1873 numbered 38. Besides the regular graduates from these schools, about 1600 non-graduates have taken courses of study varying from one to five years. Three presidents have preceded the present incumbent, Rev. Ebenezer Dodge, D. D., LL.D.—viz. Rev. Nathaniel Kendrick, D. D. (1836); Stephen W. Taylor, LL.D. (1851); Rev. George W. Eaton, D. D., LL.D. (1856), who was succeeded by Rev. Dr. Dodge in 1868. The commencement takes place on the third Wednesday of June. Twenty prizes, $10 to $70, are awarded, amounting to $450 annually. The fall term begins in September.

In 1850 the university had no endowment, it having been the policy to rely on annual gifts and collections. But the removal controversy brought new issues and made a change of policy necessary. Yet up to the close of the war in 1864 only $52,000 had been secured. Since that date a debt of $15,000 has been paid, the college buildings have been reconstructed at a cost of $10,000, a college museum collected at a cost of $13,000, a president's house and 65 acres of land purchased at $15,000, the endowment increased to $393,000; so that the whole value of property is over $500,000, and no debt.

Besides a president's house, professors' houses, gymnasium, and university boarding-hall, there are three edifices of stone used strictly for college purposes. The Hall of Alumni and Friends, 107 by 73, was finished in 1859; has ten lecture-rooms, a library, a college chapel, and a large audience-room, 107 by 73, for college commencements. West College, 100 by 60, built in 1826, and East College, 100 by 56, built in 1834, are mainly occupied by students' rooms and dormitories, but East College has two halls for literary societies and two academical drill-rooms. West College has also an auditorium, a museum of foreign curiosities, a museum of natural history, and a set of rooms for chemistry, geology, and physics. P. B. SPEAR.

Mad'isonville, post-v., cap. of Hopkins co., Ky., on the St. Louis and South-eastern and the Madisonville and Shawneetown R. Rs., in the great tobacco-growing district and in the centre of large coal-fields, has 3 churches, 1 newspaper, a Masonic, an Odd Fellows, and a Good Templar order, 3 hotels, 2 livery-stables, 1 bakery, 2 flouring and 1 planing-mill, 1 cotton-gin, 2 wagon and 1 carriage manufactory, 5 tobacco-stemmeries, 1 bank, 1 pearl and potash factory, and a number of stores. There are three coal companies operating in the county. Pop. 1022.
ZENO F. YOUNG, ED. "TIMES."

Madisonville, post-v. of St. Tammany parish, La., 38 miles N. of New Orleans. Pop. 398.

Madisonville, post-v., cap. of Monroe co., Tenn., 10 miles E. of Sweet Water R. R. Station. It is the seat of Hiawassee College (Lutheran). Pop. 324.

Madisonville, post-v., cap. of Madison co., Tex., 35 miles E. of Nashville Station. Pop. 98.

Mäd'ler (JOHANN HEINRICH), b. at Berlin, Prussia, May 29, 1794; early became a proficient in astronomy; received an appointment at the observatory of Berlin in 1836; went in 1840 to Dorpat, Russia, as professor of astronomy; returned to Germany in 1865, and d. at Hanover, Mar. 18, 1874. His maps of the moon, with descriptions (1834–36), attracted much attention, and his *Popular Astronomy* has been republished several times in Germany and translated into other languages.

Ma'doc, one of the county-towns of Hastings co., Ontario, Canada, has one weekly paper and a large trade in potash. Iron, gold, and marble are obtained near by. The water-power is good. The town is 28 miles N. of Belleville. Pop. about 800.

Madoc, a Welsh prince, son of Owen Gwynnedd, who according to some annalists sailed westward with a fleet A. D. 1170, discovered a vast and fertile continent, returned to Wales, sailed again with ten vessels, and was never after heard of. The story forms the subject of one of Southey's poems, and is believed to be purely legendary.

Madon'na [It., originally equivalent to *madame*], a title of the Virgin Mary, and given especially to artistic representations of her. In mediæval times the Madonna was the symbol of glorified womanhood and maternity, and feelings of chivalric devotion, blended with religious reverence, made her a prominent subject of Christian art. (See Mrs. Jameson, *Legends of the Madonna*, 1852.)

Mado'qua (*Neotragus saltiana*), an Abyssinian antelope, about two feet long and barely fourteen inches high. It is very slender, and is perhaps the smallest horned animal in existence.

Madoz' (PASCUAL), b. at Pamplona, Spain, May 17, 1806; studied at the University of Saragossa; volunteered for the defence of the castle of Mouzon against the French in 1823; was taken prisoner and held for seventeen months, when he resumed the study of law at the university, but was expelled soon after for liberal opinions; resided several years in Tours, France; went to Barcelona and edited a *Universal Geographical Dictionary* in 10 vols. (1829–34), a *Collection of Celebrated Trials* (20 vols.), and a liberal newspaper, *El Catalano;* became a lawyer and a judge; fought against the Carlists as colonel of a battalion of volunteers; was elected to the Cortes, and published a *Geographical, Statistical, and Historical Dictionary of Spain* (Madrid, 16 vols., 1848–50). He became governor of Barcelona 1854; was leader of the *Progresista* party in the Cortes, minister of finance 1855, exiled by O'Donnell 1856, took part in the revolution of 1868, became governor of the province of Madrid, and deputy to the Constituent Cortes, and d. in 1870, on the journey to offer the crown of Spain to Amadeo.

Madras', one of the three presidencies of British India, extends from Cape Comorin, lat. 8° 4′ N., to Nagpoor, lat. 21° 10′ N., and is bounded N. by the presidency of Bombay and the Nizam and Berar dominions, N. W. by Bengal, E. and S. E. by the Bay of Bengal, S. by the Indian Ocean, and W. by the Arabian Sea. Area, 141,746 square miles, or 367,107 square kilomètres. Pop. 31,311,142. The surface forms a plateau sloping down from the centre on both sides, enclosed E. and W. by the Ghaut, and S. by the Neilgherry Mountains, and traversed by three large rivers, the Godavery, Kistnah, and Cavery, besides several minor ones. The rivers, which flow westward to the Arabian Sea, expand at their mouths, become shallow, and form lakes. The soil is sandy along the coast, and much mixed with salt in the interior; there are, nevertheless, many very fertile districts, as, for instance, Tanjore, which is rich in corn. The great forests yield teak and many other valuable kinds of wood. Sugar, cocoanuts, tobacco, indigo, and cotton are produced. Considerable quantities of iron, copper, lead, manganese, silver, and coal are found. AUGUST NIEMANN.

Madras, capital of the presidency of the same name, has 395,440 inhabitants, and is situated on the Coromandel coast, extending for a distance of about 7 miles along the shore of the Bay of Bengal. Its location is very unfavorable—extremely hot, much exposed to cold winds, with no harbor, and with no navigable river to bring the products of the interior to the sea. Nevertheless, as it is the seat of the highest government authorities, it has attained great importance. In the centre of the straggling town, immediately on the sea, stands Fort St. George, a strongly fortified citadel. To the N. of this fort, separated from it by a large esplanade, the so-called Black Town is situated, the most populous part of Madras and the seat of the European wealth. The Black Town, which is surrounded with bastioned fortifications, is 1 mile long, 1½ miles broad, and bounded W. by the Cochrane Canal; to the E., along the shore, it is lined with handsome public buildings, having colonnades to the upper stories. On the other side of the fort, to the S., and separated from it by the Kuam River, the Mohammedan part of the city is situated, the so-called Triplikam, with the Chepák Gardens and the palace of the former núwábs of the Carnatic. W. of the palace stands the government-house. The suburbs, inhabited by the Hindoos, consisting of narrow streets with miserable houses, extend along the W. side of these principal parts of the city; farthest to the N., Rayapuram, Attapuram, and Tandiavudu; to the W., Veperg and Parsawakam, Chintadripet, and Egmore; to the S. W., Pudupak and Namgambákam; and to the S., Kishnahpéta, Royapéta, Pascheri, St. Thome, Quibble Island, and Alvárpéta. The Adyar River to the S., and the Long Tank and Namgambákam Tank to the W., form the boundaries of the southern half of the city. Thus, the suburbs form a half circle of great breadth around the kernel of Madras, consisting of the Black Town, the Triplikam, and the citadel situated between them. Fort St. George, with its system of bastions, is built in the form of a half circle, the coast forming the diameter. Twice the French troops entered it victoriously (Sept. 10, 1746, and Dec. 14, 1758); also in the wars with Hyder Ali and other Indian princes it several times played an important part. Besides sev-

eral barracks and other military institutions, it contains the council-house, in front of which, and exactly in the centre of the fort, stands the marble statue of Lord Cornwallis, the arsenal, St. Mary's church, more than 100 years old, and other public and military buildings. To the N. W. of the fort the Kuam forms an island, in the centre of which stands the statue of Sir Thomas Munro. The beautiful lighthouse, 128 feet above the level of the sea, is situated between the citadel and the Black Town. Other noteworthy buildings are the church of St. Andrew's, near the Kuam, founded Apr. 6, 1818; the mint, in the north-western corner of the Black Town; the observatory; the Military Orphan Asylum; the university, and the palace of the núwáb. The numerous residences of the European officials, civil and military, are generally palatial structures; the peculiar Indian lime employed in their construction has an architectural effect like that of marble. Parks and gardens generally surround the houses, and contribute much to the beauty of the aspect of the city, which else has no rich vegetation, as the soil is sandy. The hotels are insignificant, as the Madras Club, the largest private building of the city, generally offers accommodation to travelling Europeans; of late, however, the increasing railway traffic has made some change in this respect. In spite of its low position and the absence of good river-water, the city is well provided with water from a number of wells, noteworthy among which are the so-called Seven Wells, a series of large reservoirs built in the form of immense quadrangular towers, and filled from draw-wells. A peculiar feature of Madras is the difficulty of landing. Large vessels are often compelled to anchor several miles off the shore, and the peculiar boats of the natives, held together by strings instead of nails, are the only means of reaching land through the surf; the so-called catamarans, a sort of raft, consisting of three logs tied together, are important also for this purpose. The imports of Madras consist principally of cotton goods, corn, wine, spirits, metals, sugar, silk, horses, and jewelry; the exports of cotton, saltpetre, and pepper. AUGUST NIEMANN.

Mad'repore, a name applied in a wide sense to radiate animals of the class Polypi and order Madreporaria, which includes simple and compound coral polyps, usually broad, with simple tentacles, and forming solid coral in the dermal covering, and often in the radiating septa. They are mostly found in warm seas. The order is divided into four groups—Stauracea, Astræacea, Fungacea, and Madreporacea. The latter group (the true madrepores) is of four families, of which the Madreporidæ are the typical madrepores. They have a definite number of simple, well-developed tentacles (twelve or more), and are generally compound. As usually employed, the name "madrepore" belongs to this family, and especially to the genus *Madrepora*. The madrepores are popularly termed tree-corals, from the form of their coral.

Madrid', the capital of Spain and of the province of Madrid, a part of New Castile, is situated nearly in the centre of the country, in lat. 40° 25′ N., lon. 3° 42′ W., on the left bank of the Manzanares, a small stream which joins the Jamara and flows to the Tagus. The site offers no commercial or industrial advantages, nor has it any special military importance; and the surrounding plateau —2200 feet high, and once covered with forests, but now, with the exception of the immediate neighborhood of the city, naked and arid—suffers from a very harsh climate. In the streets of Madrid the thermometer sometimes falls in the winter to 18°, and rises in the summer to 105° in the shade. Changes are frequent, sudden, and violent, and the difference in temperature between the sunny and shady sides of the street often amounts to 20°. Thus, it seems to have been a mere whim which made this place the capital of the realm. It is first mentioned in history as a Moorish outpost, called *Majerit,* but was captured in 1083 by Alfonso VI. of Castile. Henry III. of Castile resided there often for the pleasure of hunting; Charles V. went there occasionally, and in 1560 Philip II. made the place his capital. From this time it grew rapidly into a magnificent city, and became the centre of the history of the Spanish people, politically and literary. Pop. (in 1870) 332,024.

The city is surrounded by a brick wall 20 feet high and pierced by fifteen gates, of which the most remarkable is Puerta de Alcalá, 72 feet high, built in the form of a triumphal arch with five openings in 1759; it stands at the foot of the street of Alcalá, which, three-fourths of a mile long, traverses the city from N. E. to S. W., and forms one of the most magnificent streets in Europe. The south-western (or old) part of the city contains many narrow, crooked, and ill-kept streets, but the central and eastern parts consist of straight, broad, well-kept streets, lined with handsome houses, magnificent palaces, and elegant public buildings. Among the public squares, of which Madrid numbers 72, the most interesting, at least at present, is Puerta del Sol, once forming the eastern entrance of the city, but now occupying nearly its centre. The government palace, the post-office, and other public buildings are situated here; also the best hotels, clubs, and reading-rooms; and thus the place has become a general rendezvous both for business and pleasure. Plaza Oriente, situated between the royal palace and the royal theatre, contains an equestrian statue in bronze of Philip IV., nineteen feet high, designed by Montañes; in the promenade skirting the place stand forty-four colossal statues of kings and queens. Plaza Mayor, 398 feet long by 306 feet wide, contains an equestrian statue in bronze of Philip III.; here the so-called *autos-da-fe* were formerly celebrated, and from the Real Casa de la Panaderia the king and the court used to witness the burning of heretics. The bull-fights take place in Plaza de Toros, just outside Puerta de Alcalá, but the old building, erected by Philip V., and accommodating 12,400 persons, was taken down in 1874, and a new one was commenced a little farther to the N. In Plaza de las Cortes stands a fine bronze statue of Cervantes. Among the numerous promenades and gardens, the Prado is the most remarkable; 2½ miles long, divided into parts—the Prado proper, the Salon, the Fuente Castellana, formerly the Delicias de Isabel—finely laid out, planted with beautiful trees, and in part adorned with magnificent fountains and statues. The view which these grounds present on a fine evening, when thronged with people, is very brilliant and characteristic.

Although Madrid is one of the handsomest modern cities, it contains, properly speaking, only one striking building —namely, the royal palace. It has no cathedral. It forms only a suffragan bishopric of Toledo. Many of its churches, of which it numbers between 60 and 70, are beautifully decorated with paintings of the old masters, but none of them has any architectural merit. The same is the case with the convents and monasteries, which formerly were so numerous in Madrid, but which now mostly are used for other purposes; 44 monasteries were suppressed in 1836. The royal palace was built between 1737 and 1750, of granite and white marble, forming a square 470 feet long, 100 feet high, enclosing a court 240 feet square, occupying an area of 220,900 square feet, and surrounded with magnificent gardens. It contains a library of 100,000 volumes, an interesting collection of arms, consisting of 2533 specimens, among which are the armor of Columbus, Gonsalvo de Cordova, and Don John, a numismatic collection of 150,000 pieces, and a great number of magnificent pictures, though most of these have been transferred to the royal museum in the Prado. This collection of pictures is said to be the largest and richest in Europe, and contains 65 pictures by Velasquez, 58 by Ribera, and 46 by Murillo, besides numerous and excellent works of the Italian and Dutch schools. The educational institutions of the city are good, from the elementary schools, among which the Protestant Sunday schools begin to play a conspicuous part, to the learned societies. There are, besides the national library, containing about 250,000 volumes, several minor libraries accessible to the public, an observatory, a botanical garden, a medical school, military and engineering schools, a theological seminary, normal schools, and schools of art, law, etc. Its hospitals and other charitable and benevolent institutions are also good.

The industry of the city is not considerable. Besides the manufacture of certain necessary articles, such as chocolate, beer, shoes, and hats, only those of plated ware, coaches, gloves, and fans have acquired prominence. But the commerce is important. The retail business is mostly in the hands of foreigners, especially Frenchmen. But wholesale transactions are mostly made by native houses, and are very large, the city forming the entrepôt for all the interior provinces. CLEMENS PETERSEN.

Madrid, post-tp. of Franklin co., Me., 23 miles N. W. of Farmington. Pop. 394.

Madrid, post-v. and tp. of St. Lawrence co., N. W., on Grass River, has good water-power and some manufactures. Madrid Station (Madrid Springs P. O.) is on the same river, 1 mile below, and on the Ogdensburg and Lake Champlain R. R. Pop. of v. 670; of tp. 2071.

Mad'rigal [Fr. *madrigal;* It. *mandriale*], in music, the name of a certain species of composition, originally of a light, airy, joyous, and pastoral character. The old madrigals are often of complex and elaborate structure, usually for voices alone, and consist of four, five, or more parts, in which the skill of the composer exhibits itself in fugues, canons, imitations, and other highly labored styles of writing. Compositions of this kind abounded in the sixteenth and seventeenth centuries, and in their production the best masters appear to have found a congenial field for the exercise of their ability. It is supposed by some wri-

ters that the madrigal originated in Flanders, was subsequently taken up with success by the Italians, and finally became popular in England about the middle of the sixteenth century. Numerous collections of these compositions were published in that century and the following, and these give evidence not only of the popularity of the madrigal in England, but also of the high rank attained by the English masters in this style of composition. In 1741 the well-known Madrigal Society was founded in London—an institution which has had a wide influence in the cultivation of a taste for madrigal music, and incidentally for glees, canons, rounds, catches, and national airs. The derivation of the name "madrigal" is merely conjectural. By some it has been traced to *mandra*, a sheepfold, as the early madrigal was of a pastoral character; Dr. Burney derives it from *Alla madre*, "the first words of certain hymns addressed to the Virgin;" Sir John Hawkins connects it with the name of a town in Spain; but no satisfactory etymology has yet been reached. WM. STAUNTON.

Mad River, tp. of Champaign co., O. Pop. 1803.

Mad River, tp. of Clark co., O. Pop. 1873.

Mad River, tp. of Montgomery co., O. Pop. 1867.

Madu'ra, an island of the Malay Archipelago, N. E. of Java, comprising an area of 1300 square miles, and belonging to the Netherlands. The inhabitants, numbering 662,720, are Mohammedans, and live in three kingdoms governed by native princes under Dutch superintendence. They are brave and honest, but, although they cultivate sugar, indigo, and tobacco to some extent, they have no disposition for agriculture, and the island is a possession of inferior importance.

Madura, a city of British India, in the presidency of Madras, capital of the district of Madura, which, comprising an area of 7656 square miles, with a population of 1,756,791, occupies the south-eastern part of Hindostan. The city is fortified, carries on a considerable trade in cotton and tobacco, and contains some of the most remarkable Hindoo buildings, among which are the magnificent Pandiyan palace, the great temple of Mahadeva, and a celebrated choultry or inn for pilgrims, 312 feet long and 125 feet broad, resting on six rows of columns of gray granite and 25 feet high. A Roman Catholic mission was started here in 1606 by the Portuguese Jesuit Roberto de Nobili, and labored with great success till the middle of the eighteenth century, when the wars between France and England stopped and nearly annihilated the work. It was resumed in 1837, and in 1834 a Protestant mission was established by the American Board of Foreign Missions, which in 1873 numbered 30 churches, 149 congregations of natives, 100 schools—of which 93 were free—besides two dispensaries. Pop. 36,000.

Mad'vig (JOHANN NICOLAI), b. Aug. 7, 1804, at Svanike, a small town of the island of Bornholm; was educated at Frederiksborg, and studied philology and history at the University of Copenhagen, where he became professor of the Latin language and literature in 1829. From 1848 to 1852 he was minister of public worship and education, and since 1854 has taken part very actively in Danish politics. One of his first writings, *Epistola critica ad Orellium* (Copenhagen, 1828), made quite a sensation on account of the acuteness of its critical remarks and its solid and comprehensive learning. He has since published critical editions of several of the works of Cicero, which have become standard, and a great number of corrections and illustrations to Lucretius, Juvenal, and Livius. Several points of Roman archæology and history are very ably treated in his *Opuscula Academica*, but his celebrity rests principally on his *Latin Grammar* (Copenhagen, 1841), which has not only been translated into most European languages, and generally introduced in schools, but has exercised a decided influence on the whole study of grammar. Less eminent are his essays on the philosophy of language; in spite of much acuteness in the details, the standpoint is antiquated. CLEMENS PETERSEN.

Mæan'der (now *Meinder*), a river of Asia Minor, rises in Anatolia, and flows into the Ægean Sea after a course of 200 miles. It is noted for its winding and tortuous course, on account of which it gave name to one of the most beautiful patterns of Greek ornamentation. There was in antiquity a story of a subterraneous connection between the Mæander and the Alpheus in Elis, although there is apparently nothing in the physical aspect of the river which could furnish a foundation for such a story. It has in all nine tributaries. It is narrow and deep, and carries with it a large quantity of mud, which, being deposited at the mouth, has extended the coast many stadia farther into the sea, and connected it with some adjacent islands. It is navigable only for small craft, and not above the influx of the Lycus.

Mæce'nas (CAIUS CILNIUS), b. before the middle of the first century B. C. of a family of Etruscan origin, and belonging to the equestrian order; appears for the first time in history after the assassination of Cæsar as the friend and adviser of Octavian, who confided to him many difficult negotiations. Later, however, he seems to have lost his political influence, and to posterity he became known only as the great patron of literature and art. His magnificent house on the Esquiline Hill was the centre of literary society in Rome. He had amassed an enormous fortune, and he was lavish in his hospitality. Virgil and Horace were his friends, and both received most substantial services from him. Even in antiquity his fame as a supporter of genius and talent was very great, and from the Middle Ages up to the beginning of this century his name became proverbial. Nevertheless, it must be remembered that he showed the same enthusiasm and the same patronage to cookery, warm swimming-baths, mimic dances, and the lowest sensuous enjoyments; and there is nothing whatever which indicates that he considered poetry and art as anything more than a pleasure. Even the relation between him and Horace, which excited so much admiration in former days, impresses our time much less favorably, and the picture which modern criticism has drawn of Mæcenas, his usuries, his dissipations, gloom, and sleepless nights, is very little attractive. He d. 8 B. C., and being childless he left his fortune to Augustus.
CLEMENS PETERSEN.

Maelstrom, or **Malström,** a famous whirlpool on the western coast of Norway, immediately S. of Mosköe, the southernmost island of the Lofoden group, in lat. 67° 48′ N. The name, literally translated, means "grinding stream," and although the stories of its grinding ships to pieces as fine as flour are mere fables—as at certain times it may be passed even through its very centre without any danger at all—yet at other times it becomes extremely dangerous, and a ship entangled in its current is irretrievably lost. Even whales when caught by the vortex have been killed, and later on dashed up upon the coast. The depth of the whirlpool is only 20 fathoms, but the currents which run here for six hours from N. to S., and then for six hours from S. to N., are tremendous; and when, as often happens, the wind blows from just the opposite direction to that of the current, the agitation of the sea increases to perfect fury. Just outside the straits where the whirlpool is formed the depth is between 100 and 200 fathoms.

Mæsa (JULIA), sister of Julia Domna (the wife of Septimius Severus), and grandmother of the Roman emperors Elagabalus and Alexander Severus, b. at Emesa, a city of Syria, about 150 A. D. She was a daughter of Bassianus, a Roman citizen of humble position, but married Julius Avitus, a Roman of consular rank. On the accession of her brother-in-law to the throne, Julia Mæsa seems to have lived in splendor at Rome and to have accumulated a large fortune, but on the death of Severus retired to her native city, Emesa (her husband being apparently dead), and caused her two grandsons to become priests to the Phœnician sun-god *Elagabal* in that city. On the death of Caracalla, Mæsa soon perceived the unpopularity of his successor, Macrinus, and by representing to the Roman garrison at Emesa that her elder grandson, Elagabalus, was in reality a son of Caracalla, induced them to proclaim him emperor. On the death of this infamous youth, four years later, Mæsa had the tact to secure the proclamation of her other grandson, Alexander Severus. She exercised the chief power under his reign, and d. about 225 A. D.

Maesto'so [It.], in music, a directive term implying dignity, power, and majesty of movement.

Maes'tri (PIETRO), b. in Milan in 1816; was educated at Pavia; took a most active part in the affairs of Milan in 1848, both as a soldier and a surgeon, and finally as one of the heads of the provisional government. After a long exile in France he returned to Italy in 1859, and served as a Garibaldian volunteer. In 1861 he founded and assumed the direction of the *Statistica Generale*, etc., and in 1863 published at Milan a volume entitled *La Francia Contemporanea*. On the occasion of the Paris Exposition in 1867 he published *L'Italia Economica*, and after this became editor of a journal with the same title. D. at Florence in 1871. Though buried in Florence, Milan has honored him with a cenotaph.

Maes'tricht [Dutch, *Maastricht; anc. Trajectum ad Mosam*], city of the Netherlands, capital of the province of Limburg, on the Meuse, was founded in the fifth century. It is regularly and well built, and contains several fine buildings, among which is the church of St. Gervais with five towers. It is fortified, and is considered one of the strongest fortresses in Europe and the principal defence of Holland, as parts of the surrounding ground can easily be put under water. In the wars between the United

Provinces and Spain and France it often formed the centre of the contest, and suffered much. It has an extensive transit-trade and manufactures. Pop. 28,840.

Maestricht Beds, certain strata which at St. Pietersberg near Maestricht, in parts of France, and at Faxöe, Denmark, cap the Upper White Chalk, and thus terminate the Cretaceous series of rocks, and record the conclusion of the Mesozoic age. In the immense subterranean quarries abounding with fossils near Maestricht were found the celebrated remains of the huge reptile *Mosasaurus.*

Maffe'i (Andrea), b. at Riva di Trento in 1802; studied literature under Paolo Costa, and then went to Munich for the study of German. At the age of sixteen, encouraged by Monti, he began to publish his finished metrical translation of the *Idyls of Gessner* (Milan, 1818). This was followed by a translation of Schiller's *Bride of Messina*, and later by that of all the dramatic works of this great German, on whose manner Maffei formed his own poetic style. After this he made admirable translations of the poems of Moore, of Milton's *Paradise Lost*, of Byron's *Childe Harold*, of the *Faust* of Goethe, of his *Hermann and Dorothea*, and also of the *Odes* of Anacreon, and has also published three volumes of original poems.

Maffei (Francisco Scipione), Marquis, b. at Verona, Italy, June 1, 1675; educated at Parma; went in 1698 to Rome, devoting himself to literature and poetry; made several campaigns during the war of the Spanish Succession in the Bavarian service; founded in 1710 the *Giornale dei Letterati*, the first literary journal in Italy; exercised considerable influence on the development of the Italian stage by his *Tratato dei Teatri antichi e moderni*, and still more by his tragedy *Merope* and comedy *La Ceremonia*, which were received with great applause; published in 1731 his *Verona Illustrata;* travelled in France, England, Holland, and Germany, and d. at his native city Feb. 11, 1755. His collected works were published at Venice in 1790 in 21 vols.

Maffei (Giovanni Pietro), b. at Bergamo, Italy, about 1536; became professor of rhetoric at Genoa 1563; secretary of the republic 1564; entered the order of Jesuits 1565; taught rhetoric several years at Rome; visited Spain and Portugal in quest of materials for his Latin *History of the Indies* (1588), a work of great value upon which he bestowed twelve years' labor. He had previously published a *Commentary on the Achievements of the Society of Jesus in the East up to 1568* (1571), and a *Life of Ignatius Loyola* (1585). He edited a collection of missionary *Letters from the East* (1588), wrote the *Annals of Gregory XIII.*, and had commenced those of Clement VIII. at the time of his death, at Tivoli Oct. 20, 1603. His complete works in Latin were published at Bergamo (1747) with a *Life.*

Maf'fitt (John Newland), D. D., b. at Dublin, Ireland, Dec. 28, 1794; became a Wesleyan preacher in Ireland; was noted for his powers of oratory; came to the U. S. in 1819; was pastor of several churches in New England; published *Tears of Contrition* (1821), *Pulpit Sketches* (1828), and in 1831 began a remarkable career as "revivalist" in the Southern States; established the *Western Methodist* at Nashville, Tenn., in 1833; became professor of elocution and belles-lettres at Lagrange College, Ala., in 1837; published a volume of *Poems* (1839); was elected chaplain of the U. S. Congress in 1841; settled at Auburn, N. Y., where he edited (1845–46) the *Calvary Token*, a monthly paper; resided in Arkansas 1847–48, and d. at Mobile, Ala., May 28, 1850.

Ma'fra, small town of Portugal, a few miles N. W. of Lisbon, famous for the immense building which John V. erected here in 1717–31, and which comprises a royal palace with 866 rooms, a cathedral 186 feet long, 135 feet broad, and surmounted with a magnificent dome, and a monastery with 300 vaulted cells, the whole of white marble from Carrara, and surrounded with magnificent gardens.

Maga'da, the principal kingdom of India in the fourth century B. C., at the time of the invasion of Alexander the Great. It occupied the valleys of the Ganges and Jumna, but with undefined boundaries, the capital being Palibothra, generally identified with Patna. The greatest monarchs of Magada were Chandra-gupta, called by the Greeks Sandracottus (312–280), founder of the Mauryæ dynasty, and his grandson Asoka (250 B. C.), who extended his empire and the Booddhist religion over the greater part of India.

Magadox'o, or **Makadi'shu,** an Arabic town of East Africa, on the Indian Ocean, in lat. 2° 2′ N. It was founded in the tenth century, and was formerly an important place, but is now decaying, though carrying on some trade in ivory, gums, and dates. It belongs to Muscat. P. 5000.

Magalha'ens, de (Domingos José Gonçalves), b. in Rio de Janeiro, Brazil, in 1810; was admitted to the bar about 1832; went to Europe as attaché of the Brazilian legation in Paris 1836; became on his return in 1838 professor of philosophy and member of the chamber of deputies, and took rank as a leader of Brazilian literature. His works include *Poesias* (1832), *Mysterios*, an imitation of romantic models, *Antonio José* (1838), and *Olgiato* (1839), historical tragedies on national subjects; *A Confederação dos Tamoyos* (1857), a lyrical epic of the foundation of Rio de Janeiro, and *Urania* (1862), a collection of songs, chiefly amatory. He has been minister at Naples, Turin, Vienna (1859–67), and Washington (1868–72).

Magalhaens, de (Fray Gabriel), b. at Pedrogao, near Coimbra, Portugal, in 1609; was admitted into the order of Jesuits when sixteen years old; went to Goa, India, as a missionary 1634; sailed for Japan 1640, when, stopping at Macao, he determined to penetrate into the interior of China; studied the language at Macao, and reached the western province of Szechuen, where he met with great success in preaching through his command of the language and of the popular religious traditions. He incurred frequent perils during a rebellion of that province, and was wounded with an arrow; accompanied the victorious imperial army to the capital, where he arrived in 1648; gained the favor of the emperor through his mechanical ingenuity, and built a church, but on the accession of a new emperor was persecuted, twice put to the torture, and condemned to death, but saved by the interposition of the council of regency; was again arrested three years later and commanded to leave the country, but in the panic that followed a great earthquake the order was not attended to, and he remained in China in peace until his death at Peking May 6, 1677. He was honorably buried by the emperor's order. Fray Gabriel was of the same family as the illustrious navigator, and left a work, published in a French translation, with the title *Nouvelle Relation de la Chine, contenant la description des particularités les plus remarquables de ce grand empire* (Paris, 1688), with a plan of Peking. This work enjoys a high reputation as a source of accurate information.

Magalhaens de Gandave, de (Pedro), b. at Braga, Portugal, about 1540; passed several years in Brazil, and on his return published a curious work, *Historia da provincia Sancta Cruz, a qui vulgarmente chamamos Brazil* (1576), of which, though extremely erudite and written in classic style, so few copies were known at the beginning of this century that no bibliographer had mentioned it. A French translation was printed in the historical series of Ternaux-Compans (1838). Magalhaens also wrote a work on the rules of Portuguese composition (1574; twice reprinted). The date of his death is unknown.

Magalla'nes, or **Magellan** (Fernando), b. at Oporto, Portugal, in the latter part of the fifteenth century; entered the navy at a very early age, and distinguished himself in the East Indies, but left in 1517 the Portuguese service and went to Spain, proposing to Cardinal Ximenes to discover a western route to the Molucca or Spice Islands. With a fleet of five vessels and 234 men he sailed from Seville Aug. 10, 1519, reached the mouth of the river La Plata Jan. 12, 1520, and on Oct. 21, 1520, entered the strait between the island of Terra del Fuego and the American continent, which he called the Strait of the Eleven Thousand Virgins, but which afterwards came to bear his own name. On Nov. 28 he had cleared the strait and launched into the immense ocean, which he called the Pacific on account of the smoothness of its waters and the steadiness of its winds. After many hardships and much suffering the fleet, now reduced to three vessels, reached the Ladrones on Mar. 6, 1521, and Tamar, the first discovered of the Philippine Islands, on the 18th of the same month. Magellan took possession of these islands in the name of the Spanish king, and was at first very successful in subduing or conciliating the natives, but on Apr. 27, 1521, he was killed in an encounter with the natives of the island of Martan. Only one of the ships and fifteen men returned to Europe, reaching Spain in Sept., 1522, and thus the first circumnavigation of the earth was achieved.

Magallanes, or **Magellan, Strait of,** separates the continent of South America from the island of Tierra del Fuego. It is 300 miles long, from 5 to 30 miles broad, but difficult to navigate. It was discovered in 1520 by the Portuguese navigator Magallanes.

Magas'ka, tp. of Martin co., Minn. Pop. 141.

Mag'azine [Arab. *makhzan*, "storehouse"] is especially employed as the name of a storing-place for gunpowder. In military structures the magazine is made bombproof, and is usually covered with earth. The entrance is protected by heavy traverses, and great care is taken to prevent the necessity of using lanterns or artificial light of any kind about the place. On shipboard the magazine is in the hold, and is so placed that it may be instantly flooded in case fire should appear in its vicinity.

Magazine, tp. of Yell co., Ark. Pop. 729.

Magazine Guns, breech-loading small-arms, having a magazine-tube in the stock to carry several cartridges. After firing a cartridge the empty shell is thrown out, and a full cartridge successively brought into position and loaded by mechanical means. The Spencer, Henry, and Ward-Burton are the best known varieties of magazine guns in the U. S. P. V. HAGNER.

Mag'dala [Arab. *Mejdel*], in Galilee, on the W. shore of the lake, at the S. E. corner of the plain of Gennesaret, about 3 miles N. of Tiberias. It contains some twenty miserable huts, and is the only inhabited spot in the plain. R. D. HITCHCOCK.

Magdala, a mountain-fortress of Abyssinia, situated on one of the three peaks of the spur which King Theodore defended against the English. The three peaks are called Fâla, Selassye, and Magdala. They rise about 9000 feet, and are separated from each other by saddle-like depressions. On Apr. 13, 1868, the English took the wretched fortress standing on the top of the steep peak, Theodore committed suicide, and Gen. Napier, commander-in-chief of the English expedition, was created baron of Magdala. AUGUST NIEMANN.

Magdale'na, a river of South America, rises in Ecuador, flows through Colombia, and enters the Caribbean Sea in lat. 11° N. and lon. 75° W., after a course of 900 miles. Its upper part is very rapid and full of cataracts, but below Honda, 540 miles from its mouth, it becomes navigable, and is the chief means of communication with Bogotá, the capital of that republic.

Mag'dalene, or **Mary Magdalene,** a woman who stood by Jesus at the cross; was present when Joseph of Arimathea laid him in the sepulchre; came early on the first day of the week to the tomb and found it open; went to Peter and John, and saw the two angels sitting in the sepulchre when she returned with the apostles. Jesus himself appeared to her shortly after, and announced his approaching ascension. The derivation of her surname is uncertain, though probably from Magdala, a town of Galilee. She is gratuitously identified with the "woman who was a sinner" (Luke vii. 37). She is the "Mary called Magdalene, out of whom went seven devils" (Luke viii. 2).

Mag'dalen Islands, a group of islands in the Gulf of St. Lawrence, belonging to Gaspé co., Quebec, comprising some 80,000 acres. They are the property of the descendants of Admiral Coffin of the British navy, and contain numerous harbors. Amherst, on Amherst Island, is a port of entry, and has a custom-house and jail. Fish, oil, and gypsum are exported. Pop. of the S. group, 1131; of Grindstone Island, 1053; of Allright Island, 838; of the N. group, 151; total, 3172.

Magdeburg', city of Prussia, capital of the province of Saxony, on the Elbe, founded in the tenth century by Otto the Great, and consists, besides its two suburbs, Neustadt and Sudenburg, of four parts—Altstadt and the Sternschantze on the left branch of the Elbe, the citadel on an island in the river, and Frederickstadt on the right bank. Each of these parts is strongly fortified, and together they form a fortress of the first rank, making Magdeburg one of the strongest places in Europe. Most of the streets are crooked and narrow, but the houses are generally neat and substantial, and there are several fine buildings, among which is a Gothic cathedral of the thirteenth century. There are many beautiful promenades, such as the Fürstenwald and the Friedrich-Wilhelm's Garten. The manufactures comprise woollens, cotton, ribbons, leather, soap, and glass; the breweries and distilleries are very extensive. On account of its position on the Elbe and at the junction of four principal railway lines, Magdeburg is one of the commercial centres of Northern Germany, its imports amounting to 627,983 cwts. in 1860, and its exports to 363,239 cwts. It has many benevolent institutions, and several good military, scientific, industrial, and commercial schools. Its capture by Tilly in 1631 and the massacre which followed were the most frightful events in the Thirty Years' war. Pop. 114,501.

Magdeburg Centuries. See CENTURIES OF MAGDEBURG.

Magee' (WILLIAM), D. D., b. Mar. 18, 1766, in co. Fermanagh, Ireland; graduated at the University of Dublin 1785; was elected a fellow 1788; served as tutor while studying for the ministry; was ordained in the Church of England 1790; became some years later assistant professor of Oriental languages; senior fellow and professor of mathematics 1806; retired from the university 1812, taking the livings of Kappagh and Killyleagh; became dean of Cork 1814; won fame as a pulpit-orator; was promoted to the bishopric of Raphoe 1819; was appointed 1822 archbishop of Dublin, where he d. Aug. 18, 1831. Archbishop Magee was noted for his hostility to Romanism and Unitarianism. As a writer he was best known by his *Discourses on the Atonement and Sacrifice* (1811; 7th ed. 1841). His complete works were published in 1842.

Magee (WILLIAM CONNOR), D. D., b. at Cork, Ireland, in 1821; studied at Trinity College, Dublin; became curate in a Dublin parish; went to Malaga, Spain, for his health, 1846, remaining there two years; obtained the curacy of St. Saviour's, Bath, 1848; became incumbent of the Octagon chapel, Bath, 1850; took a leading part in organizing the Church Defence Society in opposition to the Liberation Society; became minister of Quebec chapel, London, 1860, rector of Inniskillen 1861; dean of Cork 1864, and shortly afterwards dean of the chapel royal, Dublin; was Donellan lecturer at Dublin 1865–66, and appointed bishop of Peterborough 1868. He has acquired considerable reputation for eloquence, has preached on public occasions in various parts of Great Britain, and has taken an active part in the debates of the House of Lords, especially in opposition to the disestablishment of the Irish Church. Many of his sermons have been published.

Magellan. See MAGALLANES.

Magellanic Clouds. See NEBULÆ.

Magendie' (FRANÇOIS), b. at Bordeaux, France, Oct. 15, 1783; received a medical education in Paris; was admitted to the Academy of Sciences 1821; became professor of anatomy in the Collége de France 1831; president of the consulting committee on public health 1848. D. at Paris Oct. 8, 1855. He practised vivisection extensively, and in far less humane methods than are now in use; but by this and other means of observation he made numerous and highly important discoveries in physiology, especially in that of the nervous system, and also in other departments of medical science. Among his works are *Formulaire* (1821) for new medicines, *Éléments de Physiologie* (1816–17), *Leçons sur les Phénomènes physiques de la Vie* (1836–42), *Leçons sur les Fonctions et les Maladies du Système nerveux* (1839), and *Leçons sur le Sang* (1839), which have been several times reprinted, and were translated into German.

Magen'ta, town of N. Italy, in the province of Milan, about 20 miles E. of the city of Milan, in a fertile district watered by the Naviglio Grande. Its topographic position has made it the theatre of many battles, the last and most memorable being that known as the battle of Magenta, fought on the 4th of June, 1859, in which the Austrians were defeated by the Italians and French, and thus forced to evacuate Lombardy. It gives the title of duke of Magenta to Marshal MacMahon, president of the French republic. Pop. in 1874, 6135.

Ma'ger (KARL), b. June 1, 1810, at Gräfrath, near Solingen, in Rhenish Prussia; studied philology and philosophy at Bonn; resided for several years in Paris; held different positions at educational institutions in Geneva, Aran, and Eisenach, but retired in 1854 from practical activity on account of ill-health, and d. at Wiesbaden June 10, 1858. His *Die Deutsch Bürgerschule* (1840), *Pädagogische Revue, Die Modernen Humanitäts-studien* (1846), and a number of schoolbooks, exercised a considerable influence on the ideas of education in Germany.

Mag'eröe, an island of the Arctic Ocean, belonging to Norway, and terminating in the North Cape, a promontory 970 feet high, and lying in lat. 71° 10′ N. A few Norwegian and Lappish families live on the island.

Ma'gi, the priestly class among the ancient Medians. They are considered by some Orientalists to have originally formed a tribe or clan of the Median people, by others to have been the representatives of a more ancient Scythian or Turanian race which dwelt in the country conquered by and named from the Medes. The amalgamation between the Magian religion and the Zoroastrian, derived by the Persians from their Bactrian ancestors, seems not to have begun until the two nations were subjected to a common rule under Cyrus the Great, who was descended from both races. The Magi attempted to reassert their power during the reign of Cambyses by placing Gomates, one of their race or class, upon the throne; but upon his overthrow by Darius Hystaspes the Magi and their religion were proscribed and the faith of Zoroaster officially established. It was probably on account of this great revolution that in later generations the half-mythical Zoroaster was supposed to have lived during the reign of Darius Hystaspes, and to have personally established the predominance of his religion. This view prevailed until the revival of Oriental studies in the present century. The Magian religion was consequently confounded with the Zoroastrian, as it still continues to be by historical manuals in frequent use, the Magi being supposed to have been merely the priests of the Zoroastrian fire-worship. The knowledge of many oc-

cult arts (whence the term "magic") attributed to them caused *Magi* to be synonymous with "wise men," and they were gradually regarded as the inheritors of the astronomical and other lore of the Chaldæans. In this sense, probably, the word was current in the first century A. D. when applied to the visitors of the infant Christ. In the Middle Ages the Magians or "wise men" of the Nativity had become three kings, whose names were given as Melchior, Gaspar, and Balthasar, their residence was assigned to various localities in Persia, and their relics successively deposited in the church of St. Sophia at Constantinople, in the cathedral at Milan, and finally (A. D. 1162) in the grand minster of Cologne, where they still remain.

Mag'ic [Lat. *magus;* Gr. μάγος; Pehlvi, *mag* or *mog*, a "priest," probably from an Aryan original, indicated by the Sanskrit *mahat*, "great," from which the Latin *magus*]. Though popularly derived from the arts of the Magi, or Old Persian priesthood, the belief in magic, or the art of working wonders by supernatural power, is inherent in man, and history presents no instance of any race at any time in which pretenders to it have not existed. It is evident that before exact science was founded, yet while students were unwearied in searching into the mysteries of mind and of matter, and of the self-development of a First Cause, and while they were led astray at every step by the wonderful in nature, it was impossible not to believe that there existed some primal clue by which all knowledge, both of the sensible and the spiritual world, could be gained and all power attained. All that they knew indicated the existence of such a science of sciences and power of powers. As all that was positive and intelligible could be represented by numbers or expressed geometrically, it was natural enough to assume that the mysterious and spiritual was subject to the same laws. Hence, a belief in the occult power of numerals and proportions, derived from the East and taught by Pythagoras, Plato, and their followers. The heavenly bodies had certain influences, as of the moon on the tides, the sun in giving light, heat, and health. This was exaggerated as a matter of course, until it was believed that all the planets in their conjunctions had peculiar effects on individuals. The study of astronomy was closely allied to that of mathematics, and in this spirit they mutually became more and more magical. Such methods applied to natural philosophy naturally made chemical investigation reduce matter to a few elements and to a *prima materia*, which, once apprehended, could enable man to develop or make any later forms, such as gold or diamonds, an elixir of immortality, and a universal panacea, just as the first principle in astronomy, also divine, was believed to give the illimitable godlike knowledge of all that the stars governed. The next step was to bring chemical principles into harmony with astrology and the lore of God and spirits. So H. Cornelius Agrippa, whose work on occult philosophy (which he afterwards declared was nonsense) was the cornerstone of magic in the sixteenth century, declares, "There are four elements, without the perfect knowledge whereof we can effect nothing in magick. Now, each of them is threefold, that so the number of 4 may make up the number of 12; and by passing by the number of 7 into the number of 10, there may be a progress to the Supreme Unity, upon which all virtue and wonderful operations depends." As spirits were innumerable, they were classified, especially by Paracelsus, according to this chemico-astrologic theosophic philosophy. At the base of all was the fifth element, "the divine astral spirit," the *intelligentia abscondita* of Vaughan, the transcendental principle or power, "that spirit which God himself breathed into man, and by which man is united again to God." The powers of this spirit, according to Agrippa, "are full of wonders and mysteries, and are operative as in Magick Naturall, so Divine. For from these proceed the bindings, loosings, and transmutations of *all* things, the knowing and foretelling of things to come, the driving forth of evill and the gaining of good spirits." Objectively, this subtle spirit streamed through all nature, as the spirit or very being of stars, mountains, rivers, trees, fountains, flowers, leaves, gems, metals, herbs, establishing between them wonderful affinities or a grand *signatura rerum*, bestowing on them occult properties, either medical or magical, and impressing on them by divine art in their curves, lines, colors, or spots a secret alphabet and written language. The stars in the heavens considered as points, when connected, made Hebrew letters, "these having," says Agrippa, "the greatest similitude with celestials and the world." This poetic and picturesque principle of magic, which made forests, fountains, and gardens, with the stars above, a literal library, was curiously set forth by Jacques Gaffarel in the *Curiositez inouyes* (Rouen, 1632). *Subjectively*, this astral light becomes in man the *intellectus illustratus*, or magic perceptive power, which, united to a transcendent will proceeding from illumination or penance, enabled him to grasp all the mysteries and power hidden in the divine life of nature. As certain gems, metals, etc. were virtually the same with certain planets or certain divine numbers or times (time itself being a form of divinity), all of them consisting of matter (*i. e.* a lower form of God), impressed by the same astral element, it followed that these gems especially, when marked at fit times with signs of the proper planets, spirits, names of God, etc., became amulets or charms which protected the bearer from disease, evil spirits, or death. Hence the endless charms, talismans, and written spells founded on the theo-magic philosophy. From learning to know, and from conferring with the spirits of nature by means of prayer, will, and communion with God, there was but a step to commune with the dead and call up their spirits by the art of necromancy, which was professed from the earliest times in the East. Good or harmless spirits were drawn by pleasant charms and ceremonies; the dark and evil powers were won by horrors, by midnight incantations among graves, with such disgusting spells as we read of in *Macbeth*.

When the *Tarot*, or infinite Spirit of God, or God in nature, was supposed to be in all things, with a reciprocal appreciative spirit in man, it was soon believed that inspired books concealed deep mysteries. This was the secret of the Cabbala, or "the mystical explanation of the Bible, the art of finding sense by the decomposition of words, and that of working miracles by virtue of these words pronounced in a particular way." This kind of magic probably existed in Egypt and India, and it was known to Pythagoras. The rabbis by means of it deduced universal categories of the spirit-world, which they classified according to the elements, the art of governing them by spells, that of making talismans, and all manner of magic, great and small. The names of God properly pronounced were the highest spells; among these *Agla* was greatly revered. The Cabbala was much studied in the fifteenth and sixteenth centuries in Europe; among its greatest expounders were Akiba, Philo, Avicenna, Raymond Lullius, Mirandola, Paracelsus, Reuchlin, H. More, Robert Fludd, Postel, and Knorr von Rosenroth. The Rosicrucians, an imaginary sect of magicians, in whose name many books were written, were an offshoot of the Cabbala, allied to the peculiar views of the alchemists and Christian mystics.

As magic embraced a mutual harmony of all that exists, it included good and evil. Hence, white or holy magic, and also black magic or sorcery, which works by the aid of demons. This latter was closely connected with witchcraft. Celestial magic was founded on prayer and communion with God, or mysticism. Natural magic is the art of working wonders simply by science—*e. g.* by mechanics or chemistry. Ceremonial magic is chiefly cabbalistical, and treats of raising spirits, exorcising, finding treasures, and consecrating talismans by reciting sacred formulas when in circles drawn at certain hours with the aid of peculiar perfumes. Works on this subject are innumerable; as a specimen the reader may consult the *Heptameron, or Magical Elements* of Peter di Abano, or the *Magus* of Francis Barrett (London, 1824). Sorcery involved many horrible iniquities; according to Philo and Eliphas Levi, some of the old Hebrew works of magic are enough to cause their writers to be execrated by all the world. Magic was a passion—we might say the principal study—in Egypt and Assyria; several papyri and cylinders in the British Museum treat of it. In Alexandria, from the second to the fourth century, where the relics of old Egypt combined with Neoplatonic doctrines and many strange sects, magic revived, as it did subsequently at Cairo in the ninth century under the Arabs. The Knights Templar are believed to have brought Oriental magic to the West. The Renaissance, as well as the Reformation, had its school of devotees to occult philosophy; and since the doctrine is essentially religious, the movement of Luther, which made religious discussion common to all, also popularized the study of magic, and books hitherto kept in Latin for the learned were now translated, so that everybody could raise the devil in his native tongue. The last grand revival of such studies took place with that of Masonry, Illumination, and the extraordinary fancies of the eighteenth century. The lives of Cagliostro and Casanova, the works of Pierre le Brun, of Lascaris, the Count de St. Germain, and the Marquis d'Argens throw much light on the follies of this period. As astrology and the Cabbala lost ground in popular faith, and witches and devils grew dim, magic took refuge in mesmerism, and more recently in its nearly related Spiritualism. As of old, its professors did not disdain to aid their sacred lore with marvels which modern science claims were mere juggling, as many of the miracles of our modern magicians from their very humble and useless nature appear to be principally based on "hankey-pankey." Among the im-

mense number of works on magic are—*Histoire et Traité des Sciences occultes*, by Count de Résie (Paris, 1857); *Histoire du Merveilleux dans les Temps modernes*, by Louis Figuier (Paris, 1860); *Réalité de la Magie*, by Collin de Plancy; *Von der alten und neuen Magie, Ursprung, Idee, Umfang und Geschichte*, by Horst (Mentz, 1820); *Curiosités des Sciences occultes*, by the Bibliophile Jacob (Paul Lacroix); *Dialogus in Magica Arte*, by Symphorien Champier (Lyons, 1506); *Le Entretiens du Comte de Gabalis, etc.*, by M. de Villars (Abbé de Montfaucon); *System of Magic*, by Defoe; the works of Delrio; *La Magie*, by L. F. Alfred Maury; *La Magie au XIX. Siècle*, by the Chevalier Gougenot; the *Clavis Solomonis*, by Rabbi Hawa (1714); *Trois Livres de Charmes*, by M. du Vair; *Bibliotheca Magica*, by Johann Geo. Th. Grässe (Leipsic, 1843); *Arcanes de la Vie future, Magie magnétique*, and other works, by M. Cahognet (Paris, 1848–56); *Sammlung der merkwürdigsten Visionen, etc.*, by Carl von Eckhartshausen (Munich, 1792); *Le Diable Rouge* (Paris, 1843); *Das Siebente Buch Mosis* (the common handbook of magic in Germany); *History of the Supernatural*, by William Howitt; J. Bodinus, *Demonomania* (Paris, 1501); Johannis Macarei *Abraxas;* a treatise on talismans, by Jean Chifflet (Antwerp, 1657); Johann Wierus, *De Præstigiis* (Frankfort-on-the-Main, 1566). C. G. LELAND.

Mag'ic Lan'tern, an optical instrument, invented by Anastasius Kircher (1602–80), which throws upon a screen magnified images of figures painted in transparent colors upon glass. This instrument, which, for a century or two after its invention, was nothing more than a philosophic toy, fulfilling no higher purpose than to amuse, has recently been made so important an auxiliary to public instruction in the lecture-room as to deserve, in its improved form, a particular description, for which see APPENDIX.

Magic Squares, arrangements of the terms of an arithmetical series in parallel and equal rows and columns, so that the sum of every continuous row, whether vertical, horizontal, or diagonal, may be the same. For convenience, the terms are commonly arranged in regularly celled geometrical squares. In some of these arrangements, the rows parallel to the diagonals, which, after running out at top or bottom, are resumed from the point immediately opposite, and continued to completion, give also the same sum as the diagonals themselves. Such rows may be called broken diagonals; and the squares which have this property possess the magical character in the highest degree, and may be distinguished as *perfect* magic squares, others being called *ordinary*. It is obvious that in any magic square the transfer of columns from side to side or of rows from top to bottom, and *vice versâ*, cannot affect the vertical or horizontal sums. By such transfers any broken diagonal may be made a true diagonal. In perfect squares these changes do not affect the magical character, but in ordinary squares they do so.

The subject of magic squares possesses a curious interest to the student of the properties of numbers, which has made it singularly fascinating to many minds. It has occupied the attention of numerous investigators, some of them men of high eminence. But the methods of construction invented by these writers, though manifesting in many instances great ingenuity, are none of them founded upon principles largely general, being apparently in most cases the results of tentative or empirical processes of inquiry. Special methods of construction may be multiplied almost to infinity; the aim of the present investigation is to discover the principles which such methods involve, and out of which their diversities naturally grow. The mode of treating the subject is original, and this circumstance may perhaps justify the devotion to it in this work of so large a space as is occupied by this article.

Magic squares seem to have been early known in the East, but their inventor and the date of their invention are alike unknown. The earliest writing on the subject in existence is a manuscript said now to belong to the National Library of France, the work of Emanuel Moschopulus, a Greek of the sixteenth century, which was translated

FIG. 1.

11	24	7	20	3
4	12	25	8	16
17	5	13	21	9
10	18	1	14	22
23	6	19	2	15

FIG. 2.

1	15	14	4
12	6	7	9
8	10	11	5
13	3	2	16

into Latin by the celebrated De la Hire and read by him before the Academy of Sciences of France in 1691. The foregoing are examples of the squares of Moschopulus, in the first of which the common sum is 65, and in the second, 34.

In these squares the series employed is the natural series, and the order the natural order. It should be observed, however, that any series of numbers in arithmetical progression will serve for this purpose as well as the natural series, and also that, under certain limitations and conditions to be mentioned later, the terms of such series may be permuted in their order without vitiating the result. But the discovery of the laws which must govern the processes of construction is much facilitated by employing in the first instance the natural series without permutation; and in what follows such a series, so arranged, is always to be understood, unless the contrary is expressly stated. It will contribute to clearness to present, before proceeding further, a few preliminary explanations and definitions.

The series of natural numbers from 1 to n^2 (n representing any integral number whatever) is made up of n subordinate series, each composed of n terms, each term of each succeeding series being greater than the corresponding term of the series preceding by n units. In other words, the series 1 to n^2 consists of the series 1 to n repeated n times, every term at each repetition having an added *constant*, these successive constants increasing by the common difference n, from zero to n multiplied by $n-1$. This proposition is illustrated generally and specially in the following diagrams:

FIG. 3. Square of n.

$$\begin{array}{l}
1+0,\ 2+0,\ 3+0\ \ldots n+0=n.\\
1+n,\ 2+n,\ 3+n\ \ldots n+n=2n.\\
1+2n, 2+2n, 3+2n\ldots n+2n=3n.\\
1+3n, 2+3n, 3+3n\ldots n+3n=4n.\\
\ldots\ldots\ldots\ldots\\
\ldots\ldots\ldots\ldots
\end{array}$$

FIG. 4. Square of 5.

$$\begin{array}{l}
1+0, 2+0, 3+0, 4+0, 5+0,\\
1+5, 2+5, 3+5, 4+5, 5+5,\\
1+10, 2+10, 3+10, 4+10, 5+10,\\
1+15, 2+15, 3+15, 4+15, 5+15,\\
1+20, 2+20, 3+20, 4+20, 5+20.
\end{array}$$

$$1+(n-1)n, 2+(n-1)n, 3+(n-1)n \ldots n+(n-1)n=n^2.$$

For facility of reference the several subordinate series may be called *grades;* the constants, 0, n, $2n$, etc., *grade-bases;* the simple series 1 to n, the *elementary series;* and the series of constants, the *basic series*. It will be seen that when, as above, the grades are arranged horizontally, the elementary series increases horizontally, the basic series increasing at the same time vertically; in other words, that the directions of increase of the two are necessarily normal to each other. In what follows, it is assumed that the ordinary rules relating to arithmetical progressions are known.

Putting then Σ for the symbol of summation, E for the elementary series, B for the basic series, and S for the sum of any single row or column of the magic square, we shall have

$$\Sigma[1, 2, 3 \ldots n^2]=n.\Sigma[1, 2, 3 \ldots n]+n.\Sigma[0, n, 2n \ldots (n-1)n]= n.\mathrm{E}+n.\mathrm{B}. \quad (1)$$

Hence $$\mathrm{S}=\frac{1}{n}\Sigma[1, 2, 3 \ldots n^2]=\mathrm{E}+\mathrm{B}=\tfrac{1}{2}(n^2+n)+\tfrac{1}{2}(n^3-n^2)= \tfrac{1}{2}(n^3+n). \quad (2)$$

And consequently any square will be magic which has every term of E and every term of B in every vertical, horizontal, and diagonal line. Furthermore, no square will be magic in which any term of E or any term of B is repeated in any line, unless there be repetition in the same line of some other term or terms of the same series, in such manner as to produce a compensatory effect.

Now, if in any square of n^2 vacant cells we enter successively in their order the terms 1 to n of the first grade, in such manner that no term entered shall be in the same line, vertical, horizontal, or diagonal, with any term previously entered, it is manifest that the first grade-base (0) will be found once in every such line, and will not be repeated in any. That this is always practicable with any *one* of these systems of lines (vertical, horizontal, or diagonal—the broken diagonals being taken along with the entire to form a system) is self-evident, since each such system contains as many lines as the number of terms in the grade and no more. It is equally evident that it is also simultaneously practicable with the system rectangularly co-ordinate to this; that is to say, it is practicable at once, whatever n may be, with the vertical and horizontal, or with the two diagonal systems, but not necessarily so in every case with both these co-ordinate systems at the same time. Trial will show, however, and it will be presently demonstrated, that the arrangement proposed can always be made with reference to all the systems, whenever n is a prime number greater than 3; and also when n is composite, provided it does not embrace either 2 or 3 among its component prime factors. The terms of the first grade having been entered, those of the second, third, etc. may be entered in like manner, beginning in each instance with any unoccupied cell, and preserving between the successive terms the same geometrical relations as in the first grade; and when all have been entered, every term of the basic series will be found in every line of every system, vertical, horizontal, or diagonal. Moreover, if, instead of beginning

with each succeeding grade in a cell selected at random, we place the first or leading term of such grade in a cell which is not in line in any manner with the leading term of any grade previously entered, it is obvious that every term of the elementary series, as well as every term of the basic, will be found in every vertical, horizontal, and diagonal line. This too will be practicable whenever n is prime, or when it is composite without containing either of the prime factors 2 or 3. When either of these two factors is present, however, some terms of one or both series will be repeated in one or more systems of lines, and the square will only be magic in case such repetitions are compensatory. We find here a characteristic difference which suggests the first and most general classification of magic squares according to their structure as follows:

Class I. Squares in which every term of the elementary series and every term of the basic series occurs in every line of terms however taken.

Class II. Squares in which terms of the elementary series, or of the basic series, or of both, are repeated in some lines, in such manner that the repetitions are compensatory.

Squares of the first class are necessarily perfect; those of the second can only be so when compensation takes place in all the lines in which repetition occurs. Perfect squares can be constructed upon all numbers except those in which 2 is a factor, and a factor once only. If 2 is repeated as a factor in n, or if $n=4m$, the square of n can be made perfectly magical.

From the foregoing explanation of the principle which must govern the construction of squares of the first class, it will be obvious that the arrangement of the terms of such squares admits of large variation. As an example, one of the possible varieties of form of a perfect square on the number 11 is given in Fig. 5. In order to make the governing terms conspicuous, those of the first grade, which in this relation we may call the *primitive* series, are printed in heavy *italic* type, and the leading terms of the following grades are enclosed within heavy lines.

Fig. 5.

1	17	49	62	101	113	32	97	37	88	74
106	112	25	98	42	81	77	***8***	**12**	50	60
43	86	70	***11***	19	**45**	61	104	117	24	91
22	52	**56**	105	115	29	90	36	87	75	***4***
116	27	95	35	80	76	***9***	15	55	63	**100**
79	69	***10***	20	48	66	107	**111**	28	93	40
53	59	110	118	**23**	94	38	84	68	***3***	21
30	**89**	39	82	73	***2***	14	54	64	103	121
71	***7***	13	47	65	108	114	33	96	**34**	83
58	109	119	26	99	41	**78**	72	***5***	18	46
92	44	85	**67**	***6***	16	51	57	102	120	31

To construct squares, however, with no guidance but this general principle, involves the necessity of study for the placing of each governing term, and is therefore tedious, besides being attended with some liability to error. It is on this account desirable to devise some practical method by which the construction may be reduced to a mechanical process capable of being rapidly executed. The variety of such possible methods is very great, but they are all deducible from certain general formulæ which will presently be given, and all rest on a well-known property of numbers, which may be thus stated:

If the consecutive multiples of any integral number, a, by the terms of the natural series, 1, 2, 3 . . . . n, viz. a, $2a$, $3a$ . . . na, be successively divided by n (itself also integral and prime to a) there will be obtained a series of integral remainders having every value less than n from $n-1$ to 0, without any repetition; and if the division be carried beyond na to the multiples $(n+1)a$, $(n+2)a$, etc., the same series of remainders will recur in the same order as before. These remainders, in fact, constitute an arithmetical progression, of which the first remainder is the common difference, subject to the condition that when any term exceeds n, it shall be reduced by the subtraction of n.

Let therefore the positions of the terms of the series 1 to n, as placed in the square of n^2 cells, be governed by a system of co-ordinates uniformly increasing—horizontally by the common difference a, and vertically by the common difference b—any terms which may stray beyond the limits of the square being brought back within those limits by deducting n units from either or both the co-ordinates.

Take as the origin of such co-ordinates, or the zero cell, the cell exterior to the square diagonally contiguous to the upper left-hand corner. Let x and y represent the horizontal and vertical co-ordinates respectively, and let the first term of the series be placed in any cell at pleasure, of which the co-ordinates h and k are known. The co-ordinates of the successive terms to the nth, which is the end of the first grade, will then be,

$$x=h, \quad \frac{1}{n}(h+a)_r, \quad \frac{1}{n}(h+2a)_r, \quad \frac{1}{n}(h+3a)_r \ldots \frac{1}{n}(h+(n-1)\,a)_r. \qquad (3)$$

$$y=k, \quad \frac{1}{n}(k+b)_r, \quad \frac{1}{n}(k+2b)_r, \quad \frac{1}{n}(k+3b)_r \ldots \frac{1}{n}(k+(n-1)\,b)_r, \qquad (4)$$

in which the subscript r denotes the remainder left after dividing by n.

The $(n+1)$st term of the general series will be the leading term of the second grade, and its co-ordinates

$$\frac{1}{n}(h+na)_r, \quad \frac{1}{n}(k+nb)_r, \qquad (5)\ (6)$$

will evidently be h and k, or those of the first term of the first grade. Without a new departure, therefore, the second grade would follow the track of the first, and its terms would fall into the same cells. We take such new departure by placing the leading term of the second grade in some unoccupied cell of which the co-ordinates may be made

$$\frac{1}{n}(h+a')_r, \quad \frac{1}{n}(k+b')_r. \qquad (7)\ (8)$$

The leading term of the third grade will then properly be determined in position by the co-ordinates,

$$\frac{1}{n}(h+2a')_r, \quad \frac{1}{n}(k+2b')_r, \qquad (9)\ (10)$$

and so on. These leading terms will thus form a series which may be called the *leading series*, of which the terms are placed by a system of co-ordinates resembling entirely in literal form, but not in the value of the increments, that of the primitive system. In referring to these two systems, the letters P and L will be employed to represent them respectively. It is obvious that, with definite values assigned to the increments a, b, a', b', the terms of a series may by their guidance be rapidly entered into the cells of a square. What limitations or conditions should control the selection of such values in order that the terms of P and L may not interfere, and in order that the resulting square may be perfectly or imperfectly magic, must be determined by further analysis.

First, in regard to interference. By this is meant the falling of different terms into the same cells. There are two kinds of interference possible; first, the terms of the series P, or of the series L, may interfere with each other; and secondly, the terms of P may interfere with those of L. All combinations of values of the increments a, b, a', and b', which lead to such interferences are unavailable in forming magic squares. It is self-evident that interference of the first description cannot occur in the series P when n is prime to a and b; nor in the series L, when n is prime to a' and b'. But if a, b, and n, or a', b', and n, have a common factor, then such interference will occur, as is manifest from the following:

Put μ to represent the common factor, and make $a=\alpha\mu$; $b=\beta\mu$; $n=\mu\nu$. Then the co-ordinates of the $(\nu+1)$st term of the series P will be,

$$x=h+\alpha\mu\nu=h+\alpha n=h.\ (11), \quad y=k+\beta\mu\nu=k+\beta n=k.\ (12)$$

In other words the $(\nu+1)$st term will fall into the same cell as the first, the $(\nu+2)$d into the same cell as the second, and so on. And so also of the series L, if a', b', and n are commensurable. It should be observed, however, that of the pairs a and b, a' and b', *one* of the members of either may have a common factor with n without interference, though both may not.

In order to investigate the possibilities of interference between the terms of the two series, assume T to represent the number, in regular sequence from the beginning, of the first interfering term of L, and t the number in like manner of the term of P with which T interferes. Then, as the first term of the general series is common to both, $T-1$ will be the interval from the beginning at which the first interference will take place. And,

$$(T-1)a'-(t-1)a=m_1 n; \qquad (13)$$

$$(T-1)b'-(t-1)b=m_2 n; \qquad (14)$$

whence,

$$T-1=\frac{(am_2-bm_1)n}{ab'-a'b}; \ (15) \qquad t-1=\frac{(a'm_2-b'm_1)n}{ab'-a'b}. \ (16)$$

By giving to the indeterminates m_1 and m_2 in (15) the values $m_1=a'$ and $m_2=b'$, the fractional coefficient of n becomes unity, and $T-1=n$, or $T=n+1$; and in (16), by making $m_1=-a$ and $m_2=-b$, $t-1=n$, or $t=n+1$; that is to say,

there will in all cases be interference in the $(n+1)$st term, which is the first term of a succeeding grade and is of no consequence. Also in (15), if $m_1=a$ and $m_2=b$, $\mathrm{T}-1=0$, showing that there is interference or coincidence in the first term; which is true by hypothesis, and is equally of no consequence. If there is interference anywhere between these extremes, there must be an integral value of $\mathrm{T}-1$ greater than zero and less than n, which self-evidently can only be true in case the fractional coefficient of n is less than unity, and n itself is composite. If a and b are prime to each other, the numerator may be made to have any numerical value by properly substituting for the indeterminates. If they have a common factor, the numerator may be made any multiple of that common factor, and the denominator will be a multiple of the same factor. It has been seen above to be inadmissible that a, b, and n should all have a common factor; but n may possibly have a common factor with the denominator, in which case it must be a different factor from that which is common to denominator and numerator. Suppose, then, that $n=\mu\nu$, and that μ is also a factor in the denominator; also that γ is the factor common to a and b; and κ a third factor prime to one or both of these. We may then have—

$$\mathrm{T}-1=\frac{\kappa\gamma.\mu\nu}{\kappa\gamma\mu}=\frac{\kappa\gamma}{\kappa\gamma}.\nu=\nu, \tag{17}$$

or interference will occur after an interval which is numerically the quotient of n divided by the factor common to it and the denominator. If $\mu=n$, $\nu=1$; that is to say if the denominator is a multiple of the root of the square, interference will take place in every term. If $\gamma=1$ and $\kappa=1$, while $\mu=n$, the root of the square is itself the denominator. Combinations which lead to these results are therefore unsuited to form magic squares.

It may be added that we must not take simultaneously $a=b$ and $a'=b'$, since in such case expressions (13) and (14) give necessarily $m_1=0$, $m_2=0$, and expressions (15) and (16) become

$$\mathrm{T}-1=\tfrac{0}{0};\quad t-1=\tfrac{0}{0}; \qquad (18)\ (19)$$

of which the mathematical significancy is that any value whatever will satisfy the equation, or that interference is continual. Nor may we take $a+b=n$ and $a'+b'=n$, at the same time; for in this case $b=n-a$ and $b'=n-a'$, whence (5), (6),

$$\mathrm{T}-1=\frac{a(m_2+m_1)-m_1n}{(a-a')n}n; \tag{20}$$

$$t-1=\frac{a'(m_2+m_1)-m_1n}{(a-a')n}n; \tag{21}$$

in which the denominator is a multiple of n.

But if a and a' are both prime to n, and n is odd, there may be taken at once $a=b$ and $a'+b'=n$, or *vice versâ*; for (15) and (16) then become

$$\mathrm{T}-1=\frac{a(m_2-m_1)}{an-2aa'}n; \tag{22}$$

$$t-1=\frac{a'(m_2+m_1)-m_1n}{an-2aa'}n; \tag{23}$$

in which the denominator cannot be commensurable with the root of the square.

We have next to consider the character of the squares formed with given values of the increments. Assume p to express the place in numerical order of any term of the general series in its own grade, as first, second, etc.; q to denote the number of the grade; and give to x, y, h, and k the significancy already assigned them. Then, the co-ordinates of the term corresponding to p and q will be,

$$x=\frac{1}{n}\Big(h+(p-1)a+(q-1)a'\Big)_r; \tag{24}$$

$$y=\frac{1}{n}\Big(k+(p-1)b+(q-1)b'\Big)_r; \tag{25}$$

which, for convenience, may be written,

$$x=h+(p-1)a+(q-1)a'-m_1n; \tag{26}$$

$$y=k+(p-1)b+(q-1)b'-m_2n; \tag{27}$$

the indeterminates m_1 and m_2 being taken of such value that neither co-ordinate shall be less than 1, or greater than n. From the foregoing we deduce

$$p=\frac{b'(x-h)-a'(y-k)+(b'm_1-a'm_2)n}{ab'-a'b}+1; \tag{28}$$

$$q=\frac{a(y-k)-b(x-h)+(am_2-bm_1)n}{ab'-a'b}+1. \tag{29}$$

And if N be the numerical value of the term to which p and q belong, we shall have,

$$\mathrm{N}=p+(q-1)n. \tag{30}$$

These expressions for p and q must be integral for every possible value of x and y, in order that the square may be possible. The indeterminate co-efficients $b'm_1-a'm_2$, and am_2-bm_1 may be varied so as to make the expressions integral in every case except that in which n has a common factor with the denominator; and as this denominator $ab'-a'b$ is the same as in the expressions (15) and (16), this case has been already excluded and need not be considered. The case is also excluded in which n has a common factor with a and b, or with a' and b' [(11) and (12)]. But the joint value of the first and second terms in either of the numerators (28) or (29) may admissibly have a common factor with n; and in such case the same factor will remain in the integrated value of the fraction. The effect of this upon the structure of the square, as will be seen hereafter, is rather important. The truth of the proposition may be shown as follows: Let $n=\mu\nu$, and for simplicity let the joint value of the first and second terms of either numerator (28) or (29) be expressed by $\kappa\mu$, the common factor being μ. Put the denominator $=\lambda$, and the indeterminate co-efficient of $n=m$. Then,

$$p, \text{ or } q=\frac{\kappa\mu+m\mu\nu}{\lambda}=\frac{\kappa+m\nu}{\lambda}\mu. \tag{31}$$

Here the fractional part is evidently integrable independently of μ, and its value must be multiplied by μ to give p or q.

Now if in (28) and (29) we make $x=h$ and $y=k$, the numerators of the literal fractions become zero, and we have $p=1$, $q=1$, and therefore $\mathrm{N}=1$; which accords with the original hypothesis that h and k are the co-ordinates of the first term of the series. If in (28) we put $y=k$, and $x=h+1$, $h+2$, etc. successively, the successive values of p (omitting for convenience the indeterminate term, which is always to be understood) will be,

$$p=\frac{b'}{ab'-a'b}+1;\ p'=\frac{2b'}{ab'-a'b}+1;\ p''=\frac{3b'}{ab'-a'b}+1,$$

and so on, (32)

showing that the values of p in the direction of x form an arithmetical series, of which the common difference is

$$\Delta p_x=\frac{b'}{ab'-a'b}. \tag{33}$$

In like manner, in the direction of y, the values of p form a series, having the common difference

$$\Delta p_y=\frac{-a'}{ab'-a'b};\ \text{or to make it positive, }=\frac{n-a'}{ab'-a'b}. \tag{34}$$

The values of q form similar series with the common differences,

$$\Delta q_x=\frac{n-b}{ab'-a'b};\ \Delta q_y=\frac{a}{ab'-a'b}. \qquad (35)\ (36)$$

For the diagonal direction, between x and y from the origin (which we shall call the *direct* diagonal), we shall have

$$\Delta p_{xy}=\frac{b'-a'}{ab'-a'b};\ \Delta q_{xy}=\frac{a-b}{ab'-a'b}. \qquad (37)\ (38)$$

And for the *transverse* diagonal, joining the extremities of the ordinates $x=n$, $y=n$,

$$\Delta p_{-xy}=\frac{b'+a'}{ab'-a'b};\ \Delta q_{-xy}=\frac{-a-b}{ab'-a'b}. \qquad (39)\ (40)$$

The negative sign prefixed to the subscript index, xy, in these formulæ, denotes that, in the direction of this diagonal, one of the co-ordinates is diminishing and the other increasing. We suppose x to increase, and place the *diminishing* ordinate *last*. The distinction will have more importance in treating, further on, of magic cubes. In general, when the numerical values of the symbols are substituted in the formulæ, the expressions are not immediately integral. In order to make them so, the omitted indeterminate multiple of n must be restored. These differences give the law of progression both of the elementary and of the basic series in every direction in the square; and it is evident that, if they are all prime to n, every term of E and every term of B will be found in every line; and that the resulting square will be a square of the first class.

If in any case the denominator $ab'-a'b$ exceeds n, it will simplify the numerical operation of integration to replace it by the remainder left after subtracting n as often as possible. For in this case,

$$\Delta=\frac{\kappa+m_1n}{\lambda+m_2n};\ \text{or } \kappa+m_1n=\Delta\lambda+\Delta m_2n; \tag{41}$$

whence $\kappa+(m_1-\Delta m_2)n=\Delta\lambda$; or $\kappa+m_3n=\Delta\lambda$,

and
$$\Delta=\frac{\kappa+m_3n}{\lambda}=\frac{\kappa+m_1n}{\lambda+m_2n}. \tag{42}$$

It appears from (37) and (38) that the differences in the line of the direct diagonal of the series E will be either zero or n (which is practically the same thing) in case $a' = b'$; and those of the series B, in case $a = b$. And from (39) and (40) it appears that the same will be true in case $a' + b' = n$, or $a + b = n$. This indicates an arrangement of the terms such as that of Figs. 3 and 4, supposing the columns which are there vertical to have the diagonal direction. By inspection of those figures it will be seen that the differences are zero for the series E in one direction (the vertical in that arrangement) and for the series B in the transverse direction. The several rows sum up unequally in either direction, and if 2 is a factor in n, no one of the rows will give a sum equal to S. But when n is odd, the middle row in each direction gives such a sum; and if, when these rows are diagonally directed, as indicated in (37), (38), (39), and (40), they are brought into the position of the entire diagonals, the square will be an ordinary magic square of the second class. Such an arrangement may be effected by giving to h and k the values obtained from the following equations:

$$h = \tfrac{1}{2}(n+1) - \tfrac{1}{2}(n-1)(a + a') + m_1 n; \qquad (43)$$
$$k = \tfrac{1}{2}(n+1) - \tfrac{1}{2}(n-1)(b + b') + m_2 n; \qquad (44)$$

assigning to m_1 and m_2 such values as to make the expressions positive. The effect of this is to bring the middle term of the general series $(=\tfrac{1}{2}(n^2+1))$ to the central cell of the square.

If in any one of the formulæ (33) to (40) the numerator has a factor common to it with n, the case occurs which is shown in (31), and the integrated value of the fraction will contain the same factor. In this case there will be a rhythmic or periodical recurrence of certain terms of the series (E or B) to which the given difference belongs, and the resultant square, if magical, cannot belong to the first class. The recurring terms which are continually repeated in the same order form a cycle of which the component terms are distant from each other in the natural series by as many places as there are units in the common factor, and the number of terms is equal to the quotient of n divided by the same common factor. Thus if $\Delta = \kappa\mu$ and $n = \mu\nu$, the cycle will be composed of ν terms separated from each other in the natural series by μ places. These terms, if $\kappa = 1$, will follow each other in the regular order of increase; otherwise the order will be more or less permuted. The terms excluded from this cycle will form other cycles in lines parallel to it, so that there will be μ cycles having ν terms in each. The terms of these different cycles necessarily sum up unequally; but except when 2 is a factor in n, there will always be one series of cycles which sums up equal to $\Sigma(p)$ or $\Sigma(q)$; and it will presently be seen that, by permuting the order in which the terms of the series P, or of the series L, or of both, are entered in the square, all the cycles may be made of equivalent value. Cycles thus formed will be called in what follows *forced* or *artificial* cycles, in contradistinction to those formed in employing the natural order, which latter may be denominated *natural* cycles. If the terms are entered without permutation, no square can be perfectly magic in which any one of the increments a, b, a', b' is commensurable with n; but when permutation is employed this difficulty may be made to disappear. To this subject we shall presently return. But it should here be noticed that since, in the numerators of the expressions (33) to (40) there occur severally all the increments a, b, a', b', and also the sum and the difference of each pair, it will inevitably be the case that one or more of these numerators will be divisible by 2, and one or more also either divisible by 3 or zero. Hence no square of the first class can be formed on any number in which 2 or 3 is a factor.

Combinations of increments which lead to natural cycles will only produce magic squares in case the series of cycles whose sums equal $\Sigma(p)$ or $\Sigma(q)$ are brought into the position of the entire diagonals; and then the squares will be ordinary. This arrangement can be effected with the cycles of both classes, if both are present; since the directions of increase of E and B are normal to each other. To find the terms composing these particular cycles, put $n = \mu\nu$, and let Δ, the difference which has a factor common with n, be $= \kappa\mu$. There will be μ cycles with ν terms in each; and if ζ be the initial term of the cycle sought, we shall have

$$\nu\zeta + \tfrac{1}{2}(\kappa\mu\nu^2 - \kappa\mu\nu) = \frac{1}{2\mu}(\mu^2\nu^2 + \mu\nu). \qquad (45)$$

Whence,

$$\zeta = \tfrac{1}{2}(\kappa\mu + 1 - (\kappa - 1)\mu\nu) = \tfrac{1}{2}(\kappa\mu + 1 - (\kappa - 1)n). \quad (46)$$

The successive terms of the cycle of values of p or q will then be $\zeta + \kappa\mu$, $\zeta + 2\kappa\mu$, $\zeta + 3\kappa\mu$, and so on; in which κ may have, in different cases, any value from 1 to $\nu - 1$. When ζ has been found, its cycle may be brought into the required position by means of equations (43) and (44); but if there are cycles only in one series (say the series E) and in one direction and not in the direction at right angles to this, any term of the cycle may be placed in any cell of the diagonal to which it belongs, and the ordinates h and k of the initial term may be found from equations (26) and (27), putting the co-ordinates of the cell in place of x and y, the numerical value of the term in place of p, and giving to q any value at pleasure. Such a case occurs in the square of 35 (5×7) with $a = 13$, $b = 1$, $a' = 1$, $b' = 4$, in which $\Delta p_{-xy} = 20$ and $\kappa = 4$, giving $\zeta = 28$; whence, in the transverse diagonal,

Cycle E = 28, 13, 33, 18, 3, 23, 8.

If the term 3, for instance, is put into the fourth cell of the transverse diagonal, we shall have $x = 32$, $y = 4$, $p = 3$, and $q =$ any value at pleasure—say 26. Then from (26) $h = 16$, and from (27) $k = 7$. And the term occupying the selected cell, found from (30), will be 878. If there are cycles in transverse directions, but an elementary only in one and a basic in the other, the process last described may be still employed, giving to p and q in the equations the numerical value of any terms in their several cycles; but the cell employed must be the central cell of the square. We may derive an example of this also from the square of 35, putting $a = 1$, $b = 4$, $a' = 16$, $b' = 6$, which will give $\Delta p_{xy} = 5$ and $\Delta q_{xy} = 20$. Here $\kappa = 1$ and $\kappa' = 4$; whence $\zeta = 3$ and $\zeta' = 28$, and the cycles are

Cycle E = 3, 8, 13, 18, 23, 28, 33; Cycle B = 28, 13, 33, 18, 3, 23, 8.

We may therefore put p and q equal to any of the numbers in cycles E and B respectively, but x and y must each be put $= \tfrac{1}{2}(n+1) = 18$. If there are cycles of the same kind (elementary or basic) in both directions, they cannot both be formed on the same difference; if one, for example, is formed on the difference μ, when $n = \mu\nu$, the other must be formed on the difference ν. These two cycles, since they intersect each other, must have a common term; and that term must be placed in the central cell of the square. The square of 35 may again be taken as an illustration, with $a = 1$, $b = 2$, $a' = 6$, $b' = 1$, giving two cycles in the series E, one on the difference 5 and the other on the difference 7. Here we have $\Delta p_{xy} = 10$, $\Delta p_{-xy} = 28$, $\kappa = 2$, and $\kappa' = 4$, which give $\zeta = 23$ and $\zeta' = 32$; and the cycles are

Direct cycle E = 23, 33, 8, 18, 28, 3, 13; Transverse cycle E = 32, 25, 18, 11, 4.

The common term is 18, which must be placed in the central cell of the square. If n has but two component factors, there can be four systems of cycles, an elementary and a basic on the difference μ, and an elementary and a basic on the difference ν. The *species* of cycles, however, are two only. But if the component factors of n are more numerous, there may be cycles of three or four different species. Thus suppose n to be composed of the factors 5, 7, 11, and 13; then if $a = 12$, $b = 1$, $a' = 6$, $b' = 1$, there will be cycles of the series E on the differences $6 + 1$, and $6 - 1$ (7 and 5); and cycles of B on the differences $12 + 1$, and $12 - 1$ (13 and 11). The side of such a square would be 5005. As no one would think of constructing it, the proposition has only a theoretic interest.

From what precedes, we are able to state the conditions under which squares of the first class may be formed by means of uniformly increasing co-ordinates as follows:

1. The increments of increase of the co-ordinates must in every case be prime to the root of the square; and the same must be true of the sum and of the difference of the increments of each pair.

2. The difference of the products formed by cross-multiplication of the two pairs of increments must not be equal to the root of the square, nor commensurable with it, nor zero.

It follows from the first specification above that neither pair of co-ordinate increments may have zero for their difference nor the root of the square for their sum.

These conditions may be fulfilled in a variety of ways with every number which does not embrace 2 or 3 among its component factors, the variety increasing with the magnitude of the number, if prime, or that of its component factors if composite. Disregard of the conditions may result either in failure to produce a magic square at all, or in the production of an imperfect or ordinary square. The second of the specifications is, as we have seen, indispensable for squares of either class. And, assuming the terms of the successive grades to be entered in the natural order, that portion of the first specification which requires that the increments of increase taken severally shall be prime to the root of the square, is equally indispensable; but the sum or the difference of one or both pairs may have a common factor with n, or the sum of a pair may be equal to n, or the difference of a pair may be zero, without making it impossible to render the square

magical; only that, in these cases, it will be an imperfect or ordinary and not a perfect magic square. The case may occur in which only one sum or one difference may have a common factor with n, or in which one difference may be zero or one sum may equal n. In this case the sums of the diagonal lines (whole and broken) may be equal in one direction and unequal in the transverse direction, giving the square a character which may be called one-sidedly imperfect. Illustrations of the varieties above mentioned will be found in Figs. 6, 7, 8, and 9 which precede. The values of h and k for all the imperfect squares have been determined from the equations (43) and (44); for the perfect square they have been both taken $=1$, but the initial term may be placed in any cell at pleasure.

Fig. 6.

$a=2,\ b=3,\ a'=4,\ b'=5,$
$\Delta p_x=3,\ \Delta q_x=7,\ \Delta p_y=2,\ \Delta q_y=10,$
$\Delta p_{xy}=5,\ \Delta q_{xy}=6,\ \Delta p_{-xy}=1,\ \Delta q_{-xy}=8.$

1	81	40	120	68	27	107	66	14	94	53
113	72	31	100	59	18	98	46	5	85	44
104	63	22	91	50	9	78	37	117	76	24
95	54	2	82	41	121	69	28	108	56	15
86	34	114	73	32	101	60	19	99	47	6
77	25	105	64	12	92	51	10	79	38	118
57	16	96	55	3	83	42	111	70	29	109
48	7	87	35	115	74	33	102	61	20	89
39	119	67	26	106	65	13	93	52	11	80
30	110	58	17	97	45	4	84	43	112	71
21	90	49	8	88	36	116	75	23	103	62

Perfect.

Fig. 7.

$a=7,\ b=4,\ a'=5,\ b'=5,\ h=1,\ k=5,$
$\Delta p_x=4,\ \Delta q_x=10,\ \Delta p_y=7,\ \Delta q_y=10,$
$\Delta p_{xy}=0,\ \Delta q_{xy}=9,\ \Delta p_{-xy}=8,\ \Delta q_{-xy}=11=0.$

50	43	25	18	11	114	107	89	82	75	57
35	28	21	3	117	110	92	85	67	60	53
31	13	6	120	102	95	88	70	63	45	38
16	9	112	105	98	80	73	66	48	41	23
1	115	108	90	83	76	58	51	44	26	19
118	100	93	86	68	61	54	36	29	22	4
103	96	78	71	64	46	39	32	14	7	121
99	81	74	56	49	42	24	17	10	113	106
84	77	59	52	34	27	20	2	116	109	91
69	62	55	37	30	12	5	119	101	94	87
65	47	40	33	15	8	111	104	97	79	72

Imperfect.

Fig. 8.

$a=1,\ b=3,\ a'=6,\ b'=5,\ h=4,\ k=10,$
$\Delta p_x=3,\ \Delta q_x=7,\ \Delta p_y=3,\ \Delta q_y=5,$
$\Delta p_{xy}=6,\ \Delta q_{xy}=1,\ \Delta p_{-xy}=11=0,\ \Delta q_{-xy}=2.$

9	78	37	117	76	24	104	63	22	91	50
56	15	95	54	2	82	41	121	69	28	108
114	73	32	101	60	19	99	47	6	86	34
51	10	79	38	118	77	25	105	64	12	92
109	57	16	96	55	3	83	42	111	70	29
35	115	74	33	102	61	20	89	48	7	87
93	52	11	80	39	119	67	26	106	65	13
30	110	58	17	97	45	4	84	43	112	71
88	36	116	75	23	103	62	21	90	49	8
14	94	53	1	81	40	120	68	27	107	66
72	31	100	59	18	98	46	5	85	44	113

One-sidedly imperfect.

Fig. 9.

$a=4,\ b=1,\ a'=7,\ b'=2,\ h=6,\ k=2,$
$\Delta p_x=2,\ \Delta q_x=14,\ \Delta p_y=8,\ \Delta q_y=4,$
$\Delta p_{xy}=10,\ \Delta q_{xy}=3,\ \Delta p_{-xy}=9,\ \Delta q_{-xy}=10.$

28	15	212	199	186	173	160	147	134	106	93	80	67	54	41
81	68	55	42	29	1	213	200	187	174	161	148	135	107	94
149	121	108	95	82	69	56	43	30	2	214	201	188	175	162
202	189	176	163	150	122	109	96	83	70	57	44	16	3	215
45	17	4	216	203	190	177	164	136	123	110	97	84	71	58
98	85	72	59	31	18	5	217	204	191	178	165	137	124	111
151	138	125	112	99	86	73	60	32	19	6	218	205	192	179
219	206	193	180	152	139	126	113	100	87	74	46	33	20	7
47	34	21	8	220	207	194	166	153	140	127	114	101	88	75
115	102	89	61	48	35	22	9	221	208	195	167	154	141	128
168	155	142	129	116	103	90	62	49	36	23	10	222	209	181
11	223	210	182	169	156	143	130	117	104	76	63	50	37	24
64	51	38	25	12	224	196	183	170	157	144	131	118	105	77
132	119	91	78	65	52	39	26	13	225	197	184	171	158	145
185	172	159	146	133	120	92	79	66	53	40	27	14	211	198

Fig. 9 is an example of a square imperfect in consequence of the occurrence of cycles in its diagonals. There are four cycles, two in the series E and two in the series B, as follows: Direct cycle E = 13, 8, 3; direct cycle B = 2, 5, 8, 11, 14; transverse cycle E = 5, 14, 8, 2, 11; transverse cycle B = 13, 8, 3.

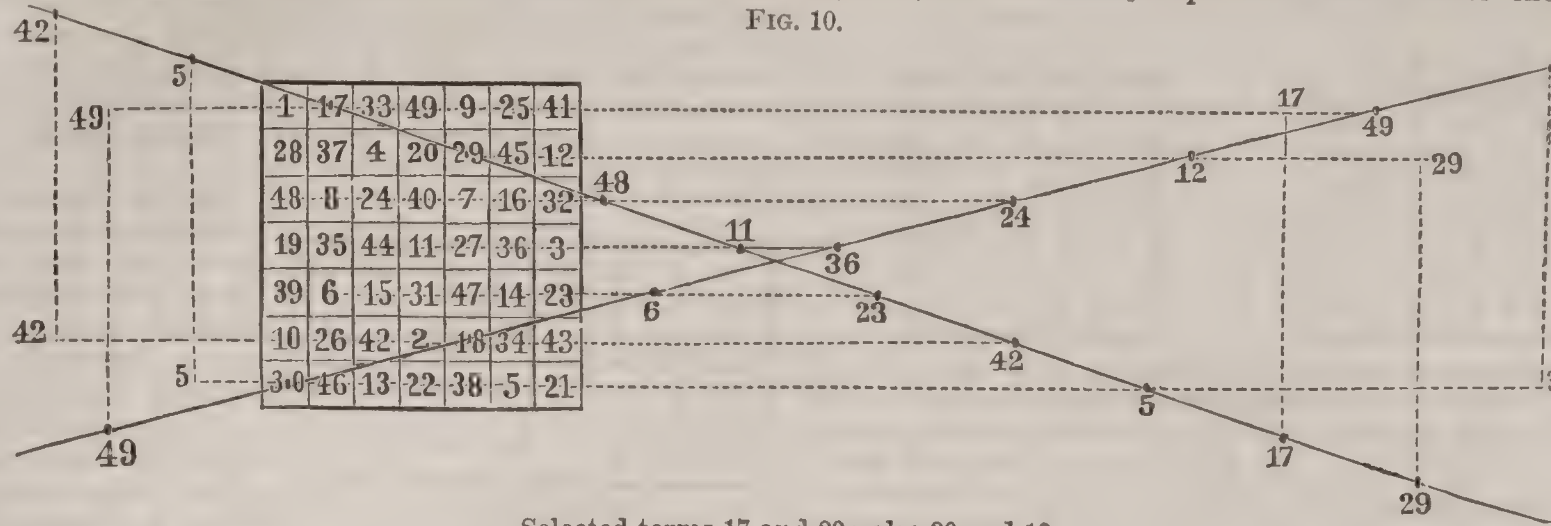
It will now be perceived that the odd-numbered square of Moschopulus (Fig. 1), and others of its kind, of which the law was probably discovered empirically, or without any far-reaching method of research, belong to a class of squares imperfectly magical, in which $a=b=b'=1$, $a'=n-1$, and h and k, determined by equations (43) and (44), have the values $\frac{1}{2}(n+1)$, and $1+\frac{1}{2}(n+1)$ respectively.

It is a curious property belonging to every perfect magic square, that if any two terms for which both p and q are different are selected, no matter how situated in such a square, and a straight line be drawn through the centres of the cells containing them, and if upon this line prolonged there be measured off from one of these centres successive distances equal to the distance between them, and to the points of intersection there be transferred from the square the terms whose co-ordinate distances from such points are zero, n, or multiples of n, then any n consecutive terms so transferred will give a sum equal to S. Or if the co-ordinates of one of the selected terms referred to the other as the origin be α and β, then the n terms whose successive co-ordinates referred to the same origin are $x=0,\ \alpha,\ 2\alpha,\ 3\alpha \ldots\ldots (n-1)\alpha$; and $y=0,\ \beta,\ 2\beta,\ 3\beta \ldots\ldots (n-1)\beta$, will give a sum equal to S. Fig. 10 on the following page illustrates this statement.

Permutation. The principle on which the construction of squares of the first class depends, makes it evident that the certainty of the result is independent of the order in which the terms of the several grades are arranged, provided that those of each succeeding grade follow the same order; and that it is equally independent of the order in which the grades are entered. An inspection of the examples given, especially Figs. 5 and 6, will show that the same results would have been obtained with other values of the increments of the ordinates, provided the series had been suitably permuted. Thus, in Fig. 6, if we had taken $a=5$, $b=2$, the terms of P would have fallen into the same cells which they actually occupy, supposing the series to have been arranged in the order 1, 9, 6, 3, 11, 8, 5, 2, 10, 7, 4; and with $a'=1$, $b'=4$, the same would have been true of the terms of L, in case the original order had been 1, 34, 67, 100, 12, 45, 78, 111, 23, 56, 89. Many variations of this kind may be made without altering the position of a single number in the square. In Fig. 5 we have an example which could not be produced with the natural series of numbers by any system of uniformly increasing co-ordinates; but it may be produced by permutation of terms with the increments $a=3$, $b=2$, $a'=2$, $b'=3$. Neither of these squares, however, could be produced by any one of the systems of co-ordinates which would produce the other. It thus

appears that there are systems of co-ordinate increments which are essentially equivalent, and others which are essentially inequivalent. Any increment which exceeds $\frac{1}{2}(n-1)$ is essentially equivalent to a lesser increment

Fig. 10.



Selected terms 17 and 29; also 30 and 18.

taken negatively or in the opposite direction. Hence, there is a limit to the distance by which the terms of the series P or L can be separated. If this limit is exceeded in one direction the terms will approximate in the opposite. In general, the limit may be said to be the numerical root of the largest square contained in n. In 5 and 7 this root is 2, and accordingly in squares on these numbers no co-ordinate systems essentially different can be found, except those in which the consecutive terms follow each other without interval, and those in which they obey what is called the chess-knight movement. But as this movement may be made in several different directions, the apparent variety is considerable.

An important advantage derived from the principle of permutation is the possibility it affords of equalizing the sums of the parallel cycles in squares like Fig. 9. The differences denoted by Δ are not differences of value, but differences of place in the series. Supposing the series so arranged that any set of terms taken from it differing in place by the distance Δ shall give the same sum; when cycles occur in the square in only one series (basic or elementary) and with only one value of Δ, the permuted order substituted for the natural will make the square perfect. The permutation need only be used in the series in which the cycle occurs. If there is a single cycle in each series derived from different factors of n, one species of permutation may be used in the series P and another in the series L. Neither of these cases can occur when either 2 or 3 is included among the prime factors of the root. But every number of which 3 is a factor must necessarily furnish cycles derived from that factor in both series; and there may be, though not necessarily, other cycles founded on a different factor. To meet such a case the series should be so permuted as to furnish equal cycles with either factor as a difference. In the following diagrams the series 15 is shown permuted for the factor 3, for

Fig. 11.

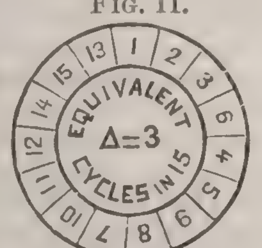


Fig. 12.

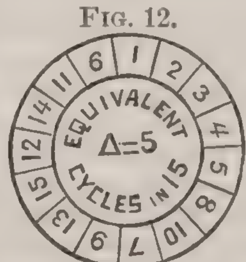
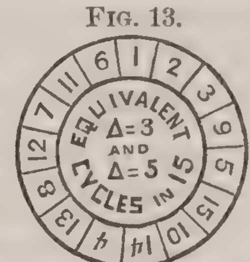


Fig. 13.



the factor 5, and for both these factors at once. This last permutation is employed in diagram 14, which is consequently a perfect square. In this example, by making the increments commensurable with n, the cycles are thrown intentionally into the vertical and horizontal lines.

Equivalent cycles may be formed upon all composite numbers whatever, except those in which 2 is a factor once, all the other factors being odd. The reason of this exception will be apparent when it is considered that, with such numbers, cycles founded on this factor are inevitable, and that the sum of the series, being itself odd, cannot furnish two integral cycles exactly equal. These numbers require a special treatment and will be considered later. Upon all numbers divisible by 4, equivalent cycles are formed with great facility. It is only necessary to reverse the order of the terms in the last half of the grade, and not only all cycles dependent on 2, but all derived from the uneven factors which may be compounded in the root with 2, will be equalized.

But if $n=4m$, m being odd, cycles dependent on 4 cannot be equalized, because in this case the sum of the series, though divisible by 2, is not divisible by 4. Generally, if $n=2^{\mu}m$ (m being odd), all cycles dependent on the powers of 2 up to the $(\mu-1)$st admit of equalization by the reversal of terms above described, and likewise all those dependent on m, or its odd multiples, and also its even multiples up to $2^{\mu-1}m$.

Fig. 14.

$a=3,\ b=5,\ a'=5,\ b'=3.$

Order of series:

1, 2, 3, 9, 5, 15, 10, 14, 4, 13, 8, 12, 7, 11, 6.

1	217	118	***10***	219	**106**	***7***	223	115	***9***	**211**	112	***13***	220	114
105	33	201	102	34	210	93	36	207	94	45	198	96	42	199
188	89	65	182	86	68	194	80	62	191	83	74	185	77	71
136	172	28	145	174	**16**	142	178	25	144	**166**	22	148	175	24
135	48	156	132	49	165	123	51	162	124	60	153	126	57	154
8	224	110	***2***	221	113	***14***	215	107	***11***	218	119	***5***	212	116
91	37	208	100	39	**196**	97	43	205	99	**31**	202	103	40	204
195	78	66	192	79	75	183	81	72	184	90	63	186	87	64
143	179	20	137	176	23	149	170	17	146	173	29	140	167	26
121	52	163	130	54	**151**	127	58	160	129	**46**	157	133	55	159
15	213	111	***12***	214	120	***3***	216	117	***4***	225	108	***6***	222	109
98	44	200	92	41	203	104	35	197	101	38	209	95	32	206
181	82	73	190	84	**61**	187	88	70	189	**76**	67	193	85	69
150	168	21	147	169	30	138	171	27	139	180	18	141	177	19
128	59	155	122	56	158	134	50	152	131	53	164	125	47	161

In constructing squares on this class of numbers, care must be taken so to select values for the increments a, b, a', b', that the difference of the products formed by cross-multiplication shall not be even. Thus all four of the increments must not be even numbers nor all four odd. Three may be odd, but three may not be even. Two may be even, provided they are neither analogous (of the same pair), or homologous (of the same letter). The following square on the number 8 illustrates the foregoing remarks. It is of course perfectly magical.

Fig. 15.

$a=4,\ b=1,\ a'=1,\ b'=2.$

Order: 1, 2, 3, 4, 8, 7, 6, 5.

1	14	24	27	**57**	54	48	35
58	53	47	36	***2***	13	23	28
3	**9**	22	32	59	**49**	46	40
60	50	45	39	***4***	10	21	31
8	11	**17**	30	64	51	**41**	38
63	52	42	37	***7***	12	18	29
6	16	19	**25**	62	56	43	**33**
61	55	44	34	***5***	15	20	26

The square of 4 formed by this method possesses some very remarkable properties which adhere to it through all the varieties of arrangement of which it is capable. In some of its forms it seems to have been found empirically by Franklin, Frénicle, and others, and to have been made by the former the basis of his magic circle and of his magic square of squares. Two varieties of this are given below, of either of which the following propositions will be found to be true: 1. The sum of any quadrate group of adjacent terms is the same, and is equal to the sum of the terms in a row. 2. The sum of any two contiguous terms at side or bottom with the two directly opposite at the other side or at top is the same. 3. The sum of the four angular terms is the same. 4. The sum of the angular terms of any square of 3 which can be formed in this square is the same.

FIG. 16.
$a = 1, b = 2, a' = 2, b' = 1.$

Order 1, 2, 4, 3.

1	14	4	15
8	11	5	10
13	2	16	3
12	7	9	6

FIG. 17.
$a = 2, b = 3, a' = 1, b' = 2.$

Order 1, 2, 4, 3.

1	8	13	12
15	10	3	6
4	5	16	9
14	11	2	7

These squares are special examples of a very general method, which may be illustrated as follows:—Take α and β to represent any two numbers of which β is the greater. These, in what follows, will be distinguished as the independent governing terms. Increase each by the constant δ; the sums $\alpha + \delta, \beta + \delta$ will be called the dependent governing terms. The term β should exceed $\alpha + \delta$. Subtract each of the four terms thus obtained from a constant ρ, which to avoid repetitions must exceed twice $\beta + \delta$, and place the difference (complement) immediately after the term subtracted, in the upper cells of the four tesseræ below, thus:

FIG. 18.

Group I.

α	$\rho - \alpha$
$\varsigma - \delta - \alpha$	$\varsigma + \delta - \rho + \alpha$

Group II.

$\alpha + \delta$	$\rho - \alpha - \delta$
$\varsigma - \alpha$	$\varsigma - \rho + \alpha$

Group III.

β	$\rho - \beta$
$\varsigma - \delta - \beta$	$\varsigma + \delta - \rho + \beta$

Group IV.

$\beta + \delta$	$\rho - \beta - \delta$
$\varsigma - \beta$	$\varsigma - \rho + \beta$

Let ς be a constant greater than twice $\rho - \alpha$; subtract the independent governing terms from $\varsigma - \delta$, and the dependent from $\varsigma + \delta$; also the complements of the independent terms from $\varsigma + \delta$, and those of the dependent from $\varsigma - \delta$; placing in every case the difference (supplement) in the cell immediately below the number subtracted.

FIG. 19.

α	$\rho - \alpha$	$\varsigma - \delta - \beta$	$\varsigma + \delta - \rho + \beta$
$\varsigma - \delta - \alpha$	$\varsigma + \delta - \rho + \alpha$	β	$\rho - \beta$
$\beta + \delta$	$\rho - \beta - \delta$	$\varsigma - \alpha$	$\varsigma - \rho + \alpha$
$\varsigma - \beta$	$\varsigma - \rho + \beta$	$\alpha + \delta$	$\rho - \alpha - \delta$

For convenience we may call each number and its supplement a *couplet*, the number itself being called the antecedent and the supplement the consequent. Then invert the second and third groups; bring IV. under I. and II. under III. and form by their union a square of 16 cells. This square will possess all the properties of those shown in Figs. 16 or 17. The arrangement may be seen above.

In the example Fig. 20 following, the numbers are assumed at random—viz. $\alpha = 3$, $\beta = 11$, $\delta = 2$, $\rho = 27$ and $\varsigma = 49$. The common sum of the columns is $2\varsigma = 98$.

FIG. 20.
General method.

3	24	36	35
44	27	11	16
13	14	46	25
38	33	5	22

Now suppose we wish to form a square on a multiple of 4 which shall possess the remarkable properties we have seen to belong to this. We shall have $n = 4m$, and $n^2 = 16m^2$; or the larger square will be made up of m^2 squares of 16 numbers each, like the foregoing; or m squares of 16 in the vertical and m in the horizontal direction. For ς we shall naturally put $n^2 + 1$; and for ρ we may have a value constant in each square or column of squares, but increasing from one to the next, or one which is constant throughout. A simple mode of construction, shown in Fig. 21, is to take 1 and 3 as the independent governing terms of the first sub-square, and 2 and 4 as the dependent; putting $\rho = 9$, and δ necessarily = unity. With the antecedents determined by these suppositions complete this square; and in the succeeding squares employ the same antecedents, increased by 8 for the second, by 16 for the third, by 24 for the fourth, and so on, passing from the bottom of each completed column to the top of the next until all are filled. But the construction which imparts to the square the most remarkable properties is the following. Make the leading independent, α, in the left-hand column of sub-squares, successively = 1, 3, 5, 7 . . . $\frac{1}{2}n - 1$. Put $\alpha + \beta = n$, and $\rho = 2n + 1$, δ being = 1. These will give the antecedents for this column. For the next, take the same antecedents increased by $2n$; for the third, the same increased by $4n$, and so on to the end. This method is illustrated in Fig. 22.

FIG. 21.

1	8	61	60	17	24	45	44
63	58	3	6	47	42	19	22
4	5	64	57	20	21	48	41
62	59	2	7	46	43	18	23
9	16	53	52	25	32	37	36
55	50	11	14	39	34	27	30
12	13	56	49	28	29	40	33
54	51	10	15	38	35	26	31

In the square thus formed, every quadrate group of four terms gives the same sum, which is always equal to 2ς. The four terms forming the angles of any rectangular figure which has even sides, gives this same sum also. Any two diagonally placed terms with a single term intervening, both within the same sub-square, added to any other similarly placed terms within the same or any other sub-square, whether parallel or normal to them in direction, will also give the sum 2ς. The square is perfect, and its diagonals, whole or broken, sum up equally; its half diagonals also sum up equally. Finally, its bent diagonals, that is to say, diagonal rows running from one side upward or downward to the central axis, vertical or horizontal, and continued from the axis to the opposite side with a movement inflected into the other diagonal direction, will sum up equally.

Tessellated Squares.—The remarkable square just described belongs to the class called tessellated squares; that is, squares made up of lesser squares which are also magic when taken separately. Tessellated squares may be formed in various ways upon any composite number. If $n = \mu\nu$, for example, $n^2 = \mu^2\nu^2$. The squares of μ may then be regarded as simple terms and arranged as such in a square of ν, or *vice versâ*. These sub-squares may be equivalent, as in the example above, in which case, if they are severally perfect, their order may be in any manner deranged, or some may be inverted and others rotated ninety degrees without destroying the magical character of the square compounded of them; or they may form an arithmetical series increasing, in which case their places in the compound square must not be changed. Equivalent tessellated squares cannot be formed on odd numbers.

Special Methods for Numbers Divisible by 4.—Besides the general methods for the construction of magic squares which are applicable to all numbers except those in which 2 is once a factor, there are others requiring notice which depend upon the properties of the powers of 2. These are founded upon the self-evident proposition that, in any arithmetical series, whether the number of terms is odd or

FIG. 22.
Magic square of squares.

1	32	241	240	**33**	64	209	208	**65**	96	177	176	**97**	128	145	144
255	226	**15**	18	223	194	**47**	50	191	162	**79**	82	159	130	**111**	114
16	17	256	225	**48**	49	224	193	**80**	81	192	161	**112**	113	160	129
242	239	**2**	31	210	207	**34**	63	178	175	**66**	95	146	143	**98**	127
3	30	243	238	**35**	62	211	206	**67**	94	179	174	**99**	126	147	142
253	228	**13**	20	221	196	**45**	52	189	164	**77**	84	157	132	**109**	116
14	19	254	227	**46**	51	222	195	**78**	83	190	163	**110**	115	158	131
244	237	**4**	29	212	205	**36**	61	180	173	**68**	93	148	141	**100**	125
5	28	245	236	**37**	60	213	204	**69**	92	181	172	**101**	124	149	140
251	230	**11**	22	219	198	**43**	54	187	166	**75**	86	155	134	**107**	118
12	21	252	229	**44**	53	220	197	**76**	85	188	165	**108**	117	156	133
246	235	**6**	27	214	203	**38**	59	182	171	**70**	91	150	139	**102**	123
7	26	247	234	**39**	58	215	202	**71**	90	183	170	**103**	122	151	138
249	232	**9**	24	217	200	**41**	56	185	168	**73**	88	153	136	**105**	120
10	23	250	231	**42**	55	218	199	**74**	87	186	167	**106**	119	154	135
248	233	**8**	25	216	201	**40**	57	184	169	**72**	89	152	137	**104**	121

even, the sum of any two terms situated symmetrically with reference to the middle point of the series is constant, and is equal to the sum of the extremes. Also the joint sum of any two grades situated symmetrically with reference to the middle of the series of grades is constant, and is equal to the joint sum of the two extreme grades. But this sum (1) is evidently

Fig. 23.
Odd-numbered tessellated square.

31	36	29	76	81	74	13	18	11
30	32	34	75	77	79	12	14	16
35	28	33	80	73	78	17	10	15
22	27	20	40	45	38	58	63	56
21	23	25	39	41	43	57	59	61
26	19	24	44	37	42	62	55	60
67	72	65	4	9	2	49	54	47
66	68	70	3	5	7	48	50	52
71	64	69	8	1	6	53	46	51

$$2\Sigma\,[1, 2, 3 \ldots . n] + n \times (n-1)n = n^2 + n + n^3 - n^2 = n^3 + n = 2\mathrm{S}.$$

Now, if σ represent the sum of the extremes of the first grade, and σ' the sum of those of the last grade, G the total sum of the first and G′ the total sum of the last, we shall have

$$\mathrm{G} + \mathrm{G}' = \tfrac{1}{2}\,n\sigma + \tfrac{1}{2}\,n\sigma' = 2\mathrm{S}\,; \text{ and } \mathrm{S} = \tfrac{1}{4}\,n\sigma + \tfrac{1}{4}\,n\sigma'. \quad (47)$$

It thus appears that one-half the first grade taken by pairs of terms symmetrically disposed, added to half the last grade similarly taken, is equal to the sum of a column in the square; a proposition true of any two other grades symmetrically situated, but practically inapplicable when n is odd, since in that case one-half the number of terms cannot be integrally expressed. Moreover, since σ and σ' are necessarily odd when n is even, the terms of the second number of (47) cannot be integral unless n is divisible by 4.

To deduce from this principle the practical modes of construction of magic squares of numbers of the form $n = 4m$, take any such number, and write the terms of the first grade in their order in a horizontal row. Under these in reversed order write those of the second grade. The couplets thus formed give severally equal sums, and the whole arrangement may be called an *equalized band.* Form similar bands with the third and fourth grades, the fifth and sixth, and so on, until half the grades have been written down; then reverse the order, commencing the $(\frac{1}{2}n + 1)$st grade at the right, and the $(\frac{1}{2}n + 2)$d at the left, according to which law the remaining bands are to be written. It is then self-evident that the sums of all the columns added vertically will be equal. Also, upon each diagonal, the sum of any two terms symmetrically chosen with reference to the middle point will be equal to the sum of the extremes, that is, to $n^2 + 1$. Accordingly, the total sums of the diagonal terms will be equal. Mark then, in the first grade, one-fourth of the terms anyhow selected on the left of the vertical axis of the square, and as many symmetrically situated to these on the right of the same axis. Mark also the terms of the last grade which are in the same vertical columns as the marked terms in the first. Finally, interchange the marked terms. Proceed in like manner with the other grades taken by pairs symmetrically situated to the horizontal axis of the square, and the arrangement finally resulting will be magic. The sums of the diagonals will not be in any manner affected by the interchanges. In fact, if t and t' are two symmetrically placed terms upon the two diagonals above the horizontal axis, and τ and τ' the corresponding terms on the diagonals below the axis with which the former are to be interchanged, then $t + \tau' = \tau + t' = n^2 + 1$, and the replacement of the former pair by the latter, and *v. v.* leaves the total sums unaltered. The following is an example of this method:

The variations of which this method admits are very numerous. In the first place the terms of each grade may be permuted at pleasure provided the two grades between which interchanges take place are similarly permuted. But each such associated pair of grades may have a system of permutation entirely different from any other. Moreover, in the selection of terms to be interchanged, there is room for large variety, which is greater as n is greater; and each pair of associated grades may have its independent system. Examples of such possible varieties may be illustrated by means of diagrams in small, without numbers, as seen in Figs. 26 and 27. Here the shaded cells are those supposed to be occupied by numbers selected for interchange; the others by the numbers remaining undisturbed. We may suppose the interchange to take place by the revolution of the entire system of shaded cells about the axis XX'.

Fig. 26.

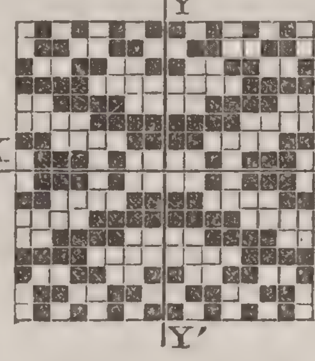
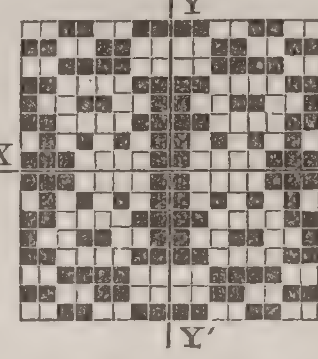


Fig. 27.



Another method of construction analogous to the foregoing is to form bands not only equalized but equivalent, by writing, or supposing to be written, all the terms of the general series from 1 to $\frac{1}{2}n^2$ in direct order from left to right, and the remaining terms in reversed order under these, forming as before couplets which sum up equally. The elongated band thus formed is then to be cut up into sections of n couplets each, the first half of which are to be written in direct order, and the second half in reversed order under each other in the square. These bands are *equivalent*, in distinction from those of the method previously described, which are *graded* bands. In what follows it may promote clearness to make the following distinctions also: Let the smaller terms of each couplet be called antecedents; the larger, consequents. Two couplets adjacent to each other constitute a group; if they are immediately consecutive in the series as above arranged, the group is a *close* group; if not, a *loose* group. A group formed of four consecutive terms of the natural series of numbers is a *current* group. The position of a couplet with the antecedent uppermost is *proper;* with the consequent uppermost, *inverted.* Increase toward the right is *direct;* toward the left, *reversed.*

Every current group, when its terms are added vertically, horizontally, and diagonally, gives three results—viz. equality, a greater inequality (which is 4), and a lesser inequality (which is 2). The typical current group is presented in the square of 2, which cannot be made magical. Every close group in an equalized band preserves the two relations of equality and of lesser inequality; but the greater inequality increases from the middle of the general series to the extremes. In the normal position of the terms, the lesser inequality is in the diagonals, but if the antecedents or the consequents be reversed, it is in the vertical sums, and the diagonals are equal. In the square constructed as last described, the vertical columns sum up of course equally, and the diagonals sum equally also; for though the direct diagonals of the groups are in deficiency in the upper half, they are equally in excess in the lower half; and *v. v.* for the transverse diagonals. If the consequents of all the groups are reversed, all the group diagonals become equal, and the inequalities thus transferred to the vertical lines balance as before. See Figs. 28, 29 following.

Fig. 24.

1	2	3	4	5	6	7	8
16	15	14	13	12	11	10	9
17	18	19	20	21	22	23	24
32	31	30	29	28	27	26	25
40	39	38	37	36	35	34	33
41	42	43	44	45	46	47	48
56	55	54	53	52	51	50	49
57	58	59	60	61	62	63	64

Bands equalized.

Fig. 25.

1	58	59	4	5	62	63	8
56	15	54	13	12	51	10	49
41	42	19	20	21	22	47	48
32	39	30	37	36	27	34	25
40	31	38	29	28	35	26	33
17	18	43	44	45	46	23	24
16	55	14	53	52	11	50	9
57	2	3	60	61	6	7	64

Bands balanced.

In order in either case to equalize the horizontal sums, one-half the couplets on the left of the vertical axis in each band must be inverted; and also an equal number symmetrically situated on the right of the axis. The band becomes then a *balanced* band. In making the inversions the couplets of each group on the true diagonals of the square must be treated alike—*i. e.*, both inverted or both preserved in proper position. Also, if diagonal groups above the axis XX' are inverted, as many must be inverted below that axis. If one-half the whole number of diagonal groups is inverted, the rest remaining undisturbed, the square becomes a tessellated square of four equivalent sub-squares. As every band may be independently balanced, and, when n

Fig. 28.

1	2	3	4	5	6	7	8
64	63	62	61	60	59	58	57
9	10	11	12	13	14	15	16
56	55	54	53	52	51	50	49
24	23	22	21	20	19	18	17
41	42	43	44	45	46	47	48
32	31	30	29	28	27	26	25
33	34	35	36	37	38	39	40

Fig. 29.

1	2	62	61	60	59	7	8
64	63	3	4	5	6	58	57
56	55	11	12	13	14	50	49
9	10	54	53	52	51	15	16
41	42	22	21	20	19	47	48
24	23	43	44	45	46	18	17
32	31	35	36	37	38	26	25
33	34	30	29	28	27	39	40

exceeds 8, balanced in a variety of ways, a corresponding diversity of arrangements is admissible, which increases with the increase of n. The bands may also be balanced in sections as well as in wholes, and such balanced sections may be interchanged with other balanced sections in any part of the square; so that for a very large value of n it would be difficult to compute the number of variations of which this method is capable. The following diagrams, without numbers, illustrate the method, the shaded cells being those in which couplets or groups are to be inverted.

Fig. 30.

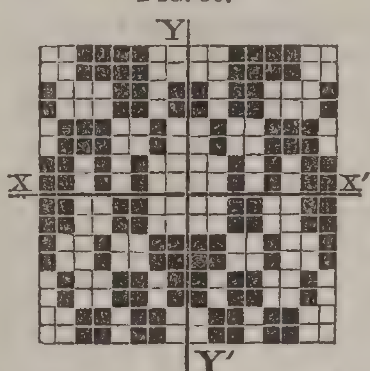
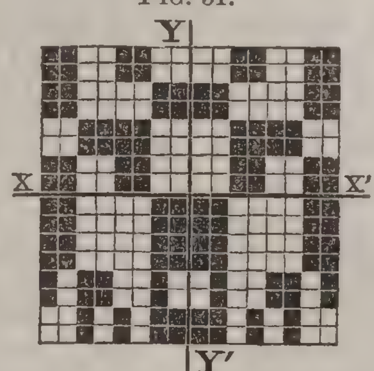


Fig. 31.



Particular examples under most of the general methods of construction thus far described may be found in works heretofore published on this subject. The two methods which follow, and which apply to cases in which n is a power of 2 exceeding the second, have not before appeared. From the form of equation (46) it is evident that ζ can have no integral value when n is even. The cycles which, with such values of n, are inevitably formed, will cause the lines in the direction of which they occur to sum up unequally, and to be invariably greater or less than the true value of S. Now every purely even square on the root n may be divided into four equal sub-squares with sides equal to $\frac{1}{2}n$. Let these be filled with grades also equal to $\frac{1}{2}n$ (which for convenience we may call sub-grades) with an alternation of movement such as is shown in Fig. 32 and in an order of succession indicated by the numbers in the following Fig. 33.

Fig. 32.

I. Movement Downward and Direct.	II. Movement Upward and Direct.
IV. Movement Upward and Reversed.	III. Movement Downward and Reversed.

Fig. 33.

Order of sub-grades in balanced squares.

Square of 16. Square of 8.

1	1	4	4	4	4	1	1	4	4	1	1	1	1	4	4
2	2	3	3	3	3	2	2	3	3	2	2	2	2	3	3
3	3	2	2	2	2	3	3	2	2	3	3	3	3	2	2
4	4	1	1	1	1	4	4	1	1	4	4	4	4	1	1

Square of 32.

In Fig. 33 the numbers 1, 2, 3, 4, in the first column indicate that the first four sub-grades are to be entered in the successive sub-squares I., II., III., IV., in the order of these numbers, which order is also to be observed with the second four; but the third and fourth series of sub-grades must be entered in reversed order, beginning at IV., and ending at I. This will suffice for the square of 8. For the square of 16, proceed in the same manner so far; and then continue to the close with the entire preceding system reversed. For the square of 32, proceed as for 16, and then as before, continue to the close with the entire preceding system reversed. This rule is general—*i. e.* for each higher power of 2 proceed as for the power next below, and then complete by reversing that proceeding from the beginning. In the selection of values for the increments a, b, a', b', two (extremes or means) should be even and the others odd. There will then be no cycles in the diagonals, but there will be one cycle in each of the remaining directions. One of the cycles will be basic and the other elementary. If the even factor determining or governing the cycle be μ ($n = \mu\nu$) and the value of Δ which is co-ordinate to the cycle (a value which will necessarily be odd) be *unity*, $\mu + 1$, $2\mu + 1$, $3\mu + 1$ . . . . . . $m\mu + 1$, we may put $h = 1$, $k = 1$. But if this co-ordinate difference have any other value and μ exceeds 2, we must find proper values for h and k as follows: Write down the first μ terms of the series co-ordinate to the cycle. Subtract μ from each term so written as often as it can be done without reducing the term to zero. Look along the resulting series to find two contiguous terms whose sum is $\mu + 1$. Two such pairs may be found. One of these must be brought to the middle of the series, by transfer of terms from one end to the other. Then the term standing first in the series so transformed, or some term in its dependent cycle, should be made to occupy the cell of the square whose co-ordinates are $x = 1$, $y = 1$. The same process should be pursued if necessary with the other cycle. There will then be known values of p, q, x and y to be substituted in equations (26) and (27) from which h and k may be ascertained. As an illustration of this, suppose $n = 16$, $a = 4$, $b = 5$, $a' = 7$, $b' = 4$. These numbers give $\Delta p_x = 4$, $\Delta p_y = 5$, $\Delta q_x = 7$, $\Delta q_y = 4$. Since in this case $\mu = 4$, and $\Delta p_y = 5 = \mu + 1$, the series E demands no attention. But as $\Delta q_x = 7$, we must form a series of μ (four) terms with this difference, thus:

Original Series, 1, 8, 7, 6. Simplified Series, 1, 4, 3, 2.

Either $4 + 1$, or $3 + 2 = 5 = \mu + 1$. Hence we transfer 1 from one extreme of the series to the other, which gives us,

Transformed Series 4, 3, 2, 1.

There are but two terms in the cycle dependent on 4. They are 4 and 8, and either of these may be taken as the value of q in the cell for which $x = 1$, $y = 1$. As p may be taken $= 1$, we find $h = 8$, $k = 5$. The square is given below, q being taken $= 8$.

Fig. 34.

$a = 4$, $b = 5$, $a' = 7$, $b' = 4$, $h = 8$, $k = 5$.

225	197	185	157	121	93	33	5	116	88	44	16	236	208	180	152
126	90	38	2	230	194	190	154	239	203	183	147	119	83	47	11
227	199	187	159	123	95	35	7	114	86	42	14	234	206	178	150
128	92	40	4	232	196	192	156	237	201	181	145	117	81	45	9
229	193	189	153	125	89	37	1	120	84	48	12	240	204	184	148
122	94	34	6	226	198	186	158	235	207	179	151	115	87	43	15
231	195	191	155	127	91	39	3	118	82	46	10	238	202	182	146
124	96	36	8	228	200	188	160	233	205	177	149	113	85	41	13
136	164	224	252	32	60	72	100	21	49	77	105	141	169	213	241
27	63	67	103	131	167	219	255	138	174	210	246	18	54	74	110
134	162	222	250	30	58	70	98	23	51	79	107	143	171	215	243
25	61	65	101	129	165	217	253	140	176	212	248	20	56	76	112
132	168	220	256	28	64	68	104	17	53	73	109	137	173	209	245
31	59	71	99	135	163	223	251	142	170	214	242	22	50	78	106
130	166	218	254	26	62	66	102	19	55	75	111	139	175	211	247
29	57	69	97	133	161	221	249	144	172	216	244	24	52	80	108

To illustrate the principle of this method more fully, a larger value should be given to n. It is unnecessary to construct the square. Put $n = 128$, which gives $\frac{1}{2}n = 64$. Then if $a = 39$, $b = 40$, $a' = 48$, $b' = 51$, we obtain $\Delta p_x = 23$, $\Delta p_y = 48$, $\Delta q_x = 8$, $\Delta q_y = 59$. The cycle of E depends on the factor 16, and that of B on the factor 8. The original series of E is accordingly,

1, 24, 47, 6, 29, 52, 11, 34, 57, 16, 39, 62, 21, 44, 3, 26.

Which simplified is,

$$1, 8, 15, 6, \underbrace{13, 4}, 11, 2, 9, 16, 7, 14, \underbrace{5, 12}, 3, 10.$$

In which $13 + 4$ or $5 + 12 = 17 = \mu + 1$.

The transformed series may begin with either 4 or 12. The two cycles headed by these terms respectively will be 4, 52, 36, 20, and 12, 60, 44, 28, any one of which terms may be taken as the value of p in the cell of which the coordinates are $x = 1$, $y = 1$.

The original series of B is in like manner,

$$1, 60, 55, 50, 45, 40, 35, 30; \text{ or simplified, } 1, 4, \underbrace{7, 2}, 5, 8, \underbrace{3, 6}.$$

In which $7 + 2$ or $3 + 6 = 9 = \mu + 1$.

Any term of either of the two cycles of 8 terms each, headed 2 and 6, may be taken as the value of q in the cell above mentioned. The cycles are 2, 10, 18, 26, 34, 42, 50, 58, and 6, 14, 22, 30, 38, 46, 54, 62. If we assume, for instance, $p = 20$, and $q = 38$, we shall have from equations (26) and (27), $h = 44$, and $k = 42$.

The other method spoken of above, which forms an arrangement visibly and pleasingly symmetrical, is as follows. There is first to be formed a succession of equalized bands, each band being two grades in length, by writing the terms from 1 to $2n$ in direct order, and those from $2n + 1$ to $4n$ in reversed order beneath them, proceeding thus up to $\frac{1}{2}n^2$. Then reverse the entire process and continue to the end, or to n^2. Reverse the consequents in all the groups down to $\frac{1}{2}n^2$; also reverse the antecedents in all the remaining groups. This done, invert the right-hand couplets of all the groups down to $\frac{1}{2}n^2$, and the left-hand couplets in all the remaining groups. Then having divided the square into four principal sub-squares, as in Fig. 32, subdivide these into four others still smaller, and these again in like manner successively, until the whole is divided into compartments of four cells each; but the lines of each successive subdivision should be characteristically distinguishable. To fill the square so divided place the successive groups of the first of the equalized bands, prepared as above, in the compartments along the direct diagonals of the sub-squares of Fig. 32, following the movement there directed. The squares of 4 along these direct diagonals will be then half filled. Take the groups of the next band, and beginning in I. at top, as before, fill the transverse diagonals of these squares of 4. The squares of 8 on the direct diagonals will then be half filled. With the third band follow the direct diagonals of the unfilled squares of 4 in these squares of 8, and subsequently the transverse diagonals of the same, always beginning at top. Thus proceed till $\frac{1}{2}n^2$ terms are entered. The remaining terms will then be most conveniently introduced by beginning with the n^2 group at the angle diagonally opposite in the main square to the first, and reversing in every respect, in the order of groups and of movement, the course pursued with the first $\frac{1}{2}n^2$ terms. The following is an example:

Fig. 35.

1	64	65	128	152	169	216	233	232	217	168	153	113	80	49	16
63	2	127	66	170	151	234	215	218	231	154	167	79	114	15	50
67	126	3	62	214	235	150	171	166	155	230	219	51	14	115	78
125	68	61	4	236	213	172	149	156	165	220	229	13	52	77	116
148	173	212	237	5	60	69	124	117	76	53	12	228	221	164	157
174	147	238	211	59	6	123	70	75	118	11	54	222	227	158	163
210	239	146	175	71	122	7	58	55	10	119	74	162	159	226	223
240	209	176	145	121	72	57	8	9	56	73	120	160	161	224	225
32	33	96	97	137	184	201	248	249	200	185	135	112	81	48	17
34	31	98	95	183	138	247	202	199	250	135	186	82	111	18	47
94	99	30	35	203	246	139	182	187	134	251	198	46	19	110	83
100	93	36	29	245	204	181	140	133	188	197	252	20	45	84	109
141	180	205	244	28	37	92	101	108	85	44	21	253	196	189	132
179	142	243	206	38	27	102	91	86	107	22	43	195	254	131	190
207	242	143	178	90	103	26	39	42	23	106	87	191	130	255	194
241	208	177	144	104	89	40	25	24	41	88	105	129	192	193	256

Unevenly Even Numbers.—The case in which 2 is a factor once only in n, commonly called the case of unevenly even numbers, is yet to be considered. The algebraic expression for an unevenly even number is $n = 2(2m + 1)$. Its square is

$$n^2 = \Big(2(2m + 1)\Big)^2 = 16m^2 + 16m + 4. \qquad (48)$$

The portion of this represented by $16m^2$ is a square of $4m$; and if the remaining terms be omitted, either from the beginning or from the end of the series, or symmetrically any how in reference to the grades of $16m^2$,

Fig. 36.

Unevenly even square.

1	98	4	96	6	94	8	92	56	50
99	10	11	89	88	87	86	16	17	2
43	91	90	12	13	14	15	85	84	58
59	26	69	70	29	30	73	74	33	42
46	67	40	65	38	37	62	35	60	55
57	41	66	39	64	63	36	61	34	44
47	68	27	28	71	72	31	32	75	54
53	25	24	78	79	80	81	19	18	48
48	76	77	23	22	21	20	82	83	52
51	3	97	5	95	7	93	9	45	100

Fig. 37.

49	41	59	44	57	56	46	54	48	51
68	1	16	*92*	*93*	17	32	77	76	33
34	99	86	7	10	83	70	23	26	67
66	8	9	100	85	24	25	84	69	35
36	94	91	2	15	78	75	18	31	65
37	3	14	95	90	19	30	79	74	64
63	97	88	5	12	81	72	21	28	38
39	6	11	98	87	22	27	82	71	62
61	96	89	4	13	80	73	20	29	40
52	60	42	58	43	45	55	47	53	50

these may be employed to construct a regular magic square by means of any of the methods heretofore described. The $16m + 4$ terms in excess of this square are just sufficient in number to form a border round it, four occupying the angles, and the remainder the four sides. Suppose $8m + 2$ of these terms, that is one-half, be taken from the beginning, and the other $8m + 2$ from the end of the general series. The whole will then form $8m + 2$ normal couplets, each having a sum $= n^2 + 1$, which denote by s. If the antecedent and consequent of each of these couplets be arranged directly opposite to each other, vertically, horizontally, and diagonally around the square already formed, they will increase each such row by the same amount s; so that if the sum of a row in this lesser square is S', and the corresponding sum in the enlarged square S, we shall have $S' + s = S$. So much is easily accomplished. What remains to be done is so to dispose the marginal numbers that they also, when added up in line, shall give a sum $= S$.

This cannot be completely accomplished by balancing the groups in the manner heretofore described, and illustrated in Figs. 24 to 31, since two groups or four couplets are necessary to a balance, and $2m + 1$, the number of groups to be balanced in this case, is odd. It will however be found practicable to make the marginal rows equal at the expense of equality in some other row or rows; and the irregularity thus introduced may usually be removed by transposing a few terms in the interior of the square. But the desired result may be effected without disturbing the interior terms, as follows:

Of the series of antecedents the first term is 1 and the last is $(8m + 2) = (2n - 2)$. These two terms are to be placed in the angles at top, the first on the left and the second on the right, and their supplements diagonally opposite to them. They are called the diagonal terms. The remaining antecedents are to be arranged as follows, their consequents being directly opposite to them:

At top, the even terms 4, 6, 8 . . . $n - 2$.

At bottom, the odd terms 3, 5, 7 . . . $n-1$, and the odd term $(\frac{3}{2}n-2)$.

On the right, the even term 2, and the series n, $(n+2)$, $(n+4)$ . . . $(2n-4)$ with the exception of the even term $(\frac{3}{2}n-1)$.

On the left, the odd terms $(n+1)$, $(n+3)$ . . . $(2n-3)$ with the exception of the odd term $(\frac{3}{2}n-2)$ and the addition of the even term $(\frac{3}{2}n-1)$. If the numbers selected as antecedents are not consecutive, these symbols must be understood to indicate *place in series* and not value.

Figs. 36 and 37 on preceding page are illustrations.

It is not necessary that these rows should occupy the border of the square. They may be interposed between those of the even square $16m^2$, provided only they be equally advanced from the exterior, and that the diagonal terms always occupy the intersections. Neither is it necessary that the antecedents $8m+2$ should be consecutive. They may be taken from the beginning or the end of the half series 1, 2 . . . . $\frac{1}{2}n^2$, or may be the first or the last $8m+2$ *odd* numbers, or the first or the last $8m+2$ even numbers. Or they may be the first $8m+2$ terms in arithmetical progression with any common difference, though thus they may overrun the limit $\frac{1}{2}n^2$, but must not pass beyond n^2. Finally, one-half the number, viz. $4m+1$, may be taken from the beginning, and the other from the end of the series 1, 2, 3 . . . $\frac{1}{2}n^2$, or these two halves may be anyhow placed symmetrically in the series, so that the remaining terms may form the even square. In Fig. 36 the antecedents are the first nine and the last nine of $50(=\frac{1}{2}n^2)$; other examples are given below:

Fig. 37 is an example in which the $8m+2$ antecedents, together with their consequents, are taken from the middle of the entire series. The marginal rows are made equal by balancing at the expense of an inequality in the fourth and fifth columns, which is compensated by transposing the terms 92 and 93, indicated by printing in heavy type. The interior square is tessellated, except as to these terms.

FIG. 38.

1	194	193	6	157	9	186	185	14	40	17	178	177	22
195	5	32	2	77	187	97	100	10	120	179	181	176	18
7	189	168	190	121	15	107	90	182	76	23	13	24	174
191	3	4	196	80	183	11	12	188	117	175	19	20	180
152	144	48	136	37	56	64	128	74	88	125	81	124	122
25	170	169	30	119	33	162	161	38	78	41	154	153	46
171	106	104	26	82	163	89	98	34	115	155	92	102	42
31	91	93	166	118	39	99	108	158	79	47	105	95	150
167	27	28	172	83	159	35	36	164	114	151	43	44	156
45	53	149	61	109	141	133	69	123	160	72	116	73	75
49	146	145	54	113	57	138	137	62	84	65	130	129	70
147	16	21	50	85	139	103	94	58	112	131	192	165	66
55	184	173	142	111	63	96	101	134	86	71	8	29	126
143	51	52	148	87	135	59	60	140	110	127	67	68	132

FIG. 39.

27	168	30	166	164	36	25	172	37	158	40	156	154	46
34	67	128	127	72	163	175	22	44	75	120	119	80	153
169	129	71	98	68	28	21	176	159	121	115	110	76	38
35	73	123	102	124	162	181	16	45	81	79	90	116	152
165	125	69	70	130	32	17	180	155	117	77	78	122	42
161	29	167	31	33	170	195	2	151	39	157	41	43	160
178	186	10	190	6	194	1	26	192	4	188	8	184	12
19	11	187	7	191	3	171	196	5	193	9	189	13	185
57	138	60	136	134	66	183	14	47	148	50	146	144	56
64	91	104	103	96	133	15	182	54	83	112	111	88	143
139	105	82	87	92	58	179	18	149	113	126	99	84	48
65	97	118	107	100	132	20	177	55	89	74	95	108	142
135	101	93	94	106	62	173	24	145	109	85	86	114	52
131	59	137	61	63	140	23	174	141	49	147	51	53	150

Bordered and Inlaid Squares.—As in the squares last described the magic character exists whether the border rows are present or absent, the question suggests itself whether this method may not be generalized. When $n=4m$, the interior square may be made independent of the border, and *vice versâ*, by the simple expedient of balancing groups against each other; which can always be done, since $2m$, the number of groups to be balanced, is necessarily even. Rules, however, both for evenly even and for odd numbers may be given analogous to that given for unevenly even numbers above, as follows:

For *evenly even numbers:* place the diagonal terms as before; afterward,

At top, the even terms 4, 6, 8 . . . $n-2$.

At bottom, the odd terms 3, 5, 7 . . . $n-1$, and the even term $(\frac{3}{2}n-2)$.

On the right, the even term 2 and the series n, $(n+2)$, $(n+4)$ . . . $(2n-4)$ with the exception of the even term $(\frac{3}{2}n-2)$ and the addition of the odd term $(\frac{3}{2}n-1)$.

On the left; the odd terms $(n+1)$, $(n+3)$ . . . $(2n-3)$, with the exception of the odd term $(\frac{3}{2}n-1)$ and the addition of the even term $\frac{3}{2}n$.

For odd numbers: the diagonal terms are 2 and $2n-2$. These being placed in the upper angles, the remaining antecedents are arranged as follows:

At top, the odd terms $(n+2)$, $(n+4)$ . . . $(2n-3)$.

At bottom, the odd terms 1, 3, 5 . . . $(n-2)$.

On the right, the even terms, $(n+1)$, $(n+3)$ . . . $(2n-4)$ and the odd term n.

On the left, the series of even terms 4, 6, 8 . . . $(n-1)$.

In all cases the consequents are to be placed directly opposite to the antecedents. By means of the methods here described, a square may be constructed like a nest of boxes, admitting the removal successively of its exterior rows, and still remaining magic. An odd square may be built up in this way from the very central cell; but in an even square, the interior nucleus cannot be less than the square of 4.

FIG. 40.
Even-numbered built-up square.

51	92	54	90	56	88	58	86	60	84	79	72
93	33	110	36	108	38	106	40	104	100	50	52
71	43	19	124	22	122	24	120	117	32	102	74
83	111	27	9	134	12	132	130	18	118	34	62
69	46	125	16	6	140	7	137	129	20	99	76
81	103	30	135	143	1	142	4	10	115	42	64
68	47	119	17	138	8	139	5	128	26	98	77
78	101	31	131	3	141	2	144	14	114	44	67
65	49	116	127	11	133	13	15	136	29	96	80
75	97	113	21	123	23	121	25	28	126	48	70
63	95	35	109	37	107	39	105	41	45	112	82
73	53	91	55	89	57	87	59	85	61	66	94

FIG. 41.
Odd-numbered built-up square.

2	113	19	117	15	121	13	119	17	115	20
106	22	95	35	101	31	99	33	97	36	16
4	92	38	85	47	83	45	81	48	30	118
110	24	78	50	73	71	55	56	44	98	12
6	93	40	52	58	65	60	70	82	29	116
111	26	79	69	63	61	59	53	43	96	11
8	90	42	68	62	57	64	54	80	32	114
108	28	76	66	49	51	67	72	46	94	14
10	88	74	37	75	39	77	41	84	34	112
104	86	27	87	21	91	23	89	25	100	18
102	9	103	5	107	1	109	3	105	7	120

Inlaid squares are those from which an interior rectangular row may be removed leaving the central square still

magic, while the exterior portions, by dropping certain couplets, may be closed up on the central, preserving the magical character still. Fig. 42 is such a square. If along with the interior quadrilateral the middle marginal groups be dropped, the remaining portions of the square closed up will be magic.

FIG. 42.
Inlaid square.

1	2	98	97	25	76	96	95	7	8
99	100	3	4	75	26	5	6	93	94
17	83	33	36	66	64	62	42	82	20
84	18	67	43	50	55	54	34	19	81
29	71	63	57	52	45	48	38	70	32
72	30	40	46	47	58	51	61	31	69
21	79	41	56	53	44	49	60	78	24
80	22	59	65	35	37	39	68	23	77
86	85	14	13	74	27	12	11	92	91
16	15	87	88	28	73	89	90	10	9

Figures 38 and 39 have the properties of inlaid squares. In Fig. 38, for instance, if the four intersecting cross-bars be removed, and the nine squares of 4 remaining be brought together, the resulting square will be magic. If the five of these which form a cross be dropped, the four still remaining will be magic. If without dropping the cross, the borders of all the nine be removed, the central groups united will form a magic square; and if the five of these groups which form a cross be dropped, the four angular groups brought together will produce a magic square of 4 which will be perfect.

In Fig. 39, if the central cross be excluded, the four bordered squares of 6 united will retain the magic character. If the borders of these be dropped, the remaining squares of 4 will form still a magic square; and if the borders of these be also dropped, the central groups united will constitute again a perfect square of 4.

There is still another mode of constructing unevenly even squares which may be briefly noticed. Let the square to be filled be divided into compartments of four cells each, and arrange the general series in consecutive current groups.

FIG. 43.
Unevenly even-numbered square with current groups.

1	3	93	95	65	68	58	60	30	32
2	4	94	96	67	66	57	59	29	31
77	79	49	51	24	21	14	16	86	88
78	80	50	52	22	23	13	15	85	87
33	35	5	7	97	99	72	71	44	42
36	34	8	6	98	100	69	70	41	43
91	89	63	61	56	53	28	26	20	18
92	90	64	62	54	55	27	25	19	17
47	45	39	37	12	9	84	82	76	74
48	46	40	38	10	11	83	81	75	73

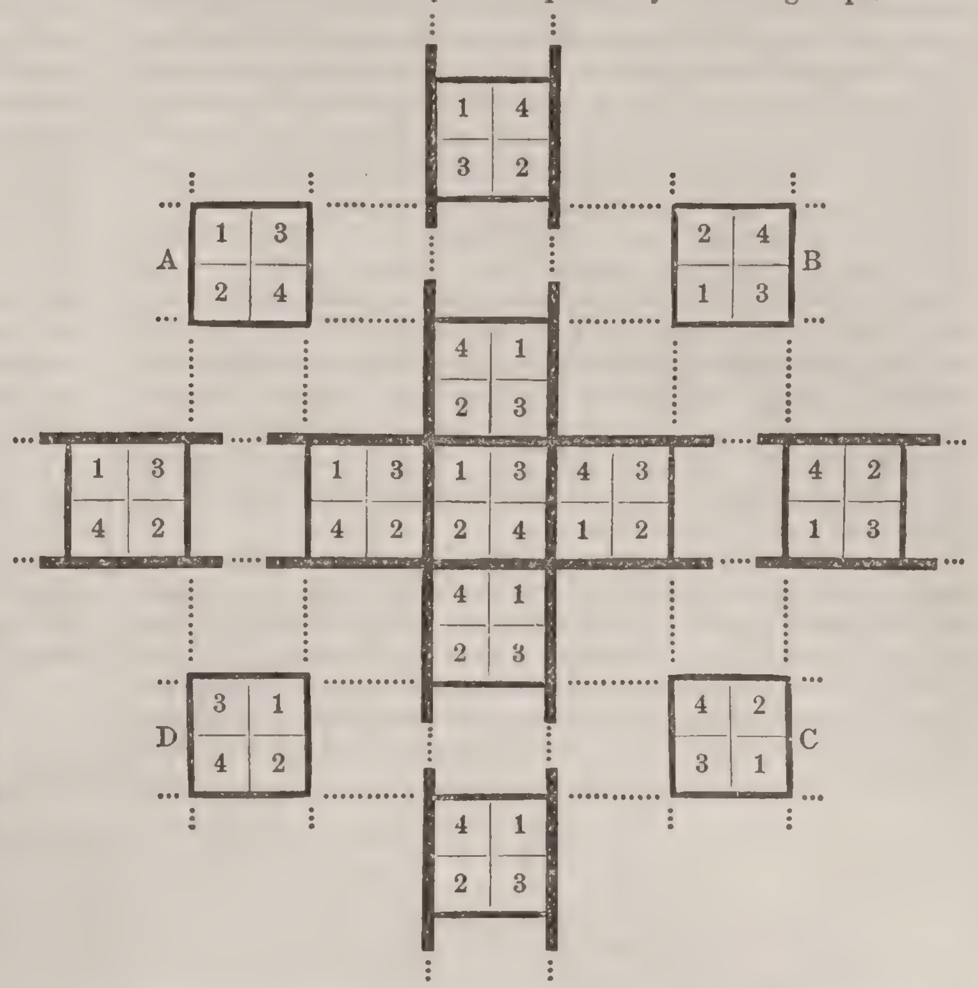
Treat these groups as single terms, and the four-celled compartments as single cells. Proceed to fill the compartments with these groups by any of the methods heretofore given, and equalize the sums of the columns by balancing the inequalities of the current groups against each other, the several groups being so arranged that their diagonal sums shall be equal. The greater inequalities may, for instance, be balanced in the vertical lines, and the lesser in the horizontal, the odd groups in the middle of each side being disposed of as in Fig. 42, with the lines of equal summation parallel to the sides 43, 44. A special arrangement is necessary for the five groups in and about the intersection of the central bands, such as is shown in Fig. 45. The isolated groups surrounding this figure are types for the arrangement of all other groups which may fall either into these bands continued or into the rectangular spaces into which they divide the square. The method may be applied, as in Fig. 44, to evenly even squares, in which case the four angular groups are the only guide needed.

FIG. 44.
Even-numbered square with current groups.

1	3	29	31	50	52	46	48
2	4	30	32	49	51	45	47
57	59	37	39	10	12	22	24
58	60	38	40	9	11	21	23
15	13	19	17	64	62	36	34
16	14	20	18	63	61	35	33
55	53	43	41	8	6	28	26
56	54	44	42	7	5	27	25

This square is perfectly magic.

FIG. 45.
Construction of unevenly even squares by current groups.



If $n = 4m$, the intersecting bands are replaced by the central axes of the square, and the only guides needed are the four groups, A, B, C, D.

Magic Circles.—Dr. Franklin devised an arrangement of the terms of a series to which he applied the name of Magic Circle. This need not detain us long, since it is only a transformation of a well-known magic square. In fact, if the vertical columns in a square of 8 on the plan of Fig. 21 be written in their actual order on eight equidistant radii of a circle, the tops or the bottoms of the columns being directed toward the centre, and the number 100 in the centre, then the sum of any radial column added to this central number will give 360 = the number of degrees in a circumference. Also, the sum of any four contiguous terms forming a quadrate group, together with half the central number, or 50, will give 180 = the number of degrees in a semicircle. Dr. Franklin disguised to some extent the character of the contrivance by adding 11 to

FIG. 46.
Magic Circle and Cyclovolute.

every term in the radial columns and reducing the central number by eight times 11 (= 88), leaving it 12, which has a semblance of relation to the sexagesimal notation. By means also of an ingenious geometrical artifice he seemingly increased the marvellous character of the arrangement. The radius of the interior circumference being made equal to once and a half the distance between the successive circumferences, it happens that a ring having a breadth of once this distance, centred at any intersection of the interior circumference with one of the dividing lines between the radial columns, and touching the outer circumference, will fall on a series of numbers whose sum added to the central number will equal 360. But this is only an indirect way of stating the property of the bent diagonals in the square Fig. 21. Mr. Eugene Nulty, in the *Transactions of the Am. Philosophical Society*, vol. v., new series, 1837, has pointed out, further, that a spiral band (which he calls a cyclovolute) coinciding with the ring above described for half its course and afterwards winding downward to the inner circumference at the centre of the ring, will give a similar sum. This is also an indirect way of saying that the *unbent* diagonals of the square Fig. 21 sum up equally. Fig. 46 on preceding page represents Franklin's magic circle, with one of the rings and one of the volutes.

Magic Cubes.—The arrangement of the terms of an arithmetical series in the form of a cube so that each linear row of terms parallel to the edges or to the diagonals may sum up equally, is a problem which appears not to have been hitherto considered. It is one of a much higher degree of complication than that presented by the square. In a perfect magic square every term is a member of four different series all having the same sum. In a perfect magic cube the number of such equal series of which every term must be a member is thirteen. To construct such a cube by any merely tentative process must evidently be a matter of great difficulty. But by applying the principles already employed in the construction of squares, we may readily succeed in reaching a satisfactory result.

The cube being a magnitude of three dimensions, we assume three co-ordinates, x, y, and z, and three independent increments of different values, a, b, and c. There are also grades of two different orders; linear grades and superficial or quadrate grades; with corresponding basic series of two orders likewise, which may be distinguished as linear bases and quadrate bases, the latter being denoted by the letter Q. It follows that magic cubes admit of the same classification as magic squares, viz. 1, Cubes in which every term of every series, E, B, or Q, is found in every line; and 2, Cubes in which terms of one or more of these series are so repeated as to be compensatory. And as we have employed p to denote the place of the term in its linear grade, and q to indicate the number of such grade, so r may stand for the number of the quadrate grade. Also, as a', b', and c' are the increments corresponding to the leading terms of the linear grades, in like manner a'', b'', and c'' will be those corresponding to the same terms of the quadrate grades. From these assumptions we derive the equations following, from which, for the sake of simplicity, we omit, as before, the negative indeterminate multiples of n:

$$x = h + (p-1)a + (q-1)a' + (r-1)a''. \qquad (49)$$

$$y = k + (p-1)b + (q-1)b' + (r-1)b''. \qquad (50)$$

$$z = l + (p-1)c + (q-1)c' + (r-1)c''. \qquad (51)$$

Whence we deduce the values of p, q, and r:

$$p = \frac{(b'c'' - b''c')(x-h) + (a''c' - a'c'')(y-k) + (a'b'' - a''b')(z-l)}{a''(bc' - b'c) + b''(a'c - ac') + c''(ab' - a'b)} + 1. \qquad (52)$$

$$q = \frac{(bc'' - b''c)(x-h) + (a''c - ac'')(y-k) + (ab'' - a''b)(z-l)}{a''(bc' - b'c) + b''(a'c - ac') + c''(ab' - a'b)} + 1. \qquad (53)$$

$$r = \frac{(bc' - b'c)(x-h) + (a'c - ac')(y-k) + (ab' - a'b)(z-l)}{a''(bc' - b'c) + b''(a'c - ac') + c''(ab' - a'b)} + 1. \qquad (54)$$

These expressions admit of simplification. Since to the construction of a perfectly magic cube it is only necessary that no term shall be in line with another of its own grade, nor with another similarly placed in a different grade, and since this object may be more easily secured if one increment out of each triplet is made zero than if all have an actual value, provided the term made zero is different in each triplet, we may put $c = 0$, $a' = 0$, $b'' = 0$; when the foregoing expressions for p, q, and r will become

$$p = \frac{b'c''(x-h) + a''c'(y-k) - a''b'(z-l)}{ab'c'' + a''bc'} + 1. \qquad (55)$$

$$q = \frac{bc''(x-h) - ac''(y-k) - a''b(z-l)}{ab'c'' + a''bc'} + 1. \qquad (56)$$

$$r = \frac{bc'(x-h) - ac'(y-k) + ab'(z-l)}{ab'c'' + a''bc'} + 1. \qquad (57)$$

In order that there may be no interference of terms in the construction of the cube, it will be understood that no pair of increments (*i. e.* neither a and b, nor b' and c', nor a'' and c'') may have a common factor with n, and that n must not be commensurable with the common denominator of the values of p, q, and r, above. The same principles in regard to the occurrence of cycles will also govern here as in the case of squares. From these equations we deduce the values of the differences of the three series, viz. the elementary series, the linear-base series, and the quadrate-base series, precisely as from the equations of the squares (28) and (29). These differences are thirty-nine in all, thirteen for each series. For, assuming the initial term to be placed in the cubic cell of which the co-ordinates are $x = 1$, $y = 1$, $z = 1$, seven lines will diverge from this, viz. three parallel to the edges of the cube, three direct diagonals of the faces intersecting at the origin, and one direct diagonal of the solid. Besides these, there are the three transverse diagonals of the same faces, and three transverse diagonals of the solid likewise. These, for the series E, are denoted by the symbols, Δp_x, Δp_y, Δp_z, Δp_{xy}, Δp_{xz}, Δp_{yz}, Δp_{-xy}, Δp_{-xz}, Δp_{-yz}, Δp_{xyz}, Δp_{-xyz}, Δp_{-xzy}, Δp_{-yzx}; in which the negative sign prefixed to the subscript exponent denotes that the ordinate of which the symbol is placed last is diminishing, while the others are increasing. This indication fixes the position of the diagonal; the point of departure being taken on the axis of diminishing ordinates at the maximum distance from the origin, and the direction being toward the solid angle diametrically opposite. There will of course be an equal number of forms of Δq and Δr. But in order to ascertain whether a given combination of increments will make a cube magical or not, or will make it perfectly or imperfectly so, it is not necessary to calculate—that is, to find the integral value—of every one of these differences. Putting first, for simplicity, h, k, and l each = unity, we find the coefficients of x, y, and z in the foregoing equations, and then consider whether any one of these, or the sum or difference of any two of them, or any sum or difference which can be made with all three of them in each equation severally, is equal to or is a multiple of n, or is zero. In such a case there may be a magic cube, but not a cube perfectly magical. If any coefficient, or any sum or difference of coefficients, has a common factor with n, there will be cycles, with the same consequences as in squares; but the prejudicial effect of these may be removed in this case as in that, by so permuting the terms in the grades, and also the grades themselves, both linear and quadrate if necessary, as to make the cycles equal. If every coefficient, and every sum and difference of coefficients, is prime to n, the cube will be perfect, and the same will be true when they are not prime, provided the resulting cycles are equalized. The number of conditions to be fulfilled is so great that no prime number smaller than 11 will afford a cube perfectly magical. The smallest perfect even number cube is that of 8, and the smallest perfect odd number cube, that of 9. With this last root the latitude of choice in the selection of values for the increments is very limited; but a perfectly magical cube will be formed if we put $a = 7$, $b = 4$, $b' = 2$, $c' = 5$, $a'' = 5$, $c'' = 2$, provided the series be permuted as in Fig. 11.

To illustrate the method of determining the character which a cube constructed with given increments will possess, let us suppose $n = 11$, $a = 7$, $b = 3$, $b' = 5$, $c' = 7$, $a'' = 3$, $c'' = 4$. These when substituted in the above equations give the following values of p, q, and r:

$$p = \frac{20x + 21y - 15z - 26}{203\ (= 5)} + 1. \qquad (58)$$

$$q = \frac{12x - 28y + 9z + 7}{5} + 1. \qquad (59)$$

$$r = \frac{21x - 49y + 35z - 7}{5} + 1. \qquad (60)$$

If the coefficients of x, y, and z, in these expressions for p, q, and r, be represented by A, B, C; A′, B′, C′; A″, B″, C″, respectively, we must examine first, for p, whether A or B, or C, or A + B, or A − B, or A + C, or A − C, or B + C, or B − C, or A + B + C, or A + B − C, or A + C − B, or

$B + C - A$, is either divisible by n $(=11)$ or is zero. If neither, the cube will be perfect so far as the series E is concerned. And if the same is found true for A', B', C', and for A'', B'', C'', it will be perfect in the series B and in the series Q also. But when any one of these numbers or combinations of numbers is zero or is a multiple of n, the cube, though it may be magic, will be imperfectly so in the direction and in the series corresponding to the value of Δ in which this occurs. In the case foregoing we have

$A = 20$	$A' = 12$	$A'' = 21$
$B = 21$	$B' = 28$	$B'' = 49$
$C = 15$	$C' = 9$	$C'' = 35$
$A + B = 41$	$A' + B' = 40$	$A'' + B'' = 70$
$A - B = 1$	$A' - B' = 16$	$A'' - B'' = 28$
$A + C = 35$	$A' + C' = 21$	$A'' + C'' = 56$
$A - C = 5$	$A' - C' = 3$	$A'' - C'' = 14$
$B + C = 36$	$B' + C' = 37$	$B'' + C'' = 84$
$B - C = 6$	$B' - C' = 19$	$B'' - C'' = 14$
$A + B + C = 56$	$A' + B' + C' = 49$	$A'' + B'' + C'' = 105$
$A + B - C = 26$	$A' + B' - C' = 31$	$A'' + B'' - C'' = 35$
$A + C - B = 14$	$A' + C' - B' = 7$	$A'' + C'' - B'' = 7$
$B + C - A = 16$	$B' + C' - A' = 25$	$B'' + C'' - A'' = 63$

No one of these results being zero or divisible by 11, it follows that the cube of 11 constructed with the given increments will be perfectly magical, and that all the rows parallel to its several edges or to the diagonals of its faces, or to those of the solid itself, whether these diagonal parallels are whole or broken, will sum up equally. It will be noticed that when, in these comparisons, there is obtained a negative result, the sign is omitted, as being of no importance to the test.

It is proper here to remark that, between the increments a, b, b', c', etc., there exist certain necessary relations, which may serve as useful guides in the selection of values for these increments. The symbols A, B, C, etc., used above, represent nine products, or binary combinations, in the formation of which each increment is multiplied into every other which is neither analogous to it (of the same pair) nor homologous with it (of the same letter). If any one of these products is a multiple of n, the cube cannot be perfectly magical. In the application of this test, which is easy, a is tried with both terms of the second pair, and with the one unlike itself in the third; b, with both of the third and one of the second; b', with both of the third, and c' with one of the third. Secondly, among the combinations of A, B, C, etc., illustrated above, are some of which the expressions $(a \pm b)c'$, $(b' \pm c')a$, $(a'' \pm c'')b'$, and others similar, are the equivalents. From these we infer that if the sum of any pair of increments is n, or their difference zero, the cube cannot be perfect; and also that if (putting $n = \mu\nu$) the sum or the difference of any pair is a multiple of μ, and the other factor in the foregoing formulæ a multiple at the same time of ν, or *v. v.*, the cube cannot be perfect. Moreover, as the common denominator of all the equations is the sum of the products of the two triads, a, b', c'' and a'', b, c', if one or more of the factors in either of those triads has a common measure with n, and any one of those of the other triad has the same common measure, there will be interference, and the cube cannot be constructed at all.

These principles, however, are only applicable to the cases represented by the equations (55), (56), and (57). If all the increments have values greater than zero, it is permissible that any pair may have a difference equal to zero or a sum equal to n in one of the triplets, provided that no homologous pair in either of the other triplets has a similar difference or a similar sum, but if any two homologous pairs sum up severally equal to n, or if their differences are severally zero, the cube will be imperfect in some of the diagonals dependent on the combination of such pairs. The test of the fitness of a given selection of increments must in this case be made by means of equa-

Fig. 47.

Magic Cube of 8—perfectly magical.

$a = 1, b = 2, b' = 1, c' = 2, a'' = 2, c'' = 3, h = 1, k = 1.$ Order: 1, 2, 3, 4, 8, 7, 6, 5.

1

1	490	59	468	8	495	62	469
144	359	182	349	**137**	354	179	348
465	2	491	60	472	7	494	61
352	143	358	181	**345**	138	355	180
57	466	3	492	64	471	6	493
184	351	142	357	**177**	346	139	356
489	58	467	4	496	63	470	5
360	183	350	141	**353**	178	347	140

2

251	276	200	303	254	277	**193**	298
438	93	**393**	98	435	92	400	103
299	252	280	199	302	253	**273**	194
102	437	**89**	394	99	436	96	399
195	300	256	279	198	301	**249**	274
398	101	**433**	90	395	100	440	95
275	196	304	255	278	197	**297**	250
94	397	**97**	434	91	396	104	439

3

328	175	382	149	**321**	170	379	148
9	482	51	476	16	487	54	477
152	327	174	381	**145**	322	171	380
473	10	483	52	480	15	486	53
384	151	326	173	**377**	146	323	172
49	474	11	484	56	479	14	485
176	383	150	325	**169**	378	147	324
481	50	475	12	488	55	478	13

4

126	405	**65**	426	123	404	72	431
243	284	208	295	246	285	**201**	290
430	125	**401**	66	427	124	408	71
291	244	288	207	294	245	**281**	202
70	429	**121**	402	67	428	128	407
203	292	248	287	206	293	**241**	282
406	69	**425**	122	403	68	432	127
283	204	296	247	286	205	**289**	242

5

449	42	507	20	456	47	510	21
336	167	374	157	**329**	162	371	156
17	450	43	508	24	455	46	509
160	335	166	373	**153**	330	163	372
505	18	451	44	512	23	454	45
376	159	334	165	**369**	154	331	164
41	506	19	452	48	511	22	453
168	375	158	333	**161**	370	155	332

6

315	212	264	239	318	213	**257**	234
118	413	**73**	418	115	412	80	423
235	316	216	263	238	317	**209**	258
422	117	**409**	74	419	116	416	79
259	236	320	215	262	237	**313**	210
78	421	**113**	410	75	420	120	415
211	260	240	319	214	261	**233**	314
414	77	**417**	114	411	76	424	119

7

136	367	190	341	**129**	362	187	340
457	34	499	28	464	39	502	29
344	135	366	189	**337**	130	363	188
25	458	35	500	32	463	38	501
192	343	134	365	**185**	338	131	364
497	26	459	36	504	31	462	37
368	191	342	133	**361**	186	339	132
33	498	27	460	40	503	30	461

8

446	85	**385**	106	443	84	392	111
307	220	272	231	310	221	**265**	226
110	445	**81**	386	107	444	88	391
227	308	224	271	230	309	**217**	266
390	109	**441**	82	387	108	448	87
267	228	312	223	270	229	**305**	218
86	389	**105**	442	83	388	112	447
219	268	232	311	222	269	**225**	306

tions (52), (53), and (54), but the symbols A, B, C, etc. represent here not simple products but differences of products. As an example let there be taken $a=1$, $b=5$, $c=6$; $a'=2$, $b'=3$, $c'=3$; $a''=4$, $b''=5$, $c''=4$; and $n=11$ as before. These, substituted in the equations, give

$$p=\frac{4y-3x-2z+1}{5}+1. \qquad (61)$$

$$q=\frac{20y-10x-15z+5}{5}+1. \qquad (62)$$

$$r=\frac{9y-3x-7z+1}{5}+1. \qquad (63)$$

From which we derive the values,

$A=3$	$A'=10$	$A''=3$
$B=4$	$B'=20$	$B''=9$
$C=2$	$C'=15$	$C''=7$

As no one of these individual numbers, and no possible combination, made by means of the signs + and −, of the several members of either of the triplets, is divisible by 11, or is zero, it follows that the cube constructed according to this law will be perfectly magic. In this case, and in that of the cube of 11 mentioned above, the indications of theory have been verified by actual construction.

In Fig. 47 there is presented a cube perfectly magic on the number 8. In this example cycles are formed in each of the series, P, L, and Q, and in the direction of all the three co-ordinates, x, y, and z; but the effect of these is compensated by following, in every series, the order, 1, 2, 3, 4, 8, 7, 6, 5. The eight squares here exhibited are those parallel to the plane xy, which to form the cube should be placed one before the other in the order of their numbers. In order to verify the properties ascribed to the cube, we select for addition the terms which, in this arrangement, are brought in any direction into line. Observing that the value of S must in general be equal to the sum of an arithmetical series of which the first term is 1, the last term n^3, and the number of terms n, we have

$$S=\tfrac{1}{2}n(n^3+1)=\tfrac{1}{2}(n^4+n). \qquad (64)$$

And for the cube of 8,

$$S=\tfrac{1}{2}(8^4+8)=\tfrac{1}{2}(4096+8)=2052.$$

The row parallel to z on the right upper edge is then,

$$469+298+148+431+21+234+340+111=2052=S.$$

The direct diagonal of the solid is

$$1+93+174+207+512+420+339+306=2052=S.$$

The transverse diagonal $-yzx$ is

$$469+400+322+294+44+113+191+219=2052=S.$$

The broken diagonal parallel to $-xzy$, beginning at 141 and ending at 385, is,

$$141+278+479+128+372+235+34+385=2052=S.$$

And so of others.

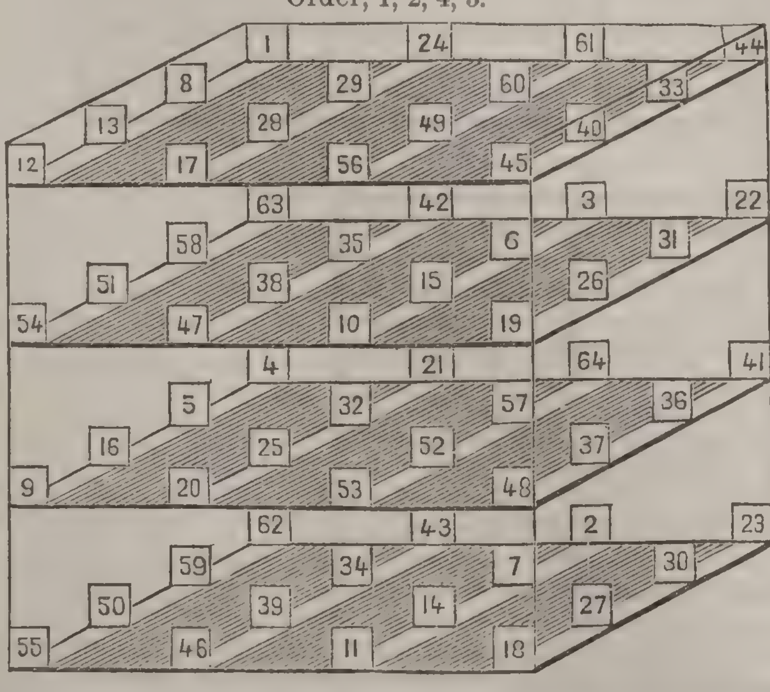
It is impossible otherwise than in this manner to exhibit magic cubes to the eye, except those of the smallest roots, which are necessarily more or less imperfect. The following diagram presents a cube of the number 4, which is magical except in the rows parallel to z, and in the diagonals of the faces xz, and two of those of the solid. In this figure every cubic tessera of eight terms, however taken, will be found to give the same sum; and cubes of the higher powers of 2 may be made to possess the same property, as is true of the cube of 8, Fig. 47.

FIG. 48.

Magic Cube of 4—imperfectly magical.

$a=2$, $b=3$, $b'=2$, $c'=1$, $a''=1$, $c''=3$, $h=1$, $k=1$.

Order, 1, 2, 4, 3.



Perfectly magic cubes may be formed on all numbers from 8 upward except the unevenly even. Odd-numbered cubes imperfect only in the diagonals may have all the diagonals passing through the central cell, whether of the solid or of the planes parallel to the faces, made equal, by giving to h, k, and l, the values determined by the equations,

$$h=\tfrac{1}{2}(n+1)-\tfrac{1}{2}(n-1)(a+a'+a''). \qquad (65)$$

$$k=\tfrac{1}{2}(n+1)-\tfrac{1}{2}(n-1)(b+b'+b''). \qquad (66)$$

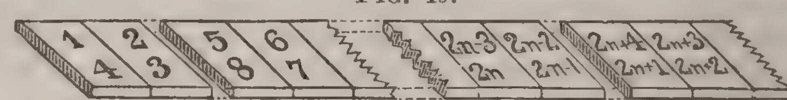
$$l=\tfrac{1}{2}(n+1)-\tfrac{1}{2}(n-1)(c+c'+c''). \qquad (67)$$

The effect of this is to bring the middle term of the general series, which is also the middle term of a series E, a series B, and a series Q, to the central cell of the cube. This takes place whether the cube is perfect or imperfect. For the perfect cube of 11 last considered, the values deduced from the foregoing equations are $h=4$, $k=7$, $l=7$.

Special Methods for Numbers Divisible by 8.—Magic cubes can be formed on numbers divisible by 8 by methods analogous to those described for squares of numbers divisible by 4. It will suffice to mention a single one of these; others may easily be devised by applying the principles heretofore explained. As in forming magic squares in accordance with these methods we begin by preparing equalized bands, so here we in the first place prepare what we may call equalized prisms. Let us suppose these prisms to be both equalized and equivalent. They will be composed of equivalent cubic tesseræ of 8 terms each, which are constructed as follows:

Arrange all the terms of the general series in a band of current groups horizontally, thus:

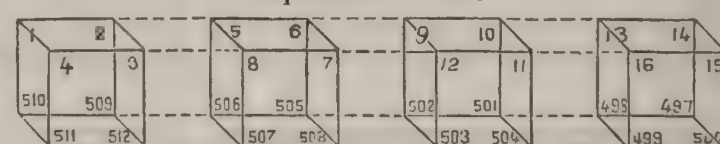
FIG. 49.



That is to say, the order in each current group is from left to right up to the term $2n$; then from right to left up to the term $4n$; then from left to right again to $6n$, and so on alternately as far as $\frac{1}{4}n^3$; every odd double grade having the first described movement and every even double grade the second. After this the odd grades take the second movement, and the even the first, up to $\frac{1}{2}n^3$; between which point and the end the entire preceding system is reversed. The last half of this band of groups is then to be brought beneath the first, not by folding under backward, but by swinging around upon an imaginary pivot at the middle point of the band. The elongated prism thus formed may be cut up subsequently into short ones, each in length equal to n, the first of which, for the cube of 8, is, for illustration, given in the figure below. The entire number of these prisms will be $\frac{1}{4}n^2$.

FIG. 50.

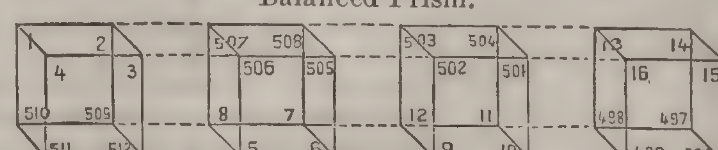
Equalized Prism.



Suppose these to be arranged in their order one beneath the other upon the plane of the co-ordinates xy. A number of them equal to $\frac{1}{2}n$ will cover the plane. In front of these is to be placed a second series in the same order, and so on until the cube is complete. Afterwards, for the purpose of balancing the linear rows, give to every even numbered tessera in the half of the first prism, and to every odd numbered one in the second half, a motion of rotation round the axis of the prism of half a revolution. The result is shown in Fig. 51. Do the same in the prisms symmetrically opposite to this both on the plane xy and on the plane xz. In the prism next below and in its symmetrically opposed associate prisms in these planes rotate the odd tesseræ in the first half, and the even in the second. So proceed till the first series has been completed, and then continue in like manner with that next in front, reversing however the order of succession of rotations, but in the third resuming the original order, and continuing

FIG. 51.

Balanced Prism.



with similar alternation until all are balanced. All the linear rows parallel to the edges of the prism, all the diagonals of the solid, and all those of the several planes except those parallel to xz will then sum up equally.

By applying the principles already explained under squares, there may be formed tesserated cubes on numbers having the form of $n=8m$; and there may also be formed cubes in shells, answering to bordered squares, in which the external strata of terms may be removed from all the sides, leaving the internal cube still magic; but the strata so removed must be two figures deep on every side.

In conclusion it may be observed, as to general methods, that the *law of construction* of a magic square or cube is known when the several increments of all its co-ordinates are given. The *system* of construction is known when, along with these values, those of the co-ordinates of the initial term are given. If, in any magic cube of which the system of construction is known, the numerical value of any term given by its co-ordinates, be represented by N, the following equation will be true, viz.:

$$\mathrm{N}=p+(q-1)n+(r-1)n^2. \qquad (68)$$

And as, in such a cube, the values of p, q, and r are directly deducible from equations (52), (53), and (54), or from equations (55), (56), and (57), it is practicable to determine, without construction, or without inspection of the cube as constructed, what term must occupy any assignable place. Again, if N be given, but not its co-ordinates, p, q, and r are ascertainable by means of the formulæ,

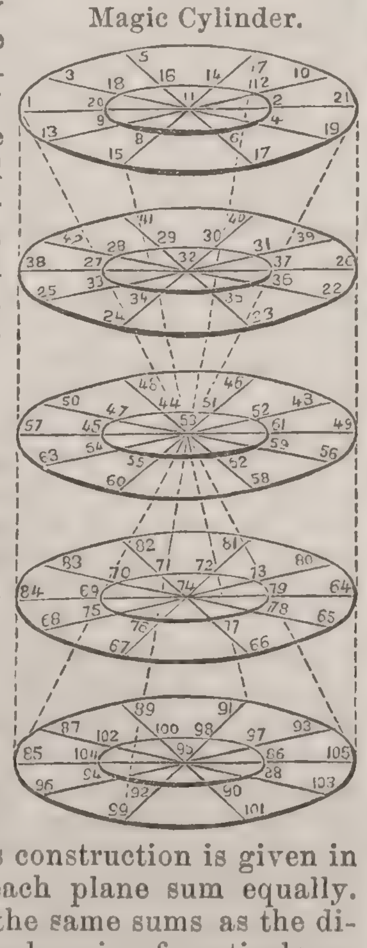
$$r=\left(\frac{\mathrm{N}}{n^2}\right)_q+1. \quad q=\left(\frac{1}{n}\left(\frac{\mathrm{N}}{n^2}\right)_r\right)_q+1. \quad p=\left(\frac{1}{n}\left(\frac{\mathrm{N}}{n^2}\right)_r\right)_r, \qquad (69)\ (70)\ (71)$$

in which the subscript indices q and r signify simply *quotient* and *remainder*, and are not identical with the same symbols used to denote functions of N. The values thus ascertained being substituted in equations (49), (50), and (51), the co-ordinates of N become known, and therefore its place in the cube.

Magic Cylinders and Magic Spheres.—If one of the surfaces of any perfect magic cube be applied to a cylinder having a circumference equal to n (the edge of the cube), the vertical squares being at the same time thrown into positions radiating from the axis of the cylinder like the leaves of a book opened wide, the result will be a magic cylinder; and if the cube be formed on the principle of the square Fig. 21, the cylinder will possess the properties of Franklin's magic circle, only that it will be every cubic tessera of eight terms, instead of every plane group of four terms, which will give the constant sum. It is easy to see that magic parallelopipedons, which may be constructed as easily as cubes, may be substituted instead of cubes in constructing magic cylinders.

Magic cylinders formed in this manner will either have no numerical terms occupying the axis, or will have the same central term in every plane. But cylinders may be formed with an axial row of unequal terms, in which the vertical and diagonal rows shall all sum equally, and the diameters in each plane shall be equal among themselves, though the sums in different planes will be different. If the height of such a cylinder contain the same number of terms as the diameter, the entire series will be odd. Put n for the height and N for the number of terms in a plane, calling the first the minor grade, and the second the major grade. The whole series will consist of n major grades. The central terms may be most conveniently made the $\frac{1}{2}(\mathrm{N}+1)$st terms of the successive major grades, or the n middle terms of the entire series. Make $n-1$ divisible by four, and let the number of diametric rows in each plane be taken at pleasure. If this number is n, the sum of every simple ring may be made double that of a diameter. These conditions determine the number of terms in the entire series. The terms in each major grade should thus be arranged in rings of balanced couplets around the centre, but some artifice will be required to make the vertical rows balance. Equality in the diagonals is secured as follows: If n' be the number of radii in a plane, it is demonstrable that there can be found $n'+1$ regular arithmetical series of n terms each, having as a common term the middle term of the general series, and for their first terms respectively, 1, $1+\frac{1}{2}(n-1)$, $1+2(\frac{1}{2}(n-1))$, $1+3(\frac{1}{2}(n-1))$, and so on. The middle term of this progression may occupy the centre of the upper plane, and the rest the extremities of the radii. The remaining diagonal terms are then easily found. A simple example of this construction is given in the figure. The diameters in each plane sum equally. Those of the central plane give the same sums as the diagonals and the verticals. A single pair of verticals remains unbalanced, which it is left to the reader to detect.

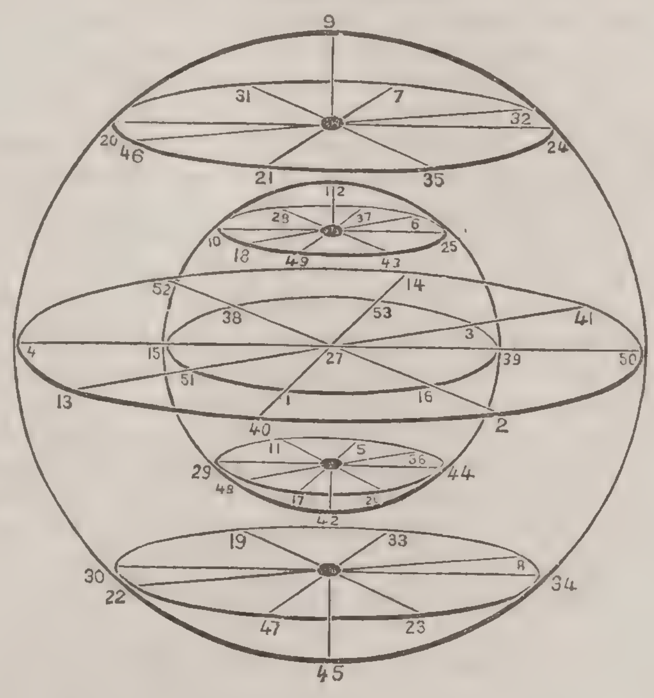
Fig. 52.
Magic Cylinder.



If the surface of a magic cube or parallelopipedon be applied to a sphere instead of a cylinder, and the several vertical columns assume the positions of radii, the result will be a magic sphere, possessing all the properties of the magic cylinder. In this mode of formation there will be no numerical term occupying the position of the pole of the sphere. Odd number spheres, however, can be constructed having a column of terms as the axis, and a term at the centre common to all the rectilinear rows (which necessarily follow the diameters). In these, all the diameters sum up equally, and the terms forming the equatorial circumference and its several parallels, whether of the exterior or of the interior shells, and those of every one of the meridional circumferences, interior or exterior, will sum equally, but with a sum different from that of the diameters.

To construct such a sphere, fix first upon the number of terms to be employed to form a circumference, which must of course be even, and if there is to be an equatorial ring, must be divisible by 4. Suppose this number 12. Then there should be six meridian circles passing through the common axis. Besides the two common polar terms, each circumference will have ten terms; or the entire number in the outer shell of the sphere will be sixty-two. If there are, say four shells, the total number of terms in these will be 248, and there will be a central term, making in all 249. This central term must be the middle term of the whole series, or 125. The remaining terms must be arranged in normal couplets, as 1, 249; 2, 248; 3, 247, and so on; and these are then to be balanced against each other on principles analogous to those employed in constructing balanced squares, Figs. 28, 29. It will facilitate the conception to suppose the spherical shells to be divided somewhere between the meridians occupied by the terms, and flattened out into plane strata. In such a development, particular attention must be paid to the polar numbers. The illustration of this branch of the subject by diagrams is difficult, but the following figure presents a simple case of a magic sphere of fifty-three terms.

Fig. 53.
Magic Sphere.



Magic Squares of Geometrical Series.—If the terms of a geometrical series be arranged in the cells of a square in accordance with any of the methods described in this article, the continued *products* of the terms in the several rows will be equal. For when numbers are in geometrical progression their logarithms are in arithmetical progression, and the sum of their logarithms is the logarithm of their product.

The literature of this subject is somewhat extensive. The largest work devoted to it is probably that of Violle, *Traité complet*, 2 vols. 8vo, with a folio vol. of plates, Paris, 1837. Other writers are Bachet de Meziriac, *Problèmes plaisans et délectables qui se font par les Nombres*, Lyons, 1613; Frénicle, *Divers Ouvrages de Math. et de Physique*, 1693; Poignard, *Sur les Quarres magiques sublimes*, 1703; De la Hire, in *Mem. Acad. Sci.*, Paris, 1705; Sauveur, in the same, 1710; Franklin, *Exp. and Obs.*, 1769; and in works collected by Sparks; Hutton, *Math. Recreations*, 1814; also in *Math. Dict.*, 1796; Montucla, *Histoire des Mathematiques*, vol. i., 1799; Möllweide, *De Quadratis magicis*, Leipsic, 1816; Nulty, *Trans. Am. Phil. Soc.*, vol. v. and vol. x., new series; Davies and Peck's *Math. Dict.*, New York, 1855; H. Carrington Bolton, *Acta Columbiana*, Nov., 1874, to June, 1875. In the conclusion of this series Dr. Bolton has given a nearly complete list of writers and writings on the subject, embracing about forty titles.

F. A. P. Barnard.

Maginn′ (William), LL.D., b. at Cork, Ireland, Nov. 11, 1793; exhibited such precocity in the classical languages as to be admitted to Trinity College at the age of ten years; was for many years a favorite contributor to *Blackwood's Magazine* under the *nom de plume* of "Morgan O'Doherty;" was Paris correspondent of the *Representative,* a daily paper started by Murray in 1824; editor of the *Standard* (1828), of *Fraser's Magazine* (1830), of the *Lancashire Herald* (1839), and of the *Magazine Miscellanies* (1840), a weekly issue of his own writings. He contributed numerous papers to the *Quarterly Review,* to *Bentley's Miscellany,* and to *Punch,* and wrote two novels, which had little success. All his writings are characterized by vast learning and exuberant wit, but his personal habits were such as to render his career a sad failure. He was dismissed from more than one literary post on account of drunkenness, was imprisoned for debt, was declared insolvent, and was reduced to great straits. D. at Walton-on-Thames, near London, Aug. 21, 1842. His critical and miscellaneous essays, *Homeric Ballads,* and *Shakspeare Papers* have been collected in the U. S. and edited by Dr. R. S. Mackenzie (5 vols., 1855–57).

Magio′ne, town of Central Italy, in the province of Perugia, near Lake Trasimeno. It contains some striking mediæval buildings, and the old Lombard tower on a hill near it was the scene of many a bloody fight between the people of Perugia and their lords. Pop. in 1874, 6851.

Ma′glie, town of Southern Italy, in the province of Lecce, in a most fertile district, about 23 miles from Gallipoli. Pop. in 1874, 5737.

Mag′na Char′ta [Lat., "the Great Charter"], a charter of liberties originally granted by King John (A. D. 1215) to the clergy, barons, and freemen of England, and repeatedly confirmed by subsequent monarchs, and justly regarded as forming the most important part of the British constitution. The tyrannical character and oppressive acts of King John, and his open violation of all law, aroused an opposition among the clergy and barons at an early period in his reign. This opposition, which at length became well organized and extensive, was headed and guided by Stephen de Langton, cardinal of the Roman Catholic Church and archbishop of Canterbury, to whose wisdom, firmness, and patriotism the successful issue of the great struggle between the people of the realm and the Crown was largely due. On Aug. 25, 1213, a council of the prelates and barons was held in London for the purpose of concerting measures by which the royal authority might be confined within legal bounds, and the rights and liberties of all estates in the kingdom might be secured and guarantied. The contest, which was thus openly commenced, lasted through the two succeeding years. On the one side were arrayed the freemen of England, the clergy, the barons, and the commons, united in one common cause and contending for rights which belonged to them all. On the other side was the king, standing almost alone, but using every artifice to divide and weaken his opponents. He applied for aid to Pope Innocent III., who, as a reward for his previous surrender of the English crown and reception of it again as a vassal of the Papal See, openly sided with him, censured the barons, and ordered the archbishop to excommunicate them. He also endeavored to detach the clergy from their union with the laity by granting (Jan. 15, 1215) a special charter to the English Church. All these manœuvres were unsuccessful: the clergy, as well as the nobility and the commons, remained firm in their demands for such fundamental guaranties as should secure their rights and liberties, and the king was forced to yield, after much delay and even violence in attempting to overthrow the organization which had been formed against him. The barons, with whom had collected a large force of armed knights and yeomen, proclaimed their array to be the "army of God and Holy Church." On May 24, 1215, they entered London, the king having fled from the Tower to Odiham in Hampshire. From this place he sent word that he would comply with the petitions, and asked that a time and place should be appointed for a conference. The barons named Runnymede as the place and the 9th of June as the day. The conference actually commenced on the 15th, and lasted until the 19th. An outline was first drawn up and assented to in the form of articles ("*articuli magnæ chartæ*"), upon the basis of which, although differing in some particulars, the more complete and formal instrument was prepared. The Great Charter itself was finally consummated and the royal seal affixed at Runnymede on Friday, the 19th, although it bears date the 15th of June, 1215, the day on which the negotiations were commenced. At the death of John the charter was at once renewed by the earl of Pembroke, who administered the government as protector on account of the minority of Henry III. In the next year it was again renewed, and again in the ninth year of Henry's reign, and on five subsequent occasions before the death of that monarch. The Great Charter, as it was promulgated in the ninth year of Henry III., was most solemnly re-established and confirmed by the king and Parliament A. D. 1300, being the twenty-fifth year of the reign of Edward I., and in the form as thus finally adopted, although differing in several particulars from the original, it appears in the English statute-book, and has been again confirmed by kings and Parliaments more than thirty times. We add a brief analysis of its text, and a general description of its most important provisions. The original charter of King John contained 61 chapters or articles. All of these after the 49th, except the 54th, were entirely temporary, relating to certain personal acts of the king, and establishing a means of enforcing its provisions by a commission of twenty-five, to be elected by the barons from among their own number, in case the king should refuse or neglect to carry it into effect. This portion was of course omitted in every subsequent renewal. Of the permanent articles a few only related to the clergy. The charter which had been granted to the Church earlier in the same year was deemed sufficient, and was expressly confirmed. By far the greater part of these chapters had reference to the laity, and they may be separated into two groups—namely, those which legislated for certain designated classes, and especially for the barons as tenants *in capite* of the Crown, defining, regulating, and limiting their feudal burdens and duties; and those which legislated for the whole nation, for the entire body of freemen. The former were based upon the then existing social condition, and, with the exceptions hereafter mentioned, they all ceased to be operative with the extinction of the feudal system. The latter remain in full force and effect as the very foundation and security of civil liberty in Great Britain, and the most important and comprehensive of the clauses has been incorporated into all the American constitutions, national and State. Among the articles defining the feudal relations of the barons to the Crown, the 12th enacts that "no scutage or aid shall be imposed in our kingdom unless by the general council of our kingdom," except for three specified purposes; while the 14th provides for the summoning and holding of the general council in order to assess such "aids." In these clauses are to be found the germs of the constitutional principle that no taxes shall be laid except by the consent of the persons to be taxed expressed through their representatives —a principle which involves the entire theory of representative government. These clauses were omitted in the charter of Henry III., but were re-enacted with even more explicitness in the confirmatory statute of 25 Edw. I. The most important articles by far of the Great Charter—since they contain a sure guaranty of every civil right and liberty belonging to freemen—are the 39th and 40th, the original text of which is: "39. *Nullus liber homo capiatur, vel imprisonetur, aut utlagetur, aut exuletur, aut aliquo modo destruatur; nec super eum ibimus, nec super eum mittemus, nisi per legale judicium parium suorum, vel per legem terræ.* 40. *Nulli vendemus, nulli negabimus, aut differemus rectum aut justitiam.*" The corresponding article of the charter of 9 Hen. III. and 25 Edw. I. is the 29th, the language of which is slightly varied and expanded: "*Nullus liber homo capiatur vel imprisonetur, aut disseisiatur de aliquo libero tenemento suo vel libertatibus vel liberis consuetudinibus suis, aut utlagetur aut exuletur aut aliquo alio modo destruatur; nec super eum,*" etc., the remainder of the clause being exactly the same as in the original form given above. The following is the authoritative translation of this capital provision as found in the English book of statutes: "No freeman shall be taken, or imprisoned, or be disseised of his freehold, or liberties, or free customs, or be outlawed or exiled, or any otherwise destroyed; nor will we pass upon him nor condemn him, but by lawful judgment of his peers, or by the law of the land. We will sell to no man, we will not deny or defer to any man, either right or justice." To this text I shall only add a sentence from the eloquent eulogium of Lord Chatham: "These three words, '*nullus liber homo,*' have a meaning which interests us all; they deserve to be remembered, they deserve to be inculcated in our minds, *they are worth all the classics.*"

John Norton Pomeroy.

Mag′na Græ′cia, the name by which the ancients denoted collectively the Greek cities and settlements in Southern Italy, sometimes, though improperly, including even those of Sicily. These colonies were planted in the eighth century B. C. by different Greek peoples—Croton in 710 by the Achæans, Tarentum in 708 by the Spartans, Locri in 708 by the Locrians, Sybaris and Rhegium by the Chalcidians—and they very soon attained a high degree of prosperity, partly through their commerce with the mother-country, partly through their communications, and even affiliations, with the natives, a Pelasgic and conse-

quently kindred races. When conquered by the Romans in the third century B. C. they lost their splendor, and at the time of Cicero most of them lay in ruins. There seems to have been something in the Roman rule which brought death to the Greek spirit, for in Sicily also the Greek colonies degenerated and withered when they became Roman possessions.

Magne (PIERRE), b. Dec. 3, 1806, at Périgueux, France, of a poor family; saved of a small salary in a subordinate position in the prefecture of Dordogne money enough to go to Toulouse and study jurisprudence; then settled as a lawyer in his native city, and soon attracted the attention of the prefect of Dordogne by his ability; in 1835 was appointed a councillor of the prefecture, and having been elected some years afterward a deputy, became noted as a member of the committee on the budget; in 1847 was appointed a secretary in the ministry of war, but resigned this office during the revolution of February, and returned to Périgueux. Napoleon, however, called him back in 1849, and made him a secretary in the ministry of finance, and in 1851 minister of public works. On Oct. 6, 1851, the prince-president formed a new cabinet, in which Magne was replaced by Lacrosse, but on the evening before the *coup d'état* he once more changed his cabinet, and Magne resumed his place. With respect to the decree by which the estates of the family of Orleans were confiscated the cabinet disagreed; several ministers withdrew, and among them Magne. Soon after, however, he was elected a senator, and in July, 1852, he again became minister of public works; in June, 1853, he also became minister of agriculture and commerce, and in the beginning of 1855 changed this position for that of minister of finance. Questions relating to the internal policy caused Magne to change his office several times, but his great financial talent always brought him back to this department. In 1863 he retired on account of a controversy with Fould, but (Nov. 3, 1867) he was again appointed minister of finance in order to effect the new great loan. When Napoleon formed the cabinet of Ollivier (Dec. 27, 1869), Magne retired into private life. Once more, however, he took charge of the ministry of finance, from May 25, 1873, to May 16, 1874, in the cabinet of Broglie, but withdrew on account of a vote of the National Assembly which went against the ministry. AUGUST NIEMANN.

Magnen'tius. See CONSTANS and CONSTANTIUS.

Magne'sia [origin of the word uncertain; conjecturally, from *Magnesia*, a locality in Asia Minor, but of this there is apparently no actual evidence]. Carbonate of magnesia, under the name of *magnesia alba*, is stated to have been introduced into Rome, and employed as a drug before its specific nature was known to chemists, and no longer ago than the beginning of the eighteenth century. Valentine first discovered the earth *magnesia* in the sulphate in 1707 (the latter having been known since 1675, as obtained from mineral springs); but it was for some time supposed to be a modification of lime. Magnesia is MgO, the oxide of the elemental metal Magnesium.

Native Magnesia.—It occurs as the beautiful crystallized mineral species *periclase* or *periclasite* in Dana's nomenclature, which is too rare even to be a gem. It has, however, been produced artificially by Ebelmen, by Deville, by Daubrée, and by Debray and Kuhlmann, all by different methods. Only one locality is known, in limestone on Monte Somma, discovered by Scacchi. Periclasite is in transparent crystals of the regular system, of density 3.65, about the same as diamond. Its hardness, however, is less than that of quartz.

Properties.—Artificial magnesia is a snow-white powder whose aspect is familiar to all. In the mass it is usually very light, because so finely divided, but its true density is high, at least 3.2, and on strong ignition it becomes, according to H. Rose, as heavy as periclasite = 3.61. Before Hare's blowpipe it melts to an enamel hard enough to scratch glass. It requires for solution 55,368 times its weight of water, or very nearly one U. S. gallon to dissolve one grain. Commercial magnesia may contain as an impurity small quantities of lime, which gives it an unpleasant taste. This may sometimes be detected by dissolving in an acid, and adding an excess of ammonia and a little oxalic acid, though, as oxalate of lime is somewhat soluble in magnesia salts, to detect minute traces of lime it is better to saturate some strong muriatic acid with the magnesia, filter clear, add a minute quantity of sulphuric acid and a considerable volume of alcohol. In some hours, if lime be present, minute crystals of gypsum will be found on the walls of the test-tube. Magnesia is an exceedingly bad conductor of heat, and may be used for confining heat in boilers, for refrigerators, and fireproof safes. Its refractory character has also led to its proposal as a material for crucibles made by hydraulic compression.

Occurrence in Nature.—Magnesia is of almost universal occurrence—in rocks, soils, mineral waters, the ocean, and as an essential constituent of almost all plants and animals. It occurs as *dolomite*, forming mountain-masses and containing 21.73 per cent.; as *serpentine*, a silicate of magnesia, containing some 43 per cent.; as *magnesite*, the carbonate, containing 47.6 per cent.; in the crystalline schists, from which most other rocks and all soils are mainly formed, it is in the forms of *magnesian amphiboles* and *pyroxenes*, containing often 20 or 25 per cent., magnesia-micas, or *phlogopite* and *biotite*, *hypersthene*, etc. etc. The trap-rocks of the Hudson River Palisades contain sometimes as much as 10 per cent. of magnesia. There are very few limestones which are not more or less magnesian. The great ocean contains nearly one-quarter of 1 per cent. of magnesia, and the *bitterish* taste of the ocean-brine is attributed chiefly thereto. Magnesia might be obtained economically and in unlimited quantities from the ocean by a simple method, by precipitating with the very cheap agent, milk of lime. Every cubic foot of sea-water contains $2\frac{1}{3}$ ounces of magnesia; it is surprising that this source of magnesia has not been availed of. The chief source of commercial magnesia and its salts at present is probably the native chloride, *carnallite*, and other magnesian minerals of the celebrated Stassfurt deposits, the residua from the evaporation of some ancient sea. Many medicinal mineral waters owe their virtues wholly or in part to magnesia. The ashes of grains of wheat contain 11.75 per cent. of magnesia, and a soil deficient in this constituent, which is not at all uncommon, could not, of course, grow wheat, no matter how rich otherwise. The amount of magnesia in the grain is nearly four times the lime, while this proportion is about reversed in the straw; so that a good calcareous soil, if lacking magnesia, might produce straw without any wheat.

Preparation.—It is usually made by gently igniting the carbonate, as previously prepared by precipitating the sulphate or chloride, or both, as they occur in admixture in the bitterns of salt-works. The carbonate is also made by the action of carbonic acid and water on calcined dolomite under pressure. A solution is thus procured of the bicarbonate of magnesia, from which the carbonate precipitates on heating. It may be prepared in a pure state by igniting the *nitrate*.

Uses.—Under *Properties*, above, some of the uses have been referred to. Its medicinal uses are elsewhere treated of. A mixture of magnesia, water, and the chloride of magnesium forms a cement, known as Sorel's cement, which hardens to an oxychloride as hard as marble. There are no other important special uses for magnesia, as such.

Salts and Compounds.—Of these, the carbonate, sulphate, and chloride are the only ones of much practical note. The carbonate has been already somewhat referred to. The commercial carbonate is liable to contain silica, carbonate of lime, and oxide of iron as impurities. It is really not a simple carbonate of magnesia, but a compound of the carbonate and a hydrate, and its composition varies considerably with the mode of preparation. The simple carbonate occurs native, as already mentioned, as the mineral *magnesite*. The hydrate is also found native as two very beautiful dimorphs, *brucite* and *nemalite*. The sulphate of magnesia is known commercially as *Epsom salt* (Ger. *Bittersalz*). It was first discovered in the springs at Epsom in England by Dr. Grew in 1675. Much is contained in the mother-liquor left after crystallizing out the salt from sea-water. It occurs as a mineral, *epsomite*, particularly in dry caves. Epsom salt is $MgO,SO_3,7H_2O$, crystallizing in orthorhombic forms; of density, when perfectly pure, 1.7244, according to determination made by the present writer. Ice-water takes up in solution, for 100 parts, 25.76 parts, and .8597 part more for each degree F. above this. When warmed it melts in its own water of crystallization, of which it contains 51.22 per cent. The chloride of magnesium is important only as being the compound employed in the manufacture of the valuable metal MAGNESIUM (which see). HENRY WURTZ.

Magnesia, often called *Magnesia ad Sipylum*, to distinguish it from Magnesia ad Mæandrum, was a town in Lydia, the present *Manissa*, and celebrated for the battle which took place here in 190 B. C. between the two Scipios and Antiochus the Great of Syria, who after this defeat was driven out of Asia Minor by the Romans.

Magne'sium, the metal of which magnesia is the oxide, and of which magnesian minerals and magnesian rocks are the ores. Among the more common magnesian rocks, *serpentine* is the richest ore of magnesium. This contains by weight 25.8 per cent. of magnesium; but, considering that this metal when free is about half as light again as the serpentine, the magnesium contained in this ore is about 37 per cent. of its *bulk*. In Canada there occurs a

rock, the *magnesitic ophiolite* of Prof. Sterry Hunt, which is richer still in magnesium, containing, as calculated from Hunt's analysis, 42.5 per cent. of its bulk of the metal. Serpentine, however, which constitutes large masses of rock in the U. S., will furnish a good deal of magnesium when it shall come to be required in large quantities; and in any case the ocean—as pointed out by the present writer in the article on MAGNESIA—is an inexhaustible reservoir of magnesium, belonging to nobody. Each cubic foot of the ocean contains 1.34 ounces of metallic magnesium, or over six-tenths of a cubic inch. A cube of 30 feet of sea-water contains one ton of 2240 pounds of the metal magnesium—more, probably, than could now be bought in the whole world.

Properties, Chemical and Physical.—Magnesium is silver-white and very brilliant, malleable, and ductile. It melts at a red heat, and is readily cast into ingots. At a higher heat it volatilizes and distills, like zinc, which will facilitate greatly its manufacture and purification on a large scale. The true density of magnesium has been in some doubt. Bunsen's earliest determination was 1.743; Kopp found 1.69 and 1.71; Deville and Caron found 1.75; but one of the latest determinations of Playfair and Joule gave the extraordinary figure 2.24. This has led the writer himself to repeat the determination of the density of this metal, with great precautions to ensure accuracy. The result was a complete confirmation of Bunsen's original figure, 1.743, at least so far as the second place of decimals. Its chemical equivalent is 24 ($O = 16$).

One of the most remarkable characters of magnesium is its combustibility in the form of filings, wire, or ribbon, with a light of dazzling brilliancy. In this also it is like zinc, which will burn in the same way if in sufficiently thin foil. A chemist named Woods has shown very recently that in this combustion more heat is developed per chemical equivalent of combustible—that is, for equal amounts of oxygen taken up—than in the case of any other metal, so far as known. Heretofore, potassium has had the reputation of possessing the greatest calorific energy among metals, but Woods rates it, as compared with magnesium, as 9 per cent. less than the latter, zinc being 50 per cent. less than potassium. When we consider how light a metal magnesium is, and that magnesia is quite a heavy oxide, nearly twice the density of the metal, we seem to see a reason for this immense evolution of heat. When shall we learn whether it is the metal or the oxygen that condenses so greatly in this combustion?

Magnesium does not rust rapidly in damp air, a thin white film of carbonate of magnesia forming, which, from its insolubility, protects the metal. It can undoubtedly be protected from corrosion as readily as steel, brass, or copper; and this will not stand in the way of its practical uses, especially as the rust, carbonate of magnesia, is devoid of toxic qualities, and not destructive to organic matter like that of iron and steel. Being by far the lightest substance of equal strength that is known (except possibly *calcium*, which is comparatively little known), and obtainable in unlimited quantities, it is unquestionably, next to *aluminium*, the most important of the metals of the future. Our almost absolute inaction in the way of bringing into common use this class of metals, which hereafter will be far more valuable than any other materials known to mankind, is difficult of comprehension. An impulse may be given to progress in this direction by the improvements now making in the conversion of mechanical force or force of combustion into chemical force, by means of modifications of the American invention of Saxton, the *magneto-electric engine*, which will undoubtedly give us currents of electricity strong enough and cheap enough to make magnesium and these other metals by direct electrolysis, without the use of sodium.

Manufacture of Magnesium.—As already intimated, the manufacture of magnesium is dependent at the present day entirely on that of sodium. The improved method of Sonstadt consists in heating in a closed crucible 6 parts of chloride of magnesium, 1 of dry common salt, 1 of powdered fluor-spar, and 1 of metallic sodium to a bright red heat. The granules of magnesium thus formed are separated from the mass, and purified by distillation in a current of dry hydrogen gas, at a white heat, in an apparatus composed of carbon. It is incorporated into a body for casting into ingots by fusing, under a flux composed of the same ingredients as above—mixed chlorides of magnesium and sodium and fluoride of calcium. The actual manufacturers who supply commerce no doubt know many important practical details which are not given to the public.

Alloys of Magnesium.—These are somewhat better known than those of calcium. They seem mostly more oxidable than magnesium itself, and no uses have been suggested for them. Mercury when hot amalgamates readily with magnesium, though without action in the cold. HENRY WURTZ.

Magne'sium, Medicinal Uses of. The compounds of magnesium used in medicine are magnesia and magnesium carbonate, citrate, and sulphate. Magnesia and the carbonate are valuable, in the first place, as alkalies to neutralize acidity in the alimentary canal, both from their high saturating power and from the absence of any corrosive or poisonous properties of their own. Hence, in poisoning by the mineral acids and in acid dyspepsia they are very useful; but from the low diffusion power of magnesian compounds they are but little absorbed, and hence cannot be employed like alkaline preparations of sodium and potassium to alkalize the blood. All soluble magnesian salts are purgative, producing, like other saline cathartics, watery discharges, while at the same time not irritating the intestinal mucous membrane. Magnesia and magnesium carbonate, formed into soluble salts by the acid of the gastric juice, thus combine the virtues of an alkali and a mild purge, and are accordingly useful in acid dyspepsia with constipation. Magnesium citrate is employed as an agreeable laxative and mild purge in the form of the officinal effervescing solution of the U. S. Pharmacopœia. This contains, besides the salt itself, free carbonic acid gas and a pleasant flavoring of syrup of citric acid and oil of lemons. Magnesium sulphate, or "Epsom salt," is a more powerful though safe neutral saline purge, and is used where a free watery evacuation is desired. From its less offensive taste it has superseded, for this purpose, the sodium sulphate, or "Glauber's salt." EDWARD CURTIS.

Mag'net; Magnetism; Terrestrial Magnetism. The word *magnet* is from the Greek *μάγνης*, the name given to the loadstone or native magnet, an ore of iron extensively distributed over the globe, and whose peculiar property of attracting metallic iron has been known from the remotest antiquity. The word *magnes* is said by some to be the name of Magnes, a Greek shepherd who observed on Mount Ida the attractive power of a large mass of loadstone on his iron crook. Others, with more probability, derive the name from Magnesia, in Lydia, where the loadstone was found; and this opinion receives weight from the fact that the ancients often called the magnet *lapis Heracleus*, from Heraclea, the capital of Magnesia.

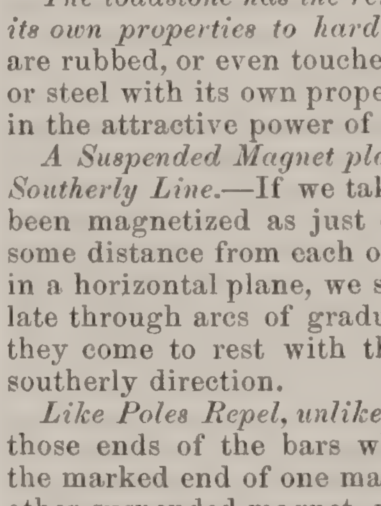
The loadstone has the remarkable power of giving all of its own properties to hard iron or steel when these bodies are rubbed, or even touched, by it. The endowing the iron or steel with its own properties does not cause a diminution in the attractive power of the loadstone.

A Suspended Magnet places its Length in a Northerly and Southerly Line.—If we take two bars of steel which have been magnetized as just described, and suspend them at some distance from each other, and so that they can swing in a horizontal plane, we shall observe that they will oscillate through arcs of gradually decreasing amplitude until they come to rest with their lengths in a northerly and southerly direction.

Like Poles Repel, unlike Poles Attract.—If we now mark those ends of the bars which point northerly, and bring the marked end of one magnet near the marked end of the other suspended magnet, we shall observe that the marked end of the latter will swing away from the marked end of the former. But if the marked end be brought near the unmarked end of the suspended magnet, the latter will move towards the former. The ends of the magnets are often designated as their *poles*, and the above laws are then expressed as follows: *Unlike magnetic poles attract, and like poles repel.* The end of the suspended magnet which points towards the N. is often called its N. pole, while the end which points towards the S. is called its S. pole. If we present either end of a bar of soft iron to either end of a suspended magnet, we shall observe attraction in all cases.

Method of Detecting a Magnet and a Magnetic Substance.—The knowledge of the above laws gives us the means of determining whether a body is a magnet, or, like soft iron, a *magnetic substance* which attracts either end of the magnet indifferently; and if the body be a magnet, of determining its N. and S. poles.

FIG. 1.



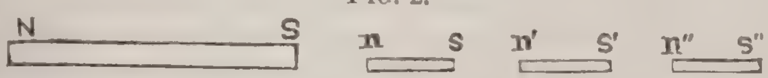
Let N S be a magnet free to move in a horizontal plane, and let N′ S′ be the steel or iron bar whose magnetic condition we would determine. We bring N′ S′ near the magnet N S, so that it points towards the centre of N S, and at right angles to its length. If now N S remain at rest, we know that N′ S′ is not a magnet; but it may be a magnetic substance, for the bar N′ S′ acts like a bar of soft iron, attracting equally N and S, and hence the magnet remains at rest. But if N S should rotate around its

centre, then $N'S'$ is a magnet; and if it should rotate in the same direction as the hands of a watch, then the end N' nearest the magnet N S is a N. magnetic pole. If N S rotate in the opposite direction to the hands of a watch, then N' is a S. pole.

Phenomena presented by a Broken Magnet.—One might infer from the above experiments that if a magnet were broken in two, one half of it would contain only N. magnetism and the other half S. magnetism; but this is not the fact; on the contrary, it will be found that no matter into how many parts the magnet is broken, each of these parts is a perfect magnet, containing N. and S. polarity, and placing itself, when freely suspended, in a northerly and southerly direction. From this experiment it has been inferred that each molecule of the magnet is itself a perfect magnet; and the fact that N. magnetism appears to exist alone at one end of the bar, and S. magnetism at the other, is owing to the interactions of these magnetized molecules; but of this and other hypotheses we shall speak further on.

Magnetic Induction.—The most remarkable phenomenon of magnetic action is that called *induction*, or the magnetizing action of a magnet on distant masses of magnetic substances. Thus, if N S be a magnet, and $n\,s$, $n'\,s'$, $n''\,s''$

Fig. 2.



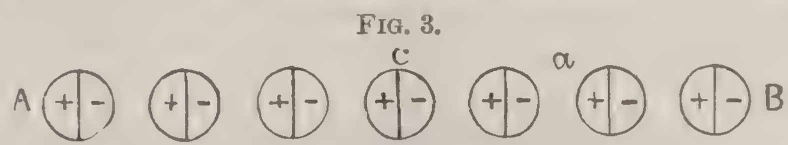
be bars of iron arranged as shown in the figure, it will be found that as long as N S is near the iron bars the latter will be magnets, with their poles $n\,s$, $n'\,s'$, etc., all placed in the same direction as those of N S, as shown in the figure. The interposition of any substance, not magnetic, between S and n, or between S and n', or s' and n'', has no effect in decreasing or augmenting the magnetic intensity of the bars. If N S be gradually removed from $n\,s$, then the magnetism of the iron bars will gradually diminish until it becomes imperceptible when N S has been removed to a considerable distance. If N S be brought in contact with $n\,s$, and the bars be pushed together, they will adhere as long as N S touches the bar $n\,s$. Another experiment will render clear this action of induction. Take two pieces of soft iron wire, and, holding them parallel to one another, bring them in contact with the end of a magnet. On taking away the hand they will adhere to the magnet, and diverge from the axis of the magnet, because of the repulsion exerted between the similar poles of the free ends of the wires. The action of induction explains the adherence of tufts of iron filings to the ends of a magnet when it is plunged into a mass of that substance and withdrawn. The particles of filings in contact with the magnet are rendered temporary magnets by induction, these act inductively on the particles touching them, and so all particles of the tuft are temporarily magnetized, with their poles arranged in lines pointing towards a point within the magnet. If instead of soft iron we had used steel in the above experiments, and had employed a powerful magnet, we should have found that the steel bars and filings had retained part of the induced magnetism after the magnet had been removed to a distance.

Explanations of Induction.—We have seen that there is reason to believe that the N. and S. magnetisms reside in or on the molecules of the magnet, and are there more or less separated, the N. magnetism being at one end of a molecule, and the S. magnetism at the other; and in these molecules like magnetic ends all face in the same direction. If, in soft iron and unmagnetized steel, we assume either that the magnetisms are, so to say, mixed on each molecule, and thus neutralize each other, or that they are already separated, but the molecules do not face with like magnetism in the same general direction, we can, with Poisson, explain the phenomena of induction as the separation of these magnetisms on the molecule, and their simultaneous arrangement, so that like magnetisms face the same general direction; or, with Weber, we may explain inductive action as the actual turning of the axes of the already polarized molecules of the iron or steel in the same direction. "If the axes of all the molecules were set parallel to each other, the iron would exhibit the greatest intensity of magnetization of which it is capable. Hence, Weber's theory implies the existence of a limiting intensity of magnetization, and the experimental evidence that such a limit exists is therefore necessary to the theory. Experiments showing such an approach to a limiting value of magnetization have been made by Joule and J. Müller. The experiments of Beetz (*Pogg.*, cxi. 1860) on electrotype iron deposited under the action of magnetic force furnish the most complete evidence of this limit. A silver wire was varnished, and a very narrow line on the metal was laid bare by making a fine longitudinal scratch on the varnish. The wire was then immersed in a solution of a salt of iron, and placed in a magnetic field with the scratch in the direction of a line of magnetic force. By making the wire the cathode of an electric current through the solution, iron was deposited on the narrow exposed surface of the wire, molecule by molecule. The filament of iron thus formed was then examined magnetically. Its magnetic moment was found to be very great for so small a mass of iron, and when a powerful magnetizing force was made to act in the same direction, the increase of temporary magnetization was found to be very small, and the permanent magnetism was not altered. A magnetizing force in the reverse direction at once reduced the filament to the condition of iron magnetized in the ordinary way. Weber's theory, which supposes that in this case the magnetizing force placed the axis of each molecule in the same direction during the instant of its deposition, agrees very well with what is observed."

Explanation of the Magnetization of Hard Steel.—Coercive Force.—That a bar of soft iron is only a magnet while under inductive action, while a steel bar retains more or less of its magnetism after the removal of the inducting magnet, is readily explained by Weber's hypothesis. In soft iron the molecules are readily placed with their magnetic axes in line, but the axes of the molecules of steel are with difficulty brought into one direction, but retain more or less of their alignment after the inducing magnet has been withdrawn. This resistance which a body offers to its magnetization is called its *coercive force*, which increases with the hardness of the steel. Also, the harder the steel the more permanent is any magnetic condition given by induction to the bar.

Explanation of the Apparent Concentration of Force at the Ends of a Magnet.—If a bar magnet be rolled in iron filings, this substance will only adhere near the ends of the magnet, the middle portion of the magnet appearing entirely devoid of magnetic properties. This fact is thus explained by the hypothesis of Poisson or of Weber: Let us consider a single row of magnetic elements A B (Fig. 3). If these

Fig. 3.



elements do not mutually modify their magnetic condition, their effects on an exterior magnetic substance would be almost nothing, by reason of their entire neutralization throughout the whole row of elements except at the extremities, where the positive or N. magnetic fluid of A and the negative or S. magnetism of B would alone act. But the exterior action is different from this, and depends on the interaction of all of the magnetic elements. Thus, all the positive poles of the elements which are on the side B act more strongly on a than do their negative poles, which are at a greater distance. In like manner, the negative poles of all of the elements which are on the side A exert on a stronger actions than the positive poles. The two portions Ba, aA of the row therefore so act as to augment the magnetic force of the element a. From these interactions it follows that in the half B of the row of elements the intensity of the negative magnetism of an element exceeds that of the positive magnetism of the element at its right; so that the action of the negative magnetism predominates in the half Bc; similarly, the actions of the positive magnetism predominate in the half Ac. Calculating the effects of the interactions of the magnetic elements on the basis of the law that the intensity of magnetic actions decreases inversely as the square of the distance from the centre of origin of such action, Poisson demonstrated that the sum of the actions which an element receives from all the others diminishes from the middle to the extremities of a magnet —at first slowly, then very rapidly. It follows that the difference between the magnetic forces of two neighboring elements augments as we go towards the extremities of the magnet. But it is this very difference which causes inductive actions exterior to the bar; the magnetic force therefore increases rapidly from the middle towards the ends. Near the middle the differences of magnetic force are barely sensible, and the exterior effect slight, although the elements are more highly magnetized than near the extremities of the bar.

Determination of the Magnetic Intensity along a Straight Magnet.—Coulomb of France made a series of researches on the distribution of magnetic intensity along the length of a straight magnet formed of very hard steel wire. In his investigation he used two methods of measurement. In the first he used his *magnetic torsion-balance*, which consists of a horizontal magnet suspended by a fine wire of silver. The magnet was placed in a vertical position, and the intensities of the exterior actions along its length were measured by observing the repulsion or attraction it caused in the magnet of the torsion-balance. The second method used by him is known as that of *oscillation*, and is prac-

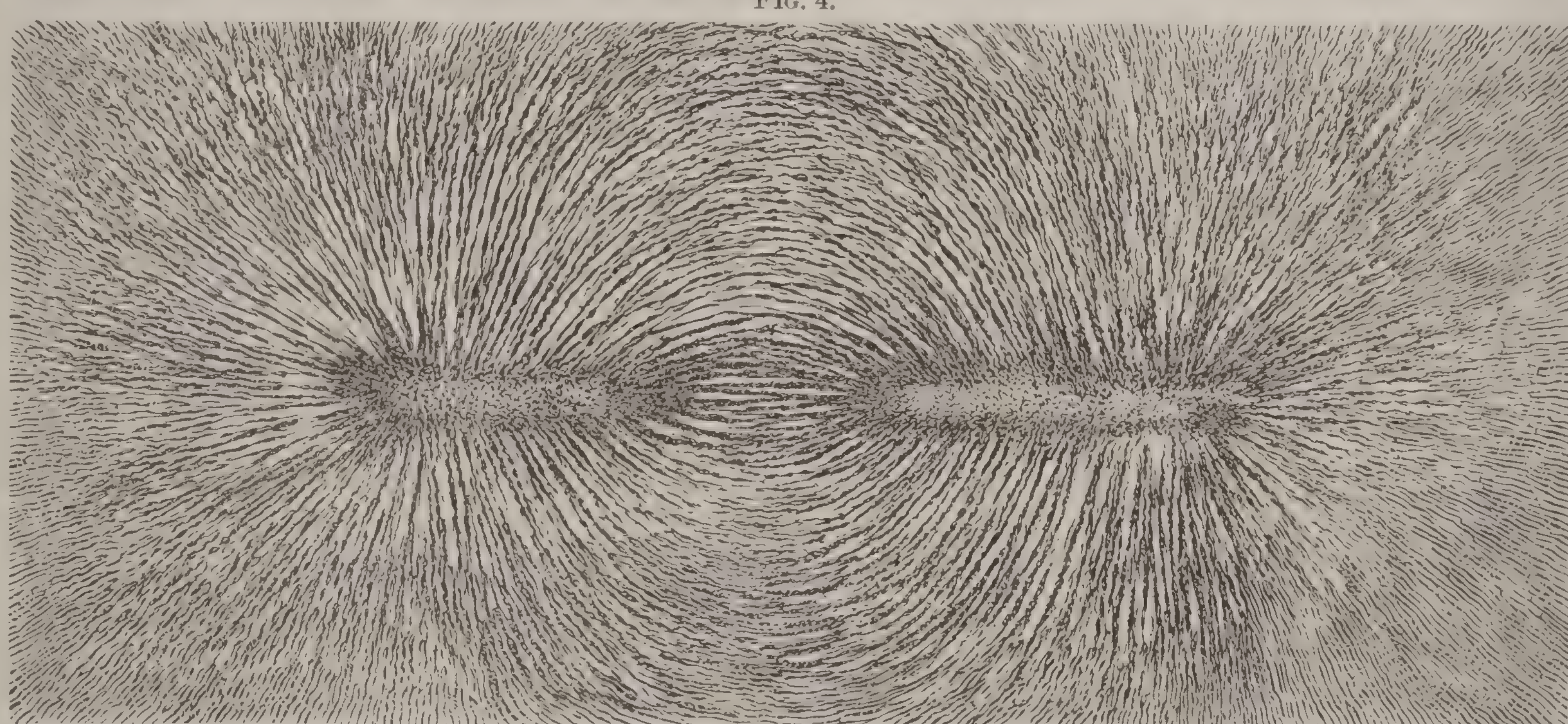
tised by placing a long magnet of hard steel in a vertical position, and then bringing various points on the surface of this magnet at the same distance from the end of a small magnet of hard steel, which vibrates in a horizontal plane, while the point of suspension of this small magnet and the axis of the vertical magnet are in the plane of the magnetic meridian. Designating by m and m' the magnetic intensities in two different points of the magnet, and by N the number of oscillations of the small suspended magnet under the influence of the earth alone, by n and n' the numbers of oscillations when the magnet is under the combined action of the earth and of the points $m\ m'$ of the magnet under measurement, we have $m : m' = n^2 - N^2 : n'^2 - N^2$. Coulomb represented the intensities of action at different points of the magnet by a curve formed by drawing ordinates at right angles to the length of the magnet, and Biot has given the following equation for this curve: $y = A(n^x - n^{2l-x})$, in which the abscissas are reckoned along the length of the magnet, starting from its extremity. A and n are constants, and $2l$ the length of the magnet. Where this length is very great, the value of n is a fraction in the neighborhood of $\frac{1}{2}$; hence, we can neglect n^{2l-x}, and the equation is reduced to $y = An^x$. The distance of the *poles* (see next paragraph) from the ends of the magnet is given by this formula: $x = -\left(2ln^l + \frac{(1-n^{2l})}{\log n}\right)\frac{1}{(1-nl)^2}$, in which the logarithms are hyperbolic. If the length is very great, n is a function, and in neglecting its powers it becomes $X = -\frac{1}{\log n}$. The results calculated by this formula agree in a very satisfactory manner with those reached by experiment.

Definition of the Pole of a Magnet.—Consider a point in which, let us say, positive magnetism is concentrated, and situate at so great a distance from a magnet that all straight lines drawn from this centre to different points of the magnet can be regarded as parallel. Each point of the negative half of the magnet is attracted, and so much the more strongly as it is nearer the extremity of the magnet. All of these parallel attractions have a resultant whose point of application is situate within the magnet at a certain distance from its extremity. This point of application is called *the pole* of the magnet. There exists a similar pole in the other half of the magnet, which is the point of application of the resultant of the repulsive forces exerted on the magnetic centre.

Law of the Variation of the Intensity of Magnetic Attractions and Repulsions with the Distance from a Magnetic Pole.—Tobias Mayer first formally stated that the intensities of the magnetic attractions and repulsions varied inversely as the squares of the distances from the pole of a magnet. This statement was subsequently confirmed by Coulomb, who made it the subject of a rigorous experimental research. He used in his measurements the same methods we have just described in his investigation on the distribution of magnetic intensities in bar magnets. (For an admirable account of Coulomb's researches the reader is referred to Biot's *Traité de Physique expérimentale et mathématique*, t. iii., Paris, 1816.)

Lines of Magnetic Force.—If fine filings of soft iron be uniformly sifted over a glass plate, and this plate be then placed gently on a magnet, we shall observe merely a slight bristling of the filings, caused by the action of the magnet; but if the plate be carefully vibrated, we shall observe a system of lines gradually develop (Fig. 4). The writer described in the *Amer. Journ. Science* (Apr., 1871) the following method of "fixing," photographing, and exhibiting these magnetic curves. A clean plate of thin glass is coated with a layer of hard varnish by flowing this substance over the plate in the same manner as a photographer coats a glass plate with collodion. After the varnish has dried to a hard film the plate is placed, varnished side up, over the magnet or magnets, with its ends resting on slips of wood, so that the under surface of the plate just touches the magnet. Fine iron filings of soft Norway iron are now sifted uniformly over the plate, and then the magnetic curves are developed by letting fall on the plate

Fig. 4.



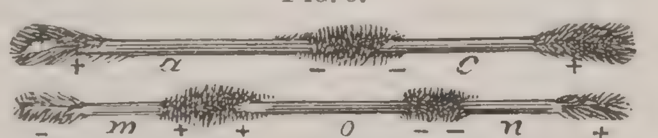
Magnetic Curves.

vertically at different points a piece of copper wire. The vibrations of the plate momentarily detach the filings from its surface, and at these moments the magnet arranges them in lines which are the resultants of its force. The plate is now carefully lifted from the magnet, and heated uniformly and slowly over a large hot metallic surface, or over a gas-lamp. The film of varnish is thus rendered soft, and the hot filings, sinking into it, are then fixed. Plates thus made have served (1) for accurate measures on the lines of magnetic force; (2) for photographic negatives from which numerous photographic prints have been obtained; (3) for lantern-slides to exhibit these curves to large audiences. The forms of these curves have been the subjects of mathematical investigation by Lambert, Leslie, and others. The contemplation of these curves, in connection with the action of magnets on magnetic and diamagnetic bodies (see Diamagnetism), led Faraday to the adoption of the terms "magnetic field" and "lines of magnetic force." A magnetic field may be defined as any space at every point of which exists a finite magnetic force; while a line of magnetic force is a line drawn through a magnetic field in the direction of the force at each point through which it passes. Before the time of Faraday's writings physicists were satisfied with the mere formal statement of Coulomb's law of the diminution of the intensity of magnetic action in the inverse ratio of the squares of the distances from a magnetic pole; but Faraday, in the words of Maxwell, "in his mind's eye saw lines of force traversing all space when the mathematicians saw centres of force attracting at a distance; Faraday saw a medium where they saw nothing but distance; Faraday sought the seat of the phenomena in real actions going on in the medium; they were satisfied that they had found it in a power of action at a distance impressed on the electric fluids." Faraday gave very general laws of the behavior of bodies in the magnetic field. When the field is uniform—that is, when the lines of force are parallel—both magnetic and diamagnetic bodies place themselves in the direction of the lines of force; but in other cases magnetic bodies (like iron, nickel, cobalt, etc.) tend to go from weaker to stronger places of magnetic action, while diamagnetic bodies (like bismuth, borate of lead, etc.) tend to go from stronger to weaker places in the magnetic field. The conception of the lines of force and the magnetic field, and the enunciation of the laws just given, Sir W. Thomson says, "formed one of the most brilliant steps made in philosophical exposition of which any instance exists in the history of science. . . . Mathematicians were content to investigate the general expression of the resultant force experienced by a globe of soft iron in all such cases; but Faraday, without mathematics, divined the result of the mathematical investiga-

tion, and, what has proved of infinite value to the mathematicians themselves, he has given them an articulate language in which to express their results. Indeed, the whole language of the magnetic field and lines of force is Faraday's. It must be said for the mathematicians that they greedily accepted it, and have ever since been most zealous in using it to the best advantage." Indeed, much of the scientific labors of Thomson, and nearly all of Maxwell's *Treatise on Electricity and Magnetism* (1873), may be regarded as the translation of Faraday's ideas (as contained in his *Experimental Researches in Electricity*, Lond., 1845–55) into the language of mathematical analysis, and the further development of the consequences of their general quantitative expression.

Methods of Making Artificial Magnets.—Consequent Points.—In hypothetical language *magnetization* may be described as a method of permanently separating the magnetisms of steel bars, and thus giving to the bars the properties of the loadstone or magnet which magnetized them. The various processes of magnetization are termed *touches*, and are divided into the methods of *simple touch, double touch,* and *separated touch.* The earliest known method of magnetization is to place the bar of steel against a loadstone, and in the direction of the line joining its two poles. After some time, depending on the strength of the loadstone, the size and hardness of the bar, the latter is found to be magnetized. Prof. Robison of Edinburgh first traced the gradual progress of the magnetization of the bar in the above experiment, and found that it proceeded more slowly as the bar was of harder steel. Thus, when the bar touches the N. pole of the magnet there is found near the point of contact a S. pole in the bar, and a little farther in the axis of the bar there exists a N. pole, and next to this a second very feeble S. pole. These poles proceed slowly towards the opposite extremity of the bar, and, if the bar be not too long, at the end of a certain time the first N. pole will reach its extremity, and the magnetized bar will be found with two poles only. If the bar is very long, this pole will never reach its extremity, and there will be produced *consequent points* in the bar; that is, there will exist more than two poles in the bar, and two of these *interior* contiguous poles form what is called a consequent point. These interior contiguous poles are of the same name. It follows that if there are an even number of consequent points, the ends of the bar are of opposite magnetisms; but these ends will be of the same magnetism when there is an uneven number of consequent points. These facts are shown

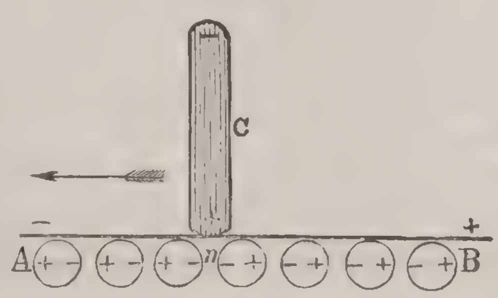
FIG. 5.



in Fig. 5, where the consequent points have been detected by rolling the bar in iron filings.

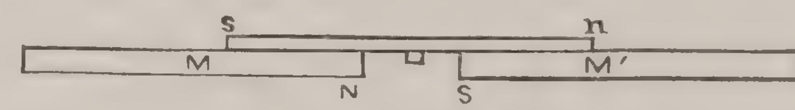
Simple Touch and Friction.—We can magnetize to saturation any little bar of steel by sliding over it the pole of a magnet several times, always being careful that the pole of the magnet glides in the same direction during each pass. In order to form a conception of what takes place, let us consider a row of magnetic elements, A B (Fig. 6), over which we slide the N. pole of the magnet C in the direction of the arrow. When the magnet has arrived in the position n, it will have caused in the different elements an arrangement indicated by the signs + and —. Those elements which are in n A will have the direction of their polarities inverted as the magnet progresses over them, so that when the magnet has reached A all the elements will have their magnetisms arranged as shown in n B of the figure. We see that the extremity last touched has a pole of the contrary name to the pole of the magnet which touched the bar. The above action is repeated several times, or until there is no more increase in the magnetic intensity of the bar.

FIG. 6.



Method of Double Touch.—Up to the middle of the eighteenth century the only known methods of magnetization were those just described. About 1740, Réaumur and Buffon received from Oxford small magnetic bars, made by Dr. Knight of London, which had an extraordinary power for their size. The arrival of Dr. Knight's magnets caused Duhamel to experiment, and he found on magnetizing several pieces of sabre-blade, placed one over the other, that the lowest had a degree of magnetism comparable to those of Knight. The latter stated that he did not employ the loadstone, but he kept his process a secret. We are indebted to Knight for the discovery of the first effective method of making powerful permanent steel magnets. His method, which is as follows, is described in the *Phil. Trans.* for 1746 and 1747 (vol. xliv.): Two powerful magnetic bars, M M′ (Fig. 7), are placed in the same

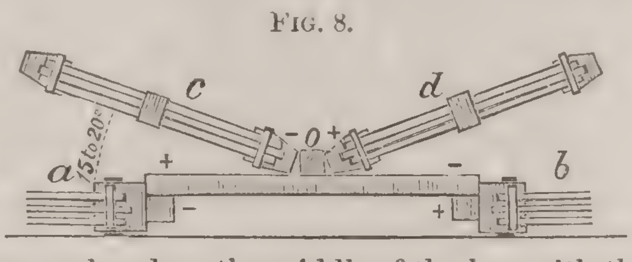
FIG. 7.



straight line with their opposite poles, N S, very near each other; the needle or bar n s to be magnetized is laid flat on the surface of the bars, with its centre over the space between the magnets. If the bar to be magnetized is a compass-needle having a cup for suspension, the cup can be placed between the magnets. The magnets M M′ are now separated by moving them in opposite directions, while the bar n s remains stationary, until the bar rests with its extremities in contact with the two magnets; it is then slid off sideways, removed to some distance, but still kept parallel to the magnets, which are to be restored to their former position, and the bar or needle replaced for a new operation. The poles N and S of the magnets conspire in their action on the bar n s; the pole N of the magnet M attracts all of the S. polarity and repels the N., whilst the pole S of the bar M′ attracts all of the N. polarity and repels the S.: hence, in the final and permanent magnetic condition of the bar, the position of the poles s n is the reverse of the poles N S of the bars. A small needle will become magnetized to saturation by one operation of this kind performed on each of its surfaces; for larger bars, two or three or more repetitions are necessary. A dozen bars or plates may be magnetized in this way in a very few minutes, and bars or plates of sixteen inches to two feet in length, and up to a quarter of an inch thick, may be magnetized within a minute. Dr. Knight thus made the bars of his two great compound magnets, at present in the possession of the Royal Society. Each magnet contains 240 bars of 15 inches in length, 1 inch wide, and half an inch thick. We have no authentic record of the power of this magnet during Knight's life. Faraday in 1830 found that when a soft iron cylinder 1 foot long and ¾ inch in diameter was placed across the dissimilar poles of these two magnets, a force of about 100 pounds was required to break down the attractive power.

In Æpinus's method the ends of the bar to be magnetized rest upon the ends of the opposite poles of two powerful magnets, a b, as shown in Fig. 8. Two movable magnets,

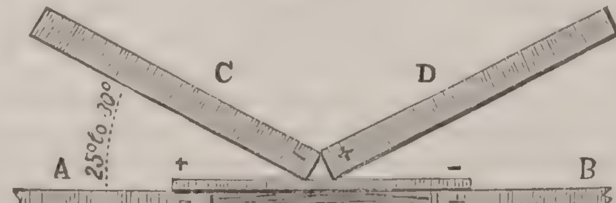
FIG. 8.



c and d, are placed on the middle of the bar, with the poles of each of the same name as that of the pole of the fixed magnet nearest it. These two magnets, separated by a block of wood, are placed at an inclination of 15° to 20° to the bar. In this position the two magnets are slid together from one extremity to the other of the bar, so that each half of the bar has had the same number of strokes. When the bar is thick the above operation has to be repeated on each side of the bar. This method gives a powerful magnetization, but has the drawback of sometimes producing consequent points and an irregular magnetization.

Method of Separated Double Touch.—Duhamel's method of separated double touch is similar to that of Æpinus, with the exception that the two movable magnets, C D (Fig. 9), placed on the centre of the bar, are not separated by the block of wood, and also they are not slid *together* backward and forward over the bar; but they are separated from each other by being drawn apart from the centre to the ends of the bar. After they have reached the ends, the magnets are raised from the bar, their poles placed together over the centre of the bar, and again drawn asunder. This method is less powerful than Æpinus's, but gives a more regular magnetization. It is much employed in the magnetization of compass-needles.

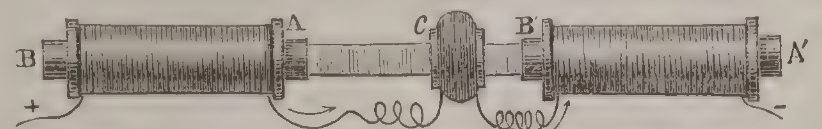
FIG. 9.



Magnetization by Means of a Current of Voltaic Electricity.—A powerful and equable magnetization is effected

by enclosing the bar in a helix through which a current of voltaic electricity passes. If we assume that the current moves from the carbon to the zinc pole of the battery, then the end of the bar facing us, around which the current flows in the same direction as the hands of a watch, will be the S. pole of the magnet. The following modification of this method is the most powerful means known for the magnetization of large steel bars. The bar to be magnetized is placed between the opposite poles of two powerful electro-magnets (see ELECTRO-MAGNETISM) A B, A′ B′ (Fig. 10).

FIG. 10.



The voltaic current which passes through these electro-magnets also passes through a helix C, which is moved backward and forward the same number of times over each half of the magnet, and is finally brought to rest in the centre of the bar. By this method the most powerful permanent compound magnets have been produced.

Qualities of Steel for Artificial Magnets.—From experiments of Scoresby it would appear that for large or massive single or compound magnets of the straight-bar form the best material is *hard cast steel;* for horseshoe magnets, if single, cast steel annealed from file hardness at a temperature of about 550°, or *shear steel* a little reduced; and for compound horseshoe magnets, cast steel annealed at 480° to 500°, or shear steel perfectly hard; for compass-needles, if single and heavy, such as are suited for stormy weather, *hard cast steel;* if light or of moderate weight, whether single or compound, the best cast steel annealed at 500° or 550°, or hard shear steel, or hard cast steel from Bradford iron; and for very light needles or other small magnets, the best cast steel annealed at the heat of boiling oil. Cast-iron bars, if hardened at the end, are capable of forming powerful and permanent magnets. Hearder constructed a compound magnet formed of twenty-four bars, each weighing 3 pounds, which lifted 60 pounds. The practice of hardening the ends only of bars destined for magnets is not to be recommended, as this mode of tempering possesses no advantage as to capacity, while it has much disadvantage as to tenaciousness, except in very thin bars. A moderate hardening throughout is the most efficacious. Scoresby found a constant relation between the *ductility* of iron and its magnetic capacity: the best iron possesses the highest magnetic quality. He examined magnetically all the varieties of steel, both hard and soft, and the results he obtained revealed such a relation between the magnetical properties of several bars and the denomination of the steel of which they were made as to show that it might not be impossible that magnetism may be rendered available for ascertaining not only the degree of carburation, but even for determining the quality of iron out of which the steel may have been manufactured.

Supersaturated Magnets.—Magnets made by the processes of double touch and of the voltaic current are often *supersaturated:* that is, they contain more separated magnetisms than the bar can maintain separated when it is left to itself; for after these magnets have been made their magnetic powers gradually diminish until they reach the condition of *saturation.* This condition is sometimes reached only after a long period, which may be shortened by the action on the bar of variable temperature and molecular vibrations. These vibrations, however, if they act on the bar during its magnetization, really aid the process, and are often employed to overcome the coercitive force of the bar. The coercitive force yields only slowly step by step at each stroke of the magnetizing bar. This phenomenon has been studied by Quetelet, who found that in order to obtain the condition of saturation the strokes of the magnets had to be made on all sides of the bar undergoing magnetization. Generally, twelve strokes gave him the maximum of magnetization. He found that after any number x of strokes, the magnetic intensity i, in function of the maximum intensity I, which the bar can receive, is given by the formula $i = \mathrm{I}\,(1 - 0.36\sqrt{x})$. The magnetization in Quetelet's experiments was effected by the method of Duhamel. (The reader who desires further information in reference to the materials employed in the construction of steel magnets and the various processes of magnetization will find a large fund of experience in Scoresby's *Magnetical Investigations*, London, 1839–44.)

Terrestrial Magnetism.—Mariner's Compass.—The Magnetic Declination.—It is not known by whom and when a natural or artificial magnet was first suspended by a thread or floated on water, and the discovery made that it placed itself in a northerly and southerly line. All that we are certain of in the early history of this discovery is, that in the twelfth century the magnetic needle was known in France, for Guyot of Provins about 1180 wrote a poem called *La Bible Guyot*—the manuscript of which is now in the Paris library—in which he tells how a needle which has been rubbed by the *marinière* (as he calls the loadstone) will point to the pole-star, and in the dark nights, without moon or stars, will guide the mariner on his course. It is also to be remarked that Europeans have always marked the N. point of the mariner's compass by a *fleur-de-lis.* Some historians, with Humboldt, give the invention of the compass to the Chinese at a date over 1000 B. C., but others who have as carefully examined into the subject state that they are convinced that the Chinese learned the directive property of the magnet from the early European navigators. However this may be, it is certain that the mode of suspension of the needle in which the Chinese persist is similar to that which was used by the early Dutch navigators. The fact that the needle does not point to the N. at all places was early known. The discovery that it changed its direction of pointing with a change of place is generally attributed to Columbus, but this is incorrect, for the departure of the needle from the geographic meridian (called its *variation* or *declination*) is marked down for different points of the sea on the atlas of Andrea Bianco, which was made in the year 1436. What Columbus really discovered was a line of no variation $2\frac{1}{2}$° E. of the Isle of Corvo in the Azores, on Sept. 13, 1492.

The Cycle of the Variation in Declination.—Some time after this, about 1620, it was found that the needle did not keep one line of direction even in the same place, but slowly changed its angle with the meridian year by year. This discovery is generally attributed to Gillebrand of England. He had compared the variation observed at London by Burroughs, Gunter, and himself, and found that the N. end of the needle was gradually drawing more to the westward, for Norman and Burroughs had observed it to point $11\frac{1}{4}$° to the E. of N. in 1580; Gunter had found its deviation only $6\frac{1}{4}$° in 1662; and he himself had observed only 4° in 1634. The examination of all of the observations made at London show that in 1580 the N. end of the needle pointed 11° 15′ to the E. of N. In 1662 the declination had fallen to 6° 15′, and in 1660 the needle pointed due N. and S. In 1730 it pointed 13° W.; in 1765, 20° W.; in 1818 it reached its maximum westerly position of 24° 41′; then it began a retrograde motion to the E., and in 1850 the declination was only 22° 30′ W.; in 1865, 21° 6′ W.; while in the present year the declination at London is about 20° W. The N. end of the needle has at London moved about $3\frac{1}{2}$° to the eastward during the last thirty years. These figures show a remarkable motion in the needle, governed by some cause acting regularly through a long period of time. We see that it occupied 158 years for the needle to swing from the geographic meridian into its extreme westerly declination, and that after reaching this extreme position it at once began its approach to the meridian. Thus, in about 320 years it makes one oscillation; and what is remarkable is, that in this oscillation it follows the same kind of motion as the pendulum, moving faster as it swings towards the meridian, and gradually slackening its motion as it proceeds to the limits of its oscillation.

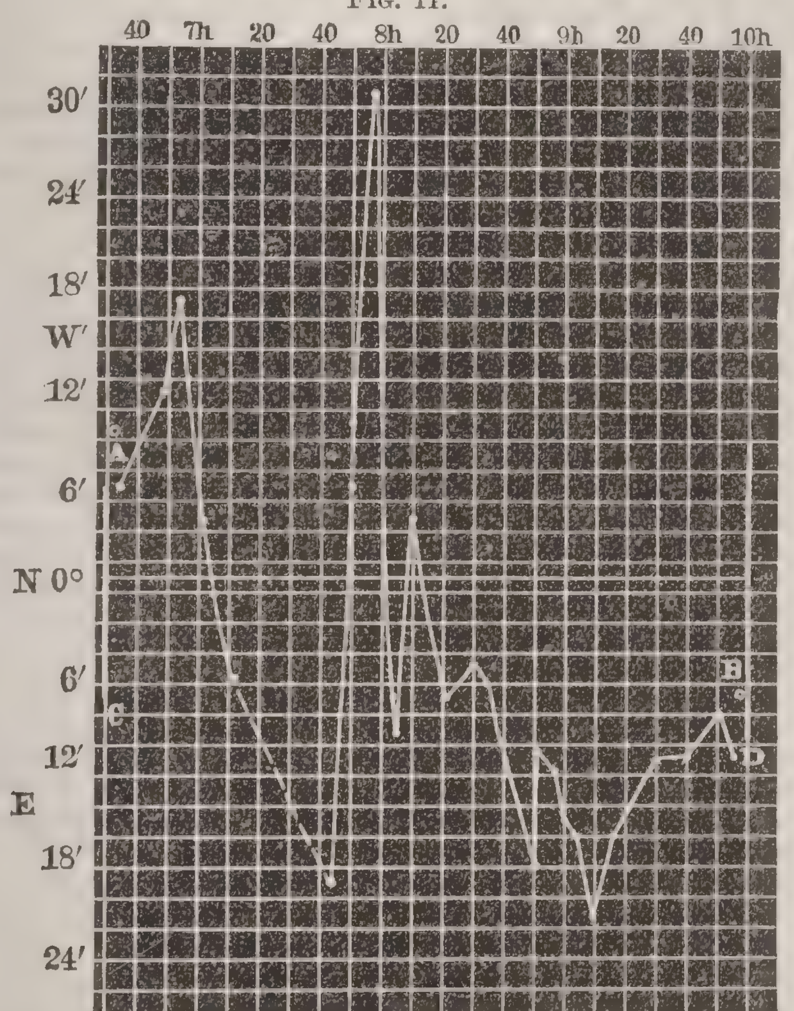
Daily Variations of the Magnetic Needle.—Perturbations.—If an elastic rod be clamped at one end and bent from its natural position, its free end will vibrate with a regular motion like a swinging pendulum; but this free end may at the same time have shorter and quicker swings, and carry these along in its main vibration. Observations have shown that in this manner the magnetic needle also vibrates, for it does not move steadily year after year, or even day after day, in its 320 years' swing, but, as Graham discovered in 1722, the needle makes during its main oscillation many minor vibrations. Some of these follow regular laws; others apparently follow no law, and are hence called *perturbations.* Among the former is the regular march of the daily variation discovered by Graham. This motion depends upon the apparent position of the sun, and therefore follows the time of the geographic meridian of the place where the needle is observed. In the northern hemisphere the northern end of the needle has its extreme easterly position four or five hours before midday; hence it begins to swing with an increasing velocity, which attains its maximum nearly at the moment when the sun crosses the magnetic meridian of the station. One or two hours afterward the needle comes to rest, and soon after begins its eastward swing, and comes, with a slight secondary vibration, to its first position about sunrise. The arc of the daily oscillation is small, only from 5′ to 25′; and its extent changes with the seasons, being nearly proportional to the diurnal arc described by the sun. Thus, from Dr. Bache's observations at Philadelphia the mean daily arc of vibration for the year is $7\frac{1}{2}$′; for summer it is $10\frac{1}{2}$′, and for winter it is $5\frac{1}{2}$′. This daily variation also increases from the magnetic equator to its poles. On the equator it

is only 3′, while Dr. Kane found over 60′ at Rensselaer Harbor, N. lat. 78° 37′.

The Cycle of the Range of Daily Motion in Declination the same as the Cycle of the Amount of Spotted Solar Surface and the Cycle of the Frequency of the Aurora Polaris.—Yet another cause, apparently removed from the earth, affects the magnitude of the needle's daily swing; which, strange to say, seems to depend upon the condition of the sun's surface. We owe this discovery to the labors of three men. First, Counsellor Schwabe of Dessau, Germany, began in 1826 daily observations on the number, size, and position of the spots which are nearly always visible on the solar disk. He kept up these observations for forty-nine years. In 1850, Schwabe announced that the amount of spotted surface which yearly appears on the sun follows a regular law, going through a cycle in about ten years. Thus, in 1860 a large number of spots was visible, but in 1865 very few were seen; after this they became more and more numerous, until in 1870 they had reached their maximum amount. About the same time that Schwabe gave this discovery to the world, Prof. Lamont of Munich discovered that the daily range of the needle's vibration went through a similar cycle. Very soon afterwards Gen. Sabine of England discovered independently the same fact, which he deduced from observations made at places so far removed from each other as Toronto in Canada and Hobarton in Van Diemen's Land, and was thus led to refer the cycle to some cause exterior to the earth, and pointed out the coincidence of the ten-year solar-spot cycle and that of the daily range of variation of the magnet. At Göttingen, for example, the daily variation is 4′ greater during the year of the greatest number of spots than during the year of the least.

Magnetic Perturbations and the Aurora Polaris.—The magnet is often subject to sudden and extensive motions in variation, coming at unexpected times, and affecting simultaneously magnets suspended at great distances from each other. These disturbances are often, though not always, accompanied by displays of the aurora polaris, and

Fig. 11.



Magnetic Motions during an Aurora.

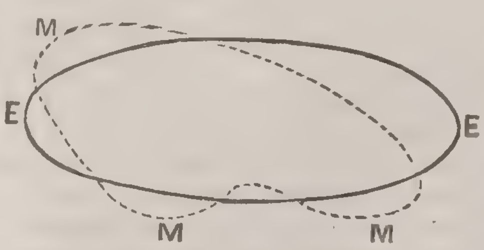
it has been observed that the flashes and lateral movements of the auroral columns are always accompanied by simultaneous movements of the magnet in declination. Also, an examination of extended series of observations on auroras has led to the remarkable discovery that they obey periods of maximum and minimum frequency, coinciding with the cycles of the solar spots and of the mean daily range in declination. The accompanying figure (11) exhibits the motions of the magnet observed by the writer during the exhibition of the brilliant aurora of the evening of Oct. 14, 1870. The vertical divisions of the figure, as shown on the left, equal 3′ of arc each. The P. M. times of observation are given on the upper horizontal line. The distances of the broken line above 0° show western, and those below eastern, positions of the N. end of the magnet, referred to the line 0°, which is the mean declination of Oct. 14, 1870. The line D represents the range (18′.43) of Oct. 14. A is the position the magnet had (+9′.33) at 1*h.* 17*m.* P. M. on Oct. 14, while B is the declination (−7′.25) at 8*h.* A. M. (the time of greatest eastern declination) on the morning of Oct. 15. Observations made on the aurora simultaneously with those on the magnet showed that the motion of the magnet coincided in its maxima and minima with the greatest activity of the aurora. The rapid and steady easterly motion, from 7*h.* 57*m.*5 to 8*h.* 5*m.*5, of 42′.04 is remarkable. The flashing up of brilliant greenish auroral streamers or columns was observed at the time of the beginning of this easterly motion.

The direction of present research is to the discovery, if possible, of constant relations between the sudden deflections of the magnet and the sudden outburst observed in the chromosphere of the sun. (See SUN.) Several such coincidences have been observed by Prof. Young and others, but more extended and systematic observations are required to prove that a physical connection between the phenomena really exists, though that this is probably the case every one admits.

The Dip of the Magnetic Needle.—Magnetic Poles and Equator.—Robert Norman, whom Gilbert describes as "a good seaman and an ingenious artificer, who first discovered *the dip* of magnetic iron," observed in 1576 that if a bar of steel is supported on its centre of gravity, so that it will necessarily remain in any position in which it is placed, it will, after having been magnetized, swing into the magnetic meridian and place its length at an angle with the horizon. In the northern magnetic hemisphere the N. end of the needle points downward, making, for example at New York, an angle of about 73° with the horizon; in the southern magnetic hemisphere the S. pole of the magnet points downward. This phenomenon is called the *dip* of the needle. We shall proceed to examine the behavior of such a needle when it is carried over the surface of the earth. Proceeding N. and to the W. of New York, we shall observe the N. end of the needle dipping more and more, until, having reached a N. lat. of 70° 5′, and a W. lon. of 96° 46′, we have attained the position where Com. Ross in 1832 first observed the needle taking an exactly perpendicular position. This point is called the N. magnetic pole of the earth. It is inferred from observations on the dip in the southern hemisphere that a southern magnetic pole—where the needle will be vertical with its S. pole downward—exists about lat. S. 70° and lon. 125° E. of Greenwich. This would place this pole in the territory discovered by our countryman Wilkes. No explorer, however, has reached the S. magnetic pole.

Magnetic Equator.—Between these two poles, along an irregular line in the tropics, the needle does not dip, but holds a truly horizontal position. This line, passing round the globe near its equator, in every part of which the dip is nothing, is called the *magnetic equator*, which is a very irregular line, crossing the equator at *four* points, as shown in Fig. 12, where the full line E E is the geographic equator, and the dotted line M M M is the magnetic equator. The general inclination of the magnetic equator to the geographic equator is about 12°, its principal intersections or nodes being in 113¼° W. lon. and 66⅔° E. lon. from Greenwich; and it is a tolerably regular line throughout one-half of its circumference in the Atlantic and Indian oceans.

Fig. 12.



"The exact position of the nodes and the true form of the magnetic equator have been determined with great care by Morlet and Hansteen. There are some slight differences in their results, which have been pointed out by Arago in the following excellent summary of the results of their inquiry: "Both Morlet and Hansteen place the magnetic equator wholly to the S. of the terrestrial equator, between Africa and America, its greatest southern latitude being at 25°; one node is in Africa, in about 22° of E. lon., or in 18° according to Morlet. In setting out towards the E. from this node, which is nearly in the centre of that part of the African continent, the magnetic equator advances rapidly to the N. of the terrestrial equator, quits Africa a little to the S. of Cape Guardafui, and in the Arabian Sea it attains its most northerly latitude of about 12° in 62° of E. lon. Between this meridian and 174° E. the magnetic equator is constantly to the N. of the equinoctial line. It cuts the Indian peninsula a little to the N. of Cape Comorin, traverses the Gulf of Bengal, making a slight advance to the equinoctial, from which it is only 8° distant at the Gulf of Siam. It then reascends a little to the N., almost touches the N. point of Borneo, traverses the isle of Paragua, the strait of which separates the most southern of the Philippines from the isle of Mindanao, and under the meridian of Naigion it again reaches the N. lat. of 9°. From this point it

traverses the archipelago of the Caroline Islands, and descends rapidly to the equinoctial line, which it cuts, according to Morlet, in 174°, and according to Hansteen in 187° of E. lon. There is much less of uncertainty respecting the position of a second node, also situated in the Pacific Ocean. Its W. lon. ought to be about 120°; but while Morlet's inquiries lead him to conclude that the magnetic equator merely touches the equinoctial at that point, and then bends again to the S., Hansteen makes it cross the line into the northern hemisphere, and continue then through an extent of 15° of lon., and then return southward and cross the equinoctial again in about 108° of W. lon., or 23° from the W. coast of America. This discrepancy between the deductions of Morlet and Hansteen is, after all, very trivial, for in the case just mentioned the magnetic equator does not go more than $1\frac{1}{2}°$ to the N. of the equinoctial; and in general the magnetic equator of Morlet differs in no part so much as 2° in latitude from that of Hansteen. The magnetic equator thus traced over the globe has a motion from E. to W., in so far as can be determined by direct observations on the position of its nodes. The two nodes of Hansteen, corresponding to the tangent node of Morlet, are divided between 108° and 126° of W. lon. In 1819, Freycinet found, on board the Uranie, that this node was in 132° of W. lon.; and Sabine found that the node in Africa, which was far from the coast in 1780, had advanced from E. to W. even to the Atlantic Ocean. Morlet found that the dip of the needle diminished wherever the motion of the equator tended to diminish the magnetic latitude, and that it increased, on the contrary, wherever the magnetic latitude was increased—a result confirmed by observation."

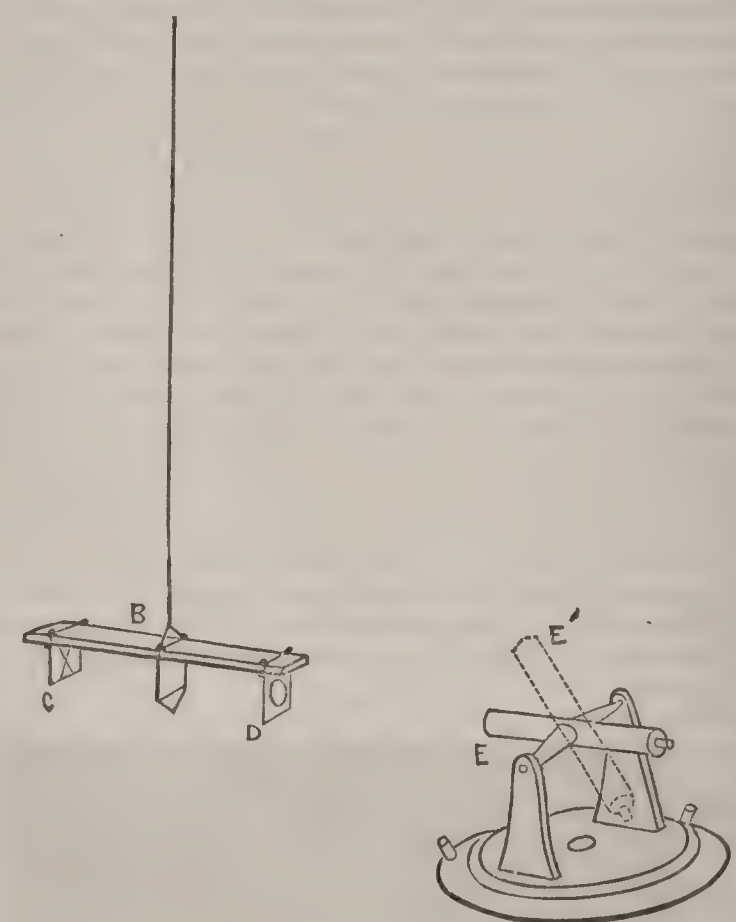
Intensity of Terrestrial Magnetism at Different Points of the Earth's Surface.—The magnetic intensity of any point of the globe can be determined by observations on the times of vibration of a dipping-needle. The dipping-needle holds to terrestrial magnetism the same relation that a pendulum does to gravitation. In a state of rest both show the direction of the resultants of these forces, and if set in vibration we can from the number of these vibrations in a given time determine the intensity of these forces if the known action of terrestrial magnetism or gravitation of any one point of the earth is taken as unity. Thus, if n and n' respectively represent the number of vibrations made in the same time by the same needle at the same temperature at two different stations on the earth, and F and F′ the intensities of magnetism at these two points, then $F : F' = n^2 : n'^2$. But this method is of no practical value, on account of the friction of the axis of revolution of the dipping-needle; and really to obtain the relative intensities of terrestrial magnetic forces we must deduce them from observations made on the vibrations of a horizontal needle suspended by a thread free of torsion. In this case the force F in the direction of the dipping-needle is supposed to be decomposed into two others—one vertical and destroyed by the suspending thread; the other, which we will call f, is horizontal, and in the magnetic meridian. Under the influence of the latter the needle makes its oscillations. If we call i the angle of the dip at the place of observation, we shall have $f = F \cos i$. The oscillations are isochronous if they do not exceed 3° or 4°. Hence, to obtain the relative magnetic intensities of two places of observation, we obtain n and n', the number of oscillations during the same time of the same magnet of hard steel at the two stations. Let i and i' be the dips, f and f' the intensities of the horizontal components, and F and F′ the magnetic intensities at the two stations; then $\frac{n^2}{n'^2} = \frac{f'}{f} = \frac{F \cos i}{F' \cos i'}$; whence $\frac{F}{F'} = \frac{n^2 \cos i'}{n'^2 \cos i}$. In 1798, Humboldt observed a point of minimum intensity on the magnetic equator in Southern Peru, and this value has been adopted as the unit of intensity by those who use the method of oscillation in determining these intensities. The following table gives the terrestrial magnetic intensities on the basis of Humboldt's observed unit:

Places of Observation.	Years.	Latitudes.	Mag. Intensity.
St. Antonio	1802	0° 0′	1.087
Carthagena	1801	10° 25′ N.	1.294
New York	1822	40° 43′	1.803
Naples	1805	40° 50′	1.274
Lyons	1805	45° 46′	1.333
Paris	1800	48° 52′	1.348
Brussels	1829	50° 52′	1.374
Berlin	1829	52° 51′	1.366
Christiania	1820	59° 55′	1.419
St. Petersburg	1828	59° 66′	1.410
Baffin's Bay	1818	62° 43′	1.590
Spitzbergen	1823	79° 40′	1.567

The magnetic intensity has been determined at many points on the earth, and the results reached are that there is an increase of magnetic intensity as we go from the magnetic equator to its poles, and that the intensity increases more rapidly in the southern hemisphere than in the northern as we recede from the equator. According to Sabine, it is equal to 1.624 at the N. magnetic pole, which is less than he found it at New York, where it is 1.803, whilst near the S. magnetic pole, at Mount Erebus, Ross found it equal to 2.052. The minimum of intensity, 0.706, was observed by Erman in S. lat. 19° 59′ and 10° 2′ of E. lon. Biot gives the following formula, which represents with tolerable accuracy the variation of magnetic intensity with the latitude: $i = \sqrt{1 + 3 \sin^2 l \ldots}$, in which i is the intensity and l the latitude of the place of observation.

Determination of the Declination.—We will now concisely describe those instrumental methods by which are determined the three magnetic elements just discussed—viz. the *declination*, the *dip*, and the *intensity*. The declination is most accurately determined with the instrument represented in Fig. 13, called a *declinometer*. E is a theodolite

Fig. 13.



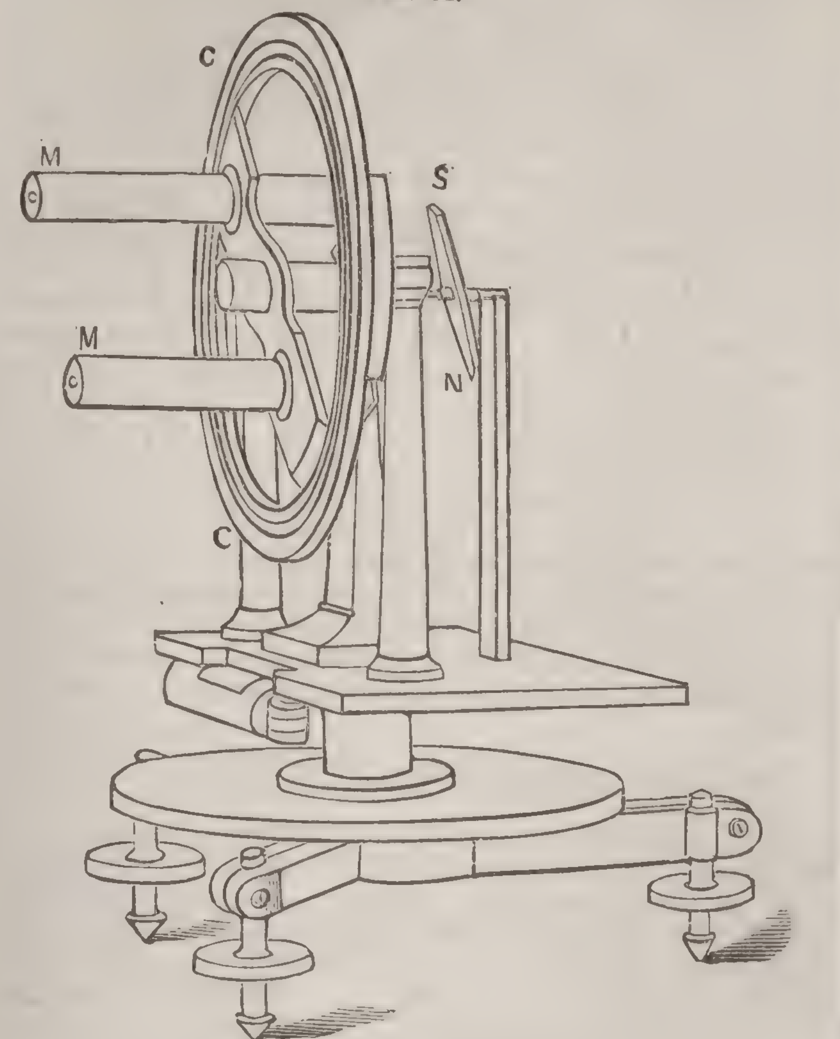
The Declinometer.

whose telescope, like a transit instrument, rotates on a horizontal axis. This telescope has also a motion around a vertical axis, and this motion in azimuth is measured by a horizontal divided circle. B is a magnet suspended by untwisted silk-fibres. Attached to the magnet is a small frame C carrying two crossed spider-threads. At the other end of the magnet is a frame D, in which is a lens whose principal focus is exactly in the plane of the cross-threads. The rays issuing from the illuminated threads will therefore emerge from the lens as parallel rays, and when the axis of the telescope is coincident with, or parallel to, the axis of the lens, we shall see distinctly the image of the cross-threads when the focus of the telescope is adjusted to parallel rays, or, what is the same, when the telescope gives the distinct image of a star. After the telescope has been adjusted so that the point of crossing of the threads at its focus coincides with the image of the point of crossing of the threads of the magnet, the reading is made on the horizontal divided circle. After this the theodolite is turned on its horizontal and vertical axes until the pole-star or some other circumpolar star is seen bisected by the cross-threads in the telescope. Knowing the time at which this bisection is made, the geographic meridian is readily computed, and the reading of the circle when the telescope points due N. is known. The difference between this angular reading and the one previously made when the cross-threads of the magnet were observed gives the *magnetic declination.* However, in the above description we have assumed that the optic axis of the lens and the magnetic axis of the magnet coincided, or were parallel to each other. This we can never assume; hence, to be sure of the correct determination we *reverse* the magnet in its support, so that the flat side which formerly was up is now down. Another reading is now made of the angle which the magnet makes with the meridian, and the mean of these two readings gives the true magnetic declination. Instead of attaching the magnet to a frame carrying the cross-threads and lens, the magnet may be *tubular*, with a plate of glass, cut with fine vertical lines, at one end and the lens at the other.

Determination of the Dip.—The dip of the magnet is the inclination to the horizon which a needle makes when it can freely rotate around a horizontal axis passing through

its centre of gravity, the plane of motion of the needle being the plane of the magnetic meridian. Fig. 14 shows the essential parts of the best form of dipping-needle,

FIG. 14.



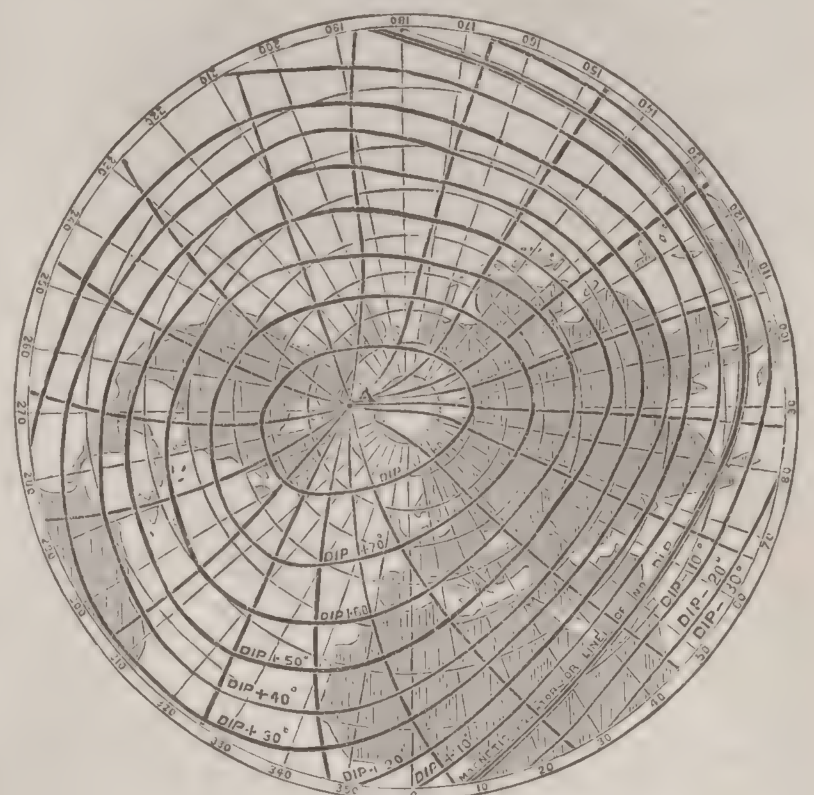
The Kew Dipping-needle.

known as the Kew pattern, from the fact of its having been first invented and used at the Kew Observatory. S N is a magnetic needle with a delicate steel axis resting on two parallel edges of agate. C C is a vertical divided circle. Attached to an arm with verniers are two microscopes with cross-threads at their foci. This arm glides around the vertical circle. To determine the dip, the vertical axis of the instrument is first adjusted to preserve a vertical position when the instrument is rotated around this axis. We then substitute for the magnetic needle a similar one made of brass, but loaded at one of its ends, so that this end always points downward. A sight is taken with one of the reading microscopes on a cross-thread stretched over an opening in this end of the needle. The axis of the needle is reversed and another sight taken, this time on the other side of the cross-threads. The mean of the readings of the vertical circle corresponding to the above two sights will give the reading of the circle for the vertical position of the axis of the needle. The magnetic needle is now placed on the agate edges, and the instrument is rotated around the vertical axis until the pointed end, or medial mark, of the needle points to the vertical reading of the circle. In this position the plane of motion of the needle is at right angles to the magnetic meridian, so that on rotating the instrument through 90° the plane of motion of the needle is brought into the magnetic meridian. The pointed ends of the needle are now bisected by the two reading-microscopes, and the corresponding readings on the vertical circle taken. If the needle were symmetric around its geometric axis, and this axis coincided with the magnetic axis of the needle while the latter turned truly on its centre of gravity, the above observations would give the true dip; but as we can never assume that the above conditions exist, we have to adopt the following method of observation: After having obtained the reading on the needle above described, the vertical axis of the instrument is rotated through 180°, and another reading of the dip obtained. The magnetism of the needle is then reversed by the method of double touch or by the voltaic current, and the two series of observations just described are repeated. The mean of the four series will give the true dip.

Determination of the Magnetic Intensity.—It has already been described how the *relative* magnetic intensities of points on the earth's surface can be determined by observations on the times of oscillation of the same hard steel magnet. By the method of Gauss we can obtain *absolute* measures of the intensity of terrestrial magnetism. Our limited space will not allow us to enter into a description of his method, which requires a discussion in the higher mathematics, which would be out of place in a work of a popular character. (The reader is referred to Airy's *Treatise on Magnetism*, Lond., 1870, and to Clerk Maxwell's *Electricity and Magnetism*, vol. ii., Lond., 1873.)

Magnetic Charts.—Observations on the magnetic declination, dip, and intensity have been made over a large portion of the earth, and maps have been constructed on which are drawn the magnetic equator and its poles, the lines of equal declination, the lines of no declination, the lines of equal dip with the magnetic meridians, and the lines of equal magnetic intensity. In Figs. 15 and 16, copied from

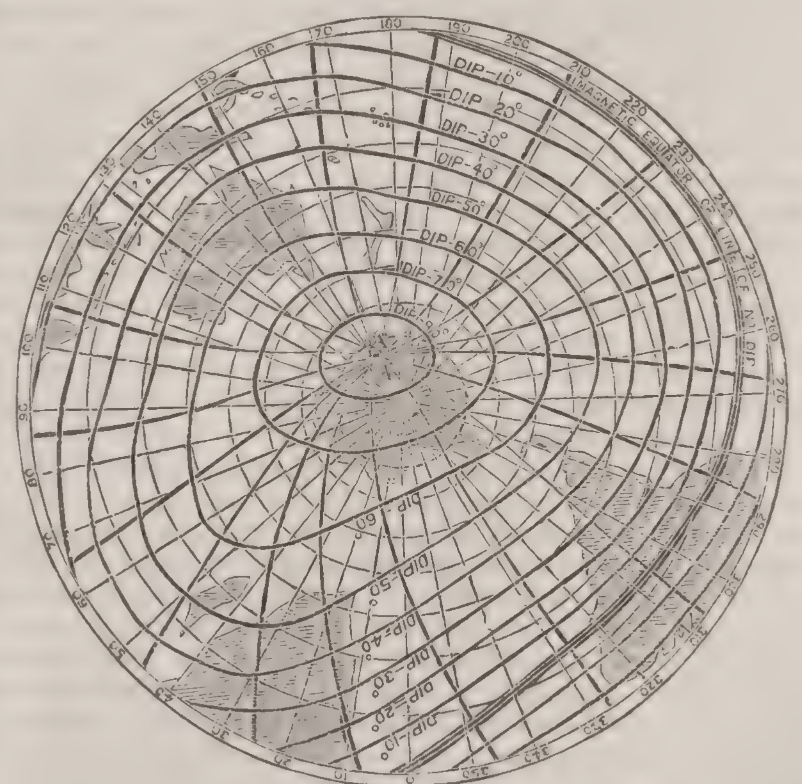
FIG. 15.



A, North Magnetic Pole.

Gauss, are laid down the position of the N. and S. magnetic poles, the magnetic equator, the lines of equal dip, and the magnetic meridians. The magnetic meridians are lines which would be described by transporting a declination

FIG. 16.



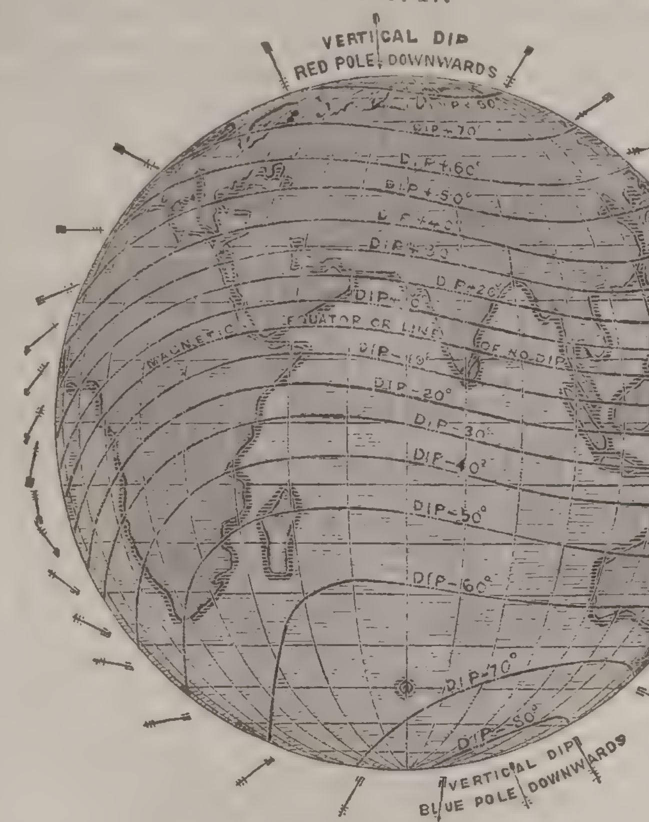
A, South Magnetic Pole.

magnet so that it constantly moved in the direction in which it pointed. These lines evidently cross the lines of equal dip, and converge to the two magnetic poles. Facing page 1448 of Vol. I. of this *Cyclopædia* is an excellent map by Prof. Guyot, showing the lines of equal magnetic declination for the year 1858. To convey a vivid idea of the phenomena of the dip and the variations of total terrestrial magnetic intensity, Fig. 17, copied from Airy's *Magnetism*, is given. This figure exhibits at a glance the directions of dip and the magnitude of total force along a meridian of the earth. The magnitude of the force at different points is rudely shown by lengths of the dipping-needles on the magnetic meridian. The map is an orthographic projection. It will be remarked that there is little accuracy near the S. pole, arising from the circumstance that it is impossible to include N. and S. magnetic poles in the same geographic meridian.

The Earth a Great Magnet.—The phenomena of terrestrial magnetism are explained by regarding the earth as a great magnet of an irregular structure, so that its magnetism is very unequally distributed in and over its mass. Indeed, spheres have been formed of large masses of loadstone which so act on small dipping-needles carried over their surfaces as to give results which approach in character to the irregular lines which express the magnetic elements of

the earth. The supposition that the earth is a magnet was first formally announced by William Gilbert, the physician to Queen Elizabeth, in a work entitled *De Magnete Magnetisque Corporibus, et de Magno Magnete Tellure* (Lond., 1600). Of this celebrated work of Gilbert, Prof. Robison of the University of Edinburgh thus wrote in the early part of this century: "It is not saying too much of this work of Dr. Gilbert's to affirm that it contains almost everything we know about magnetism. His unwearied diligence in searching every writing on the subject, and in getting information from navigators, and his incessant occupation in experiments, have left very few facts unknown to him. We meet with many things in the writings of posterior inquirers, some of them of high reputation and of the present day, which are published and received as notable discoveries, but are contained in the rich collection of Dr. Gilbert." That the earth is a great magnet is proved by its producing the same actions as does a loadstone or artificial magnet on bars of iron or steel and on suspended magnets when these bodies are placed in the same conditions in reference to the earth (considered as a magnet) and to the artificial magnet or loadstone. Thus, a bar of soft iron is temporarily magnetized when pointed towards the pole of a magnet or towards the magnetic pole of the earth. A bar of hard iron or steel is permanently magnetized when, while pointing towards the terrestrial magnetic pole or towards the pole of a magnet, it is struck a blow with a hammer in the direction of the length of the bar. A spherical magnet of steel or of loadstone produces in agitated iron filings in its vicinity lines of magnetic force similar to those traced out by the action of the earth on the beams of the aurora polaris. A small dipping-needle carried over a sphere formed out of loadstone acts like the same needle carried over the earth's surface. Finally, a current of electricity can be evolved from the earth in a closed conductor by moving this conductor so that it cuts the lines in which a dipping-needle, freely suspended, places its length; the same action is produced in like circumstances when an artificial magnet or loadstone replaces the earth in the above experiment.

FIG. 17.

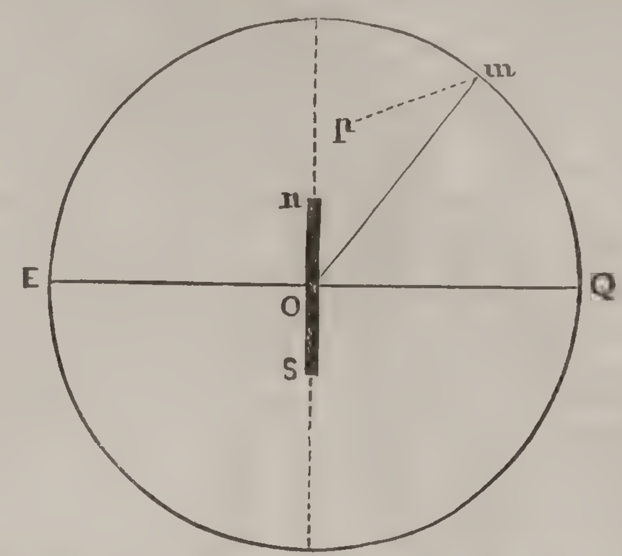


Magnetic Dip and Intensity.

Hypotheses as to the Distribution of the Magnetism of the Earth.—As far as the general fact is concerned of considering the earth as a great magnet, all physicists are agreed, but difficulties of complicated natures have occurred when into this general theory they have endeavored to bring the magnetic elements observed at different parts of the earth's surface. Hence, various hypotheses have been framed as to the positions, number, and intensities of the magnetic poles, as to the distribution of the magnetic forces within and on the earth, and as to the cause of the variations in the directions and magnitudes of the various resultants of terrestrial magnetic action.

Hypothesis of Mayer, Humboldt, and Biot.—About the middle of the last century it was suggested by the German astronomer Mayer—and the same idea was adopted independently by Humboldt and Biot—that the main phenomena of terrestrial magnetism could be explained by the supposition that near the centre of the earth exists a single magnet whose length is small in comparison with the earth's diameter, and whose axis passes through the centre of the earth in a direction perpendicular to the magnetic equator. This hypothesis may be concisely stated as follows: Let E Q represent the magnetic equator, and E m Q a great circle on the globe perpendicular to the plane of the equator. Let $n\ o\ s$ be the supposed interior magnet, whose centre o

FIG. 18.



coincides with the centre of the earth, and whose axis $n\ s$ is perpendicular to E Q. Then, the length $n\ s$ being very small in comparison with the distance $o\ m$, the direction and magnitude of the force exerted by the magnet upon any point m of the earth's surface will be given by the formulæ

$$\tan omp = \tfrac{1}{2} \tan mon,\ \mathrm{R} = \frac{m\mu}{a^3} \sqrt{1 + 3\cos^2 mon};$$

in which m is the magnetic moment of the magnet $n\ s$, μ the quantity of free magnetism in the point acted on, and a the radius of the earth. But if λ denote the magnetic latitude $m\ o$ Q, and θ the magnetic inclination, or the angle made by the direction of the force with the horizon of the place, then is $mon = 9° - \lambda$, $omp = 90° - \theta$, whence

$$\tan \theta = 2 \tan \lambda,\ \mathrm{R} = \sqrt{1 + 3 \sin^2 \lambda},$$

the force at the magnetic equator being taken as unity.

Let us examine the consequences of these formulæ:

1. On the *magnetic equator* $\lambda = 0$, and consequently $\theta = 0$, $\mathrm{R} = 1$. Accordingly, the inclination will be nothing at all points of this line, and the direction of the needle horizontal. Again, the intensity of the force will be equal to unity, and less than at any other points on the earth's surface. The magnetic equator is therefore, on this hypothesis, also the line of *minimum intensity.*

2. The points in which the axis of the magnet meet the surface of the earth will be the *magnetic poles.* At these points $\lambda = 90°$, and consequently $\theta = 90°$, $\mathrm{R} = 2$. At the magnetic poles, therefore, the freely suspended needle takes the *vertical position,* and the force will be double that at the equator.

3. The great circles passing through the line $n\ s$ will be the magnetic meridians, and the declination at each point of them will be equal to the angle which they contain with the meridian of the place.

4. If planes be drawn perpendicular to $n\ o\ s$, or parallel to the magnetic equator, they will intersect the globe in circles which are analogous to the parallels of latitude, and may be called the *magnetic parallels.* For all the points of each such circle the magnetic latitude λ is the same. Hence, θ and R are also the same, and the parallels will be *isoclinal* and *isodynamic* lines.

We see from this account that the magnetic phenomena of the globe are represented, in a rude and general manner, by the hypothesis in question. In particular, it has been found that the formula $\tan \theta = 2 \tan \lambda$ is approximately true for points on the earth's surface whose magnetic latitude does not exceed 30°, and it is probable that the law of the intensity may be depended on within the same limits. But a closer comparison of the results with those of observation shows that the discrepancies are considerable. The line of least force does not coincide with the line of no inclination; the points of greatest force on the earth's surface are four instead of two; and none of these coincide with the points at which the inclination is 90°. Finally, the isoclinal and the isodynamic lines are not parallel circles, as they would be according to the hypothesis.

Hansteen's Hypothesis.—The next hypothesis of any importance was brought forth by Hansteen of Norway. He supposed the existence of *two* magnets in the interior of the earth. These magnets are placed eccentrically and inclined to the earth's equator, and one of these magnets is more powerful than the other. He then reached certain empirical formulæ which rather precisely gave the value of the magnetic elements on the earth. In this hypothesis by the magnetic poles of the earth is understood the poles of the two interior magnets, and not the points on the earth where the dipping-needle takes vertical positions. Hansteen assumes that these four poles have a regular motion of revo-

lution about the terrestrial poles, the two poles of the N. going from W. to E. in an oblique direction, and the two S. poles from E. to W., also obliquely. He gives these motions the following durations of revolution: The stronger N. pole in 1890 years; the stronger S. pole in 4605 years; the feebler N. pole in 860 years; the feebler S. pole in 1303 years. Instead of two magnets we may imagine a greater number, and add one whenever the advance of scientific observations requires the addition in order to embrace the phenomena in the multipolar hypothesis. Thus, we may reach empirical expressions which are certainly valuable aids in directing original observations, but which cannot be said to form a *theory* of terrestrial magnetism.

Gauss's Theory.—In the year 1838, Gauss published in the *Resultate des Magnetischen Vereins*, his celebrated memoir on the earth's magnetism. It is impossible without a considerable space and the use of the calculus to give a thorough account of this theory. The reader will find Gauss's papers translated into English in *Taylor's Scientific Memoirs*, vol. ii. Gauss makes no hypothesis as to the number and position of the magnetic poles; he regards the earth as an infinite assemblage of magnets disposed in any manner; which amounts to saying that in the interior of the earth exist centres of action attracting and repelling in the inverse ratios of the squares of the distance. He determines certain relations among the components of the forces which are true generally; then he expresses these components by general formulæ, the constants of which can be obtained by observation. Gauss shows that only two poles can exist at the surface of the earth; the assumption of more than two leads to conclusions opposed to the facts of observation.

Gauss compared the results reached by his calculations with accurate observations made at ninety-one magnetic stations. In the majority of cases the difference between calculation and observation is about equal to the errors of observation; sometimes he found that these differences were not greater than those made by practised observers at the same station. He applied his formulæ to the determination of the position of the N. magnetic pole, and he found that for the year 1830 its position was 73° 35′ N. lat. and 264° 21′ E. lon. from Greenwich. Capt. Ross found for the position of this pole a lower latitude by 1°. This certainly was a very satisfactory agreement. For the same year he calculated that the S. magnetic pole was situate in 72° 35′ S. lat. and 152° 30′ lon. E. of Greenwich. As remarked before, this point has never been reached by explorers. Gauss found for the magnetic intensity of the N. pole, 1.701; for the S. pole, 2.253. Gauss succeeded in obtaining measures of the absolute magnetic forces of the earth, and thence computed the magnetic moment of the earth. He found that it was equal to 8500 trillions of magnetized steel bars each weighing 500 kilogrammes, and each having a length of one-half a mètre. He computed that if the earth's free magnetism was uniformly distributed throughout its mass, each cubic mètre would contain a quantity equal to eight of the above bars. As we know that the outer layers of the earth contain far less magnetism than this, it has been concluded that the terrestrial magnetism is concentrated towards the centre of the earth. Gauss also computed what distribution of the magnetic fluids would give effects equivalent to the magnetic actions of the globe. Poisson had previously shown that the action of any magnetic body could be assumed to be replaced by that of a surface charged with the hypothetic magnetic fluids. Gauss found that the southern hemisphere would be charged with a layer of southern fluid, and the northern hemisphere with a layer of northern fluid. The line of separation of the two fluids does not differ greatly from a great circle which cuts the equator on the coast of Guinea at 15° of W. lon. The density of these layers varies from one point to another, and has two maximum points of density in the northern hemisphere—one on the shores of Siberia, at 71° N. lat. and 116° E. lon.; the other situate S. of Hudson's Bay, at 55° N. lat. and 263° E. lon. There exists only one point of maximum density in the southern hemisphere, quite near the southern magnetic pole, in lat. 70° S. and 154° E. lon. From the observations which existed at the time when Gauss wrote his classic work he calculated the course of the magnetic curves on the earth's surface, and published maps of them which represent the magnetic condition of the earth at that period as far as observations allowed him to go.

Correction of the Compass in Iron Ships.—The importance of this subject demands a concise description of the process by which a compass is corrected for the magnetic action of the iron either composing the hull of a ship or existing in her interior. In 1803, Capt. Flinders first made the important observation that the disturbances in his compasses could be accounted for by assuming the existence of iron placed in the direction of the ship's head and charged with S. magnetism for the northern hemisphere, and with N. magnetism for the southern hemisphere. To correct these disturbances he suggested placing aft of the compass a vertical bar of soft iron whose upper end, having like magnetism as the imaginary mass in the ship's head, would, in acting on the opposite pole of the compass-needle, correct its disturbances. The discussion by Sabine of the deviations of the compasses in wooden ships during the voyage of Ross in 1839–43 showed that the peculiarities in the disturbances of the compass lasted a short time after the ship had left the regions in which the terrestrial forces were such as would tend to explain the disturbances.

The first real explanation of the peculiar disturbances observed in iron ships was given by Airy, the astronomer-royal, in 1839. He was the first clearly to distinguish between the effects of the magnetism *induced* in the ship by the earth's inductive action, and what he terms the *sub-permanent* magnetism of an iron ship. By the latter is designated such a character of magnetization as is given to a bar of iron when it is placed in the line of the dip and struck. "The magnetism of a struck bar resembles the magnetism of a permanent steel magnet in all respects but this—that, while perhaps no change can be remarked in its quantity of magnetism in hours or days, yet it infallibly diminishes in a long time. To express this partially permanent character the term *sub-permanent* magnetism has been adopted." In single iron bars the sub-permanent magnetism diminishes sensibly in a few hours, and is lost in a few days. In some large iron ships a portion of it has remained unaltered for many years. Hence, both induced and sub-permanent magnetism exists in iron ships. Airy "conceives the ship's magnetism to be resolved into two parts—one transversal to the ship, one longitudinal. When the ship's head is placed N. or S., the transversal force alone disturbs the compass, and the quadrantal (inductive) disturbance vanishes; and the transversal magnetic part can be corrected by an opposite transversal magnet broadside on to the compass, whose distance is determined without any calculation, simply by trying its effect at different distances till the needle points correctly. Then, in like manner, if the ship's head be placed E. or W., the longitudinal magnetism only disturbs the compass, as the quadrantal deviation vanishes there, and it is to be corrected by a longitudinal magnet broadside on to the compass, tentatively applied. The effects of permanent or sub-permanent magnetism are now entirely corrected. In order to correct for the induction effect which produces quadrantal deviation, the ship's head must be placed in azimuth 45° (nearly), or 135°, or 225°, or 315°; there will be no difficulty in ascertaining whether the quadrantal disturbance is such as corresponds to the effect of iron in the direction of the ship's head; and if so, it must be corrected by iron on one or both sides, shifted by trial till the correction is complete. These processes were introduced by the author (Airy) in 1838, and they are still retained in use without alteration."

If the sub-permanent magnetism of a ship were permanent in its direction and intensity, and if the earth's action on the ship in various latitudes remained the same, then the process just described would permanently correct the disturbance of the ship's compass. But changes in the above actions do take place, and it is only after a ship has made many voyages that its sub-permanent magnetism becomes permanent. Hence, a ship's compasses should be repeatedly corrected during successive years to ensure the safety of its navigation. (See SHIPS, IRON, MAGNETISM OF, by C. A. SCHOTT, M. N. A. S.) A. M. MAYER.

Magnetic Iron Ores. See IRON ORES.

Magnet′ic Pyri′tes, or **Pyrrhotine,** a natural sulphide of iron, differing from common iron pyrites in crystallizing in the hexagonal system and in chemical composition, containing a larger proportion of iron; sulphur 39.5, iron 60.5 (iron pyrites, sulphur 53.3; iron 46.7). Pyrrhotine is slightly attracted by the magnet.

Magnetism. See MAGNET.

Magneto-Electricity. See ELECTRICITY. See also APPENDIX.

Magnif′icat, the song of the Virgin Mary, as recorded in Luke i. 46–55. It is so named from the first word in the Latin version, *Magnificat anima mea, Dominum.* This song of praise by the Virgin Mother in thankfulness for the Incarnation, and uttered while yet she was the tabernacle of the Sun of Righteousness, must have formed a part of the worship of the Church from early times. It is first found prescribed about the year 506, when in France it was ordered to be sung at lauds. In the Eastern and Armenian churches it is still a lauds canticle. In the West it has during the last 800 years been sung only at vespers. A prominent place is given to this hymn in the vesper and other services of the Roman Catholic Church and the Church

of England. It is omitted from the evening service of the Protestant Episcopal Church in the U. S.

Magnin' (Charles), b. at Paris Nov. 4, 1793; was appointed assistant at the National Library in 1813, and one of the directors in 1832, and d. at Paris Oct. 7, 1862. As contributor to the *Globe*, together with Guizot, to the *National*, together with Armand Carrel, and afterwards to the *Revue des Deux Mondes*, he acquired great reputation as a spirited and acute critic, especially of dramatic poetry and art. A number of his articles he collected under the title *Causeries et Méditations historiques et littéraires* (2 vols., 1843). He also wrote *Les Origines du Théâtre moderne* (1838), *Le Théâtre de Hrosvitha* (1845), with translation and commentaries, and *Histoire des Marionnettes* (1852).

Mag'nitude [Lat. *magnitudo*], anything that can be measured. The term was originally applied to signify a portion of space possessing the three attributes, length, breadth, and thickness; by extension of meaning it has come to signify any quantity that can be expressed in terms of a quantity of the same kind taken as a unit. Lines, surfaces, and volumes are called geometrical magnitudes. An angle is also a species of geometrical magnitude. Time, weight, and numbers are arithmetical magnitudes. (See Quantity.) W. G. Peck.

Magno'lia [named by Linnæus in honor of Dr. Pierre Magnol (1638–1715)], a genus of exogenous trees and shrubs of the order Magnoliaceæ, mostly natives of the warm parts of North America and the temperate and warm parts of Asia. The U. S. have seven species, some evergreen, others deciduous, and all handsome trees and shrubs, mostly with conspicuous fragrant flowers. The wood is soft, but that of *M. grandiflora* is valued in joinery, and if kept wet is very durable. The larger Asiatic kinds are excellent timber trees, especially *Michelia champaca*, which is of a closely related genus. The Cucumber Tree and the Umbrella Tree (which see) are of this genus. The smallest and the hardiest of the American species is the white bay or beaver-wood (*M. glauca*), an evergreen found from Cape Ann in Massachusetts south-westward to Texas. The largest of our species is the *Magnolia grandiflora*, a superb evergreen of the Southern States, of noble size and large, beautiful, and very fragrant blossoms. There are as many Asiatic as American species. Some of these, from Northern China and Japan, are hardy and beautiful shrubs, becoming rather common in cultivation. The bark, leaves, and seeds of the various species abound in a bitter tonic principle, and have a limited use in medicine.

Magnolia, post-v. and tp., cap. of Columbia co., Ark., 40 miles S. W. of Camden, has 2 churches and stores and shops. Principal business, farming. Pop. of v. 259; of tp. 1946. J. P. Roberts.

Magnolia, post-v. and tp. of Putnam co., Ill., 10 miles E. of Henry, Ill., has 1 newspaper, 1 hotel, and 4 stores. Pop. 1667. H. K. Smith, Ed. "Magnolia News."

Magnolia, post-v. of Jennings tp., Crawford co., Ind. Pop. 33.

Magnolia, post-v. and tp., cap. of Harrison co., Ia., on Willow Creek, 6 miles N. W. of Logan Station. Pop. of v. 450; of tp. 828.

Magnolia, post-v., cap. of Pike co., Miss.

Magnolia, post-v. and tp. of Duplin co., N. C., on the Wilmington and Weldon R. R., 45 miles from Wilmington, has 3 churches, 1 college, 1 newspaper, 15 stores, 2 hotels, 3 distilleries, and does quite a business in trucking and naval stores. The "Natural Wells" are located about 1 mile from the town. They are 2 natural wells which have never been known to dry up, and to which no bottom has been found. Pop. 1606.
Wm. T. Hannaford, Ed. "Magnolia Monitor."

Magnolia, tp. of Abbeville co., S. C. Pop. 1790.

Magnolia, tp. of Logan co., West Va. Pop. 667.

Magnolia, tp. of Weitzel co., West Va. Pop. 1598.

Magnolia, post-tp. of Rock co., Wis. Pop. 1156.

Mag'nus (Heinrich Gustav), b. at Berlin May 2, 1802; studied natural science at the university of his native city, and chemistry under Berzelius in Stockholm, where he discovered the compound known as the green salt of Magnus; was appointed professor of physics and technology at the University of Berlin in 1834, and d. there Apr. 4, 1870. The results of his numerous original researches he communicated in Poggendorf's *Annalen* and in the transactions of the Berlin Academy of Science. The most remarkable were his experiments on the coefficient of the dilatation of gases, published in 1841, a few days after Regnault's publication of the same results; and his experiments on the transmission of heat through gases, which gave rise to a controversy with Tyndall.

Mag'nusen (Finn), b. at Skalholt, in Iceland, Aug. 27, 1781; studied at the University of Copenhagen; began to practise as a lawyer in Iceland in 1803, but returned in 1812 to Copenhagen; was appointed professor of Northern antiquities in 1815, and keeper of the archives in 1842. D. at Copenhagen Dec. 24, 1847. His principal works are a translation of the older *Edda*, with accompanying commentaries (4 vols., 1821–23), a critical exposition of the Scandinavian mythology (4 vols., 1824–26), and *Priscæ Veterum Borealium Mythologiæ Lexicon et Gentila Calendarium* (1828); but besides these works he wrote a great number of minor essays relating to Icelandic literature, Scandinavian mythology, and Northern antiquities, remarkable as well for learning as for critical acuteness.

Mago'der, tp. of Franklin co., Va. Pop. 1879.

Magof'fin, county of E. Kentucky. Area, 360 square miles. It is mountainous, and contains bituminous coal. The valleys are fertile. Corn is the principal crop raised. Cap. Salyersville. Pop. 4684.

Magoon' (Elias L.), D. D., b. at Lebanon, N. H., Oct. 20, 1810; was a bricklayer in youth, but obtained by his own exertions an education at Waterville College; was ordained in 1840 to the ministry as pastor of the Second Baptist church at Richmond, Va.; made a tour in Europe 1846, and was successively pastor of churches in Cincinnati (1847), New York (1849), Albany (1857), and Philadelphia (1860). He has written *Orators of the American Revolution* (1848), *Living Orators in America* (1849), *Proverbs for the People* (1848), *Republican Christianity* (1849), and *Westward Empire* (1856), and is widely known as a connoisseur in art.

Mag'pie, a name applied to various birds, mostly of the genus *Pica*, belonging to the crow family. The common magpie of Europe (*Pica caudata*) is a bird well known for its cunning and mischievousness, and its disagreeable screaming voice. The *Pica Hudsonica* of North America, common north-westward, is by some regarded as of the same species. The *P. Nuttalli* is a common Californian species. There are other species, nearly all of them Old-World birds.

Magruder (Allan B.), b. in Kentucky about 1780; became a lawyer; published *Reflections on the Cession of Louisiana* (Lexington, 1803); removed to Louisiana; was U. S. Senator from that State 1812–13, and collected materials for a general history of the Indians. D. at Opelousas, La., in Apr., 1812.

Magruder (Gen. John Bankhead), b. in Virginia about 1810; graduated at West Point 1830; was distinguished in the Mexican war in command of the light battery of Gen. Pillow's division, earning the brevet of major for gallantry at Cerro Gordo, and lieutenant-colonel for Chapultepec, where he was wounded; resigned from the U. S. army Apr. 20, 1861; entered the Confederate army; commanded at Yorktown until its evacuation; took part in the campaign on the Chickahominy; was appointed brigadier and major-general, and sent Oct. 16, 1862, to assume command of the western department, including Texas, Arizona, and New Mexico. He recovered Galveston from the Federal forces, and took an active part in military affairs in Texas throughout the war. He then resided for a time in Mexico, but soon returned to Texas, and d. at Houston Feb. 19, 1871.

Maguire' (John Francis), b. at Cork, Ireland, in 1815; was called to the bar in 1843; was a member of Parliament from 1852 until his death; was proprietor and editor of the Cork *Examiner*, a Catholic organ, and was a leading exponent of Irish Catholic interests in Parliament, in journalism, and in literature. He wrote *Rome and its Ruler* (1857), revised, enlarged, and republished in 1870, under the title *The Pontificate of Pius IX.; The Industrial Movement in Ireland* (1853), *The Irish in America* (1858), *Life of Father Mathew* (1863), and *The Next Generation* (1871), a political novel. Mr. Maguire was an advanced Liberal politician, an advocate of "home rule," and was four times elected mayor of Cork. He stimulated the growth of flax in the S. of Ireland by establishing linen-mills in Cork. D. at Cork Oct. 31, 1872.

Maguire (Robert), b. in Dublin, Ireland, in 1826; was educated at Trinity College, where he graduated with the highest honors in 1846; was curate of St. Nicholas, Cork, 1849–52, and became vicar of Clerkenwell 1857; was secretary of the Islington Protestant Institute, and published among other works, *The Seven Churches of Asia* (1857), *Expository Lectures on Bunyan's Pilgrim's Progress* (1859), *The Miracles of Christ* (1863), *St. Peter Non-Roman in his Mission, Ministry, and Martyrdom* (1871), and edited *Cassell's Illustrated Bunyan* (1864–65).

Mahâbhârata. The two great epics of ancient Indian literature are the *Mahâbhârata* and the *Râmâyana*. (See Râmâyana.) The word *Mahâbhârata* is from the Sanskrit *mahat*, "great," and *Bharata*, the name of an an-

cient king of the Lunar race. Judging from the nature of the poem of the *Mahâbhârata*, the word may be translated "*The Great* (epic relating to the history of the descendants of) *Bharata*." Bharata is said to have been the first *samrâj*, or universal monarch, and to have brought all kingdoms "under one umbrella." It is from him that the whole of India is known to Hindus as *Bhârata-Kânda*—*i. e.* Bharata's continent. Bharata's descendants were called Bharatas, and the *Mahâbhârata* was the great war which raged between the Bhârata heroes—that is, between the Kauravas and the Pândavas, all of whom were alike descended from Bharata. The two great dynasties of ancient India are respectively known as the Solar and the Lunar. To the latter belongs the *Mahâbhârata* narrative. It is a heroic epic, chiefly, though by no means wholly, in praise of the valorous exploits of the chiefs of the dynasty in question. The kings of the Lunar race originally reigned in the Doab, between the Jumna and the Ganges. Near the site of the present city of Allahabad stood the first capital of the dynasty—namely, Pratishthâna—at the *prayâga* or confluence of the Jumna and Ganges. The second capital adopted by the race was Hastinâpura, on the Ganges, N. of where Delhi now stands. The Pândava branch of the family subsequently built Indraprastha, on the Jumna, partly on the site of the present Delhi. The kings of Magadha also belonged to the Lunar race, and were well known to the ancient Greeks. Of all early Indian dynasties, that of the kings of Magadha was the most powerful and lasting. Though the wars carried on between the Kaurava and Pândava families form the principal subject treated of in the *Mahâbhârata*, yet a great variety of other topics are dilated on during the course of the poem. In many parts of the stupendous work the wars are only introduced as a kind of link between narrative and narrative, disquisition and disquisition—a link to bind the whole together. The *Mahâbhârata* contains old poetical versions of pretty nearly all the legends current amongst ancient Hindus; it cannot be doubted to be in parts an accurate reflex of their early history; it treats of their customs, sciences, and laws; it gives minute particulars of their religious observances; it affords us a clear insight into the domestic circumstances of Hindu kings of old; in a word, it contains almost all that which was known by ancient Hindus, with the exception of that which was contained in the Vedas. The main story of the book—namely, that about the primarily unfortunate but subsequently victorious Pândavas—is constantly interrupted. Instead of proceeding straight forward, the narrative winds about like the pathway of a traveller through an Indian forest. It now leads through tangled brushwood and matted bamboos, now ascends, now descends, now curves sharply round some obstacle, and now seems to be altogether lost in the leafy maze. Thus, though the *Mahâbhârata* has won for itself the name of a great "*kavya*" or epic, some prefer to designate it simply as an *itihâsa* or ancient narrative. But an epic it is, of vast scale, grand poetic conception, and wonderful merit. If the whole of the poem were compared to a dark and stormy sky, lurid with wild gleams of lightning, and constantly changing its threatening aspect, the episodes it contains—some of them of rare and touching beauty—might fitly be likened to patches of soft blue sky calmly islanded in the midst of the driving scud. The *Mahâbhârata* professes to have been composed by the Rishi, *Krishna-Dwaipâyana-Vyâsa*, commonly called *Veda-Vyâsa*, and still more commonly simply *Vyâsa*. It also professes to have been first recited in public by *Vaisampâyana*, who learned it from *Vyâsa*, and to have been recited for the second time by the poet *Ugra-Srava*. It is also stated in the poem that when it was first published it only contained 24,000 verses, but that many thousand verses were added to it on its second recitation. Exclusive of the "*Hari-Vamsa*," a supplement to the poem, the *Mahâbhârata* contains 91,015 slokas. In all, there are more than 100,000 verses in the whole epic. The poem contains between three and four millions of syllables! There is reason to believe that at one time the *Mahâbhârata* was even larger than it is now, and thus some have rashly imagined that, being so weighty a poem, the name *Mahâbhârata* must be derived from *mahâ*, "great," and *bhâra*, "weight." In any case, this great Indian epic is certainly one of the most enormous poems ever penned. It, like many great works of antiquity, is evidently the production of many minds and many epochs. As a poem it is very unequal; the surface-matter continually varies, but beneath all there lies, without doubt, a solid and thoroughly precious substratum of historical fact.

The manner in which the *Mahâbhârata* was composed may be stated, with nearly absolute certainty, to be as follows: The ancient legends which were current respecting the Bhârata heroes were versified by *sûtas*, or royal bards. These versified accounts were repeatedly sung at the courts of Hindu kings. New songs and poems were from time to time added to the old. Finally, some learned Hindu pandit collected all these various compositions from the *sûtas*, arranged them with some degree of order, and at last published them as one entire production, giving as the name of the whole composition the apt and high-sounding one of the *Mahâbhârata*. The Bhârata legends were of course current in India centuries before they were reduced to writing, just as the Vedic hymns were doubtless sung ages before the Vedas were written. Then, as to the dates of the *Mahâbhârata* legends, it would be rash to premise anything concerning them. The events to which any given narrative in the *Mahâbhârata* relates probably occurred long before that narrative was versified; and, as we have seen, it was at a still later period that the versified story, after being sung at the royal courts all over India, was finally embodied, in a polished and perhaps greatly altered state, in the *Mahâbhârata*. It may be truly said that, as almost all rivers flow into the sea, almost all of the compositions of the most ancient Aryan poets of Hindostan flowed into and found their final rest in the deathless pages of the *Mahâbhârata*. It is as absurd to suppose that Vyâsa composed the whole of the *Mahâbhârata* as to suppose that one man wrote the Bible from Genesis to the Apocalypse. Throughout the poem the diction in the several parts is as different as the style of the Song of Solomon from that of the Epistle to the Hebrews. In the *Mahâbhârata* we have dry metaphysics side by side with voluptuous love-scenes; on one page customs are defined and laws promulgated, whilst on the next we find ourselves hurled amidst scenes of battle, murder, and sudden death.

The contents of the *Mahâbhârata* are not only various, they are extremely contradictory in parts. Thus, it is not at all an easy matter to give a clear and succinct account of the whole work, or even of any one of the principal tales embodied in it. Every story is related in one portion of the book in one way, and in another portion of the book in another way. It does not appear that Vyâsa, or whoever it was who compiled the *Mahâbhârata*, took the trouble to compare the various versions of the stories contained therein. Certainly, he has not endeavored to reconcile them, even where they are most glaringly diverse. He appears to have transcribed primarily the first version of any given tale which he met with, and then when some other courtly minstrel related to him some other version of the same narrative he seems to have transcribed that also with calm indifference. One consequence of this may be noted. When a scholar says that such and such a narration of events is to be found in the *Mahâbhârata*, another scholar may point to some other counter-narration, and thus endless controversy will be engendered. "When any one," writes an eminent Orientalist, "affirms that the representation which the *Mahâbhârata* gives of any one subject is of such and such a nature, it is always possible for some other person to deny the statement, and to assert that the *dictum* of the *Mahâbhârata* is a totally different one on the point. On examination, however, it will probably be discovered that both statements are correct, both being contained somewhere in that extensive work. For this reason it has been customary for the authors of Purânas and the adherents of various sects to overlook so much of the *Mahâbhârata* as does not suit their purpose, to select and utilize only those portions which do suit them, and to attribute the name and authority of the *Mahâbhârata* to those portions alone."

In conclusion, an exceedingly brief epitome of the contents of the *Mahâbhârata* may be given: Bharata had a lineal descendant named Kuru. He had two sons, Dhritarâshtra and Pându. The former was blind, but was possessed of considerable political sagacity. He had a hundred sons, whilst Pându had but five—viz. Yudishthira, Bhîma, Arjuna, Nakula, and Sahadeva. The latter were called the Pândavas. The hundred sons of Dhritarâshtra were called the Kauravas. Pându resigned his throne to his elder brother, who, though blind, occupied it, and then subsequently divided his kingdom fairly, and even generously, between his own sons the Kauravas and the five Pândavas. The Kauravas, however, soon grew envious of the equable arrangement, and determined to wrest by force or guile their portion of the kingdom from the Pândavas. A game of dice was played. The Pândavas lost their all. However, the Kauravas agreed to restore their cousins to their kingdom if they passed twelve years in a forest, and a thirteenth year in undiscoverable disguises. This the Pândavas did, but when they claimed the fulfilment of the Kauravas' promise, it was basely evaded. At this the great war arose, and the Pândava princes were ultimately triumphant. The several characters of the five Pandava princes are finely drawn; many of the battle-scenes are striking for their animation; and the whole poem is re-

plete with frequent references to Hindu legends, mythology, and ceremonial rites. A thorough knowledge of the *Mahâbhârata* is essential to any one who would aspire to be a Sanskrit scholar. Even if in many particulars it fails when considered merely as a poem, yet as a repertory of ancient Aryan tradition the *Mahâbhârata* is invaluable.

R. C. CALDWELL.

Mahan' (ASA), D. D., b. in Vernon, N. Y., in 1799; graduated at Hamilton College in 1824, at Andover Theological Seminary in 1827; became pastor of a Presbyterian church in Pittsford, N. Y., in 1829, of the Sixth street church in Cincinnati 1831, and in 1835 president and professor of philosophy at Oberlin College, O.; was president of Cleveland University 1850–56; pastor of a Congregational church in Jackson, Mich., 1856–58, of another at Adrian 1858–61, and president of Adrian College 1861–71. He has been a prominent advocate of the views generally called "Perfectionist," which he set forth in a work entitled *Scripture Doctrine of Christian Perfection*, and acquired considerable distinction by his metaphysical treatises, *The Science of Intellectual Philosophy* (1845), *The Doctrine of the Will* (1846), *The Science of Moral Philosophy* (1856), and *The Science of Logic* (1857). He also published *Modern Mysteries Explained and Refuted* (1855), a treatise directed against Spiritualism, and is (1875) engaged upon a work to be entitled *A Critical History of Philosophy*.

Mahan (DENNIS HART), LL.D., b. in New York Apr. 2, 1802, but taken to Norfolk, Va., in infancy; intended for the profession of medicine, he relinquished his medical studies in 1820 to enter the U. S. Military Academy, from which he was graduated at the head of his class in 1824, and appointed a second lieutenant of engineers, but retained at the Academy as assistant professor of mathematics and of engineering until 1826, when he was sent to Europe on professional duty, where he passed four years in visiting and studying the fortifications and institutions connected with his profession, being for fifteen months a pupil at the engineering school at Metz. Returning to the U. S. in 1830, he was in 1832 appointed professor of the department of civil and military engineering, of which he had been in charge since 1830, and at the head of which he continued until 1871. He was of nervous temperament and subject to fits of depression, and in a moment of temporary alienation threw himself into the Hudson River from the steamer Mary Powell while on his way to New York to consult his physician, and was drowned near Stony Point, N. Y., Sept. 16, 1871. In his professional capacity he acquired a worldwide reputation, as well as by his many valuable works on engineering and the art of war, which have met with extensive sales and are largely used as textbooks in the U. S. In 1836 he published a *Treatise on Field Fortifications*, to which was added in 1865 *Military Mining and Siege Operations*, the whole now comprising Part I. of *An Elementary Course of Military Engineering*, of which *Permanent Fortifications* constitutes Part II. His *Course of Civil Engineering*, first published in 1837, was largely improved and extended up to 1868, when it was almost entirely rewritten; at the time of his death a new revised edition was in preparation and partly printed; *Advanced Guard, Outpost, and Detachment Service of Troops* (1847; enlarged in 1862); *Fortification-Drawing and Stereotomy* (1865); *Industrial Drawing* (1853). Mahan's American edition of *Moseley's Mechanical Principles of Engineering and Architecture* appeared in 1856, reaching a second edition in 1869. Degree of LL.D. conferred by William and Mary and Dartmouth colleges and Brown University, and member of various scientific assocations.

Mahan (MILO), D. D., brother of D. H. Mahan, b. at Suffolk, Nansemond co.,Va., May 24, 1819; was educated at St. Paul's College, Flushing, L. I.; entered the Protestant Episcopal ministry in 1845; became in 1851 professor of ecclesiastical history in the Episcopal General Theological Seminary in New York, and in 1864 rector of St. Paul's church, Baltimore, where he d. Sept. 3, 1870. He published *The Exercise of Faith* (1851), *History of the Church* (1860; new ed. 1872), *Reply to Colenso* (1863), *Palmoni, a Free Inquiry* (1863), and *The Comedy of Canonization* (1868). His collected works were published in 3 vols., 1872–75, with a memoir by Rev. J. H. Hopkins, Jr.

Mahanoy', tp. of Schuylkill co., Pa., has very important mines of anthracite coal. It includes Mahanoy City, Mahanoy Plane, and other mining towns. The Mahanoy coal-field has an area of 41 square miles of thick and excellent coal. It is a very desolate and barren region. Pop. 9400.

Mahanoy City, post-b. of Mahanoy tp., Schuylkill co., Pa., 80 miles N. W. of Philadelphia and 56 miles N. E. of Harrisburg, in the Mahanoy valley and coal-field, from which it derives its importance, has 13 churches, 2 banks, 2 weekly newspapers, a public library, 3 schools, and a foundry. The inhabitants are connected directly or indirectly with the neighboring mines of anthracite coal. Mahanoy was first settled in 1859. Pop. 5533.

Mahanoy Plane, post-v. of Mahanoy tp., Schuylkill co., Pa., 6 miles S. W. of Mahanoy City, on the Mahanoy and Shamokin R. R., and has coal-mines.

Mahanud'dy, or **Mahanadi** [Sansk. "great river"], a river of Hindostan, rises in lat. 20° 20′ N. and lon. 82° E., flows with an eastward course for a distance of 520 miles through Berar and Orissa, and falls into the Bay of Bengal, where it forms a large delta. Navigable for 300 miles during the rainy season, it becomes almost dry during the remaining half of the year. The river-bed is celebrated for the fine quality of diamonds found in it.

Mahas'ka, county of S. E. Central Iowa. Area, 576 square miles. It is somewhat diversified, with a very fertile soil. Cattle, grain, and wool are the staple products. Coal is extensively mined. The county is traversed by the Desmoines and Checauqua rivers and by the Central Iowa and the Desmoines Valley R. Rs. Cap. Oskaloosa. Pop. 22,508.

Mahim', town of British India, on the island of Bombay, 7 miles N. E. of the city of Bombay, is ill built, but has very valuable oyster fisheries. Pop. about 9000, who are mostly Christians of Portuguese descent.

Mahmood' (or **Mahmûd**) **I.,** sultan of Turkey from 1730 to 1754, b. at Constantinople Aug. 6, 1696, a son of Mustapha II.; succeeded his uncle, Ahmed III., but his long reign was comparatively insignificant.—MAHMOOD II., sultan of Turkey from 1808 to 1839, b. at Constantinople July 20, 1785, the second son of Sultan Abdul Hamed. According to Turkish custom, he was educated in the seclusion of the seraglio, and occupied himself mostly with literary and scientific studies, but he very early showed signs of a bright intellect and a strong will. In 1807 his cousin-german, Sultan Selim III., was deposed by an insurrection of the janizaries, who feared his zeal for reforms, and Abdul Hamed's oldest son, Mustapha IV., was raised to the Ottoman throne. From Selim, whose imprisonment he shared, Mahmood imbibed that implacable hatred to the janizaries which afterwards became so conspicuous in his life, and the deep conviction of the necessity of introducing into Turkey those reforms which modern European civilization had adopted. Submitting to the demands of the janizaries, Mustapha IV. abolished all Selim's reforms, but did not thereby establish peace. On the contrary, Bairaktar, pasha of Rustchuk, and one of Selim's adherents, rose in open rebellion, took Constantinople by storm, deposed Mustapha, and proclaimed Mahmood II. sultan July 28, 1808, Selim having been strangled in the mean time. Mahmood II., with Bairaktar for his grand vizier, immediately took up the work of reform, but on Nov. 14, 1808, a new insurrection of the janizaries broke forth. The house of the grand vizier was rased to the ground, the city was pillaged and set on fire at different points, and even the seraglio was stormed. In this emergency Mahmood II. ordered Mustapha and his infant son to be strangled, and his four pregnant sultanas to be thrown into the Bosporus; he thereby became himself the only surviving descendant of Osman, and, in consequence of a prevailing Turkish superstition which makes the destiny of the Turkish race dependent on the continuation of the dynasty of Osman, his person became inviolable. Peace was immediately restored, but the situation was still very dangerous. During the long series of court revolutions the authority of the sultan had decreased; the pashas ruled the provinces almost independently. The recent attempts at reform had roused the religious and national fanaticism of the Turks to the highest pitch, and in this situation entered a young prince with his head full of reforms, but without experience—shrewd, with a talent for dissimulation, but at the bottom of his heart haughty, unscrupulous, cruel, and revengeful. In some respects, however, Mahmood II. succeeded. In 1826 he dissolved the corps of the janizaries after a horrible struggle in the streets of Constantinople; 6000 were executed, 15,000 exiled, and the reorganization of the Turkish army after European models followed rapidly. Roads were made, an effective police and public safety established, postal communications introduced, and regular diplomatic connections with other European courts maintained. Of immense importance was the beginning emancipation of the Turkish women; they appeared now for the first time in public outside the harem. But in other respects Mahmood II. failed signally. Greece became independent, and Egypt was almost independent. (See the articles on GREECE, MEHEMET ALI, and IBRAHIM PASHA.) It was only the interference of Russia which prevented the Ottoman empire from falling entirely to pieces; and when Mahmood II. died (July 1, 1839) Tur-

key had actually entered on her course of a long and slow, but sure and inevitable dissolution.

Mahmood (or **Mahmûd**) **of Ghizni** (Abul-Kasim-Yemin-ed-Daulah), sultan of Persia, first Mohammedan emperor of India and founder of the Ghiznevide dynasty, b. at Ghizni (Ghazna or Ghuzny) in Candahar Dec. 12, 967. His father, Subuktigin, a descendant of the Sassanian kings of Persia, was governor of the province after the death of his father-in-law, Alptigin, and owned a nominal allegiance to Persia, but was really independent, and extended his frontiers on every side. Mahmood distinguished himself in youth, under his father's command, in campaigns against the Tartars, who had invaded Khorassan, and received from Noh, the Samanide sovereign of Persia, the title of Seif-ed-Daulah ("sword of the state"), together with the government of the province of Segestan. On the death of Subuktigin in 997, Mahmood overthrew his younger brother, Ismael, who had succeeded to the government by his father's appointment; took Ghizni 998, and having some grievance against Mansur, the new Persian monarch, formed an alliance against him with the rulers of Toorkistan and Kashgaria, and overthrew the Persian kingdom, which was divided among the confederates. Having laid the foundation of an extensive empire in Central Asia, Mahmood turned his arms against India, and in a series of twelve expeditions, begun in 1001 and extending through nearly thirty years, he plundered and devastated the country, carried off enormous treasures, and massacred vast numbers of the Hindoos. Mahmood was the first ruler who assumed the title of sultan. D. at Ghizni Apr. 3, 1030. Many of his descendants bore the same name. (See India: its History, by R. C. Caldwell.)

Mahog'any [a word of aboriginal American origin], the *Swietenia Mahogoni*, a noble forest tree of the West Indies and Central and South America, growing also to some extent in Florida. It is of the order Cedrelaceæ. Its wood is of very beautiful reddish color, extremely hard, strong, and heavy, and so costly that for a long time it has been used almost entirely as a veneering. It has for nearly 300 years been a staple article of commerce, and is brought from Honduras, Cuba, Hayti, Jamaica, and South America. The Honduras mahogany is now the most abundant and the largest, but also the coarsest and least handsome variety. The better sorts are called Spanish mahogany. Considerable quantities of the timber of *Khaya Senegalensis* from Africa and *Soymida febrifuga* from Calcutta (both cedrelaceous trees) are imported into England as mahogany, but the wood is generally inferior to true mahogany. Madeira mahogany is the wood of *Persea Indica*, and is coarse and inferior. Australia and other countries also furnish spurious though often valuable mahoganies. The bark of the true mahogany abounds in an active febrifugal principle. The "mountain mahogany" of Utah is the *Cercocarpus ledifolius*, of the order Rosaceæ.

Mahomet. See Mohammed.

Mahom'et (called also Middletown), post-v. of Middletown tp., Champaign co., Ill., on the Indianapolis Bloomington and Western R. R.

Mahon, Lord. See Stanhope, Earl of.

Mahone (Gen. William), b. in Southampton, Va., about 1827; graduated at the Virginia Military Institute 1847; devoted himself to civil engineering; was the constructor of the Norfolk and Petersburg R. R.; took part in the capture of the Norfolk navy-yard Apr. 21, 1861; raised and commanded the 6th Virginia regiment; was engaged in most of the battles of the Peninsular campaign, those on the Rappahannock, and those around Petersburg; was appointed brigadier-general Mar., 1864, and major-general Aug. 12, 1864; commanded a division in Hill's corps, and at Lee's surrender was in command at Bermuda Hundred. Since the war he has devoted himself to the development of Virginia railroads as president of several lines.

Maho'ning, county of Ohio, bounded E. by Pennsylvania. Area, 403 square miles. Coal is largely mined. The surface is uneven and the soil generally excellent. Cattle, grain, and wool are the staples. Lumber, leather, carriages, etc. are among the manufactures. The county is traversed by the Pittsburg Fort Wayne and Chicago, the Niles and New Lisbon, and other railroads. Cap. Canfield. Pop. 31,001.

Mahoning, post-tp. of Armstrong co., Pa. It contains beds of coal. Pop. 1402.

Mahoning, tp. of Carbon co., Pa. Pop. 1589.

Mahoning, tp. of Lawrence co., Pa. Pop. 1598.

Mahoning, tp. of Montour co., Pa. Pop. 1036.

Maho'ny (Francis), b. in Cork, Ireland, about 1805, studied at Jesuit colleges in Paris and Rome, and took orders in the Catholic Church, and relinquished that profession to connect himself with *Fraser's Magazine* about 1831, in which he published an amusing series of articles, collected in 1836 as *Reliques of Father Prout.* He was also a contributor to *Bentley's Miscellany* (1837), travelling correspondent, and afterwards Roman correspondent, of the *Daily News*, and for many years Paris correspondent of the *Globe.* He advocated the unity of Italy in the powerful letters published as *Facts and Figures from Italy*, by Don Jeremy Savonarola, Benedictine monk (1849). His closing years were passed in a monastery at Paris, where he d. May 19, 1866. Some of his later essays were edited by Blanchard Jerrold as *Final Reliques of Father Prout* (1874).

Mahopac', Lake, in Carmel tp., Putnam co., N. Y., is a pleasant summer resort, 14 miles from Peekskill. It has many pleasant residences and several good hotels. The lake is about 3 miles across, has three beautiful wooded islands, and is 1800 feet above the sea-level.

Mahrattas, a people of Central and Western India, who in the last century overran the greater part of the peninsula, placed the Mohammedan empire of Delhi under tribute, and were for half a century the most formidable obstacle to British supremacy in India. Their origin, geographical and ethnological, and their early history, are alike unknown, but the evidence of physical characteristics, customs, religion, and language, combined with the feeble indications of tradition, would point to one (or several) of the numerous irruptions of Turanian races from Central Asia prior to the rise of Mohammedanism (seventh century A. D.). This supposed race must have found its chief seat in the N. W. of the Deccan, along the Indian Ocean southward from the Nerbudda River to the neighborhood of Goa, and by intermarriage with Sudras and other low-caste Hindoo women acquired at once a language and a religion, the latter, however, being distinctive in ignoring caste and in permitting the use of meats. There can be no doubt that intermarriages with Arabs and Abyssinians impressed further characteristics upon the race during its period of formation. (See Grant Duff's *History of the Mahrattas*, and, for a comprehensive though brief résumé of Mahratta history, Meadows Taylor's *Student's Manual of the History of India.* See also India: its History.)

Mai (Angelo), Cardinal, b. at Schilpario, near Bergamo, Italy, Mar. 7, 1782; educated by the Jesuits; was appointed assistant at the Ambrosian Library of Milan in 1813; chief-keeper of the Vatican Library in Rome in 1819; secretary to the Propaganda in 1833; cardinal in 1838, and d. at Albano Sept. 8, 1854. Even when in Milan he acquired great reputation from his publications of fragments of ancient works discovered on palimpsests; the most remarkable of these were the fragments of Cicero's *Orationes*, M. C. Fronto's letters, Eusebius, Dionysius, Halicarnassus, and Julius Valerius's *Res Gestæ Alexandri.* In Rome he discovered an imperfect manuscript of Cicero's *De Republica*, which he published in 1822, and in 1825 he began the publication of those series of ancient works, Greek and Latin, which have made his name so celebrated among scholars—namely, *Scriptorum Veterum Nova Collectio e Vaticanis Codicibus edita* (10 vols., 1825–38), *Auctores Classici e Vaticanis Codicibus editi* (10 vols., 1828–38), *Spicilegium Romanum* (10 vols., 1839–44), and *Nova Patrum Bibliotheca* (6 vols., 1845–53).

Maid'en Creek, post-tp. of Berks co., Pa. Pop. 1615.

Maidenhead, town of England, in the county of Berks, on the southern bank of the Thames, has a brisk trade and 6170 inhabitants.

Maiden Rock, post-v. and tp. of Pierce co., Wis., on the Mississippi River (Lake Pepin), is a place of summer resort. Here is the precipice, 409 feet high, from which the Dakota maiden Wenona leaped, rather than marry a warrior of the Wabashaw tribe, preferring a young brave of her own nation. Pop. 501.

Maiden Spring, post-v. and tp. of Tazewell co., Va. Pop. 3694.

Maid'stone, town of England, in the county of Kent, on the Medway, is a handsome old place, with a fine church, many good educational institutions, extensive oil and paper mills, breweries, and manufactures of hats and blankets. The surrounding country is famous for the wheat, and especially for the hops, it produces. Pop. 26,198.

Maidstone, tp. of Essex co., Vt., on the Connecticut River, 75 miles N. E. of Montpelier. Pop. 254.

Mai'gre, French name of the *Sciæna aquila*, a fish of the family Sciænidæ, caught principally in the Mediterranean. It sometimes attains the length of six feet, is much sought as a food-fish, is very strong, and the stroke of its tail is dreaded by fishermen. It emits a groaning sound, which often guides the fishermen to its shoals. The maigre is

taken with the net. Its ear-bones are worn by some as charms against colic.

Maimaitchin′, a commercial station of Mongolia, the entrepôt of the Chinese trade with Russia, is situated immediately opposite Kiakhta, well built and fortified. It is inhabited by 1500 men; no women are allowed to live there. Since the treaty of Peking (1860), which opened the whole Russian-Chinese frontier to commerce, it has lost much of its importance.

Maimon′ides, or, more properly, **Rabbi Moses ben Maimon,** generally abridged into the initials **Ra M Ba M,** b. Mar. 30, 1135, of a rich and influential Jewish family in Cordova, at that time the principal seat of Arabic learning; received an excellent education, his father being himself a distinguished Hebrew and Arabic scholar. For many years he was compelled by the religious intolerance of the kings of the dynasty of the Almohades to renounce the public profession of Judaism, and (at least outwardly) embrace Mohammedanism; but in 1165 he determined to emigrate from Spain with his whole family. He settled in Egypt, at Fostat or Old Cairo, and was for some time engaged in the jewelry trade, but his great learning and eminent genius soon gained for him a most prominent place among his coreligionists, who rank him next to Moses, and at the Egyptian court, where he became physician to the sultan Saladin, while his numerous writings, theological, philosophical, and scientific, spread his fame all over the world. His position in the Jewish civilization is that of a systematizer. Well versed in Greek and Arabic speculation, and aided by a comprehensive knowledge of mathematics, astronomy, and medicine, he succeeded in bringing into a consistent system the whole mass of Jewish tradition, which lay scattered in Midrash, Mishnah, and Talmud, and demonstrated the principles on which Judaism is based. Even during his lifetime his views met with some opposition, and in the next century they occasioned the fiercest controversy. Nevertheless, when he died, at Cairo, Dec. 13, 1204, his body was brought to Tiberias in Palestine, and his tomb became a place of pilgrimage, and at the close of the thirteenth century his ideas had become authoritative, not only among the Jews, but, on many points and for a long time, also among Christian and Mohammedan philosophers. He wrote generally in Arabic; his principal work, however, is written in Hebrew, *Mishneh Torah* ("The Second Law") or *Yad Chazakah* ("The Strong Hand"), which gives in 982 chapters a systematic representation of all Jewish laws scattered in the Bible, Talmud, and elsewhere, even those which were no longer in practical use, such as the precepts regarding the soil of Judæa. The most remarkable of his Arabic works is the *Delalath Al-Hairin*; Hebrew, *Moreh Nebuchim*; Latin, *Doctor Perplexorum* ("The Guide of the Erring"), a philosophical representation of Judaism or the philosophy of the Jewish religion. This last book, as well as his compends of logic, astronomy, and medicine, was much studied in the Christian universities during the Middle Ages. *Doctor Perplexorum* has been translated into German by Scheyer and Fürstenthal (1838), and into French by S. Munk (1856).

Main, a river of Germany, rises in the Fichtelgebirge, flows westward with a tortuous course for a distance of 300 miles, and joins the Rhine opposite Mentz. It is navigable for a distance of nearly 200 miles, and is connected with the Danube by the Ludwig's canal. The principal cities on its banks are Würzburg, Offenbach, and Frankfort.

Maine, an ancient province of France, lying S. of Normandy, and comprising the present departments of Mayenne and Sarthe, and parts of Eure and Orne.

Maine, the largest of the Eastern or New England States, and the extreme north-eastern portion of the U. S., lying between the parallels of 43° 04′ and 47° 31′ N. lat., and between the meridians (including the islands of the Grand Menan group) of 66° 45′ and 71° 06′ W. lon. from Greenwich. It is bounded on the N. W. by the province of Quebec, Dominion of Canada; on the N. by Quebec and the province of New Brunswick, from which the river St. John is for some distance the separating line; on the E. by New Brunswick; on the S. E. and S. by the Atlantic Ocean; and on the W. and S. W. by New Hampshire. Its area, according to the estimates of the land-office and U. S. census bureau, is 35,000 square miles, or 22,400,000 acres. Its greatest length, on a diagonal line from the mouth of the Piscataqua River to the northern angle, is 320 miles; its greatest width, from the sea to the Canada line, is 160 miles; a line from the Piscataqua River to Quoddy Head, the eastern extremity of the mainland, is 278 miles in length.

Face of the Country.—The surface is much diversified. The sea-coast for 10 or 20 miles inland is, with some notable exceptions, flat, low, and at some points marshy; the principal exceptions are Mount Agamenticus, near the coast in the S. W., 670 feet high, the Camden Hills on the Penobscot, 1500 feet, and the thirteen peaks of Mount Desert Island and its vicinity, ranging from 1000 to 2800 feet. The Appalachian chain, of which the White Mountains of New Hampshire form a link, has its origin in the province of New Brunswick, enters Maine at Mars Hill, about lat. 46° 32′, and crosses it in a S. W. direction, joining the White Mountain range at the New Hampshire line in about lat. 44° 25′. In Maine, however, it does not form a continuous range, though much of the land is from 800 to 1000 feet above the sea, but consists of isolated peaks, all trending south-westward, though often separated by broad river-valleys and large streams. Mars Hill is about 2000 feet above the sea; Mount Katahdin, in the centre of the State and in lat. about 45° 55′, is 5385 feet in height. Mount Abraham, in Franklin co., 3400 feet, Mount Blue, in the same county, 2800, Sugar Loaf, Chase's Mountain, Mount Mattatuck or Speckled Mount, Mount Puzzle, and Mounts Saddleback and Bigelow, also belong to this chain. Two principal spurs or outliers from this range deserve notice—viz. the Ebene and Spencer Mountains, trending southward in Piscataquis co., and the range of highlands along the Canada boundary, which rise to the height of 2000 feet at the Monument, just above the 46th parallel, and attain a higher altitude in Bald Mountain, about 45° 45′. Between these isolated summits, the Penobscot, a large and noble river with numerous affluents, and its principal tributary, the Piscataquis, the Kennebec, and the Androscoggin, all rivers with broad valleys, flow toward the ocean; and the valleys thus formed also contain large and deep lakes. This peculiar conformation distinguishes Maine from the other States traversed by the Appalachian range. The northern portion of the State slopes gradually down to the valley of the St. John, which is less than 300 feet above the sea at the northern extremity of the State.

Seal of Maine.

Coast, Bays, Rivers, Lakes, etc.—Following the line of the shores, Maine has 2486 miles of sea-coast, being the most irregular and deeply indented coast-line in the U. S. There are no less than seventeen large bays on the coast, many of them forming excellent harbors from the islands at their entrance. The principal of these bays are Passamaquoddy, Machias, and Little Machias, Englishman's, Narraguagus, Frenchman's (protected by Mt. Desert Island), Isle au Haute, Penobscot and Belfast bays (forming together the fine estuary of the Penobscot River), Muscongus, Damariscotta, Sheepscott, Quohog, Casco, Saco, and Piscataqua Bay or estuary. The lakes and rivers must be considered together, as the numerous lakes which cover so large an area in the State are mostly grouped in distinct chains or series, each discharging its surplus waters through some one of the larger rivers by way of its tributaries. The Saco River drains a dozen or more small lakes, and itself falls into Saco Bay. The Umbagog chain of lakes, consisting of Lakes Umbagog, Welokenebacook, Molechunkemunk, Moosetocmaguntic, Argwassuck, and Parmachena, are drained by the Androscoggin, which by a circuitous course finds its way into Quohog Bay. Sebago Lake and the smaller lakes which surround it have for an outlet a small stream called Tresumpscut River. The Moosehead chain, which comprises, besides Moosehead Lake, many small lakes, finds an outlet in the Kennebec River, whose course is nearly due S., and which discharges its waters into the ocean by many channels through a wide delta. The Penobscot River drains nearly one-third of the area of the State, and through its E. and W. branches and their tributaries furnishes an outlet for the surplus waters of more

than fifty lakes and ponds, of which Chesuncook, Caribou, Lobster Pond, Pamadumcook, and Milinoket Lakes are the largest, and debouch a full volume of water into Penobscot Bay. Every stream which discharges its waters into the Atlantic forms the outlet of from half a score to a score of these lakes and ponds; Union River has a chain of twenty or more; Pleasant River, of ten or a dozen; Machias River, of twelve or fifteen; Narraguagus River, of eight or ten; Schoodic River, of Sysladobsis, Lascauhegun, Big Lake, and a dozen more of smaller size; St. Croix River, of Schoodic Lake, Grand Lake, North Lake, and several large lakes in the province of New Brunswick; and the St. John River, which drains the N. part of the State, has not far from a hundred lakes and ponds attached to it and its tributaries. Mr. Walter Wells, superintendent of the hydrographic survey of the State, estimates the area covered by the rivers and lakes at 3200 square miles, or a little more than one-eleventh of the total area of the State, and that of the lakes alone at upwards of 2300 square miles.

Geology and Mineralogy.—Maine belongs principally to the Eozoic and Silurian periods. S. of the chain of isolated summits extending from Mars Hill on the E. to Blue Mountain, which is the connecting link with the White Mountains already described, and extending to the seashore, with but small exceptions the rocks are Eozoic, and a large spur of primitive rocks extends from Blue Mountain N. E. to near the northern boundary of the State, including the highlands which form the watershed between Maine and the province of Quebec. The triangular space between this spur and the line of peaks mentioned above is mostly Silurian, except a tract of Eozoic rocks in the region of the larger lakes, and several long and narrow stretches of Devonian and Lower Carboniferous rocks, trending, like all the rocky strata, from N. E. to S. W. The Silurian makes its appearance also on the coast from Passamaquoddy to Pleasant Bay, along the shores of the estuary of the Penobscot, nearly as far N. as Bangor, and around Farmington on the upper Kennebec. Much of the State has its surface covered with drift in the form of boulders, sand, and gravel; on the sea-shore, except at the points indicated, there are deposits of Tertiary clays beneath the drift, which from their fossils are identified as belonging to the newer Pliocene. They are fifty feet or more in thickness. On the shores of Passamaquoddy Bay are strata of the Old Red Sandstone, which are penetrated by dikes of trap. In Penobscot Bay and along its shores are found beds of limestone, which, from the Thomaston quarries, has furnished supplies of lime for the greater part of the U. S. for many years. Argillaceous slates of excellent quality for roofing purposes are found along the Piscataquis River, a branch of the Penobscot. Where the dikes of trap penetrate the argillaceous slates, limestone, and sandstone many interesting minerals are developed, such as galena, red hæmatite, etc. The principal minerals of economic value are iron, galena, granite, lime, slate, and a fine white marble. Fine colored tourmalines are found at Paris, Oxford co., garnets, etc. at Phippsburg and Parsonsfield, feldspar, etc. at Brunswick and Topsham, and beryls of fine quality at Bowdoinham.

Vegetation, Soil, and Botany.—The soil in the river-valleys and between the Penobscot and Kennebec is of good quality and yields large crops. In the mountainous districts and along the sea-coast it is sterile, and does not repay cultivation. In other parts of the State it is moderately productive. A large portion of the State (its geographers say three-fifths) is still covered with forests, and its timber and lumber trade directly and indirectly gives employment to a large number of its inhabitants. The forests of the northern part of the State are principally composed of pine, hemlock, and spruce. Farther S. there is an admixture of white and red oak, maple, beech, birch, and ash. There are cedar swamps in the northern portion. Butternut and hickory are found, but are not abundant. Poplar, elm, basswood, dogwood, sassafras, juniper, pine, hornbeam, buttonwood, wild-plum, alder, willow, etc. are found in the forests of the southern part of the State. Among the fruit trees, the cherry, plum, pear, and apple flourish, but the peach does not succeed well. The wild flowers are those of New England and Canada.

Zoology.—With the exception of a very few specimens seen at long intervals in Northern New York, Maine is the only State in the Union where the moose and caribou or American elk are yet found. The moose, under constant hunting, is fast diminishing in numbers, and will probably ere long become extinct. Northern and Central Maine afford the best hunting-ground, perhaps, E. of the Rocky Mountains. The black bear, deer, catamount, wild-cat, wolverine, badger, martin, sable, weasel, mink, wolf, raccoon, woodchuck, porcupine, rabbit, several species of squirrels, etc. etc. are found. Wild geese, ducks, brant, and teal inhabit the lakes, ponds, and, at certain seasons, the bays along the coast. Eagles, hawks, owls, and crows are found in all parts of the State, and gulls, fish-hawks, etc. on the coast, while partridges, pigeons, quails, robins, and generally the birds of passage common to New England, are abundant in their season. Salmon, salmon-trout, shad, trout, pickerel, muskelonge, sturgeon, etc. abound in the rivers and lakes, and cod, herring, mackerel, and halibut are found along the coast in great numbers. The reptiles are less numerous, though the rattlesnake, milk-adder, and a smaller adder are not uncommon; the black snake or racer is our only North American representative of the boa tribe, and a considerable number of harmless snakes and several of the batrachians are sufficiently plentiful.

Climate.

Meteorological data.	Fort Preble (Portland), lat. 43° 39′ N., lon. 70° 15′ W.; elevation, 20 feet —32 years.	Bowdoin College (Brunswick), lat. 43° 53′ N., lon. 69° 55′ W.; elevation, — feet—52 years.	Belfast, lat. 44° 26′ N., lon. 69° 2′ W.; elevation, — feet —5 years.	Agricultur'l College (Orono), lat. 44° 53′ 10″ N., lon. 68° 38′ 57″ W.; elevation, 134 feet — 5 years.	Fort Sullivan (Eastport), lat. 44° 54′ N., lon. 66° 56′ W.; elevation, 70 feet —32 years.	Hancock Barracks (Houlton), lat. 46° 07′ N., lon. 67° 53′ W.; elevation, 620 feet — 16 years.	Fort Kent (St. John River), lat. 47° 15′ N., lon. 68° 35′ W.; elevation, 575 feet — 4 years.
Temperature:							
Annual av. temp., mean...	43.23°	44.40°	42.08°	42.10°	43.02°	40.51°	37.04°
Maximum temperature....	100.05°	102°	85°	94°	99°	101°	100.3°
Minimum temperature......	— 25°	— 30°	— 32°	— 26.5°	— 28.7°	— 29°	— 30.2°
Annual range of temp......	125°	132°	117°	120.5°	127.7°	130°	130.5°
Mean temp. of spring......	42.77°	41.65°	40.93°	39.61°	40.15°	39.15°	35.42°
" " summer...	65.64°	66.49°	67.01°	64.28°	60.50°	63.33°	61.68°
" " autumn....	48.16°	48.05°	48.57°	42.69°	47.52°	43.15°	39.88°
" " winter......	24.70°	23.91°	23.17°	17.12°	23.90°	16.41°	11.36°
Rainfall:							
Av. annual rainfall, inches	45.25	44.51	43 94	43.34	39.39	36.97	36.46
Av. rainfall of spring "	12.11	10.58	9.15	8.70	8.88	7.62	5.46
" " summer "	10.28	10.05	6.99	7.33	10.05	11.92	11.65
" " autumn "	11.93	13.46	17.28	16.60	9.85	9.95	9.64
" " winter "	10.93	10.42	10.52	12.14	10.61	7.48	9.71
Winds:							
Prevalent winds of spring	S.W.N.W.& N.E.	N. E. S. E. W.	....	N. W. W. & N. E.	N. N. N. W. & S.		
" " summer	S. W. & N. W.	W. N. W. S. W.	....	S. W. S. & N. W.	S. N. W. & N. E.		
" " autumn	S. S. W. N. & W.	S. W. S. E. N. E.	....	N. W. W. S. W.	N. W. S. W. & S.		
" " winter	N. W. W. & S. W.	N. E. S.E. & S.W.	....	N. W. W. & N. E.	N. E. N. W. S. E.		
Barometer:							
Mean annual pressure......	29.998	....	....	29.794			
Maximum "	30.072	....	....	30.680			
Minimum "	29.809	....	....	28.423			
Annual range..................	00.263	....	....	2.257			

The climate, though severe and subject to great extremes, as the above table shows, is moderately uniform during each season, and is considered generally favorable to health. The fogs and easterly winds on the coast, as well as the intense cold of the winters, are supposed to increase the mortality from pulmonary diseases, but in the interior there is little or no danger from these causes. Snow lies on the ground on the coast from three and a half to five months, and in the interior from four and a half to six months. The summers are short and hot. At Brunswick, in fifty-two years of observation, July was the only month in which no frost occurred.

Agriculture.—In 1870 the number of farms in Maine was 59,804, containing 5,838,058 acres; the number of

acres of improved land was 2,917,793; of woodland, 2,224,740 acres; and of other unimproved farm-lands, 695,525 acres. The land not in farms, including the area of lakes and ponds, was 16,561,942 acres, and the amount in forests and woodland, 10,505,711. The cash value of the farms was $102,961,951; of farm implements, $4,809,113; of farm productions, including additions to stock, etc., $33,470,044; of orchard products, $874,509; and of forest products, $1,531,741. The principal products were—wheat, 278,703 bushels; rye, 34,115 bushels; Indian corn, 1,089,888 bushels; oats, 2,351,354 bushels; buckwheat, 466,635 bushels; common potatoes, 7,771,009 bushels; wool, 1,774,168 pounds; butter, 11,636,482 pounds; cheese, 1,152,590 pounds; wine, 7047 gallons; maple-sugar, 160,805 pounds; hay, 1,053,415 tons. The State industrial statistician reports the crops of 1873 as follows: Hay, 2,007,000 tons, valued at $25,087,500; Indian corn, 852,600 bushels, valued at $831,444; wheat, 219,750 bushels, valued at $421,920; rye, 26,010 bushels, value $30,951; oats, 1,305,750 bushels, value $652,875; barley, 420,280 bushels, value $348,832; potatoes, 2,997,100 bushels, value $2,038,028. There was a decided falling off in all the crops except hay; and potatoes, one of the great agricultural staples of the State, was only about two-fifths the crop of the census year. The factory-system of manufacturing cheese and butter on a large scale was introduced in 1872, and would probably very greatly increase the production of the Maine dairies. The fruit crop in 1873 was very light. The total value of these leading agricultural products was $29,411,550. In 1870 the total value of live-stock was $23,357,129, and of slaughtered animals and animals sold for slaughter, $4,939,071. The live-stock reported that year included 71,514 horses, 336 mules and asses, 139,259 milch cows, 60,530 working oxen, 143,272 other cattle, 434,666 sheep, and 45,760 swine. In 1873 the number of horses was estimated at 55,960; of milch cows, 126,878; of working oxen, 75,503; of other cattle, 138,479; of sheep, 338,682; of swine, 63,000; the value of live-stock, $20,096,272. The factory-cheese product was $55,783; other dairy products, estimated, $2,125,000; orchard products, $500,000; produce of market-gardens, $3,000,000; of animals slaughtered or sold for slaughter, $3,000,000; wool product, $553,057; unspecified products, $500,000, making a total value of $56,541,662, showing a decided falling off in agricultural productions and values in three years.

But the gain in manufacturing industry has been as decided as the loss in agricultural, as will be shown by the following table and statistics:

Leading Manufactures of Maine in 1873.

Mechanical and manufacturing industries.	Number of establishments.	Hands employed. Total.	Men.	Women.	Children.	Capital invested.	Wages paid.	Annual product.
Bleaching and dyeing	3	180	164	16	......	$300,000	$180,000	$5,500,000
Boots and shoes	112	5,394	4,726	629	39	1,863,964	2,295,230	8,820,986
Brick	93	917	914	3	......	317,185	206,091	520,574
Canned goods	33	4,087	2,027	1,760	300	825,000	262,500	1,842,000
Carriages, wagons, and sleighs	63	298	287	5	6	210,965	127,154	335,850
Clothing for men and boys	42	3,693	83	3,590	20	267,243	237,821	811,250
Cotton goods, batting, warp, and yarn	21	10,794	2,769	7,304	721	12,382,000	3,426,825	12,427,670
Edge tools	20	328	324	....	4	430,000	165,374	638,800
Fisheries	*861	....	....	....	......	900,000	....	850,000
Flouring and grist mill products	85	161	160	1	......	620,600	72,204	2,276,122
Gas, illuminating	6	54	54	....	......	829,000	28,100	260,230
Gunpowder	2	53	53	....	......	325,000	37,800	250,000
Ice, prepared for market	24	160	160	....	......	60,000	18,500	552,000
Iron, cast, forged, and rolled	22	472	472	....	......	605,200	320,575	1,649,640
Leather, tanned and curried	61	663	663	....	......	1,529,380	306,244	3,187,300
Lumber, long and short, and planed	1,092	7,556	7,506	12	38	6,959,492	2,766,173	9,230,222
Lime	25	456	454	2	.....	1,099,500	133,900	1,535,025
Machinery, steam-engines, etc	38	1,351	1,331	20	......	1,310,300	766,730	2,816,747
Mining and quarrying	54	4,939	4,929	4	6	1,208,000	3,810,000	4,822,050
Oil, fish	12	446	440	6	......	323,500	87,180	352,550
Oil floor-cloths	4	75	75	....	......	385,000	50,000	964,000
Paper, printing and wrapping	9	836	517	319	......	1,500,000	356,727	3,041,600
Printing and publishing	31	324	158	96	20	440,262	131,018	801,600
Sash, doors, and blinds	21	241	238	....	3	370,000	106,254	364,450
Shooks, box and hogshead	23	368	343	....	25	149,950	127,969	652,013
Woollen goods	39	2,727	1,346	1,183	198	3,217,000	995,107	6,605,292

The total statistics of all manufactures carried on in the State in 1873 was—establishments, 6072; hands employed, 55,614, of whom 37,154 were men, 16,612 women, and 1848 children; capital invested, $48,808,448; wages paid, $16,584,164; raw material used, $57,911,468; annual value of products, $96,209,136. These statistics compare as follows with those of the census of 1870; there were then enumerated 5550 establishments, employing 49,180 hands, of whom 34,310 were men, 13,448 women, and 1422 children; the capital invested was $39,796,190; the wages paid, $14,282,205; the raw material used, $49,379,757; and the annual product, $79,497,521.

Customs Districts.	Imports for year ending June 30, 1874.	Domestic exports for year ending June 30, 1874.	Foreign exports for year ending June 30, 1874.	Imports for year ending Dec. 31, 1874.	Domestic exports for year ending Dec. 31, 1874.	Foreign exports for year ending Dec. 31, 1874.	No. of vessels built in year ending Dec. 31, 1873.	Tonnage.	Vessels employed in the cod and mackerel fisheries in each district and in the State.	Tonnage.
Aroostook	$40,157	....	....	$32,787						
Bangor	15,834	$298,367	$784	12,466	$486,861	$1,596	5	1,210.30	1	8.00
Bath	21,744	79,071	....	29,211	80,965	....	59	28,993.49	23	489.57
Belfast	15,930	5,787	....	16,356	8,352	....	24	7,478.23	36	956.51
Castine	2,919	7,719	....	3,850	7,264	....	8	1,968.96	74	3,057.72
Frenchman's Bay	400	6,508	....	....	7,904	....	18	2,241.77	41	1,193.24
Kennebunk	....	....	....	....	....	....	11	4,948.19	18	279.51
Machias	13,671	101,803	894	10,508	126,191	874	33	10,934.05	14	226.10
Passamaquoddy	774,279	1,264,107	5,930	618,238	1,323,716	4,127	41	8,590.60	15	513.25
Portland and Falmouth	2,733,569	3,581,502	431,307	2,419,048	3,364,647	459,563	23	8,791.49	112	2,861.40
Saco	....	483	....	....		....	1	288.29	4	97.09
Waldoboro'	9,784	....	....	15,514	1,599	....	43	13,605.53	403	32,541.25
Wiscasset	148	27,238	....	2,415	89,223	....	10	766.27	118	3,947.93
York	....	....	....	130	....	....			2	24.74
Totals	$3,628,435	$5,372,585	$438,915	$3,160,523	$5,496,722	$466,160	276	89,817.17	861	46,196.31

Commerce and Navigation.—There are fourteen customs districts in the State, and there is a considerable amount of foreign commerce carried on, both from the ships which enter and clear from the various ports of the State, and from the border-trade with New Brunswick and Canada. Portland is also a port through which a considerable portion of the Canadian imports and exports pass in bond. The foregoing table gives the imports, domestic exports, and foreign exports of each customs district, and of all for the year ending June 30, 1874, and also

* Number of vessels employed.

the amount of shipping built in the year preceding Jan. 1, 1874.

Maine has for many years been largely engaged in building vessels for sale to other States, but since the revolution produced in commerce by the building of iron ships, and the transfer of ocean commerce to foreign-built ships owned abroad, which was occasioned by the late civil war, this branch of industry has largely declined. There were on June 30, 1873, in the State, 455 registered vessels, with a tonnage of 246,120.20 tons; 1930 enrolled vessels of 172,595.15 tons; and 530 licensed vessels of under 20 tons each, measuring in all 6626.41 tons, making a total of 2915 registered, enrolled, and licensed vessels, of 425,341.76 tons. Of these, 2848 were sailing vessels, having a tonnage of 405,512.84 tons; 66 steamers, with a tonnage of 19,677.50 tons, and 1 barge of 151.42 tons.

Finances of the State.—The balance in the State treasury Jan. 1, 1874, was $436,430.68; the receipts from all sources during the year 1874 were $1,423,473.70, which, added to the above balance, makes the entire amount received $1,859,904.38. The disbursements by the treasurer for all purposes during the year 1874 were $1,537,718.54, leaving a balance in the treasury Jan. 1, 1875, of $322,185.84. Of the expenditures of the year 1874, $13,241 were sums which simply passed through the treasury, but did not belong to the State; $81,900 were special and exceptional appropriations for repairs to State buildings or in aid of State institutions; $714,426 was on account of war-debt, pensions to soldiers, and aid to soldiers' orphans; and $407,477 on account of public and free high and normal schools, leaving the ordinary expenditures of the State, $320,694. On Jan. 1, 1875, the State debt, after deducting the sinking funds, was $5,561,076, a reduction of $321,575 during the previous year. In ten years preceding nearly $7,000,000 had been paid on account of the State debt and interest. The credit of the State was so good that it was impossible to buy its bonds for the sinking fund except at a premium.

Banks.—On Nov. 1, 1874, there were in the State 66 national banks, of which two were closed or closing, leaving 64 in operation. These 64 banks had $9,840,000 capital paid in; $8,930,750 in bonds on deposit; the amount of circulation issued was $11,471,360; amount of circulation redeemed, $3,524,784; circulation outstanding, $7,946,576. There were also at the same time 3 State banks, having an aggregate capital stock of $225,000, a circulation of $3609, deposits to the amount of $106,209.32, and total liabilities, including surplus and profits ($29,846.77), of $368,367, with assets of equal amount. There were 58 savings banks in the State, having aggregate deposits and profits to the amount of $31,051,963.73, and assets of undoubted value of equal amount. There are also in the principal cities a number of private banking-houses.

Insurance.—In Jan., 1874, there were 41 fire, fire marine, and marine insurance companies organized under the laws of the State and doing business therein; 36 of these were mutual fire, 2 stock fire and marine, 1 mutual and 2 stock marine. Three insurance companies, all of Bangor, were in the hands of receivers, and 1 also of that city had been compelled to reduce its capital stock $100,000. The capital invested in the stock companies was $590,520. The assets of the mutual companies amounted to $886,429.68, of which amount $773,448.57 consisted of premium notes. They paid for losses during the year $41,681.51.

Life Insurance.—The Union Mutual Life Insurance Company of Augusta is the only life insurance company organized in the State. Its assets Jan. 1, 1874, were $7,717,850.55; its income, $2,171,996.64; its expenditures, $1,322,577.17; its surplus as regards policy-holders $796,934.55. Thirty-two life insurance and 129 fire insurance companies from other States and countries do business in the State.

Newspapers.—In 1870 the number of newspapers published in Maine was 65; the number of copies annually issued, 9,867,680; the amount of circulation, 170,690. In 1874 the number of papers had increased to 72, and the aggregate circulation and issues were moderately enlarged over those of 1870. In 1870 there were 7 dailies, with 10,700, in 1874 there were 9, with a circulation of about 12,000; in 1870 there was 1 tri-weekly, which in 1874 had become a daily; in 1870 there were 47 weeklies, with an aggregate circulation of 114,600; in 1874 the number had increased to 57, and the circulation exceeded 125,000; in 1870 there was 1 semi-monthly and 8 monthlies, with an aggregate circulation of 43,540; in 1874 there were but 5 monthlies, having an aggregate circulation of not over 27,000 or 28,000; and 1 quarterly, with a circulation of 1500, continued in being in 1874. In 1874, 36 of these papers were political, including 7 which were independent or neutral in politics; 14 were miscellaneous, family, or local newspapers; 5 were religious, 1 Masonic, 1 agricultural, 1 educational, 1 devoted to real-estate business.

Railroads.—There are in the State 24 railroads; capital stock (Jan., 1875), $49,568,711.85, of which $25,037,164.63 had been called and paid in; funded and floating debt, $25,868,584.04.

Names of Railroads.	Miles in operation Jan., 1875.	Amount of capital stock.	Amount called and paid in.	Whole cost of road and equipment.	Indebtedness.		Whole cost of operating roads.	Whole amount of receipts.	Number of miles run by passenger trains.	Number of miles run by freight and mixed trains.	Number of through and way passengers.
					Funded debt.	Floating debt.					
Androscoggin (included in Maine Central)	70½										
Atlantic and St. Lawrence (leased by Grand Trunk)	82	$5,000,000	$5,000,000	....	$3,484,000	....	$1,185,479.91	$1,207,246.84	180,624	702,818	157,220
Bangor and Bucksport	18										
Bangor and Piscataquis	54½	2,000,000	356,900	$1,211,436.85	887,218.10						
Bath Branch (leased by Maine Central)	9										
Belfast and Moosehead Lake (leased by Maine Central)	33⅓	950,000	725,000								
Boston and Maine	46½	7,000,000	6,921,274.52	10,646,835.82	997,252.47	....	1,345,882.89	2,421,789.27	940,575	484,123	4,749,785
European and North American	114	17,500,000	4,249,966.50	10,491,997.70	6,231,298.41	....	314,170.59	706,756.57	234,940	171,158	274,956
Grand Trunk											
Houlton Branch	3										
Knox and Lincoln	49	2,000,000	364,400	Not complete.	2,395,000	....	72,629.44	158,669.32	64,653	48,554	106,239
Lewiston and Auburn Branch (leased by Grand Trunk)	5½										
Maine Central	127½	5,000,000	3,601,400	12,337,623.86	7,753,892	$1,357,333.81	....	2,089,388.75	486,930	782,751	751,434
Newport and Dexter (leased by Maine Central)	14	125,000	122,000	300,000	Town loans.	175,000					
Portland and Kennebec, including Somerset and Kennebec (leased by Maine Central)	100										
Portland and Ogdensburg	51	2,000,000	1,046,621.31	2,613,701.82	282,539.18	....	116,816.34	171,492.78	60,936	86,557	69,482
Portland and Oxford Central	27½										
Portland and Rochester	49½	636,111.85	....	Not known.	books destroy	ed by fire.	111,101.66	158,388.76	85,997	53,802	136,332
Portland Saco and Portsmouth	52	2,000,000	1,500,000	1,744,485.96	1,500,000	....	433,831.94	517,595.82	182,833	275,769	250,865
Portsmouth Great Falls and Conway	4¼	600,000	500,200	....	450,000						
Somerset	20	2,500,000	291,802.30	538,842.28	23,654.07	....	5,214.79	6,552.22	....	5,512	3,163
St. Croix and Penobscot	22	2,000,000	100,000	569,000	222,700	7,000	46,574.42	75,342.75	....	47,154	26,498
Whitneyville and Machiasport	7½	100,000	100,000	....	....	....	....	6,500			
Portland (horse)	6¾	157,600	157,600	175,000	1,686	....	49,088.63	53,884.12	90,422	....	858,479
Totals	967⅓	$49,568,711.85	$25,037,164.63	$40,628,924.29	$24,329,240.23	$1,539,333.81	$3,891,789.61	$7,573,607.20	2,427,910	2,658,158	7,384,453

Population of the State from 1790 to 1870, with Sexes, Race, Nativity, Density, Ratio of Increase, Selected Age, and Illiteracy.

Census year.	Total population.	Males.	Females.	White.	Colored.	Natives.	Foreigners.	Density of population.	Rate of increase.	Of school age, 5 to 18, both sexes.	Of military age, males.	Of voting age, males.	Citizens, males.	Illiterate, cannot read and write, ten years old and over.
1790	96,540	49,432	47,108	96,002	538	....	....	2.75						
1800	151,719	77,250	74,469	150,901	818	....	....	4.33	57.1					
1810	228,705	116,118	112,587	227,736	969	....	....	6.53	50.7					
1820	298,269	149,664	148,671	297,340	929	....	....	8.52	30.6					
1830	399,455	201,299	198,114	398,263	1,192	....	....	11.41	33.9	139,589	69,419	88,727	74,285	
1840	501,793	253,709	248,084	500,438	1,355	....	....	14.33	25.6	173,652	88,384	114,928	99,327	
1850	583,169	297,471	285,698	581,813	1,356	550,878	31,825	16.66	16.2	184,783	106,606	147,851	131,643	6,282
1860	628,279	317,189	311,090	626,947	1,327	590,826	37,453	17.95	7.9	186,476	117,766	165,360	149,873	8,598
1870	626,915	313,103	313,812	624,309	1,606	578,034	48,881	17.91	—.02	175,588	118,940	169,821	153,160	19,052

Of the foreign-born population, 48,881 in number in 1870, 20,672 were born in Great Britain and Ireland and 26,788 in British America, leaving but 1421 from all other foreign countries; of these, 508 were from Germany and 149 from Sweden and Norway (the emigration from the two latter countries has since largely increased, and there are now more than 1500 Swedish immigrants in the State, and a Swedish colony has been established here). Of the emigrants from Great Britain and Ireland, 15,745 were from Ireland; of the 26,788 from British America, 9437 were from Canada, 8936 from New Brunswick, 2135 from Nova Scotia, 463 from Newfoundland, 125 from Prince Edward's Island, and 5692 from British America, not specified. Besides those of foreign birth, there were 91,651 persons of foreign parentage in the State.

Education.—Public Schools.—The following summary of school returns is compiled from the report of the superintendent of schools for the year 1874. The returns were made from every town and 69 out of the 74 plantations in the State. The whole number of children of school age (between 4 and 21) was 225,219, or more than one-third of the entire population of the State. (For the number of persons of school age, according to the government standard (5 to 18), see Table of Population.) Number registered in summer schools, 122,458; average attendance in summer schools, 98,744; number registered in winter schools, 132,333; average attendance in winter schools, 108,478. Average length of summer schools in weeks and days, 9 weeks and 4 days; average length of winter schools, 10 weeks 3 days; average length of schools for the year, 20 weeks 2 days, or about 5 months. Number of districts in the State, 4043; number of parts of districts, 361. Number of school-houses, 4199; number in good condition, 2591; number built in 1874, 122; cost of these, $150,220; estimated value of all public school property in the State, $3,079,311. Number of male teachers employed in the summer, 161; number of male teachers employed in winter, 1928; number of female teachers employed in summer, 4366; number of female teachers employed in winter, 2367; number of teachers who are graduates of normal schools, 294; average wages of male teachers per month, excluding board, $36.17; average wages of female teachers per month, excluding board, $17.55; average price of board per month for teachers, $10.05. Amount of school-money voted, $673,314, an excess above the amount required by law of $187,782; amount raised per scholar, $2.90. From the State treasury there was received, in addition, during the year, $367,009; from local funds, $17,334; the total amount expended for public schools during the year was $951,773. The amount paid for tuition in private schools, academies, and colleges in the State during the year was $43,152, and for tuition out of the State for Maine pupils, $8119. The aggregate amount expended for schools in the year was $1,237,778. The amount of the permanent school fund is $369,883. The appropriation for teachers' institutes for the year was $4000, for normal schools and instruction, $13,200; the cost of free high schools was $98,632. The course of instruction in the public schools has been extended, and now includes, in addition to most of the studies necessary for a good English education, very thorough instruction in drawing with special reference to industrial pursuits; and the reports indicate admirable progress in this branch.

Higher Education in Maine.—The following table presents the statistics of the colleges, universities, and professional schools for the year 1874:

Institution.	Location.	Date of organization.	Corps of instruction.	Number of students. Preparatory.	Collegiate or professional.	Sex of students. Male.	Female.	Value of grounds, buildings, and apparatus.	Amount of endowment.	Amount of productive funds.	Income from productive funds.	Receipts (annual) from all other sources.	Volumes in library.
Colleges and Universities:								$	$	$	$	$	
Bates College	Lewiston	1863	10	......	106	104	2	100,000	200,000	200,000	12,000	50,000	4,500
Bowdoin College	Brunswick	1794	20	......	137	137	......	95,868	168,484	110,000	7,996	46,456	35,000
Colby University	Waterville	1820	7	......	59	59	......	125,000	200,000	200,000	14,000	1,000	10,500
Wesleyan Seminary and Female College	Kent's Hill, Readfield	1821	12	......	694	......	694	90,000	50,000	40,000	2,500	8,000	1,600
State College of Agriculture and Mechanic Arts	Orono	1868	13	1	102	99	4	150,000	124,000	124,000	8,000	22,000	1,500
Professional Schools:													
Maine Medical School	Brunswick	1820	11	......	58	58	......	20,000	....	....	....	4,125	4,000
Bangor Theological Seminary	Bangor	1820	5	......	37	37	......	50,000	170,000	170,000	10,000	1,000	15,000
Bates College Theological School	Lewiston	1870	5	......	18	18	......	....	....	....	....	....	2,000
Scientific Dept. Bowdoin College	Brunswick	1872	7	......	78	78							
Normal Schools:													
Western Normal School	Farmington	1864	8	......	132	31	101	Supported	by State	....	5,500	....	1,700
Eastern Normal School	Castine	1867	7	......	123	49	74	Supported	by State	....	5,500	....	1,500
Maine Central Institute	Pittsfield	1866	8	......	30	......	30	....	12,000	....	600	....	400
Oak Grove Seminary	Vassalboro'	1871	......	......	17	9	8	....	....	....	600	....	500

There is also a so-called business college at Portland, having 3 instructors, 79 students (75 males and 4 females), and completing its course in a single year.

Institutions of Special Education.—Of these there are but three in the State—viz. the Soldiers' Orphans' Home, at Bath; the State Reform School, at Cape Elizabeth; and the Maine Industrial School for Girls, at Hallowell. The deaf mutes are provided for at the American Asylum at Hartford, Conn., and the Clarke Institution at Northampton, Mass.; the blind at the Perkins Institution at Boston; and the feeble-minded and idiotic to some extent at Boston and Barre, Mass., and Lakeville, Conn. The following table gives the statistics of the Orphans' Home, Reform School, and Industrial School for 1874:

Institution.	Location.	Date of organization.	No. of instructors & employés.	No. of children.	Males.	Females.	Total annual cost of institution.	Endowment, if any.	No. discharged to situations.	Under what control.	State appropriation.
State Soldiers' Orphans' Home	Bath	1867	5	57	28	29	$10,762	$12,500	14	Corporation...	$9,500
State Reform School	Cape Elizabeth	1852	19	140	140	...	25,231	Farm 160 acres	50	State and city	14,800
Maine Industrial School for Girls—opened Jan. 20	Hallowell	1875	...	...	...	...	21,970.64	4,082	...	Corporation and State....	12,500

Maine State Prison.—This prison has 23 officers and employés; the average number of convicts for the year was 133; 52 were committed during the year, and 44 discharged, 38 by expiration of sentence, 5 by pardon, and 1 by death. The labor of the prisoners is mostly contracted for; the earnings of 1874 were $28,019.33, and the expenses $30,904.96. The prison inspectors report that the prison is well managed. They also report that they had visited all the jails of the State—that 2067 prisoners (1900 males and 167 females) had been confined in them during the year, and that the sum of $17,271.44 had been expended for the board of these prisoners. In only one of these jails was there a provision for the prisoners earning anything for the county.

Libraries.—According to the census of 1870, there were in that year 3334 libraries, public and private, in the State, containing 984,510 volumes; of these, 1462 were in some sense public, and had in the aggregate 533,547 volumes. The State Library at Augusta had 20,000 volumes; 58 town and city libraries had 14,649 volumes (evidently an under-estimate); 19 court and law libraries had 9748 volumes; 25 school and college libraries had 63,425 volumes (the table of colleges and other institutions of higher education shows that 13 of these in 1874 had 78,000 volumes); 1079 Sunday-school libraries had 277,742 volumes; 140 church libraries had 39,910 volumes; 1 historical library had 25,000 volumes; 3 libraries of benevolent societies had 5300 volumes; 136 circulating libraries had 100,273 volumes (this is probably an under-estimate, as few of them have less than 1000 volumes, and the Portland Mercantile has 16,000, and a number of others 2500 to 4000 each); 1872 private libraries had 450,963 volumes.

Religious Denominations.—According to the census of 1870, there were in Maine 1328 churches, 1104 church edifices with 376,738 sittings, and church property valued at $5,200,853. The following table gives the statistics of the different denominations in the State in 1870 and 1874:

Denominations.	Church organization, 1870.	Church edifices, 1870.	Sittings, 1870.	Value of church property, 1870.	Associat'ns, dioceses, conferences, etc., 1874.	Churches or congregations, 1874.	Church edifices, 1874.	Ordained clergymen, 1874.	Licensed, local, or lay preachers, 1874.	Members of churches or congregations, 1874.	Sunday schools, 1874.	Sunday-school teachers and scholars, 1874.	Value of church property, 1874.
Baptists, regular	262	213	70,966	$858,050	13	260	223	166		19,303	238	18,027	$1,002,725
Baptists, other (including Seventh Day, Free Will, etc.).	218	154	46,223	382.917	3	289	179	241		14,928			513,863
Christian Connection.	44	20	4,922	42,200		51	26	32		4,173			52,275
Congregationalists	231	219	83,985	1,401,736	16	238	226	178		19,329	247	19,867	1,513,650
Episcopal (Protestant)	25	23	8,975	280,213	1	21	23	28		1,944		2,008	287,472
Jews	23	23	7,315	36,400		23	23	18		1,807			39,000
Lutherans	1	1	500	800		1	1	1		90	1	60	850
Methodists	327	264	82,530	885,237	2*	238	219	235	156	23,930	284	24,106	1,052,050
New Jerusalem (Swedenborgian)	3	2	1,200	58,000		3	3	2		327			65,000
Roman Catholics	32	32	17,822	461,700	1	44	40	30	12	40,000			572,500
Second Adventists	28	13	3,175	13,050		27	14	21	8	1,867			16,425
Shakers	2	2	700	4,000		2	2	8		350			4,000
Spiritualists	3	1	200	300		2	1			420			300
Unitarians	18	18	9,185	245,000	1	19	19	18		3,470			270,000
Universalists	84	65	23,910	434,850	1	80	32	41		1,242			440,000
Union churches	26	54	15,130	96,400		22	50	21		1,460			80,000

Principal Towns.—The political capital of the State is Augusta, in Kennebec co., a city of 7808 inhabitants in 1870; the commercial capital and largest city of the State is Portland, in Cumberland co., which had in 1870 a population of 31,413, and has now (1875) probably nearly 40,000. Bangor, Penobscot co., had 18,289 inhabitants in 1870, and now somewhat exceeds 20,000; Lewiston, with 15,000, and Biddeford, with nearly 12,000, are the only cities of over 10,000 inhabitants. Bath, Auburn, Rockland, Belfast, Saco, Westbrook, Ellsworth, Calais, Gardiner, Oldtown, Cape Elizabeth, Brunswick, have each between 5000 and 10,000; Waldoboro', Waterville, Thomaston, Skowhegan, Gorham, Hallowell, Orono, Hampden, Deer Isle, Eastport, and Farmington, from 3500 to 5000; Paris, Houlton, Kennebunk, Machias, Brunswick, China, Freeport, Winthrop, and Wiscasset are thriving towns.

Counties in Maine.—There are sixteen counties in Maine, as follows:

Counties.	Population in 1870.	Males.	Females.	Population in 1860.	Population in 1850.	Assessed valuation in 1873.	True valuation in census of 1870.	No. of polls rated, 1873.	Number of plantations, towns, and cities, 1874.	Area of county.
Androscoggin	35,866	16,847	19,019	29,726	....	$17,592,555	$23,163,709	7,894	13	400
Aroostook	29,609	15,540	14,069	22,479	12,529	4,992,285	5,184,179	5,212	45	6800
Cumberland	82,021	40,009	42,012	75,591	79,538	48,942,323	84,068,337	19,812	26	
Franklin	18,807	9,434	9,373	20,403	20,027	5,791,659	8,057,012	4,518	29	1600
Hancock	36,495	18,653	17,842	37,757	34,372	7,554,073	12,058,753	8,311	31	
Kennebec	53,203	26,399	26,804	55,655	62,521	21,004,034	31,078,916	12,024	27	
Knox	30,823	15,584	15,239	32,716	....	10,507,542	15,121,850	7,609	16	
Lincoln	25,597	12,851	12,746	27,860	74,875	6,857,610	9,718,573	6,002	17	
Oxford	33,488	16,845	16,643	36,698	39,763	9,894,166	13,926,318	8,390	36	1700
Penobscot	75,150	38,527	36,623	72,731	63,080	22,697,948	31,688,437	16,149	54	
Piscataquis	14,403	7,394	7,009	15,032	14,735	4,857,280	6,545,030	3,355	20	3780
Sagadahoc	18,803	9,176	9,627	21,790	....	11,041,340	14,371,779	4,669	11	300
Somerset	34,611	17,597	17,014	36,753	35,581	10,990,609	13,187,909	8,169	36	
Waldo	34,522	17,417	17,105	38,447	47,230	10,090,581	17,471,527	8,428	26	
Washington	43,343	21,917	21,426	42,534	38.811	9,566,038	26,615,048	8,983	49	2700
York	60,174	28,913	31,261	62,107	60,098	22,442,875	35,898,294	13,834	26	
Add wild lands	....	....	....	....	....	5,156,356				
Total	626,915	313,103	313,812	628,279	583,169	$224,822,860	$348,155,671	143,195	462	

The reports of the assessors in 1874 indicate a valuation of real and personal property of $242,808,688.

Constitution, Courts, Representation in Congress, etc.—The governor is chosen annually by a majority of votes; in case of no election by the people, the house of representatives sends to the senate the names of two from the four candidates receiving the highest number of votes, and the senate chooses one of those two governor. He must be thirty years old, a native and citizen of the U. S., and five years a resident of the State, and continue to reside in it while in office; no person holding an office under the U. S. can exercise the office of governor. In case of vacancy, the president of the senate succeeds to the office. The council consists of seven persons, having the same qualifications as representatives, elected annually in joint convention of both branches of the legislature; it is assembled by the governor in his discretion, and their resolutions are to be recorded in a register, and signed by those agreeing thereto. The governor and council appoint all judicial officers, except judges of probate and of municipal and police courts; and coroners the governor nominates, subject to the confirmation of the council. The heads of departments are—secretary of state, treasurer, attorney-general, land agent, and adjutant-general, chosen annually in the same manner as the councillors. County treasurers, registers of deeds, registers of probate, sheriffs, county commissioners, and clerks of court are chosen by the voters of the several counties. The legislature consists of a senate and house of representatives, members chosen annually. Senators, 31 in number, must be twenty-five years old, must have been citizens of the U. S. five years, and inhabitants of the State one year, and during

* Methodist Episcopal churches only. There are some Methodist Protestant, Wesleyan, and Primitive Methodist churches.

their term, and for the three months next preceding their election, must be residents of their district. The districts are based upon population. A majority of ballots is necessary for an election. In case of non-election or vacancy choice is made by joint convention of both branches. They must be chosen from the candidates having the highest number of votes; twice as many candidates as there are vacancies in the district are eligible. Representatives, 151 in number, must have the same qualifications as senators, save they may be only twenty-one years old, and are elected from districts fixed by law, by a plurality of votes. The judiciary consists of—(1) a supreme court of eight judges, appointed by the governor and council for a term of seven years; (2) superior court of Cumberland county, one judge, appointed in the same way and for the same term; (3) probate courts in each county, the judge elected by the people of the county for a term of four years; (4) municipal and police courts in the larger cities, with a judge elected by the city for a term of four years; (5) trial justices, appointed by governor and council for seven years, with jurisdiction not exceeding $20. Every male citizen of the U. S., of the age of twenty-one years and upwards, excepting paupers, persons under guardianship, and Indians not taxed, having his residence established in the State for the term of three months next preceding any election, shall be an elector for governor, senators, and representatives in the town or plantation where his residence is so established; and every such elector shall be regarded as qualified to vote at all local elections in the town, city, or plantation in which he resides when his residence has been for a period of three months previous to such election. By the apportionment of 1872 Maine is entitled to five members of Congress.

History.—The first discovery of the coast of Maine was made by the Northmen as early as the year 990. They made occasional visits to it until the middle of the fourteenth century, but made no attempt to settle upon it. From that time to the second voyage of Cabot, in 1498, we have no evidence that the coast was seen by any European until the French expedition under Verrazano in 1524, of Gomez, the Spaniard, in 1525, and of Rut, under the English, in 1527, which were mere cursory visits without any results. In 1556, André Thevet, a Roman Catholic priest, sailed in a French ship along the entire coast, entered Penobscot Bay, where he spent five days, and had numerous conferences with the natives. This is the last notice we have of Maine to the close of the sixteenth century. The first attempt to settle upon the territory was made by the French under Du Mont, who, having received a grant from the king of France, planted a large colony on Neutral Island, in the river St. Croix, to which he gave that name in 1604, but the location being unfavorable, it was abandoned the next year. In 1605 the coast in the neighborhood of the river St. George was visited by Capt. Weymouth and explored to a small extent, which led to the well-appointed expedition to the mouth of the Kennebec River in 1607, under command of Capt. George Popham as president and Capt. Raleigh Gilbert as admiral sent forth by the noble gentlemen Sir John Popham and Sir Ferdinando Gorges with a view to colonize this portion of the coast, for which, and the whole country from N. lat. 34 to 44, a charter had been obtained from King James in 1606. But from various unfortunate circumstances the colony became discouraged and returned to England the next year. In 1613, French Jesuits established a mission on Mount Desert Island, which was driven off by the English the next year. In 1616, Sir F. Gorges, a leading adventurer and promoter of colonization in Maine, sent his agent, Richard Vines, with a small company to Saco, to remain through the winter, explore the country, and test the climate. A company of fishermen was also established at Monhegan Island at this time, under Capt. John Smith, who took possession of it in 1614, and thence ranged the whole coast to Cape Cod, and prepared a map upon which he affixed the name of New England. In 1620, James I. made a division of the grand charter of 1606, and granted to the Plymouth Company in England the whole country lying between the 40th and 48th degrees of N. lat., and to the Virginia Company the southern portion of the original patent. This gave a new impulse to commercial operations in America, and numerous vessels were fitted out for the fish and fur trade. In 1622, Gorges and Capt. John Mason obtained of the Plymouth Company a grant of the territory lying between the Merrimack and Kennebec rivers, and the next year planted a colony at the mouth of the Piscataqua, which was the first permanent occupation of the mainland in Maine. Gorges and Mason divided their possessions, Gorges taking all E. of the Piscataqua, Mason all W. In 1624, Gorges established a colony at York. In 1625, Pemaquid was occupied under grants from the Plymouth Company. From 1630 to 1632 settlements were commenced in Saco, Biddeford, Scarborough, Cape Elizabeth, and Portland, all which continued to grow prosperously until the Indian war of 1675, when they were all overthrown, as well as those between the Kennebec and Penobscot rivers. E. of the Penobscot River the French laid claim to the country, and very little improvement was made there until after the revolution of 1775, although Sir William Alexander, earl of Stirling, had a grant of the whole country to Pemaquid, including Nova Scotia. On the division by the Plymouth Company of their patent among the proprietors, the portion lying between Piscataqua and Kennebec rivers was awarded to Gorges in 1635, confirmed by the king in 1639, and he forthwith established a regular government over it under his deputy, assisted by an assembly of delegates chosen by the people; and by the king's patent of confirmation it received the name which is now extended over the whole territory. His government continued, under himself and heirs, with occasional interruption, during the period of the Commonwealth in England and the usurpation of Massachusetts, until 1677, when the heirs, wearied by the conflicts with Massachusetts for jurisdiction, sold their interest to that colony for £1250. Two years before this (in 1675) King Philip's Indian war commenced with terrible massacres in Maine, more than 100 persons being murdered in cold blood in less than three months. For the next 85 years the country was kept in terror by the frequent raids of the savages. Gorges died in 1647. The province between the Kennebec and Penobscot rivers was granted by Charles II. in 1664 to his brother James, duke of York (afterwards James II.), who had the year before purchased the territory awarded to the earl of Stirling in the division of the country of his heirs, and immediately established a government there, whose seat was at the city of Pemaquid, where an expensive and strong fort was built. This country was surrendered to Massachusetts in 1686, who took possession, exercised government over it as far E. as the Penobscot, which, with all the territory E. to the St. Croix and Nova Scotia, was confirmed to her by the provincial charter of 1691. Between 1687 and 1689, Andros, the royal governor of the New England colonies, visited Maine, and there as elsewhere practised great extortion. Massachusetts afterwards relinquished Nova Scotia, but all the remainder was secured to her by the treaty of 1783, which established the independence of the U. S. After the organization of Massachusetts as a State, and its incorporation into the Union, Maine became a part of the State of Massachusetts, which exercised jurisdiction over it as "the District of Maine." There were, however, frequent bickerings between Massachusetts and its "district," and conventions were held at Portland between 1784 and 1791 to devise plans for a separation. These difficulties increased, but it was not until after the war of 1812 that they became sufficiently serious to lead to decisive measures. After repeated conferences and an amicable adjustment of the public lands and other matters of dispute, an act of Congress was passed and approved Mar. 3, 1820, declaring that on and after the 15th of March of the same year Maine should be admitted into the Union on the same terms as the original States. A dispute had existed between the U. S. and the British government in regard to the true interpretation of the treaty of 1783 respecting the boundaries between the northern portion of Maine and the provinces of Quebec (or Canada East) and New Brunswick. The British government claimed the territory as far S. as the watershed dividing the affluents of the St. John from those of the St. Croix and Penobscot—a devious line, winding on either side of the parallel of 46° N. lat. The U. S. government, on the other hand, claimed the watershed between the St. John and the St. Lawrence, which would have made the northern boundary not far from the 48th parallel, and took also a considerable tract from Canada East. This dispute, which had been in progress since about 1784 or 1785, had nearly resulted in bloodshed, when in 1842 the boundaries were definitively settled by the Ashburton treaty, by the provisions of which the St. John and the St. Francis were agreed upon as the northern and north-eastern boundaries, with free navigation of the former, and the highlands between the province of Quebec and Maine recognized as the N. W. boundary. In 1851 the Maine legislature passed what is generally known as the "Maine Liquor law," prohibiting the sale of intoxicating liquors as a beverage. Several other States have followed her example, partially or wholly, in this legislation. During the late civil war Maine was one of the most active of the Northern States in filling her quota, and her regiments distinguished themselves for valor in the field. Since the war she has been encouraging immigration, and has succeeded in establishing a large Swedish colony within her territory.

Governors of Maine.

Wm. King (resigned)....1820–21	Robert P. Dunlap.........1834–38	John W. Dana.............1847–50	Lot M. Morrill..............1858–61
W. D. Williamson (act'g). 1821–22	Edward Kent...............1838–39	John Hubbard.............1850–53	Israel Washburn, Jr.....1861–63
Albion K. Parris..........1822–27	John Fairfield.............1839–40	W. G. Crosby................1853–55	Abner Coburn..............1863–64
Enoch Lincoln (died)...1827–29	Edward Kent...............1840–41	Anson P. Merrill..........1855–56	Samuel Corry...............1864–67
Nathan Cutler (acting).1829–30	John Fairfield.............1841–43	Samuel Wells...............1856–57	J. L. Chamberlain........1867–71
Jonathan D. Hunton....1830–31	Edw. Kavanagh (act'g)..1843–44	H. Hamlin (resigned)...1857–57	Sidney Perham............1871–74
Samuel E. Smith..........1831–34	Hugh J. Anderson........1844–47	Jos. H. Williams (act'g).1857–58	Nelson Dingley, Jr.......1874–76

Electoral and Popular Vote for President and Vice-President.

Elect. year.	Candidates who received the electoral vote of the State.	Elect. vote.	Popular vote.	Minority candidates.	Popular vote.	Minority candidates.	Popular vote.
1820	James Monroe P. Daniel D. Tompkins V.-P.	9	12,887	John Quincy Adams P. Richard Rush V.-P.	6,811		
1824	John Quincy Adams P. John C. Calhoun V.-P.	9	6,870	Andrew Jackson P. J. C. Calhoun V.-P.	2,330		
1828*	John Quincy Adams P. Richard Rush V.-P.	8	20,773	Andrew Jackson P. John C. Calhoun V.-P.	13,927		
1832	Andrew Jackson P. Martin Van Buren V.-P.	10	33,291	Henry Clay P. John Sergeant V.-P.	27,204		
1836	Martin Van Buren P. Richard M. Johnson V.-P.	10	22,300	W. H. Harrison P. Francis Granger V.-P.	15,239		
1840	William H. Harrison P. John Tyler V.-P.	10	46,612	Martin Van Buren P. Richard M. Johnson V.-P.	46,201	James G. Birney P.	194
1844	James K. Polk P. George M. Dallas V.-P.	9	45,719	Henry Clay P. Theo. Frelinghuysen V.-P.	34,378	J. G. Birney P.	4,836
1848	Lewis Cass P. William O. Butler V.-P.	9	39,880	Zachary Taylor P. Millard Fillmore V.-P.	35,125	Martin Van Buren P. Chas. Francis Adams V.-P.	12,096
1852	Franklin Pierce P. William R. King V.-P.	8	41,609	Winfield Scott P. William A. Graham V.-P.	32,543	John P. Hale P. George W. Julian V.-P.	8,030
1856	John C. Fremont P. William L. Dayton V.-P.	8	67,379	James Buchanan P. J. C. Breckenridge V.-P.	39,080	Millard Fillmore P. A. J. Donelson V.-P.	
1860	Abraham Lincoln P. Hannibal Hamlin V.-P.	8	62,811	Stephen A. Douglas P. Herschel V. Johnson V.-P.	26,693	John C. Breckenridge P. Joseph Lane V.-P. John Bell P. Edw'd Everett V.-P.	6,368 2,046
1864	Abraham Lincoln P. Andrew Johnson V.-P.	7	61,803	George B. McClellan P. George H. Pendleton V.-P.	44,211		
1868	Ulysses S. Grant P. Schuyler Colfax V.-P.	7	70,426	Horatio Seymour P. Francis P. Blair V.-P.	42,396		
1872	Ulysses S. Grant P. Henry Wilson V.-P.	7	61,422	Horace Greeley P. B. Gratz Brown V.-P.	29,087	Chas. O'Conor P.	no report.

For statistics and documents relative to the State used in compiling this article we are indebted to His Excellency Nelson Dingley, Jr., governor of Maine from 1874 to 1876, and to Hon. A. Jackson, deputy secretary of state; and for historical data to the writings of the late Hon. William Willis of Portland. L. P. Brockett.

Maine, tp. of Cook co., Ill. Pop. 1808.

Maine, tp. of Linn co., Ia. Pop. 1262.

Maine, post-v. and tp. of Brown co., N. Y., on Nanticoke Creek, has 4 churches. Pop. of v. 303; of tp. 2035.

Maine, tp. of Columbia co., Pa. Pop. 599.

Maine, post-v. and tp. of Marathon co., Wis. Pop. 694.

Maine, tp. of Outagamie co., Wis. Pop. 101.

Maine (Sir Henry James Sumner), LL.D., K. C. S. I., F. R. S., b. in 1822; graduated B. A. in 1844 at Pembroke College, Cambridge, and received a fellowship; was regius professor of civil law at Cambridge 1847–54; reader on jurisprudence at the Middle Temple 1854–62; was engaged in India on the great legislative reform 1862–69; became in 1870 Corpus professor of jurisprudence at Oxford, and in 1871 entered the council of the secretary of state for India; has written an essay on *Roman Law* (1856), *Ancient Law* (1861), *Village Communities* (lectures at Oxford, 1871), and *Early History of Institutions* (1875).

Maine de Biran' (Marie François Pierre Gonthier), b. near Bergerac, France, Nov. 29, 1766; served in the French Revolution in the army and in the legislature, and after the Bourbon Restoration was a moderate royalist. In 1803 his *Mémoire sur la Habitude* won a prize from the French Institute. His *Sur la Décomposition de la Pensée* (1805), and other essays regarding intuitions without the aid of the sense, and the relations of man's moral and physical constitution to each other, also won prizes. Among his other writings are an *Essai sur les Fondements de la Psychologie*, and *Nouveaux Essais d'Anthropologie*, both published in 1859; but perhaps the best of all are his *Examen des Leçons de M. de Laromiguière*, and his article "Leibnitz" in the *Biographie Universelle*. He was one of the most original and sagacious of recent French philosophers, but he wrote little, and his style is obscure, though pregnant with meaning. D. July 16, 1824.

Maine-et-Loire, department of France, on the Mayenne and Loire. Area, 2755 square miles. The surface is undulating and hilly, and the soil very fertile. The wine, of which the department annually produces 11,000,000 gallons, is much esteemed, especially the white kinds. Large crops of wheat and excellent fruits are raised, and iron and coal are mined. Pop. 518,471. Of 54,036 children, 13,442 received no school education in 1857. Cap. Angers.

*Jackson and Calhoun received one electoral vote each from Maine in 1828.

Maine'ville, post-v. of Hamilton tp., Warren co., O. Pop. 290.

Mai'notes, the people of Maina (Mani), a mountain-district of Laconia, in the Peloponnesus, between the Messenian and Laconian gulfs, so called since the reign of Constantine Porphyro-Genitus (944–959 A. D.). They boast of their descent from the ancient Spartans, although some consider them Slavic. They remained pagan until the reign of Basil (867–886 A. D.). They were virtually independent for many years before the rest of modern Greece. They are handsome, warlike, superstitious, and were formerly noted robbers, but their manners are now greatly softened. Their number is estimated at 60,000.

Main Prairie, post-v. and tp. of Solano co., Cal. Pop. of v. 160; of tp. 761.

Main Prairie, post-v. and tp. of Stearns co., Minn. Pop. 621.

Mains'burg, post-v. of Sullivan tp., Tioga co., Pa. Pop. 212.

Maintenance, in law. The ancient common law stringently prohibited all acts tending to promote litigation done by persons having no pecuniary interest in the controversy. Any such upholding or "taking in hand" the quarrel of another with a design to assist him in its prosecution was in general termed maintenance (*main*, "hand;" *tenir*, to "hold"); the transaction was a criminal offence, and the contracts based upon it were voidable. Advancing money, employing counsel, or aiding in any other manner was illegal, unless done by a person standing in certain close relations, social or domestic, with the litigant party. One species of maintenance was termed "champerty," and was an agreement between a litigant and another to divide the land (*campum partire*) or other subject-matter recovered, the stranger undertaking to carry on the suit in consideration thereof. The law concerning maintenance not only forbade such bargains between attorneys and clients for a share in the recovery, but prohibited all transfers of claims for the purpose of prosecution. Indeed, the ancient rule which prevented the assignee of a thing in action from suing upon it in his own name was originally founded upon this doctrine. The common law as thus described has been greatly modified in this country. Aid given in good faith to a litigant is not illegal; in most of the States agreements to share the recovery, even between attorneys and clients, are sustained; while things in action are transferable, and the assignee not only may, but must, sue upon them in his own name. John Norton Pomeroy.

Maintenon', de (Françoise d'Aubigné), Marquise, born of noble Protestant parentage in the prison of Niort, France, Nov. 27, 1635; went in 1639 with her parents to Martinique, her father not being allowed to remain in France on account of his alleged treason. She returned

in 1646; was sent by her relatives to be educated at an Ursuline convent. Under its influences she became a Roman Catholic after a long resistance. She was (1651–60) the wife of the poet Scarron; and in 1669 she became governess to Louis XIV.'s children by Madame de Montespan, whom she supplanted in the king's affections. She acquired and long maintained a powerful influence over the king, but it is not believed that she was ever his mistress. In 1685 the king married her in private. She procured the Revocation of the Edict of Nantes, and displayed great zeal for the Roman Catholic Church. D. Apr. 15, 1719. She had considerable literary talent, and her *Letters* (9 vols., 1759; improved ed. 1865) are valuable.

Mainz. See MENTZ.

Mai'pures, or **Maypures,** an Indian tribe of Southern America, settled on the upper part of the Orinoco and the Rio Negro, and including the Caveres, Guaypunabis, Pareni, Maipures proper, Moxos, and other families. The Moxos were subdued by the inca Yupanqui, and were thus brought into contact with Peruvian civilization. Later on, Christian missions worked among them, and a grammar and vocabulary of their language were published at Lima in 1701 by Father Pedro Marban.

Maisonneuve' (JULES GERMAIN FRANÇOIS), b. at Nantes, France, in 1810; studied at Paris, and graduated in medicine in 1835; was surgeon of the Hôtel Dieu, the Hôpital Cochin, and later of the Hôpital Pitié; and received the cross of the Legion of Honor in 1848. His principal works are—*Le Périoste et ses Maladies* (1839), *De la Coxalgie* (1845), *Sur les Kystes de l'Ovaire* (1848), *Mémoire sur une nouvelle méthode de Cathétérisme* (1855), *Clinique chirurgicale* (2 vols., 1863–64), *Mémoire sur les Intoxications chirurgicales* (1867).

Maisonneuve, de (PAUL DE **Chomedey**), SIEUR, b. in Champagne, France, early in the seventeenth century; entered the army at an early age; was sent in 1641, at the head of a band of colonists, to Canada; founded Montreal in May, 1642; was governor for twenty-two years; brought over a second body of settlers in 1652; displayed vigor and ability in his administration; was removed from office 1664; sent to France 1665; resigned his post 1669, and d. at Paris Sept. 9, 1676.

Maistre, de (JOSEPH), COUNT, b. at Chambéry Apr. 1, 1753, was the son of the president of the senate of Savoy, and himself became a senator in 1787; entered the service of the king of Piedmont; was grand chancellor of Sardinia 1799; minister to Russia 1803–17; regent of the grand chancery 1818; became a member of the Turin Academy 1819; d. at Turin Feb. 26, 1821. De Maistre was the most powerful defender of Ultramontanism, the divine right of kings, and the papal infallibility, and advocated with marked ability and shrewdness a return to the mediæval system. The politics and thought of his own and subsequent times were much influenced by his powerful writings, among which may be named *Soirées de St. Petersbourg, Considérations sur la France* (1796), *Essai sur la Principe générateur des Constitutions* (1810), *Du Pape* (1819), *De l'Eglise gallicane* (1821), *Examen de la Philosophie de Bacon* (1836).

Maistre, de (XAVIER), COUNT, b. in 1764 at Chambéry; entered the military service of Sardinia; emigrated to Russia after the conquest of Sardinia by the French; participated in the campaigns against Persia, and d. at St. Petersburg June 12, 1852. In 1794 he published at Turin *Voyage autour de ma chambre*, a very pleasant and original book, which in 1825 was followed by *Expédition nocturne autour de ma chambre*. He also wrote *Les Lépreux de la Vallée d'Aoste* (1811), *Prascovie* (1826), etc.

Mait'land, town of New South Wales, Australia, on the navigable river Hunter, which divides it into East and West Maitland. It is a prosperous place, has extensive manufactures of tobacco, active trade in wool, and rich coal-mines in the vicinity. Pop. 7500.

Maitland (Sir RICHARD) OF LETHINGTON, b. in Scotland in 1496; was educated at St. Andrew's and in Paris; became a distinguished lawyer; was successively employed in public affairs by James V., the regent Arran, and Mary of Lorraine; became a knight and lord of session about 1551; lost his sight 1560; was Speaker of the Protestant convention Aug., 1560; became lord privy seal 1562; resigned that post 1567; made a MS. collection of early Scottish poetry and wrote original verse of considerable merit. D. at Edinburgh Mar. 20, 1586. The Maitland Club, established at Glasgow in 1828, published his poems in 1830. He wrote a *Historie and Cronicle of the Hous and Surename of Seytoun*, and his MS. collection of ancient poetry is preserved in the Pepysian Library, Magdalen College, Oxford.

Maitland (SAMUEL ROFFEY), D. D., b. in London, England, in 1792; educated at Trinity College, Cambridge; was called to the bar in 1816; took orders in the Church of England in 1821; was perpetual curate of Christ church, Gloucester, 1823–29, and became in 1838 keeper of MSS. at Lambeth and librarian to the archbishop of Canterbury; which posts he retained until his death at Lambeth Palace Jan. 19, 1866. He wrote several works on prophecy, on the history of the Albigenses and Waldenses, on the state of religion and literature in the Middle Ages, and on English ecclesiastical history.

Maitland (WILLIAM) OF LETHINGTON, known as "Secretary Lethington," eldest son of Sir Richard Maitland, b. in Scotland about 1525; was educated at St. Andrew's and on the Continent; became a convert to the doctrines of the Reformation about 1555; was appointed secretary of state 1556; joined the "Lords of the Congregation" 1557; was one of the commissioners who met the duke of Norfolk at Berwick, 1558; was made an extraordinary lord of session 1561; opposed the ratification of the *Book of Discipline*, and conducted the prosecution of Knox for treason 1563; had a debate with Knox on the independence of the Church 1564; took part in the conspiracy against Rizzio; was proscribed and escaped to Germany 1566; was present at the coronation of James VI. 1567; fought against Mary at Langside 1568; attended the conferences at York in the same year; was arrested, but soon liberated, and joined Kirkaldy of Grange in support of the queen 1569; assisted in the defence of Edinburgh Castle 1572–73; surrendered May 30, and d. in prison at Leith June, 1573—whether by suicide or natural death is unknown.

Maize, or **Indian Corn** [*Zea mays;* Sp. *maiz*, from Haytian *mahiz*], a well-known American plant of the grass family (GRAMINEÆ, which see), and tribe Phalarideæ. (See also GRASSES and INDIAN CORN.)

Majesty, as a title of royalty, is a reminiscence of the *majestas* claimed by the Roman emperors—a peculiar dignity, or literally *greatness*, which was held to have directly descended to the emperors of Germany. Henry VIII. was the first English king to assume the style of "His Majesty." The French kings after Louis XI. were by papal bull authorized to take the title of "Most Christian Majesty;" those of Spain, after Ferdinand and Isabella, "Most Catholic Majesty;" the kings of Hungary, "His Apostolic Majesty;" the kings of Portugal, "Most Faithful Majesty." The monarch of Austro-Hungary is called "His Imperial Royal Majesty."

Majol'ica [from *Majorca*, where it was once made] was originally the name of those kinds of pottery since called faïence, but it is now applied to a cheap earthenware of colored clay covered with a white glaze. It is much used in Southern Europe.

Ma'jor in the army and marine corps, an officer next in rank below the lieutenant-colonel, and next above the captains.

Major [Lat.]. In music, this term is used to designate any mode, interval, or key which is in certain respects *greater* than others. The major *mode* is that in which the third above the tonic is major, as from C to E, G to B, or D to F♯. On analysis, this interval of a major third will be found to embrace *four* semitones, whereas in a minor third there are only *three*. From this arises the distinction of greater and lesser—*i. e.* major and minor. Several of the intervals are thus variable in their contents—viz. the third, sixth, seventh, and ninth, not comprising in all cases the same number of semitones, and hence needing the discriminating names of major, minor, diminished, etc. The major intervals always contain one semitone more than the minor. (See INTERVAL.) WM. STAUNTON.

Major (GEORG), D. D., b. at Nuremberg, Germany, Apr. 25, 1502; studied theology under Luther and Melanchthon; became rector at Magdeburg 1529, superintendent at Eisleben 1536, professor of theology and court-preacher at Wittenberg 1539; was a representative of the Protestants in the colloquy at Regensburg 1546; was for a few months in 1547, during the Smalkaldic war, superintendent and court-preacher at Merseburg; returned to his post at Wittenberg 1548; became superintendent of the Mansfeld churches 1552; again returned to Wittenberg, and d. there Nov. 28, 1574. By the active support he gave to the Leipsic Interim (Dec. 22, 1548), which asserted that good works are necessary to salvation, he separated from the strict Lutherans, and became involved in a controversy with Amsdorf (1552), who declared good works prejudicial to salvation, and his doctrine was rejected by the Formula of Concord (1580). In his later years he was involved in the Crypto-Calvinistic controversy, and was forced to sign the Torgau Articles. His principal works, being homilies and commentaries on the New Testament, were printed at

Wittenberg (1569). The "Majoristic controversy" gave rise to the formation of a theological circle called Majorists.

Major (John Richardson), D. D., b. in London in 1797; graduated at Cambridge in 1819; took orders in the Church of England; was for some years head-master of Wisbeach Grammar School, and from 1830 to 1866 head-master of the grammar school connected with King's College, London. In 1871 he was appointed vicar of Arrington, Cambridgeshire. He has published numerous classical textbooks, including a Latin grammar and reader, a *Guide to Reading the Greek Tragedians;* has edited the plays of Euripides, Stephens's *Greek Thesaurus*, the lexicons of Scapula, Schrevelius, and Parkhurst, various portions of Homer, Xenophon, Herodotus, and Virgil, and the Gospels of Mark and Luke, with philological notes.

Major (Richard Henry), F. S. A., b. in London, England, in 1818; appointed keeper of the maps and charts in the printed book department of the British Museum 1844; was honorary secretary of the Hakluyt Society 1849–58, editing for it the *Select Letters of Christopher Columbus* (1847), *The Historie of Travaile into Virginia Britannica*, by W. Strachey (1849), and *Notes upon Russia* from the Latin of Herberstein (1851–52), and writing introductions for Mendoza's *History of China*, edited by Sir George Staunton (1853), and *The Tartar Conquerors of China*, by the earl of Ellesmere (1854). At a later period he edited for the same society *India in the Fifteenth Century* (1857), and *Early Voyages to Terra Australis* (1859). In 1861 he found in the British Museum, and laid before the Society of Antiquaries, documents showing the discovery of Australia by a Portuguese navigator in 1601, which procured him from the king of Portugal the honor of knighthood. In 1868 he published an elaborate and valuable *Life of Prince Henry of Portugal, surnamed the Navigator*. He is honorary secretary to the Royal Geographical Society and a frequent contributor to its *Journal*.

Major'ca, an island of the Mediterranean, belonging to Spain, and forming the largest of the Balearic group. Area, 1420 square miles. Pop. 262,893. The northern part of the island is mountainous, Silla de Torellas rising 4596 feet. The southern and western parts are lower, and afford several good harbors. The soil is very fertile, and the climate an everlasting spring. All the products of Southern Spain, more especially of the province of Valencia, are raised here to perfection. Cap. Palma.

Ma'jor-Gen'eral. See General Officer.

Majorists. See Major (Georg).

Major'ity Point, post-v., cap. of Cumberland co., Ill., contains the court-house, several churches and schools, 2 weekly newspapers, 1 hotel, stores, and is surrounded by a rich agricultural district. Pop. about 600.

Geo. E. Mason, Ed. "Cumberland Democrat."

Major Mode. See Mode.

Major Scale, in music, with a major third and seventh. (See Mode and Scale.)

Makal'lah, town of Arabia, situated on its southern coast, in lon. 49° 6′ E., has a good harbor, and many vessels visit it to take in provisions. Pop. 7000.

Makan'da, post-v. and tp. of Jackson co., Ill., on the Illinois Central R. R., in the fruit-region of Southern Illinois. Pop. 1680.

Makee', tp. of Allamakee co., Ia. Pop. 1784.

Ma'ko, or **Makovia,** town of Hungary, on the Maros, has an extensive trade in corn, hemp, wine, fruit, and cattle. Pop. 25,595.

Makree'zee, or **Makrîzî, Al** (Ahmed), b. in 1360 at Makreezee, near Baalbec, in Syria; lived for the largest part of his life in Cairo, and d. there in 1442. He wrote in Arabic several works on the history and topography of Egypt from the time of the Mohammedan conquest, down to 1327 A. D., parts of which, as well as his essay on Egyptian weights and measures, have been translated into French by Quatremère and Silvestre Sacy. He drew largely from Elmacinus, a Christian writer, who preceded him. Of a large work, which he left unfinished, on the important persons who had visited Egypt, the original manuscript of the first volume is in the National Library in Paris.

Malabar', district of British India, in the presidency of Madras, extending from lat. 10° 15′ to 12° 18′ N., along the Arabian Sea, comprising an area of 6050 square miles, with a population of 1,514,909. The principal products of the district are timber, especially teak, and pepper. The teak tree grows on the plateau formed by the western Ghauts at an elevation of 5000 feet. The trunks, which often reach a length of 120 feet and a diameter of 15 feet, are dragged by elephants from the forests to the river Ponani, and then floated down to the coast, but many trunks are spoiled by the cataracts of the river. The pepper is cultivated on the coast-land. The district swarms with wild elephants, living in herds of 200 or 300, and is infested with tigers. The name *Malabar* is often applied to the whole western coast of the peninsula.

Malabath'rum [Gr. μαλάβαθρον], a drug composed of leaves brought from India, and much esteemed as a perfume and as a medicine by the ancients. The name is considered a corruption of *tamala-putra* ("tamala leaves"), the title of a drug composed of the leaves of several species of cinnamon tree (*Cinnamomum*). Some writers identify it with the betel-leaf.

Malac'ca, district of the Malay peninsula, extending from lat. 2° to 3° N. on the western coast, along the Strait of Malacca, and belonging to Great Britain. Area, 1000 square miles. Pop. 16,000. The surface is mostly swampy, but the soil is very fertile and the climate is salubrious. Rice and timber are the principal products. The hills which stretch inland are rich in tin. The inhabitants are partly Malays, partly Hindoos. The capital, Malacca, was formerly an important city, but has now greatly declined. Pop. 10,000, mostly a mixture of Malays and Europeans.

Malacca, Strait of, separates the Malay peninsula from the island of Sumatra. It is 520 miles long; its breadth varies from 25 to 200 miles.

Mal'achi, the last prophet in order of time whose writings appear in the Old Testament. He lived in the time of Nehemiah (440–420 B. C.). He rebukes the people for despairing of God's mercy, for neglecting the tithes, for offering imperfect animals, and for intermarrying with Gentiles. It is instructive to observe in this catalogue of sins that the tendency which produced the Pharisees was already in motion. The Septuagint takes Malachi not as a proper name, but as an appellative—"the angel" or "messenger" of God. Some modern scholars adopt this idea, but with little reason.

Mal'achite [Gr. μαλακός, "soft"], a natural green carbonate of copper, occurring in certain localities (as Siberia and Australia) in such beauty as to be highly valued for ornamental purposes.

Mal'achy, Saint (O'Morgair), b. at Armagh in 1094; became in youth a rigid ascetic, and when twenty-five became a priest; restored the monastery of Bangor; became in 1124 bishop of Connor; in 1134 archbishop of Armagh, primate of all Ireland, and labored with much zeal to bring the Irish Church, thus far independent, under the papal sway. In 1137 he resigned the primacy to its legal possessors (for that see was then a family possession), and became bishop of Down. In 1137 he visited Bernard of Clairvaux; in 1139 was named legate for Ireland by the pope; and in 1142 established a Cistercian monastery in Ireland. In 1148 he induced the synod of Inis Padrig to request the pope to bestow the pallium upon the Irish bishops. D. at Clairvaux Nov. 2, 1148, in the arms of St. Bernard, his biographer and friend. He was one of the most learned, eloquent, and influential men of his time.

Malacology. See Conchology.

Malade' City, post-v., cap. of Oneida co., Id., 25 miles W. by N. of Franklin, Ut.

Mal'aga, province of Spain, bordering on the Mediterranean, and bounded by the provinces of Cadiz and Granada. Area, 2786 square miles. Pop. 505,010. It produces excellent and abundant wine, corn, and fruit, and is rich in metals and mineral springs.

Malaga, city of Spain, the capital of the province of Malaga, on the Mediterranean. It is beautifully situated at the foot of a lofty mountain-range, whose highest peak is crowned with the old Moorish castle Gibralfaro, and whose majestically undulating sides are covered with magnificent vines, producing the famous malaga wine. It is an old city, founded by the Carthaginians, having lived through long periods of Roman and Moorish dominion. Many of its streets are narrow, crooked, and quaint alleys, but the newer part, extending along the harbor and the beautiful alameda, is elegant and has a thoroughly modern appearance. It is chiefly a place of commerce, increasing every year, and now competing successfully with Barcelona. Its harbor is spacious and safe, lined with handsome quays, and provided with excellent dockyards. Its trade in wine, oil, figs, almonds, raisins, and grapes is very extensive, and its manufactures of cloth, silk, ropes, and leather are prosperous; besides, it has several large iron-foundries, breweries, and distilleries. Its educational institutions, museums, and scientific collections are good, and its inhabitants reputed for their elegance and civility. Pop. 92,611.

Malaga, post-v. and tp. of Monroe co., O. Pop. of v. 114; of tp. 1577.

Mal'aka, tp. of Jasper co., Ia. Pop. 1010.

Malakoff. See SEVASTOPOL.

Malamocco. See VENICE.

Malan′ (CÉSAR HENRI ABRAHAM), D. D., b. at Geneva, Switzerland, July 7, 1787, of French Protestant descent; was bred a Socinian, and ordained in 1810; became a Trinitarian under the guidance of Robert Haldane and of Dr. J. M. Mason of New York, and was (1820–63) the pastor of an independent church at Geneva. His sect were called *Mômiers* (comedians) by the people. He was the author of many religious works. His hymns, *Les Chants de Sion* (1826; with original music 1841) and *Les Grains de Sénevé* (1846), are noteworthy. Many of his works have been translated into English. D. May 8, 1864.

Malan (SOLOMON CÆSAR), D. D., son of César Malan, b. in Geneva in 1812; graduated with honors at St. Edmund's Hall, Oxford, in 1837; received in 1838 a professorship in the Bishop's College, Calcutta; returned to England, and in 1871 became a prebendary of Sarum. He has written several original works on ecclesiastical subjects, ornithology, travels, etc., composed sacred and other music, designed illustrations for his own and others' works, and translated a great number of works from Chinese, Japanese, Ethiopic, Arabic, Armenian, Coptic, Persian, Russian, and other literatures, mostly works of a religious character, including *The Gospel of St. John* in eleven translations, from the Syriac, Armenian, Geez, Georgian, Slavonic, Memphitic, Gothic, Sahidic, Anglo-Saxon, Persian, and Arabic—all ancient versions. He understands nearly 150 languages, and is the greatest living polyglot scholar since Mezzofanti, his friend, whom he excels in the versatility of his powers.

Mä′laren, or **Mälar,** the most beautiful and one of the largest of the lakes of Sweden. With a breadth of from 2 to 20 miles, it stretches 70 miles inland from the Baltic Sea, with which it is connected by a small but deep channel. It contains over 1200 islands, fertile and beautiful, well cultivated, or covered with forests of pine and birch. Stockholm is situated on both sides of the channel and on a number of islands in the Mälar Lake, and several other towns are along its shores or on its islands.

Malay Archipelago. See EASTERN ARCHIPELAGO.

Malay Peninsula, the southern extremity of Farther India, projects from Indo-China between the China Sea and the Gulf of Siam to the E., and the Bay of Bengal and the Strait of Malacca to the W., for a distance of about 900 miles; greatest breadth 180 miles. It is traversed by a mountain-range from 3000 to 6000 feet high, bordered with alluvial plains along the coast. The peninsula is supposed to be the cradle of the Malayan race, though a tradition among some Malayan tribes asserts that at one time they immigrated from Sumatra and drove the original inhabitants back into the mountains. Large parts of the country are now dependencies of Siam. The British have several important settlements—PENANG, MALACCA, and SINGAPORE (which see). But there are also independent Malayan states, as Quedah, Patani, and Johori, which comprise the southernmost part of the Peninsula.

Malay Race [called by themselves *Malayu*], the dominant race of Malacca (the Malay peninsula) and the East Indian Islands (Malay Archipelago). In a larger sense, the inhabitants of the greater part of the islands of Polynesia are said to be of Malay race, since physically and in language they are kindred, and the Malay traditions assume an insular origin for their people. Some ethnologists have made the Malays the type of a fifth or brown race of mankind, but others regard them as essentially Mongolian. They are of a brown color, have black and often curled hair, and prominent facial bones, are short of stature, and as a rule courageous, but unstable and subject to fits of indomitable rage. They are treacherous and unforgiving enemies and inconstant friends, idle and revengeful, but are active and useful sailors. Gambling, cockfighting, intoxication, and, until recently, piracy, are the national vices. The Malays are inveterate liars. In religion they are Mohammedans. Fondness for music and disregard of death are almost universal. There are, however, observers who give the Malays a much better character than the one here drawn. It is not improbable that intercourse with Europeans and Chinese has degraded them, as it has most other rude peoples, and the injustice and cheating of traders has done much to make them treacherous and deceitful. Fortunately, the Malays have a patriarchal feudal system of living which has ever prevented this enterprising and unscrupulous people from becoming a far-conquering race. Their so-called civilization is small. There are manufactures of weapons, of ornamental gold and filigree work, and of fast-sailing but small vessels of curious construction. The people are very largely maritime in their pursuits. The language is soft in its sounds, and is easily learned. It is the commercial language of the East, and has been called, for its euphony, the Italian of Asia. The literature is small, and bears strong marks of Sanskrit and Arabian influence. The Arabic alphabet is used. (See the *Dictionary* of Marsden, 1812; Crawfurd, *Malay Grammar and Dictionary*, 1852.)

Malbone′ (EDWARD G.), b. at Newport, R. I., in Aug., 1777; became distinguished as a portrait-painter at Providence, Boston, Charleston, and London; visited the chief cities of the U. S. painting miniatures; went to the West Indies for his health in 1806, and d. at Savannah, Ga., May 7, 1807.

Mal′colm, post-v. and tp. of Poweshiek co., Ia., on the Chicago Rock Island and Pacific R. R. Pop. 804.

Malcolm (Sir JOHN), b. at Burnfoot, near Langholm, Perthshire, Scotland, May 2, 1769; entered the army at the age of twelve years; became a cadet in the military service of the East India Company, and having familiarized himself with several Oriental languages, successfully performed a political mission to Persia in 1799, and became president of Mysore in 1803, and in the same year accompanied Gen. Arthur Wellesley in the Mahratta campaign, and signed the treaty of peace with Scindia after the latter's defeat at Assaye. During the ensuing years Malcolm was employed in high civil functions under the successive Indian administrations; was again sent as envoy to Persia in 1807 and 1809, but with less diplomatic success than before, and returned to England in 1812. He was knighted, wrote his elaborate *History of Persia* (2 vols., 1815), still an authority, and visited Paris during its occupation by the allied forces. He returned to the East in 1817; engaged in the Mahratta and Pindaree wars in the Deccan as second in command, with the rank of brigadier-general; distinguished himself at the battle of Mehudpoor (Sept. 21, 1817), in which he broke the power of the Mahrattas; was governor of Malwa 1818–22; published his *Memoir of Central India* (1823), and his *Political History of India from 1784 to 1823* (1826); was governor of Bombay 1827–30; was member of Parliament for Launceston 1831; and d. in London May 31, 1833. A monument was erected to his memory in Westminster Abbey, and an obelisk 100 feet high at his native place. His posthumous *Life of Lord Clive* was published in 1836. (See his *Life and Correspondence*, by J. W. Kaye, 1856.)

Malcom (HOWARD), D. D., LL.D., b. in Philadelphia Jan. 19, 1799; graduated at Dickinson College in 1817; studied at Princeton Theological Seminary; was pastor of Baptist churches at Hudson, N. Y., Boston, and Philadelphia; was president of the college at Georgetown, Ky., 1839–49, and of Lewisburg University in Pennsylvania 1851–59, after which, he retired from the ministry and settled in Philadelphia. He published a *Dictionary of the Bible* (1828), *The Christian Rule of Marriage* (1830); visited the Baptist missions in India, Burmah, Siam, China, and Africa, 1835–36; published his *Travels in South-eastern Asia* (1839), which reached a 10th ed. in 1857, and an *Index to Religious Literature* (2d ed., 1870). He was one of the founders of the American Sunday-school Union and the American Tract Society, and labored in their behalf.

Malczew′ski (ANTONI), b. in Volhynia in 1792; received a military education; entered the army in 1811; retired in 1816 on account of a duel; travelled in Germany, Switzerland, Italy, and France; returned in 1821, having squandered his fortune, and lived as a farmer in Volhynia, then as a littérateur in Warsaw, where he d. in poverty and misery May 2, 1826. In 1825 he published *Marja*, an epic poem in two songs, at first much criticised, but, since the victory of the romantic school over French classicism, considered one of the finest productions in Polish literature, and translated into French and German.

Maldah′, town of British India, in the presidency of Bengal, on the Mahanunda, an affluent of the Ganges, is poorly built, with narrow and filthy streets lined with decaying houses. Its weaving-factories, once very active, have nearly stopped, and the surrounding districts, which in the rainy season are completely inundated, lie uncultivated. Pop. 15,000.

Mal′deghem, town of Belgium, province of East Flanders, with celebrated lace manufactures. Pop. 7695.

Mal′den, post-v. of Berlin tp., Bureau co., Ill., on the Chicago Burlington and Quincy R. R.

Malden, post-v. and tp. of Middlesex co., Mass., on the Malden River, and on the Boston and Maine and the Saugus branch R. Rs., 4 miles N. of Boston; has gas and water works, 7 churches, 7 schools, a high school, a lyceum, a hotel, a national and a savings bank, 2 weekly newspapers, and water-power utilized by various manufactures. Pop. 7367.

Malden, post-v. of Saugerties tp., Ulster co., N. Y., on the Hudson River, has extensive trade in flagging-stone.

Malden, tp. of Kanawha co., West Va. Pop. 3190.

Mal'dive Islands, a group of small islands, numbering in all about 50,000, situated in the Indian Ocean, S. W. of Ceylon, between lat. 0° 45′ S. and 7° 6′ N. They are of coral formation, low, hardly more than 20 feet above the sea, of circular form, and having a lagoon in the centre. On the larger grow figs, palm trees, citrons, and rice is cultivated; poultry and wild fowls are abundant. The inhabitants, numbering 200,000, are Mohammedans, and governed by a sultan who resides on Male and pays a tribute to the English government of Ceylon.

Mal'don, town of England, in the county of Essex, at the confluence of the Chelmer and the Blackwater. It has manufactures of salt and silk, and breweries and iron-foundries. Pop. 5362.

Malebranche' (Nicolas), b. in Paris Aug. 6, 1638, of a rich and respectable family; prevented by a feeble constitution from frequenting any public school as a youth, he when older studied theology at the Sorbonne, and entered in 1660 the congregation of the Oratory. But the incidental perusal of Descartes's *Traité de l'Homme* filled him with such an enthusiasm that henceforth he devoted himself exclusively to philosophy, and after ten years' preparation he produced his principal work, *De la Recherche de la Vérité* (1674), which ran through numerous editions in the course of a few years. His health was still very precarious, but by his quiet and cautious manner of living he reached a good old age. The study of philosophy he alternated with that of mathematics, in order to sharpen his powers without burdening his memory. He made short excursions in the country, and delighted in associating with children. As he was a man of genuine piety, it was to him a most serious task to demonstrate the true relation between the metaphysical ideas set forth in his first book and the doctrines of Christianity, and all his subsequent writings reveal more or less directly the same tendency: *Conversations Chrétiennes* (1677), *De la Nature et de la Grace* (1680), *Méditations Chrétiennes et Métaphysiques* (1683), *Entretiens sur la Métaphysique et sur la Religion* (1688), *Entretiens d'un Philosophe Chrétien et d'un Philosophe Chinois sur l'Existence de Dieu* (1708), etc. On this point, however, he met with much censure and opposition from Arnauld, Régis, and even from Bossuet; but in spite of the fierceness of the controversy, he himself remained calm and benign to the last. D. at Paris Oct. 13, 1715, after a protracted sickness and much suffering. In the history of philosophy Malebranche represents the so-called Occasionalism. With Descartes he assumed a difference between matter and mind so absolute that no transition from one to the other, no influence of one on the other, is possible. The question then became, How is the striking harmony between the material and spiritual phenomena which pervades the whole world to be explained when there is no causal connection between the two spheres? To this Malebranche answered, All that exists, matter and mind, and the movements going on in their respective spheres, rests on God as its sole and immediate cause; and as God is one and the same, there must be a certain consistency between the phenomena of the various spheres, even though that which takes place in one sphere is only a *causa occasionalis*, and not a *causa efficiens* for that which occurs in another. This, the fundamental idea of the metaphysical system of Malebranche, is by itself as artificial as Leibnitz's *harmonia præstabilita*, as obscure in its interior construction, as barren in its practical application; but while Malebranche as a philosopher, as a metaphysician, hardly has any other interest than that of showing certain consequences of the Cartesian speculation, as an author, generally speaking, he occupies a very high rank by the power and purity of his spirit, by the richness and soundness of his psychological observations, and by the lucidity and elegance of his style; he is reckoned among the French classics. Clemens Petersen.

Malesherbes', de (Chrétien Guillaume de Lamoignon), b. at Paris Dec. 6, 1721, of a rich and influential family; educated by the Jesuits; studied law, and entered very early the civil service, in which he occupied with great honor the most responsible positions. From 1750 to 1771 he was censor of the press and president of the court of aids. In the former office he gained the esteem of all literary men by his liberality and courage; without him the *Encyclopédie* would probably never have been printed. In the latter he attained still greater popularity by the firmness with which he opposed all arbitrary measures of the government and all extortions of the tax-farmers. In 1771, when Louis XV. dissolved the Parliament because they would not register his tax-edicts, Malesherbes presented a memoir to His Majesty, advising the convocation of the States General, for which memoir he was banished from Paris. On the accession of Louis XVI. he was recalled to the court in 1774, and as he now was one of the most popular men in France, he was made minister of the interior in the cabinet of Turgot. He could do nothing, however, against the follies, prejudices, and intrigues of the court; and when he left the ministry in 1776, together with Turgot, he had lost much of his popularity. Many years he then spent in travels in foreign countries and on his estates, always occupied by some plans of public usefulness; and when in 1792 Louis XVI. was arraigned before the National Convention, he undertook his defence, and spoke with admirable courage, and not without making some impression. The immediate result, however, of this noble act was his own arraignment in Dec., 1793, and on Apr. 22, 1794, he was guillotined, together with several members of his family. He wrote several essays and pamphlets, mostly on subjects relating to political economy and finances.

Malet' (Sir Alexander), Bart., K. C. B., b. in England in 1800; graduated at Oxford in 1822; pursued the diplomatic career; was envoy to the Germanic confederation from 1852 to 1866, and wrote the history of the extinction of that political body under the title *The Overthrow of the Germanic Confederation by Prussia in 1866* (1870). Some years earlier he translated from the Norman-French Master Wace's *Chronicle of the Conquest of England.*

Malet, de (Claude François), b. June 28, 1754, at Dôle, in the department of Jura, France; entered the army in 1771; was brigadier-general in 1799, and commanded in Italy in 1804 under Prince Eugene, but was dismissed from the army in 1807, and confined in La Force, suspected and in a measure convicted of having intrigued against the emperor. While in La Force he plotted a new conspiracy, but was again discovered, and Napoleon now ordered him to be shut up in a state prison. This order was either disobeyed or forgotten, and in 1812 he was allowed to take up his residence for the sake of his health in the house of a physician in Paris, one Dubuisson. Here he found the associates he needed, and planned with great shrewdness and circumspection a *coup d'état*, which he executed in the night between Oct. 22 and 23 with an astonishing audacity and admirable skill. The first rumor of the disastrous retreat from Moscow had just reached Paris. At midnight Malet appeared in the barracks, announced that the emperor had been killed in Russia, represented himself as an emissary from the provisory government, and at the head of a few companies of soldiers arrested the chiefs of the police and the postal department, whom he replaced with his own accomplices, and was just about taking possession of the military command of Paris when Laborde, chief of the military police, recognized him, disarmed and arrested him, and disclosed his fraud to the soldiers. He was shot Oct. 29, 1812. (See the exhaustive representations by Lafon and Dourille, both entitled *Histoire de la Conspiration de Malet*—the former 1814, the latter 1840.)

Malherbe', de (François), b. at Caen in 1555, d. at Paris Oct. 16, 1628. He was called to the court by Henry IV., received a pension from Marie de Médicis, rich donations from Louis XIII., and many compliments from Richelieu. His statue in bronze was raised in his native city in 1847, and his works, consisting of odes on court occasions, were frequently republished—by Chevreau (1723), by Lefèvre de St.-Marc (1764), by Didot (1797), by Lalanne (1865). By French critics he is generally called the founder of the classical poetry in France, but that can be said only with respect to the form, as his odes are entirely destitute not only of poetical inspiration, but even of that subordinate quality which in French criticism is called *esprit.*

Malheur' River rises by several head-streams in Baker co., Or., and flows into the Snake River.

Malibran' (Maria Felicità), b. at Paris Mar. 24, 1808, a daughter of the celebrated singer and singing-master, Manuel Garcia; made her début June 7, 1825, as Rosina in *The Barber of Seville* in London; entered in the same year on an artistic tour through the U. S.; married (Mar. 25, 1826) Mr. Malibran, a French merchant of New York; returned the next year alone to Europe; appeared for the first time at Paris Jan. 14, 1828, as Semiramis; sang for several years alternately in London and Paris, with occasional excursions to Italy and Belgium; married after the dissolution of her first marriage the famous violinist De Bériot, Mar. 29, 1836, and d. at Manchester Sept. 23, 1836, in consequence of a fall from her horse. Her voice, a mezzo-soprano, was beautiful by nature and developed to perfection, and with these musical advantages she connected a considerable dramatic talent, much natural grace, a rich imagination, and an astonishing audacity in following up her momentary inspirations.

Mal′ic Acid [Lat. *malum*, "an apple"], $C_4H_6O_5$. Wöhler represents the molecular constitution thus:

$$\begin{cases} CH.OH.CO.OH \\ CH_2.CO.OH. \end{cases}$$

Its anhydride (not yet isolated) would be $C_4H_4O_4$, a metamere of *maleic* and *fumaric* acids. First discovered by Scheele in *apples*. It occurs in many fruits and berries; among them, *cherries, gooseberries, strawberries, raspberries*, and the berries of the *sumach* and of the *mountain-ash*, from which latter it is usually procured. It exists also in *pineapples*, and in the leaves, stems, seeds, and roots of a great many plants. The acid of *tomatoes* is chiefly citric. Mountain-ash (*Sorbus aucuparia*) berries are pressed when not quite ripe, the juice boiled and filtered, neutralized partially with potash, and precipitated with a lead-salt. The liquid is allowed to stand for a few days, during which malate of lead crystallizes, and the crystals may be separated by careful elutriation from other deposits that form. Sulphuric acid then separates malic acid, but its purification is rather troublesome. When pure it crystallizes from a syrupy solution. It is deliquescent, and soluble in alcohol. It is lævo-rotatory to about $-5°$. Malic acid has not yet been prepared synthetically.

Malates.—Almost all the malates are soluble, malate of lead being about the only one soluble with difficulty in the cold, though even this appears soluble in its mother-liquor when heated. The acid often occurs in fruits and plants in the form of acid malates of lime, magnesia, and potash.

Maleic Acid, $C_4H_4O_4$.—Wöhler makes it $C_2H_2(CO,OH)_2$. It is metameric with fumaric acid, from *fumitory* (*Fumaria officinalis*). Both these acids are formed by distilling malic acid, fumaric acid being the solid residue, and maleic the liquid distillate dissolved in the water produced by the decomposition. Maleic acid may also be crystallized. Several chemical agents convert it into fumaric acid. H. WURTZ.

Mal′ice [Lat. *malitia*, "bad"], in law. Primarily, malice imports a wicked purpose towards the person injured, but as a word of strictly legal nomenclature it has acquired a broader technical meaning, and is used to describe and characterize the intentional doing of any wrongful act without just cause or excuse. As was very accurately said by an English judge, "Malice in common acceptation means ill-will against a person, but in its legal sense it means a wrongful act done intentionally, without just cause or excuse. If I give a perfect stranger a blow likely to produce death, I do it of malice, because I do it intentionally and without just cause or excuse. If I traduce a man, whether I know him or not, and whether I intend to do him an injury or not, the law considers it done of malice, because it is wrongful and intentional." In this technical signification malice is an essential element of very many crimes, and of certain civil wrongs for which a right of action is given to the injured party, particularly of libel, slander, and malicious prosecution. Malice is often separated into two classes, express and implied, or, as the division is sometimes very inaccurately made, malice in fact and malice in law. This classification, however, has reference solely to the manner of proving the malice in a given case. It is express when its existence is established by direct evidence showing the intention; if implied, the wrongful intention, which is its principal ingredient, is presumed from certain acts or omissions of the wrongdoer, as by the common law the intent to kill was inferred from the fact of killing. There is, therefore, no substantial distinction between express and implied malice, but simply a difference in proving the single element of malice, which is the same in its effects when established by either method. JOHN NORTON POMEROY.

Mali′cious Mischief, in law. At common law, malicious mischief seems to have been confined to the wilful destruction of personal property from actual ill-will or malice towards the owner or possessor. In the U. S., through a judicial enlargement of this definition, or by means of numerous special statutes, any intentional or wanton injury to property, real or personal, done through malice and committed secretly, or exhibiting cruelty to animals, or accompanied by a breach of the peace, so that the offence would be more than a mere civil trespass on the one hand, and would not amount to arson or any other well-defined crime on the other, is embraced within the general term "malicious mischief." Actual injury, wantonness, and malicious intent are essential elements, and such circumstances as distinguish the wrongful act from a mere trespass. Simply as illustrations of the almost innumerable special offences which have been described by statutes may be mentioned the defacing of buildings, the girdling or other injury to ornamental or fruit trees or to shrubbery, the setting on fire or other destruction of crops, the killing or wounding of animals, and the like. The punishment is generally fine or imprisonment, or both.

JOHN NORTON POMEROY.

Malicious Prosecution, a prosecution at law from malice and without reasonable or probable cause. This is a tortious injury, for which the party against whom the wrongful proceedings have been instituted may maintain an action and recover damages. (See TORT.) It is deemed in law as primarily a violation of the personal right of reputation, but it usually results also in a violation of the right of personal liberty by the arrest or imprisonment of the party prosecuted, and of the right of property by occasioning expense. Proof of injury or damage in either of these respects, however, will be sufficient to support an action against the prosecutor. The fundamental ground upon which actions of this kind rest is, that the processes of law are not to be employed for purposes of injury, extortion, or oppression, but only to enforce claims or demands believed on reasonable grounds to be just and valid, to protect legal rights, or to punish alleged offenders against the laws in regard to whom there is at least reasonable probability of guilt. The form of the malicious prosecution is not material. It may be either criminal or a civil suit at law. Thus, if an indictment be obtained against a person for an alleged crime, or a warrant be procured for his arrest by complaint to a magistrate; or if in a civil action he be arrested and held to bail for a debt not due or for more than is due, or his property be attached upon a groundless claim; or if a commission of lunacy or of bankruptcy be sued out against him; or if he be put under bonds to keep the peace; or if any other proceedings of a like nature are taken against him, and in any case the law be put in motion maliciously and without probable cause, an action is maintainable. If a person is arrested and imprisoned or held to bail in a civil suit, the offence is commonly termed a "malicious arrest," but the general principles of law relating to it are the same as are applicable to other modes of malicious prosecution. To sustain an action for a malicious arrest or prosecution the plaintiff must prove (1) that the defendant caused or instigated the proceedings complained of; (2) that they were instituted maliciously and without probable cause; and (3) that they are at an end and terminated in favor of himself, the party therein prosecuted.

(1) If the alleged prosecutor directly and personally instituted the malicious proceeding, as by bringing an unfounded civil action or by procuring an indictment or the issue of a warrant upon testimony known to be false, he is undoubtedly responsible. But he is also liable if he merely instigated or excited the prosecution, or if it was brought by his agent, who was duly authorized to institute such proceedings. An attorney-at-law is not, however, liable, unless he acted without authority from his client in commencing the prosecution, or conspired with his client to injure and oppress the other party. If a person makes a malicious accusation of a crime against another before a magistrate without reasonable cause, and the magistrate, relying upon the charge, causes the arrest of the party accused, an action will lie against the complainant; but if the magistrate, relying upon his own judgment, mistakenly deems the alleged offence to be a crime when it is not such in reality, it has been held that the issue of a warrant and an arrest upon this ground will not make the complainant responsible, since the injury is attributable to the magistrate's error. It was formerly questioned whether corporations could be sued in an action for malicious prosecution, but actions of this kind are now generally held maintainable.

(2) The existence of malice and the want of probable cause must both be established by the plaintiff by affirmative proof. Malice in the legal sense of the term, and as it is used in this connection, is not confined in meaning to actual malevolence, animosity, or ill-will against the person to whom the injury is done, but signifies also that habit, disposition, or intent of mind from which proceed wrongful acts done intentionally, without cause or excuse. In the former meaning it is termed technically "malice in fact"—in the latter, "malice in law." Adequate proof that the prosecutor was actuated by a malicious intent in either of these senses of the expression will be sufficient to sustain the action against him. (See MALICE.) Malice in fact may be proved by evidence of expressions or conduct showing that the prosecutor was conscious of the innocence of the accused, and was influenced by a positive intent to do him injury rather than to bring him to justice for the alleged offence. But malice is usually inferred in actions of this kind from the want of probable cause, which is therefore essentially the gist of the action. Probable cause is defined as a reasonable suspicion supported by circumstances sufficiently strong in themselves to warrant a cautious and prudent man in the belief that the person accused is guilty of the offence charged. If this ground of justification be absent, it is a natural presumption that the prosecution was instituted from an indirect motive of wrong or with an intention to subserve some improper or unworthy pur-

pose; and the existence of malice in law is therefore established without more specific proof. If it be shown, however, by appropriate testimony, that the defendant acted in entire good faith in prosecuting a groundless claim, or was actuated solely by an honest desire to bring a supposed offender to justice, proof of actual malice will be necessary in rebuttal, or the action will not be sustainable; for proof that there was want of probable cause, without malice, will not be sufficient, since a wrongful intent is an essential ingredient in this offence. A case of this kind, however, occurs but rarely. In like manner, proof of the most express actual malice will not be sufficient to support an action if it appears that there was reasonable ground for the prosecution, since otherwise damages would be awarded by the law for the assertion of a valid legal right or for the prosecution of an actual offender; which would be both illogical and inexpedient. While malice is ordinarily inferable from the want of probable cause, the converse of the proposition is never true. Want of probable cause must always be directly proved, and cannot be implied, for a man may, though actuated by positive malevolence, undertake a prosecution for real guilt, or upon credible grounds of belief proceed upon apparent guilt; and under such circumstances the law favors legal measures of redressing the real or supposed grievance. Probable cause does not depend upon the actual guilt or innocence or responsibility of the person prosecuted, nor upon the fact that any offence has been committed or any liability incurred, but upon the belief of the prosecutor concerning such guilt or innocence or responsibility. Belief and reasonable grounds of belief are both essential elements in the justification. The prosecutor must not act from mere conjecture, impulse, or passion, or upon suspicion not warranted by facts or by appearances which would seem to a reasonable man indicative of guilt or liability. What proof will be sufficient to show the existence or absence of probable cause will depend chiefly upon the circumstances of each particular case. A discharge by the examining magistrate of a person apprehended upon a criminal charge is *prima facie* evidence of the want of probable cause, and is sufficient to throw the burden of proving the contrary upon the defendant. The same is true if the suit complained of as malicious was voluntarily discontinued. But the mere omission or neglect to prosecute a suit commenced does not of itself afford adequate evidence that there was no reasonable ground for the prosecution. Nor is the acquittal of a person prosecuted adequate evidence that no probable cause existed, for the party making the charge might have adduced evidence which considered by itself would have constituted a reasonable justification of his action, but was contradicted and nullified at the trial; or he may have been compelled to abandon the prosecution by reason of the death or absence of witnesses or the difficulty of procuring sufficient legal proof. But if the trial resulted in conviction or in a judgment in the plaintiff's favor, and no appeal has been taken from the judgment, there is conclusive evidence of probable cause. If, however, the judgment be reversed upon appeal, upon the ground that it was procured by fraud, conspiracy, perjury, or other like means which prevented a trial upon the merits and misled the jury, it ceases to be adequate proof that probable cause existed. But if the ground of reversal be of a different character, this result will not follow, for if the case were fairly tried, and the jury concluded from a survey of the evidence that the charge was substantiated, their concurrence is adequate to establish the fact that the action of the prosecutor, though it may have been erroneous, was based upon reasonable grounds. These are the rules generally sustained by the more recent decisions, though the authorities are not in entire accord upon the subject. If a prosecution be undertaken in accordance with the advice of counsel, this will be sufficient evidence of probable cause, provided a full and fair statement of the facts of the case is made to the counsel, and his advice is based upon the information which he thus receives. But if the client mislead his counsel by fraudulent misstatements or the suppression of important facts, or by giving him erroneous impressions in regard to the matter in controversy, the advice given will furnish no defence to the action for malicious prosecution. Malice is a question of fact to be determined by the jury; probable cause is a mixed question of law and of fact. When the facts are in dispute, it is the duty of the court to instruct the jury what facts if established will constitute a probable cause for the prosecution, and to submit to them only the question as to the existence of those facts. But where there is no conflict as to the circumstances, the question is one of law to be determined exclusively by the court.

(3) The rule that the plaintiff must prove a termination of the previous prosecution in his favor grows out of the doctrine that the existence of probable cause is a complete defence to the action. For until the proceedings are ended, there is a possibility that they may result adversely to the party prosecuted, and if such were the case the existence of probable cause would be fully established. It is not necessary, however, that the prosecution be brought to trial, for it may be sufficiently terminated at an earlier stage. It is only requisite that the proceeding be so far ended that nothing more can be done by the prosecutor without commencing anew. But if the case be actually tried, an acquittal of the party prosecuted must be shown. If a *nolle prosequi* be entered upon an indictment by the prosecuting attorney representing the government, this will not be a sufficient termination; for the finding of the grand jury is some evidence of probable cause, and another indictment may still be found upon the same complaint. Some authorities hold that a *nolle prosequi* does not even terminate proceedings upon the indictment on which it is entered, but that it may in process of law be withdrawn. If the prosecution is commenced by complaint to a magistrate who has jurisdiction only to bind over or to discharge, it will be sufficiently ended by an abandonment of the charge and a discontinuance of the prosecution by the party instituting it. The discharge of the accused in such a case is equivalent to an acquittal. If the accused, after being arrested, is discharged by reason of the grand jury's finding no indictment, this shows a legal end to the prosecution. When the suit complained of is a civil action, a voluntary discontinuance thereof by the plaintiff, or a discharge of the defendant without judgment or verdict, is a sufficient termination of the suit.

Analogous to the action for malicious prosecution is the action for "malicious abuse of legal process," as the offence is called. This consists in making use of legal process for some unjustifiable and unauthorized purpose, as by extorting money from a person illegally, or by compelling the delivery of property which the process does not require to be attached or seized. To maintain an action for this injury it is not necessary to prove that the process improperly employed is at an end, nor that it was sued out without reasonable or probable cause. No probable cause can exist for such an act, and the fact that this justification is lacking, therefore, does not need to be established by positive evidence, being conclusively presumed from the wrongful nature of the act itself. On the same ground also the existence of a malicious intent is inferable.

(For the general rules as to the damages to be given in actions see the article MEASURE OF DAMAGES. Consult on this subject the works of Hilliard and Addison on *Torts*.)

GEORGE CHASE. REVISED BY T. W. DWIGHT.

Malignant Diseases. See CANCER.

Malig′nant Pus′tule, a disease communicable from the lower animals to man (and especially from horned cattle), though sometimes, apparently, originating in man without contagion. It is apparently the same as "black quarter" in neat cattle and "murrain" in sheep. It sometimes attacks those who handle the hides, and especially the hair, of the lower animals; and is believed to be sometimes propagated by insects, which, flying from the animal which is diseased, may alight upon some abrasion or pimple on the skin of a human subject, and thus transmit the disease. In its inception it resembles a boil, or sometimes a carbuncle, seldom very painful; the pustule soon becomes the seat of gangrene, sometimes emitting a remarkable fetor; there is an intense fever, with profound septic symptoms; and unless active treatment be employed death is certain to follow; which, indeed, is often the case with the best treatment. To be effectual the treatment should be undertaken early. But, unfortunately, it is often impossible to distinguish the disease early, unless it assumes a quasi-epidemic character, as sometimes happens. The use of powerful caustics upon the pustule, with general stimulants, tonics, and concentrated food, is sometimes effectual in saving life.

Malines. See MECHLIN.

Mal′lard, or **Greenhead,** the most common wild-duck in North America and Europe (*Anas boschas*). It is the original from whence have sprung all the varieties of the domestic duck, excepting some which are bred in China and Japan. It is nearly two feet long, and has a grass-green neck and head, with a tint of violet; a white ring around the neck, brownish chestnut below. The speculum is a violet purple. It is strictly monogamous, unlike the common domestic duck. (See DUCK.)

Mallard Creek, tp., Mecklenburg co., N. C. Pop. 1436.

Malleability. See METALS, by PROF. H. B. CORNWALL.

Mal′leus (in comparative anatomy), [Lat., "hammer"], a small bone forming one of the chain of three bones in the internal ear of mammals, but morphologically answering to the quadrate bone with which the lower jaw articulates in the Ichthyopsida and Sauropsida.

Malleus (in zoology), [Lat., "hammer"], a genus of monomyarian lamellibranch mollusks, closely allied to the pearl-oysters, and with them belonging to the family Pteriidæ (Aviculidæ), or wing-shells.

Mal'lory, tp. of Clayton co., Ia. Pop. 945.

Mal'lory (STEPHEN R.), b. in Nassau, N. P., in 1810, was the son of a shipmaster of Connecticut; settled with his mother at Key West, Fla., in 1821; was educated at the North; admitted to the bar at Key West in 1833; was inspector of customs under Jackson, and became county judge and judge of probate for Taylor co., Fla.; became in 1845 collector of the port of Key West; was U. S. Senator from Florida 1851–61; became secretary of the Confederate navy. After the war he was imprisoned, released on parole in 1866, and pardoned in 1867 by Pres. Johnson. He afterwards practised law in Pensacola, where he d. Nov. 9, 1873.

Mal'low. See MALVACEÆ.

Malmes'bury (JAMES **Harris**), K. B., FIRST EARL OF, b. in Salisbury, England, Apr. 21, 1746, was son of James Harris, the author of *Hermes;* studied at Oxford and Leyden; became secretary of legation at Madrid 1767; ambassador in Berlin 1772; in St. Petersburg 1777; at the Hague 1784; supported Fox in the House of Commons; knighted 1780; made a baron 1788 in reward for treaties of alliance negotiated with Holland and Prussia; was again ambassador in Berlin 1793; negotiated the marriage of the prince of Wales with Caroline of Brunswick 1794; was engaged in unsuccessful negotiations for peace with the French republic 1796–97; was created earl of Malmesbury and Viscount Fitz-Harris 1800. D. in London Nov. 20, 1820.

Malmes'bury (JAMES HOWARD **Harris**), THIRD EARL OF, grandson of the first earl, b. at London Mar. 25, 1807; studied at Eton; graduated at Oxford 1828; succeeded to the title Sept., 1841; was secretary of state for foreign affairs under the earl of Derby 1852, and again 1858–59; was lord keeper of the privy seal 1866–68; edited his grandfather's *Diaries and Correspondence* (4 vols., 1844), and published *The First Lord Malmesbury, his Family and Friends, a Series of Letters from 1745 to 1820* (2 vols., 1870).

Malmesbury, William of, b. in Somersetshire, England, about 1095; became a monk and librarian of the monastery at Malmesbury, whence he took his name, and wrote in Latin a historical work which, next to the *Saxon Chronicle*, is considered the most valuable authority for Anglo-Saxon times. D. in Malmesbury about 1143. His *History of the Kings of England*, and its continuation, the *Modern History*, were published in Latin by Sir Henry Savile (1596) and by T. D. Hardy (1840), and a translation of the former by Rev. John Sharpe appeared in 1815, and again in Bohn's "Antiquarian Library" (1847).

Mal'mö, town of Sweden, on the Sound, opposite to Copenhagen. Its fortifications, which date back to the fifteenth century, are now transformed into public promenades, and its manufactures of stockings, woollens, soap, gloves, and sugar, and its trade with Copenhagen and the Baltic ports, are steadily increasing. Pop. 27,485.

Malm'sey [Fr. *vin de Malvoisie*], originally a sweet white or red wine from Monembasia (or Napoli di Malvasia). The name afterwards came to be applied to other sweet Levantine wines, and still later to any other very sweet wines. It is at present applied especially to "malmsey madeira," a wine which is much weaker than standard madeira wine. It is understood that all wines of this class are produced from over-ripe and partly dried grapes. They have a peculiar bouquet. These wines are not now very popular.

Malone', tp. of Tazewell co., Ill. Pop. 710.

Malone, post-v. and tp., cap. of Franklin co., N. Y., on Salmon River and the Ogdensburg and Lake Champlain R. R., 60 miles from Ogdensburg, and an equal distance from Rouse's Point, in a fine agricultural district and centre of a large trade. The village has 2 banks, 2 newspapers, a hotel, and is engaged in manufactures. Pop. 7186. A. N. MERCHANT, ED. "FRANKLIN GAZETTE."

Malone (EDMOND), b. at Dublin, Ireland, Oct. 4, 1741; studied at Trinity College 1756; was called to the bar 1767; inherited a considerable fortune soon after, and thenceforth devoted himself to literary pursuits in London. He wrote on the Rowley poems (1782), edited the works of Sir Joshua Reynolds (1797), of Dryden (1800), and of W. G. Hamilton (1808), in each instance accompanied by a memoir, and published a *History of the English Stage* (1790), but is chiefly known by his exposure of Ireland's Shakspearean forgeries (1796), and by his critical edition of Shakspeare (11 vols., 1790). Hallam characterizes him as a dull commentator, but laborious and truth-loving. D. in London May 25, 1812.

Malpi'ghi (MARCELLO), b. near Bologna in 1628; held the chair of medicine successively at Bologna, Pisa, and Messina; was called to Rome in 1691 by Innocent XII. as his chief physician, and d. there Nov. 29, 1694. He was the first to apply the newly-invented microscope in the study of anatomy, and showed himself a sagacious observer. His principal discovery was that of the transition of the blood from the arteries to the veins, described in his *De Pulmonibus* (1661). Various parts of the epidermis, spleen, and kidneys bear still his name.

Malplaquet', a v. of France, in the department of Nord, famous for the battle which took place here (Sept. 11, 1709) between the French under Villars and the allied English, Dutch, and Austrians under Marlborough and Eugene, resulting in favor of the allies.

Malpractice. See JURISPRUDENCE, MEDICAL.

Malt [Ger. *Malz*, from *malen*, to "grind"] is barley which has been allowed to pass through the earlier stages of germination, and then dried to destroy its vitality and prevent further change. (See BEER.) C. F. CHANDLER.

Mal'ta, an island in the Mediterranean, belonging to Great Britain, situated in lat. 35° 53′ N. and lon. 14° 31′ E., 58 miles from Sicily and 180 from Africa. Area, 115 square miles. Pop. 139,502. The surface is elevated and rocky, and has only a shallow layer of soil, but it is well cultivated, and produces corn, cotton, figs, oranges, and grapes in abundance. The climate is hot, but healthy. Excellent marble is quarried. The chief importance, however, the island derives from its position as a station on the route from England *viâ* Egypt to India, and its most remarkable features are the immensely strong fortifications which the English have built around the capital, Valetta, the foundations of which were laid by the Knights of St. John. Malta was known to the Greeks under the name of Ogygia; it was the residence of the nymph Calypso, whose grotto is still shown. In the fourth century the Carthaginians colonized the island, but at the close of the Second Punic war it became a Roman possession. In 56 A. D. Paul was shipwrecked here, and the legend tells us that he founded the first Christian congregation here. After the fall of the East Roman empire the island was conquered by the Vandals in 454, the Goths in 494, the Byzantines in 533, the Arabs in 870, and the Normans in 1090, who united it to Sicily. In 1530, Charles V. gave it to the knights of the order of St. John of Jerusalem, who shortly before had been driven by the Turks from Rhodes. Here, too, they were besieged by the Turks in 1557 and in 1565, but at the latter siege Sultan Solyman was compelled to re-embark with a loss of over 25,000 of his best troops. In 1798, Bonaparte took the island by treachery; in 1800 it was taken by the English, and they have held it since. (See VALETTA.)

Malta, post-v. and tp. of De Kalb co., Ill., on the Chicago and North-western R. R. Pop. 1157.

Malta, post-tp. of Saratoga co., N. Y., on the W. bank of Saratoga Lake. It has 5 churches. Pop. 1212.

Malta, post-v. and tp. of Morgan co., O., on the Muskingum River, opposite McConnelsville. Pop. of v. 513; of tp. 1625.

Malta Bend, post-v. of Saline co., Mo., 1½ miles from the Missouri River.

Malte-Brun', b. at Thisted, Jutland, Aug. 12, 1775; his true name was MALTE CONRAD BRUUN. He was destined for the Church, but preferred literature, theatricals, and politics, and very early in his life became the favorite in all literary circles in Copenhagen. The boldness, however, with which he advocated the principles of the French Revolution, and the rather unprincipled violence with which he attacked the state of affairs in Denmark, caused considerable excitement, and after several conflicts with the government he was exiled. He went to Paris, where he applied himself with zeal to the study of geography and politics. D. Dec. 14, 1826. For several years he was joint editor of *Journal des Débats*, and several of the papers he wrote for this journal have been collected and republished by Nachet. But his fame rests on his geographical works. From 1803–05 he published, in connection with Mentelle, *Géographie, Mathématique, Physique et Politique*, in 16 vols., and from 1810 to 1825 he published his *Précis de Géographie Universelle.* Geography was at the beginning of this century something almost unknown. Voltaire had told his readers that Copenhagen was a city in Skaane, and nobody laughed at him. But Napoleon's campaigns roused attention at once to this branch of knowledge; they made geography a necessary element of a man's education, and to this new want Malte-Brun administered with great talent and earnestness. CLEMENS PETERSEN.

Maltha [Gr. μάλθα], a name originally given to a mineral tallow from Kirwan, which resembles wax, and prob-

ably consists of paraffine. It has been more recently applied to certain varieties of mineral oil. (See PETROLEUM.)
C. F. CHANDLER.

Mal'thus (THOMAS ROBERT), b. at the Rookery in Albury, Surrey co., England, in 1766. His father was a gentleman of good family and independent fortune, of considerable classical and philosophical culture. He kept his son under private tuition from the age of nine or ten till he was admitted at Jesus College, Cambridge, in 1784. There the young man attained a high standing as a classical scholar, won prizes for declamation, and in 1788 graduated with the honors of ninth wrangler. He gave himself to the cultivation of history, literature, and poetry for a few years. In 1797 he received his master's degree and a fellowship at Cambridge. About the same time he was admitted to holy orders, and took the charge of a small parish in Surrey, dividing his time between parochial duties there and his studies in the university. In 1798 the first edition of his work on population was published anonymously—*An Essay on the Principles of Population as it Affects the Future Improvement of Society, with Remarks on the Speculations of Mr. Godwin, Condorcet, and other Writers* (1 vol., 8vo). This work created quite a sensation at the time, and gained for Malthus his chief reputation. It went through several editions, the last of which appeared in 1826 under the modified title, *An Essay on the Principles of Population, or a View of its Past and Present Effects on Human Happiness, with an Inquiry into our Prospects respecting the Future Removal or Mitigation of the Evils which it occasions.* Its leading idea is, that population unchecked increases in a geometrical ratio, while food can be made to increase at least only in an arithmetical ratio. Hence the inference, that in order to avoid the evils of a population in excess of support, some checks must be applied to the increase of population. Vice and misery, shortening human life, come in as natural checks. That which is most insisted on in the essay is the moral check of abstinence from marriage and sexual intercourse on prudential considerations. The facts and reasonings of Malthus on the subject have been disputed and opposed by both economists and moralists. The theory disregards the vast undeveloped resources of that large portion of the earth's surface which is still uncultivated, and the effect of freedom of emigration and commercial intercourse between different parts of the world, the facilities for which have been greatly multiplied in the half century since the essay appeared. (For further discussion of the subject see POPULATION.) In 1799, Malthus travelled through Sweden, Norway, Finland, and a part of Russia, and during the interval of peace in 1802 through France and Switzerland, gathering by direct observation facts bearing on his favorite subject. He married in 1805, and the same year received the appointment of professor of history and political economy in the East India College at Haileybury, in which position he continued till his death. The other published writings of Malthus are—*Observations on the Effects of the Corn Laws, An Inquiry into the Nature and Progress of Rent* (1815), *Principles of Political Economy* (1820), and *Definitions in Political Economy* (1827). None of these have attracted much attention. Mr. Malthus passed the later years of his life in his family, occupied with his clerical and official duties. He was honored by sovereigns and scientific societies, particularly the National Institute at Paris and the Royal Academy of Sciences at Berlin. D. at Bath, of an affection of the heart, Dec. 29, 1834.
A. L. CHAPIN.

Malus' (ÉTIENNE-LOUIS), b. at Paris July 23, 1775; studied mathematics and engineering at Mézières, and afterwards at the École Polytechnique; was employed in the reconstruction of the fortifications of Antwerp and Kehl; became examiner at the École Polytechnique in 1811, and d. at Paris Feb. 23, 1812. He was the discoverer of the polarization of light by reflection, and his memoir on the subject, entitled *Sur une Propriété de la Lumière réfléchie par les Corps diaphanes*, received a prize from the Academy.

Malva'ceæ [Gr. μαλάχη, "mallow"], an important but not very large order of dicotyledonous plants, in habit either herbaceous or shrubby, only in the tropics attaining the dignity of trees. The order is largely dispersed over the globe, but is chiefly warm, temperate, and tropical. The species are most abundant in America, but the most useful plants are all natives of the Eastern continent. There are, in all, nearly 1000 species. These have a great general similarity to each other in appearance and in properties, and are all innocuous and mucilaginous. The mucilage abounds in the roots of the herbaceous species, and makes these valuable for various medicinal purposes—to allay irritation or to serve as an emollient. The well-known marshmallow (*Althæa officinalis*) is thus used in Europe. The seeds of all contain a fixed oil; that of cotton-seed is used in the arts. The flowers of Malvaceæ are often beautiful, but sometimes fugitive. This fact, which would be an important drawback to their use as ornamental plants, is compensated for by the rapid and long-continued succession of blossoms during the flowering season. The hollyhock, for instance, presents for a long period in summer large and showy flowers of red, yellow, white, or purple hues. It is the *Althæa rosea* of botanists. The natural group Columniferæ, established by Linnæus, to which the Malvaceæ belong, is very decided in its characters. The plants agree in having the calyx valvate, and the corolla convolute in æstivation; the stamens usually monadelphous in a column, and the embryo large, with foliaceous cotyledons. The leaves are alternate, and furnished with stipules. The true mallow family is readily separable from the remainder of the group by its strictly monadelphous stamens, one-celled reniform anthers, and simple leaves. The anthers open by a longitudinal slit at the top. The flowers are regular, and generally large, furnished, as a rule, with an involucre like a sort of outside calyx. The true calyx consists of five sepals, more or less united at the base. The petals are of the same number. Ovaries united in a ring, or forming a several-seeded capsule. The flower-stalks have a joint just beneath the flower. The pubescence is stellate. The bark is tough and fibrous. The leaves are petioled, palmately-veined and lobed. The stipules are sometimes deciduous. All the Malvaceæ have globose pollen, beset with minute hairs, and the flowers are with one exception (*Napæa*) hermaphrodite. The rounded fruits of *Malva rotundifolia*, remarkable for the elegance of their outline, are known as "cheeses," and by the French as *fromagions*. The leaves of this species and of *Malva sylvestris* were used by the Romans as salad, and are still employed for this purpose in some portions of Europe. The elongated young capsules of *Hibiscus esculentus*, forming the ochra or gumbo, are used in thickening soups. The showy, deep-red corolla of *Hibiscus rosa-Sinensis* is used by the Chinese for imparting a black tint to their shoes and eyebrows. Cordage is produced by several species of Malvaceæ. The whips with which the negro slaves of the West Indies were punished were made of the fibres of *Hibiscus arboreus*. Cuba bast, familiar to gardeners and cigar-makers, is the inner bark of *Hibiscus tiliaceus*. All these economic uses are insignificant in comparison with those which the one genus *Gossypium* offers. There are many species of the genus, but the best known is the *Gossypium herbaceum* or cotton-plant, so largely grown in our Southern States, and so important in commerce and manufactures. It is a native of Asia. The hairy or flocculent covering of the seeds yields the familiar fibre.
W. W. BAILEY.

Mal'vern, post-v. of Mills co., Ia., on the Burlington and Missouri River R. R., 28 miles E. of Council Bluffs. It has 4 churches, 1 high school, 1 weekly newspaper, a national bank, a savings bank, 2 hotels, 2 elevators, 1 wagon manufactory, and a number of stores. It is surrounded by a rich agricultural district. Pop. about 720.
ROBERT AITON, ED. "MILLS CO. CHRONICLE."

Malvern, post-v. of Brown tp., Carroll co., O., on the Cleveland and Pittsburg R. R. (Tuscarawas branch), and on Big Sandy Creek. Pop. 269.

Malvern, Great, town of England, in Worcestershire, on the eastern side of the Malvern Hills, and celebrated as a watering-place, the waters of its springs being much recommended for certain skin diseases. It has an interesting church in Gothic style of the time of Henry VII., and 7825 inhabitants.

Malvern Hill, Va., an elevated plateau about $1\frac{1}{2}$ miles by $\frac{3}{4}$ mile in area, near the James River, and the position occupied (June 30–July 1, 1862) by the Union army on its retreat after the battle of GAINES'S MILL (which see) from its position on the Chickahominy towards the banks of the James River. In front of the elevation are numerous defensible ravines, with ground sloping N. and E. to the woodland, allowing clear range for artillery in those directions, falling off more abruptly towards the N. W. into a ravine which leads to the James River. The left and centre of the Union lines rested on Malvern Hill, the right curved backward through a wooded country towards Haxall's, on the James. The plateau itself is well cleared of timber, with several converging roads running over it. The left wing of the Union army, being most exposed to attack, was strengthened by massing the troops here, and disposing the artillery so that a fire of sixty pieces could bear upon its front and left; several siege-guns were also got into position on the highest part of the hill. Towards 3 P. M. (July 1) the battle was commenced in earnest by the Confederates, who opened a heavy fire of artillery along the right of their lines, fol-

lowed by an assault of infantry, which fell upon Couch's division, by whom it was repulsed in disorder, the Federal lines advancing some 800 yards, and during which time a very effective fire was maintained by the Federal artillery. The attack was renewed by the Confederates about 6, with the whole strength of their artillery, upon the left of the Union lines, held by the divisions of Porter and Couch, followed at once by columns of infantry to carry the hill. Under cover of the woods column after column formed and started out at a run across the intervening opening, but were met in every case with an overwhelming fire from the batteries and infantry, and repelled with great loss, the desperate efforts of the Confederates being vainly continued until darkness put an end to the battle; the fire of the Union batteries did not cease until 9 P. M. During this battle the navy, under Com. Rodgers, maintained a constant and annoying fire of shells. Although the result of the battle was a decided victory, Gen. McClellan continued his retreat to the James, the army arriving in great disorder at Harrison's Landing on the day and evening of July 3. The loss on the Union side exceeded 300 killed and 1800 wounded, the Confederate loss being more than double.

Mamaka'ting, tp. of Sullivan co., N. Y., is mountainous, has several villages, and is traversed by Midland R. R. and by Delaware and Hudson Canal. Pop. 4866.

Mamar'oneck, post-v. and tp. of Westchester co., N. Y., on New York and New Haven R. R., and on Long Island Sound, 22 miles N. E. of New York. Pop. 1483.

Mame'li (GOFFREDO), surnamed "the Italian Körner," b. at Genoa in 1826, was the son of an admiral; d. in 1849 on the walls of Rome, bravely fighting against the French. His patriotic hymn, beginning with "Fratelli d'Italia," was the true Marseillaise of Italy during 1848 and 1849. Mazzini, who loved the young hero tenderly, has left this sketch of him: "Mameli was beautiful and graceful in person, of a very fair and ruddy complexion, with hair inclining to blonde. His eyes were flashing and full of command, and his expression, naturally sweet, became stern and determined whenever his mind was resolutely bent to accomplish an object."

Mamelle', tp of Craighead co., Ark. Pop. 496.

Mamelu'co [Sp.], in parts of South America, the offspring of a negro father and an Indian mother; called also *Cariboco* and *Zambo*.

Mam'elukes [Arab. *mamlûk*, a "slave"], a former class of slaves in Egypt, who became and long remained the dominant people of that country. The Mamelukes are mentioned before 950 A. D. In the twelfth century the sultan of Egypt bought of Genghis Khan 12,000 Circassian, Mingrelian, Tartar, and Turkish slaves. Soon after 1240, Malek Sulah made them his body-guard. In 1250 they killed Turan Shah and became masters of Egypt. Ibeg was the first sultan of the first (Baharite) or Tartar-Mameluke dynasty, which gave place in 1382 to the Borjite or Circassian-Mameluke dynasty. In 1517, Selim I. deprived them of the sultanate, but they retained much power, and gradually regained the virtual government of the country. The battle of the Pyramids (1798) demonstrated their excellence as cavalry soldiers, but almost annihilated them; and in 1811 the greater part of their number were massacred by Mehemet Ali. A small remnant escaped, and for a few years maintained themselves at New Dongola. The Mamelukes kept up their numbers by the purchase of Circassian and Georgian slaves. Their wives, of the same stock, and also acquired by purchase, usually proved childless in the untoward climate of Egypt. Their inheritance was therefore usually from master to slave, instead of from father to son. The Egyptian-born Mamelukes were, as a rule, feeble and short-lived, and generally childless. The Mamelukes of New Dongola were exterminated in 1820.

Mamers', town of France, department of Sarthe, has manufactures of linens, calicoes, serges, etc. Pop. 5839.

Mamia'ni (TERENZIO), COUNT, b. at Pesaro in 1800; educated in Rome by the Jesuits, and became in 1831 a member of the revolutionary provisional government of Bologna. Being afterwards proscribed, he was captured by an Austrian vessel in the waters of Ancona, was conducted to Venice, where he was kept a prisoner four months, and then allowed to retire to France. He remained at Paris, devoting himself to philosophical and literary studies until 1847. In 1848, Pius IX. named him minister of the interior, and after the death of Pelegrino Rossi he assumed, temporarily, the duties of minister of foreign affairs. Having been elected deputy to the Roman constituent assembly, Mamiani voted against the republic. On the arrival of the French he retired to Genoa, where he founded the Academia di Filosofia Italica. In 1859 he was elected deputy to Parliament, and afterwards appointed senator. In 1860 he became minister of public instruction, occupying at the same time the chair of philosophy and of history in the University of Turin. Afterwards he was sent as minister from Italy to Athens. He now (1875) presides in Rome over the superior council of public instruction and edits a philosophical review. His principal writings (besides a volume of poems, in which the sacred hymns are particularly noteworthy) are the following philosophical works: *Rinnovamento della Filosofia Antica Italiana* (Paris, 1834), *Dialoghi di Scienza* (Paris, 1848), *Le Confessioni di un Metafisico* (Florence, Barbera), *Le Meditazioni Cartesiane* (Florence, Barbera), *D'un nuovo Diritto Europeo* (Turin, 1859).

Mammal'ogy [a hybrid word, compounded by ellipsis from MAMMALIA (which see) and λόγος], or **Theriol'ogy** [from the Greek θηρίον, "animal," and λόγος, a "discourse"], that branch of zoology which treats of the mammals. The word "mammal" is of comparatively recent coinage, and was the outcome of the scientific recognition of the organic similarity of the several forms comprised under that name.

The close relations of those several types were not appreciated by the older naturalists. It has often, indeed, been asserted that Aristotle fully recognized the class with its present limits under the name *zootoka*, but this statement is quite erroneous, inasmuch as Aristotle by the term zootoka simply meant to include all those vertebrates which are viviparous, including thus, besides the mammals, certain reptiles and fishes. In fact, he widely separated the terrestrial and quadruped mammals from the aquatic and fishlike forms: in his second book he enumerated (1) man, (2) quadrupeds, (3) birds, (4) fishes (including selachians), (5) whales, (6) serpents, and (7) the crocodile, in the sequence indicated; and this seems to have expressed, as nearly as may be, his vague ideas as to their relations. The statements frequently made respecting his classification of the mammals are equally baseless, and it is evident that he simply intended to describe the superficial prominent characteristics of the groups which he is credited as having recognized. The successors of Aristotle and the naturalists of the Middle Ages, as well as those that flourished up to the seventeenth century, were equally devoid of any scientific ideas respecting the class.

In 1693, John Ray, an English clergyman, published a work * which contains the best attempt at classification that had been up to that time proposed. In this attempt he dichotomously divided the viviparous quadrupeds—(1) into (*a*) Ungulata, including most of the true ungulates, and (*b*) Unguiculata, including all the others, as well as the camels, which are true ungulates, and the elephants, which have the essential characteristics of ungulates; (2) the Unguiculata were divided into (*a*) those whose feet were bifid, including the camels, and (*b*) those whose feet were multifid; (3) the latter were subdivided into (*a*) those with undivided digits, as the elephant, and (*b*) those with separate digits, as in all others; (4) the latter were again distinguished into (*a*) those with flat nails, as the apes, and (*b*) those with compressed claws, as in the remaining species; (5) these last into those with several incisors, as in most, or with two incisors in each jaw, as in rodents; (6) finally, the first section was divided according to size, (*a*) the larger species (Felidæ and Canidæ) being grouped together on the one hand, and (*b*) the smaller (Mustelidæ) on the other. This will suffice to show the inaptness of the classification.

Linnæus, in the early editions of his *Systema Naturæ*, adopted the prevalent ideas of classification, and accepted the name Quadrupedia for the four-footed mammals, and confounded the mutilate or fish-like types with the true fishes. In those early editions he divided the Quadrupedia into orders distinguished chiefly by their dentition and feet; these were (1) Anthropomorpha, (2) Feræ (afterwards divided into Feræ and Agriæ), (3) Glires, (4) Jumenta, and (5) Pecora. In the tenth edition,† published in 1766, he for the first time combined together in one class the quadruped and mutilate mammals, and gave to this new group the name "Mammalia," in allusion to the development of the mammary glands in all the members of the class. This is the first great scientific advance that was made in the improvement of their classification. He then divided the class into seven orders—viz. (1) Primata, (2) Bruta, (3) Feræ, (4) Glires, (5) Pecora, (6) Bellua, and (7) Cete. Of these the first, second, third, and fourth were combined under the name Unguiculata, the fifth and sixth as Ungulata, and the seventh (Cete) was contrasted with the others under the name Mutica.

* *Synopsis methodica Animalium Quadrupedum et serpentini Generis* (Londini, 1693).

† *Caroli Linnæi, etc., Systema Naturæ per Regna tria Naturæ, secundum classes, ordines, genera, species, etc.* (*editio decima, Holmiæ*, 1758).

It is, however, proper to recall that Brisson* in 1756 had recognized the intimate relationship of the viviparous quadrupeds and cetaceans, and had approximated them as allied but distinct classes. The class of quadrupeds was divided into eighteen orders, based upon various characters, the first to third being Bruta; the fourth to fifth, Pecora; the sixth to eleventh, Belluæ; the twelfth, Glires and Agriæ; the thirteenth and fourteenth, Primates; and the fifteenth and sixteenth Feræ, of the Linnæan arrangement; while the seventeenth was proposed for the genus Talpa, and the eighteenth for Philander (= Didelphis).

Passing over several authors who are generally referred to, but who are unworthy of special mention in this historical sketch, we come to Vicq d'Azyr. Inasmuch as he introduced groups with the terminations of families into the class; as many of these groups were approximately coequal with now recognized families; and as it doubtless influenced the subsequent course of mammalogy, his system for these reasons is worthy of detail. In 1792, in one of the series of volumes of the *Encyclopédie Méthodique*,† he published and adopted, in great part from Daubenton, the characteristics of his system; reversing the names *class* and *order*, he employed the latter for the higher group and the former for the subordinate ones. The mammals, exclusive of the cetaceans, were primarily divided into two orders—man (*l'homme*) and animals (*les animaux*). The order of animals or viviparous quadrupeds was divided into fifteen "classes" (*i. e.* orders)—viz.:

I. Pédimanes (Pedimani), with the genera Singes, Makis, Loricans, Tarsiens (Tarsii), and Boursons (Marsupiales).

II. Rongeurs (Rodentes), with the genera Sciuriens (Sciurii), Ecureuils volans (Sciuri volantes), Glirins (Glirini), Murins (Murini), Surmurins (Surmurini), Essorillés (Inauriti), Planiqueues (Planicaudati), Sauteurs (Saltatores), Double-dents (Duplici-dentes), Epineux (Spinosi).

III. Alie-pieds (Pteropodii).

IV. Taupins (Talpii).

V. Soriciens (Soricii).

VI. Edentés (Edentati), with the genera Paresseux (Pigri), Cuirassés (Loricati), Mangeurs de fourmis (Myrmecophagi), and Ecailleux (Squammei).

VII. Carnivores (Carnivori), with the genera Oursinins (Ursini), Mustelins (Mustelini), Ichneumons (Ichneumoni), Felins (Felini), Hyænins (Hyænini), Canins (Canini), and Loutrins (Lutrini).

VIII. Empêtrés (Involuti) with the genera Phocins (Phocini), Manatins (Manatini), and Rosmariens (Rosmarii).

IX. Chevaux-d'eau (Hippopotamii).

X. Elephantins (Elephantini).

XI. Tapiriens (Tapiri).

XII. Rhinocéros (Rhinoceri).

XIII. Porcins (Porcini).

XIV. Ruminans (Ruminantes), with the genera Branchus (Ramosi) and Cornus (Cornuti).

XV. Solipèdes (Solipedes).

It should be added that the nomenclature of the species is not binomial, the names being the current vernacular terms, or Gallicized, and the generic designations not being used in the singular number.

In 1811, Illiger, in his *Prodromus Systematis*,‡ published a system which demands notice, inasmuch as it is always referred to in the histories of the science, and really contains some features of special interest. He fundamentally differed from his predecessors in the arrangement, dividing the class into 14 orders and 39 families, and was the first to distinguish orders and families with anything like the limits now understood in the class. His system in brief, with the orders and families, is as follows, the representation of the families by those now admitted being indicated in brackets when they are at all similar with natural groups:

Order I. Erecta, with family 1, Erecta [Hominidæ].

Order II. Pollicata, with families 2, Quadrumana [Anthropoidea]; 3, Prosimii [Lemuridæ]; 4, Macrotarsi [=Tarsiidæ + Lemuridæ galagininæ]; 5, Leptodactyla [Daubentoniidæ]; 6, Marsupialia.

Order III. Salientia, with family 7, Salientia [= Macropodidæ].

Order IV. Prensiculentia, with families 8, Macropoda; 9, Agilia; 10, Murina; 11, Cunicularia; 12, Palmipeda; 13, Aculeata; 14, Duplicidentati; 15, Subungulata.

Order V. Multungula, with families 16, Lamnunguia [= Hyracidæ]; 17, Proboscidea [= Elephantidæ]; 18, Nasicornia [= Rhinocertidæ]; 19, Obesa [= Hippopotamidæ]; 20, Nasuta [= Tapiridæ]; 21, Setigera [= Suidæ, etc.].

Order VI. Solidungula, with family 22, Solidungula [= Equidæ].

Order VII. Bisulca, with families 23, Tylopoda [=Camelidæ]; 24, Devexa [= Giraffidæ]; 25, Capreoli [= Cervidæ, etc.]; 26, Cavicornia [= Bovidæ].

Order VIII. Tardigrada, with family 27, Tardigrada [= Bradypodidæ, etc.].

Order IX. Effodentia, with families 28, Cingulata [= Dasypodidæ]; 29 Vermilinguia [= Myrmecophagidæ].

Order X. Reptantia, with family 30, Reptantia [= Monotremata].

Order XI. Volitantia, with families 31, Dermoptera [= Galeopithecidæ]; and 32, Cheiroptera.

Order XII. Falculata, with families 33, Subterranea [Insectivora vera]; 34, Plantigrada; 35, Sanguinaria; 36, Gracilia.

Order XIII. Pinnipedia, with family 37, Pinnipedia.

Order XIV. Natantia, with families 38, Sirenia; and 39, Cete.

No natural groups, except such as are superficially defined, were recognized in this classification, and the approximation, as well as severance, of forms did equal violence to true method. It will be noticed that he applied first the name "Marsupialia" to a group, but the little credit due him for this will be apparent when it is noticed that he associated the group so called by him in the same order with the monkeys, and distinct from the kangaroos. He is, however, entitled to the credit of having recognized and tolerably well defined a number of genera (over 40), for which he has coined euphonious names.

In 1798 and succeeding years Cuvier worked on the classification of the mammals; and in 1816,§ in the first edition of his *Règne animal*, recognized eight orders, with families and tribes—viz. (1) les Bimanes, ou l'homme; (2) les Quadrumanes; (3) les Carnassiers, with four families (1, les Cheiroptères, 2, les Insectivores, 3, les Carnivores—this with three tribes, les Plantigrades, les Digitigrades, and les Amphibies—and 4, les Marsupiaux, ou animaux à bourse); (4) les Rongeurs; (5) les Edentés, with three tribes (les Tardigrades, les Edentés ordinaires, and les Monotrêmes); (6) les Pachydermes, with three families (les Proboscidiens, les Pachydermes ordinaires, and les Solipèdes); (7) les Ruminans (Pecora, L.); and (8) les Cétacés, with two families (les Cétacés herbivores and les Cétacés ordinaires). It will be thus seen that the groups called "families" by Cuvier are very different from those designated by the same term by modern naturalists, and that they rather correspond, in extent, to sub-orders. There is little that indicates improvement in this classification, save the recognition of the marsupials as a natural group; and even this group is inadequately valued. The separation of man from the Primates is a backward step we should scarcely expect in so able an anatomist. In 1829, in the second edition of the *Règne animal*, he raised the "Marsupiaux" to the rank of an order interposed between the "Carnassiers" and "Rongeurs."

A far superior classification was that which appeared (also in 1816) from the pen of De Blainville,‖ the celebrated antagonist of Cuvier. This naturalist recognized a number of types around which he congregated the various forms of animals. The mammals were primarily separated into two sub-classes: (1) Monodelphes and (2) Didelphes, but it was suggested that the latter should be subdivided, and that the Echidnas, etc. should form a distinct sub-class—a suggestion that was afterwards carried out by himself. In brief, his classification was as follows:

Sous-classe I. Monodelphes.

- I[er] degré d'organisation, ou ordre. Quadrumanes?
  - Normaux: Singes du continent ancien = Pitheci, les Singes; Singes du continent nouveau = Pitheciæ, les Sapajous; Makis = Pithecoides, viz. les Makis, les Loris, l'Aye-Aye.
  - Anomaux: Pour le vol, Galeopithèques; pour grimper, Tardegrades.
- II[e] degré d'organisation, ou ordre. Les Carnassiers?
  - Normaux: Plantigrades = Omnivores; Digitigrades = Carnivores; Insectivores.
  - Anomaux: Pour volor, les Cheiroptères; pour fouir, les Taupes; pour nager, les Phoques.
- III[e] degré d'organisation, ou ordre. Les *Édentés?*
  - Normaux = *Édentés;* Anomaux = Pour nager, Cétacés.
- IV[e] degré d'organisation, ou ordre. Les Rongeurs? ou Célérigrades, Grimpeurs, Fouisseurs, Coureurs, Marcheurs.
- V[e] degré d'organisation, ou ordre. Les Gravigrades = Elephans.

* *Le Règne animal divisé en IX. classes, etc.* (Paris, 1756).

† *Système anatomique: Quadrupèdes* (Paris, 1792), *Encyclopédie Méthodique.*

‡ *Prodromus Systematis Mammalium et Avium, etc.* (Berolini, 1811).

§ *Le Règne animal, distribuée d'après son Organisation, etc.* (Paris, 1817, t. i.).

‖ *Prodrome d'une nouvelle Distribution systematique du Règne animal*, in *Bull. Scienc. Soc. Philom.* (1816, pp. 105–124).

VI^e degré d'organisation, ou ordre. Les Ongulogrades.
Normaux: Doigts impairs = Pachidermes et Solipèdes; Doigts pairs = Brutis ou non Ruminans, et Ruminans.
Anomaux: Pour nager. Les Lamantins.
Sous-classe II. Didelphes.
Normaux: Carnassiers, Rongeurs.
Anomaux: Pour fouir, l'Echidné; pour nager, l'Ornithorinque.

Besides the improvement evinced in the separation of the class into the primary categories, special attention is called to the classification of the hoofed mammals, and the recognition of the elephants as one distinct order, and the typical ungulates as another (marred, however, by the inclusion of the sirenians). The order "Ongulogrades" was also very naturally subdivided. A less trustworthy, and indeed vicious, innovation was the inclusion of the true edentates and cetaceans in one order, but it was suggested that they should be differentiated as distinct orders. On the whole, this classification exhibits a more decided advance than any since the foundation of the class by Linnæus.

In 1821, J. E. Gray published a new scheme of classification of the mammals,* distinguished by many eccentricities, and unworthy of mention but for the fact that he, for the first time, introduced the names of most of the families in current use; he evidently adopted, but without credit, the suggestion of William Kirby, made in 1811, to introduce a regular system of families, with terminations in "*-idæ,*" in the zoological system. This article, notwithstanding its historical importance, has been almost overlooked on account of its mode of publication. The families, when superficially well distinguished, are often natural, but unless their characters are very obvious, the author almost always erred in his restrictions and applications of the groups. The following synopsis gives the names of the families, with the abundant errors observable in the orthography of the original, and will serve as a starting-point for the modern nomenclature:

Class I. Bimanes.

Ord. 1, Primates.

Class II. Quadrumanes.

Ord. 1, Platyonychæ, with families 1, Pithecidæ; 2, Cercopithecidæ; 3, Callitricidæ.
Ord. 2, Gampstonychæ, with family 1, Harpaladæ.
Ord. 3, Heteronychæ, with families 1, Lemuridæ, and 2, Loridæ.

Class III. Cheiroptera.

Ord. 1, Fructivoræ, with families 1, Pteropodidæ, and 2, Cephalotidæ.
Ord. 2, Insectivoræ, with families 1, Noctilionidæ, and 2, Vespertilionidæ.

Class IV. Quadripedes.—*Sub-class* 1, *Unguiculata.*

Ord. 1, Pterophoræ, with family 1, Galeopithecidæ.
Ord. 2, Plantigradæ, with families 1, Erinacidæ; 2, Soricidæ; 3, Myaladæ; 4, Tenrecidæ; 5, Ursinidæ.
Ord. 3, Digitigradæ, with families 1, Mustelladæ; 2, Canidæ; 3, Viveridæ; 4, Hyænadæ, and 5, Felidæ.
Ord. 4, Amphibiæ, with families 1, Phocadæ; 2, Trichecidæ.
Ord. 5, Rosores, with families 1, Castoridæ; 2, Arvicolidæ; *2*, Myosidæ; 4, Dipsidæ; 5, Muridæ; 6, Spalacidæ; 7, Halamydæ; 8, Arctomydæ; 9, Sciuridæ; 10, Histricidæ; 11, Leporidæ; 12, Caviadæ; and 13, Agoutidæ.
Ord. 6, Tardigradæ, with family 1, Bradypidæ.
Ord. 7, Oligodontæ, with families 1, Megatheriadæ; 2, Dasipidæ; and 3, Orycteropidæ.
Ord. 8, Edentulæ, with family Manidæ.

Class IV. Quadripedes.—*Sub-class* 2, *Ungulata.*

Ord. 9, Proboscidiæ, with families 1, Elephantidæ, and 2, Mastodonadæ.
Ord. 10, Tesserachenæ, with families 1, Hippopotamidæ; 2, Suidæ; and 3, Anoplotheriadæ.
Ord. 11, Trichenæ, with families 1, Rhynocerotidæ; 2, Hyracidæ; and 3, Taperidæ.
Ord. 12, Monochenæ, with family 1, Equidæ.
Ord. *12*, Hydrophoræ, with family Camelidæ.
Ord. 13, Ruminantes, with families 1, Moschidæ; 2, Cervidæ; 4, Giraffidæ; *4*, Antilopidæ; 5, Capridæ, and 6, Bovidæ.

Class V. Pedimanes.

Ord. 1, Feræ, with families 1, Didelphidæ; 2, Phalangistadæ.
Ord. 2, Brutæ, with families 1, Potoridæ; 2, Macropidæ; and 3, Koladæ.
Ord. 3, Glires, with family Phascolomidæ.
Ord. 4, Rosores, with family 1, Cheiromydæ.

Class VI. Cetacæ.

Ord. 1, Herbivoræ, with families 1, Manatidæ; 2, Dugongidæ.
Ord. 2, Carnivoræ, with families 1, Delphinidæ; 2, Monodontidæ; 3, Physeteridæ; 4, Balanadæ.

In 1825, Gray, entirely casting aside his previous classification, proposed a new one, radically different.† The explanation of this may be found in the fact that William Sharp MacLeay had originated a fantastic theory—that the entire animal kingdom was divided in a definite number of successive groups *ad infinitum;* that these groups were always five of a kind; each completing a circle of its own; and each with five constituents, representing, in an analogous manner, the five constituents of each of the other groups. Baseless as such an idea was, and strange as it may appear, it was widely accepted in England, and perhaps the majority of English naturalists gave their adherence to the wild chimera. Among these, to a limited extent, was Mr. Gray, who then divided the class of mammals into five orders, and those genera into five (or in one case six) families, etc. His classification in brief was as follows:

Order I. Primates, with families 1, Hominidæ; 2, Simiadæ; 3, Cebidæ; 4, Lemuridæ; 5, Galeopithecidæ; 6, Vespertilionidæ (with sub-families *a*, Phyllostomina, *b*, Rhinolophina, *c*, Vespertilionina, *d*, Noctilonina, *e*, Pteropina).

Order II. Feræ, with families 1, Felidæ (with sub-families *a*, Felina, *b*. Hyænina, *c*, Viverrina, *d*, Canina, *e*, Mustelina); 2, Ursidæ (with sub-families *a*, Ursina, *b*, Procyonina, *c*, Cercoleptina, *d*, Ailurina); 3, Talpidæ (with sub-families *a*, Talpina, *b*, Chrysochlorina, *c*, Tupaina, *d*, Erinacina, *e*, Centetina); 4, Macropidæ (with sub-families *a*, Phalangistina, *b*, Macropina, *c*, Peramelina, *d*, Dasyurina, *e*, Didelphina); 5, Phocidæ (with sub-families *a*, Stenorynchina, *b*, Phocina, *c*, Trichecina, *d*, Cystophorina, *e*, Otariarina).

Order III. Cete, with families 1, Balænidæ; 2, Delphinidæ; 3, Manatidæ; 4, Halicoridæ; 5, Rytinidæ.

Order IV. Glires, with families 1, Muridæ (with sub-families *a*, Murina, *b*, Arvicolina, *c*, Saccomyna, *d*, Castorina, *e*, Echimyma); 2, Hystricidæ (with sub-families *a*, Hystricina, *b*, Cercolabina, *c*, Dasyproctina, *d*, Hydrochœrina, *e*, Caviina); 3, Leporidæ; 4, Jerboidæ (with sub-families *a*, Chinchillina, *b*, Pedetina, *c*, Dipina, *d*, Myoxina, *e*, Sciurina); and 5, Aspalacidæ.

Order V. Ungulata, with families 1, Bovidæ (with sub-families *a*, Bovina, *b*, Camelopardina, *c*, Camelina, *d*, Moschina, *e*, Cervina); 2, Equidæ; 3, Elephantidæ (with sub-families *a*, Elephantina, *b*, Tapirina, *c*, Suina, *d*, Rhinocerina, *e*, Hippopotamina); 4, Dasypidæ (with sub-families *a*, Manina, *b*, Dasypina, *c*, Orycteropina, *d*, Myrmecophagina, *e*, Ornithorhynchina); 5, Bradypidæ.

One reason for referring to this is that it is an unexaggerated type of a series of classifications that were proposed in England and on the Continent with a numerical basis. But it is also more especially worthy of note, because in it were for the first time introduced sub-families with the uniform termination "*-ina.*" As to the procrustean number, it is sufficient to state that probably no idea has done more to retard and interfere with true method than this. The classifications of Oken, MacLeay, Swainson, Kaup, Fitzinger, etc.—all accepting this idea of dominance of some number (3 or 5)—may therefore be passed over as unworthy of further mention.

In 1837,‡ C. L. Bonaparte, prince of Musignano, availing himself of suggestions and information conveyed to him by Prof. Jourdan of the natural history museum of Lyons, proposed a remarkable arrangement of the mammals, dividing the class into two sub-classes: (1) Placentalia and (2) Ovovivipara. He distributed the placental mammals into orders characterized by the development of the brain. The first section, named *Educabilia,* was distinguished by the bi- or tri-lobate cerebrum, and included the orders Primates, Feræ, Pinnipedia, Cetacea, Belluæ, and Pecora; the second section, designated *Ineducabilia,* was characterized by the uni-lobate brain, and included the orders Bruta, Cheiroptera, Bestiæ [= Insectivora], and Glires. The subclass Ovovivipara included the remaining orders, Marsupialia and Monotremata. The idea thus developed was a pregnant one, and destined to yield excellent fruit, although for a long time neglected. It was, perhaps, the most important improvement in general classification of the Mammalia subsequent to De Blainville's recognition of the primary divisions. The groups Educabilia and Ineducabilia are not only distinguished by the characters of the

* *On the Natural Arrangement of Vertebrose Animals* (Part I. Mammalia), in *London Med. Rep.* (vol. xv., pp. 296–310, 1821).

† *An Outline of an Attempt at the Disposition of Mammalia into Tribes and Families, etc.*, in *Ann. Phil.* (vol. x., pp. 337–344, 1825).

‡ *A New Systematic Arrangement of Vertebrated Animals* (1837) in *Trans. Linn. Soc. London* (vol. xviii., pp. 247–304, 1841).

brain indicated, but others are coincident with them, and they being taken as a basis, all the groups fall in natural array to a much greater extent than when arranged under any other system.

A number of years afterwards, Prof. Richard Owen, a distinguished naturalist and palæontologist, promulgated *de novo* an essentially similar classification* but not on as good grounds, and less perfect than Jourdan's and Bonaparte's. He divided the mammals into four sub-classes, to which he assigned equal rank—viz. (1) *Archencephala*, characterized by the great development of the cerebrum and its deep gyri and sulci, for man alone; (2) *Gyrencephala*, including forms whose cerebrum was alleged to be less developed, but also provided generally with deep gyri and sulci, including the Quadrumana, Carnivora, Artiodactyla, Perissodactyla, Proboscidia, Toxodontia, Sirenia, and Cetacea; (3) *Lissencephala*, characterized by the much smaller cerebrum and its smooth surface, and including the orders Bruta, Cheiroptera, Insectivora, and Rodentia; and (4) *Lyencephala*, said to be distinguished from all the others by the want of a corpus callosum and the very small cerebrum, including Marsupialia and Monotremata. The characters alleged to distinguish these several classes are not constant, and therefore not diagnostic. The classification erred, too, in the equal rank assigned to the four primary divisions, and especially in the differentiation of the Archencephala and Gyrencephala. It was, however, for some time quite generally adopted, and the superior one published by Bonaparte overlooked.

The combination of the primary groups or sub-classes, established by De Blainville, Huxley, etc., with the subdivisions of the monodelph or placental mammals, suggested by Jourdan and Bonaparte, has recommended itself to several recent authors, and is adopted in the article on MAMMALS (which see).

Sir Everard Home, in 1823, in the third volume of his *Lectures on Comparative Anatomy* (pp. 470–472), noticed some of the modifications of the placenta in mammals, and suggested their employment in classification, but his own use of these means was too imperfect to deserve mention.

In 1828, however, K. E. von Baer gave the principal modifications exhibited by the mammals in this respect in a tabular form in a very intelligent manner, thus:

Mammalia with an umbilical cord.
- α. Which disappears early;
  - 1°. Without connection with the mother: Monotremata.
  - 2°. After a short connection with the mother: Marsupialia.
- β. Which is longer persistent;
  - 1°. The yolk-sac continues to grow for a long time.
    - The allantois grows little: Rodentia.
    - The allantois grows moderately: Insectivora.
    - The allantois grows much: Carnivora.
  - 2°. The yolk-sac increases slightly.
    - The allantois grows little; umbilical cord very long: Monkeys and man.
    - The allantois continues to grow for a long time; placenta in simple masses: Ruminants.
    - The allantois continues to grow for a long time; placenta spreading: Pachyderms and Cetacea.

He also exhibited the modifications of the placenta under the following form:

The fœtal placenta consists everywhere of the same elements, but offers the most remarkable differences in its external disposition. It is

Either (1) merely applied to the maternal placenta [= Non-deciduata, Huxley], and
- (*a*) continuous and zone-like: first form.
- (*b*) divided into many parts: second form.

Or (2) it and the maternal placenta grow together [Deciduata, Huxley], and they lie
- (*a*) in a zone round the egg: third form [= Zonoplacentalia].
- (*b*) at one end of it: fourth form [= Discoplacentalia].

This placental system was subsequently developed in greater detail by Eschricht, Milne-Edwards, Gervais, Vogt, and especially Huxley; the latter in his most recent works has differentiated the mammals into the following primary groups: (1) sub-class Ornithodelphia, with the order Monotremata; (2) sub-class Didelphia, with the order Marsupialia; and (3) sub-class Monodelphia. The Monodelphia are first discriminated into (*a*) those with median incisor teeth developed (Edentata), and (*b*) those with median incisor teeth developed, and the latter into (1) *Non-deciduata*, including the orders Ungulata, Toxodontia, Sirenia, and Cetacea; and (2*a*) *Deciduata with a zonary placenta* (Hyracoidea, Proboscidea, and Carnivora), and (2*b*) *Deciduata with a discoidal placenta* (Rodentia, Insectivora, Cheiroptera, and Primates). This classification has met with great favor in recent times.

* *On the Characters, Principles of Division, and Primary Groups of the class Mammalia*, in *Journ. Proc. Linn. Soc. London* (vol. ii. pp. 1–37, 1858).

While the general system was being thus perfected, numerous monographers and specialists made known new species from various parts of the world, and the number of described representatives of the class was rapidly increased; thus, Linnæus at most (1756, etc.) recognized but about 230 living species; Brisson in 1756 admitted 275; Pennant in 1771, 412; Erxleben in 1777, 345; Boddært in 1788, 344; Buffon and his continuators in 1769–85, 333; Gmelin in 1789, 440; Desmarest in 1820–22, 622; Temminck in 1827, 860; and Fischer in 1829–30, 1126 good and 220 doubtful species. There are now recognized about 2250 species, but many of these are doubtless at most geographical races or varieties.

Numerous extinct forms have also been made known and incorporated into the mammalian system. The earliest scientific introduction of extinct forms is due to Cuvier, who exhumed and restored the remains of numerous remarkable species from the Tertiary beds near the city of Paris. Successive palæontologists have largely added to the number; and in this country Harlan, Cooper, Wyman, Warren, and especially, in later times, Leidy, Cope, and Marsh, have described many new and remarkable types.

Such have been the principal stages of progress towards the perfection of the classification of the mammals. The numerous improvements in the arrangement of subordinate groups cannot, of course, be enumerated. Suffice it to say, that the laborers have been numerous and effective; and chief of them have been Owen, Huxley, Flower, Mivart, Peters, Brandt, Gervais, Milne-Edwards, Gaudry, etc. The most recent literature respecting the groups and species may be found in the following: *A Manual of the Anatomy of Vertebrated Animals*, by Thomas H. Huxley (1872); *An Introduction to the Osteology of the Mammalia*, by William Henry Flower (1870); *Histoire naturelle des Mammifères*, par M. Paul Gervais (1854–55, 2 vols.); *Arrangement of the Families of Mammals*, by Theodore Gill (1872); *Catalogue of Monkeys, Lemurs, and Fruit-eating Bats in the Collection of the British Museum*, by Dr. J. E. Gray (1870); *Catalogue of Carnivorous, Pachydermatous, and Edentate Mammalia in the British Museum*, by Dr. J. E. Gray (1869); *Catalogue of Ruminant Mammalia* (Pecora, *Linnæus) in the British Museum*, by Dr. J. E. Gray (1872); *Hand-list of the Edentate, Thick-skinned, and Ruminant Mammals in the British Museum*, by Dr. J. E. Gray (1873); *Catalogue of Seals and Whales in the British Museum*, by Dr. J. E. Gray (1866), and *Supplement to the Catalogue of Seals and Whales in the British Museum*, by Dr. J. E. Gray (1871); *Hand-list of Seals, Morses, Sea-lions, and Sea-bears in the British Museum*, by Dr. J. E. Gray (1874). The several volumes by Dr. Gray will be found useful for the notices of species of the respective groups and references to other publications, but they require to be consulted with extreme caution, and their classification must be completely ignored. For American mammals the chief recent authorities are Baird (*Mammals of North America*, 1859), Harrison Allen, J. A. Allen, Cope, and Coues. The extinct North American species have been almost exclusively described, in recent times, by Leidy, Cope, and Marsh. THEO. GILL.

Mam'mals [Lat. *mamma*, "teat"] are the first and highest class of the vertebrate branch of the animal kingdom, and include all the vertebrates with a quadrilocular heart, warm blood, the lower jaw composed of simple rami and articulated directly with the skull, and the body covered wholly or partially with hair. It thus includes man, as well as all the hairy quadrupeds, and the cetaceans (whales, porpoises, etc.) and sirenians (manatee, etc.). Notwithstanding the great external differences manifested in the several types thus embraced, the group is perhaps the best defined and most exclusively limited of any of the polymorphic classes of the animal kingdom. The chief characteristics (excluding all but such as have acknowledged systematic significance) are as follows:

Tegumentary System.—Hair is a characteristic feature of the mammals, and, although approximated by the feathers of some birds, is developed as such in no other class. It is found in more or less abundance in all mammals; only in the embryos of whales, and in them only in the upper lip; over the greater portion of the skin in all others. Sometimes, however, the hairs assume the strength of spines. In a few forms, also, the body is covered with a regular case, as in the armadillos, and the extinct Hoplophoridæ had a shell resembling that of a turtle; some also (Manididæ) have scale-like appendages.

Osseous System.—The skeleton is always completely developed, and is quite constant in the number and relations of the constituent parts in comparison with the lower vertebrates, exclusive of the birds.

The vertebral column is divided into five distinct regions —viz. (1) the cervical, containing always seven vertebræ, except in *Trichechus* (*Manatus*) and *Cholœpus Hoffmannii*, which have each six, and the three-toed sloths (*Bradypus*), which have nine; (2) the dorsal vertebræ, quite variable in number, to which the ribs are attached; (3) the lumbar vertebræ; (4) the sacral vertebræ, connected with the sacral bones of the pelvis; and (5) the caudal vertebræ, which vary greatly in number. These grade into each other, and in the cetaceans and sirenians, in which the pelvis is wanting or aborted, the posterior regions are practically undistinguishable. In the cervical series the first and second vertebræ are decidedly differentiated, as (1) the "atlas" and (2) the "axis."

The skull is very characteristic, and may be divided into four parts: (1) the cranium, (2) the lower jaw, (3) the auditory ossicles, and (4) the hyoidean apparatus. It may be regarded as the anterior continuation of the vertebral column.

(1) The cranium is most uniform in all the types at the posterior part, and deviates most at the distal and peripheral parts. The hindmost segment has an axial element (the *basioccipital*), with which, on the respective sides, are connected two lateral ones (the *exoccipital*), chiefly bearing the condyles for the articulation of the "backbone;" and these are connected above by a keystone element (the *supraoccipital*): these four elements, always separately developed in early life, in some of the lower forms (*e. g.* marsupials) are persistent as separate bones throughout life, but in the higher forms early coalesce into a single bone, the OCCIPITAL; they all bound the aperture through which the nervous system enters the skull, the "foramen magnum." On the axial line, in front of the basioccipital, also an unpaired bone, is the *basisphenoid;* with the upper sides of this are connected dilated wing-like elements, one on each side (the *alisphenoids*); with the anterior surfaces another axial element (the *presphenoid*) articulates; and with the upper margins of this and the anterior of the alisphenoid two lateral elements (the *orbitosphenoid*) are connected; finally, with the inferior surface of the previous axial bones, as well as with processes of the alisphenoids, is connected a median vertical element (the *pterygoid*); these several elements (*i. e.* basisphenoid, alisphenoid, presphenoid, orbitosphenoid, and pterygoid) are in various degrees combined, all being united in the higher animals, including man, in a single bone—the SPHENOID; this itself, in its axial portion, finally coalesces behind with the occipital. The roof of the skull is formed, in front of the supraoccipital element, first, by two bones (the *parietal*), which are chiefly connected by their lateral margins with the alisphenoid elements, and these are followed forward by two other bones (the *frontal*), connected below with the orbitosphenoid elements; in front are the *nasal*. The foremost axial bone is the *mesethmoid*, which together with two lateral ones (the *ethmoturbinal* and *maxilloturbinal*) form the compound ETHMOID. All the bones thus far enumerated, or at least the combinations, concur together and with the periotic bones (hereinafter mentioned) to form the cerebral chamber or calvarium. The olfactory chamber is in advance; its floor, and partly its sides, are constituted in front by the *intermaxillary* and *supramaxillary* bones, and behind by the *palatine;* its roof by the *nasal* and in part the *frontal* bones. Lodged between the frontal, supramaxillary, and palatine bones is one which enters into the front margin of the orbit, is in most a thin laminar bone, and, being generally provided with a canal for the lachrymal gland, is called the *lachrymal* bone. The periotic bones, already referred to, are interposed between the occipital, parietal, and sphenoid ones, and are represented, it is alleged, in the embryo by three centres of ossification: these, however, very soon unite and form a single bone (the *periotic*), which includes the labyrinth of the inner ear; the antero-internal portion of this forms the so-called "petrous" portion, and the postero-internal the "mastoid" portion. With this bone is connected, and often ankylosed (as in man), a scale-like bone called the "*squamosal*," which emits from its anterior borders the zygomatic process to meet the malar or cheek bone; from the inferior portion is developed the *tympanic* bone, which forms the auditory bulla so ordinarily developed in mammals. These several elements frequently coalesce and form a compound TEMPORAL bone.

(2) The lower jaw is composed of two simple rami (*mandibles*), connected together at the symphysis, and each has a more or less convex condyle by which it articulates with a "glenoid cavity" at the base of the zygomatic process of the squamosal bone. In this simplicity of the rami and direct articulation with the skull the mammals differ widely from all other vertebrates.

A bar-like bone (*malar* or *jugal*) generally connects the zygomatic processes of the squamosal and frontal bones, but is frequently absent, as in many Insectivores, Edentates, and Cetaceans.

The next two series of bones are the results of ossifications of the Meckelian (3) and hyoidean (4) cartilages.

(3) In a chambered space formed by the periotic bones—the tympanic cavity—are three ossicles or small bones devoted entirely to the organ of hearing; these are the (1) malleus, (2) incus, and (3) stapes; the names recall their shapes. (1) The *malleus* is hammer-like; the handle connected with the tympanic membrane and the head articulated with the incus; it is homologous with the quadrate bone of the other vertebrates; (2) the *incus* is anvil-shaped, or like a human molar tooth, situated in the upper and posterior part of the tympanic cavity, and corresponds with the supra-stapedial element of other vertebrates; (3) the *stapes* is stirrup-shaped, the lowest down in the tympanic cavity, and answers to a corresponding ossicle in birds and reptiles. (See Huxley in *Proc. Zool. Soc. of London* for 1869, pp. 391–407.) A fourth ossicle, frequently developed, and called orbiculare or lenticulare, is simply a separate element of the incus. The malleus and incus are peculiarly characteristic of the mammals.

(4) The hyoidean apparatus must also be regarded as an appendage to the skull, although chiefly subservient to the respiratory apparatus: it is composed of two pairs (anterior and posterior) of "cornua." The anterior is connected with the periotic bone, and each cornu, although sometimes with a single proximal cartilage or bone, has generally three long bones—a proximal ("*stylohyal*"), middle ("*epihyal*"), and distal one ("*ceratohyal*"); the last are connected with a cross-piece (the "*basihyal*"), and from the sides of this diverge backward the posterior cornua ("*thyrohyal*"), which are directly united with the thyroid cartilage of the larynx.

The skull undergoes considerable change in development from the low forms to the high ones, as well as with age. In the lower types the segmented or quasi-vertebrated character is much more evident, and is in correlation with the development of the brain, whose several parts are more nearly on a longitudinal axis. In the progress from the low to the high forms the several regions of the brain become concentrated and subordinated to the cerebrum. The skull follows, and in man the cerebral cavity forms the largest portion. In the lower forms the brain, and consequently the cerebral cavity, increases but little, if any, after birth; the subsequent growth being chiefly due to the development of ridges for muscular insertion, air-cells, and the extension of the jaw-bones. The brain also differs comparatively little in size in the members of a natural family, although the skulls may vary greatly: the differences as to the skulls between large and small animals are due chiefly to the outgrowth of bone. The skull is also modified to adapt the animal to its surroundings, and consequently in the aquatic forms, as the cetaceans, it is excessively modified.

With the anterior ribs at least, at their distal ends, are connected a chain of median bones or cartilages designated by the common name of *sternum*. This apparatus is very variable in its development. In the most primitive mammal type (the Monotremes) it is composed of a chain of bones (forming the *mesosternum*), of which (1) several are small; (2) one at the fore-end is enlarged (*presternum*); (3) in front of this is a small central piece (the *proosteon*); and (4) enclosing and foremost of all is a peculiar large T-shaped bone (*interclavicle* or *episternum*), whose forward border is connected with the clavicles lengthwise. This episternum is wanting in all other forms. In all normal types the sternum is represented by (1) an anterior piece (*presternum*); (2) a series of succeeding bones (the *mesosternum*); and (3) a posterior piece (the *xiphisternum*). These are alike developed in the lowest (marsupials) and the highest (man), but by ossification and various combinations later in life the sternum sometimes loses this character, as in man, and in the sirenians and cetaceans it is extremely modified.

The members are specialized upon a common principle, although they may be externally very much modified, and adapted for walking with the hind pair and manipulation with the fore, as in man; for quadrupedal progression, as in ordinary mammals; for flying, as in bats; or for swimming, as in sirenians and cetaceans. The terrestrial forms have always four members; the aquatic frequently only two, the posterior being greatly atrophied or entirely wanting. The anterior members have each successively (1) a single long proximal bone (*humerus*); (2) two following long and parallel ones (*radius* and *ulna*); (3) a group of two rows of small (most frequently 8 or 9) wrist (*carpal*) bones, varying much, however, among themselves by reason of different modes of coalescence, but always differentiated from the fore arm as well as palm-bones; (4) a row of longish *metacarpal* or palm-bones; and (5) three rows of *pha-*

langes or digital bones in variable numbers, the normal number of carpal and phalangeal bones or series (5) being often much abridged by the suppression of the lateral elements.

With the humerus is connected a single flattened bone (the *scapula*) at the sides or back of the thoracic cavity. Between a process of the proximal end of the scapula (the acromion) and an angle of the xiphisternum a long bar-like bone is generally developed (the *clavicle*), but is, however, frequently wanting; *e. g.* in many Carnivores, all Ungulates, one Insectivore, some Rodents, etc.

Apposed to the sacral bones, and indeed distinguishing them as such, are two compound bones (the *innominata*), which, together with the sacrum, form the pelvis. Each innominate bone is composed of three elements—(1) a proximal bone (the *ilium*), obliquely inserted on the processes of the sacral vertebræ, and (2–3) two distal bones parallel with each other, and connected together at their extremities, but leaving between them a space (the thyroid or obturator foramen) occupied only by membrane; (2) the dorsal or posterior of these pieces is the *ischium*, and (3) the lower or anterior one is the *pubis*. At the junction of the three bones is the acetabulum, or socket for the head of the femur or proximal joint of the hind leg.

The hind legs are composed of bones similar to those of the fore limb—viz. (1) a proximal long bone or *femur;* (2) two succeeding long bones, the *tibia* and *fibula;* (3) two rows of small bones, the *tarsal*, interlocking among themselves, and completely differentiated from the leg as well as metatarsal bones; (4) several parallel moderately long ones (the *metatarsal*); and (5) several parallel rows of small-longish ones, the *phalanges*, three or two in each row. These last, like the corresponding bones of the fore limbs, are normally in five parallel rows, but there is a tendency to the atrophy or suppression of the lateral ones. A large sesamoid bone, the *patella* or kneepan, is also almost always developed in the tendon of the "rectus femoris" muscle, and caps the knee-joint, being connected with the femur as well as the tibia.

Finally, it should be added that there is much difference in the development of the long bones of the fore arm and corresponding segment of the hind limb, one being frequently atrophied, and both frequently uniting at their extremities.

Muscular System.—This is so variable that there are few generalizations that can be specified as applicable at once to all the mammals and to no other vertebrates. The modifications coincident with the variations in form and the development of the several parts are extreme. The muscles connected with the mandibulary apparatus and the ossicles of the ear may be regarded as among the most characteristic. The muscles have, however, furnished no characters for systematic purposes, except in the "*diaphragm*," which is a development peculiar to the mammals. This arises from "the eighth to the twelfth ribs by fasciculi which interdigitate with those of the 'transversalis abdominis' muscle," is convex headward, and separates the thoracic and abdominal cavities: in most mammals it is nearly transverse to the axis of the trunk, but in the cetaceans and sirenians is very oblique backward.

Nervous System.—The brain is highly developed; the cerebrum always larger than the cerebellum—much more so in the lower forms, and excessively preponderant in the higher ones (especially in man). While in the lower forms it leaves exposed the entire cerebellum, as well as the optic lobes and the olfactory ones, its increasing volume in the higher forms overlaps those parts, until finally in man all are covered from view from above. The hemispheres of the cerebrum are connected together (1) by an *anterior commissure*, and (2) by a great superior commissure, the *corpus callosum:* these are developed in inverse proportion, in the lower forms the anterior commissure being very large, while the corpus callosum is very small; in the higher forms the corpus callosum is greatly developed, while the anterior commissure is extremely reduced. The cerebral hemispheres in the smaller and inferior forms are nearly smooth, while in the larger and more highly organized ones they are deeply convoluted or provided with gyri and sulci. The most characteristic feature in the brain of mammals is the development of the corpus callosum.

Dental System.—Although when the teeth are developed they are quite characteristic of mammals in their mode of insertion, etc., they are not infrequently entirely wanting, as in the Tachyglossidæ, Manididæ, Myrmecophagidæ, and whalebone whales. They vary in others in number from one (in the narwhal) to nearly 200 (as in some porpoises). They may be all nearly uniform in appearance (as in the porpoises) or differentiated into several kinds (as is usually the case). They are indeed generally distinguished as incisors, canines, and molars, which last are further separated into premolars and true or postmolars. They are almost always implanted by roots in the jaws. They do not grow in size *pari passu* with the jaws, but the series are accommodated to the size of the animal in a peculiar way. In the typical diphyodont mammals (*i. e.* those forms which have two sets of teeth), shortly before or after birth a set of teeth becomes gradually evolved, but after the animal has well advanced in growth these are shed, and are succeeded by a second and final set of larger ones, and somewhat differing in other respects; and still later, in the back of the jaws, teeth come up where none had appeared before. Thus, in the human child the teeth in the first set are finally 20—viz. deciduous incisors $\frac{2}{2}$, deciduous canines $\frac{1}{1}$, deciduous molars $\frac{2}{2}$ on each side; in the adult these are replaced by 20, and 12 new ones are added—viz. second incisors $\frac{2}{2}$, second canines $\frac{1}{1}$, second premolars $\frac{2}{2}$, *permanent molars* $\frac{3}{3}$ on each side. In the marsupials a different system of growth prevails. The teeth are successively evolved, the lateral incisors and hindmost molars last, and when once cut and lost are not succeeded by others, save one in each jaw-bone. As expressed by Flower, "the tooth in which a vertical succession takes place is always the corresponding or homologous tooth, being the hindmost of the premolar series, which is preceded by a tooth having the characters, more or less strongly expressed, of a true molar." Although the names of the teeth have been derived from form or function (the incisors from their adaptation for cutting—*incido;* the canines from their likeness to the fangs of a dog—*canis;* and the molars from their millstone or grinding function), the application of names is determined by the position of the teeth; thus, the upper incisors are those in the intermaxillary bone, and the lower those opposite to them; the canines, those in the supramaxillary behind the suture with the intermaxillary, while those in the lower jaw project in front of the ones in the upper; the premolars are all those next behind which have had deciduous predecessors; and the molars those only which have had none. The form is no certain criterion, as incisors may be fang-like or like canines, and canines like incisors (as in all the ordinary ruminants). The variations in the number and character of the teeth furnish the most generally striking characters for the diagnoses of families and genera.

Alimentary System.—The alimentary canal and its appendages exhibit great variations, but the common characters contrasting with those of all other vertebrates are not evident, and have furnished no material to the systematist for the diagnosis of the class.

Circulatory System.—The blood has its red blood-corpuscules non-nucleated. The circulation is complete and closed, the stream being received and transmitted by the right half of the quadrilocular heart to the lungs for aëration, therein oxygenated and warmed, thence sent to the left side of the heart, and finally transmitted through the system. Thus, although resembling birds, mammals are distinguished from the reptiles and inferior vertebrates. The aorta is single and reflected over the left bronchus.

Respiratory System.—Respiration is effected in all cases, in aquatic as well as terrestrial forms, by inhalation of the air direct, and consequently by means of the lungs. These are, in common with the heart, in a special thoracic cavity, separated, as already indicated, from the abdominal cavity by the diaphragm. This diaphragm, by its alternate contraction and expansion, assists the lungs in their inhalation and expulsion of air. The windpipe or trachea bifurcates in its distal portion, and sends special branches to the respective lungs.

Reproductive System.—The male and female organs, although strictly homologous and in early embryonic life undistinguishable, become greatly differentiated in after life. In the female the chief organs are the ovaries, which by oviducts communicate directly with the uterus, and thereby with the vagina. The so-called clitoris is the homologue of the penis of the male, but is rarely (as in the lemurs and some Rodents and Insectivores) perforated by a urethral canal. In the male the testes (which are homologous with the ovaries), although in the lower types abdominal, in the higher descend into external "scrotal" pouches, and the penis is almost always external, and often pendulous and free. The eggs are in the lowest type of considerable size, but in the others extremely small. Impregnation is always effected internally. The fœtus in the lower type is not long carried in the mother's womb, but is born in a comparatively immature state, and attached to the teats by the mother; in the higher type it is nourished by means of a peculiar outgrowth in connection with the embryo and wall of the uterus (the *placenta*) in the womb, and when born is of considerable size and quite mature in development.

The development of the uterus and its relations to the vagina, as well as the development of the vagina and its connections, exhibit several modifications in the various

groups which are coincident with other phases of progress, and indicate successive stages of differentiation towards the type exhibited in man and the kindred mammals. The placenta also exhibits several modifications, which have been employed by some systematists to group the various orders of Monodelphs. (I.) Those in which the uterus develops a "decidua" are combined under the name of *Deciduata*, and then differentiated into (1) those whose placenta is discoidal, as in the Rodents, Insectivores, Cheiropters, and Primates; and (2) those whose placenta is zonary, as in the Proboscideans, Hyracoids, and Carnivores; (II.) those in which the uterus develops no "decidua" are designated *Non-deciduata*, and are the Ungulates and Cetaceans, and probably Tillodonts, Toxodonts, and Sirenians. The Edentates exhibit examples of each kind, and consequently convey a caution against the ascription to those modifications of an undue value.

For the nourishment of the new-born young a peculiar provision is made in the development of certain glands (*mammary*), which in the female are highly specialized and secrete the milk. The position and number of these mammæ vary greatly; they are without teats in the Monotremes, but have them in the marsupials and ordinary mammals. They are almost always on the inferior surface of the trunk, and either abdominal, inguinal, or on the breast.

The chief modifications of the class of mammals are expressed in three types, which have been differentiated as sub-classes—viz. Monodelphia, Didelphia, and Ornithodelphia; these are themselves opposable under two categories, Eutheria and Prototheria.

In the Eutheria the sternum has no element in front of the manubrium or presternum; the coracoid is not connected with the sternum, but early ankyloses with, and develops as a simple process of, the scapula; the brain has its superior tranverse commissure (*corpus callosum*) composed of a body as well as "psalterial" fibres; the ureters discharge into the bladder the renal secretion, which then passes into the urethra. In the males the testes are variable in position to the vasa deferentia, and open directly or indirectly into a distinct or complete urethra (and not into a cloacal cavity); in the females the oviducts debouch into a double or single vagina, and not into a cloacal chamber: the mammary glands have well-developed nipples.

Some of these (the Monodelphia) have the cerebral hemispheres of the brain connected by a more or less well-developed corpus callosum and a reduced anterior commissure. In the male the scrotum is always behind the penis; in the female the vagina is a single tube, but sometimes has a partial longitudinal septum; the young are retained within the womb till of a considerable size, and derive therein nourishment from the mother through the intervention of a placenta (which is developed from the allantois) till birth. This sub-class includes the orders Primates, Feræ, Ungulata, Toxodontia, Hyracoidea, Proboscidea, Sirenia, Cete, Cheiroptera, Insectivora, Rodentia, and Bruta.

Monodelphs are the chief sub-class of the class of mammals, and are so called on account of the development of a single uterus and vagina, thus contrasting with the Didelphs or Marsupials, and Ornithodelphs or Monotremes. The group is divisible into sections distinguished by modifications of the brain and placenta. The former gives the most natural combinations. These are primarily two—the "super-orders" Educabilia and Ineducabilia. These exhibit two principal modifications in their brains, with which, however, other characters are co-ordinated.

In the Educabilia the brain is highly developed; the cerebrum is bilobate or trilobate (the sylvian fissure being always well defined and a posterior lobe sometimes developed), and covers the greater part or all of the cerebellum as well as the olfactory lobes; the corpus callosum extends in an arch backward to or beyond the vertical of the hippocampal sulcus in the inner face of each hemisphere, and has a well-defined rostrum in front. This super-order includes the orders Primates, Feræ or Carnivores, Pinnipedia, Ungulata, Hyracoidea, Proboscidea, and Sirenia, and Cete, as well as the extinct groups Taxodontia, Dinocerata, and Tillodontia.

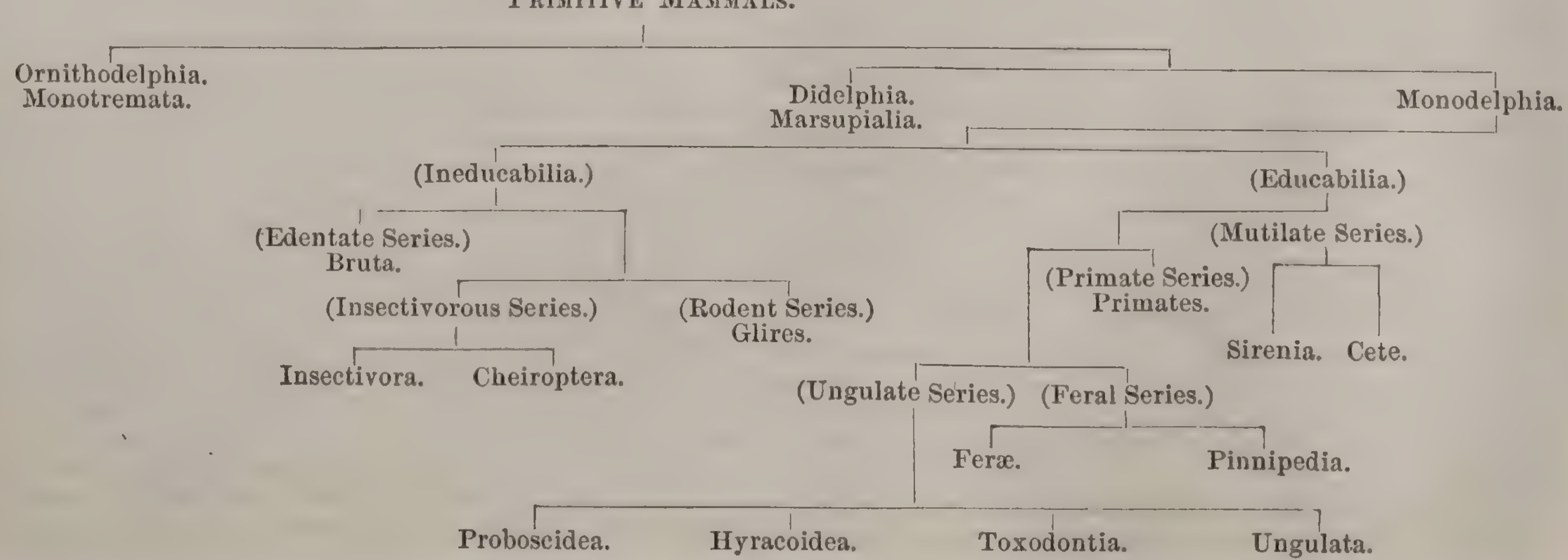
In the Ineducabilia the brain has the cerebral hemispheres relatively small and unilobate (the sylvian fissure being obsolete and the posterior lobe undeveloped), leaving exposed the cerebellum (and sometimes the optic lobes), as well as the olfactory lobes; the corpus callosum extends more or less obliquely upward, terminating in front of the vertical of the hippocampal sinus, and has no well-defined rostrum interiorly. The super-order includes the orders Cheiroptera, Insectivora, Glires or Rodentia, and Bruta or Edentata.

The others (the Didelphia) have the cerebral hemispheres of the brain chiefly connected by a well-developed anterior commissure, the corpus callosum being rudimentary. In the male the scrotum is always in front of the penis; in the female the vagina is more or less completely divided into two separate passages: the young are born when of very small size and imperfect development, and are never connected by a placenta with the mother; when born they are placed by her upon the nipple, from which the milk is forced, partly by herself, into the mouth of the young. Only one order (Marsupialia) is generally recognized.

In the Prototheria the sternum has a T-shaped bone (episternum or interclavicle) situated in advance of the manubrium or presternum; the coracoid extends from the clavicle to the sternum, and only towards maturity is ankylosed with the scapula; the brain has a superior transverse commissure (corpus callosum), with no well-defined "psalterial" fibres; the septum is very much reduced in size. In the male the testes are abdominal in position throughout life, and the vasa deferentia open into the cloaca, and not into a distinct urethral passage; the ureters discharge the renal secretion, not into the bladder, which is connected with the upper extremity of the cloaca, but into the latter cavity itself; in the female the oviducts are enlarged below into uterine pouches, but, opening separately from one another, as in oviparous vertebrates, debouch, not into a distinct vagina, but into the cloacal chamber, common to the urinary and genital products of the fæces; the mammary glands have no distinct nipples. The only known representatives are the Australian families Ornithorhynchidæ and Tachyglossidæ, constituting the order Monotremata.

Evolution and Genetic Relations.—The class of mammals is so decidedly differentiated from all others, and its early history is so fragmentary, that its exact phylogeny is not apparent. It is, however, most probable that the original progenitors of the class were modified from the Dinosaurian reptiles, or rather near allies of those animals, and that they culminated into the present types at a comparatively early epoch, the earliest known forms—those found in the Liassic formation—being quite specialized. But the relations between the existing and known fossil forms render the genealogical development of the type itself more readily appreciated. Unquestionably, the Ornithodelphs or Monotremes are the most reptile-like; of the other the Didelphs, or marsupials, and the Monodelphs, or placental mammals, are successively divergent and specialized from the primitive type. The successive differentiation and development of the various orders of the class may be best exhibited in a diagrammatic form or genealogical tree. In this the more generalized forms, or quasi-eldest, are represented in each case by the left branch or fork:

PRIMITIVE MAMMALS.



Geographical Distribution.—Mammals exist in almost every region of the globe, but were wanting, previous to their introduction by man, in the Polynesian Islands, as well as New Zealand. There are many noteworthy combinations, but only a few can be referred to. Monotremes are peculiar to Australasia. Marsupials are now confined to Australasia and outlying islands and America; in the former numerous types being represented, and in the latter but one, the opossums. Insectivores are wanting in the regions where marsupials abound, but are well represented in the entire northern hemisphere, as well as in Asia and Africa. Primates are represented especially in the tropical regions of Africa, Asia, and America, but in very different forms, the lowest type (Lemuroids) being now peculiar to the Old World, and best developed in Madagascar; and in Africa and Asia the highest type (catarrhine monkeys and apes) is also existent, while in America all the species are of an inferior type of monkeys—the platyrrhine group. The Edentates are represented still more exclusively than the Primates in warm countries, and have most members in America (the sloths, ant-eaters, armadillos, and pichiegos), but some also in the Old World, the earth-hogs (Orycteropodidæ) being confined to Africa, and the pangolins (Manididæ) occurring in both Africa and Asia. The carnivorous mammals, on the other hand, are quite widely distributed, extending almost between the extremes of the northern and southern hemispheres, and under the same generic forms on at least the continental areas of both the Old World and the New, Australia alone having no representatives except of a single species of dog (*Canis dingo*). The Felidæ (cat) and Canidæ (dog) families are especially thus distributed. The others are more limited, or have a greater number of genera restricted to limited countries. The most striking examples of this restriction are afforded by families of the arctoid superfamily, the Procyonidæ (raccoons, etc.) and Cercoleptidæ (kinkajous) being peculiar to warm America, and the Æluridæ (pandas) to Southern and Eastern Asia. The ungulates are at present generally more restricted; the Equidæ (horses) and Rhinocerotidæ (rhinoceroses) being peculiar to the warmer regions of the Old World, although horses have become feral and greatly increased in numbers on the plains of America. The Tapiridæ (tapirs) and Camelidæ are distributed in an anomalous manner. Of the former about four species are found in South and Central America, and one in Sumatra; of the Camelidæ, one generic type (camel) is represented in Africa and Asia, while one (llama) inhabits Chili and Peru. The proboscidians (elephants) are now restricted to the Old World; one generic form (*Loxodonta*) being represented in Africa, and another (*Elephas*) in Asia. Bats, fitted by their organization for extensive migrations, are found nearly everywhere, and some genera are almost cosmopolitan; but many generic types, notwithstanding their apparent equal capability of extension, are quite confined in their range. The cetaceans are abundantly represented in the polar regions by peculiar genera and species, but are also rich in tropicopolitan genera (*i. e.* types which are common to the entire tropical zone), and have also several peculiar fresh-water types in the tropics. The Sirenia are cosmopolitan in their genera, one of which (*Trichechus* or *Manatus*) is common to both sides of tropical and sub-tropical America, as well as the western shores of Africa; another (*Halicore*) is represented in the Red Sea, Indian Ocean, and Australia; and a third (*Rhytina*) was, till within a century ago, abundant in Behring's Sea.

Geological Range.—Although the discovery of the remains of fossil mammals in rocks as far back as the Oolitic was announced as early as 1823 on the authority of Cuvier, much skepticism prevailed respecting them, the great anatomist De Blainville expressing the strongest doubts so late as 1838 and after. For a long time it was believed that no representatives of the class existed previous to the Tertiary epoch. The evidence, however, is now conclusive of their existence in the Mesozoic, both in the Triassic and Oolitic periods, although only fragments, chiefly of lower jaws, have been found. These remains have been mostly attributed, and probably with right, to the order of Marsupials. In the Tertiary epoch numerous remarkable extinct types, representing even orders without living members, existed, and have furnished clues for the appreciation of the genetic relations of the several groups of the class. Those of this country have been chiefly elucidated by Leidy, Marsh, and Cope.

A consideration of the extinct forms is necessary in order to correct the impressions that might be derived from the geographical range of the existing forms, and will explain some apparent anomalies in their distribution.

The families of Rhinocerotidæ and Equidæ, for example, were formerly abundantly developed in America, as well as in the Old World; and such was also the case with the proboscidians. The tapirs, too, which are now so remotely separated, one being in India and several in America, had formerly a number of relatives which lived in North America and Europe. The family of camelids also was formerly not only well represented in America, but in that country related types were so numerous, and some of those early types were so generalized in their characters, as to make it possible, if not probable, that the camel type originated in the New World rather than the Old, and that those now living in the latter were derived from progenitors originating in the American hemisphere. THEO. GILL.

Mam'mary [Gr. μάμμα, "breast"] **Glands,** one of the most characteristic and distinctive marks of the mammalian class of vertebrates, the organ which produces milk. No animal except the mammals produces milk, or has anything approaching the character of a mammary gland. In most species the mammary glands of the male are undeveloped, save in exceptional instances; but, according to Dr. Curtis and Mr. Merriam, both males and females of the *Lepus Bairdii* (Baird's hare, an animal of the Rocky Mountain region) produce milk. The male of the human race has also been known to secrete milk and actually nurse a child. The mammary gland is of various structure in different animals. In the ornithorhynchus it is a collection of simple cæcal follicles, opening on the surface, without a nipple; and the mother appears to possess the power of extruding the milk into the mouth of the young animal. The cetaceans have very simple mammary glands, and the teat is enclosed in a slit. The marsupial mammals attach their young, in an exceedingly embryonic state, to the nipple, and the gland is provided with a muscular apparatus by which the mother feeds the feeble young creature at will, expressing the milk, which flows into the stomach of her offspring. In the higher animals the young are fed by suction. The mother does not feed her suckling, though her *consensus* is apparently needful to the free secretion of milk. Thus, it is well known that if cows are beaten or irritated before milking, the flow of milk is small. The mammary glands are always in pairs, and placed symmetrically on either side of the mesial line and on the ventral aspect of the body, but in number and in position they vary greatly in the various species. Some animals, like the cow, have often a pair or two of abortive or undeveloped nipples, besides those which yield milk. In the human species the mammæ consist of lobes and lobules of gland-tissue, with interlobular fibrous and fatty substance. The lobules consist ultimately of little groups of vesicles which open into minute ducts; the ducts converge into larger ducts, which at the base of the nipple open into *ampullæ* or reservoirs of milk. The nipple is slightly erectile, and in the human species has several orifices for the discharge of milk. The milk-ducts are lined with pavement epithelium. The gland itself is subject to many inflammatory, malignant, cystic, and other diseases. Of these, one of the most frequent is acute inflammation, an extremely painful affection occurring almost always during lactation. Hot stimulating lotions and the careful drawing of the milk are very useful. The gland should be suspended in a bandage. If it be not desirable to prolong the lactation, a solution of atropia should be applied, which often arrests lactation at once, and thus alleviates the disease remarkably; but if this be applied, the infant should not be fed from the breast, unless after the poisonous atropia has been carefully removed from the surface by washing.

Mammee' [Haytian, *mamey*] **Apple,** the fruit of *Mammea Americana* and *Africana*, trees of the order Guttiferæ, growing respectively in South America and the West Indies and in Africa. The former is one of the most delicious of tropical fruits. The tree is very valuable for its timber.

Mam'mola, town of Southern Italy, in the province of Reggio di Calabria, in a luxuriant district especially abounding in fruit. Pop. in 1874, 7804.

Mam'moth [of Samoied origin, applied to burrowing animals], (*Elephas primigenius*), an extinct species of elephant, about twice the weight of the living species, formerly abundant in the higher latitudes of both the Old and New Worlds. (An engraving of the mammoth is given in GEOLOGY.) Their remains are abundant in Siberia and Alaska, where their tusks are gathered as an article of export. The mammoth was closely related to the existing Indian elephant, and some authors have even considered them identical. It differs, however, in many respects, and one of the most important of these differences is found in the molar or grinding teeth. These teeth are broader than those of *E. Indicus*, and have narrower, more numerous, and close-set transverse plates and ridges. They exemplify the extreme type of the peculiar elephantine dentition. The tusks are long and much curved, in some cases form-

ing a complete circle, but being directed outward they clear the head, and the points are directed outward, downward, and backward. Two principal sizes of tusks are found—the larger averaging 9½, the smaller 5½, feet in length. They seem to have belonged to males and females respectively. Tusks have, however, been found over 12 feet in length. This animal is better known than any other species extinct before the historic period, as its remains have been perfectly preserved in the ice and frozen soil of the Arctic regions. A fine specimen was discovered at the close of the last century, in a cliff at the mouth of the river Lena. The flesh was so well preserved that dogs and wild animals fed upon it. The skin was thick, and covered with a reddish wool and long black hairs. This skeleton is now preserved at St. Petersburg, and measures 16 feet 4 inches from the fore part of the skull to the end of the tail, which is imperfect. Parts of the skin of the head, the strong ligament of the nape, which principally sustained the head, and the hoofs remain upon the skeleton. The hairy covering enabled the mammoth to endure a much colder climate than that to which the existing elephants are confined. Its food consisted of the leaves and branches of northern pines, willows, birches, and other hardy trees, such as may now be found along the isothermal of 40°, which in that age may have run as high as Northern Siberia, where these animals then lived in large herds. They roamed also over Europe, where they were contemporary with at least two kinds of two-horned rhinoceroses, a hippopotamus, gigantic deer, three kinds of wild oxen (two of which were of large size, and one shaggy and maned), a tiger as large as that of Bengal, and another fierce carnivore of equal size, the *Machærodus*, together with troops of hyænas, and a savage bear larger than the grizzly of the Rocky Mountains. During the Palæolithic and Reindeer eras they were contemporary with men, who have left rude delineations of this animal engraved on the ivory of its own tusks. Much confusion has existed among naturalists in regard to the species of mammoth. Cuvier referred to the single species, *E. primigenius*, teeth from Europe, Northern Asia, and all North America, from strata as early as the Lower Pliocene and as late as the frozen drift and ice-cliffs of Siberia. De Blainville included the existing Indian elephant in the species, thus giving it a range both in time and space unequalled by any known mammal in a state of nature. Later naturalists have more carefully discriminated the species, and restricted its range to Europe, Northern Asia, and North-western North America above the parallel of 40°, and in time to the Quaternary age. The mammoth of the warmer parts of North America is regarded as a different species, *E. Americanus*, and is comparatively little known, as the remains hitherto found have consisted principally of teeth. These have often been found associated with more numerous and better preserved remains of the mastodon. Remains from the Later Pliocene have been doubtfully referred to this species by Dr. Leidy, and represent the oldest known fossil elephants of this country. From the Tertiary of Europe and Asia, Dr. Falconer enumerates ten species of the genus *Elephas*, which he divides into three sub-genera—*Euelephas*, *Loxodon*, and *Stegodon*. In *Euelephas* the worn crowns of the molars present nearly parallel ridges of enamel, alternating with cement and dentine, as in the mammoth and Asiatic elephant. In this sub-genus belong also two Pliocene species—*E. antiquus*, from England and Southern Europe, and *E. nomadicus*, from Central India, and the *E. Hysudricus*, from the Miocene of the Sewalik Hills, India. *Loxodon* has the tracts of dentine lozenge-shaped, as in the living African species, *Elephas* (*Loxodon*) *Africanus*. With these are grouped two Pliocene species, *L. priscus* and *L. meridionalis*, from England and Southern Europe, and *L. planifrons* from the Miocene of the Sewalik Hills, India. The sub-genus *Stegodon* had the molars intermediate in form between *Elephas* and *Mastodon* (see article on MASTODON), and was represented by three species from the Miocene of the Sewalik Hills, *S. bombifrons*, *S. Ganesa*, and *S. insignis*, and *S. Cliftii* from the Miocene of Southern India. No remains of elephants have yet been found below strata referred to the Miocene. O. C. MARSH.

Mammoth Cave. This celebrated cavern is situated in Edmonson co., Ky., about 80 miles S. S. W. of Louisville, and about 10 miles from the railway which connects that city with Nashville, Tenn. It is but one of a great series of caverns which occupy nearly every part of the sub-carboniferous limestone, and are thus found over an area of at least 6000 square miles in Kentucky, besides a part of the neighboring States of Tennessee and Indiana. Within the county of Edmonson there are at least 500 cavern-mouths, many of which lead into vast, beautiful, but mostly little-explored caverns, often rivalling the Mammoth Cave in some of its features. This particular cavern is situated on the left bank of the Green River; the entrance is about 200 feet above the stream, and a quarter of a mile from its borders. Access is had to the floor of the cavern by means of a breaking down of the roof, and it is over the broken fragments that we descend to the floor. From this point the cavern is excavated in a series of chambers and passages descending in successive stages to the level of Green River, 200 feet below the entrance; the river communicates freely with the cave. A voyage of some hundreds of yards on the winding branches of Echo River brings the visitor to an extensive system of passages beyond its borders far more beautiful from the incrustations than anything on the entrance side of the stream. It requires a walk of about 7 miles to attain the farthest point, but as the survey of the cave has not been permitted, it is not possible to say how far in a direct line from the entrance this point really is. In the bewildering variety of curious and unaccustomed facts the cave affords we may recognize certain distinct divisions. In the first place, there are several levels or stories to the cavern, ranging from the level of Green River to 200 feet above it; all these show the action of water, and doubtless mark in succession the stages of downward cutting of the main river. These passages range in width from 70 feet or more to narrow rifts which just admit of passage. As a general rule, the highest level passages are the loftier and broader. Cutting through from the upper part of the cave to the lowest level are a set of gigantic pits commonly called "domes," such as Gorin's Dome, Mammoth Dome, the Maelstrom, etc. These have been, and sometimes still are, the seat of waterfalls which have cut all the way from the sandstone roof down to the permanent water-level, or to some harder bed which still resists their action. Besides these excavated features, there are a number of downfalls which make passages from one level to another, and some rifts which may possibly be the work of earthquakes. This is the framework on which the processes of excavation and deposit have built many beautiful structures. The flutings of running water and the incrustations arising from the crystallization of carbonate of lime on the walls in very fantastic forms have together done much to give grace to what is else only weird and peculiar.

Though the cave furnishes some scenes of great beauty, its most imposing effects arise from the great size of some of the halls and the majestic dignity of its domes. In detail of ornament it is much exceeded by the grottoes of Adelsburg in the Tyrol, by Wyers' Cave in Virginia, as well as by many of the other caves of this immediate neighborhood; but for grandeur none can excel some of the scenes of this cave. Perhaps the finest of its effects will be found in the Star Chamber, where pendent stalactites, each tipped by a bright reflecting point, catch the gleam of a concealed light, and imitate with their faint twinkling glow the stars of the firmament in a manner which is bewilderingly like.

To get the general history of this cavern it is only necessary to take what is now going on in this and neighboring caves. In all of them which extend down to the water-level of the region where they are found we find the water, gathered in the surface-beds, on its road to the main river in streams some of which are rivers in volume. This water, by its passage through the humus bed, has become charged with a certain quantity of carbonic acid gas. This gas while it is present in water gives to it the power of taking up a certain amount of carbonate of lime, and thereby of dissolving the walls of the channels through which it flows. Where the water courses in a considerable stream this dissolved limestone is carried away into the open river and thence to the sea; when, however, the stream is minute and trickling, the atmosphere may take up most of it, when it appears on the ceiling, and the result is a rapid precipitation of the lime in the shape of stalagmite or stalactite. Even when the evaporation is small, the loss of the carbonic acid from the exposure of the water in a thin sheet to the air causes a large part of the suspended lime to be thrown down. Thus, to the same process under different conditions we owe the formation of chambers and channels and their more or less complete closure by stalactitic masses. In this as in many caverns entire chambers have been closed by the deposit of these masses. There is a regular passage from the formation of a cavern to its obliteration; while strong currents sweep through it, everything tends to enlarge it to the limit of strength of the walls and roof; as soon as the water-currents weaken, then begin the actions which lead to its closure. As a whole, the Mammoth Cave is now shrinking in size. The accumulation of dust upon the floor has already gone far to diminish its size in the larger chambers. This dust is composed of the waste from the roof and walls, together with the waste of living and the remains of the dead animals, chiefly rats and bats, which inhabit the cavern. There are at least three species of fish and a number of insects peculiar to this and the neighbor-

ing caves, which with a blind crayfish make up the list of cavern-animals to about twenty species. Nearly all these insect forms are more or less closely allied to those of the neighboring outer world, yet the differences are quite enough to entitle them to rank as distinct species. It is impossible to exaggerate the value of this evidence in the great questions connected with the origin of species. There can be no doubt that we have here organic forms—not only insects, but vertebrates as well—in the very process of becoming fitted for changed conditions of life. There are several forms where the eyes, the most highly organized of all the organs, are disappearing or have quite vanished.

Upon the important question of the antiquity of these caverns the geological evidence leads to the conclusion that less than 1,000,000 years has sufficed for their production. As this period is less than the hundredth of the time which has doubtless elapsed since the introduction of life on the earth, the rapidity of the process is relatively great. It might be expected, from the fact that organic life generally has been profoundly affected by existence in the conditions afforded by caverns, that human beings would find some peculiar effects from spending much time in them. As far as observed, the effect upon tourists is much the same as that obtained by a great change of climate. The temperature of the cave is uniformly at 59° F. The air is very clear, being free from dust and from the odors of vegetation. Coming from it out into the forest, we perceive, in summer-time, a wonderful transition from the pure to the impure air. The utter change from the ordinary conditions of life without to this air of marvellous purity gives great relief to many diseases of the respiratory, digestive, and nervous systems. Some unintelligent efforts to increase these effects by prolonged residence within the cave have been attended by damaging results from the want of sunshine. But taken in moderation, exercise within the cave has undoubted therapeutic value. Tourists desirous of getting the best effects in the way of health, as well as enjoyment, should spend a month in the study of this and a half dozen other neighboring caverns. N. S. Shaler.

Mamoon′, or **Mâmûn, Al** (Abul Abbas Abdallah), the seventh caliph of the Abbasside dynasty, b. at Bagdad in 786, a son of Haroun-al-Raschid; was invested with the government of Khorassan in 800, and ascended the throne Oct. 4, 813, after the deposition of his elder brother. He was a great patron of science and literature, collected many Greek and Hindoo manuscripts, and made Bagdad the centre of learning. But in other respects his government was weak; the outlying provinces declared themselves independent, and even over Egypt and Syria his authority was merely nominal. Visiting Cairo in 820, Al-Mamoon was induced, by the current legends of immense treasures concealed in the pyramids of Gizeh, to attempt an entrance into the Great Pyramid, of which the proper entrance-passage, though previously known to the Romans, had been lost. His workmen, after long and toilsome labor, succeeded in striking the descending passage, which the Romans, Greeks, and Persians had known, at its point of junction with the ascending passage, which had been sealed up by the builders and had remained undiscovered for 3000 or 4000 years. Effecting a forced passage around the obstruction, he made his way at length into what has since been called "the king's chamber," and found, to reward his pains, no other object but the solitary sarcophagus of Cheops. The forced passage above referred to is still the only way of access by which visitors can reach the interior of the pyramid. In 827 he joined the heterodox sect, Motasalis, which considered the Koran a created work and not eternal. D. Aug. 9, 834, on the outbreak of a war with the Byzantine emperor.

Man [Teutonic, from Aryan *man*, "to think;" Sanskrit, *menu*, "thinker"]. The scientific study of man is now quite generally pursued under two designations—Anthropology and Ethnology. These can hardly be considered two sciences, for the two departments of inquiry are in so many ways connected, in subject-matter, method, and aims, that the division seems somewhat arbitrary and indistinct. The division in question is comparatively recent, is not universal nor sharply defined, and is mainly due to the different ends at which investigators have aimed.

Anthropology, as the term is now used, may be defined as the study, according to scientific methods and processes, of the relation of man to the whole body of lower animals. If the hypothesis of evolution, as taught by the Greek philosophers before Socrates, and formulated and expounded by Democritus and Lucretius, and in later times by Spencer, be accepted, the department of inquiry involves the relation of man to all the forms, forces, and phenomena of nature. Thus considered, anthropology is but an insignificant branch of the general science of life, whether animal or vegetable; which itself is again included in the still wider range of general physics. All alike are included in the discussion of the hypothesis of evolution, which supposes all beings and things to have been developed by inherent dynamic agencies from universally diffused and infinitesimally minute particles of inorganic matter. Giving to anthropology this breadth of meaning, distinctness of definition and classification passes away, and the tendency of thought is to become vague and speculative. Observation is likely to give place to hypothesis, and we are in danger of reproducing in all its essential elements the methods of the pre-Socratic era in Greece. Hence, cautious investigators who seek to establish the affiliation of man to the lower animals by descent confine themselves to the study of the relation of man to the animal kingdom, and take the name of anthropologists, from the fact that the discovery of the origin of man, rather than his migrations and tribal relations, is the ultimate aim of all their studies.

When we assume the origin of man on the earth as scientifically beyond the limits of human observation, a series of problems present themselves, all of which are of great interest and importance. Among these are (1) the geological period of the introduction of man among the fauna of the earth; (2) whether man has had his origin in one centre or many; (3) whether man belongs to one species or many; (4) what modifying effect the external agencies of nature have exerted upon him; (5) what influence natural selection and survival of the fittest have had in developing and improving varieties; (6) the influence of intermixture of different stocks or races; (7) the direction and influence of migration as connected with food, climate, and institutions. In all these problems it will be seen that the objective point in the investigation is (in general) man's relation to his fellows.

Whether man is considered as belonging to the same species or different species of the same genus, the aim of the investigator is the tribe, the race, the nation. Hence we see the propriety of the name ethnology for such inquiries. Whether it is wise thus to confine the attention exclusively to specific points in a general subject in which the facts and laws involved are so related that they all modify and affect each other, and where nearly the same range of investigation is required for each, may well be doubted. Possibly, all that is gained in simplicity and exactness is lost in breadth of view and correct interpretation of the phenomena. Leaving out of view the attempt to separate these branches of inquiry as such, we shall present a rapid outline of the points of most importance in the general subject of man's relations to the animal kingdom and to his fellows.

The greater part of the problems involved in the study of man belong to what Whewell calls the palætiological sciences, in which we reason from effect to cause, seeking from phenomena actually existing, described, and classified to ascertain their origin and causes. The existing facts of the science of man must be sought out and classified before there can be any adequate solution of problems which lie beyond observation. Those inquiries with which anthropologists are mostly conversant lie in the direction of search after origins and causes of existing facts. As analysis must always precede synthesis, and as phenomena must be known and classified before we can make any legitimate search after causes, so ethnology should precede the discussion of the problems which of late have been included under the name of anthropology. It may be suggested that a division of the science of man analogous to that adopted in astronomy would be more conducive to clearness of thought than that which has prevailed. If inquirers had been willing to subdivide ethnology into descriptive and physical, much misapprehension and confusion would have been avoided. The early investigators, like Buffon and Blumenbach, assumed man to be a distinct species, and devoted themselves first of all to a survey of the elements which distinguish and describe him individually and in society. They laid a basis in carefully classified facts before they proceeded to attack the problems which these suggest without solving. The natural method in this study is that which has been so fruitful in the allied science of geology. In an exposition of the science of man it is requisite to take account of all the elements, both moral, intellectual, and physical, which enter into his constitution. We must look at man as connected with inorganic nature; as connected with the vegetable and animal world; as an intellectual and moral being; as a social being, adapted to political organization; as a religious being, showing everywhere the disposition to worship; as an economical being, showing the disposition to accumulate possessions far beyond the necessities imposed by the vicissitudes of the seasons; as a being capable of forming an articulate and written language, and gathering up in it the facts and ex-

perience of preceding ages in the forms of science, history, and literature. The subject is therefore one of the broadest which can engage the human mind. It touches, on the side of man's material organization, the facts and laws of physics, of chemistry, astronomy, meteorology, geology, general zoology, anatomy, and physiology. On the side of his moral and intellectual nature it involves all that man has accomplished in the whole range of thought and action. In this study we occupy a peculiar and unique position, for the student is himself the type and representative of the subject-matter of his study. He is both subject and object. He surveys the whole field of objective nature to distinguish, to classify, and to interpret, and then turns upon himself to ascertain the relation which he sustains to the facts and laws which he has collected and arranged into a reasoned and coherent system. Moreover, man finds that the world of external nature and the world of self-conscious and reasoning activity within him are mysteriously united in his own person. By his physical organization he is a part of the vast plan of external nature. By his intellectual and moral being he is conscious of standing above every other form of animal nature, and dwelling in a world of thought apart from them all.

When we apply to this subject the methods of scientific investigation, and survey the whole phenomena of our complex being, we find the elements of free-will, self-conscious intelligence, and capacity for moral distinctions factors so important that they throw all physical phenomena into the shade to such a degree that it is only by conscious, and often severe, effort that we are able to examine with adequate attention the elements of our nature which we have in common with the inorganic and animal world. The history of man is so much that of his moral and mental nature and activity that we are in danger of undervaluing the study of man as an *animal*—closely related to the world of matter around him, and of which his body forms a constituent part. These more obvious and important elements in man's nature first claimed attention. It was only after these had been studied and classified that the study of man as an animal became prominent as a branch of science. Like all neglected subjects of inquiry, when at last it gained the ear of the world extravagant expectations were raised and extravagant claims put forth on its behalf; and a tendency is now shown in the direction of the other extreme. With many naturalists the moral and intellectual is sunk in the physical, and those elements which so widely separate man from beast are considered as simply developments of the animal instincts. But however this may be, no student of the nature of man can ignore his relations to other parts of the animal and inorganic world. These relations throw the most important light upon all the problems of life, mind, and society, and are equally important to the psychologist, the historian, the theologian, and the statesman. In the investigation of this, as of every department of nature, sound method requires that we take into account all the phenomena presented, each in its completeness and natural relations, and estimate their value in accordance with their relative weight and bearing on the problems before us. Unfortunately, psychologists, naturalists, and linguists, while properly confining themselves to their own specialties as bearing on man's nature and origin, have quite generally undervalued the labors of each other, and too much neglected the results of each other's inquiries in drawing their conclusions.

When we contemplate carefully the order of nature, we find the elements of a plan or system which shows progress in the unfolding of its parts from the lower and simpler forms of existence to the higher or more complex. Each department of nature becomes higher through the addition to itself of something in organization and endowment which the next below it does not manifest or possess. Consequently, each department above the lowest subsumes into itself all that is inferior, and varies from the order next below it by something new and real which is added. Upon the reality, distinctness in character and function of these *added* elements of difference rests the possibility of real scientific classification in natural history. As the differences of the animal and vegetable world form successive additions to a common original plan or system of organization, we may expect to find in each some vague foreshadowings or prophecies of the attributes and characteristics which when actually added will mark the next higher forms. The crystal suggests to the imagination by its recurrent uniformity the hereditary life and organization of the plant. The plant, as it turns to the sun or shrinks from the heat of the hand, foreshadows without exemplifying the nervous system. When in the animal kingdom we examine the various genera and species, we find an economy of thought, so to speak, in the principles which underlie their organization. We see the development of single sets of organs by additions which constitute specific differences, while the generic character remains unchanged. The higher animals have capacities which are vague and indistinct analogues of the vast endowments and godlike reason of man. Hence, we find in the earliest thought a tendency to look upon all the varied forms of nature as outgrowths of one substance, endlessly modified, but without essential and fundamental differences. The doctrine of a chain of beings, all the links of which are connected with each other—a disposition to sink all the varieties of nature into one multiform unity of existence—shows itself among the early Greek philosophers, and, under various modifications, the same idea prevails in the systems of the East. At some times the tendency has been to assume a material substance as the common basis of all forms of physical and mental existence in the universe, and at others to assume an ideal or spiritual one. Philosophers in ancient and modern times have oscillated between these opposite assumptions, and idealism and materialism have been alternately predominant throughout the history of thought. These alternations in modes of thought agree in the resolution of all things into a unity of existence without will or consciousness, and in referring all the varieties of present existence to the dynamic agency of laws which are independent of all intelligence. This search after unity is common to both schools of thought, and the method and formulas of each may be interchanged. Hence the surprising facility with which men have passed from a system of idealistic to a system of materialistic development. In each theory the unconscious passes into the conscious. The cosmos begins without thought or will, but finally works out both by a necessary process of differentiation. The unconscious has its outcome in the conscious, the necessary in the free, the chaos in the cosmos. The one system supposes a universally diffused, ideal existence without specific form, will, or consciousness; the other, a universally diffused, undifferentiated matter, uncreated, and uncontrolled by mind or will. In each of these systems the search is for unity of things as distinguished from a unity of creative power and formative intelligence.

These theories, substantially one in method, stand over against that which finds the unity that satisfies the thought in an intelligent and free First Cause of all things. As distinguished from the theories which find the origin of beings in a necessary dynamic and unconscious agency working in a self-existent substratum, this theory regards nature as the outcome of a mind and will working out, in form, space, and time, a complicated series of ideas or thoughts which antedate as plan or thought their exhibition in the universe of matter. Both systems make use legitimately of the term "development." But with the one development is of the unconscious by the unconscious, without foreseen aim or purpose or volition; with the other, "development" is conversant with a series of ideas consciously apprehended, the order and relations of whose appearance in time are determined by a free intelligence and will adequate to the results produced. It implies a self-existent cause, to whose agency the substance and form of all the varieties of nature are due, and whose continuous existence in time and space is the permanent basis, ground, and cause of that universal, orderly activity which we designate collectively as the laws of matter and mind. The idealist affirms that the universally diffused non-material substance becomes self-conscious in the mind of man; the materialist finds that the diffused unorganized matter reaches self-consciousness and the power of thought by successive differentiations, and increasing complexities of combination in the human body. Both find the origin of the universe of things and beings in a unity of chaotic existence, without a presiding mind. Both alike are compelled by their systems to deny any distinction between mind and body—the one resolving the body and all forms of matter into mind; the other resolving mind and conscience into modes of matter.

Hence it will be seen that speculations on the origin of man logically take their rise and coloring from the speculator's view of the origin and constitution of the universe. If there is no dualism of mind and matter in man, it naturally follows from the same method of reasoning that there is no mind which controls the agencies and forces of nature. It follows also that he who denies the dual form of existence in the universe is driven to the task of showing the adequacy of inorganic material forces to produce the phenomena of life and thought, either by discovering the actual process of such production, or by something like an approximate verification of such an hypothesis—by appealing to analogous facts in nature, and showing also that the hypothesis of mind in nature and man is essentially out of accord with the phenomena to which both schools of thought must alike appeal.

The subject of evolution in general cannot here be taken

up. It has been discussed under its appropriate head. In speaking of the doctrine, now so widely advocated, of the origin of man from anthropoid apes, we must be allowed to caution the reader against confounding the words "evolution" and "law" with concrete and intelligent forces. Many seem to suppose that these terms denote a causal agency instead of a process. When the origin of species is said to be due to evolution we use a figure of speech only, and give concrete existence to a mere abstract term. The term is legitimately used when it expresses the opinion of the writer that the creative process was slow rather than sudden, and that the processes of creation were orderly and followed a thought or plan. Creation through evolution or law has to do with the time and order of action of the creative force, and cannot, in any intelligible sense of the terms, refer to the concrete orderly-acting force whose mode of action these abstract terms describe.

In all departments of scientific inquiry we soon reach profound mysteries and insoluble problems. Around these both dogmatic skepticism and dogmatic credulity have fought their battles. Questions regarding origins have been most fruitful in suggesting these mysterious problems. Regarding the most of these, scientific investigation (and with this alone this discussion is conversant) gives us no solution which commands our confidence and excludes all difficulties. The hypothesis of evolution gives us no clue to the origin of those substances which, resisting all chemical reagents, are called simple; it gives us no clue even to the origin of that cosmic vapor which is postulated as the material basis of all things. The origin of life, even if we admit the unverified hypothesis of spontaneous generation, is wrapped in mystery, for no one has detected the real nature of the change by which inorganic matter is supposed to pass into living tissue. If we deny the maxim *omne animal ex ovo*, we have only pushed the difficulty one step farther back. We may attempt to trace the origin of consciousness to reflex or unconscious activity of the nerves, but in the attempt we are obliged to assume the existence of all the facts and laws which we seek to account for. The origin of volition is equally dark. We are conscious of freedom, and equally conscious of external conditioning agencies which we must take into account. But the precise relation to each other of these two elements entering into an act of will no one can determine. We find the consciousness of freedom and those elements which we call motives, whether external or internal, coexisting in our consciousness; but he who denies the existence of either for the sake of referring the phenomena to a unit of explanation sets aside the very problem which he seeks to solve. This has been the battle-ground of the ages, but we are no nearer the solution of the difficulty than were the Greeks in the age of Zeno. The origin of human language is beset with the same difficulties. We must assume the two factors of conscious intelligence and instinctive animal impulse in all our attempts at explaining the phenomena. He who seeks the origin of speech by referring it either to intelligence or the unconscious motions of the nervous organism alone will fail. The resolution of the originating or causal agency into one and the same force must assume the existence of a part of the facts for whose origin we would account.

We have referred to this general problem of origins as analogous in character to that involved in the origin of life or the origin of man. This origin cannot, of course, have been a matter for observation. No man can be supposed present for the purposes of testimony at his own birth, nor can he have been a witness of the mode or process of his own creation. An exhaustive discussion of the problem of origins would be an important contribution to scientific method. We propose to state in outline the principal hypotheses which have been suggested to account for the origin of man, naming some few objections by which these hypotheses have been met. (1) The hypothesis of Darwin is that man has grown by a series of modifications in geological time from some extinct form of the anthropoid apes—"from a hairy quadruped furnished with a tail and pointed ears, arboreal in its habits, and an inhabitant of the Old World." (*Descent of Man*, p. 372.) Darwin also states that man "since he attained to the rank of manhood has diverged into different races, or, as they may be more appropriately called, sub-species." . . . "Nevertheless, all the races agree in so many unimportant details of structure, and in so many mental peculiarities, that they can be accounted for only through inheritance from a common progenitor."

(2) Mr. A. R. Wallace, who, independently of Darwin, formulated and defended the hypothesis of natural selection, denies that it will account for the origin of man. Like Darwin, Wallace affirms the original unity of man. He says that "man may have been—indeed, must have been—once a homogeneous race." (*Natural Selection*, p. 321.) On the basis of man's exemption from the action of the law of natural selection as applied to animals, he finds an "argument for placing man apart, as not only the head and culminating point of the grand series of organic nature, but as, in some degree, a new and distinct order of being." (*Nat. Sel.*, p. 324.) The argument in the work here alluded to, showing that man is by his nature independent of the law of natural selection, is familiar. We have not space to reproduce it. Wallace's general conclusion is that an external intelligent force, acting independently of those laws which control the differentiation of the animal kingdom, must be postulated to account for the special physical, mental, and moral endowments which make up the specific and unique nature of man. He concludes that "a superior intelligence has guided the development of man in a definite direction and for a special purpose, just as man guides the development of many animal and vegetable forms." (*Nat. Sel.*, p. 359.)

(3) Another hypothesis of the origin of man, differing from both these just named, is that of Carl Vogt. He adopts Darwin's idea, that the law of natural selection accounts fully for the origin and endowments of man; but he positively rejects the idea put forth by Wallace, that a higher and controlling intelligence is necessary to account for the capacities of man, and assumes that man has descended not from one form of anthropoid apes, according to the judgment of Darwin, but from three forms, and possibly from several. His words are: "In short, we cannot see why American races of man may not be derived from American apes, negroes from African apes, or negritos perhaps from Asiatic apes." After speaking of the "plurality of races as a fact" "well established," he adds: "Then all these facts do not lead us to one common fundamental stock, to one intermediate form between man and ape, but to many parallel series, which, more or less locally confined, might have been developed from the various parallel series of the apes." (*Lects. on Man*, p. 467.) He further says: "Our savage ancestors stand opposed to each other, stock against stock, race against race, species against species." (*Lects.*, p. 468.) We thus find Carl Vogt, while adopting the methods of Darwin, arriving at the conclusion that the different types of men constitute different species, from the fact that they have been developed from different types of monkeys.

(4) In addition to these we have the evolutionist hypothesis proper, which finds the origin of man, as well as of all inorganic, vegetable, and animal forms, in successive and continuously connected differentiations and integrations of a universally diffused ether. With this school man is but an animal more highly differentiated than the mass of his congeners who have preceded him in the cosmical process. The complexity of his organization constituting the only difference between man and the other animals, to this complexity the genesis of his moral and intellectual capacities is solely to be attributed. This view is best represented in the works of Herbert Spencer.

(5) Other theories are thus described by Dr. Dawson (*Story of Earth and Man*, p. 320): "One school assumes an innate tendency in every species to change in the course of time. (*Owen.*) Another believes in exceptional births, either in the course of ordinary generation or by parthenogenesis. (*Mivart, Ferris.*) Another refers to the known facts of reproductive acceleration or retardation observed in some humble creatures. (*Hyatt* and *Cope.*) New forms arising in any of these ways or fortuitously may, it is supposed, be perpetuated, and increased and further improved by favoring external circumstances and the efforts of the organism to avail itself of these. (*Lamarck.*)" Closely in harmony with these views are those adopted by the ancients, especially of the Epicurean school, as set forth in the brilliant poem of Lucretius on the *Nature of Things*. The difference between these speculators and the moderns in knowledge of natural history is enormous, but the similarity in methods of thought and statement is remarkable.

When we examine these various hypotheses we find a general agreement in assuming that man has been derived by generation from some one or more forms of lower animal life. But we are struck, on closer examination, with the great want of agreement in the methods of reasoning and the arguments adduced. Spencer and Häckel seem to consider the problem of the origin of man and his faculties as included in the broader problem of the origin of life. In this they see no insuperable difficulty. Indeed, the whole system of evolution as taught by Spencer grounds its claim to acceptance as a philosophy of the universe in its ability to give a scientific explanation of the origin of life through observed modifications of matter and force. Darwin, on the other hand, postulates the existence of living animal germs as his point of departure, and intimates his belief that the origin of life and intelligence in the lower animals is a hopeless inquiry. "In what manner,"

he says, "the mental powers were first developed in the lowest organisms is as hopeless an inquiry as how life at first originated. These are problems for the distant future, if they are ever to be solved by man." (*Descent of Man*, p. 35.) Prof. Tyndall as a physicist says: "The passage from the physics of the brain to the corresponding facts of consciousness is unthinkable. Granted that a definite thought and a definite molecular action in the brain occur simultaneously, we do not possess the intellectual organ, nor apparently any rudiment of the organ, which would enable us to pass by a process of reasoning from the one to the other. They appear together, but we know not why." (*Scientific Materialism*, Am. ed., p. 117.)

As we have already remarked, Wallace denies that "natural selection" can be made to account for the origin of man. His great ability as a naturalist, and his relation as an independent discoverer to the law in question, give to his views a special value and importance. In his article on the "Limits of Natural Selection as applied to Man" (pp. 334–362), referring to Mr. Darwin's care to impress upon his readers that natural selection has no power to advance any being much beyond his fellows, but only so far as to enable him to survive them in the struggle for existence, and also that it has no power to produce modifications which are in the least injurious or even useless to its possessor, or out of proportion to its degree of development, he proceeds to give a series of points in which the law of natural selection fails to meet the considerations which Mr. Darwin himself lays down as requisite for its legitimate application. Hence, Mr. Wallace utterly rejects Darwin's conclusions regarding the origin of man from the anthropoid ape, while he accepts them so far as they bear upon the origin of species among plants and animals in general.

Equally trenchant and irreconcilable differences may be pointed out in the applications and modifications of this hypothesis in the works of naturalists who have in some of its forms adopted it. These differences tend to confirm the impression that, however imposing the authority under which these methods of accounting for our origin have been put forth, they still await scientific verification, and have no claim to be accepted as catholic truths tested by the severe processes of scientific method. As working hypotheses they may all be useful. They may aid investigators to bring out new or neglected truths; but so long as no transition fossils bridging over the gulf between man and the apes can be produced, so long as the system depends upon what *may possibly have been*, and not upon what is proved as fact, we may reasonably place the various suppositions regarding the origin of man by generation from lower animals among the immense mass of unverified hypotheses which active minds are continually bringing to the surface in the progress of inquiry. In addition to the difficulties of accounting for the origin of man by the hypothesis of evolution, apart from an informing and directing agency (such as are suggested by Wallace, Mivart, and others), there are those which affect the system as a whole. Thoughtful naturalists in large majority affirm that no well-authenticated instance of spontaneous generation has been shown; that no new species able to maintain itself has been produced by the hybrid union of allied families of animals; that palæontology has revealed few if any of the manifold series of transitional forms between animal species which the system necessarily implies and requires for its maintenance. All that Darwin really claims for his hypothesis in its application to man is that it *may* be true. It is noteworthy that Darwin is much less positive in his conclusions than his pupils and followers. He concedes that his hypothesis is an inference from premises which are not seldom speculative or doubtful. In all sciences in which we reason from phenomena to their causes we can only infer a possible past from the actual and ascertained present. When we take into account the nature of the inquiry, and the serious difficulties which have led so many naturalists of the highest reputation to reject it entirely, we can safely say that, whatever may become true in the future, at present the hypothesis is unverified, and has no legitimate standing among the settled theories of natural science.

When we take into account the laws of man's mind, his use of articulate language, his social, moral, and religious constitution, we are met by problems which are extremely difficult of explanation on any hypothesis of evolution. Speaking generally, the opinions of those who deny to man the possession of a mind, with its constitution and laws of action, as an inherent part of his original being, fall naturally into two classes. The first, which includes the immense majority of materialists, hold that man comes into the world endowed with sensibility alone, and that contact with the external world through the nervous system comes, in the course of his life, to generate the capacity for acquiring knowledge, the power of thought, and all those fixed modes of mental action which psychologists of a different school call the primordial laws of action that are native to mind, whether necessary or contingent in their nature. With these the development of intelligence originates in the *matter* of the nerves, and is completed in the lifetime of each human being. They deny that the laws of mental and moral activity which limit and condition all possible thought are laws of the mind as a distinct entity. They find by analysis no such elements. They resolve these laws or limitations of all thinking into habits or associational residua which have been developed by the activity of the nervous system. Whatever this school may attribute to the development of capacity by hereditary influence does not essentially modify these statements. This school is best represented by the elder Mill in his *Analysis of the Human Mind.* The second school of sensational psychologists is best represented by Spencer. In contradiction to the views of Mill, Spencer finds the human mind conditioned and limited, in all its activity, by necessary laws which are a part of the natural furniture of every human mind now existing. In this respect he agrees with the spiritualistic school of psychologists, but he attributes the existence of these constitutive laws of thought, which do not yield to analysis in the present state of man, to an accumulation of hereditary influences, continued through an indefinite period, which had their origin in the relation of an undifferentiated sensibility to its material surroundings. He disagrees entirely with Mill and his school in his estimate of the actually existing facts of the human mind, and the analysis of these facts into irritations of the nervous tissue of each man after birth. He agrees with Mill in reference to the process by which these laws of mental action have been generated, but extends the time indefinitely backward, giving almost unlimited influence to the law of heredity. What Mill finds to be built up in a man's lifetime, Spencer assumes to be possible only as the accumulated result of hereditary influences, gaining infinitesimal increments through innumerable ages. However much these two schools differ regarding the facts of the human mind and their analysis, the systems are both liable to similar criticism and present similar defects of method. Both James Mill and Spencer found their systems upon association and habit. The question naturally arises: What are the conditions necessary for the beginning of mental habits and the processes of association? A mental habit is formed by going through a mental process, or a series of mental processes, so frequently that the subject of them acquires great facility in the operation—possibly, a facility so great that the processes are possible without a conscious act of will. Association is the power to recall in memory mental acts or processes which have, in any manner, been connected with each other. Now, habit and association are unintelligible terms except on the assumption of the fundamental laws of intelligence as already existing. For two objects of knowledge to be associated with each other there must be the intelligence to apprehend them as objects of knowledge—the power to discriminate them from the self and from each other, to note their distinguishing marks and attributes in time and space. They must both be held in thought at the same instant as actual knowledge, or one as a fact of knowledge, the other of memory, or both as facts of memory. If, as we have said, a mental habit is formed by frequently going through a mental process or mental processes, manifestly habit, like association, postulates those very laws of mental activity to account for which it is brought forward. Both the system of Mill and that of Spencer are vitiated by this fatal defect, while in vitally important particulars they contradict each other.

The difficulties which attach to all systems that seek to account for the powers and laws of the mind by habit and association alone are illustrated by the laws of human speech. Language is the instrument of human thought more emphatically than it is a means for its transmission. The rudest forms of human speech involve the presence of all the germs of a complete human mind. We hear, it is true, of languages which have no abstract terms, and which indicate no powers beyond the rudimentary instincts and intelligence of animals. But when we attempt to analyze a sentence in any language, however uncultivated, we recognize abstract terms, and some of a high degree of generality. We find always subject, object, and predicate; we can detect the agency of all the laws and limitations which make up what we call the constitution of the mind. So completely are these wrought into language that their absence from it is impossible to thought. The fundamental postulate of the broad distinction between the thinker and the object of his thought is a recognized element of universal grammar, and language becomes unintelligible or absurd whenever the universal laws of human thought fail of recognition. A complete psychology can be readily

deduced from the rudest language ever spoken. No system which fails to recognize the broad distinction between that in man which thinks and feels and acts, and the phenomena of the external world, can be stated in human language without an implied contradiction. This dualism of thoughts and things strikes so deep into language, and is made so necessary by the constitution of the human mind, that failure to recognize it in thought or expression involves a contradiction. Man, as a thinker, stands by his personality apart from the universe in which he lives. He cannot in thought recognize himself as identical with universal matter or universal mind. The reality of what thinks, as distinguished from the material world, is a condition of our knowledge of the material world; for all knowledge involves, at bottom, a discrimination between the thinker and the material fact which he knows. Hence, neither the materialist nor the idealist can formulate his theory in language without an essential contradiction in terms. The beginning of articulate speech, as well as the beginning of thought, necessarily postulates the essential characteristics of mind and its laws, however imperfectly developed that mind may be.

The question whether man shall be classed with the anthropoid apes or separated from the animal kingdom has been much discussed by naturalists. With some noted exceptions this matter has been determined, apparently, by foregone conclusions concerning the origin of man by generation from the lower animals. As this is a matter which affects the naturalist rather than the general inquirer, and is partially involved in what has already been said, we waive further discussion.

The Unity of Man was generally conceded by the early naturalists—notably by Buffon, Blumenbach, Linnæus, and Prichard. Virey, whose work was first published in 1801, seems to have been the first among modern naturalists to call in question the specific unity of man. The discussion which ensued has led to the use of the terms *monogenist* and *polygenist* to characterize those who affirm or deny the unity of the human race. Virey divided man into two species, founding his distinction mainly upon the facial angle of Camper. In 1825, Bory de St. Vincent divided man into fifteen species. In 1826, Desmoulins, who had previously recognized eleven species, increased the number to sixteen. Jacquinot in 1849 recognized three species; Dr. Morton, twenty-two "families;" Luke Burke, sixty-three species. Agassiz assumes eight centres of creation for the human race, although there is some difference of statement in his earlier and later writings. He held the men of these different creations, though different in origin, to be one in their intellectual and moral nature. Nott and Gliddon, in their *Types of Mankind*, adopted generally Agassiz's views with reference to the different centres of creation, but insisted that the men of different origins constitute fundamentally different species, denying the unity of moral and mental nature which had been affirmed by Agassiz. This hypothesis was naturally pressed into the service of the defenders of the institution of slavery, and became the foundation of a diplomatic paper addressed to the British government upon the antislavery agitation by Mr. Calhoun. We are struck, in this enumeration of different classifications (which might be indefinitely extended), with the extreme differences in the conclusions at which these writers have arrived both in respect to the basis of classification and the classification itself. It indicates clearly that the polygenists, as a whole, are more fatally at variance with each other than they are with those who maintain the unity of man. If such contradictory systems of classification were to be put forth concerning any *animal* as well known as man, we should be inclined to suspect that the systems of classification, taken as a whole, were vitiated by some fundamental error. It is easy to see, without contrasting these essentially different systems with each other, that they are mutually inconsistent and destructive. The deductions of the polygenists from their theories vary as widely as the theories themselves. Knox (*Races of Men*) denies the possibility of a change of habitat for man, and affirms that Europeans in America are suffering a sure and constant deterioration; Dr. Caldwell (*Unity of the Human Race*) is equally confident that European races are steadily improving in America. Kombst (in *Johnston's Physical Atlas*) separates man into three species, but affirms that a mixture improves the result; Dr. Nott (*Types of Mankind*) denies the possibility of a permanent union of the different species of man, and appeals for proof to the weakness and inferiority of the mulattoes in the South. From these specimen illustrations of the utter absence of any agreement in fundamental principles on the part of the polygenists, as well as from the fact that their underlying principles of classification are often essentially contradictory, we are driven to the conclusion that they have undertaken an impossible task; and the presumption in favor of the unity of the human species is greatly strengthened by the dissensions and contradictions of its opponents. The range of facts bearing upon the subject of the unity or non-unity of man, and the imperfection of our knowledge, present great difficulties whichever hypothesis we assume. The naturalists who have assumed the unity of man are numerous and their authority weighty. From Linnæus, Buffon, and Blumenbach to the present day there has been an unbroken line of succession of ethnologists who have affirmed the unity of the human race. So far as the argument from language is concerned, writers on comparative philology have been, with few exceptions, unanimous that it points in the direction of unity. The remarkable treatise by Mr. L. H. Morgan, published by the Smithsonian Institution, on *The Systems of Consanguinity and Affinity in the Human Family*, points in the same direction. Our limits forbid any extended citation of the opinions of naturalists upon this point. The views of Darwin and Wallace have been already given. De Quatrefages (*Rapport sur les Progrès de l'Anthropologie*, p. 128) thus sums up an extended and valuable discussion of the point in question: "The conflict between these two doctrines was originally caused by dogmatic and anti-dogmatic controversies which originated in the last century. When these controversies shall have ceased, when the feeling which they excite shall have been allayed, all wise and studious men will, I am entirely confident, accept of monogenism; for it will be necessary at last to recognize the fact that man, a simple animal so far as his body is concerned, is in this quality subject to all the laws which govern anywhere organization and life; and scientific monogenism, with which alone we are here concerned, is, at bottom, only the development of this truth."

A few years since polygenism was popularly supposed to have become the settled creed of men of "advanced" views in science. It was claimed, indeed, as one of the points which science had *settled*. The change within twenty years is noteworthy. Mr. E. B. Tylor says (art. "Anthropology" in *Encyc. Brit.*, 9th ed.): "On the whole, it may be asserted that the doctrine of the unity of mankind now stands on a firmer basis than in any previous ages. It would be premature to judge how far the problem of the origin of races may be capable of an exact solution, but the experience of the last few years countenances Mr. Darwin's prophecy that before long 'the dispute between the monogenists and the polygenists will die a silent and unobserved death' (*Descent of Man*, vol. i. p. 227)." When we recall the extreme confidence with which the doctrine of the non-unity of man was put forth by a large segment of naturalists a few years ago, we are taught the need of caution in the acceptance of scientific hypotheses, and find that fashion and authority prevail in science as well as in literature and philosophy.

Antiquity of Man.—Many attempts have been made to determine the antiquity of man by reference to the Hebrew Scriptures, the monumental inscriptions of Egypt, and the literature of Eastern nations. Jewish and Christian writers have endeavored to settle this question from the Pentateuch, but the continuity of the chronological record embodied in the Pentateuch is by no means certain; and the Masoretic Hebrew text, the LXX. version, and the Samaritan Pentateuch greatly differ in respect to their chronology, as may be seen from a table in Poole's *Genesis of the Earth and Man* (p. 90), which is reproduced in the Bible dictionaries of Dr. Smith and of McClintock and Strong under the article "Chronology." The tendency of the early Church was to conform its chronological system to the indications afforded by the LXX. Archbishop Usher (*Chronologia Sacra*, 1660), following the Hebrew text, fixed upon 4004 B. C. as the date of the creation of Adam. William Hales (*New Analysis of Chronology*, 1809–14), taking the LXX. as his guide, assigned the creation of Adam to 5411 B. C., indicating a reaction in the Christian Church in the direction of a longer chronology. At this period, it should be recollected, the question of the antiquity of man was not sharply discriminated from that of the earth. The drift of Christian opinion with reference to this subject is further illustrated in the preface to the *Oxford Chronological Tables* (1835), which says: "The Scriptures were written for nobler and more exalted purposes than the mere transmission of dates or the gratification of antiquarian curiosity; and hence we must not be surprised if, on topics connected with chronology, we fail to meet with the information we desire, and find ourselves at a loss to ascertain the precise time at which some of the most important transactions took place. This increased uncertainty, however, seems to have aroused the diligence and ingenuity of chronologers, who have compiled system upon system, without adding much to our stock of knowledge respecting the remote ages of antiquity. Thus, for example, there are not less than

three hundred different dates assigned as the era of the Creation, varying in the extremes no less than 3000 years; and equal uncertainty, though perhaps not extending to an equal number of discordant opinions, prevails respecting other eras, and perplexes the chronological student at every step of his inquiry." The tendency of opinion among reverent students of the Scriptures is still further illustrated in the following passage from Prichard's *Physical History of Mankind* (vol. v., 1847): "By some it will be objected to the conclusions at which I have arrived that there exists, according to my hypothesis, no chronology, properly so termed, of the earliest ages, and that no means are to be found for ascertaining the real age of the world. This I am prepared to admit; and I observe that the ancient Hebrews seem to have been of the same opinion, since the scriptural writers have always avoided the attempt to compute the period in question. . . . In no one instance, as far as I can remember, . . . has any one writer alluded to the age of the world." Without further reference (which the limits of this article will not permit) to critical authorities, we may reasonably question, as the result even of this meagre and imperfect sketch of the opinions of some of the most devout and competent students of the Bible, whether it was the design of the Hebrew Scriptures to reveal either the antiquity of man or the antiquity of the earth. The tendency of opinion in this direction was marked and clear before recent discoveries of fossil remains and stone implements in the Drift formation had specially called the attention of naturalists to the general subject. A note on the chronology of Genesis in the *Speaker's Commentary* (vol. i. p. 61) affords conclusive evidence that the best scholars of the Church of England fully recognize the difficulty of determining the age of man from the Hebrew Scriptures.

Fossil human bones and stone implements had been found during the eighteenth century in such situations as led to the supposition that they were deposited in the localities where found previous to the historical period; but down to the time of Cuvier, who died in 1834, they had not been accepted by scientific men in general as affording satisfactory evidence of the great antiquity of man. From the time of Boué (1823) there was a gradual increase of evidence in this direction, but only so late as 1838 did the discoveries of Boucher de Perthes give to the question such importance as to command the attention of the scientific world. Subsequent to this time discoveries similar to those of De Perthes at Abbéville and St. Acheul have rapidly multiplied. The discovery by Dr. Keller, in 1854, of the remains of lake-dwellings in the Swiss lakes, and the exploration in 1847 of the shell-heaps in Denmark (though these remains are incontestably of a later period than those found by De Perthes), excited the public mind to great activity on this subject. These investigations have led a large majority of scientific men to conclude that this geological evidence points to a much higher antiquity for man than had been commonly assumed. Attempts have been made from this evidence to settle a definite chronology for the human race, but the results obtained in this direction have been as conflicting and unsatisfactory as those arrived at by chronological writers who proceed by other methods.

The nature of primitive man has been much discussed within a few years past under the form of inquiries into the origin of "civilization" and "culture." Some writers like Whately have taken the ground that man has never in any instance emerged from barbarism by his own powers, inferring from this assumption that civilization must have had a supernatural origin. The remains of pre-historic man which have been found over so wide a portion of the earth seem to point to a gradual development of civilization by slow degrees, and from a state of intelligence low indeed, but sufficient to generate successful efforts in the direction of higher conditions of life. These pre-historic remains have led some writers to assume a primitive state utterly savage, even below that of the most barbarous tribes at present known. But various considerations give weight to the hypothesis that primeval men started in the race of improvement from the condition of grown-up children rather than from that of brutal savages. It has been too readily assumed that the remains of pre-historic men, and the implements found with them, are proof that they led a life scarcely above that of beasts. The well-known Engis and Neanderthal skulls, though at first pressed into the service of this notion, do not on careful examination favor it. Prof. Huxley says of the Neanderthal skull that it "is by no means so isolated as it appears to be at first, but forms in reality the extreme of a series leading gradually from it to the highest and best-developed human crania." Of the Engis skull he says, "It is, in fact, a fair average human skull." He also adds the conclusion that the fossil remains of man hitherto found do not indicate a lower condition than the lowest savages of the present day. (*Man's Place in Nature*, pp. 181–183.) The Cro-magnon fossils belonging, says Dr. Dawson (*Nature and the Bible*, pp. 166–167), "to the oldest race of men known in Western Europe," present the skeleton of a man nearly six feet high, with a brain "of greater size than in the average of modern men, and the frontal region as largely developed." Gratiolet sent to the museum in Paris the skull of a modern idiot, which, though a little smaller, reproduced the Neanderthal skull in almost every particular. Quatrefages says that the Neanderthal skull "differs in nothing from the mean type of the existing Germanic races, and in no respect approaches that of the Simians." (*Rapport*, p. 251.) In regard to internal capacity of the skull, the earliest remains of pre-historic men do not essentially differ from barbarous peoples of the present day. Even the Neanderthal skull, which, in the absence of any means of comparison with other skulls of the same period and locality, may have been exceptional or that of an idiot, has been estimated to indicate a brain-cavity equal to 75 cubic inches. The collections of Drs. Davis and Morton give the average internal capacity of the cranium in the chief races as follows: Teutonic family, 94 cubic inches; Esquimaux, 91; negroes, 85; Australians and Tasmanians, 82; showing that the Neanderthal skull (which has been mainly relied on as proving the degradation of primitive man) is in brain-capacity but a few cubic inches less than that of the Bushman of to-day. A large majority of these fossil remains will compare favorably in brain-capacity with the average of living men; while the average size of the brain in the orang-utan is 28 cubic inches, and that of the gorilla 30—scarcely one-third of the average brain-capacity of existing human races. (See Wallace, *Natural Selection*, p. 338.) It may be further said that the table given by Prof. Daniel Wilson (*Pre-historic Annals of Scotland*) shows that the skulls of the pre-historic period measured by him compared with the skulls of the early historic period, which he also measured, differ from each other in brain-capacity less than those of various civilized races at the present day. Nor is the inference to be drawn from the earliest implements used by man at variance with that drawn from the form and capacity of these primitive skulls. We have before us some specimens, taken from the drift in the valley of the Somme, of the earliest and rudest stone implements that have yet been discovered. The manufacture of one of these with only such tools as the drift period could afford indicates an amount and continuity of thought and persistence of will which will compare favorably with that possessed by a considerable segment of the inhabitants of civilized countries. The implements found in the "kitchen-middens" of Denmark and the lake-dwellings of Switzerland, though confessedly of a later period, indicate not only a considerable degree of mechanical ingenuity, but an adaptation to their evident uses, and even a sense of beauty, which indicate that they are the products of beings of considerable intelligence. Quatrefages (*The Prussian Race*, p. 23) says: "Every artist will admire what is correct, firm, and true in some of the designs, graven with mere flints upon plates of mammoth teeth and upon reindeer horns, which have been taken out of the caves of the Madeleine of Langerie-Basse, etc. The ivory handles of poignards found in the caverns of Bruniquel are worthy of our best modern sculptors."

From the long infancy and early helplessness of primitive man he must, from the first, have lived in a social state. Some sort of a family or tribal organization seems to be a condition of the propagation of our species. But a social state, of whatever kind, involves a medium of communication, and for a being with the impulses and capacities of man naturally leads to the development of articulate speech. Certainly, no tribe, however degraded, has ever been found without a spoken language which involved all the essential principles of general grammar, however limited its vocabulary or imperfect its development. These languages, due, in great part, to association and convention, arbitrary, to a considerable extent, in the signs which they employ, varying indefinitely in vocabulary, even when spoken by kindred tribes, the vehicles of thought, and not merely of emotion, are to be sharply discriminated from that natural and instinctive language by which men, and to some extent the brutes, communicate their emotions to each other—the test of which is, for each species, prevailing uniformity and universal intelligibility. All attempts to trace the origin of articulate speech to that natural and instinctive language which we have just characterized signally fail from the incapacity of the theory to account for the vast change of meaning in words originally onomatopoietic, as well as for the many words in every language which are purely arbitrary and conventional. Thought and language are so connected that neither can exist without the other; and the rudest language ever spoken implies the possession, by those speaking it, of a mental constitution which is es-

sentially the same as that of civilized man. This view is not affected by the evidence that language may have passed through successive stages of development and growth from monosyllabic through agglutinative forms to the inflectional system of the Aryan nations. For those languages which, like the Chinese, have been arrested in their course of development in the monosyllabic state, have shown themselves equal to all the requirements of literature and civilization.

The assumption that the movement of man has always been one of progress, and that the lowest forms of savage life at present illustrate everywhere an advance upon man's primitive condition, seems irreconcilable with the facts of history or of our present life. Unfortunately, there are within the ranks of every civilized society large communities of persons who, though surrounded by all the appliances of education, morality, and civilization, are, in their modes of life, habits, and instincts, savages. All know that the pauper and dangerous classes are continually recruited from the ranks of those above them. All know that these classes transmit their habits and character to their descendants, and that were it not for the constant efforts of the better portions of society, they would threaten the very existence of civilization. What is constantly seen among the paupers and criminal classes has, under certain conditions, become true of whole communities and nations. Civilization is in great part the victory of man over the forces of nature. Great changes, like the elevation or subsidence of continents, or the influence of a glacial period, producing great or sudden changes in climate on the surface of the earth, would inevitably overthrow the supremacy over nature which ages of thought and conflict had secured to man. Races and peoples who by the increase of numbers or the exigencies of war have been pushed into inhospitable climates or upon a barren soil suffer always in a few years an arrest of development or a deterioration of their intellectual and physical condition. The gradual sinking of Greenland and the Aleutian Islands are illustrations in point. Half-civilized peoples feel these influences even more severely than those who have better learned the processes by which man defends himself against the antagonistic forces of inorganic nature. The presence or withdrawal of the moral and religious agencies of civilization have wrought results for good or evil, instances of which must occur to every thoughtful reader. (See Marsh's *Man and Nature*, ch. i.; also Guyot's *Earth and Man*, p. 268.) In the absence of positive knowledge concerning the origin of the arts of life and the condition of primitive man, we see no speculative reason for assuming either a golden age or a state of bestial degradation. Nor do we see reason for giving a chronological significance of universal application to implements of stone, bronze, or iron. We may reasonably suppose that in primitive ages, as now, there were oscillations of progress and decadence. We know that the age of stone succeeded the age of copper in America, and that the use of stone, bronze, and iron has been contemporaneous in different countries. The use of these implements indicates rather states of development than periods of time. Implements of stone are in certain localities in use even at the present day.

Our limits forbid us to discuss the complicated questions which are suggested by polyandria and the abnormal conditions of life existing among the hill-tribes of India and elsewhere among degraded races. The testimony of Col. Ross King is that the hill-tribes have degenerated, and are still in process of deterioration. (*Tribes of the Nilgiri Hills*, pp. 47, 51.) The same testimony is given by Marshall. (*A Phrenologist among the Todas*, p. 268.) The considerations which have been advanced lead us to regard the opinion that primitive man started upon his career from a state of grown-up childhood as more reasonable than that which attributes to him a semi-bestial condition. Whatever can be said in favor of the opposite view may be found stated with sufficient fulness and clearness in Sir John Lubbock's *Origin of Civilization*.

If we assume the hypothesis toward which scientific opinion seems now drifting, of the unity of man's origin, man must have dispersed over the earth from a single centre. From the absence in man of natural means of protection against cold, and from other considerations which might be named, it seems most natural to suppose that man had his origin in a tropical or semi-tropical climate. Tracing back the lines of migration so far as it is possible, we find that intertropical Asia appears the most reasonable point of departure for the primitive race. This hypothesis has certainly been most widely received by scientific men, and harmonizes with any indications on this point which are contained in the Hebrew Scriptures, and with the fact that the earliest civilizations originated in that vicinity. The question of the varieties of men, and the determination of their lines of migration, are complicated with each other. It is necessary, however, to settle some proximate system of classification in order to discuss the question of migration at all. As we have already seen, a capital obstacle in the way of those who would classify man into distinct species is the absence of coincidence in the several marks of distinction upon the presence of which such classification must depend. This difficulty, which forbids us to classify man into distinct species, embarrasses us to some extent even when, accepting the unity of man, we attempt merely a classification into varieties. Every basis of classification that has been adopted has a certain value, but when we rigidly apply them they clash with each other, and bring us to confused and contradictory results. The facial angle, which was Camper's basis of classification, conspicuously fails when applied to individuals who are regarded on other distinctive marks as belonging to the same race. Classification upon the basis of the character of the hair is contradicted by the facts of color. The projecting jaw, which is claimed to be a peculiarity of the blacks, is rather a mark of degradation among peoples, either black or white, than of the blacks as a race. Illustrations of this fact are by no means uncommon among segments of the Indo-European race subjected for a considerable time to degrading influences. Color, though apparently among the most constant of marks of difference, varies so much among peoples who, judging from all other considerations, belong to the same race, that it cannot be relied on to classify the people of an entire continent or of different continents. The typical negro is hardly characteristic of the people of the African continent. According to Latham (*Man and his Migrations*, p. 147), "The negroes themselves are referable to an extreme rather than a normal type; and so far are they from being coextensive with the Africans that it is almost exclusively along the valleys of rivers that they are to be found." The Hottentots are yellow, the Caffres brown, and the Tuaricks of the Great Desert vary from the light color of the Arab to nearly black; while some Africans thoroughly black have finely-formed European features. The difference of color among the inhabitants of Hindostan is notorious. The law of consanguinity, and the formulas by which it is expressed, have been lately suggested as a possible basis for the classification of men. Tracing descent by the female line, and a complicated series of formulas indicating different degrees of relationship, have been shown to exist in closely allied forms over a large majority of the Asiatic Turanians and the native American races. Still, a large segment of undoubtedly Turanian peoples W. of the Ural Mountains, including among them the Finns and the Magyars, formulate their relationships after the ordinary European methods. (See L. H. Morgan's *Systems of Consanguinity*, in *Smithsonian Contributions* (vol. xvii.).) The failure of language to constitute a basis for the classification of man which shall be trustworthy and *universal* is obvious to the least instructed observer. The instances in which whole nations have, within the historic period, laid aside the language of their forefathers are numerous. Notwithstanding this fact, however, it may be questioned whether a language which has once been spoken by a large body of people is ever completely eradicated. Names of places and certain elements of the vocabulary always remain, so that minute investigation to a certain extent neutralizes the defect of which we have spoken. The French is substantially a Latin tongue, but the considerable number of Celtic and German words in its vocabulary shows that the French people were not originally a Latin race. The investigations of William von Humboldt regarding the aboriginal inhabitants of the Spanish peninsula are a remarkable illustration of the possibility of finding and interpreting the fossil remains of a speech which for ordinary purposes of life had been superseded. Basque words fastened to the most prominent physical features of Spain and its oldest towns go very far to prove that the Basques were its aboriginal inhabitants. On the whole, language furnishes the solution of a greater number of ethnological problems than any other mark of race-affinity. Prichard's *Eastern Origin of the Celtic Nations* is a remarkable illustration of the immense value of language for establishing affinities which other lines of inquiry could never have revealed. The truth is, all these bases of classification have value, and must enter as factors into any adequate classification of the human race. (For a discussion of the extent to which language has contributed to ethnological science see *Christian Review* for July, 1859.) The following classification of the principal human races—which is mainly that of Latham—is, like all other classifications that have been proposed, measurably provisional and defective. (For detailed accounts of various tribes and races we refer to their titles in the body of this work.)

A. ASIATICS AND NORTHERN EUROPEANS—POLYNESIANS—AMERICANS.

Class I. Mongolians.—Area, Northern, Central, and South-eastern Asia; Northern Europe.

Division 1 (languages monosyllabic).—The Chinese, the Siamese, the Burmese, Thibetans, the peoples of the Indian Archipelago, and various smaller tribes.

Division 2. *Turanians* (languages other than monosyllabic).—Groups: (1) The Mongolians proper, occupying the great central steppes of Asia. (2) The Turks, by which we understand not merely the Turks of the Ottoman empire, but their congeners in Independent and Chinese Tartary, Bokhara, some tribes of the Caucasus, Crimea, and Northern Siberia. (3) The Ugrians, occupying an area which is pretty equally divided by the Ural Mountains. The most prominent representatives of the western Ugrians are the Lapps and Finns and the Magyars of Hungary, the latter having intruded on the country which they occupy in the tenth century. Possibly, the Eskimo and some of the Kamschatkan tribes must be added to this group. (4) The Tungús, occupying an area to the N. and E. of the Mongolians proper. (5) The Peninsular group, including the Coreans, Japanese, Kurile Islanders, Kamskadales, and Koriaks, whose affinity for each other is acknowledged to be doubtful.

Class II. Iranians, who may be grouped as follows: (1) *Persians*—divided into Persians proper, Kurds, Bilúch, Afghans. (2) *Paropamisans*—occupants of the Kohistan of Cabul. (3) *Armenians*—who are scattered beyond the limits of the country which bears their name. (4) *Dioscurians* (or Caucasians, in the limited and more recent sense of the term)—including the Circassians, Georgians, and other cognate tribes.

Class III. Indians (Asiatic).—These may be divided into two families—the northern, or Sanskritic, and the southern, or Tamul—which in many localities are so blended and interwoven with each other as to make any accurate discrimination, whether of race or language, extremely difficult. To the Sanskritic family belong, on the basis of language at least, the peoples speaking the Hindi, the Bengali, the Mahratta, and other less important tribes. The Hindostani is, according to Latham, "a Lingua-Franca rather than a true native form of speech." The Gypsies are, both on linguistic and physical considerations, to be referred to the Sanskritic branch of the Indic race.

Class IV. The Oceanic Stock, which may be divided into—1. *The Amphinesian*—of the Mongol rather than the African type, and with language akin to the Malay. This division may be subdivided into—(1) Protonesians, or occupants of the Indian Archipelago and Chinese Sea, Sumatra, Borneo, Java, Moluccas, Philippines, and, in general, those islands (νῆσος) which were first (πρῶτος) occupied from the Eastern continent; (2) Micronesians of the Caroline and Marianne Isles; (3) Polynesians of the South Sea Islands in general, from the Sandwich Islands to New Zealand, from the Fijis to Easter Island; (4) Malagasi of Madagascar. 2. *The Kelænonesians*—of the African (κελαινὸς) rather than the Mongol type, and with slight affinities in language to the Malay. This division may be subdivided into—(1) The Papuans of New Guinea, Louisiade, New Hebrides, Tanna, Mallicollo, and New Caledonia; (2) Tasmanians; (3) Australians. (See Earle, *Papuans*.)

Class V. The American Stock.—1. *Eskimo and Algonkin Stocks*.—Beginning with the coast of Greenland, we find the Eskimo extending along the Arctic shores to Asia. On the N. E. coast of the Atlantic we meet the Algonkin stock, which extends S. from the Eskimo line to North Carolina on the sea-coast, and in the Mississippi Valley to the mouth of the Ohio River, with outlying tribes as far S. as the Tennessee. It also has a north-western extension, reaching through Canada to the valley of the Red River of the North, the Saskatchewan, and the northern portion of the Rocky Mountains.

2. *The Iroquois Stock* was found mainly in New York, its range extending from the Hudson to the valley of the Genesee, the Susquehannas extending into Pennsylvania, and the Tuscaroras so far S. as North Carolina, whence they migrated northward about 1711.

3. *The Dakota and Sioux Stock* seems to have originally occupied the territory between the head-waters of the Mississippi and Missouri rivers. It extended, at a later time, to the Rocky Mountains, and S. till it included the Black Hills. It reached S. from the Niobrara River to the mouth of the Missouri, and down the Mississippi to the Arkansas.

4. *The Gulf Tribes* occupied the territory S. of the Tennessee to the Gulf of Mexico, and from the Mississippi to the Atlantic.

5. *The Athapascan Stock* extended from Hudson's Bay westward, in the extreme North-west, to the Pacific.

6. *The Shoshone and Snake Tribes* spread S. from the Lewis branch of the Columbia to Utah, including the Utes, the Comanches of Texas, and some scattered tribes in Lower California.

The mound-builders of the Western States, who were replaced, before the discovery of America, by less civilized tribes, would seem to have been connected with the semi-civilized tribes of New Mexico. The semi-civilized populations embraced Mexico, Yucatan, and Central America, and may be traced northward to Cape Honduras and the Mosquito Shore. The similar civilization in South America was confined to Peru and the elevated table-land of New Granada. (Gallatin, *Am. Eth. Soc. Trans.*, vol. i. p. 1.) Analysis of the uncivilized tribes of South America must be omitted. (See Latham, *Varieties of Man*, p. 459.) The languages of the tribes extending over the immense area from the Arctic to Cape Horn, though dissimilar in their vocabularies, are so uniform in their structure and grammatical forms that they are considered to belong to one great stock. (Gallatin, *Ibid.*, p. 10.) The Otomi, whose habitat is the N. E. portion of Michoacan in Mexico, speak a language supposed by some to be exceptional from its monosyllabic character. But there is good reason to connect it with the American languages in general, rather than with any Eastern monosyllabic tongue. (*Ibid.*, p. 403.) The partial civilization of the Peruvians and Mexicans is thought by some to segregate them in origin from the other American tribes. There is reason to believe that the exceptional character of this civilization has been very much overrated. It was in all probability indigenous, and the organization of Mexican society appears to have been a natural development of a system widely prevalent among the less civilized or barbarous American tribes. The Indian tribes have suffered great displacement since they have been known to civilized man, and are now in constant change. The migrations of these tribes, actual and probable, are worked out in the article on Migrations of the American Aborigines, by Hon. Lewis H. Morgan, LL.D.

B. CENTRAL AND SOUTHERN EUROPEANS.

The principal races of this region are to be referred, on both linguistic and historic grounds, to one family, the *Indo-European*, so called because it had its possible origin, certainly its early abode, on the banks of the Indus, whence it has overspread the principal portion of Europe. To this family belong the Sanskritic division of the Indic group and the Iranian group, which have already been mentioned in their appropriate locality. The European division of the Indo-European family includes—

I. The Celtic, which may be divided into (1) the Cymric; (2) the Gaelic.

II. The Italic, including—(1) the ancient races of the Italian peninsula; (2) the Latin race and its lineal descendants.

III. The Hellenic, including the various tribes of ancient Greece and Southern Italy, with their descendants, and possibly the Albanian or Skipetar, though in regard to this last point there is considerable doubt.

IV. The Lithuanic, occupying a narrow belt extending from the Gulf of Finland to the Vistula, and represented by the peoples of Livonia, Courland, and Old Prussia. (See Quatrefages, *The Prussian Race*.)

V. The Teutonic, which may be subdivided into—(1) the Low German peoples, including the Frisic, Dutch, and English; (2) the High German, or German in the modern sense of the term; (3) the Scandinavian, including the Icelandic, Danish, Norwegian, and Swedish.

VI. The Sclavonic, of which the Russians and the Poles are the prominent representatives.

We have already recognized the fact that the Lapps and Finns and the Magyars of Hungary are of "Ugrian," the Turks of "Mongolian" stock, and that the connection of the Skipetar or Albanians with the Indo-European family is doubtful. The Basques—whose habitat is in the S. of France and N. of Spain, in the vicinity of the Western Pyrenees—must also, on the ground of language and other considerations, be regarded as standing apart from the Indo-European family.

C. AFRICANS AND SOUTH-WESTERN ASIATICS.

This class may be divided into the following groups:

1. *The Semitic*, including, in Asia, the Syrians, Assyrians, Babylonians, Phœnicians, Ammonites, Moabites, Ishmaelites, Edomites, Samaritans, and Jews, with their colonies; in Africa, the Abyssinians of Tigré, the Abyssinians speaking the Amharic language, and the Gafat Abyssinians, and (as sub-Semitic) the Berber and the Coptic tribes.

2. *The Nilotic* tribes, which may be grouped as (1 and 2) the Nubians and Bishari, approximating to the Copts; (3) the Agows, resembling the Abyssinians; (4) the Gallas, having both Semitic and Kafre characteristics.

3. *The Kafres*, extending from the parts N. of the equator, on both sides of the continent, to the Hottentot frontier, and, in the hottest and moistest portions of their habitat, nearly akin to the negro type.

4. *The Negro*, subdivided into numerous petty tribes (which vary in color and physiognomy from the typical

black according to locality), occupying the centre of the continent S. of the equator.

5. *The Hottentot*, who, according to Latham, "has a better claim to be regarded a separate species of the genus *Homo* than any other section of our kind," occupies the southern portion of the African continent.

The Migrations of Man.—We can give but little space to the general subject of the migrations of man. Those which are actually taking place at the present time are as rapid and extensive as any which have occurred in the past. From these we may infer the possibility of those which are indicated by linguistic and archæological considerations. The movement of the Indo-European family, which spread from the Ganges to Iceland, though pre-historic, is now unquestioned. The Turks have come from the heart of Asia within a few centuries, occupying and controlling the whole region around the Levant. The Hungarians from the N. of the Caspian are settled in the Carpathian valleys, retaining the language which connects them with the Vougouls and Ostiaks. Soon after the Christian era the Germanic peoples proper spread from their narrow habitat S. of the Baltic to Poland on the E. and to Scotland in the W. The allied Scandinavians pushed the Lapps and Finns to the extreme N., occupied Iceland, the islands N. of Scotland, and contributed an important element to the population of Great Britain. The Slavonians, receding before the encroachments of the German area, have spread eastward over the greater part of European Russia, before occupied by tribes of Tartars. The Slavonic movement eastward in Siberia and Central Asia is a constant topic of newspaper comment. The migration of Spanish, French, Africans, and especially English and Germans, to the American continent surpasses enormously in number that of the barbarians who absorbed the Roman empire of the West. The Arabian change of habitat under the impulse of Mohammed and his successors is familiar to all. Though the power of this impulse as affecting Europe and Asia seems nearly spent, it is still vital as an encroaching, and to some extent as a civilizing, force in the interior of Africa. The immense range and permanence of these changes of habitat prove that men of all races are capable of acclimatization in localities the most distant and different from those of their origin. It shows that man's intelligence enables him to win a livelihood in the most inauspicious situations—that, unlike the animals, he is able to set at defiance the most formidable and active forces of heat, cold, and insalubrity, and to subject to his supreme control all the kingdoms of nature.

The literature of this subject is vast, and it is perhaps better to refer (in addition to those works specially noted in the text) to a few books which contain, in their references, the bibliography of the subject, than to use space in the enumeration of titles. Prichard's *Researches into the Physical History of Mankind* (1841–47, 5 vols.) is very full, giving sources of information down to the date of its publication. The *Rapport sur les Progrès de l'Anthropologie*, by De Quatrefages (1 vol., Paris, 1867), contains a detailed and elaborate bibliography of works bearing on the various divisions of the science of man. Waitz's *Anthropologie der Naturvölker* (5 vols., 1860–70) is also extremely full in references. These, with the well-known anthropological journals and volumes of transactions of anthropological and ethnographical societies of England, France, Germany, and the U. S., will be found more useful to the investigator than any collection of title-pages without critical estimates of the works named. M. B. ANDERSON.

Man, Isle of, an island of Great Britain, in the Irish Sea, comprises an area of 180,000 acres, half of which is cultivated, and has a population of 52,469. It is traversed from N. to S. by mountain-ranges whose highest peak, Sneafell, rises 2024 feet above the level of the sea. Black marble, copper, zinc, and iron occur; lead is abundant. Agriculture and cattle-breeding are pursued to some extent, the climate being very favorable; the soil, however, is only mediocre. The fisheries are rich. The inhabitants are of Celtic race, and still speak a language of their own, the Manx language, although the English language is generally understood. The government is vested in a governor appointed by the Crown, and an elected body with which the legislative and judicial authority rests. Principal town, Castletown.

Manaar', Gulf of, a wide inlet of the Indian Ocean between Ceylon and the southern extremity of Hindostan, and separated from Palk's Strait by the islands of Ramisseram and Manaar, and a low reef called Adam's Bridge.

Manacor', town of Spain, on the island of Majorca, 3 miles E. of Palma, is a summer resort of the nobility of the island, and a handsome and thriving town, with considerable trade in wine, oil, fruits, and corn. Pop. 10,438.

Mana'gua, the capital of Nicaragua, stands on the southern shore of the lake of the same name, in lat. 12° 7′ N., lon. 86° 12′ W., surrounded with rich coffee plantations. The town owes its rank as a capital partly to its central position, partly to the rivalries of the cities of Granada and Leon, but it contains nothing remarkable. Pop. 6500.

Managua, Lake of, a body of water in Nicaragua, 40 miles long, 16 miles wide, and from 2 to 40 fathoms deep, which has played a conspicuous part in the various projects of interoceanic communication. It is situated 157 feet above the Pacific, and its northern shore, where the volcano of Momotombo projects boldly into its waters, is separated from the ocean only by the plain of Leon, 15 miles broad and elevated about 50 feet above the level of its waters. At its southern extremity it is connected with Lake Nicaragua by the river Tipitapa or Estero de Panaloya, which carries a considerable body of water during the rainy season, but which is nearly empty during the dry. The difference of level between the two lakes is about 28 feet at average stages of water, and it has been proposed to build a canal between the two lakes by deepening the Tipitapa and constructing a series of locks to the superior lake.

Man'akin, a name given to the rather numerous spe-

Green Calyptomena.

cies of birds of the family Ampelidæ, sub-family Piprinæ, and genera *Phœnicercus, Pipra, Rupicola, Metopia,* and *Calyptura* (South American), and the Old-World species *Calyptomena viridis* (green manakin), from Java and Sumatra. The male manakins are beautifully colored.

Manal'apan, post-tp. of Monmouth co., N. J., traversed by the Freehold and Jamesburg R. R. Pop. 2286.

Man and his Migrations. See MAN.

Manas'sas, city and tp. of Prince William co., Va., on the Washington City Virginia Midland and Great Southern R. R., at the junction of Manassas Gap R. R., 35 miles from Washington, D. C. It has 5 churches, 2 schools, 1 weekly newspaper, 2 large hotels, 1 tin and sheet-iron factory, and a number of stores and shops. The city is incorporated, and governed by a mayor and council. Pop. of city, about 680; of tp. 1645. D. W. WHITING, ED. "GAZETTE."

Manassas Junction, Battle of. See BULL RUN, BATTLE OF.

Manas'seh, the eldest son of Joseph; was adopted by Jacob on his deathbed, and became the head of a tribe of Israel, which numbered 32,200 warriors on the exodus from Egypt and 52,700 on the entrance into Canaan. It received land on both sides of the Jordan—on the western side, between the tribes of Issachar on the N. and Ephraim on the S.; on the eastern side, N. of Gad. In the eastern part lay the towns of Gadara, Gamala, Jabesh-Gilead, Gerasa, and others.

Manasseh, the fourteenth king of Judah, a son of Hezekiah; reigned from 696 to 641 B. C.; became an open idol-

ater; was taken prisoner by the king of Assyria, and detained for several years at Babylon, but repented and was restored to his kingdom. The apocryphal composition called *The Prayer of Manasseh* is received as canonical by the Greek Church.

Manatee′ [Haytian], a genus of herbivorous marine animals, called "sea-cows." They are usually associated with the order Cetacea, the external features being closely allied thereto; the internal structure, however, places them near the Pachydermata. At present they are included within the family Manatidæ, which numbers also the Indian dugong (*Halicore dugong*) and Steller's rhytina (*Rhytina Stelleri*), the latter now extinct. Three species of *Manatus* are known—the Mexican sea-cow (*Manatus latirostris*), found in Florida, on the Mexican shores, and in the West Indies; the lamantin (*M. Senegalensis*) of the western coast of Africa; and the *Manatus australis* of the tropical portions of South America. The adult manatee is a clumsy oval form, about nine feet in length, though individuals are sometimes found much exceeding this. It has a tough hide, resembling that of the pachyderms, sparsely beset with short, stiff hairs. The flippers are furnished with flat nails. The posterior extremity is flattened and expanded horizontally like that of the whale, and constitutes a very large proportion of the whole body. It has thirty-two molar teeth, eight on either side, above and below. The canines and incisors are absent, except in extremely young individuals. All members of the family are vegetable eaters, and are often spoken of as herbivorous Cetacea. The intestinal canal is of extraordinary length, measuring in the *Rhytina* nearly twenty times the entire length of the animal. Their favorite food is the coarse fuci and the herbage that grow along the shoal waters at the mouths of rivers. The manatee is able by aid of its flippers, which are provided with stout nails, to climb on shore and browse on the rushes and other plants growing near the water. A specimen of the *Manatus latirostris* was kept alive at the Central Park Zoological Gardens, N. Y., during one summer, but the cold of the later season proved too severe for it. This individual measured nearly seven feet in length, and weighed 450 pounds. Its circumference was four feet and nine inches. It manifested at times a certain species of playfulness, and readily responded to the call of its keeper. At such times there was quite perceptible a peculiar sound, resembling the squeak of a mouse. It uniformly ate its food under water; rushes and fuci were always drawn down from the surface, and masticated under water; leaves of the canna proved an acceptable diet. It usually remained immersed five or six minutes. The immense size and strength of these creatures is exhibited in a late account, by Mr. Charles Lanman, of a fight between the Mexican sea-cow and a jaguar. The latter animal was beaten so furiously by the tail of the manatee that it was soon disabled, and finally was crushed underneath the huge form until its back was broken. The length of this manatee was eighteen feet. J. B. Holder.

Manatee, county of Florida, bounded S. W. by the Gulf of Mexico. Area, 4200 square miles. Its S. E. corner reaches Lake Okechobee. Large tracts are open, wet prairie, but there is much splendid timber. Rice-culture and cattle-raising are the chief industries. The soil is well adapted to cotton and sugar culture and fruit-raising. Cap. Pine Level. Pop. 1931.

Manatee, post-v., formerly the cap. of Manatee co., Fla., on the S. bank of Manatee River, 40 miles S. of Tampa, is accessible to steamers of ten-feet draft, and has an active and prosperous trade.

Manayunk′, a part of the 21st ward of Philadelphia, Pa., on the E. bank of the Schuylkill River and on the Reading R. R., is connected with the heart of the city by steam and horse cars, by steamboat, and an excellent highway. It has a bank, savings fund, 5 insurance companies, water and gas works, 2 weekly newspapers, 8 churches, 4 public schools, excellent postal and telegraphic facilities, and a large number of stores of every variety, in addition to a good market-house. The Schuylkill Navigation Company's canal begins at the lower part of the town, and extends nearly 2 miles up the river near its bank, affording fine facilities for manufacturing purposes. The town is celebrated for its cotton, woollen, and paper mills. Within its limits are 30 manufacturing establishments, with a capital of $6,000,000, whose annual product amounts to $10,000,000, employing 4500 operatives, whose annual wages amount to $2,000,000. Pop. about 10,000.

Joseph Yeakel, Ed. "Manayunk Sentinel."

Mancha, La, an old province of Spain, forming the southern part of New Castile, chiefly celebrated as the scene of *Don Quixote.*

Manche, department of France, bordering on the English Channel. Area, 2263 square miles. Pop. 544,776. The ground is mostly low, and in many places even marshy, but the soil is fertile, and grain, flax, hemp, and apples are produced; 44,000,000 gallons of cider are made annually. Large cattle and very strong horses are reared; also many sheep, but of an inferior kind. Of 72,511 children, 9598 received no school education in 1852. Cap. St. Lô.

Man′chester [Sax. *Mamchestre;* Lat. *Mancunium*], a city of England, Lancashire, on the Irwell, consists of Manchester proper, on the western bank of the river, and Salford, on the eastern, connected by eight bridges, and virtually constituting one town, though having separate municipal governments. It is the greatest cotton-manufacturing centre in the world. Its textile fabrics, the so-called "Manchester cottons," were mentioned in the fourteenth century. In the seventeenth the place was spoken of as one of the thriftiest towns of England. In 1780 it imported 6,700,000 pounds of raw cotton, and the value of the exports of its cotton manufactures amounted to £355,060. But the importation of raw cotton rose in 1800 to 56,000,000 pounds, and in 1860 to 1,115,890,608 pounds, and the value of its exports from £1,101,457 in 1781, to £56,000,000 in 1856. The following table gives a representation of the state of this industry in 1871, and of some branches connected with it:

	No. of works.	Steam-power.	No. of persons employed.
Cotton-factories	111	16,564	20,346
Worsted "	13	671	2,538
Silk "	11	185	1,980
Bleaching and dyeing works	26	769	2,281
Warehouses	30	1,218	1,236
Calendering and finishing works.	161	1,528	5,490
Millinery and dressmaking	346	32	3,334
Tailors and clothiers	218	...	1,914
Miscellaneous	417	772	4,476
Total	1,333	21,739	43,595

Besides its manufactures of textile fabrics and clothing, its metal manufactures (machinery and small ware) employed, in 1871, 12,646 persons, and its various other manufactures (chemicals, paper, coaches, rubber goods, etc.) over 15,000; so that the total number of persons engaged in manufacturing industry amounted to 73,235. The spirit of this busy hive is shown by the many industrial inventions and improvements by Leigh, Hughes, Arkwright, Hargreaves, Watt, and Stephenson, which either originated or were first adopted here. One of the finest canal works in the world, the Bridgewater Canal, and the first railway ever in active operation, were built between Manchester and Liverpool. The ideas of free trade originated here, and here was established the first free lending library in England. The city has over 200 places of worship, and a great number of charitable, benevolent, and educational institutions, though the latter are said to be insufficient for the teeming population. But in spite of many recent improvements the city is still one of the unhealthiest in England. The drainage of the ground has been greatly improved; new and wider streets have been opened; parks have been formed—Queen's Park, Phillips Park, and Alexandra Park in 1870; good water has been procured, led into the city through an aqueduct 20 miles long. Nevertheless, the annual death-rate is 3.2 per cent. In architectural respects the city is not very remarkable, though some of its public buildings, such as the town-hall, the Royal Exchange, the assize court, etc., and also many of its warehouses, factories, and residences, are splendid structures. The cathedral, 216 feet long and 120 feet wide, in Gothic style, was built in 1422, but has undergone many changes. The population of Manchester was 240,367 in 1841, 338,722 in 1861, 351,189 in 1871; and of Salford, 113,023 in 1841, 102,449 in 1861, 124,801 in 1871.

Manchester, tp. of Clarke co., Ark. Pop. 770.

Manchester, tp. of Dallas co., Ark. Pop. 574.

Manchester, post-v. and tp. of Hartford co., Conn., on the Hartford Providence and Fishkill R. R., 8 miles E. of Hartford. The extensive silk manufacturing establishment of the Messrs. Cheney Bros. is located here, which alone gives employment to 1000 operatives. The works occupy about 8 acres. Manchester is also famous for the large number of its paper-mills, of which there are 12 or 15 in a flourishing condition. The extensive mills of the Union Manufacturing Co. are also located here. There are in addition several stockinet, cotton, woollen, needle, and other factories. Manchester has 7 churches, 2 graded schools, 1 newspaper, a large hall, reading-rooms, libraries, and stores. Pop. 4223.

N. Kingsbury, Ed. "Manchester News."

Manchester, tp. of Boone co., Ill. Pop. 1144.

Manchester, post-tp., Dearborn co., Ind. Pop. 2029.

Manchester, a v. of Wabash co., Ind., 40 miles W. of Fort Wayne, on Eel River, at the crossing of the Cincinnati Wabash and Michigan, the Detroit Eel River and Illinois, and the Chicago and Atlantic R. Rs., has 3 churches, 1 newspaper, 1 bank, 7 manufactories with steam, 2 steam grain-elevators, 1 flouring-mill, 3 hotels, 20 stores, and an art-gallery. M. E. PLEAS, ED. "REPUBLICAN."

Manchester, post-v. of Delaware co., Ia., 47 miles W. of Dubuque, on the W. branch of the Magnoketa River and the Iowa division of the Illinois Central R. R., has 5 churches, 2 hotels, a high school, a newspaper, a private and a savings bank, a town-hall, several large mills, shops, and stores. Principal business, farming. Pop. 1492. C. SANBORN, ED. "PRESS."

Manchester, post-v., cap. of Clay co., Ky., 85 miles S. E. of Lexington, in a region abounding in coal, iron, and salt.

Manchester, post-v. and tp. of Kennebec co., Me., 4 miles W. of Augusta, has 3 churches and some manufactures. Pop. 732.

Manchester, post-v. of Carroll co., Md., 23 miles N. W. of Baltimore. Iron is mined in the vicinity. Pop. 755; of district, 3368.

Manchester, post-tp. of Essex co., Mass., on the N. shore of Massachusetts Bay, and on the Eastern R. R. (Gloucester branch), 8 miles N. E. of Salem, has 3 churches, manufactures of leather and furniture, a public library, contains the summer residences of many wealthy citizens of Boston and New York, and is a favorite summer resort. Pop. 1665.

Manchester, post-v. and tp. of Washtenaw co., Mich., 55 miles W. of Detroit, at the intersection of the Detroit Hillsdale and Indiana with the Jackson branch of the Lake Shore and Michigan Southern R. R. It has ample water, 1 union school, 7 churches, 1 weekly newspaper, 1 saw and 2 planing mills, foundry and machine-shops, 1 bank, a large brewery, and a number of stores and shops. The village also possesses medicinal springs. Pop. 2516.

G. R. PALMER.

Manchester, tp. of Freeborn co., Minn. Pop. 701.

Manchester, city of Hillsborough co., N. H., lying on both sides of the Merrimack River, lat. 42° 53′ N., lon. 71° 31′ 9″ W., 16 miles S. from Concord, was the first city incorporated in the State, is one of the largest and richest, contains one-tenth of its wealth and population, produces one-eighth of its manufactured goods, and is the fourth city in the U. S. in the value of cotton and woollen manufactures. It was settled in 1722 by the descendants of Scotch-Irish Presbyterians, and was incorporated in 1751 as the town of Derryfield. Its name was changed in 1810 to that of Manchester, and it was made a city in 1846. It owes its extraordinary growth since 1838 to the Amoskeag Manufacturing Co., which controls the water-power of the Merrimack. It has 23,536 inhabitants (largely increased since the census), 15 churches, several benevolent societies, a Roman Catholic convent and orphan asylum, 32 secret organizations, 4 national banks with a capital of $650,000, 5 savings banks with deposits of $7,750,000, a fire insurance company, 2 post-offices, 8 hotels, 1 monthly, 4 weekly, and 2 daily newspapers. It is on the line of the Concord R. R., and is a terminus of the Concord and Portsmouth, the Manchester and Lawrence, and the Manchester and North Weare R. Rs. The city is compressed into a square mile upon the eastern side of the Merrimack, into which, just opposite, the Piscataquog River empties. It contains the State reform school, county jail, and county court-house. It has a system of water-works, completed in 1874 at a cost of $600,000, with a reservoir of 16,000,000 gallons capacity, fed from Lake Massabesick, which is 4 miles from the city hall, and contains 2300 acres. It has a free library of 18,000 volumes, established in 1854, 5 public parks in the heart of the city, and 2 cemeteries. It contains 44 public schools, graded and ungraded, with 2500 pupils, and 70 teachers, besides the Roman Catholic parochial schools and academy, which have 1000 pupils. It has paid police and fire departments, 4 steam fire-engines, and a fire-alarm telegraph. The Amoskeag Falls, with a fall of 54 feet 10 inches, the highest on the Merrimack River, supply the water by two canals of a joint length of $2\frac{1}{2}$ miles for four large corporations—the Amoskeag Manufacturing Co., Stark Mills, Manchester Mills, and Langdon Mills, which have, in the aggregate, 300,000 spindles and 7600 looms, a capital of $6,750,000, and a pay-roll of $265,000 a month, and make 143 miles of cloth a day, including sheetings, drillings, delaines, seamless bags, etc. The Amoskeag Co.'s machine-shop makes 50 steam fire-engines a year, and the Manchester Locomotive Works, with a capital of $150,000, are able to turn out 14 locomotives a month. Other manufactories make 160,000 dozen pairs of stockings a year, 4 tons of paper a day, and a large amount of edge tools, files, machinery, carriages, leather, boots and shoes, woodwork, and ale. The total amount of capital invested in manufactures is $10,000,000; the number of men, women, and children employed, 10,000; the yearly pay-roll, $4,000,000; the value of manufactured goods, $25,000,000.

MAURICE D. CLARKE.

Manchester, post-v. and tp. of Ocean co., N. J., 41 miles S. S. W. of Sandy Hook, on the Southern New Jersey R. R., at the junction of the Tom's River branch. Pop. of tp. 1102.

Manchester, tp. of Passaic co., N. J. Pop. 1166.

Manchester, a v. (KIRKLAND P. O.) in Kirkland tp., Oneida co., N. Y., has some manufactures. Pop. 158.

Manchester, post-tp. of Ontario co., N. Y., is traversed by the Erie Canal and New York Central R. R. (Auburn branch), contains numerous villages, and has 8 churches and manufactures of flour, paper, and other goods. Pop. 3546.

Manchester, post-v. of Adams co., O., on the N. bank of the Ohio River, 75 miles E. of Cincinnati, has 3 churches, a weekly newspaper, a national bank, a furniture manufactory, 4 large mills, 2 hotels, and stores, and is the shipping-point for the agricultural products of the surrounding country. Pop of v. 942; of tp. 982.

W. H. HOLDERNESS, ED. "MANCHESTER GAZETTE."

Manchester, tp. of Morgan co., O. Pop. 712.

Manchester, a v. (WOOD'S RUN P. O.) of Allegheny tp., Allegheny co., Pa., on the Pittsburg Fort Wayne and Chicago R. R., and on the Ohio River, 2 miles below Pittsburg, and is the seat of various manufactures.

Manchester, tp. of Wayne co., Pa. Pop. 1269.

Manchester, post-b. and tp. of York co., Pa., on the Northern Central R. R. (Mount Wolf Station). Pop. of b. 406; of tp. 2427.

Manchester, post-v. and tp. of Sumter co., S. C. Pop. 320.

Manchester, post-v., cap. of Coffee co., Tenn., 70 miles from Nashville, on a branch of the Memphis and Charleston R. R., on the Bark Camp fork of Duck River, has 4 churches, 1 college, 1 newspaper, and stores. Pop. 500. C. T. WILSON, ED. "COFFEE CO. DEMOCRAT."

Manchester, post-v. and tp., cap. of Bennington co., Vt., on the Harlem Extension R. R., 30 miles S. of Rutland and 60 N. of Troy, N. Y., is a distinguished summer resort, has 3 large hotels, nearly 3 miles of marble sidewalk, beautiful drives and mountain scenery, a national bank, 2 churches, Burr and Barton Seminary, a classical school for both sexes, a cemetery, a newspaper, and stores. Pop. 1897. D. K. SIMONDS, ED. "JOURNAL."

Manchester, post-v. of Chesterfield co., Va., on the S. bank of the James River, opposite Richmond, of which it is a suburb, and is the seat of important manufactures. (See RICHMOND.) Pop. 2599; of tp. 5043.

Manchester, tp. of Green Lake co., Wis. Pop. 1140.

Manchester, tp. of Jackson co., Wis. Pop. 421.

Manchineel′ [Sp. *mancinilla*, a "little apple," so called from the appearance of the fruit], the *Hippomane mancinella*, a very poisonous evergreen tree of the West Indies, belonging to the order Euphorbiaceæ. Its white *latex* or juice burns the skin upon which it falls. To taste its fragrant fruit would be dangerous were it not that the mouth is at once blistered by it. It is affirmed that men have died from sleeping in its shade, but it is believed that the bark of the *Bignonia leucoxylon* (which often grows near by) is an antidote to the poison. The beautiful wood is of excellent quality, but is poisonous even when dry. The bastard manchineel of the West Indies is the *Cameraria latifolia* of the order Apocynaceæ. It is also poisonous.

Manchooria. See MANTCHOORIA.

Manci′ni (PASQUALE STANISLAS), b. at Naples about 1820; at an early age became prominent as a publicist; took a lively part in the Neapolitan movements of 1848, after which he retired to Turin with his wife (the gifted poetess, Laura Beatrice Oliva Mancini, who d. in 1869), and there practised with great success as an advocate. In 1851 he was elected professor of international law in the University of Turin, where his lectures were enthusiastically applauded. In 1855, Cavour invited Mancini to take part in the Consiglio del Contenzioso Diplomatico. As an opposition member of Parliament the speeches of Mancini were listened to with lively interest. In 1862 he was for a short time minister of public instruction while Rattazzi was president of the council. He now (1875) lives in Rome, being at the same time a deputy in Parlia-

ment, a professor in the university, and an active advocate. In the peace conference at Ghent in 1873, Mancini, as representative from Italy, was chosen president of the congress. He published at Naples in 1873 his *Prelezioni di Diritto Internazionale,* and also an admirable essay on Macchiavelli.

Man′co Capac′, the founder of the Inca dynasty of Peru, represented by the traditions of the Peruvians as a man of fair complexion from a distant land, who with his sister and wife, Mama Oello, appeared on an island in the Lake of Titicaca several centuries before the Spanish conquest, professing to be children of the sun, becoming the instructors of the Peruvians in religion and civilization, and the builders of the city of Cuzco. (See Peru.) A reputed descendant, called Manco Capac II., brother of Atahuallpa, was placed on the throne of Peru as nominal sovereign by Pizarro in 1534, escaped from tutelage the following year, assembled his people and besieged Cuzco unsuccessfully (1536), and carried on a desultory warfare until killed by soldiers of Almagro's faction in 1544.

Manda′mus, in law. The writ of mandamus is a command issued—in England by the court of king's bench, in this country by any superior court upon which the jurisdiction has been conferred—directed to an inferior tribunal, an officer, or a corporation, and requiring them to do some particular thing therein specified which belongs to their office or duty. In all ordinary cases where the primary rights of the citizen have been violated the remedies to which he is entitled can be obtained by actions. But it sometimes happens that persons clothed with official or quasi-official authority, and thus having the power, as a part of their public functions, to perform certain acts in which a private citizen is interested, become charged with a duty towards such citizen, who in turn acquires a right against them to demand that the acts in question should be performed. If the official persons neglect or refuse to fulfil the obligation which thus rests upon them, it may be that the injured party can obtain no adequate remedy by means of an ordinary action, and for this case the English and American law furnishes the high and most effective remedy of mandamus, by which the very thing that ought to be done is ordered to be done, and the relief is therefore specific, complete, and absolute. The rules of procedure require that the prosecution shall be in the name of the State or the people as the plaintiff, with the private complainant as the relator—that is, the promoter of the proceeding—but this connection of the State is merely nominal; the judicial process is as completely under the control of the injured person who seeks redress by its means as though it were a common suit at law or in equity. From the foregoing description it may be seen that the three following requisites must exist in order that a mandamus may be granted: (1) A right that some act should be done by an official or quasi-official person pertaining to his special functions and duty; (2) a corresponding legal obligation resting upon such person to do the act in question; and (3) the absence of any other adequate legal remedy for the non-performance of the obligation. When all of these essentials exist the writ of mandamus is the proper mode of obtaining relief, and its application is thus exceedingly extensive. It is a means by which the higher judiciary, representing the majesty of the State, can exercise a controlling influence not only over the inferior tribunals, but over ministerial, administrative, and executive officers; by it the hierarchy of officials may be taught that they are subject to the law, and abuse of power, neglect of duty, and arbitrary conduct in its discharge may be effectually prevented. One universal principle regulates its use: it is never employed to interfere with or to control the exercise of a discretion, but only to compel the performance of a fixed and certain legal duty. When directed, therefore, to an inferior tribunal, or to persons whose functions are judicial, it only commands them to adjudicate upon the matter described and to render some decision; when directed to ministerial officers, it commands them to do some specific act, but the act must be one which they are legally obliged to do as commanded, and in respect to which they are not clothed with a discretion. Mandamus may also be used against a corporation, on account of its quasi public nature, to compel it or its officers to perform acts required by law; as, for example, to admit or restore a member legally entitled. John Norton Pomeroy.

Man′dans, a tribe of Indians of the Dakota family, on the upper Missouri River, near Fort Berthold, Dakota Territory. When first brought into communication with the whites near the close of the eighteenth century they inhabited nine villages, but when Lewis and Clark ascended the Missouri in 1803 they had been driven by the Sioux up the river to the Arickaree country, and occupied but two villages, one on each side of the river, near the spot where the explorers built Fort Mandan. They were more friendly to the whites and of a lighter color than the surrounding tribes. This circumstance has been frequently insisted upon, especially by George Catlin, the artist, who lived a considerable time with the Mandans, in connection with the Welsh legend of Prince Madoc, and the Mandans have been gravely pronounced descendants of the Welsh colony. Affinities to Welsh have been stated to exist in their language, but all efforts to substantiate this conjecture have proved illusory. The Mandans were nearly swept away by the smallpox in 1837, being reduced from 2500 to 145 individuals, and they have since suffered from frequent hostilities with the Sioux, but have nevertheless increased to nearly 500 souls (1875). They made treaties with the U. S. in 1825 and 1866, and since 1870 have been officially confederated with the Arickarees and Minnetaries, to whom a large common reservation has been assigned on the Yellowstone River, on the borders of Montana and Dakota. The Mandans live chiefly by agriculture, are peaceable and friendly to the whites, but have never taken any considerable steps toward civilization.

Manda′ra, or **Wandala,** kingdom of Central Africa, S. of Bornoo, of which it has been a dependency since 1863, consists of a large, well-watered, very fertile, beautiful, and well-cultivated valley, encircled by the high and picturesque Mendepy Mountains. The inhabitants are Mohammedan negroes, who are industrious in the manufacture of cotton fabrics and articles of iron, and who possess a celebrated breed of horses. They are more intelligent and better shaped than the surrounding negro tribes, but they are generally accused of cowardice, and owe their independence to the surrounding mountains rather than to their courage. The capital is Doloo, with 30,000 inhabitants. The former capital, Mora, was entirely destroyed in the war with Bornoo in 1863.

Mandarin′, post-v. of Duval co., Fla., on the E. bank of St. John's River, 15 miles above Jacksonville, is a place of winter resort from the North, and is celebrated for its oranges.

Mandarin Duck (*Anas galericulata*), one of the domesticated species of duck, brought from Japan and China. It is of singularly brilliant plumage, has a fine green crest, and a fan-shaped tuft of feathers on the back. It is asserted that these ducks, unlike the common domestic duck, are never polygamous, and that they never mate but once. They are remarkable for conjugal fidelity.

Man′date [Lat. *mandatum,* a "commission"], a species of bailment in which the bailee undertakes to perform some labor or service with or about the property delivered to him, without recompense; as if, for example, he agrees to carry goods from one place to another (not being a common carrier), or to make some article out of them for the benefit of the bailor, acting in either case gratuitously. As this kind of bailment is exclusively for the benefit of the bailor, the bailee is only bound to use slight diligence in caring for the property entrusted to him. (See Bailment.) Such care and vigilance are to be exercised as are usually shown by men of common sense and ordinary prudence in the management of their own property. This will, of course, vary in degree with the circumstances of each particular case. Greater care is requisite if the property is peculiarly exposed to danger, or is liable to be easily injured, or is of great value, than under other circumstances. If the service to be performed be one requiring professional or mechanical skill, and the occupation or experience of the bailee be such as to imply the possession of such skill, he will be held responsible for its exercise in executing the work undertaken. He will, however, in general, only be required to exercise the ordinary degree of skill which is usually exhibited by those who are engaged in the same occupation, and not the highest degree of skill of which such persons may be deemed capable. There may, however, be special cases where a more severe rule will be applied, as where he is known to have extraordinary abilities, and is employed for that reason. The same rules will be applicable if the mandatary be known to possess the skill necessary, though he is engaged in no occupation by which it might be acquired, or if he positively professes competence for the service to be performed, and his incapacity is not known to the bailor. If, however, the bailee be known to the owner of the property to be incompetent for the work, or there is no reason to presume the possession of sufficient skill, an unskilful execution of the task undertaken will not render the former liable. He will only be bound in that case to exercise such skill as he actually possesses. If goods entrusted to a mandatary be lost, destroyed, or injured by reason of theft, robbery, inevitable accident, or the commission of acts of violence which could not be guarded against, or from any other similar cause, and the loss or damage could not have been prevented by the exer-

cise of a reasonable degree of foresight or the use of ordinary precautions, he will incur no liability for the injury. It is sometimes the case that the parties to such a bailment determine their mutual duties and responsibilities by special agreement, which would then, if in accordance with the policy of the law, supersede or modify the usual legal rules by which a mandatary's liability is determined. It would seem to be contrary to public policy to allow the mandatary to stipulate that he should not be responsible for the consequences of his own negligence. A mandatary is in all cases obliged to follow strictly the instructions given by the bailor. It is not allowable for him to use the property for any purpose of his own, but only to effectuate the object of the bailment. During the continuance of the bailment he has a special or qualified property in the goods entrusted to him, which will entitle him to bring an action against any one by whom they are wrongfully injured or converted, and to recover damages for the loss sustained. The bailor, by virtue of his absolute title to the goods, has also a right of action in such a case. A recovery by either bailor or bailee, however, will bar the other's right of action. If the mandatary, losing sight of the object of the trust, appropriate the property to his own use, he may be sued by the owner in an action of trover for the value of the goods, or in replevin for the recovery of the goods themselves. The bailor may resume possession of the property at any time, even though the object of the bailment is not fully completed. This right is qualified by the condition that he is not to cause serious and unnecessary detriment to the bailee, being without fault. But the natural expiration of the bailment occurs when the purposes of the trust have been fully accomplished or the time has ended within which the service was to be performed. It is then the bailee's duty to deliver the property to the owner without its being otherwise altered, deteriorated, or improved than would be the result of the proper performance of the work undertaken and of the natural wear and tear to which the goods had been necessarily subjected.

The consideration upon which a contract of mandate is based is the trust and confidence on the part of the owner induced by the bailee's acceptance of the goods and by his undertaking to fulfil the purposes of the bailment. A mere executory promise to accept such a bailment and discharge its resulting duties is void for want of a consideration. But if the fulfilment of the trust be entered upon, the owner is deprived of his present possession of the goods, and of the immediate power of using them, and is forced to depend upon the promises of the bailee for assurance that they will be kept safe and that the object of the bailment will be carried out; this is regarded in law as a sufficient detriment to the bailor to constitute an adequate consideration. (See CONTRACT.) It is therefore generally true in regard to gratuitous promises that no action will lie for nonfeasance or an entire failure to perform the duty undertaken, although a party suffers damage thereby; but only for misfeasance or an improper performance of the service imposed. But mandataries may also in many instances be sued in an action of tort as well as in an action of contract. Thus, an action of tort might be maintained for an injury to the property occasioned by their gross negligence. (See TORT.) (See the works of Story and Edwards on *Bailments;* Parsons on *Contracts;* Chitty on *Contracts.*)

GEORGE CHASE. REVISED BY T. W. DWIGHT.

Man′davee, city of Cutch, Hindostan, on the Gulf of Cutch. It has a considerable trade with all the ports of Arabia and Western Africa. Pop. 50,000.

Mandelay, or **Pattawapura,** the present capital of the kingdom of Burmah, is situated 3 miles from the Irrawaddi River, a little N. of Amarapura, the former capital. It was founded in 1856, and is laid out in three parallelograms, one within the other, and separated from each other by walls, ditches, towers, palisades, and other kinds of fortifications. The innermost parallelogram is occupied by the king's palace, with the spiral tower rising above his throne, and its gardens; the second by the military and the government officials; the third by the merchants and mechanics. The whole city is built of wood, but glittering with bright colors and gilding, and it stands in a very fertile plain surrounded with cornfields and orchards. Pop. 90,000.

Man′deville, post-v. of St. Tammany parish, La., on the N. shore of Lake Pontchartrain. Pop. 541.

Mandeville (BERNARD), b. at Dordrecht (Dort), Holland, about 1665; studied medicine, and was admitted to practice at Rotterdam in 1685, after which he settled in London as a physician. Published *Esop Dressed, or a Collection of Fables in Familiar Verse* (1704), and after several other poems of little note brought out *The Grumbling-Hive, or Knaves turned Honest* (1714), and in 1723 an enlarged edition, under the title *The Fable of the Bees, or Private Vices Public Benefits,* which was censured by Berkeley and others. A second part of the *Fable* appeared in 1728, and both parts in 1732. He also published *Free Thoughts on Religion, the Church, and National Happiness* (1720–29), *An Inquiry into the Origin of Honor and Usefulness of Christianity in War* (1732), a reply to Bishop Berkeley, entitled *A Letter to Dion* (1732), and several other books. He was patronized by Lord Macclesfield, and d. at London Jan. 21, 1733.

Mandeville (HENRY), D. D., b. at Kinderhook, N. Y., Mar. 6, 1804; graduated at Union College 1826, at New Brunswick Theological Seminary 1829; was a clergyman of the Reformed Dutch Church at Shawangunk, Geneva, and Utica; was professor of moral philosophy and belles-lettres at Hamilton College 1841–49, and did much to establish the fame of that institution for oratory. He published a successful series of readers and a manual of elocution and oratory (1845). He became pastor of a Presbyterian church at Mobile, Ala., where he d. of yellow fever in 1858.

Mandeville, or **Maundeville** (Sir JOHN), b. at St. Alban's, England, about 1300; acquired all the scholastic learning, as well as the knowledge of medicine and natural science, attainable at that time, and set out for the East in 1322, with a view to satisfy himself by extensive travel concerning the truth of the marvellous Oriental stories then current. Arriving in Egypt, he was favored by the sultan, whom he accompanied in some campaigns. Returning to England, he wrote, thirty-four years after they had been undertaken, an account of his travels—first in Latin, afterwards in Norman-French, and lastly in English—dedicating the work to Edward III. He d. at Liege, Belgium, Nov. 17, 1372. The English version of Mandeville passes for the first extended work in English prose, and has a great value as a monument of the language, independent of the question of the veracity of the traveller. The earliest English edition was printed at Westminster by Wynkin de Worde in 1499. The best modern edition is that of J. O. Halliwell (1839).

Mandin′go, territory of Western Africa, extending between lat. 10° and 14° N., and between lon. 6 and 10° W., consists of a high table-land, and contains the sources of the Senegal and the Niger. Its inhabitants, the Mandingoes, form one of the finest negro tribes, remarkable as well for the strength and harmony of their physical features as for their intellectual powers and aptitude for civilized life. They have a passion for music and dancing, and a talent for trade. They possess a rich language, written with Arabic characters, and as they are very fond of travelling, they have spread widely. They are Mohammedans, and very zealous propagandists of Islam. Their number has been estimated at between 6,000,000 and 8,000,000. They have formed no great empire, but live in small, independent states, of which the principal are Manding, Bambook, Bondoo, Dentilia, and Yarra. Polygamy is very frequent among them, but each wife has a house of her own, or rather hut.

Man′dolin [Gr. πανδοῦρα], an instrument of music somewhat resembling the guitar and the lute. Its body is an open, shell-shaped box made of strips of bent wood. It has four or five strings, which are struck by the plectrum. The neck has a finger-board. This instrument is chiefly Italian. Its sounds are peculiar, but sweet and loud.

Man′drake [Gr. μανδραγόρας], the *Atropa mandragora* (*Mandragora officinarum*), a solanaceous perennial herb of the warm parts of the Eastern continent. It is a narcotic poison, and was used by the ancients for its soporific and anæsthetic effects. It was anciently believed to have many magical virtues: it could cure barrenness; its forked root was likened to a man, and believed to possess a soul; it was believed to shriek so loudly when dug up that the person digging it died. Consequently, the earth was carefully removed from it by one whose ears were stopped with wax, and a dog was attached by cords to the root to drag it out. The name has been applied in the U. S. to *Podophyllum peltatum,* the May-apple, of the barberry family.

Man′drill [said by some to be a name of African origin, but by others to be a combination of *man* and *drill,* a species of baboon—*i. e.* the "manlike drill;" *drill* is an Old English word, not yet quite obsolete], the *Cynocephalus mormon,* the largest of the baboons, a native of Northern Africa, and one of the most formidable of the monkey tribe. It often attacks man in its native forests. It is a hideous brute, and excels in intelligence and strength, as well as in ferocity.

Mandu′ria [anc. *Mandyrium* or *Mandonium*], a town of Southern Italy, in a fertile part of the province of Lecce. It was originally a Greek settlement, and S. of the town are ancient sepulchres in which Greek vases of

much interest have been found. Pliny mentions an intermittent spring which still exists here, and there is another of great antiquity issuing from an excavation in a rock. Pop. in 1874, 8733.

Manee'sa, or **Manis'sa** [anc. *Magnesia*], town of Asiatic Turkey, in Asia Minor, on the Hermos. It is a large city, containing more and finer public buildings, mosques, minarets, public baths, and bazaars, than Smyrna, and carrying on an important trade in cotton, grain, and tobacco. This last article is raised in the immediate vicinity of the city, and is considered the best of its kind in Asia Minor. The streets of Maneesa are generally protected against the sun by overspreading mats or vines. Pop. 73,000.

Ma'nes [Lat. pl., probably at first signifying the "good ones"], among the ancient Romans, the name for the spirits of deceased persons. The household Lares came to be regarded as identical with the ancestral Manes, and hence received worship as *dii Manes*, or divine spirits.

Man'etho of Heliopolis, Egyptian high priest and keeper of the sacred archives in the third century B. C. under the first two Ptolemies, b. at Sebennytus in Lower Egypt. He wrote in Greek, with the aid of the temple records and other documents, his Egyptian history, of which nothing remains but fragments. Josephus, *Contr. Apion.*, i. 3, 9. See Cory, *Fragments*, 2d ed., 1832; Scaliger, Eusebius (Syncellus and Julius Africanus), and his *De Emendatione temporum*, 1629; Fabricii, *Bibliotheca Græca*, ed. Harles, iv. 128; Fruin, Leyden, 1847, and Müller's *Fragment. historicorum Græcorum*, Paris, 1848.) These fragments, in addition to an account of the Hyksos, furnish the complete lists of thirty dynasties, running over more than 3500 years. By means of this, in conjunction with recent discoveries which attest their correctness, the Egyptian chronology has been restored. He wrote a work on the antiquity and religion of the Egyptians. Original fragments on papyrus were found by Seyffarth at Turin, which were edited by Lepsius in his *Auswahl* (1842). (See also Lepsius, *Chronologie*, 1850, and his work on Manetho's determination of the compass of Egyptian history, 1857; Boeckh, *Manethos und die Hundstern-periode*, 1845; Unger, *Chronologie des Manethos*, 1867.) A poem on the influence of the stars is attributed to him, which the critics now refer to the fifth century A. D. It has been edited by Gronovius, 1698, by Koechly (Didot), 1851, and, with a German translation, by Axt and Rigler, 1832. The fragments of Manetho are now conceded to have great value. Besides the writers mentioned, see Freret, Marsham, Usher, Bunsen (*Egypt's Place*), Poole, Rask (1830), Champollion, Wilkinson, Hincks, Hengstenberg. C. P. KRAUTH.

Man'fred, b. in Sicily about 1233, a son of Frederick II. of the house of Hohenstaufen, received, on the death of his father in 1250, the principality of Tarent, and acted as regent in Italy during the absence of his half-brother, Conrad IV. He subdued with great valor the insurrections in Capua, Naples, and other cities, but his services were ill-rewarded by Conrad. In 1254, Conrad died, and Manfred was for the second time appointed regent in Italy during the minority of Conradin, and, on a rumor of the death of Conradin in Germany, he was proclaimed king of the Two Sicilies, and crowned at Palermo, Aug. 11, 1258. The rumor proved false, but he now refused to abdicate; and when the pope, Urban IV., put him under ban, he invaded the Papal States and conquered all Tuscany after the victory at Montaperto, Sept. 4, 1260. His government, thus consolidated, was vigorous, splendid, and beneficial to the country. He founded Manfredonia, built the harbor of Salerno, and established schools in all the large cities. At his magnificent court poets and scientists gathered together, and he himself was the most brilliant in the whole circle, a true Hohenstaufen. Meanwhile, the pope, Urban IV., and after him Clement IV., put up for sale in Europe the crown of Naples and Sicily, and Charles of Anjou, a brother of Louis IX. of France, was found to be the highest bidder. With a French army he landed in Italy, was crowned in Rome Jan. 6, 1266, and defeated Manfred, by treachery rather than by valor, in the battle of Benevento, Feb. 26, 1266. Manfred himself fell in the battle, and, being under the papal ban, was buried without ceremonies under a heap of stones, afterwards called the "rock of roses." His wife and sons were imprisoned—the former for eighteen, the latter for thirty-one years.

Manfredo'nia, a maritime town of Southern Italy, in the province of Foggia, on the Gulf of Manfredonia. The commerce of the port is very considerable, and several European nations have consuls here. It is also an important fishing station. The town itself is pleasantly situated at the foot of Monte Gargano, about 23 miles N. E. of Foggia. The site was chosen by Manfred in 1261, who induced the inhabitants of the large but fever-stricken Siponto to settle here. The Turks destroyed this town in 1620, and it has never recovered its former prosperity. Pop. in 1874, 7938.

Mangalore', town of British India, in the presidency of Madras, on the Malabar coast, in lat. 12° 52′ N. It is poorly built, but stands on a fertile plain, surrounded with palm-groves and plantations of rice and sugar, and has a large trade in sandal-wood and rice. Pop. 11,548.

Manganese', Chemistry of. [The derivation of this name is curious. The mineral in which it was first discovered, *pyrolusite*, the deutoxide of manganese, had in some way obtained the fanciful name "black magnesia," or, as Latinized, "*magnesia nigra*;" whence, it is asserted, *manganese*.] The earlier chemists considered the manganese ores as containing some modification of iron, but Pott in 1740, and others subsequently, Kaim, Winterl, Scheele, and Bergmann, proved that they contained a metal chemically distinct from iron; and Gahn, the master of Berzelius, first obtained the metal manganese at a date not left on record. It was in examining the action of muriatic acid on pyrolusite, in the course of his investigation of this very question, that Scheele made the grand discovery of *chlorine* in 1774.

Metallic Manganese.—Though known for nearly a century, this metal has not yet come into use, either in a pure form or in alloys, though it was long since found to form some alloys having promising properties. The difficulty of procuring it from its ore is so great that it is at present only a curiosity of the laboratory, held by dealers in laboratory-supplies at a cost of over $100, gold, per pound—not far below the cost of platinum. It is described as being, when obtained by smelting the ore with carbon at the highest attainable heat of a blast furnace, a soft, brittle metal, grayish-white, and with the aspect of cast iron, feebly magnetic, and having a density, according to Bergmann, of 6.861 to 7.1, to John of 8.013, and to Bachmann of 8.03. These variable figures argue either variable purity or the existence of two or more allotropes, most probably the latter, because the variations are too great to be due to any supposable impurity. It oxidizes so readily in the air that it must be preserved, like sodium, in liquid hydrocarbons, according to John and Bachmann. Brunner in 1857 obtained manganese in another way—by reducing its chloride with sodium; and *he* describes it as *not magnetic*, of density 7.138 to 7.206, approaching to the figures of Bergmann, hard enough to *cut glass like a diamond*, taking a fine polish, and *not tarnishing in the air*, though it decomposes water slowly. Wöhler found that Brunner's manganese contained silicon, the truth being that, as in the case of iron, the presence of silicon (others since state, of carbon also) modifies the properties of manganese profoundly (as the present writer believes, by producing allotropic modifications). These matters should be reinvestigated more thoroughly. Deville obtained manganese in a form in which it had a reddish color like bismuth, and decomposed water readily in the *cold*.

Oxides of Manganese.—There are six oxides of this metal known: manganous oxide, MnO; manganoso-manganic oxide, Mn_3O_4, or MnO, Mn_2O_3; manganic oxide, Mn_2O_3; manganic deutoxide or peroxide, MnO_2; manganic acid, MnO_3; permanganic acid, Mn_2O_7. Manganous oxide is the base of the ordinary salts of manganese, the sulphate, carbonate, acetate, etc. Manganoso-manganic oxide, corresponding in composition to the magnetic oxide of iron, is the mineral species *hausmannite*. Manganic oxide, the sesquioxide, occurs as the mineral *braunite*. The deutoxide is the mineral *pyrolusite*, occurring in powdered form in commerce as *black oxide of manganese*. This is the most valuable manganese mineral; used in making chlorine. When mixed with muriatic acid, the following simple reaction occurs: $MnO_2 + 4HCl = MnCl_2 + 2H_2O + Cl_2$. Manganic acid, MnO_3, has not yet been isolated, being known only in its salts, which are themselves decomposed by contact with water, yielding solutions of permanganates. The manganates are green in color. By fusing together any oxide of manganese in the air with an alkali, a green manganate is formed, which was formerly known as *chameleon mineral*, from the alterations of color from green to purple which its solution in water undergoes through the change from a manganate to a permanganate. Permanganic acid is known, isolated, in liquid, and even in solid crystalline, forms. It is described as a thick, greenish-black, metallic-looking liquid, evaporating when warmed as violet vapors, but exploding when heated quickly. It sets fire to paper, and explodes with alcohol on contact. Its most important compound is the *permanganate of potash*, familiar now in commerce in beautiful crystals, which are largely used as a disinfecting agent. It is also one of the most valuable tests used by the chemist in the laboratory. Manganese has been stated by Percy and others to form alloys with copper similar to,

and capable of being substituted for, *German silver*, which, if correct, would enable it to take the place, to some extent, of the expensive metal *nickel*, and thus make the latter cheaper. Manganese compounds have valuable uses in dyeing, also in medicine. Manganese has been found to be a normal constituent of the ashes of plants, and in very minute quantity is believed to be always present in human blood and in animal tissues generally. With the exceedingly delicate test known as "Crum's test" it is found to be almost, if not quite, as universally diffused throughout nature as iron, to which latter it is closely linked by a great many chemical analogies and affiliations. HENRY WURTZ.

Mangaska, tp. of Martin co., Minn. Pop. 141.

Mange [Fr. *demanger*, to "eat"], a disease of dogs, horses, cattle, swine, and sheep, distinguished by the presence of *acari* or mites upon the skin, and also marked by scurfiness, itching, heat, and pimples upon the skin. Sulphur ointments, carbolic-acid washes, corrosive sublimate in weak solution, and decoction of tobacco or of the green leaves of *Veratrum viride*, are all useful applications. The afflicted animal should be kept alone, for the disease is contagious. When the mites have been destroyed by the use of any of the above applications the animal will need liberal feeding, and perhaps some mild tonic, like iron. A little copperas dissolved in his drink will probably be sufficient.

Man'gle [Dutch, *mangel*], a machine for smoothing cotton and linen goods, such as tablecloths, sheets, etc., after washing. The old style of mangle is a box filled with stones, and resting upon two wooden cylinders, which roll backward and forward upon the smooth table upon which the linen is spread. The box is drawn back and forth by simple machinery. No heat is usually employed, but there are several improved forms of the mangle in the market. For the finer kinds of work no mangle, it is believed, can ever take the place of the sad-iron.

Man'gles (JAMES), b. in England about 1785; became a commander in the British navy, and with Capt. C. L. Irby made a tour in the Levant 1816–20, of which the narrative, printed for private circulation in 1823, was published in 1844 under the title *Travels in Egypt, Nubia, Syria, and the Holy Land.* He wrote a few geographical treatises, among which are *Geography, Descriptive, Delineative, and in Detail; and Hydrography in Detail, etc.* (1849), and *Guide to the Navigation of the Thames Mouth* (1853). D. Nov. 18, 1867.

Man'go [Malayan, *mangga*], the fruit of *Mangifera Indica*, an East Indian tree of the order Anacardiaceæ, now naturalized in most warm climates. The tree is widespreading and affords a dense and very grateful shade. There are many varieties of the fruit, many of which are very fine for desserts, having an agreeable blending of sweetness and acidity. The fruits of other species of this genus are eaten, but none of the others are valuable.

Mango'hick, post-tp. of King William co., Va. Pop. 2362.

Mangold-Wurzel [Ger. for "beet-root"], a name adopted by farmers and others into English to designate the larger and coarser varieties of the beet (*Beta vulgaris*), now extensively grown as food for domestic animals. Mangolds are too coarse and rank for human food, and even for cattle they are harsh and irritant to the bowels in the early part of the winter; but towards spring they may be fed to all kinds of stock with great advantage, though too liberal feeding is believed to have a diuretic effect. Mangolds need a generous soil, clean culture, and liberal manuring. As much as 80 tons to the acre have been grown in favorable circumstances.

Man'gosteen [Malayan, *mangusta*], the fruit of *Garcinia mangostana*, a small tree of the order Guttiferæ, a native of the Spice Islands, now grown in many tropical regions, and cultivated in the Eastern Archipelago. The fruit externally resembles an orange, but is usually brownish-red rather than yellow. The outer flesh is very astringent and incdible, but is sometimes used medicinally in dysenteries. The edible portion is a white pulp around the seeds, large and five in number, in the centre. This juicy pulp is described as "having the whiteness and solubility of snow, and a refreshing, delicate, delicious flavor, . . . partaking of the compound taste of the pineapple and peach, with many other equally good but utterly inexpressible flavors." This excellent fruit may be eaten freely without harm, and is very refreshing in fevers. The tree is highly ornamental.

Man'grove [probably corrupted from Malay *mangle*, and *grove*], a popular name for the shrubs and trees of the order Rhizophoraceæ, natives of the muddy coasts of hot countries, where they form dense thickets, which exclude the sun's rays from the soil and become most fruitful centres of malarial influence. There are some five genera and twenty species, of which *Rhizophora mangle* and *candelaria* are the typical mangroves. The mangrove is found in many tropical regions, and is abundant on the coasts and keys of Florida. The fruit is eatable, the bark useful in tanning. Most of the mangroves are remarkable as invaders of the domain of the sea, which they convert slowly into dry land. Their stems put forth long aërial roots which extend down into the water; the seeds germinate in the fruit, and send down a long and heavy root, which on falling sinks into the mud; and thus the mangrove-swamp slowly gains upon the shallow seas. The wood of some species is hard, heavy, and useful in the arts, particularly in boatbuilding. Mangrove-wood is often brought to seaports as part of a ship's dunnage. It is sold as firewood, for which some species are excellent. The bark is also imported for tanners' use, and is useful for some kinds of work. In some countries there are other trees which share the habits and the habitat of the mangrove, as the *Laguncularia racemosa* (order Combretaceæ) of the West Indies, Florida, etc. The white mangroves (*Avicennia*) of Australasia, India, South America, etc. are of the order Myoporaceæ, and have the habit of true mangroves. The bark of some species (as *A. tomentosa*) is excellent for tanning. The resin, the seeds, and the roots of this species are used as food by the poor in many countries. The *Conocarpus racemosa*, a mangrove of Brazil (order Combretaceæ) yields bark for tanning. Zanzibar exports to Arabia great numbers of mangrove poles, called "Zanzibar rafters," in trade. The business affords a handsome profit.

Man'gum, tp. of Orange co., N. C. Pop. 2465.

Mangum (WILLIE PERSON), b. in Orange co., N. C., in 1792; graduated at the University of North Carolina in 1815; became a successful lawyer and Whig politician, and was in 1819 and 1826 chosen a judge of the superior court; was in Congress 1823–26; U. S. Senator 1831–37, and again in 1841–53. In 1837 eleven electoral votes were cast for him for the office of President of the U. S. He was president of the Senate during the Tyler administration. D. in Orange co., N. C., Sept. 14, 1861.

Manhat'tan Island. See NEW YORK, CITY OF.

Manhattan, tp. of Will co., Ill. Pop. 922.

Manhattan, post-v. and tp., cap. of Riley co., Kan., on the Kansas Pacific R. R., at the junction of Big Blue and Kansas rivers, has 7 churches, the Kansas State Agricultural College, a public library, 1 weekly and 1 monthly newspaper, 3 banks, a boot and shoe, a cigar, and 2 wagon and carriage factories. Pop. of v. 1173; of tp. 1969.

ALBERT GRIFFIN, ED. "NATIONALIST."

Manhattan, tp. of Lucas co., O. Pop. 1394.

Man'heim, tp. of Herkimer co., N. Y., on the N. bank of the river Mohawk, is the seat of various manufactures. Pop. 2000.

Manheim, tp. of Lancaster co., Pa. Pop. 2603.

Manheim, post-b. of Lancaster co., Pa., on the Reading and Columbia and Lancaster R. R., 10 miles N. N. W. of Lancaster, has 6 churches, a commodious school building, a newspaper, a national bank, 2 large steam flouring-mills, an extensive steam saw and planing mill, foundry, machine-shop, 2 carriage-factories, 16 cigar manufactories, 2 lumber-yards, coal-yard, 4 hotels, and stores. The borough has a fine park, and is surrounded by an agricultural district of great fertility. Pop. 1122.

JOHN M. ENSMINGER, ED. "SENTINEL."

Manheim, tp. of York co., Pa., on the Maryland line. Pop. 1159.

Mania. See INSANITY.

Man'ichæism, a religious system which arose toward the end of the third century in the Persian empire, compounded mainly of Persian Dualism, Booddhism, and Syrian Gnosticism, and using certain Christian ideas as a gloss for a heathen theosophy. In respect to the founder of the sect, the Latin and Greek Fathers differ from the Persian accounts. The former—all derived from a corrupt Latin translation of reports of a discussion of Bishop Archelaus of Cæsarea with Manes or Manichæus—trace the system to one Scythianus, a Saracen merchant of the time of the apostles, whose pupil, Terebinthus—called by himself Buddas—wrote by his direction four books, of which Eubricus, a liberated slave, obtained possession after his death and founded on their doctrine a new religion. According to Persian accounts—later and much more credible—one Mani (sprung from an illustrious family of the Magi, of high gifts and extensive culture in art and science, a painter and a mathematician, having professed Christianity and been ordained presbyter in the Church, yet retaining his Parsee ideas), amid the attempts at the accession of the Sassanidæ to the throne

of Persia to restore the old national religion, conceived the idea of forming a universal religion, blending Christianity with Parsism. Accordingly, under the reign of Shaphur I. (Sapor) he came forward as a reformer and the founder of a new sect, claiming to be the Paraclete promised by Christ. Excommunicated by the Christians and persecuted by the Magi, he fled, and travelled through India and Central Asia as far as China, gathering, as he went, additional materials for his religious system. For twelve months he lived in a cave in Toorkistan, where he was fed by ravens, and wrote his book, the *Ertenki Mani*—the gospel of his sect, full of gorgeous imagery and pictorial illustration, symbolizing his theosophy. Returning to Persia, he was protected by the new king, Hormuz; but afterwards by his successor, Behram, being compelled to discuss his system with the Magi, and being declared vanquished, he was flayed alive (277 A. D.). After his death his sect, spreading in the Roman empire, was persecuted by Diocletian because of its Persian origin, and afterwards by the Christian emperors as heretical and antichristian; which very fact subsequently tended to secure for it protection in Persia.

Ancient Persian Dualism furnished the fundamental idea of this system. In it good and evil were opposed from eternity, and were represented by light and darkness. The good god, Ormuzd, and his twelve sons, constituting the kingdom of light, were in eternal warfare with Satan and his demons, the kingdom of darkness. Inroads had been made by the latter upon the former, and in order to guard the border-land Ormuzd places over it an Æon (the mother of life), who gives birth to the ideal man; who, assisted by the five pure elements, enters on the contest, but is taken captive. Another Æon (the living Spirit) is now sent to his aid—not, however, in time to prevent the kingdom of darkness from swallowing up part of his luminous essence (the soul of the world). The remaining part of the ideal man—the Jesus Impatibilis—is now transported to the sun. Out of the mixture of the luminous essence, thus absorbed, with the kingdom of darkness, the living Spirit now creates this present visible world, in order that from a process of purification now entered on the particles of light may now regain strength and freedom. From this mixture every man has, besides a soul of light, an evil soul; the former of which is to gain the victory by drawing to itself the particles of light scattered through nature, and especially in the vegetable world. While this purification is being accomplished under the superintendency of the ideal man residing in the sun, and of the living Spirit, the evil demons, on the other hand, are attempting by false religions, as Judaism and heathenism, to bind souls to the kingdom of night. At last the ideal man in the sun—the Christ—descends in a seeming bodily form, and aims by his doctrine to liberate the imprisoned souls of light. He is seemingly killed by demons, but it is only the phantom of his body that is crucified. But his doctrine is misapprehended and misrepresented by his apostles, to restore which to its purity Mani, the promised Paraclete, is sent. He was thus the head of the Church, with apostles, bishops, presbyters, deacons, and evangelists under him. His community or Church was divided into the catechumens or *auditores*, and the elect or perfect; the latter to be supported by the former, while they, the elect, were to practise the most rigorous asceticism and to abstain from marriage and from sins of the mouth, the hand, and the body. Baptism and the Lord's Supper—the former with oil, the latter without wine—were part of the secret ceremonial of the perfect. They had no altars or images. The sun was revered by them merely as representative of the ideal man, or the principle of light. Fasts, prayers, and readings from Mani constituted their worship. Sunday was a festival devoted to the sun. But their great festival was the anniversary of the martyrdom of Mani. The Old Testament they rejected absolutely, and of the New they retained only what had been revised and redacted by the Paraclete, Mani.

The system of Mani seems to have been formed on the apparent opposition of good and evil in the material universe and in the soul of man. This opposition he teaches to be the expression of two antagonistic principles, existing independently from eternity, and professes to represent a scheme by which the material universe and the soul of man may be freed from this conflict, may be purged of the evil, and wholly possessed and perfectly blessed by the good. As a system, it is to the utmost extent fanciful. Its attraction for curious and speculative minds lies in its professed solution of the dark and (to many minds) desperate enigma of the origin of evil—an exposition of the blending and conflict of good and evil in the universe, with the ultimate liberation and triumph of the former. The sect, though pursued with hostility in various forms by Magians, Christians, and subsequently by Mohammedans, continued to subsist by a secret tradition down to the Middle Ages, when it reappeared in connection with several heretical sects.

In various forms and combinations, and under various names, its main elements were soon after the death of its founder widely diffused through the Roman empire. Africa was its chief seat in the West, and its chief apostle there was Faustus of Mileve, who wrote apologies for it and against Christianity. Through his influence Augustine was for a time captivated with its promises of occult and profounder wisdom, but afterwards, disappointed and disgusted with its emptiness, he wrote largely and with great earnestness against it. From Valentinian I. (364–375) the Roman emperors issued frequent and severe edicts against it. In Africa it was also persecuted by the Vandals, and whole shiploads of its adherents (477) were transported by them to the continent of Europe. At the time of Leo the Great (A. D. 440–461) numbers of them were found at Rome. The sect was distinguished by rigorous formal asceticism, but was accused of Antinomian principles, and of the indulgence of secret lusts. The elements and principles of the Manichæan system were diffused through Spain through the Priscillianists, a dualistic sect, which, appearing 380, spread extensively, but was finally suppressed 583. But, despite the rigorous measures taken against them in various countries, the elements of their system appear during the Middle Ages in various mystic and Gnostic schools, such as the Paulicians and the Catherini, by whom its doctrines were widely diffused through the S. of France and Germany, where successively they established their chief seats. Indeed, the mystery of the origin of evil and the seeming dualism of human nature have ever tended to drive minds in the direction of their speculations, though entirely independent and ignorant of their system. T. M. POST.

Manigault (GABRIEL), b. in South Carolina in 1704 of Huguenot parentage; became a wealthy merchant, and at the outbreak of the war of independence loaned the State $220,000. When Gen. Prevost attacked Charleston in May, 1779, Manigault, at the age of seventy-five, was among the volunteers in the lines, accompanied by a grandson fifteen years old. D. at Charleston in 1781.

Mani′la, or **Manil′la,** city of Luzon, capital of the Philippines, and the residence of the Spanish viceroy or governor, is situated at the mouth of the Pasig. It consists of the city proper with about 15,000 inhabitants, and a number of suburbs with a population of 150,000. The city proper is situated between the river and the sea, and is surrounded by walls and defended by a citadel. It is laid out with straight and broad streets, and with many public squares sparkling with fountains and displaying the whole gorgeousness of a tropical vegetation in their gardens. It contains a fine cathedral, the magnificent palaces of the governor and the archbishop, the colleges, barracks, and other public buildings, and has a most beautiful promenade along the ramparts, which in the evenings, when crowded with people, presents a most animated aspect. Of the suburbs, Binondo, situated on the northern bank of the river, is the largest and most important. It is the seat of traffic and commerce, and here Spaniards, Englishmen, Americans, Chinese, Hindoos, Malays, and mestizoes meet to buy and sell; hundreds of races, costumes, and languages mix together in endless confusion. Manila has been one of the principal centres of commerce in the East Indies almost since its foundation in 1571 by Legaspi. It has an excellent harbor, and all the products of the Philippines are brought hither—rice, sugar, coffee, cotton, hemp, and tobacco. The last two articles are the principal ones. Manila cheroots and cigars are world-famous; the manufacture, which is a government monopoly, employs more than 20,000 hands. Of the Manila hemp many delicate and beautiful fabrics, much appreciated in commerce, are made. But the city has a dangerous enemy in the earthquake. Three times it has been almost entirely destroyed; on the last occasion, in 1863, all its churches fell, and thousands of people were killed.

Manila Hemp, or **Abaca,** the fibre of *Musa troglodytarum* (order Musaceæ), a plant resembling the plantain and the banana. It is cultivated principally in the Philippine Islands, and the fibre is obtained from the leaf-stalk of the plant. It is largely imported for the manufacture of cordage and canvas, which is of the very best quality, exceeding hemp in durability, but not in flexibility. Old Manila is used for paper-stock, and makes a wrapping-paper of excellent quality and great strength.

Manil′ius (MARCUS), a Latin poet, of whom a didactic poem in five books, *Astronomica*, has been preserved, but of whose life and age nothing is known, though it is probable that he flourished under Augustus. The first manu-

script was discovered by Poggio, and printed at Nuremberg in 1473. Scaliger in 1579, Bentley in 1739, and Jacob in 1836, have given editions based on several manuscripts. There is an English translation by Creech (1697) and a French by Pingré (1786).

Manilla, post-v. of Walker tp., Rush co., Ind., on the Jeffersonville and Indianapolis R. R. (Cambridge City branch). Pop. 163.

Manin' (DANIELE), b. in Venice in 1804; educated at Padua, and at an early age became one of the most distinguished advocates in Venice. His influence, together with that of Tommaseo, was most important in preparing the revolution in Venetian Lombardy. Being imprisoned with his friend, he was subjected to a political trial, but on Mar. 17, 1848, the people forced the dungeons, liberated the two illustrious prisoners, bore them in triumph through the city, and then placed them at the head of the provisory government. Manin moderated the violence of the revolution, restrained it from excesses, sustained the honor and defended the independence of Venice to the utmost. On his banishment he withdrew to France, where he supported himself by teaching Italian, and at the same time was a most active apostle for the freedom of Italy. No Italian abroad ever rendered more important service to his country than Daniele Manin. The sympathy and esteem he won for himself converted some of the most distinguished French writers to the cause of Italian independence. To Daniele Manin should be especially attributed the efficiency of the Societa Nazionale Italiana, which, by the advice of the illustrious Venetian refugee, La Farina founded at Turin. D. in Paris Sept. 22, 1857. His remains were solemnly conveyed by his son to Venice, where in May, 1875, a fine monument was erected to his memory.

Ma'nioc, Cassa'va, Ju'ca, or **Mandio'ca,** names of the *Jatropha Manihot* or *Manihot utilissima*, and of the *Manihot Aipi*, half shrubby euphorbiaceous plants of South America, perhaps natives of Africa also. They are extensively cultivated as sources of food. From the farinaceous root is prepared tapioca, Brazilian arrowroot, the Brazilian *farinha*, and other forms of amylaceous or starchy food. The first-mentioned species is poisonous, but its dangerous qualities are dispelled by heat; the other species is considered harmless. The plants are propagated by cuttings, and produce a large amount of food. (See TAPIOCA.)

Manis. See PANGOLIN.

Manis'tee, county of Michigan, bounded W. by Lake Michigan. Area, 750 square miles. It is level and adapted to grain-culture, but is largely covered with forests. Lumber cutting and sawing is the chief industry. The county is traversed by Manistee River. Pop. 6074.

Manistee, city and tp., cap. of Manistee co., Mich., on both sides of the Manistee River, and between Lake Manistee and Lake Michigan. The river between the lakes is 1½ miles in length, and navigable for small vessels drawing 10 to 12 feet of water. It has 6 churches, 4 union school-buildings, the central costing $18,000, 20 steam saw-mills, 6 shingle-mills, 2 planing-mills, 2 foundries and machine-shops, and 1 grist-mill. It ships annually 200,000,000 feet of lumber, an immense quantity of shingles, lath, pickets, wood, bark, etc. It is also located in the great peach and fruit belt of Michigan. Pop. 3343; of tp. exclusive of city, 271. S. W. FOWLER, PROP. "TIMES AND STANDARD."

Manistee River rises in Antrim co., Mich., and flows in a generally S. W. course to Lake Michigan.

Mani'to, post-v. and tp. of Mason co., Ill., on the Peoria Pekin and Jacksonville R. R. Pop. of v. 375; of tp. 1352.

Manito'ba, province of the Dominion of Canada, British North America, bounded on the N. by the parallel of 50° 30′ N. lat., on the E. by the meridian 96° W. lon., on the S. by Minnesota and Dakota, U. S. A.—the line being the 49th degree of N. lat.—and on the W. by the meridian of 99° W. lon. Area, 14,340 square miles, or 9,177,600 acres.

Surface, Climate, Geology.—The whole area of the province is included in the valley of the Red River of the North, and is a fertile plain, the part near the river being a remarkably dead level. W. of the river the streams flow in deep troughs or *coulées*. Tall grass covers a great part of the country. From what is known of the geology of this region, it would appear that it is a Cretaceous surface, generally resembling that of N. E. Dakota. The soil is very productive of wheat and most other crops; but from its lower level it is claimed that the winter climate, though severe, is milder than that of the same river-valley in its more southern portions. Thus, the bank of the Red River at St. Vincent, Minn., is 792 feet above the sea (*U. S. Geol. Survey*, F. V. Hayden, 1872). Farther up, at Breckenridge, the elevation is 953 feet (*ibid.*), while at Fort Garry, Manitoba, it is but 640 feet (*Profile Map Can. Pacific Railway*). Lake Winnipeg, according to Mr. Hind, is but 628 feet above the sea-level. There is at least sufficient timber in the province for all immediate wants. Buffalo and other game abound. The waters teem with valuable fish. Notwithstanding the very favorable statements with regard to the mildness of the climate of Manitoba, the published climatological statistics of the Canadian government appear to show that it is one of the coldest inhabited parts of British America in winter, though the rather short summer is very warm. The rain and snow fall is very light in winter, hence the Canadian Pacific Railway, which will pass through the province, will here meet with but small obstruction to its trains from snow. The climate is remarkably healthful. The Red River, though very serviceable in navigation, has been known to inundate the surrounding country. Formerly, the inhabitants suffered much from severe winters and from the visitations of grasshoppers. The eastern portion of the territory has more wood and water than the western, and is not such a dead level. It has some marshy land. Cattle, horses, and sheep are reared, and flour and furs exported.

Finances.—The Dominion subsidy pays nearly all the public expenses. The custom-houses of the province pay a very considerable revenue to the Dominion. There is no provincial debt.

The government consists of a lieutenant-governor and an executive council of five. The legislature consists of a legislative council of seven members, appointed for life, and a legislative assembly, or lower house, of twenty-four elective members. The province sends two senators to the Dominion Parliament, and four elective members to the lower house of that body. Either English or French may be spoken in the legislature, and the records, laws, and public documents are printed in both languages. The common law of England prevails, subject to statutory modification by the imperial, federal, or provincial legislature. Some of the laws of the old council of Assiniboia are also in force.

Religion, Education, etc.—A large part of the people are Roman Catholics, that religion having been long since established here by missionaries to the Indians. St. Boniface is the seat of a Roman Catholic archbishop. At Fort Garry is the see-house of the lord bishop of Rupert's Land (Anglican). The board of education consists of equal numbers of Protestant and Catholic members. Separate schools are established, and are maintained partly by fees and assessments and partly by a provincial grant. St. John's College (Anglican) and St. Boniface College (Roman Catholic) were incorporated in 1872. There is a very considerable Scotch Presbyterian element in the population. Manitoba had in 1873, 3 weekly newspapers, with a total circulation of some 1300 copies weekly.

History.—This province is the northern part of the region purchased in 1810 from the Hudson's Bay Company by Thomas Douglas (1744–1820), earl of Selkirk, who planted here the famous "Red River Settlement," called also "Pembina," and afterwards "Assiniboia." The first settlers were Gaelic-speaking Highland Scotch. Many Canadians of English, Scotch, and French descent, and many half-breed Indians, joined the colony in 1815, and subsequently, when the U. S. boundary-line was run through, it was found that a good part of the colony was S. of that line. Pembina, Dak., and St. Vincent, Minn., are parts of this old colony. The attacks of the Northwest Co., the severity of the winters, and visitations of grasshoppers interfered sadly for many years with the prosperity of the people. The government devolving at last upon the Hudson Bay Co., it transferred the burden of local government to the "council of Assiniboia," which endured till 1871, when on Mar. 15 the elective legislature of the new province was first convened. At the beginning of the negotiations for the transfer of authority to the Dominion (1869 and 1870) there was a strong feeling against the movement, especially among the French Canadians and half-breeds. Under one Louis Riel they imprisoned many of their opponents, organized an armed resistance, and seized the public treasury. In July, 1870, a military expedition from Canada appeared and compelled the insurgents to submit.

Population.—The population in 1871 was 11,963, of whom 1565 were white, 5757 were French-speaking half-breeds, 4083 were English-speaking half-breeds, and 558 were Indians. In 1857 the population was but 6522. The capital is at Fort Garry. CHARLES W. GREENE.

Man'itou [Indian]. Among the North American Indians of Algonkin stock, any object of religious reverence or dread is called *manitou*, whether it be a divinity, an evil spirit, a fetich, or an amulet. *Gitche Manitou* ("the Great Spirit") is the Supreme Being.

Manitou, county of Michigan, consisting of islands in the N. part of Lake Michigan. Among these are Great Beaver, Garden, High, Great and Little Manitou, N. and S. Fox, Hog, Trout, Squaw, Whisky, and Gull islands. They are rough and not very productive. The inhabitants are in part Mormons, who settled here in 1846 under Joseph Strong. Cap. St. James. Pop. 891.

Manitowoc′, county of Wisconsin, bounded E. by Lake Michigan. Area, 600 square miles. It is uneven, fertile, and well timbered. Cattle, grain, and wool are largely produced. The manufactures are important, and include flour, leather, lumber, malt liquors, etc. Cap. Manitowoc. Pop. 33,364.

Manitowoc, city and tp., cap. of Manitowoc co., Wis., on Lake Michigan, at the confluence of Manitowoc River, 75 miles N. of Milwaukee, with which it is connected by the Milwaukee Lake Shore and Western R. R., has 5 churches, 1 national bank, 1 semi-weekly and 4 weekly newspapers (2 German), a system of graded schools, several manufactories and tanneries, a good harbor, several shipyards, and a considerable lake-trade. Pop. of city, 5168; of tp. exclusive of city, 1016.

Manitowoc Rapids, post-v. and tp. of Manitowoc co., Wis., on Manitowoc River. Pop. 1860.

Manka′to, city and tp., cap. of Blue Earth co., Minn., on the Minnesota River, at the mouth of the Blue Earth, and on the St. Paul and Sioux City and the Winona and St. Peter R. Rs., and is the terminus of the Central R. R. of Minnesota. It is 86 miles from St. Paul, 184 from Sioux City, and 140 from Winona. It has 11 churches, 6 schools—3 public, a State normal, a Catholic, and one in charge of the Lutherans—affording accommodations for 2200 scholars; 3 English and 1 German newspaper, a public library, 2 national and 1 private bank, a board of trade, 10 hotels, a large linseed-oil works, a woollen manufactory, 2 foundries and machine-shops, a furniture manufactory, a cracker and confectionery manufactory, 2 large halls, a fine driving park, 4 breweries, 2 flouring-mills, several wagon and carriage manufactories. It is the centre of a large agricultural district. Pop. of city, 3482; of tp. exclusive of v., 1272. O. BROWN & SON, PUBS. "RECORD."

Mankind. See MAN, by PRES. M. B. ANDERSON, LL.D.

Man′lius, post-tp. of Bureau co., Ill. Pop. 973.

Manlius, tp. of La Salle co., Ill. Pop. 2463.

Manlius, tp. of Allegan co., Mich. Pop. 541.

Manlius, tp. of Onondaga co., N. Y., has extensive quarries and manufactures of lime, gypsum, and cement. The township contains the Green Lakes, remarkable for their situation in deep chasms and for their sulphurous waters. There are several villages, of which FAYETTEVILLE (which see) is the most important. The post-v., MANLIUS, on Limestone Creek, has extensive manufactures, a union school, and an academy. There are several mineral springs in the vicinity. Pop. 879.—MANLIUS CENTRE is on the Erie Canal. Pop. 100.—MANLIUS STATION is on the New York Central R. R. Pop. 200. Pop. of tp. 5833.

Man′ley (H. DE HAVEN), b. in Pennsylvania Dec. 21, 1839; graduated at the Naval Academy in 1860; became a master in 1861, a lieutenant in 1862, a lieutenant-commander in 1866, a commander in 1874; served on board the Congress in her action with the Merrimack, Mar. 9, 1862, and commanded the boats of the Canandaigua in the joint army and navy attack upon Morris Island, July 8, 1863, which resulted in the capture of a large part of the island. Commended for gallantry. FOXHALL A. PARKER.

Manley (Capt. JOHN), b. at Torbay, England, in 1733; was a mariner in early life; settled at Marblehead, Mass., and became master of a merchantman; was commissioned captain by Washington Oct. 24, 1775; sailed in the schooner Lee and captured in Boston harbor three vessels, one of which was an ordnance brig of great value; commissioned captain by Congress Aug. 22, 1776, he took command of the Hancock (32 guns), with which he captured the British man-of-war Fox, but in which he was himself captured by the Rainbow, July 8, 1777. After several years' confinement he was exchanged, tried for the loss of his vessel, honorably acquitted, and placed in command of the Hague frigate 1782, with which he cruised in the West Indies, and when driven on a sandbank at Guadaloupe by a British 74, defended himself three days against the cannonade of four ships of the line, and finally escaped. This exploit closed the naval annals of the Revolution, in which Capt. Manley, next to Paul Jones, was the principal hero. He was again tried for his conduct at Boston, and censured on some of the details. D. in Boston Feb. 12, 1793.

Manly (BASIL), b. near Pittsborough, Chatham co., N. C., Jan. 28, 1798; became a member of a Baptist church when sixteen years old, and soon began to preach, though not regularly licensed until 1818; entered the junior class in South Carolina College the following year; graduated 1821; was for three years pastor of a church in Edgefield district, then for eleven years (1826–37) pastor of the only Baptist church in Charleston; was influential in the establishment of Furman University at Greenville, S. C.; became in 1837 president of the University of Alabama, which post he filled until 1855, when he resumed his pastoral labors at Charleston, S. C.; acted subsequently as a travelling missionary in Alabama; was for a time pastor of a church at Montgomery, Ala., and d. at Greenville, S. C., Dec. 21, 1868. Dr. Manly was the chief organizer of the Southern Baptist convention 1845, and of the theological seminary at Greenville 1858, and was author of a *Treatise on Moral Science*, for many years a textbook in Southern colleges.

Mann (A. DUDLEY), b. in Virginia in 1805; was commissioner to negotiate commercial treaties with Hanover, Oldenburg, and Mecklenburg 1845, to all the minor German states 1847; special commissioner to the insurgent government of Hungary 1849; minister to Switzerland 1850; private secretary to Pres. Pierce 1853, but resigned the same year; devoted himself thenceforth to the development of the material resources of the Southern States, and was appointed 1861 upon a special mission to procure the recognition of the Confederate States by European governments, being afterwards associated for the same purpose with Messrs. Mason and Slidell.

Mann (ALFRED TURNER), D. D., b. in Augusta, Ga., Nov. 1, 1815; studied at the State University at Athens, and at Randolph-Macon College in Virginia, where he graduated in 1836, and in the same year entered the ministry of the M. E. Church, South, and is an eloquent pulpit orator. A. H. STEPHENS.

Mann (HORACE), LL.D., b. at Franklin, Mass., May 4, 1796; graduated at Brown University in 1819; studied law at Litchfield, Conn.; was admitted to the bar in 1823, and settled at Dedham, Mass., but in 1833 removed to Boston. He was often in the State legislature, where he was an effective laborer for educational and other reforms. As a lawyer he had a remarkable power over juries, for all who had dealings with him were convinced of the complete honesty and earnestness of the man. He was (1837–48) the secretary of the Massachusetts board of education; a member of Congress 1848–53, Free-Soil candidate for governor of Massachusetts 1852, and president of Antioch College, Yellow Springs, O., 1852–59. D. at Yellow Springs Aug. 2, 1859. Mr. Mann was born in comparative poverty, and his youth, like his whole life, was a season of ceaseless toil. While presiding over the Massachusetts board of education he accomplished a great and much-needed reform in the face of opposition, public distrust, and a succession of obstacles the narration of which seems almost incredible. At Yellow Springs his labors and anxieties were redoubled, and unquestionably his life was greatly shortened thereby. His twelve annual reports to the Massachusetts legislature (1837–49) are of high value. He published also *Lectures on Education* (1848), *Letters and Speeches on Slavery* (1851), *Lectures on Intemperance* (1852), and supervised (1835) the publication of the *Revised Statutes of Massachusetts*. (See *Life*, by Mrs. Mann, 1865.)

Man′na [Heb. *mân*], the concrete juice of the *Fraxinus Ornus*, a small tree native in the countries on the Mediterranean coast. At present the manna of commerce is obtained exclusively from Sicily. It is in the form of cream-colored, brittle, spongy flakes of an agreeable sweet taste. It contains a large percentage of a peculiar sugar called *mannite*. Manna is a gentle laxative, and is occasionally used as such in medicine, especially in case of children, from its pleasant taste. It is an ingredient of the old "black draught." EDWARD CURTIS.

The manna [Arab. *mon*] of the Sinaitic peninsula is found, during the month of June only, on the twigs and branches of the shrub *turfa*, whose botanical name is said by Porter to be *Tamarix gallica*. Small pots of it are kept for sale at the convent of Mount Sinai. The present annual yield of the peninsula is five or six hundred pounds only; and there could never have been enough to feed two or three millions of people, so that the manna of Ex. xvi. 14 and Josh. v. 12 must have been miraculous. R. D. HITCHCOCK.

Manna Grass, or **Floating Fescue,** the *Glyceria fluitans*, a kind of grass growing in wet places in the temperate regions of nearly every quarter of the world. It is prized as affording abundant hay of very fair quality; and in Poland and parts of Germany the seed is collected and used as a grain. It is called Polish manna, and is nutritious and palatable.

Manna′nah, tp. of Meeker co., Minn. Pop. 375.

Mannahaw′kinsville, a v. (MANNAHAWKIN STATION and P. O.) of Stafford tp., Ocean co., N. J., on the Tuckerton R. R. Pop. 689.

Manners (John James Robert), D. C. L., P. C., by courtesy Lord John Manners, b. at Belvoir Castle Dec. 13, 1818, son of the fifth duke of Rutland; educated at Eton and Trinity College, Cambridge; was an early member of the Camden Society, and took a deep interest in Gothic church-restorations. He was in Parliament 1841–47 for Newark, 1850–57 for Colchester, and 1857–74 for North Leicestershire. After 1846 he became a Tory. In 1852 he became first commissioner of public works, and again in 1858 and 1866. He was the author of several volumes of prose and verse. D. at London Sept. 9, 1874.

Man'ney's Neck, tp. of Hertford co., N. C. Pop. 1313.

Mann'heim, or **Manheim,** town of Germany, in the grand duchy of Baden, at the influx of the Neckar in the Rhine. It is well built and very regularly laid out, containing a ducal palace, which is one of the largest buildings of the kind in Germany, and several fine churches. Its manufactures are not important, but its trade, carried on partly by rail, partly by boats on the Neckar and the Rhine, has of late become very brisk. Pop. 39,606.

Man'ning, post-v. and tp., cap. of Clarendon co., S. C., has 1 weekly newspaper. Pop. 1278.

Manning, tp. of Marion co., S. C. Pop. 858.

Manning (Henry Edward), Cardinal, b. at Totteridge, Hertfordshire, England, July 15, 1808; studied theology at the University of Oxford, and was appointed rector of Lavington and Graffham in Sussex in 1834, and archdeacon of Chichester in 1840; but the Gorham case occasioned him to give up in 1851 his preferments in the Anglican Church and join the Roman Catholic. After residing for several years in Rome, he was ordained a priest in 1857, and appointed rector of St. Helen and St. Mary's, Bayswater, and on the death of Cardinal Wiseman in 1865 he was nominated archbishop of Westminster. He was created a cardinal Mar. 15, 1875. He founded the Roman Catholic university of Kensington Oct. 15, 1874, and took a very active part in the Council of the Vatican, defending the dogma of the infallibility of the pope. The most prominent of his writings are *The Temporal Mission of the Holy Ghost* (1865), *The Temporal Power of the Pope* (1866), *England and Christendom* (1867), *Petri Privilegium* (1871), and *Unity of the Church* (1842). Cardinal Manning replied to Mr. Gladstone's *Expostulation*, in *The Vatican Decrees in their Bearing on Civil Allegiance* (1875).

Manning (Jacob Merrill), D. D., b. at Greenwood, N. Y., Dec. 31, 1824; graduated at Amherst College in 1850, and at Andover Seminary in 1853; was settled over the Mystic church (Congregational) in Medford, Mass., 1854–57, when he became associate pastor with Dr. Blagden of the Old South church in Boston, and in 1866 also lecturer at Andover on the relations of Christianity to popular infidelity. Besides several sermons, addresses, and articles in the *Bibliotheca Sacra*, he has published an *Oration before the City Government of Boston, July 4, 1865, Half Truths and the Truth* (1873), *Helps to a Life of Prayer* (1875). R. D. Hitchcock.

Manning (James), D. D., b. at Elizabethtown, N. J., Oct. 22, 1738; graduated at Princeton in 1762; was the first president of Rhode Island College (now Brown University) 1765–90; and was 1770–91 pastor of the First Baptist church, Providence, R. I. He was sent to Congress in 1786, and was a zealous Federalist. He was one of the first pulpit-orators of his time. D. at Providence, R. I., July 29, 1791. (See his *Life*, by R. A. Guild (1864).)

Man'nington, tp. of Salem co., N. J. Pop. 2351.

Mannington, post-v. and tp. of Marion co., W. Va., on Baltimore and Ohio R. R. Pop. of v. 411; of tp. 2924.

Mannite. See Manna.

Manns'ville, post-v. of Ellisburg tp., Jefferson co., N. Y., on the Rome Watertown and Ogdensburg R. R., and on Skinner's Creek, has 3 churches and manufactures of lumber, leather, etc.

Manny, post-v., capital of Sabine parish, La., 25 miles S. W. of Natchitoches.

Manoel (Francisco), b. at Lisbon, Portugal, in 1734; was considered the best modern lyric poet of his nation. His productions consist chiefly of odes, sonnets, and epistles, and were published under the *nom de plume* of "Filinto Elysio." Among his poems is an ode to Washington. The liberality of the principles avowed in his writings led to an accusation of heresy, and he escaped the dungeons of the Inquisition only by flight to France in 1784. D. at Paris in 1819. He made Portuguese translations of La Fontaine's *Fables*, of Chateaubriand's *Martyrs*, and of Wieland's *Oberon*.

Manom'eter [Gr. *μανός*, "rare," and *μέτρον*, "measure"], an instrument for determining the degree of density of the air. One simple form is a bent tube, of which the shorter leg is sealed at the end. The bend is filled with mercury. The pressure of the mercury on the enclosed air equals the sum of the atmospheric pressure, and the weight of that part of the mercurial column which rises in the longer leg above the level in the shorter leg. Many other manometers have been invented, some of which are employed as steam-gauges.

Mano'nin, post-tp. of Anoka co., Minn. Pop. 103.

Ma'nor, tp. of Armstrong co., Pa. Pop. 1071.

Manor, tp. of Lancaster co., Pa.; it includes the borough of Washington (which see). Pop. 4371.

Man'orville, post-b. of Armstrong co., Pa., on the E. bank of Allegheny River and on the Allegheny Valley R. R. Pop. 330.

Manre'sa, town of Spain, in the province of Barcelona, on the Cardouet, in a rich and fertile plain, and manufactures cloth, ribbons, white lead, paper, chocolate, and brandy. Pop. 15,264.

Mans, Le, town of France, the capital of the department of Sarthe, with 42,654 inhabitants, on the Sarthe, forms a centre of the railways between Paris, Tours, Angers, Rennes, and Cherbourg, and is one of the most important commercial and manufacturing places of Western France. The city is old-fashioned, Norman in its character, but has a very beautiful Gothic cathedral, commenced in 1216 and finished in 1434; several other interesting buildings, such as the town-house, the theatre, the corn-market, etc., and numerous scientific and benevolent institutions, as, for instance, a lyceum, a theological seminary, a library, a museum of natural history, an art-gallery, several hospitals, etc. It is the seat of a bishop and of the government of the department. Its trade is chiefly in cattle, poultry, and other agricultural produce; among its manufactures are those of carpets, linen, and lace, the most important; also its bleaching-fields and tanneries are extensive. In ancient times its name was *Vindinum*, and it was the capital of the Cenomani; in the fourth century it became the seat of a bishop, and at the time of Charlemagne it was one of the most important cities of France. But the invasion of the Normans in the ninth century, and later on the long contest between the count of Anjou and the duke of Normandy, destroyed its prosperity. A battle took place here Dec. 12, 1793, between the royalists and the republicans, in which the latter were victorious under Marceau; and another on Jan. 12, 1871, between the Germans under Prince Friedrich Carl and the French under Gen. Chanzy. At the end of 1870 the French occupied Le Mans and vicinity with the second army of the Loire, consisting of the 16th and 17th corps and parts of the 19th and 21st, numbering 120,000 men; and hence they intended to push forward towards the army besieging Paris, and at the same time prevent Prince Friedrich Carl from pursuing the army of Bourbaki. On Jan. 5, 1871, the prince commenced his operations against Chanzy with 57,737 foot, 15,426 horse, and 318 guns, forming his army into a large curve in order to surround the French army from the N., E., and S. On Jan. 6 his right wing stood at Bron and Nogent la Rotron, the centre at Vendôme, and the left wing at Montoire, and from these points the German divisions began to draw nearer and nearer together around Le Mans. A series of minor contests now began, and lasted for seven days, until at last a decisive battle gave the Germans the victory. This peculiar character of the contest was due partly to the straggling position of the French, partly to the circumstance that the ground was very much cut up by the rivers Huisne and Loire, with their affluents, and by numerous hill-ranges. Cold, snow, and storms also embarrassed the operations. On Jan. 7 the Germans reached Montmirail, Epinay, and Savigny; Jan. 8, La Ferté Bernard, St. Calais, and Ecorpain; Jan. 9, Montfort, Artenay, Bouloire, and Parigné l'Evêque; Jan. 10, Changé, Champagné, Granducé, Connerré, and Pont de Gesner; thus they were already standing in the immediate neighborhood of Le Mans. Opposite, the French stood with a curved front, E. and N. E. of the city. On the evening of Jan. 11 the Germans occupied the following points: The 3d army corps, Arches-Château and Noyers-Château; the 18th division, the Plateau d'Anvour; the 13th army corps, La Chapelle and the district E. of Lombron; the 10th army corps, Les Mortes Aures, Mulsanne, and the hills of Vert-galant. The prince took his quarters at the castle of Artenay, and gave orders for a renewed attack the next day. On the 12th, however, Chanzy himself made the attack. It is admirable that after repeated defeats the French still had the courage to attack; they were defeated, however, in spite of the desperate valor with which they fought. In the afternoon, at four o'clock, the first German soldiers entered the city. The French army retreated hastily and with immense loss to-

wards Alençon and Laval. The Germans took during those seven days 18,000 prisoners, 20 guns, and 2 colors; they lost 180 officers and 3470 men. AUGUST NIEMANN.

Mansard′, or **Mansart** (FRANÇOIS), b. at Paris, France, in 1598; became early distinguished as an architect; built several churches and numerous châteaux, but of most of his buildings only prints are extant. He is the initiator of the curved roof named after him. D. at Paris in 1666.—His nephew, JULES HARDOUIN MANSARD, b. at Paris in 1645, d. at Marly in 1708, was a son of the painter Hardouin, but assumed his uncle's name when he entered the profession of an architect. He built the châteaux of Marly and Lunéville, the palaces of Versailles and Grand Trianon, the dome of the Hôtel des Invalides, and the Place de Vendôme and Place des Victoires.

Man′sel (HENRY LONGUEVILLE), D. D., b. at Cosgrove, Northamptonshire, Oct. 6, 1820; was educated at Merchant Taylors' School and at St. John's College, Oxford, where he became a fellow in 1842; was ordained priest of the Anglican Church 1845; became reader in moral and metaphysical philosophy at Magdalen College, Oxford; delivered in 1858 the Bampton lecture on *The Limits of Religious Thought;* became Waynflete professor of philosophy 1859; regius professor of church history and canon of Christchurch 1867; dean of St. Paul's 1868. D. in London July 30, 1871. Besides the Bampton lecture aforesaid, his chief works are *Prolegomena Logica* (1851), *Metaphysics* (*Encyc. Brit.*, 1857), *The Philosophy of the Conditioned* (1866). He was one of the editors of Hamilton's *Lectures.* Dean Mansel was an elegant writer, and in philosophy was a follower of Hamilton. A posthumous work, *The Gnostic Heresies of the First and Second Centuries,* preceded by a memoir, was published in 1874.

Mans′field, town of England, in the county of Nottingham. It has some manufactures of hosiery and lace, and a large trade in corn, malt, and cattle. Pop. 8346.

Mansfield, post-tp. of Tolland co., Conn., on the New London Northern R. R., is the seat of an important sewing-silk manufacture and of the Connecticut Soldiers' Orphans' home. Pop. 2401.

Mansfield, post-v., cap. of De Soto parish, La., has 1 weekly newspaper. Pop. 813.

Mansfield, post-v. and tp. of Bristol co., Mass., at the junction of the Boston and Providence, the New Bedford, and the Mansfield and Framingham R. Rs., 24 miles S. of Boston, has 5 churches, 1 newspaper, 4 cutlery-shops, several gold, shell, and horn jewelry factories, strawworks, 40 basket firms, 2 foundries, spindleworks, 2 hotels, and stores. Pop. 2432. THOMAS S. PRATT, ED. "NEWS."

Mansfield, post-tp. of Freeborn co., Minn. Pop. 379.

Mansfield, tp. of Burlington co., N. J. Pop. 2880.

Mansfield, tp. of Warren co., N. J. Pop. 1997.

Mansfield, tp. of Cattaraugus co., N. Y. Pop. 1135.

Mansfield, city, cap. of Richland co., O., at the junction of the Atlantic and Great Western, the Pittsburg Fort Wayne and Chicago, and the Lake Erie division of the Baltimore and Ohio R. Rs., and the terminus of the Mansfield Coldwater and Lake Michigan R. R., has a fine court-house, 15 churches, 4 large school-houses, 4 newspapers, 4 banks, 7 hotels, 2 agricultural implement manufactories, 1 woollen-mill, and 1 paper-mill. It is situated in the midst of a flourishing agricultural community, has a large wholesale mercantile trade, aggregating a business of $3,000,000 annually, Holly waterworks, a public library, opera-house, and public hall. Pop. 8029. J. W. MYERS, ED. "HERALD."

Mansfield, post-b. of Tioga co., Pa., 31 miles from Corning, N. Y., on the Tioga River and Tioga R. R., has 3 churches, a State normal school, a school for soldiers' orphans, a newspaper, a bank, 3 hotels, an iron furnace, a bedstead-factory, a planing-mill, and several stores. Pop. 616. O. D. GOODENOUGH, ED. "ADVERTISER."

Mansfield (EDWARD D.), LL.D., b. at New Haven, Conn., Aug. 17, 1801; graduated at the U. S. Military Academy in 1819, but declined appointment in the army, and graduated from the College of New Jersey 1822; studied law at the Litchfield Law School, and was admitted to the bar in Connecticut, but immediately removed to Ohio, where in 1836 he was elected professor of constitutional law in Cincinnati College. Leaving the profession of the law for that of public writer, he was editor of the Cincinnati *Chronicle* 1836–49, of the *Atlas* 1849–52, of Cincinnati *Gazette* 1857, and of the *Railroad Record* 1854–72; and for several years contributed to the New York *Times* over the signature of "Veteran Observer;" commissioner of statistics for the State of Ohio 1857–67. Author of *Utility of Mathematics, Political Grammar, Treatise on Constitutional Law, Legal Rights of Women, Life of Gen. Scott, History of the Mexican War, American Education,* etc. Degree of A. M. conferred by College of New Jersey, and LL.D. by Marietta College, O.; member of the Société Française Statistique Universelle.

Mansfield (JARED), b. at New Haven, Conn., in 1759; graduated at Yale College in 1777. Becoming distinguished as a teacher and scholar, his *Essays, Mathematical and Physical,* attracted the notice of the government, which led to his appointment in 1802 to a captaincy in the engineer corps of the army, and assignment to duty at the Military Academy as acting professor of mathematics; in 1803 he was appointed surveyor-general of the North-west Territory, and removed to Ohio, where he was the first (being appointed for that purpose) to run the meridian lines on which is based the admirable system of the public surveys, and to do which he imported astronomical instruments from London, and practically established the first observatory in the U. S. in his own house near Cincinnati. Returning to New Haven in 1812, having meanwhile been promoted to be lieutenant-colonel in his corps, he was in October of that year appointed professor of natural and experimental philosophy at West Point—the first to fill this chair. After sixteen years of service in this capacity, he resigned in 1828, and returned to New Haven, where he d. Feb. 1, 1830.

Mansfield (JOSEPH K. F.), b. at New Haven, Conn., Dec. 22, 1803; graduated at West Point, and appointed a second lieutenant of engineers 1822. Prior to 1846, Mansfield was engaged entirely on engineering duty on the Atlantic and Gulf coasts, in the construction of fortifications, improvement of rivers and harbors, and as member of the board of engineers; in the war with Mexico, as chief engineer of Gen. Taylor's army, he was distinguished in the defence of Fort Brown (brevet major); at the battle of Monterey, where he was severely wounded (brevet lieutenant-colonel); and at Buena Vista (brevet colonel). Returning to duty with his corps (in which he had attained a captaincy in 1838) at the close of the war, he was for five years a member of the board of engineers for fortifications on the Atlantic and Pacific coasts, when he was appointed (1853) inspector-general of the army, with the rank of colonel, which position he held at the outbreak of the civil war. In Apr., 1861, he was placed in command of the department of Washington, and at once commenced the work of fortifying the capital, receiving the appointment of brigadier-general of volunteers the following month. Retained on this duty until October, he was in that month transferred to Camp Hamilton, Va., and in November to the command of Newport News, participating in the capture of Norfolk, May 10, 1862; transferred in command of Suffolk June–Sept., 1862; promoted to be major-general of volunteers in July; assigned to the command of a division in the Army of the Potomac Sept. 10, at the head of which, a week later, while encouraging his troops at the battle of Antietam, he received wounds from the effects of which he d. the next day, Sept. 18, 1862.

Mansfield (WILLIAM **Murray**), EARL OF, b. at Scone, Perthshire, Scotland, Mar. 2, 1705, was the third son of Viscount Stormont, a Scottish nobleman of Jacobite opinions; educated at Westminster School, at Christchurch, Oxford, and at Lincoln's Inn, he travelled in France and Italy in company with the young duke of Portland; was called to the bar Nov. 23, 1730, and, settling at London, soon acquired almost a monopoly of a lucrative practice consisting of appeals from the Scottish court of sessions to the House of Lords. At the same time he cultivated the society of men of letters, especially of Pope, who often sang his praises, and being endowed with a fine presence, engaging manners, great oratorical powers, untiring industry, and keen judicial insight, he rose rapidly in his profession; was soon in the receipt of an annual income of £3000; married in 1738 a daughter of the earl of Nottingham; was elected to Parliament in Nov., 1742, on the downfall of Walpole, and in the same month received the appointment of solicitor-general from the ministry of Lord Wilmington. The Jacobite rebellion of 1745, favored as it was by many of his relatives, exposed Murray to an accusation of disloyalty, which was presented to the cabinet and afterward to the House of Peers, but without result, his only reply being the energy, conjoined with moderation and impartiality, with which he conducted the prosecutions against Lord Lovat and other noblemen who were convicted of treason. In 1747, and again in 1754, Murray was re-elected to Parliament, was in May of the latter year appointed attorney-general, and on Nov. 8, 1756, chief-justice of the king's bench, with the title of Baron Mansfield and a seat in the cabinet. In 1757, while filling temporarily the post of chancellor of the exchequer, he effected the coalition between Pitt, Fox, and Newcastle, which resulted in the formation of the ministry of the former. For more than thirty years Lord Mansfield presided

over the chief British tribunal, gaining golden opinions for his promptness, decision, equity, and integrity, but gradually losing popular favor by his decided leaning toward Toryism and the "principle of authority." In the American troubles consequent upon the repeal of the Stamp Act he gave his opinion that the colonists must submit to the authority of Parliament before their grievances could be considered. In the trial of Woodfall, the publisher of Junius's letters, he held that the jury was competent only to pronounce upon the fact of publication and the "sense of the paper," not upon any question of law; and this view he steadfastly maintained. He was created earl of Mansfield in 1776; had his house in Bloomsbury Square sacked in 1780 during the Gordon riots, for which loss he refused all compensation; retired from the bench June 4, 1788, and d. at Highgate Mar. 20, 1793. Having left no issue, the barony expired with him; the earldom, with most of his large fortune, descended to his nephew, David Murray, Viscount Stormont. (See his *Life*, by Roscoe (1838), Lord Campbell's *Lives of the Chief-Justices*, and Foss's *Judges of England*.)

Mansfield, Mount, in Cambridge, Lamoille co., Vt., is 4348 feet in height. The mountain itself presents a grand appearance, and the view from the summit is one of the finest in New England, the mountains about Montreal, 70 miles away, being easily seen in clear weather. It is the highest of the Green Mountains.

Mansfield Valley, post-v. of Allegheny co., Pa., 5 miles from Pittsburg, on Chartiers Creek and the Panhandle and Chartiers Valley R. Rs. It has 5 churches, an academy, a newspaper, 3 savings banks, a smelting furnace, a glass-factory, 10 hotels, 3 large coal-banks, and a number of stores. Principal business, mining. Pop. about 3000. CHARLES KNEPPER, ED. "ITEM."

Manslaughter, in law. By the common law, manslaughter was the unlawful and felonious killing of another without any malice express or implied; that is, without the intent to kill, either proved by direct evidence or inferred from the facts of the homicide, which raises the crime to murder. It was separated by the text-writers into two classes, the involuntary and the voluntary. Involuntary manslaughter was where one doing an unlawful act, not a felony, accidentally kills another, or where one through culpable neglect of a duty resting upon him causes the death of another; voluntary manslaughter was when upon a sudden quarrel two persons fight and one kills the other, or when one greatly provokes another by personal violence, and that other immediately kills him. In both of these instances of voluntary manslaughter the element which characterized it was the heat of passion under which the act was done, and the want of time for the anger to cool and for reason to resume its sway over the man. In most if not all the States of this country the crime is entirely defined and regulated by statute, and the common law does not prevail. These statutes, however, in general closely conform to the common-law principle, but add thereto a number of special cases found to be necessary by the exigencies of modern society, and reduce to manslaughter some modes of killing which at the common law would have been murder. While the common law knew no grades or degrees of the offence, the statutes of the various States separate it into several degrees, according to the amount of culpability. Since they differ exceedingly in their details, it is impossible to give even an abstract of their provisions. The highest degree generally embraces cases of accidental killing while the slayer is engaged in the commission of some crime which at the common law would have rendered the homicide a murder; and often some other particular offences which were not specially provided for at the common law, such as killing in the act of procuring an abortion, and the like. The degrees then succeeding generally include all cases of unintentional killing while in a heat of passion, while the remaining grades cover all the particular instances of homicide through negligence and wherever not entirely excusable or justifiable. The punishment is imprisonment in the State prison for different periods of time, varying with the degree of the crime. JOHN NORTON POMEROY.

Man'stein, von, Prussian general of infantry, made a celebrated name for himself first in the war of 1866 against Austria, but more especially in the war of 1870–71 against France. In the latter he commanded the 9th army corps, which belonged to the army of Prince Friedrich Carl; took part in the battle of Vionville (Aug. 16, 1870), and played an important part in the battle of Gravelotte (Aug. 18, 1870), in which he commanded the centre of the German line, and had to sustain a very heavy contest for a long time until the German left wing became fully developed. At Noisseville (Aug. 31 and Sept. 1, 1870), when Bazaine attempted to break out of Metz, he led his corps with great distinction; also in the battles on the Loire, at Orléans, and Le Mans. In 1873 he retired from active service loaded with honors. AUGUST NIEMANN.

Mant (RICHARD), D. D., b. at Southampton, England, Feb. 12, 1776; educated at Winchester School and at Trinity College, Oxford; became fellow of Oriel College 1798; was incumbent of several parishes in and near London; became bishop of Killaloe 1820, of Down and Connor 1823, and of Dromore (in addition) 1842. D. at Ballymoney, Ireland, Nov. 2, 1848. He is chiefly known as one of the authors of an *Annotated Bible* (3 vols., 1814), known as D'Oyly and Mant's, which had an immense circulation in England, and was republished in New York, with additions by Bishop Hobart (2 vols., 1818–20). His *Bampton Lectures* for 1811 passed through several editions. His greatest work, *History of the Church of Ireland from the Reformation to the Revolution* (2 vols., 1840), passed to a second edition the year following. He is also the author of *Ancient Hymns, from the Roman Breviary, with Original Hymns* (1837). REVISED BY R. D. HITCHCOCK.

Mantchoo'ria, a region of North-eastern Asia, forming the northernmost part of the Chinese empire, extends between lat. 40° and 53° 30′ N. and lon. 118° and 135° E., bounded S. by Corea and the Yellow Sea, W. by Mongolia, and N. and E. by Asiatic Russia, from which it is separated by the rivers Amoor and Usuri. The country, which is very imperfectly known, extended formerly to lat. 58° N. and lon. 142° E., but that part of it which lies N. of the Amoor and E. of the Usuri was ceded in 1858 by China to Russia. Its present area is estimated at 370,000 square miles, its population at about 3,000,000. It consists of large plateaus, bordered S. by the Shan-Alin Mountains and W. by parts of the Khingan Mountains, which rise to a height of 15,000 feet, and traversed by several broad valleys, of which that of the Soongari River, an affluent of the Amoor, is the most remarkable. The plateaus are mostly covered with dense forests, the habitation of many wild animals which yield excellent furs. The rivers teem with fish, salmon and sturgeon. The valleys are well cultivated; barley, wheat, millet, ginseng, tobacco, and rhubarb are raised, and large herds of cattle, horses, and sheep are reared. The country is divided into three provinces—Liaotung, or Shinking, capital Mukden; Girin, and Saghalin-ulu. The inhabitants, the Mantchoos, belong to the Tungusian family of the Mongolian race. They have the same peculiar formation of the eyelids as the Chinese, whom they resemble very closely also in other respects. But they have a lighter complexion, are more strongly built, and endowed with more energy and intelligence. In the beginning of the seventeenth century they invaded China, and in 1643 conquered Peking and placed their chief on the Chinese throne. They now form the dominant race, and are spread over the whole empire as officers and soldiers.

Mantegn'a (ANDREA), b. at Padua in 1431 in humble circumstances; adopted, on account of his brilliant talents, as a son by his teacher in painting, Squarcione; attracted attention by his pictures when only seventeen years old, and was invited to Mantua in 1468 by Ludovico Gonzaga, for whom he painted the famous nine cartoons of *Cæsar's Triumph*, which later were bought by Charles I., and are now placed in Hampton Court. From 1485 to 1490 he resided in Rome, invited by Innocent VIII., and one of his most celebrated pictures of this period is *Madonna della Vittoria*, in the Louvre. He also gained a great reputation as an engraver. D. at Mantua on Sept. 13, 1506.

Man'tell (GIDEON ALGERNON), F. R. S., LL.D., b. at Lewes, England, in 1790; became a surgeon in his native town, and acquired celebrity by his geological researches into the Wealden formation of Sussex, in which, besides many other fossil genera, he discovered the gigantic iguanodon, the hylæosaurus, the pelorosaurus, and the regnosaurus; became a member of the Royal Society 1825; received the Wollaston medal of the Geological Society 1835, and the royal medal of the Royal Society in 1849; settled at London in 1839 as a physician, and had great success as a lecturer on geology. He published *Fossils of the South Downs* (4to, 1822, 42 plates), *The Wonders of Geology* (1833), *The Geology of the South-east of England* (1833), *A Day's Ramble in and around the Ancient Town of Lewes* (1838), *The Medals of Creation, or First Lessons in Geology* (1844), and a *Pictorial Atlas of Fossil Remains* (1850), besides several minor works. The whole number of his books and papers on geology amounted to 67. Dr. Mantell sold his geological collections to the British Museum in 1839, and bequeathed to Yale College his geological drawings. His works are highly readable, and maintain their value as a record of conscientious and minute research. D. in London Nov. 10, 1852.

Mante'no, post-v. and tp. of Kankakee co., Ill., on the Illinois Central R. R. Pop. 1681.

Manteno, post-v. of Galland's Grove tp., Shelby co., Ia. Pop. 50.

Manteo, post-v., cap. of Dare co., N. C., on Roanoke Island, on the S. shore of Shallowbag Bay.

Mantes, town of France, in the department of Seine-et-Oise, on the Seine, manufactures leather, sailcloth, and saltpetre. Pop. 5722.

Man'teuffel, von (Edwin Hans Carl), Baron, b. at Magdeburg Feb. 24, 1809; entered the regiment of guard-dragoons in 1826, and became aide-de-camp to the king in 1848. On account of his abilities, and through his connections with influential persons, he often held very important positions, especially of a diplomatic character, but he was always treated with suspicion, and even with hatred, by the liberal party. In 1857 he became the chief of the military cabinet, and as such he had the direction of all army matters in immediate intercommunication with the king himself; he was the most important man in the reorganization of the army, and he created for himself a great number of enemies. In 1861 he was made a lieutenant-general, but retained his position as chief of the military cabinet. At this time Twesten, afterwards the famous leader of the liberal party, called him in a pamphlet a "mischievous man in a mischievous position." Manteuffel challenged him, and wounded him. A favorite at the courts of St. Petersburg and Vienna, he was sent in 1864 to the Austrian capital in order to effect an energetic participation by Austria in the war against Denmark; and he fulfilled the mission with success. After the war, when some uneasiness arose in the relations between Austria and Prussia, he succeeded in establishing harmony between the two powers, and he had a large share in the conclusion of the convention of Gastein; he was then sent to Sleswick as governor. In the war of 1866 against Austria he first commanded under Gen. Vogel von Falkenstein, but in July he became commander-in-chief of the army of the Main. He proceeded with great harshness, imposed an immense war-contribution on the city of Frankfort, and exhibited the most singular manners, which were generally considered as sheer affectation. During the armistice he received the important mission of securing the sympathy of the Russian court for the intended reorganization of Germany, and he succeeded in his endeavors. But soon after he took his leave and retired to his estates at Naumburg. In 1868, however, he was recalled to military service, and received the command of the first army corps. This he led in the French war—at Courcelles, Aug. 14, and at Noisseville, Aug. 31 and Sept. 1, 1870. After the capitulation of Metz he was made commander-in-chief of the first army, consisting of the 1st, 7th, and 8th army corps and the 3d division of cavalry, and was sent to Northern France, where Faidherbe was organizing the army of the North. At Amiens and the Halluc he defeated the enemy, but did not achieve succcesses as brilliant as those of the other German army, and was heavily attacked in consequence by public opinion. In the beginning of Jan., 1871, he received the command of the southern army—that is, of the 2d and 7th army corps—which was sent to aid that threatened by Bourbaki's 14th army corps. Here he carried through a brilliant manœuvre under the most difficult circumstances. The army of Bourbaki, which, defeated by Gen. Werder, retreated from Belfort, he attacked in the flank, cut off its retreat, and compelled it to cross the Swiss frontier. Thus he gained the triumph of driving an army far superior in numbers entirely out of the contest. After the end of the war he received the responsible position of commander-in-chief of the army of occupation, and he fulfilled the task with great tact. On Sept. 14, 1873, the emperor created him a field-marshal; also a dotation was assigned him. August Niemann.

Man'ti, city, cap. of San Pete co., Ut., 22 miles S. E. of Nephi. Pop. 1239.

Mantine'a, one of the oldest and most active cities of Arcadia, Peloponnesus, situated on the Ophis, near the frontier of Argolis. It became very famous as the place in which in 362 the battle was fought between the Thebans and Spartans; the Spartans were defeated, but Epaminondas fell. Some remains of it are still found in the neighborhood of the modern village, *Palæopolis*.

Man'tis [Gr. μάντις, a "diviner"], a remarkable genus of large orthopterous insects, raptorial in their habits, and kindred to the Phasmidæ, or walking sticks, from which *Mantis* and some four other genera have been separated and made a family, the Mantidæ. They are popularly called walking leaves, race-horses, soothsayers, or prophets. When watching for their prey these creatures assume a sort of kneeling posture, doubling the great spiny fore legs under the thorax. Hence they were once believed to be engaged in prayer. The Hottentots worship them. There are numerous species. *M. argentina* of South America devours small birds. *M. Carolina* is found in the U. S., where insects of the curious mimetic genus *Mantispa*, though neuropterous, have the appearance and habits of the true Mantidæ.

Mantis'sa [Lat., "an addition"], the decimal part of a logarithm. (See Logarithm.) W. G. Peck.

Mant'let, in fortification, a heavy portable shield designed to protect the gunners from bullets which may enter the embrasures. Mantlets are made of plank, boiler iron, wattles, plaited ropes, etc.

Man'torville, post-v. and tp., cap. of Dodge co., Minn., on the Zumbro River, $2\frac{1}{2}$ miles N. of Winona and the St. Peter R. R., has a court-house, 2 churches, 2 school-houses, 1 newspaper, 1 hotel, 1 grist-mill, 1 brewery, stores, and a very fine stone-quarry, from which many fine buildings of the town have been built. Principal business, farming. It also contains Kasson (which see). Pop. of v. 622; of tp. 1969. R. A. Pier & Son, Pubs. "Express."

Man'tua (*Mantova*), city of Northern Italy, in the province of Milan, the strongest fortress of the celebrated "Quadrilateral," and even of Italy. It is in lat. 45° 07′ 45″ N., lon. 28° 27′ 33″ E., 8 miles N. of the Po, and 90 feet above the level of the Adriatic. This town is built on two islands formed by the Mincio, which here spreading out creates a lake that encircles the city. The channel or canal between the two islands dividing the city is called the *Rio*. Mantua, though its fortress and citadel are of immense strength, has a still more certain defence in the stagnant water that surrounds it, and that proves far more deadly to besieging armies than to those within the walls. The streets and squares are broad and regular, and the public and private buildings have a grand mediæval aspect, and are very rich in works of art. The town has five gates and a dockyard, called Porta Catena, from whence there is a navigable communication with the Po. This port, closed by a chain at night, presents by day an animated commercial scene. The cathedral of Mantua was designed by Giulio Romano, and contains fine frescoes. The church of St. Andrea is magnificent, that of Santa Barbara very elegant, and both are adorned with pictures by first-rate artists. St. Martino and St. Egidio are churches of the sixth century. The old ducal palace is very sumptuous, with frescoes by Mantegna, Giulio Romano, etc. Mantua was one of the political and religious centres of the Etruscans. Cæsar bestowed upon it the privilege of Roman citizenship. It was the birthplace of Virgil (70 b. c.). In 568 it was not yet surrounded by water. In the eleventh century it belonged to the celebrated countess Matilda, and after her death passed to the emperor of Germany. In 1328 the duchy was governed by Luigi Gonzaga, the first of an illustrious house that retained its power for 379 years. In 1708 it again fell to Austria, but was well governed only by Joseph II. Wurmser, the Austrian general, surrendered it to Bonaparte on Feb. 3, 1797, after which it became a part of the Cisalpine republic. In 1874, having changed masters several times meanwhile, it submitted again to Austria, who treated it with cruel severity until the treaty of Vienna (Oct. 1, 1866) made it a part of the kingdom of Italy. Pop. in 1874, 26,687.

Mantua, tp. of Greene co., Ala. Pop. 1598.

Mantua, tp. of Monroe co., Ia. Pop. 1185.

Mantua, post-v. and tp. of Gloucester co., N. J., on the West Jersey R. R. Pop. 1897.

Mantua, post-tp. of Portage co., O., on the Atlantic and Great Western R. R. Pop. 1126. (See Mantua Station.)

Mantua, post-v. of Collin co., Tex. Pop. 86.

Mantua, tp. of Lancaster co., Va. Pop. 1608.

Mantua Station, post-v. of Mantua tp., Portage co., O., 36 miles N. W. of Youngstown, and on the Atlantic and Great Western R. R., Mahoning division.

Man'ual. In music, the finger-board of an organ—that played by the hand, as distinguished from the pedal, which is played by the feet.

Man'uel I., Comnenus, Byzantine emperor, b. about 1120; succeeded his father, John II., or Calo-Joannes, in 1143, and d. Sept. 24, 1180. His reign was a succession of campaigns against the barbarous tribes in Dacia, Geisa of Hungary, Roger of Sicily, Egypt, Raymond of Antioch, and the Turks. He was a valorous soldier, with an ambitious desire of reviving the old Roman empire in all its splendor; but his considerable military successes were barely sufficient to keep his tottering throne standing. He suffered a great defeat from the Turks in the battle of Myriocephalus in Pisidia (1176), but the following year he defeated the Turks in Lydia, and obtained an honorable

peace, after which he seems not only to have given up his ambitious plans, but even to have lost his energy.

Manuel II., Palæologus, Byzantine emperor, b. in 1348; succeeded his father, John V., in 1391, and d. July 21, 1425. The Byzantine empire consisted at that time of the city of Constantinople and the adjacent districts; and so miserable had this throne, once so gorgeous, become, that on a tour to the Western countries for the purpose of forming alliances against the Turks, John V. was detained in Venice for debt. Many Turks had settled in Constantinople, where they had three mosques and free exercise of religion, besides other advantages. Bajazet pushed his demands still further, and John V. sent Manuel to his court as security for the fulfilment of the demands. On the death of his father Manuel fled to Constantinople in order to secure the throne for himself, and Bajazet, provoked by this breach of faith, followed him with a great army. Aided by Sigismund, king of Hungary, Manuel met him at Nicopolis, but was completely defeated in 1396, and Bajazet laid siege to Constantinople. The last hour of the Byzantine empire seemed now to have come, when the progress of Timur and the terrible rout of the Turks at Angora (1401) still left it standing for some time.

Manufac'tures. By a curious etymological irony the word *manufacture* (that which is made by the hand) has come to signify chiefly that which is made by the agency of machinery, "so that the most perfect manufacture is that which dispenses entirely with manual labor." The object of all manufactures, whether in the primary or secondary sense of the word, is the modification of natural objects, and their adaptation to satisfy human wants. Dr. Ure divides manufactures into the two great classes of chemical and mechanical; but, practically, nearly every industry requires an application of some of the principles of both. The most important feature of modern manufactures is its employment of automatic agents. In place of depending upon the skill of the workman, subject to a thousand influences capable of producing variation, manufactures depend upon machinery, whose action is invariable under known conditions. The hand-loom weaver throwing his shuttle through the loom would do so not with a constant regularity, but with variations arising from changing conditions of health, skill, and industry. The thing of iron that has taken his place acts uninfluenced in this way. Operations which to be performed even coarsely by hand would need the highest skill and the closest attention, can be performed in machinery with greater certainty and greater despatch under the supervision of a child. Intimately connected with modern manufactures is the factory system, on which to a large extent their success is dependent. The hand-loom weaver in his own house, obliged to work long hours for a bare pittance, is a type of the old system; the weavers congregated in a large mill containing many looms, all animated by the same motive-power, working for regular and comparatively moderate hours, is the type of the new system. Considered from the industrial point of view, the advantages of machinery and manufactures may be stated, in Babbage's words, "to arise from the addition which they make to human power; the economy they produce of human time; the conversion of substances apparently common and worthless into valuable products." Under the first head must be included not only the use of the simpler machines, but also the *additional* forces derived from wind, water, and steam. The complex nature of most of the industrial operations of the present day will show what serious inconveniences would arise from the deprivation of labor-saving instruments. The economy of time is another important advantage of machine over manual industry. Not only can the machine work at quicker velocity than the man, but the period of natural operations can be abridged, as in tanning, bleaching, and many other processes. Tasks too great for human strength and operations too delicate for human touch can be accomplished by machinery. The great regularity of the operations of machinery involves much less waste, and thus increases the use to which the raw material can be applied. Absolute accuracy can almost be guaranteed. These words when placed in the printing-press will in a marvellously short time be multiplied by many thousand copies, each of them identical to the minutest point—a feat utterly beyond manual skill, with years to work in. The power of copying—that is, of faithful reproduction to a practically unlimited extent—is one of the most important of the advantages of manufactures, and is developed in a thousand diverse manners.

In manufactures there is a constant endeavor to lessen the cost of production. This gives rise to a succession of inventions, benefiting first their ingenious authors, but in a still greater measure the consumer of the article. It is by the action of this principle that luxuries formerly found only in the houses of the wealthy now add to the comfort and pleasure of the humblest homes. Division of labor is one of the cardinal principles of manufactures, the advantage being a great increase in the quantity of work, owing, "first, to the increase of dexterity in every particular workman; secondly, to the saving of time, which is commonly lost in passing from one species of work to another; and lastly, to the invention of a great number of machines which facilitate and abridge labor, and enable one man to do the work of many." (*Adam Smith.*) The causes which have led to the establishment of manufactories—to the factory system—are indicated in the preceding remarks. In no other way would it be possible to combine the conditions necessary for production on the large scale now required. Local advantages sometimes cause an aggregation of manufactures of one class in particular districts, yet there are many examples of the migrations of industries, which when examined often convey valuable lessons. Sometimes municipal *un*wisdom, sometimes mob-fury, has impoverished a district in this way. The large scale upon which modern manufactories are conducted usually implies that the owner of one is a person with considerable capital at command. The supposed antagonistic interests of the master and men have led to great suffering and to great loss. The system of partnership of labor by which the worker receives a percentage of profit in addition to wages has been tried with varying degrees of success. At present it can only be regarded as being in the tentative stage, though some modification of it will probably form an increasingly important feature in the future of industry. Taxation and local regulations have sometimes exercised an important influence upon the success of specific manufactures.

The sanitary influence of manufactures has been greatly debated. In the early stages of the factory system in England the absence of regulation and the cupidity or thoughtlessness of the employers led to the infliction of great suffering. Children were kept at work for many hours at a time. Physical deformity, mutilation, and even death, were the result. Pauper children were placed in factories under an "apprenticeship" system differing little from slavery. The passing of the Ten Hours' act greatly changed the aspect of affairs. Shorter hours, better ventilation, improved construction have ameliorated the condition of the workers in manufactories. (See FACTORY.)

Historically, the manufacturing system dates its importance from the last century. Previous to Arkwright's time manufactures were everywhere feeble and fluctuating in their development. The handicrafts of the ancient world were small indeed when placed in comparison with the manufactures of to-day. The development of steam-power and the systematic application of machinery have changed almost the entire social fabric, and added in no small degree to the comfort of mankind. Not the least beneficial result is that bond of union with which it surrounds the nations. Babbage on *The Economy of Machinery and Manufactures* and Dr. Ure's *Philosophy of Manufactures*—the first for its philosophic originality, and the second for its abundant details—are useful works to consult on this subject. W. E. A. AXON.

Manure. See FERTILIZERS.

Man'uscript [sing. MS., plu. MSS.; Lat. *manuscriptum*, "written by hand"] signifies abstractly anything written. Through use and association the term is generally understood as meaning a book of paper or parchment, yet, strictly speaking, especially of the earliest works, it is difficult to draw the line exactly, since lapidary inscriptions are executed by hand, and there was a gradual transition from these to plates of lead or bronze, on which whole works—*e. g.* the *Eugubian Tablets*—were inscribed, and so to cakes of clay afterwards burned, wooden tablets, tablets covered with wax, sheets of horn, bark (whence *liber*, a "book"), leather, and palm-leaves, which latter are still extensively used in the East. The Egyptian MSS. were chiefly written on papyrus, made from a water-plant which has now, like the lotus, disappeared from Egypt, but which is abundant on the upper Nile. Parchment is said to have been invented at Pergamos (159 B. C.), whence its name (Lat. *pergamena*), on account of an Egyptian embargo on papyrus. Modern discoveries have proved that it was made centuries before this date. It came into general use for MSS. about the eighth century. The preparation of MSS. was a great art among the Greeks and Romans; with the latter so many were sometimes employed in a *scriptorium*, or writing establishment, that hundreds of copies of a book could be produced in a single day. When the great cheapness of labor in Rome is taken into consideration, and the rapidity with which professional copyists produce MS., it will be found that books were in ancient times not as expensive as we are taught to believe. Elaborately ornamented works were of course dear, and these

are almost the only ones which have been thought worth preserving. Even the Gothic text, resembling type in its accurate uniformity, was produced more rapidly than is generally supposed. It is not unusual for auctioneers and others to speak of some missal as having cost some monk a life's labor, when two or three months amply sufficed the illuminator and writer to perfect it. The many uses to which both parchment and paper can be applied, and the perishable nature of the papyrus, fully account for the fact that so few early Greek or Latin volumes exist. To the custom of illuminating MSS. (see ILLUMINATED MANUSCRIPTS) we doubtless owe the preservation of many books which were kept for the sake of their ornament by persons who had no understanding of the text. At the present day there are many collectors who own valuable MSS. which they will not suffer to be copied or published for fear of diminishing their value. The great libraries of Europe—as, for example, that of the British Museum—are to a certain extent *scriptoria* at the present day. Any person desirous of having a neat MS. copy of any other MS. or book in it can do so, the librarian or superintendents being always able and willing to supply the names of professional copyists. The usual rate for copying from clear type is 3*d.* per folio or seventy words. Copying from MS. is dearer; that of the Elizabethan era is about 6*d.* per folio. The *scriptorium* of the Middle Ages had its guardian angel. If the monks in their prayers or psalms passed over anything, the lost syllables were gathered up by a little demon named Titivitilarius or Titivillus, who carried a bagful into hell every morning. But, on the other hand, every word faithfully transcribed was recorded by the angel of the *scriptorium*, and for it one sin was pardoned to the writer. It is possible that the "devil" of the modern printing-office is a descendant of Titivillus. Early MSS. are of great value, since by them alone the truth of a text is often determined. The science of reading different MSS. and of judging of them is called diplomatics; that of writing in all its phases, palæography. Among the principal works on MSS. are Herman Hugo, *De prima Scribendi origine* (Treves, 1738); Ebert, *Handschriftenkunde* (Leipzig, 1825–27); Astle, *Origin and Progress of Writing* (London, 1784); G. Pauthier, *De l'origine et de la formation des différents systèmes d'écriture; Essais d'appréciation*, etc., *sur l'écriture* (Paris, 1837); Léon de Rosny, *Recherches historiques et philologiques sur l'écriture des différents peuples anciens et modernes* (Paris, 1857–58); Montfaucon, *Bibliotheca Bibliothecarum Manuscriptorum Nova* (Paris, 1739). A very full index of works on writing is given in the *Dictionnaire Universelle* of Larousse, under the title "Écriture." CHARLES G. LELAND.

Manu'tius (ALDUS), b. at Bassiano, Italy, about 1449; established about 1490 a printing-press at Venice, from which issued a series of editions of Greek and Latin authors which acquired a great reputation, and are still highly prized for their correctness. (See ALDINE EDITIONS.) Manutius was himself a good scholar, and he was helped in his editorial labors by a number of other scholars, who assembled with him and formed the so-called Aldine Academy. He introduced the character called Italic, said to have been cast in imitation of Petrarch's handwriting, and used on account of its smaller bulk instead of the frequent printers' abbreviations which at that time made reading very difficult. He compiled a Greek-Latin lexicon (1497). At the death of his grandson, Aldus the Younger, in 1597, the establishment was broken up. D. at Venice Feb. 3, 1515.

Manzana'res, town of Spain, province of Ciudad Real, stands in a beautiful and fertile district, rich in grain, wine, fruit, olives, and vegetables, and manufactures woollen fabrics. Pop. 10,267.—Madrid is situated on a small river bearing the name of Manzanares.

Manzanill'o, town of Cuba, is situated on the southeastern coast of the island, has a good harbor, and carries on a considerable export trade in sugar, tobacco, and timber. Pop. 5643.

Manzo'ni (ALESSANDRO), COUNT, b. at Milan May 8, 1785. His mother, Giulia Beccaria, was the daughter of the celebrated Marchese Cesare, author of *Dei Delitti e della Pene*. Manzoni's early studies were prosecuted at Merate and at Lugano, and he graduated at Pavia. At the age of twenty he went to Paris, where his mother was residing with Carlo Imbonati. Imbonati dying in 1806, Manzoni wrote his famous verses on the death of his mother's friend, which were the keynote of his future career. At this time Manzoni made the acquaintance of Fauriel, to whom he became warmly attached. In 1807 he published his little poem *Urania*. Hitherto atheistic in his opinions, he became converted between 1807 and 1808 to the Catholic faith, of which he was afterwards an eloquent defender—first by his *Inni Sacri*, published soon after his marriage with Luigia Enrichetta Blondel, the daughter of a Genoese banker, and afterwards in his *Apologia della Morale Cattolica*, which he defended against the accusations of the illustrious Protestant historian Carlo Sismondi. Returning to Milan after his marriage, Manzoni commenced his tragedy, *Il Conte di Carmagnola*, which he completed at Paris in 1819, and dedicated to Fauriel. Goethe spoke of this tragedy with the highest praise, and was among the first to hail with supreme honor the name of Manzoni in the Stuttgart review entitled *Ueber Kunst und Alterthum.* On the death of Napoleon in 1821, Manzoni composed his immortal ode, *Il Cinque Maggio*, which Goethe immediately translated into German. The following year Manzoni published his tragedy, *Adelchi*. The distinguishing characteristic of the tragedies of Manzoni is a return to the most natural forms of dramatic representation, to the most simple and truthful dialogue. In 1825 he published what Walter Scott called the "most beautiful of romances," *I Promessi Sposi*. This was followed by a little historical romance, *Storia della Colonna Infame*. After this Manzoni devoted himself entirely to the study of Italian, in order to show the unity of the Italian language in its typical form, which, according to him, is the Florentine dialect. Manzoni was not only named senator by the Italian government, but an annual pension of 12,000 francs was settled upon him for his extraordinary civil and literary services. D. at Milan May 22, 1873.

Ma'oris, the name given by themselves to the inhabitants of New Zealand. It is supposed to be derived from *Maoui*, "the Creator or God," a term common to many tribes of the Polynesian group. The natives of this vastly extended archipelago are derived in all probability from the Malay stock, "whose tribes not only cover the islands in the southern Asian seas, but are extended to the lower part of Africa, since the Malagasy, or inhabitants of Madagascar, also belong to the Malays, as Wilhelm von Humboldt has observed." According to others, *Maori* signifies "born of the soil or native," a term applied by many races to themselves in all parts of the world. The Maoris have, however, a tradition that their ancestors came about 500 years ago in seven canoes from a distant island called Hawaiki, in all probability Hawaii. There seems to be some reason to believe that the real aborigines of New Zealand were a small dark race akin to the Papuans, and that traces of this occasionally occur in the darker-skinned Maoris. Owing, in all probability, to favorable physical influences, the natives of New Zealand have developed into the first family of the Polynesians, being as remarkable for their bodily vigor as for intellect. Until subdued and civilized they were a cruel race. Though endowed with great energy and intelligence, they were extremely greedy, rapacious, and unscrupulous. The two great national customs which have not yet disappeared are *muru* and *tapu* or taboo. By the former any man who had by accident or otherwise—but in most cases inadvertently—transgressed certain customs rendered himself liable to a heavy fine, or in some cases to be plundered by everybody. Owing to this, no property was secure; an object of value, such as a coat, would pass in a few days through many hands; and it became disgraceful not to be plundered, because the being subject to *muru* gave a man a right to rob others. *Tapu*, or "prohibition," was infinite in its refinements. Under it nothing belonging to chiefs or *rangatira* (gentlemen) could be touched. Superstition aided this; a powerful man who had eaten unknowingly the remains of a chief's dinner died in a few hours of terror. *Rangatira* were *tapu* from carrying anything on their backs, but they evaded it by bearing it in their arms and nursing it like a child. No man could take light from a chief's fire. *Mana*, luck, virtue, force, or inherent power, was an element of vast influence among the Maoris. A weapon which had slain many men, a virgin fortress, the prestige of a great chief, a pig which foretold changes in the weather by squealing, were all *mana*. Suicide was practised for many causes. When husbands or wives died the survivors in many cases hung themselves; widows did so almost invariably; and debtors often settled their accounts in this manner. Cannibalism, which is now extinct among the Maoris, was a few years ago their ruling passion. The younger generation are beginning to leave off tattooing their faces, which is not remarkable, since they have chapels, school-houses, and a newspaper in Maori and English. Polygamy was universal, and infanticide prevailed generally until of late years. They excel in carving, of which their war-canoes, carrying 100 men, are specimens. They entertained formerly a superstitious dread of an *Atua* or supreme being, and cultivate many superstitions akin to worship relative to the stars, sun, moon, and minor divinities. Many writers vindicate the character of the Maoris, and express admiration of them. They believe that the stars are the left eyes of deceased

chiefs; that the higher class among themselves are immortal, but when the *Cookees* or vulgar perish they die for ever. Capt. Cook describes the female Maoris as very plain, but Mr. Savage and Capt. Cruise declare that they are well formed, with very attractive faces and sweet voices. The Maoris subsisted formerly principally on fern-roots, eels, and other fish, *kumara* or sweet potatoes, and *kiore*, a rat. These latter are so much smaller than the European rat that a chief expressed a wish for some from England to improve the breed. No people in the world are so fond of tobacco, and it is said that owing to its abuse the Maoris are rapidly deteriorating. The three principal tribes are the Ngatihaouas, the Waikatos, and the Ngatimaniapatos. The Maoris do not at present amount to more than 10,000, or perhaps 12,000, and they are rapidly diminishing. (For details see *Maori Mementoes*, by Sir George Grey, late governor of New Zealand (Auckland, 1855); *Polynesian Mythology*, by Sir George Grey (London, 1855); *Mythology of the New Zealanders*, in Maori (London, 1854); *On the Native Songs of New Zealand*, by J. A. Davies (appendix to the foregoing); *The New Zealand Government and the Maori War of 1663–64* (London, 1864); *Important Information relative to New Zealand* (Sydney, 1839); *A Summer's Excursion in New Zealand* (London, 1854); *Ko nga Whakapepeha, etc., or Proverbial and Popular Sayings of the Ancestors of the New Zealand Race*, by Sir George Grey (London, 1857); *The New Zealanders* (London, 1830); *Voyages de M. l'Abbé de Rochon aux Indes Orientales* (Paris, 1783); Marsden's *Visit to New Zealand* (1820); Nicholas, *Voyage to New Zealand.*) CHARLES G. LELAND.

Map [Lat. *mappa*, "cloth"]. The word *map* is applied in its most usual sense to a representation of the whole or of some portion of the earth's surface, properly termed a *terrestrial* map; it is also used to designate charts of the positions of the stars or constellations of the celestial vault, considered as a surrounding sphere, or more special delineations of the earth's satellite or neighboring planets, as their external appearances are revealed by the telescope. The first man who attempted to draw a map of the world is reputed to have been Anaximander of Miletus, a scholar of the Greek school of philosophy who lived from B. C. 611 to 547. Eratosthenes, born at Cyrene in B. C. 276, is the first of whom it is recorded that he tried to measure the magnitude of the earth, and that he collected into a scientific treatise the scattered information respecting places and countries. The astronomer Hipparchus of Bithynia, born in the beginning of the second century B. C., also treated of geography. But it was not till the second century of the Christian era that Claudius Ptolemy of Alexandria in Egypt, who must be considered the great father of mapping, constructed his series of twenty-six maps, together with a general map of the then known world, basing these upon a catalogue of the astronomical latitudes and longitudes of places. Roman geography of the third century was represented by the still famous and interesting document known as the Peutingerian table, executed, it is believed, in about 230 A. D., which exhibits the military roads of the empire, and indeed the itineraries of the whole world known to the Romans, from Britain to Farther India. In mediæval times the scientific mapping of Ptolemy seems to have been forgotten, and to have given place in Europe to sentimental representations of the earth, in which the holy city of Jerusalem is taken as the central point of the world, all the lands of the globe being made to circle round it, and the ocean to encompass the whole on the outer margins. Perhaps the best example of this age of maps is that known as the Hereford map of the world, drawn on vellum about the end of the thirteenth or beginning of the fourteenth century, by Richard de Haldingham, who then held a prebendal stall in the cathedral at Hereford. The spirit of true geography appears at this time to have taken up its abode in more eastern countries, for during the Middle Ages the Arabians rendered most important services to this science, and the old Arab treatises on geography and travels by Abulfeda, Edrisi, Leo Africanus, Ibn Batuta, and others are still interesting and valuable. Italian maps of the fourteenth and fifteenth centuries, however, betoken a return to scientific mapping.

An epoch was marked in the history of maps when the geographer Gerard Mercator introduced in 1556 the cylindrical projection of the sphere which bears his name, and which since that time has formed the basis of every chart used for the purposes of navigation. Between this time and the conclusion of the following century vast strides were made in geography, and the volumes of maps which were then published by private individuals far excel in costly elaboration any such works of the present day; as examples of these may be taken the nine folios of the great atlas of Joannes Blaen, published at Amsterdam about 1650; that of De Wit, also prepared in Amsterdam about thirty years later; or the atlas of Sanson, geographer to the French king, published in three huge folio volumes at Paris between 1690–96. Among the most important geographical works of the beginning of the eighteenth century is the survey of China given out in the name of Père du Halde, the work of a number of Jesuit missionaries, who gained admittance first into China about the end of the fifteenth century; this great work was completed in 1718, and still forms the basis of all maps of the Chinese empire. It should be mentioned, however, that native Chinese maps of high value existed previously to this Jesuit survey, and that both in this empire and in Japan geography and mapping had made great progress, quite independently of the advances in the science of the Mediterranean and European countries. Coming down to more modern times, we find in the latter part of the eighteenth century the beginnings of those mathematically accurate surveys and delineations of the surfaces of civilized countries which are now making such steady progress, and fast narrowing the regions of hypothetical or altogether unknown geography.

In considering briefly the different kinds of maps and their construction, we shall divide these into the two chief classes of *topographical* or special, and *geographical* or general maps. This distinction is simply one of the scale which may have been chosen, and of the amount of detail given in the representation. It has been laid down by Col. Jackson* that topographical maps range in scale from a one hundred-thousandth reduction of nature (or 0.63 inch to one mile) to a one ten-thousandth (or 6 inches to a mile); between these and the geographical maps this author introduces a semi-topographical class, but it appears simpler to consider all maps of smaller scale than one two-hundred and fifty-thousandth (or .25 inch to a mile) as general, all of a larger scale as topographical maps, until the limit of one ten-thousandth is reached, above which scale all representations, necessarily of small portions of land, are properly considered as *plans*, not maps.

The greater part of the existing *topographical* maps are the result of surveys undertaken by the governments of the more advanced countries of the globe, in which careful and elaborate mechanical measurements of the surface of the ground are made. The preliminary step in the survey is the exact measurement of a base-line in some level plain, from the extremities of which base-angles are observed to surrounding objects chosen as trigonometrical stations. The distances of these stations from the ends of the base-line are then calculated and laid down on paper, forming so many new base-lines from whence other trigonometrical stations are determined, until the entire area of the country to be surveyed is covered with a network of triangles. The bases measured in making the surveys of Great Britain and Ireland vary from 5 to 8 miles in length. Within the principal triangulation minor triangles, termed *secondary* and *tertiary*, are observed, and afterwards the interior of each is filled up by measurements with theodolite and chain. By this process the length and breadth of each part of the land are determined, and its features in respect of these two co-ordinates are accurately known; but a third element, that of elevation or depth, is also requisite to complete the true representation. In ascertaining this third element of height, the level of the sea is assumed as a datum line, and in more exact surveys horizontal sections, termed *contour-lines*, are traced by means of the spirit-level at certain equal intervals of elevation above the assumed datum, thereby giving a mathematically exact representation of the form and height of the ground at each change of level. In the British surveys contour-lines have been run generally at constant vertical intervals of 25 feet. In order to determine the true position on the globe of the tract surveyed, the astronomical position of some of the chief stations of the principal triangulation must be obtained with the most rigid accuracy, their latitudes being observed independently, their longitudes by differences of time between each other and between a certain known or assumed meridian.

The class of *general* maps, embracing as it does the whole of the geographical representations of the world, or of portions of its surface which are smaller in scale than the limit of topographical maps, is an exceedingly wide one. The most natural, and the only representation of the whole world in which the relative proportions of its various parts can be accurately preserved, is that of an artificial globe, on the surface of which the features of land and sea are mapped; and without the aid of such a globe no true ideas of the planet on which we live can be impressed on the mind. Since, however, the use of such an instrument is limited both by the necessarily small scale upon which it can be readily constructed, and by the obvious inconveniences of transport, it becomes imperative to have recourse to the more convenient though less true representa-

*Essay on "Chartography" in the *Manual of Geographical Science* (London, 1852).

tions on a flat surface. Just as it is impossible to lay a sheet of paper on the surface of a globe without folding in some parts, so no map on a plane surface can represent any considerable portion of the globe without distortion. In the case of general maps, then, more than in that of topographical maps, which are more restricted in the areas they depict, some plan by which these errors of representation shall be reduced to a minimum must be employed. Various methods, termed *projections*, have from time to time been devised for this end, each having its application to some special purpose, some being designed for the truer representation of smaller areas, others for larger or for the whole globe. The two chief classes of projection are those which are truly *perspective* views of the globe, various points of view being chosen, and those in which a process of *development* is employed which shall preserve the geometrical relations of the parts of the surface to those of the real figure. In the former class the projections known as the stereographic and orthographic are those which are most frequently used in depicting the hemispheres of the world. In the one the point of projection is conceived to be placed on the surface of the globe, and to be vertically over the plane of projection; in the other the eye is assumed to be at an infinite distance from the globe, so that all visual rays to it may be regarded as parallel. The latter class embraces the developments known as the conic projection of Ptolemy and its modifications, one of which, the polyconic projection, is much employed in maps of the U. S., and the cylindrical projection of Mercator, with many others. The student of this subject is referred to the exhaustive French work on projections noted beneath, or to the more simple, practical English book.*

When a country has been topographically surveyed, the production of a general geographical map of that region is a simple matter of reduction of the larger to the smaller scale, and should be a perfect delineation of the main features of the land. The number of purposes of illustration to which maps may be applied, besides and along with that chief one of indicating the geographical features of the land, are exceedingly various; indeed, there is no science or culture which cannot be illustrated in some of its branches by means of maps. Most of the countries which have instituted topographical surveys have also employed a staff of geologists to examine thoroughly the structure of the country, and to lay down its geology and mineralogy upon the sheets of the topographical map in progress; in the case of the geological survey of the U. S. this plan has been to some extent reversed, and the geological surveyors have themselves been the first to survey topographically the parts of the less known Western regions which they have also geologically examined. The number of more general geological maps of all countries of greater or less value is endless. In meteorology maps are largely employed to represent the various phenomena, such as barometric pressure, temperature, or rainfall, over the globe or in special localities. General maps are also admirably adapted for displaying graphically the results of any great statistical inquiry: good examples of this class of maps are given in the *Statistical Atlas of the U. S., illustrating the Results of the Census of 1870*. Celestial maps are to the astronomer what the general chart of the world is in the eye of the geographer, a record of work accomplished and knowledge already gained. Both are still in a progressive stage, not perfected; and just as the geography of new countries is constantly being more accurately defined, so new stars are from time to time discovered by the improving telescope, and the positions and motions of those already known are more certainly determined and catalogued. In studying the celestial vault, as in seeking a true idea of the earth, the artificial globe is the truest guide; for the same reasons, however, as maps on a plane surface are used in terrestrial geography, they have also been adopted for convenience' sake in depicting the relative position of the stars as seen from the earth.†

KEITH JOHNSTON.

Mapes (JAMES J.), LL.D., b. in New York May 29, 1806; became a merchant and sugar-refiner, and was for a time professor of chemistry and natural philosophy in the National Academy of Design. He invented useful processes in industrial chemistry, and after heavy pecuniary losses became a successful agriculturist in Newark, N. J. He became a manufacturer of fertilizers, editor of the *Working Farmer*, and published many addresses and papers on chemistry and agriculture. He published also *The American Repository of Arts*, etc. (1840, 4 vols.), *The Practical Farmer*, and other works. D. at Newark, N. J., Jan. 10, 1866.

* *Traité des Projections des cartes géographiques*, par A. Germain (Paris). *Principles of Mathematical Geography, comprehending a Theoretical and Practical Explanation of the Construction of Maps*, by William Hughes, F. R. G. S. (London).

† The most recently constructed star-maps are those by Mr. R. A. Proctor (London).

Mapes, or **Map** (WALTER), b. in England, probably in Herefordshire, about the middle of the twelfth century; studied at Paris; became a noted theologian; a favorite of Henry II., by whom he was sent on missions to the French and papal courts; was canon of St. Paul and of Salisbury, precentor of Lincoln, incumbent of Westbury, Gloucestershire, and archdeacon of Oxford (1196). D. about 1210. He wrote many Norman-French and Latin poems on festive and romantic topics, as also in prose in both languages, but the authenticity of the poems now attributed to him has been seriously questioned of late years. The *Latin Poems commonly attributed to Walter Mapes* were edited by Thomas Wright for the Camden Society in 1841, and the prose work, *De Nugis Curialium*, in 1850.

Ma'ple [Ang.-Sax. *mapeltréo*], a name given to trees of the genus *Acer* and order Sapindaceæ, natives of North America, Asia, and Europe. Many of them are noble shade and timber trees. The American species are the following: (1) The sugar-maple (*A. saccharinum*), called also hard or rock maple, and its variety, *nigrum*, the black maple. In Canada and the Northern States great quantities of sugar of good quality are made by boiling the sap of this tree. It is one of our handsomest park and forest trees, and is prized as firewood and timber. It is used extensively in making furniture, especially the peculiar forms of the wood called birdseye and curled maple. (2) The white maple or silver maple (*A. dasycarpum*), a fine shade tree; its soft and white wood is not prized as fuel or timber, but is used for making shoemakers' lasts. This is the earliest of all our trees to bloom. (3) The red or swamp maple, which shares with the preceding the name of soft maple, the red blossoms of which appear considerably later, but before the leaves. The wood is not unlike that of the silver maple. (4) The striped maple (*A. Pennsylvanicum*), sometimes called moosewood, and (5) the mountain maple (*A. spicatum*) are small trees or tall shrubs of little importance, although the former is planted for ornament. Their flowers appear later than the leaves. These are the Atlantic U. S. species. In the Rocky Mountains occurs (6) *A. glabrum*, a handsome small tree, and a variety of it, generally very distinct, which was called *A. tripartitum*, the leaves being divided into three pieces or leaflets. Finally, Oregon and California have two species: (7) the vine maple (*A. circinatum*), a small tree or large shrub which obtained its popular name either from a sarmentose habit which it affects in its native swamps or on low banks of streams, or from the rounded and many-lobed leaves, which may be likened to those of the grapevine; (8) the large-leaved maple (*A. macrophyllum*), a very handsome tree, but never very large; its timber hard and close-grained, and greatly valued in Oregon, this and an ash being the principal hardwood trees of the region. Of European species, the species commonly planted in the U. S. for shade and ornament are the Norway maple (*A. platanoides*), a round-headed tree, with bright green leaves, most like those of sugar-maple, and the sycamore maple (*A. Pseudo-platanus*), in England called simply sycamore, known by its large leaves, long and reddish stalks, and the lobes acute and pointed, both hardy trees of rapid growth and good timber. The wood of the latter is much used in Europe for carving. (See also BOX ELDER.)

REVISED BY ASA GRAY.

Maple, tp. of Monona co., Ia. Pop. 345.

Maple, tp. of Dodge co., Neb. Pop. 456.

Maple Creek, tp. of Outagamie co., Wis. Pop. 631.

Maple Grove, post-tp. of Barry co., Mich. Pop. 1328.

Maple Grove, tp. of Saginaw co., Mich. Pop. 505.

Maple Grove, post-tp., Hennepin co., Minn. Pop. 1014.

Maple Grove, post-tp. of Manitowoc co., Wis. P. 1147.

Maple Lake, post-tp. of Wright co., Minn. Pop. 381.

Maple Rapids, post-v. of Clinton co., Mich., on Maple River, 14 miles N. W. of St. John.

Maple Ridge, post-tp. of Isanti co., Minn. Pop. 268.

Maplesville, post-tp. of Baker co., Ala. Pop. 1087.

Mapleton, post-tp. of Blue Earth co., Minn. Pop. 583.

Mapleton, a b. (MAPLETON DÉPÔT P. O.) of Union tp., Huntingdon co., Pa., on the Juniata River and the Pennsylvania R. R. Pop. 389.

Ma'pleton Planta'tion, tp. of Aroostook co., Me. Pop. 444.

Maple Valley, post-tp., Montcalm co., Mich. Pop. 462.

Maple Valley, tp. of Sanilac co., Mich. Pop. 335.

Maquet (AUGUSTE), b. at Paris Sept. 13, 1813; was educated in the college of Charlemagne, where in 1831 he was appointed professor. In 1845 his *Maison Alexandre Dumas et compagnie* made quite a sensation, revealing to the public that he possessed a large share in the authorship of Alexandre Dumas, especially in his most popular novels,

Les Trois Mousquetaires, Vingt Ans après, Vicomte de Bragelonne, Monte Christo, etc., and their dramatizations. The most popular of the novels which he wrote alone are *La Belle Gabrielle* (1853), *La Rose Blanche* (1859), and the drama *Le Hussard de Berches.*

Maquoketa, city and tp. of Jackson co., Ia., has 3 weekly newspapers. Pop. of city, 1756; of tp. exclusive of city, 1071.

Maquon', post-v. and tp. of Knox co., Ill., on the Chicago Burlington and Quincy R. R., Galesburg and Peoria division. Pop. 1426.

Marabou' Stork, the *Leptoptilus marabou* of Western Africa, one of the ugliest of the stork family, held sacred from its usefulness in devouring large quantities of filth. From this bird, and from the almost equally repulsive adjutant-bird of India, the very beautiful and costly marabou feathers are obtained. These feathers grow beneath the wings. The name is probably given on account of the sacred character of the bird (Arab. *marabouth*, a "saint").

Marabouts' [Arab.], a sort of half-priestly caste in the N. and W. of Africa, among Mohammedan peoples. They are descendants of the Almoravide sovereigns of Spain and Morocco. They profess to exercise miraculous powers, and are regarded with great veneration by the vulgar. The late Abd-el-Kader belonged to their number. Their title comes from the Arab. *marabouth*, a "saint."

Maracay'bo, city of Venezuela, capital of the state of Zulia, is situated in lat. 10° 40′ N., lon. 71° 40′ W., on a channel which connects the lake with the gulf of the same name, has a good harbor, though admitting only vessels drawing less than ten feet; defended by three forts and containing good facilities for shipbuilding, which is carried on to some extent. Cacao, cotton, fustic, coffee, and cattle are exported. Pop. 15,000.

Maracaybo, Lake of, is 100 miles long and 70 miles broad, and communicates through a channel 20 miles long and 5 miles broad with the Gulf of Maracaybo, an inlet of the Caribbean Sea, on the northern shore of Venezuela. The Lake of Maracaybo is very deep, but the shifting bar at its mouth prevents large vessels from entering. During the reign of the northern winds, in May and April, its waters become brackish. The entrance to it is fortified; it was the last spot of the country held by the Spaniards, and was given up Nov. 9, 1823.

Ma'ragha, town of Persia, in the province of Azerbijan, on the Safi, whose waters are conducted through canals over a large territory and employed for irrigation. The raisins of this vicinity are considered the best in Persia. The manufactures of glass are considerable. Pop. 15,000.

Marais' des Cygnes ("swans' marsh") **River** rises in Waubunsee co., Kan., flows in a tortuous E. S. E. course 125 miles to the Missouri line, near Fort Scott, and takes the name of Osage River (which see). It receives numerous streams and drains a fertile region.

Marajo', an island of Brazil, formed by the Amazon, the Pará, and the Atlantic Ocean, and belonging to the province of Pará. Although low, it is not altogether alluvial; in some places appear rocks. The southern part is covered with primitive forests, the northern with pastures, feeding immense herds of cattle and horses. Pop. 20,000, a mixture of Indians and white men.

Mar'amec, tp. of Dent co., Mo. Pop. 374.

Maramec, tp. of Jefferson co., Mo. Pop. 2764.

Maramec, post-tp. of Phelps co., Mo. Pop. 1048.

Maranhão', or **Maranham,** province of Brazil, bounded W. by the Pará, N. by the Atlantic, E. by the Parnahyba. Area, 141,939 square miles. Pop. estimated at 500,000. Although its soil cannot compare with that of Pará and Amazona in fertility, yet it is one of the richest provinces of Brazil, producing immense crops of sugar, cotton, and rice, and yielding much fine timber, ornamental and dyewoods. It differs from those two provinces with respect to its climate, by having a dry and a wet season; during the dry season, from June to November, the trees lose their leaves, the grass withers, all vegetation dies, and men and animals often suffer severely from lack of water; during the wet season the appearance of the country is most luxuriant. The ground is generally low; only in the south-western parts appear some ranges of hills, which, however, are rich in useful minerals. The inhabitants consist of a mixture of Indians, negroes, and white men, with the exception of a few pure Indian tribes.

Maranhão, or **Maranham,** town of Brazil, the capital of the province of Maranhão, is situated on the north-western coast of the island of the same name, and at the mouth of the Maranhão River, in lat. 2° 31′ S. and lon. 44° 18′ W. It is a handsome city, with many fine and substantial buildings. The streets are generally so steep, the city being situated on two hills, that carriages cannot be used, but they are broad, straight, well paved, and lined with handsome two-storied houses surrounded with gardens. It has a good harbor, though its entrance is somewhat difficult, and a large and important trade. Pop. 30,000.

Mara'no di Napoli, town of Southern Italy, in the province of Naples, 8 miles N. of the city of Naples. Abundant and interesting vestiges of its very ancient origin still remain. Pop. in 1874, 7143.

Maranta'ceæ [from *Maranta*, one of the genera], a natural order of endogenous herbs, mostly tropical, and closely allied to the gingerworts, which, however, have an aromatic principle, while Marantaceæ have a pure starchy deposit. A few Marantaceæ have some acridity. Arrow-root and *tous-les-mois* are the most important products of the order. The Southern U. S. have two species of *Thalia* and one of *Canna*.

Maraschino. See Liqueur.

Marat' (Jean Paul), b. May 24, 1744, at Boudry, Neufchâtel, Switzerland, of Protestant parents; studied physical science and medicine, read many books, and acquired a great multitude of miscellaneous notions, but learned nothing; travelled, or rather wandered, restlessly around from place to place; published at Edinburgh in 1744 *The Chains of Slavery*, translated into French in 1792 under the title of *Les Chaines de l'Esclavage*, but generally achieving nothing; settled at Paris in 1775; began to practise as a physician, and wrote book after book on optics, electricity, etc., but found no patients and no readers; and retired at last to the service of the count of Artois, afterward Charles X., as a veterinary surgeon, hiding away from the world his enormous ambition and enormous disappointment. With the Revolution this man, a dwarf, deformed, and with a ridiculous carriage, made his appearance to take his revenge. His heart knew only two feelings, envy and hatred, and in addressing people he could appeal to them only. His understanding had actually grasped only one single fact in the whole universe, the difference between rich and poor, and whatsoever he treated his ideas always ran hither. But just these two circumstances made him the idol of the rabble. His paper, *L'Ami du Peuple*, begun under the title of *Le Publiciste Parisien* and continued as *Le Journal de la République Française* and *Le Publiciste de la République Française*, was a power in France during its whole lifetime, from Sept. 12, 1789, to July 14, 1793. Several times the editor was arraigned for the infamous calumnies with which he attacked people and the unheard-of recklessness with which he demonstrated that 270,000 persons had to be guillotined in order to save France. The first time he secreted himself in the cellar of the Cordeliers, whence, however, he continued to issue his paper; the second time he had courage enough to face his arraigners, and was acquitted; the third he defied them and triumphed; to attack this evil was simply to make it worse. His power, however, would probably never have reached such a height but for Danton. Danton, the minister of justice, the man of great talents, wished to use Marat and his paper. He introduced him in the club of the Cordeliers. Thence he crept into the Convention, and one day he stood beside Danton as member of the committee of public weal, and made Danton himself tremble. The September massacres, and the law against suspicious persons, which brought 400,000 French citizens to jail, were his greatest deeds. In the last month of his life he was evidently crazy. An inflammatory fever attacked him, and he would probably not have lived more than a few days, when he was stabbed (July 13, 1793) by Charlotte Corday. His body was brought to the Pantheon, his portrait hung in the hall of the Convention, and a pension was voted to his concubine; but hardly two years elapsed before this enthusiasm gave way to a general indignation and disgust, which have proved the last judgment of Marat. His portrait and his body were transferred to other and more proper places.

Marate'a, town of Italy, in the province of Basilicata, on the Gulf of Policastro. Pop. 5108.

Mar'athon, a plain on the coast of Attica, about 6 miles long, 1½ miles wide, and 22 miles E. N. E. of Athens. The river Charadrus runs through it, and two little hamlets (Vrana and Marathona) are on its western edge, under the hills. The battle fought there in Sept., 490 B. C., is one of the most important in history. Ancient accounts of it, however, are inexact, contradictory, and some of them very wild. On the Greek side there were 9000 or 10,000 Athenians, and 1000 Platæans; on the Persian side, at least 100,000, and perhaps 200,000. There fell of the Persians 6400, and of the Greeks only 192, who were buried under the mound which still remains. R. D. Hitchcock.

Marathon, county of Wisconsin, bounded N. by Michigan. Area, 5520 square miles. It is sparsely settled, and

mostly covered with forests. The cutting and sawing of pine timber is the principal industry. The county is traversed by the Wisconsin River. It is generally level, and much of the soil is adapted to grain-culture. Cap. Wausau. Pop. 5585.

Marathon, post-tp. of Lapeer co., Mich. Pop. 986.

Marathon, post-v. and tp. of Cortland co., N. Y., on the Syracuse and Binghamton R. R., 50 miles from Syracuse and 30 from Binghamton, has 4 churches, 1 newspaper, 3 hotels, a number of stores, 3 carriage and 1 cheese-box manufactory, a manufactory of hoe-handles, etc., an extensive tannery, and is the centre of a large dairy country, and butter, cheese, and live-stock are extensively shipped from this point. Pop. of v. 871; of tp. 1611.

WALLACE KELLEY, ED. "MARATHON INDEPENDENT."

Marathon, tp. of Marathon co., Wis. Pop. 344.

Marbeau' (JEAN BAPTISTE FRANÇOIS), b. in 1798 at Brives, in the department of Corrèze, France; studied law, practised as an advocate in Paris, became known by several treatises on political economy, was appointed adjunct-mayor of the first arrondissement of Paris, and founded in the same year the first infant asylum in France, an institution which proved very beneficial, and was adopted not only in the capital, but in all the large cities of the country. His essay *Des Crèches* (1845) was crowned by the Academy; he also wrote *Du Paupérisme en France* (1847) and *De l'Indigence et des Sécours* (1850).

Mar'binton's, tp. of Newberry co., S. C. Pop. 1171.

Marble. In common language any limestone which will take a good polish is called marble, but the name is only properly applied to limestones which have been exposed to metamorphic action, and have thereby been rendered more crystalline in texture, and have had their colors more or less modified or totally removed. White marble belongs to the latter category. This is formed from limestones in which the coloring-matter was organic, and was expelled by heat. A similar process may be observed in limekilns where a gray or blue stone is used, from which a snow-white lime is produced. By removing the stone when half burnt it will often be found to have entirely lost its color before parting with its carbonic acid, and while all its strength is retained. In chemical composition, marbles are either carbonates of lime or compounds of the carbonates of lime and magnesia. Many of the best marbles contain much magnesia, and some of them are true dolomites. The use of marble in architecture apparently dates from the dawn of civilization. Among the Egyptians it was extensively used at a very early period; and nearly all the great masterpieces of architecture left by the Greeks and Romans are composed of this material. Marble has also been employed in all civilized nations for the internal and external decoration of buildings constructed of this or other material, and it has been the favorite, and almost the only, stone in which the sculptor has given form to his ideal.

Marbles are found to exhibit great diversity of color and texture, running into varieties which have served different purposes among both the ancients and moderns. They are commercially classified as *white* and *colored*, but each of these divisions constitutes a group in which there are many varieties, known by distinct names. The white marbles are divided into the pure white, or statuary, and the mottled, or clouded white, in which the mass is white with more or less clouds or stains. The colored marbles are gray, blue, black, red, and yellow, or mottled with various mixtures of these colors with each other or with white. Of all these, the rarest and most highly esteemed is the pure-white or statuary marble. When this is faultless in color and texture it is worth in the great markets of the world from fifteen to twenty dollars per cubic foot. Comparatively few localities are known where good statuary marble is found, and the quarries which have supplied the material employed by ancient and modern sculptors have worldwide fame. The white marbles chiefly used by the Greeks were the Pentelic and Parian. Of these, the first was obtained from Mount Pentelicus, in Attica; the second from the island of Paros. By the ancients the Parian was regarded as the most beautiful of all marbles, and the finest works of Phidias, Scarpa, and Praxiteles were wrought in it. The Pentelic marble is very fine-grained, translucent, and somewhat waxy in appearance. The Parian is more granular, resembling in color and texture *fine* loaf-sugar. The studios of the Roman sculptors were mainly supplied from the quarries at Carrara, on the shore of the Gulf of Spezzia; and the greater part of the white marble now used for statuary in Europe and America is derived from the same source. The Carrara marble is of somewhat coarser grain than the Greek, but is very pure in color and sufficiently compact to receive a high polish. In the U. S. statuary marble has yet been quarried only at West Rutland, Vt. Here a layer from three to four feet in thickness of pure white is interstratified with forty to fifty feet of clouded marble. This is as perfect in color as the Italian, but is somewhat less strong and durable. White marble of fine quality occurs at Brandon, Vt., but in layers too thin to afford large blocks. The finest deposit of statuary marble known in this country is at Pittsford, Vt., where there is a bed full twenty feet thick, apparently equal in quality to the finest Carrara.

The clouded white marbles are much more abundant than the pure white, and usually constitute nine-tenths of the deposit where that occurs. This variety is generally employed for walls, cornices, and columns of buildings, for sepulchral monuments, mantels, etc., and the "clouded Italian marble" so largely imported into this country may be considered as a typical example of it. Most of the temples and palaces of antiquity are constructed from this variety, often taken from the same quarries which yielded the pure white in smaller quantities. The Parthenon at Athens is built of Pentelic marble, and is white, with a few spots or clouds of darker color. In North America what are called white marbles occur in a great number of localities, as in the Laurentian rocks of Canada, throughout the Alleghany belt, in the Rocky Mountains and Sierra Nevada. White or light marbles of desirable quality are, however, yet known to exist in but few places, and almost all the fine marbles, such as come in competition with the Italian, are obtained from Rutland co., Vt. The marble of this region is of the age of the Trenton limestone of New York, and forms part of a calcareous mass about 2000 feet in thickness, called the *Eolian limestone* by Prof. Hitchcock. The quantity of good marble in this mass is very variable. At West Rutland a thickness of from 40 to 60 feet is worked; at Sutherland Falls, 70 to 80; at Pittsford, 600 feet. Up to the present time most of the Vermont marble used in this country has been quarried at West Rutland and Sutherland Falls, but the marble deposits at Pittsford are much more extensive and of quite as good quality; and the future production of fine marble in this country is apparently destined to centre there.

The marble belt of Rutland co. extends to a great distance N. and S. through the States of Vermont and Massachusetts, but the quality of the stone deteriorates in either direction. Toward the N. it becomes finer, harder, and more translucent, but is less sound; while towards the S. it is coarser. A belt of white marble, probably distinct from that described above, runs southward along the flanks of the Alleghanies from Massachusetts to and beyond the Potomac. The marble of this belt is a typical dolomite, and is very coarsely crystalline. It is quarried at Sing Sing, Tuckahoe, and various points in Westchester co., N. Y., and near Baltimore, Md. The coarseness of this marble forbids its use for any other than architectural purposes. Fairly good light marble for buildings and monuments is also found at Lee, Mass., Canaan, Conn., Dorset, Vt., and other places in New England. The Lee marble was used for the extension of the Capitol at Washington. Deposits of white and clouded marbles are known to exist at various places in the southern extension of the Alleghany belt, but none of these have been worked, or even opened, except one in Louisa co., Va. At this point the quantity of marble is large, and some of it is of beautiful color and grain. Should this prove to be "sound" (*i. e.* free from cracks and flaws), from its proximity to Washington and Baltimore this deposit will be of great value.

"Colored" marbles exist in endless variety. They are either of one simple color or variegated. Among the first are the black, red, blue, gray, and yellow marbles. Jet-black marble was somewhat largely used by the ancients, and that found in the ruins of Italy is known as the *Nero antico*. It is now highly prized, and is chiefly used as a groundwork for mosaics. Black marbles are found in Derbyshire, England, Kilkenny, Ireland, and in the U. S. at Shoreham, Vt. A black limestone quarried at Glenn's Falls, N. Y., is called a black marble, and is employed for tiles, which are placed alternately with squares of white. The red and yellow marbles of the Romans are called by the modern Italians the "*Rosso antico*" and "*Giallo antico*." Like the *Nero antico*, they were largely used by the Romans and Etruscans for the decoration of the interiors of their houses; but the localities from which they were derived are not now known. Gray marbles have always been more or less employed in architecture, chiefly for walls, cornices, and columns. The most common gray marble of the Romans is the *Cipolino*. This is of a banded or clouded gray color, having much the aspect of gray granite. The columns of the temple of Jupiter Serapis at Baiæ (bored by mollusks, and thus recording the former partial submergence of the temple) are of *Cipolino*. The variegated

marbles are often spotted or veined with different colors, and are sometimes of great beauty. They are used for the decorations of the interiors of buildings, for counters, soda-fountains, mantels, etc. *Brocatello* is the name given to a peculiar mottled marble found in Spain. The marble of the mottled layers in the Rutland quarries is also called *Brocatello*. *Lamachello* (Fr.), or *Lumichella* (It.), is a highly fossiliferous marble or limestone, to which the enclosed fragments of shells, retaining their nacre and iridescence, give great brilliancy and beauty. *Bardiglio* is a bluish-gray marble with strongly-marked veins and spots of black. The best known foreign colored and variegated marbles brought to this country are the yellow "Sienna," the Genoese "Portoro"—black, with yellow and white veins—the "Lisbon," and others, which may be seen in the stock of any dealer.

In the U. S. the colored and variegated marbles are known to exist in various localities, and some of them are in general use for the purposes such marbles serve. Of these, the best known is the "Tennessee," a very handsome stone, mottled chocolate or lilac and white in color, and a favorite material for the interior decoration of public buildings. A scarcely less beautiful variety is the "Winooski" marble, quarried near Burlington, Vt. This is mottled with red, brown, and white, and is much esteemed; but, like many other veined and mottled marbles, it contains much silica and is difficult to work. The black marble of Shoreham, Vt., is apparently of good quality, and would be valuable in Rome, but in this country the use of such a material is so limited that there is little demand for it. The same may be said of a beautiful mottled gray marble found at Plymouth, Vt., and many other variegated marbles which are known to exist on the Atlantic slope or in the far West. Up to the present time our people have not been sufficiently rich and luxurious to make great use of purely ornamental stones. The demand for them is increasing, as is shown by the growing popularity of the "Tennessee," the "Winooski," and the blue-mottled "Columbian" of Rutland, but the spirit of the age in this country, and in all countries, is opposed to palaces, public or private, especially such as have their walls encrusted with many-colored marbles. They belong to an age which has passed away, never to return. The white marbles, on the contrary, were never so much used as now. In the form of mantels or table-tops they find their way into almost every household, and the industries concerned in their production were never so flourishing as at present. In comparing the value of property containing white or colored marbles, it should be remembered that not one cubic foot of the latter is used to a hundred of the former, and this ratio will probably never be greatly varied. The so called *verd-antique marble* is omitted from the list given above because it is not a marble. It consists of a mixture of serpentine and carbonate of lime, and will be described under its proper title.

In quarrying marble, the surface-rock, except when protected by clay or earth, is found cracked and decomposed by frost, sun, etc. to a depth of 10 to 30 feet, and is worthless. This is removed by blasting, and is discarded. The soundness and value of the marble can only be determined when the excavation has been carried beyond the reach of external agents. Even then the marble is often found to be unsound; so that the opening of marble-quarries is always expensive, and in untried territory hazardous. When the surface or "cap rock" is removed, a "floor," or level space, is formed, where the "channelling-machines" are set to work. These machines are worked by steam, and are of two kinds—viz. those which work one or two gangs of heavy chisels, like the "Wardnell machine," and those which drive the diamond drill. By these machines narrow parallel channels are cut across all the floor to the depth of perhaps six feet. The machines are then turned, and channels are cut at right angles with the first. The floor is thus cut into blocks of any required size. One of these, called the "*key-block*," is then broken out, and the others, thus rendered accessible, are drilled through at their bases—a process called "gadding"—and are lifted out by cranes. No powder is used in quarrying marble in this country, as it shatters and wastes the material. The cost of cutting and raising block marble is from seventy-five cents to one dollar per cubic foot. When removed from the quarry the blocks of marble are taken to a mill constructed for that purpose, and *sawed* into slabs of different thickness or into pyramids for monuments, blocks for building, etc. This is done with gangs of horizontal saws, which are strips of soft iron, fed with sand and dripping water. The polishing of marble is also done by machinery, the slabs or blocks being placed in a "rubbing-bed" and ground and polished with sand, emery, "putty," etc. by a rubber which has either a rotary or a to-and-fro motion. J. S. NEWBERRY.

Mar'ble, post-v. and tp. of Madison co., Ark. Pop. 338.

Marble, post-tp. of Saline co., Ark. Pop. 493.

Marble (MANTON), b. at Worcester, Mass., Nov. 16, 1835; graduated at the University of Rochester in 1855; became a writer for newspapers at Boston and New York; took part in founding the New York *World* in 1860, and became its proprietor in 1862, since which time it has been a leading organ of the Democratic party, and an able advocate of free trade.

Mar'blehead, post-v. and tp. of Essex co., Mass., on the Marblehead branch and the Swampscott branch of the Eastern R. R., 20 miles N. E. from Boston, is a seaport, and has a deep and spacious harbor, nearly landlocked, 8 churches, a weekly newspaper, 1 savings and 2 national banks, and a number of shoe manufactories, the last being the principal business of the place. The fisheries, once prominent, are declining, the fleet numbering but seventeen sail. It is coming into notice as a summer resort. Pop. 7703. WM. M. CHAMBERLAIN, ED. "MARBLEHEAD MESSENGER."

Marble Hill, post-v., cap. of Bollinger co., Mo.

Mar'bletown, post-tp. of Ulster co., N. Y., on the Delaware and Hudson Canal, has valuable stone-quarries, good water-power, and some manufactures. The Esopus Creek has a fall of 60 feet. Pop. 4223.

Marble Valley, post-tp. of Coosa co., Ala. Pop. 634.

Marbois. See BARBÉ-MARBOIS.

Mar'burg [anc. *Matiacum*], town of Germany, in Hesse-Cassel, on the Lahn. It is a quaint old town, climbing the sides of a hill whose top is crowned with an old castle. The church of St. Elizabeth is a fine building. It is the seat of a university founded May 20, 1527. Manufactures of leather and earthenware are carried on. Pop. 9065.

Marcari'a, town of Northern Italy, province of Mantua, near the left bank of the Oglio. Its mediæval history is closely connected with that of Mantua. Pop. in 1874, 8244.

Mar'casite [It. *marcassita*], or white iron pyrites, a mineral having the same composition as pyrites, but differing from it in crystallizing in the trimetric system. It is also more liable to decomposition.

Marca'to [It.], a musical directive term, implying that the notes should be struck in a distinct, short, and pointed manner.

Marceau' (FRANÇOIS SÉVERIN DES GRAVIERS), b. Mar. 1, 1769, at Chartres, France; studied first law, but enlisted in 1785 in the army; became noted for his valor and magnanimity; fought with great distinction in 1792 in the army of the Ardennes; was made a general of division in 1793; commanded with success in the Vendée in 1793; decided the victory at Fleurus June 26, 1794; took Coblentz in 1794, and Königstein in 1796, but was mortally wounded on a reconnoissance at Altenkirchen in Rhenish Prussia, Sept. 20, 1796, and d. three days after. Monuments in honor of him were raised both in Chartres and Coblentz.

Marcelli'nus, SAINT, and bishop of Rome, succeeded Caius in 296, and d. Oct. 24, 304. The old story of his apostasy under Diocletian is now regarded as fabulous.

Marcel'lo (BENEDETTO), b. at Venice July 24, 1686, of a noble family; received a careful education; studied music under Gasparini; held several important government offices; composed music to Giustiniani's version of fifty of the Psalms, for two, three, and four voices, with accompaniment of organ and string instrument; also several oratorios, masses, and cantatas, and a pastoral, *Calisto in Orsa*. D. at Brescia July 17, 1739.

Mar'cellon, post-tp. of Columbia co., Wis. Pop. 920.

Marcel'lus, post-v. and tp. of Cass co., Mich., on the Chicago and Lake Huron R. R. Pop. 1255.

Marcellus, post-v. and tp. of Onondaga co., N. Y. The railroad station is on the New York Central R. R., 10 miles W. of Syracuse. Lime, plaster, and water-power are abundant. Some manufactures are carried on in the township. Pop. of Marcellus (post-v.) 428; of Marcellus Falls (post-v.) 140; of the tp. 2337.

Marcellus, the name of an illustrious plebeian family of ancient Rome, belonging to the gens Claudia. The most famous member of this family was Marcus Claudius Marcellus, b. about 268 B. C., and killed at Venusia, in Apulia, in 208 B. C. He was five times consul—namely, in 222, 215, 214, 210, and 208 B. C. A valorous soldier, he slew with his own hand Viridomarus, king of the Gauls, in the battle of Clastidium, during his first consulship, and dedicated the armor of the fallen foe as *spolia opima* in the temple of Jupiter Feretrius. Of still greater importance was his success at Nola in 215 B. C., where he repelled the attack of Hannibal, which was the first real check the Carthaginians suffered in Italy. But his greatest exploit was

the conquest of Sicily, especially the capture of Syracuse, in 212 B. C. Archimedes led the defence of the works, and it was a traitor who at last introduced Marcellus into the city after a siege of many months. But his valor and success as a soldier, and the great services he did to the republic in the war against Hannibal, were disfigured by the cruelty and rapacity of his character. Syracuse he gave up to be plundered by his soldiers, and he carried away not only the treasury of the city, but also its works of art, thus inaugurating a custom which afterwards made the Roman generals so hateful. In Rome itself his proceedings occasioned much censure. Livy and Plutarch have drawn his picture with much partiality, and greatly exaggerated the advantages he now and then gained over Hannibal, which appears from the statements of Polybius, and may be discovered even between the lines of his panegyrists.

Marcellus I., SAINT, a Roman, is said to have become bishop of Rome in 308, and was forced by Maxentius the emperor to become a slave in his stables. D. 310.—MARCELLUS II., POPE (*Marcello Cervini*), was cardinal-legate of Julius III. at Trent; became pope, retaining his own name, and d. of poison May 1, 1555, after a pontificate of twenty-two days.

March [Lat. *Martius*, the month of Mars], the third month of the new or Gregorian style, the first of the Julian calendar.

March [Lat. *Marus;* Slavonian, *Morawa*], the principal river of Moravia, passes by Olmütz, forms for some distance the boundary between Hungary and Moravia and Austria proper, and enters the Danube 7 miles above Presburg. It is navigable 50 miles from its mouth. The plain between the lower March and the Danube has often been the theatre of war; here were fought the battles of Aspern and Essling and of Wagram.

March (ALDEN), M. D., LL.D., b. at Sutton, Mass., in 1795; graduated at Brown University in 1820, and in the same year settled as a surgeon at Albany, N. Y. He was the principal founder of the Albany Medical College and the City Hospital, and was long a professor of surgery and dean of the faculty in the former institution. He was a remarkably successful surgical operator, and was at one time president of the American Medical Association. He wrote some excellent professional papers, and introduced important changes in operative surgery. D. at Albany, N. Y., June 17, 1869.

March (AUSIAS), a Valencian poet, the year of whose birth is unknown, but who appears to have died in 1462. His poems in subject and general character resemble those of Petrarch, but his treatment of his themes is original, and he is entitled to rank not only first among the bards of his native language, but among the first of the century in which he flourished. His compositions, whether turning upon love, upon death, or upon moral or spiritual topics, are distinguished by seriousness and elevation of tone, as well as by great tenderness and delicacy of sentiment, and they are almost wholly free from the conceits so common in early Provençal and Italian poetry. His style is remarkable for force as well as simplicity, and for a naturalness of expression which seems almost peculiar to dialects not yet over-refined and rendered artificial and conventional by literary culture. Though March may be considered a follower of Petrarch, he is by no means a slavish imitator of his model, and indeed he often rises to a loftier height of poetical inspiration than was ever attained by the Italian bard. Helfferich says he soars above the Italian "as high as Schiller above Lamartine," and he finds in him the best qualities which have so much endeared the German poet to the Teutonic race. March does not even copy the poetical forms of Petrarch. His compositions are generally in stanzas of seven, eight, or ten verses, in most cases rhymed, but sometimes simply *assonant.* Four editions of the works of March, all now very rare, were printed in the sixteenth century, and a more complete edition, based upon these, was published at Barcelona in 1864 in 1 vol., 8vo, entitled *Ausias March, Obras de aquest Poeta, per Francesch Pelayo Briz.* GEORGE P. MARSH.

March (CHARLES W.), b. at Portsmouth, N. H., Dec. 15, 1815; graduated at Harvard College in 1837; studied law; engaged in journalism in New York; published *Daniel Webster and his Contemporaries* (1850); travelled in Europe; wrote *Sketches and Adventures in Madeira, Portugal, and the Andalusias of Spain* (1856); was for some time vice-consul at Cairo, and d. at Alexandria, Egypt, Jan. 24, 1864.

March (FRANCIS ANDREW), LL.D., b. at Millbury, Mass., Oct. 25, 1825; graduated at Amherst College in 1845; was tutor there 1847–49; admitted to the bar in New York 1850; was a teacher at Fredericksburg, Va., 1852–55; and became in 1858 professor of the English language and of comparative philology at Lafayette College, Easton, Pa., and has taken rank as one of the first of American philologists. He has written *A Method of Philological Study of the English Language* (1865), an *Anglo-Saxon Grammar* (1870), and an *Introduction to Anglo-Saxon* (1871), besides editing *Latin Hymns* and a portion of the *Ecclesiastical History* of Eusebius as textbooks. He has also written on philosophical topics in the *Princeton Review*, and on philology for the *Transactions* of German and American societies. In 1873 he was elected president of the American Philological Association.

Marchand (JOHN B.), U. S. N., b. Aug. 27, 1808, in Pennsylvania; entered the navy as a midshipman May 21, 1828; became a passed midshipman in 1834, a lieutenant in 1840, a commander in 1855, a captain in 1862, a commodore in 1866; retired in 1870. Served against the Seminoles in the Florida war, and participated in the capture of Tuspan, Mexico, during our war with that country; commanded the Lackawanna at the battle of Mobile Bay, Aug. 5, 1864, and displayed throughout the fight, during which he twice rammed the iron-clad Tennessee, great coolness and self possession. FOXHALL A. PARKER.

Marche'na, town of Spain in the province of Seville, on the Galapagar. It is a lively and thriving town, with celebrated sulphur-springs in its vicinity. Pop. 12,208.

Marche'si (POMPEO), b. in 1790; studied under Canova; was appointed professor of the Academy of Art in Milan, and d. there Feb. 6, 1858. The first of his works which attracted general attention was a *Venus Urania* and a colossal statue of St. Ambrose. His principal work is a colossal group representing the *Mater dolorosa* with the dead Christ in her lap, now in the church of San Carlo in Milan, to which it was presented in 1852 by the emperor Francis. Among his other works are a statue of Goethe in the city library of Frankfort, of Volta in Como, of Charles Emanuel in Novara, of Bellini, Madame Malibran, and others. He enjoyed a very great reputation, and his conceptions have truly more strength and less sentimentality than those of Canova.

March'ing, in military tactics, is the movement of troops in ranks or files, in lines, columns, or other tactical arrangements. On long marches the *route step* is employed, an ordinary walk, the men preserving their places in the ranks. But in musters, reviews, parades, drills, and the like the cadenced step, in common, quick, or double-quick time, is employed. Music, preferably that of the drum and fife, assists in keeping the time and step. Marshal Saxe has the credit of being the first general in modern times to perfect a system of marching, but there have been many improvements made upon his system.

Marcia'na, or **Mari'na,** a maritime town of Central Italy, in the province of Leghorn. The inhabitants, chiefly sailors or shipbuilders, are industrious and skilful. Pop. in 1874, 7382.

Marciani'se, town of Southern Italy, in the province of Caserta, near Capua, in a low, unhealthy situation in the neighborhood of several small lakes, plans for drainage of which are under consideration. Pop. in 1874, 9525.

Mar'cion, the son of a bishop of Sinope in Pontus; was excommunicated by his father on account of his heretical views; went to Rome about 140; associated with the Syrian Gnostic Cerdon; formed a new Gnostic system and founded a sect, the Marcionites, which found many adherents in Syria, Egypt, and Palestine, and continued as a separate sect till the sixth century. He established the first known canon of sacred books, from which, however, he excluded many writings which now belong to the New Testament. (For his system see GNOSTICS.)

Marcoman'ni ("men of the borders"), a German tribe, first settled in the regions between the Neckar and the Main; accompanied Ariovistus when in the time of Cæsar he invaded Gaul, but were later on led by their own chief, Maroboduus, into the land of the Boii (Bohemia), which they conquered, and where they maintained a standing army of 70,000 fighting men. Maroboduus's rule was of short duration, however; he was compelled to flee from his country, sought refuge with the Roman emperor, Tiberius, and d. at Ravenna. The Marcomanni continued, nevertheless, to be the ruling people in Bohemia, and soon they began to push forward towards the Danube. In the latter part of the second century Marcus Aurelius was occupied in war with them during almost his whole reign, from 161 to 180, and when he d. at Vindobona (Vienna) his son Commodus bought peace of them. In the third century they crossed the Danube and invaded Italy itself, though with various success. But in the general whir of the fourth century they became lost, and their name is not heard of any more in history.

Marcou' (JULES), b. Apr. 20, 1824, at Salins, in the department of Jura, France; studied geology; received in

1847 employment at the palæontological collection of the museum of the Sorbonne; made extensive scientific travels in the U. S., 1848–50, 1853–54, and 1860, and was appointed professor in geology at Zurich in 1855. As results of his American explorations, partly undertaken in connection with Agassiz, he published in English *Geological Map of the U. S.* (1853), and *Geology of North America* (1855). He also published *Drias et Trias* (1859), *Carte Géologique de la terre* (1862), and *Derniers Travaux sur le Drias et le Trias en Russie* (1870).

Mar'cus, bishop of Rome, came to that dignity in 336, and d. Oct. 7 of that year. It is claimed that he was before election the first dignitary who bore the title of cardinal.

Mar'cus Aure'lius Antoni'nus, b. at Rome Apr. 20, 121 A. D., a son of Annius Verus; was adopted by Antoninus Pius, whose daughter, Annia Faustina, he married in 145, and on whose death (Mar. 7, 161) he succeeded to the imperial throne. He was both by natural inclination and by education a literary man. Poetry, music, painting, law, and mathematics he had studied, and the philosophy of the Stoic school he not only professed in conversation and costume, but practised in actual life with a consistency and nobleness which excited general admiration. But in spite of his passion for studies and meditations he was nevertheless an energetic and successful ruler. In the war against the Parthians (162–163) he did not command in person, but in the long series of campaigns against the Alani, Marcomanni, and Quadi, by which he succeeded in securing the northern boundary of the empire along the Danube, he led the armies himself. During one of these campaigns he d., either at Vindobona or Sirmium, Mar. 17, 180, deeply lamented by the whole Roman people. A strange feature in his character (of which also so many strikingly noble traits are known) was his hatred of the Christians; the persecutions which took place in Gaul in 177 he not only knew of, but sanctioned. It also seems somewhat singular that his son, whom he educated with so much anxiety and care, was Commodus, probably the worst and most contemptible of all the Roman emperors. His *Meditations*, a collection of philosophical, mostly moral aphorisms by himself or extracted from the writings of other Stoic philosophers, is still extant. It is written in Greek, but has been translated into most European languages. The Greek text with Latin version was published by Gataker at Cambridge (1652). The best English translations are by R. Graves (Bath, 1792) and G. Long (Lond., 1862).

Mar'cy, tp. of Boone co., Ia. Pop. 2015.

Marcy, post-v. and tp. of Oneida co., N. Y., on the Utica and Black River R. R., on the N. shore of the river Mohawk, has 6 churches. Pop. 1451.

Marcy (Gen. Randolph B.), b. in Massachusetts about 1811; graduated at West Point in 1832, became lieutenant 2d Infantry 1837; was engaged in the battles of Palo Alto and Resaca de la Palma May, 1846, for which he was promoted to a captaincy; was engaged for several years in the exploration of the Red River country, in operations against the Seminoles, and in the Utah expedition 1857–58; became paymaster, with the rank of major, 1859; inspector-general, with the rank of colonel, Aug., 1861; was chief of staff to Gen. McClellan (his son-in-law) in West Virginia, on the Peninsula, and in Maryland, and was appointed brigadier-general of volunteers Sept. 23, 1861. He published *Exploration of the Red River in 1852* (1853), *The Prairie Traveller* (1859), and *Personal Recollections* (1866).

Marcy (William Learned), b. at Southbridge, Mass., Dec. 12, 1786; graduated in 1808 at Brown University; was for a time a teacher, but became a lawyer of Troy, N. Y.; served as an officer of volunteers in the war of 1812–14, capturing at St. Regis, Canada, the first prisoners and the first flag taken on land in the war; became in 1816 recorder of Troy, and for a time conducted the Troy *Budget*, then a leading anti-Federalist organ; became in 1821 adjutant-general of New York, in 1823 comptroller; a judge of the State supreme court in 1829; was chosen U. S. Senator in 1831, but resigned this office the following year upon being elected governor of New York, to which position he was twice re-elected, but defeated in 1838 by W. H. Seward. In 1839, Pres. Van Buren appointed him commissioner to adjust the Mexican claims, and in 1845 Pres. Polk selected him as secretary of war. During his term of office the war with Mexico occurred, in which he displayed great ability, as well as in the settlement of numerous intricate diplomatic questions. In 1853, Pres. Pierce appointed him secretary of state, in which capacity he added to his already established reputation as a statesman of a high order. Many of his state papers are masterly productions. This was the last office he held. Retiring on the accession of Mr. Buchanan to the Presidency in 1857, he d. at Ballston Spa July 4, 1857.

Marcy, Mount, called by the Indians, *Tahawus*, or the "cloud-splitter," the highest land in New York State, is in the town of Keene, in Essex co., in a cluster containing several of the highest of the Adirondacs. It reaches 5467 feet.

Mardeen', or **Mardin,** town of Asiatic Turkey, in the district of Diarbekir. It is built on the steep sides of a rock whose top is crowned with a castle, and presents a very picturesque aspect. It is the seat of a Jacobite library and several Jacobite institutions, and carries on a considerable trade. Pop. 15,000.

Mar'disville, tp. of Talladega co., Ala. Pop. 1357.

Maréchal' (Ambroise), D. D., b. at Ingre, near Orleans, France, in 1769; was educated at St. Sulpice, and in 1792 came to Baltimore; held theological professorships in France 1803–11; declined the Roman Catholic bishopric of New York, but became coadjutor to the archbishop of Baltimore, Dr. Neale, whom he succeeded in 1817. D. at Baltimore Jan. 29, 1828.

Maree', Loch, a lake of Scotland, in the western part of Ross-shire, is 18 miles long and 3 miles broad, and sends its waters to the sea through the river Ewe. It is studded with islands and surrounded by beautiful scenery.

Mare Island, in Solano co., Cal., is an island in the N. E. part of San Pablo Bay, near Vallejo, with which it is connected by ferry. It has a U. S. navy-yard, sectional floating dock, and naval arsenal.

Marem'me (*Ora Maritima*), a name applied to a vast, marshy, unhealthy territory bordering on the Tyrrhene Sea, from the mouth of the Magra to that of the Volturno. It covers about 1000 square miles, and is divided into the Tuscan Maremma and the Roman Maremma, these being again subdivided. This great tract is covered with stagnant water or immense deposits of sea-weed, interspersed with thorny thickets, wild forests, and verdant meadows. During the winter it is frequented by Apennine shepherds and haunted by lawless persons. In summer the fertile portions are cultivated on a large scale by peasants who descend from the mountains of Lucca, from the Sabine Hills, and the Abruzzi to plough and sow, then return home to wait for the harvest, when they redescend for as short a time as possible. But even this costs hundreds of lives every year. There are few villages, or even roads, in the Maremme, and the pestiferous exhalations extend even to the more elevated portions. They are, however, least felt on the slopes descending to the Arno and the Tiber. Draining on a large scale, with careful cultivation and extensive planting of trees, may in time overcome the malaria, and the effects which have already followed wherever such efforts have been made are encouraging. The railroad opened within the last few years along the Tyrrhene shore has produced very favorable results.

Maren'co (Carlo), b. at Ceva in 1800; received his legal degree from the University of Turin when scarcely eighteen years old, and was already remarkable for his poetic culture. In 1828 his first tragedy, *Buondelmonte*, was represented in Turin with marked success. His subsequent tragedies were *Famiglia Foscari, Adelisa, Manfredi, Giovanna I., Pia, Berengario, Arrigo di Sveria, Corso Donati, Ezzelino Terzo, Ugolino, La guerra de' Baroni.* D. at Savona in 1846, leaving nine children, one of whom, Leopold, himself became a renowned dramatic poet. (See his *Giorgio Gandi, Celeste, Il Falconiere*, etc.)

Maren'go, a v. of Italy, in the province of Alessandria, is famous for the battle fought here June 14, 1800, in which Napoleon defeated and routed the Austrians.

Marengo, county of W. Alabama, bounded W. by the Tombigbee River. Area, 940 square miles. The county is partly level, and has a very fertile soil. Live-stock, corn, and cotton are the staple products. The N. part is traversed by the Alabama Central R. R. Cap. Demopolis. Pop. 26,151.

Marengo, post-v. and tp. of McHenry co., Ill., 66 miles N. W. of Chicago, on the Chicago and North-western R. R., in the midst of a rich and fertile section of country, has 6 churches, a fine school-house, a newspaper, 1 national and 1 private bank, a steam flouring-mill, a steam foundry, a large carriage-factory, 2 extensive fruit-nurseries, 2 hotels, and stores. It is in an excellent farming district. Pop. of v. 1327; of tp. 2253. J. B. Babcock, Ed. "Republican."

Marengo, tp. of Iowa co., Ia., contains Marengo City. Pop. 2329.

Marengo City, post-v., cap. of Iowa co., Ia., 84 miles W. of the Mississippi, on the Iowa River and the Chicago Rock Island and Pacific R. R., has 7 churches, a high school, 2 newspapers, a banking-house, a woollen and a grist mill, 5 hotels, several elevators, and stores. It is surrounded by a good farming and grazing country. Pop. 1693. F. E. Spering, Ed. "Marengo Republican."

Marengo, post-v. and tp. of Calhoun co., Mich., on the Michigan Central R. R. Pop. 1329.

Ma'renholz-Bülow (BERTHA VON BULOW), BARONESS, the principal apostle of Froebel's Kindergarten idea, and the foremost authority on it, through her personal intimacy with him, her devotion to the system, and his expressed confidence in her powers. Through her intercession the injunction laid against Froebel's institution by the Prussian government was removed. In 1855 she held séances in her own parlors at Paris, and had the support of Michelet, Quinet, Abbé Michaud, and other distinguished people. Her lectures were in substance published, and went through two editions. She assisted personally in the establishment of kindergartens in Germany, Switzerland, Holland, Belgium, England, and Italy (aided in Florence by the influence of Mrs. George P. Marsh); in Berlin she lectured gratuitously during three years in a normal school for the education of kindergartners. Her lectures in Italy were condensed into a pamphlet, which was translated from the French into English, and printed in the *American Circular for Information* for July, 1872. Other works are *The Kindergarten, The Educational Mission of Woman, The Child and its Being.* She is at present chief lecturer in the new college for kindergartners in Dresden, and is writing reminiscences of Froebel in the monthly magazine *Erziehung der Gegenwart.* ELIZABETH P. PEABODY.

Mareo'tis, Lake, or **Birket-el-Marioot,** a salt lake or marsh in Lower Egypt, 30 miles long, 15 miles broad, and separated from the Mediterranean by a narrow isthmus of sand. It had been perfectly dry for three centuries, when in 1801, during the war between England and France, the English, ascertaining that the tract of land lay below the level of the sea, and having some military purpose in view, dug through the isthmus and let in the waters. This passage was closed by Mehemet Ali.

Marey' (ÉTIENNE JULES), b. at Beaune, in the department of Côte-d'Or, France, in 1830; studied medicine at Paris, and was appointed professor in natural history at the Collége de France in 1867. His *La Machine Animale,* resting on many original and ingenious experimental researches on the movements of animals, was translated into English, entitled *Animal Mechanism* (New York, 1874).

Marfo'ri (CARLOS), b. in 1819, the son of an Italian cook; obtained an office in the Spanish civil service through the influence of Gen. Narvaez, of whom he had married a relative. He afterwards became a deputy and counsellor in the administration of various financial associations, and was known to the Queen Isabella, who honored him very much. Always in association with Narvaez, who soon learned to appreciate the value of his friendship, he by degrees obtained political influence, and in 1866, when Narvaez became minister, Marfori was appointed governor of Madrid and chief of the royal household. Hated and scoffed at by the people, he was overloaded with honors by the queen. He contributed more than all her political mistakes to undermine her position. In 1868, when the revolution broke out, she was told from all sides, even by Napoleon III., that the dismission of Marfori was the only means of preserving the throne, but she remained faithful to her favorite, and sacrificed her crown. Also in exile, during her residence at Paris and other places, Marfori still continued to be the *maître de la maison* of the queen. AUGUST NIEMANN.

Mar'garet, queen of Scotland (called THE SAINT), b. in Hungary in 1046, was grand-niece of King Edward the Confessor and daughter of Edward, son of Edmund Ironside, who was driven into exile by Canute. She resided at the English court at the time of the Norman Conquest, when she accompanied her brother, Edgar Atheling, in his flight to Scotland. She there attracted the admiration of King Malcolm Canmore, whom she married in 1070, and earned canonization by her efforts in diffusing Christianity, and especially by connecting the Scottish with the Romish Church. D. Nov. 16, 1093, four days after the death of her husband, killed in battle while fighting against William Rufus. She was canonized in 1251, and made the patron saint of Scotland in 1673.

Margaret of Angoulême', generally known as **Marguerite de Valois,** queen of Navarre, b. at Angoulême Apr. 11, 1492, a sister of Francis I., and married in 1509 to the duke of Alençon. She was beautiful, witty, and exceedingly fascinating. Still more gifted by nature than her brother, she received an excellent education. She spoke Latin, Spanish, and Italian, understood Greek and Hebrew, and to these literary attainments added great practical ability. After the battle of Pavia in 1525, in which she lost her husband, while her brother, the king, was taken prisoner and brought to Madrid, she repaired to this capital—an undertaking which was connected with the greatest dangers, and could be accomplished at that time and for such a purpose only by a lady of eminent courage and inexhaustible resources under all emergencies; but her courage was rewarded, and her skilful negotiations at the court of Charles V. exercised great influence on the destiny of her brother and on the relations between France and the German-Spanish empire. In 1527 she married Henry d'Albret, count of Béarn and titular king of Navarre, and from this time, and up to her death (Dec. 21, 1549), she resided in Béarn, to whose progress and prosperity she contributed much by encouraging agricultural and industrial improvements, and by the liberal spirit which pervaded her government. The Protestants found shelter in Béarn and Alençon against the persecutions of the infuriated Roman Catholics, and her book, *Le Miroir de l'Ame Pécheresse* (1533), shows a leaning towards Protestantism; it was condemned by the Sorbonne, and she herself was openly denounced by the monks as a heretic who ought to be sewn in a sack and thrown into the Seine. She was a voluminous writer, and her *L'Heptaméron des Nouvelles,* an imitation of Boccaccio's *Decamerone,* first published in 1559, and afterwards republished in numerous editions, is considered a classic work in French literature. It has great historical interest and considerable æsthetic merit, but its elegance, vivacity, and rich invention are often marred by indecencies. A collection of poems was published in 1547 under the title of *Marguerites de la Marguerite, etc.* She left one child, Jeanne d'Albret, mother of Henry IV.

Margaret of Anjou, queen of Henry VI. of England, and daughter of René, count of Provence, b. at Pont-à-Mousson, Lorraine, Mar. 23, 1429; married Apr. 22, 1445; became unpopular in England on account of the cession of the provinces of Maine and Anjou, then in the hands of the English, to her father. She founded Queen's College, Cambridge, in 1449, and, the king being subject to protracted periods of imbecility, she soon became the real ruler of the kingdom. This power being contested by the duke of York, who claimed the throne by an elder line of descent, gave rise to the "Wars of the Roses," which continued thenceforth for several reigns. Margaret was at first victorious; afterwards forced to flee to Scotland, she invaded England and killed the duke of York at Wakefield (1460); released her captive husband by the battle of St. Alban's, Feb. 17, 1461; was herself defeated at the great battle of Towton, Mar. 29, and forced to escape to Scotland and France; made another unsuccessful invasion 1464; succeeded by the aid of Warwick the "king-maker" in momentarily reinstating Henry upon the throne 1470; but Warwick being killed at Barnet, Margaret was defeated and captured at Tewkesbury May 4, 1471, her only son, Prince Edward, being killed, and the king put to death soon after. Margaret was kept in prison in the Tower or at Windsor until 1475, when she was ransomed by Louis XI. of France at the cost of the independence of Provence, ceded to that monarch by her father. She lived in strict seclusion thenceforth at Reculée, near Angers, and d. at Dampierre Aug. 25, 1481. Margaret was a beautiful, talented, and educated princess; her valor and reverses of fortune have invested her name with a romantic interest.

Margaret of Denmark, queen-regnant of the three Scandinavian kingdoms, b. in 1353, a daughter of Valdemar IV. Atterdag, king of Denmark, and married in her tenth year (Apr. 9, 1363) to Haco VI., king of Norway, to whom she bore in 1371 a son, Olaf. In 1375, Olaf succeeded his grandfather as king of Denmark, and in 1380 his father as king of Norway. During his minority Margaret conducted the government of both countries, and this difficult task she fulfilled with so much discretion and vigor that on the death of Olaf in 1387 the estates of both kingdoms chose her queen-regnant, and left to her to appoint her successor. In Sweden a large party was strongly opposed to the king, Albert of Mecklenburg, and opened negotiations with Margaret; and as Albert always had shown himself very hostile to her, she sent her general, Ivar Lykku, into Sweden with an army. On Feb. 24, 1389, the combined Danish-Swedish army defeated Albert's German mercenaries at Falköping. The king himself was captured, and detained in prison for seven years, and after a short struggle with his party Margaret was acknowledged queen-regnant also of Sweden. She combined in her person a high degree of womanly fascination with a rare force of character. She was courageous, but she was also shrewd, and in her political actions she was led probably less by personal ambition than by plans of far-seeing statesmanship. On July 20, 1397, she promulgated an act of union between the three Scandinavian kingdoms, the so-called Calmar Union, drawn up and agreed upon by emissaries from all three countries; and this act shows that her idea was not to get possession of as much land as possible, but to form a powerful Northern empire. During her lifetime her plan succeeded,

in spite of the jealousies of the three peoples, but her successor, Eric of Pomerania, was a miserable person, and soon after her death (Oct. 28, 1412) the Calmar Union became the source of many calamities to the three Scandinavian countries.

Margaret of Parma, b. in 1522 at Brussels, a daughter of Charles V. by Margaret van der Gunt; was educated at the court of Mary, queen-dowager of Hungary, whom she somewhat resembled. She was first married in 1536 to Alessandro of Medici, duke of Florence, who was assassinated in the following year, and then in 1542 to Ottavio Farnese, duke of Parma and Piacenza, to whom she bore a son, the celebrated general, Alexander Farnese. She was rather masculine in her appearance, and liked to dress in man's costume. She had a moustache, rode on horseback astride, was fond of hunting and strong wine, and suffered from gout. But with a peremptory and somewhat imperious character she connected an honest and benevolent disposition, great shrewdness in judging character, and much adroitness in handling political affairs. In 1559, Philip II. made her regent of the Netherlands, which position she filled for eight years, but it was impossible for her, as it would have been for any person, to reconcile the principles of Philip II. and the instincts of the Dutch. In 1567 she retired to Italy, richly endowed by the king, and not unregretted by the people. D. at Ortona in 1586. A fine delineation of her character and history is found in Prescott's *Philip II.*

Mar'garetsville, a port of entry of Annapolis co., Nova Scotia, on the Bay of Fundy, exports fish, agricultural products, and firewood to the U. S. It has a lighthouse. Pop. about 300.

Margaret'ta, tp. of Erie co., O., on the S. shore of Sandusky Bay. Pop. 1622.

Mar'garetville, post-v. of Delaware co., N. Y., 23 miles from Delhi, 45 miles from Kingston, and 1¼ miles from the Ulster and Delaware R. R. It has 2 churches, 1 weekly newspaper, 6 stores, 2 hotels, 1 tannery, a large cooperage, a foundry, a carriage manufactory, and the various industries are well represented. Pop. about 384.

H. T. Becker, Ed. "Utilitarian."

Margar'ic Acid and **Margarine.** By the action of potash on cyanide of cetyl (margaronitrile) there is produced, besides cetylic ether, cetylic aldehyde, ammonia, and other products, a potassic salt of an acid which has the composition $HC_{17}H_{33}O_2$, intermediate between palmitic acid, $HC_{16}H_{31}O_2$, and stearic acid, $HC_{18}H_{35}O_2$. This acid exhibits all the properties of a pure fatty acid. It melts at 59.9° C., and cannot be resolved into acids differing in melting-point. This is the only process by which margaric acid can be prepared. The acids obtained from natural oils and fats by saponification, to which the name and formula of margaric acid were applied, were mixtures of stearic acid with palmitic acid or other acids of lower melting-point. Margarine, the tri-margarate of propenyl, the glyceride of margaric acid, which would be the neutral fat of this acid, has not been prepared. (For further information with regard to margaric acid see Heintz, *Pogg. Ann.*, cii. 272.) The so-called margaric acid and margarine of natural fats were announced by Chevreul in 1820, though he was not then fully satisfied that the acid was not a mixture of stearic acid with some acid of lower melting-point. Many other chemists announced the discovery of margaric in natural fats and their products: Varrentrapp in human fat and in the products of the dry distillation of beef-suet, lard, olive oil, etc.; Gottlieb in goose-fat; Thomson and Wood in shea-butter; Bromeis in the products of oxidation of stearic acid and by the action of nitric acid on oleic acid; Ridtenbacher in the products of the dry distillation of stearic acid; Anderson in the products of the dry distillation of almond oil with sulphur; Poleck, Lewy, and others among the products of the saponification or dry distillation of wax. Heintz in 1852 and subsequent years published the results of investigations on this acid, which have shown that none of the acids derived from natural fats or oils are the true margaric acid, but simply mixtures of stearic, palmitic, and other acids. (See Watts's *Dict.*, iii. 851.) C. F. Chandler.

Margari'ta, an island in the Caribbean Sea, belonging to Venezuela. Area, 441 square miles. Pop. 20,206. It is high, with a hot but healthy climate, and produces rice, fruits, poultry, and salt, and has important fisheries along its coasts. It was discovered by Columbus in 1498, and in the sixteenth century it was very famous for its pearl fisheries, from which it received its name, the Latin word *margarita* signifying a "pearl." These, however, lost their importance in the seventeenth century, and have now ceased altogether.

Mar'garite [Gr. μαργαρίτης, "pearl"], or **Pearl Mica,** a beautiful mineral crystallizing in the trimetric system, with micaceous cleavage and a pearly lustre, consisting essentially of a silicate of alumina and lime. It is generally found associated with deposits of corundum and emery, as at Chester, Mass.

Mar'gate, a seaport town of England, on the Isle of Thanet, Kent co., England. Its fisheries are important, but it is best known as a fashionable watering-place, much frequented during the summer. Pop. 12,054.

Margay', the *Felis tigrinus*, a handsome little tiger-cat of tropical America. When taken young it may be domesticated, and is highly prized as a destroyer of rats. *F. tigrinoides*, a similar species, is called the false margay.

Margoliouth (Moses), Ph. D., LL.D., b. in London, England, Dec. 3, 1820, of Jewish parents; was converted to Christianity in youth; studied at Trinity College, Dublin; took orders in the Church of England 1844, and after holding benefices in Liverpool, Glasnevin, and Kildare, became assistant minister of St. Paul's, Onslow Square, Kensington. He has written much upon the religious prospects of the Jewish race, contributed to Cassell's *Bible Dictionary*, wrote a *History of the Jews* (12 vols.), *Rabbinical Hermeneutics of the Old Testament* (2 vols.), and executed a revision of the authorized translation of the Old Testament.

Marhei'neke (Philipp Konrad), b. May 1, 1780, at Hildesheim, in Hanover; studied at Göttingen, and became professor of theology in 1806 at Erlangen, in 1809 at Heidelberg, in 1811 at Berlin, where he was also appointed pastor of Trinity church, and where he d. May 31, 1846. One of his principal works is his *Grundlinien der christlichen Dogmatik*, of which the first edition (1819) is based on the philosophy of Schelling, the second (1827) on that of Hegel. The attempt to mediate a full harmony between the data of science and the doctrines of Christianity by raising both into a higher, ideal, speculative sphere, the sphere of truth, is here undertaken with great ingenuity, but the enthusiasm with which the book was received has now waned, and the standpoint from which Marheineke wrote his philosophical works, and even his sermons, has been given up as barren. His *Geschichte der Deutschen Reformation* (4 vols., 1816–34) is of lasting worth.

Mari'a Christi'na, b. at Naples Apr. 27, 1806, a daughter of Francis I., king of the Two Sicilies, was married, Dec. 11, 1829, to Ferdinand VII., king of Spain, his fourth wife. On Mar. 29, 1830, when the queen declared herself pregnant, the king abolished the Salic law of inheritance, to which the Bourbons had conformed, and according to which only the male members of the family could inherit the throne, and reintroduced, by a pragmatic sanction, the old Castilian law, according to which the crown could be inherited also by females. On Oct. 10, 1830, the queen bore a daughter, Isabella (afterwards Queen Isabella II.), and immediately the court and the country became divided into two parties, the Carlists and the Christinos, the former headed by Don Carlos, brother to the king, heir-presumptive to the throne according to the Salic law, and supported by the Ultramontane clergy and the absolutists—the latter headed by Maria Christina, vindicating the throne for her daughter according to the pragmatic sanction, and supported by the liberals. On the death of the king (Sept. 29, 1833) the two parties took up arms, and a civil war commenced which lasted till 1840, devastating the country and demoralizing the people. Meanwhile, Maria Christina, who was appointed regent during the minority of Isabella II., soon lost the popularity she had gained by her alliance with the liberals. She was intrinsically indifferent in political matters, but her instincts were absolutist rather than constitutional. Her subserviency to the policy of Louis Philippe placed her in opposition to the progressists or radicals, who found much sympathy in England; and her personal relations gave general scandal; she bore ten children to one Fernando Muñoz, a member of her body-guard, created duke of Rianzares, to whom she was not publicly married until Oct. 13, 1844. On Oct. 12, 1840, she was compelled to abdicate the regency to Espartero and leave the country. She resided for some years in Paris, but returned after the fall of Espartero in 1844 to Spain, and although Isabella II. had been declared of age in 1843, Maria continued to meddle with the government, until she was once more expelled in 1854. For ten years she lived in France, Italy, and England, returned in 1864 to Spain, from whence, by the revolution which dethroned Queen Isabella, she was again expelled in 1868.

Maria Louisa, b. Mar. 12, 1791, a daughter of the emperor Francis I. of Austria; was married Apr. 2, 1810, at Paris, to Napoleon I., who had obtained a divorce from his wife, the empress Josephine, for the sake of this connection with Austria, and bore him a son Mar. 20, 1811. During the campaigns of 1812 and 1813 she was appointed

regent, and her actions under the difficult circumstances were marked by ability and dignity. She was not allowed to follow her husband when he abdicated and went to Elba. She took up her residence in Schönbrunn, near Vienna, where she remained also during the Hundred Days. By the Peace of Paris, Parma, Piacenza, and Guastalla were given to her, and she governed them quietly for more than thirty years. After the death of Napoleon she contracted a marriage with Count Niepperg, to whom she bore several children. D. at Vienna Dec. 18, 1847.

Maria'na (Juan), b. at Talavera, Spain, in 1536; educated at the University of Alcala; joined the Society of Jesus at an early age; became professor of theology in the Jesuit college at Rome in 1561; was afterward a lecturer on divinity in Sicily and in Paris; settled at Toledo; wrote a treatise, *De Rege et Regis Institutione* (1599), which was burned by the hangman in Paris on account of its justification of tyrannicide; published various works on theological and political topics, and a *History of Spain* (1592–1609), translated into English by Steevens (1699). D. at Toledo Feb. 6, 1623.

Marian'na, city of Brazil, in the province of Minas Geraes, was originally founded by gold-miners, and was a busy and even noisy place. Since the mines ceased to be worked the town has greatly declined, and it now derives its sole importance from being the seat of a bishop and some educational institutions. Pop. about 7000.

Marianna, post-v., cap. of Jackson co., Fla., 60 miles N. W. of Tallahassee. It has 2 academies, 4 churches, 1 newspaper, and 1 hotel. Principal business, farming. Pop. 663. Geo. A. Baltzell, Ed. "Marianna Courier."

Marianne Islands. See Ladrones.

Mari'a There'sa, b. at Vienna May 13, 1717, a daughter of the emperor Charles VI.; was declared sole heir of all the possessions of the house of Hapsburg by the Pragmatic Sanction (which see), and married (Feb. 12, 1736) to Francis Stephen, grand duke of Tuscany. On the death of her father (Oct. 20, 1740) she ascended the throne, and on Nov. 21 in the same year appointed her husband co-regent, but in spite of the Pragmatic Sanction claims to various parts of her inheritance were raised immediately from different sides, a formidable alliance was formed against her between Spain, France, Bavaria, Saxony, and Prussia, and the Austrian War of Succession (which see) was opened by the invasion of Silesia by Frederick II. The heroic resoluteness of the young empress, however, and the chivalrous enthusiasm of the Hungarian people, saved her crown, and by the Peace of Aix-la-Chapelle (Oct. 18, 1748) she lost only Parma and Piacenza to Spain and Silesia to Prussia, while her husband was recognized as emperor of Germany. But the loss of Silesia she could never forget. In 1753, Prince Kaunitz, in whom the empress soon learnt to put entire confidence, became Austrian chancellor, and he succeeded in forming an alliance between Austria, France, Saxony, and Russia for the humiliation of Prussia. Maria Theresa even stooped so far, in order to get revenge on Frederick II., as to write a letter to Madame de Pompadour and address her as "My dear cousin." But the Seven Years' War (which see), although conducted by Austria with great vigor and some success, brought no result; the Peace of Hubertsburg (Feb. 15, 1763) left Silesia a Prussian possession. On Aug. 18, 1765, the emperor Francis I. died, and Maria Theresa now took her eldest son, Joseph, as co-regent. His policy was decidedly one of aggrandizement, and it was probably due to his influence that she participated, though not until she received the consent of the pope, in the first partition of Poland (Aug. 5, 1772), which brought Galicia and Ludomeria under the Austrian dominion. Turkey was compelled to cede Bukowina (Feb. 25, 1777), but the plan of annexing Bavaria was foiled, and the Austrian influence in Germany received a severe check by the formation of the so-called *Fürstenbund* under the auspices of Frederick II. In the interior her government was successful, and marked with great energy and wisdom. The finances, the weakest point in the Austrian household, were improved by the emperor and Count Haugwitz. The army, an ineffective and disorderly mob, was organized and strengthened by Joseph and Count Lasey. Servitude and torture were abolished, a number of schools of different grades established, and a better criminal code was introduced; which improvements were partly due to the exertions of Van Swieten. Although she was herself a pious Catholic, and not disposed to be indulgent to her Protestant subjects, she had an open eye for the infamous abuses of the Roman Church, and stopped them at many points. She forbade the priests to be present at the making of wills, and any person, male or female, to take monastic vows before their twenty-fifth year, and in 1773 she expelled the Jesuits. D. at Vienna Nov. 29, 1780, leaving four sons, of whom the eldest, Joseph II., succeeded her, and six daughters, of whom the next to the youngest was Marie Antoinette.

Mari'aville, tp. of Hancock co., Me., 12 miles N. of Ellsworth. Pop. 369.

Marico'pa, county of Arizona, bounded E. by New Mexico and S. by the Gila River. Estimated area, 14,500 square miles. It contains gold and silver mines, and lands which when irrigated are productive. It is in part mountainous. Cap. Phœnix. Constituted since the census of 1870.

Marico'pas, or **Coco-Maricopas,** an Indian tribe of Arizona belonging to the Pueblo family, living with the Pimos upon a joint reservation of 100 square miles extending on both sides of the Gila River, about 150 miles above its mouth. Their language is very different from that of the Pimos, but otherwise the Maricopas have all the characteristics of close affinity to them, as well as to the Pueblo Indians of New Mexico, all being probably descended from the ancient people of the rock-habitations in the Colorado Valley. They are semi-civilized, agricultural, and pacific, living in comfortable huts, employing artificial irrigation, spinning and weaving cotton, making pottery, and plaiting baskets. Their language resembles that of the Yumas. They occupy two villages, are rapidly decreasing, and number little more than 300 souls.

Marico'pa Wells, post-v. of Pima co., Ara., 105 miles N. W. of Tucson.

Marie' Antoinette', the fifth daughter of Maria Theresa and Francis I., b. at Vienna Nov. 2, 1755, and married at Versailles May 16, 1770, to the dauphin (afterwards Louis XVI.), to whom she bore four children, of whom two died in infancy; the other two were Louis XVII. and the duchess of Angoulême. Her position at the French court was difficult from the very first, and it soon became dangerous. There was a difference of character between her and the people among which she had come to live which proved fatal in the end. Her morals were perfectly pure and her heart full of noble and generous instincts. But she felt a haughty independence of etiquette, ceremonies, public opinion, etc., and in her character gay levity and impulsive caprices were singularly mixed up with innocence, virtue, and elevated purposes. At the French court every vice was committed, but none was shown; an elegant hypocrisy covered the rottenness. But it was evident that such a character under such circumstances could not escape slander and intrigue, and after the affair of the "diamond necklace" (see Lamotte, Countess de) in 1785 the young queen was completely overwhelmed and ruined by them. The indolence of her husband and the desperateness of affairs compelled her to meddle with politics, for which she had no interest and no ambition. And again the character of her husband prevented him from following her influence, the result of which circumstance was a series of half measures which became blunders, and of violence which ended in weak submission. At the outbreak of the Revolution she was actually hated by the French people, and after the unfortunate attempt at flight (June 21, 1791) her doom was certain. But her character developed with the situation, and under the horrors which surrounded her she grew heroic. Although broken both in body and mind, when placed after a long imprisonment before the Revolutionary Tribunal (Oct. 13, 1793) she flung back the accusation of having seduced her own son with an indignation which made every heart in the room tremble; and during the two hours' ride to the scaffold on Oct. 16, between rows of stern soldiers and under the execrations of a furious mob, she preserved her dignity to the last. (See *Mémoires*, by Weber (1822), Lafont d'Ausonne (1824), Mde. Campan (1826), and *Histoire*, by Goncourt (1859).)

Marie de Médicis, b. at Florence Apr. 26, 1573, a daughter of Francis I., grand duke of Tuscany; was married Dec. 16, 1600, to Henry IV., king of France, to whom she bore in the next year a son, afterwards Louis XIII. She was beautiful, passionate, ambitious, but singularly low and mean; Henry always avoided her, and she was not crowned until the day before his assassination (May 13, 1610). From this time she conducted the government together with her favorites, the Concinis, till the conspiracy of De Luynes (Apr. 14, 1617), after which she was confined in the castle of Blois. On the death of De Luynes (Dec. 14, 1621) she returned to the court and took her place in the king's council, having been reconciled to him by Richelieu; but, jealous of the growing power of the new minister, she began intriguing against him, too, and was sent once more from the court in 1630, and confined in the castle of Compiègne. Thence she escaped, wandered several years in England and the Netherlands, dying at Cologne July 3, 1642, in miserable circumstances.

Marie' Galante', one of the Lesser Antilles, in the West Indies, belonging to France. Area, 60 square miles.

Pop. 12,456. It is high, with steep coasts, and surrounded with coral reefs. The soil is fertile, but adapted only to the cultivation of coffee and cotton; rain-water must be gathered in large cisterns. Principal town, Basseterre.

Mari'enbad, small town of Bohemia, picturesquely situated among wooded hills at an elevation of 2200 feet, and much frequented as a watering-place and on account of its saline springs. Pop. about 1000.

Mari'enberg, town of Germany, in the kingdom of Saxony, manufactures linen, lace, and straw-plaiting, and has rich copper and iron mines in its vicinity. Pop. 5175.

Mari'enburg, town of Prussia, 27 miles S. E. of Dantzic. Its castle, a magnificent and imposing edifice of Gothic architecture, was erected from 1276 to 1341 by the knights of the Teutonic order, whose grand masters resided here for several centuries. Pop. 8235.

Mari'enwerder, city of Prussia, the capital of the province of West Prussia, at the confluence of the Vistula and the Nogat. It is a handsome city, with many fine buildings, among which is the cathedral from the thirteenth century, and the castle built by the knights of the Teutonic order in the fourteenth century. It has many benevolent and educational institutions, and some manufactures. Pop. 7172.

Marienzell', or **Mariazell,** a v. of Austria, in the province of Styria, has a handsome church with a celebrated picture of the Holy Virgin, annually visited by more than 100,000 pilgrims. Pop. 900.

Ma'ries, county of S. Central Missouri. Area, 480 square miles. It is rough and heavily wooded, with fertile valleys. Iron, copper, and lead ores exist in the hills. The county is traversed by the Gasconade River. Grain is cultivated. Cap. Vienna. Pop. 5916.

Marie' Saline', tp. of Ashley co., Ark. Pop. 450.

Mariet'ta, post-v., cap. of Cobb co., Ga., 2 miles from Kenesaw Mountain, on the Western and Atlantic R. R., 20 miles N. of Atlanta, has 4 churches, 1 female college, 1 male academy, 1 newspaper, 1 savings bank, several large steam-mills, 1 paper-mill, several factories, 1 hotel, and stores. Pop. 1888. NEAL & MASSEY, EDS. "JOURNAL."

Marietta, post-v. of Morris tp., Fulton co., Ill., on the Toledo Peoria and Warsaw R. R. Pop. 110.

Marietta, post-tp. of Marshall co., Ia. Pop. 1005.

Marietta, city and tp., cap. of Washington co., O., on the Ohio River at the mouth of the Muskingum River, and the terminus of the Marietta and Cincinnati and the Marietta Pittsburg and Cleveland R. Rs., 180 miles from Pittsburg, 300 from Cincinnati by water, 115 miles from Columbus, and 175 miles from Cleveland by rail, has 3 newspapers, art-galleries, fine city-hall, 15 churches, a children's home, fine public-school buildings, one of the leading colleges of the West, with a library, 4 banks, 1 large rolling-mill, 3 flouring, 3 planing, and 2 saw mills, 2 carriage and hub factories, a large bucket-factory, 1 extensive chair-factory, lockworks, 5 machine-shops, 3 hollow-ware foundries, 6 tanneries, 1 glue-factory, 2 breweries, 1 boatyard, 1 woollen-mill, 1 spike-mill, car-shops, and 5 oil-refineries. It is in the great oil-region of Ohio and West Virginia, and within a few miles of rich iron and coal deposits. Pop. of city, 5218; of tp., exclusive of city, 2697.
E. R. ALDERMAN, ED. "REGISTER."

Marietta, post-b. of Lancaster co., Pa., on the Susquehanna River, the Pennsylvania Central R. R., and the Pennsylvania Canal, 25 miles E. of Harrisburg and 81 miles W. of Philadelphia, has five furnaces, 1 rolling-mill, 1 foundry and machine-shop, 1 large hollow-ware and enamelling works, 3 saw and planing mills, 5 lumber-yards, 2 banks, a new town-hall, a new market-house, hotels, stores, and 1 weekly newspaper. It is the Eastern market for all the timber and lumber brought down the river, and during the lumber season most of the men are engaged as pilots on the river from here to Port Deposit. Pop. 2397. PERCY P. SCHOCK, ED. "REGISTER."

Marietta, post-tp. of Crawford co., Wis. Pop. 452.

Marietta College, Marietta, O., was chartered in 1835, and its first class was graduated in 1838. The first faculty were all graduates of New England colleges, and in its course of study and general arrangements the college has adhered to the New England type. No aid has been received from the State, but the institution has been wholly sustained by private liberality. The citizens of Marietta have given largely and frequently. The largest donor is Douglas Putnam, Esq., of Marietta, who has given $46,000, and has pledged $50,000 additional. Col. John Mills has given about $25,000. These two gentlemen have been trustees from the founding of the college. Many others have given in sums of $5000 and upward. The apparatus connected with the department of physics and chemistry has been recently largely increased. The college cabinet contains over 16,000 specimens of minerals, shells, etc.; besides which there is the valuable cabinet of the late Dr. S. P. Hildreth, which, with some 500 volumes, he gave to the college some years since. The number of volumes in the college and society libraries is 25,000. A building for the various libraries has just been erected by the alumni of the college. The whole number of instructors is eight, of whom one-half are graduates of the college, and the others are from Williams, Amherst, Yale, and Princeton. The presidents have been Rev. Joel H. Linsley, D. D., from 1835 to 1846; Rev. Henry Smith, D. D., from 1846 to 1855; Rev. Israel W. Andrews, D. D., from 1855 to the present time. ISRAEL W. ANDREWS.

Mariette' (AUGUSTE ÉDOUARD), known as MARIETTE BEY, b. at Boulogne-sur-Mer Feb. 11, 1821; studied in the college of Boulogne, in which he became an instructor; was early a student of archæology; entered the Egyptian museum at the Louvre 1848; was sent in 1850 on a scientific mission to Egypt; was afterwards made inspector-general and keeper of the national monuments in Egypt, and keeper of the museum at Boulak. He has made many important archæological discoveries, and has published several volumes and reports relating to his labor in Egypt.

Marie'ville, post-v., cap. of Rouville co., Quebec, Canada, has a large trade in produce, and is in a good agricultural region. Pop. about 900.

Mariglia'no, town of Southern Italy, in the province of Caserta, near Nola. It is a walled town, and has a castle with towers, moat, drawbridge, etc. Its one fine church contains some good pictures. This town suffered severely from an eruption of Vesuvius in 1631, and again in 1793. Pop. in 1874, 10,215.

Mar'igold, a popular name for various yellow-flowered plants, but especially for those of the genera *Tagetes* and *Calendula,* of the order Compositæ. The so-called African and French marigolds are of the first-mentioned genus. Both are South American. The true marigold (*Calendula officinalis*), indigenous to the S. of Europe, has long been cultivated in gardens, and is prized in domestic medicine. It is sometimes employed in flavoring soups.

Maril'la, post-tp. of Manistee co., Mich. Pop. 129.

Marilla, post-v. and tp. of Erie co., N. Y., 9 miles S. of Alden R. R. Station. Pop. of v. 250; of tp. 1804.

Marin', county of California, bounded W. by the Pacific Ocean and E. by San Pablo Bay. It is mountainous and hilly, with very fertile valleys. Cattle, wool, dairy products, grain, and hay are important staples. The manufactures include paper and bricks. Area, 500 square miles. Cap. San Rafael. Pop. 6903.

Mari'na, or **Malintzin,** b. about 1505, daughter of a Mexican chief; in childhood sold into slavery; became acquainted with the Mexican and Spanish languages, and as interpreter was of great assistance to Cortez, by whom she had a son who was prominent in the colonial history; married a Spanish officer, whom she survived; d. at Jalpan, Tehuantepec, where her burial-place is still shown. (See Prescott's *Conquest of Mexico*, bk. ii.)

Marine', post-v. of Madison co., Ill., 8 miles N. E. of Troy. Pop. 858.

Marine, tp. of Washington co., Minn. Pop. 1698.

Marine City, post-v. of Cottrellville tp., St. Clair co., Mich. on the St. Clair River, 7 miles below St. Clair, and opposite Sombra, Canada, with which it is connected by ferry. It has an active trade. Pop. 1240.

Marine Glue. See GLUE, MARINE, and INDIA-RUBBER.

Marine Insurance. See INSURANCE, by T. WILDER MAY.

Marine Mills, post-v. of Washington co., Minn., in Marine tp., on the St. Croix River, 12 miles N. of Stillwater. Lumber is manufactured.

Marine'o, town of Sicily, in the province of Palermo, in a grain, vine, and olive-bearing district, about 15 miles S. of the city of Palermo. In a little country church near Marineo are some very fine frescoes of the fourteenth century. Ficuzza, an old feudal seat and a favorite summer retreat of Ferdinand III., is in this neighborhood. Pop. in 1872, 8991.

Mariner's Compass. See COMPASS.

Marines, U. S. Corps of. Considered in the light of infantry serving afloat, marines are, as a distinct corps, coeval with navies. Among the Greeks they were known as *epibatæ*, a class described by historians as the fighting men who served exclusively on board ships of war. Though armed like the infantry on shore, they were yet distinct from the land troops, and entirely unlike the rowers or mariners who served in the fleet. The number of epibatæ

assigned to each vessel bore about the same proportion to the crew as the number of marines to the crew of a modern man-of-war. In the Roman navy marines were styled *classiarii milites*. In the early history of the English navy we read of men-at-arms still serving afloat, their armor and weapons differing but little from those of the ancients. The Scandinavians called them *båt-karler* or sea-soldiers —that is, carls, or sturdy fellows, who fought in boats. Later they were called *supra-salientes*, a word still preserved in the Spanish *sobresaliente*. The Genoese cross-bowmen, the best marines of the period, were in the thirteenth century employed, and very highly esteemed, in the English navy. In Aug., 1387, Sir Henry Percy ("Gunpowder Percy") was appointed "captain of all the men-at-arms and archers of the fleet." He was, in fact, commandant of marines.

With the introduction and gradual increase of naval ordnance the occupation of men-at-arms afloat passed away. The earliest employment of marines under their present form was in 1653, when Admiral Blake embarked a number of soldiers to act as small-arms men (Schomberg's *Chronology*, vol. i. p. 51) in the battle with Von Tromp off Portland. Subsequently, in 1664, troops from the line were detailed for service afloat, and came to be called *marine soldiers* or *marines*. (Grose's *Military Antiquities of the English Army*.) For good conduct in battle, but more particularly for steadfast loyalty during the great mutinies in the fleet at the Nore and at Spithead, they were, in general orders dated Apr. 20, 1802, styled "royal marines."

Much has been written by English naval officers in favor of marines, and since their permanent organization serious difficulties have almost invariably followed the attempts to substitute for them land-troops. (See McArthur on *Military and Naval Courts-martial*, Appen., vol. i. pp. 421, etc.; also Ekin's *Naval Battles*, p. 162. For an able discussion on the value of the modern royal marine see *Journal of the Royal United Service Institution*, vol. xv. p. 486, Apr. 24, 1871, paper by Gen. Schomberg, R. M. A.)

The U. S. marine corps was first established by the act of Congress of Nov. 10, 1775, authorizing the enlistment of two battalions, to be styled "first and second battalions of marines." After the adoption of the present Constitution and the reconstruction of the navy, the marine corps was again called into existence by the act of July 11, 1798, "establishing and organizing a marine corps." By this act the marine corps is at any time liable to do duty in the forts and garrisons of the U. S. on the sea-coast or any other duty on shore, as the President may direct. The act of June 6, 1874, directs that on the vacating of present incumbent, who enjoys the rank of brigadier-general, the commandant of the corps shall have the rank and pay of colonel. Marines, while enlisted, are exempt from arrest for debt or contract. The corps has no regimental organization, but it "may be formed into as many companies or detachments as the President may direct." The marines are at all times subject to the laws and regulations of the navy, except when detached by order of the President for service with the army, when they are subject to the Articles of War prescribed for the army (act of July 11, 1798, and June 30, 1834). The corps, though much in the same condition that it was in 1798, is considered an indispensable auxiliary to the navy. It has no organization in a military point of view except as stated above. Young gentlemen destitute of military education are commissioned as officers in the line of promotion, and sent to headquarters for a few months' instruction in infantry tactics. The legal strength of the corps is by the act of July, 1861, 3074 enlisted men, but the naval appropriation of 1875 practically reduced the effective force to 1500 privates.

S. B. LUCE.

Marinette′, post-v. and tp. of Oconto co., Wis., on the Chicago and North-western R. R., 50 miles N. of Green Bay, at the mouth of Menominee River, has 4 churches, 1 newspaper, 5 large steam saw-mills, 2 planing-mills, iron-works, 1 bank, 2 large hotels, and a number of stores. Principal business, lumbering. Pop. 1334.

ED. "MARINETTE EAGLE."

Mari′ni (GIOVANNI BATTISTA), b. at Naples Oct. 18, 1569; devoted himself to poetry under the influence and encouragement of Torquato Tasso; lived in Rome, Turin, and France, where Marie de Médicis gave him a pension; returned to Italy in 1622, and d. at Naples Mar. 25, 1625. His principal work is *Adone* (1623), a heroic poem, much admired, but marred by numerous licentious descriptions. Many of his sonnets are among the most beautiful in Italian literature, and he became the head of a literary school, the Marinists, which enjoyed a great reputation in the seventeenth century, but is now generally depreciated on account of its florid mannerism.

Mari′no, town of Italy, in the province of Rome, beautifully situated on a slope of the Alban Hills, about 13 miles S. E. of the city of Rome. The walls and towers of this town present a very picturesque appearance; its streets and squares are broad, and the public buildings, especially the churches, are well worthy of notice, both for their external architecture and their interior decorations, the latter often by the hand of renowned artists. It was formerly supposed to be the ancient *Castrimœnium*, though modern archæologists dispute it. In 1347 it was the scene of a conflict between Rienzi and the great Orsini family, after which it was for a long time in the hands of the Colonna, who still have large possessions here. There is more manufacturing industry in this place than is usual in this part of Italy. Marino was the birthplace of the celebrated Victoria Colonna, also of the poetess Maria Domenica Fumazoni, who is said to have first wrought asbestos into tissues. Pop. in 1874, 6509.

Mari′o (GIUSEPPE), MARQUIS DI CANDIA, b. at Cagliari, Sardinia, Oct. 18, 1810; served for some time in the Sardinian army, from which he resigned, and, upon his resignation not being accepted, succeeded in escaping to Paris. Having received a fine musical education, and possessing an admirable tenor voice, which he further improved by two years' study in Paris, he accepted an engagement in opera, and made his *début*, under the assumed name of Mario, in *Robert le Diable*. He soon became the acknowledged leading tenor, and was a great favorite in England and on the Continent. He married Giulia Grisi, by whom he had several children. In 1854, in company with Grisi, he fulfilled a successful operatic engagement in the principal cities of the U. S. In 1871 he retired from the stage in London, but in 1872 appeared in concert in the U. S. with poor success, his voice having lost its beauty.

Mario′latry. See MARY, THE BLESSED VIRGIN.

Ma′rion, county of Alabama, bounded W. by Mississippi. Area, 720 square miles. It is uneven and generally fertile. Corn and cotton are produced. Cap. Pikeville. Pop. 6059.

Marion, county of Arkansas, bounded N. by Missouri. Area, 810 square miles. It is traversed by the White River. It is in the Ozark Mountains, and is covered with high wooded and grassy ridges. Lead and rich yellow marble are found. The county is adapted to grain and tobacco culture and cattle-raising. Cap. Yellville. Pop. 3979.

Marion, county of Florida, extending W. from Lake George, an expansion of St. John's River. Area, 1760 square miles. Its soil is generally productive. Cotton, corn, oranges, and tropical fruits are produced. The county contains much fine timber, and is traversed by the navigable Ocklawaha River. The Withlacoochee washes its S. W. border. Cap. Ocala. Pop. 10,804.

Marion, county of W. Georgia. Area, 500 square miles. It is level, heavily wooded, and has a good soil. Corn and cotton are staple products. Cap. Buena Vista. Pop. 8000.

Marion, county of S. Central Illinois. Area, 576 square miles. It is a level prairie region, adapted to corn and wheat culture. Cattle, grain, and wool are leading products. Carriages, flour, and harnesses are the chief manufactures. The county is traversed by the Ohio and Mississippi and the Illinois Central R. Rs. Cap. Salem. Pop. 20,622.

Marion, county of Central Indiana. Area, 420 square miles. It is generally level, but hilly to the northward. The soil is very productive. The manufacturing interests are very important. INDIANAPOLIS (which see) is the chief manufacturing, commercial, and railroad centre in the county. Cattle, grain, wool, and hay are leading products. Cap. Indianapolis. Pop. 71,939.

Marion, county of S. Central Iowa. Area, 576 square miles. Its surface is varied, with a very fertile soil. Coal and iron are found, the former abundantly. The county is traversed by the Desmoines River and the Desmoines Valley R. R. Cattle, grain, and wool are leading products. Cap. Knoxville. Pop. 24,436.

Marion, county of E. Central Kansas. Area, 1044 square miles. It is traversed by the Cottonwood River and its branches, which afford abundant water-power. The soil is good, and adapted to grain and cattle-raising. The county is crossed by the Atchison Topeka and Santa Fé R. R. Cap. Marion Centre. Pop. 768; it has largely increased since the census.

Marion, county of Central Kentucky. Area, 335 square miles. It is diversified and very fertile. Live-stock, grain, tobacco, and wool are extensively produced. It is traversed by affluents of Salt River, and by the Knoxville

branch of the Louisville and Nashville R. R. Cap. Lebanon. Pop. 12,838.

Marion, county of Mississippi, partly bounded on the S. and W. by Louisiana. Area, 1530 square miles. It is intersected by Pearl River, is level, sandy, and has extensive pine forests. Rice, corn, and cotton are produced. Cap. Columbia. Pop. 4211.

Marion, county of N. E. Missouri, bounded E. by the Mississippi River. Area, 450 square miles. It is a fertile rolling or hilly region, with heavily timbered valleys. Cattle, wool, grain, and tobacco are staple products. Carriages and wagons are leading articles of manufacture. The county is traversed by the Hannibal and St. Joseph R. R. Cap. Palmyra. Pop. 23,780.

Marion, county of N. W. Central Ohio. Area, 360 square miles. It is level and fertile. Cattle, grain, and wool are leading products. Carriages and lumber are important articles of manufacture. The county is traversed by the Atlantic and Great Western and the Bee-line R. R. Cap. Marion. Pop. 16,184.

Marion, county of Oregon, extending from the Cascade Range W. to the navigable Willamette River. Area, about 2000 square miles. The W. part is very fertile. Cattle, wool, wheat, and oats are staple products. The E. part is rough and heavily timbered. The county is traversed by the California and Oregon R. R. Cap. Salem. Pop. 9965.

Marion, county of E. South Carolina, bounded N. E. by North Carolina. Area, 1110 square miles. It is bounded S. E. by the Little Pedee River and S. W. by Lynch's Creek. It is level, with a light, productive soil. Cotton, rice, corn, and live-stock are the staples. The county is traversed by the Great Pedee River and by the Wilmington and Manchester R. R. Cap. Marion Court-house. Pop. 22,160.

Marion, county of Tennessee, bounded S. E. by Tennessee River and S. by Alabama. Area, 750 square miles. It is partly occupied by the Cumberland Mountains, and abounds in valuable coal-mines. The Sequatchie River traverses the county, flowing in a deep cañon-like valley. Live-stock, corn, and tobacco are the agricultural staples. Cap. Jasper. Pop. 6841.

Marion, county of N. E. Texas, bounded E. by Louisiana and S. by Big Cypress Bayou and the Caddo lakes. Area, 320 square miles. The county is well timbered, and abounds in good iron ore and other minerals of value. The bottom-lands are very rich. Cotton, tobacco, grain, and live-stock are produced. Jefferson, the capital, is the seat of an extensive trade. The county is traversed by the Texas and Pacific and the International and Great Northern R. Rs. Pop. 8562.

Marion, county of N. West Virginia. Area, 275 square miles. Most of the county is rolling and very fertile. Bituminous coal, iron ore, and glass-sand abound. Live-stock and grain are leading products. The county is traversed by the Monongahela River and the Baltimore and Ohio R. R. Cap. Fairmount. Pop. 12,107.

Marion, post-v., cap. of Perry co., Ala., on the Selma Marion and Memphis R. R., has 2 colleges, 2 female seminaries, 8 churches, 2 banks, 4 newspapers, 2 mills, 1 carriage-factory, railroad repair-shops, 2 hotels. Principal business, planting. Pop. 2646. M. T. Sumner.

Marion, tp. of Bradley co., Ark. Pop. 248.

Marion, post-v., cap. of Crittenden co., Ark, 8 miles N. W. of Memphis, Tenn.

Marion, tp. of Drew co., Ark. Pop. 2100.

Marion, tp. of Lawrence co., Ark. Pop. 440.

Marion, tp. of Ouachita co., Ark. Pop. 643.

Marion, tp. of Phillips co., Ark. Pop. 735.

Marion, tp. of Sebastian co., Ark. Pop. 1315.

Marion, tp. of White co., Ark. Pop. 382.

Marion, tp. of Lee co., Ill. Pop. 747.

Marion, tp. of Ogle co., Ill. Pop. 1030.

Marion, post-v., cap. of Williamson co., Ill., on the Carbondale and Shawneetown R. R., has 3 weekly newspapers.

Marion, tp. of Allen co., Ind. Pop. 1319.

Marion, tp. of Boone co., Ind. Pop. 1786.

Marion, tp. of Decatur co., Ind. Pop. 2315.

Marion, post-v., cap. of Grant co., Ind., on the Pittsburg Cincinnati and St. Louis R. R., contains large flouring-mills, flax-factories, 1 foundry, 3 newspapers, 2 banks, several wood-working factories, and stores. Pop. 1658.
Marshall F. Tingley, Ed. "Chronicle."

Marion, tp. of Hendricks co., Ind. Pop. 1263.

Marion, tp. of Jasper co., Ind. Pop. 1629.

Marion, tp. of Jennings co., Ind. Pop. 1200.

Marion, tp. of Lawrence co., Ind. Pop. 3006.

Marion, tp. of Monroe co., Ind. Pop. 372.

Marion, tp. of Owen co., Ind. Pop. 1767.

Marion, tp. of Pike co., Ind. Pop. 1428.

Marion, tp. of Putnam co., Ind. Pop. 1453.

Marion, tp. of Shelby co., Ind. Pop. 949.

Marion, tp. of Clayton co., Ia. Pop. 1066.

Marion, tp. of Davis co., Ia. Pop. 798.

Marion, tp. of Hamilton co., Ia. Pop. 885.

Marion, tp. of Henry co., Ia. Pop. 1371.

Marion, tp. of Lee co., Ia. Pop. 1335.

Marion, post-v. and tp., cap. of Linn co., Ia., on the Michigan and St. Paul and the Dubuque South-western R. Rs., has 8 churches, 2 parks, 2 banks, 2 flouring-mills, a lint-factory, foundry, brewery, 4 newspapers, and carriage, furniture, plough, wagon, and agricultural implement manufactories, stores, and hotels. Pop. of v. 1822; of tp. 3854. S. W. Rathbun, Ed. "Register."

Marion, tp. of Marshall co., Ia. Pop. 853.

Marion, tp. of Washington co., Ia. Pop. 1124.

Marion, tp. of Bourbon co., Kan. Pop. 1182.

Marion, tp. of Doniphan co., Kan. Pop. 658.

Marion, post-v. and tp. of Douglas co., Kan., 15 miles S. W. of Lawrence. Pop. 879.

Marion, post-v., cap. of Crittenden co., Ky., 16 miles S. W. of Hurricane R. R. Station. Pop. 102.

Marion, post-tp. of Washington co., Me., 18 miles N. N. E. of Machias. Pop. 213.

Marion, post-tp. of Plymouth co., Mass., on the Fairhaven branch of the Cape Cod R. R., 52 miles S. by E. of Boston, and on the W. shore of Buzzard's Bay. The principal village is called Sippican, and has a good harbor. The township has 3 churches. Pop. 896.

Marion, tp. of Charlevoix co., Mich. Pop. 302.

Marion, post-tp. of Livingston co., Mich. Pop. 1111.

Marion, tp. of Sanilac co., Mich. Pop. 665.

Marion, post-tp. of Olmsted co., Minn. Pop. 929.

Marion, tp. of Buchanan co., Mo. Pop. 1697.

Marion, tp. of Christian co., Mo. Pop. 473.

Marion, post-tp. of Cole co., Mo. Pop. 1108.

Marion, tp. of Dade co., Mo. Pop. 414.

Marion, tp. of Daviess co., Mo. Pop. 1321.

Marion, tp. of Grundy co., Mo. Pop. 2284.

Marion, tp. of Harrison co., Mo. Pop. 2567.

Marion, tp. of Jasper co., Mo. Pop. 3964.

Marion, tp. of Mercer co., Mo. Pop. 1006.

Marion, tp. of Monroe co., Mo. Pop. 2107.

Marion, tp. of Newton co., Mo. Pop. 1166.

Marion, tp. of Ozark co., Mo. Pop. 745.

Marion, tp. of Polk co., Mo. Pop. 2489.

Marion, tp. of St. François co., Mo. Pop. 854.

Marion, post-v. and tp. of Wayne co., N. Y. The village is 6 miles N. of Palmyra, has 4 churches, a mineral spring, a collegiate institute, and some manufactures. The township has valuable limestone-quarries. Pop. of v. 432; of tp. 1967.

Marion, post-v., cap. of McDowell co., N. C., on the Western (N. C.) R. R. Pop. of tp. 1943.

Marion, tp. of Allen co., O. Pop. 2920.

Marion, tp. of Clinton co., O. Pop. 1592.

Marion, tp. of Fayette co., O. Pop. 743.

Marion, tp. of Hancock co., O. Pop. 990.

Marion, tp. of Hardin co., O. Pop. 671.

Marion, tp. of Henry co., O. Pop. 513.

Marion, tp. of Hocking co., O. Pop. 1561.

Marion, post-v. and tp., cap. of Marion co., O., 40 miles N. of Columbus, on the Cleveland Columbus Cincinnati and Indianapolis, the Atlantic and Great Western, the Columbus and Toledo, and the Atlantic and Chicago R. Rs., has good schools, 4 banks, 2 newspapers, rake, chain, wagon, and carriage factories, large machine-shops, grain-elevators, 3 hotels, 9 churches, and stores. Pop. of v. 2531; of tp. 3486.
George Crawford, Ed. "Marion Co. Independent."

Marion, tp. of Mercer co., O. Pop. 1876.

Marion, tp. of Morgan co., O. Pop. 2074.

Marion, tp. of Noble co., O. Pop. 1733.

Marion, tp. of Pike co., O. Pop. 813.

Marion, tp. of Beaver co., Pa. Pop. 307.

Marion, tp. of Berks co., Pa. Pop. 1440.

Marion, tp. of Butler co., Pa. Pop. 850.

Marion, tp. of Centre co., Pa. Pop. 823.

Marion, tp. of Greene co., Pa. Pop. 1349.

Marion, a b. (P. O., BRADY) of East Mahoning tp., Indiana co., Pa. Pop. 310.

Marion, post-v. and tp., cap. of Marion co., S. C., on the belt between the Great and Little Peedee rivers, and on the Wilmington Columbia and Augusta R. R., 85 miles from Wilmington, 125 miles from Columbia, and 8 miles from the Great Peedee River, navigable by steamers, has 5 churches, 1 high school, 2 female schools, 1 public school, 2 newspapers, and 27 stores. Pop. of v. 968; of tp. 2490.
W. J. MCKERALL, ED. "MARION STAR."

Marion, post-v. and tp., cap. of Smythe co., Va., on the Atlantic Mississippi and Ohio R. R., 160 miles W. of Lynchburg, has 4 churches, a female college, a male school of high grade, 3 primary schools, 1 newspaper, a savings bank, 2 large flouring-mills, an iron-foundry, a plough-factory, 3 hotels, and 12 stores. Principal business, farming and cattle-raising. Pop. of v. 368; of tp. 3779.
VENABLE & PENDLETON, EDS. "PATRIOT AND HERALD."

Marion, tp. of Grant co., Wis. Pop. 675.

Marion, tp. of Juneau co., Wis. Pop. 284.

Marion, tp. of Waushara co., Wis. Pop. 565.

Marion (Gen. FRANCIS), b. at Winyaw, near Georgetown, S. C., in 1732, of Huguenot ancestry; received a very limited education; went to sea at the age of sixteen, and barely escaped with his life from a vessel that foundered on a voyage to the West Indies. He was afterward engaged in agricultural pursuits; volunteered in the expedition of Gov. Lyttleton against the Cherokees (1759), serving as lieutenant in a cavalry troop commanded by one of his brothers; was engaged in Montgomery's campaign the following year. In 1761 he was a captain in Middleton's regiment; participated in Col. Grant's expedition, and led the forlorn hope at the bloody battle of Etchoee. In 1775 he was elected a member of the provincial Congress of South Carolina, and in June was commissioned captain in Col. William Moultrie's regiment; was engaged in the early operations against the forts and British shipping in Charleston harbor; was promoted to major, placed in command of a fortification at Dorchester, and aided in the memorable defence of Fort Moultrie, then being erected on Sullivan's Island, against a formidable British fleet, which was repelled with great loss of life (June 28, 1776). He served during the next year in the defence of Georgia at the head of a body of 600 men; was in 1779 left in command at Fort Moultrie during Gen. Prevost's operations against Charleston; was engaged in the siege of Savannah by the combined French and American forces in the same year, and in the defence of Charleston when again besieged in 1780. Having accidentally broken his leg, he was sent into the country, and thus escaped falling into the hands of the enemy when Charleston was surrendered to Clinton in May. In the summer Marion, now a colonel, recruited a few companies from among his neighbors, who were obliged to content themselves with the rudest arms and equipments, and joined Gen. Gates in North Carolina, but this reinforcement met only with ridicule on account of its ragged condition. Marion was returning from a bootless errand against the British boats on the neighboring rivers at the time Gates was defeated at Camden (Aug.), and falling suddenly upon the British guards he succeeded in rescuing the Continental prisoners. A few days later he surprised and dispersed in quick succession two bodies of Tories, baffled pursuit by Tarleton, and from that time was for more than two years engaged in a constant series of adventurous forays, skirmishes, surprises, and manœuvres utterly unintelligible to the enemy, which procured him the name of the "Swamp Fox," and laid a basis for a thousand legendary tales. He occasionally undertook more formal warfare in the capture of British outposts, and took part in several battles in connection with the army of Greene. During this time his forces gradually increased, and they were dignified with the title of brigade, though never regularly organized. After the evacuation of Charleston (Dec., 1782) Marion disbanded his forces and resumed the life of a farmer, and married a lady of wealth. He served in the State senate and the constitutional convention of 1790, was until 1794 a general of the State militia, and d. on his plantation near Eutaw Feb. 29, 1795. He was buried at Belle Isle, St. John's parish. (See his *Life*, by Horry and Weems, and that by W. G. Simms.)

Marion Centre, post-v., cap. of Marion co., Kan., has 1 newspaper.

Marionettes', or **Puppets** [Fr.], a spectacle in which the action of a pantomime is represented on a miniature stage by means of small figures set in motion by a concealed mechanism of springs and wires or cords. This amusement was known both to the Greeks and Romans [Gr. *αγάλματα νευρόσπαστα*; Lat. *imaguncula*], has been popular in Italy from the Middle Ages to the present time under the name of *fantoccini*, and was introduced into France in the time of Charles IX. (1560–74) by an Italian named Marion, whence the name by which it is known in several languages. In England the puppet-show was common in the time of Elizabeth, as may be gathered from allusions in *Hamlet*, *Two Gentlemen of Verona*, and Ben Jonson's *Bartholomew Fair*. There was a "master of the motion," who introduced the puppets and made occasional remarks explanatory of their pantomimic actions. The figures themselves were sometimes made to "speak their parts," and even to reply to remarks from the audience. Regular dramas were sometimes attempted, as in the case of Jonson's *Bartholomew Fair*, so named from the locality in London which was then the chief resort of puppet-players, as it continued to be a century later, when, however, a more artistic performance of the same kind was introduced in Covent Garden and performed before Charles II. at Whitehall. Puppets were still popular in the days of Swift and the *Spectator*, but for a century and a half thereafter were rarely seen except at country-fairs or as strolling "Punch-and-Judy shows," until in 1872 they reappeared in London, under the name of "marionettes," as a French novelty, and were exhibited for many months with very complete apparatus and scenery at the Egyptian Hall. Since that time the marionettes have been represented in various parts of the U. S. and in the Spanish-American republics.

Ma'rionsville (MARIONVILLE P. O.), a v. of Buck Prairie tp., Lawrence co., Mo., is 2 miles N. W. of Logan R. R. Station. Pop. 272.

Mariotte's' Law, the principle, called otherwise **Boyle's Law,** that if the temperature remains the same the volume of a gas will vary inversely as the pressure. This formula was enunciated independently both by Mariotte (a French physicist, d. 1684) and BOYLE (which see), and is found true in experiment with gases incapable of liquefaction. With those which under severe pressure become liquefied, departures from the law occur, which are wider the more nearly the point of liquefaction is approached, the diminution of volume being more than proportional to the increase of pressure.

Maripo'sa, county of California, extending W. from the Sierra Nevada. Area, 1350 square miles. It contains many objects of interest, among which are the Yosemite Valley and one of the two celebrated groves of Big Trees (*Sequoia gigantea*). Gold-mining is the chief industry, but much less gold is produced than formerly. The raising of wool is now becoming a leading interest. Cap. Mariposa. Pop. 4572.

Mariposa, post-v., cap. of Mariposa co., Cal., has 1 newspaper.

Mariposa, tp. of Jasper co., Ia. Pop. 407.

Maris'cal (IGNACIO), b. in Oaxaca, Mexico, July 5, 1829; was admitted to the bar in 1849; became solicitor-general of Oaxaca 1850; removed to the city of Mexico 1853; was elected in 1856 a deputy to the congress which framed the constitution of 1857; appointed judge of the supreme court of Oaxaca 1859, and a federal circuit judge 1860; was again a member of congress 1861–62; a supernumerary justice of the supreme federal court 1862, assistant secretary of state 1863, secretary of legation in the U. S. 1863–66, and was chargé d'affaires 1867–68. In July, 1868, he was appointed minister of justice by Pres. Juarez; returned to the U. S. as envoy extraordinary, being received in that capacity Aug. 11, 1869, and was Mexican secretary of state from May 25, 1871, to June, 1872, since which time he has again resided as minister in the U. S. Mr. Mariscal is a master of the English language and literature, and has produced some pleasing Spanish verse, of which the best-known specimen is a fine translation of Poe's *Raven*.

Mar'itime Law. See INTERNATIONAL LAW, SUMMARY, by THEODORE D. WOOLSEY, S. T. D., LL.D.

Marit'za, the ancient *Hebrus*, is a river in European Turkey, in the province of Room-Elee, passing by Adrianople, where it becomes navigable, and falling into the Ægean Sea.

Ma'rius (CAIUS), b. at Cereatæ, near Arpinum, in 157 B. C., in very humble circumstances. He had no cognomen, and he is even said to have worked while a youth in the fields for wages. In the Numantian war (133 B. C.) he served under Scipio Africanus the Younger, and distinguished himself so much that this great general pointed him out as a military genius of great promise. In 119 he was elected *tribunus plebis*, and in this office he found an

opportunity of marking himself out as the leader of the popular party. He had no political talent, but his savage hatred to the nobility gathered around him all those vague but embittered passions which had lived in the populace from the days of Gracchus, and his entire lack of literary refinement, very conspicuous at a period in which Greek literature, art, and philosophy had become fashionable in Rome, as well as his rough and somewhat ostentatious integrity, made him the representative of the old Roman virtue. That he was a man of consequence even at this time is evident from the circumstance that he could marry Julia, the aunt of Cæsar and a member of one of the most distinguished patrician families. He did not become consul, however, till the year 107, but when in 106 he defeated and conquered Jugurtha, Numidia having been assigned to him as his province, he stood forth at once as the greatest general of the age, the glory of the republic, and soon his fame assumed a still more radiant color, that of the saviour of the country. At this time the Teutones and Cimbri, two wild Scandinavian swarms, appeared on the frontiers of the republic; and when the Teutones broke into Gallia Transalpina, and the Cimbri, gliding on their shields down the snowclad precipices of the Alps, showed themselves even in Gallia Cisalpina, Rome was struck with terror. Marius was chosen consul five times in succession, from 104 to 99, and after routing, or rather destroying, the Teutones at Aquæ Sextiæ (Aix) in 102, and the Cimbri at Campus Raudius, near Vercellæ, in 101, he was called the third founder of the city, after Romulus and Camillus, and his name was mentioned at the banquets with those of the gods. From this height the fall was terrible. Like all men who are barbarians at the bottom of their natures, his ambition found no rest even in the noblest achievements, and no stop even in open treason. Having entered into civil life, his popularity soon decreased. He wanted war, and in 99 he travelled in Asia and instigated Mithridates to begin war with Rome, sure to be chosen commander by the republic. As soon as he was ready Mithridates declared war, but in 88, Sulla, the head of the aristocratic party, and not Marius, was appointed commander by the senate. This disappointment was so much the more humiliating to Marius as Sulla very early had awakened his jealousy by distinguishing himself both in the war against Jugurtha and in the battle of Campus Raudius, and newly excited his hatred by nearly outshining him in the Social war (91). By the aid of his party Marius tried to overthrow the decision of the senate by force, but Sulla marched to Rome at the head of his army, and the old man was compelled to flee through Southern Italy to Africa, hunted from place to place like a wild beast. At no period, however, does he seem more imposing than in this emergency, showing the tremendous force of his will, the horrible egotism of his character, the mad superstition of his soul. Hiding in the swamps of Minturnæ, wandering among the ruins of Carthage, he felt divinely sure that he could not and should not die without getting revenge. And he got it. By the aid of Cinna, one of his partisans, he returned to Rome in 86. At the head of a guard composed of liberated slaves he entered the city, declared himself and Cinna consuls, let loose his soldiers to murder and plunder, and d. on the seventeenth day after his return, amidst an uproar and massacre such as Rome had never seen before. At Sulla's instigation the senate declared him an enemy of the state, and his ashes were thrown into the Anio.

CLEMENS PETERSEN.

Marivaux′, de (PIERRE CARLET DE CHAMBLAIN), b. at Paris Feb. 4, 1688; d. there Feb. 12, 1763. His comedies, which enjoyed a great reputation in their time, are distinguished by an adroit management of the plot and a fluent dialogue, but contain no characterization. His romances are without interest, and his *Le Spectateur Français* is a mediocre imitation of the English *Spectator*. A collection of his dramas was published in 5 vols. in 1758; all his works in 10 vols. in 1827–30.

Mar′joram [Ger. *Marjoran*], a popular name for several aromatic labiate herbs of the genus *Origanum*. The common marjoram (*O. vulgare*) has been naturalized in the U. S. from Europe. Its leaves are used in cookery, and its essential oil is employed in liniments. The sweet marjoram of the gardens is either the descendant of *O. Majorana* of the S. of Europe and the Levant, or of *O. Majoranoides* of Barbary. It is much pleasanter in odor and taste than the preceding, and is employed in garnishing meats and seasoning soups.

Mark, originally, in several European countries, was a half pound, by weight, of silver or gold. Hence, the mark became a money of account, but of many different values. Anglo-Saxon England, we are told, had a gold coin called the mark as early as 878 A. D. Later, the English mark was two-thirds of a pound, or 13*s.* 4*d.* The Scottish mark is only 13½*d.* The Prussian mark is 14 thalers; the Austrian is 20 gulden. The Hamburg mark is equal to 1*s.* 4*d.*

Mark, tp. of Defiance co., O. Pop. 595.

Mark, SAINT. I. *Life.*—There was in the primitive Church an office which occupied an intermediate position between the apostolate and the ministry—namely, that of *evangelist* or missionary of the second order, subordinate to the apostles (Eph. iv. 11). Mark belonged to this class of ecclesiastical functionaries. He was of Jerusalem ancestry, where his mother, called Mary, owned a house (Acts xii. 12). His Israelitic name was John, but to this was added, according to a Jewish custom of that time, the Roman surname of Mark. A singular tradition preserved in some old documents tells that he was of priestly descent, and, having once embraced Christianity, he cut off one finger in order that the defect might make him unsuitable for the performance of any service in the temple.* The first part of this tradition is supported by the circumstance that, according to Col. iv. 10, he was a cousin of Barnabas the Levite. He was no doubt won to the faith by St. Peter, who was a friend of his family (Acts xii. 13, 14), and calls him *his son* in the same spiritual sense of the word in which Paul gives this name to Titus and Timothy (1 Pet. v. 13). The Gospel of Mark contains a short narrative, omitted in the other Gospels, of a young man who, observing what took place at Gethsemane, fled when surprised by the constables, leaving behind him the linen robe in which he was wrapped. Why, now, has the evangelist preserved this small trait, which is of no interest for the principal story? It leads naturally to the conclusion that this young man was Mark himself, who, living in the vicinity, heard the noise and would see what was going on. Mark appears for the first time in the evangelical history in Acts xiii., when, about the year 44, Paul and Barnabas set out on their first missionary journey among the pagans to the island of Cyprus and the adjacent parts of Asia Minor. On their arrival in the wild regions of the Taurus Mountains, Mark left the two missionaries and returned to Jerusalem; and this circumstance was the reason why on his second journey St. Paul absolutely refused to have him for a companion, though Barnabas, whom their relationship no doubt made more lenient, insisted on it. The two missionaries then separated, Paul taking Silas along with him, instead of Barnabas, and Timothy instead of Mark, while Barnabas, together with Mark, went to the island of Cyprus, and thence to other countries which are not specially mentioned in the history (Acts xv. 37 *seq.*). Later on, however, Mark became reconciled to St. Paul. We find them together at Rome about the year 62, when Paul remembers him to the Colossians and Philemon (Col. iv. 10; Philem. 24), and towards the close of his life Paul called him a second time to stay with him as a coadjutor "profitable for the ministry" (2 Tim. iv. 11). Nevertheless, Mark appears to have been most closely connected with Peter. A tradition, almost unanimous, designates him as the companion of Peter, either his secretary or his interpreter. It is difficult, however, to ascertain at what time Mark thus accompanied Peter. In 62, when he was in Rome with Paul, Peter was certainly not there, since he is not mentioned in the Epistles written during the Roman captivity (Colossians, Ephesians, Philippians, and Philemon). It must have been either before or after. If *before*, it is necessary to consider the city of Babylon, whence Peter wrote his First Epistle (1 Pet. v. 13), as Babylon proper, situated on the Euphrates, and to admit that before Peter went to the Occident he had visited, together with Mark, the numerous Jewish settlements in Syria and Mesopotamia. But, then, why should Mark separate from him and go to Rome to stay with Paul? If *after*, there remain only the year 63 and the first half of 64 for the voyages of Mark with Peter, which is a very short term. In this case it must be admitted that at the time when the Epistle to the Colossians was sent off Mark himself was going to the Orient (iv. 10); that he met Peter in Asia Minor, accompanied him, and came with him to Rome, whence Peter wrote his First Epistle to the churches of Asia. If so, Babylon is used figuratively for Rome, which, indeed, is the conception of most of the Fathers. Several ancient writers attribute to Mark the foundation of the church of Alexandria. According to them, he was the first bishop of that church, died there, and left the episcopal see to Anianus.† At all events, it was from Alexandria that in the Middle Ages the Venetians carried his ashes, and deposited them in the cathedral to which they gave his name. It is possible that Barnabas and Mark after leaving Paul went to Alexandria, where there was a numerous

* This is perhaps the reason why the *Philosophumena* call him the κολοβοδάκτυλος, the "stump-fingered," though it would not be impossible to explain this surname from the mutilated state of the last part of his Gospel.

† Eusebius, *Historia Ecclesiastica*, ii. 24.

and rich Jewish population wishing to have the gospel preached to them. When St. Paul wrote the Epistle to the Romans, in the winter of 58–59, he declared that all the great centres of the Orient were evangelized, and that there was no more room for his labor in those countries (Rom. xv.). Could he have spoken thus if no missionary had as yet visited Egypt? But if Mark and Barnabas are the founders of the church of this country, it is easy to understand that it was hither Mark went when in 64 he left Peter at Rome during the persecutions of Nero. Chrysostom, moreover, asserts that it was at Alexandria he composed his Gospel. Thus, the career of Mark, although not so very conspicuous, is nevertheless very interesting. He forms a connecting link between the great apostles. Attached now to Barnabas, now to Paul, and now to Peter, he resembles a comet which successively traverses the orbits of the great planets, accompanying them for some moments, though always preserving its independence. And to these personal relations correspond the relations between his and the three other Gospels.

II. *Gospel.*—The testimonies of the Fathers relative to our second canonical Gospel are nearly unanimous with respect to the following three points: (1) That it was composed by the evangelist Mark; (2) that Mark wrote it from the statements which he heard from the lips of Peter in the churches which he visited together with him; (3) that it was written at Rome, and on the demand of the Christians of that capital. With respect to the first point, it follows from the title, "according to Mark," which title the work must have received at the time when the collection of our Gospels was made; that is, at the latest, in the first half of the second century. With respect to the second point, we will only quote the tradition given by Papias, and by him received from an ancient presbyter of Palestine called John, who by some is identified with the apostle St. John: "Mark, having become the secretary of Peter, wrote down exactly all that he remembered of the words and deeds of Christ, though not in order. For he had never himself heard or accompanied the Lord, but, as above mentioned, he accompanied Peter, and Peter made his statements according to the demands of the moment, and not for the purpose of giving a complete exposition of the discourses of the Lord. Thus, Mark has made no fault in writing down the facts detached as he remembered them, simply wishing not to omit anything of what he had heard, nor to alter it." With respect to the third point, the composition of the Gospel as having taken place at Rome, we have a detailed testimony in two passages of Clement of Alexandria, of which we give this one: "As Peter preached the gospel publicly at Rome, and stated several words of Christ in the presence of a number of prominent men, these desired to keep firmly in their memory what they had heard, and applied to Mark, the companion of the apostle, who afterwards wrote those accounts, which are called the Gospel according to Mark." The contents of the Gospel itself confirm these three points. To begin with the last: (1) Is it not evident that the second Gospel was written for Christians of pagan origin, since it omits throughout the evidence of the Messiahship of Jesus drawn from the prophecies of the Old Testament, and gives explanations of Jewish customs unnecessary to Christians of Hebrew origin? The most striking example is found in Mark vii. 1–4, especially when compared with Matt. xv. 1–2, destined for converted Jews. Furthermore, is it not evident that these Christians were of Latin origin, since Mark always prefers Latin terms, Hellenized, to the Greek terms, and in the account of the poor widow even transfers the Greek money into Roman (xii. 42), which Luke does not? And does it not follow from the notice relating to Simon of Cyrene, "the father of Alexander and Rufus" (xv. 21), that these Latin Christians were those of Rome, since Rufus was a member of the church of Rome (Rom. xvi. 13), and this small detail could interest none who were not personally acquainted with the members of this family? (2) It is as incontestable that the statements of Peter must have served as a basis for the work. A multitude of small details betray the remembrance of an eyewitness, while of a grave history they would have formed no very dignified element: "And he was in the hinder part of the ship, *asleep on a pillow*" (iv. 38); "and he, *casting away his garment*, rose, and came to Jesus" (x. 50); "*And when he had looked round about on them with anger*, being grieved for the hardness of their hearts, he saith unto the man" (iii. 5); "*And looking up to heaven, he sighed*, and saith unto him" (vii. 34); "*Then Jesus beholding him, loved him*" (x. 21); not to speak of a number of small traits in the discourses of Jesus which are of considerable importance.* Who else but an eyewitness, very intimate, and observing with deep interest the emotions which painted themselves on the face of Jesus, could have scattered such traits throughout the narrative? The same conclusion follows from the Aramaic expressions which Mark inserts, such as *Abba*, *Talitha-cumi*, etc. The narrator reproduces the very words of the Lord, whose voice he seems to hear. But this witness so intimate cannot be he who among the disciples loved Jesus most; it must be he who admired him most. Throughout the whole narrative he strives at one aim only—to impress the reader with that admiration which penetrated all who came in contact with Jesus. And all people were *amazed* and *filled with fear*, etc., are expressions common throughout the whole narrative, but such expressions make us immediately think of Peter, the passionate admirer and enthusiastic confessor of Christ. And of whom else could we think when reading the scene between Jesus and his disciples at Cæsarea Philippi (viii. 27–33)? Our evangelist here reports the crushing words of Jesus to Peter: "Get thee behind me, Satan: for thou savorest not the things that be of God, but the things that be of men;" but he omits the honoring words which preceded immediately, "And I say also unto thee, that thou art Peter, and upon this rock I will build my Church"—two traits which are closely connected in the account of Matthew (xvi. 13–23). Such a manner of narrating must either proceed from Peter himself or from a declared enemy of his, which latter supposition would be absurd. It is also in this Gospel alone that we find mentioned the crowing of the cock twice, a little trait which makes the denial of Peter still more inexcusable. In the Acts (x.) we find a specimen of Peter's manner of teaching while founding or travelling in order to build up the churches. This speech of the apostle to Cornelius is a sketch of the history of Jesus, exactly such as it is developed into details in our second Gospel; it is, indeed, as it has sometimes been called, the Gospel of Mark in a nutshell. (3) The authorship of Mark might be inferred from the two following facts, even if we had no tradition: first, the style of our Gospel is so absolutely different from that of the First Epistle generally attributed to Peter that even though the statements belong to Peter the narrative must have proceeded from another; next, in his Epistle Peter calls Mark his son, thus designating him as his spiritual heir, with whom he had deposited his most precious treasure, his personal acquaintance with Jesus. The objection to this explanation of the origin of the second Gospel, which rises from the resemblance between this work and those of Matthew and Luke, has in the latter's time often been met with the supposition that Mark was the source from which the two others have drawn, the freshness and originality of his work forbidding us to suppose that he had used those of the two others. But ought not the problem to be solved in quite a different manner? An apostolical tradition concerning the acts and discourses of Jesus was formed at Jerusalem, first in Aramaic and then in Greek, and on account of its sincerity and simplicity it immediately received a fixed form, which was reproduced nearly identically in the reports of the apostles and evangelists. It is this narrative—so to speak, stereotyped—which constitutes the foundation of our first three Gospels, and it is from this the striking resemblance between Matthew and Mark arises. Matthew first wrote down this tradition at Jerusalem; Peter reproduced it in the churches through oral recital, introducing only such minor significant details as sprang from his personal remembrance. And thus the double fact which we have indicated may be easily explained: on the one hand, the common foundation for Mark and Matthew; on the other, the small picturesque traits which characterize the narrative of the former. A recent critic, Klostermann, supposes that Mark wrote with the work of Matthew before him, but such a supposition materializes the relation between the two evangelists in a manner open to very serious objections, from which our explanation is exempted. If Mark wrote, or began to write, his Gospel at Rome, it dates from the year 64 or 65, which date corresponds to a remark with which he interrupts the discourse of Jesus on the destruction of Jerusalem (xiii.). In the passage indicating the signs which shall show to the Christians of Judæa the moment when they must flee in order to escape from the catastrophe which threatens the country, Mark, like Matthew, interrupts the discourse of Jesus in order to fix the attention of the reader on the importance of the indication: "Let him that readeth understand" (14). This remark, which no doubt was used when the discourse was repeated in the churches of Palestine, proves that the present form of the discourse belongs to the time before the destruction of Jerusalem. At all events, the notice relating to the two sons of Simon of Cyrene shows that they were personally known to those for whom the Gospel was destined, and that the composition of the work thus belongs to the time of the apostles. The

* Thus: "Father, all things are possible unto thee" (xiv. 36); "But of that day and that hour knoweth no man, no, not the angels which are in heaven, neither the Son" (xiii. 32), etc.

end of the second Gospel, from verse 9 of chapter xvi., is lacking in the oldest manuscripts (C. Sinaiticus and C. Vaticanus), and even the Fathers mention this gap. But how is it to be explained, and whence is derived the traditional termination of the Gospel? Did Mark die before finishing the work, or has the last leaf of his manuscript been lost? And has another ecclesiastical writer finished the narrative? At all events, Mark could not stop with the word γάρ, with which the eighth verse terminates. Furthermore, an angel had promised an apparition of Jesus, and the author must have had the intention of narrating it. But is it not possible that it was the persecution of Nero during the sojourn of Peter at Rome in 64 which caused the interruption of the work of Mark, and that an incomplete copy remained at Rome, whence the manuscripts having no conclusion, while the copy which Mark carried along with him was completed afterwards, and hence the version which has finally prevailed in the Church? With respect to the plan of the work, which Papias found inconsistent with the historical order, it seems very natural, on the contrary, from our point of view. The author having placed Jesus in the centre of his activity at Capernaum, shows us how this activity expands in every direction through excursions more and more prolonged, though at the end of each excursion the Lord always returns to Capernaum.* And his final departure for Jerusalem thus appears as his last missionary voyage. The Gospel of Mark is the most picturesque delineation of the ministry of Jesus in its office of evangelization; and the first and the last words of the work confirm this view: "The beginning of the gospel of Jesus Christ, the Son of God" (i. 1); "And they went forth, and preached everywhere, the Lord working with them, and confirming the word with signs following" (xvi. 20). Thus, from heaven Jesus still continues through his apostles that office of evangelization which he filled himself so faithfully during his ministry on earth. FRÉDÉRIC GODET.

Mar'kesan, post-v. of Mackford tp., Green Lake co., Wis., 14 miles W. by S. of Brandon.

Mark'et O'vert [*i. e.* "open market"]. The general legal principle, that no man can sell goods and convey a valid title to them unless he is the owner or lawfully represents the owner, is qualified in England by the doctrine that sales in market overt, as it is termed, or open market, shall be deemed valid, even though the vender had no title at all in the goods. This rule is established for the benefit of purchasers, that they may not be compelled to investigate the ownership of goods offered for public sale. In the country districts market overt is held only on the special days provided for particular towns by charter or prescription, but in London every day is market-day except Sunday. In the country, also, market overt can only be held at the particular place set apart by custom for the sale of particular goods, and this does not include shops; but in London every shop in which goods are publicly offered for sale is a market overt for such articles as are usually sold therein. But if goods in which the vender has no title be disposed of at secret sale, no right of ownership is conferred upon the purchaser. The ground of the distinction between open and secret sale is that in the former case opportunity is presumed to be afforded to the real owner of the goods to trace them and prevent their being sold. But even a sale in market overt will not give a good title to goods belonging to the sovereign, or to goods which are known by the purchaser not to belong to the vender. Fraud in the sale will also render it voidable. The sale must not be made in a concealed place, as a back room or warehouse, nor between sunset and sunrise. If the first vender who sold without title again obtains possession of the goods, the title of the original owner revives. By a recent statute (24 and 25 Vict. ch. 96, § 100) it is provided that if any person guilty of stealing or embezzling or otherwise criminally obtaining the property of another shall be indicted for such offence by or on behalf of the owner of the property and convicted, restitution of the property shall be awarded to the owner or his representative by the court. If, however, the innocent purchaser of the goods in market overt is obliged to make restitution, whatever money has been taken from the thief on his arrest may be applied in reimbursement. This is provided by statute 30 and 31 Vict. ch. 35. The English doctrine of market overt does not prevail in this country. The consequence is, that no person here can in general obtain a valid title to goods purchased, even in good faith and for value, from a thief. The exceptions to this rule are money, commercial paper, and public bonds, railroad bonds, coupons, etc. etc., payable to bearer or endorsed in blank.

GEORGE CHASE. REVISED BY T. W. DWIGHT.

*Ch. i. 21–45; ii. 1–v. 20 (Gadara, E.); v. 21–vi. 52 (Bethsaida and Julias, N.); vi. 53–viii. 21 (Phœnicia, N.); viii. 22–ix. 50 (Cæsarea Philippi, N.); x. *seq.* (Peræa and Jerusalem).

Mark'ham, post-v. of York co., Ontario, Canada, 23 miles N. E. of Toronto, on the Toronto and Nipissing Railway, has 1 weekly newspaper. Pop. about 1000.

Markham (CLEMENTS ROBERT), C. B., F. R. S., b. at Stillingfleet, near York, England, July 20, 1830; educated at Westminster School; entered the navy as cadet in 1844; served in the Pacific squadron under Admiral Seymour; attained the rank of lieutenant in 1850; participated in an Arctic expedition in search of Sir John Franklin 1850–51, of which he published an account entitled *Franklin's Footsteps* (1852); left the navy in order to undertake a journey of exploration in Peru 1852–54, the results of which were narrated in a volume, *Cuzco and Lima* (1856); became clerk in the board of control 1855; secretary of the Hakluyt Society 1858; visited Peru and India 1860–61 as commissioner to introduce into the latter country the cinchona or quinine tree; published *Travels in Peru and India* (1862) and a *Quichua Grammar and Dictionary* (1863); became secretary of the Royal Geographical Society 1863; visited India and Ceylon 1865–66; became assistant secretary in the India office 1867, in which year he published a work on *Spanish Irrigation;* accompanied the Abyssinian expedition as geographer 1867–68; published a *History of the Abyssinian Expedition* (1869); wrote a *Life of the Great Lord Fairfax* (1870), *Ollanta, a Quichua Drama* (1871), a *Memoir on the Indian Surveys* (1871), a *General Sketch of the History of Persia* (1873), *The Threshold of the Unknown Region* (1874), and a *Memoir of the Lady Ana Osorio, Countess of Cinchon* (1875). Since 1868, Mr. Markham has had charge of the geographical department of the India office; has written valuable annual reports on the *Moral and Material Progress of India* (1871 *seq.*); has edited *Ocean Highways*, a monthly periodical, merged in 1874 into the *Geographical Magazine;* has translated for the Hakluyt Society several Spanish MS. *Reports on the Conquest of Peru;* superintended the other publications of that society, and aided in preparing a manual of Arctic discoveries and desiderata for the use of the magnificent expedition sent out in quest of the North Pole in May, 1875, under the direction of his brother, Commander Albert H. Markham.

Markham (GERVASE), b. at Gotham, Nottinghamshire, England, in 1570; was a captain in the army of Charles I., and one of the most voluminous as well as versatile authors of his time, having exercised his pen upon poetry, the drama, agriculture, horsemanship, military tactics, angling, archery, and many other subjects. His works are now much sought by bibliopolists, the best known being a tragedy, *Sir Richard de Grinville* (1591), *The Poem of Poems* (1596), *The English Husbandman* (1613), and *The Whole Art of Angling* (1656). D. about 1655.

Markham (WILLIAM), a relative of William Penn, deputy governor of Pennsylvania and Delaware 1681–82; in 1684 secretary of the province; deputy governor of Delaware 1691–93; deputy governor of Pennsylvania, under Gov. Benjamin Fletcher, 1693–95; deputy governor, under William Penn, 1695–99.

Markham Station, post-v. of Fauquier co., Va., on the Manassas Gap R. R. at the foot of the Blue Ridge, 65 miles W. of Alexandria.

Mar'kle, post-v. of Rock Creek tp., Huntington co., Ind. Pop. 218.

Mar'kleeville, post-v. of Alpine co., Cal., 14 miles N. of Silver Mountain.

Mar'klesburg (JAMES CREEK P. O.), a b. of Huntingdon co., Pa., on the Huntingdon and Broad Top R. R., 12 miles S. of Huntingdon, has 3 churches. Principal business, iron-ore mining. Pop. about 260.

A. B. BRUMBAUGH, LITERARY ED. "PILGRIM."

Mar'kleville, post-v. of Adams tp., Madison co., Ind. Pop. 83.

Mark's Creek, tp. of Wake co., N. C. Pop. 1396.

Marks'ville, post-v., cap. of Avoyelles parish, La., is the centre of a thickly-settled prairie, 3 miles from Red River, with which it is connected by Ware's R. R., has 1 church, a convent, 1 high and 2 public schools, 2 weekly newspapers, 1 hotel, and a number of stores. Pop. 473.

A. D. LAFARGUE, ED. "BULLETIN."

Marksville, post-v. and tp. of Page co., Va. Pop. 2208.

Marl [Lat. *marga*], a name vaguely applied to those soils and earths which contain a mixture of clay and sand, with a considerable proportion of carbonate of lime. They are frequently useful fertilizers, but not always. The greensand marl (see GREENSAND) of New Jersey is valuable from the presence of phosphate of lime and potash. The white marls of Canada West (Ontario) are often very useful when applied to land.

Marl'boro', post-v. and tp. of Middlesex co., Mass., on the Boston Clinton and Fitchburg and the Fitchburg R. Rs.,

25 miles W. of Boston, 15 miles E. of Worcester, has 7 churches, 1 high school, 36 public schools, 5 private schools, 2 newspapers, a public library of about 5000 volumes, a brick town-hall costing $87,000, 1 post G. A. R., 1 military company, 3 Masonic, 1 Odd Fellows, and 1 Knights of Pythias lodge, 4 temperance societies, 2 brass bands, gas-works, a good fire department, 1 national and 1 savings bank, 3 hotels, 4 machine-shops, and 25 boot and shoe manufactories, one of which is among the largest in the world. It contains a beautiful lake (Williams), covering 160 acres, and an elegant soldiers' monument. It is in a fine fruit-section. Pop. 8474. S. B. PRATT, ED. "MARLBORO' UNION."

Marlboro', tp. of Delaware co., O. Pop. 562.

Marlboro', post-v. and tp. of Stark co., O. Pop. 1870.

Marlboro', post-tp. of Windham co., Vt., 10 miles W. of Brattleboro'. Pop. 665.

Marl'borough, county of South Carolina, bounded N. and N. E. by North Carolina. Area, 505 square miles. The Great Pedee River flows along the S. W. boundary. Cotton, rice, and corn are staple products. The soil is generally good. Cap. Bennitsville. Pop. 11,814.

Marlborough, post-v. and tp. of Hartford co., Conn., 16 miles S. E. of Hartford. Pop. 476.

Marlborough, a v. (UPPER MARLBOROUGH P. O.) and tp., cap. of Prince George's co., Md., on the Pope's Creek branch of the Baltimore and Potomac R. R., and on the W. branch of Patuxent River. Pop. 492; of tp. 3239.

Marlborough, post-v. and tp. of Cheshire co., N. H., on the Cheshire R. R., has 3 churches and manufactures of furniture, wooden wares, blankets, yarn, and other goods. Pop. 1017.

Marlborough, post-v. and tp. of Monmouth co., N. J., 4 miles N. of Freehold. Pop. 2231.

Marlborough, post-v. and tp. of Ulster co., N. Y., on the W. bank of the Hudson, contains the village of Milton and has some manufactures. Pop. of tp. 2975.

Marlborough, tp. of Montgomery co., Pa. Pop. 1303.

Marlborough (JOHN **Churchill**), DUKE OF, b. at Ashe, Devonshire, England, June 24, 1650, son of Sir Winston Churchill, who obtained for him shortly after the Restoration an appointment as page to the duke of York, afterwards James II. About the same time his sister Arabella was appointed maid-of-honor to Anne Hyde, duchess of York, and soon became mistress to the prince. It was probably to this circumstance that young Churchill was indebted for rapid promotion in the army, which he entered in 1666 as ensign in the guards. In 1672–77 he served with the rank of captain of grenadiers in the corps sent to co-operate with France against Holland, and distinguished himself at the sieges of Nymwegen and Maestricht, attracting the attention of Turenne and of Louis XIV., by whose favor he was promoted to colonel. At the Peace of Nymwegen (1678) he returned to England, received a lucrative position in the household of the duke of York, and increased his influence at court by marriage with Sarah Jennings, maid-of-honor to the duchess, celebrated for her beauty and talent, who had been the most intimate friend of the princess Anne from childhood. He now became the constant and favorite companion of the duke of York, his confidant in his intercourse with Charles II. and with the king of France, to whom he was repeatedly sent on secret missions. He was soon created Baron Churchill of Aymouth in the peerage of Scotland (1682), and was given the command of the only regiment of dragoons then existing in England in the following year, while on the occasion of the marriage of the Princess Anne to Prince George of Denmark (July 28, 1683) Lady Churchill was attached to her household. On the death of Charles II., Churchill was sent as ambassador to Louis XIV. to announce the accession of James (Feb., 1685), as well as to sue for a continuance of his friendship, alliance, and subsidies. On his return from this successful negotiation the powerful favorite was created brigadier-general and Baron Churchill of Sandridge in the English peerage, rendered good service in the suppression of Monmouth's rebellion, and was advanced to major-general. He did not scruple, however, when the follies of James rendered his downfall imminent, to enter into treasonable correspondence with the prince of Orange, nor to desert with many of his officers to the invading army (1688) at the critical moment. He received the reward of his baseness in the earldom of Marlborough (Apr. 9, 1689) and a commission as lieutenant-general; was in command of the English forces in Flanders (1689) and in Ireland (1690), where he captured Cork and Kinsale, but in Jan., 1692, was suddenly dismissed from all his official posts and thrown into the Tower in consequence of the partial discovery of treasonable intrigues with the exiled king. He was soon released from prison, but not restored to favor, and spent the ensuing years of the reign of William in false protestations of loyalty, soliciting military command while carrying on secret correspondence with James, and employing every artifice to strengthen his favor with Anne as the probable successor to the throne. In 1698, William so far restored Marlborough to favor as to appoint him governor to Anne's infant son, the duke of Gloucester. On the accession of Anne (1702), Marlborough, who had recently been employed in military and diplomatic service in Holland, became at once the most influential subject of the new queen, since to his own favor at court was added that of Lady Marlborough, and that of his son-in-law Godolphin, who became prime minister. He was at once entrusted with the chief command of the armies of the formidable alliance then combined against France. His subsequent history for several years is merged in the military annals of England, and may be summarized as consisting of an extraordinary series of victories and a no less remarkable succession of rewards and honors. The capture of Liege (Oct. 23, 1702) brought him the dukedom of Marlborough and the thanks of Parliament; in 1703 other successes were recognized by the grant of the celebrated manor of Woodstock, on which Blenheim Palace was erected at the expense of government. With the aid of Prince Eugene he terminated the campaign of 1704 by the important victory of Blenheim (Aug. 13). In the following years he gained the notable battles of Tirlemont (July 18, 1705), Ramilies (May 23, 1706), Oudenarde (July 11, 1708), Tournay (June 30, 1709), Malplaquet (Sept. 11, 1709), and Bouchain (Aug., 1711); was made a prince of the German empire; was rewarded by a magnificent pension (£5000) by act of Parliament of 1706. Marlborough returned to England in Oct., 1711, but was charged with peculation shortly after, and the duchess having fallen from Anne's favor in the same year, the Tory ministry of Harley succeeded to power. Marlborough was dismissed from all his offices Jan. 1, 1712, and retired to Germany, where he became an energetic partisan of the Hanoverian succession; returned to England at the accession of George I. (1714), by whom he was restored to his offices and honors. He rendered prompt service in the direction of the campaign of 1715 against the Pretender, passed the remainder of his life in quiet enjoyment of his immense wealth, d. at Windsor Lodge June 16, 1722, and was buried in Westminster Abbey. He left no son, but the title has been perpetuated through the descendants of his second daughter. Through the brilliancy of his military genius Marlborough long found apologists as well as admirers among the historians of England, but the bare recital of unquestioned facts convicts him of numerous treasons under aggravated circumstances of ingratitude. Due justice was first meted out to him from this point of view in Lord Macaulay's celebrated *History of England*. His great military and political talents were intuitive, as his education was extremely limited. The duchess of Marlborough survived until Oct. 18, 1744, having lived long enough to discern the rising greatness of the elder Pitt, to whom she bequeathed £10,000. (See Murray's *Letters and Despatches of Marlborough* (5 vols., 1845–46); Coxe's *Memoirs* (3 vols., 1817–19), and Alison's *Life* (2 vols., 1847).) PORTER C. BLISS.

Marlette', post-v., tp. of Sanilac co., Mich. Pop. 705.

Mar'lin, post-v., cap. of Falls co., Tex., on the Waco North-western R. R., near the Brazos River, has 5 churches, 1 high school, 1 newspaper, 75 business-houses, 3 banks, cotton-seed oil-factory, and 3 benevolent societies. Pop. 602. T. C. OLTORF, ED. "MOVING BALL."

Mar'low, post-tp. of Cheshire co., N. H., 14 miles N. of Keene, has an academy and manufactures of leather, lumber, and other goods. Pop. 716.

Marlowe (CHRISTOPHER), b. at Canterbury, England, in 1564; studied at King's School, Canterbury, and at Corpus Christi College, Cambridge, where he graduated 1583, and produced upon the stage in 1586 the first part of his tragedy of *Tamburlaine*, which, though filled with extravagant flights, exhibited more poetic genius and better dramatic combination than any previous English play. In 1588 he brought out his *Tragical History of the Life and Death of Dr. Faustus*, a powerful conception of the subject, which in a German version formed the basis of Goethe's *Faust*. A second part of *Tamburlaine* was added in 1590, and he wrote two other plays, *The Jew of Malta* and *Edward II.* Several anonymous dramas are generally attributed to Marlowe, and by many critics he is believed to be the author of the second and third parts of *Henry VI.*, included in Shakspeare's works. He also made translations from Ovid. He d. from a wound received in a quarrel at Deptford June 16, 1593. The best edition of his works is that of Dyce (3 vols., 1850).

Marl'stone [from *marl* and *stone*], a stratum of rock belonging to the Middle Lias. (See LIAS.)

Mar'malade [Port. *marmelada;* Lat. *malum mellatum,* "honeyed apple"], a conserve made of fruit, as the orange, quince, peach, etc., with a large proportion of sugar. Marmalade is also the name of the fruit of *Achras mammosa,* a valued dessert fruit of tropical America, produced by a sapotaceous tree.

Marmande', town of France, in the province of Lot-et-Garonne, on the Garonne. It is an old town, with a spacious and much-frequented harbor, extensive distilleries, large trade in corn, hemp, and white wines, and manufactures of linens, sailcloth, oil, and leather. Pop. 8661.

Mar'maton, post-v. and tp. of Bourbon co., Kan., on the Missouri Kansas and Texas R. R. Pop. 904.

Marmont', de (Auguste Frédéric Louis Viesse), duke of Ragusa, marshal of France, b. at Chatillon-sur-Seine, in the department of Côte-d'Or, France, July 20, 1774; received a military education; was aide-de-camp to Napoleon in 1796; accompanied him to Egypt; was made general of division after the battle of Marengo, commanded the forces in Dalmatia from 1806 to 1809, and in Portugal in 1811–12, where he lost the battle of Salamanca (July 22, 1812) and was severely wounded; joined the great army the day before the battle of Wagram, and was made a marshal on the battlefield of Znaym. In 1814 he commanded the troops in and around Paris, and compelled Napoleon to abdicate by evacuating the capital and entering into negotiations with the allied powers. For this reason Napoleon exempted him, on his return from Elba, from the general amnesty, and he was compelled to flee, while afterwards Louis XVIII. made him a peer of France and loaded him with honors. He lived mostly in retirement, until in 1830 Charles X. called him to Paris to quell the revolution of July. In this he failed, but so great was the indignation he excited that his name was struck from the lists of the French army. Afterwards he resided mostly in Vienna. D. at Venice Mar. 2, 1852. His *Mémoires* (9 vols., Paris, 1856–57) are important for the history of his time.

Marmontel' (Jean François), b. July 11, 1723, at Bort, in the department of Corrèzes, France; began to prepare himself for the Church at Toulouse, but went in 1746 to Paris with the purpose of devoting himself to literature; was patronized by Voltaire; wrote tragedies, also opera-texts for Rameau and Pucini; obtained a secretaryship at Versailles in 1753 through the influence of Madame de Pompadour, and for two years the editorship of the *Mercure;* published in 1761 his *Contes Moraux,* which achieved an immense success, and were translated even into Hungarian and Danish; wrote in 1767 his *Belisaire,* which was condemned by the Sorbonne as heretical and blasphemous; collected in 1787 his contributions to the *Encyclopédie* under the title *Eléments de Littérature;* retired during the Revolution to Abloville in Normandy, and d. there Dec. 31, 1799.

Mar'mora, Sea of, separates European from Asiatic Turkey, and communicates with the Black Sea by the Strait of Constantinople and with the Ægean Sea by the Strait of the Dardanelles. It is 135 miles long and 45 miles broad. Among its islands, Marmora or Marmara is famous for the fine marble and alabaster which it contains.

Mar'moset [Fr. *marmouset*], a name applied to various small South American monkeys of the aberrant family Mididæ, and of the genera *Saguinus, Midas,* etc. They are the nearest of all the true monkeys to the Prosimiæ or lemurine Quadrumana. The thumbs are not opposable, nor is the tail prehensile. These creatures are harmless, affectionate, and often very beautiful. They are, however, very delicate, and in cool climates the marmoset soon dies if exposed. The *Saguinus jacchus* is one of the best known species. (See Mididæ.)

The Marmoset.

Mar'mot [Fr.], a name given to rodent mammals belonging to the squirrel family. Closely akin to the marmots are the prairie dogs (*Cynomys*), which some, indeed, include in the genus *Arctomys,* to which the marmots belong. (See Prairie Dog.) The typical species of marmot is *Arctomys Marmotta,* the European marmot, which is abundant in the Alps. The Old World has several other species. The best known American species is *Arctomys monax,* the woodchuck or ground-hog, which is very abundant E. of the Mississippi. Its flesh is sometimes eaten, but is not good. Its fur is not of much value. The Pacific coast has several species. (See Sciuridæ.)

Marne, department of France, along the Seine and the Marne. Area, 3116 square miles. In the southern part the soil is very fertile and much corn is raised; the northern part is chalky and sandy, but produces annually 15,400,000 gallons of excellent wine, among which are several varieties of the famous champagne wine. Sheep of a good breed are reared here, and a great number of millstones are quarried. Pop. 386,157. Of 32,977 children of school-age, 1046 received no education in 1857. Cap. Chalons-sur-Marne.

Marnix, van (Philip), baron of St. Aldegonde, b. at Brussels in 1538; was educated at Geneva, and became a staunch adherent of the Reformed creed. He was among the nobles who protested in 1566 against the introduction of the Inquisition into the Netherlands, and by the prince of Orange was employed in many difficult diplomatic missions to Paris, London, the Diet of Worms, etc. D. at Leyden Dec. 15, 1598, and left a metrical translation of the Psalms and several controversial treatises.

Maro'a, post-v. and tp. of Macon co., Ill., 11 miles N. of Decatur, at the junction of the Illinois Central and Peoria Atlanta and Decatur R. Rs., has 4 churches, 2 banks, very fine mills, 1 newspaper, a grain-elevator, 3 grain-warehouses, a number of enterprising business-firms, and large trade in grain. Pop. of v. 766; of tp. 1824.

Henry B. Funk, Ed. "News."

Marochet'ti (Carlo), Baron, b. at Turin in 1805, naturalized and educated in France; began his studies under Bosio; visited Italy, and exhibited in 1827 in Paris a group, *A Girl Playing with a Dog,* which attracted much attention. He afterwards was much at the court of Louis Philippe, and after 1848 in the aristocratic circles of London, where he d. in 1867. His principal works are an equestrian statue of Emmanuel Philibert at Turin and a colossal statue of Richard Cœur-de-Lion at London, besides busts and statues of Prince Albert, the queen, etc.

Mar'onites, a Christian people of Syria who take their name from their first monothelitic bishop, John Maro, who d. 701 A. D. Their number is estimated at from 200,000 to 250,000. They live chiefly in the N. part of the Lebanon, but are found also all over the Lebanon and the Anti-Lebanon, with a few in the larger cities of Syria. They are Roman Catholics of the Syrian Rite (which see). They have a patriarch who lives at Canubin, a monastery near the foot of Lebanon, but who bears, in common with five other dignitaries, the title of patriarch of Antioch. They have also metropolitans of Tyre, Damascus, Aleppo, Tripoli, and Cyprus, besides seven bishops. They were anciently monothelites, but having joined in the second crusade against the Saracens, in 1182 renounced their heresy before the Latin patriarch of Antioch, Aimeric III. In 1445 they were more formally united to the Roman Catholic Church. They are hospitable towards all Christians; have since 1840 been deadly enemies of their neighbors, the Druses; speak Arabic or Greek; consider the Syriac their sacred language, and make use of Syro-Chaldæan books, which they do not understand. Their secular

clergy may marry before ordination, and the Eucharist is administered under both kinds. They have a great number of celibate monks and nuns, who follow the rule of St. Anthony, take no vows, but fast often, and never eat meat. The Maronites have suffered much from their neighbors, the Druses, who are far inferior to them in numbers, and who were, it appears, the injured party at the origin of the recent bloody feud.

Maroons′ [Fr. *nègres marrons*, from the Sp. *cimarron*, a "mountaineer"], a name used formerly in Jamaica, and now in Guiana, to designate the runaway slaves and their descendants. The Maroons of Jamaica fought the British government from 1655 to 1795, and were finally conquered by the aid of Cuban bloodhounds, of which the Maroons had a well-founded horror. Some were sent to Africa and some to Nova Scotia, where their descendants still remain. The Maroons of Guiana are mostly from the Dutch colony, and are virtually independent. In 1869 their number in Dutch Guiana was given as about 7500.

Maros′, a river of Europe, rises in Transylvania, near the frontier of Moldavia, flows in a western direction into Hungary, and joins the Theiss opposite to Szegedin, after a course of about 400 miles, for the greater part of which it is navigable.

Maros′-Vasarhely′, town of Austro-Hungary, in Transylvania, on the Maros. It has a large trade in wheat, wine, and tobacco. Pop. 11,217.

Marot′ (Clement), b. in 1495 at Cahors, in the department of Lot, France; was educated as one of the pages of Margaret of Valois, and succeeded his father as poet and *valet de chambre* to Francis I., whom he accompanied also in the field. His *Le Temple de Cupidon* and other light, amorous poetry, as well as his personal qualities, made him a favorite with the ladies, among others with Diana of Poitiers, but this last tender relation ended by her delivering him over to the Inquisition as a heretic. During his imprisonment he wrote a witty satire, *L'Enfer*, on his judges, and gave a new version of the celebrated *Roman de la Rose*. Francis I. procured his liberation, and he now repaired to the court of Margaret of Navarre, where he commenced his translation of the Psalms. When the first 50 psalms were published, they were much applauded by the court and the public in general, but the Sorbonne condemned the translation as heretical, and Marot fled to Geneva. Here he was well received by Calvin, and translated 20 more psalms in connection with Beza, but his frivolous life made it impossible for him to stay here. He returned to the Roman Catholic Church, and wandered for some years in France and Italy. D. at Turin in 1544.—His father and son were also poets, and the works of the three Marots were published at the Hague in 1731, and several times afterward. *Le style marotique*, called thus after him, means something naïf.

Mar′ple, post-tp. of Delaware co., Pa. Pop. 858.

Marque [Fr.], **Letters of.** In international law these words denote the consent of a government, expressed in a formal permission, that a certain vessel may act as a privateer when the requisite bonds and formalities have been given or complied with. The words are explained best by the French *lettres de marque—i. e.* of stamp, or stamped letters, like *lettres de cachet*, letters of seal, or sealed with the king's signet, but specially giving authority to arrest. They are, then, stamped letters allowing reprisals or private warfare. T. D. Woolsey.

Marque′sas (or **Mendaña**) **Islands** consist of two groups of islands situated in the Southern Pacific Ocean, between lat. 7° 30′ and 10° 30′ S., and between 138° and 140° 20′ W. The northern group is generally called Washington Islands, and the name of Marquésas Islands confined to the southern group. This latter group consists of five islands of volcanic origin, high, mountainous, with steep coasts, comprising an area of 500 square miles, and belonging to France. The interior of the islands is generally fertile; the climate hot, but healthy; the sugar-cane, cocoanut tree, and cotton-plant abound. But the inhabitants, numbering about 10,000, form one of the most savage and (to European civilization) most inaccessible tribes of the Polynesian race. Guns and whisky are the only foreign elements which have been able to penetrate into their lives; all missionary and commercial efforts have hitherto been in vain.

Mar′quess, or **Marquis,** a British title of nobility, next in rank below that of duke, and next above that of earl. The ancient English title of *lord-marcher* and the German one of *Markgraf* are in some sense equivalent to it. There are at present thirty marquesses in the different classes of the British peerage, besides the dukes who are also marquesses. A marquess is addressed as "the most honorable." The title of his wife is "marchioness," and she is also addressed as "*most* honorable," or as "your ladyship."

Marquetry′ [Fr. *marqueterie*], the art of inlaying wood with shells, metal, ivory, or pieces of wood of another color. It is carried to great perfection by the cabinet-makers of France, Germany, and Belgium, that of Sorrento, Italy, being perhaps the most elaborate. The process as regards woodwork consists in cutting out with a fine saw a pattern from two or three thicknesses of wood glued together, and then inserting the part cut from one into the cavity of the other, and *vice versâ*, filling up the interstices with sawdust. A variety of this process is called Buhl-work (which see.)

Marquette′, county of Michigan, bounded N. E. by Lake Superior and S. W. by Wisconsin. Area, 3225 square miles. It is generally rough and well timbered. It contains very valuable beds of the best of iron ore (a red oxide, free from impurities), of which more than 1,000,000 tons are shipped yearly by lake and rail. Some iron is manufactured in the county. The S. part of the county has large beds of marble; it is traversed by the Marquette Houghton and Ontonagon R. R. and the Peninsular division of the Chicago and North-western. Cap. Marquette. Pop. 15,033.

Marquette, county of S. Central Wisconsin. Area, 490 square miles. It is level and fertile, and is traversed by the navigable Fox River. Corn, wheat, and wool are the leading products. Cap. Montello. Pop. 8056.

Marquette, post-v. and tp., cap. of Marquette co., Mich., on the Marquette Houghton and Ontonagon R. R., 425 miles N. of Chicago, is the principal shipping-port of the great iron-region, which in 1873 produced 1,178,879 gross tons of iron ore, and has regular communication by steamers with all the lake cities. It is situated upon a low bluff 25 feet above the bay, is supplied with water taken from the lake, and the streets are lighted with gas. It has a fine natural park, 4 public schools, 6 churches, 4 banks, a public library, a Catholic cathedral and convent, 1 weekly newspaper, 3 large blast furnaces, 1 rolling-mill, 2 foundries and machine-shops, 2 brownstone-quarries, the railroad car-shops, and business firms. Pop. of v. 4000; of tp. 4617. A. P. Swineford, Ed. "Mining Journal."

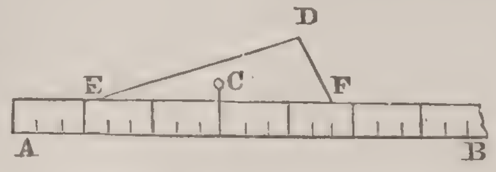
Marquette, post-v. and tp. of Green Lake co., Wis. Pop. 928.

Marquette (Jacques), b. at Laon, France, in 1637; sailed in 1666 as a Jesuit missionary to Canada; founded the mission of Sault Ste. Marie in 1668; went in 1669 from La Pointe (now in Michigan) to Mackinaw, where in 1671 he built a chapel; accompanied Joliet in his expedition of 1673 down the Wisconsin and Mississippi, and returned *viâ* the Illinois River and Green Bay, Wis.; opened in 1675 the mission at Kaskaskia, but finding his strength failing, set out to return to Mackinaw; died on the journey, May 18, 1675, near the mouth of Marquette River, in what is now Michigan. In Shea's *Discovery of the Mississippi Valley* (1852) there are translations of his narrative and journal.

Marquez′ (Gen. Leonardo), b. in the city of Mexico about 1818; took part in the defence of the valley of Mexico against the American army in 1847; headed a revolutionary movement in Guanajuato in favor of Santa Anna 1849; was advanced to important military commands by Santa Anna during his last presidency (1853–55); maintained a guerilla warfare against Alvarez and Comonfort 1856–57; was one of the most trusted generals of Presidents Zuloaga and Miramon in their struggle against Juarez 1858–60, generally known as the "war of reform," and continued to wage an irregular warfare against Juarez after the downfall of Miramon until the French intervention, which he supported 1861–64. He was sent by the archduke Maximilian as minister to Constantinople, but returned without permission Oct., 1866, when the Mexican "empire" was about to fall; accepted the command of a division, and during the siege of Querétaro defended the city of Mexico against the republican forces under Gen. Porfirio Diaz. On the fall of the city he succeeded in escaping to Havana, where he has since resided. The "massacre of Tacubaya" (see Miramon), the execution of his prisoners, Gens. Degollado and Valle and the prime-minister Ocampo, with other deeds of blood, caused a price to be set on his head, and gave him the title of "tiger of Tacubaya," which adheres to him notwithstanding two pamphlets he has published in defence of his "honor" and his military record. He is one of three persons expressly excluded from the Mexican amnesty of 1870.

Marquoi's′ Rulers. A set of rulers devised by an artist named Marquoi to facilitate the operation of plane drawing. The set consists of one triangular ruler, whose hypothenuse is three times as long as the shorter side about

the right angle, and of several rectangular rulers graduated according to different scales. Each rectangular ruler bears two scales, the first of which may be any scale of equal parts; each division of the second scale is three times as long as a division of the first. The triangular ruler has an index, C, near the middle of its hypothenuse, which may be brought to coincide with any division of the rectangular scale, as shown in the diagram. The use of the triple scale is to enable the draughtsman to draw a line parallel to a given line, and at a distance from it equal to any number of divisions of the simple scale. If the drawing is to be made on the simple scale A B, the parallel in question may be drawn as follows: The rulers are placed as shown in the figure, and the side E D is made to coincide with the given line; the rectangular ruler is then pressed against the paper, and the triangular ruler is moved along it, keeping its edge E F in close contact. For every division of the triple scale passed over by the index C, the edge D C will advance in the direction D F; that is, it will recede from a given line a distance equal to one of the divisions of the simple scale A B. The object of having several rectangular rulers is to enable the draughtsman to make his drawings to any desired scale. W. G. PECK.



Marra'di, town of Central Italy, in the province of Florence, about 42 miles N. E. of the city of Florence. It is situated in the valley of the Lamone, and is surrounded at a distance of some two miles by forests of oaks and chestnuts. The first knowledge we have of Marradi is in 1025, when it was governed by an abbot. For some centuries afterward it was a subject of contention between the neighboring republics, though generally under the dominion of Florence. Pop. in 1872, 8226.

Mar'riage, and Married Women. The term "marriage" is used in two quite distinct senses. It is applied to the contract by which a man and a woman agree to become husband and wife, and it also denotes the legal status or condition of the parties which they assume and enter upon by means of that contract. It is a grave error to say, with many legal writers, that marriage *is* a contract. Although based upon a contract, it is properly the peculiar condition of the spouses flowing from their mutual act of agreement, with the various capacities and incapacities inhering in them by virtue thereof. The law of marriage now prevailing in Europe and in the U. S. is derived to a great extent from the doctrines which were finally established in the Roman jurisprudence. By the researches of modern scholarship it has been ascertained beyond a doubt that the monogamic principle was adopted among the Aryan races in the earliest stages of their development, and that in the original form of their social institutions marriage itself was a highly religious act. Traces of this conception were preserved among the ancient Romans in the peculiarly sacred mode of solemnizing marriage termed *confarreatio*, which was at first employed by the patricians generally, but which afterward became restricted to the priests. During the earlier periods of the Roman state there were two kinds of marriage: one of these, which was confined to the citizens, brought the wife and children under the marital "power" of the *paterfamilias* (see PATRIA POTESTAS); the other, which was used by those not entitled to full citizenship, did not confer this terrible dominion upon the husband. The former species gradually became infrequent, and finally disappeared under the emperors, while the second more simple and natural mode was made universal. The only essential element of marriage by the Roman law, the single requisite to its validity, was the consent of the contracting parties. As a result of that species of marriage which subjected the wife to the husband's "power," all her property at once passed to and vested in him. When, however, this peculiar method, with all of its consequences, had been abandoned, marriage did not of itself produce any effect upon the property of the spouses; each remained the owner of his or her own, with full power of control and disposition. While no change of proprietorship was wrought by the law, nuptial contracts might produce such an effect; and they were very common. A marriage portion, called the *dos* or dowry, was almost universal. The wife's father generally furnished this dowry, but it was sometimes advanced by the wife herself or by a third person. The husband had the sole possession and management of the *dos* while the marriage continued, and the sole enjoyment of its income and profits, but did not, as a general rule, become its absolute owner. When the marriage was terminated by death or otherwise, except for the wife's adultery, he was obliged to restore the dowry to the wife or to her heirs, or sometimes to the person who had furnished it. The nuptial contract might provide, on the other hand, that if he survived the husband should himself retain the dowry. This dotal system has been adopted with all its substantial features by those continental states of Europe which have taken the Roman jurisprudence as the basis of their own. After the papal supremacy was established the Church of Rome asserted that marriage was purely a religious act, and was therefore within its exclusive jurisdiction. An elaborate code of rules for its regulation was incorporated into the canon law; and since the canon law was generally accepted and followed, prior to the Reformation, throughout Christendom, these rules were recognized in all Christian countries as the foundation of the local legislation and as the guides for the local tribunals. In asserting its exclusive control the Church maintained that its own concurrence, through the presence and the blessing of a priest, was essential to the validity of any marriage. This doctrine was formally announced by a decree of the Council of Trent (Nov., 1563), which declared that after that date all marriages not contracted in the presence of a priest and two or three witnesses should be void. Notwithstanding this position, so vehemently maintained by the Roman Church, the conception of marriage as a purely civil status regulated by the municipal law alone generally prevails in the modern legislation of Europe. In France every marriage must be celebrated before a designated civil officer in the presence of four witnesses, after certain public notices have been given. A religious ceremony may then follow if the parties desire, but is not made requisite; and any clergyman who performs the religious ceremony before the civil form has been consummated is liable to severe punishment. (*Code Civil*, arts. 75, 76, 165; *Code Pénal*, arts. 199, 200.) In order that the marriage of a son under twenty-five years of age and of a daughter under twenty-one may be valid, the consent of the parents or of the surviving parent must first be obtained; if both are dead, the consent of the grandparents; or, in the absence of these relatives, the consent of a "family council." "Civil marriage" in substantially the same form has also been established by the kingdom of Italy, by Austria, and by the German empire. This legislation has been the cause of bitter controversies between the governments of those countries and the Papal See. Passing to England, the same type of statutory enactment is found. It was decided by the House of Lords in 1844 that subsequent to the Council of Trent, and prior to any act of Parliament establishing a different rule, the law of England required the presence of a clergyman of the Established Church in order that a marriage should be valid. The subject is now wholly regulated by statutes, which permit a marriage to be solemnized either with or without a religious ceremony. Since the 6 and 7 Will. IV. (ch. 85) a marriage must either be solemnized in a church—in which case it must be conducted by a clergyman of the Established Church according to its rites, with the presence of two witnesses—or it must be performed, after due public notice and a certificate properly granted, in a licensed dissenting place of worship or in a registrar's office; and in each of these two cases it must be conducted by a civil officer called the registrar, although there may be superadded to the civil contract whatever religious ceremonies the parties see fit to adopt. The archbishop of Canterbury is authorized, however, to grant special licenses to marry at any convenient time and place. In consequence of these statutes, which are now in force, no marriage can be contracted in England by the mere consent of the parties, however clearly it may be expressed. Marriage between persons related to each other within the Levitical degrees is unlawful, and this prohibition embraces relationship by affinity as well as that by consanguinity. A marriage between a man and the sister of his deceased wife is therefore void. Parliament has been frequently urged to abolish this particular restriction, but thus far without success.

In the U. S., by the law which prevails very generally, if not, in fact, universally, throughout the States, marriage is regarded as wholly based upon contract, upon the present mutual consent of the parties, and no special forms are necessary to its validity. If a man and a woman, by words of present import, promise and agree with each other to be husband and wife, the contract and the resulting status of marriage are perfected; solemnization by a clergyman or by a civil magistrate, the presence of witnesses, and all the ceremonies and forms which are customarily used, even those provided for by statute, are nothing more than convenient means of perpetuating the evidence of the contract between the spouses, which itself constitutes the marriage; they are not in the least essential to its efficacy. Whenever certain preliminary steps, such as license, notice, and the like, are prescribed by statute, a failure to comply with these provisions does not impair the marriage which has been contracted without their presence; it simply sub-

jects the delinquent parties to a slight pecuniary penalty. The words of the contract by which the parties signify their intention must be *in præsenti* (of a present force and operation), and they do not need to be followed by a cohabitation, since the status of marriage arises from the mental and not the physical union of the spouses. In this respect the U. S. law of marriage is identical with that which has long prevailed in Scotland, so that the decisions of the Scotch courts furnish valuable precedents which may be followed by our own tribunals. If the words used by the parties in their mutual promise are *in futuro* (of a future force and operation), and are followed by an immediate cohabitation, it is held in New York and in several other States that no marriage arises, while in a few of the States the contrary doctrine, which is also the rule in Scotland, has been established. The doctrine is well settled by judicial decision that, in the absence of more definite proof, the existence of a marriage may be inferred from the acts of the parties—from their cohabitation, from their treatment of each other and holding each other out to the world as husband and wife. This rule is simply one of evidence. From these and other similar acts of the parties juries and courts are permitted to draw the conclusion that at some previous time the man and the woman entered into a contract to become husband and wife, but the fact of such an agreement must always be found as a result of the circumstantial proofs. The prohibition of marriage between persons related within the Levitical degrees does not generally exist in the law of the several States. The restriction is confined to those relationships which would render the union incestuous—that is, to all persons lineally related as ascendants or descendants in whatever degrees, and in the collateral line to brothers and sisters alone. Marriage with a deceased wife's sister is therefore lawful, and is by no means uncommon. In some of the States, however, a few additional disabilities have been created by statute, which consist chiefly in placing relationship by affinity and by consanguinity among the prohibited lineal degrees upon the same footing. Where this legislation exists, a union between a man and his step-daughter, or between a woman and her step-son, and the like, is illegal. Following the English and the canon laws, which had copied that of Rome, the age of consent, or the age at which persons become capable of entering into a valid and binding marriage, is generally fixed at fourteen years for males and twelve years for females. In other words, a boy of fourteen years or more and a girl of twelve or more may contract a marriage as effectually as though they were adults. Consent of parents or guardians is not requisite to the valid marriage of a minor. From the foregoing outline it is evident that the law of the U. S. has left this most important of all contracts and of all social or domestic relations in a condition of absolute freedom, without any of the formal restraints and safeguards which are common in other modern systems of jurisprudence, and which are perhaps demanded by considerations of the highest public policy.

The Effects of Marriage upon the Capacities, Rights, and Duties of a Married Woman.—These effects may be considered (1) as they concern her property rights; (2) as they concern her personal rights and duties.

(1) *Her Rights of Property.*—On the European continent three distinct systems coexist—the "dotal system," borrowed directly from the Roman law, and found in all the nations which have based their jurisprudence upon that law; the "community of goods," which prevails in France, Holland, parts of the German empire, and wherever the *Code Napoléon* has been accepted; and, finally, the system by which each spouse is left the separate owner of his or her own property. The parties are generally permitted to indicate by their nuptial contract which one of the existing modes of regulation they adopt for the disposition and management of their estates. The dotal system has already been described. The fund set apart as the dowry (*dos, dot*) is settled by the marriage contract, and may include the whole or any portion of the wife's property, as the spouses may agree; the husband has its entire management and its rents and profits during the marriage, but when this is dissolved for any cause, he or his heirs must restore the whole fund to the wife or to her heirs. The "community of goods" is a species of partnership between the husband and wife. The property owned by each at the date of their marriage, except their lands, and all that may be subsequently acquired by either of them, except lands inherited or donated, are brought into and constitute the common fund. This fund is chargeable with the debts of each existing at the commencement of the marriage, and with those subsequently contracted by the husband; and he alone possesses the right to its control and management. Upon a dissolution of the marriage by death, divorce, or judicial decree the specific claims of each are first satisfied out of the fund, and the residue is then divided between them in equal shares, or between the survivor and the heirs of the deceased, one-half of the partnership debts being charged against the recipient or recipients of each share. These arrangements may, however, be modified by the stipulations of the nuptial contract. This same partnership system has been adopted by the civil code of Louisiana, and to a partial extent by the statutes of California. The common law of England and of the American States was very harsh in its provisions concerning the property rights of married women. Upon marriage the husband acquired an absolute ownership over all the wife's goods, chattels, and moneys; lands held by her under lease, and all debts and demands due to her, also became his as soon as he reduced them to his possession by collecting the amounts due or taking new securities in his own name, and the like. Lands owned by the wife in fee or for life did not become the husband's absolutely, but he was entitled to their possession and profits during the marriage, and if he survived and a child had been born, this right continued until his death. The wife acquired no corresponding interest in her husband's property during their joint lives, but upon his death she became entitled to dower in his lands; which estate has been preserved, with some modifications, in nearly all the American States. (See DOWER.) A method of evading these unjust rules of the common law was long ago contrived by the courts of equity. By means of marriage settlements land or other property may be conveyed to trustees, and held by them for the sole benefit of a married woman, free from any control of her husband or his creditors; and thus a fund may be set apart for her use and management. These marriage settlements never became common in the U. S., although they are universally employed in Great Britain among the higher classes of society. The stern doctrines of the common law as above described have been practically abolished by the recent legislation in the States of this country. Commencing in New York in 1848, the reform rapidly spread throughout the Union. In its common type it provides that the real and personal property of every married woman which she owns at the time of her marriage, or which she shall acquire thereafter, shall remain her sole and separate property as though she were unmarried, free from any interest of the husband therein and from any claim thereto by his creditors. In several of the States, although this particular provision is wanting in some, she is expressly permitted to convey her property by deed and to bequeath or devise it by will. While this legislation has cut off all interest of the husband in the wife's property, and clothes her with the capacity to enjoy its use and proceeds, it does not enable her to contract, to acquire property by her labor, or to engage in business. In New York and in a few other commonwealths additional and more recent statutes have greatly enlarged her capacity by enabling her to manage her property as though she were single, to make any contracts relating to it, to acquire and hold the earnings of her own labor, to engage in any trade or business and enter into any contracts connected therewith, to sue and to be sued alone in all actions growing out of her property or her contracts, and to sue alone in all actions brought to recover damages for torts to her property, person, or character. This legislation has gone far toward the complete assimilation of the married woman's legal condition with that of the single woman or of the man. By the "homestead" system established in the Western and Southern States the wife acquires a secure and personal interest in the homestead, which, although held jointly or in common with the husband, cannot be affected by his own act. In California and a few other States she may become a "sole trader," and in carrying on her business has the powers and liabilities of a single woman.

(2) *Her Personal Rights and Duties.*—The personal status of the wife, according to the common law, results from the conception of the husband as the single head of the family, and of her legal personality as wholly swallowed up in his own. For this reason her rights were few, and her condition was rather to be described by the duties and incapacities which attended it. Many of these duties, however, were simply moral in their nature, since no legal sanctions were provided for their enforcement. Her personal rights may be summed up in the single notion of support. The family looks alone to the husband for its maintenance; he must furnish a home for the wife, and provide her with necessaries suitable to her situation and to his condition in life; and she possesses, as the general rule, the power to procure such necessaries upon his credit. The recent changes made in the law which enable the wife to hold and enjoy her own property have not abridged this obligation of the husband, or made it her duty to contribute toward her own support or that of the family. It is often said in the textbooks that a married woman owes obedience to her husband, and that he is entitled to her

presence, society, and services in the household. Such a social and moral obligation no doubt exists, but it cannot be called a legal one on her part. The wife's continued cohabitation and residence with the husband are entirely voluntary—at least in this country—and if she chooses to leave his home and to live apart from him, her return cannot be compelled by any legal remedies, but her claim for support will cease. At the same time, the law recognizes this right of the husband to such an extent that if the wife is enticed away from his home, or is seduced, or is personally injured through violence or neglect, he is entitled to such redress from the wrongdoer as a recovery of pecuniary damages will give. And her duty of obedience is also recognized in the rule that if she commit a crime in her husband's presence and by his direction, he alone is liable to punishment, she not being regarded as responsible. At the common law the married woman was incapable of doing any civil act which would presuppose her separate legal personality. She could not sue or be sued in her own name, although a departure from this rule was permitted in courts of equity. She was also incapable of entering into any contracts, and at law her agreements were absolutely void. Equity, however, recognized her contracts when made in reference to her separate estate, and enforced them, not as creating a personal liability, but as creating a charge or lien upon her property. The husband and wife were also prohibited, with certain special exceptions, from being witnesses for or against each other in judicial proceedings. Modern reforms have greatly modified these dogmas. In England and in many of the American States the husband and wife are now admitted as witnesses, except in reference to facts learned in their domestic confidence. The power of the wife to contract, and to sue or be sued in relation to her own property, conferred by recent statutes in the U. S., has been already described. JOHN NORTON POMEROY.

Mar'row [Lat. *medulla*], the substance which fills the central canal of the long bones of the adult, the largest of the Haversian canals, and the hollows in cancellous bone. In the cavities of long bones of the adult it is of the yellow or fatty variety, of which 96 per cent. is fat; in the young subject, and in many of the bones of the adult, it is of the red or watery variety, which is almost without fat. The last form of marrow appears to share the functions of the closed glands in preparing food so as to render it serviceable for nutrition. (See HISTOLOGY.)

REVISED BY WILLARD PARKER.

Marrow'bone, post-tp. of Moultrie co., Ill. Pop. 1127.

Marr's, tp. of Posey co., Ind. Pop. 2029.

Marr's Hill, tp. of Washington co., Ark. Pop. 1280.

Mar'ryat (Capt. FREDERICK), b. in London, England, July 10, 1792; entered the British navy in 1812 as a midshipman; took part in many naval engagements with the French, gaining great credit by rescuing drowning shipmates on more than one occasion; served on the American squadron 1812–15; was engaged in action on Lake Pontchartrain in 1814. Having attained the rank of captain and the command of a vessel in the Channel squadron, he commenced in 1829 the publication of a series of nautical romances which proved a brilliant success. He was also the author of a *Code of Signals for Vessels employed in the Merchant Service* (1837), of a record of travel in the U. S., *A Diary in America, with Remarks on its Institutions* (1839), and of numerous miscellaneous works. D. at Langham, Norfolk, Aug. 2, 1848. (See his *Life and Correspondence* (2 vols., 1872), by his daughter FLORENCE, now Mrs. Ross CHURCH, who has also written several successful novels.)

Mars [Lat. *Mavors* or *Mamers*], one of the principal gods among the ancient Italians, was worshipped at Rome under three aspects: First, as *Mars Gradivus* he was the god of battle, early identified with the Greek Ares, son of Zeus and Hera, and more famous as the lover of Venus (Aphrodite) than as a war-god—a character very different from that of the Italian Mars; secondly, as Silvanus he was the god of husbandry and rural life; lastly, as Quirinus he was the father and tutelary divinity of the Roman state, whose founders were his offspring.

Mars. The planet Mars is the fourth in order of distance from the sun, and the nearest of the superior planets. Mars travels at a mean distance of 139,311,000 miles from the sun. But the eccentricity of his orbit is considerable, amounting to 0.093262, so that the greatest and least distances of the planet differ from his mean distance by nearly a tenth part, or by about 13,000,000 miles. His greatest distance amounts to 152,304,000 miles, his least to 126,318,000. When the earth and Mars are in conjunction, and Mars near perihelion, the earth is about 92,500,000 miles from the sun, and therefore the planet is distant from us only 126,318,000 miles, *minus* 92,500,000 miles, or about 33,800,000 miles; whereas, when he is in opposition—that is, Mars and the earth in conjunction, and Mars near aphelion—the earth is only about 90,500,000 miles from the sun, and the planet is therefore distant from us only 152,304,000 miles, *minus* 90,500,000 miles, or about 61,800,000 miles. Thus, at different oppositions of the planet his distance varies between 33,800,000 miles and 61,800,000 miles, the widest relative range of distance of any planet's oppositions. It is on this account that the appearance of Mars when he is most favorably placed for observation during the course of any synodical revolution varies so much more than that of any other planet—a circumstance not unnoted by the ancients. For, if we consider that the apparent brightness of a planet depends conjointly on the apparent size of the planet's disk and on the amount of sunlight received by the planet, we perceive that the brightness of Mars when in opposition ranges between a maximum and a minimum proportioned to each other as $(61,800,000)^2 \times (152,304,000)^2$ to $(33,800,000)^2 \times (126,318,000)^2$, or about as 34 : 7. In other words, at an opposition occurring near perihelion Mars is nearly five times as bright as he is at an opposition occurring near aphelion. At some of these brighter oppositions, which recur at intervals of about thirty-three years, Mars has been mistaken by the ignorant for a new and fiery orb of evil portent to the nations. The perihelion of the orbit of Mars lies in longitude 333½°. His orbit is inclined 1° 51′ to the ecliptic, its rising mode being in longitude 48½°. He completes his sidereal revolutions in a mean period of 686.9797 days, and returns to opposition at intervals separated by a mean period of 779.936 days, which is therefore his mean synodical period. But on account of the eccentricity of his orbit and the variability of his rate of motion his successive synodical periods are considerably unequal.

The diameter of Mars has been variously estimated. The value at present regarded as most probable is about 4400 miles. The planet's equator is inclined about 28° to his orbit. Although Mars does not appear so large an object in the telescope as Jupiter, yet he is in reality seen on a much larger scale; not only because of his much greater proximity to us, but because, being also much nearer to the sun, his surface is much more brightly illuminated, so that a much higher telescopic power can be advantageously employed. In fact, there is no planet which can be studied under such favorable circumstances as Mars; for, though Venus in inferior conjunction is nearer to us than Mars in opposition, yet Venus then turns her darkened hemisphere towards the earth. Accordingly, ever since the invention of the telescope Mars has been a favorite object of observation. So far back as 1643, Fontana of Naples detected spots on the surface of Mars, and suspected the planet's rotation. Cassini's more trustworthy observations were commenced in 1666 in Bologna. In about a month he had satisfied himself that the planet rotates on its axis once in 24*h.* 40*m.* Astronomers at Rome, however, assigned a rotation-period of only 13*h.*, which Cassini explained by showing that they had mistaken two opposite faces of the planet (not greatly unlike) for one and the same aspect. Cassini again observed Mars in 1670, with results confirming those he had obtained earlier. Hooke in 1666, and Huyghens between 1656 and 1670, made drawings of Mars which are among the most trustworthy obtained in the seventeenth century. In 1704, Maraldi made several observations, and detected a change of shape in some of the spots, easily explained as due to changes in the condition of the planet's atmosphere. Maraldi assigned 24*h.* 39*m.* as the planet's rotation-period at this time, but his observations in 1719, when the planet was exceedingly well placed, resulted in a period of 24*h.* 40*m.* Sir W. Herschel, from a series of observations made between 1777 and 1785, deduced 24*h.* 39*m.* 25*s.* for the planet's rotation-period, but it appears that he had overlooked one complete rotation in a period of about two months, and when correction is made for this mistake the period is reduced about two minutes. Mädler, from observations extending over the years 1830–37, obtained the period 24*h.* 37*m.* 23.8*s.* Kaiser of the Leyden Observatory extended his researches over a much wider period, going back as far as the date of Huyghens' observations, and forward to the years 1864–65. His result gave 24*h.* 37*m.* 22.6*s.* Lastly, the present writer, going back to Hooke's observations and carrying the calculation forward to the year 1867, deduced 24*h.* 37*m.* 22.7*s.*, exceeding Kaiser's value by one-tenth of a second. Kaiser re-examined his work (for the difference, small though it is, produces effects too large to be easily explained when multiplied by some 80,000 rotations made by Mars since the days of Hooke and Huyghens). He reasserted the accuracy of his result, and ascribed the difference between the two values to the probable inaccuracy of Hooke's drawing. But when the writer had examined Kaiser's elaborate calculations, he found that an error of two days had crept in, apparently from the years

1700 and 1800 being treated as leap-years. (The case was a singular illustration of the fact that large errors will often escape notice when attention is specially directed to the removal of all the minute causes of error.) Correction made for this mistake, the same rotation-period comes out from Kaiser's calculations as from the writer's—viz. 24*h.* 37*m.* 22.7*s.*, which may be regarded as certainly within a twentieth of a second of the true value.

Amongst the markings of Mars, a whiteness around the S. pole of the planet had been already noticed for sixty years when Maraldi first paid special attention to the peculiarity. He found that the outskirts of this white region were subject to notable variations, and even while his observations were in progress the fainter portion of the spot disappeared. At this time the northern polar regions had not been carefully examined, being, in fact, only brought favorably into view, as regards the position of the polar axis, when Mars is near his aphelion. But Sir W. Herschel, whose powerful telescope enabled him to disregard the planet's changes of opposition-distance, detected a similar whiteness around the northern pole of the planet. He was soon led to ascribe the peculiarity to the probable existence of ice and snow around the polar regions of Mars. "The analogy between Mars and the earth," he wrote, "is perhaps by far the greatest in the whole solar system. Their diurnal motion is nearly the same, the obliquity of their respective ecliptics not very different; of all the superior planets, the distance of Mars from the sun is by far the nearest alike to that of the earth; nor will the length of the Martial year appear very different from what we enjoy when compared to the surprising duration of the years of Jupiter, Saturn, and the Georgium Sidus. If we then find that the globe we inhabit has its polar region frozen and covered with mountains of ice and snow, that only partially melt when alternately exposed to the sun, I may well be permitted to surmise that the same causes may probably have the same effect on the globe of Mars; that the bright polar spots are owing to the vivid reflection of light from frozen regions; and that the reduction of these spots is to be ascribed to their being exposed to the sun."

It would follow from this that there is water upon the planet; and, indeed, the bluish tint of the darker spots confirms this opinion. But in Herschel's day no means existed for ascertaining the condition of the atmosphere of Mars. The spectroscope, however, has enabled the astronomers of our time to demonstrate what in Herschel's day was a mere surmise. It has been found that the atmosphere of the planet is at times heavily laden with aqueous vapor. We have in this an explanation also of a phenomenon noticed by the first observers of Mars—the whiteness of the planet near its edge. This seems very well accounted for when we remember that the edge of the illuminated disk of Mars is the region where either morning has just begun or evening is just approaching, for the morning and evening skies would naturally be vapor-laden. On the whole, it must be admitted that Mars presents features which we are accustomed to associate with the requirements of living beings, though it would be rash to assume that the planet is necessarily inhabited. R. A. PROCTOR.

Mars (ANNE FRANÇOISE HIPPOLYTE BOUTET-MONVEL), b. at Paris Feb. 5, 1779, a daughter of Jacques Monvel, acting at the Théâtre Français, and Mars-Boutet, acting at the theatre of Versailles; entered very early on the stage; made in 1800 a great impression by her representation of the deaf and dumb girl in *Abbé de l'Épée;* was soon acknowledged as the greatest actress ever seen in certain *rôles*, the so-called *grandes coquettes*, Agnès, Célimène, Elmire, etc.; achieved a perfect triumph by her impersonation of Gabrielle de Belle-Isle, a girl of twenty, herself being sixty; retired from the stage in 1841, honored, admired, and rich, and d. Mar. 20, 1847. Her greatest charm was her voice, soft, melodious, and capable of expressing the most complex states of the mind and the most delicate movements of the soul with striking clearness and wonderful grace.

Marsa'la [Arab. *Marsa Alla*, "the port of God"], a maritime town of Sicily, in the province of Trapani, about 19 miles S. S. W. of the port of Trapani, in lat. 27° 47′ N., lon. 30° 05′ E. The back country is fertile, the town itself well built and well fortified, and the public edifices contain many objects of historic and artistic interest. Marsala occupies nearly the site of the old Carthaginian *Lilybæum*, and the archæologist cannot fail to be attracted by the curiously painted sepulchres cut in the solid rock, the ancient Grotto of the Sibyl with its prophetic well, the rare old mosaics, etc., which may be seen outside the western gate. Marsala owes much of its present prosperity to Mr. Woodhouse, an English vine-grower, who by his own extensive outlays has encouraged the inhabitants to improve their harbor and create other facilities for commerce. Its trade consists in grain, oil, salt, etc., but chiefly in marsala wine, which much resembles sherry, and is a favorite wine in England. Of the 30,000 pipes produced annually, about three-fourths are exported. The number of vessels, coasting and others, which enter this port yearly exceeds 1200. Marsala has recently acquired historic interest as the point where Garibaldi, eluding the vigilance of the Neapolitan fleet, landed with his heroic *thousand*, and began the romantic campaign which terminated the kingdom of the Two Sicilies so ignominiously. Pop. in 1874, 34,202.

Marsar'dis, post-tp. of Aroostook co., Me. Pop. 169.

Marsch'ner (HEINRICH), b. Aug. 16, 1796, at Zittau in Saxony; studied law for some time at the University of Leipsic, but devoted himself exclusively to music after 1817, when he composed his first opera; became in 1823 musical director of the opera at Dresden; went in 1831 to Hanover as chapel-master to the king, and d. there Dec. 14, 1861. Of his numerous compositions, the two operas *The Vampyre* (1828) and *Hans Heiling* (1833) were received with much applause, and are still often performed in Germany. His music to Mosenthal's drama, *The Goldsmith of Ulm*, is perhaps his most original and impressive composition.

Marscia'no, town of Italy, in the province of Perugia, about 18 miles from the town of Perugia. It is a walled town, tolerably well-built; it was founded in the tenth century, and was for the most part a possession of Perugia during the Middle Ages. Pop. in 1874, 10,600.

Mars'den (SAMUEL), b. in England in 1764, of humble parentage; was educated at the free grammar school at Hull; was at first a tradesman at Leeds and a member of the Wesleyan Methodist Church, but after some years joined the Church of England, prepared for the ministry at St. Joseph's College, Cambridge, and in 1794 went as chaplain to the recently established penal colony at Paramatta, near Sydney, Australia, where he established a model farm and trained the convicts to habits of industry. In 1809 he returned to England to submit projects for the benefit of the convicts to the English government, and also to solicit aid in founding a mission to the Maoris of New Zealand, but failed to secure help from the Church Missionary Society or the services of any clergyman. Three laymen, William Hall, John King, and Thomas Kendall, volunteered for the work. Marsden purchased a small vessel, the Active, at his own expense, and went to New Zealand, where he was well received by the natives, and commenced operations by teaching them the arts of civilization. Marsden continued to reside in Australia, but visited New Zealand at intervals, procuring reinforcements both of the Anglican and the Wesleyan Church for the mission, which made rapid progress, persuaded the natives to adopt a fixed form of government, provided for the preparation of a grammar and dictionary of the Maori language, and lived to see the islanders generally Christianized, and himself to be regarded as the "apostle of New Zealand," to which island he made seven voyages. D. in Australia, May 12, 1838.

Marsden (WILLIAM), D. C. L., b. at Dublin, Ireland, Nov. 16, 1754; entered in 1771 the civil service of the East India Company at Bencoolen, Sumatra; rose to the post of principal secretary to the colonial government; became deeply versed in the Malay language and literature; returned to England in 1779; published a *History of Sumatra* (1782), a *Grammar and Dictionary of the Malay Language* (1812), a translation of *Marco Polo* (1817), and *Numismata Orientalia* (1823–25). In 1795 he became chief secretary to the admiralty; resigned in 1807 on a handsome pension; donated in 1834 his fine collection of coins and medals to the British Museum, and his Oriental library to King's College, London. D. near London Oct. 6, 1836.

Marseilles' [anc. *Massilia*], the principal seaport of France and the capital of the department of Bouches-du-Rhône, is on the north-eastern shore of the Gulf of Lyons, in lat. 43° 18′ N., lon. 5° 22′ E. The old part of the city consists mostly of narrow, crooked, and even dirty streets, with a few spacious squares, and is separated from the new part, with its broad, straight streets and magnificent quays along the harbors, by an elegant avenue running from the Porte d'Aix, a fine triumphal arch at the northern entrance of the city, to the Porte de Rome, which to the S. leads into the Prado, the principal promenade. The most elegant part of the new city is the Cannebière, a street running from the above-mentioned avenue to the old harbor, and containing, besides several public buildings, the most prominent hotels and the most brilliant shops. But the liveliest and most characteristic part of Marseilles is the quays, thronged with people from Algeria, Egypt, Syria, and all parts of Europe. Of the public buildings, none has any great architectural merit; the most remarkable

are the cathedral, situated in the old town, on the site of an ancient temple of Diana, and the town-house, the bourse, and the mint in the new town. But the whole city presents a picturesque aspect, rising amphitheatrically around the bay, and surrounded with hills covered with olive-groves, vineyards, and elegant villas. The educational and benevolent institutions are numerous and good. There are a library of 75,000 volumes, several active scientific societies, a hydrographic institution, a botanical garden, an observatory, a lyceum, an excellent medical school, several free industrial and commercial schools, an academy of Oriental languages, etc. The manufacturing industry is very flourishing, especially of soap, leather, glass, porcelain, liqueurs, etc. But its principal importance the city derives from its commerce, extending to all ports of the Mediterranean Sea. The old harbor comprises a basin 1000 yards long, 330 yards broad, from 18 to 24 feet deep, covering an area of 70 acres, and capable of accommodating about 1200 merchant vessels; it is defended by Fort St. Nicolas and Fort St. Jean. The new harbor, La Jolliette, formed by a breakwater 1300 yards long, was opened in 1855. Still more recently the basin called Dieu-Donné, admitting the largest men-of-war, was formed between the islands of Ratonneau and Pomègue, both fortified. Four lighthouses show the way into the harbors. In 1871, 5120 French vessels, of 1,309,000 tons burden, entered the port, and 3715 foreign vessels, of 908,000 tons burden. In the same year the value of the imports, consisting of cotton, sugar, precious metals, timber, cork, etc., was estimated at 964,000,000 francs, and that of the exports, consisting of wine, salt, manufactured goods, etc., at 732,000,000 francs.

Marseilles was founded in the sixth century B. C. by Phocæans from Asia Minor. In the fourth century B. C. it sent its traders into the Baltic (see PYTHEAS), and had founded a number of ports on the Mediterranean Sea. In 49 B. C. it was conquered by Cæsar and united to the Roman republic; Cicero calls it at this time the Athens of Gaul. In the ninth century of our era it belonged to Burgundy, in the thirteenth to Provence; in 1481 it was united to France. During the Revolution it suffered frightfully from Fréron's atrocities, but it rose rapidly after the Restoration, and the conquest by the French of Algeria gave its commerce a powerful impulse. Pop. in 1872, 312,864.

Marseilles, post-v. of La Salle co., Ill. Pop. 758.

Marseilles, post-v. and tp. of Wyandot co., O., 13 miles S. W. of Upper Sandusky, and on Tymochte Creek. Pop. of v. 251; of tp. 603.

Marseillaise′, the grand anthem of the French Revolution, composed, both words and music, in 1792, in a single night, by Rouget de Lisle, an officer of artillery at Strasbourg. It was called the war-song of the army of the Rhine. The name *Marseillaise* was given it at Paris from the incorrect report that it had originated at Marseilles.

Marsh, tp. of Surry co., N. C. Pop. 619.

Marsh (ANNE **Caldwell**), b. at Lindley Wood, Staffordshire, England, about 1798; married in 1820 Mr. Arthur C. Marsh, a London banker (d. 1849), and began in 1834 the publication of a long series of novels, some of which acquired considerable popularity, and were republished in the U. S. The best known is *Emilia Wyndham* (1846). In 1858, on the death of a brother, she succeeded to his estate, and assumed the name of MARSH-CALDWELL of Lindley Wood. The wives of William Roscoe and of Sir Henry Holland were her sisters. D. at Lindley Wood Oct., 1874.

Marsh (CHARLES), LL.D., b. at Lebanon, Conn., July 10, 1765; graduated at Dartmouth 1786; commenced the practice of law at Woodstock, Vt., 1788; was U. S. district attorney for Vermont during Washington's presidency; member of Congress 1815–17; was one of the founders of the American Colonization Society, and a liberal benefactor of the missionary and Bible societies. D. at Woodstock, Vt., Jan. 11, 1849.

Marsh (GEORGE PERKINS), LL.D., b. at Woodstock, Vt., Mar. 15, 1801; graduated at Dartmouth College in 1820; studied law at Burlington, Vt., and practised at the bar; was elected in 1835 a member of the supreme executive council of the State; studied comparative philology, and printed privately a translation of Rask's *Icelandic Grammar* (1838); was a member of Congress from 1842 to 1849, when he was appointed minister resident at Constantinople; went on a special mission to Greece in 1852; travelled extensively in Europe; returned to the U. S. in 1854; published in 1856 *The Camel, his Organization, Habits, and Uses, considered with Reference to his Introduction into the U. S.*; served as railroad commissioner in Vermont 1857–59; delivered in 1859 a course of thirty *Lectures on the English Language* (published 1861) at Columbia College, N. Y., and in the winter of 1860–61 a second course on the same subject before the Lowell Institute at Boston, *The Origin and History of the English Language* (published in 1862); published in 1861 a largely annotated edition of the first volume of Wedgwood's *Etymology*. He has also written *Man and Nature* (1864), which was reissued with important additions in 1874, with the title *The Earth as Modified by Human Action*. Mr. Marsh was appointed in 1861 minister to Italy, a post he still retains (1875).—His second wife, CAROLINE CRANE, b. at Berkeley, Mass., Dec. 1, 1816, published in 1857 *The Hallig, or the Sheepfold in the Waters*, translated from the German of Biernatzki, with a biographical sketch of the author, and in 1860 a volume entitled *Wolfe of the Knoll, and Other Poems*.

Marsh (HERBERT), D. D., b. in London, England, in 1756; educated at St. John's College, Cambridge; studied theology at the universities of Göttingen and Leipsic; published a number of pamphlets in German in defence of the war-policy of England, which obtained him a pension from Pitt; returned to Cambridge in 1792, and published a translation of Michaelis' *Introduction to the New Testament* (4 vols., 1792–1801), accompanied by an extended commentary—a work which first made known in England the results of the biblical researches of the founders of the modern school of German criticism, and which accordingly excited discussion and provoked opposition from conservative English theologians. In 1807, Marsh became Lady Margaret professor of divinity at Cambridge, and published an extended *Course of Lectures on the Criticism and Interpretation of the Bible* (7 parts, 1809–23), consisting chiefly of a popularization of the views of German scholars. In 1812 he published a *History of the Translations of the Scriptures;* in 1813 *Horæ Pelasgicæ;* became bishop of Llandaff 1816, of Peterborough 1819; wrote numerous minor treatises on theology, politics, and classical topics. D. at Peterborough May 1, 1839. Bishop Marsh was the most learned and acute English theologian of his time, and excelled in polemics, directed chiefly against Calvinistic views and the Church of Rome.

Marsh (JAMES), M. D., b. in England in 1789; studied medicine, and practised for many years as a physician at Dublin; was the discoverer of a method of detecting arsenic in a liquid by means of an apparatus called by his name. (See ARSENIOUS OXIDE.) The method was described by him in the *Edinburgh Philosophical Journal* for Oct., 1836, and has come into general use in Europe in cases of suspected poisoning. Dr. Marsh d. at Woolwich June 21, 1846.

Marsh (JAMES), D. D., b. at Hartford, Vt., July 19, 1794; graduated at Dartmouth in 1817; was a tutor there 1818–20; graduated at Andover Seminary 1822; was ordained to the Congregational ministry in 1824; professor of languages in Hampden-Sidney College, Va., 1824–26; was president of the University of Vermont 1826–33; professor of moral and intellectual philosophy 1833–42. D. at Colchester, Vt., July 3, 1842. Dr. Marsh was author of many able reviews and contributions to periodical literature, chiefly philosophical and theological. He also made some translations from the German. (See his *Remains*, with memoir, by Dr. Joseph Torrey, 1843.)

Marsh (JOHN), D. D., b. at Wethersfield, Conn., Apr. 2, 1788; graduated at Yale in 1804; was 1818–33 pastor of the First Congregational church in Haddam, Conn., and afterwards devoted himself to the temperance cause, which he effectively served as a writer and public speaker. He was (1836–66) editor of a temperance journal in New York. Among his works are a *Compendium of Ecclesiastical History* (1838; revised ed. 1865) and *Temperance Recollections* (1866). D. at Brooklyn, N. Y., Aug. 4, 1868.

Marsh (OTHNIEL CHARLES), F. G. S., b. at Lockport, N. Y., Oct. 29, 1831; prepared for college at Phillips Academy, Andover, Mass.; graduated at Yale College 1860, and at Yale Scientific School 1862; prosecuted scientific studies at the universities of Berlin, Heidelberg, and Breslau 1862–65, and was appointed professor of palæontology in Yale College 1866. He has written largely upon that science in the *American Journal of Science* and elsewhere. For the last few years he has been investigating the extinct animals of the Rocky Mountain region in North America, discovering more than 200 fossil animals before unknown, most of which he has described. He is now (1875) engaged in the preparation of an extended memoir on this subject.

Mar′shal [Old High Ger. *Marah-scalc,*" horse-servant"], originally the person who had charge of the king's horses. When chivalry became the only important secular pursuit, and nearly all offices about the royal courts were filled by noblemen, the marshal's position became one of great importance, and finally in England there was appointed an earl-marshal, who at present has only a ceremonial dignity except as the head of the College of Heralds. The office is hereditary with the dukes of Norfolk. In Scotland there

was an hereditary earl-marischal of the Keith family, but the office is now in abeyance. There are also knight-marshals. The highest military title in most European armies is marshal (field-marshal, *maréchal de camp, Feld-marschall, Feldzeugmeister*). This title is of direct descent from feudal times, when the marshal was the king's esquire and commanded the advance-guard. The gradual increase of his authority in the army after a time led to the creation of a distinct military office of this name. In the U. S. a marshal is an officer of the U. S. courts, whose duties correspond to those of the sheriff of the State governments. There is one U. S. marshal in each judicial district.

Mar'shall, county of N. E. Alabama. Area, 600 square miles. It is traversed by the Tennessee River. A portion is elevated, and covered with forests, and contains iron and coal. Another portion is a broad fertile plain. Live-stock, cotton, and corn are leading products. Cap. Guntersville. Pop. 9871.

Marshall, county of N. Central Illinois. Area, 360 square miles. It is level, fertile, and abounds in coal. Its staple products are grain, cattle, and wool. It has manufactures of carriages, harnesses, etc. The county is traversed by the Illinois River and by the Chicago and Alton and the Peoria Pekin and Jacksonville R. Rs. Cap. Lacon. Pop. 16,956.

Marshall, county of N. Indiana. Area, 400 square miles. It is level, fertile, and partly covered with timber, with numerous oak-openings. Cattle, grain, wool, and lumber are leading products. The county is traversed by the Pittsburg Fort Wayne and Chicago and the Chicago Cincinnati and Louisville R. Rs. Cap. Plymouth. Pop. 20,211.

Marshall, county of Central Iowa. Area, 576 square miles. It is level and fertile, and the W. part contains coal. Cattle, grain, and wool are leading products. Carriages, harnesses, etc. are manufactured. The county is traversed by Iowa River and by the Chicago and Northwestern and Iowa Central R. Rs. Cap. Marshalltown. Pop. 17,576.

Marshall, county of N. E. Kansas, bounded N. by Nebraska. Area, 908 square miles. It is rolling, fertile, well watered and fairly timbered, abounding in building-stone and constant water-power. Live-stock, corn, and wheat are staple products. The county is traversed by the Big Blue River and by the Central branch of the Union Pacific R. R. and the St. Joseph and Denver City R. R. Cap. Marysville. Pop. 6901.

Marshall, county of W. Kentucky. Area, 350 square miles. It is bounded N. and E. by the Tennessee River. It is fertile and undulating. Live-stock, corn, and tobacco are staple products. The N. part is traversed by the Elizabethtown and Paducah R. R. Cap. Benton. Pop. 9455.

Marshall, county of Mississippi, bounded N. by Tennessee. Area, 740 square miles. It is undulating and fertile. Cotton, corn, and live-stock are leading products. The county is traversed by the Mississippi Central R. R. Cap. Holly Springs. Pop. 29,416.

Marshall, county of S. Central Tennessee. Area, 375 square miles. It is mostly quite level and very fertile. Live-stock, cattle, grain, wool, and lumber are leading products. The county is traversed by Duck River. Cap. Lewisburg. Pop. 16,207.

Marshall, the southernmost county of the "Panhandle" of West Virginia, bounded E. by Pennsylvania and W. by the Ohio River. Area, 280 square miles. Back from the river it becomes rolling and hilly, but is uniformly fertile and well cultivated. Live-stock, grain, and wool of the best quality are largely produced. Beds of coal exist, but are not worked to any extent. The county is traversed by the Baltimore and Ohio R. R. Cap. Moundsville. Pop. 14,941.

Marshall, post-v., cap of Searcy co., Ark., 60 miles W. N. W. of Batesville.

Marshall, tp. of White co., Ark. Pop. 429.

Marshall, post-v. and tp., cap. of Clark co., Ill., on the St. Louis Vandalia and Terre Haute and the Paris Danville and Vincennes R. Rs., has good schools, 6 churches, 2 newspapers, 4 flouring-mills, 1 woollen-mill, and stores. Pop. 2541. M. O. FROST, ED. "CLARK CO. HERALD."

Marshall, tp. of Lawrence co., Ind. Pop. 830.

Marshall, tp. of Louisa co., Ia. Pop. 967.

Marshall, tp. of Marshall co., Ia. Pop. 727.

Marshall, tp. of Taylor co., Ia. Pop. 309.

Marshall, post-v. and tp., cap. of Calhoun co., Mich., on the Michigan Central R. R., has an excellent system of graded schools, 3 banks, several churches, 2 newspapers, and stores. Pop. of v. 4925; of tp. 984.

MORGAN BATES, ED. "STATESMAN."

Marshall, post-v., cap. of Lyon co., Minn., on the Chicago and North-western R. R., has 2 churches, 1 newspaper, a flouring-mill, 2 hotels, and several stores. Pop. about 800. C. F. CASE, ED. "PRAIRIE SCHOONER."

Marshall, tp. of Platt co., Mo. Pop. 2038.

Marshall, post-v. and tp., cap. of Saline co., Mo., 85 miles N. W. of Jefferson City and 16 miles W. of the Missouri River, has 3 churches and 2 weekly newspapers, abundance of stone-coal, and is surrounded by a fine agricultural region. Pop. of tp. 3701.

Marshall, post-tp. of Oneida co., N. Y., is traversed by the Utica Chenango and Susquehanna Valley and the Midland R. Rs. Pop. 2145.

Marshall, post-v. and tp., cap. of Madison co., N. C., near the French Broad River, and 23 miles S. E. of Wolf Creek (Tenn.) R. R. Station. Pop. 1502.

Marshall, post-v. and tp. of Highland co., O., 8 miles E. S. E. of Hillsboro'. Pop. of v. 112; of tp. 821.

Marshall, tp. of Allegheny co., Pa. Pop. 705.

Marshall, post-v., cap. of Harrison co., Tex., on the Texas and Pacific R. R., has 2 institutes and several primary schools, 7 churches, 1 bank, 4 benevolent institutions, county fair association and grounds, 2 weekly newspapers, several mills, 3 good hotels, and stores. Pop. 1920.

T. P. HAWLEY, ED. "EAST TEXAS BULLETIN."

Marshall, tp. of Buckingham co., Va. Pop. 2605.

Marshall, tp. of Fauquier co., Va. Pop. 4312.

Marshall, tp. of Richmond co., Va. Pop. 1992.

Marshall, post-v. of Medina tp., Dane co., Wis., on the Milwaukee and St. Paul R. R. (Madison division), is the seat of Augsburg Theological Seminary (Lutheran).

Marshall, tp. of Richland co., Wis. Pop. 847.

Marshall (HUMPHREY), a relative of Chief-Justice Marshall, emigrated to Kentucky in 1780; was a prominent man in State affairs; U. S. Senator 1795–1801, and published a *History of Kentucky* (1 vol., 1812; 2 vols., 1824). D. at Lexington, Ky., July 1, 1841.

Marshall (HUMPHREY), b. Jan. 13, 1812, in Frankfort co., Ky., grandson of Humphrey Marshall, author of the first published history of Kentucky, and son of Judge John J. Marshall; graduated from the U. S. Military Academy in 1832, and entered the army as brevet third lieutenant of mounted rangers; transferred to the 1st Dragoons as brevet second lieutenant in the following year, and resigned from the army Apr. 30, 1833; studied law, and was admitted to the bar, practising his profession first at Frankfort till 1834, then at Louisville till the outbreak of the war with Mexico, when he led the 1st Kentucky Cavalry to the seat of war as its colonel, and was engaged at the battle of Buena Vista. On the disbandment of his regiment he returned to his native State and settled on a farm in Henry co. In 1849 he was chosen Representative to Congress, and re-elected in 1851; in 1852, Pres. Fillmore appointed him commissioner of the U. S. to the empire of China, which was at once raised to a first-class mission; recalled in 1853, and practised law in Washington; elected to Congress from Kentucky in 1855, and re-elected in 1857. Although opposed to secession, he espoused the Confederate cause in Sept., 1861, and was appointed brigadier-general; resigned his commission shortly after, and was elected to the Confederate Congress; practised law in Richmond, Va., for a time, subsequently returning to Louisville, Ky., where he enjoyed an extended and lucrative practice. D. at Louisville, Ky., Mar. 28, 1872. G. C. SIMMONS.

Marshall (JOHN), LL.D., b. at Germantown, Fauquier co., Va., Sept. 24, 1755, the eldest of the fifteen children of Col. Thomas Marshall, a small planter, who served with the greatest honor as an officer of the Revolution. The son, whose early education was imperfect, was himself an officer in active service from 1775 to 1779, distinguishing himself alike in the field and in courts-martial, where he often acted as judge-advocate. In 1779, while on detached service in Virginia, he attended Mr. Wythe's law-lectures at William and Mary College, and was licensed to practise. In 1781 he resigned his commission and entered upon the practice of law. In 1783 he married and returned to Richmond; distinguished himself in the Virginia convention for ratifying the U. S. Constitution and in the State legislature; declined the U. S. attorney-generalship, a seat on the bench of the Supreme Court, and other important positions; went in 1798 as envoy to France; entered Congress in 1799, where he was one of the ablest Federalists in the House; was appointed in 1800 secretary of war, and soon after secretary of state; and in 1801, having been nominated chief-justice of the U. S. by President Adams, was confirmed by the Senate without a dissenting vote. Mr. Marshall held this office for many years with the greatest honor and benefit to his country. The

influence of his legal decisions was great and permanent, and his fame as a solid reasoner, a just judge, and a profound jurist is world-wide. In constitutional, commercial, and prize law his decisions are of paramount importance. His *Life of Washington* (5 vols., 1805; abridged and improved, 1 vol., 1832) and his *History of the Colonies* are more valuable to the historian than to the general reader. Chief-Justice Marshall was a man greater in wisdom than in learning, a sincere Christian and a true philanthropist. He was tall, ungraceful, and even awkward in manner, but most genial and kindly in private life. D. at Philadelphia July 6, 1835.

Marshall (John James), b. in Woodford co., Ky., Aug. 4, 1785; graduated at Princeton in 1806; was for many years an able lawyer and active politician of Kentucky; was 1836–46 a judge of the State circuit court, and published 7 vols. of law reports. In the financial crash of 1837 he lost his property through the generous support he gave to his friends. D. at Louisville June, 1846.

Marshall (Nellie), daughter of Gen. Humphrey Marshall, b. in Kentucky in 1847; began to write for the press in 1863; is author of *Gleanings from Fireside Fancies* (1866) and *As by Fire*, a novel of merit and power (1869).

Marshall (Thomas Alexander), LL.D., son of Humphrey Marshall the historian, b. in Woodford co., Ky., Jan. 15, 1794; graduated at Yale in 1815; began law-practice in Frankfort in 1817; removed to Paris, Ky., in 1819; was a member of Congress 1831–35; a judge in the court of appeals 1835–56; professor of law in Transylvania University 1836–49; and chief-justice of the court of appeals 1866. D. at Louisville, Ky., Apr. 17, 1871.

Marshall (Thomas Francis), b. in Frankfort, Ky., June 7, 1801, was a nephew of Chief-Justice Marshall. He began law-practice when young; removed in 1831 to Louisville; became a prominent political orator and a judge of the State circuit court; was a member of Congress 1841–43, and won distinction by his brilliant talents. D. near Versailles, Woodford co., Ky., Sept. 22, 1864. A collection of his writings and speeches has been edited by W. L. Barre (Cincinnati, 1858).

Marshall (William Calder), R. A., b. at Edinburgh, Scotland, in 1813; studied sculpture in London under Chantrey and Bailey; visited Rome in 1836; took up his permanent residence in London in 1839, and devoted himself chiefly to the poetic or ideal element in sculpture, in which branch he achieved success, his most notable works being *The Broken Pitcher, Rebecca, The First Whisper of Love, The Dancing-Girl Reposing*, and *Sabrina*. Marshall was one of the three sculptors employed for the decoration of the new houses of Parliament, for which he executed statues of Lord Clarendon and Lord Somers. He designed the statue of Sir Robert Peel at Manchester, that of Jenner now in Kensington Gardens, that of Campbell in Westminster Abbey, that of Sir George Grey at Cape Town, and those of Crompton and of James, seventh earl of Derby, at Bolton, the national monument to the duke of Wellington, and is now (1875) executing in marble a series of bassi-relievi for the Wellington chapel in St. Paul's cathedral.

Marshall Isle, an island in the Atlantic, belonging to Hancock co., Me. Pop. 5.

Marshall's, or **Belmont,** a place in Boulder co., Col., 22 miles N. W. of Denver, on South Boulder Creek, and on the Julesburg and Golden R. R., 5 miles S. of Boulder. It has valuable mines of good lignitic coal. Iron and fire-clay are also found.

Marshall's, tp. of Harford co., Md. Pop. 4409.

Mar'shallsville, post-v. of Macon co., Ga., on the South-western R. R. Pop. 424.

Mar'shalltown, post-v., cap. of Marshall co., Ia., at the intersection of the Chicago and North-western with the Central R. R. of Iowa, in the centre of a fine agricultural region, has 3 public schools, 7 churches, 3 banks, a public library, 3 newspaper-offices, 1 furniture and soap factory, an oil-mill, a foundry, 2 flouring-mills, 2 breweries, and 3 grain-elevators. Pop. 3218.

M. Waterman, Ed. "Marshall Republican."

Mar'shallville, post-v., in Baughman and Chippewa tps., Wayne co., O., on the Cleveland Mount Vernon and Delaware R. R. Pop. 322.

Mar'shalsea Prison in Southwark, London, was built in the twelfth century, and placed under the control of the king's marshal of the household. It was opened by the Gordon rioters in 1780. It was long a king's bench prison, but finally, like the Fleet, became a poor debtors' prison. It was abolished, with the ancient Marshalsea and Palace courts, in 1849, and has been since pulled down.

Mar'shan, tp. of Dakota co., Minn. Pop. 527.

Marsh'field, a v. of Washington co., Me., 1 mile N. of Machias. Pop. 350.

Marshfield, post-tp. of Plymouth co., Mass., on the sea-coast, 30 miles S. E. of Boston, has 6 churches, and manufactures of flour, lumber, shoes, clothing, etc., and was for years the residence of Daniel Webster. Pop. 1659.

Marshfield, post-v., cap. of Webster co., Mo., on the Atlantic and Pacific R. R., 218 miles from St. Louis. Pop. 809.

Marshfield, post-v. of Waterloo tp., Athens co., O., on Marietta and Cincinnati R. R., in a coal-region. Pop. 240.

Marshfield, post-v. of Coos co., Or., on the S. side of Coos Bay, 4 miles from the mouth of Coos River, in a hilly and densely-wooded region, and has important mines of good lignitic coal.

Marshfield, post-tp. of Washington co., Vt., 16 miles N. E. of Montpelier, has 3 churches and manufactures of boots, shoes, lumber, and starch. Pop. 1072.

Marshfield, tp. of Fond du Lac co., Wis. Pop. 1593.

Marsh Fork, tp. of Raleigh co., W. Va. Pop. 736.

Marsh-Gas [Ger. *Sumpfgas, Grubengas;* Fr. *gaz de marais*], *light carburetted hydrogen, methane, formene* (Berthelot), *hydruret of methyle, fire-damp.* Chemical composition, CH_4. That compound of carbon and hydrogen, or hydrocarbon, which contains what is believed to be the maximum proportion of hydrogen possible, called by Berthelot a "saturated hydrocarbon." It is a highly important gas in nature, being one of the principal and invariable products of the decomposition of organic matter in the absence of air in excess, at ordinary temperatures, as well as at the high temperatures of the gas-retort, coal-gas containing 40 to 45 per cent. or more of it. Volta seems to have been the first chemist who examined the gas from stagnant water and marshes; Priestley was among its earliest subsequent investigators.

Occurrence in Nature.—Locally, marsh-gas must occur as a constant constituent of the atmosphere—namely, in districts where it is constantly emitted from the earth in enormous volume, which is the case in a great number of countries. As it has not been detected, however, as a normal constituent of the air, it is no doubt duly destroyed therein by oxidation. It is found in a number of ancient geological strata in a highly compressed form, exuding constantly from fissures in their outcrops, or far more copiously when holes are bored into these rocks where they lie at a depth below the surface. Such are gas-wells, which are to play an important and valuable part in the future of some large sections of the U. S., and possibly of other countries on the earth. (See *Gas-Wells* under the head of Gas-Lighting, by Prof. Chandler.) A view of the mode of production of marsh-gas in these formations, offered in 1871 by the present writer, is as follows: Marsh-gas, being that hydrocarbon which contains the most hydrogen and the least carbon, is the natural and necessary residuum of the abstraction of the carbon from organic matter by some oxidizing agency at low temperatures in the presence of water. The oxidizing agency was oxide of iron, doubtless partly in the form of sulphate of iron, which acted as a carrier of oxygen from the combined water of the cellulose and other organic substances present by alternating changes of reduction by the carbon to the form of sulphide, and oxidation again to sulphate, and so on. In the mud of stagnating pools and marshes the same process may be seen at any time in progress, such mud being always black with sulphide of iron, and giving off marsh-gas when a stick is thrust in. The rocks which furnish the gas of the gas-wells were the highly organic mud of ancient shallow seas or lagoons. They always contain iron sulphide and carbonate. The carbonic acid formed, by reason of its solubility in water has been partly removed, though the marsh-gas of the wells is usually found still to retain more or less of carbonic acid. This acid remains in the rocks in part also, no doubt, in the forms of carbonates of iron, lime, and magnesia.

Artificial Preparation.—Marsh-gas is remarkable in being a compound which, while so abundantly and universally produced in nature, is not often encountered as a product of artificial transformations in the laboratory. Indeed, it is not easy to obtain it in a pure state; the most practicable method, which does not furnish it free from contamination, being the destructive distillation of a mixture of acetate and hydrate of potash. In a pure state it can be obtained only by a very expensive method, by the action of water upon the substance called methylide or methide of zinc:

$$ZnH_2,CH_2,CH_2 + 2H_2O = ZnO,H_2O + 2\ (H_2,CH_2),$$

the sole products being zinc-oxide hydrate and marsh-gas.

Chemical Constitution and Properties.—On the homologic theory of the constitution of organic compounds, marsh-gas has the molecular constitution assigned in the equation above, H_2,CH_2; but according to the hypothetical views

of the prevailing school of chemists, CH_4 is a *typical* body, one of the four fundamental types of all organic compounds. As this latter hypothesis is in opposition to the plain facts of HOMOLOGY (see under that head), we may rest satisfied here with a mere presentation of both views, without discussion. Marsh-gas, next to hydrogen gas, is the lightest known body, having a density of .5576 (air = 1), or little over half the weight of air. Hence, the fire-damp of coal-mines collects in the higher parts of the workings, and forms an explosive stratum, first near the roof of a passage in which the air is quiet. The gas of the gas-wells is also lighter than air, notwithstanding the 10 per cent. of heavy carbonic acid that it often contains, and has been used for filling balloons. CH_4 contains, by weight, just 75 per cent. of carbon and 25 per cent. of hydrogen, but it nevertheless partakes so much of the nature of hydrogen that it burns with a similar flame, when pure, without any light, being the only known hydrocarbon free from oxygen whose flame is non-luminous. It has a great general chemical indifference towards other bodies, at least at the ordinary temperature, though chlorine combines with it with the assistance of light, being without action in the dark. A mixture with chlorine does not immediately explode when put in sunshine, as in the case of some other hydrocarbons, but does so nevertheless after some time. It is somewhat soluble in water—to the extent of $5\frac{1}{2}$ per cent. of its volume at 32° F., and less than 4 per cent. at 60°. In alcohol it is about twelve times as soluble as this, and might thus be approximately separated from a mixture with hydrogen, of which alcohol takes up but 6.7 per cent. HENRY WURTZ.

Marsh'-Hawk, or **Harrier,** of the U. S., the *Circus Hudsonius*, a large and rapacious bird found in all parts of North America. The marsh-hawk of Europe and Africa is *Circus rufus*.

Marsh'-Hen, a name applied to the clapper rail, called also salt-water marsh-hen (*Rallus crepitans*), and to the *Rallus elegans* (fresh-water marsh-hen, king-rail), game-birds of the U. S., rarely seen except by sportsmen and naturalists. (See RAIL.)

Mars Hill, post-tp. of Aroostook co., Me., 33 miles N. of Houlton, on the New Brunswick line. It is named from a peak 2000 feet high on its S. border. Pop. 399.

Marsh Island, an island belonging to Lincoln co., Me. Pop. 20.

Marsh'mallow, the *Althæa officinalis*, an herb of the mallow family, a native of the Old World, but naturalized in the U. S., principally in salt-marshes. The plant is remarkably mucilaginous, and is used chiefly in domestic practice as a demulcent in coughs and diseases of the bowels and kidneys. It appears to have mild diuretic virtues. It is in some countries used as a potherb. Marshmallow paste and candy are popular confections, used to allay irritation in the throat.

Marsh'man (JOHN CLARK), son of Joshua, b. at Serampore, India, about 1810; was educated by his father, and spent his life until 1856 in the civil service of the East India Company in Bengal. He wrote a valuable *History of India* (1867), *The Life and Times of Carey, Marshman, and Ward, embracing the History of the Serampore Mission* (1859), and a *Life of Sir Henry Havelock* (1860). Gen. Havelock married a sister of Mr. Marshman.

Marshman (JOSHUA), D. D., b. at Westbury-Leigh, Wiltshire, England, in 1767; went to India in 1799 as a Baptist missionary; resided chiefly at Serampore; gained a competent knowledge of Bengalee, Sanskrit, and Chinese; prepared Chinese translations of Genesis, the four Gospels, and the Epistles to the Romans and the Corinthians; published a *Dissertation on the Characters and Sounds of the Chinese Language* (1809), *The Works of Confucius, containing the Original Text, with a Translation* (1811), *Clavis Sinica, Elements of Chinese Grammar* (1814), and a *Defence of the Deity and Atonement of Jesus Christ* (1822), in reply to Rammohun Roy. He aided Dr. Carey in the preparation of his *Sanskrit Grammar* and *Bengalee and English Dictionary*. D. at Serampore Dec. 5, 1837.

Marsh-Marigold. See CALTHA.

Marsh'-Rosemary, or **Sea-Lavender,** the *Statice Limonium*, a salt-marsh plant, common along the Atlantic shores of the U. S., Canada, and Europe. There are many varieties, by some botanists regarded as one species. Its root abounds in tannic acid, of which it contains nearly 12.5 per cent. It is used in medicine, especially as a remedy for sore mouth and sore throat, and is best prepared by infusion.

Marsh's Test, a test for arsenic, especially applicable in cases of supposed poisoning. It has been described by Prof. Chandler under the head of ARSENIOUS OXIDE (which see).

Mar'si, an ancient and warlike Italian people, early allies of the Romans, but fought against them with the greatest valor in the Social war. They dwelt in an inland and mountainous district around the basin of the Fucine Lake, and were famous for their skill as magicians and diviners. Their chief city was Marruvium.

Mar'siconuo'vo, town of Southern Italy, in the province of Potenza, about 22 miles S. W. of the town of Potenza. It stands on a hill, and is subject to furious winds. Pop. in 1874, 8611.

Marsipobran'chia [Gr. μάρσιπος, "purse," and βράγχια, "gill"], a class of vertebrates generally confounded with the fishes, but distinguished by many remarkable peculiarities. The skeleton is of a very inferior type, the notochord or embryonal vertebral column being persistent. The skull is in a most rudimentary condition, and represented by a small brain-case and capsules for the organs of sense (auditory and olfactory), as well as by an ethmovomerine plate; the inferior appendages are developed as elements designated as (1) the subocular arch, with a metapterygoid or "superior quadrate," and an "inferior quadrate" portion; (2) a "palato-pterygoid" element; and (3) a "stylohyal process;" labial cartilages form also a prominent feature of the skull; bones or cartilages representing the upper as well as lower jaws are entirely wanting; the branchial apparatus is sustained by a basket-like skeleton; no limbs are developed, and consequently no scapular arch or pelvic girdle. The brain, though small, is distinctly developed, and differentiated into the brain proper and medulla oblongata; the former is composed, as in the higher forms, of the "mesencephalon," "thalamencephalon," "prosencephalon," and "rhinencephalon;" the latter is small, with a fourth ventricle conspicuous from above; and the "cerebellum" very rudimentary. The auditory apparatus is quite simple, being represented by a single membranous tube without any differentiation into canals and vestibules, as in the Hyperotreta, or, at most, as in the Hyperoartii, with two semicircular canals and a sacculated vestibule. The olfactory apparatus consists of a median sac, which is provided with but a single external aperture. The heart is distinctly developed, and is divided into an auricle and ventricle, the former having in front a venous sinus; and the whole is enclosed in a "pericardium," which connects with the peritoneal cavity. The intestinal canal is simple, the liver specialized as such, and the kidneys well developed, and with ureters opening behind into the rectum. The organs of generation have no ducts, but discharge into the abdomen, from which they depart by an abdominal pore.

The class thus distinguished is represented by very few species, but these exhibit two radically distinct types of structure, and have been differentiated into two orders—(1) Hyperoartii, in which the tube terminates in a blind sac at its posterior end; and (2) Hyperotreti, in which the narial canal perforates the pharyngeal roof and connects with the pharynx. These two orders differ very decidedly from each other in the skeleton, armature of the mouth, ovulation, etc. (Further details will be found under the respective titles.)

A remarkable metamorphosis is undergone by the representatives of the order Hyperoartii (*i. e.* the Petromyzontids or lampreys), but the transformations of the Hyperotreti (*i. e.* Myxinæ or hags) are unknown; and this is a gap most desirable to be filled, as no general characters can be specified respecting the embryology of the class until these are made known. It has been suggested that the remarkable *Branchiostoma* or *Amphioxus* represents the immature condition of Myxinæ, but this idea is evidently erroneous.

The species of the class are found both in fresh and salt waters, the Petromyzontids having members in the fresh and salt waters of all temperate and sub-temperate countries; while the Myxinoids are represented in the cold waters of the northern hemisphere by Myxinæ, as well as along the shores of a considerable portion of the Pacific—*e. g.* in the Japanese and Chinese seas, California, Chili, and Australia.

Although no representatives of the class have been found in a fossil condition, their absence in the older strata is undoubtedly due rather to the difficulty connected with the preservation of the readily destructible cartilaginous skeleton than to their actual absence. It is indeed probable that the order was extensively represented in past times, and that it was more abundantly developed than any other type. THEO. GILL.

Mars la Tour, a v. on the road from Metz to Verdun, 10 miles to the W. of Metz, is noted for the battle which took place here Aug. 16, 1870, and which is often called after this place, though generally after Vionville, a village situated farther to the E., and nearer the centre of the battle. AUGUST NIEMANN.

Mars'ton (Gilman), b. in Orford, N. H., about 1815; graduated at Dartmouth College in 1837, and at the Law School, Cambridge, Mass., in 1840; settled in 1841 at Exeter, N. H.; was a member of Congress 1859–63 and 1865–67; served with distinction through the war of 1861–65, at first as colonel of the 2d New Hampshire, and afterwards as a brigadier-general of volunteers.

Marston (John), b. in England about 1570; was educated at Corpus Christi College, Oxford; became lecturer at the Middle Temple, London, in 1593, and was author of eight dramas and two volumes of poems which were edited by J. O. Halliwell (1856, 3 vols.). Very little is known of the life of Marston. He aided Ben Jonson and George Chapman in writing the comedy of *Eastward Ho!* (1605), which caused the imprisonment of the three writers on account of its satires upon the Scotch. The best of his dramas is *The Malcontent* (1604), a tragi-comedy, originally written by John Webster, but recast by Marston and dedicated to Ben Jonson. D. about 1634.

Marston (Westland), LL.D., b. at Boston, Lincolnshire, England, Jan. 30, 1820; studied law in London, but devoted himself to literature as a profession, and has produced a large number of popular plays, tragedies, and comedies, besides occasional poems and tales.

Marston Moor, an open plain, 8 miles from York, England, memorable as the scene of the victory gained (July 2, 1644) by the allied Parliamentary and Scotch armies, commanded respectively by Lord Fairfax and the earl of Leven, over the royal forces under Prince Rupert. York was then held by the royalists, and had been besieged by Fairfax. When Prince Rupert advanced to its relief, Fairfax drew off to Marston Moor. Each army consisted of about 25,000 men. The battle commenced by a cannonade on both sides with little effect. Rupert charged with his cavalry towards evening, and dispersed the left wing of the Parliamentary forces, the commanders of which fled, but the fortunes of the day were retrieved by Leslie's Scotch regiments and Cromwell's brigade of "Ironsides," who captured the enemy's artillery, taking 1500 prisoners and 100 colors. The losses on each side were about 2000. The result was the surrender of York to Lord Fairfax a few days later, which rendered the Parliamentary cause triumphant throughout the N. of England.

Mar'strand (Wilhelm), b. at Copenhagen Dec. 24, 1810; studied in his native city, at Munich, and at Rome; became professor in 1848 at the Academy of Copenhagen, and d. there Mar. 25, 1873. His masterpieces are his historical paintings in the chapel of Christian IV. in the cathedral of Roeskilde, but he became most widely known as a genre painter. His pictures treating subjects of the comedies of Holberg show a very remarkable power of characterization and a dry, massive humor truly Danish.

Marsupia'lia [Lat. *marsupium*, a "pouch"], the only generally recognized order of the mammalian sub-class Didelphia, and comprising the opossums, kangaroos, wombats, and related types. The characters which differentiate the group as a sub-class will be found in the article Mammals, and the common ordinal characters will alone be given here. The skull is of a low type, and the nasal chamber much larger than the cerebral. The degree of difference, however, depends on the size of the animal and other considerations. The bones retain their distinctness for a considerable period, and sometimes throughout life, the basi-occipital, exo-occipital, and supra-occipital elements being long or permanently separated from each other, as are also the periotic, squamosal, and tympanic elements of the temporal bone. The pituitary fossa and clinoid processes are obsolete or wanting; distinct par-occipital processes are almost always developed; the basisphenoid is perforated by an internal periotic artery; the alisphenoids are dilated, and form the anterior wall of the tympanic cavity; the pterygoids are small and lamelliform; the bony palate has generally two or more vacuities (sometimes confounded in one) near its posterior margin; the mesethmoid is extensively ossified, and its anterior termination is abrupt and nearly vertical; the nasal bones are large; the ascending process of the premaxillaries more or less remote from the frontals; the zygoma complete; the orbit without a posterior process; "the periotic sends backward a distinct mastoid, which appears as a narrow strip of bone of considerable vertical extent between the squamosal and occipital on the side of the occipital region of the skull;" the tympanic bones are always free; the lachrymal with its perforation upon, or external to, the anterior margin of the orbit; the malar large and extending far forward as well as backward; the mandible has always, except in Tarsipedidæ, an inverted margin to the angle, and its condyles are more or less transverse; the hyoid apparatus is quite peculiar, the basihyal being rhomboidal, the ceratohyals very broad, and near or quite in contact anteriorly, and the rest of the anterior cornua cartilaginous, while the thyrohyals are stout and compressed. There are always nineteen thoracico-lumbar vertebræ, and almost always thirteen pairs of ribs (rarely, as in Phascolarctos, eleven, or, as in *Phascolomys vombatus*, fifteen). The scapula has a long acromion and a small coracoid; in all, save Peramelidæ, clavicles are developed. The fore limbs have both radius and ulna well developed and distinct, allowing of rotation; the carpal bones seven or (by the suppression of the lunar) six; five digits are developed in all except *Chœropus*. The pelvis has, in all except *Thylacinus*, two long bones ("marsupial") articulated with the anterior margin of the pubis, resulting from the ossification of the inner tendons of the external oblique muscles. The hind limb has the bones of the second segment always well developed and distinct, and sometimes capable of rotation; the carpus has always seven bones, and the astragalus is comparatively small; the first or inner toe is generally absent or thumb-like, the second and third often united, and the fourth usually much the largest.

The muscles of the hind limbs in most (the saltatorial types being excepted) present a peculiar modification in that the *flexor longus digitorum pedis* "is inserted fleshy into the fibula, and the knee and ankle joints are so modified as, through the action of the muscle so inserted, to admit of rotary movements of the hind foot."

The brain is lowly developed, and the cerebellum, as well as olfactory lobes, and often the optic lobes, are exposed above; the cerebrum is also peculiar, according to Flower, in (1) the arrangement of the folding of the inner wall of the cerebral hemisphere, a deep fissure, with a corresponding projection within, being continued forward from the hippocampal fissure along the whole of the inner wall (the *hippocampus major* extending thus into the body of the lateral ventricle, and constituting its inner wall); (2) the altered relation (consequent upon this disposition of the inner wall) and the very small development of the corpus callosum; and (3) the great increase in amount (and probably in function) of the anterior commissure.

The teeth are peculiar in that there is only one perfect set, none having deciduous predecessors except one on each side of each jaw, the hindmost (and indicated as such by its development) of the premolars; in other respects the teeth vary greatly; they frequently, however, are peculiar in the great number (5×2) of upper incisors, and in the number of true molars (4×2) in each jaw.

The heart is peculiar in the absence of a *fossa ovalis* and *annulus ovalis* in the right auricle; and in all it receives the two *venæ cavæ superiores* by two separate inlets.

The living marsupials are divisible into nine families, in addition to which there are several represented by forms no longer living. These nine families exhibit two quite distinct types of structure in the hind feet. In some, as in the opossums and thylacines, all the toes are free and unconnected with each other; in others, as kangaroos, wombats, etc., the second and third toes are much reduced in size, and closely connected together in a common integument, which leaves only the claws visible, and gives the impression of a single toe with two claws.

The chorisodactylous marsupials are represented by three very distinct families, two of which (Dasyuridæ and Myrmecobiidæ) are confined to Australia, and one (Didelphidæ) to America, one species advancing far up into the U. S.

The syndactylous marsupials exhibit in their dentition two very decided types. In one the incisors are permanently rooted, and in the lower jaw are either two large incisor teeth opposed to six in the upper, or six in the lower opposed to eight or ten in the upper. All these are inserted by roots. To this group belong the Phascolarctidæ, Phalangistidæ, Tarsipedidæ, and Macropidæ. In the other in both jaws the incisor teeth are like those of rodents, there being two in each jaw, continually reproduced, and growing in a subcircular direction. To this group belongs the single family Phascolomyidæ.

The marsupial pouch is developed in all the living representatives of the order except *Thilomys dorsigera* (the opossum of South America), which derives its name from carrying its young upon its back, with their tails swung around their mothers. This pouch is formed, according to William S. Barnard, "by the infolding of the skin. Its concavity opens on the median line of the abdomen, and extends backward and laterally, forming a kind of double bag, in the bottom of which the milk-glands open through long papillæ."

The genital organs, as to their superior modifications, have been noticed under Mammals; in this connection it may be added that the uteri form a nearly continuous track with the vaginal canals, and that those canals are generally connected at their proximal ends, and develop there a *cul de sac*, but sometimes, as in *Didelphis dorsigera*, etc., they are distinct, and debouch into the urogenital canal

without any function. The young, instead of being nourished in the womb until it has attained a considerable size and a certain maturity of development, as in ordinary mammals, has no organic connection with the mother, but is born or expelled from the uterus in a very immature condition. The interval between the impregnation of the mother and birth of her young in the opossum is about twenty-four to twenty-eight days. The young one is extremely small, about half an inch long, and weighing only a few grains, even in the largest species; the organs are in a very undeveloped condition, and the animal is naked, blind, and perfectly helpless; its fore limbs are more developed than the hind ones. It seems to be, sometimes at least, dropped directly on the ground, according to the observations of E. S. Hill (1867), in the kangaroo, but it is possible that it is occasionally received by the mother with the mouth from the vagina; at any rate, the newly-born animal is taken by the mother with her lips and transferred to the pouch; the parent thrusts her head into this pouch, and the young instinctively grasps with the sharp claws of its fore feet and clings to the teat to which it is presented, and, the corners of the mouth growing around it, the animal remains clinging to the teat for several weeks, and until it has attained a considerable size and the adult characters have been in a large degree assumed. Although it is thus capable of grasping and clinging to the nipple, it is, however, at first incapable of directly sucking, and the milk is furnished by the mother through the compression of the gland by a muscle analogous to the cremaster. To guard against suffocation of the young a peculiar modification of the laryngeal apparatus is provided; "the epiglottis and arytenoid cartilages are elongated and approximated, and the rimaglottidis is thus situated at the apex of a cone-shaped larynx, which projects, as in the Cetacea, into the posterior nares, where it is closely embraced by the muscles of the soft palate. The air-passage is thus completely separated from the fauces, and the injected milk passes in a divided stream on either side of the larynx to the œsophagus." Thus sustained and nourished by the mother, the little marsupial develops and increases in size, and after a greater or less length of time, according to the species, it assumes the characters of approximate maturity, and leaves the teat and the pouch itself, but for some time after resorts to the latter in case of danger, to be conveyed by the mother.

Although the marsupials are now confined to Australasia and South America (exclusive of a few emigrants beyond those borders), they were formerly the predominant mammal types of every part of the globe palæontologically known, and remains of representatives of the class recovered from the Liassic and Oolitic formations have been referred to this order. In the Eocene they are developed in several types, both in North America and in Europe, and among these were representatives of genera closely related to the opossums of the present age. Although none of the marsupials of the present epoch can vie with the largest placental mammals, in former times and as recently, perhaps, as the advent of man, species of gigantic size existed, the Diprotodontids of Australasia having been nearly as large as our elephants. THEODORE GILL.

Mar'supites [from *marsupium*, a "pouch"], or **Tortoise Encrinite,** a genus of the Crinoidea occurring in the Cretaceous rocks of Europe, remarkable for having no stem or attachment; its pelvis thus resembles a plated pouch surrounded by a circle of arms.

Mar'syas, in Greek mythology, a satyr who picked up the flute which Athene had thrown away and cursed when she saw how distorted her features became by playing it; challenged Apollo, who played the lyre, to a musical contest, with the Muses for judges. Marsyas was defeated, bound to a tree, and flayed alive by the god. Some mythologists see behind this myth a contest between the citharœdic style of music prevalent in Greece, and the aulœdic prevalent in Phrygia, the native country of Marsyas.

Martel (CHARLES). See CHARLES MARTEL.

Mar'tell, post-tp. of Pierce co., Wis. Pop. 717.

Martel'lo Tower, according to Webster and others originally *watch* (or bell) towers (*martello*, "hammer"), erected on the coasts of Sicily and Sardinia against the Barbary pirates. According to Col. Pasley, the name of martello tower was adopted in consequence of the good defence made by a small round tower in the Bay of Martello, in Corsica, in the year 1794, which, although armed with one gun only, beat off one or two British ships of war without sustaining any material injury from their fire. This construction gave such towers a prestige which caused the erection of numbers along the sea-coasts of England for defence against maritime invasion, and bearing the generic name as above. These towers were of masonry, and round, their height about 30 feet, their upper platform vaulted and bombproof. One or two heavy guns of the period were usually served, through "embrasures," from the main floor. The basement contained magazine stores, etc. Towers of various kinds have been introduced as parts of sea-coast defences and intrenched camps (*e. g.* the Maximilian towers of Lintz), all of which have somewhat indiscriminately been called martello towers. Those on the coasts of England and her colonies have generally been superseded by more efficient works. They have never been erected in the U. S., if we except (for special purposes) the somewhat analogous structures of Tower Dupré, La., and Tybee Island, Ga.

Mar'ten (*Mustela*), the common name of several carnivorous fur-bearing animals of the family Mustelidæ. In North America we have the Hudson's Bay sable or pine marten (*Mustela Americana*), which produces a very valuable fur, inferior in value to that of the Russian sable only. The latter animal (*M. zibellina*) is caught in Siberia. The pine marten of Europe (*M. martes*) and the stone marten or common European marten (*M. foina*) produce great quantities of cheap and useful fur. The FISHER (which see) belongs also to this genus. They are all lithe, active creatures, with long bodies and very short legs.

Marten, Spotted, or **Long-tailed Dasyure** (*Dasyurus viverrinus* or *macrurus*), a small but fierce carnivorous marsupial mammal of Australia, having a chestnut-colored fur spotted with white. It is some eighteen inches long, exclusive of the tail. It inhabits marshy places, and is nocturnal in its habits, nesting by day in a hollow tree. It is a marsupial representative of the martens.

The Spotted Marten.

Mar'tensen (HANS LASSEN), D. D., b. at Flensborg, Denmark, Aug. 19, 1808; studied theology at the University of Copenhagen. In 1832 he visited Berlin, Vienna, Munich, and Paris; in 1836 he took the degree of doctor in divinity, and in 1840 was appointed professor at the university, first in philosophy, afterwards in theology. His first book, *Mester Eckart*, which appeared in 1840, is an essay on the mysticism of the Middle Ages, and made a great sensation, both in Denmark and Germany, on account of the wonderful intuition and singular eloquence with which the old mystic was interpreted and represented. In 1841 followed *Outline of a System of Ethics*, and in 1849 *Christian Dogmatics*, which last book found many admirers in Denmark, Germany, Sweden, Holland, and Scotland. As a disciple of Hegel, Martensen here undertakes to reconcile faith and reason, revelation and science, but, deeply impregnated by the Christian ideas as he is, he defines this process, with respect to the Bible, as "a reckoning of an

account whose balance has been struck elsewhere; if we bring out another figure, we have reckoned wrong." The problem is solved, as far as it is solved, with great acuteness and ingenuity. In 1845 he was appointed preacher to the court, and in 1853 bishop of Sealand, the highest dignity of the Danish Church. As such he has taken a very active part in the religious movements which are going on in the Danish community, and by the repose of his character, the superiority of his intelligence, and his sympathy with all that is genuine he has exercised a great and beneficial influence. He has published several collections of sermons, and in 1872 a *System of Christian Ethics*. CLEMENS PETERSEN.

Mar'thasville, post-v. of Charrette tp., Warren co., Mo., seat of a German Protestant theological seminary, about 1850. Pop. 178.

Mar'tha's Vineyard, the principal island of Dukes co., Mass., in the Atlantic, is 19 miles long, and averages 5 miles in breadth. It is rather level, and in part has a very productive soil. It contains the towns of Edgartown, Chilmark, Tisbury, and Gay Head. (See DUKES co., Mass.)

Martialis (MARCUS VALERIUS), b. at Bilbilis, in Spain, Mar. 1, 43 A. D.; went during the reign of Nero (in 66) to Rome, where he resided for thirty-five years, and achieved a great literary fame, and returned in 100 to his native city, where he seems to have d. a few years afterwards. Of his works, fourteen books, containing about 1500 small poems, *epigrammata*, are still extant, all distinguished by cutting wit, an elegant and pointed form, a high degree of felicity of expression, and very interesting for the moral study of the time to which they belong, but sometimes revealing an offensive sensuality and a talent for flattery of a very doubtful character. There is a good edition of his works by Schneidewin (2 vols., Grimma, 1842), a complete translation into French by E. T. Simon (1819), and numerous translations of single parts in English and German.

Mar'tial Law. As defined by a recent English writer, "Martial law is the suspension of all law but the will of the military commanders entrusted with its execution, to be exercised according to their judgment, the exigencies of the moment, and the usages of the service, with no fixed or settled rules or laws, no definite practice, and not bound even by the rules of the military law." It differs widely from "military law" and from "military government," with each of which it is often confounded. "Military law" is the code of rules for the regulation of the army and navy alone, either in war or in peace; it is a department of the municipal law applicable to a particular class of persons; and in the U. S. it is enacted by Congress in the same manner and with the same force and effect as any other legislation, and civilians are expressly exempted from its operation. "Military government" is the authority by which the commander of an invading army governs for the time being a district conquered from the enemy, in which the local institutions have been temporarily overthrown as the result of a successful invasion. Martial law, on the other hand, if permitted at all, may be applied to civilians as well as to the military, and its operation is not necessarily confined to the enemy's territory nor to districts technically hostile. On the contrary, it is established, if at all, within the limits of the country whose officials invoke its aid, and is enforced against the citizens of that country as ancillary to the operations of actual warfare. An able American jurist in describing its nature regards its exercise as controlled by some limitations. "Martial law," he says, "is that military rule which exists in time of war in relation to persons and things under and within the scope of active military operations in carrying on the war, and which extinguishes and suspends civil rights and the remedies founded upon them for the time being, so far as it may appear to be necessary in order to the full accomplishment of the purposes of the war; the party who exercises it being liable for any abuse of the authority thus conferred." Experience shows, however, that when resorted to, this species of military rule is actually exercised without limitation or restraint other than "the will of the commander entrusted with its execution." It is an interesting question whether martial law as thus described is compatible with civil liberty, and can be proclaimed in a free and constitutional country. This question has recently received a judicial answer both in the U. S. and in Great Britain. In the celebrated case of Milligan, growing out of the late civil war, the Supreme Court denied the lawfulness of martial law within the U. S. except in districts actually occupied by the opposing forces, which are the very theatre of hostilities, and in which the civil courts are for the time being completely displaced. Lord Chief-Justice Cockburn also, by a most able judgment pronounced in 1867, declared that the Crown has no authority to enforce martial law in any part of the British realm where the laws of England prevail; but he admits that Parliament, by virtue of its unlimited power, may call it into operation. JOHN NORTON POMEROY.

Mar'tic, tp. of Lancaster co., Pa. Pop. 1926.

Martigues', town of France, department of Bouches-du-Rhône. It has large distilleries and manufactures of salt, oil, and chemicals. Pop. 8433.

Mar'tin [Fr. *martinet*], a name given to several birds of the swallow family (Hirundinidæ). The purple martin of the U. S. (*Progne purpurea*) is one of the finest of our native swallows. It often inhabits boxes put up near houses, and is a popular favorite, being regarded as a bird of good omen. The house-martin of Europe (*Chelidon urbica*) frequently attaches its nest to the walls of houses even in towns. The name is extended to other swallows.

Martin, county of S. W. Central Indiana. Area, 325 square miles. It is hilly, well timbered, and contains coal. The soil is fertile. Live-stock, grain, tobacco, and wool are leading products. The county is traversed by the White River and by the Ohio and Mississippi R. R. Cap. Dover Hill. Pop. 11,103.

Martin, county of Kentucky, bounded N. E. by West Virginia. Area, 250 square miles. Its N. E. border is washed by the Tug Fork of Big Sandy River. It is very mountainous and contains coal. Cap. Warfield. The county was formed since the census of 1870.

Martin, county of Minnesota, bounded S. by Iowa. It is somewhat uneven, and abounds in lakes. The soil is well adapted to the cultivation of grain, which is the leading product. Area, 720 square miles. Cap. Fairmont. Pop. 3867.

Martin, county of North Carolina, bounded N. by the navigable Roanoke River. Area, 520 square miles. It is level and in parts marshy, and contains large forests. The soil is generally good. Corn, live-stock, and cotton are leading products. Cap. Williamston. Pop. 9647.

Martin, tp. of Pope co., Ark. Pop. 360.

Martin, tp. of Crawford co., Ill. Pop. 1099.

Martin, tp. of McLean co., Ill. Pop. 687.

Martin, post-v. and tp. of Allegan co., Mich., on the Grand Rapids and Indiana R. R. Pop. 963.

Martin, tp. of Anderson co., S. C. Pop. 1525.

Martin, bishop of Tours and a saint of the Roman Catholic Church, b. in 316 at Sabaria, in Pannonia, the present Stein in Lower Hungary, of pagan parents; visited the school of Pavia, but entered the army in his sixteenth year, his father being a military tribune, and served under Constantine and Julian the Apostate. Having left the army, he became a disciple of Hilary, bishop of Poitiers; returned to Pannonia; converted his mother to Christianity, but suffered much from the persecutions of the Arian party, which finally expelled him from the country. Once more he went to Gaul; was made bishop of Tours in 375, and founded the monastery of Marmontiers, where he d. about 400. His life has been described by a contemporary of his, Sulpicius Severus, adorned with many miracles and wonderful stories; and by the Roman Catholic Church he was made a saint, and his festival appointed on his birthday, Nov. 11. In Scotland this day marks the winter term (*Martinmas*), and was formerly celebrated with feasting and drinking. The French expressions, *martiner, faire la St. Martin*, and *mal de St. Martin*, show that the same custom has existed in France. It arose from an old story, that at a great festival the emperor Maximinus offered the drinking-cup first to the bishop, in order that he might receive it from his hand. The treatise *Professio Fidei de Trinitate*, ascribed to Martin, is considered spurious by many scholars.

Martin I., POPE and SAINT, received the tiara in 640, succeeding Theodore I.; called in 649 the first Lateran Council, and was consequently banished by the emperor Constans II. to Naxos 653, to Constantinople 654, and to the Thracian Chersonese 655. D., after great sufferings, Sept. 16, 655.—MARTIN II. (or MARINUS I.), b. at Montefiascone; became pope in 881, and d. Feb. 14, 884.—MARTIN III. (or MARINUS II.) succeeded Stephen VIII. in 942, d. 946; a man of learning and noble character.—MARTIN IV. (*Simon de la Brie*), b. in Touraine of very humble parentage; became a Franciscan at Tours; was patronized by St. Louis; became a cardinal in 1262; was long papal legate at Paris; became pope in 1281. The Sicilian Vespers soon followed (1282), and he excommunicated the enemies of the French, thereby greatly weakening his own cause in Italy. D. Mar. 28, 1285.—MARTIN V. (*Otto Colonna*), b. of noble stock at Rome; became auditor of the rota 1394; cardinal-deacon 1405; was chosen pope by the Council of Constance 1417; fulminated a bull against the Hussites 1418; and soon proved himself one of the ablest and boldest of the popes. His policy overcame the reform movements begun at the

Council of Florence. He healed the divisions of the Church, restored the diminished splendors of Rome, pacificated Europe, and advanced the cause of learning. D. at Rome Feb. 20, 1431.

Martin (Alexander), LL.D., b. in New Jersey of Irish parentage about 1740; graduated at Princeton in 1756; removed to Guilford co., N. C., 1772; was a colonel of Continental troops in the Revolution; served often in the North Carolina senate, of which he was for a time president; acting governor of North Carolina 1781; governor 1782–85 and 1789–92; member of the U. S. constitutional convention 1787; and U. S. Senator 1793–99. He had some literary ability, and occasionally wrote poetry in the periodicals. D. at Danbury, N. C., in Nov., 1807.

Martin (Benjamin Nicholas), D. D., b. at Mount Holly, N. J., Oct. 20, 1816; graduated at Yale 1837; studied theology at New Haven 1837–40; Congregational pastor at Hadley, Mass., 1843–47; pastor of the Fourth Presbyterian church, Albany, N. Y., 1848–49; became in 1852 professor of rhetoric and intellectual philosophy in the University of the City of New York.

Martin (Bon Louis Henri), b. at St. Quentin, France, Feb. 20, 1810; commenced his literary career by writing historical novels and dramas, but turned soon to a more serious and thoroughgoing treatment of history. Of his *Histoire de France* there are three different editions: one in 15 vols. (1833–36); one in 19 vols. (1837–54), parts of which, such as vols. x. and xi., narrating the religious wars, and vols. xiv.–xvi., describing the age of Louis XIV., made a great sensation and were crowned by the Academy; and one in 16 vols. (1855–60), embodying the latest researches in Celtic antiquities, mediæval society, etc. The most prominent of his other writings are *De la France, de son Génie et de ses Destinées* (1847), which gives the ideal view on which his narrative of the history of France is based; *L'Unité Italienne* (1865), *La Russie d'Europe* (1866), etc.

Martin (Félix), S. J., b. in Normandy, France, Oct. 4, 1804; entered the order of Jesuits in 1823; was sent to Canada in 1842, founded St. Mary's College at Montreal, and spent much time at Quebec in the collection and arrangement of materials for the early history of Canada. Owing to impaired eyesight he was compelled to return to France, but has since published *Mission du Canada, Relations inédites* (1861), *De Montcalm en Canada* (1867), and *Le R. R. Isaac Jogues* (1873), besides aiding in the preparation of Carayon's great work on the Jesuit missions.

Martin (François Xavier), LL.D., b. at Marseilles, France, Mar. 17, 1762; came in 1782 to the U. S., and became a French teacher, printer, and journalist at New Berne, N. C. In 1789 he was admitted to the bar, and soon won distinction. Jefferson made him a judge in Mississippi, where in 1813 he was chosen attorney-general. In 1815 he was appointed a judge of the supreme court of Louisiana, and was its chief-justice 1837–45. He published valuable histories of Louisiana (1818) and North Carolina (1829), besides several volumes of legal reports, digests, and other works. He was a sound and able jurist. D. at New Orleans Dec. 10, 1846.

Martin (George), b. at Middlebury, Vt., in 1815; settled in 1836 at Grand Rapids, Mich., and became a county judge. In 1851 he was appointed a judge of the State supreme court, and was its chief-justice 1857–67. D. at Detroit, Mich., Dec. 15, 1867.

Martin (Sir James Ranald), C. B., F. R. S., b. at Kilmuir, Skye, about 1800; entered the medical staff of the Bengal army 1818; was appointed sanitary commissioner in England 1841; was knighted in 1860, and became examining physician to the secretary of state for India, and inspector-general of hospitals, etc. D. Nov. 27, 1874. His work *On the Influence of Tropical Climates* (1855) is a standard treatise and has won him much distinction.

Martin (John), an English painter and engraver, b. near Hexham July 19, 1789; d. in Douglas, Isle of Man, Feb. 9, 1854; was called the painter of "architectural dreams." Thirty years ago mezzotint engravings of his pictures, done by the artist, were common in the U. S., and three of his masterpieces, *The Day of Judgment, The Day of Wrath, The Plains of Heaven*, exhibited here, were admired by the lovers of the tremendous in art. Aside from these three, his best-known works were *The Seventh Plague, Joshua commanding the Sun to stand still, The Fall of Nineveh, Belshazzar's Feast, Satan summoning his Legions, Sadak seeking the Waters of Oblivion.* He had his period of success and glory, but is now forgotten. In the latter years of his life he was devoted to schemes for improving the city of London. O. B. Frothingham.

Martin (Joshua L.), removed in early life to the N. of Alabama; was a judge of a State circuit court 1831–35; a Democratic member of Congress 1835–39; governor of Alabama 1845–47, chosen as an independent Democrat, but supported by the Whigs in a most exciting canvass. Gov. Martin had previously been chancellor of Alabama. D. at Tuscaloosa Nov. 2, 1856.

Martin (Josiah), b. in Virginia Apr. 23, 1737; entered the British army as ensign in 1756, and in 1769 had risen to the rank of lieutenant-colonel. He became in 1771 governor of North Carolina; took refuge on board a British man-of-war Apr. 24, 1775; was with the fleet of Sir Peter Parker before Charleston 1776, and with Cornwallis at the battle of Camden 1780. He withdrew to Long Island 1781, and thence to England, and d. in London in July, 1786.

Martin (Luther), LL.D., b. in New Brunswick, N. J., in 1744; graduated at Princeton in 1766; became a prominent lawyer of the Eastern Shore of Virginia and Maryland; was in Congress 1784–85; attorney-general of Maryland 1778 and 1818; was a member of the convention which drew up the Constitution of the U. S., which he bitterly opposed. In 1814 he became judge of oyer and terminer for Baltimore. D. in New York July 10, 1826. He was a zealous friend of Aaron Burr, whom he defended on his trial for treason. Author of a *Defence of Capt. Cresap.*

Martin (Robert Montgomery), b. in England about 1805; author of a series of valuable geographical and statistical works, *The Colonies of the British Empire* (1834–38), *The British Colonial Library* (1836–37), *The History, Antiquities, Topography, and Statistics of Eastern India* (1838), *Ireland before and after the Union* (1843), *China, Political, Commercial, and Social* (1847), *The Hudson's Bay Territories* (1848), *The Indian Empire* (1858–61), and *Progress and Present State of British India* (1862). Mr. Martin edited the *Colonial Magazine* for some years, superintended the issue of *The Illustrated Atlas and Modern History of the World*, and arranged for publication the papers of the duke of Wellington.

Martin (Robert M.), b. in Worcester co., Md., in 1798; graduated at Princeton; was a member of Congress 1825–27; chief judge on the western circuit of Maryland 1845–51; judge of the superior court of Baltimore 1856–67; a professor in the law school 1867–70. D. at Saratoga, N. Y., July 20, 1870.

Martin (Theodore), LL.D., b. at Edinburgh, Scotland, in 1816; settled in London as a solicitor in 1846; wrote verses for the magazines over the signature of "Bon Gaultier;" published *The Book of Ballads* in conjunction with Prof. Aytoun; translations of the *Poems and Ballads of Goethe* (1858), of several Danish dramas by H. Hartz and Oehlenschläger (1854–57), of the *Odes of Horace* (1860), of the *Poems of Catullus* (1861), of Dante's *Vita Nuova* (1862), and of Goethe's *Faust*, and printed for private circulation translations of various miscellaneous poems by Goethe, Schiller, and Uhland. He also wrote a biography of Prof. W. E. Aytoun (1868) and *The Life of the Prince Consort* (vol. i., 1874) from materials furnished by Queen Victoria.

Martin (William D.), b. at Martintown, S. C., Oct. 20, 1789; studied in the law school at Litchfield, Conn.; became one of the ablest jurists and most prominent legislators of South Carolina; was made a judge of the State circuit court in 1830, and d. at Charleston Nov. 16, 1833. He belonged to the extreme State rights school.

Marti'na Fran'ca, town of Southern Italy, in the province of Lecce, about 17 miles N. of Taranto. This beautiful little city is built on a hill near the sources of the Tara. The churches and other buildings, private and public, are handsome; the ducal palace—the architecture of which resembles the Pamfili of the Piazza Navona, Rome—is one of the most magnificent in the Neapolitan territory. Martina Franca was the feudal possession of the Caraccioli, and is not a very old town. Pop. in 1874, 18,102.

Mar'tindale (John H.), b. at Sandy Hill, N. Y., Mar. 20, 1815; graduated at the U. S. Military Academy, and was appointed in the dragoons, but resigned 1836, and became a railroad engineer. In 1838 he located at Batavia, N. Y., and practised law until 1851, when he removed to Rochester. In Aug., 1861, he was appointed a brigadier-general of volunteers, and commanded a brigade in Porter's corps in the Virginia Peninsular campaign of 1862; was military governor of the District of Columbia from Nov., 1862, until the opening of the final campaign, when he joined (May, 1864) the 18th corps (Army of the James), which, united with the Army of the Potomac, fought the battles of Cold Harbor June 1–3, 1864, and was engaged in the siege of Petersburg. Gen. Martindale succeeded to the temporary command of the 18th corps July 7–22, and resigned, owing to impaired health, Sept. 13, 1864. Elected attorney-general of the State of New York in 1866.

Martin de Moussy (Jean Antoine Victor), M. D., b. at Moussy-le-Vieux, France, June 26, 1810; studied medicine at Paris; practised in the military hospitals, and in 1841 went to Montevideo, S. A., where he resided for twelve years as a physician, keeping a constant meteorological register. During the nine years' siege of Montevideo he was director of the medical service to the French and Italian legions (the latter commanded by Garibaldi). On the downfall of the Argentine dictator, Rosas, in 1852, Dr. Martin de Moussy was engaged by the government of Pres. Urquiza to prepare a geographical description of the republic, and spent four years in constant travels, visiting Paraguay, the Gran Chaco, portions of Chili and Bolivia, and all the Argentine provinces in detail. The result was his valuable and accurate work, *Description, géographique et statistique, de la Confédération Argentine* (3 vols., Paris, 1860–64, with atlas), which is considered the best source of information, not only upon the subjects embraced in its title, but also upon the ethnography and geology of the Rio de la Plata. Dr. Martin de Moussy was one of the writers of the *Encyclopédie des Connaissances utiles* and of the *Dictionnaire Politique*. D. at Paris about 1870.

Mar'tineau (Harriet), sister of James, b. at Norwich, England, June 12, 1802, of a family descended from Huguenot exiles; was educated under the auspices of her uncle, a distinguished surgeon; entered upon literary life in 1823, and has published a very great number of works, including many tales, of which those illustrating the principles of political economy, the operation of the poor-laws, and kindred subjects are especially noteworthy. She visited the U. S. in 1834, and travelled in Palestine and the East in 1846. Among her other important works are *Society in America* (1837), *A Retrospect of Western Travel* (1838), *Eastern Life, Past and Present* (1848), *British India* (1851), a condensed translation of Comte's *Positive Philosophy* (1853), *History of England during the Thirty Years' Peace* (1849–50), *The Factory Controversy* (1855), and *Biographical Sketches* (1869). A Unitarian Christian in early life, she has gradually assumed in her writings more and more radical religious opinions. Of late years she has been a frequent writer in the editorial columns of the *Daily News*.

Martineau (James), LL.D., b. in Norwich, England, Apr. 21, 1805, of French extraction. His father was a manufacturer of bombazines, in humble circumstances. Mr. Martineau studied in the Unitarian college at York, and was minister of societies first in Dublin, and afterwards at Liverpool in Hope chapel. While in Liverpool in 1839 he took part, in connection with J. H. Thom and Henry Giles, in a controversy with thirteen clergymen of the Church of England on questions of Christian theology. Mr. Martineau's themes were—*The Bible, The Deity of Christ, Vicarious Redemption, The Christian View of Moral Evil*, and *Christianity without Priest and without Ritual*. All the lectures were published. *The Rationale of Religious Inquiry* and *Endeavors after the Christian Life*, two volumes of very remarkable sermons, appeared in 1843–47; a volume of *Miscellanies*, edited by T. Starr King, was printed in Boston in 1852; in 1858, another volume, entitled *Studies of Christianity*, was collected by W. R. Alger, and published by the American Unitarian Association; two volumes of *Essays, Theological and Philosophical*, were issued by W. V. Spencer in Boston, 1866 and 1868, comprising significant papers from various English periodicals. The *Westminster, Prospective*, and *National* reviews contained his most elaborate essays. In 1853, Mr. Martineau was called to the chair of moral and metaphysical philosophy in Manchester New College, London, whither he went to live, and in 1858 assumed joint pastorship with J. J. Tayler of the Unitarian chapel in Little Portland street, of which, on the death of Mr. Tayler, he became sole incumbent. A fine scholar, a penetrating thinker, a rich, massive, luminous mind, Mr. Martineau easily holds the front rank among English Unitarians. His position is that of the boldest thinker within the Christian limits. Better than any other he reconciles the claims of reason and faith in religion. Of late years he has been distinguished as the defender of spiritual faith against the different schools of atheism, materialism, and skepticism, taking sharp issue with the negative tendencies of science and philosophy, not in the interest of any dogma, creed, or Church, but in the interest of the moral and spiritual nature of man. (See his *Religion and Modern Materialism*, New York, 1874.) Thackeray called him the greatest theologian in England. Within three years ill-health has compelled Mr. Martineau to desist from preaching, but he continues to write. The Boston magazine *Old and New* contained in 1874 able articles in criticism from his pen. The splendor of his style makes the profoundest of his discussions engaging, and the loftiness of his reason lifts every question into light. O. B. Frothingham.

Marti'nez, post-v., cap. of Contra Costa co., Cal., 30 miles N. E. of San Francisco, has a good public school, the county court-house and buildings, 3 churches, a Masonic lodge, 1 bank, 1 weekly newspaper, and a number of stores and shops. In the vicinity is Mount Diablo, an isolated peak rising to the height of about 4000 feet, and commanding one of the most extensive views on the globe. A fine road enables the tourist to reach the summit with ease. Pop. 560. C. B. Porter, Ed. "Contra Costa Gazette."

Martinez de la Rosa (Francisco), b. Mar. 10, 1789, at Granada; was appointed professor of philosophy in his native city in 1808; participated with great enthusiasm in the war of independence and the political movements after the war, but was imprisoned on account of his liberal ideas, and exiled. After the establishment of the constitution in 1820 he was recalled and appointed minister of foreign affairs, but left the country after the subversion of the constitution in 1823 by French intervention; lived in Italy and Paris; returned to Spain in 1833, and became again minister of foreign affairs in 1834, as one of the leaders of the moderate party; was ambassador to France during the government of Espartero; president of the senate in 1860, and d. at Madrid Feb. 7, 1862. He was a prolific and talented writer of fiction; several of his dramas and his lyrical poems were received with great applause.

Martinique' [called by the Indians *Madiana*], one of the Lesser Antilles, in the West Indies, belonging to France, which colonized it in 1635. Area, 380 square miles. Pop. 153,334. It is of volcanic origin, high, mountainous, with deeply indented coasts, which afford good harbors, and very fertile. Its climate is moist and hot, but not absolutely unhealthy; hurricanes and earthquakes are frequent. Sugar is the principal produce. In 1867 were produced 671,372 cwts., besides 7,682,500 gallons of molasses and 6,086,000 gallons of rum; cotton and coffee are also raised. Principal towns, St. Pierre and Port Royal, between which a railroad is under construction.

Mar'tinsburg, post-v. and tp. of Pike co., Ill., 6 miles S. of Pittsfield. Pop. 1466.

Martinsburg, post-v. of Jackson tp., Washington co., Ind. Pop. 123.

Martinsburg, post-v. of Steady Run tp., Keokuk co., Ia., 12 miles S. of Sigourney.

Martinsburg, a v. (Sandy Hook P. O.), cap. of Elliott co., Ky., 21 miles S. W. of Grayson. Pop. 62.

Martinsburg, post-v. of Audrain co., Mo., on the St. Louis Kansas City and Northern R. R.

Martinsburg, post-v. and tp. of Lewis co., N. Y., on the Black River and the Utica and Black River R. R., has 7 cheese-factories, ores of lead and beds of limestone, 3 churches and an academy. Pop. 2282.

Martinsburg, post-v. of Clay tp., Knox co., O., 13 miles S. E. of Mount Vernon, the seat of Martinsburg Seminary.

Martinsburg, post-b. of Blair co., Pa., 21 miles S. of Altoona, on a branch of the Pennsylvania R. R., has a seminary, 6 churches, 1 bank, 1 newspaper, a planing and grist mill, 1 hotel. Pop. 536. B. H. Lehman, Ed. "Cove Echo."

Martinsburg, post-v., cap. of Berkeley co., West Va., 80 miles W. of Washington, on the Baltimore and Ohio and the Cumberland Valley R. Rs., has 3 public schools, private seminaries, 10 churches, 1 daily and 2 weekly newspapers, railroad repair-shops, 3 banks, 3 flouring-mills, and 30 stores. Pop. 4863. R. S. Eichelberger, Pub. "Statesman."

Martin's Ferry, post-v. of Pease tp., Belmont co., O., on the Cleveland and Pittsburg R. R., has good schools, 4 churches, 1 bank, several stores, and a capital of $2,000,000 invested in the manufacture of glass, iron, and mill-machinery. It is also called Martinsville. Pop. 1835.
John J. Ashenhust, Ed. "Ohio Valley News."

Martin's Grant, a v. of Lancaster tp., Coos co., N. H. Pop. 17.

Mar'tinsville, post-v. of Clark co., Ill., on the St. Louis Vandalia and Terre Haute and the Indiana R. Rs., has 1 college, 3 churches, 3 large grain-warehouses, 1 flouring-mill, 2 hotels, and stores. Pop. 1572.
Jerry Ishler, Ed. "Martinsville Express."

Martinsville, post-v., cap. of Morgan co., Ind., on the White River, 31 miles S. W. of Indianapolis, at the junction of the Indianapolis and Vincennes and the Cincinnati and Martinsville R. Rs., has 4 churches, 1 high school, 1 public hall, 1 Masonic lodge, 2 Odd Fellows' lodges, 1 national and 2 private banks, 4 hotels, 1 foundry and machine-shop, 1 planing-mill, 1 woollen-factory, 1 pork-house, 1 flouring-mill, 2 saw-mills, and stores. Its principal business is in pork, grain, and lumber. Pop. 1131.
E. W. Callis, Pub. "Morgan County Gazette."

Martinsville, Belmont co., O. See Martin's Ferry.

Martinsville, post-v. of Clark tp., Clinton co., O., on the Marietta and Cincinnati R. R. Pop. 264.

Martinsville, post-v. and tp., cap. of Henry co., Va., 25 miles N. W. of Danville. Pop. 3157.

Mar'tinton, tp. of Iroquois co., Ill. Pop. 866.

Mar'tius, von (KARL FRIEDRICH PHILIPP), b. at Erlangen, Bavaria, Apr. 17, 1794; studied medicine at the university of his native city, and participated in the great scientific expedition to Brazil (1817–20), which was sent out by the Austrian and Bavarian governments. On his return he was appointed professor of botany and director of the botanical garden of Munich, from which offices he retired in 1864, and d. Dec. 13, 1868. Besides his *Reise nach Brasilien* (3 vols., 1824–31) he published *Nova Genera et Species Plantarum* (3 vols., 1824–32); *Genera et Species Palmarum* (1828–34), giving 582 species to Humboldt's 99 and Linnæus's 15; and *Flora Brasiliensis*, containing much new information and provided with magnificent illustrations. His researches concerning South American ethnography and languages, which he communicated in 1867, are valuable.

Mar'tos, town of Spain, province of Jaen, celebrated for its cold mineral springs, which are much used for bathing. Pop. 11,666.

Mart'ville, post-v. of Sterling tp., Cayuga co., N. Y., on the Southern Central R. R. Pop. 126.

Mar'tyn (HENRY), B. D., b. at Truro, Cornwall, Feb. 18, 1781; graduated as senior wrangler at St. John's College, Cambridge, in 1801; became a fellow in 1802; was ordained deacon of the Anglican Church 1803; priest in 1805, and went to Madras 1806 as a missionary; was subsequently stationed at Dinapore and Cawnpore (1809); set out to return to England on account of his broken health in 1810, but remained more than two years in Persia, laboring for his faith. D. at Tokat, Asia Minor, Oct. 16, 1812, among strangers. A monument was erected there in 1856. Martyn translated the New Testament and liturgy into Hindostanee, the New Testament and Psalms into Persian, and the New Testament into Arabic. He was author of *Controversial Tracts* (1824), *Sermons* (1822), *Journals and Letters* (1837). (See *Memoir*, by Rev. John Sargent (1819), often reprinted.)

Mar'tyr [Ger. *Märtyrer;* Fr. *martyr,* in Old French sometimes changed to *martre* (whence *Montmartre,* the "Martyr's Hill"); Sp. *martir;* It. *martire*—all forms of the Greek *μάρτυρ*, a "witness"], one who dies for his religion. In our New Testament the Greek word is generally rendered by its English translation, *witness*, "martyr" occurring but in three places—Acts xxii. 20; Rev. ii. 13; xvii. 6. The number of martyrs during the first three centuries has been variously estimated. H. Dodwell (the elder), in his *Dissertationes Cyprianicæ*, declares it to have been inconsiderable; and this opinion is shared by Gibbon (*D. and F.*, ch. xvi.), who cites Origen as his authority. Monkish enthusiasts, on the other hand, exaggerated both the strength of the "noble army of martyrs" and the sufferings of those who composed it; while the Roman Catholic writers Ruinart and Pagi take a middle view.

It was natural that all Christians should greatly reverence those who gave up all for Christ. Confessors (those whose lives were spared) were much respected, but far higher honor was paid to martyrs. If they died unbaptized, their death was regarded as a nobler baptism, and they were believed to at once enter Paradise (Matt. v. 10, 12; x. 39). Each anniversary of a martyr's death, called *natales* or *natatalia* ("birthday"), because on it he was born to eternal life, was commemorated at his grave, and by degrees it became usual to build over such honored tombs churches called *martyrii* or *memoriæ*, each named after the saint buried beneath it. There his festival was kept yearly, his "acts" were read, prayers were offered, the Eucharist was celebrated, and *agapæ* or love-feasts were held. The zeal, the love, the patiently-borne sufferings of martyrs made many converts. "Their blood," truly declared Tertullian, "was the seed of the Church" —*Semen est sanguis Christianorum.* (*Apol.*, c. 50.) Orations, some of which are preserved in the "Fathers," were spoken in their honor; poems were written to celebrate them; their deeds and words were cited as models for all men for ever. As the days of martyrdom were left farther behind the martyrs received higher honor. Heathen converts adored them as they had adored the heroes of paganism. Their remains were disinterred and laid under the altars of churches. Every relic of theirs became a sacred treasure. Their intercession was deemed all-powerful with God. Martyrs formerly unheard of announced themselves in visions and told the place of their graves. Nay, Christian martyrs not being enough, many Old Testament sufferers—the Maccabees, for instance—were honored as such. "If they endured so much, not knowing the Lord," said enthusiasts, "what would they not have done for his sake had they known him?" The Innocents, having in a sense died for Christ, were included among his martyrs, and one Sunday in the year was set apart to commemorate all who had borne witness to the faith.

All religions and forms of religion have had their martyrs. Jews have been scorned, oppressed, and murdered for holding fast to their ancient belief; Mohammedans have died calmly for their Prophet; Booddhist missionaries have fallen victims to their zeal; Roman Catholics have burned Protestants, who, when their day of power came, retaliated, although it must in all fairness be admitted that Protestants never carried persecution to such an extent as Romanists, and have long since given up the theory and practice. The word *martyr* is often applied to those who lose life or wealth in scientific research. It is used to denote innocent sufferers from almost any cause, and has also been affixed to the names of kings who underwent the last penalty for misgovernment; *e. g.* Charles I. and Louis XVI. (See Ruinart, *Acta Martyrum* (Paris, 1682); Mosheim, *Eccles. Hist.;* Bingham, *Antiq. of the Christian Church;* Foxe, *Book of Martyrs.*) JANET TUCKEY.

Martyr (PETER), Italian historian. See ANGHIERA.

Martyr (PETER), Protestant Reformer. See VERMIGLI.

Martyrology [Lat. *Acta Martyrum* or *Martyrologium;* Gr. Μενολόγιον]. Etymologically, this term would denote any work devoted to an account of the (Christian) martyrs, but in the early Church it acquired the secondary meaning of a calendar of the martyrs and other saints arranged in chronological order, representing the dates of martyrdom, or, when these were unknown, the dates conventionally assigned for the commemoration of the death of the individual martyrs. This practice doubtless sprung from a very natural and laudable sentiment among those who had been witnesses of the edifying comportment of the genuine martyrs; but when Christianity had become the dominant religion it degenerated into a superstition. The martyrs were gradually transformed into *saints* (in the technical sense), to whom worship was paid, and the dishonest zeal of priests was employed in ransacking catacombs and cemeteries, whence they brought out relics by the thousand, for each of which they invented a name and a legend. The martyrology thus constructed became excessive in size; the few genuine accounts transmitted from an earlier age became the models for a wholesale fabrication of *Lives of the Saints*, which on a greater or lesser scale has been continued to the present day. Not only Gibbon and Lecky, but writers of undeniable Christian sentiment, have pronounced that the authentic materials now remaining concerning the martyrdoms of the first three centuries are few and far between, and that the vast majority of the accounts which have obtained currency and been generally believed until a recent period were forged after the time of Constantine. By a careful comparison of the testimony of the earlier Fathers it results that the "ten persecutions" of Roman tradition may be resolved into only two persecutions having anything like a general character—namely, those of Decius and Diocletian. The official Roman martyrology is that of Baronius, published by authority of Pope Gregory XIII. in 1586; the oldest now extant is that of St. Jerome. PORTER C. BLISS.

Mar'vell (ANDREW), b. at Winestead, Yorkshire, England, Mar. 2, 1621; was educated at Cambridge and on the Continent; became the friend and assistant of Milton in the Latin secretaryship; was the constant friend of liberty both under the Commonwealth and after the Restoration; from his well-known probity was called the "British Aristides;" refused to be moved by the bribes of Charles II. or the persecutions of royalists, who frequently threatened his life. His political writings, if often too vehement and coarse, are full of noble and generous thoughts, and much of his verse is very sweet and beautiful. D. in London Aug. 17, 1678.

Marvin (ENOCH M.), D. D., bishop of the Methodist Episcopal Church, South, b. in Warren co., Mo., June 12, 1823. In 1841 he entered the itinerant ministry in the Missouri conference. He filled important stations in the Missouri and St. Louis conferences, and during the war, in Marshall, Tex. He was elected to the episcopate by the General Conference in New Orleans in 1866. He is a very zealous and successful preacher. He has published several works, among which is a valuable treatise on *The Work of Christ.* He resides in St. Louis, Mo. T. O. SUMMERS.

Mar'vin (JOSEPH D.), b. in Ohio Oct. 2, 1839; graduated at the Naval Academy in 1860; became a master in 1861, a lieutenant in 1862, a lieutenant-commander in 1866, a commander in 1873; served as executive officer of the Mohican at both attacks upon Fort Fisher, and was distinguished for his coolness and the skill which he displayed in superintending the fire of the Mohican's battery; was

associated with Commander Simpson in 1870 in his mission to Europe, "to inspect its principal foundries, ordnance establishments, dockyards, powder-magazines, and other naval dépôts," and in 1871 placed in command of the battery at Annapolis, Md. FOXHALL A. PARKER.

Marx (KARL), b. at Treves in 1818; studied at Berlin and Bonn, and became in 1842 editor of the *Rheinische Zeitung*, published in Cologne, which formed a most decided opposition to the Prussian government, but which was suppressed in 1843. Having settled in Paris, he continued his attacks on Prussia; was expelled from France in 1846; returned in 1848 to Cologne; founded the *Neue Rheinische Zeitung*, but was expelled in 1849 on account of his connection with the revolutionary party of Baden. In 1850 he settled in London, where he has lived since, and where he has devoted his services to the INTERNATIONAL (which see). The principal of his writings, which all reveal a strongly developed tendency towards Socialism, are *Kritik der politischen Œconomie* (1859) and *Das Kapital* (1867).

Mary, The Blessed Virgin, and **Mariolatry.** Of Mary—the highest of God's creatures, from whom, by her submissive act, the Son of God took upon him the nature of man, whom Jesus loved as mother, and who therefore is, on the part of all who love him, the object of tenderest affection and deepest reverence, checked only by fear of evil—Holy Scripture tells us all that we know with certainty. And in Scripture her life is hid with Christ. She is mentioned only in connection with her Divine Son. And so is it in the writings of the first ages in the Church. Little is said, as though little were known, and even the titles connected with her name are given with reference to maintaining the honor of her Saviour whom she bore, not to magnifying the handmaid of the Lord. And yet there are volumes called *Histories of the Blessed Virgin*, in which we may read fullest details from her immaculate conception to her bodily assumption. All of which, as is granted, "is founded on writings wholly apocryphal and full of fables." The devotion to the Blessed Virgin which culminated in the addition to the Creed by the present pope, Pius IX., the glory of one part of Christendom and the amazement of the other, is of gradual growth. What began among heretics has been developed in the Church through a spirit, common enough, which leads men to add to truths which they have received the suggestions of their own sense of what ought to be. An illustration of this tendency may be found in the spiritual exercises of St. Ignatius Loyola. It is plainly said in Scripture, "He appeared first to Mary Magdalene." But the sainted founder of the Society of Jesus feeling what was due to the mother rather than the tenderness of the Lord toward the sinner out of whom he had cast seven devils, writes: "Jesus Christ appears first to his Blessed Mother after his resurrection. The Gospel leads us to think so by saying that Jesus Christ appeared to several persons; if we do not find in this general expression a sufficiently sure proof, we deserve that reproach of our Saviour to his disciples, Are ye still without understanding?"

Modern devotion to the Blessed Virgin is called by opponents Mariolatry—a term of which her votaries may rightly complain. Worship is a relative term; its force depends upon the object to which it is addressed. Not long ago it expressed the mere reverence rendered to any honored person. Reverence is due to the saints; the worship rendered them is called in theological language *dulia*. To the highest of saints, "the Mother of God," a higher reverence, or *hyperdulia*, is offered. That reverence or worship which is shown only to God is *latria*. Mariolatry, then, is the giving to Mary the honor due to God only. No man can assent to the charge that he renders to any creature what belongs only to the Creator. And yet what is the difference between hyperdulia and Mariolatria? A candid Roman Catholic has said that a Protestant cannot appreciate the difference. The question, then, naturally rises, Does not a large body of the ignorant and superstitious faithful also fail to perceive the difference? And is not their error justly attributable to the Church that sanctions what may so readily mislead in so vital a matter as worship? By this modern hyperdulia, to all who receive it, the character of Christ's religion is changed. The loving-kindness of the Lord is blotted out. It is forgotten that "God so loved the world;" Christ, the merciful Redeemer, is looked upon only as the exacting Judge; while love and mercy are relegated to Our Lady. Books are written—*e. g.* that of the late eloquent Padre Ventura of Rome—to show that as in the natural family children are loved by the father because of the mother, who in her tenderness is a shield to the children against the stern justice of the father (a strange conception of a family), so is it in all respects in the spiritual family. And to our Mother we can fly for protection against the else inevitable justice of our Father. There are pointedly two religions—the religion of loving confidence, that of Mary; and the religion of stern law, causing fear, that of Jesus. From the foot of the cross, it is said, these two religions went out into the world. For an unprejudiced, even tender, exhibition of the wrong thus done to Christ's holy religion, the reader is referred to the writings of Dr. Pusey on this subject. If he would see how what is now prevalent was long ago common, though resisted, he may seek proof in the works of the canonized Bonaventura. Besides a wonderful number of sermons in praise of the Blessed Virgin, he may find prophecies, psalms, canticles, gospel statements, and creeds of the Church travestied in supposed honor of Mary. The whole book of the Psalms—not every sentence of any one psalm—is so changed as to give the place of Our Lord to Our Lady.—*e. g.* Ps. ii.: "Venite ad eam qui laboratis et tribulati estis; et dabit refrigerium animabus vestris;" x.: "In Domina confido;" xvii.: "Diligam te, Domina cœli et terræ;" xxvi.: "Domina, illuminatio mea;" xlvi.: "Ipsa est porta vitæ, janua salutis et via nostræ reconciliationis;" lxx.: "In te, Domina, speravi. Non confundar in æternum." Grant, what is claimed, that all such expressions are to be taken in a Catholic sense, and so Mariolatry is excluded, yet by what peculiar words can we then express our faith and trust in God? (See IMMACULATE CONCEPTION.) W. F. BRAND.

Ma'ry I., queen of England from 1553 to 1558, b. at Greenwich Castle Feb. 18, 1516, a daughter of Henry VIII. by his first wife, Catharine of Aragon; educated entirely in Spanish fashion, a fanatic Roman Catholic. During her infancy the king seems to have loved her very much, and she had a splendid court at Ludlow Castle. In 1522 she was betrothed to the emperor, Charles V., but after the divorce of Henry VIII. from Queen Catharine the emperor broke the contract, and other marriage negotiations with Francis I. and his second son, the duke of Orleans, failed. Meanwhile, her strong adhesion to her mother's cause diverted her father's feelings from her. Later she came naturally to be considered as the head of the Roman Catholic party, which made her suspected in the king's eyes; and after the birth of Elizabeth her position became really perilous. James V. of Scotland asked her in marriage, but the proposition was refused on account of the consequences which such a union might have for the children of Anne Boleyn. She was even compelled to sign articles acknowledging that her mother's marriage was illegal and her own birth illegitimate, which involved a renunciation of her right to the succession. In the last years of the reign of Henry VIII. her position became better, however; she lived on a good footing with Catharine Parr, and her right to the succession was restored to her. During the reign of her half-brother, Edward VI., she lived in retirement and took no part in politics; the different suitors to her hand were not accepted. On the death of Edward VI. (July 6, 1553) she succeeded to the throne after a short struggle with the party supporting the claims of Lady Jane Gray; and a reaction immediately took place in the government, headed by Gardiner, who was made lord chancellor Aug. 23, 1553, and Bonner. Nevertheless, the first period of her reign was rather mild, and it was not until after her marriage with Philip II. of Spain, which took place July 25, 1554, that those persecutions against the Protestants commenced which have made her name so odious in the history of England. She experienced great disappointments in her marriage from the coldness of her husband and from her childlessness; a mistake she made on the occasion of an attack of dropsy even subjected her to great mortifications. Her character, by nature cheerless, sullen, and singularly mixed, seemed to change for the worse under these influences, and she yielded willingly to the counsels of Philip and Gardiner. On Nov. 30, 1554, Cardinal Pole declared England and Rome reconciled, and on Feb. 4, 1555, John Rogers was burnt at the stake. Cranmer, Latimer, and Ridley shared the same fate, and were followed by 200 or 300 more, and the ruin of the country seemed impending, when in the summer of 1558 the queen was attacked by an intermittent fever, from which she d. at St. James's Palace Nov. 17, 1558. Tennyson, in his drama *Queen Mary* (1875), calls her "unhappiest of queens and wives and women." Her reign was a total failure in politics and religion.

Mary II., queen of Great Britain, b. Apr. 30, 1662, daughter of James II. by Anne Hyde, and in 1677 was married to her cousin, the prince of Orange (King William III.), with whom she was declared joint sovereign in 1689. She d. of smallpox Dec. 28, 1694. (For details of the reign see WILLIAM III.)

Mary Ann, tp. of Licking co., O. Pop. 804.

Mary, Brothers of, a Roman Catholic community whose work is that of instruction, founded at Bordeaux in 1817 by G. J. Cheminade, a priest; confirmed in 1839 by

the pope; introduced in 1849 into the U. S., where they have (1875) twenty-three houses.

Mary, Society of, a congregation of Roman Catholic priests, established in 1815 at Lyons, France, by J. C. M. Colin; received papal approbation in 1831, 1836, and 1873; introduced in 1862 into the U. S. Theological and other instruction and domestic and foreign missions are the principal objects of their attention.

Mary Stuart, queen of Scots, daughter of James V. by Mary of Guise, and great-granddaughter of King Henry VII. of England through his daughter, Margaret of Tudor, b. at Linlithgow Dec. 8, 1542. Her father died a few days after her birth, and on Sept. 9, 1543, she was crowned queen of Scotland, the earl of Arran, and afterwards her mother, conducting the government. In 1548 she was affianced to Francis, dauphin of France, son of Henry II. and Catharine de' Medici, and in the same year she was brought to France to be educated at the French court. Buchanan and Ronsard were among her teachers, and when she grew up she added to a striking and fascinating personal beauty all the accomplishments and charms which a perfect education can give. Her marriage with the dauphin was celebrated Apr. 24, 1558, in the church of Notre Dame, and when Mary I. of England died in the same year (Nov. 17) she had her arms quartered with those of England, though she put forth no direct claim to the English throne. On July 10, 1559, Henry II. died, and was succeeded by Francis II. Mary thus became queen of France, but Francis died Dec. 5, 1560; she was childless, and Catharine de' Medici, who now grasped the reins of the government, treated her rather coldly. In the same year her mother died, and she then returned to Scotland, landing at Leith Aug. 14, 1561. Coming from a gay court resounding with merry dances and amorous madrigals, she was met on the Scottish shores by the austere hymns of the adherents of Knox. An ardent Roman Catholic, she had come to rule a Protestant people whose predominant passion was hatred to her own religion. Terrible feuds among the powerful families, violence and murder, surrounded her on all sides, and engaged in this chaos she nourished many fantastic plans of her own. All the kings and princes of Christendom wished to marry her, partly on account of her beauty, partly on account of her prospects of inheriting the crown of England. No other person made such a stir in European politics, and she liked it. Nevertheless, the first period of her reign gave satisfaction. James, her half-brother, whom she created earl of Murray, was her councillor. But soon she was caught by a sudden fascination. On July 29, 1565, she married Henry Darnley, a grandson of the earl of Angus and of Margaret Tudor, the widow of James IV., and thus related both to Elizabeth and to herself. Murray and his party among the nobility were opposed to this marriage, and revolted; but, although she succeeded in suppressing the revolution, a sore disappointment overtook her. Darnley was profligate and jealous, weak and treacherous. On Mar. 9, 1566, he burst with Ruthven, Morton, and others into her chamber, dragged Rizzio, an Italian adventurer who had become her councillor after the breach with Murray, out into the corridor, and stabbed him. The horror of this night Mary never forgot or forgave; the son she bore three months afterwards (June 19), James VI. of Scotland and James I. of England, could never see a drawn sword without trembling. She detached Darnley from the other conspirators, fled with him to Dunbar, became reconciled with Murray, entered into an intimate alliance with the earl of Bothwell, and thus strengthened began to persecute the murderers of Rizzio without mercy. On Feb. 9, 1567, the house in which Darnley lay sick was blown up by gunpowder, and his mangled corpse was found at a distance. Bothwell's connection with this murder was apparent; his trial was a mere mockery; and when Mary married him, three months after the death of her husband (May 15), a general rising took place. In the battle of Carberry Hill (June 15) Bothwell was defeated and fled, and Mary was confined in Lochleven Castle and compelled to abdicate. She escaped, however, from Lochleven May 2, 1568, and rallied a new force, but was defeated at Langside May 13, and fled to England. Here she was immediately imprisoned—first at Carlisle, afterwards in different other places, and at last in Fotheringay Castle. After several years' imprisonment she was tried on a charge of complicity in conspiracies against the life of Elizabeth, and on Oct. 25, 1586, a sentence of death was pronounced against her. On Feb. 1, 1587, Elizabeth signed the warrant of execution, and the next day Mary Queen of Scots was beheaded. She was buried at Peterborough, whence in 1612 she was removed to Henry VII.'s chapel at Westminster. That her life was not one of unmingled innocence and virtue is abundantly evident, but the exact measure of her guilt or the exact degree of her complicity in the crimes committed for her sake and in her name has not been made out. And still more obscure and entangled seem those ideas and passions from which such guilt sprung. There are two brilliant dramatical delineations of her character by Schiller and by Björnstjerne Björnson, and among the numerous prose works relating to her history the most interesting is perhaps Labanoff de Rostov's *Lettres, Instructions et Mémoires de Marie Stuart* (7 vols., 1844). CLEMENS PETERSEN.

Ma'ryland, one of the central Atlantic States, one of the original thirteen, lying between the parallels of 37° 53′ and 39° 44′ N. lat., and the meridians of 75° 2′ and 79° 30′ W. lon. from Greenwich. It is bounded on the N. by Pennsylvania, from which the conventional line of the parallel of 39° 44′ divides it, and by the southern line of Delaware, which forms the boundary of a part of the Eastern Shore; on the E. by Delaware and the Atlantic Ocean; on the S., S. W., and W. by the Potomac River and its estuary, which separate it from Virginia and West Virginia; and on the N. W. by West Virginia. Its extreme length

Seal of Maryland.

from E. to W., along its northern boundary, is 198 miles, and its width varies with the course of the Potomac River, from 3 or 4 miles at the narrowest portion to 120 at the widest. Its area is usually stated at 11,124 square miles, or 7,119,360 acres, but this does not include the waters or smaller islands of Chesapeake Bay, and there is an unsettled boundary question between Maryland and Virginia which includes the title to numerous water-lots and some islands in the lower Potomac River; a joint commission has been in session at intervals for several years past, but the commissioners have been unable to agree on any boundary-line. The Eastern Shore of Maryland—*i. e.* E. of Chesapeake Bay—is divided from the Eastern Shore of Virginia by a line running due E. from the mouth of Pocomoke River to the Atlantic.

Face of the Country.—The Eastern Shore—under which name is included the territory lying between Chesapeake and Delaware bays and the Atlantic, and comprising also the greater part of the State of Delaware—is mostly level, and in portions low and swampy. Toward the neck of the peninsula at the N. it is more rocky and broken. The Western Shore, lying between the Potomac River and the Chesapeake Bay, with its principal affluent, the Susquehanna, is, as far N. as the Great Falls of the Potomac, level and sandy, and in some places marshy; above that point it rises in terraces, and soon in broken and rugged hills; and in the region above Rockville, especially toward the N. W., it is decidedly mountainous; the Blue Ridge, Laurel Ridge, and the other main ranges of the Alleghanies, five or six in number, pass through the narrow N. W. portion of the State. Washington co., lying between South Mountain and Tuscarora Mountain, is a part of the Cumberland Valley, and abounds in beautiful scenery, while its soil is very rich and productive. The mountains in the extreme W. of the State, in Garrett co., are the highest, but none of them exceed 2500 feet in height.

Coast, Bays, Rivers, Lakes, etc.—The Atlantic coast proper is only 33 miles in extent, and has no good harbors; but Chesapeake Bay, which extends in a northerly direction almost to the northern boundary of the State, furnishes a coast-line of more than 500 miles; the Potomac is navigable for about 125 miles on the western line of the State, and several of the other rivers are navigable for a considerable portion of their length. Chesapeake Bay is navigable throughout its whole extent, and has numerous excellent harbors. The State is therefore admirably situated for conducting an extensive commerce. The principal river of the State is the Potomac, which rises in the mountains of West Virginia and flows N. E., E., and S. E. for a distance of about 450 miles, of which nearly 200 are navi-

gable. The lower portion of the river below Alexandria is rather an estuary than a river, being for most of its distance of great breadth, and its shores in that section are mostly low and marshy. The other rivers of the State are—on the Western Shore, the Wicomico, Patuxent, South, Severn, Patapsco, Bush, and Susquehanna; on the Eastern Shore, the Pocomoke, Manokin, Nanticoke, Choptank, St. Michael's, Wye, Chester, Sassafras, Elk. Many of these are rather bays, coves, or estuaries, setting up from Chesapeake Bay, than rivers proper, especially in the lower part of their courses. To this class also belong the so-called Fishing, Honga, and Hudson rivers. Chincoteague Bay, Sinepuxent Bay, and St. Martin's Bay are sounds lying between the Eastern Shore and the island reefs and barriers which receive the Atlantic surf. Pocomoke Sound, Tangier Sound, and Eastern Bay are portions of Chesapeake Bay. There are numerous islands in the bay, the largest of which are Kent, Bloodworth's, Holland's, Smith's, Tangier, Halfmoon, and Assateague.

Geology.—The Eastern Shore as far N. as the Choptank River, and St. Mary's and Calvert cos. on the Western Shore, are wholly alluvial; the Eastern Shore between the Choptank and the Elk River, and Charles, Prince George, and Ann Arundel cos. on the Western Shore, are Tertiary, mainly Pleistocene and Miocene, with some argillaceous clays and slates of earlier date; a narrow belt of the Cretaceous formation runs south-westerly from New Jersey to the Potomac. Beyond the chalk is a broad belt of Eozoic rocks, containing veins of copper, specular iron ore, chrome iron ores. Through the middle of this Eozoic belt is a narrow strip of Trias, the Middle Secondary red sandstone, which traverses the eastern part of Frederick co. It contains the beautiful breccia of which the pillars of the old House of Representatives at Washington were made. The metamorphic rocks are succeeded by the Silurian formation — Potsdam sandstones, Trenton limestones, etc.— which in turn give place to the Devonian red shales and sandstones, which in the extreme N. W. are overlaid by the coal-measures, and some of the best of the bituminous coal which finds its way to a market at Baltimore is mined in this portion of the State.

Mineralogy.—As we have already implied, copper, hæmatitic iron, chrome iron, and other ores, including galena, manganese, and barytes, are found in the Triassic region in the centre of the State; bituminous coal in great quantities in the N. W.; bog-iron ores in the E.; breccia and other marbles and building limestones and sandstones in the central portion of the State. There are also marls, magnesia, honestone, and traces of gold, nickel, and cobalt have been discovered.

Zoology.—For the most part, the quadrupeds are those of the Atlantic coast; fox, raccoon, and opossum are not uncommon, and bears are found in the western counties; a few deer are left in the mountains, and smaller game is abundant, but the most characteristic of the fauna of Maryland are its birds, fishes, and mollusks. The Baltimore oriole is one of the most brilliant-hued of song-birds; the rice-bird (the Northern bobolink) and many other of the finches and tanagers have their homes for at least a part of the year in Maryland. The number of species of wild-ducks, brant, and teal found in its bays and estuaries is very large, and pigeons, partridges, snipe, quail, etc. are found in the eastern part of the State in immense numbers. Fish are abundant and of excellent quality; the oysters of Chesapeake Bay have the highest reputation both for size and flavor, and the various departments of the oyster-trade furnish employment to many thousands of persons. The interests at stake are so large as to be the subject of frequent and solicitous legislation.

Soil and Vegetation.—Among the forest trees, the gum, cypress, cedar, juniper, dogwood, magnolia, holly, elm, cherry, locust, persimmon, beech, sycamore, poplar, sassafras, red maple, etc. are most abundant in the lowlands, while several species of oak, maple, walnut, hickory, ash, birch, chestnut, pine, and spruce are found in large forests in the mountainous districts. The soil in the eastern part of the State is a light sandy loam, easily tilled, and with a good supply of fertilizers yielding good crops. It is well adapted to peach-culture and to market-garden products. Maryland, Delaware, and New Jersey furnish nearly nine-tenths of the peach-crop of the Atlantic coast. The soil of the valleys of the middle and northern counties is very rich and fertile, and yields immense crops of tobacco, wheat, and Indian corn. The mountain-slopes are clothed with forest trees, and some of them hardly repay cultivation.

Climate. — The climate of Maryland, as is to be expected from its situation, is equable, removed alike from the intense cold of the North and the protracted heat of the South. It is generally healthy, except along the low and marshy lands which border the bay and the lower Potomac, where miasmatic influences are prevalent, and congestive, bilious, intermittent, and remittent fevers occur. The following table gives the means and extremes of temperature, rainfall, etc. in different parts of the State:

Meteorological Data.	Baltimore, lat. 39° 18′ N., lon. 76° 38′ W.; height above sea, 45.2 feet.	Woodlawn, Cecil co., lat. 39° 37′ N., lon. 76° 6′ W.; elevation, — feet.	St. Inigoes, St. Mary's co., lat. 38° 8′ N., lon. 76° 35′ W.; elevation, — feet.	Frederick City, lat. 39° 25′ N., lon. 77° 25′ W.; elevation, — feet.	Washington, D. C., lat. 38° 53′ N., lon. 77° 1′ W.; elevation, 105.56 feet.	Emmittsburg, Frederick co., lat. 39° 44′ N., lon. 77° 25′ W., elevation, — feet.
I. *Temperature:*						
Average mean temperature of year.....	54° 64′	52.3°	54.6°	51.7°	54.18°	51.2°
Maximum temperature of year..........	96° 5′	94°	96°	96°	101°	104°
Minimum " " "	2°	12°	10°	—7°	—7°	—8°
Range of temperature "	94° 5′	82°	86°	89°	108°	112°
Average mean temperature of spring...	48.2°	49.8°	52.3°	50.9°	52.8	—48.6
Maximum " " " ...	89°	92°	84°	83°	92.5°	82°
Minimum " " " ...	5°	10°	15°	15°	4°	2°
Range of temperature in spring........	84°	82°	69°	68°	88°	80°
Average mean temperature of summer	76.3°	73°	76.2°	74.2°	77.2°	74.9°
Maximum " " " ...	96.5°	94°	96°	96°	101°	104°
Minimum " " " ...	49°	52°	54°	50°	46.5°	53°
Range of temperature in summer......	47.5°	42°	42°	46°	54.5°	51°
Average mean temperature of autumn	47.2°	51.1°	58°	52.5°	55.4°	52°
Maximum " " " ...	93°	88°	90°	86°	92.5°	86°
Minimum " " " ...	17°	24°	32°	24°	14°	22°
Range of temperature in autumn......	76°	64°	58°	62°	78.5°	64°
Average mean temperature of winter..	33.6°	35.4°	31.9°	29.3°	31.2°	28.8°
Maximum " " " ...	62°	64°	60°	60°	64.5°	52°
Minimum " " " ...	2°	12°	10°	—7°	—7°	—8°
Range of temperature in winter.........	60°	52°	50°	53°	57.5°	44°
II. *Rainfall:*						
Total rainfall for year..........................	48.11	45.36	44.59	43.84	46.16	51.12
Rainfall in spring..............................	12.10	12.22	10.03	6.50	11.43	14.19
" " summer	13.33	9.18	13.93	12.25	12.76	11.37
" " autumn..........................	10.95	12.03	10.78	14.95	11.06	15.62
" " winter..........................	11.73	14.93	9.85	10.14	10.91	9.94
III. *Barometrical Changes:*						
Mean pressure for the year...........	30.057	......	......	......	30.054	
" " " spring..............	29.994	......	......	......	29.987	
" " " summer...........	30.029	......	......	......	30.024	
" " " autumn...........	30.101	......	......	......	30.093	
" " " winter...........	30.105	......	......	......	30.107	
IV. *Wind-Currents:*						
Prevalent winds for year.............	N. W., N. E., S. W., and calm.	......	......	......	N.W., S., N. E., N.	
" " " spring..........	N. W., N. E., and S. E.	......	......	......	N. W., S., N. E.	
" " " summer.......	N. E., S. E., N., and W.	......	......	......	S., N. W., S. W.	
" " " autumn........	N. W., W., N., and calm.	......	......	......	N. W., S., W.	
" " " winter.........	N. W., W., N., calm, and N. E.	......	......	......	N. W., calm, S., N.	

The average mean temperature in the mountainous portions of Garrett co. in the extreme W. of the State is 50.1°.

Agricultural Productions.—In 1870, 4,512,579 acres, out of the 7,119,360 acres which constitute the land-area of the State, were in farms, and of this 2,914,007 acres were under cultivation and improvement, while 1,598,572 were not in cultivation. The value of these farms was $170,369,684, and of farming implements, $5,268,676. The value of all farm productions for the year 1869–70 was $35,343,927; of animals slaughtered or sold for slaughter, $4,621,418; of home manufactures, $63,608; of forest products, $613,209; of market-garden products, $1,039,782; of orchard products, $1,319,405; of wages paid to farm-laborers, $8,560,367. The wheat-crop of Maryland that year was 5,774,503 bushels; rye, 307,089 bushels; Indian corn, 11,701,817 bushels; oats, 3,221,643 bushels; barley, 11,315 bushels; buckwheat, 77,867 bushels. The amount of flax raised in the State was 30,760 pounds; of wool, 435,213 pounds; of hay, 223,119 tons; of hops, 2800 pounds; of tobacco, 15,785,339 pounds; of maple-sugar, 70,464 pounds; of maple-syrup, 374 gallons; of sorghum-syrup, 28,563 gallons; of Irish potatoes, 1,632,205 bushels; of sweet potatoes, 218,706 bushels; of peas and beans, 57,556 bushels; of beeswax, 3439 pounds; of honey, 118,938 pounds; of domestic wine, 11,583 gallons; of cloverseed, 35,040 bushels; of flaxseed, 1541 bushels; of grass-seed, 2609 bushels. In 1870 the value of all live-stock was $18,433,698; the number of horses was 102,216; the number of mules and asses, 9830; of milch cows, 94,794; of working oxen, 22,491; of other cattle, 98,074; of sheep, 129,967; of swine, 257,893. We have the estimates of the agricultural department of these crops and products at a later date. According to that authority, the crop of wheat in 1873 was 5,262,000 bushels, and its value $8,103,480; of rye, 309,000 bushels, and its value $247,200; of Indian corn, 10,451,000 bushels, and its value $7,106,680; of oats, 2,798,000 bushels, and its value $1,231,120; of barley, 10,600 bushels, and its value $9010; of buckwheat, 60,000 bushels, and its value $45,000; of Irish potatoes, 1,336,000 bushels, and its value $935,200; of hay, 169,400 tons, and its value $3,218,600; of tobacco, 19,300,000 pounds, and its value $1,486,100. Total value of the above crops, $22,382,300. The number of horses was 104,500; of mules and asses, 10,700; of milch cows, 96,900; of oxen and other cattle, 125,600; of sheep, 133,200; of swine, 256,200. The value of all live-stock was estimated at $18,461,733.

Manufactures.—In 1870, Maryland had, according to the census report, 5812 manufacturing establishments, employing motive-power equal to 32,422 horse-power, furnishing employment to 44,860 hands, of whom 34,061 were men, 8278 women, and 2521 children. The capital invested was $36,438,729; the wages paid, $12,682,817; the raw material used, $46,897,032; and the annual product, $76,593,613. The most important branches of manufacture are the refining of molasses and sugar, of which the reported production in 1870 was $7,007,857; next, clothing, annual product $5,970,713; cotton goods, $4,852,808; flouring-mill products, $3,772,630; the various branches of the iron manufacture, $6,644,395; boots and shoes, $1,997,768; tin, copper, and sheet-iron ware, $1,654,009; tobacco and cigars, $1,762,748; fruits and vegetables canned, $1,587,230; oysters and fish canned, $1,418,200; bread and bakery products, $1,220,399; leather tanned and curried, $1,888,696; furniture, $1,399,488; lumber sawed and planed, $1,636,580; malt and distilled liquors, $1,555,004; printing and publishing, $1,561,449; brick, $1,191,545; copper milled and smelted, $1,016,500. None of the other industries were reported as aggregating $1,000,000 of annual product, though several approached it very closely. The value of the oysters and other fish canned was either greatly understated in the census or has rapidly increased since. It was estimated from carefully collected data in 1874 to amount in Baltimore alone to over $6,000,000. The preparation of canned fruits has also greatly increased, and now amounts to more than $5,000,000. The very large importations of coffee into Baltimore have made the preparation of coffee and coffee-essence a large branch of industry.

Railroads.—In Jan., 1875, there were 1825.29 miles of railroad in Maryland and the District of Columbia, and the cost of road, equipment, etc. was $57,318,219. The principal roads are—the Baltimore and Ohio, one of the four great trunk-roads across the Continent, which, including its branches, has more than 300 miles of track in the State; the Annapolis and Elk Ridge Railway, 21 miles in length; the Philadelphia Wilmington and Baltimore, 56 of whose 98 miles are within the State: the numerous branches and connections of the Delaware Railway to Rock Hall, Queenstown, Cambridge, Oxford, Crisfield, Newtown, and Snow Hill; the Philadelphia and Baltimore Central; the Northern Central; the Frederick and Pennsylvania line; the Cumberland and Pennsylvania R. R.; the Western Maryland and the Southern Maryland, to Port Tobacco, etc. Many of these roads are mostly sustained by local travel, and those on the W. have for the most part a direct connection with Baltimore. The railroad system of Maryland, except the merely local roads, is so fully connected with that of other States, and is so little under the control of the State, that it can hardly be considered separately. Even its great trunk-road, the Baltimore and Ohio, has 80 miles of its course between Harper's Ferry and Cumberland in the States of Virginia and West Virginia, and continues its course in the latter after crossing the western boundary of Maryland.

Finances.—The sessions of the legislature of Maryland being biennial, and occurring in the even years, the latest report of the finances of the State is for the year ending Oct. 1, 1873. The receipts into the treasury for the year ending at that date were $2,432,677.48; the balance in the treasury at the close of the preceding year was $339,171.10; making a total of $2,771,848.58. The disbursements during the fiscal year ending Oct. 1, 1873, were $2,287,038.36, leaving in the treasury on Oct. 1, 1873, $484,810.22. The aggregate debt of the State for which interest has to be provided was, Oct. 1, 1873, $10,741,215.60; the productive assets of the State at the same date were $4,522,043.46, leaving the State debt, over and above its productive assets, $6,219,172.14. The unproductive assets of the State are estimated worth $21,608,694.51, and of these the greater part will probably become interest-paying and productive in the course of a few years; so that the credit of the State is sound. Under the head of the counties we have given in detail the valuation of the State in 1873. The amount of the tax-levy of that year was $721,994.17. Of this sum, $424,672.71 was for the support of the public schools of the State.

Commerce of Maryland.—(1) *Foreign Commerce.*—There are nominally four customs districts through which the commerce of Maryland is conducted, but so far as the foreign commerce is concerned, Baltimore is practically its only port of entry, Annapolis and Georgetown, D. C., importing little or nothing, and exporting only a few hundred dollars' worth per year, while the eastern district has neither imports nor exports. The following table gives the imports, domestic exports, and foreign exports for 1870, and for the years ending June 30 and Dec. 31, 1874, and the shipping so far as ascertainable:

Customs Districts.	Imports for year ending June 30, 1870.	Domestic exports for year ending June 30, 1870.	Foreign exports for year ending June 30, 1870.	Imports for year ending June 30, 1874.	Domestic exports for year ending June 30, 1874.	Foreign exports for year ending June 30, 1874.	Imports for year ending Dec. 31, 1874.	Domestic exports for year ending Dec. 31, 1874.	Foreign exports for year ending Dec. 31, 1874.	Tonnage of vessels owned in the district, 1874.
Annapolis	....	....	....	....	....	....	....	$5,560	....	1,903.67
Baltimore	$19,512,468	$14,330,248	$200,225	$29,302,138	$27,513,111	$179,598	$26,621,725	29,478,788	$137,274	121,187.07
Eastern district	....	....	....	....	....	....	....	....	....	19,176.91
Georgetown, D. C.	1,062	....	....	173	1,610	....	1,693	4,783	....	28,196.50
	$19,513,530	$14,330,248	$200,225	$29,302,311	$27,514,721	$179,598	$26,623,418	$29,489,131	$137,274	170,464.15

There were entered in the Baltimore district in 1870, from foreign countries, 355 American vessels, of 124,584 aggregate tons burden, and employing 3982 men and boys; and 345 foreign vessels, of 147,706 aggregate tons burden, and employing 5023 men and boys; making a total of entries of 700 vessels, of 272,290 tons tonnage, and employing as crews 9005 men and boys. During the same year there were cleared for foreign ports 256 American vessels, of 91,652 aggregate tons, and manned by 3006 men and boys; and 348 foreign vessels, of 154,917 tons burden, and employing 4980 men and boys; making a total of clearances of 604 vessels, of 246,569 tons, and manned by 7986 men and boys, and a total of entrances and clearances of 1304 vessels, with a tonnage of 518,859 tons, and employing as crews 16,991 men and boys.

(2) *The Domestic and Coastwise Trade.*—This, though vastly larger than the foreign commerce, is much less easily ascertained. The great articles of domestic commerce in

Maryland are oysters, taken in immense quantities in Chesapeake Bay, and of which not less than 15,000,000 bushels, mostly canned or bottled, are annually shipped, representing a value of from $15,000,000 to $20,000,000, and requiring about 30,000,000 cans annually; flour and grain, of which from 8,500,000 to 10,000,000 bushels of grain and from 1,100,000 to 1,500,000 barrels of flour are annually received and shipped, representing a value of $17,000,000 to $20,000,000 annually; tobacco, of which from 41,000 to 55,000 hogsheads are received and shipped annually; coffee, of which over 500,000 bags are received annually, and all parts of the Union supplied; sugar, refined largely in the State, and of which the receipts in 1870 were 90,648 hogsheads, 57,717 boxes, and 25,421 bags and mats; and molasses, of which about 24,000 hogsheads are received annually. The cotton receipts are from 105,000 to 120,000 bales. Coal, mostly from Maryland coal-mines, is shipped to the extent of about 3,000,000 tons. Wool, hides, leather, provisions, guano, naval stores, iron, whisky, fish, and canned fruits—in which last the State is pre-eminent—are the other articles which constitute the cargoes of the vessels and freight-cars which are the carriers of this vast domestic commerce. For the year ending June 30, 1874, the number of steamers engaged in the coastwise trade which *entered* the ports of the four customs districts named above was 1943, of an aggregate tonnage of 1,588,958 tons, and employing 43,259 men and boys; the number of sailing vessels entered was 414, of an aggregate tonnage of 81,320, and employing 2415 men and boys. The *clearances* of vessels in the domestic and coasting trade for the same year were—steamers 2046, 1,567,142 tons, crews 46,332; and sailing vessels 378, 71,283 tons, crews 2164; making a grand total of entrances and clearances, 4781 vessels, of 3,308,703 tons burden, and manned by 94,170 men.

Banks.—On Nov. 1, 1874, there were 33 national banks in the State, of which 2 were closed or closing. The 31 in operation had an aggregate capital of $13,790,203; their bonds on deposit amounted to $10,391,250; the circulation issued, to $14,236,850; the circulation redeemed, to $4,954,523; and the circulation outstanding, to $9,382,327. On Jan. 1, 1875, there were also 13 State banks, having an aggregate capital of $3,704,500, and 5 savings banks, the aggregate deposits in two of which amounted to $17,091,998.27. There were also 22 private banking-houses, all in Baltimore.

Insurance.—On Jan. 1, 1873, there were in the State 19 fire and marine insurance companies, chartered by the State between the years 1794 and 1872; their aggregate capital was $2,835,702; their total assets, $5,220,660, of which $4,454,034 was reserve; their total liabilities, $1,070,297, of which $977,934 was classed as reserve liabilities; their surplus as regarded policy-holders, $4,150,363; and the net surplus of capital, $955,032. Their total income for the year had been $1,239,190; their total expenditures, $1,000,314; the net risks outstanding, $134,157,039. There were at the same time only two life insurance companies chartered by Maryland. These had a capital of $200,000; total assets, $798,543; total liabilities, $536,185; surplus as regarded policy-holders, $262,358. The total income of the year was $225,277; the total expenditures, $147,479; the excess of income over expenditures, $77,798.

Population.

Census year.	Total population.	Male.	Female.	White.	Free colored.	Slave.	Native.	Foreign.	Density	Ratio of increase.	Of school age, 5–20 years.	Of military age, 18–45 years. Males.	Of voting age, 21 years and over. Males.
1790	319,728	*107,254	*101,395	208,649	8,043	103,036	....	....	28.74	......			
1800	341,548	*110.650	*105,676	216,326	19,587	105,635	....	....	30.70	06.82			
1810	380,546	*120,220	*114,897	235,117	33,927	111,502	....	....	34.20	11.42			
1820	407,350	206,862	200,488	260,223	39,730	107,397	....	....	36.62	07.04			
1830	447,040	225,688	221,352	291,108	52,938	102,994	....	....	40.19	09.74	*107,142		
1840	470,019	234,059	235,960	318,204	62,078	89,737	....	....	42.25	05.14	*111,029		
1850	583,034	297,471	285,698	417,943	74,723	90,368	531,476	51,209	52.41	24.04	212,393	114,915	137,932
1860	687,049	340,898	346,151	515,918	83,942	87,189	609,520	77,529	61.76	17.84	248,219	130,833	160,595
1870	780,894	384,984	395,910	605,497	175,391	None.	697,482	83,412	70.20	13.67	276,120	144,695	184,742

Religious Denominations.

Denominations.	Church organizations, 1870.	Church edifices, 1870.	Sittings, 1870.	Church property, 1870.	Dioceses, conferences, presbyteries, associations, 1874.	Church organizations, 1874.	Church edifices, 1874.	Ordained clergymen, 1874.	Licensed local or lay preachers, 1874.	Church members or communicants, 1874.	Adherent population, 1874.	Church property, 1874.	Sunday-schools, 1874.	Sunday-school teachers and scholars, 1874.	Benevolent contributions, 1874.
All denominations......	1420	1389	499,770	$12,038,650	......	1568	1530	1149	......	140,097	757,200	$13,874,100			
Baptists (regular).......	59	58	12,025	87,100	1	54	54	51	8	7,773	39,000	127,000	44	5764	45,396
Baptists (others), Mennonites, Tunkers, & other minor Baptist denominations........	38	34	8,705	62,500	......	40	36	31	7	4,127	20,000	80,000			
Christian Connection (including "Disciples")...................	5	5	1,850	28,000	1	7	6	5	......	950	4,500	35,500			
Congregationalists......	1	1	400	40,000	......	3	3	1	1	190	1,000	48,000	3	215	
Episcopalians............	153	155	61,480	1,594,800	1	131	138	153	2	16,442	80,000	1,825,000	......	13,967	340,020
Evangelical Associat'n	3	3	1,000	45,500	......	4	4	3	1	812	4,000	50,000			
Friends.....................	22	21	7,440	151,700	1	23	22	......	......	4,650	16,000	160,000	20		
Jews.........................	5	4	2,750	650,000	......	5	5	5	......	....	4,000	700,000			
Lutherans..................	88	84	40,915	875,100	1	96	91	71	13	14,882	68,000	920,000			
Methodists.................	771	757	231,530	3,220,650	3	813	793	430	367	67,850	340,000	4,127,000	798	63,620	173,260
New Jerusalem Ch. (Swedenborgians)....	3	3	900	27,000	......	3	3	3	......	400	2,000	28,000			
Presbyterians............	77	77	32,415	1,279,550	5	127	122	124	12	15,873	64,000	1,753,100			
Reformed (German)...	47	42	19,980	562,150	3	54	48	31	2	4,123	21,000	631,500			
Roman Catholics........	103	103	62,525	2,836,800	2	159	159	212	......	....	85,000	3,100,000			
United Brethren (German Methodists)......	36	34	12,100	233,500	1	40	37	21	......	1,500	6,500	245,000			
Universalists...............	2	2	1,000	32,500	......	2	2	2	......	250	1,000	36,000			
Union churches..........	4	4	1,500	17,700	......	4	4	3	......	275	1,200	18,000			

There were also reported in 1870, 1 Moravian church, with 500 sittings and $4500 of church property; 1 Reformed (Dutch), with 1 church edifice, 600 sittings, and $15,000 church property; and 1 Unitarian congregation (in Baltimore), with 1 church edifice, 800 sittings, and $150,000 of church property. We believe these all still exist.

Education.—A glance at the population table shows that the number of persons of school age (5 to 20 years) in Maryland in 1870 was 276,120. Of these, 130,324, or almost one-half, were in attendance upon the public schools of the State in 1873. The following are the statistics of the public schools for the year ending Oct. 1, 1873, as reported by the State superintendent: Number of schools in the State, 1742, of which 123 were in Baltimore City; number of different pupils, 130,324, of which 40,183 were in the Baltimore schools; highest number enrolled in one term, 99,258, of which 28,329 were in Baltimore; average daily attendance, 60,817—22,181 in the city; number of teachers, 2555—city, 624; number of months schools were

* Whites only.

open in the city, 10; in the country, $9\frac{1}{5}$; average of the State, $9\frac{1}{3}\frac{3}{0}$ months; amount paid for teachers' salaries in the city, $388,984.77; in the counties, $500,491.70; total for city and counties, $889,476.47; amount paid for building, furnishing, and repairing school-houses, $197,487.10; amount paid for books and stationery, $69,526.29; amount paid for colored schools, $69,577.18; total expenditure for public schools in the State, $1,354,066.71, of which $540,487.67 was expended in Baltimore. The institutions of higher education in the State presented the following statistics for the year 1873:

I. *Literary Institutions.*

Institutions.	When organized.	Location.	Teachers and instructors.	Students. Preparatory or partial.	Students. Collegiate or professional.	Value of buildings, grounds, etc.	Amount of endowment, etc.	Income from productive funds.	Income from all other sources.	Volumes in library.
Colleges:										
Frederick College	1797	Frederick	3	100	23	$15,000	$800	......	$2,000	2,500
Loyola College	1853	Baltimore	10	.....	.....	....	......	......	....	20,000
Mt. St. Clement's College	1853	Ilchester	14	40	120	....	......	......	....	9,000
Mt. St. Mary's College	1808	Emmittsburg	26	.....	161	....	......	......	....	8,000
Rock Hill College	1867	Ellicott City	22	105	27	32,000	......	......	....	6,500
St. Charles' College	1848	Near Ellicott City.	11	.....	185	....	......	......	....	4,060
St. John's College	1789	Annapolis	9	72	68	200,000	......	......	25,000	4,500
Washington College	1783	Chestertown	3	.....	23	....	......	......	....	1,000
Western Maryland College	1867	Westminster	11	.....	72	33,000	500	......	18,000	3,000
Baltimore Female College	1849	Baltimore	10	16	88	60,000	......	......	Tui'n, etc.	4,350

II. *Normal and Professional Schools.*

Institutions.	Location.	Under what control.	Date of organization.	Number of instructors.	Number of students.	Value of buildings and grounds.	Endowment and productive property.	Income from productive funds.	Annual income from all other sources.	Volumes in library.
Normal Schools:										
State Normal School	Baltimore	State	1865	10	146	....	State.	$9,500	....	1,250
Normal Dept. St. John's College	Annapolis	State	1861	...	50	....	....	10,000		
Howard Normal School (colored)	Baltimore	State	1865	6	240	....	State.	2,000	....	1,750
Professional Schools:										
St. Mary's Seminary	Baltimore	Roman Catholic	1791	6	70					
Mt. St. Mary's Theological Department	Emmittsburg	Roman Catholic	......	4	25					
Woodstock College	Woodstock	Roman Catholic	1868	11	102	$150,000	....	....	$40,000	20,200
Schools of Medicine:										
Med. dept. Univ. of Md.	Baltimore	University, Md.	1807	12	114	....	....	....	Fees.	
Med. dept. Washington University	Baltimore	Washington Univ	1833	9	39	....	....	....	Fees.	3,500
Baltimore College of Dental Surgery	Baltimore	Corporation	1840	9	60	6,000	....	....	Fees.	
Maryland Dental Col.	Baltimore	Corporation	1873	8	17	3,000	....	....	Fees.	
Maryland Col. of Phar.	Baltimore	Corporation	1840	4	65	....	....	....	Fees.	250
National:										
U. S. Naval Academy	Annapolis	U. S. government	1850	57	280	....	All expenses paid by U. S.	....	....	16,828
School of Science:										
Maryland Agricultural College	College Station, Prince George co.	State	1858	6	130	150,000	$112,200	6,747	6,000	2,100

III. *Schools of a Special Character.*

Institutions.	Location.	Date of organization.	Instructors.	Pupils and inmates.	Value of buildings and grounds.	Amount of endowment.	Income from productive funds and other sources.	Under what control.	Volumes in library.
Endowed Institutions of Special Character:									
Maryland Institute	Baltimore	......	...	......	....	....	....	....	16,300
Peabody Institute	Baltimore	1857	4	180	....	$1,171,466	....	....	57,000
McDonogh School and Institute	Owing's Mills, Baltimore co.	1872	6	50	$150,000	800,000	$45,000	Corporation.	
Johns Hopkins University	Clifton Park	1869	...	......	2,000,000	6,500,000	not yet	fully organized.	
Hospital and Orphans' Home	Near Baltimore.	......	...	......	....	....	....	Corporation.	
Schools of Special Instruction:									
Maryland Institution for the Deaf and Dumb	Frederick	1867	9	99	150,000	50,000	25,000	State.	2,000
Maryland Institution for the Blind	Baltimore	1853	...	......	350,000	....	30,000	Corp. and State.	125
Institute for Colored Blind and Deaf Mutes	Baltimore	1872	3	18	12,000	....	10,000	State.	
Reformatories, etc.:									
House of Refuge	Baltimore	1855	17	380	....	....	39,095	City.	1,813
House of Reformation for Col'd Chil'n.	Bowie	1873	5	72	80,000	....	....	Corporation.	
Manual-labor School	Baltimore	1865	...	210	....	....	....	Corporation.	
St. Mary's Industrial School	Baltimore	1840	7	120	....	....	....	R.C. corporation	350
The Boys' Home	Baltimore	1866	2	70	....	....	....	Corporation.	

Maryland, especially its chief city, has received noble endowments for higher education from its wealthy citizens. The McDonogh bequest, from which nearly $800,000 have been received, and a larger sum will be, is devoted to a farm school, somewhat analogous to the Girard College at Philadelphia, which is now in successful operation. The princely gift of Mr. Peabody, which has endowed the Peabody Institute with nearly $1,200,000 besides buildings, has the triple purpose of founding a great library, an able and extensive series of lectures, and an academy or conservatory of music of high grade; while the unrivalled gift and bequest of the late Johns Hopkins furnishes in all nearly $8,500,000 for building and endowing the largest university in America—one which, wisely and judiciously administered, will become a truly national institution—and in connection with this a hospital more amply endowed than any other on the continent, and two extensive orphan homes. Other citizens have made large gifts for educational purposes, but these are unparalleled in their munificence. The provision made for the poor and helpless, for the morally endangered, and for the vagrants and young offenders against the laws, are ample and worthy of a great State, though due rather to the benefactions of the few than to the humbler contributions or taxation of the many. The Maryland Hospital for the Insane, an excellent and well-managed institution, is near Baltimore,

and, though under the control of a corporation, has received large sums from the State for its care of the insane. The State penitentiary is at Baltimore. In 1873 the average number of prisoners was 600, and the prison was self-sustaining, and there was a surplus of $5638.42 of the earnings over the expenditures of the year. The county jails of the State are not generally so well managed as they should be, though there are honorable exceptions in some of the more populous counties.

Libraries.—According to the census of 1870, there were in the State 3353 libraries, public and private, having in all, 1,713,483 volumes. Of these, 1316 were public, having 570,945 volumes. The details of these libraries are largely under-estimated; 2 are said to belong to the State and Federal governments, and to have 31,462 volumes (these two, the State Library and the Naval Academy Library, in 1873 had 61,828 volumes, or nearly double the number reported); "1 town or city library" must have referred to the Peabody Institute Library, and its 41,500 volumes were 57,000 in 1873; but the Maryland Institute Library, which properly came under the same designation, had 16,300 volumes in 1873; the court and law libraries, 20 in number, with 14,662 volumes, are probably somewhat under-estimated, as the Library Company of the Baltimore bar alone had over 7000 in 1873; the 72 college, school, etc. libraries, with 98,470 volumes, were certainly an under-estimate, as the educational report for 1873 gives a list of college and school libraries of over 130,000 volumes, without enumerating half that number of schools and colleges. The Sunday school and church libraries are said to number 1191, with 306,752 volumes. The census reports no libraries of literary and benevolent associations, yet the Odd Fellows' Library of Baltimore in 1873 had 21,307 volumes, the Young Men's Christian Association over 3000, and the Maryland Institution for the Deaf and Dumb over 2000. The circulating libraries, 30 in number, were reported as having 78,099 volumes, of which the Mercantile Library of Baltimore has 30,000 volumes. The 2037 private libraries had 1,142,538 volumes, according to the census.

Newspapers.—Maryland in 1870 had 88 newspapers, issuing annually 33,497,778 copies, and having an aggregate circulation of 235,450 copies. Of these, 8 were dailies, having an aggregate circulation of 82,921; 1 tri-weekly, with 5015 circulation; 2 semi-weeklies, with 1600 circulation; 69 weeklies, with 127,314 circulation; 8 monthlies, with 18,600 circulation. In the beginning of 1872 the number had increased to 96, of which 9 were dailies, 77 weeklies, 9 monthlies, and 1 quarterly. The commercial and religious papers of Maryland maintain a very high character.

Constitution, Courts, Representation in Congress, etc.—Every male citizen of the U. S. of the age of 21 years or upward, who has been a resident of the State for one year, and of the county or legislative district in which he may offer to vote for six months next preceding the election, is entitled to vote in the ward or election district in which he resides; *provided,* that no person above the age of 21 years, convicted of larceny or other infamous crime, unless pardoned by the governor, shall ever thereafter be entitled to vote, nor shall any person under guardianship as a lunatic or as a person *non compos mentis* be entitled to vote. The executive power is vested in the governor, who is chosen by the electors for a term of four years. He possesses the pardoning power, and any bills which he may veto can only be passed over his veto by a vote of three-fifths of all the members of each house. He nominates, and with the advice and consent of the Senate appoints, the secretary of state, commissioner of the land-office, the adjutant-general of the militia, and State librarian, as well as coroners and notaries public. He appoints an assistant secretary of state, the State board of health, two commissioners of fisheries, the auctioneers of Baltimore City, and other subordinate officers. The comptroller of the treasury is elected by the voters for two years; the treasurer, who serves for the same term, is elected by the two houses of the legislature; the attorney-general and superintendent of labor and agriculture are chosen in the same manner and for the same length of term as the governor. The State board of education are appointed by the governor with the advice and consent of the senate, and the principal of the State normal school is *ex officio* a member of the board, and usually its superintendent of public instruction. The legislature consists of a senate of 26 members, elected for four years, and a house of delegates of 84 members, elected for two years. The judicial power of the State is vested in the court of appeals, circuit courts of the counties, the several courts of Baltimore City, orphans' courts, and justices of the peace. These judges must all be citizens of Maryland, must be qualified voters, and have resided in the State not less than five years, and in the district not less than six months. They are elected by the people of their respective districts for a term of fifteen years, unless they sooner attain the age of 70 years, when their office ceases. The court of appeals is composed of the chief judges of the first seven judicial circuits of the State, and a judge from the city of Baltimore, specially elected thereto. The chief-justice is specially designated for that position by the governor with the advice and consent of the senate. There are eight judicial circuits, for the courts in each of which there is to be one chief and two associate justices, except in the city of Baltimore, where the number of associate judges is necessarily increased. The orphans' courts are presided over by three judges in each county and in the city of Baltimore, who are elected for four years. Their powers are substantially the same with those of the surrogates or judges of probate of other States. The justices of the peace in each county are appointed for two years by the governor by and with the advice and consent of the Senate. Under the apportionment of 1872 the State is divided into six Congressional districts.

Counties.—The State is divided into 23 counties, with a population in 1870 of 780,894. The statistics are given in full in the following table:

Counties.	Pop. 1870.	Males, 1870.	Females, 1870.	Pop. 1860.	Pop. 1850.	Assessed valuation, 1873.	Assessed valuation, 1870.	True valuation (census), 1870.	Tax levied, 1873.
Alleghany	38,536	19,889	18,647	28,348	22,769	$7,958,565	$9.521,884	$24,328,620	$13,530
Anne Arundel	24,457	12,794	11,663	23,900	32,393	9,664,906	9,822,454	10,237,999	16,430
Baltimore City and county	330,741	157,830	172,911	266,553	210,646	240,323,057	237,806,530	401,634,738	408,549
Calvert	9,865	4,909	4,956	10,447	9,646	2,024,908	2,112,879	3,100,000	3,493
Caroline	12,101	6,043	6,058	11,129	9,692	4,120,106	4,101,959	4,239,452	7,004
Carroll	28,619	14,341	14,278	24,533	20,616	16,403,268	17,080,159	21,366,192	27,886
Cecil	25,874	13,169	12,705	23,862	18.939	12,918,494	13,252,030	14,703,747	21,961
Charles	15,738	7,886	7,852	16,517	16,162	3,067,776	3,062,738	4,351,302	5,215
Dorchester	19,458	9,707	9,751	20,461	18,877	5,861,708	6,056,563	7,228,875	9,965
Frederick	47,572	23,265	24,307	46,591	40,987	24,666,012	26,435,079	32,920,117	41,932
Garrett	New	county.	....	....	....	3,189,294	....	....	5,422
Harford	22,605	11,212	11,393	23,415	19,356	12,014,596	12,271,766	12,917,526	20,425
Howard	14,150	7,234	6,916	13,338	....	6,514,610	6,478,365	9,509.640	11,075
Kent	17,102	8,878	8,224	13,267	11,386	7,877,188	7,827,151	13,090,185	13.391
Montgomery	20,563	10,598	9,965	18,322	15,860	7,626,767	7,629,057	8,992,534	12,966
Prince George's	21,138	10,852	10,286	23,327	21,549	8,484,460	8,782,240	8,782,240	14,424
Queen Anne's	16,171	8,265	7,906	15,961	14,484	8,295,426	8,307,896	9,145,779	14,102
St. Mary's	14,944	7,446	7,498	15.213	13,698	2,887,394	2,936,834	2,936.834	4,909
Somerset	18,190	9,271	8,919	24,992	22,456	3,766,575	3,602,302	5,000,000	6,403
Talbot	16,137	8,136	8,001	14,795	13,811	7,476,316	7,645,956	10,705,297	12,710
Washington	34,712	17,150	17,562	31,417	30,848	20,737,203	20,185,928	27,550,532	35,253
Wicomico	15,802	7,922	7,880	....	....	4,266,301	4,422,290	4,422,290	7,253
Worcester	16,419	8,187	8,232	20,661	18,859	4,527,782	4,492,858	6,585,057	7,697
Total	780,894	384,984	395,910	687,049	583,034	$424,672,712	$423,834,918	$643,748,976	$721,994

Principal Towns.—Annapolis is the political capital of the State, and has a population of 5744; but Baltimore (population in 1870, 267,354) is the commercial metropolis of the State and region. Of the other cities and towns of the State, Frederick and Cumberland have from 8000 to 10,000 inhabitants; Hagerstown, about 6000; Westminster, Havre de Grace, Easton, and Salisbury, from 2000 to 4000; Port Deposit, Elkton, Chestertown, Ellicott City, Cambridge, and Williamsport, from 1600 to 2500; while Sharpsburg, Lamel, Newtown, St. Michael's, and Chesapeake City have from 1000 to 1500 inhabitants.

History.—The first white settlement made within the present limits of Maryland was that of William Clayborne, an adventurer from Virginia, who with a party of his followers landed upon Kent Island in Chesapeake Bay in 1631. In 1632, through the influence of Queen Henrietta Maria, consort of Charles I., a charter with greater powers than had ever before been bestowed on any colonial pro-

prietor was granted to Cecilius Calvert, second Lord Baltimore, who made immediate preparations to establish a colony in his new possessions. In 1634 he sent out his brother, Leonard Calvert, as governor of the colony, with 200 emigrants. The colonists landed at St. Mary's, named the colony Maryland in honor of the queen, and commenced a permanent settlement there. Lord Baltimore's charter contained a provision, inserted at his own request, authorizing the colonists to elect a legislature to make laws for them. This legislature met in 1635, and enacted some criminal laws, mostly aimed at Clayborne, who was disposed to make serious trouble for the new colonists. He was indicted for murders, piracy, and sedition, and to escape punishment fled to England, and his estates were confiscated. Lord Baltimore in organizing his colony had proclaimed religious toleration, and, though himself a Roman Catholic (which was a passport to the favor with which he was regarded by Henrietta of France), welcomed men of all religions and of none to his colony. In consequence, his colony had a rapid growth, and many of those who had suffered from religious persecution elsewhere flocked thither. In 1642 an Indian war commenced, which the colonists attributed to the intrigues of Clayborne or his followers. In 1645 there was a rebellion which had its origin in Kent Island, Clayborne having returned and leading it; this extended to St. Mary's, and was so formidable for a time that Governor Calvert was obliged to escape to Virginia, but returned in August of the next year, the revolt being suppressed. For the next twelve or thirteen years there was constant trouble for the gentle proprietor and his governors. A large colony of Puritans, driven out of Virginia, had settled in Maryland, mainly in and around Providence (the present city of Annapolis), and, forgetful of the kindness which had given them a refuge from persecution, allied themselves with Clayborne and his malcontents, and sought to wrest the colony from its rightful proprietor. In 1649, at the prompting of the Calverts, the assembly passed a law defining religious toleration, which prohibited atheism and all bitter reviling of one sect by another. The Puritans, after the regaining of his power by Gov. Calvert, still proved turbulent, but the governor sought to conciliate them by granting them additional land. They increased rapidly in numbers, and when the power in England had passed into the hands of the Commonwealth and the Protector, they insisted on the immediate proclamation of the new order of things. The Calverts objected; to them Charles I. had, with all his faults, been their beloved monarch; his queen had been their liberal patron, and the colony was named after her. They could only recognize her son, Charles II., as their rightful monarch. But the Puritans were found to be a majority, and in 1652, commissioners from England, with whom were associated Clayborne and Bennett, the leader of the Puritans of Anne Arundel co., visited Maryland, deposed the acting governor, Stone, and fully established the authority of the Commonwealth. Clayborne received more than his former power, and Bennett was made governor of Virginia. Lord Baltimore made a determined effort to regain possession of the province, and from his great influence succeeded, and reinstated Gov. Stone, but Bennett and Clayborne interfered and overturned the government, placing it in the hands of commissioners. A civil contest ensued, and the proprietary party led a force against Providence (Annapolis), but were defeated, and their whole force killed or captured. Many of the captives, and among them Gov. Stone, were condemned to death, and four or five were executed. This was in Mar., 1655. In 1658, Lord Baltimore regained his proprietary rights, and his brother, Philip Calvert, was appointed governor. The colony began again to thrive, containing 12,000 inhabitants in 1660, and 20,000 in 1671. Charles Calvert, son of the lord proprietary, became governor in 1662, but on the death of his father in 1665 returned to England, and made Thomas Notley his deputy. In 1689, King William avowed his intention of assuming the government of the province, and sent over in 1691–92, Sir Lionel Copley as governor. The capital was removed in 1693 or 1694 from St. Mary's to Providence, which then received the name of Annapolis. In 1714, Benedict Charles Calvert, fourth Lord Baltimore, succeeded to his father's proprietary rights, and, having been educated as a Protestant, his authority was restored the next year. The colony thenceforward grew rapidly; Baltimore was founded in 1729, Frederick in 1745, and the first newspaper issued in the colony the same year; Georgetown was laid out in 1751. In 1756 the population was 154,188, of whom nearly 50,000 were blacks. In 1750 the boundary-line between Pennsylvania and Maryland was run by the commissioners, Mason and Dixon, and thus a long and troublesome dispute was settled. In the two French wars Maryland bore a prominent part; Gen. Braddock's unfortunate expedition was organized in the colony, and from 1754 to 1758, Western Maryland was kept in constant terror by Indian raids. Maryland entered heart and soul into the Revolution of 1776, and so well satisfied were the people of the justice of their cause that some of the descendants of the first lord proprietary were among the more active of the Revolutionary leaders. During the war of the Revolution the "Maryland line" was famous for its valor, taking an active part in most of the great battles of the war. It was to the Congress in session at Annapolis that Gen. Washington resigned his commission. The constitution adopted by the State Aug. 14, 1776, was retained till 1851. Maryland ratified the Constitution of the U. S. Apr. 28, 1788, by a vote of 63 to 11. In the war of 1812 the State suffered severely. Admiral Cockburn ascended Chesapeake Bay, plundering and burning Frenchtown, Havre de Grace, and Georgetown, and the British troops defeated the Maryland militia at Bladensburg, and burned the public buildings at Washington. The attacks of the British fleet on Baltimore (Sept. 13–14, 1814) were not so successful. On Sept. 16 they abandoned the attack, which had been gallantly resisted, and sailed hastily down the bay. The State has been largely engaged in works of internal improvement. The slack-water Navigation of the Potomac, the Chesapeake and Ohio Canal, the Baltimore and Ohio Railway, have all been measures in which she has taken a large pecuniary interest, and which have aided powerfully in building up the great city on Chesapeake Bay. In the late civil war Maryland was peculiarly situated: a slaveholding State, and with large interests in the South, she had also warm and strong attachments to the Union, and was, moreover, the highway to the national capital. At first, like Kentucky, she proposed to take a neutral position, but the attack upon the Massachusetts regiment at Baltimore (Apr. 19, 1861) and the destruction of the railroad from Annapolis to Washington led to the occupation of Baltimore by Federal troops, and to the suppression of manifestations of sympathy with the South. Very many citizens of Maryland left their homes and joined the Confederate armies, but of those who remained at home a majority were loyal to the Union. One of the greatest battles of the war (that of Antietam, Sept. 17, 1862) was fought on her territory, and several other minor but important engagements, as South Mountain, Monocacy, etc., were also on her soil. Northern and North-western Maryland were more than once traversed by the contending armies. Since the war the State has been laboring zealously to recover its commercial prestige, and to become more firmly bound to the great West. In 1851 its constitution was revised and largely remodeled, and in 1864, and again in 1867, constitutional conventions were held and changes made in its organic law. The constitution of 1864, which abolished slavery in the State, was adopted by a very small majority; that of 1867 by nearly 25,000.

The Lords Proprietary and Governors of Maryland.

Lords Proprietary:

Cecilius Calvert, second Lord Baltimore....1632–75
Charles Calvert, third Lord Baltimore....1675–1715
Benedict Leon. Calvert, fourth Lord Baltimore.1715–15
Chas. Calvert, fifth Lord Baltimore....1715–51
Frederick Calvert, sixth Lord Baltimore....1751–71
Sir H. Harford, last proprietary....1771–76

Governors of Maryland Appointed by the Lords Proprietary:

Leonard Calvert....1633–47
Thomas Greene....1647–49
William Stone....1649–54
Commiss'ers under Parl.1654–58
Josiah Fendall....1658–61
Philip Calvert....1661–62
Charles Calvert....1662–67
Charles, third Lord Baltimore....1667–78
Thomas Notley....1678–81
Charles, third Lord Baltimore....1681–85
Wm. Joseph, president of Deputies....1685–89
Conven. of Prot. Asso....1689–92

Royal Governors:

Sir Lionel Copley....1692–93
Sir Edmond Andros....1693–94
Francis Nicholson....1694–99
Nath. Blackistone....1699–1703
Thomas Tench, pres....1703–04
John Seymour....1704–09
Edward Lloyd, pres....1709–14
John Hart....1714–15

Proprietary Government:

John Hart....1715–20
Charles Calvert....1720–27
Benedict Leon. Calvert....1727–32
Samuel Ogle....1732–33
Charles, fifth Lord Baltimore....1733–35
Samuel Ogle....1735–42
Thomas Bladen....1742–47
Samuel Ogle....1747–52
Benjamin Tasker, pres....1752–53
Horatio Sharpe....1753–69
Robert Eden....1769–74

The Revolution:

The Convention and Council of Safety....1774–76

State Government (1777–1838), *Annual Elections:*

Thomas Johnson....1777–79
Thomas Sim Lee....1779–82
William Paca....1782–85
William Smallwood....1785–88
John Eager Howard....1788–91
George Plater....1791–92
Thomas Sim Lee....1792–94
John H. Stone....1794–97
John Henry....1797–98
Benjamin Ogle....1798–1801
John Francis Mercer....1801–03
Robert Bowie....1803–06
Robert Wright....1806–09
Edward Lloyd....1809–11
Robert Bowie....1811–12
Levin Winder....1812–15
C. Ridgely of Hampton..1815–18
Charles Goldsborough....1818–19
Samuel Sprigg....1819–22
Samuel Stevens, Jr....1822–25
Joseph Kent....1825–28
Daniel Martin....1828–29
Thomas King Carroll....1829–30
Daniel Martin....1830–31
Geo. Howard (acting)....1831–32
George Howard....1832–33
James Thomas....1833–35
Thomas W. Veazey....1835–38

Constitution of 1838, *Three-year Terms:*
William Grason..............................1838–41
Francis Thomas..............................1841–44
Thomas G. Pratt..............................1844–47
Philip F. Thomas..............................1847–50
Enoch Lewis Lowe..............................1850–53

Constitution of 1851, *Four-year Terms:*
Thomas Watkins Ligon..............................1853–57
Thos. Holliday Hicks..............................1857–61
Augustus W. Bradford..............................1861–65

Constitution of 1864, *Four-year Terms:*
Thomas Swann..............................1865–69

Constitution of 1867, *Four-year Terms:*
Oden Bowie..............................1869–72
Wm. Pinkney White..............................1872–75
James B. Groom.........Mar., 1875–Jan., 1876

Electoral and Popular Votes for President and Vice-President.

Elect. year.	Candidates for whom the electoral vote of the State was cast.	Elect. vote.
1788	George Washington P......	6
	R. H. Harrison V.-P........	6
1792	George Washington P......	8
	John Adams V.-P..........	8
1796	John Adams P..............	7
	Thomas Jefferson P.........	4
	Thomas Pinckney V.-P.....	4
	Aaron Burr V.-P............	3
	John Henry V.-P............	2
1800	Thomas Jefferson P.........	5
	John Adams P..............	5
	Aaron Burr V.-P............	5
	C. C. Pinckney V.-P.......	5
1804	Thomas Jefferson P........	9
	C. C. Pinckney P...........	2
	George Clinton V.-P........	9
	Rufus King V.-P...........	2
1808	James Madison P...........	9
	C. C. Pinckney P...........	2
	George Clinton V.-P........	9
	Rufus King V.-P...........	2
1812	James Madison P...........	6
	De Witt Clinton P..........	5
	Elbridge Gerry V.-P........	6
	Jared Ingersoll V.-P........	5
1816	James Monroe P............	8
	D. D. Tompkins V.-P.......	8
1820	James Monroe P............	11
	D. D. Tompkins V.-P.......	10
	Robert G. Harper V.-P.....	1

Elect. year.	Candidates for whom the electoral vote of the State was cast.	Elect. vote.	Pop. vote.	Minority candidates.	Pop. vote.	Minority candidates.	Pop. vote.
1824	Andrew Jackson P.........	7	14,523	Henry Clay P............ Nathan Sanford V.-P....	695		
	John Quincy Adams P.....	3	14,632				
	W. H. Crawford P..........	1	3,646				
	John C. Calhoun V.-P.....	10					
	Andrew Jackson V.-P.....	1					
1828	Andrew Jackson P.........	5	24,578				
	John Quincy Adams P.....	6	25,759				
	John C. Calhoun V.-P.....	5					
	Richard Rush V.-P.........	6					
1832	Andrew Jackson P.........	3	19,156				
	Henry Clay P..............	5	19,160				
	Martin Van Buren V.-P....	3					
	John Sergeant V.-P........	5					
1836	William H. Harrison P.. John Tyler V.-P.........	10	25,652	Martin Van Buren P..... R. M. Johnson V.-P.	22,268		
1840	William H. Harrison P.. John Tyler V.-P.........	10	33,528	Martin Van Buren P..... R. M. Johnson V.-P......	28,752		
1844	Henry Clay P............. T. Frelinghuysen V.-P...	8	35,984	James K. Polk P......... Geo. M. Dallas V.-P.....	32,676		
1848	Zachary Taylor P........ Millard Fillmore V.-P....	8	37,702	Lewis Cass P............ William O. Butler V.-P..	34,528		
1852	Franklin Pierce P....... William R. King V.-P...	8	40,020	Winfield Scott P......... Wm. A. Graham V.-P...	35,066		
1856	Millard Fillmore P....... A. J. Donelson V.-P.....	8	47,460	James Buchanan P...... J. C. Breckenridge V.-P..	39,115		
1860	John C. Breckenridge P.. Joseph Lane V. P........	8	42,482	John Bell P.............. Edward Everett V.-P....	41,760	Stephen A. Douglas P.. H. V. Johnson V.-P....	5,966
						A. Lincoln P........... H. Hamlin V.-P........	2,294
1864	Abraham Lincoln P..... Andrew Johnson V.-P...	7	40,153	Geo. B. McClellan P..... Geo. H. Pendleton V.-P..	32,739		
1868	Horatio Seymour P...... Francis P. Blair, Jr., V.-P	7	62,357	U. S. Grant P........... Schuyler Colfax V.-P....	30,438		
1872	Horace Greeley P........ B. Gratz Brown V.-P....	8	67,685	U. S. Grant P............ Henry Wilson V.-P......	66,750	Charles O'Conor P.........	19

For much of the material used in this sketch of Maryland, as well as for his enterprise and kindness in collecting it, we are indebted to the Hon. Henry Stockbridge of Baltimore. L. P. BROCKETT.

REVISED BY HON. HENRY STOCKBRIDGE, BALTIMORE, MD.

Maryland, tp. of Ogle co., Ill. Pop. 1181.

Maryland, post-v. and tp. of Otsego co., N. Y., on the Albany and Susquehanna R. R. The tp. contains also the village of SCHENEVUS (which see). Pop. 2402.

Ma'rysville, city and tp., cap. of Yuba co., Cal., at the junction of the Feather and Yuba rivers, and on the Oregon division of the Central Pacific R. R., 52 miles N. of Sacramento, was incorporated in 1851; is well laid out, supplied with gas and water, has 8 churches, several graded public and private schools and academies, a high school, 5 hotels, a foundry and machine-shop, flouring-mills, woollen, carriage, and other factories, a savings bank and 3 private banks, a daily and weekly newspaper, and is the centre of trade for the surrounding country. Pop. of city, 4738; of tp. 5171.

Marysville, post-v. of Marion co., Ia., has 2 churches, 1 newspaper, a large woollen-mill, 1 grist-mill, and stores. Vast beds of coal underlie this place and throughout the county, having veins from 5 to 8 feet in thickness. Pop. 266. E. WALTER RUNYON, ED. "MINER."

Marysville, a v. of Competine tp., Wapello co., Ia. Pop. 42.

Marysville, post-v., cap. of Marshall co., Kan., on the St. Joseph and Denver City R. R., and on the E. bank of the Big Blue River, here crossed by a fine bridge. A stone dam has been built, utilizing for mills the fine water-power of the river. Pop. of v. 300; of tp. 1625.

Marysville, tp. of Miami co., Kan. Pop. 1383.

Marysville, tp. of Wright co., Minn. Pop. 527.

Marysville, city, cap. of Union co., O., on the Short Line of the Cleveland Columbus Cincinnati and Indianapolis R. R., 28 miles N. W. of Columbus, has 6 churches, 2 weekly newspapers, 3 banks, and stores. Pop. 1441.
C. M. KENTON, ED. "UNION CO. JOURNAL."

Marysville, post-b. of Rye tp., Perry co., Pa., on the W. bank of the Susquehanna, 7 miles N. W. of Harrisburg, at the crossing of the Northern Central and the Pennsylvania R. Rs. Pop. 863.

Maryville, post-v., cap. of Nodaway co., Mo., 45 miles N. of St. Joseph, on branch of the Kansas City St. Joseph and Council Bluffs R. R., has 7 churches, 2 newspapers, 3 banks, 1 grist-mill, 1 planing-mill, 4 hotels, and stores and shops. Principal business, farming and stock-raising. Pop. 1682. B. A. DUNN, ED. "REPUBLICAN."

Maryville, post-v., cap. of Blount co., Tenn., on the Knoxville and Charleston R. R., is the seat of Maryville College (Presbyterian). Pop. 811.

Masac'cio [true name TOMMASO GUIDI; nicknamed *Tommasaccho* or "Hulking Tom," shortened to MASACCIO], b. at Castel S. Giovanni in 1402; said to have d. in Rome in 1429. Of his personal life little or nothing is known, but his genius left its mark on the work of the greatest masters. In regard to the pieces that may be safely attributed to him there has been much dispute. The frescoes in the Brancacci chapel at Florence are with most confidence traced to his hands. They represent the story of Eden, the fall and expulsion of Adam and Eve, and scenes in the life of St. Peter. In the cloister of S. Maria del Carmine at Florence there is a remarkable fresco by Masaccio. Others are at San Clemente. The paintings in the Uffizi at Florence and in other European galleries are of doubtful genuineness. The few specimens of Masaccio's art that remain show him to have been a man of genius, a student of nature and life, a strong draughtsman and colorist, a thoughtful, poetic mind. In the development of art Masaccio holds a distinguished place.
O. B. FROTHINGHAM.

Masaniel'lo (TOMMASO **Aniello**), a fisherman of Sorrento, who in 1647 excited a popular insurrection in Naples against the duke of Arcos, the Spanish viceroy. Some state that the immediate cause of the tumult was the imposition of a new and oppressive tax; others, an attempt to establish the Inquisition as a means of extirpating the Reformed religion, then in great favor in this city. It is certain that the previous forty years of Spanish misrule had exasperated all classes, and though the duke of Arcos had pursued in some respects a wiser policy than his predecessors, yet the Neapolitans, crushed by taxes and maddened by famine, only waited for an occasion and a leader. This leader was found in Masaniello, who (stung to fury by indignities offered his wife for attempting to smuggle a few handfuls of flour) at the moment when the authorities were fixing on the doors of the duomo the detested inquisitorial brief tore it down amidst the applause of the bystanders, and soon after raised the cry, *Morte al mal governo!* In an instant the whole population, even to the women and children, were in arms; the Spanish authorities were maltreated, the soldiers successfully resisted, and after great loss of life among the Spaniards the insurgents obtained from the terrified viceroy the revocation of the order for the Inquisition, the abolition of many cruel taxes, and a full pardon for all who had taken part in the rebellion. Whether Masaniello was really frenzied by his great success, or whether his enemies were crafty enough to magnify his excesses into insane crimes, it is now difficult to say; but, at any rate, the populace itself rose against him soon after his triumph, and he was assassinated on July 17, 1647.

Masay'a, town of Nicaragua, Central America, beautifully situated near the lake and the volcano of the same name, is well built, with broad, airy streets planted with trees. The surrounding district is very fertile and well

cultivated. The last eruption of the volcano took place in 1670, but since 1860 it has begun to emit smoke. Pop. 15,000, most of whom are Indians.

Masca'li, town of Sicily, province of Catania, lying in a fold of Etna about 2½ miles from the sea. The soil of the neighborhood is altogether volcanic and extremely fertile. Pop. in 1874, 5047.

Mascalonge, or **Muskinunge** [believed to be the Fr. *masque allongé*, "long face"], the largest, finest, and best-flavored fish of the pike family, the *Esox nobilior* of the St. Lawrence basin, but now introduced by canals and the hands of man into several other streams. It is sometimes more than four feet long, and has been known to weigh sixty pounds. It is an extremely bold and vigorous biter, and is caught by the hook or the net. (See also PIKE.)

Mascara', town of Algeria, province of Oran, occupies the site of an old Roman colony on the slope of the Atlas Mountains, among fertile and well-cultivated surroundings. Pop. 8629.

Mascarene' (JEAN PAUL), b. at Castres, France, in 1684, of a Huguenot family; was educated at Geneva; naturalized in England 1706; entering the army as lieutenant, came with the English troops to Nova Scotia in 1711, and remained there nearly fifty years, becoming a member of the council 1720; was associated with the governors of Massachusetts and New Hampshire in negotiating the celebrated treaty of 1725 with the eastern Indians; was acting governor of Nova Scotia 1740–49; defended the province against the French 1744; became major-general 1758, and d. at Boston, Mass., Jan. 22, 1760.

Mascarene Isles, the collective name comprising the islands of BOURBON, RODRIGUES, and MAURITIUS (which see) in the Indian Ocean.

Mascou'tah, post-v. of St. Clair co., Ill., 25 miles E. S. E. of East St. Louis, and on the St. Louis and Southeastern R. R., in a fertile region, and has important manufactures of flour and other commodities. Pop. 2790.

Mascou'tins, a tribe of Indians of the Algonkin family, who were in the seventeenth century among the most prominent in the region of the upper lakes. They were allies of the Miamis, Foxes, and Kickapoos, and enemies of the Ottawas, the "Neutral Nation," and the French. In 1669 they lived on Wisconsin River, but afterward settled on the Ohio, within the present limits of Indiana. They attacked Col. Croghan on the Wabash in 1765 and Col. Clarke in 1777. They have not since been known by name to the government of the U. S., and it is uncertain which of the numerous petty tribes now removed to Kansas are the representatives of the ancient Mascoutins. If, as is stated by some writers, Mascoutin means "prairie," the name ceases to be a tribal designation, and their disappearance from notice cannot be surprising.

Maseres (FRANCIS). See MAZERES.

Mashe'na, town of Central Africa, in Bornoo, is built on a fine slope, in lat. 13° 3′ N., lon. 10° 2′ E., and surrounded with clay walls. Pop. about 12,000.

Mash'pee, post-tp. of Barnstable co., Mass., bounded S. by the Atlantic Ocean. Its inhabitants are Indians, for whom the present township has long been a reservation. Pop. 348.

Masinissa, or **Massinissa,** king of the Massylians, one of the most powerful Numidian tribes, b. about 240 B. C., a son of Gala. Hasdrubal having promised to give him his daughter Sophonisba in marriage, he attacked the Massæsylians, another powerful Numidian tribe, which in the struggle between Rome and Carthage sided with Rome; defeated their king, Syphax, in 213; crossed over to Spain and fought with success against Cneius and Publius Scipio. But when Hasdrubal broke his promise and gave his daughter to Syphax in order to win him over from the Romans, Masinissa turned around and attacked Carthage. In the beginning he was very unsuccessful, but when (in 204) Scipio landed in Africa, Masinissa entered into a firm alliance with him, routed the Massæsylians, fought with great distinction in the battle of Zama, and received by the peace of 201 the territories of Syphax. Sophonisba, who in the course of the war had become his prisoner, he now married, but Scipio, fearing her influence on her husband, demanded her as a Roman captive, and Masinissa, not venturing to refuse, sent her a cup of poison, which she drank. Steadily extending his dominions at the expense of Carthage, he occasioned the Third Punic war, but d. before its close, 148 B. C. Numidia was then divided between his three sons, of whom the youngest, Mastanabal, was the father of Jugurtha.

Mask [Med. Lat. *masca*]. Masks were used by the Greeks from the remotest times at their festivals in honor of Bacchus; and as the Greek drama, both tragedy and comedy, was a direct development of these festivals, masks became a constant part of the Greek actor's costume. They were made of bark, paper, leather, and wood, formed so as to express the different tragical or comical characters, provided in the mouth-openings with a metallic contrivance for the purpose of strengthening the voice of the actor, and covered not only the face, but the whole head. The peculiar character of the Greek drama, far behind the modern with respect to individualization, made the use of masks less inappropriate, and it became almost necessary on account of the enormous size of the theatres. Masks were used also in the Roman *atellanæ*, and from these they were transferred through the Roman theatre down to the Middle Ages, during which they were used not only in popular merry-making and in *commedia dell' arte*, but also in solemn processions and by the performers of the mysteries; at some places—for instance, at Venice—they became of common usage even in ordinary life, like gloves in our days. A peculiar species of literary production called *masques*, consisting of dialogues, songs, dances, processions, and gorgeous decorations, and performed by the court itself, became very fashionable in France under Louis XIV. and in England under James I.; Molière and Ben Jonson have written many masques. (See Donaldson, *The Theatre of the Greeks;* Flögel, *Geschichte des Komischen;* and Sand, *Masques et Bouffons.*)

Mask, Iron. See IRON MASK.

Mas'kelyne (NEVIL), D. D., b. in London, England, Oct. 6, 1732; graduated at Cambridge 1754; took orders in the Church of England; became a fellow of the Royal Society in 1758; was sent to St. Helena in 1761 to observe the transit of Venus, and to Barbadoes in 1762 to experiment with and report upon Harrison's chronometers; succeeded Nathaniel Bliss as astronomer-royal 1765, which post he retained through life, never absenting himself from the Greenwich Observatory except once in 1772, when he went to Scotland to experiment upon the aberrations of the plumb-line as affecting the mean density of the earth. He published *The British Mariner's Guide* (1763), the *Nautical Almanac and Astronomical Ephemeris* (46 vols., annual 1767–1811), a *Standard Catalogue of Stars, Astronomical Observations made at Greenwich from 1765 to 1810* (4 vols.), and many papers in the *Philosophical Transactions.* D. at Greenwich Feb. 9, 1811.

Maskinongé, county of Quebec, Canada, extending N. W. from Lake St. Peter, an expansion of the St. Lawrence. Cap. Rivière du Loup. Pop. 15,079.

Ma'son, county of W. Central Illinois. Area, 450 square miles. It is bounded N. W. by the Illinois River and S. by the Sangamon. It is level, very fertile, and abounds in coal. Cattle and grain are largely produced. The county is traversed by the Peoria Pekin and Jacksonville, the Chicago and Alton, the Springfield and North-western, the Champaign and Havana, and other railroads. Cap. Havana. Pop. 16,184.

Mason, county of Kentucky, bounded N. by the Ohio River, which separates it from Ohio. Area, 235 square miles. In the N. it is hilly. The county has a fertile limestone soil. Live-stock, corn, and tobacco are the staple products. The county is traversed by the Maysville and Lexington R. R. Cap. Maysville. Pop. 18,126.

Mason, county of Michigan, bounded W. by Lake Michigan. Area, 490 square miles. It is level and generally fertile, and abounds in timber. Grain and potatoes are produced, and the lumber manufacture is important. The county is traversed by the Marquette River. Cap. Lincoln. Pop. 3263.

Mason, county of W. Central Texas. Area, 910 square miles. It is traversed by Llano River. The county is rolling, fertile, well timbered and watered, and abounds in iron, copper, and other mineral wealth. There is good water-power. Grain and stock raising are the chief industries. Cap. Mason. Pop. 678.

Mason, county of Washington Territory, bounded E. by Hood's Canal and Puget Sound. Area, 800 square miles. Much of its surface is broken and heavily timbered. The valleys are fertile. Cap. Oakland. Pop. 289.

Mason, county of West Virginia, bounded N. and W. by the Ohio River. Area, 300 square miles. It is hilly and fertile. Cattle, grain, wool, and tobacco are leading products. The county is traversed by the navigable Kanawha River. Coal abounds and salt is manufactured. Cap. Point Pleasant. Pop. 15,978.

Mason, post-v. and tp. of Effingham co., Ill., on the Illinois Central R. R. Pop. of v. 490; of tp. 1908.

Mason, tp. of Cerro Gordo co., Ia. Pop. 1784.

Mason, tp. of Taylor co., Ia. Pop. 580.

Mason, tp. of Oxford co., Me., 25 miles N. of Fryeburg. Pop. 127.

Mason, tp. of Cass co., Mich. Pop. 809.

Mason, post-v., cap. of Ingham co., Mich., on the Jackson Lansing and Saginaw R. R., 12 miles S. of Lansing, has 4 churches, 2 banks, 1 newspaper, 4 hotels, several large mills, stores, etc. Pop. 1212.

K. Kittredge, Ed. "Ingham County News."

Mason, tp. of Marion co., Mo. Pop. 600.

Mason, tp. of Esmeralda co., Mo. Pop. 158.

Mason, post-tp. of Hillsborough co., N. H., on the Peterborough and Shirley R. R., has extensive stone-quarries and contains Mason Village. Pop. 1364.

Mason, tp. of Lawrence co., O. Pop. 1884.

Mason, post-v. of Deerfield tp., Warren co., O., 9 miles S. W. of Lebanon. Pop. 387.

Mason, post-v. of Tipton co., Tenn., on the Memphis and Louisville R. R., 36 miles N. E. of Memphis.

Mason, post-v., cap. of Mason co., Tex., 95 miles W. N. W. of Austin. Pop. 296.

Mason, post-v. of Mason co., W. Va., opposite Pomeroy, O., on the S. bank of the Ohio River, has manufactures of nails, and of salt from the waters of artesian wells. Coal is mined and shipped by the river. Pop. 1182.

Mason (Gen. Armistead Thomson), son of S. T. Mason, b. in Loudoun co., Va., in 1787; graduated at William and Mary College 1807; served as colonel of a cavalry regiment in the second war with England; distinguished himself in the defence of Norfolk; was subsequently brigadier-general of Virginia militia; served some years in the Virginia legislature; was chosen U. S. Senator in 1815 as a Democrat; served until 1818, when he resigned to become a candidate for the House of Representatives against the eminent Federalist, Charles Fenton Mercer; was defeated by a few votes in a contest of great personal bitterness, which led to several duels, in one of which, fought with muskets at Bladensburg, Md., with his cousin, Col. John Mason McCarty, he was killed, Feb. 6, 1819.

Mason (Charles), F. R. S., b. in England about 1730; was assistant for several years at Greenwich Observatory to the celebrated astronomer-royal, Dr. James Bradley, and afterwards to his successors, Dr. Nathaniel Bliss and Dr. Nevil Maskelyne; and with Mr. Jeremiah Dixon was sent to the Cape of Good Hope to observe the transit of Venus of June 6, 1761, while Dr. Maskelyne proceeded with them to St. Helena for the same purpose. In 1763, Messrs. Mason and Dixon were commissioned by the proprietors of Pennsylvania and Maryland to survey the boundary-line between their American possessions; arrived at Philadelphia Nov. 13, and were engaged upon this task until Dec. 26, 1767. (See Mason and Dixon's Line.) On Oct. 24, 1765, the council of the Royal Society resolved "that the precise measure of a degree of latitude in America, in the neighborhood of Pennsylvania, appears to the council and to the astronomer-royal, who was pleased to assist on this occasion, to be a work of great use and importance; and that the known abilities of Messrs. Mason and Dixon, the excellence of the instruments with which they are furnished, the favorable level of the country, and their having assistants well practised in measuring, do all concur in giving good ground for hope that this business may now be executed with greater precision than has ever yet been done, etc.;" and consequently granted those gentlemen the sum of £200 for that purpose, requesting the astronomer-royal (Dr. Maskelyne) to draw up instructions, and the proprietors of Maryland and Pennsylvania to allow the use of their instruments. These gentlemen cheerfully complied with the request, and Messrs. Mason and Dixon employed a month in the following year in executing the measurement in question, the particulars of which are printed in vol. lviii. of the *Transactions* of the Royal Society. In the same volume are found some *Astronomical Observations made at the Forks of the Brandywine*, made for the purpose of "determining the going of a clock sent thither by the Royal Society in order to find the difference of gravity between the observatory at Greenwich and the spot where the clock was set up in Pennsylvania." To this is added an *Observation of the End of the Eclipse of the Moon* and *Some Immersions of Jupiter's First Satellite*, observed at the same place.

Charles Mason was a trained scientific observer, and recorded in his private journal, interspersed with the original field-notes of the survey, not only the adventures, haps, and mishaps of each day's proceedings, with the name of every halting-place and that of every person whose hospitality he shared, but frequent accounts of the flora and fauna, the geological structure, and the agricultural capabilities of the country traversed, as well as interesting notices of the Mohawk, Seneca, Delaware, and other Indians who served as his escort or with whom he met on his route. He dwells with enthusiasm upon the beauties of the scenery as viewed from the Alleghany Mountains, and gives a tolerably correct account of the Mississippi Valley as obtained from "Prince Prisquetoom," who was eighty-six years of age, and a brother of the "king of the Delawares." Messrs. Mason and Dixon embarked at New York for Falmouth Sept. 9, 1768. Dixon d. at Durham, England, in 1777. Mason observed the transit of Venus of June 3, 1769, at Cavan, Ireland, and published his observations in the *Philosophical Transactions* for 1770; was employed by the bureau of longitudes to verify the celebrated *Lunar Tables* of Tobias Mayer, in which he made some changes and corrections, and they were published after his death by Dr. Maskelyne under the title *Mayer's Lunar Tables, improved by Charles Mason* (London, 1787). Mason returned to America, but at what date is unknown, and d. at Philadelphia in Feb., 1787. His MS. journal and field-notes, from which the preceding account is chiefly drawn, was found at Halifax, N. S., in 1860, among a pile of waste paper flung into the cellar of the government house, whence it was rescued by a gentleman of that city. A brief notice of its contents was published by the writer of this article in the *Historical Magazine* for July, 1861.

Porter C. Bliss.

Mason (Charles), b. in New York about 1808; graduated from the U. S. Military Academy in 1829, but retained as assistant professor of engineering until 1831, when he resigned from the army and commenced the practice of law at Newburg, N. Y., removing to New York City in 1834, where for a time he had the editorial management of the *Post*. In 1837 he removed to Wisconsin Territory, and in 1838 was appointed chief-justice of the supreme court of Iowa, which he held until the admission of Iowa into the Union, when for several years he was State attorney to settle the question of boundary-lines, and one of the commissioners which drew up the code of laws adopted by the State in 1851; was commissioner of patents during the administration of Pres. Pierce, and since 1860 has practised his profession at Washington.

Mason (Ebenezer Porter), b. at Washington, Conn., Dec. 7, 1819; graduated at Yale College 1839, distinguishing himself as a mathematician and astronomer; was engaged in the summer of 1840 as a member of the commission for determining the boundary between Maine and Canada, and published soon afterwards a paper entitled *Observations on Nebulæ*, which was highly commended by Sir John Herschel. This precocious astronomical genius d. at Richmond, Va., Dec. 24, 1840, a few days after attaining the age of twenty-one. (See his *Life and Writings*, by Prof. Denison Olmsted.)

Mason (Erskine), D. D., youngest child of Dr. John M. Mason, b. in New York City Apr. 16, 1805; graduated at Dickinson College in 1823, and at Princeton Seminary in 1824; was pastor of the Presbyterian church in Schenectady from 1827 to 1830, and of the Bleecker street church in New York from 1830 till his death, May 14, 1851. From 1836 to 1842 he discharged the duties of professor of ecclesiastical history in Union Theological Seminary. He was an argumentative preacher of great power. A posthumous volume of his sermons, with a brief memoir of the author by Dr. William Adams, was published in 1853.

R. D. Hitchcock.

Mason (Francis), D. D., b. in York, England, Apr. 2, 1799; came to the U. S. in 1818; worked as a shoemaker in several towns of Massachusetts; became connected with the Baptist church at Canton, Mass., about 1825; married there; studied ancient languages under the guidance of his minister; entered Newton Theological Seminary in 1827, and was sent in 1830 as a missionary to Burmah. He devoted himself chiefly to the Karens, among which tribe he had wonderful success, and with the aid of other missionaries made many thousands of converts among that wild but simple-hearted tribe. He translated the Bible into two Karen dialects, as well as numerous other religious books, educated many native preachers, prepared a work on the natural productions of Burmah (1852) which contained a very valuable addition to the then existing scientific data on the subject, published a grammar, chrestomathy, and vocabulary of the Pali language, a *Life of Ko-Thah-Byu, the Karen Apostle*, a memoir of his wife, Mrs. Helen M. Mason (1847), a *Memoir of San Quala*, another Karen convert (1850), *Burmah, its People and Natural Productions* (1860), being a revised edition of his earlier work on the same subject, and an autobiography, *The Story of a Workingman's Life, with Sketches of Travel* (1870). D. at Rangoon, Burmah, Mar. 3, 1874.

Mason (George), a celebrated Virginian patriot of the American Revolution, descended from Col. George Mason,

a member of Parliament in the reign of Charles I., and officer in the army of Charles II. at the battle of Worcester, after which he escaped to Virginia in disguise, losing all his estate in England. His great-grandson, also called George, married Anne Thomson, a niece of Sir William Temple, by whom he had two sons who attained distinction, George and Thomson. The former, b. at Doeg's Neck, Stafford (now Fairfax) co., Va., in 1726, settled after his marriage in Truro parish (which includes Mount Vernon), built Gunston Hall on the banks of the Potomac, and became the intimate friend of Washington, his neighbor and fellow-parishioner at Pohick church. Possessing considerable historical knowledge and legal attainments, as well as liberal sentiments, fine powers of reasoning, and a sound judgment, Mason was a valuable adviser to the future leader of the Revolution, for whom he drafted the "non-importation resolutions" which the latter presented to the Virginia assembly, and procured their adoption 1769. One of these resolutions pledged the Virginia planters to purchase no slaves imported after Nov. 1 of that year. In support of the political rights of the "Old Dominion," Mason printed a pamphlet entitled *Extracts from the Virginia Charters, with Some Remarks upon them*, and at a meeting of the people of Fairfax, July 18, 1774, he presented a series of twenty-four resolutions on the questions at issue between Great Britain and the colonies, which were sanctioned by the Virginia convention in August, and substantially reaffirmed by the Continental Congress in October of the same year. In 1775 he was a member of the Virginia convention, declined an election to the Continental Congress, which was pressed upon him, nominated Francis Lightfoot Lee in his place, and reluctantly consented to serve as a member of the committee of safety. In May, 1776, he drafted the celebrated "Declaration of Rights" and the "Plan of Government," which were adopted June 12 and 29. In the revision of the statutes of Virginia his liberal sentiments were conspicuous, and his talents in debate elicited universal admiration. He was a member of the Continental Congress 1777, and of the convention for framing the Federal Constitution 1787. In the latter body Mason took a conspicuous part, proposing that the election for President should be direct, and for a single term of seven years, opposing the postponement of the repeal of the slave-trade, the counting of slaves as a basis for representation, and the establishment of a property basis for suffrage. Despite his efforts, several features which he considered dangerous were incorporated in the Constitution, which he consequently refused to sign; and having been elected to the Virginia convention to consider that instrument, he united with Patrick Henry in demanding its rejection unless some twenty amendments should be made. Several of these were subsequently adopted by the States and incorporated into the Constitution. He was chosen one of the first Senators from Virginia, but declined the post, and spent the remainder of his life in retirement, occupied in hunting, fishing, and congenial studies. D. at Gunston Hall Oct. 7, 1792. His statue is one of the group which surrounds that of Washington in front of the State Capitol at Richmond, Va. PORTER C. BLISS.

Mason (Col. JAMES L.), b. at Providence, R. I., 1817; graduated at West Point, and appointed brevet second lieutenant of engineers July, 1836, first lieutenant 1838, captain 1847; engaged in the usual routine duty of an engineer officer till 1846, when he was assigned to duty with the army under Scott, which captured Vera Cruz and marched to the city of Mexico, gaining the brevet of major for Churubusco and lieutenant-colonel for Molino del Rey, receiving severe wounds in the latter fight which disabled him from active service until 1850, at which date he resumed duty with his corps in building the St. Augustine sea-wall, repairing Fort Marion, Florida, and at the time of his death was engaged in the construction of the defences of San Francisco. D. Sept. 5, 1853, at San Francisco, Cal. Author of *An Analytical Investigation of the Resistance of Piles to Superincumbent Pressure,* and other professional papers.

Mason (JAMES MURRAY), grandson of George, b. at Analosta Island, Fairfax co., Va., Nov. 3, 1798; graduated at the University of Pennsylvania in 1818; studied law at William and Mary College; began practice in 1820; was prominent in the State legislature; a member of Congress 1837–39; U. S. Senator 1846–61, and was the author of the Fugitive Slave law; entered in 1861 the Confederate Congress, and was sent with John Slidell as a commissioner to England and France; was taken off the British steamer Trent by Capt. Wilkes Nov. 8, 1861, and confined in Fort Warren, near Boston, Mass.; released on the demand of the British government Jan. 2, 1862, and proceeded upon his mission to Europe. D. near Alexandria, Va., Apr. 28, 1871.

Mason (JEREMIAH), LL.D., b. at Lebanon, Conn., Apr. 27, 1768; graduated in 1788 at Yale College; was admitted in 1791 to the Vermont bar; practised law at Westmoreland, N. H., until 1794; at Walpole, N. H., 1794–97; at Portsmouth, N. H., 1797–1832; after which he resided in Boston. He was for many years one of the ablest lawyers of New England. In 1802 he became attorney-general of New Hampshire; several times elected to the legislature, and U. S. Senator 1813–17. D. at Boston Oct. 14, 1848.

Mason (Capt. JOHN), founder of the colony of New Hampshire, b. at Lynn Regis, Norfolk, England; served in 1610 in the navy against an insurrection in the Hebrides; went in 1616 as governor to Newfoundland, of which he published a description (1620) and a map (1626); explored in 1617 the New England coasts; obtained in 1622 a grant of a region called Mariana, now the N. E. part of Massachusetts; procured in 1622, with Sir Ferdinando Gorges, a patent for the province of Maine; sent in 1623 a colony to the Piscataqua River. Mason was 1624–29 treasurer and paymaster of the royal armies in the Spanish war. In 1629 he took a patent for the New Hampshire colony, and with Gorges took another patent for Laconia, a tract including Lake Champlain. Capt. Mason held various important positions in England. In 1635 he was a judge in Hampshire, and was appointed vice-admiral of New England. D. in London in Dec., 1635. Mason's rights in New Hampshire were sold to Gov. Samuel Allen in 1691, and proved a fruitful source of litigation to that gentleman and his heirs.—JOHN TUFTON MASON, one of John Mason's heirs, in 1746 sold his own rights to a Portsmouth company called the Masonian proprietors.

Mason (JOHN), b. in England about 1600; served in the Netherlands under Sir Thomas Fairfax; was one of the first settlers of Dorchester, Mass., 1630, and one of the founders of Windsor, Conn., 1635; was commissioned in 1637 to command an expedition against the Pequot Indians, who had massacred several settlers at Wethersfield, and with a party of 90 English, 70 friendly Mohegans under Uncas, and several hundred Narragansett warriors under Miantonomoh, he surprised one of the Pequot forts on Mystic River, between Groton and Stonington, before daybreak May 26, 1637, and destroyed more than 500 Indians, either by the sword or by the burning of the fort, his own loss being 2 killed and 20 wounded. Soon afterwards he killed or captured most of the remaining members of the tribe in another expedition in Western Connecticut. Mason was appointed major of the Connecticut forces, retaining that office through life; settled first at Saybrook, and in 1659 at Norwich; was for many years a magistrate, and was deputy governor 1660–70. At the request of the general court he published an account of the Pequot war, reprinted by Increase Mather 1677, and by Prince 1736. D. at Norwich in 1672. (See his *Life*, by George E. Ellis, in Sparks's *Am. Biog.*, 2d series, vol. iii.)

Mason (JOHN MITCHELL), D. D., son of John (1734–92), b. in New York Mar. 19, 1770; graduated at Columbia College in 1789, and studied at the University of Edinburgh; succeeded his father in an Associate Reformed pastorate in New York in 1792; founded in 1804 a theological seminary in New York, in which he became professor of theology. He was provost of Columbia College 1811–16, president of Dickinson College 1821–24, and in 1822 united with the Presbyterian Church. D. in New York Dec. 26, 1829. (See his *Works*, edited by E. Mason (4 vols., 1832), and his *Memoirs*, by J. Van Vechten, D. D., 1856.) Dr. Mason was one of the first pulpit-orators of his time.

Mason (JOHN Y.), LL.D., b. at Greensville, N. C., Apr. 18, 1799; graduated at the University of North Carolina in 1816; became a lawyer, and served long in the State legislature, and became a judge in the district court of Virginia; was in Congress 1831–37; became in 1837 a judge of one of the Federal courts; was in the Virginia constitutional conventions in 1828 and 1849; became secretary of the U. S. navy 1846–49; was U. S. minister to France 1854–59. D. in Paris Oct. 3, 1859.

Mason (JONATHAN), b. at Boston, Mass., Aug. 30, 1752; graduated at Princeton 1774; studied law under John Adams; was admitted to the bar 1777; delivered the official oration before the authorities of Boston Mar. 5, 1780, on the tenth anniversary of the "Boston massacre," of which he had been a witness; took a high position at the Boston bar; served repeatedly in the State legislature; was a member of the governor's council 1798; U. S. Senator 1800–03; took a prominent part in the debates of the Senate, especially in that upon the repeal of the Judiciary act of 1801; was Representative in Congress from 1817 to 1820, when he resigned. He was an active and energetic politician of the Federalist party, and possessed great dignity of character and manners. D. at Boston Nov. 1, 1831.

Mason (Lowell), Mus. Doc., b. in Medfield, Mass., Jan. 8, 1792; began his career as instructor and leader of choirs in Savannah, Ga., 1812; in 1821 published the *Handel and Haydn Collection of Church Music;* removed to Boston in 1827, and gave himself entirely to the task of instructing classes in vocal music and encouraging the public taste for music. To him Massachusetts is indebted for the introduction of music into the public schools. His labors soon became arduous and extensive; his zeal was felt throughout New England; the Academy of Music was established in Boston; by means of classes, schools, lectures, institutes, textbooks, glee-books, collections for family and Sunday use, a practical interest in the subject was awakened even in the Middle States. The musical education of the people was Mr. Mason's object, and to this end he encouraged congregational singing in churches and the use of simple compositions in which mass of sound was effective. His own compositions were numerous, and his compilations exceeded in number those of any other man. Of juvenile collections, glee-books, compilations of church music there are more than forty that bear his name, either alone or in association with George J. Webb. Besides these there were several small books and single pieces. In 1837, Mr. Mason visited Europe to study on the Continent and in England the latest methods of musical instruction, and whatever he found he adopted and used. In 1855 the University of New York conferred on him the degree of doctor in music, the first instance of the kind in America. Mr. Mason did more to make the practice of vocal music popular than to raise the standard of musical culture, and long before his death, Aug. 11, 1872, the influence of his school had yielded to the power of more finished art. Still, his work was of great value in its time. O. B. Frothingham.

Mason (Stevens Thomson), b. at Chapawasick, Stafford co., Va., in 1760; was educated at William and Mary College; served in the Revolution, becoming a colonel when twenty years old, and afterwards a general officer; was a prominent member of the Virginia convention of 1788, U. S. Senator 1794–1803, and had great fame and popularity as an orator. D. at Philadelphia May 10, 1803.

Mason (Stevens Thomson), b. in Loudon co., Va., in 1811, a son of Gen. John T. Mason and grandson of S. T. Mason; when nineteen years old became secretary of Michigan Territory; was acting governor 1834–35; governor of the State 1836–40. D. in New York Jan. 4, 1843.

Mason (Thomson), brother of George, b. in Virginia in 1730; studied law in London; took an active part in opposing British aggressions, writing in 1774 a series of papers in favor of resistance; was in 1778 a member of the supreme court of Virginia; was appointed one of the revisers of the laws of Virginia, and was a member of the legislature in 1779 and 1783. D. in 1785.

Mason (William), b. at Hull, England, in 1725; graduated at the University of Cambridge 1745; became a fellow of Pembroke College 1747; took orders in the Church of England 1754; became royal chaplain and canon of York; wrote *Isis* (1748), a poem directed against Jacobitism in the university; *Elfrida* (1752) and *Caractacus* (1759), both dramatic poems, which were represented with moderate success; and *The English Garden*, a poem in four books (1772–82). Mason was a tasteful musician and painter and a correct poet, but will be best remembered as the intimate friend, executor, and biographer of the poet Gray—*Memoirs of Gray* (1775). D. at London Apr. 7, 1797. His *Works* appeared in 1811.

Mason and Dixon's Line, the line which forms the southern boundary of Pennsylvania, separating it from Delaware, Maryland, and Virginia. From the celebrity which this term acquired during the anti-slavery agitation as a synonym of the divisory line between free and slave territory, it has been generally confounded in Europe (and not unfrequently in America) with the parallel of 36° 30′, fixed by the "Missouri compromise" of 1820 as the northern limit for the extension of slavery into the Territories. According to the original grants from the Crown of England to William Penn and Lord Baltimore, the boundary between their respective colonies was fixed at the 40th parallel of N. lat. That line being found by subsequent observation to pass N. of Philadelphia, and to exclude Pennsylvania from Delaware Bay, negotiations ensued between the proprietors for the purpose of rectifying the blunder which the royal ignorance of geography had committed, and for the greater part of a century the matter was unsettled. An agreement was made between the proprietors (May 10, 1732) for fixing their boundary; and as Delaware then belonged by purchase to the heirs of William Penn, it was necessary to begin at its S. E. extremity, then fixed at Cape Henlopen. The boundary between Pennsylvania and Delaware had been already defined to be the arc of a circle drawn with a radius of twelve miles from the court-house at New Castle from the Delaware to the Maryland line. It was now agreed to bisect the line drawn W. across the peninsula from Cape Henlopen to Chesapeake Bay, and from the point of bisection to project a line northward as a tangent to the arc which formed the northern limit, the same to constitute the W. boundary of Delaware. From this point of tangency common to the three colonies, 12 miles N. E. of New Castle a line was to be projected due N. to a point 15 English statute miles S. of the southernmost point of the city of Philadelphia, and from this point a line was to be drawn due W. for five degrees of longitude as the S. boundary of Pennsylvania. Commissioners were appointed to run these lines in 1732, 1739, and 1750, but disagreed, and chancery suits were the result. By decision of Lord Chancellor Hardwick of May 15, 1750, taken as the basis of a final adjudication signed July 4, 1760, commissioners and surveyors were again appointed, who commenced operations Nov., 1760, and spent three years in measuring the base and tangent lines separating Delaware from Maryland. The proprietors then determined to send out more skilled mathematicians to complete the operations, and selected Messrs. Charles Mason and Jeremiah Dixon (see Mason, Charles), who verified the work of their predecessors, and ran the western line, fixed at lat. 39° 43′ 26.3″ N., since known by their name. They began work in Nov., 1763, and were stopped by the Indians in the summer of 1767 at a point 244 miles W. of the Delaware and only 36 miles E. of the terminus they were seeking. Stones were erected at intervals of one mile, and every fifth stone was engraved on the opposite sides with the arms of the lords proprietors. The remaining part of the line was fixed in Nov., 1782, by Col. Alexander McLean of Pennsylvania and Joseph Neville of Virginia, and was verified and permanently marked in 1784. In consequence of the accidental removal of the stone at the N. E. corner of Maryland, commissioners were appointed by the three States in 1849 to revise the former survey, which was done by Lieut.-Col. James D. Graham of the U. S. topographical engineers. The result of his revision was to confirm the work of Mason and Dixon, and Maryland gained by the operation a little less than two acres.

Porter C. Bliss.

Mason'a, tp. of Chicot co., Ark. Pop. 215.

Mason Bee, a name applied to numerous bees, chiefly of the genus *Osmia*, which construct their cells of mud. They put their cells in the hollow stalks of plants, in empty shells, under flat stones, inside oak-galls, in chambers which they construct in rotten wood, etc. Some species form cells of great beauty and perfection, and line them with a kind of silk. The ceilings of many Egyptian temples are completely covered with these cells, masses of which hang down like stalactites. The U. S. has quite a number of mason bees.

Ma'sonboro', tp. of New Hanover co., N. C. P. 541.

Mason City, post-v. and tp. of Mason co., Ill., on the Chicago and Alton and the Indianapolis Bloomington and Western R. Rs., the centre of one of the richest corn-growing regions in Illinois, has 5 churches, 2 banks, 2 weekly newspapers, 5 grain-elevators, 3 hotels. Pop. of v. 1615; of tp. 2387. Wells Corey, Ed. "Mason City Journal."

Mason City, post-v., cap. of Cerro Gordo co., Ia., in lat. 43° N., on the Iowa and Dakota division of the Milwaukee and St. Paul and Central Iowa and the Mason City and Minnesota R. Rs., in the midst of an agricultural and stock-raising section, has 1 school-house, a public square, 2 banks, 2 flouring-mills, water-power, limestone quarries, 2 weekly newspapers, and stores. Pop. 1183.

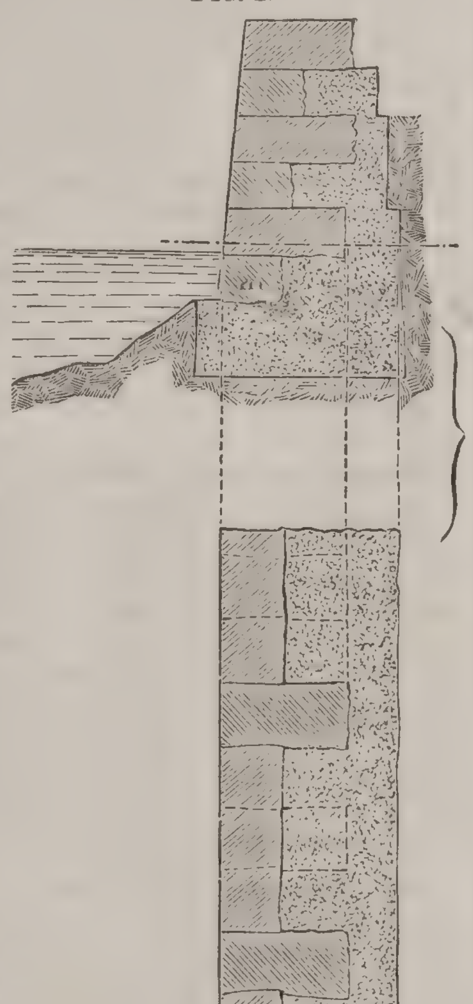
Noyes & Lanning, Pubs. "Cerro Gordo Republican."

Mason Plains, tp. of Mason co., Ill. Pop. 800.

Masonry [Fr. *maçonnerie;* Ger. *Mauerwerk*] is the art of building in stone or brick with mortar, and is classified into *stone masonry*, *brick masonry*, and *concrete* or *béton*. *Stone masonry* is divided into *cut stone* (or *ashlar*) *masonry* and *rubble masonry;* and rubble may be *coursed* or *uncoursed*, while the uncoursed may be *squared rubble*, showing only vertical and horizontal joints on the face, or *irregular rubble*, with the joints running in random directions according to the shapes of the stones. *Concrete* may be *brick*, *stone*, *gravel*, or *shell* concrete, depending on the material used for ballast. The front of a wall is termed its *face*, and the material composing it *facing*, as distinguished from the *back* and *backing*, which apply to the rear or inner surface of the wall. The interior is called the *heart*, and the material *hearting* or *filling*. When the face or back of a wall is not vertical, but inclines toward the wall from bottom to top, the inclination is called the *batter* or *bâtir*. Thus, "a face-batter of 1 in 20" means that in a height of 20 feet the face of the wall departs 1

foot from a vertical line. The method of arrangement of the stones or bricks in order to secure strength and unity of mass is called the *bond*. *Headers* are those stones or bricks which show an end upon the face and back of the wall, and therefore reach into the wall their entire length and bind it together transversely. *Stretchers* are laid to show their longest dimensions on the face or back, as the case may be, and to give longitudinal strength. For walls of stone masonry not exceeding 3 feet in thickness each header should extend through from face to back, and is termed a *through*. In thicker walls the headers should reach back at least 18 inches beyond the contiguous stretcher, and are termed *binders*. The lower surface of a stone is termed its *lower bed*, the upper surface its *upper bed*. All the spaces between contiguous stones are also called joints, whether above, below, or at the sides. *Ashlar* is an external facing of cut stone laid with close joints in courses, the quality of the face-dressing being such—either axed, tooled, rubbed, or polished—as will best suit the character of the material and the design of the work under construction. In *rock-faced* ashlar the face of each block is the natural fracture or split of the stone, left undressed or only deprived of large protuberances. The filling and backing behind an ashlar facing may be rough, irregular rubble, brickwork, or concrete, preferably the latter in most cases, unless rubble stones are plenty and cheap. The ashlar should be well bonded to the hearting, for which purpose one-fifth to one-third of the entire length of each course should be headers, and these should not be placed one above the other in contiguous course, but so that the headers of each course shall rest on or near the middle of the stretchers of the course below. In important work, such as sea-walls, for example, the face-ends of headers for a distance back equal to the breadth of the stretchers are usually cut dovetail on the sides, the ends of the stretchers fitting against them being cut to corresponding angles with the face of the wall, so as to give close joints. The *tails* of the headers, in order to secure a good bond with the hearting, are left with the rough rock-face on the sides, although the beds, for convenience of laying, are roughly dressed to general parallelism with each other. The vertical and horizontal joints for a distance back equal to the breadth of the stretchers should therefore be formed accurately and full. (Fig. 1 gives a transverse and a horizontal section of a sea-wall on a concrete foundation, with stone facing and concrete backing.)

FIG. 1.



The practice of thinning off the blocks from a few inches from the face, so as to show close face-work, with little labor of stone cutting, as in Fig. 2, should be avoided. The method of building with headers and stretchers is not followed in laying the thin ashlar, a kind of veneering, generally not over 4 inches or 5 inches in thickness, used for facing the walls of city houses, in which the only bond-stones extending through or nearly through the wall are those forming the jambs to window and door openings. The face-stones, usually rubbed or finely-axed brownstone or sandstone or polished marble, are tied to the brick backing with hoop-iron clamps, and even these are sometimes omitted where the distance between the jambs of the openings does not exceed 5 or 6 feet. The rise or height of headers should not exceed their width as seen on the face of the wall; that of stretchers should be somewhat less than their transverse breadth. Where the batter is great—say, exceeding an angle of 25° to 30° with the vertical—the bed-joints should not be carried out horizontally to the face of the wall, for the reason that the lower edge of each face-stone would present an angle so acute as to be liable to injury from accidents and the effects of weather. One method of construction recommended in such cases is to cut the beds of the stones so that at least 4 inches in width of the bed-joint shall be normal to the face of the wall, as shown in Fig. 3.

FIG. 2.

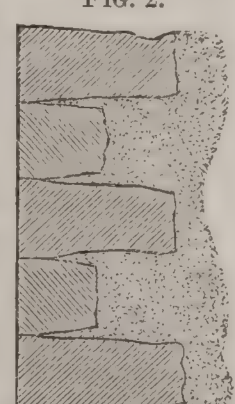


FIG. 3.

There are objections to this device unless the wall is under water, for the joints will retain water, and will be injured by frost in cold climates, and from the growth of vegetation during the summer season in all climates. Moreover, the stone-cutting is expensive. A better design is to secure the requisite strength at the angle by allowing the stones to project beyond the face of the wall, as in Fig. 4. Indeed, it will generally be less expensive, and produce stronger work, to lay up the wall in offsets, as shown by the dotted lines of Fig. 4. In compressive soils, or where from any cause it is difficult to get a solid and unyielding foundation, additional thickness, so as to distribute the weight over a larger area, should be given to the wall at the base; and in order to lessen the weight and cost of the superstructure, without endangering its stability, it may be built hollow; a concave batter is sometimes given to the face. Fig. 5 shows a transverse section,

FIG. 4.

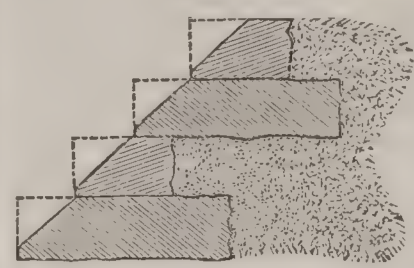
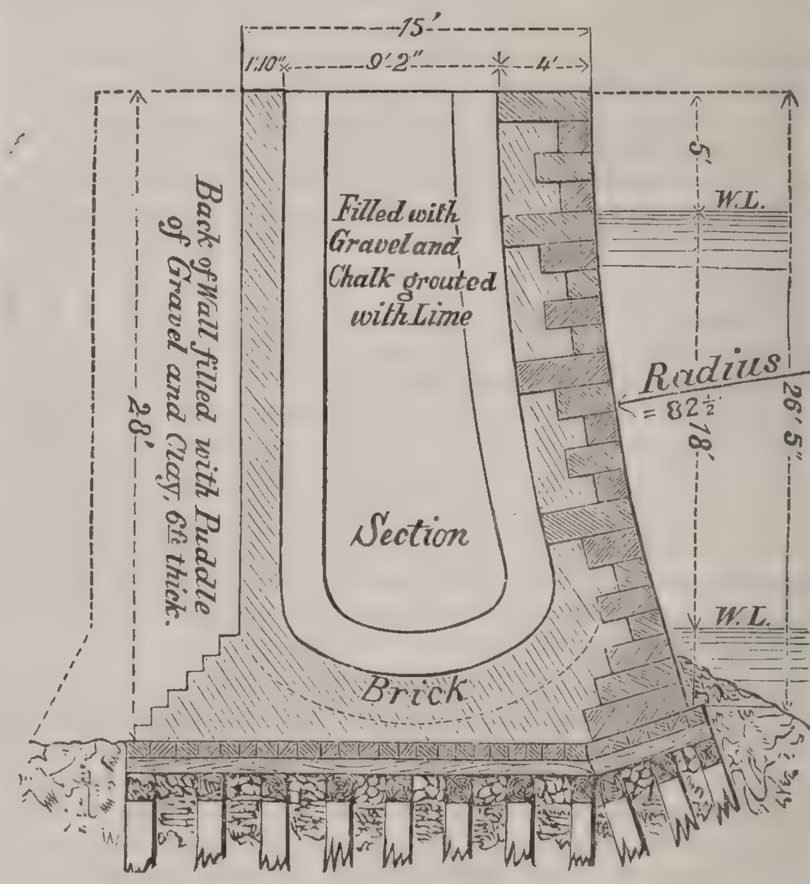
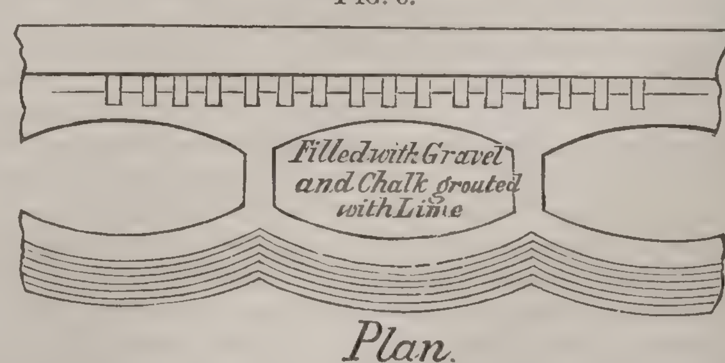


FIG. 5.



and Fig. 6 a plan, of a structure of this description. It is a river-wall in Sheerness, England, designed by Rennie. Masses of cut stone in positions exposed to violent pressures and shocks, such as sea-jetties, piers, and lighthouses, should have the component parts connected together with great strength. Not only should the stones of each course be dovetailed and notched or clamped into each other, so that no single piece can move without displacing a large mass, but each course should be firmly connected with those above and below it. To prevent sliding projections may be left in the beds of one course to fit into corresponding cavities of the contiguous course, or cylindrical cast-iron dowels, 6 to 8 inches in diameter, may be placed in a vertical position between courses, extending some inches into the blocks above and below. Heavy wrought-iron bolts may be inserted vertically through several courses to prevent the uplifting of the mass.

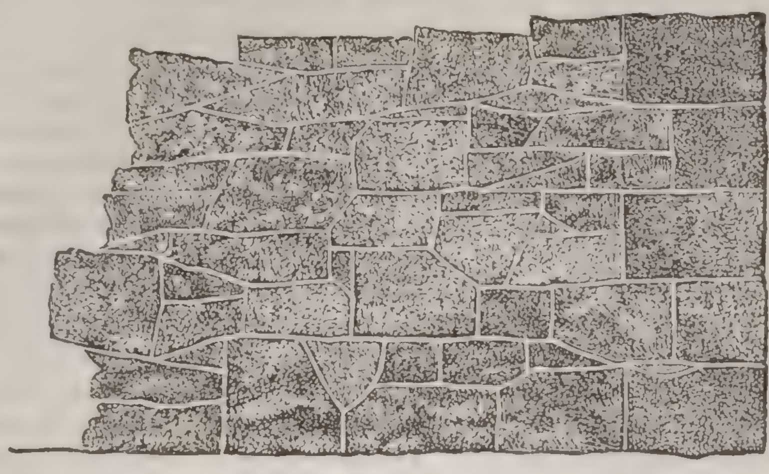
FIG. 6.



Common *uncoursed* rubble, generally styled random rub-

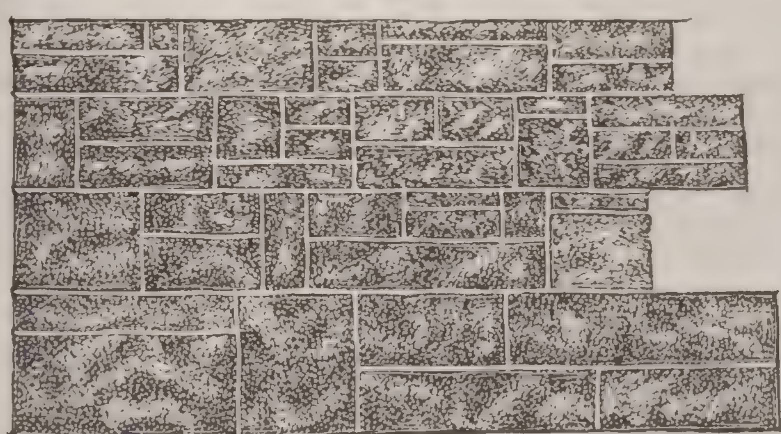
ble, is built with stones of random shapes and sizes as they come from the quarry, with only their most salient protuberances broken off with the scabbling-hammer. The

FIG. 7.



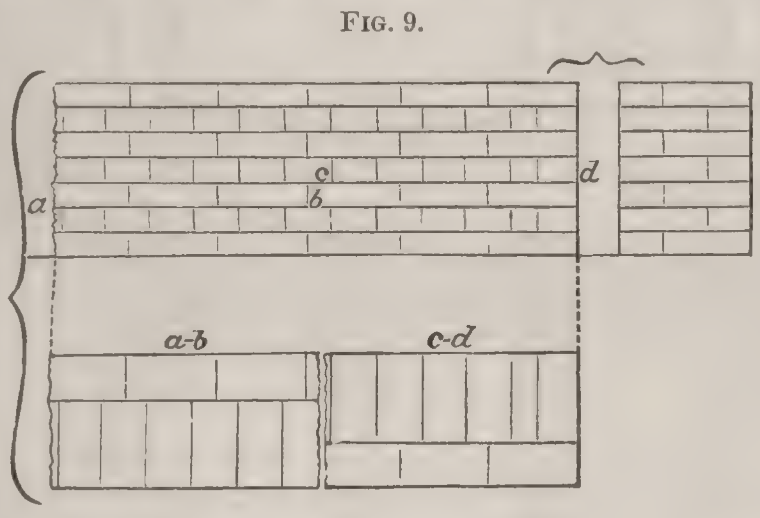
only implements used in laying are the trowel and plumb-rule, and no attention is paid to courses. The interstices of the larger stones are filled in with those that are smaller and with spalls, all well bedded in mortar. The face and back of the wall should be well bonded to the hearting with

FIG. 8.



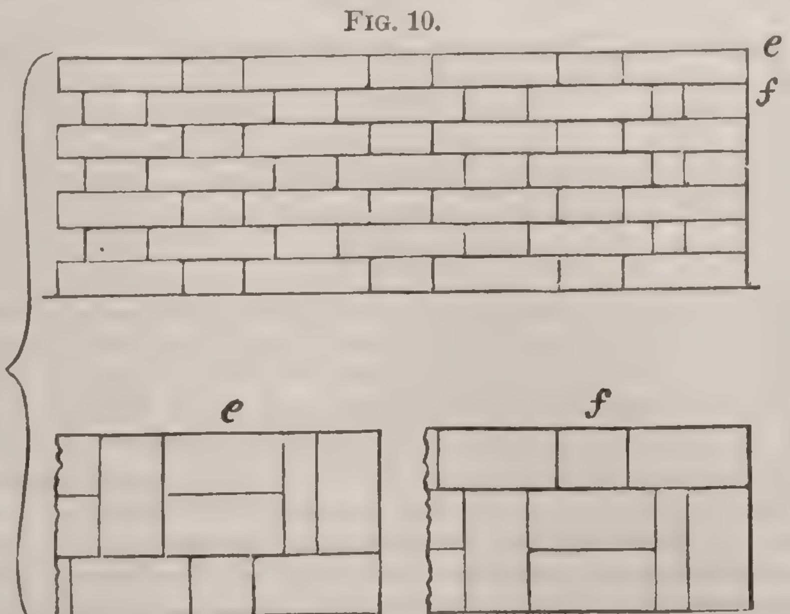
headers, and the stones should be selected so as to fit together as closely as possible, and thus reduce to a minimum the volume of mortar necessary to completely fill all the voids; but no two stones should touch each other. For the angles or corners of a wall of this kind the stones should be as nearly rectangular as can be found. Ashlar

FIG. 9.



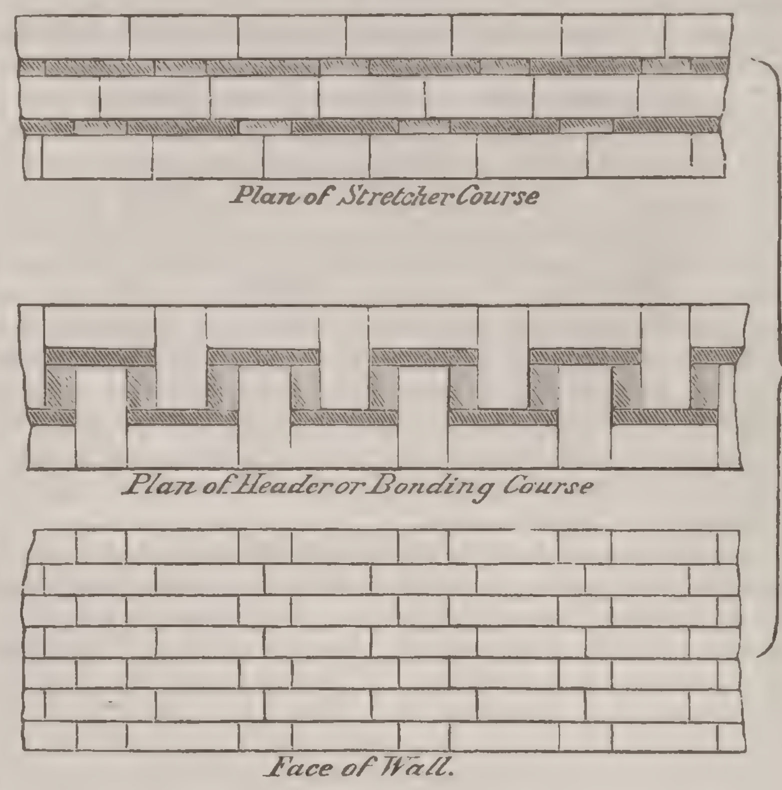
is frequently introduced at the angles and around window and door openings to obtain architectural effect, after the manner of the *opus incertum* of the ancients. With stone of a dark color a fine effect can be produced by pointing the joints with white mortar (Fig. 7).

FIG. 10.



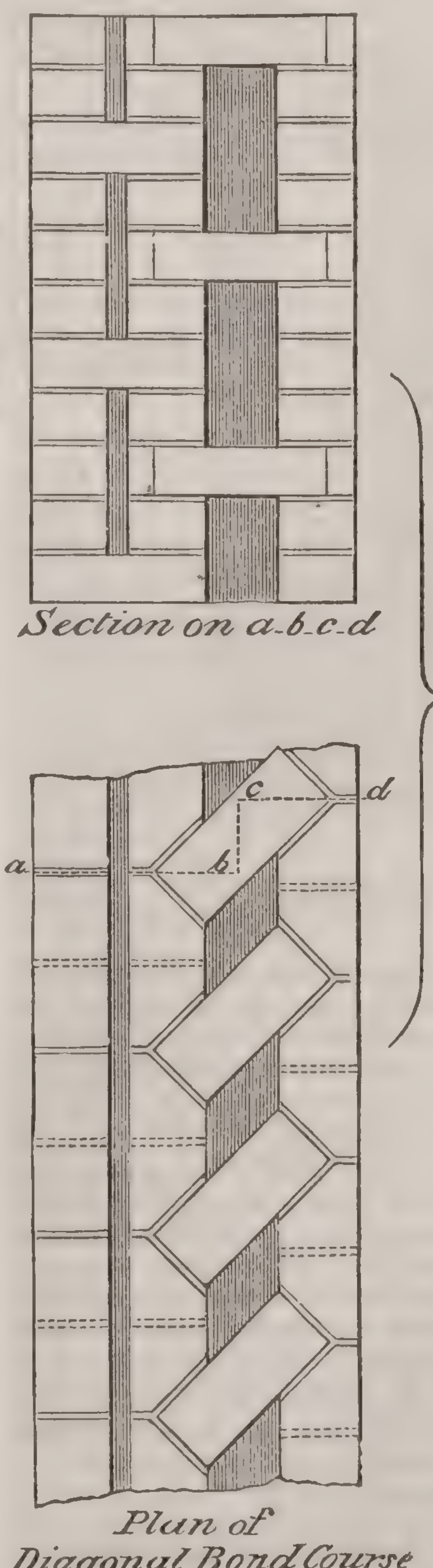
Coursed rubble, or squared rubble built in courses (Fig. 8), differs from *random* rubble in being built of stones that are, at least approximately, rectangular in form, so that only vertical and horizontal joints are shown upon the face of the wall, and they vary considerably in thickness. Although the stones are laid up in what are termed courses, there is no uniformity in the heights of the several courses, nor even in the stones of the same course, two or more small pieces being often employed to obtain a rise equal to that of a single large one; the height of a course being equal to that of the highest stone in it. The

FIG. 11.



top of each course is carefully finished to a plane level surface by filling in voids and open spaces with rough rubble masonry or spalls set in mortar or with concrete, so as to get a good bed for the course which follows, especially for the headers, which should be set so as to be in close contact on their beds throughout their entire length. When the stones run very generally in rectangular blocks and of good size (containing, say, from 2 to 6 cubic feet), or are brought to that form by cutting, a good strong bond can be secured by frequent headers, and it is not desirable to lay them in *built* courses. Indeed, the wall will possess greater longitudinal strength by carefully avoiding continuous horizontal joints. Such work is sometimes called rubble masonry with horizontal and vertical joints, or simply *"squared uncoursed rubble"* or *"irregular coursed rubble."* It is much used, and by most architects and builders is preferred to coursed rubble, and by many to ashlar. With dark stone, showing a split rock-face, pointed with white mortar, a fine architectural effect can be produced. Stone having a fine cleavage is well suited to this kind of work. When rubble is laid without mortar it is called dry rubble. It is generally "random."

FIG. 12.

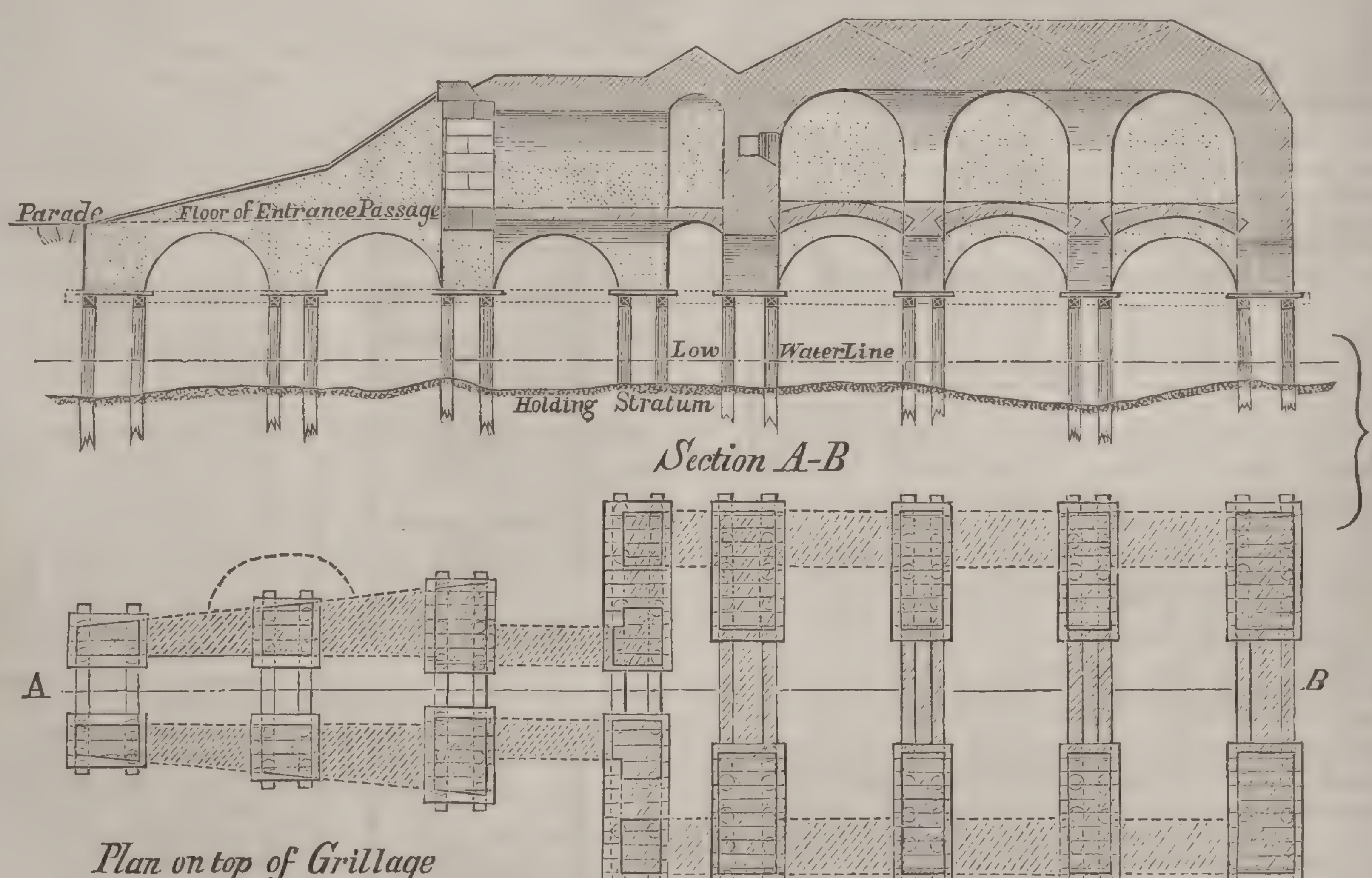


Brick masonry, when both the brick and mortar are of good quality and the work is well done, is strong and durable. Various kinds of bond are used, the most usual being the *English* and *Flemish*. The first (Fig. 9) consists in arranging the courses alternately, entirely as *headers* or *stretchers*, the bricks through the course breaking joints. In the second (Fig. 10) the

bricks are laid as headers and stretchers in each course. The first gives the strongest bond, and the second the best architectural effect. Hollow brick walls are much used, the thickness of the inner shell being usually 4 inches, or the width of one brick. It is tied to the outer wall at frequent intervals with iron clamps, or more generally with bricks laid transversely or diagonally (Figs. 11 and 12), and bonded into the masonry at both ends. Moisture will not condense on the inner face of such a wall. The expense of firring out with wood and lathing is therefore saved, and the danger from fire lessened. The mortar for brickwork should be made with clean, sharp, and rather fine-grained sand, or preferably grains of variable sizes. For common lime-mortar the proportions will be 1 volume of lime-paste to from 3 to 4 volumes of sand. Sea-sand, or sand rounded by attrition, is not suitable, and neither sea-water nor even brackish water should be used in mixing. (For the preparation of cement-mortar, for either stone or brick masonry, see article CEMENT.) The bricks should be laid wet, so that they will not rapidly dry the mortar by extracting the moisture from it. All the void between the bricks should be completely filled with mortar, and no more mortar than will suffice for this purpose should be used. The joints, especially those between the courses, should not exceed a quarter of an inch in thickness.

Concrete (*béton*) masonry is admirably adapted to many important purposes. A brief description of the method of preparing and laying it is given in the article CEMENT. For foundations in damp and yielding soils and all kinds of submarine constructions; for quay-walls, jetties, piers; for foundations, hearting and backing of massive walls generally; for cisterns, reservoirs, and tanks; for tunnels and aqueducts, and for many other purposes, it possesses advantages over either brick or stone masonry. For submarine masonry concrete possesses the advantage that it can be laid without exhausting the water (which is an expensive operation under the most favorable circumstances), and also without the aid of a diving-bell or submarine armor. Groined and vaulted arches, and even entire bridges, dwelling-houses, and factories, in single monolithic masses, with moulded ornamentation of no mean character, have been constructed of this material alone. By omitting the coarse fragments or ballast a smoother finish and a more elaborate ornamentation can be given to the surface. The material is then usually called artificial stone, of which an excellent variety may be made with Portland cement (dry) 1 vol. and clean fine sand $2\frac{1}{2}$ vols., mixed with little water, so as not to be plastic, and compacted in thin layers by ramming. The form to be given to the construction is accomplished by a plank moulding. In Europe a portion of the Portland cement is usually replaced by silicious hydraulic lime, like that of Theil, a good formula being $\frac{3}{4}$ vol. of dry cement, 1 vol. of dry (slaked) hydraulic lime, and 4 vols. of sand. This mixture was used in the construction of the aqueduct of the Vanne for supplying water to the city of Paris. The pipe is $6\frac{1}{2}$ feet in interior diameter, 9 inches thick at top, and 12 inches at the sides at the water-surface, resting on an arcade, the whole forming a single monolith. (For details see *Béton Aggloméré and other Artificial Stones*, New York.) An entire Gothic church, with its foundation, walls, and steeple, was built of this material at Vesinet near Paris, as well as several large houses in that city. It is coming into extensive use in the U. S. A fine and highly ornamented bridge in Prospect Park, Brooklyn, and the fluted columns and other interior finish of the new cathedral in Fifth avenue, New York, are constructed with it. Fig. 13 shows a longitudinal section and foundation-plan of the concrete powder-magazine recently constructed by the writer at Fort Pulaski, Ga. The earthwork covering to make it shot-proof is omitted. The concrete for the entire work (except the arched floors) is composed of Rosendale cement, sand, and oyster-shells. For the floors Portland cement was employed. It will be seen that the substructure consists of a piling and grillage of timber, which supports an arcade of concrete, upon which the magazine rests. (For reference see Mahan, *Civil Engineering*, 1873; Rivingtons' *Notes on Building Construction*, 1875; Dupuit, *Traité de l'équilibre des Voutes*, etc., 1870; Gillmore, *Limes, Hydraulic Cements, and Mortars*, 1874; same, *Béton-Coignet and other Artificial Stone*, 1871; Nicholson, *Railway Masonry*, 1846; Robson, *Mason's Practical Guide*, 1865.) Q. A. GILLMORE.

FIG. 13.



Masonry. See FREEMASONRY.

Mason Village. See MASON, N. H.

Ma'sonville, post-tp. of Delta co., Mich., on the Green Bay and Lake Superior R. R. Pop. 152.

Masonville, post-v. and tp. of Delaware co., N. Y. Pop. of v. 200; of tp. 1738.

Maso'rah, Masoreth, or **Massoreth** [Heb., "tradition"], the technical name given to a collection of grammatico-critical notes on the Hebrew text of the Old Testament, with the object of determining its divisions, grammatical forms, letters, vowel-marks, and accents. This species of authoritative commentary was rendered necessary by the fact that the early Hebrew text, like Semitic writings in general, consists of the consonants alone, without separation between the words, and consequently it was often a matter of no less delicacy than importance for the sense of the sacred text to discover which of several vowels should be employed in pronunciation. The same is true in a lesser degree in regard to the accents and the division into words. The Masorah was compiled by certain Jewish critics whose names and age are involved in great uncertainty. Some rabbins have formerly contended that Ezra and the "great synagogue" commenced the Masorah, but the more usual opinion assigns it to the schools which were formed at Babylon, Tiberias, and elsewhere in the second century A. D. Be this as it may, it was not committed to writing as a separate compendium until after the sixth century, having previously existed only in the form of marginal

notes on the copies of the sacred books. The vowel-points introduced by the rabbinical editors are known as Masoretic, and the current Hebrew text of the Old Testament is called by the same name. The language of the Masorah is Chaldee, and of a very crabbed, difficult type. There are two recensions, called respectively the *Great* and *Small* Masorah, the former being the full text, of which the latter furnishes a synopsis. Much of the Masorah is devoted to puerile computations of the number of words and letters in the respective books and chapters, and the number of times that certain words and letters recur. The Masoretic editors have often been charged by modern Christian writers with having corrupted the text, but apparently without any evidence to support so serious a charge. As to the value of the Masorah, while much of it is confessedly useless, it is certain that the older portions, if they could be separated from the more modern, would supply valuable materials for a critical edition of the Hebrew Scriptures.

PORTER C. BLISS.

Masque, in drama. See MASK.

Masquerade, an amusement generally consisting of a ball, public or private, in which the participators wear masks for purposes of disguise. An eccentric costume was an early feature of the masquerade, and under the form of a "fancy ball" has nearly or quite superseded it in England and the U. S., each guest personating some mythological or historical character or assuming the costume of some remote people. The masquerade proper flourished in Italy in the fifteenth century, and was introduced at the French court by Catharine de' Medici, and at the English in the time of Henry VIII. It doubtless arose from the "miracles and mysteries" which were so popular in the Middle Ages, and to the present day a masked ball is in Catholic countries an invariable feature of the Carnival, on which occasion processions of maskers often pass through the streets playing wild pranks.

Mass, one of the many names by which the holy Eucharist has been designated. The derivation of the word is disputed. It has been derived from the Saxon *mæsse*, a "feast;" from the Hebrew מִסָּה, *missah*, an "oblation;" and from the termination of the service, *Ite! Missa est*—"Go in peace! you are dismissed." This last derivation is the one most commonly received. But *Missa est* are also taken in the sense of "The offering is made; the sacrifice is sent up to God by the ministration of angels." It is solely because the sense of sacrificial offering is attached to the word that any importance can be given to it. In the first book of Common Prayer of Edward VI. (1549) the term mass is retained in the title of the order for the administration of the Lord's Supper, etc. In the second book it was omitted, either through the influence of those who wished to reduce the idea of the service to that of mere communion, or because of a wish to avoid offending the prejudices of those who connected the word with supposed Romish doctrines, although it had been in use since the days of Ambrose. The name has never been restored by authority. But it has been resumed by some in the Anglican communion, who seek thus to show that they hold the doctrine of the ancient liturgies. On the part of others its use excites indignation, as the mark of a party denounced as Romanizers, who seek to undo all that was done at the Reformation.

W. F. BRAND.

Mass [Lat. *missa*], in music. When large portions of the service are set to music, the composition is known as a mass. A full mass comprises the *Kyrie, Gloria in excelsis, Credo, Sanctus, Benedictus,* and *Agnus Dei.*

Mas'sa, town of Central Italy, in the province of Carrara-Massa. It lies on the Frigido, with the sea on the W., and on the N. E. and S. are charming hills clothed with the orange, lemon, olive, chestnut, and pine. The mildness and salubrity of the climate are almost unrivalled in Italy. The old part of the town is on a hill; the new, with its broad streets and squares and good buildings, spreads over the plain below. The national palace is a noble structure, built by the princes of the house of Cybo. Massa is first mentioned in the ninth century. It was for a long time subject to the republic of Lucca, but in the fifteenth century the Cybo family became its feudal lords, and Alberic I. built the new town, and gave Massa a civil and penal code remarkable for that age. Pop. in 1874, 18,031.

Mas'sac, county of S. Illinois, bounded S. by the Ohio River. Area, 227 square miles. It is hilly, well wooded, fertile, and contains lead and coal. Tobacco and corn are leading products. Cap. Metropolis City. Pop. 9581.

Massachu'setts, one of the Eastern or New England States of the American Union, and one of the original States of the confederacy of 1776–88, lying between the parallels of 41° 14′ (including the islands) and 42° 53′, and between the meridians of 69° 53′ and 73° 32′ W. lon. from Greenwich. The State is very irregular in form, and has been not inaptly compared to a boot, the leg of which is formed by the counties lying N. of Connecticut and Rhode Island, the heel by Essex co., the foot by the S. E. counties, including the islands of Martha's Vineyard and

Seal of Massachusetts.

Nantucket, while Cape Cod forms the sole, partially ripped off and turned back. It is bounded N. by Vermont and New Hampshire, E. by the Atlantic Ocean, S. by the Atlantic and the States of Rhode Island and Connecticut, and W. by Rhode Island and New York. Its greatest length from E. to W. is from Chatham Beach to the meridian of the W. boundary of the town of Mount Washington, 180 miles; from Cape Ann to the New York State line is 140 miles. Its greatest breadth from the New Hampshire line at Salisbury to the S. line of No Man's Land, or Nantucket, is 113 miles; across the leg of the boot—*i. e.* from Worcester co. westward—it averages $47\frac{1}{2}$ miles. The total area is 7800 square miles, or 4,992,000 acres.

Face of the Country.—The surface of the State is for the most part uneven, and portions of it are rugged and mountainous. The western, middle, eastern, and north-eastern sections are for the most part hilly and broken, and the south-eastern more level and sandy, though with many rocks along the coast. The Taghkanic and the Hoosick ranges are separate ridges of the Green Mountain range of Vermont. Of these the westernmost, or Taghkanic, is much the highest. Saddle Mountain, or Graylock, 3505 feet high, and Mount Washington—or, as it is now more generally called, Mount Everett—2624 feet, both belong to this range. The Hoosick range maintains a somewhat regular elevation of from 1200 to 1600 feet. Farther E., near the W. bank of the Connecticut River, are two isolated peaks, Mount Tom and Sugarloaf, the former 1214 feet in height, and across the beautiful valley of the Connecticut Mount Holyoke, 910 feet high; while still farther E. Wachusett Mountain, in the township of Princeton, Worcester co., rises to the height of 2018 feet. These isolated peaks are generally regarded as outliers of the White Mountain range. The valley of the Connecticut, in Massachusetts, is remarkable for the beauty of its scenery and the fertility of its soil. The eastern and south-eastern part of the State, including the island counties and Cape Cod, is moderately level and sandy, but under careful cultivation much of it yields fair crops.

Rivers.—The principal rivers of the State are—the Connecticut, which has a course of more than 50 miles through the centre of the State; the Housatonic with its affluents, which has its sources among the Taghkanic and Hoosick ranges in the N. W.; the Hoosick River, a tributary of the Hudson, in the N. W.; the Agawam or Westfield and the Deerfield rivers, tributaries of the Connecticut from the W.; and the Chicopee, with several branches, and Miller's River, eastern tributaries of the same river; the Merrimack, which has its source in New Hampshire, but flows for 35 miles, to its mouth, in Massachusetts, receiving in the State the Nashua and Concord rivers, and furnishing vast water-power for the great manufacturing towns of Lowell, Lawrence, Haverhill, etc.; the Charles River, Taunton River and branches, and the Blackstone River, which, like the others, furnishes a large amount of water-power. None of these rivers are navigable within the State, except the Connecticut for a few miles, and the Merrimack below the falls. There are no large lakes in the State, but numerous ponds or small lakes, especially in the S. E. and S. W. portions. Wenham Lake, famous for its ice, is near Boston, and Quinsigamond Lake or Pond, for a long time the scene of the regattas of the colleges, is not far from Worcester.

Bays, Islands, etc.—The coast of Massachusetts is deeply indented by bays, harbors, and sounds. The largest of

these, beginning with the S. E., are—Buzzard's Bay, which is almost landlocked by the chain of the Elizabeth Islands, and has many small bays and harbors on its N. W. shore; Vineyard Sound, between the Elizabeth Islands and Martha's Vineyard; Edgartown and Nantucket harbors; Cape Cod Bay, three-fourths landlocked; Wellfleet Bay, Plymouth harbor; Duxbury Bay; Massachusetts Bay, and within it Boston harbor; Lynn harbor, Nahant Bay, Marblehead, Salem, and Beverly harbors; Gloucester harbor or bay, Sandy Bay, and Annisquam harbor. There are hundreds of islands along the coast, mostly small, but Martha's Vineyard, Nantucket Island, and several of the Elizabeth group are of good size, the two former constituting each a county by itself. On Penikese Island, one of the smallest of the Elizabeth Islands, the Anderson School of Natural History, established by Prof. Agassiz, was situated.

Geology.—With the exception of the S. E. part of the State, the valley of the Connecticut, and a small tract of the Carboniferous era in the E., Massachusetts is mostly a region of metamorphic rocks. In the Taghkanic range the Silurian, or that subdivision of it which is now generally recognized as the Taconic system, prevails as far as to the borders of the Housatonic River valley; thence eastward the Hoosick range is Eozoic; from this to the Connecticut River valley, and in the northern part of the State across the river, are Silurian rocks somewhat older than the Taghkanic Mountains; from Greenfield southward on both sides of the river the rocks are mainly the new red sandstone of the Triassic era—the sandstone which yields such numerous footprints of gigantic birds and batrachians; thence eastward to Worcester are Eozoic rocks again, extending indeed N. E. from Worcester to Cape Ann, and E., S. E., and S. to the Connecticut and Rhode Island lines, and nearly to Cambridge; but N. and N. N. E. of Worcester the Silurian rocks reappear, and extend in New Hampshire to the coast. In the vicinity of Boston the Silurian rocks again appear; the Quincy granite is near the borders of this formation, while the coarse conglomerate which abounds upon the islands of Boston harbor, and the argillaceous slates, though of uncertain age, undoubtedly belong to it. In Bristol and the W. part of Plymouth cos., extending into Eastern Rhode Island, the coal-measures come to the surface, and beds of anthracite, some of which have been worked for many years, are found in Mansfield and other places in that vicinity. The coal is of but little value, however, the coal-strata being thin and irregular, and always very much crushed. E. of the Carboniferous rocks comes another Eozoic tract, while the eastern part of Plymouth co., Barnstable co., and the islands of Martha's Vineyard and Nantucket, as well as the smaller islands, are diluvial and alluvial.

Mineralogy.—Gold has recently been discovered in Essex co., and mining has been commenced with great zeal. It is yet too soon to decide whether it will prove very profitable. Lead, copper, and zinc have been discovered in the vicinity of the Connecticut River, but the exploration and attempted working of the mines have never proved profitable. Iron is found abundantly in the western part of the State, and to some extent in Plymouth and Bristol cos. Talcose slate, limestone, steatite, and soapstone all exist in large quantities in Berkshire, Hampshire, and Franklin cos.; glass-sand of excellent quality in Berkshire. Asbestos, plumbago, several of the ochres and ochreous earths, slate, and in Berkshire co. a beautiful white marble, are the other principal minerals of the State.

Vegetation.—Much of the soil of Massachusetts is naturally sterile, and though originally covered with heavy forests of pine, hemlock, oak, chestnut, hickory, maple, and other deciduous trees, except in the S. E., where the sandy flats were treeless, yet when these forests were cleared the soil produced but scanty crops except by the aid of manure. The indigenous flora of the State was, nevertheless, copious both in quantity and variety of genera and species. Nearly all the trees, shrubs, and flowering plants indigenous in any part of New England and Northern or Central New York were natives of Massachusetts; and though cultivation of the soil has driven out some of them, their place has been supplied by many naturalized plants and trees, as well as some noxious weeds from other States and countries. It is not easy to speak in too high terms of praise of the industry, patience, and skill which the agriculturists of Massachusetts have exercised in bringing these lands, not naturally fertile, to so high a degree of productiveness. The red sandstone region of the Connecticut Valley and the valley of the Housatonic, as well as some portions of the central counties, have a better soil, and have been kept in excellent condition by skilful farming.

Zoology.—In a State which has been settled for more than 250 years, and densely populated for 100, most of the larger wild animals are of course extinct. The bear, wolf, panther, wild-cat, and deer have disappeared from the State or are seen very rarely, though they were once plentiful. Of smaller game there are yet considerable numbers, rabbits, squirrels, and the various game-birds being tolerably abundant. Of the other larger birds the variety is not great. Two species of eagle are occasionally though rarely seen; no vulture is found in the State; the great owl, the fish-hawk and other species of hawks, several species of gulls, the brant, and wild-ducks, and most of the song-birds common to the Northern States, are found in the State. There are the usual variety of batrachians and reptiles, though not more than three species of the latter are venomous. The fish of the coast and rivers are abundant, and many of them edible and of excellent quality. The halibut, mackerel, cod, tautog, bass, etc. of the Massachusetts bays and coasts have the highest reputation.

Climate.—The climate is cool. The winters are generally long and severe, the summers short and warm. Snow falls usually during five or six months, and in rare instances exceeds six months. The amount of annual rainfall has been for a term of years from 40 to 43.5 inches, and is very equably distributed through the seasons. The following table, prepared with great care from various sources, gives the average temperature for many years at five different points between the eastern and western limits of the State:

Observations.	Boston, lat. 42° 21′ N., lon. 71° 4′ W.; elevation, 77 feet above the sea.	Worcester, lat. 42° 16′ 17″ N., lon. 71° 48′ 13″ W.; elevation, —— feet.	Amherst, lat. 42° 21′ N., lon. 72° 30′ W.; elevation, —— feet.	Springfield, lat. 42° 5′ N., lon. 72° 34′ W.; elevation, —— feet.	Williamstown, lat. 42° 43′ N., lon. 73° 12′ 20″ W.; elevation, —— feet.
Temperature:	°	°	°	°	°
Highest temp. in Jan...	52	44	40	48	45
Lowest " " ..	−5	−15	−15	−1	−18
Mean " " ..	26.3	24	21.9	22.9	19
Range of " " ..	57	59	55	69	63
Highest temp. in Feb...	52	57	55	55	55
Lowest " " ..	−4	0	−3	−3	−15
Mean " " ..	27.5	27	26.2	27.1	24.9
Range of " " ..	56	57	58	58	70
Highest temp. in Mar...	60	67	56	64	62
Lowest " " ..	12	10	12	10	18
Mean " " ..	34.2	32.3	31.6	25.8	29.4
Range of " " ..	48	57	44	54	44
Highest temp. in Apr...	66	76	84	85	80
Lowest " " ..	34	34	30	25	24
Mean " " ..	44.6	49.3	48.6	48.4	46.2
Range of " " ..	32	42	54	60	56
Highest temp. in May..	76	76	80	85	78
Lowest " " ..	34	40	40	32	37
Mean " " ..	56.8	54.2	54.6	53.7	52.3
Range of " " ..	55	36	40	53	41
Highest temp. in June..	93	88	90	97	89
Lowest " " ..	47	51	48	42	52
Mean " " ..	67.2	66	65.8	65.8	64.6
Range of " " ..	46	37	42	55	37
Highest temp. in July..	96	94	94	103	91
Lowest " " ..	55	60	52	48	53
Mean " " ..	72.9	73.7	72.9	74.1	69.3
Range of " " ..	41	34	42	55	38
Highest temp. in Aug..	96	80	82	85	82
Lowest " " ..	50	52	48	44	49
Mean " " ..	68.8	65	63.5	64.7	59.8
Range of " " ..	46	28	34	41	33
Highest temp. in Sept..	90	83	83	92	80
Lowest " " ..	42.5	42	36	35	36
Mean " " ..	61.7	62.4	60	62.2	58.5
Range of " " ..	47.5	41	47	57	44
Highest temp. in Oct...	75	73	73	79	74
Lowest " " ..	35	32	27	27	28
Mean " " ..	52.1	51	49.5	51	45.7
Range of " " ..	40	41	46	52	46
Highest temp. in Nov...	62	63	61	65	60
Lowest " " ..	15	18	17	17	15
Mean " " ..	40.7	43.3	40.1	41.9	40.2
Range of " " ..	47	45	44	48	45
Highest temp. in Dec...	47	54	51	56	49
Lowest " " ..	−8	−3	−4	−6	−17
Mean " " ..	24.1	28.2	26.3	27.6	23.7
Range of " " ..	55	57	55	62	66
Highest temp. of the year	96	94	94	103	91
Lowest " " ..	−8	−15	−15	−21	−18
Mean " " ..	48.5	48.1	47.2	47.1	44.4
Range of " " ..	104	109	109	124	109
Rainfall:	Inches.	Inches.	Inches.	Inches.	Inches.
January	5.76	2.56	1.36	1.52	1.01
February	3.21	5.27	4.62	4.86	1.78
March	3.76	3.18	3.16	2.93	1.24
April	3.83	2.09	2.03	2.23	0.75
May	5.10	5.33	4.48	5.86	3.38
June	0.54	3.40	5.66	4.88	4.38
July	3.84	3.78	4.02	3.00	3.70
August	6.21	3.32	3.96	2.83	3.38
September	2.91	4.77	4.71	5.21	4.97
October	4.85	2.37	3.38	2.76	2.37
November	3.66	2.51	3.86	3.24	4.00
December	3.09	3.73	3.57	3.30	3.80
Of the year	46.76	42.31	44.81	42.62	34.76
Barometer:					
Mean for January	30.072				
" " February	29.909				
" " March	29.858				
" " April	29.902				
" " May	29.992				
" " June	29.957				
" " July	29.987				
" " August	30.056				
" " September	30.052				
" " October	30.067				
" " November	29.993				
" " December	30.061				
" " the year	29.992				
Winds:					
Winter	N. W., W.				
Spring	N. W., E., W.				
Summer	E., W., N. W.				
Autumn	N. W., W., E.				

Agricultural Products.—The census of 1870 reports but 2,730,283 acres of land in farms in Massachusetts, a falling off of 600,000 acres since 1860. We believe this to be an error, for though in the larger towns a considerable amount of land formerly in farms has been laid out in town-lots, yet this has been more than balanced by lands reclaimed by skilful tillage from swamps, from drifting sand, and from overflow. The assessors' report of farming lands taxed May 1, 1874, gives 4,467,066 acres, and we may be very sure that Massachusetts farmers are not taxed for lands which are not in some sense under cultivation. The value of farms in the State, according to the census of 1870, was $116,432,784, or about $43 per acre; of farming implements and machinery, $5,000,879. The value of all farm productions in the year 1869–70 was stated at $32,192,378; of animals slaughtered or sold for slaughter, $4,324,658; of home manufactures, $79,378; of forest products, $1,616,818; of market-garden products, $1,980,231; of orchard products, $939,854; of wages paid for farm labor, $5,821,032. The wheat crop for that year was 34,648 bushels; rye, 239,227; Indian corn, 1,397,807; oats, 797,664; barley, 133,071; buckwheat, 58,049. Of other products there were 930 pounds of flax, 2 tons of hemp, 306,659 pounds of wool, 597,555 tons of hay, 61,910 pounds of hops, 7,312,885 pounds of tobacco, 399,800 pounds of maple-sugar, 2326 gallons of maple-syrup, 3,025,446 bushels of common potatoes, and 917 bushels of sweet potatoes, 24,690 bushels of peas and beans, 1195 pounds of beeswax, 25,299 pounds of honey, 10,956 gallons of domestic wine, 252 bushels of clover, 464 of grass-seed, and 52 of flaxseed. The agricultural department statistics for the year ending Jan. 1, 1874, were—Indian corn, 1,446,000 bushels; wheat, 31,000; rye, 246,000; oats, 665,000; barley, 110,000; buckwheat, 50,000; potatoes, 2,425,000; tobacco, 8,200,000 pounds; hay, 400,200 tons. The live-stock statistics of 1870 were—horses, 86,266; mules and asses, 103; neat cattle, 271,315; sheep, 78,560; swine, 49,178. The value of all live-stock was stated at $17,049,228. In Jan., 1874, the number of horses was said by the agricultural department to be 102,800; of oxen and other cattle, 122,600; of milch cows, 136,300; of sheep, 76,300; of swine, 78,000; value of all live-stock, $24,282,079. The State assessors reported Jan., 1875, 127,601 horses, 147,359 milch cows, 50,228 sheep; value not given. Massachusetts buys largely of cereals, her climate and location not being favorable to their cheap production; she exports some butter, hay, oats, Indian corn, and potatoes, and a large amount of tobacco.

Manufactures.—In the actual amount of its manufactures Massachusetts is the third State in the Union, New York and Pennsylvania only exceeding it. In proportion to its area and population it is the first. In 1865 the aggregate amount of capital invested in manufacturing was $147,662,758; the number of hands employed, 244,386; the annual product, $418,823,390. In 1870 there were 13,212 establishments, employing 279,380 hands, having a reported capital of $231,677,862, using raw material to the amount of $334,413,982, paying wages to the amount of $118,051,886, and producing annually the value of $553,912,568. The following table shows the extent of the manufacture of leading articles in 1865 and 1870, respectively:

Principal Products of Industry.

Manufactures	No. of establishments.	No. of hands employed.	Capital invested.	Cost of raw material.	Value of products.
1865.					
Cot. goods, yarns, and thread	214	23,678	$33,293,986	$49,683,919	$54,436,881
Calico, delaines, and bleached goods	12	4,208	4,222,000	13,014,394	25,258,703
Woollen goods and yarn	218	18,433	14,735,830	35,374,296	48,430,671
Paper and paper wares	118	3,554	3,785,300	5,381,671	9,008,521
Rolled and slit iron and nails.	35	3,194	2,827,300	5,599,340	8,836,502
Printing and newspapers	205	2,409	1,919,400	2,012,723	5,358,148
Clothing	601	24,722	4,634,440	11,092,434	17,743,894
Tanning and currying	375	3,847	4,994,933	8,464,472	15,821,712
Boots and shoes	....	55,160	10,067,474	35,040,544	52,915,243
1870.					
Agricultural implements, etc.	37	477	499,400	487,460	1,033,590
Bleaching and dyeing	32	1,387	1,063,650	20,623,653	22,252,429
Boots and shoes	2392	54,831	19,559,738	51,363,406	88,399,583
Carpets	8	2,205	3,250,400	3,257,728	4,490,725
Carriages and wagons	326	2,914	1,729,091	1,326,968	4,038,656
Men's clothing	446	9,878	5,096,764	11,913,317	20,212,407
Cotton goods	194	43,586	44,834,375	37,485,686	59,679,153
Flour and meal	316	855	2,171,314	8,768,926	9,720,374
Furniture	243	4,044	3,372,225	3,146,828	7,397,626
Hats and caps	50	3,290	855,600	1,846,566	3,416,191
Hosiery	32	2,415	1,570,500	1,515,326	3,213,481
India-rubber goods	16	1,405	1,920,600	1,554,006	3,183,218
Forged and rolled iron	29	2.590	2,760,125	4,538,866	6,699,907
Nails and spikes	49	2,458	2,600,850	4,082,775	5,986,144
Iron castings	101	2,749	2,496,900	2.574.320	5,265,154
Leather, tanned and curried.	334	5,618	6,293,926	22,995,498	29,195,827
Lumber	705	3,414	3,717,879	5,806,989	9,651,690
Machinery	295	6,442	7,046,350	4,829,058	11,554,416
Paper	95	4,855	7,719,128	8,016,349	12,687,481
Printing cot. and wool. goods.	11	2,996	2,894,653	15,420,530	17,325,150
Straw goods	39	11,441	1,361,400	2,503,070	5,869,514
Woollen goods	182	20,541	20,622,400	24,866,118	39,489,242
Worsted goods	35	5,275	2,839,500	5,663,048	8,280,541

Fisheries.—The fisheries of the State in 1870, according to the U. S. census, were carried on in 237 establishments, employing 8993 men and boys, and a capital of $4,287,871, paying $2,291,370 in wages, using $1,001,891 of raw materials, and producing annually $6,215,325. This was exclusive of the whale fishery, which in 1865 employed 3496 hands and a capital of $5,879,862, and produced annually $6,618,670.

Railroads.—The railroad system of Massachusetts is very complete. Almost every portion of the State is gridironed with railroad tracks, and in proportion to its territory the State has more miles of railroad than any other in the Union. The railroad commissioners report in Dec., 1874, 60 railroads, of which they give the following statistics:

Total length of railroads and branches, miles	2,418.46
Total length in Massachusetts, "	1,782.52
Total length computed as a single track, "	3,701.09
Capital stock paid in	$117,066,798.07
Net debt	48,557,338.65
Total stock and debt	165,624,136.72
Total amount of permanent investment, including cost of roads, equipment, and other property	170,970,113.40
Proportion of permanent investments for Massachusetts	111,642,551.92
Total receipts from passenger department	16,910,266.19
Total receipts from freight department	15,771,689.60
Gross income	34,632,483.54
Total expenses	23,929,181.84
Net income	10,703,301.70
Dividends	6,988,170.85
Total surplus	11,697,499.32
Total miles run by trains	20,247,549
Total passenger mileage	681,875,870
Passengers carried, number	42,480,494
Tons of freight carried	12,014,812

The Hoosac Tunnel, commenced in 1855, was completed in 1874. It is 5¾ miles in length, being, next to the Mont Cenis tunnel, the longest railway tunnel in the world; it cost $9,000,000, and brings Boston into shorter and more direct communication with Chicago and the other cities of the North-west than New York City, and both by direct railroad routes and by its connection with the Dominion of Canada will make that port the natural outlet for much of the grain, provision, and perhaps the lumber-trade, of Canada and the North-west. Besides the 60 railroad corporations, 30 street-railway corporations also reported; these had an aggregate length of track of 210.36 miles. The average cost of the roads equipped was $32,702 per mile. The aggregate capital stock was $5,538,125, the total indebtedness, $2,573,746, and the entire amount of stock and debt, $8,111,871. Only 10 of the 30 made dividends, and these averaged 6.11 per cent. The amount of their gross or net earnings is not stated, but the commissioners say that it averaged a profit of 6 per cent. on their stock and indebtedness, and that the average profit was $\frac{93}{100}$ths of a cent upon each passenger. Their total mileage was 7,938,360 miles, and 50,058,979 persons were carried. The cost of a round trip was $1.876, and the profit upon it 35.9 cents. The whole number of persons employed on the street railways was 1848, while on the steam railroads 20,523 were employed in all departments.

Finances.—The assessed valuation of the State in 1870 was $1,591,983,112, of which $901,037,841 was real and $690,945,271 personal estate. The true valuation, according to the marshal's estimate, was $2,132,148,741; the State debt, bonded and other, $28,270,881, and the debts of counties, towns, and cities, about $41,000,000. In May, 1874, the assessed valuation of the State was $2,164,398,548.91, of which $1,289,308,763 was real estate, $542,292,402 personal estate, and $302,227,871.34 deposits in savings banks and excess of property of corporations above real estate and machinery. The total tax for all purposes for the year 1874 was $28,700,605. The total debt of the State Jan. 1, 1875, was $29,465,204. The aggregate of the trust and sinking funds of the State Jan. 1, 1875, was $13,577,105.57. The State has other resources ultimately available for the payment of its indebtedness, aside from its occupied real estate, of the value of probably $16,000,000; so that its credit is of the best. The receipts from all sources during the year were $11,247,339.31, and there were unexpended balances in the treasury at the beginning of the year 1874 to the amount of $3,003,980.86, making the total amount of the year $14,251,320.47. Of these receipts of the year, $7,033,337.06 and a revenue balance of $1,361,097.97, making together $8,394,435.03, belonged to the revenue account, and $5,846,885.14 to funds and funds' balance. The total expenditures of the year were $7,529,097.04 of revenue payments, and $4,248,367.13 of payments from the funds, making a total of $11,777,464.17, and leaving cash balances of $2,473,856.

Commerce.—The foreign commerce of Massachusetts is very large; there are twelve collection districts, but some

of them have very few entries or clearances. The following table gives the imports and domestic and foreign exports from each port for the year ending June 20, 1874, and also for the year Dec. 31, 1874:

Customs or collection districts.	Imports for year ending June 30, 1874.	Domestic exports for year ending June 30, 1874.	Foreign goods re-exported for year ending June 30, 1874.	Imports for year ending Dec. 31, 1874.	Domestic exports for year ending Dec. 31, 1874.	Foreign goods re-exported in year ending Dec. 31, 1874.
Barnstable	$300	....	....	$194	$3,016	
Boston and Charlestown	52,212,405	$28,335,627	$2,725,023	49,525,226	27,051,156	$2,084,257
Fall River	34,974	....	....	31,671	6.250	
Gloucester	94,007	1,400	109	103,359	14,000	196
Edgartown						
Marblehead	11,725	519	....	9,793	2,579	
New Bedford	95,971	30,369	233	65,981	30,188	233
Newburyport	227,353	39,076	3,633	180,936	16,955	3,633
Plymouth	128	34	....	5.525		
Salem and Beverly	60,717	49,009	1,744	37,803	58,812	639
Nantucket						
Totals	$52,737,580	$28,456,034	$2,280,742	$49,960,788	$27,120,356	$2,088,958

The coastwise and internal commerce by coasting vessels and railways is probably more than ten times this amount, as the greater part of the products of her manufactories and her fisheries, a considerable part of her importations, and the immense quantities of supplies of food and of raw material for her factories—cotton, wool, leather, iron, steel, copper, etc. etc.—are included in this internal and coastwise commerce. There are no sufficient data to determine with any exactness its real amount.

Banks, Savings Banks, etc.—There were in the State in Jan., 1875, 223 national banks, of which 3 were closed or closing. Of the other 220, the condition was as follows Nov. 1, 1874: Capital paid in, $93,039,350; bonds on deposit, $67,491,250; circulation issued, $93,218,685; circulation redeemed, $34,167,666; circulation outstanding, $59,051,019. There were also 5 loan, safe-deposit, and trust companies, with banking and discount powers, not banks of circulation, having capital stock of $1,821,400; deposits aside from their capital, $6,924,307.85; loans to the amount of $6,865,033.56. Most of these corporations paid dividends. The number of savings banks was 179; they reported Dec. 1, 1874, 702,099 depositors; the amount of deposits, $217,452,120.84; number of deposits in 1874, 645,149; amount of these deposits, $57,611,608.52; number of withdrawals during the year, 483,947; amount of withdrawals, $49,696,893.51; number of new accounts opened during the year, 131,715; number closed during the year, 96,584; dividends averaged, 6¼ per cent.; annual expenses of the 179 savings banks, $644,682.68. The largest amount of loans—a little more than one half, $109,254,540.01—was made on mortgage of real estate; $18,843,066.32 was invested in public funds; $22,377,009.56 in bank stock; $13,746,158.37 loaned to cities, counties, and towns; $2,798,970.82 was invested in real estate; nearly $40,000,000 on personal security and undoubted collaterals; $3,294,486.26 was on deposit in banks bearing interest, and $2,042,958.70 cash on hand. The aggregate amount of surplus on hand in these 179 banks was $3,490,934.39. There were also 57 private banking-houses in the State.

Insurance Companies.—There were in the State Jan. 1, 1874, 55 mutual fire insurance companies, having gross assets of $4,459,626, and gross liabilities amounting to $2,686,876, showing a surplus as regards policy-holders of $1,772,750. The amount at risk by these companies was $367,659,880. There were also 9 mutual marine and mutual fire and marine insurance companies, having an aggregate guaranty capital of $2,281,436, gross assets of $4,842,400, gross liabilities of $1,546,918, showing a surplus as regarded policy-holders of $3,295,482. The amount at risk by these 9 companies was $49,962,058. There are also 20 joint-stock fire insurance companies, having an aggregate guaranty capital of $4,567,000, gross assets of $7,557,175, gross liabilities of $2,365,364, a surplus as regarded policy-holders of $5,191,811, and holding at risk the amount of $215,364,712. Ninety-six fire insurance companies of other States and 11 foreign fire insurance companies also did business in the State, insuring an amount of risks nearly equal to the home companies. Twenty-eight fire insurance companies, mostly joint-stock, belonging in the State, were rendered insolvent by the Chicago and Boston fires of 1871 and 1872; 14 of these have closed their accounts, paying an average of 44.35 per cent. on all the claims against them.

Life Insurance.—There were in 1874, 6 life insurance companies in Massachusetts, all but 2 mutual. The 2 joint-stock companies had a guaranty capital of $525,500 paid in. The assets of the 6 companies were (including $1,691,914.70 of unrealized assets, premium notes, etc.) $25,218,611.99; their total liabilities, $22,291,740.93; their total income, $6,749,854.42; their total expenditures, $4,259,303.44. The whole amount insured by existing policies was $132,951,829, of which $630,000 was reinsured. The profits (or surplus) actually set apart for stockholders were $56,302.21, and for the assured, $1,031,038.84. Thirty-six life insurance companies from other States and 2 accident companies transacted business in the State. The amount insured by these life insurance companies in the year ending Jan. 1, 1874, was $149,717,157, a decrease of $7,513,282.50 on the amount of the previous year.

Population.—The following table gives the population of the State at each census from 1790 to 1870, with the sexes, nativity, race, illiteracy, and selected ages, and includes the State censuses:

Census year.	Total pop.	Males.	Females.	White.	Colored.	Natives.	Foreigners.	Ratio of increase.	Density.	Illiterate.	Of school age, 5–20.	Of military age, 18–45, males.	Of voting age, over 21, males.	Citizens and voters, males.
1790	378,787	182,672	190,582	373,324	5,463	....	....	....	48.56					
1800	422,845	205,494	211,299	416,393	6,452	....	....	11.76	54.21					
1810	472,040	229,742	235,561	465,303	6,737	....	....	11.53	60.52					
1820	523,159	255,526	267,761	516,419	6,740	....	....	10.86	67.07					
1830	610,408	298,043	312,364	603,359	7,048	....	....	16.65	78.25	....	205,770			
1840	737,699	365,333	372,366	729,030	8,669	....	....	20.85	94.6	4,876	232,641			
1850	994,514	488,517	505,997	985,450	9,064	827,430	164,024	34.81	127.5	29,687	238,029	223,662	279,367	
1855	1,132,369	550,034	582,335	1,122,463	9,906	886,575	245,263	16.30	145.2	....	343,007			
1860	1,231,066	596,713	634,353	1,221,432	9,602	970,960	260,106	7.49	157.8	48,979	258,074	266,485	313,160	
1865	1,267,031	602,010	665,021	1,256,864	10,167	1,001,545	265,486	4.40	162.4	50,110	387,285	249,806	338,785	246,182
1870	1,457,351	703,779	753,572	1,443,156	13,947	1,104,032	353,319	13.98	186.84	97,742	371,820	298,767	398,157	312,770

The census of 1870 included also 97 Chinese and Japanese, and 151 Indians. Of the population of foreign birth, 70,045 were from British America, 1627 from France, 13,072 from Germany, 34,099 from England, 216,120 from Ireland, 9003 from Scotland, 1384 from Sweden, 302 from Norway, and 491 from Switzerland. Of the entire population two-fifths (579,844) were engaged in useful occupations—viz. 72,810 in agriculture, 131,291 in professional and personal services, 83,078 in trade and transportation, and 292,665 in manufacturing and mechanical industries. There were, according to the census of 1870, 761 blind persons in the State (this probably includes some pupils in the blind institution from other States), 538 deaf mutes (not including about 75 Massachusetts pupils in the American Asylum at Hartford), 2662 insane (including a considerable number from other States), and 778 idiots and feeble-minded persons.

Education.—Massachusetts has always maintained a very high position in educational matters. The following statistics show the condition of the public schools at the beginning of 1874: Number of cities and towns, 342; of public schools, 5305; of persons in the State between 5 and 15 years of age, 287,090; of pupils of all ages in the public schools during the year, 283,872. Average attendance in all the public schools for the year, 202,882; ratio to whole number of persons between 5 and 15, 71 per cent.; number of children under 5 attending the public schools, 2516; of persons over 15 attending public schools, 23,905; of different persons employed as teachers in the public schools

during the year—males, 1028; females, 7421; total, 8449; of teachers who have attended a normal school, 1634. Average length of public schools, 8 months and 8 days; average wages of male teachers per month, $93.65; average wages of female teachers per month, $34.14; amount raised by taxation for support of public schools, including only wages, fuel, care of fires, and school-houses, $3,889,053.80; income of funds appropriated for public schools at the option of the towns, $30,106.20; voluntary contributions to prolong public schools or to purchase apparatus, $13,535.01; incomes of the local funds appropriated for schools and academies, $93,360.39; income of State school fund paid to cities and towns for their schools, $86,336.44; other items, $178,141.72; total amount returned as expended on public schools alone, exclusive of expense of repairing and erecting school-houses, and cost of school-books, $4,140,037.17; sum raised by taxes and funds for the education of each child between 5 and 15 years of age, per child, $13.65; amount expended in erecting and repairing school-houses, $1,416,109.76. Number of high schools in the State, 190, of which 43 are in towns having less than 500 families; of evening schools, 85, kept in 36 cities and towns; of teachers, 373; whole number attending, 8713; average attendance, 4577; expense, $52,320.03. There are also 18 schools in State reformatory and charitable institutions, having 1304 pupils, and an average attendance of 755; these are taught by 23 teachers—4 males and 19 females; wages of the male teachers, $50 per month; of females, $25 per month. There were returned 71 incorporated academies and 402 private schools and academies; the number of pupils in them was 22,001; amount paid for tuition, $731,568.20. The amount paid to maintain the public schools alone, including the wages, fuel, care, supervision, repair, and erection of school-houses, apparatus, printing, etc., was $5,564,246.93, or $19.38 for each person between 5 and 15 years of age, or $3.81 for each person of the entire population of the State; and if to this is added the income of local funds, tuition paid in private schools and academies, appropriations by the legislature for the benefit of public schools, but excluding the interest of the money invested in school-buildings, the cost of school-books, and all the expenses of collegiate, professional, and scientific education, the aggregate amount expended by the State for popular education only for the year ending Jan. 1, 1874, exceeded $6,500,000—nearly half a million of dollars more than was devoted to that purpose that year in Great Britain. The preceding table of population gives the number of persons over 10 years of age in the State in 1870 who could not read or write as 97,742, but of this number 89,830 were of foreign birth, and but 7912 natives; 85,676 were over 21 years of age, and 7630 were between 15 and 21, leaving no question that the greater part of these illiterate persons were those who had come into the State illiterate when beyond school-age, and mostly factory employés.

College, University, Scientific, and Professional Education.—The following table gives the statistics of higher education in the State in 1874:

Colleges, Universities, Seminaries, etc.	When organized.	Location.	Professors and instructors.	Students.		Corporate property.				Volumes in library.
				Preparatory.	Collegiate, professional, or scientific.	Value of grounds and buildings.	Amount of endowment.	Income from productive funds.	Receipts for year from all other sources.	
I. *Universities and Colleges:*										
Amherst College	1821	Amherst.	20	...	303	$550,000	$650,000	$33,000	$28,000	39,000
Boston College	1864	Boston	8	...	130	500,000	....	....	....	5,000
Boston University *	1872	Boston	6	...	80					
College of the Holy Cross	1843	Worcester	14	40	145	150,000	150,000	....	30,000	8,000
Harvard College	1636	Cambridge	35	...	706	....	† 2,305,684	261,902	not stated	136,000
Tufts College	1852	College Hill, Medford.	11	...	62	149,716	894,713	37,741	9,423	13,000
Williams College	1793	Williamstown	13	...	136	200,000	330,000	20,000	10,000	16,000
II. *Colleges for Women:*										
Mount Holyoke Female Seminary.	1837	South Hadley	35	...	271	262,200	39,440	2,730	not stated	9,585
Sophia Smith College ‡	1872	Northampton	...	...	......	....	456,000			
Wellesley College ‡	1874	Needham	...	...	......	....	1,000,000			
III. *Theological Schools:*										
Andover Theological Seminary	1808	Andover	10	...	78	190,000	560,000	4,400	....	32,500
Boston Univ. School of Theology	1847	Boston	14	...	95	....	....	....	....	5,000
Divinity School of Harvard Univ	1816	Cambridge	7	...	22	....	146,737	....	19,609	16,000
Episcopal Theological School	1867	Cambridge	4	...	12	220,000	100,000	6,500	4,500	1,000
Tufts College Divinity School	1867	Medford	10	...	15	....	200,000			
Newton Theological Institution	1825	Newton Centre.	6	...	70	387,939	306,815	24,662	....	12,500
New Church Theological School	1866	Waltham	3	...	10	....	27,000	....	625	650
IV. *Law Schools:*										
Boston University School of Law	1872	Boston	12	...	54	....	....	....	....	1,200
Law School of Harvard University.	1817	Cambridge	5	...	138	36,782	....	....	22,915	15,000
V. *Schools of Medicine:*										
Boston University School of Med	1869	Boston	33	...	67	....	....	....	....	1,500
Harvard Medical School	1782	Boston	29	...	175	47,123	....	....	30,865	2,000
New England Female Medical Col.	1850	Boston	33	...	26	100,000	....	....	....	15,000
Boston Dental College	1868	Boston	10	...	20	....	....	....	....	1,400
Dental School, Harvard University	1867	Boston	14	...	28	18,000	....	....	3,500	
Massachusetts College of Pharmacy	1823	Boston	3	...	83	1,000	2,000	140	3,050	400
VI. *Schools of Science:*										
Massachusetts Agricultural College	1867	Amherst	18	...	95	250,000	250,000	15,000	10,000	4,000
Mass. Institute of Technology	1861	Boston	36	...	353	300,000	200,000	....	49,000	2,000
Lawrence Scientific School	1848	Cambridge	22	...	42	....	328,784	....	32,513	
Worcester County Free Institute of Industrial Science	1868	Worcester	10	16	105	200,000	367,000	24,000	1,400	500
Totals, 29 educational institutions			421	56	3331	$4,062,760	$8,314,173	$469,675	$276,000	337,132

INSTITUTIONS OF SPECIAL EDUCATION.—I. *For Deaf Mutes, Blind, and Feeble-minded.*

Name of Institution.	When founded.	No. of instructors.	No. of pupils at close of previous year.	No. received during year.	No. Jan., 1875.	Under what control.	Value of buildings and grounds.	State appropriation or endowment.	Income, 1874.	Expenditure, 1874.	No. of years for full course.
Am. Asylum for Deaf and Dumb, Hartford (Massachusetts pupils)	1816	......	53	14	67	Corporation	$250,000	$12,790	$71,635	$77,691	7
Clarke Institution for Deaf Mutes, Northampton	1867	......	49	9	58	Private	100,000	11,205	31,715	22,645	10
Boston School for Deaf Mutes	1869	......	48	13	61	Bos. sch. b'rd.	....	6,004	....	....	10
Perkins Institution and Mass. Asylum for the Blind, Boston	1829	55	176	29	182	Corporation	389,084	30,000	81,072.65	70,645.53	6
The Massachusetts School for Idiotic and Feeble-minded Youth, Boston	1850	24	119	24	102	State	....	19,500	22,098.33	24,128.11	6
Institution for Education of Feeble-minded Youth, Barre	1848	......	77	10	79	Private	....	....	38,000		
Hillside School, Fayville	1870	3	5	2	6	Private.					

* Endowment not yet settled. † Whole amount not separated. ‡ Commences its regular course in 1875.

II. *Reformatories, Industrial, and Truant Schools.*

Name of Reformatory, etc.	When founded.	Instructors and employes.	Boys.	Girls.	Total.	Of native parentage.	Of foreign parentage.	White.	Colored.	Percentage reported reformed.	Volumes in library.	Average annual cost of each inmate.	Average annual earnings of each inmate.	Annual* cost of institution.	Annual earnings of institution.
State Reform School, Westboro'	1848	42	323	.....	323	99	224	306	15	60	2642	$121	$39.33	$61,531.08	$19,513.57
State Industrial School, Lancaster	1856	18	.....	82	82	31	51	78	4	66	1253	178.48	12.22	28,564	1,001.96
Massachusetts Infant Asylum, Brookline	1867	...	.....	.....	33	.....	.....	.....	...	...	......	....	....	9,035.65	None.
State Primary School, Monson	1866	47	359	126	485	.....	.....	.....	...	...	......	132.08	9.00	42,744.94	4,290
Boston House of Reformation	1847	...	440	38	478	261	217	.....	...	...	......	213.72	....	68,772.29	
Lowell House of Reformation	1870	...	80	5	85	.....	.....	.....	...	...	......	....	....	3,848	
Plummer Farm School, Salem	1871	...	26	.....	26	.....	.....	.....	...	...	......	....	....	6,051.92	
Industrial School, Lawrence	1874	...	20	.....	20										
Truant School, Cambridge	1872	...	38	.....	38	.....	.....	.....	...	...	......	156	....	5,928	
Truant School, Worcester	1872	...	9	.....	9	.....	.....	.....	...	...	......	173	....	1,556.21	
Temporary Asylum for Discharged Female Prisoners, Dedham	1864	...	.....	27	27	.....	.....	.....	...	...	......	315	....	8,500	

Institutions for the Insane.

Institutions.	When founded.	In the hospital, Oct., 1873.	Admitted, males.	Admitted, females.	Apparent number within the year.	Average number.	Discharged.	Recovered.	Improved.	Not improved.	Died.	Number remaining Oct. 1, 1874.	Number insane for the first time of admission.	Income.	Expenditures.	Percentage of recoveries.
Insane Hospital, Worcester	1832	469	202	198	869	476	384	71	137	101	75	485	268	$320,006.35	$304,675.96	18.5
Insane Hospital, Taunton	1853	434	237	218	889	481	381	93	162	59	67	508	328	183,625.48	183,397.41	29.6
Insane Hospital, Northampton	1855	433	105	88	626	469	150	37	43	45	25	476	74	99,906.48	98,058.53	25.
McLean Insane Asylum, Somerville.	1818	164	35	46	245	162	95	20	40	25	10	150	53	....	....	21.05
South Boston Insane Hospital	1839	192	25	15	232	199	26	7	3	6	10	206	29	....	....	27.
Insane Asylum, Ipswich	1837	64	12	6	82	63	21	8	2	2	9	61	11	....	....	38.1
Insane Hospital, Tewksbury Almshouse*	1853	303	45	61	409	304	90	7	5	36	42	319	51	....	....	7.8
Herbert Hall, Worcester	1873	28	7	21	28	12	16	5	3	5	3	12	14	....	....	31.25
Totals		2087	668	653	3380	2167	1163	248	395	279	241	2217	828			25.99

Almshouses, etc.

Institutions.	When founded.	Number at beginning of year.	Number admitted during year.	Males.	Females.	Discharged during year.	Supported during year.	Deaths during year.	Births during year.	Illegitimate births during year.	Weekly average of inmates.	Number remaining Oct. 1, 1874.	Amount of sickness in year.	Percentage of deaths to inmates.	Appropriations.	Average weekly cost.
State Almshouse, Tewksbury	1853	762	2686	1694	992	2643	3,448	314	52	32	885	805	1500	9	$93,282.47	$2.03
State Workhouse, Bridgewater	1867	347	488	119	188	460	835	64	47	...	404	375	432	7.9	46,432.40	2.21
Town paupers in almshouses †	1874	.....	......	......	.....	......	38,268	.....	...	...	3501	.....	......	...	987,875.74	2.63
Town paupers out of almshouses‡	1874	.....	......	......	.....	......	3,904	.....	...	...	556	.....	......	...	149,185.17	3.93
Totals	......	.....	......	......	.....	......	74,955	.....	...	...	5346	.....	......	...	1.266,775.78	

Prisons, Houses of Correction, and Criminal Statistics.—The State prison at Charlestown presented the following statistics for the year ending Oct. 1, 1874: Number remaining Oct. 1, 1873, 586; received from courts, 244; from violated pardon, 2; total, 246. Whole number in prison during the year, 832; discharged during the year, 149—viz. by expiration of sentence, 111; by pardon, 20; by death, 14; by escape, 2; to insane hospitals, 2. Number remaining Oct. 1, 1874, 683; daily average for the year, 645. The aggregate of receipts from all sources was $81,098.67, of which $77,068.17 was from convict labor. A disastrous fire in the workshops threw many of the convicts out of employment, and thus greatly reduced the receipts from labor, which in 1873, with a smaller number of convicts, had been $131,957.54. The expenditures of 1874 were $123,673.27. The contract system is in force, but is strongly opposed by the officers of the State board of charities. The county prisons are not in a satisfactory condition. They report for 1874 an aggregate average of 2112 prisoners; receipts for labor, $115,566.79; total expenses, $366,273.97, showing a balance against the prisons of $250,706.18. The whole number confined during the year was 5838 in jails and 6265 in houses of correction. The number at the end of the year was 2305, or 273 more than at the end of the previous year. The Boston House of Industry on Deer Island is a municipal prison, having an aggregate of 5835 persons (two-fifths females) committed to it in 1874, an average for the year of 716, and at the end of the year 815. Its expenditures were $91,696.40; the earnings of prisoners amounted to only $2577.48, while in 1872, with fewer inmates, they were $13,987.22. The actual number of commitments to all the prisons in the Commonwealth for the year ending Oct. 1, 1874, was 20,752, of whom 16,656 were males, and 4096 females; the actual number of different persons committed was 15,818, of whom 12,787 were males, and 3031 females; the number of persons discharged was 14,421, 11,733 males, and 2688 females; there remained in confinement Oct. 1, 1874, 4110—viz. 3273 males and 837 females; and the average number of prisoners for the year was 3826, 3100 males and 726 females; 5671—viz. 4107 males and 1564 females—had been in prison before; 33 children—28 boys and 5 girls under 17 years of age—were among the prisoners; 2096 were committed for crimes against the person, 3342 for crimes against property; 15,139 for crimes against public order and decency, of whom 11,431 were for drunkenness; 164 were held as witnesses; and 11 for sundry causes; 78 (21 from State prison) were pardoned during the year.

Libraries.—The library statistics of Massachusetts in the census of 1870 are so far below the truth that they have at most only a relative value. According to the census tables, there were in Massachusetts 3169 libraries of all classes, public and private, of which 1544 were public. The public libraries had 2,010,609 volumes (an under-estimate of at least 1,000,000 volumes); they included 1 State library, with 30,000 volumes (over 50,000 in 1874); 95 town and city libraries, with 475,873 volumes (in 1874 this class of libraries had over 800,000 volumes); 18 court and law libraries, with 27,708 volumes (both the number of libraries and volumes greatly under-estimated); 20 school and college libraries, with 253,127 volumes (in 1874 there were 54 of these, with 530,000 volumes); 1042 Sunday school libraries, with 539,609 volumes (the Sabbath schools connected with the Congregational Church alone had nearly this number in 1874); 164 church libraries, with 85,956 volumes; 11 historical, literary, and scientific libraries, with 186,800 volumes; 1 charitable or penal association library, with 1000 volumes (the State prison had

* Expenses and income of almshouse reported under *Almshouses* only.
† 215 towns. ‡ 125 towns.

in 1874 a library of 3210 volumes, and every insane hospital, reformatory, almshouse, and workhouse in the State had one of 1000 or more volumes); 6 benevolent and secret associations had libraries amounting to 63,000 volumes (there are more than 20 of these, with at least 150,000 volumes); 186 circulating libraries had 347,556 volumes; and 1625 private libraries, 1,007,204 volumes. This item, like the rest, might safely be multiplied by three.

Newspapers.—The census of 1870 gives Massachusetts 259 newspapers, issuing annually 129,691,266 copies, and having an aggregate circulation of 1,692,124. Of these, 21 were said to be dailies, having 231,625 circulation; 1 tri-weekly, with 800; 16 semi-weeklies, with 41,484 circulation; 153 weeklies, with 899,465 circulation; 11 semi-monthlies, with 45,200; 48 monthlies, with 462,150 circulation; and 9 quarterlies, with 11,400. Of these, 1 weekly and 3 monthlies were advertising sheets; 7 (6 weeklies and 1 monthly) agricultural and horticultural; 7 (1 weekly, 3 semi-monthlies, and 3 monthlies) were the organs of benevolent or secret societies; 13 (1 semi-weekly, 5 weeklies, 2 semi-monthlies, 3 monthlies, and 2 quarterlies) were commercial and financial; 54 (1 semi-weekly, 31 weeklies, 2 semi-monthlies, 17 monthlies, and 3 quarterlies) were illustrated, literary, and miscellaneous; 129 (viz. 21 dailies, 1 tri-weekly, 14 semi-weeklies, 92 weeklies, and 1 semi-monthly) were political; 31 (viz. 13 weeklies, 2 semi-monthlies, 14 monthlies, and 2 quarterlies) were religious; 1 weekly was a sporting paper; and 13 (viz. 3 weeklies, 1 semi-monthly, 7 monthlies, and 2 quarterlies) were technical or professional. At the beginning of 1872 the number of newspapers and periodicals had increased to 280, of which 21 were dailies, 1 tri-weekly, 13 semi-weeklies, 165 weeklies, 4 fortnightlies, 5 semi-monthlies, 60 monthlies, one bi-monthly, and 10 quarterlies. The whole number now (1875) somewhat exceeds 300.

Religious Denominations.—According to the census of 1870, there were in Massachusetts 1848 religious congregations, 1764 church edifices with 882,317 sittings, and $24,488,285 of church property. The following table gives the statistics of each denomination in 1870, and also the latest available statistics from the denominational year-books:

Denominations.	Organizations, 1870.	Church edifices, 1870.	Sittings, 1870.	Church property, 1870.	Dioceses, conferences, or associations, 1874.	Churches, parishes, or congregations, 1874.	Church edifices, 1874.	Ordained clergymen, 1874.	Local or licensed preachers, 1874.	Church members or members of congregations, 1874.	Adherent population, 1874.	Sunday-school teachers and scholars, 1874.	Church property, 1874.
Baptists, regular	271	280	132,805	$3,194,298	15	288	290	316	.....	44,679	223,000	18,455	$3,793,350
Baptists, Freewill, Seventh-Day, etc	15	15	6,230	136,700	...	19	19	21	3	1,350	5,400	975	178,700
Christian Connection	31	31	9,675	128,440	...	35	32	28	4	3,375	16,000		
Congregationalists	500	502	269,314	6,293,327	24	508	510	617	101	82,479	412,000	91,183	6,918,723
Protestant Episcopal	107	99	46,245	2,304,435	1	101	100	130	21	12,492	62,000	12,220	2,493,500
Friends	29	29	7,950	91,680	4	30	30	.....	.....	5,300	15.000		
Hebrews	5	2	1,500	33,000	...	6	3	6	.....	750	1,800		
Lutherans	2	1	450	20,000	...	3	2	2	.....	315	1,350		
Methodist Episcopal	297	290	117,325	2,904,100	4	318	312	374	216	41,327	229,500	39,416	3,673,500
New Jerusalem Church or Swedenborgians	15	12	3,800	199,800	1	16	14	12	4	2,150	8,000		
Presbyterians	13	10	5,700	257,325	1	14	12	13	2	2,700	13,500		
(German) Reformed	3	3	950	24,000	...	4	3	2	1	600	2,500		
Roman Catholics	196	162	130,415	3,581,095	3	262	224	274	62	....	400,000		
Second Advent	15	12	3,400	53.540	...	18	15	17	4	2,000	7,000	....	64,000
Shakers	4	4	1,550	13,600	...	4	4	.....	.....	800	1,200	....	16,000
Spiritualists	19	1	400	1.400	...	15	1	.....	.....	500	1,500		
Unitarians	180	179	98,306	3,470,575	...	178	179	185	17	24,400	90,000		
United Brethren in Christ	1	1	500	1,000	...	1	1	1	2	223	500		
Union	42	44	10,575	167,470	...	37	40						
Universalists	97	87	35,627	1,613,000	...	75	80	122		5,020	20,000		

Counties.—The following table gives the counties of the State, with their population of each sex in 1865 and 1870, valuation of real and personal estate, and total valuation, number of dwellings, number of acres of land taxed, and total taxes of all kinds in 1874, and the aggregates of these particulars for the State:

Counties.	Total pop. in 1865.	Males in 1865.	Females in 1865.	Total pop. in 1870.	Males in 1870.	Females in 1870.	Value of real estate in May, 1874.	Value of personal estate in May, 1874.	Total valuation for purposes of taxation in May, 1874.	Number of dwellings in May, 1874.	Number of acres of land taxed in May, 1874.	Total taxes, State, county, city, or town, school and highway, May, 1874.
Barnstable	34,610	17,043	17,567	32,774	16,035	16,739	$8,637,050	$6,433,237	$15,070,287	6,976	173,411	$231,348
Berkshire	56,944	27,724	29,220	64,827	32,294	32,533	26,028,364	11,945,426	37,973,790	11,054	542,968	555,486
Bristol	89,395	42,786	46,609	102,886	49,419	53,467	68,423,224	43,156,148	111,579,372	17,435	311,563	1,625,271
Dukes	4,200	2,047	2,153	3,787	1,819	1,968	2,768,551	602,374	3,370,925	1,626	45,203	54,453
Essex	171,034	80,164	90,870	200,843	95,498	105,345	110,149,433	53,516,918	163,666,351	33,674	268,161	2,708,898
Franklin	31,340	15,459	15,881	32,635	16,362	16,273	12,739,509	3,962,147	16,701,656	6,518	404,751	293,158
Hampden	64,570	30,566	34,004	78,409	37,382	41,027	56,264,291	17,238,293	73,502,584	13,456	344,587	1,267,788
Hampshire	39,269	18,655	20,614	44,388	21,443	22,945	18,980,795	7,798,992	26,779,787	8,003	335,739	401,873
Middlesex	220,384	104,115	116,269	274,353	131,959	142,394	217,661,531	72,728,403	290,389,934	46,255	489,721	4,309,954
Nantucket	4,748	2,158	2,590	4,123	1,825	2,298	989,618	1,377,621	2,367,239	736	11,533	29,420
Norfolk	116,306	54,796	61,510	89,443	42,944	46,499	62,770,618	28,097,430	90,867,448	15,633	233,874	1,209,887
Plymouth	63,107	30,772	32,335	65,365	32,116	33,249	27,288,070	9,689,876	36,977,946	13,562	366,540	574,126
Suffolk	208,212	96,529	111,683	270,802	129,482	141,320	573,133,499	247,071,612	820,205,111	43,132	24,915	13,025,727
Worcester	162,912	79,196	83,716	192,716	95,201	97,515	103,474,810	38,673,925	142,148,735	31,678	914,100	3,413,216
Total	1,267,031	602,010	665,021	1,457,351	703,779	753,572	$1,289,308,763	$542,292,402	$1,831,601,165	249,738	4,467,066	$28,700,605

Principal Towns.—Boston, the capital, metropolis, and largest port of entry of Massachusetts, had in 1870 a population of 250,526. It has since absorbed some of the adjacent towns, and has now probably nearly or quite 350,000 inhabitants. The cities of Worcester, Lowell, and Cambridge come next, with populations ranging between 40,000 and 50,000; Lawrence, Lynn, Springfield, Fall River, and Salem range from 25,000 to 40,000; New Bedford, Chelsea, and Taunton have from 20,000 to 25,000, while Gloucester, Haverhill, Somerville, Newton, Newburyport, Fitchburg, Adams, Pittsfield, Holyoke, and Northampton have each from 12,000 to 20,000, and Milford, Waltham, Weymouth, Chicopee, Abingdon, Dedham, West Roxbury, Woburn, Marblehead, Malden, North Bridgewater, Peabody, Quincy, and Westfield are towns of from 8000 to 12,000. Attleborough, Beverly, Clinton, Danvers, Framingham, Grafton, Great Barrington, Hingham, Hopkinton, Leominster, Natick, Plymouth, Southbridge, Randolph, Stoneham, Stoughton, Wakefield, Ware, Watertown, Webster have each from 5000 to 8000 inhabitants.

Constitution, Courts, Representatives in Congress, etc.—The constitution of the State is the same (with the addition of some amendments) under which the State received its present organization in 1780. Three conventions have been held to form a new constitution or materially modify the old one, but the proposed new constitutions and a number of the revised articles have been rejected by the people. The State ratified the Constitution of the U. S. in 1788. The most important provisions of the State constitution are the following: The governor, lieutenant-governor, secretary, treasurer, and receiver-general, auditor, and attorney-general are chosen by the legal voters of the State on the Tuesday after the first Monday in November annually, and hold office for one year from the first Wednesday in January. Eight councillors, the legal advisers of the governor, are chosen from their several council districts, while 40 senators and 240 representatives from their several senatorial and representative districts are also elected at the same time as the governor, and, like him, hold office for one year. The senate and house of representatives together constitute the legislature, whose style is "The General Court of Massachusetts." The pay of the councillors is $5 for each day's attendance and $2 for every ten miles' travel. The pay of the senators and representatives is $5

for each day's attendance at the session, and $1 for every five miles' travel from his place of abode. The president of the senate and speaker of the house receive $10 for each day's attendance. Not less than 16 members of the senate, and not less than 100 members of the house, are necessary to form a quorum. Every male citizen, 21 years of age, able to read the constitution in the English language, and write his name, who has resided in the State one year and in his election district six months, and has paid a tax within two years, is entitled to vote. Paupers, persons under guardianship, and those convicted of felony are excluded. The supreme judicial court consists of one chief-justice (salary $5500) and five associate justices (salary $5000 each). It has exclusive cognizance of all capital crimes and exclusive chancery jurisdiction so far as chancery powers are conferred by statute, and concurrent original jurisdiction of all civil cases where the amount in dispute exceeds $4000 in Suffolk co. and $1000 in the other counties. The superior court consists of a chief-justice (salary $4500) and nine associate justices (salary $4200 each). It has civil jurisdiction in all cases where the amount in controversy exceeds $20, and criminal jurisdiction in all except capital cases. The judges of both courts are appointed by the governor, by and with the advice and consent of the senate, and hold their offices during good behavior. The State under the apportionment of 1872 is entitled to eleven members of Congress.

History.—The evidence seems to be conclusive that S. E. Massachusetts, and probably not only the islands of Nantucket and Martha's Vineyard, but a part of Plymouth and Barnstable counties, were discovered by Leif Bjornsen and his brother Thorwald about 1000–03, named Vinland from the abundance of wild grapes, and settled by Thorwald and his comrades, and that this settlement, though soon relinquished, was succeeded by others through a period of about 300 years. Nearly 200 years later, in 1497, John Cabot and his son Sebastian again discovered the Massachusetts coast. Cortereal, a Portuguese navigator, Verazzano, a Florentine, and Gomez, a Spanish sailor, visited the New England coast in the early part of the sixteenth century, but made no efforts to found colonies there. The English claimed it under Cabot's discovery, he having been at the time in their service. In 1602, Bartholomew Gosnold, with a colony of 32 persons, landed in or near Salem harbor, and subsequently coasted along Cape Cod and discovered the Elizabeth Islands and the little island of No Man's Land; he gave the latter the name of Martha's Vineyard, which was afterward transferred to the larger island N. of it, and selected Cuttyhunk, the southernmost of the Elizabeth group, to which he gave the name of Elizabeth, as the site of his settlement. This settlement was relinquished after a few weeks, the colonists quarrelling and becoming disheartened. In 1603 another attempt was made at a settlement on or near the present site of Edgartown, in Martha's Vineyard, by Martin Prynne, with a colony somewhat larger; this also failed two months later, as did that of George Weymouth in 1605, but the latter led to the formation of the Plymouth Company in England, to whom was assigned North Virginia, lying between the parallels of 38° and 45°. After several attempts to found colonies under the jurisdiction of this company, the first which proved permanent was one which was intended for the old Virginia colony, but by accident or design was landed within their limits. This was the Pilgrim colony, a body of Puritans or non-conformists who had migrated to Leyden to avoid persecution in England, but found themselves so uncomfortably situated that they resolved to emigrate to the New World. Their arrangements were made with the Virginia Company, but after their embarkation at Delft Haven, Holland, July 22, 1620, in the Speedwell, their subsequent mishaps, and transference to the Mayflower, they finally sailed from Plymouth, England, Sept. 6, 102 in number. After a stormy passage of 63 days they entered what is now Provincetown harbor, Cape Cod, Nov. 11, and before landing organized a government, as they found themselves without the bounds of the Virginia Company's territory. After exploring the coast the colonists landed Dec. 22 at Plymouth. The severe winter which followed caused great suffering, and nearly half their number died within four months. They endured great privations, and were often near perishing of starvation till 1623, when they gathered their first plentiful harvest; but they adhered heroically to their new-found homes in the wilderness, and soon began to grow. They were unable to obtain a charter from the Plymouth Company, but organized and maintained a system of self-government, under which they prospered. Meanwhile, other colonies were founded by Puritans within the present limits of the State—one which failed disastrously at Wessagusset (now Weymouth), under Mr. Weston, in 1622–23; a successful one at Salem in 1628, under John Endicott, which in 1630 was merged in a larger one which had been undertaken in 1629 under the direction of John Winthrop, and which was connected with the transference of the government and patent of the Plymouth colony to New England. About 1300 persons came over from England in the two years 1629 and 1630, and though they suffered greatly at first, they continued to increase by immigration, and speedily became the larger colony of the two. Friendly and cordial relations were maintained between the two colonies, but each maintained its separate and independent government till 1692, when they were united under one charter. During this period of more than sixty years both colonies had had troubles from without and within. In 1636 and 1637 troubles with the Pequot Indians led to the Pequot war, the principal losses of which, however, fell upon the Connecticut colony, an offshoot from that of Massachusetts Bay. In 1643 a confederacy was formed, consisting of the colonies of Massachusetts Bay, Plymouth, Connecticut, and New Haven. This confederacy lasted for twenty years, and then gave place to a more comprehensive one. Massachusetts Bay then included the settlements in New Hampshire and Maine. There was necessity for some such confederation, for there was trouble with several of the Indian tribes, and the Dutch colonists at New Amsterdam were maintaining a semi-hostile attitude toward the New England colonies. Internal difficulties, partly from the waywardness and lawlessness of some of the emigrants, and partly from intolerance of the religious and doctrinal beliefs of some of the colonists on the part of the leaders, led to dissensions, accusations, banishment, and severe punishments of the disaffected. The Massachusetts Bay and Plymouth colonies had also serious difficulties with the English government, especially after the restoration of Charles II. The king appointed a commission to investigate and govern these colonies, but the colonial authorities refused to permit them to exercise their powers, and trouble ensued, with anger and rebukes on the part of the king, but his love of ease prevented any outbreak for several years. The great struggle with the Indians in 1675 and 1676, known as King Philip's war, checked the prosperity of these colonies for a long time. During the two years of this war thirteen towns were destroyed, nearly 600 houses burned, and more than 600 colonists perished in battle, besides those who were massacred at their homes. One man in every twenty in the colonies had fallen, and one-twentieth of the families were without shelter. The expense of the war was a little more than $500,000, a sum equal to at least $3,000,000 in our day, and crushing in its magnitude in colonies not fifty years old. Before this disastrous war had ended new troubles with the king had begun. Prompted by the vindictive spirit of Edmund Randolph, Charles II. had at last decided to annul the charter of Massachusetts Bay and to bring all the New England colonies under the sway of a royal governor. The colony of Massachusetts Bay by its agents endeavored to avert the impending disaster by concessions, protestations of loyalty, appeals to the king and privy council, and finally by a policy of delay; but their efforts were fruitless. In 1684 the English high court of chancery gave judgment against them, and declared their charter forfeited. Joseph Dudley, a citizen of Massachusetts Bay, son of the early emigrant governor, and who had been one of the colonial agents in London, was appointed president, but under the control of the revengeful Randolph, and the general court or legislature was abolished. Two years later, on the accession of James II., in Dec., 1686, Dudley was superseded by Sir Edmund Andros, already known to the colonists as an imperious and tyrannical commissioner. Andros lost no time in asserting his power over all the New England colonies, and subsequently over New York and New Jersey, but his head-quarters were at Boston, and he determined to make the humiliation of Massachusetts complete by exercising his authority with the utmost oppression and greed, seizing the property and persons of the citizens and disposing of both as he saw fit. His administration was endured for two years and four months, and then, upon the first report that the prince of Orange had landed in England, Andros and all his coadjutors, including Joseph Dudley, whom he had made chief-justice, were arrested, imprisoned, and held for trial; the general court reassembled; the former deputy governor, Thomas Danforth, made acting governor till the king's pleasure should be made known; and immediately upon the receipt of the intelligence of the proclamation of William of Orange in England he was proclaimed in Massachusetts Bay, and simultaneously in the Plymouth Colony. In 1690 Massachusetts took part in the intercolonial war between the possessions of France and England, and to pay the colonial troops issued for the first time in its history treasury notes. Sir William Phipps, a native of New England, and greatly endeared to the Massachusetts people, was their commander

in this colonial war, and being high in favor with King William was in 1692 appointed the first governor under the new charter granted by the king, by which Massachusetts Bay and Plymouth were consolidated into one government. During his administration the Salem witchcraft delusion occurred. The consolidated colony had at this time a population of about 47,000. There were frequent disturbances with the Indians for the next twenty-three years, the French colonists in Canada prompting the savages to make raids upon the colony of Massachusetts. From 1722 to 1725 these raids assumed the larger proportions of a war, and were finally ended by the almost complete extermination of the Indian tribes adjacent. From 1744 to 1748 in the war between England and France, Massachusetts contributed largely to the capture of Louisburg in 1745 and to the success of the Canadian expeditions. In the second war with France in the following decade the colony again played a conspicuous part. Her enterprise, her rapidly increasing population (she had 247,000 inhabitants in 1767), and her independent spirit seemed to have excited their jealousy towards her, and, as Charles II. and James II. had done eighty years before, they sought occasion to humiliate her. Oppressive measures of taxation were devised, her commerce was hampered by restrictions, and large bodies of troops were kept upon her soil to repress any attempted resistance. But the spirit of her people was not to be crushed. Every measure of oppression was resisted, and the other colonies were appealed to for sympathy and harmony of action. The Boston massacre of 1770 increased the excitement of the people, and the destruction of the tea in 1773 in Boston harbor, the opposition to the Port Bill in 1774, the representation of the colony in the General Congress, the seizure of the arsenal at Charlestown by the militia, the adjournment of the assembly to Concord, and its reorganization there as a provincial Congress, were the most prominent of the many events which immediately preceded the Revolution. The first blood of the Revolutionary war was shed at Lexington and Concord on Apr. 19, 1775; the battle of Bunker Hill on June 17 of the same year followed, and Massachusetts was fairly involved in the great issues of the war more than a year before the Declaration of Independence. In 1780 she adopted her constitution; and it was decided not long after that by a clause in the Bill of Rights prefixed to that constitution slavery in the State was abolished. John Hancock, the patriotic leader of the colony in the Continental Congress, was her first State governor. An insurrection occurred in the western part of the State in 1786, known as Shays's rebellion, arising from the poverty and distress of the people of that section and the severity of the taxes; some lives were lost in its suppression. The Constitution of the U. S. was ratified in Jan., 1788, by a State convention, by a vote of 187 to 168. In the division of parties which occurred at the beginning of the present century a large majority of the citizens of Massachusetts sided with the Federal party, and many of them were opposed to the war with Great Britain in 1812, which was so disastrous to her commerce, though the State furnished great numbers of seamen to the navy during that war. A number of delegates from the State appeared at the convention of the New England States which met at Hartford, Conn., in 1814, to confer upon their grievances, and George Cabot, a Massachusetts man, presided over the convention. In 1820 the district of Maine was set off as a separate State. In the same year a convention met to revise the constitution, and proposed fourteen amendments, of which nine were accepted and five rejected by the people. Other amendments have been adopted (to the number of twenty-six in all) in the years 1831, 1833, 1836, 1840, 1855 (six in that year), 1857, 1859, 1860, and 1863. The amendments of 1857 changed the mode of electing representatives and senators to the State legislature to a district system.

Governors of Massachusetts.

Plymouth Colony, elected.

John Carver.................1620–21
William Bradford.........1621–33
Edward Winslow.. 1633–34
Thomas Prence............1634–35
William Bradford.........1635–36
Edward Winslow..........1636–37
William Bradford.........1637–38
Thomas Prence............1638–39
William Bradford.........1639–44
Edward Winslow..........1644–45
William Bradford.........1645–57
Thomas Prence............1657–73
Josiah Winslow 1673–81
Thomas Hinckley 1681–86
Sir Edmund Andros, governor-general...1686–89
Thomas Hinckley 1689–92

Governors of Massachusetts, chosen annually under First Charter.

John Endicott..............1629–30
Matthew Cradock (did not serve).
John Winthrop............1630–34
Thomas Dudley............1634–35
John Haynes................1635–36
Henry Vane..................1636–37
John Winthrop............1637–40
Thomas Dudley............1640–41
Richard Bellingham.....1641–42
John Winthrop............1642–44
John Endicott..............1644–45
Thomas Dudley............1645–46
John Winthrop............1646–49
John Endicott..............1649–50
Thomas Dudley............1650–51
John Endicott..............1651–54
Richard Bellingham.....1654–55
John Endicott..............1655–65
Richard Bellingham.....1665–73
John Leverett..............1673–79
Simon Bradstreet..........1679–84
Jos. Dudley, President...1684–86
Sir Edmund Andros, governor-general...1686–89
Thos. Danforth (act'g)...1689–92

Governors appointed by the King under the Second Charter.

Sir William Phipps.......1692–94
Wm. Stoughton (act'g)...1694–99
Richard Coote, earl of Bellamont...........1699–1700
Wm. Stoughton (act'g)...1700–01
The Council.................1701–02
Joseph Dudley......1702–Feb. '15
The Council.......Feb.–Mar., '15
Joseph Dudley....Mar.–Nov., '15
Wm. Tailer (acting)......1715–16
Samuel Shute...............1716–23
Wm. Dummer (acting)...1723–28
Wm. Burnett.....Jan.–Sept., '28
William Dummer (acting)..Sept., 1728–June, 1730
William Tailer (acting) June–Aug., '30
Jona. Belcher ......Aug., 1730–41
William Shirley............1741–49
Spencer Phips (act'g)....1749–53
William Shirley............1753–56
Spencer Phips (act'g)....1756–57
The Council......Apr.–Aug., '57
Thomas Pownal 1757–60
Thomas Hutchinson (acting)......June–Aug., 1760
Sir Francis Bernard, Bart........................1760–69
Thomas Hutchinson (acting)...................1769–71
Thomas Hutchinson.....1771–74
Thomas Gage....May–Oct., 1774
A Provincial Congress, Oct., 1774–July, 1775
The Council.........July, 1775–80

Governors under the Constitution.

John Hancock..............1780–85
James Bowdoin............1785–87
John Hancock....1787–Oct., 1793
Samuel Adams (acting) Oct., 1793–94
Samuel Adams..............1794–97
Increase Sumner 1797–June, '99
Moses Gill (acting) June, 1799–1800
Caleb Strong.................1800–07
James Sullivan....1807–Dec., '08
Levi Lincoln (acting) Dec., 1808–09
Christopher Gore..........1809–10
Elbridge Gerry.............1810–12
Caleb Strong.................1812–16
John Brooks..................1816–23
Wm. Eustis.......1823–Feb., 1825
Marcus Morton (acting) Feb.–July, 1825
Levi Lincoln.................1825–34
John Davis.......1834–Mar., 1835
Samuel T. Armstrong (acting)...........Mar., 1835–36
Edward Everett............1836–40
Marcus Morton.............1840–41
John Davis...................1841–43
Marcus Morton.............1843–44
George N. Briggs..........1844–51
George S. Boutwell........1851–53
John H. Clifford...........1853–54
Emory Washburn 1854–55
Henry J. Gardner........1855–58
Nathaniel P. Banks.......1858–61
John A. Andrew...........1861–66
Alexander H. Bullock...1866–69
William Claflin.............1869–72
William B. Washburn, 1872–May, 1874
Thomas Talbot (acting), May–Dec., 1874
William Gaston.............1874–

Electoral and Popular Vote for President, etc.

Elect. year.	Candidates who received the electoral vote of the State for President and Vice-President.	Elect. vote.	Elect. year.	Candidates who received the electoral vote of the State for President and Vice-President.	Elect. vote.	Pop. vote.	Minority candidates.	Pop. vote.	Third party candidates.	Pop. vote.
1788	George Washington P... John Adams V.-P......	10	1832	Henry Clay P.......... John Sergeant V.-P....	14	33,033	Andrew Jackson P...... Martin Van Buren V.-P	15,545		
1792	George Washington P... John Adams V.-P......	16	1836	Daniel Webster P....... F. Granger V.-P.	14	42,247	Martin Van Buren P.... R. M. Johnson V.-P.....	34,474		
1796	John Adams P........... Various V.-P...........	16	1840	William H. Harrison P.. John Tyler V.-P........	14	72,874	Martin Van Buren P.... R. M. Johnson V.-P.....	51,944		
1800	John Adams P........... C. C. Pinckney V.-P....	16	1844	Henry Clay P.......... T. Frelinghuysen V.-P..	12	67,418	James K. Polk P........ Geo. M. Dallas V.-P....	52.846	James G. Birney P.... Thomas Morris V.-P...	10,860
1804	Thomas Jefferson P..... George Clinton V.-P....	19	1848	Zachary Taylor P....... Millard Fillmore V.-P...	12	61,070	Lewis Cass P........... William O. Butler V.-P.	35,281	Martin Van Buren P..... Charles F. Adams V.-P.	28,058
1808	C. C. Pinckney P....... Rufus King V.-P........	19	1852	Winfield Scott P........ Wm. A. Graham V.-P...	13	52,683	Franklin Pierce P...... William R. King V.-P...	44,569	John P. Hale P........ George W. Julian V.-P.	28,023
1812	D. W. Clinton P........ Jared Ingersoll V.-P.... Elbridge Gerry V.-P....	22	1856	John C. Fremont P..... Wm. L. Dayton V.-P....	13	108,190	James Buchanan P..... J. C. Breckenridge V.-P.	39,240	Millard Fillmore P...... A. J. Donelson V.-P....	19,626
1816	Rufus King P........... J. E. Howard V.-P......	22	1860	Abraham Lincoln P.... H. Hamlin V.-P........	13	106.533	Stephen A. Douglas P... H. V. Johnson V.-P....	34,372	John Bell P........... Edward Everett V.-P. J. C. Breckenridge P. Joseph Lane V.-P....	22,331 5,939
1820	James Monroe P........ D. D. Tompkins V.-P.... Richard Stockton V.-P..	15	1864	Abraham Lincoln P..... Andrew Johnson V.-P...	12	126,742	Geo. B. McClellan P.... Geo. H. Pendleton V.-P.	48,745		
1824	John Quincy Adams P.. John C. Calhoun V.-P..	15	1868	U. S. Grant P.......... Schuyler Colfax V.-P....	12	136,477	Horatio Seymour P..... F. P. Blair, Jr., V.-P....	59,408		
1828	John Quincy Adams P.. Richard Rush V.-P.....	15	1872	U. S. Grant P.......... Henry Wilson V.-P.....	13	133,472	Horace Greeley P...... B. Gratz Brown V.-P....	59,260	Charles O'Conor P.....	No rept.

We are indebted to Hon. Oliver Warner, secretary of the Commonwealth of Massachusetts, for documents and statistical records which have enabled us to make this article so complete.

L. P. BROCKETT.

Massachusetts Indians. The tribes inhabiting the territories in which the colonies of Plymouth and Massachusetts Bay were founded belonged, like those of New England generally, to the great Algonkin stock, but neither constituted a nation nor lived within well-defined boundaries, and consequently cannot be accurately discriminated from the tribes of the adjoining colonies. Five principal tribes are enumerated as dwelling chiefly within the limits of the two colonies—the Nausets, on Cape Cod; the Pokanokets or Wampanoags, living between Plymouth and Narragansett Bay; the Massachusetts, in the vicinity of the bay of that name; the Pennacooks, on the northern frontier, extending into New Hampshire; and the Nipmucks, in Central Massachusetts, extending into Connecticut and Rhode Island. There were few Indians in the upper Connecticut Valley, and none in the Green Mountain region. The language of all these tribes was substantially the same, so that Eliot's Bible and the books written in the Massachusetts dialect by his successors were available for their religious instruction. All these tribes, except the Christian Massachusetts and Nausets, took part in King Philip's war (1675), and as a result were nearly exterminated, most of the survivors having been sold as slaves in the West Indies. There are still 1610 Indians in Massachusetts, of whom 438 live at Marshpee and Herring Pond, Cape Cod, 306 on Martha's Vineyard, 12 at Natick, and small bands at Canton, Dudley, Dartmouth, Fall River, and elsewhere. They have all lost their original language, have generally intermarried with negroes, and are commonly regarded as mulattoes. (For their language see Eliot's *Indian Grammar Begun* (1664) and *Indian Primer* (1720), and Cotton's *Vocabulary of the Massachusetts Language* (1830).)

Massa'fra, town of Southern Italy, in the province of Lecce. It stands on a hill near the sea, about 10 miles from Taranto, on the railway to Bari. The neighboring district is almost entirely devoted to the cultivation of the olive, which yields in the best years 30,000 quintals of oil. The cotton-plant also thrives well here. Pop. in 1874, 9719.

Massa'getæ [of doubtful etymology, thought by some to be the Magog of the Bible], an ancient Turanian or Turkish tribe, inhabiting the steppes to the N. of the Jaxartes. According to Herodotus, it was with them that Cyrus of Persia went to war, and fell in battle, 529 B. C., their queen, Tomyris, having refused an offer of marriage made by Cyrus for the purpose of picking a quarrel with her. According to Ctesias, the war was with another tribe, and Cyrus died of his wounds after the battle.

R. D. HITCHCOCK.

Mas'sa Lombar'da, town of Northern Italy, in the province of Ravenna, situated near Lugo, in a level tract once occupied by woods and swamps, but now very fertile. It acquired some importance in the thirteenth century, and was walled and fortified by the Bolognese. It belonged to the Papal States till 1859. Pop. in 1874, 5488.

Massalubren'se, town of Southern Italy, in the province of Naples, situated on a narrow tongue of land, with several small islands near it, and one of greater size which appears to have been violently torn from the continent. The present town had its origin in the third century. It was sacked by the Turks in 1558, and the inhabitants carried off as slaves. The town now contains some good churches and extensive conventual buildings. Pop. in 1874, 8296.

Mas'sa Marit'tima (*Massa Maritiba*), town of Italy, in the province of Grosseto, about 40 miles N. of the town of Grosseto. It is composed of several villages lying near each other, the principal one having become the seat of a bishopric in the place of the once celebrated Populonia. During the Middle Ages this town was often contended for by the rival cities of Siena and Pisa. Pop. in 1874, 13,052.

Massaro'sa, town of Italy, in the province of Lucca, containing within its municipal limits, in 1874, a pop. of 9200.

Massasoit, the chieftain of the Pokanoket or Wampanoag Indians, found by the colonists of Plymouth, Mass., living in their vicinity in 1621 as ruler of the territory from Cape Cod to Narragansett Bay. (See MASSACHUSETTS INDIANS.) He made a treaty with the settlers at Plymouth Mar. 22, 1621, and maintained friendship with them until his death. His permanent residence was in the present township of Warren, R. I., where he was frequently visited by commissioners from the neighboring settlements. He entertained Roger Williams for several weeks when banished from Massachusetts. He was supposed to be eighty years of age when he d. in 1661, leaving two sons—Mooanum and Pometacom, called by the colonists Alexander and Philip. They succeeded him in the chieftainship, the latter being the celebrated "King Philip."

Mas'se di Sie'na or **di Città,** town of Italy, in the province of Siena, embracing several small villages within its communal limits. Pop. in 1874, 10,258.

Masse'na, tp. of St. Lawrence co., N. Y., on the St. Lawrence. The post-village of Massena is at the lower falls of Grass River, 15 miles N. of Potsdam Junction. It has some manufactures. Pop. 483.—MASSENA SPRINGS, post-v., 1 mile distant, on the Racket River, has saline sulphur springs, is a pleasant summer resort, and has spacious hotel accommodations. The township has 5 churches, and embraces some islands in the St. Lawrence River. Pop. 2560.

Masséna (ANDRÉ), prince of Essling, marshal of France, b. May 6, 1758, at Nice, served for fourteen years in the Sardinian army without promotion on account of his plebeian birth; entered the French army after the annexation of Nice to France in 1792; became chief of a battalion Aug. 1, 1792, and brigadier-general Aug. 22, 1793. His most brilliant exploits were his victory over the allied Austrian-Russian army at Zurich Sept. 25, 1799, which freed France from invasion, the siege of Genoa in 1800, which he held for three months, though invested by an Austrian army and blockaded by an English fleet; and his valorous defence of the villages of Aspern and Essling during the battle (May 21, 1809) which saved the French army from total destruction. In 1810 he received the highest command in Spain, and drove Wellington back to the lines of Torres Vedras, but receiving no reinforcement he was compelled to retreat into Spain, and in the spring of 1811 he resigned his command on account of ill-health. In the events with which Napoleon's career closed he played no conspicuous part. D. Apr. 4, 1817. He had a great military talent, but a mean and rapacious character. Napoleon called him a robber, and by the soldiers he was much disliked.

Mas'sey (GERALD), b. at Tring, Herts, England, May 29, 1828, of poor parents; worked in youth in a silk-mill and as a straw-braider, and received a scanty education; went to London; published *Poems and Chansons* (about 1846); started in 1849 and became editor of the *Spirit of Freedom*, and was secretary of the Christian Socialists, a co-operative society; was placed upon the civil list with a pension in 1863. He has published several volumes of poems and some prose works, among which are *Robert Burns, and other Lyrics* (1859), *Havelock's March, and other Poems* (1861), and *A Tale of Eternity, and other Poems* (1870); is a frequent contributor to periodical literature, a popular lecturer, and an earnest believer in Spiritualism. He lectured in the U. S. in 1873.

Massey's Cross-roads, post-v. of Kent co., Md., at the junction of the Queen Anne's and Kent and the Kent County R. Rs., 21 miles N. E. of Chestertown. Pop. 75.

Mas'sico (the *Mons Massicus* of Latin poetry), a mountain in the province of Terra di Lavoro, Naples, Italy, famous in ancient and modern times for the Massic wine produced from its vineyards. On the southern slope is a town of the same name. The locality was on the frontier between Latium and Campania, and was celebrated for the victory gained there by Appius Claudius over the Samnites.

Mas'sicot [Fr.], protoxide of lead (PbO), prepared without fusion. (See LEAD.) C. F. CHANDLER.

Mas'sie, tp. of Warren co., O. Pop. 1270.

Massie (Gen. NATHANIEL), b. in Goochland co., Va., Dec. 28, 1763; entered the Revolutionary army at the age of seventeen years; studied surveying; settled in Kentucky in 1783; became a resident of Manchester, O., in 1790, and laid out the town of Chillicothe upon his own lands; was engaged in the Indian wars of the North-west, in which he gained the rank of general of Ohio militia; was a delegate to the convention which framed the Ohio constitution in 1802; was frequently a member of the State legislature, having served one term as Speaker of the senate; was a candidate for governor in 1807, and declared elected, but resigned before entering upon the office. D. at Paint Creek Falls, O., Nov. 13, 1813.

Massie's Mills, post-v. and tp. of Nelson co., Va. Pop. 4546.

Massieville, a v. of Scioto tp., Ross co., O., 5 miles S. of Chillicothe (P. O. Waller). Pop. 119.

Mas'sillon, post-tp. of Cedar co., Ia. Pop. 974.

Massillon, city of Marlboro' tp., Stark co., O., 65 miles S. of Cleveland, on the Pittsburg Fort Wayne and Chicago, the Cleveland Tuscarawas Valley and Wheeling, and the Massillon and Cleveland R. Rs., and the Tuscarawas River and Ohio Canal, in the midst of the Tuscarawas Valley coal-fields, has a good educational system, 9 churches, gasworks, 2 blast furnaces, 3 quarries of Massillon white sandstone, a large rolling-mill, 4 flouring-mills, a sash-factory, machine-shops, an iron-bridge factory, 1 paper-

mill, and the extensive agricultural implement establishment of Russell & Co., the Massillon Excelsior Works and the Massillon Harvester Works, the two latter furnishing machinery for the West in large quantities. There are 2 newspapers, and a library belonging to the Young Men's Christian Association. Pop. 5185.

JAMES J. HOOVER, ED. "MASSILLON AMERICAN."

Massillon' (JEAN BAPTISTE), b. at Hyères, Provence, France, June 24, 1663; entered the Congregation of the Oratory in 1681; went in 1696 to Paris; became Roman Catholic bishop of Clermont 1717; was admitted to the Academy in 1719. D. Sept. 18, 1742. His style is one of charming delicacy, pathos, and grace, and his own character was pure and gentle, but his public life, though marked by modesty and simplicity, was ever manly and independent. His complete works, mainly sermons, were first published 1745–46, and are models of elegant rhetoric.

Mas'silon, tp. of Wayne co., Ill. Pop. 781.

Mas'singberd (FRANCIS CHARLES), b. in Lincolnshire, England, about 1800; graduated at Magdalen College, Oxford, with honors in 1822; took orders in the Church of England in 1824 and 1825, when he received the living of South Ormsby. In 1847 he was made a prebendary of Lincoln, and was 1862–72 chancellor of the cathedral church, and afterwards a residentiary canon. He was an active member of the lower house of the convocation of Canterbury; author of a *History of the English Reformation* (1842), *Church Reform* (1833), *Law of Church and State* (1857), *Lectures on the Prayer-Book* (1864), and other works. D. in Dec., 1872.

Mas'singer (PHILIP), b. at Salisbury, England, 1584; studied at St. Alban's Hall, Oxford; went in 1606 to London, where it has been supposed that he became a Roman Catholic. Little is known of the events of his life. His first play is the *Virgin Martyr* (1622). Only eighteen of his works are extant, the MSS. of several others having been carelessly destroyed. He excelled in the drawing of tragic character, in the dignity, refinement, and moral superiority of his sentiments, and in melody of expression. Among his best works are the *Duke of Milan* (1623), *Fatal Dowry* (1632), *A New Way to Pay Old Debts* (1633), which still keeps the stage; *A City Madam* (1659), *A Very Woman* (1655), and *The Picture*. D. Sept. 18, 1640. Says a burial-register of London, "March 20, 1639–40, buried Philip Massinger, a stranger." He was the associate of Fletcher and Decker. Best edition of his works by William Gifford (London, 1850).

Mas'son (DAVID), M. A., b. at Aberdeen, Scotland, Dec. 2, 1822; educated at Aberdeen and Edinburgh; was for a time a journalist; professor of the English language and literature in University College, London, 1852–65; became in 1865 professor of rhetoric and English literature in the University of Edinburgh; and was from 1859 editor of *Macmillan's Magazine*. His articles in reviews and magazines are widely known. Author of *Essays, Biographical and Critical* (1856), *Life of Milton* (vol. i. 1858; vol. ii. 1871), *British Novelists* (1859), and other works.

Mass'mann (HANS FERDINAND), b. at Berlin Aug. 15, 1797; studied theology, natural science, and the German language and literature; was an enthusiastic disciple of Turnvater Jahn; became professor in Old High German at Munich in 1829, and at Berlin in 1842. He gave annotated editions of the Gothic and Old High German literary monuments, of Tacitus's *Germania*, and wrote a number of essays on the oldest history of Germany.

Massorah. See MASORAH.

Mas'sowah, or **Masoua,** town belonging to Egypt, on a small island of coral formation in the Red Sea, in lat. 15° 36′ N., lon. 39° 21′ E., has a good harbor. It is ill built, dirty, and filthy, but has some importance as a commercial place. Pop. about 6000.

Mast [Ang.-Sax. *mäst*], a nearly upright spar of wood, iron, or steel rising upward through the decks of a vessel for the purpose of affording attachment to the sails and rigging of a ship. The fir and pine of Puget Sound and Norway are of great repute as material for masts. Iron and steel masts are constructed upon several different systems. In all vessels of any considerable size each mast consists of several parts, of which the lowest is the mast proper, next the top-mast, the top-gallant-mast, and the royal-mast, and sometimes a sky-scraper, the highest of all. The foremost mast of a ship is the foremast; the central one, the mainmast; the one farthest aft, the mizzen-mast; and the separate parts of each are distinguished as the fore-top-mast, the main-top-gallant-mast, etc., by combining the name of each mast with the appropriate name of each part of a mast. Ships, barques, and some schooners have three masts. Brigs, barkentines, and schooners have usually two masts. Many sloops, smacks, luggers, and other small craft have but one mast. Large sea-going steamers have often four, and sometimes five, masts.

Mas'ter [Ang.-Sax. *mäster*], an officer in the U. S. navy belonging to the grade next above that of ensign and next below that of lieutenant. Masters correspond in rank to first lieutenants in the army and the marine corps.

Master and Servant. These terms indicate a mutual personal relation which implies on the one side authority and will to direct and appropriate, and on the other obligation, under direction, to perform labor, chiefly manual labor. It is a relation indispensable in the social life of mankind. It grows necessarily out of that diversity of capacity among men which springs from difference of natural endowment and acquired wisdom and skill, and out of the principle of division of labor, which is the most effective means of multiplying human comforts, and out of recognized factitious distinctions based on wealth and social position. When the liberty and equality of men, as men, with regard to their rights, are recognized and respected, the parties enter into this relation voluntarily for their mutual advantage. The benefits on either side are defined by contract, expressed or implied, the rights and obligations of which are guarded by law. This is the natural and legitimate basis of the relation. But in the actual history of the world, under the sway of human selfishness, this natural order has been very extensively subverted. Masters have used their superior power to gain ownership of their fellow-men, and to hold them as servants bereft of freedom, subjected to their absolute control, and fixed in a condition of servitude from which neither they nor their children could emerge. Hence the existence of slavery almost universally under the ancient civilization; hence villeinage and serfdom in the Middle Ages; and hence, too, the domestic slavery of modern times. (See SLAVERY, VILLEINAGE, SERF.) The consequent division of society into classes tended to degrade all forms of manual labor as more or less servile and disgraceful. Thus, in the palmy days of Greece and Rome all mechanical industry and mercantile operations were carried on by slaves for the benefit of their masters, and all such pursuits came within the purview of this one relation of master and servant. But the spirit of Christianity has worked steadily an influence adverse to slavery in all its forms, and now almost throughout Christendom the claim of one man to own the person and labor of his fellow-man is abrogated, and the principle of individual freedom in the relation under consideration is established. The great industries of society are raised to the dignity of honorable vocations, and other terms, such as merchant and salesman or clerk, master and apprentice or journeyman, farmer and laborer, manager and operative, and especially the broad terms of capital and labor, distribute much that was formerly treated of under this relation. Especially is this true in our own country, where the terms master and servant are restricted very much to household or domestic relation. Even there the spirit of liberty quite generally protests against everything servile by substituting for "servant" the term *help* or *hired man*.

It is one of the problems of modern social science so to adjust this relation, and so to mould public sentiment concerning it, as to protect the rights of both parties in full recognition of their freedom and independence, and at the same time to secure more of permanence and more of mutual regard, attachment, and fidelity in this relation. This is closely linked with the *labor question* in its broad application. The solution of the problem is to be reached not mainly by legislation, nor in great combinations and associations, fitly as these means may be employed, but by magnifying to the common apprehension the dignity of "honest work well done" in every sphere, and by applying the Christian law of love to repress the suspicions, envies, jealousies, and restless aspirations which are now the disturbing elements in the relation. A. L. CHAPIN.

Master and Servant, in Law. The duty of one person to render service to another may either be derived from a rule of law or may be created by contract. Servants are thus capable of division into two principal classes—slaves and servants by contract. Slaves will be considered in a separate article. (See SLAVES.) Apprentices form a special class of servants, which has already been treated of. (See APPRENTICES.) While the relation of a master to an apprentice usually originates in a contract, yet it is governed by a peculiar set of statutory rules, whereby labor under it is made compulsory. In the ordinary relation of master and servant, as understood in modern times, there is simply a contract relation. The remedies on either side are those which attach ordinarily to breach of contract; *e. g.* an action in a court of law for compensation. It is this class of servants only which will form the subject of the present article. The topic will be considered under the

following divisions: I. The rights and duties of the parties; II. The effect of the relation upon third persons.

I. The principal duty of a servant is to work for the master for the entire time required by his contract, with reasonable skill, depending upon the nature of the employment, and to follow such reasonable orders and directions as may be given him in the course of his service. He may be engaged either indefinitely or for a fixed period. In the former case he may quit the employment without notice; in the latter instance, the contract is an "entire" one, and he can recover no wages unless the term of service is fully performed. Thus, if the servant were hired for a year at a specified sum, and should leave during that time without cause, he could recover no portion of his wages. The same result would follow though his wages were estimated by the month. Thus, a hiring for a year at $50 per month is an annual hiring, the mention of the month being a mode of reckoning the annual wages. If, however, the contract prescribed that the wages should be *paid monthly*, the servant would earn wages for each month that he continued in service, subject to deductions for any injury sustained by his master by his breach of contract. There is a tacit engagement on the part of a servant that he has the usual skill possessed by the persons who follow the calling in which he professes to serve; as, if he becomes a clerk to a merchant, that he has the ordinary qualifications of a clerk. If these be absent, he can properly be dismissed by his master on that ground alone. Dismissal may also be made for any failure or refusal on his part to obey such orders as the master may properly give him in the course of his employment. The remedies of the master are not confined to a dismissal of a refractory servant. As in general in cases of breach of contract, he may have his action for damages. A servant—as, *e. g.*, an accomplished singer—may have made a contract whereby if performed the master would naturally reap large gains. If she wilfully breaks it, she will be liable to pay an adequate amount of damages. This contract is of a personal nature, and there is a tacit stipulation in it that if either party die it is at an end. It seems, accordingly, to follow that the representatives of the servant would be entitled to receive such portion of the wages as had equitably been earned at the time of death.

The principal duty of the master is to keep up the relation created by the contract, to furnish the servant with suitable tools and instruments of labor, to employ suitable fellow-servants, and to pay the stipulated wages. When these obligations are violated the servant has a right of action.

When the master wrongfully discharges a servant before the time of service has expired there is a choice of remedies. The servant may take one of two views—either that the contract is at an end, or that it continues. If he adopts the first theory, he may sue for what he has done, and recover its value. If he prefers the second, he has an action for not being permitted to work, or, in other words, for the non-recognition by the master of the relation existing between them. His action in such a case is not for wages, but for breach of contract. This doctrine has recently been carried so far in England as to allow the servant who is discharged after the contract is made, but before the time for entering upon the service has arrived, at his election to bring an immediate action, without waiting until the contract-day occurs. The positive refusal of the master to recognize the relation of service relieves the servant from any readiness to perform on the stipulated day. Still, the servant may in such a case await the day fixed, tendering performance or showing readiness to perform, and base his action on a refusal then to receive him. This theory has not yet been fully recognized in this country.

It is a well-settled rule that the master must not knowingly supply his servant with tools or other instruments of labor which are unfit for use. Should he do so, and the servant without his fault sustain damage in consequence, the master is responsible. This rule is, however, subject to an important qualification. If the servant is aware of the defect, and notwithstanding continues his work, he is in a sense the author of his own injury, or, in legal language, is guilty of "contributory negligence," which is a fatal objection to his claim. (See Negligence.) The same general remark may be made of the duty of the master to select competent fellow-servants. It is a matter of common knowledge that in the great undertakings of modern times it is frequently necessary to employ a number of servants to co-operate in the accomplishment of a particular result. It is a well-settled general rule that if the master has used reasonable care in selecting such co-operating servants, and one of them by his carelessness injures another, no action will lie against the master, but only against the servant in fault. The theory is, that the servant in fixing his rate of wages took this risk into account as one of the dangers incident to the business in which he was engaged. Nice distinctions are taken as to whether the employment in which the two servants are engaged is a common one or not, as the rule cannot be extended in reason to a case where, though the employments are distinct, the master is the same. The rule itself gives way when the master has not used due care in the selection of the servant at fault. But even in that case, if the person injured, knowing of the carelessness of a fellow-servant, still works with him and sustains injury, the doctrine of contributory negligence may be applied to him, and the master thus be relieved from liability. A servant has no claim upon his master for damage sustained by him owing to the dangerous nature of the business which he follows, as this risk is plainly assumed by him in fixing his rate of wages. Nor can he call upon his master to provide him with medicines or medical attendance in case of sickness, though if the latter should engage a physician to render him service he may become liable to pay the medical fees, on the ground that the physician contracted with him and gave him credit. It is not essential to the existence of the relation of master and servant that there should be any agreement to pay wages. The nature of the service may show that it is intended to be gratuitous. Thus, if a bystander should, in the absence of a master, volunteer to aid hired servants in performing a task which they should not have sufficient force to accomplish, he would become in some respects a servant, and clearly would have no action against the master for injury sustained by the negligence of those whom he aided. It frequently happens that the relationship between the parties leads to a presumption that no wages are to be paid. An instance is that of a daughter living in her father's family after attaining majority, rendering services and receiving support. It may, however, be shown that there was a mutual understanding that wages were to be paid, when they can be collected.

It is not, by the rules of the common law, necessary that the relation of master and servant should be created by writing. The provisions of the statute of frauds (see Frauds, Statute of), requiring that every contract "not to be performed within a year" should be written, may, however, be applicable. In such a case, if the term of service should extend beyond one year from the day when the contract is entered into, it must be written. Still, if such a contract should be void by the statute, the servant could collect the reasonable value of any services that he may have rendered.

II. The principal question under the second subdivision of this article concerns the right of third persons to hold the master responsible for the acts of the servant. The liability of the master in such a case depends largely upon the fact that there is in law a substitution of the servant in his place, so that the legal maxim may be applied that he who acts by another, himself acts. There is also another principle of importance to be noticed. Even where the servant goes beyond the course of his employment, yet if the master has so conducted himself as to induce third persons, acting in good faith, to suppose that the servant has authority, he will be precluded from denying the apparent authority of the servant. This rule is, in fact, a branch of the doctrine of estoppel (see Estoppel), and is especially applicable to the case where a servant acts in making a contract substantially as an agent. (See Agent.) Thus, if a master should send his servant on several occasions to purchase for him family stores on credit, and the servant should on a further occasion make a purchase without authority and for his own private ends, the merchant still supposing him to be acting for his master, the latter would be liable. Dismissing from view this class of cases, the more serious inquiry is, How far is the master responsible for the wrongful or tortious acts of his servants? The great inquiry is in this case whether the servant is acting in the course of his employment. As this is a subject of great complexity and importance, it will conduce to clearness to consider (1) the distinction between a contractor and a servant, and (2) the master's liability for the acts of the latter. (1) It is of great consequence to distinguish accurately between a servant and a contractor. The rule of *respondeat superior*, which makes a master liable for the acts of a servant, has no general application to the case of a contractor. There are certain well-known tests whereby a servant is to be distinguished from a contractor. The following general characteristics in each case may be stated: The latter follows an independent employment, receives compensation for an aggregate amount of work done rather than for the time occupied in it, and supplies a result to his employer, who has no control over the means whereby it is effected. The former in general has no independent employment, is paid for his time rather than for the end attained, and is liable to be controlled both in the mode of doing his work and in the result to be accomplished. While

these distinctions may not always be so broadly drawn as they are here given, yet they in substance always exist. They have, however, only been recently recognized in jurisprudence. In the year 1799 the following case occurred in the English court of common pleas: A, having a house by the roadside, contracted with B to repair it for a stipulated sum; a carpenter, having a contract under B to do the whole business, employed a bricklayer under him, and he again contracted for a quantity of lime with a limeburner. The servant of the latter laid a quantity of lime in the road, by means of which the chaise of the plaintiff was overturned, and he was thrown out and injured. The question was whether A was responsible for the act of the limeburner's servant. It will be observed that the specific act which caused the injury was not authorized by A, and the most that could be contended was that it was included in the acts which he did in fact authorize. This the court held, and pronounced A liable. The decision, however, has since been disregarded in England, as well as in this country, and the proposition maintained that as B was a contractor, none of the persons acting under him could be regarded as A's servants. The act of ordering the house to be built did not naturally or necessarily result in causing the injury. That was to be imputed simply to the negligence of the limeburner's servant, for which it is not reasonable to consider the original employer responsible.

While this general rule has now become fully settled, there are cases in which an employer will be liable for the act of a contractor. One is where the thing to be done is in its nature unlawful. Thus, if one should employ a contractor to commit a nuisance in a public street by tearing up, without legal authority, a pavement and disturbing public travel, he would be responsible for the injury caused. The same rule would perhaps be applied if a contractor was directly employed to do the very act which caused the injury; as, for example, if in the above case he had been employed by A specifically to place the lime in the road. Similar doctrines are applied to cases where the employer is under a duty to the public to perform an act in a prescribed manner. In that case he cannot shift off responsibility by employing a contractor. This proposition may be illustrated by the case of a city having a duty imposed upon it by law to keep its streets in repair or properly lighted. If it employs a contractor to make the necessary repairs, and he acts negligently, so that individuals making use of the streets are thereby injured, the city will be responsible. (2) Having thus distinguished the case of contractors from that of servants, it remains to consider the responsibility of a master for the acts of a true servant. The sole question here is, Was the act done within the scope of the servant's employment? Attempts have been made to take a distinction between negligent and wilful acts, on the theory that the master is liable for the former and not for the latter. It has been found in the late exhaustive discussions of this subject that this difference does not exist, and that it is immaterial whether the act be negligent or wilful, so long as it falls within the scope of the servant's employment. Under this rule, whenever the master entrusts the servant with power to decide whether a given state of facts exists, on the existence of which he is authorized to act, and he makes an erroneous decision and acts so as to injure another, that person will have an action against the master. Thus, if a proprietor of an omnibus should entrust a driver with power to eject an intoxicated passenger, and the driver should erroneously conclude that intoxication existed in a particular case, and should remove the passenger accordingly, the master would be liable. The same rule would be applied if the same circumstances should exist in the common case of a passenger to be removed for the non-payment of fare. On the other hand, if the driver or conductor knew that the passenger was not intoxicated or that he had paid his fare, and removed him simply to vent his own spite or malice, he could not be said to be acting within the scope of his employment. In some cases the master is *directly* liable for the wrongful acts of the servant; in others, indirectly. In the former case in technical language he is said to be liable to an action of trespass, and in the latter to an "action on the case." Thus, whenever the master directs the specific act to be done, and it directly results in injury, the master is a trespasser, as if he ordered a servant without cause to eject a passenger from one of his vehicles. The same rule prevails where the act which he orders necessarily results in a trespass, as if he should order earth to be removed from his own land in such a manner as must inevitably lead to the caving in of his neighbor's land. But in cases where the act of the servant can be performed in a manner which will cause no injury to third persons, and yet it is in fact done by him in such a way as to invade another's rights, the master is no longer liable directly, but only consequentially. The correct theory, then, is, that he is legally responsible for the employment of a servant who in the performance of orders is so derelict in his duty as unnecessarily to injure others. The rules that have been stated cease to prevail when the service is at an end or is even temporarily suspended. For the time being the apparent servant is not a servant. Thus, if it were a coachman's duty to put up his master's horses at six o'clock at night, and he should without his master's knowledge use them in a particular instance at a later hour for his own purposes, he would not be in his master's service, and the latter would not be responsible for his conduct, though it was apparently but a repetition of acts performed while in service at an earlier hour of the day. Reference should be made to a class of cases where the master has entered into a contract with a person to do a specified act, and through the wilful act of the servant the contract remains unperformed. In that case an action may be based upon the breach of contract, it being immaterial to the injured party whether that breach is occasioned by the wrongful act of the servant or not. Thus, if a railroad company should agree to carry goods or passengers from one place to another within a specified time, and its servants should by a combination among themselves prevent the transportation, the contract is broken and the company is liable.

There are instances in which it has been determined that a master is liable for the acts of one employed by his servant, even without any specific authority to make use of his services. The ground of this would seem to be that the master by implication confers upon a servant the power of obtaining assistance from others, so far as to become responsible for acts done within the scope of the general employment. It is thus a dictate of public policy that the master should be answerable. In an early case it appeared that a master having employed a servant to do some act, the servant out of idleness employed another to do it, and that person in carrying into execution the orders which had been given to the servant committed an injury. The master was held liable. This doctrine was sanctioned by the New York court of appeals in a recent instance, in which a servant was directed to throw snow from the roof of a house into a street, and one passing by was injured by a piece of ice carelessly thrown down by a person employed by the servant without the master's knowledge.

There is such a complete identity between a master and a servant acting in the course of his employment that notice to the latter of a certain fact connected with the business is deemed to be notice to the former, even though the servant is so neglectful of his duty as not to mention the fact to the master. Thus, if a servant having charge of a vicious dog should know his propensities, the master would be deemed to have like knowledge, and would be answerable accordingly.

Assuming that a person is a servant, it is sometimes difficult in a legal point of view to determine who is his master. He may be regularly employed by one person who may commission him to serve another. The question will be, if he is guilty of an act of negligence whereby some third person is injured, whether he is the servant of the regular employer or of the one whom he happens temporarily to be serving. Thus, if an owner of a carriage should hire for a day a pair of horses and a driver from the keeper of a livery stable, and the driver should, while obeying the directions of the owner of the carriage, through negligence, injure a stranger, who would be liable? The answer is, that the driver is the servant of the party who selected him and who pays his wages, and not of the man whom he happens to be serving by force of the directions of the true master. Under special circumstances the owner of the carriage may, undoubtedly, make himself liable, as if he should personally interfere with the mode in which the driver performs his service.

The fact that the master is liable for the wrongful act of the servant does not relieve the latter. He is the true author of the wrong done. The injured party may at his election sue either the master or the servant, and according to some authorities both in one action. If the master is obliged to pay damages, he has a remedy over against the servant. It is a wise course for the master when sued to notify the servant to defend the action, in which case the judgment against the master is conclusive against the servant.

The master may on his part have an action against third persons who injure his servant and thus deprive him of his services. The ground of the action is "loss of service." Examples of this are cases in which an assault has been committed or there has been a deprivation of personal liberty. So, if a female servant were seduced and loss of service thereby sustained. It is a further rule that if one knowingly entices away a servant and leads him to break his contract of service, the master will have a cause of action against the enticer, even though he may also have

one against the servant. This rule has been applied to cases of greater magnitude than those usually found in contracts of service; *e. g.* contracts with managers of theatres or operas by musical or dramatic performers. These principles cannot be extended so far as to give the master a cause of action for a mere breach of contract made by the third person with the servant, whereby the latter is injured. Thus, if a servant should enter into an ordinary passenger contract with a railway company, and in the course of it should sustain injury, disabling him from service, the master could have no action, as he would be no party to the contract. The servant alone could enforce its provisions. When, on the other hand, no contract intervenes, and the efficiency of the service is impaired by a wrongful act done to the servant, the master has his remedy in an action for damages. If, however, the servant were killed by the wrongful act of another, the master would have no action. The contract of service is deemed to be terminated by the death of the servant, and every remedy is suspended. Statutes in some States have varied this rule in the case of parent and child, but not in that of the mere contract of service. The rules thus stated are not reciprocal. The servant has no remedy for an injury done to the master, not even if the master is so disabled as to prevent him from continuing the work in which the servant is engaged. It is an old rule of the common law that the servant may defend the master from unjustifiable personal assaults, as well as the master in like case the servant. These rules are extended to the cases of parent and child and of husband and wife. A parent may sue one who injures or seduces his child for "loss of service." (See PARENT AND CHILD.) On the same ground a husband may sue an adulterer who has seduced his wife, or any person who in legal language has "harbored" her, or wilfully and without good cause withdrawn her from his service. (See HUSBAND AND WIFE.)

This branch of the law has become in modern times one of great extent and importance, particularly in the administration of such great departments of business as railways. The general rules of law will be applied to corporations acting as masters, as well as to individuals. (For further information consult Smith on *Master and Servant;* Redfield on *Railways;* Kent's *Commentaries;* lecture on this topic.) There is some legislation in England concerning "laborers" and "servants of husbandry." This has not been copied in this country. (For peculiar rules concerning seamen consult SEAMEN.) T. W. DWIGHT.

Master in Chancery, in former times an officer in the English court of chancery who acted as general assistant to the judge, and performed much of the administrative and collateral business of the court. These officers were twelve in number, of whom the master of the rolls was the chief. (See MASTER OF THE ROLLS.) The practice of appointing them grew up at a very early period in the history of English law. Their principal functions were the hearing of references of causes, the taking of affidavits and acknowledgments, the examination of witnesses in certain cases—as, *e. g.*, for the perpetuation of testimony—the taking of recognizances, etc. When a suit involved a matter of account, particularly if this were long and complicated, it became the usual practice to refer its settlement to a master. The masters also examined upon reference the propriety of bills in equity, and if report was made that a bill contained scandalous and impertinent matter, it was struck out. If no objection was made to the report or decision of a master in any case, it was the regular practice to perfect and confirm it by a judicial order. Within a comparatively recent period the office of master in chancery has been abolished in England by statute (15 and 16 Vict. ch. 86), and the duties which formerly devolved upon this officer are performed by the judges and registrars. In the U. S. there are still masters in chancery in some of the States. In those which follow the New York code of procedure it is the usual practice to refer matters of account and other incidental business in equity to attorneys-at-law or solicitors for settlement or determination, who are in such a case styled technically "referees." In performing such functions they have much the same powers as masters in chancery formerly possessed. (For further information as to masters in chancery consult Spence, *Equitable Jurisdiction of Courts of Chancery,* Daniell's *Chancery Practice,* Barbour's do.)

GEORGE CHASE. REVISED BY T. W. DWIGHT.

Master of a Ship (law), the chief officer of a merchant vessel, having supreme command of the crew and the sole management of the ship, often in common speech called the "captain." This office, with its peculiar legal functions, is very ancient; it is described in the *Laws of Oléron,* which appeared in the twelfth century in the Italian *Consolato del Mare,* a collection or digest of the principal commercial usages of the thirteenth century, and in other maritime codes of the Middle Ages. The master is appointed by the owners of the vessel, and as an agent represents both them and the owners of the cargo. He is clothed with very great powers in respect to the ship, the cargo, and the crew, and while in foreign countries his authority to act for and to bind his principals exceeds that of any other regular commercial agent, and is almost unbounded. (For a full description of his powers, duties, and functions see SHIPPING.)

Master of the Rolls, one of the judges of the court of chancery in England, before whom equitable causes may be heard in the first instance. He possesses co-ordinate jurisdiction with the three vice-chancellors. (See COURTS.) Appeals may be taken from his decisions to the court of appeal in chancery or to the lord chancellor. This specific title was given to him originally because he had the custody of the public rolls and records. This custody, however, was gradually withdrawn from him, and vested in officers not in his appointment, but has in recent times been restored to him by statute (1 and 2 Vict. ch. 94). He was formerly chief of the masters in chancery until this office was abolished. (See MASTER IN CHANCERY.)

GEORGE CHASE. REVISED BY T. W. DWIGHT.

Mas'tersingers [Ger. *Meistersinger*], the name of a peculiar kind of literary guild or association which was formed in various German cities in the fourteenth and fifteenth centuries, when poetry had died out at the courts among the Minnesingers, and was taken up by the burghers. The productions of these schools have comparatively little poetical interest, and as the invention of some novelty in form was the condition of becoming master of the guild, hunting after novelties soon drove the form into absurdity. (For interesting information of this peculiar phenomenon see Puschmann, *Gründlicher Bericht des Deutschen Meistergesangs* (Görlitz, 1573), and Wagenseil, *Buch von der Meistersinger holdseligen Kunst* (1697).)

Mas'tic [Gr. *μαστίχη*; literally, *chewing* substance, because it was used as a masticatory by the ancients as now by the Orientals], a valuable gum-resin used as an ingredient of many varnishes. Alone, it is transparent, tough, brilliant, and delicate, and is often employed in finishing maps and paintings. It is obtained from cuts in the bark of *Pistachio lentiscus, P. Atlantica,* etc., shrubs of the order Anacardiaceæ. It comes from Barbary, the Levant, and especially from China. It has a limited use in medicine and in mounting objects for the microscope, and in dentistry is a temporary material for filling decayed teeth.

Mas'tiff [L. Lat. *mastivus*], a name applied to several distinct breeds of large watch-dogs. The old English and Irish mastiffs (breeds which are unfortunately now nearly extinct) resemble the bull-dog in courage and strength, but excel him in magnanimity, faithfulness, and affection for man. The mastiff is a most dangerous enemy. The Thibet mastiff, from Central Asia, is one of the largest of the dog tribe. He is bred both as a sheep-dog and as a defender of the house. The so-called Cuban bloodhound is really a mastiff of Spanish origin, but in ferocity and blood-thirstiness appears to excel all other breeds.

Mas'tin (CLAUDIUS HENRY), M. D., LL.D., b. in Huntsville, Ala., June 4, 1826; educated at the University of Virginia; began the study of medicine in 1846; was a private pupil of the distinguished Dr. George B. Wood, and graduated M. D. in the University of Pennsylvania 1849; went to Europe in 1850, and studied in London, Paris, and Edinburgh. Returning, settled in Mobile, where he has since practised, chiefly as a surgeon, in which capacity he served in the Confederate army. In Mar., 1874, delivered the annual address before the medical alumni of the University of Pennsylvania, and that institution conferred upon him the honorary degree of LL.D. in 1875. Dr. Mastin has contributed valuable articles to medical journals, and is a most excellent surgeon. PAUL F. EVE.

Mas'todon [Gr. *μαστός*, a "nipple," and *ὀδούς*, a "tooth"], an extinct genus of Tertiary and Quaternary quadrupeds of large size, belonging to the order Proboscidea, and closely related to the elephant and the mammoth. They are distinguished from those animals principally by the more simple structure of the crowns of the molar or grinding teeth. These teeth, according to Owen, are seven on each side, above and below. The first two, at least in the upper jaw, are followed by vertical successors, but the remaining teeth displace one another from behind forward, usually not more than two of each series being in use at one time, or eight in all. The molar teeth have wedge-shaped, transverse ridges, and the summits of the ridges are divided by a depression lengthwise with the tooth, and further subdivided into smaller cones, more or less resembling the teats of a cow, whence the name, meaning "nipple-tooth." The form of these teeth is of peculiar interest, as being intermediate between those of ordinary herbivorous ani-

mals and the complex teeth of the elephant. In the common American species, *M. Americanus* (*Ohioticus*, *giganteus*), the posterior molars are crossed by three to five such ridges, the last molar above and below being subject to some variation; but in the three teeth preceding the last there are three such ridges, and this form was taken by Dr. Falconer as the type of his sub-genus *Trilopodon* ("three-crested"). *M. longirostris* of Europe has four such ridges on the corresponding teeth, representing his sub-genus *Tetralophodon* ("four-crested"). *M. Sivalensis* has five ridges, while another group, considered by that author as intermediate between *Elephas* and *Mastodon*, and named *Stegodon*, has six or more such crests. These ridges are built up of dentine or the bony substance of the tooth, and covered by a layer of enamel. The fangs and base of the tooth are further covered by a coating of cement, which in the typical *Mastodon* extends only in a very thin layer over the enamel of the crown, while in *Stegodon* it is present in considerable quantity in the valleys between the crowded ridges. In the elephant the same process has been carried still further. The ridges of dentine coated with enamel have become numerous, thin, and proportionally high, and the intervals are filled with cement, which also invests the whole crown of the tooth. As such a tooth becomes worn by use the grinding surface will present a series of ridges of enamel crossing the tooth, and uniting with each other in pairs at the sides of the tooth, so as to enclose an elongated area of dentine. Each of these areas represents a section of a dentinal ridge, while between the areas, and continuous with the exterior of the tooth, is a layer of cement. Both the cement and dentine, being softer than the enamel, will be worn into hollows alternating with ridges of that material.

The coarser teeth of the *Mastodon* indicated a coarser food than that of the elephant, and the remains of twigs and branches of trees, especially spruce and hemlock, found in the position of the stomach of some mastodon skeletons, have given very positive evidence as to the nature of their food. There were no canine teeth, but two of the upper incisors were developed in the form of tusks, like those of the elephant. These were also preceded by a pair of deciduous tusks, and in some species were provided with a band of enamel upon their surface. Shorter tusks were also present in the lower jaw of many and perhaps all the species. These were early deciduous in the females, and in the males one, usually the right, was frequently retained. The skull was massive, but considerably lightened by air-cavities. The form and position of the nasal opening, as well as the shape of the nasal bones, indicate the presence of an elongated and flexible proboscis, and the necessity of such an organ is shown by the shortness of the neck, the vertebræ of which are much compressed longitudinally and flattened. All the vertebræ are short, with the neural spines of the thoracic region elongated. The *M. Americanus*, the earliest and best known species, has been very fully described under the name *M. giganteus* by Dr. J. C. Warren, the description being mostly drawn from a very perfect skeleton discovered in a swamp at Newburg, N. Y. This skeleton measures 11 feet in height, and 17 feet in length to the base of the tail. The entire length of the tusk is 10 feet 11 inches, about 2½ feet being included in the socket. The fore foot measures nearly 2 feet across. The bones were massive compared with those of the elephant. When alive this animal must have been 12 or 13 feet high, and, including the tusks, about 25 feet long. Other skeletons more or less complete have been discovered in Orange co., N. Y., in New Jersey, Indiana, and on the banks of the Missouri, while isolated bones and teeth have been found in nearly all parts of the U. S. and in Canada. This species seems to have been confined to the Quaternary. At the same time there were living at least two species in South America, the *M. Andium* and *M. Humboldtii*, the former species extending into the southern parts of this continent. From the Pliocene of Nebraska, Dr. Leidy has described a species, *M. mirificus*, smaller than *M. Americanus*, and with a greater number of transverse ridges upon its molars. *M. obscurus* was first described from the Pliocene of Maryland, and remains of the same or a closely allied species have since been found in North Carolina, Georgia, California, and New Mexico. This species closely resembled the *M. angustidens* of Europe, and like that species was provided with a band of enamel upon the tusk. No American species are known earlier than the Pliocene, but in Europe *M. longirostris* and *M. tapiroides* are from the Miocene, and the explorations of Capt. Cautley and Dr. Falconer have made known several species from the Sewalik Hills of India, which are referred to the Miocene. Below that formation no species have yet been discovered. O. C. MARSH.

Mastodonsau'rus [Gr. μαστός, a "nipple," ὀδούς, a "tooth," and σαῦρος, a "lizard"], an extinct genus of Amphibia. (See LABYRINTHODON.)

Masû'di, or **Al-Masûdi** (ALI-ABUL-HASSAN), b. at Bagdad about the close of the ninth century; received a brilliant education and spent many years in travel. The Mohammedan power and the Arabic language were then at their highest development, and Masûdi visited and described many regions which no writer of his race and creed had seen, including the shores of the Caspian, Persia, India (perhaps even China), Madagascar, Arabia, all the countries of North Africa, and Spain. His later years were passed in Palestine, Bassora, Antioch, and Damascus, and he d. in Egypt in 956. His work, embracing the geographical and historical results of his travels, is the most celebrated of its kind in the Arabic language, and abounds in curious information illustrating the manners, morals, and beliefs of the time. It is styled *Meadows of Gold and Mines of Gems*, and is but an epitome of a larger work, now lost, called the *History of the Times*. The *Meadows of Gold* has been frequently printed, and a partial English translation was published by Dr. A. Sprenger in 1841 under the title of *El-Masûdi's Historical Encyclopædia.* Other works of Masûdi are extant in MS., and several others have been lost.

Masulipatam', seaport of British India, the capital of a district of the same name in the presidency of Madras, at the mouth of the Kristnah, in lat. 16° 10′ N. It carries on a considerable trade, as its harbor is the only place on the whole eastern coast of the Deccan where the heavy surf allows large vessels to cast anchor; from October to December, however, no ships can arrive on account of the monsoon. Pop. 27,884.

Mat, or **Matting** [Ang.-Sax. *meatte*], a coarse textile fabric made by weaving grasses, rushes, palm-fibre, bark, and the like, and used for summer floor-covering, for packing furniture and other goods, as material for bags, as covering for hotbeds and cold-frames in gardens, etc. In rude nations matting is used instead of sailcloth. Vast quantities of "bass matting," made from the inner bark of the European linden tree (*Tilia*), are made in Northern Russia. Nearly all kinds of Russian exports are packed in this material, which has an extensive sale. Chinese or Canton matting is made from rushes, as are the excellent mats of the Japanese. The Mauritius exports sugar and grain packed in mats, which are made of the leaves of a tree. When washed they are sold very cheaply. The beautiful India matting is woven from a sedge, the *Papyrus Pangorei.* In Portugal and Spain very handsome mats are made from Esparto grass and reeds. Mats are also made from coir or cocoanut and other palm fibres. These are used for covering the floors of public halls, and are very durable. The Japanese make mats so soft and elastic that they are used as bedding.

Matagor'da, county of Texas, bounded S. by the Gulf of Mexico and Matagorda Bay. Area, 1334 square miles. It is traversed by the Colorado River, and has large tracts of alluvial lands of the richest description. Live-stock and cotton are leading products. The county is well timbered near the streams. Cap. Matagorda. Pop. 3377.

Matagorda, post-v., cap. of Matagorda co., Tex., on the N. shore of Matagorda Bay, has 5 churches and several schools. It is an old Spanish town, and a favorite summer resort. Pop. 386. During the severe storm of Sept. 15–20, 1875, which visited this section of the Texas coast, Matagorda was submerged, with much loss of property and a few lives. (See INDIANOLA.)

Matagorda Bay, an extensive bay of Calhoun and Matagorda cos., Tex. It receives the waters of the Colorado River, and Lavaca Bay, one of its arms, receives Lavaca River. The land about the bay is flat and much cut up by bayous, but a part affords rich pasturage. The entrance to the bay is by Pass Cavallo. Matagorda Peninsula, which separates the bay from the sea, is a low sand-spit, often marshy, and in some places is overflowed completely by high tides. Indianola, Port Lavaca, and Matagorda are the principal towns on the bay, which is the channel of much commercial activity.

Matagorda Island, a long sandy island in Calhoun co., Tex., separating Espiritu Santo Bay from the Gulf of Mexico. Its N. E. end reaches Pass Cavallo, and has an iron lighthouse with flashing light; lat. 28° 20′ 49″ N., lon. 96° 23′ 30″ W.

Matamo'ras, or **Matamoros,** a frontier town of Mexico, state of Tamaulipas, on the Rio Grande, 40 miles from its mouth. It has considerable trade, exporting horses, hides, wool, and metals, and importing manufactured goods of all kinds. Pop. 12,000.

Matamoras, a v. (NEW MATAMORAS P. O.) of Grand View tp., Washington co., O., on the Ohio River. Pop. 406.

Matamoras, a v. of Lykens tp., Dauphin co., Pa. Pop. 143.

Matamo'ros (Gen. Mariano), b. in Mexico about 1770; was in 1811 priest of the village of Jantelclco, in the district of Cuernavaca, when the excesses of the Spanish soldiery induced him to join the insurgents who had proclaimed independence. He went to Izucar, S. of Puebla, then held by the celebrated chieftain Morelos, who, being himself a priest, received him with great favor, and at once made him a colonel. In that capacity he soon showed such decided military talent as to be called "the right arm of Morelos," and the heroic defence of Cuantla (1812) was largely due to his efforts. He bore a distinguished part in the successful expedition against Oaxaca, and was in command at the signal victory of San Agustin del Palmar (Oct., 1813). Had he then exercised supreme power, Mexican independence would probably have been established; but Morelos, having resolved to attack Valladolid, was repulsed and his forces shattered at the battle of Puruarán, in which Matamoros was captured. He was shot a few days later at Valladolid (now Morelia) Feb. 13, 1814. His remains at a later day were placed with those of Hidalgo and Morelos in the cathedral of Mexico, and his memory has been honored by giving his name to an important city, as well as to numerous towns and districts. Alaman, in his *History of Mexico*, characterizes Matamoros as the best military genius among the insurgent leaders.

Matan'zas, town of Cuba, on the northern shore of the island, at the head of a beautiful bay of the same name, 52 miles E. of Havana, with which it is connected by two lines of railway, is well built, and contains one of the best educational institutions in the West Indies, the Empresa Academy. It is fortified, has a good harbor, and carries on a very considerable trade; in 1867 it exported 1,725,699 cwts. of sugar and 1,212,587 cwts. of molasses. Pop. 36,102.

Mataro', town of Spain, in the province of Barcelona, on the Mediterranean. It has large manufactories of cotton, sailcloth, and glass, iron-foundries, and shipbuilding docks. Pop. 15,861.

Matawan', post-v. and tp. of Monmouth co., N. J., 28 miles from New York City, on the Matawan Creek. It contains 1 institute, 4 churches, 2 hotels, 1 bank, 1 newspaper, a fine public hall, and a number of stores. Pop. 2839.

D. A. Bell, Ed. "Journal."

Matches, fine sticks or splinters of inflammable material tipped with a substance yet more inflammable to facilitate ignition. Our English word—like the Fr. *mêche*, a "wick," a "lock of hair;" the Port. *mecha*, a "match or wick;" It. *miccio, micco*—is derived from the Mid. Latin, *myxa, myxus*, the "wick or snuff of a candle," a modification of the Gr. *μύξα*, "mucus;" *μύξα*, which also signifies the nozzle of an antique lamp, is traceable to the Sanskrit *muc, muncāmi*, to "throw away," to "scatter." The earliest matches of which we have any record were thin strips of wood about six inches long and tipped with sulphur or brimstone. These were first used with the old tinder-box, one being applied to the smouldering tinder, into which a spark had been struck with flint and steel; but they were also employed in conjunction with more rapid means of obtaining light. Phosphorus, discovered in 1677, was first applied to common lighting purposes by Godfrey Haukwitz, who in 1680 found that a minute portion rubbed between folds of brown paper would take fire and ignite a sulphur match brought in contact with it. But as phosphorus was for some time very costly, neither this invention nor others necessitating its use could be of general service. Among the best of these inventions was a small bottle in which a piece of phosphorus had been stirred with a hot wire so as to coat its interior with oxide of phosphorus; the bottle was kept tightly corked except when a light was required, then the cork was withdrawn, and a sulphur match was dipped in and thus ignited. Oxymuriate matches, a much later invention, were strips of wood tipped first with sulphur, then with a paste of chlorate of potash, gum, and sugar, colored with vermilion. They were sold in small boxes with double compartments, in one of which fitted a little bottle containing a piece of asbestos soaked in oil of vitriol; a match dipped into this bottle ignited immediately. But the plan had its disadvantages, for the oil of vitriol was dangerous to carry about, and soon deteriorated from exposure to the air. The first friction matches, or *lucifers*, invented in 1829, were tipped with a paste of chlorate of potash, sulphate of antimony, and starch, and were ignited by being drawn between folds of sand-paper. For greater safety they were made in the shape of a comb, twelve or fifteen together, and were broken off as required. When first introduced into America they were called *locofoco*, a jingling term with no apparent meaning, unless its second part be the Italian *fuoco*, "fire." In 1835 the expression became the nickname of a political party. A meeting having been called by the New York Whigs, the Democrats, in order to obtain possession of the hall where it was held, blew out the candles, and after their opponents had left the building relighted them with these matches. Thence the name *Locofoco* was given to the Democrats, and retained for about thirty years. The sand-paper for lighting was after a time gummed on the box, so that the lucifers could be drawn across it. So noisy was this operation that the matches were called congreves, after the rockets of that name. It was also dangerous, for such pressure was needed to light a match that its top was liable to be forced off and to ignite after falling on the carpet or on people's clothes. But in 1834, more than a century and a half after the discovery of phosphorus, that substance was employed in making a safer and more agreeable match, to which the old names congreve and lucifer were applied.

Those workpeople who have to do with the igniting composition are subject to necrosis of the lower jaw, called the "jaw" or "match" disease, or "the flute." It begins with toothache, gradually becoming more intense; the teeth decay and fall out, and then the decay extends to the jawbone, causing intense pain, which never ceases until a surgical operation or death relieves the sufferer. In bad cases the whole lower jawbone may be lost, and the disease, even when cured, causes terrible disfigurement. Some German manufacturers refuse to employ persons whose teeth are in the least decayed, as they are more readily attacked. It is said that cleanliness, ventilation, and constant attention to the teeth are almost infallible preventives of the jaw disease; workers in large factories, whose masters can and do spend money on sanitary arrangements, are therefore comparatively safe. But very different is the case of those employed in small factories, or, as too often happens, making matches clandestinely in their own homes. They, says Tomlinson, "are never free from the fumes. Their clothes are luminous in the dark, and in the daytime white fumes may be seen ascending from them. In some cases they eat and sleep in the room where the matches are made, and the materials when not in use are kept under the bed." In the matches made by these poor creatures the phosphorus sometimes "forms four-ninths of the igniting paste, while in proper factories 1 pound of phosphorus to 20 pounds of the other ingredients would be thought excessive." All danger of disease is avoided by substituting red phosphorus for the common kind. The use of machinery in matchmaking is much to be desired, as lessening the risk of accident and disease, and diminishing the number of women and young persons employed in the more unhealthy processes. Machines have been invented for dividing the wood into blocks, for cutting splints, round and square, for separating the double matches, for dipping, and for cutting and folding the wooden boxes. The consumption of matches is enormous, 95 per cent. of all the phosphorus made being employed in their manufacture. According to Muspratt over 300 tons of phosphorus are fabricated annually in Europe, and as 1 pound of this substance will make 1,000,000 matches, some idea of the number manufactured may be arrived at. Timber and labor being very cheap in Austria and some parts of Germany, matches are there made in specially large quantities. Janet Tuckey.

Matè, or Paraguay Tea [Sp. *yerba de matè;* matè is properly the vessel in which it is prepared], the dried and broken leaves and shoots of *Ilex Paraguayensis* and several other species of *Ilex* (order Aquifoliaceæ), shrubs which grow in Brazil and Paraguay. The leaves are gathered in great quantities, dried by artificial heat, and stored away for several months to cure. They are then sent to market, and are an important article of commerce. Matè is used in most parts of South America much as we use tea and coffee, like which it abounds in caffeine. It is drunk in large quantities in an almost boiling state, and has the general properties of tea and coffee.

Mate'lica, town of Italy, in the province of Macerata, about 30 miles from the town of Macerata. This place contains interesting works of art, and its secret archives are very curious. It was an important town during the Roman period, many vestiges of which still exist, and it was the scene of much turbulence during the Middle Ages. Woollen cloths are now largely manufactured here. Pop. in 1874, 7298.

Mate'ra [prob. *Mateola*], town of Southern Italy, in the province of Potenza, situated in a plain flanked by two deep valleys and surrounded by smiling hills. It contains several well-built churches and a remarkable chapel, San Pietro Barisano, consisting of three naves, the whole excavated in a single huge block of stone. This town suffered cruelly from wars and earthquakes during the Middle Ages. The present inhabitants are mostly agriculturists or shepherds. Pop. in 1874, 14,312.

Mate'rial Cause, in ontology, the first of the four kinds of causes distinguished by Aristotle and accepted by

later metaphysicians. As defined by him, the material cause of a thing is the physical basis of its existence—namely, the matter from which it was formed or developed; *e. g.* the block of marble from which a statue is carved. The material cause of a thing is thus partly, but not absolutely, identical with the thing itself (*das Ding an sich*). In the instance cited a portion of the material cause, or block of marble, must be eliminated in order to arrive at the semblance of the pre-existing type—*i. e.* the finished statue.

Materialism [Lat. *materia*, "matter"]. In general, materialism is the doctrine that nothing exists but matter with its sensible properties. It is opposed to idealism, the doctrine that nothing exists but mind with its ideal phenomena; and it may be distinguished from spiritualism, which maintains the existence of mind or spirit as well as matter, and from dualism, which seeks to co-ordinate the two as distinct essences in man and in nature. It might also be distinguished from some kinds of sensualism or sensationalism, which imply the separate substance of the mind, though they derive its ideas through the senses from material impressions. In its extreme form it would resolve all spiritual beings and phenomena into mere illusions, or explain them as refined material manifestations. Rightly to appreciate it as a philosophical doctrine we must briefly trace its history and modern phases, the problems it has raised, and the terms of their solution.

Materialism, says its latest and best historian, Lange, is "as old as philosophy, but not older." It could not arise until men began to reflect upon the spiritualistic religions which everywhere prevailed, and it would then be among the first attempts to explain their seeming inconsistency with natural phenomena, and construct in their place a purely rational theory of the world and of the nature and destiny of man. Grecian materialism led the way. While the systems of the Orient—unless the Chinese be excepted—continued to be dualistic, and even largely idealistic in their tendency, the Greek philosophers, Leucippus, Democritus, and Epicurus, speculating upon the origin of the universe, posited an infinite number of atoms or refined particles of matter combining and recombining in mathematical proportions throughout space and time, until, after endless trials, all existing things have been produced. In these systems not only were solid objects, plants and animals, regarded as mere masses of compounded atoms, but also the souls of men, which were supposed to consist of ethereal and luminous particles diffused like air or light through the body, and dispersed with it at death; and even the gods themselves were fancied as atomic beings or dream-like images in human form, dwelling in the interspaces between the worlds in happy indifference to the course of nature and the affairs of mortals. Roman materialism followed as little more than a reproduction of the Grecian, and had its chief representative in Lucretius, who expounded the doctrines of Epicurus in a majestic philosophical poem, *On the Nature of Things*. Traces of Epicureanism are also to be found in the writings of Horace, Virgil, and other men of letters, but it did not maintain at Rome the high ethical character which it had claimed among the Greeks, having been so bitterly assailed by the Stoic philosophers that the very name has since remained a synonym for sensual pleasure.

Italian materialism rose with the classical revival as a mock compromise between the dogmas of the Church and the speculations of the Alexandrian school of Aristotle. The leader of the movement, Pomponatius, until silenced by a decree of the Lateran Council, held the mortality of the soul, the necessity of the will, and the embodiment of God in nature. And subsequently the systems of Democritus and Epicurus were partially revived by Telesius, Campanella, and Magnenus, and at length fully sanctioned by Peter Gassendi, a French ecclesiastic, whose learned defence of Epicureanism as consistent with Christianity has caused him to be styled the father of modern materialism.

English materialism at the same time was opening new paths with greater boldness and freedom. Thomas Hobbes, in a work well named *Leviathan*, described the soul as a corporeal substance receiving ideas as material images, the state as an incarnation of absolute power, and God himself as but a name for the incomprehensible omnipotence of nature. He was followed by Locke, sowing the seeds of a sensual materialism, not only by deducing all ideas from sensation through reflection, but by suggesting that reflection itself might be a property of matter. And upon this system the free-thinkers Layton, Coward, and Collins espoused anew the materiality and mortality of the soul and the mechanical necessity of the will, while more devout philosophers, such as Dodwell, Hartley, and Priestley, sought to reconcile the same views with the Christian faith.

French materialism grew out of the previous systems under the combined influence of Gassendi and Locke. The Abbé Condillac, as a disciple of the latter, illustrated the process of transforming sensations into ideas by an imaginary human being encased in marble and allowed to acquire successively the different senses and combine their impressions by acts of attention, memory, and judgment. It would seem to have been but a step farther for La Mettrie, in his treatises *On Man a Machine* and *Man a Plant*, to reduce the mind to a mere perishable mechanism or organism. And at length the Baron d'Holbach, in his *System of Nature*, brought materialism to the climax of impiety, as well as sensuality, by not only denying the existence of mind, freedom, and immortality, and maintaining the eternity of matter, the indestructibility of force, the immutability of physical law, but by assailing virtue, religion, and God as mere superstitious fictions.

German materialism has since followed under a reactionary impulse against the long-prevailing idealism. Schopenhauer had already substituted his Universal Will or Force for the Absolute Reason of Hegel; Feuerbach had resolved his ideas into phosphates; and it has only remained for Moleschott, Vogt, and Büchner, in the light of these speculations, to revive the materialism of La Mettrie and D'Holbach with illustrations drawn from recent physical research.

It is evident from this glimpse of the history of materialism that numerous questions have arisen from time to time through its conflicts with opposing doctrines, and it will be found that these questions have at length been brought to definite issues in our day as if for final settlement. A preliminary question is the essential nature of matter. The idealist, distinguishing between matter in itself and as it appears to us, begins by referring certain of its properties, such as light and sound, to the percipient subject as without objective reality; then adds to these the other more metaphysical properties of extension, impenetrability, figure, even space and time; and thus ends by resolving all matter into mind. But the materialist, reversing the process, starts with the idea of matter as an external independent something which he divides into invisible atoms, distributes through space and time, endows with motion, life, even sensation and thought, until at length he has resolved mind itself into mere matter. Such extremes were reached in the opposite systems of Berkeley and D'Holbach.

The next question is the connection of matter with force, or materialism as opposed to dynamism. Newton, though an atomist, could only conceive of force as an expression of mind, of some voluntary agent imparting it to the ultimate atoms of matter in the form of attraction, repulsion, and other properties; Leibnitz regarded the atoms themselves as intrinsically active substances termed monads; and Boscovich, in his dynamic theory, treated them as mere metaphysical points or centres of attraction and repulsion, thus virtually resolving all matter into force. But the modern materialists, Moleschott and Büchner, seem to have reverted to the atomic theory of Leucippus, maintaining the properties of attraction, repulsion, affinity to be inseparable from the particles which manifest them, and even inconceivable without them; thus apparently resolving all force into matter. It is their maxim, "No matter without force; no force without matter."

Another consequent question is the connection of matter with life, or materialism as opposed to vitalism. In the early speculations upon organized beings there was always supposed some immaterial principle or cause of life, such as the *psyche* of Pythagoras, the *archæus* of Paracelsus, and the *anima* of Stahl, who went so far as to imagine that it unconsciously moulds the body and presides over all its functions. Berthez termed it the vital principle or force, to distinguish it from the physical and chemical forces which govern inorganic matter, and Bichat lodged it in the animal tissues under the name of the vital properties. But since Buffon vainly endeavored to distinguish between organic and inorganic molecules, the course of materialistic speculation has tended to obliterate the distinction between living and dead matter by referring one vegetal and animal process after another to purely physical and chemical laws. Prof. Huxley has lately maintained that "protoplasm," the original organic matter of all living beings, is composed of the same atoms as ordinary lifeless matter, and differs from it only in the manner in which they are aggregated; so that there is no more reason for explaining vital phenomena by a supposed principle of vitality than to speak of aquosity as the cause of water.

A still more important question is the connection of matter with thought, with mind, and with will, or materialism as opposed to spiritualism. The soul was carefully distinguished from the body by Descartes as a thinking substance; by Leibnitz as a conscious monad; and more

recently by Herbart, Beneke, and Lotze as a spaceless essence, spiritual atom, or force endowed with the immaterial properties of thought, free-will, and immortality. The opposite school, however, since Locke suggested the possibility of cogitative matter, has been steadily undermining this fundamental distinction, and reducing the mental faculties to physical functions and processes. Carl Vogt, even more grossly than Cabanis, has described the brain as an organ secreting thought; Maudsley has defined the mind scientifically as an exalted natural force developed from the other chemical forces of the body; and Huschke has likened the relation between thought and the molecular movements of the brain to that between color and the vibrations of ether. Others have pushed such views to their moral consequences by merging the will in mere animal automatism, and declaring the only immortality to be that of the disintegrated body whose atoms may chance to enter future generations of men.

All these questions have at length been brought together under the modern hypothesis of evolution, thus opposing materialism to theism or dualism. In the early cosmogonies, both heathen and Christian, some immaterial principle or Intelligent First Cause was supposed to have moulded and fashioned chaotic matter into worlds, and gradually produced plants, animals, and man by specific acts of creation, with definite forethought and design. Of late, however, this dualistic conception of God and the world as distinct existences, the former creating the latter, has been disappearing before a system of materialistic monism which would derive the universe from matter alone as the sole original substance, without the agency of any mind or intelligent purpose. Büchner has revived the doctrines of Democritus and D'Holbach in their baldest form, maintaining the absolute eternity, infinity, and indestructibility of matter as the only real existence. Herbert Spencer, after representing a Creator as utterly inconceivable and unknowable, has proceeded to unfold the whole knowable universe out of mere persistent force, acting under laws, from the primitive nebula up to the highest forms of human society. Prof. Huxley suggests that the existing world once lay potentially in the cosmic vapor, so that the present state of the fauna of Great Britain might have been predicted from a knowledge of the primitive forces and molecules. And Dr. Tyndall has lately startled religious as well as scientific circles by proclaiming from the presidential chair of the British Association that he discovers in the original matter of the world the promise and potency of every quality of life. While some advocates of the new scientific materialism, as the last named, take an indifferent position in reference to theism, others are pressing it to the most atheistic and irreligious consequences.

For a full discussion of these different questions the reader must be referred to the opposing authors that have been named. It will be enough in this place to state the general principle applicable to them all—that while materialism has never adequately explained the phenomena of life, intelligence, and creation, spiritualism affords a consistent account of the material world and retains any elements of truth involved in the other system, as may be shown by the fact that nearly every materialistic school has had its Christian advocates endeavoring to reconcile it with the spiritual doctrines of Holy Scripture. It should also be observed that ethical as distinguished from scientific materialism, or sensualism, has usually flourished in corrupt states of society as both a cause and consequence of decaying civilization, while spiritualism has generally exercised a refining and ennobling influence, and done good service in the cause of virtue and religion. (Consult the valuable work of Prof. A. Lange, *History of Materialism;* and compare Büchner, *Matter and Force;* Paul Janet, *Recent Materialism;* Maudsley, *Physiology and Pathology of Mind;* Leacock, *Mind and Brain;* Huxley, *Lay Sermons;* Lionel Beale, *Protoplasm, or Matter and Life;* and the controversial literature called forth by Prof. Tyndall's *Address to the British Association at Belfast.*) C. W. SHIELDS.

Materials, Strength of. See STRENGTH OF MATERIALS.

Mate'ria Med'ica [Lat.], a phrase used to designate the substances used in the practice of medicine. But as the art of the physician embraces the scientific use of articles in common vogue, as food and drink, and of moral and hygienic influences, fully as much as of drugs, it is plain that the term *materia medica* cannot be used to designate a definite group of substances, but is simply a convenient phrase by which to refer to the weapons of the physician in general. So far as drugs are concerned, they are derived principally from mineral and vegetable sources, though some few are of animal origin. They are commonly classified according to their effects on the animal system in health or disease. But inasmuch as the majority produce an effect more or less complex, as these combinations of effects are almost endless, and as even with the same drug the effect varies with varying circumstances of dose or state of the patient, it follows that an accurate division of medicines into groups on the basis of their effects on the living organism is simply impossible. Such terms as irritant, anodyne, astringent, etc. must therefore be taken as defining simply a kind of effect, not as designating a distinct group of medicines. The meaning of these various terms and the uses of each drug will be found described under the individual headings. EDWARD CURTIS.

Mathemat'ics [Gr. μαθηματική], the science that treats of the properties and relations of quantities. It is based on a few simple and universally admitted propositions, from which, as premises, the whole system is built up by a chain of rigid logical arguments. The science of mathematics is naturally divided into three branches: I. arithmetic; II. geometry; and III. analysis.

I. *Arithmetic* is that branch which treats of the relation of numbers expressed by the aid of figures and combinations of figures. It is divided into two parts. The *first* part treats of the methods of expressing numbers by the aid of figures, together with the fundamental operations that may be performed on them. It embraces notation and numeration, addition, subtraction, multiplication, division, raising numbers to powers, and extracting their roots, whether the units of the numbers are entire or fractional. It also treats of the transformation of numbers from one scale to another. The *second* part explains the methods of applying these principles to the practical wants of life. This part embraces the rule of three or proportion, percentage, practice, and a variety of other rules and applications.

II. *Geometry* is that branch which treats of the properties and relations of geometrical magnitudes—that is, of lines, surfaces, and volumes—to which may be added angles. In this branch we reason directly upon the magnitudes themselves, or upon their pictorial representations. Geometry is divided into two parts. The *first* part is called *elementary* geometry; it treats of those magnitudes whose elements are the right line and the circle. This part embraces all propositions relating to figures bounded by straight lines, circles or portions of circles, together with the surfaces of the sphere, cylinder, and cone. It also treats of all volumes bounded by plane surfaces, as well as of the volumes of the three round bodies, the sphere, the cylinder, and the cone. An immediate application of this part of geometry is to trigonometry, which considers the relations between the sides and angles of triangles, and also the properties and relations of the circular functions. Elementary geometry embraces the solution and construction of all geometrical problems which can be effected by the rule and compass—that is, by the straight line and circle alone. The *second* part is called *higher* geometry; it embraces all propositions relating to magnitudes whose elements are more complex than the straight line and circle, such as the conic sections and curves of a higher order, with the corresponding surfaces and volumes. It includes the higher investigations of the ancient geometers, of which class are the famous isoperimetrical problems from which originated the modern branch of *calculus of variations*. It also includes the noted problems of the duplication of the cube, the trisection of an angle, and the insertion of two geometrical means between two given lines. This part of geometry has been vastly extended by the modern researches of Monge, Carnot, Chasles, and others. An immediate application of this part of geometry is to the solution of geometrical problems requiring the aid of other instruments than the rule and compass. Among the applications of both parts of geometry, are descriptive geometry and its cognate branches. Descriptive geometry undertakes the graphical solution of all problems involving the three dimensions of space. In this branch of applied geometry lines are given by their projections on two rectangular planes of reference (called planes of projection), planes are given by their intersections with these planes, and surfaces are given by the projections of their characteristic elements. Descriptive geometry embraces within its scope the solution of all problems in shades and shadows, perspective, spherical projections, and stonecutting, together with many other problems in engineering and architecture. In many of its uses—as, for example, in perspective and spherical projections—but one plane of projection is employed.

III. *Analysis* is that part of mathematics in which the quantities considered are represented by letters and other symbols, and in which the operations to be performed are indicated by conventional signs. Analysis is usually divided into three parts—algebra, analytical geometry, and calculus. (1) *Algebra* investigates the properties and

relations of numbers analytically; it may be divided into *elementary* and higher or *transcendental* algebra. *Elementary* algebra explains the nature and use of the symbols employed, and teaches the method of interpreting results. It also treats of what are called the *ordinary operations* of algebra—that is, addition, subtraction, multiplication, division, raising to powers denoted by constant exponents, and extracting roots indicated by constant indices. It also investigates the properties and methods of solution of algebraic equations—that is, equations in which the relations between the known and unknown quantities are expressed by the ordinary operations of algebra. *Transcendental* algebra treats of quantities that cannot be expressed (in a finite number of terms) by the ordinary operations of algebra; such quantities are called transcendental. It also treats of transcendental equations, under which head are embraced logarithmic, exponential, and trigonometric formulas, and series of all kinds. (2) *Analytical geometry* is that branch of analysis which has for its object the analytical investigation of the properties and relations of geometrical magnitudes. In this branch of analysis the points of the lines and surfaces considered are referred to fixed objects by means of elements called *co-ordinates;* the relation between the co-ordinates of each point is then expressed by one or more equations, which are termed equations of the magnitude; and finally, the properties and relations of the magnitudes are determined by discussing these equations. Analytical geometry may be either determinate or indeterminate. *Determinate geometry* is that branch in which the conditions of the given problem limit the number of solutions; in this case there are as many independent equations as there are unknown quantities. *Indeterminate geometry* treats of the general properties and relations of lines and surfaces; in this case there are fewer equations than unknown quantities. The equations of magnitudes may be algebraic, or transcendental, and there are consequently two corresponding divisions of the subject. The first division treats of all lines and surfaces of the first, second, and higher orders. The second division treats of transcendental lines, such as the cycloid logarithmic curve, exponential curve, curve of sines, etc., together with the corresponding surfaces. Most of the processes of analytical geometry are facilitated by the use of the principles of the differential and integral calculus. (3) The calculus treats of relations of functions and of their laws of variation. It is divided into three general parts—*differential calculus, integral calculus,* and *the calculus of variations.* 1. The *differential calculus* explains the relations that exist between given functions and certain other functions that may be derived from them, called *derived functions* or *differential coefficients.* It treats of the properties of these differential coefficients, and of the methods of applying them in the higher branches of analytical geometry, and in those branches called mixed mathematics, such as mechanics, optics, astronomy, and the like. 2. The *integral calculus* is the inverse of the differential calculus. It explains the methods of passing from a differential coefficient back to the function from which it may have been derived; it also explains the methods of applying the principles of integration to the investigations of higher geometry and physical science. We are often able to find the differential coefficient of a function without knowing the form of the function; in such cases the integral calculus enables us to find the function itself. In this manner we may sometimes deduce important mathematical and physical laws. 3. The *calculus of variations,* which is usually regarded as the highest branch of mathematics, treats of the laws of variation of the forms of functions. Its principal object is to solve certain problems in maxima and minima which cannot be solved by the ordinary methods of the differential calculus. As an example, we may instance the problem of the *brachystocrone,* a problem in which it is proposed to find the curve along which a heavy body must move from one point to a lower one, not in the same vertical, in order that the time of descent may be the least possible. By means of the calculus of variations this curve is shown to be the arc of an inverted cycloid. This branch of the calculus was used, in an imperfect form, by Legendre, Euler, and other mathematicians, but it owes its complete development to Lagrange, who gave it the general form under which it is now employed. Lagrange applied the method of variations to physical investigation, making it the basis of a complete system of rational mechanics.

It will be noted that every principal branch of mathematics enumerated in this brief sketch consists of two parts. The first part has for its object to investigate the principles peculiar to that branch, and the second part shows how to apply these principles to science and the arts. The first part of each branch, as thus pointed out, belongs to the field of pure mathematics, and the second part may be termed applied or mixed mathematics. The former parts make up the *science* of mathematics; the latter may be considered as forming the *art* of mathematics. The *science* of mathematics forms an important element of a liberal education. It impresses the mind with clear ideas; it cultivates habits of close discrimination; it develops the powers of abstraction and generalization; it cultivates and expands the reasoning powers. The applications of mathematics aid in the discovery of new truths in science, and contribute vastly to the progress of every branch of art and manufacture. The mason computes the quantity of his material by the principles of geometry and the rules of arithmetic; the carpenter frames his building and adjusts its parts by the rules of practical geometry; the millwright computes the pressure of the water and steam, and adjusts all the parts of his machinery by rules evolved from analytical formulas; in fine, every workshop and manufactory is an embodiment by intelligent labor of some of the more difficult investigations of mathematical science.

W. G. Peck.

Mathematical Machines. See Calculating Machines.

Math'er (Cotton), D. D., F. R. S., son of Increase Mather and grandson of John Cotton, b. at Boston, Mass., Feb. 12, 1663; was trained by Ezekiel Cheever, and graduated at Harvard College in 1678; became a teacher, and in 1684 was ordained his father's colleague over the North church, Boston, having by persistent effort overcome an impediment in his speech; labored with great zeal as a pastor, endeavoring also to establish the ascendency of the churches and ministry in civil affairs, and in the putting down of witchcraft by legal sentences, a work in which he actively engaged. Author of *Memorable Providences relating to Witchcraft* (1689), *Wonders of the Invisible World* (1692), *Essays to Do Good* (1710), *Magnalia Christi Americana* (London, 1702), a very quaint and curious book, full of learning, piety, and prejudice; and other works, large and small, numbering 382, not reckoning his great *Illustrations of the Sacred Scriptures* and other unpublished writings. He was made D. D. in 1710 by the University of Glasgow, and F. R. S. in 1713. Mather, with all the faults of his early years, was a man of great excellence of character. He labored zealously for the benefit of the poor, for mariners, slaves, criminals, and Indians. His cruelty and credulity were the faults of his age, while his philanthropy was far more rare in that age than in the present. D. at Boston Feb. 13, 1728.

Mather (Increase), D. D., b. at Dorchester, Mass., June 21, 1639, son of Richard Mather; graduated at Harvard 1656, and at Trinity College, Dublin, 1658; preached in England and America; was ordained over the North church, Boston, in 1664; was president of Harvard College 1685–1701; received (1692) the first doctorate in divinity conferred in English-speaking America; procured in England (1692) a new charter for Massachusetts, which conferred upon himself the power of naming the governor, lieutenant-governor, and council; opposed the severe punishment of witches; author of 92 publications, large and small, of which one of the most noteworthy is *An Essay for the Recording of Illustrious Providences* (1684; republished London, 1856). D. at Boston Aug. 23, 1723.

Mather (Moses), D. D., b. at Lyme, Conn., Feb. 23, 1719; graduated at Yale College 1739; was minister of the Congregational church at Darien, Conn., sixty-two years; author of two theological treatises, and twice imprisoned in New York as a patriot during the Revolution. D. at Darien, Conn., Sept. 21, 1806.

Mather (Richard), b. at Lowton, Lancashire, England, in 1596; studied at Oxford; became parish minister of Toxteth, Lancashire; was silenced in 1634 for non-conformity; went to New England in 1635; was minister of Dorchester, Mass., 1636–69; did much to settle church discipline, and was an able writer. D. at Dorchester Apr. 22, 1669.—Three of his sons, Samuel, Increase, and Nathaniel, became noted divines. The latter, b. Mar. 20, 1630, preached many years in England and Holland; was a learned author; and d. at London July 26, 1697.

Mather (Samuel), b. in Toxteth, England, May 13, 1626; graduated at Harvard 1643; preached at Rowley and Boston, and at Oxford and Dublin, where he became senior fellow of Trinity, and wrote *Old Testament Types Explained and Improved* (1673). D. at Dublin Oct. 29, 1671.

Mather (Samuel), D. D., son of Cotton Mather, b. at Boston, Mass., Oct. 30, 1706; graduated at Harvard 1723; was ordained 1732, and held Congregational pastorates in Boston till his death, June 27, 1785; wrote a *Life of Cotton Mather* (1729); published several pamphlets, sermons, and short poems.

Mather (William Williams), LL.D., b. at Brooklyn, Conn., May 24, 1804; graduated at West Point 1828; as-

sistant professor of chemistry there 1829–35; first lieutenant in U. S. army 1834–36; professor of chemistry University of Louisiana 1836; engaged in the New York geological survey 1836–44; Ohio State geologist 1837–40; State geologist of Kentucky 1838–39; professor of natural science in the University of Ohio 1842–45; its vice-president and acting president 1847–50; editor of *Western Agriculturist* 1851–52; author of numerous geological reports and scientific papers. D. at Columbus, O., Feb. 27, 1859.

Math'ew (Theobald), D. D., known as "Father Mathew," b. at Thomastown, Tipperary, Ireland, Oct. 10, 1790; studied for a time at Maynooth College; joined the Capuchins at Kilkenny, and was ordained a Roman Catholic priest in 1814. He was distinguished for his laborious charities and his heroism at Cork, especially in the cholera season of 1832. In 1838 he organized the first total abstinence society in Cork. He afterwards travelled over all parts of Great Britain and Ireland, and induced hundreds of thousands to sign the temperance pledge. He labored 1849–51 in the U. S., and met with remarkable success. D. at Cork Dec. 1, 1856. (See his *Life*, by J. F. Maguire.)

Math'ews (Charles), b. in London June 28, 1776; after a brief apprenticeship to his father, a bookseller, went on the stage as an amateur, and then as comedian of the regular company at the Theatre Royal, Dublin; made his first appearance in London in 1803 as Jubal in *The Jew;* in 1818 introduced his *At Home*, and on his return from a successful trip to this country appeared in his specialty, a *Trip to America*, which was well received. D. at Plymouth June 28, 1835.

Mathews (Charles J.), son of Charles, b. in Dec., 1803; though intended for an architect, he adopted the stage as a profession, achieving remarkable success on his first appearance in public in *The Hunchbacked Lover;* in 1838 married Madame Vestris, at the time lessee of the Olympic Theatre; they visited the U. S., and on their return to England managed the Covent Garden and Lyceum theatres, but not successfully. His wife dying in 1857, Mathews again visited the U. S. in 1858 and married Mrs. Davenport, better known as Lizzie Weston; in 1860 introduced a similar entertainment to his father's *At Home*, in which his wife assisted; in 1863 made a successful professional trip to Paris, and in 1869–72 visited America and Australia, returning to England in 1873, in which year his wife died.

Mathews (Cornelius), b. at Port Chester, N. Y., Oct. 28, 1817; graduated in 1835 at the University of New York; admitted to the bar in 1837; author of successful plays, tales, poems, etc., and distinguished as an editor of various periodicals and as an advocate of international copyright; prepared *Indian Fairy Legends* (1868) from materials furnished by William Schoolcraft.

Mathews (George), son of Gen. George Mathews, b. near Staunton, Va., Sept. 21, 1774; was admitted to the Georgia bar 1799; was appointed judge of the superior court of Mississippi Territory 1805, and transferred in the same capacity to New Orleans 1806, and on the organization of the State judiciary became presiding justice of the supreme court of Louisiana, which post he filled until his death, at Bayou Sara Nov. 14, 1836. His decisions form an important portion of the jurisprudence of Louisiana.

Mathews (William), LL.D., b. at Waterville, Me., July 28, 1818; graduated in 1835 at Waterville College (now Colby University) and at Dane Law School, Cambridge. From 1841 to 1855 he was editor of the *Yankee Blade*. Since 1861 he has been professor of rhetoric and English literature in the University of Chicago, Ill. Has published *Getting on in the World, or Hints on Success in Life* (1872).

Mathi'as (Thomas James), b. in England about 1750; graduated at Trinity College, Cambridge, 1774; wrote a volume of *Runic Odes* (1781), imitated from the Norse; an *Essay on the Evidence relating to the Poems attributed to Thomas Rowley* (1783), sustaining the authenticity of the Chatterton poems; and a poem, *The Pursuits of Literature* (4 parts, 1794–97), issued in sumptuous style, with copious notes, chiefly devoted to a ferocious criticism of the literary favorites of the time. The work made a great sensation, and is still much sought. Mathias was for many years previous to 1818 treasurer of the household to Queen Charlotte. He published in 1805 an edition of Tiraboschi's *History of Italian Literature* (4 vols.), and in 1814 an edition of Gray's works. His last years were passed at Naples, Italy, where he d. in 1835. Mathias was proficient in the Italian language, in which he wrote several works.

Mathura, or **Muttra,** town of British India, in the presidency of Agra, on the Jumna, is a decaying and disagreeable place, but as the birthplace of Krishna it is highly venerated by the Brahmans, and visited by a great number of pilgrims. The shores of the river are provided with gorgeous flights of steps, and the city contains an immense temple, from which, however, foreign conquerors have carried away the idols of gold and silver with eyes of diamonds. Sacred apes are kept here; they are fed at the public expense, and allowed to do what mischief they like; swarms of holy parrots and peacocks are also maintained. Pop. 65,749.

Mati'co [Peruvian], the leaves of *Artanthe elongata* and *A. adunca*, shrubs of the order Piperaceæ, the former growing in Peru and the latter in various parts of tropical America. It is a stimulant and styptic, but not an astringent. It has valuable medicinal properties.

Matin'icus Plantation, tp. of Knox co., Me., consisting of Great Green Island (pop. 14), Matinic Island (pop. 13), and Matinicus Island (pop. 250). Total pop. 277. P. O., Matinicus. To the S. lies Matinicus Rock (lat. 43° 47′ N., lon. 68° 50′ 58″ W.), with two granite lighthouses, a fog-bell, and steam-whistle.

Mat'ins [Lat. *matutinus*, relating to the morning]. Specifically, the early morning service of the Church, as distinguished from vespers or even-song.

Matoa'ca, post-tp. of Chesterfield co., Va. Pop. 2595.

Mat'rix [Lat.], a term used in geology to denote the rock in which a mineral or fossil is imbedded.

Matsmai', town of Japan, on the southern coast of the island of Jesso, in lat. 41° 32′ N., lon. 140° E., at the head of a large bay which forms an excellent harbor. The number of inhabitants is sometimes stated to be 60,000, but the statement is the merest guesswork; nothing is known of the place. It has never been visited by a foreigner.

Mat'sys (Quentin), b. at Antwerp about 1450; was in youth a blacksmith; loving the daughter of an artist, he became a painter of great merit; and of his masterpieces, *The Descent from the Cross* is in the museum at Antwerp, *The Misers* in the gallery at Windsor, and the *Portrait of a Jeweller* in the imperial collection of Vienna. D. in 1529.

Mat'tacks (John), b. at Hartford, Conn., Mar. 4, 1777; became a lawyer of Danville, Vt., 1797; removed in 1798 to Peacham; was much in public life; was a militia brigadier-general during the war of 1812–15; was in Congress 1821–25 and 1841–43; a judge in the State courts 1833–34; a member of the constitutional convention 1835; governor of Vermont 1843–44. D. at Peacham, Vt., Aug. 14, 1847.

Mattamiscon'tis Plantation, tp. of Penobscot co., Me. Pop. 51.

Mat'tapan, post-v. of Suffolk co., Mass., in the 16th ward of Boston, 6 miles S. E. of the main part of the city, on the New York and New England R. R., and on the Milton branch of the Old Colony R. R.

Mattapoi'sett, seaport and post-tp. of Plymouth co., Mass., on the Cape Cod R. R. (Fairhaven branch), 55 miles S. S. E. of Boston, has a deep and spacious harbor, 5 churches, and a high school. Pop. 1361.

Mattap'ony River, in Virginia, unites with the Pamunkey to form the York River. It is itself formed from the union of four streams—the Mat, the Ta, the Po, and the Ny rivers.

Mat'tawa, the proposed eastern terminus of the Canadian Pacific Railway, is at the junction of the Ottawa and Mattawa rivers, Nipissing district, Ontario, 189 miles above Ottawa. It is the site of an old Hudson's Bay trading-fort.

Mattawam'keag, post-tp. of Penobscot co., Me., at the confluence of the Mattawamkeag with the Penobscot, and on European and North American R. R. Pop. 356.

Mattawan', post-v. of Antwerp tp., Van Buren co., Mich., on the Michigan Central R. R.

Matteawan', post-v. of Fishkill tp., Dutchess co., N. Y., situated on the Dutchess and Columbia R. R. and on Fishkill Creek $1\frac{1}{2}$ miles above Fishkill Landing, has important manufactures of felt goods, hats, files, lawn-mowers, wood-working machinery, etc. There are 5 churches, 1 newspaper-office, a union free school, and a pop. of about 2000.

Mat'ter [Gr. ὕλη; Lat. *materia;* Ger. *Stoff*] has two main significations, which have changed gradually with the changes in philosophical thinking. They may be called the idealistic and the materialistic, the former dating from Parmenides, and receiving its full expression in Plato and Aristotle; the latter from Thales and the atomists Leucippus and Democritus. In the former signification *matter* is little more than a logical postulate; in the latter, it is an abstraction of the imagination. In Parmenides it is simply not-being (μὴ ὄν) as opposed to being, and is the ground of the phenomenal, illusory multiplicity of the world.

This is virtually the view of Plato, who, however, is compelled to attribute to matter something more than a mere negative existence. With him it is the correlate of *idea*. (See Plato, Parmenides, Philebos, Timæos; Siebeck, *Plato's Lehre von der Materie*, in *Untersuchungen zur Philosophie der Griechen*.) According to Aristotle, ὕλη is one of the four αἰτίαι or grounds of existence, the correlate of *form*, the ground of change, being pure potentiality, utterly devoid of determination, and therefore, as such, unknowable. (See FORM.) Aristotle sees process where Plato sees but multiplicity. When united with *form*, *matter* gives οὐσίαι, or substantial things, which owe to it their imperfection. The Aristotelian doctrine was adopted by the Stoics, and the Platonic by the Neo-Platonists. Proclus held that matter was neither good nor bad, but constituted the ground of necessity. The Fathers of the Church, mingling philosophic speculation with dogmatism, were divided on the question of the eternity of matter, as well as of the mode of its production. The same is true of the Arabic philosophers, who based their doctrines mainly upon Aristotle. Bishop Berkeley denied the existence of matter altogether, as does Lotze at the present day. The materialistic view of matter was held in a rude form by the Ionian philosophers, whose whole efforts apparently were a search for a single material principle to explain the world. The *atomic* theory was apparently first propounded by Leucippus or Democritus of Abdera, and has been held by the majority of materialists ever since. According to it, matter consists, in the last analysis, of an indefinite number of indivisible particles. Some naturalists, such as Democritus, imagined that these differed in form, position, and aggregation; which differences constituted the differences of material objects. Lucretius was the great atomist among the Romans. In modern times an atomic doctrine has been maintained by Diderot, Kant, Herbart, and by all or nearly all the natural scientists of the present day. (See ATOM, MOLECULE.) By most of them matter is no longer looked upon as dead or separable from force, but as endowed with all the potencies of which existing things are the realizations. Whichever theory we adopt, matter remains an abstraction, the correlate of force, without which it would be unthinkable. (Cf. Lange, *Geschichte des Materialismus;* Fechner, *Uber die physikalische und philosophische Atomlehre;* Hartmann, *Philosophie des Unbewussten*, § c. cap. v.; Büchner, *Force and Matter;* and various articles in *Popular Science Monthly* and *Philosophie positiviste*.) THOMAS DAVIDSON.

Mat'ter (JACQUES), b. May 31, 1791, at Alt-Eckendorf, Alsace, of German parents; studied at Strasburg, Göttingen, and Paris; became in 1819 professor of history at Strasburg, in 1832 inspector-general of the University of Paris, in 1845 of the public libraries of France; retired afterwards to Strasburg, and d. there June 23, 1864. His *De l'Influence des Mœurs sur les Lois, et des Lois sur les Mœurs* (1832), was crowned by the Academy. The most prominent of his numerous other writings are *Histoire Critique du Gnosticisme* (1828), *Histoire Universelle de l'Église Chrétienne* (1829–32), *Schelling et la Philosophie de la Nature* (1842), *De l'Etat Moral, Politique, et Litteraire de l'Allemagne* (1847), *Saint Martin* (1862), and *Emmanuel de Swedenborg* (1863).

Matter, Nature, Properties, and Relations of. See SOMATOLOGY.

Mat'teson, tp. of Branch co., Mich. Pop. 1305.

Matteson, tp. of Waupaca co., Wis. Pop. 289.

Matteuc'ci (CARLO), b. at Forli June 21, 1811; graduated at University of Bologna in 1828, and began his scientific experiments at Forli, but soon after went to Paris to prosecute them. After the publication of his articles upon electricity and upon torpedoes in 1840 he was appointed, on the recommendation of De la Rive and of Humboldt, to the chair of physics in the University of Pisa. In 1848 he was sent by the Tuscan government as civil commissioner into Lombardy with the Tuscan troops, and later on a diplomatic mission to the diet of Frankfort. After the political events of 1849 he resumed his professorship at Pisa, and in 1859 the Tuscan government gave him a mission to the court of Berlin, afterwards to the government of Turin before the annexation of Tuscany to Piedmont. After this annexation he took an active part in the moderate constitutional politics of Italy. In 1862 he became for a short time minister of public instruction for the kingdom of Italy. On the transfer of the capital to Florence he was made director of the Museo di Fisica Fiorentina, and devoted himself almost exclusively to the prosperity of that institution. D. at Leghorn 1868. Among his very numerous scientific publications the following are best known: *Cenni sull' Influenza dell' Elettricità nella Formazione delle Principali Meteore Acquee* (Bologna, 1827); *Sull' Influenza del Calore sul Magnetismo* (Forlì, 1831); *Sulle Correnti elettro-Magnetiche di Faraday* (Forlì, 1833); *Sur l'Electricité animale* (Florence, 1834); *Discorso sul Metodo Razionale Scientifico* (Forlì, 1835); *Essai sur les Phénomènes Electriques des Animaux* (Paris, 1870); *Lezioni di Fisica* (Pisa, 1852); *Cours d'Electro-Physiologie* (Paris, 1856).

Mat'thew (SAINT). I. *Character.*—Among the twelve apostles there was only one whose previous occupation had made him familiar with the use of the pen; and this one, St. Matthew, seems also to have been the first among them to prepare an evangelical record. We know very little of his character and life. His apostolical calling is narrated in Matt. ix. 9; Mark ii. 14; Luke v. 27. He was sitting at the receipt of customs on the border of the sea, near Capernaum, filling the office of a publican. It is said that these officers were generally abhorred by the Jews, being considered as renegades because they served the pagan lords of the country. Jesus passing by, followed by a great multitude, noticed him, and discovered at first glance that there was in him a future apostle and preacher of the new faith. The publican, who perhaps previously had received salutary impressions from the teachings of Jesus, obeyed without hesitation the call of the Lord, and in order to celebrate the career which opened before him he invited all his former colleagues to a feast in his house, together with Jesus and his disciples, desirous that they too should partake in some manner in the grace which had been conferred on him. It was his first missionary act. Mark and Luke call this publican Levi; and it is probable that this was the original name of the apostle, and that Jesus, as he had given to Simon the surname of Peter on their very first meeting (John i. 42), gave to Levi the surname of Matthew —that is, "a gift from God"—in order to designate the striking manner in which God had given him this disciple in the very moment when their eyes first met. The only surprising circumstance according to this explanation is, that Mark and Luke do not indicate the identity of Matthew with this publican Levi, whose calling they have previously narrated in their lists of the twelve apostles (Mark iii. 18; Luke vi. 15; Acts i. 13). Thus, from the second century, and up to our days, some have been of the opinion that there were two different publicans whose callings occurred in a similar manner. But this is not probable; the story of the calling of Levi and Matthew is so similar that it is difficult to consider it as the record of two different facts. There is a more natural solution. From a regard to the apostle, tradition would not like to attach to his name the humiliating title of publican; and this seems to be the simple reason why it is omitted in the lists of the Gospels of Luke and Mark, which were prepared from the general tradition, while Matthew himself had no fear of recalling in his Gospel the memory of his former profession; hence, these words in the first Gospel: "Matthew the publican" (Matt. x. 3). The father of Matthew is called Alphæus, but must not be confounded with Alphæus called Clopas, who was the brother of Joseph and the uncle of Jesus. Matthew remained, no doubt, in Jerusalem, together with the twelve, as long as the preaching of the apostles in this city continued—that is, nearly up to the year 60. When Paul came to Jerusalem for the last time, in 59, he seems to have found none of the apostles there (Acts xxi.). Clement of Alexandria tells us of Matthew that he ate no meat, but only vegetables and fish. The historian Hegesippus, in the second century, attributes a similar ascetic practice to James, the brother of the Lord, the first chief of the congregation of Jerusalem and a contemporary of the apostles. It is also known that the Essenes, a Jewish sect which aspired to a particular sanctity, confined themselves to the same diet. But in this privation the aim was merely a more complete consecration of the body to the service of God, and not the attainment of any legal merit; the law never gave any such precept. The Jewish Christians of Rome, mentioned in Rom. xiv., ought also to be remembered here. By this austere discipline James and Matthew no doubt desired to recommend their ministration to the Jews and procure access among them for the gospel, in accordance with the spirit of St. Paul's precept: "To them that are under the law, as under the law, that I might gain them that are under the law" (1 Cor. ix. 20). Various later traditions, originating between the fourth and sixth centuries, tell us that Matthew went to Ethiopia, or Macedonia, or Parthia, or Arabia, or India; we are even told by some that he suffered martyrdom in Arabia or Persia. But the discord between the dates prevents us from attaching any importance to these traditions.

II. *The Gospel.*—All the Fathers agree that the apostle Matthew wrote a Gospel, but in the Hebrew language, and not in the Greek, in which is written the book contained in the canon under the name of Matthew. Papias, at the beginning of the second century, says: "Matthew composed the speeches (the teachings of Jesus) in the Hebrew

language (Aramæan), and each translated them (into Greek) as well as he could." These last words signify, very probably, that each evangelist translated orally from Matthew into Greek while teaching in the church. Eusebius tells furthermore that Pantænus, the founder of the catechetical school of Alexandria, when in the second century he went to India to preach Christianity, found the Gospel of Matthew in Hebrew among some Christians to whom it had been brought by the apostle Bartholomew, the first missionary to that country. All the other Fathers have the same traditions concerning the original language of our first Gospel. Nevertheless, our Greek Matthew does not make the impression of being a translation, at least not in the narrative parts. The language is vigorous, fresh, pure, like that of an original writing. Thence it has been inferred, in accordance with the literal sense of the expressions of Papias, that the Gospel mentioned by him contained only the speeches of Jesus, and not a complete history of his ministration, and that the narrative part was added later as a historical framework, in which the primitive work of Matthew was inserted, translated into Greek. Two circumstances confirm this inference: First, in the record of the first Gospel five principal groups of speeches of Jesus can be distinguished—namely, chs. v.–vii.; x.; xiii.; xviii.; xxiii.–xxv.; all of which are connected with the narrative by very similar formulas, and which might very well have originally formed a separate work having for its subject the teachings of Jesus. Second, in these great speeches in our Matthew the Old Testament is most frequently quoted according to the translation of the Septuagint, while in the narratives it is most frequently quoted from the Hebrew text—a circumstance which seems to indicate a different origin. Accordingly, we must suppose that Matthew composed an Aramæan work which comprised only the teachings of the Saviour, arranged according to some leading principles. Thus, (1) *the justice of the kingdom of heaven*, which division appears in our first Gospel as the sermon on the mount (v.–vii.); (2) *the apostolate*, which second division is found in our first Gospel (x.); (3) *the picture of the kingdom of heaven*, the grand collection of parables (xiii.), which depicts the foundation of the kingdom (the sower), its anomalous development (the tares), its power, both externally and internally (the mustard-seed and the leaven), its worth both to him who finds it without seeking, and to him who seeks (the hidden treasure and the pearl), and its terms (the net); (4) *the discipline of the Church*, which division is contained in ch. xviii. 1–20 of our first Gospel; and, lastly, (5) *the consummation of the present era*, or the judgment of Israel, the Church, and all the nations, which division (xxiii.–xxv.) formed the imposing conclusion of the work of Matthew, corresponding with the opening, the sermon on the mount. Christ thus appeared as the divine *legislator* (chs. v.–vii.), *king* (ch. xiii.), and *judge* (chs. xxiii.–xxv.). This original work by Matthew, in Aramæan, was probably the foundation of that *Gospel of the Hebrews* which was adopted by the Jewish Christian communities of the first centuries. This Gospel needed a complement, and this need was supplied, no doubt, by the narrative part of our first Greek Gospel, translated into Aramæan, and adorned with many legendary additions borrowed from an already falsified tradition. It also suffered mutilation in order to conform to the peculiar ideas of the different Jewish Christian sects. As for the narrative frame of our first Gospel, it was possibly composed by one of the companions of St. Matthew, who had partaken of his evangelical labors and written down the apostolical tradition, such as it had become fixed at Jerusalem and in Palestine. In the arrangement of the historical matter the same method of systematical grouping may be observed here as in the composition of the speeches: chs. viii. and ix., following after the sermon on the mount, give a collection of *acts of power;* chs. xi. and xii., following after the apostolical instruction, give a collection of *words of wisdom;* chs. xiv.–xvii., following after the collection of parables, contain a record of *various excursions* which preceded the teaching of the discipline (ch. xviii.) and the departure from Galilee (ch. xix.). Two small details show that Matthew had taken part in this labor, directly or indirectly: (1) the surname of "publican" added to his name, as we have seen, in the list of the twelve apostles in the first Gospel (x. 3); (2) the fact, so much the more significant as it is unobtrusive, that in this same list, in the fourth couple of apostles—which couple in all the lists comprises Matthew and Thomas—the name of Thomas is placed before that of Matthew, while in the other lists Matthew is placed before his colleague. It is evident that he could not change the place of the couple to which he belonged, but he could change the place of his name in this couple; and this he did. Eusebius says, referring to his predecessors, that "Matthew, after preaching to the Jews, and about to depart in order to preach to other nations, composed in the language of the Fathers (in Hebrew) the Gospel he had preached, in order to fill the void which his absence would leave among his audience." This date is closely connected with the preceding, relating to the language in which Matthew wrote; and it accounts for the absence in this Gospel of all explanations of Hebrew customs, such as we find in Mark and Luke, also Jewish writers, but writing in a pagan country. The time of the composition is indicated by Irenæus: "Matthew published among the Hebrews and in their native tongue his evangelical record at the time when Peter and Paul preached at Rome and founded the Church there." Some have taken umbrage at this tradition, because neither Peter nor Paul founded the Church of Rome, which follows clearly from the Acts of the Apostles and the Epistles of St. Paul. But they have forgotten that in the epoch in which Irenæus wrote (the last third of the second century) the apostolical times appeared in a general way as the epoch of the foundation of the Church. The work of Matthew bears, so to speak, its date marked on its face. This Gospel is a divine act, an official proclamation issued by the government of God. It is God himself who summons His people by a solemn ultimatum to recognize Jesus as Messiah, and threatens them with destruction if they will not obey. This is the reason why the Gospel opens with the genealogy of Jesus, and why he is called "Christ, the son of David, the son of Abraham" (i. 1), the Messiah who shall raise the "throne of David, his father," and redeem the promise of the salvation of the world attached to the posterity of Abraham. This is furthermore the reason why the whole Gospel is a demonstration of the Messianic dignity of Jesus; why the five traits of the history of his infancy, recorded in the first two chapters, are accompanied each by a prophecy; why his residence in Galilee at the beginning of his ministration is justified (iv. 14–16) by a prophecy of Isaiah; why the collection of the acts of power (viii.–ix.) is grouped around a prophecy by Isaiah, quoted viii. 17, which serves as text; why the collection of the words of wisdom (xi. and xii.) centre in a prophecy by Isaiah, quoted xii. 17. Moreover, there is no trait in the history of the Passion which is not accompanied by a prophecy, and the last words, "Go ye, therefore, and teach all nations, baptizing them," etc., give the programme of the work of the Messiah. By such a book God said to his people, "The forty years of repentance which were accorded to thee (Matt. xxiv. 34) will soon expire; acknowledge Jesus as thy Messiah or thou shalt perish." This situation is indeed in harmony with the date indicated by Irenæus—namely, about 64, or five to six years before the destruction of Jerusalem. There is especially one passage which determines exactly the period of the composition. It is the parenthetical clause xxiv. 15, by which the author interrupts, in the same manner as Mark, the speech of Jesus on the destruction of Jerusalem, and invites the Church to take notice of the signal of flight which Jesus gave in advance. Such a *nota bene* shows evidently that the sign has not yet been realized, but is imminent. The sign was the invasion of Judæa by the Roman armies, which took place about 66, and the time of the composition is consequently about 64 or 65. Thus we arrive at nearly the same time of composition for all the three earlier Gospels, composed as they were in different countries and for different nations (Romans, Greeks, Hebrews); and this chronological result coincides with the fact, evident to our eyes, that none of the three evangelists has employed the writings of any of the others in the composition of his work. This reciprocal independence, which seems to us to have been demonstrated by a minute exegesis, would have been impossible if one of the three had written a long time before the others; the last writer must necessarily have known the writings of the others. Moreover, the date indicated corresponds very well to the situation of the Church at this epoch. Was it not the time in which those who had witnessed the appearances of the Saviour began to die out? Hence resulted in the feeling of the Church a void and uneasiness, which demanded a rich compensation; and this was given to the Church in the different countries in which it existed by the publication of our first three Gospels. A fragment of an antique work, found in the last century by Muratori in the library of Milan, speaks thus of our four Gospels: "Although the beginning of each of our Gospels differs (each choosing its own point of departure), this is nevertheless of no importance to the faith of the believers, since all things are represented by them all *in the same ruling spirit*" (*uno ac principali spiritu*). Thus, the relation between our four Gospels was understood in the second century, while modern criticism has attempted to place these works in opposition to each other, and to discover among their authors motives of mutual rivalry and hostility unworthy of the characters of such men and of the sanctity of such an object. But this false criticism

will break down before the indestructible feeling of the moral purity of these books. The Church feels that in calling these authors the *holy evangelists* she has not followed an illusion. That spirit of holiness which is her own life-blood recognizes itself in the spirit which, one and the same, pervades all the four books. And it is this divine spirit which produces that grave and firm bass which sounds in the Gospel of Matthew, that evangelical soprano which issues from the lips of Luke, that alto, so moderate and suited for the transition, which the ear catches from Mark, and, at last, that brilliant silver tenor which, like the voice of an angel, makes our heart vibrate in the Gospel of John. The Author of this incomparable quartet is, and will always remain, one and the same, though His inspiration bursts forth through four different organs. The picture of the divine work, its *history* proper, was written by Luke; the simple, apostolical *memoirs*, with all their ingenious and dramatic freshness, were given by Mark; the official and theocratic proclamation of Jesus as King, Messiah, was issued by Matthew; and to John we owe the revelation of Jesus as the Son of God, as the everlasting Word. Matthew forms evidently the transition from the Old to the New Testament. His Gospel is the Old Testament reflected in the New. Hence, it was always placed at the head of the evangelical collection and of the whole New Testament. It is the *Genesis* of the New Testament. On the other hand, the Gospel of Matthew corresponds to the Revelation. As the former reproduces under the form of history in the New Testament that part of the Old which is already accomplished, the latter reproduces under the form of prophecy at the end of the New Testament that whole part of the Old which is not yet realized. The Revelation says, "All is accomplished." Thus, in the divine word the beginning, middle, and end correspond with each other in a marvellous manner.

FRÉDÉRIC GODET.

Matthew of Paris. See PARIS, MATTHEW.

Matthew of Westminster. See PARIS, MATTHEW.

Mat'thews, county of Virginia, bounded N. by Piankatank River, E. by Chesapeake Bay, and S. by Mobjack Bay. Area, 90 square miles. It is level, and has a light productive soil. Indian corn is the leading crop. Cap. Matthews. Pop. 6200.

Matthew's, tp. of Chatham co., N. C. Pop. 873.

Matthews, post-v., cap. of Matthews co., Va., near East River, and 35 miles E. by N. of West Point.

Matthews (E. O.), b. in Maryland Oct. 24, 1836; graduated at the Naval Academy in 1855; became a master in 1858, a lieutenant in 1860, a lieutenant-commander in 1862, a commander in 1870. Served in the Wabash at the capture of Forts Hatteras and Clarke, and commanded a battery of naval howitzers in the battles of Honey Hill and Tullifinny Cross-roads in Nov. and Dec., 1864. Commended for "zeal and gallantry." FOXHALL A. PARKER.

Matthews (Gen. GEORGE), b. in Augusta co., Va., in 1739; served with great distinction in the Indian and Revolutionary wars; was taken prisoner at Germantown, Pa., after receiving nine bayonet wounds; removed in 1785 to Oglethorpe co., Ga.; was governor of Georgia 1780 and 1793–96; Representative in Congress 1789–91, and was engaged in military operations in Florida in 1811, with the rank of brigadier-general of militia. D. at Augusta, Ga., Aug. 30, 1812.—His son GEORGE (1774–1836) was a distinguished judge of Mississippi and Louisiana.

Matthews (JOHN), b. in South Carolina about 1744; was an active patriot during the Revolution; Speaker of the South Carolina house of representatives; associate justice of the supreme court 1776; was a member of Congress 1778–82; governor of South Carolina 1782–83, and became in 1784 a judge of the court of equity. D. at Charleston, S. C., in Nov., 1802.

Matthi'as, SAINT, the twelfth apostle, in place of Judas Iscariot, chosen during the ten days between Ascension and Pentecost. Of the 120 disciples in Jerusalem, apparently only two (Barsabas and Matthias) could be found who had been companions of Christ during the whole course of his ministry; and of these two the latter was chosen somehow by *lot*. In spite of specious arguments against it, the validity of this election can be sustained. The New Testament makes no further mention of Matthias, and ancient traditions clash. (See the *Acta Sanctorum*, Feb. 24.) R. D. HITCHCOCK.

Matthias, the assumed name of ROBERT MATTHEWS, a religious impostor, b. in Washington co., N. Y., about 1790; resided in Albany when, excited by the preaching of the celebrated revivalists Rev. Charles G. Finney and Rev. E. N. Kirk (about 1830), he determined to become a religious leader. He began by ardent advocacy of temperance, and having had some success in street-preaching, claimed to have received a revelation, and undertook to convert the city of Albany. His violence, however, defeated itself, while his absurd pretensions were promptly refuted and placed in their proper light. Enraged at the failure of his projects, he prophesied the destruction of Albany, and proceeded secretly to New York, where he succeeded in imposing upon several respectable families and created a great popular sensation. Having been accused of poisoning one of his wealthy disciples, he was tried and acquitted, but, having then lost all influence, quietly disappeared, and d. some years later in Arkansas. (See *Matthias and his Impostures,* by William L. Stone, New York, 1835.)

Matthias, German emperor from 1612 to 1619, b. Feb. 24, 1557, a son of Maximilian II., and educated in Spain at the court of Philip II. In 1577 he repaired secretly to the Netherlands, and made an attempt at managing affairs there, but failed, and withdrew in 1580. On June 14, 1612, he succeeded his brother, Rudolph II., as emperor of Germany, but his reign was very unsuccessful. The differences between the Protestant Union, formed in 1608, and the Catholic League, formed in 1609, grew now into open controversies. The emperor first tried to put himself at the head of the Catholic League, but, failing in this, he undertook to suppress both associations by an imperial decree, to which, however, neither of them paid any attention. In 1617 the bigoted archduke Ferdinand was appointed king of Bohemia, and on May 23, 1618, the Protestant inhabitants of Prague took arms and broke out in open rebellion. Thus began the Thirty Years' war. Hardly a year after (Mar. 20, 1619) the emperor d., and was succeeded by Ferdinand.

Matthias I., Corvinus, king of Hungary from 1459 to 1490, b. in 1443, a son of John Hunyady, and educated in Bohemia, where for a long time he was detained a prisoner; afterwards he married the daughter of the Bohemian king, George Podiebrad. In Hungary a large party among the nobility was opposed to the election of Matthias, and invited the German emperor, Frederick III., to the throne, while at the same time the Turks, taking advantage of these internal dissensions, invaded and ravaged the country. Matthias, however, fought with great success against both his enemies. The Turks he drove out with heavy losses, and in a later war of 1485 he compelled Frederick III. to cede to him large parts of Austria, including Vienna. George Podiebrad having been excommunicated in 1469 as a Hussite, and a crusade being preached against him by Pope Paul II., Matthias invaded Bohemia in 1469. At first he had only small success, but by the final peace in 1470 he received Moravia, Silesia, and Lusatia; he also gained some advantages over the Poles. But although his reign was a long series of wars and campaigns, the interior government was by no means neglected, and although the king was a most brilliant soldier, he possessed a fine taste for learning and art. A great collection of Greek manuscripts was brought together in Buda, but, unfortunately, the largest part of it was destroyed by the Turks in 1527. Matthias was much beloved by his subjects. The despotic power he possessed he wielded with judiciousness and magnanimity, and in Hungarian history he is generally called "the Great." In the rest of Europe his name and his government enjoyed a great reputation, especially after he succeeded in actually stopping, at least for some time, the progress of the Turks.

Mat'thisson, von (FRIEDRICH), b. at Hohendodeleben, near Magdeburg, in the Prussian province of Saxony, Jan. 23, 1761; studied theology and belles-lettres at Halle; became tutor, reader, and travelling chamberlain in different noble and royal families, and was appointed librarian at Stuttgart in 1812 by the king of Wurtemburg, from which position he retired in 1824, and d. Mar. 12, 1831. His poems, mostly elegies, published in 1787, were at one time the favorite reading of the German public, but they have lost their popularity. His memoirs, published at Zurich in 5 vols. (1810–16), have more interest.

Mat'tison (HIRAM), D. D., b. at Norway, N. Y., Feb. 8, 1811; resided in childhood at Oswego; was a teacher for some years; joined the Black River (N. Y.) conference as a preacher 1836; removed to New York City in 1852, and filled important pulpits until 1861, when he withdrew from the Methodist Episcopal Church on account of slavery, but returned to it in 1868, and became secretary of the American and Foreign Christian Union. D. Nov. 24, 1868. Dr. Mattison published *The Doctrine of the Trinity* (1843), *Astronomy* (1846), *Spirit-Rappings* (1854), *Resurrection of the Body* (1866), and edited Burritt's *Geography of the Heavens* (1850), a popular textbook of astronomy.

Mattituck', post-v. of Southold tp., Suffolk co., N. Y., on the Long Island R. R.

Mat'tocks (C. P.), b. at Danville, Me., Oct. 11, 1840; educated at Bowdoin College in 1862 and at Harvard Law

School in 1867; served during the civil war with the Army of the Potomac in the 1st Maine Vols., rising to be colonel, and brevetted brigadier-general; made prisoner at the battle of the Wilderness May 5, 1864, and held until Mar., 1865; has been county attorney of Cumberland co., Me.

Mattocks (JOHN). See MATTACKS (JOHN).

Mat′to-Gros′so, the largest and westernmost province of Brazil, comprising an area of 865,800 square miles, and bounded E. by the provinces of Goyaz and São Paulo, S. W. by Paraguay and Bolivia, and N. by the provinces of Amazonas and Pará. It is traversed from W. to E. by a mountain-range whose branches form valleys which by degrees slope down to the vast plains around the Amazon and Rio de la Plata. Large tracts of this province are covered with immense forests; others are arid and sandy; and as a whole it is very imperfectly known. Gold, diamonds, and iron are frequently found, and mineral springs abound. But the entire population of this immense territory does not probably amount to more than 46,000—that is, 1 to each 20 square miles—and of this number nine-tenths are Indians and negroes, very little suited to utilize the riches which the land evidently contains. The gold and diamond mines are worked by the government; agriculture does not raise sufficient food; the forests are unused; rearing of cattle is the only productive pursuit of the inhabitants.

Matto-Grosso, town of Brazil, in the province of the same name, on the Guapore, was founded in 1734 by gold-diggers; rose rapidly, and was in 1818 the capital of the province, the residence of the provincial government, and had 18,000 inhabitants. It has now hardly 1500. The gold-fields have become exhausted, the insalubrity of the place has put the government officials to flight, and the surrounding districts cannot be cultivated, as they are annually inundated by the Guapore.

Mattole′, tp. of Humboldt co., Cal. Pop. 453.

Mattoon′, post-v. and tp. of Coles co., Ill., on the Illinois Central, the Indianapolis and St. Louis, and the Terre Haute Paris and Decatur R. Rs., has 2 schools, 10 churches, 2 banks, 3 newspapers, 4 mills, railroad repair and car shops, and a number of stores and shops. Pop. 4967.

T. E. WOODS, ED. "DAILY AND WEEKLY JOURNAL."

Mattoon (Gen. EBENEZER), b. at Amherst, Mass., Aug. 19, 1755; graduated at Dartmouth College 1776; joined the Revolutionary army in Canada; served as lieutenant of artillery at the battle of Bemis Heights 1777, and rose to the rank of major; settled in his native town as a scientific farmer; served often in the legislature; was for twenty years sheriff of Hampshire co.; member of Congress 1801–03; major-general of State militia 1797–1816; adjutant-general 1816; colonel of the Ancient and Honorable Artillery Company of Boston 1817, and member of the State constitutional convention 1820. D. at Amherst Sept. 11, 1843, having been blind nearly twenty-five years.

Matts′ville, tp. of Douglas co., Nev. Pop. 289.

Mat′urin (CHARLES ROBERT), b. at Dublin, Ireland, in 1782; educated at Trinity College; took orders in the Church of England, and became curate of St. Peter's, Dublin. Pecuniary losses induced him to write several novels of an extravagant character, which had little success, but his tragedy of *Bertram*, represented by Edmund Kean at Drury Lane Theatre, brought him £1000 and a considerable reputation as a poet, which his later productions scarcely justified. Some of his works were highly commended by Sir Walter Scott. He was an eloquent pulpit-orator and a bold opponent of Roman Catholicism. D. at Dublin Oct. 30, 1824.

Maubeuge′, town of France, department of Nord, on the Sambre, which here becomes navigable, is fortified, and has iron-foundries and manufactures of firearms, iron and steel goods, saltpetre, oil, and sugar, and an active trade in coal, slate, and marble. Pop. 10,557.

Mauch Chunk′, post-b. and tp., cap. of Carbon co., Pa., 120 miles N. W. of New York City, on the Lehigh Valley and the New Jersey Central R. Rs., in the centre of the Lehigh anthracite coal-region. It derives its chief importance from its connection with the anthracite coal-trade, and all tolls and wages are based on the fluctuations of its markets. The first iron smelted by anthracite coal was made here. The Switchback R. R., one of the most famous pleasure-roads in the world, brings annually large numbers of tourists to this place. It is a gravity road, 18 miles in length, the necessary elevation being attained by stationary engines. Mauch Chunk has 7 churches, a public library, 3 banks, 2 foundries, 2 weekly newspapers, several fine hotels, machine-shops, and a number of stores. Pop. of b. 3841; of tp. 5210. E. MELL BOYLE, ED. "COAL GAZETTE."

Mauds′ley (HENRY), M. D., b. at Giggleswick, Yorkshire, England, Feb. 5, 1835; studied at the University of London, where he graduated in medicine in 1857; was physician to the Manchester lunatic asylum 1859–62; settled in London as a consulting physician upon lunacy 1862; published *The Physiology and Pathology of the Mind* (1867); was made fellow of the Royal College of Physicians 1869; appointed Gulstonian lecturer to that body in 1870; published his course of *Lectures on Body and Mind* (1870), and wrote a treatise on *Responsibility in Mental Disease* (1874) for the "International Scientific Series." He is now (1875) professor of medical jurisprudence in University College, consulting physician to the West London Hospital, and editor of the *Journal of Mental Science.*

Mauduit Duplessis, de (THOMAS ANTOINE), CHEVALIER, b. at Hennebon, France, Sept. 12, 1753; entered in boyhood the school of artillery at Grenoble, from which he ran away and made journeys as cabin-boy to Greece, Egypt, and Constantinople; became in 1776 captain in an artillery regiment; came to America with La Fayette; rendered good service as an engineer in constructing Fort Mercer at Red Bank, N. J., and as a soldier in defending it; was distinguished at Brandywine, Germantown, Monmouth, and Yorktown. Sent to Hayti in 1787 as colonel of the regiment of Port-au-Prince, he disarmed the national guard (1790) and enlisted the white settlers in companies of "royal volunteers," at the head of which he made sanguinary campaigns against the disaffected blacks. Upon the arrival of new battalions from France in Mar., 1791, a revolution took place at the capital, where the newly-arrived soldiers fraternized with Mauduit's regiment and the mass of the people against the wealthy planters. After a fruitless resistance at the head of the "royal volunteers," Mauduit was massacred with them by his own grenadiers, Mar. 4, 1791.

Mauduit (ISRAEL), b. at Exeter, England, in 1708; was educated for the ministry as a dissenter, but never preached; went into mercantile business with his brother Jasper and accumulated a fortune, and in 1763 was entrusted with representing the interests of the province of Massachusetts, of which Jasper Mauduit was the nominal agent. He became collector at Southampton 1765; wrote several pamphlets in behalf of Massachusetts and of the New England colonies generally during the ten years of negotiations before the Revolution, and afterwards wrote ably in behalf of American independence, treating Lord Howe and Sir William Howe with great severity for their conduct at Boston. D. June 16, 1787.

Maui. See HAWAIIAN ISLANDS.

Maulmain′, or **Moulmein,** city of British Burmah, Farther India, at the mouth of the Salwen, in the Bay of Bengal, in lat. 16° 30′ N. It is a flourishing place, important for its exports of teak, the value of which in 1867 amounted to $600,000. Besides teak, ivory, grain, wax, and gum are exported, and silks and cottons, wine and beer, tobacco, arms, and sugar are imported. The climate, though hot and moist, is not unhealthy. Pop. 43,683.

Maumee′, tp. of Allen co., Ind., traversed by the Maumee River and Canal and the Toledo Wabash and Western R. R. Pop. 394.

Maumee City, post-v. of Lucas co., O., in Waynesfield tp., on the Maumee River, opposite Perrysburg, at the head of ordinary navigation, and on the Toledo Wabash and Western R. R., 8 miles S. W. of Toledo, has a good trade, and is the seat of the Central Ohio Conference Seminary (Methodist Episcopal). Pop. 1779.

Maumee River is formed by the union of St. Mary's and St. Joseph's rivers at Fort Wayne, Ind. It flows into Maumee Bay, the W. part of Lake Erie. Its mouth is at Toledo, O. It is navigable 8 miles to Maumee City, and in high water to Defiance, 50 miles.

Maumelle′, post-tp. of Pulaski co., Ark. Pop. 422.

Mau′na Lo′a ("great mountain"), a volcano of the Sandwich Islands, is nearly in the centre of the island of Hawaii, and rises 13,758 feet above the level of the sea. It contains several craters, both on its summit and on the sides, among which that called Kilauea is the most remarkable. It is 3½ miles long, 2½ miles broad, and 1044 feet deep, and contains a vast sea of fire, always surging and roaring, and sometimes swelling and overflowing, sending forth tremendous streams of white-hot lava.

Maunder (SAMUEL), b. in England about 1790; was brother-in-law to William Pinnock, whom he aided in compiling his educational *Catechisms*, and produced the valuable "Treasury Series," containing manuals of useful knowledge, history, natural history, biography, chronology, geography, etc. D. at Islington, London, Apr. 30, 1849.

Maundrell (HENRY), b. in England in 1650, was for many years chaplain to the English factory at Aleppo, Syria, and author of a volume of travels, *Journey from Aleppo to Jerusalem* (1698), many times reprinted, and still highly prized. D. in 1710.

Maun'dy Thurs'day, so called from *mandatum novum*, the "new commandment" given by Christ to his disciples to "love one another" (John xiii. 34). On this day, in Roman Catholic countries, the feet of pilgrims are washed in the church, while the *Mandatum novum* is sung, and doles are given to the poor. Maundy Thursday is the same as the Holy Thursday in Passion Week.

Maupertuis', de (Pierre Louis Moreau), b. July 17, 1698, at St. Malo, Bretagne, France; studied mathematics and astronomy; attracted much attention both in England and France by his able advocacy of the ideas of Newton in opposition to those of Descartes, and was placed in 1736 at the head of a scientific expedition to Lapland for the purpose of measuring there an arc of a meridian; which expedition he described in a very clever book, *De la Figure de la Terre* (1738). In 1740 he accepted an invitation from Frederick the Great, went to Berlin, and became president of the new Prussian Academy of Science. But although the king treated him with great kindness, his residence in Berlin was not very enjoyable. König accused him of plagiarism, and Voltaire's *Dr. Akakia* made him the laughing-stock of all Europe. D. at Bâle July 27, 1759.

Maurepas', de (Jean Frédéric Phélypeaux), Count, b. at Versailles July 9, 1701; inherited in his fourteenth year an office as minister of state, including the departments of the royal household, of the city of Paris, and of the marine. This office had belonged to his family for 170 years, and when he was twenty-four years old he took charge of it himself. In 1749 he was banished from the court on account of a sarcastic epigram on Madame de Pompadour, but on the accession of Louis XVI. he returned as prime minister, which position he held till his death, Nov. 21, 1781. His abilities consisted in business routine and an excellent talent for court intrigues. His knowledge was superficial, his character frivolous, his administration a hotbed for all kinds of abuses. He rendered some service to the French marine, but his two most famous measures were the convocation of the parliaments and the participation in the American war of independence, both of which had a decisive influence in bringing about the French Revolution. The *Mémoires de Maurepas* (3 vols.), published in 1792 by Soulavie, are considered spurious.

Mau'rer, von (Georg Ludwig), b. Nov. 2, 1790, at Erpolsheim, in Rhenish Bavaria; studied at Heidelberg; was appointed professor of jurisprudence at Munich in 1826; became a member of the Grecian regency 1832–34; was for a short time Bavarian minister of foreign affairs, and minister of justice in 1847, and d. at Munich May 9, 1872. His *Geschichte des Altgermanischen Gerichtsverfahrens* (1824) was crowned by the Academy of Munich. Besides a number of valuable works on jurisprudence and the history of legislation and government in Germany, he wrote in 1836 *Das Griechische Volk vor und nach dem Freiheitskampfe* (3 vols.).—His son, Konrad Maurer, b. in 1823 at Frankenthal in the Palatinate; studied at Munich, Leipsic, and Berlin, and was appointed professor of jurisprudence at Heidelberg in 1847. He has made comprehensive studies of Icelandic language, literature, and history, and written several works on this subject, such as *Die Entstehung des Isländischen Staats und seiner Verfassung* (1852), *Gullthórissaga* (1858), *Isländische Volkssagen* (1860), etc.

Maurice', count of Nassau, prince of Orange, b. Nov. 14, 1567, at Dillenburg in Nassau, a son of William the Silent of Orange; studied at Leyden, and was proclaimed stadtholder of Holland, Zealand, and Utrecht shortly after the assassination of his father in 1584, and appointed commander-in-chief by all the provinces after the recall of Leicester by Queen Elizabeth in 1587. His military career was very brilliant. He took Zutphen, Deventer, and Nymwegen in 1591, Geertruidenberg in 1593, Groningen in 1594. In 1597 he defeated the Spaniards at Turnhout in Brabant, and in 1600 at Nieuwport, near Ostende. But from ambitious designs he opposed the armistice of twelve years which Barneveldt succeeded in concluding with Spain in 1609, and by which the United Provinces were acknowledged as an independent republic. He aspired to sovereignty, and used the hot controversy between the Arminians and the Gomarists as a means of overcoming the resistance of Barneveldt and the republican party. He did not succeed, however. After the execution of Barneveldt (in 1619) the popularity of Maurice was lost, and it was hardly regained by some new exploits in the renewed war with Spain in 1622. D. at the Hague Apr. 23, 1625. Next to Alexander Farnese, he was generally considered the greatest general of his age, and numbers of young men of royal or noble birth who wished to learn the art of war gathered in his camp. (See Motley, *History of the United Netherlands* (1860–67) and *Life and Death of John of Barneveld* (1874).

Maurice, duke of Saxony, of the Albertine line, b. Mar. 21, 1521, at Freiberg, a son of Henry the Pious, joined the Protestant Church in 1539; married in 1541 a daughter of the landgrave Philip of Hesse, and succeeded his father on the ducal throne in the same year. His relations with the emperor Charles V. were most amicable at this time. He fought in his army against the Turks and against the French, and although he was an ardent Protestant, and his father-in-law at the head of the Smalcald League, he not only did not become a member of that league, but he even helped the emperor to crush it in the battle of Mühlberg, Apr. 24, 1546. As a reward he received from the emperor the possessions of the other line of the house of Saxony, the Ernestine, whose representative, John Frederick, had been one of the leaders of the League; and with the possessions followed the rank and title of elector. As soon, however, as Maurice had reached his aim, the good relations with the emperor ceased, and he began to take umbrage at every undertaking of the latter. At last, having made a secret alliance with Henry II. of France in Oct., 1551, he suddenly marched in May, 1552, on Innspruck, where the emperor lay ill of the gout. By a hasty flight the emperor saved himself from being captured by Maurice, but by the Peace of Passau (Aug. 2, 1552) he was compelled to consent to all his demands, the first of which was full religious liberty for the Protestants. Next year, on July 9, 1553, Maurice was mortally wounded in the battle of Sievershausen against the margrave of Brandenburg, and d. two days afterwards. He was succeeded by his brother. His daughter Anne was married to William the Silent.

Maurice, count of Saxony, generally known as Marshal Saxe, b. at Goslar Oct. 28, 1696, a son of Augustus II. the Strong, elector of Saxony and king of Poland, and Aurora von Königsmark. In his twelfth year he fought with distinction in the armies of Prince Eugene and Marlborough, and was legitimized by his father, but his debaucheries and dissipations, in which he surpassed even his father, developed as early and as rapidly as his brilliant talents. In 1720 he went to France, bought a regiment, was appointed maréchal de camp, and studied with great energy mathematics, mechanics, and fortification. In 1726 the estates of Courland elected him duke, but the project failed on account of Mentchikof's intrigues; and when it was taken up once more in 1728 by the dowager duchess, Anna Ivanovna, who wished to marry him, it was foiled by his dissipation and lack of attention. At the outbreak of the Austrian War of Succession he offered his services to his native country, but by the fault of Count Brühl they were not accepted, and he received a French command. He took Prague by storm in 1741, and fought with great distinction in Bohemia, Bavaria, and on the Rhine. But his fame as a great general he gained chiefly by his campaigns in Flanders from 1744 to 1748. He won a brilliant victory at Fontenay May 11, 1745, and at Roucoux Oct. 11, 1746. He took Brussels, Bergen-op-Zoom, Maestricht, and conquered the whole of Belgium. The enthusiasm of the French people and king knew no bounds; honors were heaped upon him; he was made marshal-general of all French camps and armies, and presented with the palace and estates of Chambord, where he led a princely life, and d. Nov. 30, 1750. His *Rêveries Militaires*, written in 1731, but afterwards revised and much enlarged, is full of ingenious and audacious ideas; his *Lettres et Mémoires*, published in 1794, have also some interest.

Maurice (John Frederick Denison), b. Aug. 29, 1806, in Normanton, Suffolk, England; d. in Cambridge Apr., 1872; was the son of a Unitarian clergyman; was educated at Cambridge, and took a degree in law, his birth in a nonconformist sect obliging him to forego honors and degrees in other schools. He early took an interest in the social, political, ecclesiastical, and scientific questions that agitated thoughtful men in England, writing fervently in the *Athenæum* and other periodicals. In 1830 he joined the Established Church, having convinced himself that it was the best ground for an Englishman to stand and work on, although holding the Church responsible, through its shortcomings, not only for the degradation of the working-classes, but also for the dissent that should have found room for expression within the Establishment. By his work, *The Kingdom of Christ* (1838), his *Lectures on Education* (1839), his *Thoughts on Conscientious Subscription*, and *Reasons for not Joining a Party in the Church* (1841), he laid the foundation of the Broad Church, as it was called, a new party name which he regretted, as pointing to another division in the Church. Maurice was a preacher from the time of his ordination in 1831. His first curacy was a small village in Warwickshire that has never yet heard the whistle of a locomotive; from 1846–59 he was chaplain at Lincoln's Inn; and for the next seven years addressed intellectual audiences in De Vere street. Maurice

was of fertile mind and fluent, abounding utterance. His writings, mostly publications in book-form of his copious lectures on nearly all questions of church history, social and political ethics, practical and speculative theology, and philosophy, bear the stamp of an earnest intellect, a sweet and consecrated spirit, a profoundly humane heart. His Warburtonian lectures on *The Epistle to the Hebrews*, his Boyle lectures on *The Religions of the World*, the lectures on *The Religion of Republican Rome* (1855), *The Patriarchs and Lawgivers of the Old Testament*, *The Ten Commandments*, *The Gospel of the Kingdom*, *The Gospel of the Word*, *The Epistles of St. John*, *Christian Ethics*, *The Apocalypse, a Vision*, *The Prophets and Kings of the Old Testament*, *History of Moral and Metaphysical Philosophy*, the lectures on *The Ecclesiastical History of the First Two Centuries*, on *The Unity of the New Testament*, on *The Word "Eternal,"* on *The Lord's Prayer and the Book of Common Prayer*, on *The Claims of Religion and Science*, *The Dialogues on Family Worship*, illustrate the variety and the vitality of his labors. His last works were on *Conscience* and *Social Morality*. Death surprised him in the fulness of his powers, while he was preparing lectures on *The Ethical Systems of Plato and Aristotle*. For twenty-five years Maurice was acting president of the Working-men's College, where he never ceased to be a personal teacher, having as counsellors and coadjutors men like Thomas Hughes, John Ruskin, Lawrence, Rossetti, Cave Thomas, and others eminent in science, history, literature, and art. His influence was exerted in favor of a relaxation of the laws respecting the Sabbath, of healthful Sunday recreations for the working people, the opening on Sunday of the Crystal Palace; all the time his labors being directed to the spiritual culture of the people. His sons—he left two—are preparing a memoir of their father.

ELIZABETH P. PEABODY.

Maurice (THOMAS), b. at Hertford, England, Sept. 25, 1754; was educated at St. John's and University College, Oxford; became curate of Woodford, Essex, and subsequently at Epping, and vicar of Wormleighton and of Cudham, Kent. He became assistant librarian to the British Museum in 1799. He wrote a number of sermons and poems, two tragedies, and a valuable series of works on India—*Indian Antiquities* (7 vols., 1791–97), *The (Ancient) History of Hindostan* (3 vols., 1795–99), and *Modern History of Hindostan* (2 vols., 1802–04). He received from the government the pension which had been enjoyed by Cowper. D. in London Mar. 30, 1824. He published his *Memoirs* (3 vols., 1819–22).

Maurice River, tp. of Cumberland co., N. J., bounded S. by Delaware Bay. Pop. 2500.

Mauri'cius (FLAVIUS TIBERIUS), emperor of Constantinople from 582 to 602 A. D., b. at Arabissus, Cappadocia, about 539, descended from a noble Roman family, and distinguished himself so much in the wars against Persia that on his deathbed the emperor Tiberius appointed him his successor under general rejoicing of the people. But after his accession to the throne his popularity soon waned, and his long reign is distinguished only by a series of wars with Persia and the Avars, in which he did not himself command. Victories alternated with defeats, but the most prominent features in these wars were the perpetual mutinies, conspiracies, and intrigues. One of these, under the leadership of Phocas, succeeded in overthrowing the emperor, as a revolt rose at the same time both in the army and the city. Mauricius fled with his family from Constantinople, and sought refuge in the church of St. Autonomus, near Chalcedon, from which, however, he was dragged and beheaded, Nov. 27, 602, and Phocas was proclaimed emperor. He left a work on military art, published at Upsala in 1664 by John Scheffer.

Maurita'nia, the ancient name of North-western Africa, corresponding to the present Morocco and part of Algeria, and inhabited by the Mauri (Moors). After conquering it, the Romans founded many colonies here. In 429 A. D. it was overrun by the Vandals, but it was reconquered by Belisarius, and remained with Italy till the end of the seventh century, when it was taken by the Arabs.

Mauri'tia [Brazilian, *Miriti*, *Buriti*], an interesting genus of American fan-leaved palm trees, usually very tall and beautiful. Palm wine, edible fruits, and useful timber and leaves are produced by *M. vinifera* and *flexuosa*.

Mauri'tius, one of the Mascarene Isles in the Indian Ocean, situated 400 miles E. of Madagascar, in lat. 20° 32′ S. and lon. 57° 46′ E., and belonging to Great Britain. Area, 708 square miles. Pop. 326,454. It is of volcanic origin, surrounded with coral reefs, and covered with mountains, not very high, the Brabant Mountain being only 3000 feet, and Peter Botte 2000 feet, but which present the most extraordinary outlines. The valleys contain a very rich soil, and the climate is singularly fine, the heat seldom exceeding 90°. It was discovered in 1505 by the Portuguese, and colonized in 1598 by the Dutch, who, however, soon left it. In 1721 it was colonized a second time by the French, who kept it till 1810, when it was taken by the English. As a British possession it has become very flourishing; the value of its exports in 1871 amounted to £3,324,161. Sugar is the principal produce, cultivated by coolies, who have been transferred from India for this purpose. Besides sugar, coffee and rice are extensively cultivated. Principal town, Port Louis.

Mau'ry, county of W. Central Tennessee. Area, 530 square miles. It is generally level and very fertile. Live-stock, grain, cotton, wool, and lumber are leading products. The county is traversed by Duck River and by the Nashville and Decatur R. R. Cap. Columbia. Pop. 36,289.

Maury (Gen. DABNEY H.), b. in Virginia about 1824; graduated at West Point 1846; entered the mounted rifles and served in the Mexican war; was professor at West Point 1847–52; published *Skirmish Drill for Mounted Troops* (1859); entered the military service of the Confederate States 1861; attained the rank of major-general, and was in command of the defences of Mobile, Ala., when that place was captured, Apr. 10, 1865.

Maury (JEAN SIFFREIN), b. at Valréas, Venaissin, France, June 26, 1746, the son of a shoemaker, prepared himself for the Church at Avignon; came in 1766 to Paris, and attracted great attention by his eloquent discourses and *éloges*. In 1785 he was chosen a member of the Academy, and in 1789 he took his seat in the National Assembly as member for Peronne. He was one of the most passionate and influential opponents of the revolutionary theories, but in 1791 he left France, went to Rome, where he was received with great distinction, and was made bishop of Nicea *in partibus* in 1794, and cardinal in 1798. In 1806 he became reconciled to Napoleon, and returned to France, and in 1810 the emperor made him archbishop of Paris. As he had not been consecrated in this position by the pope, he lost it on the restoration of the Bourbons, and was even imprisoned for some time in the castle of St. Angelo. D. at Rome May 11, 1817. His *Essai sur l'Eloquence de la Chaire* (2 vols., 1810) is still much read.

Maury (MATTHEW FONTAINE), LL.D., b. in Spottsylvania co., Va., Jan. 14, 1806; spent his childhood in Tennessee; entered the U. S. navy as midshipman Feb. 1, 1825, serving on board the Brandywine during its voyage to France to convey La Fayette thither, and afterwards on the Pacific coast in the same vessel; made a voyage around the world in the Vincennes, during which he began his *Treatise on Navigation* (1835), which has since been a text-book in the navy and a popular manual for the merchant marine. He became lieutenant June 10, 1836, and was appointed astronomer to the Wilkes exploring expedition in the same year, but resigned before sailing. In 1839, Lieut. Maury met with an accident which resulted in lameness and a consequent permanent disability for active naval service. While confined from this cause he wrote, under the pseudonym of "Harry Bluff," in the *Southern Literary Messenger*, a series of articles entitled *Scraps from the Lucky Bag*, chiefly devoted to the exposure of abuses in the navy. He had previously commenced an accumulation of hydrographical observations, and on being appointed keeper of charts and instruments at Washington was enabled to enlarge the scope of his researches. In 1844 this bureau was united with the National Observatory, of which Maury was made superintendent. In that year he communicated to the National Institute a paper upon the Gulf Stream and other oceanic currents, in connection with great-circle sailing, which was printed in the *Southern Literary Messenger* under the title *A Scheme for Rebuilding Southern Commerce*. The results of these researches were also embodied in the *Wind and Current Charts* and *Sailing Directions* issued by the observatory. At his suggestion the U. S. government took the initiative in convoking a general maritime conference, which met at Brussels in Aug., 1853, the chief object of which was the adoption of a common method of hydrographical observation and registry, which was effected by the adoption of a model for a logbook previously (1848) prepared by him. In 1855, Maury's great work, *The Physical Geography of the Sea*, was issued, and at once placed his name at the head of the great scientific department of which it treats. In 1855 he was made a commander, but resigned in 1861 to enter the Confederate service, in which he obtained the rank of commodore; spent a year or two in Europe during the war, at the close of which he took service under the archduke Maximilian in Mexico as commissioner of emigration. This position proving ephemeral, he again went to Europe, where he resided until 1868, in Russia and in England, engaged in the preparation of a series of text-

books. In 1868 he accepted the professorship of physics in the Virginia Military Institute, declined in 1871 the presidency of the University of Alabama, and d. at Lexington, Va., Feb. 1, 1873.

Mau'ser Gun, The, the common name for the rifle used by the Prussian infantry, and invented in 1871. It combines the advantages of the Bavarian Werder gun with some new improvements introduced by Mauser, a gunsmith in Kannstadt, Würtemberg. It is distinguished from the needle-gun by a longer range, a greater rapidity in firing, and a greater simplicity in loading. The charge of powder is heavier, the cartridge lighter, narrower, and longer. The whole mechanism is very simple; only four movements are required in loading and discharging. It is provided with a bayonet, which, however, is only inserted for bayonet-attacks. Without the bayonet it weighs but four kilogrammes, while the needle-gun weighed five. Its range is about 1200 mètres. Since the end of 1874 all the infantry of the army of the German empire have been provided with this gun, with the exception of the Bavarian infantry, which has retained the Werder gun.

August Niemann.

Mausole'um [Gr. Μαυσώλειον], the tomb of Mausolus, king of Caria, erected at Halicarnassus by Artemisia, his widow, in 353 B. C. It is often referred to by ancient writers as one of the wonders of the world, and it surpassed all other structures of the kind so much by its magnificence that the name of Mausoleum came to be the generic term for a costly tomb. Pliny gives a minute description of it, and it remained standing for centuries after his time. Gradually, however, it fell into decay. One part of it seems to have been destroyed by an earthquake; when in 1404 the Knights of Rhodes took possession of Halicarnassus, and built a castle there, they gathered their materials from the mausoleum; finally, the Turks disturbed the building so completely that even the site of it was forgotten. Of late, however, the excavations of Mr. Newton, undertaken under the auspices of the English government, have brought to light not only the site and fundamental outlines of the building, but so many fragments have been found that it seems possible to make a complete ideal reconstruction of the whole structure.

Maus'ton, post-v., cap. of Juneau co., Wis., 124 miles W. of Milwaukee, on the Chicago Milwaukee and St. Paul R. R., has good educational advantages, 6 churches, abundant water-power, grist and saw mills, lath and shingle works, foundry and machine-shops, 1 barrel-factory, 1 carriage manufactory, sash and blind shop, 1 bank, 1 newspaper, 5 hotels, and the usual number of stores and shops. Pop. 952. John Turner, Ed. "Mauston Star."

Mauvaises Terres [Fr.], or **Bad Lands,** a name given to various desolate tracts in Dakota, Nebraska, Colorado, and other Territories of the U. S., but especially to a tract along the White River, an affluent of the Missouri. The Bad Lands are usually treeless, broken, and utterly waste regions of Tertiary formation, abounding in interesting relics of extinct species of rhinoceros, hyæna, and other mammals. Some parts of the Bad Lands afford a scanty pasturage in the rainy season, but for the most part they are not known to have any valuable animal, vegetable, or mineral products.

Mauvaise Terre, tp. of Morgan co., Ill. Pop. 736.

Mauve. See Aniline Colors.

Ma'verick, county of Texas, bounded S. W. by the Rio Grande. Area, 900 square miles. It is mostly employed as a stock-range. Cattle and wool are the leading products. Much of the soil requires irrigation to render it productive. Cap. Eagle Pass. Pop. 1951.

Ma'vor (William Fordyce), LL.D., b. in Aberdeenshire, Scotland, Aug. 1, 1758; was in early life a schoolmaster; took orders in the Church of England 1781; became vicar of Hurley, Berkshire, rector of Stonesfield, and of Bladon-cum-Woodstock, where he d. Dec. 29, 1837. He was the author of numerous educational books which enjoyed a wide circulation, but are now superseded. His most ambitious work, and the only one which retains a certain value, is *The Universal History* (25 vols., 1802).

Mavrocorda'tos (Alexander), b. at Constantinople Feb. 15, 1791; received an excellent education, partly as secretary to his uncle, hospodar of Wallachia, partly in travels in Western Europe. On the outbreak of the war of independence he immediately returned to Greece, and although he soon became involved in political strifes with the parties of Colocrotonis and Capo d'Istria, which were a great hindrance to the progress of the national cause, his brilliant military achievements, the battle of Peta, the defence of Missolonghi, Navarino, and Sphacteria, rendered, nevertheless, great service. After the establishment of King Otho on the throne, Mavrocordatos was several times at the head of the government, in 1833, 1841, 1844, 1850, and 1856, and filled different positions as ambassador during the intervals. D. in Ægina Aug. 18, 1865. In his policy he represented the ideas and influence of England in sharp opposition to those of Russia. In the cause of public education he took a great interest.

Mawe (John), b. in Derbyshire, England, in 1764; went in early life to Brazil, where he was employed by the prince regent to make a scientific exploration of the mineral regions, the results of which were given in his work, *Travels in the Interior of Brazil, particularly in the Gold and Diamond Districts of that Country* (1812), which attained great popularity both in England and the U. S. Mr. Mawe subsequently became a noted practical mineralogist in London, where he d. Oct. 26, 1829. He was also author of *The Mineralogy of Derbyshire* (1802), *Diamonds and Precious Stones* (1813), and *Familiar Lessons on Mineralogy and Geology* (1816).

Maxataw'ney, post-tp. of Berks co., Pa. Pop. 2531.

Max'cy (Jonathan), D. D., b. at Attleborough, Mass., Sept. 2, 1768; graduated at Rhode Island College (now Brown University) 1787; was tutor there 1787–91; became pastor of the First Baptist church, Providence, R. I.; professor of divinity in Brown University, and its president 1792–1802; president of Union College, Schenectady, N. Y., 1802–04, of the college at Columbia, S. C., 1804–20, where he d. June 4, 1820. He was an able scholar, and published, among other works, a celebrated course of sermons on the existence of God.

Maxcy (Virgil), brother of Jonathan, b. at Attleborough, Mass., about 1785; studied law at Baltimore, Md., under the direction of Robert Goodloe Harper; settled in Maryland and became a prominent advocate; published *A Compilation of the Laws of Maryland from 1692 to 1809* (4 vols., 1809); was a member of both houses of the legislature; solicitor of the U. S. treasury, and appointed chargé d'affaires to Belgium 1837. He was one of the victims of the explosion on board the U. S. steamer Princeton in the Potomac, Feb. 28, 1844.

Max'ey, post-v. of Oglethorpe co., Ga., on the Georgia R. R. (Athens branch).

Maxey (Gen. Samuel Bell), b. in Kentucky about 1825; graduated at West Point 1846; served as a lieutenant in the Mexican war, after which he resigned from the army, studied law, and settled at Paris, Lamar co., Tex. He entered the military service of the Confederate States as a colonel in 1861; rose to the rank of general, resumed the practice of law after the close of the war, and was elected in 1873 U. S. Senator for the term commencing Mar. 4, 1875.

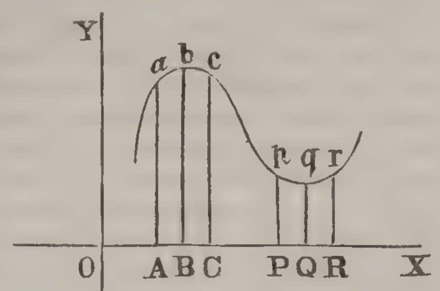
Max'field, post-tp. of Bremer co., Ia. Pop. 735.

Maxfield, post-tp. of Penobscot co., Me., on Pleasant River, 45 miles N. of Bangor. Pop. 156.

Maxfield (Thomas), b. in England about 1720; was one of Wesley's converts at Bristol, and was subsequently appointed "to pray and expound the Scriptures, but not to preach," at the Foundry church, London, during Wesley's absence. In contravention to his instructions he soon began to preach with great fervency and success, and Wesley, after hearing one of his sermons, gave him permission to preach. He thus became the first Methodist itinerant lay-preacher. He was subsequently ordained by the bishop of Londonderry, made an advantageous marriage, attended the first Methodist conference at the Foundry June 25, 1744, and the third conference at Bristol 1746; suffered imprisonment and persecution; became separated from Wesley about 1764, in consequence of a doctrinal schism, and in company with Bell set up a congregation with 170 members, who seceded from the Foundry church. He preached for twenty years longer, was visited and comforted by Wesley many years later when sinking under paralysis, and d. at London about 1785.

Max'ima and Min'ima [Lat.]. A function of a single variable is at a *maximum* state when it is greater than the states that immediately precede and follow it; it is at a *minimum* state when it is less than the states that immediately precede and follow it. The terms greater and less are to be understood in their algebraic sense; that is, greater means nearer to $+\infty$, and less means nearer to $-\infty$. It may be shown that every function of one variable may be represented by the ordinate of some curve of which the independent variable is the corresponding abscissa; this curve is called the curve of the function. It may also be shown that the value of the first differential coefficient of the function for any value of the variable is equal to the tangent of the angle which a tangent line to the curve of the function, at the corresponding point, makes with the axis of abscissas. The tangent of this angle is called the *slope* of the curve.

Let $acpr$ be the curve of any function, referred to the axes OX and OY, and suppose the ordinate Bb to be greater than Aa and Cc, AB and BC each being equal to dx; also suppose that the ordinate Qq is less than Pp and Rr, PQ and QR being equal to dx; then is Bb a maximum and Qq a minimum, the former corresponding to the abscissa OB and the latter to the abscissa OQ. For particular forms of the function we might have a cusp of the first species turned upward at b and downward at q. This would not impair the generality of the explanation now to be given.



An examination of the figure shows that a tangent to the curve at a slopes upward, and that a tangent at c slopes downward; in the former case the first differential coefficient is + just before reaching a maximum ordinate, and — just after passing it; that is, it changes sign from + to — in passing over a maximum. In like manner the first differential coefficient changes from — to + in passing over a minimum ordinate. In the case represented in the figure the differential coefficient corresponding both to a maximum and to a minimum is equal to 0. In the special case alluded to, the differential coefficient changes sign as before, but at the maximum and minimum states it reduces to ∞. From what precedes we have the following rule for finding all the maximum and minimum states of any function of one variable: *Rule.* Find the first differential coefficient of the function, and place it equal to 0, and also equal to ∞, and solve the resulting equations with respect to x. The values thus found will embrace all that correspond either to maximum or minimum values of the function, and they may embrace other values. Then test each value as follows: subtract from, and also add to, the root to be tested an infinitely small quantity, and substitute these results for x in first differential coefficient; if the first result is + and the second —, the root corresponds to a maximum; if the first result is — and the second +, the root corresponds to a minimum; if both results have the same sign, the root does not correspond either to a maximum or to a minimum. As an illustration of the manner of proceeding, let it be required to find the maximum or minimum values of y from the relation $y=x^2-3x+2$. By this rule we have $\frac{dy}{dx}=2x-3=0$, whence $x=1\frac{1}{2}$; making $x=1\frac{1}{2}-dx$, and $x=1\frac{1}{2}+dx$ in the expression $2x-3$, we have in the first case $-dx$, and in the second case $+dx$, which shows that $x=\frac{1}{2}$ corresponds to a minimum value of y; to find this minimum we make $x=1\frac{1}{2}$ in the given expression, and denote the corresponding value of y by y'; this gives $y'=-\frac{1}{4}$, which is the required minimum. In like manner, if $y=4-(x-3)^{\frac{2}{3}}$, we find $\frac{dy}{dx}=-\frac{2}{3}(x-3)^{-\frac{1}{3}}$, which placed equal to ∞ gives $x=3$. Making $x=3-dx$ and $x=3+dx$ in the differential coefficient, we find for the first supposition that it becomes $\frac{2}{3\sqrt[3]{dx}}$, and for the second $-\frac{2}{3\sqrt[3]{dx}}$; hence, $x=3$ corresponds to a maximum, which is given by the equation $y'=4$.

The case in which the first differential coefficient is equal to ∞ is exceptional; that is, it only corresponds to the case in which the curve of the function has a cusp of the first species at which the tangent is perpendicular to the axis of the independent variable. Setting aside this case, the rule for testing the values of x that makes the first differential coefficient equal to 0 admits of great simplification. The test in this case is as follows: substitute each root in the successive differential coefficients of the function until one is found that does not reduce to 0; if this is of an even order and *negative*, the root corresponds to a maximum, but if it is of an even order and *positive*, the root corresponds to a minimum. In all other cases the root corresponds to neither a maximum nor a minimum. Thus, in the first example above given the second differential coefficient is $+2$, which is positive for all values of x; hence, $x=1\frac{1}{2}$ corresponds to a minimum. The practical application of the above test admits of still further simplification in certain cases, for which the reader is referred to Church's *Calculus*, pp. 90–94.

A function of two variables is at a maximum state when it is greater than all the immediately surrounding states, and it is at a minimum state when it is less than all the immediately surrounding states. In all except a few particular cases the following equations give all the values of x and y that can correspond to either a maximum or minimum state:

$$\frac{du}{dx}=0, \quad \text{and} \quad \frac{du}{dy}=0; \qquad (1)$$

in which u is the given function, and x and y the independent variables. The test in this case requires that $\left(\frac{d^2u}{dxdy}\right)^2$ shall be equal to or less than $\frac{d^2u}{dx^2}\times\frac{d^2u}{dy^2}$, when x and y are made equal to the values deduced from equation (1). If this condition is satisfied, and $\frac{d^2u}{dy^2}$ is negative, the corresponding value of u is a maximum, or if $\frac{d^2u}{dy^2}$ is positive, the value of u is a minimum. As an example, let it be required to find the maxima and minima of the function

$$u=x^3y^2(a-x-y).$$

Differentiating, we have

$$\frac{du}{dx}=x^2y^2(3a-3y-4x), \quad \text{and} \quad \frac{du}{dy}=x^3y(2a-3y-2x);$$

placing these results separately equal to 0, and combining, we have $x=\frac{1}{2}a$, and $y=\frac{1}{3}a$. We also have by further differentiation,

$$\frac{d^2u}{dx^2}=2xy^2(3a-3y-6x); \quad \frac{d^2u}{dy^2}=x^3(2a-6y-2x);$$

$$\frac{d^2u}{dxdy}=x^2y(6a-9y-8x).$$

Substituting for x and y the values found above, we have

$$\frac{d^2u}{dx^2}=-\frac{1}{9}a^4, \quad \frac{d^2u}{dy^2}=-\frac{1}{8}a^4, \quad \text{and} \quad \frac{d^2u}{dxdy}=-\frac{1}{12}a^4.$$

Then satisfy the conditions for a maximum; substituting the corresponding values of x and y in the given function, we find the maximum value to be $\frac{1}{432}a^4$. W. G. PECK.

Maximil'ian I., b. at Neustadt, near Vienna, Mar. 22, 1459, succeeded his father, Frederick III., as emperor of Germany in 1493, and d. at Wels, in Upper Austria, Jan. 12, 1519. Nearly all the most prominent events of his history are more or less intimately connected with his marriage affairs. After the death of Charles the Bold in 1477, he married his daughter and sole heiress, Mary, but Louis XI. of France laid claims to several of the possessions. An agreement was made after several years of strife, according to which his daughter Margaret should marry the dauphin Charles, and receive Artois, Flanders, and the duchy of Burgundy as her dowry; but the French government continued to stir up dissensions in the provinces of the Netherlands against the house of Austria. After the death of Mary of Burgundy in 1482, Maximilian married by proxy Anne of Brittany, another rich heiress, but this engagement was suddenly broken off; Anne married Charles VIII. of France, and he sent his affianced bride, Maximilian's daughter Margaret, back to Vienna. After his accession to the imperial throne Maximilian married Bianca Sforza, a daughter of Galeazzo Maria, duke of Milan, who had been murdered in 1476, and this marriage involved him in wars with Venice, Milan, the pope, Naples, France, and Spain. His participation, however, in the League of Cambray and in the Holy League, and his many Italian campaigns, were not of much consequence; he always lacked money and could only form a small and ineffective army. He was more successful in marrying his children, Philip and Margaret, to a Spanish prince and princess, thereby uniting Spain to the possessions of the house of Hapsburg. He also laid the foundation for the annexation of Hungary to the Austrian crown by marrying his grandchildren into the royal family of that country. His government of Germany, although disturbed by his many wars, was not altogether without fruits. By various institutions he succeeded in establishing a higher degree of public security throughout the realm, and commerce and industry, as well as science and art, made progress; but Switzerland became lost to Germany during his reign.

Maximilian II., b. at Vienna Aug. 1, 1527; succeeded his father, Ferdinand I., as emperor of Germany in 1564, and d. Oct. 12, 1576. Although he had spent several years at the court of Madrid, he was favorable to the Reformation, and it was even hoped that he might join the Protestant Church. This, however, he did not do, but he showed himself very tolerant. Protestants were appointed to government offices in Austria, and the evangelical theologian, Chytræus, from Rostock, was called to Vienna to arrange the Protestant service. On the other hand, he allowed the Jesuits free scope for their activity, and they gained great influence even in his own family.

Maximilian (FERDINAND MAXIMILIAN JOSEPH), archduke of Austria and titular emperor of Mexico, b. at the palace of Schönbrunn, Vienna, July 6, 1832, was the second son

of the archduke Franz Karl and of the archduchess Sophia Dorothea, and brother of the present emperor of Austria, Franz Joseph; was carefully educated, acquiring the principal modern languages and a considerable acquaintance with science and literature; was trained in the naval service, which he entered in 1846; made several extended cruises; rose through the subordinate grades to the posts of rear-admiral (1854) and commander-in-chief of the Austrian navy; visited Greece, Syria, and Egypt in 1855; was viceroy of the Lombardo-Venetian kingdom 1857–59; married the princess Charlotte, daughter of Leopold I., king of the Belgians, July 27, 1857, and acquired great popularity at Milan by his enlightened administration and his zeal for the promotion of material improvements and industrial enterprises; retired to Venice in 1859 on the outbreak of the Italian war; visited Madeira with his wife; made a scientific tour in Brazil; visited England, where he was received with great honor by the section of liberals headed by Mr. Roebuck, and took up his residence at the beautiful palace of Miramar near Trieste, which he adorned with exquisite taste. From the period of his appointment to the Italian viceroyalty a circle began to be formed in Austria which more or less openly intrigued in his favor with the view of placing him upon the Austrian throne by revolutionary means; and although it cannot be alleged that he performed any overt act of disloyalty to his brother, it is certain that his naturally ambitious disposition was encouraged by schemers, who kept before his eyes the prospect of succession to the throne. As early as 1861, Napoleon III., when organizing the conquest of Mexico, which he designed to be "the most brilliant page in the history of his reign," conceived the idea of investing Maximilian with the future vassal crown of Mexico, believing that he would thereby propitiate public sentiment in Europe and console the emperor of Austria for the loss of Lombardy by the removal of a dangerous rival in the person of his popular brother. The varying fortunes of the Mexican campaign delayed the formal offer of the throne until the summer of 1863. As the result of an artful manipulation of the sentiments of the Mexican "Church party," which had been carried on for more than a year by the agents of Napoleon III. among the numerous Mexican exiles, generals and prelates, resident in Paris, an "Assembly of Notables," appointed by Gen. Forey upon his occupation of Mexico, met in that capital July 10, 1863, and with great unanimity declared the will of the Mexican people to be the establishment of an empire in the person of the archduke Maximilian of Austria, "or such other prince as the emperor Napoleon should designate." Similar "acts of adhesion" to the will of the conqueror were drawn up in the principal cities of Mexico as fast as they were occupied by the French, and received the signatures of the principal leaders of the Church party. The crown was formally tendered to Maximilian by a Mexican deputation at Miramar Oct. 3, 1863. He deferred his reply until he could be satisfied of being the choice of the Mexican people, but was easily induced to accept as evidence the "acts of adhesion" referred to, and on Apr. 10, 1864, signified his acceptance, and at once began to distribute offices, honors, and decorations. He was obliged, much against his will, to abdicate his eventual right of succession to the Austrian throne; visited Rome and received the papal blessing; paid farewell visits to the courts of Paris, Brussels, and London; contracted for the organization of Austrian and Belgian legions, and arranged a loan from France. He landed at Vera Cruz May 28, 1864; was received with civic festivities, flowers, poetry, and triumphal arches at the cities of Córdova, Orizaba, and Puebla; entered Mexico amid similar demonstrations of apparent popular enthusiasm June 12. A few days sufficed to prove the illusory character of the hopes that had been entertained by his Mexican partisans. Instead of frankly accepting the Church party as the only possible basis of his administration, and governing in accordance with the views of the circle to which he owed his nominal election, Maximilian quickly displayed a contempt for the wishes and advice of his officious partisans, reversed many of the acts of the regency from whose hands he received the government, and addressed himself to well-known republicans for the organization of his cabinet. Several of the statesmen consulted had sufficient force of character to decline all overtures, but enough were found who were seduced by the archduke's profession of being himself a liberal and "as much of a republican as he could be under the circumstances," to form a cabinet, and a determined effort was made to win the support of the republican masses. The hopes of the Church party for the repeal of the "laws of reform" and the restoration of the confiscated wealth of the Church were dashed, and Maximilian soon found himself without the active support of any party. A large part of the principal offices of state were filled by Frenchmen, French influence became paramount, and it was no longer doubtful that the existence of the "empire" depended upon the bayonets of his French, Austrian, and Belgian legions. During the first year of Maximilian's "reign" the arms of France were tolerably successful. All the central states were occupied, and the imperial machinery of prefects and commissioners duly set in motion; but the republican armies held their own in all the remoter states, while guerilla leaders swarmed in Michoacan, and even in the mountains surrounding the capital. The downfall of the government presided over by Jefferson Davis satisfied intelligent observers that the ephemeral "empire" established by Napoleon III. in Mexico must soon share its fate; but Maximilian persisted in believing himself able to maintain his position, even without the aid of his protector. He was soon involved in financial straits, resorted to fresh loans at exorbitant rate of interest, quarrelled with the French generals and civil employés sent to his assistance, alienated the loyalty of his original supporters, and did not succeed in winning the support of any considerable body of the republicans. No great administrative measures were accomplished to reconcile the Mexican people to the new régime; on the contrary, the civil list became extravagant and burdensome, and there was no hope of amelioration. Nevertheless, Maximilian acquired a certain personal popularity from his chivalric disposition, his winning manners, and his cultivated tastes. The greatest error of his career—one which was the immediate cause of his own tragic end—was the celebrated edict of Oct. 3, 1865, ordering the execution, as bandits, of the republican officers who should be taken prisoners. In 1866 the imperial cause rapidly declined through the vigor of the Juarist leaders in the N. and W.; and the withdrawal of the French auxiliary forces, demanded by Secretary Seward and conceded by Napoleon III., proved the signal for the advance of the republican government into Central Mexico. Yielding to the suggestions of Napoleon, Maximilian determined to abdicate, and in Oct., 1866, proceeded to Orizaba on his way to Europe, the empress having preceded him many months before upon an unsuccessful mission for support to the friendly European courts. Unfortunately, the influence of the Church party was effectually brought to bear upon the doomed prince, and he was induced to return to Mexico and throw himself upon the support of the "conservatives." A Mexican army was recruited in place of the French auxiliaries, and the two military leaders of that party, Miramon and Marquez, were advanced to high command. The effort was hopeless, and culminated a few months later in the capture of Maximilian and his principal generals at Querétaro, May 15, 1867. After a trial by a military council, lasting several weeks, Maximilian was condemned to death along with his generals, Miramon and Tomas Mejia, and, all efforts to obtain their pardon having proved unavailing, they were shot at Cerro de las Campanas, near Querétaro, June 18, 1867. Maximilian met his fate with valor. His remains were surrendered to his family in the following year, and were pompously buried in the cathedral of Vienna Jan. 18, 1868. PORTER C. BLISS.

Maximi'nus (CAIUS JULIUS VERUS), Roman emperor from 235 to 238, b. in the latter part of the second century, of barbarian parentage; attracted the attention of Septimius Severus by his strength and gigantic stature; was allowed to enlist in the cavalry, and was promoted by Caracalla; enjoyed the confidence of Alexander Severus, who entrusted him with the organization of a corps of soldiers destined for an invasion of Germany, and was proclaimed emperor by this army on the assassination of Severus. His campaigns against the Germans were successful, but his suspicion, rapacity, and cruelty knew no bounds. An insurrection in Africa and the sympathy it found in Italy threw him into a fit of frenzy. He hastened across the Julian Alps with his army, but was stopped at Aquileia, and while besieging this city was killed by his own soldiers and his head sent to Rome.

Maxims, Legal. The common law of England and of the U. S. is founded to a great extent upon general principles, either of justice, expediency, or policy, and a large part of the work done by the courts in both countries has consisted in the application of these comprehensive principles to the innumerable varieties of facts and circumstances brought before them in judicial controversies, and in the creation thereby of special rules for the decision of such disputes. The practical regulations, therefore, which form a very large and most important part of the common law were originally derived from these fundamental and all-embracing principles, and were enacted by the judges as the results of a strictly logical process. The same mode of building up the law was pursued in ancient Rome—at first

by the magistrates, the prætors, and subsequently by the later school of philosophical jurists, who during the most exalted period of the empire remodeled the whole jurisprudence and put it into an orderly and scientific form. As this method of constructing the law required a constant recurrence by the judges, magistrates, or juridical writers to the first principles whence so large a portion of it was derived by logical inference, it happened that very many of these principles came to be expressed in a brief and epigrammatic form, and clothed in pithy, familiar language; in a word, they grew to be *legal maxims*, and have fulfilled the same office for courts and lawyers which the ordinary popular proverbs have subserved for the community at large. It is impossible in most cases to trace these legal maxims to their immediate authors. As Lord John Russell most aptly said of proverbs, "They are the wisdom of many and the wit of few." A considerable number of them are found in the writings of Roman jurists, and have been transmitted from that distant origin to our own jurisprudence, enriching it throughout its entire course of development. Others were struck out and put into a permanent shape by the genius of some old English judge. Since they were either thus taken directly from the repositories of the Roman law, or else were invented during that ancient period of English history in which the Latin was the common tongue of all learned men, and especially of courts and judicial proceedings, they are all expressed in that language; and as the Latin, on account of its terseness and its power of condensation, is peculiarly fitted for maxims and proverbs, they lose very much of their original force and effect when translated into English. The number of these legal maxims scattered through the opinions of courts and the works of text-writers is great. An able English author who has made them the subject of a treatise selects one hundred as the most important, and as worthy of special comment and illustration. In addition to these, he gives a list of several hundred others of minor importance and less general in their nature. The range of particular subjects over which they extend is also very wide, reaching from the fundamental principles of government on the one hand, to the practical details and affairs of every-day life and the common rights and duties of person, property, and contract, on the other. The most important of the general subjects to which these legal maxims relate, when very broadly and comprehensively classified and grouped, are the organization of society into the state; the fundamental principles and the powers, obligations, and limitations of government; the administration of justice; the essential notions or conceptions upon which the entire law is based; and, passing from these somewhat theoretical and general topics to those more common and practical, the rules of the law concerning property, including its acquisition, its use and enjoyment, and its transfer; the rules of the law as to contracts, especially those which relate to the interpretation and construction of all written instruments; the rules of evidence; and the law regulating marriage and inheritance. I shall add a few of the most important and most familiar maxims, selected from several of these divisions, which will serve to illustrate the form and nature of the whole, and will exhibit, although but partially, the vast amount of legal principle and doctrine often compressed into a single epigrammatic sentence, and the wide extent of their application. Of those which more directly pertain to the state, the government, and the administration of justice, the following have been fruitful of practical inferences: *Salus populi suprema lex*—the public welfare is the highest law, from which are derived all those doctrines which subordinate private rights to the public good; *Leges posteriores priores contrarias abrogant*—later statutes repeal prior ones to which they are opposed; *Nemo debet esse judex in propria sua causa*—no one ought to be a judge in his own cause. Of the group which embodies the essential notions of law, some of the most striking as well as familiar are, *Ubi eadem ratio ibi idem jus*—like reason makes like law, a principle constantly acted upon by the courts in the decision of cases and the announcement of legal rules; *Cessante ratione legis cessat ipsa lex*—the reason of a rule ceasing, the rule itself ceases, a principle of like importance and application with the last; *Ubi jus ibi remedium*—there is no wrong without a remedy, perhaps the most fruitful of all general maxims, in pursuance of which the courts have constantly acted in devising new forms of relief or in extending old ones to meet new cases, so that the law as a whole might keep pace with the wants of an advancing civilization; *Ignorantia facti excusat, ignorantia juris non excusat*—ignorance of the fact excuses, ignorance of the law does not excuse, or the doctrine that all persons must be presumed to know the law (see IGNORANTIA JURIS); *Nemo debet bis vexari pro una et eadem causa*—no one should be twice vexed for the same cause, a provision which in substance, but with some change in the language, is found in all our constitutions, State and national, but which was recognized by the common law from the earliest period. From the maxims relating to property one or two only will be given: *Qui prior est tempore, potior est jure*—he has the better title who was prior in point of time; *Cujus est solum ejus est usque ad cœlum*—a man's property in the soil reaches up to the sky; *Sic utere tuo ut alienum non lædas*—so use your own property as not to injure that of another, a principle of universal application, creating a just limitation upon the rights of ownership, and a maxim constantly quoted by the courts at the present day; *Domus sua cuique est tutissimum refugium*, which has passed into common speech in the form of the popular proverb, "Every man's house is his castle." The maxims which relate to contracts and to the interpretation of written instruments are very numerous, but they are, more than any other class, technical and professional, and have therefore less of general interest. A few examples will suffice as illustrations: *Certum est quod certum reddi potest*—that is certain which can be made certain; *Qui hæret in litera hæret in cortice*—he who hangs in the letter hangs in the bark; *Ex nudo pacto non oritur actio*—no right of action arises from a bare promise; *Qui facit per alium facit per se*—he who acts by another acts by himself, the basis of the whole law of agency. These examples are enough to show the peculiar nature and application of legal maxims. (Consult Noy's *Maxims* and Broom's *Legal Maxims*.)

JOHN NORTON POMEROY.

Max'ville, post-v. of Buffalo co., Wis. Pop. 434.

Max'well, post-v. of Hutchinson co., Dak., on the W. bank of the Dakota or Rivière au Jacques.

Maxwell (HUGH), b. in Scotland in 1787, and was brought to the U. S. in early childhood; graduated at Columbia College 1801; became a prominent lawyer of New York and a leading Whig; was assistant judge-advocate-general U. S. army 1814; district attorney for New York county 1819, and again 1822–29; distinguished himself in the great "conspiracy trials" of 1823; was collector of the port of New York 1849–53, and soon afterwards retired from active business. D. at New York Mar. 31, 1873.

Maxwell (JAMES CLERK), b. at Edinburgh, Scotland, in 1831; educated at the Academy and University of Edinburgh; graduated at Cambridge 1854; was professor of natural philosophy in Marischal College, Aberdeen, 1856–60, and at King's College, London, 1860–65, and became in 1871 professor of experimental physics at Cambridge. His writings on physics are of a very high order, and include an *Essay on the Stability of the Motion of Saturn's Rings* (1859), *Theory of Heat* (1871), and a *Treatise on Electricity and Magnetism* (2 vols., 1873). The last-named work proceeds upon the basis of Faraday's *Experimental Researches in Electricity*, which are expressed in mathematical form.

Maxwell (Sir MURRAY), C. B., F. R. S., b. in Lancashire, England, in 1766; entered the naval service in childhood; became lieutenant 1796 and captain 1803; distinguished himself in the West Indies in the capture of the French and Dutch colonies of St. Lucie, Tobago, and Guiana; accompanied the Jamaica squadron to the Mediterranean 1805; captured seven Spanish vessels from under the batteries of Cadiz, and subsequently took many French prizes on the coast of Italy; was shipwrecked on the coast of Ceylon 1813, losing his vessel, the Dædalus; was made commander of the Alceste, in which he conveyed Lord Amherst's embassy to China, 1816; surveyed for the first time the Gulf of Pecheli, the coasts of Corea, and explored the Loo Choo group of islands; forced a passage to Canton after a sharp engagement with the Chinese forts; lost the Alceste by shipwreck on a reef in the Philippine Archipelago Feb. 18, 1817, for which accident he was tried on his arrival in England, but acquitted of all blame; knighted and pensioned by the East India Company; was an unsuccessful candidate for Parliament at Westminster 1818; subsequently commanded a squadron in American waters; was appointed governor of Prince Edward's Island May, 1831, but before proceeding to his post d. at London June 26, 1831. Interesting narratives of Maxwell's voyages, explorations, and shipwrecks were written by his companions, Capt. Basil Hall (1817) and Dr. John McLeod (1818). He furnished several memoirs to the *Transactions* of the Royal Society.

Maxwell (ROBERT), LORD, b. in Scotland about 1480; was steward of Annandale 1514, warden of the West Marches 1517, provost of Edinburgh 1524; made extraordinary lord of session 1533, lord of regency 1536; negotiated the marriage of James V. to Mary of Lorraine 1537; escorted James to Caerlaverock Castle 1542; had a share in the mutiny at Solway Moss Nov. 25, 1542; embraced the principles of the Reformation, and caused the passage of an act

in Mar., 1543, authorizing the reading of the Scriptures in the vulgar tongue, in spite of the opposition of the lord chancellor, the bishops, and the priests. D. July 9, 1546.

Maxwell (Gen. WILLIAM), b. probably in Ireland about 1735; entered the army in America in 1758, during the French war; remained in constant military service until and during the Revolution; was colonel of a New Jersey battalion in the Canadian campaign of 1776; appointed by Congress brigadier-general Oct. 23, 1776; commanded the New Jersey brigade at Brandywine and Germantown; pursued Clinton in New Jersey; took a leading part in the battle of Monmouth; was engaged in Sullivan's expedition against the New York Indians 1779, and in the battle of Springfield, June 23, 1780; soon after which he resigned. He was highly esteemed by Washington. D. Nov. 12, 1798.

Maxwell (WILLIAM), LL.D., b. at Norfolk, Va., Feb. 27, 1784; graduated at Yale College 1802; studied law, and practised with distinction at Norfolk; was long the secretary of the Virginia Historical Society; became in 1827 literary editor of the New York *Journal of Commerce;* was a member of the Virginia house of delegates 1830, and of the State senate 1831–37; was president of Hampden-Sidney College 1838–44; published a *Memoir* of Rev. John H. Rice, D. D. (1835), and edited the Virginia *Historical Register* 1848–53. D. at Richmond, Va., Jan. 9, 1857.

Maxwell (WILLIAM HAMILTON), b. at Newry, Ireland, in 1794; graduated with high honors at Trinity College, Dublin, at the age of nineteen; visited the British army in Spain; studied theology; took orders in the Church of England, and in 1820 was presented with the prebend and rectory of Ballagh in Connaught. As there was not a single Protestant in the parish, the rector enjoyed abundant leisure, which he devoted to field-sports and to literature. He wrote many successful sketches of country life and adventure, and was the chief originator of the prolific school of military novels. Among his numerous works were *Stories of Waterloo* (1829), *Wild Sports of the West* (1833), *The Dark Lady of Doona* (1836), *Stories of the Peninsular War* (1837), *Life of the Duke of Wellington* (1839–41), *Victories of the British Army* (1839), *Rambling Recollections of a Soldier of Fortune* (1842), *Wanderings in the Highlands and Islands of Scotland* (1843), *The Fortunes of Hector O'Halloran* (1844), *History of the Rebellion in Ireland in 1798* (1845), and *Bryan O'Lynn* (1848). Maxwell was a frequent contributor to *Bentley's Miscellany* and to the *Dublin University Magazine.* D. Dec. 29, 1850. (See biographical sketch prefixed to *Rambling Recollections.*)

Maxwell (Sir WILLIAM STIRLING), BART., LL.D., b. at Kenmure, near Glasgow, Scotland, in 1818; was known by the name of STIRLING until 1866, when by the death of Sir John Maxwell, his maternal uncle, he succeeded to a baronetcy and assumed the name of Maxwell. He graduated at Cambridge (1839), and devoted several years of residence and research in Spain and France to the history, literature, and art of Spain at the close of the mediæval period. He is the author of the valuable works, *Annals of the Artists of Spain* (3 vols., 1848), *Cloister Life of Charles V.* (1852), and *Velasquez and his Works* (1855); was elected to Parliament for Perthshire 1852, and represented that borough most of the time for more than twenty years; was rector of the University of St. Andrew's 1863, of that of Edinburgh 1872, and elected chancellor of that of Glasgow Apr. 28, 1875.

May [Lat. *Maius*], the fifth month of the year in the Gregorian calendar, consisting of 31 days, was by the ancient Saxons called *threo-meolee*, "three-milk month," because in this season cows were milked three times a day. The derivation of the Latin name is doubtful. Ovid, in his *Fasti* (v. 483–490), gives three, of which that from *Maia*, the mother of Mercury, seems the most probable. Modern philologists, however, generally explain *Maius* as a contraction of *Magius*, derived from a root *mag*, Sanskrit *mah*, to "grow." During the Middle Ages the month of May was generally ushered in by some popular merriment, but it is not clear whether this custom, which was found among all European nations, had any connection with the Roman festival of *Floralia*, beginning Apr. 28 and continuing for several days, or whether it sprang up spontaneously from joyous feelings on the arrival or approach of spring. In England the going out a-Maying was a very common custom in former days; Chaucer and Shakspeare mention it; Henry VIII. and Queen Catharine of Aragon followed it. On May 1, before sunrise, all the young folks repaired to the groves to gather flowers and branches with young foliage. With these the doors and windows of the houses and the Maypole of the village were adorned, and the day was spent in dancing around the pole. To preside at the festival a queen of May, the most beautiful girl of the village, was elected in England; in Germany, a count of May, the wittiest and handsomest youth; and the life at court and in the castle was imitated in the village streets by the peasants, probably not altogether without satire. With the Puritans the Maypoles and all the merriment connected with them disappeared in England. In Germany and Scandinavia the custom is dying out, though in Denmark the peasants still turn out on the 1st of May early in the morning to see "the sun dance," and in Stockholm great popular rejoicings take place in Djurgården. In the Highlands of Scotland the day was formerly celebrated as *Bel-tein* day; a fire was made, and certain ceremonies were performed which were supposed to have had a reference to the worship of Baal or the sun.

May, tp. of Christian co., Ill. Pop. 681.

May, tp. of Lee co., Ill. Pop. 1007.

May (CAROLINE), daughter of Rev. E. H. May, b. in England about 1820; published *American Female Poets, with Biographical and Critical Notices* (Philadelphia, 1848), *Treasured Thoughts from Favorite Authors* (1850), *The Woodbine, a Holiday Gift* (1852), a volume of *Poems* (1864), and *Hymns on the Collects* (1872). Miss May's poems were highly commended by competent critics (see Hart's *Female Prose Writers* and T. B. Read's *Female Poets*), and she enjoys the reputation of being an accomplished musician and painter. She has resided for some years at Pelham, Westchester co., N. Y.

May (Col. CHARLES A.), b. in Washington, D. C., in 1818; was appointed second lieutenant in the 2d Dragoons 1836; did efficient service in the Florida war; became captain, and was highly distinguished in Gen. Taylor's campaign in Northern Mexico in command of a squadron of his regiment. He was brevetted major for gallantry at Palo Alto, and colonel for similar conduct at Buena Vista. He resigned his commission in the army 1860; took up his residence in New York City; became vice-president of the Eighth Avenue R. R., and d. Dec. 24, 1864.—His father, FREDERICK MAY, M. D. (b. at Boston, Mass., Nov. 16, 1773; d. at Washington, D. C., Jan. 23, 1847), was a distinguished physician and surgeon; was professor of obstetrics in Columbian College 1823–39, and at the time of his death president of the District of Columbia Medical Society.

May (EDWARD HARRISON), b. at Lynn Regis, England, Jan. 28, 1795; studied for the ministry at Hoxton College, near London; was ordained in 1815 pastor of the Independent church at Bury, Lancashire; preached subsequently at Rochford and Croydon; settled in the U. S. in 1834; connected himself with the Dutch Reformed Church; was pastor of a church at Schuylerville 1836, and of the 21st street church, N. Y., 1839; became in 1848 secretary to the Pennsylvania Colonization Society, and in 1849 of the Pennsylvania Seamen's Friend Society, which post he retained until his death at Philadelphia in Aug., 1858.

May (EDWARD HARRISON), son of the above, b. in England in 1823; accompanied his parents to the U. S. in 1834; was noted in childhood for skill in mathematics, as well as for a talent for drawing; became a civil engineer, and was employed for some years upon railroad surveys, but, yielding to his artistic instincts, began to paint portraits, and soon proceeded to ideal and historical experiments; became favorably known to the public by a panorama illustrative of *The Pilgrim's Progress*, which he painted in union with other artists; studied under Daniel Huntington in New York, and in 1851 entered the studio of Couture in Paris. He has since resided chiefly in Paris, though making frequent visits to Italy and England; took high rank as a portrait-painter; made a series of fine copies from the "old masters" in the Louvre, and executed many imaginative pictures covering a wide range of subjects. He has taken prizes at several French exhibitions, and his works are justly popular with American art-patrons and critics. (See *Annales Historiques*, vol. xxxviii., Paris, 1864, and Tuckerman's *Book of the Artists*, 1867.)

May (SAMUEL JOSEPH), b. in Boston, Mass., Sept. 12, 1797; educated at Harvard College in the class of 1817; studied for the ministry with Henry Colman at Hingham, and Henry Ware, Andrews Norton, and Prof. Frisbie at Cambridge; was ordained in Chauncy Place church, Boston, Mar. 14, 1822; was settled immediately at Brooklyn, Conn.; was installed pastor of the church at S. Scituate Oct. 26, 1836; in 1842 accepted the charge of the State Normal School at Lexington; in 1845 removed to Syracuse, N. Y., to become pastor of the Unitarian society there, and there remained till his death, July 1, 1871. In 1859, Mr. May visited Europe for his health, which continued so feeble that in the autumn of 1867 he resigned his ministry, but became a missionary throughout Central New York for the American Unitarian Association. From early life Mr. May was a constant friend of civil liberty, popular education,

and social equality. He was one of the first and one of the most uncompromising advocates of the abolition of slavery, an ardent and enlightened philanthropist; soldierlike in his courage, saintlike in his humility and tenderness; a cordial supporter of his country during the war, though a believer in the gospel of peace; a diligent and efficient worker in behalf of the sanitary commission and in aid of the Freedmen's Relief Associations; a man everywhere venerated and beloved. Gerrit Smith said of him, "He was the most Christlike man I ever knew." Not eminent either as preacher or as author, or shining in intellectual gifts, he was great in moral qualities of the rarest kind. As a writer he is chiefly known by a series of papers recording his *Recollections of the Anti-slavery Conflict.* A memoir of Mr. May, prepared by T. J. Mumford, was published in Boston in 1873. O. B. FROTHINGHAM.

May (THOMAS), b. at Mayfield, Sussex, England, in 1594; educated at Sidney College, Cambridge, where he graduated 1612; commenced the study of the law at Gray's Inn, London, but was never admitted to the bar; inherited a considerable estate on the death of his father, Sir Thomas May (1616), when he began to figure at court and in literary circles as a wit and a brilliant genius; became a favorite of Charles I.; published poetical translations of Virgil's *Georgics* (1622) and Lucan's *Pharsalia* (1627), to which he added a *Continuation* (1630), also in verse, bringing the history down to the death of Cæsar, and afterwards translated this continuation into Latin hexameters, published under the title *Supplementum Lucani, Libri VIII.* (Leyden, 1640; frequently reprinted), a work which brought him great repute on the Continent, where it was considered the first Latin poetry from an English author worthy of notice. During his period of favor at court he produced five dramas, and by request of Charles I. wrote the historical poems, *The Reign of King Henry II.* (1633) and *The Victorious Reign of King Edward III.* (1635). For some unknown reason, May abandoned the royal cause at the outbreak of the great rebellion, offered his services to the "Long Parliament," and obtained the double office of secretary and historiographer. In the latter capacity he published *The History of the Parliament of England which began Nov. 3, 1640; with a Short and Necessary View of some Precedent Years; published by authority* (1647), which concludes with the battle of Newbury in 1643; but in a Latin translation May brought down the narrative to the death of Charles I., and afterwards wrote an English epitome with the title *A Breviary of the History of the Parliament of England* (1650). This work has been differently judged; Clarendon pronounced an extremely unfavorable opinion, but the great earl of Chatham considered it "a much honester and more instructive book of the same period of history than Lord Clarendon's," and it was highly commended by Warburton, Allen, Hallam, and Macaulay. (See citations in Allibone's *Dictionary of Authors.*) A good edition of May's history was published by Baron Maseres in 1812, and another appeared in 1853, and it was translated into French by Guizot (1823). May was also the author of several political tracts, translated by request of Charles I. the poetical portions of John Barclay's famous allegorical romance, the *Argenis* (1628), and left in MS. a tragedy entitled *Julius Cæsar.* D. at London Nov. 13, 1650, and was buried in Westminster Abbey, but at the Restoration his monument was destroyed and his remains were removed to St. Margaret's churchyard.

May (Sir THOMAS ERSKINE), K. C. B., b. in England in 1815; educated at Bedford School; entered the civil service of the Crown in 1831 as assistant librarian of the House of Commons; called to the bar at the Middle Temple 1838; published *A Treatise on the Law, Privileges, Proceedings, and Usage of Parliament* (1844), which was adopted as a parliamentary textbook, and as such translated into German and Hungarian; reduced to writing for the first time in 1854 the *Rules, Orders, and Forms of Proceeding of the House of Commons,* adopted and printed by command of the House; wrote other tracts on legal and parliamentary subjects; contributed biographies and articles on political economy to the *Penny Cyclopædia,* and published a *Constitutional History of England since the Accession of George III.* (3 vols., 1861–63; 3d ed., revised, 1871), reprinted in America and translated into French and German. He has continued more than forty years in the service of the House of Commons in different capacities; was knighted 1866, and became clerk of the House 1871. His last work is a *History of Democracy in Europe.*

Ma'ya, a term employed in different senses in the Puranic mythology, in the Booddhistic legends, in the Vedanta philosophy, and in some of the modern sectarian theologies of India. Originally it was the name of a goddess, the wife of Brahma, who, through her, created the universe; hence, when the universe came to be regarded as unreal, its creation was necessarily the work of illusion, which being personified in the goddess, her name became in late Sanskrit a synonym for "illusion," and it has preserved nearly the same mythical sense in the modern theologies. Gotama Booddha, according to the legendary narrative, was the son of a queen named *Maya;* whether she may be identified with either of the other Mayas is disputed.

Mayans' y Siscar' (GREGORIO), b. at Oliva, Valencia, Spain, May 9, 1699; graduated at the University of Salamanca; published several dissertations on Roman law, and afterwards devoted himself to the collection and publication of materials for the early literary history of Spain. In 1733 he became librarian to Philip V.; published *Cartas Morales* (1734), a *Life of Cervantes* (London, 1738), *Origines de la Lengua Española* (2 vols., 1737), a treatise on rhetoric (2 vols., 1757), editions of the works of Vives, Fray Luis de Leon, and Montaloo, and many literary treatises once deemed authoritative, but now neglected. D. at Valencia Dec. 21, 1781.

May-Apple, the common name of the *Podophyllum peltatum,* a perennial herb, indigenous to the U. S., once referred to the Ranunculaceæ, or thought to be the type of a separate natural order, now recognized as belonging to the Berberidaceæ. It has also received the popular name of *mandrake,* but improperly. From a perennial creeping rhizome a slender stem about a foot high rises, which forks near the top into two petioles, each surmounted by a large peltate leaf. At the crotch of the division appears a solitary white flower. The fruit of the may-apple is yellowish and fleshy, and about the size of a pigeon's egg. It is somewhat acid and mawkish in flavor, but may be eaten freely. The dried rhizome constitutes the drug *podophyllum.* Its virtues depend on a duplex resin improperly called *podophylline,* which is obtained in the form of a light brownish-yellow powder. This resin is a rough and harsh drastic purgative, which seems, like calomel, to include the upper part of the small intestine in its action, and thus to bring away a good deal of bile in the dejections. Hence it has been called "vegetable mercury." In overdose, like all the drastic cathartics, it may cause serious irritation, and even inflammation of the intestinal canal, with severe purging, nausea, and vomiting. Resin of podophyllum is used in small dose in many digestive derangements with constipation and clay-colored stools, and in full dose as an active purge. In the latter case some anodyne extract is commonly combined with it to correct the griping. EDWARD CURTIS.

May'as, a race of Indians inhabiting the peninsula of Yucatan and the adjoining regions of Guatemala and Tabasco. They are generally regarded as the descendants of the builders of the massive ruins of Uxmal, Chichen, Itza, Palenque, and Copan, which have excited the admiration of archæologists in a high degree; and this opinion is thought to be confirmed by the Maya traditions. The origin of the race is usually referred to the Toltecs, who were driven from the table-land of Mexico by the Aztecs in the eleventh or twelfth century A. D. A residuum of words in the Maya language seems to indicate some connection with the aborigines of the Antilles, from which it is probable that the Toltecs conquered and absorbed an earlier people. Tradition ascribes the origin of civilization in Yucatan to one Kukulkan, a prophet from the W., who is almost certainly identical with the Mexican Quetzalcoatl. The northern central region of the peninsula was called Mayapan, or the "home of the Mayas," and more than forty ruins of cities described by Stephens still attest its former splendor. The royal dynasty of Mayapan, according to tradition, was overthrown about A. D. 1400, from which period the decay of the cities may be calculated. A large number of the Mayas migrated at that time to the islands and shores of Lake Peter, where they are now known as Itzaes. The kingdom was about the same time broken up into numerous petty chieftaincies, in which condition the country remained at the time of the Spanish discovery, though the cacique of Mani seems then to have exercised a kind of suzerainty over the neighboring chiefs. The Mayas of that period could scarcely be called civilized, though they retained some vestiges of an earlier culture, especially a knowledge of a system of hieroglyphics and a calendar consisting of eighteen months of twenty days each, with five days and six hours over. They practised many barbarous and bloody religious ceremonies, flattened the heads of infants, tattooed the person, painted the face and body, wore nose-rings, were addicted to intemperance, had only the rudest musical instruments, used arrowheads of fishbone or obsidian, and manufactured light garments of cotton with considerable skill. They were Christianized during the latter half of the sixteenth century, and led the lives of peaceful and loyal agriculturists until the year 1848, when

a terrible outbreak took place in Southern Yucatan; the citizens of Spanish descent were massacred by hundreds, several flourishing towns were laid in ashes, the Mexican rule over the greater part of Central and Southern Yucatan was annihilated; the Mayas asserted and have maintained their independence to the present day, carrying on a constant and devastating warfare upon the frontier settlements. They are on friendly terms with the English settlers of Belize, from whom they obtain arms and ammunition. They are rapidly relapsing into heathenism, but still retain some vestiges of Christian ceremonies, especially a reverence for the cross. They are governed by a queen, who resides at Chan Santa Cruz, not far inland from Belize. Many expeditions sent against them from Mérida have been successfully resisted, only one having penetrated to their capital; and becoming bolder year by year, they have advanced their frontiers northward, ravaging *haciendas* and villages, and even cities like Valladolid (1871). The language of the Mayas constitutes the chief stock of the Huaxteco-Maya-Quiché family, with which that of the Natchez of Mississippi has been affiliated by a recent inquirer (Brinton). The Huaxtecos reside upon the Gulf of Mexico, at the junction of the three states of Vera Cruz, Tamaulipas, and San Luis Potosi; the Quichés are a tribe of Guatemala, where are also spoken the Kakchikel, Izutuhil, and other dialects belonging to the same family. The Maya language is still spoken by a majority of the people of Yucatan, and has some religious literature. It is copious, melodious, and regular in its grammatical forms, and lacks the letters *d, f, g, q, r,* and *v.* Maya hieroglyphics are now rarely found in Yucatan, where all knowledge of the characters became extinct soon after the Conquest as a consequence of the religious zeal of the Spanish bishop Fray Diego de Landa, who destroyed all the manuscripts that could be accumulated as instruments of idolatry! Fortunately, the zealous bishop took the trouble to learn something of this "doctrine of devils," and in a *Relacion de las Cosas de Yucatan* which he sent to Spain gave the phonetic alphabet of the Mayas, all knowledge of which was soon after lost in Yucatan; and it was not recovered until about 1865, when Abbé Brasseur de Bourbourg, a distinguished French archæologist who had spent several years in Mexico and Central America, discovered the bishop's MS. in a Spanish library, and soon afterwards published it. The alphabet was reproduced in a pamphlet published by Dr. D. G. Brinton at Philadelphia in 1870. Several Maya MSS. preserved in European libraries have since been published, with translations by Abbé Brasseur, and seem to contain important notices of ancient Maya history, but the accuracy of the translations is not deemed sufficiently established to warrant their use as authorities. A grammar, dictionary, and chrestomathy of the Maya language was published by the same scholar in 1872, and a copious dictionary prepared by Dr. Berendt, a scholar who has devoted many years to the study of this group of languages, is now (1875) in the press. The other principal grammars of the Maya language are those of Gabriel de San Buenaventura (Mexico, 1560) and Beltran de Santa Rosa (Mexico, 1746; reprinted Mérida, 1862).

PORTER C. BLISS.

Mayber'ry, tp. of Montour co., Pa. Pop. 215.

May-Bug. See COCKCHAFER.

Mayence. See MENTZ.

Mayenne', department of France, in the basin of the Loire, along the Mayenne. Area, 1966 square miles. Pop. 350,637. The ground is a plain, swelling towards the S. E. into a range of low hills. The soil is fertile, producing corn, flax, hemp, and apples, and yielding coal, iron, marble, and slate. Linens and cider are the principal manufactures. Of 44,328 children of school age, 8084 did not receive any education in 1857. Cap. Laval.

Mayenne, town of France, department of Mayenne, on the Mayenne. Its manufactures of linens and calicoes and bleach-fields and dyeworks are important. Pop. 10,370.

May'er (ALFRED MARSHALL), b. at Baltimore, Md., Nov. 13, 1836; was educated at St. Mary's College, Baltimore; devoted his attention to the physical sciences, in which department he became professor in the University of Maryland 1856–58, in Westminster College, Mo., 1859–61, in Pennsylvania College, Gettysburg, 1865–67, in Lehigh University, Pa., 1867–70, and in the Stevens Institute of Technology, Hoboken, N. J., since 1871. He spent a year (1863–64) in scientific studies at the University of Paris. At Lehigh University he superintended the erection of an observatory, from which he made a series of observations of Jupiter; was at the head of the expedition which observed the total eclipse of the sun at Burlington, Ia., Aug. 7, 1869, securing forty-one perfect photographs; began at Hoboken an important series of researches in acoustics, which led to several curious discoveries; was in 1873 one of the editors of the *American Journal of Science and Arts*, but was forced by weakness of sight to abandon that occupation. He has published numerous scientific papers.

Mayer (BRANTZ), b. at Baltimore, Md., Sept. 27, 1809; was educated at St. Mary's College, Baltimore; travelled in China and the Indies; became a lawyer in 1832; went in 1841 to Mexico as secretary of legation; became editor of the Baltimore *American*; author of *Mexico as it Was and Is* (1844), *Mexico, Aztec, Spanish, and Republican* (1851), *Captain Canot* (1854), *Mexican History and Archæology* (1856), *Mexican Antiquities* (1858), and other works.

Mayer (CHARLES), b. at Clausthal, Hanover, in 1799; came in 1812 to Russia; was educated in Moscow; studied in 1818–19 in Paris; returned to Moscow, and d. at Dresden July 2, 1862. He was a very prolific composer for the piano-forte, and his pieces have a certain kind of superficial elegance which made them very popular at one time; they are seldom heard now.

Mayer (JOHANN FRIEDRICH), b. at Leipsic in 1650; studied theology in his native town and at Strasbourg; was appointed superintendent at Leissnig in 1673, and at Grimma in 1679, and became in 1684 fourth professor of theology at the University of Wittenberg. He was a man of great mental vigor and possessed of a powerful eloquence; his lectures attracted large audiences, but his ambition and greed and certain scandalous disturbances in his domestic life made it difficult for him to remain in Wittenberg, and in 1686 he accepted a position as preacher at St. Jacob's church in Hamburg. He had received his first religious inspiration from Spener, but even while in Wittenberg a certain coolness arose between them, and when Mayer came to Hamburg and found his three colleagues in the ministry, Horbius, Winkler, and Hinckelmann, all more or less impregnated by the pietism of Spener, he at once assumed a polemical attitude against this religious movement, and became in a short time famous, or rather notorious, on account of his polemics. By his singularly impressive eloquence he roused the mob of Hamburg to such a pitch of fanaticism against everything which looked like pietism or Spenerism that Horbius fled for his life and his house was razed to the ground, the senate being unable to defend either his life or his property; the emperor himself had to interfere. In 1701, Charles XII. appointed him first professor of theology at the University of Greifswalde, and superintendent-general of Pomerania and Rugen; and in this position he d. at Stettin in 1712. His works, numbering in all 378, have no theological worth, but give an interesting picture of the circumstances and characters of the time. It deserves to be mentioned that he was professor of theology at the University of Kiel at the same time he was preacher at St. Jacob's church in Hamburg, though the distance between the two places where he had to preach and to lecture could not be traversed in one day.

Mayer (JOHANN TOBIAS), one of the most celebrated astronomers of the eighteenth century, b. Feb. 17, 1723, at Marbach, Würtemberg; was principally self-educated; at twenty-two published a treatise on curves for the construction of problems in geometry, and in the same year an *Atlas mathématique;* contributed largely to the Cosmographic Society of Nuremberg, of which he was one of the founders, one of his contributions relating to the librations of the moon having been translated and incorporated almost entire by Lalande in the 20th book of his *Astronomy;* in 1751 was appointed professor in the university and director of the observatory at Göttingen, where during the Seven Years' war, the French troops made the basement of his observing tower a powder-magazine. Every evening Mayer passed through this magazine with a lantern. At the other extremity of the town the Saxons had established a similar magazine in a similar tower; and this one evening blew up with a frightful explosion, in which seventy persons perished. Mayer continued, nevertheless, his observations, disregarding the danger so startlingly illustrated; and it was under circumstances so unfavorable that he prosecuted the work of preparing his catalogue of zodiacal stars which has been of such value to modern astronomy. This catalogue embraced the positions of 998 stars, observed from four or five to twenty-five or twenty-six times each, with others not so important observed less frequently. He published also tables of the sun and of the moon, in the latter of which the errors were reduced to less than 2′, the tables previously in use being uncertain to 8′ or 10′. These tables, published in 1755, were sent to London in competition for the prize offered by the British Parliament for a satisfactory method of finding the longitude at sea. They were tested by Bradley, astronomer-royal, and pronounced worthy of the attention of the admiralty; but it was only after his death, in 1762 (Feb. 20), that the merited recompense

was awarded: the sum of £3000 sterling was paid to his widow. Mayer was the author of many able memoirs not here enumerated, and of some very ingenious inventions, among them the repeating circle. F. A. P. Barnard.

Mayer (Joseph), F. S. A., b. at Newcastle-under-Lyme, England, Feb. 23, 1803; settled as a jeweller at Liverpool in 1822, and devoted himself to the formation of a private museum of art, in which he gathered a surprising variety of coins, gems, ivories, etc. from Greek, Egyptian, Abyssinian, Etruscan, and mediæval sources, which he recently presented to the city of Liverpool, the citizens of which as a mark of gratitude erected in 1869 a colossal statue of Mr. Mayer in St. George's Hall. He has been a liberal patron of antiquarian literature, and has made a vast collection of materials for a *History of the Rise and Progress of Art in England from 1550 to the Present Time.*

Mayer (Julius Robert), physicist of Würtemberg, originator of the doctrine of the conservation of force, b. at Heilbronn Nov. 25, 1814; studied medicine in Tübingen, Munich, and Paris; practised medicine and surgery in Heilbronn; sailed in 1840, on a Dutch freighting-vessel, to Java, and remained in Batavia through the summer. While there, in bleeding a patient ill of fever, he was surprised to find the color of the venous blood much more brilliantly red than he had observed it to be in Europe; and further observation satisfied him that the case was not exceptional. He explained the phenomenon by the supposition that the amount of oxidation in the blood necessary to maintain the natural temperature of the body is less in hot countries than in cold, the difference of tint between arterial and venous blood being attributed to such oxidation. This observation turned his attention to the study of the laws of heat, and through this to a consideration of the nature and relations of all the physical forces. His first publication on the subject, which appeared in Liebig's *Annalen der Chemie und Pharmacie*, under the title *Bemerkungen über die Kräfte der unbelebten Natur*, though brief, contained a clear announcement of the theory of force to which his celebrity is mainly due, and which it was the object of later labors to develop and apply. Setting out with the postulate, "Forces are causes," and with the proposition, *Causa æquat effectum*, he argues that the effect is but the cause in a new form, quantitatively undiminished, and capable of being a cause in its turn. Thus, there may be a chain of causes and effects indefinite in length, no term of which can ever be zero, but of which the last shall be for ever equal to the first. This first property of causes he calls their indestructibility. But as every cause, in producing its effect, itself disappears, and continues to exist only in the effect produced, the second property of causes is their convertibility. Physical forces are distinguished from matter in being without the properties of weight and impenetrability. The three distinctive characteristics of these forces are therefore indestructibility, convertibility, imponderability. This was the first announcement of a doctrine which has revolutionized the modes of philosophizing in physics, and which has greatly simplified the solution of a multitude of difficult questions. In the close of this remarkable paper the writer presented a determination of the mechanical equivalent of heat, derived from observation of the elevation of temperature in air compressed by a descending column of mercury. The value thus obtained involves as a factor the specific heat of air, a constant which was not then accurately known. By substituting for this constant the specific heat as established by the later admirable investigations of Regnault, Mayer's result is found to accord very nearly with that obtained in the long-continued and elaborate researches of Mr. Joule, conducted independently and in part simultaneously, but published later. The doctrine thus put forth found prompt acceptance with the most eminent physicists of the age, and was advocated and illustrated by Liebig, Seguin, Faraday, Helmholtz, Grove, Carpenter, and others. It is now universally received. Dr. Mayer's second publication, which was much more extended than the first, appeared in 1845, and embraced a bold extension of the principles of his theory to the phenomena of organic nature, thus reducing physiology to the form of an exact science. It was published under the title *Die organische Bewegung in ihrem Zusammenhange mit dem Stoffwechsel.* His *Celestial Dynamics* (*Beiträge zur Dynamik des Himmels*) made its appearance in 1848, and in 1851 he published a somewhat extended memoir entitled *Bemerkungen über das mechanische Aequivalent der Wärme.* In the former of these papers he discusses the sources of heat, and demonstrates the inadequacy of combustion, chemical action, or any other cause except mechanical force, to create or maintain the intensely-elevated temperature of the sun, which he regards as being fed by cosmical matter constantly precipitated upon its surface. He considers also the effect of the tides in retarding, and of terrestrial refrigeration in accelerating, the velocity of rotation of the earth upon its axis; holding that, in the earlier stages of a planet's history, the balance will be in favor of acceleration, and in the later, of retardation; there being an intermediate period of long duration in which, as at present in the earth, these opposing influences will sensibly compensate each other. Three of these important memoirs of Dr. Mayer, the first, third, and fourth above mentioned, have been published in English by Prof. Grove as an appendix to his work on the *Correlation of Forces.* In 1867, Mayer's collected works were published at Stuttgart under the title *Die Mechanik der Wärme.*

During the political troubles of 1848, Dr. Mayer incurred the hostility of the revolutionary party, and was subjected to a degree of annoyance which, in combination with domestic affliction, seriously impaired his health. In May, 1850, in a paroxysm of delirium, he threw himself from a window thirty feet above the ground, and received injuries from the effects of which he was long a sufferer. His physical health has been restored, but the mental vigor which marked his early investigations has been sensibly diminished. F. A. P. Barnard.

Mayer (Simon), b. June 14, 1763, at Mendorf, near Ingoldstadt; studied music under his father, and afterward in Bergamo and Venice, where he composed his first opera, and was appointed chapel-master in 1805. He composed about 70 operas, serious and comic, some of which had a great success, and are distinguished by the gracefulness and freshness of their melodies, though there is no originality or depth. The instrumentation of his operas is richer and more conscientious than was common in the Italian opera of his time; but in spite of their success and real merits, they all disappeared from the stage when Rossini began to compose, and in 1816 Mayer retired. He also composed a great quantity of church music, which, however, has not proved more enduring than his operas. D. at Bergamo Dec. 2, 1845.

Mayes'ville, post-v. of Sumter co., S. C., on the Wilmington and Augusta R. R.

May'field, post-v. of Santa Clara co., Cal., on the Southern Pacific R. R., 35 miles S. E. of San Francisco.

Mayfield, tp. of De Kalb co., Ill. Pop. 941.

Mayfield, post-v., cap. of Graves co., Ky., 26 miles S. of Paducah, on Mayfield Creek and the Paducah and Memphis R. R., has an institute and 3 schools, 1 park, a court-house, 1 bank, 1 large flouring-mill, 6 churches, 1 woollen-mill, 2 tobacco-houses, 1 telegraph and express office, and stores and shops. No liquors are sold in the place. Pop. 779. R. J. Beaumont, Ed. "Mayfield Democrat."

Mayfield, tp. of Somerset co., Me. Pop. 96.

Mayfield, post-v. and tp. of Grand Traverse co., Mich., on the Grand Rapids and Indiana R. R. Pop. 250.

Mayfield, tp. of Lapeer co., Mich. Pop. 1028.

Mayfield, post-v. and tp. of Fulton co., N. Y., 6 miles N. E. of Gloversville. Pop. of tp. 2241.

Mayfield, post-tp. of Cuyahoga co., O. Pop. 892.

May-Fly. See Ephemera.

May'hem [Late Lat. *mahainium, mahemium*]. By the common law of England, mayhem consists of violently depriving a person of the use of any of his limbs or members which may be used in fighting, so that he is rendered less capable of protecting himself against assault or injury. But an injury which merely causes disfigurement, but does not lessen the capacity for fighting, is not a mayhem. Thus, it is mayhem to disable or injure a man's arm or leg, his hand or foot, to deprive him of a fore tooth, or to destroy his eye; but to cut off his ear or nose, to injure the lip, or to knock out a back tooth would not be mayhem, as these are not considered defensive members. In modern times, however, this common-law rule has been changed in some States by statute, and injuries merely causing disfigurement have been declared acts of mayhem. Thus, in New York it is enacted that it shall be mayhem to cut out or disable the tongue, to slit the lip, or slit or destroy the nose, or to cut off or destroy any limb or member. Mayhem at common law is a criminal offence, and was in ancient times punished by a mode of retaliation, the person inflicting the injury being deprived of the same member of which he had deprived another, or being disabled in a like manner. But this practice went out of use at an early period, and the offence was punished by fine and imprisonment, until it was declared by various statutes to be felony. In the U. S. mayhem is usually declared to be a felony. (See Felony.) A civil action for damages may also be maintained for an injury of this kind by the person maimed, since it is an act of assault and battery. (See Assault, Battery.)

George Chase. Revised by T. W. Dwight.

May'hew (EXPERIENCE), son of John, and great-grandson of Gov. Thomas Mayhew, b. in Martha's Vineyard Jan. 27, 1673; succeeded his ancestors in the pastoral charge over the Indians in Mar., 1694, and was employed by the Society for Propagating the Gospel to translate the Psalms and the Gospel of John into the Indian language, which he had learned in childhood. He published in 1727 *Indian Converts*, being the lives of thirty Indian preachers and eighty other converts, and a volume entitled *Grace Defended* (1744). D. Nov. 29, 1758.—His son, ZACHARIAH, was missionary at Martha's Vineyard from 1767 to his death, Mar. 6, 1806.

Mayhew (HENRY), b. in London, England, Nov. 25, 1812; was educated at Westminster School; made a voyage in his boyhood to Calcutta, and served an apprenticeship to his father, a solicitor. He commenced a literary career by bringing out at the Queen's Theatre, in conjunction with Gilbert à Beckett, the farce of *The Wandering Minstrel;* founded a comic paper, *Figaro in London;* was one of the promoters of *Punch* (1841), and for some years its chief editor, and in association with his brothers Horace and Augustus wrote numerous popular humorous novels, fairy-tales, and farces. His chief achievement, however, has been in making known the every-day life of the lower classes of the British metropolis in his work, *London Labor and the London Poor* (1851; new ed. 1868), originally contributed to the *Morning Chronicle.* He has written largely for magazines, is author of *The Mormons* (1852) and of the valuable juvenile books, *The Wonders of Science* (1855), *Young Ben Franklin* (1858), *Boyhood of Martin Luther*, and *The Story of a Peasant-Boy Philosopher.*—His brother HORACE, b. in London in 1819, was for some years on the staff of *Punch*, published several humorous works in his own name, and d. at London Apr. 30, 1872. Three other brothers, THOMAS (b. in 1810), EDWARD (b. in 1813), and AUGUSTUS, aided Henry and Horace in some of their literary undertakings. Thomas was a pioneer in the publication of penny grammars, dictionaries, etc., as part of a "Penny National Library," and lost £10,000 by the undertaking; he was also editor of the *Poor Man's Guardian*, and was a conspicuous advocate of reform measures; Edward was theatrical manager and writer of farces in youth, and has published standard works on horses and dogs, especially on their diseases; while Augustus is known as the author of several successful romances.

Mayhew (IRA), b. at Ellisburg, N. Y., in 1814; received a careful education; removed to Michigan in youth; became a successful teacher and author of educational works. He was for many years superintendent of public instruction in Michigan; did much to increase the efficiency of the public-school system, and prepared, at the request of the legislature of Michigan, his valuable *Treatise on Popular Education, for the use of Parents and Teachers.* Among his other publications, a *Practical System of Bookkeeping by Single and Double Entry* (1851) deserves special mention.

Mayhew (JONATHAN), D. D., son of Experience, b. in Martha's Vineyard Oct. 8, 1720; graduated at Harvard College 1744; became minister to the West church, Boston, June, 1747, retaining that position until his death, July 9, 1766. He was a man of learning and literary ability; took part in the political questions of the day as a friend of Otis and advocate of colonial liberty; and in his theological opinions inclined to the views afterwards termed Unitarian. He published many occasional discourses, one of which was a *Thanksgiving Sermon for the Repeal of the Stamp Act* (1766). His writings were republished in 1838, with a *Memoir*, by Alden Bradford.

Mayhew (THOMAS), b. in England Mar., 1592; was a merchant at Southampton; came to New England in 1631; resided several years at Watertown; obtained in 1641 from the agent of Lord Stirling a grant of a considerable portion of the island of Martha's Vineyard, with the title of governor; began the colonization in 1642, aiding his son Thomas in converting the Indians, and proving himself so true a friend that through his influence they not only abstained from joining in Philip's war, but protected the white settlers against the savages. Gov. Mayhew founded Edgarton in 1647, preached in his old age to the Indians, as well as to the English, in place of his deceased son and grandson, and d. in Mar., 1682. From him was descended a remarkable series of missionaries to the Indians of Martha's Vineyard.

Mayhew (THOMAS), son of Gov. Thomas, b. in England in 1621; was well educated; went with his father to Martha's Vineyard in 1642 as minister to the settlers; learned the Indian language, began in 1646 to preach to the natives, and in 1650 had 100 converts among them. He undertook in Nov., 1657, a voyage to England for the purpose of obtaining aid for more extended Indian missions, but the vessel was lost at sea and all on board perished. Four of his letters on the Indians of Martha's Vineyard were published in London.—His sons, MATTHEW and JOHN, also preached to the Indians, the latter as a regular missionary, but d. before his grandfather, who became his successor.

Maynadier (Gen. WILLIAM), b. in Maryland in 1806; graduated at West Point, and appointed brevet second lieutenant of artillery 1827; served on duty at the school of practice at Fort Monroe, and of which he was subsequently adjutant; during the Black Hawk war was selected by Gen. Scott as one of his aides, and for similar duty by Gen. Macomb during the early part of the Florida war. Frequently assigned to ordnance duty while in the artillery, he was, in 1838, on the increase of that corps, appointed captain of ordnance, and assigned to the Pikesville (Md.) Arsenal, where he remained in command, acting also as inspector of ordnance, until 1842, when he was selected by the chief of ordnance as his principal assistant; from which date he was associated in close official connection with the successive chiefs of that bureau, and by whom his eminent abilities, sound judgment, and valuable experience were freely acknowledged. Major and lieutenant-colonel 1861; colonel in 1863; brevet brigadier-general 1865. D. at Washington, D. C., July 3, 1871.

May'nard, post-v. and tp. of Middlesex co., Mass., 27 miles W. N. W. of Boston, on the Marlboro' branch of the Fitchburg R. R., and on Assabet River, which furnishes valuable water-power. Maynard has extensive manufacturing interests, 3 churches, and a high school.

Maynard (HORACE), b. in Westborough, Mass., Aug. 30, 1814; graduated in 1838 at Amherst College; was tutor and afterwards mathematical professor in the East Tennessee University; was admitted to the bar in 1844, and became a successful lawyer; represented Tennessee in Congress 1857–63; suffered much from loss of property and exile during the war of 1861–65; was in Congress again 1866–75, representing the Knoxville (2d) district until 1873, when he was chosen Representative at large. In 1862 his alma mater gave him the degree of LL.D. In 1875 he was sent as minister to Constantinople.

Maynard (Sir JOHN), b. at Tavistock, England, in 1602; was educated at Oxford; studied law at the Middle Temple; was elected to Parliament in 1625; called to the bar 1626; was distinguished in the Long Parliament as one of the prosecutors of Strafford and Laud, and afterwards as an opponent of the encroachments of the army and of the assumption of supreme power by Cromwell, for which conduct he was twice sent to the Tower; became serjeant-at-law 1654, serjeant to the Commonwealth 1658; made king's serjeant and knighted 1660, refusing to accept a judgeship; took an active part in the "Convention Parliament" (1689) in obtaining the formal acceptance of the resignation of James II., and in the same year was made first commissioner of the great seal. When waiting upon William III., that prince, struck with his great age (eighty-seven years), observed that he must have outlived all the lawyers of his time, upon which Maynard replied that "he had like to have outlived the law itself if His Highness had not come over." Serjeant Maynard was a firm friend of liberty and of Presbyterianism, and is ranked by Sir James Mackintosh with Lord Somers as one of the greatest constitutional lawyers of England. Some of his *Reports* were printed, as well as a number of speeches and political tracts. D. at Gunnersbury, near Ealing, Oct. 9, 1690.

May'nardville, post-v., cap. of Union co., Tenn., 20 miles N. of Knoxville. Pop. 155.

Mayne (JASPER), b. at Hatherlagh, Devonshire, England, in 1604; studied theology at Oxford; was elected vicar of Cassington and Pyrton; lost his benefices during the Revolution, but received them back after the Restoration; was appointed archdeacon of Chichester and chaplain to the king, and d. at Oxford Dec. 6, 1672. Besides translations from Lucian and others, he wrote *The City Match*, a comedy (1639), and *The Amorous War*, a tragi-comedy (1648).

Mayne (JOHN), b. at Dumfries, Scotland, in 1761; was apprenticed in a printing-office; worked for some time on the Dumfries *Journal;* settled in London; became proprietor of the *Star*, and d. there in 1836. The first outline of his well-known poem, *The Siller Gun*, was published in 1777, and consisted of twelve stanzas printed on a quarto page. In 1780 the poem was published in *Ruddiman's Magazine*, embracing three cantos; in the final edition of 1836 it contains five cantos. Among his other poems are the ballad of *Logan Braes, Halloween, Helen of Kirkonnel*, etc.

May'nooth, a v. of Ireland, in the county of Kildare, has a celebrated Roman Catholic college or ecclesiastical seminary, with endowments for 500 students destined to

become priests in Ireland. It was founded in 1795. Several attempts have been made to repeal the act of endowment, though it is the only state endowment for religious purposes which the Roman Catholic population ever received in Ireland. The last attempt was made in 1858, but was defeated by a majority of fifty-five votes.

May'o, county of Ireland, in the province of Connaught, comprising an area of 2131 square miles, and bounded N. and W. by the Atlantic. It consists of a large and fertile plain enclosed by two ranges of mountains, whose highest peaks, Muilrea and Nephin, reach 2680 feet. As the climate is moist and windy, the soil is better adapted for pasturage than for tillage; many cattle and sheep of a good breed are reared. Next to agriculture, fishing is the chief branch of industry. Excellent marble is quarried. Pop. 246,033, of whom 121,337 can neither read nor write; 61,340 emigrated from this county between 1851 and 1872. Chief towns, Castlebar, Ballina, and Westport.

Mayo, tp. of Rockingham co., N. C. Pop. 3539.

Mayo (Amory Dwight), b. in Warwick, Franklin co., Mass., Jan. 31, 1823; educated at Deerfield Academy and Amherst College; studied for the ministry with Rev. Hosea Ballou, president of Tufts College (Universalist); from 1846–54 was pastor of the Independent Christian society in Gloucester, Mass.; from Oct., 1854, to Jan., 1856, preached in Cleveland, O.; from Jan., 1856, to Jan., 1863, was minister to the Division street church at Albany, N. Y.; from Jan., 1863, till July, 1872, was settled in Cincinnati, O., at the Church of the Redeemer (Unitarian); since Nov., 1872, has been pastor of the Church of the Unity in Springfield, Mass. Mr. Mayo has always been engaged in public-school work; was an active member of the board of education at Cincinnati, as he is now in Springfield, and has written many tracts and addresses on that and related subjects; has been a strong advocate of the importance of the Bible as an element of moral instruction in the schools, and took decided ground in favor of the "Christian amendment" to the U. S. Constitution. For several years he has been professor of ecclesiastical polity in Meadville Theological School, where he annually delivers a course of lectures. His published volumes are *The Balance; Memoirs of Mrs. S. C. E. Mayo,* his wife, who was also an authoress; *Graces and Powers of the Christian Life;* and *Symbols of the Capitol,* a volume of discourses on the elements of Christian civilization. Mr. Mayo received the title of A. M. from Amherst College. O. B. Frothingham.

Mayo (Herbert), professor of anatomy and physiology at King's College, London; was a fellow of the Royal Society, and d. at Bad-Weilbach, near Mentz, Aug. 15, 1852. His principal works are *Outlines of Human Physiology* (1827), *Outlines of Human Pathology* (1836), *The Nervous System and its Functions* (1842), etc.

Mayo (Richard Southwell **Bourke**), Earl of, b. at Dublin, Ireland, Feb. 8, 1822, was the eldest son of the fifth earl, and was known during his father's life by the courtesy title of Lord Naas. He was educated at Trinity College, Dublin; published a narrative of travels in Russia under the title *St. Petersburg and Moscow* (1845); was elected member of Parliament for the county of Kildare 1847, and for Coleraine 1852; was chief secretary for Ireland in Earl Derby's three administrations (1852, 1858–59, and 1866–68), and was a member of the cabinet during the third period; succeeded to the earldom Aug. 12, 1867; was appointed viceroy of India in 1868; arrived at Calcutta Jan., 1869, and became noted for executive ability and the reform of abuses. While on a tour of inspection through India he was stabbed in the back by a Mohammedan (Wahabee) convict in the penal settlement of Fort Blair, Andaman Islands, killing him instantly, Feb. 8, 1872.

Mayo (William Starbuck), M. D., b. at Ogdensburg, N. Y., Apr. 20, 1812; studied at Potsdam Academy; graduated in medicine at the New York College of Physicians and Surgeons 1833; practised his profession for several years; visited Spain for his health; passed over to Morocco with the design of penetrating into the interior of Africa, but found his project impracticable. Several years after his return to the U. S., Dr. Mayo published *Kaloolah, or Journeyings to the Djebel Kumri* (1849), in which he utilized his knowledge of Northern Africa in presenting the adventures of his fictitious hero, Jonathan Romer, who was supposed to meet with a series of very extraordinary adventures, culminating in marriage to a black princess. A portion of the work contains a satirical view of some of the customs of civilization. He has since published *The Berber, or the Mountaineer of the Atlas* (1850), *Romance-Dust from the Historic Placer* (1851), and after a silence of more than twenty years issued in 1873 *Never Again,* a romance which has elicited high praise from the English critical journals.

Mayo River, tp. of Patrick co., Va. Pop. 4017.

May'or (John Eyton Bickersteth), b. at Baddagamme, Ceylon, Jan. 25, 1825; educated at Shrewsbury School and St. John's College, Cambridge, of which he became a fellow 1849; was assistant master at Marlborough College 1849–53; college lecturer 1853; took orders in the Church of England 1855; was librarian of the University of Cambridge 1863–67, and was appointed professor of Latin in that university 1872. Prof. Mayor has edited the *Satires of Juvenal* (1853), Cicero's *Second Philippic* (1861), Homer's *Odyssey,* books ix.–xii. (1872), *Quintilian,* book x. (1872), and numerous Early English historical, biographical, and antiquarian publications, and has published several textbooks of Latin grammar. He was one of the editors of the *Journal of Classical and Sacred Philology* and of the *Journal of Philology.*

Mayor'ga, de (Martin), forty-seventh viceroy (1779–83) of Mexico or New Spain. At the time of his arrival in Mexico the smallpox was an epidemic, from which as many as 8000 persons died in a few days, infesting the streets of the capital with corpses. He had all the people inoculated, a precaution the value of which had only become very recently known in Europe. Mayorga was an able, energetic executive of the better class of viceroys, whose usefulness, however, was much obstructed and impaired by the intrigues of enemies. He founded an academy of the arts in Mexico, and during his viceroyalty gold and silver to the value of \$74,866,054 were coined. He died on the voyage back to Spain from the effects of poison. Thos. Jordan.

May'ow (John), M. D., LL.D., b. in Cornwall, England, in 1645; was educated at Wadham and All Souls' Colleges, Oxford; took degrees in both law and medicine; became a distinguished physician at Bath; wrote several learned medical works, published together in his *Opera Omnia Medica Physica* (Leyden, 1681), and propounded in his chapter on chemical affinities doctrines so far in advance of the science of that day that Dr. Beddow republished a great part in 1790 under the title *Chemical Experiments and Opinions extracted from a Work published in the Last Century.* It was claimed that the chief discoveries of Priestley and Scheele were known to Mayow a century earlier. D. in London Sept., 1679.

May's Landing, post-v., cap. of Atlantic co., N. J., in Hamilton tp., on Great Egg Harbor River and on the May's Landing and Egg Harbor R. R., 48 miles by rail S. S. E. of Philadelphia.

May's Lick, post-v. of Mason co., Ky., 12 miles S. S.W. of Maysville. Pop. 199.

Mays'ville, post-tp. of Madison co., Ala. Pop. 2682.

Maysville, city and tp., cap. of Mason co., Ky., on the Ohio River, terminus of the Maysville and Lexington R. R., is well built, has 12 churches, several academies, factories, and banks, 1 hotel, 3 weekly newspapers, and a large hemp-trade. Pop. of city, 4705; of tp. 6431.

Maysville, tp. of Aroostook co., Me., 42 miles N. of Houlton. Pop. 758.

Maysville, post-v., cap. of De Kalb co., Mo., 30 miles E. N. E. of St. Joseph.

Maysville, v. of Salt Creek tp., Wayne co., O. Pop. 88.

Maysville, tp. of Sumter co., S. C. Pop. 1763.

Maysville, tp. of Buckingham co., Va. Pop. 1916.

May'town, post-v. of E. Donegal tp., Lancaster co., Pa. Pop. 613.

May'ville, tp. of Houston co., Minn. Pop. 611.

Mayville, post-v., cap. of Chautauqua co., N. Y., on the Buffalo Corry and Pittsburg R. R., at the head of Chautauqua Lake, contains a fine school, 6 churches, 1 banking-office, 1 newspaper, several hotels, and stores. Pop. 701. John F. Phelps, Prop. "Mayville Sentinel."

Mayville, post-v. of Dodge co., Wis., 12 miles N. E. of Juneau, has valuable mines of iron, which is here smelted. The village has a good water-power.

May'wood, post-tp. of Benton co., Minn. Pop. 83.

Mazamet', town of France, in the department of Tarn, on the Arnette, has extensive wool-spinning factories and manufactures of cloth. Pop. 10,924.

Mazanderan', province of Persia, bounded N. by the Caspian Sea, W. by Ghilan, and S. by Irak-Ajemi, from which it is separated by the Elbrooz Mountains. The ground is low along the shore of the sea, but farther inland it rises, covered with spurs of the Elbrooz. The soil is fertile; rice, cotton, mulberry trees, sugar-cane, and fine fruits are grown. The climate is cooler and more equable than that of the rest of Persia. Firdousi called Mazanderan the "land of roses," and Shah Abbas the Great often resided here. The area and number of inhabitants of this province are unknown. Cap. Sari.

Mazarin′ (Jules), [It. Giulio Mazarini], b. July 14, 1602, but his birthplace, whether Rome or Piscina in the Abruzzi, as well as the condition of his family, are uncertain, some saying that his father was a Sicilian nobleman of good standing, others that he was a merchant of Jewish descent and in humble circumstances. Young Mazarin was educated in the schools of the Jesuits at Rome, but refused to enter their order; studied law at Alcalá and Salamanca, where he led a very gay life; entered the military service of the pope, and was employed in some political missions in which he evinced great diplomatic skill; was introduced in 1628 to Richelieu, who entertained so high an opinion of his abilities that he had him appointed vice-legate of Avignon in 1634, made a cardinal in 1641, though he had never taken holy orders, naturalized as French citizen in 1639, and appointed his successor as minister; and after the death of Richelieu (Dec. 4, 1642) Mazarin governed France for eighteen years with absolute power, though not without some violent interruptions. He was as crafty a diplomate as Richelieu, but he was far inferior to him as an administrator, and having no other ideas than those inherited from Richelieu, and no other aims than those dictated by his own vanity and rapacity, his subtlest intrigues sometimes turned out gross blunders. The aversion of Anne of Austria—who, after the death of Louis XIII., May 14, 1643, became regent during the minority of her son, Louis XIV.—he conquered by his bland manners and elegant flattery; she became his firm friend, and the contemporary gossip was that they were secretly married. But the rich dotations he made in order to gain the good-will of the princes, the prodigality of the court, and his own lack of thorough capacity as a financier exhausted the treasury. The Parliament of Paris refused to register the new tax-edicts. He answered by throwing its president and several of its members into prison. The next day (Aug. 27, 1648) Paris rose in rebellion, and the wars of the Fronde (which see) began. A peculiar feature of this whole movement were the so-called *Mazarinades*—pamphlets, about 4000 in number, published against the cardinal, and speaking in a very unrestrained manner of his life at Alcalá, his relation to Dame Anne, his foreign birth, his rapacity, and his nieces. He was intensely hated, and the hatred was not tempered with awe. Twice between 1651 and 1653 he had to resign his office and retire from the court—the first time to Brühl, near Cologne, the second time to Sedan, where Turenne and his army were. He was arraigned as a traitor and enemy of France; his property was confiscated; his library, furniture, and statues were sold. But after the end of the wars of the Fronde and the flight of the prince of Condé to Spain, Mazarin re-entered Paris (Feb. 3, 1653) in triumph, and was received not only by the king and the court, but even by the people, with great ovations. The subsequent years of his government were more quiet. He could now prosecute the war against Spain, commenced in 1635, with undisturbed vigor, and by the Peace of Westphalia (Oct. 24, 1648) and of the Pyrenees (Nov. 7, 1659) he succeeded in curbing both branches of the house of Hapsburg, and procured for France the foremost place in the political system of Europe. Another idea of Richelieu's, the establishment of the absolute authority of the crown in France, he carried out with considerable success, but the interior administration, the finances, commerce, industry, agriculture, etc., were in confusion and decadence when he d. at Vincennes Mar. 9, 1661. He left an enormous fortune, 200,000,000 livres, which he presented to the king a few days before his death, probably because he considered this manœuvre the only means of securing it for his family; the king returned it graciously, and his nieces inherited it. Clemens Petersen.

Mazarne′, tp. of Montgomery co., Ark. Pop. 387.

Mazarre′do y Salazor (José Maria), Admiral, b. at Bilbao, Spain, in 1744; entered the navy 1760; participated in the campaign against Algiers 1775; was instrumental in saving the remnant of the army from destruction; negotiated peace with the regency; was appointed major-general of naval forces; took part in the naval operations against the English 1780–83; made lieutenant-general 1789; appointed commander-in-chief of the Spanish navy, which he reorganized, 1793; defended Cadiz against the English July, 1797; was ambassador to Paris 1799, and again 1804; was a partisan of Joseph Bonaparte, by whom he was made counsellor of state and minister of marine, which offices he held until his death at Madrid in 1812. He was considered one of the most scientific seamen whom Spain has produced; published *Rudimentos de Tactica Naval* (1785), and built the naval observatory at Cadiz.

Mazatlan′, a port of Mexico, state of Sinaloa, at the entrance of the Gulf of California. Its harbor is not safe against the south-western wind; its climate is extremely hot, and its drinking-water poor; but the town is important for the exports from the mining districts, much silver and copper being shipped thence. In the year 1872–73 the value of exports amounted to $2,797,385, of which $2,435,450 was gold and silver bullion; and that of imports to $1,276,000: 53 steamers and 26 sailing vessels of 117,493 tons burden entered and cleared the harbor. Pop. 12,706.

Mazdak, a Persian religious enthusiast and founder of a sect, b. at Persepolis about A. D. 470; became *mobed* or chief priest at Nishapur, and on the occasion of a pestilence and famine in 500 presented himself to King Kobad as a prophet sent for the regeneration of mankind. His system was based upon the dualism of Manes, and his practical teaching was a form of communism. He succeeded in converting the king, and his projects became law, causing great commotions. Under Khosru Nushirvan, Mazdak was put to death at Nahrvan between 530 and 540, with thousands of his followers, but his ideas took deep root after the rise of Islam in the following century.

Mazep′pa, post-tp. of Wabashaw co., Minn. Pop. 681.

Mazeppa (John), b. in 1645, descended from a noble family in Podolia; was educated as a page at the court of John Casimir of Poland. Surprised in an adventure with a Polish lady, her husband stripped him naked, bound him stretched along the back of his half-wild horse, and put the frightened animal to flight. It carried its owner to his own estate, but Mazeppa fled for shame into the Ukraine, and joined the Cossacks. He soon made himself very popular among them, and became secretary to their hetman, Samvilowich, whom he overthrew in 1689, becoming hetman himself. In this position he soon gained the confidence of Peter the Great, who made him prince of the Ukraine. After the Peace of Altranstadt (Sept. 24, 1706) he opened negotiations with Charles XII. for the purpose of throwing off the Russian authority. Peter the Great was informed of this treachery, but did not believe it; he sent the informers to Mazeppa, and Mazeppa had them put to death. The czar afterwards obtained indubitable proofs, and Mazeppa was now compelled to join Charles XII. openly. He took part in the battle of Pultowa, June 27, 1709, and fled to Bender, where he d. 1710.

Mazeres′, more correctly **Maseres** (Francis), M. A., b. in London Dec. 15, 1731, of a French family who settled in England on the Revocation of the Edict of Nantes; educated at Kingston and at Cambridge, where he was made B. A. 1752 and M. A. 1755; published *A Dissertation on the Negative Signs in Algebra* (1758), denying the propriety of such expressions as negative roots, etc.; called to the bar, and appointed attorney-general of Quebec; returning to England, was made cursitor baron of the exchequer Aug., 1773, also agent to the Protestant settlers of Quebec. His friendship for America led him to urge conciliatory measures towards the colonies, and his deep interest in the laboring classes resulted in the publication of his *Principles of the Doctrine of Life Annuities* (1783). Besides many mathematical works, he edited or wrote *An Account of the Proceedings of the British and other Protestant Inhabitants of Quebec* (1775), *The Canadian Freeholder* (1779, 3 vols.), *Enquiry into the Extent and Power of Juries* (1792), *Essays on Various Subjects, chiefly Historical and Political* (1809), *The Curse of Popery and Popish Pains* (1807), and *Select Tracts relating to the Civil Wars in England* (2 vols., 1815). D. at Reigate May 19, 1824.

Mazo′manie, post-v. and tp. of Dane co., Wis., on the Milwaukee and St. Paul R. R., Prairie du Chien division, 23 miles W. by N. of Madison. Pop. of v. 1143; of tp. 1713.

Ma′zon, post-v. and tp. of Grundy co., Ill., on West Mazon Creek, 10 miles S. of Morris. Pop. 1005.

Mazur′ka [Polish], a dance in $\frac{3}{4}$ or $\frac{3}{8}$ time, having a peculiar and pleasant rhythm. From four to eight couples join in the mazurka, which is lively and sometimes rather grotesque.

Mazza′ra del Vallo, town of Sicily, in the province of Trapani. It is a walled town, lying on the sea-shore, with a good harbor overlooked by a castle, but the roadstead is unsafe. The streets are narrow and crooked, and there is but a single square—that on which stands the cathedral containing interesting old inscriptions. The first landing of the Arabs on the island was made here in 827. About 600 vessels of different sizes enter this port annually. Pop. in 1874, 12,155.

Mazzari′no, town of Sicily, in the province of Caltanissetta, situated on the river Terranuova. It contains large churches, a theatre, and some fine private edifices, among them the palace of the Branciforte, princes of Buteria. Not far from the town stands the castle of Grassuliato on a rocky hill surrounded by crenellated walls, with vast cisterns and a subterranean passage connected with the valley below. Pop. in 1874, 11,951.

Mazzei (Philip), M. D., b. in Tuscany in 1730; resided for some years as a physician at Smyrna; was engaged in mercantile business in London from 1755 till 1773, when he came to Virginia with a number of Italians for the purpose of introducing the cultivation of the olive and other European fruits; became an intimate friend and correspondent of Jefferson; went to Europe in 1783 on a secret mission from the State of Virginia; published at Paris in 1788 *Récherches Historiques et Politiques sur les Etats-Unis de l'Amérique Septentrionale* (4 vols.); was subsequently in the service of the kings of Poland and Russia, and d. at Pisa, Italy, Mar. 19, 1816.

Mazzi'ni (Giuseppe), the son of a physician, b. at Genoa on the 28th—or, according to some of his biographers, on the 22d—of June, 1805. His first master was Giuseppe Patroni, a colonel of artillery and a cousin of his mother. This man had the insight to divine the future greatness of his pupil, and when Mazzini was scarcely seven years old Patroni wrote from Pavia to the boy's mother, "This dear child is a rising star of the first magnitude, beaming with native light, and one day to be proclaimed as such by cultivated Europe. For this reason we ought all to regard him as our own, and to interest ourselves, at the same time, in everything that may concur to turn to the best account the extraordinary gifts which prodigal nature has lavished upon him. The highest geniuses who, appearing at wide intervals, have done honor to their century, have generally manifested at an early age those special intellectual qualities that distinguish your son. An astonishingly tenacious memory, unbounded talent, and an extraordinary aptitude for study are his most decided characteristics. Having an innate and insatiable desire for knowledge, he will pass easily from one occupation to another without risk of confounding previously received ideas, without physical weariness, and without any overtasking of his mental powers." The Piedmontese revolution of 1821, and the sight of his banished fellow-citizens embarking from Genoa for the land of exile, made the deepest impression upon Mazzini, then a boy of sixteen; and from that time he devoted himself wholly to the liberation of his country. Ugo Foscolo's *Ultime Lettere di Jacopo Ortis* inflamed his imagination still further. He studied at the university, became acquainted with the brothers Ruffini, and confided to them his bold designs. Giovanni Ruffini—afterwards distinguished in England as a romance-writer, and the author of *Doctor Antonio* and of *Benoni*—describes the young conspirator, Mazzini, in his *Memorie d'un Cospiratore* under the name of Fantasio, representing him as something very like a utopist. At the age of twenty-one—that is, in the year 1826—Mazzini began to be known as an author, and he then commenced his political warfare with his pen. Mazzini's first essay treated of Dante's love of country, but he was only able to publish it about the year 1831 in a Genoese journal entitled *Il Subalpino*. Mazzini felt that in order to have a free country it was necessary first to liberate the literature from arcadian and academic shackles, and make it a political instrument. Mazzini began his politico-literary conflicts in the journal *L'Indicatore Genovese*, where appeared his articles upon Manzoni, Botta, Guerrazzi, Monti, and Schlegel in the year 1828. These writings form a part of the Mazzinian collection published at Milan in 1847 under the title of *Scritti d'un Italiano vivente*, and which were reproduced in the edition of the complete works of Mazzini commenced by Daelli in Milan, and continued by Robecchi. Mazzini at an early age took part with the Carbonarists, and in consequence he was arrested in Genoa in 1830, and imprisoned at Savona. While there he became convinced that Carbonarism was no longer suited to the times, and he conceived while in prison the idea of *La Giovine Italia*. Acquitted by the tribunal, he retired to Marseilles, and was afterwards condemned *par contumace* to the gallows for conspiracy by Charles Albert. At Marseilles he united with Garibaldi in planning the insurrection of Genoa. When this plot failed, Mazzini withdrew to Switzerland, and there formed a conspiracy to invade Savoy; this was the unfortunate expedition of 1834. After its failure he did not give himself up for vanquished, but continued his machinations, proceeding first to Paris, and afterwards to London, where in 1839 he established a revolutionary committee. From London, which then became his head-quarters, he instigated various attempts at revolution in Italy—attempts that cost the lives of many noble victims, among others, of the brothers Bandiera, betrayed by the British post-office in 1844, but which were not without fruit for the future. The moderate Guelph school turned to its own advantage the agitation created in Italy by Mazzini and his followers, and thus it may be said that the Italian revolutionary movements of 1848 were in great part the work of this active conspirator. In the spring of 1848, Mazzini established and edited in Milan *L'Italia del Popolo*, in which he manifested a strong opposition to King Charles Albert and the moderate monarchical party. The Guerrazzian triumvirate being formed in Tuscany, and Mazzini chosen member of the Tuscan assembly, he hoped to secure the proclamation of a republic. Not succeeding in this, he withdrew to Rome, where the republic was proclaimed, and he himself became the first of the triumvirs. After the fall of Rome he first took refuge in Switzerland, then once more returned to London. There he incited the Italians to fresh insurrectionary movements, which proved unfortunate, disastrous, and fruitless—that of Mantua in 1852, that of Milan in 1853, and that of Genoa in 1859. He co-operated in the expedition of Carlo Pisacane in Southern Italy, which also was unfortunate in its termination, but which served in some degree as pioneer of the glorious and fortunate expedition of Gen. Garibaldi in Sicily (see Garibaldi), made with the consent and encouragement of Count Cavour. In the events which transpired in Italy in 1859 and 1860, Mazzini took no part; he was a mere spectator. What he desired above all things was the expulsion of the foreigner and the unity of Italy. These two objects were being accomplished; he did not applaud nor did he interfere. He was willing to see the kingdom of Italy put to the proof. When it seemed to him that the Italian monarchy had failed to satisfy the requirements of the people, he recommenced his conspiracies with a purely republican aim. But in this last period of his revolutionary labors his desire to separate republicanism from socialism and atheism is most noteworthy. He was neither Catholic nor Christian, but he had taken for the motto of his banner "God and the People!" and in the last years of his life he struggled energetically against everything which implied the negation of a God. For this reason, before his death he emphatically condemned the Commune of Paris and the objects and the acts of the Internationals. With the same zeal Mazzini opposed the ultra doctrines of the pontifical syllabus. Some of the last months of his life Mazzini passed at Lugano, being already seriously ill, and finally, in search of a milder climate, he went to Pisa under an assumed name—a precaution altogether unnecessary, as from 1866 full liberty had been allowed him to return to Italy. Here he d. on Mar. 10, 1872. His obsequies were celebrated with great solemnity, both at Pisa and at Genoa, on Mar. 17, and it is said that the bier was followed to the cemetery of Staglieno by ten thousand persons. Mazzini often wrote in English and in French, and his works in both these, as well as in his native language, are remarkable for ability, for purity and vigor of style, and for an elevation of sentiment which, in spite of great political indiscretions, distinguished him through life. Angelo de Gubernatis.

Meach'am, tp. of Marion co., Ill. Pop. 835.

Mead [Gr. μέθυ, "wine"], an alcoholic drink made by fermenting a mixture of honey and water or the washings of honeycomb. It is sometimes flavored with aromatic substances. It is the same as hydromel and metheglin. It was a favorite drink among the Norse peoples of antiquity, and was not unknown in ancient Greece and Rome. It is very heady and intoxicating. According to Brande, it contains but 7.32 per cent. of alcohol, but the percentage is of course variable.

Mead, tp. of Belmont co., O. Pop. 1850.

Mead, tp. of Crawford co., Pa., contains Meadville (which see). Pop. 9524.

Mead, tp. of Warren co., Pa. Pop. 463.

Mead (Charles Marsh), b. at Cornwall, Vt., Jan. 28, 1836; graduated at Middlebury College 1856, and at Andover Theological Seminary 1862; studied at German universities 1863–66; became professor of Hebrew at Andover 1866; has written several essays in periodicals, theological and literary; delivered two of the lectures in the Boston course on *Christianity and Skepticism* 1870–71, and is now (1875) engaged in preparing an edition of Lange's *Exodus*.

Mead (Larkin Goldsmith), b. at Chesterfield, N. H., Jan. 3, 1835; removed in childhood with his parents to Brattleboro', Vt., where he was educated, and first made known his artistic genius by modelling in snow a colossal figure of an angel, which excited great admiration and was mentioned in the newspapers. The story having met the eye of Mr. Nicholas Longworth of Cincinnati, he wrote to Brattleboro', offering young Mead inducements to pursue the study of sculpture. He accordingly became a pupil of Henry Kirke Brown at Brooklyn, N. Y., for three years, after which he produced in marble his *Recording Angel* (1855), executed the colossal statue of *Vermont*, now placed over the dome of the State-house at Montpelier (1857), and a statue of Ethan Allen (1861), which stands in the portico of the same building. In the same year he sent to a New

York paper from the encampment of the Army of the Potomac some graphic sketches of battle-scenes. In 1862 he went to Florence, where he was welcomed by Hiram Powers, and produced several fine statuettes. He returned to the U. S. some years later, bringing his celebrated *Returned Soldier*, *La Contadinella*, *The Thought of Freedom*, and *Echo*, as well as a model for a monument to Lincoln, which was ordered for his tomb at Springfield, Ill., and inaugurated there Oct. 15, 1874. He has since executed several admired works.

Mead (Richard), M. D., F. R. S., b. at Stepney, near London, Aug. 11, 1673; educated under Grævius at Utrecht; studied medicine at Leyden and at Padua; settled at Stepney 1696; became physician to St. Thomas's Hospital 1703, anatomical lecturer at Surgeons' Hall 1711; attended Queen Anne in her last illness; removed to London 1714; was admitted fellow of the College of Physicians 1716; was consulted by the government in 1719 as to the means of preventing the spread of the plague to England; wrote a treatise on the subject which ran through seven editions in that year, and was charged in 1721 with conducting experiments as to the effects of inoculation upon criminals condemned to death, which resulted so favorably that the princesses Amelia and Caroline were soon afterwards inoculated. In 1727, Dr. Mead became physician-in-ordinary to George II. The extraordinary reputation which Dr. Mead enjoyed for half a century as the highest English medical authority dated from his work, *A Mechanical Account of Poisons* (1703), and was strengthened by his intimacy with Boerhaave. He attained a practice which produced over £5000 per annum; was intimate with the great authors of the day, a liberal patron of letters, and collected a library, a gallery of pictures, and a museum of antiquities which were renowned through Europe. Several of his medical works were written in elegant Latin; of these the most known was *Medicina Sacra* (1749), a treatise on the principal diseases mentioned in the Bible, notable for taking the position (then a novel one) that the demoniacal possessions of the Gospels are to be considered cases of lunacy and epilepsy. D. at London Feb. 16, 1754. His *Medical Works*, which had appeared in Latin, French, and Italian, were published in English in 1762.

Meade, county of S. W. Kansas. Area, 720 square miles. It is watered by the Cimarron River and its branches, and is adapted to grazing.

Meade, county of Kentucky, separated from Indiana by the Ohio River. It is rolling and fertile, and is based on cavernous limestone. Live-stock, tobacco, corn, oats, and wool are leading products. Area, 500 square miles. Cap. Brandenburg. Pop. 9485.

Meade, tp. of Huron co., Mich. Pop. 213.

Meade, tp. of Marshall co., W. Va. Pop. 1308.

Meade, tp. of Pocahontas co., W. Va. Pop. 887.

Meade, tp. of Tyler co., W. Va. Pop. 817.

Meade, tp. of Upshur co., W. Va. Pop. 1284.

Meade (Gen. George Gordon), b. in Cadiz, Spain, Dec. 31, 1815, his father being at the time U. S. consul at that port. After receiving a careful education he entered the U. S. Military Academy at West Point in 1831, from which he was graduated June 30, 1835, and appointed in the army a brevet second lieutenant of artillery, receiving his full rank the same year. Remaining in the army but little more than a year, during which time he was engaged in Florida against the hostile Seminoles, he resigned Oct., 1836, and entered upon the profession of civil engineer, which he followed for about six years, being employed by the government to assist in an elaborate survey of the mouths of the Mississippi River, where he made some original experiments which elicited facts leading to important consequences in the improvement of that river. He was next engaged in the survey of the boundary-line of Texas, and subsequently in the survey of the N. E. boundary-line between the U. S. and Great Britain, where we find him in 1842, in which year he was reappointed in the army a second lieutenant of topographical engineers, and retained for some time upon the same duty; then in river and harbor improvements. In the Mexican war he served with distinction on the staffs of Gen. Taylor and of Gen. Scott in the battles of Palo Alto, Resaca de la Palma, and Monterey, winning the brevet of first lieutenant for the latter battle. In 1851 he was promoted to be first lieutenant in his corps, captain in 1856, and major in 1862. After the close of the Mexican war he was engaged upon lighthouse construction, and during the four years preceding the civil war had charge of the geodetic survey of the great lakes, in which he added largely to his scientific and engineering reputation. In Aug., 1861, he was appointed a brigadier-general of volunteers, and placed in command of the second brigade of the Pennsylvania Reserve Corps, which constituted a division in the Army of the Potomac, with which army he remained prominently identified until the close of the war, and a full history of his conspicuous services would be to repeat the history of that army. In the Virginia Peninsular campaign of 1862 he took an active part in the battles of Mechanicsville, Gaines's Mill, and Glendale, being severely wounded in the latter. Returning to the field as soon as his wound would permit, he was assigned to the command of a division, and distinguished himself in the battles of South Mountain and Antietam, being placed in command of the 1st corps when Gen. Hooker was wounded at the last-named battle, where he was later himself slightly wounded. For these services he was promoted to be major-general of volunteers in Nov., 1862. Upon the recovery of Gen. Hooker he returned to the command of his division, and in Dec., 1862, at Fredericksburg, he led the attack which broke through the right of Lee's line and penetrated far to the rear, but being at length outnumbered, was driven back with heavy loss. In the latter part of this month he was promoted to the command of the 5th corps, and at Chancellorsville (May, 1863) his sagacious advice and soldierly bearing so impressed Gen. Hooker that upon requesting to be relieved, two months later, he designated Gen. Meade as his successor, and on June 28, 1863, he was appointed by Pres. Lincoln to command in chief the Army of the Potomac, then scattered and moving hastily through Pennsylvania to the great battlefield of Gettysburg, at which he commanded, and on the 1st, 2d, and 3d days of July won a victory with whose glory and decisive results his name will for ever be identified. From that time he commanded the Army of the Potomac until the close of the war. For his skill and valor at Gettysburg he received the thanks of Congress, and was promoted in the regular army to the rank of brigadier-general. The operations of the army during the winter of 1863–64 were unimportant, and before the return of the season for active operations Gen. Grant had been placed in command of all the armies with the rank of lieutenant-general, and had taken up his head-quarters with the Army of the Potomac. During the extraordinary campaign which opened in May, 1864, with the battle of the Wilderness, and only terminated with the surrender of the army of Northern Virginia, Meade's ability as a commander was conspicuous; and though his position was a delicate one, by reason of the presence of his superior in command, he discharged his duties in such a manner as to command the respect and esteem of the lieutenant-general, and his services were recognized by his promotion to the rank of major-general in the regular army in Aug., 1864. After the close of hostilities Meade was (July 1, 1865) assigned to the command of the military division of the Atlantic, with his head-quarters at Philadelphia; which post he held, with one short period of detached service in Georgia, till his death, which occurred at Philadelphia Nov. 6, 1872. G. C. Simmons.

Meade (Col. Richard Kidder), b. in Nansemond co., Va., in 1750; was educated at Harrow School, England; entered the Revolutionary army in 1775; took part in the battle of Great Bridge, near Norfolk (Dec., 1775), the first fought in that State; became aide-de-camp to Washington (1777–83), whom he attended in the principal battles of the war; attained the rank of colonel, and superintended the execution of Major André. He became a farmer in Frederick (now Clarke) co., Va., where he d. Feb., 1805.

Meade (Richard Kidder), son of Col. R. K. Meade and brother of Bishop Meade, b. in Frederick co., Va., about 1795; was liberally educated; became a lawyer and a prominent Democratic politician; was a member of Congress from 1847 to 1853, chargé d'affaires to Sardinia 1853–57, and minister to Brazil 1857–61. He returned to Virginia in 1861, supported the Confederate movement, and d. in Apr., 1862.

Meade (Richard Worsam), b. in Chester co., Pa., June 23, 1788; was son of George Meade, a wealthy merchant of Philadelphia, distinguished for his patriotism, who on one occasion subscribed $10,000 in gold for the support of the government during the war of the Revolution. He settled at Cadiz, Spain, as a shipping merchant in 1803; rendered good service to the cause of Spanish independence during the war with the French by importing from the U. S. immense supplies of flour into Cadiz when besieged, and was from 1805 to 1816 naval agent of the U. S. On May 2, 1816, he was imprisoned in the castle of Santa Catalina on account of charges emanating from hostile individuals in the council of war, but was released in 1818 upon the demand of the U. S. government. The ruin of Meade's business gave rise to a claim against the Spanish government, which was fruitlessly prosecuted for many years by the aid of counsel which included Clay, Webster,

and Choate. Mr. Meade was said to be the first importer of sherry wine and of merino sheep into the U. S., and formed a gallery of paintings and statuary unrivalled by any private collection in the country. D. at Washington, D. C., in 1828.

Meade (R. W.), U. S. N., b. Oct. 9, 1836, in New York; entered the navy as a midshipman Oct. 2, 1850; became a passed midshipman in 1856, a lieutenant in 1858, a lieutenant-commander in 1862, a commander in 1868; was very actively employed during the civil war on the Mississippi River and in the North Atlantic squadron, and highly commended in official despatches for "skill and gallantry." FOXHALL A. PARKER.

Meade (Com. RICHARD W.), U. S. N., b. in Cadiz in 1807, a brother of George Gordon; graduated at the Naval Academy, and successively rose to be commander at the commencement of the civil war; in 1864 took command of the steam sloop-of-war San Jacinto, on the loss of which he was retired with the rank of commodore. D. Apr. 16, 1870. He left three sons, who are in the navy.

Meade (WILLIAM), D. D., b. in Frederick (now Clarke) co., Va., Nov. 11, 1789; graduated at New Jersey College 1808; was ordained in the Protestant Episcopal Church in 1811; for many years preached gratuitously near his home, besides contributing freely to educational and missionary work; became in 1829 assistant bishop, and in 1841 bishop of Virginia; was a recognized Low-Church leader; opposed earnestly the secession of 1861; was author of valuable devotional works, and of *Old Churches, Ministers, and Families in Virginia* (2 vols., 1856). D. at Richmond, Va., Mar. 14, 1862.

Mea'dow [Ang.-Sax. *mæd, mädu*], the general name for any tract of grassland in which the natural herbage is permanent and frequently made into hay, but more especially applied to the low grounds on the banks of rivers, which are kept moist by their situation and occasionally flooded by the rise of the waters. In the low, wet meadows the herbage is coarser and less nutritious than in those which lie higher and to which the floods never rise. For this reason upland meadows are very valuable wherever there is a demand for good hay, but as they are not recruited by annual flooding, some pains must be taken to keep up their natural fertility. The best means of preventing them from degenerating is, of course, a frequent application of rich animal and vegetable manure, spread over the surface either early in spring or immediately after midsummer, when showers are abundant and able to wash the nutriment down to the roots of the grass. Whether the hay is taken off by mowing or by the grazing of cattle, the effect is nearly the same with respect to the formation of a closer sward; but it is a mistake to suppose that pasturing can replace manuring. The urine of cattle greatly promotes luxuriant vegetation in rainy weather, but in hot and dry weather it does more harm than good. The dung when dropped on the grass is of little value compared with what it would be if mixed with straw, earth, or peat, or diffused through water in a tank. If a natural meadow deteriorates and the grass becomes mixed with rank weeds and mosses, the shortest method of restoring it, and in most cases also the best, is to plough it up clean, and manure it during a course of tillage, without taking very exhaustive crops from it, and then to lay it down again in a clean and enriched state by sowing the best sorts of grass-seed. Another remedy is inoculation; small tufts of grass from some rich meadow are planted, and they will soon increase and produce a new and improved sward. Where the sward is thin it is prudent to mow before the seeds of the grasses are formed, contrary to a common notion that in a thin meadow the seed should be allowed to shed in order to increase the number of plants. Such an increase should be effected by sowing seeds produced on other ground, as the ripening of the seed tends to exhaust the soil.

Meadow, tp. of Johnston co., N. C. Pop. 1043.

Meadow Bluff, post-tp. of Greenbrier co., West Va. Pop. 1306.

Meadow Lake, tp. of Nevada co., Cal. Pop. 1655. Here are quartz-mines, formerly of great importance.

Meadow Lark. See LARK.

Meadow Mouse. See ARVICOLA.

Meadows, tp. of Stokes co., N. C. Pop. 2065.

Meadows (THOMAS TAYLOR), b. in England about 1810; entered the civil service of the British government in the East; was employed in various capacities in China, chiefly as interpreter; obtained an extensive acquaintance with the Chinese and Manchu languages and literature; published *Desultory Notes on the Government and People of China* (1847), *Translations from the Manchu, with Original Texts* (1849), *The Chinese and their Rebellions* (1856), and other valuable works upon China. D. in China in the summer of 1875.

Meadow-Saffron, the common name of the *Colchicum autumnale*, a small perennial bulbous herb of the natural order Melanthaceæ, growing wild in moist soil in England and Middle and Southern Europe. The mode of growth is peculiar. From the corm of one year there sprouts a new one, from which, late in the summer, a stem grows bearing for that season only flowers. These are from two to six in number, and are of a lilac or light-purple color. The following spring the young plant matures, bearing leaves and fruit, and the old corm shrivels. The leaves are large, broad, and lanceolate; the fruit is a three-celled capsule, containing small brown seeds about the size of black mustard-seeds. The corm and seeds are used in medicine. Their virtues depend upon a crystallizable principle called *colchicine*. Colchicum is an acrid irritant, producing when taken internally a general increase of the secretions of the intestines, kidneys, and skin, and in fuller dose active purging with colic, nausea, and vomiting. In large dose it is a violent poison, producing inflammation of the stomach and intestines, with dysenteric purging, incessant vomiting, great feebleness of the heart's action, extreme prostration, collapse, and death. The action of colchicum is too violent and poisonous to permit it to be used in full dose as an emetic or purge, and its principal use is in smaller dose in gout, where in some unknown way it has great power in subduing for the time the pain and fever of a gouty "fit." Some use it also in acute rheumatism and certain inflammations. EDWARD CURTIS.

Meadow Valley, a v. of Lincoln co., Nev. Pop. 365.

Mead'ville, post-v., cap. of Franklin co., Miss., 35 miles E. by S. of Natchez, on the Homochitto River.

Meadville, post-v. of Linn co., Mo., on the Hannibal and St. Joseph R. R., 116 miles W. of Hannibal.

Meadville, city of Mead tp., cap. of Crawford co., Pa., on French Creek, and at the junction of the Franklin branch with the Atlantic and Great Western R. R., has 15 churches, 18 graded schools, a high school, a public library of 2500 volumes, 2 national and 2 savings banks, 3 hotels, a court-house, opera-house, State arsenal, 1 daily and 3 weekly newspapers; has a large trade with the oil-regions, has several machine-works, paper and woollen mills, and is the seat of Allegheny College (Methodist Episcopal) and Meadville Theological School (Unitarian). Pop. 7103.

Mea'ford, a port at the mouth of Big Head River, on Nottawasaga Bay, Lake Huron, and in Grey co., Ontario, Canada. It has woollen, flour, and lumber manufactories, and ships large quantities of spring wheat. There are 1 monthly and 1 weekly newspaper. The town is 22 miles W. by N. of Collingwood. Pop. about 1200.

Meagh'er, county of Central Montana, extending E. from the Missouri River to the meridian of 109° W. lon. Area, 11,051 square miles. Its surface is broken by mountains and cañons, but contains much choice farming-land. Gold-mining is the principal industry. Cap. Diamond City. Pop. 1387.

Meagher (Gen. THOMAS FRANCIS), b. at Waterford, Ireland, Aug. 3, 1823; studied at the Jesuit college of Clongawes, Kildare, and at Stonyhurst College, England; became a favorite orator with the Young Ireland party of 1846–48; was sentenced to death for sedition, but the sentence was commuted to transportation for life; escaped from Tasmania in 1852, and came to New York; lectured with success in various parts of the country; became a lawyer, and wrote for the press; became editor of the *Irish News* in 1856; became in 1861 a captain, and then major, of the 69th New York Volunteers; raised a brigade of Irish volunteers in 1862; commanded this brigade as brigadier-general 1862–63; left the brigade after the battle of Chancellorsville; was assigned in 1864 to the command of the district of Etowah; in 1865 became secretary of Montana, and was drowned by falling from a steamer into the Missouri River at Fort Benton, Mont., July 1, 1867.

Meal-Worm. See TENEBRIO.

Mealy Bug. See COCCUS and ENTOMOLOGY (section HEMIPTERÆ).

Mean [Lat. *medius*]. The mean of two quantities is a quantity lying between them, and connected with them by some mathematical law. There are several kinds of mean values, the principal ones being the *arithmetical mean*, the *geometrical mean*, and the *harmonic mean*.

(1) The *arithmetical mean* of two quantities is one-half their sum; the arithmetical mean of several quantities is equal to their sum divided by their number; it is the same as their average. Thus, we say that the mean temperature of a day is equal to the sum of the temperatures at every hour (or minute) of the day, divided by the number of

hours (or minutes) in the day; and the mean temperature of a year is equal to the sum of the mean temperatures of every day in the year, divided by the number of days in the year.

(2) The *geometrical mean* of two quantities is the square root of their product; if several quantities form a geometrical progression, the first and last are called extremes, and all the others are said to be geometrical means between them. The ratio of the progression is equal to the nth root of the quotient of the last term by the first, $n+1$ being the number of terms. Thus, any ordinate of a circle is equal to the geometrical mean of the corresponding segments of the diameter; the radii vectores of a logarithmic spiral, corresponding to equal increments of the directing circle, are in geometrical progression, and each is a geometrical mean between the one that precedes and the one that follows it.

(3) The *harmonic mean* of two quantities is the reciprocal of the arithmetical mean of the reciprocals of the two quantities. Thus, the harmonic mean of 6 and 12 is $1 \div \frac{1}{2}(\frac{1}{6}+\frac{1}{12})$, or 8. The harmonic mean of two quantities is a third proportional to their arithmetical and geometrical means; that is,

$$\frac{a+b}{2} : \sqrt{ab} :: \sqrt{ab} : \frac{2ab}{a+b}.$$

The method of arithmetical means is employed in finding the probable result of several discrepant observations of the same quantity when there is no reason to suppose that an error of observation is more likely to be in one direction than in the other. Thus, if a body is weighed several times under the same circumstances, the arithmetical mean of the results is more likely to be true than any single result taken at random. This method is also used to determine the effects of several causes when we know their joint effects, and are certain that each cause acts in like manner at one time to increase and at another time to diminish the joint effect. Thus, the spring tide is equal to the sum of the lunar and solar tides, and the neap tide is the excess of the lunar over the solar tide; in this case the lunar tide is the arithmetical mean of the spring and neap tides. In like manner, the latitude of a place, or the altitude of the elevated pole of the heavens as seen from a place, is equal to the arithmetical mean of the true altitudes of a circumpolar star at its upper and lower culminations.

The method of geometrical means is used in solving many practical problems. Thus, to find the rate per cent. at which a sum of money will double in a given number of years, we regard the amounts at the ends of the successive years as terms of a geometrical progression, and then find the value of the corresponding ratio; this ratio (which is the annual amount per cent.), diminished by 1, is the required rate. Let it be required to find the rate per cent. at which a given sum of money will double in 10 years: here there are 9 geometrical means to be inserted between 1 and 2, and by the rule we find the ratio equal to $\sqrt[10]{2}$, or to 1.0717; hence, the required rate is .0717.

The geometrical problem of the insertion of two geometrical means between two given lines has called forth a great deal of ingenuity, but thus far it has not been solved by the processes of elementary geometry, but it can easily be solved by higher geometry by means of the logarithmic spiral. (See SQUARES, LEAST, METHOD OF.) W. G. PECK.

Meandrinæ. See CORAL.

Means (ALEXANDER), M. D., D. D., LL.D., b. in Statesville, Iredell co., N. C., Feb. 6, 1801; received a classical education at the academy at Statesville; removed to Georgia about 1822, taught school for four years, then attended medical lectures at Transylvania University, Ky., and commenced the practice of medicine in Covington, Ga., 1826. In the same year he was licensed to preach by the Methodist Episcopal Church. In 1834 he was called to the superintendency of the manual-labor school near Covington. On the organization of Emory College at the same place (now known as Oxford) in 1838, he was chosen professor of the physical sciences, which position he held for eighteen years; in 1840 was appointed professor of chemistry and pharmacy in the Medical College of Georgia, located at Augusta; delivered regular courses of lectures there during the winter season, continuing at the same time for eight months in each year to fill his chair in Emory College; in 1853 presided over the Masonic Female College in Covington (a few miles from Oxford). In 1854, Dr. Means was called to the presidency of Emory College, but shortly after accepted the chair of chemistry in the Atlanta Medical College, which position he held for twelve years, including the period of the war, lecturing during the summer season. In 1851 he travelled extensively through Europe. As a member of the State convention of 1861 he spoke eloquently and voted against the ordinance of secession, but when it was carried he promptly and thoroughly identified himself, his family, and fortunes with his native South. Since the war he has held the position of agricultural chemist for the State at the port of Savannah, which he still (1875) holds, retaining also his time-honored connection with Emory College. His latest work is entitled the *Centennial of Chemistry*. A. H. STEPHENS.

Means (JOHN H.), governor of South Carolina 1850–52; became a colonel in the Confederate service, and was killed at the second battle of Bull Run, Aug. 28, 1862.

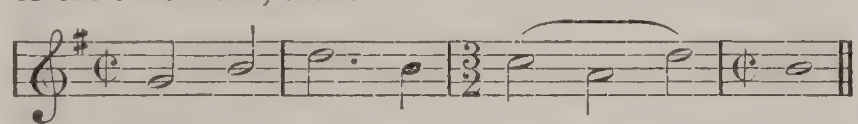
Meares (Capt. JOHN), b. in England in 1746; became a sailor, and made many voyages to Newfoundland, Labrador, and Greenland; entered the navy in 1776; served against the French in the West Indies; became captain in the merchant service after the Peace of 1783; went to India; formed at Calcutta the "North-west America Company" for opening trade with Russian America; sailed from Calcutta in the Nootka, a vessel of 200 tons, Mar. 12, 1786, with which he explored a portion of the coasts of the present Territory of Alaska, and fought with the Indians, but had little success in trading with the Russians; returned to the coast of China *viâ* the Sandwich Islands; fitted out a new expedition of two vessels, with which he sailed from Typa Jan. 22, 1788; explored Nootka Sound, which he entered May 11, 1789; reconnoitred the neighboring coasts, of which he took possession for the crown of England, and reached Macao Dec. 5, 1789. He published *Voyages made in the years 1788–89 from China to the North-west Coast of America* (2 vols., London, 1790). Capt. Meares's discoveries form the chief basis upon which the British title to Oregon and British Columbia was based. D. in London in 1801.

Mearns, The. See KINCARDINESHIRE.

Mea'sles [Lat. *morbilli*], one of the most frequent of the eruptive fevers. It is met with in the young (rarely in the first half year of life) and old, more so in the former, as the opportunities for communication are very great in our social relations. Most people are affected but once in a lifetime, but the cases of second, third, and even fourth attacks are not excessively rare. Its contagion is most effective about the time when the eruption first shows itself, but it remains active until the skin has been restored, by peeling (desquamation) and successive development, to its normal state. The eruption consists of small elevated reddish spots (like a raspberry), which merge into each other, and form discolorations of the size of a pea to that of a dime-piece, interrupted by normal white skin. It makes its appearance in from a few to thirteen days after contagion has taken place, and after a number of premonitory symptoms, such as cough (loose or barking), sore eyes, nasal catarrh, headache, fever, have shown themselves. It appears first on temples, forehead, and cheeks, progresses downward a day or two, and disappears in about four days. The skin will peel off in very small scales (not in flakes as in scarlet fever), and be in a normal condition after a week. Meanwhile, the cough will become looser, the discharge from nose and bronchial tubes less, and fever subside. The large majority of cases run this mild and normal course with a very small mortality. But there are cases and epidemics accompanied with great danger in consequence of complications. The main danger lies in the accompanying inflammation of the bronchial tubes and lungs, which may prove fatal in a short time, or result in chronic inflammation and consumption. Besides these, inflammation of throat, ear (not so frequently as in scarlatina), eyes, kidneys may remain behind. As these affections are very serious, every case, no matter how mild, ought to be seen once or twice by a physician. The usual treatment of mild cases consists in rest in bed from three to eight days, moderate darkness, and cool temperature (67–68° F.) of the room, cooling beverages. Where cough is obstinate a child of two years may take twenty-five drops of paregoric or one grain of Dover's powder at bedtime. In some cases there is a difficulty in regard to distinguishing measles from scarlet fever, especially where the former is also complicated with sore throat of a simple or diphtheritic character. The ushering-in symptoms belonging to the *respiratory* organs, such as described above, are characteristic for measles, while scarlet-fever symptoms take hold of mouth, throat, and the digestive tubes in general. A. JACOBI.

Meas'ure [Lat. *mensura*], or **Bar,** one of the small regular portions into which written or printed music is divided by "bar-strokes." These measures mark and regulate the time, accent, and rhythm of the notes included in them. In every regularly constructed melody or train of notes the ear observes a certain rhythmical order, under which the melody seems to form itself into clauses, phrases, sections, or periods. In the performance of each of these portions there will also be noticed a constant

series of pulsations or accents recurring at equal distances or lapses of time. These smaller divisions, marked out and defined by the periodical strokes of the accent, are the "measures" or bars of modern music; and the first note of each such measure always bears the principal accent. Measures or time-divisions are of various kinds and capacities, according to the nature, accent, speed, or other qualities of the music expressed in them. But with one or two exceptions they may all be regarded as varieties or modifications either of "common" or "triple" time. In common time the natural progression as marked by accent is as | 1′, 2, 3, 4 | 1′, 2, 3, 4 | , etc., and in triple time as | 1′, 2, 3 | 1′, 2, 3 | , etc. (In both these times there is also an inferior accent on the third beat of each measure.) The radical difference between these two forms—the triple and the twofold or quadruple—renders it both easy and convenient to group all time-values into two distinct families, notwithstanding the introduction of the triple element into what is called "compound common time." The measures, portions, or divisions into which music is thus set off by bar-strokes are not to be considered as determining the *rate* or speed of the music by clock-time, but as the means whereby the degree of slowness or rapidity chosen by the performer shall be regulated and uniformly preserved, the accentuation properly expressed, and all the beauties of form and phrase developed with clearness. In any given strain or movement the time-value of the first measure is the standard of speed for all the measures following, except in passages where the composer specially directs that the time shall be accelerated or retarded, or otherwise changed. In ancient music, and occasionally in modern, an interruption of the regular time-movement occurs by the introduction of one or two measures different in quality from the current time of the piece; as, for instance, when a measure of triple time is inserted in a common time movement, or *vice versâ*. Such cases are generally (but not always) indicated by a temporary change of the time-mark, thus:



(For further observations on the varieties of time and measure see MUSIC and TIME.) WILLIAM STAUNTON.

Measure of Damages, in law. By this phrase is meant a collection of the rules which govern the award of damages in courts of justice. The subject is one which in actual practice runs out into great complexity and forms the topic of extensive legal treatises. All that can be done in this article is to state a few of the principal rules that are applied by the courts, and to refer the reader to leading textbooks and other sources of knowledge for detailed information.

It is necessary in the outset to notice the settled distinction that prevails in English and American jurisprudence between courts of law and equity. (See EQUITY.) It is the principal province of courts of law to award damages as a compensation to an injured party for breach of contract or other invasions of private right. Courts of equity, on the other hand, seek to prevent threatened or apprehended injury, or to compel a party in case of a contract to perform it, instead of causing him to pay damages for its violation. Still, in special cases, the equity courts, as auxiliary to other relief, entertain the matter of damages. It is not necessary in this general survey to consider these special cases, and the residue of the discussion will be confined to the examination of rules concerning damages prevailing in courts of law, without referring to special instances recognized in courts of equity. A preliminary remark is, that courts of justice do not seek to give an injured party compensation for all the damages that he may, by a strict course of reasoning, be supposed to have sustained. Thus, no compensation is given for mental anxiety or suffering, nor is full and adequate indemnity necessarily made for the costs and expenses to which a party is unjustly subjected in the course of a groundless litigation. The courts adopt rules of practical convenience which, while they may not supply the demands of an ideal system of jurisprudence, work out substantial justice. The principal propositions recognized in the law of damages will now be stated in the form of rules.

Rule I. The great general principle governing the law of damages is to give *compensation* for the right violated, and nothing more. If a party to a contract plainly stipulates for a larger sum in case of its breach than compensation, he will not be allowed to recover it. The stipulation will be regarded as a "penalty," and will not be enforced. This is well shown by the case of an ordinary bond for the payment of money. This is so drawn that it would appear that the debtor would forfeit twice the amount of his debt if he did not pay with punctuality on the appointed day. Still, no more can be collected than the actual debt with interest. The great point of inquiry in regard to the fact whether a stipulation is a penalty is, whether the amount of damages can be ascertained by a numerical calculation or its equivalent. If so, an agreement to pay more will not be enforced. On the other hand, if the damages are uncertain in amount, and the parties choose to enter into an agreement as to the sum to be paid in case the contract is broken, the courts will not interfere with it.

Rule II. Exemplary or vindictive damages are allowable in certain cases, notwithstanding the general principle that the damages must be compensatory. "Exemplary" or "vindictive" damages mean such as are not in their nature compensatory, but are awarded with a design on the part of the court to punish a wrongdoer. The rule respecting them must be regarded as exceptional in its nature, and founded to a certain extent on theories of public policy. There is a certain class of injuries (mainly wrongs or torts) in which the bad intent of the wrongdoer is allowed to enter as an element in fixing the damages. So the absence of an intent may lead to their reduction, as where the act was accidental or committed by an irresponsible person—*e. g.* a lunatic. Both of these cases may fall within the rule of compensatory damages, since the presence or absence of an evil intent may increase or diminish the injury sustained. Vindictive damages go still further, having in them no element whatever of compensation, but are strictly punitive. The cases in which such damages, among others, are allowed are aggravated cases of trespass upon property or upon the person, slander, libel, seduction, cases of fraud, etc. The theory adopted, as already suggested, is, that over and above all compensatory damages the wrongdoer should be made to pay a sum of money as a punishment for his *quasi* criminal act. This is but a rude and imperfect kind of justice, and not reconcilable with sound principle; for if there is to be an amercement of this kind, reason would dictate that the amount should be paid to the state in the course of some appropriate proceeding, rather than to the injured party. The rule has, however, become too well settled in the practical administration of justice to be shaken. Public convenience is promoted by it, since the law in a number of these cases permits no criminal proceeding, and without the doctrine of "vindictive" damages the wrongdoer would escape all punishment.

Rule III. In making up an estimate of compensatory damages, there are various circumstances to be taken into account, lessening or increasing their amount. Among them are bodily pain caused by a personal wrong. The law distinguishes between bodily pain and mere mental suffering. Damage is assumed to be derived from the former, and not from the latter. In some cases damages enter as an element into the cause of action itself. Some forms of slander are only made actionable by affirmative proof that actual damages of a pecuniary nature have been sustained. Thus, a charge of unchastity against a female is not by the common law an actionable slander. It may be made so by proof of consequent loss of employment. So in certain cases of slander actual malice or ill-will on the part of the defendant is proper to be taken into account. The fact that a slander known to be false has been deliberately repeated may be used for the purpose of enhancing the damages in an action simply for the first utterance, as it tends to characterize the intent of the defamer. No damages can be given for the repetition of the slander in that action, since that may be the foundation of a subsequent proceeding, and it would be unjust to award damages twice for the same violation of right.

Rule IV. From a violation of right the law assumes, as a rule, that damage will follow. If no actual damage is proved, "nominal" damages will be recoverable, such as a farthing or a penny. It has been said by high authority that "every injury imports a damage." It might at first thought be regarded as an idle and foolish thing to bring an action when it must be known in advance, from the circumstances of the case, that only nominal damages are recoverable. Such actions, however, are frequently instituted for the purpose of establishing a right. Thus, if inspectors at a public election should wilfully and improperly reject a vote, the right to vote might be vindicated by an action for damages, though it may be difficult to say that the elector has sustained any appreciable damage. A judgment in his favor would at least establish his right. So, if one should assert a right of way over another's land, the owner might establish the non-existence of the right by bringing an action against the claimant for its exercise, even though the trespass was really nominal. A judgment to this effect might be highly important, since an unmolested exercise of the asserted right for twenty years might give the claimant a way by prescription. (See PRESCRIPTION.) There may perhaps be cases where no possible present or prospective damage would be sustained by an

invasion of right, thence called cases of *injuriâ sine damno* (invasion of a right without damage), and accordingly no recovery even of nominal damages can be had.

Rule V. The damages must not be too remote. This is a rule of great importance, and one in respect to which it is easy for inexperienced persons to err. The damage complained of must have been the natural and reasonable result of the act of the wrongdoer, or, in cases of contract, must have been within the contemplation of the parties. Simple as these statements are, they are found in practice to be quite difficult of application. A wide range of inquiry is open as to the point when the result is natural and reasonable. It is plain that no recovery should be had if the damages are really attributable not to the wrongful act of the defendant, but to some intermediate cause. If A were slightly injured by B, and the medical treatment of the wound thus occasioned were so unskilful as to lead to a dangerous result, the damage is not to be imputed to the act of B, but to the want of skill on the physician's part. On the other hand, if the intermediate act be in no sense a cause, but only an attendant upon the injury, the author of the primary act is liable for all the damage sustained. There is a well-known case in which a squib was unlawfully thrown by one person at another, who warded it off so as to direct it towards a third, and so on until the plaintiff, a remote person in the series, was so injured by it as to lose his eye. It was decided that the true author of the plaintiff's injury was the person who first cast the squib, the intermediate parties not having acted deliberately, but involuntarily and by way of self-defence. There is an important distinction to be observed in certain cases between actions of tort and upon contract. In the former case any one directly or consequentially injured by the act of the wrongdoer may bring his action. In the latter, the plaintiff must be substantially a party to the contract. Thus, if a person should lend to another for use a tool or machine which he knew to be dangerous and unfit to be used, and did not give notice of the defect to the borrower, he would be liable to him for resulting damages, but not to a mere stranger who might casually make use of the machine, as he would have no connection with the contract of lending.

One of the most important cases that arises under a contract is whether in an action for its breach profits that might have been realized if it had been fulfilled may be recovered as damages. Sometimes the question concerns the right to a rise of price occurring between the time of the making of the contract and of its fulfilment. At other times it relates to the profits to be gained from the use of an article, such as a steamboat running for hire, or a manufactory. The inquiry is to be solved by determining whether the profits can in a just sense be said to have been within the contemplation of the parties. Thus, if a seller had merely contracted to sell a chattel, as, for instance, a steamboat, as a mere article of merchandise, supposing, perhaps, that the purchaser intended himself to sell it again, it could scarcely be claimed that anything more could be recovered for breach of contract than the rise in price of the steamboat. On the other hand, if one contracting to repair such an article for an owner had been informed that it was to be used for a season to carry passengers on a particular line, and that for the use of it a large rent could be obtained, and he failed without cause to perform his contract, it might be just to hold him for loss of *rental value.* It would be necessary to distinguish between profits that are in their nature conjectural and arbitrary, and such a price as that for which the thing in question would rent in the market, since the latter would be reasonably certain. The true line of distinction is between that which is uncertain, fluctuating, and therefore not ascertainable, and that which is capable of being measured and ascertained. The same general line of argument must be adopted as to losses sustained. If a common carrier, to whom had been entrusted by an owner a broken shaft of a mill to have it repaired at a distant point and then returned, should neglect to perform his contract, and the mill should consequently lie idle, loss of rental value could not be charged to the carrier unless when the contract was made he was informed of the relation of the broken shaft to the mill, and thus had the means of knowing the consequences that would naturally result from his want of diligence. Without such information he might suppose himself liable simply for the piece of iron considered as a chattel, and might for that reason fail to exercise the extreme diligence that he would have observed had he known all the facts of the case. Similar questions will arise where one is deprived of his property by wrong. The damages should be the legal, direct, and necessary result of the act. Conjectural profits can no more be recovered than in the case of contract. Thus, if one should unlawfully deprive another of the use of a manufactory, compensatory damages (as distinguished from vindictive, already explained) would consist in awarding the rental value to the party injured. In the case of personal injuries, disqualifying a person from labor or diminishing his productive power, the question has arisen whether account can be taken of the personal profits of a business in which the injured party is engaged. This will depend upon the point whether the profits are reasonably certain. Thus, it has been decided that the past professional income of a physician can be considered in such a case. The New York court of appeals has recently refused to extend this principle to the past profits of a commercial business (such as importing teas), as being too uncertain. (*Masterton* v. *Mount Vernon*, 58 New York Reports, 390, 1875.) A good illustration of the general principle is to be found in the case where a sale of goods is made with a warranty of their quality. They turn out to be defective, and loss is sustained. No recovery can be had except for losses directly attributable to the defects within the scope of the warranty. Accordingly, if one should purchase with warranty seeds of grass simply as an article of merchandise, without informing the seller that he intended to sow them in his field, and he should sow them accordingly, and, owing to their want of germinating qualities, should lose the use of his soil for a season, he could only recover the market value of the grass-seed, and not for the loss of the use of the ground. Another conclusion would be reached if the dealer in seeds had been informed that growing seed was wanted for the purchaser's use, to be sown upon his farm. On a like principle, if one should buy a ship's cable under a warranty that it was a good cable, it would appear, notwithstanding a questionable decision to the contrary, that he could not recover for the loss of an anchor which it failed to hold owing to its poor quality, unless he had informed the seller, or that person had reason to know, that it was to be used in and about a ship. It should be added that damages are deemed to be too remote when they are produced or aggravated by the plaintiff's own act or negligence. Under this salutary rule an injured party is not by his own remissness and inattention to allow the damages to become unnecessarily swollen, and then charge them to the wrongdoer. If a trespasser should open the gate to my farm, and I become aware of it, I should not leave the gate open for cattle to despoil my field, and then hold him responsible. So, if a servant is hired for a definite period, and is wrongfully discharged by his master before the time has elapsed, he is not to lie idle if opportunities to work present themselves and charge his master for an amount equivalent to his wages. He should have accepted an offer to labor in the same business, received such wages as he could obtain, and only have held the master for the deficiency. This rule is one of general application in all branches of business, and dictates that an injured party should use reasonable efforts to confine the damages for a wrongful act within as narrow limits as possible. Damages will also be too remote in a class of cases where the defendant may have set another person in motion who was the immediate author of the wrong, and yet the loss sustained could not reasonably have been within the defendant's contemplation. Still, if the damages could have been foreseen by the defendant, and were the natural result of his act, the modern view is that he ought to be responsible. It was at one time supposed that if the injured party had an action against the direct author of the wrong, the instigator of it, being more remotely related to the occurrence, was not liable. An illustration of the correct principle will be found in the case where a manager of a theatre had induced a singer for a rival theatre to break her engagement for the theatrical season. In this case the injured party had an action against the singer for violating her contract, and yet the court, after full discussion, held the manager also liable, as the damage sustained was the natural result of his act. The following may serve as an illustration of a case where no liability would attach: A person defames another, who is a servant, in general conversation. One of the listeners repeats the conversation to the master, who wrongfully discharges the servant, so as to make himself liable to an action. In such a case it is plain that there is no natural connection between the slander and the master's wrongful act. It may be that the slanderer did not even know that the person defamed was a servant, or, if he did, had no expectation that the conversation would be repeated to the master.

Another important question in the law of remoteness is whether the costs of an action growing out of or incident to the claim in respect to which damages are demanded can be recovered. For instance, suppose that A is a surety for B. The latter makes default in payment, and the former is sued, incurs a bill of costs, and finally pays the creditor. Should he be allowed his costs? This will depend upon

the point whether his resistance to the action was reasonable or not. Perhaps it was wholly useless and unnecessary. In such a case the costs cannot be regarded as derived from the principal's default, but from the surety's own obstinacy or pertinacity. It is a wise course when a surety or other person is sued, who, in case he is made to pay, has a claim over against another, to notify that person to make a defence to the action. If he neglects to attend to this notice, and the party sued acts reasonably and in good faith, he may compel the party notified to repay him such costs and expenses as he was obliged by the rules of law to pay. Even in this case of notification there must have been some reasonable ground of defence, otherwise costs cannot be recovered. It has been well said "that no person has a right to inflame his own account against another by incurring additional expense in the unrighteous resistance to an action which he cannot defend."

Rule VI. Losses not yet accrued may be included in damages, provided that they are naturally derived from the wrongful act, and do not themselves supply a separate cause of action. If a man were wounded in the skull, and at different times fresh pieces of the skull should come out, he would not have a separate action for each piece, but only one for the whole. Accordingly, whenever he brought his action he should recover damages for the entire injury sustained, both present and prospective. Where an injured party may recover the entire damage in one action, in general he must do so. If he fails to demand the whole amount, the judgment will be a bar to all further proceedings. It is sometimes extremely difficult to determine whether the entire damages can be recovered in one action, and the law upon the subject seems to be in a provisional and unsatisfactory condition. Reference must be made for precise information to the decisions of the courts. The rule now under consideration bears a close relation to the statute of limitations (see LIMITATIONS, STATUTE OF), since, if the damages are all recoverable when the wrongful act is done, that statute will begin to run from the time when the wrong was committed, rather than from the period when substantial loss is actually sustained. Thus, if an attorney who was employed to examine a title should do his work in such a negligent manner as to induce his client to pay a price for encumbered land while he only intended to pay for unencumbered, the statute begins to run from the time of the breach of duty, rather than from the foreclosure of the encumbrance.

Rule VII. Interest is frequently to be paid by way of damages. (See INTEREST.) In some cases, there is a distinct contract to pay interest; in others, the duty to pay interest has no relation to contract, but it is allowed as a compensation for the detention of property unlawfully withheld, or is imposed upon a wrongdoer as a punishment for his wrongful or fraudulent conduct. It is only necessary to refer to this topic, it having been sufficiently considered under the topic of INTEREST.

Rule VIII. An important rule applicable to the subject of pleading must be adverted to. For this purpose a distinction is taken between general and special damages. The former are such as the law implies or presumes to have occurred from the act complained of. Special damages are such as are not necessarily implied by the law, but in the particular case do in fact arise, and are sufficiently proximate to be recognized by the rules of law. In this case the law of pleading requires that such special damages should be set forth in the plaintiff's declaration and as a part of his claim. The particular cases to which this rule applies must be sought in the special treatises upon damages and in works upon pleading. One or two instances may be referred to. In an action for a personal injury damages for an interruption of the plaintiff's occupation must be specially stated. The same remark may be made of a loss of rent in an action for injuries to real estate.

Rule IX. The rules concerning the measure of damages are matters of law, to be decided by the court rather than by the jury. The amount of damages is frequently in the discretion of the jury. This is the case in many actions for wrongs and in personal actions upon contract, such as a breach of promise to marry. Still, over these cases the court exercises a superintending power, and may set aside verdicts for excessive damages, showing, as they frequently do, undue prejudice or passion on the part of the jury. This power is sparingly exercised, and only in extreme cases. In extraordinary cases verdicts may be set aside where the damages are too small. This is mainly the case where no damages are allowed by the jury when some ought to be given.

The cases to which the general rules thus referred to are to be applied are very numerous, and require careful consideration on the part of the courts. Among them may be mentioned actions to recover possession of real property or for wrongful interference with it; actions for the breach of covenants for the conveyance or use of land; also upon bills of exchange or promissory notes, upon policies of insurance, upon the sale of goods, contracts growing out of the carriage of goods, including bills of lading; also between special parties, such as principal and agent or principal and surety. Actions for wrongs involving damages are among others for specific goods wrongfully taken (replevin), for their value (trover), for injuries immediate and direct, to person or property (trespass), for injuries indirect and consequential (trespass on the case). Underlying all these actions will be found the rules already stated. For example, if a principal should bring an action against an agent for violating his instructions in selling merchandise below a fixed price, the measure of damages is the loss sustained, and not the difference between the price received and the instruction price. The former rule supplies complete compensation, since the principal could obtain equivalent goods by means of the sum awarded to him. So, if goods be wrongfully taken or "converted," the general rule of damages is their value at the time of conversion, with interest, though, according to some authorities of inferior weight, a much wider range is allowed, so as to include the highest price down to the time of the trial.

A peculiar rule prevails in most of the States, as well as in England, in case of a contract to convey land. In the absence of fraud or of knowledge, or reasonable means of knowledge, on the vendor's part that his title is defective, only nominal damages can be recovered if he fails to make a good title to the property which he has contracted to convey. The principal reason of this rule is that in an ordinary covenant for title in a deed the utmost amount of damages allowed by the law of most of our States is the consideration-money and the interest. If no consideration has been paid, nothing can be recovered, so that rise of price does not enter in as an element in an action upon a covenant for title in a deed. It would not be reasonable that in a contract to convey, any higher rate of damages should be allowed than would be given in case an actual deed had been delivered and the title had proved defective. The law of damages in real-estate transactions is therefore somewhat anomalous and exceptional, and differs widely from that which prevails in the case of the sale or contract to sell personal property.

Distinctions affecting this subject cannot be further pursued, and reference for additional information must be made to the excellent treatises of Mr. Sedgwick and of Mr. Mayne, as well as to the leading works on contracts and torts, and to the digests and cases in the law reports.

T. W. DWIGHT.

Measures. See WEIGHTS AND MEASURES.

Meat or Flesh, Extract and Juice of. This is a subject which, besides its great and obvious scientific importance, has of late years assumed a practical aspect from the introduction into dietetics, medicine, and hence into commerce, of condensed extracts from flesh-meat—an introduction due to the great Liebig. Several chemists throughout the world have lately given attention to points of chemical theory involved in the processes of formation and destruction of flesh which constantly go on in the animal body. As yet comparatively little progress has been made, owing to the immensity and complexity of the subject. Liebig himself many years since laid the foundation of these investigations by studying several important definite crystalline principles in the juice of flesh, which are no doubt intermediate products of the breaking up of the organic molecules of the proteid bodies in the process of their ultimate transformation into carbonic acid, water, urea, and other constituents of the various animal excreta. *Sarcolactic* acid (already described under the head LACTIC ACID) is one of these; also LEUCINE (which see), although the latter was long before discovered by Proust. Among the substances studied and discovered by Liebig may also be mentioned *creatine* (previously discovered by Chevreul), *sarcine*, and *inosinic acid*. Doubtless some remain yet to be isolated.

Besides these crystalline organic principles, the juice of flesh contains some proteid bodies coagulable by boiling, together with various salts, organic and inorganic, of potash, and, to a less extent, of soda and other bases. Among the inorganic salts the predominant acid is the phosphoric, and next to this hydrochloric. In the making of *beef-tea*, so largely used as a food for invalids, all the soluble ingredients of the flesh are, in the first instance, communicated to water, inclusive of the soluble proteid bodies; and on subsequent boiling the latter will be converted into an insoluble coagulum, just as white of egg would be if dissolved in the water. Much will then depend, no doubt, upon the subsequent steps of the operation. If the beef-tea be merely strained through a cloth, as is usual, this coagulum will chiefly pass through and become an ingre-

dient of the preparation, and doubtless, in consequence of its fine state of division, will be to those capable of digesting it a highly nutritious ingredient, one which furnishes food of a "plastic" character, capable of building up new muscle and tissue. There appears no reason to suppose that beef-tea, if first clarified and freed from ingredients of the proteid class—whether condensed subsequently or not into meat-extract—would furnish a *complete* food, either for the sick or the well. At the same time, the entire absence of value, in a dietetic point of view, which is imputed by some is entirely unreasonable. There is every reason to believe that the organic, and particularly the nitrogenous, principles found among the soluble ingredients, perform, as claimed by Baron Liebig, some precious functions, as yet not understood, in the process of nutrition; and the weight of testimony is strongly in favor of the great value, at least, of these beef-extracts in assisting nutrition, and even in stimulating the same into a greater degree of rapidity, in such manner as to prove in many cases of the greatest value. It has even been asserted that by reason of the excess of potash salts present in these meat-extracts they may exert a really poisonous action. This no doubt is true also, as of almost any other special nutritive agent if taken exclusively and to excess. Such is actually the case with *sugar*, for example, when constituting too large and continuous an ingredient of the food. Such is the case with fatty substances also, even of the most digestible kind, like butter.

We may quote here some recent very instructive analyses of two kinds of beef-extract, made by C. F. Chandler and F. A. Cairns, which are especially valuable as distinguishing between the ingredients soluble and insoluble in *alcohol*, as well as in water:

	Liebig's Fray-Bentos extract.	San Antonio meat-extract factory.
Water (expelled at 212° F.)	17.21	14.78
Ash	13.01	18.16
Substances soluble in 88 per cent. alcohol, dried at 212° F	33.09	44.57
Fat, etc., soluble in ether	0.14	0.18
Total nitrogen	8.18	9.12
Nitrogen in portion soluble in alcohol	3.19	4.75
Soda	2.44	2.35
Potassa	9.20	7.55
Lime	0.05	0.06
Magnesia	0.56	0.50
Oxide of iron	0.02	0.07
Chlorine	2.98	1.95
Sulphur	0.29	0.22
Sulphuric acid (SO_3)	0.03	0.03
Phosphoric acid (PO_5)	8.20	5.64

HENRY WURTZ.

Meath, county of Ireland, in the province of Leinster, bordering on the Irish Sea. Area, 906 square miles. It forms the eastern portion of the great limestone plain which occupies the whole central part of Ireland. The ground is level or gently undulating; the soil consists of a rich loam, and is very fertile. The occupations are almost exclusively agricultural, chiefly grazing and dairy-farming. Pop. 95,558, of whom 37,715 are unable to read or write: 42,925 persons emigrated from this county between 1851 and 1872. Principal town, Trim.

Meaux, town of France, in the department of Seine-et-Marne, on the Marne. It is the see of a bishop, and has a fine cathedral with a monument of Bossuet, who was bishop here. It has large manufactures of cottons, calicoes, sailcloth, vinegar, and saltpetre, and numerous flour-mills on the Marne from which great quantities of flour are sent to Paris. Pop. 11,343.

Mebanes'ville, post-v. of Alamance co., N. C., on the North Carolina R. R., is the seat of the Bingham School.

Me'can, tp. of Marquette co., Wis. Pop. 712.

Mec'ca, city of Arabia, the capital of the province of Hedjaz, in lat. 21° 30′ N. and lon. 40° 8′ E., 65 miles E. of Jiddah, its port on the Red Sea. It is situated in a narrow and barren valley enclosed by naked hills, but although it has no trees, no public places, and only one public building of importance, and although its streets are unpaved, dusty in the summer and muddy in the rainy reason, Mecca is handsomer and better built than most Eastern cities. The streets are wide and the houses solidly built of brick, granite, and sandstone, two or three stories high, and with windows opening into the streets. The city is comparatively modern, built about 450 A. D. Its peculiar character as a city corresponds to the peculiar circumstances which have made it not only a large city, but the most celebrated city of all Islam. It is the birthplace of Mohammed, and it contains the KAABA (which see). It has no manufactures and (properly speaking) no trade. It depends wholly on the pilgrims who annually gather here to the number of 100,000. It is not exactly an absolute duty, but it is a sacred obligation, of every Mohammedan to visit Mecca at least once in his life, to make his prayers in its mosque, El-Haram, and to kiss the black stone of the Kaaba. And the inhabitants of Mecca live by hiring rooms to the pilgrims and supplying them with the necessaries of life during their sojourn in the city. The natives, however, of this sacred place are generally described as cold, irreligious, shrewd, avaricious, and addicted to debaucheries of all kinds; they often amass princely fortunes, which they spend in the most extravagant manner. Of late, however, the number of pilgrims to Mecca has decreased considerably. Pop. about 45,000, with lodging-room for three times that number. (See Richard F. Burton's *Personal Narrative of a Pilgrimage to Mecca and Medina*, 1855.)

Mecca, post-v. and tp. of Trumbull co., O., 4 miles N. of Baconsburg Station (Atlantic and Great Western R. R.), celebrated for its heavy petroleum, valued for lubricating purposes. Pop. 935.

Mecca Balsam, called also **Balm of Gilead.** The class of substances called *balsams* are, chemically, mixtures of solid resinous matters proceeding from the oxidation of essential oils, with some of the essential oils themselves from which they proceed. Common *crude turpentine* and *Venice turpentine* are familiar examples. The balsam of Mecca, when pure and genuine, is the resinous exudation from a plant that grows on the banks of the Red Sea, known to botanists as *Balsamodendron Gileadense*, a small evergreen shrub. In the East it is much employed in medicine and perfumery, but the inferiority and spurious character of the material sent under its name into Western commerce have led to the almost entire abandonment of its use. Trommsdorff found in it 30 per cent. of volatile oil, 64 per cent. of hard and 4 per cent. of soft resin, and a minute quantity of a bitter substance. Bonastre found only 10 per cent. of fragrant volatile oil. The essential oil is no doubt a terpene, but no special examination of it has been made. H. WURTZ.

Mechan'ic, tp. of Holmes co., O., contains a valuable bed of cannel coal 8 feet thick. Pop. 1066.

Mechanical [Gr. μηχανικός] **Art** is most easily distinguished from fine art by the character of its products: those of fine art represent ideas, those of mechanical art answer purposes; the former result in a gratification of the æsthetical sense, the latter are made for practical use. The painting of a flower so as to represent a certain effect of color or form characteristic of vegetable life, and thereby symbolical of life in general, is a work of art; the painting of a flower so as to show to the student the structure and correlation of its organs is a work of mechanical art. There is, nevertheless, much that is mechanical in all fine art, even in a lyrical poem or a symphony; and when the artist is not thoroughly trained in this, the mechanical part of his work, no inspiration can save the æsthetical effect from being blurred. On the other hand, there is much that is æsthetical in all mechanical arts—in carpentry, coach-making, etc.; and if the artisan is without taste or has a bad taste, no smartness of contrivance or skill of workmanship can ever make his work completely satisfactory. Yea, in certain fields—as, for instance, in architecture—the fine and the mechanical arts are mixed so closely together that the dominion has become disputed. Here, too, however, the above-given distinction will suffice. A building, whether a court-house, bank, or church, is a work of mere mechanical art if it is made only to answer its practical purposes, but if it is also made to represent in its forms the ideas of worship, government, or enterprise which underlie those purposes, it is also a work of art. (See ART and FINE ART.)

Mechanical Calculation. The employment of simple mechanical devices for assisting arithmetical computations dates from the very origin of the science, as is shown, in fact, by the etymology (Lat. *calculus*, "a pebble"), which indicates that the earliest "calculations" of a rude people were effected by means of an actual counting of grains or bits of stone, each representing a unit of the staple of traffic. They would not be employed, however, until the number of the fingers on the two hands, which forms the basis of the decimal notation, was exceeded. The second step in the development of arithmetic must have been to make a single pebble or grain represent a group of 5 or 10 units. The third step would be reached at a much later period by making a pebble or grain (of larger size or different color) represent 100, when a problem of addition involving many thousands of units could be mechanically performed by the aid of a small number of pebbles of three different kinds, the operation of "carrying ten" being mechanically represented by the substitution of a unit of the larger denomination for 10 of the smaller. This was the principle from which originated the abacus. It is thus seen that mechanical methods of computation preceded the perfection of mental arithmetic and the use of writing for the same purpose. Plato invented

a sliding square to solve the problem of two mean proportionals, and Nicomedes in the first century B. C. devised a conchoid curve for the solution of the same problem, as well as for trisecting an angle. The Greeks and Romans employed the abacus for their ordinary problems of arithmetic, and the same or similar instruments continued in common use in Southern Europe till the end of the fifteenth century, and in England still later, until they were superseded by the progress of written arithmetic. GUNTER'S SCALE and NAPIER'S BONES (which see), invented in the seventeenth century, were extremely ingenious contrivances, but of little practical use from the limited nature of their operation. Blaise Pascal, one of the most sublime geniuses whom the world has ever seen, constructed in 1642, at the age of nineteen, a machine for performing the routine operations of arithmetic. It consisted of a group of wheels and cylinders. On the convex surfaces of the latter were inscribed the numbers with which the operations were to be performed, consisting of the ten figures of the decimal system, and the numbers adapted for the addition and subtraction of livres, sous, and deniers. These cylinders were connected by wheels in such manner that a single revolution of one wheel produced, according to the character of the desired operation, ten, twelve, or twenty revolutions of the other wheels. The first cylinder was turned by hand, and the others were moved in conformity to the desired arithmetical rule. In 1673, Leibnitz described a machine for a similar purpose, said to have been superior to Pascal's in practical operation, but too complicated and expensive to be brought into use. In 1822, Mr. Charles Babbage read two papers before the Royal Astronomical Society descriptive of a machine he had invented for solving mathematical problems of some complexity, and at the same time printing its own results by means of types. This would evidently have been of incalculable service in the tedious toil of computing astronomical tables, and the society therefore memorialized the government for pecuniary aid in constructing a machine. The subject was referred to the Royal Society, and a committee, of which Herschel, Davy, Young, and Wollaston were members, reported in favor of the invention. The government thereupon made a liberal grant, but the plan of the machine was extremely complicated, and was more than once modified, so that artisans had to be specially educated to understand it. Large sums were advanced from time to time for many years, but the machine was never completed, and in 1843, after twenty years' labor and a fruitless expenditure of $85,000, the government refused to countenance any farther outlay, and the unfinished "difference engine," as it was called, was placed in the museum of King's College, London. Had the plan of the inventor been successfully carried out, this machine would perform all the operations of simple arithmetic on any numbers whatever; combine quantities algebraically or arithmetically in an unlimited variety of relations; use algebraic signs according to their proper laws, and develop the consequences of those laws; arbitrarily substitute any formula for any other; effect processes of differentiation and integration on functions in which the operations take place by successive steps; execute the operations of the combinatory analysis, and compute the numbers of Bernouilli. The cardinal principle of Babbage's machine is the fact that if we begin with a table of logarithms or sines, then make a second table consisting of the differences between the successive numbers of the first, then a third from the differences of the second, etc., we ultimately reach a table in which all the numbers are the same. Reversing the process, and the first number of each table being given, the first table could be recovered by a series of additions starting from the table of equal numbers. Moreover, the machine stamps each figure as fast as calculated upon a stereotype plate, so that no errors of the press could be made in the publication of tables thus calculated. A machine for effecting the same object upon a different principle was commenced by two Swedish brothers, George and Edward Scheutz, in 1834, and successfully completed in 1853. It was exhibited in London in 1854, and in Paris in 1855, and purchased by the Dudley Observatory at Albany in 1856. It calculates to fifteen places of decimals, impressing upon lead the result to eight places, at the rate of twenty-five figures per minute. By taking out certain wheels and putting in others it will calculate and record in pounds, shillings, and pence; in degrees, minutes, and seconds; in tons, hundredweights, and pounds, and in many other modes of notation. It is undoubtedly the most perfect instrument of its kind ever completed, and has been successfully employed at Albany in delicate astronomical calculations. PORTER C. BLISS.

Mechan'ical Powers, certain elementary forms of mechanism in which the simplest possible material connection between two points or surfaces is such that the action of a force applied at one point in a given direction is caused to overcome a resistance at another point in any required direction. In its general acceptation the term "mechanical power" implies also the condition that an "advantage" is gained by the use of one of these elementary machines; or, in other words, that a small force acting through a given space may be made to overcome a greater force acting as a resistance through a less space. When increase of motion is the principal object, a force acting through a given space may overcome a less resistance acting through a greater space. Where a simple transfer of the direction or point of application of a force takes place, without any possible "advantage" in either of these respects, the material connection between the points of application of the power and resistance does not necessarily involve the employment of one of the elementary machines or mechanical powers.

In discussing the motions which are transmitted by means of elementary machines it is unnecessary to take into account the nature of the forces which act upon them. These may be any of the ordinary forms in which forth exhibits itself or is employed by men and animals, such as gravity, inertia, friction, etc.; one general principle being sufficient for all—viz. that in any elementary machine the product of the force or effort into the distance passed over by its point of application must be equal to the product of the resistance multiplied by the distance passed over by its point of application. If the force or effort be a liquid pressure acting on a surface, the resistance being a corresponding liquid pressure acting on a different surface, then the volumes through which the two surfaces move under the influences of the action and reaction must be equal. This latter enumeration of the general principle is applicable especially to hydrostatic machines.

Under these general definitions and conditions all the elementary machines which are met with in mechanical constructions, or which are employed by man and animals in locomotion, may be arranged under four heads, each depending, for the calculation of the work performed by the moving force and the resistance, upon certain elementary theorems of mechanics. The classifications are the *lever;* the *inclined plane;* the *jointed links* (called also the funicular machine, and also the "toggle-joint"); and the *hydrostatic press.* All machines of artificial construction and all movements of animals in locomotion depend on the action of these simple machines or mechanical powers, either in their elementary forms or in various combinations.

The lever is based on the theorem of *moments of forces,* and involves a rotation of a material, rigid bar or form about a point called the fulcrum. The moment of a force is the product of the force measured in units of force (pounds), multiplied by the perpendicular distance from its line of action to the centre of rotation, the fulcrum. Whatever be the directions of the effort or power, and the resistance, applied to two points of a lever, the products obtained by multiplying each by the perpendicular distance from its line of action to the fulcrum must be equal. The pressure upon the point of rotation in the fulcrum acts as a third force, which at any instant maintains the other two in equilibrio. To find this pressure in any given direction, it is only necessary to find the components of the other two forces, which act in directions parallel to the given direction, and the equilibrium is established by the general theorem of parallel forces—viz. the resultant of two parallel forces is always equal to their sum if they act in the same direction, and to their difference if they act in contrary directions. This resultant in the case of the lever is the pressure upon the fulcrum, acting in the direction of the greater force if the parallel components of the forces act in opposite directions, and in the common direction of the forces if they act in the same direction. All problems of levers, whether they be straight or bent, and whether the forces applied to them are parallel or oblique, may be solved by the application of the preceding rules.

The wheel-and-axle and the movable pulley are elementary machines, depending for their action on the principle of the *lever,* although sometimes classed as separate mechanical powers. The fixed pulley merely changes the direction and point of application of the force applied to the cord passing over it, but no other advantage results from it. In the case of the movable pulley the fulcrum is movable, and acts as an instantaneous axis, the resistance acting between the power and the fulcrum.

The *inclined plane* and the *jointed links* depend for their action on the theorem of the parallelogram of forces. Representing the relations between the height, length, and base of an inclined plane by the altitude, hypothenuse, and base of a right-angled triangle, the relation between

the forces which cause a sliding of a body on an inclined plane is as follows: If the effort or power be applied parallel to the length of the plane, and the resistance parallel to the height, the effort will be to the resistance as the height of the plane to the length. When a man rolls a barrel up an inclined plane into his wagon, he obtains not only the advantage of the inclined plane, but also the advantage of rolling over sliding friction. The total useful work performed, leaving friction out of consideration, is the work of elevating the weight of the barrel from the ground to the wagon; and this total work can in no way be avoided. It is, however, accomplished by a small muscular effort exerted through a greater space than the height of the wagon, the diminution of the effort necessary depending on the length of the plane.

The wedge is an example of an inclined plane. When a pressure is exerted against the end of a wedge to force it forward, the resistance against the face of the wedge will be to the pressure applied to the end as the distance through which the wedge moves is to the distance, perpendicular to the face, through which the material yields to the action.

The screw is an inclined plane in the form of a helix wound around a cylinder, and its action is determined by the same laws.

The jointed links, in which the relation between the power and resistance is found by the application of the parallelogram of forces, is not so often found in artificial constructions as some of the other elementary machines, but it possesses especial interest in being found applied in the mechanism of all walking or leaping animals. A few artificial constructions, among which may be named Hicks's press, are based on this mechanical power, the elements of which are two rigid bars or *links* jointed together, the effort being applied at the joint in such a manner as to enlarge the angle between the bars. If one bar rest against an immovable point of resistance, and the other be guided in a given direction, when the two bars approach a straight line the action of the force at the joint is to overcome a much greater resistance at the end of the guided bar. A succession of jointed links, as in the hinder legs of leaping animals, not only multiplies motion, but enables the animal to exert the greatest effort in the direction of the terminal motion.

The *hydrostatic press* is an elementary machine which depends for its action on the principle of distribution of pressures through the medium of a liquid. If a closed vessel filled with a liquid be tapped at any point, and a small piston be inserted in such a manner that an external pressure may be applied to the piston, no liquid being allowed to escape,—when such a pressure is applied, every part of the internal surface of the vessel, equal in area to the piston, will feel the additional pressure independently of all the other parts. If one end of the vessel be closed by a tight piston movable outward, the total additional pressure upon the surface of this larger piston will be equivalent to the sum of all the additional pressures upon its parts, each of these small parts being equal to the area of the smaller piston. The force required to resist the total additional pressure on the large piston will then be as many times greater than the force applied to the small piston as the surface of the larger is greater than the surface of the smaller piston. If motion take place, the extent of motion of the two pistons must follow the inverse of this rule. The distance passed over by the two pistons will be inversely proportional to their areas.

Ordinary machines, whether they be *prime movers—i. e.* whether they receive directly and utilize the action of muscular force, the force of gravity acting through falling water, the wind, or the moving force of heat—or whether they be secondary machines driven by prime movers, are elementary machines, or combinations of the elementary machines which have been named. They consist generally of a framework for sustaining and supporting the moving pieces, and certain connections between the moving pieces by which motion is communicated from one moving piece to another, or from the driving point to the working point. The principles according to which such motions are communicated are based on the laws of motion (see MOTION), and have been fully developed for all ordinary machines in modern works on the principles of mechanism. Prof. Robert Willis, M. A., F. R. S., of the University of Cambridge, is entitled to the credit of having been the first to develop this interesting and useful branch of practical mechanics into a special science.

W. P. TROWBRIDGE.

Mechan'ic Falls, post-v. of Androscoggin co., Me., 33 miles N. of Portland, on the Atlantic and Pacific R. R., has 1 academy, 4 churches, 6 paper-mills, 1 rifle-factory, 1 shoe-factory, 1 cheese-factory, 1 weekly newspaper, excellent water-power, a corn-canning establishment, a good hotel, manufactories of harness, organs, and furniture, and a number of stores. Pop. about 1700.

WALTER CLARKE, ED. "ANDROSCOGGIN HERALD."

Mechan'ics [Gr. μηχανικά]. The term "mechanics" was originally employed to designate the principles of action of machines; the science which embraces the laws of motion and force, commonly called the *science of mechanics*, having derived its origin principally from practical operations rather than from theoretical abstractions. The proficiency of the ancients in practical mechanics is sufficiently evinced by the descriptions of machines which have been preserved in their writings. In the construction of temples, pyramids, bridges, aqueducts, and other great works, the elementary machines must have performed an important part; and indeed some ideas of modern physics seem to have entered into the conceptions of the old Greek philosophers; such as that of the elements or atoms, the æther, and the idea that all things are in incessant motion. Archimedes (287–212 B. C.) may even be said to have laid the foundation of theoretical mechanics in his investigations in regard to the lever, centres of gravity, etc. The theory of Aristotle, that a body contains in itself the principles of rest and motion, uninfluenced by external causes, continued, however, to be received until the time of Galileo (1564–1642). Galileo disputed the ideas of Aristotle, and by experiments on falling bodies showed the existence of a force independent of the falling body which produced a velocity of motion dependent on the time of descent, and not on the mass of the body. After this the science made slow but gradual progress, and was extended in its signification beyond the principles of mere mechanical contrivances to embrace the laws of force and motion as exhibited in universal phenomena. With this signification the science became enlarged and subdivided, some writers on mechanics dividing the subject into two parts—*statics*, embracing the principles or theorems which apply to bodies at rest under the action of natural forces; and *dynamics*, embracing the principles of equilibrium and action of bodies in a state of motion. Other writers subdivide the subject into two—the *mechanics of solids* and the *mechanics of fluids;* and others, again, into *kinematics* or the laws of motion, geometrically considered, without reference to the causes of motion, and *dynamics*, the laws of motion and force.

A brief summary of the laws and principles of the science of dynamics under this broad acceptation has been given under the head DYNAMICS, and it only remains to follow a little further the enunciations of these general principles, and to give a brief history of their discovery or development. The principles of kinematics, or the abstract theory of motion, will be found under the head MOTION. Benedetti (1530–90) was the first to discover the true *cause* of acceleration in falling bodies in properly considering the principle of inertia, it having been previously supposed that every movement was due to an independent and additional exercise of force.

Of the principles which form the foundation of the science of mechanics or dynamics—viz. the principle of inertia, the equality of action and reaction, the non-dependence of the effect of a force on the previous motion acquired by a body, and the independence of the effects of forces which act simultaneously upon the same body—the first was recognized by Descartes (1596–1650), who, observing the acceleration of bodies moving in straight lines, called the force of continuance the indwelling force of the matter, a property called by Newton (1642–1726) *inertness*, while the resistance to change due to the body alone he called *inertia*.

According to Lagrange, Guido Ubaldi (1545–1607) was the first to make an exposition of the principle of *virtual velocities*. The virtual velocity of a point due to a force is the motion of the point in a right line to a position infinitely near, projected upon the line of the force; and the *virtual moment* is the product obtained by multiplying the virtual velocity by the intensity of the force. This principle has been useful in investigating the analytical conditions of equilibrium of a system of forces.

Galileo announced the principle that two forces are in equilibrio if their moments are equal and opposed, the moments being proportional to the products of the forces by their virtual velocities. The conception of the parallelogram of forces is due to Galileo, and its subsequent applications to motions and velocities to Descartes, Wallis, Roberval, and others.

A theorem which has been most useful in analytical investigations, called the "Theorem of D'Alembert," is found in most textbooks. It was first announced by D'Alembert (1717–83), and is especially useful in the investigations connected with dynamical engineering. It is as follows: "If at any instant the forces of inertia of the different parts of a material system are joined to the other forces which act upon the system, a system of forces is obtained

which will produce, at that instant, a condition of equilibrium in the material system."

The term "living force" is due to Leibnitz (1646–1716), who made a distinction between living and dead force; living force being such as causes motion, and dead force such as opposed by an immovable obstacle causes no motion.

A contention arose between the followers of Descartes and Leibnitz in regard to the measure of force, the former contending for the principle that the force is proportional to the velocity, while the latter made the mass multiplied by the velocity the measure of force. The apparently conflicting views were reconciled by D'Alembert. Definitions were so arranged that by "quantity of motion" was to be understood the product of the mass into the velocity, and by "living force," the mass multiplied by the square of the velocity. The term *momentum* is at present usually employed, instead of *quantity of motion*. Newton (1642–1726) conceived the idea that the proper measure of the *motive* force is the mass multiplied by the acceleration, and Helmholtz as late as 1847 announced a new principle, that all motive forces are *central* forces. All forces of attraction or repulsion between two masses affect only the relative positions of those masses. Helmholtz introduced the idea of other forces of a system acting towards a fixed point, these being the real motive forces, which, combined with the other forces, determine the paths and velocities of the points.

The property called inertness—viz. that if there be no continuous action of forces upon a mass or material point, it either remains at rest or moves uniformly in a straight line—was announced by Descartes, Huyghens, and Newton. D'Alembert observed that if the acting forces upon a mass or material point are constant, and tend always in the same direction, the mass will move as if free. (For a discussion of the principle of areas see INVARIABLE PLANE.) This principle was discovered separately by Euler (1707–83), D. Bernoulli (1736–1813), and D'Arcy.

The following are general theorems relating to any system whatever:

1. The centre of gravity of any system acted upon by exterior force moves in the same path as if the whole mass of the system were concentrated at that point, and as though the exterior forces were transported parallel to themselves to that point. This theorem shows that the motion of a material system may be traced by referring it to the motion of its centre of gravity regarded as a material point. As a familiar application of this general theorem, suppose a shell to be fired from a cannon. Its path will at first be approximately a parabola. If it explodes in its course, the resistance of the air being left out of consideration, the paths of the separate pieces will diverge, but the path of the common centre of gravity of all the pieces will remain unaltered. The explosion of the powder, being only an exertion of internal forces, cannot alter this path: it is only when one of the pieces strikes an obstacle that the path of the centre of gravity of the whole is changed, a new external force being thus introduced. Applied to the planetary system, this theorem shows that if the influence of the fixed stars be disregarded, the centre of gravity of the system must be either at rest or moving in some path due to forces external to the system.

2. The theorem of moments of quantity of motion or moments of momentum may be enunciated as follows: "The increase in the sum of the moments of momentum of a system in reference to any axis during a given time is equal to the sum of the moments of all the impulses of the exterior forces with reference to the same axis in the same time."

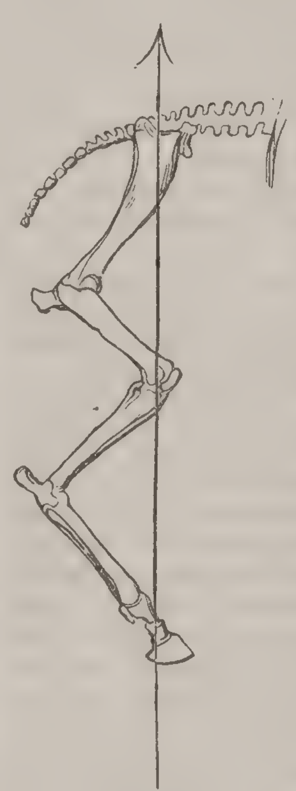
3. The theorems of living force and of inertia have been noticed under the head DYNAMICS. It results from this theorem, and from the constitution of bodies, that the general analytical expression for the living force of a system of material points or masses contains three terms—one giving the living force of the system, supposing the whole mass concentrated at the centre of gravity, and partaking of the motion of that point; another giving the living force due to *rotation* about a line passing through the centre of gravity; and a third, the living force due to the separate motions of the masses under the action of the central or internal forces of the system.

These general theorems are sufficient to solve in a simple manner some of the practical questions which present themselves to ordinary observation. An invariable solid, for instance, abandoned to itself after having received an impulse, will generally have two motions, one of translation of the centre of gravity, and another of rotation about a line passing through the centre of gravity—movements the laws of which have been distinctly and beautifully demonstrated by Poinsot. A circus performer in accomplishing the difficult feat of throwing two somersaults in the air is incapable of controlling the rotation of his body by any muscular effort while in the air; the number of turns depending only on the original impulse and the elevation and length of path described by the centre of gravity before he reaches the ground.

The principle of the indestructibility of force or the conservation of force is of recent development, although discussions of the subject may be found in the works of the older writers. Some modern authorities give Newton the credit of anticipating the more recent discoverers. The investigations of Carnot, Clapeyron, Mayer, Colding, Joule, Clausius, Helmholtz, Rankine, and Thompson have served to definitely establish the principle.

The more recent establishment of the principle that the laws of dynamics embracing motion and force hold true as well for the minute invisible motions of the particles of bodies as for the great masses of the solar system, has had a most important effect on the development of the physical sciences. The living force or energy of a body is no longer confined to its sensible movements as a whole, but embraces the living force due to molecular motions which give rise to the phenomena of heat; and the sciences of heat, electricity, magnetism, chemistry, and even astronomy, have derived new interest and experienced a great expansion from a knowledge of the above principle. W. P. TROWBRIDGE.

Mechanics, Animal. In animal mechanics the muscular force is utilized through either one of the elementary machines or mechanical powers (see MECHANICAL POWERS), or through a simple combination of two or more of them. The employment of these elementary machines supposes a resistance or point of support which by its reaction enables the machine to act. In walking or leaping on the ground the "jointed links" or "knee-joint" is the simple machine employed when the body is raised from the ground, and the lever when a limb only is raised or moved, the earth furnishing the resistance in the first case, and the body in the second. The greatest effort of an animal is required in leaping or in hauling a load. The application of the principle of the lever involves the consequence that the bones of the limbs in these efforts sustain great cross-strains, which from their structure they are not calculated to bear. The bones of the hind leg of the horse, for instance, are arranged as in the engraving, and whether in leaping or in hauling a load (or rather pushing a load, because the principal effort is a pushing operation, the load being attached to the shoulder), the action of the muscles of the hinder parts is to straighten out the links which form the hind legs. The ground gives a point of support, but not a fulcrum in the sense of the lever; and instead of the greatest effort being a cross-breaking effort, it is transmitted through the axes of the bones, in which direction, as short columns, they are capable of withstanding very great pressure. When the limbs are raised from the ground the body acts as the point of resistance, and the bones act generally as levers; but when the ground forms the point of resistance, the principle of the lever does not furnish the means of calculating the effort necessary to elevate the weight of the body. The jointed construction shown in the sketch corresponds to the device known as "lazy tongs" in mechanics, and acts in the same manner, except that muscular force is applied at each joint. When this system of jointed links is extended to nearly a straight line, a very slight muscular effort at each joint transmits a powerful force through the axis of the extended system in the direction of motion. Swimming animals usually make use of the "inclined plane," combined with the lever or the jointed links, although some animals, like the cuttle-fish, make use of an apparatus which involves the principle of the hydrostatic press; a quantity of water being drawn into the body by a large opening, and then ejected by a smaller opening with a greater velocity.



The operation of flying is nearly identical, on mechanical principles, with that of swimming, the only differences being those which arise from the lesser density of the medium in which the motion takes place. In many motions of animals the *inertia* of the body or of parts of the body acts as an instantaneous resistance by which the motion is accomplished.

The kinematics of animal movements, or the mere motions of the bodies and extremities of animals, have been made the subject of extended experiments, and have been quite fully treated by various authors. The dynamics of animal movements, or the laws of the forces exerted, have received

less attention. The latter study is perhaps the more important, as the structure of nearly all animals is based, to some extent, on their mode of progression, and the conditions under which they are obliged to move from place to place, or the mode in which they procure food, defend themselves, or escape from enemies.

The general law that in animal locomotion the same elementary machines are employed, and the same mechanical principles applied, as in artificial constructions made by man, furnishes the basis of the study of animal movements. W. P. TROWBRIDGE.

Mechan'icsburg, post-v. and tp. of Sangamon co., Ill., on the Toledo Wabash and Western R. R., 13 miles E. of Springfield. The principal village is 3 miles S. of the railroad station. Pop. of v. 366; of tp. 1443.

Mechanicsburg, post-v. of Henry co., Ind., in Fall Creek tp. Pop. 133.

Mechanicsburg, post-v. of Champaign co., O., 17 miles N. W. of Springfield, on the Cleveland Columbus Cincinnati and Indiana R. R., contains 3 churches, 2 banks, 1 newspaper, several large mills and shops, 2 hotels, the district fair-grounds, and a number of stores. Principal business, farming, dairying, and stock-raising. Pop. 940. O. C. WHEELER, ED. "CENTRAL OHIO NEWS."

Mechanicsburg, post-b. of Cumberland co., Pa., 8 miles W. of Harrisburg, on the Cumberland Valley R. R. It was incorporated in 1826, and besides being supplied with water and gas, contains Irving Female College, the Cumberland Valley Institute, and several graded schools, 9 churches, a library, 1 foundry, 3 door and sash factories, spoke and bending works, 6 large warehouses, 5 hotels, 2 newspapers, and a number of stores. Pop. 2569.
R. H. THOMAS, ED. "INDEPENDENT JOURNAL."

Mechanicsburg, a v. (BRUSH VALLEY P. O.) of Brush Valley tp., Indiana co., Pa., 10 miles S. E. of Indiana. Pop. 204.

Mechanicsburg, post-tp. of Bland co., Va. Pop. 1233.

Mechan'icstown, post-v. and tp. of Frederick co., Md., 45 miles N. W. of Baltimore, on the Western Maryland R. R., has 5 churches, 3 tanyards, a planing and saw mill, a fulling-mill, the Catoctin furnace, 3 miles outside the town, with a capacity of turning out 300 tons of pig iron per week, and stores and shops. Pop. of v. 583; of tp. 2340. WM. NEED, ED. "CATOCTIN CLARION."

Mechan'icsville, post-v. of Pioneer tp., Cedar co., Ia., on the Chicago and North-western R. R., has a hotel and 1 weekly newspaper. Pop. 628.

Mechanicsville, post-v. of Half Moon and Stillwater tps., Saratoga co., N. Y., on the Hudson River, at the mouth of Anthony's Kill, and on the Rensselaer and Saratoga R. R., has 5 churches, 2 hotels, and a large linen thread manufactory. Pop. 1075.

Mechanicsville, a v. in Henrico co., Va., about 7 miles N. E. of Richmond, which gives its name to a battle fought near by between the Confederate and Federal forces June 26, 1862. After the battle of Fair Oaks the Army of the Potomac remained inactive until June 25th, when Gen. McClellan reported his readiness to move upon Richmond. Gen. Lee, who had succeeded Johnston in command of the Confederate army of Virginia, had, however, so far completed the concentration of troops about that city as to himself assume the initiative on the 26th. The plan of Gen. Lee contemplated the advance of Jackson from Ashland on the 25th, and the turning of Beaver Dam early on the 26th; A. P. Hill to cross the Chickahominy at Meadow Bridge when Jackson's advance should be known, and move directly on Mechanicsville, held by the advance of the Federal army with a regiment and a battery; Longstreet and D. H. Hill to cross as soon as the Mechanicsville bridge should be uncovered, the former to go to the support of A. P. Hill; the latter to unite with Jackson; the entire force to sweep down the N. bank of the Chickahominy and throw itself upon the Federal communications with the York River. Jackson's entire command not arriving at Ashland in time to move according to instructions, he was consequently a day behind on the 26th, and at 3 P. M. A. P. Hill crossed the river and advanced upon Mechanicsville, whereupon the Federal advance withdrew to the strongly intrenched position on the left bank of Beaver Dam Creek, about a mile distant, held by the corps of Fitz John Porter. Longstreet and Hill thus being enabled to cross the bridge, the proposed advance down the N. bank of the Chickahominy was attempted. The Federal position was, however, a strong one, the banks of the creek in front being high and almost perpendicular, while the approaches to it were over open fields swept by artillery. The Confederates, moving resolutely forward, were baffled by the abatis and exposed to a disastrous artillery and musketry fire, before which, after repeated assaults, they were compelled to retire with great loss. Firing was, however, maintained until 9 P. M. This battle was sustained on the Federal side mainly by the brigades of Seymour and Reynolds, the remainder of the corps not being warmly engaged. On the authority of Gen. Longstreet, Swinton places the loss of the Confederates between 3000 and 4000. The Federal loss was less than 400. The attempt was unsuccessfully renewed at dawn of the 27th, when, Jackson arriving, the position was abandoned. (See GAINES'S MILL.) This battle also takes the name of Beaver Dam.

Mechanicsville, post-v. of Mount Holly tp., Rutland co., Vt., 3 miles S. of Mount Holly R. R. Station. It has manufactures of chair-stock, leather, and other goods.

Me'chi (JOHN JOSEPH), b. in London, England, May 22, 1802, was the son of an Italian in the household of George III.; became in youth a clerk in a mercantile house, and afterwards set up a cutler's shop; amassed a large fortune by the sale of razor-strops; in 1840 purchased 170 acres of poor land at Tiptree Heath, Essex, where by deep drainage, steam-ploughing, and the use of liquid manures he has carried on farming at a handsome profit; became in 1856 sheriff of London; alderman 1857–65; author of *Letters on Agricultural Improvements* (1845), *Experiments in Drainage* (1847), *How to Farm Profitably* (1860).

Mechitar. See MEKHITAR.

Mech'lin [Ger. *Mecheln;* Fr. *Malines*], city of Belgium, in the province of Antwerp, on the Dyle. It is the see of the archbishop-primate of Belgium, and has an ecclesiastical seminary and several other educational institutions. Its cathedral is a magnificent edifice erected in the twelfth century, and adorned by paintings of Rubens and Van Dyke. In the fourteenth century Mechlin was one of the manufacturing centres of Europe, but it has entirely lost that reputation; its lace manufactures are now the only ones of any importance. Pop. 36,090.

Mechum's River, post-v. of Albemarle co., Va., is on the Chesapeake and Ohio R. R., at the E. foot of the Blue Ridge, 10 miles W. of Charlottesville.

Meck'el's Ganglion, or the **Spheno-palatine Ganglion,** a heart-shaped mass of grayish-red nerve-substance in the human body, occupying a place in the spheno-maxillary fossa, near the hearing apparatus. It is connected with the second (superior maxillary) branch of the fifth nerve, which branch is purely sensory, with the seventh (facial), a motor nerve, with the sympathetic and the other ganglia of the fifth nerve. Its physiology is not well understood.

Meck'lenburg, county of North Carolina, bounded S. by South Carolina and W. by Catawba River. It is uneven and fertile. Live-stock, grain, and cotton are leading products. Gold and copper abound and several diamonds have been found. Lumber and carriages are leading articles of manufacture. The county is traversed by the Charlotte Columbia and Augusta, the Richmond and Danville (North Carolina division), and the Wilmington Charlotte and Rutherford R. Rs. Area, 600 square miles. Cap. Charlotte. Pop. 24,299.

Mecklenburg, county of Virginia, bounded N. by Meherrin River and S. by North Carolina. Area, 485 square miles. It is uneven and fertile. Tobacco and corn are leading products. The county is traversed by the Roanoke River and by the Roanoke Valley R. R. Cap. Boydton. Pop. 21,318.

Mecklenburg, post-v. of Hector tp., Schuyler co., N. Y., 12 miles N. W. of Watkins.

Mecklenburg Declaration of Independence, History of. The text of this document, as well as that of the principal "Resolutions" of May 31, 1775, having been printed under the appropriate heading (see DECLARATION OF INDEPENDENCE, THE MECKLENBURG), it remains to give a historical sketch of the circumstances under which both instruments originated, and to notice the arguments brought against the authenticity of the former.

On Feb. 9, 1775, both houses of the Parliament of Great Britain presented a joint address to the king declaring that a rebellion existed in Massachusetts, and pledging their lives and property to its suppression. The American colonies took Parliament at its word, and proceeded to organize local governments in all quarters. Owing to the infrequency of communications, which were at that time by way of Charleston, S. C., the news did not reach Mecklenburg county until some time in April, when it gave rise to frequent consultations between the leaders of public opinion at Charlotte and vicinity. Among these were Col. Thomas Polk, commander of the county militia; Dr. Ephraim Brevard, a forcible and energetic writer, a graduate of Princeton; and several members of the Alexander family, so numerous in the county. As the result of these conferences a series of twenty resolutions was drawn up, which, start-

ing from the premises of the parliamentary address, inferring therefrom the annulment of all laws and commissions in the province derived from the authority of king and Parliament, proceeded to provide the forms of local self-government by means of a committee of public safety and to determine the rules by which that body should act, subject to the future pleasure of the provincial Congress. They were from the pen of Dr. Brevard, and in the words of Bancroft "were framed with superior skill, precision of language, and calm comprehensiveness." The project being ripe for execution some time in May, Col. Polk called upon the nine companies of militiamen to elect each two delegates, with powers to act according to the urgency of the times; and they accordingly met in the little court-house at Charlotte May $\frac{19}{30}$, 1775.* An eager multitude of spectators from all parts of the county testified to the popular interest, and facilitated a knowledge of popular sentiment. Among those spectators several survived to take a leading part in the semi-centennial celebration of the event in 1825, and to give their testimony to the facts of the case.† Abraham Alexander was chosen chairman, Dr. Brevard and John McKnitt Alexander secretaries or clerks. Col. Polk, Dr. Brevard, Rev. Hezekiah J. Balch, and William Kennon, Esq., addressed the assembly, and the three latter were appointed a committee to report resolutions. The project previously prepared, based upon the "joint address" of Parliament, was discussed and accepted as a practical measure, probably without change. But on the same day news had come up from Charleston of the battle of Lexington; it created intense excitement, and prompted the determination to go beyond the original intention of the movers. After a discussion prolonged far into the night, the meeting adjourned until noon of the following day, instructing the committee to report at that time a formal declaration of independence, which should be transmitted by express to the Continental Congress at Philadelphia. At the appointed time on the following day, May $\frac{20}{31}$, the assembly was reconvened, and the Mecklenburg Declaration of Independence, consisting of six resolutions in the form published in Martin's *History of North Carolina*, was received with enthusiasm, adopted, signed by all the delegates, and read to the expectant multitude from the court-house steps by Col. Polk, along with the previously adopted series of twenty resolutions forming the code for their practical observance. Both documents were despatched to Philadelphia by a special messenger, Capt. James Jack, and by him delivered to Richard Caswell and William Hooper, delegates from North Carolina. The state of affairs at Philadelphia was such that the delegates judged it premature to present so daring a document to a body which still professed its loyalty to the Crown. They therefore wrote a joint letter to the Mecklenburg committee approving their sentiments and explaining the reason of their reluctance to precipitate a crisis. The Declaration was undoubtedly shown to other members, and probably to Richard Henry Lee of Virginia, one of the leaders of Congress, who a year later consciously or unconsciously employed several of its phrases in his celebrated "resolutions of independence," whence they passed into the national Declaration of July 4.

The Mecklenburg Declaration of Independence was not designed for publicity other than such as might be obtained by its presentation to Congress. In form it was expressly passed for the purpose of communication to Congress as the sentiment of Western Carolina on the burning question of independence. Its authors well knew that the Mecklenburg convention was technically incompetent to take a step which could only proceed from an entire State. It is not therefore surprising that while copies of the longer series of resolutions were speedily published in the papers of Charleston and Wilmington, as well as in the Massachusetts *Spy*, the "Declaration" was apparently not circulated. It was known to all the people of Mecklenburg, and its further publicity was referred to Congress; why should its authors gratuitously invoke the rage of the Tories of Central North Carolina and Upper South Carolina? For practical purposes the so-called "by-laws and regulations" were sufficient, yet the imagination was so deeply impressed by the bolder manifesto that in a few years more it was alone remembered. When, therefore, towards the close of the century, Dr. Hugh Williamson, a historian of the State, was collecting documents for his work, he found it necessary to apply to J. McK. Alexander, the surviving secretary. Dr. Brevard, after service in the army and imprisonment at Charleston, had died in 1780 at Charlotte, in the house of his fellow-secretary, to whom he presumably left his official manuscripts. Alexander had furnished at least one other copy from the original record, when it was destroyed by the burning of his house in Apr., 1800. In the same year, being requested to furnish a copy to ex-Gov. W. R. Davies, he attempted to reproduce the document from memory, in which he succeeded to a very considerable degree, though somewhat at the expense of elegance and logical connection. At the same time he appended a certificate of substantial but not verbal accuracy, referring for the exact text to the copy in the hands of Dr. Williamson. J. McK. Alexander died in 1817, without having seen the promised history from the pen of Williamson, which was never extended beyond the year 1771. Nearly fifty years had therefore elapsed, and innumerable histories of the American Revolution had appeared, none of which contained the slightest reference to the Mecklenburg Declaration. Dr. Joseph McKnitt Alexander, son of the secretary, very properly judged the action of the Mecklenburg patriots too important to be condemned to further oblivion, and on Apr. 30, 1819, he published his father's memorandum in the Raleigh *Register*, adding the reference to a more perfect copy in the hands of Dr. Williamson, then still living in New York. Republished throughout the country, this document was the first intimation to that generation of American citizens of an interesting fact of Revolutionary history. It became the subject of correspondence between ex-Presidents Adams and Jefferson, the former accepting, the latter questioning, its authenticity. There was no lack of skepticism; but, fortunately, there still remained a score or more of witnesses of the highest character, who if they could not speak to the exact date and language of the document, gave full confirmation to the accounts of the Mecklenburg convention and its results. Their evidence was obtained and published in due form, and the people and government of North Carolina placed the 20th of May on an equality with the 4th of July in their estimation. A more perfect text had appeared in 1829 in Martin's *History of North Carolina*, derived from a copy made previous to 1800, and its variations from the so-called "Alexander" and "Davies" copies were precisely such as to corroborate the claim of substantial but not verbal accuracy made for the latter. After the year 1830, when the legislature had given the stamp of its authority to the received version of the Mecklenburg Declaration, the question seemed to be for ever settled. It was not until 1837 that an entirely unexpected discovery put a new face upon the subject. The witnesses in their certificates had spoken of only one meeting at the court-house, and remembered as its result only the "Declaration of Independence." It is true that one or two of them had spoken of some "bye-laws and regulations," but they attached no importance to them, while they were very clear and decided in their recollection of the main event. In 1837 a printed copy of the "bye-laws and regulations," dated May 31, 1775, was discovered by the antiquary Peter Force, and other copies were soon found in the State Paper Office in London. This settled the doubt as to the fact of a Mecklenburg convention, and that it had passed a series of audacious resolutions, but they were not a "declaration of independence," and the date of May 31 was thought to disagree with that assigned to the convention. It was therefore argued by several learned as well as undoubtedly patriotic citizens of North Carolina that the document bearing date May 20 is a myth, or, to speak more accurately, an exaggerated travesty of the resolutions of May 31. This argument has been most elaborately presented in the *North American Review* of Apr., 1874, and in a series of articles in the New York daily press April and May, 1875, on the occasion of the approaching Centennial celebration, which took place with suitable ceremony May 20. It is believed, however, that every important argument has been incidentally answered in the above narrative, and that the only real ground of controversy was the supposed discrepancy of dates. It is singular that so protracted a controversy should have been waged without the discovery of the simple solution first propounded during the present year. Yet there can be no doubt that if this mode of reconciliation had been put forward at the outset all controversy would have been spared. The two essential facts of the equivalence of May 20 O. S. with May 31 N. S., and that the correction of the calendar was many years in becoming generalized in the remoter regions of America, are undeniable; and it is only necessary to suppose that the two secretaries followed different reckonings, and the extant copies having all come ultimately from the pen of J. McK. Alexander, the origin of the mistake is obvious. But we have positive testimony of the highest character on this head, which is all the better for being completely unconscious. It has never before been pointed out. Rev. Humphrey Hunter, in some respects the most circumstantial of the witnesses whose testimony remains, said in a memoir

* May 19, Old Style = May 30, New Style. The reformed calendar adopted in England in 1752 was still in a transition state in Western Carolina.

† Rev. Humphrey Hunter, Gen. George Graham, and Isaac Alexander.

written shortly before his death in 1828 that the convention took place on May 20, 1775, and that "on that memorable day I (he) was 20 years and 14 days of age." Elsewhere in the same memoir he stated that he was born May 14, 1755. Correcting the obvious misprint of a 4 instead of a 7 in the latter case, and adding the two dates (17+14) gives as the date of the Declaration May 31. This is a striking confirmation of the theory above advanced, and shows that the writer had made the correction of the calendar in the instance of his own birthday, and had also borne it in mind when he made the calculation of his age "on that memorable day," but had subsequently overlooked the application of the same rule in reducing to N. S. the date of the "Declaration of Independence." It would seem that this unwitting evidence, which in no possible way can be made to agree with any other date, may be accepted as decisive.

(The above was carefully prepared from materials furnished to the editor-in-chief of this work by the late ex-Gov. William A. Graham of North Carolina, and was intended to bear his name after revision, which it was prevented from receiving by his death, which occurred at Saratoga, N. Y., Aug. 11, 1875.) PORTER C. BLISS.

Meck'lenburg-Schwerin', grand duchy of Northern Germany, bounded N. by the Baltic, and E., S., and W. by Prussia. Area, 5138 square miles. Pop. 557,897, chiefly of Slavonian origin, of which they still retain marks in their features. The ground is low and level, dotted with small lakes, and covered with forests. Along the shore of the Baltic the soil is sandy or marshy, but farther inland it is fertile and well suited to agriculture and pasturage. Rye, wheat, flax, and tobacco are raised; cattle and horses are reared, and, especially the latter, are much valued. Cap. Schwerin.

Meck'lenburg-Strel'itz, grand duchy of Northern Germany, consisting of two separate parts—Stargard, between Mecklenburg-Schwerin and Pomerania, and Ratzeburg, between Mecklenburg-Schwerin and Lauenburg. The total area is 909 square miles. Pop. 96,982. Cap. Neu-Strelitz.

Mecon'ic Acid [Gr. *μήκων*, the "poppy"], an acid which occurs combined with morphine in opium. (See OPIUM.)

Mecos'ta, county in the W. central part of the southern peninsula of Michigan. Area, 576 square miles. It is level and generally fertile. It is extensively covered with forests. Lumber is manufactured, and some grain produced. The county is traversed by Muskegon River, and by the Grand Rapids and Indiana and other railroads. Cap. Big Rapids. Pop. 5642.

Mecosta, tp. of Mecosta co., Mich. Pop. 262.

Med'als, large coins not intended for circulation as money, but struck or cast on extraordinary occasions in commemoration of victories, treaties, coronations, or other conspicuous events, or in honor of remarkable persons. The Greeks struck no medals, and the Roman brass *medallions* differ considerably from modern medals, as they represent only political or religious ideas in an allegorical manner, not busts of historical persons. The first medals of modern times were designed by painters and sculptors, made of lead and bronze, and cast in moulds of clay or fine sand taken from models of wax. Subsequently, the art was adopted by the goldsmiths, and medals were made in *repoussé* work or in chasing in the precious metals (Cellini). In the beginning of the sixteenth century medals were made in Germany in boxwood or soapstone, from which moulds were made (Albert Dürer). At the beginning of the seventeenth century Camelio began to cut steel dies; a master-mould or model of raised steel was made, and soft iron dies stamped from it. The oldest medal known is that of David II., king of Scotland, of gold, and made between 1330 and 1370. From the fifteenth century there is a succession of medals down to our time in most European countries. In England it begins in 1480, in Denmark in 1474, in Germany in 1453, in Rome in 1464, in Spain in 1503, etc. The most beautiful series of medals are the papal and those belonging to the reigns of Louis XIV. and Napoleon I.

Med'ary (SAMUEL), b. in Montgomery co., Pa., Feb. 25, 1801; became a printer and Democratic politician; was for many years editor of the *Ohio Statesman*, and afterwards of the Columbus (O.) *Crisis;* was appointed minister to Chili 1855, but did not accept; governor of Minnesota Territory 1857–58, of Kansas 1859–60. D. at Columbus, O., Nov. 7, 1864.

Med'aryville, post-v. of Pulaski co., Ind., 52 miles N. of Lafayette, on the Louisville New Albany and Chicago R. R., has 2 large schools, 4 churches, 1 newspaper, 7 dry-goods stores, and a number of shops. Pop. 193.
J. A. WINEGARDIN, ED. "PULASKI GUARD."

Med'dybemps, post-tp. of Washington co., Me., 45 miles N. E. of Machias. Pop. 200.

Me'de, town of Italy, in the province of Pavia, situated in a plain abounding in fruit and game. Its silk industry is considerable. Pop. in 1874, 6209.

Mede (JOSEPH), b. at Berden, England in Oct., 1586; graduated at Cambridge 1610; became a fellow of Christ College; took orders in the Church of England, and spent his life in teaching Greek. D. at Cambridge Oct., 1638. He was well versed in Oriental learning, and wrote several esteemed theological works, of which the best known is the *Clavis Apocalyptica*, published in Latin in 1627, and in English in 1643. It was the earliest English work of any value upon the interpretation of the Apocalypse.

Mede'a [Μήδεια], in Greek mythology, the daughter of Æëtes, king of Colchis. She assisted Jason in getting the Golden Fleece, and became his wife. With him she went to Greece, where she became renowned for her sorceries and her many tragic adventures. Repudiated by her husband, she destroys Glauce, her rival, and slays her own children by Jason. She rejected the love of Zeus, healed Heracles of a mortal illness, and at last became immortal and espoused Achilles in Elysium. Her story is variously told, and has furnished much material for the artist and the tragedian.

Medellin', town in the state of Antioquia, republic of Colombia, South America, in a fertile and beautiful valley at an elevation of 5030 feet above the level of the sea, is well built and carries on a considerable trade. Pop. 13,700.

Medeola, or **Indian Cucumber** [from the sorceress *Medea*], a genus of the natural order Liliaceæ and tribe Trillideæ, consisting of a single species, the *M. Virginica*, called *Gyromia* by Nuttall, a perennial herb with a simple slender stem, clothed with flocculent and deciduous wool, rising from a horizontal and tuberous white root, which has the taste of cucumber, whence the popular name. The scientific name was given from the erroneous notion that this root possesses great medicinal virtues. The stem bears near the middle a whorl of 5–9 obovate-lanceolate and pointed, sessile, lightly parallel-ribbed, thin leaves with netted veins; also another of three much smaller ovate leaves at the top, subtending a sessile umbel of small recurved flowers, which bloom in June. The plant grows chiefly in the rich damp woods of the Central Atlantic States.

Med'field, pleasant post-tp. of Norfolk co., Mass., 20 miles S. W. of Boston, at the crossing of the New York and New England and the Mansfield and Framingham R. Rs., has manufactures of straw goods and carriages, a town-hall, a public library, and 3 churches. Pop. 1142.

Med'ford, post-tp. of Piscataquis co., Me., 10 miles N. of La Grange R. R. Station. Pop. 294.

Medford, post-v. and tp. of Middlesex co., Mass., 5 miles from Boston, on the Boston Lowell and Nashua and the Boston and Maine R. Rs., contains a public library, 1 bank, 1 newspaper, and is the seat of Tufts College. Medford rum and crackers are largely manufactured here. Pop. 5717. A. B. MORSS, ED. "CHRONICLE."

Medford, post-v. and tp. of Steele co., Minn., on the Milwaukee and St. Paul R. R. (Iowa and Minnesota division), 65 miles S. of Minneapolis. Pop. 520.

Medford, post-v. of Burlington co., N. J., is the southern terminus of a branch of the Camden and Burlington County Railroad, 26 miles by rail from Philadelphia, has a national bank, 4 churches, and considerable trade. Pop. of tp. 2189.

Medford's, tp. of Cherokee co., Ala. Pop. 574.

Med'hurst (WALTER HENRY), b. in London, England, in 1796; went to the East in 1816 as a missionary; travelled through India several years; resided at Batavia (Java) eight years (1822–30), laboring also in Borneo; settled at Canton, China, about 1830, and at Shanghai in 1843; spent six years in the interior of China, and d. at London Jan. 24, 1857. He acquired a remarkable knowledge of the Chinese, Japanese, and Javanese languages, translated the Bible into Chinese, edited the *Chinese Repository* (20 vols., Canton, 1838–51), published a *Chinese and English Dictionary* (2 vols., Batavia, 1842–43), and many other linguistic works; wrote an *Account of the Malayan Archipelago*, a valuable work on *China, its State and Prospects, with especial reference to the Diffusion of the Gospel* (1838), followed by *A Glance at the Interior of China* (1850), and translated the Chinese classic called *Shu-King* (1848), besides numerous minor works from the Chinese and other Oriental languages.

Me'dia, a territory of Asia, bordering N. on the Caspian Sea, and bounded on the other sides by Parthia, Assyria, and Persia, corresponded nearly to the present

Persian provinces Irak-Ajemee, Azerbaijan, Ghilan, and Mazandaran. The Medes (the *Madai* of Gen. x. 2) were closely allied to the Persians in language and religion, and they distinguished themselves by their horsemanship and their skill with the bow. They came first into notice when attacked by the Assyrians about 830 B. C. The great monarchy established by them dates from 650 B. C., with Ecbatana for its capital. In 625 B. C. their king, Cyaxares, in league with Nabopolassar of Babylon, took Nineveh and overthrew the Assyrian empire. The revolt of the Persians under Cyrus brought the Median kingdom to an end, 558 B. C. The Medes, who originally were a warlike race, are later spoken of as a very effeminate people.

Media, post-b., cap. of Delaware co., Pa., 13 miles W. of Philadelphia, on the Media and West Chester R. R., is supplied with gas and water, has several churches, the Delaware County Institute of Science, good public and private schools, 1 hotel, and stores. The Pennsylvania Training School for Feeble-minded Children is located about half a mile beyond the city limits. Pop. 1045.

VERNON & COOPER, PUBS. "DELAWARE CO. AMERICAN."

Me'diant [Lat. *medius*, "middle"], in music, the designation of the third above the tonic or keynote. It may be major or minor, and is named from its position as midway between the tonic and the dominant.

Med'ical Electric'ity. Until late years electricity has not been used to any extent as a therapeutic means in the treatment of disease. In the year 1804 and farther back the static form obtained from the large glass friction apparatus was used somewhat empirically, the spark being thrown from the brass balls of the machine. Recent investigations have shown what real value this powerful agent has in many forms of nervous disease, notably in paralysis and neuralgia. Duchesne of Boulogne was among the first to treat patients with the localized induced current, and Remak in Germany employed the galvanic current with equally successful results. Three forms of electricity are employed—viz. the induced current, the galvanic current, and the static current. The two first are examples of dynamical electricity, and the other of frictional electricity. Galvanic electricity, or galvanism, and induced electricity, or Faradism, as it has been called out of compliment to its discoverer, Faraday, are the two modes generally made use of, while frictional electricity is but rarely resorted to. Golding Bird advocated its use while he lived, and Arthius has written a great deal about its merits, particularly in chorea, rheumatism, and the diseases of women. Electro-magnetism, a species of induced current produced by the rotary apparatus, has been the favorite form of treatment among quacks and empirics. Faradism is furnished by an instrument containing a coil of wire surrounded by another, the inner one containing in its centre a bundle of wires or a rod of soft iron. Through these several coils a galvanic current is passed. At the end of the wires in every instrument is a small hammer of soft iron fastened to a spring, and a pole containing a platinum-pointed screw is placed at a short distance from it, opposite the end of the bundle of wires. This hammer breaks the current induced in the coil of wire, and rapidly vibrates, producing shocks. If the wire about the inner coil receives the current, it is *secondary*, but if it passes through *one coil only*, the current is *primary*. The advantages of a perfect instrument are the following: It should be made to furnish slow or rapid shocks; the wire of the coils should be fine enough to offer such resistance to the current as to give a "*fine*," *strong* induced current. The galvanic current is obtained from a series of cells sufficient in number to give a current of *tension*. Tension is the resistance offered to the passage of a current. One cell supplies a current, the poles of other cells being alternately joined, and there are finally but two terminal poles. We find that as the current from the original cell passes through the cells which follow, its *tension* or power is increased, and the effect is appreciable to a greater or less degree in proportion to the number of cells included in the circuit. *Quantity* is another variety of the galvanic current. A current of *quantity* is furnished by a large surface of metal in the battery-cell, while *tension* is the product of a number of small metal plates. One large cell may give the quantity which twenty smaller cells would not furnish. The *tension* or *intensity* current is that which serves us the best for medical purposes, while the *quantity* current, which furnishes heat, is adapted to the purposes of electro-surgery, which will be presently described.

The best galvanic cell for medical purposes is the Bunsen, which has been adopted by Stöhrer of Dresden, and the Grenèt, a modification of the latter, is that most commonly used. The Siemens and Halske cell is now employed to a great extent. It consists of an outer cell of glass with elements of zinc and copper, a diaphragm of porous earthenware and a diaphragm of papier maché between the solutions. The static current may be furnished by the Holtz electric machine, which is undoubtedly the best. The Ruhmkorff coil has recently been used, one wire only being brought in contact with the patient, the air forming the other conductor. A spark having all the peculiarities of the ordinary friction spark will be produced.

For the application of electricity to the body we make use of various appliances called *electrodes*. These are either sponge-covered or present a polished metallic surface to the skin. Some have sponges of different sizes for the face or smaller parts of the body, and large ones for the trunk and limbs. For active effect the metallic electrodes are the best. Neuralgias are best treated by these, either bare or covered by a piece of buckskin. The points of Duchesne consist of two cones of metal attached to handles. The sensation upon the skin is like that associated with the entrance of many small needles. The electric brush is often used to restore diminished cutaneous sensibility. It consists of a number of fine wires bound together in a handle. This electrode, as well as the other metallic ones, are used upon the dry skin. Various double electrodes and electrodes for special parts, such as the eye, uterus, and bladder, are employed in different cases. The galvanic battery should include appliances for breaking the current, reversing it, and increasing or diminishing its intensity. New and improved apparatus contains adjustments for the production of shocks and varying intermittent discharges. A galvanometer is very useful to the electro-therapeutist.

Rational electro-therapeutics should be based upon electro-physiology, and the German and French observers have experimented the most, consequently their results are most perfect and reliable. Remak, Dubois-Reymond, Zeimssen, Onimus, and Le Gros, Brenner, Benedikt, and Erb stand in the front rank as authorities. In this country and England electro-*therapeutists* predominate, and, sad to say, electro-physiology has not received the attention it has demanded. Morgan, whose untimely death has robbed us of one of the most promising scientists of this day, gave to the world a work of very great value which remains as a monument to his greatness.

Certain facts have been evolved from the labors of the workers in this field, and I will briefly allude to them. We have been taught that a motor nerve, when stimulated by an electric current, is followed by a contraction of the muscles it supplies. Strong currents uninterrupted produce an activity in motor nerves, but if these currents be rapidly interrupted or broken, the contractions of the muscles will be stronger, and the force of the excitation in proportion to the rapidity of the alterations in the motor stimulation. The theory of *electrotonus* is based upon the following facts: If a portion of a motor nerve is included between the poles of a galvanic battery, it is said to be *polarized*, and in a state of "electrotonus." At the positive pole the irritability of the nerve is diminished, while at the negative it is excited and more susceptible to stimulation. The condition at the positive pole is called *anelectrotonus*, and that at the negative, *catelectrotonus*. The positive pole is known as the *anode*, the negative the *cathode*, and these give the names to the states described. A nerve is said to be *tetanized* when the muscle supplied is thrown into a state of permanent tetanic contraction by a rapidly intermitting current. The passage of a number of these shocks for some time will diminish the irritability of the nerve to such an extent that finally there will be no further response. This is a valuable fact to consider in connection with electro-therapeutics. An ascending current causes a greater irritability in a nerve than a descending one; a descending one depresses excitability. The stimulus is felt at the negative pole when the current commences, and when it is broken it is felt at the positive pole. Greater sensation is felt at the negative pole. Pfluger has shown that a shock is felt at the *opening* of the weak currents; with moderately strong ones, it is felt both at the opening and the closure. With very strong currents it is impossible to tell the points of sensation, as the power of the nerve is impaired.

Brenner's theories, upon which he has based his treatment of deafness, are dependent upon the fact that "when one pole is placed near a nerve and the other at a distance, the nerve obeys the nearer pole"—that the auditory nerve will obey the pole placed upon the mastoid process or in the meatus. No effect is produced by the other pole held in the patient's hand. If the negative pole is placed against the ear, the current is "ascending"—if the positive, "descending." The action upon voluntary muscles themselves is very much the same so long as the integrity of their immediate nerve-supply is concerned. Involuntary muscles respond less quickly. There are various degenerations and atrophies of muscles which interfere to a great extent with their susceptibility to electric currents.

It is, then, well in disease to endeavor to pass the current through the nerve-trunk which supplies them.

The action of the faradic current upon the surface of the body is but local. It does not affect the deeper muscles nor nerves. Its action upon the skin is its characteristic property. When an electrode is applied to the moistened skin it is followed by prickling sensations, attended by redness and tingling. The faculty of perceiving sensation by the cutaneous nerves and muscles has been called the *electro-muscular sensibility*. The sensation produced by the galvanic current is one of warmth, like that which always follows the application of local stimulants, such as liniments or a mustard plaster. When the faradic current is applied to the skin previously dried, or when the electrodes are lightly brought in contact with it, there is appreciable pain produced. Cutaneous sensibility is more exaggerated by rapidly succeeding shocks from a faradic instrument than by slow ones. The galvanic current produces deeper impressions than the faradic. It likewise produces electrolytic changes which do not follow the use of the faradic. Another feature of the galvanic current is its property of producing absorption and changing the structure of different tissues of the body. The effects of the galvanic current upon various parts of the body may be briefly enumerated as follows: The application of the electrodes of a battery of moderate strength to any part of the head or face will be attended by the occurrence of flashes of light appreciated by the individual, a metallic taste, giddiness, dizziness, and a peculiar sensation at the root of the nose. The passage of a galvanic current through the bones of the cranium has been doubted by Cyon and other writers, though numerous other physiologists, Zeimssen and Erb among them, agree as to its feasibility.

The passage of such a galvanic current, according to neuro-therapeutists in general, is followed by beneficial results in many diseases of the brain. When we apply the galvanic current to the great sympathetic nerve, placing one pole upon the upper part of the sternum and the other behind the angle of the lower jaw, we bring this nerve under the galvanic influence. The first evidences of "galvanization of the sympathetic" are dilatation and subsequent contraction of the pupil. The pulse diminishes in frequency, and the tension of the carotid arteries is lowered. Electricity is used for the purpose of diagnosis. By it we may detect local tenderness, exalted sensibility, or their opposite conditions, anæsthesia and paralysis. We may ascertain whether there is disease of the nerve-centres, the brain, or spinal cord—whether a paralysis is of recent date or long standing. We may settle the question of doubtful death; we may also detect malingering. There are several important physiological facts to be taken into consideration — the function of muscles or nerves, their loss of contraction and sensation, or the reverse; and as various nervous diseases are associated with these conditions, we are enabled by electricity to determine the extent of such changes. A reference to a few morbid conditions will make these facts more clear. The existence of some recent disease of the brain will be characterized by increased muscular contractility oftentimes when there is paralysis of the muscles. Certain local paralyses, or central diseases attended with atrophy of the muscles or disease of some part of the nerve, destroying its conductivity, are associated with loss of reaction. In the application of the electric currents it is very necessary to bear in mind the anatomy of the parts affected; thus, for neuralgia of the fifth nerve we must apply one pole as near as possible to the emergence of the nerve from the cranium, and the other pole to the remote parts of distribution. In sciatica it is of importance to place one electrode over the sacro-sciatic notch, where the great sciatic nerve leaves the pelvis. Groups of muscles may be acted upon through special nerves supplying them. Many of the internal organs may be influenced through the sympathetic nerve.

We use galvanism and Faradism for the relief of pain and spasm, for the improvement of the nutritive processes, to restore lost muscular power, for stimulation of sensation in peripheral or deep nerves, for stimulation of secretion, to affect the organs of special sense, to influence circulation by means of the vaso-motor system, to produce absorption of fluids, morbid tissues, and deposits, to procure sleep, and in the form of the galvano-cautery for surgery. We employ both forms of current in the treatment of paralysis, the galvanic perhaps being the most important for paralysis from central diseases. The galvanic current is used at the nerve-centres, and the faradic upon the peripheral muscles. There are many cases of paralysis in which faradic currents will produce no muscular contraction, while the galvanic current will be followed by vigorous contractions of the muscles. In cases of this kind (lead paralysis is an example) we begin treatment with the galvanic, and afterward use the faradic. Local paralyses are best treated by the faradic current. Those conditions that are called *atrophic*—*i. e.* wasting—common forms of which are infantile paralysis, progressive muscular atrophy, and adult spinal paralysis, are cases for the galvanic treatment. Vaso-motor ataxia and other forms of sclerosis of nerve-tissue are treated by galvanism, and for cerebral hæmorrhage, commonly called apoplexy, we use both forms. The use of electricity in the beginning is injudicious, as there is considerable irritability of the brain and rigidity of the muscles. After two or three weeks, galvanization of the brain is to be commenced, and faradization of muscles. A general rule may be laid down in all paralyses. This is: Use the faradic current at first, and if no contractions are produced in the muscles use the galvanic. It will be found in most instances that after a few weeks' use of the galvanic, the faradic will begin to produce contractions. The application should be made three times a week, each *séance* lasting fifteen minutes at least. The forms of paralysis from all causes, whether they be from pressure, from injury, or from rheumatism, may be treated successfully. Paralyses of special parts are treated by differently shaped instruments. There are electrodes for applying it to the vocal cords, to the muscles of the orbit, to the ear, and Reliquet has devised an apparatus for applying it to the bladder. A very important class of cases calling for treatment is that which includes neuralgia and other nervous diseases symptomatized by pain. We may either apply it to a nerve-trunk or directly to the skin.

The galvanic current is the most appropriate for the *mediate*, and faradic for the *immediate* application. The faradic current is of great use for many of the headaches, particularly those of a rheumatic character. Galvanism asserts itself most favorably in neuralgia of all kinds. It is indicated particularly in sciatica, tic douloureux, spinal irritation, and a number of other conditions attended by pain. Forms of hysteria are particularly under the control of galvanism. Writers' cramp and chorea are benefited to some degree by both currents. Obstinate constipation and many diseases of women are improved by electrical treatment. "Galvanism of the cervical sympathetic," as it has been somewhat improperly called, effects many beneficial changes from diseased states resulting from disturbance of the nutritive processes, particularly in some forms of dyspepsia, or hyperæmia of different parts of the body. Little can be said of its value in the treatment of skin diseases. Electricity has produced very few authenticated cures, and those reported are undoubtedly due for the most part to other remedies (or galvanism only so far as it proved of use as a general tonic) and disappearance of the causes. Electricity has been used by Simpson, Thomas, Dubois, Murray, and Allen in obstetrics for the production of uterine contractions. A most important use of electricity is its application for the production of absorption of morbid products in different parts of the body.

When the two poles of a galvanic battery are connected with needles, and these needles thrust into the tissues of the body, a process goes on which has been called *electrolysis*. At the *negative* pole bubbles of hydrogen gas are disengaged, which separate mechanically the surrounding tissues and break them down, so that the disintegrated particles may be taken up in the circulation. At the *positive*, oxygen is disengaged, which forms an acid with certain elements of the tissue, and the albumen is coagulated, forming a clot if this happens in a cavity filled with blood. With this mode of treatment the physician is enabled to disperse a great many forms of tumors, among them aneurism, and even goître.

A platinum wire placed between the poles of a powerful battery possessing the requirement of sufficient *quantity* will become in a very few minutes white hot. Such wires properly adjusted in handles may be used in place of the knife or écraseur in many surgical operations. It is particularly of service in deep cavity operations, where the use of the knife is impossible. The galvanic cautery is unattended by pain or hæmorrhage. Its cuts are covered by perfect cicatrices, and it is very valuable in certain uterine operations. Care must be exercised by all persons who use electricity and are not experienced, to avoid applying strong currents to the head. It is unadvisable to use it for over ten or fifteen minutes at a time, and then very carefully.

ALLAN MCLANE HAMILTON.

Medical Jurisprudence. See JURISPRUDENCE, MEDICAL, by PROF. JOHN ORDRONAUX, M. D., LL.D.

Me'dici, a famous Florentine family, who early became prominent in public affairs, figuring largely in the fourteenth century. They were merchants. COSIMO DE' MEDICI, the Great, b. 1389, was the son of Giovanni, gonfaloniere of Florence, and by his liberality, urbanity, and prudence won great influence with the people, but avoided the appearance of power, being content with the substance. He

adorned Florence with splendid public buildings, patronized art, and d. Aug. 1, 1464, and after death was honored as *pater patriæ*.—His grandson, LORENZO THE MAGNIFICENT, b. Jan. 1, 1448, was the splendid patron of Greek learning and of all the liberal arts, being himself no mean poet. He brought Florence to a great pitch of opulence and power, and, notwithstanding the hostility of Pope Sixtus IV., exercised a great influence throughout Italy. D. Apr. 8, 1492.—His son, Pope LEO X., did much to advance the fortunes of his family. (See LEO X.)—COSIMO, b. June 11, 1519, the first grand duke of Florence, was a successor of Alessandro (1510–37), the subverter of Florentine liberty, who was himself an illegitimate son by an African slave. Cosimo was declared grand duke by Pius V. 1569, and d. Apr. 21, 1574. The grand ducal line of the Medici family ended in 1743 with Jean Gaston de Medici (1671–1737), but the princely line of Ottajano, the ducal house of Sarto, etc. have perpetuated the name till our times. The popes Leo X. and XI. and Clement VII., Queens Catharine and Marie de Médicis of France, some eminent cardinals and dukes of Urbino, were also of this family. (See CATHARINE DE' MEDICI and MARIE DE MÉDICIS.)

Medici'na, town of Italy, in the province of Bologna, about 28 miles from Imola. It is substantially built, with an artesian well in one of its squares, and was once surrounded by walls, now destroyed. Antique objects of interest are often found in its vicinity. Pop. in 1874, 11,355.

Med'icine [Lat. *medicina*, from *mederi*, to "heal"], the art and science of curing disease. Its origin is obscure, but dates back to the early existence of the human race, coincident with the liability to injuries, sickness, and processes of decay. Medicine in its primitive state comprised a recognition of the relative virtues of different articles of food, an empirical use of medicinal herbs and roots, and superstitious rites. For ages it was merely traditional usage in families or communities. Hence it was practised, as it is to-day in barbarous tribes, by the local chiefs. Superstition ascribed disease to evil spirits or to the displeasure of divinities, and reverenced the gifted physicians as superhuman. Temples were erected to their worship, whose priests were guided in their treatment by invocation of the oracle. The profession thus became a sacerdotal order, within which acquired knowledge of medicine was preserved and secretly transmitted. The Chinese have practised and written of medicine in the remotest ages, but without intelligence or method, being possessed only of a vast collection of extravagant empiric formulæ. The Hindoo practice has always been simple, restricted to a knowledge of dietetics, hygiene, and mild antiphlogistic measures. The methodical study of medicine began in the fabulous age of Egypt. Isis or Orus, the Hermes of the Greeks, was the god of medicine. At first, the method pursued was to expose the sick by the wayside, that passers-by who had suffered from similar maladies might recognize them and declare the means of cure. Herodotus tells us that the Babylonians, Chaldæans, and other nations had no physicians, but followed this same custom. But later, in Egypt, the sick were required, upon recovery, to go to the temple and record on tablets their symptoms and remedies. The temples of Canopus and Vulcan were the repositories, and a skilled priesthood arose which framed a code controlling public hygiene, individual regimen, and the treatment of disease. Thus, far back in a period of mythology Egypt possessed a store of medical knowledge, had able surgeons, many devoted to the study and pursuit of a single specialty, as lithotomy, and remedies bearing the name of Isis and Osiris down through subsequent Grecian, Roman, and early Christian centuries. The early medicine of Greece is legendary. Æsculapius, instructed in the healing art by Chiron the Centaur, became so skilled that he incurred the displeasure of Pluto, and was stricken by a thunderbolt from Jove. He became the god of medicine, temples were erected bearing his name, and the officiating priesthood were designated the Asclepiadæ. The sons of Æsculapius, Machaon and Podalirius, accompanied the Greeks in the Trojan war, and their skill has been immortalized in the songs of Homer. Hygieia, the goddess of health, and Hercules, reputed to cure epilepsy — the "sacred disease" or "disease of Hercules"—were also worshipped. The practice of the Asclepiadæ was simple. The temples were located in salubrious places, their interior purified by burning fragrant incense and secret remedies. Thither the sick were brought for treatment. Recourse was had to baths, gymnastics, mineral and thermal springs, and the use of unctions. Remedies were prescribed by the oracle and skill of the priesthood. Votive tablets inscribed with records of the disease and cure were deposited within or placed upon the columns and gates. Pythagoras and the sect which took his name supplanted the Asclepiadæ. They promulgated the knowledge, before a secret, sought the philosophy of disease, but confined their treatment to dietetics and hygiene. The Pythagoreans declined about 500 B. C. Hippocrates was b. in the year 460 B. C., and d. in 357 B. C. He is known as the "father of physic." He was descended remotely from the Asclepiadæ through a long line of physicians. He developed a system of theories on disease and medicine which has given to his school and period of practice the title "dogmatic." He acquired anatomy by dissection of animals, and was skilled in surgery. His study of symptoms and diseases was careful and accurate; he recognized stages and crises in disease; he relied upon the power of Nature, which he termed "first of physicians;" stimulated when Nature failed, moderating when her forces were excited. His remedies were mainly vegetable and dietetic. His works were numerous, chief of which are *The Prognostics, Aphorisms, On Epidemics, Regimen in Acute Disease.* Hippocrates made great and permanent contributions to medicine by his descriptions of disease. With the founding of the Alexandrian Library (320 B. C.) the Alexandrian school began. Most celebrated were Erasistratus and Herophilus. The latter was an anatomist, studied the nerves, the brain, and to this day his name is retained connected with its circulation, the confluence of venous sinuses being termed the "torcular Herophili." Two Alexandrian schools of medicine flourished successively — the "Empirical" of Philenus and Serapion, who renounced "dogmatism" and relied only on experience, and the "Methodists," whose influence extended over Greece, thence to Rome, and lasted for at least two Christian centuries. Methodism asserted that the body was permeated in health by atoms which entered from without and moved freely in every part and direction of the organism. Disturbances of this perfect relation by constriction or relaxation were states of disease, and all medication was therefore by astringents or relaxants.

Medicine was introduced into Rome from Greece 200 B. C. Asclepiades, who practised at Rome 100 B. C., was a Methodist. Chief among Roman physicians was Celsus, "the Cicero of medicine," great as a surgeon and scholar, whose work, *De Medicina*, in 8 books, is a record of medical knowledge down to his time. Claudius Galen, known as Galen, by his teachings and writings so influenced medicine that he was esteemed infallible authority for fully twelve centuries. He was b. at Pergamos A. D. 130, but lived and practised at Rome. He is reputed to have written 200 distinct treatises, upon every subject then known in medicine. He was educated at Alexandria, and his knowledge of anatomy was matured by dissection of animals. He was a "Humoralist," regarding disease as due to putridity of the "four humors"—blood, phlegm, bile, and black bile. The Methodists, on the other hand, found disease only in the tissues, and were known as "Solidists." So long as medicine was swayed by theories, the conflict of "Humoralism" and "Solidism" was constantly revived. Chief among Galen's works are treatises *On the Use of the Different Parts of the Body, On Temperaments, On the Seat of Disease, Methods of Cure.* During the Dark Ages medicine declined in Europe, but was preserved and advanced by the Arabian school, which dominated from the ninth to the end of the fourteenth century. Symptoms were studied, new diseases described, Galen's works were translated and commentated, rendering famous the names of Rhazes, Avicenna, Albucasis, Avenzoar, Averrhoes, etc., and drawing the students of the whole continent to the renowned Spanish schools of Cordova, Seville, Toledo, and Saragossa. Renourd in his *History of Medicine* styles the subsequent period, from the close of the fourteenth century to the present, the "age of renovation." Medicine, thus far an art based upon experience and biassed by erroneous theories, now began to advance by successive discoveries in anatomy, physiology, and pathology to the standard of a science. Printing ensured the dissemination of each progressive step. The Italian schools succeeded the Arabian. Mondini of Bologna dissected before the class in 1315, and wrote imperfectly on anatomy. To Andreas Vesalius, professor at Padua, who published his great work in 1543, anatomy owes its origin and permanent impetus. Vesalius was followed by Eustachius, Fallopius, Sylvius, Pacchioni, and others whose names now exist in anatomical nomenclature. In A. D. 1622, Aselli of Milan described the lacteals; in 1628, Harvey announced the circulation of the blood; in 1661, Malpighi of Bologna detected the movements of the red blood-globules; in 1690, Leeuwenhoek of Delft demonstrated the capillaries. The researches of Vieussens, Haller, Meckel, and Scarpa, the separation of the cerebro-spinal and ganglionic nervous systems by Bichat, the treatise of Sénac (in 1749) on the action and diseases of the heart, of Avenbrugger (in 1761) on percussion of the chest, the first work on pathology by Morgnani in 1762, the recognition of nerve origins, of the ganglia,

and different faculties in the brain by Willis and others, the writings of Sydenham and Huxham, the discovery of vaccination by Jenner in 1796, are a few of the very many scientific truths which warrant us in speaking of medicine as a science. The status of medicine was again elevated. The barber-surgeons of Paris were abolished by law in 1743, at London in 1745. Clinical teaching was inaugurated at Padua in 1758. Schools of medicine were established in England, France, and Germany. During the nineteenth century this devotion to the development of technical and scientific investigation, rather than to speculation, as the true basis of the treatment of disease, has steadily increased, and warrants the belief that we are erecting a system of scientific medicine. It has also been designated an age of "rational empiricism" in medicine, since skill in treatment is largely cumulative from past experience, yet rendered intelligible and certain by a clear discernment of the laws of life, of the functional activities which constitute health, and of their perversion in disease. Histology, physiology, microscopy, micro-chemistry, pathology, physiological medicine, pharmacy, and therapeutics are fields of incessant work and progress. The physical exploration of the chest, the study of Bright's disease, the cellular pathology, the elaboration of the specialties, are some of the many results. Correct and intelligent diagnosis is sought as the only substantial basis for the treatment of disease. E. DARWIN HUDSON, JR.

Medicine, tp. of Livingston co., Mo. Pop. 901.

Medicine, tp. of Mercer co., Mo. Pop. 939.

Medicine, tp. of Putnam co., Mo. Pop. 665.

Med'ick [Gr. Μηδική, so called because they were believed to be natives of Media], a name for several leguminous herbs of the genus *Medicago*, resembling clover, and often cultivated, especially in Europe, as forage-plants. Several species are naturalized in the U. S. from Europe; others are cultivated as ornamental plants. (See LUCERN.)

Medill' (JOSEPH), b. in New Brunswick, near Maine, Apr. 6, 1823; removed in childhood to Massillon, O.; studied law; founded in 1849 a "Free-Soil" paper at Coshocton; established at Cleveland in 1852 a Whig paper, the *Forest City*, which in the following year was merged in the *Leader;* was in 1854 one of the organizers of the Republican party in Ohio; went to Chicago soon after, and with two partners bought in May, 1855, the *Tribune*, a paper with which he has since been identified. He was in 1870 a member of the Illinois constitutional convention, and was the author of the minority representation clause; was appointed in 1871 a member of the U. S. civil service commission, and elected mayor of Chicago. He spent a year in Europe (1873–74), and on his return purchased a controlling interest in the *Tribune*, of which he became editor-in-chief.

Medill (WILLIAM), b. in 1805 in New Castle co., Del.; studied law; was admitted to the bar of Ohio in 1832; was often in the State legislature, and twice chosen Speaker; was in Congress from Ohio 1839–43; first assistant postmaster-general 1845–49; then commissioner of Indian affairs; chairman of the State constitutional convention of 1850; lieutenant-governor of Ohio 1851–53; governor of Ohio 1853–56; and was first comptroller of the treasury under Pres. Buchanan. D. at Lancaster, O., Sept. 2, 1865.

Medi'na, city of Arabia, in the province of Hedjaz, 250 miles N. of Mecca and 132 miles N. E. of Jemb, or Yambu, its port on the Red Sea. It is situated in a fertile and well-watered valley on the eastern slope of a lofty mountain-range, and is surrounded with high stone walls flanked with towers and defended by a strong castle. It is a handsome and well-built town, consisting of two-story houses, generally built of brick, surrounded with gardens and provided with wells. Its importance is derived from its mosque, which contains the tomb and mausoleum of Mohammed, and is annually visited by more than 50,000 pilgrims. The mosque is a large but irregular building, like that of Mecca, but the mausoleum itself, about which so many fables have been told and exploded, has never been seen by any European. Mohammed fled to Medina in 622, and d. there in 632 A. D. Accordingly, it is regarded by Mohammedans generally as quite equal if not superior in sanctity to Mecca. The inhabitants are not unlike those of Mecca, though of a more sedate character. The city has no manufactures and only an unimportant trade. Pop. 18,000.

Medina, county of N. E. Ohio. Area, 425 square miles. It has a fertile clay soil. Cattle, grain, fruit, and dairy products are the agricultural staples. The leading manufactures are of cheese, lumber, saddlery, and harnesses. The county is traversed by the Atlantic and Great Western R. R. Cap. Medina. Pop. 20,092.

Medina, county of S. W. Texas. Area, 1175 square miles. It is bounded N. E. by Medina River, and is elevated, dry, and healthful, but rather deficient in water and timber. Cattle, wool, and corn are the leading products. Most of the inhabitants are Germans. Cap. Castroville. Pop. 2078.

Medina, tp. of Peoria co., Ill., on the W. side of Peoria Lake. (P. O. MOSSVILLE.) Pop. 905.

Medina, tp. of Warren co., Ind. Pop. 609.

Medina, post-v. of Jefferson co., Kan., in Kentucky tp., 14 miles N. W. of Lawrence, on the N. bank of the Kansas River and on the Kansas Pacific R. R. Pop. 197.

Medina, post-tp. of Lenawee co., Mich. Pop. 1973.

Medina, tp. of Hennepin co., Minn. Pop. 1058.

Medina, post-v. of Orleans co., N. Y., on the New York Central and Hudson River R. Rs. and the Erie Canal, has 2 academies, 2 schools, 1 bank, 5 churches, 3 hotels, 2 weekly newspapers, 3 flouring and planing mills, 1 saw-mill, a pump and agricultural tool factory, and several carriage and other factories. Pop. of v. 2821.
HURD & TAYLOR, PUBS. "MEDINA TRIBUNE."

Medina, post-v. and tp., cap. of Medina co., O., on the Lake Shore and Tuscarawas Valley R. R., has 1 normal and 1 union school, 4 churches, 2 banks, 1 newspaper, several flour, saw, and planing mills, 1 iron-foundry, other manufactories, and stores. Pop. of v. 1159; of tp. 1553. J. H. GREENE, ED. "MEDINA CO. GAZETTE."

Medina, tp. of Dane co., Wis. Pop. 1525.

Medi'na de Ri'o Se'co, town of Spain, province of Valladolid, on the Sequillo, an affluent of the Douro, is in a fertile plain rich in wine, and carries on some trade. Pop. 5333.

Medi'na-Sido'nia, town of Spain, province of Cadiz. It was built by the Moors, is situated on a steep eminence surrounded by walls, contains a fine Gothic cathedral and a magnificent castle, and has a grand and imposing appearance; it is, however, a gloomy and comparatively insignificant town. Pop. 9703.

Mediterra'nean Sea, The, is the large sea bounded by the continents of Europe, Asia, and Africa, 2200 miles long, 1200 miles broad between Tunis and the Bay of Sidra, and covering an area of 977,000 square miles. It has a very irregular shape, forming many gulfs, as those of Lyons, Genoa, Taranto, Lepanto, Koron, Kolokythia, and Salonica on the shores of Europe; on the shores of Asia, Adramyti, Smyrna, Adalia, and Iskanderun; on the shores of Africa, Sidra and Cabes; and bearing different names in the different localities—as, for instance, the Tuscan, Ionian, Adriatic, and Ægean seas. Its depth in the Strait of Gibraltar is 5500 feet, but on the line between Sicily and Cape Bon in Africa only 200 feet, in some places even not more than 40 feet. It communicates E. with the Black Sea through the Strait of Constantinople, and W. with the Atlantic through the Strait of Gibraltar, through both of which the water steadily pours into it in rapid currents. It also receives the waters of several large rivers, the Ebro, Rhone, Po, and Nile. But a much greater evaporation takes place in the Mediterranean than in the Atlantic or in the Black Sea, owing to the hot winds which blow over it from Northern Africa, while the Pyrenees and the Alps prevent the cold winds from Northern Europe from reaching it. The temperature of the Mediterranean is about 3° 05′ F. higher than that of the Atlantic, and on account of this more rapid evaporation its water contains about one-sixth of 1 per cent. more salt than the water of the Atlantic. There is very little tide, owing to the narrowness of the strait which connects it with the ocean. The prevailing winds are in spring S. E. and S. W., and during the rest of the year N. E. and N. W.; they often rise suddenly and blow with great violence. (See *The Mediterranean* (1854), by Rear-Admiral William Henry Smyth.)

Med'lan's Ranche, a v. of Young co., Tex. Pop. 28.

Med'lar [Ang.-Sax. *mäd*], the fruit of *Mespilus Germanica*, the medlar tree of Asia and Europe, belonging to the order Rosaceæ. This is a small, sometimes thorny shrub, which is often cultivated. There are many varieties. The fruit is not eaten until over-ripe. The Japan medlar is usually known by the Chinese name of LOQUAT (which see).

Med'ley (JOHN), D. D., b. in England in 1804; graduated at Wadham College, Oxford, in 1826 with honors; was several years vicar of St. Thomas's, Exeter, prebendary of the cathedral, and in 1845 was consecrated first Anglican bishop of the see of Fredericton, comprehending the province of New Brunswick.

Medley's, tp. of Montgomery co., Md. Pop. 3885.

Me'do, post-tp. of Blue Earth co., Minn. Pop. 712.

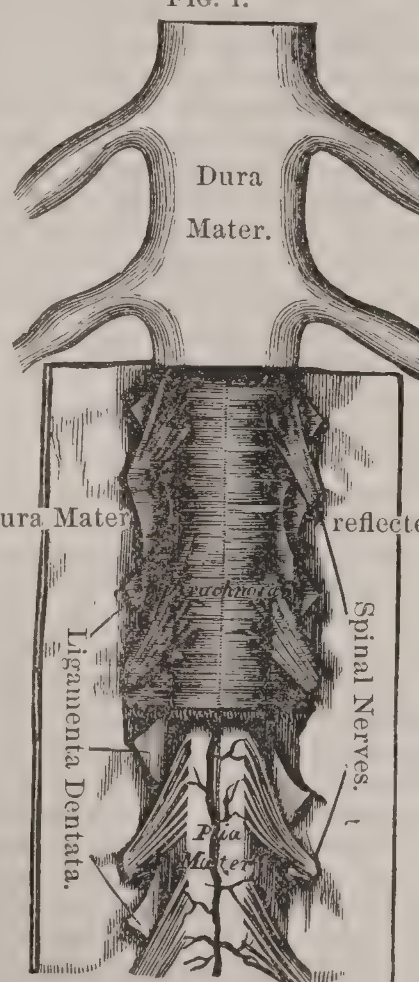
Medo'ra, post-v. of Carr tp., Jackson co., Ind., on the Ohio and Mississippi R. R., and on the E. fork of White River.

Med'ows (Sir William), K. B., b. in England Dec. 31, 1738; entered the army in 1756; served with distinction in Germany 1760; came to America in Sept., 1775, with the 55th regiment; afterwards commanded the 1st brigade of grenadiers, distinguishing himself on several occasions; was wounded at Brandywine and at the capture of St. Lucie 1780; was made colonel of the 89th regiment, and sent as major-general to India 1781; was governor of Madras 1790–92; led the right wing of Cornwallis's army at the siege of Seringapatam 1792, where he displayed great courage and ability; became lieutenant-general Oct., 1793; was governor of the Isle of Wight for some years, and commander-in-chief in Ireland 1801–03. D. at Bath Nov. 14, 1813.

Medulla Oblongata. See Brain, by Prof. Henry Hartshorne, M. D.

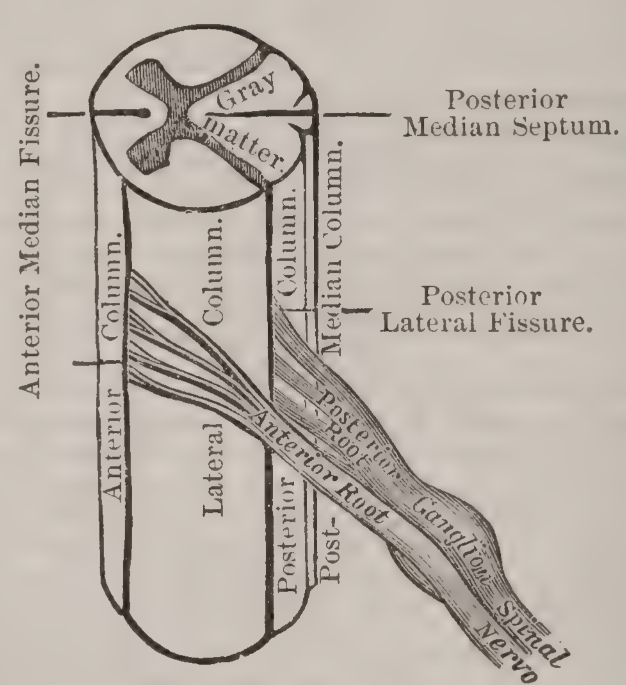
Medul'la Spinal'is [Lat.]. *Anatomy.*—The medulla spinalis, or spinal cord, is that part of the central nervous system which is enclosed in the spinal canal, extending from just below the foramen magnum, at the base of the skull, to a point between the first and second lumbar vertebræ. It is a rounded, cordlike mass of nervous matter, continuous at its upper end with the medulla oblongata, and terminating below in a conical extremity. In this long (16–17 inches) course it gives off thirty-one pairs of spinal nerves, by means of which it is placed in communication with the whole of the body below the head. It is enclosed by three membranes, which lie within the bony canal of the spine—the dura mater, arachnoid, and pia mater. The structure and general arrangement of these membranes do not essentially differ from those of the same envelopes around the brain. One or two peculiarities are worth noting. The dura mater has a firm attachment to bone at its upper end, at the edge of the foramen magnum of the skull. From the sides of the spinal cord, or from the pia mater covering it, there spring very numerous little processes of strong membrane having the shape of teeth of a saw, whose sharp points are attached to the inner surface of the dura mater, thus holding up the spinal cord within the sheath of the dura; this is the ligamentum dentatum. (See Fig. 1.) Between the dura and arachnoid there is only present a little lubricating fluid, while under the arachnoid, in the meshes of the pia mater, as in the brain, lies the cerebro-spinal fluid, in considerable though changing quantity.

Fig. 1.



The spinal cord itself, like the other nervous centres, consists of the following elementary parts: a basis-substance (neuroglia) of fibro-connective tissue, bloodvessels, ganglion-cells, nerve-fibres with myeline, and others without. The special grouping of these elements gives form and character to different parts of the spinal cord. In general terms, it may be said that the spinal cord is made up in its central parts of gray matter—*i. e.* ganglion-cells of different sizes peculiarly grouped, with nerve-fibres, bloodvessels, and delicate basis-substance; and in its outer peripheral parts of white matter—*i. e.* more or less coarse basis-substance, supporting nerve-fibres with myeline, and containing bloodvessels. If we look at a spinal cord whose membranes have been stripped off, we observe the following appearances on its external surface: The cylindrical shape of the organ is made irregular by two swellings, uniform and gradually formed, in that part of the cord lying in the middle cervical and in the lowest dorsal vertebræ—the so-called cervical and lumbar enlargements. On the whole of the front surface of the cord there runs a line or deep mark, which after the removal of the pia mater is seen to be a real fissure or crack, penetrating quite deeply, separating the organ into two equal halves. This, the anterior median fissure, is in life filled by the pia mater and the anterior spinal artery and branches. On either side of the anterior median fissure very numerous delicate bundles of nerves arise from the spinal cord; these are the anterior roots of the spinal nerves, whose deep connections we shall presently learn. Turning the spinal cord over, we notice that the median line is not by any means as distinct behind as in front, and it is impossible to demonstrate a fissure without lacerating the tissue; the separation between the halves of the spinal cord posteriorly is a permanent incorporated extension of the pia mater, and is called the posterior median septum. On either side of this are arranged the posterior rootlets of the spinal nerves, in the same manner as the anterior. These two kinds of roots (which are physiologically distinct) pierce the dura mater, conjoin and mingle, escaping from side openings between the vertebræ, and receive the name of spinal nerves. Just before joining the anterior root the posterior exhibits a swelling—the ganglion of the posterior root. At the upper part of the spinal canal the spinal nerves issue from the spine at a point not much lower than their origin in the cord, but in the lower regions the nerves make a very acute angle in their course downward to their canals of exit. The structure of the central gray matter can best be studied in transverse sections of the organ. (See Fig. 2.) Such a section shows the white substance covering in the gray

Fig. 2.



matter everywhere, except at a very narrow point behind where the gray matter reaches the pia mater. This piercing of the white substance by the gray enables us to divide the white substance into two unequal masses on each side—the smaller behind, between the point of gray matter and the posterior median septum, being called the posterior column (as it extends the whole length of the organ); the larger part, filling up the space in front of the point of gray matter, and extending to the bottom of the anterior fissure, is the antero-lateral column. The gray matter is irregularly developed in the cord, forming a figure not unlike a rough letter H, whose forward arms are club-shaped. The lateral pieces of the H constitute the horns of the gray matter; the connecting bridge is known technically as the gray commissure. The anterior horns are larger, more rounded than the posterior, and are differently constituted. In them (much more largely developed in the cervical and lumbar enlargements of the cord) are the largest ganglion-cells known, which present a multitude of delicate branching processes, and one short round non-branching process. The former ramify in the gray matter; the latter is continuous with a nerve-fibre which, traversing the anterior white column, issues externally as an anterior rootlet. Thus, it is likely, are all anterior nerves connected in the anterior horns. In the cervical and lumbar parts of the cord these ganglion-cells are very numerous, and fill up the anterior horns. In the cervical and upper dorsal region we meet, besides, with an accumulation of smaller ganglion-cells in the middle of the side of the gray matter, nearly on a level with the commissure. In the posterior horns very few ganglion-cells are seen, and those which exist are oval, with few processes. The posterior nerve-roots do not, as far as we know, communicate with these ganglion-cells; the rootlets enter the white matter a little to the inner side of the point of the posterior horn, and send fibres in several directions—into the posterior horn, upward and downward in the posterior column. The central parts of the spinal cord consist of an anterior commissure, lying at the bottom of the fissure, and composed of nerve-fibres with myeline. Just back of it is a quantity of basis-substance in which there is a round or oval hole lined by columnar epithelial cells, or filled up by their *débris*—the central canal of the spinal cord. This canal extends from the lowest end of the cord to the fourth ventricle in the medulla oblongata, and is

visible only to the microscope. Behind this is the transverse connecting band of gray matter, the posterior commissure. This summary description applies to the higher Vertebrata as well as to man.

Physiology.—During the first twenty-five years of this century the spinal cord was looked upon as a bundle of nerves extending from the brain to the external parts—the spinal nerves gathered up into a sheaf, as it were. The brain sent nervous force through the passive cord to the muscles. Researches made previous to this time (Prochaska, Legallois, and others) had already shown that the spinal cord possessed energy of its own. In the last forty years this organ has been clothed with all the attributes of a high nervous centre, and some have even gone so far as to admit that it possesses volition and consciousness. These two attributes are not by any means proved to be truly spinal. Leaving out these, we must study the cord as a conducting organ for sensory impressions and motor excitations, as a source of force, as a co-ordinating organ, and perhaps as the seat of an obscure sensibility. Sensory impressions received from the periphery of the body reach the cord by the posterior roots (which are purely sensitive), immediately cross over to the other side of the organ, and are then conducted directly upward to the perceptive organ in the brain. If we imagine the path as one continuous nerve-fibre, we should say that it extends from the right fore-finger to the right posterior column of the cord, then crosses the median line in the gray matter to the left half of the spinal cord, and ascends on that side to the parts of the left brain which perceive and appreciate sensations. This crossing over of sensory paths takes place throughout the length of the spinal cord. The gray matter is the chief pathway for these fibres, the posterior columns not containing any, or containing them for a very short part of their courses. Motor excitations or impulses pursue quite a different course, in an inverse direction. A motor impulse destined to move the right fore-finger starts from the left side of the brain, descends through the left half of the basal parts of the encephalon, until it reaches the lower edge of the medulla oblongata (at its junction with the spinal cord), where it suddenly passes across the median line into the right half of the spinal cord, descends in the right half of that organ, issues out of the right anterior horn, which gives origin to the nerves of the arm, and follows this nerve to cause contraction of the muscles which move the right fore finger. In general terms, the motor paths (or nerves) all decussate at a small part of the spinal cord, the so-called decussation of the pyramids of the medulla oblongata. To sum up, motor paths decussate in a small spot, while sensory paths decussate along the whole length of the cord; or, in other words, the course of motor paths in the cord proper is direct (not crossed) in its whole extent. The motion referred to in the above illustration is a voluntary motion—one starting from the supreme cerebral ganglia—but the spinal cord furnishes involuntary movements of great variety and force originating within itself: it is consequently a source of power, a centre for reflex motions. Simple and convincing proof of this assertion is had by watching the movements of a frog whose head has been cut off. The legs of the animal separately move when the creature is touched, and complex movements of jumping, removing irritations by means of two legs, are done just as well as when the animal was perfect. These movements all occur after some irritation of a sensory nerve, never spontaneously; they are consequently called reflex movements. A reflex movement may be defined as the result of a direct transformation (by ganglion-cells) of a sensory impression into motor impulse; and in this sense reflex actions occur in every nervous centre, great or small. In the living, healthy man reflex spinal actions are (in part) breathing, movements produced by tickling, etc. In diseased states some convulsions are reflex spinal movements, and in some cases of palsy of the legs from disease cutting the cord across in its upper part, most extensive and violent movements are commonly observed in the palsied limbs. The spinal cord may also rightly be spoken of as a co-ordinating centre for certain coarse movements. By co-ordinating centre is meant a mass of gray matter whose ganglion-cells act in such a way, harmoniously and simultaneously, as to produce an exact movement. This performance of an exact movement (walking) must be learned by repeated trials, but when the ganglion-cells have acquired the habit of acting together (education), they so act without the watchful and directing influence of volition; *e. g.* we start walking by a volitional impulse, but continue walking by spinal action, quite inattentive to what our legs are doing. Thus it is with very many complex movements of daily life. The kind of sensibility which the spinal cord possesses is one of which we are quite unconscious; it is rather a capacity to receive and retain impressions which reach it by sensory nerves. This property of the ganglion-cells of the spinal cord (and of all ganglion-cells) I have ventured to call retentivity; or it may be spoken of (as by a few authors) as the memory of the spinal cord. In proof of this may be adduced the performance of various acts without volitional interference and outside of consciousness—the execution of complicated movements by decapitated cold-blooded animals, and the possibility (known to all) of educating the spinal cord. Impressions are stored up and kept ready for use in the gray matter of the spinal cord as well as in that of the brain.

In conclusion, one word may be added about centres for certain actions in the spinal cord. Some ganglion-cells are grouped, and exert an influence over certain nerves destined to special organs; thus nerve-fibres supplying the blood-vessels of the face and eyeball pass into the upper cervical region of the spinal cord. Movements of the parts within the pelvis (bladder, uterus, etc.) are under the control of a part of the lumbar spinal cord and parts just above it; these are the cilio-spinal and the genito-urinary centres. The spinal cord furthermore exerts an influence upon the organs contained in the chest and abdomen, and also, probably, upon the nutrition of tissues in general, and therefore upon calorification. E. C. SEGUIN.

Medusa. See GORGON.

Medu′sa [so called from its tentacles, often poisonous to the touch, and likened to Medusa's snaky locks], properly the name of a genus of Discophoræ, an order of radiates of the class Acalephæ (jelly-fishes). The term is, however, extended to the whole order (called true Medusæ) and to the order Ctenophoræ (Peroid Medusæ). The genus belongs to the family Cyaneidæ. *Medusa aurita* is a common European species.

Medusa, post-v. of Rensselaerville tp., Albany co., N. Y., has 2 churches and manufactures of paper. Pop. 94.

Med′way, post-v. and tp. of Norfolk co., Mass., on the Charles River and on the Woonsocket division of the New York and New England R. R., has 6 churches, 8 schools, 4 public halls, a library, a savings bank, 2 hotels, 2 weekly newspapers, boot and shoe factories, 4 brickyards, 2 grist, 2 cider, 2 paper, 4 saw, 6 cotton and woollen, and 5 planing-mills, 1 tannery, 1 bell-foundry, 1 organ-factory, etc.; and 56 acres are devoted to cranberry culture. Pop. 3721.

Medway Plantation, tp. of Penobscot co., Me. Pop. 321.

Med′win (THOMAS), b. in England in 1789; became captain of the 24th light dragoons; was a cousin and intimate friend of the poet Shelley, with whom he travelled in Italy. He published, besides several novels and works of travel, a volume of *Conversations with Lord Byron* (1824) and a *Life of Shelley* (1833), prefixed to the Shelley papers. D. at Horsham, England, Aug. 2, 1869.

Meek (ALEXANDER BEAUFORT), b. at Columbia, S. C., July 17, 1814; removed with his father in 1819 to Tuscaloosa; graduated in 1833 at the University of Alabama; was admitted in 1835 to the bar, and became editor of a Democratic newspaper; served three months in 1836 in the Seminole war; and on his return became attorney-general of Alabama; edited the *Southron* 1839; was 1842–44 judge of the court of Tuscaloosa county; law-clerk to the solicitor of the U. S. treasury 1845; U. S. district attorney for Southern Alabama 1846–50; a journalist of Mobile 1848–53; went in 1853 to the legislature, where he originated the free-school system of Alabama; became in 1854 judge of the city court of Mobile; Speaker of the house of Alabama 1859; was a fine chess-player, and author of a legal digest (1 vol., 1842), *The Red Eagle* (1855), *Songs and Poems* (1857), *Passages in South-western History* (1857), and an unpublished *History of Alabama*. D. at Columbus, Miss., Nov. 30, 1865.

Meek (FIELDING BRADFORD). See APPENDIX.

Meek′er, county of Central Minnesota. Area, 558 square miles. It is a rolling prairie region, fertile, and abounding in small lakes. Wheat and oats are the leading products. The county is traversed by the St. Paul and Pacific R. R. Cap. Litchfield. Pop. 6090.

Meeme, post-v. and tp. of Manitowoc co., Wis. Pop. 1579.

Mee′rane, town of Saxony, with very flourishing and rapidly growing manufactures of cottons, cloths, and all kinds of woollens. Pop. 19,187.

Meer′man (GERARD), BARON, b. at Leyden, Holland, in 1722; became distinguished as a jurist; was counsellor-pensionary of Rotterdam 1748–67, and was sent as envoy to England in 1757. He edited the vast collection of Latin jurisprudence known as the *Novus Thesaurus Juris Civilis et Canonici* (the Hague, 7 vols., 1751–53), but is best known by his sumptuous work, *Origines Typographicæ* (the Hague,

2 vols. 4to, 1765), devoted chiefly to maintaining the invention of movable wooden types by Laurent Coster of Haarlem. Meerman formed a magnificent library, and purchased all the manuscripts belonging to the Jesuits at Paris, but some of them were recovered by Louis XV. He was made a baron of the German empire by Joseph II., emperor of Austria. D. at Aix-la-Chapelle Dec. 15, 1771. —His son, JAN MEERMAN, b. at the Hague Nov. 1, 1753, became minister of fine arts under Louis Bonaparte, king of Holland, and count of the empire and senator under Napoleon 1811; was author of a *Supplementum* to his father's *Thesaurus* (1780), and of valuable works on Dutch history. D. Aug. 19, 1815.

Meer'schaum [Ger., "froth of the sea," so named from its lightness and white color], a compact mineral with a smooth feel, soft when first dug out of the earth, but hardening to 2.0 and 2.5. In composition it approaches silica, 60.9 per cent.; magnesia, 26.1 per cent.; water, 12 per cent. It is obtained from localities in Turkey, Asia Minor, Morocco, etc., where it is used as a substitute for fuller's earth; its principal use, however, is as a material for the bowls of tobacco-pipes. EDWARD C. H. DAY.

Mee'rut, city of British India, cap. of a district of the same name in the presidency of Agra, on a tributary of the Ganges. It has a healthful situation, and contains one of the largest English churches in India. At this place the Sepoy mutiny began May 10, 1857, by the revolt of the garrison and the massacre of the European residents. Pop. 29,014.

Meet Camp, tp. of Watauga co., N. C. Pop. 370.

Megac'erops [Gr. μέγας, "great," κέρας, "horn," and ὤψ, "face"], an extinct genus of mammals from the Miocene of Colorado, allied to the rhinoceroses, but bearing a large pair of horns upon the nose. (See TITANOTHERIDÆ.)

Megac'eros Hiber'nicus [Gr. μέγας, "great," and κέρας, "horn"], the Irish elk, an extinct species of elk or deer of large size, remains of which are found in the Quaternary deposits of marl below the peat-swamps in England, and especially Ireland. Fragments have also been

Irish Elk.

found in bone-caverns. This animal was much larger than any existing species of the group, the largest individuals measuring eleven feet in height to the top of the antlers, which were sometimes twelve feet across from tip to tip. The horns were proportionally larger than in the living species, and the cervical vertebræ of the males were correspondingly developed to support the heavy armature of the head. The females had no antlers. The bones of the extremities were stronger in proportion to their length than in living species. The small spurious hoofs, or dew-claws, were present, but in the fore feet at least their metacarpals were ossified only at their extremities. The dentition was of the ordinary ruminant type, and the upper canines were wanting. The Irish elk became extinct before the beginning of the historic period, although perhaps contemporaneous with man in the British Islands. Goldfuss has conjectured that it is mentioned in the *Nibelungen Lied* of the thirteenth century under the name "*schelch*." O. C. MARSH.

Megadac'tylus [Gr. μέγας, "great," and δάκτυλος, "claw"], a genus of extinct bird-like reptiles whose remains are found in the Triassic sandstone of the Connecticut Valley. Its tracks were formerly regarded as those of birds.

Megaderm'idæ [from *Megaderma,* the typical genus], a family of insectivorous bats or Cheiroptera, with "nose leaf" or nasal appendages variable in extent of development; the ears large, and provided each with a well-developed tragus; the intermaxillaries well developed; the molars $(\frac{4}{4}-\frac{5}{5})$ with distinct W-shaped ridges; the incisors small or wanting in the upper jaw $(0-3\times 2)$, constantly developed $(2-3\times 2)$ in the lower; and the middle finger of the wings with one or two phalanges; the stomach is sacciform, and the cardiac and pyloric portions approximated. The food is insects. The family, according to Dr. Wilhelm Peters, has five genera—viz. *Megaderma, Rhinopoma,* and *Nycteris* of Africa, as well as *Nyctophilus* of Australia and *Antrozous* of the South-western U. S. The relations of the latter are, however, not perfectly established, and the family itself needs confirmation. THEO. GILL.

Megalich'thys [Gr. μέγας, "great," and ἰχθύς, a "fish"], a genus of extinct rhomboganoid fishes whose bones are found in European Carboniferous strata. They were covered with huge bony plates, and their powerful jaws were armed with immense teeth. These fishes seem to have possessed a crocodilian character, and are now represented by the much smaller gar-fishes of the U. S.

Megalon'yx [Gr. μέγας, "great," and ὄνυξ, a "claw"], a genus of extinct Quaternary mammals from North and South America, allied to the sloths. The type, *Megalonyx,* was first discovered in the caves of Virginia, and named by Pres. Jefferson in allusion to its large claws, the length of the terminal phalanx or bony support of the median claw being seven inches, or more than one-third the length of the humerus of the same animal. Its remains have also been found at Bigbone Lick in Kentucky, and other localities. The typical species has received the name *Megalonyx Jeffersoni.* Many other species of the genus occur in South America, principally in the southern part. (See MEGATHERIIDÆ.)

Megalop'olis ["the great city"], city of Greece, situated on both sides of the river Helisson, an affluent of the Alpheius, was founded in 371 B. C., immediately after the battle of Leuctra, for the purpose of gathering the Arcadian communities, hitherto independent of each other, into a compact state, thereby forming a bulwark against Sparta. The city was laid out in grand style, but never acquired any considerable importance. It contained the greatest theatre in Greece, of which remains are extant.

Megalosauridæ. See APPENDIX.

Megalosau'rus [Gr. μέγας, "large," and σαῦρος, "lizard"], a large carnivorous reptile from the Oolite and Wealden of England, belonging to the order Dinosauria, and exemplifying the carnivorous type of that order, as *Iguanodon* does the herbivorous. *Megalosaurus Bucklandi,* the best-known species, was perhaps thirty feet in length, and attained a weight of two or three tons. The head is supposed by Prof. Phillips to have resembled that of the monitor lizard. The teeth are large, curved, pointed, and compressed; the crown is covered with smooth enamel, which rises along the margin of the tooth into a trenchant serrated edge. They are directed backward and set in sockets. The cervical vertebræ are little known, but appear to indicate an upward curve in the neck, as in some mammals and birds. The dorsal vertebræ have the anterior face somewhat convex, the posterior concave. The bodies of the vertebræ are smooth and hour-glass-shaped, and the neural spines elongated. Both faces of the lumbar vertebræ are concave. The sacrals are five in number, and the caudals estimated at between thirty and forty. The structure of the shoulder-girdle recalls that of the wingless bird *Apteryx* of Australia. The humerus is hollow internally, but beyond that bone the structure of the fore limbs is unknown. They were, however, small in comparison with the hind limbs. In the pelvis the ilium was a broad, strong, arched plate, narrowed in front, and ending with a double truncated keel. The lower margin projects in thick strong processes, which receive the pubic and ischial bones. These appear to have been joined in the lower part of the acetabular socket, which probably was perforated at the side. This arrangement resembled that of a bird or monitor, and not that of a crocodile. The ischium and pubis were slender and directed backward. The femur is of the crocodilian type, and more curved than in *Iguanodon.* It appears to be hollow like that of a bird. There were three well-developed toes on the hind foot, and the claws were strong and compressed. These animals lived upon the land, and

probably moved mainly by means of their hind limbs. Remains of *Megalosaurus* have been found in the strata of the Mesozoic or Reptilian age in England, from the Lias to the Wealden; also in the Kimmeridge clay at Honfleur in Normandy, and in Oolite at Besançon, France.

O. C. MARSH.

Megan'tic, county of E. Central Quebec, Canada. It contains abundant ores of iron and copper, and probably gold and other metals. It is intersected by the Grand Trunk Railway. Cap. Inverness. Pop. 18,879.

Megapod'idæ [from the generic name *Megapodius*, μέγας, "big," and πούς, "foot"], a family of gallinaceous

Nest of Megapodius.

birds whose representatives are chiefly Australian, and there are popularly known as brush turkeys and mound-birds; they are nearly related to the curassows (Cracidæ) of South America, and the two form the group Peristeropodes of Huxley. The different types of the group vary much in external appearance, some (*Megapodius*) reminding one somewhat of a rail or a hen that has lost her tail, while others (*Tallegallus*, etc.) rather resemble a turkey; the head and neck are sometimes (in Megapodinæ) thickly feathered, and sometimes (in Tallegallinæ) sparsely feathered or almost naked; the bill is more or less like that of the common cock; the gape not deep; the nostrils are subcentral or somewhat anterior; the tarsi unarmed; the hind toe on a level with the fore ones; the tail is very variable in its development. The sternum is broad, and the middle and lateral portions ("lophosteon" and "pterostea") are united for the greater part of their length, the lateral or "xiphioid" processes arising from or near the sides of the posterior half, thus agreeing with that of the curassows, and markedly differing from that of the turkeys. G. R. Gray admits in the family two sub-families and four genera—viz. Tallegallinæ, with the genera *Tallegallus* (New Guinea and Australia) and *Megacephalon* (Celebes), and Megapodinæ, with *Megapodius* (East Indian Islands and Australia) and *Leipoa* (Southern Australia). The different forms differ considerably in habits, but are all terrestrial birds; the Tallegallinæ live in small flocks; the Megapodinæ generally in pairs. The Megapodinæ are unique among birds in their nesting arrangements; they do not sit upon their eggs, but deposit them in mounds formed by themselves, and composed of sand, leaves, etc.; and in these a sufficient degree of heat is generated to hatch the eggs. (See also BRUSH TURKEY.) THEO. GILL.

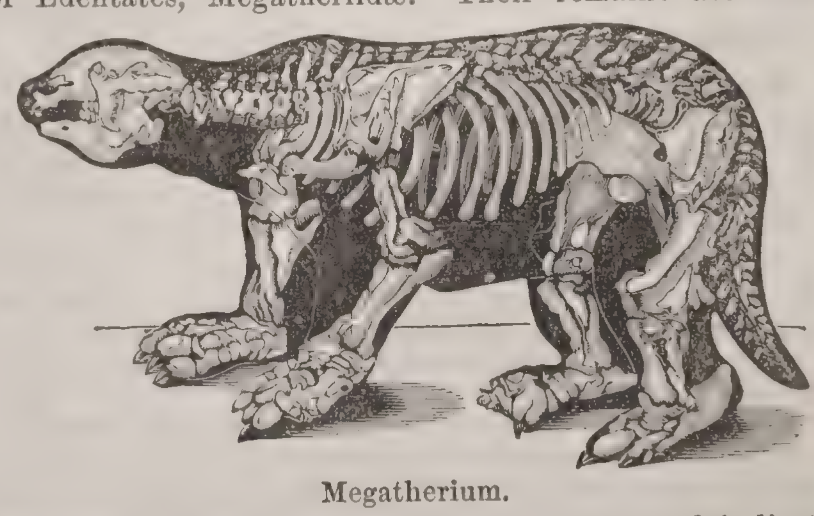
Meg'ara, a celebrated city of ancient Greece and the capital of Megaris, a territory bounded by Attica, Bœotia, Corinthia, the Saronic and the Corinthian Gulfs. As early as the seventh and eighth century B. C. it was a prosperous and even wealthy city. It formed many colonies, of which Chalcedon and Byzantium were the most remarkable. It even entered into rivalship with Athens, but had to yield in the contest, and became subject to that city. By its attempts to free itself from the Athenian supremacy it became one of the causes of the Peloponnesian war, during which it suffered severely, and sustained losses from which it never recovered. Euclid the philosopher was a citizen of Megara.

Megas'thena [μέγας, "great," and σθένος, "force"], a name given by Prof. Dana to the group of generally large mammals constituting the orders Primates (exclusive of man), Feræ, Ungulata, Cetacea, etc. The term in question alludes to the supposed superior life-force and specialization (so far as ways and means, mental as well as physical, are concerned) exhibited by them. The group is exactly equivalent as to its contents with the "sub-class Gyrencephala" of Owen, and, with the addition of man, to the "super-order Educabilia." THEO. GILL.

Megas'thenes, a Greek statesman and author in the service of Seleucus Nicator, one of the generals of Alexander the Great, who became monarch of Syria, Persia, and Bactria. He was sent as ambassador about B. C. 302 to the court of Sandracottos (Chandra-gupta), king of the Prasii, at Palibothra (Pataliputra) on the Ganges, supposed to be the modern Patna. He resided at this great capital many years, and wrote a work upon the history and geography of India, which was the foundation of nearly all that subsequent writers have communicated upon ancient India. The work of Megasthenes is lost, but copious extracts, given by Strabo and other geographers, show him to have been an acute observer. These fragments were edited by E. A. Schwanbeck (Bonn, 1846).

Megatheri'idæ [from *Megatherium*], an extinct family of monodelph mammals of the order Bruta or Edentata, and sub-order Tardigrada, related to the Bradypodidæ or sloths, but distinguished by their comparatively gigantic size, heavy bodies, short robust legs, and long stout tail. The skull was oblong; the intermaxillary bones developed simply as the front of the floor of the olfactory chamber; the supramaxillary retracted but moderately under the orbits, and with a considerably anterior extension, and converging backward; malar bone moderately or largely developed, articulating with or shortly disconnected from the zygomatic process, with a posterior ascending "supratemporal" process behind the postorbital, and a descending "masseteric" process in front; the zygomatic process of the squamosal enlarged backward, and trigonal from its base; "the mastoid bone with a wide digastric fossa, and a strong, thick styloid process, terminating in a circular concavity for the reception of the stylo-hyal bone;" the lower jaw with a wide gutter-like extension forward; molar teeth $\frac{5}{4} \times 2$; the members are stout; the anterior moderately so, with the humerus comparatively slender, but the radius and ulna very stout; pelvis massive, the iliac and ischiac bones being much expanded; posterior limbs much stouter and shorter than the anterior; femur very robust; tibia and fibula co-ossified; toes in moderate number, 4–5 in front, 3–4 behind. The remains of these animals (if we except some very doubtful ones from Australia) have only been found in America. They lived during the Later Tertiary, perhaps even till the advent of man on this continent, under a number of forms. Gervais has recently (1874) claimed nine genera for the family—viz. (1) *Megatherium*, (2) *Cœlodon*, (3) *Lestodon*, (4) *Megalonyx*, (5) *Mylodon*, (6) *Scelidotherium* or *Platyonyx*, (7) *Spherodon*, and (8–9) two unnamed genera, all having been represented in South America, and the first, fourth, and fifth in North America as well. They are generally supposed to have been terrestrial, feeding upon the leaves of trees, which they partly obtained by pulling downward wholly or in part. Gervais supposes them to have fed upon ants, etc. (See MEGALONYX, MEGATHERIUM.) THEO. GILL.

Megathe'rium [Gr. μέγας, "great," and θηρίον, a "wild beast"], an extinct genus of Quaternary mammals. This genus may be considered as typical of the extinct family of Edentates, Megatheriidæ. Their remains are more



Megatherium.

abundant in South than in North America, and indicate a former much greater development of the order of Edentates than now prevails. The tibia and fibula are co-ossified. The vertebræ of the tail are very large and

powerful, and that organ, with the hind legs, seems to have formed a support for the heavy body, while the huge fore legs were employed in breaking the branches from trees or tearing them down for food. There are four toes in front, two behind. The teeth, five above and four below on each side, resemble those of the sloths. They grew from persistent pulps, and are deeply implanted in the jaw; they have a grinding surface of triangular ridges, and were fitted for masticating coarse vegetable food. The lower jaw is prolonged, and grooved in the symphysial region, and probably supported a powerful muscular tongue. *Megatherium Cuvieri,* from South America, exceeded the rhinoceros in size, its skeleton measuring eighteen feet in length. The femur is three times as thick as that of the elephant. The former is very large. *M. mirabile* is a North American species, and its remains occur in Georgia and South Carolina. O. C. MARSH.

Megerle. (ULRICH). See ABRAHAM-A-SANCTA-CLARA.

Meh'emet A'li, b. in 1769 at Kavala, a small town of Macedonia; gave very early proofs of the energy and enterprise of his character, of his audacity and shrewdness. An intimate friendship with a French merchant from Marseilles, M. Lion, developed that enthusiasm for France, those ideas of reform, that feeling of tolerance, and passion for speculation, which characterized him throughout life. In 1800 he came to Egypt at the head of the contingent which his native township sent to the Turkish army operating here against the French. He was soon at the head of the whole Albanian corps, and with great cunning utilized the confusion which reigned in the country after the departure of the French. In 1806 he was appointed viceroy of Egypt by the Porte, in which position he developed an astonishing activity. His aims were generally good—even those dictated by his personal ambition command respect—but the means he employed were rather Asiatic. The Mamelukes were the plague of the country. In 1811 he invited the greater number of their chiefs to a great festival at Cairo, and after the banquet he shot them down in the corridors of the palace. About 1000 were massacred on the spot; the rest were pursued into Upper Egypt, and from Egypt into Nubia, where the last were slain in 1820. He cleared the country of robbers; introduced the cultivation of cotton, indigo, and sugar; organized an army on a European plan; created a fleet; established schools; built roads, etc.; but among his means of procuring money for the execution of his plans were arbitrary confiscations of private property and the exportation of the inhabitants of Kordofan, which country he conquered, to the slave-markets. The prosperity of Egypt soon excited the jealousy of the Porte, and the ambition of Mehemet Ali at last brought about an open conflict. Twice, after the battle of Konieh (Dec. 20, 1832) and of Nizeeb (June 24, 1839), it was in his power to crush the Ottoman empire (see IBRAHIM PASHA), but both times it was saved by the intervention of the great European powers—that is, Russia, Austria, and England. France never participated in these infamous transactions. It serves the speculations of the exchange of London, the ambitious desires of the court of St. Petersburg, and the fears of the house of Hapsburg to have Turkey always tottering. Mehemet Ali's only ally was France during the short ministry of Thiers, and in spite of the brilliant victories of his son and the sympathy of the whole civilized world, he was restricted to the viceroyship of Egypt, which was made hereditary in his family. But Syria, which he had conquered in 1833, which was formally ceded to him at that time by the Porte, and which prospered under his government, he was compelled to give back to Turkey in 1839. In the last years of his life he fell into dotage, and d. Aug. 2, 1849, at Cairo. (See M. P. Mouriez, *Histoire de Méhémet-Ali* (1858); Ed. Gouin, *L'Égypte au XIXe. Siècle* (1849); and Hamont, *L'Égypte sous Méhémet-Ali* (1843).)

Meher'rin, tp. of Brunswick co., Va. Pop. 5019.

Mehoo'pany, tp. and post-v. of Wyoming co., Pa. The village is on Mehoopany Creek, near the Susquehanna River. Mehoopany Station (Carney P. O.) is on the Pennsylvania and New York R. R., on the opposite side of the Susquehanna, in Washington tp. Pop. of tp. 888.

Méhul' (ÉTIENNE HENRI), b. June 24, 1763, at Givet, in the department of the Ardennes, France, in humble circumstances; went in 1779 to Paris with an introduction to Gluck, whose favor he gained, and under whom he studied; made a successful début as a composer in 1791 by his opera *Euphrosine and Conradin;* achieved a most brilliant success by his composition of Chenier's song, *Chant du Départ;* became professor at the Conservatory; wrote 42 operas. D. at Paris Oct. 18, 1817. His most remarkable composition, besides the above-mentioned song, is his opera of *Joseph.* The overture to the opera *La Chasse du Jeune Henri,* also characteristic, is often performed.

Meiggs (HENRY), b. at Catskill, N. Y., in 1811; was engaged in business as a contractor in Boston, and in the lumber-trade in New York made a considerable fortune, which he lost in the panic of 1837; resumed business, and in 1848 sailed for San Francisco with a cargo of lumber, for which he obtained such enormous profits as to enable him to establish lumber-yards on a vast scale. In 1854 he again became bankrupt, and embarked for South America with his family. He engaged in railway construction in Chili, and in 1858 for the government laid the road from Santiago to Valparaiso in two years, with great profit to himself. In 1867 he undertook for the Peruvian government the construction of a railway from Mollendo to Arequipa, which was finished Jan. 1, 1871; and in 1870 contracted to build six other railroads in Peru; besides which he has executed many other large public works.

Meigs, county of Ohio, separated on the E. and S. E. by the Ohio River from West Virginia. Area, 490 square miles. The surface is uneven, the soil generally good. Coal is very extensively mined, and salt largely produced from artesian wells. Lumber and cooperage are also manufactured. Cattle, grain, and wool are the agricultural staples. Cap. Pomeroy. Pop. 31,465.

Meigs, county in the valley of E. Tennessee. Area, 225 square miles. It is a beautiful and fertile region, and is bounded N. W. by the Tennessee and S. by the Hiawassee River. Corn is the leading product. Cap. Decatur. Pop. 4511.

Meigs, tp. of Adams co., O. Pop. 1748.

Meigs, tp. of Muskingum co., O. Pop. 1412.

Meigs (CHARLES DELUCENA), M. D., b. at St. George's, Bermuda, Feb. 17, 1792; received medical degrees from the University of Pennsylvania 1814, and at Princeton 1818; settled in Philadelphia in 1820; made specialties of obstetrical practice and the diseases of women and children, in which he acquired a high reputation; was a professor in Jefferson Medical College 1840–62. He wrote several professional works, among which are *Midwifery* (1838), *Lectures on the Female* (1847), *Obstetrics,* a standard work (1849), *Childbed Fevers* (1854); he made several valuable translations from French medical literature. He was also the author of a *Memoir of Samuel George Morton, M. D.* (1854). D. in Delaware co., Pa., June 25, 1869.

Meigs (JAMES AITKEN), M. D., b. in Philadelphia July 31, 1829; graduated at Jefferson Medical College 1851; became in 1856 librarian of the Philadelphia Academy of Natural Sciences; professor of the institutes of medicine in Pennsylvania College in 1859; professor of the institutes of medicine in Jefferson Medical College 1868. Author of works chiefly on craniology and ethnology.

Meigs (JOHN FORSYTH), M. D., son of Prof. C. D. Meigs, b. in Philadelphia Oct., 1818, and wrote an excellent *Practical Treatise on the Diseases of Children* (1857), which has passed through many editions.

Meigs (MONTGOMERY CUNNINGHAM), b. at Augusta, Richmond co., Ga., May 3, 1816; educated at the University of Pennsylvania and U. S. Military Academy; graduated from the latter July 1, 1836, and appointed second lieutenant of artillery; which commission he relinquished in 1837 for the purpose of being transferred to the corps of engineers as brevet second lieutenant from date of graduation; became first lieutenant of engineers 1838, captain 1853. From 1836 to 1841 he was mainly engaged in the construction of Fort Delaware, of the Delaware Breakwater, and in the improvement of the Delaware Bay and River; in charge of the construction of Fort Wayne, Mich., and Forts Porter and Niagara, N. Y., 1841–49; of Fort Montgomery, N. Y., 1850–52. From Nov., 1852, to 1860 was engaged upon his great work of supplying the national capital with water from the Potomac River; the Washington aqueduct, by which the cities of Washington and Georgetown are now supplied, was designed and constructed under his personal direction, during which time he conducted the construction of the Capitol extension and its iron dome, as well as of the post-office extension. In Nov., 1860, he was sent to Florida to put Forts Jefferson and Taylor in a condition to resist attack; returning to Washington, he was by request relieved from other duties, Apr., 1861, and appointed chief engineer of the expedition for the relief of Fort Pickens; appointed colonel 11th Infantry May 14, 1861, and the next day quartermaster-general U. S. army, with the rank of brigadier-general, and as such directed the equipment and supply of our vast armies during the civil war, making frequent inspections of the operations of the quartermaster's department in the various armies in the field, being at Chattanooga throughout its investment, and engaged in the battle of Nov. 23–25, 1863; during Gen. Grant's operations in the Wilderness, May, 1864, was in charge of the base of sup-

plies at Fredericksburg and Belle Plain; and during the appearance of the Confederate forces under Breckenridge and Early in front of Washington commanded a division composed of employés of the war department. Brevetted major-general July 5, 1864. In Jan., 1865, he directed, at Savannah, Ga., the supply and refit of Gen. Sherman's army, just arrived from Atlanta, and in March, at Goldsboro', N. C., directed the opening of communications for the supply of that army on its arrival there and at Raleigh. Visited Europe 1867–68, since which he has inspected the operations of his department in Texas, California, Dakota, Wyoming, and Arizona; also the North Pacific R. R. route to Red River of the North. In 1875 he was sent to Europe on important special services, particularly to inspect the organization of the staff department (especially the quartermaster's) of European armies. G. C. SIMMONS.

Meigs (Col. RETURN JONATHAN), b. at Middletown, Conn., Dec., 1740; served as major in the expedition against Quebec, where he was taken prisoner; raised a regiment 1777, becoming its colonel, and performed several brilliant exploits; removed in 1788 to Marietta, O., as one of the first settlers in Ohio; was commissary of clothing under Wayne 1795; became in 1801 an agent to the Indians; and d. Jan. 28, 1823, at the Cherokee agency. His *Journal of the Expedition to Quebec* was printed in Almon's *Remembrancer* (1776), and reprinted with an introduction and notes by C. J. Bushnell (New York, 1864).

Meigs (Col. RETURN JONATHAN, JR.), son of Col. R. J. Meigs, b. at Middletown, Conn., Nov., 1765; graduated at Yale in 1785; went to Marietta, O., with his father 1788; became a lawyer there, and was much engaged in border warfare; chief-justice of the Ohio supreme court 1803–04; brevet colonel U. S. army, serving in Louisiana, 1804–06; a judge in Louisiana 1805–06; U. S. district judge in Michigan 1807–08; U. S. Senator from Ohio 1808–10; governor of Ohio 1810–14; U. S. postmaster-general 1814–23. His governorship was remarkable for the active support which he and his State afforded the U. S. government during the war of 1812–15. D. at Marietta, O., Mar. 29, 1825.—His son, bearing the same name, became a distinguished lawyer of Tennessee, and published a volume of *Law Reports* (1839).

Meigs'ville, post-tp. of Morgan co., O. Pop. 1295.

Mei'ningen, town of Germany, capital of the duchy of Saxe-Meiningen, on the Werra, has a large palace, the ducal residence, and several good educational institutions. Pop. 8876.

Meis'sen, town of Saxony, on the Elbe, has a beautiful Gothic cathedral and celebrated manufactures of porcelain, in which the so-called "Dresden china" is made. Pop. 11,455.

Meissonier' (JEAN LOUIS ERNEST), b. in Lyons, France, in 1813 (some say 1815); went to Paris as a youth, and entered the studio of Leon Cogniet; produced several works, among others *Le Petit Hallebardier*, which since his great fame have been valued. His special domain in art was disclosed in 1836 in a picture, *Le Petit Messager*, which attracted attention by the extreme delicacy of its execution and the compression of thought within the smallest compass. Thenceforth the painter devoted himself to microscopic art, and soon rose to a rank with Terburg and Metzer, the famous Dutch painters of genre. But Meissonier is peculiar in his power to give character to single figures and to groups of figures either in violent action or in repose. His work is intellectual. He paints slowly, producing comparatively few pieces, but each is a masterpiece of its kind. Among his best-known pieces are *The Chess-Players, The English Doctor, The Reader, The Painter in his Studio, The Guardhouse, The Bravos, A Man in Armor, Napoleon III. at Solferino, Napoleon in Russia, Charity.* He has also executed a few portraits, illustrative vignettes, and lithographs. His pictures bring great prices. Meissonier was elected member of the Academy of Fine Arts in 1861; obtained a third-class medal in 1840, a second-class medal in 1841, two first-class medals in 1843 and 1848; in 1846 was created a knight of the Legion of Honor, and in 1856 an officer; in 1867 he was made commander. At the Paris Exposition in 1855 one of the grand medals of honor was bestowed on him. Fine examples of his art may be seen at several private galleries in New York.—His son, JEAN CHARLES, is an artist, also a pupil of his father, who has many imitators. O. B. FROTHINGHAM.

Meji'a (Gen. IGNACIO), b. at Zimatlan, Oaxaca, Mexico, Aug. 14, 1814; was educated in the Institute of Arts and Sciences at Oaxaca; took up arms as a volunteer at the time of the Spanish invasion of Barradas in 1829; became captain of grenadiers in 1833 in the campaign against the revolution headed by Gens. Arista and Duran; became colonel in 1846; was chosen to both houses of the state legislature; became military commander of Tehuantepec 1852, in which year he was for a short time provisional governor of the state; took an active part in behalf of the liberal cause during the "war of reform," with the rank of brigadier-general, having presented himself to Juarez at Vera Cruz in May, 1858, at the head of his brigade; was defeated in an important battle at Teotitlan del Camino (1860), but acquitted of all blame by a court-martial convened at his own request; took part in the bloody battle of Pachuca (Oct. 20, 1861) against Marquez and Tomas Mejia; was quartermaster of the "army of the east" organized to repel the French in Dec., 1861, and participated in the glorious repulse of Lorencez from Puebla, May 5, 1862; but was taken prisoner on the capitulation of that city in May of the following year, and sent to France, where he remained until released in June, 1864, when he immediately traversed the U. S., and presented himself to Pres. Juarez at Chihuahua. In 1865 he was made general of division and minister of war, and has retained that post to the present time (1875), displaying remarkable skill in organization and unflinching loyalty both to Juarez and his successor, Pres. Lerdo.

Mejia (Gen. TOMAS), b. in the state of Guanajuato, Mexico, about 1812, was of pure Indian blood, and having become a soldier acquired such influence among his countrymen of the Sierra Gorda as to be called the "king of the mountains." He was a consistent member of the conservative or "Church" party, and took part in many revolutions in its favor; fought with credit against the American invasion of 1847–48; headed a rebellion against Pres. Comonfort in 1856, which was at first quelled rather by policy than by arms, but soon afterwards took up arms again, captured Querétaro, and operated in force in San Luis Potosi, but was ultimately defeated and forced to capitulate. On the outbreak of the "war of reform" in 1858 he was a formidable antagonist of Pres. Juarez, whom he drove successively from Querétaro and Guanajuato; received high honors from the conservative presidents Zuloaga and Miramon, and continued to wage a guerilla warfare against Juarez after his restoration to power in 1861. He naturally became a prominent supporter of the archduke Maximilian, to whom he was much attached, and with whom he was captured May 15, 1867, and after trial executed at Querétaro, June 19, 1867. He was uneducated, but a brave and skilful soldier, loyal, honorable, and humane in his conduct.

Mek'hitar, or **Mechitar,** the founder of a congregation of Armenian monks, called after him Mekhitarists, was b. Feb. 7, 1676, at Sebaste in Lesser Armenia. His true name was MANUK, but on entering a monastery in the vicinity of his native city in 1690 he received the name of Mekhitar, "comforter." He distinguished himself both for religious zeal and talent for learning, and in 1701 founded in Constantinople a congregation with the purpose of uniting the Armenian and Roman Catholic churches. Compelled to leave Constantinople on account of the persecutions of the Armenian patriarch, he moved in 1703 to Modon in the Morea, where, under the authority of the Venetians, who at that time held the country, he founded a monastery. Expelled from this place too by the war between Turkey and Venice, he repaired with his followers to the latter city, and having received the island of San Lazzaro as a possession for all future times, he built a new monastery here (1717), and d. Apr. 29, 1749. In their original aim of uniting the Armenian and Roman Catholic churches the Mekhitarists have not been very successful. They have branches in Italy, Germany, and Turkey, but United Armenians are hardly found in Armenia proper. (See article on the ARMENIAN CHURCH.) But as a link of intercommunication between their native country and European civilization they have developed a great and beneficial activity. Through them, Armenia, its language, literature, and history have become known to Europe, and many of the best products of European learning and genius have become accessible to Armenian readers through their translations.

Mekhitarists. See MEKHITAR.

Meklong', town of Siam, Farther India, on the Meklong, near its junction with the Menam, is a well-built and thriving place, surrounded with very fertile and densely-peopled districts. Pop. 8000.

Mekong (or **Mèikhong**) **River.** See INDO-CHINA.

Mel [anc. *Castrum Zumellarum*], town of Northern Italy, in the province of Belluno, situated in a hilly region overlooking the Piave, about 8 miles from Belluno. There is an old castle near it, said to have been built by the Goths as early as 553. Some curious Roman sepulchral stones are preserved here. Pop. in 1874, 7839.

Me'la (POMPONIUS), b. at Tingentera in Spain, in the beginning of the first century of our era, was the first Ro-

man who composed a formal treatise on geography. His work, *De Situ Orbis Libri III.*, is still extant, though the text has suffered much. The first edition was published at Milan (1471); the best are those by Tzschucke (Leipsic, 1807) and by Parthey (Berlin, 1867). There is an English translation by Arthur Golding (London, 1585).

Melam, and **Melamine** (the latter also called **Cyanuramide**), two substances as yet obscurely known. Liebig discovered melam as a residue from the destructive distillation of sulphocyanide of ammonium, CN_2H_4S. Melam being amorphous, its true composition has been a matter of uncertainty, but an analysis of Völckel makes it $C_3N_6H_6$, and a metamere of cyanuramide, $(CN)_3H_6N_3$. These substances have as yet no interest except for the advanced chemical student. HENRY WURTZ.

Melan Asphalt, or **Albertite,** a variety of asphaltum found filling an irregular fissure in rocks of the sub-Carboniferous age (or Lower Carboniferous) in Nova Scotia. It is jet black, and has a brilliant pitch-like lustre. It is very brittle, has a gravity of 1.097, softens a little in boiling water, undergoes a very imperfect fusion when heated, dissolves partially in oil of turpentine (30 per cent.), in ether (4 per cent.), and in alcohol (a trace). It contains carbon, 86.04; hydrogen, 8.96; oxygen, 1.97; nitrogen, 2.93; sulphur, a trace; ash, 0.10 = 100. (*Wetherill.*) It is thought to be the product of inspissated and oxygenated petroleum. Before the introduction of petroleum it was employed for the production of burning and lubricating oils and paraffine. (See OIL FROM COAL, and PETROLEUM.) It has since been used as an enricher in the manufacture of coal-gas. (See GAS-LIGHTING.) (For further information consult *Trans. Am. Phil. Soc.*, 1852, 353, and *Am. J. Sci.* [2], xxxix. 267.) C. F. CHANDLER.

Melancholia. See INSANITY, by WILLIAM A. HAMMOND, M. D.

Melanch'thon (PHILIPP), b. at Bretten in the Rhenish Palatinate Feb. 16, 1497; was educated at the Latin school of Pforzheim, and studied at the universities of Heidelberg and Tübingen. His grandmother was a sister of the celebrated scholar Reuchlin, and his German name, SCHWARZERD, "black earth," was by Reuchlin made into a Greek form from μέλας and χθών, after the custom of the day among learned men. In his seventeenth year he began to lecture at Tübingen, and published a Greek grammar and an edition of Terence which won the admiration even of Erasmus. On the recommendation of Reuchlin he was appointed professor of Greek at the University of Wittenberg in 1518, and held this position till his death. He lectured first on rhetoric, philosophy, and classical literature, and soon became one of the most celebrated teachers of Germany. His immense learning and the wonderful clearness of his presentation of his subjects attracted crowds of students from all parts of Europe, and his handbooks, *De Dialectica, De Anima, Epitome philosophiæ moralis*, etc., were widely used. But his highest fame he gained by his participation in the great work of the Reformation, in which his superior knowledge, his systematic power, and his dialectic skill formed a necessary supplement to the labors of Luther. As early as 1519, at the Leipsic Disputation, he took up openly the defence of Luther's ideas, and two years afterwards (in 1521) he published his *Loci Communes Rerum Theologicarum*, which was republished over fifty times during his own lifetime, revised and enlarged, and may be considered as the first attempt at a systematic representation of Protestant dogmatics. In 1529, at the Diet of Spires, he drew up the Protest of the evangelical minority, whence arose the name of Protestants; and in 1530, at the Diet of Augsburg, he wrote his most important work, the *Augsburg Confession*, which was signed by all the Lutheran princes. This work and the *Apology for the Confession*, form the two principal symbolical books of the Lutheran Church. In the course of time a difference of views became apparent between him and Luther, though perhaps not greater than might be charged to a difference of character; their intimate friendship was never broken off. But after the death of Luther, when Melanchthon stood as the acknowledged leader of the Lutheran Church, this difference grew into one of party, the strict Lutherans and the Philippists. It is alleged that Melanchthon inclined more and more to the doctrines of Calvin concerning the Lord's Supper, and that in the later editions of the *Augsburg Confession* he altered the tenth article in conformity with Calvin's views. On the other hand, his standpoint in the controversy of the Adiaphorists (1549), and still more his theory of synergism (1557), were considered as a leaning towards Roman Catholicism. He was violently attacked by the strict Lutherans, and he felt the attacks so much the more keenly as he was by nature a tender, conciliatory, peace-loving man. Up to the very last, even after the convention of Worms in 1557, he hoped for a reconciliation of the various branches of the Christian Church, and on his deathbed (Apr. 19, 1560) he gave as one of the reasons why he wished to die that thus he might escape from the fury of the theologians. He was buried in the castle church of Wittenberg, beside Luther. His wife, whom he married in 1520, d. in 1557; of his three children, only the son survived him. His collected works were published at Bâle 1541 and Wittenberg 1562–64, but both these editions are incomplete; the only complete one is that by Bretschneider and Bindseil in *Corpus Reformatorum* (1834–60).

Melastoma'ceæ [from *Melastoma*, one of the genera, whose name, "black mouth," is given because its fruit blackens the mouth of the eater], a natural order of some 1200 species of trees, shrubs, and herbs, mostly tropical, represented in the U. S. by the deer-grasses (*Rhexia*). None are poisonous. Useful fruits, dyestuffs, and medicines of value are among the products of the order; but none of its genera are of very marked importance.

Mel'bourne, city of Australia, the capital of the colony of Victoria, on the Yarra-Yarra River, 9 miles above its mouth in the basin of Port Philip, in lat. 47° 48′ S. and lon. 144° 57′ E. It was founded in 1837. In 1847 it had 10,955 inhabitants, and became the seat of a bishop. In 1851 it had 20,400 inhabitants, and became the capital of the newly-formed colony of Victoria. In 1874 it was the largest commercial port in the southern hemisphere, and an elegant city with 210,000 inhabitants. This marvellous growth is mostly due to the discovery in 1851 of the goldfields at Mount Alexander and Ballarat, from 60 to 70 miles distant from Melbourne. In the single year 1852 the shipping increased to 1657 vessels of 408,000 tons burden. In the same year the value of imports rose from £1,056,000 to £4,044,000, and in 1853 to £14,000,000. The situation of Melbourne is very fine. Although the Yarra-Yarra does not admit large sea-going vessels, on account of the bars at its mouth, railways have been constructed between Melbourne and Port Philip, which is a beautiful inlet of the Indian Ocean, safe and deep. The streets are all paved and provided with gas and water, and many elegant buildings have been erected, among which is a well-endowed university.

Melbourne (WILLIAM **Lamb**), VISCOUNT, b. at Melbourne House, Derbyshire, England, Mar. 15, 1779, was the second son of Sir Peniston Lamb, first Viscount Melbourne; was educated at Eton and at Trinity College, Cambridge; studied politics and jurisprudence under Prof. Millar at the University of Glasgow; was called to the bar at Lincoln's Inn Nov. 23, 1804; entered Parliament for Leominster and married Lady Caroline Ponsonby 1805; was elected member for Lander 1806, for Portarlington 1807, for Westminster 1812, for Peterborough 1816, and for the county of Hertford 1819; attached himself to the Whig opposition led by Fox, and continued a moderate opposition to the administrations of Perceval and Lord Liverpool; became chief secretary for Ireland on the accession of the Canning ministry Apr., 1827; succeeded to the title on the death of his father, July, 1828; was a distinguished advocate of Catholic emancipation and of parliamentary reform; became secretary of state for the home department in Earl Gray's cabinet Nov., 1830, and on the retirement of the latter, July 9, 1834, succeeded him as first lord of the treasury and premier; was dismissed in November of that year, but recovered his place in Apr., 1835, through the support of the House of Commons, and retained his position until Aug. 30, 1841. He was therefore the responsible head of the British government at the accession of Queen Victoria and during the first four years of her reign, and contributed much to the education of his young sovereign in the performance of her royal duties. D. at Brocket Hall, Hertfordshire, Nov. 24, 1848.—His wife, CAROLINE PONSONBY, known in literature as LADY CAROLINE LAMB (she died before he succeeded to the title), a daughter of the earl of Bessborough, b. Nov. 13, 1785, acquired great celebrity through her romantic attachment to Lord Byron, and her subsequent bitter quarrel with him. She wrote three novels, *Glenarvon* (1816), *Graham Hamilton* (1820), and *Ada Reis* (1823). D. in London Nov. 26, 1828.

Mel'cher (JOSEPH), D. D., b. in Vienna, Austria, Mar. 19, 1806; was educated at Modena; became a priest 1830; came to the U. S. in 1843; was consecrated Roman Catholic bishop of Green Bay, Wis., in 1868, and d. Dec. 19, 1873.

Mel'chites [Syr. *melek*, a "king," because they belonged to the royal instead of the clerical and popular party], (1) a sect of Greek Christians in Egypt, descendants of those who in the fifth century conformed to the orthodox Greek faith, in opposition to the Coptic priests, who by way of reproach gave them this name. They are few in numbers, and are greatly detested by the Copts of the national (monophysitic) Church. (See COPTS.) (2) One

of the branches of the Roman Catholic Church in the East. They are strictly a branch of the United Greeks, but are under a patriarch of their own, who resides at Damascus, but with five other prelates bears the title of patriarch of Antioch. They are of the Eastern rite, use a Greek liturgy, take the Eucharist in both kinds, and their priests and deacons may be married, but only once, and that before ordination. They are not numerous. (See EASTERN RITE.)

Melchiz'edek, or **Melchisedec** [Heb. *Malki-zedek,* "righteous king"], a mysterious personage who appears but once in a historical light in the Bible (Gen. xiv. 18–20), but who was regarded by the writers of Psalm cx. and of the Epistle to the Hebrews (vi. 20; vii. 1–21) as a type of an order of priesthood superior to the Levitical, of which the Messiah was interpreted to be the fulfilment. Melchizedek in Genesis was "king of Salem" and "priest of the most high God;" he met Abraham on his return from the rescue of Lot and slaughter of Chedorlaomer, brought forth bread and wine, and offered a banquet to Abraham and the king of Sodom in the valley of Shaveh, called "the king's dale," after which he blessed Abraham, and received from him tithes of the spoil. The real character of this incident, as well as the localities, have furnished Jewish and Christian commentators abundant scope for conjecture, and many extravagant interpretations have been ventured. Jewish traditions, recorded in the Targums as well as in many cabbalistic and rabbinical writings, identified Melchizedek with the patriarch Shem, who, according to the current biblical chronology, was still living at that period. This was the prevalent Jewish opinion in the time of Jerome, was adopted by Luther and Melanchthon, and by Selden, Lightfoot, and Jackson among English writers. A sect of Christian heretics, called Melchizedekians, regarded him as an incarnation of the "great power of God," superior even to Christ. Others regarded him as an angel, as the Holy Ghost, or as the son of God, with which conception harmonized a Jewish belief that he was the Messiah. This latter opinion has been held by many modern writers, but at present the current view seems to have returned to the simplicity of the original narrative, regarding Melchizedek as a Canaanite monarch of Hamitic descent, and chief priest by virtue of his kingly office in a form of worship identical with or closely similar to that of the earliest Phœnicians. The locality of Salem and Shaveh has been much questioned. By Jewish tradition, hitherto generally accepted, the former has been identified with Jerusalem, but the "Shalem, a city of Shechem," of Gen. xxxiii. 18, where Jacob bought a field and erected an altar, seems to be preferable on both historical and geographical grounds. It still exists under the name of Salim, as a village 3 miles E. of Nablus, the ancient Shechem. Shaveh would then be the well-known valley in the immediate vicinity. Dean Stanley maintains (*Sinai and Palestine,* pp. 237, 238) that Mount Gerizim, subsequently the holy place of the Samaritans, was the spot where Melchizedek ministered to the most high God.

PORTER C. BLISS.

Melcombe (LORD). See DODINGTON.

Mel'dola, town of Italy, in the province of Forli, on the left bank of the Reno. It is a place of considerable trade, almost all the unmanufactured silk of the province being collected here for market. During the Middle Ages Meldola was one of the strongest fortresses of the Romagna. Pop. in 1874, 5969.

Melea'ger, in Greek mythology, a hero-hunter who killed the boar which Artemis sent to ravage the fields of Calydon, Ætolia, because Œneus, the king of the place, had neglected to offer up to her a sacrifice. This Calydonian hunt was a favorite subject with the ancient poets and artists.

Meleager, a Greek epigrammatist and cynic philosopher, the son of Eucrates, b. at Gadara in Palestine, and lived in the middle of the first century before Christ. The Greek Anthology contains 131 epigrams by him, which have been separately published by Gräfe (Leipsic, 1811). A collection of epigrams, of all kinds, he made from more than forty different poets, of all ages of Greek poetry, and known in ancient times under the title Στέφανος Ἐπιγραμμάτων, has been lost. The work was arranged in alphabetical order, according to the initial letters of the first line of each poem.

Meleagrid'idæ [from *Meleagris,* the name of the common turkey], a family of gallinaceous birds, forming one of the sections of the group of Alecteropodes of Huxley; the guinea-fowls (Numididæ), common fowls, and pheasants (Phasianidæ), and grouse and partridges (Tetraonidæ) forming the others. The turkeys have a characteristic form in the large upraised body, long neck, and small head; the head and neck are destitute of feathers, but have scattered "hairs," and are more or less carunculated; an extensible fleshy process is also developed from the forehead; the bill is moderate; the nasal fossæ are bare; the tarsi armed with spurs in the male; the hind toe elevated; the tail (about as long as the wing) is truncate, and has more than twelve feathers. The breast-bone, as will be readily recalled, has a long, narrow keel (the "lophosteon") extending far backward, while from near the front on each side, and separated by a very deep notch from the sides of the anterior portion, a wing-like process (the "metostea") diverges backward, and extends far backward, but split into two parts, the external and internal xiphioid processes; the pelvis is peculiar in the extension of the post-

The Turkey.

acetabular area (or that behind the insertion of the legs), which is greater than the anterior; the second metacarpal bone has a backward directed process, in this respect, as well as several others, differing from the guinea-fowls, to which they are most nearly related. The family is at present limited to two species—viz. (1) the common turkey, *Meleagris gallipavo,* with two varieties, the typical *gallipavo* of the South-western U. S. and Mexico, and the *sylvestris* of the more Northern U. S.; and (2) the rare and beautiful turkey, *Meleagris ocellata,* of Honduras. Our common domesticated bird is a descendant of the Mexican form, and not of the common wild one of the U. S., which has generally been considered a distinct species. In former geological epochs other species existed within the limits of the present U. S., the remains of two species (*Meleagris altus,* or *superbus,* and *M. celer*) having been found in the Post-pliocene of New Jersey, and of another (*M. antiquus*) in the Miocene beds of Colorado. THEO. GILL.

Melegna'no, town of Northern Italy, in the province of Milan, on the railway between Milan and Piacenza. This little town is well built, having quite the aspect of a small city, and its trade in all the produce of the neighborhood is very active. Its mediæval history is interesting, and in modern times it has been the theatre of two important battles—one in which Francis I. defeated the Swiss mercenaries of the duke of Milan in 1515; the other the victory of the French and Italian allies over the Austrians on June 8, 1859. Pop. in 1874, 5124.

Melen'dez Val'dez (JUAN ANTONIO), b. Mar. 11, 1754, at Ribera de Fresno, near Badajoz; studied law at Salamanca, and held various judicial positions at Saragossa, Valladolid, and Madrid during the government of Jovellanos; but was banished from Spain at his fall in 1798, and not allowed to return until 1802. Won by Murat and Napoleon, he was employed in various important civil-service offices during the French government, but the indignation of the national party was so strong that once he came near being shot in Oviedo by the populace, and after the departure of the French he was compelled to flee to France, where he d. at Montpellier May 24, 1817. In 1780 his eclogue *Batilo* was crowned by the Academy of Madrid, and his lyrical poems and pastoral dramas, in which he broke with the French classicism and returned to the old national Spanish models, made so deep an impression that he was called a "restaurador del Parnaso." Collected editions Madrid (1820), Paris (1832), Barcelona (1838).

Mel'fi, town of Southern Italy, in the province of Potenza, lying in a most fertile region, about 28 miles from the town of Potenza. The commerce and industry of this place are noteworthy. The cathedral and episcopal palace are fine structures. Six out of its eight monasteries have recently been suppressed. Melfi was a large town in 304 A. D., and its mediæval story is one of the most stormy of those stormy times. In 1528 the French general Lautrec de Foix took Melfi after an obstinate resistance, and put 18,000 of its inhabitants to the sword. It suffered from earthquakes in 1456, 1694, and 1851. Pop. in 1874, 11,640.

Melgare'jo (Gen. MARIANO), b. in Bolivia about 1810; became a famous partisan leader in the civil wars of his country; had been concerned, with varied success, in revolutions against every president of Bolivia for more than twenty years, when in Dec., 1864, he overthrew the government of his brother-in-law, Pres. Acha, and made himself dictator. He maintained himself in power against a constant series of revolutions for five years; joined in 1865 the quadruple alliance of Ecuador, Peru, Bolivia, and Chili against Spain; was made general-in-chief of the combined armies, but had no occasion to take the field; was overthrown by Morales in Jan., 1870; escaped to Peru, and was killed at Lima by his son-in-law, Gen. Sanchez, in an altercation, Nov. 23, 1870.

Melia'ceæ [from *Melia*, its typical genus], a natural order of exogenous trees and shrubs, mostly tropical. The china tree (*Melia azedarach*) has been naturalized in the Southern U. S. from Asia. This order contains useful timber and fruit trees, medicinal and oil-bearing plants, and ornamental shrubs.

Mel'ic, a name given to grasses of the genus *Melica*. *M. mutica* is an unimportant species of the U. S. *M. altissima* and *uniflora* are useful Old-World forage and pasture grasses.

Melil'la, town of Sicily, province of Syracuse, situated on a hill about 2½ miles from the sea and about 35 from Syracuse. It is a very ancient town, and antique objects are found in the neighborhood. Pop. in 1874, 5770.

Mel'ilot [Lat. *melilotus*, "honey lotus," from its sweet smell], a name applied to various leguminous herbs of the genus *Melilotus*. *M. officinalis* (common melilot), *M. alba* (sweet clover), *M. cœrulea, arborea, Messanensis*, and others are cultivated in Europe, but not much in the U. S., as forage-plants. The fibre of some species is useful. These plants possess the rich odor so familiar in "sweet clover." The forage is eagerly eaten by cattle, and is of excellent quality, but is not very abundant.

Meline' (Col. JAMES F.), b. in 1811 at Sackett's Harbor, N. Y., was the son of a French officer of the U. S. army, of remote Swedish descent; was educated at Emmittsburg, Md.; taught for a time in the Athenæum, Cincinnati; was admitted to the bar; studied three years in Europe, and afterwards held several U. S. consulships there; became a banker; served during the civil war, chiefly on the staff of Gen. Pope as major and judge-advocate, and was soon promoted to the grade of colonel; served after the war as chief of bureau of civil affairs third military district; was a brilliant lecturer and writer; author of *Two Thousand Miles on Horseback, Mary Queen of Scots and her Latest English Historian, Life of Sixtus V.*, etc. He was a devout Roman Catholic, a brilliant essayist, a genial wit, and an accomplished musician. D. at Brooklyn, N. Y., Aug. 14, 1873.

Meliphag'idæ [from *Meliphaga*—μέλι, "honey," and φαγεῖν, to "eat"—the name of one of the genera], a family of passerine birds, the "honey-suckers," distinguished by G. R. Gray in the following combination of characters: The form is thrush-like; the head well-shaped; the bill more or less long, curved, and usually acute at the tip, which is slightly emarginated; the nostrils placed in a large groove, and generally covered by a membranous scale; the tongue is extensile, and furnished at the tip with a pencil of short fibres; the tarsi rather short and strong; the toes more or less long, the outer always united at its base; the tail long and broad. The species are quite numerous, and almost entirely confined to Australia and New Zealand, with the outlying islands; and of the ornis of the former country especially they form a characteristic feature. They vary in size from a large thrush to a small warbler. By Gray the family is divided into three sub-families—viz. Meliphaginæ, with seven genera; Melithreptinæ, with two genera; and Myzomelinæ, with four genera. Neither the family nor subordinate groups, however, have been confirmed by anatomical evidence. THEO. GILL.

Mell (PATRICK H.), D. D., LL.D., b. in Walthourville, Liberty co., Ga., July 19, 1814. His parents both died when he was fourteen years of age, leaving him a penniless orphan. Having a good elementary education for one of his age, he earned means sufficient to support him two years at Amherst College, Mass., and then became a Baptist minister. By constant study he rose to distinction, and soon after the organization of Mercer University by the Baptist convention of Georgia he became professor of ancient languages. In 1857 he was called to the same chair in the State University, and subsequently became vice-chancellor, which he resigned in 1872, but retained a professorship. For fifteen years he was president of the Georgia Baptist convention, and for nine years president of the Southern Baptist convention. Dr. Mell has published several works which have been highly valued and extensively circulated—one on *Baptism*, one on *Corrective Church Discipline*, one on *Predestination*, an *Essay on Calvinism*, an *Argument on the Subject of Slavery*, a sermon on *God's Providential Government*, a treatise on *Parliamentary Practice*, and *Prayer as Related to Providence*. A. H. STEPHENS.

Mel'len (GRENVILLE), son of Judge Prentiss, b. at Biddeford, Me., June 19, 1799; graduated at Harvard in 1818; became a lawyer and *littérateur*, residing successively at Portland and North Yarmouth, Me., in Boston, and in New York, where he d. Sept. 5, 1841. He was the author of several volumes of prose and verse, the latter very popular in his lifetime.

Mellen (PRENTISS), LL.D., b. at Sterling, Mass., Oct. 11, 1764; graduated at Harvard in 1784; practised law at Bridgewater, Mass.; removed in 1792 to Biddeford, Mass. (now in Maine), and in 1806 to Portland; was U. S. Senator from Massachusetts 1817–20; chief-justice of the supreme court of Maine 1820–34, and held other important public positions. D. at Portland, Me., Dec. 31, 1840.

Mellon, or **Mellone,** supposed to be $C_6N_9H_3$ by Gerhardt, who also considered the H_3 to be basylic, and susceptible of replacement by metals; thus making the substance a hydracid, which he called hydromellonic acid. It is obtained by a number of methods, from different sources, and is certainly a well-defined compound, though its composition, nature, and relations are still subjects of discussion. The easiest mode of preparation, one of the methods of Liebig, its discoverer, is to heat together sulphocyanide of potassium and chloride of sodium in a current of chlorine gas, and wash the product with water, in which it is insoluble. (For further information the textbooks on chemistry must be referred to.) HENRY WURTZ.

Mellon (HARRIET). See ST. ALBANS, DUCHESS OF.

Mel'lonville, post-v. of Orange co., Fla., on the S. side of Lake Monroe, river St. John's, opposite Enterprise.

Mel'more, post-v. of Eden tp., Seneca co., O. Pop. 188.

Mel'moth (WILLIAM), b. in London, England, in 1666; was called to the bar 1693; became a bencher of Lincoln's Inn; was treasurer of that corporation 1730; was appointed by the court of chancery, in conjunction with William Peere Williams, to edit the celebrated *Reports of Cases in Chancery* (1726–28) of Thomas Vernon, but is best known as the author of *The Great Importance of a Religious Life* (new ed. 1849), of which more than 100,000 copies were sold. D. at London Apr. 6, 1743.

Melmoth (WILLIAM), son of the above, b. in London in 1710; was bred to the law, and in 1756 became a commissioner of bankrupts. He resided many years at Shrewsbury, and afterwards at Bath, where he d. Mar. 15, 1799. He was an elegant writer, and his *Translation of the Letters of Pliny* (1746) is claimed on good authority to be "better than the original." He also translated Cicero's *Letters* (1753), the *De Senectute* and *De Amicitia* (1773–77), and wrote *Letters on Several Subjects* (1742) under the pseudonym of "Sir Thomas Fitzosborne," which were much admired, and were reprinted at Boston in 1805.

Me'lo (or **Mello**) **de** (FRANCISCO MANOEL), b. at Lisbon, Portugal, Nov. 23, 1611; was educated by the Jesuits; rose to the rank of colonel in the Spanish army (Portugal being then subject to Spain), serving in the Netherlands

and in Catalonia against the rebels who attempted to establish a separate kingdom. Of this movement he wrote (in Spanish) a history which has taken rank as a classic, *Historia de los movimientos, separacion y guerra de Cataluña* (Lisbon, 1645). He entered the service of Portugal when it declared its independence; was imprisoned nine years through the enmity of a powerful nobleman, and spent many years in exile in Brazil. D. at Lisbon Oct. 13, 1665. He wrote a multitude of works, chiefly in Portuguese, embracing essays, satires, poems, tragedies, and farces, few of which have been published, as well as historical works relating to Portugal and Brazil.

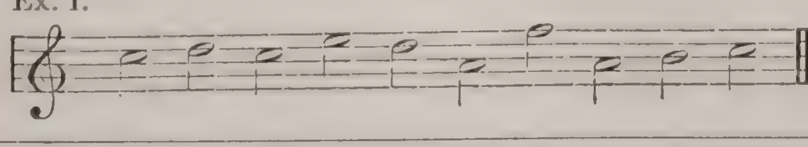
Melodeon. See REED INSTRUMENTS.

Melodra′ma [Gr. μέλος, "song," and δρᾶμα, "drama"], a name first bestowed upon the opera by Rinuccini, but now more frequently given to a non-operatic play of a semi-tragic or serious character, and marked by sensational, effective, or startling situations, and by exaggerated sentiment.

Mel′ody [Lat. *melodia*], in music, a connected series of single sounds, so arranged and linked together as to become capable of expressing some sentiment, and stirring up pleasurable, religious, patriotic, warlike, tragic, or other emotions. It is not *every* succession of sounds that can properly be called a "melody," for sounds in any number may be produced by voice or instrument which are unrelated, devoid of form, rhythm, accent, and symmetrical arrangement, and are therefore unmeaning, and incapable of awakening any feeling other than that of weariness. The music of the ancient Greeks appears to have been of a type not unlike this, however admired and extolled in its own day, when true melody was unborn, and music and noise were nearly akin. To *our* perceptions the music of the ancients seems to have consisted of a mere succession of intervals, selected without taste and refinement, and laid together without skill, design, or any trace of elegance and inspiration. The fragments that remain to us of such music, while valuable as curiosities and historical relics, are yet so sterile as to yield no indications of that connection of thought and richness in ideas which we look for now in what bears the name of "melody." The same may be affirmed, to a considerable extent, of the early music of the Church, which, though much improved by the labors of St. Ambrose, and afterwards by the learning and patience of Pope Gregory I., was, in modern judgment, bald, dry, and dreary; and whatever power it possessed of exciting emotion appears to have been due to external associations, the surroundings of liturgical grandeur, its alliance with sacred ideas and poetical imagery, rather than to its own intrinsic merit. Even as late as the fourteenth and fifteenth centuries, or the period when the early masters of harmony were working out their elaborate fugues and canons, the distinctive beauties of melody were scarcely known. Hence the dryness and the hard mechanical stiffness of much of the music of their age—music which, in spite of its ponderous harmony, lacks altogether the spirit, life, and warmth which would have been imparted to it by an infusion of glowing melody. Musical thought, however rich in harmonious combinations, is not perfect without a certain leading theme or train of ideas to which all other things bear relation, and which is itself the golden thread around which all the harmonies seem to cluster. In modern schools of music the cultivation of melody has risen to an importance which proves the value assigned it by the severest masters and professors of counterpoint. And this importance springs not only from the large space occupied by melody in its scientific relations, but also from the facility with which it is recognized and appreciated by the ordinary ear, and its power also in gradually leading the mind to a just conception of the harmonies dependent upon it. Without melody much of the gorgeous harmony now heard would be unintelligible to nine-tenths of those who hear it; and to a popular audience the richest symphonies of a Beethoven or Mendelssohn would be a bewilderment were it not for those clear, captivating, and ever-present lines of melody which enchain attention and take hold on the memory.

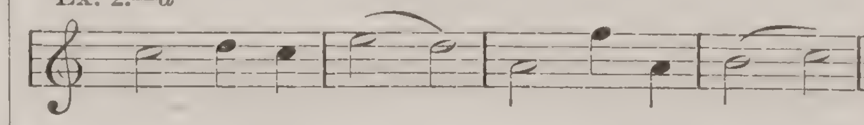
In the conception or formation of melody much more is implied (as we have already said) than the mere arranging of several sounds or notes in any haphazard order of succession. Considerations of key and scale, mode, rhythm, time, accent, cadence, and rules affecting the progressions of certain intervals, are all to be taken into account if from any series of notes we would form a melodious strain, having in itself evidence of meaning and design. To illustrate this, we give in Ex. 1 a short train of notes, which, taken just as they stand, express little or nothing:

Ex. 1.

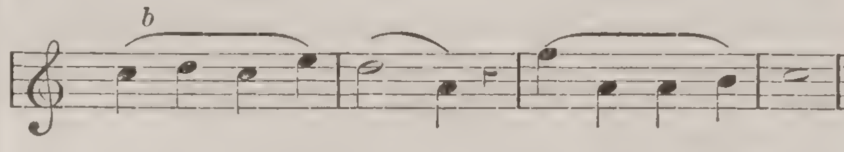


But these same unmeaning notes, when moulded into form and regularity by the application of rhythm, and by various changes of their time-values, as at *a*, *b*, and *c* in Ex. 2, are found to assume more or less of a melodious character:

Ex. 2.—*a*



b

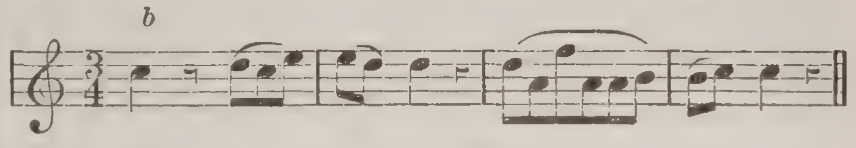


c

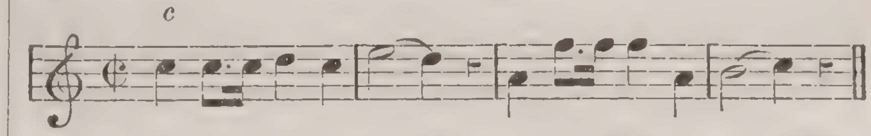
Under still freer treatment, as at *a*, *b*, and *c* in Ex. 3, the dryness of the original notes entirely disappears, and the qualities of a simple but true melody are distinctly apparent:

Ex. 3.—*a*

b

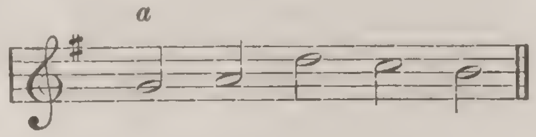


c

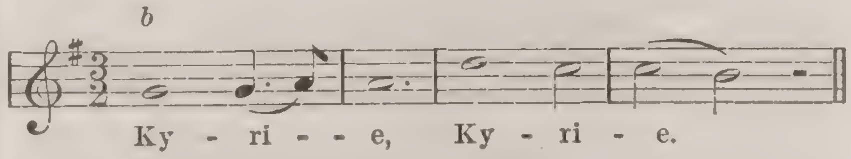


By dint of art and contrivance the most meagre and limited series of notes may thus become the origin and source of many melodious ideas and progressions, often interesting and attractive, and suggestive also of still other ideas by the simple laws of association. In Ex. 4, at *a*, see a formula of only five notes, from which the melodies at *b*, *c*, and *d* are derived, and into which they may again be readily reduced:

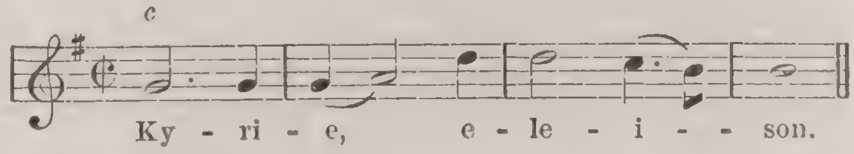
Ex. 4. *a*



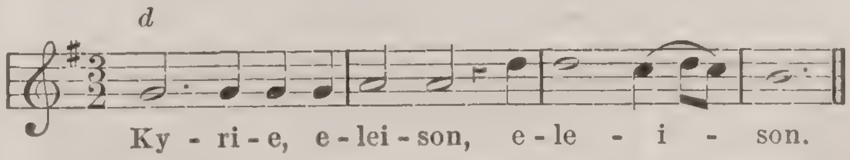
b



c

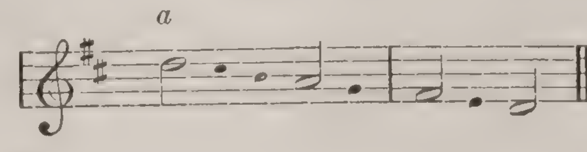


d

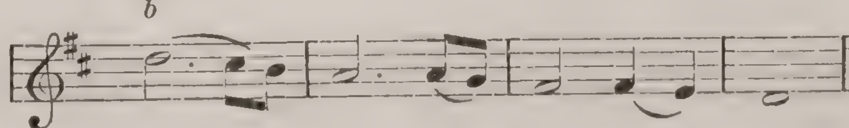


In the derived melodies given in the above examples no other notes have been used than those found in the rough formulas from which they spring. It will be observed, also, that those melodies have been produced chiefly by the addition of *rhythm* and of variations of the *times* of the original notes. But the field of invention is much enlarged, and the process of creating new melodies greatly facilitated, first, by filling up with notes the intervals made by skips in the original sketch, and using such notes as occasion serves. See Ex. 5, where at *a* the notes thus gained are marked by black dots, and several of the melodious forms obtained are shown at *b*, *c*, *d*, and *e*:

Ex. 5. *a*



b



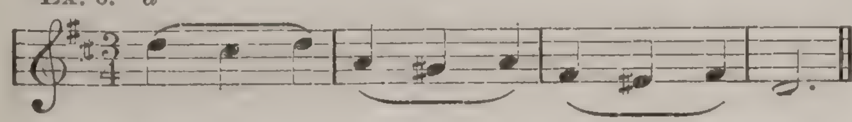
c

d

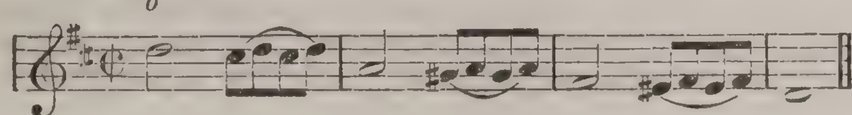
e

Secondly, by a judicious use of the semitone *below* any prominent note of the model, in the manner of an accidental leading-note, as in Ex. 6, at *a*, *b*, and *c*:

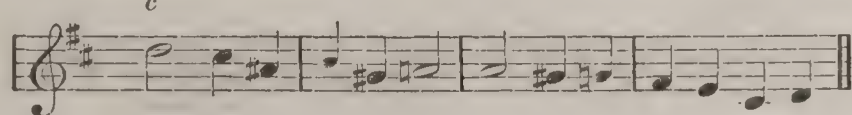
Ex. 6.—*a*



b



c



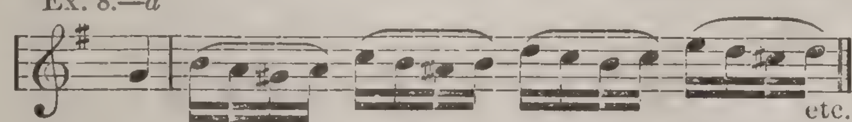
Thirdly, by a similar use of the note *above*, as in Ex. 7, at *b*, where the progression may be compared with the plain notes at *a*:

Ex. 7.—*a*

b

Fourthly, by the use of both the note above and the semitone below, by which means the plain notes at *a* in the last example may take such forms as appear at *a* and *b* in Ex. 8:

Ex. 8.—*a*



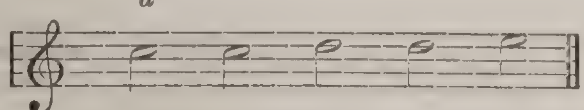
etc.

b

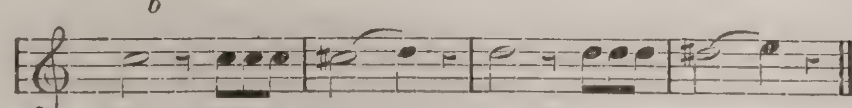
etc.

Fifthly, by a discriminating use of a lengthened semitonic appoggiatura where the current of the melody naturally suggests it. See Ex. 9, where the plain notes at *a* are cast into form at *b*, and enforced by appoggiaturas. At *c*, the appoggiaturas are accompanied by suspensions and marks of emphasis:

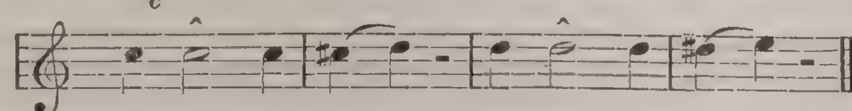
Ex. 9. *a*



b

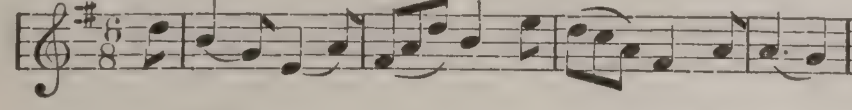


c



Sixthly, by the use of harmonic intervals in arpeggio form, either as the prevailing character of the melody, or as a passing relief to the ordinary motion when it consists of direct and contiguous intervals. It is to be carefully observed, however, that as melodies of this kind consist chiefly of broken *chords*, their progressions must be such as are proper to those chords and in conformity with the rules of musical harmony. Instances of such melodies are given in Ex. 10, at *a* and *b*:

Ex. 10.—*a*



b

The observations thus made on the development of melody are to be taken, of course, rather as hints than rules. Melody is so dependent on the power of imagination and the existence of a creative talent as to render it far less amenable to laws and restrictions than the harmony by which it is accompanied. In its higher departments it requires gifts of nature and powers of invention so peculiarly its own that many of the most accomplished harmonists have signally failed in the production of original melody; while, on the other hand, minds quite unskilled and unscientific have conceived and written such glowing strains as take strange hold on human feeling and linger for years in the memory. WILLIAM STAUNTON.

Mel'on [Lat. *melo*], the large edible fruit of several species of annual running and climbing plants of the order Cucurbitaceæ, natives of Africa and Asia. In the desert of South Africa wild melons, both edible and poisonous, abound, and are greedily eaten by men and beasts, the poisonous ones being easily distinguished by the bitter taste. In like manner the common watermelon when planted near the colocynth (which is a true melon) becomes hybridized and acquires poisonous properties. The melons of cultivation are extensively raised in the U. S. They are of two or more species and of many well-marked varieties. The *Citrullus vulgaris*, or watermelon, is prized for the coolness and sweetness of its abundant watery juice. It does best on sandy soils, and has been proposed as a source of sugar for general commerce. The amount of sugar present varies according to the soil, treatment, and variety. The muskmelon (*Cucumis melo*) is of Asiatic origin. Its numerous varieties are highly esteemed for their delicate flavors. Tropical Asia and Africa have several other cultivated species which deserve acclimatization in the U. S.

Melpom'ene [Gr., the "singer"], one of the nine Muses, the Muse of Tragedy. As represented by Greek art, she bears a mask, Heracles' club, or a sword, is shod with buskins, and wears on her brows a garland of vine-leaves.

Mel'rose, a v. of Roxburghshire, Scotland, 31 miles S. E. of Edinburgh, contains the ruins of the celebrated Melrose Abbey. The abbey was founded in 1136 by David I., but destroyed in 1322 by the English under Edward II. It was rebuilt in 1326 by Robert Bruce and David II., but suffered severely in 1385 and 1545 by the English, and still more during the Reformation. While standing in its original splendor it was the finest structure in Scotland, and a remarkable specimen of Gothic architecture; but now it is only a ruin, though the church has been tolerably well preserved.

Melrose, tp. of Adams co., Ill. Pop. 2076.

Melrose, post-tp. of Clark co., Ill. Pop. 989.

Melrose, post-tp. of Grundy co., Ia. Pop. 513.

Melrose, post-v. and tp. of Middlesex co., Mass., 8 miles N. W. of Boston, on the Boston and Maine R. R., is supplied with water from Spot Pond (in Stoneham), and gas, has 14 public schools, 7 churches, 2 post-offices, a park, a public library, 1 weekly newspaper, a volunteer fire department, manufactories of furniture, boots and shoes, sewing-machine needles, silver polish, etc., 1 hotel, a fine town-hall, and a number of stores. There are 4 Masonic lodges, a lodge of Odd Fellows, 3 temperance societies, 1 musical and 2 literary associations. Pop. 3414.

GEO. M. RAY, LOCAL ED. "MELROSE JOURNAL."

Melrose, post-tp. of Stearns co., Minn. Pop. 269.

Melrose, post-v., cap. of Harlan co., Neb.

Melrose, post-tp. of Jackson co., Wis. Pop. 929.

Mel'ton, tp. of Jefferson co., Ark. Pop. 800.

Melun', town of France, in the department of Seine-et-Marne, on the Seine. It manufactures great quantities of cement, bricks, and tiles, and has some trade in timber and flour. Pop. 11,408.

Mel'vil (SIR JAMES) OF HALLHILL, b. at Raith, Fifeshire, Scotland, about 1535; went to France in early youth as page to Mary Stuart, who was betrothed to the dauphin; was for nine years a gentleman of the household to the Constable Montgomery, and employed three years at the court of the elector palatine; travelled in Italy; returned to Scotland when his former mistress had become queen of Scots, and was appointed by her privy councillor and member of the royal household. He was closely connected with political affairs for several years, but having opposed the queen's inclination in favor of Bothwell after the murder of Darnley, he was obliged to consult his own safety by withdrawal from court. After the overthrow of the queen's party Melvil returned to court, enjoyed the confidence of the four successive regents who governed the country during the minority of the heir, and when King James as-

sumed the direction of affairs was appointed a privy councillor. When James succeeded to the throne of England, Melvil retired to his estate at Hallhill, where he d. Nov. 1, 1607. His name had been nearly forgotten when in 1660 a collection of MSS. left by him was accidentally discovered in Edinburgh Castle, and found to contain very important data concerning the reigns of Mary and James. They were published in 1683 by George Scott, under the title *The Memoirs of Sir James Melvil of Hallhill, containing an Impartial Account of the most Remarkable Affairs of State during the Last Age, not mentioned by Other Historians*, etc. This edition was incomplete; the first perfect edition was that published in 1827–33 by the Bannatyne Club, which has also printed Melvil's *Diary* (1829).

Melvill (Henry), D. D., b. at Pendennis Castle, England, Sept. 14, 1798; graduated with high honors at Cambridge 1821; became a fellow and tutor there; took orders in the Church of England; was minister of Camden chapel, Camberwell, London, 1829–43, where he acquired wide celebrity as an eloquent preacher; was appointed by the duke of Wellington chaplain to the Tower of London 1840; was principal of the East India College at Haileybury from 1843 to its dissolution in 1859; was long chaplain to the queen, canon of St. Paul's, rector of Barnes, rural dean, and "Golden lecturer" at St. Margaret's, Lothbury. He published many volumes of sermons, all of them remarkable for rhetorical power and a glowing imagination. Some of them were republished in the U. S. by the late Bishop McIlvaine (1847–48). D. in London Feb. 9, 1871.

Mel'ville, an island of British North America, situated in the Arctic Ocean between lat. 74° and 77° N., and between lon. 105° and 117° W., and bounded W. by Fitzwilliam and Kellet Straits, and S. and E. by Melville Sound. It was discovered in 1819 by Capt. Parry, who wintered here with his crew.

Melville, tp. of Alamance co., N. C. Pop. 1221.

Melville (Andrew), b. at Baldovy, near Montrose, Scotland, Aug. 1, 1545; was educated at the University of St. Andrew's, which he left in 1564 with the reputation of being "the best philosopher, poet, and Grecian of any young master in the land;" studied law and theology at Paris and elsewhere on the Continent; became a teacher at Poitiers (1566), and soon afterwards (1569–74) professor at Geneva, through the influence of Beza. Returning to Scotland, in 1574 he was appointed principal of the University of Glasgow. In 1580 he was made principal of St. Mary's College, St. Andrew's. In 1582 he preached the opening sermon before the Presbyterian General Assembly, boldly attacking the interference of the court with religious liberty, and headed a deputation which presented a remonstrance to King James at Perth. He was moderator of the General Assembly in 1587, 1589, and 1594, was made rector of the university in 1590, and was recognized as the most prominent member of the Scottish National Church. In May, 1606, James then king of England, Melville was summoned to London with other Presbyterian divines to confer upon Scottish ecclesiastical matters, and, having denounced the archbishop of Canterbury for encouraging popery, was committed to the Tower 1607, where he remained four years. In 1611 he was released at the request of the duke of Bouillon, who appointed him professor of theology at Sedan, where he d. in 1622. He published a number of Latin poetical paraphrases of portions of the Bible, the best of which, the *Song of Moses*, is accounted an elegant production. His epigrams were very neat, and sometimes brought him into trouble, especially one written in ridicule of the chapel-services at King James's English court. (See his *Life*, by Dr. Thomas McCrie.)

Melville (George John Whyte), b. near St. Andrew's, Scotland, in 1821; entered the army in 1839; became captain in the Coldstream Guards 1846, and retired in 1849, but served again in the Turkish cavalry during the Crimean war. He has written several novels, which became popular both in Great Britain and the U. S. The best known are *Captain Digby Grand* (1853), *Kate Coventry* (1856), *Holmby House* (1860), *Good for Nothing* (1860), *The Gladiators* (1863), *Cerise* (1865), *Sarchedon* (1871), *Satanella* (1872), and *Katerfelto* (1875). He has also published a translation of the *Odes* of Horace and a volume of *Songs and Verses*.

Melville (Herman), b. in New York Aug. 1, 1819; shipped as a common sailor when eighteen years old; deserted in 1842 from a whaling ship at the Marquesas Islands, remaining four months a prisoner in Typee (Taipi) Valley, Nukaheva; escaped, and returned in 1844 to the U. S. He published *Typee* (1846), *Omoo* (1847), *Mardi* (1849), *Redburn* (1849), *White Jacket* (1850), *Moby Dick* (1851), *Pierre* (1852), *The Piazza Tales* (1856), *The Confidence Man* (1857), *Battle-Pieces* (1866), and other works. He married a daughter of Chief-Justice Shaw of Massachusetts in 1847, and in 1860 he went upon another whaling voyage. In 1850 he removed from New York to Pittsfield, Mass. Most of his works are fictions of much power, of which the best are his sea-tales.

Melville (Gen. Robert), LL.D., b. at Monimail, Scotland, Oct. 12, 1723; served in the West Indies in the Seven Years' war; participated in the capture of Guadalupe, Dominique, Martinique, and other French islands, upon which he was made brigadier-general and governor of all the captured possessions. In his later years he was a sagacious inquirer into Roman military antiquities, traced the sites of many Roman camps in England; solved the question of the arrangement of oars and rowers in Roman galleys, and made minute examinations of the Alps to determine the route of Hannibal in the invasion of Italy. He became a full general in 1798, and d. Aug. 29, 1809.

Melville (Viscount). See Dundas (Henry).

Membré (Zenobius), b. at Bapaume, France, in 1645; entered the Franciscan order; went as a missionary to Canada in 1675; accompanied La Salle upon his expedition to the Western rivers 1679; remained at Fort Crèvecœur, on Lake Peoria, with Tonty, whom he aided in effecting a peace between the Iroquois and Illinois; descended the Mississippi with La Salle 1682; returned to France the same year; wrote a narrative of the expedition, which was published by his cousin, Le Clerc, in his work, *Etablissement de la Foi dans la Nouvelle France* (1691); became warden of a convent at Bapaume; accompanied La Salle in his final expedition to Texas by sea 1684, and remained in Fort St. Louis, where, with his companions, he was massacred by the Indians in 1687. Membré's narrative was plagiarized by Hennepin (1697), and by some authorities is ascribed to La Salle himself.

Mem'el, town of Prussia, on the great salt lagoon called the Kurisches Haff. It has a large and safe harbor, considerable shipbuilding, manufactures of ropes, sailcloth, and linens, distilleries, breweries, and iron-foundries, and a very important trade in corn, hemp, flax, timber, and amber. Pop. 19,031.

Mem'ling (Hans), a Flemish painter belonging to the school of Van Eyck; was received, after the battle of Granson in 1476, wounded and miserable, into the hospital of St. John at Bruges, where he painted an altarpiece and the reliquary of St. Ursula. Another celebrated work of his is the altarpiece in the church of Mary in Dantzic, and the striking resemblance between these pictures and certain paintings in Miraflores and Palencia in Spain, belonging to the period between 1496 and 1509, has given rise to the supposition that he went to Spain. The dates of his birth, death, and other events of his life are unknown.

Mem'mingen, town of Bavaria, on the Iller. It has manufactures of ribbons, silks, cottons, and linens, and a large trade in hops, which are produced in its vicinity. Pop. 7215.

Mem'minger (Charles Gustavus), b. at Würtemberg, Germany, Jan. 7, 1803; came when two years old to Charleston, S. C., with his mother. Left an orphan, he was befriended by Gov. Thomas Bennett; graduated at South Carolina College in 1820; became a lawyer of Charleston in 1825; opposed nullification, and wrote the satirical *Book of Nullification* (1832–33); was for many years prominent in the financial business of the legislature, and took part in the school reform in 1854; was secretary of the treasury in the Confederate cabinet 1861–64.

Mem'non, a name of several persons, the most remarkable of whom was the son of Tithonos and Eos, who after the death of Hector brought the Æthiopians to the assistance of Priam in the war against Troy. His adventures were the subject of the poem called the *Aithiopis* by Arktinos, according to which his armor was made by Hephaistos or Vulcan. He was, although of dark color, distinguished for his beauty. He killed Antilochos, the son of Nestor, in single combat, and was himself subsequently killed by Achilles. His mother, Eos, had in vain pleaded before Zeus against Thetis for the life of Memnon, her son, and was present with the daughters of the Sun at the fight. Ajax challenged him to single combat, and Memnon being wounded, Achilles came and pierced him through the neck. The ancient works of art, however, represented a monomachia or single combat between Achilles and Memnon alone over the dead body of Antilochos. Eos carried in her arms the naked corpse of her son out of the battlefield. A flower, the *Paphlagonios*, was supposed to have sprung from the earth out of his blood. His body, according to some traditions, was burnt on a pyre in the plains of Troy, and the ashes sent to his country or his sister Hemera, or to the Æsopos, where a mound was erected for his grave, or else in the Trojan

territory. His companions, the Æthiopians, or negroes, always thus represented in ancient art, were changed into birds which contended at his pyre and frequented his grave. Other and later traditions make Memnon come to Troy with 20,000 Æthiopians and Susians and 20 war-chariots, by orders of Teutamos, king of Assyria, and state that the palace or city of Susa was called Memnoneion. The name of Memnon was connected at the period of the Roman empire with that of Amenhetp or Amenophis III., of the eighteenth Egyptian dynasty, about B. C. 1400, and attached to the northernmost of the seated colossal statues still remaining on the W. bank of the Nile at Thebes, where they formed part of a dromos or row of statues leading to the pylon or gate of the Amenopheum, or palace of Amenophis, in that quarter. The two statues still remaining amidst the ruins of eighteen others, all made of a breccia sandstone, bear the name and titles of Amenophis III., and the most northern gave out sounds at sunrise when touched by the morning beams, supposed to be the salutations of Memnon to his mother, Eos or Aurora. The statue was said to have been broken in two by Cambyses (B. C. 525), and was called by the Thebans Phamenoph. The upper part appears really to have been thrown down by an earthquake B. C. 27, and continued so till A. D. 170, when it was set up and restored by brickwork, but ceased to give out sounds. In that interval seventy-two inscriptions were cut in Greek and Latin on it, recording the visits of Roman military officers, prefects, and others, some of which are dated, the earliest one mentioned being in the eleventh year of Nero (A. D. 64), and the last, A. D. 194. These record, sometimes in verses, the visit of the writer, and attest that he has heard the voice of Memnon. The most remarkable visit was that of the emperor Hadrian and his wife Sabina (A. D. 130), recorded in verses by Julia Balbilla, a poetess in their suite. There has been much speculation as to the cause of the harp-like sound or tone given forth by the statue, which was heard emanating from the pedestal by several modern travellers in 1821 and later. It has been attributed to the expansion of the stone by the warmth of the sun, a phenomenon occurring occasionally in certain mountains, or to the frauds of the priests. Certain parts of Egyptian Thebes were named Memnoneia in honor of Memnon. Some historical personages of this name are known, as a Rhodian who revolted against Artaxerxes Ochos and fled to Philip, king of Macedon, but subsequently returned to the service of Persia, where he repulsed the first attempts of the Macedonians to establish their forces in Asia Minor, and became under Darius the commander-in-chief of the forces of Darius, and fought against Alexander the Great the battle of Granicus (B. C. 334). His plans of the campaign were unfortunately not followed, and after an unsuccessful attempt to defend Ephesus and Halicarnassus, which he burned, Memnon retired to Mitylene, where he d. B. C. 333. There was also a historian of this name, who wrote the local history of Heraclea of Pontus in the commencement of the second century A. D., and an Æthiopian people between the Nile and Astapus called Memnones, probably from their supposed resemblance to the hero of the Trojan war. S. BIRCH.

Mem'oirs [Fr. *mémoires pour servir*], a class of literature very abundant in France, which may be styled the raw materials of history. If this species of literature is not always reliable in the sense of implicit trust to be reposed in all the statements made, it never fails to throw a vivid light upon the surroundings and the contemporaries of the author; and his own real character is unconsciously revealed, not by his own estimate, but by the sum-total of the unquestionable facts related. English and American literature is sadly deficient in this amusing and valuable department of literature, of which the best recent example is the *Greville Memoirs* (1874).

Mem'ory [Lat. *memoria*, from *memini*, preterite of the old form *meno;* Gr. *μέμνω*, *μνάω*, *maneo*, to "stay or remain"], the mind's faculty for connecting its past experience with its present self, or "the faculty for retaining representatives of whatever has once been in the consciousness." (*Hickok.*) When this faculty is exercised involuntarily, it is *remembrance*, and when its exercise is occasioned by some intention or purpose of the will, it is *recollection.* In Greek the former of these is *μνήμη*, and the latter *ἀνάμνησις*; in Latin, *memoria* and *recordatio.* Without this faculty our past experience would be a blank, and not only would all knowledge be limited to the field of the present moment, but all plans and calculations respecting the future would be impossible. Its value, therefore, cannot be exaggerated. Neither can its possibilities be overestimated. It has been said that neither Pascal nor Grotius ever forgot anything he had ever read or thought. Leibnitz and Euler were as remarkable for their memory as for their other powers. Joseph Scaliger committed the whole of Homer to memory in twenty-one days, and all of the Greek poets in three months. Cyrus knew the name of every officer (according to Xenophon, and of every soldier, according to Pliny and Quintilian) who served under him. Themistocles, it is said, could call by name each one of the twenty thousand citizens of Athens. Mithridates is said to have conquered twenty-two nations, whose different languages he knew and spoke with the same ease as his own. While we justly call these instances remarkable, there are yet facts which render it probable that no mind ever actually loses anything which has once entered its consciousness. Persons resuscitated from drowning or hanging have reported a sudden revelation of all their past life flashing out with distinctness and minuteness just before their consciousness was lost. I am myself acquainted with an army officer who has had two distinct experiences of this sort—once in early life when near drowning, and once in a sudden exigency in a battle. Pointing in a similar direction are the numerous facts cited where persons in extreme sickness and under operations for injuries of the head have conversed in languages which they had known in youth, but had for many years seemed to have entirely forgotten. Persons also in the delirium of a fever have repeated with apparent accuracy discourses to which they had listened many years previously, and of which, before the fever, they had no recollection. More remarkable cases still are reported where persons in certain abnormal states have accurately repeated long passages from foreign tongues which they had casually heard recited long before, but of which they never had any understanding. Whatever may be thought about arts of remembering, there would seem to be no art of forgetting.

A memory at the same time ready and trustworthy, though often an original gift, is often also largely the result of culture. Sir Philip Warwick in his *Memoirs* says of Lord Stratford: "His memory was great, and he made it greater by confiding in it;" and it may be affirmed as a general truth that the memory grows in trustworthiness by being trusted. By trusting his memory, even though it often fails him, and by giving himself with undivided attention to what he would remember, any person may increase his powers of memory to any degree. (See MNEMONICS.) J. H. SEELYE.

Mem'phis, a celebrated city, for more than 1000 years the capital of Egypt, was in the Delta, on the western arm of the Nile, about 10 miles S. of Cairo. It was founded by Menes, the first king of the first dynasty, and was one of the most magnificent cities the world ever saw. It was 17 miles in circumference, and contained the temples of Apis, Isis, and Serapis. After the building of Alexandria it began to decline, and soon fell into ruins. The modern Cairo was built from its remains, and it disappeared so utterly that for many years even its site was disputed. The remains which during the last ten years have been excavated are of the most stupendous description.

Memphis, tp. of Pickens co., Ala. Pop. 475.

Memphis, post-v. of Richmond tp., Macomb co., Mich. Pop. 385.

Memphis, post-v., cap. of Scotland co., Mo., 40 miles W. of Keokuk, Ia., on the Missouri Iowa and Nebraska R. R., has an academy and school, 7 churches, 2 banks, 3 newspapers, 2 flouring-mills, 2 hotels, lodges of Masons and Odd Fellows, and several stores. Principal occupation, farming and stock-raising. Pop. 1007.
C. W. JAMISON, ED. "MEMPHIS REVEILLE."

Memphis, city and cap. of Shelby co., Tenn., in lat. 35° 8″ N. and lon. 13° W. Incorporated in 1827. The city possesses fine educational advantages, its public free schools numbering 67, besides 32 other institutions of learning, 4 of them being attached to the Roman Catholic Church. Its churches, representing all creeds and faiths, number 35, while 10 home fire and marine insurance companies with a capital of $1,328,000, and 36 foreign companies represented by agencies with a capital of $127,516,570, and 1 life insurance company, capital $250,000, make up the list of insurance companies. It has a board of health, chamber of commerce, cotton exchange; and railroads making connections with all prominent points North, South, East, and West enable the city to carry on an immense traffic with all parts of the U. S. The Mississippi River, the inland sea of the U. S., affords navigation at all seasons of the year between Memphis, New Orleans, and St. Louis. The total value of imports for 1874 was $60,847,389, and the value of cotton received for same year (426,676 bales) was $34,000,000. Cotton is the chief and absorbing article of commerce. The tonnage of the river is represented by the departure yearly of 2075 steamboats, averaging 2000 tons, and the arrival of 2059. Memphis has 3 daily, 7 weekly, and 3 monthly newspapers, and

the amount of taxable property for the year 1874 was $32,500,000. The city possesses a fine water-front of nearly 2 miles, and massive stone-paved wharves facilitate the heavy shipments from the districts watered by the Mississippi, White, Arkansas, St. Francis, Hatchie, and other rivers, of which Memphis is the entrepôt. The streets of Memphis are broad, well laid out, and most of them fitted with the Nicolson pavement. Pop. 40,226. On June 6, 1862, a short engagement took place near Memphis, in which the Confederate fleet of eight vessels, under Com. Montgomery, was defeated by the Union fleet of fourteen vessels, under Col. Ellet, and the city thenceforth occupied by Union forces; but in Aug., 1864, Gen. Forrest's cavalry entered and took several hundred prisoners.

Andrew J. Kellar, Ed. "Memphis Avalanche."

Memphrema'gog Lake, a beautiful lake, 35 miles long and from 2 to 5 miles in breadth, lying partly in Orleans co., Vt., and partly in Canada. Its shores are marked by bold headlands, and there are numerous wooded islands. Its waters flow northward into St. Francis River. The lake is navigated by steamers and abounds in trout.

Me'na, de (Juan), b. at Cordova, Spain, about 1411; studied at Salamanca and at Rome, and became Latin secretary and historiographer to John II., king of Castile. He composed many verses in honor of his sovereign, the allegorical poems *Coplas de los Siete Pecados Mortales* and *La Coronacion*, and an imitation of the *Divina Commedia* entitled *El Laberinto*. All these productions were extremely popular, and were printed in many editions soon after the introduction of the press into Spain, hence they are highly prized by bibliographers, but are no longer esteemed for poetic merit. Mena was patronized by the famous marquis of Santillana, and many curious letters alleged to have been addressed to the king by him are found in the *Centon Epistolario* of Cibdareal, but the authenticity of that collection is more than doubtful. D. in 1456.

Menabre'a (Luigi Federigo), Count, b. at Chambéry Sept. 4, 1809, of a Piedmontese family; studied mathematics at Turin; entered the Sardinian corps of engineers, and was appointed professor in technical science at the military academy and at the University of Turin while yet only a lieutenant. In 1848, having attained the rank of captain, he was employed in a diplomatic mission to the Italian duchies which were afterwards annexed. He was elected a deputy, and served first in the ministry of war, then in the ministry of the interior. In the war of 1859 against Austria he was chief of the staff. After the cession of Savoy and Nice to France the French government endeavored to win him as a native of Savoy over to France, but he remained true to Italy, and Victor Emmanuel created him a senator. As chief of the engineering department he fortified Bologna, Piacenza, and Pavia; was made a lieutenant-general in 1860, and led the siege of Gaeta. In 1861 he became a member of the ministry of Ricasoli as minister of the marine, in which position he carried through several important reforms and devoted much interest to the building of the arsenal at Spezzia. In 1866 he was Italian plenipotentiary at the conclusion of peace between Austria and Prussia. In 1867, when the ministry of Rattazzi resigned, he formed a new cabinet, and took charge of the ministry of foreign affairs under difficult relations with France. In the Roman question he defended the rights of Italy against France, without suffering any breach to take place; he spoke for the annexation of Rome, but he imprisoned Garibaldi for his arbitrary intermeddling; thus he threaded his way between the hostile parties with great adroitness and without compromising the dignity of the government. Only a few months after he entered office as president of the cabinet the imprisonment of Garibaldi brought him a vote of want of confidence in the house. He gave in his resignation immediately, but was induced by the king to remain and form a new cabinet. In May, 1869, the financial difficulties made another reorganization of the ministry necessary, but even after the accession of the new ministers Menabrea did not succeed in gaining the confidence of the house. On the opening of the session (Nov. 19, 1869) the government proposed Mari for president, but Lanza was chosen. Menabrea resigned immediately, and Lanza became president of the cabinet. Menabrea is a great mathematician and physicist. Prominent among his scientific works are *Études sur la série de Lagrange,* which appeared at Turin 1844–47, and *Le génie italien dans la campagne d'Ancone et de la Basse-Italie* (Paris, 1866). His administration as president of the cabinet, although lasting only two years, brought order into the interior, and the relations of Italy to foreign countries were improved by his cautious policy.

August Niemann.

Mena'do, town of Celebes, in the East Indian Archipelago, and the capital of an important Dutch possession of the same name, comprising the whole north-eastern peninsula of that island, and containing a population of 228,051. The high, volcanic surface of the territory is eminently well adapted to coffee-culture; rice is also extensively grown. The value of the exports of the district during the year 1870 amounted to 1,250,370 gulden. The town, Menado, has about 6000 inhabitants.

Men'ai Strait, a narrow channel, 13 miles long and from 250 yards to 2 miles wide, between the island of Anglesea and Carnarvonshire, Wales, crossed by two bridges, the suspension and the Britannia bridge. At the entrance of the channel the tide sometimes rises 30 feet, and ordinarily from 10 to 12 feet. The navigation is difficult, but as it saves time, the route is often chosen by vessels under 100 tons burden.

Menal'len, tp. of Adams co., Pa. Pop. 1814.

Menallen, tp. of Fayette co., Pa. Pop. 1376.

Menan'der, a celebrated Greek dramatist, of whose works only fragments are extant, edited by Meineke in his *Fragmenta Comicorum Græcorum* (Berlin, 1841), but whose character as a dramatic poet is well known to us through the imitations of Terence. He was b. at Athens in 342 B. C.; lived in elegant circumstances; had Theophrastus for a teacher, Epicurus for a friend, Demetrius Phalereus for a patron; was invited by Ptolemy to his court at Alexandria, but declined to come; wrote about 100 comedies; and was drowned in 291 B. C., while swimming in the Piræus. The Athenians raised to him a monument beside that of Euripides, and placed his statue in the theatre. His plays formed the transition from the old to the new comedy—that is, with him the representation of general ideas and their political relations, with its personal satire, such as we know it from Aristophanes, ceased, and the representation of individual characters and their social relation, with its psychological signification, began, such as afterwards became the principle of modern comedy.

Menant' (Joachim), b. at Cherbourg, France, in 1820; studied law; became a magistrate of the civil tribunal at Havre, and acquired considerable celebrity as one of the earliest French decipherers of the cuneiform inscriptions of Assyria. He published, among other works, *Zoroastre* (Caen, 1844), *Receuil d'Alphabets des Écritures cunéiformes* (1860), *Éléments d'Epigraphie assyrienne* (1860; 2d ed. 1864), *Inscriptions assyriennes des Briques de Babylone* (1860), *Inscriptions de Hammourabi, roi de Babylone au XVI. siècle avant notre ère* (1863), and *Exposé des Eléments de la Grammaire assyrienne* (1868). He aided Prof. Jules Oppert in translating the *Grande Inscription de Khorsabad* (1865) and *Les Fastes de Sargon* (1863), and has published several learned essays in the *Journal* of the French Oriental Society.

Menard', county of W. Central Illinois. Area, 300 square miles. It is traversed by Sangamon River, and is bounded N. by that stream and Salt Creek. It is level, fertile, and abounds in coal. Cattle, grain, and wool are leading products. The county is traversed by the Chicago and Alton and the Springfield and North-western R. Rs. Cap. Petersburg. Pop. 11,735.

Menard, county of W. Central Texas. Area, 870 square miles. It is traversed by the Rio San Saba, along which there is a wide fertile valley. The uplands are rugged, and afford a good cattle-range. The county affords good water-power, and contains ores of silver. Cap. Menardville. Pop. 667.

Menard (René), b. in Paris, France, in 1604; entered the Society of Jesus in 1624; went to Montreal 1640; labored among the Nipissings and other Algonkin tribes, subsequently among the Cayugas and Oneidas of Central New York, 1656–60; and established the mission-station of St. Thérèse among the Ottawas on Keweenaw Bay, Lake Superior. In 1661 he set out to visit the friendly Huron Indians on Black River, and perished in an unknown manner upon the journey. His name has been given to a county in Illinois.

Menard'ville, post-v., cap. of Menard co., Tex., on the Rio San Saba, 132 miles W. N. W. of Austin.

Menash'a, post-v. and tp. of Winnebago co., Wis., on the Chicago and North-western and the Wisconsin Central R. Rs., 18 miles N. of Oshkosh, has 1 weekly newspaper, 1 national bank, and several manufactories. Pop. of v. 2484; of tp. 3107.

Menas'seh Ben Is'rael (properly Manasseh ben Joseph ben Israel), b. in Portugal about 1604; came very early with his family to Holland, fleeing from the Inquisition; settled in Amsterdam; was elected rabbi in his eighteenth year; engaged afterwards in business, as the property of the family was confiscated by the Inquisition, but

did not abandon his studies and literary pursuits. D. at Middelburg, in Zealand, Nov. 20, 1657. He wrote several books in Portuguese, Spanish, Latin, and Hebrew, but his best-known work is the *Defence of the Jews* (London, 1656), which he wrote in order to persuade Cromwell to re-admit the Jews into England.

Men'cius, the Latinized form (first brought into use by the Jesuits) of the Chinese Meng-tse, "the teacher Meng," next to Confucius the most celebrated philosopher of Chinese literature. He was b. about 370 B. C. in the state of Tsow, afterwards incorporated with the kingdom of Loo, and forming part of the present province of Shan-Tung. He lost his father very early, but his mother educated him so carefully and conscientiously that "the mother of Meng" became proverbial among the Chinese. When his studies were finished and his ideas ripened he travelled through all the petty kingdoms into which the Chinese empire was divided at that time, setting forth his views at the courts somewhat in the manner of Socrates. His success was small, however, and the last twenty years of his life he spent in retirement among his disciples and writing his books. D. about 288 B. C. He acknowledged himself a disciple of Confucius, and Chinese critics consider it one of his greatest merits that he revived the influence and authority of that philosopher. He considered man good by nature, and his vices and miseries produced, like the stunted and distorted growth of a tree, by evil influences. The great problem, then, was to return to the original goodness, to set one's heart right. In politics he emphasized the rights of the subjects so strongly in opposition to those of the sovereign that he declared it righteous for a people to kill their ruler when he injured their welfare. His works have been translated into Latin by P. Noel (Prague, 1711) and Stan. Julien (Paris, 1824); into French by Pauthier (Paris, 1851); and into English by Collie (Malacca, 1828).

Mendæans, a religious sect in Persia, called also **Nazareans, Sabæans,** and **Christians of St. John,** residing chiefly in the vicinity of Bassorah. When discovered by Catholic missionaries about 1650, they numbered above 20,000 families, but are said to have dwindled to 1500 souls. Their history is involved in great obscurity. According to their own statements, they took their rise from the preaching of John the Baptist on the banks of the Jordan, and were driven from Palestine by the Mohammedans, some going to Persia, others to India. To avoid persecution the Persian Mendæans connected themselves with the Nestorians, and were officially regarded as Christians, but they preserved their doctrines and rites, and separated from the Nestorians some centuries later. They assert Jesus to have been an impostor, and the Jehovah of the Old Testament a spurious divinity. Their doctrines have been largely tinged with Persian dualism, and they recognize a double Supreme Being, male and female; the religious history of the world consists of a struggle between the kingdoms of light and darkness. John the Baptist was the revealer of the kingdom of light through the ordinance of baptism, which they regard as the only means of obtaining salvation and the pardon of sins. They prohibit mourning for the dead and the practice of all sensual indulgence by their devotees, but tolerate polygamy, even among their priests. They preserve a kind of love-feast resembling the *agapæ* of the early Christians. They have five sacred books, four of them doctrinal, and the fifth astrological. As to the origin of the name, various opinions have been offered; the most probable seems to be that of Neander, who interprets it to signify "disciples," and concedes to them the correctness of their claim to be the present representatives of a sect which took its rise from John the Baptist. If this be the case, it must be admitted that their doctrines have undergone such changes that they would not be recognized by the founder whose name they invoke.

Menda'ña de Ney'ra (Alvaro), b. in Spain in 1541; had resided in Lima for some years when his uncle, Lope Garcia de Castro, viceroy of Peru, gave him the command of an expedition sent for purposes of discovery among the islands of the Pacific. He sailed from Callao Nov. 19, 1567, with two small ships and 125 men; met with many adventures; discovered a numerous group of islands to which he gave the name of "Solomon Islands," thereby indicating his belief that they were the source of the gold employed upon the temple of Jerusalem. He returned by way of Colima on the coast of Mexico, reached Lima in Mar., 1568, and circulated reports of the wealth of the Solomon Islands. The myth thus originated gradually took form, and twenty-seven years later a considerable expedition was formed for the colonization of the Solomon Islands, of which the command was given to Mendaña. He sailed from Callao Apr. 11, 1595, but, instead of reaching the Solomon Islands, discovered another group, which he named after the wife of the viceroy of Peru, the marchioness Mendoza, and which are still known as the "Marquesas," while the archipelago bears the name of Mendaña, its discoverer. Proceeding N. W., many other groups of islands were visited, but Mendaña d. Oct. 17. His widow, Doña Isabel, who was on board, took command of the expedition, and with the aid of the skilful navigator Fernandez de Queiros it was brought safely to Manila Feb. 11, 1596, where the "lady governor" was received by the authorities with great honors. After some time she embarked for Mexico, and is presumed to have died there. Mendaña's MS. narrative of his first expedition is in the Imperial Library at Paris.

Mende, town of France, capital of the department of Lozère, on the Lot. Its manufactures of serges are very celebrated and largely exported. Pop. 6370.

Men'delssohn (Moses), b. at Dessau, in the duchy of Anhalt, Germany, Sept. 6, 1729, of Jewish parents; studied almost from infancy with the greatest energy, but under the hardest circumstances, the Bible, the Talmud, Maimonides, and afterwards also modern literature, and became in 1750 tutor in a rich Jewish family at Berlin, and in 1754 bookkeeper in the firm. An accidental acquaintance with Lessing soon grew into an intimate friendship, and Lessing is said to have taken Mendelssohn as a model for his *Nathan*. He also associated with Nicolai, Abbt, and other literary persons, and began in 1755 to write for different periodicals. In 1763 his treatise on the *Evidence of Metaphysics* received a prize from the Academy of Berlin. In 1767 he published his *Phædon*, a dialogue on the immortality of the soul, which won a European celebrity. In 1783 appeared his *Jerusalem;* in 1785 his *Morgenstunden*, which exercised a considerable influence on his coreligionists. D. at Berlin Jan. 4, 1786. A complete edition of his works was published by his grandson at Leipsic (1843–45). At one time he occupied a prominent place in German literature as a philosopher, but it was before the time of Kant. The later development of German philosophy has rendered entirely antiquated both his ideas and his method. The most interesting of his works are his controversies with Lavater, who wished to convert him to Christianity, and Jacobi, who accused Lessing of being a Spinozist.

Mendelssohn-Bartholdy (Felix), b. at Hamburg Feb. 5, 1809. His father, a wealthy Israelite, was a man of extensive learning and refined taste, and his mother was equally cultivated, being one of the brightest women in the best society of Berlin. He very early showed great talent for music under the instruction of his mother and of Madame Bigot; became the pupil of the romantic Berger for the piano, and of the severe Zelter for harmony; at eight years of age could read any music at sight, and write correct harmony. Although he had not the time to practise a great deal, yet such were the flexibility of his hands and the quickness of his musical faculty that he played perfectly the most difficult music. For his improvement and the entertainment of their guests Mendelssohn's father hired for the boy a small orchestra, which he led with skill and great zeal at the home musical evenings. Aided by his talented sister Fanny, he often produced his own compositions before the large circle of artists and scholars frequenting his home; he thus became the musical prodigy and the bright centre of their friendly interest. Up to 1826 his compositions showed less of the spontaneousness of genius than of skill in scholastic forms, which were the natural expression of a sensitive and not very self-asserting nature while under the dominion of the scientific Zelter. But in that year, writing his *Midsummer Night's Dream*, he left the class-room, and revealed the leading quality of his originality, the graceful vivacity of his fancy. In 1829 he left Berlin to travel through Scotland, England, Germany, Italy, and France. In 1833 he was made musical director of the city of Düsseldorf. This office he kept but two years, and then moved to Leipsic, where he lived till his death, excepting during short periods of time—once to go to Berlin as director of music to the king of Prussia, and occasionally to visit England and various German cities to conduct performances of his works. By his strong personal influence, his intelligent direction of the concerts of the Gewandhaus, and the establishment of the conservatory, he made Leipsic the leading city of Germany for pure music. In recognition of his services the university conferred on him the degree of doctor of philosophy and of fine arts, and in 1836 the king of Saxony made him his honorary kapellmeister. In 1837 he married Cecile Jean Renaud of Frankfort, whose grace, intelligence, and devotion were the happiness of the remaining ten short, busy years of his life. His continuous, laborious activity so much exhausted his sensitive organization that the death of his beloved sister Fanny (in 1847) was a blow from which he could not rally. A few months afterwards he d. of apoplexy (Nov. 4, 1847).

His leading characteristic was extraordinary sensibility, but his nature united also strong affections and a keen intellect, great energy, and mirth that was even frolicsome. One of his strongest traits was his unflagging pursuit of perfection; in every detail of every work he strove to express his best thought in the best form. He was too excitable and exacting to be a perfect conductor for the somewhat dull and stubborn players given him in England and Berlin. But in Leipsic, where enthusiasm and intelligence united in the cause, his power seems to have been little short of magical in rousing his men and leading them to the heights of his conceptions. As a pianist he was one of the greatest of an age that counted such artists as Liszt, Madame Schumann, and Chopin. His execution was a rare union of fire, delicacy, and purity. Among his best-known works may be mentioned the oratorio *Elijah*, which is more popular in England than any other oratorio excepting Handel's *Messiah;* the oratorio *St. Paul*, in which are happily united the grandeur of the ancient masters and the resources of modern art; the 42d Psalm; the *Midsummer Night's Dream*, a composition of extraordinary sprightliness and grace, probably the most striking work of its kind in the world; the concerto for the violin; the first concerto for the piano; the third symphony (in A minor); and the overture *Fingal's Cave*. His chamber-music, *Songs without Words* for the piano, and his vocal quartets and songs are among the purest and most charming contributions to the art. He seems to have had no dramatic power, or else that side of his genius was undeveloped, for his efforts in opera are failures.

His works are a worthy culmination of the art and science of his predecessors. They are the latest master-works of the pure classic school, and just precede the rise of the "music of the future" under the leadership of Wagner. In them are perfectly exquisite details, harmonious proportions, perfection of finish, and the refined, elevated taste to be expected of the perfect scholar.

C. H. FARNHAM.

Men'denhall's, tp. of Newberry co., S. C. Pop. 1675.

Men'des Le'al (JOSÉ DA SILVA), b. at Lisbon, Portugal, Oct. 22, 1820; became at an early age distinguished as a lyric and dramatic poet, and also as a liberal politician. He became in 1845 a member of the Academy, in 1850 librarian of the royal library, and on the death of Viscount Santarem was entrusted with the continuation of his great work on cosmography. His *Poems* were collected in 1858, and have enjoyed a popularity not exceeded by that of any Portuguese author of the time. He has written much on political subjects and on literary topics, and is author of several romances and historical essays.

Men'dez-Pin'to (FERNAM), b. at Montemor-o-Velho, near Coimbra, Portugal, about 1510, of poor parents; after various adventures in Europe he set out for the East Indies, and arrived in 1537 at Diu, on the W. coast of India. His adventures lasted many years, and were narrated by him in a book published after his death, in which he states that he had spent twenty-one years in the East, had been thirteen times taken prisoner by the enemy, and seventeen times sold as a slave. His captivities had carried him from Egypt, Abyssinia, and Arabia through Persia, India, Burmah, Malacca, Siam, Java, the Loo Choo Islands, Japan, China, and Tartary. Mendez-Pinto made four visits to Japan, one of which was in company with St. Francis Xavier, through whose influence he entered the order of Jesuits at Goa, devoting the large fortune he had acquired to the establishment of a seminary in Japan. Obtaining a release from his vows, he returned to Portugal in 1558 with letters of commendation from the viceroy at Goa. He resided at court several years, and d. at Almada, near Lisbon, July 8, 1583. His book, *Peregrinação de Fernam Mendez-Pinto*, was first printed in 1614, when it immediately became a favorite, and is now ranked among the Portuguese classics. It was translated into the principal languages of Europe, and was much read.

Mend'ham, post-v. and tp. of Morris co., N. J., 7 miles W. of Morristown. Pop. 1573.

Men'dicant Orders and **Mendicants** [Lat. *mendicare*, to "beg"], persons who beg alms. Persons of this class have existed in all times since the fabled golden age. It is remarkable how few references to mendicants occur in the Bible. Homer has left us a fine picture of the bold beggarman of classical times in Irus, who is drubbed by Ulysses when the hero comes home disguised. Irus surpassed the other beggars of Ithaca in his unbounded stomach, was ever craving for meat and drink, and seems to have been sent hither and thither on messages. Juvenal speaks of the beggars of Aricia who ran beside the chariots and blew fawning kisses as they descended the hill. There are many allusions to this place as a haunt of mendicants. Martial wishes that the slanderous poet may wander from town to town, outcast on bridge and hill, begging for the scraps of spoilt bread that had been reserved for the dogs. Apuleius has left a vivid picture of the rogueries of the begging priests of the Syrian goddess—their public flagellations and ecstasies and their private gluttony and vice. This serves to remind us of the curious fact that begging has often been considered as a religious duty. The fakirs of India can claim a very remote antiquity. In that land beggary and saintliness were almost synonymous. This facile method of gaining a living may have attracted to the profession many not remarkable for piety. At the same time, it must be remembered that if in the East mendicant saints are in very small danger of starvation, the austerities and self-tortures common amongst them are not likely to attract any but the fanatical. These celibates, devoted to religious meditation and repentance, are clothed in filth, and may not even ask for their daily bread, the only petition allowed being to carry the open box into which free-will offerings may be thrown. The monstrous cruelties they inflict upon themselves sometimes end in lunacy, even when they are not prompted by a diseased brain. They number about 3,000,000 at the present time. Some of them live for years in constrained and painful positions; others inflict wounds upon their bodies or expose themselves to the rays of the burning sun. The central idea is that of conquering human feelings, emotions, loves, and hopes, and becoming absorbed in the contemplation of spiritual truth. No doubt a fearful amount of suffering is thus caused, and a fearful amount of hypocrisy engendered. In Booddhism clerical poverty is a leading rule. Every follower of Booddha who aspires to the priesthood must imitate the founder of the religion, who clothed himself in rags, renounced riches and power and family ties, and lived upon unasked alms.

In Christendom the literal acceptation of some of the gospel precepts led to the development of the monastic spirit. Sometimes in individual seclusion, as in the case of the hermits and pillar-saints, and sometimes in organized communities of men and women, the doctrines of personal poverty and celibacy were wrought out with more or less of consistency and success. In the thirteenth century came the mendicant orders. St. Francis of Assisi, the founder of the Frati Minores, forbade the possession of property, not merely to the individual members, but to the brotherhood also as a body; in this deviating from monasticism. The progress of the Franciscans was of an astonishing character. Over 100,000 of them are said to have perished whilst attending to the sick when the "black death" was sweeping over Europe. The interpretation of the rigid vow of poverty led to disputes which occasioned some offshoots from the main body. The success of the order also led to imitation. At one time the mendicant orders were so numerous that the general Council of Lyons (in 1274) limited them to the four orders of Dominicans, Franciscans, Carmelites, and Augustinian friars. The mendicant friars had access to every class of society, and as they went from place to place preaching and instructing the people, the orders became powerful corporations, and their members sometimes exercised great influence in temporal affairs, enjoying offices not always according with the simplicity of their rule.

Begging was by no means an exclusively clerical profession in the Middle Ages. Perhaps, indeed, in some cases, the success of the mendicant orders would induce imitation by those who could not plead any religious motive, but were merely seeking an easy mode of obtaining daily food. To the suggestions of idleness would be added the charm of variety and the pleasure of seeing the world. Some curious documents have been preserved which serve to show how numerous were the branches of the begging profession in the "good old times." About 1509 was written the *Liber Vagatorum*, of which the first edition was printed at Augsburg about 1512–14. This book commended itself to Luther, who wrote a preface to the edition issued in 1528. He had himself been imposed upon by some of these tramps. Amongst those named are the honest paupers who cannot obtain work: the bread-gatherers; the liberated prisoners who carried chains, and professed to have been captives amongst the infidels; the cripples (one is mentioned who obtained the leg of a dead thief, which he put on and tied his own leg up); knaves with the falling sickness, some of whom, by means of soap, made themselves foam at the mouth; blind rogues, some of whom, with bloody cotton tied over their eyes, pretended to have had their eyesight destroyed by robbers; women who lay outside churches covered with a sheet, and asserted that they had recently been delivered and that the babe was dead, or that they had given birth to a monster (at Strasbourg one of these *dütz betterins* was found to be a man); vagrants who said they were of noble birth and had suffered by war, etc.; pretended merchants who asserted they

had been robbed of their goods; women who said they were baptized Jewesses. After this classification various curious particulars are given of other varieties—treasure-seekers, travelling quack doctors, card-sharpers, tinkers, and roguish peddlers. The little book ends with a canting vocabulary. There is a vivid description of the mendicants who swarmed in England in the sixteenth century in Thomas Horman's *Caueat, or Warning for Common Cursetors,* published about 1567. This work was preceded by *The Fraternitye of Vacabondes,* written and printed by John Awdeley in 1560, and the subject being popular was succeeded by many others. (See introduction to the reprint of Awdeley and Horman in the Early English Text Society's extra series.)

There would seem to be very little essential variation in the fashion of roguery, for many of the tricks recorded of these early mendicants are still practised by the beggars of to-day. In the Roxburghe collection there is a spirited ballad which confirms the details given by Horman. The "cunning Northerne beggar" would not change his rags for rich preferments, and acts many parts, being a poor old soldier, a sailor in old canvas clothing, a one-legged cripple, a mass of festering flesh infected with the falling sickness, and a burnt-out countryman. W. E. A. Axon.

Mendic′ity [Lat. *mendicare,* "to beg"] is that condition of pauperism in which the poor make a business of begging alms and become mendicants by profession. It has become a more permanent condition in Roman Catholic than in Protestant countries, partly because the latter have more frequently a "poor law," and partly because it is held a religious duty in the former to give alms directly to the poor, while under the modern system more thought is given to removing the causes of poverty. Yet all countries have seen the evils of mendicity, and have sought to remove them by legislation. A begging population will of necessity be more or less a criminal and thievish one: it has no ties of home, and few of family; social opinion does not reach it; it seeks to live in violation of the great law that man shall earn his bread by labor. Its habit is dependence, without any of the good effects of personal relations to a superior. The mendicants under modern habits of life become the most worthless and debased of any members of "the dangerous classes." Legislation has been almost useless against this evil.

French Mendicancy.—In the history of France we find as far back as 1351 an ordinance of King John commanding all lazy persons, *truands,* and able-bodied beggars to go to some species of labor or to leave Paris in three days, under penalty of imprisonment for the first violation of the law, of pillory for the second, and of branding with red-hot iron and banishment for the third. Again, in 1413 an important act was passed requiring able-bodied beggars to be forced to labor, under strict penalties. Under Francis I. these penalties were removed, and an ordinance of 1545 compelled the authorities to employ mendicants by force on the public works of Paris. All these severe laws did not, however, check the growth of mendicity; and, gradually discovering the failure of over-strict legislation, the French authorities in the seventeenth century made trial of more humane methods of repression. In 1627 the law required beggars to be forced into the service of commercial companies or into the French naval service and to embark for the Indies. At the same time there were ordered to be founded in the different provinces "hospital workshops" or workhouses, which were the beginnings of the present French system of "dépôts of mendicity." Still, the evil steadily increased with the nation's growth. Again, in 1688, an ordinance was passed expelling every pauper and beggar from Paris, under penalty of being sent to the galleys. Nothing, however, seemed to check mendicity in France, till in 1698 it was calculated that one-tenth of the whole population of the country was reduced to beggary. In the eighteenth century, however, the great progress of manufacturing industry and of commerce reduced the evil. Still, in 1790 a decree was passed ordering the opening of workshops for able-bodied beggars. The poor who were impotent or sickly were to be sent to the hospitals, and those strangers to the kingdom were to be forwarded to the frontier. Another law organized workhouses and almshouses for ordinary beggars, while those were sentenced to transportation who persisted in begging after their punishment or who committed other offences. Under the Empire the humane principle seems to have been recognized in legislation that before punishing mendicity as an offence work must be offered as an assistance. A decree of 1808 ordered that a workhouse or "dépôt of mendicity" be established in every department. In four years 80 of these were founded. Many complaints against them, however, arose on account of their large expenditures and their industrial competition with non-pauper laborers. It had been hoped that these establishments would in process of time nearly support themselves by the labor of the inmates, but this proved illusory, and these houses gradually became refuges of incurables. Under the Restoration they were nearly all suppressed, and at the present time (1874) but few "dépôts of mendicity" remain in France. By the law of 1838 the departments were relieved from the legal obligation of repressing mendicity by special establishment. There was no legal obligation placed on the tribunals to repress mendicity by penalties. Several workshops were substituted under the Restoration for the dépôts, and some provinces founded houses of refuge for beggars, but none of these succeeded. Thus, during five centuries every species of penalty and punishment has been tried in vain in France to repress mendicity. Humane legislation has been equally a failure; and the sum of all experience in that country is that all legal means fail to reach this great evil.

English Mendicancy.—From the earliest periods begging has been held as an offence by the English laws. The laws of Henry VII. required beggars not able to work to return to the hundred where last they dwelt. The distinction, however, was very early recognized between the impotent poor and able-bodied beggars. In 1531 the law required that an able-bodied beggar must be whipped and returned to the place where he was born. This law and others similar had no effect in diminishing the evil, of the progress of which a more full account will be given under Pauperism. The failure of severe legislation undoubtedly led to the formation of the poor laws of England. The principle recognized in this legislation is that begging is to be repressed, and no excuse is to be taken from the beggar for this mode of life. The unfortunate poor are to be provided for, but those accepting charity are to work for it. The 27th Hen. VIII. enacts that land-officers of every parish shall receive the poor and the vagabonds who may come there, and shall support them by voluntary alms, so that none shall be compelled to beg openly; and that the parish authorities shall force "the said valiant beggars" to be kept to continual labor, so that they may earn their own living. Almsgiving on the streets or at doors is forbidden, on forfeit of ten times the amount given. A "sturdy beggar" is to be whipped for the first offence, for the second his right ear is to be cropped, and for the third he is to be sent to jail, and, if convicted, he shall suffer death as a felon. As in France, legislation grew gradually milder against the evil from the experience gained that severe penalties did not diminish it. Still, even in Elizabeth's reign an act (14th) sentenced all persons convicted of begging and defined as "sturdy beggars" for the first offence to be whipped or branded with hot iron, for the second to be deemed felons, and for the third to suffer death. Licenses, however, were now permitted for beggars on condition that they begged only in their own parish and for food alone, and in the manner directed by the church-wardens and overseers. In the time of Charles II. the more modern condition of settled pauperism had begun to take the place of mendicant vagrancy. The poor law of Elizabeth (see Pauperism) did succeed in largely diminishing mendicancy during 150 years, but before the great reform in 1834 it had again appeared in alarming proportions. It has again been diminished by the slow working of the new legislation and by more general causes. In fact, the conclusion of all European experience is that nothing can permanently affect the evil of mendicity but a general diffusion of prosperity, morality, and intelligence. Whatever tends to the equal distribution of wealth, to the elevation and improvement of the working-classes, to the increase of the self-respect and the comfort of the workingman—whatever cheapens food and spreads education—whatever in political privilege or religious hope adds to the dignity of the laborer—in so far diminishes the tendency to mendicity.

Mendicity in the U. S.—There is, in fact, no good ground in the U. S. for any class of persons resorting to mendicancy for a livelihood. So great is the demand for labor that even children's earnings in street-trades in the large cities amount to a considerable sum per diem. Chance-work in all towns and villages is well paid, and a small sum in the spring would put every laborer's family in the Western districts, where they would be sure of good wages and cheap land. Still, with all this, there is a certain proportion of idle and dissolute persons in every American community who prefer the vagabond and restless life of a mendicant to steady labor. These persons have frequently no settled home, but migrate to the country from the cities in the spring, living on mendicancy, thieving, and chance-work, and then drift back at the approach of winter to enjoy the city charities during that season. The great proportion of these persons are able-bodied and of foreign descent. They are, however, not found to any large extent in the Western States. Their number in the State of Massachusetts alone is estimated at 25,000 each year. By the laws of that State, if vagrants under the

meaning of the act, they may be committed by magistrates to the house of correction or to a workhouse for a term not exceeding six months, and constables are authorized to arrest them without warrant, to take them before such magistrates, and then make proper complaint. There are also methods of obtaining a longer period of commitment to the State workhouse. Such, however, is the extreme humanity of the Massachusetts law that some towns send the tramps to a hotel, and pay for meals and lodging for a night! According to the New York law, a vagrant may be committed to the poorhouse, there to be kept to hard labor for any time not exceeding six months, or, if he be a hardened offender, to the common jail for a term not exceeding sixty days, there to be kept, if the justice think proper, on bread and water for a time not exceeding one-half the time of his commitment. Children found begging may be sent to the poorhouse or to some appropriate institution, there to be instructed in useful labor. All the Eastern States suffer under the evil of mendicancy or vagrancy, and have passed similar laws to reform it. What, however, is most needed in American legislation is the establishment of State workhouses, where able-bodied tramps and beggars should be sent from the country poorhouses, and compelled to work out their own support during a period of not less than six months. Shorter sentences make it impossible to establish any remunerative farm or industrial work.

What the mendicant most dreads is labor and detention. If he found that he would incur the risk of both these in our villages and towns, he would abandon begging for industrious labor. As population increases, however, there will be a necessity for a system of connection by passes or tickets for the different county poorhouses, so that a vagrant may receive the necessary alms, but be kept under supervision and forced to move to his destination. The difficult subject of "settlement" has met with different treatment in different States. In regard to the statistics of mendicancy, it should be remembered that they are everywhere exceedingly untrustworthy, as in general the same beggar or vagrant is re-counted in every almshouse or police-station which receives him, or at every fresh sentence of the magistrate who commits him. De Watteville (an excellent authority) makes the proportion of mendicants in France 1 to 104. In certain departments, as Bordeaux, Nantes, Rouen, Strasbourg, no beggars are registered; in Marseilles the proportion is 1 to 1429; in Paris, 1 to 397; in the department Du Nord, 1 to 62. According to E. Villeneuve, the proportions are as follows: 1 beggar in 117 in England; 1 in 200 in Germany; 1 in 200 in Austria; 1 in 250 in Denmark; 1 in 154 in Spain; 1 in 166 in France; 1 in 126 in Italy; 1 in 102 in the Low Countries; 1 in 121 in Portugal; 1 in 202 in Prussia; 1 in 1000 in Russia; 1 in 243 in Sweden; 1 in 150 in Switzerland; 1 in 666 in Turkey (in Europe). The tramps on a given night in England have been returned as amounting in 1867 to 33,191, which would make a proportion of about 1 in 666. CHARLES L. BRACE.

Mendizabal′ (JUAN ALVAREZ Y), b. in Cadiz, Spain, 1790, son of a Jewish tradesman named Mendez; was employed in the commissariat of the French army of invasion 1808–13; was afterwards engaged in a banking-house in Madrid; took part in 1819, with Alcalá Galiano and Isturiz, in the conspiracy for the restoration of the constitution of 1812; rendered important services in procuring funds for the revolutionary army 1820; aided the constitutional minister, Canga-Arguelles, in negotiating loans. In 1823, on the re-establishment of absolute government, Mendizabal fled to England, where he was for some time imprisoned at the instance of some capitalists who had lost money by investing in Spanish securities. He afterwards established in London a successful mercantile house; negotiated a loan for Dom Pedro I., the ex-emperor of Brazil (1827), and effected other operations in favor of the Spanish government which were considered to display great financial abilities. He was in consequence appointed minister of finance in June, 1835; negotiated a fresh loan in August before setting out from London. Received with great honor in Madrid, he became president of the cabinet Sept. 14, promised to finish the Carlist insurrection in six months, and was granted all his demands by the Cortes; but being unsuccessful in realizing his expectations, he retired from his post in May, 1836. He was again in office from Sept., 1836, to Aug., 1837, was for several years deputy for Madrid in the Cortes, again became minister of finance under Espartero in 1841, was obliged to escape to Portugal on the fall of the latter in July, 1843, and afterwards lived in great splendor in London and Paris. He returned to Spain in 1848, and d. at Madrid Nov. 3, 1853. His statue has been erected in that capital.

Mendoci′no, county of N. W. California, extending W. from the main Coast Range to the Pacific Ocean. Area, 3125 square miles. There is a lower range of coast mountains W. of the main range. The valleys are fertile and well watered. Cattle and wool raising are leading industries. The W. part abounds in dense forests of redwood, pine, etc., which afford great quantities of lumber. Cap. Ukiah. Pop. 7545.

Mendocino, tp. of Sonoma co., Cal. Pop. 2690.

Mendocino City, post-v. of Mendocino co., Cal., 125 miles N. of San Francisco. It is a seaport town, has good harbor facilities, several churches, 1 bank, 1 newspaper, Odd Fellows and Masonic lodges, several hotels, 1 large saw-mill, and the usual number of stores and shops. Principal business, lumbering. Pop. about 800.

GALVIN & PIKE, PUBS. "WEST COAST STAR."

Men′don, post-v. and tp. of Adams co., Ill., on the Chicago Burlington and Quincy R. R. Pop. of v. 501; of tp. 1796.

Mendon, tp. of Clayton co., Ia. Pop. 2029.

Mendon, post-tp. of Worcester co., Mass., 34 miles S. W. of Boston. It has 2 churches and a high school. Agriculture is the chief pursuit. Pop. 1175.

Mendon, post-v. and tp. of St. Joseph co., Mich., on the Grand Rapids and Indiana R. R., 21 miles S. S. E. of Kalamazoo, and on the St. Joseph River, which furnishes water-power. It has manufacturing and commercial interests of importance. Pop. 660; of tp. 1908.

Mendon, tp. of Monroe co., N. Y., traversed by the Canandaigua and Niagara Bridge division of the New York Central R. R. It contains HONEOYE FALLS (which see). The post-v. of Mendon has some manufactures. The township contains 9 churches. Pop. 2900.

Mendon, post-v. of Union tp., Mercer co., O., on St. Mary's River. Pop. 164.

Mendon, post-tp. of Rutland co., Vt., 4 miles N. E. of Rutland. Pop. 612.

Mendo′ta, post-v. and tp. of La Salle co., Ill., at the junction of the Chicago Burlington and Quincy and the Illinois Central R. Rs., has 2 graded public schools, 2 churches, a public library, 2 banks, 1 iron-foundry, an organ manufactory, 1 weekly newspaper, and a number of stores. Pop. of v. 3546; of tp. exclusive of v. 1043.

RUGGLES & FORD, PUBS. "BULLETIN."

Mendota, post-v. of Dakota co., Minn., at the confluence of the Mississippi and Minnesota rivers, on the E. shore of the latter, opposite Fort Snelling, and at the junction of the Milwaukee and St. Paul and the St. Paul and Sioux City R. Rs. Pop. of tp. 444.

Mendo′za, province of the Argentine Republic, on the eastern slope of the Andes, between lat. 32° and 34° S. and lon. 67° and 70° W. Area, 25,632 square miles. Pop. 65,413, mostly mestizoes, descending from Spaniards and Indians of the Guapes tribe. Agriculture is the main occupation; corn, wine, and fruits are produced. The soil is fertile, but rain is rare, and artificial irrigation is necessary. The province was almost treeless when the Lombardy poplar was successfully introduced.

Mendoza, town of the Argentine Republic, and the capital of the province of Mendoza, is on an elevation of 2891 feet above the sea. It was a thriving and even prosperous town, with 15,000 inhabitants, when in 1861 it was totally destroyed by an earthquake; nine-tenths of its inhabitants perished. The rebuilding of the town on its old site speedily began, and it has already 6000 inhabitants.

Mendoza (ANTONIO), b. in Spain about 1590; became secretary of state under Philip IV.; and was author of poems and dramas which were much admired in the literary circles at court. D. in 1644. Near fifty years afterwards his works were edited by the archbishop of Lisbon under the title *El Fenix Castellano, D. Antonio de Mendoza renascido* (Lisbon, 1690). A second edition appeared at Madrid in 1728.

Mendoza, de (ANTONIO), Conde de Tendilla, Spanish statesman and first viceroy (from 1535 to 1550) of Mexico or New Spain. Chamberlain and high in the consideration of Charles V., he was chosen to inaugurate the viceregal system in Mexico, all the more difficult at the time from the presence there of Cortez. His administration was marked by the highest order of statecraft. Considerate for the rights and well-being of the natives, founding schools for their instruction, he brought them into remarkable assimilation with European political and religious ideas. He founded cities and public institutions, including a mint, and greatly extended Spanish settlements, promoted agriculture, introduced the printing-press as early as 1536, and developed the mineral wealth of the land. A grave, obstinate Indian revolt in Guadalajara he repressed with the aid of Indian allies, but so tempered his rigorous course with justice and moderation as in a short time to obliterate

hostility and discontent. It is estimated that in 1548 as many as 800,000 of the natives perished with a mortal fever which swept over Mexico. In 1543 he despatched a party of exploration to the Pacific coast, which discovered Cape Mendocino, named in his honor, with other points in California. During his administration the exportation of silver to Spain exceeded $22,500,000, exclusive of the very considerable quantity smuggled. Affairs in Peru having fallen into disorder, Charles V. transferred Mendoza to that viceroyalty in 1550, as essential for the restoration of good government. THOMAS JORDAN.

Mendoza, de (DIEGO HURTADO), b. at Granada about 1503; studied at Salamanca, and was employed by Charles V. in many important diplomatic missions to Venice, the pope, the Council of Trent, etc., and as governor-general of Siena, but made himself hated by his haughty manners and cruel proceedings. Philip II. banished him from the court on account of a quarrel with one of his rivals, and he d. at Valladolid in 1575. Although very successful in his undertakings as a statesman, his fame rests chiefly on his literary merits. His poems (only collected edition, Madrid, 1610) did not make a lasting impression. But his comical romance, *Vida de Lazarillo de Tormes* (1554), first condemned by the Inquisition, formed a new literary species, much admired, and imitated not only in Spain, but in all Europe; and his historical work, *Guerra de Granada*, which could not be published entire until 1776, is considered a masterpiece. His library, which contained many manuscripts of great value, is now at the Escurial.

Mendoza, de (IÑIGO LOPEZ). See SANTILLANA, MARQUIS OF.

Mendoza, de (JUAN GONZALES), b. at Toledo, Spain, about 1540; belonged to a wealthy and distinguished family; had been for some years an officer in the army when he entered the order of St. Augustine, and was sent by Philip II. to China in 1580 to obtain information about the politics, commerce, manners, and customs of that country. Father Mendoza spent three years in China, and remained two years in Mexico on his return. He published a valuable account of his observations in China in a work entitled *Historia de las Cosas mas Notables Ritos y Costumbres del Gran Reyno de la China* (Madrid, 1586). An English translation was published in 1588, and reprinted by the Hakluyt Society (2 vols., 1853–54). Father Mendoza was successively bishop of the Lipari Islands, vicar-apostolic of Mexico (1607), bishop of Chiapas and of Popayan, New Granada, where he d. in 1617. His great work contains an important account of early missionary explorations in New Mexico.

Mendoza, de (LORENZO SUAREZ), of the same family with the first and noblest of the viceroys of New Spain; was the fifth viceroy, and exercised power from Oct., 1580, to June, 1583, when he d. He established the Royal Tribunal of Commerce of Vera Cruz (1581), subsequently so important a feature in Spanish colonial administration. During his administration the coinage amounted to $9,000,000. His title was that of count de Coruña. THOMAS JORDAN.

Mendoza, de (PEDRO), b. in Spain about 1487; filled a high office at the court of Charles V. in 1535, when he proposed to undertake the discovery, conquest, and settlement of the southern portions of South America; was appointed adelantado, alcalde mayor, and alguazil mayor of the region in question, and agreed to transport thither a large and well-equipped colony. He sailed from San Lucas de Barrameda in Apr., 1535, with twelve ships and 800 men; touched at the Bay of Rio de Janeiro, where the vice-admiral, Osorio, was murdered by his own officers; ascended the Rio de la Plata as far as the island of San Gabriel; founded the city of Buenos Ayres, but lost a great part of the colonists in a war with the Querandi Indians, who attacked and burned the settlement. Mendoza sent his brother, Gonzalo, to Paraguay, where he founded the city of Asuncion Aug. 15, 1536; and another brother, Diego, was his general in the wars with the Indians. The adelantado embarked for Europe after a long series of misfortunes, was reduced to famine on the voyage, became a lunatic, and d. at sea in 1537.

Menees (THOMAS), b. in Davidson co., Tenn., June 26, 1823. He graduated in medicine in Transylvania University, Lexington, Ky., in 1846; returned to Springfield, and practised there until 1857, when he was elected to the State senate; then resumed his practice in Springfield. He was elected in 1861 to the Confederate Congress, and re-elected in 1863. In 1865 he went to Nashville. He was in 1873 elected professor of materia medica and therapeutics in the medical department of the University of Nashville; after filling that chair for one term he was transferred to the chair of obstetrics, which he still occupies. In 1874 he was elected to the chair of obstetrics in the medical department of Vanderbilt University, and dean of the faculty, and before the Tennessee State Medical Society presented an able paper on hour-glass contraction of the uterus. PAUL F. EVE.

Menela'us, king of Lacedæmon, son of Atreus and brother of Agamemnon, was the husband of Helen, and became thereby one of the most conspicuous figures in the Trojan war and the verses of Homer.

Menen'dez de Aviles, b. at Aviles, Spain, in 1519, of a noble Asturian family; took service in the Spanish navy, and was for many years a daring and successful cruiser on his own account, under royal commission, against Moorish and other pirates, but more especially against the French during the long wars of Charles V. with that nation. He attained the rank of captain-general; commanded the fleet which carried Philip II. to England 1554, of that which brought to Flanders the money and reinforcements which enabled Philip to win the battle of St. Quentin (1557), and of that which brought back the king and court to Spain in 1559. He went several times to the West Indies, where he amassed great wealth, and served twice as "general" of the annual India fleet. On returning to Spain (July, 1560) he was imprisoned and fined for alleged misconduct, but his great abilities enabled him to regain the favor of the court, and in 1565 Philip made him adelantado of Florida, and entrusted him with perhaps the best-appointed fleet sent to the Indies in that century. The news of a French colony having been planted in Florida was a powerful incentive, and Menendez sailed from Cadiz June 29, 1565, with thirty-four vessels, carrying 2646 colonists, while about the same time several vessels sailed for Florida from other Spanish ports. Touching at Puerto Rico in August, Menendez proceeded to Florida; went first in quest of the French on St. John's River; announced to the commander his intention of exterminating the colony; discovered the bay and river, which he called St. Augustine, and established on its bank (Sept. 8) the town of the same name, the oldest now existing in the U. S. The French fleet, commanded by Ribault, soon appeared in the Bay of St. Augustine with the intention of attacking the Spanish settlement, but it was driven off by a storm, and Menendez profited by the circumstance to march a force overland, with which at daybreak (Sept. 21) he surprised and massacred the French garrison at Fort Caroline. Only about seventy persons were spared, but Laudonnière with a few others escaped in boats and reached the French fleet. Menendez left a garrison in the fort, changing its name to San Mateo, and returned to St. Augustine. Ribault was soon afterwards wrecked on the coast, and having surrendered to Menendez, most of the French were put to death, in violation, as is alleged, of a formal promise of mercy. The fort of Santa Lucia was built at Cape Cañaveral, that of Santa Elena in what is now Port Royal harbor, S. C., and the next year Menendez pushed his explorations northward as far as Chesapeake Bay, called by him Santa Maria, after which he returned to Spain. During his absence Dominique de Gourgues, a French adventurer, captured Fort San Mateo, and massacred its garrison. Menendez sent in 1570 a colony of Jesuits to begin a mission on the Rappahannock River, but they were soon cut off by the Indians. In 1572 he sailed up the Potomac, avenged the destruction of his colony, and proceeded to make a careful exploration of the coasts of the Chesapeake. Two years later he was summoned to Spain, and appointed to the command of a squadron to be sent against the revolted Netherlands, but before setting sail he d. at Santander Sept. 17, 1574. PORTER C. BLISS.

Menes. See EGYPT.

Men'fi, town of Sicily, in the province of Girgenti, about 3½ miles from the sea-shore. Pop. in 1874, 9542.

Mengs (ANTON RAFAEL), b. at Aussig, Bohemia, Mar. 12, 1728; was educated, or rather trained, to be a painter by his father; lived alternately in Dresden, where he was court-painter to Augustus III., in Rome, and at the court of Charles III. of Spain, and d. at Rome June 29, 1779. His pictures, the products of a fine taste and great care, enjoyed high reputation in their time, but his art-criticisms, written in Italian, published at Parma in 1780, and translated into most European languages, are considered more interesting.

Menha'den, Moss-Bunker, or **Bony Fish,** the *Brevoortia menhaden*, a fish of the herring family, extensively caught along the Atlantic coast. It is full of small bones, and is almost uneatable in the regular way, but for some years it has been the subject of an extensive and growing industry. The fish are put up as sardines. They are decapitated, the tail cut off, and otherwise trimmed, and by being subjected to steam the bones are softened; they are then put in cotton-seed or other oil. They have been long caught for their oil, which is abundant and is

used in leather-dressing, rope-making, and for adulterating higher-priced oils. The refuse, called fish-guano, is a valuable fertilizer. The business of making this oil and guano is extensively carried on along the coasts of New England, Long Island, and New Jersey.

Menifee, county of N. E. Kentucky. Area, 200 square miles. It is a broken, hilly region, drained by affluents of the Licking and Kentucky rivers. Indian corn is the leading product. Cap. Frenchburg. Pop. 1986.

Menin', town of Belgium, in the province of West Flanders, on the Lys. It has some breweries and manufactures of lace and tobacco. Pop. 9752.

Menin'ges [Gr. μῆνιγξ, "membrane"], in anatomy, the three membranes enveloping the brain and spinal cord, called *dura mater*, *pia mater*, and the arachnoid membrane. Each is described under its alphabetical head.

Meningi'tis [Lat. *meninges*, "membrane," and *-itis*, an affix denoting "inflammation"], inflammation of the membranes which envelop the brain and spinal cord, termed cerebral, spinal, and cerebro-spinal meningitis according as the inflammatory process is limited to the region of the cerebrum or brain, the region of the cord, or involves the investments of both. Acute cerebral meningitis results from injuries of the head, as fractures and diseases of the cranial bones, inflammation and suppuration of the middle and internal ear, from excessive mental labor, from perverted states of the blood, as in typhus fever and acute rheumatism. Sub-acute or secondary meningitis, of less intensity, occurs in many of the febrile diseases. The tubercular meningitis of children is the result of mal-nutrition of the blood or of actual tubercle of the brain. Spinal meningitis most often follows injury or disease of the vertebræ, less frequently is excited by rheumatic, gouty, and tubercular blood states. It may occur, as among soldiers in the field, from exposure in sleeping on the ground. Cerebro-spinal meningitis is usually epidemic, and is but one manifestation of a malignant febrile disease, the cerebro-spinal or spotted fever. In cerebral meningitis there are intense headache, active delirium, contracted pupil, flushed face, a tense, bounding pulse, sometimes convulsions, coma, paralysis, and death, due to exudation of inflammatory products upon the surface or within the ventricles of the brain. Chronic meningitis may be the cause of chronic headache, of epilepsy, idiocy, and insanity. In tubercular meningitis of children delirium is absent, but the pain in the head is lancinating and intense, causing the utterance of shrill cries, constant motion of the head, sleeplessness, and peevishness. There are automatic movements of the extremities, and convulsions. General emaciation coexists, as this is a disease of delicate and bottle-fed infants or of children tainted with scrofula or tuberculosis. In spinal meningitis movement of the body develops intense pain over the length of the spine and in the extremities, and an incurvation or rigid arching of the back. Epidemic cerebro-spinal meningitis has, in addition to meningeal symptoms, febrile disturbance, great debility, and a peculiar purple eruption. Acute meningitis is treated locally by cold applications and counter-irritants, internally by remedies reducing the action of the heart. In secondary meningitis we treat the primary disease, the exciting cause. Tubercular meningitis requires improved hygiene, diet, tonics, and alteratives. Cerebro-spinal meningitis requires nourishing diet, tonics, and stimulants to resist the degenerated blood state, and opium is pre-eminent in curative effects. E. DARWIN HUDSON, JR.

Menisperma'ceæ [from *Menispermum*, "moon-seed," one of the genera], a curious natural order of climbing exogenous shrubs, mostly tropical lianas, but there are a few species found in the U. S. Colombo, cocculus Indicus, and pareira brava are its most important medicinal products. There are a number of actively poisonous species.

Menisper'mine [Gr. μήνη, the "moon," and σπέρμα, "seed"], one of the crystalline principles found, with PICROTOXINE (which see), in a plant known as *Anamirta cocculus*, one of the names of which, formerly used by Linnæus, is *Menispermum cocculus*. The seeds are familiarly known as COCCULUS INDICUS. (See this head.) Menispermine, by analyses of Pelletier and Conerbe, is $C_{18}H_{12}NO_2$. Though alkaloid in its nature, it is stated to be not poisonous; while picrotoxine, which is *not* alkaloid, is very baneful. H. WURTZ.

Men'no, post-tp. of Mifflin co., Pa. Pop. 1173.

Menno, or **Menno Simons.** See MENNONITES, BAPTISTS, and ANABAPTISTS.

Men'nonites, a body of Christians deriving their name from Menno Simons (1496–1561). After the taking of Münster, and the execution of the leaders of the ANABAPTISTS (which see), June 24, 1535, Menno Simons, who had been a Roman Catholic priest, gave himself to the winning of the remnants of the deluded people from the lawless fanaticism into which they had been led. With older and purer elements he united them in the Netherlands and in North Germany, and the adherents of his views were known henceforth as *Tauf-gesinnte* (Baptists in the general sense) or as Mennonites. While some of the earlier views of the Anabaptists were retained, their fanatical violence was completely set aside. The Mennonites were carefully organized after what was regarded as the primitive congregational model. They had ministers and deacons. Their discipline was very strict. They maintained that Christians should not bring lawsuits, demand interest, take oaths, nor serve as soldiers. They rejected infant baptism, but did not immerse. Some of them adopted feet-washing in connection with preparation for the Lord's Supper. They dropped all the views subversive of civil rule which had been held by the Anabaptists. Their ministry is unpaid, and, for the most part, not regularly educated. The Galenists, however, established a seminary for preachers in 1735, and in our own century some efforts have been made in theological education. Their simple lives, thrifty habits, and fidelity to promises made them many friends. They obtained toleration first in the Netherlands, and then in England and in Germany. Diversity of views in regard to strictness in excommunication led to their division into the "Fine" or "Strict" and "Coarse" or "Mild" (1554–61). The "Mild" are the Waterlanders, taking their name from their locality. The "Strict" have many subdivisions. The milder party also divided on the questions between Calvinism (the Apostoolists) and Arminianism (the Galenists), 1664. In 1801 the parties united, the Galenists forming the major part, and (1811) strengthened the theological seminary in Amsterdam. In Holland there are about 120 congregations; in Germany the number of Mennonites is estimated at 14,000, probably half of whom are in the province of West Prussia. In Prussia they were freed 1802 from the obligation to bear arms, and in 1827 from the necessity of taking official and judicial oaths. In 1867 the North German federal constitution again imposed on them the obligation of military service. In 1783 many emigrated from Prussia to the Russian dominions, settling first on the Dnieper. In 1870 they had reached the number of 40,000. (For the history of the Mennonites see Schyn (1723), Mattschoen (1729), Hunzinger (1831), Bouterweck (1864), and the literature under ANABAPTISTS and BAPTISTS. For the theory of their points of contact with the Waldenses see Halbertsma and Blaupot ten Cate (1844).) In the U. S. the Mennonites are a body of considerable strength. On the invitation of Penn many immigrated in 1683–98. In 1735 there were about 500 families settled in Lancaster co., Pa. By reason of being subjected to the conscription in 1871 large numbers of the Russian Mennonites have recently emigrated to America. The translation of the Dort Confession of 1632 tended to remove many prejudices against them. They have in America about 500 churches, 250 ministers, and 60,000 communicants. The Amish or Omish Mennonites (1693) are rigid in discipline and in dress, proscribing even buttons as carnal vanities. The Reformed Mennonites arose in Lancaster co., Pa., in 1811. Their aim is to restore the ancient faith and practice of their Church. There are other subdivisions of later origin. C. P. KRAUTH.

Menobranch'us, Proteus of the Lakes, or **Fish-Lizard,** a batrachian of the order Amphipneusta, has the head and mouth large; the upper jaw and palate thickly set with small sharp teeth; a short neck, with three branchial tufts on each side; tail compressed laterally, and fringed with a delicate membrane; four limbs, each having four toes without nails; small eyes, without lids; thick and fleshy lips; a large tongue, immovable except at the tip and edges; small nostrils; a long body, and a smooth skin. Two species are found in the fresh waters of the U. S.—*M. maculatus*, twelve inches long, with sub-circular dark-gray spots, in the lakes and streams of the St. Lawrence system; and *M. lateralis*, characterized by a dark band passing from the nostrils along the sides to the tail. It is found only in the Southern waters tributary to the Mississippi. It has rudimentary lungs, and is able to support life out of water two or three hours.

Menom'inee, county of Michigan, bounded S. W. by Wisconsin (from which it is separated by the Menominee River), and on the S. E. by Green Bay. It is cold, hilly, and covered mostly by forests. Lumber-cutting and the mining of marble and iron ore are the leading industries. The county is traversed by the Peninsular division of the Chicago and North-western R. R. Area, 1300 square miles. Cap. Menominee. Pop. 1791.

Menominee, post-v. and tp., cap. of Menominee co., Mich., on Green Bay, at the mouth of the Menominee River, and on the Chicago and North-western R. R., is an im-

portant shipping-point for lumber to Chicago and the Eastern markets, is engaged in mining iron and marble, and has 2 weekly newspapers. Pop. 1597.

Menom'onee, a v. and tp. of Jo Daviess co., Ill., on the Illinois Central R. R. and the Mississippi River. Pop. 593.

Menomonee, post-v. and tp., cap. of Dunn co., Wis., on the West Wisconsin R. R., 23 miles N. W. of Eau Claire, has excellent public schools, 7 churches, 1 foundry, machine and carriage shop, 2 brickyards, 5 hotels, 1 newspaper, a sash-factory, and stores. It is a dépôt for the fur-trade. Pop. 2210. R. J. Flint, Ed. "News."

Menomonee, tp. of Waukesha co., Wis. Pop. 2350.

Menomonees, a tribe of American Indians of the Algonkin stock, at present numbering 1362 souls, placed upon a reservation of 230,400 acres in the Green Bay region of Wisconsin. Their reservation abounds in noble pine forests and excellent water-power. Upon timber cut here they receive a royalty, besides a government annuity. They have made considerable progress in civilization.

Menop'oma, a tailed batrachian reptile peculiar to the fresh waters of North America, which seems to form a connecting link between the perennibranchiate amphibians and the salamander. It has a large and flat head; two concentric series of minute teeth in the upper jaw, and one series in the under jaw; a branchial orifice on each side; rudimentary branchiæ: four limbs, the anterior having four and the posterior five short palmated toes; and a loose skin folded on the sides of the body. The commonest species, *M. Alleghaniense*, known as hell-bender, mud-devil, ground-puppy, young alligator, or tweeg, abounds in the waters of the Ohio and its tributaries, and was formerly classified as *Protonopsis horrida*. It attains a length of two feet, has a slaty-gray color with dark spots, feeds chiefly on fish, worms, and mollusks, is fierce and voracious, and erroneously regarded as poisonous. The species *M. fuscum* (Holbrook), found in Western North Carolina, is brownish-white above and yellowish-white below.

Menstruation. See Catamenia.

Mensura'tion [Lat. *mensura*, a "measuring"], that part of practical geometry which teaches how to measure the area of figures and volume of solids by measuring certain lines and angles of the figures and solids. As every rectilinear plane figure can be decomposed into triangles, and every solid bounded by planes can be decomposed into pyramids, the measurement of the area of such figures and of the volume of such solids resolves itself into the determination, by the methods of elementary geometry, of the sides and angles of certain triangles. But the determination of the length of curved lines, the area of plane surfaces bounded by lines which are not all right, of the area of curved surfaces, and of the volume of solids bounded by surfaces which are not all plane, requires the aid of the integral calculus.

Mental Philosophy. See Psychology.

Menta'na, a small place with an old castle, 13 miles to the N. E. of Rome, noted on account of the battle which took place here Nov. 3, 1867. The small army of volunteers under Garibaldi, numbering about 3500 men, and purposing to take Rome and unite the Papal States to the kingdom of Italy, had defeated the papal troops at Monterotondo (Oct. 26), and was about to push on towards Rome, when on the 28th and 29th the French fleet landed the detachment of Failly at Civita Vecchia. Garibaldi, who was before the Roman gate of St. Jean on Oct. 30, retreated to Monterotondo and Mentana, and began to intrench this position. On Nov. 2 he pushed one detachment towards Corresa and another towards Tivoli. This latter fell in with 3000 papal troops, followed by 2000 French troops. The volunteers retreated to Mentana, and here began a fight which lasted four hours, and in which they were completely defeated by the papal troops, aided by the French. Their loss was very heavy, principally on account of the Chassepot gun, with which the French infantry had recently been provided, and which were tried here for the first time. Garibaldi had only infantry, ill-armed people without discipline. His adversaries had all three weapons, regular troops, and were superior in numbers. On the retreat the volunteers met with the Italian army, which had entered the Papal States; they were disarmed, and Garibaldi himself was taken prisoner and brought to the fortress of Varignano, near Spezzia. In honor of this victory the pope instituted the Mentana medal, a silver cross with the inscriptions, *Fidei et Virtuti* and *Hinc Victoria*, which was given to all who had participated in the battle. August Niemann.

Men'tchikof (Alexander Danielovitch), Prince, b. at Moscow Nov. 27, 1672, in humble circumstances, and apprenticed to a pie-baker; attracted the attention of Lefort by his spirited face; enlisted in the regiment of Preobashenski; discovered a conspiracy among the Strelitzes; distinguished himself at the capture of Azov; accompanied the czar on his journey to Holland and England; gained by degrees his confidence; became after the death of Lefort his most intimate friend and adviser, and was made a prince in 1707 and field-marshal in 1709. He was a man of superior talent, both as a statesman and as a military commander. He won the decisive battle of Kalisz 1706, contributed much to the victory of Poltava 1709, conquered Pomerania in 1712, took Stettin in 1713, and his influence was felt in all branches of the civil government of Russia. But his rapacity was amazing; and when in 1713 he abandoned Stettin to Prussia without the consent of the czar, he was tried by a court-martial; his general conduct underwent investigation, and he was sentenced to death. The czar changed this verdict to a heavy fine, and even appointed him governor of St. Petersburg, but he had lost his influence. Once more, however, he came into power on the accession of Catharine I. in 1725, and when in 1727 she was succeeded by the young Peter II., he obtained absolute control of the government of Russia. He was just about to marry his daughter to the czar when he was overtaken by a conspiracy headed by the family of Dolgoruki, Sept., 1727; his property was confiscated, and he and his family were banished to Berezov, in Siberia, where he d. Nov. 2, 1729.—His great-grandson, Alexander Sergeivitch Mentchikof, b. in 1789, d. May 3, 1869; was aide-de-camp to the emperor Alexander in 1812–14, governor of Finland in 1831, minister of marine in 1836, and commander-in-chief during the Crimean war. He lost the battles of Alma and Inkerman, but defended Sebastopol with success for several months. He retired on account of ill-health, and was succeeded by Gortchakof. In politics he belonged to the Old Russian party, and was averse to all reforms.

Mentone' [Fr. *Menton*], town of France, in the department of Alpes-Maritimes, is beautifully situated on a bay of the Gulf of Genoa, and celebrated for its delicious climate, being surrounded on the three sides by the Sea-Alps, here between 3000 and 4000 feet high. Although it has no regular harbor, it carries on a brisk trade in fruits, fish, and perfumeries. Pop. about 10,000. Close by are the famous bone-caves, 88 feet above the Mediterranean, and rich in pre-historic remains. On Mar. 26, 1872, a fossil human skeleton was found here, 21½ feet from the surface, supposed to belong to the Palæolithic age. It was six feet long, and showed a facial angle of nearly 85°. It was placed in the Museum of Natural History in Paris.

Men'tor, tp. of Lake co., O., on Lake Erie. The post-village of Mentor is near the Lake Shore R. R., 6 miles S. W. of Painesville. Pop. 416; of tp. 1666.

Mentor, tp. of Clark co., Wis. Pop. 441.

Mentz [Ger. *Mainz;* Fr. *Mayence;* anc. *Moguntiacum*], city of Germany, in Hesse-Darmstadt, on the left bank of the Rhine, opposite the influx of the Main, founded in the second century by the Romans, destroyed in the fifth by Attila, but restored by Charlemagne. It is surrounded on all sides by a system of strong fortifications consisting of fourteen immense bastions and four detached forts, which command both sides of the Rhine. Its streets are generally crooked and narrow, though a large portion of the city has been rebuilt since the conflagration in 1857 in a thoroughly modern fashion; but it contains many interesting buildings—among which is the cathedral, of the fourteenth century—and many beautiful promenades and public places, such as the Gutenberg Place, with the magnificent bronze monument by Thorwaldsen of Johann Gutenberg, who was born and died here, and whose house is still preserved. Among its manufactures, those of carriages, furniture, and musical instruments enjoy great repute, and its trade is very considerable. Pop. 53,902.

Mentz, tp. of Cayuga co., N. Y. It contains the village of Port Byron (which see). Pop. 2278.

Me'nu, or **Manu** [Sans. *man*, "to think"], the mythical ancestor of the human race in the Vedas and other sacred books of India. Several other Menus are recognized in Hindoo mythology, forming a succession of ten or fourteen personages, each of whom was said to have created the world, and perished with it after a period of incalculable ages, called a *manwantara*, or "age of Menu." The authors of the Brahmanical code of social and religious ordinances gave their work the name of *Institutes of Menu* to conciliate the support of the Vedic Aryans, thereby intimating that this code had been handed down from the earliest times; but at a later period, when the *origines* of the Vedic and Brahmanic religions had been confounded together by the sacred caste which arrogated to itself the exclusive custody and interpretation of the ancient books, Menu was represented as the author of the code bearing

his name. Hence, some European scholars have supposed that a real Menu lived and promulgated laws at the transition period between the Vedic and Brahmanic periods, but this opinion is wholly unsupported and unnecessary. The *Institutes of Menu* (translated by Sir William Jones) are the sacred books of the Brahmans, and chiefly devoted to the establishment of the system of caste and the definition of the social and religious duties of the members of the four castes.

The following new and striking derivation of this primitive mythological word is given in Mr. S. P. Andrews's recent work, *Radical Etymology, or the Origin of Language and Languages*: "Throughout the Indo-European family of languages, the syllable MA (changeable to *me, mi, mo, mu*) means 'great,' and NA (changeable to *ne, ni, no, nu*) means 'small,' as to their primal sense. Hence Mana, Mena, Menu, etc. mean 'great-small,' and thence '*ratio*' or '*proportion*,' allied with tapering or spindle-form, the cone, pyramid, or triangle. Compare Lat. *men-sa*, 'a surveyor's triangular measuring-board,' *me(n)ta*, 'anything conical;' *mon-s*, Eng. '*moun-tain*;' Lat. *men-s*, Eng. 'mind'—*i. e.* 'ratio;' Sansk. *mā*, Lat. *men-sura*, Eng. '*meas-ure*,' hence Sansk. *mana*, 'to think.' *Manu*, the mythic ancestor of the human race; Eng. 'man,' Ger. *mensch*, etc." Compare also Sansk. *men*, "the moon"—*i. e.* "the measurer," traceable perhaps in Manah, an Arabian goddess; Mana, Mania, Manes, early Etruscan and Italian deities; Mannus, ancestor of the German race; Manes, founder of a Persian religion; Men, or Mene, a Phrygian divinity mentioned by Homer; Menes, founder of the Egyptian monarchy; Meni, a Babylonian divinity (Isa. lxv. 11, margin); and the Cretan lawgiver, Minos. (See this root in Chaldean, Hebrew, and Egyptian weights and measures.) PORTER C. BLISS.

Menur'idæ [from *Menura*, μήνη, "crescent," and οὐρά, "tail," and *-idæ*], a family of birds of the group Passeres or Coracomorphæ, distinguished by the peculiar form of the vomer, which, according to Huxley, is "broad and rounded off in front and deeply cleft behind. The maxillopalatines are altogether obsolete, or at any rate unossified. The sternum has a well-developed and forked manubrium, but its posterior edge is strongly convex, and only exhibits a slight notch on each side. The furcula has no median process, and its scapular ends are comparatively little expanded." The bill is moderately slender and pointed; the gape quite well cleft; the nostrils linear, and advanced beyond the middle of the bill; the tarsi quite long, but stout; the toes normal; the tail very peculiar in the male, simulating the ancient lyre in appearance, the external feathers being full and sigmoidally curved, and the intermediate ones with distant barbules diverging from the shafts. There is but one known species (*Menura superba*), which is an inhabitant of Australia; it generally lives in pairs, and feeds upon insects. THEO. GILL.

Menza'leh, the largest lake or lagoon of Lower Egypt, 50 miles long, 25 miles broad, situated E. of Damietta, and separated from the Mediterranean by a narrow row of sandbanks. Its depth is only from 2 to 5 feet, but it is rich in fish and fowl, and its many islands are densely peopled and celebrated for their fertility. The Suez Canal runs straight through the lake for 27 miles.

Men'zel (WOLFGANG), b. June 21, 1798, at Waldenburg, Silesia; served as a volunteer in the campaign of 1815; studied philosophy and history at Jena and Bonn; was an enthusiastic disciple of Jahn, the founder of the German Turners; lived from 1820 to 1824 as a teacher at Aarau, Switzerland, but settled in 1825 at Stuttgart, where he devoted himself exclusively to literature, and d. Apr. 23, 1873. His productions are very varied, comprising tales and romances—*Rübezahl* (1829), *Narcissus* (1830), *Furore* (1851); historical and mythological works and travelling sketches, sometimes consisting of several volumes, of which *Geschichte der Deutschen* ("History of the Germans," 3 vols., 1824–25) was translated into English by G. Horrocks (London, 1849); and finally, criticisms in the form of essays in the *Literaturblatt*, which he edited for many years, and also in the form of books, such as *Streckverse* (1823), *Die Deutsche Literatur* (1828), translated by C. C. Felton in Ripley's *Specimens of Foreign Literature* (Boston, 1840).

Mep'pel, town of the Netherlands, province of Drenthe, has some manufactures and trade. Pop. 6941.

Mequon', tp. of Ozaukee co., Wis. Pop. 3156.

Mer'amec, tp. of Crawford co., Mo. Pop. 907.

Meramec, tp. of Franklin co., Mo. Pop. 1480.

Meramec, tp. of St. Louis co., Mo. Pop. 3436.

Mercadan'te (SAVERIO), b. at Altamura in 1797, and educated at the musical college of San Sebastio in Naples; attracted first attention in 1818 by a cantata performed at Naples; was appointed director of the Italian opera in Madrid in 1827; chapel-master at the cathedral of Novara in 1833; director of the conservatory of Naples in 1840; became entirely blind in 1862, and d. at Naples Dec. 18, 1870. He was a very prolific composer, vivacious and graceful; none, however, of his fifty operas is now performed; only some of his sacred compositions have survived.

Mer'cantile Law. That department of the municipal law which relates particularly to mercantile persons and contracts is termed the mercantile law, or the law merchant, and sometimes commercial law. The mercantile law is often spoken of as though it were a code of regulations existing by itself, separate and distinct from the general law of the country, and possessing an independent authority, derived either from the customs of traders or from some foreign legislation. This is an entirely erroneous conception. The various rules which control the business acts of mercantile persons, and prescribe the effect and operation of mercantile contracts, and which for purposes of convenience and general description merely have been denominated the mercantile law, are and must be originated and made authoritative in exactly the same manner as any other rules of the municipal law; that is, in the U. S. and in Great Britain they must either be directly enacted by the legislature or must be uttered by the superior courts while rendering their judicial decisions. The mistaken view mentioned above results from the habit, very prevalent among careless writers, of confounding the process of creating the law, the legislative act by which rules become mandatory and compulsive, with the sources from which these rules are derived, from which the material is taken and added to the constantly growing fabric of the national jurisprudence. Numerous special subjects are embraced within the purview of the mercantile law which may be properly classified as pertaining to the persons who are engaged in trade and commerce, the peculiar kinds of things which are the objects of mercantile ownership, such as ships, and the different species of contracts which are ordinarily used in the transactions of business. The following are the most important of these subdivisions included within the general denomination of mercantile law when used in its broadest sense according to the extension given to it by the modern modes of carrying on trade and commerce: The law as to sole traders, partnerships, corporations, and joint-stock companies, these being the forms in which merchants themselves may engage in trade, either singly or in combination with others. Of contracts, the principal ones are agency, sale, bailments, and especially hiring, common carriage, and pledge, bills, notes, and other negotiable paper, guaranty, suretyship, marine, fire, and life insurance, and all the contracts connected with the ownership of shipping and its use in foreign and inland commerce, including charter-parties, bills of lading, bottomry bonds, the rights, powers, and duties of part owners, masters, and seamen, and all the various maritime liens resulting either from contract or from tort, and the enforcement thereof in admiralty. To these must be added certain peculiar remedies, some of which apply to all mercantile persons and to all kinds of property, while others are strictly maritime—namely, bankruptcy, stoppage *in transitu*, and lien, to the last of which may be referred the whole subject of admiralty jurisdiction so far as it is concerned with private commerce and the transactions of business. It is plain from the foregoing enumeration that the mercantile law covers a wide field and embraces a vast variety of particulars; and yet there is in it, as a whole, a remarkable unity and simplicity, since its rules, although many and minute, are derived from a comparatively few general principles of equity and justice, and are based upon customs and usages almost identically the same among mercantile men in all parts of the civilized world. If we compare this department of our own jurisprudence with that portion of the law of all other enlightened nations which deals with the same subject-matter, we shall discover a close resemblance, a marked similarity, running through them all, often extending not only to the general doctrines, but even to the minute detail of rules. This likeness results both from the nature of the subject-matter itself, and from the common origin whence the legislation of all commercial and maritime states originally derived the regulations which make up the mercantile law of each. The great transactions of trade and commerce are necessarily international, and cannot, from the necessity of the case, be confined within any one territory or jurisdiction. Antecedent to all legislation, and independent of all positive national law therefor, it was inevitable that merchants of all lands should fall into the same methods of doing business, and should adopt the same usages and customs to which they voluntarily conformed in their mutual intercourse; and a violation of these customs would be prevented by the common opinion among them, since all commerce depends upon complete good faith and implicit trust. When such a body of customs and usages was formed for

the regulation of all foreign commerce, it was equally natural and inevitable that the same should extend to the internal trade of any given country; and thus it is known as a historic fact that in all the commercial, and especially the maritime cities and districts of Europe prior to the action of the English courts and prior to any universal legislation, the same code of rules was voluntarily adopted and followed in the transactions of both external and internal traffic; and this body of regulations constituted the original "law merchant"—a law to the merchant in every country, not always imposed by his own government, but acquiesced in by him and his fellow-traders throughout the civilized world. These rules were not arbitrary, they had no historic and tribal origin like the law concerning land, but they were founded upon equity and good faith, and upon the considerations of convenience which experience had shown to be most conducive to the freedom and regularity of trade. This voluntary code, these customs of merchants, were transferred into positive law and incorporated into the jurisprudence of England by the action of the higher courts, and the whole proceeding forms the most striking and instructive example of their creative function, of their inherent power to legislate for the nation. The process of transformation was commenced during the time of Lord Chief-Justice Holt, but it was under Lord Mansfield that the broad foundations of the mercantile law were laid and a large part of the superstructure was erected. The original usages of the merchants were taken as the basis, but they were enlarged, extended, and improved as the increasing extent and requirements of commerce demanded. Although the legislation of other European countries was conducted in a different manner—that is, by legislatures rather than by courts—yet it closely adhered to the original model, and thus from motives of expediency a mercantile law has been developed in each nation similar in its fundamental doctrines, and often in its special rules, to that which exists in every other state. The same likeness extends to the law of our own country; and although in certain States some minute changes have been made by the legislature, some departures from the common type, yet on the whole the same rules, in respect to the subjects above enumerated as contained within the mercantile law, prevail in all the commonwealths. Among the most important and immediate sources from which the modern mercantile law, at the commencement of its development, was borrowed, were certain maritime codes into which the customs of the Middle-Age merchants had been collected, and which, although promulgated by single and often small states, were at one time accepted, either by acquiescence or by express legislative recognition, in all the countries of Europe that bordered upon the ocean or the Mediterranean Sea. After the overthrow of the Western Roman empire, and even during the almost universal establishment of feudalism, a few cities preserved much of their old municipal institutions, and through the eleventh, twelfth, and succeeding centuries they and other towns of a later growth became the centres of an extensive commerce, and grew to be independent, rich, and flourishing republics. On the shores of the Mediterranean were Amalfi, Venice, Pisa, Genoa, Marseilles, Barcelona, and others engaged in a vast commerce with the East, while on the shores and tributaries of the Baltic Sea, the German and Atlantic oceans, were Wisby, Lubeck, Hamburg, Bremen, Ghent, Cologne, which traded with England as well as with the interior and S. of Europe. The traditionary customs prevailing in these commercial cities were in several instances consolidated into "codes," which, originally local, at length acquired, as has been said, a universal authority. The earliest of these compilations was made by the republic of Amalfi, which partially collected the existing sea-customs into a legislative form; but its independence and trade were both destroyed about the middle of the twelfth century, and its laws were supplanted by others more extensive and important which subsequently appeared. The customs of maritime traffic prevailing in all the Southern cities were gathered and arranged in a written code, and published about the middle of the thirteenth century under the name of *Il Consulato del Mare*. The exact local origin of this celebrated complication is disputed, but it was undoubtedly a gradual and progressive work, obtaining its material from different authors and from various cities, and was at length promulgated in a completed condition either at Pisa or at Barcelona. It acquired the authority of law in France and in the Italian states, and has contributed more than any other single source to give shape and character to the maritime law which now prevails throughout Christendom. Its provisions contained the then existing rules applicable to trading vessels in time of peace, and to neutral and belligerent vessels in time of war. They are of course very few and meagre when compared with the enormous development which has taken place since the epoch of its first appearance, but they state the principles which were the germs of that development. Similar codes arose from like causes among the cities of Northern Europe. The first in time was the *Laws of Oléron*. The small island of Oléron, on the N. coast of France, was a flourishing commercial centre, and here this code appeared. It was introduced into England by Richard I., became common law in France, and was even adopted in Spain. The *Laws of Oléron* bear a close resemblance to the *Consulato del Mare*, although in some matters more full and minute. Among the topics of which it treats are the powers and duties of shipmasters and of seamen, the rights and duties of owners, partial and total losses by the perils of the sea; and, in fact, it touches upon all the most important subjects which are covered by the more elaborate legislation of the present day. Although never acquiring the authority of absolute law in England, it was one of the depositories from which the judges drew their material at an early day, and it has even been cited by the courts in modern times. A second compilation was made about A. D. 1290 at Wisby, then an exceedingly flourishing, rich, and splendid town on the Baltic, but of which hardly a vestige now remains. It differs little from the *Laws of Oléron*, and portions of it were extracted from that code. A third of these Northern codes was promulgated in 1614 by the Hanseatic Confederation, which embraced Lubeck, Hamburg, Bremen, and other important cities on the coasts and the German rivers. It was chiefly borrowed from the *Laws of Oléron*, and of course had the force of positive law within the jurisdiction of that confederacy. The effect of these several compilations was to fix and establish the mercantile usages of Europe, especially those relating to purely maritime subjects, and a common system was thus created and preserved adapted for the use of modern courts and legislatures.

John Norton Pomeroy.

Mercanti'ni (Luigi), b. at Ripatransone, in the Marches, in 1821. Destined by his father for an ecclesiastical career, he renounced it before taking orders. At the age of twenty he was already professor of the humanities in Arcevia; from thence went to Sinigaglia to teach Latin and Italian literature; in 1848 composed the popular song of the Italian volunteers known as "Tre Colori." Having taken part in the revolutionary movements of 1848–49, he was driven into exile, and retired to Corfu, where he published a volume of poetry; returned in 1853 to Turin, where he gave lessons in the most distinguished families; from Turin went to Genoa to take charge of the female institution of the Peschieri, and occupied himself at the same time with the direction of a woman's journal entitled *La Donna*. During this period he published his touching little patriotic poems *Tito Speri*, *La Spigolatrice di Sapri*, and the popular poems entitled *Il Buon capo d'anno del pellegrino Italiano* and *La Madre Veneziana*. In 1861, Mercantini was named professor of æsthetics in the Academy of Fine Arts at Bologna, and soon after he accepted a professorship in the University of Palermo. D. at Palermo in 1872.

Mercap'tan and **Mercaptans,** a peculiar and interesting class of compounds discovered by Zeise in 1833. (The name is a contraction of *Mercurio corpus aptum*, a fanciful name founded on its powerful reactions with mercury compounds.) The fact should be well impressed by the student upon his mind that these bodies contain no mercury. They have gained an interest of late from the announcement of their detection among the products of the distillation of coal and the constituents of coal-gas. *Sulphur-alcohols* and *sulphuretted alcohols* are other names that have been applied to them. Ethylic sulphohydrate is a name also applied to Zeise's original mercaptan by those who follow the hypothesis of the compound alcohol-radicals. Zeise's compound is C_2H_6S. Wöhler formulates it as C_2H_5,HS; according to which we must have here another imaginary radical, HS, of the class of the so-called "hydroxyle," HO, of the prevailing school of organic chemists, according to which school common alcohol is marsh-gas, in which one hydrogen molecule is replaced by *methyle*, CH_3, and another by *hydroxyle*, both unknown substances, common alcohol being $C(HH.CH_3,HO)$, while mercaptan must be $C(HH.CH_3.HS)$. On the homologic view (see Homology), common alcohol being $H_2O.2H_2C$, mercaptan would be $H_2S,2H_2C$. We certainly have the one advantage, if no other, in this latter case, of having to admit but one unknown molecular group in constructing the two compounds. The decision as to which view, if either, conveys the truth is yet in the future, to be revealed through discoveries yet to appear of the true molecular structure of chemical compounds in general. Common mercaptan is prepared by distilling together a salt of ethyl-sulphuric acid and an alkaline sulphide. It is a very thin, colorless liquid, immiscible with water, and of a highly offensive and persistent smell, resembling onions.

Mercaptides.—This name is applied to compounds formed by the action of metals and their oxides upon mercaptans. Common mercaptan gives with potassium and sodium, with evolution of hydrogen gas, solid mercaptides of potassium and sodium. If the alcohol, or substituted marsh-gas and alcohol-radical type, is preserved here, it would seem inevitable that further admissions of unknown radicals must be made—KS and NaS, namely. On the homologenic doctrine, on the other hand, we have $KHS,2H_2C$ and $NaHS,2H_2C$. H. Wurtz.

Merca'to San Severi'no, town of Southern Italy, province of Salerno, in a fruitful district, about 9 miles from the town of Salerno. It was once the capital of an extensive feudal territory. Pop. in 1874, 9840.

Merca'to Sarace'no, town of Italy, province of Forli, walled, and with an industrious and active population in 1874 of 6532.

Merca'tor (Gerard), b. Mar. 5, 1512, at Rupelmonde, Flanders; studied philosophy, mathematics, and the art of engraving at Louvain; attracted attention first by two superb globes he made in 1541 for Charles V.; moved in 1559 to Duisburg; published several valuable geographical works giving maps and descriptions of the world, Europe, France, Germany, and the British Isles; and d. Dec. 2, 1594. His principal works are *Tabulæ Geographicæ ad mentem Ptolemei Restitutæ* (1578), and *Atlas sive Geographicæ Meditationes* (1595).

Mercator's Chart, a map of a portion of the earth's surface in which meridians are represented by parallel straight lines, and circles of latitude by lines perpendicular to the meridians. Longitudes are plotted from a scale of equal parts, and latitudes from a varying scale so adjusted that the plot of a ship's course or of a rhumb shall be a straight line making with the meridians an angle equal to the course or the angle of the rhumb. The principle on which the projection is made is as follows: The length of a minute of longitude in any latitude is equal to the length of a minute of longitude at the equator multiplied by the cosine of that latitude. Now, the length of a minute of longitude being represented by a constant distance, the length of a minute of latitude must be represented by the same distance multiplied by the secant of the corresponding latitude. A scale constructed according to this law is called a scale of meridional parts. (See Meridional Parts.) In projecting a chart of this kind the earth is supposed to be a perfect sphere, and 1 minute of longitude at the equator, or 1 geographic mile, is taken as a unit. The parallels of latitude at the bottom and top, commencing at some meridian, are divided into equal parts, each of which contains some convenient number of minutes; the extreme meridians are divided into parts which continually increase in passing from the equator towards the pole, in accordance with the law heretofore explained; these parts are taken from a table of meridional parts (Table iii. Bowditch's *Navigation*), each division corresponding to a convenient number of minutes, usually the same number that is employed on the parallel of latitude; the corresponding points are united by straight lines, and the outlines of continents, islands, oceans, and the like are then laid down from their known geographical positions, with such other information as may be useful to the navigator. If any two points on such a chart are joined by a straight line, and a right angle formed by drawing a meridian through one extremity, and a parallel of latitude through the other extremity, we shall have the triangle of Mercator's sailing. The side parallel to a meridian is the augmented latitude, the other side about the right angle is the longitude, and the angle at the base is the course. W. G. Peck.

Mercator's Sailing is the method of solving problems in navigation in accordance with the principles of Mercator's chart. W. G. Peck.

Merced', county of California, extending N. E. from the main Coast Range. Area, 1680 square miles. It is traversed by the San Joaquin River, and is generally level and highly fertile. Cattle, wheat, wool, and fruit are leading products. Wine and brandy are manufactured. The county is traversed by the Visalia division of the Central Pacific R. R. Cap. Snelling. Pop. 2807.

Merced, post-v. of Merced co., Cal., 139 miles E. of San Francisco, on the Visalia division of the Central Pacific R. R., has a good school, 3 churches, 2 newspapers, 2 banks, 1 planing-mill, 1 machine-shop, 4 large hotels, and a number of stores. This is the point of departure for tourists visiting the Yosemite Valley and Falls, and the Mammoth Tree Grove. Pop. about 2000.

Robt. J. Steele, Ed. "San Joaquin Valley Argus."

Mer'cer, county of N. W. Dakota. Area, about 900 square miles. The Missouri River is on the N. and E., several affluents of which intersect the county. It has been recently formed.

Mercer, county of N. W. Illinois, bounded W. by the Mississippi River. Area, 540 square miles. It is rather rolling, and is very fertile. Coal is mined at various points. It is traversed by the Chicago Burlington and Quincy and the Rockford Rock Island and St. Louis R. Rs. Live-stock, grain, and wool are leading products. Carriages and wagons are the chief articles of manufacture. Cap. Aledo. Pop. 18,769.

Mercer, county of Central Kentucky, in the beautiful and fertile blue-grass region. Area, 308 square miles. It is bounded N. E. by the Kentucky River. Live-stock, corn, wheat, and wool are leading products. Cap. Harrodsburg. Pop. 13,144.

Mercer, county of Missouri, bounded N. by Iowa. Area, 480 square miles. It is well timbered, fertile, and contains copper, iron, and coal. Cattle, grain, and wool are leading products. It is in part bounded W. by the Crooked Fork of Grand River, and is traversed by the S. W. division of the Chicago Rock Island and Pacific R. R. Cap. Princeton. Pop. 11,557.

Mercer, county of New Jersey, bounded S. W. by the Delaware River. Area, 221½ square miles. It is for the most part nearly level, and is very fertile and well cultivated. Live-stock, wool, grain, tobacco, hay, fruit, and garden products are extensively raised. The manufacturing interests are important, and include iron, iron castings, stone, earthen, and metallic wares, carriages, clothing, flour, woollen goods, etc. The county is traversed by the Camden and Amboy, the New Jersey, the Belvidere Delaware, and other railroads. Cap. Trenton. Pop. 46,386.

Mercer, county of Ohio, bounded W. by Indiana. Area, 470 square miles. The Great Canal Reservoir, believed to be the largest artificial lake in the world, is nearly all in this county. It is 8 miles long, 3½ wide, 10 feet deep, and covers 17,000 acres. A dam of earth is built at each end across a broad valley. Its waters feed the Miami Canal. Cattle, grain, and wool are extensively produced in the county. Bricks and lumber are the leading articles of manufacture. Cap. Celina. Pop. 17,254.

Mercer, county of Pennsylvania, bounded W. by Ohio. Area, 600 square miles. It is uneven and very fertile. Live-stock, grain, and wool are leading products. Coal is extensively mined. The manufactures include leather, lumber, flour, carriages, iron, iron castings. The county is traversed by the Atlantic and Great Western, the Erie and Pittsburg, the Jamestown and Franklin, and the Shenango and Allegheny R. Rs. Cap. Mercer. Pop. 49,977.

Mercer, county of West Virginia, bounded S. by Virginia. Area, 450 square miles. It lies between Great Flat-top Mountain on the N. W. and East River Mountain on the S. E. It is a fine, well-timbered, fertile region, containing coal and limestone. Tobacco and corn are leading products. Cap. Princeton. Pop. 7064.

Mercer, tp. of Mercer co., Ill. Pop. 1949.

Mercer, tp. of Adams co., Ia. Pop. 138.

Mercer, post-tp. of Somerset co., Me., 7 miles S. W. of Norridgewock, has 3 churches and manufactures of leather, starch, and pegs. Pop. 846.

Mercer, post-v. of Dublin tp., Mercer co., O. Pop. 73.

Mercer, tp. of Butler co., Pa. Pop. 478.

Mercer, post-b., cap. of Mercer co., Pa., on the New Castle and Lawrence and the Shenango and Allegheny R. Rs., 60 miles from Pittsburg, has 2 weekly newspapers. Pop. 1235.

Mercer, tp. of Loudon co., Va. Pop. 4360.

Mercer (Gen. Charles Fenton), LL.D., b. at Fredericksburg, Va., June 6, 1778; graduated at Princeton 1797; was commissioned by Gen. Washington captain of cavalry in 1798, in anticipation of war with France; studied law; travelled in Europe 1802–03; became aide-de-camp to the governor during the war of 1812; commanded the defences of Norfolk 1813, with the rank of brigadier-general; served in the general assembly of Virginia 1810–17; was chairman of the committee on finance in 1816, when he introduced the bill for the construction of the Chesapeake and Ohio Canal, and became president of the canal company; was elected a member of Congress as a Federalist in 1816, and remained in that body till 1840, a longer period of continuous service than that of any of his contemporaries. In 1853 he visited Europe, and conferred with the leading men of several countries in the interest of the complete abolition of the slave-trade. He was a leading protectionist. D. at Howard, near Alexandria, Va., May 4, 1858.

Mercer (Gen. Hugh), b. at Aberdeen, Scotland, about 1721; educated at the University of Aberdeen; became a physician, and served as assistant surgeon in the army of Prince Charles Edward, the "Young Pretender," in 1745.

In consequence of the failure of the rebellion he emigrated to America in 1747, and settled as a physician near the present town of Mercersburg, Pa. He volunteered in Braddock's campaign; was appointed captain; was severely wounded in the battle on the Monongahela, July 9, and being unable to keep up with the fugitives from that disastrous field, wandered through the wilderness alone for several weeks, until he finally reached Fort Cumberland, 100 miles distant. He received a medal from the corporation of Philadelphia for his courage upon this expedition. In 1758 he was made lieutenant-colonel; accompanied Gen. Forbes to Fort Duquesne (Pittsburg), and commanded that post for some time. He then settled as a physician at Fredericksburg, Va.; was actively engaged in drilling and organizing the minutemen of Virginia in 1775 and the militia in 1776; was appointed colonel of the 3d Virginia regiment Feb. 13, 1776, and at Washington's request was chosen by Congress brigadier-general June 5, 1776. He commanded the column of attack at Trenton, and advised the night-march upon Princeton, in which he led the advance, and at daybreak on Jan. 3, 1777, was mortally wounded at the commencement of the action of Princeton, and left for dead on the field. Removed to a neighboring farmhouse, he d. Jan. 12, 1777, in the arms of his aide-de-camp, Major Lewis. His funeral at Philadelphia was attended by 30,000 people. A monument was erected to his memory in Laurel Hill Cemetery, 1840.—His son HUGH (d. 1853) was educated at the expense of Congress.

Mercer (Maj. JAMES), b. in Aberdeenshire, Scotland, in 1734; was educated at the University of Aberdeen, where he obtained an extensive knowledge of Greek literature; embraced the military career; served in Germany during the Seven Years' war; retired from the army with the rank of major in 1772; resided a few years in the S. of France, and passed the remainder of his life in literary seclusion in Aberdeenshire, where his society was sought and highly prized by the most eminent Scottish writers of the time. Maj. Mercer wrote poems of exquisite beauty, the first edition of which was published without his consent. D. in 1804, in which year a second edition of his poems was issued.—He married MISS KATHERINE DOUGLASS, a sister of Lord Glenbervie, a lady whose extraordinary beauty and accomplishments were long proverbial in Scotland.

Mercer (JESSE), b. in Halifax co., N. C., Dec. 16, 1769; moved to Georgia, and after being ordained to the Baptist ministry took pastoral charge of a church in Wilkes co. in 1789; was an eloquent preacher, and perhaps did more to build up his denomination in the Southern States than any other one man. His collection of hymns, in a volume entitled *Mercer's Cluster*, is still in use in almost all the Southern Baptist congregations; wrote *History of the Georgia Baptist Association* (1836), and edited for many years the *Christian Index* of Georgia. He was one of the most prominent and useful members in the constitutional convention of 1798. Having acquired a considerable estate, and being without children, he founded by a liberal donation an institution of learning which was named Mercer University. This was at first established at Pennfield, but has since been moved to Macon, Ga., where it is still in a flourishing condition. D. in Butts co., Ga., Sept. 6, 1841. (See his *Memoir*, by C. D. Mallory.) A. H. STEPHENS.

Mercer (JOHN FRANCIS), b. in Virginia in 1758; was a Revolutionary soldier; member of the Continental Congress 1782–85; delegate to the convention which framed the Federal Constitution 1787, which he did not sign; member of Congress from Maryland 1792–94; governor of Maryland 1801–03. D. at Philadelphia Aug. 30, 1821.—His daughter MARGARET, b. at Annapolis, Md., 1791, freed her slaves and sent them to Liberia, and for twenty-five years supported herself by teaching school; author of *Studies for Bible-Classes* and *Ethics in Letters to Young Ladies*. D. in 1841.

Mer'cersburg, post-b. of Franklin co., Pa., on the Cumberland Valley R. R., 10 miles W. of Greencastle, has 1 weekly newspaper, and is the seat of Mercersburg College. It was formerly the seat of Marshal College and the Theological Seminary of the German Reformed Church (1835). "Mercersburg theology," headed by Dr. Nevin, and advocated in the *Mercersburg Review* (1851), developed a peculiar type of thought, and created much commotion and controversy in the Reformed Church. Mercersburg College was organized after the removal of Marshal College to Lancaster, Pa. (1853), and occupies the same building. Pop. 971.

Merchant, Commission. See FACTOR.

Mer'chantville, post-v. of Stockton tp., Camden co., N. J., 4 miles E. of Camden, contains the residences of many business-men of Philadelphia. Pop. 245.

Mer'cia, the largest and most powerful of the seven Saxon kingdoms in England, comprised the whole central part of the country from the Thames to Yorkshire. It was an independent state from 585 to 825, when it was conquered and merged into the kingdom of Wessex.

Mer'cury [Lat. *Mercurius*, from *merx* and *mercari*], in Roman mythology, the god of commerce and gain, corresponding to the Greek Hermes, and became in course of time completely identified with him. A temple was built in Rome to Mercury as early as 495 B. C., and an altar was raised to him near the Porta Capena, by the side of a well to which the merchants repaired on the festival of the god (May 25) to sprinkle themselves and their goods with the magic waters of the well, that they might be purified and yield a large profit. In the Vicus Sobrius stood a statue of *Mercurius malevolus*, the ill-willed; no shop was allowed to be kept in this street, and milk was offered to the god in this place instead of wine.

Mercury, the planet which travels nearest to the sun, unless, indeed, reliance can be placed upon the accounts which some observers have given of the transit of dark bodies other than the sun-spots across the disk of the sun. Mercury travels at a mean distance of 35,392,000 miles from the sun, but the eccentricity of his orbit is considerable, amounting to 0.205618, and thus his greatest distance, 42,669,000 miles, differs from his least distance, 28,115,000 miles, by 14,554,000 miles, or by more than half his least distance. As the earth's mean distance from the sun amounts to 91,430,000 miles, Mercury's distance from the earth when he is nearly on a line between the earth and sun varies from about 63,300,000 miles to about 48,760,000 miles; but when thus placed he is invisible. He is most favorably placed for observation when at a distance of about 85,000,000 miles, at his greatest elongation from the sun, at which time he appears as a half disk. He is always seen near the sun, however, his maximum elongation amounting only to about 27°, while his minimum amounts only to about 18°. In northern latitudes, moreover, Mercury is always S. of the sun when he attains his maximum elongation, and is therefore less favorably seen. Mercury completes a sidereal revolution in 87.9693 days; his mean synodical period (the interval separating his successive returns to inferior conjunction) amounting to 115.877 days. His orbit is inclined 7° 0′ 8″ to the plane of the ecliptic—an inclination greater than that of any of the primary planets, but far surpassed in the case of several of the planetoids or asteroids. Telescopic observation of Mercury has revealed very little of interest. Schröter, by careful study of the phases of Mercury, was led to the conclusion that the planet rotates on his axis in *24h. 5m. 30s.*, but very little reliance can be placed either on this result, or on the estimated inclination of the axis of Mercury to the plane of his orbit. Still, it is worth mentioning that in 1801, Harding discovered a streak on the southern hemisphere of Mercury, the careful observation of which resulted in his obtaining a rotation-period almost identical with Schröter's. The figure of Mercury shows no sensible compression. There would seem to be mountains of great size on the planet's surface, for, if Schröter's observations can be trusted, one mountain on Mercury has a height equal to $\frac{1}{126}$th of the planet's radius, or to about 12 miles. But later observers, using telescopes of the best modern construction, have failed so completely in recognizing the marks described by Schröter that great doubt necessarily rests on the accuracy of his conclusions. Mercury passes between the earth and sun more than three times in each year, and when, during one of these passages, Mercury is near one or other of the points on his orbit, called his nodes, where he crosses the plane of the ecliptic, he appears to pass across the face of the sun. Such an occurrence is called a transit of Mercury, and, though of less interest than a transit of Venus, is yet of use to astronomers—first, as a means of determining with great accuracy the motions of the planet; and secondly, because indicating the nature of the phenomena to be expected during the more important transits of Venus. Transits of Mercury occur at intervals of 13, 7, 10, 3, 10, 3, etc., years, always either in May or November. R. A. PROCTOR.

Mercury, Compounds and Nature of [Lat. *Mercurius*]; synonyms, *Hydrargyrum* (which is its Latin name, from the Greek name ὑδράργυρος, "liquid silver"), *Quicksilver, Argentum vivum;* Ger. *Quecksilber;* Fr. *mercure*, the only yet-known simple metal which assumes naturally a melted or liquid form—that is, which has a fusing-point below our average normal range of temperatures over the middle zones of the globe. It occurs as a native metal, like gold, silver, copper, etc., and has been known to mankind, therefore, from time immemorial. Its chlorides were also known of old—*corrosive sublimate* and the *red oxide* to the Arabians, and *calomel* to the alchemists. Its sulphide, *cinnabar*, has been used as a pigment from the most ancient times.

Occurrence and Preparation.—Besides the native metal, it occurs chiefly as cinnabar, its most abundant ore. The most famous American localities are in California, New Almaden and New Idria, named after the two most productive European localities, Almaden in Spain and Idria in Carniola. There are, however, numerous other undeveloped cinnabar-bearing regions in the Pacific States of America. Cinnabar is reduced to metallic mercury either by distilling with lime to combine with the sulphur, or by simply distilling in a current of air, which oxidizes the sulphur to sulphurous acid gas, leaving the mercury free. Metallic iron has also been used to combine with and retain the sulphur. The reduced liquid metal is sent into commerce in bottles of wrought iron closed with screw stoppers, containing about seventy-five pounds each.

Chemical and Physical Nature.—It is justly to be ranked among the "noble metals," from the fact that when pure it does not waste away or rust in ordinary air, resembling in this respect gold, silver, and platinum. Of course, however, the inconvenience arising from its liquidity renders it impossible that it should become generally a repository of value or a medium of exchange, like the precious metals, though it *has been* used as such in emergencies. Pure mercury is almost silver-white, of mirror-like lustre, which lustre it preserves perfectly in air free from sulphur. Like silver, it is tarnished superficially by sulphurous emanations. Dust also may adhere and tarnish it, but it is readily restored to perfect brilliancy by straining, or even by pouring through a glass funnel, to which the dust or tarnish-films will adhere. The worst enemies to its purity are *other metals*, and ignorance of this fact often leads to the ruin or great deterioration in value of large amounts of mercury. No metal should ever be allowed to touch it except iron or platinum. The smallest proportion of some common metals, especially lead, tin, and zinc, and even copper to a less extent, causes it to tarnish constantly and lose its lustre, and injures its perfect liquidity, making it somewhat viscous and adherent to other bodies, so that it will "drag a tail" behind when flowing over a surface, rendering it useless for nearly all its practical applications without purification by processes which are none too easy. In such cases, however, if the amount of base metal is minute, it may be removed by agitating with a diluted solution of perchloride of iron for some time. The mercury is thus "floured" or finely divided into globules, extending its surface so greatly that the base metal is soon converted into chloride and dissolved out. On washing then repeatedly with clean water, the globules will usually coalesce again. If some of them refuse to do so, it is best to add a minute quantity of *amalgam of sodium*, which causes *instant* coalescence of the minutest globules. Mercury which gets into this state of fine division, so that it will not run together spontaneously, is lost in immense quantities in mining countries by being washed away in suspension in water and mingled with sand and "tailings." This is the chief cause of the final loss of the mercury which passes into commerce; and great saving of wealth would follow from the practice of methods that would obviate this—*a fortiori*, from the fact that in these cases the floured mercury is generally charged, usually very richly, with the *precious metals* it has taken up in its commingglement with the ore. Mercury when pure has a density varying, according to the best determinations (those of Biot and Arago, Kuppfer, Kopp, and Regnault), from 13.58 to 13.59 in the liquid form, but contracting so greatly when frozen, to between 14.4 and 14.5 (Schulze and Biddle), that it suggests passage into an allotropic or polymeric modification (a circumstance in which both silver and lead resemble it). When it is frozen, which requires a reduction of temperature to just about 39° F. below zero, according to Hutchins (= −39.44° C.), it forms a tin-like mass, which is crystalline, but nevertheless malleable. It boils, when pure, at a temperature variably stated at from 346.5° (Crichton) to 360° (Dulong and Petit), yielding a transparent colorless vapor 6.7 times as heavy as air. Some believe that minute impurities raise its point of ebullition, which may account for these variable figures. Mercury, when exposed to the air at or near its boiling-point, is slowly oxidized to the red oxide; which, when exposed again to a still higher heat, is again decomposed into its elements.

Uses of Mercury.—The most important of these is in the working of the ores of GOLD and SILVER. (See these heads.) It is also used in the amalgamation of the zincs of voltaic batteries, in making looking-glasses, in barometers, thermometers, steam-gauges and other pressure-gauges, in dental amalgams (with copper). In the laboratory it is a valuable agent also in eudiometry (for confining gases), in mercurial pumps, and in other ways. It is used for preparing several important medicinal compounds.

Compounds of Mercury.—Several of the *amalgams*, or compounds of mercury with other metals, are useful substances. The dental amalgam, with *copper*, has already been mentioned. That with *tin* forms the coating on looking-glasses. *Sodium-amalgam* is used in the laboratory for a multitude of purposes, and in the arts in the amalgamation of the ores of the precious metals, and in the recovery of mercury which has been employed for this purpose. The two chlorides of mercury, known commercially as *corrosive sublimate* and *calomel*, have already been described under their appropriate heads. The protoxide or red oxide of mercury, known as *red precipitate* in medicine, is formed both by heating mercury in the air and by applying heat to the nitrate. The only other compound of importance is the sulphide, which, when artificially prepared, forms the beautiful pigment known as *vermilion*, and as found native is the mineral CINNABAR, already described. (See that head.) HENRY WURTZ.

Mercury, Medicinal Uses of. The medicinal uses of compounds of mercury are various, depending on the different physiological effects of different preparations. These have therefore to be studied seriatim. But there is a general affection of the system called *mercurialization*, induced by the steady impregnation of the blood with the metal, which is essentially the same whatever be the preparation of mercury used. This will, then, first be considered. Physiologically, the symptoms of mercurialization are briefly as follows: There are first a metallic taste in the mouth, a soreness of the gums, with swelling and redness of the same, and a peculiar fetor in the breath. Next comes a tendency to increase of the secretions, especially of the saliva, to be followed by a general inflammation of the structures of the mouth, swelling of the salivary glands, excessive and foul-smelling salivary secretion, and accompanying fever. If the poisoning continue, this condition, known as *salivation*, may lead to most disastrous consequences. Ulcers, gangrene, caries of the teeth, and hæmorrhages may occur in the affected parts; and now also the general nutrition of the body will be profoundly disturbed. Diarrhœa, emaciation, grave impoverishment of the blood, with absorption of newly-formed tissues, may result, establishing a state of general devitalization, from which the sufferer will but slowly recover. While in this condition the internal organs are liable to inflame, or, in common parlance, the individual is apt to "take cold." If the poisoning have resulted from breathing mercurial vapors, as in the case of artisans working with mercury, the symptoms of the mercurial infection are somewhat different. Salivation does not occur, but the poison attacks the nervous system, producing a peculiar trembling of the limbs, called "mercurial tremor." This may be so severe as to render the sufferer unable to stand, or even to use the hands for any useful purpose. Therapeutically, the induction of moderate grades of general mercurialization was formerly one of the commonest practices of the physician, being systematically resorted to in almost all inflammations, under the idea that thereby the inflammatory process could be checked, or at least controlled in severity, and the absorption of its morbid products hastened. But of late years this practice has been steadily losing favor, the treatment of inflammations without mercury apparently giving as good and even better results than the mercurial system. Very many physicians therefore limit the medicinal use of general mercurialization to the single disease syphilis, in which its extraordinary power has been overwhelmingly demonstrated. But even here the old habit of pushing the drug to actual salivation has been wholly abandoned, and the development of a slight sponginess and tenderness of the gums is recognized as the utmost physiological limit of therapeutic mercurialization.

Other special properties and uses of mercurial preparations are as follows: In general, the *mercuric* compounds are intensely irritant, corrosive, and highly poisonous to all forms of life, animal and vegetable. When swallowed in poisonous dose they produce intense gastro-intestinal inflammation, with extremely severe burning pain, vomiting, purging, cramps, excessive prostration, and death. If the sufferer live several days, salivation from absorption of the mercurial may occur. The antidote in mercuric poisoning is some form of albumen, as white of egg, milk, flour and water. But as the insoluble albuminates thus formed are again redissolved if left in the alimentary canal, the poison must be got rid of by emetics. The effects on the system are to be treated on general principles. The mercuric compounds used internally in medicine are mercuric chloride (corrosive sublimate), mercuric iodide (red iodide), and mercuric cyanide. These are employed in minute dose, largely diluted, to induce therapeutic mercurialization in syphilis, and in weak solution or in ointment as external applications in many forms of chronic skin disease, especially where depending on the presence of a parasite. Corrosive sublimate in exceedingly small

doses is also used internally in certain digestive derangements with diarrhœa. In striking contrast with the mercuric are the mercurous compounds and preparations of the metal itself. Those used internally in medicine are mercurous chloride (calomel), mercurous iodide (green iodide), blue pill or blue mass (metallic mercury thoroughly rubbed into a pasty mass with confection of roses and liquorice-root), and mercury with chalk or "gray powder" (metallic mercury rubbed into a grayish powder with prepared chalk). These preparations have not the corrosive and poisonous properties of the higher compounds—a fact probably largely due to their great insolubility. Given in small repeated dose, they are in some way slowly dissolved in the juices of the alimentary canal, become thus absorbed, and readily induce general mercurialization. They are accordingly much employed for this purpose in syphilis. In single large dose the tendency of the present group is to a cathartic effect, strongest in the case of calomel, weakest in mercury with chalk. When so operating the mercurial is itself discharged before there is time for its solution and absorption, and hence this mercurial purging is unattended by any general infection with the metal. The stools produced are yellow and green, apparently from the presence of bile—an indication that the cathartic action extends to the duodenum, and thus the bile contained in that part of the intestine is discharged *per rectum* instead of being reabsorbed. Calomel is a good deal used, either alone or with other cathartics, as a purgative, and calomel, blue pill, and mercury with chalk often prove curative in many intestinal derangements, especially in that condition commonly called "biliousness;" but the philosophy of their curative action is not fully made out. Many other preparations of mercury are used for certain special purposes. Mercurial or blue ointment (metallic mercury rubbed thoroughly with lard and suet) is much used as a means of producing general mercurialization in syphilis, a small piece of the ointment being rubbed into the skin daily. It is also employed for purely local purposes in many skin diseases and for the killing of parasites. A solution of mercuric oxide in oleic acid forms a more elegant preparation for the same purposes. Mercurous oxide (black oxide) and mercuric sulphide (cinnabar) are sometimes used to mercurialize in syphilis by the process of "fumigation," the compounds being volatilized by heat and allowed to precipitate upon the naked skin of the patient; calomel is also used for the same purpose. Mercuric oxide and ammoniated mercury (white precipitate) are used only externally as gently irritant applications to sluggish sores. They are generally used made into ointments. Citrine ointment, containing mercury in the form of nitrate, is used for the same purposes. An acid solution of mercuric nitrate is used as a powerful caustic, and finally the yellow sulphate, or "turpeth mineral," is a prompt and non-nauseating but harsh and unequal emetic. EDWARD CURTIS.

Mercy, Sisters of, a religious order founded in 1831 by Catharine McAuley at Dublin, adopted in 1835 the rule of St. Augustine, somewhat modified in accordance with the practical purpose of the order, and was confirmed in 1840 by Pope Gregory XVI. After a preliminary postulancy of six months and a novitiate of two years the Sisters become members of the order by taking the vows, binding for life, of poverty, chastity, obedience, and the service of the poor, sick, and ignorant. Wherever sufficient means are procured a House of Mercy is established, in which destitute girls of good character are taken care of, and from which help, spiritual and bodily, is administered to the sick and poor. All such houses within one diocese form one body under a common superior, elected by the Sisters and subject to the bishop of the diocese. The first House of Mercy in America was established at St. John's, Newfoundland, in 1842; the first in the U. S. at Pittsburg in 1843. The order has now houses, schools, asylums, and hospitals all over the U. S. In Europe the order has also spread very rapidly.

Mer'cyville, post-v. of Macon co., Mo. Pop. 79.

Mer'edith, tp. of Belknap co., N. H., on the W. side of Lake Winnipiseogee. It contains Meredith Village, a post-village on the Boston Concord and Montreal R. R., 37 miles N. of Concord. It has a savings bank, 3 churches, and manufactures of boots, shoes, cottons, lumber, hosiery, and other goods. Pop. 1807.

Meredith, post-tp. of Delaware co., N. Y. Pop. 1462.

Meredith (GEORGE), b. in Hampshire, England, about 1828; was educated in Germany; studied law, but early devoted himself to literature; published *Poems* (1851), *Farina, a Legend of Cologne* (1857), *The Ordeal of Richard Feveril* (1859), a philosophical novel, *Modern Love, Poems and Ballads* (1862), *Emilia in England* (1864), *The Adventures of Harry Richmond* (1871), and numerous other novels.

Meredith (LOUISA **Twamley**), b. at Birmingham, England, 1812; received an artistic education; published in 1835 a volume of poems, and in 1836 *The Romance of Nature, or the Flower Seasons Illustrated*, both illustrated by her own pencil. In 1839 she was married to Mr. Charles Meredith, and emigrated with him to Australia. After residing five years at Sidney, they settled in Tasmania, where Mr. Meredith became colonial treasurer. She published *Notes and Sketches of New South Wales* (1844), which appeared in Murray's "Home and Colonial Library," and was highly commended; *My Home in Tasmania* (1852), with illustrations; *Some of My Bush Friends in Tasmania* (1859), *Over the Straits* (1860), and *Loved and Lost*, a volume of verse, illustrated by herself.

Meredith (WILLIAM MORRIS), LL.D., b. in Philadelphia June 8, 1799; graduated at the University of Pennsylvania; began legal practice about 1820; attained a wide reputation; was much in public life in Pennsylvania; secretary of the U. S. treasury 1849–50; attorney-general of Pennsylvania 1861–67; presided over the Pennsylvania constitutional convention; declined a position as counsel for the U. S. at the Geneva conference. D. at Philadelphia Aug. 17, 1873.

Meredo'sia, post-v. and tp. of Morgan co., Ill., on the E. bank of the Illinois River, and on the Toledo Wabash and Western R. R., 126 miles by water above St. Louis, and 24 miles W. by N. of Jacksonville. Pop. 1383.

Meres (FRANCIS), b. in England about 1570; was author of *Wit's Treasurie* (1597), *Wit's Academy, a Treasurie of Goulden Sentences, Similies, and Examples* (1634), and of a translation of the *Sinner's Guide* by Fray Luis de Granada (1598–1614). The first-named work was a "comparative discourse of our English poets with the Greek, Latin, and Italian poets," which became popular as a schoolbook, and is celebrated as containing the earliest critical references to Shakspeare. The time and place of Meres's death are unknown.

Mergan'ser, a name given to several birds of the family Anatidæ and the genus *Mergus*. Six species are recognized by G. R. Gray. The hooded merganser of North America (*Mergus cucullatus*) is a beautiful water-fowl, known as hairy-head, water-pheasant, and hooded sheldrake. The red-breasted merganser, *M. serrator*, is common to both continents. These birds belong to the family of ducks, and have been said to hybridize with other ducks even when wild.

Merg'er [Lat. *mergere*, "to sink"], in law, is the absorption or extinguishment of one estate or contract or interest by another of a higher grade, when both become vested in the same person in one and the same right. The most extensive and general application of this doctrine is in the law of real estate. Whenever a greater and a less estate coincide and meet in the same person, without any intervening estate, the latter is absorbed, or, as it were, swallowed up by the former, which is therefore the only estate which the owner of the property is subsequently deemed to have. Thus, if a tenant for years acquire the reversion in fee simple in his own right, the estate for years is merged in the fee, and he ceases to be longer *lessee*, having become the absolute owner of the property. So if the mortgagee of an estate acquires the equity of redemption, merger will take place and he will become vested with the entire estate. The same result will follow if the mortgagor takes an assignment of the mortgage or becomes otherwise vested with the mortgagee's interest. It is a general principle that whenever a legal and an equitable estate in the same land unite in the same person, the latter will merge in the former. In courts of equity, however, the strict legal rules of merger are not invariably adhered to, and may be disregarded when they would work injustice or frustrate the lawful intentions of the parties. If it is for the advantage of the person in whom the estates unite that they should be kept distinct interests, and the rights of other parties will not be unwarrantably prejudiced, equity will usually prevent the operation of merger. An estate in land may become merged as to a part of the premises, but still subsist as to the remaining part; as if, for example, a tenant for life or years acquire the reversion in part of the property held under the tenancy. He will in such a case become the absolute owner of one portion of the land, while he remains tenant of the other. If the several estates by act of the law unite in the same person, but not in the same right or interest, no merger will occur. If, therefore, an executor who has a reversion in his own right acquire a term for years in his capacity as executor, the two estates will not merge. So if a reversioner marries the tenant for years, no merger will take

place, as he holds the reversion in his own right, but the term in the right of his wife. The several estates must also be immediately expectant upon each other as a general rule, though there are some exceptions at common law when the intervening estate is a contingent remainder.

Instances of the application of the doctrine of merger occur also in other branches of the law. Thus, if a contract of specialty, as a bond, be given by a debtor, binding him to the payment of a debt founded upon simple contract, the remedy upon the specialty supersedes or extinguishes that upon the original agreement, inasmuch as the substituted obligation is of a higher nature. For a like reason the recovery of judgment upon a claim arising out of simple contract extinguishes the original ground of indebtedness, and the only subsequent remedy available is an action upon the judgment if it be not previously satisfied. So a valid award by arbitrators is a bar to a suit for the original cause of action. But no merger will take place when both securities are of the same character or degree. Thus, one chattel-mortgage would not extinguish another. A lien upon chattels is generally extinguished if the property to which it attaches is purchased by the lienor. The term "merger" is also employed in the English law in a somewhat different sense from those which have been hitherto illustrated. Thus it is there a rule that when a felony has been committed which entitles the party injured to bring a civil action for redress, as well as to institute a criminal prosecution, the remedy by action is merged in the remedy by prosecution, or, as it is briefly expressed, the trespass is merged in the felony. But this does not mean that the civil remedy is extinguished, but only that it is superseded or postponed until the criminal proceedings are terminated. After the end of the prosecution the action is maintainable. This rule is established in order that the party injured may be induced to prosecute the public offence, which he might avoid doing if he were first permitted to recover satisfaction for his private injury. The fact that private persons generally act as criminal prosecutors in England makes this rule important. But in the U. S., where the prosecution of criminal offences is generally committed to special public officials, the English rule has been generally abolished.

George Chase. Revised by T. W. Dwight.

Mergui, one of the three Tenasserim provinces of Farther India, belonging to Great Britain, and consisting of a territory stretching along the coast of the Bay of Bengal from lat. 10° to 13° N., and an innumerable multitude of small islands known as the Mergui Archipelago. The islands are all high and mostly naked, but rich in edible birds' nests, tortoise-shell, and pearls. The territory of the mainland produces sapan-wood and ivory, and is rich in tin and zinc. The capital is Mergui, situated on an island in the delta of the Mergui River, in lat. 12° 26′ N. It has a good harbor and some trade, but with the exception of the house of the governor, the hospital, and the barracks, it contains only mean and miserable houses. Pop. 8000, consisting of Burmese, Siamese, and Chinese settlers.

Mer′iam (Ebenezer), b. at Concord, Mass., June 20, 1794; became a manufacturer of saltpetre in Kentucky, and was afterwards a merchant of Zanesville, O.; removed in 1838 to New York, and became a successful soapmaker and chandler. For more than thirty years he kept records of the weather, which he observed with unusual care; was also remarkably charitable and kind to the poor. He established in 1841 the *Municipal Gazetteer*, a periodical, and wrote many scientific articles, mainly printed in the *Journal of Commerce*. D. at Brooklyn, N. Y., Mar. 19, 1864.

Mer′ian (Matthæus), b. at Bâle in 1593; lived in Paris and Frankfort, and d. at Schwalbach June 19, 1653. His topographical work, giving perspective views of European cities, drawn, engraved, and described by himself, commenced in 1640 and continued after his death, is of great value, while his illustrations of the Bible, Gottfried's *Chronicle*, etc. have only small interest.—His daughter, Maria Sibylla Merian, acquired great skill in painting insects, caterpillars, and butterflies with water-colors on parchment. She was b. at Frankfort Apr. 6, 1647; went to Surinam, where she spent two years studying the insects of the tropical zone; published *Metamorphosis Insectorum Surinamensium* (1705), for which she engraved the illustrations. D. at Amsterdam Jan. 13, 1717.

Mer′ida [anc. *Augusta Emerita*], town of Spain, province of Badajoz, on the Guadiana. During the Roman empire it was the capital of Lusitania and a magnificent city; it is still interesting for its remains of that time, among which are the superb bridge over the Guadiana, 2575 feet long and containing 81 arches, and the triumphal arch of Trajan in the middle of the city. Pop. 5505.

Merida, city of Mexico, capital of the state of Yucatan, 25 miles from the Gulf of Mexico, is handsome and well built, with a fine cathedral and university, flourishing manufactures of tobacco, sugar, leather, and rope, and a brisk trade. A railroad connecting Merida with the port of Progreso has been begun. Pop. 33,025.

Merida, town of Venezuela, South America, capital of a province of the same name, is beautifully situated on an elevated plain, the climate of which is described as an everlasting spring, and which produces all fruits and vegetables of the tropical and of the temperate zones. The city was entirely destroyed by an earthquake in 1812, but is now rebuilt, and is in a flourishing condition. Its coffee and its cotton fabrics are widely appreciated. Pop. 6000.

Mer′iden, city and tp. of New Haven co., Conn., on the New York New Haven and Hartford R. R., 94 miles N. E. of New York. The growth of Meriden is due principally to its manufactures, which employ a capital of $5,000,000, and produce annually goods to the value of $12,000,000 or $15,000,000. Meriden contains 10 churches, a city-hall, 1 savings and 3 national banks, 1 fire insurance company, 6 newspapers, extensive manufactures of silver-plated wares, woollen goods, table and pocket cutlery, gas-fixtures, guns, machinery, malleable iron, iron and brass castings, etc. etc. The State Reform School is located here. The city is supplied with waterworks, has a paid fire department, and 2 post-offices—West Meriden and Meriden, the former the principal office. The post-office of South Meriden is about 3 miles S. W. of the business-centre of Meriden. Pop. 10,495. Orville H. Platt.

Meriden, post-v. and tp. of La Salle co., Ill., 6 miles E. of Mendota. Pop. 1069.

Meriden, post-v., cap. of Steele co., Minn., on the Winona and St. Peter R. R. Pop. of tp. 739.

Meriden, post-v. of Plainfield tp., Sullivan co., N. H., 7 miles S. of Lebanon R. R. Station, is the seat of Kimball Union Academy.

Merid′ian (degree of). See Geodesy.

Meridian, post-tp. of Ingham co., Mich. Pop. 1374.

Meridian, post-v. of Lauderdale co., Miss., 85 miles E. of Jackson, on the Mobile and Ohio R. R., in the heart of the pine region of East Mississippi, has 2 female seminaries and 5 schools, 8 churches, 2 banks, 4 newspapers, 1 furniture and 2 sash, door, and blind factories, 1 iron-foundry and plough-factory, 2 cotton-yarn factories, 3 steam corn-mills, 1 machine-shop, a soda-water factory, and the usual stores and shops. Pop. 2709.

F. T. Cooper, Ed. "Meridian Gazette."

Meridian, post-v., cap. of Jefferson co., Neb., 5 miles W. by N. of Fairbury.

Meridian, post-v. of Cayuga co., N. Y., in Cato tp., 10 miles N. of Weedsport. Pop. 249.

Meridian, post-v., cap. of Bosque co., Tex., near Bosque River, 39 miles N. W. of Waco.

Meridian Circle. See Transit Circle.

Meridian [Lat. *meridies*] **Curve of a Surface of Revolution,** the intersection of the surface with a plane passing through its axis. All such curves on the same surface of revolution are equal. W. G. Peck.

Meridian, Degree of. See Geodesy.

Meridian Distance of a Point, in surveying, the distance of a point from some assumed meridian line, usually the one through the extreme E. or W. point of the survey. W. G. Peck.

Meridian of a Place, the intersection of the earth's surface with a plane passing through the place and the earth's axis. It is a N. and S. line. If the plane of the meridian of a place is prolonged to intersect the celestial sphere, the line in which it cuts that sphere is the celestial, or astronomical, meridian of the place. The *magnetic meridian* of a place is the intersection of the earth's surface with a vertical plane passed through the axis of a freely-suspended magnetic needle at the place. The angle between this meridian and the true meridian is called the *declination* or *variation* of the needle. W. G. Peck.

Meridian Plane of a Surface of Revolution, any plane passing through the axis of revolution.

Merid′ianville, post-v. and tp. of Madison co., Ala. Pop. 3842.

Merid′ional Parts, parts of the meridian, as used in Mercator's system, extending from the equator, and computed for all latitudes differing by 1 minute up to some limit, usually 83°. These parts are tabulated, and are used in this form for projecting charts and for solving problems in Mercator's sailing. The method of computing a table of meridional parts is as follows: Starting from the equator and taking 1 geographical mile as a unit, the length of the first minute of latitude is the natural secant of 1′, the length of the next minute is the secant of 2′, the length of

the next minute is the secant of 3′, and so on; hence, the distance from the equator to lat. 2′ is equal to sec. 1′ + sec. 2′, the distance from the equator to lat. 3′ is equal to sec. 1′ + sec. 2′ + sec. 3′, and so on. The results obtained in this way are only approximate, and the process of computation is somewhat tedious. Other methods of computation have been devised that are more accurate, and at the same time of easier application; but the method just given shows more clearly the nature of the table in question. The best method of computing a table of meridional parts is from the formula

$$M = 7915'.70447 \log \cot \tfrac{1}{2}(90^\circ - L),$$

in which L is any latitude, and M the corresponding meridional part. (See Coffin's *Navigation.*) W. G. Peck.

Merimée′ (Prosper), b. at Paris Sept. 28, 1803; studied law and was admitted to the bar, but did not practise; held various positions in the civil service; succeeded M. Vitet in 1831 as inspector of the archæological and historical monuments of France, and d. Sept. 23, 1870. Besides a number of travelling sketches, originally reports to the minister of his professional researches, such as *Voyage dans le Midi de la France* (1835), *Voyage dans l'Ouest de la France* (1836), *Voyage en Auvergne et dans le Limousin* (1838), and *Voyage en Corse* (1840), he wrote several valuable archæological and historical works—*Monuments Historiques* (1843), *Peintures de l'Église Saint-Savin* (1844), *Histoire de Don Pedro I., Roi de Castille* (1843), *Episode de l'Histoire de Russie* (1854), *Mélanges Historiques et Littéraires* (1855). He made his appearance in literature in 1825 with *Théâtre de Clara Gazul*, which was followed in 1826 with *La Guzla*, a collection of lyrical poems. Both were published simply as translations, the former from the Spanish, the latter from the Illyrian, and for many years the secret remained undiscovered; but their influence in propagating the taste and the ideas of the romantic school in France was nevertheless very considerable. Afterwards followed a series of novels or small romances, often based on some historical data, and delineating the character of the nation and the age with wonderful precision and vividness. *Colomba* may be mentioned as his masterpiece in this style. After his death a very intimate but somewhat peculiar correspondence with an unknown lady was published, under the title *Lettres à une Inconnue;* an autobiography was also found.

Merino Sheep. See Sheep.

Mer′ioneth, county of North Wales, bordering on Cardigan Bay. Area, 663 square miles. Pop. 38,963. It is covered with mountains, the highest peak of which, Arran Mowddy, rises 2955 feet. The soil is generally poor, and suited only for pasturage, but some lead and copper are found, and considerable limestone and slate. Cap. Dolgelly.

Merionid′idæ [from *Meriones*—μηρός, "thigh"—the typical genus, a family of the order of rodents and sub-order Simplicidentata, closely related to the Muridæ. The skull is moderate; the infraorbital foramen large, elliptical, and oblique, and giving passage to the masseter muscle, as well as infraorbital nerve; the lower jaw has the coronoid and condyloid processes and descending ramus distinct, and in nearly the same plane, but the last is twisted and angulated inward; molar teeth $\frac{4}{3} \times 2$, the upper anterior one very small; the hind legs are much enlarged, adapting the animal for progression by leaps, with the tibia and fibula united below, and the metatarsal bones separated from each other; a cæcum is developed. This family has been constituted for the genus *Meriones*, F. Cuvier (= *Jaculus*, Wagler, and *Zapus*, Coues). Its chief character is the development of the hind limbs and the separate metatarsal bones. The *Meriones Hudsonius* is the well-known jumping mouse of the U. S. and Canada; this animal is about three inches long from nose to tail, and the tail is rather more than five inches long. It progresses with amazing rapidity by great leaps. Theo. Gill.

Mer′ivale (Charles), D. D., b. in 1808; was educated at Harrow, Haileybury, and St. John's, Cambridge, where he was an honor-man, a fellow, university preacher (1839–41), Hulsean lecturer (1861), and Boyle lecturer (1864–65); rector of Lawford 1848–70; chaplain to the Speaker of the Commons 1863–67, and in 1869 became dean of Ely. He wrote *The Fall of the Roman Republic* (1853), *History of the Romans under the Empire* (1850–62), *Conversion of the Roman Empire* (1864), *Conversion of the Northern Nations* (1865), a translation of the *Iliad* (1869), and *A General History of Rome* (1875).

Merivale (Herman), C. B., D. C. L., elder brother of Charles, b. in 1806; was educated at Harrow and Trinity College, Oxford, where he graduated with high honors in 1827; became a fellow of Baliol College; was called to the bar at the Inner Temple 1832; was professor of political economy at Oxford 1837–42; under-secretary for the colonies 1848–60; was perpetual under-secretary for India; author of *Lectures on Colonization* (1860), *Historical Studies* (1865), *Life of Sir Henry Lawrence* (1873). D. in London Feb. 9, 1874.

Mer′iwether, county in the W. of Georgia, bounded E. by the Flint River. Area, 490 square miles. It is somewhat uneven and very fertile. Cotton and corn are the leading products. Flour is the principal article of manufacture. Cap. Greenville. Pop. 13,756.

Meriwether (David), b. in Virginia in 1755; served in the Revolutionary army; was taken prisoner at the siege of Savannah; settled in Georgia in 1785; was several times a member of the State legislature; was Representative in Congress 1802–07, where he was a prominent supporter of Jefferson, by whom he was appointed in 1804 a commissioner to treat with the Creeks, and was associated with Gen. Jackson and Gov. McMinn of Tennessee in negotiating with the Cherokees the treaty of July 8, 1817, by which the State of Georgia acquired a large territory W. of the Appalachee River. He was a Presidential elector in 1817 and 1821, and d. near Athens, Ga., Nov., 1825.

Merle, the European Blackbird (which see).

Merle d'Aubigné. See D'Aubigné (J. H. M.).

Mer′lin, a little hawk of Europe, the *Falco æsalon.* It is swift and courageous, as well as docile in confinement, and hence it was once extensively employed for hawking at small game. It is represented by the pigeon-hawk in the U. S.

Merlin (Ambrosius), an ancient Welsh prophet and enchanter, traditionally stated to have lived in the fifth century A. D. The legendary history of Merlin is given by Geoffrey of Monmouth in his *Historia Brittonum*, where he is represented as having sprung from the intercourse of a Welsh princess with a demon, to have been the adviser of Kings Vortigern, Uterpendragon, and Arthur. He figures largely in all the Arthurian poems from Spenser to Tennyson. A collection of prophecies ascribed to him were printed in French in 1498, in English in 1529, and in Latin at Venice in 1554.—Another Merlin, called *Caledonius*, or "the Wild," was said to have lived at Strathclyde in Scotland in the sixth century, and his grave is still shown at Drummelzier on the Tweed, where he was killed on returning from an incursion into Northumbria. He seems to have been a copy of his Welsh prototype, and his prophecies are almost identical with those of the former. An ancient metrical *Life* of this Merlin, consisting of 1500 lines, was published by the Roxburghe Club.

Merluci′idæ [from *Merlucius*, Latinized from the Fr. *mer*, "sea," and *luce*, "pike"], a family of teleocephalous fishes of the sub-order Anacanthini, typified by the common hake of Europe. The body is elongated, covered by small cycloid scales; the lateral line a continuous tunnelled groove, covered by a membranous linear roof; the head conical; the frontal bones separated, with a triangular frontal excavation, bounded laterally by ridges which converge into the occipital crest; the opercula distinct externally; the mouth deeply cleft; the teeth or jaws biserial, largest in the inner row, and movable; branchial apertures extensive; branchiostegal rays seven; dorsal fins two, the first short, the second long; anal like dorsal; pectorals slender; ventrals sub-brachial. The family is chiefly (if not exclusively) represented by the genus *Merlucius*, whose species are found in the cooler seas of both the northern and southern hemispheres. The peculiar dentition and skeleton isolate it. The neural spines are largely developed, and wedged one into the other. Theo. Gill.

Mer′maid ("sea-maid"), an imaginary marine being, having the form of a woman to the waist, and ending in the tail of a fish. Mermen, the males of this supposed species, are also described. The probability is that the appearance of the dugong or some other marine animal in places where it was not well known may have given rise to the stories regarding this fabulous being. The sirens, nereids, and water-nymphs of poetry are all forms of the same creature.

Mer′oë, the name of a modern dilapidated village, of an ancient city, and of an ancient kingdom in the upper valley of the Nile, above the fifth cataract. The village is in lat. 17° N., and occupies a part of the site of the ancient city, which was the capital, or one of the capitals, of the ancient kingdom. The territory of the kingdom was called an "island," bounded E. by the desert, W. by the Nile, and N. and S. by the Atbara and Azrek, the two main branches of the Nile. The country was noted for its fertility and wealth. The kingdom became prominent in the time of the Ptolemies. The Candace of the New Testament (Acts viii. 27) is supposed to have been one of the queens of this kingdom. Pyramids and ruins of temples attest its former greatness. R. D. Hitchcock.

Me'rom, the biblical name (Josh. xi. 5) for *Huleh*, a lake in Northern Palestine, triangular in form, the apex pointing southward, about 4 miles long, and at its greatest breadth 3½. The best description of it is in Macgregor's *Rob Roy* (1866). R. D. HITCHCOCK.

Merom, post-v. of Gill tp., Sullivan co., Ind., on the Wabash River, 35 miles below Terre Haute, is the seat of Union Christian College (Christian Connection). Pop. 426.

Merop'idæ [from *Merops*, the typical genus], a family of "coccygomorph" or cuckoo-like birds, popularly called "bee-eaters." (See BEE-EATER.) They have a peculiar physiognomy; the head moderate; the bill longer than the head, curved, and acutely pointed at the tip; the gape is not deep; the nostrils basal, rounded, and partly hidden by the short bristles; the tarsi very short; the toes long, the second, third, and fourth anterior, and more or less united at the bases, the first posterior; the tail is long and broad. "In *Merops*," according to Huxley, "the long and slender palatines are devoid of any postero-external elongations. The maxillo-palatines are slender and expanded at the end, as in passerine birds, but they unite in the middle line with one another and with the ossified septum." The species are tropical or sub-tropical birds, confined to the Old World. Three genera are generally recognized—viz. *Merops*, with about 20 species; *Melittophagus*, with 6 species, peculiar to Africa; and *Nyctiornis*, with 7 species, in the Indian mainland and archipelago, as well as Africa. They feed upon insects generally. THEO. GILL.

Merovin'gians, the first Frankish dynasty in Gaul, derived their name from Merwig or Merovæus, who was supposed to have founded a Frankish empire on the soil of Gaul in the middle of the fifth century, which CLOVIS or CLODWIG (which see) greatly extended and perfectly consolidated. The most characteristic events in the history of the Merovingian dynasty are the perpetual division and subdivision of the empire (see AUSTRASIA and NEUSTRIA); the horrible feuds originated by the rivalry and hatred of Brunehild and Fredegonda, and so vividly depicted by Augustin Thierry in his *Récits Merovingiens* (1839); and the establishment of a peculiar office, that of *major domus*, which occasioned the overthrow of the dynasty. In 752, Pepin the Short, *major domus* to Childeric III., confined the king in a monastery and seated himself on the throne; thus the Carlovingian succeeded the Merovingian dynasty.

Mer'rick, county of E. Central Nebraska. Area, 615 square miles. It is traversed by the Union Pacific R. R. and by Platte River. It is fertile, and finely adapted to grain and stock-raising. Cap. Lone Tree. Pop. 557. It has largely increased since the census.

Merrick (JAMES), b. at Reading, England, Jan. 8, 1720; educated at Trinity College, Oxford, where he obtained a fellowship; took orders in the Church of England; was author of *Poems on Sacred Subjects* (1763), *Annotations, Critical and Grammatical, on the Gospel of St. John* (1764–67), *The Psalms Translated or Paraphrased in English Verse* (1765), *Annotations on the Psalms* (1767), and other poetical and theological writings. His translation of the Psalms displayed learning and cultivated taste. An amusing little poem by Merrick, entitled *The Chameleon*, has been frequently included in poetical miscellanies. D. at Reading Jan. 5, 1769.

Merrick (JAMES LYMAN), b. in Monson, Mass., Oct. 11, 1803; graduated at Amherst College 1830, and at Columbia Theological Seminary 1833; was a missionary to Persia 1835–45, and pastor of the Congregational church at Amherst, Mass., from 1849 till his death, June 18, 1866. Author of a volume of poems, *The Pilgrim's Harp* (1847), *Life and Religion of Mohammed* (1850), and a *Genealogy of the Merrick Family* (1860). He translated *Keith on Prophecy* into Persian (1846), and left his property to found Persian scholarships in Amherst College and Columbia Seminary.

Merrick (PLINY), LL.D., b. at Brookfield, Mass., Aug. 2, 1794; graduated at Harvard in 1814; became a lawyer of Worcester, Mass., in 1817; practised also in Swanzey and Taunton; a judge of the common pleas 1843 and 1851; judge of a municipal court 1844; of the Massachusetts supreme court 1853–64; was president of the Worcester and Nashua R. R., and left large sums for the benefit of the schools of Worcester, Mass. D. at Boston, Mass., Feb. 1, 1867.

Mer'rickville, post-v. of Lanark and Grenville cos., Ontario, Canada, 45 miles S. W. of Ottawa, on the Rideau Canal. It has extensive water-power and 1 weekly newspaper. Pop. about 1000.

Mer'rill (AYERS PHILIPS), M. D., b. at Pittsfield, Mass., Apr. 17, 1793; graduated at Fairfield Medical College, N. Y., was at once appointed surgeon's mate in the U. S. army, and served with his regiment to the end of the war of 1815. He then resigned and settled at Natchez, Miss. In 1850 he removed to Memphis, Tenn., where he was the most active in organizing the medical college of that city, in which he occupied the chair of the theory and practice of medicine, and also edited the Memphis *Medical Recorder*. In 1864 he returned to New York, and spent his remaining days in that city. He wrote on yellow fever, scurvy, epidemic diseases, mercury, chloroform as an internal remedy, etc. D. in New York Nov. 3, 1873. PAUL F. EVE.

Merrill (JOHN WESLEY), D. D., b. at Chester, N. H., May 9, 1808; graduated in 1834 at Wesleyan University; studied divinity at Andover, Mass., 1837–41; was president of McKendree College, Lebanon, Ill., 1837–41; professor of ethics, metaphysics, etc. in the Biblical Institute, Concord, N. H., 1854–68; held various pastorates in the Methodist Episcopal Church, chiefly in Massachusetts.

Merrill (STEPHEN M.), D. D., b. in Jefferson co., O., Sept. 16, 1825; entered the Ohio conference as a travelling preacher in 1846; was elected editor of the *Western Christian Advocate*, the official paper of his denomination, at Cincinnati in 1868; and consecrated bishop at the General Conference of 1872.

Merrill (WILLIAM E.), b. at Fort Howard, Brown co., Wis., Oct. 11, 1837; son of Capt. M. E. Merrill, 5th Infantry, who was killed while leading his command in the assault of Molino del Rey Sept. 8, 1847; was graduated from the U. S. Military Academy in 1859 at the head of his class, and appointed brevet second lieutenant of engineers; first lieutenant 1861, captain 1863, and major 1867. Served in the civil war as assistant engineer in Virginia and Ohio, and subsequently as chief engineer of the Army of the Cumberland; engaged in the battles of Chickamauga, Missionary Ridge, Knoxville expedition, etc., until July, 1864, when he was appointed colonel of the engineer regiment of veteran volunteers, which he had organized, and with which command he was engaged in fortifying important points on the lines of military railroads in Tennessee, Alabama, and Georgia. Since the close of the war he has served as chief engineer on the staff of the lieutenant-general of the army, and on important duty with his corps in the improvement of rivers, surveys, etc. in the West. Author of *Iron Truss Bridges for Railroads* (1870).

Merrill's, a v. of Tehama tp., Tehama co., Cal. P. 124.

Mer'rimac, post-v. and tp. of Sauk co., Wis., on the Chicago and North-western R. R., and on the W. side of Wisconsin River. Pop. 765.

Merrimack, county of S. Central New Hampshire. Area, 900 square miles. It is hilly and generally fertile. Cattle, grain, and wool are leading products. The county has abundant water-power, and has manufactures of lumber, leather, woollens, harnesses, carriages, brick, wooden ware, and many other kinds of goods. The county is traversed by the Merrimack River and by the Boston Concord and Montreal, the Northern, and other railroads. Cap. Concord. Pop. 42,151.

Merrimack, post-tp. of Hillsboro' co., N. H., on the W. bank of the Merrimack River, and on the Concord R. R., 7 miles N. of Nashua. It contains the villages of Read's Ferry and Thornton's Ferry, and has manufactures of bricks, furniture, clothing, cooperage, lumber, and woollen goods. The village of South Merrimack is on the Nashua and Wilton R. R. Pop. 1066.

Mer'rimack River, in New Hampshire and Massachusetts, is formed by the union of the Pemigewasset and Winnipiseogee rivers at Franklin, N. H. It flows southward into Massachusetts, where it curves towards the N. E., and reaches the ocean in lat. 42° 48′ 27″ N., lon. 70° 48′ 46″ W. On its banks are the thriving cities of Concord, Manchester, and Nashua, N. H., and Lowell, Lawrence, Haverhill, and Newburyport, Mass. It is a navigable tidal stream as far as Haverhill, 15 miles; and above this point its channel is being fitted for navigation by the U. S. government. At its mouth there is a bad and shifting bar which impedes commerce. The river below the dam at Lawrence has valuable fisheries, but its chief industrial importance is from the immense water-power it affords.

Mer'ritt, tp. of Yolo co., Cal. Pop. 480.

Merritt (WESLEY), b. in New York in 1836; graduated from the U. S. Military Academy, and entered the army as brevet second lieutenant of dragoons 1860; captain 2d Cavalry 1862. In the early part of the civil war he had much valuable experience on the staff of cavalry commanders, and in Apr., 1863, accompanied Stoneman's raid to Richmond; was appointed a brigadier-general of volunteers in June, and brevetted major the week following for Gettysburg and subsequent pursuit of the enemy; in the Richmond campaign of 1864 was in command of a division under Sheridan, and subsequently at Opequan,

Cedar Creek, and Fisher's Hill, where he won the brevet of major-general; again at Five Forks, Sailor's Creek, and final surrender was distinguished, and promoted to be major-general from date of Five Forks. Subsequent to the close of the war he served as chief of cavalry in various departments till Feb., 1866, when he was mustered out of the volunteer service; in July following was appointed lieutenant-colonel of the 9th Cavalry.

Mer'ry (Robert), b. in London in Apr., 1755; educated at Harrow and at Christ's College, Cambridge; studied law at Lincoln's Inn; bought a commission in the Guards; settled for some years at Florence, Italy, where he became a member of the famous Della Crusca Academy; contributed to the *Florence Miscellany*, and returning to London began to publish plays and poems under the *nom de plume* of "Della Crusca," which met with some imitators, and thus gave occasion to Gifford to satirize the "Della Cruscan school." Merry married in 1791 Miss Anne Brunton, an actress, with whom he came to the U. S. in 1796, and d. at Baltimore, Md., Jan. 24, 1798. His widow married William Warren, the comedian. Merry is said by Dr. R. W. Griswold to have exercised great influence upon American taste in poetry.

Merry Green, tp. of Grant co., Ark. Pop. 278.

Merry Hill, tp. of Bertie co., N. C. Pop. 1114.

Mer'seburg, town of Prussia, in the province of Saxony, on the Saale. Its cathedral, adorned with four beautiful towers, is a noble structure of the thirteenth century. Merseburg is famous for its beer, which is considered the best made in Germany. Pop. 13,364.

Mersey, a river of England, rises in the N. part of the county of Derby, flows in nearly a westerly direction, expanding at Runcorn into a broad estuary, on the N. side of which is Liverpool; below which it joins the Irish Sea. It has an entire length of about 60 miles, and is navigable to its junction with the Irwell, its principal affluent.

Mer'thyr Tyd'vil, town of Wales, in the county of Glamorgan, on the Taff, is a dirty and unhealthy place, but important on account of its ironworks and coal-trade. Pop. 51,949.

Mer'ton, post-tp. of Steele co., Minn. Pop. 548.

Merton, post-tp. of Waukesha co., Wis. Pop. 1612.

Merton, de (Walter), b. at Merton, in Surrey, England, early in the thirteenth century; educated at the convent of his native place; took holy orders; obtained several benefices; was appointed lord chancellor 1258, deprived of his office by the barons 1259, reappointed 1261, superseded 1263, and again reinstated in Nov., 1272. He was appointed bishop of Rochester Nov., 1274, when he resigned the great seal. He was reputed a man of great learning. D. Oct. 27, 1277. Chancellor Merton established at Basingstoke a hospital for poor travellers and decayed ministers, and founded at Oxford (Jan. 7, 1264) Merton College, gave it a further endowment in 1270, and saw it completed in 1274. Its distinctive feature was that of a literary not a sacerdotal institution, and the students were not to be monks. It became the archetype upon which most subsequent colleges at Oxford were modelled, and celebrated its sexcentenary in 1864.

Meru, in Hindu mythology, was a fabulous mountain in the centre of the world, 80,000 leagues high, and surmounted by the heaven of Vishnu, which was invested with every conceivable attraction. So far as the myth has any geographical basis, it undoubtedly referred to the highest peaks of the Himalaya range.

Merville', or **Merghem',** town of France, department of Nord, on the Lys, carries on a varied manufacturing industry, comprising linen, velvet, salt, spirits, leather, beer, and tiles. Pop. 6521.

Merycopotam'idæ [from *Merycopotamus*—*i. e.* a ruminating hippopotamoid—μηρυκίζειν, to "ruminate," and ποταμός, "river"], an extinct family of artiodactyle ungulates, in some respects intermediate between the ruminants and Omnivores, but in its dentition resembling the former. The representatives seem to have been moderately stout animals; the skull had an elongated snout; the lower jaw was contracted in front of the ascending ramus, and provided with a deep preangular expansion directed forward; the molars were of the ruminant type—*i. e.* with two pairs of crescentiform ridges on each half; those of the upper jaw comparatively broad, and of the lower narrower, the last with a supplementary posterior lobe; the canines comparatively small and cylindro-conic. The typical species of the family (*Merycopotamus dissimilis*) was originally referred to the genus *Hippopotamus* by Falconer; and even when he established a new genus for it, he was still led to retain it near *Hippopotamus*, being undoubtedly chiefly influenced by the form of the lower jaw. There can, however, be little doubt that it was a ruminant of the same group as the Areodontidæ of Miocene North America. The remains of the species of *Merycopotamus* have been obtained in the Tertiary deposits of the Sewalik Hills of India. Theo. Gill.

Mescala, a river in Mexico, emptying into the small but commodious port of Zacatula on the Pacific. Rising in the state of Tlascala, as it passes Puebla it is known as the *Atoyac*, then as *Rio Pablano*, and next, or chiefly, as the *Rio de las Balzas* in its course through Guerrero and as the boundary-line between that state and Michoacan. With a general direction of S. S. W. and S., it is 450 miles long, and navigable in the last section, where it is locally known as *Rio Zacatula*. Engineers regard it as open to easy improvement, and an important part of a practicable water-way across Mexico. Its bed has furnished rich gold-placers on the Pacific slope, and it traverses a rich mineral region. Several of its affluents are considerable streams, and its fish are particularly esteemed. Thomas Jordan.

Mesembryanthema'ceæ, otherwise named Ficoideæ, a natural order of succulent exogenous herbs and shrubs, of nearly 400 species, largely from South Africa. In Spain and North Africa they yield much barilla. The ice-plants of greenhouses and gardens are the most familiar representatives of this order.

Mes'entery [Gr. μέσος, "middle," and ἔντερον, "intestine"], a double fold of the Peritoneum (which see) which attaches the small intestine to the spinal column, but so loosely as to allow much freedom of motion. The corresponding support of the large intestine is the *mesocolon*, with the *mesorectum*. The mesentery contains between its folds numerous blood-vessels, nerves, lacteals, and lymphatics, and the ganglia known as mesenteric glands, which are connected with the lymphatico-lacteal system. It is about four inches wide, and extends nearly the whole length of the intestine.

Me'sha, a king of Moab in the reigns of Ahaz, Ahaziah, and Jehoram, tributary to the kingdom of Israel, to which he annually paid "a hundred thousand wethers and a hundred thousand rams with their wool." On the death of Ahaziah he seems to have revolted, and Jehoram made an alliance with Jehoshaphat, king of Judah, against him. The two kings overran Moab with the exception of one stronghold, which Mesha successfully defended after offering his first-born son as a burnt-offering to his god Chemosh. An inscribed tablet of this king, the famous Moabite Stone (which see), was discovered in 1868 at Dibon, and gives a somewhat different view of the events of his reign.

Mesh'ed, city of Persia, the capital of the province of Khorassan, situated on an elevated but fertile plain in lat. 36° 17′ N. and lon. 59° 25′ E. To some extent Meshed derives its importance from the circumstance that it contains the mausoleum of Imâm Riza, who was the founder of the great Mohammedan sect of the Shiites. This mausoleum and the mosque built over it, with its gilded domes and minarets, its doors of silver, its rails of gold, and forests of columns of marble and porphyry, is among the most magnificent buildings of the East, and is annually visited by thousands of pilgrims. But besides being a holy city, Meshed is a great trade-centre. Caravans are coming and going every day, carrying loads of the most costly merchandise from India, China, Persia, Arabia, and Europe; and in several branches of industry its own manufactures are celebrated; its carpets, shawls, light silks, and sword-blades enjoy a high reputation; also certain kinds of earthenware, glass, and porcelain. Pop. about 70,000.

Meshop'pen, post-v. and tp. of Wyoming co., Pa., on the Susquehanna River and the Pennsylvania and New York R. R. and Canal, 15 miles by rail N. W. of Tunkhannock. Pop. 1239.

Mesil'la, post-v., cap. of Dona Ana co., N. M., 35 miles above El Paso, on the W. bank of the Rio Grande.

Mes'mer (Franz, or, according to others, Friedrich Anton), b. at Itzmang, on the Lake of Constance, May 23, 1733, or, according to others, at Meersburg in Suabia in 1734. Neither his name nor the date and place of his birth is known with certainty. Educated at Dillingen and Ingolstadt, he studied medicine at Vienna, took the degree in 1766, and commenced his famous magnetic cures (see Mesmerism) in 1772; went to Paris in 1778; made an enormous sensation and a great fortune, but lost his reputation here by the unfavorable report made on his method by a royal committee of the greatest French physicians and scientists; practised for some time in London, though with less success; returned to Germany, and d., almost entirely forgotten, at Meersburg Mar. 5, 1815.

Mesmerism. Dr. Mesmer expounded as early as the year 1773 the results of certain experiments made by him,

advancing the theory that some individuals might be rendered temporarily unconscious by others. He claimed that this state was a species of animal magnetism, and that the passage of powerful magnets over the surface of the body of some persons would induce in them a trance state. This condition received his name. About the same time Pusegne, his student, discovered somnambulism, and really explained the peculiar state Mesmer had described before in a very unsatisfactory manner. He eliminated magnetism and other fallacious parts of Mesmer's doctrine. Pusegne accomplished many cures by mesmerism. For a number of years it was looked upon as a species of witchcraft, and was forbidden by the French and German governments and discountenanced by the Church. Although commissions were appointed by the former government to investigate the matter, our own countryman, Franklin, being a member of one of them, it was not till the year 1840 that the subject received proper attention. Before this it was considered dangerous to the morals of the people and productive of licentiousness. Of late years it has been practised by clairvoyants and other quacks as a branch of the healing art. Notwithstanding its interest as a peculiar psychic state, it has been degraded and remained a comparatively unstudied subject. The claims of those who practise it are so extravagant, and are based upon such an unscientific ground, that it receives but little notice from reputable medical investigators. Among the many foolish theories of ignorant pretenders is that of animal magnetism. This supposed physiological quality is made by these people to account for table-tipping, so-called spiritual manifestations, and other doubtful performances. "Animal magnetism" is an ambiguous term. Science has demonstrated that a species of electricity is the product of the body, and is generated in the animal system. Du Bois Reymond and Radcliffe have elucidated this by many striking experiments upon frogs, but these do not prove that there is any connection between psychic phenomena and electricity. Mesmerism and somnambulism can undoubtedly be induced, but are only peculiar mental states. The former is based upon the predominance of one idea over all others. So absorbing is the fixation of the mind on this idea that the subject is unmoved by all outside influences. The popular belief in the mesmerizer, and his exercise of power by the simple use of will to produce this state in another, is a somewhat erroneous one. The first individual must resign or "give himself up" entirely, and simply be influenced afterwards by the mesmerizer. This condition may be produced by looking fixedly at any small bright object held close to the face. After a few minutes the person will become very sleepy and the eyelids will droop. Numerous mesmerists have insisted that the object should be made of copper and zinc, or two other opposite electrical elements; but anything will do for the purpose, so that it be bright.

Probably one of the most able and conscientious observers was Mr. Braid of England, whose system was known as *Braidism* or *hypnotism;* and Dr. Carpenter of London, after investigating it, testified to its feasibility and occurrence, but this system differs very little from the other. When the mesmeric state is produced—that is to say, the condition of induced sleep—it will be found that there is a remarkable exaltation of one or more of the senses, so that the person mesmerized is very ready to receive suggestions implied by the tone of the voice, by the peculiar emphasis and manner of the mesmerizer. Many extraordinary answers are given which astonish the bystanders. In these states any very slight irritation of the muscles, whether by the touch of the operator to the skin or the blowing of air over the surface, will be followed by tonic muscular contractions, so that the subject will support weights, allow his arm to remain in an extended position, or even himself lapse into a cataleptic state. The curative effects of mesmerism are *nil.* It often does much harm, and produces very disagreeable results upon nervous, excitable individuals.

A person mesmerized presents a peculiar appearance. There is first restlessness, faintness, and trembling, dilatation of pupils, and turning upward of the eyeballs, and finally sleep. The susceptibility of individuals varies greatly, there being about one in twenty who may be so influenced. A weak, nervous person or one possessed of sufficient faith is the best subject. Numerous stories are cited of certain individuals who by looking fixedly at others induce in them a species of mesmeric sleep. Schele de Vere relates the case of Jean Paul, who while sitting with a large company by merely looking at a lady caused her to fall asleep. Other anecdotes are told of people who were able to exert this power upon others sitting at a distant part of a public hall in which they were. It is very certain that all human beings exert a remarkable unconscious influence upon each other. Every one has undoubtedly witnessed the contagion of a gape, and may have made others gape by simply opening their hands in imitation of jaws. Other performances seemingly wonderful may be explained by the observers of mental phenomena; for example, we have been told by many of the believers in animal magnetism that if a button or ring be suspended from the finger by a fine thread in their immediate neighborhood, so-called animal magnetism will make it sway to and fro, and strike the hour of the day in spite of the effort of the person who performs the experiment to stop it. This may be tried by any one, and it will be found that the ring will oscillate, but will never strike the proper hour unless the individual has previously made himself acquainted with it. It is impossible to keep the ring from moving, and as long as expectation is aroused so long will it strike. This is a species of unconscious influence exerted by expectant attention, and instead of being the result of any magnetic power, is simply an ideo-motorial impulse. This theory of unconscious influence, a result of expectant attention, fully accounts for so-called clairvoyance, mind-reading, mesmerism, and other astonishing performances. In all of the conditions "the directing power of the will is suspended, the intellect is in a state of exalted excitement, and the reflex power of the cerebrum stimulated. The mind is in a condition to receive ideas from outside, suggestions through the senses or evolved by the inner consciousness of the individual. In whatever mode the ideas have been brought before the consciousness, it is the essential characteristic of these states that the mind is entirely given up to that which may happen to be before it at the time; which consequently excites an uncontrolled directing power over the actions, there being no antagonistic agency to keep it in check." Numerous writers and champions of mesmerism advance the theory that there is a universal fluid that carries a peculiar force akin to the so-called animal magnetism. This has been called by some *odyl, etherium,* or other high-sounding and inappropriate names. It is needless to say that there are no physical laws that account for the existence of any such fluid.

The literature of magnetism is certainly sensational as well as interesting. Anecdotes are told of people in the mesmeric sleep who correctly describe the faces of people they have never seen—minutely describe their dress and tell where they are. A case of this kind is mentioned by Schele de Vere: the subject accurately pictured the house of a friend in New South Wales; the description was afterwards found to be correct in every particular. States identical with the mesmeric have been produced in nearly every country, and form an element of the literature of every nation. The Chinese believe in a quality that is possessed by every one, which it is possible to diffuse, one individual having the power to communicate it to another. This corresponds to our so-called magnetism, and is denominated *yu-yang.*

The advocates of mesmerism prove the divine origin and antiquity of the art by numerous quotations from the Bible. Frequent reference is made to the laying on of hands, which is supposed by them to be identical with the first steps of mesmerism. Ezekiel (i. 3) says, "The hand of the Lord was upon me in the evening." It was certainly known among the ancients. Plutarch mentions it, as well as other writers, and it is clearly proved to have entered largely into the religious rites of the ancients. It is useless to refer to many of the extraordinary conditions which some writers have said to belong to the mesmeric state. One that has received much notice is exaggerated intelligence during the mesmeric sleep. A case is related of a child who had heard some person play a violin a long time before. During the trance state she repeated some of the pieces almost note for note. This does not seem impossible when we consider that in some forms of rare nervous disease patients have been known to quote long extracts and sentences from books they may have heard but once during their previous lifetime, and even in other languages than their own. What is more remarkable, some of them before their illness were notably dull and devoid of usual intelligence.

Allan McLane Hamilton.

Me'sola [Lat. *Mensula* or *Mesula Magna*], town of Italy, province of Ferrara. From its marshy situation near the Po it is subject to continual fever. Pop. in 1874, 6399.

Mesopota'mia [Gr. μέσος, "middle," and ποταμός, "river"], the name generally given in ancient times to the territory lying between the Euphrates and the Tigris, and which the Arabs call *El Jezirah,* "the island." It forms a low and level plain, with only a few hilly tracts towards the N., and it consists mostly of dry steppes. It is only along the rivers, where artificial irrigation is employed, that the soil shows fertility; elsewhere it affords only meagre pasturage. The whole region belongs to Asiatic Turkey, and is divided into eyalets or governments.

Mesopotamia, tp. of Trumbull co., O. Pop. 796.

Mesozo'ic [Gr. *μέσος*, "middle," and *ζωή*, "life"] **Time,** the great Reptilian Age of geology, which succeeded the Palæozoic and preceded the Cainozoic. It was divided into three periods—the Triassic (the oldest), the Jurassic, and the Cretaceous. In it the molluscan and reptilian types of animals reached their culmination, and began to decline. The same is true of the cycads among plants. Palms and angiospermous plants, osseous fishes, birds, and mammals all first appear in the Mesozoic strata.

Mesquite' Grass, a name given in the South-western U. S. to rich pasture-grasses of the genus *Aristida*. They require a hard soil, without shade, and are of great value to stock-raisers, but are unfit for hay-making. The mesquite grasses are spreading eastward. They are procumbent or running in character, and do not stand high.

Mesquite Tree, the *Prosopis dulcis* or *Algarobia glandulosa*, a small thorny and gnarled tree of Texas, New Mexico, Arizona, and Mexico. It is of the order Leguminosæ, sub-order Mimoseæ. Its hard wood affords good fuel, and its branches yield abundantly a gum which is a good substitute for gum arabic. It appears sparingly in commerce, and is called mesquite gum. The long pods abound in a thick, sweet, edible pulp. Both bark and wood are rich in tannic acid, and are excellent materials for use in tanning hides. Another mesquite is the *Prosopis odorata* (screw mesquite); its beans are eaten by the Indians, and the wood is of great value on the South-western desert plains. It is a shrub or small tree, considerably resembling the above.

Messagn'e [anc. *Messapia*], town of Southern Italy, in the province of Lecce, situated in a charming plain about 9 miles from Brindisi. It is well built and surrounded by a strong wall. Ancient sepulchres and shattered columns are found in its neighborhood. Pop. in 1874, 8511.

Messali'na, or **Messallina** (Valeria), b. at Rome in 23 A. D., was a daughter of Marcus Valerius Messala Barbatus and Domitia Lepida. In 38 she was married to Claudius, who became emperor in 41, and in 48 she was put to death. The picture which Tacitus, the elder Pliny, Juvenal, and Dion Cassius give of her profligacy, avarice, and atrocity would be incredible were it not that these writers agree with one another, and were not the portrait drawn by Tacitus with a vividness and consistency which a purely ideal delineation might have, but slander and gossip never.

Mes'senheimer, tp. of Union co., Ill. Pop. 1076.

Messe'nia, an ancient territory of Greece, consisted of the south-western part of the Peloponnesus, between the sea and Laconia. After two fierce wars with Sparta (from 743 to 724 B. C. and from 685 to 668 B. C.), the Messenians were subdued by the Spartans; a portion emigrated to Sicily, where they conquered Zancle, afterward Messana, but the rest were reduced to slavery. When the power of Sparta was finally broken by Epaminondas, this noble man restored the Messenians to freedom, and founded and fortified their new capital, Messene. Of the descendants of those who had emigrated 300 years before many returned, and the country flourished anew as an independent state until conquered by the Romans in 146 B. C.

Mes'ser (Asa), D. D., LL.D., b. at Methuen, Mass., in 1769; graduated at Brown University 1790, where he became tutor 1791, professor of languages 1796, of mathematics and natural philosophy 1799, and president 1802, holding that position until 1826, when he resigned. He was licensed to preach 1792, and ordained 1801, but was never settled as a pastor. Several of his sermons and orations were published. He filled several civil offices at Providence, and d. there Oct. 11, 1836.

Messerve (Col. Nathaniel), b. at Portsmouth, N. H., early in the eighteenth century; rendered good service at the siege of Louisburg (1745) as lieutenant-colonel of Moore's regiment; commanded the New Hampshire regiment in the Crown Point expedition 1756, and defended Fort Edward; embarked in 1758 for the second siege of Louisburg, and d. of smallpox June 28, 1758. He was an eminent shipbuilder.—His son George was stamp-agent for New Hampshire and collector at Boston and Portsmouth; was a loyalist, and went to England 1777.

Messi'ah is the name in the sacred Scriptures and in the usage of Jew and Christian ascribed to that holy Person in whom the hopes of redemption centre. מָשִׁיחַ in the Old Testament, used as an adjective, is applied to the high priest (Lev. iv. 3; vi. 15, etc.) as the one anointed with the holy oil; but as a substantive, to the theocratic king (1 Sam. ii. 10; Ps. xviii. 50, etc.), and so by the reflection of the poets to the patriarchs as the ancestors of the theocratic king (1 Chron. xvi. 22; Ps. cv. 15); and thus by eminence to that Person in whom the functions of priesthood and royalty culminated (Ps. ii. 2; cx. 1, 4; Dan. ix. 26). In the New Testament, ὁ Μεσσίας is used in John i. 42; iv. 25, but generally מָשִׁיחַ is rendered by its Greek equivalent Χριστός, which with the article refers to Jesus as the expected Messiah, but without the article, especially in the Epistles, became a proper name of Jesus Christ, the historical Messiah. Now in the New Testament it is easy to separate the person of Christ from his redemptive work and the last things; but this cannot be carried out in the Old Testament, because the person of the Messiah is ever involved in the future redemption, and the last things embrace both advents. Hence we must treat of the Messiah under the more general head of *Messianic Prophecy*, which may be defined as the revelation of the fulfilment of redemption through the Messiah.

Messianic Prophecy begins with the dawn of human history and unfolds in the Mosaic, Davidic, and prophetic periods of biblical theology.

I. *The Mosaic Period.*—Immediately after the Fall, in the midst of the condemning sentences of God, the hope of redemption was planted as a precious seed wrapped up in the shell of the curse.

(1) The Protevangelium (Gen. iii. 15) is a generic prophecy, bringing into contrast the seed of the woman and the seed of the serpent; the human race struggling, suffering, but finally victorious over the forces of evil. And as these forces of evil culminate at the end as well as the beginning in the serpent, the devil, so implicitly the human race is to be conceived as culminating in a personal head at the victorious end as well as at the sad beginning. (See Rom. xvi. 20; 1 Cor. xv. 25; Rev. xii. 9 *seq.*; xx. 2 *seq.*)

(2) As a new era begins with the departure from the ark, so there is an appropriate advance in the promise of redemption. The blessings of Noah (Gen. ix. 25–27) rise up over against his curse. Regarding אֱלֹהִים as the subject of יִשְׁכֹּן, after Onkelos, most Jews (Baumg., Hofm., Schultz, Conant, *et al.*), the blessing of Shem is the presence and indwelling of God, whose advent is promised to dwell in the tents of the Shemites. Here the divine line of Messianic prophecy begins, which develops side by side with the human line until they converge in the God-man at his advent. The advent of God is prepared by the theophanies and the dwelling enthroned above the cherubim, and is fulfilled in the incarnation (John i. 14; Eph. ii. 22; Rev. xxi. 3).

(3) Abraham's blessing (Gen. xii. 1–7; xiii. 14–17; xv. 4–5; xvii. 2–8; xxii. 15–19; xxviii. 13–15) unfolds the Protevangelium. It is a divine call, with the institution of a covenant relation and a promise which includes a promised land, a promised seed, and a blessing to all nations through the seed. The promised seed is now viewed as to its unity as a generic term, and we must conceive of it as unfolding the seed of the woman, with a culminating head (Gal. iii. 16); then it is resolved into its members—many nations, peoples as the stars and sand for multitude—and so we must think of the children of Abraham by faith (Matt. iii. 9; John viii. 39; Acts ii. 39; Rom. iv. 16; Gal. iii. 29). The promised land was Canaan (Gen. xiii. 15), involving the spiritual Canaan (Heb. xi. 10 *seq.*; Rev. xxi.).

(4) The patriarch Jacob on his deathbed divides the promised land among his sons, singling out Judah as the one through whom the covenant blessings especially unfold (Gen. xlix. 8–12). Taking שִׁילֹה as an accusative of place, with most recent interpreters, we see the blessing of the promised land unfolding through the designation of a place therein where the lion of Judah rests after victory, receives the submission of the nations, and enjoys the richest fruits of the land. Shiloh is the historical place of this resting, which passes over into Jerusalem and the new Jerusalem, where all the conditions are fulfilled in the lion of Judah (Rev. v. 5), who is the great conqueror (Eph. iv. 8; Col. ii. 15), leads to the true resting-place (Heb. iv. 1 *seq.*), and bestows final blessings (Rev. xxii.).

(5) On the arrival of Israel at Mount Sinai, prior to the giving of the law, a covenant relation was established (Ex. xix. 1–6), by which Israel becomes God's purchased possession (סְגֻלָּה), a kingdom of priests, and a holy nation. As such, they fulfil the third factor of the Abrahamic covenant, and become a blessing to the world in their ministry in sacred things. This calling is inherited by the Church (1 Pet. ii. 9), and realized in the latter days (Rev. i. 6; xx. 6).

(6) The same factor in the Abrahamic promise fully unfolds on another side through the foreign prophet Balaam (Num. xxiv. 15–24), who sees a star or sceptre rising out of Jacob, subduing the nations far and near. Those mentioned are the most prominent of the time, representing,

in accordance with the constant usage of prophecy, the opposing nations of all time. The sceptre or star is a generic reference to Israel as the kingdom of God, with the culminating head (Rev. xxii. 16).

(7) Moses is the suitable organ of the final Messianic prophecy of this period. The mediator of his people, establishing the typical institutions of salvation and proclaiming a divine law, which was no less prophetic, he was in his own person the most appropriate type of the prophet who was to fulfil his work, his institutions and revelations. This prophet (Deut. xviii. 15–19) to be raised up by Jehovah will be like his brethren, like Moses especially, and will speak the divine word with the divine authority. That prophet is Jesus, according to Acts iii. 22–26; Heb. iii. *seq.*, who fulfils the law and the prophets as the Mediator of the new covenant, the final goal and ultimate realization of the old covenant (Matt. v. 12; Rom. x. 4; Gal. iii. 24; Heb. xii. 24).

II. *The Davidic Period.*—A new era begins with the organization of the kingdom of David and the establishment of the religious and political centre at Jerusalem. The desire of David to build Jehovah a house is the occasion of the fundamental prophecy (2 Sam. vii. 12–16; 1 Chron. xvii. 11–15). Jehovah will build the seed of David into a house of everlasting sovereignty. That seed will build Jehovah's temple, and in the peculiar relation of sonship will never be forsaken, though chastised for sin. The seed of David is generic as the seed of the woman and of Abraham, with a culminating head. The dynasty of David is ever the theocratic house of sovereignty, becoming eternal through Christ (Acts v. 31; Rom. i. 3–4; Heb. i. 8; 1 Cor. xv. 26; Eph. iv. 8–10). The seed of David, beginning with Solomon, ever erected, restored, and cared for Jehovah's temple, which becomes eternal through the erection of Christ (John ii. 19–21). The seed of David was ever involved in sin and chastisement, and peculiarly bore the mercy of God; the chastisement and mercy culminate in Christ, who, though sinless, suffers for the sins of the entire line and world, and becomes the ultimate bearer of the divine mercy (2 Cor. v. 21; Gal. iii. 13; 1 Pet. ii. 24). The ideas of this and all previous Messianic prophecies now develop in the Psalter, where the *experience* of the psalmist becomes the typical form to set forth the Messianic ideas; and this either in the simple type, the experience being purely historical, or in the typico-prophetic psalm, the psalmist's real historical experience becoming the basis of an ideal prophetic experience.

A. *The Davidic Psalms.*—(1) Ps. cx. cites a divine oracle and oath, and from these as a basis represents the Messiah going forth to battle, engaged in the struggle, and triumphant. He is a priest-king after the order of Melchizedek, the Lord of David, exalted to a position of peculiar dignity at the right hand of Jehovah, whilst he subdues all his enemies under his feet. (Comp. the typical Psalms xx., xxi., and lx., and for the fulfilment Matt. xxii. 41–45; Mark xxii. 35–37; Luke xx. 41–44; Acts ii. 34–36; Heb. i. 13; vii. 17 *seq.*; x. 12–13; Eph. i. 20; 1 Cor. xv. 25; Rev. xix. 11–16.) The typico-prophetic viii. psalm presents the ideal man, made to fall a little short of the divine, destined to have dominion over all creatures. Ps. cx. and viii. are thus united in the citation Heb. ii. 7 *seq.*

(2) Ps. lxviii. describes Jehovah's march and conquests, with the blessings of his advent, with a more general reference to all Israel (comp. the typical Ps. xxiv. and Eph. iv. 8); whilst in Ps. xviii. (comp. Ps. xlv.; Rom. xv. 9) this general reference arises out of a particular reference to the history of the psalmist himself.

(3) A group of Messianic psalms arises from David's experience of suffering as an innocent victim of unjust persecution. They describe sufferings which transcend anything in David's historical experience, and with a minuteness of detail that cannot be explained from a figurative description of it. We can only understand them from that experience, and yet we cannot but find mingled therewith the experience of the man of sorrows. In the depths of his own sorrows David comes to woes of which he has an ideal experience through foreboding and presentiment in anxiety respecting his son. The Messianic features are—(*a*) Cruel reproaches of malicious enemies (Ps. lxix. 26; xli. 7–8; xxii. 7–8; comp. Matt. xxvii. 39 *seq.*). (*b*) He is persecuted because of his consecration to the divine will as the acceptable sacrifice (Ps. xl. 6–8; comp. Heb. x. 8 *seq.*; Ps. lxix. 7–12; comp. Matt. xxvii. 29 *seq.*; John ii. 17; vii. 5; Rom. xv. 3). (*c*) The sufferings are the stretched body, feverish frame, intense thirst, offering of gall and vinegar, division of his garments, agonizing cry, and broken heart (Ps. xxii. 1, 12–18; lxix. 20–21; comp. Matt. xxvii. 39 *seq.*). (*d*) Notice also the traitor and his doom (Ps. xli. 9; comp. John xiii. 18; Ps. lxix. 23 *seq.*; comp. Acts i. 20 and Ps. cix. 8). (*e*) Observe also the praise of the delivered one and the worldwide significance of the sufferings (Ps. xxii. 22; comp. Heb. ii. 12; Ps. lxix. 30 *seq.*; xl. 9; comp. John xvii. 4).

(4) The hopes of the Psalmist respecting communion with God after death in the typical Ps. xxxi. 5 (comp. Luke xxiii. 46; Ps. lxi. 7); xvii. 15 and xvi. 9–11 become typico-prophetic in his experience of preservation from corruption in the grave and life in the divine favor. (Comp. Acts ii. 26.)

B. *Psalms of Solomon and his Singers.*—(1) In Ps. ii. the Messiah is represented calmly seated at the right hand of Jehovah on Mount Zion, in the relation of sonship, citing a divine decree entitling him to this position, with its prerogatives of sovereignty and inheritance. (For the fulfilment see Acts xiii. 33; Rom. i. 4; Heb. i. 5; comp. Acts iv. 25.) Ps. lxxii. presents the aspirations of the Messiah and their realization, as righteousness, mercy, and peace everywhere prevail, his dominion extends over the whole earth, the soil yields its abundance, and all nations unite in grateful tributes of praise and adoration. Ps. xlv. represents the Messiah espousing the nations through the type of the marriage of Solomon with Pharaoh's daughter; describes the glories of the godlike bridegroom, the splendors of the bridal procession, and the joys of the marriage. (See John iii. 29; Eph. v. 25; Rev. xix. 7–9; comp. Heb. i. 9.)

(2) A group of psalms describes the reign of Jehovah in the holy city. Ps. xlvi. represents the safety and security of the city under the rule of Jehovah, who subdues all enemies and stills the commotions of the nations. Ps. xlvii. presents the throne of Jehovah as surrounded by the princes of all nations, whilst the shields of their heroes are hung up in his palace. Ps. xlviii. describes the glories of Mount Zion as the residence of the great King, as well as the justice, mercy, and blessedness of his reign, extending to the ends of the earth. Ps. lxxxvii. describes the adoption of the nations into the family of God and their enrollment as citizens of Zion.

C. Psalms reflecting the sad experience of the disastrous times of Rehoboam, which the aged singers pour forth in mournful strains of plaintive expostulation and yearning for Jehovah's advent. Ps. lxxxix. bases its pleading on the faithfulness and mercy of Jehovah, the covenant with David, and the present humiliation of the Davidic throne. Ps. lxxx. touchingly alludes to Israel as the flock of Jehovah, the vine of his planting, in order to plead for the restoration of prosperity and the establishment of the man of the right hand (Ps. cx. 1), the son of man (Ps. viii. 4). Ps. lxxxv. anticipates the brighter times when mercy and truth, righteousness and peace, now far apart, may meet and kiss in harmony in the land and people. Ps. cxxxii. quotes the Davidic covenant in order to the plea in terms of the old battle-cry of Num. x. 33 *seq.* for the advent of Jehovah on his throne, with the consequent blessings upon priests and people, and above all the horn of David, the anointed of Jehovah, which last reference is re-echoed in the words of Zacharias (Luke i. 6 *seq.*).

III. *The Prophetic Period* begins with the decline of Israel, and is subdivided by the various stages of that decline.

Stadium 1st.—Joel declares the advent of Jehovah. (*a*) Chap. ii. 28–32, in the outpouring of his Spirit, with the manifold gifts of prophecy, upon all classes and conditions of men, in the exhibition of wonders in heaven and on earth to herald the approach of the judgment, and as the establishment of deliverance in Jerusalem for all who call upon his name. The fulfilment is claimed in Acts ii. for the day of Pentecost, and is applied in Rom. x. 12, 13 to the gospel call and salvation, whilst the heralding wonders reappear in Matt. xxiv. 29. (*b*) The advent in judgment is described (chap. iii.) as an assembly of all nations before the throne, as if to battle in the valley of Jehoshaphat; as a harvesting and treading of the winepress amidst the confusion of the multitudes and the elements; as the establishing of the enemies as a desolate waste, and of the people of God as an exceedingly fertile land, fructified by the living waters flowing forth from the house of God in Zion. (See Matt. xxiv.; Rev. vi. 12; xiv. 14 *seq.*; xvi. 16 *seq.*; xx. 11 *seq.*; xxii. 23 *seq.*)

(2) Amos (chap. ix.) represents the house of David, which has been reduced to a ruined hut, as rebuilt, as taking possession of the remnant of the nations for an inheritance, and as realizing the blessings of the promised land. Acts xv. 16 refers it to the erection of the kingdom of Christ and the gathering of the Gentiles by apostolic labors.

(3) Hosea, the Jeremiah of the northern kingdom, carries out the idea of the Pentateuch, that idolatry is whoredom, in three symbolical transactions: (*a*) The prophet takes a symbolical wife of whoredoms, who bears children of whoredom. These, through their significant names, Jezreel, Lo-ruhamah, and Lo-ammi, represent on the one

hand the condition of Israel as forsaken of Jehovah—*e. g.* scattered, unpitied, not my people; and on the other as restored—*e. g.* sown in the field of Jehovah's planting, pitied, my people, sons of the living God. In this connection Israel and Judah recognize one another as sisters, and under the one head, the second David, march up out of the land of captivity. (Comp. Rom. ix. 25 and 1 Pet. ii. 10.) (*b*) Mother Israel, guilty of adultery with Baal, is disciplined in the wilderness as at the Exodus, then comforted by Jehovah, who leads her through the valley of Achor into the holy land. The reunion is a marriage of which the divine attributes are the bands. The instruments of war are destroyed, a covenant is made with the animal kingdom, and all nature responds to the voice of Jehovah. (Comp. Rom. viii. 19–23 and Rev. xii.; xxi. 3 *seq.*) (*c*) The faithful love of Jehovah to unfaithful Israel is emphasized. She remains many days without settled government and institutions of worship, but finally returns trembling to Jehovah and David her king. (Comp. Rom. ix.–xi.)

Stadium 2d.—Israel having gone into exile, the moral struggle is more immediately about Jerusalem as a centre until the exile of Judah. There are two revivals, accompanied with Messianic prophecies—one in the reign of Hezekiah, the other in that of Josiah. The former (1) is introduced by Micah, whose prophecy unfolds in three sections: (*a*) iv. 1–7 represents the temple-mount as rising from its degraded condition, exalting itself above the proudest peaks of earth, as the mountain of the world, up which all nations flow in pilgrimage, and from which the divine law, word, and judgment go forth, producing universal peace. This is the temple of Christ's body (John ii. 19–22; Eph. i. 20–23; ii. 22). (*b*) iv. 8–13. There is a mingling of the shepherd-tower of David, the daughter of Zion in childbirth, the bullock with iron horns and hoofs, threshing the nations—all representing the exaltation of the humbled and despised kingdom of David. (Comp. Rev. xix. 14–16.) (*c*) Chap. v. Little Bethlehem is exalted in that One whose outgoings were from everlasting, makes his historical appearance from thence, delivering Zion from her enemies, the Shepherd of his people, the peace of the nations. Matt. ii. 5 *seq.* applies it to the babe of Bethlehem who is our Peace (Eph. ii. 14).

(2) Isaiah, the greatest of all prophets, takes up the entire body of previous Messianic prophecy in order to reproduce it in new forms and fresh development. Part I. is composed of several groups of prophecies (i.–xxxix.), and presents the varied phases of the Messianic idea. (1) In ii. 1–5 the exaltation of the temple-mount is briefly stated in terms of Mic. iv. 1 *seq.* Another turn to the idea is given in xxviii. 16, where we have the Messianic cornerstone of Zion. (Comp. Ps. cxviii. 22, a favorite term of the New Testament; Matt. xxi. 42; Acts iv. 11; Rom. x. 11; 1 Pet. ii. 6 *seq.*) The Messianic person is distinctly brought out (*a*), vii. 14–16, as a wonderful Child, called Immanuel, the bearer of the divine deliverance, until whose maturity distress will continue in the land. (Comp. Matt. i. 20–25.) (*b*) ix. 1–7. A wonderful Light shines on the northern frontier, which exalts that people as highly as they had been previously brought into contempt as the first of the Jews to go into exile: a great deliverance, transcending that of Gideon in the day of Midian, is wrought, a Child of the house of David is born, named Wonderful, Counsellor, Divine Hero, Everlasting Father, Prince of peace, who reigns on the throne of David in righteousness for ever. (Comp. Matt. iv. 15–16; xi. 23; Luke x. 15.) (*c*) xi. A twig comes forth from the stump of Jesse; a shoot from his roots bears fruit. The sevenfold gift of the Spirit rests upon him, endowing him to fulfil his work of judging the poor with spiritual discernment and the wicked with the word of his mouth. Girded with righteousness and faithfulness, he establishes universal peace in the earth, in which the animal kingdom shares. He becomes the standard of the nations; a deliverance like that of Egypt takes place; the ransomed assemble from all lands, marching up on highways of redemption. Matt. ii. 23 applies the נֵצֶר of our passage, with the corresponding צֶמַח of Jer. xxiii. 5; xxxiii. 15; Zech. iii. 8; vi. 12, to the Nazarene, as the one who grew up in that obscure place to which the line of David had wandered as a shoot from a neglected stump. (Comp. John i. 32; xii. 32; Rom. viii. 22; xv. 12; Rev. i. 16.) The nations share in Messianic blessings. Ch. xviii. 7 points to the conversion of Ethiopia; xix. 18–25 represents Egypt and Assyria as united with Israel as the people of God, speaking the holy language and serving Jehovah with altar and sacrifices; xxiii. 18 predicts the consecration of the merchandise of Tyre. (2) The advent of Jehovah is in judgment; the earth reels to and fro like a drunken man, the heavenly lights are in commotion, the heavens dissolve and roll together as a scroll, their host fall as the foliage, the great ones of earth seek refuge in dens and caves, the host of the high on high (evil spirits?) are imprisoned in the pit, the wicked suffer in unquenchable fire, the smoke of their torment ascending for ever (chs. xxiv. and xxxiv; comp. Rev. vi. 12–17; xiv. 11; xxi. 8). Jehovah's advent is to refine and purify his people, so that the remnant becomes holy and blessed (iv. 2–6). There is a resurrection of the pious dead, whose shades the earth brings forth under the quickening influence of the dew of the divine glory (xxvi. 14 *seq.;* comp. Ez. xxxvii. 1–14; Rev. xx. 4–6). They sing songs of victory over the world's metropolis and the destruction of sorrow and death (xxv. 1–8; comp. xxxv. 10; Rev. xv. 3–4; xix. 1, 2; 1 Cor. xv. 54). Zion becomes the quiet habitation of Jehovah, the glorious judge, warrior, and king, a place of streams, where no hostile navies appear from fear of Jehovah (xxxiii. 10–24), who dwells among them on Mount Zion (iv. 5, 6), before his elders in glory (xxiv. 23; comp. Rev. iv. 43). The land becomes wonderfully fruitful (iv. 2), the wilderness a fertile garden, a highway of holiness is established, and sorrow and sighing are exchanged for joy and gladness (xxxv.).

The second part of Isaiah (xl.–lxvi.), assigned by Ewald and his school to the great unknown, is really an organic whole, weaving into one web about the person of the servant of Jehovah the previous Messianic references. This servant, referred by the Jews and many Christians to Israel as a whole, or the pious portion of Israel, by others to the prophetic order, is really, like the terms Son and Seed of the Psalter and Pentateuch, a generic term, with a culminating head. Jehovah calls him from the womb to be his servant, anoints him with his Spirit. He is the gentle preacher and saviour of the poor, the meek, and broken-hearted. He restores the remnant of Israel, is a covenant of the people, a light of the Gentiles, Jehovah's salvation to the end of the earth (xlii. 1–9; xlix. 5–8; lxi. 1–3; comp. Matt. xii. 17–21; John viii. 12; Heb. viii. 6; ix. 15; Luke ii. 32; iv. 18 *seq.*). He is a suffering servant (chap. liii.), without form or majesty, despised and rejected of men, a man of sorrows and acquainted with grief—one covering his face as a leper, an outcast. He is an *innocent* sufferer, bearing his people's sorrows, pierced for our transgression, crushed for our iniquities, and his stripes were for our healing and peace. (Comp. Ps. xxii. 16; lxix. 26; Zech. xii. 10; Gal. iii. 13; 1 Pet. ii. 24.) All were wandering sheep. Jehovah laid on him, the uncomplaining lamb, the iniquities of all. (Comp. John i. 29; Acts viii. 32; 1 Pet. i. 19; Rev. v. 6; vii. 14, etc.) His contemporaries did not consider this, but assigned him his place with the wicked in his death, but were overruled in that he was buried with a rich man on account of his innocence. (Comp. John xix. 38–41; 1 Pet. ii. 22.) The divine purpose was that he should be a *guilt-offering,* a substitute for transgressors, and then reap his reward in his exaltation, his spoils of victory, and his prosperous ministry. (Comp. Heb. ii. 10–13; Matt. xx. 28; John x. 11–17; Rev. i. 18; Heb. xii. 2.) Chap. lv. gives the Messianic invitation to the free grace of the gospel (Rev. xxii. 17). The sure mercies of David, the everlasting covenant, are offered in him who is the witness, prince, lawgiver of the people. (Comp. John xviii. 37; Rev. i. 5; iii. 14; Acts v. 31; xiii. 34.) The seed of the righteous servant enjoy the riches of the Gentiles as they become the priests of Jehovah and minister clothed in the garments of salvation; righteousness and praise spring forth before all nations (lxi. 9–11), who come up to the holy places from the most distant parts, even China (Sinim, xlix. 12). Hunger and thirst, the violent heat of the sun, together with all sorrow and mourning, are banished from the land (xlix. 10; lxi. 3. Comp. iv. 3; Rev. vii. 16–17). In lxiii. the exalted servant is represented as treading his enemies in the winepress of his wrath. (Comp. Rev. xix. 11–16.)

The advent of Jehovah is no less prominent. In xl. 3–11 we see the herald of the advent. Zion and Jerusalem become evangelists. Jehovah comes as the gentle shepherd. This is applied to the Baptist and Jesus in Matt. iii. 3. (Comp. John x. 1–18; Luke xv. 3–7.) In liv. 5 *seq.* and lxii. 5 Jehovah takes Israel as the wife of his youth and rejoices over her as his bride; and in lx. 1 *seq.* he becomes the light and glory of his people, instead of the sun and moon (Rev. xxi. 23–26). So in lxii. 1 *seq.* the righteous of Zion and her salvation becomes a bright and shining light to the nations; she is called by a new name (Rev. ii. 17), becomes a crown of glory in the hand of the Lord, and is named Hephzibah and Beulah. Jerusalem is rebuilt with precious stones (liv. 11 *seq.;* comp. Rev. xxi. 18–21); her walls are salvation and her gates praise; they are open day and night, whilst kings and nations enter therein (lx. 11 *seq.;* Rev. xxi. 25), and great is the peace of her children as they are taught of Jehovah (liv. 13; comp. John

vi. 45; 1 Thess. iv. 9; 1 John ii. 20). In lix. 15–18 Jehovah appears as a warrior armed with vengeance for his enemies and redemption for his people. He pours out his Spirit as water upon the offspring of the people (xliv. 3–5; comp. lix. 21), and puts his words in their mouth for ever, and they spring up as willows by the watercourses, whilst the Gentiles claim to belong to Jehovah and enroll themselves as his people. The call goes forth to the ends of the earth, and the oath is sworn "that unto me every knee shall bow and every tongue shall swear" (xlv. 22 *seq.*), and the sons of the stranger come to the holy mount, offering their sacrifices in the house of prayer for all nations (lvi. 6 *seq.*; comp. Rev. viii. 3–5; Heb. xiii. 15, 16). Chap. lxv. 17–27 predicts the creation of a new heaven and earth, as well as a new Jerusalem, in which there is no more weeping or crying, but length of days, prosperity, and communion with God, in which the animal kingdom shares (2 Pet. iii. 13; Rev. xxi. 1). Ch. lxvi. now describes the final catastrophe and glories. On the one side all flesh assemble in one immense congregation every Sabbath, as at the great feasts, before the throne (Rev. v. 11 *seq.*; vii. 9–12, etc.); on the other side, the carcasses of transgressors are cast out into the unquenchable fire and to the never-dying worm. (Comp. Matt. xxv. 41 *seq.*; Rev. xx. 10 *seq.*; xxi. 8 *seq.*)

The second revival under Josiah has its Messianic prophets, Habakkuk, Zephaniah, and Jeremiah, the two former merely reproducing the ideas of Joel and Isaiah, Jeremiah giving a new advance. (1) Ch. iii. 14–17, Jehovah the Saviour marries his exiled people, selecting one from a city and two from a tribe, restores them to Zion, setting over them shepherds after his own heart. (Comp. John xxi. 15–17.) Rachel, weeping for her children (xxxi. 15 *seq.*), is comforted with the promise that they will come again out of the land of the enemy (Matt. ii. 18). Jehovah will sow both the house of Judah and the house of Israel in their own land again (xxxi. 27 *seq.*; comp. Hos. ii. 23). They will come together out of the land of the north, and inherit the goodly heritage of the host of the Gentiles (iii. 18; comp. Hos. i. 11). Jehovah makes with them a new covenant (xxxi. 31 *seq.*), the law being written in the heart, so that all shall know him. (Comp. Hos. ii. 18 *seq.*) New institutions are established (iii. 17), entire Jerusalem is called the throne of Jehovah instead of the ark; and all nations gather into it (Rev. xxi. 2; xxii. 3 *seq.*). The whole city and suburbs become holy as the temple (xxxi. 38–40), even the hill Gareb, the abode of the lepers, and the valley of Hinnom, the place of refuse. (2) The sprout of Isa. xi. 1 *seq.* is taken up and clothed with new ideas. He is called the righteous branch, Jehovah our righteousness (xxiii. 5 *seq.*) as the bearer of that righteousness, and so the New Jerusalem bears the same name as the divine throne (xxxiii. 16; comp. Isa. vii. and Ex. xvii. 15). The exodus from Egypt is no more remembered for the greater exodus from all countries of the dispersion to the land of their inheritance (xxiii. 7–8). The monarchy and priesthood become eternal (xxxiii. 17).

Stadium 3d.—The period of the exile and restoration is rich in Messianic prophecies, which assume the symbolical and apocalyptic form. (1) Ezekiel develops both sides of the subject. (*a*) The tiara of the high priest and the crown of the king are removed until the coming of the One appointed by Jehovah (xxi. 25–27), until whose advent there will be a constant overturning of the nations. The second David as the faithful Shepherd will recover the scattered sheep, and restore them to their own land again (xxxiv. 23 *seq.*; comp. Matt. xviii. 11; John x.; Heb. xiii. 20). (*b*) Jehovah is the temple of the exiles for a while, until he restores them to their own land (xi. 14 *seq.*), after purging away their abominations, giving them a new heart, a heart of flesh, with the sprinkling of clean water upon them and the baptism of the Spirit (xxxvi. 25 *seq.*; comp. Isa. xliv. 3), and so they keep his commands and become his people, and he their God. The restoration is represented by several symbols: (*a*) A cedar twig is planted on the mountains of Israel, growing to an immense tree towering above the land (xvii. 22 *seq.*; comp. Ps. lxxx. and Mic. iv. 1). (*β*) There is a resurrection of the dead through the Spirit of Jehovah (xxxvii. 1–14; comp. Isa. xxvi. 19; Dan. xii. 2). (*γ*) Two sticks are joined together, and so under one head, the second David, Israel and Judah unite; a new and everlasting covenant of peace is made with them, and the sanctuary of Jehovah abides in their midst for ever (xxxvii. 15–28; comp. Hos. i.). There is a final conflict with Gog and Magog, with nations from the ends of the earth (xxxviii. and ix.), accompanied with the outpouring of the spirit of Jehovah on the house of Israel. (Comp. Joel iv. and Rev. xx. 7–10.) There is a prolonged description of the new temple, its arrangements of worship, the wonderful fertility of the land, and its division among the tribes (xl.–xlviii.). This is a transfiguration of the temple and land of Solomon. (Comp. Rev. xx.–xxii.) The forms of worship differ from the Mosaic in the removal of the great sin-offering to the beginning of the year. The stream of life is described in its marvellous increase in depth, the quickening power of its waters, and the wonderful fruit and leaves of the tree of life on its banks.

(2) Daniel represents (*a*) the kingdoms of the world in conflict with the kingdom of the Messiah. These four kingdoms, united in one great and terrible image (ii. 31 *seq.*), or as four beasts (vii. 2 *seq.*), are variously interpreted, probably to be referred to the empires of Babylon, Persia, Greece, and Rome—the latter viewed first in its unity, and then in its subsequent divisions in the ten horns of the last beast, the little horn representing Antichrist. The stone cut out of the mountain without hands, that breaks in pieces all these kingdoms, is the kingdom of Christ erected at Pentecost (comp. Mic. iv. 1), which is growing in order to fill the earth. The Ancient of days, Jehovah, comes in judgment on a flaming throne, with a stream of fire issuing from it. (Comp. Rev. xiii. and xvii.) The Son of Man comes in the clouds to the Ancient of days, and receives the everlasting dominion (referred to the second advent, Acts i. 11). (*b*) The times of chs. ix. 24–27 and xii. are difficult of interpretation. It is better to regard the sixty-nine weeks as from the decree of Cyrus to the advent, the final week as the advent week, in the midst of which the Messiah is cut off, the Old Testament worship brought to an end, the holy city destroyed, and the new covenant established. In this connection Daniel sees the end of the world, as indeed Jesus connects these events (Matt. xxiv.)—a time of trouble transcending all previous trouble, followed by the resurrection of the dead and the final judgment. The time, times and a half, and the 1290 and 1335 days, then, refer to the events of the last weeks of affliction, and there may be here a hint of the expansion of the final week, as the 70 years of Jer. xxix. 10 expanded into the 70 weeks of Daniel. Similar numbers occur in Revelation. They are not to be interpreted as years, but as symbolical numbers of fixed times known to God alone (Acts i. 7).

The restoration is accompanied by the prophets Haggai, Zechariah, and Malachi.

(3) *Haggai.*—The promise is made to shake all nations, and indeed the heavens and earth (ii. 6–9), that the kingdoms of the heathen may be overthrown, and the nations will bring their choicest treasures into the house of Jehovah, and the glory of the latter house will be greater than the former.

(4) Zechariah, like Isaiah, reproduces and unfolds previous Messianic prophecies: (*a*) The daughter of Zion rejoices at the advent of her King, who comes just and victorious, meek and riding upon an ass's colt (ix. 9–10; Matt. xxi. 5); all the instruments of war are destroyed. He speaks peace to the nations, and his dominion is from sea to sea and to the ends of the earth. The shoot and branch of Isa. xi. and Jer. xxiii. is introduced as the *servant* of Jehovah (Isa. liii.), who is priest as well as king, who builds the temple and secures the promised blessing to Israel and the nations (iii. 8 *seq.*; vi. 12 *seq.*). He is the Good Shepherd rejecting his flock, breaking the staves Beauty and Bands (xi. 7 *seq.*), having been rejected by them, estimated at the miserable price of thirty pieces of silver (Ex. xxi. 32), which is cast to the potter in the house of Jehovah (Matt. xxvii. 3–10). The shepherd, the associate of Jehovah, is smitten by his sword (xiii. 7–9), in consequence of which Jehovah's hand is turned in protection over the little ones (Matt. xxvi. 31–32; Mark xiv. 27; John x. 15). The house of David and inhabitants of Jerusalem grieve in penitence, influenced by the spirit of grace and supplication, looking upon Him whom they have pierced, and mourning for him as for an only begotten (xii. 10–xiii. 1; comp. John xix. 37; Rev. i. 7; Matt. xxiv. 30). The fountain for sin and uncleanness is opened by which all sins, moral and ceremonial, may be washed away (1 John i. 7; v. 6; Eph. v. 26; Tit. iii. 5). (*b*) Jehovah is a wall of fire round about Jerusalem, a glory in her midst (ii. 5 *seq.*; Isa. iv. 5; Jer. iii. 17). Jehovah dwells in the midst of Jerusalem, which is inhabited by old men and little children (viii. 3 *seq.*). His people will come from the east and west, and many strong nations will join the Jew in worshipping Jehovah in Jerusalem; which under the Malaak Jehovah will overthrow all nations besieging it (xii. 1–9). There will be a final judgment on the Mount of Olives (xiv. 4 *seq.*), which will be cleft in twain when Jehovah comes with his saints. The wicked will flee in terror; a glorious light will dispel the darkness; living waters will flow eastward and westward; Jehovah will reign King over all the land; the remnant of nations will go up yearly to worship the King at the feast of tabernacles. Even the bells of the horses and every vessel in Jerusalem will be as holy as the high priest's tiara, and nothing unclean can enter any more. (Comp. Rev. xxi. and xxii.)

(5) Malachi introduces the herald of the advent, "my messenger" (iii. 1), "Elijah the prophet" (iv. 5)—who is John the Baptist, according to Matt. iii. 1–12; xi. 10; xvii. 11; Luke vii. 27—turning the hearts of parents and children to one another. The coming one is הָאָדוֹן ("the Lord"), and the Malaak Jehovah, both terms referring to Jehovah, the divine Messiah. The advent is in judgment as the refiner's fire and fuller's ley, purging the sons of Levi, to offer acceptable sacrifices. It is a day of fire, burning up the wicked as stubble, whilst to the god-fearing the Sun of righteousness arises with healing in his wings. (Comp. Ps. lxxxiv. 11; Isa. lx. 19; Ex. xxv. 20; Deut. xxxii. 11.) This divine Messiah is Jesus Christ, according to the Baptist (Matt. iii. 11–12 and John i. 30).

The advent began with the birth of Jesus Christ, and continues throughout these latter days of the dispensation of grace until the second advent in glory at the end of the world. This distinction of advents is not made in the Old Testament, but first by the advent itself and the prophecies of Christ and his apostles. Hence, whilst the first advent fulfils all those references on the divine side to the outpouring of the Spirit, the establishment of a new covenant with new institutions of salvation, and the growth of the kingdom under Jehovah's favor, and on the human side to the more humble features, as of the prophet like Moses, the suffering servant of Jehovah, etc., yet the great mass of Messianic prophecy is referred by the New Testament writers to the second advent—on the divine side in judgment, on the human side in glory. And yet the human and the divine lines, which in the Old Testament remain ever apart, converge in Jesus Christ the God-man at his first advent, who in his first state of humiliation and his final state of glory either has fulfilled, or is yet to fulfil, all the law and the prophets.

The *literature* is abundant upon portions of the subject, but there are few full and complete discussions. Of the latter are—J. Pye Smith, *Scripture Testimony to the Messiah* (2 vols., London, 1818–21; 5th ed., Edinburgh, 1859); Hengstenberg, *Christologie des alt. Test.* (3 Bde., Berlin, 1829–32; 2d ed., 1854; translated in Clark's *Foreign Theological Library*); J. Bade, *Christologie des alt. Test.* (3 Bde., Münster, 1850–51); J. Stähelin, *Die messian. Weissagungen des alt. Test.* (Berlin, 1847); L. Reinke, *Beiträge zur Erklärung des alt. Test.* (4 Bde., Münster, 1849–55); *Die messian. Psalmen* (2 Bde., Giessen, 1857–58); *Die messian. Weissagungen bei den grossen und kleinen Propheten* (4 Bde., Giessen, 1859–62). Of the latter are—Hofmann, *Weissagung. und Erfüllung* (Nördlingen, 1844); Auberlen, *Der Prophet Daniel und die Offenbarung Johannis in ihrem gegenseitigen Verhältniss betrachtet* (2te Auf., Basel, 1857); McCaul, *The Messiahship of Jesus* (Warburton Lectures, 1852); G. Baur, *Geschichte des alttestament. Weissagung.* (Giessen, 1861); Kurtz, *Zur Theologie der Psalmen* (Dorpat, 1865); Stanley Leathes, *The Witness of the Old Testament to Christ* (Boyle Lectures, 1868); Anger, *Vorlesungen über die Geschichte des messianischen Idee* (Berlin, 1873); E. Riehm, *Die messian. Weissagung., ihre Enstehung, ihr zeitgeschichtlicher Charakter und ihr Verhältniss zu den neutestamentlichen Erfüllung* (Gotha, 1875). (The two works last mentioned show a decided advance upon all that had preceded them.) Besides these there are valuable articles by Auberlen, *Die messian. Weissagung. der mosaischen Zeit* (*Jahrb. für deutsche Theol.*, 3 Bd. 778 ff.); Bertheau, *Die alttestamentliche Weissagung. von Israel's Reichsherrlichkeit in seinem Lande* (*Id.*, 4 Bd. 627 ff.); Diestel, *Die Idee des theokrat. Königs* (*Id.*, 8 Bd. 685 ff.); Riehm, *Zur Charakteristik d. messian. Weissagung.*, *Studien und Kritiken* (1865 and 1869); Green, *The Knowledge and Faith of the Old Test. respecting the Promised Messiah* (*Bib. Sacra*, 1857); Bartlett, *Theories of Mess. Proph.* (*Id.*, 1861); Martineau, *Early History of Messianic Ideas* (*National Review*, 1863). See also the able article of Oehler, *Messias*, in Herzog's *Real-Encyklopädie* (Bd. 9, p. 408 ff.); the biblical theologies of H. Schultz (Frankfort, 1869), Ewald (Leipsic, 1871–76), Oehler (Tübingen, 1873; translated in Clark's *Foreign Theological Library*); the biblical dictionaries of Winer, Kitto, Smith, and Riehm, under "Messiah" and "Messias;" and the commentaries of Hengstenberg on the Psalms (Berlin, 1849–52), and especially of Delitzsch on Isaiah (Leipsic, 1866) and Psalms (1867), and Moll on the Psalms in Lange's *Bible Work* (American edition, Scribner's, 1872). The Jewish views of the Messiah, and the expectations respecting him at his advent, are discussed in Schöttgen, *Horæ Hebr. et Talmudicæ* (2 vols., 1873–74); also, *Jesus der wahre Messias* (Leipsic, 1748); Robert Young, *Christology of the Targums* (Edin., 1853); A. Wünsche, *Die Leiden des Messias* (Leipsic, 1870); Colani, *Jésus Christ et les Croyances messianiques de son Temps* (2ᵉ éd., Strasbourg, 1864); Holtzmann, *Die Messiasidee zur Zeit Jesu*, in the *Jahrb. f. deutsche Theol.* (xii. p. 389 ff.); Hilgenfeld, *Die jüdische Apokalyptik in ihre geschichtlichen Entwickelung* (Jena, 1857). Compare also Jost, *Geschichte des Judenthums und seiner Sekten* (Leipsic, 1858); Neumann, *Die messianischen Erscheinungen bei den Juden* (Bleicherode, 1865); Ewald, *Geschichte Christus und seiner Zeit* (Göttingen, 1867); Keim, *Geschichte Jesu von Nazara* (Zürich, 1867); E. Schürer, *Lehrbuch der Neutest. Zeitgeschichte* (Leipsic, 1874). C. A. BRIGGS.

Mess'ina, province of Sicily, occupies the north-eastern corner of the island, and has an area of 1500 square miles, with 420,649 inhabitants. It is mountainous, but the valleys are very fertile, and produce excellent wheat, flax, hemp, wine, oil, and fruit. Sulphur abounds.

Messina, a large seaport town of Sicily, which gives name to the province. It lies in lat. 38° 17′ 38″ N., lon. 15° 35′ E., and rises amphitheatre-like from the sea, backed by the rocky extremity of the Siculo-Calabrian Apennines. The tongue of land on which it stands curves inward on the right; on the left projects the historic Pelorus or Cape Faro, and thus is formed the *sickle* from which the original town was named *Zancle* by the Greeks. The harbor of Messina, the largest and safest in the kingdom of Italy, is deep, spacious, well furnished with quays, and defended by a fort and citadel. The annual amount of shipping it receives is over 6000 vessels, the imports being chiefly cotton and woollen goods, hardware, etc.; the exports, fruits, wine, oil, silks, etc. Messina, having suffered so often from earthquakes and bombardments, now consists in the main of fine new buildings, with well-paved streets and spacious squares, flanked by stately palaces and adorned with fountains and statues. There are many noteworthy churches, and the old cathedral is one of the most interesting monuments of the city, the exterior being very quaint and curious, and the interior decorated with the rarest marbles, porphyry, jasper, lapis-lazuli, etc. Messina existed as a town long before the foundation of Rome. It suffered severely during the Punic wars and during the Roman civil wars, also from the Goths and the Saracens. In 1282, 12,000 Frenchmen perished here in the terrible Sicilian Vespers. In 1783 the town was almost totally destroyed by an earthquake. In 1848, Messina threw off the Bourbon yoke, but was reduced to submission after an obstinate and destructive resistance. In 1860 it was restored to liberty by the arms of Garibaldi. The climate of Messina is delightful, and the views are magnificent. Pop. in 1874, 111,854.

Messina, Strait of [It. *Faro di Messina;* Lat. *Mamertinum fretum*], a narrow channel of water connecting the Ionian and the Tyrrhene seas, and dividing Sicily from Calabria. Its length is 26 miles, its greatest width 12 miles, its least 2 miles. The tide is most irregular in this strait, the eastward current being vastly stronger than the westward, and the flood and ebb succeed each other with great rapidity. There is a dream of a bridge to be thrown some day across this strait at its narrowest point, thus connecting the city of Messina with the mainland. (For a curious phenomenon witnessed here, see FATA MORGANA. See also SCYLLA and CHARYBDIS.)

Mesti'zo [Sp., "mixed"], in Spanish America, a half-breed, the offspring of a white father and an Indian mother. The white characters usually predominate. The offspring of an Indian father and a quadroon mother (three-fourths white, one-fourth negro, the latter by the female side) or a quinteroon mother produces what is called a brown mestizo. A mestizo-claro is the offspring of an Indian father and a mestizo mother. (See MIXED RACES, and also HYBRIDITY.)

Mes'tre, town of Northern Italy, province of Venice, lying a little less than 2 miles N. of the lagoons, and 7 miles from the city of Venice, on the canal that leads to Marghera. It is an old town, was for a time an appanage of Treviso, became a part of the Venetian republic early in the fourteenth century, and has since shared the fortunes of Venice. It is now a place of considerable industry with iron-foundries, saw-mills, etc. Pop. in 1874, 9930.

Meszaros (LAZAR), b. at Boja, Hungary, Feb. 20, 1796; was educated first for the Church, then for the bar, but followed in 1813 the summons of the emperor, Francis I.; entered the Austrian army as a volunteer; made the campaigns of 1814–15; rose slowly, as he was without connections, but acquired a solid reputation in the army, and was made a colonel in 1844. When, in 1848, Count Bathyani formed a separate Hungarian ministry, he chose Meszaros as head of the military department, and although he at first opposed the separation of the Austrian and Hungarian armies, he organized the Hungarian army with great rapidity and skill when the decision was taken. After the declaration of independence (Apr. 14, 1849), he left the ministry and received an active command, and after Gorgei's surrender at Vilagos (Aug. 13, 1849) he fled to Turkey; was sentenced to death by an Austrian court-martial, and hanged *en effigie* at Vienna. He afterward

lived in France, England, and the U. S. D. at Eywood, Herefordshire, England, Nov. 16, 1858.

Me'ta, town of Southern Italy, in the province of Naples, delightfully and healthfully situated on the beautiful road leading from Castellamare to Sorrento. Pop. in 1874, 9229.

Met'al, tp. of Franklin co., Pa. Pop. 1419.

Met'aline is a name that has been given to a series of substances intended for application to all kinds of machinery where friction is encountered, obviating the necessity of oil or other lubricant. Its appearance is that of a soft, dark, metallic compound. It is prepared originally in the form of a fine powder, and is then moulded into any shape required by hydraulic pressure. After moulding it may be cut or turned to suit any form of application. It is usually applied to journal-boxes in the form of cylindrical plugs or disks from $\frac{1}{8}$ to $\frac{5}{16}$ of an inch in diameter, inserted in holes bored near together over the whole inner surface. In small bearings, such as spindle-bolsters and the journals of sewing-machines, it is pressed into longitudinal slots or creases. Several varieties of metaline are manufactured, differing in composition and adapted to use under the various conditions encountered in running machinery, such as steel on brass, steel on cast iron, etc. Metaline was invented and patented by Dr. Stuart Gwynn of New York, the patents being dated Apr. 12, 1870, and numbered 101,861 to 101,869, inclusive. It is applicable to all bearings—the shafts of steamships, axles of car, locomotive, and carriage wheels, steam-engines, drawbridges, saws, centrifugal machines, cotton-spindles, etc.—and entirely obviates the use of oil, and avoids its attendant cost and dangers. C. F. Chandler.

Metallammoniums. This rather inelegant term has been used to designate a class of chemical compounds whose (hypothetical) mode of derivation is explained under the head of Metamerism, below. Under that head will be found a tabulation illustrating the assumed mode of derivation of complex "compound ammonias" from ammonia itself, through successive removals and replacements of the three hydrogen equivalents of the ammonia by equivalents of the (hypothetical) "organic radicals." Metallammoniums have their existence, derivation, and constitution explained by an expansion of this same theory, so far as it goes (and in this case it must go much farther than in the other), by taking the real compound radical, ammonium, NH_4 or NHHHH—which, in combination at least, has a *demonstrable* existence—and substituting for its hydrogen equivalent quantities of certain heavy metals. It happens that among the compounds which have been maintained to be thus formed, occur two quite useful and important substances. One is common "white precipitate," so called in medicine, which is formed by precipitating a solution of corrosive sublimate, $HgCl_2$, with solution of ammonia. By the metallammonium hypothesis,

$$(NH_4)_2O + 2HgCl_2 = H_2O + \overset{\text{Dimercurammonic chloride.}}{2(NH_2Hg,Cl)}.$$

It should be observed that mercury, Hg, as a dyadic or bivalent element, is equivalent to, and therefore replaces, H_2. The other compound is the so-called *cuprammonium*, formed by the action of ammonia on cupric compounds. Copper being also a dyad, we have a similar exhibition of equivalency with H_2:

$$(NH_4)_2O + CuSO_4 = \overset{\text{Cuprammonic sulphate.}}{(N_2H_6Cu)SO_4} + H_2O.$$

This latter product constitutes one of the cuprammonium solvents for cellulose, as paper, cotton, etc., now coming into use in the arts.

The difficulty in accepting the metallammonium view consists in the *infinite* complexity of the consequences which would ensue. If we are forced to admit that not only are hydrogen equivalents replaceable by elementoid radicals, but that also the hydrogen equivalents in these radicals themselves are further replaceable by elements, and therefore also by elementoid radicals, and so on without end, we must convict nature of working by a system whose results are so far removed from the *simplicity* of plan in the molecular structure of chemical compounds which our past experience has led us to expect as to excite both the suspicion and the hope that we are here off the right track. Henry Wurtz.

Met'allurgy [Gr. μεταλλουργός] is the science and art of preparing metals from their ores. In very ancient times the word probably included all the operations of mining, smelting, and the subsequent manufacture of the metal into articles of use. Mining has for many centuries been recognized as an entirely distinct and different calling, though metal-working, such as copper-beating and founding, gold and silver smithing, and blacksmithing, continued for a much longer time to be regarded as metallurgical. As these became more commonly practised, they were looked upon as mechanical trades, each of which, with the expansion of metal-working, attained a separate existence and took a separate name. As the word is now used by those who follow the calling, the "metallurgist" is strictly one who prepares metals from their ores, and performs in addition such other operations as are necessary to the production of a finished raw material. Thus, in the metallurgy of iron is included not only the smelting of the ores, but also the manufacture of wrought iron and steel from the first product, and such processes of refining as are necessary to obtain the different marketable grades of iron and steel. Only in a few instances does the metallurgist carry his work so far as to produce a finished article ready for immediate use, thus adding metallurgical engineering to the productive branch of his calling. These exceptions are nearly all confined to the manufacture of bulky and low-priced goods, when economy requires the immediate union of the smelting-works and the finishing-shop. The production of railway iron is the most prominent example of this practice. On the other hand, true metallurgical establishments are frequently producers of finished articles which properly belong to chemical manufactures and other branches of technical industry, such as sulphuric acid, arsenic, paints, etc. But these are by-products, obtained from substances occurring in the ore which yields the metal, and their manufacture belongs to other branches of technology than metallurgy. From the foregoing it will be seen that while the meaning of the word "metallurgy" has in the process of time become restricted to the mere production of metals, instead of its old application to all the arts of working in metals, the practice of the metallurgist has extended so as to embrace the work of the chemist and the manufacturer of products which in former times were not classed as metallurgical.

The minerals from which the useful metals are obtained do not form more than $\frac{1}{100}$th of the earth's mass, so far as known. The basic elements of the remaining 99 per cent. include such metals as aluminium, sodium, potassium, etc., which, though employed to a limited extent, are not technically classed among the "useful metals." The list of the latter has, however, been greatly extended by the increasing use of metals in modern civilization. At present, iron, copper, lead, zinc, tin, silver, gold, mercury, nickel, antimony, bismuth, and perhaps platinum, may, either on account of common use, employment as currency, or importance of application, be ranked among the useful metals; while arsenic, potassium, sodium, aluminium, and magnesium have found some application, though a very limited one in the case of the last. Other metals still, like cæsium, cerium, etc., have been made for the purposes of chemical study or for cabinet curiosities.

The science of metallurgy includes the processes for obtaining all the metallic elements, but in practice the *art* of metallurgy is restricted to the production of the useful metals alone, the preparation of the others being the work of chemical manufactories. Those minerals which contain enough metallic base to make its extraction profitable are called *ores*, and as the question of profit is dependent upon local circumstances, a given mineral may be an ore in one country and not in another. It is rare to find an ore consisting entirely of the metal-bearing mineral, other non-metalliferous minerals being nearly always mixed mechanically with it. This useless rock is technically known as the "gangue," and it plays a very important part in metallurgy, frequently compelling the choice of operations that are not favorable to the complete extraction of the metal, or that are costly for some other reason. Two general kinds of gangue are distinguished: First, earthy gangue, which is either acid, from a preponderance of silica, or basic, when lime, magnesia, alumina, and iron most frequently occur. In this case two methods of removing the associated rock may be used. One is mechanical, the ore being crushed fine and passed through machines which cause a separation of the heavy ore from the lighter gangue by virtue of their different specific gravities; or by subjecting the crushed ore to some uniform force which affects the two minerals differently. This work, however, is usually allotted to mining operations, and the smelter receives the dressed product. The other mode of separating the gangue is by fusion with fluxes. A "flux" is any substance which will make the ore fusible and fluid at temperatures which are within our control. Practically, the operations of the metallurgist are confined to the treatment of compounds containing silica for the acid, and usually lime, magnesia, alumina, or iron for the base. Other acids and bases occur, but they play a very subordinate part, and are always accompanied by one or more of the above. The art of fluxing therefore simply consists in adding silica when the bases predominate in the ore, and one of the above bases when the contrary is the case. Its

difficulties lie entirely in the fact that the proportions must be properly adapted to the metal under treatment and the temperature required. The second kind of gangue is one that consists of a metal-bearing mineral, with which is associated the mineral containing the object of the metallurgist's labors. A distinction has to be made between these two sorts of gangue—partly for the reason that the latter is always basic, and partly because it is often impossible to separate the two metalliferous minerals by mechanical means; and these ores therefore usually come into the metallurgist's hands just as they are received from the mines. Many type-processes of metallurgy have been invented to surmount the difficulties presented by such a metalliferous gangue. Among metals occurring in this manner the most frequent examples are tin, copper, lead, nickel, gold, silver, and others in pyrite (a bisulphide of iron). Most ores consist of both earthy and metalliferous minerals, and therefore require both mechanical and chemical processes for their treatment. While the ores present a great variety of combinations, three general classes may be recognized by the character of the negative element combined with the metal. They are—(1) Native metals, in which no acidifying element occurs, the metal itself being found uncombined in nature. These native metals are, however, never pure, but are always alloyed. They are gold, silver, copper, platinum, and bismuth. (2) Sulphides, or compounds of the metal with sulphur as the negative element; and in this class may be ranked the compounds in which arsenic and antimony occur, as they come under the same general mode of treatment. Copper, lead, silver, mercury, iron, antimony, nickel, and zinc form such compounds. (3) Oxides, which form by far the largest and most important class. Iron, copper, lead, tin, zinc, and all the rarer metals belong to it. Many metals occur in two or in all three of these classes, and the division here made refers only to their common occurrence and the mode of treating their ores. The general character of the processes by which a metal is extracted from its ore is not governed by the metal itself, but by the negative element with which it is combined. The metal may decide the adoption of a particular class of operations or apparatus, but the native metals may all be obtained by mechanical dressing or by simple fusion; the sulphides must all be melted with some substance that will combine with the sulphur and leave the metal free, or else they must be roasted and then treated like oxides; and the oxides of the useful metals are all reducible to metal by heating them with carbon. In carrying out these different processes a great variety of reactions are employed, but only those of a general character will be spoken of here. Two grand modes of producing these reactions are employed, the dry and the wet. In the former the fluidity necessary for the free action of the substances employed is obtained by heat; in the latter, by solution in a liquid. These two modes are frequently combined in the treatment of an ore. So far as is known, the dry method is the oldest, and the wet is at present the most progressive part of the art, having grown out of the establishment of chemical science. Its modes of operation simply repeat the reactions of the laboratory, and are therefore more under control and better understood than those of the dry method.

The metallurgy of the native metals consists usually in a combination of mechanical and chemical processes. When the ore occurs in a vein, as copper, and sometimes gold and silver, the vein-rock must be crushed fine; and the most common apparatus for this work is the stamp-mill. A stamp is a heavy pestle, of which the head is iron and the stem may be either iron or wood. It is supported between guides, and rests upon an iron seat or "die" placed in a mortar, and the crushing is performed by raising the stamp and allowing it to fall upon the ore, which is introduced upon the die, while a constant stream of water passes through the mortar. Stamp-mills form a very important part of the metallurgical apparatus used in the western part of the U. S., and their management includes many important questions of theory and practice. The side of the mortar contains a sieve of the proper degree of fineness, and as soon as the ore has been sufficiently crushed it is carried through the sieve by the water-current. It now consists of metallic grains mixed, but no longer combined, with particles of rock-matter. The succeeding operations are intended to effect the separation of the metallic grains, either by means of gravity or by taking up the metal (in the case of gold and silver in mercury). Several modes of utilizing the force of gravity are employed. One of the most common is to run the stream of "slime" (the ore and water) over coarse blankets. The metal, being heavier than the rock, sinks to the bottom of the stream, and is caught in the meshes of the blankets, from which it is afterwards removed by washing them in a tank of water. A similar separation will be obtained if the slime runs over a flat, shallow trough without blankets, provided the force of the current is not sufficient to wash off the metal after it has once settled upon the trough. Many other mechanical methods of separation are also used. When mercury is used, as in the case of gold and silver ores, the operation is known as "amalgamation;" and it is not yet positively decided whether this is a mechanical or a chemical act, but it is probable that both of these forces are included. The mercury may be used either as a shallow bath, into which the gold sinks by virtue of its greater specific gravity, or it may be distributed in a thin layer over copper plates. The former method is most employed in Europe, and the latter in America. Agitation of the mercury and slime by a percussive movement of the vessel which contains them, or by causing ripples and low falls in the stream, is thought to increase the efficiency of the operation. A large part of the gold and all of the platinum obtained is found in sands and deposits of gravel. In this case the stamp-mill is not needed, the mining being so managed that the sand is conveyed in a current of water through the separating or amalgamating machinery. Platiniferous sands are first concentrated on blankets, as above described; the concentrated sand is carefully washed by hand; the gold removed by amalgamation; and the product, which contains about 75 per cent. of platinum, is sold to manufacturing chemists, who prepare the marketable metal. Of the metals so far considered, native copper and platinum are obtained only by washing, gold and silver by washing or amalgamation. Bismuth differs from the foregoing in having so low a fusing-point that it is more economical to melt the metal out of the ore by the operation called "liquation" than to crush and dress it. The ore is therefore placed in inclined iron tubes holding about 25 pounds, and heated to redness, when the metal flows out.

Next to these processes in point of simplicity is *the metallurgy of the oxides*. These ores include the most important metals known, such as iron, copper, lead, tin, and zinc. With the exception of iron, all of these are used pure in the arts, and the mode of treating the ores is to heat or fuse them in direct contact with the fuel. The affinity of carbon for oxygen is so strong at high temperatures that the elements in the ore are dissociated, the oxygen uniting with the fuel and passing off as a gas, leaving the metal to run out in a fluid state. This simple operation is one of the oldest in the art, and the time of its discovery is unknown. It is certain, however, that the oldest form of metallurgical apparatus is the shaft-furnace, which is especially adapted to satisfy the conditions of this operation. A shaft-furnace consists of four vertical walls containing within them a space which is usually much higher than it is wide or deep. Fire being made within it, the ore, fluxes, and fresh fuel are thrown in at the top, and combustion is maintained by driving a steady current of air in at the bottom. The especial characteristic of this apparatus is that the ore and fuel being in immediate contact, and the amount of air being limited, the carbon of the fuel must satisfy its affinity for oxygen by extracting and combining with that contained in the ore, producing the reaction known as "reduction." This affinity is so strong that most ores give up their oxygen at comparatively low temperatures, so that the metal is often obtained in the upper part of the furnace. As the materials at the bottom are melted by the higher heat there and flow out, the reduced ore descends by its own weight until it is in turn melted and collected in the bottom of the furnace, from which it is removed by "tapping" or opening a small hole in the furnace-wall. Oxides of copper, lead, and tin may be smelted in one operation to metal in furnaces of this kind, which vary from 2 to 30 feet in height. Ores of iron, which are more "refractory"—that is, do not give up their oxygen with the same ease—require higher furnaces, technically called "blast furnaces," the extreme limits of which, in civilized countries, are 25 and 106 feet, while barbarous nations still employ very rude furnaces of 2 or 3 feet in height. Iron differs from almost all other metals in not being commonly produced in the pure state from its ores, though this is done in a few works by what is called the "direct process." The product of the blast furnace is always a carbide of iron, called pig iron. Iron ore being a compound of iron and oxygen, and pig iron being a compound of iron and carbon, it is evident that the work of the blast furnace consists in removing the oxygen from the ore and substituting a small amount of carbon in its place. It accomplishes this by means of two important chemical reactions. When a carbon-fuel is burned with a limited access of air, the product of the combustion contains 1 unit of carbon and 1 unit of oxygen in combination, and is called carbonic oxide. This product is not, however, a stable one, there being a higher oxide of carbon, which contains 2 units of oxygen to 1 of carbon. It is a law of chemistry that when an element enters into combination with another without completely satisfying its affinities, the new compound exerts the unsatisfied power of attraction,

and therefore acts like the original substance. The combustion of fuel in the hearth of a blast furnace furnishes an example of this kind. The product CO has one of the affinities of carbon unsatisfied, since the carbon is capable of forming a higher oxide, CO_2. There are two methods by which the remaining affinity can by satisfied. One is to add a fresh supply of oxygen, and the other is to remove part of the carbon from the CO, leaving the remainder with both affinities satisfied. Both of these reactions take place in the blast furnace. The gas, rising through the materials in the furnace, extracts the oxygen from the ore, leaving it in the form of metal; and at the same time the ore exerts some power over the carbonic oxide, by which the latter is made to deposit part of its carbon. Thus, carbonic acid, in which all the affinities of carbon are satisfied, is produced in two ways. But only about half the carbon leaves the furnace in this state of combination, the other half being still the lower oxide, CO, and a condition of equilibrium seems to be established which depends upon the temperature, the rate of flow of the gas, and other circumstances. Experiments have proved that these operations go on nearly to completion in the upper half of the furnace. The lumps of ore there become porous masses of metallic iron, in the pores of which carbon is deposited in the form of soot. These descend to the bottom, are there raised to such a temperature that the iron and carbon combine, and the fusible alloy, pig iron, is formed, melts, and is tapped out. By thus forming an alloy the metallurgist is able to bring iron into fusion, though the temperature of the blast furnace is not high enough for the fusion of the pure metal.

Zinc differs from the other oxides in being volatilizable at high temperatures, and it is therefore obtained by "distillation." The ore is ground fine, mixed with a pure carbon-fuel, like charcoal or anthracite, and placed in a tube made of fire-clay. This is heated to whiteness, at which temperature the carbon attracts the oxygen of the ore, leaving the zinc to distil off as metal. In front of the tube are placed condensers of clay and sheet iron, in which the metal collects.

The metallurgy of the sulphides is more complicated than that of either of the above classes. The metals of this class are (1) volatilizable and (2) non-volatilizable. The former include mercury and zinc. The compound of mercury and sulphur, cinnabar, is not stable at high temperatures if sufficient air is present, the sulphur oxidizing and leaving the metal free. The ore is therefore heated to redness with access of air, when the mercuric sulphide distils off, and in doing so breaks up into mercury and sulphurous acid. The vapor is passed through large chambers, where the metal condenses and runs out. Sometimes the dissociation of the mercury and sulphur is aided by mixing iron or lime with the ore, as these have a stronger affinity for sulphur than the metal. The sulphide of zinc, called blende, is converted to oxide by "roasting," which consists in heating it in contact with the air. It is then treated like the oxide, as above described. In the treatment of the non-volatilizable metals three general processes are followed: (1) Roasting and reaction; (2) roasting and reduction; (3) precipitation. The first two depend upon the removal of the sulphur by roasting; and this operation, which is exactly the opposite of reduction, has a furnace especially adapted to its requirements which is in all respects the exact opposite of the shaft-furnace. It is called a "reverberatory furnace," and consists of a horizontal chamber with a low roof, having a fireplace on one side and a chimney on the other. The ore is placed in the chamber, which is called the "laboratory" or "hearth." The flames produced in the fireplace pass through this chamber, and are deflected by the low, arched roof upon the ore. Openings are made in the sides for the admission of air and for the purpose of working the charge. In this furnace the amount of air is in excess of that required by the fuel, so that the ore is subjected to oxidation. The oxide of sulphur, being a gas, passes off, leaving the remainder of the ore as a solid oxide. Various modes of utilizing this reaction are in use, depending upon the individual characteristics of the metals. When pure sulphide of silver is roasted, metallic silver, and not the oxide, remains; but in all other cases the residue is partly or wholly an oxide. Roasting and reaction is performed by interrupting the oxidation when only partially finished, thoroughly mixing the half-roasted ore, piling it up, closing the furnace doors to prevent the entrance of air, and heating the charge to such a temperature that the sulphur still remaining will combine with the oxygen absorbed by the ore. In this way both the sulphur and the oxygen are removed without giving the metal an opportunity to reoxidize, and metal is accordingly the result. Lead and copper ores are treated in this way. Roasting and reduction consists in allowing the oxidation of the ore to become complete, and then treating the product as above described for the oxide class. Lead, copper, antimony, nickel, and iron are obtained by this method.

It should be remarked, however, that the sulphide of iron is never directly employed to produce the metal. It is used first as an ore of sulphur, and the oxidized residue is then treated as here described. Without the utilization of the sulphur as a source of sulphuric acid the sulphide of iron could not compete with the native oxide. Precipitation consists in melting the sulphide ore with some substance which has a stronger affinity for sulphur than the metal already combined with it. Lime, zinc, and iron are such substances, but the first requires too high a temperature for perfect action, and the second is too dear. Iron is the only reagent that is of universal application for this purpose. It may be used either as metal, oxide, or silicate, and the cinder made in ironworks is frequently employed. The unroasted ore is melted with the iron or cinder and the fluxes necessary to make the gangue fusible. A shaft-furnace is theoretically the best apparatus for the work, since no waste of iron by oxidation can take place in it. But the reverberatory is frequently used, because in it the sulphur can be partly removed by roasting at a low heat, and the operation finished by melting the residues with iron.

The outline of metallurgical practice here given relates only to the most general principles. It is rare that an ore can be smelted at once to metal of purity sufficient for its immediate use in the arts. A refining process is almost always applied to the metal; and very often the process of smelting is lengthened out by making each operation incomplete, and thus obtaining the metal by a gradual elimination of the elements combined with it. The reason for this is, that the impurities are always more volatilizable or more oxidizable, or their oxides are more reducible, than the metal itself, and by repeatedly subjecting the compound to operations which affect its constituents in different degrees a complete separation is effected. It is found to be much easier to eliminate these impurities from some compound of the metal than from the latter when fully reduced. For this reason the metal is often combined with some element that admits of perfect subsequent separation; and this compound is then passed through the purifying operations, in which there is a gradual concentration of the metallic base. The element employed for this purpose is sulphur. Oxides of copper are often turned into sulphides by adding some sulphide ore, like pyrite, to them, instead of reducing them at once to metal, which would not only cause serious loss in the slag, but also give an impure product in the case of impure ores. The popular belief that sulphur is the smelter's greatest enemy is therefore unfounded. It is often his chief dependence, and purposely added in his operations. A rich ore is usually smelted without concentration. Of poor ores there are two kinds. The ore may contain a rich mineral mixed with a great preponderance of gangue; and when mechanical concentration is not admissible, such ores are usually melted raw, with fluxes to make the gangue fusible. The product is the metalliferous mineral without the gangue, and the process can then proceed on this rich product with greater care. The other case is that of an ore which contains a great deal of metalliferous mineral, but of low grade. Such ores are usually subjected to some process like roasting, by which part of the mineral is obtained in a condition that will admit of its removal by the fluxes in the first fusion.

The products of the fusion of an ore are threefold: (1) That containing the metal. This may be either metallic or a "matte" when it contains sulphur, or "speise" when it contains much arsenic or antimony. (2) That containing the gangue and fluxes; it is the stony part of the ore melted to a glass, and is called "slag" when the bases are chiefly non-metallic, and "cinder" or "scoria" when the base is chiefly a metallic oxide. (3) The gaseous products, which, besides the products of combustion, contain the oxygen of the ore and such other constituents of it as are volatile.

Metallurgy is rapidly advancing as a science in consequence of the great aid given by the progress of chemistry. At the present day the most prominent question is the economical use of fuels. The best construction of furnaces, the use of gaseous fuel (which permits the employment of refuse carbonaceous materials), the heating of the blast to increase the effect of the fuel used, the utilization of the half-burned carbon which exists in furnace-smoke, and the direct production of metals from their ores in one or two operations, are all phases of this important problem; and these things are now chiefly occupying the attention of metallurgists. Great care is also taken in large works to make useful every element in the ore that has a market value. To this end, metallurgical establishments are now large manufactories of sulphuric acid, arsenic, iron, and copper vitriol, such paints as zinc white, smalt, etc. The most noticeable instance of this economy is the manufacture of sulphuric acid from pyrite, which is a bisulphide of iron. No less than 800,000 tons of this ore are burnt for

this purpose yearly in Europe, producing about two-thirds its weight of acid. Pyrite almost always contains at least a trace of silver, and in England about 200,000 tons of the burnt ore are treated for silver, of which it contains about three-fourths of an ounce per ton. After extracting the silver the residue is sold to the ironworks. This is probably the most complete utilization of an ore known at the present day.

The *wet method* of treating ores consists in bringing the metal into solution, and then precipitating it by some agent. When the ore is an oxide or contains a native metal, the solution may be effected by treating it with an acid which will dissolve the metal; sulphides may also be treated in this way by first roasting them. Sulphuric and hydrochloric acids are those usually employed, but they are too dear in most localities, and the use of purchased acid is limited. Examples of such treatment are mostly confined to the metallurgy of gold, platinum, and bismuth, all high-priced metals. The acidification of the metal is sometimes accomplished by heating it with some substance containing the acid. Thus, silver is frequently chlorinated by heating the roasted ore with salt, which contains chlorine. The resulting chloride of silver may then be extracted by solution in strong brine, or it may be treated with iron, which reduces the chloride to metal, and mercury, which amalgamates the metal as fast as formed. The most usual mode of accomplishing solution is employed with the sulphides, which are carefully roasted in such a manner that the product is not an oxide, but a sulphate of the metal to be extracted. This is accomplished by regulating the temperature employed, and when the material operated on contains sulphides of several metals, a proper management of the operation will give a product containing oxides of the metals which are not desired, and a sulphate of the one which is to be extracted. The roasted material is then treated with water, which dissolves the sulphate, leaving the oxides; and the metal is then precipitated by some reagent. Copper precipitates silver, and iron precipitates copper. This operation is much employed in the metallurgy of silver when the ores are pure. But the ore itself is not treated directly in this way, the gangue being first removed by fusion, and the roasting applied to the resulting matte. Copper, silver, and nickel are the metals most frequently extracted by the wet way, but it is also applied to gold, platinum, and bismuth. For poor ores it is usually much cheaper than the dry method, but when the ore is rich, or if the gangue is a substance soluble in acid, the use of acid and labor may be so great as to make the dry method preferable. J. A. CHURCH.

Met'als [Gr. μέταλλον]. The elementary bodies known as the metals are especially characterized by their peculiar and generally high lustre, known as the metallic lustre; by very great opacity; and, with few exceptions, by their high specific gravity. The *opacity* of even the thinnest films is perfect, except in the case of gold, which is so malleable that it can be beaten into exceedingly thin films, through which a greenish light is found to pass. The *color* of the metals is generally white, although of various tints; zinc and lead having a bluish, bismuth a reddish, and calcium a yellowish tint. Gold is yellow, and copper red. The metals have generally a high *specific gravity*, but potassium, sodium, and lithium are lighter than water, while magnesium and aluminium have a specific gravity of 1.75 and 2.56 respectively. Of the others, the more important vary from arsenic at 5.88 to platinum at 21.5 in the form of fine wire. The specific gravity of malleable metals is decidedly increased by compression. *Malleability*, or the property of flattening more or less under pressure or blows, is possessed by a large number of the metals. Gold has been beaten into films only $\frac{1}{200000}$ of an inch thick; silver is also very malleable, and so are copper, tin, and platinum, although in an inferior degree. Iron, lead, nickel, cadmium, and mercury, when frozen, are more or less malleable; bismuth is very slightly malleable in small globules; while antimony, arsenic, cobalt, and manganese are brittle. Zinc is rather brittle at ordinary temperatures, but between 120° and 150° C. it can be rolled into sheets, which remain malleable when cold. At a higher temperature, 210°, it becomes very brittle again. Hammering and rolling render malleable metals more or less brittle, but their malleability can be restored by heating them strongly and slowly cooling them. This process is called *annealing*. Related to malleability is *ductility*, the property of being drawn into wire; but as this depends partly on the power of resisting a strain, or tenacity, the most malleable metals are not necessarily most ductile; the order being as follows, beginning with the most ductile: iron, copper, platinum, silver, gold, zinc, tin, lead. Metals are drawn into wire by pulling them through holes in steel plates. If they become brittle during this operation, they must be annealed. In *conductivity* the metals vary greatly. Silver is the best conductor of heat, and bismuth one of the poorest. Silver is likewise the best conductor of electricity.

Conductivity of Heat.—Silver, 1000; copper, 736; gold, 532; tin, 145; iron, 119; lead, 85; platinum, 84; bismuth, 18. The *linear expansion* of metal rods by heating from 0° to 100° C. is expressed by the following fractions: iron, $\frac{1}{819}$; gold, $\frac{1}{682}$; copper, $\frac{1}{584}$; silver, $\frac{1}{524}$; lead, $\frac{1}{351}$; zinc, $\frac{1}{333}$. Platinum expands only $\frac{1}{1167}$, and this being very nearly the rate of expansion of glass, it is found that platinum wires can be inserted into fused glass without any danger of cracking the glass on cooling. The fusibility of the metals covers a very wide range, mercury being liquid at ordinary temperatures, and platinum requiring the heat of the oxyhydrogen blowpipe for its liquefaction. Osmium is the most refractory of the metals, volatilizing without fusing at a temperature capable of volatilizing platinum.

Fusing-Points of Metals.

Mercury	39.44° C.	Antimony	—— C.
Tin	227.8	Silver	1023
Cadmium	228.	Copper	1091
Bismuth	258.	Gold	1102
Lead	325.	Cast iron	1530
Zinc	412.		

Nickel, cobalt, manganese, and palladium require the highest forge heat; molybdenum, tungsten, and chromium only agglomerate in the forge; titanium, iridium, rhodium, and platinum are infusible except at the temperature of the oxyhydrogen blowpipe. Wrought iron and platinum become soft before melting, and pieces of iron or steel can therefore be united together by pressure while in this pasty state, and porous platinum sponge can be made solid. This is called *welding*. *Volatility*, or the property of assuming the gaseous state, is known to be possessed by most of the metals, and is probably a property of them all. It is especially characteristic of certain of them, which volatilize at comparatively low temperatures. Thus, mercury yields a sensible amount of vapor at 20° C., and at 350° boils; zinc, cadmium, and magnesium volatilize rapidly at a red heat; and even gold and platinum may be vaporized before a properly arranged oxyhydrogen blast. Arsenic passes off in vapor without fusing. In *hardness* the metals vary at ordinary temperatures from the fluid mercury and soft, waxy potassium to the exceedingly hard chromium and manganese, capable of scratching glass and hardened steel. The *crystalline form* of some of the metals has been determined; some being found naturally crystallized, as gold, copper, and silver; others being deposited in crystals by the galvanic battery, as tin; by sublimation, as arsenic; or by fusion and gradual cooling, as bismuth. Zinc, arsenic, antimony, and bismuth crystallize in forms belonging to the hexagonal system; tin is tetragonal; gold, silver, platinum, mercury, copper, lead, and iron are isometric.

The metals are found both free and combined in nature. Gold and platinum almost invariably occur free, for it is a disputed question whether the gold so generally found in iron pyrites is combined with sulphur or not. Mercury occurs mainly as sulphide, and sometimes metallic. Silver is often found native, but more generally as sulphide, and with sulphides of antimony, arsenic, copper, and lead; also largely as chloride. Copper mainly as sulphide, generally with sulphide of iron, also very commonly as carbonate and oxide, and in a few localities large deposits of native copper are found. The iron ores are the oxides and carbonate; sulphide of iron furnishing sulphur, sulphuric acid, and green vitriol, but not being generally accounted an iron ore. Lead occurs mainly as sulphide, but the carbonate is also an important ore. Tin is found as oxide; the sulphide is a less esteemed ore, although abundant in the English mines. The most valuable zinc ores are the carbonate and sulphide; the oxide is less abundant. Nickel and cobalt occur chiefly as arsenides and sulphides; bismuth, antimony, and arsenic are found combined with sulphur, and also native, in sufficient quantities to be worked.

There are forty-nine of the elements universally considered as metals, tellurium, which is sometimes reckoned as the fiftieth, being generally classed among the *metalloids* with selenium, to which it bears close relations. Gold, silver, mercury, lead, copper, iron, and tin were known to the ancients. Potassium was discovered by Davy in 1807 while acting upon potash with a powerful galvanic battery, and this led to the discovery of sodium, lithium, and the metals of the alkaline earths. Rubidium, cæsium, thallium, and indium were discovered by the use of the spectroscope, indium being the last metal discovered. Gallium was discovered by M. Lecoq de Boisbaudran Aug. 27, 1875, during the spectroscopic examination of zinc-blende from the Pierrefitte mine, valley of Argeles, Pyrenees. It gives a violet line at 417, and a faint band about 404, and is a white, moderately hard metal, closely allied to zinc.

The metals have been variously classified, according to the purposes to be served by the grouping. To express their electrical relations they were arranged in succession, beginning with the most electro-positive metals, the alkali-metals, and ending with the most electro-negative, the noble metals; the noble metals being those whose oxides are reduced by heat alone—viz. gold, silver, mercury, and the metals of the platinum group. They are also classified according to the properties of their oxides, some forming powerful bases, as the oxides of metals of the alkalies and alkaline earths, with the lower oxides of most of the other metals; others form only acid oxides, as arsenic and antimony, and the higher oxides of chromium, manganese, and iron; while others, like sesquioxide of aluminium, may sometimes play the part of acids and sometimes of bases.

The classification of the metals according to their equivalence or combining power is the most accurate for the general purposes of modern chemistry. This method of classification assumes the atomic weight of hydrogen as the unit for the relative combining weights of the elements, which are then placed in groups whose members have equivalent combining proportions, and also possess certain properties in common.

1. *Monad Metals.*—The *alkali metals*, potassium, sodium, lithium, cæsium, and rubidium, which form only one chloride each. Silver, although differing widely from the alkali metals in general, is a monad, and yields an alum closely related to potash alum.

2. *Dyad Metals.*—Barium, strontium, and calcium, whose oxides are called the *alkaline earths*, form a group together. Glucinum, yttrium, erbium, lanthanum, and didymium, all rare metals, whose oxides are called earths, form a second group. Zinc and cadmium, with magnesium, which is analogous in many of its compounds to zinc, although it was formerly reckoned among the alkaline earths, form a third group. The elements of each of these groups form only one chloride. Mercury and copper constitute a fourth group, and form each two chlorides.

3. *Triad Metals.*—Indium, forming only a trichloride, and thallium and gold, forming each a mono and a trichloride, belong here. Thallium, however, has strong analogies to the alkali metals, and indium is capable of forming an alum with ammonium.

4. *Tetrad Metals.*—Platinum, palladium, iridium, rhodium, ruthenium, and osmium are classed together, and all form tetrachlorides, as well as dichlorides, excepting rhodium, which forms a dichloride and a trichloride, but is retained here from analogy. Tin and titanium form a second group of tetrads. Lead is considered quadrivalent, because it yields a plumbo-tetrethide with the hydrocarbon radical ethyl. Zirconium and thorinum form tetrachlorides. Iron, aluminium, manganese, cobalt, nickel, and cerium are also considered as tetrads, although their proper position is on some accounts doubtful.

5. *Pentad Metals.*—Arsenic and antimony form trioxides and pentoxides, and bismuth is grouped with them from its analogy to antimony. Vanadium is regarded as a pentad on account of its analogy to phosphorus in some of its combinations. Tantalum and niobium have been shown to form pentachlorides.

6. *Hexad Metals.*—Chromium forms a hexfluoride, and uranium is reckoned as a hexad from compounds similar to those of chromium. Tungsten forms a hexchloride, and molybdenum, being analogous to it, is considered hexadic.

Specific Gravities of Metals at 15.5° C.

Platinum (in thin wire)	21.50	Cobalt	8.54
Gold	19.50	Manganese	8.00
Uranium	18.40	Iron	7.79
Tungsten	17.60	Tin	7.29
Mercury	13.59	Zinc	6.86–7.1
Palladium	11.30–11.80	Antimony	6.80
Lead	11.45	Arsenic	5.88
Silver	10.50	Aluminium	2.56–2.67
Bismuth	9.90	Magnesium	1.75
Copper	8.96	Sodium	0.972
Nickel	8.80	Potassium	0.865
Cadmium	8.70	Lithium	0.593
Molybdenum	8.63		

H. B. CORNWALL.

Metam'erism in Chemistry [Gr. μετὰ, "after" or "beyond," and μέρος, "part" or "proportion"]. As intimated under the head ISOMERISM (which see), metamerism is a term sometimes used as a synonym of that term, oftener, however, as indicating special kinds of isomerism; but in the later literature of the science isomerism is often applied in a narrower sense, only to certain cases of identity of composition chiefly occurring among the immediate products of life—cases in which there is a minor degree of difference in physical properties; while metamerism is broadly applied, according to the prevailing fashions in nomenclature, to cases in which the same proportional numbers of equivalents are supposed to be arranged according to different hypotheses of molecular structure, and in which there are distinct, definite, and characteristic differences of physical properties. The distinction, however, between isomeres and metameres is ill defined, and apparently becoming more so. For the purposes of this article metamerism will be regarded as the broad term, and, as such, may be said to cover almost the whole ground of organic or zoic chemistry, so far as study and investigation are concerned; all the hypotheses which now prevail to explain the vast mass of facts of the science being shaped and bent with more or less reference to the continually expanding cases and classes of metameric correspondences between organic bodies, of which there would seem to be a capacity for an unlimited number and variety.

As we have yet made but little real progress in the unriddling of the true molecular structure of chemical compounds, all our hypotheses must be regarded as only possible, or at the best, if admitted to be *probable*, only partial views of the truth. They are none the less necessary, however, if only to enable us to classify facts and substances, the enormous accumulation of which would otherwise be far beyond the grasp of human memory and intellect. Caution must nevertheless be preserved to view these classifications as but provisional and founded on mere hypotheses, which some new expansion or development of exact science may at any time essentially modify.

There may be said to be three main hypotheses employed in the modes at present in vogue of explaining cases of metamerism: (1) The hypothesis of *compound radicals*, elementary groups which assume the function of elements, or *elementoids* as they may be most appropriately called. (2) The hypothesis of *types*, or that a certain small number of simple compounds constitute the typical structures—or probably we might say the molecular skeletons—upon or about which other elemental or compound elementoid molecules are attached. (3) The *replacement* hypothesis, according to which an equivalent of an element in any compound may be replaced by another element or elementoid—a process which may be extended to each and several of the elementary equivalents in the original typical compound, each being replaced by the same, or each by a different element or elementoid, thus leading to the production of a variety of substances almost beyond computation.

In the application of the above three primary hypotheses a number of subsidiary hypotheses are necessary. Thus, as an illustration, if the *existence* of elementoids or compound radicals be regarded as matter of fact, and not of hypothesis, there being at least two—*ammonium*, NH_4, and *cyanogen*, CN—whose elementoid functions admit of no doubt, yet there seems so far no *certain* basis for the settlement of the precise groups of equivalents which exist as elementoids in the huge class of organic carbon compounds. Many chemists deny altogether the existence of the series of radicals called ethyle, methyle, propyle, butyle, etc., or their existence in combination as elementoids; and it is true that while these radicals were invented especially to form the basis of a hypothetical constitution of the monatomic alcohols, few chemists now believe them to exist in these alcohols. There is no difficulty whatever in supposing for every progressive series of carbohydrogen compounds a genetic formula in which but one single hydrocarbon radical is common to all—namely, H_2C, similar in structure to water, H_2O; nor is there any difficulty whatever in citing an immense number of facts to support such a view; as, for example, if we call ethylene H_2CH_2C, alcohol becomes $H_2CH_2CH_2O$, and Berthelot's famous synthesis of alcohol by direct combination of ethylene and water is an illustration in point. As has been remarked in the article on HOMOLOGY, the old organic radicals themselves constitute one of the "progressive series" of Schiel, having the genetic or "homologenic" formula, $H + {}_nH_2C$.

With these brief preliminary observations to illustrate the uncertainty of the prevailing systems of explaining metamerism, one or two cases may be cited of classes of metameres to give a partial idea, at least, of some of these cases. We shall first quote, from Prof. Wauklyn, a tabulation of nine metameres having the same empirical composition, $C_{10}H_{20}O_2$, which are formulated on the common "organic radical" hypothesis:

Amylic valerate	$C_5H_{11}O,C_5H_9O$.
Hexylic butyrate	$C_6H_{13}O,C_4H_7O$.
Heptylic propionate	$C_7H_{15}O,C_3H_5O$.
Octylic acetate	$C_8H_{17}O,C_2H_3O$.
Nonylic formate	$C_9H_{19}O,CHO$.
Tetrylic caproate	$C_4H_9O,C_6H_{11}O$.
Tritylic œnanthate	$C_3H_7O,C_7H_{13}O$.
Ethylic caprylate	$C_2H_5O,C_8H_{15}O$.
Methylic pelargonate	$CH_3O,C_9H_{17}O$.
Rutic acid	$C_{10}H_{20}O_2$.

Another example may be given among bodies of the "ammonia type," in which the metamerism is believed to be explained by a replacement or substitution of one, two, or

three of the hydrogen equivalents in ammonia, NHHH, by different hydrocarbon radicals. These bodies all have the same empirical formula, $C_6H_{15}N$:

Hexylamine	NHH,C_6H_{13}.
Amyle-methylamine	NH,CH_3,C_5H_{11}.
Tetryle-ethylamine	NH,C_2H_5,C_4H_9.
Tetryle-dimethylamine	N,CH_3,CH_3,C_4H_9.
Di-tritylamine	NH,C_3H_7,C_3H_7.
Trityle-ethyle-methylamine	N,CH_3,C_2H_5,C_3H_7.
Tri-ethylamine	N,C_2H_5,C_2H_5,C_2H_5.

All such metameres are liable to vary in chemical and physical characters, such as boiling-points and densities (and therefore in equivalent volumes).

Another mode of representing metamerism hypothetically is by means of the so-called "graphic formulæ," by which it is sometimes supposed that the arrangement of the equivalents in certain ways *upon the same plane* can give us a correct idea of their true arrangement and relations in a compound molecule, which must *occupy space*, as it possesses *volume*. The best textbooks admit that these methods cannot represent the actual arrangement of the elements in a compound, and their continued employment must therefore be detrimental to science, by tending to imbue the mind of the student with wholly artificial views, which must be again eradicated therefrom as he attempts to follow the advancement of true inductive discovery. HENRY WURTZ.

Metamo′ra, post-v. and tp., cap. of Woodford co., Ill., on the western division of the Chicago and Alton R. R., has 2 hotels, 1 weekly newspaper, and some manufactures. Pop. of v. 702; of tp. 1718.

Metamora, post-v. and tp. of Franklin co., Ind., on the White Water Valley R. R. and Canal. Pop. 1222.

Metamora, post-tp. of Lapeer co., Mich. Pop. 1310.

Metamor′phism in Chemical Geology [Gr. μεταμορφόω, to "transform," to "change over"]. Broadly, this term applies to all those changes by which loose sedimentary matters are transformed into solid rock, but is generally confined, in the geological literature of the present day, to those changes by which *compact crystalline* rocks, including granites, gneisses, crystalline marbles, etc., have been formed from sediments *in situ*, excluding thus products of actual fusion, like true lavas and such so-called traps, basalts, etc. as are homogeneous or not bedded. Understood in this narrower sense, no rock will usually be admitted as metamorphic which does not retain unmistakable indications, in some part, of its original bedding or sedimentary deposition. The view being now widely accepted, as a highly probable generalization, that *all other* known rocks—except the truly igneous ones—are formed of materials originally abraded mechanically from these crystalline bedded metamorphic rocks, and that these constitute the universal substratum of the earth's crust, melted or fused masses (which themselves often include fragments of metamorphic rocks, having been formed by their fusion) being only local in their occurrence, it has been recognized of late years as one of the most important fundamental problems of geology to arrive at some consistent hypothesis which may serve as a provisional theory, at least, of the mode of transformation of ancient sediments into compact crystalline masses; in other words, to arrive at a theory of the nature and agents of metamorphism. The main facts are that (1) Metamorphic action, properly so called, has been *uniform*, or nearly so, over *enormous surfaces* of the earth and throughout *thick masses* of rocks. (2) Some *higher degree of temperature* than that normal in the present crust of the earth (so far as it is known) must have prevailed, though it is very generally maintained that this temperature was much below that of incandescence, and, some believe, not much above 300° or 400° F. (3) This elevation of temperature must often have been nearly uniform throughout vast extents of rock-mass, and thus could not have been due to conduction or convection of heat from one part or one level of the mass to other distant parts or levels. (4) Metamorphism is uniformly found to be concurrent with immense changes of the original internal position of the planes of bedding of the rock, so that from horizontal it has often become vertical. (5) The distortions of the lamination, the compacting of the rock into a mass devoid of visible pores, and the flattening of the beds into lenticular shapes combine to prove a condition of *plastic or pasty* consistence under a *pressure* vast almost beyond computation.

The origin and cause of the uniform internal *heat* of the rock-masses during metamorphism being one of the most important and (previously) incomprehensible questions connected therewith, a careful consideration of the above-stated conditions of the problem led the present writer to propose, to the American Association for the Advancement of Science, at Buffalo in 1866, the view that the *heat* of metamorphism was produced by the transformation of *work* into *heat*—that is, of molar motion into molecular motion—during the compression and plication of the mass. This theory is now adopted by many of the leaders of the science of geology. Dana, in the last edition of his *Manual of Geology* (1874, p. 729), says: "It is then true, as Wurtz was first to announce, that the heat of metamorphism was made, in the very rocks that were altered, by the movements to which they were subjected." The distinguished English geologist Robert Mallet tried in 1872 to extend this new dynamic theory of metamorphism to the explanation of *volcanic heat*, which is local and not general, but he is as yet followed in this by few geologists of authority.

The origin of the *pressure*, the second great essential element in metamorphism, is not yet beyond dispute among geologists, and as it does not strictly come under the head of chemical geology, it will be elsewhere treated of.

HENRY WURTZ.

Metamor′phosis, in botany, was the term introduced by Linnæus to signify the relation which the parts of a blossom bear to leaves. (For an exposition of the facts and the conceptions as now understood, see BOTANY—*Metamorphoses of Leaves and Stems;* also LEAF, and MORPHOLOGY, VEGETABLE.)

Met′aphor [Gr. μεταφορά, a "transference"], a rhetorical figure by which one idea, more concrete, more familiar, and consequently more impressive to the imagination, is placed in the stead of another more abstract, less familiar, and needing some reinforcement in order to strike the imagination. Webster calls it a simile in one word. The most common form of the metaphor is that by which the name of some sensible object is transferred to an object which does not fall under our senses. In this form the metaphor denotes not only a rhetorical figure, but a stage in the development of a language. (See FIGURE, GRAMMATICAL LANGUAGE, TROPE.)

Metaphys′ics, as the name of an independent science, originated incidentally. In the collection of the works of Aristotle a number of essays containing the highest generalizations to which he carried physical science were placed immediately after his physics, and received as their running title the name τὰ μετὰ τὰ φυσικά—literally, "that which follows after the physics." This title, which originally referred only to the place occupied by the essays as part of the collection, became in course of time, especially among the later Peripatetics, suggestive of the general character of the contents of these essays; and thus "metaphysics" became the name of the highest development of physical science—that science which treats of being in its nature, irrespective of its manifestations under individual forms.

No sharp line of distinction can be drawn between physics and metaphysics—as little as between physiology and psychology; only a general characterization of the difference can be given. As all those mental phenomena which can be demonstrated as resulting directly or indirectly from merely physical processes are generally and properly included in physiology, and only those phenomena are retained by psychology which cannot be demonstrated as products of some change taking place in the body, so all those cognitions which are derived from experience and can be proved by experiment are referred to physics, while metaphysics deals in such cognitions only for which no other evidence can be given than their logical necessity. But the transition from one of these groups of cognitions to the other is very vague. The two sciences are complementary and reciprocally dependent. When metaphysics loses its connection with, and applicability to, physics, it becomes empty and dreamy. The neo-Platonic school in the Greek philosophy, the later Schoolmen in the Middle Ages, numerous phases in modern German philosophy, are examples. On the other hand, when physics ceases to be penetrated with metaphysics, it becomes confused and stupid, as shown by the French philosophy of the eighteenth century and some phases of the latest English philosophy.

In the history of philosophy, metaphysics appears under different names, according to certain modifications which its general problem has undergone at different times or with different philosophers. When treating simply of being *per se*, and the logical correlations of the constituents of this idea, it is called ontology—by Hegel, objective logic. When it applies itself more especially to the relation between knowledge and being, consciousness and objective reality, it has been called critical philosophy, speculative psychology, etc. When it considers being under the view of the final cause from which all phenomena are derived, it forms cosmogony, natural theology, philosophy of nature, and philosophy of religion. CLEMENS PETERSEN.

Metasta′sio (PIETRO ANTONIO DOMENICO BONAVENTURA), b. at Assisi Jan. 13, 1698, in humble circumstances. His true name was TRAPASSI, but having attracted the at-

tention of the famous jurisconsult, Gravina, by his talent for rhyming and improvisation, he was adopted and educated by him, received the name of Metastasio, and inherited a large fortune, which enabled him to follow his passion for poetical production. In 1724 he published his *Didone Abandonata*, which was composed by Sardi and brought on the stage at Naples with immense success. Other lyrical dramas followed, alternating with cantatas, sonnets, and lyrical poems of different kinds; and he was already a man of great fame when in 1729 the emperor Charles VI. invited him to his court as *poeta laureatus*, with a pension of 4000 florins a year. At Vienna he continued his poetical activity with great success till his death, Apr. 12, 1782. Besides his lyrical poems and cantatas, he wrote 63 lyrical dramas, which, although their dramatic form is now antiquated, are still read in Italy with great pleasure on account of their noble ideas and natural and felicitous expressions. There are many editions of his works; one of the best is that in 20 volumes (Mantua, 1816–20).

Metas'tasis [Gr. μετά, "across," and ἱστάναι, to "place"], in pathology, the sudden removal of a disease to a distant part, as when the disease called mumps is transferred from the parotid to the mammary glands or to the testes. There are also metastatic abscesses, dependent upon septicæmia, pyæmia, or blood-clot. Besides these there are metastatic inflammations, whose transfer cannot be accounted for by any theory yet advanced.

Met'calf (Ralph), b. at Charlestown, N. H., Nov. 21, 1798; graduated at Dartmouth 1823; began the practice of law at Newport, N. H., 1826; was much in public life; several years secretary of state of New Hampshire; was governor 1855–56. D. at Claremont, N. H., Nov. 21, 1858.

Metcalf (Theron), LL.D., b. at Franklin, Mass., Oct. 16, 1784; graduated at Brown University 1805; became a reporter of the Massachusetts supreme court in 1839, and was one of its judges 1848–65; author of numerous volumes of legal reports, digests, etc., and editor of important legal works, especially *Digest of Cases in the Massachusetts Supreme Court* (1816–23) and Metcalf's *Reports, 1840–49* (13 vols., 1840–51). D. Nov., 1875.

Metcalfe, county in the S. of Kentucky. Area, 500 square miles. It is undulating and fertile. Corn and tobacco are leading products. The county is traversed by the S. fork of Green River. Cap. Edmonton. Pop. 7934.

Metcalfe (Charles Theophilus), Baron, b. in Berkshire, England, Jan. 30, 1785; went to India in 1801; became heir to a baronetcy 1822; acting governor-general of India 1835–36; governor of Jamaica 1839–42; governor-general of Canada 1842–44; a baron 1844. D. at Basingstoke Sept. 5, 1846.

Metcalfe (Rev. Frederick), B. D., b. in England about 1817; graduated at St. John's College, Cambridge, in 1838; was elected fellow of Lincoln College, Oxford; became head-master of Brighton College in 1848; translated from the German A. Becker's *Gallus* (1844), and *Charicles* (1845), each accompanied with notes and exercises; wrote *History of German Literature* (1858), *The Oxonian in Norway* (1856), *The Oxonian in Thelemarken* (1858), and *The Oxonian in Iceland* (1861).

Metcalfe (Thomas), b. in Fauquier co., Va., Mar. 20, 1780; removed in early youth to Fayette co., Ky., where he was bred a stone-mason, a fact of which he was always proud; became a political orator in 1809; fought with great distinction at Fort Meigs in 1813, and was thenceforth much in public life; was in Congress 1819–29; governor of Kentucky 1828–32; became a State senator 1834; president of the board of internal improvement in 1840; U. S. Senator 1848–49. D. in Nicholas co., Ky., Aug. 18, 1855. He was a Clay Whig, and displayed great ability in public affairs.

Metel'lus, the name of a Roman family belonging to the plebeian gens Cæcilia, and distinguished as much for the virtue as for the talents of its members. It first became known in history during the First Punic war, when Lucius Cæcilius Metellus was elected consul in 251 B. C., and it seems to have become extinct at the beginning of our era. Its most conspicuous members, all of whom adhered firmly to the party of the optimates, were (1) Quintus Cæcilius Metellus Macedonicus, who defeated the Macedonians in 148 B. C. and the Achæans in 146 B. C., and who was carried to his funeral pile by his four sons, of whom three had been consuls, while the fourth was a candidate for the office.—(2) Quintus Cæcilius Metellus Numidicus, who fought successfully in 108 B. C. against Jugurtha, king of Numidia, but was superseded by Marius, at that time his legate.—(3) Quintus Cæcilus Metellus Celer, who was prætor in 63 B. C., when Cicero was consul, and contributed much to the suppression of the conspiracy of Catiline.

Metempsycho'sis [Gr. μετά, "after," and ἐμψυχόω, to "vivify," to "animate"], the transit of the soul from one stage of being or life to another, commonly called transmigration. As the belief that the soul after death appears again in animals or in men and women is spread all over the world, it would appear to be anthropologically innate, and to be the first form in which the idea of immortality occurs to man. The early Egyptians saw in it an explanation of the sufferings endured by many men on earth, which sufferings were otherwise inexplicable. Their entire religion was based on this doctrine, that man is a fallen angel, once an equal of the gods. He is to be judged after death, and if his life on earth has been evil he must renew his earthly existence, if not as a human being, as an animal, according to his crimes. But it was in India, where the problems of metaphysics and ethics as connected with ontology and the destiny of the soul were elaborated to the last degree on a theistic basis, that metempsychosis was most ingeniously and extensively developed. All the problems of fate, free-will, and human suffering were easily explained by the doctrine that the soul, an emanation from God, passed from life to life, and that the sins committed in one existence were expiated in another. It was even held that the account was kept so closely that a soul might pass thousands of years or *kalpas* (æons) in one or other of the heavens as a reward for good deeds or self-inflicted suffering, and yet be obliged to return to earth or hell to expiate as an animal, man, or demon certain sins. To the pure theism of the early Jews and Arabs, or of the Shemitic race, who simply held that God directly made and willed all things, the idea of metempsychosis was utterly opposed. According to the latter, the soul is guided by laws which lie far behind the highest conceivable idea of a God; according to the former, God distinctly makes all laws with full self-consciousness. Consequently, the Old Testament contains no trace of the transmigration of souls. But after the building of the second temple foreign speculation and superstition flowed in on them freely. The *Gilgul Neshamoth*, or theory of metempsychosis, forms an important doctrine in the Cabbala, and ere long a mass of wild and beautiful legends arose to illustrate it. The rabbis held that David had been Adam, and is to come again as the Messiah, and that Simeon had been Japheth. Many fanciful ideas sprung up in the Hebrew theory of transmigration—*e. g.* that when a woman had a soul which had been that of a man she could not bear children until God had breathed into her some part of a woman's soul. The Greeks derived the doctrine of metempsychosis from teachers who had taken it from Egypt or India. Thales had taught it at an early period, and it was subsequently greatly developed by Pherecides, Pythagoras, and Plato. The Greek mysteries were, in fact, not only a school in which metempsychosis was taught, but an indispensable grade or lodge through which all of the aspirants must pass before they could be purified and pass on to higher stages of existence. Pindar, setting forth the Orphic doctrines, teaches that the soul must thrice lead a pure life before it could be fully set free; and Plato, refining on all the theories of his predecessors, believed (or rather argued for) the principle that souls had pre-existed, and that on earth they assumed shapes corresponding to their character. What with purification, penance, and intervals of a mere ghost-existence apart from the body, Plato assumed that ten thousand years must pass before the soul would attain divinity. There is, in fact, every reason for believing that there were no religious or spiritual systems of antiquity which did not eventually include metempsychosis, strange as it appears to us at the present day. The Epicureans denied it, but it appears to have been generally inculcated as one of the deepest doctrines of the mysteries. The Neoplatonists, who believed in magic, as in all the wild deductions from a theory of a universal soul and life, of which man was a part, assumed the doctrine of metempsychosis as a natural inheritance. Gnostics and Manichæans welcomed it, and the more speculative or mystical of the Church Fathers found in it, as the Egyptians had before them, a ready explanation of the fall of man and the doctrine of evil spirits. All are "dreeing their weird," or undergoing penance for sins. This considerable step towards reconciling the existence of suffering with that of a merciful God was distinctly set forth by Porphyry and Origen, and passed from the East, with all the strange heresies of "illumination," in all probability, through such institutions as the Cairene House of Light and the Knights Templar, into the wild doctrines of the obscure sects of the Middle Ages in Europe. The Taborites, an extreme branch of the Hussites, are said to have believed in transmigration, and this view has been thoroughly set forth by Madame George Sand in *Consuelo*. The Druids taught it, and of late years poetical philosophers or true poets have found in its inexhaustible fitness for romantic pictures and incidents subjects for their pens. C. G. Leland.

Me′teorite, Meteor′olite, or **A′ërolite.** These are used synonymously to denote a solid body that has fallen from the heavens. Of the three, meteorolite is perhaps the most correct and expressive, being derived from the Greek μετέωρα, a "meteor," and λιθος, a "stone." It is not to be confounded with those small luminous bodies that flash across the sky every bright night, visiting us in large numbers at stated periods, and called *shooting stars;* for these last are doubtless composed of very attenuated matter, and never leave any solid residue behind them. A genuine meteorite may flash across the sky, become visible, and yet pass on without sending to the earth any evidence of its true character; but it is very doubtful if one of these bodies ever became entangled in our atmosphere without ultimately falling to the surface of the earth and constituting an addition to our globe. These bodies have been observed to fall in all ages of the world; and doubtless the earliest account we have of any one of them is to be found in the eleventh verse of the tenth chapter of Joshua; at any rate, the phenomenon referred to in that verse can be interpreted by reference to some of the more modern falls of meteoric stones. But one of the most remarkable falls recorded in ancient history is that of the Thracian stone mentioned by Pliny in the 58th chapter of his second book of natural history. It fell near Ægospotamos in Thrace 467 years before Christ. Pliny describes it as being as large as a cart (which, however, gives us a very indefinite idea of its size, the carts of those days being much smaller than those now in use); he describes it also as being of a burnt color. It was held in veneration by the inhabitants of the country, and the time of its fall served to fix the period of certain important events, as evidenced by the following statement to be found in the *Parian Chronicle:* "From the time when the stone fell at Ægospotamos, and the poet Simonides, who died at the age of ninety during the archonship of Theagenides at Athens, is 205 years." Another ancient and memorable meteorolite is now at Mecca; for the celebrated black stone, *Hajar el Aswad,* that forms an object of adoration of the pilgrims to the Kaaba at Mecca, is doubtless one of these bodies; and some think, with very good reason, that the image which fell down from Jupiter (referred to in the 35th verse of the 19th chapter of Acts), and was worshipped by the Ephesians, was also an aërolite.

As more careful observations and more accurate records were kept of natural phenomena, so the authentic accounts of the fall of these bodies, commencing with that of Ensesheim in 1492, have multiplied, until we have about 200 of these falls, represented by a large number of separate masses varying from the size of a pea to that of several hundred pounds' weight. The fall at L'Aigle, France, Apr. 26, 1803, is one of the most remarkable ones known; it occurred about 1 o'clock in the day-time, and it is estimated that from 2000 to 3000 stones fell, of which the largest found did not exceed 17½ pounds in weight.

To give an idea of the phenomena accompanying the fall of these bodies, we shall furnish a short statement of those connected with the fall at L'Aigle, and that in Guernsey co., O., in 1860. At the time of the fall of the L'Aigle meteorite the atmosphere was clear and calm, and many persons observed a brilliant fiery ball passing rapidly through the atmosphere; and a few moments after there was heard a violent explosion, or rather succession of explosions, lasting five or six minutes, the first two or three sounds resembling those of cannon, and subsequent ones that of musketry, then a rumbling noise like the beating of a drum; all these noises being produced by the original explosions and subsequent reverberations. The noise appeared to proceed from a small rectangular cloud, parts of which from time to time were thrown off by the successive explosions; the noises were heard in an area of over 100 miles, and the area over which the stones fell was about 6 miles long by 3 miles broad. Of the Guernsey fall we have no very definite account of the meteorite during its flight through the atmosphere. This occurred also in the day-time, a little after 1 o'clock, when three or four distinct explosions were heard, like the firing of heavy cannon, with the interval of a second or two after each report. This was followed by sounds like the firing of musketry in quick succession, which ended with a rumbling noise like distant thunder; and this continued two or three minutes. The first reports were so heavy as to produce a tremulous motion like heavy thunder, causing the glass in the windows to rattle; the sound was so singular that it caused excitement and alarm, many supposing it an earthquake.* The stones as they fell near to observers produced a buzzing noise. When these falls occur during the night-time the body as it passes through the air emits a most brilliant light, accompanied frequently with emission of sparks and a long trail of light behind.

The general character of these bodies *of the stony variety* is (1) great variety in size, from that of a pea to many cubic feet; (2) irregularity of form, with rough and indented surfaces; (3) they are coated with a black crust or varnish, which doubtless arises from the fusion of the surface by the intense heat developed during the rapid passage through the atmosphere; (4) their specific gravity is between 3 and 4; (5) the minerals constituting the mass are principally of the class belonging to the pyroxenes and olivenes, always containing more or less metallic iron alloyed with nickel and cobalt. There are one or two meteorites supposed not to contain this metallic iron, but it is very doubtful if such be really the case. There are other minerals associated with them; the most interesting and constant are schreibersite (a phosphuret of iron and nickel) and triolite (a sulphuret of iron). A fragment of one of the Guernsey county meteorites gave for its composition—

	Per cent.
Olivene	56.884
Pyroxene	32.416
Nickeliferous iron	10.690
Schreibersite	.002
Triolite	.015

Iron Meteorites.—This class simply represents the metallic particles found in the stony meteorites, increased to several pounds and even tons in weight, as exemplified by the Cranborne iron in the British Museum or the Texas iron (of less weight) in the Yale College Museum. All of the irons that are known, except three or four, have been discovered some time after their fall, this not having been observed, their composition being the only guide as to their origin. There have, however, been three of them seen to fall, and these constitute the three most valuable specimens of this class. They are the following:

Agram	1751
Dickson co., Tenn	1835
Braunau	1847

The iron meteorites have the same irregular shape as the stony ones, with a specific gravity of 7 and 7.8, with a composition of which the three following irons are types:

	Tazewell, Tenn.	Oldham co., Ky.	San Gregorio, Mex.
Iron	84.10	91.61	95.01
Nickel	15.22	8.09	4.40
Cobalt	.43	.25	.51
Copper	.06	trace.	trace.
Phosphorus	.19	.05	.08

In the interior of these irons it is not uncommon to find nodules of sulphuret of iron, phosphuret of iron and nickel, and graphite. When polished the surface of the metal is very brilliant, and in some cases remains so; in others the surfaces are rapidly rusted from the effects of chlorine contained in some of them. If the polished surfaces of these irons are acted on by nitric acid, either alone or with a little hydrochloric acid, a number of angular figures, more or less delicately defined, are made apparent; and these are called Widmannstättian figures.

Origin of Meteorites.—Whence come these masses of stones and iron? It was at one time supposed that they originated in the atmosphere or were ejected from terrestrial volcanoes, but these crude notions have been long since exploded. Another theory, advanced by Terzago, and subsequently by La Place (adopted by Berzelius and others), and sustained in part by his mathematical calculations, is that they were projected from the moon. There are many points of plausibility connected with this theory, when modified by supposing that these bodies have not come directly to the earth from the moon, but may have been detached or projected from the moon many thousands of years before they became entangled in our atmosphere. The most formidable objection to the moon-theory is that the supposed velocity of some of them precludes the idea of their being satellitic fragments, their velocities being such as belong to planetary and even cometary bodies. About this question of velocity there is yet much that is obscure. The most commonly received theory is the one first promulgated by Chladni, who considered them as bodies, or fragments of bodies, revolving in space, that from time to time came near enough to the earth to be brought within its sphere of attraction. Some, adopting this theory, connect them intimately with comets. But whatever theory be adopted, it will be difficult as yet to reconcile any one of them to all the phenomena in connection with the physical character and chemical constitution of meteorites.

J. LAWRENCE SMITH.

Meteorological Instruments. See OBSERVATORY, METEOROLOGICAL.

Meteorol′ogy [Gr. μετεωρολογία], the science that treats of the earth's atmosphere and its relations to all the various features of the weather. A distinction is properly made between meteorology and climatology, in that the latter

*The number of stones that fell must have exceeded 100; there were about 28 of them discovered, the largest weighing over 300 pounds.

deals with the condition of the atmosphere at the surface of the dry land, in so far as it influences animal or vegetable life, while meteorology extends its scope to the whole atmosphere, over the ocean as well as over the land, at great as well as at small elevations, and deals with mechanical and physical problems that are foreign to climatology. It is true that only a generation ago our knowledge of meteorology was in fact but a knowledge of climatology, and most of our treatises on meteorology are necessarily chiefly occupied with climatology. There is, however, every prospect that a few years hence we shall be able to treat the phenomena of the atmosphere from a very comprehensive point of view, and, in fact, by a deductive rather than an inductive method.

In the excellent works of Kämtz (Halle and Leipsic, 1836), Schmid (Leipsic, 1860), Muhry (Leipsic and Heidelberg, 1856 and 1862), Blodgett (Philadelphia, 1860), Loomis (New York, 1868–74), Buchan (Edinburgh and London, 1868–75), Lorenz and Rothe (Vienna, 1874), and Mohn (Berlin, 1875), we find comprehensive reviews of the results of the great mass of observations that have been accumulating since the introduction of accurate methods and instruments. Referring to these works for the numerical details of these results, we shall in the present article briefly indicate the physical and mechanical explanations of the observed phenomena, and shall pursue, in fact, a semi-deductive mode of presentation of the subject.

Temperature and Moisture.—In dealing with the phenomena of the atmosphere deductively, we have to begin with the consideration of the density of the air, the inequalities of which are the direct cause of the general currents as well as of the local winds. Given the distribution of density, and the resulting currents of air should be deducible by the laws of mechanics. This density depends upon temperature, aqueous vapor, and pressure; of these, the first is the fundamental, and demands our first attention. The temperature may be regarded as regulated by, first, the radiation from the sun, subject to the absorption of such solar atmospheres or other envelopes as may exist; second, the absorption by the air of the heat radiated into it from the sun, either directly or after reflection from the earth or clouds; third, the radiation into space of the heat thus received from the sun; fourth, the mutual conversion of heat and molecular work. Taking these subjects up in this order, we note—first, that the amount of heat annually received from the sun is probably not constant, as has been indeed suspected since the time of Herschel. For the actual demonstration of its variability we are indebted to a number of physicists, of whom we need only mention especially Köppen, whose elaborate computations, based on the observations of temperature alone, are given in the *Journal of the Austrian Meteorological Society* for 1872. This author seems to have shown that the quantity of heat received increases and diminishes to a slight extent parallel with the increase and diminution of the solar spots. It follows, therefore, that there is a slight secular change, while other investigations, prominent among which may be mentioned those of Prof. S. P. Langley, show that there are also sensible hourly changes in the intensity of solar radiation. Neglecting these smaller changes, Sir William Thomson finds that the average quantity of heat received by the earth from the sun, as determined by Pouillet and Herschel, and converted by Joule's unit, is, for an area of one square foot exposed perpendicularly to the direction of the solar rays, 83 foot-pounds per second. This number relates to the heat received at the outer surface of our atmosphere. The quantity absorbed by the atmosphere will depend upon the chemical constitution or the mechanical purity of the atmosphere at that place, and upon the thickness of the stratum of air traversed by the solar rays; which thickness depends principally upon the latitude of the station and the apparent altitude of the sun above the horizon. For the latitude of Paris, from various measures made in different parts of the world (Pouillet and Desains in France, Leslie in England, Herschel in England and Southern Africa, Lambert and Erman in Germany), it may be concluded that on the driest clearest days 15, but on ordinary days 25 per cent. of the solar heat is absorbed by the atmosphere before the rays reach the earth, the sun being supposed in the zenith. A similar result has been reached with reference to the so-called visual rays (by Bouguer, Seidel, Zollner, Alvan Clark, and others), and also the chemical rays (by Vogel, Schall, Bunsen, Roscoe, and others). In accordance with modern ideas on this subject, it would be more proper to speak of the thermal, visual, and chemical effects of solar radiation than to speak of heat, visual, and actinic rays. The solar radiation, whether we consider its visual, thermal, or chemical effects, diminishes, as is known from experience and may be demonstrated by molecular mechanics, in a geometrical ratio as the thickness of the absorbent increases in an arithmetical ratio. It is therefore possible to express by a formula pretty approximately the law of diminution of the heat received from the sun with the increase of the zenith distance of that luminary. We give, therefore, in the second column of Table I. the numbers expressing the relative total radiation received by a unit of area of the surface of the earth at each ten degrees of latitude in the northern hemisphere on the average of an entire year, during which the sun has varied from a declination $+23°$ to one of $-23°$, and back again, as calculated by Meech for the outer portion of the earth's atmosphere, and therefore unaffected by the absorption of the air. The numbers for the southern are very slightly greater than those for the northern hemisphere, but are not given by Meech:

TABLE I.

LATITUDE.	Total solar radiation received annually by a unit's surface of the earth; the atmosphere being—			Forbes's investigation.		
	Perfectly diathermanous.	At its maximum diathermicity.	At its average cloudiness.	Observed mean annual temperature.	Measured ratio of land to water.	Computed mean annual temperature.
$-40°$	......	......	......	54.6°	0.040	55.5°
-30	......	......	......	66.9	0.200	64.9
-20	......	......	......	74.1	0.225	73.3
-10	......	......	......	78.0	0.204	78.1
0	1.00	0.75	0.30	79.7	0.216	80.0
$+10$	0.99	0.74	0.29	79.9	0.234	79.6
20	0.94	0.71	0.28	77.5	0.308	76.6
30	0.88	0.64	0.26	69.8	0.434	69.4
40	0.79	0.55	0.22	56.5	0.445	58.0
50	0.68	0.49	0.20	42.5	0.563	43.0
60	0.57	0.37	0.15	29.8	0.568	27.5
70	0.47	0.26	0.10	16.4	0.483	16.5
80	0.43	0.16	0.06			
$+90$	0.42	0.08	0.03			

In the third column of the table we give the amounts of heat received at the corresponding latitudes upon the earth's surface as diminished by the absorption of the atmosphere, assuming the latter to have been throughout the year in a uniform state of maximum diathermancy. In the second column of the table Meech has taken complete account of the varying length of the day and altitude of the sun, as changing with the seasons; and the striking influence of the long summer days at the poles, in increasing the quantity of heat received there to a total comparable with that received at the polar circles, is quite apparent. By comparing the first and second columns it appears that of the total amount of heat received by the entire earth during the year from the sun, only about 0.66 reaches its surface, even on the assumption of a uniform cloudless sky. If, however, we consider that the average cloudiness of the entire globe is not far from six-tenths, it is evident that we must diminish the numbers given in the third column of our table to four-tenths of their present value, the result of which diminution is given in the fourth column, from which it appears that in the average condition of the atmosphere, so far as our observations have made it known to us, about $\frac{27}{100}$ths, or one-fourth of the solar radiation that is incident upon our atmosphere, actually reaches the surface of the ground. Of the work done by the $\frac{73}{100}$ths which is absorbed by the atmosphere, but little account has been taken, thus far, in meteorology. Doubtless, its most important function is the performance of molecular work—viz. the preservation in an invisible state of that aqueous vapor which, if allowed to condense into cloud, would cover the whole earth with a perpetual canopy of fog. Of the $\frac{27}{100}$ths that reach the earth's surface, we may consider that almost the whole of it penetrates the earth or water on which it falls, and is retained there for a greater or less period—some only for a fraction of a second, some for many days; in so doing we neglect the slight percentage that is specularly reflected from the land and from the water. Knowing as we do that the earth at the distance of a few feet below its surface maintains a uniform temperature, instead of becoming gradually warmer and warmer under the influence of the solar radiation, it becomes necessary to trace in general terms the process by which it is relieved of its continually increasing amount of heat; in this process the atmosphere acts as a carrier. A small portion of the heat received at the surface of the solid earth is, by conduction, conveyed toward the interior so long as the latter is cooler than the surface; the mathematical laws determining this conduction have been satisfactorily elucidated by Fourier and Poisson. The larger portion of the heat is, however, immediately (and the whole ultimately) given by radiation (as ultra red rays) back to the adjacent or lowest stratum of air, while a very sensible quantity is absorbed in various chemical and organic processes, of which those of principal importance to meteorology are the evaporation of water, ice, or snow and the

development of vegetable growth. The radiative and conductive powers of the various components of the earth's surface are, however, not sufficient thus immediately to relieve the surface of *all* the heat received from the sun; the temperature of the soil consequently continues to increase, at least in clear weather, so long as the sun remains near the meridian. The surface of the earth therefore continues to warm up the lowest stratum of the atmosphere (aqueous vapor being, according to Tyndall, opaque to the ultra red rays) until a considerable time after the sun has passed the meridian, and until the combined amount of heat received at the surface, both from the sun and from the next lowest stratum in the earth, equals its own combined evaporative and radiative power. (The radiative power depends on the temperature of the adjacent air, and therefore on the mobility of the latter viewed as a convector.) The radiative and conductive powers of the components of the earth's surface are therefore a matter of great importance in deductive meteorology, and have been studied by numerous physicists, among whom we may mention Wells, Boussingault, Daniel, Poisson, Quetelet, Stone, Smyth, Schubler, Forbes, Helmersen, Pfaundler, etc. The general results of the investigations of Kämtz and Kupffer were graphically expressed by them in isogeotherms or lines of equal earth's surface temperature. Similar lines expressing the temperature of the surface of the ocean have been given by numerous authorities, especially the U. S. Coast Survey, the Netherlands Meteorological Institute, and the hydrographic bureaus of England, France, and the U. S.

The results of the processes of radiation which we have here sketched in general terms may be approximately said to be—(1) The land is warmed up more rapidly and cooled more rapidly than the ocean. (2) The air in contact with the land receives its heat more rapidly than that in contact with the ocean. (3) The air over the ocean or over fields of snow or over regions covered with heavy vegetation receives more moisture than that over the arid portions of the earth, other circumstances being the same. (4) Those portions of the lowest stratum of atmosphere which are specifically lighter, either from containing more moisture or more heat, are forced by the surrounding heavier gas to rise, in doing which they allow the neighboring air to flow in, producing winds or currents, while the rising lighter portions expand, thereby consuming a portion of their superabundant heat in molecular work, and losing a greater portion by radiation to the colder strata about them; which radiation goes on more rapidly in proportion as they ascend higher. (5) It is by the conductive process referred to in the last paragraph that it becomes possible for the heat received at the earth's surface to be dissipated into empty space; which dissipation is partially accomplished in one diurnal rotation of the earth, but more perfectly in one annual revolution, as is evident from the fact that the mean annual temperatures vary so slightly. (6) The total movement of the atmosphere as measured at the surface of the earth in units of force must, on the average of the year, be nearly equivalent to the mechanical equivalent of the total amount of heat received by the surface of the earth, or 45×10^{15} foot-pounds per second. (7) When over a given region the sun's direct heat is entirely or almost entirely withdrawn, and radiation from the earth's surface has continued to deplete its store of heat, until it is no longer able to heat up the lowest stratum of the superincumbent atmosphere to a temperature above that of neighboring regions, that layer of air ceases to have any buoyant power, and remains lying quietly on the earth's surface; which quiescence, however, does not hinder the transmission through it of radiations from the surface of the earth. This may continue to an indefinite extent, or at least until an equilibrium is established between the temperature of the ground and the temperature of the entire mass of air above it. Such an equilibrium is, however, scarcely attainable except at very low readings of the thermometer; and long before this point is reached it usually happens either that the sun rises or that either dew or hoar-frost forms on the surface of the ground, or else fog forms in the air immediately above, or, more frequently still, layers of strati or cirri cloud form in the higher atmosphere. In either of these latter cases the fog or cloud, acting as a covering to the earth's surface, neutralizes any further radiation therefrom; which radiation is then confined to the upper surface of the fog or cloud. (8) The capability of the earth and atmosphere at any season or any place to convey away the heat received by them is approximately shown by the interval elapsing after noon at which the maximum of the temperature takes place, and by the range between the maximum temperature of the afternoon and the minimum temperature in the morning; or, still better, by the interval of time elapsing between such maximum and minimum. (9) The study of local winds is thus seen to be a mechanical problem whose data are local topography, etc. Thus, for example, stations near the seashore or near mountains experience a diurnal change in the force of the wind, the strongest winds being experienced in the afternoon, with opposite winds in the early morning, and periods of calm between. In connection with local winds, local storms are to be classed, and indeed all the minor atmospheric peculiarities that constitute the climate of any locality. Local storms may be due either to topographical peculiarities, or to the intense uprising currents of midday, or to the rapid radiation at night-time, or to a combination of all these causes. The effects of rapidly uprising currents, the consequent cooling, the formation of cloud and hail, etc., have been happily developed by Espy, Hirn, Peslin, Reye, Thompson, Hann, etc. The laws according to which a mass of air cools as it ascends—so far, at least, as that cooling is due to the mechanical absorption of heat—have been developed by these writers from the principles established by Clausius and others, and are represented in Table II., as given by Hann:

TABLE II.—*Diminution of Temperature, in fractions of a degree Centigrade, experienced by a mass of Saturated Air in ascending through 100 mètres.*

Initial.		Initial temperatures.				
Pressure, milli-mètres.	Approx. altitude, mètres.	− 10° C.	0° C.	+ 10° C.	+ 20° C.	+ 30° C.
760	20	0.76°	0.63°	0.54°	0.45°	0.38°
700	680	.74	.62	.53	.44	.37
600	1,910	.71	.58	.49	.40	
500	3,360	.68	.55	.46	.38	
400	5,150	.63	.50	.42		
300	7,430	.57	.44			
200	10,670	.49	.38			

This, however, takes no account of the radiation of heat from this same mass of air. Some of the effects of the radiation of heat in the upper strata of the atmosphere have been forcibly set forth by Faye, who has shown that the air thus cooled by radiation need not, in its descent to the earth, necessarily become sensibly warmer, as most of the previous writers on this subject had supposed, but may retain its low degree of temperature under certain circumstances, thus giving rise to the streams of cold air that pour down the sides of mountains, and that generally also attend tornadoes and thunderstorms. (10) The study of the general currents of the atmosphere is a similar problem, whose data are the general orography of the earth and the general distribution of clouds, moisture, and temperature: in this connection also must be studied the general or extensive storms that sweep over the earth's surface. For the study of the general atmospheric currents the average distribution of the temperature in the lower stratum of the air is the fundamental desideratum: it may be approximately deduced from the considerations of the previous articles, and has been graphically given by the isothermal lines of Humboldt, Dove, Buchan, Hennessy,* and others, which represent graphically the results of actual observations with all possible minuteness. Others have, however, very approximately expressed some of these results in convenient mathematical formulæ. First, Brewster showed that the mean annual temperature of stations on any parallel was for the northern hemisphere pretty closely expressed by the formula $T = +81.5° \cos L$. Sartorius has, with considerable critical skill, given us an approximate view of what the distribution of temperature probably would be in case the earth's surface were all water or all land; his memoir is known to me only through a review thereof. His methods of investigation seem to be similar to those of Forbes, who in an interesting memoir has shown that the annual average temperature of the lower stratum of air may be closely represented on Fahrenheit's scale by the formula $T = 12.5° + 59.2° \cos \frac{4}{3}L + 38.1° \lambda \cos 2L$, where L represents the latitude, and λ the ratio of land to water as measured around the entire globe on the respective parallels of latitude. The remarkable agreement of this formula with observation is shown in Table I., where we have given the observed temperatures and measured land ratio, together with the results of Forbes's computations. By the aid of such considerations and such formulæ as these we should be able by means of the laws of dynamics to deduce the general movements of the atmosphere; which subject we will now take up.

The Movements of the Air.—Were the earth or air perfectly quiescent, meteorological phenomena would be reduced to the most absolute uniformity; the variations introduced by the movements of the air, as primarily due to the varying densities of its various parts, and as affected

* Prof. Hennessy's synthermal lines are in *Trans. R. Irish Acad.*, vol. xxiv.

by the rotation of the earth, constitute the most prominent phenomena of the weather. The influence of the rotation of the earth has, since the enunciation by Hadley (1735) of his theory of the trade-winds, been more or less imperfectly taken into account by numerous writers; more recently the memoirs of Poisson, and the discussions that took place at the Paris Academy of Science subsequent to the exhibition of Foucault's pendulum experiment (see Paris *Comptes Rendus*, 1859–61) and the publications of Prof. James Thomson (1857), Peslin (1868), Colding (1868), Everett (1871), have more fully elucidated the subject. But both in respect to priority and in fulness of detail, as well as in the comprehensiveness of their scope, the works of Prof. William Ferrel of Washington are pre-eminent, and especially worthy of our attention, as they have served to establish on a firm foundation the dynamics of meteorology. According to this mathematician (*Nashville Journal of Medicine and Surgery*, vol. i. p. 291, Nashville, 1856), "There are four principal forces which must be taken into account in a correct theory of the winds. The first arises from the greater specific gravity of the atmosphere in some places than others, on account of its condition as to temperature and the dew-point; for when it becomes heated in any place or charged with vapor to a greater degree than at others, it becomes specifically lighter; hence the equilibrium is destroyed; there is a flowing together there of the heavier air on all sides, which displaces the lighter air, and causes it to rise up and to flow out in a contrary direction. This is the *primum mobile* of the winds, and all the other forces concerned are dependent upon it for their efficiency. A second force arises from the tendency which the atmosphere has, under the influence of gravity, when from any cause it has risen above the general level, to flow to places of a lower level. These two preceding forces generally produce counter-currents. Again, when from any cause a particle of air has been put in motion toward the N. or S., the combination of this motion with the rotatory motion of the earth produces a third force, which causes a deflection of the motion to the E. when this motion is toward the N., and a deflection to the W. when it is toward the S. This is the same as one of the forces contained in La Place's general equations of the tides, the analytical expression of which is $2\sin l \cos l nur$; l being the latitude, n the motion of the earth at the equator, u the velocity of the particle N. or S., and r the radius of the earth. The fourth and last force arises from the combination of a relative E. or W. motion of the atmosphere with the rotatory motion of the earth. In consequence of the atmosphere's revolving on a common axis with that of the earth, each particle is impressed with a centrifugal force, which, being resolved into a vertical and a horizontal force, the latter causes it to assume a spheroidal form conforming to the figure of the earth. But if the rotatory motion of any part of the atmosphere is greater than that of the surface of the earth—or, in other words, if any part of the atmosphere has a relative easterly motion with regard to the earth's surface—this force is increased, and if it has a relative westerly motion, it is diminished; and this difference gives rise to a disturbing force which prevents the atmosphere's being in a state of equilibrium with a figure conforming to that of the earth's surface, but causes an accumulation of the atmosphere at certain latitudes, and a depression at others; and the consequent difference in the pressures of the atmosphere at these latitudes very materially influence its motions. This force is also expressed by one of the terms of La Place's equations, the analytical expression of which is $2\sin l nvr$; v being the relative eastern or western velocity of the atmosphere."

The third and fourth forces enumerated in this extract from Mr. Ferrel's first publication on the subject admit of being compounded together, so as to be represented by one expression, which is defined as follows (Ferrel's *Motion of Fluids and Solids relative to the Earth's Surface*, in Runkle's *Mathematical Monthly*, 1859–60): "Whatever direction a body moves on the surface of the earth, there is a force arising from the earth's rotation which deflects it to the right in the northern hemisphere, but to the left in the southern. This deflecting force is represented by the expression $2nv \cos \theta$." The influence of this deflecting force, although imperfectly understood by Hadley, was rightly applied by La Place, Poisson, Poncelet, Foucault, and others to the problems treated by them; but on account of its importance in meteorology, and its fruitful applications by Ferrel, it has, with some propriety, been called "Ferrel's law." By careful deductive treatment of his general mechanical formulæ in the memoir last referred to, Ferrel shows that if there were absolutely no friction between the earth and the wind, or between the particles of the air itself, it would follow that the atmosphere, "however deep it may be at the equator, cannot exist at the poles; and the exterior surface of the atmosphere would be slightly depressed at the equator, and have its maximum height about the parallel of 35°, and meet the surface of the earth near the poles. At the latitude of maximum height the atmosphere would have no motion E. or W.; between the parallels of 35° and the poles the motion would be eastward, but between those parallels and the equator it would be toward the W." If, now, we suppose a uniform coefficient of friction, we have to consider that, as there can be no resistance until there is motion, "the atmosphere must have a tendency to assume in some measure the same motions and figures as in the case of no resistances. Hence, toward the poles the general motion of the atmosphere must be toward the E., and in the torrid zone toward the W. There must also be a comparatively small depression at the poles and at the equator. There must be a region of calms about the poles, and a belt of calms at the equator. The belt of calms which, in the case of no friction, would exist at the parallels of 35°, would be moved toward the equator N. of the parallel of 30°. The less friction of air moving over air than over the earth causes an additional accumulation of atmosphere at the tropical belts, the outflow of which, combined with the westerly and easterly motions of the atmosphere, gives rise to the fresh N. E. trade-winds of the northern hemisphere, and to the S. W. surface-currents of the temperate zone." This assumption of a uniform frictional resistance over the entire earth is, however, but a very rough approximation to the actual condition of the surface of the globe, on which we find a greater quantity of land, and consequently greater resistances to motion of the air, in the northern than in the southern hemisphere. Consequently, "the eastward motion of the air upon which the deflecting force depends is in the northern hemisphere much less, and therefore the more rapid motions of the southern hemisphere cause a greater depression there, and a greater part of the atmosphere to be thrown into the northern hemisphere." This also accounts for the mean position of the equatorial calm-belt being in general a little N. of the equator. But in the Pacific Ocean, where there is nearly as much water N. of the equator as S., the position of the calm-belt nearly coincides with the equator. For the same reason, the tropical calm-belt of the northern hemisphere is farther from the equator than that of the southern hemisphere; and, on account of the irregular distribution of the land and water of the two hemispheres in different longitudes, this belt does not coincide throughout its whole extent with any parallel of latitude. In the longitude of Asia, where there is all land in the northern hemisphere and the Indian Ocean in the southern, this belt, which is also the dividing-line which separates the winds which blow E. from those which blow W., is farther from the equator than at any other place, as shown by Prof. Coffin's charts of the winds.

"In winter the difference of temperature between the equator and the poles upon which the disturbance of the atmosphere depends is much greater than in summer; this causes the eastward motion of the atmosphere in either hemisphere during its winter to be greater, while in the other hemisphere it is less. Hence, a portion of the volume of the atmosphere in winter is thrown into the other hemisphere; but although the volume or height of the atmosphere is then less, yet, being more dense, the barometric pressure remains nearly the same. The difference at Paris, and in the middle latitudes generally, between winter and summer, is only about one-tenth of an inch. On account of this alternate change with the seasons of the velocity of the eastward motion of the atmosphere in the two hemispheres, the equatorial and tropical calm-belts change their positions a little, moving N. during our spring, and S. in the fall." (*American Journal of Science*, 1861, vol. xxxi. p. 31.)

The subdivision of each hemisphere into continental and oceanic areas introduces further complications into the systems of winds and pressures; thus, for instance, over the N. Atlantic and N. Pacific oceans the regions of maximum pressure and of calms lie to the southward of the corresponding regions over the continents. Moreover, the belts of maximum pressure are most clearly perceived when the movements of the air meet with the least resistance. They are, therefore, in both hemispheres, pushed over to the eastern sides of the oceans. The general movements of the air, as thus deduced by Mr. Ferrel from the laws of mechanics, are in singularly close accordance with the general results of observations, as may be seen by a study of the maps published by Coffin, Buchan, the British admiralty, etc. In respect to the historical development of our knowledge upon this subject, as based upon observations, we note that the diminution of pressure in the equatorial regions, and the excess near the tropics, were first clearly brought to light by Capt. Wilkes, and almost simultaneously by Schouw, who first gave a very complete table of average barometric pressure at some forty stations in

the northern and southern hemispheres. The existence of a slight easterly movement of the atmosphere in the polar regions of the earth was first established by Coffin in his *Winds of the Northern Hemisphere* (Washington, 1853), where he states that "between the parallels of latitude 60° and 66° in the northern hemispheres there appears to be a belt of easterly and north-easterly winds, while farther N. the mean direction of the wind in the arctic regions of North America is about nearly N. W."

Equally successful has been the application by Mr. Ferrel of his analytical formulæ to the study of storms. Since all moving bodies deflect to the $\left\{\begin{matrix}\text{right}\\ \text{left}\end{matrix}\right\}$ in the $\left\{\begin{matrix}\text{northern}\\ \text{southern}\end{matrix}\right\}$ hemisphere, it follows that all extensive storms will exhibit a rotation around a central region in the $\left\{\begin{matrix}\text{negative}\\ \text{positive}\end{matrix}\right\}$ direction. The additional centrifugal force thus introduced produces a diminution of pressure in the central regions of the storm, which is quite satisfactorily given by a remarkable relation between the wind and the barometric gradient first published by Ferrel in June, 1874. (See *American Journal Science*, 1875.)

It is not possible in this brief introduction to deductive meteorology to detail the laws partly belonging to mechanics and partly to molecular physics that lead to the minor phenomena of diurnal barometric variations, formation of rain and snow, etc. Equally difficult would it be to give here any satisfactory account of the methods, partly philosophical, but principally empirical, by means of which the information given daily on the synoptic weather-maps of Europe and America is made available for the prediction of the weather twelve or twenty-four hours in advance.

CLEVELAND ABBE.

Me'teor. The word *meteor*, from the Greek *μετέωρος*, means a "thing in the air" or "above the ground." It has been used to denote many different objects and phenomena, generally of short duration, that have their place in the atmosphere. Thus, there are *aërial meteors*, as winds, tornadoes, etc.; *aqueous meteors*, as fogs, rain, snow, hail, etc.; *luminous meteors*, or those due to the action on light of elements in the air, as rainbows, halos, parhelias, mirages, etc.; *electrical meteors*, as lightnings, auroras, etc.; and *igneous meteors*, as shooting or falling stars, star-showers, bolides or fireballs, aërolites or meteorites, etc. In present usage the term *meteor* is generally limited to the last group, or to the igneous meteors.

Upon any clear night a person looking upward will from time to time see a bright starlike point of light appear in the sky, move rapidly several degrees in a right line across the heavens, and as suddenly disappear, the whole flight lasting perhaps only a fraction of a second. This is a *shooting* or *falling star*. On certain nights these shooting stars have been seen in immense numbers. Thus, on the morning of Nov. 13, 1833, they came so thickly as to be described as a fiery snowstorm. On Nov. 12, 1799, Nov. 13, 1832, Nov. 14, 1866, Nov. 14, 1867, Nov. 14, 1868, Apr. 4, 1095, Oct. 24, 1366, Nov. 27, 1872, and on many other nights that could be named, they came by thousands. On the night of Aug. 10–11 of every year three or four times the usual number are to be seen. The brighter of these displays are called *star-showers*.

Varieties of Meteors.—The shooting stars are of all degrees of brightness. Some are so faint that one looking at them cannot be certain that he sees anything, and some are visible only in a telescope. Others may be brighter than the planets, or even than the moon. These are called *bolides* or *fireballs*, or by older writers *flying dragons*. Sometimes they are seen in full daylight. The larger fireballs often explode into fragments, the parts chasing one another across the sky or scattering in different directions. In some cases terrific explosions, as of distant and numerous cannon, are heard over all the region a few minutes after the disappearance of the body. These are called *detonating meteors*. At times from these detonating meteors come down stony fragments, scattering themselves over a region miles in extent, and usually striking the ground with enough force to bury themselves in soft earth one or two feet. These fragments are called *aërolites* or *meteorites*. All these igneous meteors have, it is believed, a similar origin and character, though they differ in size, in color, in brightness, in chemical composition, etc.

Height.—By observers near each other the track of a shooting star is seen in the same part of the heavens. But when two observers see the same track from two stations 50 or 100 miles apart, it appears in different parts of the sky. Hence the actual altitude can be determined. It is found that they are not seen higher than about 100 miles from the earth, and they rarely come lower than 30 miles unless they send down fragments. While they are thus very far above the region of clouds, they are still more distinct in place from all other astronomical phenomena, excepting, perhaps, the auroras and twilight.

Numbers.—Shooting stars are seen on any clear, moonless night. One person would on the average see not less than eight per hour, but the number increases through the night, so that about three times as many can be seen just before dawn as in the evening hours. A large group watching together can see five or six times as many as one person, or an average, at midnight, of 40 or 50 per hour.

Trains.—Many of the shooting stars leave behind them a bright cloud of phosphorescent light. Often this disappears in a fraction of a second or in two or three seconds. Not unfrequently, however, a bright one leaves in its path a narrow bar of light several degrees long. This contracts in length and broadens, sometimes changing into a small round cloud, which slowly floats away. But usually it retains its elongated form, and after a fraction of a minute is seen to lose its straightness. If it lasts several minutes, the cloud gets twisted forms, the result, no doubt, of winds in the upper air and of currents produced by the meteor itself. One such train the writer saw during 45 minutes, and they have been reported as lasting more than an hour.

Color.—The meteors and their trains have various colors—white, green, blue, yellow, scarlet, etc. Those which are seen on Nov. 13 of various years leave a bluish train. The body and train of a large meteor may give in its various parts all these colors.

Duration of Flight.—The duration of the flight is generally less than a second of time, but the brighter ones may last several seconds. The fireball of July 20, 1860, was in sight over half a minute, which was, however, an extreme instance, for its path was very long. It was first seen over the State of Michigan, and last seen when it was 200 or 300 miles E. of New York City.

Velocity.—Some meteors move through the air as slow as 8 or 10 miles, and some as fast as 40 or more miles, a second. The mean velocity is about 30 miles a second, more than 100 times that of a cannon-ball.

Density.—The stony meteorites are solid. The same is true, also, of all the smaller meteors; for some of them are seen to split into fragments; some are seen to describe curved lines, or to glance in the air like stones on water, or on hitting a hard body. Small agglomerations of gas, moreover, could not retain their integrity during their travels so as to enter the air like shooting stars.

Shape.—The stony meteorites have in general the shape of broken fragments of stone. The outside is usually covered with a thin black crust, which is evidently due to a melting of the surface in the atmosphere. The stones have often a peculiar shape, as though a broken surface had been melted to a small depth. The occasional glancing of the shooting stars implies that the same irregular shape sometimes, if not always, belongs to the small meteors.

Meteoric Irons.—There have been found at various times and places loose iron masses that are assumed to be of meteoric origin, because their peculiar form, their peculiar chemical composition, and their peculiar crystalline structure are like those of the iron masses that have been seen in several instances to come down from meteors.

Actual Size.—There was a fall of meteorites in Iowa on Feb. 12, 1875, from which many fragments, in all not less than 500 pounds in weight, were secured. Iron masses assumed to be of meteoric origin are known to exist which weigh many tons, and it may be readily believed that the larger detonating and stone-producing meteors are, when they enter the air, as large as these irons. On the other hand, the smallest shooting stars, especially the telescopic ones, are probably not greater than small pebbles or grains of coarse sand. The apparent size of all meteors is magnified by the surrounding flame and by irradiation, and does not therefore indicate the real size of the meteoric body.

Fracture in the Air.—The meteorites coming from a single meteor must before entering the air have been in close company, and were probably coherent. The resistance of the air, and the consequent sudden heating of the body, whose temperature must have that of space, are sufficient causes for breaking the body into fragments. At the close of the flight these fragments are usually distributed over areas miles in extent. Upon them we often find evidences of successive fractures. One surface may show by its smooth form continued melting. On an adjacent surface may be an accumulation of melted matter, with clear evidence on its margin of its having come from the other side. Another surface may show a mere accumulation of melted matter, while its own material is not changed. Another surface may be more or less browned as with smoke, with some or all of its margins exhibiting a delicate rounding of the black crust of the adjacent surfaces, showing the fracture to have taken place while the crust was soft. Still other surfaces are so slightly discolored that it is impossible to decide whether the fracture may not even have been subsequent to the fall, while numerous cracks extending into the stony mass show that the disintegration was still

in progress. All these peculiarities are shown in some Iowa meteorites that fell Feb. 12, 1875, and which are now before me. This breaking is shown peculiarly by the fragments of a meteor that fell in India in 1861, which were picked up at places three or four miles apart, and which fit to one another. Moreover, some of the fitting surfaces had the usual black crust, while others were unaltered. A large meteor seen through a telescope by Schmidt at Athens in 1863 was made up of a large number of smaller meteors, which, however, to the naked eye seemed to be a single fireball.

Structure of the Meteorites.—The meteorites contain no elements, so far as we know, which have not been found on the earth. But these elements are compounded differently from any terrestrial minerals. Iron is always present, usually in metallic form and combined with nickel. The stones from different meteors differ much in their structure, though they may be grouped in a few well-marked classes. In general, the meteorites resemble the igneous more than the other rocks of the earth's crust. The iron masses have a crystalline structure, which is revealed by polishing a surface and etching it with acid. The lines developed by the acid are called the *Widmannstätten figures.*

Gases in the Meteorites.—If fine chips of meteoric iron, or powdered fragments of the stony meteorites, be placed in a vacuum and then heated moderately, they yield up gases consisting of oxygen, carbon, hydrogen, and nitrogen. These gases seem to have been absorbed at some former time by the meteor, probably by the iron of the meteor. The spectrum of these gases corresponds to the spectrum of the light of a comet's coma and tail.

Chemical Constitution.—For the chemical components and the minerals in meteorites and meteoric irons, see METEORITES.

The Meteors are Astronomical Phenomena.—It is now universally admitted by astronomers that igneous meteors are caused by small bodies which have been travelling about the sun in their orbits, but now come into the earth's atmosphere, and, in general, burn up. These bodies before they come into the air are called *meteoroids.*

Star-shower of Nov. 13.—On the morning of Nov. 13, 1833, from about 3 o'clock till daylight, large numbers of shooting stars were seen throughout the western hemisphere. The very important fact was noticed that wherever the observer might be, the paths of the meteors across the sky were always directed from a point in the constellation Leo, and that this point kept its place among the stars notwithstanding the earth's rotation. This fact could be explained only by assuming that the paths of the meteors through the air were parallel to each other, and were directed from the constellation Leo; also that the meteors were of cosmical not of terrestrial origin. Further research established that there had been star-showers on the following earlier dates:

Nov. 13, 1832;	Oct. 19, 1202 (O. S.);
" 12, 1799;	" 17, 1101 "
" 9, 1698;	" 15, 1002 "
Oct. 28, 1602 (O. S.);	" 14, 934 "
" 25, 1533 "	" 15, 931 "
" 23, 1366 "	" 13, 902 "

These dates show a cycle of about 33 years, with a change of date of about three days in a century, the apparent change of twelve days in the seventeenth century being due in the main to the difference between old and new style. The cycle, the change of date, and the radiation all implied that the meteors belonged to a group of bodies revolving about the sun in similar elliptic orbits. It was also found that only five possible orbits could explain the cycle and the radiation, and that one, and only one, of these explains the change of date. This is an orbit whose period is $33\frac{1}{4}$ years, inclination 17° 45′, eccentricity about $\frac{9}{10}$, and motion retrograde. According to expectation, the meteors appeared again in thousands on the morning of Nov. 14 in 1866, 1867, and 1868.

Comet 1866^1.—A comet passed its perihelion in Jan., 1866, which has an orbit very nearly identical with the common orbit of the meteors as thus determined. In fact, the comet is travelling with the group, and near the head of it.

Comets 1366.—A star-shower occurred in Oct., 1366. Two or three days afterward a comet appeared in the northern heavens, and travelled along the track of the meteors. A week later a second comet followed along the same path. Probably both were members of the group.

Dimensions of the Leonid Meteor Stream.—These meteors, because of their radiation from the constellation Leo, are called *Leonids.* The denser part of the stream of meteors is traversed by the earth in from one to three hours, which implies an actual thickness of 20,000 to 50,000 miles. It takes three or four years for the stream to pass the node, which implies a length of many hundreds of millions of miles. The breadth in its own plane is unknown. The numbers seen per minute in the middle of the brighter of these star-showers imply that the meteoroids have in the centre of the stream, as they travel through space, a mean distance from one another of from 25 to 50 miles.

The August Meteors and Comet 1862^3.—There are shooting stars every year on Aug. 9–12, numbering on the morning of the 10th or 11th 200 or 300 per hour for four observers with a clear moonless sky. They radiate from the constellation Perseus, and are hence called *Perseids.* The comet 1862^3 has an orbit that very nearly cuts the earth's orbit at the point where the earth is on the 10th of August. If a stream of meteoroids were moving with this comet, as the Leonids move with comet 1866^1, they would appear like the Perseids, the radiant being in the same place in Perseus. Hence, it is reasonable to assume that the Perseids and comet 1862^3 have like orbits.

The Biela Comets and the Andromedes.—A comet of short period, making three circuits in 20 years, was discovered in 1772, and observed in 1805, 1826, 1832, 1845, and 1852. In 1845 it was seen to be separated into two parts, about 150,000 miles from each other. In 1852 the two comets were about 1,200,000 miles from each other. Since that time they have never been seen. The earth's orbit came very close to the comet's orbit, the earth crossing the comet's path at first early in December, but afterward, owing to the action of Jupiter on the comet, late in November. Shooting stars were seen in considerable numbers Dec. 7, 1798, and Dec. 8, 1838, and at the latter time were observed to radiate from Andromeda; they are hence called *Andromedes.* From this same point in the sky any meteoroids travelling along the orbit of the Biela comets, and coming into the air, would be seen to radiate. On Nov. 24 and 27, 1872, large numbers of Andromedes were seen in Europe and America, forming on the latter date a star-shower of the most brilliant character. Immediately after the shower a comet was seen in the part of the heavens directly opposite to Andromeda, apparently moving away from the earth. This comet, though it was not one of the two main fragments of the Biela comet, nor yet was what the earth had just passed through, is supposed to be travelling with the Andromeda meteoroids along the orbit of Biela's comet. The whole forms a stream, more or less intermittent, hundreds of millions of miles in length.

The April Meteors and Comet 1861^1.—Shooting stars in large numbers have been observed in certain years on the 20th of April, radiating from a point in the constellation Lyra. They are hence called *Lyriads.* They seem to be connected with the comet 1861^1, in the same way as the star-showers with the comets already described. Brilliant displays of shooting stars were seen in China on this day B. C. 687 and B. C. 15, and in Europe A. D. 1095 and A. D. 1122, which probably were Lyriad meteors.

Other Meteor-streams and Sporadic Meteors.—Shooting stars are seen every clear night. An attempt has been made to separate these sporadic meteors into meteor-streams other than the three named above. About 200 radiants have been named by observers as more or less probable. Some of these will no doubt be found to be connected with comets, while some are probably not real.

Numbers of Sporadic Meteors.—By considering the number of meteors visible each hour, their distribution over the sky, and the average relative velocity of the meteoroids in space—all of which can be determined with a certain degree of accuracy—we find that there are in the region through which the earth is travelling 10,000 or 15,000 meteoroids in each volume of the size of earth. In other words, each meteoroid that would, in coming into the air, under favorable circumstances, furnish a meteor-track visible to the naked eye, occupies an average space equal to a cube whose edge is 200 or 300 miles. The number of the meteoroids that enter the atmosphere daily is not less than 10,000,000. If we include those smaller meteors which are seen only in the telescope, that number may be multiplied twenty or forty fold.

Theory of the Meteors.—We may then regard the meteoroid as a small solid body describing its long elliptic orbit about the sun, like any comet. The number of such small bodies is so great that every day many millions of them come within 4000 miles of the earth's centre, the number being but little increased by the earth's attraction. They are entirely invisible until, at a height of less than 100 miles from the ground, they enter air dense enough to resist their motion and create light. The air being compressible, an intense heat is developed directly in front of the body. The anterior surface is in consequence melted away, the melted matter being wiped off by the air. This streams back, forming in part the apparent flame and the train of the meteor. Its own firmer constitution prevents the meteorite from like condensation and internal heating, and it therefore proceeds many miles before it is entirely destroyed. Under favorable circumstances of velocity, chemical and mechanical constitution, and size the meteoroid is not entirely scattered, but, breaking up into frag-

ments, comes to the ground in a shower of stones. These stones often show traces of the flow of melted matter, also evidences of successive fractures, and even the partially-developed cracks which with further action would have become fractures. But for this action of the air in arresting and destroying the meteoroids, we should be intolerably pelted with them. The meteorites are all evidently fragments, not separate formations. They are in the heavens, to some extent at least, grouped in streams along the orbits of known comets, and hence have some common origin with them. The continuity of these streams, the double and multiple character of Biela's and other comets, and the steady diminution of comets in brilliancy at successive returns, seem to argue a continuous breaking up of the comet into fragments by some cause—probably by the sun's heat. This view is strengthened by the fact that the meteoric irons and stones bring with them carbonic acid, which is known to form so prominent a part of the comet's tail. The meteoroids, however, are not constituents of either the comet's coma or its tail.

Literature.—The literature of this subject is quite extensive. I would specially refer to the various articles in the *American Journal of Science*, in the *Astronomische Nachrichten*, in the *Monthly Notices* of the Royal Astronomical Society, and to the annual reports of the Luminous Meteor committee of the British Association for the Advancement of Science; also, to the following separate works: Schiaperelli, *Note e Riflessioni sulla Teoria astronomica delle Stelle cadenti* (Florence, 1867), or its German translation by Boguslawski (Stettin, 1871), Kirkwood, *Meteoric Astronomy* (Philadelphia, 1867), and *Comets and Meteors* (Philadelphia, 1873). H. A. NEWTON.

Meter, Gas. See GAS-LIGHTING.

Meter, Water. See WATER AND WATER-SUPPLY.

Meteyard (ELIZA), better known as "Silverpen," b. in Liverpool, England, June 21, 1822; became well known as a contributor to the magazines edited by Hood, Eliza Cook, and Douglas Jerrold, in which she wrote principally upon social and sanitary reforms and upon antiquarian subjects. Her most elaborate and valuable work is the *Life of Josiah Wedgwood* (2 vols., 1865–66), which was supplemented by *Records of the Younger Wedgwoods and their Friends, embracing the History of the Discovery of Photography and a Fac-simile of the First Photograph* (1871).

Meth'odism. The title "Methodists" was applied to Wesley and some of his Oxford associates not in derision, but as expressive of the regularity of their religious habits, especially their punctual devotion to the ritualistic services of the Church, for the Oxford "Holy Club," as they were otherwise called, were not only extremely "High Church," but exceedingly "ritualistic." They were distinctively the "ritualistic party" of their day, notwithstanding the very simple practical character and comparative disregard for ritualism which the Methodistic movement subsequently assumed. The little society, begun in 1729, grew slowly, and consisted in its sixth year of only fourteen members, the most memorable of them being John and Charles Wesley and George Whitefield. (See WESLEY.) The departure of the Wesleys to America terminated the history of the "Oxford Methodists" and the existence of the "Holy Club." The return of the two brothers to England, however, revived the denominational epithet, for by the next year (1739) they and Whitefield had spread a religious sensation over much of the United Kingdom. They were excluded from the pulpits of the national Church, and had to preach in the open air, and in many places they and their adherents were denied the Eucharist at the church altars. They were therefore compelled to unite their followers in "societies," to give them the sacraments, and provide for them places of assembling and worship. The year 1739 is considered the true epoch of Methodism. In that year Wesley began the erection of his first chapel at Bristol, opened his famous "Old Foundry" in London, and formed in the latter city his first "society," which he says (in the introduction to his *General Rules*) was the "rise of the UNITED SOCIETY"—that is to say, of organized Methodism. In the same year "bands" were formed, for the first time, in the city of Bristol, and it is the date of the first publication by the brothers of their *Hymns and Sacred Poems*, the beginning of that Methodistic psalmody which has spread over most of the Protestant world, and which has been the chief liturgy of the denomination.

Thus had the "great Methodistic movement" commenced. It soon extended over Great Britain and into Ireland. Additional "societies" were continually formed; *General Rules* were prepared for them by John and Charles Wesley jointly. These "Rules" are the recognized "terms of membership" throughout the Methodist communion, and they expressly declare that no other "condition" than such as they define "is previously required of those who desire admission to these societies." They are singularly liberal, being "remarkable," says a Methodist writer, "as containing not a single dogmatic condition of communion." They are thoroughly practical, requiring as the "only condition" "a desire to flee the wrath to come and be saved from sin," and the exemplification of this desire, first, by the avoidance of certain specified vices; secondly, "the doing good of every possible sort, and as far as possible, to all men," especially in certain specified respects. Wesley, though at first, as he acknowledges, a "High Churchman," and as strict a "ritualist" as the Anglican Church possessed in his day, had now become one of the most charitable of men. Throughout the remainder of his life he refers often to the liberality of the terms of membership in his societies, and demands of all good men the sacrifice of sectarian bigotry and co-operation in practical religion. Though he now formed "societies," not churches technically or strictly considered, yet when, many years later, he prepared a form of organization for the Methodist Episcopal Church in the U. S., he still retained the *General Rules* as presenting the only condition of membership, and inserted in a separate part of the book the Anglican Articles, not as an obligatory symbol to be virtually subscribed, but as a merely indicative standard of the best theological opinions. Members of the Church were to be amenable not so much for their individual opinions as for making strife and trouble in the denomination by them. It cannot be questioned that John Wesley was not only immeasurably in advance of his own age, but also far in advance of ours in "evangelical liberality."

The societies rapidly increased. Wesley and his few clerical coadjutors flew, it may be said, over the realm, preaching daily. They were soon compelled to organize more thoroughly their converts if they would not labor in vain. The societies were therefore divided into "classes" of about twelve persons each, and placed under the inspection of select "leaders." They met weekly, sang, prayed, and related their Christian experience. The "class meeting" has since been the germ of almost every Methodist church in the world. Each member contributed a penny a week and a shilling a quarter for the support of the cause, and thence arose the whole financial system of Methodism. The clerical laborers could not supply the increasing local societies; laymen of natural talents were therefore recognized, first as "exhorters," and then as "local preachers," to conduct their public services in the absence of their clerical guides. Wesley soon called out some of his ablest "local preachers" into the general field, to travel and preach continually, like himself, his brother, and Whitefield; and thence arose the lay *itinerant ministry*—one of the greatest facts in the history of the Methodist movement throughout the world. To give regularity to the labors of these lay evangelists, they were assigned to different sections of the country; thence came the famous Methodist "circuit"—of incalculable service, especially in the early frontier settlements of the New World, for it sometimes put under the regular ministrations of one or two "itinerants" parishes 500 miles in extent. Over a given number of these circuit preachers presided a select itinerant, and thence arose the "district," with its "presiding elder" in America, its "chairman" in England. This officer assembled the preachers and other "official members" of each circuit four times a year, for the better regulation of their work; thence arose the "quarterly conference;" a similar gathering from all the circuits of a district constituted the "district conference;" the yearly gathering of all the preachers of all the districts, for the revision of their entire work and its redistribution for the ensuing year, made the "annual conference." The latter, however, preceded, chronologically, the other forms of "conference," Wesley having held the first session in 1747. In America the great territorial range of the denomination has rendered necessary a quadrennial session called the "general conference," composed of delegates from all the annual conferences.

Besides these peculiarities, Methodism has some minor functions or distinctions which have contributed much to its popular effectiveness. Its "love-feast" was borrowed, through its early Moravian associates (see WESLEYS), from the agapæ of the primitive Church. Bread and water are distributed among the assembly at the opening of its service, and the rest of the time is spent in the narration of Christian experience. The "band meeting" was also copied from the Moravians. Each sex met in its own bands; the "class meeting" has generally superseded this institution. The "watch-night" is usually celebrated on New Year's Eve, its services closing with silent prayer at midnight. It originated with the early Methodist converts among the Kingswood colliers. It had been their custom to close the old and hail in the new year with drunken orgies. Methodism reclaimed hosts of these poor people, who changed to this new and devout form their observance of

New Year's Eve, and gave it to the denomination throughout the world. The lay "prayer meeting" is universal among Methodists, and has been claimed as original with them, at least in the modern Church. (Smith's *Hist. of Meth.*, vol. i.) It is characterized by great freedom and fervor, and especially by its popular psalmody. Both sexes have equal liberty of prayer and exhortation in it.

The *theology of Methodism* may be said to be substantially that of the Church of England, though it eliminates the alleged Calvinistic teachings of the Thirty-nine Articles. Wesley was thoroughly Arminian, and his followers are universally such. The "minutes" of his early conferences record many discussions with his assembled preachers on theological subjects. Certain compilations from these documents, together with his sermons and his notes on the New Testament, are recognized as the theological standards of the English or Wesleyan Methodists. In the U. S. his abridgment of the Anglican Articles is the only authoritative Methodistic standard. It does not include his views of the "witness of the Spirit" and of "sanctification," which, though subjects of much interest to American Methodists, are left quite freely to individual opinion and discretion. These two doctrines have usually been considered, by outside critics of Methodism, as peculiar to its theology. Neither Wesley nor any subsequent authority of the denomination would admit them to be so. They consider them to be not only biblical, but generally admitted truths in Greek and Latin Christendom. Wesley did not even go as far in his teachings regarding the "witness of the Spirit" as many of the older Protestant theologians went in the doctrine of "assurance." According to him, the Spirit, not by any marvellous demonstration, outward or inward—"not by an inward voice, though He may do this sometimes"—gives the peaceful impression to the justified man that his sins are forgiven. To use his own words, "the Spirit so works upon the soul by His immediate influence, and by a strong though inexplicable operation, that the stormy wind and troubled waves subside, and there is a sweet calm; the heart resting as in the arms of Jesus, and the sinner being clearly satisfied that all his 'iniquities are forgiven and his sins covered.'" In his teachings on sanctification—or "perfection," a word which he used because the Scriptures use it—he taught not absolute moral perfection. "We are no more to expect any man to be infallible," he says, "than to be omniscient." A Methodist writer affirms that "perfection, as defined by Wesley, is not perfection according to the absolute moral law; it is what he calls it, *Christian perfection*—perfection according to the new moral economy introduced by the atonement, in which the heart, being sanctified, fulfils the law by love (Rom. xiii. 8, 10), and its involuntary imperfections are provided for by that economy without the imputation of guilt, as in the case of infancy and all irresponsible persons."

Though in the foregoing remarks historical references have been made chiefly to Wesleyan or English Methodism, the subject has nevertheless been treated with a studied generality in order to economize room. Nearly all that has been thus far said is applicable to the many divisions of the denomination, and will not therefore need to be repeated in their respective treatment. For one of the most noteworthy facts of Methodism is its essential unity. Whatever distinctive prefixes or affixes its numerous bodies may have adopted, they all hold to what they justly consider substantive Methodism. Their theology is universally the same, except among the Welsh Calvinistic Methodists. They have very generally the same practical system and interior regimen, and aim at the same type of spiritual life. They nearly all have fraternal relations. Though there are now, according to one of their most cautious authorities, more than 12,000,000 "persons receiving Methodist instruction, and from week to week meeting together in Methodist buildings for the purpose of worshipping Almighty God" (Tyerman's *Life and Times of Wesley*, i. 9), and though these are scattered over most of the outlines of the globe, yet are they essentially one people.

We may now proceed more particularly, yet briefly, to record their various branches.

Wesleyan Methodists is the title of the British parent body. The outlines of its early development have already been given. During Wesley's life it was chiefly controlled by his patriarchal authority. He left, however, a "Deed of Declaration," recognized in 1794 by the high court of chancery, providing for the government of the "connection" after his decease. By this deed the annual conference is composed of 100 travelling preachers, with power to fill vacancies in their number. They are the "legal conference," but the other travelling ministers attend their sessions and share in their debates, without the right of voting. The president of the conference is elected for one year, and has during this term the general supervision of the denomination. The proceedings of the "district" and "quarterly conferences" (above noted) are subject to revision and amendment in the annual conference. Committees appointed by these minor bodies to prepare the principal business of the annual session meet about a week before the latter, and their measures are generally, if not invariably, adopted by the "legal hundred." As these committees consist largely of laymen, the rigor of Wesley's "Deed of Declaration" is much relieved by this concessive policy of the conference. Wesleyan Methodism cannot, under that deed, have "lay representation," but it has nearly its equivalent in the preliminary committees. One of these committees makes a draft of the "appointments" of all the travelling preachers for the ensuing year; this document is submitted to the attention of the societies, which have the right of appeal to the conference for changes. Its final determination is with the conference. No preacher, however, can be appointed to the same place more than three successive years. The Wesleyans now report about 3200 travelling preachers and 560,000 church members. Their foreign missions dot much of the globe. A Wesleyan authority (Tyerman) says: "The parent conference employs in Great Britain and Ireland 1782 regular ministers. Besides these, there were in 1864, in England only, 11,804 lay preachers, preaching 8754 sermons every Sabbath day. In the same year the number of preaching-places in England only was 6718, and the number of sermons preached weekly by ministers and lay preachers combined was 13,852. To these must be added the lay preachers, preaching-places, etc. in Wales, Scotland, Ireland, Shetland, and the Channel Islands. The number of church members in Great Britain and Ireland is 365,285, with 21,223 on trial; and, calculating that the hearers are three times as numerous as the church members, there are considerably more than 1,000,000 persons in the United Kingdom who are attendants upon the religious services of the *parent* conference of 'the people called Methodists.' Some idea of their chapel and school property may be formed from the fact that during the last seven years there has been expended in Great Britain only, in new erections and in reducing debts on existing buildings, £1,672,541; and towards that amount of expenditure there has been actually raised and paid (exclusive of all connectional collections, loans, and drafts) the sum of £1,284,498. During the ten years from 1859 to 1868, inclusive, there was raised for the support of the foreign missions of the connection £1,408,235; and if to this there be added the amount of the Jubilee Fund, we find more than a million and a half sterling contributed during the decade for the sustenance and extension of the Methodist work in foreign lands. The missions now referred to are carried on in Ireland, France, Switzerland, Germany, Italy, Gibraltar, India, Ceylon, China, South and West Africa, the West Indies, Canada, Eastern British America, Australia, and Polynesia. In these distant places the committee having the management of the missions employ 3798 paid agents, including 994 who are regularly ordained and are wholly engaged in the work of the Christian ministry. Besides these, there are about 20,000 agents of the society (as lay preachers, etc.) who are rendering important service gratuitously, while the number of church members is 154,187, and the number of attendants upon the religious services more than half a million. Space prevents a reference to the other institutions and funds of British Methodism, except to add that, besides 174,721 children in the mission schools, the parent connection has in Great Britain 698 day schools, efficiently conducted by 1532 certificated, assistant, and pupil teachers, and containing 119,070 scholars; also 5328 Sunday schools, containing 601,801 scholars, taught by 103,441 persons, who render their services gratuitously; and that the total number of publications printed and issued by the English Book Committee only, during the year ending June, 1866, was 4,122,800, of which nearly 2,000,000 were periodicals, and more than 250,000 were hymn-books." The Wesleyans have conferences, affiliated and subordinate to that of England, in Ireland, Australia, Canada, Eastern British America, and France. Besides a quarterly review and monthly magazine, they have 12 weekly journals and several missionary and Sunday-school periodicals. Some of these are published in their foreign fields; most of them are "official," others are "independent." They have 4 collegiate institutions, 2 theological schools, an important normal seminary, and numerous academies or boarding schools.

The *Calvinistic Methodists* arose from a difference between Whitefield and Wesley respecting the Calvinistic doctrines. Wesley, as we have seen, was thoroughly Arminian, Whitefield as thoroughly Calvinistic. After Wesley's celebrated sermon on "free grace" they pursued separate though parallel lines of public labor. Personally, they became cordial friends again, but their followers were

never reunited. The Calvinistic Methodists were finally organized in three denominations. The first was called *Lady Huntingdon's Connection.* Her ladyship was their liberal patron and their chief director. She purchased or built for them numerous chapels. Their pastors were settled, they used the liturgy of the national Church, but their system of government was essentially congregational. They early established a theological school, which still exists under the title of Cheshunt College. They have not shared the prosperity of the other Methodist bodies. The last British religious census (for 1851) reported their number of chapels at 109, with accommodations for about 39,000 hearers. They have now less than 100 preachers and less than 70 chapels.

The second body of Calvinistic Methodists was called the *Whitefield Methodists.* They no longer exist as a "connection" or denomination, but some of their early churches survive among the independent congregations of England.

The third and greatest result of Calvinistic Methodism was that which bears the title of the *Welsh Calvinistic Methodists.* Whitefield's ministerial incursions into Wales contributed much to their early success, but their chief founders were Howell Harris, Griffith Jones, Daniel Howlands, Howell Davies, and Thomas Charles, the last surviving long enough to shape the later history of the denomination. Its first "association" was held in 1743; in 1785 it was more thoroughly organized, chiefly under the influence of Charles. According to statistics of the British government respecting Wales for 1857, there were in the principality 52,670 Calvinistic Methodist communicants, with 462 preachers and 794 churches. They now report in Wales about 60,000 members. In the U. S. they have 4 conferences and about 4000 communicants, who are mostly Welsh immigrants.

The *Wesleyan Methodist New Connection* is the title of an organization originally composed of about 5000 seceders from the parent connection, who for certain alleged grievances withdrew in 1797, under the leadership of Alexander Kilham, an able preacher who had been expelled the preceding year for his zealous advocacy of liberal changes in the system of government which Wesley had established. The New Connection adopted equal lay and ministerial representation in its conference. It extended into Ireland, and for a considerable time was the refuge of members of the elder body who were dissatisfied with their restricted liberties. There are some 10,000 New Connection Methodists in Canada. The New Connection in Canada has recently united with the Wesleyans. The ministry of this denomination now comprises about 260 travelling preachers, and its membership about 35,000 communicants.

The *Primitive Methodists* are distinguished by their zeal and success, and form one of the most important branches of the great Methodist family. Lorenzo Dow, an eccentric American Methodist, introduced the American camp-meeting into England about 1807. William Clows, a Wesleyan local preacher, approved and labored in these "open-air" assemblies. Hugh Bourne, a layman, but an influential chapel trustee, saw in them an important means of reaching multitudes of the common people who could not otherwise be brought under religious influence. He defended them in a pamphlet; counter-publications were issued by the preachers of Burslem and Macclesfield circuits. No small agitation ensued, and in 1807 the conference denounced camp-meetings and "disclaimed connection with them." In 1808, Bourne was expelled from the connection; two years later Clows was also expelled. They continued, however, their "out-door meetings," organized their converts in classes, and in 1810 established the Primitive Methodist Connection. It retained the doctrines and internal discipline of Wesleyan Methodism, and attempted to restore the primitive simplicity of the latter in dress, manners, and living. It revived Wesley's custom of "out-door preaching," and licensed women to preach. Its church government is notably liberal towards the laity, two-thirds of its annual conference being laymen. The Primitive Methodists have done much good among the neglected classes of England; they have also established several foreign missions. In the U. S. they have about 2000 members. Their aggregate membership is more than 161,000, and their ministers about 1000.

The *Primitive Wesleyans of Ireland* must not be confounded with those of England, above noticed. The Irish body was distinguished by its partiality to the Established Church in Ireland, and originated in that partiality. As early as 1795 the British conference allowed its preachers to administer the sacraments to their people, under specified restrictions. The Irish conference (a branch of the former) voted in the next year that it was not expedient for the preachers within its territory to avail themselves of this concession. About twenty years later (1816), in compliance with an extensive demand of the people, the concession of the parent conference was adopted. In a vote of 88 members there was a minority of 26 which sturdily insisted that their people should still resort to the Established Church for the sacraments. This, it was argued, was Wesley's design down to his death regarding all his societies, except those of America, where the Anglican establishment had ceased to exist. Adam Averell, one of the most commanding members of the Irish conference, withdrew from the connection, leading with him the minority and about 10,000 members. Wesleyan Methodism lost by this schism at least one-third of its numerical strength in Ireland. The Irish Primitives have not had remarkable success; for some years they have been declining. Their latest statistics which have reached us show about 14,000 members and 85 preachers.

Besides the above, there are minor sects of Methodists in England, among which may be mentioned—(*a*) The *Band-room Methodists,* so called from a "band-room" in Manchester where they were accustomed to assemble as a Wesleyan "class," but where they violated the rules of the connection by admitting persons who were not members of the society, and by rejecting the authority of the "leaders' meeting," which intervened against their irregularities. They seceded in 1806. They have annual conferences, but no salaried ministry. They have had no remarkable success, and have changed their name to the *United Free Gospel Churches.* (*b*) The *Protestant Methodists,* chiefly seceders from the Wesleyan societies of Leeds, who became disaffected in 1828 because the societies placed an organ in one of their chapels. More than 1000 communicants, including 56 class-leaders and 28 local preachers, combined in the schism. (*c*) The *Wesleyan Methodist Association,* originated in 1835 by a secession chiefly under the direction of Rev. Dr. Samuel Warren, who with his followers opposed the introduction of theological schools among the Wesleyans. Though Wesley himself had proposed such means of ministerial education, it was assumed by the seceders that they were incompatible with the genius of Methodism, and would be adverse to its prosperity. The *Protestant Methodists* of Leeds united with these Association Methodists in 1828. (*d*) The *Reformed Methodists* originated in an extraordinary proceeding of the parent Wesleyan conference in 1849, when six of its members, some of them eminent men, were arraigned before that body and half of them reproved, the other half expelled, under an accusation of disguised hostility to the conference and of secret co-operation with the Wesleyan Methodist Association. It was alleged by the accused and their many friends that the action of the conference was precipitate, and violated the legal formalities in such cases required. It excited profound agitation throughout the connection, and no less than 100,000 Wesleyans seceded. These last-mentioned three bodies have been consolidated under the title of the *United Methodist Free Churches.* They have adopted a "liberal" system of church government, admitting laymen to their annual conference or assembly, and giving independent jurisdiction to the circuits over their interior or local affairs. They report about 312 ministers and 68,000 members.

Besides these branches, others of less significance have existed for more or less time in England or Ireland, such as the *Wesleyan Reform Union,* a remnant of the schism of 1849 (who were unwilling to be merged in the *United Methodist Free Church*), the *Independent Methodists,* the *Tent Methodists,* etc. It will be observed that secession has played a conspicuous part in the history of English Methodism. The frequency of this evil is attributable largely to the ardent popular elements which it has been the task of the denomination to gather and improve, but still more, perhaps, to the restricted and rigid ecclesiastical system which Wesley's "Deed of Declaration" has entailed upon the parent body. Every schism in the history of Methodism has been occasioned by ecclesiastical or economical provocations; no theological defection or controversy has ever seriously disturbed the denomination in any part of the world.

We can now pass to Methodism in the New World, where it has had its chief mission, and where by its peculiar practical system, especially by its ministerial "itinerancy," it has spread the provisions of religion coextensively with the ever-extending emigration, until it has become numerically the predominant denomination of the republic.

The *Methodist Episcopal Church* is the title of the earliest Methodist organization in the U. S. Philip Embury, with other Wesleyan immigrants from Ireland, began to hold meetings for preaching and prayer in New York City as early as 1766. In the next year Capt. Thomas Webb, a British officer who like Embury had been a Wesleyan local preacher in England, visited the little flock, and preached to them in his regimentals, exciting much popu-

lar interest. The captain also preached on Long Island, in New Jersey, Philadelphia, Delaware, and Maryland, and is honored as one of the chief founders of American Methodism. Embury's congregation increased rapidly in New York. In 1767 they worshipped in a rigging-loft, which was thronged, and in 1768 they built the famous old "John street chapel," supposed to be the first Methodist church erected in the Western hemisphere, though about the same time Robert Strawbridge (another Irish Wesleyan) began to preach, formed societies, and built a small chapel on Sam's Creek, Frederick co., Md. Some Methodist authorities still consider it doubtful which had priority, Embury or Strawbridge; the Church generally, however, recognizes the date of Embury's labors (1766) in New York as the epoch of American Methodism. In 1769, Wesley sent over two of his itinerants, Pillmoor and Boardman, who labored successfully in and about New York and Philadelphia. They were followed in 1771 by Wright and Asbury. The latter became the representative character and most effective bishop of the denomination, and did more for its outspread and permanence than any other man in its history. In 1773, Wesley sent over two more itinerants, Rankin and Shadford; and this year is also memorable for the session of the first American Methodist conference. It was held in Philadelphia, and reported 1160 members of society and 10 preachers—the same number of the latter as constituted Wesley's first conference in England twenty-nine years before. Notwithstanding the disturbed condition of the country during the ensuing American Revolution, the cause prospered, and in 1784 enrolled 15,000 communicants. There were now 84 preachers, travelling 46 "circuits," for by this time a considerable native ministry had been raised up. Hitherto, the Methodists had been dependent on the colonial English Church for the sacraments, none of their own preachers having yet been ordained; but in this year Wesley ordained two of his English itinerants to the function of presbyters, and consecrated Rev. Dr. Thomas Coke as a bishop, and sent them to America with authority to organize the scattered societies as a distinct Church, under the title of "The Methodist Episcopal Church in the U. S. of America." He sent with them a printed liturgy and formulæ for ordinations, the sacraments, marriage, burial of the dead, etc., abridged from the Book of Common Prayer, and substantially the same as those still in force in the Methodist Book of Discipline. Coke and his two presbyters assembled a general conference about Christmas at Baltimore, where the plan appointed by Wesley was adopted, and Asbury (at Wesley's suggestion) was ordained successively deacon, presbyter, and bishop. Wesley was led to these extraordinary measures by the abolition of the authority of the English Church establishment in the colonies, by the urgent demand of his American people for the sacraments, and by his repeated failure to obtain relief for them in the ordination of some of his preachers by the bishop of London.

American Methodism had now become a consolidated and distinct Church. It retained the ecclesiastical system of English Methodism, as well as its theology, except that its chief administration was placed in the hands of bishops. As it rapidly extended over the continent its annual conferences were multiplied, until in 1792 regular "general conferences" were created, meeting quadrennially, and comprising all the travelling preachers who could attend. It was found necessary at last, by the growth of the ministry, to make the general conference a *delegated* body. It assembled as such, for the first time, in 1812, at the Old John street church, New York. The ratio of delegates to the number of travelling preachers has been necessarily changed from time to time. In 1872, the popular demand for lay representation having prevailed, the delegates consisted of one minister for forty-five of the preachers, and two laymen for every annual conference. The ministry itself had been zealous in the promotion of lay representation.

The quadrennial general conference is the supreme assembly of the Church—legislative, judicial, executive. It elects the bishops, who are, in fact, but its executive agents; it makes all laws except minor local regulations, which are left to the annual conferences; it tries judicial appeals from the annual conferences; it is itself under constitutional restraints, called "Restrictive Rules," which can be suspended or changed only by the concurrence of specified majorities in the general conference and in all the annual conferences. American Methodism has now a quarterly conference for each circuit; a district conference for all the circuits which are under the care of each presiding elder; annual conferences for larger sections of the country, embracing often considerable portions of one or more States; and a general conference, comprehending all the annual conferences. The work of the denomination is thus under periodical supervision in a series of sessions extending from a quarter of a year to four years. The preachers are appointed at the annual conferences for one year, but they can be assigned for three successive years to the same appointment. The bishops make these appointments, aided by the presiding elders; the latter can be continued four years on the same district. The bishops are required by an organic law of the Church to travel at large. The whole nation is their common diocese. The denomination has a powerful publishing institution called the "Book Concern," with above $1,000,000 capital. It has two large establishments—one in New York, the other in Cincinnati—with depositories in other cities from Boston to San Francisco. It issues a quarterly review, two monthly magazines (one in German), a monthly Sunday-school paper, several weekly Sunday-school and tract journals in different languages, and nine or ten weekly religious newspapers. There are also several unofficial or independent religious journals issued in various parts of the Church. Its theology and ecclesiastical economy have been sufficiently indicated in the preliminary remarks of this article. Though the denomination maintains episcopacy and the two ministerial orders of deacons and presbyters, it does not claim for them divine right or scriptural obligation. It regards them only as expedient for its own peculiar working system. Episcopacy it esteems merely as an office, not as an "order." The English Methodists have neither bishops nor deacons, but the American Methodists recognize the Wesleyans as a genuine Church. Wesley did not believe that any particular system of church polity is *enjoined* in the Holy Scriptures, and the claim of any denomination to validity *as* a Christian Church does not rest, in the estimation of Methodists, on its form of organization, but on theological and moral grounds.

One of the most momentous events in the history of the Methodist Episcopal Church was its division, by the separation from it of all the conferences (save one) in the slaveholding States, and their organization as the "Methodist Episcopal Church, South;" by which measure were severed from the parent Church 1474 travelling preachers, 2550 local preachers, 330,710 white members, 124,811 colored members, and 2978 Indian mission converts, making an aggregate of 462,428. At the general conference of 1844 the anti-slavery controversy, which had long agitated the denomination, culminated in measures which led the Southern delegates to declare that it would be impossible any longer to maintain Southern Methodism in connection with the Northern portion of the denomination. The conference thereupon made provision for a separate organization of the South, contingent on the necessity of any such division. This necessity was subsequently asserted by Southern conferences, quarterly and annual, and a convention was held at Louisville, Ky., in 1845, at which the new Church was definitively organized. (See METHODIST EPISCOPAL CHURCH, SOUTH.) It would be impossible here to enter into the arguments, pro and con., of this great ecclesiastical controversy, nor is it desirable. Later national events have extinguished the chief cause of the strife, and fraternal and conciliatory measures may now well befit both parties, even should reunion be out of the question. Both churches have since the civil war had signal success.

There are now in the Methodist Episcopal Church 80 annual conferences, 10,854 travelling preachers, 12,581 local preachers, ——— members, 1,363,876 Sunday-school pupils, 200,492 Sunday-school teachers, and property in churches and parsonages amounting to $78,893,045. It has 27 universities and colleges, 5 theological schools, and 69 academies or boarding schools. The Methodist Episcopal Church has foreign missions in Mexico, South America, Sweden, Norway, Denmark, Germany, Switzerland, Italy, Bulgaria, Africa, India, and China. In Africa (Liberia) it has a conference, a colored bishop, a weekly journal, and schools. In Germany it has a conference, a theological seminary, and a "book concern," with one quarterly, two semimonthly, and two monthly periodicals. Its home missions are numerous and notably successful, especially among our German and Scandinavian population. Its German work includes 8 conferences, with 161 travelling preachers, 346 local preachers, 35,000 communicants, 500 churches or chapels, 2 colleges, 2 orphan asylums, a weekly journal, a Sunday-school periodical, and a monthly magazine. It was from this prosperous home German work that its missions in Germany and Switzerland sprang. The Scandinavian domestic missions comprise 50 travelling preachers, 52 local preachers, 50 churches, about 5000 members, and a monthly journal.

The *Methodist Protestant Church* arose from a controversy in the Methodist Episcopal Church against the alleged exclusively clerical government of the denomination. The seceders opposed episcopacy and demanded lay representation. They organized at a convention held in Baltimore, Md., in 1830, which in a session of about twenty days

formed a constitution, retaining the doctrines and essential discipline of the elder Church, but excluding episcopacy and establishing equal lay and clerical representation in the government of the Church. Its annual conferences have presidents elected by ballot. It has a delegated general conference, composed of laymen and preachers sent from its annual conferences. As the Protestant Methodists demanded not only lay representation, but the abolition of episcopacy, the concession of the former by the parent Church has not succeeded in bringing them back again to its fold. They have themselves been divided by the controversy on slavery into the Methodist Protestant Church of the North-western States and the Methodist Protestants of the Southern States; latterly, the Northern branch has assumed the title of the *Methodist Church*, proposing to combine under this name the various Methodist sects which have rejected episcopacy. This body reports about 75,000 members and 625 preachers. The *Methodist Protestants, South*, report about 60,000 members and 423 preachers. The two branches have taken steps for unification under the title *Methodist Protestant Church*.

The *Wesleyan Methodist Church* originated chiefly in the anti-slavery controversy; the question of lay representation, however, became one of the motives of its organization. Some of the most zealous anti-slavery preachers in the Methodist Episcopal Church called a convention at Utica, N. Y., in 1843, where the new Church was formed on a basis identical in theology and internal discipline with that of the elder body, but excluding episcopacy and presiding elders, and providing lay representation. They have annually elected presidents of conferences and stationed chairmen of districts. Their preachers are appointed by a committee, the conference having authoritative revision of the appointments. Local preachers as well as laymen have representation in the annual and general conferences. At the time of the organization of this body it reported 6000 members, with 300 preachers, travelling and local. It now reports about 20,000 members and 250 preachers.

The *African Methodist Episcopal Church*, whose members are sometimes called *Allenites*, was organized at Philadelphia in 1816, under the guidance of Richard Allen, afterwards Bishop Allen. They considered themselves disparaged and oppressed in the Methodist Episcopal Church, and finding no redress, formed themselves into an independent body, consecrated Allen as their first bishop, and adopted a system of government substantially the same as that of the parent Church. They have spread considerably in the Middle and Southern States, and have extended into Canada. They report 200,000 members and 600 preachers, including 7 bishops.

The *Zion African Methodist Episcopal Church* originated in a secession of colored people from the Methodist Episcopal churches of New York City in 1819. They retain all the distinctive features of the parent Church, but elect their bishops annually. These officers are not consecrated by formal ordination. They report 164,000 members and about 500 preachers.

The *Colored Methodist Episcopal Church in America* consists mostly of former African members of the Methodist Episcopal Church, South. After the civil war the colored members of the Methodist Episcopal Church, South, desired a separate organization; this desire was acceded to, and the new Church was accordingly formed on Dec. 16, 1870. W. H. Miles and R. H. Vanderhorst, colored men, were consecrated bishops. It consists of some 75,000 members. No white person is admitted to its membership. It has a weekly journal (*The Christian Index*, published at Louisville, Ky.). In its theology and polity it is a copy of the Methodist Episcopal Church, South, and the latter extends to it parental care, without trenching on its independence. It includes but a fragment of the former numerous African membership of the Methodist Episcopal Church, South; some of these remain in the latter, some have joined the Methodist Episcopal Church, and thousands have been absorbed in the two African Episcopal churches above mentioned.

The *United Brethren in Christ*, though bearing the same name as the Unitas Fratrum, or Moravians, have no relations with the latter, but are Methodists, and are often called *German Methodists*. In theology and polity they are nearly identical with the Methodist Episcopal Church, having bishops, a general conference, and annual conferences. They date from 1800, the year of their first conference, and have numerous societies in the Middle and Western States.

The *Evangelical Association* is also an organization of German Methodists, sometimes called *Albrights*, from the name of their principal founder. They have bishops, a general conference, and annual conferences, about 635 preachers, and 80,000 members.

The *Free Methodist Church* was formed in 1860, chiefly by friends of two preachers of the Methodist Episcopal Church who were expelled from the Genesee conference. They disclaim episcopacy, but have an elective *superintendent*, whose term of service is four years; otherwise, they copy the discipline and also the theology of the parent Church, but are distinguished by their zeal for the restoration of the "simplicity" of primitive Methodism. They insist on congregational singing, excluding instrumental music; on free seats in the congregation; on extempore preaching; on plainness of dress and living; and especially on the doctrine of Christian perfection. They have about 100 preachers and 6000 members.

The *Canada Wesleyan Methodists* were organized in 1828. Before that date the Methodist societies of both Upper and Lower Canada were under the jurisdiction of the Methodist Episcopal Church, but the political differences of the two countries rendered an independent organization of Canadian Methodism expedient; and the general conference in the U. S. readily acceded to the wishes of its Canadian communicants. The latter in their new organization did not adopt episcopacy, but copied mostly the polity of the English Wesleyans and affiliated with the latter. They have a book concern, weekly journal and periodicals, a university, Indian missions, and 70,000 members.

The *Eastern British American Wesleyan Methodists* are a branch of the great English Wesleyan family, with an annual conference, a book concern, a weekly journal, a collegiate institution, 150 preachers, and about 17,000 communicants. They are now united with the *Canada Wesleyan Methodists* in the *Canada Methodist Church*.

The *Methodist Episcopal Church of Canada* was founded in 1828 by Canadian Methodists who were dissatisfied with the action of the majority of their brethren, who in their reorganization after the separation from the Church in the U. S. declined to continue the episcopal government under which they had hitherto existed and prospered. The minority organized separately on the model of the parent Church. It has bishops, a publishing-house with a weekly and other periodicals, more than 20,000 communicants, and 230 preachers.

The latest estimate of Methodism throughout the world is 4,000,000 communicants, of which number the U. S. and the North American British possessions have 2,591,875. These being actual recorded members of the churches, do not of course comprise the total Methodist *population*. It has been usual in calculating the latter to add three non-communicant members of the congregation for each recorded member of the Church, including thus the children of communicants and the other numerous adherents of the denomination, who, while habitually attending its services, do not formally join its societies. At this rate, the Methodist population throughout the world must be 16,000,000, an aggregate considerably larger than the earlier estimate of Tyerman, above given. Notwithstanding the great annual growth of the denomination, this total is probably exaggerated; 14,000,000 would be a more correct estimate.

ABEL STEVENS.

Methodist Episcopal Church, South. The introduction of Methodism into America dates from 1766, but it was not till 1784 that it received a distinct ecclesiastical organization. In that year John Wesley, having repudiated the doctrine of prelatical succession, set apart the Rev. Thomas Coke, LL.D., a presbyter of the Church of England, as superintendent or bishop, and empowered him to organize the Methodists of America into an Episcopal Church, with Francis Asbury as his colleague in the episcopate, and other ministers as elders or presbyters. He abridged the Thirty-nine Articles of the Anglican Church, reducing them to twenty-four—another was subsequently added—and curtailing several of them, so as to free them from alleged Calvinistic elements; and in a similar way he abridged the Liturgy, eliminating passages which are thought to have a Romish complexion. These formularies were adopted by the "Christmas Conference," and the Church was organized under the style of "The Methodist Episcopal Church in America." All the distinguishing features of Methodism, such as itinerancy, conferences, love-feasts, class-meetings, psalmody, etc., were retained as in England, with such modifications as the new country required. As the connection rapidly increased, it was found expedient to divide it into several annual conferences, with a General Conference, consisting of delegates from the annual conferences, to meet quadrennially. The first General Conference met in New York in 1812. For thirty-two years the Church flourished under this régime as a united and powerful organization. It became, indeed, too unwieldy for one General Conference jurisdiction, and this, with the question of slavery, which had agitated the Church from the beginning, rendered a division necessary. At the General Conference held in New York in 1844 the subject was discussed with painful

interest, and measures were adopted in the interest of peace for a separation of the Church into two distinct organizations. This is concisely set forth in an account of the organization of the M. E. Church, South, inserted in the *Discipline* of 1846 as follows: "In the judgment of the delegates of the several annual conferences in the slaveholding States, the continued agitation of the subject of slavery and abolition in a portion of the Church, the frequent action on that subject in the General Conference, and especially the proceedings of the General Conference of the Methodist Episcopal Church of 1844 in the case of the Rev. James O. Andrew, D. D., one of the bishops, who had become connected with slavery by marriage, produced a state of things in the South which rendered a continuance of the jurisdiction of that General Conference over the conferences aforesaid inconsistent with the success of the ministry in their proper calling. This conviction they declared in solemn form to the General Conference, accompanied with a protest against the action referred to, assured that public opinion in the slaveholding States would demand, and that a due regard to the vital interests of Christ's kingdom would justify, a separate and independent organization. The developments of a few months vindicated their anticipations. The Church in the South and South-west, in her primary assemblies, her quarterly and annual conferences, with a unanimity unparalleled in ecclesiastical history, approved the course of the delegates, and declared her conviction that a separate jurisdiction was necessary to her existence and prosperity. The General Conference of 1844 having adopted a 'Plan of Separation' and provided for the erection of the annual conferences in the slaveholding States into a separate ecclesiastical connection, under the jurisdiction of a Southern General Conference, the delegates of the aforementioned conferences in a published address recommended that a convention of delegates from the said conferences, duly instructed as to the wishes of the ministry and laity, should assemble at Louisville, Ky., on the first day of May, 1845. The convention met, delegates having been formally appointed in pursuance of this recommendation, and after a full and minute representation of all the facts in the premises, acting under the provisional 'Plan of Separation,' declared by solemn resolution the jurisdiction hitherto exercised by the General Conference of the Methodist Episcopal Church over the conferences in the slaveholding States *entirely dissolved*, and erected the said annual conferences into a separate ecclesiastical connection, under the style and title of *The Methodist Episcopal Church, South*, the first General Conference of which was held in the town of Petersburg, Va., on the first day of May, 1846." The "Plan of Separation" was conceived in the most fraternal spirit, and its acceptance by the South was urged by such distinguished Northern men as Drs. Olin, Elliott, and others, who believed that the Church in the South would be ruined if Bishop Andrew were deposed from the episcopate (as virtually proposed in the pending resolution), and in the North if he exercised his episcopal functions in the Northern conferences. The "Plan" is as follows: "The select committee of nine to consider and report on the declaration of the delegates from the conferences of the slaveholding States beg leave to submit the following report: Whereas, a Declaration has been presented to this General Conference, with the signatures of *fifty-one* delegates of the body from thirteen annual conferences in the slaveholding States, representing that, for various reasons enumerated, the objects and purposes of the Christian ministry and church organization cannot be successfully accomplished by them under the jurisdiction of this General Conference as now constituted; and whereas, in the event of a separation, a contingency to which the Declaration asks attention as not improbable, we esteem it the duty of this General Conference to meet the emergency with Christian kindness and the strictest equity; therefore, *Resolved*, by the delegates of the several annual conferences in General Conference assembled—1st, That should the conferences in the slaveholding States find it necessary to unite in a distinct ecclesiastical connection, the following rule shall be observed with regard to the northern boundary of such connection: All the societies, stations, and conferences adhering to the Church in the South by a vote of a majority of the members of said societies, stations, and conferences shall remain under the unmolested pastoral care of the Southern Church; and the ministers of the Methodist Episcopal Church shall in no wise attempt to organize churches or societies within the limits of the Church, South, nor shall they attempt to exercise any pastoral oversight therein, it being understood that the ministry of the South reciprocally observe the same rule in relation to stations, societies, and conferences adhering, by vote of a majority, to the Methodist Episcopal Church; provided also, that this rule shall apply only to societies, stations, and conferences bordering on the line of division, and not to interior charges, which shall in all cases be left to the care of that Church within whose territory they are situated. 2d, That ministers, local and travelling, of every grade and office in the Methodist Episcopal Church, may, as they prefer, remain in that Church or without blame attach themselves to the Church, South. 3d, *Resolved*, by the delegates of all the annual conferences in General Conference assembled, That we recommend to all the annual conferences, at their first approaching sessions, to authorize a change of the sixth restrictive article, so that the first clause shall read thus: 'They shall not appropriate the produce of the Book Concern nor of the Chartered Fund to any purpose other than for the benefit of the travelling, supernumerary, superannuated, and worn-out preachers, their wives, widows, and children, and to such other purposes as may be determined upon by the votes of two-thirds of the members of the General Conference.' 4th, That whenever the annual conferences, by a vote of three-fourths of all their members voting on the third resolution, shall have concurred in the recommendation to alter the sixth restrictive article, the agents at New York and Cincinnati shall, and they are hereby authorized and directed to, deliver over to any authorized agent or appointee of the Church, South, should one be authorized, all notes and book-accounts against the ministers, church-members, or citizens within its boundaries, with authority to collect the same for the sole use of the Southern Church; and that said agents also convey to the aforesaid agent or appointee of the South all the real estate, and assign to him all the property, including presses, stock, and all right and interest connected with the printing establishments at Charleston, Richmond, and Nashville, which now belong to the Methodist Episcopal Church. 5th, That when the annual conferences shall have approved the aforesaid change in the sixth restrictive article there shall be transferred to the above agent of the Southern Church so much of the capital and produce of the Methodist Book Concern as will, with the notes, book-accounts, presses, etc. mentioned in the last resolution, bear the same proportion to the whole property of said Concern that the travelling ministers in the Southern Church shall bear to all the travelling ministers of the Methodist Episcopal Church; the division to be made on the basis of the number of travelling preachers in the forthcoming *Minutes*. 6th, That the above transfer shall be in the form of annual payments of $2500 per annum, and specifically in stock of the Book Concern and in Southern notes and accounts due the establishment, and accruing after the first transfer mentioned above; and until all the payments are made the Southern Church shall share in all the net profits of the Book Concern in the proportion that the amount due them or in arrears bears to all the property of the Concern. 7th, That Nathan Bangs, George Peck, and James B. Finley be and they are hereby appointed commissioners to act in concert with the same number of commissioners appointed by the Southern organization (should one be formed) to estimate the amount which will fall due to the South by the preceding rule, and to have full power to carry into effect the whole arrangements proposed with regard to the division of property, should the separation take place. And if by any means a vacancy occurs in this board of commissioners, the Book Committee at New York shall fill said vacancy. 8th, That whenever any agents of the Southern Church are clothed with legal authority or corporate power to act in the premises, the agents at New York are hereby authorized and directed to act in concert with said Southern agents so as to give the provisions of these resolutions a legally binding force. 9th, That all the property of the Methodist Episcopal Church in meeting-houses, parsonages, colleges, schools, conference-funds, cemeteries, and of every kind within the limits of the Southern organization, shall be for ever free from any claim set up on the part of the Methodist Episcopal Church, so far as this resolution can be of force in the premises. 10th, That the Church so formed in the South shall have a common property in all the copyrights in possession of the Book Concern at New York and Cincinnati at the time of the settlement by the commissioners. 11th, *Resolved*, That the bishops be respectfully requested to lay that part of this report requiring the action of the annual conferences before them as soon as possible, beginning with the New York conference. 12th, *Resolved*, That the Book Agents at New York be directed to make such compensation to the conferences South for their dividend from the Chartered Fund as the commissioners to be provided for shall agree upon. ROBERT PAINE, Chairman.

"New York, June 7, 1844."

The Southern conferences organized according to the provisions of the foregoing Plan, and at the first general conference (in 1846) Joshua Soule, senior bishop of the M. E. Church, and Bishop Andrew adhered South, and were recognized in their episcopal character; and William

Capers, D. D., and Robert Paine, D. D., were elected and consecrated as their colleagues. Lovick Pierce, D. D., was appointed to bear the fraternal regards of the conference to the General Conference of the M. E. Church, which met in Pittsburg in 1848, but that conference declined to receive him in his official character, and repudiated the "Plan of Separation" as null and void. A refusal to divide the Church property with the Southern Church led to litigation, which was finally terminated by a decision of the Supreme Court of the U. S., which recognized the validity of the Plan agreeably to the claim of the M. E. Church, South. The court affirmed that according to its provisions "the religious association known as the Methodist Episcopal Church in the U. S. of America, as then existing, was divided into two associations or distinct Methodist Episcopal churches, as in the bill of complaint is alleged." At first, the bishops of the M. E. Church (North) declined to exercise their functions in the South; but during the war (1862–65) and since, in obedience to the instructions of their General Conference, they have organized annual conferences in all parts of the South, as have also the "African" and "African Zion" connections, thus taking from the M. E. Church, South, a large part of its colored members, of whom it numbered nearly 200,000 in 1860. At the General Conference of the M. E. Church in 1872, messengers were appointed to bear fraternal greetings to the General Conference of the M. E. Church, South, which met in Louisville in 1874. The manner in which these messengers fulfilled their mission and were received by the conference was highly creditable to both parties. The conference responded fraternally to their communications, and authorized the bishops to appoint commissioners to bear fraternal greetings to the General Conference of the M. E. Church, which is to meet in 1876, and to adjust existing difficulties between the two connections. The same venerable minister, Dr. Lovick Pierce, now over ninety years of age, who was appointed on a similar errand in 1848, leads this fraternal commission. The tendency to fraternal intercourse is increasing. Few of either connection desire organic union, as the representation in one general conference would be little more than nominal, the annual conferences being so numerous and the membership so large. It would be better to subdivide both connections, so as to have several distinct jurisdictions, all of which might be represented in an œcumenical conference, with no legislative or judicial powers. Though all the Arminian Methodists in the world agree in the great essentials of Methodism, yet there is considerable difference in matters of polity, which preclude organic union, but need not interfere with fraternal intercourse. The "two Methodisms," *e. g.*, differ as to the relative powers of the bishops and the general conference—the M. E. Church, South, holding that the bishops are a co-ordinate branch of the government, and cannot be *deposed* by a *delegated* general conference, except as they may be excommunicated by regular process of trial; which was the vexed question that divided the Church in 1844. The M. E. Church has made an addition to the terms of membership not sanctioned by the M. E. Church, South, and altered the general rule on slavery, which the M. E. Church, South, has cancelled as not being in the "General Rules" as drawn up by John Wesley. The M. E. Church, South, admits of lay representation in the annual conferences, as well as in the General Conference; which the M. E. Church does not. There are also differences in the organization and powers of district and quarterly conferences, and other points which are not very important, but which, with the foregoing, render an organic union undesirable, if not impossible.

As the great theatre of the late war covered the region occupied by the M. E. Church, South, it suffered greatly thereby. Churches, parsonages, seminary buildings, etc. were destroyed or alienated from the Church in many places; thousands of its members perished; and after the surrender the greater part of its colored membership was taken into other folds. But the Church has rallied its fortunes with wonderful energy. The *General Minutes* for 1874 report 3224 effective travelling ministers, of whom 8 are bishops; 261 superannuated ministers; 5356 local preachers; 696,764 white communicants, 2663 colored, 4497 Indians; total, ministers and members, 712,765, being a net increase in 1874 of 36,165. Sunday-schools, 7204; teachers, 48,825; scholars, 328,634. Over $100,000 was contributed in 1874 for missions. At the General Conference of 1874, 61 universities, colleges, and other institutions of learning were reported as under the care of the Church, and the number is constantly increasing. The Publishing-house, located in Nashville, is a magnificent institution; it is supervised by a Book Committee appointed by the General Conference, and managed by a Book Agent. It employs an editor of books and of the *Christian Advocate*, a weekly sheet, the organ of the General Conference; and also a Sunday-school secretary, who edits a Sunday-school magazine, the *Sunday-school Visitor*, and other publications in that department. There are many other weekly papers issued in various parts of the connection. Before the war a quarterly review was published; at present its place is supplied by the *Southern Review*, issued by Dr. Bledsoe. The board of missions has its bureau in the Publishing-house; it employs two secretaries, and superintends the missions in China, Mexico, Brazil, and among the Indians. The domestic missions are managed by the several annual conferences within whose bounds they are located. The property formerly held by the Church for the colored people has been legally transferred (as also the members for the most part) to the Colored Methodist Episcopal Church in America. That connection reported to the General Conference of the M. E. Church, South, 4 bishops, 15 annual conferences, 607 travelling preachers, 518 local preachers, 74,799 members, 535 Sunday-schools, 1102 teachers, 49,955 scholars. It has "a book-store" in Louisville, Ky., where it publishes *The Christian Index*, a very creditable monthly sheet. It is taking steps for the establishment of a seminary for the training of ministers, in which it is aided by its friends of the M. E. Church, South. (See *Disciplines*, *General Minutes*, and *Journals* of the General Conferences of the Methodist Episcopal Church and Methodist Episcopal Church, South; Redford's *Organization of the Methodist Episcopal Church, South*; Myers's *Disruption of the Methodist Episcopal Church*; Howard's *Reports of the Supreme Court*; and the foregoing article on METHODISM, by Dr. Abel Stevens; McTyeire's *Manual of the Discipline*; Summers's *Commentary on the Ritual of the M. E. Church, South.*) T. O. SUMMERS.

Metho'dius, one of the two apostles to the Slavonians, archbishop of Moravia; cited to appear before the pope on two occasions—once for the use of the vulgar tongue in the church services. D. about 900. (See CYRIL.)

Methodius, Church Father and bishop of the fourth century; wrote against Origen and Porphyry; suffered martyrdom. His works are translated in Clarke's *Library*.

Methomania [from the Gr. μέθη, "drunkenness," and μανία, "mania"], also called **Dipsomania,** is an irresistible desire or morbid craving for intoxicating substances, and originates from the depression of the nervous system and general weakness of all the vital processes which follow after inebriation. In order to bring the organism back to its former vigor new stimulants are used, and thus grows up a habit of intoxication which is now not considered simply as a moral blemish, to be corrected by moral means, but is treated as a disease, and in this way often cured.

Meth'uen, post-tp. of Essex co., Mass., on the Manchester and Lawrence R. R., bounded N. by the New Hampshire line, and S. in part by the Merrimack River, has good water-power, furnished by the Spicket River, manufactures of cottons, woollens, shoes, jute, and hats, 1 national and 1 savings bank, a high school, a public library, and 4 churches. Pop. 2959.

Meth'yl [Gr. μετά, "with," and ὕλη, "wood"], ($Me = CH_3$; in the free state, $Me_2 = C_2H_6$), the first member of the series of alcohol radicals C_nH_{2n+1}, bearing the same relation to methylic alcohol that ethyl (C_2H_5) bears to common alcohol. Methyl may be prepared (1) by decomposing cyanide of ethyl with potassium; (2) by the electrolysis of acetic acid; (3) by the action of zinc on methyl iodide. It is a colorless and odorless gas, which burns with a bluish flame. It is isomeric, and probably identical with the hydride of ethyl, $C_2H_5H = C_2H_6$. Methyl enters into the composition of a great variety of interesting compounds—methylic or wood-ether $(CH_3)_2O$, methylic alcohol, CH_3OH, compound ethers, as CH_3Cl, $CH_3C_2H_3O_2$, amines, etc. C. F. CHANDLER.

Methyl Alcohol, Methyl Hydrate, Carbinol, Pyroxylic Spirit, or **Wood-Naphtha** ($CH_4O = CH_3$-OH). It is found associated with acetic acid in the watery product from the distillation of wood, and may also be formed (1) by distilling methyl-chloride with potassic hydrate; (2) by distilling oil of wintergreen, which is chiefly methyl-salicylate, with potassic hydrate; (3) from hydrocyanic acid, by first converting it into methylamine, and then applying argentic nitrate according to the method of Mendius. (*Ann. Chem. Pharm.*, cxlv. 42.)

Preparation of Commercial Wood-Spirit.—The crude watery liquid (*pyroligneous acid*) obtained by the distillation of wood is redistilled; the first tenth which passes over is rectified over slaked lime, whereupon considerable ammonia is given off; sulphuric acid is then added, which fixes the remaining ammonia and precipitates some tarry matter: the liquid is redistilled and rectified several times over quicklime. Oak-wood yields about two gallons crude

wood-spirit to the cord. The crude product has a strong aromatic odor, and turns brown on keeping. It contains considerable quantities of acetone, methyl-acetate, ethyl-acetate, and lignone or xylite, which is the dimethyl-acetate of ethylene.

The Purification of Crude Wood-Spirit is effected by saturating it with fused calcic chloride, with which the methyl alcohol forms a compound which is not decomposed by a temperature of 100° C. It is then heated over a water-bath as long as anything volatile is given off. It is then distilled with water, and the product is rectified over quicklime. A purer product is obtained when the crude product is distilled with strong potash or soda ley previous to the treatment with calcic chloride. To obtain perfectly pure methyl alcohol an ether of methyl, as the oxalate, must be first prepared from the wood-spirit.

Properties.—Methyl alcohol is a colorless, mobile liquid, having a purely spirituous odor, like that of common alcohol. Sp. gr. = 0.8142 at 0° C. It boils at 60°–66.5°, according to the nature of the vessel, and bumps strongly while boiling. It burns with a pale flame, and is used as a substitute for alcohol in spirit-lamps. It mixes with water, alcohol, and ether, and dissolves fixed and volatile oils and most resins. It unites directly with some substances, forming compounds like the alcoholates, in which it takes the place of water of crystallization; with calcic chloride it forms $CaCl_2.2CH_4O$; with anhydrous baryta, $BaO.2CH_4O$; with potassium and sodium, KCH_3O and $NaCH_3O$. By oxidation it is converted into formic acid, $CH_4O + O = HCHO_2 + H_2O$. Calcic hypochlorite (bleaching-powder) converts it into chloroform.

The following table exhibits the strength of pure methyl alcohol diluted with water, as determined by Ure (*Phil. Mag.*, [3], xix. 51):

Percentage of Anhydrous Methylic Alcohol (sp. gr. 0.8136, at 15°) in Wood-Spirit.

Sp. gr.	Per cent.	Sp. gr.	Per cent.	Sp. gr.	Per cent.	Sp. gr.	Per cent.
0.8136	100.00	0.8674	82.00	0.9008	69.44	0.9344	53.70
0.8216	98.11	0.8712	80.64	0.9032	68.50	0.9386	51.54
0.8256	96.11	0.8742	79.36	0.9060	67.57	0.9414	50.00
0.8320	94.34	0.8784	78.13	0.9070	66.66	0.9448	47.62
0.8384	92.22	0.8822	77.00	0.9116	65.00	0.9484	46.00
0.8418	90.90	0.8842	75.76	0.9154	63.30	0.9518	43.48
0.8470	88.30	0.8876	74.63	0.9184	61.73	0.9540	41.66
0.8514	87.72	0.8918	73.53	0.9218	60.24	0.9564	40.00
0.8564	86.20	0.8930	72.46	0.9242	58.82	0.9584	38.46
0.8596	84.75	0.8950	71.43	0.9266	57.73	0.9600	37.11
0.8642	83.33	0.8984	70.42	0.9296	56.18	0.9620	35.71

G. Krell (*Deut. Chem. Ges. Ber.*, vi. 1310) has given a method for estimating the proportion of pure methyl alcohol by means of phosphorus di-iodide. Methyl alcohol does not give Lieben's iodoform reaction with iodine and potash; hence this reaction may be employed to test it for ethyl alcohol, acetone, and other compounds which yield iodoform when thus treated. There is said to be a considerable demand for methyl alcohol for the preparation of methylene chloride, to be used as a substitute for ammonia in ice-machines. C. F. CHANDLER.

Methyl'amine, Methylammonia, or **Methylia** ($CH_5N = N\left\{\begin{matrix}H\\H\\CH_3\end{matrix}\right)$), an organic base which consists of ammonia (NH_3) in which one atom of hydrogen has been replaced by methyl (CH_3). (See AMINES.) Methylamine is prepared by the action of potassic hydrate on cyanurate of methyl, or of nascent hydrogen on hydrocyanic acid. It is a colorless gas, having a strong ammoniacal odor. It turns reddened litmus-paper blue, fumes with hydrochloric acid, burns readily, and is more soluble in water than any other known gas. The aqueous solution is very caustic, and resembles aqua ammonia in its properties.

C. F. CHANDLER.

Meth'ylene (CH_2). This compound, the first and simplest of the olefines, is not known with certainty in the free state. It is a diatomic radical, forming ethers analogous to those of ETHYLENE (which see).

C. F. CHANDLER.

Meth'ylene Bichlor'ide, or **Chloromethyl,** a clear, very volatile, inflammable liquid of an agreeable chloroform-like odor, boiling at 88° F. Its formula is CH_2Cl_2. It was introduced into medicine as an anæsthetic in 1867 by Dr. B. W. Richardson of London. As such it surpasses even chloroform in speed of action and absence of disagreeable after-effects, but, unfortunately, like chloroform, it is not entirely safe. It is administered by inhalation through a special apparatus. EDWARD CURTIS.

Meto'men, post-v. and tp. of Fond du Lac co., Wis., on the Milwaukee and St. Paul R. R., Northern division. Pop. 1898.

Metomp'kin, post-tp. of Accomack co., Va. Pop. 4450.

Metonic Cycle. See CYCLE.

Meton'ymy [Gr. μετωνυμία, "change of name"], a trope or figure of speech by which the name of one idea is substituted for that of another to which it stands in some relation, such as that of cause to effect, substance to quality, precedent to sequence, etc. As the connection between the two ideas must be real, and not a mere combination accomplished by the imagination, this trope has been defined by Dr. Krauth as a grammatical and not a rhetorical figure. (See FIGURE OF SPEECH.)

Mètre [Gr. μέτρον, "measure"], the linear base of the metric system of weights, measures, and moneys. Theoretically, it is the $\frac{1}{10000000}$th part of a terrestrial meridian; actually, it is the length of a bar of platinum designed to represent that dimension, now deposited in the Palace of the Archives of France in Paris. (See METRIC SYSTEM.)

F. A. P. BARNARD.

Me'tre [μέτρον, "measure"], the arrangement of rhythmic feet into groups constituting lines or stanzas. In English verse a *foot* is a binary or triple group of syllables which admit of being distributed into rhythmic periods by means of the presence or absence of accent, or the distribution of strong or weak effects. Feet are the measures of verse, the form of which depends on their number, kind, and succession; and when the groups of feet are too long to be readily seized by the listener, they fall into rhythmic prose, as in much of Macpherson's *Ossian*:

> The maids of the song came into our presence, and the mildly blushing Everallin. Her dark hair spread on her neck of snow, her eye rolled in secret on Ossian; she touched the harp of music, and we blessed the daughter of Branno.—*Lathmon.*

Whether the following Ossianic example contains three or four feet depends upon the accent of the last word:

Once' we | wres'tled on | Mal'mor; . . .
Once' we | wres'tled | on' Mal | mor';

the latter form being the correct one. In case "on' Mal'" are both accented, we get part of a second line—

Once' we | wres'tled | on' 𝄾 |
Mal'mor | . . . ,

where the first line is *catalectic*, or incomplete at the end; but should a line end in a weak syllable, as in

The ves' | per hymn' | is steal' | ing,

the overplus syllable makes it *hypermetric*. A perfect line commonly bears the inconvenient negative name of acatalectic, instead of which we apply the term *holometric* (ὅλος, "entire") to forms like

Hark', the | ves'per | hymn' is | steal'ing |;

and *amphimetric* when the time of a foot is made up of an initial *anacrusis* (or preliminary fragment of a line or a strain) and a final *catalexis*—a common phase in music and in lyric verse:

Be | hold' the | chief' who | now' com | mands'.

In the stanza following the first three lines are *independent* in metre, each being complete in itself, but the third and fourth are *dependent*, because they have the foot "light with" in common—

Common | Sense one | night, 𝄾 ‖ — Catalectic line.
Though not | used to | gambols, ‖ — Holometric "
Went out | by moon | light,- — Catalectic "
With ‖ Genius, | on his | rambles. ‖ — Anacrusic "
Th. Moore.

In the next dependent lines (Campbell, 1801) it will be observed that a dissyllabic ending requires a monosyllabic initial in the next line, as "-saken, In," while a monosyllabic ending requires a dissyllabic continuation, as "shore; but a-":

Erin, my | country! though | sad and for | saken,-
In | dreams I re | visit thy | seabeaten | shore;-
But, a | las! in a | fair foreign | land I a | waken,-
And | sigh for the | friends who can | meet me no | more!

But this important metric point is neglected in other lines, such as—

Never a | gain in the | green sunny | bowers,-
Where my | forefathers | lived, shall I | spend the sweet | hours,

where the rhythm is injured by a foot of four syllables. These lines belong to a poem commencing with the amphimetric line—

There | came to the | beach a poor | exile of | Erin;

and, judged by its metre, the absence of the anacrusis in a correlative catalectic line like

𝄾 | Erin, my | country! though | sad and for | saken,

makes it *acephalous* or headless.

In the following lines of Collins we may mark the first as oxytonic (see under PROSODY), and the second as paroxytonic:

But thou', | O Hope'! | with eyes' | so fair', ‖
What' was | thy' de | light'ed | meas'ure? |

But as this changes the rhythm and brings two accents ("fair′," "what′") together, the better scansion is—

But | thou′, O | Hope′! with | eyes′ so | fair′,
¬ | What′ was | thy′ de | light′ed | meas′ure? |

Gray's paroxytones—

Thee, the | voice, the | dance o | bey, ¬ |
Temper'd | to thy | warbled | lay, ¬— |

are better than the oxytonic scansion—

| ¬ Thee, | the voice, | the dance | obey, ‖
Temper'd | to thy | warbled | lay. ¬ |

The latter scansion is inconsistent with our musical notation, which places the accented note and syllable at the beginning of the measure, and as a consequence most verse, however written, is recited with the initial accent.

As in the Latin hexameter, there are neutral feet in English verse, but here, instead of being rhythmic, they are monotonous bits of prose inserted to fill out the metre. This defect is indicated by italics in the following lines, which are mere prose:

Let the mad poets say whate'er they please
Of the sweet fairies, peris, goddesses,
There is not such a treat among them all,
Haunters of cavern, lake, and waterfall,
As a real woman, lineal indeed.—Keats.

Dryden makes efficient use of neutral feet composed of weak syllables to paint rapidity of action, as in

Swift as a shaft′, or wĭngĕd wĭnd′, she flies′,
And dart′ing to the port′, obtains′ the prize′.

Metre is *symmetric* when the number of syllables in the line is a multiple of the accent-places; in other cases it is *unsymmetric*. The mixed metre line,

Calls′ a | loud′ to the | chase′,

is symmetric, because the third syllable of the second foot supplies the deficiency of the third, and allows of a scansion in pure binary rhythm and compound metre:

Calls′ a | loud′ to ‖ the chase′.

Metre is *simple*, whether in binary, triple, or mixed rhythm, when the strong and weak syllables follow in a certain degree of regularity; it is *compound* when different parts of the line or stanza admit of a different scansion, as in Dr. Guthrie's line—

Wait′ing | till′ the | Mas′ter ‖ shall bid′ | me rise′ | and come.′ |

The most common English metre is the *heroic* line of ten syllables, a pentapody in which the second, fourth, sixth, eighth, and tenth occupy the points of accent. This metre is often varied by a hexapody or Alexandrine, as in the last line of the Spenserian stanza—

What booteth then the good and righteous deed,
If goodnesse find no grace, nor righteousnesse no meed?

A monosyllable *per se* cannot form a foot, but with the aid of a rest it may occupy the time of one, as in the two first feet of Tennyson's—

Break, | break, | break,—
At the | foot of thy | crags, ‖ O Sea! |

or—

At the | foot of ‖ thy crags, | O Sea! |

A detached single foot is not metric, but it may fill out the metre of other feet, or become metric by repetition. The examples of monopody which follow fall respectively into four and three metric lines. The side letters indicate the rhymes:

Let′ us	*a*	When damp′,	*a*
Nightly	*b*	With lamp	*a*
Get a	*a*	I tramp,	*a*
Sprightly	*b*	My cup	*b*
Cup or	*c*	To sup,	*b*
Supper	*c*	And dip	*c*
In—or	*d*	My lip	*c*
Dinner.	*d*	In flip.	*c*

The next form is a paroxytonic (′ °) holometric tetrapody, in binary rhythm:

Senseless trees, they cannot hear thee;
Ruthless bears, they will not cheer thee.—*Shakspeare.*

This is the metre of *Hiawatha*, of the Finnish *Kalevala*, and it is known to Oriental and Slavonic verse. The shortness of the lines leaves little room for variety, and it has been but sparingly used in English, where a form is preferred with the alternate lines shortened, and which is sometimes written in long lines—

Leapt the troutling idly darting from some root-encircled spot,
Bent the bulrush, blushed the mallows, smiled the blue forget-me-not.— *All the Year Round*, July, 1870.

Cease, rude Boreas, blustering railer!
List, ye landsmen, all to me;
Messmates, hear a brother sailor
Sing the dangers of the sea.—*G. A. Stevens.*

Akin to this, we have lines like these of Hemans:

There's beauty all around our paths, if but our watchful eyes
Can trace it 'midst peculiar things, and through their lowly guise;

constituting the metre of Chapman's *Homer*, Phaer's *Virgil*, and Golding's *Ovid*. Such long lines require a wide page, and as a consequence they are commonly cut in two (at a point indicated by the commas in the preceding distich), when they are known as ballad metre, service metre, or common metre. Originally, when such lines were divided, the copyist did not always use additional capitals, and in fact there is no reason why printed verse should differ from prose in this respect, particularly in Greek and Latin:

Eche daye declareth by his course,
an other daye to come,
And by the night we knowe likewise
a nightly course to runne. *Sternholde*, 1551.

The additional syllable in triple rhythm yields somewhat more material for variety than binary rhythm affords, but most of the metres in one may be represented in the other. When feet of two and of three syllables are used together, they constitute an inferior kind of metre in *mixed rhythm*. (See the final paragraph at Hexameter.) As in music an appropriate *modulation* introduces a discord, so in mixed metre the addition or suppression of a syllable should be so managed as not to shock the rhythmic sense; the syllables in the binary feet should be rather long, those in the triple ones rather short.

The metres used in hymnology are given in treatises on rhetoric, grammar, and sacred music. The present article and others on collateral subjects are based upon an unpublished volume on English prosody by the writer.

S. S. Haldeman.

Met′ric System, The, of Weights, Measures, and Moneys, a system designed to remove the confusion arising out of the excessive diversity of weights and measures prevailing in the world, by substituting in place of the arbitrary and inconsistent systems actually in use, a single one constructed on scientific principles and resting on a natural and invariable standard. The proposition for the creation of such a system originated in 1790 with Prince Talleyrand, then Bishop of Autun. He recommended the length of the pendulum beating seconds in latitude 45° as a suitable linear basis, and introduced into the National Assembly of France a decree embodying this proposition and providing for a scientific determination of the exact length of this pendulum by a commission to be composed in equal numbers of members of the French Academy of Sciences and of the Royal Society of London. This decree with some modification was adopted, and the king, Louis XVI., was requested to open a correspondence on the subject with the king of Great Britain, which he did; but owing to the temper and the public troubles of the times this overture met with no response. Similar applications to other nations were more successful, and in subsequent proceedings, Spain, Italy, the Netherlands, Switzerland, Denmark, and Sweden participated by sending delegates to an international commission. The system itself was however matured by the labors of a committee of the Academy of Sciences, embracing Borda, Lagrange, Laplace, Monge, and Condorcet, five of the ablest mathematicians of Europe. Their report, dated March 19, 1791, after considering the comparative fitness, as a standard of length, of the pendulum and of the earth itself in some one of its natural dimensions, decided in favor of the latter, and recommended as the standard unit of linear measure, one ten-millionth of the quadrant of a terrestrial meridian. The report was communicated to the Assembly and received its sanction. Committees of the Academy were then charged with the duty of making the necessary determinations of the standard units, including those of capacity and weight as well as that of length. An arc of the meridian passing through Paris and extending from Dunkirk to Barcelona was measured trigonometrically by Delambre and Méchain, an operation of immense labor which occupied seven years; the object being to ascertain with the greatest exactness the length of the linear base, called the metre. It was resolved to make the unit of volume equal to the capacity of a cubical vessel measuring one-tenth of a metre on its edges; and the standard of weight, the actual weight of distilled water which should fill such a vessel at the temperature of maximum density. The weight of a given volume of water under these conditions was therefore made a subject of elaborate investigation by a committee of the Academy, and in conformity with the results obtained, the standard unit of weight, called the *gramme*, was fixed at one one-thousandth part of the standard weight above mentioned, which, being one thousand grammes in weight, is called the *kilogramme*.

On the 4th day of the month Messidor, in the seventh year of the Republic "one and indivisible," the international commission above referred to, after having carefully tested the accuracy of the standards prepared by the committees of the Academy, proceeded in a body to the Palace of the Archives in Paris, and there deposited the standard metre, a simple bar of platinum, which represents the linear base of the system, and the standard kilo-

gramme, a simple cylinder, also of platinum, which represents the unit of metric weights. The value of these units had, however, been ascertained much earlier with an accuracy sufficient for all practical purposes; and by a law passed on the 1st of August, 1793, the metric system was established as the only legal system of weights and measures for France and the French colonial possessions. The system has since been successively adopted by Holland, Belgium, Spain, Portugal, Italy, the German Empire, Greece, Roumania, British India, Mexico, New Granada, Ecuador, Peru, Brazil, Uruguay, the Argentine Confederation, and Chili. Switzerland, without adopting the system in full, has given to all her standards metric values, and Denmark has done the same for her standard of weight. Austria has adopted the system for custom-house purposes, and Turkey has introduced a metric measure of length. In Great Britain the use of metric denominations in business transactions has been made legally permissible; but, by a singular inconsistency, the metric weights and measures themselves are not allowed to be kept in tradesmen's shops, and employed in actual commerce. In the United States, metric weights and measures were legalized by an act of Congress passed July 27, 1866, and at the same time the Bureau of Weights and Measures at Washington was directed to prepare and furnish to the executive authorities of the several States authenticated standards for the verification of metric weights and measures used in commercial affairs. The aggregate population of the countries in which the metric system has been established by law amounts to nearly 350,000,000; of those in which it has been partially introduced, to about 70,000,000; and of those where its use is legally permissible, to 70,000,000 more. It has thus been adopted by largely more than one-half the civilized and Christian world.

The question has been somewhat discussed whether the prototype metre of the Archives is really, with great severity of exactness, as it purports to be, one ten-millionth part of a terrestrial meridian. This question complicates itself with the further question what is the true figure of the earth. There is no doubt at all of the accuracy of the measurement made by the French geodesists; but they measured only about ten degrees of the Paris meridian, and from this measurement deduced the length of the entire quadrant of ninety degrees, by calculation on the supposition that the earth is a regular spheroid having an ellipticity of $\frac{1}{309}$th. The investigations of Gen. T. F. De Schubert of the Russian army, and of Capt. A. R. Clarke of the British Ordnance Survey, have made it probable that the earth is an ellipsoid of three unequal axes, rather than a spheroid, and that the meridian passing through Paris is a trifle longer than the French computers supposed. If this is so—a thing, however, which must be yet regarded as doubtful—the prototype metre of the Archives is by a very minute fraction (hardly more than one two-hundredth of an inch) less than $\frac{1}{10000000}$th of the Paris meridian quadrant. On the other hand, it is, on the same supposition, with almost mathematical exactness, the $\frac{1}{10000000}$th part of the meridian quadrant passing through New York City.

These discussions, and the desirability of settling all doubts as to the stability of the system and the permanency of its unit-bases, as well as of providing authenticated copies of the prototype standards to be distributed to the governments of all metric nations, and of securing such standards against the danger of alteration in all coming time, led to the assembling at Paris, in the year 1870, of an international commission to consider and adjust all questions connected with this subject. In this commission, thirty independent powers were represented. The deliberations of the commission, interrupted by the war of that year between France and Germany, were subsequently resumed, and resulted at length in an international convention providing for the maintenance at Paris of an International Bureau of Weights and Measures, to be supported by *pro rata* contributions from all the signatory powers, and charged with the care of the prototype standards, and with the duty of constructing and verifying copies of those standards not only for the powers interested but for other governments or even for corporations and individuals who should apply for them and should be willing to pay the expense attending their construction and comparison. This convention was signed in March, 1874, the diplomatic representative of the United States, Mr. Washburne, being, by consent and direction of the President, one of the signers. It was resolved by this commission that the prototype metre and the prototype kilogramme of the Archives shall be recognized and perpetuated for ever as the true bases of the system, without regard to any doubtful questions which have been raised as to the exactness of their correspondence with their theoretic values.

The units of the Metric System are five—viz. 1. The Metre—the unit of length = 3.280899 feet = 39.37079 inches.

2. The Are—the unit of surface = the square of ten metres = 119.60332 square yards.

3. The Litre—the unit of capacity = the cube of one-tenth of a metre = 0.26418635 gals. = 1.0567454 qts. = 2.1134908 pints.

4. The Stere—the unit of solidity = one cubic metre = 35.336636 cu. feet = 1.308764 cu. yards. This unit has fallen into general disuse.

5. The Gramme—the unit of weight = 15.43234874 grains troy.

Each unit has its decimal multiples and submultiples; that is, weights and measures ten times larger or ten times smaller than the unit of the denomination preceding. These multiples and submultiples are indicated by prefixes placed before the names of the several fundamental units. The prefixes denoting multiples are derived from the Greek language, and are *deka*, ten; *hecto*, hundred; *kilo*, thousand; and *myria*, ten thousand. Those denoting submultiples are from the Latin, and are *deci*, tenth; *centi*, hundredth; and *milli*, thousandth.

The unit of itinerary measure is the Kilometre, which is equal to 0.62138 mile.

The unit of land measure is the Hectare, equal to 2.47114 acres.

The unit of commercial weight is the Kilogramme, equal to 2.20462125 pounds avoirdupois.

The system of French moneys is connected with that of metric weights by the creation of a coin of standard silver (nine parts pure silver and one of alloy) to represent the monetary unit, called the Franc, having the weight of exactly five grammes; the coins of higher and lower denominations being multiples and submultiples of this. As in the coinage system of France gold and silver are equally standard metals, it is necessary that their relative values, weight for weight, should be determined by an arbitrary ratio. This ratio is fixed by law at $15\frac{1}{2}$ to 1; and accordingly the twenty-franc piece of gold, commonly (though not legally) called the napoleon, has the weight of twenty times five grammes divided by $15\frac{1}{2}$, which is equal to 6.4516 grammes of standard gold.

F. A. P. Barnard.

Met'ronome [Gr. μέτρον, "measure," and νόμος, "a division"], in music, an instrument for the measurement and regulation of time. As the directive terms usually prefixed to musical compositions, such as *adagio*, *lento*, *andante*, *allegro*, etc., can only give to the performer an approximate idea of the rate or velocity intended by the composer, various means have been employed to indicate the speed with more precision. The metronome, invented by John Maelzel, a mechanician in the service of the emperor of Austria, and brought into use in the early part of the present century, is a simple but ingenious contrivance by which any degree of slowness or rapidity can be marked, and practically shown with the greatest exactness. The instrument is small and portable, in form between that of the pyramid and the obelisk, and consists of an inverted steel pendulum (eight or nine inches long), on which is a sliding weight which may be moved up or down the pendulum, and thus brought opposite to any of the figures on a graduated scale in its rear. The pendulum is moved by simple wheelwork, and makes a loud tick for every vibration. It is evident that the sliding weight determines the rate at which the pendulum will vibrate. If it is near the point of suspension the motion will be rapid; and the rapidity decreases in proportion as the weight is moved towards the remote end, where the slowest point is reached. In practical use the object is to ascertain how many minims, crotchets, etc. of a given piece of music are to be performed in *one minute* of time. The numbers on the scale have therefore reference, as Mr. Maelzel remarks, "to a minute of time—*i. e.* when the weight is placed at 50, fifty beats or ticks will occur in each minute; when at 60, sixty beats (or seconds exactly) in a minute; when at 100, one hundred beats in a minute," etc. The rate at which any piece of music is to be played is thus easily found when the metronome mark is placed by the composer at the beginning. For example, 𝅗𝅥 = 50, means that when the sliding weight is placed at that figure on the graduated scale, the pendulum will vibrate *once for every minim* in the music, and that there will be fifty minims (or their value in other notes) in a minute of actual or clock-time. And when the rate indicated is ♩ = 75, and the weight is set accordingly, then the pendulum will vibrate and tick seventy-five times (or crotchets) in each minute.

William Staunton.

Metrop'olis, city, cap. of Massac co., Ill., 40 miles above the mouth of the Ohio River, has 5 churches, 2 shipyards, 4 steam saw-mills, 3 flouring-mills, a steam-ferry, 2 newspapers, and stores. Pop. 2490.

B. O. Jones, Ed. "Massac Journal."

Met'ternich (Clemens Wenzel Nepomuk Lothar), Prince, b. at Coblentz May 15, 1773; studied jurisprudence at Mentz and Strasburg; was appointed Austrian ambassador at the Hague in 1794, but returned to Vienna after the conquest of the Netherlands by the French; married in 1795 the granddaughter and sole heiress of Prince Kaunitz; was employed at the Congress of Rastadt (1797–99), and went in 1801 to Dresden as ambassador, in 1803 to Berlin, and in 1806 to Paris; on Oct. 8, 1809, was made minister of foreign affairs, and on May 25, 1821, chancellor of the empire, which positions he held till Mar. 13, 1848. With great shrewdness he kept Austria out of the great conflict of 1813 until she could make her own conditions for her participation, and at the Congress of Vienna (1814), of which he was unanimously chosen president, he procured for Austria a great extension of territory and a prominent position in Germany and Italy. For the next thirty years he actually stood at the head of the continental politics of Europe, and by the congresses of Aix-la-Chapelle (1818), Carlsbad (1819), Vienna (1820), Laybach (1821), Verona (1822), Münchengratz (1833), Töplitz (1835), etc., and by the aid of the Holy Alliance, he succeeded in suppressing almost every national or liberal movement in Europe. He most completely worked out his system within the boundaries of Austria, which by censure, police, etc. was almost hermetically shut out from the rest of Europe. Nevertheless, on Mar. 13, 1848, the revolution in Vienna compelled the prince to flee for his life. He resided in London till Nov., 1849, when he returned to Vienna, where he lived in retirement till his death, July 11, 1859.

Mettray', a v. of France, in the department of Indre-et-Loire, contains a celebrated institution for juvenile delinquents which has been in operation for several years with great success. Pop. 2211.

Metuch'en, post-v. of Middlesex co., N. J., in Raritan tp., on the New Jersey R. R.

Metz, a city and fortress in Alsace-Lorraine, on the Moselle, has 51,388 inhabitants (Dec. 1, 1871). The town is beautifully situated on both sides of the river, which divides into several arms, surrounded by mountains, and is one of the strongest fortresses in the world. Seven strong forts—Plappeville and St. Quentin to the W., St. Eloy to the N., St. Julien to the N. E., Les Battes to the E., Quenlen to the S. E., and St. Privat to the S.—crown the hills around it. It is the seat of the highest authorities of Lorraine, of a bishop, of a civil and commercial tribunal, etc., and has an academy, a college, 2 seminaries, a school of artillery, a museum with collections of Roman antiquities, coins, and pictures, a library containing 30,000 volumes, a botanical garden, and an arsenal. The most important public buildings are—the cathedral of St. Stephen, a Gothic structure, commenced in the thirteenth century, the nave finished in 1392, the choir in the sixteenth century, with a tower 118 mètres high and containing a bell weighing 260 cwts.; the church of St. Vincent, commenced in the thirteenth century; the church of St. Eucharius, from the twelfth century; and the palace of justice, from the eighteenth. Statues of Marshal Fabert and Marshal Ney adorn the city. The esplanade presents beautiful walks; opposite stand the magnificent barracks. Brushes, fur, felt, leather, paper, soap, silk, woollens, embroideries, drugs, etc. are manufactured, and a brisk trade is carried on in wine, timber, corn, and hides.

Metz, whose ancient name was *Divodurum* or *Mediomatrica,* was destroyed by Attila in the fifth century, then became the capital of Austrasia, fell on the division of the empire of Charlemagne to Germany, and was established as a free imperial city, governed by a count in the name of the emperor. In 1444 the French besieged the city without taking it, but in 1552 it fell into their hands. The Protestant princes of Germany, with the elector Maurice of Saxony at their head, asked King Henry II. of France to aid them against the German emperor. Henry entered Lorraine with 35,000 men, and, calling himself *vindex libertatis Germanicæ,* demanded free passage through the cities, also through Metz. But his troops, having entered the city under the constable of Montmorency, remained there. The emperor Charles V. besieged it in vain from Oct., 1552, to Jan., 1553; the French commander, Duke Francis of Guise, defended it successfully. Nevertheless, the French considered themselves as yet only the protectors of the city; Louis XIII. was the first who exercised the rights of a sovereign, and made it in 1633 the seat of a parliament. The German empire complained, but was too weak to retake the city, and by the Peace of Westphalia in 1648 the authority of France over Metz, as well as over Toul and Verdun, was acknowledged and guarantied. But by the war of 1870–71 the state of affairs was entirely changed. The fortress, which had been much strengthened by Napoleon III., formed the principal point of support for the imperial army drawn up along the German frontier, and after the first defeats at Weissenburg and Wörth it served as a retreat for the largest part of the army, numbering more than 180,000, under Marshal Bazaine. But before the marshal could lead this army out for operations in the open field he was shut up in the fortress by the manœuvres of the Germans. First he was attacked at Courcelles, Aug. 14, 1870, to the E. of the fortress, and thereby prevented from completing in proper time his march through, though he had already commenced it. Then, having left the fortress, he was attacked (Aug. 16) by Prince Frederick Charles on the opposite side, and thrown back within the walls of Metz by the battle of Vionville. At last, by the battle of Gravelotte (Aug. 18) he was compelled to shut himself up in Metz. Prince Frederick Charles enclosed Metz with an army of 200,000 men, and thus the memorable siege began which ended with the surrender both of army and fortress. Provided with a suitable garrison, Metz might have held out for a long time, but an army so large would necessarily consume the supplies very soon, and be compelled by hunger to surrender. The fortress, on the other hand, weakened the army, which, drawn up between the forts, could only form slowly under the eyes of the enemy and within reach of his guns. Thus it happened that these two powerful agencies of resistance neutralized each other because they were unduly combined. Nevertheless, in spite of this wretched situation and the greatest privations, the army held out for a long time and made several brilliant sallies. A severe contest took place between the besiegers and the besieged on Aug. 31 and Sept. 1. On these two days Bazaine endeavored with his whole force to break through to the N. E., in the direction of St. Barbe and Malroy-Charly, expecting that the army of Chalons would approach at the same time and support him. But this army did not come up; it was itself enclosed at Sedan by another German army, and the attempt at breaking through met with so stubborn a resistance in the battle of Noisseville that, after a contest of two days, in which there fell on the German side about 2000 men and on the French side still more, the French were compelled to return to the fortress. The situation of the French army became more and more wretched under the double influence of both moral and physical sufferings. The damp weather and the scanty and poor food caused much sickness. The German army also suffered much from its long inaction; it had more than 25 per cent. sick. At last, toward the end of October, Bazaine offered to capitulate, having lost, from Aug. 14 to Oct. 7, 25 generals, 2099 officers, and 40,339 men, wounded, dead, and missing, without counting the sick. On Oct. 27 the capitulation was concluded, according to which the fortress was to be occupied by the Germans, and the French army to go to Germany as prisoners of war. All war-materials and insignia of honor were to be given up to the Germans. The French army which surrendered, including the sick and the national guard, comprised 173,000 men, with 6000 officers and 3 marshals. The war-material, worth 80,000,000 francs, comprised 800 cannon, furniture for 85 batteries, 66 mitrailleuses, 300,000 muskets, an enormous number of sabres and cuirasses, 2000 wagons, etc.; 53 eagles and colors were taken. By the Peace of Frankfort (May 10, 1871) Metz was ceded to the German empire, and the German military administration has strengthened the fortress. (See Bazaine.) August Niemann.

Met'zu (Gabriel), b. at Leyden in 1615; resided in Amsterdam, and acquired a reputation as a genre painter equal to that of Terburg and Dow. His pictures are rare. D. at Leyden about 1667.

Meudon', town of France in the department of Seine-et-Oise, has a fine palace, extensive wine-culture, and manufactures of glass. Pop. 5417.

Meu'lebeké, a v. of Belgium, in the province of West Flanders, 20 miles S. W. of Ghent, on the Mandel, an affluent of the Lys, carries on flax-spinning and manufactures of lace. Pop. 8249.

Meung, or **Mehun, de** (Jean), b. at Meun, near Orleans, about 1279; lived at the court of Philippe le Bel, where he enjoyed a great reputation for his scholarship, his talent as a poet, and his biting sarcasm, and d. about 1320. His principal work is his continuation of the *Roman de la Rose.* This famous work was commenced, but left unfinished, by Guillaume de Lorris; more than one-half of the work was composed by Jean de Meung.

Meur'sius (Johannes), [Dutch, *De Meurs*], b. at Loosduinen, near the Hague, in 1579; studied philology; travelled much, and became professor of history at Leyden in 1610, afterwards of Greek, but left Holland, disturbed by the political broils in his country, and accepted a position at the Academy of Soröe in Denmark, where he d. Sept. 20, 1639. He was one of the most learned men of his age, and his *Glossarium Græco-barbarum* (1614) and *Athenæ*

Batavæ (1625), as well as his numerous critical monographs relating to the later Greek and Roman literature, are still of interest. He also wrote a history of Denmark in Latin. His works by Lamie (12 vols. fol., Florence, 1741–63).

Meurthe-et-Moselle, a department of North-eastern France, was formed after the Franco-Prussian war, on Sept. 11, 1871. It comprises an area of 2025 square miles with a population of 365,137. It consists of the four arrondissements, Briey, Lunéville, Nancy, and Toul, and contains some of the most beautiful scenery and some of the most fertile soil in France. Vine-culture is the chief occupation; half of the surface is occupied by vineyards. Cap. Nancy.

Meuse, department of North-eastern France, comprising an area of 2368 square miles, with a population of 284,725. It extends along both sides of the river Maas, which is enclosed between two ranges of low hills running parallel with it. The valley is very fertile and produces wheat and good wine; cattle, horses, swine, and bees are reared. The hills contain iron, limestone, and gypsum. Cap. Bar-le-Duc.

Meuse, a river of Europe which rises in France, in the S. of the department of Haute-Marne, and proceeding N. crosses the N. W. corner of the department of Vosges, and traverses the departments of Meuse and Ardennes, through the wild mountainous region of which latter, still known as the "Forest of Ardennes," it pours through a wild romantic gorge; on reaching Sedan it enters Belgium, and at Namur, where it receives on the left its largest tributary, the Sambre, almost doubling its volume, changes its course to N. E., and passes Liège, where it is augmented by the Ourthe; separates Dutch from Belgian Limburg, passing Maestricht and Roermond, at the latter of which it receives the Roer; at Bommel it draws so close to the Rhine as to be brought into communication with it; resumes its W. course, and finally turning N. W. joins the left bank of the Waal, one of the arms of the Rhine, and gives its name to the mighty accumulated flood of these streams, which proceeding W. is divided near Dordrecht into two great rivers, the one of which bends round to the N., and reaches Rotterdam; the other branch continues W.; and shortly after the two branches again unite and discharge themselves, amid shoals and quicksands, into the North Sea. Total length, 580 miles, of which 460 are navigable.

Mex′ia, post-v. of Limestone co., Tex., 231 miles N. W. of Galveston, on the Houston and Texas Central R. R., has an academy, 2 churches, 1 bank, 1 newspaper, 2 hotels, 1 mill, and stores. Pop. about 700.

J. W. FISHBURN, ED. "MEXIA LEDGER."

Mexican Antiquities. See ARCHITECTURE OF THE AMERICAN ABORIGINES, by HON. L. H. MORGAN, LL.D.

Mexican Hieroglyphics. See INDIAN LANGUAGES OF AMERICA, by HON. J. HAMMOND TRUMBULL.

Mexican Languages. See INDIAN LANGUAGES.

Mex′ico [from Aztec, *Mexitli*, a name of the tutelary divinity], **United States of,** a federal republic of North America, and, next to the U. S., the most populous and wealthy country of the New World, occupies the whole breadth of the continent between the U. S. on the N. and Central America on the S. E., stretching from the Gulf of Mexico and the Caribbean Sea on the E. to the Pacific Ocean on the W. and S. In shape resembling a cornucopia, it has a length of 1950 miles along the axis of the continent, from the N. line of Sonora to Yucatan, a maximum breadth of 750 miles E. and W. in the latitude of Matamoras (excluding the peninsula of Lower California), an average breadth of about 400 miles in a line from N. E. to S. W. drawn through the capital, and a minimum breadth of 140 miles N. to S. at the Isthmus of Tehuantepec, with a coast-line of more than 6000 miles. The natural grand divisions of the country are those made by the tropic of Cancer and the Isthmus of Tehuantepec, which separate the original Mexico, central and tropical, from Northern and Eastern Mexico, which in colonial times were for the most part separately named and governed.

Area and Population.—The following table exhibits the areas of the 27 states, the territory of Lower California, and the federal district, according to the calculation made in 1869 by a leading Mexican authority (Garcia y Cubas). No accurate census has ever been taken, but there can be little doubt that the population now (1876) exceeds 10,000,000. The figures given in the table are chiefly from state estimates of 1873 or 1871. In regard to the remaining states, in a conflict of estimates the higher has generally been preferred. The population of the City of Mexico, given as 250,000, should properly include that of the whole federal district (85 square miles), or 315,996. Other large cities not capitals of states are Leon (Guanajuato), with a population variously estimated from 90,000 to 120,000; Celaya, San Miguel de Allende, Salvatierra, Orizaba, Zapotlan, Lagos, Tepic, Zamora, Matamoras, and Huajuapan, which range between 40,000 and 20,000.

States.	Area in square miles.	Population.	Capitals.	Pop. of capital.
Aguas Calientes...	2,216	160,630	Aguas Calientes...	31,000
Campéche............	26,083	80,366	Campéche............	20,000
Chiapas...............	16,769	193,987	San Cristobal	12,000
Chihuahua..........	105,295	179,971	Chihuahua..........	15,000
Coahuila.............	61,050	98,347	Saltillo................	20,000
Colima................	2,393	65,827	Colima................	35,000
Durango.............	42,643	190,846	Durango.............	26,000
Guanajuato.........	11,130	929,431	Guanajuato.........	70,000
Guerrero	24,226	301,080	Bravos (Chilpancingo)..............	7,000
Hidalgo...............	8,480	404,207	Pachuca	18,000
Jalisco	48,967	966,689	Guadalajara.........	75,000
Mexico	9,598	663,527	Toluca................	20,000
Michoacan...........	21,609	618,240	Morelia...............	30,000
Morelos	1,898	147,039	Cuernavaca..........	15,000
Nuevo Leon.........	14,363	178,872	Monterey............	20,000
Oaxaca	27,389	662,463	Oaxaca................	25,000
Puebla................	11,761	830,560	Puebla................	75,000
Querétaro...........	3,429	171,666	Querétaro............	50,000
San Luis Potosí...	28,889	476,500	San Luis Potosí...	35,000
Sinaloa...............	25,927	168,031	Culiacan.............	10,000
Sonora................	81,022	147,133	Ures....................	7,000
Tabasco..............	12,716	83,707	San Juan Bautista.................	5,000
Tamaulipas.........	28,659	108,778	Ciudad Victoria...	6,000
Tlaxcala.............	1,498	121,665	Tlaxcala	4,000
Vera Cruz..........	27,433	504,325	Jalapa................	20,000
Yucatan..............	32,658	422,365	Mérida...............	25,000
Zacatecas............	26,585	397,945	Zacatecas............	30,000
Lower California (territory)........	59,033	21,645	La Paz...............	1,000
Federal District...	85	315,996	Mexico	250,000
Total............	....	9,611,838		

Physical Features.—Mexico proper consists of a vast table-land 6000 to 8000 feet above the sea, with narrow fringes of semi-tropical terrace-lands (*tierras templadas*) varying in elevation from 3000 to 5000 feet, and lowlands (*tierras calientes*) stretching from the sea-coasts to the bases of the mountains. The two latter regions sometimes penetrate far within the central mountain-system, along the courses of streams, expanding into broad fertile valleys, as in portions of Oaxaca, Puebla, Morelos, Mexico, Michoacan, and Jalisco. The mountain-system of Mexico is the northern prolongation of the Cordillera of the Andes (though the latter name is unknown in Mexico), divided into several branches. The *Sierra Madre*, or "mother-range," extends from the Isthmus of Tehuantepec to the northern frontier of the republic, skirting the Pacific at a considerable distance inland. A coast-range projects northward along the Gulf of Mexico, rising to the height of 17,176 feet in the celebrated peak of Orizaba, while the central range, or *Cordillera de Anahuac*, which surrounds and separates the valleys of Mexico and Puebla, reaches the greatest altitude as yet proved to exist in North America in the mighty cone of Popocatapetl, 17,540 feet, while its twin volcano, Iztaccihuatl, attains 15,705 feet, and the *Nevado de Toluca* (90 miles N. W.), 16,616 feet. Many other mountains vary from 10,000 to 12,000 feet, but the four so-called "volcanoes" above named are the only ones which are covered with perpetual snow. Popocatapetl alone occasionally sends up clouds of smoke, the most active volcanoes in modern times being the smaller ones of San Martin Tuxtla (Vera Cruz) and Jorullo (Michoacan). The central table-land of Mexico, broken by numerous transverse ranges into a series of great valleys, or rather basins, sometimes scores of miles in width, descends gradually northward, and Northern Mexico consists of a similar series of mountains and valleys at a less elevation. In Eastern Mexico the peninsula of Yucatan (including Campéche) is a vast plain rising but slightly above the sea, while the states of Chiapas and Tabasco belong geographically to the Central American mountain-system.

Climate.—There are in tropical Mexico but two seasons, the rainy and the dry, of irregular duration, usually extending from May to October, and from October to May, respectively, the heaviest rains occurring in September. The dry season is marked by frequent *nortes*, or gales of wind, sweeping southward across the Gulf of Mexico, rendering navigation somewhat perilous during their continuance. The mean annual temperature in the *tierras calientes* is from 75° to 85° F., in the *tierras templadas* from 65° to 70°, and in the *tierras frias* from 55° to 62°, rarely rising to 80° or sinking to 45°. At many points on the coast, however, especially at the ports of Vera Cruz, Acapulco, Mazatlan, and Guaymas, the summer heat ranges from 85° to 105°, usually accompanied by the terrible scourge of yellow fever. The temperate regions, or *tierras templadas*, enjoy a delicious climate, justly entitling them to the title of "paradise of Mexico" usually applied

to the region of Jalapa and Huatusco. The table-land or "cold region" is cold only in a relative sense, the climate being as mild and equable as that of Naples, the chief discomfort to winter visitors arising from the rarefaction of the atmosphere. Moisture is irregularly distributed through the three regions, and largely affects their comparative healthiness, the dry climate, whether hot or cold, being reckoned the more salubrious; but this rule is not invariable, since the greatest annual rainfall (90 to 100 inches) is that of Huatusco, a healthful region of the terrace-lands.

Rivers.—From its physical configuration Mexico has few large or navigable rivers, being less favored in this important element of commercial prosperity than any other considerable country in the world except Arabia. The largest is the Rio Bravo or Rio Grande del Norte, forming the boundary with Texas, and navigable for vessels of light draught for a small portion of its lower course. The Panuco, Alvarado, Coatzacoalcos, Grijalva, and Usumasinta, flowing into the Gulf of Mexico or the Bay of Campêche, are important streams, navigable through that portion of their course which traverses the lowlands. On the Pacific slope the largest river is the Lerma, called in its middle course Tololotlan, and in its lower course Rio Grande de Santiago, which rises in Lake Lerma in the central valley of Toluca, flows W. through Michoacan and Jalisco, traversing Lake Chapala, and forming numerous cataracts. It is wholly unnavigable, and the same may be said of the Mescala or Rio de las Balsas, which, rising in Puebla, flows W. 400 miles to the Pacific, and has been several times explored with a view to utilizing it for interoceanic communication.

Geology and Mines.—Mexico is eminently a country of mineral wealth, and its production of the precious metals was for more than three centuries subsequent to its discovery greater than that of any other country. Its geology has always been subordinated to its mineralogy, and is therefore very imperfectly known. Granite forms the foundation both of the central table-land and of the great mountain-system of Oaxaca, the mineral-bearing superstructure being chiefly porphyry. Caverns are numerous, one of them, Cacahuamilpa, being reputed the largest in the world. Much of the country has been the scene of volcanic action, of which the débris remain in immense fields of basaltic lava. Iron is found in immense masses in Coalcoman (Michoacan), Lagos (Jalisco), and in Durango, where the Cerro del Mercado is a solid mountain of magnetic iron ore. Copper, usually associated with gold, is found in considerable quantities in Chihuahua, Sonora, Guanajuato, Mexico, Guerrero, Jalisco, and Michoacan; tin in the two latter states; and lead occurs in connection with the ores of silver in many parts, but especially in Oaxaca. Quarries of marble, alabaster, gypsum, and rock-salt are numerous; sulphur is found in the craters of the volcanoes, and mineral springs occur in many localities. Cinnabar or red sulphuret of mercury has been found in small quantities in many states, and valuable mines have recently been developed in Morelos and Guerrero under the stimulus of the immense consumption and high price of quicksilver. The utility of this article for reducing silver ores was discovered in the sixteenth century by the Mexican miner Bartolomé Medina, a native of Pachuca. Bismuth occurs in several states; platinum has recently been discovered in Tlaxcala and Hidalgo, and coal has been found in small deposits in many quarters, but no mines are actually worked upon a profitable scale. Gold, being found in placers and easily worked, was the chief mineral treasure of the Aztecs, who made little use of silver from the difficulty of reducing the ores; hence, while Mexico was at first celebrated chiefly for its gold, that metal soon became subordinate to silver, and has ever since, in Mexico proper, afforded a very small proportion of the annual coinage. Of late years, however, gold-mines in the states of Mexico, Michoacan, and especially Guerrero, have been worked with profit, and, though the placers are nearly exhausted, the use of improved mining machinery will doubtless yield rich results. Silver early became, and will ever remain, the staple production of Mexico. The supply is practically illimitable. Though many thousands of mines have been abandoned as unprofitable, the introduction of improved processes of extraction and reduction and of cheap transportation through railway extension will augment the yield of silver to an indefinite extent, more especially if supplies of coal and quicksilver should in any way become cheap and abundant. In the first half of the sixteenth century the silver-mines of Tasco, Sultepec, Tlalpujahua, and Pachuca were developed by Cortés and his immediate successors. Subsequently, the great mining-districts of Guanajuato, San Luis Potosí, Zacatecas, and Durango were gradually discovered and worked, but it was not until the eighteenth century that they attained that high development which gave them a worldwide renown. At the close of that century the famous Veta Madre ("mother vein") of Guanajuato had, according to Humboldt, yielded one-fifth of the silver then current in the world, having far exceeded the famous mountain of Potosí in Upper Peru. The Veta Grande of Zacatecas during the last century frequently yielded $3,000,000 annually, and the mines of Catorce (San Luis Potosí) produced $150,000,000 in seventy-seven years. At the beginning of the nineteenth century the prosperity of Guanajuato and Pachuca attained its apogee; the proprietors of the Valenciana, Rayas, Regla, and other great *bonanzas* had become, virtually by purchase from the Spanish crown, counts or marquises under the titles of their mines, and had thus founded an aristocracy based on wealth. But the long war of independence (1810–20) ruined the mining interests of Mexico, causing the abandonment of all incipient or partially completed enterprises, and even of many prosperous mines, which soon filled with water, and have never since been worked. In 1825, on the establishment of the republican government, a fever for Mexican mines, largely traceable to the great work of Humboldt, pervaded the London money-market; the most reckless investments were made, and operations on a lavish scale of expenditure were carried out for years under the direction of so-called mining-engineers, whose inconceivable ignorance refused to learn anything from Mexican sources. Naturally, the English companies nearly all collapsed within a few years, to the great detriment of Mexico in European eyes, as the blame was, with but slight reason, ascribed either to revolutions or to the obstructiveness of Mexican governments. The mining resources of the country are now almost exclusively in the hands of Mexican capitalists, and are gradually recovering their prosperity. The Spanish "mining code," formed chiefly in Mexico, is still in use, and is the most elaborate in the world.

Mints and Coinage.—There are now (1876) 11 mints in the republic—namely, at Mexico (established 1538), Oaxaca, Guanajuato, San Luis Potosí, Zacatecas, Guadalajara, Durango, Chihuahua, Culiacan, Alamos, and Hermosillo. They coin on an average $20,000,000 per annum, of which less than $1,000,000 is in gold. The total production of Mexican mines up to 1875 is estimated at $4,300,000,000, and the total coinage for the same period is stated at $3,063,660,068, of which not more than 5 per cent. was gold.

Vegetation and Agriculture.—Besides the European cereals, roots, and fruits, nearly all of which have found congenial homes in the uplands, Mexico produces a surprising variety of useful indigenous plants and trees. There are over 100 species of timber trees and cabinet woods, 17 oil-bearing plants and trees, 12 species of dyewoods, 8 of gum trees, and over 60 of medicinal plants. Indian corn is everywhere the staple food of the aboriginal population; wheat and barley grow to perfection in the central valleys, especially in the great *bajio* of Guanajuato; rice, sugar-cane, tobacco, cotton, coffee, cacao, and indigo thrive in the *tierras calientes* and *tierras templadas*, where oranges, lemons, olives, mangoes, bananas, pineapples, grapes, sweet potatoes, yuca, and scores of luscious wild fruits abound. The maguey of the *tierras frias* furnishes a palatable fruit, while its fermented juice, the famous *pulque*, constitutes the national beverage; and in Yucatan a plant of the same species affords the *heniquen*, a fibre which now constitutes the chief wealth of that peninsula. Many varieties of cactus are found, one of which is cultivated in Oaxaca as food for the cochineal insect. The mulberry thrives in Puebla, Michoacan, and Guanajuato, but the rearing of silkworms, once a considerable industry, has fallen into insignificance. The great cotton-producing regions are the northern states of Coahuila, Durango, and Sinaloa. The tobacco of Southern Vera Cruz and Tabasco, the cacao of Tabasco, Oaxaca, and Soconusco (Chiapas), the coffee of Michoacan and Colima, are reputed equal to any in the world. The market of Mexico is more abundantly and cheaply supplied with magnificent and varied flowers than that of any other city in the world.

Animal Kingdom.—All the European domestic animals are successfully reared, and the northern states are noted for their vast herds of cattle, droves of horses, and flocks of sheep. Among the wild animals are the puma, jaguar, ocelot, wolf, and coyote, with several species of bears, deer, and monkeys. Alligators abound in the lagoons and rivers of the lowlands; rattlesnakes and other venomous ophidians are common, as well as many kinds of noxious insects, especially scorpions and tarantulas. A great variety of brilliantly-colored parrots, humming-birds, and song-birds are found in the forests, as also many wild fowl and game birds. The coasts are well supplied with fish, and pearl-fishing is a valuable industry in the Gulf of California. Amber is found on the coasts of Yucatan.

Industry and Manufactures.—Agriculture is the occupation of the mass of the aboriginal population, whether in the tillage of their own small plots of ground or in the cultivation of the great plantations. Petty industries, such as the manufacture of earthenware, clay and rag figures, wooden toys, sweetmeats, artificial flowers, and other ornaments, are largely carried on in the cities, the goldsmiths especially excelling in filigree-work. Superior glassware and porcelain are made at Puebla, Texcoco, and other cities. In Leon, Celaya, Salvatierra, and other central cities the manufacture of *rebozos* or shawls, the weaving of cotton and woollen cloths by hand, and the manufacture of saddlery, all of fine quality, have acquired a great development. There are a few iron-foundries, paper, grist, and saw mills, but the latter are surprisingly rare. Cotton and woollen factories are as yet in their infancy, though a few are found in each of the principal cities, and they form a notable feature at Puebla, Querétaro, Guadalajara, Colima, and Saltillo. The manufacture of sugar is carried on upon a vast scale in Morelos.

Commerce.—The exports of Mexico for the year ending June 30, 1873, were valued at $31,791,150.84; the imports at $29,062,406.84. Of the total of exports, the precious metals amounted to more than $25,000,000, the other leading articles being hides, heniquen or Sisal hemp, lumber, coffee, vanilla, cochineal, cattle, tobacco, India-rubber, orchil, indigo, and sarsaparilla. Great Britain received $12,000,000, the U. S. $11,000,000, France $4,500,000, and Colombia (Panama) $1,500,000. Of the imports, Great Britain furnished articles to the value of $10,000,000, the U. S. $7,000,000, France $5,000,000, Germany $4,000,000, Spain and Cuba $1,500,000, and Colombia $1,250,000. The leading articles of importation are cotton, linen, woollen, and silk fabrics, wrought and unwrought iron, machinery, hardware, and provisions. The leading ports are Vera Cruz, Campêche, Progreso, Tampico, Tuxpam, and Matamoras on the Gulf of Mexico; Acapulco, Manzanillo, San Blas, Mazatlan, La Paz, and Guaymas on the Pacific. Of these, Acapulco is the only one having a good harbor. Nine-tenths of the foreign commerce of the republic passes through Vera Cruz, which is connected by lines of steamers with New Orleans, New York, Liverpool, Southampton, and St. Nazaire. Most of these lines touch at Progreso (Yucatan) and at Havana or St. Thomas. The American lines receive subsidies from the Mexican government. On the Pacific the steamers of the Pacific Mail Company touch twice a month at the principal ports, and also receive a subsidy. The commerce of the Pacific ports is largely in the hands of German mercantile houses. The average number of vessels arriving annually in Mexican ports is 5000, of which about one-fifth are national vessels.

Railways and Roads.—The only extended line of railway is that from Vera Cruz to the City of Mexico (263 miles), with a branch from Apizaco to Puebla (29 miles). The main line was completed in Dec., 1872, having been constructed at intervals dating back to 1852. The ascent from the lowlands to the summit of the plateau (8000 feet) is a wonderful monument of engineering skill, and will compare favorably with the most noted constructions of the kind in Europe. A railway from Vera Cruz to Jalapa (about 60 miles) was nearly completed in 1875. The other lines now existing are those from Vera Cruz to Medellin (11 miles), Mexico to Tlalpam (16 miles), and Mexico to Tlalnepantla (10 miles). The latter is a narrow-gauge, which is to be extended to Toluca *viâ* Cuautitlan. There is also a steam railway to the suburb of Guadalupe Hidalgo (4 miles), and several horse-railways within the city. Concessions have been granted for lines of railway from Mexico to Leon, and from Leon to the Rio Grande and to the Pacific, the latter to the International R. R. Company of Texas, and work was commenced on the former Nov. 1, 1875. Other concessions have been frequently granted, extended, and renewed, and as frequently forfeited for non-fulfilment of contract, so that it is impossible to state which of the many projected lines will be earliest constructed, though the most promising seem to be the line from Ometusco N. to Pachuca, to connect that great silver-producing centre with a seaport, and the line from Puebla southward to Matamoras Izucar, in the sugar-producing *tierres calientes*. A concession was granted many years since to an American company for a ship-canal across the Isthmus of Tehuantepec, and more recently for a railway. The former project is in abeyance; the latter may, it is hoped, be soon realized. The ordinary carriage-roads in Mexico are few in number, being limited to the highways between the principal cities. Mail and passenger communications are effected by means of 24 lines of diligences administered by a single company. The ordinary means of commercial transportation are by ox-carts and pack-mules. Telegraph-lines have been rapidly extended since 1870. Every state capital is now in communication with the City of Mexico, and consequently with the U. S. and the whole world, by the line *viâ* Matamoras, open since 1872.

Administration.—The federal national government is administered according to the provisions of the liberal republican constitution of 1857, twice overthrown and restored (1858–60 and 1863–67), and considerably amended in 1873–74. The president is chosen by indirect popular suffrage every fourth year; the supreme judiciary and both houses of Congress are elected in the same manner, the former and the senate for terms of six years, the house of deputies for two years. The chief-justice is *ex-officio* vice-president. The senate existed for short periods under two former constitutions, but was abolished in 1853, and not restored until the constitutional amendments of 1874, by virtue of which the new senate was elected in 1875. The states have local constitutions, with elective governors and legislatures. The powers of the various branches of the national government closely resemble those of the U. S. The revenues are largely derived from export and import duties, and amounted in 1873–74 to $22,197,803. The expenditure during the same fiscal year was $20,910,193. The national debt, chiefly held in England, amounted in 1861 to about $60,000,000, but since the restoration of the republic in 1867, diplomatic relations with England, as well as with France, have been in abeyance, and the Mexican government not only repudiates all the loans contracted by Maximilian, but holds that the former English debt was vitiated by the conduct of the British government. At the same time, it professes a willingness to make an equitable adjustment whenever the proper preliminary steps shall be taken by the British government. The Mexican army consists of 22,387 men, who are maintained on an efficient footing at an annual expense of about $7,000,000. The navy is little more than nominal, consisting chiefly of four steamers recently constructed for coast-guard purposes.

Religion.—During the colonial period Roman Catholicism was the only creed tolerated, and was the religion of the state under the earlier republican codes. By the constitution of 1857 all religions are equally protected, but none officially recognized by the state. The Catholic hierarchy possesses 3 archbishoprics, Mexico, Michoacan, and Guadalajara, and 12 bishoprics, Puebla, Vera Cruz, Oaxaca, Chiapas, Yucatan, San Luis Potosí, Tamaulipas, Nuevo Leon, Zacatecas, Durango, Sonora, and Lower California. The Catholic Church formerly owned nearly one-third of the soil, throughout Mexico, but by the "laws of reform" of 1856 and 1859 their landed property was nationalized, the convents abolished, and all superfluous church buildings sold or converted to public uses. American Protestant missions, chiefly of the Methodist Church, have been very successful in Mexico 1870–75, and the "Church of Jesus," a Mexican undenominational Protestant organization, possesses several large church edifices and has more than a score of congregations within the Valley of Mexico.

Education.—The University of Mexico, an ecclesiastical institution dating from the sixteenth century, was abolished in 1856. In its place special schools of law, medicine, music, agriculture, engineering, mines, commerce, fine arts, the sciences and literature, and a military college, are now maintained by the federal government, besides various grades of lower schools for both sexes, amounting in the City of Mexico to above 200, besides 100 private schools. The state governments support common schools at all the centres of population, and institutes for higher education at the capitals. The total number of public schools throughout the republic amounts to nearly 4000, and is rapidly being extended. There are also schools for deaf mutes, for the blind, and for juvenile delinquents, besides many creditable institutions supported by private beneficence. (For notices of the libraries, museums, and various other national institutions having an educational character see article MEXICO, CITY OF.)

History.—The chief interest of Mexican history prior to the present century is concentrated in the remarkable circumstances of its conquest (for which see CORTÉS, HERNANDO). The shadowy and uncertain events prior to Spanish discovery have been given with sufficient fulness under the heads AZTECS and MIGRATIONS OF THE AMERICAN ABORIGINES, and the annals of three centuries of Spanish rule are almost a blank in the usual staples of history, there having been no foreign wars and no important internal revolutions. The modern Mexican people was being formed through those three centuries of race-fusion, the several Indian nations supplying the foundation upon which the Castilian superstructure was reared. The Mexicans at the beginning of the nineteenth century were a composite people, but the Indian element was so largely in

the ascendant that persons of pure Castilian blood, though settled for generations in the country, were regarded by the mass of the nation as foreigners. Unfortunately, it was precisely this class which monopolized the posts of honor and influence, as well as the great landed estates and the commercial wealth of the country. The revolution of eleven years' duration which resulted in the independence of Mexico in 1821 was directed not so much against the abstract right of the Spanish crown as against odious caste-distinctions and the scandalous oppressions exercised by the *gachupines*, or men of pure Spanish birth. The native element not only obtained the ascendency, but ruined the colossal fortunes of the colonial aristocracy, and even expelled all natives of Spain from Mexico (1829). The earliest independent government of Mexico, that presided over by the liberator Iturbide (1821–23), was from the first intended not as a change of system, but merely a change of *personnel*, and it was only when the royal house of Spain had refused to permit one of its princes to assume the crown of Mexico that Iturbide himself was proclaimed emperor. The "republic" proclaimed by Santa Anna at Vera Cruz Dec., 1822, had originally little but the name in common with other republics, but the constitution adopted in 1824 made liberal drafts upon that of the U. S. The change of system thus attempted to be introduced was too radical to be permanently carried out, and the reformers, who in 1833 passed laws abolishing convents, suppressing the compulsory payment of tithes, and otherwise curtailing the power of the clergy, precipitated the downfall of the constitution. The numerous "plans," "organic bases," or "constitutions" that prevailed in Mexico under military leadership for the ensuing twenty years were for the most part mere pretexts for dictatorship, and Mexico never obtained a thoroughly republican form of government until the triumph of the "plan of Ayutla" overthrew the fifth dictatorship of Santa Anna (Aug., 1855) and prepared the way for the constituent convention of 1856. That body promulgated (Feb. 5, 1857) a constitution which, with some later amendments, is still the organic law of Mexico. It represents in many respects the most advanced principles of modern republicanism, and could not triumph over the privileged classes—*i. e.* the corrupt national Church, the army, and the conservative aristocracy—without two desperate struggles, known in Mexican history as the "war of reform" (1857–60) and the "French intervention" (1861–67), to which latter period belongs the ephemeral "empire" presided over by the Austrian archduke Ferdinand Maximilian (1864–67). In both these struggles the master-spirit, the genuine representative of republican Mexico, was the Indian statesman Benito Juarez, president of Mexico from Dec., 1857, till his death, July 18, 1872. (See MAXIMILIAN, MIRAMON, MEJIA, and MARQUEZ.) His chief assistant in the maintenance of national dignity and independence was the minister of foreign affairs, Sebastian Lerdo de Tejada, who succeeded to the presidency, and now (1876) ably fills that post, having had the rare good fortune to preserve peace and to establish the republican institutions of his country upon a firm basis. (See histories of Mexico by Prescott and Brantz Mayer, and upon the Mexican war and its consequences consult the articles SCOTT (WINFIELD), TAYLOR (ZACHARY), SANTA ANNA (A. L.), CALIFORNIA, TEXAS, and names of battles.)

PORTER C. BLISS.

Mexico, a state of the republic of the same name, bounded N. by the state of Hidalgo, E. by Tlaxcala and Puebla, S. by Morelos and Guerrero, and W. by Michoacan, with an area of 9598 square miles, exclusive of the Federal District embraced by it. Two mountain-ranges and elevated valleys, with numerous picturesque lakes, constitute the peculiar physical features of the state. The main valley, that of Mexico, separated on the W. by a mountain-chain from the more elevated valley of Toluca, is oval in form, and has a circumference of 200 miles along the crest of the mountains which environ it on all sides. It is broken into three basins of different levels—that of Chalco, in which lie Lakes Chalco and Xochimilco; the central basin of Lake Texcoco; and in the N. that of Teotihuacan, containing Lakes San Cristobal, Tonanillo, and Zumpango. The length of the whole valley is about 55 miles, and its width 37, with an area of 155.6 square leagues or 1710 square miles, about 170 of which are covered by lakes. The soil is a recent alluvion and detritus, with calcareous beds or deposits covered with vegetable mould in the arable lands, and occasionally also by an efflorescence of salt or alkaline matter. From the centre of the valley of Toluca, which has a level of 8210 feet, rises the peak of Nevado de Toluca, 15,770 feet above the sea. The southern valleys of the state are within the *tierras calientes* of the Pacific slope, producing sugar, coffee, and other tropical staples, while the plateau is fertile in cereals and the maguey. The mountains of the state are mineral-bearing, yielding gold, but particularly silver, also copper, cinnabar, lead, sulphur, antimony, lithographic stone, with quarries of fine marble and other valuable building-stone. Its manufactures are cotton and woollen cloths, some of the latter of much excellence, glass and porcelain equal to that imported from Europe, chocolate, sugar, salt, and soda from the saliferous deposits of the lakes of the valley, which are of immense extent. The state government is administered by an elective governor, who appoints his secretaries, and a legislature of a single chamber, having a member from each of the sixteen districts into which the state is divided —namely, Toluca, Ixtlahuaca, Tenango, Chalco, Jilotepec, Texcoco, Lerma, Tlalnepantla, Sultepec, Villa del Valle, Temascaltepec, Tenancingo, Otumba, Cuautitlan, Zumpango, and Zacualtipan, which are further subdivided into 117 municipalities with 3 cities, 18 towns, 605 villages, and 391 haciendas, with a total population in 1873 of 685,603. The property subject to taxation at the same period was assessed at $22,304,054. Public instruction is receiving the special attention of the public men of the state, and a literary institute at Toluca, a thorough collegiate school, is well supported by the state. THOMAS JORDAN.

Mexico, a city and federal district, capital of the republic of the same name, is situated in lat. 19° 25′ 45″ N., lon. 99° 7′ 8″ W. from Greenwich, at an elevation of about 7435 feet above the level of the sea. Founded, according to Aztec tradition, about the year 1325 on an island in Lake Texcoco, by tribes from the N. W., by whom it was named Tenochtitlan ("nopal upon a stone"), it was the largest and most civilized city of America at the time of the Spanish conquest, since which time the waters of the lake have receded eastward. Built upon the ruins of the Aztec capital in 1521–22, upon uniformly level ground, the streets are about forty feet wide, well paved for the most part, well lighted, and lined by structures of a solid, handsome architecture. Subdivided into eight chief quarters, with an aggregate of 304 streets (each of a single block) and 90 public squares, the city has a circumference of about 16 miles. The chief structure is the cathedral, erected upon the site of the great teocalli of the Aztec Mars (Huitzilopochtli). Begun in 1593, it was dedicated in 1677; as then finished, the cost had been $1,757,000, subsequently increased to $2,500,000. Highly enriched with carvings, the precious and other metals, with costly altars, statuary, and paintings, there is no more sumptuous church-interior in the world. On the S. of the cathedral is the chief square, or Plaza de Armas, which is 810 by 600 feet. The E. side of the same is occupied by the government palace, which contains the residence of the president, bureaus of the cabinet ministers, the general post-office, the national archives, the national museum, and many other public offices, with a botanical garden in one of the courts. Under the Spanish régime this was the residence of the viceroys. One of the public squares, the plaza of Santo Domingo, is faced by several remarkable buildings—that of the old Inquisition, formally established in Mexico in 1571, now occupied as a school of medicine; the custom-house, and the convent of Santo Domingo with its beautiful chapel. The city is well provided with markets which are supplied with vegetables and flowers brought upon the canals from the *chinampas* or "floating islands," public hospitals, asylums, and other institutions of beneficence. The National Museum contains a rare collection of articles throwing light upon the aboriginal history of Mexico, including the great Calendar Stone of the Toltecs, a huge statue of Huitzilopochtli, and a massive sacrificial stone. The Academy of San Carlos, founded by Charles III. of Spain, contains the largest and most valuable collection of paintings in America. The principal public pleasure resorts are the Alameda, shaded with superb trees; the Paseo de la Viga, along the canal of that name; and the Paseo de Bucareli, or public drive, adorned with fountains and a fine bronze equestrian statue of Charles IV. Several societies are fostered by the government, such as that of natural history, of mines, and of geography and statistics, a particularly useful and creditable association, from the comprehensive, zealous, intelligent labors of its members. The National Library, occupying the ancient church of San Agustin, lately remodelled and rebuilt at great expense by the government, has 103,000 volumes. Another library, founded in 1870, known as the "Cinco de Mayo," embraces only about 12,000 volumes, many of which, however, are well-selected, recent acquisitions in French and English. Two noble aqueducts constitute a striking architectural feature of the city. The city government is presided over by a governor appointed by the president, and an elective municipal council or *ayuntamiento*. The population of the city was 137,000 in 1803, 205,430 in 1838, and is now (1875) estimated at 260,000. The population of the federal district (85 square miles, including the cities of Tacubaya, Guadalupe, and Tealpam) is about 320,000. THOMAS JORDAN.

Mexico, post-tp. of Oxford co., Me. Pop. 458.

Mexico, post-v., cap. of Audrain co., Mo., 108 miles N. W. of St. Louis, near the junction of the St. Louis Kansas City and Northern and the Louisiana and Missouri River R. Rs., contains 1 female seminary, a public school, 10 churches, a fine court-house, mills, and stores. Pop. 2602.
HUTTON & JACKS, PUBS. "MEXICO INTELLIGENCER."

Mexico, post-v. and tp. of Oswego co., N. Y., 15 miles E. of Oswego, on the Oswego and Rome R. R., has an academy, 5 churches, 1 bank, 1 weekly newspaper, 3 flour and grist mills, a foundry, 1 tannery, 2 carriage-factories, 1 sash and blind factory. Pop. of v. 1204; of tp. 3802.
HENRY HUMPHRIES, ED. "MEXICO INDEPENDENT."

Mexico, post-v. of Walker tp., Juniata co., Pa., on the N. side of the Juniata River and on the Pennsylvania Canal.—MEXICO R. R. STATION, on the Pennsylvania R. R., is on the S. side of the river, in Turbett tp. Pop. of v. 102.

Mexico, Gulf of, is a vast inlet of the Atlantic on the eastern shore of North America, between the two peninsulas of Yucatan and Florida, bounded by Mexico, the U. S., and the island of Cuba, and covering an area of nearly 800,000 square miles. The Gulf Stream enters it through the Yucatan Channel, traverses it in a curved line, and leaves it through the Florida Channel, and this circumstance makes the temperature of its water several degrees higher than that of the Atlantic. From September to March it is visited by violent northern gales.

Meyer, county of S. Dakota, bounded S. by Nebraska. It is diversified and is watered by affluents of White River.

Meyer (HEINRICH AUGUST WILHELM), TH. D., b. at Gotha Jan. 10, 1800. As early as 1831 his labors as an exegetical commentator upon the New Testament were recognized in Germany as uniting sound learning and the most searching criticism with an orthodox, conservative faith. From that day to the period of his death (June 24, 1873) the circle of his commentaries spread wider and wider, and with the aid of kindred scholars he was constantly putting forth new editions, masterpieces of exegesis. Besides these commentaries he also edited a leading work on the Evangelical confession, and at the same time held high office (*Ober-consistorialrath*) in the church at Hanover, where he resided and preached for the larger part of his life. An English translation of his writings, designed to be complete, is in course of publication at Edinburgh under the supervision of Drs. W. P. Dickson, D. D., of the University of Glasgow, and F. Crombie, of St. Mary's College. Some four or five volumes have already appeared, embracing the commentaries on the Galatians, translated by G. H. Venables; the Romans, 2 vols., by Rev. J. C. Moore; and the Gospel of John, by Rev. Wm. Urwick. T. JORDAN.

Mey'er (JOHANN GEORG), b. at Bremen Oct. 28, 1813; studied at the Academy of Düsseldorf 1833–42; settled in Berlin in 1852; painted first biblical subjects, but turned afterwards to genre painting, in which field he achieved a great reputation. His pictures, of which several have been sold in America, and many become widely known by engravings, are always strikingly impressive.

Mey'erbeer (GIACOMO), otherwise JAKOB MEYER BEER, b. in Berlin Sept. 5, 1794; d. in Paris May 2, 1864. His father, James Beer, a wealthy Jew, who appreciated the value of culture and had a fondness for art, gave his three sons, Michael, Wilhelm, and Jakob, the full advantages of education. Giacomo (or Jakob) had a genius for music, and enjoyed the benefit of the best teaching that could be commanded. His instructors were Franz Lanska for the piano, and Karl Friedrich Zelter, the friend of Goethe and teacher of Mendelssohn, in musical science. His proficiency as a pianist became soon manifest, but the ambition to excel as a dramatic composer carried him away in that direction, and under new masters, Bernhart Anselm Weber and Georg Joseph Vogler, he pursued his career. In 1810 he was admitted to Vogler's select school at Darmstadt, and in close intimacy with Karl Maria von Weber, who had already composed operas, he studied hard and successfully for two years. At this time Meyerbeer composed an oratorio, *Gott und die Natur*. In 1812, under Vogler's auspices, the opera of *Jephthah* was produced at Munich. It failed, and the disconcerted composer, dropping dramatic music for a time, returned to the piano, and achieved great distinction in Vienna. A second opera, *Die Beiden Kalifen*, failed. Italian music alone was popular, and Meyerbeer went to Italy to learn the methods of the Italian school. Thenceforward his labor was successful. His *Romilda e Costanza* (1812) at Padua, his *Semiramide* (1819) at Turin, his *Emma di Resburgo* (1820) at Venice, were received with applause. In 1822, *Margaret of Anjou* was brought out triumphantly at the Scala in Milan. The next year *L'Esule di Grenata* was produced with Lablache and Pisaroni. In 1825 the *Crociato* was received with immense favor at Venice. This closed the first period in the composer's career. The second period opened in Paris with *Robert le Diable*, which was brought out in 1831, and roused unprecedented enthusiasm, not in Paris only, but in Germany and all over Europe. *The Huguenots* followed in 1836, and added new laurels to Meyerbeer's fame, it being the first of what may be termed "historical" as distinguished from the purely romantic lyric drama. The appearance of *The Huguenots* made an epoch in operatic art. Thirteen years passed before the *Prophète* was completed. In 1854 came *L'Étoile du Nord*, four years later *Dinorah*, both works inferior in dignity to the two preceding. *L'Africaine*, the work of years, waited long for an opportunity, and was not produced till 1865, a year after the composer's death. Other works by Meyerbeer comprise a *Miserere*, a *Te Deum*, a *Stabat Mater*, eight *canticles*, and numerous miscellaneous compositions, the *Camp of Silesia*, an opera, and music for *Struensee*, a drama composed by his brother Michael. The chief operas of Meyerbeer are too well known to need description, and they are too elaborate, various, and peculiar in musical technicalities to admit of description here. Their brilliancy as dramatic compositions, the splendor of their vocal and instrumental effects, together with the implied magnificence of their setting, entitle them to a distinguished place in the order of works to which they belong. (For the life of Meyerbeer see Blaize de Bury (1865) and Henri Mendel (1868).) O. B. FROTHINGHAM.

Meyers, county of S. Dakota, bordering on Nebraska, recently organized. Area, about 2800 square miles. It is watered by affluents of the White River.

Meyerstown, Pa. See MYERSTOWN.

Meyr (MELCHIOR), b. at Ehringen in Ries, a fertile plain included by the Franconian and Suabian Jura, Bavaria, June 28, 1810; studied at Munich and Heidelberg; devoted himself to literature; lived at Berlin 1840–52, afterwards alternately at Munich and Ehringen, where he d. Apr. 22, 1871. His best-known productions are *Stories from Ries* (1856), *New Stories from Ries* (1871), *Duke Albert* (1852), and *Charles the Bold* (1862).

Meyr'ick (FREDERICK), b. in England in 1826; educated at Trinity College, Oxford, where he was successively scholar, fellow, and tutor, and has since held the university offices of select preacher and public examiner. He was the chief founder of the Anglo-Continental Society; published *The Practical Working of the Church in Spain* (1851), *The Moral Theology of the Church of Rome* (1857), *The Outcast Poor of London* (1858), and controversial writings against Roman Catholicism; has contributed to Dr. Smith's *Dictionary of the Bible* and to the *Speaker's Commentary*.

Meyrick (Sir SAMUEL RUSH), LL.D., b. in London in 1783; educated at Queen's College, Oxford, and became an advocate in the ecclesiastical and admiralty courts, but devoted his chief attention to archæological studies, and contributed innumerable papers to the *Gentleman's Magazine*. His specialty was the collection and illustration of ancient armor, of which he ultimately formed a fine and well-arranged museum. Among his works were *The History and Antiquities of the County of Cardigan* (4to, London, 1810), *The Costume of the Original Inhabitants of the British Islands* (1815), *A Critical Inquiry into Ancient Armor* (1824; improved ed., 3 vols., 1844), with more than 100 carefully illuminated plates, and *Engraved Illustrations of Ancient Arms and Armor, a Series of 154 Etchings of the Collection at Goodrich Court* (2 vols., 1830). D. at London Apr. 2, 1848. His collection of armor is now deposited in the South Kensington Museum, London.

Mezeray', de (FRANÇOIS EUDES), b. in 1610 near Falaise, Normandy; commenced his literary career as a poet, but turned soon to historical studies, and published in 1643 the first volume of his *Histoire de France*, which procured for him the patronage of Richelieu, who gave him a pension of 4000 livres and the title of historiographer. His *Abrégé chronologique de l'Histoire de France* (1668) is considered better than the principal work. D. July 10, 1683.

Meze'reon [Pers. *madzaryoun*], in materia medica the bark of *Daphne mezereum*, *D. laureola*, *D. gnidium*, and other species of the genus, handsome shrubs of Europe and Asia, sometimes seen in cultivation in the U. S. They are of the order Thymeleaceæ. The bark has strongly irritant-narcotic properties. It was once extensively employed in medicine, and now has a limited use in rheumatism and other diseases. The fresh bark will quickly blister the skin.

Mézières', a fortified town of France, the capital of the department of Ardennes, stands on the Meuse, opposite Charleville, with which it is connected by a bridge. In 1520 it was successfully defended by Bayard against

Charles V., and his banner is still preserved in the hôtel de ville. Pop. 5818.

Mézières (Alfred), b. Nov. 19, 1826, at Rehon, in the department of Moselle, France; studied literature, and was appointed professor in Nancy in 1854, and at the Sorbonne in 1863. His most prominent works are *Prédécesseurs et Contemporains de Shakspeare* (1863), *Petrarque* (1867), both crowned by the Academy, and *Goethe* (1871).

Me'zö-Tur, town of Hungary, on the Berettyo, has large manufactures of pottery and earthenware, and a considerable trade in wine, corn, and cattle. Pop. 18,040.

Mez'zo [It.], in music, a term of diminution, signifying the half, middle, or mean between two things of a positive nature or description. Thus, a mezzo-soprano voice is one whose range is between the soprano and alto. Mezzo forte (or *m. f.*) is rather loud; and mezzo piano (or *m. p.*) rather soft. Mezzo voce, in like manner, implies the use of only half of the usual force of the voice.

Mezzofan'ti (Giuseppe Gaspardo), b. at Bologna Sept. 17, 1774. At the age of fifteen, besides Greek and Latin, he already knew many foreign European languages. Having entered the priesthood, he was appointed professor of Oriental languages and librarian at Bologna. In 1831 he removed to Rome, in 1833 succeeded Angelo Mai as chief keeper of the Vatican library, and in 1838 was made a cardinal. He is said to have spoken over one hundred languages. D. at Rome in 1848. His books and papers became the property of the library of Bologna. There exists but a single printed work of his, a eulogy pronounced in 1819 upon his old master in Greek, Emmanuele da Ponte. (See his *Life*, by Charles William Russell (1858; 2d ed. 1863).)

Mezzoju'so, town of Sicily, in the province of Palermo, in a rich grain and vine-bearing district. The inhabitants are in part Albanese, who took refuge here from the Turks in the fifteenth century, and who still speak their own language and observe the rites of the Greek Church. Pop. in 1874, 7161.

Mezzotint Engraving. See Engraving.

Mgleen, or **Mglin,** town of Russia, in Tchernigov, on the Sudinka, has cloth manufactures. Pop. 6327.

Miaco. See Japan.

Mi'all (Edward), b. at Portsmouth, England, in 1809; was educated at the Protestant Dissenters' College at Wymondley; became an Independent minister at Ware, and afterwards at Leicester; removed to London in 1841 and established the *Nonconformist*, of which he has ever since been editor and proprietor; was an unsuccessful candidate for Parliament in 1845 and 1847; was elected for Rochdale July, 1852; lost his seat 1857, but was again returned for Bradford in 1869. Mr. Miall has been perhaps the most conspicuous parliamentary advocate of manhood suffrage and opponent of all religious endowments. These services, added to those performed in an editorial capacity, were splendidly recognized by his political admirers, who entertained him at a dinner at the Crystal Palace July 18, 1873, and presented him the sum of 10,000 guineas. Among his works are *Views of the Voluntary Principle* (1845), *Ethics of Nonconformity* (1848), *Title-Deeds of the Church of England to her Parochial Endowments* (1861), *Politics of Christianity* (1863), and *Wayside Musings and Reminiscences* (1865).

Mia'mi, county of N. Central Indiana. Area, 384 square miles. It is heavily timbered and fertile, especially in the bottom-lands. Live-stock, grain, and wool are leading products. Lumber and carriages are the chief articles of manufacture. It is traversed by the Wabash River and by the Toledo Wabash and Western and the Chicago Cincinnati and Louisville R. Rs. Cap. Peru. Pop. 21,052.

Miami, county of Kansas, bounded E. by Missouri. Area, 576 square miles. It is nearly level, very fertile, and abounds in coal. Petroleum has been found. Grain and stock are leading products. The county is traversed by Osage River and by the Missouri River Fort Scott and Gulf and the Osage division of the Missouri Kansas and Texas R. R. Cap. Paoli. Pop. 11,725.

Miami, county of W. Ohio. Area, 410 square miles. It is somewhat uneven and very fertile. Live-stock, grain, tobacco, and wool are leading products. The manufactures include flour, carriages, clothing, brick, furniture, metallic wares, etc. The county is traversed by the Columbus Chicago and Indiana Central and the Dayton and Michigan R. Rs. Cap. Troy. Pop. 32,740.

Miami, tp. of Cass co., Ind. Pop. 1008.

Miami, tp. of Miami co., Kan. Pop. 725.

Miami, post-v. and tp. of Saline co., Mo., on the Missouri River. Pop. of v. 742; of tp. 3622.

Miami, tp. of Clermont co., O. Pop. 3491.

Miami, tp. of Greene co., O. Pop. 2784.

Miami, tp. of Hamilton co., O., lies between the Ohio and the Great Miami River, and is the south-westernmost township in the State. Pop. 2105.

Miami, tp. of Logan co., O. Pop. 1768.

Miami, tp. of Montgomery co., O., contains Miamisburg and other villages. Pop. 4418.

Miami (or **Mineam'i**) **Indians,** a tribe of Algonkins who once occupied a large part of the W. and N. W. of Ohio and a part of Indiana. In 1764 they had 350 warriors. They fought against the U. S. in the war of 1812. In 1818 they left Ohio, and in 1846 the greater part left Indiana, where a few still remain; 500 people of this tribe were removed in that year to what is now Linn and Miami counties in Kansas, where they have a reservation of 10,240 acres. They now number but 95, having been mostly destroyed by vice and intemperance. A few others have become citizens. Many have gone to the Indian Territory and joined themselves to the Peorias and Quapaws. The Indiana Miamis are good and peaceable citizens, numbering about 350. There are a very few in Michigan.

Miami River, in Dade co., Fla., rises in the Everglades and flows into Biscayne Bay. At its mouth is a fine grove of cocoa-palms.

Miami River, of Ohio, rises in Hardin co., runs in a S. W. course, passing the cities of Troy, Dayton, and Hamilton. It is a rapid stream, flowing through a beautiful, fertile, and populous valley, and joining the Ohio below Cincinnati. A canal has been cut along the river. It is 150 miles long, and furnishes much water-power. Its ultimate source is 1335 feet above tide.—The Little Miami is a smaller unnavigable stream, flowing through a fertile and hilly region to the E. of the Miami, and reaching the Ohio 6 miles above Cincinnati.

Miami University, an educational institution at Oxford, Butler co., O., incorporated in 1809; commenced as a grammar school in 1818, and as a college in 1824. It derives its origin from a grant of the township of Oxford, made by Congress to the State of Ohio in 1803, to be held in trust for educational purposes. The university is governed by a board of 18 trustees appointed by the governor of the State, and has four buildings. The presidents have been Rev. R. H. Bishop, D. D., 1824–40; Rev. George Junkin, D. D., 1840–44; Rev. E. D. McMaster, D. D., 1844–49; Rev. W. C. Anderson, D. D., 1849–54; Rev. J. W. Hall, D. D., and Rev. A. D. Hepburn.

Miam'isburg, post-v. of Montgomery co., O., in the centre of the tobacco-growing region of the Miami Valley, 50 miles N. of Cincinnati, on the Cincinnati Hamilton and Dayton, the Erie Atlantic and Great Western, and the Cleveland Columbus Cincinnati and Indiana R. Rs., has extensive water-power, excellent schools, 5 churches, 1 bank, several mills and factories, 1 foundry, 1 newspaper, several hotels, a fire department, and stores. Pop. 1425.

Blossom Bros., Props. "Miamisburg Bulletin."

Miantonomoh, sachem of the Narragansett Indians and nephew of Canonicus, assumed the government about 1636, in which year he concluded an alliance with the government of Massachusetts. He aided the colonists in the Pequod war 1637, and was friendly to Roger Williams and other early settlers of Rhode Island, to whom he made grants of land. Having engaged in war with Uncas, sachem of the Mohegans, he was taken prisoner, carried to Hartford, and by the advice and consent of the commissioners of the United Colonies was put to death by the tomahawk, Sept., 1643, near Norwich, on the spot where he had been defeated, afterwards called Sachem's Plain. A monument was there erected to his memory in 1844.

Mia'nus, a v. of Greenwich tp., Fairfield co., Conn., on Mianus River. Mianus P. O. is at Cos Cob, a station on the New York and New Haven R. R.

Mias'ma [Gr. μίασμα, "stain," from μιαίνειν, to "contaminate"], an emanation, especially that from the earth in low marshy districts, which is capable of penetrating the human system, and producing therein certain manifestations of disease. Of the nature of it we know nothing, whether gaseous, animal, or vegetable. It is never generated unless the average temperature of the day is 60° F., and sometimes a much higher temperature is required, as in yellow fever, which never occurs below 80° F. Another thing necessary for its production is moisture, hence we do not find it in dry or sandy regions. Besides these, it is essential that there should be vegetation; accordingly, we find it in the extensive marshes of warm latitudes, and not in high and cold regions. Exceptions to this rule may be found in the Dismal Swamp and in the bogs of Ireland, which do not produce it. New alluvial soils, when there is a subsoil of clay, are especially adapted to its production. Miasmatic diseases

may and do occur where miasm is not produced, as it may be carried from one place to another by rivers, and it seems to be more prevalent on the eastern than on the western bank. It is also found at the mouths of rivers. The drying up of an inundation is apt to reproduce it where it has previously existed. It is formed about meadows that have been flooded for the purpose of cultivation. A wet season followed by dry weather is eminently productive of it, but a continuous wet season not so. In miasmatic regions turning up the soil will give rise to this poison in great abundance. In the excavation of the Erie Canal the fever was renewed in regions where it had ceased. Mill-dams have been known to produce miasm. It can be conveyed by the wind over level surfaces for several miles.

The circumstances which are unfavorable to the production of miasm are — 1st, high latitudes and altitudes. Mountain-regions are generally free from this disease. Primitive forests are little subject to miasmatic affections, but whether this is due to the shade or to absorption by the leaves is not known. Free ventilation diminishes the danger, and the more stagnant the air the more concentrated will be the poison. Obstacles may be interposed to cut off the miasm. A screen of trees will very often preserve a house from malarious influence; this is true also of hills. Inundation appears to drown it out for a time, but as soon as the water disappears it returns. Cultivation of the soil while continued will drive away the miasm. The drainage of marshes is a protective measure, although it requires some years to exhaust it. This is very strikingly illustrated in the drainage of large cities. Cold has the power of destroying it, and when miasmatic diseases occur in winter they are due to exposure during the previous season. Certain plants growing in the marshes have the power of destroying it. Night adds to the power of the poison—day dissipates it. No point in the history of miasm is probably better settled than this. It is known to be more active on the ground than on neighboring elevations, and the upper stories of a house are safer than the lower. Many persons suffer from miasm without having fever; these persons lack mental and physical power; the countenance is pale, and the period of life is shortened. The influence of the poison may be seen even in animals, which are fat enough, but certain diseases of the viscera appear when they are prepared for market. Miasmatic fevers may return any number of times. Quinine will both cure and prevent them. EDWARD J. BERMINGHAM.

Miau'lis (ANDREAS VOKOS), b. in 1768 or 1772 at Negropont; received his surname, MIAULIS, from his commanding a small merchant vessel (Turk. *miaul*); settled in Hydra, where he built up an extensive commercial business; joined in 1821 the Greek revolution; was made commander-in-chief of the Greek fleet, and achieved several brilliant successes over the Turkish and Egyptian fleets, but retired in 1827 when Lord Cochrane was placed at the head of the Greek navy. Although afterwards reinstated in his office by Capo d'Istria, the president of the Greek republic, he joined the opposition; was member of the provisory government established in Hydra, and became much involved in the intrigues of the different parties. He was a member of the deputation which in 1832 went to Munich to offer the Greek crown to King Otho. D. at Athens June 24, 1835, and was buried near the mausoleum of Themistocles.

Miau-tse, a race of hillmen inhabiting the mountains of China. It has been conclusively shown that they are essentially the same with the Karens of Burmah. Many of them are independent and wage war against the Chinese.

Mia'va, town of Hungary, on the Miava, has manufactures of linen and cloth, breweries, distilleries, coal-mines, and extensive forests in which numerous herds of swine are fed. Pop. 9922.

Mi'ca [Lat. *micare*, to "shine"]. The micas constitute a group of very interesting and widely spread minerals, belonging to the Unisilicates, and containing silicic acid, with varying proportions of the alkalies, magnesia, lime, and protoxides of iron, with the sesquioxides of aluminium, iron, and manganese, usually a little fluorine, and more rarely titanium. Titanium occurs to the extent of 7 or 8 per cent. in the rare mica *astrophyllite*, which also contains zirconia. *Lepidolite*, which is confined to a few localities, and the very rare *cryophyllite*, contain an important percentage of lithia, with a little rubidia and cæsia. The micas occur generally in thin, shining scales, usually transparent, but opaque in some very dark varieties of *biotite* and *lepidomelane* (an iron-potash mica). More rarely, some of the micas are found in large plates, and occasionally six-sided prisms. Unless decomposed they are distinguished by a very easy cleavage, splitting readily into extremely thin, elastic laminæ, and showing usually a pearly lustre on the cleavage faces. The most important micas are *phlogopite, biotite, lepidolite,* and *muscovite*. *Phlogopite*, or *magnesia mica*, contains magnesia as well as potash, among the protoxides, with very little of the oxides of iron. It is orthorhombic, with an optic-axial divergence of 3°–20°. It is light colored, usually yellowish-brown, and very liable to alteration. Phlogopite occurs chiefly in serpentine, crystalline limestone, and dolomite. *Biotite* (*magnesia-iron mica*) is hexagonal, generally dark green or black, and is similar in composition to phlogopite, but with 5–10 per cent. of sesquioxide of iron; sometimes much more. *Lepidolite* is very interesting, because it contains the rarer alkalies. *Muscovite* (*potash mica*) contains principally potash among the protoxide bases, with some soda, and among the sesquioxides alumina, with generally 2 or 3 per cent. of sesquioxide of iron. It is orthorhombic, and has an optic-axial divergence of 44°–78°. Muscovite includes nearly all common mica, and is a constituent of granite, gneiss, and mica-schist; it is also found sometimes in shales and other sedimentary rocks in small scales, and may occur in eruptive rocks and granular limestone. Being usually of light color, quite transparent, and very tough, it becomes valuable when found in plates of considerable size, and is then used in stoves for doors, etc. There are very few localities where marketable mica is found, the supply for this country being almost confined to mines in Haywood, Yancey, Mitchell, and Macon cos., N. C., where the mineral is found in granitic rock with coarse feldspar. It is regularly mined, and there are manifest traces of work done by the inhabitants of the same region many years ago. Mica is reported to have been found in working quantity near Salt Lake, but none is yet obtained for the market. At present mica is exported from this country to Europe. It has been proposed to import it from the East Indies, where it is said to occur in quantity. The demand for mica exceeds the supply, and hence it is a valuable article of commerce. The mineral is sold by the pound, at prices varying according to the size of the plates and regulated by a scale. The plates can be split to suit the purchaser. H. B. CORNWALL.

Mi'cah, one of the minor Hebrew prophets, was b. at Moresheth, near Gath. He lived in the latter half of the eighth century B. C. He was an older contemporary of Isaiah. Mic. iii. 12 is quoted in Isa. xxvi. 18 to justify the latter in foretelling the destruction of Jerusalem. Micah's prophecies are written in a vivid, poetical style, and refer chiefly to the fate awaiting the two Hebrew nations. The style is not unlike that of Isaiah. Micah deals with social and popular rather than political sins. His prophecies, as we have them, some consider incomplete.

Mica'li (GIUSEPPE), b. at Leghorn about 1776; studied archæology, travelled much, and published in 1810 *Italia avanti il dominio de' Romani* (4 vols., with maps and illustrations); in 1832, *Storia degli antichi popoli italiani* (3 vols.; much enlarged in 1843); and *Monumenti Antichi* (1 vol., with 120 plates) in 1844.

Mi'ca-Schist, a metamorphic, stratified, schistose, crystalline rock, always foliated in texture, and composed of variable proportions of mica and quartz. It gradually passes in one direction into gneiss and in another into quartz-schist. *Argillaceous mica-schist*, according to Cotta, may be regarded as "an imperfect mica-schist, or as a somewhat crystallized clay-slate." EDWARD C. H. DAY.

Michael Angelo. See ANGELO BUONARROTI.

Michael Palæologus. See BYZANTINE EMPIRE.

Michae'lis (JOHANN DAVID), b. at Halle Feb. 27, 1717; studied theology, Oriental languages, and biblical archæology under his father, who was professor at the university; travelled in Holland and England, and was appointed professor in 1745 at the University of Göttingen, where he d. Aug. 22, 1791. His works, the results of immense learning and great acuteness, are very numerous, and contributed much to a fuller understanding of Holy Writ, especially the Old Testament. His theological standpoint may be indicated as a transition from the old orthodoxy to the subsequent rationalism, and on his age he exercised a considerable influence. His principal works are *Introduction to the New Testament* (2 vols., Göttingen, 1750), translated into English by Bishop Marsh, and *Commentaries on the Laws of Moses* (6 vols., Frankfort, 1770–75), translated into English by Alexander Smith (1814).

Mich'aelmas, the festival of St. Michael the Archangel, celebrated on Sept. 29.

Michaud' (JOSEPH), b. at Albens, Savoy, June 19, 1767; went to Paris in 1790; wrote in the *Gazette Universelle, Postillon de la Guerre*, and *Courrier Républicain*, three royalist papers, and showed himself a staunch defender of the monarchy; founded in 1794 the *Quotidienne;* was condemned to death Oct. 27, 1795, for his anti-revolutionary opinions, but succeeded in getting the verdict annulled; was banished to Cayenne by the Directory, but escaped

and hid himself among the Jura Mountains, where he wrote his popular poem, *Le Printemps d'un Proscrit*, which was published in 1803; returned to Paris under the consular government, but continued to adhere to the cause of the Bourbons, and addressed his *Adieux à Bonaparte* and *Derniers Adieux à Bonaparte Victorieux* to Napoleon, for which he was confined in the Temple; formed, with his brother and Giguet, a publishing firm, and devoted himself principally to historical studies, though he once more, after the Restoration, took up journalism and renewed the *Quotidienne*. His principal historical works are—*Histoire de l'Empire de Mysore* (2 vols., 1801), *Histoire de Croisades* (3 vols., 1812–17), *Correspondance d'Orient* (7 vols., 1830–39), *Collection de Mémoires pour servir à l'Histoire de France* (20 vols.). He also participated in the production of the edition of the *Biographie Universelle* published from 1811 to 1828. D. at Passy Sept. 30, 1839.

Michaux′ (ANDRÉ), botanist, b. at Satory, near Versailles, France, Mar. 7, 1746, was the son of a rich farmer, and was bred to agriculture; studied botany under the Jussieus; in 1779 sent many British trees to France for culture; botanized in Spain in 1780, and collected seeds for French cultivators; was in Asia 1782–85, whence, after many adventures, he returned with a rich supply of seeds and plants; was 1785–97 the French agent in North America for the collection of useful trees and shrubs for naturalization in France; made near Charleston, S. C., and New York, large nurseries for arboriculture. After suffering shipwreck and the loss of his effects, and waiting in poverty and hunger for the arrears of his pay, he started in 1800 upon Baudin's expedition to Australia, but at the Mauritius left the expedition and went to Madagascar, where he d. Nov. 13, 1802. His principal works are a *Treatise on the Oaks of North America* (in French, 1801) and a *Flora Boreali-Americana* (1803).

Michaux (FRANÇOIS ANDRÉ), M. D., son of André Michaux, b. at Versailles in 1770; for a time was his father's assistant in the U. S., and was himself sent in 1802, and again in 1806, to explore the botany of the Mississippi Valley and collect useful seeds. He published a *Treatise on the Naturalization of American Forest Trees* (1805), a *Journal* of his travels, a work on the Bermudas (1806), *North American Sylva* (in French, 1810–13; in English, the translation by Mr. Hillhouse, 1817–19; completed by Nuttall and others 1842–50). In 1816, Michaux was received into the French Academy of Sciences. D. at Vauréal, France, Oct. 23, 1855.

Michel′ (FRANCISQUE XAVIER), b. at Lyons, France, Feb. 18, 1809; educated at the Lyceum of Charlemagne, Paris, wrote a few novels; edited a vast number of old English, Anglo-Saxon, and French MSS.; became in 1839 professor of foreign literature at Bordeaux; translated several important works from the English. Author of *Histoire des Races maudites de la France et de l'Espagne* (1847), *Le Livre d'Or des Métiers* (1851–54), *Histoire des Tissus de Soie au Moyen Age* (1852–54), *Le Pays Basque* (1858), *Les Écossais en France et les Français en Écosse* (1862), *Histoire du Commerce, etc. à Bordeaux* (1867–71).

Michelet′ (JULES), b. at Paris Aug. 21, 1798, and educated at the Lyceum of Charlemagne, in which he was elected professor in 1821. After the revolution of 1830 he was appointed chief of the historical section of the royal archives, and in 1838 professor of history and morals at the Collége de France. In 1851 he lost his position both at the archives and at the university, as he refused to take the oath of allegiance to Louis Napoleon. D. at Hyères Feb. 9, 1874. Of his historical writings, the most important are, *Histoire de France* (12 vols., 1833–60), *Histoire de la Révolution* (7 vols., 1847–53), *Précis de l'Histoire moderne* (1827), *Histoire Romaine* (2 vols., 1831); of his polemical writings are *Les Jesuits* (1843), *Du Prêtre, de la Femme, de la Famille* (1844), *Le Temple* (1846), *Pologne et Russie, Legende de Kosciusko* (1851), *Principautés danubiennes* (1853); of his miscellaneous writings, *L'Oiseau* (1856), *L'Insecte* (1857), *L'Amour* (1858), *La Femme* (1859), *La Montagne* (1868), *Nos Fils* (1869).—His second wife, ATHANAISE MICHELET, who survived him, assisted him in these latter works.—As an historian Michelet pictures the general state of the civilization of an age and the principal agents in the historical evolution, but he does not demonstrate the underlying continuity of facts. In his polemics it is his sarcasm and his pathos which gain the victory, not his arguments; and in his moral and miscellaneous writings it is his ready sympathy with everything beautiful and noble and good, rather than his ideas, which captivates us. His style is a combination of all kinds, naïve and paradoxical, dry and inspired, sarcastic and enthusiastic; but it is always clear and suggestive.

Michelet (KARL LUDWIG), b. at Berlin Dec. 4, 1801; studied first law and afterwards philosophy, and was appointed professor of philosophy at the University of Berlin in 1829. Of interest for the study of Aristotle are his *Ethik des Aristoteles* (1827) and *Examen critique du Livre d'Aristote, intitulé Métaphysique* (1836), which was crowned by the French Academy. Interesting for the study of German philosophy are his *Geschichte der lezten Systeme der Philosophie in Deutschland* (1837), *Schelling und Hegel* (1839), *Entwickelungsgeschichte der neuesten deutschen Philosophie* (1873). His own standpoint is principally developed in his *Die Persönlichkeit des Absoluten* (1844), *Der historische Christus* (1847), *Die Zukunft der Menschheit* (1852), *Naturrecht oder Rechtphilosophie* (1866).

Mich′igan, one of the Northern Central States of the Union, lying among the great lakes, and forming on its northern line a part of the northern boundary of the U. S., lying between the parallels of 41° 42′ and 48° 22′ N. lat., and between the meridians of 82° 26′ and 90° 30′ W. lon. from Greenwich. Its northern boundary is the line running through Lake Superior, which forms the boundary between the U. S. and British America, most of the islands of the lake belonging to Michigan; its eastern boundaries are the north-easternmost channel of the straits connecting Lake Superior and Lake Huron, Lake Huron, St. Clair River or Strait, Lake St. Clair, and the Detroit River or Strait connecting Lake St. Clair and Lake Erie; the southern boundary of the lower peninsula is a part of the States of Ohio and Indiana, the latter State extending to a line

Seal of Michigan.

about 4 miles farther N. than Ohio; the upper peninsula is bounded on the S. by Lake Huron, the Straits of Mackinaw, Lake Michigan, Green Bay, and the N. line of Wisconsin; the western boundary of the lower peninsula is Lake Michigan; of the upper peninsula, Lake Superior and Wisconsin. The extreme length of the State from N. to S., from the channel N. of Isle Royale to the Ohio line, is about 465 miles; the upper peninsula is 320 miles in its greatest breadth from E. to W., and 130 from N. to S.; the lower peninsula is 275 miles from N. to S., and 200 from E. to W. Its area is 56,451 square miles, or 36,128,640 acres.

Face of the Country.—The State is divided naturally into two irregular peninsulas, separated from each other by the Straits of Mackinaw, the lower having its projection northward—the upper, eastward. The latter contains about one-third or a little more of the area of the State, and has a rugged, mountainous, and broken appearance; a range of mountains called the Porcupine Range forming the watershed between the streams flowing into Lake Superior and those flowing into Lake Michigan. This range at its highest point is about 2000 feet above the sea, or nearly 1400 above the lake. From this range there proceeds on either side an elevated table-land sloping gradually toward the lakes. The country is rocky, abounding in mineral wealth, but generally sterile, though a part of it is covered with dense forests. The portions nearest to the lake are often sandy plains. The lower or southern peninsula is very nearly level, the watershed being seldom more than from 125 to 250 feet above the lakes, which are themselves nearly 600 feet above the sea. The watershed is nearer Lake Huron than Lake Michigan, and has a gentle slope toward Michigan; the shores of the lakes are often steep and elevated, those on Lake Michigan especially being from 100 to 250 feet above the lake, and bold, water-worn bluffs.

Coasts, Lakes, Bays, and Rivers.—The extent of the lake-coast of Michigan is very great, exceeding 1100 miles, and including numerous bays and excellent harbors. The northern peninsula has Keweenaw Bay, Marquette harbor, Tequamenon Bay, the bays and inlets around St. Mary's River; and on its southern shore, Mackinaw Bay and Strait, the Big and Little Bays de Noquet, and the long and deep Green Bay. The lower peninsula has on the

Lake Huron side Thunder Bay, Saginaw Bay, and the fine and sheltered roadsteads of Port Huron, the St. Clair and Detroit rivers, and Lake St. Clair: and on Lake Erie, Monroe harbor. On the W. or Lake Michigan side are several artificial harbors, such as New Buffalo, South Haven, Grand Haven, and Ludington, all more or less exposed to the W. winds; and farther N., Grand Traverse and Little Traverse bays, which are excellent and sheltered harbors. Besides the four great lakes, Superior, Michigan, Huron, and Erie, and the smaller one, St. Clair, which form so large a part of the boundaries of the State, there are hundreds of small lakes, which add largely to the beauty of the scenery, although they may not count among the navigable waters of the State; the larger share of these is in the northern peninsula, though the southern has a considerable number. The southern part of the lower peninsula, now the garden and orchard of the North-west, was at first encumbered with swamps, and was regarded, as we shall presently see, as worthless. The principal rivers of the State are in the upper peninsula—the Ontonagon, Tequamenon, Escanaba, White Fish, Michigaunne, and Manistique rivers; in the lower peninsula, the Cheboygan, Thunder Bay, Au Sable, and Saginaw, discharging into Lake Huron; Racine River into Lake Erie; Grand Kalamazoo, St. Joseph, Muskegon, and Manistee into Lake Michigan; the so-called Detroit and St. Clair rivers are only straits connecting the lakes with each other. The islands are very numerous: Isle Royale in Lake Superior and its dependent islands, now forming a county of the State, are the farthest N.; the Beaver, Fox, and Manitou isles in the northern part of Lake Michigan, Bois Blanc in the Mackinaw Straits, Drummond Island in Lake Huron, the Sugar Islands in the Straits of St. Mary, are the others of most importance.

Geology and Mineralogy.—The geology of the upper peninsula, which has recently been very thoroughly investigated by Prof. Pumpelly and his associates, is somewhat complicated. Beginning with its southern shores, we find a tolerably broad belt, extending from Drummond Island to the Big Bay de Noquet, of members of the Niagara group of the Silurian rocks; immediately N. of these, and extending about the same distance from E. to W., is a narrow belt of the next lower member of the Silurian, the Hudson River group, followed in turn by a somewhat broader one of Trenton limestones; to this succeeds a narrow belt of Cretaceous rocks, and thence to White Fish Bay and Lake Superior the Potsdam sandstones, the lowest member of the Silurian. W. and N. of the Menominee River the Potsdam sandstone gives place for a time to other and earlier rocks. Broad patches of the Laurentian group alternate with the Huronian group, the matrix of the vast deposits of iron the next above it in geological order, and then the Potsdam sandstone again crops out, lining the shores of Keweenaw Bay and the coast of Lake Superior E. of that bay. From the extreme end of Keweenaw Point, and indeed from the Little Manitou Island E. of it (as well as on a considerable portion of Isle Royale and other islands to the N.), we find the copper-bearing strata, extending westward to the Minnesota line. These strata are Eozoic, and are perhaps more fully charged with copper ores of great richness and value than any other copper-bearing rocks in the world. Beyond these, on the N. W. shore of the peninsula, at the back of the long promontory of Keweenaw Point, these copper-bearing rocks are overlaid by the pre-Silurian sandstone, the next group above them. There is a small outcrop of the Onondaga limestone and the Helderberg limestones on Bois Blanc Island and the northern shores of Mackinaw Straits. The lower peninsula is composed wholly of the groups of the Appalachian series, the coal-measures, the highest member of the series, occupying the central portion of the peninsula and covering an area of 7000 square miles. The coal-field proper extends from about the middle of Saginaw Bay to the line of the Michigan Central R. R. Though occupying the highest portion of the peninsula, it is mostly found at such depth as to require constant pumping to keep the mines free from water. The coal is bituminous and of fair quality, though not the best. For smelting purposes it is said to be inferior to the Indiana or Ohio block coal. Salt is another product of the coal-measures, and immense quantities are made, of excellent quality, in the neighborhood of Saginaw Bay. In Bay, Saginaw, and Kent cos., outside the coal-field, the underlying Carboniferous limestone crops out, yielding at some points plaster of Paris and gypseous shales. Around these appear the Portage and Chemung groups, principally slates and sandstones, and still beyond and sweeping down into Indiana and Ohio, and extending up to Mackinaw Straits, the limestones and other strata of the Niagara and Helderberg groups. The principal value of these is to give fertility to the soil; they contain no minerals of importance. The production of copper and iron from the ores, and of salt from the salt springs of the Saginaw region, has placed Michigan in the first rank of mining States, and her other productions of the quarry and mine, such as the slates from the upper peninsula, coal, gypsum, grindstones, petroleum, building-stone, etc., though important in themselves, are hardly to be considered in connection with these greater interests. The following statistics of the production of copper and iron from these mines will be of interest. It should be noticed that in both the amount of ores and of metal is given, and that in the iron-mines both magnetic and specular iron ores are found. Thirty-four copper-mines are reported, and 21,894 tons 1892 pounds of copper ores were raised in 1874. Of the 39,304,833 pounds of ingot copper produced in the year ending Dec. 31, 1874, 34,654,433 pounds were the product of the Michigan Lake Superior mines, and its estimated value was $7,623,975.26. There are in what is known as the Marquette iron-region in Marquette and Houghton cos. between 50 and 60 iron-mines. These mines raised in the year 1874, 935,490 tons of iron ore, valued in the cars at the mines at $5,058,979. There are in the same region 17 charcoal pig-iron furnaces, which produced in the same year 90,494 tons of pig-iron, worth $2,533,832 at the furnace, and shipped 84,489 tons of pig-iron to market, worth at its average value $2,703,648. This mining of iron ores commenced about 1856. The following table shows what has been its growth in nineteen years:

Product of Lake Superior Iron-Mines and Furnaces, 1856–74, inclusive.

Year.	Iron ore, tons.	Pig iron, tons.	Ore and pig iron, tons.	Value.
1856.........	7,000	....	7,000	$28,000
1857.........	21,000	....	21,000	63,000
1858.........	31,035	1,620	32,664	249.202
1859.........	65,679	7,258	72,937	575,520
1860.........	116 908	5,660	122,568	736,496
1861.........	45,430	7,970	53,400	419,501
1862.........	115,721	8,590	124,311	984,977
1863.........	185,257	9,813	195,070	1,416,935
1864.........	235,123	13,832	248,955	1,867,215
1865.........	196,256	12,283	208,539	1,590,430
1866.........	296,972	18,437	315,409	2,405,960
1867.........	466,076	30,911	496,987	3,475,820
1868.........	507,813	38,246	546,059	3,992,413
1869.........	633,238	39,003	672,241	4,968,435
1870.........	856,471	49,298	905,769	6,300.170
1871.........	813,379	51,225	864,604	6,115,895
1872.........	952,055	63.195	1,015,250	9,188,055
1873.........	1,167,379	71,507	1,238,886	11,395,887
1874.........	935,488	90,494	1,025.982	7,592,811
Total....	7,648,280	519,351	8,167,631	$63,366,731

Soil and Vegetation.—It was long supposed, even by those who had investigated the subject to some extent, that the soil of the southern peninsula of Michigan was too swampy and its climate too deadly, from the excess of malaria, to make it habitable. In May, 1812, Congress voted for the soldiers of the second war with Great Britain 6,000,000 acres of bounty-lands, to be taken in equal quantities from the Territories of Louisiana, Illinois, and Michigan, as a reward for their services. On Apr. 29, 1816, they repealed so much of this act as referred to the Territory of Michigan, on the ground that there were no lands in Michigan fit for cultivation, and allotted the soldiers their lands elsewhere. The surveyor-general of Ohio reported to the commissioner of the general land-office on Nov. 30, 1815, a detailed account of the Michigan lands, which we give below in a foot-note.* And yet this region,

* "*Description of the Military Lands in Michigan.*—The country on the Indian boundary-line, from the mouth of the great Auglaize River, and running thence for about fifty miles, is (with some few exceptions) low, wet land, with a very thick growth of underbrush, intermixed with very bad marshes, but generally very heavily timbered with beech, cottonwood, oak, etc.; thence continuing N., and extending from the Indian boundary eastward, the number and extent of the swamps increase, with the addition of numbers of lakes from twenty chains to two and three miles across. Many of the lakes have extensive marshes adjoining their margins, sometimes thickly covered with a species of pine called 'tamarack,' and other places covered with a coarse, high grass, and uniformly covered from six inches to three feet (and more at times) with water. The margins of these lakes are not the only places where swamps are found, for they are interspersed throughout the whole country, and filled with water, as above stated, and varying in extent. The intermediate space between these swamps and lakes, which is probably near one-half of the country, is with a very few exceptions a poor, barren, sandy land, on which scarcely any vegetation grows except very small, scrubby oaks. In many places that part which may be called dry land is composed of little, short sandhills, forming a kind of deep basins, the bottoms of many of which are composed of a marsh similar to the above described. The streams are generally narrow, and very deep compared with their width, the shores and bottoms of which are (with a very few exceptions) swampy beyond description; and it is with the utmost difficulty that a place can be found over which horses can be conveyed. A circumstance peculiar to that country is

so despised that the skilful surveyor thought that hardly one acre out of a thousand would in any case admit of cultivation, has proved to be the garden of the North-west, and now sustains a population of 1,350,000 souls, with ample room and ample sustenance for fifteen or twenty millions more. The swampy lands were readily drained, the forests of pine, spruce, hemlock, and tamarack proved to be themselves sources of wealth, and the soil of the lower peninsula was found to possess remarkable fertility, its readily disintegrating limestones fertilizing the soil so constantly, that little or no manures were required for years. The soil of the upper peninsula, though much of it covered with dense and heavy forests, is more sterile, but will yield fair crops with diligent cultivation, while its immense mineral wealth renders it desirable for a residence independent of the qualities of its soil. The timber of this region is mostly white pine, spruce, hemlock, birch, aspen, oak, elm, maple, and ash. Indian corn will not always ripen, in consequence of the shortness of the season, but wheat, rye, barley, and oats do well. Most of the larger fruits require a longer season than they find here, though the small fruits generally do well. In the southern peninsula Indian corn and all the cereals grow very abundantly, and the State is one of the great grain-growing States. The south-western part is also noted as a fruit-region, supplying peaches, pears, and apples to the whole North-west; the upper portion of this southern peninsula is remarkable for its fine forests, and its pine, spruce, hemlock, and cedar lumber is largely exported. Its forest trees also include black walnut, sugar-maple, hickory, oak, bass-wood, linden, ash, beech, elm, locust, dogwood, sycamore, chestnut, tamarack, and cypress. The oak-openings and prairies, when not under cultivation, have a great profusion of wild flowers, including many genera and species not elsewhere found in as high latitudes.

Zoology.—The extensive forests of the State shelter large numbers of wild animals, though the larger and more ferocious are so constantly hunted for their pelts that they are rapidly diminishing. The black bear, wolf, lynx, wild-cat, panther, fox, weasel, marten, badger, skunk, mink, otter, raccoon, opossum, marmot, beaver, hare, rabbit, and squirrel are yet in considerable numbers; the elk is rare, but occasionally found, while deer are yet plenty in some sections. The lakes abound in fish, and the trade in white-fish is very large. Much pains have also been taken by the commissioners of fisheries to stock the waters of the State with salmon, shad, trout, black bass, and other edible fish. The birds of the State are numerous, and many of them are very beautiful in plumage and melodious in song.

Climate and Meteorology.—Extending as it does through nearly six degrees of latitude, there is of course a considerable variation in the climate of Michigan. The lower peninsula, being almost surrounded by large bodies of water, has a milder climate than regions farther E. in the same latitudes; but the upper peninsula has a rigorous climate in winter, and a short, hot summer. The mean annual temperature of the lower peninsula is about 47° 25′; that of the upper peninsula, about 40° 40′. This is too low a mean for the ripening of Indian corn or most of the grapes, but the hardier grains thrive in the upper peninsula. The lower peninsula for many years suffered in its more marshy sections from bilious and intermittent fevers, dysentery, etc., but these are now much less prevalent. The 5th Registration Report of the State for the year ending Jan. 1, 1872, published in 1874, gives the following fifteen causes of death, and the proportional number of deaths from each out of every 100 deaths: Consumption, 13.39; scarlet fever, 1.15; pneumonia, 4.53; old age, 3.82; typhoid fever, 3.67; heart disease, 2.36; diarrhœa, 2.22; inflammation of the brain, 2.21; dropsy, 2.16; casualties, 2.53; inflammation of bowels, 1.89; brain disease, not inflammatory, 1.78; dysentery, 1.77; croup, 1.57; lung disease, 1.56. The entire number of deaths from all causes in 1871 was 9728—viz. 5190 males, 4503 females, and 35 sex not known. The entire number of births was 25,992—13,596 males, 12,327 females, 69 sex not known. The following table gives the meteorological statistics of nine points, six in the lower and three in the upper peninsula, representing nearly every part of the State:

METEOROLOGICAL DATA.	Monroe, lat. 41° 54′ N., lon. 83° 13′ W.; elevation, about 625 feet.	Detroit, lat. 42° 21′ N., lon. 83° 07′ W.; elevation, 656.3 feet.	Agricultural College, near Lansing, lat. 42° 56′ N., lon. 84° 29′ W.; elevation, about 630 feet.	Grand Haven, lat. 43° 05′ N., lon. 86° 15′ W.; elevation, 616.3 feet.	Alpena, lat. 45° 05′ N., lon. 83° 30′ W.; elevation, 608 ft.	Northport, lat. 45° 08′ N., lon. 85° 41′ W.; elevation, about 617 feet.	Escanaba, lat. 45° 4′ N., lon. 87° 05′ W.; elevation, 601.6 feet.	Marquette, lat. 46° 33′ N., lon. 87° 36′ W.; elevation, 666.3 feet.	Ontonagon, lat. 46° 53′ N., lon. 89° 37′ W.; elevation, about 600 feet.
Temperature:	°	°	°	°	°	°	°	°	°
Mean temp. year......	52.47	45.5	49.10	44.6	43.95	46.40	40.01	38.30	44.33
Highest " "	99	....	99	....	83	93	....	....	90
Lowest " "	−7	....	−13	....	−3	−12	....	....	−24
Range " "	106	....	112	....	86	105	....	....	114
Mean temp. winter...	28.61	21.2	24.81	20.76	20.51	23.38	13.30	14.17	18.31
Highest " "	52	....	52	....	36	49	....	....	46
Lowest " "	−7	....	−13	....	−3	−12	....	....	−24
Range " "	59	....	65	....	39	61	....	....	70
Mean temp. spring...	49.76	43.3	48.66	42.3	39.63	43.22	37.66	31.83	41.38
Highest " "	88	....	88	....	76	82	....	....	90
Lowest " "	8	....	−4	....	10	−4	....	....	−14
Range " "	80	....	92	....	66	86	....	....	104
Mean temp. summer..	76.34	69.9	71.79	68.87	61.81	67.02	67.63	61.83	67.7
Highest " "	99	....	99	....	83	93	....	....	90
Lowest " "	56	....	49	....	44	48	....	....	46
Range " "	43	....	50	....	39	45	....	....	44
Mean temp. autumn..	55.14	47.97	51.50	45.29	50.73	51.95	42.10	42.00	49.92
Highest " "	88	....	90	....	74	82	....	....	78
Lowest " "	28	....	13	....	22	23	....	....	20
Range " "	60	....	77	....	52	59	....	....	58
Rainfall:	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
Year, total amount...	33.76	28.54	37.76	36.43	35.58	48.80	25.70	23.46	31.37
Winter " "	4.68	4.21	5.70	12.66	11.31	5.97	1.42	1.11	5.18
Spring " "	3.61	10.01	6.19	9.28	7.17	10.02	5.17	3.73	5.44
Summer " "	15.88	8.75	19.82	9.35	8.97	23.50	10.08	12.24	9.97
Autumn " "	9.59	5.55	6.03	5.16	8.13	12.32	9.03	6.38	10.76
Winds:									
Year, prev'g winds	N., W., N. W., S. W.	S. W., W., N. W., E.	S. W., W., N. E.	S. W., W., N. W., E.	W., N. W., S., S. E.	W., N. W., S., E.	S. W., N. W., W.	N. W., W., S. E., calm.	S., S. W., N., N. E.
Winter, " " ..	N. W., S. W.	W., S. W., N. W.	S. W., W.	W., S., E.	W., S., N. W., S. W.	N. W., W., S., S. E.	W., N. W., calm, N.	W., N. W., S. W., calm.	S. W., S., N. E., N.
Spring " " ..	N., N. N. W., W.	N. W., E., S. W.	S. W., W., N. E.	S. W., W., N. W.	W., N. W., E., calm.	W., N. W., S. W.	N., S., N. E.	N.W., calm, N.	S., S. W., N. W., N.
Summer, " " ..	W., N. W.	W., S. W., E.	S. W., W., N. E.	S. W., calm, W., N. W.	S. E., W., E., calm.	S. W., W., N. W.	S., N., N. E.	Calm, N. W., S. E., S. W.	S., S. W., W., N. W.
Autumn, " " ..	S. W., S.	S. W., W., N. W.	S. W., W., N. E., N. W.	N. W., S. W., W.	N. W., W., S. W., S. E.	W., N. W., S. W., S. E.	S. W., S., N. W., W.	W., S. W., S. E., N. W.	S. W., W., N. W., N.
Barometer:									
Year, mean pressure.	......	29.986	28.876	29.959	29.986	......	29.936	29.986	
Winter " "	......	30.050	28.815	30.010	30.039	......	29.977	30.139	
Spring " "	......	29.921	28.868	29.896	29.966	......	29.889	29.953	
Summer " "	......	29.954	28.867	29.942	29.976	......	29.928	29.968	
Autumn " "	......	30.019	28.955	29.987	29.994	......	29.950	29.953	

Agricultural Productions.—Michigan stands high as an agricultural State. In 1874 it had 113,413 farms, and of its 36,128,640 acres (which include its lakes), 10,213,692 acres were in farms and 5,540,840 acres were under improvement. Of this improved land, over 2,000,000 acres were devoted to corn and cereals; 1,134,484 acres in 1873 were devoted to wheat alone, and wheat was sown upon 140,000 acres more in 1874. Indian corn was grown on 641,329 acres in 1873; the grain-crops of 1873 were—wheat, 15,456,202 bushels; Indian corn, 20,792,911; all other

exhibited in many of the marshes by their being thinly covered with a sward of grass, the walking on which evinced the existence of water or a very thin mud immediately under their covering, which sinks from six to eighteen inches from the pressure of the foot at every step, and at the same time rising before and behind the person passing over. The margins of the lakes and streams are in a similar situation, and in many places are literally afloat. On approaching the eastern part of the military lands, towards the private claims on the *straights* and lake, the country does not contain so many swamps and lakes, but the extreme sterility and barrenness of the soil continue the same. Taking the country altogether, so far as has been explored, and to all appearances, together with the information received concerning the balance, it is so bad there would not be more than one acre out of one hundred, if there would be one out of one thousand, that would in any case admit of cultivation."

grains, 13,209,758. Of potatoes, 5,618,863 bushels were raised; of hay, 1,134,077 tons were cut. Wool was sheared to the extent of 7,729,011 pounds; 48,434,106 pounds of pork sent to market; 4,101,912 pounds of cheese and 27,972,117 pounds of butter sent to market. Of dried fruits, 2,664,709 pounds were marketed, and 182,347 barrels of cider and 50,858 gallons of wine were sold; 1,003,803 two-pound cans of fruit were sent to market, and 224 two-quart cans of pickles; 4,319,793 pounds of maple-sugar were made. A partial census of the fruit-growing counties in 1874 shows that from eleven points on or near the Lake Michigan shore there were shipped 2,310,514 packages, mostly crates and large baskets, of fruit, the produce of 2721 farms. The orchard product of 1873 for the whole State was ——— ———. Gov. Bagley, in his message of Jan., 1875, estimates the value of the fruit marketed at $5,000,000, of the live-stock of the State at $7,000,000, and of the entire agricultural products for 1874 at $84,000,000; and this was probably, in round numbers, an under-estimate. The State census of 1874 gives the number of horses in the State that year as 281,394, and their value as $21,682,710; of mules and asses, as 3906, and their value as $320,956; of milch cows as 321,732, and their value as $9,812,826; of working oxen as 38,901, and their value as $1,351,535; of other cattle as 307,554, and their value as $7,996,404; of sheep as 1,676,176, and their value as $4,140,155; of swine as 401,719, and their value as $1,928,251. We ought to say, further, that as more and more of her rich and fertile lands come under the plough each year, the agricultural products of the State are increasing with great rapidity.

Manufacturing and Mining Industry.—The products of the mines in 1874 are stated by Gov. Bagley at $16,000,000, consisting mainly of iron, copper, and salt. As over 1,000,000 barrels of salt were marketed, and we have already given the product of the iron and copper mines, which exceeds $15,000,000, we think the governor has somewhat under-estimated the value of the mining product, especially as he does not include in it the coal mined during the year. Gov. Bagley estimates the products of the forest for 1874 (mainly lumber, timber, shingles, and lath, with some tanner's bark) at $45,000,000. That this is not an over-estimate is demonstrated by the following statistics of the lumber production of the State in 1874, collected by the editor of the *Lumberman's Gazette*, and published May 29, 1875: Lumber cut as of 1874, 2,313,772,085 feet (two-sevenths of the entire product of North America, and 40 per cent. more than that of Canada); lumber on hand Jan. 1, 1875, 409,891,000; shingles cut of 1874, 1,408,370,000; shingles on hand Jan. 1, 1875, 235,200,000; lath cut of 1874, 727,500,000; lath on hand Jan. 1, 1875, 114,500,000; logs on hand Jan. 1, 1875, 387,303,000. It is certain that the lumber production of Michigan is equal to that of Maine, New York, Pennsylvania, Wisconsin, and Minnesota put together. In other manufactures we find that according to the census of 1870 there were in the State 9455 manufacturing establishments, employing 63,694 hands, of whom 58,347 were men, 2941 women, 2406 children; that the capital employed was estimated at $71,712,283; wages paid, $21,205,355; materials used, $68,142,515; and annual product, $118,394,676, so that she ranked ninth in the list of manufacturing States. The State census of 1874 shows an increase on most of these figures, notwithstanding the great decline in business of the four years previous. There were in 1874, 4292 manufacturing establishments (the State census not enumerating blacksmith's-shops and other individual industries), employing over 60,000 hands (46 establishments failed to report). The amount of capital invested was estimated at $74,448,568; and the annual product at $127,326,562. In the statistics of the census of 1870, after lumber, which is the greatest product (its annual amount being represented at $33,301,767), the next largest were flouring and grist mill products, $21,174,247 annually; the next, copper milled and smelted, $9,260,976; iron, about $6,000,000; carpentering and building, which, with sash, doors, and blinds, amounted to about $5,800,000; boots and shoes, $2,552,931; clothing, $2,577,000; carriages, wagons, and railroad cars, $3,902,000; furniture, $1,953,000; salt, $1,176,811; tobacco, cigars, and snuff, $1,933,000; leather tanned and curried, $2,670,000; machinery, $2,320,000; agricultural implements, $1,569,596. The principal manufacturing industries of the State, according to the State census of 1874, were—Lumber (including lumber, shingles, lath, and the products of the planing-mills), $47,988,372; flouring-mills, $20,170,067; foundries and machine-shops, $5,924,937; railroad cars and car-wheels, $6,029,911; iron-smelting furnaces, $4,640,507; tobacco and cigars, $4,411,200; furniture and chairs, $2,630,611; breweries, $1,931,992; carriages and wagons, $1,777,525; boots and shoes, $1,748,550; staves, headings, hoops, barrels, kegs, and pails, $2,617,275; tanneries, $1,597,600; agricultural implements, $1,400,000; shipbuilding, $1,204,000; salt, $1,119,255; paper, $949,479.

Railroads and Canals.—There are 29 railroads in the State, most of them having numerous branches. In the autumn of 1874 these roads were reported as having in operation within the State 3993.84 miles of track, and as having cost for roads and equipment $173,817,299. The State report (which, though professedly based on returns of Jan. 1, 1874, includes those of a later date) gives the following aggregates: Proportion of main lines and branches in Michigan, 3253.01 miles; double track, 303.75 miles; sidings, 818.86 miles; total of tracks, 4375.62 miles. Entire capital paid in, $139,441,875.75; proportion for Michigan, $60,831,492.20. The total funded and floating debt was $148,814,623.77, of which the proportion for Michigan is $90,414,846.90; debt per mile, $28,963.19. The entire stock and debt of these railroads was $288,256,499.52, or $56,102.20 per mile. The total cost of roads and equipment was $273,650,968.41, or $53,259.59 per mile. The proportion of this cost for Michigan was $141,582,400.37. The total earnings of the roads from all sources, for the year ending Jan. 1, 1874 (a few of the smaller roads not having been operated during the whole year), was $35,752,465.45, nearly five-sevenths of the amount being for freight. The total operating expenses were $25,458,449.90, and the interest paid and unpaid being added, the whole expenses amount to $33,257,486.80. Of this, the true proportion for Michigan was $12,332,366.59; and the proportion of earnings, $17,219,048.91. The number of miles run by passenger trains was 8,687,384; by freight trains, 18,748,049; construction and other trains, 4,423,293; by all trains, 31,858,726. The number of passengers carried, 9,361,230; number of passengers carried one mile, 424,857,134. There are two ship-canals in the northern peninsula—the St. Mary's ship-canal around St. Mary's Falls, and the Portage Lake and Lake Superior ship-canal in Houghton co., which cuts off the long and somewhat dangerous navigation around Keweenaw Point. The latter company has been placed in bankruptcy.

Commerce and Navigation.—Michigan has a moderately large foreign commerce from her situation on the frontier and lakes which separate her from British America, and a still larger coasting-trade, which, together with her extensive railroad connections, makes her commerce larger than that of any other Western State except Illinois. She has four customs districts, and the following table shows the extent of her imports, exports, and foreign exports, her transshipment and *in transitu* trade, and the entries and clearances from her ports in 1874–75:

CUSTOMS DISTRICTS.	Imports from foreign countries for year ending June 30, 1874.	Domestic exports for year ending June 30, 1874.	Foreign goods re-exported in year ending June 30, 1874.	Imports for year ending Mar. 31, 1875.	Domestic exports for year ending Mar. 31, 1875.	Foreign goods re-exported in year ending Mar. 31, 1875.	Coastwise trade. Vessels *entered* year ending June 30, 1874.			Coastwise trade. Vessels *cleared* year ending June 30, 1874.			U. S. merchant marine, year ending June 30, 1874.		*In transitu* and transshipment trade for year ending June 30, 1874.
							No. of vessels.	Tons.	Crews.	No. of vessels.	Tons.	Crews.	Vessels.	Tons.	
Detroit	$1,450,072	$3,240,839	$52,601	$1,196,262	$2,357,243	$59,036	5,790	853,127	35,537	4,412	885,070	35,209	365	83,099	$371,700
Huron	852,869	5,608,294	430,780	817,672	5,864,847	358,414	2,448	1,027,235	32,884	3,589	1,066,338	33,610	314	53,265	455,528
Superior	47,400	179,980	....	26,756	19,183	....	2,184	944,070	22,709	2,194	943,040	22,491	64	4,527	29,346
Michigan........	3,445	14,130	....	7,011	36,900	....	10,947	2,061,789	88,331	11,289	2,123,074	92,855	196	17,592	
Totals........	$2,353,786	$9,043,243	$483,381	$2,047,701	$8,278,173	$417,450	21,369	4,885,221	179,461	21,484	5,022,522	184,165	939	158,483	$856,574

The extent of the coastwise and railroad traffic can only be inferred from the statistics given of the shipping employed in the one and the freights of the other. It is sufficient to say that a larger tonnage is employed in the coastwise trade of this State than in the whole foreign navigation of the U. S.

Finances.—The balance in the State treasury Sept. 30, 1873, was $854,713.44; the receipts for the fiscal year ending Sept. 30, 1874, were $2,246,199.33, making a total of $3,100,912.77; disbursements for the same time, $2,030,638.45; balance in treasury Sept. 30, 1874, $1,070,274.32. Of this balance, $920,443.77 belongs to the

sinking fund, the canal fund, the trust fund, agricultural college fund, primary school interest fund, and military fund. The funded and fundable debt of the State Sept. 30, 1874, consisted of $1,555,000 of interest-bearing bonds, and $33,135.64 of called bonds on which interest had ceased. There was in the treasury at that date cash in the several funds applicable to the payment of this debt, of which only the called bonds were due, $691,821.15, leaving only $896,314.49 of debt beyond the present resources for its payment. The trust debt of the State amounts to $2,943,862.37, and consists mainly of school, college, and university funds set apart for the special use of these institutions, and of which the State is trustee.

Banks, Savings Banks, etc.—On Nov. 1, 1874, there were in Michigan 84 national banks, of which 4 were closed or closing, and 80 in full operation. These 80 had a capital of $10,268,500; bonds on deposit, $7,924,150; circulation issued, $9,860,400; circulation redeemed, $2,470,527; circulation outstanding, $7,389,873. There were also 14 banks of deposit and discount, organized under State laws, having a capital and surplus of $1,391,328.57, and deposits of $2,247,260.66; and 10 savings banks, organized under the same laws, having a capital and surplus of $885,697.85, and deposits amounting to $4,210,684.22. The capital of all the chartered banks, national, State, and savings, was $14,772,918, and their deposits $18,185,617. There were also 110 private banking-houses.

Insurance.—On Jan. 1, 1875, there were 35 mutual fire insurance companies in the State, 2 of them but just organized; of the 33 in operation, the total expenditures were for the year ending Jan., 1874, $135,161.96; amount of claims not yet paid, $70,717.22; total immediate resources, $76,745.68; assessments levied during the year, $113,450.22. The amount at risk by these companies was $80,525,893; the number of members, 41,587; losses paid during the year, $95,925.69. There were at the same time 3 joint-stock fire and fire marine insurance companies in the State, having an aggregate capital of $400,000; total assets, $734,904.61; aggregate liabilities, except capital stock, $249,072.75; aggregate cash income, $371,016.85; aggregate cash expenditure, $282,296.79; amount of risks written, $17,134,348.50; amount of premiums received, $284,409.03; amount of losses paid, $108,439.57; amount of losses incurred, $142,427.11. There was but 1 life insurance company in the State, the Michigan Mutual of Detroit, which had Jan. 1, 1874, $100,000 cash capital, $373,546.60 net assets, and other assets making a total of $441,042; total liabilities, $374,062.14; surplus as regarded policy-holders, $66,979.86; income, $256,355.11; disbursements, $148,739.24.

Population.—From the time when the Territory was set off from Indiana Territory to the present the State has shown a remarkably rapid increase in population, rising from 551 pioneers in 1800 to 1,334,031 persons according to the State census of 1874, and from a density of 0.08 to 23.63 per square mile. In 1870 the total population was 1,184,059, of which only 268,010 were of foreign birth, distributed as follows: born in British America, 89,590; Ireland, 42,013; England, 35,051; Scotland, 8552; Wales, 558; Great Britain not specified, 26; Germany, 64,143; Holland, 12,559; France, 3121; Sweden, 2406; Switzerland, 2116; Norway, 1516; Denmark, 1354; Bohemia, 1179; Poland, 974; Belgium, 832; Austria, 795; Russia, 194; Hungary, 144; West Indies, 128; Italy, 110; Spain, 34; Portugal, 31; Mexico, 25; and China, 4. In 1874 there were 362,026 males. The following table shows the population from 1800 to 1874:

Census year.	Total population.	Males.	Females.	White.	Colored.	Natives.	Foreign.	Density.	Ratio of increase.	Of school age, 5 to 20.	Of military age, 18 to 45, males.	Of voting age, 21 and upwards, males.	Citizens and voters, males.
1800	551	406	145	551									
1810	4,762	2,911	1,851	4,618	144	....	....	0.08					
1820	*8,894	5,552	3,342	8,591	174	....	....	0.16	86.81				
1830	31,639	18,338	13,290	31,346	293	....	....	0.56	255.65	10,964			
1840	212,267	113,788	98,479	211,560	707	....	....	3.77	570.9	77,486			
1850	397,654	209,896	187,758	395,071	2,583	341,656	54,703	7.04	87.34	152,025	....	‡84,397	101,634
1860	749,113	394,694	354,419	736,142	6,799	600,020	149,093	13.27	88.38	262,877	....	‡163,796	191,390
1870	1,184,059	617,745	566,314	1,167,282	†11,849	916,049	268,010	20.97	·58.06	413,211	252,821	315,937	274,459
1874	1,334,031	697,184	636,847	....	....	....	....	23.63	12.62	436,105	289,826	362,026	

Education.—The census of 1874 reported 436,105 children of school age in the State, of whom 326,142 attended school—nearly one-fourth of the whole population. There were, Dec. 1, 1874, 5685 school-houses in the State, with 405,582 sittings. The total cost of these school-houses was $8,889,569. The indebtedness of school districts was $1,175,130. The number of teachers employed during the school year was 14,026; the total expenditure for school purposes in that year was $3,408,632. The primary school fund at the close of the fiscal year was $3,125,918.79, producing an annual income of $213,016. At the close of 1873 there were 311 graded or union schools in the State; 166,540 children were enrolled as belonging to these schools, and there was an average attendance of 118,616. There were employed 2125 teachers in these schools, most of them permanent teachers; of these, 417 were males, 1708 females. The average salaries of the male teachers were $715.57 per annum; of the female teachers, $308.42. The total expenditure for teachers' wages in these graded schools was $825,178.12. For the whole State the number of teachers employed in 1873 was 11,950, of whom 3010 were males, 8940 females. The aggregate amount of salaries or wages paid was $1,765,069.59; average monthly wages of male teachers, $51.94; of female teachers, $27.13. There was paid for school-buildings and repairs during the year $597,006.68.

Higher Education.—No new States, and very few of the older ones, have made such ample provision for the higher education of all their children and youth as Michigan. In all its larger towns and cities there are high schools or academies, supported by State funds and taxes, and so well conducted that they are able to fit students for the university. On a higher plane are the State Normal School for the education and training of teachers; the Agricultural College, to prepare those who are inclined to agricultural pursuits for their calling; and above all, the great State University, which, with its undergraduate, legal, medical, and scientific departments, is ready to give to all of either sex who seek knowledge the opportunity of acquiring it. Besides these there are 6 colleges, 3 female seminaries of high grade, and several professional schools, which are to some extent under the control of the State, and all of them anxious to impart instruction on very moderate terms. The following tables give the latest statistics of these institutions of higher education. It is worthy of notice that nearly all admit both sexes:

I. *Collegiate Institutions.*

Institutions.	Location.	Date of organization.	No. of instructors.	Students. In preparatory.	Students. In collegiate department.	Under what control.	Value of buildings and grounds.	Amount of endowment and personal property.	Income from productive funds.	Income from all other sources.	Volumes in library.
University of Mich..	Ann Arbor.......	1841	45	......	476	State........................	$297,000	$690,000	$90,167	$51,500	31,000§
Adrian College........	Adrian	1859	15	32	127	Methodist................	137,000	137,031	7,602	3,002	750
Albion College	Albion	1864	11	163	59	Methodist Epis........	83,385	207,609	11,526	3,305	1,750
Hillsdale College.....	Hillsdale...........	1855	24	408	186	Free-will Baptist....	120,000	120,000	15,000	5,000	5,000
Hope College..........	Holland City.....	1863	10	108	30	Reformed Dutch	30,000	60,000	9,300	5,100	1,650
Kalamazoo College..	Kalamazoo........	1855	10	215	34	Baptist	100,000	80,000	8,181	3,800	2,500
Olivet College.........	Olivet...............	1859	15	168	125	Presb. and Cong......	91,200	100,000	13,934	1,875	5,400

* Includes a few Indians or half-breeds. † 4926 Indians. ‡ Estimated.
§ There are about 40,000 geological, 38,000 botanic, and 26,000 zoological specimens in the university museums.

II. *Institutions of Professional Education.*

Institutions.	Location.	Date of organization.	Number of instructors.	Number of students.	Under what control.	Value of buildings and grounds.	Endowment or appropriation.	Income from productive funds.	Income from all other sources.	Volumes in library.
State Normal School...	Ypsilanti........	1852	3	329	State..............	$50,000	Appropriation......	$19,000	$23,171	2000
Schools of Theology:										
Theol. Dep't Adrian College....................	Adrian..........	1870	3	20	Methodist......	....	$25,000	....	....	750
Theol. Dep't Hillsdale.	Hillsdale........	1871	4	10	Free-will Bapt	....	20,000	....	....	1000
School of Law:										
Law School University of Michigan.....	Ann Arbor....	1858	6	345	State..............	Univ. buildings ...	From univ. funds.	....	....	3300
Schools of Medicine:										
Detroit Med. College...	Detroit..........	1868	15	74	Corporation....	20,000	20,000			
Med. Dep't University of Michigan............	Ann Arbor....	1849	12	370	State..............	Univ. buildings ...	From univ. funds.	....	....	1500
School of Pharmacy Univ. of Michigan...	Ann Arbor....	1868	6	68	State..............	Univ. buildings ...	From univ. funds.			
Schools of Science:										
State Agricultural College........................	Near Lansing.	1857	14	121	State & Cong.	$60,000 & 676 acres	$214,875.49 and 148,397 acres land.	14,980	27,980	2800
Polytec. School University of Michigan.	Ann Arbor....	1873	21	146	State..............	Univ. buildings ...	From univ. funds.			

Among the institutions which are required to report to the board of regents are two large female seminaries of the collegiate class, both excellent institutions—the Michigan Female Seminary, at Kalamazoo, founded in 1856, having $65,000 of real estate, a yearly income of $10,000, 7 instructors, 52 students, and 500 volumes in library; and the Monroe Female Seminary, at Monroe, with 9 instructors, 106 students, 275 volumes in library, $10,000 of real estate, and $1000 of other funds and property, and a yearly income from all sources of $8500. The German-American Seminary at Detroit, an incorporated institution, following the German methods of teaching, and having 9 classes, beginning with the kindergarten and ending with the higher branches of natural science, mathematics, and English and German literature, has 290 pupils, 10 teachers, $25,000 of real estate, and $14,000 of endowment, apparatus, etc., and a library of nearly 600 vols.

Schools of Special, Charitable, and Reformatory Education.—The following table gives the particulars of the institutions for the instruction of the dependent, helpless, and vagrant youth of the State:

Institutions.	Location.	When organized.	Instructors.	Pupils, etc.	Under what control.	Value of property.	Annual income from all sources.	Annual expenditure.	No. graduated or discharged.	Term of instruction, years.	Percentage who became useful citizens.	Libraries, vols.
Michigan Inst. for Deaf and Dumb and Blind..	Flint	1852	19	183	State..........	$429,690	$47,018	$45,394	*23	8	All.	1,000
Private Institution for Deaf and Dumb.........	Royal Oak, Oakland co..	1873	...	......	Private.......							
State Public School...........	Coldwater......	1874	12	162	State..........	107,591	25,000	†12.261	...	1 to 5		
State Reform School.........	Lansing.........	1855	14	245	State..........	238,155	41,826	28,126.15	97	2 y. 5 m.	75	1,600
Detroit House of Correc...	Detroit..........	1861	19	495	City and co.	450,000	....	....	...	....	...	2,200
Detroit Industrial School..	Detroit..........	1858	...	50	Private.......	12,000	1,125	1,000	...	trans.	...	150

Religious Denominations.

Denominations.	Church organizations, 1870.	Church edifices, 1870.	Sittings, 1870.	Church property, 1870.	Dioceses, synods, presbyteries, conferences, 1874.	Church organizations, 1874.	Church edifices, 1874.	Ordained clergymen, 1874.	Licensed, local, or lay preachers, 1874.	Church members or communicants, 1874.	Adherent population, 1874.	Sunday schools, 1874.	Sunday-school teachers and scholars, 1874.
All denominations..............	2239	1415	456,226	$9,133,816									
Baptists..............................	335	218	70,140	1,029,630	16	341	267	233	12	20,503	100,000	256	12,631
Baptists, Free-will...............	31	14	3,960	47,800	2	125	69	91	5	4,405	22,000		
Christians..........................	38	18	4,625	51,550	...	43	22	21	3	2,871	11,000		
Congregationalists...............	156	114	38,355	758,700	1	196	166	162	2	13,287	65,000	.....	16,069
Disciples............................	8	4	1,200	10,600	1	10	6	6	.....	897	2,500		
Episcopalians......................	100	79	26,800	911,250	1	90	79	80	4	8,791	44,000	.....	8,924
Evangelical Association......	15	11	2,350	24,600	1	30	21	37	22	3,342	15,000	40	3,780
Friends..............................	10	8	2,600	8,850	1	10	9	.....	.....	983	3,600		
Jews...................................	5	3	1,300	51,000	...	5	3	5	.....	480	2,200		
Lutherans...........................	96	81	23,150	360,650	2	100	87	54	5	6,897	30,000		
Methodists (Episcopal)........	642	343	104,929	1,881,981	3	673	402	511	461	58,023	250,000	705	64,233
Methodists (other)‡.............	217	121	31,790	394,100	5	239	147	163	141	19,089	85,000		
Moravians...........................	1	1	100	800	...	2	2	4	1	187	800		
New Jerusalem Church.......	3	3	970	12,000	...	3	3	3	.....	194	750		
Presbyterians......................	177	132	45,925	1,069,900	6	157	149	134	9	12,817	60,000		
Presbyterians, United, etc...	13	13	3,650	58,000	1	15	15	14	2	1,129	5,500		
Reformed (Dutch)...............	26	24	8,700	120,150	2	28	26	25	3	2,081	10,000		
Reformed (German).............	35	25	8,150	102,600	3	38	29	19	3	2,967	14,000	.....	2,177
Roman Catholics.................	167	148	62,991	2,122,730	2	187	180	119	32	....	200,000		
Second Adventists..............	39	21	4,940	44,500	2	54	41	13	19	1,616			
Spiritualists........................	36	5	1,150	15,050	...	30	5	.....	.....	....	3,500		
United Brethren..................	69	19	4,225	40,800	2	167	101	59	17	3,130	16,000		
Unitarians...........................	7	4	1,700	42,500	...	7	5	5	1	425	2,100		
Universalists.......................	33	20	5,550	92,200	...	30	22	30	.....	817	4,000		
Union.................................	3	3	750	6,000	...	3	3	3	.....	180	900		

Newspapers and Periodicals.—In 1870 there were 211 newspapers and periodicals reported in the State, having a circulation of 253,774, and issuing annually 19,686,978 copies. Of these, 6 were dailies, 5 tri-weeklies, 174 weeklies, 2 semi-monthlies, and 16 monthlies. In 1873 the whole number of newspapers and periodicals was 253, of which 22 were dailies, 3 tri-weeklies, 209 weeklies, 2 semi-monthlies, 1 fortnightly, and 16 monthlies. The great increase had been in dailies and weeklies. The circulation had also largely increased.

Counties.—In 1875 there were 76 organized and 3 unor-

* Two years. † $6\frac{1}{4}$ months.

‡ Includes Methodists, Free Methodists, Protestant, Wesleyan, and African Methodists.

ganized counties, having the following population and valuation:

Counties.	Population.				True valuation of personal and real estate in 1870.	Date of organization of co.
	1860.	1870.	Males, 1874.	Females, 1874.	$	
Alcona	....	766	688	526	2,147,102	1869
Allegan	16,091	32,093	16,976	15,405	15,795,133	1835
Alpena	291	2,756	2,808	1,999	2,977,460	1857
Antrim	....	1,985	7,813	1,424	920,866	1863
Baraga	New county.		....	....	....	1875
Barry	14,041	22,204	11,538	10,463	11,174,848	1839
Bay	3,169	15,820	13,687	11,175	10,680,792	1859
Benzie	....	2,184	1,422	1,241	461,119	1869
Berrien	22,274	35,119	17,942	17,087	25,584,976	1831
Branch	21,197	26,229	13,041	12,685	17,376,032	1833
Calhoun	29,398	36,571	18,156	17,499	30,083,300	1833
Cass	17,895	21,097	10,592	9,933	17,434,288	1829
Charlevoix	....	1,724	1,280	1,080	208,030	1869
Cheboygan	599	2,197	1,706	1,364	448,140	1853
Chippewa	1,544	1,690	1,222	948	331,257	1826
Clare	....	266	745	609	....	1871
Clinton	13,923	22,852	12,162	11,499	10,264,995	1839
Crawford	Not organized					
Delta	1,172	2,441	2,882	1,859	945,000	1861
Eaton	16,574	25,164	13,875	13,032	13,192,842	1837
Emmet	1,155	1,211	669	603	144,115	1853
Genesee	22,707	33,965	17,536	17,032	18,097,122	1836
Gladwin	....	....	....	....	....	1875
Gr. Trav'se	1,067	4,443	2,801	2,548	1,739,295	1851
Gratiot	4,427	11,809	7,304	6,582	4,029,711	1855
Hillsdale	26,307	31,691	15,971	15,595	20,123,856	1835
Houghton	9,253	13,881	11,013	8,017	3,835,190	1846
Huron	3,167	9,049	6,614	5,350	3,571,986	1859
Ingham	17,456	25,270	15,204	13,989	13.382,718	1838
Ionia	16,665	27,676	14,788	13,588	12,743,370	1837
Iosco	175	3,175	2,859	1,923	3,036,818	1857
Isle Royal	New county.		....	....	....	1875
Isabella	1,445	4,113	3,273	2,786	2,137,057	1859
Jackson	26,664	36,042	19,853	18,135	30,763,029	1832
Kalamazoo	24,663	32,063	16,583	15,701	28,004,560	1830
Kalkaska	....	424	692	567	....	1871
Kent	30,743	50,410	32,576	30.095	34,470,860	1836
Keweenaw	....	4,209	3,237	2,178	2,245,832	1861
Lake	....	548	1,015	798	....	1871
Lapeer	14,875	21,345	13,095	12,045	11,488,808	1835
Leelanaw	....	4,577	2,692	2,339	687,340	1863
Lenawee	38,497	45,503	23,256	22,828	32,961,867	1826
Livingston	16,629	19,417	10,569	9,760	6,118,946	1836
Mackinac	1,939	1,716	765	731	616,401	1818
Macomb	23,112	28,050	14,367	13,938	23,456,288	1818
Manistee	874	6,074	4,792	3,679	4,411,460	1855
Manitou	1,043	891	364	293	113,550	1855
Marquette	2,899	15,077	12,893	9,053	5,410,872	1851
Mason	831	3,266	2,971	2,390	1,389,300	1855
Mecosta	1,017	5,646	4,874	4,258	3,587,455	1859
Menomonee	....	1,894	2,213	1,277	1,624,950	1863
Midland	783	3,383	2,925	2,381	6,215,136	1855
Missaukee	....	....	395	211	....	1871
Monroe	21,648	27,534	15,302	14,809	8,976,690	1817
Montcalm	3,984	13,642	11,311	9,504	4,739,250	1850
Montmor'cy	Not organized					
Muskegon	3,893	14,895	10,761	8,614	6,971,774	1859
Newaygo	2,766	7,292	4,879	3,879	3,153,206	1857
Oakland	38,020	40,906	19,446	18,636	28,802,457	1820
Oceana	1,802	7,222	4,581	3,779	3,584,236	1855
Ogemaw	....	....	....	....	....	1875
Ontonagon	4,575	2,846	1,276	1,130	1,887,236	1855
Osceola	....	2,104	3,491	2,725	966,922	1869
Oscoda	Not organized					
Otsego	New county.		....	....	....	1875
Ottawa	13,077	26,665	15.789	14,140	11,123,310	1837
Presq' Isle	....	355	851	764	....	1871
Roscomm'n	....	....	....	....	....	1875
Saginaw	12,758	39,079	25,968	22,441	18,022,846	1835
Sanilac	7,623	14,565	8,652	7,640	3,547,074	1848
Schoolcraft	....	....	824	466	....	1871
Shiawassee	12,888	20,864	11,265	10,508	9,128,000	1837
St. Clair	26,814	36,687	21,181	19,507	13,890,174	1821
St. Joseph	21,111	26,274	13,267	12,639	19,083,846	1829
Tuscola	4,885	13,721	8,950	8,048	5,551,932	1845
Van Buren	15,230	28,735	15,062	14,094	12,860,480	1837
Washt'naw	35,757	41,442	19,653	19,170	33,499,038	1826
Wayne	75,394	119,054	72,306	72,597	96,054,196	1815
Wexford	....	650	1,752	1,259	931,279	1869
Totals	749,113	1,184,638	697,184	636,847	719,208,118	

Principal Towns.—Lansing, the political capital of the State and the site of the new Capitol, the State Agricultural College, and the State Reform School, had in 1874, 7445 inhabitants; Detroit, the commercial metropolis, had in the same year 101,255. The other principal cities and towns are Grand Rapids, with 25,923 inhabitants in 1874; East Saginaw, 17,084; Jackson City and Bay City, with 13,859 and 13,690 respectively; Kalamazoo, Saginaw, Adrian, Muskegon, Port Huron, and Flint, ranging from 8000 to 12,000 each; Ann Arbor, Monroe, Battle Creek, Marquette, Ypsilanti, Springwells, and Manistee, from 5000 to 7000; Ishpening, Niles, Ely, Marshall, Coldwater, Grand Haven, Alpena, Hillsdale, Pontiac, Negaunee, Wyandotte, Ionia, Big Rapids, and Greenville, between 3200 and 5000; Charlotte, Lapeer, Albion, Paw Paw, Holland, Owosso, Ludington, and St. Clair, between 2000 and 3000. Corunna, an incorporated city, had in 1874 less than 2000 inhabitants.

Libraries.—Michigan is settled by an intelligent, reading population. The number of libraries, public and private, reported as existing in the State by the census of 1870 was greater by nearly 6000 than that of any other State in the Union, and in the number of volumes it ranked sixth, only Illinois, Massachusetts, New York, Ohio, and Pennsylvania exceeding it. The whole number of libraries was 26,763, of which, however, 23,761 were private; the number of volumes reported was 2,174,744, of which 1,196,113 were in the private libraries. As usual, the public libraries were under-estimated. The State Library is put down in the census as containing 31,265 volumes; the report of the librarian for 1874 gives 45,745, which has since been still further increased; 423 town, city, etc. libraries have 124,207; 49 court and law libraries, 10,359 (one-third of that number are in the law library of Michigan University); 246 school, college, etc. libraries are reported as having 37,734 volumes, whereas the public schools alone in 1873 had 115,331 volumes, and the colleges, professional schools, etc., not including academies and private schools, 66,000 more, making an aggregate of 181,331, or about five times what the census reported; 1731 Sabbath-school libraries were reported as having 239,471 volumes, and 436 church libraries 81,891 volumes; 116 circulating libraries, 53,704 volumes, while 5 of these libraries have an aggregate of 58,000 volumes.

Insane Hospitals.—The Michigan asylum for the insane at Kalamazoo, organized in 1854, is a well-managed institution, but its accommodations are insufficient; and having reached its largest possible number of patients, the State in 1873 determined upon the erection of another asylum or hospital, which is now in progress of construction at Pontiac. The Michigan asylum had on Dec. 1, 1874, 481 patients under treatment, and its average for the year had been 425. The inventory of the asylum property was in Oct., 1874, $590,444.89; the receipts on current expense account from all sources for the two years ending Oct. 1, 1874, were $209,219.24; the expenditures on the same account were $211,060.18. The building of the extension of the asylum cost $162,393.08, and there were special expenses amounting to $4922.24, making a grand total expenditure for the two years of $436,375.50. Of the patients in the asylum and received during the two years, 373 were males and 327 females; of these there were discharged, recovered, 43 males and 26 females; discharged, improved, 35 males and 21 females; discharged, not improved, 25 males, 17 females; died, 29 males, 23 females, leaving in the asylum Oct. 1, 1874, 241 males and 240 females. The new insane hospital, it is hoped, will be completed in 1876. The Michigan State Retreat near Detroit is a private insane hospital under the care of the Sisters of Charity. It had in 1874, 63 inmates.

Penal Institutions.—The State prison at Jackson, founded in 1838, is well managed, but it is overcrowded; in Oct., 1874, it had 703 prisoners, while it has but 648 cells, and not all of these fit for use. Taking the ground that 600 was the largest number of prisoners that should be confined in one prison, the State legislature has ordered the erection of a State house of correction on the most improved plan, to be located at Ionia. This will eventually be made to accommodate 500 prisoners, those who are most likely to reform being sent thither. In our table above we have given the statistics of the Detroit House of Correction, which is properly a penal institution, as well as the State Reform School, the State Public School, and the Detroit Industrial School, which are reformatories. The State Public School is intended for children who are morally endangered rather than actual criminals, and has thus far proved a great success. Some of the jails, workhouses, etc., are well managed, but not all, nor perhaps even a majority. This is often the result in part of the ill-constructed, ill-ventilated, and uncleanly character of the buildings themselves. In 1874 there were 9022 prisoners confined in the jails, of whom 8331 were males and 691 females over 18 years of age; 377 boys and 100 girls under 18. Of the whole number, 308 were convicted of high crimes and sent to the State prison, while 1154 charged with State-prison offences were either not tried or were acquitted; 918 were convicted of minor offences, and sent either to the house of correction or the reform school. The almshouses or poorhouses of the several counties (there are but 45 of these in the State) are not satisfactorily managed, and the district system of almshouses and workhouses, substantially like that of Massachusetts, is strongly recommended by the State commissioners. The almshouses, with the land belonging to them, are valued at $524,420. The total cost of supporting all the paupers in the several poorhouses for

the year ending Oct. 1, 1874, was $167,177.46; for outdoor relief, $183,338.67; for the transportation of paupers, $10,395.74, making a total of $360,911.87 for pauperism in the State for the year 1874. The total amount paid for the care of the insane was $113,485.24; for the pupils or wards of the State in the blind, deaf, and dumb asylums, the State Public School, and the State Reform School was $80,827.26; for disabled pensioners in Harper Hospital, $2592.40; the total cost of maintaining prisoners in prisons, jails, and houses of correction was $170,399.79, of which, however, $107,013.72 was earned by the prisoners, making a grand total of expenditure annually for the dependent classes of $728,216.56.

Constitution, Government, Courts, Representatives in Congress, etc.—The constitution of 1850 (the second adopted by the State) is at the present time (July, 1875) its organic law, though commissioners appointed in 1873 revised that constitution and reported to the legislature of 1875 the results of their revision. These may be acted upon during the year. The present provisions of the constitution require the election of the following State officers every two years, on the Tuesday succeeding the first Monday in November—viz. governor, lieutenant-governor, secretary of state, treasurer, auditor-general, commissioner of the land-office, attorney-general, superintendent of public instruction, secretary of board of agriculture, and adjutant-general. At the same time, and for the same term, there are chosen in their respective districts 32 senators, and not exceeding 100 representatives, who constitute the legislature. The legislature commences its session on the first Wednesday in January every other year, sitting (except in a specially-called session) only in the odd years, 1875, 1877, 1879, etc. Every male citizen, 21 years of age, who has resided in the State three months and in his election district ten days, and every naturalized male citizen who shall have resided in the State two years and six months, having declared his intentions, and every civilized male Indian not a member of any tribe, is entitled to a vote; the usual exceptions, of persons convicted of felony or not being of sound mind, being made. The judicial power is vested in one supreme court, consisting of a chief-justice and three associate justices, elected and holding office for eight years, or longer if re-elected, which has both appellate and original jurisdiction; in fourteen circuit courts, each presided over by one judge, elected for six years, all the judicial elections being held in April; these courts have original jurisdiction in all matters civil and criminal, and appellate jurisdiction from all inferior courts and tribunals; in probate courts, and in justices of the peace. The salaries of the supreme court judges are $2500 per annum, and of the circuit courts $1800 per annum. Prosecuting officers are elected by the people of each county, to hold office for two years. By the apportionment of 1872, Michigan is entitled to nine members of Congress.

History.—Michigan derives its name from the Indian words *Mitchi Sawgyegan*, signifying "lake country"—a very appropriate name, since it is almost surrounded by lakes. There were no white inhabitants within its present limits prior to 1641, though the French Jesuit missionaries had visited Detroit as early as 1620. The first settlement was made in 1641 at the Falls of St. Mary, in the upper peninsula. This was only temporary, however, and no permanent colony was established until 1668, when Allouez, Dablon, and James Marquette founded the mission of St. Mary at St. Mary's Falls. In 1671, Father Marquette laid the foundations of a fort at Michilimackinack (now Mackinac). In July, 1701, a colony was planted at Detroit by M. Antoine de la Motte Cadillac. As a consequence of the great battle on the heights of Abraham (Sept. 13, 1759), between Wolfe and Montcalm, the French surrendered to the English Crown, on Sept. 8, 1760, Detroit, Michilimackinack, and all other places within the government of Canada then remaining in the possession of France; and this surrender was ratified by the Treaty of Paris, Feb. 10, 1763. Silver and copper were discovered, and the mines worked to some extent in 1772 and 1773. During the war of the Revolution, Michigan was included within the bounds of Canada, and was not the scene of any battles. Though it was claimed as being included in the territory ceded to the U. S. by Great Britain, it was not formally surrendered till June, 1796, and was then included in the North-west Territory. This Territory was divided into two May 7, 1800, and the eastern portion, which included Michigan, was called Indiana Territory, and Gen. W. H. Harrison appointed governor. On June 30, 1805, Indiana Territory was divided, and Michigan Territory was organized with substantially the present boundaries of the State, Detroit made the seat of government, and Gen. William Hull appointed governor. He entered upon his duties July 1, 1805, but the little settlement of Detroit had been destroyed by fire nineteen days before. In its rebuilding it was laid out on a handsome and extensive plan, which it has since retained. On June 18, 1812, war was declared between the U. S. and Great Britain, and Gen. Hull appointed commander-in-chief of the forces of the North-west. The appointment was unfortunate, for he not only took no aggressive measures, but within thirty-seven days after taking command ingloriously surrendered Detroit and its fort to the British. It was occupied by them with a small garrison, and all of the Territory came under their control: but the naval battle of Lake Erie (Sept. 10, 1813) resulted in the restoration of Michigan to the U. S., and on the 29th of the same month Detroit was occupied by a detachment of the army of Gen. Harrison. In Oct., 1813, Col. (afterward Gen.) Lewis Cass was appointed governor of Michigan Territory. In 1823 a legislative council of nine members, appointed by the President from eighteen persons elected by the people of the Territory, was ordered, and entered upon their duties in June, 1824. They, with the governor, constituted the actual government of the Territory, which had previously been vested in the governor and judges. In 1831, Gen. Cass was succeeded by George B. Porter as governor, and on his death, in July, 1834, Stevens T. Mason was appointed his successor. In 1835 a controversy arose between Michigan and Ohio in regard to their boundary-line and the right to a strip of land to which both laid claim. At first there was danger of bloodshed, but the excitement passed away without it. A constitution was adopted and a State government elected in 1835, which were accepted by Congress June 15, 1836, and the State admitted into the Union with the condition that Michigan should accept the boundary claimed by Ohio. This condition was very unsatisfactory to the people of Michigan, but it was finally accepted under protest Dec. 15, 1836, and the State was allowed to record its vote for President that year, though it was not formally declared a State by act of Congress until Jan. 26, 1837. On May 16, 1847, the seat of government was removed from Detroit to Lansing. In 1850 a constitutional convention was held, and a new constitution reported and ratified by the people in November of that year. The legislature of 1873, by joint resolution, provided for the appointment of a commission of two persons from each congressional district in the State to revise the constitution and report to the legislature of 1875 such amendments or such revision of the constitution as in their judgment might be necessary for the best interests of the State and the people. The action of this commission is, we believe, now before the people. The action of Michigan during the late civil war was highly creditable to her patriotism. She sent to the field 90,747 able-bodied and efficient men of all arms, or more than one-ninth of her entire population, and none of them disgraced the State whose standards they bore. During the four years of the war 357 commissioned officers and 14,466 enlisted men from the State fell in defence of their country's honor, and their names are inscribed on its "roll of honor," as well as in the hearts of their grateful countrymen. The State, counties, cities, and towns paid during the war for bounties, premiums for recruits, relief of soldiers' families, and other war purposes, $16,548,992.91, besides liberal appropriations by the State and large and abundant gifts by citizens of the State for disabled, wounded, and destitute soldiers. In the ten years since the war her population has increased 75 per cent.

Governors.

Under French Dominion:

Samuel Champlain	1622–35
M. de Montmagny	1636–47
M. d'Aillebout	1648–50
M. de Lauson	1651–56
M. de Lauson (son)	1656–57
M. d'Aillebout	1657–58
M. d'Argenson	1658–60
Baron de Avangour	1661–63
M. de Mesey	1663–65
M. de Courcelles	1665–72
Count de Frontenac	1672–82
M. de la Barre	1682–85
M. de Nonville	1685–89
Count de Frontenac	1689–98
M. de Callieres	1699–1703
M. de Vaudreuil	1703–25
M. de Beauharnois	1726–47
M. de Galissoniere	1747–49
M. de la Jonquiere	1749–52
M. du Quesne	1752–55
M. de Vaudreuil de Cavagnac	1755–63

Under British Dominion:

James Murray	1763–67
Guy Carleton	1768–77
Frederick Haldimand	1777–85
Henry Hamilton	1785–86
Lord Dorchester	1786–96

Territorial Governors — North-west Territory:

Arthur St. Clair	1796–1800

Indiana Territory:

William Henry Harrison	1800–05

Michigan Territory:

William Hull	1805–13
Lewis Cass	1813–31
George B. Porter	1831–34
Stevens T. Mason, *ex officio*	1834–35

Governors of the State:

Stevens T. Mason	1835–40
William Woodbridge	1840–41
J. Wright Gordon (act'g)	1841–42
John S. Barry	1843–45
Alpheus Felch	1846–47
Wm. L. Greenly (act'g)	1847–47
Epaphroditus Ransom	1848–49
John S. Barry	1850–51
Robert McClelland	1852–53
Andrew Parsons (act'g)	1853–54
Kinsley S. Bingham	1855–58
Moses Wisner	1859–60
Austin Blair	1861–64
Henry H. Crapo	1865–68
Henry P. Baldwin	1869–72
John J. Bagley	1873–

Electoral and Popular Vote for President and Vice-President.

Elect. year.	Candidates who received the electoral vote of the State.	Elect. vote.	Popular vote.	Minority candidates.	Popular vote.	Minority candidates.	Popular vote.
1836	Martin Van Buren P........ Richard M. Johnson V.-P.	3	7,332	W. H. Harrison P............ Francis Granger V.-P......	4,045		
1840	William H. Harrison P.... John Tyler V.-P..............	3	22,933	Martin Van Buren P........ Richard M. Johnson V.-P.	21,131		
1844	James K. Polk P.............. George M. Dallas V.-P......	5	27,759	Henry Clay P.................. Theo. Frelinghuysen V.-P.	24,337	James G. Birney P.......... Thomas Morris V.-P.........	3,632
1848	Lewis Cass P.................... William O. Butler V.-P....	5	30,687	Zachary Taylor P............ Millard Fillmore V.-P......	23,940	Martin Van Buren P........ Chas. Francis Adams V.-P.	10,389
1852	Franklin Pierce P............ William R. King V.-P......	6	41,842	Winfield Scott P...... ...... William A. Graham V.-P..	33,859	John P. Hale P................ George W. Julian V.-P.....	7,237
1856	John C. Fremont P.......... William L. Dayton V.-P...	6	71,762	James Buchanan P........... J. C. Breckenridge V.-P...	52,136	Millard Fillmore P........... A. J. Donelson V.-P.........	1,660
1860	Abraham Lincoln P......... Hannibal Hamlin V.-P.....	6	88,480	Stephen A. Douglas P...... Herschel V. Johnson V.-P	65,057	John C. Breckenridge P. Joseph Lane V.-P......... John Bell P................... Edward Everett V.-P....	805 405
1864	Abraham Lincoln P......... Andrew Johnson V.-P.....	8	91,521	George B. McClellan P..... George H. Pendleton V.-P.	74,604		
1868	Ulysses S. Grant P............ Schuyler Colfax V.-P.......	8	128,550	Horatio Seymour P......... Francis P. Blair V.-P......	97,069		
1872	Ulysses S. Grant P............ Henry Wilson V.-P..........	9	138,455	Horace Greeley P............ B. Gratz Brown V.-P........	78,355	Charles O'Conor P.............	286

For a large part of the material for this article, both historical and statistical, we are indebted to His Excellency Hon. John J. Bagley, governor of Michigan, and Hon. E. G. D. Holden, secretary of state. L. P. Brockett.

Michigan, tp. of Clinton co., Ind. Pop. 1732.

Michigan, tp. of La Porte co., Ind.; it includes Michigan City. Pop. 4688.

Michigan City, post-v. of La Porte co., Ind., 70 miles E. by rail from Chicago, on the Indianapolis Peru and Chicago, the Louisville New Albany and Chicago, and the Michigan Central R. Rs., has 7 churches, 1 bank, 2 weekly newspapers, the Northern Indiana State prison, foundries, planing-mills, and an extensive lake-trade in lumber, salt, and iron ore. Pop. 3985.

N. Conover, Ed. "Michigan City News."

Michigan, Lake, the second in area of the great lakes of the St. Lawrence basin, and the only one entirely within the limits of the U. S. Area, 25,600 square miles. Its greatest length is 340 miles; average depth, 990 feet; height of surface above the ocean, 578 feet—the same as that of Lake Huron. Its shores are generally low and often sandy. It has comparatively few bays or very good harbors. The principal bays are Green Bay in Wisconsin and Grand Traverse Bay in Michigan. It receives many streams the mouths of which in some instances (as at Chicago, Ill.) have by artificial means been converted into capacious harbors. Most of the islands of this lake are in the N. part. Lake Michigan is subject to violent storms, but it is an important area of commerce, being traversed by many steamboats, three-masted schooners, and other craft. It has the State of Michigan on the E. and N., Wisconsin and Illinois on the W., while its S. extremity reaches Illinois and Indiana. It has extensive fisheries, the whitefish and several large trout being the most important species caught.

Michigantown, post-v. of Michigan tp., Clinton co., Ind. Pop. 315.

Michigan University, an institution of learning at Ann Arbor, Mich. Congress in the year 1826 set apart two townships in the Territory of Michigan for the future foundation of a university, which was accordingly established by the first legislature of the new State Mar. 18, 1837, though not opened until Sept. 20, 1842. It is supported by the State, and open to both sexes on payment of a small matriculation fee and an annual payment of $15. Michigan University is now the largest and most prosperous institution of the kind in the North-western States. To the original academic institution a medical department was added in 1850 and a law department in 1859. The university proper, or "department of literature, science, and the arts," embraces six regular courses of four years and two special courses (analytical chemistry and pharmacy) of two years each, besides a post-graduate course. The total number of instructors in 1874 in the various departments was 44; the number of students was 1112. The libraries contain over 30,000 volumes; the various museums have above 150,000 specimens. A fine observatory was erected by citizens of Detroit in 1854. The grounds of the university embrace 45 acres, and the buildings were erected at a cost of $230,000. The university fund, derived from the sale of lands, now amounts to $540,000; the annual expenditure averages a little more than $100,000. The government is in the hands of eight regents, elected by the popular vote of the State. President, since 1871, James B. Angell, LL.D.

Michoacan′, state of the Mexican confederation, extends along the Pacific from lat. 18° to 21° N., and comprises an area of 22,993 square miles, with 618,240 inhabitants, most of whom are mestizoes and Indians. The middle part is mountainous, traversed by the Sierra Madre; the mountains are of volcanic origin, rich in metals and covered with vast forests. The soil is everywhere extremely fertile (maize yields in most parts four hundred-fold), and the climate mild and healthy. Only the low coast-land is hot, and in some places unhealthy. The riches of nature are little utilized, however, every kind of industry being in a very backward state. Shawls, blankets, and silverware are manufactured; silver, gold, and copper are mined to the value of $1,175,300 annually. Cap. Morelia.

Micipsa. See Jugurtha.

Mickie′wicz (Adam), b. at Novogrodek, Lithuania, in 1798; studied natural science, history, and literature at Minsk and Wilna; was appointed teacher of Latin and Polish at the gymnasium of Kovno, and published in 1822 two volumes of poems, which at once gave him rank among the greatest poets of the Polish literature, and decided the contest between the old classical and the new romantic school. In 1824 he was banished for participation in the conspiracy of Zan to the interior of Russia, and here he wrote his celebrated sonnets and the epic *Konrad Wallenrod* (1828). Having received permission to make a tour in Europe, he went to Germany and Italy, but never returned. In 1832 he published *Books of the Polish Nation*, and in 1834 a new epic, *Pan Tadeusz.* In 1840 he was appointed professor of the Slavic language and literature, and his brilliant lectures attracted much attention; but afterwards he became much mixed up with various fantastical religious and political plans, and his lectures were suspended. In 1851, Napoleon made him librarian at the arsenal in Paris. D. at Constantinople Nov. 27, 1855.

Mic′kle (William Julius), b. at Langholm, Dumfriesshire, Scotland, Sept. 29, 1734; was educated at Edinburgh; was first engaged in the brewing business, in which he failed, when he came to London and devoted himself to literature; became in 1765 corrector to the Clarendon press at Oxford, where he edited a collection of poems, many of which were his own production. Having become interested in Portuguese literature, he published in 1771 the first book of a translation of Camoens' *Lusiad* into English verse as a specimen of a complete translation, which he executed by shutting himself up in a farmhouse for four years. The work was published in 1775, and brought him great credit. He was sent in an official capacity to Lisbon about 1780, and realized a handsome fortune as his commission on the sale of naval prizes. He passed his closing years in literary leisure at Forest Hill, Oxfordshire, where he d. Oct. 28, 1788. Some of the finest pieces in F. Evans's *Old Ballads* (1777) were from his pen. That entitled *Cumnor Hall* suggested to Sir Walter Scott his novel of *Kenilworth.* Mickle's poetical works were printed in 3 vols. (1806).

Mic′macs, a tribe of Indians residing in New Brunswick, Nova Scotia, Prince Edward's Island, and Newfoundland. They were apparently the earliest aborigines of the continent to come in contact with Europeans, since there is reason to believe that the Indians carried to England by Cabot in 1497 were of this tribe, as well as those taken to France by Aubert in 1508. The French called them "Souriquois," and by the interior tribes they were known as "Salt-water Indians," from the fact of

their residing near the sea-coast and their expertness as fishermen and canoe-men. In remote times they carried on warfare with the Esquimaux N. of the St. Lawrence. After the French colonization of Acadia they adopted many of the habits of civilization, were converted to Catholicism, and became staunch allies of the French in their warfare with the English and the New England colonies. After the conquest of Acadia they continued hostile to the English until 1760. Several treaties were afterwards made with them, and reservations assigned to them. They now reside chiefly on the Basin of Minas in Nova Scotia and on the upper St. John's River in New Brunswick. At the close of the sixteenth century they numbered about 3500, and they still numbered 3600 in 1873, of whom 2165 were in Nova Scotia (including 400 on Cape Breton), 1386 in New Brunswick, and 70 in Newfoundland. The Micmacs constitute the most eastern division of the Algonkin family, their language being closely akin to that of the Penobscots of Maine. A peculiar kind of hieroglyphics, partly original with the Micmacs, but modified by Father Leclercq, a Catholic missionary, has been current among them for nearly 200 years, its chief use being in connection with the Catholic devotional services. Protestant missions have been established among the Micmacs in Nova Scotia for some twenty years, and portions of the Scriptures have been translated into their language by Rev. S. R. Rand, and printed at New York, partly in phonetic type. The same zealous missionary philologist has formed an extensive Micmac dictionary, still unpublished. A Micmac grammar by Abbé Maillard, revised by Bellenger, was printed at New York in 1864. PORTER C. BLISS.

Micras'ter [Gr. μικρός, "small," and ἀστήρ, "star"], a genus of Echinoidea or sea-urchins belonging to the family Brissidæ, and occurring fossil in the Cretaceous formation. *M. cor-anguinum* is one of the characteristic fossils of the Upper Chalk of Europe. EDWARD C. H. DAY.

Mi'crocosm [Gr. μικρόκοσμος, "little world"], a name which was applied by the astrological philosophers of the Middle Ages to man, who was conceived of as the epitome or miniature representation of the universe, which was named by them *Macrocosm*, or the great world. This theory, a very ancient one, was believed to explain the supposed influence of the stars upon the events in the history of the human race and of individual men.

Microcos'mic Salt, also called phosphorus salt, ammonic-sodic phosphate $(NH_4)NaHPO_4.4H_2O$, used as a flux in blowpipe analysis. (See PHOSPHATES.)

Microm'eter [Gr. μικρός, "small," and μέτρον, "measure"], an apparatus for measuring small distances. The term is usually limited to a contrivance placed in the field of view of a telescope or microscope. Gascoigne in 1640 first suggested the idea of measuring distances in the field of view of a telescope by separating mechanically the edges of two brass plates placed in the focus of the eyepiece. Auzout and Picard in 1666 described a micrometer in which silver wires take the place of the brass edges. Felix Fontana in 1775 substituted spiders' web for the silver wires, which seems to be, in connection with the previous suggestions of Bradley, the incipient idea of our modern position micrometer. A fixed micrometer is mentioned by M. Cassini, and M. Cavallo used a strip of mother-of-pearl ruled to $\frac{1}{200}$th of an inch. Roemer hints at the heliometer with two object-glasses in 1675, and Bouger first calls it by that name in 1748; but it remained for Dolland in 1753 to construct a heliometer with a divided object-glass. The simplest form of micrometer is the reticulated micrometer shown in Fig. 1, which consists of a network of lines whose distances apart are known for the telescope to which it is applied. The apparent size of an object in the field of view then becomes known by noting how many divisions of the micrometer are occupied by its image. Scales ruled on glass, such as shown in Fig. 2, are sometimes substituted for the reticule. These lines are rendered visible at night by artificial light. For the observation of very faint objects, Prof. Rood suggests (*Am. Jr. Arts and Sci.*, 3d series, vol. vi. p. 44) an inexpensive scale micrometer made as follows: A dead black surface is formed on a thin plate of silver. Lines are ruled through the blackened surface, ending at the edge of the plate. These lines look bright on a dark background. The plate is then put in the focus of the eye-piece, so as to obscure less than half the field of view. The lines are illuminated by the light of a distant lamp or diffused light, which reaches them through an opening cut in the telescope-tube between the observer's eye and the ruling on the silver plate. The ring micrometer is simply an exactly circular metallic ring suspended in the focus of the telescope, such as shown in Fig. 3. The filar micrometer, shown in Fig. 4, is composed of a rectangular frame *a a a a*. (See Loomis's *Pract. Astronomy*, p. 33.) Two rectangular forks, *b, b, b* and *c, c, c,* slide in this frame, and can be moved by the screws *f, f* by turning the graduated heads *g, g,* which are graduated usually into 100 equal parts; at *a* and *a* are two pointers. If the head is turned so that 100 divisions will pass the point *a*, obviously we move one of the forks a distance equal to the distance between the threads of the screw *f*. The forks carry two spider-lines, *e* and *d*. The distance apart of any two points in the field of view may be determined by making the line *e* bisect one of them, and the line *d* the other, and at the same time having the line joining them parallel to *l*. For every entire revolution of the screw *f* the line *e* or *d* passes over a single tooth of the comb *c*. By noting the number of teeth included between the lines *e* and *d*, and also noting the readings of the pointers *a* and *a*, the exact distance between the two points becomes known, expressed in terms of the distance between the threads of the micrometer screw *f, f,* which has usually about 100 threads to the inch. One division on the head of the micrometer screw would in this case be equal to $\frac{1}{10000}$th of an inch. When the filar micrometer is attached to a graduated circle, so that it can be rotated around the axis of a telescope, as shown in Fig. 5 (see Loomis's *Pract. Astr.*, p. 35), it is then called a position micrometer. The spider-lines are illuminated by lamplight at night. Browning suggests (*Month. Not. R. Astr. Soc.*, vol. xxx. 3, p. 72), for measuring faint lines in spectra, a micrometer shown in Fig. 6, where *c* is the head of the micrometer-screw, which moves across the opening *o* a plate which is opaque with the exception of two intersecting lines. These lines are illuminated by light reflected from the mirror *m*. The rays from the intersecting lines are reflected from the anterior surface of the prism *p* to the eye at *e*, after being brought to

FIG. 1.

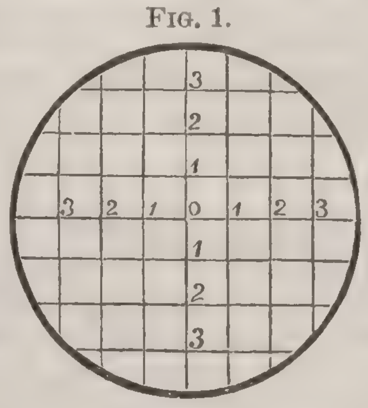


FIG. 2.

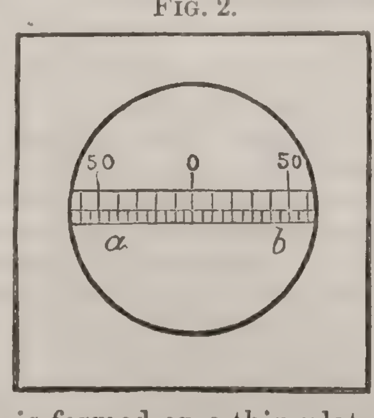


FIG. 3.

FIG. 4.

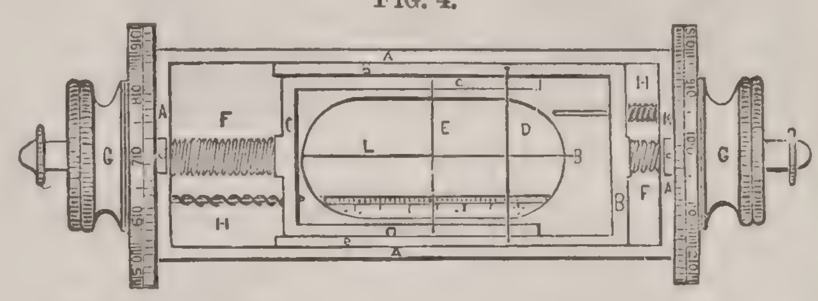
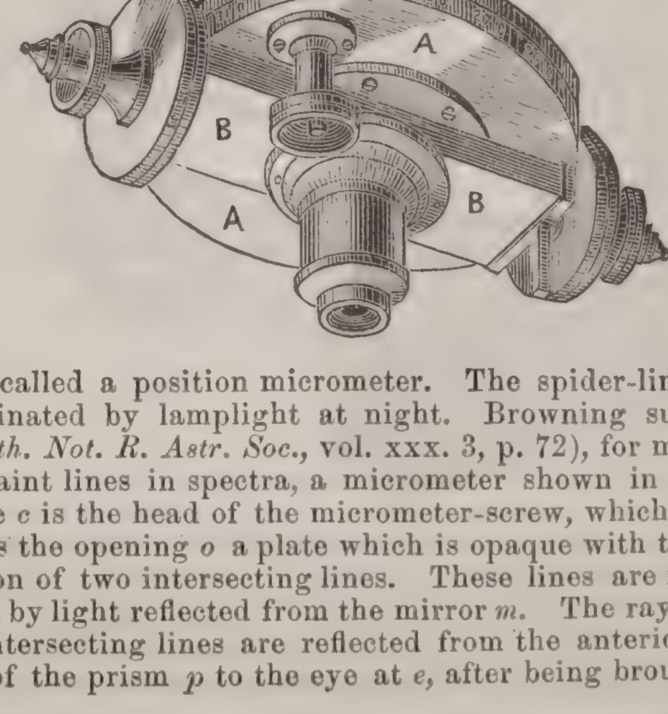
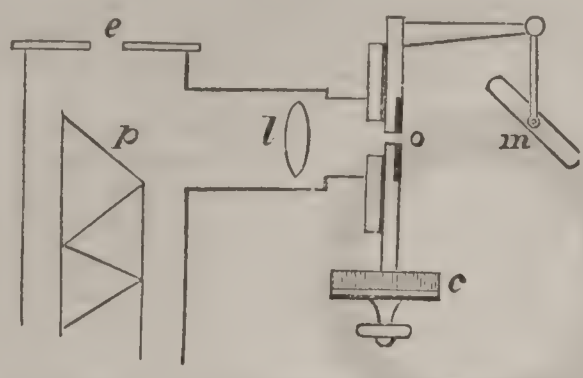


FIG. 5.



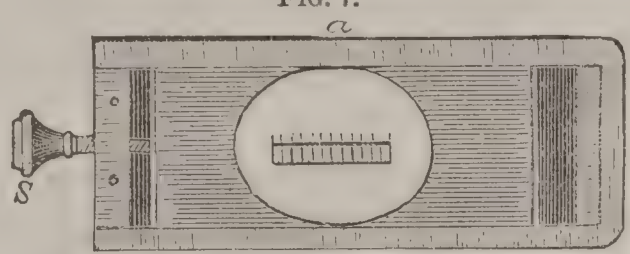
a proper focus by the lens l. The observer at e can thus measure the position of the spectrum lines by bisecting

FIG. 6.



the spectrum lines by the reflected image of the intersecting lines at o. Instead of the intersecting lines, a fine clear white pointer may be substituted. In the double-image micrometer the images of two objects are made to

FIG. 7.



coincide in the field of view, either by the motion of the two halves of a divided object-glass of a telescope, in a line parallel to the line of section, or by the separating of the two halves of a simple eye-lens. The motion in either case is effected by proper micrometer-screws, and the displacement of the lenses necessary to effect a coincidence gives the data necessary to determine the angular distance between two objects. The first form of instrument is called the heliometer, and is superior to the position micrometer in that much larger distances can be measured. The second form is known as the double-image eyepiece micrometer. Either the reticulated or the filar micrometer may be used with the mi-

FIG. 8.

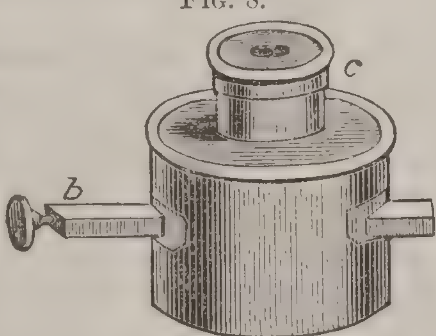
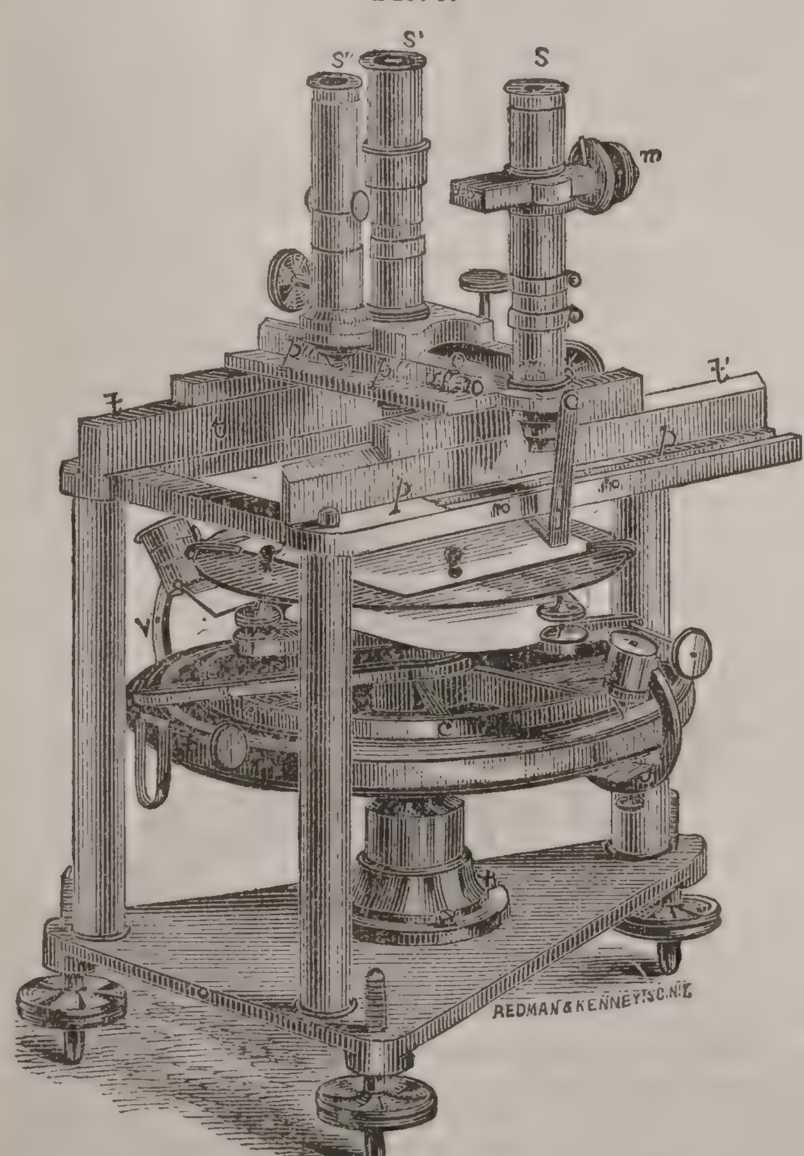


FIG. 9.



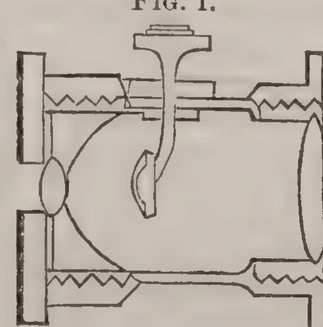
croscope, but perhaps one of the best microscope micrometers is that known as Jackson's micrometer, and shown in Figs. 7 and 8, where a is a frame containing a glass plate on which a scale of fine lines is ruled. This scale can be moved by a screw s, so that when placed in the focus of the eyepiece $b\ c$, any desired line of the scale may be made to bisect any point in the field of view. The distance between two points may easily be determined in terms of the scale divisions.

The application of photography to astronomy has rendered necessary some means of measuring the photographs made. A micrometer for this purpose is shown in Fig. 9, where $g\,g'$ is the plate containing the photograph to be measured, supported in the focus of the microscope s' over the graduated circle $c\,c'$, whose position is read by the two verniers v and v'. The microscope s' has two motions—one parallel to the bearings $p'\,p$ and $t\,t''$, and the other perpendicular to these bearings and parallel to the bearings $p''\,p'''$. A glass scale is inlaid at $p'\,p$, which can be read by the microscope micrometer $s\,m\,m'$ as it traverses the bearing $p'\,p\,t'$. A second glass scale is inlaid at $p''\,p'''$, which may be read by the microscope s'', which is attached to an arm from the microscope s', and moves with s' perpendicular to the bearing $p'\,p\,t'$. The co-ordinates of any point on the plate to be measured may be expressed either in rectangular or polar co-ordinates by using the two glass scales alone, or by using the micrometer $s\,m\,m'$, with the glass scale $p'\,p$, in conjunction with the circle $c\,c'$. The figure is engraved from a micrometer designed by L. M. Rutherford, Esq., and now in his possession.

(See for discussion of errors of micrometers Chauvenet's *Manual of Practical Astronomy*. For description of various forms of micrometers see *Monthly Notices Royal Astr. Soc.*, vol. xix. p. 324; same journal, vol. xviii. p. 58; same journal, vol. xxxiv. p. 395. For index of literature on micrometer, and descriptions of, see Dr. Philipp Carl on *Die Principien der astronomische Instrumentkunde*, Leipsic, Voight & Gunther, 1863.) L. WALDO.

Mi'croscope. Those objects which are too minute to be seen by the unaided vision are brought into view by the instrument called *microscope* (from μικρός, "small," and σκοπεῖν, "to see"). There can be no doubt but that the ancients were acquainted with the simple laws of light, for Ptolemy in his *Optics* has given a table of the refractive indices of glass, and his results agree quite closely with those obtained at the present day. It is scarcely necessary here to record all the evidences which would tend to prove that the simple microscope or magnifying-glass was known very many years ago. The period at which the microscope first became generally known was about the year 1590, Zacharias Jansens and his son having made the instrument at this time. Fontana (1618) and Stellati (1685) also made use of the microscope, and the latter published a description of the anatomy of the bee, including its minute structure. With the simple microscope (a single lens) Swammerdam, Leeuwenhoeck, and others made many discoveries; in fact, it would seem that the simple lens served to establish the immense value which this instrument was destined to render, and has rendered, almost every department of science. The form of single microscope used by Dr. Nathaniel Lieberkuhn (1740) consisted of a small lens placed in the centre of a polished concave speculum of silver, thus allowing a brilliant light to be reflected upon the surface of the object. (Fig. 1.) Leeuwenhoeck's discoveries were made with a single lens mounted between two plates, each plate pierced with a hole. The objects were fastened to needles or plates of talc, which could be brought into position by means of screws. As each instrument was arranged for only two or three objects, Leeuwenhoeck had a large number of such simple microscopes. From the time of Zacharias Jansens (1590) to the period when uncorrected instruments were being abandoned, many forms of microscopes were constructed by scientists and opticians of England, France, Germany, and Italy. The names of Adams, Baker, Hill, Delabarre, and Wollaston remain as pioneers in the perfection of the optics of the microscope. The great difficulty which beset these early microscopists was the *spherical and chromatic aberrations* of the lenses, by which the image formed was distorted in figure and surrounded by a colored fringe. Wollaston and Fraunhofer directed their attention to the improvement of these defects, which resulted in the celebrated Wollaston doublet called by its inventor "periscopic microscope," and the combination by Fraunhofer of two glasses in juxtaposition, forming a single achromatic object-glass (1816). Euler as early as 1776 discovered the achromatic objective. The value of clear definition had now become so established that the greatest scientists of the day were engaged upon the subject of achromatism, both theoretically and practically. In 1829, Mr. Jackson Lister effected one of the greatest improvements in the construction of the object-glass, using a plano-

FIG. 1.

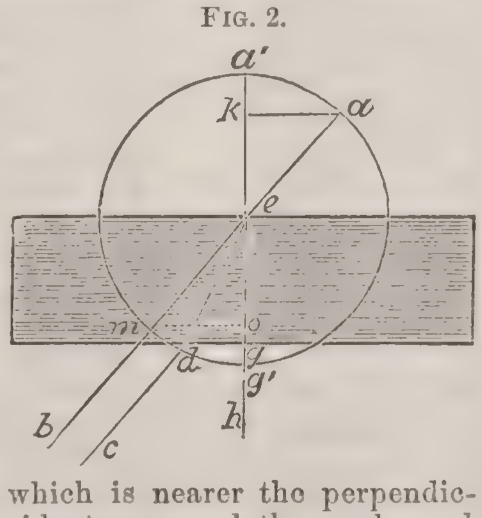


concave lens of flint glass and a double convex of crown. These two lenses were cemented together by Canada balsam. The details developed by Mr. Lister will be more fully treated of under the head of the *Object-Glass*. With the principles laid down by Lister rapid strides were made in the perfection of lenses used in the microscope, and, owing to the constant care and attention to points of minutiæ, the compound achromatic microscope of to-day may be said to represent almost "theory perfected in practice."

In order fully to appreciate the exact construction of the microscope, the division of the subject into *simple* and *compound microscopes* is necessary. By a *simple* microscope is understood a single lens or set of lenses, by means of which the object is viewed directly. The ordinary hand-magnifier or pocket-lens is an example. Here one, two, or three lenses may be employed. A more convenient form consists in having the simple microscope mounted upon a stand provided with an arm made to move up and down by means of a rack and pinion or other device. The steadiness attained by this addition enables much useful work to be accomplished, such as dissecting animal and vegetable tissues, studying in a rough way fragments of rock, plants, etc. Hand-magnifiers, to be serviceable, must range in focal length between two inches and half an inch. High powers on this plan are generally known as the "Coddington lens," "Stanhope lens," and "Wollaston doublet." It seems that the Coddington lens was really invented by Sir David Brewster, its present name having been given to it by Mr. Carey, who constructed one for Mr. Coddington, and supposed that he was the originator. This Coddington lens consists of a sphere of glass with a groove cut all around it and filled with dark opaque material; the definition is good, and the instrument is used very much in collecting specimens for study with the larger microscopes, or where a rapid view is desired of many objects. Under the head of *compound* microscopes may be included those furnished with an object-glass, and an eyepiece, or ocular, which further amplifies the image formed by the object-glass. A stand furnished with stage or object-carrier, quick and slow motions for focusing, with many accessories, constitutes the complicated though easily-managed modern instrument.

In order fully to comprehend the optical arrangements of the microscope it seems best to consider very briefly some of the laws of optics which are immediately connected with it, and, as lenses are the chief parts to be looked into, to begin with their study. "A lens is a piece of glass or other transparent substance having its two surfaces so formed that the rays of light in passing through it have their direction changed, and are made to converge or diverge from their original parallelism, or to become parallel after converging or diverging." "When a ray of light passes in an oblique direction from one transparent medium to another of a different density, the direction of the ray is changed both on entering and leaving; this influence is the result of the well-known law of refraction, that a ray of light passing from a rare into a dense medium is refracted toward the perpendicular, and *vice versâ*. (Fig. 2.) The ray $k\ e$ falling perpendicularly on the piece of glass at e is continued in a straight line to h. Now, if the same ray should take the course $a\,e$—that is, obliquely—instead of passing in a straight line $a\,e\,m\,b$, it will be turned out of its course, or refracted, to d, which is nearer the perpendicular $a'\,k\,h$. $a\,e$ is the incident ray, and the angle $a\,e\,k$ the angle of incidence with the perpendicular $k\,h$. From e to d is the refracted ray, and the angle $d\,e\,g$ is the angle of refraction to the perpendicular. After the change in the course of the ray has taken place in the glass, we find that when the ray is allowed to pass out from the glass, as at $d\,c$, another bending takes place, by means of which the course is made parallel with the incident ray $a\,e$, only its course is shifted a little to one side. With any radius, as $d\,e$, describe a circle from the centre e; then the angle of incidence $a\ e\ k$ is measured by the arc $a\,a'$, and the arc $g'\ d$ measures the angle of refraction $g\ e\ d$. The line $a\ k$ equals the sine of the angle of incidence, and $d\ g$ equals the sine of the angle of refraction. The sine of the angle of incidence (in a given transparent medium) has always the same ratio to the sine of the angle of refraction with all degrees of obliquity of the incident ray.

Fig. 2.



Lenses are of various forms, and change the course of light passing through them according to their special figure. In Fig. 3 are represented the different shapes of lenses. a is simple parallel glass, b a meniscus or concavo-convex lens, c a double concave, d a plano-concave, e a double convex, and f a plano-convex. In the optical construction of the microscope, convex and concave lenses are chiefly employed, the convex being the most important form, as the concave is used more for the purpose of correcting the errors which exist in simple convex glasses. The course of parallel rays when they pass through a convex lens is changed, and brought to a point called a focus, *the principal focus*, and the distance from the centre of the lens to this point is the focal length. Diverging rays are rendered parallel in their passage through a convex lens, and the focal distance for a double convex will be one-half that of a plano-convex having the same curved surface. The focal length depends upon the curvature of the lens and its index of refraction, so that a lens of crown glass will have a longer focus than one of flint with the same curvature. The principal focus, in general terms, may be considered as the distance of its radius for a double convex lens (that is, in its centre of curvature), and at twice the distance of its radius for a plano-convex, parallel rays being understood as passing through in both cases. A concave lens refracts light in exactly the opposite manner from a convex; hence, parallel rays are caused to diverge, etc. By means of a convex lens a great number of rays proceeding from some point of an object are united in one point; each ray carries with it the image of the point from which it proceeded; therefore all the rays united form an image of the object, and the image is brighter in proportion to the number of rays united. "If an object be placed at twice the distance of the principal focus, the image, being formed at an equal distance on either side of the lens, will be of the same dimensions with the object." (Fig. 4.) As the object approaches the lens, the image increases both in size and distance from the lens; and as the object is withdrawn from the lens, the image is smaller and closer to the glass. The smaller the image the more brilliantly it is illuminated; and on the other hand, the light decreases as the image increases in size. Images formed by simple lenses are first distorted, and secondly surrounded by a colored fringe. These defects are due to the spherical form in which the lenses are ground, as practically such curves as the ellipse and hyperbola cannot be accurately made. The rays of light, then, in passing through a convex lens are not *all* brought to the same focus, but those on the periphery come to a point first—*i. e.* nearest to the lens—and then those rays passing through closer to the centre, afterward or farther from the lens. (Fig. 5.) This produces a curved image, and is called spherical aberration. A concave lens has precisely the same defects, but of an opposite character; hence, as will be seen further on, by combining the convex and concave a compound lens is obtained in which figure-distortion is greatly reduced. Chromatic aberration is due to the fact that the light, which consists of rays of different degrees of refrangibility, in its passage through the lens has the more refrangible rays brought to a focus first, and those of less degree at a greater distance from the lens. (Fig. 6.) Chromatic aberration can be corrected by the combination of two media of opposite form and of different refracting and dispersing power; and by the neutralizing of the dispersion the refraction is not entirely overcome, but only modified. With a lens of crown glass, double convex, index of refraction 1.519,

Fig. 3.

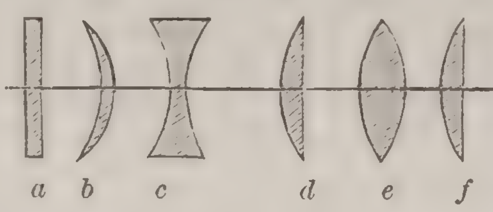


Fig. 4.

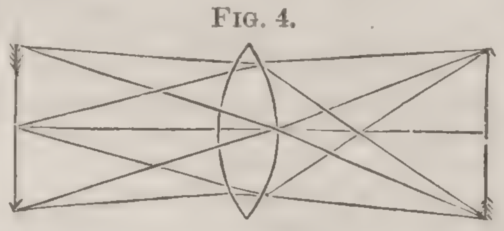


Fig. 5.

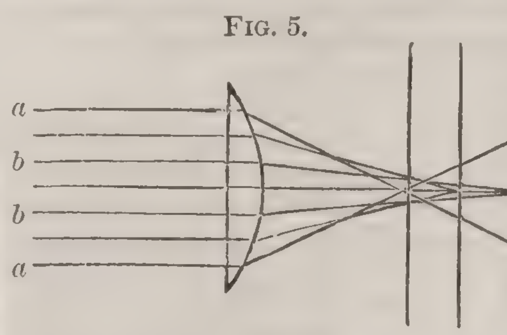
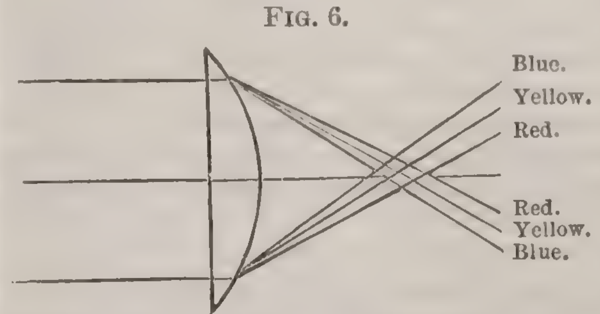
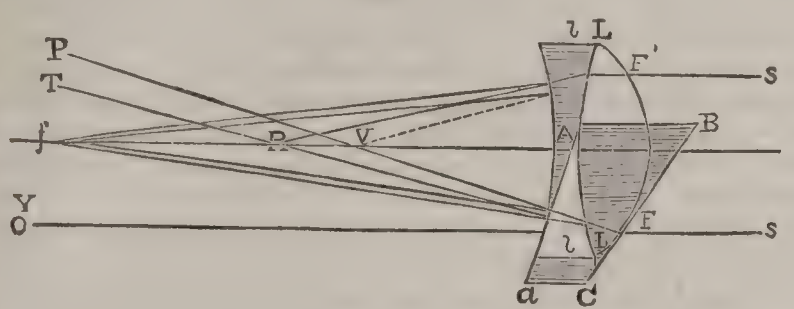


Fig. 6.



dispersive power 0.036, focal length $4\frac{1}{3}$ inches, cemented to a concave lens of flint, index of refraction 1.589, dispersive power 0.0393, focal length $7\frac{2}{3}$ inches, the combined focal length 10 inches, an image free from color will be produced, which can be better understood from Fig. 7. L L is a double convex of crown glass, and *l l* is a concave of flint glass. The ray S falling on the lens

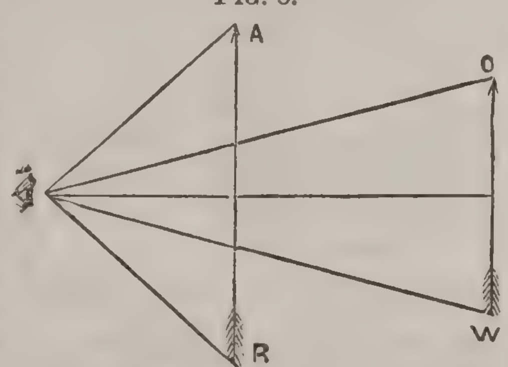
Fig. 7.



L L at F is refracted just as it would be were it to fall on a prism A B C whose faces touch the lens at points of entrance and emergence of the ray. The ray S F goes on to form the spectrum P T, with F V, the violet ray, crossing the axis *f* V, and going to the upper end of the spectrum, and the red ray going to the lower end of the spectrum T. The flint-glass lens, however, *l l*, or the prism A *a* C, instead of allowing the rays to take the course indicated above, unites the rays F V, F R at *f*, refracting the ray S F without color from S F Y to F *f*. The ray S′ F′ is refracted in the same manner to *f*.

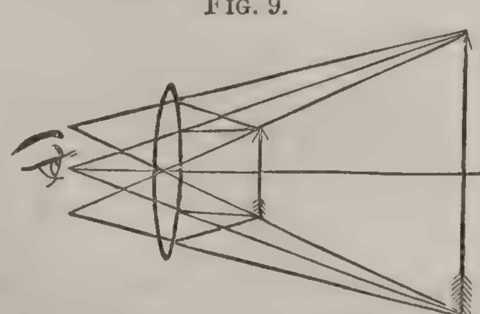
The Magnifying Power of a Lens.—In order that an object may be seen, it must be at such a distance as to form an image of some appreciable size upon the retina; and it must furthermore be sufficiently illuminated to produce an impression. The apparent size of an object depends upon the angle which it subtends to the eye, or the angle formed by two lines drawn from the extremities of the object to the centre of the eye. (Fig. 8.) The lines from A and R form twice the angle at the centre of the eye that O and W do; therefore, the object O W seems one-half the size of A R. The angles formed as just described are called the visual angles. The eye can receive rays of a certain character only to produce distinct vision, and the rays must be parallel or slightly divergent, so that the crystalline lens may form an image of the object upon the retina. The distance or limit of distinct vision ranges from six to ten inches; and when an object is brought closer to the eye, although it appears larger, it becomes more and more indistinct as the distance decreases, due to the fact that the rays which enter the eye are becoming more and more divergent.

Fig. 8.



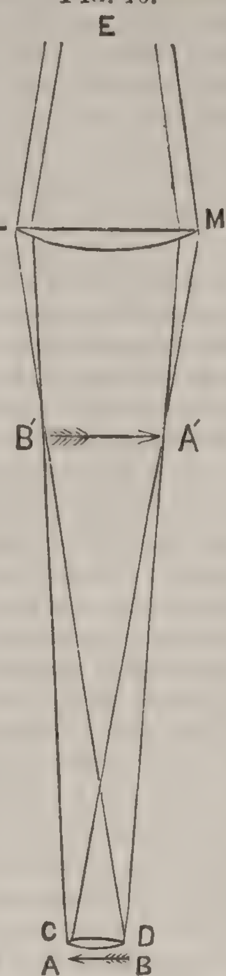
When a convex lens is interposed between a near object and the eye, it reduces the divergence of the rays forming the pencils issuing from it, and in this manner enables the rays to enter the eye so that an image may be formed upon the retina. (Fig. 9.) The more important laws of optics relating to the microscope will be considered as the various parts of the instrument are described.

Fig. 9.



In the simple microscope, as has been seen, several lenses may be used, but they all act as a single glass; now, in the compound microscope, there are two parts, the object-glass, which may be a single lens, and the eye-piece or ocular, and this can also be a single lens. (Fig. 10.) The object-glass C D forms an enlarged and inverted image A′ B′ of the object A B, and the eye-glass L M receives the diverging rays from this image, as if from an object, and brings them to the eye at E, so that the object appears greatly magnified, on the same principle as the simple instrument. The magnifying power can be varied by changing the power of the objective, of the eyepiece, and by altering the distance between object and object-glass, eye-glass and object-glass. By approaching the object to the objective, and moving the ocular to a greater distance from the object-glass, the image is increased in size; and, conversely, by increasing the distance from object to object-glass, and lessening that between the latter and eye-glass, the image is reduced in size. In order that a greater portion of the object may come within range of the eyepiece, and so be made visible, a third lens (F F, Fig. 11) is placed between the objective and the eye-glass. As the third lens limits the circle of light or field of view which is seen in looking into a microscope, it is called the *field-glass.* The eye-glass and field-glass together are considered as one, and termed eyepiece or ocular. The Huyghenian is the most usual form of eyepiece, and consists of two plano-convex lenses (Fig. 12, E E and F F) with their plane surfaces toward the eye. The lenses "are placed at a distance equal to half the sum of their focal length, or, to speak with more precision, at half the sum of the focal length of the eye-glass and of the distance from the field-glass at which an image of the object-glass would be formed by it. A stop or diaphragm B B must be placed between the two lenses in the visual focus of the eye-glass, which is, of course, the position wherein the image of the object will be formed by the rays brought into convergence by their passage through the field-glass. Huyghens devised this arrangement merely to diminish the spherical aberration, but it was subsequently shown by Boscovich that the chromatic dispersion was also in great part corrected by it."

Fig. 10.



The *object-glass*—which, as has been stated, may be a single lens—is of the utmost importance; it is this part of the instrument that requires the greatest amount of care and skill in construction, and therefore requires special attention. The distortions known as spherical and chromatic aberration are the obstacles to be overcome in the construction of the object-glass. Now, it has been shown that, by combining a double convex lens of crown glass with a plano-concave of flint, the spherical and chromatic errors may be remedied—not in a single combination of flint and crown glass, but by means of two or more so-called achromatic lenses. To Mr. Joseph Jackson Lister is due the discovery by means of which the errors in the object-glass may be almost if not entirely overcome. Mr. Lister in 1830 communicated his investigations to the Royal Society about as follows: Plano-convex achromatic lenses, of the form shown in Fig. 13, are most easily constructed. When the convex and concave lenses have their inner surfaces of the same curvature cemented together, much less light is lost by reflection than if the lenses are not cemented. Every such plano-convex combination has some point *f*, not far from its principal focus, from which radiant light falling upon the lens will be transmitted free from spherical aberration; the point *f* is called the *aplanatic focus.* The incident ray *f d* makes, with the perpendicular *i d*, an angle considerably less than the emergent ray *e g* makes with the perpendicular at the point of emergence. The angle of emergence is nearly three times as great as the angle of incidence, and the rays emerge from the lens nearly parallel, or converging to a focus at a moderate distance from the lens. If the radial point is now made to approach the lens so that the ray *f d e g* becomes more divergent from the axis as the angles of incidence and emergence become more nearly equal to each other, the spherical aberration becomes negative or over-corrected. But if the radiant point *f* continues to approach the glass, the angle of incidence increases, and the angle of emergence diminishes and becomes less than the angle of incidence, and the negative spherical aberration pro-

Fig. 11.

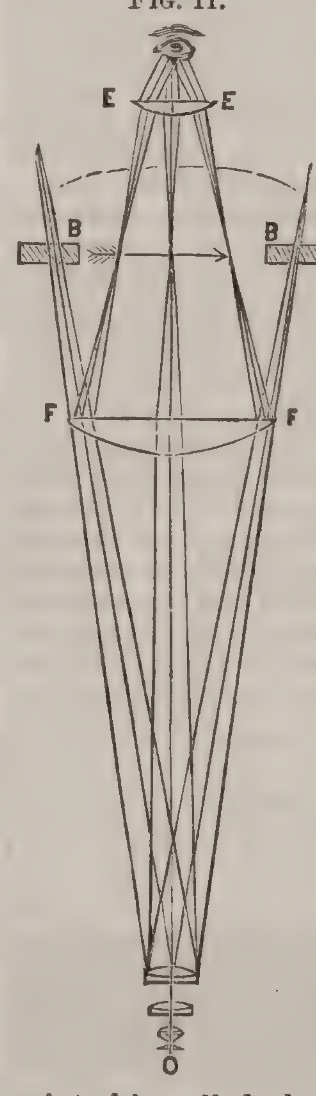
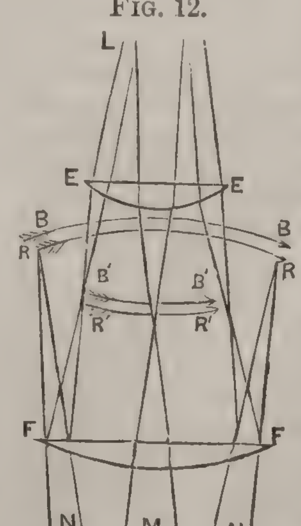
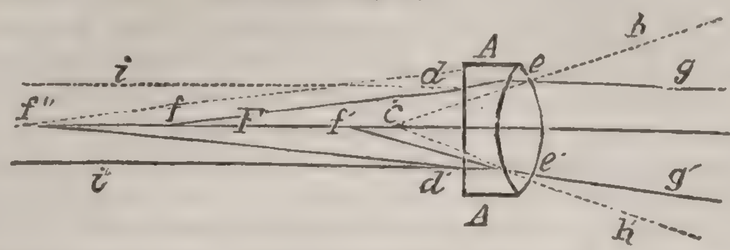


Fig. 12.



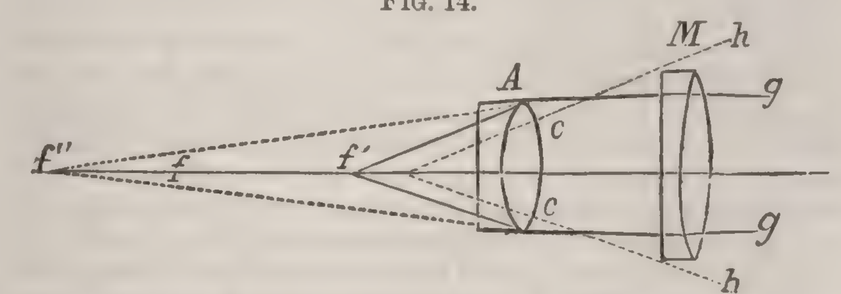
duced by the outer curves of the compound lens becomes again equal to the opposing positive aberrations pro-

FIG. 13.



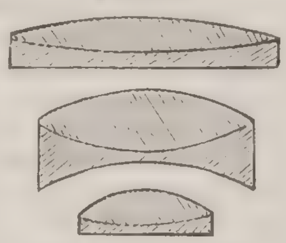
duced by the inner curves which are cemented together. When the radiant has reached this point f' (at which the angle of incidence does not exceed that of emergence so much as it had at first come short of it), the rays again pass the glass free from spherical aberration. The point f' is called the shorter aplanatic focus. For all points between the two aplanatic foci f and f' the spherical aberration is over-corrected, or negative; and for all radiant points more distant than the longer aplanatic focus f, or less distant than the shorter aplanatic focus f', the spherical aberration is under-corrected, or positive. These aplanatic foci have another singular property. If a radiant point in an oblique or secondary axis is situated at the distance of the longer aplanatic focus, the image situated in the corresponding conjugate focus will not be sharply defined, but will have a coma extending outward, distorting the image. If the shorter aplanatic focus is used, the image of a point in the secondary axis will have a coma extending toward the centre of the field. These pe-

FIG. 14.



culiarities of the coma, produced by oblique pencils, are found to be inseparable attendants on the two aplanatic foci. These principles furnish the means of entirely correcting both chromatic and spherical aberration, and of destroying the coma of oblique pencils, and also of transmitting a large angular pencil of light free from every species of error. Two plano-convex achromatic lenses (A M, Fig. 14) are so arranged that the light radiating from the shorter aplanatic focus of the anterior combination is received by the second lens in the direction of f'', its longer aplanatic focus. If the two compound lenses are fixed in this position, the radiant point may be moved backward or forward within moderate limits, and the opposite errors of the two compound lenses will balance each other. Achromatic lenses of other forms have similar properties. It is found in practice that larger pencils free from errors can be transmitted by employing three compound lenses, the middle and posterior combinations being so united as to act as a single lens, together balancing the aberrations of the more powerful anterior combinations. (Fig. 15.)

FIG. 15.



In many objectives it is required that there should be what is termed a large "angle of aperture," by means of which the definition is much improved. "The angle of aperture is that angle which the most extreme rays that are capable of being transmitted through the object-glass make at the point of focus." A much larger quantity of light passes through a lens of high angular aperture. The lenses constructed upon the principles given are termed *dry lenses*—*i. e.* a layer of air is between the objective and the front of the combination; for higher powers, however, the *immersion system* is now generally used, which is simply the intervention of a drop of water between the object and the lens, and consequently the rays of light from the object pass through water instead of air. The interposition of the water seems to prevent reflection of certain rays which would otherwise be lost; and therefore with the immersion system a greater amount of light can pass into the glass. Immersion lenses, as a rule, cannot be used dry, although at the present time objectives are made by Tolles, Wales, and Powell & Lealand that work both as wet or dry. Some makers construct two fronts, one for *dry* and the other for *wet*, the middle and posterior combinations remaining the same in both instances.

The great perfection obtained by opticians in late years has rendered imperfect the performance of certain higher powers when different thicknesses of glass are used for covering the object. The discovery was made by Mr. A. Ross, that a very marked difference exists in the precision of the image according as the object is viewed with or without the thin cover.* A correction for this has been effected by Mr. Ross by giving to the *front* pair of the objective an excess of positive aberration, by under-correcting it, and by giving an excess of negative aberration to the middle and posterior combinations. When the lenses are adjusted for an uncovered object, by bringing the anterior combination closer to the middle and posterior a certain amount of positive aberration can be produced, which will neutralize the negative aberration caused by the covering glass. A *screw-collar* is added, therefore, to those lenses which require the change in the position of the front lens, and in this manner the different thicknesses of glass covers are easily disposed of.

Objectives are named according to their magnifying power. Unfortunately, there is no uniform system upon which the lenses are constructed. In England and America lenses are called 1-inch, $\frac{1}{2}$-inch, $\frac{1}{4}$-inch, etc. On this principle it is supposed that ten inches is considered the standard for distinct vision, and therefore the 1-inch object-glass would produce an image at ten inches distance enlarged ten diameters,† the $\frac{1}{2}$-inch (at the same distance) twenty diameters, the $\frac{1}{4}$-inch forty diameters, etc. Lenses made in France and Germany are named according to an arbitrary system adopted by the maker himself; and Hartnach of Paris simply gives a series of numbers, 1, 2, 3, 4, etc., to designate the various powers. The eyepieces of American and English manufacture receive the letters of the alphabet to distinguish them; the A eyepiece magnifing five diameters; B, ten; C, fifteen, etc. Hence the 1-inch objective with A eyepiece gives a power of fifty diameters; $\frac{1}{2}$-inch, 100 diameters. Continental eyepieces are named 1, 2, 3, in just the same manner as are the objectives. Low-power objective glasses are those of longer focus than the $\frac{1}{2}$-inch; medium, $\frac{4}{10}$ths, $\frac{1}{4}$th, and $\frac{1}{5}$th; high, from $\frac{1}{5}$th to $\frac{1}{75}$th, which is about the highest.

It is not proposed to discuss the various properties of the objective, such as *penetration, definition, resolution*, as these topics are fully described in special treatises on the microscope. Object-glasses of rare excellence are made by Wales, Tolles, and Spencer in the U. S., by Ross, Powell & Lealand, and others in England, and Hartnach and Gundlach in France and Germany.

Reference has been made, in a general way, to the *stand*, which carries the eyepiece and object-glass, together with the object. The most perfect form of stand is that of Powell & Lealand of London, which combines more in perfection of workmanship, as well as completeness of detail, than any other. The "*coarse*" or rapid adjustment is effected by milled heads, which move the tube by means of rack and pinion, while the "*fine*" adjustment is made by a delicate screw (also provided with milled head), which acts upon a lever, and this lever moves the nose carrying the objective. The stage or object-carrier is moved by milled heads up and down and from side to side; at the same time it can be caused to rotate concentrically. A scale of graduations is so arranged that the exact position of the stage can be recognized or effected, so that after an object has been placed in position, and clamped, and some particular part brought into the centre of the field, it is simply required to take the reading of the graduations; and when the same place is sought for in the object again, adjust the stage to the reading, put the object in place on the stage, and it will be found in the centre of the field of view. Below the stage is what is termed the sub-stage, into which can be fitted the "achromatic condenser," "polariscope," and various other accessories. The sub-stage is provided with centring screws, rotation, and vertical motion. The achromatic condenser is the most perfect known. This addition is for the purpose of concentrating the light which is reflected from the mirror, and in this manner any amount of illumination of the object is produced. By means of the polariscope the effect of polarized light may be studied upon the minute structures. In like manner, the addition of the "spectroscopic eyepiece" enables the smallest portions of substances to be submitted to the spectroscopic test. The various accessories which are of so much value to the microscope can be best studied in the larger works devoted to the special subject.

J. W. S. ARNOLD.

* Microscopical objects are examined upon plates of glass one inch by three inches, and covered with a disk or square of thin glass; this cover is for the purpose both of protecting the object and of preventing the formation of moisture or deleterious vapors from reaching the exposed portion of the objective.

† As the image is enlarged equally in all directions, ten diameters would represent a space occupied by the image 100 times greater than the original object. The simple form of writing magnifying power is, $\times$ 10, which means magnified ten diameters. When very high magnifying power is used, the expression in diameters is more convenient than superficial measurement.

Microscopic Organisms. See GENERATION, SPONTANEOUS, by PRES. F. A. P. BARNARD.

Mi'das, a common name among the Phrygian kings; Herodotus mentions three. One of them, a son of Gordias by Cybele, was a pupil of Orpheus, promoted the worship of Dionysus, and became the centre of a number of popular myths. Thus, Dionysus gave him the power of transforming everything he touched into gold. But the gift proved a terrible curse. The man would have starved to death had not the god helped him a second time. By bathing in the river Pactolus the auriferous power was transferred from the body of Midas to the waters of the river, and they became henceforth productive of gold. Another time he was chosen umpire in a musical contest between Apollo and Pan. He gave the prize to the latter, and the angry god punished him by changing his ears into those of an ass. Midas concealed the deformity under a Phrygian cap, but one of his slaves happened to discover the secret. Unable to keep it to himself, and yet not venturing to tell it to anybody, the slave dug a hole in the soil, whispered the secret down into the hole, and covered it up with earth. But the reeds which grew upon the spot always sang when the wind blew among them, "Midas has ass's ears."

Mid'delburg, town of the Netherlands, capital of the province of Zealand, situated on the island of Walcheren. It is a handsome town, surrounded and traversed by canals lined with trees, and it has many public squares and interesting buildings, among which the town-hall is the most remarkable, built by Charles the Bold in 1468, and ornamented with twenty-five colossal statues of counts and countesses of Flanders. Its trade has greatly declined, but it has some manufactures of soap, vinegar, leather, and lace. Pop. 16,580.

Middelburg (PAUL), b. at Middelburg, island of Walcheren, in 1445; studied at the University of Louvain; took holy orders, and was appointed chaplain at the church of St. Bartholomew in his native city; but, preaching a little too zealously against ignorance, drunkenness, gluttony, and other Middelburg fashions of that day, he was expelled from the city, and returned to Louvain, where he lectured with great success on mathematics. Chosen by the grand council of Venice to the chair of mathematics in Padua, he afterward became physician to the duke of Urbino, on whose recommendation he was appointed bishop of Fossombrone in 1494 by Pope Alexander VI. With Julius II. and Leo X. he stood in great favor, and presided over the fifth Lateran Council (1512–18). D. at Rome Dec. 15, 1534. He was one of the first to urge the necessity of reforming the calendar, showing in his learned work *Paulina, de recta Paschæ Celebratione, et de Die Passionis Domini nostri Jesu-Christi* (fol., 1513), that the great Easter festival was not celebrated on the day determined by the Council of Nice, but sometimes a whole month earlier and sometimes a whole month later. Some of his many other writings treat the same subject, such as the *Epistola ad Universitatem Lovaniensem: De Paschate recte observando* (1487), which occasioned a long controversy, during which he furthermore published *Epistola apologetica Magistri Pauli de Middelburgo, Alumni Universitatis Lovaniensis*, in answer to a criticism by Pierre de Rivo, professor of theology at Louvain.

Mid'dle, tp. of Franklin co., Ark. Pop. 840.

Middle, tp. of Hendricks co., Ind. Pop. 1422.

Middle, tp. of Cape May co., N. J. Pop. 3443. It includes Cape May Court-house, and extends across the cape.

Middle, tp. of Chowan co., N. C. Pop. 1610.

Middle, tp. of Orangeburg co., S. C. Pop. 1104.

Middle Ages. This is the term generally used to designate that great historical period lying between the ancient and modern epochs of the world's civilization, and separating them from each other as *young* manhood separates youth from *mature* manhood.

1. *Chronology.*—Concerning the exact date of the beginning and end of the mediæval period differences of opinion exist, some authors regarding the triumph of the Franks over the remnants of the Roman power in Gaul at the battle of Soissons (486 A. D.), others the overthrow of the West Roman empire in 476 A. D., and still others the accession of Charlemagne in 768 A. D., or the dissolution of the Frankish empire in 843 A. D., as the opening events; and consider, some the discovery of America, others the discovery of printing, most the German Reformation, and a few the Westphalian Peace (1648), as marking the close; which differences show that the Middle Ages is no epoch whose opening and closing can be put down to the credit of any single year or event, but began and ended through a series of years and events, as all epochs of civilization must. The most definite statement we can make is that those historians who consider ancient history to comprehend the *world's history* down to the dissolution of the Roman state begin the Middle Ages with the overthrow of the Roman power by the Germans and the settlement of the Vandals, Goths, Anglo-Saxons, Franks, and Burgundians upon Romanic soil in the last half of the fifth century; while those who regard *Teutonic history* in its more *specific light*, and consider each nationality to have its own childhood, youth, manhood, and old age, are inclined to look upon the life of the Teutonic peoples down to the dissolution of the Frankish European empire (see article on the FRANKS) as the period of their wardship, and hence to set the beginning of the following period of young manhood or middle age between the years 814 and 843 A. D.; while, as regards the boundary of the epoch on the other side, very nearly all are agreed that the great events of the fifteenth and sixteenth centuries—viz. the discovery of printing, the discovery of America, the employment of gunpowder, the development of the absolute monarchy in the state, and the Reformation in the Church—designate the point where the spirit of civilization was throwing off its mediæval and taking on its modern form.

2. *Events.*—The cardinal events of the Middle Ages were—

(*a*) The reaction of the spirit of nationality against the artificial union of the Frankish European empire, producing the treaty at Verdun in 843 A. D. between the different sovereigns of the Carlovingian house, whereby the empire was divided into three independent kingdoms, corresponding in their territorial extent very nearly to the geographical basis of three distinct types of nationality, which had been for three and a half centuries developing themselves, and which may be termed from that time forward Italian, German, and French.

(*b*) The reaction of individuality against the authority of law imposed from without, and which may be termed a great *series* of events rather than an event, realizing themselves all through the mediæval period, and splitting Europe up into a multiplicity of petty sovereignties, standing closed and hostile over against each other, blockading trade and intercourse, and producing unceasing intestine strife.

(*c*) The great invasion of the Scandinavian vikings (836–912 A. D.), striking the deathblow to the tottering Carlovingian powers, already threatened by the Saracens in the S. and the Magyars in the E., compelling the members of this dynasty, in their impotence to defend their lands and peoples, to give way to stronger arms and cleverer genius, occasioning thus the elevation of the Capetians to the throne of France, changing Germany into an elective monarchy, and delivering emperorless Italy over to three-quarters of a century of most fearful intestine struggles.

(*d*) The settlement of the Northmen upon the territory of Northern France, founding there the dukedom of Normandy, accepting the culture of the Romanized Franks both in state and Church, setting the great North into connection with the Continent, and opening it up to the influences of Christianity and the civilization of the Romanic world; and then from this continental basis making conquest both of England (1066 A. D.) and Southern Italy (1029–85 A. D.), and founding independent kingdoms upon Anglo-Saxon and Italian soil.

(*e*) The Crusades, eight in number, and reaching chronologically from the year 1096 to 1270 A. D. In this great European movement, in which the chivalrous type of Christianity, beginning with the consecration of King Clovis's sword to the service of the Church, culminates, the peoples of Europe, especially those of Romanic nationality, impelled chiefly by the power of religious fanaticism, threw themselves back upon Asia with the nominal purpose of freeing the Holy Sepulchre from the desecrations of the Turks. In 1099 A. D. Jerusalem was captured and a European kingdom erected in Palestine, which existed with changeable fortune for nearly two centuries. In 1291 A. D. the last remnants of European sovereignty in Syria were extinguished, but the influence which the movement and its results exercised upon the course of European civilization was all-guiding and permanent. Six millions of men perished in these undertakings. Among these the nobility as a class suffered far the most severely both in loss of life and property. From some districts this class was almost entirely obliterated. Moreover, the establishment of a political connection with Asia had led to the establishment of an intercourse and trade which enriched the burgher class as much as the wars had impoverished the nobility. The effect of this change in the conditions of property upon the political constitution of Europe was most marked. The political power passed over more and more to the cities and the burgher class, and the old feudal constitution began to be undermined. The results as regards the Church were of a double nature. Its temporalities had been immensely increased, in that it fell heir, for the most part, to the property of those who perished in these great religious adventures, having been made the

guardian of the same during the absence of the owners. But its moral power entered upon the period of its sinking, not only because the increased wealth of the Church led to luxurious living on the part of the clergy, but because also that power of religious fanaticism and unreflecting devotion upon which the Church of that age so much rested had been broken of its intensity and exhausted. The Crusades were, after all, among the most powerful elements in opening the way for the absolute monarchy and the Reformation.

(*f*) Lastly, we mention the re-establishment of the Carlovingian imperium by Otho the Great (962 A. D.), under the name of "Holy Roman Empire of the German Nation," thus bringing, both for weal and for woe, the German and the Roman into direct contact with each other, and paving the way for that great conflict between pope and emperor for the supremacy over European Christendom which, of all the movements of the Middle Ages, was the most continuous, important, and heavy with results.* The clergy had ever regarded the Carlovingian imperium as their own creation. In it European Christendom had found its point of unity. No wonder, then, that they sustained it to the last, and when it fell, felt themselves compelled to look for a new centre and a new head. And what more natural than that all eyes should be turned towards the bishop of Rome? From the moment of the dissolution of the Carlovingian imperium the watchword had been the establishment of the "*papal monarchy*," and the withdrawal of the Church, with its property and its *personnel*, from under the jurisdiction of the secular powers to unite it under the sovereignty of the pope, both as regards temporal and spiritual matters. In this way it would make good that which had been lost in the dissolution of the imperium—viz. the *principle of unity* in European Christendom. During the century and a quarter between the Treaty of Verdun (843 A. D.) and the re-establishment of the empire by Otho (962 A. D.) this had been the reigning idea in the Church; and the chief reason why it did not *then* come to realization was the lack of a mighty personality upon the papal throne, by the power of whose genius that which lay in the consciousness and desire of the Church might be made an objective reality. This power was first attained when Hildebrand became first the manager and maker of popes, and then pope himself under the title of Gregory VII. The creation of the college of cardinals with the sole power of electing the pope, and the laws against marriage and simony, were the chief means made use of in the establishment of the European papal monarchy. These measures, or something with the same nominal purpose, were indeed, to a certain extent, justified by the needs of the time. The conflict between the emperors and the nobility of Rome over the papal appointment had been productive of such confusion and bloodshed as to become an offence to all Christendom, while the unchastity and venality of the clergy had risen to a most fearful height. But these measures, though nominally taken for correcting these abuses (and which fact justified them fully in the eyes of the unthinking masses), were attended by far more wide-reaching results, and were used for the execution of a far more wide-reaching plan in the mind of Gregory and his assistants. He had conceived the relationship of the Church to the state to be that of the soul to the body, and meant to realize in the world of fact the forms of his idea. By the constitution of the college of cardinals he would withdraw the papal office from under the influence both of the secular princes and the laity, and place it under the immediate control of a narrow ecclesiastical aristocracy of the Roman diocese. *It was not meet that the body should choose the organ through which the soul realized its will.* By the forbiddance of priestly marriage he would cut the bond of blood and interest which connected the servants of the Church with society at large, and make the clergy the complete and willing executors of the papal will; and by the laws against simony he would withdraw the bishops and abbots from their feudal relationship to the secular princes in whose territories their bishoprics and cloisters lay, *and bring the property for which they owed feudal service to the state under the complete and independent ownership of the Church.* It was one of the most daring attempts to unsettle and transform the relationships of property which the world has ever known. Borne by the power of such personalities as Gregory VII., Alexander III., Innocent III., and Boniface VIII., the cause of the papacy and the universal Church monarchy was for two and a half centuries, from the beginning of the eleventh to the middle of the fourteenth, powerfully and successfully pushed forward upon the road of universal European sovereignty. By the help of the great German dukes, who were ever striving for more independence of the imperial power, the triumph over the mightiest secular lord of Christendom, the Roman German emperor, was secured, while England, Scotland, Poland, Hungary, Aragon, and the Two Sicilies became little more than fiefs of the papal throne. It was Philip the Fair of France (1285–1314 A. D.) who first opposed with success this growing and threatening power. Through force and intrigue the papal seat was removed by him from Rome to Avignon (1307 A. D.), and became thenceforth a luxurious court devoted to pleasure and the interests of French politics. From this time forth the moral influence of the papacy and of the Church declined from year to year; and the scientific discoveries and revival of learning in the fifteenth century, and the Reformation in the sixteenth, lifted society above that stage of its civilization where the Church can absorb the state.

3. *Spirit and Genius of the Middle Ages.*—From the above-mentioned facts it is not difficult to generalize a conception of the spirit and genius which brought them forth. Defiant self-reliance upon rude physical force in regard to the attainment of all things temporal, and superstitious subjection to a sacerdotal order in regard to things unseen, unknown, and represented as eternal; narrow selfishness in regard to the duties and functions lying near and in the common course, connected with the most chivalrous devotion to the mystical, the undefined, and the distant; the direst immorality and disobedience to law and order, coupled with the most exaggerated and enthusiastic religiosity; bold adventuresomeness without defined purpose; fancy and imagination without reflection; faith without reason; devotion without humanity,—these are some of the contradictions which characterize the mediæval spirit. Those great cathedral piles testify not only to the power of the imagination and devotion of the age, but also to the under-valuation of the human sufferings and sacrifices through which they were founded and builded.

4. *Institutions of the Middle Ages.*—This spirit and genius incorporated itself in the two all-comprehending institutions, the feudal state and the hierarchical Church. The spirit of the age was far too objective to conceive of the authority of law as based upon the common consciousness of the governed. The individual felt no *internal* behest to observe the rights of his neighbor any further than he had by contract or promise agreed to do so. Personal contract, varying in the details of its terms with time, place, and circumstances, occupied thus the proper ground of universal political law. Under such an order the common man could only protect himself by contracting for the protection of some great man, whose land and people furnished him the means of protection. The cost of such protection to the common man was the surrender of his own land to the *ownership* of the lord, retaining only the *possession* of the same as a fief, and rendering certain tributes or services to the lord for such possession and protection. The vassals of the same lord were connected with each other not directly, but only through their feudal relation to a common lord, and different lords only through their feudal relation to a common superior or by *contract* with each other, and so on until the sovereign lord of the land was reached—the apex of the feudal pyramid; only the pyramid was inverted, with the greatest weakness where the greatest strength ought to be. These actual relationships were legalized through the ratification obtained mediately or immediately from the kingship and the imperium, in which latter office the sum and substance of all authority was theoretically held to exist as the immediate gift of God to *one man* through his vicegerent upon earth—the pope. The practical result of such a system was anarchy in the state. In regard to the Church, the same externality of idea manifests itself in the conceptions of authority and grace. The sum and substance of all authority and grace were conceived as proceeding from Christ to the chief of his apostles, of whom the pope was successor; by the latter dealt out again upon the bishops in their consecration, and then by these in turn upon the priests and laity. The power to bind and to loose, to damn and to save, became thus, according to this conception, the property of a close corporation, which by the power of excommunication from the company of the saved upon earth, with all its attending consequences upon the social and political status of the individual, and of the threats of eternal punishment hereafter, held the souls of men in a state of spiritual subjection of a most degrading nature. The practical result of such a system was spiritual despotism in the Church.

Men have been wont to call the Middle Ages "Dark Ages." But, on the contrary, they are full of light. In them the great questions of the relationship of individual right to political right, of local government to central government, and of ecclesiastical government to secular government, were lighted and drawn into conscious consideration. Had the European empire of Charlemagne been

* See article on the FRANKS.

perpetuated, Europe might have become a second China, but would never have been what it is—viz. the source of the civilization of the modern world. The unceasing conflicts of the Middle Ages between private right and public law, local government and central government, state authority and Church authority, were necessary to bring men out from under the monotony of slavish subjection to the artificial, external, Church-State system of the Carlovingian empire, and develop them by the antagonism of thought and will into the power of producing systems more reflected and more free. (See FEUDAL SYSTEM.)

The reader may further consult—for history of the Middle Ages, Hallam, Leo, Kortüm, Rückert; for history of the period of the German emperors, Giesebrecht and Waitz; and for history of the city of Rome in the Middle Ages, Gregorovius. JOHN W. BURGESS.

Mid'dleboro', post-v. and tp. of Plymouth co., Mass., on the Middleboro' and Taunton and the Old Colony R. Rs., has an academy, 5 churches, a public library, 2 hotels, 1 weekly paper, and large manufacturing interests. Pop. 4687. JAMES M. COOMBS, ED. "MIDDLEBORO' GAZETTE."

Mid'dleborough, a v. of Erie co., Pa. Pop. 126.

Mid'dlebourne, post-v., cap. of Tyler co., West Va., 10 miles S. E. of Sisterville Landing. P. 182.

Middle Branch, tp. of Osceola co., Mich. Pop. 49.

Mid'dleburg, post-v. and district of Carroll co., Md., on the Western Maryland R. R. Pop. 1276.

Middleburg, post-v. and tp. of Schoharie co., N. Y., on Schoharie Creek, and on the Middleburg and Schoharie R. R., has 7 churches, a seminary, 1 hotel, 2 foundries, a tannery, and 1 weekly newspaper. Pop. of v. 863; of tp. 3180.

Middleburg, post-tp. of Cuyahoga co., O. Pop. 3662.

Middleburg, a v. of Noble co., O. Pop. 116.

Middleburg, post-v. and tp., cap. of Snyder co., Pa., on the Pennsylvania R. R., has a good school, 2 churches, 1 printing-office, a sash-factory, a tannery, tinware and stove establishment, and stores. Pop. 370.
JEREMIAH CROUSE, ED. AND PROP. "THE POST."

Middleburg, post-v. of Loudon co., Va.

Mid'dlebury, post-v. and tp. of New Haven co., Conn., 6 miles W. of Waterbury. Pop. 696.

Middlebury, post-v. and tp. of Elkhart co., Ind. Middlebury Station is on the Michigan Southern R. R., 14 miles E. of Elkhart, and is in York tp. Pop. 1709.

Middlebury, tp. of Shiawassee co., Mich. Pop. 1018.

Middlebury, tp. of Wyoming co., N. Y., traversed by the Buffalo division of Erie R. R., has 3 churches and an academy at the village of Wyoming. Pop. 1620.

Middlebury, tp. of Knox co., O. Pop. 929.

Middlebury, post-tp. of Summit co., O. Pop. 994.

Middlebury, tp. of Tioga co., Pa. Pop. 1500.

Middlebury, post-v. and tp., cap. of Addison co., Vt., on the Central Vermont R. R., has an excellent public-school system, 6 churches, 1 bank, a public library, 1 newspaper, 3 flouring-mills, 1 iron-furnace, 3 hotels, woollen, cotton, paper, and leather manufactories, 3 door, sash, and blind factories, 6 marble-quarries, and good water-power. The village is incorporated, and has a fire department, and is the seat of Middlebury College, founded in 1797. Pop. 3086. LYMAN E. KNAPP, ED. "REGISTER."

Middle C, in music, the note standing a fifth *above* the F or bass clef and a fifth *below* the G or treble clef. Its place is therefore on the ledger-line between the bass and treble clefs. It takes its name from this circumstance, and also from its midway position on the general scale. The C clef, whether placed on the third, fourth, or any other line, is always representative of the note or sound called "middle C," and the lines and spaces above and below are named accordingly.

Middle Creek, tp. of Miami co., Kan. Pop. 650.

Middle Creek, tp. of Wake co., N. C. Pop. 1477.

Middle Creek, tp. of Snyder co., Pa. Pop. 574.

Middle Creek, post-v. of West Beaver tp., Snyder co., Pa.

Mid'dlecreek, tp. of Somerset co., Pa. Pop. 580.

Mid'dlefield, post-v. and tp. of Middlesex co., Conn., on the New Haven and Willimantic R. R., 5½ miles S. W. of Middletown. Pop. 1053.

Middlefield, post-tp. of Buchanan co., Ia. Pop. 666.

Middlefield, post-tp. of Hampshire co., Mass., on the Boston and Albany R. R., 135 miles W. of Boston, is mountainous, produces wool, timber, and soapstone, and has manufactures of paper, woollens, lumber, spokes. Pop. 728.

Middlefield, post-tp. of Otsego co., N. Y., on the E. side of Otsego Lake. Pop. 2868.

Middlefield, post-tp. of Geauga co., O. Pop. 732.

Middle Fork, tp. of Vermilion co., Ill. Pop. 1440.

Middle Fork, tp. of Ringgold co., Ia. Pop. 457.

Middle Fork, tp. of Macon co., Mo. Pop. 1134.

Middle Fork, tp. of Worth co., Mo. Pop. 279.

Middle Fork, tp. of Forsyth co., N. C. Pop. 1046.

Middle Fork of Ivy, tp. of Madison co., N. C. Pop. 793.

Mid'dle Gran'ville, post-v. of Granville tp., Washington co., N. Y., on the Rensselaer and Saratoga R. R., Rutland and Washington division, and on Pawlet River.

Middle Park, in Summit co., Col., consists of several minor parks, the whole some 15 miles wide and 70 miles long. It is an elevated basin, surrounded by mountains of gneiss, and abounding in grass, timber, and lignite. Its drainage is by tributaries of the Colorado of the West.

Mid'dle Pax'ton, tp. of Dauphin co., Pa. Pop. 1317.

Middle Point, post-v. of Washington tp., Van Wert co., O., on the Pittsburg Fort Wayne and Chicago R. R. Pop. 119.

Mid'dleport, tp. of Iroquois co., Ill. Pop. 861.

Middleport, post-v. of Hartland and Royalton tps., Niagara co., N. Y., on the Erie Canal and New York Central and Hudson River R. R., midway between Rochester and Buffalo, has 2 schools, 4 churches, 1 bank, 1 weekly newspaper, 2 saw and 2 planing-mills, 1 paper-mill, 1 furniture-factory, 2 foundries, a grist-mill, boatyard and dry dock, a cheese-factory, 2 hotels. It is an important shipping-point for produce, etc. Pop. 731.
T. F. O'BRIEN, ED. "MIDDLEPORT MAIL."

Middleport, post-v. of Meigs co., O. Pop. 2236.

Middleport, post-b. of Blythe tp., Schuylkill co., Pa., on the Schuylkill Valley R. R., has important coal-mines. Pop. 377.

Mid'dle Riv'er, tp. of Augusta co., Va. Pop. 4376.

Mid'dlesborough, town of England, county of York, at the mouth of the Tees. It has very important ironworks, and considerable exports of coal, besides shipyards and manufactures of ropes and sailcloth. It was founded in 1830, and has a population of 39,585.

Mid'dlesex, the metropolitan county of England, is bounded S. by the Thames, and E. and W. by its two affluents, the Colne and the Lea. Area, 281 square miles. Pop. 2,538,882. The soil is mediocre, mostly employed for grass-farming and gardening for the supply of London with milk, hay, and vegetables.

Middlesex, a fertile and picturesque county of Ontario, Canada, is intersected by the Grand Trunk, Great Western, and other railways. It has 3 ridings. Cap. London. Pop. including London, 82,595.

Middlesex, county of Connecticut, bounded S. by Long Island Sound. Area, 425 square miles. It lies on both sides of the Connecticut River, which is for some distance its E. boundary. Tobacco is extensively raised, and hay, grain, and fruit are produced to some extent. Brown sandstone and granite are quarried, and cobalt has been mined in the N. E. portion. The county has extensive manufactures, including hardware, cotton goods, brick, lumber, metallic wares, furniture, sleigh and hand bells, flour, pumps, machinery, musical instruments, shipping, etc. The county is traversed by the Shore Line, the Connecticut Valley, and the New Haven Middletown and Willimantic R. Rs. Caps. Middletown and Haddam. Pop. 36,099.

Middlesex, county of E. Massachusetts, bounded N. by New Hampshire. Area, 830 square miles. It is traversed by the Merrimack, Nashua, Concord, Charles, and other rivers. It is uneven, but well cultivated and productive. Grain, potatoes, live-stock, and garden and dairy products are extensively raised. The manufactures are very important, and include cotton and worsted woollen goods, machinery, boots, shoes, carpets, metallic wares, lumber, chemicals, glassware, watches, straw goods, cooperage, boxes, leather, cordage, and a great variety of other goods. The county is traversed by a great number of railroads. A portion has been set off to Suffolk co. since the last census. Caps. Lowell, Cambridge, and Concord. Pop. 274,353.

Middlesex, county of E. New Jersey. Area, 300½ square miles. It is traversed by the navigable Raritan and South rivers and by several railroads. Much of the soil is very fertile, and it is in general light and easily cultivated. Grain, garden products, and small fruits are extensively raised. Moulding-sand and marl are found. Brick, india-rubber goods, carriages, hosiery, carpets, flour, and other goods are manufactured. Cap. New Brunswick. Pop. 45,029.

Middlesex, county of Virginia, bounded N. E. by the estuary of the Rappahannock and S. by that of the Piankatank River. Area, 150 square miles. It is level, with a light productive soil, marshy in some places. Grain is the leading product. Cap. Saluda. Pop. 4981.

Middlesex, post-tp. of Yates co., N. Y., on the E. border of Canandaigua Lake. Pop. 1314.

Middlesex, tp. of Butler co., Pa. Pop. 1010.

Middlesex, tp. of Cumberland co., Pa., on the Cumberland Valley R. R. Pop. 1417.

Middlesex, a v. (W. Middlesex P. O.) of Shenango tp., Mercer co., Pa., on the Erie and Pittsburg R. R. and Beaver and Erie Canal, has mines of valuable block coal.

Middlesex, post-tp. of Washington co., Vt., on the Central Vermont R. R. Pop. 1171.

Mid′dle Smith′field, tp. Monroe co., Pa. Pop. 1359.

Mid′dleton, town of England, in the county of Lancashire, near the Irwell, with manufactures of cotton cloths and silks. Pop. 9876.

Middleton, post-v. and tp. of Essex co., Mass., on the Essex R. R. It has manufactures of shoes. Pop. 1010.

Middleton, post-tp. of Strafford co., N. H., 40 miles N. E. of Concord. Pop. 476.

Middleton, tp. of Nash co., N. C. Pop. 1465.

Middleton, tp. of Columbiana co., O. Pop. 1327.

Middleton, v. of Milton tp., Jackson co., O. Pop. 71.

Middleton, tp. of Sumter co., S. C. Pop. 649.

Middleton, a v. of Bell co., Tenn., on the Memphis and Charleston R. R., 17 miles E. of Grand Junction (P. O. Middleton Station). Pop. 150.

Middleton, tp. of Dane co., Wis., contains Middleton Station and Pleasant Branch (which see). Pop. 1821.

Middleton (Arthur), b. in South Carolina in 1743, was a son of Henry Middleton, who was president of Congress 1774–76, and the latter was a son of Arthur Middleton, who was governor of South Carolina 1725–31. The younger Arthur Middleton was educated at Harrow, Westminster, and Cambridge, England, where he graduated in 1764; was in Congress 1776–77; signed the Declaration of Independence; assisted by arms and by the effective use of his pen in the cause of freedom; was long a prisoner of war, and suffered great pecuniary losses in the Revolution; was again in Congress 1781–83. D. Jan. 1, 1788.

Middleton (Conyers), D. D., b. at Richmond, Yorkshire, Dec. 27, 1683; graduated at Trinity College, Cambridge, 1702, where he became a fellow 1706. He was for years engaged in an acrimonious quarrel with Dr. Bentley; wrote *A Letter from Rome showing an Exact Conformity between Popery and Paganism* (1729); became principal librarian of Cambridge; was Woodwardian professor of mineralogy 1731–34. His best known works are the *History of Cicero* (1741) and the *Free Inquiry* (1749) concerning miracles, which in his own day was regarded as an infidel work. D. at Hildersham July 28, 1750.

Middleton (Henry), son of Arthur Middleton (1743–88), b. in 1771; was 1801–18 a State legislator of South Carolina; governor 1810–12; U. S. minister to Russia 1820–31. D. at Charleston, S. C., June 14, 1846.—His son Arthur (1795–1853) was for some time in the U. S. diplomatic service.—Another son, Henry, b. 1797, graduated in 1815 at West Point, studied at Edinburgh, was admitted in 1822 to the bar of Charleston, and became a political and economical writer of distinction.—John Izard Middleton, a brother of Henry, Senior, b. 1785, educated at Cambridge, England, resided for many years in Paris, and published a valued work on *Cyclopean Walls* (London, 1812, folio). D. Nov., 1849.

Middleton (Peter), M. D., b. in Scotland; educated at Edinburgh. In 1750 he assisted Dr. Bard of New York in making the first recorded dissection in America; in 1767 took part in establishing a medical school in New York, in which he was professor of physiology and pathology and instructor in materia medica 1767–76; was governor of King's (now Columbia) College 1775; author of some medical works. D. in 1781 in New York.

Middleton (Thomas), b. probably at London about 1570; studied law at Gray's Inn; became a dramatic author; assisted Rowley, Massinger, Fletcher, and Ben Jonson in the composition of some of their plays, and produced several dramas, among which are *A Mad World, my Masters, The Roaring Girl, Women beware Women, A Trick to Catch the Old One*, especially *The Witch*, which resembles Shakspeare's *Macbeth*, and it is doubtful which was the earlier production. Middleton's plays were edited by Rev. Alexander Dyce (5 vols., 1840). D. July, 1627.

Middleton (Thomas Fanshaw), D. D., b. at Kedleston, England, Jan. 26, 1769; educated at Christ's Hospital and at Pembroke Hall, Cambridge; took orders in the Church of England; became archdeacon of Huntingdon 1812, and consecrated at Lambeth first bishop of Calcutta May 8, 1814. In 1808 he had published a learned work on *The Doctrine of the Greek Article, applied to the Criticism and Illustration of the New Testament* (5th ed. 1855). He arrived at Calcutta in Nov., 1814, where he d. of fever July 22, 1822. A volume of his sermons, charges, and tracts was published in 1824. Bishop Middleton was an elegant scholar, and was for some time editor of the *British Critic*. (See his *Life*, by Rev. C. W. Le Bas, 2 vols., 1831.)

Middleton Station, a v. (Middleton P. O.) of Middleton tp., Dane co., Wis., on the Prairie du Chien division of the Milwaukee and St. Paul R. R. Pop. 285.

Mid′dletown, city and tp., port of entry, and semi-capital of Middlesex co., Conn., on the W. bank of the Connecticut River, in 41° 33′ 8″ N. lat. and 72° 39′ W. lon., 31 miles above the mouth of the Connecticut River, 15 miles S. of Hartford, and 24 miles N. E. of New Haven. The town was settled in 1650, and the city was incorporated in 1784. The Connecticut Valley and the New Haven Middletown and Willimantic R. Rs. run through the city, and a branch railroad connects it with the New York New Haven and Hartford R. R. The Hartford and New York steamboats make daily landings here on their passage each way. The river is navigable here for vessels of 10 feet draught, and the tide rises from 18 to 24 inches. Middletown is pleasantly situated, partly on an acclivity that commands a wide, varied, and beautiful prospect that has attracted much attention. The vicinity is rich in minerals, some of which, as columbite, are very rare. There is a quarry of feldspar. Gold and silver are found, and a silver-mine has been worked. A lead-mine yielded considerable lead before the Revolutionary war, but the working of it has been abandoned as unprofitable. The streets of the city are wide, pleasant, and well shaded by trees. There are excellent schools, both public and private. Wesleyan University, a flourishing college, is located on High street. Within a few years costly buildings, a fine telescope, a well-appointed museum rich in its varied collections, and other important resources have been added to the institution. The Berkeley Divinity School, under the superintendence of Right Rev. John Williams, D. D., bishop of the diocese of Connecticut, is located on Main street. The city has 10 churches and a large, well-appointed building for a public library, which will soon be opened; 1 daily and 2 weekly newspapers; the Connecticut hospital for the insane; the Connecticut industrial school for girls; 4 national and 3 savings banks; 13 incorporated and manufacturing companies; 6 hotels, a fine custom-house, and a court-house. Pop. of city, 6923; of tp. 11,126. Joseph Cummings.

Middletown, post-v. of St. George hundred, Newcastle co., Del., 52 miles S. W. of Philadelphia, on the Philadelphia Wilmington and Baltimore R. R., at the head of the great peach district of Delaware and Maryland, has an academy, 3 churches, 1 bank, 1 newspaper, 2 Alden fruit-preserving establishments, 2 hotels, a fine public hall, and stores. Pop. 915. C. Reynolds, Ed. "Transcript."

Middletown, tp. of Champaign co., Ill. Pop. 1401.

Middletown, post-v. of Corwine tp., Logan co., Ill. Pop. 223.

Middletown, post-v. of Fall Creek tp., Henry co., Ind., on the Pittsburg Cincinnati and St. Louis R. R., Indianapolis and Chicago division. Pop. 711.

Middletown, post-v. of Jefferson co., Ky., 12 miles E. of Louisville. Pop. 244.

Middletown, post-v. and tp. of Frederick co., Md., 53 miles W. of Baltimore, on the Baltimore and Ohio R. R., has 2 academies, 5 churches, 1 newspaper, 2 carriage-factories, 1 hotel, and stores. Pop. of v. 746; of tp. 2874.
G. C. Rhoderrick, Ed. "Valley Register."

Middletown, tp. of Jackson co., Minn. Pop. 165.

Middletown, tp. of Lafayette co., Mo. Pop. 2163.

Middletown, post-v. of Montgomery co., Mo., 10 miles N. E. of Wellsville R. R. Station.

Middletown, post-v. and tp. of Monmouth co., N. J., on the Port Monmouth branch of the New Jersey Southern R. R. The township includes Sandy Hook and Port Monmouth. Pop. 4639.

Middletown, tp. of Delaware co., N. Y., is traversed by the E. fork of the Delaware River and by the New York Kingston and Syracuse R. R., contains numerous villages and has manufactures of lumber and leather. Pop. 3035.

Middletown, post-v. of Wallkill tp., Orange co., N. Y., 67 miles N. W. of New York, on the New Jersey Midland, the Erie, and the New York and Oswego Midland R. Rs., has 8 churches, 3 banks, 4 newspapers, 3 hotels, the State

homœopathic asylum for the insane, saw and file works, 3 wool-hat factories, and stores. Pop. 6049.
G. H. THOMPSON, ED. "MIDDLETOWN MERCURY."

Middletown, tp. of Richmond co., N. Y., on Staten Island. Many of its citizens are business-men of New York. Pop. 7589.

Middletown, post-v. of Lemon tp., Butler co., O., 32 miles N. of Cincinnati, on the Cincinnati Hamilton and Dayton and the Cleveland Columbus Cincinnati and Indiana R. Rs., has 3 banks, 10 churches, 1 tobacco-factory, 7 paper-mills, paper bag and scissors factory, 1 foundry, 1 planing-mill, several hotels, flour-mills, extensive water-power, 2 newspapers, and is supplied by the Holly water-works. Principal business, manufacturing. Pop. 3046.
E. T. HARKRADER, ED. "MIDDLETOWN JOURNAL."

Middletown, a v. (MIDDLEBOURNE P. O.) of Oxford tp., Guernsey co., O. Pop. 166.

Middletown, a v. (MT. HOPE P. O.) of Salt Creek tp., Holmes co., O. Pop. 150.

Middletown, tp. of Wood co., O. Pop. 1221.

Middletown, tp. of Bucks co., Pa. Pop. 2360.

Middletown, post-b. of Dauphin co., Pa., on the Pennsylvania Central R. R., has several good public schools, 7 churches, extensive car-shops, 1 foundry, 4 steam saw-mills, 1 bank, 1 newspaper, an orphan asylum, 3 grist-mills, pipe and tube factory, 2 planing-mills, 2 fire companies. Pop. 2980. J. W. STOFER, ED. "MIDDLETOWN JOURNAL."

Middletown, tp. of Delaware co., Pa. Pop. 2578.

Middletown, tp. of Susquehanna co., Pa. Pop. 871.

Middletown, tp. of Newport co., R. I., on the island of Aquidneck or Rhode Island, immediately N. E. of Newport. It is traversed by the Old Colony and Newport R. R., and has a public library. Pop. 971.

Middletown, post-tp. of Rutland co., Vt., 8 miles S. E. of Poultney R. R. Station, has 3 churches and some manufactures. Pop. 777.

Mid′dleville, post-v. of Barry co., Mich., 21 miles S. E. of Grand Rapids, on the Michigan Central R. R., has 1 foundry and machine-shop, 2 churches, 2 saw-mills, 1 grist-mill, 1 newspaper, 2 sash and door factories, and stores. It has an excellent water-power. Pop. 541.
P. W. NISKERN, ED. "BARRY CO. REPUBLICAN."

Middleville, tp. of Wright co., Minn. Pop. 362.

Middleville, post-v. of Newport and Fairfield tps., Herkimer co., N. Y., 8 miles N. of Herkimer, has 2 churches, manufactures of cotton and other goods, and is celebrated for its fine quartz-crystals. Pop. 406.

Middle Wood′berry, tp. of Bedford co., Pa. Pop. 1483.

Midge [Ang.-Sax. *mygge*], a name applied in England to several dipterous insects resembling gnats and mosquitoes in their habit of feeding upon the blood of men and animals. Some are of the family Chironomidæ, which has representatives in North America. But in the U. S. the name is especially given to the *Cecidomyia tritici*, or wheat midge, a most destructive insect, which lays its eggs in the blossoming ears of wheat. Deep ploughing destroys many of them by burying their cocoons deeply in the earth, and late-sown spring wheat generally blossoms so late as to escape their ravages.

Mid′ianites, an ancient Arabian race, the descendants of Midian, the fourth of the six sons of Abraham by Keturah. They were idolaters. They appear to have dwelt mainly to the S. of Moab. The Sinaitic peninsula was a part of their territory, and the Tawarah Arabs, now dwelling there, are supposed to be their descendants.
R. D. HITCHCOCK.

Mid′idæ [from *Midas*, the principal genus], the lowest family of anthropoid Primates, or monkeys, having, like the Cebidæ, the septum of the nose broad and flattened and the nostrils proportionally distant, no bony external auditory meatus, and the tympanic membrane attached by a ring close to the surface; but distinguished by the presence of only 32 teeth—viz. M. $\frac{2}{2}$, P. M. $\frac{3}{3}$, C. $\frac{1}{1}$, I. $\frac{2}{2} \times 2$; and the manus or hand with the inner digit not opposable, but on the same plan as the rest of them, with elongated compressed claws instead of nails. This family is represented by two genera—viz. *Saguinus*, Lacépède (= *Hapale*, Geoffroy), and *Midas*, Geoffroy, which have been, however, much subdivided by Dr. Gray. The species are of small size, and confined to South and Central America. The marmosets or squirrel-monkeys are the best-known representatives.

Mid′land, county of the E. central portion of the S. peninsula of Michigan. Area, 576 square miles. It is nearly level, with a good soil. It has extensive lumber interests, and is traversed by the Flint and Père Marquette R. R. Cap. Midland. Pop. 3285.

Midland City, post-v. and tp., cap. of Midland co., Mich., 21 miles N. W. of East Saginaw, with which it is connected by the Flint and Père Marquette R. R., has 1 bank, 2 newspapers, 2 saw-mills, 1 grist-mill, several shingle-factories, 3 hotels, and stores. Pop. of v. 1160; of tp. 1616. FRANK S. BURTON, ED. "MIDLAND INDEPENDENT."

Mid-Lothian. See EDINBURGH.

Midlo′thian, a locality in Garrett co., Md., on the Cumberland and Pennsylvania R. R., 20 miles W. of Cumberland, produces large quantities of good semi-bituminous coal and iron.

Midlothian, post-v. and tp. of Chesterfield co., Va., on the Richmond and Danville R. R. (Coalfield Station), 14 miles W. of Richmond. Here are mines of good Triassic coal, one bed being 30 feet thick. Pop. 2629.

Mid′rash [Heb., "explanation"], a general name for the Talmudical writings of the Jews, including both the Halacha and the Haggada, together constituting a large body of literature, of which important parts have never been published.

Mid′shipman, in the U. S. navy, is an officer of the ninth grade, ranking next below ensign. After appointment midshipmen now pass six years at the Naval Academy as cadet midshipmen. At the end of this time, after satisfactory examination, they become midshipmen of the navy, and enter the line of promotion in active service.

Mid′ville, post-v. of Burke co., Ga., on the N. bank of the Ogeechee River, and on the Central R. R. of Georgia, 15 miles W. of Millen.

Mid′way, post-v. and tp. of Bullock co., Ala., on the Montgomery and Eufaula R. R. Pop. 3036.

Midway, tp. of Monroe co., Ala. Pop. 889.

Midway, post-v. of Woodford co., Ky., on the Louisville and Lexington R. R. Pop. 532.

Midway, post-v. and tp. of Davidson co., N. C., 10 miles N. of Lexington. Pop. 1026.

Midway, post-v. and tp. of Barnwell co., S. C., on the South Carolina R. R. Pop. 1218.

Midway, tp. of Clarendon co., S. C. Pop. 425.

Midway, post-v. of Greene co., Tenn., on the East Tennessee Virginia and Georgia R. R.

Midwifery. See OBSTETRICS.

Mie′ris, van (FRANS), THE ELDER, b. at Delft in 1635; became a pupil of Gerard Dow, and painted like him small genre pictures of social life with a wonderful precision and delicacy. D. at Leyden in 1681. Even during his lifetime his pictures commanded a very high price, and now they are very seldom for sale. The galleries of Dresden, Munich, and Florence possess quite a number of them. His two sons—WILLEM VAN MIERIS, b. in 1662, d. in 1747, and JAN VAN MIERIS, b. in 1660, d. in 1690—were both painters, disciples of their father, and the elder reached a high degree of perfection in his art.—FRANS VAN MIERIS THE YOUNGER, son of Willem, confined himself mostly to copying after his father and grandfather. He wrote *Historie der Nederlandsche Vorsten* (3 vols., the Hague, 1732–35) and several other works. He was b. in 1689, and d. in 1763.

Mif′flin, county of Central Pennsylvania. Area, 375 square miles. It is traversed by steep parallel mountain-ranges of the Alleghany system, and has very fertile valleys. Cattle, grain, and wool are leading products. Leather is extensively manufactured; also iron, edge tools, machinery, clothing, etc. The county is traversed by the Juniata River and by the Mifflin and Centre County, the Sunbury and Lewistown, and the Pennsylvania R. R. Cap. Lewistown. Pop. 17,508.

Mifflin, post-tp. of Ashland co., O. Pop. 781.

Mifflin, tp. of Franklin co., O. Pop. 1562.

Mifflin, tp. of Pike co., O. Pop. 1108.

Mifflin, tp. of Richland co., O. Pop. 898.

Mifflin, tp. of Wyandot co., O. Pop. 866.

Mifflin, tp. of Allegheny co., Pa., on the W. side of the Monongahela River. It contains Braddock's Field, the scene of Braddock's defeat, July 9, 1755. It has several villages, and coal-mines and manufactories. Pop. 5058.

Mifflin, tp. of Columbia co., Pa. Pop. 1029.

Mifflin, tp. of Cumberland co., Pa. Pop. 1455.

Mifflin, tp. of Dauphin co., Pa. Pop. 614.

Mifflin, tp. of Lycoming co., Pa. Pop. 1004.

Mifflin, post-tp. of Iowa co., Wis. Pop. 1490.

Mifflin (Thomas), b. in Philadelphia in 1744 of Quaker stock; was educated at Philadelphia College; became a merchant, and in 1772–73 was in the legislature; went to Congress in 1774; joined the Revolutionary army; rose to be brigadier-general in 1776 and major-general in 1777, serving with great honor; withdrew from active service after the battle of Germantown; was sent to Congress in 1782, becoming its president in 1783; Speaker of the State legislature in 1785; was in the convention of 1787 which formed the U. S. Constitution; president of the Pennsylvania executive council 1788–90; president of the State convention of 1790; governor 1791–1800. D. Jan. 21, 1800.

Mif′flinburg, post-b. of Union co., Pa., about 25 miles W. of Danville, on the Lewisburg Centre and Spruce Creek R. R., has excellent schools, 2 banks, 1 newspaper, 1 steam flouring and planing mill, 1 steam factory, extensive deposits of limestone, iron, soft and hard coal. Pop. 911. G. W. Schoch, Ed. "Mifflinburg Telegraph."

Mif′flintown, post-v., cap. of Juniata co., Pa., 49 miles W. of Harrisburg, on the Juniata River and Pennsylvania Central R. R., has 3 churches, 2 banks, 3 newspapers, a court-house, and stores. Pop. 857.
J. W. Speddy, Ed. "Mifflintown Independent."

Migne (Jacques Paul), b. at Saint-Flour, in the department of Cantal, France, Oct. 25, 1800; studied theology at Orleans; was ordained priest in 1824, and appointed curate at Paiseaux; went in 1833 to Paris, and founded the Ultramontanist journal *L'Univers*, and founded in 1836 the Imprimerie Catholique, which soon became one of the most remarkable industrial establishments in Paris. From this office issued *Collection des Orateurs Sacrés* (100 vols. 1846–68), *Patrologiæ Cursus Completus* (390 vols.), *Encyclopédie Théologique* (171 vols.). In the establishment were also manufactured organs, statuary, pictures, and all kinds of church utensils. In Feb., 1868, the establishment was destroyed by fire.

Mignet′ (François Auguste Marie), b. at Aix in Provence May 8, 1796; was educated at Avignon; studied law at the Academy of Aix at the same time with M. Thiers; removed to Paris in 1822; produced a dissertation on feudalism and the institutions of St. Louis; then followed *Histoire de la Révolution Française* (1824), *Histoire de Marie Stuart* (1851), *Éloges Historiques* (1864), etc.; was in 1830–48 director of the archives of the foreign ministry; member of the Institute and of the Academy, and commander of the Legion of Honor, etc.

Mignonnette′ [Fr., "little darling"], the *Reseda odorata*, an herb, sometimes half shrubby, a native of North Africa, universally cultivated for its delicious fragrance. It belongs to the order Resedaceæ, and is frequently seen in window and parlor cultivation.

Migrations of the American Aborigines. The writer of this article has elsewhere presented at length the evidence (*N. A. Review*, Apr., 1869) which seems to him to establish several points which form an indispensable preliminary to the statement of his conclusions in regard to the migrations of the various families of Indians. As this evidence cannot be here presented, it is necessary to assume the following facts: I. The valley of the Columbia River in Oregon, on account of the abundance of food afforded by its fisheries, was for thousands of years the centre of a rapidly increasing population, from which successive groups of aborigines radiated to the extremities of North and South America. II. Owing to the vast expanse of prairie, impassable to a purely hunting community, there were but four routes for migration eastward—namely, by the Saskatchewan River in the Dominion of Canada, by the Missouri, the Platte, or the Arkansas River, the first and fourth of these routes being by far the most practicable. III. There was a time, however remote, when neither North nor South America possessed any human inhabitants. IV. The present aboriginal tribes, with the exception of the Esquimaux, correspond to each other so closely in physical and mental characteristics and systems of consanguinity as to constitute but one race. It will be further assumed, V., that the original status of the parent family on the Columbia River was one of savagery, and, VI., that this status had been diffused to the extremities of the southern continent before favoring circumstances, especially the cultivation of maize in the central table-lands, afforded the basis for rising to the lower and middle levels of barbarism. The writer even believes it probable that the earlier Columbian colonies would, by following southward the great natural highway provided by the slopes of the Andes, reach the Straits of Magellan before any other offshoot from the parent stem would surmount the intervening obstacles between the Columbia River and Florida. That the great stretches of prairie, whether fertile or desert, really constituted a barrier to the advance of the hunting tribes, is sufficiently evident from the fact that nearly all this territory was a solitude at the period of European discovery. Even the Mound-builders, who are known on sufficient evidence to have depended rather upon horticulture than upon fishing and the chase for the means of subsistence, were overmastered in the struggle for life by the rigor of the climate, and retired to seek more propitious conditions. They may, not improbably, have formed one of the successive waves of population which flowed into the valley of Mexico, and founded there that confederation of peoples in the middle status of barbarism which romantic writers have dignified with the illusory title of the "Aztec empire."

Between 1600 and 1700 A. D. the area between the Atlantic and the Mississippi, and from Hudson's Bay to the Gulf of Mexico, had been sufficiently explored to render both the English and the French familiar with the locations of the several Indian tribes within these limits. Some knowledge of the Dakotas and of the Missouri tribes had also been obtained. But it was not until the eighteenth century that the same degree of information was acquired of the tribes in the interior and upon the Pacific coast. Our systematic knowledge of the aborigines dates from the present century. Their unity of origin will be assumed on the basis of evidence furnished by their "systems of consanguinity and affinity." (See *Smithsonian Contributions to Knowledge*, vol. xvii.) The 150 dialects, more or less, spoken N. of New Mexico have been reduced to a number of stock-languages, which resolve the aborigines into a limited number of linguistic groups, whose migrations will be considered separately. As a general rule, the tribes speaking dialects of the same stock-language were found in territorial continuity, as would have been expected.

I. *Migrations of the Algonkin Tribes.*—A much larger area was occupied by the Algonkin tribes than by any other single stock of the Ganowanian family. (This name signifies the Family of the Bow and Arrow.) N. of the great lakes the tribes of this lineage were spread from the eastern slopes of the Rocky Mountains to the coast of Labrador. They also occupied the Atlantic coast from New Brunswick to the confines of South Carolina, and along the E. side of the Mississippi from Lake Superior to the Ohio. They were thinly scattered over these immense regions, and held them free from intrusion, with the exception of the Winnebagoes in Wisconsin and the Iroquois and their kindred tribes in New York and Western Canada. That they were migrants from the western side of the continent by a high northern route is plainly shown by the continuous line of their occupation. It will not be necessary to discuss their traditions of a north-western origin or their secondary migrations, except to make a single point. These tribes fall into the following subdivisions: 1, The Atlantic tribes; 2, the Great Lake tribes; 3, the Mississippi tribes; and 4, the Rocky Mountain tribes. It can be shown that they had within their areas two centres of population where tribes were grown and thrown off. One of these was upon the head-waters of the Mississippi, from which they were displaced by the Dakotas. The Shiyans, Arapahoes, Ahahuelins (Gros Ventres of the Prairie), the Menomonees, Kickapoos, Sauks and Foxes and Shawnees seem to have been derived from this secondary source. The other was upon the outlet of Lake Superior, the original home of the Ojibwas, Ottawas, and Pottawattamies, and possibly of the Crees. In this area and upon its fisheries the Miamis and the tribes known collectively as the Illinois—namely, the Peorias, Weas, Kaskaskias, and Piankeshaws—originated, and migrated from thence into the areas between the Mississippi and the Ohio, where they were found. It affords a striking illustration of the influence of great fisheries in developing tribes of men under institutions which belong to this status of society.

II. *Migrations of the Dakotan Tribes.*—Some evidence both with respect to the migrations of the several tribes and the general direction of their advance as one of the great stocks of the Ganowanian family may be derived from the relations of the dialects, and from the geographical positions of the numerous tribes of this lineage. They were either lake or river Indians, which gave a peculiar character to their area of occupation. Since these lakes were in the midst of prairies, and since the rivers had a narrow border of forest, while all beyond was open prairie, unsuitable for Indian occupation, the tribes of this stock spread over great distances N. and S. along the banks of the rivers, without any corresponding lateral expansion, except in the lake region of Minnesota. Besides, as their area, with the exception of the lake region, was a comparatively poor one, it created a tendency among the more vigorous and warlike bands, like the Iroquois, who were probably an early offshoot from the Dakotan stem, to seek new habitations in distant regions.

1. *Dakotas.*—The Dakotas proper held a broad as well

as compact area on the head-waters of the Mississippi and in the lake region of Minnesota, from which they ranged eastward to Lake Superior and westward to the Missouri. A portion of them when discovered were permanently established on the Missouri. They are now divided into some twelve great bands, and occupy the plains between the Mississippi and the Rocky Mountains, forced westward, as other tribes have been, by the progress of the incoming race. When Carver visited the Dakotas in 1756, they were divided into eleven bands. (*Travels*, Philadelphia ed., 1796, p. 37.) They acknowledged seven primary divisions, as stated by Riggs (*Lexicon*, Introd., p. xv.; *Smithsonian Contributions*, vol. iv.), of which the Tetons were the seventh, now subdivided into several bands. The name *Dakota*, by which they call themselves as one people, signifies "leagued" or allied. They also speak of their confederacy as the "seven council-fires." They are divided into thirteen bands—Santees, Yanktons, Sissetons, Ogallallas, Brulés, Unkpapas, Blackfeet Dakotas, Channonpas, Sans-arcs or Itazipcos, Minnekanjoos, and Two Kettles. Isaunties is a generic term used by the western Dakotas to describe their kindred on the Mississippi; and Tetons another employed by the latter to describe the former. As the language has two dialects, the distinction is dialectical.

2. *Assiniboines.*—This tribe was originally one of the constituent bands of the Dakotas, but became detached and independent shortly before their discovery. They moved northward to Rainy Lake, and ranged thence westward to the Missouri and northward to Lake Winnipeg.

3. *Missouri Tribes.*—The nearest congeners of the Dakotas were the eight Missouri tribes, who inhabited both banks of this river and some of its tributaries from the Ponka River on the N. to the mouth of the Missouri, and thence southward to the Arkansas on the S. They fall dialectically into three groups—first, the Ponkas and Omahas; second, the Iowas, Otoes, and Missouris; and third, the Kaws, Osages, and Quappas.

4. *Winnebagoes.*—This tribe is clearly affiliated with the Missouri tribes above mentioned. Under the French name of Puants they were found near Lake Winnebago in Wisconsin, and ranged to Green Bay. They were an offshoot from the Dakotan stem, which, advancing eastward toward the forest area, were arrested by Lake Michigan, and very likely by the tribes in possession of the narrow peninsula between it and Lake Superior. This was the natural route of migration to the valley of the St. Lawrence from the Mississippi region, and probably the one previously taken by the Iroquois.

5. *Upper Missouri Tribes.*—N. of all the tribes named are the Mandans, who speak a dialect of the Dakota language; and also the Minnitarees or Hidatsa and the Crows, whose dialects have so large an infusion of Dakotan vocables that they have been regarded as of this descent. Their real connection seems to be with the Gulf tribes—namely, the Creeks, Choctas, and Seminoles.

6. *Hodenosaunian Tribes.*—This group consists of the five Iroquois tribes (Senecas, Cayugas, Onondagas, Oneidas, and Mohawks), the Hurons or Wyandottes, Eries, Neutral Nation, Susquehannocks, Nottowas, and Tuscaroras. The home-country of the Iroquois before they occupied New York was upon the N. bank of the St. Lawrence, near Montreal. (*League of the Iroquois*, p. 5.) Their last migration, of which they have preserved a full tradition, was from that district into the lake region of Central New York, where they had been established at least a century and a half when first discovered in 1608. The Hurons remained upon the Georgian Bay and around Lake Simcoe, and ranged southward to Lake Erie; the Wyandottes of Kansas are the remains of this people. The Neutral Nation occupied the banks of the Niagara River and the N. E. shore of Lake Erie, and the Eries the S. E. shore of the same lake. Both tribes were defeated and expelled by the Iroquois about 1650–55, and are now extinct. The Susquehannocks lived on the lower Susquehanna, in Pennsylvania, the Nottowas in Virginia, and the Tuscaroras in North Carolina, until their expulsion in 1712, when they settled in New York. It will be observed that the Iroquois and their kindred tribes are classed with the Dakotas. The evidence of this connection is found in their dialects, the words of which are very similar, although not identifiable; in their systems of consanguinity, which are identical in minute particulars; in the common term, *Nä-do-es-sioux*, applied by the Ojibwas and other Algonkin tribes to the Dakotas, the Iroquois, and the Hurons; and from the tradition of the Hurons that the Dakotas were descended from them, which asserts their common descent. From what quarter these tribes or the mother-tribe entered the Algonkin area we have no positive knowledge. It seems at least probable that they passed through the peninsula between Lakes Superior and Michigan, and thence to the valley of the St. Lawrence, where their traditionary history commences; and that the Winnebagoes were following on the same general line when their further progress eastward was arrested by the superior power of the tribes which then held the peninsula. Both migrations probably antedate the occupation of the head-waters of the Mississippi by the Dakotas. The initial point from which the Dakotans migrated into the central section of the continent was necessarily remote. They were northerners climatically, and their natural relations were to the western side of the continent. They must have reached the Missouri either by way of the Arkansas or the Platte, on either of which 800 miles of prairie must have been traversed. In their eastern movement, which was in progress at the epoch of European discovery, they were later in time than the Algonkin tribes, and later than the Gulf nations.

III. *Migrations of the Gulf Tribes.*—Arranged according to language, these tribes are the following; 1, Catawbas; 2, Natches; 3, Cherokees; 4, Creeks, Choctas, Chickasaws, and Seminoles. Concerning the migrations of these tribes, and of the smaller tribes along the Gulf W. of the Mississippi, no knowledge is preserved. It is only by ascertaining their connection with tribes whose migrations are traceable that this knowledge can be recovered.

IV. *Migrations of the Pawnee Tribes.*—The Pawnees and Arickarees speak closely-allied dialects. When first known, the Pawnees, in four subdivisions, occupied the upper waters of the Kansas River, and ranged from thence to the Platte. After their separation from the main stock the Arickarees removed to the upper Missouri, near the Mandans, where they became horticultural village Indians. Neither they nor the Pawnees ever lived E. of the Missouri. Their only known congeners are the Huecos, Witchitas, Keechies, and Towaches of the Canadian River and Red River of Arkansas. They all speak dialects of the same stock-language, and have been prairie Indians since first known, subsisting upon the buffalo through the possession of the horse. This branch of the Ganowanian family is thus referred to the Rocky Mountain chain near the head-waters of the Arkansas, along which, without doubt, they traversed the prairies into their modern areas. The line of their migration, which was comparatively recent, points to the valley of the Columbia as the home of their ancestors.

V. *Migrations of the Athapasco-Apache Tribes.*—The Athapascans, who occupy the greater part of the Hudson's Bay territory from the Saskatchewan to the Yukon, and from the bay westward to the Rocky Mountains, and beyond, together with the several tribes of the Apaches and the Navajoes and Pinols of New Mexico, speak dialects of the same stock-language. Their migrations present the remarkable spectacle of a stock dividing in some central area—one branch moving northward and becoming established in a nearly arctic climate, and the other moving southward into a semi-tropical region. The Apaches did not come into notice until after they became possessed of horses, which have raised many Indian tribes from obscurity.

VI. *Migrations of the Shoshonee Tribe.* — The tribes speaking dialects of this language are the Shoshonees or Snake Indians in subdivisions, who inhabit the Lewis Fork of the Columbia, and range southward to the Humboldt River and eastward to the Wind River Mountains; the Utes in several subdivisions, who inhabit the Territory of Utah from the region of Great Salt Lake southward to New Mexico, and the W. side of the Colorado southward to Arizona; the Comanches of Texas; and the Cawios, Netelas, and other small bands in the peninsula of Lower California. Of this stock the Shoshonees and Comanches are the most conspicuous members. The former have held the same area, substantially, since their discovery, but a portion of them, according to a tradition of the Crow Indians, occupied formerly the head-waters of the Yellowstone, from which the Crows displaced them. The Comanches, called at different times Paducas and Hietans, have been known from an early period, but became prominent only within a century through possession of the horse. If they were met with at all at the time of Coronado's expedition, which is uncertain, they were then a feeble tribe. When first known to Americans they ranged northward to the Kansas River, and southward through Western Texas and towards the Gulf of Mexico. In some respects the Shoshonee migration is more significant than that of any other stock of the Ganowanian family. It was the last in time, and its entire course is manifest, as well as the region in which it took its rise. The greater part of the area overspread is still held by tribes speaking dialects of this language. It extends from the principal branch of the Columbia southward to the Colorado, where it divides into two streams: one, turning south-easterly, and migrating apparently by way of the Arkansas, reached

Texas; while the other, keeping W. of the Colorado, flowed south-westerly until its most advanced bands penetrated Lower California, the two extremes being a thousand miles apart from E. to W.

It will not be necessary to notice the aboriginal tribes of the valley of the Columbia and Fraser's River, except to remark that the unusual number of stock-languages in this area, some ten or twelve, is sufficient evidence of its long-continued occupation.

VII. *Migrations of the Village Indians.*—1. *Of the Village Indians of New Mexico and Arizona.*—The valleys of New Mexico, without doubt, have been the seats of the village Indians from a very early date. This view is sustained by the number and position of the present pueblos, by the ruins of deserted pueblos, and by the number of stock-languages, five or six, spoken in these limited areas. There are reasons for supposing, from the number of pueblos in ruins in New Mexico and Arizona and in the southern part of Utah, that village Indian life in these regions was in a state of decadence at the time of their discovery. It seems probable that the Indians who occupied the deserted pueblos had been overpowered and forced southward by the more barbarous tribes falling down upon them from the valley of the Columbia. For upwards of three centuries the Pueblo Indians, as they are called, have been known to us, and have remained substantially in the same condition. Of their previous history and movements no direct knowledge remains, but the probability is strong, if not conclusive, that their remote ancestors were immigrants from the valley of the Columbia.

2. *Migrations of the Mound-builders.*—Among the tribes without recognized descendants are the Mound-builders, who lived mainly in the valley of the Ohio and upon its tributaries. It is evident that they were village Indians, depending chiefly upon horticulture for subsistence, from the implements and utensils found in the mounds, and from the areas selected by them, which were poor in fish and game. It is probable that they were village Indians from New Mexico, the nearest point from which they could have been derived. From the absence of all traditionary knowledge concerning them among the present Indian tribes, the experiment to transplant their type of village life from a dry and temperate climate into colder northern areas had been made and failed before the arrival of the ancestors of the present tribes E. of the Mississippi. The probability that they withdrew from the country is at least stronger than that they destroyed each other. (See AMERICAN ANTIQUITIES.)

3. *Migrations of the Village Indians of Mexico and Central America.*—The evidence of the occupation of these areas from a very ancient date is conclusive, both from architectural remains and from the number of stock-languages. It is not probable that the number of these languages could be reduced below eight or ten if the materials for their comparison were ample. There are supposed to be eighteen. "We can safely affirm," says Clavigero, "that there are no living or dead languages which can differ more among each other than the languages of the Mexicans, Otomies, Tarascas, Mayas, and Mixtecas." (*Hist. of Mexico*, Cullen's trans., Philadelphia ed., 1817, iii. 100.) To these should be added the Zapotecan, Totonacan, Huaxtecan, Mixe, Popolucan, and some others to make the list complete. The higher development of architecture in Yucatan and Chiapas suggests a longer occupation of these countries by village Indians than of Mexico. It is a singular as well as an instructive fact that the principal historical tribes of Mexico found in possession at the time of the Spanish conquest had resided there but a few hundred years. Their respective migrations were so recent in point of time that knowledge of the event and of the quarter from whence they came had been preserved by tradition. Acosta, whose work was first published at Seville in 1589, and who visited Mexico in 1585, gives the principal tradition quite fully. He remarks: "These second peoples, Navatalcas [the first he calls Chichemecas], came from other far countries which lie towards the N., where now they have discovered a kingdom which they call New Mexico. There are two provinces in this country—the one called Aztlan, which is to say, a place of herons; the other Teaculhuacan, which signifies a land of such whose grandfathers were divine. . . . The Navatalcas paint their beginning and first territory in the figure of a cave, and say they came forth of seven caves to come and people the land of Mexico." (*Natural and Moral Hist. of the E. and W. Indies*, London ed., 1604, Grimstone's trans., pp. 497–504.) He places the time of the migration of the first of the seven tribes at 720 A. D., which of course is an approximate date only, and the time consumed in the movement at eighty years. The migration of the Aztecs, the last of the seven in the order of time, was commenced in 1022 A. D. Herrera adopts this tradition, remarking that "they came from remote parts northward, where New Mexico was afterwards found." (*Hist. of America*, Lond. ed., 1725, Stevens's trans., iii. 188, 189.) Clavigero remarks that the name Nahuatlacas (the Navatalcas of Acosta) "was principally given to those seven nations, or rather those seven tribes of one nation, who arrived in that country after the Chichemecas, and peopled the little islands, banks, and boundaries of the Mexican lakes. These tribes are the Sochimilcas, the Chalcese, the Tepanecans, the Colhuas, the Tlahuicas, the Tlascalans, and the Mexicans. The origin of all these tribes was the province of Aztlan. . . . All historians represent them as originally of one and the same country; all of them spoke the same language." (*Hist. of Mexico*, l. c. i. 141.) Elsewhere (ii. 119) he remarks that "the Chichemecas, like the Toltecs who preceded them, and other nations which came after them, were originally from the N. countries, as we may call the N. of America, like the N. of Europe, the seminary of the human race."

Besides this general tradition of the migration of the Nahuatlacs in several tribes, there is a special tradition of the migration of the Aztecs. They left Aztlan, according to the arithmetic of Clavigero, in 1160 A. D., arrived at Tulla, N. of the valley, in 1196, at Chapultepec in 1245, at Acoloco in 1262; were enslaved by the Cholulans in 1314, freed themselves in 1325, and that year founded Mexico. (*Ib.*, i. 150.) The last date in all probability is near the truth, the remaining chronology being merely approximate. These traditions strike the writer as unquestionable in their authority as to the principal facts. They ascribe to them a northern origin, which was antecedently probable, and which leads to the final inference that their remote ancestors originated in the valley of the Columbia.

With respect to the migrations of the village Indians of Yucatan and Central America, the Chiapanese had a tradition of the northern origin of their ancestors; and there still remained in San Salvador and Nicaragua tribes speaking the Aztec language, as they did in the time of Oviedo. With these clear and specific evidences of a northern origin of the principal historical tribe in Mexico and Central America, it is difficult to arrive at any other conclusion than that the remote ancestors of all the tribes found in these countries were emigrants from the valley of the Columbia.

VIII. *Probable Asiatic Origin of the Ganowanian Family.*—A brief reference to the facts which suggest this hypothesis will conclude this article. In the first place, the number of distinct types of mankind in Asia, against a single type in America, aside from the Esquimaux, shows conclusively that the Asiatic continent has been occupied by man much the longest. Secondly, the striking affinities in physical characteristics between the Mongolians and Tungusians of North-eastern Asia and the aborigines of America warrant the assumption of the Asiatic origin of the latter, unless the independent creation of man in America is claimed. Thirdly, there are two existing lines of communication between the two continents within the power of savage tribes—one of which, across the Straits of Behring, has been proved to be practicable by the Esquimaux migration; and the other, by the Aleutian chain of islands, is rendered a probable route by the fact that most of these islands are now inhabited by a people of common descent. They are so near together as to be visible from each other, with the exception of two intervals of 60 miles each, one of 50 miles, one of 330, and one of 100, the last two near the Asiatic coast. Fourthly, these islands are gradually sinking, as has been inferred by navigators from the fact that trees are now to be seen standing under water between some of them. These islands are the peaks of a submarine chain of mountains, and it is not an improbable supposition that some thousands of years ago they may have stood higher above the sea-level than at present, and consequently nearer together. The widest gap is on the Asiatic side. From Attou Island, the westernmost of the Aleutian chain, to Behring Island, it is about 400 miles, with Copper Island between; and from Behring Island it is about 100 miles to Kamtchatka. From Attou Island the American coast is accessible by means of canoe navigation from island to island—not readily, but possibly, through the vicissitudes of the ages. Fifthly, in the Ocean Stream of the North Pacific, the counterpart of the Gulf Stream of the North Atlantic, an instrumentality is provided so remarkable in character that it would have been extraordinary if America had remained without inhabitants of Asiatic origin. This stream rises in the South Pacific, and flows northward along the Japanese and Kurilian Islands to the Cape of Kamtchatka, where it is deflected to the eastward, and divides into two streams. One of these, following the coast, enters Behring Strait, but the other, the main stream, crosses the Pacific eastward along the S. shores of the Aleutian chain to Alaska, where it turns

down the Pacific coast. It is not entirely lost until it reaches the shores of California. Trunks of camphor trees and Japanese junks have been brought to our coasts by this ocean river in our times. Lastly, it is not to be supposed that a deliberate migration brought the aborigines to America, if they came in fact from Asia. The natural obstacles to such a transit to an unknown land preclude the supposition. When it occurred it must have been purely accidental, and limited to a small number of persons, although it may have been repeated under similar circumstances a number of times in the course of the ages. The Amoor, one of the great rivers of Asia, stands nearly in the same physical relations to the north-eastern section of that continent that the Columbia does to the north-western section of the American. This river, although unequal to the Columbia in its fisheries, must have attracted inhabitants to its banks in the early ages of the existence of the human family. Its occupation would have led to boat-craft and familiarity with the sea. The Ocean Stream might easily bear off canoe-men, once thrown upon its current by the accidents of the sea, from the coast of Asia or from the Japanese or Kurilian to the Aleutian Islands. After Attou Island, the first in the series, was gained, the problem of reaching Alaska and America would be substantially solved.

The Arctic regions were undoubtedly last occupied by man. It requires the gradual adoption of hyperborean habits before human existence could be maintained in an arctic climate. For this reason, and from the great antiquity of the Ganowanian family in America, the Aleutian route is far more probable if the question is confined to Behring Straits on the one hand, or the Aleutian chain on the other. Finally, it is a striking fact, in the great chain of facts which point to the Asiatic origin of the American aborigines, that the Tungusian and Mongolian tribes, who, of all existing Asiatics, are nearest to them in type, still hold the Amoor River, upon which they have lived from time immemorial. LEWIS H. MORGAN.

Miguel′ (JOHANN), b. in the province of Hanover Feb. 21, 1828; studied law at Heidelberg and Göttingen 1846–49, and settled at Göttingen as an advocate. Enthusiastic for the unity of Germany, he worked with great energy for the national idea, but thereby, and by some papers on the financial condition of Hanover, incurred the enmity of the government. He gained the confidence of the people, however. In 1864 he was elected a deputy from three different places, and in the second chamber of the Hanoverian diet he occupied an influential position. He espoused the policy of Benningsen. In 1865 the city of Osnabrück elected him burgomaster. After the annexation of Hanover to Prussia in 1866, he exerted himself zealously in order to strengthen the newly-established connection, and it was in no slight degree due to his influence as a member of the North German diet and the Prussian house of deputies that the policy became liberal and the South German states entered into intimate relations with the North German confederation. His office of burgomaster he resigned in 1870, to accept that of director of the discounting bank of Berlin, but in the German Diet he still continued one of the most active members of the national liberal party. AUGUST NIEMANN.

Miguel (Dom MARIA EVARISTO), b. at Lisbon Oct. 26, 1802, the third son of John VI., king of Portugal, by the Spanish princess Carlotta Joachima; went in 1807 to Brazil with his parents, fleeing from the French armies. Here he grew up entirely neglected. When he returned to Europe in 1821 he could neither read nor write. When he was ten years old he was a drunkard; when he was fifteen his debaucheries and atrocities amazed the people. He was, nevertheless, his mother's favorite, and seems to have returned this love, while he hated his father and brother, and considered them as strangers. Soon after the return of the royal family to Portugal he began to form conspiracies against his father; open revolt followed. The plan was to depose the king, and, if necessary, to kill him. He escaped on board an English man-of-war, and by his escape Dom Miguel's plan was foiled. The prince was banished from Portugal May 12, 1824. On May 10, 1826, John VI. died, and in order to prevent a civil war the eldest son, Dom Pedro, emperor of Brazil, resigned the Portuguese throne in favor of his daughter, Maria da Gloria, and offered her hand to Dom Miguel. He assented, made oath on the constitution, and entered on his regency during the minority of Maria. But he soon broke his oath, subverted the constitution by the aid of the clerical party, dissolved the constitutional Cortes, assumed absolute power, filled all the dungeons of the country with the liberals, and ruled Portugal for several years by terror, while he gave up himself to the wildest dissipation. But in 1832, Dom Pedro arrived at Oporto with a Brazilian fleet. In 1833 he conquered Lisbon, and on May 26, 1834, Dom Miguel was brought to Genoa by a Portuguese man-of-war, having agreed never to re-enter Portugal. As soon as he arrived at Genoa, however, he protested against the agreement, but the only result of the protest was that he lost his pension from Portugal, and all his property was confiscated. He afterwards married a German princess, and d. at Brombach, Baden, Nov. 15, 1866.

Mika′do, the titular name of the Japanese emperor. The present mikado was b. in 1852, or, according to the Japanese calendar, in the year 2512. His name is MŬTSHITO, the son and rightful heir of Osa-hito, whose posthumous name was Komei Tenno, and whose reign lasted twenty years. Soon after the death of the father, in 1867, many circumstances conspired to force the late "tycoon" to abdicate the ruling position which he and his predecessors had held as usurpers for several hundred years, and which event was the pivot upon which the late revolution in Japan rested. On attaining the requisite age of sixteen, Mŭtshito was crowned in the city of Osaka. One of his first acts after that event was to grant an audience to the representatives of foreign powers then in Japan, which was the first time that such an audience had ever taken place. Soon afterwards, and before the close of 1868, he removed his residence to Yedo, which he decreed should be called *Tokio*, or the "Eastern Capital." Early in Jan., 1869, he granted his first audience to the ministers of foreign powers in Tokio, and received their credentials; not long afterwards he visited Kioto, the western capital, took unto himself a wife, and returned to Tokio, to which city all the great daimios of the empire had been ordered to resort by His Imperial Majesty. That the rule of the new emperor has been fraught with wonderful results is known to all the world, and it is to be regretted that we cannot in this place go into particulars. We may notice, however, that he has won the affection of his people by his high character and unselfish patriotism. He has sent ambassadors abroad for the purpose of informing themselves in regard to affairs of state; established legations in America, Germany, England, France, Italy, Russia, Austria, and China; he has sanctioned the building of railways and the establishment of steamship lines; connected his empire with the whole world by means of the telegraph; established many modern lighthouses all along his coasts; organized an army and a navy on the models of the Western World; sent young men abroad by the hundred to be educated; revised old laws and made new ones to conform with the modern spirit of civilization; abolished many barbarous usages; given his decided approval to a free press; and in these as well as many other important measures he has proved himself the very head and front of his marvellous empire. And just as this paragraph is going to press we have the authentic news that the mikado has issued an imperial proclamation or decree which has for its object the establishment of a deliberative body allied to a parliament, in which, to some extent, the will of his subjects may be expressed and recognized.

In his personal appearance the mikado is rather taller than the average of his countrymen; he has had three children, one of whom alone survives; he is not addicted to self-indulgence, but takes delight in cultivating his mind and is a hard student; although now only twenty-three years of age, he frequently presides at the meetings of his privy councillors; he frequently visits the executive departments to see that all is going on properly; he has surrounded himself with the wisest statesmen in his empire. With such a worthy ruler, and such a progressive people as the Japanese have already proved themselves to be, the empire of Japan may well count upon a great future of prosperity and happiness. F. A. P. BARNARD.

Mikhailov′ka, town of Russia, government of Koorsk, on the Khorok, has large manufactures of leather, boots, and shoes. Pop. about 6000.

Mik′losich, von (FRANZ), b. at Luttenberg, Styria, Nov. 20, 1813; educated at the gymnasium of Warasdin, Croatia; studied jurisprudence at the University of Gratz; received in 1844 an appointment at the imperial library at Vienna, and was made professor of Slavic languages at the university of the same city in 1849. His principal work is a comparative grammar of the Slavic languages (1852–70), a comprehensive and ingenious work. He also published *Lexicon linguæ palæoslowenicæ* (1850), and a great number of minor works on the Slavic language, literature, archæology, and history. In connection with I. Müller he edited *Acta et Diplomata Græca Medii Ævi* (3 vols., Vienna, 1860–64).

Mik′nas, Mequinez, or **Meknaza,** town of Morocco, in lat. 33° 58′ N. and lon. 8° W. It is situated on a fertile plain, watered by the Bet River and covered with olive-groves. It is fortified, neatly built, and contains a

magnificent palace built of marble and surrounded by beautiful gardens. The sultan resides here during the summer. A considerable trade and manufactures of leather and earthenware are carried on. Pop. 55,000.

Mi'lam, county of E. Central Texas. Area, 1048 square miles. It is bounded N. E. by Brazos River. It is diversified and fertile. Timber, coal, and medicinal springs abound. Corn, cotton, fruit, live-stock, wool, and lumber are leading products. Cap. Cameron. Pop. 8984.

Mil'an, large town of Northern Italy, in lat. 45° 28′ N., lon. 9° 11′ E., lying in the centre of the great fertile plain of the Po, between the Alps and the Apennines, the Adriatic and the Ligurian seas. (For climate see ITALY.) The Olona, a small stream, washes its southern wall, and the town is connected by navigable canals with the Adda, and, through the Ticino, with the Po. Railways centring in a most imposing station unite Milan with all the large towns of Italy. The circumference of the city, following the ramparts, is about 8 miles; it has twelve gates, the most striking being the Porta Sempione on the N. W., at the entrance of the great Simplon road, whose construction is here commemorated by a magnificent triumphal arch begun in 1807 and finished in 1836. The streets of Milan are generally broad and very clean; the palaces, though sometimes of immense size, lack the mediæval grandeur of those of Florence. Of the 240 churches existing in the middle of the last century, Maria Theresa and Joseph II. suppressed 117; others have been abandoned since, so that the actual number is about 80. The cathedral of Milan, an Italian Gothic structure, is one of the most splendid temples in the world, being exceeded in size only by St. Peter's and the cathedral of Seville. It was begun in 1366 (Heinrich Arler of Gmunden being the architect, according to some—Matteo da Campione, according to others), and was in great part completed by 1500. Under Napoleon the work was actively resumed in 1805, and further decorations and repairs are constantly going on. The interior of this cathedral is 477 feet in length, 186 feet in breadth; height of nave, 158 feet, of dome, 214 feet, of tower, 360 feet. The nave is supported by 52 columns, the four sustaining the dome being 10 feet and the others 8½ feet in diameter, canopied niches with statues taking the place of capitals; the pavement is of mosaic; the vaulting, painted to imitate carved stone, has been injured by dampness, and is unworthy the rest of this wonderful edifice. The roof is a forest of Gothic turrets, 98 in number, decorated with exquisite carvings; the exterior of the cathedral is adorned with 2000 statues, the interior with 700. Handbooks of travel usually state the whole number of statues at 4500, but the above figures are from the best Milanese authorities. The Piazza del Duomo, an open space around the cathedral, has recently been enlarged, but still does not afford a satisfactory view of this marvellous building. Passing over other very noteworthy churches, that of St. Ambrose, founded in 387 by the illustrious archbishop himself, is of the greatest interest to the architect, the antiquarian, and especially to the lover of early Christian art. Near Santa Maria della Grazie, in which are very interesting frescoes, etc., is the convent containing that ruined masterpiece of art, Da Vinci's *Last Supper*. It would be impossible here even to hint at the endless artistic and literary treasures existing in Milan. The Brera Gallery alone contains more than 400 oil paintings, many of great excellence, besides admirable frescoes, etc. In the same building is the National Library, founded by Maria Theresa in 1764, and recently enlarged by private donations, libraries from suppressed monasteries, etc., until it now counts 250,000 volumes. The famous Ambrosian Library, founded by Cardinal Borromeo, has also lately risen from 60,000 to 155,000 volumes, among which are above 15,000 manuscripts, some of the greatest rarity. The adjoining Gallery of Art contains, among its countless treasures, invaluable original drawings and manuscripts by L. da Vinci. In addition to public collections, Milan boasts 26 private picture-galleries of more or less interest. There are 15 museums of natural history, 14 of medals and antiquarian objects generally. The charitable and educational institutions of Milan are on a most liberal scale, and admirably managed; the former own a capital of more than $40,000,000. The schools, academies, musical conservatories, etc. of Milan have a high reputation. There is also ample provision for public amusements. The theatre La Scala is one of the largest in Europe. The old and new public gardens furnish charming promenades, and the drive through the Corso and around the walls is most agreeable. Among the recent improvements in the city should be mentioned the Victor Emmanuel Gallery, or arcade, which has completely eclipsed the old Cristoforis. It represents a Latin cross, 640 feet long, 48 broad, 85 in height, with a cupola 165 feet high. The roof consists of two glass vaults, one 6 feet above the other. This gallery is entered from the Piazza della Scala through a superb Corinthian arch of granite, and contains about 100 brilliant shops. The municipality has recently spent 1,000,000 francs, besides the cost of the ground, on the new cemetery outside the Porta Garibaldi. The geographical position of Milan secures it an immense inland trade, chiefly in grain, rice, cheese, silk, etc.; in the suburbs there are numerous and important manufactories.

At the time of its conquest by the Romans (220 B. C.) Milan was the largest town of Cisalpine Gaul. Cicero and Marcus Brutus were afterwards among its governors, and in the third century it almost rivalled Rome. It was Christianized very early—tradition says by St. Barnabas—and was made illustrious in the fourth century by the good and great St. Ambrose. It suffered severely from the barbarians in 452, and in 558 was destroyed by a nephew of Vitiges, who, according to Procopius, slew 300,000 of its inhabitants. After many vicissitudes we find Milan in the eleventh century once more independent and with a population of 300,000. Its moral and intellectual prosperity rose with its material wealth. The celebrated archbishop Aribert offered every encouragement for the education of the young, and from her schools of philosophy, medicine, etc. Milan sent forth her professors to Burgundy, to France, and to Germany. After this followed a series of disastrous wars, ending with the destruction of the city by Frederick Barbarossa in 1162. It was, however, rebuilt with marvellous rapidity, and in 1176 the Milanese, aided by the neighboring towns, defeated Frederick at Legnano. In 1227 they were once more crushed by Frederick II. In 1259 an attempt was made by the terrible Ezzelino to get possession of the city, which failed, and from that time till 1447 Milan was governed by the ducal house of the Visconti. The so-called Golden Ambrosian republic, of three years' duration, was followed in 1450 by the dukedom of the Sforza, which lasted till 1500. From that time Milan continued for the most part under a foreign yoke, French, Spanish, or German, until 1796, when the French entered Milan and Napoleon made it the capital of the Cisalpine republic. In 1814 the Austrians took possession of the city, promised a liberal government, but pursued an entirely opposite policy. Insurrection after insurrection broke out (1815, 1821, 1833), each followed by arrests, imprisonments, executions; and a state of chronic conspiracy existed until the "Glorious Five Days' Revolution," which began on Mar. 18, 1848, and terminated in the expulsion of the Austrians. This is one of the brightest pages in the history of Milan, but after four months the enemy returned victorious. A new but disastrous insurrection was attempted in 1853. On June 8, 1859, Milan had the happiness to welcome the Franco-Italian army within her gates, and Victor Emmanuel as the sovereign of her choice. The town is at present highly prosperous. Pop. in 1874, 261,985. CAROLINE C. MARSH.

Milan, tp. of De Kalb co., Ill. Pop. 857.

Milan, tp. of Macon co., Ill. Pop. 322.

Milan, post-v. (called also CAMDEN, CAMDEN MILLS, and LOWELL) of Black Hawk tp., Rock Island co., Ill., on Rock River and on the Peoria and Rock Island R. R. It has water-power and thriving manufactures. Pop. 818.

Milan, tp. of Allen co., Ind. Pop. 1183.

Milan, a v. of Unadilla tp., Livingstone co., Mich. Pop. 143.

Milan, tp. of Monroe co., Mich. Pop. 1420.

Milan, post-v., cap. of Sullivan co., Mo., 250 miles N. W. of St. Louis, on the Burlington and South-western R. R., has 1 church, good educational advantages, 2 newspapers, 2 steam saw and flouring mills, 1 woollen-mill, 1 cooperage, 2 benevolent institutions, 2 hotels, and stores. Principal business, farming. It has deposits of coal, fire-clay, mineral paint, and building-stone. Pop. 319.
J. F. BEATTY, ED. "SULLIVAN COUNTY GAZETTE."

Milan, post-tp. of Coos co., N. H., on the Androscoggin River and on the Grand Trunk Railway, has manufactures of starch, lumber, and other goods. Pop. 710.

Milan, post-tp. of Dutchess co., N. Y., has 4 churches and several small villages. Pop. 1474.

Milan, post-v. and tp. of Erie co., O., 66 miles W. of Cleveland, has 4 churches, the Western Reserve Normal School, 1 large paint manufactory, shipyard, 2 carriage-shops, 1 banking-house, 1 newspaper. Pop. of v. 774; of tp. 2210. A. H. BALSLEY, ED. "MILAN ADVERTISER."

Milan Dépôt, post-v. of Gibson co., Tenn., 90 miles N. E. of Memphis, at the junction of the Memphis and Louisville, the Mississippi Central, and the Tennessee R. Rs., has 1 college and free high school, 1 newspaper,

steam cotton and planing mills, 3 hotels, and a number of business-firms. Incorporated 1866. Pop. about 2000.
W. A. Wade, Ed. "Milan Exchange."

Milaz'zo, large seaport town of Sicily, in the province of Messina, situated on the Gulf of Milazzo, about 27 miles W. of the city of Messina. This town stands partly on the shore and partly on a high promontory, which gradually slopes seaward till its rocky extremity is lost in the waves. The lower town is undefended, but the upper town is walled and strongly fortified. There are some buildings of interest here, and the convent of the Capuchins commands a magnificent view of the sea and of the town below. The harbor is sufficiently large and deep to receive ships of war, and about 1000 vessels, including those engaged in the coasting-trade, annually enter this port. The exports consist chiefly of oil, wine, salt fish, linseed, dried fruits, etc. Fish of excellent quality abound in the neighboring waters. Milazzo (anc. *Mile*) was founded by the Zanclei more than 700 years before our era, and has shared the general vicissitudes of the island. It has been the theatre of many battles, the last in 1860, when Garibaldi, July 20, obtained a brilliant victory over the Neapolitan troops, followed by the surrender of the fortress of Milazzo and the city of Messina. Pop. in 1874, 12,060.

Mil'bridge, a maritime post-v. and tp. of Washington co., Me., on Narraquagus Bay, 30 miles W. of Machias. Shipbuilding, the fisheries, and trade are the leading industrial pursuits. Pop. 1558.

Mil'burn, post-v. of Ballard co., Ky., 17 miles E. of Columbus. Pop. 314.

Milburn (William Henry), b. at Philadelphia Sept. 26, 1823; removed in childhood to Jacksonville, Ill.; studied at Illinois College, notwithstanding a partial loss of sight; became a Methodist itinerant preacher at the age of twenty, chiefly in the Southern States; was settled for a time at Montgomery, and afterwards at Mobile, Ala.; became a popular and eloquent lecturer and chaplain to Congress; went to England in 1859, and lectured with success in the principal cities. On his return he was ordained in the Protestant Episcopal Church, but returned in 1872 to Methodism. He is widely known as "the blind preacher," and has published *Rifle, Axe, and Saddle-Bags* (1857), *Ten Years of Preacher Life* (1859), and *Pioneers and People of the Mississippi Valley* (1860).

Mil'dew [Ang.-Sax. *mildeaw*; Ger. *Mehlthau*, "meal-dew"], the popular name of certain minute parasitic fungi in which agriculturists and horticulturists find one of their most dangerous enemies. The name was originally restricted to the white moulds of the genus *Botrytis*, but is now commonly applied also to other genera, even to the dark-colored fungi which attack our fruit trees. The most important of these parasitic fungi are those which infest the cereals and often injure the grain-crops very materially, such as the wheat mildew (*Puccinia graminis*), the red rust (*Trichobasis rubigo* and *lineare*), the smut (*Ustilago segetum*), and the bunt (*Tilletia caries*). As a preventive against this disease the seed-wheat is treated to a bath of a solution of sulphate of copper, which kills the spores carried along with the grain. Another very injurious and widely disseminated mildew (*Oidium Tuckeri*) is that which attacks the grapevine, destroying the foliage, and thereby preventing the fruit from ripening. It appears as grayish spots on the young shoots, the under surface of the leaves, and the stems of the fruit, and has often caused great destruction and desolation in the wine-growing regions of Europe. As a remedy against this disease the vines and trellises are sprinkled in early spring, when the buds first appear, with a solution of 8½ ounces of common salt and 4 ounces of saltpetre, with 36 ounces of water, to which are added 10 drops of oil of rosemary and 10 drops of oil of lavender, 1 part of this solution being mixed with 100 parts of water. The solution is applied by the aid of a syringe. Afterwards, when the leaves have expanded, they are well dusted with flowers of sulphur by the aid of a bellows especially contrived for the purpose. Also roses, lettuce, cucumbers, and peas are liable to be attacked by mildew when sudden changes in the atmosphere take place after a long interval of close, damp air. Some kinds of fungi, also known under the name of mildew, attack even linen and cotton fabrics and paper when kept in a damp place, and appear on the surface as dark spots.

Mile [Lat. *mille passuum*, a "thousand paces," of five Roman feet each], the name for a great number of linear measures, each remotely derived from the Roman mile. Among the principal miles are the following:

English and U. S. statute mile	= 1.
Roman mile	= .9193
English nautical or geographical mile	= 1.153
German " "	= 4.611
Scotch mile, ancient	= 1.127
Irish mile, ancient	= 1.273
German short mile	= 3.897
" long "	= 5.753
Prussian mile	= 4.680
Danish "	= 4.684
Swedish "	= 6.648

The geographical mile is one minute of the earth's equator; the German geographical mile is four times as long as ours. Our statute mile was fixed in Queen Elizabeth's time at 5280 feet, and has not since been changed.

Miles, tp. of Centre co., Pa. Pop. 1325.

Miles (James Warley), b. 1819 at Charleston, S. C.; graduated at South Carolina College; entered the ministry of the Protestant Episcopal Church; became a foreign missionary; was assistant rector of St. Michael's, Charleston; was afterwards professor of Greek and history in Charleston College. His writings have vigor and merit. Among them is *Philosophic Theology* (1849).

Miles (Gen. Nelson A.), b. at Wachusettville, Mass., Aug. 8, 1839; entered the volunteer service as lieutenant in the 22d Massachusetts Vols. Oct., 1861; was distinguished at Fair Oaks and at Malvern; became adjutant-general of a brigade; was appointed colonel 61st New York Vols. Sept. 30, 1862, which he commanded at Fredericksburg; was severely wounded at Chancellorsville; was appointed brigadier-general May 12, 1864; was distinguished in the Richmond campaign of 1864; appointed brevet major-general Dec., 1864; colonel of 40th Infantry U. S. A. July 28, 1866; transferred to the 5th Infantry Mar. 15, 1869, and commissioned brevet brigadier and brevet major-general U. S. A. Mar. 2, 1867.

Miles (Pliny), b. at Watertown, N. Y., in 1818; was in early life a school-teacher; was afterwards engaged in mercantile pursuits and studied law; travelled extensively in Europe, and narrated his experiences in several newspapers over the signature of "Communipaw." He published several volumes—*Sentiments of Flowers, Statistical Register* (1848), *Elements of Mnemotechny, or Art of Memory* (1848), which had 1 English and 7 American editions; *Northurfari, or Rambles in Iceland* (1854), *Ocean Steam Navigation* (1857), and *Postal Reform* (1855). To the subject of postal reform he devoted his later years with eminent success. D. in Malta Apr. 6, 1865.

Miles (Richard Pius), b. in Maryland May 17, 1791; was consecrated Roman Catholic bishop of Nashville, Tenn., in 1838. D. Feb. 1, 1860.

Miles (W. Porcher), b. July, 1828, in Charleston, S. C.; graduated at Charleston College, and studied law; was assistant professor of mathematics in Charleston College; mayor of Charleston 1856 and 1857, and introduced improved police and drainage systems; was distinguished for gallant and humane labors during the yellow-fever season at Norfolk, Va., 1855; member of Congress 1857–61; and afterwards a Confederate colonel and Congressman.

Miles'burg, post-b. of Boggs tp., Centre co., Pa., on the Bald Eagle Valley R. R., at the junction of the Bellefonte branch, 2 miles N. by W. of Bellefonte. Pop. 600.

Mile'tus, one of the most flourishing cities of Ionia, was on the Sinus Latmicus, opposite to the mouth of the Meander, and existed as a town at the time when the Greeks planted their first colonies in Asia Minor; but on the arrival of the Ionians under Neleus all the male citizens of the ancient population (Carians or Leleges) were massacred. Miletus soon became one of the most powerful maritime and commercial places of the Mediterranean. It monopolized the trade of the Euxine; it sent its vessels into the Atlantic; it formed a great number of prosperous colonies, such as Abydos and Lampsacus on the Hellespont, Cyzicus on the Propontis, Sinope and Amisus on the Euxine, and others in Thrace, the Crimea, and on the Borysthenes. It continued to flourish under the Lydian and Persian rule, but after its unsuccessful revolt against Persia in 500 B. C. under Histiæus (which see), its strength was broken. It gave some signs of life during the Peloponnesian war by throwing off the Athenian yoke; it afterward attempted to resist Alexander the Great, and continued a place of commercial consequence until destroyed by the Turks. Its site is now occupied by Palattia, which is described as "a fever-stricken place."

Mil'field, a v. of Dover tp., Athens co., O. Pop. 94.

Mil'ford, post-tp. of Lassen co., Cal. Pop. 113.

Milford, post-v. and tp. of New Haven co., Conn., on Long Island Sound, at the mouth of the Wepowaug River, and on the New York New Haven and Hartford R. R., has several churches and schools, a manufactory of straw goods, 2 hotels, and 1 weekly newspaper. Pop. 3405.

Milford, post-v. and hundred of Kent co., Del., on Mispillion River and on the Junction and Breakwater R. R., is a shipping-point for produce, has several churches

and schools, 2 hotels, 1 weekly newspaper, and contains NORTH MILFORD (which see). Pop. 3093.

Milford, post-v. and tp. of Iroquois co., Ill., on Sugar Creek and on the Chicago Danville and Vincennes R. R., 10 miles S. of Watseca. Pop. of v. 230; of tp. 1107.

Milford, a v. (CLIFTY P. O.) of Clay tp., Decatur co., Ind., 9 miles W. of Greensburg. Pop. 316.

Milford, post-v. of Van Buren tp., Kosciusko co., Ind., on Turkey Creek and on the Cincinnati Wabash and Michigan R. R., 48 miles N. of Wabash. Pop. 432.

Milford, tp. of La Grange co., Ind. Pop. 1288.

Milford, tp. of Crawford co., Ia. Pop. 663.

Milford, tp. of Story co., Ia. Pop. 503.

Milford, post-v. and tp. of Riley co., Kan., near the N. E. bank of the Republican River, 20 miles W. of Manhattan. Pop. 741.

Milford, post-v. of Bracken co., Ky., 10 miles S. W. of Brookville, the county-seat. Pop. 108.

Milford, post-tp. of Penobscot co., Me., on the E. bank of the river Penobscot and on the European and North American R. R., has manufactures of lumber. Pop. 827.

Milford, post-v. and tp. of Worcester co., Mass., 30 miles S. W. from Boston, on the Boston and Albany R. R., has 3 railways, 2 banks, and stores; is one of the largest boatbuilding centres in the country. Pop. 9890.
W. H. COOK, ED. "MILFORD JOURNAL."

Milford, post-v. and tp. of Oakland co., Mich., 35 miles N. W. of Detroit, on the Flint and Père Marquette R. R., has 4 churches, a graded union school, 1 banking-house, a foundry, 1 newspaper, and several manufacturing interests. Pop. 1767. I. P. JACKSON, ED. "MILFORD TIMES."

Milford, post-tp. of Brown co., Minn. Pop. 632.

Milford, post-v. and tp. of Seward co., Neb., on Big Blue River, 22 miles W. of Lincoln, in an agricultural region. Pop. 659.

Milford, post-v. and tp. of Hillsborough co., N. H., 50 miles N. W. of Boston, was incorporated 1794, has a free library, a good high school, 2 banks, 1 hotel, sends 220,000 gallons of milk to Boston annually, and large quantities of knitting-cotton, men's boots and shoes, tassels, picture and mirror frames, and furniture of all kinds. Granite-quarrying forms an important branch of industry. Pop. 2606. G. E. FOSTER, ED. "MILFORD WEEKLY ENTERPRISE."

Milford, post-v. of Alexandria tp., Hunterdon co., N. J., near the Delaware River and on the Belvidere Delaware R. R.

Milford, post-v. and tp. of Otsego co., N. Y., 11 miles S. of Cooperstown. The township is traversed by the Susquehanna River and the Cooperstown and Susquehanna Valley R. R. Pop. 2301.

Milford, tp. of Butler co., O. Pop. 1828.

Milford, post-v. of Miami tp., Clermont co., O., on the E. bank of the Little Miami River. Milford R. R. Station (called also Montauk) is on the W. side of the river, in Hamilton county, on the Little Miami R. R. Pop. of v. 620.

Milford, tp. of Defiance co., O. Pop. 1555.

Milford, tp. of Knox co., O. Pop. 1024.

Milford, Union co., O. See MILFORD CENTRE.

Milford, tp. of Bucks co., Pa. Pop. 2900.

Milford, tp. of Juniata co., Pa. Pop. 1158.

Milford, post-v. and tp., cap. of Pike co., Pa., 97 miles from New York City, has 3 churches, 1 newspaper, 7 hotels, and stores. It is a popular summer resort for tourists. Principal occupation, farming. Pop. of v. 746; of tp. 912.
JAMES H. DONY, ED. "MILFORD HERALD."

Milford, tp. of Somerset co., Pa. Pop. 1409.

Milford, post-v. of Ellis co., Tex., 25 miles W. of Corsicana, has 4 churches and good schools. Pop. 995.

Milford, post-tp. of Jefferson co., Wis. Pop. 1608.

Milford Centre (MILFORD R. R. STATION), post-v. of Union tp., Union co., O., at the crossing of the Cleveland Columbus and Cincinnati and the Columbus Chicago and Indiana Central R. Rs. Pop. 372.

Milford Square, post-v. of Bucks co., Pa., 40 miles N. of Philadelphia, has several large mills, 1 printing-office publishing three different papers, and stores. Principal employment, farming. Pop. about 200.
J. G. STAUFFER, ED. "REFORMER AND AGRICULTURIST."

Milfort' (Gen. LE CLERC), b. at Mézières, France, about 1750; came to America shortly before the Revolution, and after travelling through the British colonies settled among the Creeks about 1776; married a sister of Alexander MacGillivray; became a chief and took part in the war against the Southern colonists. In 1796, after the death of his wife, he returned to France; became a brigadier-general in the wars of Napoleon; published a work upon his American adventures and his residence in the Creek Nation (1802), and d. at Mézières in 1817.

Milhau', or **Millau,** town of France, in the department of Aveyron, on the Tarn. It has large tanneries and manufactures of gloves, and carries on a considerable trade in leather, wool, and timber. During the religious wars it was one of the chief strongholds of the Calvinists, but its castle was demolished by Louis XIII. Pop. 12,636.

Mil'itary, tp. of Winneshiek co., Ia. Pop. 1515.

Military Academies, as they now exist, are of quite modern origin. In modern times many circumstances have combined to make war far more a matter of science and skill, and less a matter of brute force and courage, than formerly. Hence the great necessity for a thorough preparation of officers, upon whose character and ability the results of war, with all its momentous consequences, must very greatly depend. As the peculiar instruction and training required cannot be furnished by the ordinary educational institutions, special schools have been judged necessary, and have been carefully organized by the most enlightened nations of the globe. Only the principal military schools of some of the great military powers are here noticed.

GREAT BRITAIN. 1. *The Royal Military Academy* at Woolwich, instituted in 1741, for the instruction of officers of the artillery and engineers. Admission is by open competitive examinations, conducted by the civil service commissioners, and held twice a year. The subjects are mathematics, English language, literature, and history, Latin and Greek, French, German, Italian, Russian, Spanish or Hindustani, chemistry, general and physical geography, free-hand and geometrical drawing. Of these subjects, the candidate is examined in only four, exclusive of drawing, one being mathematics. Age of admission, sixteen to eighteen years. The course of instruction lasts two and a half years, and embraces mathematics, fortification, artillery, military drawing and reconnoissance, military history and geography, French or German, elementary chemistry and physics, drills, and exercises; certain voluntary subjects being allowed to be taken up at the option of the student. The cadets pay an annual contribution, which, however, is not the same for all, being greatest for sons of civilians, less for sons of military and naval officers, and least for sons of deceased officers whose families are in pecuniary distress. The queen's cadets pay nothing. In Feb., 1875, there were 198 cadets and about 20 professors and instructors, besides the staff of government and administration. The academy prepares candidates for the royal engineers and the royal artillery, the best scholars being allowed to choose the engineer corps.

2. *The Royal Military College* at Sandhurst, instituted in 1799. It is for the instruction of those intended for officers of cavalry or infantry. Its object is to afford a special military education to sub-lieutenants recently commissioned and to successful candidates in the competitive examinations for commissions. The number of students varies according to the requirements of the service; it is now 250, with about 24 professors and instructors, in addition to the staff of government and administration, consisting of 6 officers. Admission is by competitive examination before the civil service commission. The course lasts one year, divided into two terms. The course of instruction embraces the regulations and orders for the army, regimental interior economy, accounts and correspondence, military law, elements of tactics, field fortification and the elements of permanent fortification, military topography and reconnoissance, infantry and field artillery drill, riding, gymnastics. The sub-lieutenants have the pay of their grade; the other students receive no pay; all students pay for messing and washing.

3. The *Staff College* at Sandhurst is for the instruction of staff officers. Formerly, the senior department of the Royal Military College, it is now a distinct institution. Admission is wholly by competitive examination, open to officers of all arms of the service, including artillery and engineers. Candidates must have served five years, and also have certain certificates from their superiors. The subjects of the competitive examination are mathematics, military history and geography, French, German, and Hindustani, fortification, military drawing, geology, and chemistry; mathematics, one of the three languages, and elementary field fortification are obligatory; the remaining subjects are at the option of the candidate. The course lasts two years, and embraces fortification and field engineering, artillery, topography, etc., reconnoissance, military art, history and geography, military administration and law, French, German, or Hindustani, military telegraphy and signalling, riding. These are obligatory, and geology,

two of the three languages, and experimental sciences are voluntary. The number of students is 40, with 10 professors and instructors, exclusive of the staff of government and instruction.

4. Great Britain has also the *Royal School of Military Engineering* at Chatham, the *Advanced Class of Artillery Officers* at Woolwich, the *School of Gunnery* at Shoeburyness, the *Survey Class* at Aldershott, the *School of Musketry* at Hythe, the *Army Medical School* at Netley, the *Royal Hibernian Military School* at Dublin, *schools* and *asylums for soldiers and soldiers' children.*

France. 1. *The Polytechnic School at Paris.*—This celebrated school was commenced in 1794, but received its organic law in 1799 from La Place, then minister of the interior under Napoleon. It is a scientific school, giving a preparatory education for several branches of the public service—viz. the engineers, artillery, and staff, the department of powder and saltpetre, the navy and marine artillery, the naval architects, the hydrographical engineers, the corps of roads and bridges (*ponts et chaussées*), the corps of mines, the telegraph department, the tobacco department, and for other branches requiring an extensive knowledge of mathematics, physics, and chemistry. Admission is wholly by competitive examination. Age of admission, sixteen to twenty years, or, if in the army, not over twenty-five years. The candidate must have the degree of bachelor of science or of bachelor of literature, and is examined in arithmetic, problems in descriptive geometry, French, resolution of triangles, figure and color drawings, algebra and analytical geometry, elementary and descriptive geometry, physics and chemistry, and German language. The course lasts two years, and embraces analysis, descriptive geometry and stereotomy, mechanics and machines, physics, chemistry, astronomy, geodesy, architecture and public works, topography, military art and fortification, composition and French literature, German language, history, figure, landscape, and color drawing. The number of pupils is about 500, with about 32 professors and instructors, exclusive of the staff of government and administration. Pupils pay a certain amount annually, but aid is given by the state to those needing it. As a scientific, and especially as a mathematical, school this institution is probably not surpassed, if equalled. Among its early professors are such names as Lagrange, La Place, and Monge; among its pupils, Malus, Hauy, Biot, Poisson, De Barante, Arago, Cauchy, Cavaignac, Lamoricière, and Elie de Beaumont.

2. The *Special Military School* at St. Cyr is intended for the instruction of those destined to become officers of infantry, cavalry, and marine corps. A certain number of the highest graduates compete for admission to the Staff School at Paris. The course of study lasts two years, embracing topography, fortification, legislation and administration, artillery, military art and history, geography, hygiene, literature, German, drawing, and military exercises. There are now (Feb., 1875) about 700 pupils, with about 42 professors and instructors, and about 26 military officers of instruction in drill, etc., exclusive of the staff of government and administration. Age of admission, seventeen to twenty, or, if already in the army, not over twenty-five years. Admission is wholly by competitive examination in the following subjects—viz. French composition, Latin version, mathematical composition and use of logarithms, mechanical and imitation drawing, drawing with india ink, arithmetic, algebra and plane trigonometry, geometry, descriptive geometry, mechanics, physics, chemistry, history, geography, German. The school is more military and practical, and less theoretical and scientific, than the Polytechnic School.

3. France has also the *School of Artillery and Engineers* at Fontainebleau, the *Cavalry School* at Saumur, the *Staff School* at Paris, the *Military Orphan School* at La Flèche, the *Medical School* at Paris, the *School of Musketry* and the *Gymnastic School* at Vincennes, the *Music School* and *regimental schools.*

Prussia. 1. The *War Schools.*—These schools are eight in number, situated at Erfurt, Potsdam, Neisse, Engers, Cassel, Hanover, Anclam, and Metz, and are designed for the instruction of those intended for officers of infantry and cavalry, and as preparatory to the Artillery and Engineers' School. To become an officer in the Prussian army a young man obtains a nomination from the colonel of some regiment, which he then enters as a private soldier, with a recognition of being a candidate for the rank of officer; before attaining which he must pass an examination in the subjects of a good general education, serve six to nine months with the troops, attend a war school nine months, and pass an examination in professional subjects. Officers of artillery and engineers must also pass through the Artillery and Engineers' School. The course of instruction embraces tactics, fortification, science of arms, military surveying and drawing, drill in infantry exercises, manual of the piece in artillery, gymnastics, fencing, riding, and musketry practice. There is about six weeks' exercise in the field in surveying, reconnoissance, and applied tactics. The course lasts about nine months. There are in the war school at Anclam 100 pupils, with 1 major commanding, 1 adjutant, 6 instructors of tactics, etc., and 8 professors.

2. The *Cadet Schools.*—There are seven of these schools —viz. a senior cadet school at Berlin, and six junior cadet schools, preparatory to the senior, situated at Potsdam, Culm, Wahlstatt, Bensberg, Ploen, and Oranienstein. Usually, four years are passed in the junior school, two years in the senior school, and then the usual term at a war school; but some of the best pupils pass an additional year at the senior school, and do not pass through the war school. There is an examination for admission to the junior schools, not competitive; from the junior schools pupils are transferred to the senior school without special examination, or a pupil may be admitted to the senior school on examination without having passed through the junior school. Age of admission to the junior schools, about ten years; to the senior, about fifteen years. The course at the senior school embraces religious instruction, Latin, German, French, mathematics, history, geography, physics, military drawing, imitation drawing, drill, fencing, riding, and gymnastics. For the additional year, science of arms, tactics, fortification, military surveying and drawing, topography, military service and correspondence, French and military exercises, etc. At the senior school in Jan., 1875, there were 700 cadets (a number to be soon increased to 800), with 3 officers for superintendence, 28 officers of companies, 10 military instructors, 27 civilian professors and instructors, 5 surgeons and chaplains. Total for superintendence and instruction, 73. In the junior schools the course embraces Bible history, Latin, German grammar and composition, French, arithmetic, elementary algebra and geometry, history, natural philosophy, drawing, writing, drill, gymnastics, fencing, and dancing. In each junior school there are about 200 pupils, with 15 military officers and instructors, and 9 civilian instructors. Cadets in all the schools pay a certain sum, but state aid is given as circumstances require it.

3. The *War Academy* at Berlin. This is properly a military university, designed to raise the scientific spirit of the army, with the special object of giving to the most able officers of all arms, after a certain number of years' service, such an education as will fit them for posts of high command—for the staff, as instructors in military schools, and for other duties demanding superior ability and attainments. The course lasts three years, and embraces tactics, science of arms, mathematics, general, physical, and military geography, fortification, history, history of the art of war, military administration, surveying, geodesy, staff duty, history of literature, military hygiene, military law, physics, chemistry, art of sieges, French, and Russian. Part of the course is voluntary. Practical instruction in the field is also given in surveying, field-sketching, staff duty, etc. In Jan., 1875, there were 278 pupils, 22 military professors and instructors, 13 civilian professors and instructors, and 4 officers of government and administration, besides a number of civilian employés. Admission is by competitive examination, open to officers of all arms of the service who have seen three years' actual service, and who can obtain from their superiors certificates of character, ability, practical skill as regimental officers, good health, freedom from pecuniary difficulties. The subjects of this examination are usually mathematics, history, geography, fortification, science of arms, tactics, and French.

4. Prussia has also an *Artillery and Engineer School* at Berlin, a *Military Riding School* at Hanover, a *School of Musketry* at Spandau, a *School of Gunnery* at Berlin, a *Gymnastic School* at Berlin, two *medical schools* and a *veterinary school* at Berlin, besides *schools for soldiers* and their children.

Austria, Russia, Italy, Spain, and other powers have their systems of military schools, of which those of Austria and Russia would be especially noticeable, but those described may be considered *typical* of all the rest.

The United States. The *Military Academy* at West Point. (See West Point.) The conception of a military academy in this country dates back to 1776, when the lack of competent officers for the army led to the appointment of a committee by the Continental Congress to "prepare and bring in a plan of a military academy at the army," but no further action appears to have been taken. Washington invited the attention of Congress to the subject in 1793, and in 1796 recommended the institution of a military academy. The same thing was strongly urged by Mr. McHenry, secretary of war, in 1800, and a statement fur-

nished in 1801 in answer to a call by resolution of Congress. The results were, a provision in 1794 for a corps of artillerists and engineers of four battalions, to each of which 8 cadets were to be attached, with some provision for instruction; an additional regiment of artillerists and engineers was authorized in 1798, the number of cadets being increased to 56, with provision for books, etc., and authority to appoint 4 teachers; finally, the act of Mar. 16, 1802, founding the Military Academy. The artillerists and engineers were made distinct corps, the corps of engineers to be stationed at West Point and to constitute a military academy. Forty cadets were attached to one regiment of artillery, and 10 cadets to the corps of engineers. The senior engineer officer present was to be superintendent. In 1803 a teacher of French and a teacher of drawing were authorized. The Military Academy was thus formally established, but these provisions were far from sufficient. Between 1802 and 1812 there were in all but 6 instructors at West Point, of whom only from 2 to 4 were present at the same time. By the act of Apr. 29, 1812, it is declared that the Military Academy shall consist of the corps of engineers, and, in addition to the teachers of French and drawing, a professor of natural and experimental philosophy, a professor of mathematics, and a professor of engineering, with an assistant for each. The number of cadets was limited to 250. The age of admission was from fourteen to twenty-one years, the candidate to be well versed in reading, writing, and arithmetic, and to engage, with the consent of his parent or guardian, to serve five years, unless sooner discharged. By this and preceding acts, the *personnel* of the Academy was made a military body subject to the Rules and Articles of War. At this early period seems to have been established the policy, since adhered to, not to maintain any considerable standing army in time of peace, but to educate thoroughly officers who should be competent to organize and instruct the new levies which must form the great mass of the army in time of war. During the first ten years of its existence the Academy furnished only 89 graduates. In 1815 a change was made by an order of the war department, requiring a permanent superintendent, and making the chief of the corps of engineers inspector of the Academy, with the direction that no officer of the army of whatever rank should exercise command at West Point unless subordinate to the inspector or to the superintendent. Rules and regulations for the Academy were made, and those of 1816 provided for a board of visitors. Semi-annual examinations were ordered, and a course of study was drawn up and approved. The uniform of the cadets, nearly the same as now worn, was prescribed by a general order in 1816.

With all that had been done up to 1817, the results were very unsatisfactory. There was a great lack of system and subordination; cadets were admitted without regard to age or qualification; many of them were unfit for their positions, and they were under no proper control. Although owing much to the efforts of its two first superintendents, and especially to Col. Jonathan Williams, the real initiation of the Academy, as it has since been, dates from the appointment of Brevet Major (afterward General) Sylvanus Thayer of the corps of engineers, who assumed command July 28, 1817. Major Thayer was a graduate of Dartmouth College, as well as of the Academy, had served with distinction in the war of 1812, had studied the military schools of France, and by both character and attainments possessed rare qualifications for the position of superintendent. The Academy is to-day substantially what it was made by Major Thayer during the sixteen years of his administration, with the aid of able officers and professors under him. He established the office of commandant of cadets and instructor of tactics, since recognized by Congress; arranged a course of studies; introduced the division of classes into sections, and transfers between the sections; introduced weekly class reports showing weekly progress, and by a system of daily marks indicating the individual progress of cadets. The check-book controlling the expenses of cadets, the extensive use of the blackboard, and the essential parts of the regulations now governing the Academy, are due to him. Ten months of the year were allotted to academic duties, and two months to those of camp. He inculcated by precept and example that spirit of devotion to duty and unquestioning, prompt obedience to lawful authority which still distinguish the graduate of West Point. Under the able superintendents who have succeeded him the system has been steadily maintained, the course of instruction has been improved, new textbooks, instruments, and apparatus introduced, and most of the important buildings and improvements have been constructed. Besides the departments already mentioned, the professorship of geography, history, and ethics was created by act of April 14, 1818, with the chaplain as professor; the professorship of chemistry, mineralogy, and geology by act of July 5, 1838; the professorships of French and of drawing by act of Aug. 8, 1846; the professorship of Spanish by act of Feb. 16, 1857; the department of law, with an officer detailed from the judge-advocates of the army as professor, was authorized in 1874. In 1840, by an act of Congress, the commandant of cadets was to be the instructor of either artillery, cavalry, or infantry tactics, or of practical engineering, and by act of June 12, 1858, he was made instructor of artillery, infantry, and cavalry tactics. In 1838 an act of Congress required cadets to bind themselves to serve eight years instead of five. Instruction in light artillery and riding was introduced in 1839.

In the appointment of cadets it has been admitted as a principle that the sons of those who have lost their lives in the defence of the country should have preference. The custom of appointing cadets from districts naturally arose in accordance with the tendency to distribute all appointments under the general government in proportion to representation, and was converted into a law in 1843. In like manner became established the custom of giving decisive weight to the recommendation of the Representative or delegate from the district or Territory. This has perhaps the effect of interesting members of Congress in the Academy, but it too frequently happens that merely political or personal considerations govern the selection. Hence, the large proportion of those appointed that fail to complete the course, hitherto fully one-half. Nor is the average ability of the graduates so great as would result from admission under a better system of selection. The monthly pay of cadets was $28 in 1802, $24 in 1845, $30 in 1857, and in 1864 about $50, which is the present rate (1875). A "board of visitors," to attend the annual examinations and report on the condition of the Academy, provided for in 1816 by regulation from the war department, was first assembled after Major Thayer became superintendent. Discontinued by the act of 1843, it was again authorized by act of Aug. 8, 1846, the members to be selected by the President from one-half the number of States annually, alternating with the other half; the number of members was reduced to seven in 1868; and to this number were added in 1870 two Senators and three members of the House of Representatives, to be designated respectively by the president of the Senate and the Speaker of the House. The local rank and pay of colonel of engineers were given to the superintendent,* and the local rank and pay of lieutenant-colonel of engineers to the commandant of cadets in 1858. The course of study was in 1854, by direction of the secretary of war, extended to five years, in accordance with recommendations of boards of visitors, in order to give more time for English studies, history, and military law. By the same authority the course was suddenly reduced to four years in Oct., 1858, and again extended to five years in Apr., 1859. Again, in 1861 the course was changed to four years, and so remains at the present time.

On the breaking out of the civil war in 1861 a number of cadets as well as graduates of the Academy from Southern States resigned and joined the secession movement of their States. In Nov., 1860, the number of cadets was 278, of whom 86 were appointed from the Southern States; 65 of this number left the Academy on account of the civil war, leaving 21 from the Southern States at the Academy. The charge, hastily and ignorantly made, that the majority of the graduates of the Academy joined the Southern States, is groundless; fully three-fourths remained loyal to the U. S. government, of whom many were from Southern States. Those who went with the South were at once placed in prominent positions, which was far from being so generally the case at the North in the early part of the war. Considering that the doctrine of paramount allegiance due to the State, rather than to the U. S., had prevailed for many years at the South, and that accordingly whole delegations in Congress, judges of the Supreme Court, and numbers of civil officers went with their respective States, it was certainly difficult for Southern graduates of the Academy to remain wholly unaffected by the action of their States.

The following is a list of superintendents of the Academy, all but the first being graduates: Jonathan Williams, Joseph G. Swift, Alden Partridge, Sylvanus Thayer, René E. De Russy, Richard Delafield, Henry Brewerton, Robert E. Lee, John G. Barnard, Peter G. T. Beauregard, Alexander H. Bowman, Zealous B. Tower, George W. Cullum, Thomas G. Pitcher, Thomas H. Ruger (present, 1875). Among the professors, past and present, may be mentioned

*Up to July 13, 1866, the superintendent was an officer of engineers, of which corps the Academy itself formed part. By the act of that date the superintendency was thrown open to all branches of the service. (See ENGINEERS, CORPS OF.)

Crozet, Douglass, Mahan, Mansfield, Courtenay, Bartlett, Hassler, Ellicott, Davies, Church, Bailey, Weir, Berard, and (chaplains) McIlvaine and Warner. Of the services of the graduates in the war with Mexico, Gen. Winfield Scott has thus spoken: "I give it as my fixed opinion that but for our graduated cadets the war between the U. S. and Mexico might, and probably would, have lasted some four or five years, with, in its first half, more defeats than victories falling to our share; whereas in less than two campaigns we conquered a great country and a peace without the loss of a single battle or skirmish." A great influence has been exercised by the Academy upon scientific education in this country. Prof. Mahan, through his long career of instruction and through his textbooks, has left an ineffaceable impression upon its engineering development. The textbooks in mathematics of Davies and Church are most widely and favorably known. Many of our most distinguished civil engineers, and many of our ablest college professors, have been graduates, and especially in its early days the Academy exerted a powerful stimulus upon college education. The whole number of graduates from 1802 to 1875, inclusive, was 2592, of whom 1442 were living and 1150 deceased, including 192 killed in battle. Of those living, 755 were still in the army, and 687 out of service, many of whom are filling prominent positions of usefulness in the civil service and in our educational institutions. According to Maj. Boynton, the aggregate amount of money appropriated by the U. S. for the Academy from 1802 to 1864, sixty-two years, was $7,133,235.70, the largest annual appropriation being $202,535.30; the average being about $115,000, annually.

Present Organization, Course of Study, Mode of Admission, and Discipline.—The supervision and charge of the Academy are in the war department; and the present secretary of war has of late years exercised a personal supervision. The staff of government and instruction consists of (1) The superintendent, directing the studies and exercises, and exercising command over all persons belonging to the Academy, and commanding the military post. The military staff includes an adjutant, quartermaster, treasurer, surgeon, and assistant surgeon. (2) The commandant of cadets, an officer of the army, who is the instructor of artillery, infantry, and cavalry tactics, and is charged with the discipline and administration, and commands the battalion of cadets. He has usually six assistants, likewise army officers. (3) Eight commissioned professors, one professor detailed from the judge-advocates of the army, an instructor of practical military engineering, and an instructor of ordnance and gunnery, taken respectively from the engineer and ordnance corps. These (the superintendent and commandant included) constitute the academic board. There are about thirty-two assistant professors and instructors, including those in tactics, and one sword-master. Except eight professors, all officers and instructors of the Academy are officers of the army detailed for the duty, usually for a period of four years. The academic board examines candidates for admission and cadets, recommends textbooks, maps, models, etc., draws up programmes of instruction, etc., grants diplomas, etc. For the purpose of discipline and tactical instruction the cadets are organized as a battalion of four companies, each under the supervision of an instructor of tactics, with officers and non-commissioned officers selected from the cadets themselves. Usually cadet-officers are selected from the first class,* sergeants from the second class, and corporals from the third class. There are also a cadet adjutant, quartermaster, sergeant-major, and quartermaster-sergeant. The position of cadet officers affects their relation to other cadets only when on duty as officers.

For academic instruction, each of the four classes is divided into sections in each study, consisting of seven to fifteen cadets each, with an instructor for each section, who, however, has charge usually of more than one section. The professor exercises a supervision over the whole, instructing different sections in turn or assembling the whole class for lecture.

Admission.—Each Congressional district and Territory and the District of Columbia is entitled to have one cadet at the Academy. The appointments are made by the secretary of war at the request of the Representative or delegate in Congress from the district or Territory, of which the person appointed must be an actual resident. The President also appoints annually ten cadets at large, and may fill vacancies occurring in such appointments. Candidates must be between seventeen and twenty-two years of age, at least five feet in height, and free from any infectious or immoral disorder, and from anything which may render them unfit for military service. They must be well versed in reading, writing, and orthography, arithmetic, elements of English grammar, descriptive geography, particularly of our own country, and history of the U. S. Those admitted are required to sign articles binding themselves to serve the U. S. eight years from date of admission, unless sooner discharged. An oath of allegiance to the U. S. is also required.

The Course of Study occupies four years, and is largely mathematical and professional, embracing the following subjects: (1) Infantry tactics and military police and discipline; (2) mathematics, including algebra, geometry, trigonometry, mensuration and surveying, descriptive geometry, analytical geometry, differential and integral calculus; (3 and 4) French and Spanish languages; (5) drawing, comprising topography, with pencil, ink, and colors, etc.; (6) chemistry, mineralogy, and geology; (7) natural and experimental philosophy, comprising mechanics with applications, acoustics, optics, and astronomy; (8) ordnance and gunnery; (9) law, including general principles, international law, Constitution of the U. S., etc., Rules and Articles of War, courts-martial; (10) practical military engineering, etc.; (11) military and civil engineering and the science of war. The number of studies is not large, the design being to secure thorough instruction in a few subjects rather than superficial instruction in many. By a system of numerical marks the proficiency of a cadet's daily recitations is measured; and these are taken into account in making up the "merit rolls" in each branch, as well as in the general class "standing."

Discipline is very strict—more so than in the army, and probably than in any other similar institution. The aim is to inculcate habits of prompt and cheerful obedience to lawful authority, of neatness, order, and regularity, of thoughtfulness and attention in the discharge of duty. A scrupulous regard for one's word is also required. The system of punishment for offences is remarkable for inflexible enforcement rather than for severity. Besides "demerit" marks, which count in making up the class standing, cadets are further liable to three classes of punishment: (1) privation of recreation, etc., extra duty, reprimands, arrests, or confinement to room or tent or in the light prison, reduction to ranks of officers and non-commissioned officers; (2) confinement in dark prison; (3) suspension, dismission with the privilege of resigning, public dismission. Punishments of the first class are inflicted by the superintendent or with his approval; that of the second class only by sentence of a court-martial, except in case of mutinous conduct or breach of arrest. Monthly statements of conduct and progress in studies are sent to parents or guardians.

Upon graduating the class is divided by the academic board into three sections of varying and unequal numbers, according to class-rank; the highest, usually very small and sometimes wanting, is recommended for promotion in any corps in the army; the second, in any corps except the engineers; the third, in any corps except the engineers and the artillery. Commissions for the rank of second lieutenant are then usually conferred by the President in accordance with these recommendations. (See ENGINEERS, CORPS OF; and for further information on military schools see *Report of the English Commission on Systems of Military Education;* Barnard's (Henry) *Military Schools and Courses of Instruction;* D'Ocagne's *Grandes Ecoles de France.* For VIRGINIA MILITARY INSTITUTE see that head.)

GEORGE L. ANDREWS.

Military Frontier, The, is a crown-land of the Austrian empire, and forms a peculiar institution in the Austrian state. It consists of a belt of land stretching along the Turkish frontier from the Adriatic Sea to Transylvania, and bounded N. by Croatia, Slavonia, and Hungary, and S. by Bosnia, Servia, and Wallachia, and comprises an area of 12,800 square miles, with 1,064,922 inhabitants. Its organization is thoroughly military. The estates form fiefs, which the state gives, not to individuals, but to families, on the condition that all male members of the family shall do military service from their twentieth year, by which means it became possible for the Austrian emperor to have an army of from 40,000 to 50,000 men always ready on the frontier. In the sixteenth century, when this organization was first established, and also in the two next centuries, it rendered great service to Austria, but in our time, now that the Turks have ceased to be dangerous in a military point of view, the whole institution is rather an anomaly, and it derives its chief importance from being a sort of quarantine and a guard against smugglers. All along the boundary-line are erected posts, some for four men, some for twelve and an officer, and every one who passes the frontier must announce himself at one of these posts, and after being allowed to pass the frontier he must stop for some time at the quarantine-house. The inhabitants are Croats, Slavonians, Magyars, Germans, Wal-

* The classes are numbered in inverse order of the years of their service at the Academy—that most recently entered being the fourth, etc.

lachians, Greeks, and Jews, and their language and religion are as different as their descent, though most of them belong either to the Greek or to the Roman Catholic Church.

Military Law. See COURT-MARTIAL and MARTIAL LAW.

Military Mining. See MINES, MILITARY, by O. H. ERNST, U. S. Eng.

Military Orders. See KNIGHT.

Militel'lo, town of Sicily, in the province of Catania, situated in the Val di Catania, a luxuriant grain-growing region. This town is about 19 miles from Caltagirone. Pop. in 1874, 9978.

Mili'tia, a derivative from the Latin *miles*, which in its original signification designated the foot soldier ("thousandth walker") furnished from each household under the earlier military system of Rome. Originally synonymous with the cognate derivative "military," as embracing the whole body of national troops, whether embodied for actual service or relegated to industrial pursuits, the term "militia" is now accepted as indicating that portion of the military strength of a nation enrolled for discipline and instruction, but local in its organization, and engaged in active service only in cases of emergency. It is the organized national reserve in contradistinction to the regular army and the *levee en masse* of the country, and therefore comprehends the "volunteer" organizations of Great Britain and the U. S., the National Guards of France, the Landwehr and Landsturm of Germany, and similar organizations in the other European states.

The state has an unqualified right to exact military service from its subjects, but the problem of so exercising this right as to reconcile the productive, preservative, and destructive resources of a country presents difficulties to modern statecraft that never perplexed the lawgivers of antiquity. When all able-bodied men were warriors military systems were exceedingly simple. The earliest armies of history were the people assembled in haste, with weapons familiar from infancy, to try the issue of brute force upon some neighboring community; and while wars were limited to brief campaigns, and all nations were alike barbarous, the necessity of permanently mobilized armies had not arisen. But the extension of national boundaries and the advancement of civilization essentially modified the primitive system; with the expansion of national domination arose the necessity for more prolonged periods of military service. Instead of by days and weeks, the soldier's service with the colors was now measured by years, and the superior military efficiency thus developed rendered still further conquest possible. It certainly was not with militia, in its modern acceptation, that the Macedonian and Roman empires extended over the classic world. A no less potent cause for abandoning the older system existed in that general enlightenment of the world which gradually pervaded civil as well as military affairs till peace offered triumphs no longer despised. Communities became engrossed in productive industries that in their development became more and more incompatible with the profession of arms, which, advancing *pari passu* with the peaceful arts and sciences, is ever exacting a higher degree of technical training from its successful votaries. The impromptu armies of a barbarous people naturally prove more formidable than like congregations of the more civilized communities, and just, therefore, in proportion as a body politic became devoted to peaceable pursuits was there necessity for its securing protection against domestic violence and foreign interference by devoting a portion of the community to special training for that purpose.

Standing armies marked the acme of ancient civilization, disappeared in the chaos succeeding its extinction, and signalized the reformation of society and downfall of the feudal system; but while the superiority, for war purposes, of well-trained and disciplined troops over multitudes deficient in these qualities must be acknowledged by all students of history, it is obvious to a much larger class, the taxpayers, that the maintenance of considerable bodies of such troops is both directly and indirectly burdensome upon the resources of the country, and hence the prevailing system of standing armies supported by national reserves. By such arrangement, when judicious in details, the state secures in its peace establishment an efficient national police, so organized as to be capable of great expansion under thoroughly trained commanders in time of war, but not over-burdensome, while its military value remains latent; and at the same time disseminates a reasonable amount of military knowledge and habit of discipline among the great mass of the people. Eminent political economists hold that in modern states the proportion of regular soldiers cannot exceed 1 per cent. of the population without material detriment to national prosperity; but an efficient militia system might readily supply a military reserve embracing 10 per cent. of actual population.

The systems of Europe, as a rule, exact military service from the subject, in person or by substitution more or less direct, even in time of peace; volunteers are of course accepted, but the armies are kept on foot by annual drafts. In most of the continental states standing armies have reached the maximum sustainable proportion to population, and greater military strength has to be sought in perfecting the reserve organizations. The Prussian system of personal service in the regular army preliminary to enrolment in the reserves literally makes every citizen a soldier, and has so enhanced the war-power of Germany as to compel a self-preservative imitation in contiguous nations. In these imitations effort is naturally made to improve upon the model, and this international strife for gladiatorial preeminence has developed systems designed to furnish within the next twenty years a combatant force estimated at—for Russia, 3,000,000; for Germany, 2,800,000; and for France, 2,500,000. It is proposed to maintain these troops in a condition of discipline and instruction hardly inferior to that obtaining in the regular armies; and in recognition of the persistence of habit all of these methods make the citizen first a soldier. From parental control he passes under military discipline; serves first in an active corps, and then in the reserve of the army; then, passing into the militia, he is gradually withdrawn from the contingency of actual service in proportion as he becomes unfitted for useful participation therein.

In Great Britain alone, of the European states, is reliance placed upon voluntary enlistment for maintaining the various militia organizations in time of peace, and for recruiting the regular army both in peace and war. The British militia system originated in the Anglo-Saxon *fyrd*, and in the warlike feature of the ancient *posse comitatus*. The fyrd was overshadowed by the feudal system, was revived in the struggle between the Crown and the barons, and was superseded by the "trained bands" created by James I. These were in turn suppressed, and at the Restoration the existing system, in its essential features, was established. Under it the government appoints lords lieutenant of counties, empowered to call out, embody, and command the "regular militia" and to appoint its officers. The quota for each county is established by government, and in the failure of voluntary enlistment a levy by ballot would be made upon all non-exempted inhabitants of the county; but practically these quotas are kept up in time of peace by volunteers. This force assembles at stated periods for military exercise, and can be "embodied" in any national crisis. Most of the regiments were embodied in the Crimean war, and many of them during the Indian mutiny. They may not be sent out of the kingdom unless they volunteer, and then only by provision of Parliament. The quota of the United Kingdom is about 120,000 men. Besides this organization, there was established in 1808, and suspended in 1816, a "local militia" embracing many classes not eligible to the regular force, and therefore more numerous. They, however, could be marched from their respective counties only in the event of actual invasion. But, as in the U. S., the "volunteers" constitute the great national reserve. First organized in 1804, they in 1813 numbered over 400,000 effectives, but diminishing in numbers as danger became less imminent, they were absorbed in the local militia. A revival of military spirit was, however, initiated in 1859, and the present effective strength of this force, including the yeomanry cavalry, is not less than 180,000. By furnishing paid adjutants and drill-masters to these corps, granting them certain pecuniary allowances, arming the men, and employing a staff of inspectors under the immediate direction of the war-office, the government maintains this force in a very creditable condition of efficiency; but, excepting the yeomanry cavalry, it "may not be employed in time of civil disturbance." All of it, however, may be embodied for active service anywhere in Great Britain in case of invasion, actual or impending. In the "enrolled pensioners" is another efficient but more purely local force of about 15,000 men. The permanent peace establishment numbers about 120,000 effectives.

In Switzerland there is, nominally, at least, no standing army, but a corps of educated officers is maintained; every citizen is held to military service, and is taught its exercises in the schools; and the war-strength of the country is divided into a "regular force" of about 80,000, a reserve of about 50,000, and a landwehr organization.

In the U. S. the militia becomes national only when called into the actual service of the Federal government. The armies of the Revolution consisted of State troops adopted by Congress, and this system of maintaining a military force prevailed till after the present Union was adopted. Although our forefathers were eminently qualified by the

experiences of the French and Indian wars for military service, Continental militia, as such, played no prominent part in the Revolutionary struggle. Available only for brief periods, it was deficient in discipline, and therefore uncertain under fire; and it was mainly to the regular troops, or "Continental line," that we are indebted for national independence. The following table, compiled from records of the New Hampshire Historical Society, exhibits the number of troops, Continental and militia, furnished by the thirteen original States during the Revolutionary war, 1775–83:

States.	Continentals or regulars.	Militia.
Massachusetts	67,907	15,155
Connecticut	31,939	7,792
Virginia	26,678	5,620
Pennsylvania	25,678	7,357
New York	17,781	3,304
Maryland	13,912	4,127
New Hampshire	12,497	2,093
New Jersey	10,726	6,055
North Carolina	7,263	(?)
South Carolina	6.417	(?)
Rhode Island	5.908	4,284
Georgia	2,679	(?)
Delaware	2,386	376
Total	231,971	56,163

Under the Constitution, Congress has power to provide for the organization, equipment, and discipline of the militia, and for its government while in the service of the U. S.; and the States are prohibited from keeping troops in time of peace except under Congressional consent; but the appointment of the officers and the authority for training the militia according to the discipline prescribed by Congress is expressly reserved to the respective States. Congressional enactments for maintaining a uniform system of militia throughout the Union require the enrolment in each State of all non-exempted able-bodied male citizens, resident, between the ages of eighteen and forty-five; establish the manner of organization; prescribe as the system for its discipline and field exercises that obtaining for the time being in the regular army; and make suitable provision for arms, pay, pensions, etc. Unfortunately, the subject of national defence receives little deliberate consideration from the national legislature. Though the necessity of a "*well-regulated*" militia to the security of a free State is recognized in the Constitution, the arguments of statesmen and the logic of facts have alike failed to secure that attention demanded by the gravity of the subject. Temporary expedients are as numerous as past emergencies, but since 1795 there has been no general revision of our system. The militia code is obsolete in many particulars, and has never received effective construction. Perhaps too much has been yielded to "States' rights," but, at any rate, in some of the States general enrolments are unknown, and in others the stated musters for exercise are mere burlesques upon military discipline. A judicious system would secure to the country an effective military reserve of over 3,000,000 men; but as a matter of fact the only existing militia worthy of the name is found in the uniformed volunteer organizations maintained in many of the States as "National or State Guards," and these forces probably do not aggregate an effective force of over 25,000.

The President is commander-in-chief of the militia of the several States when called into the actual service of the U. S., and is empowered to call out these forces, by orders to such officers of the militia as he may choose to address, in event of invasion, actual or imminent, and in cases of insurrection or rebellion against the authority of the U. S. or any one of the States thereof; and he may continue the militia in service for a period not exceeding nine months. While so employed the troops receive the pay, rations, etc. of regular soldiers, are subject to the Rules and Articles of War, and their officers take precedence in rank next after officers of like grade in the regular service or in such volunteer organizations as may also be in the service of the U. S. The efficiency of our system was first tested in the war of 1812–15, in which some of the militia rendered most valuable service, particularly in defence of positions, but much embarrassment was caused to the national government by pretensions in some of the States—1st, that the State executive could decide whether or not to furnish quotas called for; 2d, that the militia could not be sent out of the U. S., or even beyond its own State; and 3d, that it was exclusively under the command of its own officers, and subject only to the *personal* command of the President. These pretensions arose of course only in localities where the war was unpopular, but they have never been quieted by statute. States that were lavish of men in 1861 had refused them in 1812, and some that furnished their quotas cheerfully in 1812 refused to honor the national requisitions of 1861; and the tendency has been for Congress to evade such difficulties by calling out volunteers, and as a final expedient resorting to conscription. Certainly, no people are better fitted for the development of a perfect militia system, and yet in no civilized country has its organization been more neglected. The troops of our late war, both Union and Confederate, demonstrated that our citizens made thorough soldiers, but the lesson of that and all other modern wars has been that civilians are not so transformed by prestidigitation. The armies that closed the war of the "great rebellion" were veteran troops, regulars in all but name; and the time that has been required for the drill and discipline of our militia and volunteer forces after pressing necessity for their immediate employment had arisen would all have been saved if these men could have been drawn from an efficient military reserve. The war of 1812 repeatedly exhibited the melancholy spectacle of large bodies of American troops marching to the battlefield without understanding a single principle of elementary tactics; and the first draft of national militia (call of Apr. 15, 1861) in the late war was practically worthless; before they could be fully organized and reasonably disciplined their terms of service began to expire, and their only actual service fittingly terminated in the disaster of the first Bull Run, where they were confronted with troops all older in service, and many fully organized prior to the organization of the "provisional Confederacy," Feb. 8, 1861. Our standing army musters but 1 soldier to every 1380 of population; and surely argument is not necessary to demonstrate that just in proportion as this force is small is there necessity for pushing the instruction and discipline of our militia to the utmost extent that circumstances will admit.

From the *Final Report of the Provost-Marshal-General U. S. Army* it appears that the total number of militia, volunteers, and drafted men received into the service of the U. S. during the late war was 2,690,401; that there were actually 1,000,516 men in the field when hostilities ceased, of whom about 978,000 were volunteers or conscripts; and that the national enrolment exhibited, at the same time, an available reserve of 2,254,063 men. From the same authority is compiled the following exhibit of *militia*, called for and accepted as such, from the loyal States during the war:

States.	Call of Apr. 15, 1861, for 75,000 militia for three months' service.		Call of Aug. 4, 1862, for 300,000 militia for nine months' service.		Militia for 100 days, mustered into service between Apr. 23 and July 18, 1864.	
	Quota.	Men furnished.	Quota.	Men furnished.	Quota.	Men furnished.
Maine	780	771	9,609	7,620		
New Hampshire	780	779	5,053	1,736	....	167*
Vermont	780	782	4,898	4,781		
Massachusetts	1,560	3,736	19,080	16,685	4,000	6,809
Rhode Island	780	3,147	2,712	2,059		
Connecticut	780	2,402	7,145	5,602		
New York	13,280	13,906	59,705	1,781	12,000	5,640
New Jersey	3,123	3,123	10,478	10,787	....	769
Pennsylvania	12,500	20,175	45,321	32,215	12,000	7,675
Delaware	780	775	1,720	1,799		
Maryland	3.123	....	8,532	....	....	1,297
West Virginia	2,340	900	4,650			
Dist. of Columbia	....	4,720	890			
Ohio	10,153	12,357	36,858	....	30,000	36,254
Indiana	4,683	4,686	21,250	337	20,000	7,197
Illinois	4,683	4,820	26,148	....	20,000	11,328
Michigan	780	781	11,686			
Wisconsin	780	817	11,904	958	5,000	2,134
Minnesota	780	930	2,681			
Iowa	780	968	10,570	....	10,000	3,901
Missouri	3,123	10,591	17,269			
Kentucky	3,123	....	14,905			
Kansas	....	650	1,771	....	....	441
Tennessee	1,560					
Arkansas	780					
North Carolina	1,560					
Nebraska Territ'y	....	....	....	1,228		
	73,391	91,816	334,835	87,588	11,300	83,612

According to returns in the war department (Jan. 1, 1875), the *organized* militia force of the U. S. consists of 119 general officers, 883 general staff officers, 1065 regimental, field, and staff officers, 4008 company officers, and 78,649 non-commissioned officers, musicians, and privates; aggregate, 84,724. ROBERT N. SCOTT.

Milk [Sax. *melce;* Ger. *Milch;* Fr. *lait;* Lat. *lac*], the liquid secreted by the mammary glands of female Mammalia for the nourishment of their young. Milk is generally a white, often bluish, rarely yellowish liquid; opaque, possessing a slight but pleasant odor, and an agreeable

* Accepted for three months.

sweetish taste. Its specific gravity varies from 1.018 to 1.045. The reaction of fresh milk has long been a subject of discussion among chemists, the majority of whom assert that it is generally faintly alkaline. Elsässer examined 385 different specimens of human milk, and found 45 neutral, the rest alkaline. Rattenmann, out of 272 specimens, found only 2 acid. Rueff, out of 94 specimens of cow's milk, found 44 acid; out of 46 specimens of mare's milk, 19 acid; ewe's milk as often acid as alkaline or neutral; and the milk of carnivorous dogs and cats always acid. Peligot found 15 samples of ass's milk acid. D'Arat and Petit found the milk of stall-fed cows to be always acid, and to become alkaline when they were turned out to grass. Peligot and Quevenne examined 75 samples, finding 45 acid, 6 feebly acid, 17 neutral, 7 alkaline. Saxhlet (*J. pr. Chem.*, 2d ser. vi. 1; *Chem. Soc. J.*, 2d ser. xi. 187) believes that milk possesses what he calls an *amphigenic* reaction—*i. e.* that it simultaneously reddens blue litmus paper and blues red paper, owing to the fact that it contains both acid and neutral phosphates of the alkali metals. A. Vogel (*J. pr. Chem.*, 2d ser. viii. 137) has examined this question further, using a very neutral tincture of litmus instead of paper. He states that he has never found fresh cow's milk to exhibit a decided alkaline reaction. Out of the milk of 30 cows examined by Bischoff at Schleisheim, only 2 specimens showed the double reaction with certainty. In most cases the reaction was either neutral or transiently acid. Some specimens gave, at first, a weak alkaline reaction, which quickly passed into an acid reaction. Milk becomes acid on keeping, owing to the conversion of a portion of the lactine (lactose or sugar of milk) into lactic acid.

The Composition of Milk.—Milk is an emulsion; it consists of water, holding in solution caseine or cheese, lactine or sugar of milk, and various alkaline and earthy salts; and in suspension in this solution, or serum, fatty matter, butter, in the form of colorless transparent globules from $\frac{1}{800}$th to $\frac{1}{250}$th of a line in diameter. These globules of fat were formerly believed to be encased in an albuminous envelope, which is ruptured during churning, thus allowing the globules to agglutinate into masses of butter. This has been disproved by Von Baumhauer and F. Knapp. Schwaller still claims the existence of a membrane. (*Arch. f. Micr. Anat.*, vii. 269.) On account of the lenticular action of the fat-globules the light is dispersed in all directions, and the milk appears white and opaque. Dr. C. A. Cameron (*Chem. News*, Feb. 5, 1875, p. 54) claims that the opacity of milk is due to suspended caseous matter.

(1) The fat contained in milk constitutes usually from 2.50 to 6. per cent. of the entire weight, the extremes noticed being 0.666 in a poor sample of human milk and 13.3 in the milk of a bitch. It is a mixture of several neutral fats or glycerides, chiefly the liquid oleine and the solid palmitine and stearine, with small quantities of myristine, butyrine, caproine, capryline, and caprine. To these latter bodies are due the peculiar taste and odor which distinguish butter from other natural fats. Butter does not contain margarine, as is generally stated in older works. (See MARGARIC ACID.) When milk is allowed to stand the fat-globules rise to the top and form a layer of cream. This separation of fat and serum is never complete; each retains a portion of the other.

(2) The caseine is an albuminoid body, containing, deducting ash, carbon, 53.5 to 54; hydrogen, 7.1 to 7.4; nitrogen, 15.6 to 16; sulphur, 0.9 to 1.0; oxygen, 22.1 to 22.6. It is present in milk to the extent of from 2 to 6 per cent. Pure caseine is scarcely soluble in water, while its compounds with alkalies are very soluble. In milk it exists in combination with soda. Acids, even in minute quantities, withdraw the alkali and precipitate caseine. The spontaneous coagulation of milk is due to the formation of lactic acid. Caseine precipitated by an acid retains an acid reaction, no matter how thoroughly it is washed. Earthy and metallic salts precipitate caseine. It is also coagulated by rennet. Coagulated caseine is soluble in caustic alkalies; in common sodic phosphate, neutralizing it; in alkaline carbonates, common salt, ammonic chloride, potassic nitrate, and borax. Moist, well-washed caseine dissolves completely in water containing 0.0005 per cent. of hydrochloric acid, and the solution, when filtered from a trace of fat, has all the characteristics of a solution of albumen. Ordinary solutions of caseine are not precipitated by heat, but form films when heated in the air which are not soluble in dilute acids or alkalies. The same film is found when milk is heated in the air. The compound of caseine and lime prepared from clotted milk is imputrescible, and is employed in distemper painting. Artificial coral jewelry is now made from caseine colored with vermilion. Soluble caseine is coagulated by the gastric juice, and then gradually digested.

(3) Albumen and other nitrogenous bodies are said by some chemists to exist in milk, and it would be very remarkable were caseine to be the only nitrogenous body present in an animal fluid. An albuminous body, not coagulated by rennet, but precipitated by boiling, has been noticed in milk, and especially in colostrum, which is supposed to be albumen. Vernois and Becquerel found in the milk of the buffalo cow and of the goat 1.3 per cent. of albumen. Heynsius found 0.5 per cent. of albumen in cow's milk previously coagulated by acetic acid; it was precipitated by boiling. On the other hand, Scherer prepared a kind of caseine from milk, which coagulated by heat. Lehmann considers albumen an abnormal constituent of milk. Payen, Gorup-Bezanez, Dieulafait, and others report from 0.58 to 1.20 of albumen. Lactalbumen and lactoproteine are two albuminous substances which, according to Commaille, occur in milk. (*J. Pharm.*, 4, ser. iv. 108; *Compt. Rend.*, lix. 301; lx. 118, 859.) Galactine is a nitrogenous body obtained, according to Morin (*J. Pharm.*, 4, ser. xiv. 11), from milk by precipitating the caseine by acetic acid, the albumen by boiling, separating fat by ether, concentrating, filtering out the phosphates, crystallizing out the sugar, and finally adding alcohol, by which the galactine is precipitated. Thus prepared, it contains a little gelatine. Thirty-five parts of dried milk yield 1 part of galactine, which would be about 0.35 per cent. on the original milk. Galactine is soluble in water, insoluble in alcohol and in ether. It is precipitated by tannin, but the precipitate differs from that of gelatine in redissolving at 60° C. Galactine emulsionizes fats. It is also found in blood, gastric juice, animal membranes, eggs, many morbid animal fluids, the juices of edible plants, and in the fluid of embryonal cotyledons.

(4) Lactine, lactose, or milk-sugar ($C_{12}H_{22}O_{11}.2H_2O$) is an important constituent of milk. It varies in quantity from 1.5 to 9. per cent. It is readily prepared from whey by evaporating it to a syrup, filtering over animal charcoal, and crystallizing, when it is obtained in very hard crystals. It is manufactured in considerable quantities in Switzerland, Silesia, and elsewhere. It is slow and difficult of solution in cold water, requiring six times its weight; it is soluble in 2 parts of hot water. It has a faint sweet taste, but in the solid state feels gritty between the teeth. In contact with caseine or gluten it undergoes lactic fermentation; but some alcohol is always produced, especially when nothing is added to neutralize the acid as it forms.

(5) The salts of milk vary in quantity from 0.10 to 2 per cent. They consist of (*a*) sodic and potassic chlorides, phosphates, carbonates, and caseine compounds, soluble in water, and (*b*) calcic, magnesic, and ferric phosphates, and calcic fluoride, insoluble in water. In the ash the soluble salts are about equal in quantity to the insoluble. Weber found in the ash of cow's milk 14.18 per cent. of potassic chloride, 4.74 of sodic chloride, 23.46 of potassa, 6.96 of soda, 17.34 of lime, 2.20 of magnesia, and 28.4 of phosphoric acid, with a little carbonic and sulphuric acid (?).

Colostrum is the milk secreted during the first two or three days after parturition. It is generally a turbid, yellowish liquid, of sticky consistence and strong alkaline reaction. It contains the usual constituents of milk, though in much larger quantities—often 40 per cent. of solids; that from cows, asses, and goats contains an excessive proportion of caseine, while lactine is found in excess in human colostrum. It also contains albumen and peculiar granular bodies. The secretion of normal milk begins on the fourth day at the earliest, usually between the sixth and the tenth day.

I. Cow's Milk.—Cow's milk has generally a pure white or yellowish-white color. Its specific gravity is variously stated from 1.025 to 1.0396. Dr. Stevenson Macadam of Edinburgh, Scotland, examined 44 samples of pure milk and found the specific gravity to range from 1.0284 to 1.0357, averaging 1.0322. W. Fleishmann tested 124 cows in Germany, and found the milk to vary from 1.0295 to 1.0343, averaging 1.0317, only 3 samples being below 1.030. Officers Jepson and Gardner of the sanitary police of New York tested 44 cows on the Harlem R. R. and 65 in Orange co., N. Y., and E. Waller, Ph. D., tested 86 cows in Orange co., 7 of which were Alderneys. They found the extremes to be 1.02958 and 1.03538 at 60° F., or 102 and 122 on the lactometer, which has the 100-mark at 1.029 and the 0 at 1.000. The solids in cow's milk vary from 11.64 to 19.34 per cent., averaging 13 to 14 per cent.

The quantity of milk furnished by a cow varies with the breed, the age of the cow, the age of the calf, the food, and the treatment and housing. Boussingault observed the yield of milk of 7 cows at Bechelbronn. Each cow received daily 33 pounds of hay or a proportionate quantity of roots. The yield during 303½ days was 3966.8 gallons of milk, equivalent to 7.2 quarts per day each. During July and August the average was over 11 quarts—during February and March, only 4.2 quarts. Another cow averaged 6.4 quarts daily during the time she gave milk.

4.2 quarts milk = 11 pounds, 11 quarts = 29 pounds, containing—

Butter	5. oz.	to	13.9 oz.
Sugar and soluble salts	7.5 "	"	21.35 "
Caseine and insoluble salts	8.4 "	"	23.65 "
Total solids	1 lb. 5 oz.	to	3 lbs. 11 oz.

The yield of milk diminishes as the calf grows older. An observer tested the daily yield of a cow, dividing the ten months after the calf was born into six periods of 50 days each, obtaining the following results: The average daily yield during the first 50 days was 24 quarts; second, 20 quarts; third, 14 quarts; fourth, 8 quarts; fifth, 8 quarts; sixth, 6 quarts. The average yield for the ten months was 13.66 quarts. The total yield for the first 50 days was 1200 quarts; second, 1000 quarts; third, 700 quarts; fourth, 400 quarts; fifth, 400 quarts; sixth, 300 quarts. Total yield for ten months, 4000 quarts. O. C. Wiggin, the milk inspector of Providence, estimates the average yield of each cow, good, bad, and indifferent, throughout the State of Rhode Island, to be 1856 quarts per annum. Some yielded as little as 1000 quarts. He thinks the yield should be brought up to 2200 quarts at least. Dr. Voelcker, chemist to the Royal Agricultural Society of England, reports that 65 cows (short-horns) averaged 642 U. S. gallons = 2568 quarts per annum, the food being grass and hay, with roots and straw in winter. As each cow is estimated to have eaten 28 tons of 2240 pounds of this food per annum, we have 1 pound of milk for every 11 or 12 pounds of grass.

The composition of cow's milk varies within certain limits; it is affected by a variety of circumstances, as the breed of the cow, her age, the age of her calf, nature of her food, time of milking, frequency of milking; and it is even found that the last milk which comes down at a milking is richer in butter than that which is first drawn. This last-mentioned fact shows that the custom which prevails in some localities of driving the cow from house to house, and supplying the consumer with milk fresh from the udders, is not quite equitable, as the last person supplied receives a richer milk than is given to the first customer. The following analyses illustrate these statements:

The Composition of Cow's Milk.

	Fat.	Caseine and albumen.	Sugar.	Salts.	Water.	Total solids.	Solids not fat.
Vernois and Becquerel, 46 analyses	4.51	4.86	4.15	0.65	85.76	14.17	9.66
Henri and Chevalier, average	3.13	4.48	4.77	0.60	87.02	12.98	9.85
Payen, average	3.20	4.20	4.30	0.70	87.60	12.40	9.20
Boussingault, average	4.10	3.20	5.10	0.20	87.40	12.60	8.50
Poggiale, 10 analyses	4.38	3.80	5.27	0.27	86.28	13.72	9.34
Muspratt, average	4.43	3.74	4.83	0.57	86.43	13.27	8.84
Dieulafait, several analyses.	3.11	4.18	4.22	0.85	87.64	12.36	9.25
Haidlen, average	3.00	4.82	4.39	0.49	87.30	12.70	9.70
Gorup-Bezanez, average	4.31	5.40	4.04	0.55	85.70	14.30	9.99
Dr. Letheby, "	3.90	4.10	5.20	0.80	86.00	14.00	10.10
W. Brinton, "	4.50	5.50	3.50	0.70	86.00	14.00	9.50
Jagielski, "	3.60	5.10	4.60	0.60	86.10	13.90	10.30
J. König, "	3.00	4.00	5.00	0.70	87.30	12.70	9.70
C. A. Cameron, 40 analyses.	4.00	4.10	4.28	0.62	87.00	13.00	9.00
S. Macadam, 44 "	2.42	8.91		0.69	87.96	12.04	9.62
Alex. Müller, 59 "	4.05	3.33	4.70	0.73	87.19	12.81	8.76
W. L. Scott, average	3.57	4.55	4.90	0.74	86.24	13.76	10.19
O. C. Wiggin, 58 cows	4.01	4.99	4.29	0.79	85.92	14.08	10.07
H. W. Vaughan, 30 analyses.	4.96	4.29	4.23	0.81	85.71	14.29	9.33
Average	3.799	4.369	4.543	0.635	86.66	13.32	9.52

Morin has published (*J. Pharm.*, xxv. 71) this still more elaborate analysis:

Fat	1.378
Caseine	3.614
Albumen	0.390
Galactine, a gelatinous body	0.382
Alcoholic extractive matter	0.542
Sugar	3.600
Soda combined with caseine	0.048
Phosphate of lime	0.256
Chloride of sodium	0.056
Water	89.734
	100.

Complete Analysis of Milk by Haidlen.

Water	87.300
Butter	3.000
Caseine	4.820
Sugar	4.390
Phosphate of lime	0.230
Phosphate of magnesia	0.042
Phosphate of iron	0.007
Chloride of potassium	0.144
Chloride of sodium	0.024
Soda, combined with caseine	0.042
	100.

Maxima and Minima.—Dr. Stevenson Macadam (*Am. Chemist*, May, 1875, p. 419) gives the results of 44 analyses, as follows:

	Max.	Min.	Average.
Specific gravity	1.0357	1.0284	1.0322
Cream	11.25	5.00	7.8
Fat	3.32	1.56	2.42
Salts	0.76	0.62	0.69
Total solids	14.54	10.57	12.04
Solids not fat	11.23	8.74	9.62
Water	89.43	85.46	87.96

The British Society of Public Analysts have fixed the following minimum:

Fat	2.50
Solids not fat	9.00
Total solids	11.50
Water	88.50
	100.

Country Milk as compared with Town Milk.—Dr. Cameron (*Chem. News*, Feb. 5, 1875, p. 54) and Dr. Voelcker (*Am. Chemist*, May, 1875, p. 414) state that the milk of town-fed cows is generally richer than that of country cows. The latter attributes this to the fact that it pays better to feed cows nourishing food, and that the cow-keepers in towns, being business-men, have become convinced of this fact.

Difference in the Milk of the same Milking.—Schübler found that on fractioning the milk at a milking the

	Specific gravity.	Cream.
First portion showed	1.0340	5.0 per cent.
Second " "	1.0334	8.0 "
Third " "	1.0327	11.5 "
Fourth " "	1.0315	13.5 "
Fifth " "	1.0290	17.5 "
Average	1.0321	11.0 per cent.

The last milk drawn is called "the strippings;" this is the richest in fat. Jebson and Gardner, milk inspectors for New York, found the milk and strippings of two cows to be as follows:

	Entire milk.	Strippings.
1st cow	Sp. gr. 1.0348; lact. 120	Sp. gr. 1.02610; lact. 90
2d cow	" 1.0319; " 110	" 1.02668; " 92

Difference in Morning and Evening Milk.—This has often been noticed, but the conditions to which it is due have not always been stated. Alexander Müller (*Jahresb. Ag. Ch.*, 1864, 388) made 59 analyses, extending over the entire year, and found the evening milk to be invariably richer than the morning milk. Dr. Voelcker (*Am. Chemist*, May, 1875, 416) examined the milk on the farm of the Royal Agricultural College at Cirenchester for an entire year, and found the morning milk the richest. He attributed this to the poor pasturage and the rich evening food, which consisted of roots, hay, and meal. Stefanelli found the evening milk of asses and ewes to be the richest.

The effect of breed on both the quantity and quality of the milk is very marked, as is shown in the following analyses:

Milk from Different Breeds of Cows—Analyses by Vernois and Becquerel.

Breed.	Water.	Butter.	Caseine.	Sugar.	Salts.
Angus	80.32	9.88	5.28	3.73	0.72
Belgian—Durham	85.77	6.22	4.06	3.29	0.67
Bohemian	84.18	6.34	3.87	4.96	0.64
Bretonne	83.74	5.70	5.37	4.55	0.62
Charollais	85.28	6.42	4.12	3.49	0.68
Durham, 2 analyses	84.56	6.41	4.37	3.97	0.68
Flamande	88.30	3.72	3.37	4.03	0.54
Dutch, 3 analyses	83.97	6.84	4.21	4.35	0.61
Murzthal	85.31	6.28	3.14	4.62	0.64
Normandy	87.18	3.24	4.76	4.21	0.60
Paris, 30 analyses	86.40	3.61	5.21	4.10	0.66
Swiss	85.19	7.08	2.55	4.59	0.56
Tyrol	81.74	7.96	4.95	4.82	0.50
Voigtland	84.99	5.14	4.56	4.62	0.68
Average, 46 analyses	85.76	4.51	4.86	4.15	0.65

The following table is from the report of O. C. Wiggin, milk inspector of Providence, R. I., for 1870–71:

Cows.	Sp. gravity.	Percentages.							Season.
		Cream by vol.	Fat.	Caseine	Sugar.	Salts.	Water.	Solid matter.	
Alderney	1030	24.	8.07	5.02	3.05	.79	83.04	16.96	Jan.
Alderney	1029	29.	8.28	3.14	4.02	.63	83.93	16.07	June.
Durham	1033	18.	6.41	4.35	3.97	.68	84.56	15.44	June.
Ayrshire	1031	10.	3.70	4.76	4.35	.59	86.60	13.40	June.
Ayrshire	1030	10.	3.80	4.69	3.58	.78	87.15	12.85	July.
Polled cow	1032	5.	3.37	5.18	4.25	.73	86.47	13.53	July.
Devon	1033	13.	3.96	5.29	4.23	.81	84.71	14.29	June.
Native	1032	12.	3.62	4.86	4.48	.78	86.26	13.74	June.
Grades, 16 cows	1033	12.	3.93	5.74	4.60	.80	84.93	15.07	Jan.
Grades, 15 cows	1031	16.	4.92	4.11	4.07	.76	86.14	13.86	Jan.
Grades, 13 cows	1033	13.	3.72	5.30	4.20	.80	85.98	14.02	June.
Grades, 14 cows	1032	14.	3.48	4.80	4.28	.80	86.64	13.36	May.
Average, 58 cows.	1032	14.	4.01	4.99	4.29	.79	85.92	14.08	6 mos

The results obtained by J. Lehmann (*Jahresb. Ag. Ch.*, xi., xii. 576) are of especial value, as he fed 9 cows of each

breed on the same food, and determined both the quality and the quantity of the milk:

Yield of Milk per Cow, yearly.

	Short-horns.	Hollanders.
Maximum	6949 lbs.	8556 lbs.
Minimum	5262 "	5972 "
Average	6172 "	7308 "

Composition of the Milk.

	Percentages.		Pounds per annum.	
	Short-horns.	Hollanders.	Short-horns.	Hollanders.
Fat	3.85	3.21	240	235
Caseine	3.47	3.27	222	230
Sugar	4.91	4.62	304	343
Salts	0.75	0.73	46	52
Water	87.02	88.17	5360	6448
Total	100.	100.	6172	7308
Solids	12.98	11.83	812	860

The Effect of Food on the Milk.—Feeding.—The kind of food has a decided influence on the quantity and quality of the milk. The following remarks by Dr. Voelcker, chemist to the Royal Agricultural Society, contain much valuable information on this point (*Am. Chemist*, v. 414, May, 1875): "*Food appropriate for producing much and good Milk.*—The influence of food on the quality of milk is very striking. A half-starved cow yields but little milk and poor milk. On the other hand, the liberal supply of pea or bean meal or oil-cake, and other food rich in nitrogenous and phosphatic elements of nutrition, tells directly, both on the quality and quantity of the milk. The finest-flavored milk and butter are produced by cows fed in summer entirely on grass and rich permanent pastures, and in winter on nothing else but hay made of fine sweet grass. Turnips yield a watery milk, and are objectionable on account of the turnipy flavor which they give to the milk. Mangolds are less objectionable, but should not be given to milk cows without an allowance of 3 to 4 pounds of meal per head. Of all kinds of meal, none is equal in milk-producing properties to bean or pea meal—a fact which finds a ready explanation in the circumstance that bean or pea meal contains on an average from 25 to 28 per cent. of nitrogenous constituents, or the same class of compounds to which the curd of milk belongs, and that it is likewise rich in phosphates or bone-earths, in which milk abounds. Egyptian lentils answer equally well with bean-meal, for they resemble intimately in composition beans or peas. Linseed-cake produces much and rich milk, but unless it is pure and fresh cake of the finest description it seriously injures the quality of the milk. Fine decorticated cotton-cake is both rich in fat and in nitrogenous constituents, and, like all food rich in nitrogen, it also contains a large proportion of phosphates, and is thus admirably well adapted for milk cows. Rape-cake is likewise an excellent food for milk cows, provided it is free from an undue admixture of wild-mustard seed, which frequently occurs in rape-cake made from Indian seed to an extent which renders it perilous to stock. The best rape-cake is green German rape or Rubsen cake, one of the cheapest and best concentrated kinds of food that can be given to milk cows. Bran or pollard, as is well known, produces good and rich milk. Nothing can be better as an auxiliary winter food for milk cows than 4 pounds of bran made into a thin mash, to which about 3 to 4 pounds of bean-meal is added. Along with this about 25 pounds of mangolds and a due proportion of hay or hay and straw chaff will supply a food-mixture which produces much and first-quality milk. Brewers' grains are the staple food in town dairies, and they are much more nutritious than their appearance seems to warrant. Even in the wet condition in which they are obtained from the breweries, and holding from 75 to 77 per cent. of water, they contain a fair proportion of ready-made fat and flesh forming matters. Desiccated grains contain from 7 to 8 per cent. of oil and about 18 per cent. of nitrogenous compounds. Dried brewers' grains make good milk, and are fully as valuable as a food for milk cows as barley-meal. Another useful and, comparatively speaking, cheap food for milk cows is palm-nut meal, but its quality and value differ greatly. The best palm-nut meal contains 19 to 20 per cent. of oil and fat, and is made from the partially-expressed kernels of the palm-nut; its value as a food for fattening stock or for milk cows depends principally upon the proportion of fatty matter which is left in the meal. The fatty matter in palm-kernels is a white, agreeably-tasting fat, of almost the same consistency as butter. A good deal has been said and written for and against feeding milk cows upon sewage grass. On the one hand, sewage grass has been praised as the most nutritious kind of grass for milk cows; and on the other, the adversaries to all schemes of applying sewage to land have endeavored to prejudice the public mind by denouncing the produce from grass-land irrigated by sewage as innutritious and a highly dangerous food for milk cows. Like all very succulent produce, the grass from sewaged land is more watery, and, in consequence, not so nutritious as the produce from rich permanent pastures. It is nevertheless a most acceptable food to the dairy farmer, who usually gives along with it to his cows some bean or other descriptions of meal or auxiliary concentrated food, and under proper management there is not the slightest ground for suspecting that sewage grass when given to milk cows will render the milk they yield unwholesome or dangerous to the youngest child. If sewage could not be usefully applied to Italian rye-grass to be turned into milk and butcher's meat, all sewage-irrigation schemes would long ago have fallen to the ground. Convinced as I am that the produce from a properly managed sewage farm supplies an increased amount of good and wholesome food, the greater part of which is especially useful to cow-keepers, I can only express the hope that all town authorities who at present allow large quantities of plant-food to run to waste, polluting our rivers and water-courses, will ere long set apart a portion of land, if such can be found appropriate for sewage irrigation, on which Italian rye-grass, cabbages, and mangolds can be raised in large quantities by means of sewage, for the special advantage of cow-keepers and the benefit of the community at large."

Very full instructions for the feeding of cows are given by Charles L. Flint in his *Milch Cows and Dairy Farming.* Important investigations have been made in Germany on the effect of different kinds of food on the quantity and quality of the milk. (For some of the results see Watts's *Dict. of Chem.*, 2d Supplement, p. 809.) "It appears from these results that it is not possible by variations in the food to produce a 'butter cow' or a 'cheese cow.' Differences in this respect are differences of stock and individuals."

Much discussion has arisen with regard to the propriety of feeding cows on the exhausted barley of breweries, *brewers' grains*, and on the swill of distillers, *still slops.* To the former, used in moderate quantities, there appears to be no objection whatever. Even the latter, "properly fed in limited quantities, in combination with more bulky food, may be a valuable article for the dairyman; but if given, as it too often is, without the addition of other kinds of food, it soon affects the health and constitution of the animals fed on it. . . . When this forms the principal food of milch cows the milk is of a very poor quality. . . . Its effect on the systems of young children is therefore very destructive, causing diseases of various kinds, and, if continued, certain death. . . . The adulteration of pure milk from the healthy cow by water, though dishonest and objectionable in the highest degree, is far less iniquitous in its consequences than the nefarious traffic in 'swill milk,' or milk produced from cows fed entirely on 'still slops,' from which they soon become diseased, after which the milk contains a subtle poison which is as difficult of detection by any known process as the miasma of an atmosphere tainted with yellow fever or the cholera. The simple fact is sufficiently palpable that no pure and healthy milk can be produced by an unhealthy and diseased animal, and that no animal can long remain healthy that is fed on an unnatural food, and treated in the manner too common around the distilleries of many large cities." (*C. L. Flint.*) By the laws of the State of New York the milk of cows fed on distillery swill is declared to be unwholesome, and its sale is forbidden.

Influence of the Age of the Calf.—Dr. Eisenstuck has published numerous analyses bearing on this point. (*Jahresb. Ag. Chem.*, vii. 1864, 395.)

The Effect of Spaying.—This operation increases the quantity and improves the quality of the milk. (See analyses by Dieulafait (*Jahresb. Ag. Chem.*, vii. 1864, 388).)

The treatment of cows exerts an important influence on both the quantity and quality of the milk. The judicious dairyman finds it to his advantage to "treat the cows gently, to provide warm, clean, and well-ventilated barns, with ample, dry, well-drained yards, abundantly supplied with pure water—to feed them liberally, without forcing. Milking should not be prolonged to the time of calving, but the cows should be allowed eight or ten weeks for recruiting, when they will begin the new season with renewed vigor and the promise of a more abundant yield of milk." (*O. C. Wiggin.*)

The souring of milk is due to lactous fermentation (see FERMENTATION), by which the lactose or sugar of milk is transformed into lactic acid, which precipitates the caseine as curd by withdrawing from it the soda which holds it in solution.

$$\underset{\text{Milk-sugar.}}{C_{12}H_{22}O_{11}.H_2O} = \underset{\text{Lactic acid.}}{4HC_3H_5O_3}.$$

Bechamp attributes the souring of milk to microzymes

which are present in the milk when it comes from the cow. (*Compt. rend.*, 76, 654.) The effect of rennet in coagulating milk is not fully understood. It has been supposed to be due to the conversion of a little lactose into lactic acid. Milk is coagulated by acids, alum, various other salts, tannin, alcohol, wood-naphtha, etc. The souring of milk during thunderstorms has been explained by attributing it to the *ozone* or active oxygen which is produced in the air by electrical discharges. It is said that the addition to the milk of a small quantity of boric acid retards the separation of cream and prevents souring for several days. (A. Hirschberg, *Chem. Centr.*, 1872, 496.) Schwalbe (*Deut. Chem. Ges. Ber.*, v. 286) states that the addition of mustard oil, 20 drops to the pint, prevents coagulation for weeks, even in summer. Coagulation is retarded by boiling and by the addition of small quantities of carbonate of soda, or potassa, borax, nitrate of potassa, chloride of sodium (common salt), etc. The following process for preserving milk is said to be in use in the vicinity of Paris: To each quart of milk, before the cream has risen, 6 grains of bicarbonate of soda are added, it is then placed in bottles, which are tightly corked and are then placed in a water-bath and heated to 190° F., no higher, and maintained at this temperature for four hours. They are then made perfectly tight with wax, and the milk will keep a long time.

The proper management of milk is a matter of the greatest importance. The pails, pans, cans, and other vessels destined to receive the milk should be scrupulously clean; they should always be cleansed with boiling water (scalded). The greatest neatness should be observed in milking. The milk should be strained through wire-cloth into a large tin vat, to render it of uniform quality. It should be at once, while still warm, drawn into cans, and these should be placed in the coolers. Milk which has been thoroughly cooled will keep much longer than that which is sent warm to market. Cans of milk should never be left open in a barn, where the exhalations from the breath and excrements pervade the air. Dr. Voelcker makes the following judicious remarks on this subject (*Am. Chem.*, v. 413): "However, by observing the following simple rules, country milk may be sent by rail on long journeys without spoiling even in very hot weather: (1) The milk should be drawn from the cow in the most cleanly manner, and strained through wire-cloth strainers. (2) The milk should be thoroughly cooled immediately after it is drawn from the cow. This may be done by a milk-cooling apparatus specially constructed for rapidly cooling milk, or by simply placing the can in which it is contained in a vat of cold water deep enough to come up to the height of the milk in the can containing it, and by using at least three times as much cold water as the milk to be cooled; the milk should be occasionally stirred until the animal heat is expelled. The milk should be cooled down as rapidly as possible to a temperature of about 55°. (3) The evening's and morning's milk should be cooled down separately, and be sent in separate cans, and not mixed together if it can be avoided. (4) No milk should be kept over to deliver at a subsequent time. (5) The pails and strainers employed on the farm should be thoroughly cleaned, scalded in boiling water, and dried morning and night. (6) Immediately before the milk is placed in the cans they should be thoroughly rinsed with clean cold water, and great care be taken to keep the cans and milk free from dirt or impurities of any kind. When the cans are not in use they should be turned down on a rack with the tops off. (7) Before the cans are returned to the country they should be thoroughly rinsed out with clean water and scalded with boiling water. (8) In very warm weather it is well to put the cooled milk in cans covered over with a coarse flannel casing, which may be kept wet for a considerable time."

Artificial milk was made at Paris during the siege by the following process (Dubrunfaut, *Comp. rend.*, 1871–72, pp. 84, 109):

1. Cane-sugar, glucose, or milk-sugar....	40–50	grammes.
2. Albumen (dry)....	20–30	"
3. Sodic carbonate....	1–2	"
4. Olive oil or horse fat....	50–60	"
5. Water....	500	"

Heat the whole to 122° F., and dilute to 1 litre. A. Gaudin (*Comp. rend.*, 1871–72, p. 108) recommended the use of sugar and the fat and gelatine of fresh bones.

Condensed Milk.—Within a few years a very important industry has been established with the object of condensing and preserving milk. The first efforts were directed to the preparation of "desiccated milk." The milk was evaporated at a low temperature, and a little sugar added when the process of evaporation was nearly completed; the residue was pulverized, and constituted a yellowish-white powder, which dissolved for the greater part in hot water. The solution resembled milk, and answered very well when fresh milk could not be obtained, as on shipboard. It could be preserved with care in closed bottles for several months. It was found necessary to remove a portion of the cream before evaporation, as otherwise the product soon acquired a taste and smell of rancid butter. Its imperfect solubility in water, and its deficiency in the agreeable taste of fresh milk, prevented its extensive introduction. The following analyses show its composition (No. 1 was made from skimmed milk—Nos. 2 and 3 from whole milk):

	No. 1, Voelcker.	No. 2, Voelcker.	No. 3, Werner.
Fat....	8.70	16.32	16.29
Caseine.... / Albumen....	20.25	20.37	11.36 / 4.09
Milk-sugar.... / Cane-sugar....	62.14	56.29	61.21
Phosphates of lime and magnesia....	2.34	2.33	1.73
Alkaline salts....	2.48	2.91	3.77
Water....	4.09	1.78	1.55
	100.	100.	100.

The condensation of milk did not become a success till the introduction of the vacuum-pan, which makes it possible to boil it down very rapidly at a very low temperature—below 160° F.—thus preserving its flavor unimpaired. This is an American industry, and has been introduced into Europe by American companies. Condensed milk is now extensively manufactured in the U. S., Switzerland, Germany, England, and Ireland. The milk is strained, heated in cans or pails placed in a vat of water kept hot by a steam-coil, then brought to a boil in an open vessel by the aid of steam, strained, and introduced into the vacuum-pan, where it is rapidly concentrated to any desired degree. The vacuum-pan is a close vessel of copper, egg-shaped, about 6 feet high and 4½ feet in diameter. It is heated by a steam jacket and coil. In the dome on one side is a small window, through which gas illuminates the interior, while on the opposite side is an eye-glass through which all the movements of the seething milk can be observed, and the boiling by this means regulated. A vacuum is maintained by a powerful air-pump. The preliminary boiling has for its object the expulsion of the gases of the milk, which would cause it to foam in the pan, and also perhaps to add to the keeping quality of the milk by destroying the mould-germs (see FERMENTATION)—not, probably, as many think, to coagulate albumen. Much of the milk is simply concentrated for immediate use without any addition of sugar. Such milk is extensively used in New York, being by many preferred to fresh milk. It is served fresh every day, but will keep for two or three days if necessary. The writer had occasion to investigate this subject at Purdy's Station on the Harlem R. R., at the works of the American Condensed Milk Co., for the Department of Public Charities and Correction. (*Am. Chemist*, ii. 25.) When 1700 quarts of milk were condensed in the ratio of 430 quarts to 100, the following results were obtained on analyzing samples of the milk before and after condensation:

Fat....	3.83	13.12
Caseine....	3.88	14.44
Sugar....	4.08	16.30
Salts....	0.76	2.60
Water....	87.45	53.54
	100.	100.

Some of the companies formerly skimmed the milk before they condensed it, and sold the cream separately. The following analyses by E. Waller, Ph. D., made in Jan., 1875, show that this fraud is no longer practised to any great extent:

	American.	Eagle.	New York.	National.
Fat....	16.29	14.36	14.28	13.97
Caseine....	17.26	15.07	13.96	14.02
Sugar....	10.64	11.64	13.90	10.44
Salts....	2.77	2.10	2.00	2.33
Water....	53.04	56.83	55.86	59.24
	100.	100.	100.	100.

In addition to this milk, which is condensed for immediate use, another variety is made for keeping which is known as "preserved" or "canned" milk. It receives an addition of cane-sugar, and is hermetically sealed in cans. When properly prepared it keeps for years. The following analyses indicate the character of this "preserved" milk:

	Borden's, U. S.	Aylesbury, English.	Cham., Swiss.	Kempten, Bavarian.	Sassin, Hungarian.
Fat....	9.55	11.73	8.67	13.14	17.89
Caseine....	10.26	15.17	13.67	12.21	13.27
Albumen....				7.93	7.46
Milk-sugar	53.34	16.24	10.82	17.93	22.70
Cane-sugar		29.46	40.48	24.11	18.44
Salts....	1.91	2.30	2.23	3.87	5.10
Water....	25.94	25.10	24.13	20.81	15.14
	100.	100.	100.	100.	100.

Cream is a distinct layer which forms on the surface of milk when it is allowed to stand a few hours. It consists of milk with an increased perçentage of fat, produced by

the rising of a considerable portion of the fat-globules from the milk below. The quantity of cream does not indicate the absolute proportion of fat, as of two samples of milk containing the same percentage of fat, one may throw up a layer of cream twice as bulky as that on the other. The specific gravity of cream is less than that of milk—about 1.012 to 1.019.

Skimmed milk is the portion left after the cream has been removed. It is poor in fat, and necessarily heavier than the milk which yielded it—from 1.031 to 1.036.

Buttermilk is the milk which is left when the greater portion of the fat-globules of cream have been agglomerated into butter by churning. It has the composition of milk deprived of most of its fat, and does not differ therefore from skimmed milk.

Curd is the coagulated caseine of milk; if made from whole milk, it contains the fat; from skimmed milk, it is nearly free from fat; from cream, it is very rich in fat.

Cheese is curd which has been salted, often colored artificially, and flavored, and then allowed to undergo a kind of fermentation by keeping. (See articles BUTTER and CHEESE.)

The following analyses by Alex. Müller show the composition of these preparations and their relation to milk (*Jahresb. Ag. Ch.*, 1864, vii. 393):

	Whole milk.	Skim milk.	Cream.	Butter-milk.	Butter.	Salt water.
Whole product........	100.	90.	10.	6.	4.	0.1
Fat..........................	4.00	0.55	35.00	1.67	85.00	
Caseine, etc.............	3.25	3.77	2.20	3.33	0.51	3.40
Sugar.......................	4.50	4.66	3.05	4.61	0.70	4.70
Salts........................	0.75	0.78	0.50	0.77	0.12	0.79
Water.......................	87.50	90.64	59.25	89.62	13.67	91.11
	100.	100.	100.	100.	100.	100.

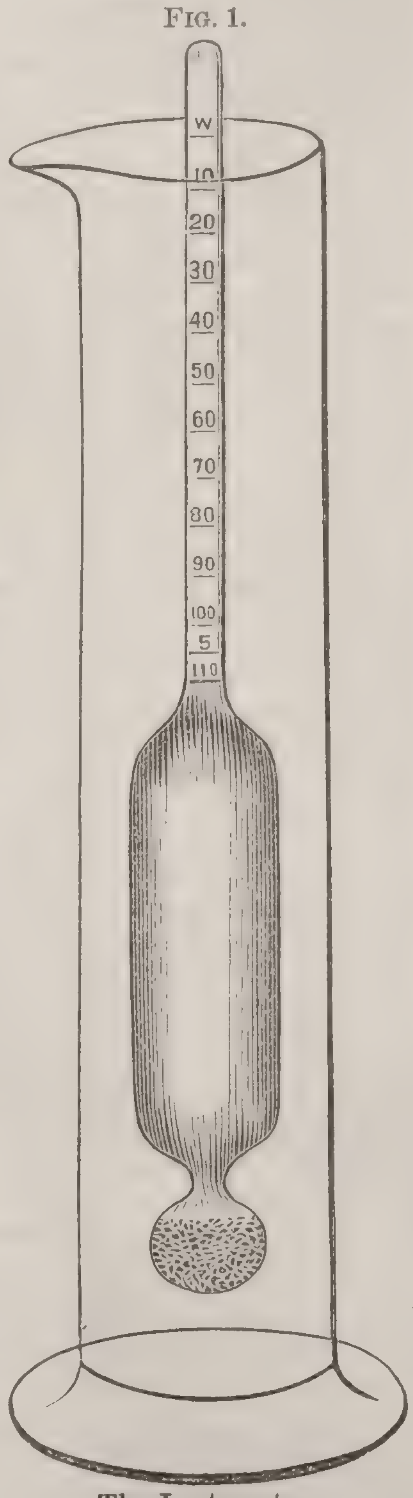
The butter was analyzed unsalted, the salt water worked out of the salted butter, and the analysis calculated without the salt.

The milk of diseased cows is always dangerous, and should never be used. The effect of distillery swill on cows has been already alluded to.

The alcoholic fermentation of milk for the preparation of alcoholic beverages has been mentioned in the article KOUMISS.

The Adulteration of Milk.—Numerous substances are mentioned by writers as used to adulterate milk, such as the following: (1) water; (2) chalk and carbonates of soda and potassa and borax, to neutralize acidity, the first mentioned to hide watering as well; (3) turmeric, annotto, and caramel (burnt sugar), to conceal the blue color of skimmed or watered milk; (4) flour, starch, emulsions of almonds or hempseed, and cerebral matter (sheeps' brains), to thicken watered milk and conceal blue color; (5) sugar, gum, dextrine, and salt, to increase the specific gravity and conceal watering. The writer is satisfied that the only substances used at present are water, and possibly carbonate of soda and burned sugar. All these adulterants, save water, are so readily detected that their use would be too dangerous for even the most abandoned milkmen. Hundreds of analyses made by the health authorities of New York and by the milk inspectors of Boston and Providence have failed to show the presence of any adulterants save those last mentioned. The adulteration with water and the skimming off of the cream are the common frauds practised in this country. A careful investigation of the milk-

FIG. 1.



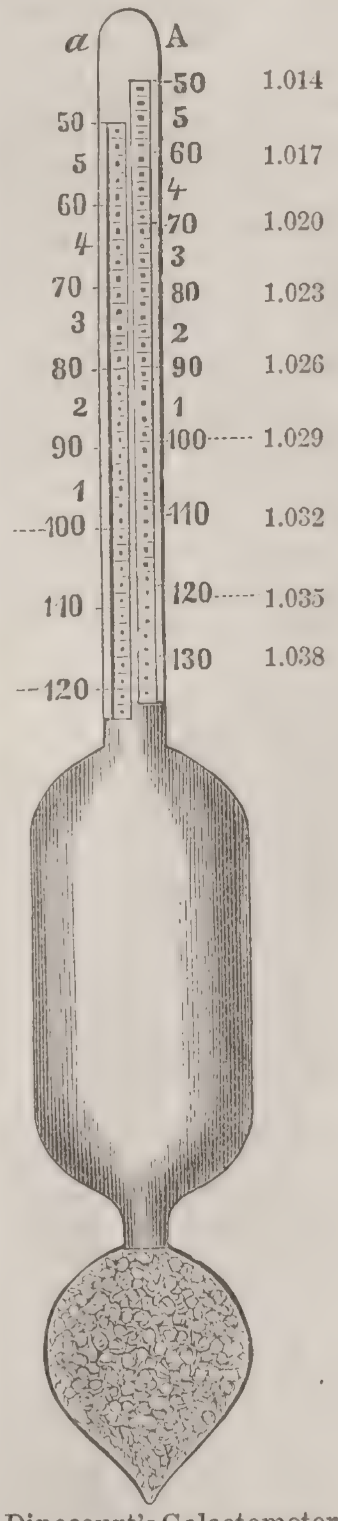
The Lactometer.

supply of New York forced the writer to the conclusion that the average milk sold here consisted of three-fourths milk and one-fourth added water. The 120,000,000 quarts of milk sent annually to New York receive an addition of 40,000,000 quarts of water, which, sold at 10 cents per quart, brings $4,000,000 per annum or $12,000 per day. This fraud, besides being expensive, exerts a most unfavorable influence on the health of young children, especially as it is aggravated by the previous skimming of the milk and consequent impoverishment of the fatty constituent. In some cases diseases have been introduced by the use of foul water, as in London, where an outbreak of typhoid fever was traced to the water added to the milk, which was poisoned with sewage.

The detection of adulteration in the case of water is not always possible. As the percentage of water in genuine milk varies, it is only possible to prove adulteration when the percentage of water exceeds the maximum quantity in pure milk. Three methods are in use for testing the quality of milk: (1) determining the specific gravity; (2) determining the percentage of cream; (3) analyzing the milk.

(1) *Determining the specific gravity* by the hydrometer (see HYDROMETER), called when graduated for this purpose a *galactometer* or *lactometer*. As milk is heavier than water, any dilution will reduce the specific gravity. The lactometer merely determines the specific gravity. In using the lactometer a certain specific gravity must be selected as a minimum below which no genuine milk ever goes. The specific gravity 1.029 has been fixed by Dinocourt, who originated the lactometer, as the proper minimum. This standard has been adopted by the Health department of New York. The old standard adopted by the milk-dealers was 1.030; this was changed by Dr. Chilton to 1.034, and has gradually dropped to 1.033. So the standard of the milk-dealers is 0.004 higher than that of the Health department! In graduating the lactometer, 100 is placed at the standard of 1.029, and 0 at 1.000, the gravity of water, the intervening space being divided into 100 divisions. The point to which the lactometer sinks in the milk under examination indicates the percentage of milk in 100 parts. Thus, if the lactometer sinks to 80, the milk must consist of at least 20 parts or per cent. of water and 80 of milk. But this assumes the original milk to have had a gravity of only 1.029, which is lower than any genuine milk. Good milk of a gravity of 1.034 requires an addition of 16.67 per cent. of water to bring it down to 1.029. After this dilution, 20 per cent. of water must be added to this watered milk to bring it down to 80 on the lactometer. The lactometer errs, therefore, in not showing the dilution of good milk down to our low standard, and consequently in reporting only a portion of the dilution. With regard to the propriety of the standard (1.029) for genuine milk, something has been already said in this article under *Specific Gravity*. The writer caused the milk of 195 cows at dairies near New York to be tested; several of the cows were Alderneys, whose milk being rich in cream is always light, and the lowest specific gravity found was 1.02958, or 102 on the lactometer, the highest being 1.0348, or 120 on the lactometer, at 60° F. As milk expands when warmed, it consequently becomes lighter; it should always be tested at 60° F., or at least the temperature should be noted. A

FIG. 2.



Dinocourt's Galactometer. The scale A is for whole milk; the scale *a* for skimmed milk. Unwatered and unskimmed milk ranges from 100 to 120 on Scale A, unwatered skimmed milk from 105 to 130 on Scale *a*.

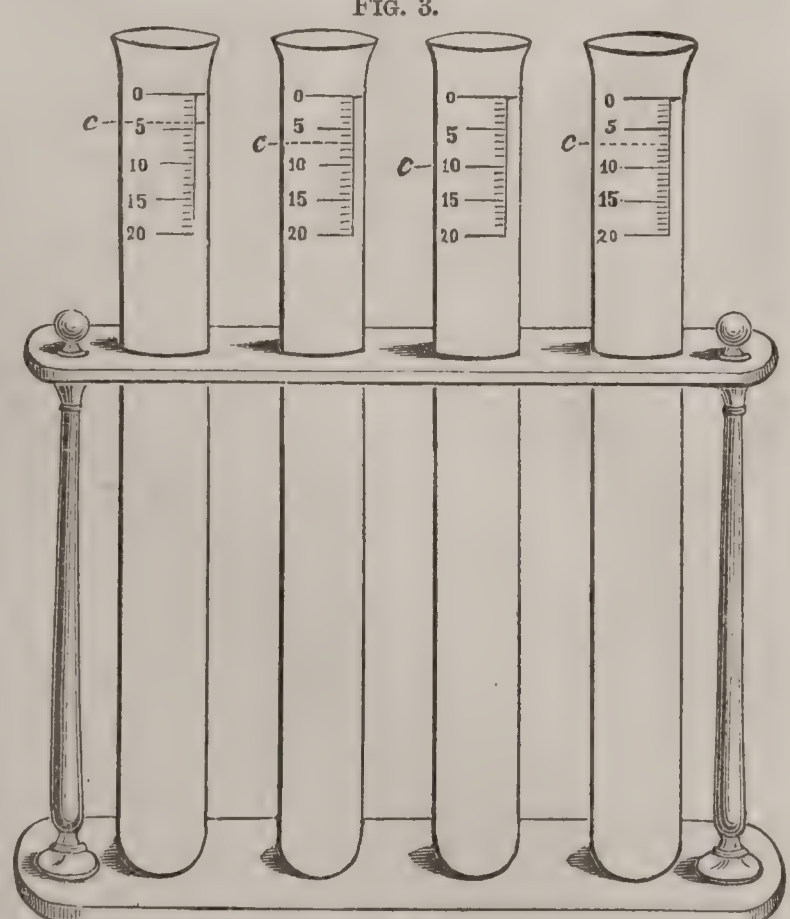
sample of milk which stood at 100 by the lactometer at 60° F. was found by the writer to stand at 106 at 44° F., at 98 at 66° F., at 90 at 80° F., and at 74 at 100° F. As a general rule, the milk, being kept cool to preserve it, is below 60° F.; consequently, it stands better by the lactometer than it would at the standard temperature. Skimming increases the gravity of the milk, and makes it stand better by the lactometer. From these statements it is seen that the lactometer is only an imperfect test for frauds of the milkmen: (1) It does not show moderate watering of good milk; (2) the watering which it records is only a fraction of that actually practised; (3) if the milk is skimmed before it is watered, the lactometer does not detect the frauds, which neutralize each other as far as specific gravity is concerned. In the face of these defects, if the lactometer shows the milk to be below 100, there then is no doubt as to its having been watered. Numerous convictions for watering have been secured in New York by the use of the lactometer, the milk inspected having stood as low as 80, 70, and even 50, by this test. The only error the lactometer can make against the milk-dealer would be in case he has adulterated his milk with cream; the lactometer does not distinguish the difference between cream and water when added to milk, except that it requires twice as much cream as water to reduce the gravity of milk to any given degree. The following table, from Dr. Voelcker's experiments, illustrates the effect of watering and skimming; the lactometer degrees are added by the writer:

	Unskimmed.		Skimmed.	
	Sp. gr.	Lactometer.	Sp. gr.	Lactometer.
Pure milk	1.0314	108	1.0337	117
10 per cent. water added	1.0295	102	1.0308	106
20 " " "	1.0257	88	1.0265	91
30 " " "	1.0233	80	1.0248	86
40 " " "	1.0190	66	1.0208	72
50 " " "	1.0163	56	1.0175	60

Thus it is seen that with a sample of fair milk more than 10 per cent. of water could be added before the gravity was reduced to 1.029, or 100 on the lactometer, and after skimming considerably more.

(2) *Determining the Percentage of Cream.*—This is accomplished in a tube which is graduated into 100 parts, and which measures the cream. This has been called a lactometer or creamometer.

FIG. 3.



Creamometer. Fill with milk to the 0-mark; after standing, read the amount of cream—for example, as indicated by *c*.

This is a very imperfect method for testing milk, as the percentage of cream is not an accurate measure of the fat contained in the milk. H. Schroeder tested this point with the following results in several samples of milk:

Samples	No. 1.	2.	3.	4.	5.	6.
Fat	3.54	4.87	4.09	5.38	3.13	4.09
Cream	21	16	10	10	12	13

(3) *Partial or complete analysis* is undoubtedly the most certain method of detecting adulteration, either determining the percentage of fat, and of solids besides fat, or making a separate determination of each constituent. In either case we are compelled to do exactly what we did in applying the lactometer—establish an arbitrary standard which shall represent the poorest genuine milk, and bear the same relation to good milk that our sp. gr. 1.029 does to the 1.030, 1.031, or 1.034 of milk of average quality. The English Society of Public Analysts have fixed the following minimum quality for unadulterated milk (*Chem. News*, Feb., 1875, p. 59):

Fat	2.5
Caseine, Sugar, Salts	9.
Water	88.5
	100.

Milk of average quality can be watered and skimmed very seriously before it falls below this standard.

The analysis of milk is not difficult if we simply determine the percentages of fat, caseine, sugar, salts, and water. Water is determined by evaporating a weighed portion of milk in a flat platinum dish (about half an inch deep and 1½ inches in diameter) at 212° F. The loss in weight is the water. The salts are determined by carefully incinerating the solid residue left after the evaporation of the water. For the determination of the other constituents a platinum dish is nearly filled with pure quartz sand; the whole weighed; a small quantity of the milk is added, which is at once soaked up by the sand, and the whole again weighed to find the weight of milk taken. The whole is then dried at 212° F., the contents of the dish extracted with anhydrous ether, and again dried; the loss in the weight of the sand, etc. indicates the percentage of butter. The butter may be weighed directly by evaporating the ethereal solution in a weighed beaker. The residue after removing the butter is washed with warm water, to the first of which a few drops of acetic acid is added, to remove the sugar. After drying the residue the loss in weight indicates the sugar. The difference between the original weight of the sand and of the sand and caseine indicates the percentage of caseine. A correction must be made in the weights of the sugar and caseine on account of the salts, which are washed out with the sugar. By evaporating and igniting the sugar solution the salts washed out will be determined; they must be deducted from the percentage of sugar; the remainder of the salts (ash) must be deducted from the caseine.

Wanklyn, Chapman, and Smith's ammonia process has been recommended for the determination of caseine in milk. The milk is first diluted with water till 1 cubic centimètre of the diluted milk contains 10 milligrammes of the original milk. About 5 cubic centimètres of the diluted milk is boiled with alkaline permanganate in a retort as long as the water which distils over contains ammonia. The amount of ammonia is estimated by Nessler's test: 100 parts of caseine yield 6.5 parts of ammonia.

(4) *Optical methods* have been proposed for the examination of milk, but they are rarely used.

II. Human Milk.—Human milk is more bluish than cow's milk, and has a sweeter taste. It is strongly alkaline, and is remarkable for the difficulty with which it coagulates. It is less easily and completely coagulated by rennet; the coagulum is not so gelatinous nor so firm and solid as that of cow's milk; it is also more digestible. Its specific gravity varies from 1.02561 to 1.04648 (Vernois and Becquerel), from 1.030 to 1.034 (Watts's *Dict.*). The milk of women confined for the first time contains more water than the milk of women who have had several children. According to Vernois and Becquerel, the percentage of fat varies with age: the milk of women from 15–20 contains 3.738 per cent.; 20–25, 2.821 per cent.; 25–30, 2.348 per cent.; 30–35, 2.864 per cent.; and from 35–40, 2.233 per cent. It increases by nearly 0.3 per cent. during the period of menstruation. The percentage of butter varies inversely as the quantity of milk produced. It decreases with imperfect nutrition. The following analyses have been published by different chemists:

Woman's Milk.

	Vernois and Becquerel, 89 analyses.	Simon, 14 analyses from one woman.	Clemm, 3 analyses from one woman.	Chevalier and Henry.	D'Hériter.	Jagielski.
Fat	2.67	2.53	3.71	3.55	5.20	2.90
Caseine	3.92	3.43	3.26	1.52	0.95	2.90
Sugar	4.36	4.82	3.84	6.50	6.34	4.80
Salts	0.14	0.23	0.19	0.45	0.45	0.20
Water	88.91	88.37	89.00	87.98	87.06	89.20
Total	100.	99.38	100.	100.	100.	100.
Solids	11.09	11.63	11.00	12.02	12.94	10.80

According to Vernois and Becquerel, the amount of fat in human milk increases during the first two months after delivery, but decreases between the fifth and sixth, as well as between the tenth and eleventh month.

Simon gives the following analysis of human colostrum:

Fat	5.00
Caseine	4.00
Sugar	7.00
Salts	0.31
Water	82.80
	99.11

Von Tolmatscheff examined the milk of healthy women at different periods after delivery (*Jahresb. Ag. Ch.*, xi., xii. 1868–69, 548); his average results were as follows:

	Days after delivery.	Fat.	Caseine and albumen.	Sugar.
1	4	2.471	4.188	4.33
2	6	3.177	2.050	5.76
3	15	2.939	2.077	5.90
4	36	1.713	1.104	6.26
5	30	1.621	4.649	3.56

He also found cholesterine 0.0385 and 0.0252, and protagon 0.146 and 0.068. D'Héritier claims to have found a persistent difference in the milk of blondes and brunettes, the milk of the former containing less fat, caseine, and sugar than that of the latter. Jourdat (*Compt. rend.*, 1870, 71, 87) examined the milk of the two breasts of a woman separately. He reports that the right breast was much more developed than the left—that the milk of this breast appeared better to the eye, and was decidedly preferred by the child. He found the composition of the milk of the two breasts to vary considerably, a temporary fatigue or slight change of diet being sufficient to produce the variation. The right breast yielded about twice as much milk as the left. The milk of the right breast was richer in fat and caseine, while the sugar and salts were alike in both. "Healthy children of both sexes discharge from the seventh to the twelfth day of their birth a white secretion from the breast (*Hexenmilch*), either alkaline or neutral, and containing milk, but no colostrum-globules. According to Guillot, this secretion has pretty much the composition of human milk." (*Watts's Dict.*)

III. Milk of Other Animals.—*Mare's milk* is rich in sugar and poor in fat and caseine. It readily ferments (see article Koumiss); sp. gr. = 1.034 to 1.045. C. A. Cameron gives the following results of the analyses of 14 samples from 14 mares (*Chem. News*, Feb. 5, 1875, 54):

	Average.	Maximum.	Minimum.
Fat	1.055	2.120	0.600
Caseine, etc.	1.953	2.400	1.460
Sugar	6.285	6.870	5.670
Salts	0.397	0.440	0.330
Water	90.310		
	100.		
Solids	9.690		

Ass's milk resembles mare's milk, being rich in sugar and poor in the other constituents; sp. gr. 1.023 to 1.035. It readily sours, and easily undergoes fermentation. Composition:

	Stefanelli, 3 analyses.	Voelcker.	Cameron.	Gorup-Bezanez.	Jagielski.
Fat	0.84	0.11	1.85	1.26	1.30
Caseine, etc.	1.89	1.82	3.56	2.02	1.90
Sugar	6.04	6.08	5.05	5.70	6.40
Salts	0.37	0.34	0.52		
Water	90.86	91.95	89.02	91.02	90.40
	100.	100.	100.	100.	100.
Solids	9.14	8.05	10.98	8.98	9.60

Camel's milk, Dragendorff (*Jabresb. Ag. Ch.*, ix. 1866, 435):

Specific gravity	1.035
Fat	2.90
Caseine	3.67
Sugar	5.78
Salts	.66
Water	86.94
	99.95
Solids	13.06

Ewe's milk is thickish, white, of agreeable taste and smell, and very rich in fat and caseine; sp. gr. 1.032 to 1.044. Analyses:

	Stefanelli, 3 analyses.	Filhol and Joly, Southdown.	Filhol and Joly, Merino.	Filhol and Joly, Jauragagio.	Voelcker.	Macadam, 4 ewes.
Fat	6.97	3.70	7.60	10.40	1.20	5.72
Caseine, etc.	5.49	7.90	9.02	8.30	4.58	11.12
Sugar	3.63	5.35	4.37	4.16	5.00	
Salts	0.97	0.55	0.61	0.16	0.68	0.94
Water	82.94	82.50	78.40	76.98	88.54	82.22
	100.	100.	100.	100.	100.	100.
Solids	17.06	17.50	21.60	23.02	11.46	17.78

Goat's milk is white, of insipid sweetness, and peculiar odor; sp. gr. 1.034 to 1.036. On coagulation its caseine forms thick clots. It is very similar to cow's milk in composition. Analyses:

	Gorup-Bezanez.	Cameron.	Jagielski.	Voelcker.	Stohmann, 32 analyses.	Macadam, 4 analyses.
Fat	4.36	5.69	3.40	3.32	4.20	5.14
Caseine	3.36	3.51	4.40	4.02	3.76	10.79
Albumen	1.30					
Sugar	4.00	3.69	4.30	5.28	4.72	
Salts	0.62	0.62	0.80	0.58	0.92	0.89
Water	86.36	84.49	87.10	86.80	86.40	83.18
	100.	100.	100.	100.	100.	100.
Solids	13.64	15.51	12.90	13.20	13.60	16.82

(See Stohmann, *Experiments on Feeding Milk-producing Animals, Jahresb. Ag. Chem.*, xiii.–xiv. 1870–72, p. 161.)

The milk of sows is thickish and stringy. The taste is cool and rich, but not sweet. It is alkaline. Sp. gr. 1.0298 to 1.041. Few analyses have been made, as the sows generally refuse to yield a drop to even the most skilful dairymaids. Analyses:

	Von Gohren.			Sintner.	Cameron.
	Colostrum.	Six days after birth of litter.	Nineteen days after birth of litter.	Five weeks after birth of litter.	
Fat	9.53	3.14	2.82	6.88	6.00
Caseine, etc.	15.56	12.89	5.68	6.89	5.30
Sugar	3.84	2.80	1.60	2.01	6.07
Salts	0.85	0.71	0.87	1.29	0.83
Water	70.13	80.43	89.26	82.93	81.80
	99.91	99.97	100.23	100.	100.
Solids	29.86	19.57	10.74	17.07	18.20

(Von Gohren, *Jahresb. Ag. Chem.*, viii. 1865, 377; Sintner, *Jahresb. Ag. Chem.*, viii. 1865, 378; Cameron, *Chem. News*, xix. 1869, 217.)

Canine milk is rather thick, and becomes thicker on warming, when it does not coagulate; sp. gr. 1.033 to 1.036. Analyses:

	Von Tolmatscheff.		Szbotin.		
	Five weeks after birth of pups.		Food, lean meat.	Food, potatoes.	Food, fat.
Fat	10.77	12.84	10.64	4.98	10.11
Caseine	5.52	3.94	5.20	4.25	5.92
Albumen	2.99	2.97	3.97	3.92	4.26
Sugar	3.05	3.38	2.49	3.42	2.15
Salts, Extractive	......	......	0.44	0.48	0.39
Water	......	......	77.26	82.95	77.37
			100.	100.	100.
Solids	......	......	22.74	17.05	22.63

(Von Tolmatscheff, *Jahresb. Ag. Ch.*, 1868–69, xi., xii. 548.) Szbotin (*Jahresb. Ag. Ch.*, x. 1867, 296) fed his dogs on lean meat, potatoes, and fat alternately. He found the milk to be always sour. The yield of milk was greatest when the food was meat. It fell off rapidly on potatoes, and still more on fat; two dogs stopped furnishing milk, but began again when fed on meat. A considerable addition of fat to the meat-diet, 3 of fat to 1 of meat, reduced the milk-yield to a minimum. Thin dogs grew fat on a meat-diet.

Literature.—In addition to authorities already mentioned: *The Milk Journal; Milch-Zeitung; Milch Cows and Dairy Farming*, C. L. Flint (1874); *Du Lait et de l'Allaitement*, C. Marchand (1874); *Milk Analysis*, J. A. Wanklyn (1873); *Lectures on Food*, Dr. Letheby (1870); *U. S. Patent-Office Report* (1861); *Food and its Adulterations*, Hassall (1855); Gmelin's *Chemie*, Bd. viii. 246; Watts's *Dict.* and Suppls.; *Du Lait*, Bouchardat et Quevenne (1857); *Anleitung zur Prüfung du Kuhmilch*, C. Müller (1857); *Memoir sur le Lait*, Quevenne (1841); *Du Lait chez la Femme*, Vernois et Becquerel (1852); *Analyse du Lait*, V. et B. (1856); Chevalier and Henry, *Dingler Pol. J.*, 74, 159; Quevenne, *Dingl.*, 84, 55; Dumas, *J. f. pr. Ch.*, 37, 14; Poggiale, *Compt. rend.*, 28, 584; Vernois et Becquerel, *Compt. rend.*, 36, 187; Baumhauer, *J. f. pr. Ch.*, 84, pp. 145, 157, 167; Müller, *J. f. pr. Ch.*, 86, 380; Liebig, *Künstliche Milch*, *Compt. rend.*, 64, 997; *Jahresb. Ag. Chem.; Jahresb. Thier. Chemie; Jahresb. der Chemie; Jahresb. der Chem. Technologie.*

C. F. Chandler.

Milk Fever, a name applied by midwives to a short febrile attack which sometimes attends the beginning of the milk-secreting process, a few days after childbirth. It is sometimes ushered in by profound and rather alarming chills, but is unimportant except as sometimes simulating the onset of puerperal fever, for which it is occasionally mistaken. Farmers and veterinarians apply the name to puerperal peritonitis of the lower animals, and to a severe form of cerebro-spinal meningitis which sometimes attacks cows after calving. The last-mentioned disease is treated by cathartics, mercury, aconite, and heat to the spine; the former, by opium, aconite, mercury, and hot abdominal fomentations.

Milk Quartz, a quartz of milk-white color, occurring chiefly in Greenland. (See QUARTZ.)

Milk Sugar. See MILK, by C. F. CHANDLER, M. D., Ph. D., LL.D.

Milk Tree, applied to trees whose trunks yield a milky fluid fit for food when incised. Such are the cow tree (see ARTOCARPACEÆ), found in the Caraccas Islands; the kiriaguma, or *Gymnema lactiferum*, of Ceylon, used for domestic purposes; and the tabayba dolce, or *Euphorbia balsamifera* (see EUPHORBIA) of the Canary Islands, yielding a wholesome juice resembling sweet milk.

Milk Weed. See ASCLEPIADACEÆ and ASCLEPIAS.

Milky Way. See GALAXY, by PROF. S. NEWCOMB, M. N. A. S.

Mill. See GRINDING AND CRUSHING MACHINERY, by PROF. R. H. THURSTON, C. E.

Mill, tp. of Conecuh co., Ala. Pop. 1031.

Mill, tp. of Grant co., Ind. Pop. 1523.

Mill, tp. of Tuscarawas co., O., includes Uhrichsville and other villages. Pop. 3436.

Mill (JAMES), b. at Logie Pert, Forfarshire, Scotland, Apr. 6, 1773; was educated at the University of Edinburgh, and was licensed as a preacher in the Scottish National Church 1798, but abandoned that career in consequence of a change of religious opinions; became a tutor in the family of Sir John Stuart, whom he accompanied to London in 1800, and settled in that capital as an author. He edited the *Literary Journal;* became intimately connected with Jeremy Bentham, residing in his house and expounding his opinions to the English public; wrote an elaborate *History of British India* (3 vols., 1817–18), which procured him an important post in the office of the East India Company; was one of the chief contributors to the *Westminster Review* (1824); published a treatise on *Political Economy* (1821–22); wrote largely for the *Encyclopædia Britannica* on political and social subjects, and was author of a remarkable work on the sensational philosophy, *An Analysis of the Phenomena of the Human Mind* (2 vols., 1829). D. at Kensington, London, June 3, 1836.

Mill (JOHN), D. D., b. at Shap, Westmoreland, England, about 1645; was educated at Queen's College, Oxford, where he became fellow 1669; was chaplain to Charles II. 1681; principal of St. Edmund's Hall 1685; became prebendary of Canterbury and rector of Bletchington, Oxfordshire, where he d. June 23, 1707. A learned edition of the *Greek Testament, with Various Readings*, by which he is still remembered, cost him thirty years' labor, and was published only a few days before his death.

Mill (JOHN STUART), son of James Mill, b. in London May 20, 1806. His father took sole charge of his education, and conducted it in a way to secure a precocious development. Mill says of himself: "I have no remembrance of the time when I began to learn Greek; I have been told that it was when I was three years old." At eight he was reading Herodotus, Xenophon, and Plato; and during the next four years he read the works of the leading Latin authors and the Greek poets, dramatists, orators, and philosophers, even to Aristotle's *Rhetoric*. In the same period he was grappling with the problems of the calculus and higher mathematics, and finding his recreation in reading history and books of experimental science, interspersed with earnest conversations with his father as they took long walks together. In his fourteenth year he was taken through a complete course of political economy, with the help of such books as were then published and of discussions with his father. Up to this time he had been excluded from participation in the ordinary sports of children and from association with other boys. When about fourteen he left England for a year, spent mostly in the S. of France. There he imbibed a taste for mountain-scenery, took lessons in fencing and other forms of bodily exercise, attended lectures on science, and studied the higher mathematics under private tuition. He carried home with him a strong and permanent interest in continental liberalism, which qualified his subsequent political views. He received the impress of his father's religious skepticism to such a degree that he confesses, "I am one of the very few examples in this country of one who has not thrown off religious belief, but never had it. I looked upon the modern exactly as I did upon the ancient religion, as something which in no way concerned me." On his return from France he assisted his father in preparing for the press a work on political economy. Soon after he studied law with John Austin, a devoted disciple of Bentham. All his associations identified him with Bentham's school of philosophy, to which he claims to have given the title "*utilitarian*." When seventeen years old his father secured for him an appointment from the East India Company, in whose service he remained for thirty-five years, rising steadily from the lowest grade of clerk to the highest post in his department, that of examiner of India correspondence. The same year (1823) the *Westminster Review* was established by Bentham and his followers as a radical organ in politics and religion. Young Mill commenced at once contributing to its pages, and made it for many years the chief medium for publishing his literary efforts. From 1835 to 1840 he was its principal conductor. When only twenty-one he edited Bentham's great work *On Evidence*, adding notes and supplemental chapters of his own. With the bringing out of his *System of Logic, Ratiocinative and Inductive,* in 1843, he became prominent as a strong, bold radical writer on philosophical subjects. This work embodied the chief peculiarities of the utilitarian school of philosophy. After having previously treated parts of the subject in a series of essays, he published in 1848 his full treatise, entitled *Principles of Political Economy, with some of their Applications to Social Philosophy*. This work has passed through several editions in England and America, and has a place among the standard works on the subject. On the dissolution of the East India Company in 1856, Mill, thrown out of his office, turned his attention altogether to literary labors. He published in 1859 a work *On Liberty*, which strikes at the despotism of public opinion over individual freedom of thought. In the same year was issued a collection of his *Dissertations and Discussions, Political, Philosophical, and Historical*, which had previously appeared in the *Westminster* and *Edinburgh Reviews;* also an essay entitled *Thoughts on Parliamentary Reform*, in which he advocated the extension of suffrage without distinction of sex on the basis of educational qualifications. In 1865, Mr. Mill was returned to Parliament, but his career in that body disappointed his constituents and the public generally. His chief prominence was in advocating the measure to admit women to the suffrage, which failed. In the new election he was rejected, and retired from public life. During his remaining years his residence was in the S. of Europe, near Avignon, varied by spending some time twice a year in the neighborhood of London. He devoted his time to miscellaneous literary work, the fruits of which were in part presented to the public under his own eye and in part reserved for posthumous publication. Of the latter, his *Autobiography* and *Essays on Theism* are worthy of special notice. In his domestic relations Mr. Mill was quite peculiar. In 1830, when in his twenty-fifth year, he formed the acquaintance of Mrs. Taylor, and was drawn into an almost idolatrous devotion towards her. Though they passed many hours of every day in each other's society, their personal intercourse was held under due restraint until after the death of Mr. Taylor, for whom both cherished high respect. She shared in his literary work, and he says, rather extravagantly, "What I owe, even intellectually, to her is in its detail almost infinite." In 1851, after twenty years of such intimacy, that "most valued friendship of his life" was consummated by a formal marriage. His wife died at Avignon in 1859, after which he fixed his residence near her grave. There, with her eldest daughter, he cherished her memory as a "religion," and endeavored still to regulate his life with supreme regard to her approbation till his own death, on May 8, 1873. Besides the works above noticed, Mr. Mill gave to the public the following—viz. *Considerations on Representative Government* (1861), *Utilitarianism* (1862), *Auguste Comte and Positivism* and *Examination of Sir William Hamilton's Philosophy* (1865), *England and Ireland* (1868), *The Subjection of Women* (1869), *Chapters and Speeches on the Irish Land Question* (1870). His *Autobiography* appeared soon after his death, in 1873, and the *Three Essays—Nature, The Utility of Religion*, and *Theism*, in 1874. A clear and candid presentation of Mill's views and character is given in a little memorial published in 1873, which is made up of twelve distinct sketches by H. R. Fox Bourne, Herbert Spencer, J. E. Cairns, Henry Fawcett, and others well acquainted with the man and familiar with his writings.

A. L. CHAPIN.

Millais' (JOHN EVERETT), b. at Southampton June 8, 1829. He is of French extraction, and spent his early years in France and Jersey; was sent to London to study art at

the Royal Academy. Before he was eighteen years old he had gained prizes for drawing and had borne off medals of silver and gold. His first exhibition was in 1846—*Pizarro seizing the Inca of Peru.* This was followed in 1847 by *Queen Elgiva delivered to the Emissaries of Dunstan* and *The Widow's Mite,* a colossal cartoon; in 1848, *The Tribe of Benjamin seizing the Women of Shiloh.* These pictures bore the marks of academic training, and were more or less conventional in manner. But in 1849, Millais, in concert with William Holman Hunt and D. G. Rossetti, threw off the academic tradition, and, starting with the purpose to paint nature and life as they really appeared, inaugurated what soon became celebrated as the "pre-Raphaelite school" of art. The doctrines of the new school were set forth in a short-lived periodical, called *The Germ,* the few numbers of which appeared in 1850. The philosophy and rationale of the painters found an eloquent champion in John Ruskin (*Modern Painters*), but the painters relied for their justification on their work. Mr. Millais produced in 1849 *Isabella;* in 1850, *Ferdinand lured by Ariel* and *Our Saviour;* in 1851, *The Woodman's Daughter* and *Mariana in the Moated Grange;* in 1852, *The Huguenot* and *Ophelia;* in 1853, *The Proscribed Royalist* opened to him the doors of the Royal Academy, not without opposition; *The Order of Release* was produced the same year; later came *The Rescue, Peace Concluded, Autumn Leaves, The Child of the Regiment, The Dove returning to the Ark, Sir Isumbrus at the Ford, The Heretic, The Black Brunswicker, Joan Darc, The Romans leaving Britain, Sleeping, Waking, Jephthah.* His picture is an object of interest at the annual exhibitions. Some of the above, *Isabella* and *The Huguenots* especially, are well known through engravings. Mr. Millais was chosen a member of the Royal Academy in 1863. He shows but slightly the mystical fervor of his friend Hunt; and Mr. Ruskin, in recent criticisms, has intimated disappointment with his latest work as lacking vigor of conception and truthfulness. O. B. FROTHINGHAM.

Mil'lard, county of Utah, bounded W. by Nevada. Estimated area, 4800 square miles. It consists largely of arid plains and high mountain-ridges, and contains valuable mineral deposits, among which is a great bed of sulphur of remarkable purity. Cap. Fillmore City. Pop. 2753.

Millard (DAVID), b. in Ballston, N. Y., Nov. 24, 1794; became a minister of the "Christian" denomination 1815; was pastor of a church at West Bloomfield, N. Y., 1818–32, and at Portsmouth, N. H., 1837–40; published *The True Messiah in Scripture Light* (1818); edited for several years a monthly magazine called *The Gospel Luminary;* visited Palestine in 1841, and published *Travels in Egypt, Arabia Petræa, and the Holy Land* (1843); settled again at Bloomfield, and was from 1845 to 1867 professor of biblical antiquities and sacred geography at Meadville Theological Seminary. D. at Jackson, Mich., Aug. 3, 1873. (See his *Life,* by his son, Rev. D. E. Millard, 1874.)

Millau. See MILHAU.

Mill'borough, tp. of Bath co., Va., on the Chesapeake and Ohio R. R. (P. O. MILLBOROUGH SPRINGS). Pop. 1004.

Mill'bridge, Me. See MILBRIDGE.

Mill'brook, post-v. of Cavan tp., Durham co., Ontario, Canada, on the Midland Railway, at the junction of the Peterboro' and Lakefield branch, 18 miles from Port Hope. It has a weekly newspaper and manufactures of importance. Pop. about 1200.

Millbrook, tp. of Peoria co., Ill. Pop. 1075.

Millbrook, tp. of Mecosta co., Mich. Pop. 301.

Millbrook, post-v. of Washington tp., Dutchess co., N. Y., on the Dutchess and Columbia R. R. Called also Hart's Village.

Millbrook, tp. of Barnwell co., S. C. Pop. 1280.

Mill'burn, post-v. and tp. of Essex co., N. J., on the Morris and Essex R. R., has manufactures of paper and hats. Pop. 1675.

Mill'bury, post-v. and tp. of Worcester co., Mass., on the Providence and Worcester R. R., 6 miles S. of Worcester, on the Millbury branch of the Boston and Albany R. R., has a national and a savings bank, a high school, 5 churches, water-power furnished by the Blackstone River, 8 cotton and 5 woollen mills, and manufactures of stockings, cutlery, castings, carriages, whips, lumber, shoes. Pop. 4397.

Mill City, tp. of Drew co., Ark. Pop. 808.

Mill Creek, tp. of Ashley co., Ark. Pop. 998.

Mill Creek, tp. of Franklin co., Ark. Pop. 883.

Mill Creek, post-tp. of Izard co., Ark. Pop. 897.

Mill Creek, tp. of Newton co., Ark. Pop. 313.

Mill Creek, tp. of Tehama co., Cal. Pop. 80.

Mill Creek, a hundred of New Castle co., Del., the northernmost in the State. Pop. 3302.

Mill Creek, tp. of Fountain co., Ind. Pop. 1491.

Mill Creek, tp. of Putnam co., Ind. Pop. 492.

Mill Creek, post-tp. of Bourbon co., Kan. Pop. 859.

Mill Creek, tp. of Washington co., Kan. Pop. 597.

Mill Creek, tp. of Morgan co., Mo. Pop. 917.

Mill'creek, tp. of Coshocton co., O. Pop. 586.

Mill Creek, tp. of Hamilton co., O., includes several suburban villages. Pop. 3291.

Mill Creek, tp. of Union co., O. Pop. 798.

Mill Creek, tp. of Williams co., O. Pop. 1181.

Mill Creek, tp. of Clarion co., Pa. Pop. 517.

Mill Creek, tp. of Erie co., Pa. Pop. exclusive of the city of Erie, 2744.

Mill Creek, post-v. of Brady tp., Huntingdon co., Pa., on the Pennsylvania R. R. and Canal, and on the N. E. bank of the Juniata River.

Mill Creek, tp. of Lebanon co., Pa. Pop. 1926.

Mill Creek, tp. of Mercer co., Pa. Pop. 1086.

Mill Creek, post-tp. of Berkeley co., W. Va. P. 1270.

Mill Creek, tp. of Jackson co., W. Va. Pop. 2821.

Mill Creek, tp. of Mineral co., W. Va. Pop. 598.

Mil'ledge (JOHN), b. at Savannah, Ga., in 1757; became a lawyer; served in the Revolutionary war; attorney-general of Georgia 1780; governor 1802–06; was in Congress nearly ten years, 1792–1802; U. S. Senator 1806–09, and was the principal founder and a liberal benefactor of the University of Georgia. D. Feb. 9, 1818.

Mil'ledgeville, post-v., cap. of Baldwin co., Ga., 32 miles N. E. of Macon, at the intersection of the Milledgeville and Eatonton and Macon and Augusta R. Rs., has good schools, 8 churches, 1 banking-house, 1 cotton manufactory, water-power, 2 newspapers, State lunatic asylum, State penitentiary, and 1 hotel. It is the centre of a cotton-growing region, and has a large trade in that staple. Pop. 3500. W. G. MCADOO, ED. "UNION AND RECORDER."

Milledgeville, post-v. of Wysox tp., Carroll co., Ill., on Elkhorn Creek, 15 miles S. E. of Mount Carroll. P. 238.

Mil'ledoler (PHILIP), D. D., b. at Farmington, Conn., Sept. 22, 1775; studied at Edinburgh, Scotland; became pastor of the German Reformed church in New York May, 1795, of the Third Presbyterian church in Philadelphia 1800–05, of the Rutgers street Presbyterian church, New York, 1805–13, and from 1825 to 1841 was president of Rutgers College, N. J. He was one of the founders of the American Bible Society, and published numerous lectures and essays. D. on Staten Island Sept. 22, 1852.

Mille Lacs, county of E. Central Minnesota. Area, 480 square miles, including one-half of Lake Mille Lacs, which bounds it on the N. Land-area, 380 square miles. It is well timbered, and consists in part of rolling prairie. Cap. Princeton. Pop. 1109.

Mil'len, post-v. of Burke co., Ga., on the N. bank of the Ogeechee River, and at the junction of the Augusta branch with the main line of the Central R. R. of Georgia.

Millenarians. See MILLENNIUM.

Millen'nium [Lat. *mille,* "thousand," and *annus,* "year"]. In theology, the term is technically applied to the thousand years' reign of the Messiah at the end of time. There are numerous theories of the millennium, but they all may be reduced to two, the literal and the spiritual.

(1) The literal notion of the millennium is said to have originated, or at least to have received its peculiar form, from Rabbi Elias, who lived about two centuries before the Christian era. According to Jewish tradition, the world is to last seven thousand years—six thousand to be years of toil and trouble, and the seventh thousand to be a grand *sabbatism.* It is to be ushered in by the advent of the Messiah, who is to establish his throne at Jerusalem. The holy city is to be rebuilt with surpassing magnificence, as described by Tobit (xiii., xiv.); the Jews are to return to Palestine; their pious ancestors are to be raised from the dead and reign in their own land, with their offspring, under the Messiah. Rabbi Saadias, on Dan. vii. 18, says: "Because the Jews rebelled against their Lord, their kingdom shall be taken from them and given to the four monarchies, that shall possess it in this world, and shall subdue and carry captive Israel till the age to come, in which the Messiah shall reign." To the same effect are the Targums in various places. They thus interpret those glowing predictions in the prophets concerning the latter-day glory of the Church. The Jews are to live in ease and splendor; all other nations are to do them homage and minister to

their pleasure. The literal theory of the millennium, as held by some Christians, is very much like the rabbinical, only it recognizes Jesus as the true Messiah, and the equality of Gentile and Jewish believers in the millennial age. It is traced to Papias, bishop of Hierapolis in the second century, though Cerinthus, a heretic of the first century, is said to have held it. Papias was a man of slender intellect and prodigiously superstitious. According to Irenæus, he pretended to have received a tradition from the apostle John to this effect: "The days shall come in which there shall be vines which shall severally have ten thousand branches, and every one of these branches shall have ten thousand lesser branches, and every one of these branches shall have ten thousand twigs, and every one of these twigs shall have ten thousand clusters of grapes, and in every one of these clusters shall be ten thousand grapes, and every one of these grapes being pressed shall give twenty-five *metretas* of wine; and when a person shall take hold of one of these sacred bunches, another shall cry out, 'I am a better bunch, take me, and by me bless the Lord.'" He reports similar traditions concerning other productions of the earth during the millennial period. Justin Martyr, who endorsed the millennial fancies of Papias, says that Jerusalem shall be rebuilt, adorned, and enlarged; Gentile believers shall dwell in the holy land with the Jews, who shall acknowledge Jesus as the true Messiah, and he shall reign corporeally at Jerusalem in great magnificence. The Jews, says Irenæus, shall then be restored to the land of their fathers. The temple, says the pseudo Barnabas, shall be gloriously rebuilt. All the just, says Tertullian, shall rise during the millennium—some sooner, some later. The millennium, says Lactantius, belongs to all the righteous who have lived from the beginning of the world; and the righteous who shall be alive at the coming of Christ shall not die, but Christ shall live with them a thousand years. Papias says it shall be a reign of Christ bodily on the earth. Justin Martyr, Irenæus, Tertullian, Nepos, Lactantius, as well as Papias, say that they shall have abundance of delicious things—rich food and wines, slaves to minister to their wants; all the animals, wild as well as tame, shall be subject to them; they shall marry and be given in marriage, and have an abundant offspring. In short, like the chiliastic Jews, they interpret all the predictions of the prosperity of the Church found in the prophets in this literal manner. They very naturally pressed Rev. xx. 1–10 into their service, interpreting in this manner the thousand years' reign of the martyrs with Christ. These fanatical notions were strenuously opposed by Origen, Dionysius, bishop of Alexandria, Jerome, Augustine, and other Fathers. Origen says those who held them were some of the simpler sort, who understood Scripture *judaico sensu*, after the manner of the Jews. He represents their doctrine as wicked, a reproach to Christianity, the heathen having better sentiments. Jerome stigmatizes these notions as Jewish fables, whose advocates do not understand the Apocalypse. He says he is not one of those who have here a continuing city; he looks not for an earthly but for a heavenly Jerusalem, which is the mother of us all. They who interpret the Apocalypse according to the letter must Judaize. He commends Dionysius, who repudiated what he called "the *fable* of the thousand years, and of the *earthly Jerusalem* glittering with jewels and gold; and the restoration of the Hiero-Solymitan temple; and the immolation of bulls and goats; and a new calendar of sabbaths; and the victorious march of armies; and the furious din of battles; and the pompous pageantry of triumphs; and the voluptuous revelry of banquets." These, he says, are the feverish dreams of fanatical enthusiasts, not the sober deductions of sound reason nor the fruits of holy meditation on the word of God. Augustine, in the twentieth book of the *City of God*, says that he once held chiliastic views, but that he had seen good reason to renounce such ridiculous fables. He explains the first resurrection, the reign of martyrs, etc. in a spiritual sense. Being thus opposed by the great doctors of the Catholic Church, these gross chiliastic views subsided. But they were revived at the time of the Reformation. The fanatical Anabaptists, Münzer and his followers, essayed to put down all temporal sovereignty and to establish the kingdom of the saints with fire and sword. They were, however, vigorously opposed by Luther, Melanchthon, Chemnitius, Gerhard, Osiander, Calvin, and the continental Reformers generally. Thus, the Augsburg Confession says: "Christ will come to judgment, and will raise all men, both bad and good; and we condemn those who are now propagating the Judaistic opinion that before the general resurrection of the dead the saints will reign on earth." Chemnitius says the opinion of the Chiliasts is a fundamental error. Calvin says, "The error of the Millenarians is too puerile to deserve or require refutation; nor does the Apocalypse give them any countenance." The Fifth-Monarchy Men in England, in the time of Cromwell, pursued a similar course to that of their congeners on the Continent. From an erroneous interpretation of Daniel's prophecies concerning the four great monarchies, to be succeeded by the kingdom of the Messiah, they fancied that the time had come when the saints of the Most High should take the kingdom, and that they were the saints. They accordingly banded together to put down all human government, assumed scriptural names, and claimed to rule as the deputies of the Messiah, whose corporeal advent and reign on the earth was soon to take place. These fanatics, however, were speedily suppressed. Yet the cardinal principle of this Judaico-Christian millennium survived, and still survives. From time to time visionaries have announced that Christ was about to descend corporeally to the earth; that the righteous dead, or at least the martyrs, were to be raised from their graves and reign with him at Jerusalem; the Jews were to be suddenly brought in with the fulness of the Gentiles; crime and oppression and all other evils were to cease; and this good time was to last a thousand years, after which the rest of the dead were to be raised, the earth was to be burnt up, the world judged, and the reign of Christ to be merged into that of the Triune God. Men holding these views have been found among all sects, even in the Church of England, though they are so severely censured by that Church. The forty-first article of the Confession set forth in the reign of Edward VI. says: "They that go about to revive the fable of heretics, called *Millenarii*, be repugnant to Holy Scripture, and cast themselves headlong into a Jewish dotage." This "fable" of the pre-millennial advent of Christ is opposed by the Collects for the first and third Sundays in Advent, in which occurs the petition, "That in the last day, when he shall come again in his glorious majesty to judge both the quick and dead, we may rise to the life immortal;" and this: "That at thy second coming to judge the world we may be found an accepted people in thy sight." So other parts of the Liturgy; so the three Creeds, especially the Athanasian, which says, "He ascended into heaven, he sitteth on the right hand of the Father, God Almighty; from whence he shall come to judge the quick and the dead. At whose coming all men shall rise again with their bodies, and shall give account for their own works. And they that have done good shall go into life everlasting, and they that have done evil into everlasting fire." So the fourth article: "He ascended into heaven, and there sitteth until he return to judge all men at the last day." The old divines opposed the Chiliastic fable in a similar way; thus, Bishop Andrewes, in a sermon on the Resurrection: "Christ riseth with *ascendo* in his mouth; no sooner risen but he makes ready for his ascending straight. This, if there were nothing but this, was of itself enough to make the idle dream of the old and new Chiliasts to vanish quite, who fancy to themselves I wot not what earthly kingdom here on earth, somewhat like Mohammed's paradise, and will not hear of *ascendo* after they have risen till a thousand years at least. This is none of Christ's rising, I am sure. So let it be none of ours." Notwithstanding all this, some learned men of the Anglican communion—Joseph Mede, Bishop Newton, and others—misled by an erroneous interpretation of Daniel and the Apocalypse, construe the thousand years of Rev. xx. in a literal sense. In later times a considerable number of the "Evangelicals" in the Church of England, and some divines of the Church of Scotland, and many Dissenters, have given countenance to the notion of the pre-millennial advent of Christ and his corporeal reign on the earth. A sect has recently arisen in the U. S., called "Second Adventists," who make these views a specialty in their creed. They have been disappointed several times in their expectations of the second advent of Christ, but they persist in asserting that he is soon to make his appearance, and they want to be found ready when he shall come.

(2) The spiritual theory of the millennium ignores all Jewish traditions and patristic fancies. The number 1000 is frequently employed in the Scriptures as denoting a great many—a definite number for an indefinite. "A thousand years" is used in three passages in this way. Thus, in Psalm xc. 4: "A thousand years in thy sight are but as yesterday when it is past." 2 Pet. iii. 8: "One day with the Lord is as a thousand years, and a thousand years as one day." So in Rev. xx. 1–7, Satan is said to be bound "a thousand years," and the martyrs reign "a thousand years." This is evidently a definite number for an indefinite, indicating a long period. The entire passage is figurative, in keeping with the enigmatical book in which it is found. The angel with the key of the abyss, a chain, and a seal to bind and confine the devil, thrones and the souls of martyrs seated upon them, and judgment given to them,—these are all pictorial representations of the cir-

cumscription of Satan's power, the revival of the martyr-spirit in the Church, and the general prevalence of truth and righteousness in the earth. This agrees with the figurative style of the Apocalypse, and corresponds with the predictions concerning the prosperity of the Church in the last days. In no other place is there any allusion to a millennium. Some, like Canon Wordsworth, think the thousand years spoken of by John is an indefinite period covering over the whole term of the Christian dispensation. They think Satan's power was so circumscribed at the coming of our Lord that he may be represented as bound with a great chain and cast into the abyss. They refer to Milton's *Hymn on the Nativity of Christ:*

> ——"for from this happy day
> Th' old dragon underground,
> In straiter limits bound,
> Not half so far casts his usurpèd sway—
> The oracles are dumb," etc.

But that hardly agrees with the statements of the New Testament, in which Satan is represented "as a roaring lion, walking about seeking whom he may devour," and "whom" we are to "resist, steadfast in the faith" (1 Pet. v. 8, 9). And Paul says, "We wrestle not against flesh and blood, but against principalities and powers, against the rulers of the darkness of this world, against spiritual wickedness in high places" (Eph. vi. 12). And in this book of the Revelation Satan is set forth as the prime agent in all the persecutions waged against the Church by Jewish and pagan powers. The seat or throne of Satan, as the prince of this world, is spoken of in Rev. ii. 13: it is predicted, "Behold, the devil shall cast some of you into prison, that ye may be tried, and ye shall have tribulation ten days" (Rev. ii. 10). Multitudes are put to death by his instigation: "And I saw under the altar the souls of them that were slain for the word of God, and for the testimony which they held; and they cried with a loud voice, saying, How long, O Lord, holy and true, dost thou not judge and avenge our blood on them that dwell on the earth? And white robes were given unto every one of them, and it was said unto them that they should rest for a little season, until their fellow-servants also, and their brethren that should be killed as they were, should be fulfilled" (Rev. vi. 9–11). This period of persecution lasted until the downfall of pagan Rome; and in later ages the persecution of the Church has been revived with scarcely less diabolic fury and rage, showing clearly that Satan was not very closely bound—was not confined to the abyss, but roamed the earth, and still roams it, like an infuriated beast of prey, the adversary of God and man. The millennium of Rev. xx. therefore can hardly be identical with the whole period of the Christian dispensation. It seems rather to denote an extended season of tranquillity and prosperity which the Church shall enjoy before the coming of Christ and the end of time. According to the prophecies of Scripture, during this period there will be a great augmentation of holiness in the Church; larger measures of the Holy Spirit's influence will be enjoyed; there will be a general diffusion of religious knowledge in the earth; the Jews will be brought in with the fulness of the Gentiles; there will be universal peace, and the dominancy of the great principles of truth and righteousness among all the nations of the earth. Besides the predictions which refer to the prosperity of the Jews after their return from captivity and under the Asmonean dynasty, and those which refer to the introduction and establishment of the new dispensation, there are others which have not yet had their fulfilment, and which therefore await their accomplishment in the last days of this dispensation. This is the millennium. (Cf. Isa. xi.; Rom. xi.) There is no sign by which this period can be pointed out. It will be brought to pass by the divine blessing upon the means employed by the Church for the conversion of the world. This glorious revival is called a resurrection, not because the bodies of the saints shall be raised —as that will not take place till the last day—but it is a resurrection of their "souls;" as Paul says, "What shall the receiving of them be"—that is, the bringing in of the Jews with the fulness of the Gentiles—"but life from the dead?" This is agreeable to the style of prophecy which is everywhere employed in the Revelation. (Cf. Isa. xxvi. 19; Ezek. xxxvii. 13, 14; Hos. vi. 2; Rev. xi. 7, 11.) It is marvellous that this, which is so obvious, should have ever been overlooked. "The rest of the dead, which lived not again until the thousand years were finished," are supposed to represent the enemies of the Church, the same spoken of in the preceding chapter (Rev. xix. 21), who shall have no power to injure the saints during this halcyon period. Dr. Cowles, indeed, suggests that the resurrection of the martyrs here spoken of denotes an accession of glory and bliss which they shall experience in heaven when they shall witness on earth the triumph of the cause for which they suffered (Rev. vi.), and that the rest of the dead are the other righteous souls in heaven, who will not realize such an augmentation of their felicity until after the general resurrection of the dead. But this seems rather forced. He admits that the revival of true religion is called in Scripture a resurrection, and may be so understood in this place. At the close of this period the power of the enemies of the Church will be somewhat revived, but they shall soon be suppressed. Then cometh the end, when Christ, having subdued all the rebels in this revolted province, shall deliver up the kingdom to God, even the Father, that God may be all in all. This plain, simple interpretation is consistent with itself, agrees with the figurative style of the Apocalypse, and harmonizes with the prophecies concerning the latter-day glory of the Church and the whole scheme of Christian eschatology. This teaches that there will be, before the close of this dispensation, an indefinite period of prosperity for the cause of Christ; that at its termination there will be a sharp but short and unsuccessful attack upon the Church; that immediately after this Christ will come the second time corporeally to the earth. This spiritual view agrees with the *paracletal* work of Christ—the Judaico-Christian does not. Christ is our Advocate, our *Paraclete*, with the Father (1 John ii. 1). It was "expedient" that he should "go away" (John xvi. 7–16), and it is expedient that he should stay away—that the heavens should receive him and retain him until the times of restitution of all things which God hath spoken (Acts iii. 21), ever appearing in the presence of God for us (Heb. vii. 25; ix. 24). In the economy of salvation his glorious bodily presence in heaven is a necessity; on the earth it would be an impertinence. The spiritual view also agrees with the *paracletal* work of the Holy Ghost—the literal does not. It was "expedient" for the Church that Christ should "go away," that the other *Paraclete*, the Holy Spirit, should be sent, and he is to "abide" in the Church "for ever" (John xiv. 16, 17, 25, 26; xv. 26; xvi. 7–15). His subjective work, as the *Paraclete* with us and in us, is as necessary as the objective work of the Lord Jesus Christ, as our Advocate, our *Paraclete*, with the Father. The Spirit is accessible and available under all circumstances; and there is no need, and there never will be any need, of repairing to Jerusalem or any where else to find the King of saints, for by his Spirit he dwells in the Church through all the ages, and in every true believer's heart (John vii. 39; xiv. 20–27; Rom. viii. 9–27). The spiritual view fosters no visionary and fanatical notions—the literal does. Judaizing Chiliasts are always asking the question, "Lord, wilt thou at this time restore again the kingdom to Israel?" (Acts i. 6). And despite the rebuke given to the chiliastic ambition of the mother of Zebedee's children, and shared by James and John themselves, there are not wanting those who are ready to prefer the request, "Grant that these my two sons may sit, the one on thy right hand, and the other on the left, in thy kingdom" (Matt. xx. 20, ff.; Mark x. 35, ff.). Such persons are always expecting "the kingdom of God to come with observation"—always looking for a sign from heaven, the corporeal coming of the Son of Man, whereas the coming spoken of in Matt. xxiv. took place eighteen centuries ago, when, in his retributive providence, not in his corporeal presence, he came to destroy the Jewish state. Those who entertain spiritual views of the millennium expect the second coming of Christ, but it is to be "in his glorious majesty, to judge both the quick and the dead." The spiritual view is favorable to efforts to convert the world—the literal view is not. Some who hold the latter are indeed zealous in the missionary cause, but it is in despite of their system, not because of it. Others carry out consistently their principles. They say that the world is to get worse and worse till Christ comes in person to make it better, and it is needless to attempt the conversion of either Jews or Gentiles before his advent. But those who believe that the millennium is to be ushered in by the instrumentality of the Church, laboring and praying for the universal spread of the kingdom of Christ, act consistently when they devote themselves zealously to this great undertaking. They know that the gospel must be preached to every creature, and that the Church has this great work in charge; and they expect no miraculous signs and wonders to be wrought for its accomplishment. Zealous, persevering efforts for the conversion of the world agree with their views of the millennium. This interpretation, too, corresponds with the scriptural account of the *Parousia*, or coming of Christ—the other does not. According to the Scriptures, when Christ makes his second advent it is to raise the dead, good and bad. There is to be but one literal resurrection; that is to take place "at the last day." (Cf. John v. 28, 29; vi. 39, 40, 44, 54; xi. 24; Luke xiv. 14; Acts xxiv. 16; 1 Cor. xv. 51, 52; 1 Thess. iv. 14–17, where it is said, "the

dead in Christ shall rise first"—that is, not before the other dead, but before the living shall be changed.) "The dead, small and great," "just and unjust," shall be raised simultaneously, and together "stand before God" (Rev. xx. 11–15); and this is to be after the millennium. (Cf. Matt. xxv. 31–46.) When Christ makes his second advent it will not be to reign a thousand years upon the earth—or three hundred and sixty-five thousand, according to the dream of those who make a day in prophecy mean a year—but it will be to burn up the earth and the works that are therein. That will take place at "his coming," as Peter expressly says (2 Pet. iii. 1–14). When Christ "appears the second time, without sin unto salvation," it will be to "the judgment" (Heb. ix. 27, 28); not to reign a thousand years on the throne of earthly dominion, but to sit upon the throne of judgment; "and before him shall be gathered all nations" for that grand assize (Matt. xxv. 31–46. Cf. Acts xvii. 31; 2 Cor. v. 10). He will "judge the quick and the dead at his appearing and his kingdom" (2 Tim. iv. 1). We are exhorted to "abide in him, that when he shall appear we may have confidence, and not be ashamed before him at his coming" (1 John ii. 28). He will then assign the good and the bad to their eternal destinies. For it is when the Son of Man shall come in his glory, and the good and the bad shall be judged by him, that these shall go away into everlasting punishment, but the righteous into life eternal. This will take place "in that day" when "the Lord, the righteous Judge," shall reward his faithful servants and consign the unfaithful to outer darkness. This is the moral of the parables of the wheat and the tares, of the good and the bad fishes. "So shall it be at the end of the world: the angels shall come forth, and sever the wicked from among the just, and shall cast them into the furnace of fire: there shall be wailing and gnashing of teeth" (Matt. xiii. 36–50). This day of judgment is called emphatically "the day of the Lord," and it will come "as a thief in the night;" not to usher in a millennial reign upon our globe, but to burn up the earth, judge the nations at his bar, admit the righteous through the gates into the city above, and punish the wicked "with everlasting destruction from the presence of the Lord and from the glory of his power." This is to take place "when the Lord Jesus shall be revealed from heaven, with his mighty angels, in flaming fire," and "when he shall come," also, "to be glorified in his saints, and to be admired in all them that believe" (2 Thess. i. 7–10). All the promises of reward for obedience and indemnity for suffering, and all the aspirations of the saints, refer not to a thousand years' reign with Christ here on earth, but to an everlasting reign with him in heaven. (Matt. v. 12; Luke xiv. 13, 14; John xiv. 1–4; xvii. 24; 1 Cor. xv.; 2 Cor. v. 1–10; Phil. i. 21, 23; iii. 20, 21; 1 Thess. iv. 13–18; 2 Tim. ii. 10–12; iv. 6–8; Heb. xi. 8–16; 1 Pet. i. 3–9; iv. 13; v. 4; 2 Pet. i. 11; 1 John iii. 2, 3; Rev. ii. 10; xxii. 14, 15, *et al.*)

Thus, the common spiritual view of the millennium agrees —while the other does not—with the figurative style of the Revelation; is adjusted to the economical work of the Son and of the Holy Spirit; fosters no visionary or fanatical notions, but is agreeable to the principles of truth and sobriety; corresponds with the scope of prophecy concerning the conversion of the world; favors missionary exertions, and harmonizes with the scriptural account of the second advent of Christ, to raise the dead, to burn up the world, to judge the good and the bad, and to assign them their eternal destinies. It is really amazing that a subject so simple should have bewildered so many minds and occasioned so much controversy.

It would be endless and useless to refer to all the writers on the millennium. Those who are curious in regard to it may consult the works of Joseph Mede, Bush on *The Millennium*, Rupp's *Religious Denominations*, Whitby's *True Millennium*, Stuart on *The Revelation*, Cowles on *Daniel and the Revelation*, and his masterly dissertation on *The Premillennial Advent of Christ*, appended to his commentary on Jeremiah, and the articles on the "Millennium" and the "Revelation" in Kitto's *Cyclopædia*, and works there cited. T. O. SUMMERS.

Millepede. See MYRIAPODS and JULUS.

Mil'lepore (*Millepora*), a genus of coral-producing acalephs of the order Hydroidæ and the sub-order Tabulatæ. The millepores and other Tabulatæ were formerly considered to be polyps, like the other coral-forming organisms; but Agassiz in 1858, while observing *M. alcicornia* in Florida, discovered their true character. There are at least five genera of tabulate corals, whose cells have horizontal partitions extending from wall to wall. As the animal grows these floors are formed one above another. The cells do not, as in other corals, have vertical partitions running through the floors. The millepores make a hard, stony coral, smooth, branching, and with exceedingly small cells. They appear to contain more carbonate of magnesia than the true corals.

Mil'ler, county of S. W. Georgia. Area, 290 square miles. It is level, well timbered, sandy, and productive. Cotton and corn are leading products. The county is traversed by Spring Creek and by the Bainbridge Cuthbert and Columbus R. R. Cap. Colquitt. Pop. 3091.

Miller, county of S. Central Missouri. Area, 580 square miles. It is traversed by the Osage River, and is very hilly, with fertile valleys and local deposits of coal. Timber is abundant. Cattle, grain, and wool are leading products. Cap. Tuscumbia. Pop. 6616.

Miller, tp. of Bradley co., Ark. Pop. 889.

Miller, tp. of Dearborn co., Ind. Pop. 1120.

Miller, tp. of Dallas co., Mo. Pop. 548.

Miller, tp. of Gentry co., Mo. Pop. 2596.

Miller, tp. of Maries co., Mo. Pop. 759.

Miller, tp. of Marion co., Mo. Pop. 1273.

Miller, tp. of Scotland co., Mo. Pop. 1245.

Miller, tp. of Alexander co., N. C. Pop. 741.

Miller, tp. of Knox co., O. Pop. 902.

Miller, tp. of Perry co., Pa. Pop. 438.

Miller (ANDREW JACKSON), b. in Camden co., Ga., Mar. 21, 1806; studied law and settled in Augusta about 1827; in 1836 was elected to the State legislature, and was continuously returned to the house or senate as long as he lived; for more than ten years was president of the senate, and thereby lieutenant-governor of the State. Georgia is greatly indebted to him, with a few others, for her present magnificent system of internal improvements. D. at Augusta Feb. 3, 1856. A. H. STEPHENS.

Miller (CINCINNATUS HEINE), known as JOAQUIN MILLER, b. in the Wabash district, Ind., Nov. 10, 1841; removed with his parents when thirteen years old to Oregon; became a miner and adventurer in California; served with Walker in Nicaragua, and afterwards lived among the Indians. In 1860 began to study law; undertook in 1861 to edit a paper at Eugene City, Or., but the authorities suppressed his paper for disloyalty. In 1863 married, after a three days' acquaintance, Miss Minnie Theresa Dyer ("Minnie Myrtle"), a writer of graceful verses, from whom he was divorced in 1870. Was (1866–70) a county judge; went in 1870 to England, and in 1871 published there his *Songs of the Sierras*, a portion of which had been previously published by the same name in the U. S. Has since published other successful volumes.

Miller (EDWARD), M. D., brother of Rev. Samuel, b. at Dover, Del., May 9, 1760; studied medicine at the University of Pennsylvania; was surgeon's mate at the military hospital at Basking Ridge, N. J., 1780–81; went to France as surgeon on an armed ship 1782; practised for some years in Maryland and Delaware; removed to New York in 1796, and with Drs. S. L. Mitchill and E. N. Smith founded in Aug., 1797, the *Medical Repository*, the first American journal of its kind. He became city physician of New York 1803, professor of the theory and practice of physic in the College of Physicians and Surgeons 1807, and clinical lecturer in the New York Hospital 1809. Dr. Miller aided his brother Samuel in the composition of his *Brief Retrospect;* wrote a *Report on the Yellow Fever in New York in 1805*, maintaining that the disease is not contagious; was a noted advocate of temperance and opponent of tobacco, and was one of the most distinguished physicians of his day. D. at New York Mar. 17, 1812. His medical writings were edited by his brother Samuel (1814), with a biographical sketch. (See also Thacher's *American Medical Biography*, the *Monthly Recorder* for Apr., 1818, and the *American Medical and Philosophical Register*, which contains a biographical notice by Dr. J. W. Francis.)

Miller (ELIHU SPENCER), b. at Princeton, N. J., in 1817, a son of Rev. Dr. Samuel Miller; graduated in 1836 at Princeton; became a leading lawyer of Philadelphia and a law-professor in the University of Pennsylvania; author of valuable legal treatises and of a volume of poems, *Caprices* (1849).

Miller (Gen. HENRY), b. near Lancaster, Pa., Feb. 13, 1751; studied law, and had begun to practise when, at the outbreak of the Revolutionary war, he entered the army as a lieutenant; rendered important services in the New Jersey and other campaigns; was quartermaster-general in the Western expedition; rose to the rank of colonel; became afterwards a merchant at Baltimore, where he was commissioned as brigadier-general when that city was threatened by the British (1813). He was subsequently appointed superintendent of revenue for the district of Pennsylvania, and d. at Carlisle, Pa., Apr. 5, 1824.

Miller (Henry), M. D., b. in Kentucky Nov. 1, 1800; took the degree of M. D. under Dudley, Caldwell, Brown, etc., in Lexington; practised a short time in Glasgow, then in Harrodsburg; and on the organization of a school of medicine in Louisville (1835) removed to that place, and became professor of obstetrics and diseases of women and children; was the author of two excellent works in his department—the first, published in 1849, *Theoretical and Practical Treatise on Human Parturition;* the other, on the *Principles and Practice of Obstetrics;* besides contributions to several medical journals. Was made president of the American Medical Association in 1859. He was also a professor emeritus in the Louisville Medical College when he died, Feb. 8, 1874, and had received many honors. Paul F. Eve.

Miller (Homer V. M.), M. D., b. in Pendleton district (now county), S. C., Apr. 29, 1814; with his parents moved to Raburn co., Ga., where he was educated; was matriculated in the Medical College of South Carolina in 1833, graduating with the highest honors in 1835, and completed his medical studies in Paris in 1838; returned to the U. S., and practised at Cassville, Ga., his fame soon extending throughout the State. Became connected with the Methodist Episcopal Church; he was licensed to preach without joining the itinerancy; feeling also a deep interest in everything pertaining to the public welfare, he took an active part on the hustings in the Presidential canvasses of 1840–44, in which his eloquence won for him the title of "Demosthenes of the Mountains." In 1846 was professor in the medical college of Memphis, Tenn., and three years after became professor in a medical college in Augusta, Ga., which position he held until 1865. During four years of this latter term was also surgeon in the Confederate States army, rose to be division surgeon, and finally medical inspector of the military department of Georgia. After the war became professor in the medical college of Atlanta, Ga., which position he held until 1869. Was an active member of the constitutional State convention under the reconstruction acts of Congress. In 1869 was elected U. S. Senator from Georgia to fill an unexpired term in the 41st Congress, where he fully sustained his high reputation for talents and patriotism. Is one of the trustees of the State University, and resides in Atlanta, Ga. A. H. Stephens.

Miller (Hugh), b. Oct. 10, 1802, at Cromarty, on the N. E. coast of Scotland, in humble circumstances; lost his father when he was five years old, but received, nevertheless, a very conscientious and careful education by his two uncles; acquired an extensive and well-digested knowledge of English language, history, and literature, and developed early that power of acute observation which afterwards made him celebrated in literature and science. He did not care, however, to attend a university. In 1819 he was apprenticed to a stone-mason, and he worked at this trade steadily till 1836, though devoting all his leisure hours to geological researches on the beach and in the rocks, and to reading. In 1829 he published a volume of *Poems written in the Leisure Hours of a Journeyman Mason,* and after that time he became a frequent contributor to different periodicals. In 1836 he received a second-accountantship in a branch bank at Cromarty, married, published his *Scenes and Legends of the North of Scotland,* and during the Non-intrusion controversy in the Scottish Church his *Letters to Lord Brougham* on the Auchterarder case brought him prominently before the public. In 1840 he went to Edinburgh as editor of *The Witness,* a Free Church organ, and it was in the columns of this paper he first published *The Old Red Sandstone, or New Walks in an Old Field,* which made a great sensation, not only on account of the important geological discoveries it contained, but also by its exact reasoning and finished style. He also published *First Impressions of England and its People, Footprints of the Creator, Testimony of the Rocks, My Schools and Schoolmasters,* a very interesting sketch of his education, etc. But during this hard work, continued through many years without flagging, his brain at last gave way, and he shot himself at Portobello, near Edinburgh, Dec. 26, 1856.

Miller (James), b. at Peterboro', N. H., Apr. 25, 1776; became a lawyer; major 4th U. S. Infantry 1808; lieutenant-colonel 5th Infantry 1810; brevet colonel 1812; colonel 21st Infantry 1814; brevet brigadier-general in 1814, when Congress presented him a gold medal for gallantry on the Canadian frontier; was governor of Arkansas Territory 1819–25; collector of Salem, Mass., 1825–49. D. at Temple, N. H., July 7, 1851. He was the father of Commodore James F. Miller, U. S. N. (1803–68).

Miller (John), served 1812–18 as lieutenant-colonel, and then colonel of U. S. infantry, and was especially distinguished at Fort Meigs 1813; was register of public lands in Missouri, then a journalist at Steubenville, O.; governor of Missouri 1826–32, and was in Congress 1837–43. D. near Florisant, Mo., Mar. 18, 1846.

Miller (Joseph), known as Joe Miller, b. in England in 1684, was a comic actor in London somewhat celebrated for his ready wit, and d. there Aug. 13, 1738. The collection entitled *Joe Miller's Jests,* published the year after his death (1739), was really made by the publisher, John Mottley (1692–1750), and contained little or nothing really derived from the person whose name has thereby become a synonym for stale jests. A fac-simile edition was recently published by J. C. Hotten.

Miller (Joseph N.), U. S. N., b. in Ohio Nov. 22, 1836; entered the navy as a midshipman Apr. 8, 1850; became a passed midshipman in 1856, a lieutenant in 1861, a lieutenant-commander in 1862, a commander in 1870. Served as executive officer of the iron-clad Passaic in the attacks upon Forts Sumter and McAllister during the spring of 1863, and in the same capacity on board the Monadnock in both the Fort Fisher fights. Highly commended for "ability and bravery" by Commanders Drayton and Parrott. Foxhall A. Parker.

Miller (Patrick), one of the numerous inventors of steam navigation, b. at Dalwinston, Dumfriess-shire, Scotland, about 1730, was a wealthy country gentleman who was fond of mechanical experiments; made some improvements in artillery; began in 1785 some experiments in ship construction and propulsion upon a loch near his estate, and published in 1786 a pamphlet giving an account of a vessel he had invented. In this pamphlet he stated his conviction that the steam-engine could be employed to work the wheels. In 1788 he, with the aid of Mr. James Taylor, propelled a boat five miles an hour by a steam-engine. The experiment proving unsatisfactory for several reasons, it was abandoned, but after the successful experience of Fulton his claims to the invention were put forward. D. at Dalwinston Dec. 9, 1815.

Miller (Samuel), D. D., b. near Dover, Del., Oct. 31, 1769; graduated at the University of Pennsylvania 1789; became associate pastor of the First Presbyterian church in New York City 1793, and professor of ecclesiastical history in the Theological Seminary at Princeton 1813, holding that office until May, 1849. Dr. Miller was prominent in the councils of his denomination, and was author of numerous theological treatises, chiefly of a polemical or denominational character. Among his works were *A Brief Retrospect of the Eighteenth Century* (1803) and the *Life of Jonathan Edwards* in Sparks's *American Biography.* D. at Princeton, N. J., Jan. 7, 1850.

Miller (Samuel F.), b. at Richmond, Ky., Apr. 5, 1816; educated at Transylvania University; became a physician, and afterwards a lawyer. Adopting emancipationist views in 1848, removed in 1850 to Iowa; became successful as a lawyer; declined all public offices until 1862, when he was appointed one of the justices of the U. S. Supreme Court. Resides at Keokuk, Ia.

Miller (Stephen D.), b. at Waxhaw Settlement, S. C., May, 1787; graduated at South Carolina College 1808; became a lawyer; was in Congress 1819–20; in the South Carolina senate 1822; governor 1828–30; U. S. Senator 1831–33; removed in 1835 to Mississippi. D. at Raymond, Miss., Mar. 8, 1838.

Miller (Thomas), M. D., b. at Port Royal, Va., Feb. 18, 1806. Received his degree from the University of Pennsylvania. Soon after with six others organized the Washington Medical Institute, and in 1832 began a course of instruction in anatomy. In 1839 assumed the professorship of anatomy in the National Medical College, which branch he taught twenty years, when he was made emeritus professor and president of the faculty. He devoted his life to medical science at the capital. D. Sept. 20, 1873. Paul F. Eve.

Miller (Thomas), b. at Gainsborough, England, Aug. 31, 1807; was in early life a farm-laborer, and afterwards a basketmaker; devoted his leisure hours to the study of the English classic poets, and attracted attention by publishing pieces both of prose and verse descriptive of rural life. He was befriended by Moore, Rogers, and Campbell; became a bookseller, and thereafter published many volumes of novels, essays, and poems which had a considerable contemporary success. He also wrote a *History of the Anglo-Saxons.* D. at London Oct. 25, 1874.

Miller (William), b. at Pittsfield, Mass., in 1781; served as a captain of volunteers on the Canadian frontier during the war of 1812, and in 1833 began to announce the speedy second coming of Christ, which, by his interpretation of the biblical prophecies, he fixed for the year 1843, at which time the world would be destroyed. In a few years his converts in the U. S., Canada, and Great

Britain numbered many thousands, and were popularly known as Millerites, though they styled themselves Second Adventists. On the failure of the original prediction Miller and his followers claimed that the error in calculation could not be great, and continued to assign dates for the consummation of all things, but the sect rapidly decreased in numbers, though it still exists and maintains its organ, the *Advent Herald*, published at Boston. Miller was untrained in biblical criticism, but his interpretations were plausible and gained the support of some educated theologians. D. at Low Hampton, Washington co., N. Y., Dec. 20, 1849.

Miller (William Allen), M. D., LL.D., F. R. S., b. at Ipswich, England, Dec. 17, 1817; was educated at the Merchant Taylors' School, at King's College, London, at Giessen, Germany, and at the London University; was a pupil of Daniell and Liebig; became in 1845 professor of chemistry in the London University; was a member of many learned societies: best known by his *Elements of Chemistry* and his valuable chemical papers. D. Sept. 30, 1870, at Liverpool.

Miller (William Hallowes), F. R. S., b. in England about 1803; graduated at Cambridge in 1826; became fellow and tutor of St. John's College; succeeded Dr. Whewell as professor of mineralogy 1832; was appointed in 1843 on a royal committee to superintend the construction of parliamentary standards of length and weight, in place of those destroyed by fire in 1834, and undertook the standard of weight, which he finished in Mar., 1854. He served in 1867 on a commission to inquire into the condition of the exchequer standards, and in 1870 on the international commission upon the metric system. He has published in the *Philosophical Magazine* and the *Proceedings* of the Royal Society many important papers on mineralogy and crystallography, for which he received in 1870 one of the royal medals. With J. Brooke he edited Phillips's *Elementary Introduction to Mineralogy* (1852). Prof. Miller was the chief promoter in England of the method of representing crystalline forms by their spheres of projection and measuring their angles by Wollaston's goniometer. He was for many years secretary, and subsequently president, of the Cambridge Philosophical Society, was foreign secretary of the Royal Society 1856–73, and is a member of the principal scientific societies in Europe.

Millerites. See Adventists and Miller (William).

Mil'ler's, tp. of Cabarrus co., N. C. Pop. 422.

Mil'lersburg, post-v. and tp. of Mercer co., Ill. The township is traversed by Edwards River, and has important beds of coal. The post-village of Millersburg is 4 miles N. E. of Millersburg Station, or Joy, which is on the Chicago Burlington and Quincy R. R., Galena and New Boston division. Pop. of v. 277; of tp. 1134.

Millersburg, post-v. of Clinton tp., Elkhart co., Ind., on the Lake Shore and Michigan Southern R. R., Air-line division, 18 miles S. E. of Elkhart. Pop. 52.

Millersburg, post-v. of Bourbon co., Ky., on the Maysville and Lexington R. R. It has several mills. Pop. 675.

Millersburg, post-v., cap. of Holmes co., O., 82 miles N. E. of Columbus, on the Cleveland Mt. Vernon and Columbus R. R., has a good union school, 8 churches, 3 banks, 1 foundry and machine-shop, 2 large halls, 1 flouring-mill, 2 lumber-yards, 2 hotels, and stores. Pop. 1457.

J. A. Estill, Ed. "Holmes Co. Farmer."

Millersburg, post-b. of Dauphin co., Pa., in Upper Paxton tp., on the E. bank of the Susquehanna River and on the Northern Central R. R., at the junction of the Summit branch, 26 miles above Harrisburg. Pop. 1518.

Mil'ler's Falls, post-v. of Franklin co., Mass., in Montague and Erving tps., on Miller's River, at the crossing of the New London Northern and the Vermont and Massachusetts R. Rs., has a fine water-power and manufactures of various kinds. It was formerly known as Grout's Corner. It has of late increased greatly in importance.

Mil'lersport, post-v. of Walnut tp., Fairfield co., O. Pop. 149.

Miller's Thumb, or **River Bullhead,** the *Cottus gobio*, a small fish of European seas and streams. It is of the family Cottidæ. It is sometimes eaten. In Russia it is used as a charm against fever, and it is believed that if hung up by a thread its head will point the way from which the wind is going to blow—a prophetic weathervane. (See Bullhead and Cottus.)

Mil'lerstown, a v. of Grayson co., Ky., 15 miles S. E. of Litchfield. Pop. 80.

Millerstown, a b. (Barnhart's Mills P. O.) of Donegal tp., Butler co., Pa., 7 miles N. W. of Brady's Bend R. R. Station. Pop. 207.

Millerstown, a v. (Macungie P. O.) of Lower Macungie tp., Lehigh co., Pa., on E. Pennsylvania R. R. Pop. 486.

Millerstown, post-b. of Perry co., Pa. Pop. 533.

Mil'lersville, a v. (James's Switch P. O.) of Washington tp., Marion co., Ind., on the Indianapolis Peru and Chicago R. R. Pop. 64.

Millersville, post-v. of Manor tp., Lancaster co., Pa., 4 m. S. W. of Lancaster, has a State normal school. P. 1180.

Millerton, post-v. and cap. of Fresno co., Cal., on the San Joaquin River, is the centre of an extensive agricultural region.

Millerton, post-v. of North-east tp., Dutchess co., N. Y., at the crossing of the Harlem, the Dutchess and Columbia, and the Connecticut Western R. Rs., has flourishing manufactures of iron, which is mined in the vicinity.

Mil'lerville, tp. of Sanford co., Ala. Pop. 504.

Millerville, tp. of Douglas co., Minn. Pop. 285.

Mil'let [It. *miglietto*, from Lat. *mille*, "a thousand," in reference to its yielding 1000 to 1], a name applied to grasses of several distinct genera and species. The *Milium effusum*, or true millet, found throughout Europe and Northern Asia and in the Northern U. S., is a slender grass of the tribe Paniceæ, four to six feet high, which has never been cultivated, but is abundant in the woodlands both of England and America. The double-seeded millet-grass, so extensively found in the marshes of New Jersey, belongs to the genus *Amphicarpum*. The cultivated millet of ancient and modern times belongs to a third genus, *Panicum*, which embraces no less than 850 species. *Panicum miliaceum* is sown chiefly for forage, though the seeds yield a very nutritious flour, as do also those of the Hungarian, German, and Italian millets, now classified by botanists under the genus *Setaria*.

Millet' (Aimé), b. at Paris about 1816; studied under David d'Angers; began to exhibit in 1842, and attracted great attention in 1857 by a statue, *Ariane*, which was bought for the museum of the Luxembourg. Of his other works, the most remarkable are *Mercure*, destined for the Louvre, and *La Jeunesse éffeuillant des roses*, on the tomb of Henry Murger.

Millet' (Jean François), b. at Greville (Manche, formerly part of the province of Normandy) in 1815; d. at Barbison Jan. 18, 1875. Millet studied in Paris under Delaroche, and exhibited at the Salon of 1844. But instead of remaining in the metropolis, and striving with his contemporaries for wealth and fame by the production of works calculated to win the applause of the fashionable or artistic world, he retired to a secluded town, and devoted himself with the earnestness of an apostle to the task of representing the common aspects of nature and of celebrating the common lives of the peasant-people about him. He was an artist by himself, with strong originality, a deep reverence for truth, poetic sensibility, and warm human sympathies. The subjects for his painting were sowers, harvesters, sheep-tenders, women carding wool, pasturing cows, shearing sheep, suckling infants; scenes in agriculture and village life; landscapes soft with evening light or gray with cloud—all touched with pensive feeling, easily deepening into melancholy. His pictures have been exhibited at the Salons; two or three were at the Paris Exposition of 1867, and procured for him a medal of the first class, which in 1868 was followed by the decoration of the Legion of Honor. Few of his pieces have been brought to America, and they are little known. Such as are obtainable are highly prized as the work of a very true artist. O. B. Frothingham.

Millet (Pierre), b. in France in 1631; went to Canada as a missionary in 1666; labored for many years among the Onondaga and Oneida Indians in what is now Central New York; was chaplain at Fort Frontenac in 1690, when he was taken prisoner by the Indians and adopted into the Oneida tribe through the influence of his converts. He remained in this semi-captivity until 1694, exercising such influence upon the Oneidas that the government of New York unsuccessfully endeavored to counteract it by procuring his release, while the government of Canada was desirous he should remain in a position of so much usefulness to French interests. He wrote an account of his life among the Oneidas, which was printed at New York in 1865. D. at Quebec Mar. 22, 1708.

Mill'grove, tp. of Steuben co., Ind. Pop. 975.

Mill Hall, post-b. of Bald Eagle tp., Clinton co., Pa., on the Bald Eagle Valley R. R. Pop. 452.

Mill'ham, v. of Lawrence tp., Mercer co., N. J. Pop. 677.

Mill'heim, post-v. of Centre co., Pa., on the Lewisburg Centre and Spruce Creek R. R., has 3 churches, 1 banking-house, 1 newspaper, 2 agricultural implement manufacto-

ries, 3 grist-mills, 3 saw and planing mills, 2 hotels, and stores. Principal occupation, farming. Pop. about 1500.
G. W. FOOTE, ED. "DER CENTRE BERICHTER."

Mil'li [Fr., abbreviation of *millième*, "thousandth"], a prefix used in the French metric system to denote a thousandth part of the measure indicated by the word to which it is prefixed; as *milligramme*, the thousandth part of a gramme, is equal to 0.0154 grain troy; *millilitre*, a thousandth part of a litre, is equal to 0.0021 pint; *millimètre*, a thousandth part of a mètre, is equal to 0.0393 inch. (See METRIC SYSTEM.)

Mil'li (GIANNINA), b. at Teramo, in the Abruzzi, Italy, in 1828. When but five years old she is said to have composed verses; she read much alone, but at the age of seventeen she found a good literary guide in De Martinis. Having heard the poet Regaldi improvise, she was seized with an impulse to emulate him, in which she was encouraged by Regaldi himself. Leaving Teramo, she gave public improvisations in the Abruzzi, in Calabria, and finally at Naples under the protection of the learned Giulio Genoino. In the same way she made a tour through the Two Sicilies, was honored with two silver medals, and at Rome with a medal of gold. But her name was not generally known throughout Italy until after 1857, when she began her poetical excursions through Tuscany and Upper Italy. In 1860, Garibaldi, then dictator in Naples, settled an annual pension upon her; in 1863 a society was formed in Florence, the object of which was to secure by public subscription a regular income to Giannina Milli. In 1869 she was appointed inspectress of the elementary female schools of the province of Naples. Since that time a female normal school has been established in Rome, and Giannina Milli was appointed, and still acts, as its superintendent. Two volumes of her poems have been published in Florence.

Mil'liken's Bend, post-v. of Madison parish, La., on the Mississippi River, 15 miles above Vicksburg, Miss. In June, 1863, near this place, a Confederate force of 2500, under Gen. H. McCullough, attacked a body of colored troops, numbering 1400, and part of an Iowa regiment, under Gen. E. S. Dennis, but with the assistance of gunboats from Admiral Porter's fleet they were repulsed, with a loss on each side of about 150 killed and 300 wounded.

Mil'lingen (JAMES), F. S. A., b. in London Jan. 18, 1774, was son of a Dutch merchant; was educated at Westminster School; became a banker at Paris, and devoted much attention to classical archæology. Among his publications are *The Medallic History of Napoleon* (1819–21), commenced by A. L. Millin, *Ancient Coins of Greek Cities and Kings* (1821), *Ancient Unedited Monuments of Grecian Art* (1822–26). In 1821, Millingen went to Italy, where he spent the remainder of his life. D. at Florence Oct. 1, 1845.

Mil'lington, post-v. of Kendall co., Ill., 61 miles S. W. of Chicago, on the Fox River branch of the Chicago Burlington and Quincy R. R., has 1 church, 1 woollen and flouring mill, 1 weekly newspaper, a butter and cheese factory, 1 saw-mill, 2 hotels, and stores. Principal employment, farming and manufacturing. Pop. about 250.
J. W. RICHARDSON, ED. "MILLINGTON ENTERPRISE."

Millington, post-v. and district of Kent co., Md., on the Queen Anne's and Kent R. R., and between the forks of Chester River. Pop. of v. 420; of district, 4419.

Millington, post-tp. of Tuscola co., Mich. Pop. 613.

Mill'port, post-v. of Veteran tp., Chemung co., N. Y., on Catharine Creek and on the Northern Central R. R. (Croton Station), 15 miles N. of Elmira, has 2 churches, good water-power, and manufactures of flour, lumber, and other goods. Pop. 741.

Mill Run, tp. of Pendleton co., W. Va. Pop. 1160.

Mills, county of E. Central Dakota, is watered by Dakota River and its branches, and contains fertile bottom and bench lands.

Mills, county of S. W. Iowa, bounded W. by the Missouri River. Area, 425 square miles. It is diversified and fertile. Live-stock and grain are leading products. The county is traversed by the beautiful West Nishnabatony River, and by the Kansas City St. Joseph and Council Bluffs and the Burlington and Missouri River R. Rs. Cap. Glenwood. Pop. 8718.

Mills (ABRAHAM), LL.D., b. in Dutchess co., N. Y., in 1796; became a teacher of rhetoric and belles-lettres in New York, and wrote *English Literature* (1851), *Greek Literature* (1853), *Lectures on Rhetoric* (1854), and a *Compendium of the History of the Ancient Hebrews* (1856). D. in New York City July 8, 1867.

Mills (CHARLES), b. near Greenwich, England, July 29, 1788; studied law, and was admitted to the bar in 1809, but devoted himself chiefly to historical literature, and produced several elegant and learned works, now too often overlooked: *History of Mohammedanism* (1817), *History of the Crusades* (2 vols., 1820), *Travels of Theodore Ducas* (2 vols., 1822), and *History of Chivalry* (2 vols., 1825). D. at Southampton Oct. 9, 1825.

Mills (CLARK), b. in Onondaga co., N. Y., Dec. 1, 1815. His first trade was that of a millwright, his second that of a plasterer. From this he proceeded to sculpture, which he began to practise in Charleston, S. C. He is self-taught, has never been in Europe or seen the works of the masters in his art, but has made his way by perseverance and ambition. His first work was a bust of John C. Calhoun, which the city of Charleston purchased and placed in the town-hall in 1846. This led to other portrait-busts of local celebrities. In 1848, while preparing for a voyage to Italy, he was invited to furnish the design for an equestrian statue of Andrew Jackson for the government. The artist abandoned his European tour, returned to Charleston, completed his design, never having seen an equestrian statue in his life, and sent it in. It was accepted. The result was the statue on La Fayette Square near the White House, chiefly remarkable for the poise of the horse on its hind legs, for which the artist has had more than sufficient praise. The work was "inaugurated" on the anniversary of the battle of New Orleans, Jan. 8, 1853. The next performance was the colossal statue of Washington at the battle of Princeton, which was unveiled Feb. 22, 1860. In overcoming the mechanical difficulties incidental to the execution of these ponderous works Mr. Mills showed extraordinary ingenuity, devising methods and creating machinery of his own. The casting of the colossal statue of Liberty, after Crawford's design, for the dome of the Capitol, was completed in 1863. For the *Washington* Mr. Mills received from Congress $50,000. O. B. FROTHINGHAM.

Mills (ROBERT), engineer and architect of South Carolina, and architect of the general post-office, treasury, and patent-office buildings at Washington, published *Statistics of South Carolina* (1826), accompanied by a folio atlas, *American Pharos, or Lighthouse Guide* (1832), and a *Guide to the National Executive Offices* (1842). D. at Washington Mar. 3, 1855.

Mills (SAMUEL JOHN), b. at Torringford, Conn., Apr. 21, 1783; entered Williams College in 1806, and in Sept., 1808, was the principal organizer of a society of undergraduates who contemplated becoming missionaries in foreign lands. This was the first organization in behalf of that object in America. He graduated in 1809; spent some months at Yale College, studying theology and seeking adherents to his missionary project; entered Andover Theological Seminary in 1810, and associated himself with Messrs. Judson, Nott, and Newell in memorializing the "General Association of Massachusetts," then in session at Bradford (June 28, 1810), upon the subject of missions, which step resulted in the formation of the American Board of Commissioners for Foreign Missions. Mr. Mills was licensed to preach in 1812, and ordained in 1815; spent three years in missionary labors in the Southern States, and two years in New York and other great cities engaged in promoting the formation of the American Bible Society and the American Colonization Society, as well as other missionary organizations, and was sent by the Colonization Society, along with Rev. Ebenezer Burgess, to Western Africa, to select a site for a colony. They proceeded first to England to confer with British philanthropists (1817), and accomplished their object in Africa in the following year, but on the return voyage Mr. Mills d. at sea, June 16, 1818. He fully earned the proud title of "father of foreign missions in America." (See his *Memoir*, by Rev. Gardiner Spring, 1820.)

Mills'boro', post-b. of East Bethlehem tp., Washington co., Pa., on the Monongahela River. Pop. 324.

Millsborough, post-v. of Dagsborough hundred, Sussex co., Del., 8 miles S. of Georgetown. Pop. 194.

Mill's Creek, tp. of Harnett co., N. C. Pop. 1137.

Mills'field, tp. of Coos co., N. H. Pop. 28.

Mill Shoal, tp. of Macon co., N. C. Pop. 528.

Mill Springs, post-v. of Wayne co., Ky., on the Cumberland River. On Jan. 19, 1862, the Federal troops, 28,000 strong, under Gen. G. H. Thomas, and the Confederate troops, 10,000 strong, under Gen. G. B. Crittenden, met in battle about 5 miles from this place. The latter were led by Gen. F. K. Zollicoffer, who was killed, and his forces defeated with a loss of 190 killed, 60 wounded, and 89 prisoners. The Federal loss was 38 killed and 194 wounded.

Mill's River, tp. of Henderson co., N. C. Pop. 1520.

Mill Station, a v. of Washoe co., Nev. Pop. 129.

Millstone. See Grinding and Crushing Machinery.

Mill'stone, tp. of Monmouth co., N. J. Pop. 2087.

Millstone, post-v. of Somerset co., N. J., on the Millstone River, the Delaware and Raritan Canal, and the Millstone branch of the New Jersey R. R.

Millstone, tp. of Elk co., Pa. Pop. 173.

Millstone Grit. See Geology.

Mill'town, a thriving post-v. of Charlotte co., N. B., on the St. Croix River, 2 miles above St. Stephen, and directly opposite Milltown, a post-village included in the limits of the city of Calais, Me. Immense quantities of lumber are sawed and shipped here. There are 18 gang saw-mills on the Canada side alone, besides an edge-tool factory and other works. The river is here narrow, and is crossed by bridges. It has an academy, 3 churches, a circulating library, and several schools. Pop. about 2000.

Milltown, post-tp. of Chambers co., Ala. Pop. 1206.

Milltown, post-v. of Whisky Run tp., Crawford co., Ind. Pop. 87.

Milltown, post-v. of Washington co., Me., is a part of the city of Calais, and is on St. Croix River, opposite to and closely connected with Milltown, N. B. (which see). It is on the Calais and Baring R. R., 2 miles S. W. of the city proper, and has an immense trade in lumber, which is here manufactured extensively.

Milltown, post-tp. of Polk co., Wis. Pop. 66.

Mill'vale, a b. of Allegheny co., Pa., in Pittsburg, 20th ward, and on the Pennsylvania R. R. Pop. 668.

Mill'ville, post-tp. of Clayton co., Ia. Pop. 842.

Millville, post-v. of Blackstone tp., Worcester co., Mass., on the Providence and Worcester and the New York and New England R. Rs., has 3 churches, also manufactures.

Millville, post-v. of Cumberland co., N. J., 40 miles S. of Philadelphia, on the West Jersey R. R., has 7 churches, 1 national bank, large manufactures of cotton, iron, window and hollow-ware glass, lumber-mills, 2 weekly newspapers, 4 hotels, large city hall and post-office. Pop. 6101.
J. W. Newlin, Ed. "Millville Republican."

Millville, b. of Taylor tp., Cambria co., Pa. Pop. 2105.

Millville, post-tp. of Grant co., Wis. Pop. 223.

Mill'wood, post-tp. of Lincoln co., Mo. Pop. 1479.

Millwood, a v. (Leatherwood P. O.) and tp. of Guernsey co., O., on the Baltimore and Ohio R. R. Pop. 367; of tp. 1524.

Millwood, post-v. of Union tp., Knox co., O. Pop. 122.

Millwood, post-v. of Clarke co., Va., 10 miles S. E. of Winchester. Pop. 213.

Mil'man (Henry Hart), D. D., b. in London Feb. 10, 1791, was the son of Sir Francis Milman, Bart., M. D., an eminent physician (1746–1821). He was educated at Eton and Brazenose, Oxford; became a fellow 1815; M. A. and took priests' orders 1816; was Bampton lecturer 1827; professor of poetry at Oxford 1821–31; rector of St. Margaret's, Westminster, and canon 1835; dean of St. Paul's 1849. D. at Sunninghill Sept. 24, 1868. His chief works are a prize poem, *Apollo Belvedere* (1812), *Fazio*, a successful tragedy (1815), *Samos*, a poem (1818), *The Fall of Jerusalem*, a poem (1820), *The Martyr of Antioch*, and other poems (1821), *Bampton Lectures* (1827), *History of the Jews* (1829), *History of Christianity to the Abolition of Paganism* (1840), *History of Latin Christianity* (1854–55), a sumptuous edition of *Horace* (1849), Gibbon's *History of the Decline and Fall*, with notes, etc.

Milmore (Martin), b. at Boston, Mass., in 1845; entered the studio of Mr. Ball in 1860; modelled an alto-relief of an ideal subject entitled *Phosphor*, which was much admired; made busts of Sumner, Longfellow, Ticknor, and other distinguished citizens; received in 1864 a commission to execute granite statues of Ceres, Flora, and Pomona for the Horticultural Hall at Boston, a task which occupied him two years; designed in 1867 a bronze statue for the soldiers' monument at Forest Hill Cemetery, Roxbury, and was subsequently employed by the city of Boston to execute a similar monument to be placed on Boston Common.

Milne (William), D. D., b. in England about 1780; went to China as a missionary in 1813; visited the chief islands of the Indian Archipelago, and established himself at Malacca, whence he circulated throughout Eastern Asia the Scriptures, as well as religious books in Oriental languages written and printed by himself. He published the *Indo-Chinese Gleaner*, a quarterly magazine, aided in translating the Bible into Chinese, and wrote *Retrospect of the Protestant Mission to China*. D. in China in 1822. (See his *Life and Opinions*, by Rev. Robert Philip, 1839.)

Milne-Edwards (Alphonse), M. D., son of Henri, was b. at Paris in 1835; doctor of medicine 1859; professor in the Paris School of Pharmacy and knight of the Legion of Honor; author of several valuable treatises and papers on geology, palæontology, and zoology and comparative anatomy.

Milne-Edwards (Henri), M. D., b. at Bruges, Belgium, Oct. 23, 1800, was the son of an Englishman; took his medical degree at Paris 1823; became professor of natural history at the Lycée Henri IV.; professor of natural history at the Musée 1841; professor of zoology 1862; dean of the Faculty of Sciences; member of the Academies of Sciences and of Medicine; commander of the Legion of Honor, etc. Author of *Anatomical Researches concerning Crustaceans* (1828), *Handbook of Materia Medica* (1832), *Elements of Zoology* (1834–35; new eds. 1840, 1851), *Natural History of Crustaceans* (1837–41), a new edition of Lamarck's *Natural History* (1838–45), *Leçons sur la Physiologie* (10 vols.), and of a great number of valuable scientific papers.

Mil'ner (Isaac), D. D., brother of Joseph, b. near Leeds Jan. 1, 1751; graduated at Queen's College, Cambridge, and received a fellowship 1775; became Jacksonian professor of experimental philosophy 1783; master of his college 1788; dean of Carlisle 1791; vice-chancellor at Cambridge 1792 and 1809; Lucasian professor of mathematics 1798; d. at Kensington Apr. 1, 1820. Is chiefly remembered for his continuation of his brother's *Church History*.

Milner (John), D. D., F. S. A., b. in London Oct. 14, 1752; was educated at Douay; became a Roman Catholic priest in 1777; became in 1803 bishop of Castabala and vicar-apostolic of the Midland district of England, but was expelled from his office by the English Catholic board in 1823. D. at Wolverhampton Apr. 19, 1826. He was author of *History and Antiquities of Winchester* (1798), *Letters to a Prebendary, Ecclesiastical Architecture* (1811), *The End of Religious Controversy* (1818), and a *Vindication* of the same (1822).

Milner (Joseph), b. near Leeds, England, Jan. 2, 1744; graduated at Catharine Hall, Cambridge, 1766; entered the Anglican priesthood, and became head-master of the Hull Grammar School. D. Nov. 15, 1797; author of *History of the Church* (1794–1812), continued by Isaac Milner.

Milnes (Richard Monckton). See Houghton, Lord.

Milnes'ville, post-v. of Hazelton tp., Luzerne co., Pa., and in the Little Black Creek coal-basin, has productive mines of anthracite.

Milnor (James), D. D., b. in Philadelphia June 20, 1773; studied at the University of Pennsylvania; was admitted to the bar in 1794; practised at Norristown 1794–97, and at Philadelphia 1797–1814, attaining a prominent position; was member of Congress 1811–13, and opposed the war with England; took orders in the Protestant Episcopal Church 1814, and became rector of St. George's church, N. Y., where he remained until his death, Apr. 8, 1844. He was a zealous and efficient pastor, prominently connected with the Bible and tract societies, and with benevolent societies, and published a number of sermons and addresses. (See his *Memoir*, by Rev. J. S. Stone, D. D., 1848.)

Mi'lo [anc. *Melos*], a Greek island, the most westerly of the Cyclades, 14 miles from E. to W., 8 from N. to S., and about 65 miles E. of Peloponnesus, with a pop. of nearly 3000. It is volcanic and very fertile, producing wine, oil, fruit, and grain, and rich in sulphur, vitriol, and alum. But its water is brackish, and its climate malarious. The ancient city, of the same name, near whose ruins stands the modern village of Kastron, was on the N. side of the island, and had an excellent harbor. The celebrated statue of Venus, found here in 1820, is now in the Louvre, Paris.
R. D. Hitchcock.

Milo, post-tp. of Bureau co., Ill. Pop. 1118.

Milo, tp. of Delaware co., Ia. Pop. 767.

Milo, post-v. and tp. of Piscataquis co., Me., on the Bangor and Piscataquis R. R., has extensive quarries of excellent roofing-slate. Pop. 938.

Milo, tp. of Mille Lacs co., Minn. Pop. 153.

Milo, tp. of Yates co., N. Y., extending from Keuka Lake to Seneca Lake. It contains a part of Penn Yan, the county-seat, has 8 churches, and numerous manufactories. Milo Station is on the Northern Central R. R., 4 miles S. of Penn Yan. Pop. of tp. 4779. (See Penn Yan.)

Milpi'tas, post-v. and tp. of Santa Clara co., Cal., on San José branch of Central Pacific R. R. Pop. of tp. 665.

Mil'port, tp. of Sanford co., Ala. Pop. 495.

Milqua'ty, post-tp. of San Diego co., Cal. Pop. 324.

Milrea′, or **Milree′** [Port. *mil*, a "thousand," and *real* (pl. *reis*), a "real"], called also *corão* or *crown*, a Portuguese and Brazilian coin and money of account. The Portuguese milrea is worth about one dollar U. S.; the Brazilian is 51¼ cents of our money.

Milroy′, tp. of Jasper co., Ind. Pop. 123.

Milroy, post-v. of Armagh tp., Mifflin co., Pa., on the Mifflin and Centre County R. R.

Milroy, tp. of Grant co., W. Va. Pop. 1836.

Milroy (Gen. Robert H.), b. in Indiana about 1814; became a lawyer; served in the Mexican war as captain of the 1st Indiana Vols.; appointed in 1861 brigadier-general of Indiana volunteers; served in Western Virginia under McClellan and Rosecrans, and afterwards under Fremont and Sigel; was appointed major-general of volunteers Nov. 29, 1862, and was in command at Winchester, Va., when that place was attacked, June 15, 1863, on which occasion he retreated with a loss of half his force.

Milti′ades, b. at Athens, son of Cimon, succeeded his brother Stesagoras as tyrant of Chersonesus, and joined Darius Hystaspis in his campaign against the Scythians. Together with the other Greeks he was left in charge of the bridge over the Danube, and when Darius did not return at the appointed time he recommended the destruction of the bridge, while the Ionians, on the advice of Histiæus, insisted on its preservation. Afterwards he conquered Lemnos, which was a Persian possession, and when the Persian fleet, after the capture of Miletus, approached Chersonesus, he fled and repaired to Athens. Here he was chosen commander against the Persian force, which under Datis and Artaphernes threatened Athens, and defeated it in the memorable battle of Marathon (490 B. C.). A new armament which the Athenians placed under his command he used for an expedition against Paros for merely private purposes. He was arraigned, and condemned to defray the whole cost of the armament, and as he could not pay this enormous fine, he was thrown into prison, where he d. from a wound he had received during the campaign. His son Cimon afterwards paid the fine, and a monument was raised in honor of him on the plain of Marathon.

Mil′ton, county of N. Georgia. Area, 150 square miles. It is bounded S. by the Chattahoochee River, and is uneven and fertile. Cotton and corn are leading products. Cap. Alpharetta. Pop. 4284.

Milton, post-v., cap. of Halton co., Ontario, Canada, 35 miles S. W. of Toronto, has 1 weekly paper. Pop. of sub-district, 891.

Milton, tp. of Autauga co., Ala. Pop. 1595.

Milton, post-v. of Broadkiln hundred, Sussex co., Del., 7 miles E. of Ellendale R. R. Station. Pop. 824.

Milton, post-v., cap. of Santa Rosa co., Fla., on Blackwater River (here crossed by a ferry). It has a large lumber-trade, a drydock, shipyards, foundries, etc. P. 1014.

Milton, tp. of Du Page co., Ill. Pop. 2175.

Milton, post-v. of Montezuma tp., Pike co., Ill., 4 miles W. of Montezuma. Pop. 354.

Milton, tp. of Jefferson co., Ind. Pop. 1975.

Milton, post-v. of Washington tp., Wayne co., Ind., on the White Water Valley R. R. Pop. 823.

Milton, post-v. of Trimble co., Ky., on the Ohio River, opposite Madison, Ind. Pop. 223.

Milton, post-tp. of Norfolk co., Mass., 9 miles S. of Boston, with which it is connected by the Old Colony R. R. and a street railway. It contains the Blue Hills, which gave name to the State, the word *Massachusetts* probably signifying Great Hills. The principal industries of Milton are market-gardening and the manufacture of paper, leather, chocolate, and rubber goods. Ice and building-stone are procured here. Milton has a high school and 4 churches. Pop. 2683.

Milton, tp. of Antrim co., Mich. Pop. 359.

Milton, tp. of Cass co., Mich. Pop. 594.

Milton, tp. of Dodge co., Minn. Pop. 912.

Milton, post-tp. of Strafford co., N. H., on the Portsmouth Great Falls and Conway R. R., has 6 churches, a classical institute, and manufactures of shoes, lumber, and woollen goods. Milton Mills (post-v.) is the seat of the principal manufactures. It lies on Salmon River, which is here the E. boundary of the State. Pop. 1598.

Milton, tp. of Saratoga co., N. Y., contains Ballston Spa (which see), the county-seat, and several manufacturing villages. It has manufactures of edge-tools, paper, lime, cotton and woollen goods, leather, and other commodities. Limestone is largely quarried. The township has 6 churches. Pop. 4946.

Milton, post-v. of Marlborough tp., Ulster co., N. Y., on the W. bank of the Hudson River, and is connected by ferry with the village of Barnegat, or Milton Ferry, on the Hudson River R. R.

Milton, post-v. and tp. of Caswell co., N. C., 12 miles N. E. of Danville, Va., has 2 schools, 3 churches, 1 newspaper, 10 plug-tobacco factories, 4 tobacco warehouses, 1 mill, 1 furniture establishment, and 7 dry goods and other stores. Business, manufacturing and dealing in tobacco. Pop. 2752. Evans & Smith, Eds. "Milton Chronicle."

Milton, tp. of Ashland co., O. Pop. 1240.

Milton, tp. of Jackson co., O. Pop. 2372.

Milton, post-tp. of Mahoning co., O. Pop. 744.

Milton, a v. (West Milton P. O.) of Union tp., Miami co., O., on the S. W. branch of Miami River. Pop. 455.

Milton, tp. of Wayne co., O. Pop. 1524.

Milton, tp. of Wood co., O. Pop. 1464.

Milton, post-b. of Northumberland co., Pa., on the Philadelphia and Erie and Philadelphia and Reading R. Rs. and the Pennsylvania Canal, contains graded schools, 10 churches, 1 weekly newspaper, extensive car-works, 1 rolling-mill, a nail-factory, agricultural works, machine-shops, foundries, saw and planing mills, and stores. Pop. 1909. Ed. "Miltonian."

Milton, post-tp. of Chittenden co., Vt., on the E. shore of Lake Champlain, and on the Central Vermont R. R., 14 miles S. of St. Alban's. The Lamoille River furnishes water-power. There are 3 churches, and manufactures of lumber, leather, sash, doors, and blinds. Pop. 2062.

Milton, tp. of Buffalo co., Wis. Pop. 244.

Milton, tp. of Rock co., Wis. The post-village of Milton is at the junction of the Monroe branch of the Milwaukee and St. Paul R. R. with the Prairie du Chien division of that road. The post-village of Milton Junction, 2 miles to the W., is on the same roads, at the crossing of the Chicago and North-western R. R., Wisconsin division, 8 miles N. of Janesville. Milton is the seat of Milton College (Seventh-Day Baptists). Pop. of tp. 2010.

Milton (John), b. in Bread street, London, Dec. 9, 1608; received a very careful education, first under a private tutor, then at Christ's College, Cambridge, which he entered Feb. 12, 1625. He was originally destined for the Church, but, reared in a family of Puritan cast, and consequently opposed in many points to the Episcopal Church of that time, he gave up this plan, and when in 1632 he left Cambridge he returned to his father's house in Horton, a village in Buckinghamshire, whither the family had retired on an independency. Here he studied classical literature and philosophy with great energy, being by nature a studious and industrious man; cultivated music, in which both he and his father were quite proficient; and composed the *Sonnet to the Nightingale*, *L'Allegro*, and *Il Penseroso*, the elegy *Lycidas*, and the two masques, *Comus* and *Arcades*; the first collected edition of his poems was not published, however, until 1645. After his mother's death in 1637 he went abroad, visited Leyden, Paris, and Rome, and made the acquaintance, among others, of Grotius and Galileo. His Latin verses and other scholarly attainments, his personal beauty and noble disposition, introduced him to learned and elegant society, and made him friends. On his return home after an absence of fifteen months, he settled in London, the household at Horton having been broken up in the mean time, and took a few pupils, sons of relatives and friends, under his tuition. But soon he became deeply entangled in the turbulent controversies, religious and political, which filled that period of English literature, and for twenty years the bright though somewhat pensive poet of *L'Allegro* and *Comus* was engaged as a most violent and intolerant, though candid and eloquent, controversialist. His first polemical onset was an attack on the Episcopal Church (1641–42). Five treatises belong to this contest—namely, *Of Reformation*, *Of Prelatical Episcopacy*, *The Reason of Church Government*, *Animadversions*, and *Apology for Smectymnuus*. In 1643 he married Mary Powell, but she left him after one month on account of the "spare diet and hard study" she found in his house. Four tracts on divorce followed (1644–45)—namely, *The Doctrine and Discipline of Divorce*, *The Judgment of Martin Bucer*, *Tetrachordon*, and *Colasterion*, in which he maintained that moral incompatibilities justify divorce. The couple became reconciled afterwards, and lived together until the death of the wife in 1653: she bore him three girls. In 1644 he also published two other essays, *On Education* and *Areopagitica, a Speech for the Liberty of Unlicensed Printing*, which latter treatise is his most eloquent piece of prose writing. After the execution of Charles I. (Jan. 30, 1649) he wrote three powerful pamphlets (1649–50) in order to defend the acts of the English people in its struggle with

its king—namely, *The Tenure of Kings and Magistrates*, *Eikonoclastes*, and *Pro Populo Anglicano Defensio contra Salmasii Defensionem Regiam;* and to this group of writings belongs also his controversy with Dumoulin (1654–55), comprising three pamphlets, among which was *Defensio Secunda.* The attack on Salmasius made a great sensation in Europe. It was written at the demand of Parliament, as in 1649 Milton had been appointed secretary in the ministry of foreign affairs by Cromwell. This position he held till the Restoration in 1660, though he became entirely blind in 1654, and could work only by the aid of a reader and a scribe. After the Restoration he was compelled to keep himself concealed for some time, and even after the Act of Oblivion he continued to live very secluded. On Nov. 12, 1656, he married Catharine Woodcock, but she died fifteen months after in childbed. In 1663 he married his third wife, Elizabeth Minshull, but his home was not a happy one. A severe regularity and haughty solitude characterized his life; studies and literary compositions occupied his time. *Paradise Lost* was published in 1667; *History of Britain* in 1670; *Paradise Regained* and *Samson Agonistes* in 1671; *Of True Religion* in 1673. A Latin manuscript, *De Doctrina Christiana*, which shows his very heterodox conceptions of different points of Christianity, was not published till 1825. He d. Nov. 8, 1674, and was buried in the church of St. Giles, Cripplegate, beside his father. At its first appearance *Paradise Lost* made no great impression. The author received £5 for the first 1300 copies; the second edition was not published until 1673. The widow of Milton sold in 1681 her interest in the work for £8. The English public of that time consisted of those in whose blood there still lingered a remembrance of Shakspeare and the Elizabethan dramatists, of Puritans who acknowledged nothing which lay outside of their religious enthusiasm, and of the dissolute swarm around Charles II. For such people *Paradise Lost* was not the book. But in the eighteenth century, when a decent deism had superseded Puritanism, when imitations of Latin models were considered as signs of genius, and the general taste preferred artistic perfection to poetical excellence, *Paradise Lost* was raised to the most conspicuous place in English literature; and it held this position till of late some few sharp voices have begun to object. Its artistic merits are in most respects above all praise. The English language was probably never written with greater mastership, and while the verse of Homer, nevertheless, has a greater charm, it is simply because that which it relates is more charming. It is against the æsthetical character of the work that objections have been made. (Among others, see Masson's *Life of Milton*, 2 vols., 1859–71.)

CLEMENS PETERSEN.

Milton College. This institution had its origin in a select school which was opened in Milton, Wis., in 1844. Three years afterwards it was incorporated as an academy by the Territorial legislature. In 1867 it received its college charter from the State. The success of the enterprise is due largely to the late Hon. Joseph Goodrich, the founder of the village of Milton, who gave several thousand dollars for the erection of its buildings. The school has grown steadily from the beginning. Starting with 1 teacher and 70 pupils, it has recently employed a faculty of 9 members and secured the attendance yearly of over 300 students. Of these, 85 have been, on an average, members of the college classes. Like most Western institutions of the same grade, it maintains also an academical department. Its work from the opening has been threefold—first, to prepare young people for teaching public schools by furnishing them with a thorough English education; second, to fit them for the usual business pursuits of life in the study of the higher English and mathematical branches in connection with the commercial; and third, to lay the foundation of full college courses by adding to most of the studies mentioned above the natural and mental sciences and the ancient and modern languages. The college is connected with the Seventh-Day Baptist denomination, which supports several important schools in this country. Nearly $30,000 have been expended in furnishing buildings, apparatus, and libraries. Both sexes recite in the same classes and compete for the same honors in all the departments. Since 1857 it has graduated 92 students—47 ladies and 45 gentlemen. During the civil war 311 of its students were enrolled in the regiments, chiefly from Wisconsin, and 43 of them died in the service. The school is situated in one of the most fertile and beautiful sections of the West, and is surrounded by an intelligent, hardy, and enterprising people. The president, Rev. W. C. Whitford, A. M., has had the supervision of the institution since 1860, assisted by an able and experienced corps of teachers.

W. C. WHITFORD.

Milton Mills, N. H. See MILTON.

Milton Plantation, post-tp. of Oxford co., Me. Pop. 258.

Mil'tonsburg, post-v. of Malaga tp., Monroe co., O. Pop. 176.

Milton Station, post-v. of Humboldt tp., Coles co., Ill., on the Illinois Central R. R.

Mil'tonville, v. of Madison tp., Butler co., O. Pop. 179.

Milwau'kee, county of S. E. Wisconsin, bounded E. by Lake Michigan. Area, 250 square miles. It is level, fertile, well timbered, and well cultivated. Grain is a leading product. The county is traversed by numerous railroads, which centre at Milwaukee, the capital. The county has important manufactures and trade, mostly carried on in the city of Milwaukee. Pop. 89,930.

Milwaukee, the metropolis and commercial city of Wisconsin, a port of entry and cap. of Milwaukee co., situated on the bay and river of the same name on the western shore of Lake Michigan, in 43° 2′ N. lat., 87° 54′ W. lon. It is 84 miles from the State capital at Madison, and 85 miles from Chicago by rail. It has an area of about 14 square miles. Pop. by State census of 1875, 100,775. It was settled and laid out as a village in 1835, and in 1836 the population was 1206; in 1840, 1750; 1850, 20,000; 1860, 45,286; 1870, 71,499. Its commerce is largely in agricultural products; the bulk of the produce of Minnesota, Iowa, Wisconsin, and much from Northern Illinois is received here and shipped to the seaboard by the lakes and by rail. The harbor, at the mouth of the Milwaukee River, a little S. of the centre of the bay, is one of the best upon the upper lakes. The river is navigable for vessels of the largest lake tonnage for 3 miles from its mouth, directly through the business part of the city. At this point there is a dam which raises the water 12 feet above high water, allowing slack-water navigation some 2 miles farther up the stream. A canal 1¼ miles in length from this dam on the W. side of the river creates a water-power estimated as equal to 100 runs of millstones. There are mills and factories upon this canal, and the largest lake steamers can load at them on the river-side without transfer. The Menomonee and Kinnickinnic rivers empty into the Milwaukee about a mile from its mouth, and are navigable for nearly 2 miles. Several limestone-quarries are worked along the banks of the Menomonee, which furnish an excellent stone for building. The bay is a beautiful expanse of water, running inland about 3 miles, and measuring about 6 miles across from its extreme points. The elevation of these points furnishes admirable shelter for shipping, and the clay bottom affords good anchorage-ground. The whole number of vessels enrolled at this port is 340, with a total tonnage of 64,933.92; of which number, 128 sail and steam vessels, with a tonnage of 26,396.24, are owned in Milwaukee. The direct export of produce to foreign countries amounted in 1874 to $2,165,163, consisting of flour, grain, and provisions. Twelve railways centre in and radiate from the city—viz. the Chicago Milwaukee and St. Paul R. R. and branches, the Chicago and North-western, the Western Union, the Milwaukee and Northern, the Wisconsin Central, the Southern Minnesota, the Wisconsin Valley, and the Detroit and Milwaukee. The last connects with a daily line of steamers across Lake Michigan. Wheat is the great commercial staple, and the amount received and stored in elevators constitutes this one of the largest primary wheat-markets of the world. These elevators have an aggregate capacity of 3,800,000 bushels. Their receipts and shipments of grain for 1874 were as follows:

	Received.	Shipped.
Wheat, bush	26,628,148	22,255,380
Corn, "	1,313,642	556,563
Oats, "	1,403,893	726,035
Barley, "	1,083,472	464,837
Rye, "	284,572	79,870
Flour, barrels	1,616,338	2,217,579

Other products as follows:

	Received.	Shipped.
Wool, pounds	3,165,125	3,165,125
Hops, bales	15,737	10,786
Butter, pounds	4,954,676	4,102,836
Cheese, "	3,352,873	2,631,175
Wis. tobacco, pounds	6,982,175	6,100,410
Iron ore, tons	39,082	6,986

Among manufactures the iron interest stands first. There are 18 iron establishments, with an aggregate capital of $3,850,000, employing 2280 men and producing about $7,300,000 in value. The largest is the Milwaukee Iron Co.'s works, rolling-mill, bar-iron mill, and blast furnaces for the reduction of ores. Next in value and importance is the manufacture of flour. There are 10 large flouring-mills, giving employment to 400 men, with an aggregate capital of about $1,500,000, annual production, about $5,600,000. Next comes the lager beer manufacture; aggregate capital invested, about $3,270,000; 500 men employed; annual

product, about $3,500,000; malt received, 19,173 bushels; shipped, 16,154. Leather manufacture, 15 tanneries; aggregate capital invested, $1,265,000; annual production, about $2,750,000; employing 638 men. Among other manufactures are brick, wagons, agricultural implements, sash, doors, blinds, barrels, willowware, matches, boots and shoes, and clothing. Besides these there are numerous small industries requiring skilled labor, which is well supplied by the large German population. Pork-packing is extensively carried on; the number of live and dressed hogs packed in the season of 1874–75 was 248,197; aggregate value, about $4,000,000. The aggregate of sales in the different branches of wholesale business for 1874 amounted to about $50,000,000. The assessed valuation of city property for 1873 was $48,559,817; for 1874, $51,324,887. Total State, county, and city taxes for 1874, $1,459,368; bonded debt in 1874, $2,545,334.73; expenditure for city government, $773,962. Waterworks of an excellent character were completed in 1874 at a cost of $1,952,247.48, which furnish the city with water from Lake Michigan. The city has been lighted with gas for more than twenty years. A thorough system of sewerage is being completed. The principal streets are well paved, mostly with Nicholson pavement. There are 12 banks, whose total deposits for 1874 were $436,607,930.40; in 1873, $451,684,356, showing a falling off of only $15,000,000 during the severe financial depression of 1873–74, and not one bank failure or temporary suspension occurred. The courts held in the city are the U. S. circuit court, U. S. district court, State circuit court, county court, probate court, and municipal court. The county court-house is a large and elegant structure, built of Lake Superior sandstone at a cost of over $400,000. The post-office is a plain, substantial building, erected by the general government, of Illinois marble; it is also used for U. S. courts and custom-house. There is a house of correction for the county, which also receives certain classes of prisoners from other counties upon payment of board. This is a workhouse, and received during 1874, 601 males, 57 females, and discharged 563 males and 59 females; whole number of days' imprisonment for the year, 39,055, at a total cost for administration of $19,733.41; *per capita*, $3.54½ per week; 26,734 days' productive labor, 12,321 non-productive, but indispensable; lost days, 7570, inclusive of Sundays; total estimate of labor, $20,272.83, showing a small profit of $539.42. The city has a police station and county jail, used only for purposes of temporary detention; a city hall, used for municipal, court, and city offices.

There are 20 public schools, with 11,750 children in attendance; total number of children of school age, 33,679, making 35 per cent. in public schools; one high school for both sexes, with normal department, all under the care of the superintendent of public schools; total amount of salaries, $120,280; average for males, $1189, females, $507.30; total annual expenditure, $141,724.84. There are 50 private schools, with 216 teachers and 8531 pupils enrolled; 16 are Roman Catholic, 12 Lutheran, 5 corporate academies, 1 female college; the others receive both sexes. The city has a creditable art-gallery, 3 theatres, 2 English and 1 German; a public library of 1300 volumes, belonging to the Young Men's Association, and a German library association and museum of natural history; 28 newspapers, of which 10 are dailies; 71 churches, with substantial edifices. The Immanuel Presbyterian is a beautiful stone edifice of mediæval Gothic style, completed in 1874 at a cost of over $200,000; it has 1500 sittings. There are 2 cathedrals, Roman Catholic and Episcopalian; each of these, with the episcopal residence and school buildings, occupies the entire front of a square. The Roman Catholic bishop was consecrated archbishop in May, 1875. A Capuchin monastery and a Franciscan college are just out of the city. There are 14 Lutheran churches, 12 of which have parish schools; 2 synagogues; the Convent de Notre Dame, which is the mother-house in the U. S.; it has over 600 inmates, besides large boarding and day schools, and owns and occupies an entire block or square, and has two branch schools in the vicinity; 4 orphan asylums—1 Protestant and 3 Catholic; these contain over 300 children. There is 1 industrial school, recently established; a home for the friendless, and in connection with it a home for young women; a bethel house for sailors; St. John's Home for old and infirm women (Protestant Episcopal); 2 hospitals—St. Mary's Catholic and Milwaukee Protestant; 1 Bible and benevolent society; 3 city charitable societies of German ladies; 1 local visiting committee for poor-houses and penal institutions; a city mission, and numerous church societies for benevolent purposes. The National Asylum for Invalid Soldiers is located about 3 miles from the city, and with its extensive and beautifully ornamented grounds and miniature lakes furnishes a most attractive resort. From 600 to 700 invalid soldiers are here maintained in ease and comfort by a generous government. A park adorns the lake bluff for half a mile, beautifully terraced in places down to the beach.

Milwaukee is mentioned by Lieut. Sarrow, U. S. engineers, in an official report in 1817 as "a Pottawattomie village lying on the right bank of the Milwaukee River at the confluence with the lake." The first white settler was Solomon Juneau, a French fur-trader, who came to Milwaukee about 1825. He entered a claim to a part of the land now occupied by the city, and lived to be mayor of the city after it had become one of the most prosperous towns upon the lakes. The lake bluff and the banks rising from the rivers, sometimes abruptly, sometimes with a gentle slope, furnish beautiful sites for residences, commanding fine views of the bay, rivers, and surrounding country. The elegance and beauty of its residences, with tasteful and highly cultivated grounds, form one of the marked features of the place, the delicate cream color of its brick forming a pleasant contrast with the fresh green of the foliage. The atmosphere is remarkably clear, pure, and bracing, climate healthful, and the death-rate is less than that of any city of equal population in the North-west. Meteorological observations maintained by the government at this point report this to be the third dryest point of observation in the U. S. The isothermal lines, as shown on Lapham's map, mark a great modification of both heat and cold from the influence of the large body of water lying E. and N. Mean temperature for 1874, 48.8°; altitude, about 600 feet. Two horse railways are in operation, and one constructing. An unusually large proportion of the houses are owned by the occupants, and very little pauperism exists. WILLIAM P. LYNDE.

Mimánsá. See HINDU PHILOSOPHY.

Mime [Gr. μῖμος; Lat. *mimus*], a rude form of the drama which prevailed in ancient Greece and Rome. The Greek mime was of Italian origin, and corresponded to our farce, but Sophron, the greatest of the mimographers, mingled ethical teachings with buffoonery. The Greek mime was written in prose, which was often rudely rhythmical. The Roman mime was a sort of modern pantomime, but it was sometimes in part dialogue. It had a generally coarse and indecent character. The actors themselves were called *mimi*, whence our word "mimic."

Mimner'mus, b. probably at Smyrna about 634 B. C.; gave to elegiac poetry, hitherto treating of warlike and joyous topics, that plaintive and melancholy strain which has remained its characteristic ever since. Of his elegies considerable fragments, mostly erotic and belonging to the poem *Nanno*, are still extant, edited by Bergk in his *Poetæ Lyrici Græci* (1866), and frequently translated into German.

Mimo'sa [Gr. μῖμος, a "buffoon," referring to the movements of the leaves in the sensitive species], an interesting genus of leguminous trees, shrubs, and herbs which gives name to the great sub-order Mimoseæ, distinguished by having regular flowers. The genus includes at least ten species which have decidedly sensitive leaves. (See SENSITIVE PLANT.) Of these, the *Mimosa pudica* is the most remarkable, and the only one familiar in cultivation. Most of the numerous species are tropical, many are African, many American, and one, an herb, *M. strigillosa*, is a native of the Southern U. S.

Mims's, tp. of Wilcox co., Ala. Pop. 960.

Mims's Cross-roads, tp. of Baker co., Ala. Pop. 788.

Mi'na [μνᾶ; Heb. *maneh*], in Greek money and weights, containing 100 drachmæ and forming the sixtieth part of a talent. The value varied according to the talent used. (See TALENT.) The Attic mina is generally stated to have been worth $17.61 U. S. money; it was a money of account, and was not coined.

Mina, post-tp. of Chautauqua co., N. Y. Pop. 1092.

Mina (FRANCISCO ESPOZ Y), b. at Ydocin, near Pamplona, Spain, July 17, 1782; joined his nephew, Xavier Mina, in 1809 in organizing the mountaineers into guerilla bands to oppose the French invasion. In the following year he succeeded to the command on his nephew's capture (see MINA, XAVIER), and soon became the most efficient as well as celebrated of the numerous partisan leaders of Northern Spain. In 1812 he received a commission as general, and was appointed commander-in-chief of Aragon; became "political chief" of Navarre 1813; contributed to the victories of Salamanca and Victoria; blockaded Pamplona 1812–13, and retired to private life on the restoration of Ferdinand VII. The despotic measures of that king, however, induced the two Minas to head an insurrection, but, having failed in an attack upon the citadel of Pamplona, Sept. 25, 1814, he was obliged to escape to France. In 1820 he took part in the constitutional revolution of Riego, becoming captain-general of Navarre; suppressed the royalist insurrection

in Catalonia 1822; became captain-general of Catalonia Jan., 1823; capitulated to the French at Barcelona Nov. 1, 1823, and proceeded to England. In 1830 he was again engaged in an unsuccessful revolt against Ferdinand VII. in Navarre, and again escaped to England. In 1834 he was recalled to Spain to defend the liberal government established in the name of the young queen Isabella against the Carlists, and took command of an army corps, but with indifferent success. Resigning in 1835, he d. at Barcelona Dec. 24, 1836.

Mina (Xavier), nephew of Francisco, b. in Upper Navarre, Spain, in 1789; was studying for the priesthood when the French invasion of 1808 impelled him to place himself at the head of a band of guerillas, and being joined by his uncle, he achieved important successes, which were, however, somewhat tarnished by the general ferocity of that war. Taken prisoner in 1810, he was kept four years at Vincennes, and employed his time in studies. Returning to Spain in 1814, he soon took up arms against the absolutism of Ferdinand VII., and having joined his uncle in his attack upon Pamplona, was, like him, forced to cross the border into France (Oct., 1814). He proceeded to England and formed the plan of an expedition to Mexico in aid of the patriots who were there struggling for independence. He succeeded in interesting some distinguished Englishmen in his plans, received subscriptions, bought a considerable quantity of arms, chartered a vessel, and sailing from Liverpool arrived at Norfolk in June, 1816, with fifteen officers, Spaniards, Italians, and English. He proceeded to Baltimore; conferred with many prominent Americans, including Gen. Scott; obtained sympathy and support; enlisted 200 volunteers, with whom he landed at Galveston, Tex., Nov. 24, but being unable to effect a junction with the Mexican patriots, he proceeded to New Orleans. Here he met with assistance, and was invited to undertake an expedition against Pensacola, but declined; reorganized his expedition; returned to Galveston, where he obtained a reinforcement of 100 Americans under Col. Perry, who had been serving in the insurgent squadron; landed at Soto la Marina, Tamaulipas, Apr., 1817; was joined by a few Mexicans, and at the head of less than 500 men forced his way to the centre of Mexico after several desperate actions with the Spaniards, especially at Peotillos, where he defeated 1800 royalists (June 18), and arrived June 24 at the fort of Sombrero, near Leon, held by the insurgents under Pedro Moreno. For the next three months Mina made repeated daring excursions, and in August attacked the Spaniards before the fort of Remedios at the head of 1000 cavalry. After numerous engagements, Mina was surprised at night at the rancho of Venadito, near Irapuato, Guanajuato, Oct. 10, and after a trial was executed in front of the insurgent fortress of Remedios Oct. 27, 1816. Mina was remarkable for generalship and heroism, and with proper support from the insurgents would have effected the independence of Mexico. The viceroy of Mexico received the title of count of Venadito as a reward for his capture. (See Robinson's *Memoirs of the Mexican Revolution.*) Porter C. Bliss.

Min'aret [Arab. *menarah*, "lantern"], a slender turret which stands near every Oriental mosque. It represents the campanile, but the bell, being a Christian device, is unlawful in the Moslem religion. Hence, the blind muezzin's call or melodious chant, *adan*, is used instead of a bell to call the faithful to prayer.

Mi'nas Gera'es, a large province of South-eastern Brazil, extends between lat. 14° 20′ and 22° 50′ S., and between lon. 40° 27′ and 51° W., and comprises an area of 223,000 square miles, with about 1,500,000 inhabitants. It consists of an elevated plateau diversified by ranges of hills, rich in gold, silver, copper, and other useful minerals, covered with beautiful and valuable forests, and everywhere containing an exceedingly fertile soil. The climate is mild and healthy, except in some low tracts along the rivers. Cotton, sugar, coffee, maize, rice, and tropical fruits grow in abundance. The inhabitants are mostly a mixed race, composed of Indians, negroes, and whites. Chief town, Ouro Preto.

Mi'naville, post-v. of Florida tp., Montgomery co., N. Y., on Chuctenunda Creek, 5 miles S. of Amsterdam. Pop. 130.

Min'cio, a river of Northern Italy, issues from the southern extremity of Lake Garda, passes by Mantua, and joins the Po 8 miles below this city after a course of 38 miles. It is navigable for barges from its union with the Po up to Mantua.

Mind [Gr. μένος; Lat. *mens, mentis*], contradistinguished from *matter*, is free, self-determined being, and hence exists in the form of atomic individuals, and not, as is the case with matter, in that of mere mechanical or quantitative aggregates. Wherever we observe activity which is in conformity to an end or purpose, we attribute it to mind. Mind contemplates its potentiality or want in the form of an idea, and uses means to realize it, while material things, although having potentialities, do not act with conscious purpose. Taken generally, material things are limited or constrained from without—conditioned through others—while spiritual beings are always free and self-conditioned, at least formally, originating their own limitations, first as ideas or purposes theoretically, and then realizing them as practical activity or will. Pure matter, devoid of all self-determination, is perhaps mere empty space—pure chaos; pure mind or absolute self-determined being is God. Between these ultimates lies the world of nature and that of man, the former containing material beings that manifest various degrees of self-determination—from the mineral through the crystal, the plant up to the animal; the latter containing the world of man or human history, which is the revelation of self-determination or mind in its progressive emancipation from matter, the humblest human soul being immortal and potentially free, though involved in manifold external complications with circumstance. Historically, it was Anaxagoras who first announced mind (νοῦς = reason) as the simple self-existent essence of things, that which sways matter. Besides this general signification of the term *mind*, in which it is a synonym of spirit, and corresponds to the German term *Geist*, including the several activities of feeling, volition, and thought, the word mind is used in a narrower sense to imply only the theoretical activity or the Intellect—the activity of cognition. Aristotle's ψυχή is identical with mind in the first-mentioned sense, if we interpret it as including the νοῦς ποιητικός. In the second book of the *De Anima* in his careful manner he defines soul (ψυχή) to be "the first entelechy of a physical organic body having life potentially." By "first entelechy" he means a self-determining or free being in its undeveloped first stages, when it *has* not unfolded, but *may* unfold, its capacities—hence, a formally free being; the "second entelechy" is the actually self-developed free being. According to this definition, soul would seem to be correlative of body. But he proceeds in the third book to describe the creative reason (νοῦς ποιητικός) as possessing independent and eternal existence apart from body, thus apparently making the term soul apply to God as well as to mixed earthly natures. In opposition to the theory of the speculative philosophers and theologians, represented by such names as Plato, Aristotle, Leibnitz, Hegel, St. Augustine, Thomas Aquinas, Duns Scotus, and Meister Eckhart, the materialists repudiate the co-ordination of mind with matter, or the subordination of matter to mind, and explain mind as a function of matter. Psychology with them, accordingly, falls into a department of physiology. From Democritus and Empedocles, and their gifted expounder Lucretius, down to Hartley and Bain, this unpopular doctrine has found in every age its hardy advocates. Physiological investigations into the conditions under which mind is active in its various phases have doubtless been of great benefit to psychology, and more is to be expected from this source in the future. Notably, in certain practical spheres—for instance, in the medical treatment of the insane—we have profited by adopting the physiological theory. John Stuart Mill, holding the doctrine of sense-perception as the highest authority, defines matter to be "the permanent possibility of sensation," and likewise mind to be "a series of feelings with a background of possibilities of feeling"—definitions which point toward Berkeley's theory of immaterialism. Another class of thinkers are found in open hostility to the theological and speculative view first mentioned, although they do not adopt the physiological view of mind. The early commentators of Aristotle were divided—some, like Themistius, holding that individual men are immortal; others, like Alexander Aphrodisias, holding that the lower faculties of the soul, memory, feeling, the discursive intellect, etc., called by Aristotle the passive reason (νοῦς παθητικός), are mere dispositions connected with the animal faculties, and therefore perishable with the body. The creative reason (νοῦς ποιητικός) was conceded to be immortal and independent of matter, but only as One, the deity or the world-soul, while men, who participate in this pure activity, lose their individuality at death with the lapse of sense-perception, memory, reflection, fancy, etc., which furnished the distinguishing attributes. The adoption by Averroës of this doctrine, subversive of all claims on the part of man as man to essential participation in the divine life, made an epoch in the history of thought. The dangerous predicament of the Church upon the revival of learning, and the study of Aristotle through Arabian commentary and translation, aroused the mightiest thinkers of the period of scholasticism, and Christian theology at length settled its dogmas upon a firm foundation beyond the power of the subtle metaphysics of the Arabians. The great question regard-

ing mind was this of the relation of the particular individual to the universal soul; and there is no second problem of equal importance to man.

The philosophy of mind must verify its theories by their application to the interpretation of human institutions. The nature and destiny of mind is revealed in those gigantic products of the united endeavor of entire peoples—the work of the will rather than of the intellect, embodied in the state, the Church, civil society—with unmistakable tracings, while the scientific theories, born of individuals, are the field of interminable disputes. Psychology as a science has been taken by some to include the entire realm of the philosophy of mind; by others it has been understood to include only the subjective manifestation of mind, or, still more limited, the self-conscious phase of it. (See PSYCHOLOGY.) An outline of the entire philosophy of mind as treated by one of the most comprehensive and profound of modern thinkers includes the following departments: A, Subjective Mind falls under three heads—I. Anthropology, or the science of those phases of mind beginning with its enthralment in nature and its struggle for individuality; these are (*a*) the peculiar qualities and processes arising from race, climate, age, sex, sleep, sensation, passions, etc.; (*b*) feeling, the interaction between consciousness and the unconscious life of instinct, ideas for the most part remaining obscure and in the form of mere impulses; (*c*) symbolism and language, the mind creating for itself a conventional medium in which it fixes the products of its thinking activity for the sake of communication, combination of the individual with the race, and self-contemplation. The human mind thus frees itself from animal impulse and elevates itself to consciousness. II. Phenomenology of mind is the science of the process by which mind comes to recognize free self-determining intelligence as the presupposition and logical explanation of the objective world. It begins (*a*) with the consideration of immediate consciousness of objects, and traces the history of its (*b*) discovery of their relativity and the origin of their properties and attributes in their mutual relations, until (*c*) it arrives at the conviction that the objects of sense-perception are mere phases or manifestations of forces which are in a state of perpetual transition into each other, originating and annulling individual things, leaving no permanent material beings, but only an abstract internal power, of which the phenomenal world is a manifestation. The thought of a genesis of difference and distinctions from an abstract force in which all concrete distinctions have vanished is the thought of a self-determining or self-duplicating entity, a manifestation by means of self-opposition; and this radical idea that underlies the thought of force is the idea of a universal that exists as a particularizing process. Here may be recognized the thought or concept of the personal Ego or of mind. Hence, all distinctions among objects in the outer world are traced ultimately to mind as their Creator, and this investigation has found the substance underlying objects and identified it with the Ego or a thinking subject. III. Psychology, considered as a special department, is the science of mind as subject; it considers the subjective factor of knowledge and investigates its forms. It treats (*a*) of theoretical mind as sense-perception, representation and pure thought; (*b*) of the emotional activity of mind; (*c*) of the practical activity, or the will. B, Objective Mind includes the world of human history and the organized institutions of man—(*a*) the family, (*b*) civil society, (*c*) the state. C, Absolute Mind (νοῦς ποιητικός) includes (*a*) the phase of manifestation of the divine mind to sense-perception in the form of the beautiful in art; (*b*) the revelation of the divine to the will in the form of the good as set forth in religion; (*c*) the systematic exposition of the divine mind as the ultimate truth in the form of science, culminating in theology or philosophy. WM. T. HARRIS.

Mindana'o, or **Magindanao,** the southernmost and (next to Luzon) the largest of the Philippine Islands in the East Indies. Its area is estimated at 36,000 square miles. It is high, covered with immense mountains, among which are several active volcanoes, and is exceedingly fertile, producing excellent timber, rice, cotton, pepper, and other spices, and yielding gold and coal. Only a small part of the island, comprising some districts on the northern and eastern coasts, with a population of about 74,000, belongs to Spain; the rest is divided into many independent states, of which the sultanate of Magindanao is the largest and most important. The inhabitants of all these states are very savage, especially those of the western coast; piracy is their chief passion, and seems to be their only occupation. On the south-western shore the Spaniards have built a strong fortress, Zamboanga, to keep these tribes in order.

Min'den, town of Prussia, in the province of Westphalia, on the Weser. It is an old town, closely built, with few open places or interesting buildings. It is strongly fortified, and its manufactures of soap, chemicals, tobacco, and hosiery are considerable. Pop. 16,593.

Minden, post-v., cap. of Webster parish, La., has 2 weekly newspapers. Pop. 1100.

Minden, post-tp. of Sanilac co., Mich. Pop. 456.

Minden, tp. of Benton co., Minn. Pop. 81.

Minden, post-tp. of Montgomery co., N. Y., bounded N. by the river Mohawk, and traversed by the Erie Canal. It contains FORT PLAIN (which see) and other villages, and has the remains of a pre-historic fortification. Pop. 4600.

Mindszent, town of Hungary, on the Kurcza, at its influx in the Theiss, has 9163 inhabitants, mostly engaged in agriculture, cattle-rearing, and fishing.

Mine. See MINES, MILITARY, and MINING ENGINEERING.

Mine Creek, post-tp. of Hempstead co., Ark. P. 2560.

Mine Hill Gap, a v. of New Castle tp., Schuylkill co., Pa., on the Mine Hill and Schuylkill Haven R. R., has mines of anthracite coal in a small detached field.

Mine'o, town of Sicily, in the province of Catania, pleasantly situated in a very fertile district W. of Agosta. Not far from this town is the little lake Palici or Natia (anciently called *Thalia*), with its sulphurous fetid waters, which, though cold, seem in a state of continual ebullition. In very dry seasons the water of this lake nearly disappears, and then the sand of its bottom is blown up as if by subterranean currents. Pop. of Mineo in 1874, 9337.

Mineo'la, post-v. of North Hempstead tp., Queen's co., N. Y., on the Long Island R. R.

Mineola, post-v. of Wood co., Tex., 110 miles W. of Shreveport, La., on the Texas and Pacific and the International and Great Northern R. Rs., has 1 school and church house, 1 bank, 1 newspaper, 3 hotels. Pop. about 400. CHARLES MARTIN, ED. "TEXAS ADVERTISER."

Mi'ner, county of S. E. Dakota, recently formed. Area, 504 square miles. It is intersected by the Dakota and Vermilion rivers, and is generally prairie-land.

Miner (ALONZO AMES), A. M., D. D., b. at Lempster, N. H., Aug. 17, 1814; was brought up on a farm, and received an academic education; was settled as pastor at Methuen, Lowell, and Boston, Mass.; filled many important offices in Massachusetts connected with educational interests (*e. g.* on the State board of education and on the board of overseers of Harvard College), and in July, 1862, became president of Tufts College. Dr. Miner has been noted as an anti-slavery and as a temperance reformer.

Miner (CHARLES), b. at Norwich, Conn., Feb. 1, 1780; emigrated in 1799 to the Wyoming Valley, Pa., where, with an elder brother, he established the *Luzerne Federalist*, and afterwards the *Gleaner*, in which he wrote a series of humorous essays which were widely appreciated; became assistant editor of the *Political and Commercial Register* at Philadelphia; established at West Chester, Pa., the *Village Record*, in which his sketches, signed "John Harwood," were very popular. He was a member of Congress 1825–29; was an active opponent of slavery and friend to the agricultural and silk-growing interests, which latter industry he was the first to introduce and popularize in the U. S. by his writings; declined a re-election on account of deafness; returned to the Wyoming Valley in 1832, and published in 1845 a *History of Wyoming*, in which the account of the celebrated Wyoming massacre was given according to the carefully gathered testimony of eye-witnesses. He also republished in a volume his early essays in the *Gleaner*, under the title *Essays from the Desk of Poor Robert the Scribe*. Mr. Miner was the author of the celebrated ballad of *James Bird*. D. at Wilkesbarre, Pa., Oct. 26, 1865.

Miner (THOMAS), M. D., b. at Middletown, Conn., Oct. 15, 1777; graduated at Yale College 1796; taught school several years and studied law, but ultimately became a physician, practising for some years at Middletown. He was one of the founders of the Yale Medical Institute and of the Connecticut Retreat for the Insane; became a high authority upon fevers; published *Essays upon Fevers and other Medical Subjects* (1823), a treatise on *Typhus Syncopalis* (1825), several translations from French medical works, and a series of biographical sketches of distinguished physicians of Connecticut. D. at Worcester, Mass., Apr. 23, 1841. His autobiography was published in the *New Englander*, vol. ii.

Mineral, county of West Virginia, separated on the N. W. and N. E. from Maryland by the Potomac River. It is intersected by several parallel mountain-ridges, and has wide, fertile, and pleasant valleys. Wool and grain are leading products. Iron, coal, and timber abound. Area, 550 square miles. Cap. New Creek. Pop. 6332.

Mineral, tp. of Pulaski co., Ark. Pop. 191.

Mineral, tp. of Plumas co., Cal. Pop. 400.

Mineral, post-v. and tp. of Bureau co., Ill., on the Chicago Rock Island and Pacific R. R., has valuable beds of coal. Pop. 1034.

Mineral, tp. of Jasper co., Mo. Pop. 1195.

Mineral Acids, Medicinal Uses of. Sulphuric, nitric, hydrochloric, nitro-hydrochloric, phosphoric, and carbonic acids are all used in medicine. The first four, undiluted, are powerfully corrosive, quickly destroying animal tissues. Sulphuric acid produces black sloughs, the others yellow. When swallowed, they are virulent poisons, causing intense pain, bloody vomiting, and speedy collapse. The antidotes are the non-poisonous alkalies—viz. lime, magnesia, and their carbonates. As caustics for surgical purposes, nitric and hydrochloric acids are alone used, sulphuric and nitro-hydrochloric being too intense in their action. Diluted, any of the four just mentioned may be used as lotions in sluggish skin diseases and to allay itching and check profuse sweating. Taken internally, all acids tend to increase the flow of saliva and the mucous secretions of the mouth and throat, and thus acid drinks quench thirst far better than simple water. Any of the acids of the present group may accordingly be used for this purpose, the stronger ones being of course greatly diluted. Acids taken before meals are useful in certain forms of dyspepsia, improving digestive power and preventing sour fermentation of the food. Sulphuric acid has an astringent effect in addition to its acidity, and is much used in diarrhœas, especially when associated with acid dyspepsia, and as a preventive of night-sweats. For internal administration this acid is most commonly given in the form of the "aromatic sulphuric acid" of the Pharmacopœia, or "elixir of vitriol," as it is often called. This is a tincture of ginger and cinnamon, to which a small quantity of sulphuric acid is added. All of the corrosive acids, even when medicinally diluted, should be taken through a glass tube to avoid injury to the teeth. Phosphoric acid is given internally in an officinal dilute solution in water. Carbonic acid, in the form of the popular carbonic-acid water, or "soda-water," is well known as a grateful thirst-quenching drink. It is also useful to allay nausea and vomiting, and to correct the nauseating tendency of many medicines, such as the diuretic and purgative salts. EDWARD CURTIS.

Mineral City, a v. (MINERAL POINT P. O.) of Sandy tp., Tuscarawas co., O., on the Tuscarawas branch of the Cleveland and Pittsburg R. R., has mines of the excellent steam coal known as "Newberry coal." Pop. 175.

Mineral Hall, post-v. of Elko co., Nev., 32 miles S. of Palisade Station on the Central Pacific R. R., has mines of exceedingly rich silver ore, which is extensively wrought and smelted at this point. Pop. 212.

Mineral′ogy [from *mineral*, and Gr. λόγος, "discourse"]. This science treats of the chemical and physical properties, relations, occurrence, and classification of minerals; the word *mineral* denoting any homogeneous, inorganic, natural product, not gaseous, and not the immediate result of organic processes. A mineral may be the indirect and altered product of organic life, like coal, which results from the alteration of the once organic wood, or amber, which is an altered vegetable resin; but fossil bones, shells, etc. are not to be classed as minerals. Minerals are distinguished by their chemical properties, their form, structure, lustre, color, hardness, specific gravity, etc.

Chemistry.—The exact composition of a mineral is ascertained by quantitative analysis; the nature of its constituents by qualitative analysis, the blowpipe reactions being especially useful in determining minerals, from their simplicity and certainty. Every one of the elements occurs in the mineral kingdom, and a mineral may consist of one element or of a combination so complex that no present system of chemical notation will give a satisfactory representation of its composition. Like any other chemical compounds, minerals are to be regarded as combinations of atoms and molecules, and in writing the formulas for these the ratios of the elements present are calculated in three ways. The *atomic ratio* is the ratio between the number of atoms; thus, for the aluminium, silicon, and oxygen in Al_2O_3,SiO_2 it is 2 : 1 : 5. The *oxygen ratio* is the ratio between the number of atoms of oxygen in the different oxygen compounds present. In Al_2O_3,SiO_2 the O ratio of the Al_2O_3 and SiO_2 is 3 : 2. The *percentage ratio* is the number of parts in 100, and is deduced from the ratio between the atomic weight of the compound and that of each constituent. The atomic weight of Al_2O_3 is 51.5 (old system); of O_3 it is 24; hence, 51.5 : 100 :: 24 : 46.6, the percentage of oxygen. For Al_2 (at. wt. = 27.5) we have 51.5 : 100 :: 27.5 : 53.4, the percentage of aluminium. The at. wt. of Al_2O_3,SiO_2 is 81.5, and that of SiO_2 is 30; hence, 81.5 : 30 :: 100 : 36.8, the percentage of SiO_2 in the compound. The atomic ratio of the constituents may be calculated from their percentage ratio by dividing the latter by the atomic weight of each constituent. In Al_2O_3 the percentage ratio of Al and O is 53.4 : 46.6; hence, $53.4 \div 13.75 = 3.93$, and $46.6 \div 8 = 5.82$, from which we obtain the ratio 3.93 : 5.82, or nearly 2 : 3, the atomic ratio of the aluminium to the oxygen. The ratio of any constituents in a compound may also be obtained by comparing the amounts of oxygen in the percentages of the constituents. Thus, in Al_2O_3,SiO_2 the percentage of $SiO_2 = 36.8$, of $Al_2O_3 = 63.2$. In 100 of SiO_2 there are 53.33 of oxygen; hence, $36.8 \times .5333 = 19.625$; 100 of Al_2O_3 contain 46.6 O; hence, $46.6 \times .632 = 29.45$; then 19.625 : 29.45 :: 2 : 3, and since SiO_2 contains 2O and Al_2O_3 3O, the result shows that the compound contains one of silica and one of alumina, or has the formula Al_2O_3,SiO_2. The atomic ratio is therefore of use in obtaining the formulas of minerals.

Compounds containing two kinds of elements are called *binary*, and one element is regarded as negative to the other. A *ternary* compound contains three kinds of elements, which are so combined as to form a base and an acid. Thus, MgO,SiO_2 contains the base MgO and the acid SiO_2, or the *basic* element Mg, the *acidic* Si, and the *acidific* O. The *replacing power* of the elements is in proportion to their combining power, reckoned in number of atoms of the acidific element, oxygen, sulphur, or whatever it may be. In accordance with this principle, if R represent any basic element, $R_{\frac{2}{3}}O$ may be written for R_2O_3, and may then replace RO in a compound.

According to the new system of chemistry, in the formulas of ternary compounds the acid and base are not written separately, as $2MgO,SiO_2$, but the symbol of each element is written by itself—Mg_2SiO_4. Regarding certain elements as negative to the others, it is held that each element has power to fix a certain number of atoms of a more negative element. The elements are divided into two classes—perissads (περισσός, "odd"), which combine with one another in the ratios 1 : 1, 1 : 3, 1 : 5, taking hydrogen as the unit; and *artiads* (ἄρτιος, "even"), with combining ratios 2 : 2, 2 : 4, 2 : 6, taking the same unit.

In some classes of compounds it is held that only a part of the oxygen present serves to unite the acidic element to the base. For example, in the formula MgO,SiO_2 we have Si combining with 2O, equivalent to 4H, and Mg with 1O, equivalent to 2H. The *tetrad* Si has then four bonds of attraction, and the *dyad* Mg two; O is likewise a *dyad*. Hence, we may represent the combination of Si, Mg, and 3O by the graphic formula $O = Si <{}^{O}_{O}> Mg$, the dashes representing so many bonds of attraction, and indicating that only ${}_2O$ unite the Mg and Si, one O being combined with Si alone. Dana writes this formula $SiO \parallel O_2 \parallel Mg$. The formula $2MgO,SiO_2$ may be represented similarly by $Mg <{}^{O}_{O}> Si <{}^{O}_{O}> Mg$; by $Mg = O_2 = Si = O_2 = Mg$; or, as Dana writes it, $Si \parallel O_4 \parallel Mg_2$. These formulas are written on the principle that the number of atoms of uniting oxygen is equal to the number of bonds of attraction of the basic or acidic element, according as the former or latter has the smaller number. The formulas are similar for sulphur, tellurium, and selenium compounds, and for ternary fluorides.

Form and Structure.—Some minerals occur only in an amorphous state, never showing any signs of crystallization, but the majority are at times well crystallized or distinctly crystalline. Any crystal can be referred to one of six systems, in which the crystal faces are determined by their position in regard to a set of assumed axes intersecting within the crystal. In the *first* (*isometric*) system there are three axes, all equal, and intersecting at right angles; hence this is called the *regular* system. In the *second* (*tetragonal*) there are two equal horizontal axes at right angles, and a third of different length, vertical to their plane. In the *third* (*orthorhombic*) are three unequal axes at right angles. In the *fourth* (*monoclinic*) are three unequal axes, one horizontal, one vertical, and a third inclined to the vertical and making a right angle with the horizontal axis. In the *fifth* (*triclinic*) the axes are all unequal and inclined to one another, one being assumed as the vertical axis. In the *sixth* (*hexagonal*), which is in some respects analogous to the *tetragonal*, are three equal horizontal axes, making angles of 60° with each other, and a fourth of different length, vertical to their plane. The physical characteristics of minerals in the isometric system are the same in the direction of any crystal axis, or any line symmetrically situated with reference to these axes; in the tetragonal and hexagonal systems they will be different in the direction of the vertical and of the horizontal axes. In minerals crystallizing in the third, fourth,

and fifth systems, authorities sometimes differ in the selection of the vertical axis, being guided by questions of cleavage, simplicity of form, and analogy.

The crystalline form is very useful in distinguishing minerals, because it is an established fact that the angle between any two faces of a crystal will, under similar conditions, always be the same for the same minerals, subject to slight variations corresponding to changes in the composition of the varieties of the mineral. The similar faces may vary greatly in size, so that one or more faces may almost or entirely disappear, but the angles between the similar faces will remain the same.

Isomorphism, or the property of similar substances to crystallize in very similar forms, admits of their mutual replacement in crystallized minerals, this replacement being often accompanied by a slight change in the angles of the crystals. Thus, lime, magnesia, the protoxides of iron and manganese, and oxide of zinc, are isomorphous bases, and yield very similar crystals when combined with the same acid. Hence, the close relation between the forms of calcite, dolomite, and the related minerals. *Dimorphism* is the property of the same substance to crystallize in two different systems, or two different types of the same system; thus, carbonate of lime appears in the hexagonal system as rhombohedral calcite, and in the orthorhombic as aragonite. *Trimorphism* and *polymorphism* refer to crystallization in more than two forms. *Pseudomorphism* is the assumption by one mineral of the peculiar form of another, but the second mineral always retains its own internal structure and physical characteristics. Pseudomorphs may result from the deposition of one mineral upon another, followed by the removal of the first mineral by solution, and subsequent filling up of the mould thus formed with the material of the second mineral; by filling up of the cavity left by previous removal, through solution or otherwise, of the first mineral from its matrix; by alteration of the original crystal through removal or addition of some components; or, lastly, by simple molecular change within the mineral, which is possible only in case of dimorphous substances, as in the alteration of andalusite into cyanite.

A distinction is made between crystallized and crystalline minerals, the latter not showing free or partially individual crystals. If a crystalline mineral does not even show recognizable individuals, it is called cryptocrystalline. Crystalline minerals are classified, according to their structure, into *granular, lamellar, scaly, radiated,* and *fibrous.*

Lamellar structure is described as *parallel, divergent,* etc.

In amorphous minerals there is no trace of crystalline form or special characteristic of structure due to individual crystals, although an intermittent deposition of the mass composing the mineral may have occasioned differences of color, hardness, and texture. The majority of the solid amorphous minerals are the result of a gradual change from a gelatinous state, or of rapid cooling from a melted condition, but many of them are the result of the alteration of pre-existing minerals.

Cleavage, or the tendency to split in certain directions, is characteristic of most crystallizable minerals, and is of great use in determining minerals, the cleavage planes being always the same for the same mineral, no matter what the modifications of the crystal. Thus, *calcite*, whether occurring as a rhombohedron or a hexagonal prism, will cleave always parallel to the faces of the type rhombohedron of calcite; *fluorite*, whether occurring in cubes, octahedrons, or any other form of the isometric system, will always cleave parallel to the faces of the octahedron. Cleavage takes place parallel to certain planes, but there may be two or more sets of cleavage-planes in the same crystal, and in this case the cleavage will be easier parallel to one set of planes than to another, but will always be easiest parallel to the same planes. Thus, *orthoclase*, in the monoclinic system, has a very perfect cleavage parallel to the base of the prism, a less distinct cleavage parallel to the clino-pinacoid, faint parallel to the ortho-pinacoid, and only in traces parallel to one face of the prism. Some minerals are devoid of cleavage, especially the amorphous minerals and native malleable metals, while the cleavage of some minerals, like mica and gypsum, is so perfect that they can be easily split into very fine laminæ. Other minerals have a distinct cleavage, which may be very hard to obtain, as in quartz, while some, like argentite, show scarcely any traces of cleavage.

Fracture differs from cleavage in not being parallel to fixed planes. It is classified as conchoidal, even, and uneven, according to the shape, and smooth, splintery, earthy, and hackly (like broken copper), according to the nature of the resulting surface.

Hardness.—Minerals vary in hardness, from the liquid hydrocarbons and water to the diamond. Hardness does not usually vary much for the same mineral, and is therefore a valuable aid in determining minerals. Its degree is ascertained by reference to the following scale, beginning with the softest: 1, talc; 2, gypsum; 3, calcite; 4, fluorite; 5, apatite; 6, orthoclase; 7, quartz; 8, corundum; 9, diamond. A mineral scratched easily by apatite, and easily scratching fluorite, would be fixed at 4.5.

According to their *tenacity*, or resistance to blows and cutting edges, minerals are classified as *brittle, sectile, malleable,* and *flexible*, the latter being *elastic* or *non-elastic*. It has been shown that the degrees of tenacity depend properly upon the elasticity of minerals.

Specific gravity is confined to narrow limits in its variations for the same minerals, and is of importance in distinguishing them.

Magnetism, or the power of affecting the magnetic needle, is possessed by a few minerals containing the magnetic oxide or sulphide of iron, and *magnetite* sometimes possesses polarity.

Electricity is developed in all minerals by friction; certain minerals become electric by pressure, cleavage crystals of calcite showing positive electricity when pressed between the fingers; others show electrical disturbance on warming, and are called *thermo-electric*. When opposite kinds of electricity are simultaneously developed at opposite parts of such crystals, they are said to possess polar thermo-electricity, and certain of these crystals are *hemimorphic*, or have different faces at their opposite ends. Tourmaline affords a very striking example of polar thermo-electricity.

Optical Properties.—All transparent crystals not belonging to the isometric system (anisometric) possess *double refraction*, or divide into two rays a ray of light passing through them. One of these rays follows the ordinary law of refraction, and is called the *ordinary* ray, while the other is called the *extraordinary* ray. A ray of light passing through a doubly refracting crystal may escape double refraction if it passes through in certain directions, according to the crystalline system. These directions are called the *optical axes*. In crystals belonging to the tetragonal and hexagonal systems there is one optical axis, parallel to the vertical axis, and such crystals are called *uniaxial*. The other systems are *biaxial*, and the two axes of refraction lie in one of the three planes passing through any two of the crystallographic axes, and are usually symmetrically situated with reference to the crystallographic axes in the same plane. The angle between the optical axes is called the optic-axial angle. A line bisecting the acute optic-axial angle is called the *acute bisectrix*, or simply *bisectrix*, and one bisecting the obtuse angle, and which is at right angles to the acute, is the *obtuse* or *conjugate bisectrix*. The optic-axial angle may vary widely for different varieties of the same mineral, but the position of the bisectrix is nearly constant. In the orthorhombic system the bisectrix is parallel to one of the crystallographic axes.

The emerging doubly refracted rays are *polarized*, but this phenomenon disappears when the light passes in the direction of an optical axis, and in the case of easily cleavable minerals we can readily determine whether they are uniaxial or biaxial by examining thin laminæ between two crossed Nicol's prisms or other suitable apparatus, because uniaxial crystals cleave best parallel to the base, and hence normal to the optical axes, while very cleavable biaxial crystals cleave best parallel to the base or one of the pinacoids, and would have neither of the optical axes normal to the laminæ.

Sections of doubly refracting crystals of proper dimensions exhibit colored rings when examined by convergent polarized light, owing to the interference of the rays. Uniaxial crystals show one set of rings, intersected by a dark cross; biaxial crystals, one or two systems of elliptical rings, crossed by a dark band. Although *quartz* belongs to the hexagonal system, yet a section of a quartz crystal vertical to the optical axis exerts double refraction in a peculiar way, the rays progressing not in direct oscillations, but with varying velocity in circular oscillations, producing what is called *circular polarization*.

Certain isometric crystals sometimes show double refraction, especially *senarmontite, diamond, boracite, analcite,* and *alum*. This is owing sometimes to incipient alteration; sometimes, perhaps, to pressure exerted by gases within the crystal; sometimes to interposed layers of some doubly refracting mineral; and sometimes, perhaps, to a lamellar structure of the mineral itself, which produces the same results as a system of glass plates, and has given the name of *lamellar polarization* to the phenomenon.

Some crystals transmit light of different colors and intensity in different directions. This property is called *pleochroism*, and belongs more or less to all crystals not isometric. Colorless crystals cause only variation in the intensity of the light—colored crystals in the color also. Uniaxial crystals are *dichroic*, and biaxial crystals *tri-*

chroic. The phenomenon is closely connected with double refraction, as the two rays suffer different absorption, and in general the more refracted ray also suffers the greater absorption. The phenomenon is observed by means of the *dichroscope.*

Labradorite, chrysoberyl, and other minerals show a peculiar change of color in reflected light, attributed partly to the presence of microscopic lamellæ and scales of foreign minerals, partly to very minute fissures in the mass of the mineral. *Asterism,* sometimes resulting in the appearance of a star, as in certain sapphire crystals, sometimes as a changeable streak of light across the fibres of certain varieties of gypsum, etc., is allied to the above phenomenon.

Lustre, Color, and Translucency.—Minerals are divided according to their *lustre,* or appearance in reflected light, into two grand classes, *metallic* and *non-metallic,* and the non-metallic again into adamantine, vitreous, greasy, pearly, silky, and lustreless or earthy. *Color* is always the same, and characteristic in the case of some minerals, as metals, pyrites, the sulphides, certain metallic oxides, and salts; others are white or colorless and transparent, like ice, quartz, many silicates, etc., but these may be colored by mechanical admixture or isomorphous combination of colored constituents. The colors of minerals vary greatly, and so does their translucency, the native metals and minerals with metallic lustre being generally quite opaque, even in very thin films.

Phosphorescence is induced in some minerals, as diamond and calcined barite, by exposure to daylight; in others, topaz and fluorite, by warming, by electricity, or by mechanical disturbance, as pressure, cleaving, etc. The *taste, smell,* and *feel* of minerals are additional means of distinguishing them.

Classification.—For a long time mineralogy as a systematized science was in a very confused state, minerals and rocks (often only aggregates of different minerals) were confounded together, and widely different minerals were placed in the same classes. Cronstedt, about 1758, pointed out the difference between a rock and a mineral; De Lisle soon after applied crystallography to the study of minerals, and finally Mohs produced a natural system, founded chiefly on external characteristics. In the early part of this century Berzelius introduced chemistry in classifying minerals, and at the present day chemistry, combined with crystallography, forms the basis of the generally accepted systems of mineralogy. Dana's system of mineralogy, as given in the fifth edition of his work on the subject, an unexcelled example of research and judgment, may be cited in illustration of the chemical grouping of minerals combined with crystallography. He first arranges the elements into three series, beginning with the more basic, then the more negative, and finally the eminently negative: *Series I. gold group,* gold, silver; *iron group,* platinum and allied metals, mercury, amalgams, copper, iron, zinc, lead; *tin group,* tin. *Series II. arsenic group,* arsenic, antimony, bismuth; *sulphur group,* tellurium, sulphur, selensulphur; *carbon-silicon group,* diamond, graphite. *Series III.* Chlorine, bromine, iodine, fluorine, oxygen. The gold group also includes hydrogen and the alkali metals; the arsenic group, phosphorus, nitrogen, and probably boron; the iron group, calcium, magnesium, aluminium, cobalt, nickel, zinc (chromium, manganese, lead, in part, etc.); the tin group, titanium and zirconium. The general subdivisions are then as follows: I. native elements; II. compounds, the more negative element an element of Series II. (1) Binary—sulphides, tellurides of metals of the sulphur and arsenic groups; (2) binary—sulphides, tellurides, selenides, arsenides, etc. of metals of the gold, iron, and tin groups; (3) ternary—sulpharsenites, sulphantimonites, sulphobismuthites. III. Compounds, the more negative element belonging to Series III., Group I.: chlorides, etc. IV. Compounds, the more negative element of Series III., Group II.: fluorides. V. Compounds, the more negative element of Series III., Group III. Oxygen compounds: (1) Binary—oxides; (2) ternary, the basic element of Series I., the acidic of Series II., the acidific of Series III. (1) silicates; (2) columbates, etc.; (3) phosphates, etc.; (4) borates; (5) tungstates, etc.; (6) sulphates, etc.; (7) carbonates; (8) oxalates. VI. Hydrocarbon compounds. The silicates may serve as an example of the further arrangement into groups and species. First, they are divided into anhydrous and hydrous silicates, and each of these into bisilicates, unisilicates, and subsilicates. In the anhydrous silicates the oxygen ratio for bases and silica is for the bisilicates 1:2; unisilicates, 1:1; subsilicates, 1: less than 1. The bisilicates are arranged into groups: amphibole group, crystallization orthorhombic or clinohedral; angle of prism not 120°: beryl group, hexagonal; pollucite group, isometric. The amphibole group has sub-groups: *pyroxene sub-group,* angle of prism, 86°–88°; composition, RO,SiO_2 or $(3RO,R_2O_3)3SiO_2$, and when both RO and R_2O_3 are present, ratio of $3RO:R_2O_3 = 3:1$ to $1:2$. *a,* Orthorhombic; *b,* monoclinic; *c,* triclinic. *Spodumene sub-group,* angle of prism, 86°–88°; composition $(3RO,R_2O_3)3SiO_2$, and $3RO:R_2O_3 = 1:4$. *Amphibole sub-group,* angle of prism, 123°–125°: *a,* orthorhombic; *b,* monoclinic.

The sulphides, etc. of the gold, iron, and tin groups may serve for further illustration. There are three divisions: (1) *Basic,* atomic ratio between the sulphur, arsenic, etc. and the basic metal is less than one to one; (2) *Proto,* with the ratio 1:1; (3) *Deuto,* ratio 2:1. The *Proto* division has four groups: (1) *Galena group,* isometric, holohedral; (2) *Blende group,* isometric, hemihedral; (3) *Chalcocite group,* orthorhombic; (4) *Pyrrhotite group,* hexagonal. The *Deuto* division has two groups: (1) *Pyrite group,* isometric; (2) *Marcasite group,* orthorhombic. H. B. CORNWALL.

Mineral Oil. See PETROLEUM.

Mineral Pitch, Resin, etc. See BITUMEN.

Mineral Point, post-v. of Washington co., Mo., on the Iron Mountain R. R., at the junction of the Potosi Branch R. R., has valuable lead-mines.

Mineral Point, post-v. of Conemaugh tp., Cambria co., Pa., on the Pennsylvania R. R. Here semi-bituminous coal is mined and shipped by rail.

Mineral Point, post-v. and tp. of Iowa co., Wis., 175 miles N. W. of Chicago, on the Mineral Point R. R., has 1 seminary and high school, 6 churches, 1 bank, 2 printing-offices, 1 monthly and 2 weekly newspapers, 1 zinc and 2 lead furnaces, 2 iron-foundries, a planing and several grist mills, a car-shop. Pop. of v. 3275; of tp. 4825.

W. H. BENNETT, ED. "MINERAL POINT TRIBUNE."

Mineral Ridge, post-v. of Austintown tp., Mahoning co., O., on the Niles and New Lisbon R. R., has several productive coal-mines.

Mineral Springs. See GEOLOGY, CHEMICAL, and WATER.

Mineral Springs, tp. of Greene co., Ill. Pop. 1181.

Mineral Springs, tp. of Richmond co., N. C. P. 1040.

Mineral Tallow, or **Hatchettine,** a fossil hydrocarbon, found in iron-stone nodules and in coal. It seems to be a fossil resin.

Mineral Veins and Deposits. See ORE DEPOSITS.

Mineral Waters. See WATER.

Mineral Wax. See PARAFFINE.

Miner'bio, town of Northern Italy, in the province of Bologna, about 16 miles N. E. of the city of Bologna. It lies in a fertile plain, and has an industrious population of 7244 (in 1874).

Mi'nersville, a v. of Trinity co., Cal. Pop. 102.

Minersville, post-v. of Sutton tp., Meigs co., O., on the Ohio River. Coal is mined, and salt extensively manufactured from salt-wells. Pop. 1000.

Minersville, post-b. of Schuylkill co., Pa., on the Mine Hill branch of the Philadelphia and Reading R. R. and the West Branch of the Schuylkill River, and the terminus of the People's Passenger R. R., has 2 public schools, 11 churches, 1 weekly newspaper, 1 library, excellent water-works, a good fire department, 2 foundries, 1 anthracite furnace, and 200 business-firms. Principal occupation, coal-mining. Pop. 3699. C. D. ELLIOTT, ED. "REPUBLICAN."

Minersville, post-v. of Beaver co., Ut., near Little Salt Lake, in a productive gold district.

Miner'va, a great Roman divinity, the virgin daughter of Jove, early identified with the Greek Athena, whom she much resembled. She was the patron of the arts and of all crafts requiring skill and tact, the inventress of wind instruments, and the frequent guide of men in battle and on other dangerous occasions. She ranked third among the gods of the Capitol. Like Athena, she took a profound interest in human affairs, and her worshippers seem to have been inspired with a profound reverence for her.

Minerva, post-tp. of Marshall co., Ia. Pop. 680.

Minerva, post-v. of Mason co., Ky., 15 miles W. of Maysville. Pop. 159.

Minerva, post-tp. of Essex co., N. Y., in the Adirondac region, 10 miles N. E. of North Creek Station, has extensive forests, a cave, an iron-mine, manufactures of leather, lumber, and is a place of summer resort. Pop. 908.

Minerva, post-v. of Paris tp., Stark co., O., about 70 miles S. S. E. of Cleveland, on the Tuscarawas branch of Cleveland and Pittsburg R. R., has 4 churches, 2 produce warehouses, 4 hotels, a foundry, 2 banks, 1 newspaper, 1 planing-mill, 1 furniture-factory. Pop. about 1200.

WEAVER BROTHERS, EDS. "MINERVA COMMERCIAL."

Minervi'no Mur'ge, town of Southern Italy, in the province of Bari delle Puglie. This rich and commercial city is situated on an eminence about 24 miles from Barletta; its climate is healthy, its buildings are respectable, and from the extent and grandeur of the view it commands it has been called the "balcony" of Apulia. Pop. in 1874, 13,844.

Mines, Coal, and Mining. See MINING ENGINEERING.

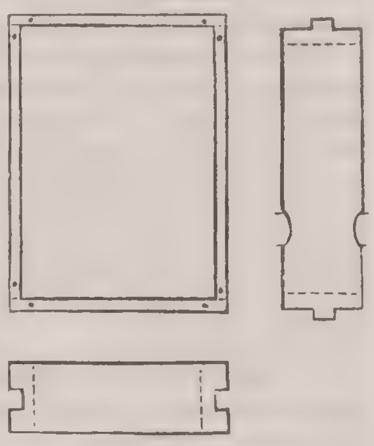
Mines, Military. I. *General Definitions.*—The term military mine originally signified a subterranean passage. In modern warfare the object of such a passage is usually to deposit a quantity of powder for subsequent explosion, and the term is now employed to designate the charge as well as the passage leading to it. This subterranean passage is called a shaft when it is vertical, a gallery when it is horizontal or inclined and exceeds in dimensions $3' \times 4'$, and a branch when it is under these dimensions. When a gallery or branch is inclined it is called ascending or descending, according to the direction of its inclination. Mines used in the attack are generally called simply mines; in the defence, countermines. In the latter the principal communications, being generally prepared long in advance, are lined with masonry; in the former wood is used for lining.

II. *Communications for Mines of Attack.*—The names and dimensions in the clear of the galleries employed in the attack are—

1st, *Great Gallery*, 6′ 6″ high and 7′ wide, used for the descent into the ditch and passage of cannon.
2d, *Principal Gallery*, 6′ 6″ high and 3′ 6″ wide, used for the descent into the ditch and passage of troops two abreast.
3d, *Common Gallery*, 4′ 6″ high and 3′ wide, used for all the general purposes of the attack, being executed more rapidly than any other.
4th, *Branch*, 3′ 6″ high and 2′ 6″ wide, used to reach a position adjacent to a gallery; is too small to work in for a distance greater than ten or twelve feet.

The wooden linings are of two kinds—viz. frames and sheeting, and cases. With the former stout frames are placed at intervals of about 4 feet, and outside them sufficient sheeting planks to prevent the earth falling in. In shafts two pieces of sheeting on a side, and in galleries sheeting for the top only will generally be required; but the case sometimes occurs when it is necessary to close-sheet all round. A mining case consists of four pieces of plank arranged with mortises and tenons (Fig. 1). The cases being fitted together, are placed touching each other, so as to form a continuous lining. Notches are cut in the uprights to facilitate handling them. In both frames and cases the pieces laid on the ground are called groundsills, the uprights stanchions, and the top-pieces capsills. In our service frames and sheeting are preferred to the other kind of lining, though the use of either has been exceedingly limited.

Fig. 1.



In driving long galleries great care must be taken to provide ventilation. A current of air may be produced by boring a hole upward to the surface; or by a fire arranged so that its supply of air must come from the gallery; or by mechanical means, such as a bellows or ventilating-fan. Should there be two galleries parallel to each other, communication opened between them will produce a current.

III. *Loading and Firing Mines.*—The cavity excavated to receive the powder is called the chamber. It is usually placed at the extremity of a branch, and is cut at right angles to it. In dry soil the powder is deposited in bags, these being kept from contact with the ground by straw or brushwood. In damp soil the bags must be coated with waterproof composition, or the powder put into a water-tight box. The powder, having been deposited, is connected with the surface by a fuze in the shape of the ordinary safety-fuze, powder-hose, or electric wires, generally the latter. To prevent the force of the explosion acting in the direction of the gallery, it is necessary to fill the latter up for a certain distance with solid materials. This operation is called tamping. To get the full effect of the powder, the tamping should extend from the charge a distance of at least one and a half times the line of least resistance. (See IV. below.) A given effect may be produced, however, with less (and indeed without any) tamping, provided the charge be sufficiently increased, though it is at the cost of considerable damage to the gallery. When the tamping is diminished one-third, the charge should be increased one-fourth; when two-thirds, the charge should be increased one-half; and when the mine is not tamped, the charge should be doubled. The materials used for tamping may be the earth just excavated or sand-bags—*i. e.* bags filled with earth or sand. The latter are the better, as they are more quickly deposited. Those farthest from the chamber are also more readily removed after the explosion; the consistency of the others is destroyed.

Mines may be fired (or, as it is technically termed, sprung) by electricity, by the ordinary safety-fuze, or by powder-hose. The first is by far the preferable method. Powder-hose is a long cylinder of linen or calico, about an inch in diameter, filled with powder. The cylinder having been prepared is filled from the top of a house. The outer end is ignited by a piece of portfire or safety-fuze. The powder-hose by its explosion itself poisons the galleries, and it is not well adapted to the simultaneous explosion of several mines. The same may be said, to a lesser degree, of safety-fuze. They are resorted to only when there are no facilities for creating the electric current.

IV. *Charges and Nomenclature.*—The explosive used in military mines is generally gunpowder—nitro-glycerine, gun-cotton, and other violent explosives being too sudden in their action to have the lifting effect required. These compounds may sometimes be used in small mines in a rigid medium like rock or masonry, where a sudden blow will do the work required; but they are not suited to the general purposes of the military miner.

The effects caused by an explosion underground depend upon the quantity of powder, upon its depth below the surface, and upon the nature of the soil. Besides the disturbance at the surface, there is a violent internal commotion which extends in all directions. The distances to which this commotion extends are called the radii of rupture. When the charge is so small as not to produce any effect at the surface, the radii of rupture are equal in all directions; but when the charge is sufficiently large to produce a crater, the horizontal radii of rupture are much greater than the vertical radii. The radius of the circular opening on the ground is called the radius of the crater. The shortest line drawn from the centre of the charge to the surface of the ground is called the line of least resistance, and is always measured in feet. The line drawn from the centre of the charge to the edge of the crater is called the radius of explosion. A crater of which the diameter is equal to the line of least resistance is called a one-lined crater; when the diameter is double the line of least resistance, a two-lined crater, and so on. Mines charged so as to produce two-lined craters are known as common mines, and are those generally employed to produce destructive effects at the surface. If more heavily charged, they are called globes of compression or overcharged mines; these are employed to produce destructive effects beneath the surface; for example, to destroy the enemy's galleries. Those with smaller charges are called undercharged mines, and are frequently used by the defence to avoid making large excavations in which the enemy can obtain cover for a lodgment. Those with charges so small as not to produce any crater are called camouflets; they are used to blow in the wall of earth remaining between two hostile miners. A small mine, with a line of least resistance not greater than 10′, formed by sinking a shaft from the surface of the ground and placing the charge at the bottom of it, is termed a fougasse; its object is somewhat similar to that of the more modern torpedo. A stone fougasse consists of an excavation in the form of a frustum of a cone, with its axis inclined towards the enemy, at the bottom of which is placed a charge of powder. The powder is covered with a platform of planks, and this with a heap of stones or bricks. The explosion throws the latter forward, scattering them over a large surface. Its action resembles that of a mortar, and it is not strictly a mine, though generally classed as such.

Charges are said to be at one, two, three, etc. lined intervals when the distances between their centres are respectively one-half, two-halves, three-halves, etc. of the sum of their lines of least resistance. It is generally assumed that the volume of a two-lined crater is equal to four-sixths of the cube of the line of least resistance.

The following are the formulæ employed at Chatham, England, for calculating the powder-charges of mines and their radii of rupture in earth. Representing the radius of the crater by r, the charge of powder in pounds by c, and the line of least resistance by l,

In a common mine, $c = \frac{1}{10} l^3$.
In an overcharged mine, $c = \frac{1}{10} [(r - l)0.8 + l]^3$.
In an undercharged mine, $c = \frac{1}{10} [l - (l - r)0.8]^3$.

An undercharged mine becomes a camouflet when the value given to r in the equation is less than $\frac{3}{8} l$.

The horizontal radii of rupture are—

In a common mine, $\frac{7}{4} l$.
In an overcharged mine, $\frac{7}{4} [(r - l)0.8 + l]$.

The vertical radii of rupture are—

In a common mine, $l\sqrt{2}$ or $l \times 1.4142$.

In an overcharged mine, $[(r-l)\,0.8 + l]\sqrt{2}$.

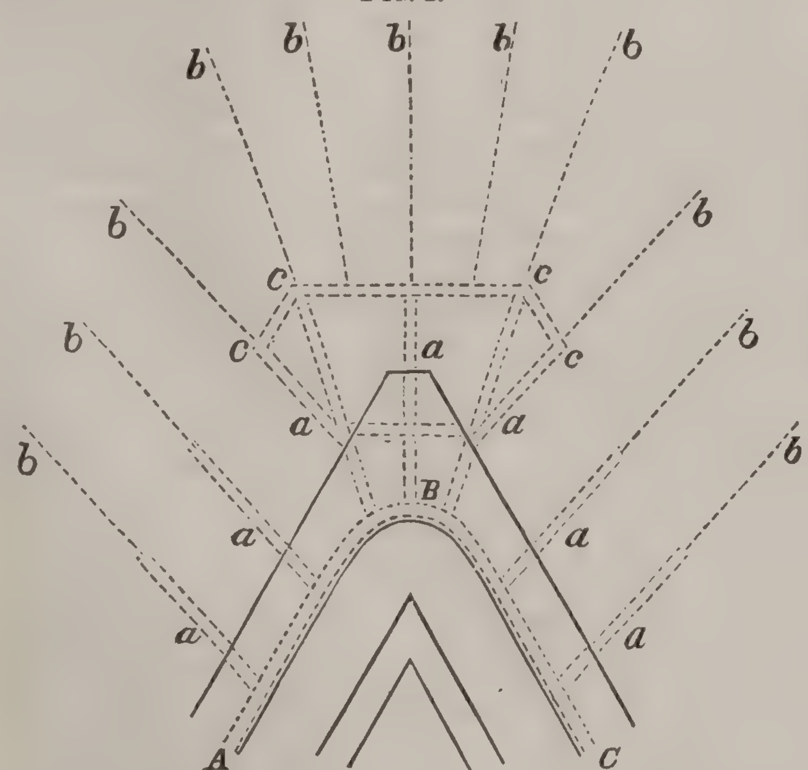
The quantity of powder for a common mine in earth having been found by the above formula, the proper amount for a different medium may be obtained with sufficient approximation by multiplying the calculated amount by

1.25 for dry sand;
1.31 " wet sand;
1.41 " earth mingled with stones;
1.55 " clay mingled with tufa;
1.66 " poor masonry;
2.25 " rock;
2.50 " good masonry.

V. *Countermines.*—The object of countermines has been, in the past—1st, to repel the enemy's miner; 2d, to annoy the besieger by their powerful moral effect; and, 3d, to overthrow the siege-works erected near the fortress, such as trench cavaliers, saps, and breaching batteries. The increased power of modern artillery has rendered them less necessary for the last-mentioned purpose, but at the same time has made it more probable that they will be needed for the first, since an attacking force, finding its advance more difficult on the surface, will resort more frequently to underground works. A system of countermines consists of two parts—viz. that exterior to the main ditch, and that under and within the main ditch. The two leading principles to be observed in its arrangement are—1st, to make each group of chambers and branches independent of the others, by giving it a separate communication with the main gallery in rear, so that the destruction of one group may not paralyze another; and, 2d, to present the ends of galleries to the blows of the enemy, rather than the flanks, since the effects of his globes of compression are thus much diminished.

Fig. 2 shows an arrangement of the most important galleries in a system of countermines. The continuous gallery A B C is placed behind the counterscarp, and is the base of the first part of the system; it is called the counterscarp gallery. The galleries *a a a* are called galleries of communication. The galleries *b b b*, of which the function is to reconnoitre the enemy's miner, are called listening galleries. The galleries *c c c* are called transversals; their object is to facilitate ventilation and the service of the mines. In the second part of the system—not shown in the diagram—the mines under the ditch, having for their main object to disperse the débris from the breaches, are placed in front of the foot of the scarp. Their branches debouch from a gallery behind the scarp and about twenty yards from it, called the scarp gallery. This gallery serves as the base to all the mines within the scarp.

Fig. 2.



Only such galleries are constructed in masonry in time of peace as are under the close protection of the works on the surface; since if they are carried far out, the enemy who, it must be assumed, knows their position, can pass rapidly over and thus paralyze a part of them.

VI. *Subterranean Warfare.*—The attack and defence by mines is not limited to the case of a regularly countermined fortress. Countermines may often be improvised after the investment of a place. In the attack the miner should advance by several galleries, the outer or flank ones being guarded by branches as listeners, and should push his advance with great vigor, at the same time taking all precautions to discover the enemy and to conceal his own approach. Upon discovering the enemy's presence, he must at once establish globes of compression, to destroy the countermines. But before springing them he must prepare for the following operations, which are to immediately follow: viz. 1st, to occupy and intrench himself in the craters; 2d, to construct shelters for the troops ordered to protect them from sorties; and, 3d, to establish surface communication between them and his trenches. The latter is done by means of the sap, and by intermediate small mines which are sprung at the same time as the globes. As soon as he has occupied the craters, the besieger should sink a shaft and debouch with his galleries. These will generally be directed straight to the front to continue the attack, but sometimes also in a lateral direction, either to unite two craters by the explosion of intermediate small mines, or as a precaution to guard his flanks. Should he be unable to advance with galleries, he may pass rapidly over the surface with the flying sap, and sink a shaft over the countermines. This shaft, being heavily charged, may be fired without tamping, and will crush in the galleries near it. It is called a shaft of attack.

Should the enemy open a crater by the explosion of a countermine, the besieger will occupy it and proceed to search for the gallery leading to it. Having taken possession of the gallery, he may convert it into a trench by the simultaneous explosion of heaps of powder deposited in it from distance to distance. The besieger should use large charges of powder, as a general rule employing globes of compression.

In the defence the besieged should suspend his labors several times a day to listen. As soon as he hears the enemy, he should push forward a branch to meet him; or he may at once excavate a chamber and load it as a camouflet, and then wait until the enemy is near enough. The object of the besieged is to destroy as much of the enemy's galleries as possible, while at the same time he avoids producing deep craters at the surface in which his enemy can make a lodgment. Hence, he should place his mines at such a depth that, even while he employs considerable charges, these shall not produce extensive craters, and he must not spring them until the distance of the enemy is less than the line of least resistance. Under favorable circumstances he should himself occupy a crater. After the enemy has sprung his globes of compression, the besieged, besides keeping up a heavy artillery fire on the craters, should at once advance with numerous branches close up to them, in front and on both flanks. If he succeeds in preventing the enemy from debouching with a gallery, he proceeds to drive him out of the crater by further explosions. He opposes the sinking of shafts of attack over his countermines by countershafts, made by boring a hole upward, loading, and firing it. He repels the storming of his galleries by barricading his loopholed doors, and firing a smoke-ball on the enemy's side; the latter being thus driven away, he has time to effect an explosion which shall destroy a portion of his gallery, and thus raise an effective barrier.

VII. *Sketch of the History of Mining.*—Military mines have been used in war since long before the Christian era. They were originally employed by the attack to obtain secret access to the interior of the besieged place, and later to reach the foundations of fortress walls, under which considerable excavations were made, the walls being supported by temporary props of timber which were afterwards set on fire. The defence was not slow to adopt this weapon, and employed it to oppose the attempts of the enemy to fill up the ditch, by carrying away from below what he deposited above, and to make cavities under the heavy movable towers and battering-rams, into which these machines were to fall, thus becoming disabled. Subterranean combats with the sword and buckler were not uncommon even as late as the Middle Ages. At the siege of Melun, in 1420, the besiegers excavated a mine and the besieged a countermine, in which they held a sort of tournament, in which Henry V. of England and the duke of Burgundy took part.

Gunpowder had been discovered for nearly two centuries before it was applied to mines, and the first attempt to use it was unsuccessful. In 1487 a Genoese engineer opened a breach with gunpowder in the citadel of Sassano in Tuscany, but the breach was incomplete and produced no results. This attempt was witnessed by Pedro Navarro, a Spanish captain, who in 1500 repeated the experiment in the island of Cephalonia, and with more success. Three years later, at the Chateau d'Œuf at Naples, he obtained a success so striking that mining became at once the means generally employed for destroying works of defence. It was so efficient that sometimes when the besieger had prepared his mine he would invite the besieged to inspect it, and the latter having verified its existence, would surrender at once. This occurred at Milan in 1515.

The first efforts of the defence to repel this method of attack were of a passive nature. They excavated galleries

either in front of or behind the foundations. By the former they cut off the approach of the enemy, and lying in wait for him attacked him as soon as he made his appearance. By the latter they sought to draw the action of the enemy's mine away from their walls, by allowing it to vent itself in the direction of their gallery, rather than against the wall. Sometimes they advanced to the chamber while the enemy was tamping, and either cut off the powder-hose or carried away the powder. But the besieged soon passed to a more active defence. He surrounded his ramparts with galleries, from which ran out branches provided with mine-chambers established at different depths, and he destroyed by successive explosions the works of the besieger as he advanced. Arranged under the glacis, the countermines prevented the enemy crossing it and establishing his breaching and counter batteries; under the bottom of the ditch they served to destroy the works of the passage, and to remove the débris at the foot of the breaches; in the body of the parapet they obstructed the assault. Their utility was so evident that all the great powers organized and attached to their military forces bodies of miners.

During the eighteenth century vast systems of countermines were proposed by various authors, and some of them were in part executed. Mines were arranged in several tiers, so as to blow up the same portion of ground several times, and some were advanced as far as the second parallel. One writer (Delorme) claimed that he could blow up the same portion of ground as many as thirty times. Another (Dubuat) proposed to go below the water-level, so as to be certain of getting lower than his enemy. The enormous cost of these systems was an objection, but the great advantage of being the first in possession of the ground caused some of them to be executed on a large scale at many of the European fortresses. In subterranean warfare the attack could not take advantage of its preponderance in numbers, and the defence seemed to resume once more its superiority. This state of affairs was based upon the generally received opinion that no crater could be formed of which the diameter should be greater than twice its depth, and that the interior effect of an explosion was very limited. About the middle of the eighteenth century Belidor discovered the fallacy of this opinion, and thereby revolutionized the whole art of subterranean warfare. He found that by using very large charges he obtained an interior commotion sufficient to destroy galleries at a distance equal to four times the line of least resistance. He gave to mines so charged the name of "globes of compression." By their employment the besieger could clear the ground for a considerable distance without coming himself within range of the more limited mines of defence. They were first used in war at the siege of Schweidnitz in 1762. These globes, however, required considerable time for their preparation, since to give them a long line of least resistance it was necessary to descend to a considerable depth below the surface and employ a long branch to give room for the requisite tamping. This enabled an active enemy to place a small mine near them and destroy them; until Mouzé discovered that by increasing the charge the tamping might be diminished.

Belidor's globes of compression had an effect upon systems of countermines similar to that which artillery had upon fortifications; that is, it became necessary for the defence to be an active and not a passive one. The complicated and costly system of countermines gave way to simpler preliminary arrangements, with a view to greater vigilance and activity during the time of action. Some military engineers have proposed to drop countermines altogether, but that, it is believed, they cannot afford to do.

The most recent employment of mines on a large scale was at the siege of Sebastopol in 1855. An excellent account of them is given in the *Défense de Sebastopol, exposé de la Guerre souterraine*, prepared under the direction of Gen. Todleben by Col. Frolow of the engineers, and printed at St. Petersburg in 1870, to which the reader is referred for an illustration of the subject. O. H. Ernst.

Mine'ville, post-v. of Moriah tp., Essex co., N. Y., on Lake Champlain and Moriah R. R., has valuable iron-mines.

Minghet'ti (Marco), b. in Bologna, Italy, in 1818; studied physical and social science almost without assistance, and as soon as he was of age he travelled extensively in Italy, France, and Germany. In 1846 he pronounced a discourse at Bologna on the corn-law reform in England, declaring himself in favor of free trade. His next work was a *Dialogue on the Philosophy of History*. In 1854 he published an essay on the *Decay of the Fine Arts* and a eulogy on Gastano Recchi; in 1859 a treatise entitled *Della Economia publica, delle sue attinenze con la morale e col diritto*, which is the most remarkable of his works. Meanwhile, Minghetti had established in 1846 a journal, *Il Felsineo*, which gave him great consideration at Bologna. In 1847 he was invited to Rome as member of the Consulta della Finanze. In 1848 he was named by Pius IX. minister of public instruction, but on the defection of the pope from the liberal cause Minghetti left the ministry and hastened to the Lombard camp, where he was appointed captain on the staff of Carlo Alberto. After the battle of Goito he was created major, and after that of Custoza (1848) he was decorated by the hand of the king himself. Rossi invited him to form a part of his constitutional ministry. Minghetti arrived at Rome on the very day of the assassination of his friend, and at once published an indignant protest against the infamous crime. Pius IX. desired Minghetti to take the place of the murdered minister, but he refused, and returned to the Piedmontese army. After the battle of Novara he gave himself up to his private studies, taking part in politics only when it was necessary to sustain the policy of Cavour. In 1858 he went to Egypt and Sinai; in 1859 he was appointed by Cavour secretary-general of foreign affairs, and contributed powerfully to secure the annexation of the duchies and of the Romagna. After the peace of Villafranca he became a member of the assembly of the Romagna, and upon the annexation he was elected member of Parliament from Bologna. In 1860, Minghetti was named minister of the interior, in 1862 minister of finance, and at the same time president of the council; in 1864 he effected a loan of 700,000,000 francs, and with the concurrence and aid of Peruzzi brought about the famous September convention which transferred the capital of the kingdom of Italy to Florence. In the Menabrea ministry Minghetti was at the head of the agricultural and commercial department. At present (1875) he is president of the council and minister of finance, and is equally distinguished as a cultivated and powerful writer and an eloquent orator.

Min'go, tp. of White co., Ark. Pop. 80.

Mingo, tp. of Bates co., Mo. Pop. 789.

Mingo, tp. of Sampson co., N. C. Pop. 1240.

Mingo, tp. of Williamsburg co., S. C. Pop. 627.

Mingo, tp. of Randolph co., West Va. Pop. 537.

Min'ho, or **Entre Douro-e-Minho,** the northernmost, the most densely peopled, and the best cultivated province of Portugal, is bounded W. by the Atlantic, N. by the Minho, and S. by the Douro. Area, 2044 square miles. Pop. 971,001. The surface is much diversified by mountains and valleys; the soil is not very fertile, but the mild, moist climate, the copious streams fit for irrigation, and a most careful cultivation have made it very productive. Useful minerals are found, but not much worked. Trade and manufactures are flourishing. Cap. Oporto.

Minho [Spanish *Miño*], a river of Spain and Portugal, rises in Galicia, forms for some distance the boundary between the two countries, and falls into the Atlantic after a course of 130 miles.

Min'iature, a delicate style of painting, generally applied to very small portraits, whence a "miniature." The word is also used as an adjective to indicate anything in a reduced form retaining all its original appearance. Thus, "Tragedy is the miniature of human life." The term is derived from the Latin *minium*, "vermilion," once employed in MSS. for capital letters, which were afterwards developed into ornaments with small portraits. In Middle Latin *miniare* means to "color" or "write in red." The word "miniature" long continued to be used for red. "If the names of other saints are distinguished with *miniature*, the Virgin's ought to shine with gold." (*Hicks.*) Warton uses *miniature* for colored with red.

Miniature painting may be divided into two kinds—that of the illuminated manuscripts, which was always executed on parchment, and the modern art so called, applicable to any material, but for which ivory plates almost invariably serve as the ground. The *miniatori* or illuminators of the Middle Ages were distinguished for great care, especially in the preparation of their colors, which are generally as fresh to-day as when first applied. After the invention of printing had superseded calligraphy and illumination, the demand for pictures, whether small portraits or reduced copies of larger works, by no means diminished; it in fact greatly increased, and the art assumed new characteristics. Though less modern in many respects than their Italian contemporaries, Hemling, and especially Holbein (d. 1554), may be regarded as the fathers of the present miniature. The earlier painters used egg, gum, or glue as a vehicle, though D'Agincourt mentions some works the colors of which were insoluble in water. They always employed body-colors thickened with white; thus, the shades were not executed with a transparent medium, but with light colors which were opaque. Many of the old miniaturists painted in oil. Opaque coloring was really better suited

to parchment and to the state of art at that time than the transparent. But as it was found that the exquisite and peculiar tone of ivory with its barely perceptible grain (see IVORY) bore a resemblance to the human complexion, transparent hues were more and more employed, until the body-colors were limited to drapery and the accessories. In fact, the delicate cross-hatching or cancellation which is peculiar to ivory, and which aids in producing the infinite blendings of the skin, had a great influence in not only inducing the free use of transparent colors, but in changing the style from stippling (or dotting), or washing and broad coloring, to *hatching*, or making repeated small lines, which are graduated and varied in every possible way to produce the requisite effect. At present, opaque colors are very sparingly used for occasional touching. The paints and brushes are the same which are employed in all water-color painting or illuminating. Among the most distinguished miniaturists may be cited Nicholas Hilliard (d. 1619), Isaac Oliver (d. 1617), who was employed by Queen Elizabeth; Anne Segers (1550), Jean Mielich (1572), Giovanni Cerva (1620), F. de Lianno (1625), J. Ligorio (1627), Scorza (1631), F. and M. de Costello (1636), Castulli (1637), Bauer (1640), Du Guerrier (1659), Stefaneschi (1659), Fruitiers (1660), Oliver (1660), Gerbier (1661), T. Flatman (1668), Sam. Cooper (1672), who painted Cromwell and Charles II.; Padre Pittorino (1662), Berganzone (1662), Garzoni (1670). With the eighteenth century miniature painting became more popular than ever, the unlimited gallantry of the Regency in France causing a great demand for pictures, especially for nude subjects. This had at least one good result in the increased study of anatomy and flesh-tints. Prominent among these *roués* of the pencil was Klingstedt (b. at Riga 1657; d. at Paris 1734), who called himself the "Raphael of snuff-boxes," since such works as his were invariably set in such objects. The duke de la Ferres once paid 12,000 livres for a Leda by Arland of Geneva, which picture the artist in a fit of penitence repurchased and destroyed. Ladies now began to distinguish themselves as miniaturists; among these were Elisabeth Sophie Cheron (1711) and Giovanna Maria Clementina. Greatest of all the artists of her time in this style was the Venetian Rosalba Carrara, who came to Paris about 1720. Her chief work was a portrait of Louis XV. About 1750, Massé was the popular miniaturist. He painted a portrait of the marshal de Richelieu, which Voltaire in a poem declares was to be found in a thousand snuff-boxes. Among the distinguished miniaturists of this time mentioned by Millin (*Dictionnaire des Beaux Arts*, 1806) and Larousse (*Dict. Univ.*) are Jacques Ferrand, Charlier, and Garand, who painted Diderot; Joseph Camerata (1764), Melendez, Baudouin, G. A. Wolfgang, De Meytens (1770), Ismael Mengs, and Jean Gros. Under Louis XVI. miniatures became still more the fashion; the art was specially patronized by Marie Antoinette. The great artists of this era were Vincent, De la Chaussée, Mosnier, De Musson, König, Chodowiecky, Füger, De Villers, and the great Hall, a Swede, called by his contemporaries the Van Dyck of miniature painting. He was followed by Siccardi and Fragonard, Vestier and Nöel Halle. With the next generation came Saint, Isabey, Augustin, and Duchesne de Gisors (b. 1770, d. 1856). This latter is claimed by the French, not without reason, as the greatest of modern miniature painters. He was in this as in enamels a true artist. This art has produced many distinguished female painters; among others of our time, Mme. de Mirbel and Mme. Herbelin. In England and America the names of Hoskins, Gibson, Newton, Ross, Thorburn, Malbone, Charles Fraser, Inman, and Staig are well known. The last phase of miniature painting is one of decadence, since it consists simply of applying color to photographs. This has become an art by itself, and is rapidly improving, yet it cannot be denied that in its best development its best productions are thus far very much inferior to third-class miniatures. It seems to be a fixed law in art that substitution of mechanism for human skill involves deterioration.

The principal works on this subject are the *Traité de la Miniature*, by Cathérine Perrot (1625); Félibien, *Entrétiens sur les Vies, etc. des plus excellens Peintres* (vol. vi.); *Traité de Miniature, etc.* (Lyons, 1672); *The School of Miniature* (1733) and *Art of Painting in Miniature* (1750), both from the French; *L'Académie de la Peinture, etc.* (Paris, 1679); Eliæ Brennesi, *Nomenclatura trilinguis, etc.* (1680); *Traité de Miniature*, by Vincent de Montpetit (1765); *Trattato del Disegno e della Pittatura in Miniatura* (Venice, 1668); *Introduction à la Miniature*, par M. Wayol (Amst., 1771); *Traité sur l'Art de peindre en Miniature, etc.*, par M. Violet (Paris, 1788); *Élémens de la Peinture*, by De Piles; Bellart, *École de la Miniature* (1817); L. Mansion, *Lettres sur la Miniature* (1823), a book in which the principles of painting are taught in a series of sentimental letters to a young lady, the whole ending with a marriage. An English translation of it was published by R. Ackermann. Also, *Manuel de Miniature*, by Viguier and Langlois Longueville (*Encyclopédie Roret*). All the artists' color-shops at the present day can supply the student with cheap handbooks teaching the elementary principles of miniature painting. CHARLES G. LELAND.

Minié' (CLAUDE ÉTIENNE), b. at Paris about 1805; entered early the army as a volunteer; fought in Algeria; was made a captain in 1849; became a teacher in gunnery at the school of Vincennes in 1852, and went in 1858 to Egypt as superintendent of a factory of firearms on the invitation of the viceroy. In 1849 he brought out his invention of the rifle-ball which is called after him. It is cylindrical, conical in the front, hollow in the rear, and provided with a ridge of thin iron, which by being pressed into the grooves of the barrel when the ball is forced through, gives to this a much higher precision and range. His invention was the first application of the principle of expansion in the construction of firearms.

Minier, post-v. of Little Mackinaw tp., Tazewell co., Ill., on the Chicago and Alton R. R.

Min'im, in music, an open-headed note equal in time-value to half a semibreve, and hence often called a "half-note." As the semibreve is in length the half of a "breve," so the name "minim" (Lat. *minus*) seems to imply or suggest a similar relation to the semibreve.

Min'ims, or **Minimi** [Lat. *minimus*, "the least"], **Order of the,** instituted by St. Francis de Paula about 1436, under the name of "Hermits of St. Francis;" confirmed in 1474 by Sixtus IV., and the name changed to Minims by Alexander II. They are also called Pauliners; in France, Bons-Hommes; in Spain, Fathers of Victory, from a victory over the Moors gained by Ferdinand IV., according to the prediction of the founder. Convents of nuns were established in 1495 in Spain, and in 1621 in France. Agreeably to their name, humility was the distinguishing feature, and with the usual vows of poverty, continence, and obedience, the most rigid abstinence was inculcated, animal food, as well as butter, cheese, and milk, being prohibited, and their dress was coarse and black. At one time the order extended through France, Germany, Spain, Italy, and even into Asia.

Minimum. See MAXIMA AND MINIMA.

Minimum Squares. See SQUARES, LEAST, METHOD OF.

Mining Engineering. Mining is the most important, next to agriculture, of all the arts of civilization, because it goes directly to the supplies of nature, and forms the basis also of all those manufacturing interests which use mineral or metallic products. As an art, mining is an art of excavation, but as a science, it may be considered justly as the science of avoiding excavation, since the true skill of the engineer is to design and develop his underground works so as to reach and remove the valuable masses entirely if possible, and no more.

The miner's method of excavating, whether in galleries or on larger fronts of attack, consists essentially in first undermining the face of rock and then prying, wedging, or blowing it down. The tools and instruments for this are picks, wedges, hand-drills, power-drills, cutting-machines, and blasting-powders, among which last the compounds of nitro-glycerine are the most handy and economical. Besides the undermining at the bottom of the face, it is often expedient to disengage the sides also with the pick; the wedges, therefore, if used, or the drill-holes and shots, are placed near the top. The perfecting of this business at present tends to the use of power-drills and cutting-machines run by compressed air sent from the surface, and also, of course, to the prompt adoption of new blasting explosives which are proved advantageous.

Many mines have been begun by a simple quarrying on the outcrop of a mineral deposit, but the increasing difficulty of supporting the yawning sides, the great amount of dead earth and rock to be disposed of, and the trouble from rain and surface-water, as well as that of infiltration, invalidate this method so decidedly that at the depth of 100 feet mostly the science of deep mining has to be invoked. Desirable as it is to car or hoist the least possible dead rock, yet it is impracticable to avoid making certain and ample preparatory works in the masses surrounding a mineral vein before the attack or exploitation can be properly commenced. These works are tunnels, shafts, and adits. Any mineral deposit, or that part of a deposit which lies above the highest water of the adjacent valleys, ought to be reached by a tunnel, and that is a universally accepted rule, particularly in metallic mining. The advantages of a tunnel are the saving of hoisting and pumping; the fact that a tunnel is a more searching prospecting work than a shaft, since in a mining region full of parallel veins—which is usually the

case in metalliferous districts—the tunnel may intersect the whole system; and finally because the tunnel is cheapest to make. Below the superficial drainage a vein or bed must be reached by a shaft or a slope, with a series of horizontal adits, spaced conveniently apart, which lead to the mineral mass at different levels.

If we imagine an inclined tabular deposit, such as a metallic vein usually is, and as a coal-bed may be, it would seem cheapest to run down in it by means of a slope dug in the material itself. That process, in fact, turns out the valuable matter at once, and might more or less pay for itself while in operation; but as a shaft or slope is the most important of all the preparatory works, usually being intended to endure, and requiring substantiality for the incessant needs of hoisting and pumping, it is necessary to make such a construction solid, and therefore a slope in a vein must be supported by flanking masses devoted to that object alone. In a coal-mine this sacrifice is not of much importance, but in a metallic one it might be a greater loss than the slight advantage of a slope would compensate for. Moreover, a slope to a given level is longer and more irregular than a shaft sunk vertically in the country-rock; the development of hoisting-ways, cables, pump-rods, pipes, etc. is therefore greater and the service more inconvenient.

Supposing, then, that a vertical shaft for the attack of a vein has been sunk, and as deep down at once as various reasons will allow, it is next put into connection with the deposit by means of the adits, which are galleries sloping a little towards the shaft for drainage and rolling. These, like the shaft, should be ample for the circulation expected, and spaced apart vertically say 100 feet. The cross-section of a shaft adapted to hoisting, pumping, and ladders, or a man-engine, all together, may be 20 by 30 or more, and the section of galleries for single track about 6 by 6 feet. From where the adits pierce the vein next are run gangways to right and left in the vein itself. These make the different levels; and as they are permanent ways for rolling, they have the same dimension as the adits, and like them and the shaft are strongly timbered. Finally, these levels being put into communication by slopes in the vein —200 feet apart, for example—the mineral mass is seen to be subdivided into a set of parallelopipeds 100 by 200, and presenting each four disengaged angles on which they may be easily attacked for the prosecution of exploitation. This finishes the preparatory work, and it remains to be said that such interior preparation should always be kept up and urged quite far in advance of the exploitation proper, so as to explore the vein for at least a year's work in prospect.

Exploitation is the taking out of the parallelopideds so prepared and exposed. If such a parallelopiped be attacked on an upper corner by miners, who with pick, drill-bar, and shovel delve into and break away the mass beneath them, such is called underhand stoping; and for ease and celerity of work the workmen are spaced behind each other 12 or 15 feet, so that the mass attacked necessarily takes the form of steps. And indeed to look into the flank of such a stope is to see a rude great stairway inclined to one side, wide as the vein, and occupied by laborers, who by the dim light of lamps and candles are employed in picking, drilling, prying down, blasting, or pushing and hauling the breached and sorted ore down to the gangway beneath. The gangue and refuse sorted out from the ore-matter is piled up behind the miner on platforms between the walls of the vein; and in most all metallic veins, always in thin ones, the refuse furnishes a complete and substantial filling for the chasm which the miner makes. This filling, however, in underhand stoping requires the accessory support of considerable timber. Overhand stoping is where the workmen attack one of the lower angles of a parallelopiped. In this case the miners, all of them, are, as it were, undermining the whole parallelopiped; the one in advance is directly on the timbering of the gangway beneath him; the refuse is piled up behind on this timbering, and the other miners follow standing on that or on trestles, so that the profile of attack becomes and shows like a stairway upside down.

In comparing these two methods it is seen that both serve to extract the entirety of the valuable mass, which is the first requisite, but differ considerably in other ways. In underhand stoping the miner, for example, treads on the vein-matter itself; therefore this method ought not to be used for coal. The filling exacts more timber, and the getting down to the gangway is, on the whole, not so easy as in overhand stoping. Here, on the other hand, gravity is always an aid to the miner, but sometimes endangers his position. He stands on the refuse, and in the interstices thereof it might therefore happen that valuable particles would be lost, unless it is covered with cloth or boards. Underhand stoping is therefore best for mining precious metal, and overhand for coal. When the vein lies flat it is evident that the same profile of steps may be laid out for the attack; but then, also, a larger style may be adopted with advantage, and particularly in coal-beds, where it is always an object to get out the material in ample dimensions. Either then longer steps are designed, with several miners on each face, or the long-wall method is applied. This, which is common now even in beds of coal nine to ten feet thick, where strong propping is attainable, consists in attacking a long, straight line of face with all the miners abreast. They prop behind them, and if there is refuse sufficient to fill up in rear, they do so, reserving open rolling ways to the shaft. This method is convenient for every element of interior economy, such as rolling, ventilating, lighting, overseeing, etc. If filling cannot be procured adequate to replenish the vacancy, then what little there may be is built into pillars or walls, and the ground is allowed to sink upon these, or even completely down if the rolling-ways can be kept open by hacking into the roof.

The exploitation of thick veins is effected by different dispositions. For example, when there is abundant filling they may be attacked from below upward, taking out horizontal slices, which are successively filled; or, again, where caving is allowable, they may be taken from above downward, each slice being treated like a horizontal bed, without filling. It is found sometimes profitable to introduce filling brought from the exterior; it is convenient then to take the mineral mass in narrow vertical slices, dumping in the filling; and finally the method by pillars and galleries is applicable anywhere. That title ordinarily refers to an exploitation in which the pillars are used for support alone, and are supposed to be left and abandoned utterly. This relinquishes one-third to one-half the material in the earth, and is the worst possible almost, though in thick veins of cheap ore or coal sometimes the only one possible. It is combined often, however, with a subsequent robbing of the pillars, whereby it becomes more economical and rational. The robbing involves caving of course, and when the creep of the caving can be commanded nicely the method is as exhaustive as any.

All the foregoing, except underhand stoping, applies to coal-mining, but this last is at the same time a larger and yet a more delicate kind of mining than metallic. Coal-mining differs from other mining principally because the fronts ought to be larger, because there is comparatively little refuse in ordinary coal-beds, and because the generation and blowing out of fire-damp in fiery mines exact peculiar lighting, particular ventilation, and besides a disposition of works in which the different portions, and even the different breasts, are isolated one from another, so that an accident in one may not compromise all. This consideration leads to disposing the main plan in boundaries, with walls of coal left between, and also to the well-known style of pillar-and-stall exploitation. In this the pillars are long strips left between the stalls, which are headings run into the coal, directed so as to take an easy grade, and out of which the coal is entirely won. The pillars are intended to be subsequently cut through and robbed out; in the mean time there is in each front or breast quite a seclusion from outside damage. The perfection of an exploitation is to get out all the valuable material, and nothing else, with rapidity and with safety and comfort to the miners.

Interior Transportation.—From the fronts down to the gangways the matters are sent in barrows, sledges, shutes, or cars. In the main-ways there are always railroads; the tracks are narrow and the rails light, but laid best on sleepers, as above-ground. The cars may be iron or wood; they must have a low centre of gravity; wheels close together, for the curves are short, and encumber with the least possible dead weight. The motors are men and boys, mules, small horses, stationary engines with endless chains to take trains, and now also locomotives for the same purpose. Examples of great drains used as canals for subterranean transportation are also not unfamiliar.

Hoisting.—At the mouth of the shaft is planted a great derrick, usually made with four uprights, on top of which are two large sheaves or pulleys to bend the cables from the shaft to the winding-drums or reels. The cables are hemp, aloes, iron or steel wire, and either round or flat; they are terminated with an end of chain, which is hooked on to the buckets, skips, or cages. The cages, now so prevalently used, are simple elevators, which carry one or more cars; they are guided by vertical strips of timber fixed to the sides of the hoisting-way for that purpose, and these also serve in connection with the parachutes, which ought to be attached to all cages, particularly if miners are hoisted in them. Parachutes are of various patterns; the best are probably those with toothed eccentric wheels, which, when the cable breaks, incrust themselves into both lateral flanks of each guide. The advantages of parachutes and guides

are immense in increasing the safety and rapidity of hoisting. The best winding apparatus is for round cables conical drums, and reels for flat. The operation of hoisting is for many reasons delicate, and the engine ought to be sensitive. The best hoisting system of these is composed of two horizontal cylinders, without any fly-wheel if possible.

Pumping.—The pumps of a deep mine are composed of a series of lifts, each more than 100 feet high. All the pumps are force-pumps with plungers, except the lowest, which is a lift-pump, more convenient for following the sinking of the shaft or being moved about. One main rod of wood and iron stretches from top to bottom of the shaft, and to this are fixed by spurs or shoulders the rods of the force-pumps. The weight of the main rod is almost always greater than that of the column to lift; therefore the work of the engine is limited to lifting that rod, which when released sinks and moves the plungers. If lift-pumps were used alone, the engine would have to lift rods and water at the same time, thereby doubling its work. The best pump-engines undoubtedly are single-acting, with large cut-off. Double-acting engines would diminish the required size of lift-pipe, and they are sometimes used in the interior of mines, but on the whole the Cornish engine is preferred; and this is usually arranged with a cataract or some other automatic machinery for regulating the number of strokes per minute. The lift-pipes are ordinarily cast iron, either galvanized or lined with wood if the waters are corrosive.

Ventilation is either natural or artificial. Many circumstances may cause a natural draught between two orifices, such as difference of level, difference of section, variety of exposure, and prevailing winds. Artificial ventilation is produced by pneumatic machines, the cheapest of which is the old Hartz blower; by fans, such as Guibal's and Fabry's; by furnaces, a common and cheap method, but dangerous in fiery mines; and by jets of steam. The use of compressed air in the drills of mines assists ventilation, but not so much as might be imagined. On the whole, it is found preferable to ventilate by drawing out the air, rather than by forcing it in; and this course is particularly advantageous in coal-mines, because by rarefying the air, instead of condensing it, the fire-damp is more freely liberated to be wafted away. The difference between blowing-machines for mines and metallurgy is principally that metallurgical machines push small volumes of air at great velocities, and mining machines draw large volumes at small velocities. The amount of air required for any mine can hardly be told except by experiment. As for the distribution of it, a general principle is to carry the current low down at first, directing it afterwards through the works upward, and split into numerous untainted streams, until it reaches the upcast. In coal-mines it is imperative to split the air without stint, in order to subserve the isolation of the works; and, moreover, it is found to be easier anywhere to move a given amount of air in split currents than in entire ones. The directing and modifying of the currents is effected by doors and air-shutes in the mine-ways. Most miners who perish by explosion in coal-mines are victims not of the fire-damp, but of the choke-damp, or carbonic acid, which stations in the works after the catastrophe, particularly if the doors and ventilating-flues are disabled; therefore, in these dangerous mines the means and potentiality of ventilation are vitally important.

Milling at coal-mines consists only in breaking, picking, screening, and washing the coal. The breakers are toothed cylinders; the screens are revolving trommels, with different-sized apertures for sorting the lumps as they pass through; the washing is done in large jigs or cisterns, where the coal, like metallic ore in smaller apparatus of the same kind, is subjected both to a current of water and to a movement of vertical oscillation of the same impressed by pistons. Masses of metallic ore when first extracted and dumped are first broken by hammers or sledge-work in a pile-driver frame; then treated by jaw-crushers and cylinder rollers, sometimes toothed, then transmitted to the stamps, which are of various patterns, the most powerful being regular steam-pestles working direct from the steam-cylinder. For the same purpose heavy wheels rolling in a circular trough are used, and in some respects to better effect, as they do not destroy the metal when native, like stamps. The metallic mud thus obtained is concentrated further by washing in jigs, shaking-tables, cloth-rollers, and the slimes are finished off in sluices and long tailing labyrinths. It is advantageous, even in the cheaper metals, to carry slime-washing far, and in the preparation of coal washing tends to come more and more in vogue.

Mining Surveying.—No engineer ought to be content without accurate and adequate maps of his underground works. The main ways are surveyed with a transit, the narrower ones and the fronts of work with a compass and half circle suspended from a cord stretched at convenient points. The vertical and horizontal angles and linear measurements being referred to three co-ordinate planes, it is easy therefrom to make maps, sections, and elevations, or to solve any problem of underground projection, by the ordinary methods of descriptive geometry or trigonometry.

F. L. VINTON.

Min'ion, in typography, type of the same size as that used in the body of this work, and between brevier and nonpareil. (See TYPE.)

Min'isink, post-tp. of Orange co., N. Y., traversed by the Unionville branch of the Erie R. R. Pop. 1443.

Min'ister, post-v. of Auglaize co., O. Pop. 868.

Minister and **Ministry.** See CLERGY and CLERGYMAN.

Minister, Public. The ministers of a nation include those who have the direction of departments of public business (minister of state), and those who represent the state at the courts of other powers (ministers plenipotentiary, or ambassadors). A group of the former class form the ministry which in constitutional states form the government. In England it is doubtful whether the cabinet of ministers has any definite place in the constitution, or whether it is merely a committee of the privy council. The last named were originally a body of the king's advisers, but became too numerous for the carrying on of the sometimes delicate and intricate deliberations needful in the conduct of public affairs. Down to the reign of Charles I. the method of promulgating important resolutions was after deliberation by the privy council. In England the construction of a cabinet is entrusted by the monarch to some statesman, who surrounds himself with the chiefs of his own party, and holds the reins of power until the balance of political feeling varies, when he is replaced by the leader of the opposition. The premier or prime minister is at the head as first lord of the treasury. The cabinet includes the lord chancellor, the chancellor of the exchequer, the secretaries of state, etc. There are also a number of ministers who have no seats in the cabinet. An organization similar but not identical prevails in most European states.

Ministers who represent the country in foreign states may either be extraordinary ambassadors, sent for some special purpose, and with powers relating only to that particular object of their mission, or may be accredited representatives, empowered to attend to the general interests of their constituents. Ministers of the first class exercise the representative function in the highest degree, and can claim the distinctions due to the power by whom they are delegated. To this order belong papal nuncios and ambassadors ordinary and extraordinary. Envoys, internuncios, and plenipotentiaries do not enjoy this full representative character, whilst ministers resident, chargés d'affaires, and diplomatic consuls form a third grade. Every sovereign state has the right to send and to receive representatives, except when debarred by treaty obligations, but the class of ministers to be sent depends upon rules and etiquette grounded to a large extent upon the principle of reciprocity. Dependent states do not generally possess the power of sending representatives, although there seems to be some doubt as to the exact law or custom regulating this matter. In some federal states, as in the German empire and the Swiss union, the power of sending ambassadors is reserved to the individual states, whilst the Constitution of the U. S., on the contrary, appears to reserve this power to the Federal executive. There are other classes of diplomatic ministers besides those already named, such as deputies to international congresses and conferences, ministers, mediators, commissioners, etc. Ministers of the first and second rank are accredited by a letter to the sovereign of the country to which they are sent, and have the right to demand an audience. The title of "excellency" is accorded to ambassadors, and they are exempt from the municipal law. As to civil suits, this exemption is undoubted, and in England has been confirmed by statute (7 Anne, c. 12), but in criminal actions there is at least one weighty precedent against immunity. In 1654 the Portuguese ambassador to England was executed for murder. Later writers seem to be of opinion that international law would now hold sacred the person of an ambassador even in so extreme a case. A minister may, however, be complained of by the power to which he is accredited, and in special cases dismissed. W. E. A. AXON.

Min'ium [Lat.], the red oxide of lead, often called *red lead*. (See LEAD.)

Miniver. See ERMINE.

Mink [of uncertain etymology], a name given to the two small species of the weasel family (Mustelidæ) and of the genus *Putorius*—viz. (1) *P. lutreola* of Europe and North Asia, and (2) *P. vison* of North America. The former is a smaller animal, with a much finer fur than the American mink possesses. Still, the mink of North Amer-

ica yields fine and high-priced furs, especially northward. The minks frequent small streams and forests and mountains. They are easily bred in a half-domesticated state,


Minks.

and several large "minkeries" have been established in the U. S. with good pecuniary results. Minks are easily trapped. They are very destructive in poultry-yards, and often catch fish, frogs, mice, and wild birds. They seldom ascend trees. They follow their prey by the scent.

Minneap'olis, post-v., cap. of Ottawa co., Kan., on the N. bank of the Solomon River, has a good educational system, 2 churches, 1 grist and 1 saw mill, 1 weekly newspaper, and stores. Pop. about 500.
M. & C. B. Rotrock, Eds. "Minneapolis Independent."

Minneap'olis, city, cap. of Hennepin co., Minn., on both sides of the Mississippi River, at the Falls of St. Anthony, 8 miles N. W. of St. Paul. It is regularly laid out, with straight avenues 80 feet wide, and double rows of trees each side, well watered and lighted, has several creditable public edifices and many elegant private residences. The site is upon a broad esplanade which commands a fine view of the falls, and the surrounding country is noted for its beauty. Several picturesque lakes are in the immediate vicinity, and the celebrated Falls of Minnehaha ("laughing water") are but 3 miles distant. Minneapolis is connected by railroad with St. Paul and Duluth, and has a line of steamers which in summer ply on the upper Mississippi, above the falls, to St. Cloud. The Falls of St. Anthony, having a descent of 50 feet within a mile, supply water-power to 18 saw-mills and 18 flouring-mills, all on a vast scale, and to very numerous other manufactories. The University of Minnesota is located here, as well as the Augsburg (Lutheran) Theological Seminary, established in 1869 by the Scandinavians of the North-west, and Hamline University, now (1876) being erected by the Methodists. There are 48 churches, 2 daily, 9 weekly, and 2 semi-monthly periodicals, 10 fine public school buildings, an academy, a female seminary, and a business college, an athenæum, academy of music and opera-house, a spacious and beautiful cemetery, extensive railroad repair-shops, 5 national and 6 private banks, and several very extensive commercial establishments. The leading industry is the manufacture of lumber and flour. The city was first settled in 1849, incorporated 1867, annexed the city of St. Anthony, on the E. bank, 1872. Pop. 1870, 18,079; in 1876 estimated at 32,000.

Minneas'ka, p.-v. of Wabashaw co., Minn., on the river division of Milwaukee and St. Paul R. R., has extensive grain-warehouses, and is a shipping-port of some note. Pop. about 500. D. F. Brooks.

Minneha'ha, county of Dakota, bounded E. by Minnesota. It is traversed by Big Sioux River, which has exceedingly fertile bottom-lands. Cap. Sioux Falls. Pop. 355.

Minnehaha ["laughing water," in the Dakota language], a waterfall in Hennepin co., Minn., celebrated for its beauty. Here the small river Minnehaha leaps 60 feet down a limestone precipice. It is half a mile from the Mississippi and near Minneapolis. The interesting legend of an Indian maiden leaping this fall when thwarted in her love for an Indian brave has been finely treated by Longfellow in his *Minnehaha.*

Minneo'la, tp. of Goodhue co., Minn. Pop. 1089.

Min'nesingers, The [O. H. Ger. *Minni,* "love," and *singen,* "to sing"], the distinctive name of a peculiar class of poets who flourished in Germany from the middle of the twelfth to the close of the thirteenth century. Many things combine to make them prominent in the history of poetry. Before their appearance lyric poetry and versification were virtually unknown in Germany; and it is now placed beyond a doubt that the Minnesingers did not learn their art from the Provençal poets. Whence, then, did they get it? No one knows. It seems as if the religious fervor excited by the Crusades, together with the chivalric sentiments of the times, had suddenly inspired the whole knight-errantry of Germany with a poetic frenzy; and one of the most remarkable features of their productions is, that while those knights were mostly uneducated men, many of them not able to read and write, their poems are distinguished by a surprising elaboration of poetical form. This poetic outbreak was at first confined exclusively to the knightly class. When subsequently the peasants and citizens began also to practise poetical composition, the Minnesong soon lost its former grace and melody, and became changed into the laboriously constructed and uncouth Meistersong. None of the early knight-minstrels, and only few of the later, wrote down their songs. They improvised the poetry and the music at the same time. Generally, the song was composed for the knight's ladylove, to whom it was sent, not on paper, but through the agency of the knight's Sancho Panza, a young *Singerlein* of good voice and quick memory, to whom the knight sang his song till the young man had it by heart. Then he was despatched to the ladylove in question to sing her his master's song. Thus, the Minnesongs were passed from mouth to mouth, until towards the close of the thirteenth century Johann Hadloub, one of the sweetest of the later Minnesingers, himself was instructed by Ruediger of Manesse, a Swiss knight, to collect and have written down all discoverable Minnesongs. The result of Hadloub's labors was the famous Manessian collection of Minnesongs in the Paris library, which had remained unknown for centuries, and was rediscovered by the German poet Bodmer in 1748. It was first published in its entirety, together with all other discovered Minnesongs, by Van der Hagen in his *Minnesinger.*

The Minnesingers sang only lyrics, which were either of an amorous or religious character or in celebration of the beauties of nature. In course of time they became didactic, censorious, and critical. Some of the Minnesingers did not confine themselves to the composition of lyrics, but put into metrical form the romances of the knights of King Arthur and of Charlemagne, which were just then being invented and spread over all Europe and Asia. Most prominent amongst these writers of Minne-romances are Wolfram von Eschenbach, best known by his great epical romance *Parcival;* Gottfried von Strassburg, the author of *Tristan and Isolde,* and undoubtedly the most gifted and cultivated of all the poets of his time; and Hartmann von der Aue, whose *Golden Legend of Poor Henry* is as sweet an idyl as language can boast of. By far the most prominent among the purely lyrical Minnesingers ranks Walther von der Vogelweide. He is interesting, moreover, not only as a highly gifted poet, but also as a model knight of his time, a man of sterling qualities and most devoted patriotism. Ulrich von Lichtenstein, on the other hand, exhibits the Quixotic side of that knight-errant period in all its absurdity. Emperor Henry VI. and his son, young Conrad, the last of the Hohenstauffens, were also amongst the Minnesingers. Amongst the others may be mentioned, as foremost in their art, Von Veldegge, the duke of Breslau, Count von Leiningen, Count von Botenlauben, Jacob von Warte, Brother von Sax, Von Kuerenberg, Reimnar the Old, Von Hohenfels, Walther von Metze, Von Steinnach, Tannhuser, Nithart, Hadloub, Frauenlob, Konrad von Wuezburg, Regenbogen, etc. The Minnesinger poetry was first introduced into the English language by Mr. Taylor in his *Lays of the Minnesingers, or German Troubadours of the Twelfth and Thirteenth Centuries* (London, 1825). A more complete account, however, has been attempted in *The Minnesinger of Germany,* by A. E. Kroeger (published by Hurd, Houghton & Co., N. Y., and Trübner & Co., London). A number of specimens are also contained in Longfellow's *Poets and Poetry of Europe.*
A. E. Kroeger.

Minneso'ta, one of the North-western States, at the head of the Mississippi Valley, lying between the parallels of 43° 30′ and 49° N. lat., and between the meridians of 89° 29′ and 97° 5′ W. lon. from Greenwich. It is bounded on the N. by British America, the 49th parallel forming the boundary as far E. as the Lake of the Woods, and thence the Lake of the Woods, Rainy Lake River, and Rainy Lake, and the chain of small lakes and connecting streams extending with but a single divide to Lake Superior; E. by Lake Superior and the State of Wisconsin, the N. shore of the lake forming the boundary as far as Fond du Lac, thence the meridian of 92° 15′ to the St. Croix River, the St. Croix to its junction with the Mississippi, and the Mississippi thence to the southern boundary of the

State; on the S. it is bounded by Iowa on the line of the parallel of 43° 30′; on the W. it is bounded by Dakota, the meridian of 96° 30′ forming the boundary as far as Big Stone Lake, and thence northward Lake Traverse and the Red River of the North and its tributaries forming the dividing-line. The extreme length of the State from N. to S. is about 380 miles, while its breadth varies from 337

Seal of Minnesota.

miles about the 48th parallel to 262 miles on the S. line, and 183 miles at about 45° 30′. Its area is estimated by the U. S. land-office at 83,531 square miles, or 53,459,840 acres. Its name is derived from that of the principal tributary of the Mississippi within its boundaries, and is said to signify in the Dakota or Sioux language "sky-tinted water," though some have attempted to derive it from the Portuguese *Minnay sotor*.

Face of the Country.—The general surface of the country is undulating, and, though having nowhere any range of mountains or even high hills, it is the actual watershed of all that part of the North American continent lying E. of the Rocky Mountains. Its central situation, midway between the Atlantic and Pacific oceans, between Hudson's Bay and the Gulf of Mexico, and between the arctic and tropic circles, makes this almost a necessity. Accordingly, we find a range of drift-hills crossing the upper portion of the State nearly from E. to W., mostly with flat tops, and nowhere exceeding 100 feet of elevation above the adjacent country (though they are 1680 feet above the sea), in or near which are the sources of the Mississippi River, of the Red River of the North (which discharges its waters eventually into Hudson's Bay), of the feeders and tributaries of the Lake of the Woods (which also connects with Lake Winnipeg, Hudson's Bay, and the immense system of water-courses of the northern part of the continent), and the sources also of the St. Louis River, the head and fountain of those waters which through the great lakes find their way to the Atlantic through the broad St. Lawrence River. There are, then, three distinct slopes, differing in soil, vegetation, and geological character, in the State—the northern slope, including not only the Red River Valley, but the valleys and lakes of the streams draining into Rainy Lake and the Lake of the Woods; the eastern slope, occupying the valley of the St. Louis River and its tributaries, and declining gently toward Lake Superior; and the southern slope, drained by the Mississippi and its affluents, comprising about two-thirds of the State, and extending into and forming part of the great Mississippi Valley. The descent from the summit of the divide, in lat. 47° 45′ to 48°, to the southern boundary of the State, lat. 43° 30′, is nearly 1000 feet, but, except in the successive terraces at and near the Falls of St. Anthony, the slope is mostly gentle, rarely exceeding two and a half or three feet to the mile. Three-fourths of the State may be generally described as rolling prairie, interspersed with frequent groves, oak-openings, and belts of hard-wood timber, dotted with numberless small lakes and drained by numerous clear and limpid streams. The remaining fourth includes the hills which form the divide, the extensive mineral tract extending toward Lake Superior, and the heavy timbered region lying around the sources of the Mississippi and Red River of the North.

Rivers, Lakes, etc.—As we have already intimated, the State is mostly drained by the Mississippi, the Red River of the North, the St. Louis, and their numerous tributaries. Of the affluents of the Mississippi, the Minnesota is the principal on the S. W. side, and is itself a noble river, with numerous branches; the other tributaries on the S. W. side are the Root, Zumbrota, Cannon, Sauk, Crow Wing, and Willow rivers; on the N. and N. E. its largest affluent is the St. Croix; and Rum River, the outlet of Mille Lacs Lake, is the only other considerable stream; the Red River has several branches of but moderate size, known as Buffalo, Wild Rice, Red Lake, and Reed Grass rivers; the St. Louis has several streams, such as the Ushkabwahka, Big White Face, Stone, Floodwood, and Savannah rivers. There are also numerous small streams flowing into Lake Superior, and several of larger size, such as the Vermilion, Little Fork, Big Fork, and Baudette, discharging into the Rainy Lake River and the chain of lakes which form a part of the northern boundary of the State. Of these rivers, the Mississippi is navigable within the State for 540 miles; the St. Croix for 53; the Minnesota at some seasons for 300; the Red River of the North for 250; and the St. Louis for 21 miles. Minnesota is emphatically the land of lakes, the lake-surface of the State, exclusive of those which form portions of its boundaries, being about $\frac{1}{35}$th of its entire area. A few of these lakes, such as Leech, Red Lake, Mille Lacs, Vermilion, Winnebegoshish, Big Stone, Traverse, Cass, and Otter Tail lakes, are of considerable size; the remainder are much smaller, but in immense numbers. Lake Itasca, the ultimate source of the Mississippi, is of horseshoe shape, and its longest diameter is only 10 or 12 miles; Lake Traverse, the source of the Red River of the North, is long but narrow; Dead Fish Lake, the source of the St. Louis, is small; Lakes Pepin and St. Croix are only enlargements of the river-beds of the Mississippi and St. Croix rivers. The navigable waters of the State have a total shore-line of nearly 2750 miles and a water-line of about 1530.

Geology and Mineralogy.—The greater part of the State is covered with a rich and fertile alluvium, or, as in the highlands, by an older and less fertile drift, which, however, sustains a noble forest-growth. Beneath this there is along the northern shore of Lake Superior, and extending southward on both sides of the St. Croix and Mississippi far below the southern boundary of the State, a broad belt of metamorphic slates and sandstones, intermingled with volcanic rocks, traps, and porphyries; these are of the Silurian epoch, and frequent dikes of greenstone and basalt are interjected in the strata. Occasionally, deposits of marl-drift and red clay are found above these rocks. This is the principal mineral region of the State. Near the southern boundary of the State, between the 92d and 94th meridians of W. lon., is a small tract of the Devonian formation. W. and N. W. of the Silurian slates and sandstones the underlying rocks are Eözoic—hornblende and argillaceous slates, and granite, gneiss, and other metamorphic rocks. Between the 94th and 96th meridians, and extending in the northern part of the State beyond the Red River of the North, is another belt of Silurian rocks, Upper Silurian in the northern portion, and Lower Silurian nearer the Mississippi, but not extending below the 46th parallel. These are mostly limestone, and almost entirely devoid of fossils. There succeeds to these and the western line of the Eozoic deposits a broad belt of Cretaceous rocks, mostly of Niagara, Galena, and Trenton limestones, and St. Peter's and perhaps also a small outcrop of the Potsdam sandstone. Lastly, in the S. W. corner of the State the Eozoic rocks again approach the surface, and here some mineral deposits are found. Iron of excellent quality exists in large quantities in the Lake Superior region, and also in the S. and S. W. portions of the State. Copper of equal purity with that in the upper peninsula of Michigan has been found in the Lake Superior region, but has not yet been mined extensively. Gold and silver exist in moderately paying quantities in the vicinity of Vermilion Lake, but the region is yet so wild and inaccessible that the mines are not now worked. The other principal minerals of the State are slate, lime, salt (the manufacture of which in the Red River Valley and at Belle Plaine on the Minnesota River has attained great success), white sand for glass-making, building-stone, peat, tripoli, marl, etc. The red pipestone of which the Indians made their pipes is found abundantly in the S. W., and is quarried and used for many purposes.

Soil and Vegetation.—The three slopes specified above have each a different soil and vegetable growths. The northern, along the Red River Valley and the basins of lakes and rivers which form the northern boundary, is a rich alluvial deposit admirably adapted to wheat-culture and to grazing. This region has forests of oak, beech, elm, and maple. The eastern slope is a better mineral than agricultural region, though the soil yields fair crops; much of this slope, as well as the highlands or divides, to the extent of 21,000 square miles, is covered with a heavy growth of pine, spruce, and other coniferous trees, valuable as lumber, but the soil beneath them, when cleared, is comparatively sterile. The southern slope, which comprises all of the State below the highlands, is composed of alternate rolling prairie and woodland, and is unsurpassed in fertility and productiveness. About one-third of the land-

surface of Minnesota is timbered land. In this southern slope there are detached groves and copses of great beauty sprinkled everywhere among the prairies and around the numerous rivers and lakes, while growths of dwarfed oaks skirt the borders of the prairies and are known as oak-openings. There is also a tract on both sides of the Minnesota River, over 100 miles in length and with an average width exceeding 40 miles, comprising an area of 5000 square miles, which is covered with a dense growth of magnificent hard-wood timber. It is said to be the largest body of deciduous timber between the Mississippi and Missouri rivers, and is known as the Big Woods. In this, as well as the smaller groves, are found almost every species of deciduous trees known in the Northern States. Minnesota has done more than any other State to repair the losses to her forest-area which result from the cutting of such immense quantities of timber for the manufacture of lumber. Already more than 20,000,000 forest trees have been planted on the treeless prairies of the State, and their planting is encouraged by the State government. The indigenous flora of the State partakes of the mixed character of the Canadian or sub-alpine which is found along our northern boundary, and the Appalachian or Mississippian of the upper portion of the Great Valley. Owing to the great number of small lakes, streams, and marshes in the N. E. the aquatic plants of the sub-alpine flora predominate—wild rice, reeds, callas, and water-loving plants generally. In the N. E. part of the State it is estimated that there are 256,000 acres of cranberry marsh, which yield abundantly. Among fruits, apples, Siberian crab-apples, pears, cherries, plums, grapes (the more northern varieties), strawberries, raspberries, currants, blackberries, whortleberries, and gooseberries are abundantly cultivated, and yield immense quantities of excellent fruit. The season is not long enough for peaches or the later grapes.

Zoology.—The prairies and forests abound in a great variety of wild animals, especially wolves (two species, the gray and the prairie wolf), bears, wild-cats, raccoons, foxes, deer, rabbits, squirrels, gophers, and woodchucks. Otter, mink, beaver, and muskrats are the principal aquatic animals, and are largely hunted for their pelts. Pigeons, grouse, wild-turkeys, and partridges are among the feathered game, as well as ducks, brant, and wild-geese in their season; and multitudes of smaller birds, distinguished for their gay plumage or melodious song, make the woods, lakes, and rivers vocal with their music or brilliant with their beautiful and varied hues. The numerous lakes of the State are plentifully supplied with pickerel, bass, pike, sunfish, and smaller fish, and the present fish commissioner is introducing into them in large numbers lake and brook trout, the lake whitefish, black bass, and other choice species of fish secured by artificial propagation.

Climate.—The climate of Minnesota is peculiar, owing to its central situation on the continent, the large amount of water-surface in the State, and its moderate elevation. It is a remarkably healthful and bracing climate, and is largely sought by invalids, especially those suffering from pulmonary disease, for its dry and tonic character. The mean average temperature of the State for the year is 44.60°; the mean winter temperature is 16.10°; the summer temperature averages about 70.50° (bringing it within the range of grapes and other fruits); the spring has a mean temperature of 46°; and the autumn about 38°. The largest amount of rainfall is in the spring and summer months, the winter being usually dry and the snowfall much lighter than in States farther S. The following table gives the meteorological data for six different points in the State, and indicates the range of temperature of the northern, southern, and central portions:

Meteorological Data.	Minneapolis, lat. 44° 56′ N., lon. 93° 13′ W.; altitude, abt. 800 feet.	Duluth, lat. 46° 48′ N., lon. 92° 6′ W.; altitude, 642.7 feet.	Breckenridge, lat. 46° 16′ N., lon. 96° 38′ W.; altitude, 966 feet.	Pembina or St. Vincent, lat. 49° N., lon. 97° 5′ W.; altitude, 790 feet.	New Ulm, lat. 44° 18′ N., lon. 94° 28′ W.; altitude, abt. 750 feet.	Madelia, lat. 44° 3′ N., lon. 94° 23′ W.; altitude, abt. 730 feet.
	°	°	°	°	°	°
Annual mean temperature	42.13	37.55	36.15	30.15	44	43.15
Highest temperature of the year	95	....	97	86.5	96	94
Lowest " " "	—38	....	—39	—51	—30	—24
Range of annual temperature	133	....	136	137.5	126	118
Mean temperature of winter	12.86	9.1	3.7	1.3	11.2	17.1
Highest " " "	53	....	39	36	42	42
Lowest " " "	—40	....	—39	—51	—30	—22
Range of winter temperature	93	....	78	87	72	64
Mean temperature of spring	45.70	36.3	34.3	33.1	45.6	40.3
Highest " " "	91	....	74	....	84	90
Lowest " " "	—23	....	—32	—40	0	—24
Range of spring temperature	134	....	106	....	84	114
Mean temperature of summer	69.36	62.3	68.1	65.2	73.8	71.2
Highest " " "	96	....	97	86.5	96	94
Lowest " " "	45	....	43	34	52	44
Range of summer temperature	51	....	54	52.5	44	50
Mean temperature of autumn	44.75	42.2	38.3	31.5	45.4	43.9
Highest " " "	92	....	79	74.5	80	88
Lowest " " "	—22	....	—18	—30	8	—2
Range of autumn temperature	114	....	97	104.5	72	90
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
Amount of annual rainfall	32.456	37.550	28.960	19.360	24.860	32.350
Rainfall of winter	3.105	2.160	4.980	2.750	2.260	5.280
" " spring	7.960	6.480	6.250	2.450	6.300	5.030
" " summer	16.304	20.850	14.150	7.250	7.020	13.340
" " autumn	5.108	8.060	3.580	6.910	9.280	8.700
Mean annual pressure of barom	28.933	29.971	30.016	29.963		
Mean pressure of winter	29.026	30.072	30.213	30.173		
" " spring	29.007	29.952	29.970	29.973		
" " summer	28.885	29.896	29.834	29.947		
" " autumn	28.991	29.967	30.048	29.903		
Prevalent winds of the year	S., N., N. W.	N. E., calm, S. W., N. W.	S. E., N. W., N.	N. W., S. E., calm.		
" " " winter	S. E., N. W., S.	S. W., N. E., calm, N. W., W.	S. E., N.W., N., W.	N. W., calm, S. E.		
" " " spring	S., N., E.	N. E., calm, N. W.	N., S. E., N. W., N. E.	N. W., S. E., calm, N. E.		
" " " summer	S., S. E., N.	N. E., calm, N. W., S. W.	S. E., N., S., N. W., N. E.	N.W., S. E., calm, S. W., N E.		
" " " autumn	S., S. E., N. W.	S. W., N. W., N. E., calm.	N. W., S. E., N., W., S.	N. W., calm, S. E.		

Railroads.—According to Poor's *Railroad Manual*, Minnesota in 1875 had 2227.31 miles of railroad, the whole cost of which for road-bed, rails, equipment, real estate, etc. was $95,312,171. The combined stock and debt of these lines in 1875, at par value, was $100,151,023. The total net earnings of the roads for the preceding year were $1,542,333.41. The total number of miles run by passenger and freight trains was 2,801,560; the number of tons of freight carried, 1,434,913, of which more than one-third was grain; the number of passengers carried, 1,012,506. There has been a want of harmony between the railroad companies and the State government for two or three years past, and new railroad enterprises are not regarded with much favor. While the State owes much of its rapid growth and development to the facilities afforded by the railroad lines which traverse it in all directions, it has suffered severely from worthless railroad bonds which unprincipled speculators have induced the State, counties, and cities to subscribe for, and the tariff of charges for the transportation of agricultural products to market has often been exorbitant and oppressive. But these evils eventually work their own cure.

Agricultural Products.—Minnesota is fast becoming the largest wheat-growing State in the Union. Spring wheat is mostly grown, as it proves more successful than the winter wheat. The crop of the State in a good year should be about 30,000,000 bushels, but the grasshoppers in 1873, 1874, and 1875, and the very wet season between harvest-

ing and threshing in 1875, have somewhat diminished the crop. The average yield per acre is 17.84 bushels, a larger average than that of any other State E. of the Rocky Mountains. The following table, prepared by Hon. C. F. Solberg, commissioner of statistics in Minnesota, shows the rapid increase of agricultural products in the State. We have added two columns, showing the acreage of the principal crops in 1874, and the product so far as reported:

	1870.	1871.	1872.	1873.	1875, estimated.	Acreage.
Wheat, bushels	15,372,941	13,467,300	22,059,375	26,402,485	31,475,000	1,764,109
Oats, "	9,895,164	10,689,484	12,550,733	12,544,536	15,775,000	441,102
Corn, "	5,650,370	7,076,268	7,142,245	6,457,368	9,500,000	364,683
Barley, "	1,518,686	1,627,007	1,495,495	669,415	1,585,000	44,430
Rye, "	73,375	130,928	182,730	96,877	70,000	4,368
Buckwheat, "	63,369	54,152	49,359	29,445	31,500	3,632
Total of grain crops	32,573,945	33,045,139	43,479,937	46,200,126	58,436,500	2,622,324
Beans, bushels	24,950	19,658	19,156	14,246	57,500	5,294
Potatoes, "	1,372,975	2,153,536	3,072,349	2,196,138	3,250,000	35,527
Cultivated hay, tons	72,639	82,456	108,028	144,712	140,000	104,897
Wild hay, "	526,616	603,146	743,414	783,619	1,000,000	126
Hops, pounds	138,803	64,243	114,429	57,291	....	
Sorghum, gallons, syrup	56,370	73,425	78,095	53,226	125,000	1,810
Flax, pounds, fibre	38,509	235,548	2,903,079	1,227,547	....	
Flax, bushels, seed	7,224	14,421	71,752	100,853	125,000	20,835
Clover, bushels, seed	3,689	2,588	2,348	1,546	5,651	
Timothy, bushels, seed	15,670	15,823	15,228	40,022	46,263	
Tobacco, pounds	20,573	37,051	42,788	28,324	22,557	
Strawberries, quarts	175,153	233,961	277,716	255,765	177,185	
Apples, trees growing	391,123	1,007,274	1,734,861	3,832,038	....	
Apples, trees in bearing	27,191	68,632	87,451	84,434	141,384	
Apples, bushels produced	10,755	34,927	39,663	20,307	50,000	
Maple-sugar, pounds	231,602	141,982	195,587	139,952	151,215	Miscellaneous products. 25,600
Maple-syrup, gallons	17,320	22,923	17,394	17,541	31,546	
Bees, number of hives	9,709	12,698	13,704	10,376	....	
Honey, pounds	138,418	229,679	232,948	134,266	....	
Wool, "	381,400	355,232	497,045	529,856	549,918	
Butter, "	6,805,866	7,356,768	8,823,630	10,140,316	12,000,000	
Cheese, "	365,048	469,147	772,630	1,031,510	1,250,000	

The following table gives the increase of live-stock and the total number at the close of 1875; the first three lines are U. S. census returns; the others, State reports:

Years.	Horses.	Cattle.	Mules and asses.	Sheep.	Hogs.
1850	860	2,102	14	80	733
1860	16,879	95,909	384	12,595	104,479
1870	93,011	310,379	2,350	132,343	184,473
1871	114,027	331,186	2,990	116,493	164,779
1872	127,200	386,048	3,569	134,509	161,786
1873	141,871	419,084	4,005	149,206	149,896
1875	167,313	467,578	5,257	162,807	141,810

Manufacturing and Mining Industry.—Minnesota possesses not only the greatest and most available water-power in the U. S. in the Falls of St. Anthony in the Mississippi, which is already largely improved, but she has available and constant water-powers sufficient for all manufacturing purposes in every county in the State. In 1860 there were 562 manufacturing establishments, with $2,388,310 capital, employing 2123 hands, consuming $1,904,070 of raw materials, and producing annually $3,373,172. In 1870 the number of establishments was 2072; hands employed, 9726; capital invested, $11,806,738; raw material consumed, $12,412,840; annual product, $23,396,097. The following table shows the condition of a few of the leading manufactures according to the census of 1870:

Description.	No. of establishments.	Capital invested.	Hands employed.	Value of materials used.	Value of annual product.
		$		$	$
Flour	208	2,862,545	627	5,567,023	6,982,959
Lumber	204	3,267,140	2,787	2,240,905	5,058,157
Sash, blinds, and doors	26	458,600	336	802,242	1,162,482
Carriages, wagons, etc.	115	351,930	461	192,130	595,780
Furniture	68	286,400	331	120,271	415,972
Agricult. implements.	27	215,256	150	109,746	304,575
Harness	73	122,475	194	170,554	334,170
Brewing and distilling	51	456,325	159	151,382	392,101
Machinery, locomotives, etc	11	631,021	542	405,599	2,051,283
Blacksmithing	294	232,770	430	202,696	559,501
Boots and shoes	168	172,419	387	239,310	529,204
Printing and pub'ing.	21	309,700	267	139,558	350,386
Coopering	57	80,100	251	190,072	395,337
Tin and sheet iron	79	157,235	184	153,980	311,321

Each successive year greatly increases this manufacturing industry. Minneapolis, situated at the Falls of St. Anthony, produced in 1874 manufactured goods of the value of over $15,000,000. Five millions bushels of the wheat produced in the State are manufactured into flour in its own mills, and Minnesota flour maintains the first rank. The lumber product of the two great lumber districts in 1874 was 421,000,000 feet, and the value of the annual product exceeded $5,500,000. The manufacture of agricultural implements and machinery has been greatly increased since 1870.

Finances.—Minnesota is in an excellent financial condition. Her recognized bonded State debt amounted Jan. 1, 1875, to $480,000. She had a school fund, well invested, on Nov. 30, 1874, of $3,030,127.09; a university fund of $211,107.53 (these two funds will eventually reach, by the sales of school and university lands and other resources, about $10,000,000 for the school fund and $1,000,000 for the university fund); a sinking fund, now increasing rapidly, of $61,222.15; a State interest fund of $40,930.53; a State institution fund, with a balance of $68,616.12; an internal improvement land fund of $39,032.42; and an inebriate asylum fund of $13,322.73. The assessed valuation of the State for the year 1874 was $217,427,211, and for 1875 somewhat more than $223,000,000. The real valuation was probably nearly or quite $300,000,000. Of this valuation, about one-third is personal property. The receipts into the State treasury (including a balance of $218,398.35) for the year ending Nov. 30, 1874, were $1,331,210.87; the disbursements for the same year were, for all objects, $1,148,059.96, leaving a balance in the treasury of $183,150.91. The estimated receipts of 1875 were $1,105,447.14, and the probable disbursements would leave a larger balance than usual in the treasury.

Commerce.—The commerce of Minnesota is of two kinds—that transmitted through her two ports of St. Paul and Duluth, and a small but rapidly increasing trade with Manitoba by steamers on the Red River of the North, and some also on the nearly completed railway between Fort Garry, St. Vincent, and St. Paul; and the great internal commerce, which tasks the energies of all her railroad lines and of her steamers on her navigable waters. In 1874 the collector at St. Paul reported 23 steamboats and 6 barges, with an aggregate of 2505.95 tons, as licensed by the surveyor of the port; imports of 114 packages of the foreign value of $15,340, and the collection of duties and dues to the amount of $7398.84. The number of arrivals at the port during the navigation season of 1874 was 218, all steamers. The collector of the port of Duluth, situated at the head of Lake Superior, reports the arrival at that port during the season of 1874 of 241 steamers and 47 sailing vessels, of an aggregate tonnage of 168,241 tons and manned by 6092 men, and the departure of 244 steamers and 48 sailing vessels, having an aggregate tonnage of 168,061 tons and crews of 6096 men. The entire amount of imported goods received at the port had a foreign value of $407,841, and the duties on them amounted to $183,118.39. The total freight received at the port of Duluth in 1874 was 42,307¾ tons, about one-seventh less than the previous year, but the shipments were 98,886¼ tons, which was about 6 per cent. in advance of any previous year. The freight on the Red River was about 8912¼ tons. The great and constantly increasing export to other States of lumber, wheat, and other cereals, flour, and agricultural machinery, and the importation of merchandise, salt, coal, etc., furnish the railways with nearly 1,500,000 tons of freight, and with the steamers and freight-boats produce a movement of not less than $50,000,000 or $60,000,000 worth of merchandise.

Banks and Savings Banks.—There were in Nov., 1874, 32 national banks in Minnesota. These had $4,448,700 of

capital paid in; $3,754,850 of U. S. bonds deposited to secure circulation, $4,455,000 circulation issued, of which $3,393,501 was outstanding; $8,215,293.79 loans and discounts; $740,397.15 stocks, bonds, and mortgages other than U. S. bonds; $1,173,903.91 due from other banks; $973,770.94 currency and specie on hand; the amount of individual deposits was $6,297,331.97. There were also 6 State banks at the same date, having aggregate resources of about $1,380,000. There were 7 savings banks, 2 of them organized in the autumn of 1874; the other 5 have aggregate resources of about $321,000—an amount more than sufficient to cover all their liabilities.

Insurance.—There are two fire insurance companies located in Minnesota: (1) the Minnesota Farmers' Mutual Fire Insurance Association, at Minneapolis, reporting assets amounting to $158,302.54; liabilities, $9486.88; income for the year 1874, $68,962.38; expenditures, $55,396.14; total outstanding risks, $9,622,884. (2) The St. Paul Fire and Marine Insurance Co., at St. Paul—capital, $400,000; assets, $728,632.21; liabilities, except capital and net surplus, $274,617.44; income during the year, $591,712.13; expenditures, $476,939.41; total risks in force, $23,066,424. Sixty-two companies from other States and countries were doing business in the State in 1874. The risks written by these companies in Minnesota in 1874 amounted to $56,816,622; the total premiums received, $846,743.64; the total losses paid, $378,788.01. There was at the same time 1 life insurance company in the State—the Minnesota Mutual Life, at St. Paul, with a paid-up capital of $8000; assets, of $53,863.85; liabilities, $49,464.50; income, $37,727.10; expenditures, $34,652.44; total amount of insurance in force, $935,924. Thirty-two companies from other States and countries were doing business in Minnesota. These companies issued 2218 policies in Minnesota during the year, covering $3,890,131 of risks, collecting $408,170 of premiums, and paid $190,054 of losses. They had in all in the State 8569 policies for $15,099,509.60.

Population.—The following table gives the population at given periods, with such other particulars as can be obtained:

Year of enumeration.	Total population.	Males.	Females.	Whites.	Colored and Indians.	Natives.	Foreigners.	Density	Ratio of increase.	Illiteracy.	Of school age, 5–20.	Of military age, males, 18–45.	Of voting age, males, 21 and over.	Citizens, males.
1850	6,077*	3,716	2,361	6,038	39	4,100	1,977	.04	....	649	1,751	1,378	1,449	
1855	68,812	....	....	....	....	....	....	.85	883.					
1860	172,023*	93,084	78,939	169,395	2,628	113,295	58,728	2.10	250.	4,763	52,731	41,226	48,186	
1865	250,099*	....	....	....	....	....	....	3.04	45.3	....	87,244			
1870	446,056†	235,299	204,407	438,257	7,799	279,009	160,697	5.26	78.	24,413	157,913	94,238	114,739	75,274
1873	552,464	294,710	257,754	540,605	11,859	350,556	201,908	6.65	24.	....	196,065			
1874	582,747	....	....	570,169	12,578	370,734	212,013	7.01	05.7	....	210,194			
1875	609,777†	316.076	281,331	594,876	14,901	379,978	217,429	7.24	04.6		228,362		150,916	

A large proportion of the foreign population of Minnesota is of Scandinavian origin. In the autumn of 1874 the Minnesota commissioner of statistics reported as the result of very careful inquiry that there were in the State 131,332 persons who were either of Scandinavian birth or parentage: of these, 75,251 were Norwegians, 50,423 Swedes, 5658 Danes. There were in 1870, 46,386 natives of Germany, Austria, and Bohemia, 30,554 from Great Britain and Ireland, and 16,698 from British America; Holland and Luxemburg furnished 3028; Switzerland, France, and Belgium, 4527; and the rest of the world, 867.

Education.—The first settlers of Minnesota were mostly from New England, and they brought with them the New England disposition to promote education and social culture and refinement. The church and school-house were among the earliest buildings reared in the new settlements. The State is now (1875) but twenty-two years old, and the population has increased from 6000 to 600,000 in twenty-five years, but the State has made greater progress in education in that time than any other State in the Union. Beginning with her public schools, we find that of the 210,194 persons of school age (5 to 21 years) in the State on Sept. 30, 1874, 128,902 were in school during some portion of the previous year—a larger proportion than in any other of the Western States. The whole number of school districts was 3266; there were 2758 school-houses in the State, valued at $2,238,700, of which 276 were built in 1874 at a cost of nearly $150,000. In these school-houses there were 2789 schools, in which the average attendance was 99,842. The whole number of teachers was 5482, of whom 1834 were males and 3648 females. The whole amount paid for teachers' wages was $678,606; the average monthly wages of male teachers was $41.57, and of female teachers, $30.52; the average number of months in which school was taught was 6.66. The whole amount expended for school purposes in 1874 was $1,155,542.25. There were in the State in 1874, 151 graded schools, and between twenty and thirty of the cities and larger towns had high schools in which pupils could pursue a course of classical and mathematical training qualifying them to enter the university. The school fund amounted in the autumn of 1874 to $3,030,127.09, and by the judicious sale of the school-lands yet unsold and the other sources of increase will undoubtedly eventually exceed $10,000,000. The normal schools of the State are 3 in number, situated at Winona, Mankato, and St. Cloud. The total number of teacher-pupils enrolled during the year was 905, of whom 548 had been regularly in attendance—126 males, 422 females. There were 22 teachers and professors in these schools. Teachers' institutes, holding from one to four weeks, are maintained in different parts of the State. The University of Minnesota at Minneapolis is the crowning institution of the public and free system of education in the State; it has a collegiate or elementary department, and beyond this departments of agriculture, science, literature and the arts, and the mechanic arts, and is to have also schools of law and medicine. It confers no honorary degrees, but requires an extended examination for all its degrees. The courses are intended to be as complete and thorough as those of any university or scientific school in the U. S. There are 19 professors and instructors, and there were in 1874, 287 students—209 males and 78 females. It is endowed with both the university and agricultural college lands to the extent of 202,412.17 acres, of which 33,872 acres have been sold. Its present fund ($211,107.53 in 1874) is destined to be largely increased by the further sales of its lands, and will eventually exceed $1,000,000. Its annual appropriation for current expenses is about $31,000. The other collegiate institutions in the State are St. John's College, near St. Joseph, Stearns co., under the control of the Roman Catholics, which has 124 students and 22 professors—not largely endowed, but has a good reputation for thoroughness of instruction; Carleton College, at Northfield, under the control of the Congregationalists, which has a small endowment, 171 students (107 male and 64 female), and 7 professors; the Shattuck School, at Faribault, under the control of the Protestant Episcopal Church, with 124 students and 9 professors. St. Mary's Hall, also at Faribault and under the control of the Protestant Episcopal Church, is a collegiate school for girls, having 114 students. Besides these there were in 1874, 31 academies and private schools, mostly under either Roman Catholic or Lutheran control. The whole number reported as under private instruction was 3764, but the State superintendent estimates that the whole number in attendance upon public and private schools during the year was not less than 135,000. There are two so-called business colleges, having nearly 400 students, in the State. There are three theological schools in the State—the Augsburg Evangelical Seminary at Minneapolis, founded in 1869, having in 1873, 5 professors, 63 students, and a library of 1100 vols.; St. John's Theological Seminary (Roman Catholic), in connection with St. John's College, with 3 professors, 19 students, and 400 vols.; and the Seabury Divinity School at Faribault, with 7 instructors and about 20 students. Of schools of special instruction, there is the Minnesota Institution for the education of the deaf and dumb and the blind, at Faribault, which has 100 deaf-mute and 22 blind pupils and 10 teachers. It is a State institution, and is well conducted. There are 2 orphan asylums, both private—one at St. Paul, the other at Shakopee; a soldiers' orphans' home, with 185 pupils, which constitutes the model school of the Winona Normal School. There is a State reform school at St. Paul, with 6 instructors and 114 children, all boys but 4. Its annual cost is about $30,000; about 90 per cent. are said to be reformed; the library has 900 vols. The State prison at Stillwater is said to be well managed. Its expenses in 1874 were $34,857, and the earnings of the prisoners between $7500 and $8000. The State hospital for the insane at St. Peter's had an average of 421 patients in 1874, and the appropriation for current expenses was $87,500. The buildings were to be completed in 1875 at a cost of nearly $60,000.

Crime.—There were 498 cases of criminal offences tried

* No enumeration of tribal Indians.
† Including 12,370 tribal Indians; sex of Indians not given.

in the county and circuit courts in 1874, and of these 320 were convicted.

Newspapers.—In 1870 there were 95 newspapers in the State, issuing 9,543,656 copies annually, and having a circulation of 110,778. In 1871 the number had increased to over 100, and in 1874 there were 128, with an aggregate circulation of about 156,000. In 1870 there were 6 dailies; in 1875 there were 15. In 1870 there were 5 tri-weeklies, 79 weeklies, and 5 monthlies. Nearly or quite all of the tri-weeklies have now become dailies, and the number of weeklies has increased to more than 100.

Libraries.—According to the census of 1870, there were 1412 libraries of all classes in Minnesota, with 360,810 volumes; 587 of these were public, having 160,790 vols. Of these, 1 State library had 10,000 vols. (18,000 in 1875); 15 town or city libraries had 9981 vols.; 1 law library, 500 vols.; 1 college or school library, 4000 vols. (in 1874 there were 13 of these libraries, with nearly 20,000 vols.); 544 Sunday-school and church libraries, numbering 112,508 vols. (these had more than doubled in 1874); 2 literary association libraries, with 7200 vols.; 23 circulating, with 16,601 vols.; 825 private, with 200,020 vols.

Churches.—The following table gives the statistics of religious denominations in 1870, 1872, and 1874:

Denominations.	No. of organizations, 1870.	No. of church edifices, 1870.	No. of sittings, 1870.	Value of church property, 1870.	No. of churches, 1872.	No. of clergymen, 1872.	No. of members, 1872.	Dioceses, conferences, associations, etc., 1874.	Church edifices, 1874.	Churches, 1874.	Ministers, 1874.	Members, 1874.	Adherent population, 1874.	Sunday schools, 1874.	Sunday-school scholars and teachers, 1874.
All denominations	877	582	158,266	$2,401,750	1036	700	152,927	...	880	1247	871	113,705	572,770		
Baptists	94	50	12,435	159,500	161	114	5,241	8	145	177	118	6,293	31,500	64	5,243
Christians	6	6	1,550	7,450											
Congregationalists	57	39	11,400	143,200	80	65	3,751	...	.....	86	66	4,165	20,825		
Protestant Episcopalians	64	54	14,595	400,500	55	38	2,939	1	50	46	56	3,659	18,295	.....	3,745
Evangelical Association and other German Methodists	25	18	4,375	25,100	37	29	2,329	1	45	48	39	3,179	15,800		
Lutherans, 4 synods	135	97	23,325	222,150	255	101	41,578	4	165	293	138	57,470	200,000		
Methodists	225	106	26,890	337,550	76	129	8,214	2	179	210	194	29,592	140,000	279	18,231
Presbyterians	76	60	16,956	275,000	90	122	5,200	...	91	103	141	6,300	31,500		
Roman Catholics	154	135	42,370	755,000	239	76	80,000	1	165	245	88	....	100,000		
Second Adventists	7	1	150	2,100	.....	.....	....	...	1	7	4	250	1,250		
Universalists	18	6	1,720	55,000	21	11	1,500	1	7	7	9	335	1,600		
Minor denominations	16	10	2,250	91,150	22	15	2,175	...	15	25	18	2,462	12,000		

Among the minor denominations are 2 Reformed (late Dutch) churches and 3 Reformed (late German), as well as several union and other churches.

Counties.—There are 76 organized counties, as follows:

COUNTIES.	Pop. 1870.	Males, 1870.	Females, 1870.	Pop. in 1875.	Total valuation of property.	Value of personal property.
Aitkin	178	94	84	205	$179,220	$18,459
Anoka	3,940	2,091	1,849	5,709	1,689,501	294,071
Becker	308	173	135	2,256	411,604	116,049
Benton	1,558	864	694	1,974	727,719	69,648
Blue Earth	17,302	9,351	7,951	20,942	7,470,101	1,491,791
Brown	6,396	3,395	3,001	9,815	2,536,250	541,410
Carlton	286	212	74	495	252,141	16,772
Carver	11,586	6,101	5,485	13,033	2,553,771	461,558
Cass	380	211	169	239	879,727	5,461
Chippewa	1,467	833	634	2,977	391,569	205,853
Chisago	4,358	2,331	2,027	6,046	1,873,848	277,198
Clay	92	60	32	1,451	689,507	142,731
Cottonwood	534	336	198	2,870	586,937	168,303
Crow Wing	200	122	78	1,031	389,222	66,044
Dakota	16,312	8,741	7,571	17,360	6,727,015	1,273,030
Dodge	8,598	4,526	4,072	10,045	3,730,352	548,602
Douglas	4,239	2,278	1,961	6,319	1,375,662	302,336
Faribault	9,940	5,244	4,696	11,131	3,638,768	539,918
Fillmore	24,887	13,221	11,666	28,337	8,093,347	1,684,530
Freeborn	10,578	5,590	4,988	13,189	3,155,152	602,850
Grant	340	202	138	1,191	281,243	77,304
Goodhue	22,618	12,012	10,606	28,500	10,040,943	2,400,158
Hennepin	31,566	16,827	14,739	48,725	27,551,998	5,988,349
Houston	14,936	7,828	7,108	16,566	4,589,784	799,255
Isanti	2,035	1,075	960	3,901	582,328	92,370
Jackson	1,825	1,008	817	3,506	496,308	142,228
Kanabec	93	53	40	311	430,060	15,141
Kandiyohi	1,760	948	812	8,083	1,939,934	454,893
Lake	135	78	57	161	209,467	4,453
Lac qui Parle	145	83	62	1,428	232,186	75,583
Le Sueur	11,607	5,999	5,608	13,237	2,814,635	339,612
Lincoln	New	co.	......	413	19,591	14,997
Lyon	3,161	1,744	1,417	2,543	778,031	97,975
McLeod	5,643	2,975	2,668	8,651	2,278,492	318,399
Martin	3,867	2,094	1,773	3,738	996,367	187,664
Meeker	6,090	3,220	2,870	8,626	2,445,488	487,755
Mille Lacs	1,109	598	511	1,300	657,069	31,013
Morrison	1,681	956	725	2,722	768,190	98,042
Mower	10,447	5,802	4,645	13,682	5,343,457	824,982
Murray	209	117	92	1,329	257,763	56,634
Nicollet	8,362	4,434	3,928	11,525	3,038,787	697,896
Nobles	117	63	54	2,750	501,101	18,137
Olmstead	19,793	10,435	9,358	20,946	8,809,610	2,043,252
Otter Tail	1,968	1,084	884	9,174	1,509,253	395,435
Pine	648	475	173	795	1,105,182	73,894
Polk	......	......	......	937	141,207	45,963
Pope	2,691	1,430	1,261	4,078	900,982	157,367
Ramsey	23,085	12,021	11,064	36,333	32,013,614	7,943,111
Redwood	1,829	1,037	792	2,982	953,424	130,373
Renville	3,219	1,757	1,462	6,876	1,039,579	314,958
Rice	16,083	8,399	7,684	20,622	7,380,886	1,847,793
Rock	138	78	60	1,861	271,725	119,987
St. Louis	4,561	3,525	1,036	3,517	2,707,164	394,683
Scott	11,042	5,826	5,216	12,394	2,936,396	524,972
Sherburne	2,050	1,150	900	3,018	845,719	136,650
Sibley	6,725	3,549	3,176	8,884	2,562,825	358,192
Stearns	14,206	7,585	6,621	17,797	5,189,447	912,354
Steele	8,271	4,377	3,894	10,739	3,974,927	863,748
Stevens	174	102	72	786	130,401	50,639
Swift	New	co.	......	2,269	226,754	115,396
Todd	2,036	1,108	928	3,818	903,614	104,212
Wabasha	15,859	8,417	7,442	17,296	5,828,719	1,101,877
Wadena	6	5	1	210	63,252	16,632
Waseca	7,854	4,154	3,700	14,751	2,972,810	486,368
Washington	11,809	6,733	5,076	9,994	6,496,924	1,574,398
Watonwan	2,426	1,343	1,083	4,024	825,840	193,449
Wilkin	295	180	115	528	421,321	53,239
Winona	22,319	11,530	10,789	27,385	10,525,230	2,440,980
Wright	9,457	4,958	4,499	13,775	2,549,056	316,151
Yellow Medicine	New	co.	......	2,484	536,715	94,271
Total	439,429	235,149	204,281	596,585	$217,427,211	$45,021,798

The counties not organized in 1874 were Beltrami, having a population in 1875 of 80; Big Stone, 305; Itasca, 96; Pembina, 202; Cook, 215; and Traverse, 100; Mankatha and Wahuata, population not given. The whole population of the counties except tribal Indians was 597,407; males, 316,076, females, 281,331. In 1860 the population of these counties and others since changed was 1938, and total, 172,023.

Principal Cities and Towns.—St. Paul, the capital, had in 1870, 20,030 inhabitants, and in 1875, 33,170; Minneapolis, at the falls of St. Anthony, in 1870, 18,087, in 1875, 32,721; Winona in 1875, 10,737; Stillwater, Red Wing, Faribault, and Mankato, from 5000 to 7000; Rochester, Duluth, Hastings, Owatonna, St. Peter, Austin, Lake City, New Ulm, Northfield, and St. Cloud, from 2000 to 5000; and Wabasha, Anoka, Rushford, Shakopee, St. Charles, Waseca, Hokah, Brainerd, Kasson, Brownsville, Caledonia, and Henderson are flourishing and rapidly growing towns.

Constitution, Courts, Representatives in Congress, etc.—The constitution of Minnesota was adopted Oct. 13, 1857, when she was seeking admission into the Union. The governor, lieutenant-governor, secretary of state, treasurer, and attorney-general are chosen by a plurality vote of the electors for the term of two years. The auditor is elected in the same way, but for three years. There are 22 senators, elected for two years, one-half chosen each year; 47 representatives, chosen annually. The legislature meets annually, and its sessions are limited to 60 days. The election takes place in November. Suffrage is confined to male citizens, but is otherwise almost universal. The voter must be twenty-one years old, and may be either a citizen of the U. S., or of foreign birth who has declared his intention to become a citizen, or of African descent if otherwise eligible, or of mixed white and Indian blood, or of Indian blood if he has adopted the language, customs, and habits of civilization, and is pronounced capable of voting by any district court of the State, but he must have resided in the U. S. a year, in the State four months, and in the election district ten days next preceding the election. The judicial power is vested in a supreme court, district courts, courts of common pleas, courts of probate, and justices of the peace, all elected by the people. The supreme court consists of a chief-justice and two associate justices, elected for seven years. It has original jurisdiction in such remedial cases as are prescribed by law, and appellate jurisdiction in all cases both in law and equity. There are no jury trials in the supreme court. There are 11 judges of the district courts, each elected by the people of their several districts for seven years; in Ramsey and Hennepin counties there are courts of common pleas, the judges of which have the same tenure of office and salary as the district judges. The probate courts are in each county, and 2 justices of the peace are chosen for each organized township. Minnesota is entitled under the apportionment of 1872 to 3 members of Congress, and with her present population should have 4.

History.—The first European who set foot on the territory of Minnesota was Louis Hennepin, a Franciscan priest, who in 1680, in the company of a party of French fur-traders, ascended the Mississippi to the Falls of St. Anthony, to which he gave their name. Some French traders and their descendants settled around the Falls, but soon lapsed into Indian customs and modes of life. In 1763 this region was ceded to Great Britain, and in 1766 it was explored by Capt. Jonathan Carver, a native of Connecticut. In 1783 it was transferred to the U. S. as a part of the North-west Territory. In 1805 a tract of land was purchased from the Indians at the mouth of the St. Croix, and another at the mouth of the Minnesota, including St. Anthony's Falls. In 1820, Fort Snelling was built, and in 1822 the first mill was erected in what is now Minneapolis. In 1823 the first steamboat visited Minnesota. Between this time and 1830 a small colony of Swiss settled near St. Paul. In 1838 the Indian title to lands E. of the Mississippi was extinguished. In 1843 a settlement was commenced at Stillwater; on Mar. 3, 1849, Congress passed an act organizing the Territory of Minnesota, its western boundary being the Missouri River. At this time the population of the Territory was between 4000 and 5000, and it was duly organized on the 1st of June following. In 1851 the Indian title to the lands between the Mississippi and the Red River of the North was extinguished, except the reservations. Immigration at once commenced in earnest, and so rapid was the increase of population that on Feb. 26, 1857, Congress passed an enabling act for its admission as a State. The provisions of the act were complied with, a constitution (under which the State is still governed) was passed and submitted to the people, and members of Congress elected in the following October, and on May 11, 1858, Minnesota was formally admitted to the Union. Her growth has been one of unexampled rapidity, not only in population, but in wealth, education, and general prosperity. In 1862 the Sioux, who claimed extensive tracts in the W. and S. W. of the State, taking advantage of the war, which had called great numbers of the able-bodied men of Minnesota to distant battlefields, suddenly made an irruption upon the new settlements, massacring whole families, burning villages, and driving thousands of settlers penniless from their homes. Nearly 1000 persons perished from this savage outbreak; but its suppression was as speedy and severe as the invasion had been brutal and barbarous; the Sioux were defeated and conquered, the most guilty executed, and the whole tribe removed from the State. There are still in the State about 12,000 friendly Chippewas, scattered on three or four reservations. The conflict between the farmers and the railroad companies has been much less violent in Minnesota than in the other States, and they are now on amicable terms. The locusts in 1873 and 1874 ravaged a few counties, and diminished by from 20 to 25 per cent. the crop of cereals, but this has but slightly disturbed the prosperity of the State.

Governors of the State.

TERRITORIAL GOVERNORS.		Alexander Ramsey......	1860–64
Alexander Ramsey......	1849–53	Stephen Miller............	1864–66
Willis A. Gorman........	1853–57	William R. Marshall...	1866–70
Samuel Medary...........	1857–58	Horace Austin............	1870–74
STATE.		Cushman K. Davis......	1874–76
Henry H. Sibley.........	1858–60	John S. Pillsbury........	1876–

Electoral and Popular Vote at Presidential Elections.

Year of election.	Candidates for President and Vice-President who received the electoral vote of the State.	Elect. vote.	Popular vote.	Principal opposition candidates.	Popular vote.	Minority candidates.	Popular vote.
1860	Abraham Lincoln P......... Hannibal Hamlin V.-P.....	4	22,069	Stephen A. Douglas P...... Herschel V. Johnson V.-P	11,920	John C. Breckenridge P... Joseph Lane V.-P............	748
1864	Abraham Lincoln P......... Andrew Johnson V.-P......	4	25,061	George B. McClellan P.... George H. Pendleton V.-P	17,375		
1868	Ulysses S. Grant P........... Schuyler Colfax V.-P.......	4	43,545	Horatio Seymour P......... Francis P. Blair, Jr.,V.-P.	28,075		
1872	Ulysses S. Grant P........... Henry Wilson V.-P..........	5	55,117	Horace Greeley P............ Benj. Gratz Brown V.-P...	34,423	Charles O'Conor P..............	No rept.

For many valuable statistics and much recent information contained in this article the writer is indebted to His Excellency Cushman K. Davis, governor of Minnesota, and to Hon. S. P. Jennison, secretary of state.

L. P. BROCKETT.

Minneso'ta, tp. of Jackson co., Minn. Pop. 126.

Minnesota City, post-v. of Rolling Stone tp., Winona co., Minn., on the Milwaukee and St. Paul and the Winona and St. Peter R. Rs.

Minnesota Junction, post-v. of Dodge co., Wis., at the crossing of the Portage branch of the Milwaukee and St. Paul R. R. and the Wisconsin division of the Chicago and North-western R. R., has the repair-shops of the latter.

Minnesota Lake, post-tp. of Faribault co., Minn. Pop. 564.

Minnesota River rises in Big Stone Lake, on the boundary between Minnesota and Dakota, traverses the State of Minnesota, flowing first S. E. and then N. E., reaching the Mississippi 5 miles above St. Paul. It flows through "the Big Woods," a great forest of deciduous trees, and is navigable 300 miles in high and 45 in low water. Total length, 470 miles.

Minnesota, University of, a public institution of learning in Minneapolis, Minn., established by virtue of the State constitution. The present charter dates from 1868. The government is vested in a board of regents, consisting (1) of seven members appointed by the governor, and (2) three members, *ex-officiis*—the governor, the superintendent of public instruction, and the president of the university. The endowment consists of 202,083 acres of public lands, about one-fifth of which have been sold for $201,000. In 1875 the general faculty included 15 persons; the number of students was 234. Tuition free in all departments. Both sexes are admitted. There is no dormitory system. No honorary degrees are conferred. The library contains 10,000 volumes. The geological survey of the State was entrusted to the university in 1872, and is in successful progress. The permanent plan of organization adopted in 1870 is a novel one. The studies usually included in the first two college years are thrown out of the university proper, and are merged with a remainder of "preparatory" work to form the department of elementary instruction required by the charter. The "secondary" department thus formed is the common feeder of the university college, but for the time being only, it being part of the plan to drop the whole of this work to the high schools as soon as practicable. The following distinct but federated colleges are in operation: (1) A college of science, literature, and the arts, having three courses of general studies, classical, scientific, and modern, leading in two years to the degrees of B. A., B. S., and B. L.; (2) a college of agriculture, having a course of proper professional studies, leading to the degree of B. Agr. in two years; (3) a college of mechanic arts, having courses in civil and mechanical engineering, leading to appropriate baccalaureate degrees. Post-graduate courses will be organized, leading to the higher academical and professional degrees.

WILLIAM W. FOLWELL.

Minnetarees, or **Hidatsa,** a tribe of Indians on the upper Missouri River, called also "Gros Ventres of the Missouri." They were formerly a branch of the Crows, but since the close of the eighteenth century have lived in close relations with the Mandans, and in permanent hostility with the Shoshones, the Flatheads, and the Sioux. In 1804 they numbered 2500, and lived in two villages on Knife River, but they lost half their number by smallpox in 1838, and settled with the Mandans in 1845 at the present site of Fort Berthold, where they still remain. They have since suffered severely from inroads by the Sioux, and now (1876) number little more than 500 souls. They have always been friendly to the whites, and made treaties with the U. S. in 1825, 1851, and 1864. A large reservation on the frontier of Montana was set apart for them, along with the Rickarees and Mandans, in 1870, but they have not yet occupied it. They live in colossal earth-covered lodges, each accommodating several families, and in their manners and religion resemble the Mandans, gaining their subsistence by hunting in the upper Missouri and Yellowstone valleys. They have been visited by Roman Catholic missionaries, but few if any have embraced Christianity. A *Grammar and Dictionary of the Hidatsa*, by Washington Matthews, was printed at New York in 1873, and a *Hidatsa-English Dictionary* in 1874.

Minneton'ka, post-tp., Hennepin co., Minn. Pop. 552.

Minnetris'ta, post-tp., Hennepin co., Minn. Pop. 626.

Min'now [Fr. *menu*, "small"], a name applied to many small fresh-water fishes of the family Cyprinidæ. The English minnow is *Phoxinus aphya*, a very common fish. In the U. S. the name is extended to the innumerable

species of *Hybognathus, Hybopsis, Hyborhynchus, Photogenis, Coliscus, Sarcidium, Clinostomus, Rhinichthys,* etc.

The Minnow.

They are used as live bait in pike and pickerel fishing, and are important as affording food to larger and better fishes.

Mino Bird, the *Gracula musica,* called also *Eulabes Javanicus,* a remarkable bird of the starling family, found wild in the Malay Islands, and often seen caged in China and India. It is very lively and intelligent, and when trained is considered the best talker among the birds, far

The Mino Bird.

surpassing any parrot. It is also a good singer. It is almost entirely black, with orange wattles and yellow bill and feet. There is a white spot on the wing, and the bird is about a foot long.

Minonk, post-v. and tp. of Woodford co., Ill., 118 miles S. W. of Chicago, on the Illinois Central and Chicago and the Pekin and South-west R. Rs. It is celebrated for its coal-mines, and has 8 churches, 1 steam-mill, 3 weekly newspapers, 8 elevators, and 50 business-houses. Principal employment, mining and agriculture. Pop. of v. 1122; of tp. 2115. W. R. Dunn, Ed. "Minonk Journal."

Minoo'ka, post-v. of Au Sable tp., Grundy co., Ill., on the Chicago Rock Island and Pacific R. R., 11 miles S. W. of Joliet.

Minor. See Infant, by Prof. T. W. Dwight, LL.D.

Mi'nor [Lat.], in music, the designation of a mode or interval which in certain respects is *less* than others. Thus, the third in the minor mode is one semitone less than the third in the major mode. The same distinction applies to all thirds and sixths.

Minor (Lucian), b. in Louisa co., Va., in 1802; graduated at William and Mary College 1823; was attorney-general for the commonwealth in his native county 1828–52; published several occasional addresses; contributed many articles to the *Southern Literary Messenger;* edited several legal publications, especially Call's *Virginia Reports;* condensed the four volumes of Hening & Munford's *Reports* into a single volume, with annotations of subsequent cases, and wrote a tract, *Reasons for Abolishing the Liquor Traffic,* of which 30,000 copies were sold.

Minor (William Thomas), LL.D., b. at Woodbury, Conn., Oct. 3, 1815; graduated at Yale in 1834; was eight years in the Connecticut legislature; governor of Connecticut 1856–58; consul-general at Havana 1864–67; was appointed in 1868 a judge of the Connecticut superior court; resides at Stamford, Conn.

Minor'ca, the second largest of the Balearic Islands, situated in the Mediterranean, and belonging to Spain. Area, 335 square miles. Pop. 39,005. It is high and mountainous, its highest point, Mount Toro, rising 4793 feet. It produces oil, wine, hemp, and fruits, but it is less fertile than Majorca; lead, copper, and iron are found. Chief town, Port Mahon.

Mi'norites [Lat. *Fratres minores*], the name given by St. Francis of Assisi to his original order. (See Franciscans.) The name is still borne by some congregations of that great order or group of orders.

Minority Representation. See Proportional Representation, by C. R. Buckalew.

Minor Mode. See Mode.

Minor Scale, in music, any scale corresponding in form with that of A minor—*i. e.* having a regular gradation of eight notes, with a minor third. The minor scale, however, is less perfect than the major, as the seventh degree ascending (being *minor*) does not properly possess the quality of leading note until raised a semitone by the addition of a sharp. But this change necessitates another—viz. a similar raising of the *sixth,* between which and the altered seventh there would otherwise be the interval of an "extreme" second—an interval only occasionally employed in the ascending scale. In *descending,* the natural or unaltered degrees of the *seventh* and *sixth* are commonly used, though in numerous cases a richer effect is produced (see Mode) by retaining the sharp on the seventh, and omitting it on the sixth, as in the example following:

William Staunton.

Mi'nos, a king of Crete, to whom the Cretans traced their laws and political institutions, is said by Homer and Hesiod to have been a son of Zeus and Europa, a brother of Rhadamanthus, and, after his death, one of the judges of the Shades in Hades. Later poets and mythologists speak of two kings of Crete of the name of Minos, probably in order to establish harmony between the many contradictory myths which clustered around the name.

Minot', post-tp. of Androscoggin co., Me., on the Grand Trunk and the Oxford Central R. Rs., 40 miles N. W. of Portland. It contains the village of Mechanic Falls (which see), and has important manufactures. Pop. 1569.

Minot (George), b. at Haverhill, Mass., Jan. 5, 1817; graduated at Harvard 1836; studied law with Rufus Choate; was admitted to the bar 1839, and became distinguished in his profession. He was associate reporter of the decisions of Judge Woodbury of the first circuit court; published in 1844 his *Digest of the Decisions of the Supreme Court of Massachusetts* (45 vols., with *Supplement,* 1852); edited the *English Admiralty Reports* (9 vols., 1853–54); aided Richard Peters, Jr., in editing the first 8 vols. of the *U. S. Statutes at Large* (1848), for which he prepared the *Index,* and was the editor of that important publication for the ten years preceding his death, which occurred at Reading, Mass., Apr. 16, 1858.

Minot (George Richards), b. at Boston, Mass., Dec. 28, 1758; graduated at Harvard 1778; was admitted to the bar 1781; was clerk of the Massachusetts legislature 1782–91; was appointed judge of probate for Suffolk co. (Boston) 1792, and became chief-justice of the court of common pleas 1799. He was one of the founders of the Massachusetts Historical Society, and edited 3 volumes of their *Collections;* was orator on the anniversary of the "Boston Massacre," Mar. 5, 1782; wrote a *History of the Insurrection in Massachusetts in 1786* (1788), being that known as "Shays's Rebellion," and a *History of Massachusetts Bay from the Year 1748* (vol. i., 1798), being a continuation of Hutchinson's work. A second volume (1803) was published after the death of Judge Minot, which occurred at Boston Jan. 2, 1802.

Min'otaur, in Grecian mythology, a monster, half bull, half man, was the offspring of Pasiphaë, the wife of Minos, and Poseidon's bull. Minos shut the monster up in the Cnossian labyrinth, where a number of youths and maidens, paid as a tribute by Athens, were sacrificed annually to it until it was killed by Theseus.

Minot's Ledge, or the **Minot's Rocks,** a portion of the extensive reefs called Cohasset Rocks, lying off Cohasset, Mass., the south-eastern promontory of the coast of Boston Bay, E. S. E., and 14 nautical miles from the city. A granite lighthouse with fog-bell is situated on the outer rock. (See Lighthouse Construction.)

Minsis Indians. See Munsees.

Minsk, government of Russia, on the upper part of the Dnieper. Area, 34,716 square miles. Pop. 1,135,588. The ground is low and level; the soil often sandy, often marshy;

the climate in the winter very severe. Extensive forests cover the land. Rye, flax, and hemp are raised; sheep and horses are reared, and tar, timber, and potash are produced.

Minsk, town of Russia, the capital of the government of Minsk, on the Svislocz, a tributary of the Beresina. It has many good educational institutions, and is the seat of the provincial government, but its trade and manufactures are unimportant. It is mostly built of wood. Pop. 36,277.

Min'ster, post-v. of Jackson tp., Auglaize co., O., and on the Miami Canal. Pop. 868.

Min'strels [Fr. *ménestral*, probably from Lat. *ministrellus*, dim. of *minister*], the name applied during the Middle Ages in England, Scotland, France, and Normandy to strolling musicians who sang to the harp verses composed by themselves or others, and usually accompanied their songs with dancing, mimicry, and other devices to *minister* to the amusement of royal or noble patrons. There can be little doubt that they were direct successors of the skalds and gleemen of earlier Scandinavian and Teutonic antiquity, and connected, though more remotely, with the "bards" who figured so largely among the Celtic and Gothic tribes. They were, however, no longer the custodians of the national epics, like the Minnesingers, nor even permanently attached to the noble families as genealogists, but had begun to degenerate into jesters. The last representative of the earlier type of warrior-minstrels was probably Taillefer, who at the battle of Hastings rode before Duke William, tossing up and catching his sword and singing the song of Roland. By the time of Edward IV. the nobler occupations of the minstrels had given place to masquerading and playing at mysteries, and in the thirty-ninth year of Elizabeth a statute was passed classing minstrels and "jugglers, bearwards, fencers, common players of interludes, tinkers, and peddlers" as "rogues, vagabonds, and sturdy beggars," and to be punished accordingly. From that period nothing more is heard of minstrelsy as a profession. In modern times the name has been employed in a double sense. The comic singers of negro and other melodies are known as "minstrels," while the same term is often employed in a complimentary sense nearly as the equivalent of "poet." Of the latter conception Scott's *Lay of the Last Minstrel* is a good example.

Mint [Gr. μίνθη], a name applied to various fragrant labiate plants, but especially to those of the genus *Mentha*. Of these, the PEPPERMINT and SPEARMINT (which see) are the most important. The whole genus, with many other plants of the order, possesses aromatic qualities. The European pennyroyal (*M. pulegium*), bergamot mint (*M. citrata*), and others have considerable use in domestic medicine, and some are employed in cookery.

Mint [Ang.-Sax. *mynet*, "money"], a factory of coin conducted under the sanction of public authority. The use of the precious metals as measures of value and mediums for effecting the exchange of commodities dates from the earliest period in the history of the human race of which any record exists. Originally, gold and silver passed by weight in the form of lumps, buttons, wedges, and spikes. With the progress of mankind, increase of barter, and the extension of commerce came the necessity for individual pieces of metal of uniform fineness, weight, and value, in form for convenient use, and bearing in effect the certificate of the supreme authority as to such fineness, weight, and value, and to pass by tale or count. The best authorities are generally agreed in awarding the invention of coins to the Lydians, and the period of their first use to about eight centuries before the Christian era. Their introduction enabled the weighing of bullion in ordinary business transactions to be dispensed with, and placed the unskilled multitude upon an equality in the use of money with the skilled few. The use of coins rapidly spread over the commercial world, and aided materially in the exchange of commodities, and powerfully promoted intercourse between the different countries of the world.

A description of the various modes employed in coinage prior to the invention of the present advanced processes and machinery would be, in fact, a history of the gradual development of the coinage-art from the stamping of rude characters on one side of a lump of metal, through all its changes and improvements, down to the time when it reached an advanced stage, and cannot be given within the limits of this article. A brief reference can only be made to the organization of the mints of the U. S., and the principal operations to which bullion is subjected in the manufacture of coin.

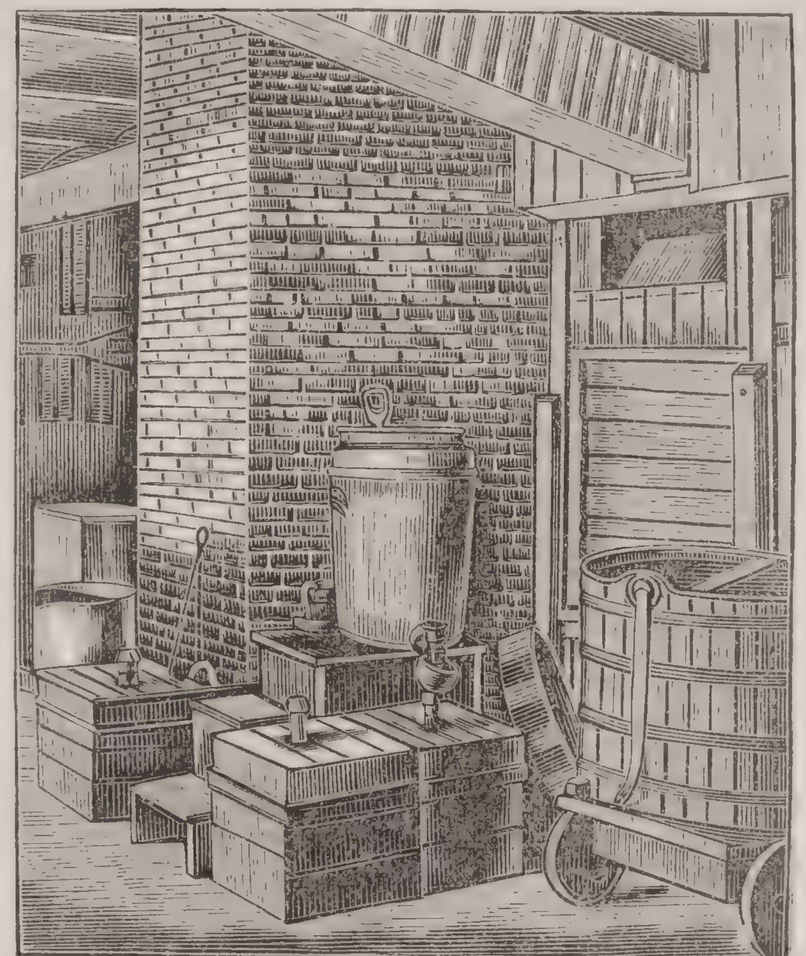
The mints and assay-offices are under the supervision of the director of the mint, whose head-quarters are in the treasury department at Washington, and who is subject to the general direction of the secretary of the treasury. The mints at which coinage is executed are located at Philadelphia, San Francisco, and Carson. Assay-offices are located at New York, at Denver, Col., at Boisé, Id., and at Charlotte, N. C. The officers of the coinage mints are a superintendent, assayer, melter and refiner, and coiner; and for the mint at Philadelphia an engraver. The assay-office at New York has a superintendent, assayer, and melter and refiner. The other assay-offices have an assayer in charge, and a melter. Such assistants, clerks, and workmen are employed as are required and provided for by law.

The various operations and processes to which bullion is subjected after being received at one of the coinage mints may be generalized as follows:

(1) *The preparatory melting*, usually with protective or refining fluxes, as the case may be; (2) *the assay*, which determines the precise proportion of fine gold or fine silver in each case, and also whether both metals are present and require parting; (3) *the parting process*, often called *refining*, since it takes the silver out, and leaves pure gold and pure silver as the separate products; (4) *the alloying of the metal*, so as to make ingots or thin bars of standard fineness, and the casting of such ingots; (5) *the assay of ingots*, to determine whether they are of the legal or standard fineness for coinage; (6) the various manipulations by which such standard ingots are converted into coin.

As a general rule, all bullion when received is subjected to "deposit" or preparatory melting, for the purpose of freeing it from all earthy matter and adhering substances, as well as to render the mass homogeneous preparatory to assay. Samples for assay are taken while the bullion is in a fused condition and before being cast into bars. The weight of the bullion after deposit-melting is that with which the depositor is credited and the melter and refiner charged. The bullion, if not of sufficient fineness and otherwise in condition to admit of being brought to the legal standard for coinage—nine parts pure metal and one of copper—is subjected to purification by melting and the use of protective and refining fluxes. If gold bullion contains silver, or silver bullion contains gold, in quantities sufficient to defray the expense of separating the two metals, it is subjected to the parting operation, which is based on the fact that silver is soluble in both nitric and sulphuric acid, while gold is not affected by either. If the metal to be parted is not present in quantity sufficient to equal the expense of the operation, it passes off in the coins, but without valuation. In the gold coins the law permits one-tenth of the alloy to be composed of silver. Tests made by the assay commission show that the silver in gold coins is almost inappreciable, amounting to but a trace, while out of five examinations made for gold contained in silver coins, the highest limit was 1 part in 5000. The most economical proportion of the two metals for the parting operation is 2 ounces of silver to 1 of gold.

FIG. 1.



Parting-hood and vessels for the separation of the silver and gold by nitric acid; carboys of acid in front.

The bullion, having been freed from all foreign substances and base metals, or separated where gold and silver are associated in the same bullion, is alloyed with copper and brought to the legal standard for coinage. It is then cast into ingots and assayed, and if found to be sufficiently

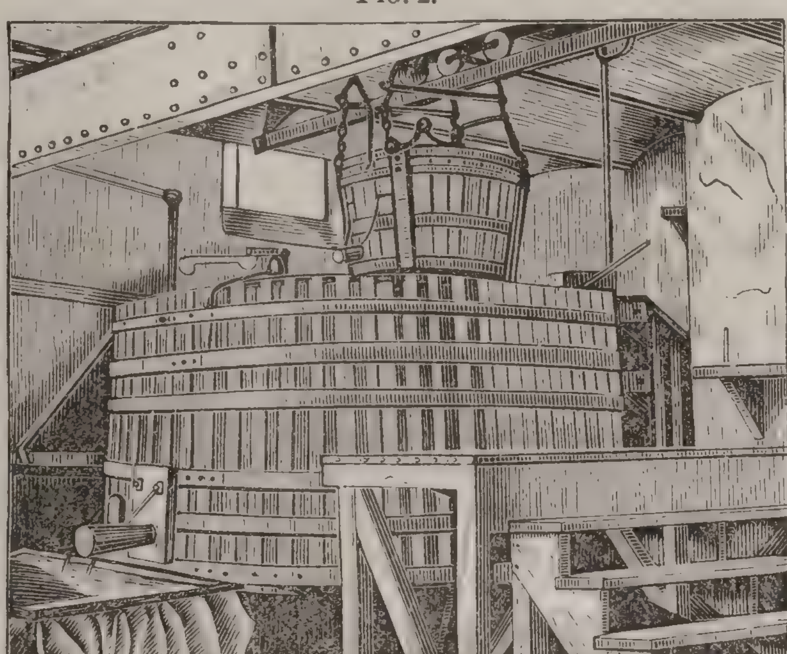
within the deviation from standard or "tolerance" allowed by law, is transferred to the coiner, who by a series of operations converts it into coin. In the case of gold coins, which are the standard of value and unlimited legal tender, each blank is adjusted by hand before being milled and stamped. The blanks for the trade dollar, which is a full-valued coin, are also adjusted by hand, while those for the subsidiary or overvalued silver coin, the half dollar, quarter dollar, twenty-cent piece, and dime, are not so adjusted, the drawbench being relied on to ensure the necessary uniformity as to thickness and correspondence of the blanks to their respective legal weights. The legal deviation from standard fineness in gold ingots for coinage is $\frac{1}{1000}$th, and in silver ingots $\frac{3}{1000}$ths. In practice, these deviations are not fully availed of, gold ingots being rarely approved by the assayer when the deviation exceeds one-half, and in the case of silver ingots one-third, the tolerance or deviation allowed by law. The object in both cases is to obtain, on the average, conformity as near as practicable to the prescribed standard.

The following statement exhibits the standard weight of the gold and silver coins of the U. S., and the legal tolerance or deviation allowed on single pieces:

Denomination.	Standard weight, grains.	Legal deviation, grains.
Gold.		
Double eagle	516	$\frac{1}{2}$
Eagle	258	$\frac{1}{2}$
Half eagle	129	$\frac{1}{4}$
Three dollar	77.4	$\frac{1}{4}$
Quarter eagle	64.5	$\frac{1}{4}$
Dollar	25.8	$\frac{1}{4}$
Silver.		
Trade dollar	420	$1\frac{1}{2}$
Half dollar	192.9	$1\frac{1}{2}$
Quarter dollar	96.45	$1\frac{1}{2}$
Twenty-cent piece	77.16	$1\frac{1}{2}$
Dime	38.58	$1\frac{1}{2}$

These deviations are intended for the protection of the mint officers, and are not taken advantage of in the preparation of the coins, which are made as close to the standard weight as practicable. In weighing a number of pieces together, when delivered by the coiner to the superintendent, and by the superintendent to the depositor, the law provides that the deviation from the standard weight shall not exceed in the case of gold coins $\frac{1}{100}$th of an ounce in \$5000 in double eagles, eagles, half eagles, or quarter eagles, or in 1000 three-dollar pieces, or in 1000 one-dollar pieces; while on silver the deviation is $\frac{2}{100}$ths of an ounce in 1000 trade dollars, half dollars, or quarter dollars, and $\frac{1}{100}$th of an ounce in 1000 dimes. The uniform practice at the mints is, that each delivery of coin made by the coiner to the superintendent shall conform to the standard weight, no advantage being taken of the limit or tolerance allowed in weighing a large number of pieces together.

FIG. 2.



Tank and apparatus employed in the precipitation and separation of the silver from the nitric acid solution from parting.

From each delivery of coins by the coiner to the superintendent a certain number of pieces are indiscriminately taken, sealed up, and placed in the pyx, for the annual trial or test of the coinage, which is made in February of each year by a commission constituted by law for that purpose; and if it appears by such examination and test that the reserved coins do not differ from the standard fineness and weight by a greater quantity than is allowed by law, the trial is considered and reported as satisfactory; but if any greater deviation from the legal standard or weight appears, the fact is certified to the President of the U. S., and if on a view of the circumstance he shall so decide, the officer or officers implicated in the error are thenceforward disqualified from holding their respective offices.

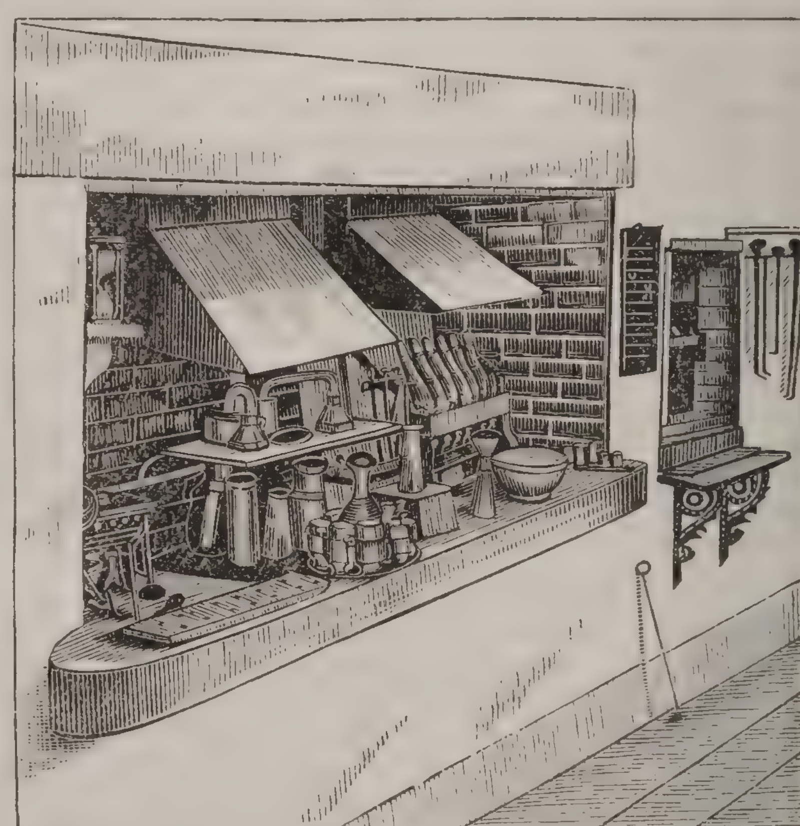
In the various processes to which bullion is subjected at the mints more or less loss occurs, particularly by volatilization in melting and refining, and is accounted for under the term "wastage." The operative officers are charged and credited with all bullion delivered to and returned by them, and are allowed a credit for actual "wastage" incurred, provided it does not exceed the legal allowance, which in the case of the melter and refiner is $\frac{1}{1000}$th of the whole amount of gold, and one-half of $\frac{1}{1000}$th of the whole amount of silver delivered to him since the last annual settlement; and in the case of the coiner, one-half of $\frac{1}{1000}$th of the whole amount of gold, and $\frac{1}{1000}$th of the whole amount of silver delivered to him by the superintendent. The actual wastage is, on the average, much within the limit fixed by law.

Great care is taken to recover from time to time all the minute particles of bullion remaining in the residuum fluxes, flues, etc. These are mostly recovered in the form of "sweeps," which are sold to bullion-smelters at about 60 per cent. of the value of the bullion contained.

A voucher is required to be taken for, and a record kept of, all transfers of bullion and coin and every transaction involving the receipt or disbursement of money. The bullion accounts are rendered quarterly, through the director, to the first auditor of the treasury for adjustment. At the close of each fiscal year a general settlement is made of the accounts of the operative officers, at which time all bullion in their possession respectively is delivered to the superintendent, and retained in his custody until the settlement is completed.

Gold is valued in the coinage at the rate of $25\frac{8}{10}$ths grains troy, nine-tenths fine, or $23\frac{22}{100}$ths grains of pure metal to the dollar. For silver the valuation in the trade dollar is at the rate of 420 grains troy, nine-tenths fine, or 378 grains of pure metal to the dollar. In the subsidiary silver coins it is valued at the rate of $385\frac{8}{10}$ths grains troy, nine-tenths fine, or $347\frac{22}{100}$ths grains of pure metal to the dollar.

FIG. 3.



View from the assay laboratory of the mint: the parting-chamber and hoods, showing the platinum and glass apparatus employed in the separation of silver from gold; on the right, front of muffle-furnace.

Charges which are estimated to equal but not exceed the average expense of each operation required to bring gold and silver bullion into a condition for coinage are fixed from time to time by the director of the mint, with the approval of the secretary of the treasury. The subjects of charge are deposit melting, parting, toughening, refining, copper alloy, coinage charge for trade dollars, bar charge. In the charge for deposit melting exceptions are made for standard gold bullion, fine gold bars, U. S. gold coin of less than legal weight, foreign coin of U. S. standard, or above, to be converted into coin, fine silver bars over $997\frac{1}{2}$ fine, unless they contain gold, and mint or U. S. assay-office bars redeposited. Gold bullion, including foreign gold coin, is received at the mints at Philadelphia, San Francisco, and Carson, and the assay-office, New York, for coin or bars. Silver bullion is received only for trade dollars or bars. At the mint at Denver, operated as an assay-office, and the assay-offices at Boisé and Charlotte, the

identical bullion is returned to the depositor in the form of unparted bars, bearing the U. S. stamp of fineness, weight, and value.

The subsidiary silver, as well as the minor or token coins (bronze one-cent and copper-nickel three and five cent pieces), are manufactured on government account only, the public treasury purchasing the bullion and metals required therefor, defraying the expense of manufacture, wastage, and transfer to the various treasury-offices, and realizing the seigniorage or gain on such coinage. Gold coins are receivable at the treasury of the U. S. at their denominational value, when not reduced in weight by natural abrasion, after a circulation of twenty years, as shown by the date of coinage, more than one-half of 1 per centum, and at a ratable proportion for any period less than twenty years. For the silver coins no legal limit of abrasion or wear is provided.

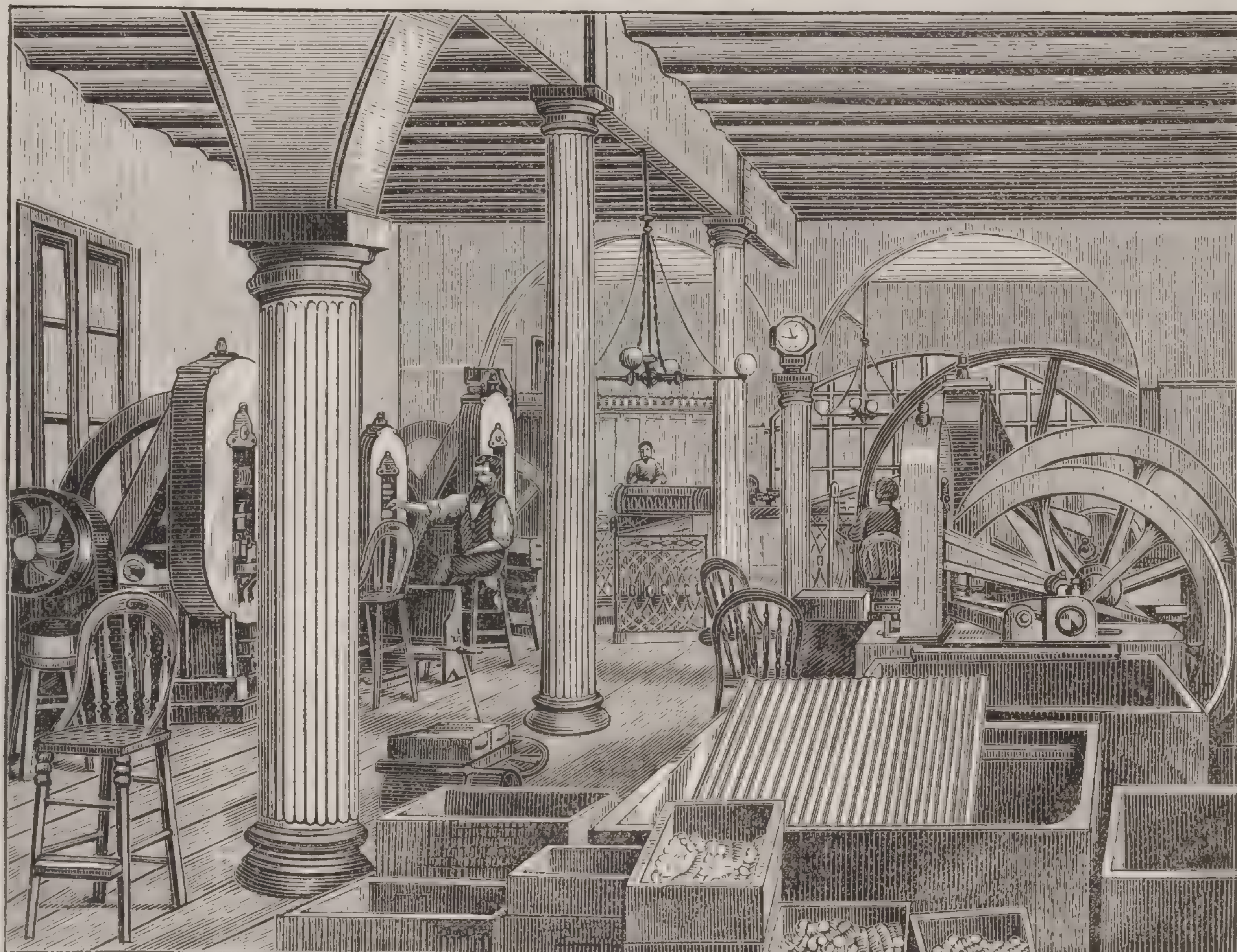
Under the title of "bullion fund" a part of the public moneys are placed at the different coinage mints and at the assay-office, New York, out of which depositors are paid for their bullion, in coin or bars, as soon as the value thereof has been ascertained by assay (generally a day or two thereafter), and on payment being made the bullion so deposited becomes the property of the U. S.

H. R. LINDERMAN.

Minting, the Mechanical Operations of. The principal operations and processes to which ingots of standard fineness are subjected in their manufacture into coin may be classified as follows:

(1) *The Rolling*, which reduces the ingots to strips or fillets of nearly a proper thickness for the denominated coins. (2) *The Annealing*, which is rendered necessary to preserve the ductility of the metal during the rolling operation. (3) *The Drawing*, whereby any want of uniformity in the thickness of the strips is corrected. (4) *The Cutting*, or forcing from the strips "planchets" or blanks of the size and shape of the coin. (5) *The Adjusting*, or weighing separately of each blank, and bringing those above standard within the working limit of deviation by filing. (6) *The Milling*, which presses up the edge of the blank in order to protect the surface of the coin. (7) *The Cleaning*, whereby all oxidation is removed from the face of the blank. (8) *The Coining*, or impressing upon the blanks the devices and inscriptions prescribed by law.

FIG. 1.



View of coining-room, showing machinery for striking and counting coins.

When ingots are received by the coiner from the melter and refiner, and the weight noted, they are taken to the rolling-room, and passed through heavy iron or steel rolls, each melt being kept and passed through separately. At each successive rolling the rolls are brought together by means of a screw, their adjustment or proximity to each other being indicated upon a dial which is regulated by the workman in charge. Successive rolling hardens or renders brittle the strips, and necessitates annealing in order to preserve their ductility. The length of time required to anneal gold is from one to one and a half hours, and for silver about fifteen minutes. The first annealing having been completed, the strips are passed a few times through the finishing-rolls, and after a second annealing are ready for the drawbench. The pointed end of the strips are inserted between the drawplates, and drawn through a small pair of perpendicular steel rolls by means of a treadle and an endless chain. Two drawings are necessary for each strip. In the first a slight reduction is made, and in the last the drawplates are carefully adjusted to the thickness of the coin. A few strips are then passed through, from both ends of which blanks are cut and weighed, and if the weight is found to conform to the working tolerance, the drawing of the entire lot is proceeded with.

The strips are then taken to the cutting-press and planchets cut therefrom. This operation consists in passing the strip across a conical steel bed, while a punch just fitting the bed operates on the upper side of the fillet and forces a piece of the exact size and shape of the punch through the sharp bed beneath. The punch, operated by steam, moves with great rapidity, and cuts from 150 to 240 pieces a minute. The number of pieces that can be cut from ingots is as follows:

Gold.

From one	double-eagle	ingot	40 pieces.
" "	eagle	"	60 "
" "	half-eagle	"	75 "
" "	three-dollar	"	136 "
" "	quarter-eagle	"	100 "
" "	dollar	"	632 "

Silver.

From one	trade-dollar	ingot	33 pieces.
" "	half-dollar	"	60 "
" "	quarter-dollar	"	70 "
" "	twenty-cent	"	170 "
" "	dime	"	354 "

The perforated strips, denominated "clippings," and the blanks, are sent to the cleaning-room for the purpose of removing all dirt and grease adhering to them from previous operations. The clippings are returned to the melter and refiner, and remelted, and the planchets or blanks delivered to the adjusters.

A blank, or counterweight, adjusted to a small fraction

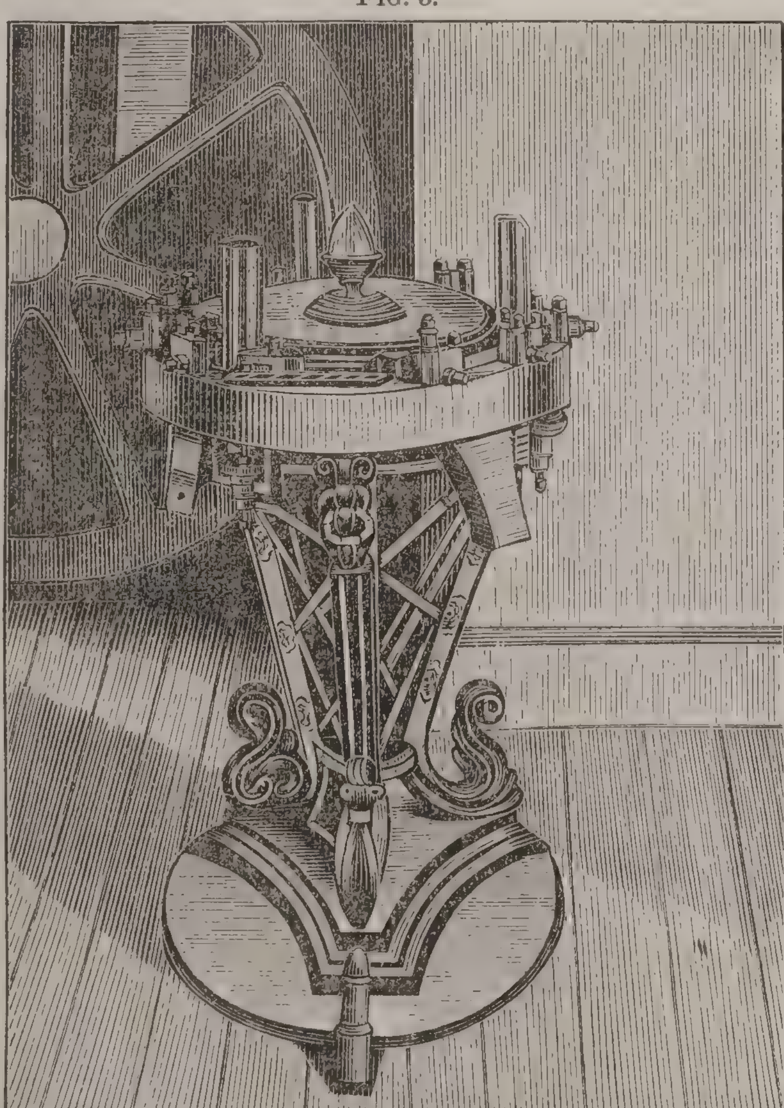
exceeding the legal weight of the coin, is furnished to each adjuster, with which the weight of all the blanks is tested, those heavier than the counterweight being carefully filed

FIG. 2.

Weighing-room, where the coins are tested, showing tables, scales, etc. in position and ready for work.

upon the edge until they are adjusted to a perfect counterpoise. The adjusted planchets are then returned to the forewoman, and under her supervision five of the most experienced adjusters prove the work, and if any planchet

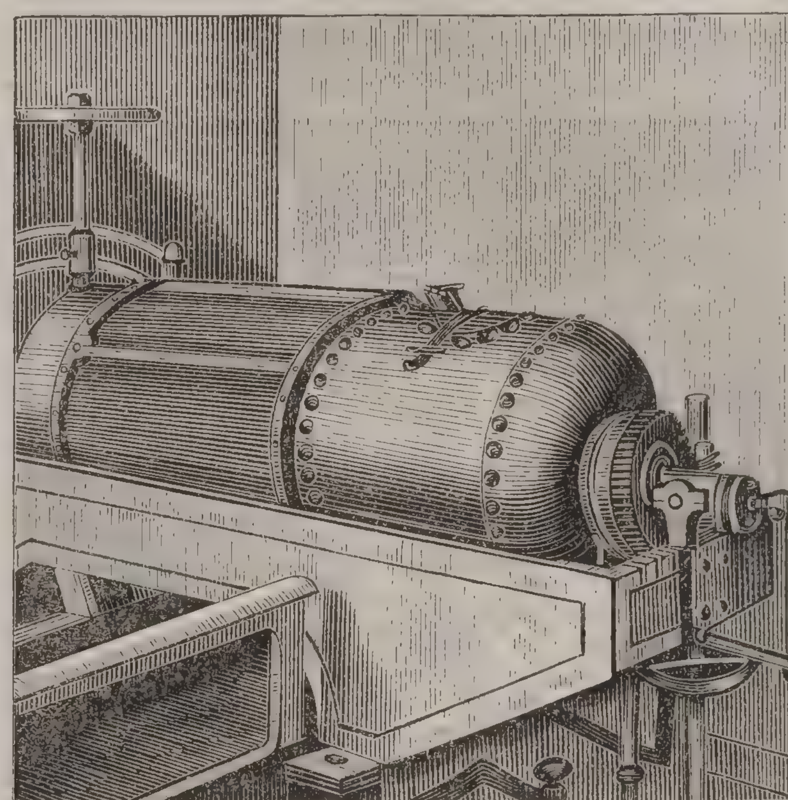
FIG. 3.



Edge-rolling or milling machine, in which the edges of the coin-disks are thickened and impressed.

is found outside of the prescribed limit, it is readjusted. Those of less weight than the counterweight are kept in separate pans and tested by a second counterweight, which is a slight fraction *below* the standard weight of the coin. The law allows on all gold and silver coins a certain deviation from standard weight. This deviation, however, is seldom taken advantage of, the coiner fixing a limit within the legal deviation, which is known as the "working tolerance." All pieces found below the "working tolerance" are designated "condemned lights," and returned to the melter and refiner. The remainder, known as "heavies," "lights," and "standards," are kept separate until they reach the weigh-room as *coin*, when they are united in proper proportions, and made up into drafts for delivery. All gold coins and the silver trade dollar are adjusted by hand. The subsidiary silver coins, half dollar, quarter dollar, and dime, are weighed separately, and all above or below the legal tolerance rejected.

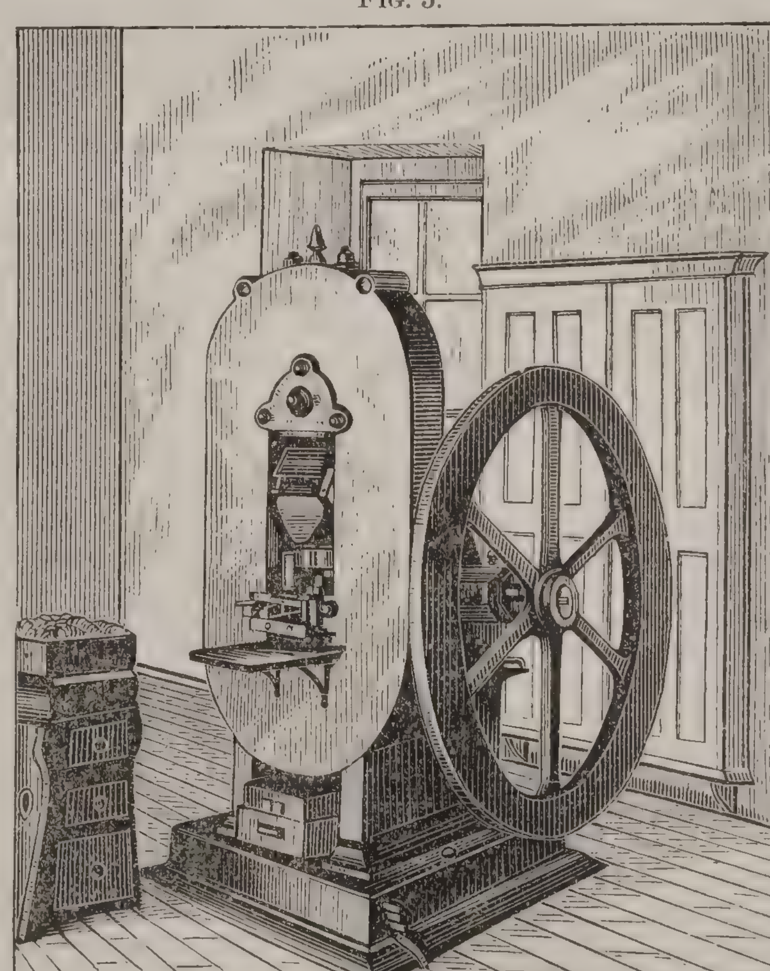
FIG. 4.



Rotating cylinder, employed for cleaning the blanks or coin-disks.

The adjusted blanks are now ready for the milling operation, which is done by a machine containing a circular plate, the outer edge being of steel, and which revolves within a strong band of the same material. The revolution of the inner disk carries the blank through the intermediate space between the working disk and fixed band, and which, being somewhat less than the diameter of the piece, presses up the edge of the planchet as it revolves. One revolution carries the piece through the mill and com-

FIG. 5.



View of coining-press in position for work.

pletes the operation. The milled planchets, more or less oxidized, before being brought to the proper condition for blanching must be entirely coated with oxide of copper. To ensure this, they are annealed to a cherry-red heat, and when removed from the furnaces are placed in a colander, dipped for a few moments into a diluted solution of sul-

phuric acid, and from thence into pure water in order to rinse off the acid. This leaves the blanks thoroughly cleaned, and after being dried by shaking in a large iron sieve or revolving riddle filled with sawdust, they are ready for the stamping operation.

This last and most important operation is performed by the coining-press. As each blank descends to the bottom of the tube, a pair of steel fingers seize it and carry it forward between the dies. While the dies are closing upon it, and stamping both the obverse and reverse inscriptions, the steel fingers return for another planchet, convey it to the dies, seize the coined piece, and force it into a box beneath the press. This operation is repeated *ad infinitum.* The coined pieces are collected from the presses and taken to the weigh-room, where they are made up in drafts for delivery to the superintendent. The speed of the coining-presses is estimated at from 70 to 100 pieces a minute, and the pressure exerted in stamping the coins ranges, according to their denomination, from 40 to 200 tons.

H. R. LINDERMAN.

Min'to (GILBERT **Elliot**), FIRST EARL OF, eldest son of Sir Gilbert Elliot of Minto, b. at Edinburgh, Scotland, Apr. 23, 1751; entered Parliament 1774 as an adherent of Mr. Fox; succeeded to the baronetcy 1777; was ambassador at Copenhagen 1788–94; made a privy councillor June, 1793; acted as governor of Corsica during the English occupancy of that island, June, 1794, to Oct., 1796; created Baron Minto 1797; appointed ambassador to Vienna 1799; president of the board of control for Indian affairs 1806–07; was governor-general of India 1807–13; directed the conquest of the isles of France and Bourbon 1810; participated in the expedition which resulted in the occupation of Java 1811; was made earl of Minto and Viscount Melgund Feb., 1813; and d. at Stevenage shortly after his return to England, June 21, 1814. (See his *Life and Letters* (1874), edited by his grandniece, the countess of Minto.)—His son, GILBERT ELLIOT MURRAY KYNYNMOND, second earl, b. Nov. 16, 1782, became ambassador to Berlin 1832–34, first lord of the admiralty 1835–41, and lord privy seal 1846–52, in the cabinet of his son-in-law, Lord John Russell. He was sent to Italy upon an important special mission 1847, and d. in London July 31, 1859.

Min'tonsville, tp. of Gates co., N. C. Pop. 1183.

Min'turn (ROBERT BOWNE), b. in New York City Nov. 16, 1805; received a good English education; lost his father at the age of fourteen, when he was obliged to leave school and enter a counting-house; became in 1825 a partner in the house of Charles Green, and in 1830 in that of Fish & Minturn, subsequently Grinnell, Minturn & Co., in which he achieved fortune and reputation, making it one of the great shipping-houses of the world. He was an active promoter of the city charities; one of the founders of St. Luke's Hospital; rendered patriotic service to the Union cause by a visit to Europe in 1861; was an earnest laborer in behalf of the freedmen, and president of the Union League Club to the day of his death, Jan. 9, 1866.

Minu'cius Fe'lix, author of a dialogue entitled *Octavius*, containing an apology for Christianity, and a defence of the Christians against the various calumnies to which they were exposed at that time, b. in Africa, and practised as a lawyer in Rome in the middle of the third century. There is an edition of the dialogue by Oehler (Leipsic, 1847), and a translation into English by Richard James (Oxford, 1836).

Min'uet [Fr. *menuet*], in music, a species of dance-tune formerly in common use. Its movement was rather slow, graceful, and stately. The minuet was written in triple time, usually of three crotchets in a bar, and always commenced with a full bar. It consisted of two divisions or parts, each containing eight bars, and both divisions were repeated. Minuets also, not intended for dancing, and of considerable rapidity of movement, are now often found as constituent parts of overtures, symphonies, sonatas, and other formal pieces. In such cases the minuet generally comprises two strains of sixteen bars each, with repetitions. Another strain, called the "trio," follows directly, and after the trio the former part of the minuet is repeated.

Min'uit, or **Minnewit** (PETER), b. in Wesel, Rhenish Prussia, about 1580, belonged to a distinguished family, and had been deacon in the Walloon church at Wesel, but had resided some years in Holland when he was appointed by the Dutch West India Company first governor and director-general of New Netherlands. He landed on Manhattan Island May 4, 1626; purchased the island from the Indians for sixty guilders; built Fort Amsterdam, and governed the colony with energy and success until Aug., 1631, when he was recalled. Having put into the port of Plymouth, England, through stress of weather, on his homeward voyage, Apr., 1632, his ship was attached at the suit of the New England Council on an accusation of illegal trading, but was released in May. Minuit had lost favor with the West India Company through a charge of having countenanced land monopoly, and after unsuccessful efforts to regain his position offered his services to the Swedish government to found a colony in America. The great chancellor Oxenstiern having patronized the project, a Swedish West India Company was formed, and Minuit sailed from Gothenburg, Sweden, in 1637, with a body of Swedes and Finns; ascended Chesapeake Bay, and in Mar., 1638, began to build Fort Christiana, 2 miles from the confluence of Minqua's Kill with the South River, near the present city of Wilmington, and called the country New Sweden. This was the first permanent European settlement on the Delaware, and the colony remained in the hands of Sweden until captured by the Dutch in 1655. Peter Minuit, whose very name is now unknown to nine-tenths of the residents of New York City, was thus the founder of the metropolis of the New World and of the American colonial possessions of two European nations. He d. at Fort Christiana, New Sweden (Del.), in 1641. A movement is now (1876) being made for a monument to commemorate his colonization of DELAWARE (which see). A similar movement would not be out of place on Manhattan Island.

Min'ute [Lat. *minutus*, "small," "diminished"], a measure of time, the sixtieth part of an hour. In the measurement of angles and of arcs of circles the minute is the sixtieth of a degree. Both kinds of minutes are divided into 60 seconds.

Mi'ocene [Gr. μείων, "less," and καινός, "recent"], the strata of the Middle Tertiary period in geology. The miocene deposits abound in animal and vegetable remains. Those of the Atlantic and Gulf coasts are marine in their origin; those of the far West are fresh-water strata. The first contain remains of large cetaceans, the latter of Carnivora and Ungulata. Some Miocene species still exist.

Miohippus. See HORSE (FOSSIL).

Mi'ra, town of Northern Italy, province of Venice, pleasantly situated on the Brenta Canal, about 14 miles N. of the city of Venice. It contains many fine private houses belonging to the Venetian nobility. Pop. 8827.

Mirabeau' (HONORÉ GABRIEL RIQUETTI), COUNT, b. at Bignon, near Nemours, in Provence, Mar. 9, 1749. His father (b. Oct. 5, 1715, d. July 13, 1789) was one of the noisiest philanthropists of the eighteenth century, a loud propagandist of the physiocratic system, author of *L'Ami des Hommes* (5 vols., 1755), and used fifty-four *lettres de cachet* in order to maintain peace in his family. Young Honoré, with his herculean body, ugly face, violent passions, and turbulent manners, was a special subject of dislike to the father, in spite of the eminent power of intellect which he showed very early. He received a military education at Paris, and was a lieutenant of cavalry in his seventeenth year; but although he pursued his military and mathematical studies, like everything he undertook, with a furious energy, his life was so wild that in 1768 his father had him shut up in the island of Ré for six months. After serving for some time in Corsica, he left the military career altogether, and settled on one of the family estates in Limousin, where (June 22, 1772) he married the young Marie Émilie de Covet. After living in brilliant style for a couple of years, he was abandoned by his wife, very seriously embarrassed by creditors, and once more imprisoned by his father (Sept. 23, 1774), this time in the castle of If, in the Bay of Marseilles, whence he was removed some time after to Fort Joux, near Pontarlier, in the Jura Mountains. From this place he eloped with the young marquise Sophie de Monnier, and fled first to Switzerland, then to Amsterdam, where he engaged in literary pursuits in order to procure some means of subsistence, and published his *Essai sur le Despotisme* (1776). On May 14, 1777, he and Sophie were arrested, and he was confined in the dungeon of Vincennes till Dec. 13, 1780. While here he wrote *Essai sur les Lettres de Cachet* (Hamburg, 1782), a number of other works, and a multitude of passionate letters to Sophie, published at Paris (4 vols., 1792). Nevertheless, as soon as he was liberated he quarrelled with her, and he now tried by a lawsuit to compel his wife to return to him. He pleaded his case himself, and, although he lost it, he made a deep impression by his powerful eloquence. During a residence in London he published in 1784, *Considérations sur l'Ordre de Cincinnatus* and *Doutes sur la Liberté de l'Escaut*, the latter an attack on the policy of Joseph II., paid for by Dutch money. On his return he began his violent attacks on the financial system of Calonne, and in order to silence him he was sent on a secret mission to Berlin. The fruits of this mission were *De la Monarchie Prussienne sous Frédéric le Grand* and *Histoire Sécrète de la*

Cour de Berlin; but as he failed to obtain any further diplomatic appointment, he continued his attacks on the government by his *Dénunciation de l'Agiotage* (1787) and *Suite de la Dénunciation* (1788). On the convocation of the States General he first tried to be elected by the nobility, but being rejected because he possessed no fief himself, he bought a clothier's shop in Aix and entered the Assembly as a member of the third estate. From this moment and up to his death he was actually the ruler of the destinies of France. Although he was not the leader of any distinct party, he governed the Assembly absolutely by his brilliant logic and wonderful eloquence. It was he who established the third estate as the dominant power in the States General, and it was he who established the States General as the dominant power in the government of France. Thus he started the Revolution, and when it began to flow in rapids and leaps, he turned around and tried to stem its course, defending the royal prerogatives and the monarchical principle. Other men, more closely allied with the brooding instincts of the mass, arose beside him. His secret connections with the court became known—his conversation with the queen, the payment of his debts by the king. His popularity waned, but still when he spoke people swayed under his voice like reeds before a storm. The activity which he developed as leader of the Assembly and president of the Jacobin Club was enormous, but the exertion, in connection with his reckless life, suddenly broke his strength. On Mar. 27, 1791, he spoke for the last time; on Apr. 2 he died. He was buried in St. Geneviève, the Pantheon, whence his corpse afterwards was removed to his family estate, in order to give room for that of Marat. The most complete account of his life is found in *Mémoires biographiques, littéraires et politiques de Mirabeau* (8 vols., 1834), published by his natural son, Lucas de Montigny.

CLEMENS PETERSEN.

Mirabel'la Ecla'no, town of Southern Italy, province of Avellino. This town occupies the site of the ancient *Æclanum,* which was an independent town until it fell into the hands of Sulla (100 B. C.). It had various names during the Middle Ages, and, though it suffered cruelly from earthquakes in 1688, 1694, and 1732, interesting remains of the Roman period still exist. Pop. in 1874, 6285.

Mirab'ile, post-v. and tp. of Caldwell co., Mo., 6 miles W. of Caldwell, the county-seat. Pop. 140; of tp. 931.

Miracle-Plays. See MYSTERIES.

Mir'acles. I. *Meaning of the Term.*—A miracle is a sensible event wrought by God in attestation of the truth. It therefore must occur in nature, else it would not be apprehensible to our senses, and it must at the same time be beyond the power of nature to produce, else it would not disclose an agency which belongs to the Author of nature alone. A miracle is not simply an extraordinary event, which, however unfrequent, occurs through the regular action of the same forces that produce the ordinary events in nature, and which might be foreknown by one acquainted with its cause; but it is an event which nature by its own action never would have brought forth, and for which the power of God alone is adequate. It is not a new birth from nature's teeming womb, but a new beginning, which rises at once from an almighty fiat. It is not a development, but a creation. It shows a new force introduced into nature, by which nature is checked and changed. A miracle may be defined, therefore, as a counteraction of nature by the Author of nature.

II. *The Occasion for Miracles.*—Nature furnishes no revelation of God's mercy to sinners. In all the records of natural religion no mention is made of the divine love. While in the idolatrous sacrifices of the heathen there is doubtless indicated some vague notion of propitiation, some undefined conviction that in some such way God may be approached and pleased, yet that God is a being who approaches us in mercy before we make any attempt to draw nigh unto him neither the Mohammedan nor any pagan religion has ever revealed. And yet without this revelation the sense of sin—the strongest and saddest sense ever felt by the soul—finds nothing to dispel its terrors. If, therefore, God can pardon sin and purify the sinner, nothing can be so important to man as the communication of this truth in a way which shall show it to be indisputable. And if nature cannot declare it, and the human mind alone cannot reach it, how is this communication possible unless directly announced by God himself? And how shall this announcement be proved to be from God unless he shall irrefutably manifest himself in connection with the utterance? And how can this manifestation be except through that miraculous interference with nature already described? If God shall reveal his mercy to sinners, we may expect the revelation will come through a miracle.

III. *The Claim of the Bible to be a Miraculous Revelation.*—While the Bible is originally the only book which declares God's love to man, it differs also from all other books in that it claims to be a miraculous revelation. It declares that God has provided a perfect remedy for sin, and it professes to prove the doctrine by miracles which furnish God's test to its truth. In both the O. and N. T. miracles are continually adduced as a motive to faith. (Ex. iv. 5; vii. 5; ix. 29; xi. 7; xvi. 6; Num. xvi. 8: Josh. iii. 7; 1 Kings xviii. 24, 38, 39; Matt. xi. 3–5; Mark ii. 10, 11; John ii. 23; iii. 2; v. 36; vii. 31; xi. 41, 42; xx. 31; Heb. ii. 4.) No other book has ever professed to rest upon such a claim. Whether or not the claim be valid, it is at least unique.

IV. *Proof that the Miracles of the Bible actually occurred.*—If these miracles did occur, no evidence of the fact could be better than that which we actually possess. The miracles were not done in a corner. There was no effort to conceal them. They challenged scrutiny. They were done in many places, at many times, and by different persons. They were witnessed by thousands. They were of such a nature that they must actually have occurred as reported, or their reporters have fabricated the stories, knowing them to be false. But why fabricate them? and how carry out the deception? The apostles had nothing to gain, but everything to lose, by such an undertaking. Because of their report they suffered obloquy, persecution, and death, and, though they must have foreseen this result, they continued their declaration, ceasing not to teach and to preach that Jesus is the Christ and that these mighty works were wrought of God through him. To suppose that in all this they were only acting out a lie, would be only to suppose something much more difficult to believe than the miracles which they declare.

But more than this: the word of the apostles was believed, and this on the very spot where the miracles were declared to have taken place, and by thousands who could have at once disproved the story if it had not been true. It was believed by their enemies. The apostles furnished proof of their statements which no amount of argument or persecution could rebut. It does not appear that the miracles were ever denied at the time when they were held up as the reason why all the world should believe that Jesus is the Christ. They were actually admitted as facts by the opposers of Christianity. Celsus, and Hierocles, and Julian the Apostate, and the Jewish rabbis in the Talmud—all of whom wrote and argued even bitterly against Christianity—have yet all left their acknowledgment, which we still possess, of the actual occurrence of these events, accounting for them by magical arts, which Celsus affirms Christ must have learned in Egypt. No historical events could be established with a greater certainty than these possess, by any amount of testimony.

V. *Objection to Miracles.*—Many men are unwilling, and perhaps unable, to weigh considerately the argument from testimony, having the preconceived opinion that a miracle cannot be proved by any amount of testimony. Nature, they say, is fixed and orderly. To change an atom would change all the worlds. To increase or diminish, in the least degree, the exact amount of forces now constituting the universe would destroy the universe. Forces of nature may be dissolved and recombined, but always their exact equivalence will remain, and neither nothing new can be created nor nothing old destroyed. Hence, no such thing as a miracle can be. This objection, stripped of its verbiage, amounts to this: a miracle is unreasonable, and therefore impossible. But what do we mean by reasonable and unreasonable, this supreme potency which determines so easily whether aught be possible or impossible? Is it only a word without reality, and with which our thoughts cheat themselves? But, then, how idle all appeals to it must be! and how absurd this very objection becomes! If the reasonable has no reality, the objector to miracles because of their unreasonableness has no reality in the very groundwork of his objection. But supposing we admit that the reasonable is real, and confine its reality to what an individual man perceives and judges? In this case there is no universal standard of reason to which all our perceptions and judgments should conform; but the reasonable is in a man's consciousness alone, and it is unmeaning to talk of it as elsewhere or otherwise. But if this be so, what folly to talk at all! Why should a man ever say a word if there is no universal standard of reason according to which his words can be judged by another mind as truly as his own? And how does all argument—*i. e.* every attempt to make others think as we do—fall to the ground if there be not above and beyond us a standard to which we feel that not only our judgments, but those of every man, should conform? If the reasonable be only what I fancy to be so, I may not, indeed, ask the objector to miracles to relinquish his objections, but just as little may he require me to admit their force. Each man thus stands upon a ground which he can neither maintain against an-

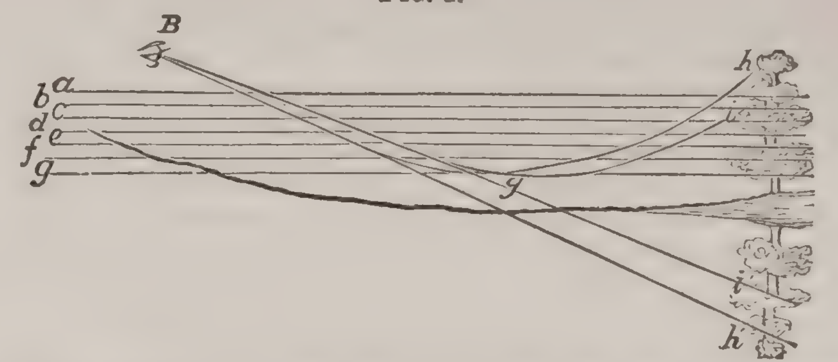
other nor be forced by another to abandon, and all argument between men is vain and all agreement among them hopeless.

But what if we suppose the unreasonable and impossible to mean only the unnatural? In this sense a miracle would be denied because a certain so-called order of nature forbids it. But what proof that there is such an order of nature? The moment we attempt to prove it we find ourselves stepping on a groundwork which lies back of nature, and which inevitably leads the thought into the living presence of the supernatural. Our natural science is fond of its generalizations, but no all-inclusive generalization is possible without the supernatural. It is an unmeaning babble to talk of comprehensive laws unless there be a comprehending reason and will, whose ideas and plans these laws express. The current notion, in some quarters, that we can gain—or have, perchance, got—such universal conclusions, that nature can be shut in upon itself, and God shut out, is exactly the absurdity of supposing that we see when we have closed our eyes and turned the very light of all our seeing into darkness. If we make comprehensive generalizations about nature which declare anything further than the facts which have been actually observed, it is because we see not that reason is limited by the order of nature, but that the order of nature is limited by reason; it is because we recognize that there is something reasonable beneath the facts, which also reaches beyond them, and which, instead of being made by the facts, has itself determined how they shall be made. The objector to miracles denies a miracle because it is different from nature, but he can only maintain that nothing different from nature can be by affirming a principle which is itself different from nature. A principle which can form the basis of a universal affirmation, and by which alone one is justified in affirming what is possible and what impossible, is not only beyond and above nature, and must control nature, but is recognized as such even by him who denies the supernatural, or else his denial has no more meaning, even to himself, than the chatter of a parrot or a monkey. We must have the supernatural; and it is alike the mystery and the majesty of the human soul that we cannot deny the supernatural except in terms which absolutely imply and affirm it. It is therefore a confusion of thought which identifies the reasonable and the unreasonable with the natural and the unnatural; the reasonable is supernatural, and on this ground the objection to miracles at once disappears. J. H. SEELYE.

Miraflo′res (MANUEL DE **Pando**), MARQUIS OF, and count of Villapaterna, b. at Madrid, Spain, Dec. 24, 1792; was educated for the public service, in which he spent more than fifty years; was ambassador at London 1834, at Paris 1838–40, and at Vienna 1860; seven times president of the senate, often a cabinet minister, and premier in 1846 and 1863. In 1868 retired to private life, and d. at Madrid Mar. 17, 1872. The marquis was decorated with nearly all the grand orders of merit in Europe, and was an active member of the Spanish Academy of History. He wrote several treatises in favor of Isabella's right of succession to the throne, a biography of Louis Philippe (1851), valuable *Memoirs* of his own life, and a *History of the First Seven Years of the Reign of Isabella II.* (2 vols., 1843–44), and published numerous speeches and fugitive writings.

Mirage′ [from *miror*, to "wonder"]. Under this head are included those aërial and marine reflections known as mirage, looming, and Fata Morgana. These are all analogous phenomena, due to the refraction of light, to its total reflection, or to a combination of both. These are—(1) mirage of the desert; (2) mirage at sea; (3) looming; (4) a combination of ordinary mirage at sea and looming; (5) Fata Morgana. The first, mirage of the desert, presents the appearance of reflection in a smooth surface of water, the inverted image of trees, etc. being seen beneath the real objects. It is due to the refraction, and finally to the total reflection, of the rays of irregularly reflected light, sent back to the eye from the object. The heated sand of the desert rarefies the lower strata of air, while the upper strata are condensed by the chilling due to the radiation of its heat. The strata of different densities mingle slowly in consequence of the stillness of the air. Fig. 1, *a*, *b*, *c*, *d*, *e*, *f*, *g*, represents the boundaries of strata of air, which decrease in density from above downward. Every point of the tree sends out divergent rays of irregularly reflected light, by means of which it is visible. The direct rays from the tree to *B* make it visible to the eye at *B*. The ray *h*, which under ordinary circumstances would never reach the point *B*, meets in its downward course strata of continually decreasing density, and becomes less and less inclined to the parallel layers of air (see REFRACTION), till at *g* the angle of total reflection is reached and the rays are bent upward (see REFLECTION), and enter the eye in

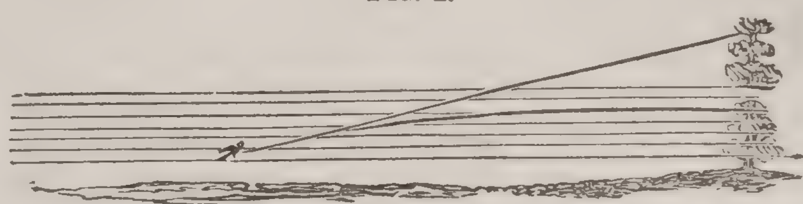
FIG. 1.



Mirage of desert: *a*, *b*, *c*, *d*, *e*, *f*, reflecting surfaces where strata of air touch; *g*, angle of total reflection; *B*, eye of observer; *h*, *i*, pencils of rays from object; *h′*, *i′*, points where pencils focus in reflection.

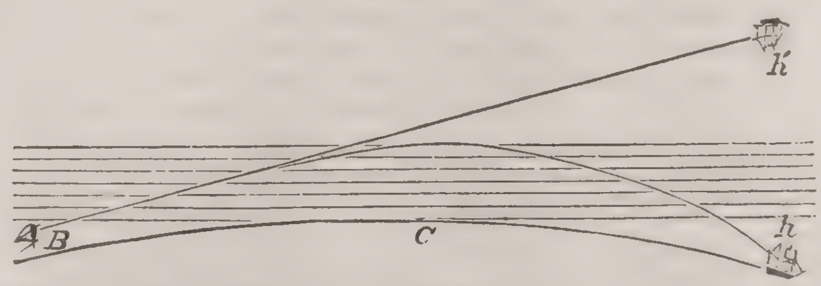
the direction *h′B*; and so with *i* and all other rays. An object is always seen in the direction by which the rays sent from it enter the eye; an inverted image is therefore formed by the portion of each pencil of rays proceeding from the tree, which is bent back to the eye as by a mirror. Second, mirage at sea is explained in exactly the same way, except that the conditions are reversed. The lower strata of air are chilled by the waters of the ocean, and increase in density from above downward; the rays which produce the image curve convexly or in the opposite direction. (Fig. 2.) Third, looming is due to refraction alone; a por-

FIG. 2.



tion of the pencil of rays which proceed from the point *h* (Fig. 3) reaches the eye direct, and produces the image of the real object, while another portion is refracted, and produces an erect image above the real one. Fourth, a real, inverted, and erect picture of the same object is sometimes projected upon the retina of the eye at the same time a portion of each pencil of rays proceeding from the body reaches the eye direct, producing the image of the real object; another portion is simply refracted, as in Fig. 3,

FIG. 3.



Mirage at sea: object *h* below horizon at *B*; *C*, curved surface of the earth.

producing an erect image; while a third portion is first refracted, and then totally reflected, forming an inverted image. In 1822, Capt. Scoresby recognized the ship Fame by her inverted image in the air, though she was seventeen minutes below the horizon. The whole of Dover Castle has been seen as if lifted over an intervening hill by the refraction of the rays of light from its surface, and in this case the image from the looming was so vivid as to obscure the hill which really lay between the castle and the observer's eye. Lateral images are sometimes formed by reflection of the rays from vertical columns of air having different densities. Two boats, one real, the other a reflection, have been seen side by side upon the Lake of Geneva at the same moment. Mirage is most common when there is a marked difference between the temperature of air and water; it is most frequent in the morning or in summer and autumn, when the air is laden with mist. It is seen oftener by an eye placed close to the surface of the water, less perfectly at a height of six or eight feet, and almost never at twenty-four feet or more above the level of the sea. Dr. Wollaston obtained three images of an object seen through a square glass vessel containing successive layers of syrup, water, and spirit. Fifth, the phenomenon called Fata Morgana, or castles of the fairy Morgana, is occasionally seen upon the Calabrian coast while looking westward toward the Straits of Messina. On still mornings, when the sun, rising behind the Calabrian mountains, strikes upon the sea at an angle of 45°, the air is rapidly heated; the strata slowly intermingle, and present a series of reflecting surfaces which multiply images on the opposite Sicilian shore. The water is supposed at the same time, by the action of the tides, to possess a slight convexity. There are three forms of this mirage—the marine Morgana, where each object is reflected again and again in an inverted position and at different angles on the sur-

face of the water; the aërial Morgana, when they are thus reflected in the air; and a third form, in which the aërial images are fringed with prismatic hues. Gigantic reflections of men and animals are sometimes observed to flit over the scene. The Calabrians hail the appearance of this beautiful but short-lived spectacle with delighted cries of "Morgana! Morgana!" This phenomenon is not confined to the Calabrian coast, though the meteorological conditions, the topography of the ground, and the conformation of the coast in this place render its appearance more frequent and more beautiful than elsewhere. In all these reflections there is apt to be a wavering in the defining lines, and sometimes the whole image is tremulous like an object seen through a current of heated air. S. B. Herrick.

Miramichi' River, a large river of New Brunswick, discharges its waters by a deep estuary into Miramichi Bay, an arm of the Gulf of St. Lawrence. The river is navigable to Newcastle by large ships, and higher up by smaller vessels. Salmon and many other valuable fish are taken here in great quantities.

Mir'amon (Miguel), b. in the city of Mexico Sept. 29, 1832, son of Gen. Bernardo Miramon, a distinguished officer of the war of independence, of French descent; entered the military academy of Chapultepec in 1846; fought gallantly with his classmates in the defence of Molino del Rey and Chapultepec against the army of Gen. Scott, and was taken prisoner Sept. 13, 1847; completed his studies after the peace; received a commission in the army 1852; was actively engaged in suppressing several local revolts against Santa Anna, by whom he was sent with the rank of captain, in Oct., 1854, in an expedition against Alvarez in Southern Mexico; was distinguished in several engagements, and was made colonel for gallantry in the battle of Temajalco, July, 1855. The revolution having triumphed in September of that year, the regular army was placed under the control of its late enemies, and was naturally disloyal to the administrations of Alvarez and Comonfort. When Miramon was sent as second in command against the rebels of Zacapoaxtla, he seized the opportunity to imprison his superior (Dec., 1855), placed himself at the head of the force, joined the rebels, of whom he assumed the chief command, led them rapidly to Puebla, and occupied that city. When Puebla was taken by Pres. Comonfort (Mar., 1856), Miramon and his officers were degraded to the ranks, but a few months later he rose again and defended the city forty-three days against an overwhelming force; escaping with Col. Osollo, he captured Toluca in Jan., 1857; taken prisoner, he again escaped, joined the rebels in the S., and had just captured the city of Cuernavaca when the movement of Zuloaga occurred in the city of Mexico. With Osollo he hastened to Mexico, galloped through the lines of Comonfort, joined the forces of Zuloaga (Jan., 1858), and took by storm the Hospicio and the Acordada. Zuloaga made them brigadier-generals, and sent them against the formidable combination which supported the cause of Juarez in the central states. Miramon gained the important battle of Salamanca, which opened the way to Guanajuato and Guadalajara, and forced Juarez to withdraw temporarily from the country. Other victories speedily followed. Miramon was made major-general, and Osollo having mysteriously died in San Luis Potosi, he found himself at the age of twenty-six the chief military leader in Mexico and the idol of the "reactionary party." The forces of the liberal coalition were decisively routed at Ahualulco in September and at Atequiza in Dec., 1858, and news of the latter victory having reached the capital at the moment when Gen. Robles had overthrown Zuloaga by the "plan of Navidad," Miramon was chosen president by the electoral junta, then in session, Jan. 2, 1859. On hearing of this event Miramon hastened to the capital, declined the presidency, and reinstated Zuloaga Jan. 24; but a few days later it was arranged that the latter should voluntarily retire, which he did, after appointing Miramon as his substitute *ad interim*, Feb. 2. He then undertook the siege of Vera Cruz, where Juarez had established his government, but was unsuccessful; and hearing that Mexico was invested by the liberal forces under Degollado, he reached the capital on the day of the decisive victory of Tacubaya, gained by Marquez, Apr. 11, which was stained by the execution not only of the prisoners, but of many non-combatants—an act still execrated as the "massacre of Tacubaya," of which he divides the responsibility with Marquez. After a prolonged struggle of three years the "war of reform" terminated in favor of Juarez by the battle of Colpulalpam, Dec. 22, 1860, and Miramon was forced to flee from the country. He proceeded to Europe, visited the courts of France, Spain, and Italy, took part in the plans of Napoleon III. for founding a monarchy in Mexico, and arrived at the port of Vera Cruz early in 1862, when that city was held by the triple alliance, but was refused permission to land by the English admiral, and returned to Europe. On the accession of Maximilian to the nominal throne of Mexico, Miramon was honored with the appointment of grand marshal Sept., 1863, and with the embassy to Berlin 1864, being thus kept abroad in honorable exile through fear of his popularity. At the crisis of the Mexican monarchy, when the French forces were being withdrawn and Maximilian was apparently about to abdicate, Miramon arrived with Marquez in Mexico, doubtless with a view to obtain control of the situation. After several conferences at Orizaba (Dec., 1866), Maximilian, resolved to make a last effort to maintain his throne by an appeal to the reactionary party, returned to Mexico, and placed the army in the hands of the two generals. Marquez remained in command at Mexico, while Miramon, accompanied by the archduke, undertook the defence of Querétaro, which terminated by the capture of that city May 15, 1867. Along with Maximilian and Gen. Tomas Mejia, Miramon was subjected to a prolonged trial before a military commission, and was condemned to death, and shot on the Cerro de las Campanas, near Querétaro, June 19, 1867. In his last moments he denied the responsibility of the "massacre of Tacubaya," and met his fate bravely, occupying the post of honor between his two companions by express desire of Maximilian. His widow and children reside in Austria, receiving a pension from the emperor Francis Joseph. Porter C. Bliss.

Miran'da (Gen. Francisco), b. at Caraccas, Venezuela, in 1750; entered the Spanish army, and served in Guatemala, where he attained the rank of captain at the age of seventeen; accompanied the French forces in their campaign in aid of American independence; became acquainted with prominent American statesmen, and conceived a project for the emancipation of the Spanish American colonies; but on the discovery of his purpose he fled to Europe, presented his views to several courts, and received marked encouragement from Catharine II. of Russia, from William Pitt, and from the French revolutionary leaders; was appointed general of division in the French armies; displayed considerable military talent in Champagne under Dumouriez, and in Sept., 1792, was made commander-in-chief of the army of Flanders. Repulsed from the siege of Maestricht, Miranda commanded the left wing at the battle of Neerwinden (Mar. 18, 1793), the loss of which led to his imprisonment, trial, and acquittal. He went to New York and enlisted the support of American capitalists; fitted out an expedition; landed Aug. 2, 1806, at Vela de Coro near Caraccas; was forced to retreat to Trinidad. At the outbreak of the revolution of 1810, Miranda reappeared in Venezuela; was accepted by the insurgent leaders as their head 1811; drove the Spaniards from Valencia, Puerto Cabello, and nearly the whole of New Granada, and was elected to the insurgent congress. The earthquake of Mar. 26, 1812, enabled the Spanish forces to occupy several of the ruined cities, and Miranda evacuated Valencia. A month later (Aug. 26) he was arrested at La Guayra in violation of the capitulation, and taken to Puerto Rico, whence he was soon removed to Cadiz and confined in one of the dismal cells of the Inquisition, where he d. in Jan., 1816. (See James Biggs's *History of Miranda's Attempt, etc.*, New York, 1808.)

Miran'dola, town of Italy, province of Modena, comprising within its limits several small villages, the principal of which is well built, with broad streets, good churches, etc. This town played an important part in the mediæval history of Modena, and is immortalized as the birthplace of the illustrious Pico da Mirandola. Pop. in 1874, 13,170.

Mira'no, town of Northern Italy, province of Venice, about 10½ miles N. of the city of Venice. It was considered of great strategic importance during the Middle Ages, and consequently suffered much from sieges. Pop. in 1874, 7393.

Mirbel' (Lizinska Amée Zoë Rue), b. at Cherbourg July 26, 1796; married in 1820 the botanist Charles François Brisseau Mirbel (b. Mar. 27, 1776; d. Sept. 12, 1854); became one of the most celebrated miniature-painters of modern times, and d. at Paris Aug. 31, 1849. Her masterpieces are the portraits of Amy, Fitz-James, and Perronnet.

Mirecourt', town of France, department of Vosges, noted for manufactures of musical instruments. Pop. 5735.

Mir'field, a v. of England, in the county of York, has manufactures of woollen and cotton goods. Pop. 9263.

Mirgorod', town of Russia, in the government of Poltava, on the Khorol, has an ecclesiastical seminary and several other educational institutions, and carries on an active general trade. Pop. 6418.

Mir'iam, the sister of Moses, was, according to Josephus, the wife of Hur and the grandmother of Bezaleel, who built the tabernacle. Her name is the Hebrew form

of Mary, and in the Arabic traditions she is often confounded with the Virgin Mary.

Mirkhond′, one of the most celebrated Persian historians, b. at Nishapur in 1433; d. at Herat in July, 1498. His great work, fantastically entitled *The Garden of Purity, containing the History of Prophets, Kings, and Caliphs,* gives the history of the world from the Creation nearly to his own times. Many MSS. of this work are found in the libraries of London, Paris, Berlin, and Vienna. Portions of it have been edited by Jaubert, Genisch, Mitscherlich, Wilken, and Vullers; translated into French by Silvestre de Sacy, Jourdain, Langles, and Defrémery; into Latin and German by numerous authors; and into English by David Shea (1832) and W. H. Morley (1848).

Mirrors [Lat. *mirari*, to "admire;" Fr. *miroir*]. Solids, usually in the form of plates having a smooth surface capable of reflecting light, have been a part of the furniture of the toilet from a period of very high antiquity. The earliest mirrors were formed of polished mineral substances or of metals, but after the invention of glass that substance naturally superseded most others in the construction of mirrors. It appears that the backs of glass mirrors were sometimes coated with lead, but about three centuries ago the process of covering glass with an amalgam of mercury and tin came into use in Venice, and has been since employed down to the present time. The process, substantially the same now as when first introduced, consists in spreading out upon a solid horizontal table a sheet of tinfoil, which is first rubbed and afterwards covered to a sensible depth with mercury, so that the superior surface may remain liquid. The mercury is prevented from flowing by means of slight ledges placed around the sheet. After having been scrupulously cleaned on its lower surface the glass to be coated is advanced horizontally along the layer of mercury, its lower edge being depressed below the surface, so as to exclude air and to remove impurities. When in proper position it is left resting on the mercury, and by tilting the table the superfluous fluid is allowed to flow off, being caught in a trough provided for the purpose at the margin of the table. A uniform pressure is then applied to the glass, and it is allowed to remain for some time in this condition, after which it is carefully lifted, the amalgam adhering to it, and is placed with the amalgamated surface uppermost. Some weeks' rest is required to allow the amalgam to harden, though it occasionally occurs that a mirror will not "dry" for months.

The preparation of mirrors by quicksilver is objectionable on many accounts, the principal of which is the injurious effect of the vapors on the health of the workmen. Quicksilvered mirrors are also liable to various faults, such as a flowing of the mercury in drops, carrying the amalgam with it, forming streaks (known as worms); also a crystallizing of the amalgam when exposed to light (called blindness). These disadvantages of the quicksilvering process have turned the attention of manufacturers to the use of pure silver for backing mirrors. Von Liebig in 1836 was the first to notice that aldehyde would reduce silver from ammoniacal solutions, depositing it upon glass or porcelain in a continuous film. Subsequently, other chemists proposed other reducing agents. The first application of the process on a large scale was made by Drayton, who patented it at Brighton, England, Nov. 25, 1843. He used different essential oils as reducing agents. But his glasses were used only for a short time; they soon became spotted. The next attempt was made by Petitjean, who obtained a patent in 1855; and this seems to have been more successful, his process with slight modifications being still in use. The materials and proportions required by one of the various modifications of Petitjean's process, used on large plates, are as follows: (1) 1 pound crystallized nitrate of silver to be treated, while stirring, with 12 liquid ounces of ammonia 26° B. After cooling and crystallization, $6\frac{1}{2}$ pints distilled water are to be added, and the solution filtered. This solution will keep for any length of time. (2) The reducing solution is to consist of pure crystallized tartaric acid dissolved in four parts of water; and this is said to improve with age. Another process, which originated with Prof. Bothe, and has been modified by Dr. Boettger, is used on small glasses, and requires the following materials and proportions: $\frac{1}{10}$th of an ounce of Rochelle salts (tartrate of soda and potash), dissolved in $1\frac{1}{2}$ quarts distilled water, is brought to a state of active ebullition, and 1 ounce of an aqueous solution of nitrate of silver ($\frac{1}{8}$) is added. This is the reducing solution, and contains what is called by its discoverer oxytartaric acid. The silver solution is prepared by dissolving $\frac{1}{8}$th of an ounce of crystallized nitrate of silver in 1 ounce of distilled water, and treating with ammonia until the precipitated oxide is nearly redissolved. This is diluted with $\frac{3}{4}$ths of a pint of water, and filtered. The two solutions being mixed in equal volumes, a precipitation of silver takes place very quickly in the cold, and a complete and beautiful mirror is formed in thirty minutes. The process is much employed for the mirrors of optical instruments.

The advantages claimed for the silver over the quicksilver process are: (1) Harmlessness to the workmen; (2) facility and expedition, the whole operation being completed in a few hours; (3) possibility of repairing damaged parts; and (4) superior power of reflection. A silver mirror reflects about 20 per cent. more light than one of quicksilver, and reflects objects more truly in their natural colors. But the durability of silver mirrors is still an open question. They are all liable, after a time, to become spotted, and unless this difficulty be overcome it is hardly probable that the silver process will ever completely supersede the quicksilver. (For the optical properties of mirrors see REFLECTION.) C. F. CHANDLER.

Mirzapoor′, town of British India, the capital of a district of the same name, on the right bank of the Ganges. The district of Mirzapoor, comprising an area of 5235 square miles, with 1,104,315 inhabitants, extends along the Ganges and the Sone between lat. 23° 50′ and 25° 30′ N., and between lon. 82° 11′ and 83° 39′ E., and belongs to the presidency of Agra. The city of Mirzapoor is a very busy and lively place, the most important cotton-market of India. Pop. 79,526.

Misdemeanor. See CRIME, FELONY.

Misere′re [Lat., "have mercy"], the name applied in the Catholic Church to Psalm li., from the first word of the Vulgate translation. This psalm is in great use on all penitential occasions, and especially on Wednesday, Thursday, and Friday of Holy Week, at the close of the office of the *Tenebræ*. Many eminent musicians have composed "misereres;" the music by Allegri is annually sung at Rome on Good Friday evening in the Sistine Chapel.

Mishawa′ka, post-v. of St. Joseph co., Ind., 4 miles E. of South Bend, has fine water-power, manufactures of wagons, carriages, windmills, axes, pumps, refrigerators, brushes, furniture, ploughs and agricultural tools, barrels, flour, woollen goods, 1 bank, good schools, 1 weekly newspaper, waterworks, and a number of business-firms. Pop. 2617. E. A. JERNEGAN, ED. "MISHAWAKA ENTERPRISE."

Mish′icott, post-tp. of Manitowoc co., Wis. P. 1551.

Mish′na [Late Heb. for "study," or perhaps for "repetition"], a part of the Jewish Talmud, containing, in Hebrew, the body of the oral law. It constitutes the most important part of the HALACHA (which see). It was reduced to nearly its present form by the Rabbi Judah the Learned at Tiberias, and published in 220 A. D.

Misilmèri [Arab. *Michelmir*], town of Sicily, province of Palermo, about 8 miles from the city of Palermo. Near this town are the ruins of a grand old castle, from which a magnificent view may be had over the island and the sea. Marble, of a very superior quality, especially that called red jasper, is quarried in the neighborhood. Pop. in 1874, 7380.

Miskolcz′, town of Hungary, situated in a beautiful and fertile valley which produces the finest wheat of the country. The town has many good educational institutions and a considerable trade in corn and wine. P. 21,199.

Mispick′el [Ger.], a mineral crystallizing in the trimetric system, and composed of iron 33.54 per cent., arsenic 33.42 per cent., sulphur 21.08 per cent. In color it is silver-white to steel-gray, with a grayish-black streak; hardness, 5.5 to 6. It occurs principally in crystalline rocks, especially associated with ores of silver, tin, lead, and zinc. It frequently forms a troublesome impurity, but has been largely used in Cornwall, England, for the manufacture of white arsenic. EDWARD C. H. DAY.

Mispil′lion, a hundred of Kent co., Del. Pop. 3478.

Misrepresenta′tion, a false or erroneous statement or representation, whether made from ignorance, carelessness, mistake, or with an intention to deceive or defraud. The subject of fraudulent misrepresentation is of great importance in law, it being a general principle that fraud has the effect to render voidable every contract and transaction into which it enters as a constituent element. But the legal rules and principles upon this subject have been already sufficiently stated under the topic FRAUD (which see). Mere innocent misrepresentation, also, made without knowledge of the falsity of the statement, may afford ground for the rescission of a contract when it has caused one or both of the parties to enter into the agreement under a mistake of fact which is subsequently discovered. When the mistake or misapprehension relates to the substance of the whole consideration, as if there is a complete difference in substance between the thing bargained for and that obtained, so as to constitute a failure of consideration, the promise resting upon it is not obligatory and will not be enforceable, or if it has been carried out may

under appropriate circumstances be rescinded by a court of equity. An innocent misstatement as to material matters of fact in reference to which the parties are bargaining or negotiating prevents in reality the formation of a valid contract, since there is no mutuality of assent on their part, which is essential that their stipulations may be binding. But if the misrepresentation honestly made is immaterial in influencing the stipulations of the parties, or if the party who seeks to be relieved from the consequences of acting upon the statement was aware of its falsity when it was made, the contract into which they enter will not be rescinded or annulled. But no innocent misstatement, although it may deceive the person to whom it is made, and cause him injury or loss in consequence of his acting upon the faith of it, will afford a cause of action in tort and entitle the party injured to recover damages for the loss he has sustained. This form of remedy is only available when the representation resulting in damage has been fraudulently made. (For misrepresentation in the law of insurance see INSURANCE.)

GEORGE CHASE. REVISED BY T. W. DWIGHT.

Mis'sal [Lat. *missa*, a "mass"], the service-book of the Roman Catholic Church, a volume containing the prayers, hymns, etc. used in the performance of the mass. There are several missals in use. Each of the Eastern rites has one or more peculiar liturgical services, and in the Latin rite, up to the time of the Council of Trent, there were many variations in the celebration of the mass; but the council fixed the present Roman missal as the standard liturgy, permitting, however, a few local liturgies to be retained, but at present the Roman missal is almost universally employed.

Missau'kee, county in the N. central portion of the S. peninsula of Michigan. Area, 576 square miles. It is covered with dense forests, and is but little developed. Pop. 130.

Mis'sion, tp. of La Salle co., Ill. Pop. 1596.

Mission, tp. of Neosho co., Kan. Pop. 1732.

Mission Creek, tp. of Wabaunsee co., Kan. Pop. 445.

Missions [Lat. *missio*, from *mittere*, to "send"]. Christian missions are founded on the command of Christ to publish the gospel in all the world. The apostles and their associates acted on this command, and imperial Rome, in less than three centuries, raised the standard of the cross. From that time to the Reformation efforts to diffuse a knowledge of the Christian religion form so much a part of ecclesiastical history that it will suffice here merely to advert to some of the more important of them. (1) The Nestorian missions to Central and Eastern Asia, begun in the fourth century, and extending—it may be with protracted interruptions—through several centuries. (See Asseman's *Bibliotheca Orientalis Clementino-Vaticana;* Mosheim's *Historia Tartarorum Ecclesiastica;* and Neander's *History.*) (2) The Irish missions, between the fifth and ninth centuries. Ireland being the remotest of European islands then known, with England and Scotland serving as ramparts against the Goths, Huns, and Northmen, was a refuge for the Church in an unsettled period of the nominally Christian world, and for ages was a fountain of scriptural instruction and scholarship in the intellectual night following the downfall of the Roman empire. The seed of the Lutheran Reformation was sowed in Germany by Irish missionaries. (See Neander's *History;* Dr. James Todd's *St. Patrick;* and a chapter on "Irish Missions" in Anderson's *Relations and Claims of Foreign Missions.*) (3) Another of the more interesting missions in the early ages was the one from Rome to the Anglo-Saxons of England at the close of the sixth century.

The Reformation of the sixteenth century is the grand epoch for both Roman Catholic and Protestant missions, since both may be said to have had their rise in events growing out of the Reformation.

The most remarkable period of the *Roman Catholic missions* was the sixteenth and seventeenth centuries. And there can be no doubt that the Church of Rome prosecuted missions, during those centuries and part of the eighteenth, on a scale exceeding anything yet witnessed in the Protestant Church. They had a grand stimulating and sustaining influence in the hearty co-operation of the French, Portuguese, and Spanish kingdoms, then in the height of their prosperity. Rome had a mission in India for the space of two centuries and a half; another in China, for 144 years; another in Japan, for nearly 100 years; another in the African kingdom of Congo, for more than 200 years; another in Paraguay, for 117 years; and she has maintained her present ascendency in the Philippine Islands for more than two centuries. The Jesuit missions among the native tribes of the American continent, both North and South, have had a wide extension.

At the opening of the present century Portugal and Spain had become, in a measure, paralyzed, and France was otherwise fully occupied; and these missions then had more or less the aspect of failure. But several of them have since been revived, and the papal Church has a large force now in the field.

The Roman Catholics have a distinct organization for missions, a department by itself. The Propaganda is a missionary society, and has charge of everything relating to the preservation of the Catholic faith in the different parts of the world. "It sends missions, assigns the several missions to the religious corporations devoted to the apostolate, presents to the Holy Father nominations to the bishoprics, vicarates, and prefectures apostolic, and settles all difficulties with regard to the spiritual and temporal administration of the missions." The receipts of the Propaganda in 1874 were $1,100,000, of which considerably more than half was contributed in France.

The names of the *Protestant missionary societies* now in operation, the times of their formation, and their annual receipts—generally as reported in the year 1874—are in the following tabular view:

Time of formation.	*In Great Britain.*	Annual receipts.
1701.	Society for Propagating the Gospel	$551,295
1792.	Baptist Missionary Society	169,745
1795.	London Missionary Society	575,496
1800.	Church Missionary Society	978,495
1809.	London Jews' Society	186,955
1816.	General Baptist Missionary Society	71,080
1817.	Wesleyan Missionary Society	839,975
1824.	Church of Scotland	49,960
1840.	Irish Presbyterian Church	25,395
1840.	Welsh Calvinistic Methodist	26,465
1843.	Free Church of Scotland	115,970
1844.	English Presbyterian Church	44,850
1844.	South American Missionary Society	58,945
1847.	United Presbyterian Church	165,400
1858.	Christian Vernacular Education Society	45,525
1860.	Primitive Methodist Missionary Society	176.039
1860.	United Methodist Free Church	72.745
1860.	Methodist New Connection	35,616
		$4,189,951
	American Societies.	
1810.	American Board of Com. for For. Missions	$478,256
1814.	American Baptist Missionary Union	261,530
1819.	Methodist Episcopal Missionary Society	337,199
1821.	Protestant Episcopal Board of Missions	114,110
1832.	Board of the Reformed Church	68,106
1833.	Free-will Baptist Foreign Missionary Society	11,389
1833.	Presbyterian Board of Foreign Missions	* 623,627
1837.	Evangelical Lutheran Missionary Society	
1844.	Board of Ref. Presbyterian Church	8,044
1844.	Board of United Presbyterian Church	
1845.	Southern Baptist Board	27.254
1845.	Baptist Free Missions	10,000
1845.	Methodist Episcopal Church, South	56,721
1846.	American Missionary Association	275,101
1853.	United Brethren Church	5,000
1853.	Southern Presbyterian Church	42.424
1859.	Nova Scotia Presbyterian Church	6,000
		$2,268,040
	Societies in Continental Europe.	
1732.	Moravian Missionary Society	$106,088
1797.	Netherlands Missionary Society	40,000
1816.	Bâle Evangelical Mission	156,468
	Leipsic Missionary Society	
1822.	Paris Evangelical Society	40,829
1828.	Rhenish Missionary Society	59,556
1833.	Berlin Missionary Society	22,050
1836.	North German Missionary Society	20,395
1842.	Norwegian Missionary Society	19,500
1850.	Berlin Union for China	3,000
1852.	Hermansburg Missionary Society	37,735
1860.	Danish Missionary Society	7,510
1860.	Utrecht Missionary Society	19,500
	Holland Missionary Society	
	Batavia Foreign Missionary Society	
		$532,631
	Total	$6,990,622

It will be observed that only two of these societies date farther back than 1792. The oldest is the English Society for the Propagation of the Gospel, and the Moravians come next. Prior to these was the mission sent by Gustavus Vasa, king of Sweden, to Lapland in 1559. In 1705, Frederick IV., king of Denmark, sent a mission to the coast of Coromandel in the East Indies. This mission, with pecuniary aid from England, was conducted by men generally of great longevity, some of them distinguished for character and usefulness. This uprising of so many churches is the more remarkable when it is considered that contemporaneous with it was the opening to their efforts of a very large portion of the heathen world. Thus, India, with its 250,000,000, was opened to Christian missions by an act of the British Parliament in the year 1813. China opened its five principal ports in 1842, and in 1858 its 400,000,000 were thrown open by a treaty with England,

* $123,503 special, for the debt.

France, Russia, and the U. S. And so was Japan, with its 30,000,000, within the past few years, by treaties with Christian powers. Turkey was made available to Protestant missions chiefly by means of the care of England for the safety of its valuable possessions in India. Turkey lay on its route thither, and France and Russia were not far off. She therefore kept her ablest diplomatists at the Porte; and the war with Egypt in 1840, with Russia in 1855 (called the Crimean war), and with Persia in 1856, grew more or less out of care for its Indian empire. Moreover, as Russia claimed the right of protecting Greek Christians in Turkey, and France of protecting the Roman Catholics, England claimed the right of protecting the Protestant Christians, then multiplying in these regions. Without such protection neither Turkey nor Persia would have been really open to Protestant missionaries. One thing more was needed. The death-penalty in Mohammedan law for abjuring the Moslem faith was virtually abolished through the efforts of Lord Stratford de Redcliffe, and native Christians in the empire, of every name, were recognized by the sultan as a distinct body, entitled to protection in their persons and religious privileges. All this was mainly owing to the fact, under God, that England had an empire in India.

The earliest of the modern Protestant missions was sent to Lapland in 1559 by Gustavus Vasa, king of Sweden. The Dutch missions in Ceylon and the Indian Archipelago grew out of the Dutch conquests early in the seventeenth century. The charter granted by Charles I. in 1628 to the Massachusetts colony expressed the hope that the colony would "win the natives of the country to the knowledge and obedience of the true God and Saviour of mankind," and the colonial seal had the device of an Indian upon it, with a label in his mouth containing the words, "Come over and help us." John Eliot began his labors among the Indians of Massachusetts in Oct., 1646, and continued them until his death in 1690 at the age of eighty-five. He translated the Bible into the language of the Indians, and 3500 copies were printed at Cambridge in 1663 and 1685. Only a few copies are now known to exist. Thomas Mayhew was really the first missionary to the Indians, having begun his labors on Martha's Vineyard as early as 1643; and the Mayhew family supplied missionaries for Martha's Vineyard and Nantucket during five generations, until 1803. Eliot had worthy co-laborers and successors, and in 1675 there were twenty-four regular congregations of "praying Indians," and as many Indian preachers. King Philip's war was a blow to the missions from which they never wholly recovered. Twenty years later there were thirty Indian churches in Massachusetts. The well-known mission of David Brainerd was commenced in 1743. The war of the Revolution had the effect to unsettle, for a long time, the relations between the Indians and the whites.

The number of Indians in the territory of the U. S. at the opening of the present century is supposed to have exceeded 400,000, and Bancroft, in the third volume of his *History*, states the number E. of the Mississippi River, before the removal westward of the Cherokee and other tribes, at 180,000. Divided and scattered over a vast wilderness, the aborigines were easily forgotten, and the spirit of Eliot, the Mayhews, and Brainerd slept for a long time. Yet it is doubtful whether many instances are on record in the history of the Church since the apostolic age in which the same amount of labor and expense was more successfully employed in the conversion of heathens than resulted from the labors of those men. Where the Indians have been protected in their homes, property, and rights they have generally been found among the more impressible of the pagans. The missions to the Cherokees and Choctaws between the years 1817 and 1860 furnish materials for an interesting history. The Rev. Cyrus Kingsbury began his mission among the Cherokees in 1817, and the first station received the name of Brainerd. Mr. Monroe, President of the U. S., unexpectedly visited this station with Gen. Gaines in 1819, and left substantial evidence that he was pleased with what he saw. The Choctaws having expressed a desire for a mission, Mr. Kingsbury was transferred to them in 1818, and called his first station Eliot. It was 400 miles S. W. of Brainerd. So much interested were the Choctaws that they devoted generous sums from their annuities to the schools, and one of their official letters relating to these grants expressed an earnest hope of their "taking a place among the enlightened nations of the land."

There is not space for even a condensed history of these missions, nor of those to the Chickasaws, Creeks, Seminoles, Osages, Dakotas (or Sioux), Ojibwas, Ottawas, Iroquois, or others on this side of the Rocky Mountains, nor to the Cayuses, Walla-Wallas, Nez Percés, and others beyond those mountains. Each had its mission and its history—some portion of it tragical, but more a matter for grateful recollection. There are not the means of stating the aggregate cost of the Indian missions to all the societies. The three largest will be specified. That of the Presbyterian Board of Foreign Missions was $886,156, of which $419,856 was from the U. S. government towards the expenses of Indian schools. That of the American Baptist Board of Missions was $357,967, of which $173,167 was from the government. That of the American Board of Foreign Missions exceeded $1,100,000, not including receipts from the government, and the aggregate number of the laborers of this board among the Indians, male and female, was more than 500.

About the year 1825 a half-breed Cherokee, named George Guess, who could neither write nor speak English, but knew that a mark could be made to represent a sound, set himself to gather the number of distinct syllables in the Cherokee language, and found them to be eighty-six. With the English letters and modifications of them, and some characters of his own, he made out an alphabet for the language. The whole was so simple that in three or four years half the nation was able to read, and was actually reading a portion of the New Testament translated into their language and printed with this syllabic type. It appeared, however, that the Cherokees within the limits of Georgia were living upon a volcano. The white man desired their lands, and resolved to have them. As the result, in the summer of 1838, 16,000 Cherokee men, women, and children were assembled at Brainerd by a military force, and from thence, though under the lead of their own rulers, they removed to territory which had been assigned them beyond the Mississippi. Being ten months on the way, including a winter, more than 4000 died as a consequence of what was inevitable in such a removal. The Choctaws made the change under less constraint and with less of suffering. The missionaries followed and resumed their labors, though with impaired success, but were helped by the incoming of Baptists, Moravians, and Methodists. In the year 1860 both nations had claims, considering their circumstances, to be regarded as Christian nations; so, also, had the Seneca nation within the State of New York.

The Dakotas (or Sioux) have since attracted much attention. They were among the most powerful tribes on the continent, numbering probably from 30,000 to 40,000, and traversing vast hunting-grounds. A mission was commenced among them in 1835, and there were early successes, with occasional trials from drunken, thieving war-parties. At length, when the great civil struggle came on between the North and the South, the heathen portion of the Dakotas, hoping for success and stimulated by their medicine-men and war-prophets, attempted to regain their hunting-grounds by the massacre of every white; and they actually murdered some hundreds of persons. A large body of U. S. troops pushed up the Minnesota Valley and routed the Indians, scattering them to the W. and N. Four or five hundred Dakotas were taken captive or surrendered, and were on the verge of severe treatment when Pres. Lincoln directed that none be executed except such as were proved guilty of murder or rape. Thirty-eight were hung in one day; and it should be stated that only three of these could read, and none had ever attended a mission school. The surviving prisoners, broken and humbled, listened to instruction; and when they joined their families on the Missouri the professors of religion numbered several hundreds, and there are supposed to be at present ten or twelve Dakota churches, with a membership of over 1000.

A very summary view will now be taken of missions in other parts of the world. The fact of there being in Western Asia 70 missionaries, 80 churches, 200 native pastors and preachers, more than 300 stations and subordinate stations, and as many schools and teachers, shows that a strong footing has been gained in the religious centres of the Greek, Armenian, Bulgarian, Syriac, and Nestorian churches; yet not with a view to the subversion of those churches, but for the revival of scriptural knowledge and influence among them.

Passing into British India, and down through the 120,000,000 in the valley of the Ganges, we find a large number of important districts more or less occupied by different missionary societies, English, German, and American. The vast system of railways recently introduced into India has added immensely to the facility of evangelizing the country. The enterprise appears to have originated in the offer of the government to guaranty a certain percentage of profit to the companies building the roads, which embrace an extent of more than 5000 miles. Calcutta is now connected with Delhi by 1000 miles of railway; and the road proceeds thence, through Lahore, to Mooltan on the Indus. From Allahabad, 500 miles above Calcutta, it crosses the Deccan to Bombay, and thence to Madras. From Madras it crosses to the Malabar coast. Other routes,

more or less completed, are from Madras, through Madura and Tinnevelly, to Travancore, and from Bombay to the mouth of the Indus. Thus, Bombay becomes the gateway through which the postal communications of Europe, America, and India must pass. And these railways, costing some hundreds of millions, are as important in a missionary point of view as they are in their relations to the social, civil, political, and commercial interests of India. Henceforward, Bombay, and not Calcutta or Madras, will be the great landing-place and point of departure for missionaries to India, saving immensely in travel, labor, time, expenditure, health, and life. The Protestant missions of India, Burmah, and Ceylon are carried on by 35 missionary societies, in addition to local agencies, and they now employ 606 foreign missionaries, of whom 551 are ordained; who are widely distributed in the different presidencies, and occupy 522 principal and 2500 subordinate stations. The native clergy are 406, and the native preachers and catechists 2784. Almost all the principal towns of the empire have at least one missionary. In 1872 the schools contain 142,850 scholars. In addition to these, 85 colleges and the training-schools connected with them contain 1618 scholars, and 28 training-schools for girls have 567 students. The zenana schools, chiefly for adult females in the houses of Hindoo gentlemen—a comparatively recent institution—number not less than 2000 scholars. The communicants in India in 1872 were 78,494, and the nominal Christians, young and old, including these, were 318,363. The 25 mission-presses in India during the ten years between 1862 and 1872 issued 3410 new works, in thirty languages, and circulated 1,315,503 copies of books of Scripture, 2,375,040 school-books, and 8,375,120 Christian books and tracts. Among the works brought to completion in that time was the entire Bible in Sanskrit, prepared by a missionary at Calcutta. (See *Church Missionary Intelligencer* for Nov., 1873.) The greatest apparent local successes have been among the peasantry S. of Calcutta, and among the Coles, Telûgûs, Shanars, and Karens. The Shanar Christian population of all ages is estimated at 90,000, and 56 of their native preachers have been ordained, and are supported to a great extent by their congregations. The native preachers among the Karen churches are 703, the church members are 34,735, and the Christian population of all ages must exceed 90,000.

The islands of the Pacific have been largely Christianized. It would be difficult to find a professed idolater in the islands of Eastern or Central Polynesia where Christian missions had been established. The Sandwich Islanders have been recognized as a Christian nation since 1863, and even longer. The Cherokee Indians were thus recognized in 1860, and the Choctaws were not far behind them. Still more recently, tens of thousands in Madagascar have surprised the world by embracing the Christian faith after a persecution of twenty-five years not exceeded in severity by any of the persecutions in primitive ages.

The shortness of the time should be considered since the oldest of the foreign missions now under consideration began to operate. The writer remembers when there was no missionary in Turkey; when missionaries were excluded from the greater part of India; when no missionaries were in Burmah, none in China, none in the Indian Archipelago, none in Africa, except Sierra Leone and the southern extremity of the continent; and none in the great island-world of the Pacific Ocean, except a small group in the south.

According to a recent statement by Dr. William Butler in his *Land of the Veda*, the number of Protestant missionaries in the unevangelized world in 1871 was 2165; of female missionaries, 2078; of native pastors, preachers, and catechists, 9886; of native church members, 280,662; of the native Christian community, 1,151,721; and of scholars of both sexes, 360,189. He estimates the copies of the Holy Scriptures issued by Bible societies since 1804 at 108,892,339, and that they had been translated, printed, and distributed, in whole or in part, in 174 languages and dialects. The receipts of the Protestant missionary societies in one year have already been stated at $6,990,622. The ordained missionaries are already outnumbered by the native pastors and preachers, and the gospel is taking root in thousands of places beyond the bounds of Christendom. Persecution cannot arrest this work. It would rather stimulate its progress. Nor will the wars of Christendom. Missions had their rise when Christendom was in arms. In no way can their progress be materially arrested, except by a general decline in the evangelic spirit among the churches; and it is undoubtedly true that the missions themselves, vigorously prosecuted, will ensure against the possibility of such a decline. RUFUS ANDERSON.

Mission San José′, post-v. of Alameda co., Cal., near Warm Springs Station on the San José branch of the Central Pacific R. R. It is a very old Spanish town. Its ancient Franciscan church, built of adobe, was almost destroyed by the earthquake of 1868.

Missis′quoi, a fertile county of Quebec, Canada, bordering on Vermont, and bounded on the W. by the river Richelieu. Among the minerals is bog-iron ore. It is traversed by several railroads. Pop. 16,922. Cap. Bedford.

Missisquoi River rises in Orleans co., Vt., makes a détour northward into Canada, and, returning to Vermont, falls at last into Missisquoi Bay, the N. E. portion of Lake Champlain.

Mississa′gas, an Algonkin tribe which resided, when first brought into notice about 1650, on the N. shore of Lake Huron, at the mouth of a river of the same name. They were allies of the Hurons, upon whose dispersion by the Iroquois in 1648 they fled to Lake Superior, but returned a few years later, when Catholic missionaries labored among them with indifferent success. Subsequently, they were engaged in hostilities with the Sioux, and made treaties with the Iroquois, by virtue of which they settled along the N. of Lakes Erie and Ontario; were adopted in 1746 as a seventh nation into the Iroquois confederacy; were allies of the English in the first French war 1743–48, of the French in the second or Seven Years' war, and again of the English in the war against Pontiac in 1763; joined the Miami confederacy against the U. S. 1792–93, and aided the Canadian forces in the war of 1812. At one time they had a settlement on the present site of Erie, Pa., but are now found only at four villages in Ontario—at Rice and Scugog lakes, Alnwick, and Grand River—and numbered in 1873 about 700. Protestant missions have been maintained among them for half a century; most of them have embraced Christianity, practise agriculture, live in comfortable houses, and have received an English education.

Mississin′awa, tp. of Darke co., O. Pop. 798.

Mississip′pi, a South-western State of the American Union, lying in the Mississippi Valley, bounded W. by the Mississippi and Pearl rivers, the first separating it from the States of Arkansas and Louisiana, and the latter from E. Louisiana; on the E. the boundary is for a short distance the Tennessee River, and thence a line extending from the point of junction of Bear Creek with the Tennessee River to about 31° 52′ N. lat., a little above the N. W. corner of Washington co., Ala., and thence due S. to the Gulf of Mexico. The 35th parallel of N. lat. separates

Seal of Mississippi.

it from Tennessee; and for 108 miles the 31st degree of N. lat. forms the boundary on the S., leaving to the eastward a strip of territory 78 miles broad, stretching down to the Gulf and Mississippi Sound, and including all the islands within 6 leagues of the shore-line. Thus bounded, and embraced between 30° 10′ and 35° of N. lat., and the meridians of 88° 06′ and 91° 40′ W. of Greenwich, with an extreme length of 330 miles from N. to S., and of greatest width from E. to W. of 186 miles, Mississippi has an area of 47,156 square miles, or 30,179,840 acres.

Topographical Features and Soil.—From the N. E. corner, where the State for 15 miles is bounded by the S. bank of the Tennessee River, and where there is a marked limestone formation with a rugged country, the surface slopes gradually, with many undulations in its conformation, toward the Mississippi River, and southward toward the Gulf of Mexico, leaving a broad low ridge running nearly N. and S. through the centre of the State, which divides the waters which fall into the Mississippi (the Yazoo, Big Black, etc.) from the affluents of the Tombigbee, Pearl, and Pascagoula rivers. On the W. this ridge extends, at Vicksburg, to the Mississippi, terminating in bold high

bluffs. To the E. of this watershed are broad tracts of gently-rolling prairies of exceeding fertility, yielding large crops of cotton and corn, as in Lowndes, Monroe, Oktibbeha, and other counties, while to the W. the surface is broken by a system of valleys and low, narrow ridges that start at right angles from the spinal ridge, and drop off into the great basin of the Yazoo delta—a basin embracing some 4,000,000 acres, the very heart of the cotton-zone of Mississippi. On the central ridge there are large tracts of rolling arable land, either in cultivation or covered by heavy forests, the soil, for the most part, a rich light loam where not denuded down to the clay, in which case the land is sterile. About Pontotoc there is a considerable breadth of fair upland. In the S., below the railway from Jackson to Meridian, stretches a rolling region of open pine woods down to the Gulf shore—a sparsely settled tract, the soil poor, but favorable for the pasturage of sheep and large cattle, with abundant riches in its vast range of timber and turpentine-yielding forests. Thus, the larger part of the State has a broken, rolling surface, but nowhere mountainous, or with ridges, at the highest, of greater elevation than 800 feet, none of which are due to upheaval, but to the denudation by the action of water, or nowhere other than mere hillocks of sand, clay, and drift, whose elevations for the most part range between 30 and 120 feet, with only occasional instances of 400 feet. Some of these higher hills skirt the Mississippi River in the S. W. part of the State, and some are in Newton, Neshoba, and E. Attala counties, about the head-waters of the Pearl River. The Yazoo basin is subject to overflow at times of extreme high water, with the sole exception of about 200,000 acres in flat ridges, which rise here and there slightly above the general level of the delta that was once the bed of the Mississippi. The northern upland section is diversified by small valley-areas of highly productive soil, as in De Soto, Panola, Yalabusha, Marshall, and Tippah counties. In the S., in that large space of ridge-and-valley surface W. of the prairie-region, E. of the Yazoo, and N. of the Vicksburg Jackson and Meridian R. R., with some exceptions, the soil is indifferent. Even the bottom-lands of the Big Black, Tallahatchie, and Yalabusha rivers, though covered by a luxuriant growth of trees and underbrush, are not productive under tillage, from the clayey nature of the subsoil, which makes the land too wet and sodden; but on some of these streams there is found a bench or "second bottom" of exceeding richness. The prairie-region, on the other hand, found so productive in Lowndes and on the tributaries of the Tombigbee, prolonged S. and W. between the head-waters of Pearl and the Big Black rivers, loses its fertile character comparatively. Below the Yazoo delta, along the Mississippi, except where interrupted for short distances by bold bluffs, as at Vicksburg, Grand Gulf, Rodney, Natchez, Ellis Bluff, and Fort Adams, a broad belt of low, thickly-timbered land of extreme fertility lines the river, but, like the Yazoo basin, is subject to overflow.

Rivers, etc.—The State is mainly drained by the Mississippi River and its affluents, the Homochitto, Big Black, Yazoo, and its tributaries the Sunflower and Tallahatchie; the Pearl River, with its principal branch the Bogue Chitto, and the Pascagoula, with the Chickasawha, and other tributaries, drain the S. E., and the Tombigbee and its affluents drain the E. In the extreme N. E. the Tennessee River forms the boundary for 15 miles, and several small streams falling into it serve to drain that section. The State has a coast-line of 88 miles on the Gulf, and, including the islands which help to form Mississippi Sound, about 280 miles, but it has no good harbor except that of Ship Island. Its river ports, Vicksburg and Natchez, are well situated for business.

Geological and Mineralogical Features.—The small streams which fall into the Tennessee River in the N. E. corner of the State are bordered by massive walls of limestone, with bedding, plane, and vertical joints as clearly marked as if made and laid by hand. This limestone in geologic age ranks no later than the lowest limestone of the Lower Carboniferous era, if indeed it is not, as some of the geologists declare, Devonian. W. of this, as far as the 89th meridian, and along the eastern border of the State to about lat. 32° 30′, the Cretaceous formations which made their first appearance in Southern Kentucky crop out. These Cretaceous rocks belong to the following groups: the Eutaw, Tombigbee sand, rotten limestone, and Ripley groups. W. of these, and occupying most of the State E. of the Yazoo River, except the immediate valley of the Mississippi and the Gulf coast for a distance of perhaps 30 miles back, Tertiary formations prevail. These are classified by the Mississippi geologists as belonging to the following deposits: Northern lignitic, silicious Claiborne, calcareous Claiborne, Jackson, Vicksburg, Grand Gulf, and the coast Pliocene. It is to be regretted that these geologists have felt the necessity for giving to so large an extent local names to these groups and deposits, as they have thus rendered a comparison with the geological structure of other States more difficult. The bottom-lands on the Mississippi, the Sunflower, and the Yazoo, and the tributaries of the latter, as well as the Gulf coast for about 30 miles back, belong to the Quaternary or Alluvial era. This has five distinct groups: first, and next in geological order to the highest Tertiary, the Orange sand, of which more will be said presently; the bluff or Loess, a calcareous silt, containing only terrestrial fossils; the yellow loam deposits already mentioned; the second bottoms; and, latest of all, the alluvial deposits along the Mississippi. The Orange sand is the most striking feature of the State's geology, for its presence on the surface is so general as to make its absence exceptional. Chiefly made up of rounded, silicious sand, colored and more or less indurated by the hydrated peroxide of iron, it is found overlying the Lower Carboniferous or Devonian, the Cretaceous, and Tertiary formations, except in the Jackson and rotten limestone groups of the second, the bluff group of the last, and the Mississippi alluvium. On the Pontotoc ridge it is either of a glaring deep red, as in Itawamba county, or of a dull iron-rust color; in the region of the long-leaf pine it is of a delicate rose tint, and sometimes of a bright yellow, crimson, or purple; elsewhere, it becomes white, and even bluish. With a large increment of iron, in some places the tendency is to concrete into a ferruginous sandstone, occasionally in such masses and solidity as to afford good building material. These indurations are generally found capping hills and ridges, some of which rise in steep isolated hillocks from the level surrounding country as high as 150 feet, forming curious landmarks which indicate the former surface-level. In some places these conglomerates are tubular, of singular regularity of dimension and mould, with the appearance of newly-made iron castings, often four to five feet in length, and with a bore from a quarter of an inch to four inches in diameter. Such hills are further crowned, generally, with clumps of the short-leaved pine, not visible elsewhere in the same vicinity. The average thickness of this Orange sand-stratum varies from 40 to 60 feet, but 100 is not at all infrequent, and it has been found as thick as 200 feet. The fossil remains are not characteristic or peculiar to the deposit, but belong to underlying formations. Thus, corals, the stems of *Cyathocrinus*, and other Crinoidea are common, while in close proximity to the Carboniferous formation of the N. E. the fossils are of that formation, such as *Cyathophyllum fenestrella*, *gorgonia*, *productus*, *spirifer*, etc. Elsewhere, the fossils are Cretaceous, as in the ferruginous sand-rocks, some of which have been identified as *Ammonites placenta*, *Trigonia thoracica*, *Cuculla capax*, *Dorsinia dentata*, etc. The useful materials of this formation are the ferruginous sandstone, much of which can be used in rough masonry, and large beds of pipeclay of great purity, and potter's and crucible clays, the first of which has been found in Tishemingo county, suitable for the manufacture of queensware and firebrick, while stoneware has been made of superior quality at several places. The Tertiary beds afford lignite or brown coal to some useful extent, mineral fertilizers of value and convenience, potter's and firebrick clays, and limestone (rotten), for burning chiefly. The mineral deposits of Mississippi are relatively of small consideration, however, in the sum of its natural advantages.

Formation.	Name of group.	Principal materials.	Fossils found.
QUATERNARY.	Alluvium........	Soils, sandbars, etc.........	Existing species of plants and animals.
	Second bottom....	Hommocks.	
	Yellow loam......	Brown and yel. brick-clays.	
	Bluff formation...	Calcareous silt.............	Terrestrial, part ex't. trees.
	Orange sand......	Sands, pebbles, clays.......	Those of underlying formation.
TERTIARY.	Coast Pliocene....	Black fetid clays............	Living marine shells,
	Grand Gulf group	Light-colored clays, white sandstones	Plants, partly extinct, lignite.
	Vicksburg " ..	Marls and limestones.......	Marine animals.
	Lignitic " ..	Black clays.................	Plants, lignite.
	Jackson " ..	Marls and soft limestones...	Marine animals.
	Lignitic " ..	Black clays.................	Plants, lignite.
	Claiborne " ..	Marls and limestones.....	Marine animals.
		Silicious sandstones......	Marine animals.
	Northern lignitic.	Black and gray clays, yellow sands...............	Plants, partly extinct, lignite.
CRETACEOUS.	Ripley group.....	Marls and limestones, sandy	Marine animals.
	Rotten limestone.	Soft chalky limestones, clayey.................	Marine animals.
	Tombigbee sand..	Greenish micaceous sands..	Marine animals.
	Eutaw group.....	Dark-colored clays, sand....	Plants, ex't, lignite.
LOWER CARBONIFEROUS OR DEVONIAN.	Limestone........	Fetid crystalline limestone..	Marine animals.
	Sandstone........	Silicious sandstone and chert	Marine animals.
	Black slate.......	Hydraulic limestone........	————?

Iron, though abundant in the Orange sand, is nowhere so concentrated as to be of practical value. The most noted

and characteristic fossil is that widely found in the prairie-region, the *Zeuglodon macrospondylus*, or *Z. cetoides*, a huge marine animal of the whale family, but resembling the alligator in form more than it does any living whale, and more than 100 feet long, as indicated by skeletons which have been found in the State. Waters of decided mineral and medicinal character are of wide occurrence, such as alkaline and saline chalybeates, containing iron, lime, magnesia, and often soda. Of these medicinal springs, that of Cooper's Wells is of highest repute, having a strong saline chalybeate character. On the preceding page is a table of the formations occurring in the State, with their several groups.

Climate.—The summer season is long and hot, but generally healthy away from the low, dank bottom-lands of the watercourses. The winters, comparatively short, are damp and somewhat colder than in the same latitude on the Atlantic coast. At the same time, from October to June no climate can be more temperate and agreeable. The State is not subject to the drenching rains of Lower Louisiana and Florida, for the rainfall, averaging 64 inches at and near the coast, ranges between 44 and 56 inches for the greater part of the State, distributed throughout the year in the most favorable manner for the agriculture of the country. The isothermal line of 60° mean annual temperature passes a little N. of Jackson, the State capital, but at the coast it is 70°. Observations at Vicksburg (32° 23′ N. lat.) gave a mean temperature in 1872 of 66.4°, and of 64.67° in 1873, the coldest days of the same years having been respectively 42.7° and 43°, and the hottest 84.6° and 82°, with a rainfall of 57.77 inches in 1872, and but 48.4 inches in 1873. Natchez (32° N. lat.) has a mean winter temperature (January) of 52.2°, and for July of 81.3° F., or nearly the same temperature for those periods as Cairo in Egypt. The following table gives meteorological data concerning four towns in different parts of the State:

Towns.	Mean annual temp.	Highest of the year.	Lowest	Range.	Mean temp. of spring.	Highest.	Lowest.	Range.	Mean temp. of summer.	Highest.	Lowest.	Range.	Mean temp. of autumn.	Highest.	Lowest.	Range.	Mean temp. of winter.	Highest.	Lowest.	Range.
Columbus.....	60°	98°	22°	76°	61.4°	87°	26°	61°	79.6°	98°	63°	35°	58.8°	88°	29°	59°	45.5°	68°	22°	46°
Paulding.....	61	97	24	73	63.7	88	30	58	80.3	97	59	38	62.1	92	34	58	46.9	69	23.5	45.5
Vicksburg....	64.67	84.6	42.7	41.9	65.9	81	28	53	81.3	84.6	61	23.6	64.1	86	33	53	47.3	70.6	22.4	48.2
Natchez......	56	90	18	72	64.3	88	27	61	79	90	63	27	60.1	84	32	52	47.6	71	23	48

Towns.	Rainfall of spring.	Rainfall of summer.	Rainfall of autumn.	Rainfall of winter.	Annual rainfall.	Mean barometer, spring.	Mean barometer, summer.	Mean barometer, autumn.	Mean barometer, winter.	Mean annual barometer.
Columbus	18.11	9.85	12.91	19.14	60.1					
Paulding	17.13	14.48	11.56	18.79	61.96					
Vicksburg........	12.42	10.69	5.19	19.74	48.4	30.058	30.080	30.169	30.177	30.020
Natchez	17.36	12.18	13.14	21.98	64.66					

Vegetation.—A large portion of Mississippi is yet covered with primitive forests. Over the Tertiary and a part of the Quaternary formations deciduous trees, and especially numerous species of oak, are the prevailing forest trees. In the northern and central portions of the State the Spanish or red oak, the scarlet Spanish, the true black or quercitron oak, the chestnut, willow, and water oaks abound on the lowlands and swamps; the rock-chestnut oak is found on ridges in the Yazoo bottom. The black-jack oak is found on poor soils, and occasionally, with the long-leaf pine, in better land. The other deciduous trees of the State are four species of hickory, black walnut, butternut, dogwood, black gum, sweet gum or liquidambar, beech, sycamore, cottonwood, *Magnolia grandiflora*, *M. acuminata* or cucumber tree, and *M. glauca* or sweet bay, red maple, ironwood, locust, black locust, papaw, black and white mulberry, alder, and cinquassia. Of evergreens, there are four or five species of pine—viz. the long-leaf, the short-leaf, the white, and the pitch or bottom pine, the cypress, and in the extreme S. the live-oak. Of fruits, there are several species of indigenous grapes, of which the muscadine (two varieties) is decidedly the best; apples do well in the north-eastern part of the State, and grapes, peaches, quinces, pears, apricots, and plums nearly all over; while, in the southern counties, figs, oranges, lemons, olives, and bananas or plantains flourish. The flora of the State has not been so thoroughly studied as it should have been, but we know that, aside from the more noticeable of the wild flowers and plants common to the Gulf States, it has a number of great beauty which are found here almost exclusively; among these are the poppy mallows, the vanilla-plant, the elegant and fragrant Cape jessamine, several species of wild millet, etc.

Zoology.—With such extensive forests, Mississippi abounds in game. Bears, foxes, wolves, wild-cats, and not unfrequently the formidable cougar or panther, the raccoon, opossum, and skunk, are found in the sparsely settled and wooded districts, and deer, as well as the smaller game—rabbits or hares, seven species of squirrels, gophers, wood-rats, etc.—are yet plentiful; wild-turkeys, pigeons, quails, and mocking-birds, and in their season the rice-bird, and on the coast many species of wild-ducks, brant, and teal, are found in great numbers. Parroquets are seen as far N. as Natchez. Other birds of gay plumage or of melodious song are numerous, as are also many species of hawks, vultures, and gulls. The alligator is found in the bayous of the Mississippi as far as the mouth of the Arkansas River. Lizards and water-snakes abound in the swamps and bottom-lands. Rattlesnakes, moccasin snakes, as well as many of the harmless snakes, are common; the batrachians—frogs, horned frogs, toads, etc.—are plentiful. Mississippi Sound, the Mississippi and the other rivers abound in fish, of which the most common are the giant catfish, pickerel, black bass, the buffalo-fish, and the usual fresh-water fish of more northern rivers. Oysters and other shellfish are found of excellent quality in Mississippi Sound.

Agricultural Productions.—Almost the entire area of the State is capable of yielding agricultural products. Even the "pine barrens" in the S. E. counties yield, in addition to turpentine, excellent pasturage, and the herds of cattle are increasing. The central prairie counties are the most productive part of the cotton-belt, and vie in this respect with the Yazoo bottoms, while they are not liable to overflow like those lands. These prairie counties also yield great crops of corn. Wheat and oats yield large crops in the upland or yellow-loam regions. In the lowlands, along the watercourses, there is exhaustless pasturage, with roots for swine. Yet but about one-seventh of the area of the State has been brought under cultivation, and only about two-fifths were included in farms in 1870. Cotton was long its great and almost exclusive staple, but of late years more attention has been paid to other crops. In 1870 there were 13,121,113 acres of land in farms, of which 4,209,146 acres were reported as improved or cultivated (about 856,000 acres less than in 1860), while 8,911,967 acres were unimproved, the larger part being in woodland. The cash value of farms was $81,716,576, and of farming implements, $4,456,633. There had been a heavy falling off of values during and since the war, and farming property averaged only about two-fifths its value in 1860. The value of all farm productions for the year 1870 was $73,137,953. The wheat-crop in 1870 was 274,479 bushels; of Indian corn, 15,637,316 bushels; of oats, 414,586 bushels, and small quantities of the other cereals. The cotton-crop was larger than that of any other State, being 564,938 bales; the wool-clip was 288,285 pounds; the rice-crop, 374,627 pounds; hay, 8324 tons. Forty-nine hogsheads of cane-sugar and 152,164 gallons of cane-molasses, and 67,509 gallons of sorghum molasses were made; 214,189 bushels of Irish potatoes and 1,743,432 of sweet potatoes; 176,417 bushels of peas and beans; 9390 pounds of beeswax and 199,581 pounds of honey; 2,613,521 pounds of butter; 3099 pounds of cheese; 17,052 gallons of milk sold. The live-stock in the State was valued at $29,940,238, and consisted of 90,221 horses, 85,886 mules and asses, 173,899 milch cows, 58,156 working oxen, and 269,030 other cattle; 232,732 sheep and 813,381 swine. In 1873 the amount of Indian corn raised was 18,543,000 bushels, valued at $15,761,550; of wheat, 189,000 bushels, valued at $330,750; of oats, 492,000 bushels, worth $423,120; Irish potatoes, 206,000 bushels, worth $247,200; tobacco, 85,000 pounds, worth $14,450; hay, 13,000 tons, worth $263,250; the cotton-crop was not far from 600,000 bales, and its value not far from $28,500,000. We have no report of the sweet potatoes, sugar, rice, or other minor crops. Ramie is cultivated to a considerable extent in the State, and a German colony are rearing silkworms on a somewhat extensive scale. On Jan. 1, 1874, there were estimated by the agricultural department at Washington to be 88,300 horses in the State, worth $7,682,100; 99,100 mules and asses, worth $10,793,990; 180,100 milch cows, worth $3,886,558; 329,800 oxen and other cattle, worth $4,053,242; 153,600 sheep, worth $296,448; 819,100 swine, worth

$2,858,659, making a total value of live-stock of about $29,000,000.

Manufacturing Industry.—Mississippi has never engaged largely in manufacturing, although possessing many advantages for it, as her citizens have preferred to sell their agricultural products, and buy what manufactured goods they needed; but they are now beginning to take more interest in home products. In 1870 there were in the State 1731 manufacturing establishments, employing 5941 hands (5500 males, 191 females, 250 children), using a capital of $4,501,714, paying $1,547,428 for wages, using $4,364,206 of raw material, and producing $8,154,758 of manufactured goods. Most of these establishments were on a small scale, but in the production of lumber there were 156 mills, employing 1643 hands, and producing $2,029,145; there were 45 flouring-mills, producing flour to the value of $468,576; 85 carriage and wagon factories, producing $268,031. In 1873 there were 11 cotton-factories in the State, using 2545 bales of cotton per annum. The saw-mills in the southern part of the State have also greatly increased their production.

Railroads.—At the close of the war the few railroads in the State, mostly trunk-lines, were in a most deplorable condition; but with the revival of trade they have been put in excellent order, and some new lines added. The following table shows their condition in Jan., 1874:

Name of Railroad.	No. miles within State.	Capital stock.	Funded debt.	Floating debt.	Stock, bonds, and debt.
Alabama and Chattanooga	18				
Memphis and Charleston	$38\frac{1}{5}$	$5,312,725	$4,157,387	$469,855	$9,939,967
Mississippi and Tennessee	$106\frac{1}{2}$	825,407	2,286,047	163,085	3,274,539
Mississippi Central	183	5,435,534	8,000,000	3,831,802	17,266,336
Mobile and Ohio	$290\frac{1}{10}$	4,444,145	10,260,764	830,203	15,535,112
Natchez Jackson and Columbus	12				
New Orleans Jackson and Great Northern	118	4,734,000	8,000,000	1,176,020	13,910,020
New Orleans Mobile and Texas	77	8,650,000	8,150,000		
Ripley (narrow gauge)	26	....	....	....	400,000
Vicksburg and Meridian	$150\frac{1}{4}$	1,118,163	3,215,422	68,902	4,402,487
Vicksburg and Nashville	25				
West Feliciana	$7\frac{1}{2}$	760,000	110,000	5,000	875,000
	$1051\frac{11}{20}$				

The *Railroad Manual* reported that in Jan., 1875, there were in the State 1141.24 miles of railroad, and the cost of roads, equipment, etc. was $43,001,792.

Finances.—The assessed valuation of the State in 1870 was $177,278,890; the true valuation was $209,197,845. The State debt Jan. 1, 1874 (except bonds to the amount of $7,000,000 repudiated in 1842, and on which nothing has since been paid), amounted to $3,558,629.24—viz. due school funds, $1,157,415.69; certificates of debt, $294,150; auditor's warrants, $1,083,682.57; interest on bonds, $73,436; interest on insurance deposits, $15,294.98. Of the bonds, $484,650 were payable before Jan. 1, 1877. The receipts into the State treasury in 1874 were $2,255,824.38, of which, however, $795,936.48 was in uncurrent and unavailable funds, and $74,269 in certificates of indebtedness, leaving of available resources, at the outside (for one or two other items are doubtful), $1,385,618.90. The disbursements were $1,238,140.67.

Commerce.—There are three customs districts in the State—Natchez, Pearl River (port of entry, Shieldsborough), and Vicksburg. Of these, the first and last are only occupied with the river trade, the direct foreign trade and the coasting trade being centred entirely in the Pearl River district. The value of foreign commerce for the year ending June 30, 1874, was $233,406, almost entirely exports, including a large amount of lumber and timber from the S. E. pine-region. The number of entrances of vessels in the foreign trade was 93, aggregating 22,523 tons; of clearances 94, aggregating 20,249 tons; entrances in the coasting trade, 68—12,048 tons; clearances, 96—21,382 tons; total tonnage of all kinds, 76,202.

Banks, Savings Banks, and Insurance Companies.—There have been but 2 national banks organized in Mississippi, and both are now closed. There are 5 banks of deposit organized under State law, having an aggregate capital of about $550,000; there are also 6 savings banks, with an aggregate capital of about $300,000. One of each class has an insurance department. In Jan., 1874, there were 21 insurance companies of other States doing business in the State.

Population.—There has been no census or general enumeration of population in the State since the U. S. census of 1870. The foreign element has never been large in the State.

Census year.	Total pop.	Males.	Females.	White.	Free colored.	Slaves.	Natives.	Foreigners.	Density.	Ratio of increase.	Of school age, 5–20.	Of military age, 18–45, males.	Of voting age, over 21, males.	Citizens.
1800	8,850	4,824	4,006	5,179	182	3,489	....	....	.02					
1810	40,352	22,273	18,085	23,024	240	17,088	....	....	.85	355.95				
1820	75,448	40,375	35,073	42,176	458	32,814	....	....	1.60	86.97				
1830	136,621	71,853	64,768	70,443	519	65,659	....	....	2.89	81.08	26,773*			
1840	375,651	195,974	179,677	179,074	1,366	195,211	371,950	3,701	7.97	174.96	67,469*			
1850	606,526	311,724	294,802	295,718	930	309,878	601,230	4,788	12.86	61.46	241,719	116,253	136,320	72,908
1860	791,305	405,948	385,357	353,899	773	436,631	782,747	8,558	16.78	30.47	305,042	145,521	171,115	79,981
1870	827,922	413,421	414,501	382,896	445,026†	....	816,731	11,191	17.56	4.83	278,999	149,698	174,845	169,737

Education.—The constitution of the State at its admission into the Union, in 1817, recognized the necessity of thorough public school education, and Congress responded with more than its usual liberality to the application for grants of school lands; not only was the sixteenth section of each township and the university land-grant bestowed, but grants were made from the Chickasaw lands, from the internal improvement and swamp-land grants, from a percentage of lands granted to railroads, from lands falling to the State for taxes, and from the agricultural college land-grant—in all, 10,697,882 acres, or an amount equal to more than one-third of the area of the State. The greater part of the proceeds of these lands, so far as they have been sold, have been turned aside from their legitimate purpose, and most of them lost by reckless mismanagement. There was no well-regulated system of public schools in the State before the war, and during its continuance nearly all attempts at education were given up. Immediately after the fall of Vicksburg, in July, 1863, some of the Northern benevolent societies established schools throughout the State, but these were principally attended by colored children. The Peabody Fund and the Freedmen's Bureau appropriations supplemented these after a time, and there was a beginning of a better educational condition. In 1869–70 the legislature enacted a code of laws for the inauguration and government of a system of public schools, which was amended in 1873. Under this code the schools have made rapid improvement and progress. In the principal cities and towns there are public schools of a very high character, and they are attended by nearly all the children. In the rural districts the progress is slower, but they are improving. In 1874 there were about 2600 teachers employed, 150,635 children enrolled, and the average attendance was 113,057; the average monthly salaries of the teachers (both male and female) were $51.32, and the enumerated children of school age (5–21 years) were 317,264. About $1,950,000 had been saved from the wreck of the school fund, or at least the legislature made itself responsible for the interest on this amount at 8 per cent., and the total amount of State funds annually distributed to the schools is $1,242,308, of which $1,089,685 is raised by tax; an amount about equal to the State appropriation is raised by local taxation and expended for schools annually. The school fund is now increased by the proceeds of the poll-tax, by all fines and amercements, and the license fees of all retail venders of liquor, as well as by the sales of the school lands not yet sold. There are 8 high schools in the State, having about

* Whites only. † Including 16 Chinese and 809 Indians.

1000 pupils; 2 normal schools—one at Holly Springs, in the N. part of the State, connected with Shaw University; the other at Tougaloo, in the centre of the State, known as Tougaloo University. Both are mainly intended for training male and female teachers for the colored schools. They had 356 pupils in 1873. There were in 1874, 586 private schools, with about 13,000 pupils. The number of illiterate persons over ten years of age, who could not read and write, was, in 1870, 349,813. The following table gives the statistics of the universities and colleges of the State, as well as of the female colleges or collegiate schools. Oxford University has scientific and law departments; Alcorn University, a scientific (agricultural) department; and Shaw and Tougaloo universities, normal departments:

Name of university, college, etc.	Location.	Date of organization.	No. of professors and instructors.	No. of students.	Value of property and grounds.	Endowment.	Income from endowment.	Income from all sources.	Under what control.	Volumes in library.
University of Mississippi	Oxford	1848	17	180	$200,000	Lands,etc.	$50,000	....	State	5,000
Mississippi College	Clinton	1851	9	98	75,000	$40,000	3,000	$10,000	Baptist	2,000
Pass Christian College	Pass Christian	1866	14	80	120,000	10,000	1,000	....	Catholic	3,000
Madison College	Sharon	1851	2	50	10,000	....	....	....	Unsectarian	1,000
Tougaloo University	Tougaloo	1870	13	148	63,450	2,725	220	14,235	Union, State in part	2,000
Alcorn University	Oakland	1872	10	179	100,000	134,900	9,852	59,852	State	5,000
Shaw University	Holly Springs	1873	5	75	....	....	....	5,000	Methodist.	
Female Colleges:										
Sharon Female College	Sharon	1834	4	46	....	....	....	....	Methodist.	
Columbus Female Institute	Columbus	1847	16	125	....	....	....	....	....	250
Chickasaw Female College	Pontotoc	1850	8	93	30,000	....	....	....	Presbyterian	2,000
Central Female College	Clinton	1853	10	126	25,000	....	....	12,000	....	1,000
Whitworth Female College	Brookhaven	1859	11	202	40,000	....	....	30,000	M. E. Church, S.	
Meridian Female College	Meridian	1865	7	108	110,000	4,000	....	3,500	Baptist	50
Union Female College	Oxford	1854	9	167	40,000	....	....	16,000	Cumb. Presb.	
Franklin Female College	Holly Springs	1870	5	90	25,000	....	....	7,000	Prot. Episcopal	250
Starkville Female Institute	Starkville	1874								

Newspapers.—According to the census of 1870, there were 111 papers in the State, with a circulation of 71,868, and an annual issue of 4,703,336 copies. This included 3 dailies, with 2300 circulation; 6 tri-weeklies, with 3650 circulation; 3 semi-weeklies, with 2400; 92 weeklies, with 60,018 circulation; 2 semi-monthlies, with 700; and 5 monthlies, with a circulation of 2800. There has been a moderate increase since that time, mainly in weekly or monthly papers devoted to the farming interest.

Institutions of Special Instruction and Miscellaneous Charities.—There is an institution for the instruction of the deaf and dumb, and another for the blind, near Jackson. The former had, at the close of 1873, 3 instructors and 37 pupils; 46 had been under instruction during the year. It was supported by the State, $15,000 per annum being appropriated for it. Its buildings and grounds were worth $50,000. The blind institution has about 33 pupils and 9 instructors and employés. It receives a State appropriation of $10,000, and the pupils earn a part of their support. There are two orphan asylums, both under Catholic control, at Natchez, and a soldiers' orphans' home for children of deceased Confederate soldiers near Lauderdale Springs. The State hospital for the insane is also at Jackson, as is the penitentiary, which has 200 cells—a number insufficient for the prisoners. There is some complaint in regard to its management.

Churches.—The churches of all denominations in the State in 1870 were 1829, having 1800 church edifices, 485,398 sittings, and $2,360,800 of church property. We give below the statistics of the different denominations, both in 1870 and in 1874, so far as we have been able to obtain them:

Denominations.	Organizations, 1870.	Edifices, 1870.	Sittings, 1870.	Church property, 1870.	Churches, 1874.	Church edifices, 1874.	Ministers, 1874.	Church members, 1874.	Adherent pop., 1874.	Church property, 1874.
Baptists	665	652	174,970	$582,325	1206	1102	588	88,269	352,000	$993,540
Christians and Disciples	30	28	7,325	50,850	35	31	30	2,400	10,000	61,000
Congregationalists	2	1	300	1,200	3	3	5	107	535	2,500
Protestant Episcopalians	33	33	8,650	203,000	49	41	29	1,818	9,000	280,000
Lutherans	10	10	2,450	12,300	17	15	11	1,743	7,000	15,500
Methodists	787	776	208,203	854,475	1090	1061	893	81,765	326,000	1,000,000
Presbyterian Church, South	181	180	51,700	376,200	203	198	147	15,241	70,000	543,500
Presbyterian, Cumberland, etc	81	78	19,400	94,000	91	86	67	5,200	21,000	112,000
Roman Catholics	27	27	8,250	165,850	36	36	32	....	12,000	205,000
Union (Christian)	12	14	3,750	19,800	15	15	10	750	3,500	21,000

There were also in 1870, 1 Universalist congregation, 1 church edifice, 400 sittings, $800 of church property.

Constitution, Courts, Representatives in Congress, etc.—The State is now governed under the constitution reported by the State constitutional convention of 1868, and which was rejected by the popular vote in June, 1868; but that vote having been set aside for irregularities and frauds, a second trial was had, and the constitution adopted Nov. 30, 1869, by a vote of 205,223 to 954. It provides that all male inhabitants who are citizens of the U. S., twenty-one years of age and over (with the usual exceptions of convicts, idiots, and persons of unsound mind), who have resided in the State six months and in the county one month next preceding the day of election, may be qualified voters. The house of representatives (107 members) is chosen for two years, the senate (33 members) for four years. The governor and lieutenant-governor (elected for a term of four years) must be at least thirty years of age, must have been citizens of the U. S. for twenty years, and of the State for at least two years previous to their election. The secretary of state, attorney-general, treasurer, auditor of public accounts, and superintendent of education are also elected for four years, and must be at the time of election at least twenty-five years of age. A sheriff, coroner, treasurer, assessor, and surveyor are elected in each county every two years. The judicial power is vested in a supreme court, consisting of three judges, who are appointed by the governor, by and with the advice and consent of the senate, for a term of nine years. The judges of the circuit courts (of which there are 15, that being the number of judicial districts) are also appointed by the governor for a term of six years; and the judges or chancellors of the chancery courts (there are 20 chancery districts) are appointed by the governor for four years. The salaries are—for supreme court judges, $4500; for circuit court judges, $3500; and for chancery court judges, $3000 per year. The schools are under the control of a board of education composed of the secretary of state, attorney-general, and superintendent of education; there are county superintendents in each county. Mississippi has now six members of the U. S. House of Representatives.

Counties.—Seven new counties have been organized since 1870, but there are no statistics published indicating their population or valuation.

Counties.	Pop. 1870.	Males, 1870.	Females, 1870.	Pop. 1860.	True valuation, 1870.
Adams	19,084	9,275	9,809	20,165	$6,000,000
Alcorn	10,431	5,290	5,141	....	2,239,014
Amite	10,973	5,423	5,550	12,336	2,654,338
Attala	14,776	7,281	7,495	14,169	2,872,720
Benton	New	county.			
Bolivar	9,732	5,135	4,597	10,471	4,333,977
Calhoun	10,561	5,297	5,264	9,518	4,500,000
Carroll	21,047	10,430	10,617	22,035	4,856,000
Chickasaw	19,899	9,899	10,000	16,426	4,033,780
Choctaw	16,988	8,376	8,612	15,722	2,364,006
Claiborne	13,386	6,626	6,760	15,679	3,772,020
Clark	7,505	3,638	3,867	10,771	2,333,575
Coahoma	7,144	3,887	3,257	6,606	4,100,460
Colfax	New	county.			
Copiah	20,608	10,229	10,379	15,398	4,367,878
Covington	4,753	2,316	2,437	4,408	497,034
De Soto	32,021	16,320	15,701	23,336	8,607,150

Counties.	Pop. 1870.	Males, 1870.	Females, 1870.	Pop. 1860.	True valuation, 1870.
Franklin......	7,498	3,654	3,844	8,265	$1,060,412
Greene.........	2,038	1,004	1,034	2,232	158,392
Grenada........	10,571	5,345	5,226	....	1,926,226
Hancock	4,239	2,218	2,021	3,139	784,146
Harrison......	5,795	2,943	2,852	4,819	1,567,450
Hinds	30,488	15,393	15,095	31,339	9,486,776
Holmes.........	19,370	9,626	9,744	17,791	5,413,514
Issaquena.....	6,887	3,524	3,363	7,831	2,629,748
Itawamba.....	7,812	3,848	3,964	17,695	1,178,900
Jackson	4,362	2,287	2,075	4,122	1,000,000
Jasper..........	10,884	5,317	5,567	11,007	1,090,229
Jefferson......	13,848	6,690	7,158	15,349	2,356,114
Jones............	3,313	1,619	1,694	3,323	200,000
Kemper	12,920	6,445	6,475	11,682	2,000,000
Lafayette	18,802	9,636	9,166	16,125	3,339,716
Lauderdale...	13,462	6,720	6,742	13,313	2,804,944
Lawrence......	6,720	3,366	3,354	9,213	1,917,084
Leake..........	8,496	4,304	4,192	9,324	1,299,698
Lee...............	15,955	8,028	7,927	....	2,972,413
Leflore	New	county.			
Lincoln........	10,184	5,006	5,178	....	1,546,722
Lowndes.......	30,502	15,120	15,382	23,625	6,749,043
Madison........	20,948	10,351	10,597	23,382	6,086,125
Marion.........	4,211	2,119	2,092	4,686	392,666
Marshall.......	29,416	14,653	14,763	28,823	6,609,988
Monroe.........	22,631	11,106	11,525	21,283	4,473,262
Montgomery.	New	county.			
Neshoba.......	7,439	3,572	3,867	8,343	921,378
Newton.........	10,067	4,928	5,139	9,661	1,213,329
Noxubee	20,905	10,394	10,511	20,667	5,704,250
Oktibbeha....	14,891	7,348	7,543	12,977	2,781,253
Panola..........	20,754	10,550	10,204	13,794	5,001,368
Pearl............	New	county.			
Perry	2,694	1,292	1,402	2,606	256,338
Pike	11,303	5,733	5,570	11,135	2,838,888
Pontotoc.......	12,525	6,095	6,430	22,113	3,701,079
Prentiss........	9,348	4,641	4,707	....	2,065,087
Rankin.........	12,977	6,408	6,569	13,635	2,743,440
Scott	7,847	3,870	3,977	8,139	1,487,310
Simpson........	5,718	2,937	2,781	6,080	696,560
Smith	7,126	3,481	3,645	7,638	750,320
Sunflower.....	5,015	2,662	2,353	5,019	4,068,670
Tallahatchie.	7,852	3,990	3,862	7,890	3,228,400
Tate	New	county.			
Tippah.........	20,727	10,125	10.602	22,550	6,272,817
Tishemingo...	7,350	3,715	3,635	24,149	4,619,062
Tunica.........	5,358	2,918	2,440	4,366	3,080,737
Union...........	New	county.			
Warren.........	26,769	13,284	13,485	20,696	9,815,338
Washington..	14,569	7,698	6,871	15,679	6,191,200
Wayne	4,206	2,075	2,131	3,691	356,684
Wilkinson.....	12,705	6,134	6,571	15,933	2,212,616
Winston	8,984	4,334	4,650	9,811	1,298,602
Yalabusha....	13,254	6,794	6,460	16,952	4,133,707
Yazoo...........	17,279	8,699	8,580	22,373	7,183,392
Total.........	827,922	413,421	414,501	791,305	$209,197,345

Principal Cities and Towns.—Jackson, the political capital of the State, is in Hinds co., near the geographical centre of the State. Its population in 1870 was 4234. Vicksburg has between 12,000 and 15,000 inhabitants; Natchez, between 9000 and 12,000; Columbus and Jackson are the only cities which have nearly 5000 inhabitants; Meridian, Holly Springs, Aberdeen, Canton, and Pass Christian, each between 2000 and 3000, and Grenada, Brookhaven, Corinth, Okalona, Oxford, and West Point range between 1500 and 2000 inhabitants.

History.—The first European who is known to have traversed the soil of the present State of Mississippi was Fernando de Soto, who with his band of Spanish adventurers penetrated into what was known as the Chickasaw country in 1539, and remained in that part of the State now known as the Great Yazoo Bottoms for somewhat more than a year. In Apr. or June, 1541, he had reached the Mississippi River. A hundred and thirty-two years later, in 1673, Joliet and Marquette, two French explorers, passed down the Mississippi, and touched at several points within the present limits of the State. In 1682, De la Salle and the Chevalier de Tonti visited the Natchez Indians, and spent some time among them. The first attempt to establish a colony was made by Iberville, who in Mar., 1699, founded a colony of 200 immigrants from France on the eastern shore of the Bay of Biloxi. This was the first French colony in the lower Mississippi Valley, and, as has been already shown under LOUISIANA (which see), was the germ of the subsequent settlement at New Orleans. Iberville returned to France, whence he sailed again for Louisiana, in the company of Bienville and the Chevalier de Tonti, with a large body of immigrants and a sufficient military force, and under the guidance of De Tonti ascended the Mississippi to the present site of Natchez, where (about 1716) they founded a fortress and established a colony, both named Rosalie, in honor of the countess of Pontchartrain. Biloxi was eventually abandoned, but Fort Rosalie prospered for a time, though this colony, with all the rest, came in 1718 under the control of the company formed by the notorious Scotch speculator John Law. After the bursting of the Louisiana Bubble, as it was called (during the existence of which Bienville, as governor of the province, had made attempts to plant colonies at St. Peter's (now Haynes's Bluff) on the Yazoo, at the Bay of St. Louis, at Pascagoula, and other points), the whole territory of Louisiana or Orleans fell into the hands of the Company of the Indies. Under their management the tendency was to concentrate population at New Orleans, and the small colonies in Mississippi grew but slowly. The Indians of this region were very numerous and powerful. The Chickasaws, a warlike tribe, had formed amicable relations with the English settlers in the Carolinas, and were hostile to their French neighbors; the Choctaws, at that time so numerous that they could bring 20,000 warriors into the field, had been, under Bienville's judicious management, friendly to the French; while the Natchez, a tribe of much higher civilization and intelligence, and probably of Aztec origin, were peaceful and cordial to the new-comers. These were the principal tribes, but there were small bands along the Gulf shore and the lower Mississippi, most of whom, judging from their names, may have been remnants of Aztec tribes. In 1728, Bienville's successor, Perrier, by bad management alienated the confidence of the Choctaws, who had hitherto been warm friends of the French, and a conspiracy followed in which all the Indian tribes united to drive out the French from the entire region. Their first attack was made on Fort Rosalie Nov. 29, 1729, and the other settlements in Mississippi were assaulted almost simultaneously. Many of the settlers were tortured and afterward butchered in the smaller settlements, and at Fort Rosalie 200 persons were killed and more than 500 made prisoners; but their triumph was short. The French commander of New Orleans, rallying his troops, pursued the Indians early in 1730, recaptured the prisoners, and, following the aborigines to their strongholds, after extensive slaughter and destruction of their property, brought 427 prisoners, among them several chiefs, to New Orleans, where they were sold as slaves and sent to Santo Domingo. The province was soon after abandoned by the Company of the Indies to the king of France, who sent Bienville back in 1733 as governor. On his arrival he found the colonists again involved in war with the Chickasaws—a war which lasted with varying fortunes for several years. From 1743 to 1752 the Indians were peaceful, but in 1752 another Indian war commenced, instigated, the French said, by English adventurers. An attempt was made by the French commander, the Marquis de Vaudreuil, to invade their country, but he accomplished little. In 1763, East Louisiana, including most of the present States of Mississippi and Alabama, was ceded to Great Britain by France, and soon after a considerable immigration commenced from the English colonies on the Atlantic. In 1798 the U. S., having succeeded to the rights of the English government in this region, established the Territory of Mississippi, comprising all of Alabama and Mississippi between the 31st and 35th parallels. In 1811 the portion of Mississippi below the 31st parallel, being a part of the land ceded by Spain, was added to the Territory. During the Indian war which preceded and accompanied the war of 1812, Mississippi was not the scene of any important conflict. In Mar., 1817, Alabama was set off from Mississippi Territory as a separate State, and in Dec., 1817, Mississippi was admitted into the Union as an independent State under a constitution previously formed. In 1832 a new constitution was adopted. The slave population of the State had been for thirty years in excess of the whites, and when Pres. Lincoln was elected in Nov., 1860, Mississippi, deeming her interests bound up with those of slavery, was one of the earliest of the Southern States to proclaim her secession from the Union. On the formation of the Confederacy, she supplied its first and only President. During the civil war she furnished with great promptness her quota of troops to the Confederate armies, and suffered severely from the ravages of war. The battle of Pittsburg Landing (or Shiloh) was fought near her border, and the pursuit was prolonged into her territory. Subsequently, the important battles of Iuka and Corinth, the capture and recapture of Holly Springs, the several attacks on Vicksburg, and the series of battles which terminated in the siege and final surrender of that city, the capture of Jackson, and the numerous raids which occurred, including the two which had Meridian for their objective, kept the State in a condition of apprehension throughout the war. At the close of the war, in Apr., 1865, measures were adopted by the legislature looking to the acceptance of the situation. The government appointed Hon. William L. Sharkey provisional governor, and a State convention was assembled which repealed the ordinance of secession and formally abolished slavery in the State. Provision was made for the restoration of the State to the Union and its representation in both houses of Congress by an election held Oct. 2, 1865, Benjamin G. Humphreys being

elected governor, and the State legislature, chosen at the same time, meeting on the 16th of October, and choosing U. S. Senators; but these measures lacking the approval of Congress, the State formed with Arkansas the fourth military district, placed under the command of Gen. E. O. C. Ord and others until 1869. A convention held in June, 1868, adopted a new constitution, which at the time failed of ratification by the people, but being a second time submitted to them (Nov. 30, 1869), was accepted by an overwhelming majority. The State was restored to the Union in Feb., 1870. It has since had some local troubles, arising in part from mismanagement and the attempt on the part of designing adventurers, not long resident in the State, to control the negro vote, but it seems now to be entering upon an era of greater prosperity.

Governors.

Territorial Governors:

Winthrop Sargent......1798–1802
William C. C. Claiborne..1802–05
Robert Williams............1805–09
David Holmes...............1809–17

State Governors:

David Holmes...............1817–19
George Poindexter.........1819–21
Walter Leake................1821–25
David Holmes................1825–27
Gerard C. Brandon.........1827–31
Abraham M. Scott..........1831–33
Hiram G. Runnels..........1833–35
Charles Lynch...............1835–37
Alexander G. McNutt....1837–41
Tilghman M. Tucker......1841–43
Albert G. Brown............1843–48
Joseph W. Matthews......1848–50
John A. Quitman...........1850–51
John J. Guion (acting)...1851–51
James Whitfield............1851–52
Henry S. Foote..............1852–54
John J. MacRae.............1854–58
William McWillie..........1858–60
John J. Pettus...............1860–62
Jacob Thompson 1862–64
Charles Clarke...............1864–65
Wm. L. Sharkey (prov'l)1865–66
Benj. G. Humphreys......1866–70
James L. Alcorn............1870–71
Ridgley C. Powers.........1871–74
Adelbert Ames..............1874–

Electoral and Popular Vote at Presidential Elections.

Elect. year.	Candidates for whom the electoral vote of the State was cast.	Elect. vote.	Popular vote.	Candidates of the opposition.	Popular vote.	Minority or third-party candidates.	Popular vote.
1820	James Monroe P.............. D. D. Tompkins V.-P........	2		John Quincy Adams P.... Richard Rush V.-P.........			
1824	Andrew Jackson P........... J. C. Calhoun V.-P...........	3	3,234	John Quincy Adams P... Nath'l Macon, etc., V.-P.	1,694		
1828	Andrew Jackson P........... J. C. Calhoun V.-P...........	3	6,763	John Quincy Adams P... Richard Rush V.-P.........	1,581		
1832	Andrew Jackson P........... Martin Van Buren V.-P....	4	5,919	Henry Clay P................... John Sergeant V.-P.........			
1836	Martin Van Buren P........ Richard M. Johnson V.-P.	4	9,979	Hugh L. White P............ John Tyler V.-P.............	9,688	William H. Harrison P... Francis Granger V.-P.....	Not reported.
1840	William H. Harrison P.... John Tyler V.-P...............	4	19,518	Martin Van Buren P...... Richard M. Johnson V.-P.	16,995		
1844	James K. Polk P.............. George M. Dallas V.-P......	6	25,126	Henry Clay P................... T. Frelinghuysen V.-P....	19,206		
1848	Lewis Cass P..................... William O. Butler V.-P.....	6	26,537	Zachary Taylor P............ Millard Fillmore V.-P.....	25,922		
1852	Franklin Pierce P............ William R. King V.-P......	7	26,876	Winfield Scott P.............. William A. Graham V.-P.	17,548		
1856	James Buchanan P........... J. C. Breckenridge V.-P....	7	35,446	Millard Fillmore P......... A. J. Donelson V.-P.........	24,195		
1860	J. C. Breckenridge P........ Joseph Lane V.-P............	7	40,797	John Bell P...................... Edward Everett V. P.......	25,040	Stephen A. Douglas P...... Herschel V. Johnson V.-P	3,283
1864	No vote.						
1868	" "						
1872	Ulysses S. Grant P............ Henry Wilson V.-P..........	8	82,175	Horace Greeley P............ B. Gratz Brown V.-P.......	47,288		

THOMAS JORDAN. REVISED BY L. P. BROCKETT.

Mississip'pi, county of Arkansas, bounded E. by the Mississippi River and N. by Missouri. Area, 900 square miles. It is low, level, and subject to overflow. It is a congeries of swamps, bayous, and lakes, mostly covered with a jungle of dense woods and canebrakes. The firm land is very fertile. Cotton and corn are leading products. Cap. Osceola. Pop. 3633.

Mississippi, county of Missouri, separated by the Mississippi River from Illinois and Kentucky. Area, 425 square miles. It is partly covered by bayous, swamps, and sloughs, but the firm land is very fertile. Corn and live-stock are leading products. The county is traversed by the St. Louis and Iron Mountain R. R. Cap. Charleston. Pop. 4982.

Mississippi, tp. of Columbia co., Ark. Pop. 829.

Mississippi, tp. of Desha co., Ark. Pop. 1600.

Mississippi, tp. of Sebastian co., Ark. Pop. 530.

Mississippi, tp. of Sacramento co., Cal. Pop. 171.

Mississippi, tp. of Mississippi co., Mo. Pop. 357.

Mississippi City, post-v., county-seat of Harrison co., Miss., on the New Orleans Mobile and Texas R. R., 70 miles E. N. E. of New Orleans, and on Mississippi Sound. Pop. 252.

Mississippi River, The [the Indian name, as spelled by the discoverers, *Mesasippi;* Algonkin, *Missi Sepe* ("Great River"); and by Chateaubriand, *Meschacebé*], is the great stream of North America, and in the area it drains and the water it discharges is, next to the Amazon and the Congo, the greatest in the world. It rises in the lakes of the plateau in the central portion of the North American continent, S. of Lake Winnipeg and W. of Lake Superior. Its remotest springs, running 3 miles N. into Lake Itaska, rise in lat. 47° 34′ N. and lon. 95° 2′ W. from Greenwich. Its most northerly waters are the margin of Lake Pemidgi, in lat. 47° 32.6′ N. The mouth (Southwest Pass) of the river is in the Gulf of Mexico, lat. 28° 58.5′ N. and lon. 89° 10′ W.

Physical Geography and Physics.—The *elevation* of the Mississippi's source is 1680 feet above the sea. The *length* in a right line is 1164 miles, and by its tortuous channel it is 2800 miles. The *breadth* of the river between its natural banks (and levees) below its lowest tributary, Red River, is 2800 feet as a mean of 153 measurements, and the mean *depth* of its deepest channel at high water is 121 feet. The breadth below the Arkansas and above the Red River is 4080 feet, the mean depth 96 feet; and thence to the mouth of the Ohio the breadth is 4470 feet and mean depth 87 feet. The area of its drainage is 1,244,000 square miles. The rainfall upon it has an annual mean depth of 30.4 inches. With a mean annual velocity of current of 3.39 feet per second through a cross-section of 199,000 square feet, the river discharges annually 19,500,000,000,000 cubic feet, equal to 145.6 cubic miles of water, into the Gulf of Mexico. The maximum rise and fall of water in the channel at Natchez, Vicksburg, and Cairo, severally 370, 480, 1097 miles above its mouth, is 52 feet. This is the distance between the highest and lowest water known, though this range has been reduced by recent cut-offs fully 6 feet at Vicksburg. The sediment transported in suspension by the river's waters amounts to $\frac{1}{2900}$th of its whole bulk—say .0035 of its volume. In addition to the suspended matter carried forward by the river, a very large amount of heavier material is borne along the bottom by slower progress, but in quantity believed to be much greater than the matter held in suspension. The delta of the river has been formed by these transported matters of both classes, and by their deposition in the shifting beds of the river and upon the lower lands it has flooded. The area of this delta is much greater than that of any other river, having an extent estimated at 38,600 square miles. The lower delta, below Red River, has manifestly been reclaimed from the Gulf by these deposits prior to levee construction. These levees, chiefly built within the last half century, now restrain the river's efflux over its banks, and compel the transportation to the Gulf of Mexico of nearly all the matter brought down by the river. The progress of the river's projection into the Gulf has been greatly accelerated by the construction of levees. Since 1838, when Capt. Talcott's surveys first accurately fixed the position of the mouths, the progress of the outer bar at the main (Southwest) pass has been a little more than 2 miles, or at the rate of 5.7 miles per century. The sedimentary matter transported is mainly brought into the Mississippi by its greatest tributary, the Missouri, the Mississippi itself and

all the other tributaries contributing clear water when not in flood. The Red River and Arkansas contribute red sediment, except in low water. This modifies the color of the river, and darkens its whitish-yellow color derived from the Missouri's contributions. The river-channel about the source is cut, or rather formed, connecting the Lakes Itasca, Pemidgi or Travers, Cass, Winnibigoshish, Fishing, Leech, Mud, and other lakes, all lying among hills of drift and boulders. These hills are crowned on their level summits of 80 to 100 feet with pine forests, and often surrounded or flanked by marshes of alder-bushes and cranberries. The channel is narrow, and characterized by rapids among drift boulders of granite, each lake offering a new plateau, and each connecting link growing larger. It may be 12 feet wide by 2 feet deep from Lake Itasca to Travers, and 120 feet to 150 thence to Cass Lake. From Cass Lake to Little Winnipec the breadth is stated by Schoolcraft and Lieut. Allen at 172 feet; and again, between Winnipec and Pecagama, the river contracts to 50 or 60 feet, flowing through broad savannahs. At the junction with Leech River the falls of 20 feet in 300 yards occur, called Falls of Pecagama. This forms the head of navigation, though it is believed practicable to continue steamer navigation up Leech River into Leech Lake. In 270 miles of estimated distance from the river's utmost source to the Falls of Pecagama the rapids and currents have a descent of 324 feet, and thence to the mouth of Pine River, nearly 200 miles below, the falls or rapids amount to 165 feet. Thence to Crow-wing River, 47 miles, the fall is 1 foot to the mile. The river still has a narrow channel through oak and maple forests, marshes, sandy pine-hills, and loose boulder rocks and fragments of granite, without any regular geological beds other than the drift-fields, bluffs, and rocks of transport. Prairies prevail thence down to Elk River, 43 miles, and pebbles appear in the channel—carnelians, agates, and other primary water-rolled fragments. The soil is better, the water transparent, but stained brownish, as usual in piney and marshy regions. From the Sandy to the Crow-wing the river bears nearly S. W., and thence it bears nearly due S. to the Saulk Rapids, of 1 mile, 133 miles below the Crow-wing. The range of rise and fall of water varies little from 20 feet from Sandy River to the Falls of St. Anthony. The Saulk Rapids exhibit the first regular beds of rock; and thence the oldest Transition rocks, the Potsdam sandstone as a type, prevail down to Dubuque and Rock Island. Gradually the more recent Niagara, and then the Carboniferous beds, are traversed by the river, whose bed has been cut 200 to 500 feet through the regular strata. The Falls of St. Anthony make a marked feature in the river-channel, limiting steamer navigation from below by a reef of somewhat friable Potsdam sandstone, over which the river plunges with a fall of about 18 feet and a width of 1200 feet. Below Lake Pepin, which is an expansion of the river, it widens, and, including numberless islands, continues nearly a mile in width, to the mouth of the Illinois. The rocky bluffs and cliffs present themselves on alternate sides of the river, varying from 200 to 300 feet in height through the range of Carboniferous strata to the mouth of the Kaskaskia, 100 miles below the mouth of the Missouri River. Two great rapids or falls occur in this portion of the channel—the Rock Island Rapids, of 22 feet fall, 350 miles below the Falls of St. Anthony, and the Des Moines Rapids, of 24 feet fall, about 125 miles below Rock River. Below the mouth of the MISSOURI RIVER (which see) the character of the Mississippi River is entirely changed. The waters mingle slowly and reluctantly, often seen unmingled in low-water season, below St. Louis for 20 miles; the Missouri keeping the right bank and the Mississippi the left. The Missouri's waters, heavily charged with light sand and aluminous clay, impart to the mingled waters a muddy, light-yellowish color, which characterizes the river's body thence to the mouth and far out, sometimes 40 miles, into the Gulf. At the Grand Chain, near above Cape Girardeau, terminates the range of limestone cliffs and bluffs. These seldom disappear, or retire more than a mile from the right bank of the river, below the mouth of the Missouri. From thence (for 1300 miles) to the sea this enormous torrent rolls through a level alluvial bed; and though at many points it touches the upland bluffs on the left bank, its right is an unchanging alluvial bed.

Alluvions.—At many places above the head of this delta, and for distances of from 10 to 40 miles, the Mississippi proper is flanked by alluvial tracts of land of great fertility. The Sny Island in Pike co., Ill., recently reclaimed by levees, reaches some 40 miles. None of these approach the magnitude of the American Bottom, which extends from nearly opposite the mouth of the Missouri to Chester, below the Kaskaskia, 90 miles below St. Louis, with a breadth of about 6 miles. From a few miles below Cape Girardeau on the right bank, 30 miles above the Ohio River, in highest floods the waters of the Mississippi, prior to levees, passed over the banks and into the St. Francis Valley. This is the proper head of the delta alluvion, that extends thence to the Gulf of Mexico. At Commerce, 10 miles below, are some isolated high bluffs, and at several points below the Ohio the banks on the right rise above overflow. These are exceptions, and the body of the country, of about 600 miles in length and a mean width of 60 miles, is an alluvion, formed chiefly by the deposits from the Mississippi River. It is this vast alluvion, as also the Yazoo basin of 360 miles long and 60 miles greatest breadth, that has been the subject of partial reclamation from floods by the application of levees along the river's bank. For twenty-five years the upper, for forty years the middle, and for fifty to one hundred years the lower, portion of this area have had the flood-waters greatly restrained by these levees. Yet, despite all the efforts of riparian proprietors—then of the counties and parishes, and ultimately of the States—to protect the lands settled and cultivated by an enterprising people, the river's ravages have put to naught human skill and labor. It undermines the banks, caving away the levees and destroying the plantations by annual floods. Such have been the ravages, and so far back have levees been driven by continual caving, that the new levees required have such height and consequent cubic contents that the burden has become too great for State treasuries. The cry, therefore, for national relief from the "levee burden" has become general and importunate. These levees have already cost the people of Louisiana, on their 780 miles of river-front, the building of 75,000,000 cubic yards of earthwork. By an estimate of U. S. engineers the construction of a complete levee-system for the entire alluvion, capable of controlling the river, would cost some \$36,000,000; and \$2,000,000 would be required for annual repairs. The total length of levees demanded for this purpose would be 1775 miles. The River's Bed below the mouth of the Ohio furnishes testimony as to the great depth of the alluvial deposits. This depth cannot be less than 100 feet, while in some localities it is much greater. The river changes its location by rapid cavings, amounting to several miles in the memory of individuals living. In a few thousand years this shifting of position must have amounted to a large portion of the delta's breadth. At least to the extent of these lateral movements the river has made an alluvion of more than 100 feet—in places 150 to 180 feet deep. The depth of the alluvion, by this testimony, increases towards the Gulf. The movements of the river's bed laterally below the Arkansas to the Red River are so great as to seriously depreciate the value of plantations. For example, at 20 miles above Natchez the plantation known as Hole-in-the-Wall has been swept away by a caving 1 mile to the westward, and by a reverse movement has been replaced, and now supports a cottonwood forest—all since the writer of this article surveyed the tract of land in 1840. Again, at the Kemp plantation, 20 miles above this, the river is now abrading a levee built in 1873 on the rear of a tract of land which was 40 arpents (nearly $1\frac{1}{2}$ miles) deep in 1840. The front levee was then four feet high, and gave entire front protection. The levee of 1873 has a maximum height of 22 feet and base of 142 feet. Thus, the natural slope of the alluvion as deposited by the river has a declination of some 17 feet in the distance carried away. The average slope from the river-bank is 7 feet the first mile, the maximum fall about 20 feet. This last example furnishes testimony of the vast increase of burden in levee-building. The cross-section of the old levee was 64 square feet, and of the new levee of 1873 it was 1672 feet. This gives an increase of 26 times. Hence, the powerful appeal now being made to the U. S. Congress to place the entire "levee burden" under national care and cost, and the construction under the U. S. engineers.

At and near the mouths of the Mississippi its methods of progress and its peculiar characteristics of channel and alluvion-making are amply illustrated. The river pushes out a long tongue of land into the Gulf as from the forts Jackson and St. Philip, 40 miles to the mouths of the passes. The Gulf on both sides was within 6 miles of the river-bank in 1800. The passes were formed by crevasses through the narrow bands of land deposited along the immediate banks. These in like manner build up lateral walls till subordinate passes are formed by like crevasses. These were found with half their present length on the discovery and settlement of the country. The Jump, or Pass Forshey, was a crevasse made in 1840 through Wilder's Oyster Canal, 12 miles above the passes. The distance through the land was one-fourth of a mile, and the fall 4 feet. In 1850, Forshey's survey found the channel 1250 feet wide and 70 feet deep, 32 feet mean depth, and a section of 45,000 square feet. At 2000 feet down its gorge shoaled to 3 feet, and disappeared in the mud deposits. In Apr., 1875, he found the channel 1000 feet wide, mean depth 30 feet, and a pass, a great river, dividing 1 mile down into five navigable channels 10 to 20

miles long, and the area reclaimed and covered with marsh grass and willow forests 200 ± square miles. In like manner Cubitt's Gap is a crevasse made in 1865 through an oyster canal on the left bank, 3 miles above the passes. This has already (in 1875) enormous dimensions, and forms a fifth pass. It divides at its source in two channels, the upper 1420 feet and the lower 900 feet wide, with mean depths of 37 and 31 feet, and sections of 30,600 and 27,900 square feet. The greatest depth of the upper channel is 154 feet, about 50 feet deeper than the river at its departure. These channels almost disappear at 2 miles from their source. This gap takes the name of Pass Howell, from its first surveyor.

The River-Mouths.—The several passes diverge from an expansion in the river of treble its mean width, say 7500 feet, and 25½ feet mean depth in 1850. The first division was into three main passes, called the South-west, South, and North-east Passes. Their comparative dimensions were in 1850—

	Width.	Mean depth.	Section.	Discharge, feet per second.
South-west Pass..	1677	41.8 ft.	73,142	342,692
North-east Pass..	1440	51.0 "	76,360	467,571
South Pass.........	900	15.0 "	12,960	80,761

Authorities of Capt. Talcott and C. G. Forshey.

	Per cent. of whole river.	Per cent.	Per cent.	Cross-section.
	1838.	1850.	1874.	1874.
South-west Pass..	.40	.45	.36	59,422
South Pass.........	.09	.08	.15	24,774*
North-east Pass..	.52	.47	.50	82,937
	Talcott.	Forshey.	Howell.	Howell.

The changes since the gauging of the river give but glimpses at the stupendous changes that are unmeasured and unmeasurable, taking place beneath the sea and along the nearly inaccessible marshes about the mouths. These appear to indicate the vibration due to length, and consequent plane of descent, in the several passes. As one grows longer, its plane becomes gentler; and the more water in proportion to cross-section is poured down, the shorter the passes. These then push out their deposits more rapidly, and the longer passes relax their rate of growth till the equilibrium is restored. The shorter thus becomes the longer, till the process is reversed. In this manner the alternation progresses, as stated above, till some crevasse through the narrow bank starts another pass; and thus the rear of shallow bays on either side is brought up. This is the vibrating process by which the river is filling the Gulf, and making alluvion for future centuries and coming races of men. The North-east Pass immediately sends off the South Pass, as above, and then at 6 miles due E. it sends off the Pass à l'Outre, in a direction E. N. E., with a capacity of about half the whole North-east Pass. It then turns E. S. E., and at 10 miles from the head of the passes it parts with the South-east Pass, long closed at its head, and only accessible through small bayous. It then turns N., and at 15 miles from the head it reaches the Gulf. The Balize Bayou, which leaves this pass 2 miles above the head of the South-east Pass, was formerly a deep river; and for more than a century, up to about 1840, was the great pass of commerce. Upon this channel De Panger, the French engineer, projected and built the great Bastion Fort shown on old maps. It once had a navigable depth of 18 to 22 feet; and in 1722, De Panger found it 1500 feet wide. But now, like the North-east and South-east passes, it has no navigable channel. Pass à l'Outre has been for three years past dredged by the U. S. engineers, using two powerful boats, and keeping, by the stirring process, a channel of 13 feet normal depth, navigable for vessels of 18 to 20 feet draught. In Apr., 1875, a stupendous upheaval of alluvial land, known as *Mud-Lumps*, so interfered with the channel-work as to drive the dredges to the South-west Pass, where they are still at work, and keeping a depth of about 18 feet.

Such is the softness of the material forming all the bars and lands about the river-mouths that vessels pass through the channel without any hesitation, drawing 1 foot, often 2 feet, more than the soundings. The wake of such vessels cannot be found an hour after the passage. Every object on shore or bay a foot or two above mean tide sinks in the marsh to a uniform level.

The hillocks known as *Mud-Lumps* that are common along the channel-side outside of the shore all sink to this level by their own specific gravity. These elevations, with head 3 to 12 feet above the surface, and with areas of 100 feet diameter to several acres, often occur in a few hours, always quietly and gently. They often subside in a few days, but oftener form permanent additions to the channel-sides, discharging gas and salt water through cones formed on their summits. Often several of these discharges are found on a single mud-lump. These phenomena have had several solutions suggested. The writer of this article, after a careful survey in 1850, suggested their *artesian source*. Observations continued to this time, in connection with the study of the geology of the uplands northward, sustain this hypothesis. Another very remarkable phenomenon appears to be brought to light by the exact surveys conducted by Major Howell of the U. S. engineers; and that is *the apparent glacial movement of these miles of semi-fluid alluvion*. This discovery will greatly favor the artesian hypothesis for the cause of mud-lumps.

Beneath the Gulf waters, as shown by the labors of the U. S. Coast Survey, the contributions of the Mississippi River have an immensely wide distribution. While the heavier sandy materials are soon dropped or rolled into the depths near the mouths, the aluminous clays held in very fine comminution by the waters are spread out upon the Gulf by the lightness of the fresh water, and are only finally parted with many miles at sea. Accordingly, the soundings bring up the blue mud that so specifically marks this river's discharges for the whole front of its delta of 120 miles, and not less than 200 miles both E. and W., and 50 to 100 miles from land. C. G. Forshey.

Mississippi Scheme, the title of a banking and commercial scheme which ended in a wild speculation and collapse. It was started in Paris in 1719 by John Law (see Law, John) in identification with the regent and financial officers of the government. Its primary object was to relieve the French finances from the burdensome debt and disorder consequent on the expensive wars of Louis XIV. A royal bank was first established, of which Law was director-general. Then a commercial company was chartered entitled "The Company of the West," of which also Law was director-general. To this company the whole province of Louisiana, watered by the Mississippi and its branches, was granted. The stock was divided into 200,000 shares, offered at 500 livres each. The shares were eagerly taken, since the paper currency of the country, then depreciated to 60 or 70 per cent. below par, was accepted at its face in payment of subscriptions. To this company were made over the charters and possessions of the Senegal Company and of the China and India Company, with the exclusive privilege of trading to the East Indies, China, and the South Seas. Hence the title was changed to "The Company of the Indies." Subsequently, it was entrusted with the collection of the taxes and of the king's revenues, and thus it had a monopoly of almost the entire commercial and financial operations of the nation. Meantime, the bank issued its notes freely till the paper currency amounted to 2,700,000,000 livres. The shares of the company were increased to 624,000, and sold only for bank-notes. This increase of currency, with a promise of large dividends, rapidly advanced the price of shares, and the whole nation was possessed with a frenzy of speculation. All classes, prince and peasant, clergy and laity, men and women, were affected alike. Under the rush of stock-jobbing business in the streets of Paris it is related that a poor man who had a hump-back made a livelihood by standing in the place where bargains were made and renting his back for a writing-desk. The speculations culminated at the close of the year 1719, when the company's shares sold for more than 10,000 livres each, and money was so abundant that the bank loaned at 2 per cent. There was, however, apparent a drain of specie from the bank, as the shrewd ones attempted to put their new-made fortunes into forms of fixed value. To check this, ineffectual edicts were passed to restrict payments in coin, to limit the amount of specie which one might hold, and to fix the value of the notes. The royal bank was incorporated with the company Feb. 23, 1720, and on the 21st of May a government edict was issued reducing the value of bank-notes and of company shares one-half. This burst the bubble at once, and universal bankruptcy and distress ensued. This scheme stands a striking illustration of the fallacies that a nation's debt can be paid or its prosperity increased by a mere increase of its money-circulation, and that paper money can be made stable and safe on some general security without respect to its convertibility. The leaders of the scheme were probably deluded with the rest. A. L. Chapin.

Mississippi Sound washes the Gulf coast of Mississippi and part of that of Alabama, extending from Mobile Bay nearly to the mouth of Pearl River. It is divided from the main waters of the Gulf by the chain of Dauphin,

*South Pass (1875), Bayley's survey, half mile down, 649 feet wide; mean depth, 31 feet; section, 22,290 square feet. This is the pass being jettied at its mouth by Capt. James B. Eads; contract with the U. S. to give and maintain 30 feet depth over bar for $7,250,000.

Petit Bois, Horn, Ship, and Cat islands—of sand and generally wooded. It affords fine harbors under protection of Ship and Cat islands (the former fortified), and its waters are generally moderately deep, affording a tranquil navigation to the numerous steamers and coasting vessels running between Mobile and New Orleans (*viâ* Lake Pontchartrain). Grant's Pass, a narrow and partly artificial channel between Dauphin Island and the mainland, forms the connection between the sound and Mobile Bay; Lake Borgne, toward the W., is entered at St. Joseph's Island.

Missolon'ghi, town of Greece, in the government of Ætolia, on the Gulf of Patras. It is well fortified, and famous for the valor with which it twice met the besieging Turks during the war of independence in 1822 and 1826. Lord Byron died here, Apr. 19, 1824. Pop. about 6000.

Missou'la, the north-westernmost county of Montana. Area, 20,091 square miles. It is bounded N. by British America, and W. and S. W. by Idaho. It is traversed by Clark's Fork of the Columbia River and by several mountain-ranges. It has much rich gold-bearing land, and is in part densely timbered. Stock-raising and gold-mining are leading industries. Cap. Missoula. Pop. 2554.

Missoula, post-v., cap. of Missoula co., Mont., on one of the principal forks of the Columbia River and the Mullan stage-road from Fort Benton to Walla-Walla. It has a good school, 2 churches, 1 bank, 1 flouring-mill, 1 hospital, and a number of business-houses. There are extensive mines and good grazing advantages in the vicinity. Pop. about 500. CHAUNCEY BARBOUR, ED. "MISSOULIAN."

Missouri, one of the central States of the Mississippi Valley, lying wholly W. of the Mississippi River, and including a small tract between the Mississippi and the St. Francis rivers in the S. E., extending from the parallel of 36° to that of 40° 30', and from the meridian of 89° 2' to 95° 44' W. lon. from Greenwich. Its greatest length from N. to S. is about 309 miles; its greatest breadth from E. to W., 318 miles, and the average breadth about 244 miles. It is bounded on the N. by Iowa, the parallel of 40° 30' forming the dividing-line from the Missouri River to the Des Moines River, and thence down the channel of that river to the Mississippi; on the E. it is bounded by the Mississippi River, which separates it from Illinois, Kentucky, and Tennessee; S. by Arkansas, on the line of 36° N. lat. from the Mississippi to the St. Francis River, and

Seal of Missouri.

from the St. Francis to the meridian of 94° 45' the parallel of 36° 30'; on the W. by the Indian Territory, Kansas, and Nebraska, following the meridian of the mouth of Kansas River from the parallel of 36° 30' to the mouth of the Kansas, and from that point to the parallel of 40° 30' the channel of the Missouri River. Its area is 65,350 square miles, or 41,824,000 acres.

Face of the Country.—The State is divided into two unequal portions by the Missouri River, which crosses it from W. to E., and forms also its N. W. boundary. The portion S. of the Missouri, forming about two-thirds of its territory, is of very varied surface, the S. E. portion being very low and swampy, much of it subject to frequent overflow by the Mississippi and its tributaries; above this, on the Mississippi, a little below Cape Girardeau, the highland bluffs commence and extend up to the mouth of the Missouri. Between St. Genevieve and the Meramec River these bluffs, which are solid masses of limestone, rise from 250 to 360 feet above the river, and extend westward across the State, but are less precipitous and rugged as they approach the Osage River. In the S. W. portion of the State the Ozark Mountains occupy the greater part of the country; these mountains, or rather hills, do not form any systematic or continuous ranges, but render the whole region exceedingly broken and hilly, the isolated peaks and rounded summits sometimes rising from 500 to 1000 feet above their bases, and then sinking into very beautiful and sometimes fertile valleys. The numerous river bottoms and valleys formed by the tributaries of the Osage and Missouri rivers are moderately fertile, but they are generally subject to overflow. Farther N., in the basin of the Osage and above it, the land is mostly rolling prairie, with occasional forests; the immediate valley of the Missouri is a rich alluvial valley of great fertility and abounding in forest-trees of magnificent size and circumference. N. of the Missouri the country is generally rolling or level; the bottoms along the Missouri and Mississippi are very rich and productive; the tributaries of both rivers have worn deep channels through the rocks, and thus made apparent valleys of erosion much like those of Iowa; indeed, this northern portion of the State is strikingly similar to Iowa in surface and soil.

Rivers, Lakes, etc.—The principal rivers of the State are—the Mississippi, which bounds the State on the E., and has a shore-line of 470 miles; and the Missouri, which forms the western boundary of the State for nearly 200 miles, and turning eastward at the mouth of the Kansas River flows in an E. S. E. direction across the State, and turning N. E. enters the Mississippi 15 miles N. of St. Louis. The tributaries of the Mississippi on its W. bank in the State are mostly (with the exception of the Missouri) small and of no great importance. The St. Francis and the White River and their affluents belong properly to Arkansas, though they drain small districts in the S. of the State. The Little River, which crosses the S. boundary of the State before entering the Mississippi, and the Meramec, are the only considerable streams discharging their waters into the Mississippi S. of the Missouri River. N. of that river Salt River is the largest of these tributaries, but the Cuivre or Copper River, Perruque Creek, Bardenne Creek, Fabius, Wyaconda, and Little Fork rivers are streams of moderate size. The Missouri receives numerous large affluents in the State; on the S. side are Lamine River, Osage River (a large and beautiful stream), and its tributary the Little Osage, Sac River, Grand River, Pomme de Terre River, Big Niangua, Auglaize, Maries Creek, and Gasconade River; on the N. side, the Nishnabatona, Nodaway, Platte, Grand, Chariton, Rocher Percé, and Cedar rivers and Yellow Creek. There are few lakes in the State. In the swampy region of the extreme S. E., in Scott, Mississippi, New Madrid, Pemiscot, and Dunklin cos., there are some ponds and lakes, like those of the Albemarle, Dismal, and Okefinokee swamps near the Atlantic coast. There are one or two small lakes in St. Charles co., and the Missouri River occasionally expands into a broad and lake-like surface dotted with islands.

Geology and Mineralogy.—The geology of Missouri may be briefly summed up as follows: Quaternary (alluvium, bluff, and drift) deposits in the S. E., extending over a triangular tract from the point where the Current River (an affluent of the White) crosses the southern boundary of the State to the Mississippi River, and comprising the counties along and near the river in the whole swamp-region to a point near Benton; the same formation extends through the immediate valley or bottom lands of the Missouri to and beyond the point where it enters Dakota. There are no Tertiary, Cretaceous, Triassic, or Jurassic rocks in the State; the next in order is the Carboniferous or coal-measures, which either as Upper or Lower Carboniferous cover 23,100 square miles of the surface of the State, occupying in general the W., N. W., and N. portions of the State. These include not only the four subdivisions of the Upper Carboniferous formation—viz. Upper, Middle, and Lower coal and Clear Creek sandstone—but six successive deposits of the Lower Carboniferous, comprising an unclassified sandstone, and the St. Louis, Keokuk, and Chouteau groups of limestones and sandstones, most of them rich in fossils. Adjoining these coal-measures we have two considerable tracts of Devonian rock, one in the S. W., the other in the N. E. portion of the State; a narrow belt of it also follows the eastern edge of the Carboniferous deposits in all their devious lines, and extends S. E. to the immediate vicinity of St. Louis. The Hamilton and the Onondaga groups, both mainly limestones, are the only strictly Devonian rocks in the State; the Upper and Lower Silurian formations come next in order; they occupy a tract almost 200 miles in width, and extending from the Missouri River to the southern line of the State, and also crop out in the immediate bottom-lands of the Mississippi above the mouth of the Missouri. Four groups of the Upper Silurian are found here—viz. Oriskany sandstone, Lower Helderberg or Delthyris shale, Niagara group, and Cape Girardeau limestone. Of the Lower Silurian formation there are three groups, belonging to the Trenton period—viz. the Cincin-

nati group, represented mainly by Hudson River shale; the Galena group, receptaculite limestone; and the Trenton group, composed of Trenton, Black River, and Birdseye limestones. There are also three groups of the magnesian limestone series, consisting of magnesian limestones, saccharoidal, and other sandstones, and Potsdam limestones, sandstones, and conglomerates. Below these, and around the head-waters of the affluents of the St. Francis and White rivers, there are frequent outcrops of Eozoic or archaic rocks—greenstone, porphyry, and granite. Much of the limestone of the coal-measures, as well as some of the other formations, is cavernous, and there are numerous caves of great extent and beauty in the central and western portions of the State. In the richness and variety of its mineral productions Missouri is surpassed by no State in the Union. Gold is found only in the drift sands of North Missouri, and silver only in combination with lead in the galena and other ores; but iron is found in some form in every county—bog ores in S. E. Missouri; limonite or brown hæmatite in most of the counties of South Missouri; gœthite, a variety of the brown hæmatite, in Adair co.; red hæmatite throughout the coal-measures, red and yellow ochres in many counties; spathic ores in the coal-measures and in Phelps co.; the specular oxide in vast masses, such as the Iron Mountain, Shepherd Mountain, Pilot Knob, Simmon Mountain, Meramec mines in Phelps co., and numerous other deposits in eight or ten other counties; sulphurets (iron pyrites) throughout the coal-measures; and sulphate of iron (copperas) in the coal-measures and abandoned coal-mines. Zinc in the form of blende is abundant in S. W. and S. E. Missouri, and the silicates and carbonates also in the same region, while zinc bloom sometimes occurs. The sulphate of cadmium (greenockite) is associated with the zinc blende. Copper in the form of blue and green carbonates (green malachite) and sulphurets is found in large quantities in Shannon, Crawford, Jefferson, Franklin, and Madison, and in smaller quantities in a dozen other counties. Copper-mining was carried on extensively for many years in the State, but the Lake Superior ores and native copper have now rendered it unprofitable. Nickel and cobalt are found in paying quantities at Mine La Motte in Madison co. and the St. Joseph mines, and the beautiful hair-like crystals of sulphuret of nickel (millerite) in the vicinity of St. Louis. After iron, lead is the greatest mineral product of Missouri, the mines of that State producing a larger quantity of lead than all the rest of the U. S. There are two great lead-fields—one in S. E. and the other in S. W. Missouri, in the porphyry and magnesian limestones of the former and the Lower Carboniferous rocks and magnesian limestones of the latter. It is also found in smaller quantities in many other counties; galena, or sulphuret of lead, and cerussite, or the carbonate, are the principal ores, though the phosphate (pyromorphite) is sometimes found. Wolfram is found in Madison co., and manganese and manganiferous iron in Iron and other counties. Of minerals not ores there are great numbers. Carbonate of lime (calcite), arragonite pearl-spar, fluor-spar, quartz in all forms; heavy spar (sulphate of baryta), largely used in the adulteration of white lead; gypsum, mainly in the form of selenite; pickeringite, feldspar, mica, hornblende, asbestos (only in Madison co.), bitumen or mineral tar (throughout the coal-measures), fireclays, potter's clay, and kaolin; an excellent glass-sand from the saccharoidal sandstone; lime of several qualities; hydraulic lime and cement; polishing-stone, saltpetre, building-stone, granite, sandstones, limestones and marbles, grindstones, millstones, slates, and numerous fine varieties of colored marbles, are the principal of these. We have already spoken of the great extent of the Missouri coal-fields, occupying about one-third of the area of the State. The coal is of various qualities, some being common bituminous, some very rich in carbon, and developing excellent results under the coking process, while some will not coke; some is in quality equal to the Liverpool cannel coal. The percentage of fixed carbon varies from 30 per cent. to 59.75, or possibly 60 per cent., the average being not far from 50 per cent. Among the coal-beds already worked are many which are well adapted to smelting purposes, though perhaps a greater number have too much volatile matter, sulphur, etc. Most of the coals are well adapted to the use of locomotives and stationary engines. There are many mineral springs in the State—sulphurous, saline, and chalybeate—and in Howard co. salt-springs containing from 1000 to 1200 grains of salt to the gallon.

Zoology.—With such extensive forests, Missouri abounds in wild animals. Bears, cougars or panthers, wild-cats, wolves, foxes, raccoons, and opossums are found in the mountains in considerable numbers. Formerly, the elk was occasionally found in the Ozark Mountains, though it is probably now extinct; but deer of several species, rabbits, hares, squirrels, and perhaps also antelopes, are abundant, as well as gophers and other small rodents. Wild-turkeys, quails, pigeons, prairie-hens and other grouse exist in great numbers, while the birds of prey—eagles, vultures, hawks, owls, etc.—prey upon the smaller birds and rodents; song-birds and birds of beautiful plumage are very numerous, and wild-geese, ducks, brant, and teal, and herons, swans, and divers are found in their season on the Mississippi and in the swampy regions. Snakes, lizards, toads, frogs, turtles, etc. are plentiful.

Climate.—The climate of Missouri is generally healthy, except in the river-bottoms and the swampy districts of the S. E., but it is a climate of great extremes. The summers are long and hot, the winters cold and icy, with strong and piercing winds. The following table gives the meteorological data of different portions of the State:

METEOROLOGICAL DATA.	Jefferson Barracks, lat. 38° 28′ N., lon. 90° 18′ W.; elevation, 472 feet.	St. Louis, lat. 38° 37′ 28″ N., lon. 90° 15′ 16″ W.; elevation, 544 feet.	Jefferson City, lat. 38° 30′ N., lon. 92° 10′ W.; elevation, —— feet.	Rolla, lat. 37° 55′ N., lon. 91° 45′ W.; elevation, — feet.	Harrisonville, lat. 38° 36′ N., lon. 94° 25′ W.; elevation, —— feet.	St. Joseph, lat. 39° 42′ N., lon. 94° 46′ W.; elevation, —— ft.	Bolivar, lat. 37° 35′ N., lon. 93° 22 W.; elevation, —— ft.
Temperature:	°	°	°	°	°	°	°
Annual mean	55.46	54.5	53.8	53.3	51.8	53.9	55.9
Highest temperature of year	95	100	96	93	94	95	95
Lowest " " "	7	7	4	1	0	2	1
Range " " "	88	93	92	92	94	93	94
Mean temperature of spring	56.15	54.1	53.0	51.9	51.1	52.8	53.6
Highest " " "	89	87	86.0	86.0	84	86	83
Lowest " " "	7	1.6	6.0	10	0	6	7
Range " " "	82	71	80	76	84	80	76
Mean temperature of summer	76.19	76.2	73.7	73.6	74	76.7	77.6
Highest " " "	95	100	96	93	94	95	95
Lowest " " "	56	54	50	46	50	54	50
Range " " "	39	46	46	47	44	41	45
Mean temperature of autumn	55.63	55.4	52	49.9	50	52.2	54.3
Highest " " "	86	88	85	86	84	85	84
Lowest " " "	25	25	19	18	20	18	23
Range " " "	61	63	66	68	64	67	61
Mean temperature of winter	33.85	32.3	35.7	37.9	32.1	33.7	38
Highest " " "	70	18	72	76	64	68	70
Lowest " " "	12	−7	4	1	0	2	1
Range " " "	58	75	68	75	64	66	69
Rainfall:	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
Rainfall in spring	10.56	12.30	11.13	13.21	9.31	10.89	12.85
" " summer	12.88	14.14	15.69	12.06	14.17	24.46	9.71
" " autumn	8.02	8.94	8.42	9.89	5.31	5.35	6.81
" " winter	6.37	6.94	6.71	5.25	7.31	5.46	9.85
Total rainfall of year	37.83	42.32	41.95	40.41	36.10	46.16	39.22
Winds:							
Prevalent winds of spring	S., N. W., S. E., E., W.	N. W., S., S. E., W., E.					
" " summer	S., S. E., S. W., N. E., E.	S. E., S., S. W., E., N. E.					
" " autumn	S. E., S., N. W., W., N., N. E.	S. E., N. W., S., N., W.					
" " winter	S. E., W., N. W., N. E., S. W.	S. E., N. W.. W., S. W., N. E.					
" " year	S. E., N. W., S., W., N. E.	S. E., N. W., S., N. E., W.					

Soil and Vegetation.—The soil of the State may be divided into five classes or districts. The alluvial deposits of S. E. Missouri and of the first bottoms of the Missouri River are exceedingly rich and fertile. Much of the S. E. region is covered with swamps, but where these are drained they will compete in productiveness with the richest lands in the world. The reclaimed lands of this section yield enormous crops of cotton and from 75 to 90 bushels of corn to the acre. The next class of lands in point of fertility are the black-soil prairies of N. W. Missouri, which are underlaid by the upper coal-measures. The underlying rock is usually either loess or a disintegrating and often calcareous limestone, and after thirty years of cultivation the lands yield quite as large crops as at first; corn-crops of from 50 to 75 bushels to the acre, and wheat of 25 bushels, are the usual yield of this region; blue grass, apples, and most of the small fruits do well here. Eastern Missouri, N. of the Missouri River, may be considered as the next class. A part of this is prairie and a part rolling lands. The soil is somewhat more sandy than that of the N. W., but yields better crops of wheat, though not so well adapted to corn. Some of the best tobacco lands in the State are in this region; all kinds of fruit do well. A region somewhat less fertile is found in S. W. Missouri; the soil is generally somewhat gravelly, and often mingled with red clay. The underlying rocks belong to the Lower Carboniferous and Silurian, but are mostly overspread with a tolerably thick deposit of bluff clays. This is a good fruit-region, grapes, peaches, pears, and apples being especially successful. It yields also good though not extravagant crops of wheat and corn. The poorest land in the State is the extensive tract lying between S. W. Missouri and the swampy lands of the S. E. It is underlaid by the primordial sandstones and magnesian limestones, and occasionally there crops out a summit of granite or porphyry. The greater part of it is from 1200 to 1500 feet above the sea, and is traversed by the low ridges of the Ozark Mountains, and the streams have cut down 200 to 300 feet below the surface through the bluffs, and the valleys are still lower. This region is not sterile, though some of the more rugged portions have too thin and rocky a soil to grow anything except grapes; but most of the hills are heavily timbered, and some of the valleys are very rich. From 20 to 35 bushels of corn or 15 to 20 of wheat are produced on this soil, and near the southern boundary of the State cotton is raised successfully. Most of N. and N. W. Missouri is prairie, though with belts of timber along the streams. The prairies are decked with numerous flowers of great beauty during the spring and summer seasons. The Missouri bottoms are generally heavily timbered with cottonwood, hickory, black walnut, hackberry, burr, and red oak. W. of Howard co. the Missouri River counties have heavy bodies of fine timber, but interspersed with prairies. E. of Howard co. there are belts of hardwood timber from 10 to 20 miles wide, including ash, oak, walnut, sugar-maple, hackberry, hickory, elm, etc. A similar belt, 15 to 20 miles wide, runs parallel to the Mississippi. Along the Osage River and in all the southern counties are heavy tracts of good timber, chiefly white, black, yellow, and post oak, black jack, black hickory, sassafras, dogwood, cedar, etc., and nearer the Arkansas border extensive tracts of pine. Yellow poplar, sweet gum, cypress, oak, catalpa, tupelo, black gum, and black walnut are the principal forest trees of the S. E.

Agricultural Productions.—According to the census of 1870, there were in Missouri 21,707,220 acres of land in farms, of which 9,130,615 acres were improved lands and 12,576,605 unimproved, including woodland. The average size of farms was 146 acres. The estimated value of farms was $392,908,047, and of farming implements and machinery, $15,596,426. The value of all farm productions for the year was estimated at $103,035,759; of animals slaughtered or sold for slaughter, $23,626,784; of home manufactures, $1,737,606; of forest products, $793,343; of market-garden products, $406,655; of orchard products, $2,617,462; of wages paid to agricultural laborers during the year, $8,797,487. The wheat-crop of 1869 was 14,315,926 bushels; rye, 559,532; Indian corn, 66,034,075 (only Illinois, Iowa, and Ohio exceeding it); oats, 16,578,313; barley, 269,240; and buckwheat, 36,252. Of cotton, but 1246 bales were reported; of flax, 16,613 pounds; of hemp, 2816 tons; of wool, 3,649,390 pounds; of hay, 615,611 tons; of hops, 19,297 pounds; of tobacco, 12,320,483 pounds; of cane-sugar, 49 hogsheads (probably an error); of maple-sugar, 116,980 pounds; of sorghum syrup or molasses, 1,730,171 gallons; of maple syrup, 16,317 gallons; of Irish potatoes, 4,238,361 bushels; of sweet potatoes, 241,253; of peas and beans, 43,986; of beeswax, 35,248 pounds; of honey, 1,156,444 pounds; of domestic wine, 326,173 gallons; of clover-seed, 2494 bushels; flaxseed, 10,391; and grass-seed, 12,246. The live-stock reported in 1870 was 545,822 horses, 111,582 mules and asses, 1,269,065 neat cattle, 1,352,001 sheep, and 2,306,430 swine. The value of all live-stock was estimated at $84,285,273. Of some of these items we have later statistics, though not of all. According to the agricultural report for 1873, the crop of Indian corn of that year was 70,846,000 bushels, valued at $26,921,480; of wheat, 11,927,000, valued at $13,477,510; of rye, 446,000, worth $285,440; of oats, 15,670,000, valued at $4,701,000; of barley, 266,000, valued at $228,760; of buckwheat, 26,000, valued at $20,020; of potatoes (Irish only), 1,839,000, valued at $1,599,930; of tobacco, 13,200,000 pounds, worth $1,161,600; of hay, 601,000 tons, worth $5,709,500. The year was an exceptionally bad one for agricultural products, but we are satisfied that several of these items are understated. The estimated numbers of live-stock in 1874 were reported by the same authority as follows: horses, 543,000, valued at $26,324,640; mules, 89,200, valued at $6,092,360; milch cows, 421,400, valued at $9,560,430; oxen and other cattle, 806,300, valued at $14,061,872; sheep, 1,408,500, valued at $2,676,150; swine, 2,603,300, valued at $8,590,890. We believe these numbers are under-estimated.

Manufactures.—In the value of her annual products of manufactures Missouri ranked in 1870 as the fifth State in the Union, though Illinois surpassed it in capital invested, and nearly equalled it in production. Both States have greatly increased their manufactures since 1870. In that year Missouri had 11,871 manufacturing establishments, employing 65,354 persons, of whom 55,904 were men, 3884 women, and 5566 children; the capital invested was reported at $80,257,244; the wages paid at $31,055,445; the raw material used at $115,533,269; and the annual product at $206,213,429. The following were the most important items: Flouring-mill products, 385 establishments, $28,332,160 annual product; packed meats, 27 packing-houses, $13,933,195; liquors, distilled, malt and vinous, 293 establishments, $8,371,440; lumber planed and sawed, $6,681,462; bags and bagging, in 8 factories, $5,787,250; iron castings, $4,163,605; pig iron, $2,991,618; iron, forged and rolled, and nails and spikes, $1,749,000; machinery, $4,408,736; printing, publishing, etc., $5,268,627; saddlery and harness, $5,424,635; sugar and molasses refined, $4,135,250; animal oils, $4,100,000; ready-made clothing (men's and women's), $8,352,132; tobacco and cigars, $10,415,604; bread and other bakery products, $3,160,053; brick, $3,148,884; carriages and wagons, $3,253,734; cars, freight and passenger, $2,200,150; furniture, $3,830,749; cooperage, $2,234,581; boots and shoes, $2,363,701; bridge-building, $2,072,620; paints, $2,090,850; patent medicines, $2,073,875; tin, copper, and sheet-iron ware, $2,945,460; sash, doors, and blinds, $2,563,416; agricultural implements, $1,588,108; marble and stone work, monuments and tomb-stones, $1,446,355; soap and candles, $1,794,160; wool-carding and woollen goods, $1,256,213. At the close of 1873 a census of the manufacturing products of St. Louis alone showed that the annual product of the manufactures of that city was $206,389,319, or more than $175,000 more than the product of the whole State three years before. If the other manufactures of the State had increased in the same ratio, the aggregate annual product of the State should have been $268,077,460. That it considerably exceeds this sum in the autumn of 1875 is altogether probable.

Mining Products.—The lead product of the State in the year 1873 was 27,676,320 pounds, worth at St. Louis $1,902,747. The value of the lead raised in the five years 1869–73 (both inclusive) was $6,423,171. The lead industry of St. Louis, including white lead, shot, pipe, and sheet lead, amounts to $4,882,424 annually. There are 97 banks of brown hæmatite or limonite iron ore already opened in the State, containing more than 2,000,000 tons of these rich ores, while of the specular iron ores there are a number of mountains of solid ore, to be estimated only by hundreds of millions of tons. The iron ore mined in 1872 in the State was 509,200 tons, of which 291,200 tons were exported, and the remainder smelted in Missouri. The same year 87,176½ tons of pig iron were produced and shipped to St. Louis. The zinc ores raised the same year and shipped to St. Louis amounted to 11,582,440 pounds. Of this, 10,000,000 pounds were smelted for zinc, yielding 1,727,450 pounds, and the remainder was used for the manufacture of white oxide of zinc. Of barytes, 10,437,420 pounds were shipped the same year to St. Louis. The coal products are large and constantly increasing, but we have no statistics which indicate the present amount. The products of the quarries of the State are also very large, and the incidental production of copper and other metals produces a very considerable sum. The estimate in the census of 1870 of the annual product of the mines of the State—$3,472,513—was then much less than one-half the truth, and now represents less than one-fourth of the annual mining product.

Railroads.—According to Poor's *Railroad Manual*, there were, Jan. 1, 1875, 3521.01 miles of railroad track operated in that State, and the cost of roads and equipment was $141,791,312. Excluding double track, sidings, etc., there were at that date about 2800 miles of road in operation. The following table gives such particulars in regard to the most important of these lines, with their branches, as are attainable:

Railroads.	Miles of road operated.	Stock.	Debt.	Cost of roads, equipment, etc.	Passengers carried.	Freight carried, tons.	Gross earnings.	Net earnings.
Atlantic and Pacific	331	$15,600,000	$9,196,500	$24,796,500	86,699	....	$1,106,883	$460,878
Burlington and South-western	65	1,050,000	1,200,000	1,980,000				
Louisiana branch Chicago and Alton	100	831,650	202,000	1,217,097				
South-western and Winthrop branches of Chicago Rock Island and Pacific	168	7,000,000	5,000,000	12,000,000				
Hannibal and Central Missouri	71	1,000,000	1,000,000	2,000,000				
Hannibal and St. Joseph and branches in the State	314	9,254,924	9,893,497	17,943,444	358,894	416,791	3,104,969	1,089,035
Kansas City St. Joseph and Council Bluffs and branch	211	2,789,414	5,776,500	8,626,158	168,158	207,497	1,221,937	448,077
Missouri Kansas and Texas	141	5,157,500	2,000,000	6,320,500	....	....	1,358,914	384,813
Pacific R. R. of Missouri, with four branches	410	3,635,756	11,131,585	15,982,481	199,200	....	3,597,798	919,801
Quincy Missouri and Pacific	70							
St. Louis and Iron Mountain and two branches	336	10,000,000	4,000,000	15,235,220	516,618	434,963	1,636,904	667,320
St. Louis Kansas City and Northern	579	24,000,000	6,203,826	30,203,826	....	....	3,056,939	1,118,528

Finances.—The State debt on Jan. 1, 1875, was $17,735,000, of which $1,589,000 bore 7 per cent. interest, and the remainder 6 per cent., making the entire annual interest charge $1,074,590. The State has an adjusted claim against the U. S., for debt incurred on account of the war, of $3,209,939.69. The school fund amounts to $2,624,354.63, and the seminary fund to $108,700. The credit of the State is very good, and it being necessary to issue new bonds to meet a part of those falling due during the year, a ready demand was found for all, and more than were put upon the market. The receipts and expenditures of the State to Jan. 1, 1874, were as follows: balance in treasury Jan. 1, 1873, $786,699.33; receipts from all other sources to Jan. 1, 1874, $3,563,138.28, making a total of receipts of $4,349,837.61; disbursements, $3,518,239.59, leaving a balance in the treasury of $831,598.02 on Jan. 1, 1874. We give elsewhere (under the counties) the true valuation according to the census of 1870. There has been a great difference of opinion in regard to the State valuation of property for purposes of taxation. In 1872 the assessors returned the property of the State for purposes of taxation at $568,155,502. The governor in his message of 1873 declared this to be both unequal and inaccurate, and insisted that a fair valuation for taxation would show more than $1,000,000,000 of property in the State. As one item, the railroads asked to be taxed on but $20,000,000, while $50,000,000 would have been a very moderate valuation of their taxable property in the State. As the true valuation of St. Louis alone in 1873 was said to be $475,000,000, there was probably justice in the remonstrances of the governor. If a later valuation has been made, we are unable to find any publication of it.

Commerce.—The foreign commerce of the State, though of considerable amount, is all indirect, it having little or no direct importations, and St. Louis being hardly more than nominally a port of entry for foreign commerce. Its imports and foreign exports in 1873 amounted to $1,376,466. The ports of New Orleans, Chicago, Milwaukee, New York, Philadelphia, Baltimore, and Norfolk afford it all necessary facilities for this purpose. Its domestic or interior commerce is of vast amount, and is transacted with all parts of the continent. Over the Union Pacific and the other trans-continental railways its freights of provisions, merchandise, gold, silver, quicksilver, lead, copper, iron, and coal reach hundreds of millions, while its exportation eastward of flour, grain, hardware, iron castings, pig iron, and a great variety of other products amounts to still greater sums. The amount of this traffic through the State annually must greatly exceed $1,000,000,000.

Banks.—On Jan. 1, 1875, Missouri had 41 national banks, of which 6 were closed or closing and 35 in operation. These 35 banks had a capital of $9,195,300, $3,985,350 of bonds on deposit, $8,646,565 circulation issued, of which $5,908,379 was still outstanding. There were also at that time 45 State banks, having an aggregate capital of $9,300,000; 56 savings banks, having capital and deposits to the amount of $9,118,306; and 92 private banking-houses.

Insurance Companies.—There were in Missouri in Jan., 1874, 35 fire and marine insurance companies, of which 18 were mutual companies. The joint-stock companies had an aggregate capital of $3,500,000, and the whole reported aggregate assets of about $10,125,000. There were at the same time 5 life insurance companies in the State, 2 of them mutual; the joint-stock companies having an aggregate capital of $616,600, and the whole reporting assets to the amount of $12,589,884.

Population.

Census year.	Total population.	Males.	Females.	White.	Free colored.	Slaves.	Natives.	Foreigners.	Density	Ratio of increase.	Illiterate.	Of school age, 5 to 20.	Of military age, 18 to 45, males.	Of voting age, 21 and upwards, males.	Citizens.
1810	20,845	11,390	9,455	17,227	607	3,011	....	....	.32						
1820	66,586	36,544	30,042	55,988	376	10,222	....	....	1.02	219.43					
1830	140,455	74,128	66,327	114,795	569	25,091	....	....	2.15	110.94					
1840	383,702	203,095	180,607	323,888	1,574	58,240	....	....	5.87	173.18	*19,457				
1848	588,971	327,205	261,766	510,435	1,779	76,757	....	....	9.01	53.50	....	... .	....	*145,496	
1850	682,044	357,832	324,212	592,004	2,618	87,422	604,522	76,592	10.44	77.75	*36,778	273,157	138,248	262,157	
1852	724,667	402,595	322,072	634,934	2,526	87,207	....	....	11.09	6.25	....	292,658	....	*157,672	
1856	911,001	496,908	414,093	806,744	2,652	101,605	....	....	13.52	25.71	....	341,121	....	*177,090	
1860	1,182,012	622,201	559,811	1,063,489	3,572	114,931	1,021,471	160,541	18.09	73.30	*60,545	446,397	249,249	290,778	
1870	1,721,295	896,347	824,948	1,603,146	118,071	....	1,499,028	222,267	26.34	45.62	222,411	577,803	352,998	408,206	380,235

Pauperism and Crime.—The census statistics of pauperism and crime are so manifestly incorrect in most of the States that we hardly feel justified in inserting them. They are at the most only relatively true, but in Missouri they are perhaps as fairly reported as in most of the States. They represent the persons supported in almshouses or other places, and at all events paupers, in the year ending June 1, 1870, as 2424, and the cost of their support as $191,171; those remaining and receiving support on that day as 1854, of whom 1415 were natives (325 colored) and 439 foreigners; 1503 persons were said to have been convicted of crime during the year, and 1623 persons to have been in prison June 1, 1870. The accuracy of these last statistics may well be doubted, for in Dec., 1874, there were 1069 convicts in the State penitentiary alone, besides all those in the 114 county jails and those in the St. Louis prisons and houses of correction; and 1205 had been committed to the State prison alone between Dec. 5, 1872, and Dec. 5, 1874.

Education.—The school system of Missouri is a very good one, and in its practical workings is becoming every year more efficient. The schools of St. Louis and of several of the smaller cities are not surpassed in excellence by any public schools in the U. S. The report of the State superintendent of schools for Jan. 1, 1875, gives the following particulars: There were at that time 7483 districts in the State; 7224 school-houses (of which 4636 were frame, 424 brick, and 2164 log), having a total valuation, aside from those of St. Louis, of $4,188,337, and having furniture valued at $310,304; adding the value of school property in

* Whites only.

St. Louis, $2,275,865, we have the value of the school property of the State, $6,774,506. In these school-buildings were maintained 7829 schools—viz. 7461 primary and common, graded and ungraded, 86 high schools, and 282 colored schools. The total number of teachers was 9676 (6281 males and 3395 females); the average monthly wages of these teachers was $39.87 for males and $30.36 for females. There were also reported 661 private schools. During the year 548 new school-houses had been erected. The principal of all the school funds amounts to $3,037,440.50. The district school-tax for the year 1874 realized $1,514,387.65, making the entire school money (aside from extra local taxes and from the expenditure on the St. Louis schools) $2,189,860.41. The enumeration of children of school age (5–21) showed 669,907 white and 38,447 colored children. The schools of St. Louis had enrolled Aug. 1, 1874, 30,898 (15,169 boys, 15,729 girls); average attendance, 23,105; 601 teachers, or 47 pupils to a teacher; the annual cost of tuition per scholar was $18.80; the average amount of teachers' salaries, $773.43. There were 54 public school-houses, with 28,530 seats. The total value of school-houses, lots, and furniture was $2,386,620.44. There were 1 normal, 6 high schools, 44 district (including the first eight years of study), 6 colored, and 21 evening schools. The normal school exclusively for girls had 220 students; the six high schools, 920; the district schools, 31,406; the colored schools, 1727; and the evening schools, 5577 scholars. The State has three normal schools for white teachers, and the Lincoln Institute for training colored teachers. The normal schools are—the North Missouri Normal School, at Kirksville, with 11 teachers and professors, 668 normal students; its receipts are about $20,000, and its expenditures in 1874, $18,742.43; the South Missouri Normal school, at Warrensburg, had 12 professors and instructors and 461 students; the receipts and expenditures were about $15,100; the S. E. Missouri School, at Cape Girardeau, had 5 teachers or professors and 127 scholars; expenses about $3000; an edifice for this school is now nearly or quite finished; the Lincoln Institute had 5 teachers, 146 students. Its expenses were $6405.81.

Higher Education.—The University of the State of Missouri, at Columbia, aims to be a university in the true sense. It has seven distinct departments—viz. (1) the college proper, founded in 1840; (2) the normal, or college of instruction in teaching, founded in 1868; (3) the agricultural and mechanical college, in 1870; (4) the school of mines and metallurgy at Rolla, under the exclusive control of the university, 1871; (5) the college of law, 1872; (6) the college of medicine, 1873; (7) the department of analytical and applied chemistry. The faculty numbers 31, and the number of students in all departments in 1874 was 553. For the first twenty-five years of its existence this university received no aid from the State beyond the income from the seminary lands, which were hastily and injudiciously sold, but it was reorganized in 1866, and the new departments added as rapidly as was consistent; and though the State has not been liberal in aiding it, yet its growth has been rapid and its progress almost unexampled. The following table gives the statistics of the colleges and universities of the State:

Colleges and universities.	Where located.	Year of organization.	Professors and instructors.	Students.	Value of buildings and grounds.	Endowment.	Income from all sources.	Volumes in library.	Under what control.
Central College	Fayette	1854	6	130	$40,000	$100,000	$8,590	....	M. E., So.
Christian University	Canton	1856	8	166	100,000	25,000	10,000	600	Christians.
College of Christian Brothers	St. Louis	1859	25	489	....	....	....	10,000	R. C.
Drury College	Springfield	1873	6	81	100,000	25,000	....	....	Cong.
Hannibal College	Hannibal	1869	5	116	8,000	....	5,200	200	M. E., So.
Lewis College	Glasgow	1865	4	65	75,000	....	....	4,000	M. E.
Lincoln College	Greenwood	1868	4	42	11,000	....	1,200	1,000	U. P.
McGee College	College Mound	1853	10	235	35,000	....	....	500	Cumb. P.
St. Joseph's College	St. Joseph	1867	9	192	15,000	....	....	501	R. C.
St. Louis University	St. Louis	1832	13	336	....	....	....	24,000	R. C.
St. Paul's College	Palmyra	1848	5	33	35,000	15,000	2,100	2,000	Prot. E.
St. Vincent's College	Cape Girardeau	1844	15	113	....	....	....	5,500	R. C.
University of Missouri	Columbia	1840	31	417	....	30,000	43,000	7,000	State.
Washington University	St. Louis	1853	22	359	500,000	200,000	80,000	2,000	Non-sect.
Westminster College	Fulton	1852	5	75	20,000	86,000	15,000	2,500	Presb.
William Jewell College	Liberty	1849	7	115	250,000	100,000	8,000	5,000	Baptist.
Woodland College	Independence	1869	4	80	40,000	....	....	....	Disciples.

Schools of Professional Instruction.

Names of schools for professional instruction.	Location.	Date of organization.	No. of professors and instructors.	No. of students.	Value of buildings and grounds.	Endowment.	Income from all sources.	Volumes in library.
Schools of Theology:								
German Evangelical Luth. Concordia Col.	St. Louis	1839	6	201	$60,000	....	$10,000	4,400
St. Vincent's (Catholic) College	Cape Girardeau	1844	16	19	....	....	....	5,000
Theological School of Westminster College	Fulton	1859						
J. Vardeman School of Theology (Baptist), William Jewell College	Liberty	1869	5	43	40,000	$25,000	2,000	3,000
Schools of Law:								
Law College University of State of Missouri	Columbia	1872	6	32	....	....	....	1,000
Law Department Washington University	St. Louis	1867	10	36	....	....	....	3,000
Schools of Medicine:								
Kansas City Col. of Phys. and Surg	Kansas City	1869	9	11	62,000	1,000	700	75
Medical College University of Missouri	Columbia	1873	7	34				
Missouri Medical College	St. Louis	1840	16	103	55,000	....	8,000	
St. Louis Medical College	St. Louis	1841	17	196	90,000	....	15,381	1,500
Homœopathic Medical College of Missouri	St. Louis	1858	13	39	1,000	....	2,000	100
Missouri Dental College	St. Louis	1865	12	17	....	....	1,200	50
St. Louis College of Pharmacy	St. Louis	1865	3	42	....	....	1,200	
Schools of Science:								
Agric. and Mech. Col. of Univ. of Missouri	Columbia	1870	13	183	....	....	9,000	200
School of Mines and Metallurgy Univ. of Mo.	Rolla	1871	8	83	12,000	100,000	12,800	1,200
Polytechnic Department Washington Univ.	St. Louis	1857	12	38				

There are many academies, female seminaries, and other private schools of a high order, mostly, though not entirely, under the control of some one or other of the religious denominations.

Schools of Special Instruction.—There are 13 orphan asylums and homes for children in the State, 8 of them under Roman Catholic control; 1 industrial school for girls, at St. Louis, and a home for the friendless or old ladies' home, also at St. Louis. The statistics of many of these we cannot procure. There is a State institution for the deaf and dumb at Fulton, which in 1873 had 8 instructors, and had under instruction during the year 179 pupils; its buildings and grounds were valued at $140,000, and its annual expenditure and income $38,100, of which $17,250 was a State appropriation. There was also a private institution for deaf mutes, under Roman Catholic control, at St. Louis, which had 1 teacher and 25 pupils. The State institution for the education of the blind, at St. Louis, had 27 instructors and employés, of whom 25 were blind, and 93 pupils; its annual expenditures were $21,000, which was appropriated by the State. The Missouri State lunatic asylum or hospital for the insane is at Fulton. On Dec. 1, 1874, this institution had 6 officers and 338 patients (206 males and 132 females); 330 had been discharged during the two years previous, of whom 134 had recovered; 47 were much improved; 63 were stationary; 82 had died, and 2 were not insane. The average number in the institution had been 360. Its finances were not in good condition, and the asylum itself was altogether inadequate to the needs of the State. The penitentiary, at Jefferson City, under a system of leasing had become nearly self-supporting, but was not in a satisfactory condition of discipline.

Libraries.—According to the census of 1870, Missouri had 5645 libraries, with an aggregate of 1,065,638 volumes.

Of these, 1742 were public, with 498,996 vols., including 1 State library of 12,000 vols.; 11 town and city libraries, with 8097 vols.; 125 court and law, with 35,104 vols.; 50 school and college, with 44,825 (the preceding tables show that 25 colleges and professional schools had 85,300 vols. in 1874, and the public school library of St. Louis alone had 36,000 vols. the same year, making 121,300 vols. in 26 schools, colleges, etc.); 1526 Sunday-school and church libraries were reported as having 285,338 vols.; 28 circulating libraries had 112,450 vols.; and 3903 private libraries, 566,642 vols.

Newspapers.—In 1870 there were reported 279 newspapers as published in the State, issuing annually 47,980,422 copies, and having an aggregate circulation of 522,866. Of these, 21 were dailies, with an aggregate circulation of 86,555; 5 were tri-weeklies, with 13,800 circulation; 225 were weeklies, with 342,361 circulation; 3 semi-monthly, with 22,000 circulation; 23 monthlies, with 53,650 circulation; 1 bi-monthly, 1500, and 1 quarterly, with 3000 circulation. Two years later the whole number was 289—viz. 21 daily, 5 tri-weekly, 227 weekly, 5 semi-monthly, 29 monthly, 1 bi-monthly, and 1 quarterly. Many papers are started every year, but the failures are also many. The present number is probably about 325.

Churches.—The following table exhibits the church statistics of 1870 and 1874:

Denominations.	Church organizations, 1870.	Church edifices, 1870.	Sittings, 1870.	Church property, 1870.	Churches, 1874.	Church edifices, 1874.	Ministers, 1874.	Church members, 1874.	Adherent population, 1874.	Church property, 1874.
All denominations	3,229	2,082	691,520	$9,709,358	4,537	3,369	2,338	264,673	1,322,930	$13,002,900
Baptists	792	513	144,210	1,090,708	1,425	1,097	831	88,662	356,000	1,897,500
Free-will Baptists, etc	13	5	1,150	5,000	18	8	7	1,210	6,000	12,200
Christians and Disciples	394	229	68,545	514,700	460	318	200	28,450	97,500	811,550
Congregationalists	37	27	12,295	235,700	71	56	45	3,406	14,200	309,500
Protestant Episcopalians	83	51	20,950	485,650	44	41	43	4,735	19,500	512,780
Evangelical Association	5	5	1,800	15,000	7	7	5	512	2,000	23,000
Friends	2	2	500	2,000	3	3	.....	300	1,500	3,350
Jews	4	4	2,100	217,100	5	5	5	....	1,800	289,500
Lutherans	94	86	39,550	768,600	121	107	56	9,675	337,000	1,073,000
Methodists	1,066	626	185,420	1,645,300	1,367	981	639	89,623	61,000	1,916,000
New Jerusalem	4	3	1,000	22,500	4	4	3	450	2,000	29,450
Presbyterians, G. A.	332	232	74,500	1,210,750	401	306	289	28,781	113,550	1,647,500
Cumberland Presbyterians, etc	144	87	28,850	175,000	161	109	86	10,091	40,000	217,500
Reformed (German)	11	9	1,900	16,900	15	12	8	1,051	4,180	25,400
Roman Catholics	184	166	97,550	3,119,450	290	228	231	....	250,000	3,997,420
Unitarian	10	9	3,200	142,200	10	10	9	800	3,200	160,000
United Brethren in Christ	105	20	5,800	32,000	111	60	56	2,121	10,000	57,000
Universalists	6	2	900	2,500	16	12	10	406	1,600	7,800
Union	5	6	1,300	8,300	8	7	5	400	1,900	12,450

Counties.—The following table gives the counties of the State (114 in number) in 1875, with their populations, distinguished as male and female, in 1870, their population in 1860, and their true valuation in 1870:

Counties.	Pop., 1870.	Males, 1870.	Females, 1870.	Pop., 1860.	True valuation, 1870.
Adair	11,448	5,892	5,556	8,531	$10,202,000
Andrew	15,137	8,014	7,123	11,850	8,000,000
Atchison	8,440	4,489	3,951	4,649	5,000,000
Audrain	12,307	6,417	5,890	8,075	8,503,407
Barry	10,373	5,224	5,149	7,995	2,500,000
Barton	5,087	2,698	2,389	1,817	3,000,000
Bates	15,960	8,541	7,419	7,215	8,000,000
Benton	11,322	5,850	5,472	9,072	4,000,000
Bollinger	8,162	4,135	4,027	7,371	2,106,000
Boone	20,765	10,420	10,345	19,486	15,000,000
Buchanan	35,109	19,175	15,934	23,861	20,000,000
Butler	4,298	2,167	2,131	2,891	1,100,000
Caldwell	11,390	5,959	5,431	5,034	7,000,000
Callaway	19,202	9,916	9,286	17,449	10,000,000
Camden	6,108	3,105	3,003	4,975	1,500,000
Cape Girardeau	17,558	9,003	8,555	15,547	10,105,000
Carroll	17,446	9,237	8,209	9,763	9,000,000
Carter	1,455	733	722	1,235	980,000
Cass	19,296	10,408	8,888	9,794	12,000,000
Cedar	9,474	4,851	4,623	6,637	2,000,000
Chariton	19,136	9,913	9,223	12,562	9,500,000
Christian	6,707	3,374	3,333	5,491	1,800,000
Clark	13,667	7,050	6,617	11,684	10,560,000
Clay	15,564	8,079	7,485	13,023	8,000,000
Clinton	14,063	7,582	6,481	7,848	8,000,000
Cole	10,292	5,595	4,697	9,697	7,000,000
Cooper	20,692	10,664	10,028	17,356	10,000,000
Crawford	7,982	4,089	3,893	5,823	2,800,000
Dade	8,683	4,430	4,253	7,072	3,000,000
Dallas	8,383	4,279	4,104	5,892	2,300,000
Daviess	14,410	7,497	6,913	9,606	9,000,000
DeKalb	9,858	5,277	4,581	5,224	5,000,000
Dent	6,357	3,256	3,101	5,654	1,900,000
Douglass	3,915	1,941	1,974	2,414	1,000,000
Dunklin	5,982	3,092	2,890	5,026	1,650,000
Franklin	30,098	15,769	14,329	18,085	15,550,000
Gasconade	10,093	5,312	4,781	8,727	5,650,770
Gentry	11,607	6,019	5,588	11,980	4,500,000
Greene	21,549	10,974	10,575	13,186	9,500,000
Grundy	10,567	5,441	5,126	7,887	4,000,000
Harrison	14,635	7,578	7,057	10,626	7,500,000
Henry	17,401	9,129	8,272	9,866	9,000,000
Hickory	6,452	3,302	3,150	4,705	2,000,000
Holt	11,652	6.173	5,479	6,550	8,000,000
Howard	17,233	8,977	8,256	15,946	9,000,000
Howell	4,218	2,150	2,068	3,169	1,000,000
Iron	6,278	3,148	3,130	5,842	12,406,100
Jackson	55,041	30,282	24,759	22,913	38,000,000
Jasper	14,928	7,893	7,035	6,883	6,000,000
Jefferson	15,380	8,146	7,234	10,344	8,108,250
Johnson	24,648	12,662	11,986	14,644	18,000,000
Knox	10,974	5,735	5,239	8,727	4,500,100
Laclede	9,380	4,724	4,656	5,182	3,000,000
Lafayette	22,623	11,689	10,934	20,098	20,000,000
Lawrence	13,067	6,634	6,433	8.846	3,000,000
Lewis	15,114	7,849	7,265	12,286	13,206,000
Lincoln	15,960	8,281	7,679	14,210	10,000,000
Linn	15,900	8,219	7,681	9,112	$6,500,000
Livingston	16,730	8,793	7,937	7,417	7,000,000
McDonald	5,226	2,667	2,559	4,038	1,500,000
Macon	23,230	11,934	11,296	14,346	10,000,000
Madison	5,849	3,015	2,834	5,664	8,210,000
Maries	5,916	3,019	2,897	4,901	1,600,000
Marion	23,780	12,282	11,498	18,838	15,750,000
Mercer	11,557	5,948	5,609	9,300	4,000,000
Miller	6,616	3,404	3,212	6,812	2,100,000
Mississippi	4,982	2,692	2,290	4,859	4,125,000
Moniteau	11,375	5,756	5,619	10,124	7,000,000
Monroe	17,149	9,014	8,135	14,785	10,550,000
Montgomery	10,405	5,272	5,133	9,718	9,550,000
Morgan	8,434	4,297	4,137	8,202	3,500,000
New Madrid	6,357	3,380	2,977	5,654	5,650,000
Newton	12,821	6,689	6,132	9,319	4,600,000
Nodaway	14,751	7,819	6,932	5,252	8,400,000
Oregon	3,287	1,683	1,604	3,009	1,125,000
Osage	10,793	5,641	5,152	7,879	3,000,000
Ozark	3,363	1,658	1,705	2,447	500,000
Pemiscot	2,059	1,079	980	2,962	850,000
Perry	9,877	5,004	4,873	9,128	4,650,000
Pettis	18,706	9,882	8,824	9,392	12,000,000
Phelps	10,506	5,292	5,214	5,714	5,000,000
Pike	23,076	11,829	11,247	18,417	15,550,000
Platte	17,352	9,114	8,238	18,350	13,000,000
Polk	12,445	6,249	6,196	9,995	4,500,000
Pulaski	4,714	2,440	2,274	3,835	1,000,000
Putnam	11,217	5,651	5,566	9,207	3,500,000
Ralls	10,510	5,542	4,968	8,592	10,250,000
Randolph	15,908	8,220	7,688	11,407	6,000,000
Ray	18,700	9,780	8,920	14,092	10,000,000
Reynolds	3,756	1,847	1,909	3,173	1,000,000
Ripley	3,175	1,572	1,603	3,747	1,500,000
St. Charles	21,304	11,346	9,958	16,523	15,650,000
St. Clair	6,742	3,445	3,297	6,812	4,000,000
St. François	9,742	5,199	4,543	7,249	12,550,000
Ste. Genevieve	8,384	4,257	4,127	8,029	4,550,000
St. Louis	351,189	183,356	167,833	190,524	511,035,000
Saline	21,672	11,307	10,365	14,699	13,000,000
Schuyler	8,820	4,499	4,321	6,697	8,550,000
Scotland	10,670	5,487	5,183	8,873	8,250,000
Scott	7,317	3,886	3,431	5,247	7,650,000
Shannon	2,339	1,152	1,187	2,284	1,850,000
Shelby	10,119	5,273	4,846	7,301	8,850,000
Stoddard	8,535	4,328	4,207	7,877	9,550,000
Stone	3,253	1,632	1,621	2,400	500,000
Sullivan	11,907	6,078	5,829	9,198	4,000,000
Taney	4,407	2,241	2,166	3,576	500,000
Texas	9,618	4,935	4,683	6,067	2,500,000
Vernon	11,247	6,038	5,209	4,850	10,000,000
Warren	9,673	5,219	4,454	8,839	8,650,000
Washington	11,719	5,868	5,851	9,723	4,550,000
Wayne	6,068	3,098	2,970	5,629	5,550,000
Webster	10,434	5,276	5,158	7,099	3,000,000
Worth	5,004	2,593	2,411	....	1,600,000
Wright	5,684	2,932	2,752	4,508	1,700,000
Totals	1,721,295	896,347	824,948	1,182,012	$1,284,922,897

Principal Towns.—St. Louis is not only the largest city of Missouri, but of the Mississippi Valley W. of that river. Its population was 310,864 in 1870, and is now probably

between 400,000 and 450,000. The capital of the State, Jefferson City, has between 4000 and 5000 inhabitants. The other principal cities and towns are—Kansas City, which has between 30,000 and 40,000 inhabitants; St. Joseph, between 20,000 and 30,000; Hannibal, between 10,000 and 20,000; St. Charles, Springfield, Sedalia, and Lexington, each between 5000 and 10,000; Chillicothe, Cape Girardeau, Louisiana, Macon, Boonville, and Independence, between 3500 and 5000; and Warrensburg, Canton, Columbia, Palmyra, Pleasant Hill, Mexico, and Iron Mount, between 2000 and 3500.

Constitution, Courts, Representatives in Congress.—Missouri is now (Nov., 1875) governed under the constitution adopted and ratified in 1865, and subsequently modified in 1870, but a new constitution, reported and adopted by a constitutional convention which sat in 1875, was ratified by a large majority in the popular vote Oct. 30, 1875, and will probably go into force as the organic law at the commencement of the political year, Jan., 1876, though this is uncertain, since by the old constitution the terms of State officers do not expire till 1877. The constitution of 1865 requires that the governor, lieutenant-governor, secretary of state, treasurer, auditor, register of lands, attorney-general, and superintendent of public schools should be chosen by the people for a term of two years, the election taking place on the Tuesday next following the first Monday of November in the even years, and those elected assuming office on the ensuing January. The senate consists of 34 members, chosen for four years, one-half biennially; the house of representatives consists of 138 members, elected for two years. Elections are biennial. The legislature assembles in January of the odd years, though called sessions often take place in the even years. The judicial power is vested in a supreme court, 29 circuit courts, inferior courts, county courts, and justices of the peace. The supreme court has appellate jurisdiction. It is composed of 5 justices elected for ten years. The circuit court judges are elected for six years. The State is entitled to 13 members of Congress.

History.—The whole territory on both sides of the Mississippi River to its source, and of somewhat indefinite breadth, was claimed by the French by virtue of their discovery and settlement. That portion of the territory which includes the present State of Missouri was sometimes called the Illinois Country, but was more definitely known as Upper Louisiana. Under this last name its lead-mines began to be known as early as 1720, and settlements were made not long after at St. Louis, Cape Girardeau, and (probably about 1755) at St. Genevieve. In 1763 it was ceded to Spain with the rest of the Louisiana or Mississippi River country, while all E. of the river came into the possession of the English. In 1775, St. Louis had attained some reputation as a fur-dépôt and trading-station, and had about 800 inhabitants, and St. Genevieve about half as many. New Madrid had been founded some time before. During the Revolutionary war Spain was at war with England, and these colonies, siding with her, were repeatedly in danger from the English and their Indian allies. In 1783 peace came, but Spain still retained her colonies, though she did little for them; St. Louis grew very slowly. In 1800, Spain ceded her provinces on the Mississippi to France, and the French government sold them to the U. S. in 1803. The U. S. government immediately divided the purchased region into the Territory of Orleans and the district of Louisiana, the latter name including most of Arkansas, Missouri, Iowa, Minnesota, and Dakota, and most of Kansas and Nebraska. In 1805 this region was erected into the Territory of Louisiana, and St. Louis made the capital. In 1810 the population of the Territory was 20,845, of which all but 1500 were in the present limits of Missouri. In 1812, Louisiana becoming a State, the name of the Territory was changed to Missouri Territory. The population increased rapidly by immigration, and in 1817 the Territorial legislature applied to Congress for liberty to prepare a State constitution preliminary to admission into the Union. At this time the population of St. Louis was above 5000, and that of the Territory was estimated at 60,000. This application led to a protracted struggle in Congress on the question of the admission of Missouri as a slave State. The whole country was greatly agitated by the controversy, and it was finally settled by the passage of the bill known as the Missouri Compromise, which provided that slavery should be allowed in Missouri, and might be permitted in all territory W. of it S. of the line of 36° 30′, but not in any territory N. of that line. This compromise was virtually repealed in 1854 by the act organizing the Territories of Kansas and Nebraska, and this repeal was among the causes which led to the civil war. A convention met at St. Louis June 12, 1820, and agreed upon a constitution, which was duly ratified by the people, and after some other conditions exacted by Congress had been complied with, the State was admitted to the Union by Presidential proclamation Aug. 10, 1821. Its subsequent progress was very rapid, and its great resources were speedily developed. At the commencement of the late civil war Missouri was almost equally divided, a large part of the slaveholding population and some others being in favor of secession. The people of the western portion of the State had taken sides in the Kansas troubles, and armed bodies of men known as Missouri "border ruffians" had penetrated into Kansas and committed many outrages there. A convention was called on Feb. 28, 1861, which decided in favor of remaining in the Union, but many of the prominent citizens of the State were in favor of the Confederacy, and for some time not only St. Louis, but the State, wavered in the balance. Several severe battles were fought in the State. On Jan. 6, 1865, another constitutional convention met at St. Louis and adopted a new constitution, providing for emancipation and the changes induced by it. This constitution was further modified in 1870, and, as stated elsewhere, a still newer constitution was offered to the people and adopted Oct. 30, 1875.

Governors of the State.

Alexander McNair	1820–24	Hancock Johnson (act'g)	1857–57
Frederick Bates	1824–26	R. M. Stewart	1857–61
John Miller	1826–32	Claiborne F. Jackson	1861–61
Daniel Dunklin	1832–36	Hamilton R. Gamble	1861–64
Lilburn N. Boggs	1836–40	Thomas C. Fletcher	1865–69
Thomas Reynolds	1840–44	Joseph W. McClurg	1869–71
John C. Edwards	1844–48	Benjamin Gratz Brown	1871–73
Austin A. King	1848–53	Silas Woodson	1873–75
Sterling Price	1853–57	Charles H. Hardin	1875–
Trusten Polk	1857–57		

Electoral and Popular Vote at Presidential Elections.

Elect. year.	Candidates who received the electoral vote of the State.	Elect. vote.	Popular vote.	Candidates of the opposition.	Popular vote.	Minority or third-party candidates.	Popular vote.
1820	James Monroe P. Daniel D. Tompkins V.-P.	3	....	John Quincy Adams P. Richard Rush V.-P.			
1824	Henry Clay P. Andrew Jackson V.-P.	3	1,401	Andrew Jackson P. John C. Calhoun V.-P.	987	John Quincy Adams P.	311
1828	Andrew Jackson P. John C. Calhoun V.-P.	3	8,232	John Quincy Adams P. Richard Rush V.-P.	3,422		
1832	Andrew Jackson P. Martin Van Buren V.-P.	4	5,192	Henry Clay P. John Sergeant V.-P.	—		
1836	Martin Van Buren P. Richard M. Johnson V.-P.	4	11,366	William H. Harrison P. Francis Granger V.-P.	7,401	Hugh L. White P. John Tyler V.-P.	936
1840	Martin Van Buren P. Richard M. Johnson V.-P.	4	29,760	William H. Harrison P. John Tyler V.-P.	22,972		
1844	James K. Polk P. George M. Dallas V.-P.	7	41,369	Henry Clay P. Theo. Frelinghuysen V.-P.	31,255		
1848	Lewis Cass P. William O. Butler V.-P.	7	40,077	Zachary Taylor P. Millard Fillmore V.-P.	32,671		
1852	Franklin Pierce P. William R. King V.-P.	9	38,353	Winfield Scott P. William A. Graham V.-P.	29,984		
1856	James Buchanan P. J. C. Breckenridge V.-P.	9	58,164	Millard Fillmore P. A. J. Donelson V.-P.	48,524	John C. Fremont P. William L. Dayton V.-P.	No report.
1860	Stephen A. Douglas P. Herschel V. Johnson V.-P.	9	58,801	John Bell P. Edward Everett V.-P.	58,372	John C. Breckenridge P. Joseph Lane V.-P. Abraham Lincoln P. Hannibal Hamlin V.-P.	31,317 17,028
1864	Abraham Lincoln P. Andrew Johnson V.-P.	11	72,750	George B. McClellan P. George H. Pendleton V.-P.	31,678		
1868	Ulysses S. Grant P. Schuyler Colfax V.-P.	11	85,671	Horatio Seymour P. Francis P. Blair, Jr., V.-P.	59,788		
1872	Horace Greeley P. B. Gratz Brown V.-P.	15	151,433	Ulysses S. Grant P. Henry Wilson V.-P.	119,196	Charles O'Conor P.	2,429

For important statistics, the writer is indebted to the courtesy of Gov. C. H. Hardin, Hon. Garland C. Broadhead, State geologist, and Hon. Richard D. Shannon, superintendent of public schools. L. P. Brockett.

Missouri, tp. of Clarke co., Ark. Pop. 502.

Missouri, tp. of Hempstead co., Ark. Pop. 1267.

Missouri, tp. of Ouachita co., Ark. Pop. 720.

Missouri, tp. of Pike co., Ark. Pop. 770.

Missouri, tp. of Brown co., Ill. Pop. 1145.

Missouri, tp. of Boone co., Mo. Pop. 2812.

Missouri, tp. of Chariton co., Mo. Pop. 820.

Missou′ria Indians, a tribe originally of Dakota stock, are on a fine reservation in Nebraska, which they occupy with the Otoes. Pop. with the Otoes, 464.

Missouri City, post-v. of Fishing River tp., Clay co., Mo., on the North Missouri R. R. P. 572.

Missouri Compromise, a name given to a law of Congress which may be regarded as one of the principal landmarks of the history of the U. S. during the nineteenth century. Upon the introduction into Congress, in the session of 1818–19, of a bill providing for the admission of Missouri as a State, but prohibiting slavery therein, the opposition on the part of the Southern members became violent and menacing, and after long and brilliant debates a compromise was effected, chiefly by the influence of Henry Clay. Missouri was admitted as a slave State, and at the same time an ordinance was enacted (Feb. 28, 1821) that from all the territory W. of Missouri and N. of the parallel of 36° 30′ (the southern boundary of the new State) slavery should be for ever excluded. This agreement subsisted until virtually repealed by the bills which established the Territories of Kansas and Nebraska in 1854, when the question, thus reopened, became the occasion of civil war in Kansas between the respective partisans of liberty and slavery. This measure determined the formation of the Republican party (1854), precipitated the anti-slavery issue, and led to the civil war of 1861–65, by which the whole question was set at rest. (See Douglas, Stephen A., by Hon. Alex. H. Stephens, LL.D.)

Missouri River, The, next to the Mississippi, is the great river of North America. It has its source in the summits of the Rocky Mountains, about 10,000 feet above the ocean-level. A small lake, near to, but across, the mountain-summit from the Yellowstone Lake, sends off on its north-western side a stream of clear water, which is the head of Madison River. The lake takes the name originally given to the river by Lewis and Clarke in 1806 after ascending the Missouri to the Three Rivers junction. These first explorers named the left fork Gallatin, the middle Madison, and the right, which appeared largest, Jefferson, for the President. Subsequent explorers—Capt. Reynolds in 1859—proved the Madison to have the remotest source, flowing from the lake. It lies in lat. 44° 19′ N. and lon. 111° W. From the head the waters flow through a series of precipitous cliffs about 60 miles in a north-westward direction, and thence bear N. for about 80 miles to the Three Forks. In this distance the slope amounts to nearly 3500 feet. From Gallatin City, at the Forks, to Fort Benton, the present head of navigation, the distance is estimated in detail at 226 miles. The fall in this distance is measured at 1150 feet. The most westerly waters (of Milk River) rise in the Rocky Mountains at lon. 113° 50′, lat. 49° N., and the most northerly waters are in Lake Pa-ka-kee in British Columbia, lat. 49° 20′, lon. 11° 20′. The most southerly water feeding the Missouri is in a tributary of the Osage, in S. W. Missouri, lat. 37° 8′ N., lon. 93° 50′ W., while its most easterly waters are the river's mouth in the Mississippi, lat. 38° 45′ N., lon. 90° 17′ W. These extremes give an area now recomputed at 557,918 square miles.

Table of Distances and Elevations.

	Detail, miles.	Total from heads, miles.	Total from mouth, miles.	Above sea, elevation, feet.
From Lake Madison.........	.....	.....	3,047	7,427
To Three Forks..................	140	140	2,907	4,319
" Fort Benton..................	225	365	2,682	2,800
" Cow Isle........................	198	563	2,484	2,390
" Milk River....................	409	972	2,075	
" Yellowstone River........	180	1,152	1,895	1,933
" Fort Berthold................	235	1,387	1,660	
" Heart River..................	184	1,571	1,476	1,610
" Moreau River................	96	1,667	1,380	
" White River..................	265	1,982	1,115	
" Nebraska River............	190	2,122	925	
" Sioux City....................	175	2,297	750	
" Platte City....................	170	2,467	580	
" Kansas River................	250	2,717	330	
" Mouth Missouri............	330	3,047	......	437
Total length of river...	3,047			

Below Fort Benton the river-valley is flanked by bluffs, the valley having a mile of breadth. After passing the rapids 400 miles below Fort Benton the navigation of the river is less obstructed by boulders of primary rock. The valley hence has a mean width of about 10 miles, and the river traverses it from side to side. The bluffs on its borders are built up of stratified rocks of the Cretaceous age, but again of sand, clay, and boulders. The valley proper is alluvial. The channel proper, like the alluvion, is always shifting, each bend moving farther down, and the bars building up in the rear with such frequency as to make the navigation very uncertain, even for the most experienced pilots. These are the leading traits of the channel down to Sioux City. The amount of water discharged remains approximately the same, the channel-breadth increasing but little in 1000 miles of distance and after receiving the waters of a number of rivers draining hundreds of thousands of square miles. Evaporation from its sandy beds explains this phenomenon. At Sioux City it receives the Big Sioux, and below, to the mouth of the Kansas in lat. 39°, a distance by channel of 500 miles, the Missouri receives twelve small rivers from Iowa and Missouri. From the mouth of the Kansas the river flows nearly eastward, receiving on both sides the waters of fertile and well-cultivated regions. The river's breadth is enlarged from 2500 to near 3000 feet; the cross-section at the mouth is 75,000 square feet, and its discharge of water 120,000 feet per second; the upper Mississippi yields only 105,000 feet at the junction.

The valley of the Missouri abounds in mineral wealth. Even the regions of desert and shifting sands are in many portions underlaid by coal, and the Black Hills and Wind River Mountains are pervaded by the precious metals, while the Carboniferous beds abound in lead, iron, marble, and coal.

The *commerce* of the Missouri and tributaries, though vast, is not in proportion to the length of navigable channel. Yet the Missouri proper has furnished 192 steamboat arrivals at Fort Benton, a distance of 2682 miles up its channel, up to 1872, one year giving 42 arrivals. The following is a list of the navigable tributaries and their distances:

Missouri proper..	2682 miles.
Yellowstone..	300 "
Platte..	50 "
Kansas..	150 "
Osage..	280 "
Grande..	50 "
	3512 miles.

The rainfall over the valley amounts to 20 inches each year, while the mean for the Upper Mississippi is 35 inches, and for the Ohio Valley 41 inches per year.

C. G. Forshey.

Missouri Valley, post-v. of St. John tp., Harrison co., Ia., on the Iowa division of the Chicago and North-western and the Sioux City and Pacific R. Rs., 5 miles from the Missouri River, has 1 weekly newspaper.

Mist. See Fog, by Prof. Joseph Henry, LL.D., M. N. A. S.

Mistake′ [from prefix *mis*, and the verb *take*], an unintentional act or omission or error, arising from ignorance, surprise, imposition, or misplaced confidence. Mistakes are of two kinds—mistakes in law and mistakes in fact. The general rules of law appertaining to these two classes severally are essentially diverse. It is a fundamental legal principle, maintained both in courts of law and in courts of equity, that mistake or ignorance of law will furnish no excuse for a violation or disregard of legal duty, and will afford no ground of relief against the consequences of acting upon the erroneous belief. Every citizen is placed under an absolute obligation to know the subsisting rules of law when his action would be governed or affected by them, however limited may be his opportunities for acquiring such knowledge, and although from defective training or from natural incapacity (not amounting to mental unsoundness) he may be incompetent to understand legal principles and distinctions. This rule is established in order that the uniform and efficient execution of the laws may be practically secured, and that persons may be induced to acquaint themselves with their legal rights and duties, and be vigilant in the observance of legal obligations. It is therefore founded upon considerations of public policy, and is necessary for the proper administration of justice. This rule prevails both in civil and in criminal procedure. If a criminal offence be committed, and the perpetrator act in ignorance or misapprehension as to the prohibition imposed by law, he will nevertheless be punishable to the same extent as if he offended knowingly; it is sufficient that he designed the commission of an act which the law forbids. If an agreement be entered into in good faith, but under a misapprehension as to its legal effect or construction, it will, notwithstanding the error, be sustained

as valid and obligatory upon the parties. The same is true of other transactions which involve an observance of special rules of law. If, for example, a creditor should execute a release to one of two joint debtors on the erroneous supposition that the other would still remain responsible, the legal rule would still be applied that a release to one redounds to the benefit of all, and the debt would be discharged. The jurisdiction of courts of equity in reference to cases of mistake is very extensive and of especial importance, but no relief will be granted when contracts are made or acts done under a pure mistake of law, unmingled with other causes of error or delusion. If, however, the mistake be attributable to fraud or imposition practised upon one of the parties, to undue influence, mental imbecility, misplaced confidence, or to misleading surprise, relief will generally be decreed in equity against the enforcement of the contract or the consequences of the transaction. So, when a person has entered into an agreement or executed some conveyance in respect to his property in entire ignorance of his title thereto, founded in the mistake of a plain and settled principle of law, the obligation assumed or interest transferred will not usually be deemed valid, but may be set aside as unjust. In some cases there may be a mistake of fact founded upon a mistake of law, and relief may be awarded on the former ground. Compromises of doubtful claims or disputed rights are generally sustained when the misapprehension or uncertainty in point of law is shared by both parties and no fraud is practised. Such mutual engagements must be entered into in good faith by all the parties concerned, and no unwarrantable advantage gained by one over another. Courts of equity favor the settlement of contested claims, if this be done fairly, and especially sustain family compromises and arrangements when there are conflicting interests in the disposition of property and mutual controversy as to the legal rights of the parties.

In regard to mistakes in fact a different rule prevails. It is a general principle that contracts made or acts done in mistake or ignorance of a material fact may be invalidated or rescinded. The law presumes that an acquaintance with all the matters of fact involved in every transaction cannot be acquired by the exercise of reasonable diligence, and therefore will not hold a party responsible for such knowledge. The application of this rule is not confined to cases where the mistake has been occasioned by fraud or surprise, but also extends to many cases where the parties act in mutual ignorance or misapprehension as to the facts involved in their transaction, but innocently and in good faith. Thus, a contract of sale entered into under the mutual mistake that the article sold was still in existence, whereas in fact it had been destroyed, would be annulled both at law and in equity. The same principle will apply to all other cases where the parties, upon the erroneous supposition of an existing right, bargain for its transfer or enter into other dealings in regard to it. But a sale will not be rescinded at law on the ground of common mistake of fact when steps have been taken to carry it into effect by the delivery of the article sold, unless this can be returned to the vendor, so as to restore him to the condition in which he was before the contract was made. If this be not possible, the purchaser will only be entitled to compensation in damages for the deficiency in the value of the goods. In order that relief may be given in any case of mistake of fact, the fact must be of a material character. The test of materiality is whether the parties, if the truth had been known, would have engaged in or completed the transaction. When the mistake is not mutual, but upon one side only, relief will not generally be granted unless it be occasioned by fraud or surprise practised upon the ignorant party by the one who is acquainted with the circumstances of the case. When the parties deal fairly, and there is no legal obligation incumbent upon the one to make a disclosure of his knowledge about the subject of their dealings to the other, the transaction between them will be sustainable. When the means of information are equally open to all parties, it is presumed that each relies upon his own vigilance, experience, skill, and enterprise. Thus, if a purchaser is aware that the real value of the commodity is considerably greater than the price demanded, and knows that the vendor is unacquainted with the circumstances which enhance the value, he is nevertheless under no obligation to communicate these facts to the vendor. But whenever confidence is justly reposed by one party in the other, if there be undue concealment, relief will be decreed in favor of the party misled. It is also an important branch of equity jurisprudence to reform written agreements and other instruments which by reason of a mistake of facts do not adequately or accurately express the intentions of the parties. If the error or defect be clearly proved to exist, and be material in its effect upon the rights and interests of the parties, the instrument will be corrected so as to be conformable to their real purpose. This is true whether the mistake be established by written or by parol evidence. For while it is a general rule of interpretation that oral evidence shall not be admitted to vary the terms of a written instrument, yet this is not to be applied to cases where the existence of the written instrument itself is the subject of controversy. The mistake may consist in embodying too many or too few provisions in the instrument, or in erroneously expressing the substance of the agreement or transaction. But if the language adopted expressed the intention of the parties at the time when the instrument was drawn, though its legal effect proves to be different from what was anticipated, relief will not be granted, since the mistake is one of law. Nor will the court interfere when the parties to the instrument purposely omit certain clauses, leaving them to depend on an oral understanding. A written agreement may be set aside or cancelled when it is founded upon a mistake of fact, and the enforcement of it would be unconscientious and unjust. In all such cases a court of equity will grant relief only as between the original parties to the transaction or those representing them. GEO. CHASE. REVISED BY T. W. DWIGHT.

Mis'tletoe [Ang.-Sax. *mistletan*], a popular name for the parasitical, exogenous shrubs of the order Loranthaceæ, only a few of which are not true parasites. Of the three European species, the best known is the true mistletoe of tradition, the *Viscum album*, which grows upon apple, pear, linden, poplar, and other trees, but not very often upon the oak. This plant was revered by the ancient Teutons and Celts, and is still hung up at Christmas, and the old custom of kissing under it still exists. *Loranthus Europæus* is a common mistletoe in Southern Europe. The most common North American mistletoe E. of the Rocky Mountains is *Phoradendron flavescens*, but several other species of *Phoradendron* and *Arceuthobium* exist within the limits of the U. S., and many more of the former in Mexico. The whole order, which is not very clearly distinguished from Santalaceæ, contains some 25 genera and about 400 species, mostly tropical and largely American and Asiatic. The fruits of many contain a viscid substance from which bird-lime is sometimes made. This substance doubtless fixes the seeds to the bark of the tree upon which the future plant grows. The radicle pierces the bark, and draws nourishment from the sap of the tree. In some places the mistletoe seriously injures the growth of timber trees.

Mis'tral [Fr.; Provençal, *mistraou;* It. *maestro*, the "master"], a violent, gusty, and very dry N. W. wind that blows in winter over the western basin of the Mediterranean, often causing great damage by sea and land.

Mistral' (FRÉDÉRIC), b. at Maillane, in the department of Bouches du Rhône, France, Sept. 8, 1830; studied jurisprudence at Avignon, and published in 1859 a Provençal epic, *Mirèio*, which received a prize from the Academy, and was translated into English by H. Crichton (London, 1868) and Harriet W. Preston (Boston, 1872). The text of Gounod's opera *Mireille* is taken from this epic.

Mistret'ta, town of Sicily, in the province of Messina, about 10 miles from the sea and about 65 miles E. S. E. from Palermo. Mistretta is usually considered to have occupied the site of the ancient town of *Mytistratum* (by most writers identified with *Amestratus*), which was taken by the Romans (259 B. C.) and razed to the ground, the inhabitants being all slain or sold into slavery. The excavations in the rock which served the old town for granaries and reservoirs, and which were repaired by the Saracens, still exist. Pop. in 1874, 11,218.

Mi'tau, or **Mittau,** town of Russia, the capital of the government of Courland, is situated on a sandy plain watered by the Buller-Aa. It is mostly built of wood, its houses either forming narrow, crooked streets or lying separately, surrounded by gardens. Its castle is a fine building, restored, or rather rebuilt, in 1739 by Biron. Its manufactures and trade are of no consequence. Pop. 23,500, most of whom are Germans.

Mitch'am's, tp. of Clarke co., Ala. Pop. 960.

Mitch'el (JOHN), b. at Dungiven, county Derry, Ireland, Nov. 3, 1815, his father being a Unitarian clergyman; graduated at Trinity College in 1836; studied law and practised for several years; contributed to the local newspapers and the Belfast *Chronicle;* was editor of the Dublin *Nation* for several years; wrote *Hugh O'Neil* (1844), which brought him to public notice; in 1847 started the *United Irishman* in the interests of the advanced "Young Ireland party," and with the leaders was arrested in 1848, convicted of felony, and transported for fourteen years, but escaped in 1853; went to New York City, where he started the *Citizen*, advocating slavery, but gave it up, and started the *Southern Citizen* at Richmond, which failed; resided at Paris till the war broke out; returned to Richmond, edited

the *Enquirer* in the interests of the South, and also lost two sons in its forces; returned to New York and established the *Irish Citizen*, which soon failed; went to Ireland in 1874, where, unmolested, he was elected and returned to Parliament from Tipperary; being declared ineligible, he was again returned to Parliament, but further action was rendered unnecessary by his death on Mar. 20, 1875. Also wrote *Jail Journal* (1854), *The Last Conquest of Ireland —Perhaps* (1861), edited the poems of Thomas Davis and James C. Mangan, and added a continuation of McGeoghegan's *History of Ireland*.

Mitchel (Gen. Ormsby McKnight), LL.D., b. in Union co., Ky., Aug. 28, 1810; resided in early childhood at Lebanon, O.; became clerk in a store at Miami, O., when twelve years old; obtained in 1825 an appointment to a cadetship at West Point, where he graduated in 1829 in a class which included Robert E. Lee and Joseph E. Johnston. He was assistant professor of mathematics at West Point until 1831; studied law, was admitted to the bar, and practised in Cincinnati until 1834, when he was elected professor of mathematics, natural philosophy, and astronomy at Cincinnati College. In the spring of 1842 he gave a course of public lectures on astronomy, which resulted in the formation of a society for the purpose of procuring a telescope and the erection of an observatory. Prof. Mitchel was commissioned to procure the necessary apparatus in Europe, where he contracted for the telescope with Merz and Mahler of Munich. The cornerstone of the observatory was laid by John Quincy Adams Nov. 10, 1843, on Mount Adams, within the city limits, and the building was formally opened with the new telescope Apr. 14, 1845. The building of Cincinnati College having been destroyed by fire during the same year, and Prof. Mitchel receiving no salary as director of the observatory, he was obliged to look elsewhere for means of support. He accordingly divided his energies between his astronomical observations, the delivery of popular lectures on astronomy, and railroad surveys. He served as adjutant-general of Ohio 1848–49, and made two voyages to Europe (1853 and 1854) as chief engineer and agent of the Ohio and Mississippi R. R. The great work of Prof. Mitchel's life was the stimulus given to astronomy by his popular lectures, which were the direct cause of the establishment of observatories at Albany, Clinton, and Allegheny City, and his success at Cincinnati probably had an influence upon the speedier establishment of the observatories at Washington and Cambridge. He established in July, 1846, a popular scientific journal entitled *The Sidereal Messenger*, which was discontinued in 1848 from lack of support. In it, and in a school edition of Burritt's *Geography of the Heavens* which he prepared in 1849, Prof. Mitchel published his observations upon double stars in so far as they have yet been given to the world. In 1848, acting upon a suggestion of Prof. Sears C. Walker, he invented a chronograph for automatically measuring and recording right ascensions by electro-magnetic mechanism, nearly at the time a similar apparatus was constructed by Mr. Locke. In 1849 he devised a declinometer, or apparatus for the accurate measurement of large differences of declinations, which after successive improvements was in 1854 attached to the equatorial, the latter instrument having been firmly clamped to the meridian. During the ensuing five years (1854–59) many zones of faint stars were observed by its means, and nearly 50,000 observations were accumulated. Among the other achievements of Prof. Mitchel may be mentioned his discovery of the duplicity of certain stars, notably Antares; his numerous unpublished observations of nebulæ, solar spots, double stars, and comets (chiefly made in 1848–49); his determination of the longitude of Cincinnati with reference to Washington and St. Louis; the invention of an apparatus for personal equation; and the training of competent and enthusiastic astronomical observers, especially Mr. Henry Twitchell, who as assistant at the Cincinnati Observatory from 1846 to 1860 carefully executed the work laid out for him, and lent important aid in the construction of apparatus. In Aug., 1859, after it became evident that no provision would be made in Cincinnati for the independent support of the observatory in that city, Prof. Mitchel accepted the post of director of the Dudley Observatory at Albany, N. Y., which had been erected in accordance with plans furnished by him five years before. Here, with the assistance of Prof. George W. Hough, he constructed an improved declinometer, which has since proved eminently useful. In 1861 Prof. Mitchel tendered his military services to his country, was made brigadier-general of volunteers Aug. 9, and ordered to the department of Ohio. He distinguished himself by a forced march into Northern Alabama, seizing the railway between Corinth and Chattanooga, was made major-general Apr. 11, 1862, and given the command of the department of the South in September; but while making energetic preparations for the coming campaign was seized with yellow fever, and d. at Beaufort, S. C., Oct. 30, 1862. In November of the same year his name was conferred upon the observatory he had created at Cincinnati, which has since been rebuilt at Mount Lookout, and its support assumed by the city of Cincinnati. His principal publications were *The Planetary and Stellar Worlds* (1848) and *The Orbs of Heaven* (1851). A memoir was published in 1865 by Rev. P. C. Headley. Cleveland Abbe.

Mitch'ell, post-v. of Perth co., Ont., Canada, on the Goderich branch of the Grand Trunk Railway, 32 miles S. E. of Goderich. It has 1 weekly newspaper, manufactories, 8 churches, and a town-hall, and has a good trade in agricultural products. Pop. of sub-district, 1802.

Mitchell, county of S. W. Georgia. Area, 450 square miles. It is level, well timbered, and fertile. Cotton and corn are leading products. The county is bounded N. W. by the navigable Flint River, and is traversed by the South-western R. R. Cap. Camilla. Pop. 6633.

Mitchell, county of Iowa, bounded N. by Minnesota. Area, 576 square miles. It is undulating and fertile. Grain is the leading product. The county is traversed by the Red Cedar and Little Cedar rivers and the Cedar Falls and Minnesota R. R. Cap. Osage. Pop. 9582.

Mitchell, county of N. Kansas. Area, 720 square miles. It is traversed by Solomon River, is quite well timbered, and well adapted to growing stock and grain. In the S. there are saline lands. Cap. Beloit. Pop. 485.

Mitchell, county of North Carolina, bounded N. W. by Tennessee. Area, 530 square miles. It is mountainous, and abounds in iron, chrome, rutile, and other valuable minerals. Sheet mica is mined and exported. Fine marble and beautiful talc-slate are found. Grain is produced in the fertile valleys. Cap. Bakersville. Pop. 4705.

Mitchell, tp. of Cross co., Ark. Pop. 670.

Mitchell, post-v. of Marion tp., Lawrence co., Ind., on the Louisville New Albany and Chicago and the Ohio and Mississippi R. Rs., has 2 weekly newspapers, and is engaged in the produce trade. Pop. 1087.

Mitchell, post-v. and tp. of Mitchell co., Ia., on the Cedar Falls and Minnesota R. R. Pop. of v. 829; of tp. 1228.

Mitchell, tp. of Sheboygan co., Wis. Pop. 1124.

Mitchell (David Bradie), b. in Scotland Oct. 22, 1766; removed in 1783 to Savannah, Ga., where he had become heir to an estate; was chosen solicitor-general of Georgia 1795; major-general of militia 1804; governor of Georgia 1809–13 and 1815–17; made a treaty with the Creeks 1818. D. at Milledgeville Apr. 22, 1837.

Mitchell (Donald Grant), "Ik Marvel," b. at Norwich, Conn., Apr., 1822; graduated at Yale in 1841; passed three years on a farm; travelled in Europe; began to study law in 1846 in New York; published *Fresh Gleanings* (1847), *The Battle Summer* (1849), a record of his observations in 1848 in Paris; *The Lorgnette* (1850), *Reveries of a Bachelor* (1850), *Dream Life* (1851); was U. S. consul at Venice 1853–55; *Fudge Doings* was published in 1854; in 1855 he settled upon his farm near New Haven, Conn.; published (1863) *My Farm of Edgewood; Wet Days at Edgewood* (1864), *Seven Stories* (1865), *Doctor Johns* (1867), *Rural Studies* (1867). He is one of the most graceful and pleasing of American authors.

Mitchell (Elisha), D. D., b. in Washington, Conn., Aug. 19, 1793; graduated at Yale 1813; was a tutor there 1816–18; professor of mathematics in the University of North Carolina 1817–25, and afterwards professor of chemistry; was ordained to the Presbyterian ministry in 1821; was State surveyor, and lost his life, June 27, 1857, upon the Black Dome, or Mitchell's High Peak, the highest point E. of the Rocky Mountains. He was buried upon its top.

Mitchell (John), M. D., F. R. S., b. in England; settled at Urbanna, Va., about 1700. Devoting himself to botany, his information was of value to Linnæus, who named for him the *Mitchella repens;* prepared a *Map of the British and French Dominions in North America* (1755); wrote *Contest in America between Great Britain and France, etc.* (1757), and *Present State of Great Britain and North America* (1767); published essays on *Different Colors of People, Potash*, and *Electrical Cohesion* in *Phil. Trans.*, vols. xliii., xlv., li. Returned to England about 1767, where he d. Mar., 1768. His tracts on botany were published in 1769 as *Dissertatio brevis de Principiis Botanicorum et Zoologorum, etc.* Among his unpublished MSS. a paper on the yellow fever as it appeared in Virginia in 1737, 1741, and 1742 was valuable to Dr. Rush in his experience with that epidemic in 1793, and was published in the *Am. and Med. Reg.*, vol. iv.

Mitchell (John), b. at Chester, Conn., Dec. 29, 1794; graduated at Yale College 1821; studied at Andover Theological Seminary, and became a Congregational clergyman; edited the New Haven *Christian Spectator* 1824–29; licensed to preach 1829; pastor of the First church at Fairhaven, Conn., 1830–36, and of the Edwards church, Northampton, Mass., 1836–42, when the state of his health forced him to abandon preaching, and he made a European tour, after which he settled at Stratford, Conn., and devoted himself, as far as feeble health would permit, to literary avocations. He published *The Practical Church Member* (1835), *A Guide to the Principles and Practices of the Congregational Churches of New England* (Northampton, 1838), *Letters to a Disbeliever in Revivals, Notes from Over the Sea* (2 vols., 1844), *Reminiscences of Scenes and Characters in College, by a Graduate of Yale of the Class of 1821* (New Haven, 1847), *My Mother, or Recollections of Maternal Influence* (1849), and a novel, *Rachel Kell, or the Disowned, a Tale of Country Life*, besides occasional sermons and magazine articles. In his later years he took some part in politics, and was once or twice a member of the Connecticut legislature. He was a gentleman of culture and rare excellence of character. D. at Stratford Apr. 28, 1870.

Mitchell (John Kearsley), M. D., b. at Shepherdstown, Va., May 12, 1798; graduated at the University of Pennsylvania 1819; made three voyages to China as ship's surgeon; settled in 1822 in Philadelphia; began in 1824 to lecture on physiology and institutes of medicine in the Philadelphia Institute; became in 1826 professor of chemistry there; in 1833 began to lecture in the Franklin Institute on chemistry applied to the arts; became professor of the theory and practice of medicine in the Jefferson Medical College 1841; author of many valuable lectures, essays, and scientific papers, a volume of poems, and a treatise *On the Cryptogamous Origin of Malarious and Epidemical Fevers*. D. at Philadelphia Apr. 4, 1858.

Mitchell (Maria), b. at Nantucket, Mass., Aug. 1, 1818, of Quaker parentage; assisted her father in his favorite astronomical studies; gave special attention to the study of nebulæ and of comets; received in 1847 a gold medal from the king of Denmark for the discovery of a comet; was afterwards employed upon the Coast Survey and the *Nautical Almanac;* became in 1865 professor of astronomy in Vassar College, and is a member of various learned societies.

Mitchell (Nahum), b. at East Bridgewater, Mass., Feb. 12, 1769; graduated at Harvard 1789; was admitted to the bar 1792; was member of the Massachusetts legislature 1798–1812, except one term in Congress 1803–05; State senator 1813–14; circuit judge 1811–19; chief-justice of common pleas 1819–21; treasurer 1822–27; commissioner for settling boundaries between Massachusetts and Rhode Island and between Massachusetts and Connecticut; librarian and treasurer of the Massachusetts Historical Society for several years, and filled numerous other posts of trust and responsibility. With Bartholomew Brown he edited the *Bridgewater Collection of Sacred Music*, which was for many years the standard in New England, more than 100,000 copies having been sold. Judge Mitchell will be chiefly remembered, however, for his *History of Bridgewater* (1840), the first extended and accurate town-history published in America, with genealogical tables. Judge Mitchell was descended from Experience Mitchell, prominent among the early Pilgrims. D. at East Bridgewater Aug. 1, 1853.

Mitchell (Hon. Peter), b. at Newcastle, New Brunswick, Jan. 4, 1824; entered public life in 1856, and has since been distinguished as a legislator and leader of the confederation party in his native province, in which he has held important public positions. Since 1867 he has been minister of marine and fisheries for the Dominion of Canada.

Mitchell (Robert B.), b. in Richland co., O., 1828; educated at Washington College, Pa.; became a lawyer; served as an officer of Ohio volunteers in the Mexican war; took an active part in the Kansas struggle, having gone thither in 1856; was treasurer of Kansas 1858–61; adjutant-general 1860–61; in the U. S. volunteer service during the war of 1861–65, at first a colonel, and afterwards as brigadier-general; was badly wounded at the Wilson's Creek fight, and was governor of New Mexico 1865–67.

Mitchell (Samuel Augustus), b. in Connecticut in 1792; removed in early life to Philadelphia; published a series of twenty-four geographical works which attained a wide popularity; d. in Philadelphia Dec. 20, 1868.

Mitchell (S. Weir), M. D., b. Feb. 15, 1829, in Philadelphia, a son of Dr. J. K. Mitchell; graduated in 1850 at the Jefferson Medical College; well known for his researches on serpent-poisons, nerve-physiology, the respiration of tortoises, etc., published in the *Smithsonian Contributions*, etc.; author of a work on the *Cryptogamous Origin of Malarious and Epidemic Fevers*, etc.

Mitchell (Stephen Mix), LL.D., b. at Wethersfield, Conn., Dec. 20, 1743; graduated at Yale 1763; was tutor there 1766–69; became a lawyer of his native town 1772; associate judge of the Hartford county court 1779, its presiding judge 1790; judge of the superior court of the State 1795, its chief-justice 1807–14; was in Congress 1783 and 1785; U. S. Senator 1793–95. D. at Wethersfield Sept. 30, 1835.

Mitchell (Sir Thomas Livingstone), D. C. L., F. R. S., b. in Stirlingshire, Scotland, in 1792; entered the army in Portugal at the age of sixteen; was aide-de-camp to the duke of Wellington, and afterwards on the staff of the quartermaster-general till the end of the Peninsular war; was afterwards sent back to Spain as a member of Sir Henry Torrens' survey of the fields of battle; in 1827 was appointed deputy surveyor-general of New South Wales, and ultimately became surveyor-general, filling that post until his death. In that capacity he conducted four daring expeditions into the great deserts of Australia; discovered Mount Byna, the vast region called Australia Felix, the Red, Peel, Nammoy, and Victoria rivers, explored the courses of the Darling and Glenelg rivers, and mapped out a practicable route between the colonies of Victoria and South Australia. He published in 1838 an account of his first three expeditions, and in 1848 his *Journal* of the heroic but unsuccessful effort to reach the Gulf of Carpentaria from Sydney. He also published several elementary geographical and military treatises, and an account of a "boomerang propeller" invented by him for steam vessels. He was knighted in 1839, made a colonel in 1854. D. at Park Hall, near Sydney, Oct. 5, 1855.

Mitchell (William L.), b. Aug. 25, 1805, in Henry co., Va.; moved to Georgia when a boy; graduated at the State University in 1825; studied law, and was admitted to the bar; rose to distinction in his profession, and in 1867, after the death of Judge Lumpkin, was put at the head of the Lumpkin Law School, one of the departments of the State University, which he still holds. He has also been one of the trustees of the university for a number of years. A. H. Stephens.

Mitchell's, tp. of Pike co., Ala. Pop. 1251.

Mitchell's, tp. of Bertie co., N. C. Pop. 856.

Mitchell's High Peak. See Black Mountain.

Mitchell's Mills, post-tp. of Elmore co., Ala. P. 640.

Mitch'elltree, tp. of Martin co., Ind. Pop. 1026.

Mitch'ellville, post-v. of Polk co., Ia., on the Chicago Rock Island and Pacific and the Des Moines Valley R. Rs.

Mitch'ie, post-v. (called also Selma Landing) and tp. in Monroe co., Ill., on the Mississippi River. Pop. 799.

Mitch'ill (Samuel Latham), M. D., LL.D., b. at Plandome, North Hempstead, N. Y., Aug. 20, 1764; took his medical degree at Edinburgh 1786; studied law, and was a commissioner to treat with the Six Nations 1788; became in 1792 professor of chemistry, etc. in Columbia College; was 1797–1813 editor of the *Medical Repository;* was in Congress 1801–04 and 1810–13; U. S. Senator 1804–09; held professorships in the College of Physicians and Surgeons, N. Y., 1808–26; vice-president of the Rutgers Medical School 1826–30; was active in establishing learned societies and in scientific observation; author of several works, mostly upon natural and physical science, besides numerous papers of value. He was one of the fathers of natural science in America. D. in New York Sept. 7, 1831.

Mite. See Acarus.

Mit'ford (Mary Russell), b. at Alnsford, Hants, Dec. 16, 1786; published in early life some volumes of poems, and then became a successful and highly popular prose-writer. Her principal works are *Our Village*, a series of pleasant sketches (5 vols., 1824–32), *Belford Regis, Country Stories, Recollections* (1852), *Atherton and other Tales* (1854), and a number of dramas, of which *Rienzi* (1828) was the most successful. (See her *Life and Correspondence*, edited by Rev. A. G. K. L'Estrange, 3 vols., 1869.) D. Jan. 10, 1855.

Mitford (William), b. in London Feb. 10, 1744; was educated at Queen's College, Oxford, where he studied little but Greek; retired to his Hampshire estate, and often sat in Parliament; became professor of history in the Royal Academy; wrote *An Inquiry into the Principles of Harmony in Languages* (2d ed. 1804), and *History of Greece* (5 vols., 1784–1815), long regarded as a standard work. It is written from the aristocratic standpoint. The best edition (8 vols., 8vo, 1838) has the notes of his brother, Lord Redesdale. Mitford d. Feb. 8, 1827.

Mith'ra, or **Mithras** [Sansk. *Mitra*], one of the earliest divinities of the Aryan race, whose worship, well known to

the Indians in Vedic times, was considerably modified by the Mazdeism of Zarathrestra, subsequently greatly extended in the later Persian empire, and even became a favorite at Rome and the Western cities during the second and third centuries A. D. Mithra in the Zendic religion was originally the highest of the twenty-eight divinities of the second class in the Persian pantheon, and of the seven *amshaspands* subordinate to the Ized or ruler of the universe; but at a later day he became the equal, and ultimately the superior, of Ormuzd, and was identified with the Sun himself. Monuments of the Mithra-worship have been found in Rome, and even at Marseilles and Frankfort-on-the-Main, in which the god is represented as a beautiful youth clad in Phrygian garb, kneeling upon an ox, into whose neck he plunges a knife, and surrounded by allegorical emblems of the sun and the twelve signs of the zodiac. The "mysteries" of Mithra were a peculiar feature of this religion; they were celebrated chiefly at the winter solstice, Dec. 25. The Mithra-worship was suppressed by law in the Roman empire 378 A. D., but lingered for centuries in the East, until extinguished by Islam. (See Lajard's great work, *Le Culte de Mithra,* and K. O. Müller's *Monuments of Ancient Art.*)

Mithrida'tes VI., king of Pontus, surnamed EUPATOR, or more generally THE GREAT, b. at Sinope, the capital of the kingdom, in 136 B. C.; succeeded his father in 124 B. C.; conquered during the first period of his reign the territories along the northern coast of the Euxine as far as Chersonesus Taurica; incorporated the kingdom of Bosporus farther to the W.; turned then to the countries S. of the Euxine, attacked Cappadocia and Bithynia, and met here with the Romans. Three wars ensued, known in the history of Rome as the Mithridatic wars—namely (1) 88–85 B. C.; (2) 83–82 B. C.; and (3) 74–66 B. C. They are fully described under SULLA, LUCULLUS, and POMPEY, and ended with the complete defeat of Mithridates, who retreated behind the Euxine, and killed himself at Panticapæum, where he was besieged by his own son, Pharnaces, in 63 B. C. Nevertheless, the Romans considered him as the most formidable enemy the republic had ever had to contend with, and he was evidently a highly gifted man, both as a general and a statesman. He had received a Greek education and spoke twenty-two languages, and, although he was an Asiatic despot in all his measures and in his whole character, he had a fine taste for art and science. His collection of gems and his library of medical books were very celebrated.

Mit'la [Aztec, *Mictlan,* "place of the dead"], a vast ruined city in Mexico, 15 miles S. E. of Oaxaca, supposed to have been built by predecessors of the Zapoteco race, who now occupy that region. The monuments, consisting of immense palaces and temples, are adorned with a high degree of art, and are still in tolerable preservation. (See Charnay's *Ruines américaines* (1860) and the accompanying magnificent collection of photographs.)

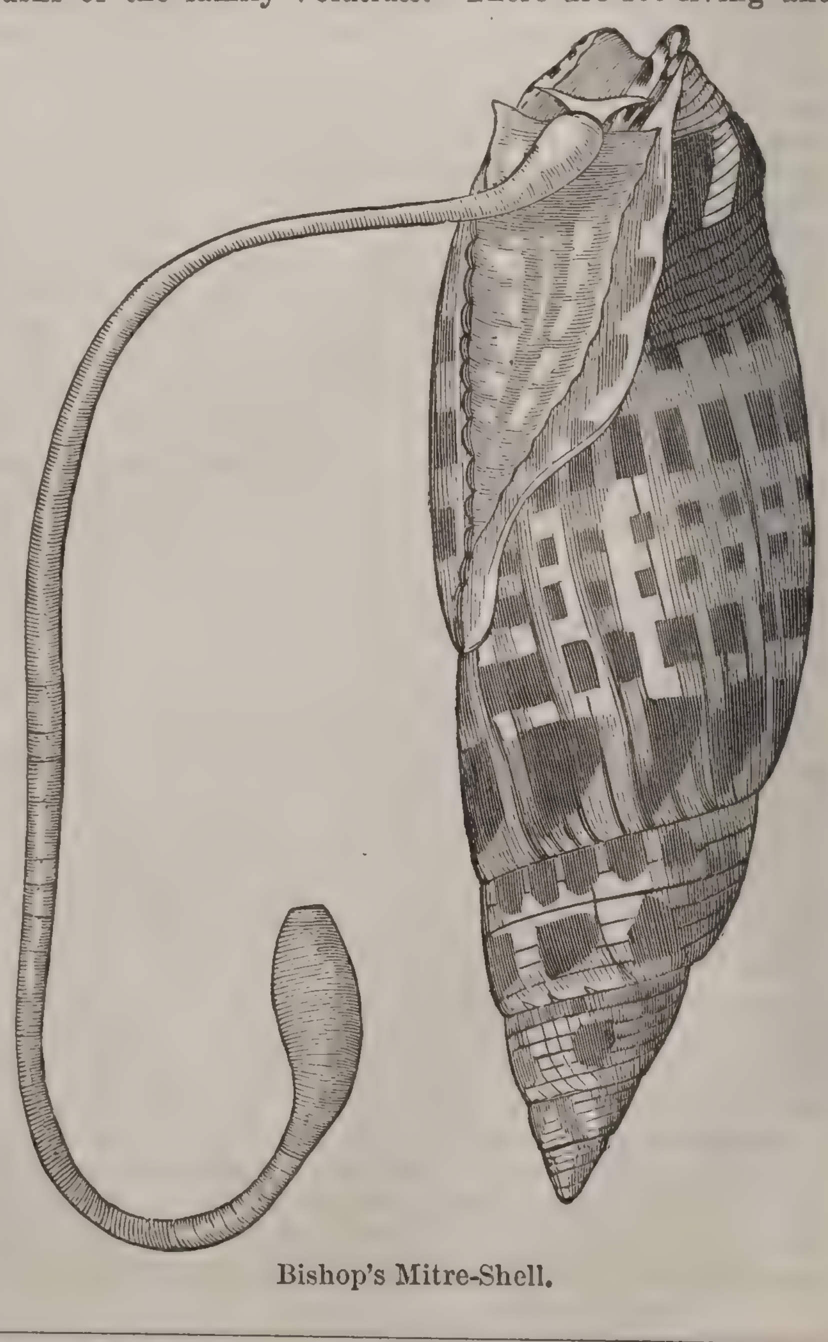
Mitrailleuse', a gun in which several barrels are combined in order to produce a greater effect by the rapid succession of a number of shots. Mitrailleuses existed as early as the fourteenth century. They were called *killing-organs* at that time; and artistically elaborated specimens, among which are also some breech-loaders, are found in the arsenals and museums of Vienna, Berlin, Rome, Constantinople, Moscow, and Sigmaringen. The Scaligers at the end of the fourteenth century, the Protestant princes of Germany in the Smalkaldian war, and Austria in the wars against Turkey, used this kind of guns. But the ancient mitrailleuse differs from the modern both in dimensions and in the position of the barrels. A peculiar kind of mitrailleuse was the *éspingol,* each barrel being loaded with several shots, which, by a slowly-burning charge, were discharged one after the other. The *éspingol* was used not only in the Middle Ages, but also recently—by the Danes in 1848–50 and 1863–64. At the storming of Düppel the Prussians took about thirty such guns. As it became evident, however, that a case-shot from a single-barrelled gun produced the same effect as the mitrailleuse, but in a higher degree, the mitrailleuse went generally out of use until recently an American inventor brought the old gun into fashion again under a new form. (See GATLING GUN.)

Mi'tre [Lat. *mitra;* Gr. μίτρα], in the Roman Catholic Church (Latin rite), the official head-dress of bishops and of certain abbots and other dignitaries. It has two points, and symbolizes the cloven tongues of fire which sat upon the apostles' heads at the great Pentecostal season. It is made of the richest and most costly materials.

Mitre (Gen. BARTOLOMÉ), b. at Buenos Ayres June 26, 1821; received a careful education, and early distinguished himself in literature; resided at Montevideo during the earlier period of the nine years' siege of that city, and aided in the defence both with sword and pen while engaged in historical researches; in 1846 proceeded to Bolivia, where he became a journalist and instructor in tactics at a military college, published a romance entitled *La Soledad,* and was engaged as an officer of the Bolivian army in a war with Peru; afterwards resided in Valparaiso, Chili, founded a newspaper, became favorably known as a poet, took an active part in politics, and was once exiled to Peru for his supposed connection with a conspiracy set on foot by the liberal party; returned to Montevideo in time to take an active part as colonel of artillery in the overthrow of Rosas at Monte Caseros, Feb. 3, 1852; was a leader in the movement at Buenos Ayres against Gen. Urquiza in the following September, resulting in the quasi independence of that province from the Argentine Confederation. Mitre engaged in journalism, literature, and politics; wrote his principal work, *Historia de Belgrano;* was minister of war under the administration of Obligado and Alsina, in which capacity he led the provincial forces in the campaign against Pres. Urquiza, which terminated in a defeat at Cepeda, Oct. 23, 1859, and resulted in the reunion of the seceded province to the Argentine Confederation, in accordance with the treaty of San José de Flores, Nov. 10, 1859. Mitre was chosen governor of Buenos Ayres in May, 1860; was made brigadier-general in July, and new difficulties having arisen with the federal government in 1861, he gained a signal victory over the national forces under command of Gen. Urquiza at Pavon, Sept. 11 of that year. As a consequence, Pres. Derqui was forced to resign, the "Confederation" was dissolved, Mitre became president *ad interim* in October, and called a congress, which met at Buenos Ayres May 25, 1862, and formed a constitution for the nation, which was thenceforth styled the "Argentine Republic." Mitre was elected president for six years in October, and administered the government with such skill and success that the country enjoyed a period of unprecedented prosperity. During the war between Paraguay and the triple alliance of Brazil, the Argentine Republic, and Uruguay he was for more than two years commander-in-chief of the allied forces. During the administration of his successor, Domingo F. Sarmiento, Mitre was sent as special minister to the Brazilian court to conclude a treaty. In the electoral campaign of 1874, Mitre presented himself as a candidate for the presidency, but being defeated by Dr. Avellaneda, he headed a rebellion which broke out Oct. 1. The attempt proved a failure, and the once-honored statesman accepted the amnesty tendered him, and has since remained in obscurity.

CHARLES A. WASHBURN.

Mi'tre-Shell (*Mitra*), a large genus of gasteropod mollusks of the family Volutidæ. There are 400 living and



Bishop's Mitre-Shell.

100 extinct species. The Philippine Islands are their geographical centre and principal habitat. The extra-tropical species are minute. The proboscis is long, and the animal emits an offensive, strong-smelling purple liquid. The bishop's mitre (*M. episcopalis*) is a fine shell from the Pacific Ocean.

Mit′rowicz [anc. *Sirmium*], town of Austria, on the Military Frontier, on the left bank of the Saave, has many interesting Roman antiquities, and is celebrated for the wines produced in its vicinity. Pop. 5200.

Mitsch′erlich (Eilhard), b. at Neuende, in the grand duchy of Oldenburg, Jan. 7, 1794; studied philology and Oriental history at Heidelberg, Göttingen, and Paris, but devoted himself from 1818 exclusively to chemistry. His discovery of the law of isomorphism attracted the attention of Berzelius, on whose invitation he went to Stockholm in 1819. In 1821 he was appointed professor of chemistry at the University of Berlin, which position he held till his death, Aug. 28, 1863. His principal work is his *Lehrbuch der Chemie* (1829–41), besides which he communicated a number of valuable papers on dimorphism, the formation of artificial metals, benzine, the formation of ether, etc. to the *Transactions* of the Berlin Academy and to Poggendorf's *Annalen*.

Mit′termaier (Karl Joseph Anton), b. at Münich Aug. 5, 1787; studied law at Landshut and Heidelberg, and became professor of jurisprudence in 1811 at Landshut, in 1819 at Bonn, and in 1821 at Heidelberg, where he d. Aug. 28, 1867. He was member of the legislature of Baden for many years, and president of the German Parliament in Frankfort in 1849, but his influence was mostly due to his books, embracing almost every department of jurisprudence, and advocating throughout liberal and progressive measures, publicity of all legal proceedings, trial by jury, etc. His *Theorie des Beweises im peinlichen Prozesse* (1821), *Die Lehre vom Beweise im Deutschen Strafprozesse* (1834), and *Anleitung zur Vertheidigungskunst*, have been translated into several other European languages.

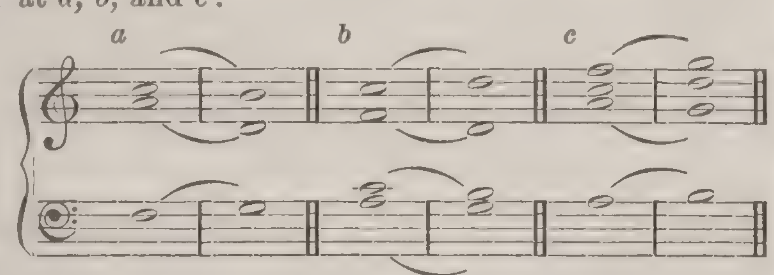
Mittineague′, post-v. of West Springfield tp., Hampden co., Mass., on the N. bank of Agawam River and on the Boston and Albany R. R., has good water-power and important manufactures.

Mitt′weida, town of Germany, in the kingdom of Saxony, has large manufactures of linen, woollen, and cotton fabrics. Pop. 7969.

Mitylene. See Mytilene.

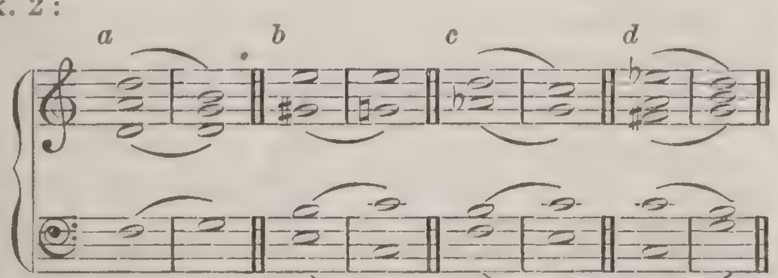
Mixed Cadence, in music, a term sometimes applied to such cadences as differ from those commonly known as the "perfect," the "imperfect," and the "plagal." The most common mixed cadence is that consisting of the subdominant harmony followed by that of the dominant, as in Ex. 1 at *a*, *b*, and *c*:

Ex. 1.



Several other mixed cadences may be seen at *a*, *b*, *c*, and *d* in Ex. 2:

Ex. 2.

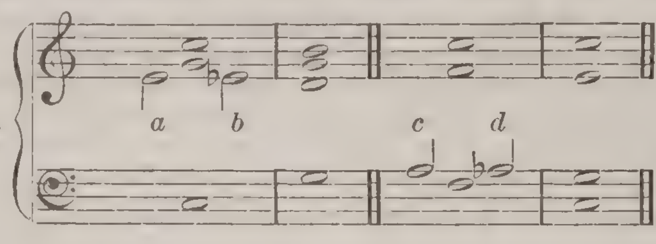


William Staunton.

Mixed Mathematics, the application of mathematical principles to scientific investigations or to practical constructions in the arts. The term is used in contradistinction to the term pure "mathematics," which is applied to the investigations of the purely scientific principles of mathematics. W. G. Peck.

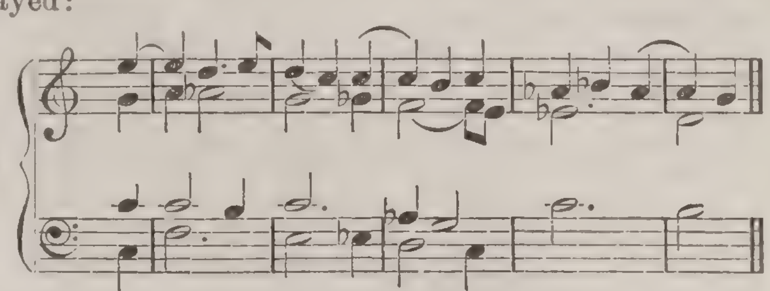
Mixed Modes. In modern music much of the variety and beauty of the harmony often arises from the mingling of chords belonging to one of the modes with the regular progressions of a composition written in the other. This occurs most frequently when in the course of a piece in the *major* mode certain harmonies are borrowed from the corresponding *minor*, and are substituted for those which would naturally occur. By a skilful use of this device many of the most striking and expressive traits of the minor mode may be transferred and incorporated into the major mode, thereby enriching that mode with new and singularly beautiful effects, and also surprising the ear by a train of unexpected and graceful turns of the harmony, such as could not be produced by the ordinary progressions of either of the modes exclusively. The chief characteristic intervals of the modes are the third and sixth, with the diminished seventh of the minor. Those belonging to the *minor*, when judiciously transferred into music of the major mode, as passing harmonies, not implying or leading into other keys, give a new interest and coloring even to very commonplace ideas, and are also the source of the grandest as well as the most elegant and pathetic developments of modern musical art. In its simplest form this mixing of modes occurs when, for instance, we change the *major* triad of the tonic or subdominant into the corresponding *minor*. Thus, in Ex. 1 the tonic triad of C major at *a* is exchanged at *b* for the tonic triad of C minor; and at *c* and *d* a similar change takes place with the subdominant triad:

Ex. 1.



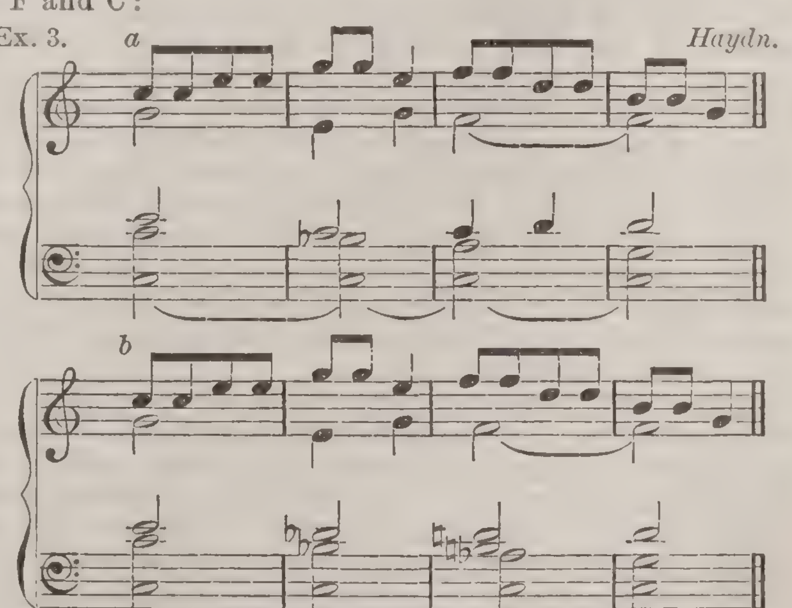
It is quite evident here that the harmony at *a* and *c* belongs to the scale or key of C *major*, while that at *b* and *d* is derived from C *minor*. On the same principle are to be interpreted such progressions as those in Ex. 2, where several intervals of one mode are exchanged for those of the other (major yielding to minor), as indicated by the accidental flats. N. B. By *omitting* all the flats, the example will be reduced to simple major harmony, and may be so played:

Ex. 2.



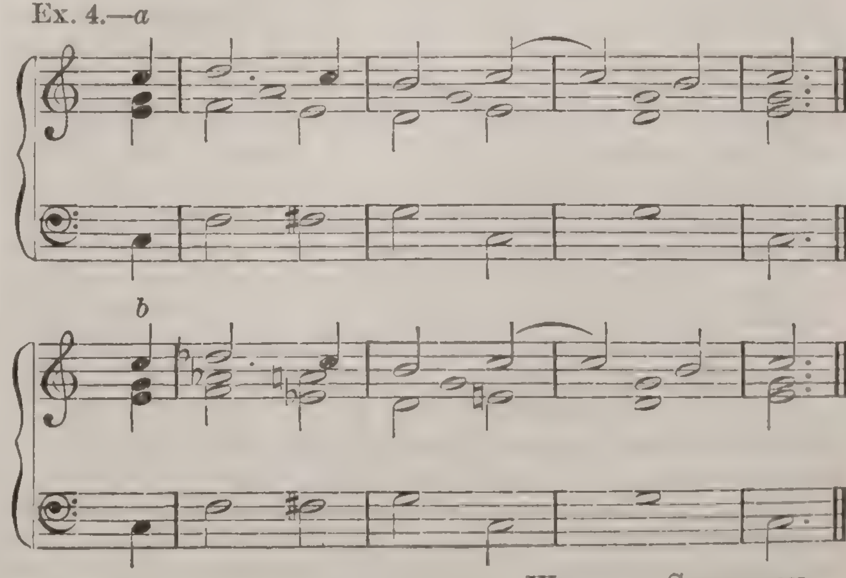
The superior richness of effect thus obtained by the mixture of modes will be still better apprehended by comparing the plain harmony of Ex. 3 at *a* with that at *b*, where two diminished sevenths are borrowed from the minor scales of F and C:

Ex. 3.



Compare also the passage at *a* in Ex. 4 with the harmony given at *b*, the mysterious beauty of which latter arises altogether from the adoption of two chords (in the first full bar) belonging to foreign scales:

Ex. 4.—*a*



William Staunton.

Mixed Number, a number which is made up of an integral and a fractional part. Thus, $2\frac{1}{4}$ is a mixed number; numbers made up of an entire and a decimal part, as 2.25, are called *mixed decimals*. W. G. PECK.

Mixed Quantity, a quantity made up of an entire and a fractional part. Thus, $a + \frac{b}{c}$ is a mixed quantity. The numerical value of a mixed quantity may or may not be a mixed number; thus, in the example just given if $a = 2$, $b = 3$, and $c = 4$, the mixed quantity is also a mixed number equal to $2\frac{3}{4}$, but if $a = 2$, $b = 6$, and $c = 3$, the quantity is an entire number equal to 4. W. G. PECK.

Mixed Races. The union of parents belonging to two distinct varieties of mankind gives rise to a mixed race, which usually blends in some measure the bodily characters of the two parent races. The intermediate complexion, hair, and features thus produced may be best traced in the descendants of whites and negroes, from the yellow-brown, crisp-haired, mulattoes of the first generation, down to the children of whites and octoroons in the fourth generation, in whom negro blood may no longer be evident in the skin and hair, though a faint violet tinge of the finger-nails may remain. In crossing between races less different in complexion the absorption takes place sooner; thus, in Texas a single admixture of Mexican blood would be hardly observable beyond the second generation in a family otherwise of European descent. Thus, there is considerable justification for the popular terms describing mixed races as "half-breed," "quarter-blood," "octoroon," etc., as if their constitutions were made up by arithmetical fractions of the constitutions of their parents. This mode of estimation, however, though useful for general guidance, makes no approach to scientific accuracy. As in cross-breeds of other animals, so in man, some elements of parentage preponderate over others. One of the parent races may impress its type on the offspring more strongly than the other. In Russian Asia the hybrid race sprang from Russian fathers and Tatar mothers, and are described as showing the maternal Mongolian type, with high cheek-bones, oblique eyes, and coarse black hair, rather than the paternal Slavonic type. Such preponderance may also depend in some measure on sex. Thus, Nott and others maintain that the children of negro fathers and European mothers partake more of the negroid character than those of European fathers and negro mothers. Also, as is usual in crossed breeds of animals, reversion is apt to take place toward one or other of the parent types. This reversion is often noticed in a striking way in the same family where the parents are of different races, some of the children taking after one parent and some after the other. The four children of a negro father and an Arab mother, according to Pruner, were two of the father's and two of the mother's complexion. There are numerous accounts of mulatto and quadroon families where some of the children have strongly tended toward the negro and others toward the white type. Many observations on these subjects have been collected by Waitz and others, but the results hardly yet admit of generalization.

It may be laid down as a general rule that any two races of mankind are capable of producing offspring. This is in great measure actually proved by the existence of crossed races in endless variety of combination. Of these mixed races, experience shows that some become permanent populations, such as would continue and increase indefinitely if left to themselves without further foreign admixture. The Griquas of South Africa, mostly of European-Hottentot descent, and the Kuruglis of North Africa, of Turkish-Moorish descent, are mixed races well able to thrive. The *mestizo* populations of Mexico, Paraguay, Caraccas, mainly of Spanish mingled with indigenous American blood, have already some uniformity of type, and if undisturbed might no doubt in the course of ages, by intermarriage among themselves, become fused into a distinct sub-race of mankind, differing from the Southern European by a yellower complexion, stiffer and coarser hair, and a slightly oblique set of the eyelids. It is evident that such crossing of races, and the fusing of the result into a homogeneous whole, has been one of the most widely-acting processes which have shaped the national types both of the Old and New Worlds. It has, on the other hand, been argued that there are races between whom no permanent mongrel race can be formed, either because few children are born, or because such children or their descendants are short-lived or sterile. This may to a certain extent be true, but in such arguments the effects of social causes have sometimes been mistaken for physical failure. To take a striking instance, the scarcity of half-breeds in Australia between the indigenes and the white colonists has often been appealed to as proving these two races incapable of forming an intermediate race; but the real cause is now well known to have been that the blacks themselves habitually killed the half-caste children. In more ordinary cases, where half-castes, with the aspirations of a higher race and the status of a lower, are thrust by social pressure into a despised and disorderly life, the unfavorable effect of these conditions on the permanence and increase of their race is evident. Thus, it is not to be wondered at that in Western South America the Zambos, mongrels of mixed European, negro, and indigenous American races, should be prominent among the criminal class, or that in the East Indies the Portuguese-Malay half-castes should be sunk in a deplorable condition of misery, sloth, and moral degradation. In the second of these two instances it is probable that there is physical as well as moral failure. Apart from social causes, physical failure of a mixed race seems oftenest due to unsuitability of one of the parent races to the climate. Thus, while the English-Maori half-breeds in New Zealand are a strong and healthy race, the Dutch-Malay half-breeds in Java (known as Liplaps) are weakly in body and mind, and are said to die out in three generations. Yet the vitality of this mixed race, low as it is, is higher than that of the unmixed or creole whites in the district.

The terms invented to denote the various race-combinations in America are very numerous, but have been used so indefinitely that only a few of the principal ones have any ethnological accuracy. The first cross between white and negro are *mulattoes* (Spanish, *mulato—i. e.* "muled"); the second cross, white with mulatto, are *quadroons* (Spanish, *quarteron—i. e.* "quarter-bred"); the third class, white with quadroon, are *octoroons*, a word formed on the model of the last, to denote "eighth-bred" (Spanish, *octavon*). Here the negro blood is reckoned fractionally, but other terms, now out of use, were applied to the number of generations; *tercerons* were mixed-bred of the third generation, and therefore the same as the above quadroons, and *quinteroons* were mixed-bred of the fifth generation, children of white and octoroon. The race sprung from Europeans and indigenous Americans are usually known by the Spanish term *mestizos* (*i. e.* "mixed-bred," from Latin, *mixtus*); the next cross, of mestizos with whites, being called *castizos* (*i. e.* "of good caste"). Even such simple terms as these cannot always be depended on, the crosses of Europeans with African and with native American blood being often confounded under the same designation. Among other well-known terms are *zambo* or *sambo* (Sp., meaning "bandy-legged"), which is applied either to the negro-American cross (such as negro with Aztec or Peruvian) or to the quarter-bred offspring of negro with mulatto. To this last combination, or to the mulatto, the name of *griffin* (from the composite nature of this fabulous animal) especially belongs. The term *saltatras* (Sp., "leap-back") is used for the quadroon-mulatto cross, as tending back toward the negro; but the similar word *tornatras* ("turn-back") describes a mestizo cross returning toward the white. The epithets *lobos* (Sp., "wolves"), *coyotes* (Mexican, "jackals"), and *cholos* (in Peru, "dogs") are bestowed more or less indefinitely on mixed populations of Spanish America. As if to increase the confusion, names of foreign peoples are brought in to describe native mixed castes. Thus, quadroons have been called *Moriscos* (Moors), while European-American mestizoes are known in Brazil as *Mamelucos* (Mamelukes), and elsewhere in South America as *Chinos* (Chinese). E. B. TYLOR.

Mixte'cas, a nation of Indians in Mexico occupying the mountains in the W. of Oaxaca, the E. of Guerrero, and the S. of Puebla. According to their traditions, they came from the N. some centuries before the Spanish conquest, and subdued the Popoloca or Chuchon tribes, the original occupants of the soil, who still occupy several mountainous recesses of the country. They at one time extended their empire to the Isthmus of Tehuantepec, but were driven from the valley of Oaxaca northward by the Zapotecas, and by the Aztecs southward from the valley of Puebla. They were a brave and warlike people, and are now intelligent Mexican citizens. Their language, which is of the Zapoteco family, is rich and melodious, and is still spoken in a considerable number of dialects. A grammar by Fray Antonio de los Reyes was published at Mexico in 1593, a copious dictionary was compiled by Fray Diego Rio, and several catechisms and religious treatises in the Mixteco language have been printed. The extensive region inhabited by these Indians, though forming part of three states, is currently known in Mexico as the *Mixteca*, which is divided according to altitude into *Alta* and *Baja*. The principal towns are Huajuapam, Yanhuixtlan, Tlaxiaco, and Tepozcolula.

Mix'ture [Lat. *mixtura*], the name of one of the compound stops in a large organ. It consists of from two to five ranks of small metallic pipes, tuned in double and triple octaves, thirds, and fifths above the diapasons. In

this respect it resembles the sesquialtera and furniture stops, but differs from them in being higher and shriller. The two smaller ranks of the mixture (sounding the 26th and 29th) usually change or "break" on the upper part of the organ scale (or range of keys) into the 19th and 22d—*i. e.* an octave lower. The necessity of such "breaking" in these compound stops arises from the obvious fact that the pipes in their upper ranks would otherwise be too small and feeble in sound to be of any practical use.

WILLIAM STAUNTON.

Mnemon'ics, or **Mnemotech'ny** [Gr. μνήμη, "memory," and τέχνη, "art"], the art of assisting recollection by methods of association. The first to devise anything of this sort is said to have been Simonides, the Greek poet (500 B. C.), of whose method both Cicero (*De Orat.*, ii. 86–88) and Quintilian (*Instit.*, xi. 2) have spoken. In modern times we have various attempts to the same end, the most important of which are the *Memoria Technica* of Richard Grey (1730; new ed. Lond., 1851) and *The New Art of Memory* by Gregor von Fainaigle (Lond., 1812), whose system was further carried out by Aimée Paris in his *Principes et Applications diverses de la Mnémotechnie* (Paris, 1833). The common aim in all these methods is to associate the thing to be remembered with something else which it is thought can be more easily recalled. Thus, the method of Simonides was to form in mind the picture of some large place or building whose different parts in their order were to be made perfectly familiar to the thoughts, and then whatever was to be committed to memory was to be associated with these parts in the same order. In this way, by recalling at will the various parts of the building, it was supposed that the recollection of the various objects therewith associated might be brought equally within our control. This was deemed specially advantageous to an orator or a listener in committing to memory the parts of a discourse in their order, which parts are hence still spoken of as in the first *place*, the second *place*, and so on. The method of Fainaigle was similar to this, to which he added, in order to recall dates or sums, the substitution, for the numbers, of letters which were to be formed into words. The following table will illustrate how this may be done:

a	*e*	*i*	*o*	*u*	*au*	*oi*	*e*	*ou*	*y*
1	2	3	4	5	6	7	8	9	0
b	*d*	*t*	*f*	*l*	*s*	*p*	*k*	*n*	*z*

This table is at the outset, and once for all, to be committed thoroughly to memory, so that the numbers corresponding to the letters may at any moment be recalled. Then, if one wishes to recollect, *e. g.*, that Constantinople was captured by the Turks A. D. 1453, let him think of Constantinople as Constantino*boli*, because the letters *b o l i* represent in the table 1453.

While the dependence of the recollection upon the law of association is undoubted, very little practical utility will be found in any of these artificial and arbitrary methods devised for any mind by another. Each mind should notice what sort of associations are most facile to itself, and should use these in its own way for the assistance of its memory. "If any one ask me," said Quintilian (*Instit.*, xi. 40), "what is the only and great art of memory, I shall say that it is *exercise* and *labor*. To learn much by heart, to meditate much, and, if possible, daily, are the most effective of all methods. Nothing is so much strengthened by practice or weakened by neglect as memory."

J. H. SEELYE.

Mnemotechnics. See MNEMONICS.

Mo'a, the name given by the natives of New Zealand to a large bird, of the former existence of which they preserve a tradition, and which by that tradition is referred to the eagle tribe. The name, however, has been without much question assigned, and is now accepted as belonging, to species of the family Dinorthidæ, gigantic extinct birds related to the family of the Struthionidæ or ostriches, and at the present day represented in the islands by the smaller Apterygidæ. The *Dinornis giganteus* was from ten to twelve feet in height, and an ordinary hat would have made a suitable egg-cup for one of its eggs. The discovery, however, which has been recently made in the same region of a bird of prey of correspondingly gigantic dimensions may yet possibly raise a doubt to which bird the traditional name really refers. (See DINORNIS and NOTORNIS.) EDWARD C. H. DAY.

Mo'abites, descendants of Moab, the son of Lot by his eldest daughter (Gen. xix. 37). An idolatrous people, they were hostile to the Israelites, in spite of the relationship between them. The southern boundary of the Moabites was the brook Zered (the modern Wady el-Ahsy), which empties into the S. E. corner of the Dead Sea. Their territory was about 20 miles from E. to W., and at one time extended as far N. (50 miles) as the mountains of Gilead. At the time of the Exodus they had lost about 30 miles of territory, having been driven S. of the Arnon by the Amorites. Subdued by David, they regained their independence after the dismemberment of the Hebrew kingdom, and disappear from history after the conquests of Nebuchadnezzar (604–561 B. C.).

THE MOABITE STONE, which celebrates the achievements of one of their kings, Mesha (about 900 B. C.), is one of the most interesting discoveries of modern times. It was a block of black basalt, 3 feet 8½ inches high, 2 feet 3½ inches wide, and 1 foot 1$\frac{78}{100}$ inch thick, rounded at both ends, and inscribed with thirty-four lines of Hebrew-Phœnician writing. It was found Aug. 19, 1868, by the Rev. Mr. Klein at Dhiban (the ancient *Dibon*), just N. of the Arnon. Though broken to pieces afterwards by the Arabs, six-sevenths of the inscription have been preserved, and two-thirds of the stone itself are now in London. This inscription proves that the Greeks added nothing to the alphabet which was brought to them from the East. (See Ginsburg's *The Moabite Stone* (1870; 2d ed. 1871); and Tristram's *The Land of Moab* (1873).) R. D. HITCHCOCK.

Moawe'qua, post-v. of Shelby co., Ill., on the Illinois Central R. R., has a public school, 3 churches, and weekly newspaper, and is in a rich timber vicinity. Pop. about 800. A. M. ANDERSON, ED. "MOAWEQUA REGISTER."

Moberly, post-v. of Randolph co., Mo., 146 miles W. of St. Louis, at the junction of the three divisions of the St. Louis Kansas City and Northern Railway, has several public schools, 9 churches, a fire department, 2 banks, 2 daily newspapers, 1 flouring-mill, 1 planing-mill, a woollen-factory, 1 brewery, the principal shops of the Missouri Kansas and Texas R. R., and business-firms. Pop. 1514.

J. B. THOMPSON, ED. "ENTERPRISE-MONITOR."

Moberly (GEORGE), D. D., D. C. L., b. about 1803; graduated at Baliol, Oxford, 1825, of which he subsequently became fellow, tutor, public examiner, and select preacher. In 1835 he was appointed head-master of Winchester School, and in 1869 succeeded Dr. Hamilton as bishop of Salisbury. Among his publications are *Introduction to Logic* (1838), *Essay on the Law of the Love of God* (1854), *Sermons on the Beatitudes, Unity of the Saints, Bampton Lectures for 1868*, etc.

Mobile', the south-westernmost county of Alabama. Area, 1200 square miles. It is bounded E. by Mobile River and Bay, S. by the Gulf of Mexico, and W. by Mississippi. It is generally level, sandy, and covered with pine forests. Rice and lumber are leading products. The county has important commerce and manufactures, chiefly carried on at Mobile, the capital. It is traversed by the various railroads centring at MOBILE (which see). Pop. 49,311.

Mobile, city and port of entry, cap. of Mobile co., Ala., on the river of the same name, near its entrance into Mobile Bay, 30 miles above the Gulf of Mexico, 140 miles E. of New Orleans, at the point of junction of the Mobile and Ohio, the Mobile and Montgomery, the New Orleans Mobile and Texas, and the Alabama Grand Trunk R. Rs., situated on a sandy plain gently rising from the river's bank, is regularly built, well paved, lighted, and shaded, has a fine supply of water from Spring Hill, 5 miles distant, has 6 lines of street railroad, and enjoys a climate usually healthy, though subject to occasional ravages of yellow fever. The suburbs embrace several beautiful hills, upon which are the summer residences of the wealthier citizens, and which afford a healthful resort in seasons of epidemic. The harbor is extremely shallow, affording anchorage only for vessels under 10 feet draught, while larger vessels have to remain 25 miles distant in the bay. The harbor improvements voted by Congress in 1873 will, it is hoped, dredge a secure passage for vessels drawing 13 feet. Mobile has 6 banks, 9 insurance companies, 30 churches, 2 daily and several weekly newspapers, an extensive public-school system, besides numerous private schools, a Jesuit college at Spring Hill, an academy conducted by the Sisters of the Visitation at Summerville, and 7 other Catholic schools, Barton Academy, the Alabama Medical College, 4 orphan asylums, a city hospital, a U. S. marine hospital, the Providence Infirmary, a spacious custom-house, affording accommodations for the post-office and the U. S. courts for the southern district of Alabama, a fine market-house, with municipal offices above, an extensive export trade, chiefly in cotton and naval stores, of lumber, rosin, and turpentine, and a moderate import trade, of which coffee forms the most important article. The annual entrances from foreign ports average about 50, and from domestic ports 130, of which 80 sailing vessels and 30 steamers are owned here, the latter plying upon the Alabama, Tombigbee, and Black

Warrior rivers. Mobile was founded in 1702 by Lemoyne de Bienville as the capital of Louisiana, which it continued to be until 1723. By the treaty of 1763, England acquired N. E. Louisiana with Mobile as its capital, but the city was captured in 1780 by the Spanish general Galvez, was confirmed to Spain by the treaty of 1783, and thenceforth regarded as belonging to Florida. It was occupied, however, by Gen. Wilkinson Apr. 13, 1813, as belonging to Louisiana, the population being then only 500. In Dec., 1819, it was incorporated as a city, having then a population of about 2500; had in 1860, 29,258 inhabitants, and in 1870, 32,034. (For an account of the remarkable naval engagements near Mobile during the civil war see FARRAGUT, ADMIRAL D. G., and the names of the several fortifications.)

Mobile Bay is 35 miles in length from its northern extremity to its outlet into the Gulf of Mexico, and 8 or 10 miles in width. The long, narrow sand-isthmus of Mobile Point, at the extremity of which is FORT MORGAN (which see), is the barrier which divides it from the Gulf of Mexico. The entrance is between the point and Dauphin Island, 3 miles distant, on which is Fort Gaines. The bar, over which 18 or 20 feet of water can be carried, is 4 miles seaward. The depth of the bay generally is 12 to 14 feet, but a small area exists near the outlet having 20 to 21 feet, which forms the anchorage of the "cotton fleet" which (loaded by lighters from Mobile) bears away the rich cotton-crop of Alabama. The ALABAMA River (which see) enters by numerous arms, separated by mud-flats, the head of the bay. On one of these arms, called Mobile River, the city of Mobile is situated. The channel over the bar of this river, at Choctaw Pass, is maintained by dredging, as also that over the Dog River bar, a few miles lower down. The margins of Mobile Bay, generally low, but sometimes rising in bluffs, are thickly wooded with pine forests, with mixture of live-oak and magnolia (especially near the water), and are not destitute of beauty. The south-eastern portion of the bay, very shallow, is known as Bon Secours Bay. Between the western main shore and Dauphin Island, Grant's Pass leads into MISSISSIPPI SOUND (which see), the steamer route to New Orleans.

Mobile Point. See MOBILE BAY and FORT MORGAN.

Mobile River is formed by the confluence of the Alabama and Tombigbee rivers. A few miles below the junction it divides into two branches, of which the eastern is called Tensas, and both branches subdivide into several others, which meet in a common embouchure at the head of Mobile Bay. The total length of the Mobile River proper is 50 miles. The city of the same name is on its W. bank.

Mobilier, Crédit. See CRÉDIT MOBILIER.

Mö'bius (AUGUST FERDINAND), b. at Schulpforta, Saxony, Nov. 17, 1790; became professor of astronomy at the University of Leipsic in 1815, and d. there Sept. 26, 1868. His principal works are *Der Barycentrische Calcul* (1827), *Lehrbuch der Statik* (1837), and *Die Hauptsätze der Astronomie*, often republished.—His son, THEODOR MÖBIUS, b. at Leipsic June 22, 1821, studied philology, especially the old Scandinavian language and literature, and became professor of the Scandinavian languages and literatures at Leipsic in 1859, and at Kiel in 1865. He wrote *Ueber die ältere Isländische Saga* (1852), *Catalogus Librorum Islandicorum* (1856), *Analecta Norroena* (1859), a Danish grammar (1871), and published an edition of the Elder Edda (1860) and *Fornsögur* (1860).

Mo'bley's, tp. of Edgefield co., S. C. Pop. 1278.

Moc'casin [Indian], **Water-Moccasin,** or **Cotton-mouth,** the *Ancistrodon* (*Toxicophis*) *piscivorus*, a very venomous serpent of the Southern States, found in swamps and wet places, and even in water. It is two feet long, dark-brown above and gray beneath. It attacks all within its reach, and its bite is justly dreaded. The name moccasin is also given to the *Ancistrodon atrofuscus* of the Southern States and to the copperhead (*Ancistrodon contortrix*), both dangerous reptiles.

Moccasin, post-v. and tp. of Effingham co., Ill., on the Springfield and Illinois South-eastern R. R. Pop. 1088.

Moccasin, tp. of Russell co., Va. Pop. 1229.

Mo'cha, town of Arabia, province of Yemen, on the Red Sea, in lat. 13° 19′ N. It has a good, strongly fortified harbor, and is the most celebrated coffee-market in the world. More than 10,000 tons of the finest coffee are annually exported. Pop. about 7000.

Mocha-Stone, or **Moss-Agate,** a beautiful variety of chalcedonic quartz, remarkable for the dendritic ("tree-like") markings seen within it, which mimic mosses, foliage, and even landscapes. These appearances are not, as popularly supposed, traces of vegetation, but are due to an infiltration of oxide of manganese or of iron. The name Mocha-stone is attributed to a locality in Arabia whence it is mostly obtained. EDWARD C. H. DAY.

Mock'ing-Bird, the *Mimus polyglottus*, a singing-bird of the family Turdidæ, found in the warmer parts of North America. It is a rare summer visitant in the more Northern States. The mocking-bird is the best American song-bird, and is one of the best singers in the world. Besides its own delightful song, it imitates the notes of most other birds. It readily learns to whistle tunes, but not to talk. The mocking-bird bears confinement well, especially if taken when young from the nest. Its song in the cage is often superior to that of the wild bird. The mocking-bird is a handsome, but by no means a brilliantly colored, bird. The male is remarkable for the courage with which he defends his nest from enemies.

Mocks'ville, post-v. and tp., cap. of Davie co., N. C., 25 miles N. of Salisbury. Pop. of v. 300; of tp. 1558.

Mode [Lat. *modus*], in modern music, a certain scheme or arrangement of sounds in direct order from grave to acute, or *vice versâ*, under which they are recognized by the ear as forming a complete and conclusive series extending over eight degrees, and having a distinctly marked beginning, progress, and ending. If the eight principal sounds comprised in the octave were *equidistant*, there could be only one such mode or system, inasmuch as a series of notes commencing on D or E, etc. would differ only in point of acuteness (not in quality) from another series commencing on B or C. But as it is, the degrees or intervals of the octave are *not* equal, for we find in the octave five whole tones and two *semi*tones; and it is also essential that these tones and semitones shall fall into a certain order to render the scale available in modern music. That order may be twofold—viz. major and minor—and these two forms of scales constitute the two *modes* now in use, the third above the tonic being in the one case major, and in the other minor. The pattern scale of the *major* mode, with the places of its two smaller intervals or semitones marked by slurs, is given in Ex. 1:

Ex. 1.

From no other starting-point but C can such a scale be formed by the use of the natural notes or intervals, inasmuch as the relative positions of the two semitones between the third and fourth and the seventh and eighth could not be preserved if we should commence on D, E, F, or any other degree of the scale. A scale in this mode may, however, be founded on any other degree by the use of such sharps or flats as may be found necessary to raise or lower the incorrect intervals, and thus bring them into conformity with the normal scale of C. (See TRANSPOSITION.) The pattern scale of the *minor* mode (that of A), with the peculiar position of its two semitones, is shown in Ex. 2:

Ex. 2.

A scale such as this also can be formed from the natural notes only by beginning on A. But (as in the major mode) it may take its rise from any other degree of the scale by using the necessary sharps or flats to bring its intervals into correspondence with the model.

The distinction between the two modes springs chiefly from the dissimilarity of the respective thirds, sixths, and sevenths, which are all (in their natural or original form) one semitone greater in the major than in the minor mode. These intervals are therefore the characteristic and essential elements of the modes when those modes are viewed in their simple and normal condition. But in the minor mode there is a certain peculiarity which does not appertain to the major—viz. a difference between the ascending and the descending scale—and also an indeterminate or equivocal quality in the sixth and seventh of the scale which is too subtle to be regulated by any fixed rule. In the ascending scale (see Ex. 2) it will be observed that the seventh is *minor*, and for that reason cannot be a true and satisfactory "leading note" to the octave above. The interval of a whole tone thus existing between the seventh and the eighth is disappointing and repulsive to the cultivated ear, and especially so in final cadences. To obviate this, it becomes necessary to bring the seventh one semitone nearer to the octave by means of a sharp, thereby constituting it a leading note similar to that of the major mode. But by this process we create a new difficulty by widening the distance between the *sixth* and the seventh into the interval of an

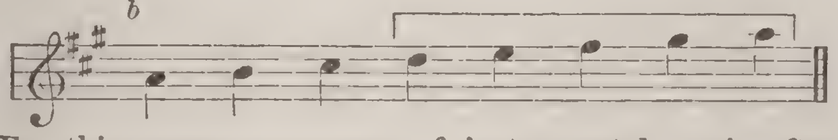
extreme second. But this also admits of adjustment by raising the sixth also a semitone, which places it now midway between the fifth and the seventh. With these modifications the ascending minor scale of A will stand as in Ex. 3:

Ex. 3.

It is a valid objection, however, to this sharping of the *sixth* that it renders the upper part of the minor scale identical with that of the major; for it is evident that by such a process every trace of a distinctively minor mode is obliterated. On comparing the altered minor scale at *a*, in Ex. 4, with the major scale at *b*, it will be seen that *from the fourth upward* there is no difference whatever:

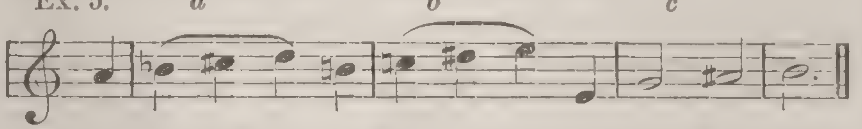
Ex. 4.—*a*

b



For this reason composers of instrumental music often prefer the use of the natural to the sharped sixth; and this not only when the progression of the melody turns *downward* from the sixth, but also when it *ascends* to the sharped seventh and the octave. Some illustrations of this are given at *a*, *b*, and *c* in Ex. 5:

Ex. 5. *a* *b* *c*



A similar difference of opinion and practice prevails also in regard to the *descending* scale in the minor mode. Ordinarily, the seventh and sixth are taken in their natural form—*i. e.* unchanged by sharps, etc. But frequently the progression by the sharped seventh and the *natural* sixth is preferred, and in numerous cases is even imperative. In this form, as shown in Ex. 6, one of the strongest characteristic intervals of the mode is preserved—viz. the sombre and plaintive effect of the sixth:

Ex. 6.

In this form of the descending minor scale a singularly beautiful effect is produced by a chain of thirds or sixths, as at *a* in Ex. 7, while no such effect is observable when the same movement is taken on the natural notes of the scale, as at *b*:

Ex. 7.—*a*

b

WILLIAM STAUNTON.

Mo′dena [anc. *Mutina*], a large town of Northern Italy, capital of the late duchy of Modena, which embraced the territory between Venetian Lombardy, the Pontifical States, Tuscany, and the Mediterranean, and the duchy of Parma and the kingdom of Sardinia. The town itself, situated in lat. 44° 38′ N., lon. 10° 56′ E., lies in a low, moist, but healthy and fertile plain between the Secchia and the Panaro, with which rivers it is connected by canals. From the ramparts, now converted into a public promenade, the views are fine; the city itself is well built and the streets and squares are spacious. The Duomo was begun in 1099; adjoining it is the famous tower La Ghirlandina, 315 feet in height, one of the seven highest in Italy. In this tower is said to be preserved the Secchia which forms the subject of Tassoni's *Secchia Rapita*. The ducal palace, a vast and grand mediæval edifice, contains a picture-gallery with many fine works by the best Italian masters; a library of 100,000 volumes and 3000 MSS.; a museum with 26,000 ancient medals; also archives of the greatest interest. Some of the churches deserve special notice. Modena boasts many learned societies, and is conspicuous for her educational and charitable institutions, but has little trade or manufacturing interest. The history of this town may be traced to 200 B. C. Mark Antony besieged it without success. Cicero names it as one of the most splendid of the Roman cities. In the reign of Constantine it began to decline, and so rapidly that St. Ambrose in 387 speaks of it as "but the corpse of a city." Its mediæval history is stormy and changeful. In 1288 the Marquis Obizzo d'Este became ruler of Modena, and in 1291 also lord of Reggio. From this time, with a few brief intervals, the house of Este, in one or another of its branches, governed Modena and its dependencies until 1859. Among the most distinguished of its dukes should be mentioned Borso (1452), afterwards also duke of Ferrara, a true friend of peace and of the people; Alphonso I. (1476), a man of great genius and valor and the patron of Ariosto; Alphonso II., a brilliant and magnificent prince, whose court was made illustrious by the poet Tasso. Modena formed a part of the Cisalpine republic, but in 1814 was restored to Francis IV., who in 1831 dishonored himself by his faithlessness in the terrible affair of Ciro Menotti. Francis V. was driven out by his subjects in 1848, restored soon after by Austria, and obliged to fly a second time in 1859, soon after which Modena by a popular vote was annexed to the kingdom of Italy. Pop. in 1874, 56,690.

Modena, post-tp. of Buffalo co., Wis. Pop. 621.

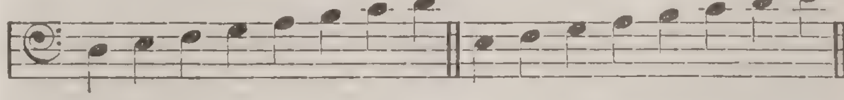
Modes, Ecclesiastical, in music, the designation of the ancient scales on which, for many ages, the music of the Church was founded. Each of these scales or "modes" consisted of five tones and two semitones in the octave, as in the modern diatonic scale. The notes, however, were taken in their natural order (*i. e.* without flats or sharps) from whatever degree of the scale the series might commence. The relative position of the two semitones to the five tones would therefore differ very much in the various scales, and music written in one scale could not be transposed to another without the loss of most of its distinguishing features. A scale commencing on C, for instance, was quite different in structure from another commencing on D or E, etc. (See MODE.) There were, in reality, as many modes as there were scales; and with one exception they were unlike either the major or minor modes of our modern system. Each scale had its own peculiarity of form, and from that form resulted a certain quality or effect—solemn, tranquil, joyous, or plaintive—which constituted its special characteristic.

The ancient Greeks, amid their confused, bewildering, and almost unintelligible speculations concerning musical intervals and their mathematical proportions, finally classified or arranged them in these several species of octaves now called "modes." At first, there appear to have been only four, and these were for the most part named after the nations to which their origin was referred. These four modes were the Dorian, Phrygian, Lydian, and Myxolydian (or mixed Lydian). The first of these commenced on D of the scale, the second on E, the third on F, and the fourth on G; and their scales, with the places of the semitones marked by slurs, were as in Ex. 1:

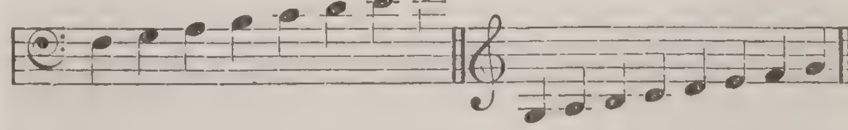
Ex. 1. *Dorian.*—D, E, F, G, A, B, C, D.
Phrygian.—E, F, G, A, B, C, D, E.
Lydian.—F, G, A, B, C, D, E, F.
Myxolydian.—G, A, B, C, D, E, F, G.

See the same expressed in notes in Ex. 2:

Ex. 2. *Dorian.* *Phrygian.*



Lydian. *Myxolydian.*



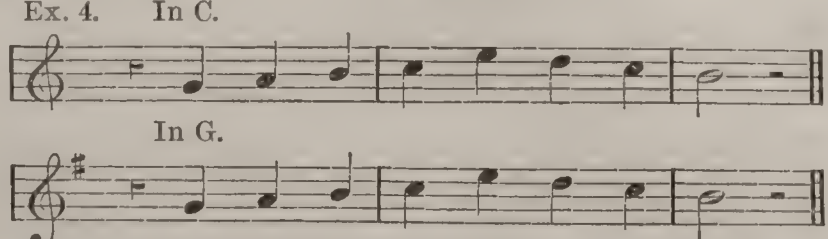
To these four modes were added by the Greeks two others called the Ionian and the Æolian; and subsequently, the Hypo-Dorian (from ὑπό, "below"), the Hypo-Phrygian, Hypo-Lydian, Hypo-Myxolydian, Hypo-Ionian, and Hypo-Æolian, making in all twelve modes by *name*, though (as will be seen presently) several of them appear to be only duplicates. Of these modes, St. Ambrose in the fourth century selected the original four for use in the Church—viz. the Dorian, Phrygian, Lydian, and Myxolydian. And, as the plain-chant or *canto-fermo* in the early ages seldom exceeded a fourth or fifth in its compass or range of inflection, the limits of these scales were held to be sufficient for all the psalmody and liturgical demands of public worship. Eventually, however, the Church melodies were extended so as to embrace the remaining degrees of the oc-

tave, and in the course of time they assumed a character so nearly resembling what was afterwards called the "florid style" as to require much more space than that afforded by the narrow bounds of the recognized modes. This led to the introduction by St. Gregory (200 years after St. Ambrose) of the other modes above mentioned, though with some modifications and under a different nomenclature. The old modes, including also the Ionian and Æolian, were called "authentic," or principal, while the added modes were styled "plagal," or subordinate; and on these twelve modes (or those most approved) the chants and other music of the Church were written. Hence, the rise of the well-known "Gregorian Tones" or chants, eight in number. These were short strains consisting of intonations (or introductory notes), reciting notes, mediations, cadences, and usually several terminations or "endings." The plagal modes always commenced on the fourth below the corresponding authentic, as if three notes below were added to the authentic, and the three upper ones omitted. In Ex. 3 all these modes, both authentic and plagal, are exhibited, and the different places of the semitones are marked, as before, by slurs:

Ex. 3.

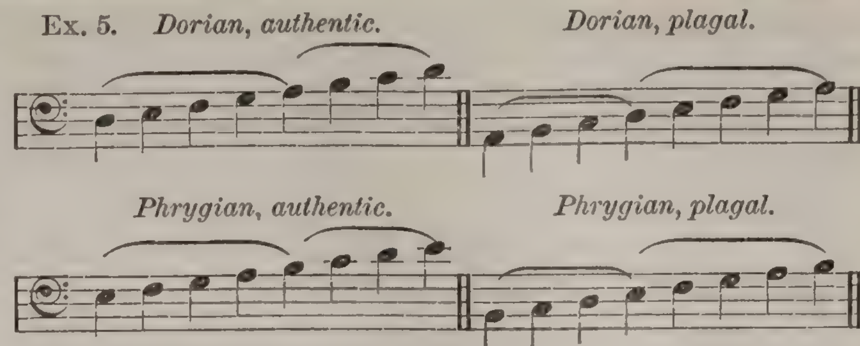
On noticing this example critically, it will be seen that several of the plagal scales are apparently mere duplicates of some of the authentic. Thus, the Lydian plagal and the Ionian authentic are the same in *notes*, as are also the Myxolydian plagal and the Dorian authentic. It is not to be presumed, however, that these scales are in all respects identical. There is a probability, at least, that the Greeks made use of some kind of *temperament*, by which certain intervals of these similar scales were so far modified as to give them a special coloring or effect, and thus enable any one to recognize in them a real distinction. It is known also that the melodies, cadences, and general mode of treatment proper to the plagal were not also considered appropriate to the authentic; and thus a difference might exist, though the notes were in other respects the same. This may perhaps be better understood by observing that something similar often occurs even in modern music, an illustration of which is given in Ex. 4, where the *same train of notes* will be found to suggest different ideas, according as the notes are regarded as belonging to the key of C or that of G:

Ex. 4.



There is also a further point of difference between authentic and plagal modes, which are alike in notes. Each mode was treated by the ancients as consisting of two parts or divisions, the lower and the upper. In the authentic, the lower division comprehended five degrees of the scale, and the remainder (commencing on the fifth) formed the upper division. But in the plagal the case was reversed—the lower division comprising only four degrees, while the upper (commencing on the fourth) contained five. The difference is shown in Ex. 5, where the divisions in two of the modes are marked by strokes:

Ex. 5.



From this it will be evident that the whole course of a melody in a plagal mode would give an impression essentially different from one in an authentic mode, even though the two should coincide in notes, and seem to form one and the same scale.

In some of the modes it was found expedient to correct the imperfection of the fourth and fifth by the use of an accidental flat or sharp. In Gregorian music the *flat* is often expressly written in cases where the note requires it; but it is probable that the *sharp* was in many cases used, though not actually written. Some diversity of opinion exists relative to the names of two or three of the modes—*i. e.* whether those names are rightly applied. Dr. Burney, for instance, remarks that "the Æolian is improperly called the Lydian." The same writer also gives similar variations of name to several of the other modes. In the present article the names employed are those which are adopted by Kollmann and other modern writers of repute. WILLIAM STAUNTON.

Modes'to, post-v. of Stanislaus co., Cal., on the Visalia division of the Central Pacific R. R., 29 miles S. E. of Stockton, has some manufactures, a considerable trade in agricultural products, several churches, and a weekly newspaper.

Mod'ica [*Sar Mohac, Motycat, Motuca*], a large town of Sicily, in the province of Syracuse, is a flourishing and industrious city, situated in a fruitful valley surrounded by lofty hills, about 20 miles W. S. W. of Noto and about 10 miles from the sea. The streets are narrow, but the buildings are good, and among them are some fine churches, a municipal palace, and a strong castle from which a charming view may be obtained. The trade here is considerable, and the exports are wheat, barley, olive oil, hemp, etc. The chief interest of Modica for the traveller, however, consists in the remains of a troglodyte city not far distant in the direction of Spaccaforno. On both sides of a valley rich in fruit trees and walnuts may be seen numerous chambers cut in the solid rock, story above story, which in their ruined condition present a most picturesque aspect. Some of the chambers communicate internally with each other, but are very difficult of access from without. Pop. in 1874, 33,169.

Modiglia'na, town of Italy, in the province of Florence, situated on the little stream Tramazzo. It is somewhat famous for the pretended exchange—by the Orleans family, then living here in the palace of the Borghi—of the daughter of the duke of Orleans for the son of a certain Chiusini, a man in very humble life. According to this story, it was this same boy who in 1830 ascended the throne of France under the name of Louis Philippe. Pop. in 1874, 6742.

Mo'docs, a tribe of American Indians, originally of the Klamath nation; since 1846 they have been known as a treacherous and murderous band, 151 persons being reported killed by them while occupying their old ground along the Klamath Basin, through which ran the old emigrant-road to Oregon. In 1864 a treaty was made with these Indians (and other tribes), requiring them to settle upon Klamath reservation. The particular band known as Capt. Jack's party complied reluctantly, but soon after, for the alleged reason of bad treatment of the agents, left the reservation. In the latter part of Nov., 1872, an ineffectual attempt was made by the Indian superintendent to induce this band to return, when military aid was invoked to compel them. A demand for surrender was refused, and they opened fire upon the troops, inaugurating the Modoc war. The Indians then retreated to the lava-beds, and maintained a successful defence until June 5, by which date nearly all were captured, but not without a loss to their pursuers in killed and wounded of 132, including Gen. Canby and Peace Commissioner Thomas, who were treacherously murdered in April while attending an appointed conference with Capt. Jack and others about 1 mile from the camp. Capt. Jack, with three others, was executed Oct. 3, 1873.

Modugn'o, town of Southern Italy, in the province of Bari delle Puglie, about $5\frac{1}{2}$ miles S. W. of the town of Bari. The inhabitants are industrious, and possess some small manufactories. Pop. in 1874, 9082.

Modula'tion [Lat. *modulor*, to "compose" or "sing in measure"]. In music, this term signifies the process by which, in any part of a composition, a transition is made from one key to another. Every piece of music, if regular, is written in some particular key, and to that key several others are so nearly related that short excursions may be made into them from the original key. From a *major* key we may thus proceed to the keys of its dominant, subdominant, relative minor, and the relative minors of the dominant and subdominant—*i. e.* from the key of C major, for instance, we may proceed to the keys of G, F, A, E, and D. And from a *minor* key we may pass to the keys of its dominant and subdominant, its relative major, and the relative major of its dominant and subdominant; *i. e.* in the key of A minor we may modulate to the keys of E, D, C, G, and F. It is to be observed, also, that a transition may be made into any of these nearly-related keys by the intervention of a single chord—viz. that containing the leading note and dominant of the new key. Transitions of this kind, being simple and easily effected, constitute what is called *natural* modulation. *Abrupt* modulation occurs when a transition is made into some more remote key, as from C major to A♭; or by a sudden change of the mode, as from C major to C minor, A minor to A major, etc. *Enharmonic* modulation takes place when one and the same note (with the harmony dependent upon it) is treated as equivocal or having two distinct relations, and therefore capable of progression in two entirely different directions. This occurs, for instance, when F♮ is assumed to be E♯, or when B♭ is regarded as A♯, and a transition is unexpectedly made in accordance with the *latter* instead of the former quality of the note or chord. (See MUSIC.) WILLIAM STAUNTON.

Mod'ulus [Lat.], in mathematics, a constant factor of a variable function, which serves to distinguish the function from others of the system. W. G. PECK.

Modulus of a System of Logarithms, a constant number which, multiplied by the Napierian logarithm of any number, will give the logarithm of that number in the given system. (See LOGARITHMS.) W. G. PECK.

Modulus of Elasticity. If a force is applied to elongate a bar of any material whose cross-section is 1, and whose length is L, the amount of elongation will depend upon the nature of the material and upon the intensity of the force. If the applied force is not too great, the bar will recover its original length when the force ceases to act; and the greatest strain to which a bar may be thus subjected and recover its original length is called the limit of the body's elasticity. If we denote the total elongation of the bar in question when acted upon by a force W, within the limit of the body's elasticity, by l, we shall have the relation

$$W=\frac{l}{L}\times E, \text{ or } E=\frac{WL}{l},$$

in which E is constant for each particular material; this constant is called the *modulus of elasticity*. (See Mahan's *Civil Engineering*, Appendix, note D.) W. G. PECK.

Modulus of a Number. M. Mourey has shown that every directed line can be represented by a number of the form $a+b\sqrt{-1}$, in which the length of the line is equal to $\sqrt{a^2+b^2}$, and in which $\frac{b}{\sqrt{a^2+b^2}}$ is the sine and $\frac{a}{\sqrt{a^2+b^2}}$ the cosine of the angle that this line makes with some given initial line. The number $\sqrt{a^2+b^2}$, which is constant for all lines of a given length, is called the modulus of the number $a+b\sqrt{-1}$. W. G. PECK.

Moe, post-tp. of Douglas co., Minn. Pop. 235.

Mö'en, an island of Denmark, in the Baltic Sea, is separated from Seeland by Ulfsund, and from Falster by Grönsund. Area, 84 square miles. Pop. 15,000. It is one of the most fertile and (on account of its elevated and diversified surface) one of the most beautiful of the Danish islands. Principal town, Stege.

Mœ'ris, a lake, or rather an artificially formed reservoir, in Central Egypt, in the province of Fayoom, connected with the lake Birket-el-Kehroon, and through that with the Nile, which during its time of inundation fills the reservoir with water. Herodotus gives a magnificent, though, as it seems, not correct, description of it.

Mœ'sia, province of the Roman empire, corresponding to the present Bulgaria and Serbia, and bounded N. by the Danube, E. by the Black Sea, S. by the Hæmus (Balkan Mountains), and W. by the Save. It was originally inhabited by tribes of Thracian race, with whom the Romans came in contact after the conquest of Macedonia, but it was not made a Roman province until the time of Augustus. It was then divided into Mœsia Inferior (Bulgaria) and Superior (Serbia), fortifications were constructed along the Danube, and several Roman settlements were formed. Among its towns the most remarkable were Tomi on the Black Sea, whither Ovid was banished; Durostorum (Silistria) on the Danube; and Singidunum near the present Belgrade. In 250 A. D. began the invasions of the Goths, and in 395 several Gothic tribes settled in the country and received the names of Mœso-Goths. The country still remained a province of the East Roman or Byzantine empire until, in the seventh century, the Slavonians and Bulgarians entered it and formed the kingdoms of Serbia and Bulgaria.

Mœso-Goths. See GOTHS, by CLEMENS PETERSEN.

Mof'fat (ROBERT), b. at Inverkeithing, Scotland, in 1795; went to South Africa as a missionary in 1817, and passed nearly sixty years in successful labors among the Bechuanas and other barbarous tribes, into whose languages he translated portions of the Bible, hymn-books, and other religious books. He published in 1842 a *History of Missionary Labors in South Africa*, widely read in England and America. A testimonial, amounting to £5800, was presented to the venerable missionary in 1873, in recognition of his lifelong labors. The wife of the celebrated explorer, Dr. Livingstone, was a daughter of Mr. Moffat. She d. Apr. 27, 1862.

Mofras', de (EUGÈNE **Duflot**), b. at Toulouse, France, July 5, 1810; studied at Paris; entered the diplomatic service as attaché at Madrid, where he became a friend of the learned Navarrete, from whom he acquired an interest in the geography of N. W. America, and in 1839 set out on a scientific voyage to Mexico, California, and Oregon, of which the result was the valuable work, *Exploration d'Oregon et des Californies* (2 vols., Paris, 1844, with an atlas).

Mogadore', or **Sui'rah,** town of Morocco, on the Atlantic, in lat. 31° 30′ N. It is regularly laid out and well built, and has an excellent harbor. It is strongly fortified, and has extensive exports of wool, gum, wax, hides, gold-dust, feathers, and almonds. Pop. 20,000.

Moglia'no Ve'neto, town of Northern Italy, in the province of Treviso, situated in a fertile district, about 6 miles S. of the town of Treviso. Pop. in 1874, 5611.

Moguer', town of Spain, in the province of Huelva, is an old and decaying place, but it is of interest in the history of Columbus, who lived here for some time, as it was from Palos, the port of Moguer, that he started on his great voyage. Pop. 7332.

Mogul', or **Great Mogul,** is a corruption of "Mongol," and is the name generally applied by Europeans to members of that Mohammedan dynasty of Mongolian descent which in the sixteenth century established itself in Hindostan under Baber, a descendant in a direct line from Timour or Tamerlane, and which here founded a great and powerful empire. The most remarkable of the rulers of this dynasty were Akbar (1556–1605), Jehan-Geer (1605–27), and Aurung-Zeb (1658–1707), during which period the empire comprised almost the whole of Hindostan. In Europe these monarchs were generally known under the name of the *Great Mogul*, and the most extravagant stories of their riches and power were current. Their magnificence became proverbial, and hints at their wealth and splendor are frequent in all comic writers of that period of European literature. The title used by themselves was the Persian *shah*, and Persian was the official language. After the death of Aurung-Zeb the power of the dynasty rapidly declined, and at the beginning of the present century the Mogul empire was but a shadow of itself. When the English conquered India they gave the dynasty a pension, but after the rebellion of 1857, in which it was implicated, they sentenced the last Great Mogul to transportation to Rangoon, though he was a man of ninety years of age, and put the twenty-four other members of the family to death.

Mohacs', town of Southern Hungary, on the Danube, the centre of a considerable trade in cattle, grain, wine, and other agricultural products, which are shipped hence to Vienna. Pop. 12,140. In history it is famous as the place where two of the most momentous battles in Hungarian history were fought (Aug. 29, 1526, and Aug. 12, 1687). In the former the young and chivalric king, Louis II., with an army of hardly 25,000 men, attacked, without waiting for the reinforcements which approached under John Zapolya, a Turkish army of 200,000 men, under Solyman the Magnificent. After a protracted and desperate fight the Hungarian army was cut entirely to pieces, the king in his flight drowned in the Csellye, and a large portion of the country fell into the hands of the Turks. In the latter battle the Austro-Hungarian army under Charles

of Lorraine completely defeated the Turks and put an end to their dominion in Hungary.

Mo'hair [of Oriental origin], the wool of the Angora goat and the fabrics which are woven from it. This kind of goods, formerly made only in the East in a small way and imported sparingly into Europe by way of Venice, is of late years extensively produced in Great Britain and other parts of Europe, and much less extensively in the U. S. Mohair is combed like coarse wool or worsted and alpaca. It is mixed in many cases with cotton or silk. The raw material brings a high price, and might doubtless be produced abundantly in the U. S.

Moham'med, or **Mahom'et,** the founder of *Islam* (which is the Arabic name for the Mohammedan creed), the prophet of *Moslem* (which is the name the professors of this creed give themselves), b. at Mecca April 20, 571. The tribe to which he belonged, the Koreish, was one of the most distinguished Arabian tribes; the guardianship of the Caaba was hereditarily entrusted to it. But his family, Hashem, was poor. His father, Abdallah, died before he was born, and he lost his mother, Amena, a nervous and sickly woman, when he was six years old; two years after, also, his grandfather, Abd-el-Moottalib, died. Adopted by his uncle, Abu Taleb, he made a journey with him to Syria, where he formed the acquaintance of a Christian monk. With another uncle, Zubeir, he afterwards travelled much in Northern Arabia for mercantile purposes. In his twentieth year he served in the war against the Beni Kinanah. In his twenty-fifth year he was a shepherd on the pasture-fields in the vicinity of Mecca. At this time he received some employment from a linen-trader named Saib, and having been recommended as a smart and trustworthy man to a rich widow, Kadijah, he undertook the management of her business. She liked him so well that she married him, though she was fifteen years older than he; and, considering himself rich enough, Mohammed now (595) gave up business and devoted himself to religious meditations. The time was very favorable for the formation of a new and more spiritual religion. Star-worship, demon-worship, and idolatry had overclouded the old monotheism of the Arabs, and brought the religious instincts of the people into manifold confusion. Judaism and Christianity were widely spread over the peninsula, and whole tribes were known to have adopted them—not in their genuine form, but mixed up with rabbinical subtleties and heretical fancies. Mohammed took part from early youth in this general fermentation of the religious state of his nation. From the thirty-fifth year of his age he often retired to a cave in Mount Hara, near Mecca, and here he spent hours and days in solitary contemplations. In his fortieth year he received the first revelation concerning the new truth, but afterwards such revelations, accompanied by epileptic fits and spasmodic convulsions, continued to occur throughout his life; from them originated the KORAN (which see). He began to preach in 609, and entered upon his *public* ministry in 612. His first believers were his wife, Kadijah, some relatives and friends, among whom were Abubekr and Ali, but their number was small; and when he proclaimed himself publicly in Mecca as a prophet, he met with ridicule and violent opposition, especially from his own tribe. It soon became necessary for his adherents to emigrate and seek refuge in Abyssinia, and he himself was banished from the city, and lived concealed in a cavern in the vicinity. But when, after three years' banishment, he was allowed to return, he met with better fortune. Of great importance was the conversion of a number of pilgrims from Medina, who carried the new faith back to their native town, where they preached it with decided success. Nevertheless, his position in Mecca was still very dangerous. Kadijah died Oct. 23, 619, but, although he felt much grief at her death, he soon after married several other wives. Abu Taleb also died. The famous Hedjrah, or flight from Mecca to Medina (250 miles N.), occurred Sept. 20, 622, from which date the Mohammedan era begins. He now built a mosque, instituted religious rites, and consolidated the congregation; but having failed in his attempt at gaining over the numerous Jews residing in and around Medina, he determined to propagate the new faith, not by preaching, but by fighting, and began to attack the surrounding Arabian tribes, the Jews, and the Christians. He was very successful. In a contest with the Meccans at Bedr in 623 he was victorious, and although he met with a heavy reverse at Ohod in 624, and was even besieged in Medina in 627, yet he made a favorable peace with the Meccans in the following year. Meanwhile, he had opened connections with different foreign courts—Abyssinia, Byzantium, and Persia. The results of these missions and some campaigns which ensued were small, but when the Meccans broke the peace during a war between the prophet and Abyssinia, he conquered the city; and this event furthered more than any other the conversion of all the Arabian tribes and their consolidation into one people. In 632 he undertook his last great pilgrimage to Mecca at the head of 40,000 disciples, shortly after which he d. at Medina, June 8, 632. He left ten wives (of fourteen, which he had in all), but only one child, Fatima, the daughter of Kadijah and the wife of Ali. He was buried in the mosque of Medina, and at his tomb thousands of pilgrims gather every year. Of the numerous biographies of Mohammed, the best are Sprenger's, in German (3 vols., 1861, 1862, 1865), and Muir's, in English (4 vols., 1861). CLEMENS PETERSEN.

Mohammed, the name of four Ottoman sultans: MOHAMMED I. (1413–21), b. in 1387, the youngest son of Bajazet I. When his father died, one year after the battle of Angora (1402), and Tamerlane retired behind the Oxus, the Ottoman empire was divided between the four sons of Bajazet, but Mohammed defeated and put to death his three brothers, and became sole ruler in 1413. Although his whole reign was filled with wars against the Venetians, Bedreddin the Reformer, Mustapha the Pretender, Persia, etc., he was a peace-loving man, and showed great nobleness towards his allies and towards rebels, whom he forgave. He built the mosque of Adrianople.—MOHAMMED II. (1451–81), b. at Adrianople in 1430, the son and successor of Amurath II., was one of the most brilliant princes of the Ottoman dynasty—valiant, sagacious, equally able in the camp and the council. He spoke Arabic, Persian, Greek, and Latin, was well versed in geography and mathematics, understood drawing, even painted; nevertheless, those features of his character which impress the student most strongly are his cruelty and treachery. On May 29, 1453, he took Constantinople by storm, and gave it up to plunder and massacre for three days. Although fearfully devastated, the city recovered, nevertheless, very soon; he rebuilt it, made it his capital, and induced the Greeks, in whose hands were the commerce and industry of the place, to return by proclaiming religious freedom. After the death of John Hunyady, who successfully checked his progress in the N. W. for some time, he conquered Serbia and Bosnia in 1458; in 1460, Morea; in 1461, Trebizond. From Scanderbeg he sustained some very heavy losses, but after the death of this prince he also conquered Albania in 1467. In 1474 he took Caffa and Tana from the Genoese; in 1480, Negroponte and Lemnos from Venice, and the Ionian Islands from Naples. His attack on Rhodes in the same year was repelled, but he was just preparing for a second attack and an invasion of Italy, where he had already occupied Otranto, when he d. in a campaign against Persia. He conquered in all twelve independent empires and 200 cities.—MOHAMMED III. (1595–1603), b. in 1556, the son and successor of Amurath III.; conquered Erlan Sept. 21, 1596, and defeated the Germans and Hungarians in the battle on the plains of Keresztes, Oct. 23 same year. Under him the signs of decadence of the Turkish power began to show themselves in insubordination in the army, corruption in the administration, and intrigues in the ruling family.—MOHAMMED IV. (1648–87), b. in 1642, the son and successor of Ibrahim I., who was strangled by the Janizaries. He was a man without talent or energy, and took no interest in the affairs of the country. In the beginning of his reign the wars with the Venetians, Hungarians, and other nations were conducted with various success, but afterwards the Turkish army met with fearful reverses. Defeated at Chotyn in 1673, routed completely by Sobieski before the walls of Vienna (Sept. 12, 1683), beaten at Mohacs (Aug. 12, 1687), it marched to Constantinople, deposed Mohammed, and raised his brother, Solyman III., to the throne. Mohammed was kept in prison till his death, in 1692.

Moham'medanism, the religion founded by Mohammed, and professed, according to recent estimates, by about 180,000,000 human beings, teaches, in opposition to the various idolatrous religions which it has succeeded in superseding, a strong theism, essentially the same as that taught by Judaism and Christianity, from which it was borrowed. "There is no God but God" is the principal tenet in Mohammedan dogmatics, and he has created the world and the immortal soul of man, whose life on earth he shall judge and reward or punish in a future state. But the further development of this idea, especially of the relation between God and mankind, is narrow, fantastic, and arbitrary. Before the almighty power of Allah the free-will of man vanishes; Mohammedanism is fatalism. Nevertheless, the idea of fate has often inspired the Moslems with a fanatical enthusiasm, while it seems never to have affected in a restrictive manner the progress of their civilization, and appears seldom to have weighed down individual life with its crushing burden. The reason is, that although the primitive conception of the idea is very decided and even rigid,

its further development is fortunately vague, wanting in consequence, and apt to evaporate in mysticism. In a similar manner, the idea of the justice of Allah is narrowed—not to say desecrated—by the childish and sensuous pictures of heaven and hell with which Mohammed inflamed the imagination of his followers; and the only thing which saves these pictures from becoming ludicrous and detestable is a certain delicate poetical atmosphere which surrounds them and softens their coarser lines. Least attractive is the delineation which the Koran gives of Divine Providence in history. Immediately after the above passage follows, "and Mohammed is his apostle." Adam, Noah, Abraham, Moses, and Christ are acknowledged as prophets sent by God, but Mohammed is the fulfilment of all prophecy and the Koran the final revelation. To a Christian the whole of this part of Mohammedanism is a pitiful delusion; in the eyes of modern science it is only miserable stuff.

As the dogmatics of Mohammedanism, so also its morals, contain many points which command respect and sympathy, though they too are often disfigured by narrowing peculiarities of time and place, and sometimes even distorted by wanton vagaries. The five principal commandments in the moral code of Islam, symbolized in Mohammedan art by the hand with its five fingers, are prayer, almsgiving, fasting, pilgrimage, and war against the infidel. The influence which these five commandments exercised in the time when they actually bore sway over the Moslem mind is very apparent in history. But at present only the first of them has maintained its authority intact; that of the last is entirely lost, and that of the three others is disputed, or at least subject to commentaries of a doubtful character. Travellers in Mohammedan countries speak with unqualified praise of the earnestness, sincerity, and devotion with which the Moslem performs his prayers several times a day after careful ablution, kneeling on his prayer-carpet in any place if he cannot go to the mosque, and with his face turned toward Mecca. But it must be remembered that prayer is the only form of divine service which Islam possesses, especially since pilgrimage has gone somewhat out of use; Mohammedanism has no priesthood and forms no Church. The two most striking features, however, of Moslem ethics are the practice of polygamy and the usury law. The Koran knows not that polygamy is so far from being natural—not to speak of its relation to any higher ideal—that Nature herself begins to eliminate it from the animal kingdom long before even the faintest foreboding of a moral consciousness has dawned upon the soul. The Koran acknowledges and encourages polygamy, and it exists in all Mohammedan countries, with all its deteriorating and weakening consequences, spiritual and bodily. The usury law is very curious. The Koran forbids the Moslem to lend money on interest. As, now, modern civilization is based on the fact that there exists an interest-bearing capital which allows certain members of society to devote themselves not to the mere maintenance, but to the progress of society, and as this state of affairs has never been doubted by any moral philosophy originating from the Christian theology, it is surprising to hear that there is a moral code which condemns it, and which at times has enforced its opposite commandments without hurting the progress of industry, commerce, and general civilization. (For further information see KORAN, MOHAMMED, SHIAHS, and SUNNAS.) CLEMENS PETERSEN.

Moha've, the north-westernmost county of Arizona. Area, 6500 square miles. It is bounded N. by Utah and Nevada and W. by Nevada and California. The Colorado River traverses this county through its deep cañon, and afterwards washes a large part of the W. border. The county is partly very rugged and partly arid plains. It is nowhere fertile except where irrigated. Gold and silver mining are the leading industries. Cap. Mohave City. Pop. 179.

Mohave City, post-v., cap. of Mohave co., Ara., on the Colorado River, just above Fort Mohave, in a fertile region adapted to grain and fruit culture.

Mohave Desert, a large basin of Southern California, mostly in San Bernardino co., having but few streams, none of which reach the sea. It is not a desert, for in large areas of this region abundant pasturage is found, and water is readily obtained in wells. Parts of this valley are intensely hot in summer.

Mohave Indians, a tribe of the Yuma division of the Pima-Apache stock, having a large reservation in Arizona, on the rivers Mohave and Colorado, known to the Spaniards as Jamajabs and Cosninas. They number some 4000, of whom 828 live on the reservation and cultivate the soil, the rest are wanderers, and all are quite uncivilized.

Mohave (or **Mojave**) **River** rises in the San Bernardino Mountains in San Bernardino co., Cal., flows N., and finally sinks in an alkaline marsh in the so-called Mohave Desert.

Mo'hawk, post-v. of Herkimer co., N. Y., 16 miles E. of Utica, on the Mohawk River, has 4 churches, 1 bank, 1 newspaper, 4 hotels, a furnace, a machine-shop, street railways, and stores. Pop. 1404.

CHARLES A. TUCKER, ED. "MOHAWK INDEPENDENT."

Mohawk, tp. of Montgomery co., N. Y., on the N. side of the Mohawk River, contains FONDA (which see), the county-seat, and other villages. Pop. 3015.

Mohawk River, the principal affluent of the Hudson, surpassing in volume that stream above its confluence. It rises in Lewis co., and after a generally eastward course reaches the Hudson at Cohoes. It affords valuable water-power, and flows through a valley famed for its beauty.

Mohawks, Mahaquas, or **Maquas,** the most eastern of the original "Five Nations" of New York, who constituted the "League of the Hodenosaunee," or confederacy of the Iroquois. They were called in their own language Agmeque or Gagmeque, and were the most warlike tribe of the league, inhabiting chiefly the valley of the river which bears their name. Allies of the English in their wars with the French and American colonists, they, after the war of the Revolution, migrated to Canada (1784) with their chief, the celebrated Joseph Brandt, and settled on the Grand River, where several hundred still remain. Portions of the Bible were translated into Mohawk by Brandt, and grammars have been published by Bruyas and Marcoux.

Mohee'lev, or **Moghilev,** government of Russia, situated on the Dnieper, between lat. 52° and 55° N. Area, 18,234 square miles. Pop. 908,858. The ground is a level or slightly undulating plain, the soil very fertile, and the climate mild; which circumstances, together with the industry and enterprise of the inhabitants, have made Moheelev one of the richest provinces of Russia. Corn, timber (especially masts), and cattle are largely produced and carried on the Dnieper to the ports of the Black Sea.

Moheelev, or **Moghilev,** town of Russia, the capital of the government of Moheelev, on the Dnieper. It is a handsome and well-built town, the see of a Greek bishop and a Roman Catholic archbishop, and the residence of many of the Russian nobility. It has many good educational institutions, several manufactures, and a lively export-trade in corn, hides, leather, wax, and honey through the ports of the Baltic and those of the Black Sea. Its cathedral, built in 1780, is a very fine building. Pop. 38,922.

Moheelev, or **Moghilev,** town of Russia, in the government of Podolia, on the Dniester. It is a beautifully-situated and thriving town, with 9936 inhabitants.

Mohe'gans, or **Mohic'ans,** a tribe of Indians formerly inhabiting a considerable part of New England and part of what is now New York as far W. as the Hudson River. They were of Algonkin stock, and were tributary to the Iroquois. They were, after the advent of the Europeans, broken up into small bands, and generally appear to have been friendly to the colonists and hostile to their Indian enemies. A remnant of this tribe long dwelt at Norwich, Conn., where a few of their descendants still remain. Relics of the Mohegans are found also with other tribes, especially at Green Bay, Wis., and among the Munsees in Kansas. Uncas, their most famous chief, was a Pequot by birth.

Mohic'an, post-tp. of Ashland co., O. Pop. 1561.

Mohl, von (JULIUS), b. at Stuttgart Oct. 28, 1800; studied Oriental languages, especially Persian and Chinese, at Tübingen, Paris, London, and Oxford; became professor of Persian at the Collége de France in 1845, and in 1852 director of the Oriental department of the national printing-office. His principal work is his edition of Firdousi's *Shah Nameh* (Paris, 1838–66) for the *Collection Orientale*.—His brother, HUGO VON MOHL, b. at Stuttgart Apr. 8, 1805, studied medicine and natural science at Tübingen, and was appointed professor in botany and director of the botanical garden in that city in 1835. D. Mar. 31, 1872. He was the most eminent vegetable anatomist of his day. His principal works are *Ueber den Bau und das Winden der Ranken und Schlingpflanzen* (1827), *Beiträge zur Anatomie und Physiologie der Gewächse* (1834), and *Grundzüge zur Anatomie und Physiologie der vegetabilischen Zelle* (1851), and a large number of memoirs, the principal ones collected in his *Vermischte Schriften*.

Möh'ler (JOHANN ADAM), b. at Ingersheim, Würtemberg, May 6, 1796; studied theology at several of the most prominent universities of Germany, both Protestant and Roman Catholic; was ordained a priest of the Roman Catholic Church in 1819; became professor of theology at Tübingen in 1825, and at Munich in 1835, and d. there

Apr. 12, 1838. His principal works are *Die Einheit in der Kirche, oder das Princip des Katholicismus* (1825), and his *Symbolik* (1832), which latter work ran through many editions, and was translated into English in 1832 by Robertson. It is a defence of the Roman Catholic creed, and an ingenious attempt to idealize it by means of modern Protestant philosophy and theology. It was ably answered by Nitzsch, Marheineke, and especially by his Protestant colleague, Dr. Baur, in consequence of which the author removed to Munich.

Mohs (Friedrich), b. Jan. 29, 1773, at Gernrode, Anhalt; studied at the University of Halle and at the mining school of Freiberg; travelled much in the Austro-Hungarian countries; became professor of mineralogy at Grätz in 1811, at Freiberg in 1817, at Vienna in 1826, and d. at Agordo, Venetia, Sept. 29, 1839. His principal works are *Grundriss der Mineralogie* (1822–24) and *Anfangsgrunde der Naturgeschichte des Mineralreichs* (1832).

Moin'gona, post-v. of Boone co., Ia., on the Des Moines River, and on the Chicago and North-western R. R., has coal-mines and manufactures of flour and stone-ware.

Moir (David Macbeth), M. D., b. at Musselburgh, Scotland, Jan. 5, 1798; received his medical education; became in 1817 a successful practitioner of medicine at Musselburgh, where he was settled till his death. He soon became widely known as "Delta," from the letter Δ appended to his numerous poems in the periodical literature of that time. His *Legend of Genevieve* (1824), *Life of Mansie Wauch*, a novel (1828), *History of Medicine* (1831), *Domestic Verses* (1846), and his lectures on *Poetical Literature* (1851) are all of value. D. at Dumfries July 6, 1851.

Moi'ra, post-v. and tp. of Franklin co., N. Y., on the Central Vermont R. R., has 1 newspaper and lumber and starch manufactures. Pop. 2064.

A. N. Merchant, Pub. of "Journal."

Moira, Earl of. See Rawdon (Lord Francis).

Moire' Antique' [Fr. *moire* is the English *mohair*], a name given to the best kinds of watered silk. Broad silks of good quality are first dampened, then carefully and smoothly folded, and lastly submitted to great pressure. On drying, the curious lines called watering appear in the fabric.

Moissac', town of France, in the department of Tarn-et-Garonne, carries on an important trade in grain and flour, also in wool, wine, oil, saffron, and salt. Pop. 10,445.

Mokel'umne Hill, post-v., cap. of Calaveras co., Cal., 1½ miles from Mokelumne River, in the centre of a quartz-mining region, has 2 churches, 1 weekly newspaper, 4 stage-lines, and 3 hotels. Pop. 850. Wm. Junes.

Mok'ena, post-v. of Frankfort tp., Will co., Ill., on the Chicago Rock Island and Pacific R. R.

Mo'la di Ba'ri, town of Southern Italy, in the province of Bari delle Puglie. It is pleasantly and healthfully situated on the Adriatic, about 12 miles S. E. of Bari. The streets are narrow and irregular, but there are some respectable buildings. The harbor is small but good, and the traffic is animated both by sea and land. The highroad to Bari is, for some distance from this town, flanked by enchanting gardens, which rise on one hand to the rich olive-crowned hills, and on the other descend to the sea. Pop. in 1874, 11,976.

Molas'ses [Lat. *mellaceus*, from *mel*, "honey"], or **Treacle** (the *Syrupus fuscus, theriaca*, or *Sacchari fæx*, of the pharmacopœias), a thick, dark-colored syrup, produced during the manufacture of sugar, and consisting essentially of uncrystallizable sugar, water, coloring-matter, and various impurities. It is in part the product of the sugar-plantations (known as West India and New Orleans molasses), and in part comes from the sugar-refineries of other countries (sugar-house molasses). The latter is separated by the centrifugal process, by claying, and the other operations of sugar-refining. (See Sugar, Manufacture of.) Molasses is used as a cheap substitute for sugar, especially by the poorer classes, and is imported in considerable quantities for the manufacture of Rum (which see).

Mol'dau, a river of Bohemia, rises in the Böhmerwald Mountains at an elevation of 3750 feet, flows first in a south-eastern, then in a northern direction, becomes navigable at Budweis, and joins the Elbe opposite Melnik after a course of 276 miles.

Molda'via, province of Roumania, bounded W. by Galicia and Transylvania, S. by Wallachia and Turkey, from which it is separated by the Danube, and E. and N. by the Black Sea and Russia. Area, 20,118 square miles. Pop. 1,462,105. The western part is hilly, covered with spurs of the Carpathians, which are said to be rich in precious metals and other kinds of useful minerals. Mines are very little worked, however, and rock-salt is the only mineral extensively produced. The middle and eastern part of the country is a low and level plain, watered by the Sereth and Pruth, two affluents of the Danube, and exceedingly fertile. Wheat and wine are produced in large quantities, though the greater part of the country is laid out as pasture-land or covered with immense forests. Herds of cattle, sheep, and horses are reared on the pastures; the latter especially are exported in great numbers to Austria and Prussia. Numerous swine are fed in the forests, and bee-culture forms an important branch of industry. Stags, wild-boars, bears, wolves, and foxes abound. The inhabitants are a mild, good-natured, industrious, and intelligent race, but, with the exception of the nobility, who enjoy all kinds of luxury and refinement, they live under almost abject conditions. Their houses, even in the towns, are mud huts, their beds a skin, their furniture a few kitchen utensils. The established religion is that of the Greek Church, but Armenians, Turks, Jews (numbering over 60,000), Roman Catholics, and Protestants are tolerated and enjoy equal political rights. The language generally spoken is a Latin dialect, mixed with Slavonic and Turkish elements, but nearer to the original Roman tongue than the Italian language; with this the Russian, Turkish, Greek, Hungarian, Italian, and German languages mingle in endless confusion; the gypsies speak a dialect of Sanskrit, and the Jews bad German or worse Spanish. Education is in a very backward state; in 1844 there were only 14 public elementary schools, with 1244 pupils, in the whole province; but in this respect, as in many others, the country is rapidly progressing under its new government, established in 1866. (For further information see Roumania.)

Mole [Dutch, *mol*], a name applied primarily to small insectivorous mammals of Europe (*Talpa Europea* and *T. cæca*), distinguished by their cylindrical or barrel-shaped body, little-defined neck, and broad, flattened fore feet, or, in other words, adaptation for digging and subterranean life; and (2) extended secondarily to analogous mammals more or less related in structure and affinities. It is therefore popularly bestowed on (1) all the various species of Talpine Talpidæ, with or without some qualifying adjectives, found in different parts of the northern hemisphere; (2) to the species of Chrysochloridæ, or "golden moles," which inhabit Africa; and (3) to certain rodents adapted for subterranean life; *e. g.* the Spalacinæ or "sand-moles" and "mole rats" of the family Muridæ. (See Talpinæ and Mole-Rat.) Theo. Gill.

Molé (Louis Mathieu), b. at Paris Jan. 24, 1781; was educated in Switzerland and England; attended afterwards the École Polytechnique of Paris; published in 1806 his *Essais de Morale et Politique*, which attracted the attention of Napoleon by their defence of monarchical principles; held different offices in the civil service during the Empire; was made a count and peer of France, which dignities were conferred by the Bourbons; became minister of marine in 1817, of foreign affairs in 1830, and prime minister from 1836 to 1839; retired from political life after the *coup d'état*, and d. at Champlâtreux Nov. 23, 1855.

Mole-Cricket, a name given to the burrowing crickets, and primarily to those of the genus *Gryllotalpa*. In the U. S. they are most common in the South. They are more commonly found in wet ground, and some species are very destructive to crops. Theo. Gill.

Molecular Volumes. See Volumes, Molecular, by Prof. Henry Wurtz, A. M.

Molecule. See Chemistry.

Mole-Rat, a name given to certain remarkable rodents of the family Muridæ, but differing from all other rats in their mole-like habits and appearance, and in their rudimentary eyes. They feed on the roots of plants, and inhabit Asia and Africa. They have been differentiated into the genera *Spalax, Rhizomys, Heterocephalus, Bathyergus, Georhychus, Heliophobius, Siphneus*, and *Ellobius*, and combined in a family designated Spalacidæ. These, however, only agree in physiological adaptation, and widely differ structurally, the first six genera being nearly related to the Murinæ and the last two to the Arvicolinæ.

Theo. Gill.

Mo'leschott (Jacob), b. at Herzogenbusch, Holland, Aug. 9, 1822; studied medicine at Heidelberg; began to practise at Utrecht; lectured on physiology at Heidelberg from 1847 to 1854, but was considered to endanger religion and morals by his views of the absolute relation between the lowest material conditions and the highest spiritual manifestations of human life; received a professorship at Zurich in 1856, and removed in 1861 to Turin. His principal works are *Physiologie der Nahrungsmittel* and *Lehre der Nahrungsmittel* (1850), which latter was translated into English by Dr. E. Bonner in 1856, under the title of *The Chemistry of Food and Diet; Ursache und Wirkung in der*

Lehre vom Leben (1867), and *Von der Selbstbestimmung im Leben der Menschheit* (1871).

Moles'worth (GUILFORD LINDSAY), brother of Rev. William Nassau, b. at Millbrook, England, in 1828; was educated at the College of Civil Engineers, Putney; served an apprenticeship on the London and North-western Railway; perfected his studies in mechanical engineering under Sir William Fairbairn at Manchester; superintended the construction of the buildings and machinery of the royal arsenal at Woolwich in 1854–55; was for several years a consulting engineer in London; went to Ceylon in 1859; became chief engineer and director-general of the railways in that island, and in 1871 was appointed consulting engineer to the government of India. His *Pocket-book of Engineering Formulæ* passed through six editions in a single year, and is recognized as a standard work in the profession.

Molesworth (Sir WILLIAM), BART., b. at Camberwell, a suburb of London, England, May 23, 1810; succeeded to the baronetcy in 1823; studied at the University of Cambridge, but was obliged to leave on account of having challenged a tutor to fight a duel; finished his education at Edinburgh University and in Germany; travelled through Europe; became in 1831 an enthusiastic advocate of reform measures; was elected to Parliament for East Cornwall Dec., 1832; was an intimate friend of Bentham and James Mill, of whose opinions he was a leading exponent in Parliament; founded the *London Review* in 1835, which he merged in the *Westminster Review* in 1836, and published at great expense a magnificent edition of the *Works of Thomas Hobbes* (16 vols., 1839–45), of which he presented copies to the leading libraries of Great Britain and Ireland, and left unfinished a *Life of Hobbes*, which remains unpublished. Sir William Molesworth was the first to call public attention to the horrors of the convict system then in vogue, and to the maladministration of the colonial office, and was largely instrumental in effecting a radical change in both these important branches of the administration. In 1853 he became first commissioner of public works in the cabinet of the earl of Aberdeen, and in 1855 secretary of state for the colonies in Lord Palmerston's first cabinet. This appointment was hailed with great enthusiasm by the colonies, but before any considerable results could be derived from his policy Molesworth d. in London, Oct. 22, 1855. Had his life been prolonged to the ordinary limit, there can be little doubt that he would have figured as one of the great statesmen of the age.

Molesworth (WILLIAM NASSAU), b. at Millbrook, near Southampton, England, Nov. 8, 1816; was educated at King's School, Canterbury, St. John's and Pembroke colleges, Cambridge, where he graduated in 1839; took orders in the Church of England; became incumbent of St. Andrew's, Manchester, in 1841, and vicar of St. Clement Spotland, Rochdale, in 1844. He has published, besides several minor works, a *History of the Reform Bill of 1832* (1864), a *New System of Moral Philosophy* (1867), and a *History of England from the Year 1830* (3 vols., 1871–73). A new edition brings this valuable work to the year 1874, making it the only reliable history of England during the period within the memory of the younger generation of readers. It is very highly commended by the celebrated John Bright, who is a neighbor of Mr. Molesworth at Rochdale.

Molfet'ta, town of Southern Italy, in the province of Bari delle Puglie, in lat. 41° 13′ N., lon. 16° 39′ E., stands on a little peninsula surrounded by the Adriatic except on the S. Its external aspect is attractive, but within all is narrow and gloomy, with the exception of some fine churches and other public buildings. A commodious and secure harbor, however, and its central position, make this place one of the chief markets of the province, both for imports and exports, the latter consisting of grain, wine, almonds, olive oil, etc. There is also considerable industry here in the way of small manufactures. The origin of Molfetta is not well known, but it was probably founded about the same time as was Amalfi (300 A. D.). Its mediæval life was that of Southern Italy generally. Pop. in 1874, 26,829.

Molière (JEAN BAPTISTE POQUELIN), b. in Paris Jan. 15, 1622. His father, M. Poquelin, was a tradesman and mechanic (*tapissier*) of good standing and connected with the court, from which he received the title of valet de chambre. This title was afterwards conferred on the son, and has given rise to many absurdities, as if Molière had been a simple valet, and his comedies mere amusements gotten up to humor his master. The son was educated in his father's shop till his fifteenth year, when he was sent to the college at Clermont, one of the best educational institutions at that time. He also enjoyed the instruction of the celebrated philosopher Gassendi, and after finishing his college course (1642) he studied law for a couple of years. He was just about entering into a professional position when he happened to fall desperately in love with Madeleine Béjart, an actress belonging to a troop of strolling actors playing in Paris. At once he gave up his profession, left Paris (1645), assumed the name of Molière, and strolled around in the provinces for twelve years—first as an actor, then also as an author, and at last even as a manager. Very little is known about his life in the provinces, except that he made a name for himself and his troop. In 1653 he brought his first original comedy *L'Étourdi* (translated into English by Dryden under the title of *Sir Martin Marall*) on the stage in Lyons, and with decided success. In 1657 he represented another original play, *Le Dépit amoureux*, with equal success in Nantes, and in 1658 he reached the goal of his exertions, to play in Paris for the court and the king. Paris had at that time two stationary theatres—one in the Hôtel de Bourgogne, where Corneille's tragedies were performed, and the other in the Hôtel de Petit-Bourbon, where was represented by Italian comedians the so-called *commedia dell' arte*, a sort of farce, whose characters comprised only a few fixed types, whose plot consisted of extravagant situations, and whose dialogue was mostly improvised. Molière pleased. His troop received the title of "troupe de Monsieur," and was allowed to perform alternately with the Italian comedians. Next year he brought on the stage *Les Précieuses ridicules*. It was hailed by the audience with the exclamation, "Voilà, la vraie comédie!" It had a run of four months, although the prices were trebled. It was not only a success, but a victory; the Italian comedy was defeated. In 1661, Molière's troop removed, under the name of "troupe du roi" and with a yearly pension of 7000 livres, to the Palais Royal, and thus the foundation was laid of the renowned institution the Théâtre Français. *Les Précieuses ridicules* was, indeed, the beginning of the true comedy; all modern comedy before Molière was farce. The plots and the characters were formed only with a view to comical effect. No regard was paid to probability, psychological truth, or moral impression. With respect to his plot, Molière made no decisive progress. Although some of his plays—as, for instance, *L'École des Femmes* (1663)—were models of brilliant composition, yet he never thought of using the situations as a means of depicting life; he only used them as a means of depicting characters. But his characters are no longer fixed types of general follies; they are studies of life. They have a satirical (consequently a moral) bearing on what was actually going on. They are historical documents, and acted as agents for ideas. In *Les Précieuses ridicules* he attacked the finery and pedantry of the Hôtel Rambouillet, the most solidly established and most generally acknowledged literary power of the time; and he repeated the attack with *Les Femmes savantes* (1671), as if he had not hit hard enough the first time. In *Le Médecin malgré lui* and *Le Malade imaginaire* (1674) he attacked the physicians of his time; and in order to understand that his satire is not a mere ridicule, it must be remembered that the science of anatomy was not yet discovered, while the most celebrated physician in Paris believed that he had invented an elixir of life. In every one of his comedies he aimed at some folly, and he was not only a man of penetrating sense, but also a man of courage. In *Tartufe* (1667) he touched the sorest but also the most dangerous point in contemporary life in France—namely, religious hypocrisy. But he was equal to his task. *Tartufe* is one of his greatest creations, and the hypocrites smarted under the blows it dealt. Of course, such a man must have many enemies, especially when he is admired and applauded by the people, as Molière was, and more than once the king himself, Louis XIV., had to step in and support him against the intrigues and chicaneries of his foes. And to the troubles of his public life were added domestic calamities. In 1661 he had married Armande Béjart, a younger sister of his former mistress. People said that he had married his own daughter, and this slander was not completely refuted till 1821. Madame Armande proved a coquette, and Molière was jealous. He suffered horribly. There is in *Le Misanthrope* (1667) a passion and almost a cry of despair which excites the deepest sympathy. Very early, too, his health failed. He was only fifty-one years old when one night, during the representation of *Le Malade imaginaire*, in which he acted the chief part, he broke down and had to be carried home. He died a few days after (Feb. 17, 1673). The archbishop of Paris, a person noted for his dissipation and debauchery, denied Molière ecclesiastical sepulture because he was an actor and because he had written *Tartufe*, and, but for a special order from the king, infamy would have been thrown on the grave of the greatest poet of his age. His works were translated into English by Von Laun (12 vols., Edinburgh, 1875).

CLEMENS PETERSEN.

Moli'na (Felipe), son of Pedro, b. at Guatemala in 1812; became a distinguished member of the liberal party; was exiled after the downfall of the federal government, and became a citizen of Costa Rica; was appointed in 1848 envoy of that republic to Nicaragua; was subsequently minister of Costa Rica in England, France, Spain, Rome, and the U. S.; negotiated a commercial treaty with the U. S.; published in several languages sketches of the history and geography of Costa Rica and reports upon its boundary and navigation questions with Nicaragua. D. at Washington, D. C., Feb. 1, 1855.

Molina (Juan Ignacio), known in Italian as Giovanni Ignazio, b. at Talca, Chili, June 24, 1740; received a brilliant education at Santiago; was acquainted at the age of twenty with the whole circle of sciences and languages then taught in the colony; entered the order of Jesuits; became librarian of its college, and devoted himself to mathematics and the natural sciences. Being expelled, with all the members of his order, from the Spanish colonies in 1767, he settled at Bologna, Italy; was ordained priest; became a teacher, and published several esteemed works upon Chili: *Compendio di Storia geografica natrale e civile del Chili* (Bologna, 1776), *Saggio sulla Storia Naturale del Chili* (1782), and *Saggio della Storia Civile del Chili* (1787), of which the latter was published in English at Middletown, Conn., by Richard Alsop in 1808. Abbé Molina inherited a fortune in 1815, when he endowed a library at his native city. D. at Bologna Sept. 12, 1829.

Molina (Luis), b. at Cuenca, in New Castile, in 1535; entered the order of the Jesuits in 1553; was professor of theology at the University of Evora, Portugal, for twenty years, and d. at Madrid Oct. 12, 1601. In 1588 he published his *Liberi Arbitrii cum Gratiæ Donis, Divina Præscientia, Providentia, Prædestinatione et Reprobatione Concordia,* which, under the form of a commentary on some parts of Thomas Aquinas's *Summa Theologiæ,* attempted to harmonize the views of Augustine concerning grace with the semi-Pelagian ideas of free-will. The Dominicans, of whom Thomas Aquinas was the pride and spiritual fortune, attacked the book with fury, and the Jesuits defended it. A contest between the *Thomists* and *Molinists* ensued, and grew very hot. The pope was asked to interfere, but, finding it not only difficult but even dangerous to be infallible on such a point, he transferred the whole question to an assembly of cardinals, the celebrated *Congregatio de Auxiliis,* and forbade all controversy till the Congregatio had made its decision. This decision, however, never came, and was never intended to come; but the question arose again in the strife between the Jansenists and the Jesuits, and still remains unsettled in the Roman Catholic Church.

Molina (Pedro), b. in Guatemala in 1777; received an excellent education; became a physician, and was distinguished as a poet and a politician; was noted for the liberality of the political views which he inculcated in his writings; was one of the members of the first national executive in 1823; went as ambassador to Colombia 1825, and signed a treaty of alliance; represented Central America in the Congress of Panama 1826; was governor of Guatemala 1829, secretary of state for foreign affairs 1832–33; was exiled by Carrera, and resided some years in Costa Rica; was deputy to the constitutional assembly 1848, and for many years president of the medical faculty and chief director of the University of Guatemala. D. about 1850.

Molina, de (Fray Alonso), b. in Spain in 1496; went to Mexico as a Franciscan monk soon after the Conquest; was zealous in the conversion of the natives; made himself a thorough master of the Mexican or Aztec language, in which he published a catechism (1564), a manual of confession (1565), and a grammar (1571), besides his great work, the dictionary of that tongue, of which the first part, *Vocabulario en Lengua Castellana y Mexicana,* was published at Mexico in 1555, and both parts in 1571. The latter has been sold in Europe for fifty guineas; the earlier edition is so rare that its existence was unknown until recently to European bibliographers. D. in Mexico in 1584.

Moline', post-v. and tp. of Rock Island co., Ill., on the E. bank of the Mississippi River, 350 miles, by river, below St. Paul, and on the Chicago Rock Island and Pacific, the Rockford Rock Island and St. Louis, and the Western Union R. Rs., has fine water-power, and owes its prosperity largely to its extensive factories, of which there are 20 for the manufacture of ploughs, malleable iron, steam-engines, files, wagons, paper, lumber, tubs and pails, pumps, pipe-organs, milling-machines, crackers, windmills, lead roofing, scales, and furniture. It contains 8 churches, graded schools, 1 weekly newspaper, a free public library, 3 banks, a horse railway, and gas and water-works. Pop. of v. 4166; of tp. 5754. B. F. Tillinghast, Ed. "Review."

Molinel'la, town of Northern Italy, province of Bologna, situated between the Reno and the Po, lies in the old valley of the Po, and had its beginning in a few hamlets built on the islands left by the river as it gradually changed its bed. As these islands became united by the further divergence of the river, new houses were put up, and Molinella is now a populous town with respectable buildings, the inhabitants of which are chiefly occupied in the manufacture of hemp and cheese. Pop. in 1874, 10,751.

Mol'inism, the scheme or theory proposed by Luis Molina in his treatise on *The Reconciliation of Grace and Free-will* (1588), and designed to harmonize the doctrine of predestination with that of human responsibility. (See Molina.)

Moli'no del Rey, a massive series of buildings half a mile N. of the castle of Chapultepec, near the city of Mexico, originally a flour-mill, afterwards a foundry of arms, and occupied as a fortress by a portion of the Mexican army, was attacked and carried by storm Sept. 8, 1847, by a division of the army under Gen. Winfield Scott, after a well-contested battle, in which the Americans lost several hundred men.

Moli'nos (Miguel), b. near Saragossa in 1627; studied at Pamplona and Coimbra, and settled, after being ordained priest, at Rome, where a great number of people chose him for their confessor; when afterwards his papers were seized, they contained about 20,000 letters from persons asking for his spiritual advice. In 1675 he published his *Guida Spirituale,* which attracted great attention and was translated into different languages. It teaches that true godliness consists in uninterrupted communion with God, established by contemplation, and was the foundation of the so-called Quietism which afterwards found its most striking development in Madame Guyon. The Jesuits, however, found that this view endangered the doctrine of good actions. Pope Innocent XI. condemned the book in 1687; Molinos recanted, and was imprisoned for the rest of his life in a Dominican monastery of Rome, where he d. Dec. 29, 1696.

Moliter'no, town of Southern Italy, province of Potenza, stands on a hill, enjoys a salubrious climate, and its inhabitants are industrious and fond of traffic. Half the trade of the Basilicata and much of that of Cosentino is carried on here. An effort is now making to supply the want of roads, which is severely felt. Pop. in 1874, 6621.

Moll, in music, the German for *minor,* whether in relation to modes, keys, or intervals. Thus, C moll is C minor.

Mol'lah, among the Turks, Persians, and Toorkomanians, the title of the superior judge of civil and ecclesiastical law. The position and dignity of the mollahs are not uniform in different Mohammedan countries.

Mollusca. See Conchology, by G. W. Tryon, Jr.

Molluscoi'dea, a name given to a provisional group of animal organisms formerly included among mollusks (see Conchology, by G. W. Tryon, Jr.), but now excluded from their number by most of the best systematists of the age. The Molluscoidea include the Brachiopoda, the Bryozoa, and the Tunicata. The prevailing tendency seems to be to consider them all, or mostly, as articulate animals, but some authorities make them intermediate between mollusks and articulates, not really belonging to either. (See Brachiopoda, Bryozoa, and Tunicata.)

Moll'witz, a v. of Prussian Silesia, near which the Prussians won a decisive victory over the Austrians Apr. 10, 1741.

Mo'loch, or **Mo'lech** [Heb. הַמֹּלֶךְ, "the king"], called also **Milcom** (1 Kings xi. 5) and **Malcham** (Zeph. i. 5), the fire-god of the Phœnicians (a modification or hypostasis of Baal, the sun-god), but spoken of in Scripture as more especially "the abomination of the Ammonites." That children were sacrificed to this deity is not to be questioned, although "passing through the fire to Molech" may not always mean so much. Diodorus Siculus (xx. 14) describes a brazen image used among the Carthaginians in sacrificing children to Cronos or Saturn. R. D. Hitchcock.

Mo'loch Hor'ridus, one of the most hideous of existing animals, a lizard of Australia, belonging to the family Agamidæ, which is completely covered with sharp spines and has large horn-like spines over the eyes. It is of a pale yellow, spotted with black, brown, and red. It is not very large. Theodore Gill.

Molo'ga, town of Russia, in the government of Jaroslav, at the confluence of the Mologa and the Volga. It carries on considerable boatbuilding and trade in timber. Pop. 5118.

Moloss′idæ [from *Molossus*, the name of the typical genus], a family of the order of bats (Cheiroptera) and sub-order Animalivora, without nasal appendages. The head is large; the ears are simple and rounded, and have each a distinct tragus; the intermaxillaries are deficient at the symphysis; molars $\frac{4}{5}$ or $\frac{5}{5}$ (M. $\frac{3}{3}$, PM. $\frac{1-2}{2}$) $\times 2$; the true molars have W-shaped ridges; incisors variable in number (*e. g.* $\frac{2}{3}$, $\frac{1}{2}$, $\frac{1}{1}$, or $\frac{1}{0}$) and small; the stomach is sacciform, and its extremities approximated. The hinder extremities are robust, and the animal more capable of progression on all fours than most of the order. They are generally larger than the familiar bats of northern countries. They inhabit chiefly tropical regions of the Old as well as New World. At least two genera are recognized—viz. (1) *Molossus* (with the sub-genera *Nyctinomus*, *Mormopterus*, *Promops*, *Molossus*, *Molossops*, *Dinops*, *Myopterus*, and *Mops*), tropicopolitan; and (2) *Chiromeles*, Indian. The family has not yet been well defined. THEO. GILL.

Molt′ke, von (HELMUTH CARL BERNHARD), COUNT, b. Oct. 26, 1800, at Parchim, in Mecklenburg, and educated at the military academy of Copenhagen; entered the Prussian service in 1822, and was appointed a member of the staff in 1832. He devoted himself with great energy to the scientific part of his office, and published in 1835 a work on the Turko-Russian war of 1828–29. This war, as all questions relating to the Orient were of great interest to Prussia, led Moltke, who was thoroughly conversant with them, to make a journey to Turkey in 1835. The sultan, Mahmood, to whom he was introduced, and whose confidence he enjoyed, procured for him a furlough of several years, during which time he aided the sultan by his advice, both in the reorganization of the Turkish army and in the improvement of the fortifications of Silistria, Shoomla, Varna, Roostchuk, and the Dardanelles. Together with several other Prussian officers on furlough, he accompanied the Turkish army in the campaigns against the Koords and against Mehemet Ali, viceroy of Egypt. After the death of Sultan Mahmood he returned home and published in 1841 *Briefe über Zustände und Begebenheiten in der Türkei aus den Jahren 1835–39*, and a map of Constantinople and the Bosphorus on the scale of 1:25,000. In 1846 he was appointed adjutant to Prince Henry of Prussia, who lived in Rome, and the fruit of his residence in this city was a map of its surroundings. After the death of the prince in 1847, he was attached to the governor-general on the Rhine, and became chief of a division of the staff in 1848, chief of the staff of the fourth army corps from 1849 to 1855, adjutant to Prince Friedrich Wilhelm in 1856, and chief of the staff of the whole army in 1858. In this prominent position he has made his name immortal as a general. Under his inspiriting leadership the staff became a most convenient and effective means of commanding the army, and in the subsequent wars his plans and dispositions resulted in an unbroken series of brilliant victories. For the achievement of such results the presence of the king was of vital importance. In 1866 and 1870–71 the latter led as commander-in-chief, and gave absolute authority to Moltke's dispositions. On a minor field, in 1864 against Denmark, Prince Friedrich Karl having received the command in April, Moltke led the army for the first time in war, having drawn up beforehand the plan of the whole campaign. In 1866, in the war against Austria and her allies, he entered a larger theatre, and showed his strategical talent in a most brilliant manner. In June, 1866, he was made a general of infantry, and after the short and astonishing campaign was finished the king gave him the highest Prussian order, that of the Black Eagle, and the Diet voted him a dotation. He was elected a deputy to the North German Diet in the next year. Anticipating the French attack, he planned a campaign against France immediately after the Austrian war; which plan was laid before the king in 1868, and followed out in 1870 as far as such a plan could be followed—that is, with respect to the organization of the army and the choice of the first point of attack. The French campaign of 1870–71 is probably one of the most brilliant which has ever been fought, and although its entire success cannot be ascribed to Moltke, as many different agencies were at work, the larger share is nevertheless his due. Although possessed of the highest theoretical education, he is never caught by a theory, but surveys with admirable freedom the changing incidents of the war, and acts in accordance with them. With him the greatest audacity of plan is connected with a perfectly cool and sober calculation in the execution; and this is his greatness. On the day of the capitulation of Metz the king created him a count; on the conclusion of the armistice he gave him one of the five grand crosses of the Iron Cross, and on the day of the return of the troops to Berlin he made him a field-marshal. He also received a dotation of 300,000 thalers, and the freedom of many cities was presented to him. He is not very talkative, and as he is thoroughly conversant with several languages, people say of him, epigrammatically, that he is silent in seven languages. Among the works which he has partly written, partly edited, are *Der italienische Feldzug von 1859*, *Ueber den Krieg vom Sommer 1866*, and *Der deutsch-französische Krieg, 1870–71*.

AUGUST NIEMANN.

Moluc′cas, or **Spice Islands,** are a group (or rather a multitude) of islands of the Malay Archipelago, lying between Celebes and Papua, between lat. 3° S. and 6° N., and between lon. 126° and 135° E. They are all of volcanic origin, high, mountainous, and exceedingly fertile. The forests which cover the mountains to their very tops contain teak, ebony, sandal, iron, and satin wood, besides palms, bread-fruit trees, and many varieties of the finest fruit trees. Rice, sage, cotton, indigo, coffee, and sugar are grown; the nutmeg and the clove are indigenous to all the islands, but the Dutch have confined the cultivation of the clove to Amboyna and the Uliassers, and that of the nutmeg to the Banda Islands; on the other islands the trees of native growth have been rooted out. The original inhabitants were Malays; Arabs, Hindoos, and many Chinese have since immigrated and settled down, and one of the most prominent features of the population are the mestizoes, descendants of Europeans—Portuguese, Spaniards, or Dutch—and natives. On the islands directly governed by the Dutch the inhabitants are Christians, and live in orderly communities; the inhabitants of the islands which are only indirectly governed by the Dutch are mostly Mohammedans, and are generally pirates. The northern division of the archipelago, comprising the islands of Ternate, Tidore, Batjan, Makian, Motir, and the Obi group, and forming the residency of Ternate, which contains 95,142 inhabitants, is thus only indirectly under Dutch government, while the southern division, comprising Amboyna, the Banda Islands, and the Uliassers, and forming the two residencies of Amboyna and Banda, which together contain 236,737 inhabitants, are governed directly as a province of the motherland. The Dutch have been in possession of these islands since the beginning of the seventeenth century. (For further information see AMBOYNA and BANDA.)

Molun′kus Plantation, tp., Aroostook co., Me. P. 61.

Mo′ly [Gr. μῶλυ], a fabulous herb, a sovereign remedy for all diseases, which Mercury gave Ulysses as a countercharm against Circe. The ancients identified it with a species of garlic. A wild Oriental garlic is now called *Allium moly*, and the name *moly* was given to a proposed genus (not now recognized) of alliaceous plants by Mönch. The *Allium moly* is a showy plant, cultivated under the name of golden garlic for ornament.

Molyb′denite, the natural sulphide, a mineral crystallizing in the hexagonal system, with eminent cleavage, and occurring commonly foliated or in highly flexible, inelastic scales. In its crystallization, hardness (1–1.5), lead-gray color, and metallic lustre it much resembles graphite, but is distinguished from that mineral by its streak, which is lead-gray, its specific gravity, 4.6, and by emitting sulphurous fumes before the blowpipe. It is met with in gneissoid, granitic, and other crystalline rocks. The natural dioxide, molybdic acid, occurs as *molybdite*, a yellow earthy mineral, and also combined in several minerals, as with lead in WULFENITE (which see).

EDWARD C. H. DAY.

Molybde′num [Gr. μόλιβδος and μόλυβδος, "lead;" μολίβδαινα and μολύβδαινα, a "ball of lead" used in games; Fr. *molybdène;* Ger. *Molybdän* and *Wasserblei:* the last term is apparently attributed by Gmelin to both the metal and the native sulphide], an elementary metal, occurring in a well-known mineral which is so extremely similar to graphite or "black lead" that it was first discovered in 1778 by the great Scheele to yield the peculiar oxide known as *molybdic acid.* A few years later, in 1782, Hjelm isolated its metal. The reason why the Greek name for *lead* was applied to it seems most probably traceable through the German term "Wasserblei." A passage is, however, quoted from Pliny in which he speaks of "molybdæna" and "galena" as the same mineral, and as "common in silver and lead veins." Molybdic acid occurs native, as *molybdite* or molybdic ochre, of which there are several American localities. Of the native sulphide, *molybdenite*, there are quite a number of localities on this continent. It is only distinguishable from graphite by a very practised eye, but on white glazed earthenware it gives a *greenish* trace, easily distinguishable from that of black lead. Its laminæ are much more flexible and infrangible than those of graphite. On heating in an open glass tube beautiful crystals of molybdic acid sublime. The metal is not too well known. It is easily reduced from its oxide, even by hydrogen gas, but is fusible with difficulty. Debray fused it, and describes

it as white, with silver-like lustre, very hard (almost equal in this respect to topaz), and of density = 8.6. Bucholz gives the density as 8.49–8.636. New density determinations, under different well-marked definite conditions, are yet needed, as is indeed the case with most of the less-known elements. It is unacted on by the air at normal temperatures, but when heated sufficiently burns to molybdic acid. Concentrated acids act upon it—diluted ones not readily or not at all. Its most important compound, practically, up to this time, is the compound of molybdic acid with ammonia, used in chemical analysis for the detection and determination of phosphoric acid. Few laboratory reagents are more important than this when its mode of use is understood so as to be reliable. It must, in the first place, be itself free from phosphoric acid. It should give no precipitate on standing, and only a faint yellow color when its dilute solution with excess of ammonia is heated to boiling and a small excess of nitric acid added. To detect phosphoric acid the manipulation is the same; another needed precaution being a large *excess* of molybdic acid over the phosphoric acid present. If the first trials fail, they must be repeated on *largely diminished quantities* of the liquid tested, to obtain certainty as to such an excess being in action. The phosphoric acid is carried down, when present, as a beautiful lemon-yellow granular precipitate, whose composition is not yet wholly settled, although it is known to contain but a very trifling percentage of phosphoric acid—a fact which explains the great delicacy of the test. In quantitative operations the yellow compound is washed, by decantation, with a mixture of molybdate of ammonia and dilute nitric acid, then dissolved in strong ammonia, and precipitated with a magnesian solution. HENRY WURTZ.

Mol′yneux (WILLIAM), LL.D., F. R. S., b. at Dublin, Ireland, Apr. 17, 1656; graduated at Trinity College; studied law at the Middle Temple; returned to Dublin 1678, and founded there a philosophical society 1683; became surveyor of public works 1684; inspected the fortresses of Flanders 1685; resided several years at Chester, where he wrote his important *Treatise on Dioptrics* (published 1692); was engaged in the siege of Limerick (1690); returned to Dublin soon after the Revolution; became a member of the Irish Parliament 1692, and wrote many papers on natural philosophy, astronomy, mathematics, politics, and law, chiefly published in the *Philosophical Transactions*. He was considered an eminent astronomer, and was a correspondent of Locke and Halley. D. at Dublin Oct. 11, 1698.

Mombas′, or **Mombaz**, an island with a town of the same name, belonging to the sultan of Zanzibar, is situated in lat. 4° 4′ S., just off the eastern coast of Africa, in a small bay formed by the estuaries of two rivers. The island is a coral formation, low and flat, but containing an excellent harbor. The town, which in the sixteenth century, when the Portuguese took possession of it and fortified it, was a flourishing place, is now nothing but a heap of wretched ruins, and the inhabitants are notorious for their rapacity and treachery. In the third century after Christ the Goths invaded it and remained, after having defeated the emperor Decius. In the sixth and seventh century the Slavic races took possession of the country.

Mom′berger (WILLIAM), b. at Frankfort-on-the-Main, Germany, in 1829; studied art at the Düsseldorf school; came to the U. S. in consequence of having participated in the revolutionary movements of 1848; established a chromo-lithographic business in New York City; engaged with great success in preparing illustrations for books; built a fine studio at Morrisania, and has painted some effective landscapes, among which is that representing Sugar-loaf Mountain (near Winona, Wis.).

Mo′mence, post-v. and tp. of Kankakee co., Ill., on the Chicago Danville and Vincennes R. R., 56 miles S. of Chicago, has 3 churches, 1 newspaper, 2 banks, 1 planing and 1 saw mill, 1 furniture manufactory, and stores. Pop. 1291. M. O. CLARK, ED. "REPORTER."

Moment and **Momentum**, in mechanics. See FORCE, by PROF. E. C. PICKERING, B. S., and MECHANICS and DYNAMICS, by PROF. W. P. TROWBRIDGE, A. M.

Mômiers′ [Fr., "mummers"], the cant name given in 1818 to a body of evangelical Protestants of Switzerland and the adjoining parts of France and Germany, whose distinguishing characteristic was the fervency of their religious exercises. The Mômiers accused the national Church of Switzerland of apostasy from Calvinism, especially in denying the divinity of Christ. They were consequently subjected to repressive measures, and ultimately returned to the orthodox communion. The most distinguished of the Mômiers was Rev. Cæsar Malan.

Momm′sen (THEODOR), b. at Garding, Sleswick, Nov. 30, 1817; studied law and philology at Kiel; travelled 1844–47 in France and Italy; was appointed professor of Roman law at Leipsic in 1848, at Zurich in 1852, at Breslau in 1854, and at Berlin in 1858. His *Oskische Studien* (1845), *Die unteritalienischen Dialekte* (1850), *Corpus Inscriptionum Neapolitanarum* (1851), *Geschichte des römischen Münzwesen* (1860), *Corpus Inscriptionem Latinarum* (1864), etc., opened up new roads for the study of the ancient Italian language and history; and his *Römische Geschichte* (1854–70), translated into English by Rev. W. P. Dickson, is one of the most original and most interesting productions of modern historical art. His description of the oldest nations which inhabited Italy, based on a most ingenious combination of the results of comparative philology, and his representation of the origin and earliest development of the city of Rome and its institutions, military and political, based on most acute inferences from that which is known to that which is not known, have excited general admiration even with those who have attacked his views; but his style is heavy, and has that juridical clearness and legal precision which outside of the court-room is awkward and obscure.

Momot′idæ [from *Momotus*, the typical genus, which is the Latin form of the vernacular MOTMOT (which see), derived from the note of the bird], a family of "coccygomorph" birds which have some resemblance to kingfishers and woodpeckers. The head is quite large; the bill rather long, somewhat decurved, depressed at the base, compressed forward, and with denticulated edges; the nostrils are roundish, near the base and upper margin of the bill; the tarsi short and scutellated; the toes normal—*i. e.* second, third, and fourth directed forward, and first backward; the tail is graduated and produced towards the middle. The maxillo-palatines and vomerine bones are of the "desmognath" type. The birds are most closely related to the todies (Todidæ) and more distantly to the Coraciidæ, Meropidæ, and Alcedinidæ or kingfishers. They are denizens of the forests of tropical America, and according to Murie (*Ibis*, 1872, pp. 383–412) there are four well-defined genera—viz. *Momotus*, *Barypththengus*, *Hylomanes*, and *Eumomotus*. THEODORE GILL.

Mompox′, town of the Columbian confederation, South America, on the Magdalena River, has some shipbuilding and considerable trade. Pop. 10,000.

Mo′mus, in Greek mythology, was a son of Night, according to Hesiod, and the personification of mockery and censure. Aphrodite was the only being whom he found blameless.

Mo′na, tp. of Ford co., Ill. Pop. 356.

Mona, post-v. of Mitchell co., Ia., on Red Cedar River, at the junction of the Cedar Rapids and Minnesota and the Austin and Mason City R. Rs.

Mon′achism [Gr. μόνος, "alone"], a life of religious seclusion, asceticism, and devotion. Traces of such a life appear in remote antiquity—among the Hindoos, in their earliest sacred books, the Vedas (cir. 1400), in the laws of Menu (cir. 1000); in Booddhism, which rose cir. 600 B. C.; and in the time of Darius and Alexander, in the Gymnosophists or naked and solitary devotees, who addicted themselves to contemplation and self-mortification as a means to the purification of the soul and its reabsorption in the original Brahm. Among the Hebrews similar ideas and tendencies are traced in the Nazarites in the time of Moses, in Elijah and the prophets in the era of the Kings, and in the Essenes and Therapeutæ of later periods. Among the Greeks, the Pythagoreans (cir. 500 B. C.) may be regarded as a species of monastic institute, and in the elder and later Platonists are found those speculations regarding matter and soul that are the primal elements of monachism.

Christian monachism differs from its Brahmanic prototypes in that, while the latter were developed from the dogma of an eternal dualism and conflict of good and evil, the former roots in the idea of an eternal divine monarchy, and the apostasy but final subjugation and recovery to it of lapsed souls. It regards a solitary, ascetic, and contemplative life as a means to this result, by liberating the soul from the dominion of sense and exalting it to the realms of pure truth and communion with Deity. The idea of expiation has also been engrafted upon it.

Christian monasticism in its development embraced four stages—the ascetic, the anchoretic, the cenobitic or conventual, and the confederation of monasteries in orders or congregations. Tendencies to a monastic asceticism appear in the apostolic age, claiming their warranty from such passages in the inspired writings as Matt. xix. 12; 1 Cor. vii. 5–7, etc. They are alluded to in the Epistles and the apostolic Fathers. An ascetic life, at first purely voluntary, came to be regarded by the middle of the second century as a superior morality and merit, for the attainment of which men gave up their property and addicted themselves to self-denial and mortifications of the flesh, but without vows

and within the churches. Subsequently, asceticism developed into anchoretism or the eremite life. Men sought the desert first as a refuge from the persecutions of the Empire, afterwards in flight from the blandishments of the world and the corruptions of a secularized Church. When martyrdom no longer challenged Christian heroism the desert became the recourse of a religious enthusiasm and saintly chivalry. About the middle of the third century Egypt especially became the theatre of the anchorite life. (See ANTONY, SIMEON STYLITES, etc.) There was the confluence of the ideas and systems from which it sprang—of the Oriental with the Occidental, Christianity with Brahmism, and of Neo-Platonism and Gnosticism with Chaldean and Persian theosophies. In Egypt we are told that the number of the anchorites increased till they nearly equalled the population of the cities. Gradually, for the sake of sustenance, defence, concert, and discipline, these solitaires were gathered into communities, organized, regulated, and living in common (cenobites), and dwelling within common enclosures (cloisters).

In 325, Pachomius established on Tabennæ, an island in the upper Nile, a society of monks, organized into priories and convents, under the superintendency of abbots (fathers), with common regulations for spiritual exercises and labors, but with no compulsory or perpetual vows. Similar communities of women (nunneries) were organized about the same time by the sister of Pachomius. Other similar institutions soon grew up around the establishments at Tabennæ, numbering, as early as 348, as many as 50,000 monks and religious recluses. About the same time similar monastic communities were established by Ammonius in the desert of Scaetis in Lower Egypt, and by Macarius in the Nitrian Mountains, the latter embracing some fifty monasteries. Soon the institution spread through the East. Monasteries were founded in Syria by Hilarion, in Mesopotamia by Ephraem, by Eustathius in Armenia, and by Basil the Great in Cappadocia and Pontus; and not in wildernesses only, but for readier access and greater influence over men they were established near the cities also, while some bands of monks led a wandering and sometimes marauding life. Monastic institutes spread along the coasts, cliffs, and isles of the eastern Mediterranean, and thence to Italy and Western Europe.

Monachism was first brought to Rome by Athanius in his flight from the persecutions of the Eastern empire, and was stimulated there especially by the panegyrics and example of Jerome and Ambrose, and by Augustine in Africa, and Martin of Tours in Gaul. Directly, the monasteries became the asylums of the persecuted, oppressed, and afflicted, the sick, the forlorn, the unhappy, and also often the refuge of those who wished to escape from labor or from civil or military service or the burdens of taxation. Idleness and corruption soon entered. Efforts were made from time to time to introduce stricter discipline for the removal of abuses and the furtherance of spiritual improvement, useful industries, and of literary and theologic culture. For this purpose Basil the Great introduced his "Rule" (cir. 350)—a rule which at his death embraced some 80,000 monks, and prevailed extensively for a long period through the East. Under this rule there were no perpetually binding vows; only a tacit and voluntary devotion to a life of seclusion, spiritual meditation, purity, and obedience to the superiors.

In time, monastic establishments, at first isolated and independent, combined into larger communities, having a common rule and a common head. These confederacies were termed orders, and appear most fully organized and powerful in the West in the mediæval period under the government of congregations and chapters. Some of them became ultimately among the most potent factors in European society, stronger often than its monarchs, and possessing a large portion of its territory. Their voice was powerful in determining not only questions of doctrine and morals, but also of international peace or war, and in electing or dethroning princes.

As regards the relations of monachism to the hierarchy, at first as a lay institution under abbots who might or might not be ordained priests, and with a life differing from the social order and relations of the rest of the world, it presented an anomaly for which no provision had been made in the hierarchical system, and was regarded with solicitude because of its great influence with the multitude. Soon, however, the hierarchy converted it into an instrument for strengthening its own power. Monasteries were first brought under episcopal control, and the monks became a standing army or force of minute-men for the bishops. A mass of men of enthusiastic or gloomy religious temperament; detached from all the relations and interests of common life, from property, families, and social ties and cares; hardened by their discipline against pain, hunger, fatigue, and all inclemencies of the sky; with affections and passions distorted and inordinate, because out of accord with nature; easily wrought to superstitious or fanatical excitement,—they became a numerous and formidable band of retainers for the hierarchy. Gradually detached from episcopal control, and brought into immediate dependency on the papacy, this class became in the Middle Ages potent instruments for subverting the independence of the national churches.

From early times (cir. 400) the monasteries became training-schools for the clergy and nurseries for missions. Selections were made from them for papal commissioners and legates and for ecclesiastical preferments. The main body of the clergy became monks. Superior sanctity was attached to the regular compared with the secular orders, and to a great extent monks became the preachers and confessors of Christian nations.

With the fall of the Roman empire in the West the monasteries almost perished in the migration and confusion of nations. They were reorganized and restored to a superior system and unity of government and discipline by Benedict of Nursia, whose order, the Benedictine, ruled the West for centuries, and who is regarded as the organizer of mediæval monachism. He founded (529) the cloister of Monte Casino, so celebrated and powerful in after ages, placed it under a mild rule adapted to the times, with irrevocable vows of poverty, celibacy, obedience, and stability (or permanent adhesion to the order). With spiritual exercises he combined various industrial pursuits, mechanical and agricultural, and also the education of the young, adapted from Cassiodorus, and missionary enterprise, incited by Gregory the Great. Affiliated convents, reformed or established on his model, were diffused through Southern and Central Europe, especially in France, Italy, and Germany, from the sixth to the ninth century. They extended also their establishments to Britain and Ireland and amid the Sclavonian and Scandinavian tribes. Their work in clearing forests, reclaiming marshes, diffusing some knowledge of letters and the arts, as well as in spreading Christianity and exterminating heathenism, was beneficent to civilization for ages. But in the troublous times toward the close of the Merovingian rule decay of discipline, with luxury, idleness, and corruption, entered the monasteries, enriched by the gifts of kings and nobles, and removed more and more from episcopal control, and under the rule of abbots subject only to the distant supervision of the papacy.

The court meantime bestowed the offices and revenues of monasteries on its favorites, not only among the clergy, but among the nobles and military chiefs, and often on the wives and mistresses of monarchs. The convents were often occupied as residences by the families of lay abbots or their retainers, and often used as rendezvous for banquets, hunts, and military games. Charlemagne attempted to correct these abuses and restore discipline, and to connect schools and literary enterprises with conventual life, as at Paris, Lyons, Cologne, Treves, Padua, and Osnaburg, with a respectable measure of success, extending through the ninth and tenth centuries.

Under the commission of William, duke of Aquitaine, Berno, a Burgundian count, founded (910) the monastery of Cluny, under the immediate supervision of the pope, with renewed enforcement of the rule of Benedict and additions of increased rigor. In imitation of Cluny a large number (1000) monasteries were reformed or newly organized, and formed themselves into a confederation, with Cluny as its head. This became the liberated congregation of Cluny, which by strict asceticism, the splendor of its ritual, and zeal for literature and education, and by a succession of distinguished abbots, secured an influence unexampled in those ages, numbering among its adherents no less than 2000 convents, attracting to itself the admiration and revenues of princes, and possessing, especially after the Crusades led men, in order to raise money, to sell or mortgage their estates, a large portion—nearly one-third—of the domain of France. They arbitrated between princes, and it was their boast that the heart of France was in the hands of the monks of Cluny. The congregation of the Cistercians, founded at or near Dijon, in 1098, rivalled that of Cluny, differing from it in simplicity of ritual and in submission to episcopal jurisdiction. Bernard, abbot of Clairvaux, gave it especial celebrity. It embraced in the thirteenth century more than 2000 monasteries and 6000 nunneries. Celebrated and powerful in Italy was the Camaldolite order, founded in 1018, and the Vallambrosan, established in 1038. Various other orders originated in the eleventh and twelfth centuries, as the Carthusians and the Carmelites, but most important of all were those of the preaching mendicant friars, the Franciscans and Dominicans.

The Franciscans originated from Francis of Assisi (b. 1182), who went forth, after the example of the apostles,

without scrip or purse, preaching the gospel to the multitudes, subsisting upon alms, and drawing with him a band of enthusiastic youth as followers. His order was sanctioned by Honorius III. (1223) with the right of preaching and the care of souls in any district or country. Their humility, simplicity, love, and contempt of the world won the multitude, and procured for them the epithet "seraphic." They became a power in the Church, and before the rise of the Jesuits divided with the Dominicans the claim of pre-eminence. The Franciscan order was strengthened much, as were subsequent orders, with a class of *Festionis*—men who wished to live according to its rule, and yet were compelled to remain in secular avocations.

The order of the Dominicans was founded by Dominico Guzman (b. 1170), a Castilian of high family, whose zeal was especially aroused for the conversion of heretics, and led him to the S. of France (1208) to preach to the Albigensians. Thoughtful, scholarly, profoundly emotive, and devoted to the Catholic faith, he drew around him disciples similar in zeal, temperament, and culture. His order, like that of the Franciscans, was empowered to preach and hear confessions everywhere; and in 1220 it adopted the rule of St. Francis, and became a mendicant preaching fraternity, differing from the Franciscans in superior literary and theologic culture, which was pursued by them with an especial view to the confutation of heretics. These orders obtained great influence as preachers and confessors of the people; the Dominicans also as confessors of the noble and the cultivated, and especially as ministers of the Inquisition, which was committed peculiarly to them. United to the papacy by reciprocal interests, these orders became its spiritual militia. They encroached on the province of the diocesan clergy. The Dominicans also, as guardians against heresy, aimed to get possession of the chairs of the universities. Their arrogance and ambition ultimately provoked the jealousy of the other clergy and of the learned classes, and produced a reaction against them. Moreover, their rivalry of position, diversity of genius, and divergency in philosophy and theology threw these orders into antagonism to each other, and in a measure broke the power of each. Subsequently, corruption of discipline, from the evasion of their vow of poverty, and internal dissensions, diminished their energy and influence. Finally, from being largely contributors to the theologic literature of the fourteenth century, they became in the fifteenth eminently antagonistic to intellectual progress and Church reform.

The Augustine order, founded 1256, also subsequently rose to importance, and was distinguished for eminent names, especially for that of the great Reformer. The Carthusian latest retained the strictness of its primitive discipline.

Especially to be noted also are the military orders, which appeared in the times of the Crusades in the eleventh and twelfth centuries—spiritual knights who added to monastic vows that of perpetual war with the infidel. (See articles on KNIGHT and TEMPLAR.)

Various other orders, representing various types of religious sentiment, temperament, and enterprise, sprang up in the latter part of the Middle and the earlier of Modern Ages. Especially to be noted among these is that one which has been the most potent arm of the papacy in its conflict with Protestantism during the last three centuries—the order of the JESUITS (which see).

In relation to the Reformation of the sixteenth century, from the monasteries came some of its earliest heralds and some of its most effective leaders, as Luther and Bucer. But the monastic orders, true to the genius of their system, soon presented the most hostile and effective resistance to it. But the rise of great Protestant powers in Europe greatly diminished their numbers, wealth, and influence. Through popular and political disfavor, retrenchment of privileges and revenues, or through suppression and by confiscation of their estates to civil, educational, eleemosynary, or religious uses, the monasteries in Protestant countries suffered loss of power or entire extinction. In Catholic countries also, though they maintained their formal existence, somewhat reformed in discipline, they were often there much depressed in estimation and influence by the spirit of the age.

The tendency to liberalism in European thought in the age preceding the French Revolution was disastrous to monachism in Catholic countries. It was regarded as hostile to the progress of ideas, and as adverse to economical interests, because discouraging marriage, withdrawing multitudes from productive avocations, and holding vast properties in a dead hand. In 1781, Joseph II. abolished some orders and reclaimed others from allegiance to a foreign (papal) power. In France the shock of the Revolution was still more damaging. Monasteries were abolished early in the Revolution, subsequently were allowed to revive, but with diminished prestige and influence. The example of France was followed by much of Catholic Europe under Napoleon. Excepting in Austria, Spain, Portugal, and Naples their wealth was extensively secularized.

Monachism at present subsists with little of its former importance, even in Catholic countries. Amid a world no longer presenting the conditions that gave it its birth, its uses, and its power, it is no longer the *potent factor* of former times in history and civilization, while its work in hospitals, schools, and asylums—which offices its establishments now more extensively subserve—is brought into comparison and competition with institutions which general society, now more enlightened, more scientific, more humane, and more free, is erecting for itself.

In historic survey, the influence of the monastic institution is marked in strong contrasts of light and darkness, widely different with different individuals and different ages. As Augustine says, the best and the worst of men were found among the monks, and its function in civilization has varied with varying eras. Monasticism undoubtedly accelerated the fall of heathenism, and was especially active in Christian missions amid barbarous tribes. It presented at times a moral contrast and check to a corrupt Church and society; furnished sanctuaries against barbaric violence in ages of force; conserved something of ancient letters, though often the classic manuscript was effaced for the monkish legend; promoted agriculture and the mechanical arts, and, to some extent, the education of the young. It opened a spiritual and intellectual gymnasium to saintly and scholarly men, and has bequeathed a literature, scholastic, theologic, devotional, and hymnic, for some of which the modern ages are its debtors. Many of our sweetest Christian lyrics and books of devotion dear to the whole Christian world come down from the old convents in eras of social decay or of anarchy and darkness. Names such as Basil the Great, the saintly Gregories, Chrysostom, Augustine, a Bernard, a Thomas à Kempis, and a Xavier constellate along its history. On the other hand, it has at times withdrawn from Church and society much of their most needed and beneficent forces, has sequestered in wildernesses their noblest, saintliest, and most gifted spirits, has diverted from economic interests much of industrial energy and enterprise, and turned the channels of religion from common life into the desert. Often through its violence to nature it has been the focus of superstition, fanaticism, and moral corruption, whence they have gone forth to infect the world, and has been the readiest instrument and most potent champion of hierarchical bigotry and despotism in their antagonism to intellectual, spiritual, and political freedom and progress. T. M. POST.

Mon'aco, a small city, with 1887 inhabitants, situated on a lofty promontory in the Gulf of Genoa, forms, together with a surrounding territory comprising an area of 6 square miles, with 3127 inhabitants, an independent principality of Europe. It is a legalized gambling-place, and has lately acquired great reputation as a watering-place and a resort for consumptives.

Mon'ad [Gr. μονάς, ἑνάς] does not seem to have been used with any technical philosophical meaning by the ancients. It obtained such first in the writings of Giordano Bruno (1548–1600), who used it to designate the primal elements of all existence, spiritual as well as material. The monads, which are minute spheres, contain the potency of all the forms of life. The soul is a monad, and God is the monad of monads. It was probably the doctrine of Giordano Bruno that gave Leibnitz the fundamental thought of his *Monadology*. In that work Leibnitz lays down his doctrine of monads, which he elsewhere defines as "metaphysical atoms, destitute of parts and incapable of being produced or destroyed naturally" (*i. e.* without a creative or annihilating act of the primal monad, or God). They all differ from each other, and are subject to continual automatic change, involving, of course, the existence of something that changes and something that remains—in other words, multitude in unity, which again involves appetite and perception. They are indeed "entelechies" (not in the Aristotelian sense) or potential souls, existing in a state of unconscious stupor. They are created by God, the primitive Unity, who is the absolutely infinite and perfect Being, toward which they all tend, and which they all symbolize and more or less confusedly represent through their more or less numerous relations. Thus, every created monad represents the entire universe. (See *Journal of Speculative Philosophy*, vol. i. pp. 132 *seq.*; cf. Coleridge, *Religious Musings*, "Believe thou, O my soul," etc.) The profundity of the *Monadology* has seldom been recognized. Kant propounded a doctrine of monads, which, however, he regarded as extended though simple. They exert attraction and repulsion through space, and are perfectly elastic. (Cf. Kant, *Monadologia Physica*.) He sug-

gested, in his *Critique of Pure Reason*, a doctrine somewhat similar, but approaching more nearly to that of Leibnitz. He holds that what to our external sense is objective may be, to its own internal sense, subjective—that the material is but the outside aspect of thought. At the present day Hermann Lotze (*Medicinische Psychologie*) propounds a doctrine of spiritual monads or simple unextended beings, each of which is a modification of the Absolute. (Cf. the *Song of the Norns* in Jordan's *Nibelunge*.)

THOMAS DAVIDSON.

Monad'nock, or **Grand Monadnock,** a solitary mountain, mostly within the town-limits of Jaffrey, Cheshire co., N. H. It rises from the swell of land E. of the Connecticut River to an altitude of 3180 feet.

Mon'agan, tp. of St. Clair co., Mo. Pop. 1434.

Mona'gas (Gen. JOSÉ TADEO), brother of Jacinto, b. in Venezuela about 1786; was actively engaged in the war of independence under Bolivar (1810–20); headed unsuccessful revolutions against Presidents Paez and Vargas; was elected president 1846; overthrew the constitution 1848; exiled Paez, and governed the country dictatorially until 1859, when he was overthrown. In 1868 he "pronounced" against the government of Gen. J. C. Falcon, which he overthrew, assumed the provisional presidency, and was elected for a regular term Oct. 4, but before his inauguration d. at Caraccas Nov. 18, 1868. He was a brave and skilful officer, but unprincipled in the exercise of power, and accumulated great wealth.—His son, Gen. JOSÉ RUPERTO MONAGAS, has since been president for a short time (1869).

Mon'aghan, county of Ireland, province of Ulster. Area, 500 square miles. The surface is hilly, in the eastern part even mountainous. In the more level portions the soil is fertile, but on the hills it consists of a stiff clay difficult to handle. The main crops are oats, barley, flax, and potatoes. Pop. 114,970, of whom 31,231 are unable to read and write; 45,878 persons emigrated from this county between 1851 and 1871. Principal town, Monaghan.

Monaghan, tp. of York co., Pa. Pop. 1028.

Mon'archy [Fr. *monarchie;* It. *monarchia;* Sp. *monarquia*—from Greek μόναρχος, from μόνος, "alone," and ἄρχω, "to rule"], government of a state by one chief only. The word in its original sense can hardly be applied to the constitutional sovereignties of the present day, in which the administrative power is shared by officers and representatives chosen by the people. The governments of England and others more or less resembling it are therefore called "limited" or "mixed" monarchies, and thus distinguished from those to which the term *absolute* is given, and where the chief has almost or altogether irresponsible power over the lives and property of his subjects. Absolute monarchies, which as the world advances toward freedom are becoming rarer, are now found in perfection only in the East, where were the five great monarchies of the ancient world—namely, Chaldæa, Assyria, Media, Babylonia, and Persia. (See G. Rawlinson, *The Five Great Monarchies*, etc., and the article on GOVERNMENT, by Hon. A. H. STEPHENS, LL.D.)

JANET TUCKEY.

Monastery. See MONACHISM, by T. M. POST, S. T. D.

Monasticism. See MONACHISM.

Monastir', or **Mistir,** town of Tunis, in Northern Africa, on the Mediterranean. It has extensive manufactures of coarse woollen fabrics. Pop. 35,000.

Monastir, town of European Turkey, in the province of Room-Elee, carries on a very important transit-trade. Pop. 14,000.

Monbod'do (JAMES **Burnet**), b. at Monboddo, Kincardineshire, Scotland, in 1714; educated at Aberdeen and Groningen; practised as advocate in Scotland in 1767; became a judge, with the title of Lord Monboddo. His *Dissertation on Language* (6 vols., 1774–92) expresses his high opinion of the Greek literature and philosophy, and the theory of the origin of the human race from the monkey, which he further elaborated in *Ancient Metaphysics* (6 vols., 1778). D. at Edinburgh May 26, 1799.

Monca'da, de (FRANCISCO), count of Osuna, b. at Valencia, Spain, Dec. 29, 1586; served as ambassador to the emperor of Germany, and as general-in-chief of the Spanish forces in the Netherlands (1633), under the administration of the infanta Isabella, and obtained some successes over the prince of Orange. D. in the province of Cleves in 1635. Moncada wrote several historical, biographical, and miscellaneous works, but his fame as a Spanish classic rests upon his picturesque account of the famous campaign of Roger de Flor in the Byzantine empire, *Expedicion de los Catalanes contra los Griegos y Turcos* (Barcelona, 1623). A good modern edition is that of Ochoa in the *Tesoro de los Historiadores Españoles* (Paris, 1841).

Moncalie'ri, town of Northern Italy, province of Turin, about 5 miles S. of the city of Turin. It is beautifully situated on a hill commanding a superb view of the Alps and the plains of Piedmont, and has some fine buildings, among them the Castello Reale, a large and imposing structure. This town was little more than a villa of the Knights Templar in the thirteenth century, but afterwards acquired importance under the dukes of Savoy. Pop. in 1874, 9994.

Monck, a fertile county of Ontario, Canada, on the N. shore of Lake Erie, formed in 1867 from parts of Haldimand, Lincoln, and Welland cos. It is traversed by the Buffalo branch of the Great Western R. R. Pop. 15,130.

Monck (CHARLES STANLEY), fourth viscount, G. C. M. G., b. at Templemore, Ireland, Oct. 10, 1819; educated at Dublin University, and called to the bar in 1841; succeeded his father in 1849; entered the House of Commons 1852; was a lord of the treasury 1855–57; was governor-general of Canada 1861–68: received a seat as a baron in the House of Lords 1866; became in 1867 a commissioner of the Irish Church temporalities. During his service in Canada the Dominion was established.

Monck'ton (ROBERT), a son of the Viscount Galway; entered the British army in 1742; served with distinction in Flanders; also at Dettingen, Louisbourg, C. B. (1758), Quebec (1759), where he was second in command and badly wounded; was lieutenant-governor of Nova Scotia 1756; governor of New York 1762; captured Martinique 1762; became lieutenant-general 1770; served afterwards in Great Britain, sat in Parliament, and d. May 3, 1782.

Monclo'va, post-tp. of Lucas co., O. Pop. 833.

Moncrieff (Sir HENRY). See WELLWOOD.

Moncton, a beautiful village and port of Westmoreland co., N. B., at the head of navigation of the Petitcodiac River, on the Intercolonial Railway, 89 miles N. E. of St. John. It contains the railway-shops, and has 4 churches, 1 weekly newspaper, and manufactures of leather, tobacco, castings, etc. Pop. about 1300.

Mon'day [Ger. *Montag;* Fr. *Lundi*—signifying "moonday"), the second day of the week. Dion Cassius (xxxvii. 18), who wrote about 220 A. D., says that "the practice of referring the days of the week to the seven planets began among the Egyptians," and had been but recently adopted by the Roman world. R. D. HITCHCOCK.

Monday Creek, tp. of Perry co., O. Pop. 1165.

Mon'dines, tp. of St. Clair co., Ala. Pop. 1440.

Mondoñe'do, town of Spain, in the province of Lugo, in a valley of the Sierra Lorenzana, Galicia, has about 7000 inhabitants, mostly engaged in cattle-rearing and agriculture.

Mondovi' [*Monsvici, Monsregalis, Vicodunum*], town of Northern Italy, in the province of Cuneo, about 42 miles S. of Turin and about 1600 feet above the sea-level. It is surrounded by ancient walls, with a citadel on the S. side, and the torrent of Ellero flows by it on the W. The episcopal palace is a very fine building, and the cathedral and other churches are of considerable interest. About 2 miles from Mondovi is the great sanctuary of the Madonna di Vico, a building of much architectural merit and adorned with interesting works of art. Mondovi is not very old, and its mediæval history resembles that of other Piedmontese towns. In 1796 occurred in this neighborhood the engagement known as the battle of Mondovi, in which Bonaparte defeated the Piedmontese army, and thus prepared the conquest of all Upper Italy. In 1799 the inhabitants of Mondovi having revolted against the French, the town was retaken by them, sacked, and nearly destroyed. Pop. in 1874, 16,543.

Monee', post-v. and tp. of Will co., Ill., on the Illinois Central R. R. Pop. of v. 598; of tp. 1600.

Monette' (JOHN WESLEY), M. D., author of a valuable work, *History of the Discovery and Settlement of the Valley of the Mississippi* (2 vols., 1846); d. in Madison parish, La., Mar. 1, 1851.

Mon'ey [commonly derived from *moneo, moneta*, because the Roman mint stood in the temple of Juno Moneta, or because *nota inscripta de valore admonet*], a standard by which wealth is measured, and an instrument by which one kind of wealth can be exchanged for another. It differs specifically from wealth, in that while wealth is any object of common desire which costs labor, money is that kind of wealth by which it has been agreed that the value of wealth shall be estimated, and for which all other kinds of wealth can be exchanged. Its two qualities are that it is a standard of value and an instrument of exchange. Money differs also from currency. While currency is anything with which commodities can be bought and debts cancelled, it does not always have an intrinsic value, but

may be, as in the case of bank-bills or government notes, merely a voucher or representative of value, in which case it is not money. Money is that kind of currency which has an intrinsic value, and which thus, if not used as currency, would still be wealth. Money also differs from capital. Capital is that portion of wealth set aside and used for the reproduction of wealth. It may have been money, but the money ceases to be such when it becomes capital.

Different Commodities used as Money.—Any article of wealth—*i. e.* anything which has value—may be used as money. Tin was thus employed in ancient Syracuse and Britain, while to the same purpose we find iron in Sparta, cattle in Rome and Germany (*pecunia*, from *pecus*, "cattle"), a preparation of leather among the Carthaginians, platinum in Russia, lead in Burmah, nails in Scotland, pieces of silk among the Chinese, cubes of pressed tea in Tartary, salt in Abyssinia, cowrie-shells on the coast of Africa, slaves among the Anglo-Saxons, tobacco in Virginia, codfish in Newfoundland, bullets and wampum in the early history of Massachusetts, logwood in Campeachy, sugar in the West Indies, soap in Mexico, etc. But from the time of Abraham, when he paid (Gen. xxiii. 16) to the children of Heth 400 shekels of silver, "current money with the merchant"—the earliest historical record of a purchase with money—till now, gold and silver have been the money of the world with civilized and commercial people. It should be noted that money does not depend upon the nature of the commodity employed as such, but wholly upon its use. When anything that has been used as money becomes devoted to any other use, it thereby ceases to be money. Gold money turned into gold plate is no longer money.

Adaptedness of Gold and Silver for Money.—These metals possess some singular advantages which explain why they are used as money. They are intrinsically valuable, everybody in the civilized world desiring gold and silver, not simply as money, but for ornaments, for plate, and other uses, and no one being able to obtain them without labor. They have both the elements, therefore, of true value. Besides this, they wear out very slowly; they are very easily divisible and malleable, and can be readily alloyed and refined; they are largely distributed over the globe, and are yet of sufficient scarcity; they are of the same quality wherever found, and are subject to fewer fluctuations in value than any other commodities known. This last quality is a prime requisite in money. In exactly the degree in which the value of money were unstable would it cease to be a trustworthy standard of value, while in the same degree exchanges would be made difficult and contracts uncertain.

Where gold and silver are the currency of a country there cannot be, for any length of time, either a redundancy or a stringency of the money-market. Supposing for a time a redundancy, more money than is needed, what takes place? One of two things, probably both. In the first place, gold becomes cheap, and it at once begins to be used for other things than money; *e. g.* ornaments and plate. Also, when gold is cheap—which means that other things are dear in comparison with it—this immediately leads to the sending of gold for the purchase of goods to where it is not so cheap—a procedure which will soon change a preponderance to a healthy equilibrium. In like manner, when there is a stringency, and gold becomes dear, it will be drawn from other lands, and diverted from the making of ornaments and other uses till the stringency is removed. By a law as beautiful as that of the tides, and as inevitable, the money-market regulates itself wherever gold and silver, the money of the world, are the currency employed.

Whence, then, come financial panics and revulsions, and so-called stringencies in the money-market? These undoubtedly occur with sad frequency and dire results. But they are not due to outside calamities. Their causes are always in some wrong procedure on the part of the commercial world which suffers them. They grow out of the attempt to make that to be real in business transactions which is not real—either the attempt to make credit or something besides capital do the work of capital, or the attempt to make a currency which is not money do the work of money. When the latter attempt is made, the former is sure to follow. An unsound currency irresistibly induces unsound credit, and these inevitably lead to an unstable business structure, which soon or late must fall with a crash and ruin.

When money alone, or a currency convertible at once into money, is used as a medium of exchange, it is not certain but that credits may be pushed inordinately, and business be carried on where there is no capital to support it; in which case a financial revulsion, however delayed, cannot be prevented, as any falsehood, however speciously concealed or plausibly declared to be the truth, can never be employed without betraying itself in ruinous results. But when a currency is used which cannot be converted into coin—a currency which professes to be what it is not—this first falsehood draws others in its train; promises become easily made which there is no power to perform; speculation grows rampant; the business of buying and selling seems to be the most profitable of all employments, and multitudes beyond its power to support them are drawn from productive works into this; trade becomes a bubble, blown till it bursts; and the highest activity and apparent prosperity are suddenly changed to stagnation and ruin. A currency like bank-bills or government notes, which cannot be converted into money at the pleasure of the holder, is only a shadow put in place of the substance, which not only furnishes no support for the community which trusts it, but is as destructive to all business prosperity as it is deceptive. This conclusion is equally supported by a clear knowledge of the nature and uses of money, or a comprehensive acquaintance with the history of trade.

In order that money may be a standard of value as well as an instrument of exchange, its own value must be invariable—a condition to which gold and silver better conform than any other commodity, but in which any currency not convertible into these necessarily fails. When bank-notes or government notes become currency without a corresponding basis of money, nothing has ever been able to prevent their fluctuation in value and the consequent effect upon all other values. The temptation to increase these issues according to the fancied interest of the bank or the government is always likely to prove irresistible, in consequence of which the community employing them finds itself flooded with a currency upon which all values float with an unsteady motion, and any standard of value is out of the question.

A poor currency inevitably causes a good one to disappear whenever put by its side. Inconvertible paper will always drive out gold and silver from circulation when brought into competition with these. The paper, being cheaper, will of course be used in preference to the dearer commodity, and gold and silver coin not only cease to circulate, but leave the country where the inconvertible paper abounds. In such a case nothing can bring the gold and silver back and put them into circulation again except the removal of the currency which has driven them out. When the poorer currency is withdrawn, that which is better flows back as naturally as the air rushes into a vacuum, while any other attempt to restore specie payments where they have been discontinued is as futile as the effort to put two mutually repellent bodies into the same place at the same time. (See COINAGE.) J. H. SEELYE.

Money Creek, tp. of McLean co., Ill. Pop. 999.

Money Creek, post-tp. of Houston co., Minn. Pop. 609.

Monfesti′no, town of Italy, province of Modena, about 20 miles from the city of Modena. Pop. in 1874, 5426.

Monghir′, town of British India, in the presidency of Bengal, on the Ganges. It is noted both for its beautiful situation on a rocky height at a bend of the river, and for its salubrious climate. It is fortified, and manufactures hardware, cutlery, and firearms of a lower grade. Pop. 30,000.

Mongo′lia [the land of the *Mongol* or *Moghols*, for the name is spelt variously even by the native population] is still a vast district in Central Asia, extending fully 1000 miles E. and W., and in some parts as much as 600 miles from N. to S. Its present boundaries E. and N. are Manchuria and Siberia, respectively, and on the S. and W. Thibet and Toorkistan; but these boundaries have varied greatly at different periods of history. The whole of what is now usually recognized as Mongolia is considered to belong to the Chinese empire; indeed, its eastern portion can hardly be separated from China proper; moreover, the Chinese province of Kansa, a late incorporation with that empire, is, in fact, as completely Mongolian as any part of the interior of that country. A large portion of Mongolia is occupied by the Great Gobi Desert, extending N. E. and S. W. between the 90th and 120th parallels of E. lon., a tract as hopelessly desolate and sterile as can be found on the face of the earth—a district alike waterless and treeless, in some places exhibiting a considerable depression, and in some parts more than 200 miles in breadth. Generally, this desert is a level land, and though, on the whole, at an average elevation of 2000 feet above the sea, there are but few hills of any altitude. On the other hand, the Alashan country to the S. is mountainous and well wooded. On the western side of these hills the great river Hoang-Ho runs for nearly 400 miles, and some peaks, beyond where the Hoang-Ho forces its way eastward, are covered with perpetual snow, and are probably not less than 10,000 to 12,000 feet high. These mountains

bear the name of Inchin or Kinghan. Beyond this range, to the N. E., Mongolia and Manchuria, with populations almost identical, extend to the shores of the Yellow Sea; and though some attempts have been made at cultivation, the interior is still for the most part wild and desolate. It was to prevent the earlier Mongolian tribes descending into and plundering the more fertile provinces of China to the E. and S. that the first Chinese emperor built, more than 2000 years ago, the famous Wall, with an extent of 1800 miles from the Gulf of Peking to Western Tartary. To the N. and N. W. chains of high mountains separate Mongolia from Siberia, the range of Altai being the most famous. This, which is the richest portion of Mongolia, is chiefly in the hands of the Booddhist priesthood, the high priest himself residing at Ourga, on about the 116° E. lon. This place is the seat also of a special Chinese Manchu governor, with a supreme court of justice, and serves as a principal dépôt for the trade passing into Siberia at Kiakhta. Though better watered than other parts of Mongolia, and the source of some considerable rivers, such as the Amoor and the Orkhon (which flows into the Siberian lake Baikal), the intense winter cold renders the rearing of even the commonest and hardiest vegetables almost impossible. Owing to the peculiar character of their country, the Mongolians are now, as they have ever been, essentially nomadic, and, though in all parts acknowledging the emperor of China as their suzerain, are still mostly under the rule of native chiefs, who govern with feudal rights the numerous tribes into which they are divided. Their two largest branches are the eastern or Mongols proper, and the western, who are usually called Calmucs; and their three leading tribes (the whole number of which is said to be twenty-six) are known by the names of Tsakhars, Kalkhas, and Sunorits; of these, the Kalkhas are, or were till recently, under four hereditary chiefs, each claiming descent from Genghis Khan. Their military service extends from the age of sixteen to sixty; and the Chinese tribunal of foreign affairs, with one civil and two military governments, is now the ultimate seat of appeal. By far the largest number of the population dwell in tents, and their chief possessions are large herds of camels, horses, sheep, asses, and mules. A considerable trade passes through Mongolia to China on the one side, and Russia on the other, with frontier marts at Kiakhta in Siberia and Maimaitchin in Mongolia; this trade is carried on wholly by barter, money being either forbidden or (at least) seldom used. The caravans perform their journeys between October and the end of the winter, bringing furs, woollen stuffs, and leather from the West, and conveying thither teas, silks, cotton, rhubarb, and sugar-candy. No reliable estimate can be formed of the actual number of these nomads, but as desolating wars long prevailed before their submission, 200 years since, to the Chinese rule, and as the greater part of the country is practicably uninhabitable, it has been conjectured that the existing Mongolians could not bring into the field more than 500,000 fighting-men, and therefore that their whole population cannot amount to 3,000,000. As they are of the same origin as the present Manchu rulers of China, similar interests as well as relationship ensure their chiefs many favors from the Chinese government; thus, some are married to princesses of the imperial house, so as to attach them more closely to the reigning family, while as a rule, the rich gifts they receive far exceed the nominal tribute exacted from them. Unlike nomadic nations, the Mongolians have an alphabet (derived from the Syrian Nestorians) and a literature—of little value, however, being chiefly translations from Chinese works, or stories, more or less fabulous, of their great national hero, Genghis Khan. The Mongolians are middle-sized, strong and active; their skin of a dark yellow hue; their faces broad, with flat noses and projecting ears. They have little beard, and generally shave off what they have except one tuft. They belong to the great group now often called Turanian, and are thus allied to the Chinese, Thibetans, and the Japanese, and more remotely to the Esquimaux, Samoyedes, Lapps, Turks, and Magyars; in other words, to nearly two-thirds of the whole human race. In ancient history we find their ancestors under the generic title of Scythians or Cimmerians, and the founders of the Median empire, whose cuneiform writings we are even now only partially able to decipher; in later times they appear as the terrible and devastating Huns, and still later as the scarcely less ferocious warriors of Genghis Khan and Timour. Though doubtless connected with the Turkish tribes, the Mongols ought not to be confounded with them. The true Tartars (or more properly Tátars), of whom little is known, historically, before their conquest in the thirteenth century by the Mongols under Genghis Khan, the Toorki or Toorkoman tribes, the ancestors of the Ottomans, now known as the Nogai, Oozbek, or Kirgheez hordes, though nearly as nomadic as the Mongols, differ from them as exhibiting in many cases a more refined and even a Caucasian type of features. Except as wandering hordes, overwhelming each country in its turn like a set of hungry locusts, and devastating (as is clear from Herodotus, Ammianus, and Jornandes) rather by their vast numbers than by knowledge of war as an art, we hear little of the Mongols till the time of Genghis Khan. Not long after the Kalkhas, under their khan, Kublai, conquered all China, and held the chief power there for about a century; and though, as is usually the case with empires so formed, that of the Mongols was soon broken up into a number of separate dynasties, the great Timour widely extended the already vast frontiers of the Mongolian empire. Lastly, in the year 1519, Baber, a lineal descendant of Timour, founded by conquest a monarchy in Hindostan, popularly called the "Mogul" dynasty, and celebrated for the famous Akbar, a contemporary of the English Elizabeth. To the invasion of Western Asia by the Mongolian tribes we owe the establishment of many dynasties which became notable in history, partly owing to their conflict with the Franks during the Crusades, and partly to the great ability in matters of government which these wild tribes from Central Asia exhibited as soon as they found themselves settled in the fertile lands of the West. Among the dynasties which owe their origin to the Mongolian conquests may be mentioned that of the Moguls of Persia and Syria (A. D. 1157–1355); the Kara-koiunbu (Toorkomans of the Black Sheep), (A. D. 1357–1496); those of the White Sheep (A. D. 1406–1502); and, connected with these, the khans of Kapchak, of the Crimea, and of Kasan, with the Oozbeks of Bokhara, Samarcand, and Balkh. In Egypt we find Thoulonides and Ikhshidites, and, as more remote descendants, the powerful kingdom of the Mamelukes, under their double designation; in Southern Central Asia, the Samamians and Bouides, and in near connection with them the earlier Ghaznaoides of Ghazna. Then comes the great dynasty of the Seljooks, first in Persia from A. D. 1029–1194, and then at Iconium, Aleppo, and Damascus from A. D. 1081 to 1154. With these last rulers commenced the long conflict with the Christians. Lastly, we may name the important dynasties of the Ortokides of Syria (A. D. 1082–1220), of the Atabeks of Syria and Persia (1084–1250), who numbered among their greatest leaders the famous Salah-ed-din (Saladin). All these rulers, and to some extent their subjects also, had embraced the doctrines of Islam, though in many cases their practice would have been scarcely sanctioned by the rigid followers of the Koran. Indeed, it may be doubted if anything but the warlike principles of the Prophet would have availed to keep together a people as wild and as shifting as their own sands. At the present time, it should be added that nearly all who claim to be Mongolians have gone back to the faith of their ancestors, the religion of Booddha.

W. S. W. Vaux.

Mongom′erie (John), a native of Ayrshire, Scotland; became a soldier; was groom of the bed-chamber and aide to George II., and governor of New York 1718–31. D. July 1, 1731.

Mongua′gon, tp. of Wayne co., Mich. Pop. 1475.

Monhe′gan (or **Manheigan**) **Island,** off the coast of Hancock co., Me., has been since 1608 a resort for cod-fishing. It was visited in 1614 by Capt. John Smith, of Virginia. It has a rock having marks which have been incorrectly regarded as of Runic origin. It has a granite lighthouse with a flashing white dioptric light; lat. 43° 45′ 52″ N., lon. 69° 18′ 37″ W. Pop. 145.

Monhegan Island, tp. of Lincoln co., Me. Pop. 145.

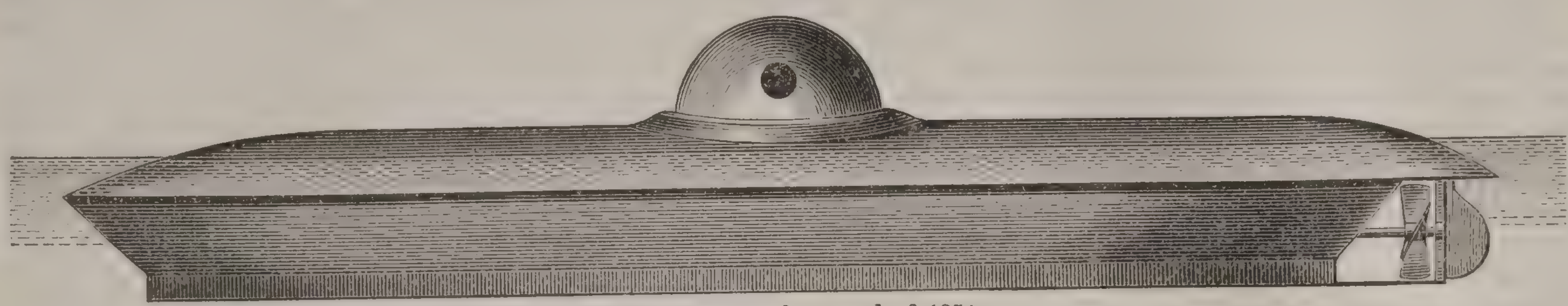
Moniteau′, county of Central Missouri, bounded N. E. by the Missouri River. Area, 380 square miles. It is hilly and well timbered, with very fertile valleys. It abounds in curious "pockets" of valuable coal of uncertain geological age, and possesses lead ores and other mineral wealth. Live-stock, wool, grain, and tobacco are leading products. It is traversed by the Missouri Pacific R. R. Cap. California. Pop. 11,375.

Moniteau, tp. of Cooper co., Mo. Pop. 1373.

Moniteau, tp. of Howard co., Mo. Pop. 2317.

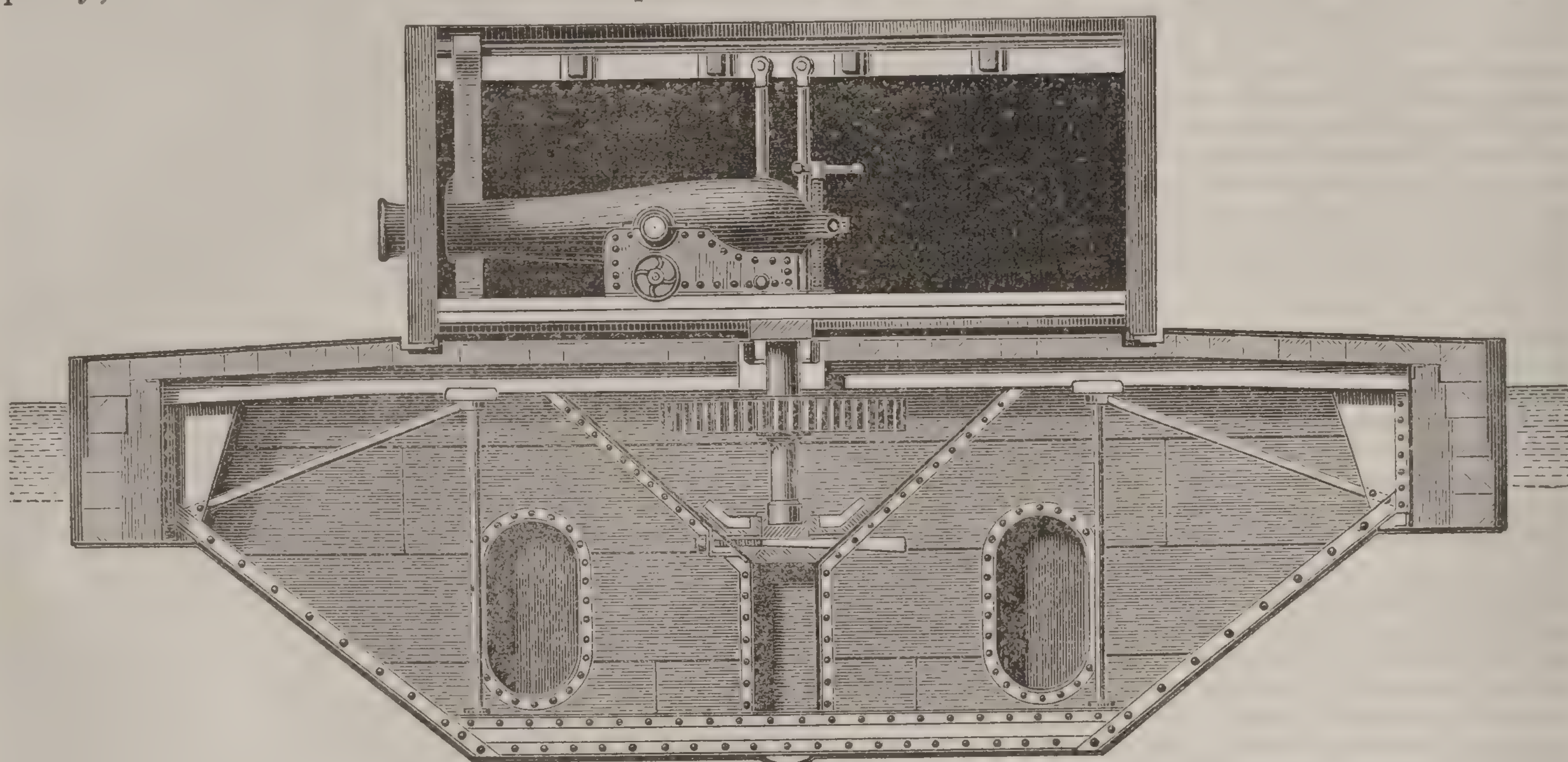
Mon′itor [so called because it was believed to give warning of the approach of the crocodile], a genus of large Old-World lizards, some of which approach the size of the alligators. *M. niloticus*, the monitor of the Nile, is the typical species. The natives believe that it is hatched from crocodile's eggs. It is certain that it devours a large part of the eggs of the crocodile. It is some six feet long. The *M. dracæna* of India and *M. Gouldii* of Australia are also well-known monitors. The great lizards of the South American family Teiidæ are also often called monitors, and indeed closely resemble the true monitors.

Monitor, the designation of a special class of armored vessels, invented by JOHN ERICSSON (which see). On Sept. 26, 1854, this distinguished engineer submitted to the emperor Napoleon III. the plan and specification of a nearly-submerged vessel, represented by the annexed engraving. The principal features of this vessel, the parent of the present monitor, consisted of a revolving cupola, composed of wrought iron six inches in thickness, for protecting a



Ericsson's Cupola vessel of 1854.

single gun of large calibre, inclined sides, and an overhang deck for protecting the propeller and rudder. In 1861 a majority of the slaveholding States made war upon the Union, and the President proclaimed a blockade of their coast. It was imperative that this should be effected quickly; and as the Southern harbors were in possession of the Confederates, light-draft iron-clads became a necessity. The competition of France and England in the construction of armored vessels had awakened in the U. S. neither interest nor anxiety, so that this subject, which required careful thought and study, was precipitated upon the counsellors of Mr. Lincoln at the beginning of a great

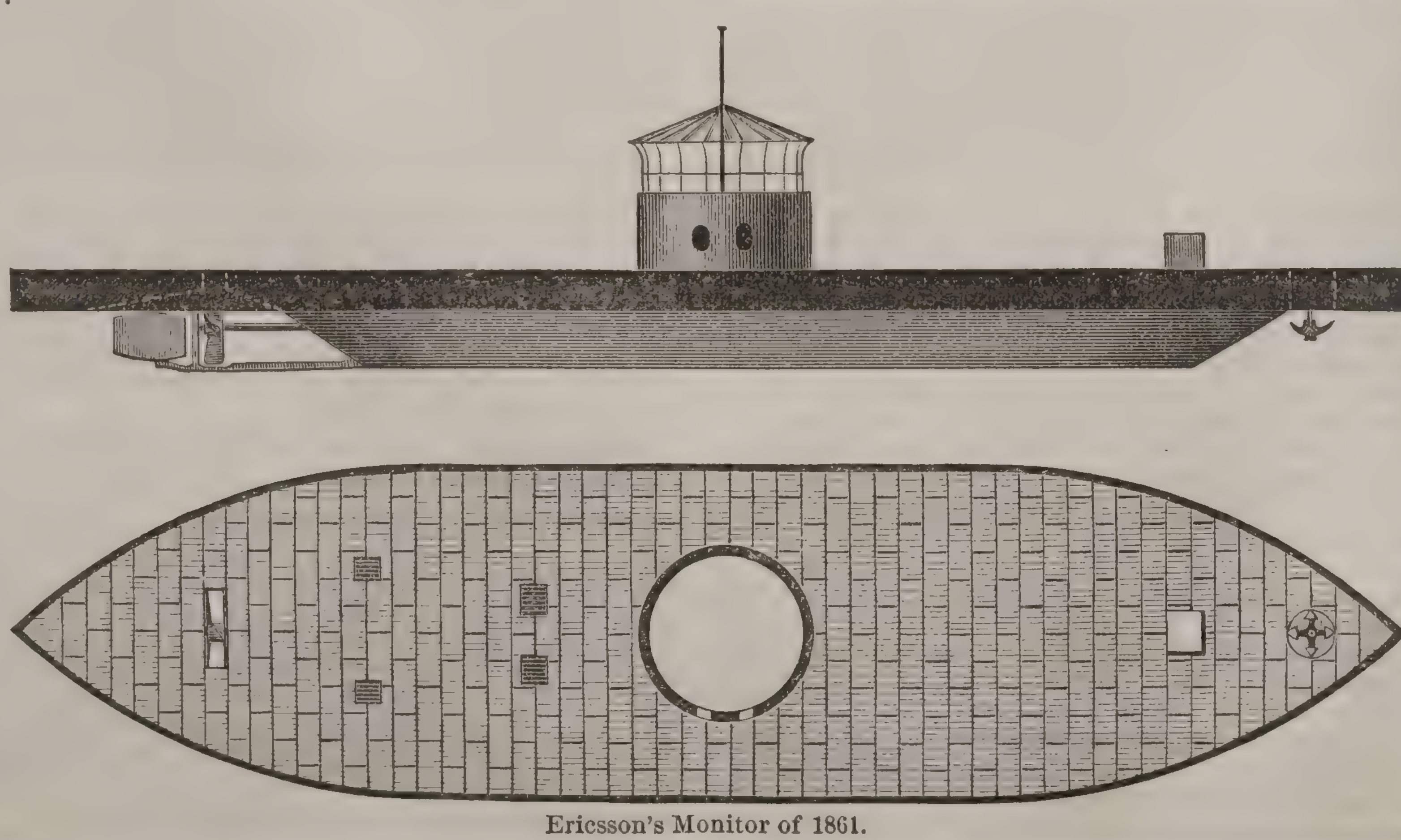


Section of Ericsson's Monitor and Turret of 1861.

war. On Oct. 4, 1861, the secretary of the navy contracted with Capt. Ericsson, as principal, for the construction of "an iron-clad, shot-proof steam battery of iron and wood combined;" and under this indenture a vessel, named by Capt. Ericsson "Monitor," was launched at Greenpoint, Long Island, on Jan. 30, 1862, and went to sea Mar. 6 in command of Lieut. John L. Worden, U. S. navy, with a crew of 43 men and 12 officers, exclusive of Chief Engineer A. C. Stimers, inspector at New York, who went as a volunteer. The Monitor was an iron hull with wooden deck-beams and side projection, and of the following dimensions:

Extreme length	172 feet.			
" breadth	41	"	6 inches.	
Depth of hold	11	"	4	"
Draught of water	10	"	6	"
Inside diameter of turret	20	"		
Height of turret	9	"		
Thickness "	...		8	"
" of side-armor	...		5	"
" " deck-plating	...		1 inch.	
Diameter of propeller	9	"		
" " steam cylinders (two)	...		36 inches	
Length of stroke	2	"	2	"
Displacement	1255 tons.			

Armament, two 11-inch shell guns, each 15,668 pounds.



Ericsson's Monitor of 1861.

The preceding engraving represents a transverse section of the Monitor and turret; also a side elevation, showing the position of the turret, pilot-house, propellers, equipoise rudder, and anchor-well. This peculiar structure put into practical operation the invention of 1854—a seagoing raft carrying a fort.

At Norfolk, Va., the steam frigate Merrimack, of 4700 tons displacement, had been converted by the Confederates into a casemated iron-clad with submerged ends, protected by four inches of iron, and armed with two banded 7-inch rifles, two banded of $6\frac{4}{10}$ inches, and six 9-inch, smooth-bore, shell guns. Her crew consisted of 320 men and 30 officers, and she drew 22 feet of water. On Mar. 8, 1862, the sailing frigate Congress and the razee frigate Cumberland were lying at anchor off Newport News, Va. The sailing frigate St. Lawrence and the steam frigates Minnesota and Roanoke (the latter with a broken shaft) were under the guns of Fort Monroe. The construction of the Merrimack, her near completion, and her probable advent were known at Washington and to the military and naval authorities at Hampton Roads;* therefore it was not a surprise when she was reported to be coming down Elizabeth River a little after meridian with two gunboats in company. About one o'clock all three vessels opened a destructive fire of shells upon the Congress and Cumberland, to which they replied promptly, but ineffectually. It was "full sea" there at 1.56 P. M., and while the Cumberland was riding to the last of the flood the Merrimack ran into her, striking just abaft the starboard fore-chains; the blow was fatal, and the ship immediately began to sink. Her defence against the attack of these new and tremendous forces—the steam-ram and iron-clad—had now been maintained to the last extremity, and her commander would have been justified in hauling down his flag; but Lieut. Morris preferred to give another example of the high standard of the American navy. He fired his last broadside as the ship made her final plunge, and the living and the dying and the dead went down together, the American flag flying at the peak. The Confederates were joined by three more gunboats from James River, and the Congress, having been set on fire by shells, slipped her cable, ran on shore, surrendered, and was abandoned, being on fire in several places. By five o'clock the battle was over. No hostile gunboat was disabled; the Merrimack had none of her plates penetrated or knocked off; only two of her crew were killed and nineteen wounded. She lost her metal prow by ramming, and the muzzles of two guns were shot away, but the whole of her injuries were not considered of sufficient importance to suggest a return to the navy-yard, therefore she anchored off Sewall's Point, that she might more conveniently complete the work of destruction on the morrow. When the Union squadron at anchor off Fortress Monroe observed that the Confederate vessels were steering for the Congress and Cumberland, an effort was made to go to their succor. The Minnesota was the only one adequate for offensive operations, and by signal from the senior officer, Capt. Marston, she slipped her cable and steamed up for Newport News, 7 miles distant. Unfortunately, she grounded before reaching there, and remained immovable during the battle within the zone of fire of the combatants. The Roanoke and the St. Lawrence, while being towed to the scene of the conflict, met with the same misfortune, but were relieved, and returned to their anchorage. At 9 P. M. the Monitor arrived, and was ordered to proceed immediately to the protection of the Minnesota. The President had directed the writer to go to Hampton Roads, and, after consultation with the naval authorities there, withdraw such portion of the naval force as he thought proper to co-operate with the army in clearing the right bank of the Potomac of the hostile batteries which closed its navigation. He reached Old Point at $7\frac{1}{2}$ A. M. Mar. 9, and learning the condition of affairs, proceeded to the Minnesota, thence to a steamer, from which he witnessed the combat.

It was a cloudless Sabbath morn, without a breath of air to sway the black column of smoke which indicated the position of the Merrimack. The engagement of the day previous had terminated the history of armed sailing ships for fighting purposes, and now for the first time iron-clads were "to join their dark encounter." At 8 A. M. the Merrimack, commanded by Lieut. R. ap Catesby Jones, supported by three gunboats, stood out to attack the Minnesota, which was lying aground about $1\frac{1}{2}$ miles E. S. E. from Newport News, with her head to the southward and westward. This magnificent frigate therefore became the stake for which the iron-clads fought. The Monitor advanced to cover the Minnesota, and when within one-third of a mile discharged both of her guns at the Merrimack, and received a broadside in return. The advantages were apparently in favor of the Merrimack. She was constructed in conformity with established principles, armed with an approved broadside battery of rifled guns, and manned and disciplined according to naval usages. The Monitor was wholly a fighting machine, constructed on principles which provoked adverse criticism, chiefly because it foreshadowed great naval changes. Neither internally nor externally was there anything

> "Like a stately ship . . .
> With all her bravery on, and tackle trim,
> Sails filled and streamers waving."

Such a novelty was repugnant to naval traditions, and before the officers and crew could become familiarized with it by use, they bravely accepted battle with a victorious and formidable antagonist. As the two iron-clads closed, all other combatants withdrew or were silent, leaving the deep water to the northward and eastward of the middle ground clear for this memorable struggle. The firing was not rapid on either side; the commanders, anxious to waste no shot, fired only in close contact. In manœuvring they were sometimes considerably apart, and once, while the vessels were thus separated, the Merrimack fired three shells at the Minnesota, one of which exploded the boiler of a tug alongside. The attempt to run down the Monitor was futile, owing to her light draft, solid deck, and overhang. The stroke of the Merrimack, hitting at an angle, simply pushed away her lighter antagonist. For more than three hours these mailed warriors interchanged indecisive blows, when near noon the Monitor hauled off, and the writer observed Chief Engineer Stimers and several men go out on deck and surround the pilot-house, where they remained some time. This movement laid open the Minnesota to another attack from the Merrimack, but her commander did not, as previously, avail himself of it; on the contrary, he steamed over to Sewall's Point, passed the bar and the obstructions in Elizabeth River, and so on to the navy-yard at meridian, three hours before high water. The writer immediately boarded the Monitor, and found her gallant commander lying begrimed with powder, bloody, and almost sightless from the explosion of one of the enemy's shells against the lookout spaces in the pilot-house. He gave him the sympathies of a shipmate and friend and congratulations upon his fortitude and success. Afterwards he requested that the officers and crew might be assembled on deck, where he thanked them in the name of the navy department for the great services they had rendered.

At 6.45 P. M. telegraphic communication was established between Washington and Fort Monroe, and the following message was the first one sent:

"FORTRESS MONROE, 6.45 P. M.,
"Mar. 9, 1862.

"The Monitor arrived at 10 P. M. last night, and went immediately to the protection of the Minnesota, lying aground just below Newport News. At 7 A. M. to-day the Merrimack, accompanied by two wooden steamers and several tugs, stood out towards the Minnesota and opened fire. The Monitor met them at once and opened her fire, when all the enemy's vessels retired excepting the Merrimack. These two iron-clads fought, part of the time touching each other, from 8 A. M. to noon, when the Merrimack retired. Whether she is injured or not it is impossible to say. Lieut. J. L. Worden, who commanded the Monitor, handled her with great skill, and was assisted by Chief Engineer Stimers. Lieut. Worden was injured by the cement from the pilot-house being driven into his eyes, but I trust not seriously. The Minnesota kept up a continuous fire, and is herself somewhat injured. She was moved considerably to-day, and will probably be off to-night. The Monitor is uninjured, and ready at any moment to repel another attack.

"G. V. FOX,
"*Assistant Secretary.*

"Hon. GIDEON WELLES,
"*Secretary of the Navy.*"

The next morning the secretary of the navy telegraphed as follows:

"NAVY DEPARTMENT, Mar. 10, 1862.

"It is directed by the President that the Monitor be not too much exposed, and that in no event shall any attempt be made to proceed with her unattended to Norfolk. If vessels can be procured and loaded with stone and sunk in the channel, it is important that it should be done. The San Jacinto and Dakota have sailed from Boston to Hampton Roads, and the Sabine, in tow of the Baltic and a tug, from New York. Gunboats will be ordered forthwith. Would it not be well to detain the Minnesota until other vessels arrive?

"GIDEON WELLES.

"Capt. G. V. FOX,
"*Assistant Secretary of the Navy*, Fortress Monroe."

The Monitor fired 41 solid cast-iron shot at the Merrimack, each weighing 168 pounds, with a charge of 15 pounds of cannon-powder. She was hit 22 times without harm, except the fracture of one of the wrought-iron logs of the pilot-house. Her commander only was wounded. The Merrimack fired 46 shells at the Monitor and 4 at the

* The navy department, for obvious reasons, had continually pressed for a joint expedition to capture Norfolk, and early in Feb., 1862, Gen. Barnard, chief engineer of the Army of the Potomac, furnished a memorandum of a plan for that purpose, but the land-forces could not be obtained.

Minnesota. The Monitor's shot did not strike the Merrimack at the water-line, where the protection was only one inch of iron, but hit the sloping casemate, which was covered with four inches of iron in two plates. These were always broken by the blow, and sometimes the wooden backing was bulged, but the plates remained in their places, not having been hit twice in the same spot. No one was killed or wounded. The head of her rudder-post was exposed, but it escaped injury. The pounding given to the Merrimack during these two days was without precedent in the history of any vessel, and she was becoming leaky and shaky, besides lightening one inch for every consumption of twenty-four tons. She had exhausted her powers against the Monitor both in battering and ramming, and a wise consultation caused her withdrawal to the dry dock at Norfolk.

The results of this encounter were decisive. The Minnesota was saved with a loss, during the two days' fighting, of but 3 killed and 16 wounded. The Merrimack remained under repairs for more than a month behind the obstructions of Elizabeth River. The Monitor continued in the roads, in conjunction with three large steamers, fitted as rams, as the chief reliance in preventing the Merrimack from passing out to destroy the transportation of the Army of the Potomac, which covered the waters between Old Point and Yorktown. To this vital duty she was limited by imperative orders.*

Throughout the North public sentiment was aroused in favor of building more monitors, and Congress responded with liberal appropriations. In a few months improved Ericsson batteries armed with 15-inch guns departed for the Southern coast, and took conspicuous positions on the blockade and in battle. In Great Britain the apathy with which the administration of Lord John Russell had permitted the agents of the rebellion to contract for the building and fitting out of ships in her ports to make war on the U. S., with whom she was at peace, gave place to diligence in the observance of her neutral duties.

At 1 A. M. Dec. 31, 1862, Cape Hatteras bearing N. N. E., distant 20 miles, this little Monitor—whose fame, "following the sun and keeping company with the hours, had circled the earth"—found a resting-place at the bottom of the ocean. G. V. Fox.

Monitor, post-v. of Alpine co., Cal., 6 miles N. of Silver Mountain, in the midst of the Sierra mining-region.

Monitor, tp. of Bay co., Mich. Pop. 568.

Monk. See MONACHISM, by T. M. POST, S. T. D.

Monk (Gen. GEORGE). See ALBEMARLE, DUKE OF.

Mon'key [generally supposed to be corrupted from the old Italian *monicchio*, the diminutive of *monna*, "ape," but more likely from *monikin* or *monkin*, a "little man"], a name vaguely applied to representatives of the order Primates and sub-order Anthropoidea; generally understood to allude to the small-tailed, active species of the several families, in contradistinction to the larger species called apes and baboons; but also frequently used as a group-name for all the representatives of the sub-order exclusive of man. (See HOMINIDÆ, PRIMATES, SIMIIDÆ, MIDIDÆ, etc.) THEO. GILL.

Monks'hood, the common name of the European aconite (*Aconitum napellus*), also called wolfsbane. This, the most important species of the genus, is a perennial herbaceous plant growing in the mountainous regions of Europe, and cultivated somewhat in our own gardens as an ornamental flower. The root is tapering or spindle-shaped, and is sometimes mistaken for horseradish. The stem is erect, simple, rising several feet. The leaves are dark green on the upper surface, shiny, and are deeply divided. The flowers, which are borne upon a handsome terminal raceme, are large, of a violet-blue color, and with the upper of the five petals developed into a hoodlike appendage. The fruit is of three small pods. All parts of the aconite are highly poisonous, but the root and leaves only are used in medicine. Their virtues depend on an alkaloid, *aconitia*, which is one of the most virulent poisons known. Aconite produces sensory and motor paralysis, and especially affects the heart, directly lessening the force and frequency of its beats. In fatal dose it kills by cardiac paralysis, the symptoms resembling those of death by hæmorrhage. A peculiar effect of aconite is a numbness and prickling which in moderate dose is felt about the lips, throat, and tips of the fingers, but in larger dose extends up the arms and legs. Aconite is used for very much the same purpose for which bleeding used to be employed—namely, to moderate the heart's action in the early stages of acute febrile complaints. It also seems to have a special power over inflammations of the tonsils and throat. From its poisonous properties it requires to be used with caution, especially as there is no antidote to it. Preparations of aconite are also very useful applied externally to relieve local pains. The application produces at the spot the peculiar tingling above referred to. EDWARD CURTIS.

Monk'ton, post-tp. of Addison co., Vt., 6 miles N. E. of Vergennes. Pop. 1006.

Mon'mouth, town of England, the capital of Monmouthshire, at the confluence of the Wye and the Monnow. It has some trade in bark and timber. Pop. 5874.

Monmouth, county of New Jersey, bounded N. by the Raritan Bay and E. by the Atlantic Ocean. Area, 452½ square miles. It is generally level and fertile. Live-stock, wool, grain, fruit, and garden products are largely raised. The county is traversed by the New Jersey Southern, the Freehold and Jamesburg, and other railroads. It has manufactures of flour, carriages, brick, harnesses, clothing, metallic wares, lumber, etc. Cap. Freehold. Pop. 46,195.

Monmouth, post-v. and tp., cap. of Warren co., Ill., 182 miles S. W. of Chicago, is the seat of Monmouth College and Preparatory School, 10 churches, 3 banks, 2 libraries, 2 weekly newspapers, a fine opera-house, 5 hotels, and many manufactories. Deposits of bituminous coal exist. Pop. of v. 4662; of tp. 1574. SWAIN & LAWRENCE, EDS. & PUBS. "MONMOUTH REVIEW."

Monmouth, post-v. and tp. of Jackson co., Ia., on the Iowa Midland R. R. Pop. 1137.

Monmouth, tp. of Shawnee co., Kan. Pop. 713.

Monmouth, post-tp. of Kennebec co., Me., on the Maine Central R. R., 48 miles N. of Portland, has 4 churches, an academy, and manufactures of clothing, moccasins, doors, sash, blinds, carriages, webbing, hoes, shovels, leather, and other goods. Pop. 1744.

Monmouth, post-v. of Polk co., Or., 14 miles S. W. of Salem, contains Christian College, 1 grange, 1 newspaper, and the usual stores and shops. Pop. about 250. T. F. CAMPBELL, ED. "CHRISTIAN MESSENGER."

Monmouth (JAMES **Fitzroy**), DUKE OF, also duke of Buccleugh, earl of Doncaster and of Dalkeith, Baron Tyndale, Ashdale, and Whitchester, was the reputed son of Charles II. of England by Lucy Walters. He was always a favorite with the king, who, however, denied his legitimacy, which was popularly believed in. His valor in the navy and army—for he served in France, Flanders, and Scotland with much distinction—together with his beauty and engaging manners, made him a general favorite, and in 1667 he married the heiress of the house of Buccleugh, whose titles, family name (Scott), and vast estates came into his possession. He took part in the Whig conspiracies of 1683, and was exiled to the Low Countries, but after his father's death landed at Lyme Regis with a small force and claimed the crown; but was defeated at Sedgemoor July 6, 1685, by the forces under the earl of Faversham; was taken prisoner, and executed at London July 15, 1685.

Monmouth, Battle of, fought (June 28, 1778) between the American forces under Gen. Washington and those of the British under Sir Henry Clinton. Intelligence of the treaty with France recognizing American independence reaching Sir Henry Clinton, he at once evacuated Philadelphia, and commenced a retreat across New Jersey to New York. The American army, which had wintered at Valley Forge, immediately set out in pursuit, the advance being given to Gen. Charles Lee, whose orders were to harass the enemy and impede his march as much as possible. By the 28th the British occupied the elevated land about Monmouth Court-house, where, on the morning of that day, the American advance became engaged with the rear of the enemy on the plain below, over whom a temporary advantage was gained; but upon the reinforcement of the British line the Americans gave way in some confusion, and Lee now ordered a retreat. Meanwhile, Washington, in ignorance of this disaster, had ordered up the main army, and himself riding forward soon met the retreating body. With much indignation he peremptorily ordered Lee to rally his forces and hold his position; which he was only partially able to do, and was forced to relinquish the ground, when, happily, the arrival of the left wing under Lord Stirling checked the further advance, and Greene, now coming up with the right wing, forced the enemy to retire. Preparations were made for an advance movement, but darkness put an end to the fight, and during the night Sir Henry Clinton silently withdrew, the intense heat securing him against pursuit. Lee alleged in

---

* "*Telegram.*

"FAIRFAX COURT-HOUSE, Mar. 12, 1862.

"CAPT. G. V. FOX,
"*Assistant Secretary of the Navy*, Fort Monroe:
"Can I rely on the Monitor to keep the Merrimack in check, so that I can make Fort Monroe a base of operations? Please answer at once.
"(Signed) GEO. B. MCCLELLAN, *Major-General.*"

his defence that, unable to hold his advanced position, he ordered the retreat, intending to re-form his command in a more favorable position. For this and subsequent disrespectful conduct to Gen. Washington he was tried by court-martial and suspended from command for one year.

Mon'mouthshire, county of England, bounded S. by the estuary of the Severn and the Bristol Channel. Area, 576 square miles. Pop. 174,633. Along the coast the land is low and level, but the northern and north-western parts are elevated and hilly, the highest point, the Sugar Loaf, rising 1856 feet. Wheat, oats, and barley are grown, coal, iron, and limestone abound, and mines are extensively worked. The Welsh language is in general use in this county.

Monnier' (Henri Bonaventura), b. at Paris June 6, 1799; was first employed as a clerk in the office of a notary, then as a copyist in the ministry of justice; studied afterwards painting under Girodet, and developed his remarkable talent for caricaturing. His illustrations of Beranger's *Chansons* and La Fontaine's *Fables* attracted little attention, but his *Scènes populaires* (1831), *Nouvelles Scènes populaires* (1835), *Bourgeois de Paris* (1854), and *Mémoires de Joseph Prudhomme* (1857), in which both text and illustrations belong to him, proved a great success and have real humor. Some of the comical types represented in these works he brought on the stage, personating them himself, though with mediocre success.

Monnier (Marc), b. at Florence about 1828, of French parents; was educated in Italy; settled afterwards in Paris; engaged in journalism; wrote a number of dramas, lyrical poems, and historical sketches of Italy, and made a name for himself by his curious and interesting critical or critico-historical sketch, *Les Aïeux de Figaro* (1868).

Mo'no, county of California, bounded N. E. by Nevada and S. W. by the main ridge of the Sierra Nevada. Its waters flow into Walker's, Mono, and Owen's lakes, none of which communicate with the sea. The land near the streams is in part arable, but requires irrigation. The rainfall is small. There is considerable timber in the mountains. There was once a good annual yield of gold from placer-mining, but that industry has declined. Area, 4100 square miles. Cap. Bridgeport. Pop. 430.

Monocen'tridæ [from *Monocentris*—μόνος, "single," and κέντρον, a "spine"—the typical genus], a family of fishes of the order Teleocephali and sub-order Acanthopteri, characterized by the compressed, oblong, and rather elevated body; the scales very large and developed as osseous plates, forming a kind of coat-of-mail; the head provided with large muciferous cavities, the eyes large and lateral; the opercular bones slightly armed; the mouth with a lateral and oblique cleft; the teeth in both jaws and on the palatine bones villiform; the branchial apertures large; the branchiostegal rays eight; the dorsal fins two, the first composed of (six) spines, with scarcely any connecting membrane, the second and anal opposite and alike, the ventrals each with a single strong spine and a few (2–3) very short rays. The family is represented by but a single known species, *Monocentris Japonicus*, which is an inhabitant of the Chinese and Japanese seas. It is most closely related to the genera *Hoplostethus* and *Trachichthys* of the family Berycidæ. Theo. Gill.

Mon'ochord [Gr. μόνος, "one," and χορδή, a "string"], an instrument chiefly used for the computation of musical intervals and the adjusting of their respective ratios with reference to the scale. It consists of a single string stretched over a board or box. At each end the string passes over a bridge, and is fastened to a strong peg or wrench-pin. Underneath the string there is usually placed a scale with numerous divisions and subdivisions, at any of which the string may be stopped by means of a movable or sliding bridge, which serves to divide the string into two parts from any desirable point. The string of the monochord should be of equal thickness throughout, and strong enough to bear a moderately high tension. For practical use, a string of sufficient length to give the sound of C C with clearness will be found most convenient. Such a string, if stopped exactly in the middle by the movable bridge, will sound on either side the octave of the C C—*i. e.* the sound of the *half* length of the string is an octave above that of its *whole* length. When stopped at one-third of its length, the sound is an octave and fifth above that of the open string; and one-fourth of its length produces the C of the second octave, or two octaves above C C. The ratios of all the intervals may be found by pursuing the same process of division. William Staunton.

Monocotyledonous Plants. See Endogens.

Monod' (Frédéric Joël Jean Gérard), son of Jean Monod (1765–1836), a Protestant Swiss minister, long a pastor in Paris. Frédéric was b. at Monnaz, Switzerland, May 17, 1794; was educated at Geneva; succeeded his father in the pastorate of the National Protestant church of the Oratoire, Paris, and in 1848 was, with De Gasparin, leader of the Free Evangelical secession. D. Dec. 30, 1863. —His brother, Adolphe, succeeded his brother in the pastorate at Paris, and was an able orator and author of the orthodox school. He was b. at Copenhagen Jan. 21, 1802; d. at Paris Apr. 6, 1856.—His brothers, Guillaume and Horace, as well as Jean (b. 1822), a son of Fréderic, were prominent French Protestant ministers.

Monodelphs. See Mammals, by Prof. Theodore Gill, M. D., Ph. D., M. N. A. S.

Monodon. See Narwhal.

Mon'ogram [Gr. μόνος, "single," and γράμμα, "character"], a figure or cipher combining all or the more prominent letters of a person's name or the name of a place or thing. Artists, printers, publishers, and engravers, and in mediæval times civil and ecclesiastical magnates, have made great use of monograms instead of writing the full name. The study of monograms is a distinct and difficult branch of the diplomatic art, for there are great numbers of ancient monograms still undeciphered. The use of the monogram is at least as old as the reign of Philip of Macedon. The first monograms seem to have been made on coins and medals.

Mon'ograph [Gr. μόνος, "single," and γραφή, "writing"], in modern scientific literature, a treatise or paper discussing a single branch or topic of a science, and not treating of the science as a whole. Thus, a treatise on the willows would be a botanical monograph, or a work on the alcohols would be a chemical monograph, or a work on Calvin a historical monograph.

Mo'no Lake, in Mono co., Cal., E. of the Sierra Nevada. It is some 14 miles long and 8 broad, and has no outlet; its waters are intensely salt and also highly alkaline, containing also borax. Nevertheless, the larvæ and pupæ of *Ephydra Californica*, an insect, inhabit the waters, and are eaten in great quantities by the Indians. It contains several islands, some having active fumeroles or boiling springs. It is very deep, and seems to have once been a crater.

Monomania. See Insanity, by William A. Hammond, M. D.

Monomya'ria. [Gr. μόνος, "single," and μυών, "muscle"], a group of the lamellibranchiate mollusks, including the Ostreidæ or oyster family, are designated as monomyarian or as the Monomyaria, being characterized by possessing but one (the posterior) adductor muscle. Their shells thus present but the one muscular impression.
Edward C. H. Day.

Mo'non, post-v. and tp. (also called Bradford) of White co., Ind., on the Louisville New Albany and Chicago R. R. Pop. 969.

Mono'na, county of Iowa, bounded W. by the Missouri River, which divides it from Nebraska. Area, 700 square miles. It consists mostly of prairies adapted to grain-culture. The county is well watered, and is traversed by the Sioux City and Pacific R. R. Cap. Onawa City. Pop. 3654.

Monona, post-v. and tp. of Clayton co., Ia., on the Iowa division of the Chicago Milwaukee and St. Paul R. R. Pop. 1656.

Monongahe'la, a b. of Allegheny co., Pa., on the S. W. bank of the Monongahela River, opposite Pittsburg. Pop. 1153.

Monongahela, tp. of Greene co., Pa. Pop. 1424.

Monongahela City, post-v. of Washington co., Pa., 21 miles S. of Pittsburg, on the Pittsburg Virginia and Charleston R. R. It was incorporated in 1873, and has 3 banks, 2 newspapers, 1 strawboard paper-mill, 1 manila paper-mill, 2 planing-mills, 11 churches, gasworks, 1 driving park, and an industry connected with the coal-mines in the vicinity. The board of trade offer free building-sites to those intending to erect factories. Pop. 1078.
C. Hazzard, Ed. "Monongahela Valley Republican."

Monongahela River rises in Randolph co., West Va., flows N. 300 miles in a tortuous course, and joins the Allegheny to form the Ohio at Pittsburg, Pa. It is navigable by slackwater improvements 40 miles to Brownsville, Pa., and 200 miles for keel-boats. It flows through a fertile and highly prosperous region, abounding in coal, timber, and various minerals. The navigable Youghiogheny is its most important tributary.

Monónga'lia, a former county of Minnesota, now united with Kandiyohi co. Pop. in 1870, 3161.

Monongalia, county of West Virginia, bounded N. by Pennsylvania. Area, 450 square miles. It is somewhat

hilly, but fertile and well cultivated. Cattle, grain, and wool are leading products. Coal and iron are found. The county is traversed by the Monongahela River. Cap. Morgantown. Pop. 13,547.

Monoph'ysites, adherents to the doctrine of monophysitism (Gr., one-natureism, antithetical to diophysitism, two-natureism). I. The Monophysites were an Oriental sect originating in the fifth century in the views of EUTYCHES (which see), concurring in the main with them, though with certain specific differences. They held that though Christ is *of* two natures, which became conjoined at the incarnation, he does not subsist *in* two natures. There is in this sense but *one nature* after the union, though that nature involves and embraces two parts. The human is not annihilated, but is virtually lost, or virtually, though not essentially, absorbed in the divine—"like a little honey mingled with the ocean." The Nestorians virtually argued there are two natures, therefore there must be two persons; the Monophysites, there is but one person, therefore there can be but one nature—both arguing in this way from a true premise to a false conclusion. It is very clear that monophysitism, in its many forms and representatives, covers various degrees of error from a mere confusion of terms—an obstinate logomachy on the one side to a very great perplexity of ideas and obscuration of truth on the other. The logomachies usually involve confusion of ideas somewhere, even if they do not involve real conflicts, and the interests of truth demand not only right things, but right terms—the soul of a sound faith in the form of sound words. Great divines of both the Roman and Protestant churches have maintained that the error of the Monophysites was an ignorant and obstinate battle with sound words, rather than with the things the words really were meant to express, and that their heresies were heresies of phrase rather than of doctrine. Such is the view of De Castro, Vasquez, Le Quien, Combefis, Asseman, and others among the Catholics, and Ludolph, Weissmann, Jablonski, Cotta, Dorner, and others among Protestants. They appeal for evidence to the monophysitic liturgies and confessions, to their comparison of the union of the two elements in Christ to the union of soul and body in man, and to their best writers in general. Basnage, Patavius, Natalis, Alexander, Fuchs, and the majority of writers take the opposite view, and rightly.

The relation of the systems to one of which the Monophysites adhere, to each other, and to the orthodox faith has never been more felicitously stated than by Hooker: "There are *four* things which concur to make complete the whole state of our Lord: his deity, manhood, the conjunction of both, and the distinction of one from the other. *Four* principal heresies have withstood the truth: Arians, against the deity of Christ; Apollinarians, maiming his human nature; Nestorians, rending Christ asunder and dividing him into two persons; the followers of Eutyches, by confounding in his person those natures which they should distinguish. Against these there have been *four* most famous councils: Nice, against the Arians; Constantinople, against the Apollinarians; Ephesus, against Nestorians; Chalcedon against Eutychians. *Four* words—*truly, perfectly, indivisibly, distinctly,* God-man, of both One, in that one Both—comprise Christian belief in refutation of the foresaid heresies. Within which *four* heads all heresies which touch the person of Christ may be brought." (*Works* (Keble), Oxford, 1865, ii. 237.)

II. The spirit of the Monophysites was that of their era, fierce and bloody. Only internal harmony was needed to make them very formidable. But a system which originated in extravagance and confusion of thought ran out of necessity into a number of sects. These multiplied rapidly after the extinction of the hopes of the Monophysites to maintain themselves as the orthodox and catholic Church of the East. The sects which arose were as follows: (1) The Acephaloi; (2) the Julianists; (3) the Severians; (4) the Julianists; (5) from the Severians sprang the Agnoetists; (6) the Tritheists; (7) the Damianists; (8) the Cononites; (9) the Niobites.

III. The most important councils associated with the history of the Monophysites are—(1) the Council of Constantinople (448–449); (2) the "Robber Synod" at Ephesus, which restored Eutyches (449); (3) the Council of Chalcedon, the fourth œcumenical (451). It decided that the two natures are united without fusion, without mutation, indivisibly and inseparably—one Christ *in* two natures. It is remarkable, however, that the common Greek text reads "*of* two natures," which is the precise form preferred by the Monophysites. (See Münscher, *Handbuch d. Dogmen. Gesch.*, iv. 101.) These results were accepted universally in the Western Church, and very generally in the East, but were rejected with great violence, as Nestorianizing, wherever the Monophysites were in force.

IV. The struggle was violent and protracted between the parties. (1) In *Palestine* the disophysite bishops were expelled, and Theodosius was made patriarch of Jerusalem. (2) In *Egypt,* under the presbyter Ælurus and the deacon Mongus, the Monophysites separated themselves. (3) In *Antioch,* Peter the Fuller, from whom the Monophysites are sometimes called Fullonians, attempted to introduce into the Trisagion the formula, "Thou (God) wert crucified for us," which the enemies of the Monophysites insisted must mean that the divine nature was crucified if Christ had but one nature, and called them Theopaschites. (4) The emperor Zeno (482) put forth the *Henoticon,* which was designed to harmonize the contending parties. It used general expressions, which ignored the exact points at issue, avoided equally the phrases "one nature" and "two natures," condemned both Eutyches and Nestorius, and made an allusion to the Council of Chalcedon which was far from respectful. Like all documents of evasive compromise issued while the passions of men are still hot, it widened the breach and inflamed the animosity. (5) Pope Felix III. (483–492) pronounced against the *Henoticon,* and excommunicated Acacius, the patriarch of Constantinople (484). This led to a suspension of communion between the Western and Eastern churches for thirty-four years. (6) The emperor Anastasius I. (491–518) at the beginning of his reign held fast to the *Henoticon,* with an evident leaning to the Monophysites. (7) In addition to the doctrinal interests there was a struggle between Rome and Constantinople for supremacy. Rome and orthodoxy came forth triumphant. Justin I. (450–527), with Pope Hormisdas (514–523), effected the reunion of the Greek and Latin churches (518), the *Henoticon* was set aside, the decisions of the Council of Chalcedon were established, the bishops deposed by the Monophysites were restored, the formula of faith demanded by the pope was acknowledged, Severus and his followers were condemned, the names of the obnoxious patriarchs of Constantinople were stricken from the DIPTYCH (which see), and the names of Leo the Great, and of Euphemius and Macedonius, the patriarchs of Alexandria, were inserted in them (519). (8) The Monophysites were now branded as heretics both by the state and the dominant Church. A thousand of their bishops and other clergy were deposed, imprisoned, and outlawed. Prominent among these was Xenajas (Philoxenus), d. 522. (9) The strength of the Monophysites in Egypt was so great that they were able to find in it a refuge in the time of the terrible storm which had broken on them (Timotheus, Ælurus, Severus, Julian).

The sphere of the Monophysites was the East, where local and political jealousies intensified the disputes which arose with the Church of the West.

(1) Monophysitism was influential in Egypt, from Alexandria as a centre. In that land it continues to this day. (See COPT, ABYSSINIAN CHURCH, and ETHIOPIA.) (2) In Syria, Mesopotamia, Asia Minor, Cyprus, and Palestine, under the patriarch of Antioch, the Monophysites take their name from their organizer and restorer, the monk and presbyter Jacob Baradai, and are known as JACOBITES (which see).

The ARMENIAN CHURCH (which see) is nominally monophysite. The total number of the Monophysites is probably about 9,000,000. (For literature see MONOTHELITES.)

CHARLES P. KRAUTH.

Monop'oli, town of Southern Italy, province of Bari delle Puglie. This town is situated on a low promontory on the shores of the Adriatic, about 25 miles S. E. of Bari. It is surrounded by a wall with three gates; the castle was built by Charles V. The harbor, though very small, is safe, and furnishes an opportunity for some navigation, and the town is not without trade and commerce. Pop. in 1874, 19,993.

Monop'oly [Gr. μόνος, "alone," and πωλεῖν, to "sell;" Lat. *monopolium;* Fr. *monopole*], the sole right of buying, selling, or manufacturing a thing. Monopoly involves an interference with the general laws of trade to rule out competition, and secure to the party having this advantage a profit above the fair average profit of business. The greatest good of the greatest number requires that all commodities be furnished to consumers at a price conformed as nearly as possible to their actual cost. Ordinarily, under free competition, the natural alternations of supply and demand are a sufficient regulator. But individual self-interest prompts effort to override this principle, that one party may, through some control of the market, set on his goods an arbitrary price, irrespective of the cost. The effect of a monopoly is thus to enrich the party possessing it at the expense of the rest of the community.

There are various ways in which a monopoly may be obtained. One may invent a new article of general utility or a new method of producing an article already in use.

If he can keep his secret to himself, he may enjoy a monopoly, and his right to do this cannot be contested. But in most cases the secret is revealed when the article is offered for sale. Hence, to secure some reward for the brain-work of thought and invention, laws of copyright and patent-right are enacted. These give to the author or inventor for a term of years a monopoly of his production, which must be regarded as entirely legitimate, though existing abuses under these laws have caused some to question whether this is the best method for attaining the end. In anticipation of a scarcity from natural causes, or to produce an artificial scarcity, a party may buy up the entire supply of an article in the market, and withhold all sales until stern necessity compels people to buy at whatever price the holder may see fit to demand. In such a case the monopoly is a wrongful imposition, little better than downright robbery. Many speculative operations of the corn exchange and the stock exchange partake of this character. Certain natural advantages sometimes give one country or a section of country the monopoly of a particular product. Thus, China and Japan have a monopoly of tea, our Southern States of cotton, and Pennsylvania of anthracite coal. True policy, as well as the golden rule, forbids the abuse of such an advantage.

The most mischievous monopolies are those which are created by special legislation. Thus, feudal laws gave to an aristocracy, few in numbers, a monopoly of lands, the burden of which has been heavy upon England to the present day. In the early development of European commerce the practice was almost universal for governments by special charters to create corporations endowed with strict monopolies. (For illustration see EAST INDIA COMPANY, etc.) The subsidy paid by such corporations to the state was a small consideration for the oppressions which they laid upon the people. After reaching a certain stage genuine commercial enterprise was restricted, rather than fostered, by these measures. Under the old system of banking in this country the same policy prevailed. Special charters were enacted, often on consideration of a bonus to the State, which made the business a monopoly for each bank, and the public was poorly guarded by the conditions prescribed. The same tendency is manifested in the giving of railway charters and the creation by legislative action of great moneyed corporations. The main plea for such legislation is that great enterprises of the highest importance to the public good must be encouraged by special privileges. The mischief of it is that the creature of the state grows into a power to control the state. If the necessity urged in the plea be admitted, it must also be considered that the stimulus is an artificial one, liable to be abused, and therefore to be employed with the utmost caution. The legislature must make responsibility commensurate with privilege, and hold the favored parties always amenable to the law. Statutes granting special favors should be regarded with suspicion, and the popular mind should ever be reasonably jealous of all monopoly. A. L. CHAPIN.

Monopter′idæ [from *Monopterus*, the typical genus], a family of the order of eels or Apodes. The body is very elongated, even for eels; the anus in the posterior half of the length; the skin quite naked; the head small; the mouth with the cleft moderate; the upper jaw, with its margin, formed by the intermaxillaries, which are in contact at the median line, and behind them and parallel with them are well-developed supramaxillaries; teeth small and in a narrow band; branchial apertures confluent into a median slit below, and with the membrane nearly attached to the isthmus; dorsal and anal fins moderately developed; caudal obsolete, and pectorals wanting; the humeral arch is connected with the skull; "two basal branchihyal pairs" are developed, and there are (third and fourth) superior pharyngeal bones on each side; the branchial arches have rudimentary laminæ, and the slits between are moderately wide; the stomach is nearly siphonal, and there are no pyloric appendages; the ovaries are provided with oviducts. The family thus distinguished has been constituted for the reception of a peculiar species of fish (*Monopterus Javanensis*), found in the East Indian and Chino-Japanese seas. It sometimes attains the length of three feet or more. There are not less than 188 vertebræ in its back-bone—100 abdominal and 88 caudal.

THEODORE GILL.

Monoquet′, a v. of Kosciusko co., Ind., in Plain tp. Pop. 92.

Mon′otheism [Gr. μόνος, "one," and Θεός, "God."], the doctrine or belief that there exists but one God, as distinguished from polytheism, which teaches the existence of more than one divinity. Judaism, Christianity, and Mohammedanism are the principal monotheistic religions.

Monoth′elites, adherents of monothelitism (Gr., one-will-ism), the doctrine that there is but one Will in the person of Christ. It is opposed to diothelitism (two-will-ism), the doctrine that each nature of Christ possesses a distinct will, both in faculty and exercise.

I. Though monothelitism proceeded from the Catholic side, it is yet an offshoot of the monophysitic influence on the church policy of the Byzantine court. The monophysite struggles of the fifth and sixth centuries had been the sources of uproar and of anarchy throughout the empire. These at last assumed such a shape as to threaten its unity and perpetuity. There seemed to be special ground for the fear that Egypt, where monophysitism ruled almost without restraint, would cut itself loose from the orthodox court in Byzantium and form a separate kingdom. The dangers of the hour were heightened by the prolonged war with the Persians (620–628). Heraclius (610–641) sought to avert the threatening evils by removing the terrible schism which still divided the Church. In his interview with Paul, the monophysite patriarch of Armenia, the expression "the one energy of Christ," had been used, and the impression it made on both sides—it is disputed by which it was first used—suggested that it might be made the basis of a compromise between the Catholics and the Monophysites. With the Catholics, and in accordance with Chalcedon, the two natures were to be asserted, and yet with the doctrine of one theandric energy, one volition, implying one will, virtual provision would be made for the sort of unification for which the Monophysites contended. Protracted conferences followed with the monophysite patriarchs, Arcadius of Cyprus and Athanasius of Hierapolis, subsequently of Antioch, and with the orthodox patriarchs, Sergius of Constantinople and Cyrus, who was placed by the emperor in the see of Alexandria. These men, representing the great divided parties, were willing to concur in the doctrine propounded by the emperor as one which would preserve the truth, for which on each side the contest had been protracted. The first fruit of the compromise was that, under the energetic efforts of Cyrus, the Severians of Egypt were brought back to the orthodox Church (633). The Monophysites, who were not satisfied, were yet forced into compliance.

II. (1) Sophronius, a learned Palestinian monk, who at the time of the union was in Alexandria, maintained, especially against the seventh proposition of Cyrus, that the doctrine was in conflict with orthodoxy. When (634) he became patriarch of Jerusalem, he caused it to be condemned by a synod, on the ground that two natures involve two natural energies of will, two operations, two wills, and that in Christ the energy of each nature, of each will, operates under the coenergy of the other nature, the other will, undivided and unmingled. (2) On the appeal of Sergius, Pope Honorius I. (625–638) advised that the whole question should be dropped as involving fruitless speculation. Nevertheless, he decided in favor of the monothelite view (633). (3) On this declaration the emperor felt himself authorized to put forth a new creed, under the title *Ecthesis pisteōs*, "exposition of faith" (638). It was probably written by Sergius. Its language is ambiguous; it forbids all controversy on the question; and while it confirms the doctrine of Chalcedon, it maintains that we are to "ascribe all the operations in Christ, the human as well as the divine, to the Word incarnate. . . . Every operation proceeded from the same incarnate Word, without division or confusion. . . . Christ's body, though animated with a rational soul, produced no motion whatever of itself." (4) Sophronius had meanwhile been keeping up a correspondence with Rome, but an end was put to all the negotiations in that direction by the Mohammedan invasion of Palestine and Egypt (637–640). While these events cut off Sophronius from connection with the rest of the Christian world, his adherents, Stephen in the East and the abbot Maximus in the West, worked in his spirit. (5) Pyrrhus, the successor of Sergius in the see of Constantinople (639), approved of the Ecthesis, but was led by Maximus (645) to renounce it. An African general synod (646) without a dissenting voice condemned monothelitism. After the death of Honorius (638) Pope Severinus declared against the Ecthesis. Pope John IV. (640–642) condemned the Ecthesis, and urged Constantine III., the successor of Heraclius, to withdraw it (641). Pope Theodore I. (642–649), at the appeal of the African Church (646), made the same demand of the emperor Constans II. (630–668), threatening that if it were refused he would excommunicate the Church of Constantinople. He constituted at the same time Stephen, bishop of Dor in Palestine, apostolic vicar, with orders to depose all the monothelite bishops and clergy. Hemmed in in this way, the Byzantine court yielded; Constans withdrew the Ecthesis (648).

III. (1) In place of the Ecthesis, however, the emperor set forth the "Type of the Faith"—the *Tupos tēs pisteōs*.

The Type forbade anew all contention on the will or wills of Christ; men were to be satisfied with the decisions of the five general councils; matters were to be put back to the point at which they stood before the strife; and those who attempted to renew the discussion were to be visited with the severest penalties, ecclesiastical and civil. (2) But principle and party zeal alike made it impossible at this stage to suppress the matter in this way. The reply of Pope Theodorus was excommunication and anathema against Paul, patriarch of Constantinople, who was supposed to be the author of the Tupos. Pope Martin I. (649–655) pursued the warfare against the emperor with yet greater vigor. At the First Lateran Synod (649) diothelitism was established as the Church doctrine; the defenders of monothelitism in general, the patriarch of Constantinople in particular, and the two imperial edicts were put under the anathema. The course of the pope was treated by the emperor as treasonable. He was seized (653) by Kalliopas, imperial deputy, and brought to Constantinople a prisoner. His life was spared only on the intercession of the dying patriarch Paul, but he was sent into exile, where he died of his sufferings, firm to the end. The abbot Maximus was appealed to by every form of persuasion to acknowledge the Tupos, but he could not be moved. Finally, his right hand was cut off, his tongue torn out, and he was sent into exile, in which, at the age of eighty, he died (662). (3) Such savagery would have power for a little time, but for a little time only. Pope Adeodatus (677) excommunicated the Greek patriarchs; the Greek Church in return excommunicated the pope; and the Eastern and Western churches were again sundered. But the fearful growth of the Mohammedan power made the healing of this perilous breach of the most urgent importance. Constantine IV. Pogonatus (668–683) entered into negotiations which led to the convening of the sixth general council, the First TRULLAN (which see), (680–681). A doctrinal writing from the hands of Pope Agatho (680) formed the basis of the conclusions reached. The Monothelites saw that nothing but a miracle could save them. The miracle was attempted, but the dead body would not rise, and the doctrine of one will lay dead with it. The council anathematized all Monothelites. Pope Honorius had been anathematized in the letter of Agatho; the council anathematized him again. It was decided that there is in Christ two natural wills and two natural operations, unseparated, immutable, undivided, unmingled—"two natural wills, not in antagonism, but the human will following, not resisting, but rather subject to, his divine and almighty will." The Church of the West had stood firm for the faith, even at the price of the dishonor of her dead pope. The decrees of the council were confirmed at Rome, and by the Second Trullan Council (692), known as the QUINISEXTUM (which see). (4) The emperor Philippicus (Bardanes) brought about a temporary triumph of the Monothelites at a council held at Constantinople (711), which reversed the decisions of the sixth general council, but at his downfall (713) monothelitism lost the little influence which had been left it, and vanishes out of history. A doctrine which for a century convulsed kingdoms, arrayed popes against emperors, and pope against pope, and council against council, had in a little while no representatives on earth except the poor handful of MARONITES (which see) who gathered about a monastery on Lebanon, and who as a body survive that Byzantine kingdom to whose policy they owed their being, though they have long renounced the doctrine which sundered them from the great body of the Catholic Church. CHARLES P. KRAUTH.

Monotrem'ata [Gr. μόνος, "single," and τρῆμα, an "opening"], the lowest order of mammals, the sole existing order of the sub-class Ornithodelphia or Prototheria. The name is derived from the fact that, as in the birds, one external orifice, opening into a common cloaca, serves for the discharge of alvine and renal excretions and for reproductive purposes. They also approach the birds in the presence of large coracoid bones, in the absence of true teeth, in the bill-like jaws of one species (*Ornithorhynchus paradoxus*), in the spurs upon the hind legs, and in the characters of the ovaries and the skull. The two species of Echidna, too, are quilled with feather-like spines. There are also other interesting resemblances to birds, and some to reptiles. Their relations to the other mammals are complex. Their non-placental development and the presence of marsupial bones ally them to the true marsupials. The absence of teeth, the character of the claws, and the resemblance in general habits have led some systematists to place them among the Edentata or Bruta, which they represent among the non-placental mammals. There are but three living species, arranged in two families, Tachyglossidæ and Ornithorhynchidæ, which are essentially sub-orders. Some very large fossil species have been found, all Australasian, like the three living ones. None have external ears.

Monovar', town of Spain, province of Alicante, on the Elda, is well built, and has large salt-works and manufactures of saltpetre. Pop. 6422.

Monrea'le, town of Sicily, province of Palermo, 4 miles S. W. from the city of Palermo. It stands high on the slope of Monte Caperto, and commands a magnificent view of the island and sea. The whole neighborhood is enchanting, but the poorly built town has little of interest except its cathedral, one of the most splendid temples in the world. It is in form a Latin cross; the exterior has undergone modifications, though some original portions remain unchanged; the bronze doors date from 1186. The interior (325 feet long and 125 broad) consists of three naves supported by sixteen gigantic columns of Oriental granite, with capitals of exquisite workmanship. The mosaics which almost cover the inner walls of the cathedral are of the richest and rarest description, and the Moresque ornamentation is beautiful. The roof has been admirably restored since the fire of 1811. Adjoining the cathedral is the great monastery of the Benedictines, one of the most superb convents existing. The cloisters, constituting the most artistic part of the building, enclose a large court, flanked by spacious porticoes, the delicate arches of which are supported by double Moresque columns. It is greatly to be regretted that this exquisite structure is fast falling into ruin. The terrible massacre known as the Sicilian Vespers (1282) began on the road from Palermo to Monreale. Pop. in 1874, 16,211.

Monro' (ALEXANDER), M. D., F. R. S., b. in London, England, of Scotch parents, Sept. 19, 1697; studied medicine and surgery at London under Cheselden, at Paris under Bouquet, and at Leyden under Boerhaave; was admitted as a surgeon at Edinburgh 1719; was elected by the town council in Jan., 1720, first professor of anatomy to the new medical school established in connection with the university, and instituted a course of instruction which soon made that school the best medical college in the world. He was one of the two principal promoters of the Royal Infirmary at Edinburgh, where he delivered clinical lectures; founded a society for collecting and publishing professional papers; edited six volumes of *Medical Essays and Observations* (1732), and two volumes of *Essays, Physical and Literary*, for the same body, which had then taken the name of the Edinburgh Philosophical Society. His own publications comprised *Osteology, or Treatise on the Anatomy of the Bones* (Edinburgh, 1726), *Essay on Comparative Anatomy* (London, 1744), *Observations, Anatomical and Physiological* (Edinburgh, 1757), and an *Account of the Success of Inoculation of Smallpox in Scotland* (1765). These, with other tracts left in MS., were printed together in 1781. Dr. Monro resigned the chair of anatomy to his youngest son, Alexander, in 1759, but continued his clinical lectures at the infirmary. D. at Edinburgh July 10, 1767. Dr. Monro is often styled *Primus*, to distinguish him from his son and grandson of the same name, who were also eminent anatomists.—His eldest son, DONALD, b. 1731, was also an able physician and published several medical books, besides a memoir of his father (1781). D. in July, 1802.

Monro (ALEXANDER), M. D., F. R. S. E., son of the above, b. at Edinburgh Mar. 24, 1733; studied surgery in the University of Edinburgh under his father, to whom he became assistant professor of anatomy July, 1756; spent some time at the medical schools of Berlin and Leyden; succeeded his father as full professor in 1759, and also as secretary of the Philosophical Society, which in 1783 took by royal charter the title of Royal Society of Edinburgh. Among his publications were *De Venis Lymphaticis Valvulosis* (Berlin, 1757), which involved him in a controversy with Dr. William Hunter of London; *On the Structure and Functions of the Nervous System*, a large illustrated folio (Edinburgh, 1783); *On the Structure and Physiology of Fishes* (folio, 1785), *Description of all the Bursæ Mucosæ of the Human Body* (1788), and *Three Treatises on the Brain, the Eye, and the Ear* (illustrated, 1797), besides several papers in the *Transactions* of the Edinburgh Royal Society.—His son ALEXANDER was in 1798 conjoined with him in the professorship, from which he retired in 1808, and d. at Edinburgh Oct. 2, 1817.

Monro (ALEXANDER), M. D., F. R. S. E., son of the above, b. at Edinburgh Nov. 5, 1773; was educated at the high school and university of that city; studied medicine, anatomy, and surgery in London; succeeded in 1808 to his father's professorship, from which he retired with the title of emeritus professor of anatomy in 1847, at which time the post had been filled for 152 years by three generations bearing the same name. Dr. Monro, *Tertius*, as he was called, became in 1828 president of the Royal College of Physicians of Edinburgh, published papers in the *Trans-*

actions of that society, and wrote several medical works. D. at Craiglockart, near Edinburgh, Mar. 10, 1859.

Monroe′, county of S. Alabama, bounded W. in part by the Alabama River. It is nearly level, well timbered, and has a light, productive soil. Area, 1000 square miles. Cotton and corn are leading products. Cap. Monroeville. Pop. 14,214.

Monroe, county of E. Arkansas. Area, 900 square miles. It is traversed by the White River and by the Arkansas Central and Memphis and Little Rock R. Rs. It is in part marshy. The uplands are exceedingly fertile. Cotton and corn are leading products. Cap. Clarendon. Pop. 8336.

Monroe, county of S. Florida, comprises the greater part of the FLORIDA KEYS (which see) and a large tract of the mainland bordering on the Gulf of Mexico. Area, 3060 square miles. The mainland is mostly covered with cypress, savannas, and everglades, and is partly adapted to stock-raising and lumber-cutting. Tropical fruits, Sisal hemp, rice, etc. are grown, chiefly upon the islands, which contain nearly all the population, who are mostly engaged in maritime pursuits. Salt is manufactured. Cap. Key West. Pop. 5657.

Monroe, county of N. W. Central Georgia. Area, 425 square miles. It is bounded E. by Ocmulgee River, and traversed by the Macon and Western R. R. It is undulating, with much fertile soil. Cotton and corn are leading products. Cap. Forsyth. Pop. 17,213.

Monroe, county of S. W. Illinois, bounded W. by the Mississippi River. Area, 310 square miles. It produces large crops of corn and other grain. Coal is mined at various points. Cap. Waterloo. Pop. 12,982.

Monroe, county of S. W. Central Indiana. Area, 425 square miles. It is hilly, fertile, and well timbered with oak. Cattle, oak-bark, grain, and wool are leading products. Limestone is quarried and lumber and leather are manufactured extensively. The county is traversed by the Louisville New Albany and Chicago R. R. Cap. Bloomington. Pop. 14,168.

Monroe, county of S. Iowa. Area, 432 square miles. It is rolling, fertile, and underlaid with vast beds of coal. Cattle, grain, and wool are leading products. The county is traversed by the Iowa Central and the Burlington and Missouri River R. Rs. Cap. Albia. Pop. 12,724.

Monroe, county of Kentucky, bounded S. by Tennessee, and traversed by the Cumberland River. Area, 610 square miles. It is rolling and fertile, producing tobacco, corn, oats, wool, and live-stock. Cap. Tompkinsville. Pop. 9231.

Monroe, county of S. Michigan, bounded E. by Lake Erie and S. by Ohio. Land-area, 540 square miles. It is level and fertile. Cattle, grain, and wool are leading products. The manufactures include carriages, brick, lumber, etc. It is traversed by the river Raisin and by the Holly Wayne and Monroe, the Toledo and Detroit, and the Michigan Southern R. Rs. Cap. Monroe. Pop. 27,483.

Monroe, county of Mississippi, bounded E. by Alabama, and traversed by the Tombigbee River and the Mobile and Ohio R. R. Area, 750 square miles. It is very fertile. Live-stock, corn, and cotton are leading products. Cap. Aberdeen. Pop. 22,631.

Monroe, county of N. E. Missouri. Area, 570 square miles. It is uneven, fertile, and abounds in timber, sandstone, limestone, and coal. Live-stock, wool, tobacco, and grain are leading products. Traversed by the Hannibal and Western Missouri R. R. Cap. Paris. Pop. 17,149.

Monroe, county in the W. of Nebraska. Area, 1008 square miles. It is traversed by the N. and S. forks of the river Platte. Pop. 235.

Monroe, county of W. New York, bounded N. by Lake Ontario. Area, 682 square miles. It is very fertile and somewhat undulating. Limestone, gypsum, and sandstone are quarried. Live-stock, wool, grain, tobacco, hay, milk, butter, cheese, fruit, ornamental and fruit trees, seeds, bulbs, etc. are extensively grown. The manufactures include lumber, leather, lime, flour, furniture, machinery, castings, cooperage, agricultural tools, carriages, paper, metallic wares, and many other kinds of goods. Rochester, the capital, is the chief seat of the manufacturing and commercial interests. These are more fully described under that head. (See ROCHESTER.) The county is traversed by the Genesee River and Canal, the Erie Canal, and numerous lines of railroad. Pop. 117,868.

Monroe, county of Ohio, bounded S. E. by the Ohio River, which separates it from West Virginia. Area, 425 square miles. It is uneven and very fertile, and contains iron ore and a large area of coal. Live-stock, tobacco, wool, and grain are extensively produced. Cheese, leather, lumber, flour, furniture, etc. are manufactured. Cap. Woodsfield. Pop. 25,779.

Monroe, county of E. Pennsylvania, bounded S. E. partly by the Delaware River. Area, 580 square miles. Its surface is somewhat broken, with elevated plateaus and fertile valleys. Grain is the leading agricultural product. Lumber, leather, and flour are largely manufactured. The county is traversed by the Delaware Lackawanna and Western R. R. Cap. Stroudsburg. Pop. 18,362.

Monroe, county of Tennessee, bounded S. E. by North Carolina and N. E. by the Little Tennessee River. Area, 400 square miles. The E. part is mountainous, the soil fertile. Cattle, grain, and wool are leading products. The county is traversed by the East Tennessee and Georgia R. R. Cap. Madisonville. Pop. 12,589.

Monroe, county of S. E. West Virginia, bounded E. and S. by Virginia, and on the W. by New River. Area, 500 square miles. The E. part is mountainous; the rest is a well-cultivated and fine arable and pastoral region. The leading products are corn, tobacco, wool, and live-stock. The county contains many valuable mineral springs, and is traversed by the Greenbrier River and the Chesapeake and Ohio R. R. Cap. Union. Pop. 11,124.

Monroe, county of W. Wisconsin. Area, 900 square miles. It is uneven and fertile. Live-stock, grain, wool, and lumber are leading products. The county is traversed by the La Crosse and Milwaukee and the West Wisconsin R. Rs. Cap. Sparta. Pop. 16,550.

Monroe, tp. of Mississippi co., Ark. Pop. 1133.

Monroe, tp. of Sevier co., Ark. Pop. 309.

Monroe, tp. of Colusa co., Cal. Pop. 1130.

Monroe, post-v. and tp. of Fairfield co., Conn. The county is traversed by the Housatonic R. R. Pop. 1226.

Monroe, post-v., cap. of Walton co., Ga., 10 miles N. of Social Circle R. R. Station. Pop. 438.

Monroe, tp. of Cass co., Ill. Pop. 630.

Monroe, tp. of Hardin co., Ill. Pop. 1468.

Monroe, tp. of Ogle co., Ill. Pop. 923.

Monroe, post-tp. of Adams co., Ind. Pop. 960.

Monroe, tp. of Allen co., Ind. Pop. 1479.

Monroe, tp. of Carroll co., Ind. Pop. 910.

Monroe, tp. of Clarke co., Ind. Pop. 1863.

Monroe, tp. of Delaware co., Ind. Pop. 1247.

Monroe, tp. of Grant co., Ind. Pop. 1047.

Monroe, tp. of Howard co., Ind. Pop. 891.

Monroe, tp. of Jefferson co., Ind. Pop. 1760.

Monroe, tp. of Kosciusko co., Ind. Pop. 990.

Monroe, tp. of Madison co., Ind. Pop. 2221.

Monroe, tp. of Morgan co., Ind. Pop. 1467.

Monroe, tp. of Pike co., Ind. Pop. 1820.

Monroe, tp. of Pulaski co., Ind. Pop. 1418.

Monroe, tp. of Putnam co., Ind. Pop. 1608.

Monroe, tp. of Randolph co., Ind. Pop. 1662.

Monroe, tp. of Washington co., Ind. Pop. 1058.

Monroe, tp. of Benton co., Ia. Pop. 759.

Monroe, tp. of Butler co., Ia. Pop. 644.

Monroe, tp. of Fremont co., Ia. Pop. 901.

Monroe, post-v. of Fairview tp., Jasper co., Ia., on the Keokuk and Des Moines R. R., has 1 weekly newspaper and 1 hotel.

Monroe, tp. of Johnson co., Ia. Pop. 1034.

Monroe, tp. of Linn co., Ia. Pop. 868.

Monroe, tp. of Madison co., Ia. Pop. 495.

Monroe, tp. of Mahaska co., Ia. Pop. 1258.

Monroe, tp. of Monroe co., Ia. Pop. 773.

Monroe, tp. of Ringgold co., Ia. Pop. 268.

Monroe, tp. of Wayne co., Ia. Pop. 587.

Monroe, tp. of Anderson co., Kan. Pop. 2044.

Monroe, post-v., cap. of Ouachita parish, La., on the Vicksburg Shreveport and Texas R. R., has 7 schools, 5 churches, 2 newspapers, 3 hotels, and stores. Pop. 1949.

G. W. McCRANIE, ED. "OUACHITA TELEGRAPH."

Monroe, post-tp. of Waldo co., Me., 6 miles N. of Belfast, has manufactures of lumber. Pop. 1375.

Monroe, post-tp. of Franklin co., Mass., 5 miles N. of Hoosac Tunnel Station. Pop. 201.

Monroe, post-v. and tp., cap. of Monroe co., Mich., 35 miles S. of Detroit, on the Lake Shore and Michigan Southern, the Toledo Canada Southern and Detroit, and the Flint and Père Marquette R. Rs., has 2 female seminaries, 10

churches, a public library, 2 newspapers, Masonic and Odd Fellows lodges, 2 hotels, 1 German workingmen's benevolent association, a conservatory of music, 1 machine and engine shop, 1 tobacco factory, 4 flouring mills, 3 sash and blind factories, saw-mills, and several factories. Good fisheries exist near the city, and extensive vineyards are springing up. Pop. of v. 5086; of tp. 1003.

M. D. HAMILTON, "MONROE COMMERCIAL."

Monroe, tp. of Daviess co., Mo. Pop. 729.

Monroe, tp. of Lincoln co., Mo. Pop. 2616.

Monroe, tp. of Livingston co., Mo. Pop. 716.

Monroe, a v. and tp. of Monroe co., Mo. Pop. of v. 353; of tp. 880.

Monroe, post-tp. of Platte co., Neb. Pop. 338.

Monroe, post-tp. of Grafton co., N. H., on the Connecticut River, opposite McIndoe's Falls, Vt., has manufactures of lumber and starch. Pop. 532.

Monroe, tp. of Camden co., N. J. Pop. 1663.

Monroe, tp. of Middlesex co., N. J., traversed by the Camden and Amboy and the Freehold and Jamesburg R. Rs. Pop. 3253.

Monroe, tp. of Orange co., N. Y., is mountainous, with fertile valleys, has numerous villages, and manufactures of iron, cotton, and other goods. Iron is mined extensively. The post-village of Monroe is on the Erie R. R. Pop. of tp. 4666.

Monroe, tp. of Guilford co., N. C. Pop. 840.

Monroe, post-v. and tp., cap. of Union co., N. C., on the Carolina Central R. R., has 3 churches, 2 schools, 1 bank, 1 carriage-factory, 1 hotel, 1 weekly newspaper, and stores. Pop. of v. 448; of tp. 2386.

BOYLIN & WOLFE, EDS. AND PUBS. "MONROE ENQUIRER."

Monroe, tp. of Adams co., O. Pop. 1304.

Monroe, tp. of Allen co., O. Pop. 1739.

Monroe, tp. of Ashtabula co., O. Pop. 1419.

Monroe, post-v. of Lemon tp., Butler co., O. Pop. 324.

Monroe, tp. of Carroll co., O. Pop. 931.

Monroe, tp. of Clermont co., O. Pop. 2088.

Monroe, tp. of Coshocton co., O. Pop. 832.

Monroe, tp. of Darke co., O. Pop. 1226.

Monroe, tp. of Guernsey co., O. Pop. 1018.

Monroe, tp. of Harrison co., O. Pop. 1012.

Monroe, tp. of Henry co., O. Pop. 658.

Monroe, tp. of Holmes co., O. Pop. 921.

Monroe, tp. of Knox co., O. Pop. 1087.

Monroe, tp. of Licking co., O. Pop. 1119.

Monroe, tp. of Logan co., O. Pop. 1372.

Monroe, tp. of Madison co., O. Pop. 463.

Monroe, tp. of Miami co., O. Pop. 2704.

Monroe, tp. of Muskingum co., O. Pop. 876.

Monroe, tp. of Perry co., O. Pop. 1120.

Monroe, tp. of Pickaway co., O. Pop. 1870.

Monroe, tp. of Preble co., O. Pop. 1631.

Monroe, tp. of Putnam co., O. Pop. 451.

Monroe, tp. of Richland co., O. Pop. 1572.

Monroe, tp. of Bedford co., Pa. Pop. 1719.

Monroe, tp. of Bradford co., Pa. Pop. 1221.

Monroe, a b. (MONROETON P. O.) of Monroe tp., Bradford co., Pa., at the junction of the Sullivan and Erie and the Barclay R. Rs. Pop. 293.

Monroe, tp. of Clarion co., Pa. Pop. 1334.

Monroe, tp. of Cumberland co., Pa. Pop. 1832.

Monroe, tp. of Juniata co., Pa. Pop. 1078.

Monroe, tp. of Snyder co., Pa. Pop. 1126.

Monroe, tp. of Wyoming co., Pa. Pop. 974.

Monroe, tp. of Greene co., Va. Pop. 1331.

Monroe, tp. of Adams co., Wis. Pop. 416.

Monroe, post-v. and tp., cap. of Green co., Wis., on the Monroe branch of the Chicago Milwaukee and St. Paul R. R., has 4 hotels, 2 wagon-factories, 1 bank, 1 foundry, and 2 weekly newspapers. Pop. of v. 3408; of tp. 4536.

Monroe (ANDREW), b. in Virginia Oct. 29, 1792, the youngest of a family of eleven, four of whom became Methodist ministers; joined the Ohio Methodist Episcopal conference in 1815; was sent by Bishop Asbury to Cumberland circuit, Ky.; stationed in St. Louis in 1824; was a pioneer worker in Kentucky, Tennessee, and Missouri, and was a member of the Missouri conference of the M. E. Church, South, at his death, Nov., 1871. T. O. SUMMERS.

Monroe (JAMES), b. in Westmoreland co., Va., Apr. 28, 1758, was the son of Spence Monroe, and a descendant of a Scottish Cavalier family; was educated at William and Mary College; entered the Revolutionary army in 1776; served with distinction in the principal engagements of 1777–78; was wounded at Trenton; studied law under Jefferson; served again in the latter part of the war; was delegate to Congress 1783–86; opposed the adoption of the U. S. Constitution 1788; was U. S. Senator 1790–94; minister to France 1794–96; governor of Virginia 1799–1802, and again 1811; an envoy to France 1802, and to Spain 1805; minister to England 1803–08; was secretary of state 1811–17, and also secretary of war 1814–15; was president of the U. S. 1817–25, elected the first time over Rufus King, the Federalist candidate, and re-elected in 1820 with little opposition; the chief events of this prosperous administration, "the era of good feeling," were the acquisition of Florida from Spain, the inauguration of a system of internal improvements, the enunciation of the Monroe Doctrine, the Missouri Compromise of 1820, the recognition of the independence of the Spanish American states, and the last visit of La Fayette to the U. S. Mr. Monroe's last days saw him much distressed by his creditors, for the free-handed hospitality so characteristic of his native State in her palmy days, together with his lifelong occupation in public affairs to the neglect of his own estate, involved him in debt. In 1831 he removed to New York, where he died, at the residence of his son-in-law, Mr. S. L. Gouverneur, July 4, 1831. Mr. Monroe was a man of plain and unaffected manners, unquestioned purity and honesty, and of very robust and useful though not brilliant qualities as a public officer. He was beloved by all parties, and few men did more than he to remove the animosities and prejudices so rife in the early part of his political life.

Monroe Doctrine. This name has been given to a declaration of the policy of the U. S. in regard to the interference of European powers in the political affairs of the American continent, made by Pres. Monroe in his message to Congress in 1823. It had been understood that at the Congress of Verona (1822) a project had been discussed of aiding Spain to recover her dominion over her revolted American colonies. Mr. Canning, while making his preparations to go to India as governor-general, received the appointment of secretary for foreign affairs in Sept., 1822, and it was by his influence that the English government was led to take energetic measures against the absolutists' principle of interference in preventing revolution and all political changes proceeding from the people in opposition to the rulers. France early in 1823 was ready to invade Spain for the purpose of overthrowing the revolutionary government. The next measure might be an attempt to subjugate the Spanish colonies, some of which we had recognized as independent nations. The British government is understood to have suggested to the U. S. the policy of making some protest against such interference in the affairs of the American states or colonies. The suggestion, being approved of by the President, by Mr. J. Q. Adams, secretary of state, and by Mr. Jefferson, who was consulted, the annual message of Dec., 1823, contained the following declarations: "That we should consider any attempt on the part [of the allied powers] to extend their system to any portion of this hemisphere as dangerous to our peace and safety," and "that we could not view any interposition for the purpose of oppressing [governments on this side of the water whose independence we had acknowledged], or controlling in any manner their destiny by any European power, in any other light than as a manifestation of an unfriendly disposition towards the U. S." This declaration, together with the known sentiments of the British cabinet and nation, put an end to any designs which may have been entertained looking towards armed interference in American affairs. It was also most consistent with international rights, and was fully justified by self-defence. The balance of power had in such a case no application, for that principle is essentially confined to states forming a circle within moderate distances from one another, and interference on political, doctrinary grounds is unrighteous. And this declaration has received the assent of the country. During the late war, when the French emperor put the archduke Maximilian on the throne of Mexico, we were too busy and too weak to endeavor to prevent the measure; the time was chosen accordingly; but in ordinary times that or a similar step would have roused government and country to opposition. Another declaration of the same message is as follows: That "the American continents, by the free and independent condition which they have assumed and maintain, are henceforth not to be considered as subjects for future colonization by any European power." If those words expressed the intention that the South American republics should be prevented from freely surrendering their territory for the purposes

of colonization, this was going altogether too far; it was avowing a rule of interference on our part equally to be condemned with the similar one acted on by European absolutists. But it is probable that the words were not well considered in their import. We are led to take this view by what Mr. Adams, then secretary of state, said in 1825, when he was President, unless he is to be considered as retracting what had been hastily uttered two years before. He says, in reference to a congress of American powers at Panama, that "an agreement between all the parties represented at the meeting that each will guard, *by its own means*, against the establishment of any future European colony within its borders, may be found to be desirable. This," he adds, "was more than two years since announced by my predecessor to the world as a principle resulting from the emancipation of the American continents." But the House of Representatives opposed the principle, even when thus interpreted, by a resolution that the U. S. "ought not to become parties" with any of the republics of South America "to any joint declaration for the purpose of preventing the interference of any of the European powers with their independence or form of government, or to any compact for the purpose of preventing colonization upon the continent of America." The majority of the House was quite willing, without question, to approve of independent action with regard to interference when it should be threatened, but to prevent colonization they seem to have regarded as not worth any diplomatic proceedings. This declaration of Mr. Monroe has since fallen into oblivion. The other will probably always carry with it the approval of the U. S. T. D. WOOLSEY.

Monroe'ton, Pa. See MONROE (borough), Bradford co., Pa.

Monroe'ville, post-v., cap. of Monroe co., Ala., about 12 miles from the Alabama River, has 1 academy, 3 churches, a brick court-house and jail, and 1 newspaper. Pop. 1597. J. McLAUGHLIN, PROP. "MONROE JOURNAL."

Monroeville, post-v. of Allen co., Ind., 16 miles E. of Fort Wayne, on the Pittsburg Fort Wayne and Chicago R. R., has 4 churches, 1 bank, 1 newspaper, 3 stove-factories, and stores. Pop. 630. THOMAS STEPHENS, ED. AND PROP. "MONROEVILLE DEMOCRAT."

Monroeville, post-v. of Huron co., O., 60 miles W. of Cleveland, at the junction of the Baltimore and Ohio with the Lake Shore and Michigan Southern R. R., contains good schools, 6 churches, 1 bank, a newspaper, 2 hotels, woollen-mills, a foundry, flouring mills, 1 brewery, 3 extensive grain-warehouses, and stores. Pop. 1344.
J. F. CLOUGH, ED. & PUB. "MONROEVILLE SPECTATOR."

Monroeville, a v. of Brush Creek tp., Jefferson co., O. Pop. 82.

Monro'via, post-v. of Monroe tp., Morgan co., Ind. Pop. 348.

Mons, town of Belgium, the capital of the province of Hainaut, on the Trouille. It is strongly fortified, has a beautiful cathedral from the sixteenth century, and a very interesting town-house built in 1443, extensive manufactures of linen, lace, earthenware, and tobacco, and carries on considerable trade. Pop. 27,764.

Monseli'ce, town of Italy, province of Padua, about 14 miles S. of the city of Padua. This is a walled town, pleasantly situated, and of considerable historic interest. Pop. in 1874, 9765.

Mon'son, post-tp. of Piscataquis co., Me., 20 miles W. N. W. of Dover, is the seat of Monson Academy. Pop. 604.

Monson, post-tp. of Hampden co., Mass., on the New London Northern R. R. The Boston and Albany R. R. passes through the N. part of the town. It is 80 miles W. S. W. of Boston, has valuable quarries of gneiss, 6 woollen-factories, a national bank, large manufactures of hats and bonnets, 3 churches, a prosperous academy, and is the seat of the State primary school for the children of paupers who are not citizens. Pop. 3204.

Monsoon' [Port. *monção*, from Arabic *mausim*, "season"], a tropical wind which in the Indian Ocean blows half the year from one point of the compass, and for the remaining half in the opposite direction. The causes of the monsoon have not been clearly ascertained, but they are generally referred to the same meteorological phenomena as the trade-winds; in fact, they may be identical. Monsoons rarely coincide with the cardinal points of the compass, their most usual directions being N. W., S. W., N. E., and S. E.

Monstrelet', de (ENGUERRAND), b. at Cambrai about 1390; was provost of his native city and bailiff of Wallaincourt, and d. there July 20, 1453. He wrote a *Chronique*, narrating the history of France from 1400 (at which point Froissart stops) to 1444. Latest edition by L. Douet-d'Arcy (6 vols., Paris, 1857–63); English translation by Thomas Johnes (13 vols., London, 1810).

Monstrosity, in natural history. See TERATOLOGY, by C. G. FISHER, M. D.

Monsumma'no, town of Italy, province of Lucca, lying at the foot of a hill on which stands a ruinous castle. The chief interest of this town is a grotto or cave that furnishes natural vapor-baths, much frequented for rheumatic affections. Pop. in 1874, 6733.

Montagna'na, town of Italy, province of Padua, about 9 miles S. W. of Este. The walls of this town, with their grand square towers and citadel, are a fine monument of the Middle Ages. Pop. in 1874, 9178.

Montagnards' [Fr., "mountaineers"], or simply **The Mountain,** in the first French Revolution a name sometimes given to the ultra-democratic members of the National Convention, so called because they originally sat in the highest seats of the hall. The Girondists were, in distinction, called the Plain; and after their destruction the lower part of the house was called the Marsh (*Marais*), and was occupied by the undistinguished rabble of Jacobins, the leaders retaining the high seats.

Mon'tagu (BASIL), b. in London April 24, 1770, was a natural son of the earl of Sandwich by an actress, Miss Ray or Wray, who was shot in Covent Garden Theatre in 1779 by the Rev. Mr. Hackman, a rejected admirer. He graduated at Cambridge 1790; was soon after called to the bar at Gray's Inn, and acquired a large and profitable practice in London, chiefly in bankruptcy cases. He was a member of the literary circle of which Coleridge was the chief ornament, and was carried away by the social theories of William Godwin to such a degree that he contemplated retiring from a profession believed to be prejudicial to society, but was dissuaded from carrying out his purpose by Sir James Mackintosh. In 1806 he was appointed a commissioner of bankruptcy, and exerted himself successfully through a series of years to procure the reform of the law concerning bankruptcy, which was then highly objectionable. Under the new law he became accountant-general of bankruptcy, compelled the Bank of England to pay interest on deposits ordered by a court of bankruptcy, and distinguished himself by his advocacy of other reforms, especially the abolition of capital punishment for minor offences. He was a voluminous author, having published 40 volumes and left in MS. 100 more. His principal professional work was a *Digest of the Bankrupt Laws*, but he is best known as the careful editor of the *Works of Francis Bacon* (16 vols., 1825–34), of which the last volume contains a *Life of Bacon*. D. at Boulogne, France, Nov. 27, 1851.

Montagu (EDWARD WORTLEY), son of the celebrated Lady Mary, b. at Wharncliffe, Yorkshire, England, in Oct., 1713; was placed at Westminster School, but ran away three times, making a voyage once as a cabin-boy to Spain; was elected in 1747 to Parliament, but had to resign on account of debt; went to Paris, where he was imprisoned on account of some gambling transactions; became a Catholic in Italy; travelled in Arabia and Egypt, and professed to be converted to Mohammedanism; and was returning to England when he d. at Padua, Italy, May 2, 1776. In infancy he had been the first English child inoculated for smallpox. He published some papers in the *Philosophical Transactions*, and a volume of *Reflections on the Rise and Fall of the Ancient Republics* (1759), of which the authorship was claimed by his tutor. The eccentric career of Edward Montagu was related by himself in an *Autobiography* first published in 1869.

Montagu (ELIZABETH **Robinson**), b. at York, England, Oct. 2, 1720; was married in 1742 to Edward Montagu, grandson of the fifth earl of Sandwich, and cousin of Edward Wortley Montagu, the husband of Lady Mary, and being possessed of wealth, ambition, and some literary talent, became a celebrated leader of London society in the second half of the eighteenth century. She gave a famous annual dinner on May Day to the London chimney-sweeps, and her magnificent residence in Portland Square was the head-quarters of the so-called "Blue-stocking Club," and figures largely in the diaries of the period. Mrs. Montagu wrote three of the *Dialogues of the Dead* published in the 4th ed. of Lord Lyttelton's work bearing that title (1765), and an *Essay on the Writings and Genius of Shakspeare compared with the Greek and French Dramatic Poets* (1769), but is best known by her *Correspondence*, of which 4 vols. have been edited by her nephew. D. at London Aug. 25, 1800. (See her *Life*, by Dr. Doran, entitled *A Lady of the Last Century*, 1872.)

Montagu (MARY WORTLEY), LADY, b. at Thoresby, Notts, England, in 1690, a daughter of the duke of Kingston, was second cousin on her mother's side to the novelist

Fielding. She was even in childhood a favorite in society from her wit and beauty. In 1712 she married Mr. Edward Wortley Montagu, without her father's consent. In 1716 she went to Constantinople with her husband, then ambassador to the Porte. In 1717 she made a successful trial of inoculation for smallpox upon her only son—a practice common in the East, but unknown before her time in Western Europe. Her successful introduction of smallpox inoculation into England was accomplished in spite of great opposition and personal abuse from all classes. After her return to England followed her bitter quarrel with Pope, who had been her friend. In 1739 she left her husband, and resided chiefly in Italy. D. in England of cancer Aug. 21, 1762. She wrote much that was never published, but is remembered chiefly for her brilliant *Letters*, written during her travels.

Mon'tague, county of Texas, bounded N. by the Red River, which separates it from the Indian Territory. Area, 900 square miles. It is hilly, and deficient in wood and water, but is adapted to pasturage. Stock-raising is the leading pursuit. The bottom-lands along the Red River are very fertile, and produce grain. Cap. Montague. Pop. 890.

Montague, post-tp. of Franklin co., Mass., on the E. bank of the Connecticut River, on the Vermont and Massachusetts and the New London Northern R. Rs., 4 miles E. of Greenfield, contains the new and thriving villages of Turner's Falls and Miller's Falls (which see), has great water-power and manufactures of paper, paper-pulp, cutlery, machinery, cotton goods, etc., a national and a savings bank, 5 churches, and a high school. Fine crops of tobacco are here produced. Pop. 2224.

Montague, post-v. of Oceana tp., Muskegon co., Mich., on White Lake and on the Chicago and Michigan Lake Shore R. R., has some commerce, 1 hotel, and 2 weekly newspapers.

Montague, post-v. and tp. of Sussex co., N. J., on the Delaware River, contains Newton (which see). Pop. 932.

Montague, post-tp. of Lewis co., N. Y. Pop. 718.

Montague, post-v., county-seat of Montague co., Tex., 83 miles W. of Bonham.

Montague (Charles). See Halifax, Earl of.

Montague (William Lewis), A. M., b. at Belchertown, Mass., Apr. 6, 1831; graduated at Amherst College 1855; taught Latin and Greek at Williston Seminary 1855–57; was tutor in Amherst College from 1857 to 1862, when he became associate professor of Latin; was appointed professor of French and librarian 1864, and of Italian and Spanish (additional) 1868. He was licensed to preach in 1860; spent two years (1865–66 and 1871–72) in study and travel in Europe; published a *Manual of Italian Grammar* (1870), and a *Comparative Grammar of the Spanish Language* (1873).

Montaigne', de (Michel Eyquem), b. Feb. 28, 1533, at the château Montaigne, near Bergerac, in the department of Dordogne; studied law at Bordeaux, and was appointed councillor in the Parliament of that city in 1554. He early obtained a great reputation for sagacity and integrity, but he had no inclination for public business, and after his father's death in 1569 retired to his château, and occupied himself with philosophical studies and meditations. In 1580 he published the first two books of his *Essais*, and in the same year he undertook a journey through Germany and Switzerland to Italy; a journal which he kept on this tour was found two centuries after his death in the family archives, and published at Paris in 1774 by Guerlon, under the title *Journal du Voyage de Michel Montaigne en Italie, par la Suisse et l'Allemagne*. In 1581 the citizens of Bordeaux chose him mayor of the city, which position he held for four years; and he kept order and peace in the place, although the terrible feuds between Protestants and Roman Catholics raged all around. He had also some influence at court, and acted several times as a mediator between the leaders of the different political and religious parties, he himself being entirely indifferent to the questions at issue, and, on account of the stoical cast of his character, very independent. The third book of his *Essais* he published in 1588. D. at Montaigne Sept. 13, 1592. Subsequently, the *Essais* were republished very frequently, and translated into most European languages. One of the best editions is that by J. V. Le Clerc (Paris, 1865). A copy of Florio's English translation (1603), containing Shakspeare's autograph, and the only book known to have been owned by him, is now in the British Museum. Bayle St. John has given an interesting biography of him (London, 1857).

Montajo'ne, town of Italy, province of Florence. There is a mineral spring here, believed to possess important medical properties. Pop. in 1874, 10,556.

Montalbod'do, town of Italy, province of Ancona. This town is situated on the ruins of the ancient *Ostra*. Pop. in 1874, 5903.

Montalci'no, town of Italy, province of Siena. Its mineral springs are held to be efficacious, especially for catarrhal affections. Pop. in 1874, 8741.

Monta'le, town of Italy, province of Florence, 6 miles E. of Pistoia. Close by are the ruins of the old castle of Montemurlo, of the ninth century, once an object of fierce contention between Florence and Pistoia. Pop. 8218.

Montalembert', de (Charles Forbes René de Tryon), Count, grandson of the engineer Montalembert, b. in London May 29, 1810; was educated at the Collége St. Barbe, Paris; became in 1830, with Lamennais and Lacordaire, one of the founders of *L'Avenir*, a democratic periodical, but the papal censure which followed caused Montalembert to join himself more closely to the Ultramontane party. Among his numerous writings the most important are the *Life of St. Elizabeth of Hungary* (1835–36), *Vandalism and Catholicism in Art* (1839), and especially *The Monks of the West* (1860 *seq.*, 6 vols.). Montalembert opposed the doctrine of papal infallibility, but submitted on his deathbed. He d. Mar. 13, 1870.

Montalembert, de (Marc René), Marquis, b. at Angoulême, France, July 15, 1714; d. 1800. Descended from a noble family, he entered the army at the age of eighteen, and served at the sieges of Kehl and Phillipsburg and in the war with Bohemia. Subsequently he engaged in the manufacture of cannon for the French navy. At the age of sixty-two he began to publish his great work, *La Fortification perpendiculaire, ou l'Art défensif supérieur à l'offensif*. The use of the casemate in some of its forms goes back to Albert Dürer and San Micheli, in the early part of the sixteenth century, and it was resorted to by Vauban in his second and third systems, of which the tower-bastions are casemated throughout. But it was reserved for Montalembert, in the latter part of the eighteenth century, to give it an extraordinary development, and to make the casemate the essential element of a system of fortification. This "most intrepid of authors upon fortification" (so styled by Chasseloup) boldly attempted to apply to his art the same principles by which Napoleon won his victories—the concentration of superior forces upon decisive points. This concentration he effected, and could only effect, by the use of casemates, upon which, numerous and well constructed, he bases all the strength of his fortifications. Rejected by the French, the principles of Montalembert have been made the basis of the modern German, or "polygonal," system. For sea-coast fortification the casemates of Montalembert had a singular applicability, and he has the merit of being the first writer who has seen in this branch of the art a subject of particular treatment, and who has given special designs for forts and batteries "for the defence of ports." Notwithstanding that the French corps of engineers rejected the system in its intended application, and disclaimed, as an engineer, its author, it nevertheless constructed in 1786, for the defence of the harbor of Cherbourg, forts which are in reality almost copied from his designs. European nations followed the example, and the universal "casemated" forts or batteries which frown upon the waters of almost every important sea-port in the world are legitimate offspring of the thought of Montalembert. The recent immense development of artillery power has modified construction and introduced iron to a certain extent in place of masonry; yet the "casemated" battery still prevails. (See Iron Plating.) J. G. Barnard.

Montal'to Uffu'go [prob. *Uffugum*], town of Southern Italy, province of Cosenza, known during the 18th century as the seat of the Academy of the Invalidi. Pop. 6095.

Montalvan', de (Juan Perez), b. at Madrid, Spain, in 1602; became in youth intimate with Lope de Vega, under whose guidance he began to write for the theatre at the age of seventeen; was ordained a priest in 1625, and wrote nearly 100 plays, but excessive literary work deprived him of reason in 1637, and he d. at Madrid in June, 1638.

Montalvano Ionico, town of Southern Italy, province of Potenza. Its chief industry is in the produce of silk and honey. Pop. in 1874, 6225.

Monta'na Ter'ritory is bounded on the N. by the British possessions, E. by Dakota, S. by Wyoming and Idaho, and W. by Idaho, the western boundary running along the ridge of the Bitter Root Range of mountains. It was organized by an act of Congress in 1863, and according to the census of 1870 contained a population of 39,895. It lies between the parallels of 44° 6′ (the greater part having for its southern boundary the parallel of 45°) and 49° N. lat., and between the meridians of 104° and 116° W. lon. Area, 143,776 square miles, or 92,016,640 acres.

Face of the Country, Mountains, Rivers, Lakes, etc.—As its name indicates, it is a mountainous country, in which there are some fine valleys, and has an abundance of timber, such as pine, spruce, cottonwood, and aspen. The streams are skirted with dense thickets, in which at the proper season there is found plenty of serviceberries, currants, and gooseberries.

In this "Land of the Mountains," or *Toy-a-be Shock-up*, as the Snake Indians call it, there is a loneliness, silence, and sublime grandeur that is exceedingly impressive. Every one feels it when entering the Territory, and it seems to hold them ever afterward. The solitudes are so profound, the mountain-heights so awe-inspiring in their magnificent proportions, that man is overpowered by them. No noises break upon the air; even the birds and animals are mute. Above, there is a sky of serene beauty, and all around an atmosphere that is purity itself. No noisome exhalations from stagnant pools and decaying vegetation are encountered, nor is there anything to mar the harmony of the scene. On every hand rise gigantic peaks, many of them covered with perpetual snow, and away off in the distance may be traced the sinuous courses of rivers and streams, whose banks are bordered with thick growths of trees and bushes.

In the Territory is the main range of the Rocky Mountains, with many detached spurs, the Bitter Root range, the Judith, and the Belt Mountains S. of the Great Falls of the Missouri River. The principal streams are the Gallatin, Jefferson, and Madison rivers, here called the "Three Forks," which unite and form the Missouri River. The heads of these streams are in the mountains, where there are many beautiful lakes, surrounded with pine trees, once the favorite haunt of the aborigines. Besides these are the Yellowstone, Mussel-shell, Milk, Teton, Sun, and Maria's rivers, and numberless other smaller streams, thus rendering Montana one of the best-watered portions of the Union. The water-power here is inexhaustible. Some of the water-courses which flow down the sides of its mountains empty through the Missouri into the Gulf of Mexico, and others through Clark's fork of the Columbia River into the Pacific Ocean. Flathead Lake is the only considerable lake in the Territory. Toward its southern boundary it dips down into that remarkable region, the Yellowstone National Park, a part of which is within its limits.

Geology and Mineralogy.—The geology of the Territory is considerably involved, the central portion being much disturbed by upheaval and the frequent occurrence of dikes and faults. The eastern portion of the Territory is Tertiary, almost to the meridian of 108° W.; this is followed, as we proceed westward, by a broad Cretaceous tract, occasionally projecting through the Tertiary farther E., having several tracts of Eozoic or archaic rocks, surrounded in all cases by a narrow belt of Silurian. W. of this is a strip of varying width of Triassic and Jurassic rocks, with frequent upheavals of archaic formations, with their Silurian rings or borders; then a narrow Silurian belt strangely contorted; and still farther W., extending to and beyond the Bitter Root mountain-range, Eozoic rocks, with a few patches of Silurian and Tertiary deposits in the valley and basin of the Bitter Root River.

Minerals.—Gold has been found in every portion of the Territory, and considerable settlements were made in Deer Lodge Valley and in Confederate Gulch, where the town of Diamond City sprang into existence. The "diggings" were found to be so numerous that the miners readily abandoned one locality to go to another. In addition to the placers, gold-bearing lodes were found which could only be worked by machinery and mills; both of which were brought in after a long journey by steamboat up the Missouri River to Fort Benton, and thence carried by ox-trains to their places of destination. Some of the first gold was found in Alder Gulch, the present site of Virginia City. At first there seemed no limit to the amount of gold which could be taken out, and the total actually mined is said to have been worth over $25,000,000. But constant working decreased the supply, although portions of the gulch are yet worked with very considerable profit. The gold-region in the neighborhood of Bannock City was discovered in 1861. Not long after it was found at Last Chance Gulch, the present site of Helena, which was found to be richer even than Alder Gulch. Silver ore was also found, as well as iron and coal. After a time the mining excitement measurably died away, or perhaps men pursued the occupation of mining more sedately and carefully, and without expecting such large returns. Lignite, copper, and petroleum are also among the mineral products.

Soil and Vegetation.—The mountains of Montana are usually well covered with forests, but the trees are, if deciduous, almost exclusively willow, poplar, and cottonwood; and if evergreen, pine, spruce, fir, cedar, and balsam. There is very little hardwood timber in the Territory. Grass and flowers of great beauty abound in the valleys. As a grazing country this will always maintain a high rank, the "bunch-grass," so excellent for cattle, covering all the hillsides and plains. Indeed, many herds are turned out in the autumn to get their own living through the winter, and spring-time finds them not only in good condition, but in reality first-rate beef.

Zoology.—Great herds of deer, elk, mountain-sheep, and antelope exist and thrive in the mountains and on the plains and foot-hills of the mountain-ranges. The moose is often found in the mountain-gorges. Beaver, otter, marten, gray wolves, badgers, bears, and mink are found in the forests and streams, and were in former times much sought after. Herds of buffalo roam through the northern portion of the Territory and S. of the Yellowstone River. The Indians have annual hunts after these animals, using their skins for a variety of purposes and their flesh for winter food. In the mountain-streams may be found salmon and brook-trout and graylings.

The climate of Montana is milder than that of States farther E. in the same latitude. The annual mean temperature ranges from 44° to 48°. The mountainous portions, on account of their great elevations, are colder, but in some of the sheltered valleys the climate is pleasant during the whole year. At Fort Benton, lat. 47° 52′, lon. 110° 40′, elevation 2674 feet, the mean annual temperature was 41.97°; of spring, 43.20°; of summer, 67.7°; of autumn, 41.6°; of winter, 15.4°. At Fort Owen, on the Bitter Root River, lat. about 46° 30′, lon. 114° 8′ W., 3284 feet above the sea, mean temperature of spring was 48°; of summer, 69.50°; of autumn, 45.50°; of winter, 24.75°; and of the year 46.75°. At Deer Lodge City, lat. 46° 22′, lon. 112° 50′ W., elevation 4768 feet, the mean temperature of spring was 41.50°; of summer, 63°; of autumn, 43.16°; of winter, 20.50°; and of the year, 41.20°. The climate is very dry. The annual rainfall at Fort Benton is but 12.17 inches, and it is much the same over most of the Territory, though the western slopes of the mountains receive about 16 inches. Irrigation is practicable and easy in most of the arable lands.

Agricultural Products and Pursuits.—The valleys in the mountain-region are generally rich and productive, and are considerably in demand for farm-lands. In 1870 there were 139,537 acres of land taken up in farms, of which 84,674 acres were improved and 54,863 unimproved. The value of farms was $729,193, and of farming implements, $145,438. The value of farm productions for the year was $1,676,660; of animals slaughtered, $169,092; of home manufactures, $155,357. Wages paid to farm-laborers, $325,213. Of wheat, 181,184 bushels were raised, 149,367 bushels of oats, 85,756 bushels of barley, and a small quantity of the other cereals; 18,727 tons of hay, 600 pounds of tobacco, 91,477 bushels of potatoes, 2414 bushels of peas and beans. The value of live-stock in the Territory was $1,818,693, and consisted of 5289 horses, 475 mules, 12,432 milch cows, 24,306 other cattle, 2024 sheep, 2599 swine. All these products and the live-stock have materially increased within the past five years.

Manufactures.—These are at present few and simple. In 1870 the Territory had 201 manufacturing establishments, employing 701 hands, all men except 4, with $1,794,300 capital, using $1,316,331 of raw material, and producing goods to the value of $2,494,511. The most important of these manufactures were milled quartz, flour and meal, sawed lumber, and malt liquors.

Mining.—This has been mostly confined to gold, and placer, hydraulic, and quartz mining are all practised. It is estimated that over $100,000,000 in gold have been taken from the mines of Montana since their discovery in 1861. This is a low estimate, and probably much less than the real sum. Much of this has been produced under circumstances of great hardship and peril. Many of the mines are as productive as ever, though the placers are fast becoming exhausted. Silver-mining may yet prove profitable at some points in the Territory.

Railroads and Transportation.—At the present time travel to and from the Territory is by way of the Pacific R. R. to Corinne, thence N. on a new narrow-gauge railroad, and thence by stage-coach to Helena, the most considerable town in the Territory. Freight is also carried up over this road, instead of by the way of the Missouri River, as in former years. In this way the trip is rendered comparatively easy.

Finances, Banks, etc.—The real and personal property of Montana in 1870 was estimated at $15,184,522. The assessed valuation was $9,943,411, personal property being largely in excess of real estate. The Territory had in Nov., 1874, 6 national banks, of which 1 was closing; the other 5 had $350,000 capital, $286,000 bonds on deposit, $310,540 circulation issued, $43,740 circulation redeemed, and $266,795 outstanding. There were also numerous private banking-houses.

Population.—As already stated, the population in 1870 was 39,895; of these 18,306 were whites, 183 colored, 1949 Chinese, and 19,457 Indians, of whom all but 157 sustained tribal relations. Of the white population, 12,616 were natives and 7979 of foreign birth, of whom about 3500 were from Great Britain and British America, 1233 Germans, and a considerable number of Scandinavian natives. S. of the Yellowstone there is a large reservation set apart for the use of the Crow Indians, and at the agency located thereon they have done something in the way of farming. Besides these, there are the Pend d'Oreilles, Blackfeet, and Bannock Indians in the Territory, who sometimes roam over immense tracts of country while hunting and fishing, leading the vagabond sort of life which is so dear to them and so adapted to their natures.

Education.—In 1870, Montana had 45 public schools, with 46 teachers and 1544 pupils; 1 academy, with 8 teachers and 50 pupils; and 8 other schools, with 11 teachers and 151 pupils. Aside from these, there were schools for the Indians on the reservations, conducted by the missionaries of different denominations, some of them very successful. In 1874 the Territorial legislature passed a good school law. In Oct., 1873, there were 90 schools, 91 districts organized; 3517 children of school age, of whom 1881 were attending school; 50 male and 49 female teachers, having an average compensation of $68.41 per month; 11 private schools, with 149 scholars; value of schoolhouses, $21,192, and amount of annual expenditure for school purposes, $33,161.50.

Newspapers.—There were 6 newspapers in the Territory in 1870, having an aggregate circulation of 12,200 copies.

Churches.—In 1870, Montana had 15 churches, 11 church edifices, 3850 sittings, $99,300 of church property. Of these, 1 was Christian; 2 Episcopal, with 1 church edifice, 700 sittings, $5500 of church property; 7 were Methodist, with 5 church edifices, 1450 sittings, $16,800 church property; 5 Roman Catholic, with 5 churches, 1700 sittings, and $77,000 of church property. In 1874, there were 3 Episcopal churches, with 3 clergymen, about 150 members; the Roman Catholics had 3 churches, 20 stations, 5 priests, and, including the Indians, about 2000 adherent population; the Methodists, 12 churches, 9 church edifices, a membership of 570, and church property to the value of $27,000; the Presbyterians had 5 churches, 3 ministers, and 260 members.

Government, Constitution, and Courts.—The Territorial officers, governor, secretary of state, district attorney, surveyor-general, superintendent of Indian affairs, U. S. commissioner, and treasurer, are all appointed by the President of the U. S., by and with the consent of the Senate. The legislature consists of two houses—a council of 12 members, and a house of representatives of 26 members—all elected by the people. There is a U. S. district court, presided over by one district judge and two associate justices, all appointed by the President. The Territory is represented in Congress by a delegate, who can speak, but not vote.

Counties.—There are eleven counties, which had in 1870 the following populations: Beaver Head, 722; Big Horn, 38; Choteau, 517; Dawson, 177; Deer Lodge, 4367; Gallatin, 1578; Jefferson, 1531; Lewis and Clarke, 5040; Madison, 2684; Meagher, 1387; Missoula, 2554.

Principal Towns.—Virginia City is the capital of the Territory. It had 867 inhabitants in 1870, but had 10,000 in 1862 or 1863. Helena is the largest town; it had 3106 inhabitants in 1870; Deer Lodge City had 788 inhabitants in 1870. Bozeman City, Bannock City, and Diamond City are flourishing towns.

History.—Montana had had a few settlers, mostly trappers and hunters and some missionaries, for many years before its organization as a Territory, but its growth dates from the discovery of gold there in 1861. It was a part of Idaho Territory till May, 1864, when it was organized as a separate Territory. After the discovery of gold people flocked in from all quarters, and during the winter season there was great scarcity of provisions, insomuch that flour at one time sold in Virginia City for $100 in gold per sack of 100 pounds. Women and children only were allowed to eat bread, the miners living on beef, which was plentiful and good. In the earlier days there was of course a very mixed population, among which were a number of noted robbers and desperadoes, who at one time seemed to have complete possession of the Territory. This state of things continued until the respectable portion of the community could endure it no longer, when they formed themselves into an organization known as the "Vigilantes," who administered the law without partiality or favor, and many a miscreant was hanged by them. The story of the operations of the Vigilantes will always be considered a singular chapter in the history of Montana. It was formerly a favorite hunting-ground for hunters and trappers, and Fort Benton, on the Missouri River, at the head of navigation, is an old fur-trading post, now occupied by U. S. troops. Eventually, this will become a fine State, as it has ample resources of every kind, and is capable of supporting a large population. Its wealth of gold and silver, its adaptability for agriculture, its unsurpassed water-power, on which there can be an unlimited number of mills and manufactories, and its immense coal-fields, all give promise of a prosperous future. For many years to come mining will continue to be a profitable pursuit, engaging the attention of many people. But agriculture and stock-raising will be successfully carried on, and Montana will take its position among the most desirable portions of our country as a place of abode.

Governors.

Sidney Egerton.........1864–65	James M. Ashley..........1869–70
Francis Meagher (act'g)..1865–66	Benjamin F. Potts........1870–76
Green Clay Smith..........1866–69	

A. G. BRACKETT. REVISED BY L. P. BROCKETT.

Montana, Ia. See BOONE, Ia.

Montana, post-tp. of Labette co., Kan., has several mills and abounds in coal. Pop. 783.

Montana, post-tp. of Buffalo co., Wis. Pop. 508.

Montandon, post-v. (called also INTERSECTION and LEWISBURG JUNCTION) in Chiliasquaque tp., Northumberland co., Pa., on the E. bank of the W. branch of the Susquehanna, opposite Lewisburg, and on the Philadelphia and Erie R. R. at its junction with the Lewisburg and Spruce Creek R. R., 9 miles N. of Sunbury.

Montanel'li (GIUSEPPE), b. at Fucecchio, in Tuscany, in 1813; d. in 1862. He was educated at the University of Pisa, and in 1838 published a volume of poetry; from 1837 to 1839 practised successfully as an advocate, and in 1848 was appointed professor of civil and commercial law in the University of Pisa. Even before 1848 he had excited much attention by his proposed liberal reforms, by the political association known as Fratelli Italiani, and by the *Italia*, a journal edited by him at Pisa in 1847 with the motto "Riforma e Nazionalità." On the breaking out of the revolution in 1848 he volunteered, and distinguished himself by his valor. A report of his death became current, and he was universally lamented. Mazzini wrote a splendid eulogy upon him. He was, however, only severely wounded and a prisoner. On his return to Tuscany he became a member of the constitutional ministry, and on the flight of the grand duke in 1849 he was chosen triumvir with Guerrazzi and Mazzini. At this time he exerted himself for the union of Tuscany with Rome. While he was on a mission to Paris the restoration took place, and Montanelli remained an exile until 1859, during which time he published two volumes of memoirs upon the events in Tuscany. Among his poems are mentioned with praise *La Tentazione*, and a tragedy entitled *Camma*. In 1859 he declared himself for the autonomy of Tuscany, rather than for the unification of Italy. *La Nuova Europa*, a journal founded by him, was the special organ of his peculiar political ideas, and its publication ceased at his death.

Montanism. See MONTANISTS.

Mon'tanists, an early Christian sect, the followers of Montanus of Pepuza in Phrygia. He appears to have been a priest of Cybele, was converted about 150 A. D., and soon after began to fall into fits of ecstasy and utter prophecies. He was joined by two women (Maximilla and Priscilla) of wealth and high social position, who deserted their husbands and became prophetesses. Expelled from the Church, he set up for himself, organizing a body of preachers to be supported by the voluntary contributions of his followers. He established a singular hierarchy, consisting of (1) a patriarch, residing at Pepuza, which was to be the metropolis of the millennial kingdom; (2) cenones, which have not been described; (3) bishops. Orthodox in respect to the cardinal doctrines, his teaching, in substance, was that the Mosaic and Christian dispensations having failed to save the world, a new revelation had been made through him and his two prophetesses. This revelation pertained not to doctrine, but to discipline. The points were—(1) fasting, at first two and afterwards three annual fasts of a week, instead of one such fast; (2) forbidding second marriages; (3) refusing restoration to such as had been guilty of murder, adultery, or idolatry; (4) requiring the veiling of virgins in the assemblies of the Church. The novelty was not in the things themselves, which were already popular, but in *prescribing* them in obedience to what was claimed to be a new express revelation. The system was received at first with some favor at Rome. Irenæus of Gaul was tolerant towards it. But finally it was treated everywhere as a heresy. Its strongholds were in Asia Minor and Northern Africa; Tertullian was its ablest champion. Severe laws against the sect

were enacted (*Cod. Just.*, 1 : 5 : 18–21) as late as 530 and 532 A. D. (The original sources of information in regard to Montanism are, mainly, Eusebius, *Hist.*, v. 3, 14–19; Epiphanius, *Hær.*, 48, 49; and 22 of the 37 *Treatises* of Tertullian.) R. D. HITCHCOCK.

Montanus. See MONTANISTS.

Montanus, Arias. See ARIAS MONTANUS.

Montargis′, town of France, in the department of Loiret, on the Loing, has manufactures of serges, calicoes, and cloth, and extensive trade in wine, wax, honey, saffron, and wool. Pop. 8010.

Montauban′, town of France, cap. of the government of Tarn-et-Garonne, on the Tarn, is an old but well-built town, founded in the twelfth century, and containing a still older cathedral. It has large manufactures of beet-root sugar, extensive dyeworks, breweries, and distilleries, and carries on a considerable trade. It was one of the Protestant strongholds in France, and has a flourishing Protestant theological school with 7 professors. Pop. 27,054.

Montauk′ Point, a high, fertile headland, the extreme eastern point of Long Island, is a part of the township of East Hampton, Suffolk co., N. Y. It was once the seat of the Montauk Indians, of whom a few representatives are still living. It has a stone lighthouse with a flashing white light of the first order, 172 feet above the sea, and also a fog-trumpet; lat. 41° 4′ 13″ N., lon. 71° 51′ 6″ W.

Montbéliard′, an old but well-built town of the department of Doubs, France, has extensive tanneries, manufactures of watches, and an active trade in wood, timber, and cheese. Pop. 6479.

Mont Blanc [Fr., "White Mountain"], the highest mountain in Europe, except Mt. Elburz in the Caucasus, is a part of the Graian Alps, in the department of Haute-Savoie, France. It covers an area of 98 square miles, with the Vale of Chamouni on the W. and that of Ferret on the E. side, and rises into a plateau 11,500 feet high, whence it splits into three peaks, of which the highest, La Bosse du Dromedaire, forms a narrow ridge 15,781 feet high. The snow-line descends to the height of 8000 feet, and from its thirty-six glaciers the waters are carried E. through the Dora Baltea to the Po, and W. through the Arve to the Rhone. It was ascended for the first time in 1786.

Montbrison′, town of France, department of Loire, on the Vizezy, has a seminary and other educational institutions, and cold mineral springs in its vicinity. P. 7201.

Montcalm′, county in the N. of Quebec, Canada, separated at its S. E. extremity from the St. Lawrence by L'Assomption co. It produces much grain, live-stock, and lumber. Cap. St. Julienne. Pop. 12,742.

Montcalm, county of the S. peninsula of Michigan. Area, 720 square miles. It is nearly level, well timbered, and productive. Stock, grain, and wool are leading products. Lumber and brick are largely manufactured, and building-stone is quarried. Bituminous coal has been found. The county is traversed by the Detroit Lansing and Lake Michigan R. R. Cap. Staunton. Pop. 13,629.

Montcalm, tp. of Montcalm co., Mich. Pop. 1006.

Montcalm, de (LOUIS JOSEPH SAINT VERAN), MARQUIS, b. near Nismes, France, in 1712. Descended from a noble family, he received a careful education, and at fourteen years of age entered the army, and was distinguished in Italy, Bohemia, and Germany, attaining the rank of colonel. In 1756 he was appointed to the chief command of the French troops in Canada, and three months after his arrival captured Fort Ontario (Oswego), and a year later Fort William Henry (Lake George); in July, 1758, he occupied Fort Ticonderoga, where he successfully repulsed a quadruple British force under Abercrombie. To protect Quebec, threatened by the forces of Gen. Wolfe, Montcalm assembled the main body of his troops on the Montmorency, where (July 31, 1759) he repulsed Wolfe, who, retiring, secretly reached (Sept. 13) the Heights of Abraham, in rear of the army of Montcalm. With numbers nearly equal, Montcalm gave battle to the British, but, though displaying the utmost personal bravery, his troops gave way, and were entirely routed by a charge which followed. Wolfe fell rejoicing in his victory, while Montcalm, who had received a fatal wound, d. the following day, exulting that he should not live to see the surrender of Quebec. A monument stands in Quebec to the memory of the two heroes.

Mont Cenis′, a remarkable mountain-pass of the Alps, is situated on the boundary between the Italian province of Turin and the French department of Savoie, at the junction of the Graian and Cottian Alps. It forms a plateau 6773 feet high, with a peak 11,451 feet high. In 1803–10, Napoleon I. laid an elegant and comfortable carriage-road over the plateau, connecting France with Italy. In 1867 a railway, on the Fell system, was carried over the pass, running for the most part by the side of the carriage-road. It never paid well, and was discontinued in 1871, with a loss to the shareholders of their entire capital, about £640,000. The famous tunnel was begun in Aug., 1857, completed Dec. 25, 1870, and opened for traffic in Sept., 1871. It is 8 miles long, lacking only 30 yards. Its N. end is 3942 feet above the sea, its S. end 4380, and the middle about 15 feet higher than the S. end. The cost was £3,000,000. Trains run through in about twenty minutes. (See FRÉJUS, COL DE.) REVISED BY R. D. HITCHCOCK.

Montclair, post-v. and tp. of Essex co., N. J., on the Delaware Lackawanna and Western R. R., has 2 hotels. Pop. 2853.

Mont-de-Marsan′, town of France, department of Landes, manufactures blankets, sailcloth, and leather, and carries on an active trade in wine, brandy, oil, wool, and grain. Pop. 8455.

Mont de Piété [Fr. for "mount of piety;" It. *Monte di Pietà*], an institution for the loaning of money at a low interest to the poor, pledges being taken for security. The earliest seems to have been that of Padua, founded in 1491 in opposition to the usurious practice of the Jews. The ancient Lombard houses and modern loan-funds are in principle the same. The *Monti di Pietà* at Rome are among the best managed in the world. The *Mont de Piété* may be regarded as a public system of pawnbrokerage. A similar system has prevailed in China for ages.

Montebel′lo, a v. of Northern Italy, province of Pavia. Here the Austrians were defeated by Napoleon I. June 8, 1800, and by Napoleon III. May 20, 1859.

Montebello, tp. of Hancock co., Ill. Pop. 1111.

Montebellu′na, town of Northern Italy, province of Treviso, 22 miles E. of Bassano. Its strong castle sustained many sieges before 1320, when Montebelluna became a portion of the republic of Venice. Very interesting Etruscan, Roman, and mediæval objects were found here in 1856. Pop. in 1874, 7906.

Montecar′lo, town of Italy, province of Lucca, the chief interest of which consists in the imposing ruins of a great fortress erected here by Cosimo I. P. in 1874, 7870.

Monte Casino. See CASSINO.

Montecastril′li, town of Italy, province of Terni, about 14 miles from the town of Terni. Pop. in 1874, 5078.

Montecati′ni di Val di Ceci′na, small town in the province of Pisa, with important copper-mines in its neighborhood. Pop. in 1874, 5000.

Montecati′ni di Val di Nie′vole, town of Italy, province of Lucca, about 20 miles E. of the city of Lucca. This town, once pestilential, has been made healthy by skilful drainage, and its mineral waters have not only an Italian, but a European, reputation. The accommodations for invalids are excellent, and the waters, which are sent to all parts of the Continent, retain their medicinal virtues remarkably. Pop. in 1874, 6791.

Montec′chio Maggio′re, town of Northern Italy, province of Vicenza, about 8 miles E. of the town of Vicenza. Near this place are seen the picturesque ruins of two ancient castles whose heavy walls were the work of the Scaligeri.

Montecell′i d'Origi′na, town of Italy, province of Piacenza, chiefly noticeable for an ancient fortress, which, unchanged in its exterior, has been converted into a beautiful modern dwelling. Pop. in 1874, 8027.

Montechia′ro sul Chie′se, town of Northern Italy, province of Brescia. It is a walled town with some fine churches, and its markets are much frequented. The old tower of Mirabello is now converted into a belvedere. Pop. in 1874, 7310.

Montecorvi′no Puglia′no, town of Southern Italy, province of Salerno, in a hilly region, about 17 miles from the town of Salerno. Pop. in 1874, 5325.

Montecorvi′no Rovel′la, a town of very ancient origin, in the province of Salerno, 14 miles E. of Salerno. Pop. in 1874, 6630.

Montecuc′coli (RAIMONDO), COUNT, b. near Modena in 1608; entered the Austrian army in 1627; distinguished himself in the Thirty Years' war, and afterwards in the Polish war against the Swedes, and received in 1660 the command of the allied Austrian and French army in Transylvania, with which he defeated the Turks in the great battle of St. Gothard, on the Raab, Aug. 1, 1664. In the war between France and Holland he again commanded the Austrian army, and distinguished himself much in the campaigns between 1672 and 1676. In 1679 the emperor

made him a prince of the empire, and the king of Naples gave him the duchy of Melfi. D. at Lintz Oct. 16, 1681, in consequence of a wound received by the fall of a beam. He left a memoir on the Turkish war, written in Italian, and translated into Latin, German, and French, and several other writings, even sonnets.

Montefal'co, town of Italy, province of Perugia, pleasantly situated about 12 miles N. W. of Spoleto. Pop. in 1874, 5146.

Montefiasco'ne, town of Italy, province of Rome, finely situated on a hill, not far from the southern shore of Lake Bolsena. The town itself contains some buildings of interest, and the neighborhood is famous for the production of an excellent wine known as Montefiascone. Pop. in 1874, 7397.

Montefio're (Sir Moses), Bart., b. in London Oct. 24, 1784, of Jewish parentage; became an opulent merchant in London, and was noted for his efforts to ameliorate the condition of the Jews in different parts of the world. This purpose has led him on more than one occasion to Room-Elee, to the capital of Morocco, and also to Palestine, his latest visit having been in 1874, when ninety years of age. He was sheriff of London in 1837, was knighted Nov. 9 of that year, and made a baronet in 1846. He founded at Ramsgate in 1867 a Jewish college in memory of his deceased wife, Judith, Lady Montefiore.

Montefiori'no, town of Italy, province of Modena, about 15 miles from Parma. Pop. in 1874, 5906.

Montégut' (Émile), b. at Limoges June 24, 1826; studied law at Paris, but devoted himself after 1847, when he became a contributor to *Revue des Deux Mondes*, to literature, and wrote a number of essays on philosophy and literature. He translated Emerson, Macaulay's *History of England*, and Shakspeare.

Monte Gior'gio, town of Italy, province of Piceno, about 11 miles W. of Fermo. It is situated on a hill surrounded by a wall, and the public buildings are very respectable. Pop. in 1874, 5924.

Monte Inferio're, town of South Italy, province of Avellino, with a population in 1874 of 5315.—Monte Superiore, an adjoining town, contains nearly the same number of inhabitants.

Monteleo'ne di Cala'bria, town of Southern Italy, province of Catanzaro, situated on an eminence and containing some fine buildings. This town occupies the site of the ancient *Hipponium* of Magna Græcia, was known under the Romans as *Vibo Valentia*, and took a prominent part in the Neapolitan wars of the Middle Ages. In 1783 it suffered fearfully from an earthquake which destroyed nearly the whole town, including the magnificent castle erected by Roger the Norman. Pop. in 1874, 11,840.

Montele'pre, town of Sicily, province of Palermo, 13 miles from the city of Palermo. This town commands a fine view of the sea and the adjacent country, and the old feudal castle is uncommonly well preserved. In the vicinity of Montelepre are found rare Phœnician and Greek coins, also human skeletons of almost gigantic size. In 1865 a fossilized elephant was discovered here, a portion of which is now in the Museum of Natural History at Palermo. Pop. in 1874, 5706.

Montélimar', town of France, in the department of Drôme, at the confluence of the Roubion and Jabron. It is traversed by canals and surrounded by old walls. Its manufactures of tiles, shoes, flour, and silk are very large, and its vicinity is rich in vines, mulberry trees, and truffles. Pop. 12,044.

Montel'la, town of Italy, province of Avellino, situated on the slope of a hill, at the foot of which flows the Calore. Pop. in 1874, 7650.

Montel'lo, post-v. and tp., cap. of Marquette co., Wis., at the junction of the Fox and Montello rivers, on the line of the ship-canal between the Mississippi River and Lake Michigan, has 2 churches, 2 flouring-mills, 1 large woollen-mill, 1 newspaper, 2 hotels, and stores. It possesses good water-power. Pop. of tp. 834.

B. F. Goodell, Ed. "Express."

Montelu'po Fiorenti'no, town of Italy, province of Florence. The castle of Montelupo was erected in the thirteenth century, and was often besieged during the wars between Florence and Pistoia. Pop. in 1874, 5505.

Montemaggi'ore Belsi'to, town of Sicily, province of Palermo. This was one of the first places occupied by the Saracens when they took possession of the island. Pop. in 1874, 7004.

Montemayor', de (Jorge), b. at Montemor, Portugal, about 1520; served in the army; became chorister in the chapel of the infante of Spain, afterwards King Philip II., whom he accompanied in his progresses through Italy, Germany, and the Netherlands, and wrote much, both in prose and verse, in the Castilian language. His *Diana Enamorada* (1542) was the earliest successful pastoral romance in Spanish, had many imitators, and was translated into Latin, French (six versions), Dutch, and English. D. about 1564, probably in a duel at Turin, Italy.

Montene'gro, a small independent principality of Europe, situated between the Turkish provinces of Bosnia and Albania and the Austrian province of Dalmatia, which separates it from the Adriatic. Area, 1880 square miles. Pop. 120,000. The surface is everywhere mountainous, the highest peaks, Kutsh-Kom in the E., and Mount Dormitor in the N., rising respectively 9300 and 8500 feet. The mountains are covered with dense forests of oak, beech, poplar, and fir, which yield excellent timber; the sumach tree grows here. The inhabitants are a tribe of the Servian race, and belong to the Greek Church. They lead a simple and rough life. Agriculture, fishing, and hunting are their occupations, but all their industry is carried on in a very primitive way. The products fit for exportation, such as wool, hides, tallow, dried and smoked fish and flesh, are carried by the women, or sometimes on mules, down to the Austrian port of Cattaro. The country has no roads and no villages. The inhabitants live in clans, always ready to fight each other when there is nobody else to fight. After the conquest of the Servian kingdom by the Turks in the fourteenth century, the Montenegrins maintained their independence in their mountains, and the attempts of the Turks to conquer them were defeated. They were aided, however, by the Russians, who pay their hospodar an annual pension of 7000 ducats in order that he shall always be ready to attack or harass the Turks whenever the czar wishes to get that people into trouble. The hospodar can raise an army of more than 20,000 excellent soldiers in the course of a few days, and in the wars of Russia he has more than once proved himself worth his pension.

Montepulcia'no [*Monte Policiano*], town of Italy, province of Siena, situated on the summit of a hill about 3200 feet above the sea. The Roman and Etruscan antiquities found in this neighborhood have led some to suppose that it was the *Clusium Novum* of Pliny, but this is disputed. The mediæval existence of Montepulciano was very stormy. A famous wine, produced in the vicinity of Montepulciano, takes its name from this town. Pop. in 1874, 13,160.

Montépin', de (Xavier Aymon), b. at Apremont, in the department of Haute-Saône, Mar. 18, 1824, is noted for his unexampled prolificacy as a writer of fancy. Besides founding a journal, *Le Canard*, contributing to several others, *Le Pamphlet*, *Le Lampion*, etc., and arranging sixteen dramas, generally in five acts and ten tableaux, he wrote, between 1847 and 1857, 169 volumes of romances, which were eagerly devoured by a certain class of readers in Europe and America, and of which one, *Les Filles de Plâtre* (7 vols., 1855), became famous because it was forbidden by the police. His fertility has not abated, but of late his power of striking the secret instincts of the uneducated imagination of his readers has gone.

Monterea'le, an old town of Southern Italy, province of Aquila degli Abruzzi, about 18 miles from the town of Aquila. Pop. in 1874, 5345.

Montereau', town of France, in the department of Seine-et-Marne, at the junction of the Seine and Yonne. It has large manufactures of faïence and earthenware. Pop. 6217.

Monterey', city of Mexico, cap. of the state of Nuevo Leon, on a small river of the same name, 450 miles N. N. W. of Mexico, situated on a fertile table-land enclosed within the northern cordillera of the Sierra Madre, 1626 feet above the sea, is well built, chiefly of stone, has a handsome public square, numerous and commodious public edifices, and a considerable manufacturing industry. The commerce with the U. S. is prosperous and rapidly increasing, especially in machinery. The climate is equable, and the vicinity abounds in gardens and orchards. Founded in 1590, Monterey is the oldest and most important city of Northern Mexico. Pop. about 15,000. The American army under Gen. Taylor, having been reinforced, left Matamoras Aug. 5, 1846, some 6500 strong, and Sept. 9 appeared before Monterey, strongly fortified and held by some 10,000 Mexicans, under Gen. Ampudia. W. of the town, and on a hill, was the bishop's palace, also fortified. Gen. Taylor opened his attack on the 21st; the next morning the bishop's palace was carried by Gen. Worth, and by the close of the 23d the whole city was occupied after a fight from square to square to the centre of the city. The next day Ampudia surrendered the city and garrison.

Monterey, county of California, bounded E. by the main Coast Range and W. by the Pacific Ocean. Area, 4000 square miles. It is mountainous, with beautiful and fertile valleys. Cattle, wool, grain, and tobacco are leading products. Cap. Monterey. Pop. 9876.

Monterey, post-v., cap. of Monterey co., Cal., and formerly capital of California. It is on Monterey Bay, 80 miles by sea from San Francisco, with which it is connected by a line of steamers. Its harbor is safe and capacious. Its light on Point Pinos is in lat. 30° 37′ 52″ N., lon. 121° 55′ W. Monterey is beautifully situated, and is the seat of a Roman Catholic bishop. It is an old Mexican town, with many of its houses built of adobe, and with tiled roofs. Among the interesting localities near are the old fort and the ruined Carmelite mission. The town has declined since the rise of San Francisco. Pop. 1112; of tp. 1923.

Monterey, post-v. of Tippecanoe tp., Pulaski co., Ind. Pop. 210.

Monterey, post-tp. of Berkshire co., Mass., 9 miles E. of Great Barrington, has manufactures of lumber, paper, and charcoal. Pop. 653.

Monterey, post-tp. of Allegan co., Mich. Pop. 1284.

Monterey, a former v. of Westchester co., N. Y., now included in New York City. Pop. 118.

Monterey, tp. of Putnam co., O. Pop. 979.

Monterey, a v. (West Monterey P. O.) of Terry tp., Clarion co., Pa., on the Allegheny Valley R. R., has mines of coal.

Monterey, post-v., cap. of Highland co., Va., 45 miles N. W. of Staunton. Pop. of tp. 1101.

Mon′te Ro′sa, next to Mont Blanc the highest mountain in Europe, is situated on the boundary between the Swiss canton of Valais and the kingdom of Italy, at the junction between the Pennine and Lepontic Alps. It rises in nine peaks, the four central ones of which are more than 14,000 feet high, the highest 15,200 feet. It is rich in metals. Gold, copper, and iron mines are worked. The highest of these mines is situated at an elevation of 10,500 feet, in the region of perpetual snow. The highest peak was ascended for the first time in 1851.

Monteros′so Al′mo, town of Sicily, province of Syracuse, situated on a hill about 4 miles from the sea. Pop. in 1874, 7207.

Monteroton′do, town of Italy, province of Rome, occupying the site of the ancient *Eretum*. It stands on a hill about 17 miles N. W. of Rome, is a walled town with many large and substantial buildings, but is now chiefly known for the engagement which took place here between the volunteers of Garibaldi and the French and pontifical troops in 1867. Pop. in 1874, 3730.

Mon′te San Giovan′ni Campa′na, town of Italy, province of Rome, about 9 miles from Frosinone. It stands on a high hill, and its mediæval walls, towers, and baronial palace are still very imposing. This town was for a time the feudal possession of the house of Aquinas, and the dungeon in which St. Thomas was imprisoned by his father is still shown. Pop. in 1874, 5988.

Mon′te San Giulia′no, town of Sicily, province of Trapani, about 7½ miles from the town of Trapani. It is finely situated on a mountain of the same name nearly 5000 feet above the sea, and is considered the most healthy place in the whole island. This town is of very great but uncertain antiquity, and the old cyclopean walls are still standing. Pop. in 1874, 17,496.

Montesa′no, post-v., cap. of Chehalis co., Wash. Ter., on the S. bank of Chehalis River, 60 miles S. by W. of Olympia.

Montesa′no sul′la Marcella′na, town of Southern Italy, province of Salerno. Pop. in 1874, 5617.

Mon′te San Savi′no, town of Italy, province of Arezzo, about 13 miles S. W. of Arezzo. The municipal palace and the loggie opposite it have great architectural merit. Pop. in 1874, 7975.

Mon′te Sant′ An′gelo, a large town of Southern Italy, province of Foggia. This town is built on a high hill not far from the sea, and contains some good buildings, especially churches. Among its many mediæval remains are an old castle and an immense tower known as Il Gigante. There are also many traces of the Roman period. Pop. in 1874, 17,242.

Montesar′chio, town of Southern Italy, province of Benevento. The inhabitants are industrious and given to commerce. It is a very ancient town, was defended by a strong castle during the Middle Ages, and interesting antiquities are often found here. Pop. in 1874, 6688.

Montescaglio′so, town of Southern Italy, province of Potenza. This town is situated on a hill about 8 miles from Matera, and commanding the Ionian Maremma. The town contains many grand buildings, among them a monastery founded by the house of Anjou, which, with the exception of La Casa and Monte Casino, is the largest in Southern Italy. Pop. in 1874, 7089.

Monte′se, town of Italy, province of Modena, dating from the twelfth century. Pop. in 1874, 5313.

Montesi′nos (Fernando), b. at Ossuna, Spain, about 1600; went in youth to Peru; became a member of the "audiencia" or supreme administrative council at Lima; was twice "visitador" or judge empowered to pronounce upon the entire administration of the colony; became acquainted in the exercise of these functions with the descendants of the ancient royal families of Peru, from whom he derived important information on history and archæology, from which he compiled his *Memorias Historicas del Antiguo Perú*, a work which has supplied much of the currently received materials upon the ancient incas, first published quite recently by Ternaux-Compans (Paris, 1849). This work was written about 1652, and the author is supposed to have died soon afterwards in Peru. He was also author of several treatises upon mining.

Montesperto′li, town of Italy, province of Florence. This town is composed of many small hamlets, and the inhabitants are chiefly occupied in straw manufactures. Pop. in 1874, 9135.

Montesquieu′, de (Charles de Secondat), Baron, b. at the château of Brêde, near Bordeaux, Jan. 18, 1689; studied jurisprudence; was appointed councillor in the Parliament of Bordeaux in 1714, and president in 1716, but occupied himself more with philosophical studies and literary pursuits than with parliamentary business, and published in 1721 his *Lettres Persanes*, which made a great sensation, ran through twenty-two editions in the first eighteen months, and were translated into most other European languages. In 1726 he resigned his office in the Parliament, and travelled through Italy, Austria, Germany, and England, where he resided for two years. On his return he settled at Brêde, and only occasionally visited Paris. In 1734 appeared his *Considérations sur les Causes de la Grandeur et de la Décadence des Romains*, which made much less sensation, but a much deeper impression, than *Lettres Persanes*, and which may be considered as the first attempt at a philosophical conception of history. At last, in 1748, after twenty years' preparation, his *Esprit des Lois* followed, and almost immediately it put all the social and political ideas of the age in thorough fermentation, and became the basis of modern political science. His minor works, *Dialogues de Sylla et de Lysimaque* (1748), *Essai sur le Goût*, etc., are of less interest. Collected editions are very frequent. D. at Paris Feb. 10, 1755.

Monteval′lo, post-v. of Shelby co., Ala., on the Selma Rome and Dalton R. R., 55 miles N. of Selma. It has mines of coal. Pop. of tp. 1276.

Montevallo, post-tp. of Vernon co., Mo. Pop. 1349.

Montevar′chi, town of Italy, province of Arezzo, situated at the foot of a hill on which stands the ancient castle of Montevarchi, famous in the mediæval wars of Florence. Pop. in 1874, 9694.

Montever′de (Gen. Juan Domingo), b. in Spain about 1772; served in the Spanish navy; became captain in 1811, when he was sent by the junta of Cadiz to suppress the revolt in Venezuela; landed at Coro; rapidly took several large towns, and compelled Gen. Miranda to capitulate July 25, 1812, after which he sent that celebrated patriot to Spain as a prisoner, in violation of the terms of the agreement; treated the principal native chieftains and their families with similar perfidy. His severities were a principal cause of the second insurrection, headed by Bolivar, by whom Monteverde was defeated and driven from Venezuela. D. in Spain in 1823.

Montevid′eo, capital of the republic of Uruguay, is on the northern shore of the mouth of the Rio de la Plata, where it enters the Atlantic. The *cerro* or mount from which the city derives its name is the distinguishing mark of the port. It rises on the western side of the bay to a height of 463 feet. Cerro lighthouse is situated in lat. 34° 53′ 15″ S. and lon. 56° 14′ 36″ W. The number of inhabitants is variously estimated at from 80,000 to 130,000; probably 110,000. The position of the city is so favorable that, free of civil wars, its importance would soon equal that of Rio de Janeiro. In recent times the city has improved in every respect; it is supplied with water, gas, and a system of sewers. The streets are regularly laid out and very well paved. They run down in all directions from a rather steep hill, on which the city is situated, towards the sea, which surrounds the city on three sides, and here in the lower parts, adjoining the quays, stand the custom-house and the warehouses. The principal build-

ing is the cathedral. It has a beautiful front façade, with a great portal composed of three round arches and flanked by two towers crowned with cupolas. The Plaza de la Constitucion, the gathering-place of the elegant world, extends in front of the cathedral, and is planted with fine trees. There are three more Roman Catholic churches—San Francisco, La Caridad, and Los Ejercicios; a Protestant church, built in 1846 and connected with the British consulate; and a Methodist mission chapel. The most noteworthy among the other public buildings are the opera-house, several theatres, and the hospital, the best in South America. The hotel accommodations are superior to those of any port of Brazil. The shops are well provided with all kinds of necessaries and luxuries. There are a small public library, several schools, and a college. The population, of which the Italians form the predominant part, is distinguished for politeness and kindness, and makes a very agreeable impression on visitors. The commerce is considerable: 1818 vessels, of 907,328 tons, entered the harbor in 1873, of which 448, of 411,984 tons, were English; 223, of 190,239 tons, French; 267, of 110,533 tons, Italian; 229, of 51,763 tons, Spanish; 90, of 39,219 tons, Brazilian; 89, of 35,052 tons, German; 60, of 18,664 tons, American; 295, of 11,647 tons, from the Argentine Republic; 47, of 13,254 tons, Dutch; 26, of 10,892 tons, Swedish; and 44, of 14,081 tons, belonging to other nations. 1839 vessels, of 924,070 tons, cleared the harbor the same year—namely, 449 English, of 410,013 tons; 327 French, of 190,294 tons; 290 Italian, of 118,442 tons; 225 Spanish, of 51,378 tons; 98 Brazilian, of 44,651 tons; 95 German, of 35,967 tons; 52 American, of 27,140 tons; 295 from the Argentine Republic, of 10,647 tons; 43 Dutch, of 12,358 tons; 22 Swedish, of 9595 tons; and 43, of 13,585 tons, belonging to other nations. The principal articles of exports are wool, skins, dried fish, tallow, oil, bones, meat-extract, and living animals (to Brazil); of imports, dry goods, jewelry, wine, spirits, flour, tobacco, furniture, etc. The city is connected by railways with Florida and Duragno. A second line, connecting it with the port of Salto on the Uruguay, and this port with Brazil, is under consideration; and a third line, running E., and connecting Montevideo with the Brazilian frontier, was commenced in 1874. By telegraph Montevideo communicates with the U. S. and Europe; a submarine line leads to Buenos Ayres and Rio Grande do Sul; two overland lines to Brazil. The city was founded by families from the Canary Islands, which settled here in 1717. It had 15,000 inhabitants in 1800; 37,000 in 1860; 80,000 in 1870. Epidemics and civil wars are the enemies of the prosperity of the city.

August Niemann.

Montevideo, post-v., cap. of Chippewa co., Minn., on the N. E. bank of Minnesota River, at the mouth of the Chippewa.

Mon'tez (Maria Dolores **Porris**), countess of Landsfeld, known as Lola Montez, b. at Limerick, Ireland, in 1824; was married at an early age to a Capt. James at Dublin, from whom she soon separated; appeared as a *danseuse* at Paris 1840; proceeded soon afterwards to Munich, where she became mistress of King Louis and received the title of countess of Landsfeld (1846). She took an active part in politics, but was compelled to leave the country by the popular outbreaks of 1848; came to the U. S. in 1851; appeared for some years as an actress and lecturer, and published her *Autobiography*, besides various other writings. D. at New York Jan. 17, 1861.

Montezu'ma, tp. of Solano co., Cal. Pop. 347.

Montezuma, post-v. of Macon co., Ga., on the South-western R. R., has 1 church, 2 banking-houses, 1 hotel, 1 weekly newspaper, and stores. It is the market for a large cotton-raising section. Principal occupation, farming. Pop. about 400. R. G. Ozier, Ed. "Montezuma Weekly."

Montezuma, post-v. and tp. of Pike co., Ill., on the W. bank of the Illinois River, 101 miles by steamer from St. Louis. Pop. of tp. 1498.

Montezuma, post-v. of Reserve tp., Parke co., Ind., on the Wabash River and Canal and the Evansville Terre Haute and Chicago R. R. Pop. 624.

Montezuma, post-v., cap. of Poweshiek co., Ia., on the Grinnell and Montezuma R. R., has an excellent graded school, 3 churches, 1 bank, 1 newspaper, 2 hotels, 3 manufactories. It is in the vicinity of extensive coal-deposits, and is the seat of a fine agricultural section. Principal occupation, farming, dairying, and stock-raising. Pop. 555. J. W. Cheshire, Ed. "Montezuma Republican."

Montezuma, post-v. of Cayuga co., N. Y., on Seneca River, and the Erie, Seneca, and Cayuga canals, has 3 churches and manufactures of salt (from springs) and of other goods. Pop. 473; of tp. 1292.

Montezuma, or **Moctezuma** [Mex. *Motecuhzoma*, "the sad or severe one"], the name of two Aztec rulers, who were dignified by the Spaniards and succeeding historians with the title of emperors of Mexico.—Montezuma I. Ilhuicomina, b. about 1390, was a valiant general; succeeded to the throne about 1436; fought successfully against the Mixtecas and the Tlaxcalans; extended his dominions to the Gulf of Mexico, and d. in 1464.—Montezuma II. Xocoyotzin, b. about 1480, succeeded his uncle, Ahuizotl, 1502; had been distinguished both as a soldier and as a priest; ruled with great splendor and military success until 1519, when Hernando Cortes arrived in Mexico with his small band of adventurers, by whom the monarch was imprisoned in his own capital, gave his allegiance to the king of Spain, and was killed by his own subjects during a tumult, June 30, 1520. His descendants were ennobled in Spain.

Montfaucon', de (Bernard), b. at Soulaye, in Languedoc, Jan. 13, 1655; served for some years in the army, but entered in 1675 the Benedictine congregation of Saint-Maur, devoting himself exclusively to studies; travelled in Italy, and settled in 1701 in Paris, where he d. Dec. 21, 1741. The first fruits of his extensive learning were new critical editions of several of the Greek Fathers, but he distinguished himself also as an original author; and of his many works the *Palæographia Græca* (1708) and *L'Antiquité expliquée et representée en figures* (French and Latin, 15 vols., 1719–24) are still valuable.

Mont'fort, de (Simon), Count, subsequently count of Toulouse, b. about 1150; took part in the fourth crusade; was appointed leader by the pope of the crusade against the Albigenses in 1208, and became famous for the unheard-of cruelty with which he suppressed this movement. In 1213 he took Toulouse from Count Raymond, but was afterwards driven from the city, and when he returned to besiege it he was killed by a stone thrown from the wall, June 25, 1218.

Montfort, de (Simon). See Leicester, Earl of.

Montgolfier. See Aëronautics.

Montgom'ery, county of S. E. Central Alabama, bounded N. by the Alabama and Tallapoosa rivers. Area, 725 square miles. It is uneven and fertile. Live-stock, grain, and cotton are leading products. The county is traversed by various railroads centring at Montgomery, the capital. Pop. 43,704.

Montgomery, county of W. Arkansas. Area, 1050 square miles. It is mountainous, and abounds in hard timber and in mineral wealth. Iron, lead, fine marble, and medicinal springs are abundant. The county contains some fertile land. Indian corn and tobacco are the leading products. Cap. Mt. Ida. Pop. 2984.

Montgomery, county of E. Central Georgia, is bounded S. by the Altamaha and S. W. by the Ocmulgee, and is traversed by the Oconee River. Area, 750 square miles. It is level and sandy, and is covered with pine forests. Cattle and wool are leading products. Cap. Mt. Vernon. Pop. 3586.

Montgomery, county of S. Central Illinois. Area, 705 square miles. It is mostly rolling prairie, is very fertile, and has beds of coal. It is traversed by the Toledo Wabash and Western and the Indianapolis and St. Louis R. Rs. Cattle, grain, and wool are leading products. Flour, saddlery, etc. are manufactured. Cap. Hillsboro'. Pop. 25,314.

Montgomery, county of W. Indiana. Area, 500 square miles. It is hilly in the W., level in the E., and is very fertile and well timbered. Cattle, grain, and wool are staple products. Lumber, flour, and carriages are leading articles of manufacture. The county is traversed by Sugar Creek, and by the Indianapolis Bloomington and Western, the Louisville New Albany and Chicago, and the Logansport Crawfordsville and South-western R. Rs. Cap. Crawfordsville. Pop. 23,765.

Montgomery, county of S. W. Iowa. Area, 432 square miles. It is undulating and fertile. Grain is the leading product. It is traversed by the Burlington and Missouri River R. R. Cap. Red Oak. Pop. 5934.

Montgomery, county of S. E. Kansas, bounded S. by the Indian Territory. Area, 624 square miles. It is undulating, with very fertile valleys, and is adapted to grain-culture and stock-raising. Coal, building-stone, timber, and water-power abound. The county is traversed by the Leavenworth Lawrence and Galveston R. R. Cap. Independence. Pop. 7564.

Montgomery, county of N. E. Kentucky. Area, 395 square miles. It is a finely diversified, fertile limestone region. Live-stock and corn are leading products. It is traversed by the Lexington and Big Sandy R. R. Cap. Mt. Sterling. Pop. 7557.

Montgomery, county of Maryland, bounded S. W. by the river Potomac and S. E. partly by the District of Columbia. Area, 508 square miles. It is hilly and in great part fertile. Chrome ores and gold are mined to a small extent. A great variety of good building-stones are found. Water-power is abundant. Tobacco, live-stock, and grain are leading products. The county is traversed by the Baltimore and Ohio R. R. Cap. Rockville. Pop. 20,563.

Montgomery, county of N. Central Mississippi. Area, 330 square miles. It is nearly level and very fertile, and is traversed by the Mississippi Central R. R. and Big Black River. It is in a fine corn and cotton region. Cap. Winona. It has been formed since the U. S. census of 1870.

Montgomery, county of E. Missouri, bounded S. by the Missouri River. Area, 500 square miles. The S. is hilly, the N. part level. Coal, timber, and building-stone abound. The soil is fertile. Live-stock, wool, grain, and tobacco are leading products. The county is traversed by the North Missouri R. R. Cap. Danville. Pop. 10,405.

Montgomery, county of E. Central New York. Area, 450 square miles. It is uneven and highly fertile. Live-stock, wool, hay, fruit, broom-corn, tobacco, butter, and cheese are extensively produced. Building-stone is quarried. Carriages, flour, lumber, brooms, brushes, harnesses, knit goods, etc. are manufactured. The county is traversed by the Mohawk River, the Erie Canal, and the New York Central R. R. Cap. Fonda. Pop. 34,457.

Montgomery, county of S. Central North Carolina. Area, 455 square miles. It is bounded W. by the Yadkin River. It is somewhat uneven and has a good soil. Gold and iron are found, with other valuable minerals. Live-stock, corn, and wool are leading products. Cap. Troy. Pop. 7487.

Montgomery, county of S. W. Ohio. Area, 450 square miles. It is somewhat uneven and very fertile. Tobacco, grain, live-stock, and wool are leading products. Building-stone is extensively quarried. The manufactures include brick, castings, malt liquors, machinery, harnesses, metallic wares, carriages, flour, cooperage, lumber, cigars, agricultural tools, etc. The county is traversed by numerous railroads. Cap. Dayton. Pop. 64,006.

Montgomery, county of S. E. Pennsylvania. Area, 460 square miles. It is bounded on the S. W. partly by the Schuylkill River. It is somewhat uneven, and remarkably fertile and well cultivated. Live-stock, fruit, grain, hay, milk, butter, cheese, etc. are largely produced. The manufactures are extensive, and include wooden and metallic wares, flour, saddlery, brick, woollen goods, farming implements, furniture, iron, leather, lime, etc. The county is traversed by the North Pennsylvania, the Reading, and other railroads. Cap. Norristown. Pop. 81,612.

Montgomery, county of Tennessee, bounded N. by Kentucky. Area, 555 square miles. It is undulating and fertile. Tobacco, grain, and live-stock are leading products. Lumber and flour are the chief articles of manufacture. The county is traversed by the Cumberland River and the Memphis Clarksville and Louisville R. R. Cap. Clarksville. Pop. 24,747.

Montgomery, county of S. E. Texas. Area, 852 square miles. It is drained by affluents of the San Jacinto. It consists chiefly of pine and cypress forests, from which lumber is largely exported. The soil is good. Live-stock, and especially corn and cotton, are extensively produced. The county is traversed by the International and Great Northern R. R. Cap. Montgomery. Pop. 6483.

Montgomery, county of S. W. Virginia. Area, 350 square miles. It is bounded W. by New and Little rivers. It is mountainous, and contains coal and other mineral wealth. The valleys are very fertile and beautiful. Tobacco and grain are leading products. The county is traversed by the Atlantic Mississippi and Ohio R. R. Cap. Christiansburg. Pop. 12,556.

Montgomery, post-v., cap. of Montgomery co., and also of the State of Alabama, has 12 churches, 2 banks (national) and 3 private banking-houses, 4 daily newspapers, many schools and academies, an orphan home, 1 large flouring-mill, several large machine-shops and foundries, a handsome Masonic temple, ample waterworks, railroad connections with all points South and West, and is situated within 60 miles of extensive deposits of coal and iron. The neighboring soil is very rich and productive, cotton being the staple product. The Capitol buildings are situated on high ground overlooking the entire city and surrounding country. Pop. 10,588. W. W. Screws, Ed. and Prop.
"Montgomery Daily" and "Advertiser and Mail."

Montgomery, tp. of Monroe co., Ark. Pop. 1123.

Montgomery, tp. of Crawford co., Ill. Pop. 1792.

Montgomery, tp. of Woodford co., Ill. Pop. 652.

Montgomery, a v. of Barr tp., Daviess co., Ind. Pop. 135.

Montgomery, tp. of Gibson co., Ind. It includes Owensville, etc. Pop. 3121.

Montgomery, tp. of Jennings co., Ind. Pop. 1326.

Montgomery, tp. of Owen co., Ind. Pop. 808.

Montgomery, post-v. of Grant parish, La., on the E. bank of Red River. Pop. 160.

Montgomery, post-tp. of Hampden co., Mass., on the Boston and Albany R. R. Pop. 318.

Montgomery, post-tp. of Le Sueur co., Minn. Pop. 609.

Montgomery, tp. of Hickory co., Mo. Pop. 1575.

Montgomery, tp. of Somerset co., N. J. Pop. 2066.

Montgomery, post-v. and tp. of Orange co., N. Y., 12 miles W. of Newburg-on-Hudson, on the Montgomery and Erie and the Wallkill Valley R. Rs., in a fine agricultural and dairy region, has 4 churches, 1 newspaper, 1 large paper-mill, and hotels. Pop. of v. 960; of tp. 4536.
Lester Winfield, Ed. "Republican and Standard."

Montgomery, tp. of Ashland co., O. Pop. 4029. It includes the town of Ashland.

Montgomery, tp. of Franklin co., O. Pop. 2470.

Montgomery, tp. of Marion co., O. Pop. 1451.

Montgomery, tp. of Wood co., O. Pop. 1636.

Montgomery, tp. of Franklin co., Pa. Pop. 3611.

Montgomery, tp. of Indiana co., Pa. Pop. 932.

Montgomery, tp. of Montgomery co., Pa. Pop. 922.

Montgomery, a v. of Morgan co., Tenn., 2 miles W. of Wartburg, the county-seat. Pop. 30.

Montgomery, post-v., cap. of Montgomery co., Tex., 12 miles W. S. W. of Willis, on the International and Great Western R. R., in a good farming district.

Montgomery, post-tp. of Franklin co., Vt., 5 miles S. E. of E. Berkshire R. R. Station, has 6 churches and manufactures of leather, sash and doors, etc. Pop. 1423.

Montgomery (George Washington), b. in Valencia, Spain, in 1804, was the son of an American merchant of Alicante; was long in the U. S. service, consul at Porto Rico and at Tampico, etc. Author of a novel, *Bernardo del Carpio* (*El Bastardo del Castilla*), in Spanish and English; Spanish translations of some of Irving's works; Spanish tales, and a *Narrative of Travels in Central America* (1839), in English. He enjoyed a high reputation as a writer in Spanish. D. at Washington, D. C., June 5, 1841.

Montgomery (James), b. at Irvine, Ayrshire, Scotland, Nov. 4, 1771, and was the son of a Moravian preacher; was educated at the Fulneck School, Yorkshire, and apprenticed to a grocer, but ran away in 1789, and in 1792 became clerk to Joseph Gales, a famous journalist of Sheffield, who soon after was compelled to escape to the U. S., having been accused of treason. Montgomery then founded *The Sheffield Iris*, which he edited thirty-one years, 1794–1825. He began in early youth to write poetry, in which he won great popularity, notwithstanding the opposition of the critics. In 1835 he received a pension, and declined the professorship of rhetoric at Edinburgh. D. at Sheffield Apr. 30, 1854. His principal works are *Prison Amusements* (1797), written during an imprisonment for seditious libel; *The West Indies* (1809), an anti-slavery poem; *The World before the Flood* (1812), *Greenland* (1810), *Pelican Island* (1827), *Prose by a Poet, Lectures on Poetry and English Literature* (1830–31), *Original Hymns* (1853). Mr. Montgomery is best known as a hymn-writer and a devotional poet.

Montgomery (Admiral John B.), b. at Allentown, N. J., about 1796; entered the navy as midshipman 1812; was a midshipman on board the flagship Niagara at Perry's victory on Lake Erie, Sept. 10, 1813, receiving a sword and the thanks of Congress; was with Decatur in the naval campaign against Algiers 1815; commanded the sloop-of-war Portsmouth on the Pacific coast 1845–48, during which cruise he took possession of Lower California, occupied Guaymas, and blockaded Mazatlan for some months; was commissioned captain 1853; was in command of the Pacific squadron 1860–61; made commodore July 16, 1862, and rear-admiral July 25, 1866; commanded the naval station at Sackett's Harbor 1867–69, when he was placed on the retired list. D. at Carlisle, Pa., Mar. 25, 1873.

Montgomery (Richard), b. near Raphoe, Ireland, Dec. 2, 1736; educated at Dublin University; entered the British army in 1754, and served with distinction in North America and the West Indies. Retiring from the army in 1772, he came to America; settled at Rhinebeck, N. Y., and married a daughter of R. R. Livingston; was a member of the first provincial congress in 1775, and the same

year was appointed a brigadier-general in the Continental army. In the expedition for the invasion of Canada, Montgomery was second in command to Schuyler, until, owing to the illness of the latter, he succeeded to the chief command, capturing Fort Chambly, St. John's, and Montreal in rapid succession. After toilsome marches the forces of Montgomery and Arnold united near Quebec Dec. 4, 1775. On the 9th, Montgomery was made a major-general. Advancing upon Quebec, the demand for a surrender of the city was refused, and with their limited numbers and inadequate artillery a *coup de main* seemed to be the only hope of obtaining Quebec. This being decided upon, a favorable moment occurred on the morning of Dec. 31, 1775. During a blinding snowstorm Montgomery with his little band started at 2 A. M., and had without opposition passed the first barrier when a discharge (the only one made) from the enemy's battery instantly killed the brave Montgomery and others, and the disheartened troops fell back in confusion. A monument erected by Congress was placed in front of St. Paul's church, New York, beneath which his remains now rest.

Montgomery (ROBERT), M. A., b. at Bath, England, in 1807, was the son of one Gomery, a low comedian; graduated at Lincoln College, Oxford, in 1833; entered the Anglican ministry in 1835; held various rectorships, mostly in London and Glasgow. D. at Brighton Dec. 3, 1855. He was a voluminous writer of prose and verse, and notwithstanding the severe criticisms and ceaseless ridicule of some of the best critics of his day, his poems attained and maintained a wide popularity. His best-known poems are *Omnipresence of the Deity* (1828) and *Satan* (1829).

Montgomery (Sir ROBERT), K. C. B., LL.D., b. in Londonderry, Ireland, in 1809; educated in that city; entered the civil service of the East India Company 1828; rose to the commissionership of the Punjaub 1849; disarmed the native forces at Lahore May, 1857; became chief commissioner of Oude 1858; restored that province to tranquillity, for which he was knighted and received the thanks of both Houses of Parliament; was lieutenant-governor of the Punjaub 1859–65, and became a member of the council of India 1868.

Montgomery (Gen. WILLIAM READING), b. in Monmouth co., N. J., July 10, 1801; graduated at West Point 1825; served in the infantry, chiefly on the Western frontier, until 1838, when he was sent as captain to the Canada border; was engaged in the Florida war 1840–42; accompanied Gen. Taylor in the Rio Grande campaign 1846, and Gen. Scott in the campaign of the Valley of Mexico; was brevetted major for gallant conduct at Palo Alto and Resaca de la Palma, and lieutenant-colonel for gallantry at Molino del Rey, where, after the death of his two senior officers, he led his regiment to the assault of the enemy's works, and was severely wounded; served in Texas and on the Plains until 1855, when he resigned; raised and commanded the 1st New Jersey Vols. 1861; rendered good service at Bull Run, for which he was commissioned brigadier-general; was successively military governor of Alexandria, Annapolis, and Philadelphia; resigned on account of failing health Apr., 1864, and d. at Bristol, Pa., May 31, 1871.

Montgomery City, post-v. of Montgomery co., Mo., 82 miles W. of St. Louis, on the St. Louis Kansas City and Northern R. R., has 1 college, 1 parish school, 4 churches, 1 savings bank, a public library, 1 newspaper, a mill and manufactory, and stores. Principal employment, farming and dairying. Pop. about 1500.

WM. S. BRYAN, ED. "MONTGOMERY STANDARD."

Montgom'eryshire, county of North Wales, England, comprising an area of 755 square miles, with a population of 67,789. The surface is mountainous, and the soil (with exception of the valleys of the Severn, Wye, and Dee) not fertile. On the mountain-pastures many sheep are reared, and the county is the chief seat of the Welsh flannel manufacture. Chief town, Montgomery.

Montgomery Station, post-v. of Clinton tp., Lycoming co., Pa., on the W. bank of the Susquehanna (W. branch) and on the Philadelphia and Erie R. R., 16 miles by rail S. E. of Williamsport.

Month [Sax. *mona*, "month"], a period of time corresponding in length to one revolution of the moon around the earth, employed almost universally in the infancy of civilization to measure intervals in chronology. The length of a mean lunation from new moon to new moon again is 29 days 12 hours 44 minutes 2.84 seconds, exceeding thus 29½ days by about three-quarters of an hour. It was early ascertained that this period corresponded very nearly to 29½ days, but as for chronological purposes fractions of days cannot well be counted, the months were made alternately 29 and 30 days, the slight outstanding error being unknown or disregarded. Twelve lunar months of 29½ days amount to only 354 days, or fall short of the length of a year by about 11¼ days. By the employment of a year of twelve lunar months, without any allowance for the discrepancy between this and the solar year, the places of the successive months in the seasons go backward, so as in about thirty-two or thirty-three years to occupy every possible position in the natural year. To avoid the inconvenience arising from this cause, the Egyptians made all their months 30 days each, and added five uncalendered days at the end to complete the deficiency. The Jews, who employed alternate months of 30 and 29 days, added a month of 30 days, called an embolismic month, every three years. The ancient Greeks used a similar month, without such allowance. The Roman months, before the reformation of the calendar by Julius Cæsar, were somewhat irregular, four of them being of 31 days, seven of 29 days, and one of 28 days. The Arabic and Turkish months were alternately 30 and 29 days, eleven uncalendered days being added at the end of the year. The Church, both Eastern and Western, has always continued to employ the lunar year of 30 and 29 days alternately, and in this respect has been followed by the Protestant Episcopal Church of England and of the U. S., embolismic months being added as often as the error thus introduced exceeds 30 days. The French, under the First Republic, divided the year into 12 months of 30 days each, with five uncalendered days at the end, called complementary days and also *sans culottides*, which were made holidays. In the reformation of the calendar by Julius Cæsar, which took place about 46 years before the Christian era, the year, which began on the first of March, was divided into 12 months of 30 and 31 days each, with the exception of February, which had but 29. The entire year thus consisted of 365 days, to which every five years an intercalary day was added immediately after the 23d day of February, so that the 24th, which in the Roman calendar was called the sixth calends of March, was twice counted, and hence the year received the name of bissextile. In this year the month of July was called Quintilis, the fifth, but the Roman senate gave it the name of Julius, which it continues to bear. In imitation of this action the senate under Augustus gave to the month Sextilis the name of the emperor, which name is also still preserved. The Roman months to the end of the year bear the same names which they bore in the Roman calendar, but by the change of the beginning of the year from the first of March to the first of January the numbers have ceased to indicate their place in the series. In our calendar the months of January, March, May, July, August, October, and December have each 31 days, the months of April, June, September, and November have 30, and the month of February 28 days in a common year and 29 in leap-year. As for business purposes it is necessary that a calendar should be definitely fixed, this distribution of days has received the sanction of law. It is greatly to be desired that there should be a reform which should make the division of the year more systematic. The most suitable distribution would seem to be to give to all the odd months 30 days, and all the even months 31, except the last, which in a common year would have 30, and in leap-year 31. (For further information on this subject see CALENDAR, and also EASTER and EPACT.)

F. A. P. BARNARD.

Montholon', de (CHARLES TRISTAN), COUNT, b. at Paris July 21, 1783; entered the army in 1798; distinguished himself in the battle of Wagram 1809; was attached to the personal staff of Napoleon; acted as his aide-de-camp during the Hundred Days; followed him to St. Helena, and was appointed one of his executors. After 1830 he re-entered the French army; took part in the attempt of Prince Louis Napoleon at Boulogne; was imprisoned together with him at Ham, but afterwards pardoned; became a member of the Legislative Assembly after 1848, and d. Aug. 21, 1853. In connection with Gen. Gourgaud he published *Mémoires pour servir à l'Histoire de France sous Napoléon, écrits à Ste. Hélène sous sa dictée* (8 vols., Paris, 1823); and in 1847 *Récits de la Captivité de l'Empereur Napoléon à Ste. Hélène.*

Mon'ti (VINCENZO), b. at Fusignano, Italy, Feb. 19, 1754; studied literature with the poet Onofrio Minzoni in Ferrara, and imitated Varano and Dante; at Rome obtained the position of secretary to Duke Luigi Braschi, himself secretary of Pope Pius VI. Inspired by the tragedies of Alfieri, Monti became a tragic poet, and wrote *Galeotto*, *Manfredi*, *Aristodemo*, and *Caio Gracco*. Basseville, the representative of the French republic, having been assassinated at Rome, Monti, to please the papal court, wrote a poem entitled *La Bassvilliana*, which gave him great celebrity. This poem was followed by two others, *La Musogonia* and *La Feroniade*. On the triumph of Bonaparte, Monti sought the protection of the rising

genius, and obtained at Milan the post of secretary of the executive directory. From thence he was sent to Bologna as commissioner of the Cisalpine republic. After the battle of Marengo, Monti published three poems on the death of the mathematician Lorenzo Mascheroni. He was appointed professor in the Brera at Milan and of Italian rhetoric in the University of Pisa. In 1805, Napoleon named him historian of the kingdom of Italy. Then followed certain adulatory but unsuccessful poems—*Il Bardo della selva nera*, *La Spada di Federico*, afterwards an indifferent translation of Persius, and an elegant translation of the *Iliad* of Homer. Napoleon having fallen in 1815, Monti was ready to compose a poem in honor of the emperor of Austria, Francis I. In the last years of his life he prepared a voluminous *Proposta di alcune correzioni ed aggiunte da farsi al vocabolario della Crusca*. D. Oct. 13, 1828.

Monticel'lo, tp. of Pike co., Ala. Pop. 569.

Monticello, post-v., cap. of Drew co., Ark., about 40 miles from the Mississippi River, has an academy and female seminary, a fine court-house and jail. Pop. about 1500. COTHAM & RAMSEY, EDS. AND PUBS. "MONTICELLONIAN."

Monticello, post-v., cap. of Jefferson co., Fla., 30 miles E. of Tallahassee, has 2 public schools, 7 churches, 2 hotels, 2 weekly newspapers. Principal business, cotton-planting. Pop. 1052. A. B. GREENWELL, "ADVERTISER."

Monticello, post-v., cap. of Jasper co., Ga., 18 miles W. of Eatonton.

Monticello, post-v. and tp., cap. of Piatt co., Ill., 60 miles N. E. of Springfield, at the junction of the Indianapolis Bloomington and Western and the Chicago and Paducah R. Rs., has 3 newspapers, 1 bank, 1 steam flouring-mill, a steam-elevator, and stores. Pop. of v. 871; of tp. 1840. J. M. HOLMES, PUB. "PIATT REPUBLICAN."

Monticello, post-v. of Union tp., cap. of White co., Ind., 21 miles W. of Logansport, on the Pittsburg Cincinnati and St. Louis R. R., has 2 savings fund and building associations, 1 furniture and 2 woollen manufactories, 1 bank, 1 paper-mill, 2 weekly newspapers, and stores. Pop. 887. W. J. HUFF, ED. "MONTICELLO HERALD."

Monticello, post-v. and tp. of Jones co., Ia., on the Dubuque and South-western R. R., at its intersection with the Davenport and St. Paul R. R., has 3 hotels, 2 weekly newspapers, and is the centre of a large trade. Pop. of v. 1337; of tp. 2241.

Monticello, post-v. and tp. of Johnson co., Kan. Pop. 1093.

Monticello, post-v., cap. of Wayne co., Ky., 23 miles S. W. of Somerset, has a national bank and manufactures.

Monticello, post-tp. of Aroostook co., Me., 12 miles N. of Houlton. Pop. 760.

Monticello, post-v. of Wright co., Minn., 50 miles above St. Paul, has 3 churches, a saw-mill, a grist-mill, 2 hotels, 1 weekly newspaper, and stores. Pop. 903. T. A. PERRINE, ED. "WRIGHT CO. TIMES."

Monticello, post-v., cap. of Lawrence co., Miss., on the right bank of Pearl River. Pop. 200.

Monticello, post-v., cap. of Lewis co., Mo., 12 miles from Canton. Pop. 301.

Monticello, post-v. of Thompson tp., cap. of Sullivan co., N. Y., the terminus of the Monticello and Port Jervis branch of the Erie R. R., has 4 churches, an academy, 7 hotels, 2 printing-offices, a foundry, a court-house, and 2 weekly newspapers. Pop. 912.

Monticello, post-v. of Valley tp., Armstrong co., Pa., on the Allegheny Valley R. R. Large quantities of coal are mined and used in smelting iron at this point.

Monticello, in Albemarle co., Va., 3 miles W. of Charlottesville, once the home of Pres. Thomas Jefferson, author of the Declaration of Independence. The mansion, now much dilapidated, stands upon an eminence. Near by, in a family cemetery, lie the remains of the President, over which rises a granite obelisk eight feet high.

Monticello, post-v., cap. of Cowlitz co., Wash. Ter., on the N. bank of the Columbia River, at the mouth of the Cowlitz, and on the Northern Pacific R. R.

Monticello, tp. of La Fayette co., Wis. Pop. 480.

Monti'lla, town of Spain, province of Cordova, the birthplace of Gonzalo de Cordova, and situated on an elevated and very fertile plain, which produces a celebrated wine. Pop. 12,100.

Montluçon', town of France, department of Allier, on the Cher, with large manufactures of glass, mirrors, and chemicals. In its vicinity is Neris, whose mineral springs are much used for bathing in certain diseases; they were known to the Romans, and much used by them. Pop. 18,675.

Montma'gny, county of Quebec, Canada, extending from the St. Lawrence to the boundary of Maine. It is traversed by the Grand Trunk Railway. Cap. St. Thomas or Montmagny. Pop. 13,555.

Montmoren'cy, a small river in Canada, rises in Snow Lake, Montmorency co., and flows S. into the St. Lawrence, 8 miles below Quebec. Near its mouth it falls nearly perpendicularly 250 feet, with a width of 50 feet, forming a beautiful and celebrated cataract, which is one of the chief attractions to tourists in the province of Quebec. A cone of ice is formed every winter below the falls, and sometimes attains a height of 200 feet.

Montmorency, county of Quebec, Canada, extends N. from the St. Lawrence, and includes the Isle of Orleans. The soil is fertile, but the surface is rugged and quite heavily timbered. Pop. 12,085.

Montmorency, county of N. E. Michigan. Area, 576 square miles. It is covered with forests and has beds of valuable iron ore.

Montmorency, tp. of Whitesides co., Ill. Pop. 668.

Montmorency, the surname of an ancient and illustrious French family, traced back as far as 950 to Bouchard, Sire de Montmorency, a great French feudatory, nephew of Edred, king of England. The Montmorencies were long known as the premier barons of France, and among those of this name were six grand constables, twelve marshals, four admirals, many cardinals, generals, grand chamberlains, and other high magnates. Belgium and Luxembourg have still several princely and ducal lines of this family. Count Horn and Marshal Luxembourg were both Montmorencies.

Montmorency, de (ANNE), FIRST DUKE, grand constable of France, b. at Chantilly Mar. 15, 1492; was one of the leading generals in the wars of Francis I., and was afterwards distinguished for cruel hostility to the Huguenots. He was mortally wounded in the battle of St. Denis, and d. at Paris Nov. 12, 1567.—HENRY, fourth duc de Montmorency, a grandson of the preceding, was b. at Chantilly Apr. 30, 1595; was godson of Henry IV., and when sixteen years old became admiral of France and viceroy of Canada. He served with distinction in Italy and against the Huguenots; took part in the rebellion of Gaston of Orleans, and was executed by command of Richelieu at Toulouse, Oct. 30, 1632.

Montmorillon', town of France, department of Vienne, has celebrated paper manufactories, large tanneries, and a trade in cattle and wine. Pop. 5130.

Montoire', town of France, department of Loire-Inférieure, has celebrated vitriol manufactures. Pop. 5388.

Monto'rio al Voma'no, town of Southern Italy, province of Teramo. This is a patriotic little town, noted for its warfare against brigandage. Pop. in 1874, 5757.

Monto'ro, town of Spain, province of Cordova, on the Guadalquivir. Its vicinity is covered with olive-groves, from which annually 50,000 cwts. of oil are exported. Pop. 11,000.

Montour', county of Central Pennsylvania, bounded S. in part by the E. branch of the Susquehanna. Area, 230 square miles. It is traversed by several steep ridges and has fertile valleys. Grain is a leading product. The county has valuable limestone-quarries and iron-mines, and a small detached bed of good anthracite coal, which is mined extensively. The county is traversed by the Catawissa R. R. The manufactures are varied and important, iron being the greatest. Cap. Danville. Pop. 15,344.

Montour, tp. of Schuyler co., N. Y., contains HAVANNA (which see), and is traversed by the Chemung Canal and the Northern Central R. R. Pop. 1828.

Montour, tp. of Columbia co., Pa. Pop. 627.

Montours'ville, post-b. of Lycoming co., Pa., on the Catawissa R. R. Pop. 1048.

Montpel'ier, post-v. of Harrison tp., Blackford co., Ind., on the Fort Wayne Muncie and Cincinnati R. R.

Montpelier, tp. of Muscatine co., Ia. Pop. 735.

Montpelier, city and tp., cap. of Washington co. and of the State of Vermont, situated 205 miles N. N. W. from Boston, on the Central Vermont and the Montpelier and Wells River R. Rs., is the commercial centre of a large territory, and its trade is quite extensive. It has an excellent union school, the Washington County Grammar School, and the Vermont Methodist Seminary and Female College, and its churches are the finest in the State. There are 5 weekly newspapers, and the Lane and Montpelier Manufacturing companies have extensive works here. It has 2 national banks, the Vermont Mutual Fire Insurance Company, and the Farmers' Mutual Fire Insurance Company. The State Capitol is one of the finest buildings in the U. S., which, combined with the pleasant drives and fine views surrounding the town, renders it more and more popular every year as a resort for summer tourists.

State Capitol of Vermont, at Montpelier.

The Wells River R. R., built mostly by the citizens of Montpelier, has opened up a new part of the State, and affords travellers a new route to the White Mountains from the W., as well as greatly facilitating the means of transit to the capital of those residing in the north-eastern portions of the State. Pop. 3023. J. M. POLAND,

ED. "VERMONT WATCHMAN AND STATE JOURNAL."

Montpelier, post-tp. of Kewaunee co., Wis. Pop. 877.

Montpel'lier, city of France, capital of the department of Herault, on the Lèze, 6 miles N. of the Mediterranean. The city itself was formerly indifferently built, with narrow, crooked, and steep streets, but has of late been much improved; its promenades afford the most splendid views of the Mediterranean, the Pyrenees, and the Alps; and as its climate is remarkably mild and salubrious, its vicinity is covered with villas and cottages. Remarkable among its buildings are the cathedral and the aqueduct; and among its institutions, its medical school, founded in the Middle Ages by Arabian physicians and enjoying a world-wide fame; a botanical garden, the first established in France, and many excellent collections, are connected with the school. Montpellier has large distilleries and manufactures of woollens and cottons, and it carries on an important trade in wine, olive oil, fruits, and grain. Pop. 57,727.

Montpensier', de (ANTOINE MARIE PHILIPPE LOUIS D'ORLÉANS), DUKE, the fifth and youngest son of the late king Louis Philippe, b. at Neuilly July 31, 1824; educated at the Collége Henri IV., and in 1842 was appointed *sous-lieutenant* of artillery; captain in 1843. He served in Africa in 1844 in the expedition against Biskara, and somewhat later, as chief of artillery under the duc d'Aumale, he directed it with efficiency upon an Arab fort, leading an assaulting column, receiving a wound in the face, and exhibiting great bravery, for which he was named chevalier of the Legion of Honor. In the subsequent year (1845), having in the interim accompanied the king on his visit to Queen Victoria, he so distinguished himself at the battle with the Kabyles as to establish a solid military reputation and attain the rank of lieutenant-colonel. A tour through the East followed, on his return from which he received the grand cross of the Legion of Honor, and was promoted to the colonelcy of the 5th regiment of artillery, and in 1846 appointed to the command at Vincennes, with the rank of *maréchal de camp* (brigadier-general). At this period the famous negotiations took place by which the duke was betrothed to the sister of the queen of Spain. These alliances and the famous "Spanish marriages" produced a great sensation in France and dissatisfaction elsewhere, especially in England. After his marriage (Oct. 10, 1846) he took up his residence at the palace of the Tuileries, from whence in 1847 the revolution which dethroned the king made him, with the rest of the royal family, an exile. He finally fixed his residence, with the duchess, in the palace of San Telmo at Seville. Here, constrained to inactivity, he passed many years, exhibiting his taste and love of art in the embellishment of his grounds and in making his palace a rich collection of works of art. Agriculture, the fine arts, and the study of the politics and events of his adopted country and of France engaged his time. The duchess, always with him, "endowed with the most engaging qualities of a mother and wife, adorned by her life and example his abode, setting to their children the example of the purest domestic virtues."* Besides honorary appointments, he was made by Queen Isabella, in 1858, captain-general of the Spanish army, and in 1859 she conceded to him the honors due to "infants" of Spain. This cordiality was disturbed by political troubles accumulating about the queen's government. In 1859 he was exiled to the Balearic Islands. The dethronement of the queen (Sept., 1869) only changed the character of the embarrassments which have since beset him and the duchess, both of whom stand in dangerous prominence as *Bourbons* nearly allied to the royal family. The most marked event of this period is the death of Duc Henrique, brother of Don Francisco, the husband of Isabella II. Violent by nature, he, affecting to regard Montpensier as a "pretender," repeatedly and conspicuously insulted him. A duel ensued, in which the duke, after twice

* Yriarte, *Les Princes d'Orléans.*

receiving his adversary's fire and twice firing in the air, forced to a third exchange, aimed, and with fatal effect. The duke, with the duchess and their six children—the fourth of whom, Maria Isabella, is married to the count of Paris—now resides in Paris. J. G. BARNARD.

Mon'tra, post-v. of Jackson tp., Shelby co., O. Pop. 110.

Montraille', county of N. W. Dakota, bordering on British America, drained by the Rivière des Lacs and the White Earth River. It has been recently formed.

Montreal', city of the Dominion of Canada, in the province of Quebec, in lat. 45° 31′ N., lon. 73° 35′ W., on the left bank of the St. Lawrence, 600 miles from its mouth, 180 above Quebec, 200 below Lake Ontario, 335 from New York, on an island formed by the two arms through which the Ottawa enters the St. Lawrence. It derives its name from Mont Réal (or Royal), which rises immediately behind it to a height of 750 feet, and it is generally a neat and well-built town, with several elegant quarters, though its streets are mostly narrow and tortuous. The largest public square is the Champ de Mars, a military parade-ground, situated behind the court-house. Of the public buildings, the most remarkable are the Roman Catholic parish church of Notre Dame, a parallelogram 241 feet long, 135 feet wide, flanked with six towers, of which the two on the main front rise 213 feet, built from 1824–29, and the English cathedral, a cruciform structure in Gothic style, 112 feet long, 70 feet wide, the transept 100 by 25 feet, and the spire 224 feet. The city contains in all 64 churches—21 Roman Catholic, 9 Episcopalian, 5 Presbyterian, 5 belonging to the Church of Scotland, 5 Methodist, 4 Wesleyan, 4 Baptist, 2 Jewish, 2 Congregational, 1 French Evangelical, 1 German Protestant, 1 Unitarian, 1 belonging to the Society of Friends, 1 New Jerusalem, 1 Christian Advent, and 1 belonging to the St. George's Hall congregation. The university, McGill College, founded as a college in 1811, erected a university in 1821, reorganized and enlarged in 1852, comprises an excellent medical school and a fine museum; and besides this and the seminary of St. Sulpice the city has several other good educational and numerous benevolent institutions. The harbor extends for nearly 3 miles, from the village of Hochelaga to the famous tubular Victoria Bridge, which, about 2 miles long, crosses the St. Lawrence on twenty-four piers. It has a line of wharves more than a mile long and of solid masonry, is perfectly safe, as it is situated 90 miles above the influence of the tide, and is open generally from the end of April to the beginning of December. Great improvements have been made in the last fifty years in the river navigation belonging to the city. In the beginning of the present century only vessels of less than 300 tons burden could reach the city, but by deepening the shallow places of the St. Lawrence between Quebec and Montreal, the latter has been made accessible for vessels of 1800 tons burden. On the other side, towards Lake Ontario, costly locks and canals have been constructed. In 1873, 422 vessels, with a tonnage of 307,453, entered the harbor, and 527, with a tonnage of 354,911, cleared. The value of imports amounted during the same year to $44,320,646, of exports to $19,679,118. The principal articles of exportation are grain and lumber. When Jacques Cartier arrived here in 1535, he found an Indian village named Hochelaga. In 1642 the town was founded, in 1758 it was fortified, and in 1779 it contained 1200 houses. It was, however, merely an outpost of Quebec, both under French and British rule, until 1832, when it was made an independent port. Since that time its growth has been very rapid; it had 27,297 inhabitants in 1840, 57,716 in 1852, 90,323 in 1861, 107,225 in 1870, of whom 77,980 were Roman Catholics and 29,245 Protestants.

Montreal, P. O. name of LOVINGSTON, Va. (which see).

Montrose', town of Scotland, county of Forfar, on the South Esk. It has a good harbor, lined with wet and dry docks and handsome quays; its bleaching-works, flax-spinning mills, and manufactures of linens are important, and it carries on some shipbuilding and a considerable trade. Pop. 14,548.

Montrose, post-v. and tp. of Lee co., Ia., on the Mississippi River, 12 miles above Keokuk, and on the Keokuk Mt. Pleasant and Muscatine R. R., on the site of the old Fort Des Moines, has 5 churches and an active trade, especially when, at low water, it becomes the head of navigation for large steamers. Pop. of v. 905; of tp. 3387.

Montrose, post-tp. of Genesee co., Mich. Pop. 805.

Montrose, post-v. of Henry co., Mo., on the Missouri Kansas and Texas R. R.

Montrose, post-b. of Bridgewater tp., cap. of Susquehanna co., Pa., 8 miles W. of Montrose Station on the Delaware Lackawanna and Western R. R., has 1 hotel, 2 weekly newspapers, and is the centre of a fine agricultural district. Pop. 1463.

Montrose, tp. of Dane co., Wis. Pop. 1155.

Montrose (JAMES GRAHAM), FIRST MARQUIS OF, b. at the family estate of Montrose, Scotland, in 1612; was educated at the University of St. Andrew's; travelled in Italy and France; returned home in 1637, and joined the Covenanters, as it is said, on account of the cold reception Charles I. had given him. In 1639, after a new interview with the king, Montrose left the Covenanters and became one of the king's most zealous partisans. He was created a marquis, and in 1644 he gathered an army of about 5000 men, partly Highlanders, who followed him from hatred to the Campbells, partly Irish mercenaries. With this army he made a most successful campaign, defeated the Covenanters several times with great slaughter, and took several towns, which were given up to plunder and massacre. But on Sept. 13, 1645, he was defeated at Philiphaugh by David Lesley; in July, 1646, he capitulated at Middleton, and soon after left Scotland for the Continent. Having been authorized by Charles I., and afterwards by Charles II., to raise a force and invade Scotland, he travelled from Austria to the Scandinavian kingdoms, busy in the king's interest. In Mar., 1650, he landed at the Orkneys with a small force, but having proceeded as far to the S. as the border of Ross-shire, his army was scattered and he himself taken prisoner, condemned to death as a traitor against the Covenant, and hanged at Edinburgh May 21, 1650.

Montross', post-v., cap. of Westmoreland co., Va., 52 miles E. S. E. of Fredericksburg. Pop. of tp. 1862.

Monts, de (PIERRE DU **Guast**), SIEUR, b. in Saintonge, France, about 1560, of an Italian Catholic family; became a Protestant, and attached himself to the fortunes of Henry IV., by whom he was given a high post in the royal household. He had already made a voyage to Canada with Chauvin when in 1603 the king appointed him director of the Canadian Company, to which he granted, under the name of Acadia, the region between lat. 40° and 46° N. De Monts fitted out a considerable expedition; took Samuel Champlain, Poutrincourt, Biencourt, and Pontgravé as his chief officers; sailed from Havre Mar. 7, 1604; explored the Bay of Fundy; discovered Annapolis harbor and the river St. John, which he ascended; visited the St. Lawrence, and returned to France in October, while his colony established itself at Port Royal (now Annapolis) under Poutrincourt. On his arrival at court De Monts found his monopoly already at an end; various other grants were made to different individuals, and he failed to obtain indemnification. Nevertheless, he despatched a vessel under the command of Lescarbot to the relief of Poutrincourt Mar., 1606; despatched Champlain and Pontgravé on a new voyage to the St. Lawrence 1607; sent them other vessels 1608, by the aid of which Quebec was founded. On the death of Henry (1610), De Monts lost favor at court, and d. at Paris in 1611.

Montserrat', one of the Lesser Antilles, in the West Indies, belonging to Great Britain. Area, 47 square miles. Pop. 7645. Only one-third of the surface is fertile and under cultivation; sugar, cotton, arrow-root, and tamarinds are produced.

Mont'ville, post-tp. of New London co., Conn., on the New London Northern R. R., has manufactures of wire and cotton goods, and was long the residence of the Mohegan Indians, now nearly extinct. Pop. 2495.

Montville, post-tp. of Waldo co., Me., 7 miles W. of Belfast. Pop. 1467.

Montville, post-tp. of Geauga co., O. Pop. 705.

Montville, tp. of Medina co., O. Pop. 1097.

Montyon', de (ANTOINE JEAN BAPTISTE ROBERT AUGET), BARON, b. at Paris Dec. 26, 1733; held different offices in the civil service; emigrated to England during the Revolution; returned in 1816, and d. at Paris Dec. 29, 1820. His large fortune he distributed for philanthropic purposes. The French Academy and the Academy of Sciences give each two annual Montyon prizes for improvements in medical and surgical art on the conditions under which the mechanical arts are exercised, etc.

Mon'ument, post-v. of Sandwich tp., Barnstable co., Mass., on Monument River and the Cape Cod R. R., 55 miles S. S. E. of Boston.

Monument Station, tp of Wallace co., Kan., on the Kansas Pacific R. R., 250 miles W. of Fort Riley.

Mon'za, town of Northern Italy, province of Milan, situated on the Lambro, about 10 miles N. N. E. of the city of Milan. This place, from its healthy and pleasant position, is a favorite summer and autumn retreat, and the crown prince and princess of Italy generally pass a portion of every year at the royal palace, situated in an extensive and beautiful park, through the midst of which flows the Lambro. Monza, though for a time the royal residence of the great Theodoric, is best known as the

capital of the old Lombard kings, and especially as the favored seat of the renowned Theodolinda, who adorned it with magnificent buildings. Very interesting memorials of this queen are still preserved in the cathedral; also the famous Iron Crown so long used for the coronation of the kings of Lombardy. The mediæval history of Monza is full of interest, and, as well as its modern story, is intimately connected with that of Milan. Pop. in 1874, 25,288.

Moo'die (SUSANNAH), a sister of Agnes Strickland, b. at Brydon Hall, Suffolk, Dec. 6, 1803; removed in 1832, with her husband, Mr. J. W. D. Moodie, to Canada West, where they led a life of much hardship for some years as pioneers. Mrs. Moodie had some fame as a poet in her youth, and has since produced *Roughing it in the Bush* (1852), *Mark Hurdlestone* (1852), *Life in the Clearings* (1853), *Flora Lindsay, Matrimonial Speculations* (1854), and *The Monctons* (1856), etc.

Moodus, post-v. of Middlesex co., Conn., on the Salmon River, near its entrance into the Connecticut, has 1 weekly newspaper.

Moo'dy, county of S. E. Dakota, bounded E. by Minnesota. There is much fertile soil along the banks of the Big Sioux and other streams. The county includes a part of the Coteau des Prairies.

Moody, tp. of Marion co., S. C. Pop. 985.

Moody (DWIGHT LYMAN), b. in Northfield, Franklin co., Mass., Feb. 5, 1837; received a meagre education; worked on a farm till seventeen, when he became clerk in a boot and shoe store in Boston; joined the Congregational Church soon after, and in 1856 went to Chicago, where he engaged zealously in missionary-work among the poor classes; in less than a year he built up a Sunday school which numbered over 1000 children; was in the service of the Christian Commission during the late civil war, and subsequently became city missionary of the Young Men's Christian Association of Chicago; a church was built for his converts, and he became its unordained pastor; in the Chicago fire of 1871 the church and Mr. Moody's house and furniture, which had been given him, were destroyed; a new church, with sittings for 2500 persons, now stands in the place of the old church. In 1873, accompanied by Ira D. Sankey, Mr. Moody went to Europe, and excited great religious awakenings at Edinburgh, Glasgow, Dublin, London, and other cities of Great Britain; in 1875 they returned to the U. S., and held large meetings in various cities. J. B. BISHOP.

Moody (Col. JAMES), b. in New Jersey about 1746; was a celebrated leader of a band of Tories during the war of the Revolution; was captured and imprisoned at West Point, but escaped and went to England, where he published in 1783 *Lieut. Moody's Narrative of his Exertions and Sufferings in the Cause of Government since 1776*, reprinted at New York in 1865. He subsequently settled in Nova Scotia, became a colonel of militia, and d. at Sissibon Apr. 3, 1809.

Moody (JOSHUA), b. in England in 1633; came to Newbury, Mass., in infancy; graduated at Harvard College 1653; began to preach about 1658; became pastor of the church at Portsmouth, N. H., 1671; was involved in quarrels with the government of the colony, and imprisoned, but released on condition of leaving the colony; settled in Boston 1684 as assistant minister of the First church; declined an invitation to become president of Harvard College; published a treatise on *Communion with God* (1685); was dismissed from his church 1692 on account of having opposed the witchcraft trials; removed to Portsmouth, and d. there July 4, 1697.

Moody (SAMUEL), b. at Newbury, Mass., Jan. 4, 1676; graduated at Harvard College 1697; was for many years minister of York, Me.; was chaplain to Sir William Pepperell's expedition against Cape Breton; was a benevolent and useful man, but extremely eccentric, and many curious stories of "Parson Moody" are still current in Maine. D. at York Nov. 13, 1747. He published *The Doleful State of the Damned* (1710) and other religious treatises.

Moo'ers, post-v. and tp. of Clinton co., N. Y. The village is near the junction of the Ogdensburg and Lake Champlain and the Montreal and Plattsburg R. Rs., 13 miles W. of Rouse's Point. The township has 5 churches, a custom-house (at the junction), and various manufactures. The post-village of MOOERS FORKS is on the Ogdensburg R. R., 4 miles W. of the junction. It is also called CENTREVILLE, and has 3 churches and manufactures of leather, sash, lumber, shingles, staves, woollens, etc. It has an active trade. Pop. of tp. 4634.

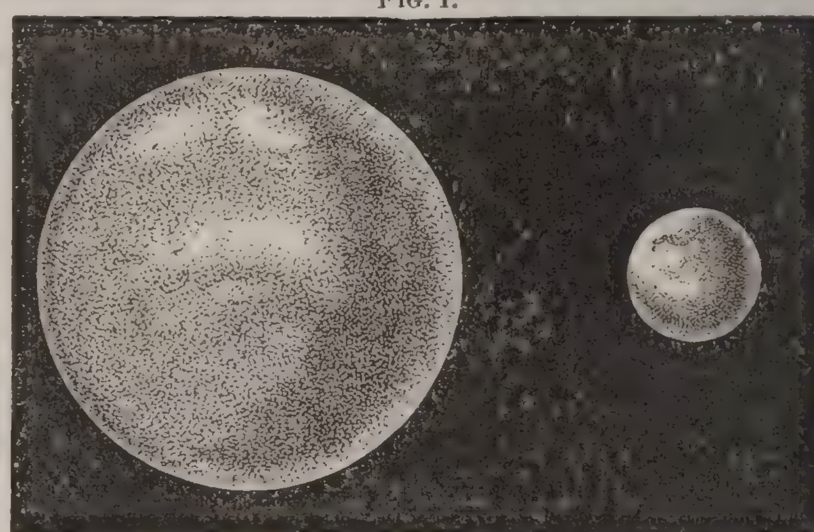
Mooers (Gen. BENJAMIN), b. at Haverhill, Mass., Apr. 1, 1758; entered the Revolutionary army as an ensign; became lieutenant and adjutant of Hazen's regiment to the close of the war, in which capacity he kept an *Order Book*, printed in 1876; was present at the surrenders both of Burgoyne and of Cornwallis; settled in 1783 near Plattsburg, N. Y., then a wilderness; was many years in the State legislature; discharged numerous county offices; became major-general of militia, and commanded at the battle of Plattsburg, Sept. 11, 1814. D. at Plattsburg Feb. 20, 1838.

Mooers Prairie, post-v. of Cokato tp., Wright co., Minn. (called also COKATO), on St. Paul and Pacific R. R.

Moon [Sax. *mona*], the conspicuous luminary of the night. The moon is one of a class, or rather description, of secondary planets which respectively revolve about some of the (primary) planets of the solar system, while both the primary and its secondaries together revolve about the sun. "Satellites" is the common term to designate all these (Lat. *satelles*, an "attendant" or "dependant").

Comparative Size of the Moon and the Earth.—The moon is much smaller than the earth, her diameter being 0.2729 (between one-third and one-fourth) of that of the earth; or if the earth be, in like manner, compared with the moon, we shall find that the diameter of the earth is a little more than 3.66 the diameter of the moon. Hence, the surface of the earth must be somewhat more than 13.4 that of the moon, and the volume of the earth be fully forty-nine times that of the moon. The moon's mean or average distance from the earth is something more than 30 diameters or 60 radii of the earth's equator. The

FIG. 1.



Comparative dimensions of the earth and the moon.

relative size of the two bodies is exhibited in the annexed diagram. The mean distance of the one from the other, on the same scale, would be represented by very nearly 4 feet 11 inches, English or American. Some of the dimensions here alluded to, as well as others, stated in English miles are very nearly as follows, the diameter being corrected for its "exaggeration," due to irradiation: diameter, 2159 miles; mean distance, 239,000 miles. But the eccentricity of the moon's orbit being 0.0549, the moon's greatest distance from the earth nearly equals 252,000 miles, and its least distance is somewhat less than 226,000 miles.

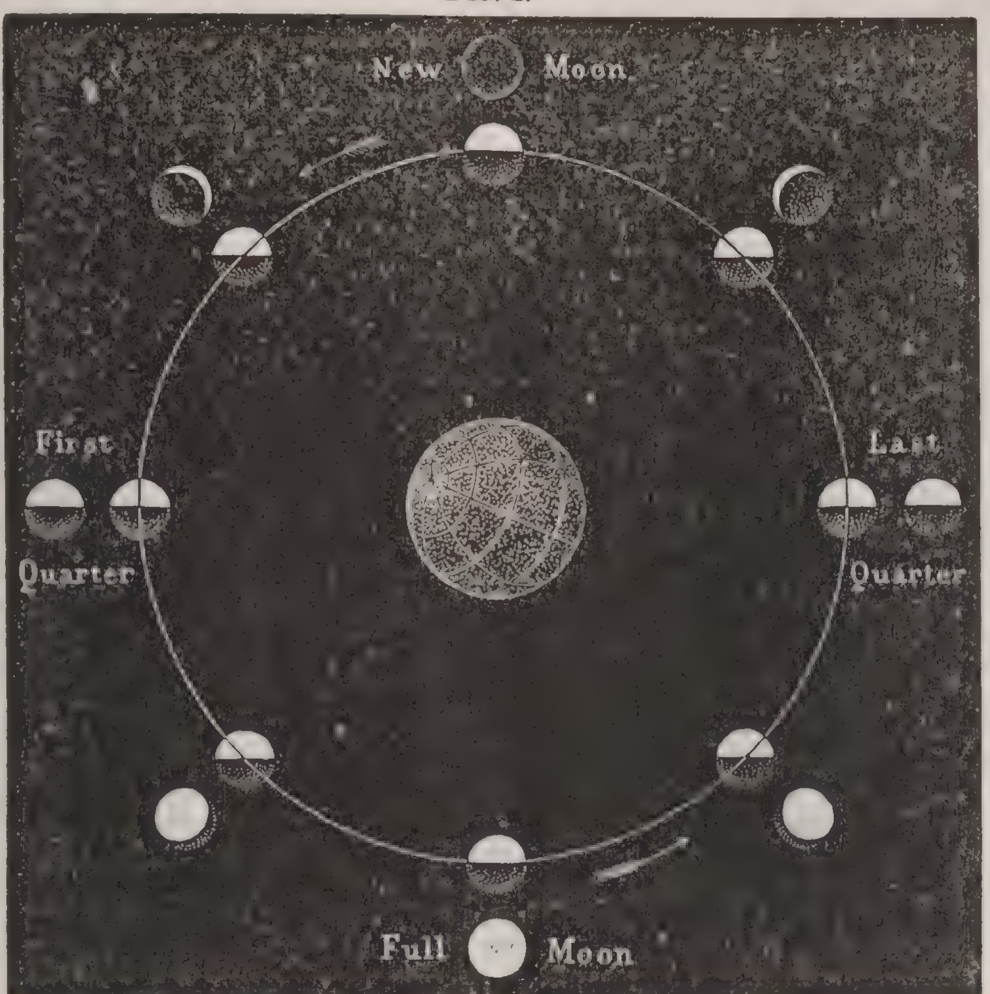
Mass and Density of the Moon, and Intensity of Gravity at her Surface.—The *volume* of the moon—as appears from what has been already stated—is scarcely $\frac{1}{49}$th of that of the earth, and her *mass* is less than that, being about $\frac{1}{81}$st of that of the earth. From this it is at once apparent that the mean *density* of the moon must be less than that of the earth, or she must be made of a lighter material. Accurately stated, her density, that of the earth being 1, is 0.55654, which is just about 3.27 that of water. Such being the case, gravity at the surface of the moon is but one-sixth as great as gravity at the surface of the earth, notwithstanding the advantage which is found at the surface of the smaller body in consequence of its being so much nearer to its own centre, the attractive force outside varying inversely as the square of the distance from such centre. With gravity only one-sixth as great, a heavy body will descend scarcely more than 2 feet 8 inches in the first second of the time of its fall; and one who could jump but 3 feet high would, with a similar application of force on the moon (if attainable), jump 18 feet high, and be 6 times as long in coming down as (but for the resistance of our atmosphere) he would be in coming to the earth in such a fall here.

Baron Humboldt remarks that "the moon is strikingly large in proportion to the diameter of its primary planet. This proportion is $\frac{1}{3.7}$; whereas the largest of the satellites of Saturn (the sixth, Titan) is probably only $\frac{1}{15.5}$, and the largest of Jupiter's satellites (the third) $\frac{1}{25.8}$ of their respective primaries." (*Cosmos*, Mrs. Sabine's translation, vol. iii. part ii., p. 340.)

Form of the Moon.—Why the Moon shines.—Phases of the Moon.—Were the moon a smooth globe, or were even

any considerable portion of its surface covered with a liquid, then under certain circumstances we might see a brilliant image of the sun, as we do in a convex mirror. But instead of being like a globe of polished metal, the appearance of the moon in a good telescope, when the amplifying power is not too great, is that of the roughened surface of enchased silver, which thus presents small surfaces for reflection in a vast variety of directions, and thus renders the light that falls upon them from the sun more or less visible on whatever part the sun may shine. All this

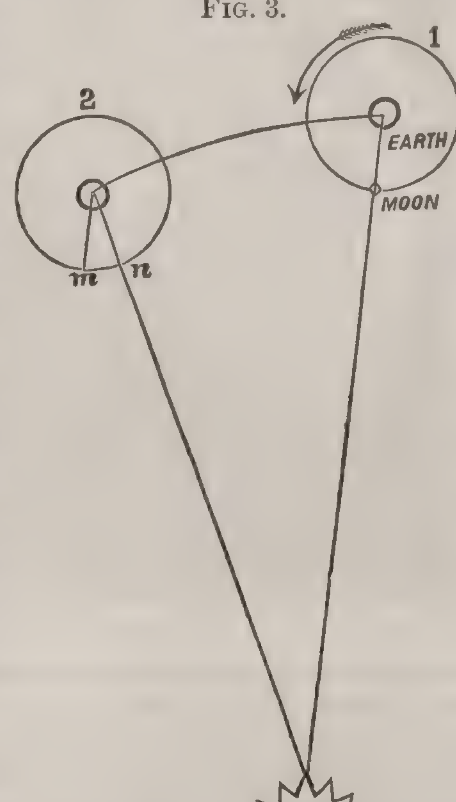
Fig. 2.



Orbit of the moon, showing the lunar phases.

in itself shows the moon to be *rough*, apart from other and more striking evidence. A rough globe, or that which is nearly a globe, will present the same *phases* with those which the moon actually exhibits. The sun being supposed to shine in the direction downward, as represented in the annexed diagram, it will be seen that the moon as represented at the top will have its illuminated portion wholly turned away from the earth, and will ordinarily be nowhere traced in the sky, being dark, like the *new moon* in the figure. But with the moon on the opposite side, nearly all the enlightened portion will be turned toward us, and we have the *full moon*. When in the position represented at the extreme left of the diagram, the *right-hand* half of the moon will appear luminous, as in the *first quarter*. In the opposite position it will be the *left-hand* portion that will shine, as in the *last quarter;* the circle of the lunar globe which divides the light from the dark part being seen on its edge in both cases, and so would appear as a *straight* edge if the moon were smooth. A careful attention to the representations of the other positions here exhibited will moreover make it plain that a sufficiently rough globe, or approximation to a globe, like the moon, will present the various *phases* represented in the diagram in their appropriate positions; the globular form and roughed surface being by these very circumstances clearly made out.

Fig. 3.



Sidereal and synodical revolutions of the moon.

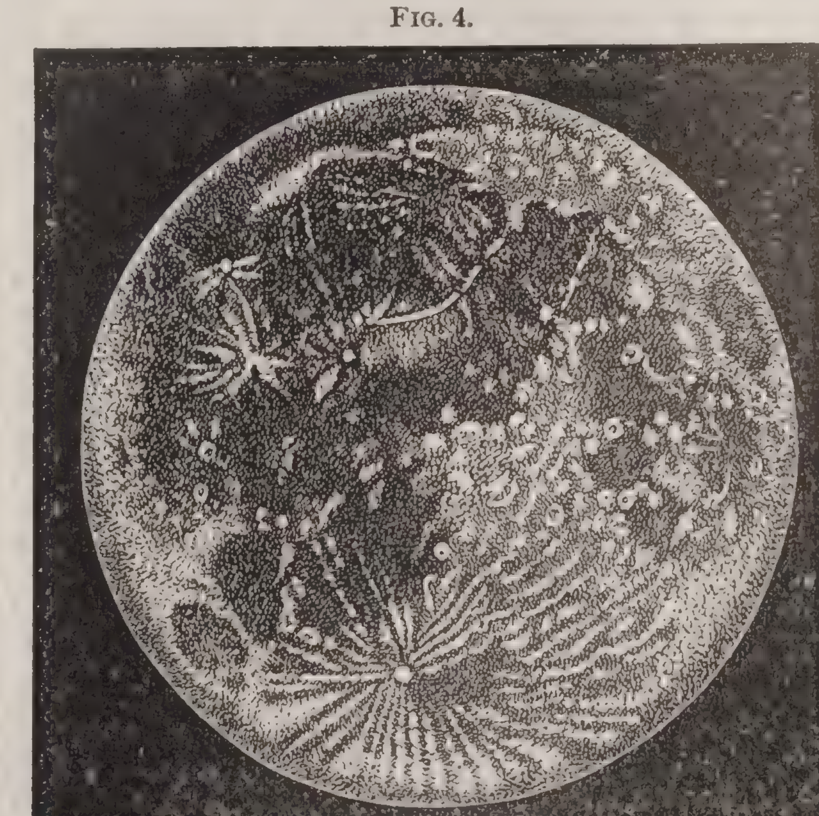
Sidereal and Synodical Revolutions of the Moon.—Let the positions of the sun, the moon, and the earth, respectively, be those represented and marked in the figure. Then if the earth were stationary as respects a revolution around the sun, the moon, having left the position here shown, and revolved around, will just have completed an entire revolution, when it returns to its first position. Such a complete revolution is termed a *sidereal* revolution, the distinguishing term being derived from the Latin *sidus*, a "star," for it would also mark very accurately the time elapsed from the date when the heavenly body was opposite to any star until it returned opposite to the same star again. But now, if the moon, thus circumstanced, while it is revolving as already described, move also with its central body, the earth, to 2, the position on the left, then, when in the position immediately *beneath* that central body, like that marked *moon* at position 1, it will not yet be, as before, in line with the *sun* in the middle, but must revolve a considerable distance farther (from m to n) to come into the direction of the *sun;* as was the case at first. Now this, which thus represents a complete revolution of the moon from sun to sun again, is styled the *synodical* revolution of the moon; and the same term is applied in the case of other satellites and of planets, etc., the appellation being derived from two Greek words —συν, "together," and ὁδός, "pathway." And as it is the position with respect to the *sun* that, as already shown, determines the *phases* of the moon, the series of the various phases or "changes" will be completed in a *synodical* revolution, which is hence denominated a *lunation* or lunar month. The respective lengths of the sidereal and the synodical revolutions are very nearly as follows, that of the synodical being the mean or average length:

Sidereal revolution.......	27*d.*	7*h.*	43*m.*	+.
Synodical revolution......	29	12	44	+.

Now, as we have thus a sidereal revolution (from star to star) and a synodical revolution (from sun to sun or other apparently moving body), so on a smaller scale of rotation of the moon or other heavenly body, or of the earth on its *own axis*, we have a *sidereal day* (from a star to the same again), and a *solar* day (from sun to sun), the latter, as in the other case, *longer* than the former.

Bright and Dark Spots on the Surface of the Moon.—Lunar Mountains.—The moon, even at the time of full moon, is far from appearing everywhere equally bright. Dark spots are readily discernible even by the bare eye. The most simple explanation of this is, that some portions of the moon reflect light less copiously than do others. The

Fig. 4.



The full moon.

general appearance of the spotted surface at the time of full moon is shown in the annexed engraving. At this very time scarcely any *shadows* are discernible. For the sun then, as we may say, looks upon the moon very nearly in the same direction in which we view the moon ourselves; so that what is hidden from him (*i. e.* is in shade) is concealed from us. The appearance of the dark portion is, in its conformation as well as its extent in latitude and longitude, not wholly unlike our eastern hemisphere, as was pointed out by the author of this article to the American Association for the Advancement of Science at their meeting in 1852. An examination of the dark spots on the right-hand side of the figure will enable one to trace a rude resemblance to a short, thick-set human figure, with

an inordinately large head covered with a species of helmet—"the man in the moon." Baron Humboldt remarks that "the spots on the moon, in which Western nations thought they could make out a face, represent, in the view of the Indians, a roebuck or a hare; hence, the Sanskrit names of the moon 'roe-bearer' (*mrigadhara*) or 'hare-bearer' (*sa'sabhrit*)." (*Cosmos*, vol. iii. pt. ii., note 565.)

Why the Moon always presents nearly the same Face to the Earth.—Some have hastily supposed and confidently asserted that this was because the moon had no rotation about an axis of her own. But a very simple illustration will readily show that such a supposition will entirely fail to account for the phenomenon in question. Let a person be seated in the middle of a room, while another walks around him, the latter facing always in the same general direction—say, for example, toward the north. Such being the arrangement, when the traveller around the room has arrived at the middle of the northern side of the apartment, then, always looking north, he will have his *back* turned to the man remaining immovable at the centre. But when in the course of his march the man moving around the other, but still looking north, has arrived at the middle of the west side of the apartment, he will present the *right side of his face* in profile to the man at the centre; at the middle of the south side the *full face* of the moving man will be directed to his friend at the centre; at the middle of the east side of the apartment it will be the *left side* of the face that will be shown *in profile* to the man at the centre; and at the middle of the north side the *back* of the moving man will be turned as before. The case here realized will be that of a body *revolving* about another, but having no rotation about an axis of its own. *All sides* of the *non-rotating* body will in their turn be visible to the spectator situated in the position of the central body. But this is precisely the reverse of what happens in the case of the moon, our satellite confessedly presenting always nearly the *same face* to the earth. A little variation of these conditions would make the comparison more accurate. The central body and the non-rotating but revolving body should both be borne along together around a more distant centre, as though both the men in the case supposed had been smoothly carried along in some sailing vessel moving in a larger curve. But this latter circumstance would not interfere with the result. All sides of the non-rotating body would, in the end, have been visible from the central position. It is plain, then, that the phenomenon in question is not to be explained by the hypothesis that the moon has *no* rotation upon an axis of her own.

Next let the case be considered in which the revolving body has the *same* face constantly *kept* turned toward the central body. Such will be the case if the two bodies be fastened together by a wellnigh inflexible rod, as in the instance of the two balls of a dumb-bell. When one of these is revolved around the other, the revolving ball will have every side very nearly presented *just once* in *every direction* around the whole circuit of the sky—*i. e.* the revolving body will be turned just *once* around its own axis in the *same time* in which it *completes its revolution* around the central body. Now, let the connecting bar be *removed*, and the revolving body itself *rotate once* in *the selfsame time* as before, and the same effect will be produced—viz. of keeping nearly *the same side* of the revolving body *turned toward the central body*. This, with the superadded condition that both bodies are *together* borne around the sun, is then the case of the moon with one side constantly turned nearly toward us. Our limits will not permit a more particular analysis of the phenomenon.

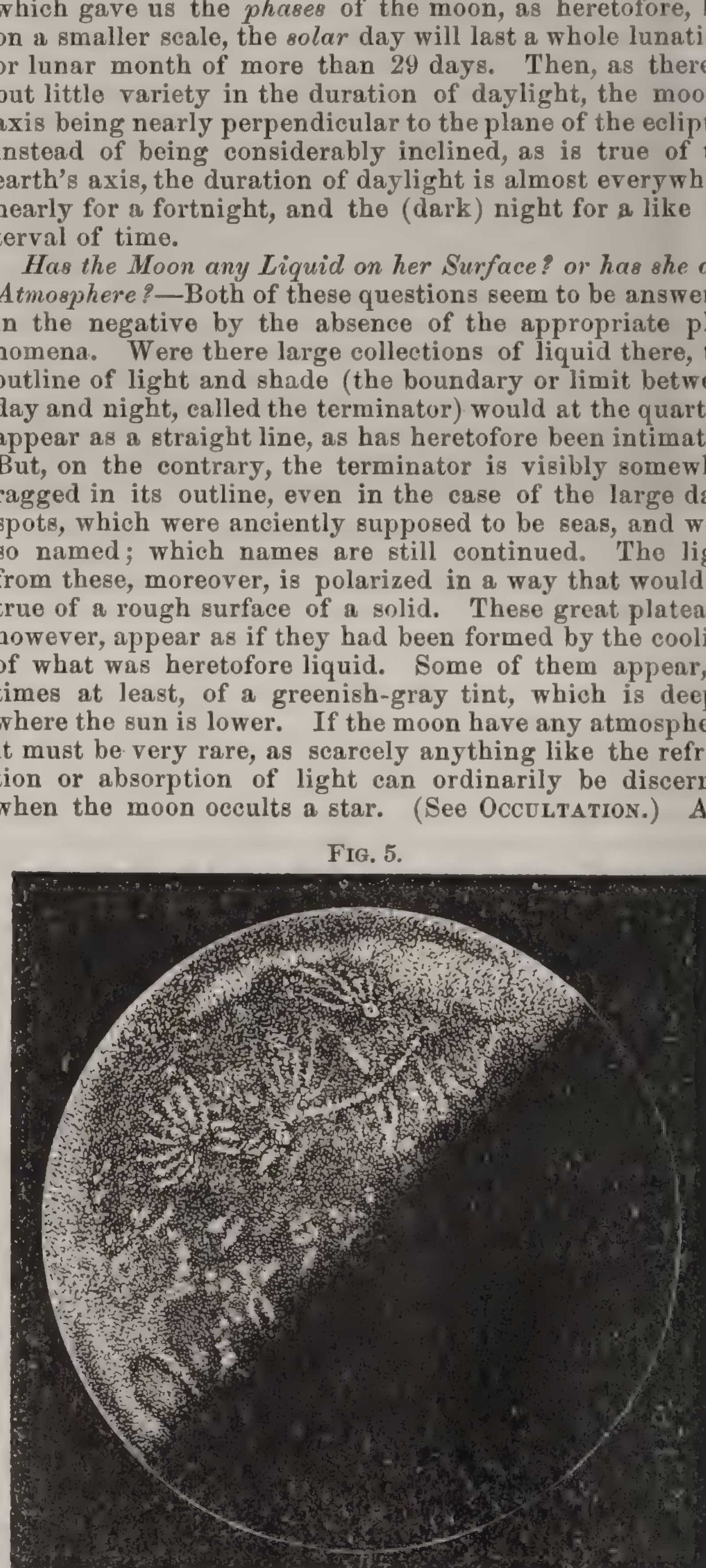
The Moon's Librations.—If the *rotation* about the moon's axis and her revolution in her orbit were both *uniform* motions, and so that the one always *kept pace* with the other, then as regards the eastern and the western edges of the moon they would always remain the same, the middle of the face turned toward us being continually the same. But as the moon sometimes revolves *faster* in her orbit than at other times, the *uniform* eastern motion around her axis will then *fail* to *keep pace* with the motion of revolution, and thus somewhat *less* of the *eastern* side be seen than usual, or *more* of the *western* side; and when the movement of revolution is too slow, then more of the eastern side. The moon, then, from time to time will seem to have oscillated, in these respects, like the beam of a balance; and this is termed the *libration* in *longitude*. Then, as the moon, in her inclined orbit, is sometimes seen to the *south* of our own orbit around the sun (viz. the ecliptic), we then look *over and beyond* the N. pole of the moon, as the sun looks over and beyond the N. pole of the earth in our northern summer. And when the moon is seen to the *north* of the ecliptic, we look over and beyond the S. pole of the moon. All this takes place with the axis of rotation of the moon nearly perpendicular to the plane of the ecliptic itself. The moon thus seems to have a balancing motion alternately toward the S. and toward the N.; and this is the *libration* in *latitude*. Lastly, when the moon is not actually in the zenith, we, standing upon the earth instead of at its centre, have our *central point of view* of the moon's disk *higher up* than it would be if we could look from the centre of the earth. And so we look *over* and *beyond* what would be the upper edge as seen from the earth's centre; and as this effect has its varieties repeated every day, or rather a little longer space of time, we have in all this a third description of libration, styled the *diurnal libration*. Here, as before, our limits will not permit a more particular analysis of the phenomena.

Portions of the Moon's Surface brought into view by the various Librations.—According to M. Arago, these enable us to see altogether $\frac{57}{100}$ths of the moon's surface. But the parts thus brought into view are very much foreshortened by being seen so near to the edge of the disk. Of course, $\frac{43}{100}$ of the surface remain always invisible.

Length of the Moon's Sidereal Day, and also of her Solar Day.—As the moon's rotation about her axis nearly keeps pace with, and is the end completed in, the same time with her revolution around the earth (but on a smaller scale), her sidereal day is thus more than 27 days long. And as her solar day will be determined by similar changes to those which gave us the *phases* of the moon, as heretofore, but on a smaller scale, the *solar* day will last a whole lunation, or lunar month of more than 29 days. Then, as there is but little variety in the duration of daylight, the moon's axis being nearly perpendicular to the plane of the ecliptic, instead of being considerably inclined, as is true of the earth's axis, the duration of daylight is almost everywhere nearly for a fortnight, and the (dark) night for a like interval of time.

Has the Moon any Liquid on her Surface? or has she any Atmosphere?—Both of these questions seem to be answered in the negative by the absence of the appropriate phenomena. Were there large collections of liquid there, the outline of light and shade (the boundary or limit between day and night, called the terminator) would at the quarters appear as a straight line, as has heretofore been intimated. But, on the contrary, the terminator is visibly somewhat ragged in its outline, even in the case of the large dark spots, which were anciently supposed to be seas, and were so named; which names are still continued. The light from these, moreover, is polarized in a way that would be true of a rough surface of a solid. These great plateaus, however, appear as if they had been formed by the cooling of what was heretofore liquid. Some of them appear, at times at least, of a greenish-gray tint, which is deeper where the sun is lower. If the moon have any atmosphere, it must be very rare, as scarcely anything like the refraction or absorption of light can ordinarily be discerned when the moon occults a star. (See OCCULTATION.) And

Fig. 5.



Last quarter of the moon.

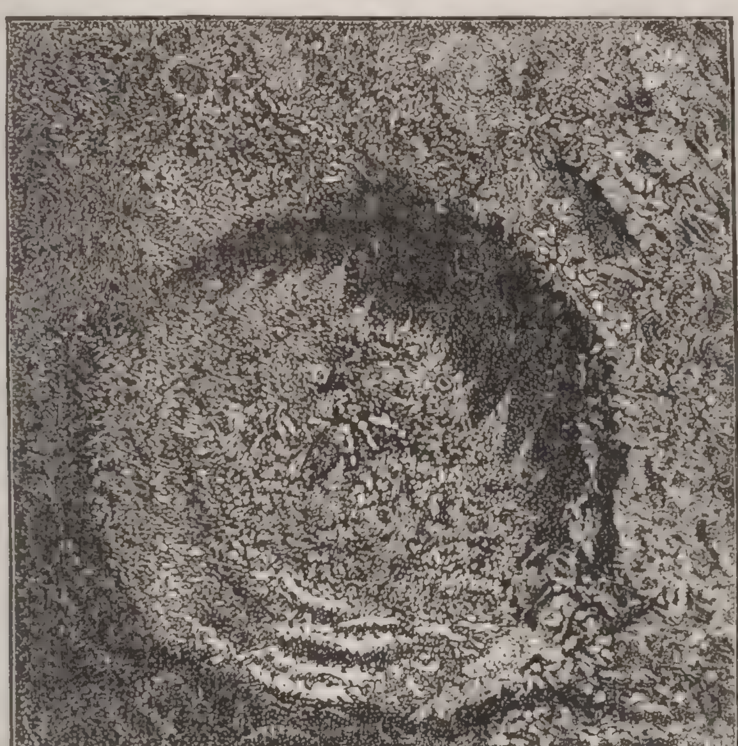
nothing like clouds can be asserted to have been seen. The steep mountains, of which there are many, shine in the morning light at sunrise with a surpassing brilliancy; the early morning to them has the brightness of noon. E. Neisson, Esq., has recently supposed that he found traces of a lunar atmosphere having a density $\frac{1}{400}$th of that of the earth. "If then," says Baron Humboldt, "the moon is without any gaseous envelope, the entire absence of any diffused light must cause the heavenly bodies, as seen from

thence, to be projected against a sky *almost black* in the daytime. No undulation of air can there convey sound, song, or speech. The moon, to our imagination, which loves to soar into regions inaccessible to full research, is a desert where silence remains unbroken." (*Cosmos*, vol. iii. part ii., p. 358.)

Lunar Mountains.—The existence of these is not a matter of mere conjecture. The rays of the rising sun tip their tops as with silver as he looks upon their elevated summits before he enlightens the regions below; and so they appear like islands in the yet dark portions, as is seen in the engraving, Fig. 5, of the moon in her last quarter. And when the lower portions of the mountains also become enlightened before the surrounding regions, the whole slant-height portion of the mountain is projected, so as to intrude upon those dark regions and present an exaggerated roughness. Then, the shadows of both elevated and of inordinately depressed portions have all the characteristics, at all hours of the lunar day, that they ought to have.

In the engraving that follows we have a representation of the huge "crater" Copernicus as it appeared when

FIG. 6.



View of Copernicus.

modelled in accordance with accurate measurements, and then photographed—all by Mr. Nasmyth.

Special Form of the Lunar Mountains.—This is specifically that of the crater (and its surroundings) of an enormous volcano. The features are altogether those which might be due to volcanic action. And in the case of the moon the effects of such an action could hardly have been other than enormous, the force being supposed the same as on the earth. For gravity, as heretofore stated, is six times as feeble at the surface of the moon as it is here, the mean density of the material there is not very much more than one-half as great, and there is almost no atmosphere to resist. "In Lord Rosse's magnificent reflector the flat bottom of the crater called Albategnius is seen to be strewed with blocks, not visible in inferior telescopes, while the exterior ridge of another (Aristyllus) is all hatched over with deep gullies radiating towards its centre." (Chambers's *Descriptive Astronomy*, p. 77.) The height of these mountains is altogether disproportionate to the size of so small a globe as the moon. Thus, Dörfel and Leibnitz, according to Mädler, are 24,300 English feet in height; Newton, "where a part of the deep excavation is never shone upon, either by the light of the sun or that of the earth," 22,822 English feet; and the same is the height of Casatus, E. of Newton. Mountains on the earth, in the same ratio to its diameter, would be not far from eighteen miles high. Then, as to their extent otherwise, Galileo was reminded by them of the configuration of entire countries surrounded by mountains. Some of them have diameters of from 100 to 120 English miles.

Heat of the Moon.—The heat of the moon's surface, exposed for more than a fortnight to a bright sun in a cloudless sky, must be very considerable. Sir John Herschel estimates that it may possibly exceed that of boiling water. The radiation of heat received from its surface has been measured by a delicate thermo-electric pile.

Is the Moon habitable—that is, the visible portion of it?—Neither vegetable nor animal life, such as that with which we are acquainted, could, as it would seem, exist where not only such vicissitudes of temperature are to be found, but where there is neither atmosphere nor liquid. But as there is some reason to suppose that the invisible portion of the moon may be *lower* than the part which we see, it has been concluded that liquids and a gaseous envelope may have both run to the lower level on that side.

Does the Moon influence the Weather?—This might seem somewhat like a question whether the moon, conspicuous as her influence on the tide is, does not also influence the mighty currents of the ocean, in which the tide, unless when crowded into narrow channels, etc., is but as a ripple. The influence of the moon upon the weather seems to be but slight, and after careful investigation hardly to be distinguished; unless it be, indeed, that the low heat radiated from the moon may have some influence in the absorption of vapor, giving the clouds a tendency to disappear at the time of full moon. (See Sir J. Herschel's *Outlines of Astronomy*, 11th ed., art. 432.)

The Harvest Moon.—The moon every month rises successively after comparatively short intervals of time when in that part of her orbit which is least inclined to our horizon. This, in September, is about the time of *full moon*, and the same is measurably the case in August. The full moon thus favored is styled the "harvest moon."

Are any Changes of the Moon's Surface now taking place?—Something of the kind has been more than suspected in the instance of the spot Linné. If real, the changes would seem to be accounted for in the most simple way by the falling in of the sides of the deep crater there. To suppose, as has been supposed, that a viscous material may have exuded from the interior, involves a twofold hypothesis, difficult to establish.

Earth-Light.—An examination of the diagram of the phases will show that when the moon is a new or nearly new moon to us, the earth is occupying the place of a very large full moon, or nearly so, to the moon. The light reflected from the earth, made ruddy by passing three times through the earth's atmosphere, shows us what is termed the old moon in the arms of the new, by making the part of the moon visible which is not then in sunshine.

Changes in the Moon in Ancient Times.—The moon not only seems to exhibit traces of some changes such as geology has made out as having occurred on the earth, but also, as insisted upon by the author of this article at the meeting of the American National Academy some years ago, of a change *subsequent* to any such as geology makes known, the surface having very extensively cracked open, and the fissures partly filled up; while a white material would seem to have exuded, which now forms the tops of the highest mountains. Other strata are thus cut through. Something like this view, entertained in a modified way by others, seems to be gaining credit. S. ALEXANDER.

Moon, tp. of Allegheny co., Pa. Pop. 1230.

Moon, tp. of Beaver co., Pa. Pop. 936.

Moo'ney, tp. of Phillips co., Ark. Pop. 300.

Mooney, tp. of Polk co., Mo. Pop. 1260.

Moon's, tp. of Newberry co., S. C. Pop. 1513.

Moon'stone, a variety of adularia, or transparent potash-feldspar (*orthoclase*), so called because when polished it presents an opalescent appearance due to its internal chatoyant or pearly reflections. A variety of oligoclase occasionally presents a similar appearance. (See FELDSPAR and ORTHOCLASE.) E. C. H. DAY.

Moorashki'no, a v. of Russia, government of Nizhnee-Novgorod, has extensive tanneries, and is celebrated for its leather and dyed lambskins. Pop. 6500.

Moor'croft (WILLIAM), b. in Lancashire, England, about 1780; was engaged in surgical studies at Liverpool when his attention was directed to an epizootic disease which had attacked the horses, and giving the subject his entire attention, he studied in Paris and became one of the earliest veterinary surgeons in England. He went to India in 1808 as superintendent of the East India Company's stud in Bengal, and being of an adventurous disposition made two daring journeys to Balkh and Bokhara in Central Asia in the disguise of a Hindoo pilgrim (1812 and 1819). He was one of the earliest explorers of the Himalayas and the lakes, rivers, and valleys of Chinese Tartary. On a third journey into Central Asia he d. at Andkhui, between Bokhara and Cabool, of malignant fever, Aug. 27, 1825. His papers were recovered by Alexander Burns, and his *Travels* were edited by Prof. H. H. Wilson in 1841.

Moore, county of Central North Carolina. Area, 950 square miles. It is somewhat uneven and has a fertile soil. Live-stock, corn, and tobacco are staple products. Flour is the leading article of manufacture. The county has valuable iron ores and beds of excellent Triassic coal. It is traversed by the Western R. R. of North Carolina. Cap. Carthage. Pop. 12,040.

Moore, county of Tennessee, organized since the census of 1870. It is in the S. E. central part of the State.

Moore, tp. of Sanilac co., Mich. Pop. 112.

Moore, tp. of Oregon co., Mo. Pop. 921.

Moore, tp. of Shannon co., Mo. Pop. 286.

Moore, tp. of Northampton co., Pa. Pop. 2938.

Moore (Alfred), b. in Brunswick co., N. C., May 21, 1755; was educated in Boston; served in the Revolutionary war with much credit; was chosen attorney-general of North Carolina in 1790, and, though he had never read law, he soon mastered its principles; became a judge in 1798, and was, 1799–1805, an associate justice of the U. S. Supreme Court. D. at Belfont, N. C., Oct. 15, 1810.

Moore (Andrew), b. in South Carolina; became a lawyer of Perry co., Ala.; was often in the legislature, and was Speaker 1843–45; was a judge in a State circuit court 1851–57; governor of Alabama 1857–61; called the convention which passed the ordinance of secession, and also sent troops to seize the U. S. forts at Pensacola.

Moore (Benjamin), D. D., b. at Newtown, L. I., Oct. 16, 1748; graduated in 1768 at King's College, N. Y.; took holy orders in 1774 in England; was assistant minister of Trinity church, N. Y., 1774–1800; became rector in 1800; Protestant Episcopal bishop of New York 1801; was professor of logic and rhetoric in Columbia College, and its president 1800–11. D. at Greenwich, N. Y., Feb. 27, 1816.

Moore (Charles Whitlock), b. at Boston, Mass., Mar. 29, 1801; became connected in 1822 with the Masonic order, in which he attained the highest degrees; was for thirty-four years recording secretary of the grand lodge of Massachusetts; edited the *Masonic Mirror* 1825, the *Amaranth* 1828, and commenced in 1841 the publication of the *Freemason's Monthly Magazine,* which he has since conducted; founded *Zion's Herald* in 1823, and published several Masonic manuals.

Moore (Clement Clarke), LL.D., son of Bishop Benjamin Moore, b. at New York July 15, 1779; graduated at Columbia College in 1798; in 1821 became professor of biblical learning in the Protestant Episcopal Seminary; afterwards professor of Hebrew and Greek, and then of Oriental and Greek literature. Author of a Hebrew and Greek lexicon (1809), a volume of poems (1844), *George Castriot* (1850), and of the well-known ballad *The Night before Christmas,* etc.; also published two volumes of his father's sermons. D. at Newport, R. I., July 10, 1863.

Moore (Edwin Ward), b. at Alexandria, Va., in 1811; entered the navy as midshipman in 1825; had become first lieutenant in 1836, when he was engaged by the government of Texas to organize a squadron for that republic, and succeeded in fitting out at New Orleans two small vessels of war, with which he defeated and dispersed the Mexican fleet of eight vessels, including two steamers, in a series of engagements in the Bay of Campeche 1843. Notwithstanding his gallantry, Com. Moore was dismissed the service by Pres. Houston for disobedience to orders, but the Texan congress indemnified him for pecuniary losses and granted him a large tract of land. He subsequently resided many years in New York City, engaged in mechanical experiments and inventions, and d. there Oct. 5, 1865.

Moore (Erasmus Darwin), b. at Winsted, Conn., Sept. 30, 1802; studied theology at New Haven 1830–33; held Congregational pastorates at Natick, Mass., 1833–38, at Barre, Mass., 1840–42; edited the *Boston Recorder* 1844–46, the *Boston Reporter* 1846–49, the *Congregationalist* 1849–51; edited also the *Old Colony and Massachusetts Bay Record,* published by the State; took a position in the Boston custom-house 1861. Author of *Life-Scenes in Mission Fields* (1857) and other works.

Moore (Frank), b. at Concord, N. H., Dec. 17, 1828, a son of Jacob Bailey Moore; published *Songs and Ballads of the American Revolution* (1856), *Cyclopædia of American Eloquence* (1857), *The Rebellion Record* (11 vols., 8vo, 1862–68), and other volumes, mostly containing matter designed as materials for future history; was for a time secretary of legation at Paris.

Moore (Gabriel), b. in Stokes co., N. C.; was M. C. from Alabama 1822–29; governor of Alabama 1829–31; U. S. Senator 1831–37. D. in 1844 at Caddo, Tex.

Moore (George H.), LL.D., b. at Concord, N. H., Apr. 20, 1823; graduated at New York University 1843; assistant librarian of the New York Historical Society 1841–49; became librarian in 1849. Author of *Treason of Charles Lee* (1860), *Employment of Negroes in the Revolutionary Army* (1862), *History of Slavery in Massachusetts* (1866), *History of the Jurisprudence of New York,* etc. He is a son of Jacob Bailey Moore, the historian, and is now in charge of the Lenox Library.

Moore (Sir Henry), Bart., b. in Jamaica in 1713; became governor of Jamaica in 1756; received a baronetcy for suppressing a slave insurrection; was governor of New York 1764–69.

Moore (Henry), b. in Dublin, Ireland, in 1751; joined the Methodists in 1799; preached as a revivalist several years in Ireland; became the confidential associate of John Wesley during his later years, and published a *Life of John and Charles Wesley, and Memoirs of their Family* (1824). He was the last survivor of the ministers ordained by Wesley. D. in 1843.

Moore (Henry Eaton), son of Dr. J. B. Moore, b. at Andover, N. H., July 21, 1803; was apprenticed as a printer to his brother, the eminent antiquarian writer; edited a newspaper at Plymouth, N. H., 1825–26; became a teacher of, and an adept in, musical science; published a *Musical Catechism,* the *Merrimack Collection of Instrumental Music,* the *New Hampshire Collection of Church Music,* the *Northern Harp,* and other popular collections. D. at E. Cambridge, Mass., Oct. 23, 1841.—His brother, John Weeks Moore, b. at Andover Apr. 11, 1807, also became a printer; edited the Bellows Falls *Gazette* for several years; published *A Complete Encyclopædia of Music* (1854) and other works on the subject.

Moore (Jacob Bailey, Jr.), b. at Andover, N. H., Oct. 31, 1797, was the son of Dr. J. B. Moore, U. S. army (1772–1813), a musical composer and song-writer, and brother of Henry Eaton Moore and of John Weeks Moore (b. Apr. 11, 1807), both authors and musical writers of distinction. Mr. J. B. Moore became a partner and brother-in-law of Hon. Isaac Hill; was long a printer and journalist of New Hampshire; librarian of the New York Historical Society 1845–48; postmaster of San Francisco, Cal., 1848–52; was one of the editors of the *Historical Collections of New Hampshire* (1822–24), author of *Memoirs of American Governors* (1846), *Gazetteer of New Hampshire,* and valuable works of local history. D. at Bellows Falls, Vt., Sept. 1, 1853.

Moore (Jesse Haile), b. near Lebanon, St. Clair co., Ill., Apr. 22, 1817; graduated at McKendree College Aug., 1842; was teacher two years at Nashville, Ill., when he was appointed principal of Georgetown Seminary; licensed to preach in 1846, he accepted in 1848 the pastorate of the M. E. church at Shelbyville; was principal of Paris Seminary 1848–54, and president of Quincy College 1854–56; then for two years in charge of the M. E. church at Carlinsville. At the outbreak of the war he was located at Decatur. Resigning his charge in 1862, he raised the 115th Illinois Vols., which he commanded at Chickamauga, Tunnel Hill, Resaca, etc., at Franklin, Nashville, and subsequent pursuit of Hood, part of the time in command of a brigade; brevet brigadier-general 1865; was presiding elder of Decatur district, Illinois conference, in 1868, when he was elected to Congress; re-elected in 1870.

Moore (John), M. D., b. at Stirling, Scotland, in 1730; studied medicine and surgery at Glasgow, London, Paris, and in Holland; was for a time physician to the British embassy in Paris; spent five years in travels as medical attendant of the duke of Hamilton; settled at London 1778; published in 1779 and 1781 his travels on the Continent, which passed through seven editions, and in 1789 a very successful novel, *Zeluco,* the work by which he is best remembered. Dr. Moore was a witness of some of the atrocities of the French Revolution during a residence at Paris in 1792, wrote two works upon that subject, and two other novels, which were much less successful than *Zeluco.* He edited Smollett's works, with a life of the author (1797), and d. at Richmond, Surrey, Feb. 20, 1802. Dr. Moore was an early friend of Burns, and was father of Sir John Moore, killed at Corunna. A uniform edition of his *Works* was published by Robert Anderson, with a prefatory memore (7 vols., 1820).

Moore (Sir John), K. B., son of John Moore, M. D., b. at Glasgow, Scotland, Nov. 13, 1761; entered the army in 1776; served in the Mediterranean, in America, and the West Indies, and sat in Parliament for a time; was governor of St. Lucia 1796–97; served in Ireland 1798; was badly wounded in the Netherlands 1799; served in Egypt, and became major-general and K. B. 1801; served afterwards in Sweden (1808) as envoy and commander of the British contingent; took (Oct. 6, 1808) chief command of the British troops in the Peninsula, numbering 23,000, managing the campaign against Napoleon with consummate skill and boldness; but the failure of the Spanish to co-operate with him compelled him to fall back upon Corunna. He conducted the retreat with masterly skill. He was killed at the battle of Corunna by a cannon-shot, Jan. 16, 1809. This battle was an extremely spirited one, and the victory was claimed by both sides. The British troops at once took

ship for England, and the town was evacuated. *The Burial of Sir John Moore*, by the Rev. Charles Wolfe, has immortalized both its subject and its author.

Moore (Joseph), b. in Virginia in 1767; was a pioneer of Methodism in Virginia and North and South Carolina; was sixty-five years in the ministry, and at his death (Feb. 14, 1851) was a venerated patriarch of the South Carolina conference of the M. E. Church, South. T. O. Summers.

Moore (Martin), b. at Sterling, Mass., Apr. 22, 1790; graduated at Brown University 1810; was for thirty years Congregational pastor at Natick, and afterwards at Cohasset; edited the Boston *Recorder* twenty years; was author of a *History of Natick* (1817) and a *Life of John Eliot*, and vice-president of the New England Genealogical Society 1861–66. D. at Cambridge Mar. 12, 1866.

Moore (Nathaniel F.), LL.D., a nephew of Bishop Benjamin Moore, b. at Newtown, L. I., Dec. 25, 1782; graduated at Columbia College 1802; was admitted to the bar 1805; became in 1817 adjunct professor, and in 1835 professor of Latin and Greek in Columbia College; was its librarian 1837–42, and its president 1842–49; was author of *Lectures on the Greek Language and Literature* (1835), *Ancient Mineralogy* (1834), an *Historical Sketch of Columbia College* (1846), and other writings.

Moore (Richard Channing), D. D., b. in New York Aug. 21, 1762; was educated at King's College, N. Y.; went to sea; became a physician; took orders in the Protestant Episcopal Church 1787; was pastor at Rye, N. Y.; for twenty years rector of St. Andrew's, Staten Island; rector of St. Stephen's, N. Y., 1809–14; consecrated bishop of Virginia 1814. D. at Lynchburg, Va., Nov. 11, 1841. (See *Memoir*, by J. P. K. Henshaw.)

Moore (Thomas), b. at Dublin, Ireland, May 28, 1779, of Roman Catholic parents; was in youth distinguished for his skill in lyric poetry; studied at the Dublin University and at the Middle Temple, London. His first volume of poems, the *Anacreon* (1800), was a success; the *Poetical Works of Thomas Little* (1801) was vastly more popular, though disgraced by a vein of licentiousness which Moore lived to regret. He was in the civil service in the Bermudas 1803–04; made the tour of the U. S. and Canada; married in 1811 Bessy Dyke, an actress and a woman of admirable character. For many years his principal writings were political satires in the Whig interest, full of wit and of general interest in their own day, but of small value now, and often disgraced by the repetition of scandalous stories and innuendoes regarding the private affairs of his adversaries. His subsequent works of permanent value are the *Irish Melodies* (1807), *Lalla Rookh* (1817), *Loves of the Angels* (1823), *Life of Sheridan* (1825), *The Epicurean*, a romance (1827), *Life of Byron* (1830), and the *History of Ireland* (1827–35). Moore as a song-writer and anacreontic and erotic poet is without a single rival in the English language. His muse, as he advanced in life, flew in a purer and serener air than in his youth. For choice diction, thorough finish, wit, and melody few poets can compare with him, yet his topics are never of the highest. His thoughts are seldom grand. His sentiments are usually generous, rather than noble or exalted. Moore had brilliant powers in conversation, was a talented singer, and often sang his own compositions in society. Late in life his mental powers underwent a decline. D. at Sloperton, Wilts, Feb. 25, 1852.

Moore (William), a merchant of Philadelphia, was president of the executive council and *ex-officio* governor of Pennsylvania 1781–82; his daughter Elizabeth became Marchioness de Marbois.

Moore (Zephaniah Swift), D. D., b. in Palmer, Mass., Nov. 20, 1770; graduated at Dartmouth College in 1793; became pastor of the Congregational church in Leicester, Mass., in 1800, and in 1811 professor of languages in Dartmouth College; in 1815 was president of Williams College, and in 1821 of Amherst College. He took a special interest in the natural sciences. Overwhelmed by the cares, labors, and conflicts attending the new institution, he d. in the second year of his presidency. (See Sprague's *Annals of the American Pulpit*, vol. ii. p. 393, and *History of Amherst College*, by the writer of this sketch, p. 91.) W. S. Tyler.

Moore'field, tp. of Clark co., O. Pop. 1268.

Moorefield, post-v. and tp. of Harrison co., O., 12 miles S. W. of Cadiz. Pop. of v. 289; of tp. 1117.

Moorefield, post-v., cap. of Hardy co., West Va., on the S. branch of the Potomac River, has 2 high schools, 3 churches, 2 weekly newspapers, 2 large grist-mills, 1 tannery, 2 hotels, and stores. Pop. 2676.

S. D. Gordon, Ed. "Weekly Examiner."

Moore's Bridge, post-tp. of Tuscaloosa co., Ala. Pop. 556.

Moore's Hill, post-v. of Sparta tp., Dearborn co., Ind., near the Ohio and Mississippi R. R., is the seat of Moore's Hill College (Methodist). Pop. 617.

Moores'town, post-v. of Chester tp., Burlington co., N. J., on the Camden and Burlington County R. R.

Mooresville, post-v. and tp. of Limestone co., Ala., on the Memphis and Charleston R. R. Pop. of v. 165; of tp. 2303.

Mooresville, post-v. of Brown tp., Morgan co., Ind., 15 miles S. W. of Indianapolis, on the Indianapolis and Vincennes R. R., has 2 schools, 3 churches, 1 newspaper, 3 saw-mills, 1 savings bank, and stores. Pop. 1229.

A. W. May & J. H. Burke, Eds. and Props. "Enterprise."

Mooresville, post-v. and tp. of Livingston co., Mo., on the Hannibal and St. Joseph R. R. Pop. 1092.

Mooresville, a v. of Harrison tp., Ross co., O. Pop. 52.

Moor-Fowl, incorrectly called **Red Grouse**, a ptarmigan of the British Islands (*Lagopus Scoticus*), which is one of the most highly prized of British game-birds. It is not only shot extensively by sportsmen, but it is snared for market, and even bred in confinement for food. It is about sixteen inches long, mostly of a red-brown color, and feathered to the toes.

Moorhead, post-v., cap. of Clay co., Minn., on the Red River and on the Northern Pacific R. R., has 1 weekly newspaper.

Moor-Hen, the *Gallinula chloropus*, a European, African, and Asiatic wading bird of the rail family (Rallidæ). The moor-hen swims well, and makes a singular nodding motion with the head. It is some thirteen inches long, and of a brown and gray color. It is domesticated, or rather bred extensively in a half-domesticated state, in England. Its flesh is prized as food.

Moor'land, tp. of Muskegon co., Mich. Pop. 194.

Moorland, post-v. of Franklin tp., Wayne co., O. Pop. 69.

Moors, the name generally given to the Mohammedan race who invaded the southern part of Spain in the early part of the eighth century A. D., though by no means accurately expressing either the character or the genealogy of these conquerors. There can be no doubt that all the leaders of this famous invasion were Arabs, just as much as those who had previously overthrown Egypt on the West and Persia on the East; but as their forces were largely recruited from the African population of the neighborhood, the old *Mauri* of *Mauritania*, the whole of the invaders were called by the popular name of Moors; so, too, in early English writers Mohammedans are constantly thus designated. In like manner, when Vasco da Gama sacked the sea-coast cities of India, his chronicler, Correa, calls the unoffending objects of his cruelties Moors. Other names given to them were Saraceni, from Al-Sherki, the Easterns; Hagareni, or the children of Hagar; and Ishmaelitæ, Ishmaelites. They were a very mixed race, of different African tribes, though principally the people of Barbary, but comprising also Numidians, Phœnicians, Romans, and Arabs. In modern history they appear first as the allies of the Vandals in their invasion of Africa, and hence at all times as opposed to the rulers of the Byzantine empire; about A. D. 707 they were finally conquered by the Arabs, but not without a desperate struggle, in which they exhibited the usual stubborn courage of a race who had never, even by the Romans, been crushed out of existence. The history of their invasion of Spain is the simplest possible, and needs not, to account for it, the poetical tales invented afterwards. Roderick, the last of the Goths (or rather Visigoths) of Spain, was probably not worse than his predecessors, and if he did insult a daughter of a Count Julian, it is probable he only acted as any other Visigoth would have acted had he had the chance. Food was scarce among the Berber tribes; much discord prevailed in the waning kingdom of the Visigoths; the Jews, cruelly oppressed by the Spanish rulers, as everywhere else, were for aiding any who might help them; above all, the Arab chiefs, who had swept the seaboard of Africa to the waters of the Atlantic, had warriors at their disposal hard to restrain under peaceful bonds, but ready to undergo any toils for the hope—indeed, certainty—of further plunder. Hence, the invasion of Spain was naturally on this wise: Musa, the Arab viceroy of Western Africa, sent his freedman Târik A. D. 711 to survey its southern provinces, and in less than one year the whole of Andalusia, then the richest part of the Peninsula, had submitted to his arms, while he had himself left behind him for all time a sure record of his prowess, the ancient Calpe, which he had captured, being named from him Gebêl-al-Târik (the hill of Târik), now shortened into Gibraltar. In the course of the next year Musa himself came over, jealous of the fame of his

lieutenant, and for the next five-and-forty years all Spain, except the Asturias, submitted to the rule of successive warriors with the title of emirs, the deputies of the viceroys of Africa. Many of these men (they were twenty-one in all) were able administrators, and revived agriculture and the arts, which had fallen into abeyance towards the close of the feeble sway of the Visigoths; while some of them carried their arms into France, and attempted, but in vain, to establish there a similar Arab kingdom. The fate of perhaps their greatest leader, Abd-er-rahman, and the crushing victory over him in A. D. 732 by Charles Martel in the plains of Tours, is known to every student of history. In later days, though Arab hosts ravaged Carcassonne and Narbonne and burnt Marseilles, they were never able to secure a permanent footing on French soil.

The subsequent history of the Moors in Spain is the history of certain dynasties they founded there, which maintained for more than seven centuries a strong or a weak sway over the whole or parts of that country, according as they were or were not supported by the bulk of their own people; internal treachery in the end accomplishing what all the arms or valor of the Christians had failed to achieve. Indeed, the first efforts of Ferdinand the Catholic were crowned with glory chiefly because the Arabs, divided among themselves, were unable to oppose a steady front to enemies far more merciless than themselves. The first, indeed the only, dynasty who swayed the whole of Spain and Portugal with the exception of the Asturias, was that of the Ommiade khalifs from A. D. 756 to A. D. 1036. This dynasty was founded by Abd-er-rahman, a military adventurer who had escaped from the final massacre of his relatives of the house of Ommiah, who, as the first khalifs or successors of Mohammed, had reigned for the most part at Damascus. Abd-er-Rahman was well received by the population of Spain, who had little reason to love the Abbasside or second family, who had destroyed their Ommiade predecessors. Abd-er-Rahman, who reigned thirty-four years, was a man of ability, and during his rule his capital, Cordova, was a centre of learning—not for Arabs only, but for Christians. Many able rulers followed him, the most eminent being the second and the third of that name. Abd-er-Rahman II. was distinguished as a warrior of great prowess, which is shown by his recapture of Barcelona from the Franks (A. D. 827), his burning of Marseilles (A. D. 839), and his successful encounter with the first Scandinavian vikings who had reached Spanish coasts (A. D. 844–845). Like the still greater Abd-er-Rahman III., he executed many noble and useful works, and was a warm friend of the arts. Abd-er-Rahman III., whose reign extended over the long period of fifty years, from A. D. 911 to 961, was probably, with the exceptions of Haroun-al-Raschid and Akbar of Delhi, the ablest ruler who has ever governed the followers of the Prophet. As a warrior he was pre-eminent, but as an administrator he was even greater. He was, too, the first of the Western rulers to adopt the title hitherto reserved for the khalifs of Bagdad alone, that of "commander of the faithful," and to rule his own dominions without reference to the original seat of Islam. Many of the works he executed still attest his power and munificence—notably, the great mosque at Cordova, with many roads, canals, aqueducts, and bridges. Many colleges and schools were also founded by him or by his son, Al-Hakem II., who, more perhaps than he, was an enthusiastic lover of literature, the great library he formed at Cordova being, according to all the best authorities, unrivalled at that period elsewhere. After the death of Al-Hakem (A. D. 976) the Ommiade power rapidly declined, chiefly from internal quarrels or from the ill-regulated ambition of individual princes. Indeed, on the dissolution of this family the Mohammedan power in Spain may be said to have been in a state of decay more or less rapid; and though from time to time men of vigor arose and for a while restored the sinking fortunes of Islam, the attacks of the Christians to the N. became more and more persistent, ending, as all know, in the final capture of Granada by Ferdinand in 1492. The Ommiades were succeeded by a series of independent chieftains, who ruled as separate kings over Seville, Saragossa, Toledo, Valentia, Badajoz, and Tortosa during about a century (A. D. 1031–1138); and these, again, were followed by the Al-Moravides, a set of religious reformers, who, having reduced the isolated tribes on Mount Atlas, invaded Spain on the invitation of their co-religionists, then hard pressed by the Christians. The Al-Moravides (sometimes called Morabetin and Marabut) held the southern part of Spain for about fifty years (A. D. 1099–1146), and then gave way to another religious sect, calling themselves the Al-Mohades, a feeble race, who have left behind them but few relics of their sway except the great mosque at Seville (now the cathedral), erected by Yoosuf-Aboo-Yakoob in A. D. 1171. At the close of their rule the Christians were in possession of almost all the chief cities and castles of Spain, even the king of Granada, Mohammed, being in 1238 the tributary of Ferdinand III.

From this time to the ultimate fall of the Moorish empire in 1492, under the rule of their last king, Aboo-Abdallah (the *Boabdil* of Western story), the chronicles of the kings of Granada record little but incessant wars with the Christians and a succession of rulers, each weaker or more worthless than his predecessor. Learning, so conspicuous in the earlier days of the Mussulman government in Spain, rapidly decayed. After the taking of Granada, the Moors who desired to remain still in Spain were required to accept the outward forms of Christianity and to be baptized, and those who did so were called by the *Moros* (or adherents to the ancient faith of Islam) *Christianos Moriscos*, or *Moriscos* alone, in derision. The atrocious cruelty with which these poor people were treated after every solemn promise had been broken by the Catholic party is a grievous blot on the memory of Ferdinand and of his successors. The Inquisition had nowhere more victims for its abominable tribunal. W. S. W. VAUX.

Moo'ruk ("the swift"), an ostrich-like bird of the cassowary genus (*Casuarius Bennetti*), but differing from the cassowary of North Australia (*C. australis*) and related species in having the helmet-shaped crest of its head much less elevated and flattened behind, and the absence of cervical wattles. Compared with its newest allies (*C. Westermanni* and *C. picticollis*), it is distinguished by the blue color of the throat as well as the back of the neck. It is an inhabitant of the Australasian island of New Britain. It is very easily tamed, and, like the ostrich, swallows stones, iron, and whatever else it can pick up. It is some five feet high. When hard pressed it kicks, giving a severe blow. The natives regard it with affection and reverence.

Moose. See ELK.

Moose'head Lake, the source of the Kennebec River, lies in Somerset and Piscataquis cos., Me. It is 36 miles long, from 3 to 10 miles wide, and is surrounded by a picturesque forest-region sparsely inhabited. It is a favorite resort for sportsmen and anglers. Its waters abound in fine trout and are navigated by steamers.

Moose Lake, post-tp. of Carlton co., Minn., on the Lake Superior and Mississippi R. R. Elevation, 1052 feet. Pop. 51.

Moose River Plantation, tp. of Somerset co., Me. Pop. 104.

Moo'sup, post-v. of Plainfield tp., Windham co., Conn., on the Hartford Providence and Fishkill R. R.

Moque'hua, or **Moquega,** town of Peru, capital of a province of the same name, is beautifully situated in a valley at the foot of the Andes, traversed by the Tambapalla, and is well built. Pop. 7000.

Moqui' Indians, a body of Pueblo Indians in Arizona, inhabiting seven villages in the region S. W. of the Navahoes. They are an interesting people, but seem to be less civilized than the other Pueblo Indians. Their houses are of stone and mortar. Their progress has been impeded by the aridity of the region they inhabit. Pop. 1663.

Mo'ra, county of N. E. New Mexico, bounded E. by Texas, S. by the Canadian and Mora rivers, and W. by the main chain of the Rocky Mountains. Estimated area, 6000 square miles. It is in part composed of arid hills and plains, with fertile valleys, having iron ores, gold, and good lignitic coal. Wool-raising is at present the chief industry. Timber is in most places deficient. Cap. Mora. Pop. (chiefly of Mexican origin), 8056.

Mora, post-v., cap. of Mora co., N. M., 18 miles W. of Fort Union, on Mora Creek, in a fertile and beautiful valley shut in by mountains, and its inhabitants are mainly of Mexican origin.

Moradabad', town of British India, capital of a district of the same name, is ill built, but contains a large state prison and extensive barracks, and carries on an active trade. Pop. 57,414.

Moraine' [Fr.], a mass of stone and earth deposited by a GLACIER (which see), either along the sides of its track (lateral moraines) or at the termination of its course (terminal moraine). A *medial* moraine is one which is deposited within the glacier's track, but below the union of two glaciers into one. Recent moraines in the Alps are frequently thirty or forty feet high and miles in length; they are generally destitute of vegetation, and can be traversed only with peril. Geological exploration discovers many ridges and hills which were originally moraines. In some instances a terminal moraine stretching across a valley serves as a natural dam, supporting a small lake. The town of La Grange, Me., affords some remarkable ancient moraines, and smaller ones are abundant in the U. S.

Mor′al, post-tp. of Shelby co., Ind. Pop. 1720.

Moralities. See Mysteries.

Moral Philosophy. Moral philosophy is the science which treats of duty or of duties. *Mos*, Lat., ἦθος, Gr., each signifies a way or manner of acting, and therefore of choosing or desiring to act; hence the appellations morality, moral philosophy, and ethics. Action in this connection signifies appropriate or becoming, or a right action, and right action signifies obligatory action, which is duty. The science which treats of duty must necessarily treat of the endowments or faculties and the conditions which are requisite for the performance of duty. It must therefore include or assume a knowledge of the nature of man as a moral being, and so far must involve psychological analyses as fundamental and preliminary to its special inquiries. It must also rest upon certain *a priori* intuitions or fundamental relations, commonly called metaphysical, otherwise it cannot be truly scientific or authoritative. It must assume that man has an ascertained place in the system of nature, in order to deduce the modes of action which are appropriate to his position and the ends for which he exists. In other words, moral philosophy, like every other science, must rest upon certain fundamental principles. These may be facts which are affirmed of the constitution of the soul, and which are attested by human consciousness to be necessary to constitute man a moral being, as reason, sensibility, and a responsible will, or they may be certain general propositions concerning the kind of actions which are obligatory. From these principles conclusions are derived by the processes of deduction. A series of such conclusions, properly arranged and connected, becomes a moral or ethical system. Such a system, when designed for instruction or other intellectual ends, is called theoretical morality, or moral science proper. When these principles are stated in such a form as to be directive of the purposes or actions of men, they are called rules. Principles are primarily designed for instruction: rules are intended for the conduct. A system of practical rules, when so arranged as to provide for and enforce the various duties of man, is called *theoretical morality*, sometimes *ethics*. The term *ethics*, however, when used in a broad sense, is a synonym for moral philosophy, and is subdivided in the usage of some writers into *scientific and practical ethics*.

Casuistry is the branch of moral philosophy which treats of questions concerning duties which appear to conflict or to be incompatible with one another. These are called cases of conscience, and the principles and rules for the adjustment of these are *casuistry*.

Christian ethics is an appellation for those principles and rules of duty which are formally sanctioned by Christianity or are indirectly derived from its facts and motives.

Theological ethics is a term peculiar to German theologians, who designate by it the theory and rules of those characteristically spiritual exercises and actions which are to be referred to the truths and motives of Christian theology for their origin and sustentation.

It is obvious that moral philosophy is somewhat peculiar as a science, in that it is directly applied not to actions as they are, but as they *ought to be*. Every other science concerns itself with the actual phenomena of matter or spirit, and endeavors to ascertain the forces which originate them and the conditions or laws by which they are produced. This science is limited to phenomena which are largely ideal and unreal. The actualities with which it concerns itself are man's capacities for these actions, and the motives or impulses which impel to them. In one view its sphere would seem to be unreal and imaginary. In another its motives and authority are the most real and important of all the forces which are either known or can be conceived. It contemplates that side of man's nature which is the most exalted, and it discusses principles and questions which are concerned with the most valued human interests; not alone with the relations which man holds to his Creator and to immortality, but to those rights of property, of liberty, and of life which are the most sacred and important of man's nature, and those duties of truth, gratitude, and humanity which are essential to human society, and those sentiments of honor and self-respect, of loyalty and courtesy, which are the support and ornament of human civilization.

Moral philosophy may be considered as speculative and practical. As speculative it is concerned with two classes of questions: (1) with those which respect the capacities or endowments which qualify man to act morally, such as these: What is the so-called moral nature of man? Is it a separate faculty which is capable of certain experiences that are called moral over and above the functions which are peculiar to the intellect, sensibility, and will, or is it an appellation for these powers when exercised in a certain manner and peculiarly related to one another? Or, again: Is it an appellation for a something other than these three —a *quartum quid*—by union with which man exercises moral volitions, experiences moral feelings, and pronounces moral judgments? Akin to this, if it be not the same, is the question, What is conscience? Is it intellectual and emotional, or both? What is its authority? Is it infallible or subject to error? Is it capable of progress and improvement, and of retrogression and deterioration? Are any of man's moral judgments infallible and uniform? If so, what and why? Are any fallible and diverse? and if so, what and why? Questions of this nature are either plainly psychological or are answered by means of psychological analyses and the inferences founded upon them. Is the freedom of the will essential to the sense of moral responsibility? Is it conceivable? Is it actual? How can it be reconciled with the domain of law? How with the influence of motives? What is moral character as distinguished from moral actions? What is a moral disposition? and what relation does it hold to a special emotion or desire, or volition? How is the supremacy or authority of moral judgments explained? What is the sentiment or the sense of obligation? Is it intellectual or emotional? Whence is it universal and assertory in character?

(2) The second class of inquiries with which speculative moral science is concerned comprises those which relate to the correct definition and ultimate analysis of ethical conceptions and the accurate statement of ethical principles. Examples of these: What is the nature of virtue? Are right and wrong original, simple, and indefinable intuitions, or are they derived, complex, and definable concepts? If the first, what relations do these intuitions hold to the emotional nature? Are they simply intuitions of intellectual relations, or are they intuitions of emotional experiences? If the second, what are their elements? How can their universal presence and their necessary origination be explained? What is the relation of the feeling of obligation to the desire of happiness? How can the universal and authoritative character of moral judgments be explained on the theory that ethical conceptions are complex?

Moral philosophy on its practical side is occupied with the determination of those rules or principles which are required for the guidance of the conduct and the formation of the character. Men owe certain duties to themselves growing out of their natural or acquired capacities, their position and prospects in life, and the ends and aims for which they exist. They also owe manifold duties to their fellow-men, which are determined by those permanent or changing relations in which they are connected with them. Supreme above all, and in a sense controlling all other relations, are those in which they stand to the Creator. To define and classify and enforce the duties which grow out of these relations are the functions of practical ethics. Should these duties appear to conflict, and questions of doubt and difficulty arise, it is its office satisfactorily to adjust the claims of each and to relieve the inquirer and doubter of his difficulties, so that he may be satisfied as to what he ought to do. Even if no difficulty or doubt should embarrass the mind, the explanation of the grounds of our duties is often most salutary and satisfying, as it increases the confidence and zeal with which duties are performed. It imparts an intellectual interest and enlightenment to our moral activities, and elevates the ethical life by the consciousness that it is justified and enlightened by intellectual convictions. For the purposes of instruction practical ethics is indispensable. It teaches those who have not learned what their duties are. It leads those to think who have not thought before, and by awakening thought secures conviction. It brings facts and truths to mind which have not been considered, and by appeals to the reason it affects the character and conduct. It arrays the motives which are fitted to influence the conduct before the sensibilities and will, and arouses men to the right and deters them from the wrong. All teachers and reformers, all preachers and prophets, more or less consciously and systematically avail themselves of ethics in their practical work.

Moral philosophy, both in its speculative and practical forms, is capable of progress. It has actually made progress with the advancement of reflective or scientific thought. In this department of knowledge and of thought, as truly as in every other, man can observe and discriminate facts unobserved before. He can discern in these facts relations before unnoticed; he can form more exact definitions and devise more fundamental and comprehensive principles. The science of duty has made as conspicuous progress as any other science, and the history of the successive steps of its advancement is marked by the changes which attend all science. In speculative morals these changes involve the clearer and the more confused observation of

facts, a sharper and a more obtuse analysis, a greater or less exactness of definition, a more or less profound and comprehensive statement of principles, and a more or less consistent arrangement of these products into a system. These changes depend largely upon the general scientific culture and progress of the age or period, upon the correctness and profoundness of its psychology and metaphysics, and, more than all, upon the soundness and thoroughness of its prevailing religion. Practical ethics in a certain sense may be said to follow in the train of speculative morality. They must necessarily do so, so far as the practical rules of life and conduct are logically derived from scientific axioms and speculative doctrines. It is only when a breach is effected between the speculation of a generation and its rules of duty that practical morality can be saved from the degeneracy of a superficialness of its speculative science and morality.

The beginnings of moral science are found in those proverbs or practical sayings which embody the sagacious observations of the wise men of their time, who are interested in the improvement of their fellow-men and of society. The sayings of the wise men of Greece, the proverbs of Solomon, the moral teachings of Confucius and of other Oriental prophets and reformers, represent the beginnings of speculative and practical ethics. These usually rise no higher than certain practical generalizations, which are often striking by a brief and antithetic statement, a pointed example, or attractive by imaginative fervor or sacred by divine authority. If the sages who write them have a crude physics or psychology, they must necessarily clothe their moral teaching in the scientific terminology of their scientific theories of nature or of man. If they confine themselves to those views of man and of nature which are expressed in the language of common life and are the common stock of poetry in all ages, they need never be outgrown or abandoned. Thus: to Thales were attributed the sayings, "Know thyself," and "What is difficult? To know one's self; and what is easy? To advise another." To Solon: "Speak not falsely," "Learn to command by first learning to obey," "Nothing in excess." To Bias: "The possession of power will bring out the man." Sayings similar to these are to be found in all literature. Those of the wise men of Greece have a special interest, because in Greece only were they followed by the beginnings of ethical science. Socrates, in originating that movement of scientific thought which has never been arrested, assigned to ethics the supreme place as the only worthy subject of philosophical investigation. He taught that moral excellence rests on true knowledge or insight as its ground, that all virtues are in their essence one, and that wickedness proceeds from ignorance. He recognized the presence of conscience under the appellation of a Genius. The immediate followers of Socrates were—*first*, Antisthenes and the Cynics, who emphasized the doctrine that virtue elevates man above dependence upon any special desires; which doctrine was caricatured by the offensive extremes of Diogenes. These were the natural forerunners of the Stoic school. *Second*, Aristippus and the Cyrenaic school, who like the Epicureans carried the Socratic doctrine that virtue and happiness must coincide to the one-sided extreme that pleasure is the supreme good. *Third*, Euclid and the Megarics emphasized the doctrine that good of every species is self-identical and one. Plato's ethics is founded on his metaphysics and psychology. Metaphysically, it is the attainment of the supreme good, which is another phrase for the realization and manifestation of the idea of humanity. Virtue in general involves the domination of the higher or governing power, the reason over the sensuous or animal, intermediate between which is the impulse of courage, the virtue of the heart; the virtue of reason is wisdom, of the heart is courage, of the senses is temperance. The virtue which regulates these three is justice. The principal sphere for the exercise of morality is the state. Plato emphasizes the doctrine, which was practically accepted by all the ancients, that the state is supreme over the individual, and that to its interests the happiness, the rights, and the interests of the individual should be sacrificed; also, that all the duties which the individual owes to his fellow-men or to humanity are limited by the organized community in which he belongs. This generally-accepted theory Plato applied with the extremest logical consistency and vigor, setting aside the relation of marriage and the rights and affections of parents and children, and giving education entirely into the hands of the state. The ethics of Aristotle is characteristic of the man and his philosophy. He finds the *summum bonum* in the highest end of which man is capable. This end is happiness—*i. e.* rational happiness, at once a well-being and a well-doing, a perfect activity in a perfect life. He recognizes virtue as dependent on activity, and defines it as an acquired moral capacity of the soul, following the definition of Pythagoras, that virtue is the habit of duty. All virtues are either ethical or dianoetic. Ethical virtue is the permanent direction of the will, which guards the *mean* between two opposite excesses, as this is determined by the intelligence. The highest of these is justice, which in its wider sense is the union of all the virtues with which our fellow-men are concerned; and in the narrower it respects the equitable in gain or loss. Dianoetic virtue is the correct ordering of the theoretical reason, either in itself or in reference to the other psychical functions.

Man is by nature a political being. The state exists not only for the life, but for the higher ends of man. Its basis is the family, and therefore the rights of the family, and in turn of the individual, must be regarded by the state.

With Aristotle the ethical science of the ancients may be said to have reached its culmination. The Nicomachean ethics, the most conspicuous of his ethical treatises, and the one oftenest referred to, has influenced the opinions of thinking men down to the present time, and it continues to command their notice and respect. The first Aristotelian schools, especially the Stoics, the Epicureans, and the neo-Platonists, introduced new practical teachings, but in principle brought no essential modifications of the doctrines of the leaders of the Socratic school.

The Stoics taught that virtue is a life conformed to nature—that virtue is sufficient for happiness, but happiness should not be made the end of human endeavor. The cardinal virtues are practical wisdom, courage, discretion, and justice. To the perfect performance of duty a right disposition is required, as well as right action. The wise man alone attains to the perfect performance of duty; he is without passion, but not without feeling; he is free, he is king and lord even over his own life.

The Epicureans taught the same system with the Cyrenaics. Happiness is the highest good. Happiness results from motion or rest. Pleasure and pain are both mental and bodily. The virtuous man is he who proceeds rightly in the quest of pleasure. Duration of existence does not affect happiness.

The neo-Platonists defined the perfection of man as consisting in his return to God by emancipation from sense and matter. This is accomplished by virtue, through the ecstatic imitation of God and union with him.

Christianity in its forms and claims was not a system of ethics, but a religion. And yet in setting forth Christ as a perfect example of moral excellence and the founder and head of a new moral or spiritual kingdom, it had an important significance in the science of morals. It is true, neither Judaism with its commands of exclusive worship of one God and of supreme love to him, and its requisition of sincere and disinterested love of man, nor Christianity, with its profoundest conceptions of love to the heavenly Father and its message of forgiveness through Christ, asserted any peculiar scientific principles or rules in either speculative or practical ethics. But the truths and facts which they taught could not but furnish both materials and impulse for the progress of moral science so soon as scientific thought should be applied to the truths of the newly-received religion. We find in the New Testament and in the teachings and practice of the Christian Church not only a purer practical morality in spirit and life, but we find that this morality implied a profounder and truer principle concerning the moral nature of man and the end of his existence, concerning his destiny, his relations to his Creator, to his fellow-men, concerning the family, the state, and the Church, than any of the ante-Christian systems had recognized. As fast as ethics, as such, became the field of special inquiry the new Christian material was viewed after the Aristotelian or Platonic method, and was assimilated, so far as was possible, with the ethical systems already received in the schools. As each writer was predominantly Platonic or Aristotelian, such would be his ethical philosophy. The doctrines of grace, of free-will, and of original sin could not be explained or defined without more or less distinctly implying an ethical system. Now and then a conflict ensued between the new and the old elements. When this happened the unscientific Christian ethics was in part adjusted to the doctrines of Aristotle and Plato, and in part was added to or modified them. The Fathers and doctors of the Church could not but discuss ethical questions and inculcate moral duties in their discourses and writings, and in the light of the history and teachings of the Scriptures and of the Church. So far as the authority of the Church was recognized as supreme in matters of duty, it introduced another disturbing element. After philosophy—*i. e.* the philosophy of Plato and Aristotle—was recognized in the schools as supplementary to the teachings of the Church, the greatest of the Scholastics, Thomas Aquinas, produced an elaborate treatise on speculative and practical ethics. This achievement may be taken as the best example of Scholastic Aristotelian ethics

as modified by the Latin Christianity. Thomas Aquinas follows Aristotle in his definition of virtue and the division of the virtues into ethical and dianoetic, the latter being ranked as the higher. To the philosophical—chief among which he reckoned the four cardinal virtues—he adds the theological virtues of faith, love, and hope, the first class being natural and the last being supernatural. The moral faculty is not destroyed by the fall of man, and is both a habit of certain principles and the act by which we apply them. Perfect happiness is the supernatural gift of God.

After the Protestant Reformation the distinction between two sorts of truth—viz. philosophical and theological—was gradually abandoned; the relation of the truth of reason and the truth of revelation was more clearly discerned. Natural was separated from revealed theology, and ethical truth as discerned by the moral nature of man was gradually recognized as the necessary assumption and foundation of supernatural religion. Jural and political discussions, however, had no inconsiderable part in developing and stimulating ethical inquiries. The writings of Grotius and Puffendorf are important in the early history of modern ethics. The early Protestant writers accepted in general the Aristotelian ethics as modified by Christian ideas, but taught no coherent scientific system. Even Descartes and Spinoza treated of ethics only in the most incidental fashion, the *Ethica* of Spinoza being a misnomer for a purely metaphysical treatise.

Modern ethics began with the discussions which were occasioned by Thomas Hobbes. Hobbes wrote primarily in the interest of his political theory of despotism, contending that the ethical distinctions are the product of positive legislation, and are consequently, in a certain sense, changeable and arbitrary. In consistency with this theory he taught that man as an individual is naturally hostile to his fellow, and is incapable of sympathetic or benevolent affections. He is also incapable of voluntary action or freedom in any proper ethical signification of the term. The boldness with which these positions were asserted, and the rigor with which they were applied, aroused a host of adversaries. In thus originating modern ethics Hobbes to a certain degree determined its form. As against Hobbes, Cumberland, his earliest and one of his ablest antagonists, taught that nature manifests and enforces ethical laws. The laws of right or practical reason are certain propositions of unchangeable truth which direct our voluntary actions, and impose an obligation to external actions without civil law. The general law which is thus imposed is that "the greatest benevolence of every rational agent towards all forms the happiest state of every and of all the benevolent, so far as is in their power; and it is necessarily requisite to the happiest which they can attain; and therefore the common good is the supreme law." The law of nature is immutable because it cannot be changed while the nature of things remains unchanged. But the nature of things depends on the Divine will. Ralph Cudworth also wrote against Hobbes a *Treatise on Eternal and Immutable Morality*, published after his death, and a *Treatise on the True Intellectual System of the Universe.* In both he contends against necessity, and for the proposition that moral good and evil cannot possibly be arbitrary things. These ideas are discerned by the reason, and not made by will. Henry More agreed with Cudworth that moral goodness is simple and absolute, and that right reason judges of its nature and truth, but its attractiveness and beauty are felt by a *boniform* faculty, like the moral sense of later writers. Locke taught that moral good and evil signify conformity or disagreement with some law; and of laws there are divine law, the civil law, and the law of opinion. The divine law may be either promulgated by the light of nature or the voice of revelation; the civil law comprehends all those positive statutes that are framed by civil rulers; and the law of opinion is that unwritten and changing law which is commonly called public sentiment. Dr. Samuel Clarke resolved the notions of right and wrong into the eternal fitness of things; Wollaston, into the truth of things. Prichard asserted that right and wrong are original conceptions or intuitions. The same doctrine is taught by the Scottish philosophers, Thomas Reid and Dugald Stewart, and by many writers in England and America. Most of these writers we have named confine their attention to the functions of the intellect in moral phenomena, and would seem to overlook more or less the emotional element in the same, conceiving of the moral nature as purely rational. Strikingly contrasted with this class of writers are those who explain these experiences by a special sensibility or capacity for peculiar emotions, called the moral sense. Among these are Henry More, already referred to; the earl of Shaftesbury, author of *The Characteristics;* Prof. Francis Hutcheson, who gave form and currency to the appellation "moral sense;" David Hume, some of whose special ethical doctrines are open to grave exception; and Thomas Brown and Jonathan Edwards. Hutcheson was foremost in asserting that all virtue is resolved into benevolence, in which he followed Cumberland, and is followed by Edwards, who defined true benevolence to be a love of being in general, which should be proportioned to the quantity of being, and thus provided for the obligation that God should love himself, and the creatures of God should love God with a supreme affection. Edwards still further distinguished virtuous love into the love of benevolence and the love of complacence. Bishop Butler rendered special service to ethical philosophy by insisting, with Shaftesbury and Hutcheson as against Hobbes and many of the English free-thinkers, that man is capable of benevolent or disinterested affection for his kind. He also contended against the licentious doctrines of his time that the true interpretation of the Stoic precept, "to live according to nature," requires man to recognize the natural supremacy of the moral over all other impulses. This doctrine of the natural supremacy of conscience has been often asserted to be original with Butler, but incorrectly. He emphasized it at a critical time, but the doctrine itself in its principle is as old as Plato. In respect to the nature of conscience he is not explicit, but asserts that it is probably neither exclusively rational nor emotional, but includes both these elements. In his sermons he agrees with Hutcheson that benevolence comprehends all human duties; in his *Essay on the Nature of Virtue* he takes exception to this doctrine, and contends that a separate and independent authority pertains to gratitude and veracity. Butler's contributions to moral science have exerted a powerful influence in England and America. A special application of this theory was made by Adam Smith in his *Theory of Moral Sentiments.* He derived our moral judgments and feelings from the principle of sympathy operating upon man in society. The original sources of our ethical judgments and feelings are the grateful and hostile feelings of our fellow-men. With these feelings we have so intimate and sensitive a sympathy that we insensibly and by ready association connect them with our actions, and these with our intentions and dispositions; and we do this so rapidly that they often seem to be independent in their origin and authority of the root from which they sprung. This theory must of course deny to man living out of society the capacity for either moral judgments or feelings. James Hartley, the originator, and Abraham Tucker, the expounder, of the associational psychology, resolved the moral phenomena into the operations of association, according to which the feelings of approbation and disapprobation become insensibly and inseparably united with certain actions and feelings. William Paley, in his *Treatise on Moral and Political Philosophy*, which for more than half a century was generally used as a textbook in England and America, resolved virtue into the arbitrary will of God, and the motives for the practice of virtue into a desire of future happiness. The moral nature, according to this theory, must necessarily be the creature of education and the product of circumstances. Jeremy Bentham was the reputed father of the utilitarian school of morals, which founded all virtue in the tendency of actions to promote happiness. The theory, as expounded by Bentham and Mill, the father and the son, was a theory of external conduct in social and public relations, rather than a theory of ethics proper. Its cardinal principle is identical with that of Cumberland, but its denial of human freedom as the ground of human responsibility, its neglect to recognize the permanent and internal springs of action, and its generally irreligious tendency have exposed it to the charge of being unscientific and superficial. The most favorable exposition and able defence of this so-called modern utilitarianism has been made by John Stuart Mill. John Austin, the author of the able treatise *The Province of Jurisprudence Determined*, writes from the same standpoint. Alexander Bain adopts the extremest views of those who derive the moral judgments from the influence of society under the laws of association. Herbert Spencer teaches the same theory, but modifies and fortifies it by his metaphysical doctrines of evolution and the law of differentiation. This, in turn, is blended with the physiological doctrine of heredity to which Charles Darwin and his followers have given extensive currency.

In America the earliest and perhaps the ablest writer upon ethics is Jonathan Edwards, whose opinions have already been stated. The theologians of his school have generally accepted his doctrines. Dr. Timothy Dwight has expounded a system more nearly like that of Bishop Cumberland, whom Dr. Nathanael W. Taylor has followed in the main. Both writers were far more exact than Cumberland in their analyses, and more scientific in their definitions. Dr. Francis Wayland and Dr. Joseph Haven published each a popular textbook upon ethics, in which they expound and defend the doctrine of Price and Dugald Stuart. Dr.

Laurens P. Hickok has written a textbook in which he makes spiritual worthiness the distinctive and fundamental characteristic of right moral feeling and action, exalting the relation itself to an intuition. Dr. Mark Hopkins has published two treatises, *Lectures on Moral Philosophy* and *Love as Law*, in which he develops the theory of moral distinctions from the idea of adaptation to the highest good. The views of President McCosh may be found in his *Intuitions of the Human Mind*, and his correspondence with Pres. Hopkins in the appendix to *Love and Law*, 3d ed. Dr. McCosh accepts the theory of Price. Pres. J. H. Fairchild, of Oberlin, O., has published a textbook which is founded on a theory similar to that of Hopkins. Rev. David Metcalf has published *An Inquiry into the Nature, Foundation, and Extent of Moral Obligation*, in which he expounds with great acuteness and tenacity the views of the New England theologians, and subjects the opposite views to minute criticism.

The Kantian ethics have had no little influence upon American and English writers within the last thirty years, originally through the school of Coleridge, and subsequently through an original study of German philosophy.

In Germany, Leibnitz gave the hints or germs of what would have been his ethical theory had it been complete, much in the vein of Cumberland. The theory of Kant has had great significance in modern speculation. After Kant, as the result of his criticism of the speculative reason, had limited its functions to phenomena, denying it the power to know *things in themselves*, and especially had tested and set aside its authority to accord anything more than regulative validity to the ideas of God, the soul, and the material universe, he resorts to the practical reason to furnish reality and validity first to ethical relations, and by means of these to that speculative truth which the speculative reason is unable to affirm. The practical reason commands the will by its categorical imperative to believe in duty. In order that duty may be disinterested, this must be enjoined and obeyed irrespective of any possible relations to the sensibility—*i. e.* to happiness—simply because it is right. But in order that duty may be performed, the will must be free; therefore it must be free in fact, and it should be believed to be free. Moreover, although duty should be performed at the simple command of the practical reason, yet it is fit and necessary that it should be rewarded; and in order that it may be rewarded there must needs be a moral ruler; therefore, the practical reason commands the speculative to believe there is a God. The moral law in its content must be a rule that is fit to be universal, because only a universal rule can be accepted by the reason. Hence, the fundamental axiom of morals is, Act in such a way as is fit and possible for you in all conceivable circumstances. The ethical system of Kant has been sharply criticised in Germany and elsewhere. In England, his doctrine of the categorical imperative, and his rejection of what he calls eudemonism, have been accepted by most of the adherents of the intuitional theory, from its supposed similarity to Butler's doctrine of the supremacy of conscience. F. P. Cobbe is the earnest and eloquent expounder of the Kantian doctrine in her *Intuitive Morals*. A few ingenious writers in England have of late endeavored to cut loose from the leadings of any received or prevalent system, as S. S. Laurie, *The Philosophy of Ethics, Notes Expository and Critical;* S. H. Hodgson, *The Theory of Practice;* H. Calderwood, *Handbook of Moral Philosophy;* Sidgwick, *The Method of Ethics;* W. Whewell, *Elements of Morality, including Polity*, and have demonstrated that the field of speculative and practical discussion is by no means exhausted.

Of the German philosophers since Kant, the ethical system of each is usually a subordinate appendage to his metaphysical theory. Schleiermacher has perhaps been the most significant next to Kant, especially for his threefold doctrine of duties, virtues, and goods. J. G. Fichte, Schelling, Hegel, Herbart, Trendelenburg, Rothe, Schopenhauer, Chalybæus, J. H. Fichte, Lotze, are all able writers upon ethics. In France, Th. Jouffroy is the most significant of modern writers, and follows the Scottish school, with some important deviations. The disciples of Cousin in general follow the Kantian and Scottish doctrine that the moral relations are intuitional. In Italy, as in Germany, the ethical and political philosophy of the leading writers is secondary to their speculative systems. Their contributions are of special interest at present for the applications which may be made of them to the political philosophy and the educational policy of the new kingdom of Italy.

Besides many special treatises not named, and general histories of philosophy, the following works may be consulted with advantage: Sir Alexander Grant, *The Ethics of Aristotle*, in 2 vols. (1st ed. London, 1857–58); John Stuart Blackie, *Four Phases of Morals* (Edinburgh, 1871; New York, 187–); A. Neander, *Ueber das Verhältniss der hellenischen Ethik zum Christenthum*, in *Wiss. Abhandl.* (Berlin, 1851); Sir James Mackintosh, *A General View of the Progress of Ethical Philosophy, chiefly during the Seventeenth and Eighteenth Centuries* (*Encyc. Brit.;* also London, 1830; Philadelphia, 1832); W. Whewell, *Lectures on the History of Moral Philosophy in England* (London, 1852; enlarged ed. 1862); *History of Moral Science*, by Robert Blakey, 2 vols. (2d ed. Edinburgh, 1836); S. S. Laurie, *Notes Expository and Critical on Certain British Theories of Morals* (London and Edinburgh, 1868); W. E. H. Lecky, *History of European Morals from Augustus to Charlemagne*, 2 vols. (2d ed. London, 1869); Alexander Bain, *Mental and Moral Science, a Compendium of Ethics; Sketch of Ethical Theories* (London, 1868); E. H. Gillett, *God in Human Thought, and the Moral System* (1874); I. H. Fichte, *System der Ethik;* F. E. D. Schleiermacher, *Grundlinien einer Kritik der bisherigen Sittenlehre*, in *Werke zur Philosophie* (1ter Band, Berlin, 1803); K. F. Staüdlin, *Geschichte der Moral-Philosophie* (1822; 3 Bde. (Bd. 1, historical and critical), Leipsic, 1850); Fr. Vorländer, *Geschichte der phil. Moral, Rechts- und Staats-Idee der Engländer und Franzosen* (3c. Marburg, 1855); Paul Janet, *Histoire de la Philosophie morale et politique, dans l'Antiquité et les Temps modernes*, tomes 2 (Paris, 1860); Rothe, *Theological Ethics* (5 vols.); Henry Sidgwick, *The Methods of Ethics* (London, 1874).

N. Porter.

Moran′, tp. of Mackinac co., Mich. Pop. 373.

Moran′ (Benjamin), b. in Lancaster co., Pa., in 1820; became a printer in Philadelphia; went to Europe about 1850; travelled over England on foot, and published a volume, *The Footpath and the Highway* (1853); became clerk to the American legation in London and private secretary to Mr. James Buchanan, then minister (1854); received the appointment of secretary of legation Nov., 1855, and remained in that post for nearly twenty years, occasionally acting as chargé d'affaires. He became noted for his thorough knowledge of the archives of the legation and of the annals of American diplomacy; was popular with American visitors to England and with the political circles of English society; was appointed minister resident in Portugal in 1874. He has been a frequent contributor to English and American periodicals.

Moran (Thomas), b. in Bolton, England, Jan. 12, 1837; brought in childhood to Philadelphia; apprenticed to an engraver in 1853; commenced painting landscapes in 1856, and, though he had received no instruction in that branch of art, he soon developed an effective style. He visited Europe in 1861, and again in 1866, paying special attention to the paintings of Turner; achieved success as an illustrator of books and in the execution of landscapes, chiefly of great size; settled at Newark in 1871, and in the same year accompanied Prof. Hayden's expedition to the Yellowstone River. The result was his magnificent painting, *The Grand Cañon of the Yellowstone.* This and a companion picture, *The Chasm of the Colorado*, produced two years later, after a similar expedition to Utah and Arizona, were purchased by Congress for $20,000.—His brother, Peter, b. in Bolton, England, Mar. 4, 1842, is a distinguished painter of animals; and another brother, Edward, has devoted himself to marine subjects.

Mora′no Cala′bro [*Muranum*], town of Italy, province of Cosenza, situated on a hill not far from Castrovillari. Near it are the ruins of an old town and castle. Pop. in 1874, 8910.

Morant′, town of Jamaica, in the West Indies, is situated on the southern coast of the island, at the mouth of a river of the same name. It was much injured by the rebellion of 1865, but is now rapidly recovering. Pop. 7000.

Morat′ [Ger. *Murten*], town of Switzerland, in the canton of Freiburg, on the Lake of Morat, famous for the victory which the Swiss won here (June 22, 1476) over Charles the Bold, duke of Burgundy.

Moratin′, de (Leandro Fernandez), son of Nicolas, b. at Madrid Mar. 10, 1760; carefully educated, and prepared himself for literary pursuits, though for some time he was engaged in the jewelry trade; received prizes from the Academy of Madrid in 1782 and 1785; visited Paris in 1787, where he made the acquaintance of Goldoni, and brought in 1770 his first and best comedy on the stage, *El Viejo y la Niña.* It was his object to reform the Spanish theatre, and he succeeded. Godoy gave him a pension; he travelled extensively in France, England, Holland, and Germany, and his following dramas, which were received with great applause, evince, besides a natural talent of considerable vigor, a highly developed taste. King Joseph made him his librarian, but after the restoration of Ferdinand VII. he left Spain, lived mostly in Paris, and d. there June 21, 1828. His excellent work, *Origines del*

Teatro Español, written in Paris, reaches only to Lopez de Vega.

Moratin, de (Nicolas Fernandez), b. at Madrid, Spain, July 20, 1737, belonged to an ancient Biscayan family; received a careful education; became a lawyer and professor of poetry in the Imperial College at Madrid; was the founder of the literary club which took its name from the coffee-house of San Sebastian, and with the countenance of the court and of the great nobles undertook, amidst great opposition, the reformation of the Spanish theatre by substituting for the religious dramas, or *autos sacramentales*, pieces more in accordance with modern taste, especially as represented by the French school. He had previously published a comedy, *La Petimetra* (1762), and a tragedy, *Lucrecia*, as specimens of the new dramatic school, but neither of them had been placed upon the stage. *Hormesinda*, represented in 1770, achieved success, and *Guzman el Bueno* (1777) was much admired for its classic verse. Moratin was also the author of *Diana*, a didactic poem (1763), and *Las Naves de Cortés destruidas* (1765), a narrative poem on the conquest of Mexico, considered by Ticknor to contain the noblest verse of its kind produced by any Spanish writer of the eighteenth century. All his pieces are characterized by purity and correctness of diction and harmony of versification. D. at Madrid May 11, 1780.

Mora'via [Ger. *Mähren*], province of Austria, bounded W. by Bohemia, N. by Silesia, E. by Hungary and Galicia, and S. by the duchy of Austria. Area, 8584 square miles. Pop. 1,997,897, of whom 1,450,000 are Slavonians and 520,000 Germans. It is almost entirely encircled by mountains—W. by the Moravian, N. by the Sudetic, and E. by the Carpathian—whose branches and spurs cover the whole country with exception of the southern part, which forms an elevated plain. Generally, the surface slopes towards the S., traversed by the Morava (or March, which see) and a number of minor streams, which all send their waters to the Danube. The more elevated portions of Moravia are not fertile; the mountains yield some coal, alum, saltpetre, and metals, especially copper and lead. But the valleys and the southern plains are very fertile, and produce not only grain, flax, hemp, hops, and excellent pastures, but also wine, chestnuts, and other varieties of fine fruits. Cattle, fine horses, geese, fowls, and bees are reared, and extensive manufactures of cloths, flannels, and other woollen fabrics are carried on. In the twelfth century Moravia was made a margravate and declared a fief of the Bohemian crown, to be held by the younger sons; in 1526, on the death of Louis II. at the battle of Mohacs, it fell to Austria, together with Bohemia.

Moravia, post-v. of Appanoose co., Ia., 10 miles S. of Albia, on the Central R. R. of Iowa, has 2 public schools, 3 church buildings, 1 private bank, 1 newspaper, and stores. Pop. 161. E. Cummins, Ed. "Messenger."

Moravia, post-v. of Cayuga co., N. Y., 18 miles S. E. from Auburn, on the Southern Central R. R., is the centre of a large grain-growing and dairying district, and has good water-power, a union graded school, 6 churches, 2 newspapers, 3 flouring-mills, a woollen factory, 1 spoke-factory, 1 tannery, a national bank, 2 cheese-factories, a foundry, good hotels, and stores. Pop. 2169.

M. E. Kenyon, Ed. "Valley Register."

Moravian Brethren. See Moravian Church, by Bishop Edmund de Schweinitz.

Moravian Church, The, is so called because in the fifteenth and sixteenth centuries Moravia constituted one of its principal seats, and because it was renewed in the eighteenth by refugees from that country. Its official name, however, is "The Church of the United Brethren," or the *Unitas Fratrum*, and it originated not only in Moravia, but also in Bohemia. The blood of the martyr John Huss (which see) was its seed. It was founded by some of his followers in 1457 on the barony of Lititz, in Bohemia. The basis of their union was the following three principles: The Bible is the only source of Christian doctrine; public worship is to be conducted in accordance with the teaching of the Scriptures and on the model of the apostolic Church; the Lord's Supper is to be received in faith, to be doctrinally defined in the language of the Bible, and every human explanation of that language is to be avoided. Lititz soon became the rallying-point for awakened persons throughout Bohemia and Moravia, so that the new Church rapidly increased. Its first ministers were priests of the Calixtine or national Church, from which the Brethren had seceded. In 1467, however, they introduced a ministry of their own, and secured the episcopacy from Bishop Stephen of the Austrian Waldenses. In spite of frequent persecutions at the hands both of the Roman Catholics and of the national Church, they increased in numbers and influence. At the beginning of Luther's Reformation (in 1517) they had about 200,000 members and over 400 parishes. In the course of time they established colleges and theological seminaries, set up several printing-presses, and translated the entire Bible from the original into the Bohemian tongue, which version has remained a standard to the present day. About 1547 they spread to Poland; and in 1557 the *Unitas Fratrum* was divided into three ecclesiastical provinces—the Bohemian, the Moravian, and the Polish—each governed by bishops of its own, but all united as one Church. Religious liberty having been proclaimed in Bohemia and Moravia in 1609, the Brethren became one of the legally acknowledged churches of these lands. In the early part of the Thirty Years' war, however, Ferdinand II. inaugurated the so-called Anti-Reformation, which crushed evangelical religion out of Bohemia and Moravia. Only a hidden seed of the Church of the Brethren remained. The majority of its members, together with the Lutherans and the Reformed, were driven into exile (1627). A new centre was now established at Lissa in Poland, and many parishes of refugees were formed. But Lissa was destroyed in 1656, in a war between Poland and Sweden, and the remaining parishes were gradually absorbed by other Protestant bodies. For more than half a century the *Unitas Fratrum* ceased to exist as a visible organization. Its hidden seed in Bohemia and Moravia, however, remained, and its illustrious bishop, Amos Comenius, filled with a prophetical anticipation of its renewal, republished its history, confession, and discipline, commended the future Church of the Brethren to the care of the Church of England, and took steps to perpetuate its episcopacy. Hence, for a period of fifty years, clergymen of the Reformed Church were consecrated bishops of the *Unitas Fratrum*, that the succession might not die out. On June 17, 1722, a few descendants of the Brethren, who had fled from their native land to Saxony, began to build the town of Herrnhut on an estate of Count Zinzendorf, where an asylum had been provided for them. This town soon became the rallying-place for the remnant of the Church, descendants of which, to the number of several hundred, immigrated thither from Bohemia and Moravia. They introduced their ancient discipline, handed down by Comenius, and in 1735 received their venerable episcopate at the hands of its two last survivors, Daniel Ernst Jablonsky and Christian Sitkovius. At the same time, however, many Christians from different parts of Germany joined them, so that the renewal of their Church involved a union of the German element of pietism with the Slavonic element which they represented. The result was a development different from that in Bohemia and Moravia. Count Zinzendorf himself became the leading bishop of the resuscitated Church, and he strove to build it up in such a way as not to interfere with the rights and privileges of the state Church, in the communion of which he had been born, and to which he was sincerely attached. In carrying out this principle he did not let the renewed *Unitas Fratrum* expand as other churches expand, but established on the continent of Europe, in Great Britain, and in America, exclusively Moravian settlements, from which the follies and temptations of the world were excluded, and in which was fostered the highest type of spiritual life. In doing this he carried out Spener's favorite idea of *ecclesiolæ in ecclesia*. Fifteen exclusive settlements still exist in Germany and four in Great Britain. In such towns, until recently, Moravians only were allowed to hold real estate, and the Church controlled not only religious but also municipal, and to some extent industrial, affairs. This fundamental principle is now undergoing a change which will gradually lead to the abolition of the entire system of exclusivism. In America it has been given up, the last vestige of it disappearing in 1856. The American Moravian Church now stands on the same footing as the other Protestant denominations of the land, and is pursuing the same polity of extension. In the last twenty years it has doubled its membership, and flourished in other respects. But even in the period in which exclusivism was fully developed throughout the *Unitas Fratrum*, it did not remain idle or stand aloof from work for the spread of the kingdom of God. On the contrary, while its peculiar system necessarily kept it small at home, it began a very extensive mission in heathen lands, a no less influential domestic mission on the continent of Europe, and a number of educational enterprises that have given it a name far and wide. In 1857 its constitution was remodelled. The *Unitas Fratrum* now consists of three *provinces*—the German, British, and American—which are independent in all provincial affairs, but form one organic whole in regard to the fundamental principles of doctrine, discipline, and ritual, as also in carrying on the foreign and the Bohemian missions. Hence, there is a provincial and a general government. Each province has a provincial synod, which elects from time to time a board of bishops and other cler-

gymen, styled the "Provincial Elders' Conference," to administer the government in the interval between synods. To this board is committed the power of appointing the ministers to their several parishes. Every ten or twelve years a General Synod of the whole *Unitas Fratrum* is convened at Herrnhut in Saxony. It consists of delegates from each province and from the foreign missions, and elects a board of twelve bishops and other clergymen, styled the "Unity's Elders' Conference," which oversees the whole Church and superintends the foreign and Bohemian missions. The doctrine of the Church is set forth in its Catechism, its Easter Morning Litany, and in the statutes drawn up by the General Synod, and comprises all those points which are held by Trinitarian Christians as essential to salvation. The distinguishing feature of Moravian theology is the prominence given to the person and work of Christ, and a marked characteristic of the Church generally is its catholicity. The ministry consists of bishops, presbyters, and deacons. The episcopal office is not provincial and not diocesan, but represents the whole *Unitas Fratrum*. A ritual is used which comprises a litany for Sunday morning—free prayer being allowed at other times—forms for baptism, the Lord's Supper, confirmation, etc., services for the festivals of the ecclesiastical year, and a particular litany for Easter morning. Love-feasts are held, in imitation of the primitive *agapæ*, preparatory to the Lord's Supper and on other occasions. The use of the lot, which at one time was universal, is now greatly restricted, and in the American province resorted to only when a minister receiving an appointment requests its use. The enterprises of the Church are the following: (1) *Boarding schools* for young people not connected with it, 48—namely, 28 in the German province, 15 in the British, and 5 in the American, educating annually about 2500 pupils of both sexes. There are, besides, numerous parochial schools, a college, a missionary institute, and 3 theological seminaries. (2) *Foreign missions*, begun in 1732, since which time about 2350 missionaries, male and female, have been sent out, and comprising the following 16 "mission provinces"—namely, Greenland, Labrador, Indian country of North America, St. Thomas and St. John, St. Croix, Jamaica, Antigua, St. Kitts, Barbadoes, Tabago, Mosquito Coast, Surinam, South African western province, South African eastern province, Australia, and Thibet. (3) *Bohemian mission*, begun in 1870 in the early seats of the *Unitas Fratrum*, and numbering four stations. (4) *Domestic mission* on the continent of Europe, called the *Diaspora*, having for its object the evangelization of the European state churches, without depriving them of their members, who are organized into "societies" within the Church, and carried on in Germany, Switzerland, Denmark, Norway, Sweden, Poland, Livonia, Esthonia, and other parts of Russia. The whole number of souls in the three provinces of the *Unitas Fratrum* is 28,980, of whom 15,308 belong to the American province; the whole number of converts in the foreign missions is 69,322; the number of foreign missionaries, 325; and the entire membership, 98,227. Besides these there are about 80,000 souls connected with the Diaspora mission. (For further particulars see *Moravian Manual*, Bethlehem, 1869.) EDMUND DE SCHWEINITZ.

Mo'ra-Wood, the timber of *Mora excelsa*, or *Dimorphandra Mora*, a noble forest tree of Guiana. It is of the order Leguminosæ. The wood resembles the best oak in quality, but is dark, like mahogany. It is used in ship-building and exported to Europe.

Mo'ray Frith, an inlet of the German Ocean, on the N. E. coast of Scotland, 16 miles wide at the entrance, and stretching inland for about 31 miles, to Inverness.

Morazan' (Gen. FRANCISCO), b. in Honduras, Central America, in 1799; was secretary-general of Honduras in 1824; was soon afterwards elected governor; distinguished himself as a soldier in frequent contests with the conservative or "reactionary" party, which he drove from the city of Guatemala in 1829, on which occasion the national congress decreed him the title of "savior of the republic," and by virtue of his extraordinary powers as commander-in-chief he effected a radical reform in ecclesiastical affairs, suppressing the convents, expelling the rebellious priests, and confiscating the Church property to educational and other public uses. In 1832, after suppressing another formidable insurrection, Morazan was chosen president, but was opposed with unrelenting hatred by the conservatives, and after several years of disturbances the republic was disorganized and broken into five independent states. Morazan took refuge in Chili in 1840; settled in Costa Rica in 1842, where he was spontaneously chosen president of the state with a view to afford him a basis for national reorganization, but after a short time a counter-revolution broke out, to which Morazan fell a prisoner, and was executed Sept. 15, 1842.

Morbihan', department of France, a part of the old province of Bretagne, bordering S. on the Atlantic. Area, 2667 square miles. Pop. 490,352. The northern part is hilly, but the rest, especially the land along the sea, is low and level, forming large plains, in some places very fertile, in others occupied by heath or marshes. Horses, cattle, sheep, and bees are extensively reared; corn, hemp, flax, and apples are raised; cider, butter, and honey are the principal products. The fisheries are very important. Out of 66,104 children, 38,149 received no school education at all in 1857. Principal towns, Lorient and Vannes.

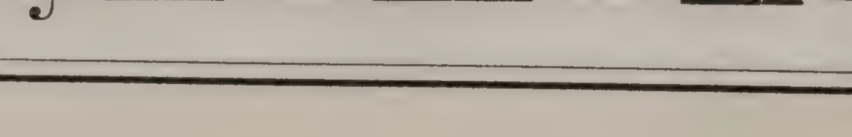
Morco'ne, town of Italy, province of Benevento. This town, of ancient origin, is supposed by some to be the *Morgantia* of the Samnites. Pop. in 1874, 6914.

Mor'dants [Fr., from Lat. *mordeo*, to "bite;" Ger. *beizen*], substances used in dyeing and calico-printing to fix colors which have no affinity for the tissues; in gilding, any viscous or sticky matter employed in making gold-leaf adhere. Mordants are indispensable to the dyer; they serve as a bond of union between the fibre and the color, and many of them modify the tint of the color, thus enabling the dyer to produce many shades of color with the same dye. Animal fibres, as silk and wool, generally attract coloring-matters; for them, therefore, mordants are less important, though they are often used, either to make the color more durable or to brighten or otherwise modify the tint. Few colors can, however, be made to adhere to vegetable fibres, cotton or linen, without the aid of a mordant. Colors which require mordants are called adjective; those which do not, substantive. Safflower is a substantive dye for cotton and linen; most other dyes are adjective for these fibres. The mordant has a positive affinity for both color and fibre, and binds the two together. The most important mordants are alumina, oxide of iron, and oxide of tin. They are generally applied in the form of soluble salts. If cotton is immersed in a solution of acetate of alumina, a basic acetate of alumina will be fixed on the fibres so firmly as to resist removal by washing; if the cotton be now treated with water and ground madder, the red coloring-matters of the madder, alizarine and purpurine, will unite with the alumina, and thus each fibre will become covered with the red madder lakes, or salts of alizarine and purpurine, with alumina. If an iron salt be substituted for the acetate of alumina, as acetate of iron, a similar result would follow the treatment with madder, except that, as the iron compounds with alizarine and purpurine are purple, the cotton would be dyed of this color. Sometimes the mordant and color are applied simultaneously. Astringents, such as sumac, nutgalls, etc., are employed as mordants, and act by virtue of the tannic acid they contain. When mordants are printed on cotton cloth in stripes and figures, and the cloth thus mordanted is subjected to the action of the dyestuff, the color is fixed in similar stripes and figures, leaving the other portions of cloth white; this is calico. Sometimes the color is mixed with a salt of the mordant, and the two are printed together ("topical printing"). On subjecting the cloth to the action of steam, the acid of the mordant, generally acetic, is expelled, and the base and color become fixed on the cloth.

The term *mordant* is sometimes applied to agents which act merely mechanically and cement the color to the fibre, as albumen, caseine, etc., which are used for pigment colors, such as ultramarine, oxide of chromium, etc., and for aniline colors. The term is also applied to salts which furnish a part of the matter of which the color actually consists, as the iron salt in producing prussian blue or the lead salt in forming chrome yellow. In these colors there is no proper mordant, as the insoluble color is merely produced in the fibre by the combination of its component parts. This difference is more apparent than real, as the same is actually true when alumina or iron is used with madder or with astringents. (See articles on CALICO-PRINTING and DYEING.) C. F. CHANDLER.

Mor'decai (ALFRED), b. in North Carolina about 1800; graduated at West Point, and was appointed second lieutenant of engineers July, 1823, remaining at the Military Academy as professor of philosophy and engineering till 1825; transferred to the ordnance corps with the rank of captain 1832, and in 1855 sent by the government as member of the military commission to the Crimea, etc., his report being published by Congress in 1860; resigned May 5, 1861. Author of various professional works, including the *Ordnance Manual*. Since 1863 he has been assistant engineer of the Mexico and Pacific R. R.

Morden'te, or **Mordante** [It.], in music, a species of short trill or shake formerly much in use. It was commonly written and played as in the example following:



More (HANNAH), b. at Stapleton, Gloucestershire, England, Feb. 2, 1745; was educated at a seminary kept by her two elder sisters at Bristol, in which she afterwards became a teacher; began writing poems, pastorals, romantic tales, and tragedies at an early age; made the acquaintance of Garrick, by whom her tragedies of *Percy* (1778) and *The Fatal Falsehood* were successfully produced at Covent Garden; obtained the warm friendship and admiration of Dr. Johnson, Burke, and the literary circle swayed by them; abandoned writing for the stage from religious scruples while in the height of success, and devoted her pen to the advancement of religion and education; settled at Wrington 1786; produced *Sacred Dramas* (1782), *Florio* (1786), *Thoughts on the Manners of the Great* (1788), and *Religion of the Fashionable World* (1791); established at Bath the *Cheap Repository* (1795), a monthly periodical which attained an immense circulation, in which she published a series of short moral tales, including the celebrated *Shepherd of Salisbury Plain;* acquired a competence by her writings and the management of her seminary; removed to Barley Wood, near Cheddart (1802), where she founded several charitable schools; published *Strictures on the Modern System of Female Education* (1799), which led to her being invited to draw up a programme for the education of Charlotte, the princess of Wales; wrote in 1809 *Cœlebs in Search of a Wife*, her most popular book, followed by *Practical Piety* (1811), and numerous other works; settled at Clifton 1828, and d. there Sept. 7, 1833, leaving a fortune of £30,000, one-third of which was bequeathed for charitable purposes. A pleasing incident in her later career was her affectionate interest in the boy Thomas Babington Macaulay, who resided a considerable time with her, and doubtless owed something of his extraordinary literary career to her watchful care. Her complete *Works* were published in 11 vols. (1830), and several of them are still frequently reprinted. (See her *Memoirs*, by William Roberts (4 vols., 1834), and the *Correspondence of Hannah More with Zachary Macaulay* (1860).)

More (HENRY), D. D., F. R. S., b. in Grantham, Leicestershire, Eng., Oct. 12, 1614; was bred a Puritan; studied at Eton and Christ College, Cambridge, where he took a fellowship. In 1675 he became prebendary of Gloucester; d. at Cambridge, Sept. 1, 1687. He is remembered as a mystical philosopher and admirer of Plato and the Cabbalists; author of *Conjectura Cabalistica*, *Philosophical Poems* (1647), *The Mystery of Iniquity* (1664), *Enchiridion Ethicum* (1669), *Enchiridion Metaphysicum* (1671), and of a number of other works characterized by acuteness, great learning, and a thoroughly devout spirit.

More (Sir THOMAS), b. in London, England, in 1480, son of Sir John More, judge of the king's bench; studied Latin under Nicholas Hart; became at the age of fifteen a member of the family of Cardinal John Morton, archbishop of Canterbury, for whom he probably acted as secretary or amanuensis in preparing *The Historie of the Pittiful Life and Unfortunate Death of King Edward V. and the Duke of York, his Brother, with the Troublesome and Tyrannical Government of the Usurpation of Richard III., and his Miserable End*, which has been called the first specimen of classical English prose; entered Canterbury College (now Christ Church), Oxford, 1497, where he learned Greek under William Grocyn, the first professor of that language in England; became an intimate friend of Erasmus; studied law at New Inn and Lincoln's Inn; lectured on jurisprudence at Furnival's Inn, and on St. Augustine's *De Civitate Dei* at St. Lawrence's church; resided for some years in a Grey Friars monastery, partaking of the manual labors and spiritual exercises of the monks while pursuing classical studies and learning French and music; married Miss Jane Colt 1505; engaged in the practice of law; soon rose to great eminence; was elected to a magistracy of criminal causes and a member of Parliament for Middlesex; opposed the exactions of Henry VII. both before the courts and in Parliament, thereby incurring the wrath of that monarch, visited upon his father in the form of malicious prosecution, fine, and imprisonment. Soon after the accession of Henry VIII. Cardinal Wolsey was charged to secure for the Crown the services of the brilliant young advocate, which he effected, not without difficulty, and More was successively made master of requests and confidential envoy to the Netherlands (1514 and 1515) to negotiate for the enlargement of commercial privileges. About this time he composed in Latin his most famous work, the *Utopia*, or account of an imaginary commonwealth in a distant island of the Atlantic, of which the manners, laws, and state of society were depicted as a model worthy of English imitation. This work, printed at Louvain, Antwerp, and Paris in 1516, and at Bâle in 1518, was quickly translated into English, Dutch, French, and Italian, and excited universal admiration. More was made privy councillor and treasurer of the exchequer; was knighted 1521; repeatedly sent by Wolsey on special commissions to France; became a favorite of the king through the wit and wisdom of his conversation; was chosen Speaker of the House of Commons 1523; made chancellor of the duchy of Lancaster 1525; accompanied Wolsey on his famous embassy to France 1527, and became lord chancellor 1529. The Reformation had then recently begun; Luther had violently assailed not only his cherished friend Erasmus, but his monarch, and More entered zealously into the lists, attacking the new doctrines upon their weakest points with inimitable learning and wit, as well as causticity. More was by nature conservative; his religious convictions were of the strongest kind; his tendencies to asceticism were now reviving; it is not, therefore, surprising that he regarded the repression of heresy as a duty of paramount obligation, but the accusations of cruelty in the persecution of Protestants seem unfounded. However ready the chancellor might be to aid Henry VIII. as "defender of the faith," he could not be expected to acquiesce in the royal vagaries in dealing with the rights of Queen Catharine of Aragon, and his refusal to countenance the proceedings for divorce led to his retirement from the chancellorship in May, 1532. He thenceforth lived in seclusion at Chelsea; was one of the believers in the divine mission of Elizabeth Barton, the nun of Kent, and in Apr., 1534, was committed to the Tower for refusing to swear allegiance to the "act of succession," which excluded the daughter of Queen Catharine from the throne in favor of the offspring of Anne Boleyn; remained in prison above a year in free communication with relatives and friends; refused to take the oath of submission to the king in his newly-assumed character of head of the Church, and all efforts by the council to change his resolution having proved fruitless, he was brought to trial before the high commission for constructive treason, condemned to death, and executed within the Tower July 6, 1535. By the unanimous consent of historians, Sir Thomas More was one of the greatest minds and purest characters on record. One of More's chief characteristics was his unconquerable pleasantry—a quality which did not desert him even upon the scaffold. His collected *Works*, Latin and English, were published at Louvain 1556–57; the best known, the *Utopia* and the Latin *Epigrams*, have often appeared separately. (See biographies by his son-in-law, Roper, his great-grandson, Cresacre More, Cayley, Sir James Mackintosh, and Lord Campbell.) PORTER C. BLISS.

More'a, the ancient *Peloponnesus* [island of Pelops], is the large southern peninsula of Greece, separated from the mainland by the Gulfs of Patras, Corinth, and Egina, and connected with it by the narrow isthmus of Corinth. Area, estimated at 8800 square miles. Pop. 600,000. It is an elevated table-land encircled with high mountains, often arid and unproductive on account of lack of water, but in many places intersected by very fertile valleys. The etymology of the name *Morea*, which in the early Middle Ages superseded the old name, Peloponnesus, is uncertain. Some derive it from *morus*, "mulberry," because the outline of the country is like that of the leaf of the mulberry; others derive it from *more*, a Slavic word, signifying "sea," meaning by it the more maritime part of Greece. The latter seems the more probable, as the land was invaded in the eighth century by Slavic tribes, which settled and remained here, and gave many rivers and places new names of Slavic origin.

Moreau', tp. of Cole co., Mo. Pop. 620.

Moreau, tp. of Moniteau co., Mo. Pop. 1084.

Moreau, tp. of Morgan co., Mo. Pop. 2168.

Moreau, tp. of Saratoga co., N. Y., on the left bank of the Hudson River and on the Rensselaer and Saratoga R. R., 48 miles N. of Albany. It has several manufacturing villages and a quarry of black marble. Pop. 2256.

Moreau (JEAN VICTOR), b. at Morlaix, in Bretagne, Aug. 11, 1763; studied first law, but joined in 1792 the army of the north as commander of a battalion of volunteers from Rennes, and evinced under Pichegru such a military talent that in 1794 he was made a general of division. In 1776 he commanded the army of the Rhine and Moselle, and penetrated into the centre of Bavaria, driving the Austrians under Archduke Charles before him; but after Jourdan's defeat at Würzburg (Sept. 3), he was compelled to retreat in order not to be cut off from France, and this retreat along the valley of the Danube and through the Black Forest, accomplished in perfect order and without loss, while fighting a superior and victorious army, established his fame as one of the greatest living generals. Incidentally implicated in the conspiracy of Pichegru, he became suspected and received no command for nearly two years; but in 1799 he commanded in Italy, first under Scherer and then under Joubert, and distinguished himself again. By those who wished to overthrow the Directory

the dictatorship was offered him, but feeling himself unable to govern a state, he declined the offer and gave his services to Napoleon. Next year (Apr. 25, 1800) he crossed the Rhine at the head of an army of 100,000 men, and now followed the campaign through Bavaria and Austria to the walls of Vienna, ending with the decisive victory at Hohenlinden (Dec. 3), which resulted in the Peace of Lunéville (Feb. 9, 1801)—a campaign as brilliant as that Napoleon made at the same time through Northern Italy. But from this moment a rivalry sprang up between the two great generals. Moreau's wife succeeded in embittering his heart against the First Consul, and Napoleon was determined to seize the first opportunity to crush him. He was arrested (Feb. 15, 1804) as an accomplice of the conspiracy of Pichegru and Cadoudal against the life of the First Consul, and although the proofs were very insufficient, he was declared guilty (June 10) and banished. He went to North America, and settled at Morrisville, Pa., but on the invitation of Alexander I. of Russia he returned to Europe in 1813, and was present at the emperor's side in the battle of Dresden (Aug. 27, 1813), when a cannon-ball fractured both his legs. He d. Sept. 2, at Laun, in Bohemia, and his body was brought to St. Petersburg, where it was buried with great solemnity.

Moreau de St.-Méry (Médéric Louis Élie), b. at Port Royal, Martinique (West Indies), Jan. 13, 1750; entered the corps of royal gendarmes 1769; studied law while in garrison; was admitted to the bar; returned to Martinique and practised his profession; became a member of the superior council of Santo Domingo 1780; studied the history, geography, and natural productions of the Antilles; discovered and renovated the tomb of Columbus; returned to Paris shortly before the Revolution; was president of the electors of Paris assembled at the Hôtel de Ville; determined the election of La Fayette as head of the national guard; took his seat in the Constituent Assembly as deputy for Martinique; was proscribed during the Reign of Terror; escaped from prison and came to the U. S. with his family; became a bookkeeper in New York City 1793; established a bookstore and a printing-press at Philadelphia; published *Descriptions* of the Spanish (1796) and the French part of Santo Domingo (1797–98); returned to Paris 1799; became historiographer to the navy, councillor of state, and commander of the Legion of Honor 1800; was envoy to Parma 1801; administrator of that state, of Piacenza, and of Guastalla 1802–06; was an enlightened administrator; lost his post through the displeasure of Napoleon at his refusal to act as a pliant tool; fell into poverty, but was succored by Josephine, his distant relative; received a gift of 15,000 francs from Louis XVIII. in 1817, and d. at Paris Jan. 28, 1819.

More′dock, tp. of Monroe co., Ill. Pop. 636.

More′head, post-v., cap. of Rowan co., Ky., 35 miles W. by S. of Grayson.

Morehead, or **Morehead City,** post-v. of Morehead tp., and seaport of Carteret co., N. C., the S. E. terminus of the Atlantic and North Carolina R. R., 36 miles S. E. of New Berne. It is on Old Topsail Inlet, and has a steam-ferry to Beaufort and a line of steamships to New York. Pop. of v. 267; of tp. 1168.

Morehead, tp. of Guilford co., N. C. Pop. 2104.

Morehead (Charles S.), b. in 1802 in Nelson co., Ky.; was educated at Transylvania University; became a lawyer; was often in the legislature, of which he was three times chosen Speaker; attorney-general of Kentucky 1832–37; M. C. 1847–51; governor of Kentucky 1855–59; was a Clay Whig, but became a strong secessionist, and was confined in Fort Lafayette, near New York, for sedition for a long time in the war of 1861–65. D. near Greenville, Miss., Dec. 23, 1868.

Morehead (James T.), b. at Covington, Ky., May 24, 1797; was educated at Transylvania University and the University of North Carolina, and studied law with J. J. Crittenden; practised law at Bowling Green, Frankfort, and Covington, Ky.; was often in the legislature; lieutenant-governor 1832; governor 1834–36; president of the board of internal improvements 1838–41; U. S. Senator from Kentucky 1841–47; author of a work on *Practice and Proceedings at Law* (1846), etc. D. at Covington, Ky., Dec. 28, 1854.

Morehead (John M.), b. about 1796 in North Carolina; graduated in 1817 at the University of North Carolina; was an able lawyer; president of the Whig national convention 1848; governor of North Carolina 1841–45. D. at Rockbridge, Va., Aug. 28, 1866.

More′house, parish of N. E. Louisiana, bounded N. by Arkansas. Area, 800 square miles. It is bounded W. by the river Washita and E. by Bayou Bœuf, and is intersected by Bayou Bartholomew, all navigable. It is very fertile; cotton and corn are leading products. Cap. Bastrop. Pop. 9387.

Morehouse, tp. of Hamilton co., N. Y. (P. O. Morehouseville). It is in the Adirondac wilderness, and abounds in lakes and mountains. Pop. 186.

Mor′el [Fr. *morille*], the name given to the members of the genus *Morchella*, belonging to the ascomycetous group of Fungi. (See Fungi.) The genus comprises only a few species, and is characterized by an ovoid or pileate, deeply-lobed, or pitted *pileus* raised upon a stalk, the pits being covered by the spore-bearing surface, called the *hymenium*. The morels are best known for their esculent qualities, being among those fungi which were first used as articles of food. The most widely known species of the genus is *Morchella esculenta*, Pers., which is easily recognized by its large olive or smoky-gray colored pileus, two to three inches in diameter, covered by anastomosing ribs, which form large and deep pits, raised upon a short, thick, and hollow stalk, confluent with the contracted base of the pileus. It inhabits woody and bushy places on sandy soil, growing chiefly in the spring. The common morel is found in the U. S., as well as in most parts of Europe, but those in commerce come mostly from Germany. From the fact that this fungus prefers to grow on soil over which a fire has recently passed, the German peasants set fire to the forests to such an alarming extent that rigid laws were enacted against such depredations. *M. crassipes*, Pers., is the "gigantic morel," remarkable for its grooved stem, which sometimes reaches nearly a foot in length. The substance of the flesh is not so firm as that of *M. esculenta*, not easily dried, and apt to decompose. *M. semilibera*, DC., as the name implies, has its pileus separated from the stalk for half its length. The reticulations of the pileus are formed by ribs running down from the apex. Stem five or more inches high, hollow, pitted, and wrinkled below and somewhat grooved throughout. *M. pustula*, Pers., the "spreading morel," is a very excellent and rare species. *M. deliciosa* in Java, *M. Bohemica* in Bohemia, and *M. Caroliniana*, Bosc., of the Southern States are a few other members of the genus, all of which are used more or less for food. Morels are largely used as a flavoring for sauces and soups and in the production of the finest qualities of catchup. They are very palatable when stewed. W. G. Farlow.

More′land, post-tp. of Pope co., Ark. Pop. 299.

Moreland, tp. of Scott co., Mo. Pop. 2613.

Moreland, tp. of Lycoming co., Pa. Pop. 815.

Moreland, tp. of Montgomery co., Pa. Pop. 2207.

More′lia, capital of the state of Michoacan, Mexico, and seat of an archiepiscopal see, established in 1863. Founded by the Spaniards as early as 1541, it was called Valladolid until 1828, when the present name was given in memory of the revolutionary chief Jose Maria Morelos, who, as well as Iturbide, was born there. Upon a gentle, flat hill, surrounded on all sides by mountains and hills forming a charming amphitheatre of flowers and verdure in the spring season, the city is solidly built, with well-paved, regularly laid-out streets embellished by a number of handsome ecclesiastical and other public structures, including, notably, the stately cathedral, with two lofty, graceful towers, erected in 1745. Water is supplied by a costly arched aqueduct, built in 1788 at the expense of the bishop, Fray Antonio de San Miguel, to give employment to the poor during a famine. The present population exceeds 30,000 souls. About 6350 feet above the level of the sea, the climate is genial, and much attention is now given to public instruction at the expense of the city and state, including the college of San Nicolas de Hidalgo, as well as day and night primary schools. An anciently founded college is devoted exclusively to the thorough instruction of persons for the priesthood. A large cotton-factory, at work day and night, established in 1868, with 2500 spindles and 78 looms, consumes all the cotton grown in the state of Michoacan. Books were printed in Morelia (Valladolid) as early as 1559. Lat. of city, 19° 42′ 12″ N., lon. (1° 46′ 45″ W. of Mexico) 101° 02′ 10″ W. of Greenwich. Thomas Jordan.

Morell′ (George), b. at Lenox, Mass., Mar. 22, 1786; graduated in 1807 at Williams College; called to the bar in 1811; removed to Cooperstown, N. Y.; was first judge of the Otsego county court 1827 and 1832; a U. S. judge in Michigan 1832–36; a judge of the Michigan supreme court 1836–43; its chief-justice 1843–45. D. at Detroit Mar. 8, 1845.

Morell (John D.), b. in England about 1815, one of the royal inspectors of schools; has published *An Historical and Critical View of the Speculative Philosophy of Europe in the Nineteenth Century* (2 vols., 1846), *Lectures on the Philosophical Tendencies of the Age* (1848), *The Philosophy of Religion* (1849), *Elements of Psychology* (1853), *Handbook for Logic* (1855), and other works upon philosophical

and educational topics, and was author of the contributions on "National Education" in the *Encyclopædia Britannica* (8th ed., 1858).

More'lla, town of Spain, province of Castellon, is surrounded with walls and defended by a strong citadel which has played a conspicuous part in many Spanish wars. Pop. 5200.

More'los, or **Montemorelos,** formerly *San Mateo del Pilon*, town of Mexico, in the state of Nuevo Leon, 2000 feet above the sea, has manufactures of sugar, rum, hardware, hats, etc., and 9000 inhabitants.

More'los y Pa'von (Jose Maria), b. at Valladolid (now named Morelia in his honor), state of Michoacan, Mexico, Sept. 30, 1765; shot in the city of Mexico Dec. 22, 1815. Of humble parentage, he earned as a muleteer the means of education, and entering the priesthood, for which he felt a strong aspiration, became curate of Tavacuaros and Nucupetaro. A pupil of the curate Hidalgo, he joined in the revolt made by the latter against the Spaniards in 1810, and was entrusted with the duty of extending the movement on the S. W. coast, where he soon was at the head of 3000 men, officered by some of the wealthiest and most influential young men of that region. He manifested decided military capacity, with the tact relating to discipline as well as handling his forces. On Feb. 19, 1812, he fought and defeated a Spanish army at Cautla Amilpas, where he was subsequently besieged by other Spanish forces, but effected his escape to win repeated victories from the Spaniards in other quarters of Mexico, at one time holding Orizaba on the E. coast, then Oaxaca in the S., and yet again Acapulco, which he took in Aug., 1813. In an expedition against Valladolid in Dec., 1813, he was disastrously beaten by Iturbide, after which the tide of fortune ran constantly against him, until he was taken prisoner Nov. 15, 1815, carried in triumph to Mexico, there tried, and shot. In his death the revolt was deprived of its ablest leader. Thomas Jordan.

Moren'ci, post-v. of Lenawee co., Mich., on the Canada Southern R. R., has a union school, 4 churches, 1 newspaper, 1 woollen and flouring mill, 2 hotels, 1 tannery, and stores. Principal employment, farming and dairying. Pop. about 1800. E. D. Allen, Ed. "New Era."

More'ton Bay, a small inlet of the Pacific Ocean, on the E. coast of Queensland, Australia, sheltered seaward by Moreton and Stradbroke islands. A convict settlement was made here in 1849.

More'town, post-tp. of Washington co., Vt., has manufactures of lumber, etc. Pop. 1263.

More'to y Caba'ña (Agustin), b. in Spain about 1600; was a fertile and successful dramatist, a friend and imitator of Lope de Vega and Calderon; became an ecclesiastic towards the close of his life, after writing more than 200 plays, of which the most admired was *Desden con el Desden* ("Disdain met with Disdain"), reckoned one of the four most perfect productions of the Spanish drama. D. at Toledo Oct. 28, 1669. An incomplete edition was commenced during his lifetime, and terminated in 1681 in 3 vols. Brunet regards Moreto as the creator in Spain of a true comedy, to which Lope de Vega and Calderon had merely approximated.

Mor'fit (Campbell), M. D., b. at Herculaneum, Mo., 1820; was educated at Columbian College, D. C.; studied chemistry with J. C. Booth, with whom he was associated as editor of the *Encyclopædia of Chemistry* (1850); became a manufacturer of chemicals; professor of chemistry in the University of Maryland 1854–58, when he removed to New York. Author of a work on the manufacture of soap and candles (1847), *Chemical and Pharmaceutical Manipulations* (1848), *Tanning and Currying*, from the French, with additions (1852), *Perfumery* (1855); with Professor Booth prepared the Smithsonian report (1851) on the progress of the chemical arts; also author and editor of other works, chiefly chemical, besides numerous scientific papers.

Morga'gni (Giovanni Battista), b. at Forli, in the Papal States, Feb. 25, 1682; studied medicine at Bologna; practised in his native town and at Venice, and was appointed in 1711 professor of anatomy at Padua, where he d. Nov. 5, 1771. His *De Sedibus et Causis Morborum per Anatomen indagatis* (2 vols., 1761), *Adversaria Anatomica* (3 vols., 1706–19), and *Epistolæ Anatomicæ XVIII.*, form the foundation of pathological anatomy.

Mor'gan, county of N. Alabama. Area, 725 square miles. It is bounded N. by Tennessee River. The N. portion is an alluvial plain; the remainder is a high plateau containing beds of coal. Corn, live-stock, and cotton are leading products. It is traversed by the Northern and Southern Alabama R. R. Cap. Somerville. Pop. 12,187.

Morgan, county of N. Central Georgia. Area, 340 square miles. It is somewhat uneven and very fertile. It is bounded E. by Oconee River, and is traversed by the Georgia R. R. Cotton and corn are leading products. Cap. Madison. Pop. 10,696.

Morgan, county of W. Central Illinois. Area, 350 square miles. It is partly bounded W. by the Illinois River, and is very fertile and well cultivated. Cattle, grain, and wool are leading products. Carriages, agricultural implements, and flour are the principal articles of manufacture. The county is traversed by various railroads. Cap. Jacksonville. Pop. 28,463.

Morgan, county of S. W. Central Indiana. Area, 450 square miles. It is well timbered and in part hilly. The soil is fertile. Live-stock, grain, and wool are leading products. Lumber and carriages are the principal articles of manufacture. The county is traversed by various railroads. Cap. Martinsville. Pop. 17,528.

Morgan, county of N. E. Kentucky. Area, 796 square miles. It is traversed by the Licking River in a deep cañon. The county is rough and mountainous, with fertile valleys and beds of coal. Corn and wool are leading products. Cap. West Liberty. Pop. 5975.

Morgan, county of Central Missouri. Area, 625 square miles. It is uneven, well timbered, and very fertile. Live-stock, grain, and wool are leading products. The county contains much valuable coal of uncertain geological age. Cap. Versailles. Pop. 8434.

Morgan, county of S. E. Ohio. Area, 375 square miles. It is traversed by the Muskingum River. It is hilly, but fertile. Petroleum is found, salt is made extensively from salt wells, and coal is mined. Live-stock, tobacco, wool, and grain are leading products. Flour and cooperage are important articles of manufacture. Cap. McConnellsville. Pop. 20,363.

Morgan, county of Tennessee, on the Cumberland plateau. Area, 1000 square miles. Coal, iron, and timber abound. The county has a fine climate and good soil, but is as yet but little developed. Cap. Wartburg. Pop. 2969.

Morgan, county of N. Utah, bounded E. partly by Wyoming Territory. It is traversed by Weber River and the Union Pacific R. R., and is mostly occupied by spurs of the Wasatch Mountains. The Weber Valley contains much fertile soil, and is inhabited chiefly by Mormons. Cap. Morgan. Pop. 1972.

Morgan, county of West Virginia, bounded N. by the Potomac River, which separates it from Maryland, and on the S. W. partly by Virginia. It is mountainous, with fertile valleys. Iron and coal are found. Area, 375 square miles. Cap. Bath or Berkley Springs. Pop. 4315.

Morgan, tp. of Sharpe co., Ark. Pop. 371.

Morgan, post-v., cap. of Calhoun co., Ga., 25 miles E. of Fort Gaines. Pop. 126.

Morgan, tp. of Coles co., Ill. Pop. 818.

Morgan, tp. of Harrison co., Ind. Pop. 1426.

Morgan, tp. of Owen co., Ind. Pop. 1031.

Morgan, tp. of Porter co., Ind. Pop. 579.

Morgan, tp. of Decatur co., Ia. Pop. 529.

Morgan, tp. of Franklin co., Ia. Pop. 240.

Morgan, tp. of Harrison co., Ia. Pop. 464.

Morgan, tp. of Dade co., Mo. Pop. 2114.

Morgan, tp. of Mercer co., Mo. Pop. 2107.

Morgan, tp. of Rowan co., N. C. Pop. 1064.

Morgan, tp. of Rutherford co., N. C. Pop. 731.

Morgan, post-tp. of Ashtabula co., O. Pop. 1083.

Morgan, tp. of Butler co., O. Pop. 1807.

Morgan, tp. of Gallia co., O. Pop. 1403.

Morgan, tp. of Knox co., O. Pop. 645.

Morgan, tp. of Morgan co., O. Pop. 2185.

Morgan, tp. of Scioto co., O. Pop. 758.

Morgan, tp. of Greene co., Pa. Pop. 1101.

Morgan, post-v., cap. of Morgan co., Ut., on the Pacific R. R. (Weber Station) and on both sides of Weber River, 25 miles S. E. of Ogden, and is inhabited by Mormons.

Morgan, post-tp. of Orleans co., Vt., 10 miles N. W. of Island Pond, has 3 churches, an academy, and manufactures of lumber. Pop. 614.

Morgan, tp. of Monongalia co., West Va. Pop. 2536.

Morgan (Charles H.), b. at Manlius, N. Y., Nov. 6, 1834; graduated at West Point, and entered the army as brevet second lieutenant of artillery July, 1857; served with the Army of the Potomac during the civil war as chief of artillery of 2d corps Oct., 1862, to May, 1863, and

inspector-general and chief of staff of same corps (with rank of lieutenant-colonel) Jan., 1863, to Mar., 1865, receiving the successive brevets from that of major to that of brigadier-general for gallant services in the field. Appointed brigadier-general of volunteers in May, 1865, he commanded the White River district in the department of Arkansas until mustered out Jan., 1866. Is now (1876) major 4th U. S. Artillery.

Morgan (Com. Charles W.), nephew of Gen. Daniel, b. in Virginia in 1790; entered the navy as midshipman 1808; was lieutenant on the Constitution during the cruise in which the celebrated engagements with the Guerrière and the Java occurred, 1812; received from the Virginia legislature a sword for his services on those occasions; became captain 1831; was in command of the Mediterranean squadron 1841–43. D. at Washington, D. C., Jan. 5, 1853.

Morgan (Daniel), b. in Hunterdon co., N. J., 1736; removed to Virginia in early life, and in 1755 joined Braddock's expedition as a wagoner; received 500 lashes in 1756 for an alleged insult to a British officer. On the outbreak of the war for independence he raised a company of riflemen, with which he marched to Boston, and accompanied Arnold's expedition against Quebec, where, after a brave resistance, he was forced to surrender himself a prisoner; upon being exchanged he was appointed (Nov., 1776) colonel of a Virginia rifle regiment, which he commanded with great ability, and was conspicuous at Saratoga; promoted to be brigadier-general in 1780, he was attached to the Southern army, and Jan. 17, 1781, won the victory of Cowpens over Tarleton, successfully avoiding Cornwallis's subsequent pursuit and rejoining Gen. Greene. For this service Congress voted him a gold medal. Shortly after ill-health compelled him to retire from the field, but in 1794 he was again actively employed in suppressing the "whisky insurrection" in Pennsylvania; was a member of Congress 1795–99. Removed to Winchester, Va., in 1800, where he d. July 6, 1802.

Morgan (Edwin Dennison), LL.D., b. at Washington, Mass., Feb. 8, 1811; became in 1828 a clerk, and in 1831 a partner, in a wholesale grocery business in Hartford, Conn., and in 1836 established a very successful mercantile business in New York City; was State senator of New York 1843–53; governor of New York 1859–63, performing the duties of his office at that trying time with great efficiency; ranked as major-general of U. S. volunteers 1861–63 (without pay); was U. S. Senator 1863–69; declined the secretaryship of the U. S. treasury in 1864.

Morgan (George Washington), b. in Washington co., Pa., Sept. 20, 1820; abandoned his studies in 1836 to join the Texan army for independence, attaining the rank of captain; appointed cadet at the U. S. Military Academy in 1841, but without graduating settled in Mount Vernon, O. (1843), and became a lawyer; the war with Mexico again commanded his services, and as colonel of the 2d Ohio Vols. he served a year under Gen. Taylor, and on the increase of the army was appointed colonel 15th U. S. Infantry Mar., 1847, which under Scott he led with ability, receiving the brevet of brigadier-general for Contreras and Churubusco, where he was severely wounded; U. S. consul at Marseilles 1855–58, in which latter year he was appointed minister to Portugal. In the civil war as brigadier-general of volunteers he commanded a division of the Army of the Ohio; of the Army of the Tennessee in the assault on Chickasaw Bluffs, Dec., 1862, and subsequent capture of Arkansas Post. Compelled by reason of ill-health to resign in June, 1863, he was the unsuccessful Democratic candidate for governor of Ohio in 1865; M. C. 1871–75.

Morgan (Sir Henry John), the most celebrated of the early English *flibustiers* or buccaneers, b. in Wales about 1637, was the son of a wealthy farmer; ran away from home in boyhood; shipped as a sailor to Barbadoes; went thence to Jamaica; soon joined a band of buccaneers, of which he ultimately became the leader; increased his numbers by admitting adventurers of all nationalities, and ultimately became possessed of a formidable fleet, with which he repeatedly captured important seaports and ravaged whole districts of the "Spanish Main." Morgan's earliest exploits were on the coasts of Campêche, where he made many prizes. He then combined his forces with those of an older corsair named Manswelt or Mansfield, taking the title of vice-admiral, and the two adventurers, after capturing the island of Santa Catalina upon the coast of Costa Rica, advanced upon Cartagena, which they would have taken had not a quarrel between the English and French buccaneers broken out, in consequence of which they returned to Santa Catalina. Upon Mansfield's death, Morgan became his heir and successor, and thenceforth meditated bolder enterprises. With a well-equipped fleet of twelve vessels he ravaged Los Cayos and the S. coast of Cuba; marched inland; took and ravaged Puerto Principe after a formal battle; took Puerto Bello in New Granada 1668, carrying by assault its three fortresses, putting to the sword the garrisons, and torturing the wealthy inhabitants to produce their hidden wealth. The city was evacuated only on payment of a heavy ransom by the governor of Panamá. Reinforced by a body of French buccaneers under Pierre le Picard, Morgan, with 960 men, attacked and took Maracaybo, a city of 22,000 inhabitants, which was freed from plunder by the payment of a ransom 1669; engaged and captured a formidable Spanish squadron, and returned to Jamaica with an immense booty. In the following year he assembled all the "brothers of the coast" (*hermanos de la costa*) for a raid upon Panamá; made rendezvous at Cape Tiburon, Santo Domingo, Dec. 16, 1670, with thirty-seven vessels and 2200 men; appointed as second in command a Frenchman named Bradelet; took La Rancheria near Cartagena; captured the island of Santa Catalina a second time, obtaining stores of powder and guides, and took and destroyed the fort of San Lorenzo at the mouth of the Chagres River, killing over 300 of the garrison. The buccaneers then ascended the Chagres River in canoes with 1300 men, had to fight with concealed Indians, and suffered much from hunger, but succeeded in crossing the Isthmus, and appeared before Panamá Jan. 26, 1671. The city was defended by four regiments of the line, besides 2800 armed citizens and 2000 savage Indians, but this considerable force was totally routed and the city taken, sacked, and burned. After a residence of a month at Panamá the buccaneers returned to Jamaica with a booty of over $2,000,000. Morgan then returned to civilized life, married the daughter of one of the royal officers at Jamaica, was knighted by Charles II., became commissary of the admiralty, published at London his *Voyage to Panamá* (1683), and spent the last twenty years of his life in opulence in Jamaica, where he d. in 1690. (See Esquemeling (or Œxmelin), *Buccaneers of America* (London, 1684), and Van Tenac, *Histoire Générale de la Marine*.) Porter C. Bliss.

Morgan (Gen. James D.), b. at Boston, Mass., Nov. 19, 1810; went to sea in boyhood in the ship Beverley, which was burned by the mutinous crew; escaped to the coast of South America, and experienced great hardships before returning to Boston; settled at Quincy, Ill., in 1834; engaged in mercantile pursuits; served as captain in the Mexican war; entered the Federal military service in 1861 as lieutenant-colonel of 7th Illinois Vols.; was made brigadier-general for meritorious services at New Madrid and Corinth July, 1862; took part in the campaigns of the Army of the Tennessee, and commanded a division of the 14th corps of Sherman's army during the Atlanta and Georgia campaigns.

Morgan (John), M. D., F. R. S., b. in Philadelphia in 1735; graduated at Philadelphia College 1757; M. D. at Edinburgh 1764, having previously studied under William Hunter and on the Continent; became in 1765 professor of theory and practice in the Philadelphia College, and the principal founder of the medical school; was 1775–77 director-general and physician-in-chief of the army general hospital at Philadelphia. D. in Philadelphia Oct. 15, 1789.

Morgan (Gen. John H.), b. at Huntsville, Ala., June 1, 1826; served in a cavalry regiment in the Mexican war; became a manufacturer of bagging at Lexington, Ky., where in Sept., 1861, he organized the Lexington Rifles, with whom he joined Gen. Buckner in the Confederate service; commanded a squadron of cavalry at Shiloh, and soon afterwards began a series of raids through the portions of Kentucky held by the Union forces, destroying railroads, bridges, and supplies, gaining a wide celebrity. In 1863 he crossed the Ohio River upon a bold raid, but was captured with most of his command, and was confined in the Ohio penitentiary. He succeeded in escaping, and again undertook a raid in Tennessee, but was surprised during the night by Federal cavalry at a farmhouse near Greenville, and killed while attempting to escape, Sept. 4, 1864.

Morgan (Lewis Henry), b. near Aurora, N. Y., Nov. 21, 1818; graduated at Union College in 1840; practised law in Rochester 1844–64; in 1861 he was a member of the New York assembly, in 1868 of the State senate; in 1851 published *League of the Iroquois;* in 1868, *The American Beaver and his Works;* in 1870, *Systems of Consanguinity and Affinity of the Human Family* (*Smithsonian Contributions to Knowledge*, vol. xvii.). He is an authority in the U. S. and in other countries on the subjects treated in his publications.

Morgan (Sydney **Owenson**), Lady, b. in Dublin, Ireland, about 1780, was the daughter of an actor at the Royal Theatre who anglicized his name from McOwen, and was said to possess some literary ability. She published in 1797 a volume of poems, and afterwards wrote two novels,

which met with little success. In 1806 her novel, the *Wild Irish Girl, a National Tale,* gained her a sudden popularity in spite of obvious defects of grammar and the violation of all rules of literary composition. This work introduced her into aristocratic English circles, and in 1812 she married Sir Thomas Charles Morgan, a distinguished physician. She continued for many years to write novels, songs, comic operas, biographies, and works of travel, which were savagely condemned by Gifford and other reviewers, but found favor with a large portion of the reading public, and were pecuniarily profitable. One of her most carefully prepared books was *France* (1817), a critical review of the state of society as observed by her during a residence in Paris, accompanied by appendices "on the state of law, finance, medicine, and political opinion in France," written by her husband. A similar work upon *Italy* appeared in 1821. Among her more popular novels were *Florence Macarthy* (1816), *The O'Briens and the O'Flahertys* (1827), and *The Princess* (1835). In other departments her most celebrated works were probably the *Life and Times of Salvator Rosa* (1823) and *Woman and her Master* (1840). Lady Morgan was long a leader in London literary society, where she gained warm friends and had no lack of bitter enemies. In the last year of her life she published *Passages from my Autobiography* (1858). D. in London Apr. 13, 1859. A collective edition of her works was edited by herself in 1855–56. She is said to have gained £25,000 by her writings, in addition to a pension of £300 conferred upon her by the ministry of Lord Grey. (See *Lady Morgan, her Career, Literary and Personal, with a Glimpse of her Friends and a Word to her Calumniators* (1860), by W. J. Fitzpatrick.)

Morgan (Sir Thomas Charles), M. D., b. in London about 1780; educated at Eton and at St. Peter's, Cambridge; practised medicine for some time in London; resided more than twenty years in Ireland, where he was knighted in 1811; was a commissioner of Irish fisheries and a zealous advocate of Catholic emancipation; wrote much for the *New Monthly Magazine* and other periodicals; resided for several years in France and Italy, aided his wife, the celebrated Lady Morgan, in the preparation of some of her works, and published *Sketches of the Philosophy of Life* (1818) and *Sketches of the Philosophy of Morals* (1822), both of which were characterized by considerable research and acuteness. D. in London Aug. 28, 1843.

Morgan (William). See Anti-Masonry and Freemasonry.

Morgan (William F.), S. T. D., b. Dec. 21, 1818, at Hartford, Conn.; educated at Union College, N. Y., and at the General Theological Seminary in New York City; has published *Sermons*, and has been rector of St. Thomas's P. E. church, New York City, for sixteen years.

Morganat'ic Mar'riage [perhaps from the Gothic *morgian*, to "limit"], or **Left-handed Marriage,** in Germany, Austria, and Denmark the marriage of a prince, nobleman, or, in some regions, of any gentleman of rank, with a woman of inferior position. Such marriages do not necessarily prevent the contract of perfect marriage with a lady of full rank. Morganatic or inferior wives do not share the rank, titles, or estate of the husband, and the children, if not really illegitimate, are not regarded as of the rank of children of a full marriage, neither can they succeed to the property or the dignity of the father.

Mor'ganfield, post-v., cap. of Union co., Ky., about 125 miles W. of Louisville, has 1 college, 5 churches, 1 flouring and saw mill, 1 bank, 2 hotels, and stores. Pop. 300. John S. Geiger, Ed. "Union County Advocate."

Mor'ganton, post-v., cap. of Fannin co., Ga., 45 miles E. by N. of Dalton.

Morganton, post-v. and tp., cap. of Burke co., N. C., on Catawba River and on the Western North Carolina R. R. Pop. of v. 554; of tp. 2221.

Mor'gantown, post-v. of Jackson tp., Morgan co., Ind., on the Cincinnati and Martinsville R. R., on Big Indian Creek.

Morgantown, post-v., cap. of Butler co., Ky., on the navigable Green River. Pop. 125.

Morgantown, post-v., cap. of Monongalia co., West Va., 100 miles S. of Pittsburg, Pa. The State University is located here; also a female seminary and graded school. It has a national and an independent bank, several manufactories, 4 churches, 1 newspaper, 4 hotels, and stores. Pop. 797. Morgan & Hoffman, Eds. "Morgantown Post."

Mor'ganville, a v. of Morgan co., O., in Union tp. Pop. 77.

Morgan'zia, post-v. of Point Coupée parish, La., on the W. bank of the Mississippi River, 88 miles above New Orleans.

Morgar'ten, a mountain-pass in the canton of Zug, Switzerland, between Morgarten Hills and Lake Egeri. On Dec. 6, 1315, the Swiss won here their first victory over the Austrians, though numbering only 1400, while the Austrian army consisted of nearly 15,000 men. Services are performed on the anniversary of the battle in a chapel erected at the foot of the hill.

Mor'ghen (Raphael Sanzio), b. in Florence, Italy, June 19, 1758; d. there in 1833. His father, an engraver, gave him early instruction in his art, and, recognizing his extraordinary talent as displayed in seven engravings from the masks of the Carnival in 1778, sent him to the school of Volpato in Rome. Volpato gave him his daughter in marriage, took him into partnership, and shared with him the labor of executing the plate of Raphael's *Parnassus* in the Stanze of the Vatican. In 1790, Morghen visited Naples, but declined tempting overtures to stay there, preferring the offer of the grand duke of Tuscany, a salary of 400 scudi, and free apartments in the city of Florence, with the liberty of engraving such works as he pleased and the right of property in his own plates. The duty imposed was the superintendence of a public school. At this period the reputation of Morghen stood very high. The dedication of the plate of Raphael's *Transfiguration* to Napoleon in 1812 obtained for him honors and preferment. From Louis XVIII. he received the decoration of the Legion of Honor and the cordon of St. Michael. The entire work of Morghen is estimated to comprise 254 pieces, 18 of which are from Raphael; 73 are portraits. The most celebrated plates are *The Last Supper*, his masterpiece, the *Madonna del Sacco*, the *Madonna della Seggiola, The Transfiguration*, the *Aurora, St. John in the Wilderness*, the *Repose in Egypt, Magdalene Penitent*, the *Sleeping Virgin with the Infant Jesus*, the *Holy Family Reposing, Diana and her Nymphs, The Seasons Dancing before Time.* Among his portraits are those of Dante, Boccaccio, Petrarch, Ariosto, Tasso, Leonardo da Vinci, Raphael, Francesco Moncada, the family of Earl Spencer. Palmerini, the pupil of Morghen, published in 1824 a *Life* and portrait of his master, with a catalogue of his works. Proof impressions of Morghen's masterpieces are rare and command high prices. O. B. Frothingham.

Morgue, The [originally an outer court or entry of a prison], a building (*La Morgue*), on the Quai de Marché Neuf in Paris, where the bodies and clothing of unknown persons found dead are exposed for identification. The name is also applied to similar institutions in other cities.

Mori'ah [the feminine of *Moreh*], a district in Palestine, on one of whose mountains Abraham attempted the sacrifice of Isaac (Gen. xxii. 2) and Solomon afterwards built the temple (2 Chron. iii. 1). This identity has been denied by Dean Stanley and others, but was affirmed by Josephus (*Antiq.*, i. 13. 2), and is accepted by a majority of the best scholars. (See also Jerusalem.) R. D. Hitchcock.

Moriah, tp. of Essex co., N. Y., on the W. side of Lake Champlain, contains the important villages of Port Henry, Moriah Centre, and Mineville, is traversed by the Whitehall and Plattsburg and the Lake Champlain and Moriah R. Rs., and has manufactures of iron, but the chief industry is the mining of iron ore, which is found in great quantity and of superior quality. The ore is magnetic, and is largely shipped from Port Henry. Plumbago is also found. Pop. 4683.

Mori Arinori, b. in the province of Satsuma, Japan, about the year 1846; was among the first students sent to England to be educated, and, after remaining in London two years, returned to Japan. He took part in public affairs after the late rebellion in his country, and was the one who proposed to have abolished the custom of wearing two swords by one of the privileged classes. He was the first to receive a diplomatic mission from his government, and in 1871 was accredited to the U. S. as chargé d'affaires. During his residence in America he devoted special attention to educational matters, and interested himself in preparing two small books in the English language for the instruction of his countrymen. In 1873 he returned to Japan, and in 1875 was appointed first assistant minister of foreign affairs.

Mo'rier (James), b. in England in 1780, was a grandson of William Waldegrave, Lord Radstock; early entered the diplomatic service; was private secretary of Lord Elgin in his embassy to Constantinople; accompanied the grand vizier in the campaign in Egypt against the French, with orders to take part in the anticipated negotiations for the evacuation of the country by the latter; was taken prisoner by the French, to whom his mission was known, and set at liberty with a threat to treat him as a spy should he return to Egypt. Having acquired an intimate knowledge of several Oriental languages, he spent many years as secre-

tary of legation or as chargé d'affaires in Persia; returning in 1816, published *A Journey through Persia, Armenia, and Asia Minor to Constantinople in the years 1808 and 1809* (London, 4to, 1812), *A Second Journey through Persia, etc. between the years 1810 and 1816, with a Journal of the Voyage by the Brazils and Bombay to the Persian Gulf* (1818), and attained great celebrity through his novel descriptive of Persian manners and customs—*The Adventures of Hajji-Baba of Ispahan* (5 vols., 1824–28), which was followed by three others upon the same theme—*Zohrab the Hostage* (3 vols., 1832), *Ayesha, the Maid of Kars* (3 vols., 1834), and *Mirza* (3 vols., 1841). D. at Brighton Mar. 30, 1849.

Mö'rike (Eduard), b. at Ludwigsburg, Würtemberg, Sept. 8, 1804; studied theology at Tübingen, and was for some time active as a minister, but retired on account of ill-health, and lived afterwards in Stuttgart as a teacher. His novels, *Maler Nolten* (1832), *Vier Erzählungen* (1856), etc., as well as his poems, *Gedichte* (1838) and *Idylle vom Bodensee* (1846), made a great impression. He also translated Anacreon and Theocritus.

Mori'llo (Gen. Pablo), count of Cartagena and marquis of Fuentes, b. at Fuentes de Malsa, Spain, in 1777; entered the Spanish navy 1793; was sergeant of artillery at the battle of Trafalgar, where he plunged into the sea and rescued the flag of his vessel, which had been shot away; served in the land-forces against the French invasion 1808–13, and rose to be field-marshal 1813 and lieutenant-general in 1814 by courage and perseverance; was sent in 1814 with 10,000 men to reconquer the insurgent provinces of Venezuela and New Granada, and after many alternations of fortune was forced by Bolivar to sign the truce of Truxillo 1820; was recalled at his own request; was ennobled, made commander of Madrid 1820, espoused the cause of Ferdinand VII. in the contest with the Cortes 1820–21; then went over to the constitutional cause and obtained command of an army corps, and, once more changing sides, submitted to the French intervention. The restored king, however, refused to pardon his former treason, and Morillo not only suffered the confiscation of his property, but spent most of his remaining days in exile, dying at Rochefort, France, July 27, 1838.

Morin' (Arthur Jules), b. in Paris, France, Oct. 17, 1795; studied at the École Polytechnique and at the École d'Application, Metz, 1813–19; entered the foot artillery, and in 1855 became a general of division; attained numerous distinctions—the grand cross of the Legion of Honor, membership in the Institute and the Academy, a directorship in the Conservatoire des Arts et Métiers, the presidency of the imperial commission for the Exposition of 1855, the presidency of the Society of Civil Engineers; is widely known as a master of experimental and practical mechanics and dynamics. Among his many important works are a *Mémoire sur la Pénétration des Projectiles, etc.* (1835), *Mémoire sur les Pendules balistiques* (1839), *Mémoire sur les Roues hydrauliques* (1835–39), *Mémoire sur Divers Appareils chronométriques et dynamiques* (1837), *Leçons de Mécanique pratique, L'Aide Mémoire de Mécanique pratique, Salubrité des Habitations*, etc.

Morindine, a yellow crystalline coloring-matter contained in the root of *Morinda citrifolia*, called *soranjee* in the East Indies. (See Soranjee.)

Morindone. See Soranjee.

Mor'ison (John Hopkins), b. in Peterborough, N. H., July 25, 1808; was educated at Exeter Academy and Harvard College, which latter gave him the degree of A. B. in 1835 and of D. D. in 1858; was first settled over the Unitarian society in New Bedford, Mass., and afterwards (1846) in Milton, where he still preaches. Is the author of a *Life of Jeremiah Smith* (1845) and of a *Disquisition and Notes on the Gospel of Matthew* (1859); has been editor of the *Monthly Religious Magazine*, and a frequent contributor to the *Christian Examiner* and other denominational journals. O. B. Frothingham.

Morisonianism. See Evangelical Union.

Morlaix', town of France, department of Finisterre, at the confluence of the Jarleau and Kerlent. It has some manufactures of tobacco and paper, and considerable trade in corn, butter, oil-seed, pork, tallow, candles, honey, and wax. Pop. 14,008.

Mor'laks [*Morlacci* or *Primortzi*, "maritime people"], a rude S. Slavic race found in Dalmatia and the Austrian coast-lands. They are mostly sailors and devout Roman Catholics. The Morlaks of the interior make the best soldiers among the Dalmatian troops.

Mor'ley, post-v. of Mecosta co., Mich., on the Grand Rapids and Indiana R. R.

Morley, post-v. of Scott co., Mo., on the Iron Mountain R. R., has 2 mills and 1 weekly newspaper. Pop. about 600. D. L. Hoffman, Ed. "Transcript."

Morley (Henry), b. in London Sept. 15, 1822; educated at King's College, London; practised medicine 1844–48; was for two years a successful instructor; became in 1851 a London journalist, and afterwards edited the *Examiner;* lecturer on English literature at King's College, London, 1857–65, and in 1865 became professor of English language and literature at University College, London. Author of *How to Make Home Unhealthy* (1850), *Defence of Ignorance* (1851), *Lives* of Palissy, Cardan, Cornelius Agrippa, Marot, etc.; *English Writers before Chaucer* (2 vols., 1864–67), and other works.

Morley (John), b. at Blackburn, Lancashire, England, Dec. 24, 1838; educated at Cheltenham and Lincoln College, Oxford, graduating in 1859; is a liberal in politics; editor since 1867 of the *Fortnightly Review;* author of *Edmund Burke* (1867), *Critical Miscellanies* (1871), *Voltaire* (1872), *Rousseau* (1874).

Morley (Thomas), b. in England about 1545; was a musical pupil of William Birde; studied at Oxford; imitated the Italian style; was a skilful performer and a prolific composer of anthems, church services, ballets, canzonets, and madrigals. He published four books of *Madrigals* (1594–1601), a *Plaine and Easie Introduction to Practicall Musicke* (1597), and *The Triumphs of Oriana* (1601), an extraordinary performance, being a collection of twenty-four madrigals in honor of Queen Elizabeth (Oriana) by as many English verse-writers, set to music by "Thomas Morley, Bach. of Musicke and Gentleman of Her Majesty's honorable Chapell." One of the verse-writers was John Milton, father of the celebrated poet. Morley d. at London in 1604.

Morman'no, town of Southern Italy, province of Cosenza, situated on a hill about 15 miles from Castrovillari. Pop. in 1874, 5890.

Mormon, Book of. See Mormons and Smith (Joseph).

Mormon Migration. See Mormons.

Mor'mons, or, as they call themselves, **The Church of Jesus Christ of Latter-Day Saints,** a religious sect founded in 1830 by Joseph Smith at Manchester, N. Y., settled since 1847 in the Territory of Utah under the presidency of Brigham Young, and comprising about 200,000 members, including about 50,000 living in other countries. The distinguishing peculiarities of the sect are, in religious respects, the belief in a continual divine revelation through the inspired medium of the prophet at the head of the Church; in moral respects, the practice of polygamy; and in social respects, a complete hierarchical organization. The government of the Mormons is a pure theocracy; its officers form a complete priesthood. The supreme power, spiritual and temporal, rests with the first presidency, elected by the whole body of the Church, and at present composed of Brigham Young, Heber C. Kimball, and Daniel C. Wells. Then follows the office of the patriarch, at present held by the nephew of Joseph Smith; then the council of the twelve apostles and of the seventy disciples; then the orders of high priests, bishops, elders, priests, teachers, and deacons. But of the first presidency two members are only coadjutors; one alone is the real head of the whole organization—the prophet, the seer—and he alone has the "right" of working miracles and receiving revelations. This belief in a continual divine revelation through the medium of the prophet—a belief which enjoins absolute obedience to the commands of the revelation on the part of all persons who accept it—is the cornerstone of the social building of Mormonism, the only vital agency in its history, the whole secret of its success; and the day it dies out, Mormonism is nothing but a heap of nonsense. The Mormons accept both the Bible and the *Book of Mormon* as divine revelations, but they hold them both subject to the explanations and corrections of the prophet. Thus, polygamy was originally condemned by the Book of Mormon, but in 1843 Joseph Smith received a revelation according to which it was not only permitted, but recommended. Joseph Smith, who was a man of gross sensuality and utterly unable to control his passions, found it impossible to lead a life of personal profligacy and yet carry out the rôle of a divinely-chosen organ for the foundation of a new religion. There was nothing to do under such circumstances but to reverse the generally accepted ideas of sin and holiness; and since the emigration to Utah the Mormons have openly avowed and preached the doctrine of polygamy, the number of a man's wives and children being considered of the greatest consequence to his perfection in the future state. The Book of Mormon was the legitimation by which Joseph Smith first introduced himself to the world—the guaranty he gave for the divine character of his mission. An angel from heaven appeared before him and told him where this book, the Bible of the Western continent, the supplement to the New Testament,

the fulness of the divine revelation, was hidden. On the spot designated by the angel Mr. Smith found in a stone box a volume six inches thick and composed of thin gold plates, eight inches by seven, held together by three gold rings. These plates were covered with writing in the "reformed Egyptian" tongue—whatever that may be—but besides the volume Mr. Smith found the "Urim and Thummim," a sort of supernatural spectacles—for the puerilities of children's stories are not wanting—which enabled him to read and understand the characters. Sitting behind a curtain drawn across the room, he then dictated a translation—for he could not write himself—to his secretary, Oliver Cowdery, and this translation was printed in 1830, accompanied by testimonials from eleven persons who had seen the golden plates before they unfortunately disappeared. It was soon proved beyond doubt that the Book of Mormon was simply a sort of historical romance written in 1812 by one Solomon Spalding, who indulged in that kind of authorship, though he never succeeded in getting his productions published, and that the manuscript had become lost in a printing-office in Pittsburg under the hands of an apprentice, Sidney Rigdon, who in 1829 became an associate of Joseph Smith. But all argument on this point proved utterly useless, as those who were able to accept evidences needed none, while those who needed them were incapable of accepting them. The book pretends to give the history of America up to the fifth century of our era; the first settlement of the country after the destruction of the tower of Babel and the dispersion of the nations; the second settlement in the sixth century B. C. by Lehi and his sons, arriving directly from Jerusalem; the origin of the American Indians from the unfaithful Jews, who were condemned to have "dark skins;" the arrival and preaching of Christ in America; the final destruction of the faithful; and the command from God to the prophet Mormon to write down an abridgment of all these events and hide the volume—the whole being interspersed with clumsy remarks relating to Calvinism, Methodism, Universalism, and Millenarianism. With this book as a basis for his teaching, and guided by divine revelations whenever such were needed, Joseph Smith began to preach, and in Jan., 1831, he led the first Mormon congregation, consisting of thirty members, from Manchester, N. Y., to Kirtland, O., which place became the head-quarters of the sect for the following seven years. Its growth was rapid, though not remarkably so. The breaking up of the one universal Christian Church into a number of more or less individual conceptions of Christianity, which has been the characteristic of Christian progress and development, especially in this last century, has caused, at least for the time being, in the lower strata of the Christian population a looseness of ideas and a confusion of feeling which make it very easy for any one to make converts among them if he be only sufficiently positive. Under such circumstances it is rather singular that the Mormons have worked for nearly half a century and have not now more than about 200,000 adherents, for they were exceedingly positive. But in Joseph Smith a certain visionary fanaticism, which made him well suited to the business he had chosen, was connected with so much licentiousness and fraud that internal discrepancies and external conflicts soon arose, and the whole enterprise would no doubt have burst but for Brigham Young, who joined the sect in 1832. He was a man of indomitable will, gifted with a most impressive eloquence, in possession of a decided talent for organization, and of great business shrewdness; and he was ambitious. Power was his ruling passion, and the passion of power is very seldom entirely destitute of moral elevation. The whole success of the sect and all the elements of respectability which it contains are due to him, while all its miseries and all its excesses had their roots in Joseph Smith's character. All his business transactions in Kirtland were more than doubtful. The bank of which he had made himself president failed in 1838, and he had to flee in order to avoid being arrested for fraud. Meanwhile, the great body of the sect had emigrated into Missouri, and settled chiefly in and around Far West. But their conduct had now become so offensive to their neighbors that they lived in a state of actual warfare, and at the close of 1838 they were driven out of the State. Crossing the Mississippi, they retired into Illinois, and settled in the vicinity of Commerce, where they founded the city of Nauvoo, and lived there for seven years. Great advantages were given them here. A charter was granted to the city which nearly made it independent of the State government, and the Mormons had everything their own way. Thus, the city prospered well, though not better than many other new towns of America; and when speaking of the Mormons it must always be remembered that one part of their success is due to the abundance of rich soil which they have had for nothing, and another to the previously accumulated capital which flowed freely into their society, for it was their practice to leave their old and poor converts behind and carry away the young and rich. That part of their success which is due to their peculiar religious, moral, and social organization is singularly small. At Nauvoo the whole association came near its dissolution. The dissipation of Joseph Smith provoked even his intimate friends, and the divine revelation concerning polygamy, with which his sins were to be covered, excited at first general indignation. A newspaper published by one of his former friends began to expose his outrages and crimes, and when, at the head of his personal party among the Mormons, he razed the printing-office to the ground and expelled the publisher from the city, a warrant for his arrest was obtained by this man and served upon him. He refused to obey; the militia was called in to enforce the warrant. The Mormons armed at Nauvoo to resist it; and civil war was on the eve of breaking out when the governor succeeded in persuading the prophet to surrender and take his trial. He was brought to the jail at Carthage, and on the evening of his arrival (June 27, 1844) he was shot here by a mob. In the following year the legislature of Illinois repealed the charter of Nauvoo, and the situation of the Mormons in the State had now become so precarious that a new emigration was deemed necessary. Preparations were immediately commenced under the leadership of Brigham Young, who was elected prophet after the death of Joseph Smith, and with admirable firmness and circumspection he led a host of about 16,000 persons across the prairie deserts to Salt Lake Valley—a movement which it took about two years to perform. (For the further history of the Mormons see the articles UTAH and BRIGHAM YOUNG; for details concerning the origin of Mormonism see the article on JOSEPH SMITH.) CLEMENS PETERSEN.

Mormop'idæ [from *Mormops,* one of the genera], a family of insectivorous bats with rudimentary nasal appendages; the ears are moderate and each has a distinct tragus; the intermaxillaries are well developed; the molars ($\frac{5}{6} - 1 \times 2$) have W-shaped ridges; the incisors ($\frac{2}{2} \times 2$) are small; the stomach is sacciform, and has the two extremities approximated. They feed upon insects. The family—or, according to Dr. Peters, sub-family—has three genera—viz. *Mormops, Chilonycteris,* and *Pteronotus.* Their known species are West Indian animals. The family needs confirmation. THEO. GILL.

Mormyr'idæ [from *Mormyrus,* the ancient name of a sea-fish applied erroneously to the typical genus], a family of fishes of the order SCYPHOPHORI (which see), of which the body is more or less oblong; the scales cycloid and with sculptured reticulated exposed areas; the head covered with a naked skin; eyes more or less lateral; the opercular apparatus with the interoperculum atrophied; the mouth subterminal or inferior, with the cleft narrow and transverse; the margin of the upper jaw formed in the middle by the intermaxillaries, which are united into a single bone, and on the sides by the supramaxillaries; teeth variable; branchial apertures restricted to narrow lateral slits; branchiostegal rays are six, two external stout and four internal slender; the fins well developed, the dorsal and anal variable in actual and relative proportions; each with a series of pores at the base; the caudal always well developed and distinct; ventrals always present and abdominal; the air-bladder is simple; the stomach sub-globular, with two pyloric cæca; on each side of the tail are linear or band-like gelatinous bodies, which have been regarded, but erroneously, as electric organs. The family is peculiar to the fresh waters of Africa; about thirty species are known, which have been distributed in a number of genera—viz. *Mormyrus, Mormyrodes, Gnathonemus, Mormyrops, Marcusenius, Petrocephalus, Hyperopisus,* and *Isichthys.* Several of these are found in the Nile, especially in its upper parts, and engravings of them have been perpetuated on the monuments of Egypt. THEO. GILL.

Morning Glory. See CONVOLVULUS.

Morning Star, tp. of Mecklenburg co., N. C. Pop. 918.

Morning Sun, post-v. and tp. of Louisa co., Ia., on the Burlington Cedar Rapids and Minnesota Railroad. Pop. of v. 314; of tp. 1258.

Morning Sun, post-v. of Israel tp., Preble co., O., 7 miles S. W. of Camden R. R. Station, is the seat of an academy.

Morny', de (CHARLES AUGUSTE LOUIS JOSEPH), DUKE, b. in Paris Oct. 23, 1811; was generally believed to be a son of Queen Hortense and Count de Flahault; was adopted by Count de Morny, a resident of the island of Mauritius, but educated by his grandmother in Paris; entered the army and fought with distinction in Algeria; but Queen Hortense having bequeathed to him an annuity of 40,000 francs, he left the service and engaged in extensive

industrial and commercial speculations; was a member of the Chamber of Deputies 1842–48; after the *coup d'état* minister of the interior for a short time; 1856–57 ambassador in St. Petersburg; from 1854 to his death president of the legislative body. D. at Paris Mar. 10, 1865.

Mo'ro, tp. of Bradley co., Ark. Pop. 311.

Moro, tp. of Calhoun co., Ark. Pop. 481.

Moro, tp. of San Luis Obispo co., Cal. Pop. 627.

Moro, post-v. of Bethalto tp., Madison co., Ill., on the Terre Haute Alton and St. Louis R. R. Pop. 184.

Moroc'co, sultanate of North-western Africa, situated between lat. 27° and 36° N., lon. 4° 30′ E. and 11° 50′ W., bounded by Algeria, the Mediterranean, the Strait of Gibraltar, the Atlantic, and Sahara. The coast along the Atlantic is generally low, flat, sandy, very dangerous to navigate, and affording only a few harbors—El-Harish, Rabat, Casablanca, Mazagan, Saffee, and Mogadore; of which the best and most important are Mazagan, entered in 1871 by 224 vessels, and Casablanca, entered by 168. The coast from the Strait of Gibraltar eastward along the Mediterranean is high, bold, and rocky. The principal harbors here are Tangier on the Strait of Gibraltar, entered in 1871 by 461 vessels, and Tetuan, entered by 214. Spain owns Ceuta and several other points on this coast. A beautiful and very fertile plain, containing all the large cities, Morocco, Fez, etc., extends between the coast-range and the Atlas Mountains, which in several parallel lines traverse the country from N. E. to S. W. None of the peaks of the Atlas reach the line of perpetual snow; Miltzin, the highest point, situated 30 miles S. E. of the city of Morocco, rises 11,500 feet, but is often entirely free from snow. A number of rivers originate in the Atlas—the Draa, Nun, and Sus flowing to the Atlantic, the Muluia to the Mediterranean—but none of them are navigable. They are generally rapid and even turbulent in the spring, but often disappear altogether during the summer. The climate in the plain is delicious, tempered by cool breezes from the Atlas, which keep off the scorching winds from Sahara; in the wet season, from November to March, showers are frequent. In the mountains and on the southern slope extreme heat and cold alternate, and the changes are often very sudden. Excellent marbles of different kinds are found; gold, silver, copper, tin, nickel, rock-salt, and sulphur; iron is abundant and of good quality, and traces of ancient mines, probably worked by the Carthaginians, are met with in several places. The luxuriant forests which clothe the mountains contain oak, cedar of Lebanon, pine, and many kinds of valuable timber-trees. In the valleys and the plain all the cereals, fruits, and vegetables of the warm and temperate zones can be cultivated—wheat, maize, rice, sugar, cotton, tobacco, grapes, oranges, figs, almonds, dates, beans, peas, saffron, etc. But agriculture is generally in a very backward state, and the country sometimes does not produce sufficient wheat for its own demand. Large herds of cattle, horses of a small but spirited breed, goats whose skins furnish the famous morocco leather, and camels, are reared, but exportation is forbidden. The lion and panther are frequent in the forests, the hyæna, jackal, and wild-boar in the plain, the gazelle and the ostrich in the regions bordering on Sahara; numerous serpents, scorpions, lizards, and insects. Manufactures of fine woollens and silks are carried on at Fez, of bricks and silver ware in other places; but the only branch of industry carried to perfection and extensively developed is that of leather. The commerce is inconsiderable; the traffic with the southern and eastern countries is carried on by caravans. The inhabitants, estimated at from 4,000,000 to 15,000,000, are Berbers (generally agriculturists), Arabs (nomads), Moors (often employed in offices), Jews (merchants), and negroes (often slaves). The languages spoken are dialects more or less corrupted of the Berber, Arabic, Spanish, and negro tongues from the interior of Africa. The reigning religion is Islam. In ancient times the country formed part of MAURITANIA (which see); in the seventh century it was conquered by the Arabs, whose religion and customs the Moors adopted. In 787 the kingdom of Fez was founded; in 1058 that of Morocco. In the beginning of the seventeenth century the country was united under one ruler, and in 1648 the present dynasty ascended the throne. In 1814 slavery of Christians was prohibited, and in 1817 piracy was abolished.

CLEMENS PETERSEN.

Morocco, one of the capitals of the sultanate of Morocco, situated in lat. 31° 38′ N., lon. 7° 36′ W., in a plain at the foot of the Atlas, 1500 feet above the level of the sea, is surrounded by a wall 23 feet high, 7½ miles in circuit, pierced by seven gates, and flanked with numerous towers, but now generally in a dilapidated condition. The city was founded in 1072, and was in the thirteenth and fourteenth centuries a famous seat of learning, to which the Moors of Spain sent their children to be educated, and said to have had 500,000 inhabitants. It contains still many large mosques and a magnificent palace, but otherwise its splendor has decayed. Of its manufactures, that of red and yellow morocco is famous; its commerce is chiefly carried on by the Jews, who number about 6000, but live in an abject condition. Pop. estimated at 50,000.

Morocco Leather is the name given originally to leather made from goat skins tanned with sumach, but is now applied also to the inferior sort (roan) made from sheep skins. The name appears to be derived from the superior excellence of the leather formerly obtained from Morocco. The goat skins are steeped in water to remove the hair, and are then scraped clean and smooth on the fleshy side, and placed in milk of lime. From the lime-pits they are drawn out from time to time, laid to drain, and then steeped afresh. When the hair has become thoroughly loose, it is scraped off with a double-handled steel knife. After a few more days' steeping it is scraped on the flesh side until it is smooth and even. The skins are then placed in a liquid made from the dung of pigeons and hens. This done, they are sewn up in a bag shape, the grain being outside. A small orifice is left, and in this a funnel is inserted and a strong infusion of sumach is poured in. A number of the skins thus filled are rolled about in a large tub containing a weaker solution of sumach. The object of this motion is to accelerate the action of the liquid contained in the skins, as well as to subject all portions of them to the equal action of the bath. They are then heaped upon a wooden rack, and pressure brought to bear until the sumach penetrates the pores and brings the tannin into the closest relationship with the fibres. The tanning is completed by a repetition of the process described, which can all be accomplished in one day. The bags are unsewn, scraped, and hung up in the drying-loft. When again wetted and smoothed with a rubbing instrument they are ready for dyeing, being sewn together at the edges, as only one side has to be colored. The mordant used is a solution of tin or alum-water. The dye used is chiefly cochineal; boiled with alum, it forms a red liquid which is filtered through linen into a cask. The skins undergo immersions in this dye. They are then rinsed and tanned with sumach, and afterwards fulled with beetles, polished, and dried. Variations in color are obtained by the use of other dyestuffs. The final operation is that of currying. The process varies according to the purpose for which the skins are intended. (See LEATHER.)

Enamel oilcloth, made to look like morocco leather, is now extensively used. Real morocco leather is considered to be the best material for bookbinding, and the estimation in which it is held has led to extensive counterfeiting, inferior sheep skins being dressed and dyed to resemble it as much as possible. The preparation of imitation morocco from sheep skins does not vary greatly from that used for the genuine article. The color of the leather is not always given by dyeing, as almost any hue can be obtained by topical application. Aniline dyes have been used, but are said not to be durable. W. E. A. AXON.

Moron', town of Spain, province of Seville, on the Guadeira. Its castle, built by the Moors, was formerly one of the strongest fortresses of Spain, but was blown up by the French in 1812. Pop. 12,846.

Mor'pheus, in Roman mythology, the god of dreams, the son of sleep (from Gr. μορφεύς, the "moulder," the former of dreams), is generally represented as an old man with huge wings and a horn exhaling a somniferous odor.

Morphia. See OPIUM.

Morphol'ogy [Gr. μορφή, "form," and λόγος, "discourse"], **Animal,** is that branch of zoology, in its widest sense, which treats of the general form (not outline) and organization of animals, and the principles involved, as well as the correspondence in the various forms of the several members and parts, so far as they are comparable in any structural characters, but entirely independently of the uses of the parts and organs. It thus contrasts with animal physiology, which treats of the organization in whole, so far as respects adaptation to surroundings, as well as the various parts and organs, so far as their uses and functions are concerned. To discover the unity of organization in diverse forms of the animal kingdom, and the essential similarity in their mode of evolution, are the principal problems within the province of morphology.

Characteristics and Method.—The science thus distinguished is of comparatively late development, inasmuch as the tendency of the human mind (as is exhibited in the phraseology used in daily life as well as in the history of science) is to determine organs and parts from the consideration of their uses, rather than their intimate structure. This is exemplified, for instance, in the terms applied to the members; thus, the fore as well as hind limbs of quad-

rupeds when adapted for walking are all called legs; when, however, the fore limbs are specialized for certain other purposes, as grasping, etc., they are called arms; when for flying, they are designated as wings; and when modified for swimming, they are re-named fins. On the other hand, the appendages for walking in the insects are called by the same name as the analogous limbs of vertebrates—*i. e. legs*—although developed in a very different manner; the flying appendages of insects are called *wings*, as are those of bats and birds, although the former are the result of an outgrowth of the integument, while the wings of the vertebrates are developed from the fore limbs; the common name *gills* has also been given to the organs of respiration, through the medium of water, of fishes, as well as of mollusks, worms, etc.; and that of *lungs* has been applied to organs for respiration, through the medium of air, in the air-breathing vertebrates, as well as in the air-breathing mollusks, although the organs thus designated in the several cases have nothing in common except their functions, and are developed from entirely different elements of the organism. In like manner have the words *mouth, jaws, teeth,* and in fact the names of all parts of the organization, been applied from a consideration of the real or supposed functions, and not with reference to their anatomical correspondence in the different types of the animal kingdom. So far, too, has this predisposition been carried to view objects with reference rather to their relations to the surrounding media than with reference to structure that even the cetacean and sirenian mammals, though agreeing in all structural points with the quadruped mammals, were formerly universally associated with fishes, and are still regarded as such even by some in other respects well-educated persons. Thus, the progress of science in the direction of morphology has been in direct opposition to our prepossessions, and has slowly but steadily advanced in proportion as our knowledge of the structure of animals has. This growth has been so gradual that it is difficult to assign the proper meed of praise to those who have contributed to the progress. Without going into details, it is sufficient to indicate that Cuvier's recognition of the four branches of the animal kingdom limited the search for homologies to a great extent within the limits of the respective sub-kingdoms for the various constituents thereof, and in an anatomical direction. Von Baer at nearly the same time recognized still more distinctly the principles of morphology and the limitations of homologies. The transcendental philosophy of Geoffroy Saint-Hilaire, Goethe, Oken, and others, however barren in results elsewise, and although even misleading to a great extent, was at least of some use in the limitation of the identification of parts from physiological considerations, and in the diffusion of morphological ideas, but erred in excessive generalization. Morphology and physiology were, however, in spite of the growth of science, long confused together, and the latter employed at the expense of the former in morphological questions; even Cuvier himself was, to a considerable extent, imbued with this error.

As has already been indicated, a principal object of morphology is the discovery and correct appreciation of the fundamental nature and correspondence of the respective regions and organs in different animals. Comparative anatomy (*i. e.* the structure of the adult animal), comparative embryology in its utmost details (*i. e.* the anatomy of the fœtus or young in its several stages of youth), and histology, are all invoked for the solution of the questions involved in this search. And so far is physiology from being a guide in such investigations that the student must be ever on his guard against being influenced by apparent similarity of functions, or superficial similarities of parts which are subservient to a common purpose. The natural prepossessions with which all must to a greater or less degree start in the consideration of natural history must be also kept in check. Thus, if any structure might be considered unchangeable as a whole, and therefore permitting exact homological comparison throughout a series, it might be supposed that it would be the intestinal tract in its whole extent. Such, however, is far from being the case, and in many forms that which is the principal cavity in the embryo, and evidently represents the oral cavity of the lower forms of animals—*e. g.* polyps and acalephs—becomes closed, or developed as the anus, and a secondary perforation of the body-wall becomes connected with the intestinal cavity and developed as a mouth. In short, the modifications and deviations are so innumerable, and parts that are insignificant in some become of such overshadowing importance in others, and *vice versâ*, that extreme caution is necessary in making comparisons and deciding on the correspondence or homologies of parts. Comparisons, too, are, to a very limited extent, capable of being extended with precision to the representatives of different branches or sub-kingdoms.

Subdivisions and Definitions.—Morphological problems admit of being grouped according to the aim in view by the investigator, and the various problems which fall within this domain have been classified primarily under (1) anatomy (which again has been divided into tectology and promorphology), and (2) morphogeny (including ontogeny or embryology and phylogeny, which is based chiefly on palæontology). Such are the divisions advocated by Haeckel in an extensive work on morphology (*Generelle Morphologie der Organismen*), who defines them as follows: *Anatomy* is morphology in the narrowest sense, and treats of the entire structure of the organism. *Tectology* (or the doctrine of structure) is that science which treats of the composition of the organism from organic elements or entities of different degrees. *Promorphology* (or the doctrine of fundamental form—*Grundformenlehre*) is that science which treats of the superficial form of organic individuals, or their stereometric fundamental form. *Morphogeny*, or developmental history, is the general science of the developing form of the organism. *Ontogeny* (or embryology) is the developmental history of the organic individuals (*onta*). *Phylogeny* (or palæontology) is the developmental history of organic stems or genealogical stocks (*phyla*).

The necessity for exact expression has also given rise to a number of terms of which only those most generally used need be referred to. *Homological* parts are those which agree in structural relations, however much they may differ in functions, and are presumably modified from corresponding primitive elements. Thus, the arms of man, the fore limbs of quadrupeds, the wings of birds, and the pectoral fins of fishes (as of whales) are homologues of each other; so are also the lungs of the air-breathing vertebrates and the swim-bladders of fishes. *Analogous* parts are those which agree in function, however much they may differ in structure, and may be (but not necessarily) modified from entirely different primitive elements. Thus, the wings of birds and of insects are analogues (but not homologues) of each other. Of course, however, those organs which are homologous in detail, such as the wings of different flying birds, are also analogous. *Metameric* or *serially homological* parts are those which agree in general characters and relations, and are developed in an analogous manner, but not from the identically corresponding elements. Thus, the fore and hind limbs are the serial homologues of each other, as are also the different vertebræ in the same individual.

Radiate and Bilateral Symmetry.—Very few general propositions can be enunciated for the entire animal kingdom. It may, however, in general terms, be affirmed (passing by the lowest types, which are amorphous or destitute of form) that there is a tendency to the manifestation of either a radiate or bilateral symmetry in all animals. The radiate symmetry is exhibited in most polyps (sea-anemones, etc.) and acalephs (jelly-fishes, etc.), as well as in the echinoderms (star-fishes, etc.). In these forms the axis may be said to be vertical, and from it the parts radiate outward; these ideally radiating parts (comparable to the separable slices of an orange) are called spheromeres. It is suggestive that this radiate symmetry, which is so characteristic of flowers, is only exhibited in the lowest (next to the protozoans) representatives of the animal kingdom. The radiated form is, however, often more superficial than real, and in the echinoderms especially there is a decided tendency to bilateral symmetry, and the viscera are often irregularly packed. It is notable that the most prevalent number of spheromeres in the radiate types is five, but there are, however, innumerable exceptions. In all of the higher forms of the animal kingdom the disposition is more or less towards bilateral symmetry. This bilaterality is exemplified in the most perfect manner in the articulates, and, although superficially as great in the vertebrates generally, is not so all-pervading, inasmuch as the viscera, as is well known, are always stowed in a more or less irregular manner; in the mammals, *e. g.*, the heart being on one side and the stomach at more or less of an angle with the axis. In these types, also, we find many exceptions to this rule of bilateral symmetry. Even the beetles with large cephalic appendages have those appendages diversely developed on the respective sides. The hermit crabs still more decidedly exhibit asymmetry in their claws as well as in their abdomen. Even in the vertebrates we find striking exceptions to bilateral symmetry; thus, a large group, with many species, of fishes (Heterosomata, including the flat-fishes, etc.) have their eyes on one side, the head being twisted accordingly; and one side is dark, and the other generally whitish. In the toothed whales, also, we find great asymmetry displayed in the olfactory region, the nasal bone of one side being much larger than the other. In the shell-bearing gasteropod mollusks, bilateral asymmetry is much more apparent (rather because

it is superficial than because much exceeding that in others) than in articulates and vertebrates, and is the result of the hernia-like protrusion of the intestines, and the development around them of a shell which is extended generally sufficiently to include the entire body. These examples suffice to prove that there is no absolute law of development of symmetry for animals, and indicate that the varieties of forms are rather the results of dynamical coefficients and for adaptation to different conditions of life.

Metamerology, or Vegetative Repetition of Parts.—In many diverse forms corresponding parts are repeated, and sometimes almost *ad infinitum*, in the same individual, and the relation of these forms to more generalized ones indicates that this tendency is not the result of genetic affiliation. This character is best exemplified in certain helminths, as well as in some true worms; in some of the former, especially, it is carried to such an extreme that we find each segment provided with generative organs, and readily separable from the contiguous ones, and capable of producing a head and tail and of attaining complete individuality. The very numerous group of arthropod (footed) articulates is also characterized by a less perfect but still well-marked repetition of segments; and to this repetition, indeed, it owes its name—*articulatus*, "jointed." In the course of specialization from the low to the high, however, differentiation supervenes between the several regions, and the anterior segments become developed disproportionately to the posterior. In the branch of vertebrates the vegetative repetition is exemplified in the segmentation of the dorsal column into vertebræ, and it is contended by many that the skull is the result of the combination of several vertebræ differentiated from the others, and specifically modified for the inclusion of the brain and the several functions connected with alimentation and the senses. (See SKELETON.) This vegetative repetition is also exemplified in the numerous legs which are developed in the myriapod articulates, the six of insects, and the four of most vertebrates. In the vertebrates it is to be noted that the anterior and posterior members of those forms which are chiefly adapted for walking or swimming are very similar, corresponding segments being reproduced for each, and the combinations being much alike in form and otherwise. This similarity is indeed so great and general that we are compelled to recognize the operation of some dynamic law, under which, and for similar purposes, like instruments are evolved; but that this similarity is not due to a simple predetermined plan, and is not the consequence of conformity with any pattern, is evident on further investigation, inasmuch as it is found that in certain forms the respective members are developed for entirely different purposes, and one or the other, or both, may be absent, in whole or in part, or with parts diversely combined. Excessive differentiation of the fore and hind members is manifested in the birds and bats. The fore limbs are wanting in representatives of every class except the mammals—*e. g.* in the extinct Dinornithidæ among the birds, in serpents and some lizards among the reptiles, in cæcelians among the amphibians, and in many fishes. The hinder limbs are also lost in many forms—*e. g.* the sirenian and cetacean mammals, most serpents and some lizards, a few amphibians, and many fishes. The direct relation which exists in all these cases between structure and habits, and the great want of coincidence between the variations noted and modifications of the other parts, bring into strong relief the unimportance of teleology and the significance of morphology; the want of coincidence is only explicable on the assumption of the parts being as they are because of development and retention consequent on adaptability for the specific conditions under which they exist—in other words, natural selection.

Antitropy, or Antero-posterior Symmetry.—It has been maintained by some comparative anatomists that there is an antagonism of the opposite extremes of the body, and that fundamentally those extremes or poles are alike, but modified for adaptation to different ends. It has even been urged that the homotypes of the mouth, tongue, salivary glands, and other organs are represented by parts peculiar to the posterior extreme, and that the posterior limbs are to be compared inversely with the anterior ones. In other words, if we should venture to give expression to this ideal conception in unsophisticated language, the typical animal would be composed of two halves—an anterior and posterior—which would be alike, but face in opposite directions. The view under a metaphorical phraseology has been advocated with much zeal by men of learning and industry; but there seems to be little in nature to verify the conception. If we look at the lowest vertebrate form (*Branchiostoma*), we are very far from finding any realization of the conception, save in superficial aspect; and if we look at man, who is the highest, we equally fail to appreciate the relevancy of the conception. If, going beyond the vertebrates, we examine the tunicates (adult as well as embryonic), from which the vertebrates are supposed to have originated through forms resembling *Branchiostoma*, we find an equally decided contradiction of the hypothesis. In view of these facts, it is not obvious what advantage is gained by the adoption of any hypothesis like that of antero-posterior symmetry. The archetypical animal, as expressed in the most generalized and lowest known form, and the most specialized and highest, almost equally fail to exhibit actual antero-posterior symmetry. It is true that there is an inversion especially manifested in the higher vertebrates in the direction of the several segments of the different members, the humerus being flexed backward and the femur forward; but it is apparently a less violent assumption that these relations are the consequents of mechanical forces, resulting in rotation in different directions and destined for the sustentation of the body, than of either a primitive or prospective tendency or plan with reference to antero-posterior symmetry. The limbs are, in fact, nearly parallel in fishes, but little inverted with reference to each other in amphibians, and most antiverted in the birds and mammals. If there is a tendency to antitropy, it should therefore apparently be most manifest in the highest form. Whether there actually is such antitropy in man is a matter for ordinary observation. The fact, too, that annelids and helminths in fission develop the heads of the segmented individuals from the end nearest the original head is also opposed to the hypothesis in question.

Examples.—The branch of vertebrates being that whose representatives are best understood, as well as most familiar to the educated generally, the application of morphological principles will be best illustrated in their case. This may be done by first taking two extremes, and then endeavoring to ascertain the meaning and relations of the members by the intercalation of intermediate types.

On the one hand, as the highest expression of the animal kingdom, we have man. In brief, he is a vertebrate, erect in stature, with two limbs developed as legs and two as arms; breathing air through the medium of lungs; with a highly-developed brain divided into cerebrum and cerebellum, and with a definite number of nerves connecting with certain organs and parts; a bony skeleton divided into well-marked regions—*e. g.* the skull (in which are to be distinguished the brain-case, the lower jaw directly articulated with the former, several small ear-bones, and the hyoid apparatus), the limbs, etc. On an examination of the abdomino-thoracic cavity we find, besides an intestinal canal, a pair of lungs connecting directly with the oral cavity; a quadrilocular heart; a distinctly differentiated liver; kidneys for the secretion of urine; and highly-specialized organs of generation (in the female, in connection with the ovaries, a uterus, in which the young are for some time borne, and in the male, in connection with the testicles, certain complicated parts).

On the other hand, by far the lowest of the vertebrates, stands the *Branchiostoma lanceolata*. Although a vertebrate, inasmuch as it has a nervous chord encased in a sheath and separated by a vertebral axis from the abdominal cavity, it is without a distinct head, and has rather the aspect of a worm than of a vertebrate; the body is horizontal, and pointed at both ends; entirely destitute of limbs, as well as scapular and pelvic arches; breathes air through the medium of water; has no distinctly differentiated brain (the several regions in the higher forms not being represented as distinct elements), and the skeleton is represented by a simple notochord or persistent cartilaginous axis, which ends in a point forward, no skull being developed; the viscera are also few in number; the intestinal canal has a large perforated pharynx, and thence runs straight and without lateral curvature backward; there are no lungs or air-bladder; the heart is tubular, and not divided into partitions; the liver is a diverticulum of the intestinal canal; the kidneys are extremely rudimentary, and the organs of generation very simple, and scarcely differing superficially in the two sexes.

Such are the extremes exhibited by the members of a universally accepted branch. If we compare these two extremes together, it is at first impossible to perceive any resemblance in whole, or even to recognize the similar or homologous parts in each. The statement so often made in popular works that all the representatives of a single branch or sub-kingdom are built upon the same pattern, and that the corresponding parts are reproduced in all, is most evidently falsified by a comparative examination of the animals in question. It would be indeed absolutely impossible to obtain an adequate conception of the correspondence of these two forms were it not that numerous intermediate types exist which enable us, by successive intercalations, to trace the development of the various organs and parts. The examination of these intermediate forms

in their adult as well as in their embryonic condition shows us that not even the rudiments of several parts exist as such in the inferior type. It becomes evident in the course of our examination that the limbs are the development of buds which spring from the side, and these are first developed in selachians (sharks, rays, etc.). The brain becomes gradually developed and differentiated into regions, which finally become subordinate to a central mass (the cerebrum) as we ascend the animal scale, and in the lowest form the nerves alone are present to remind us of the relations of the simple brain—if so it may be called—to the specialized organ of the higher forms. The notochord in *Branchiostoma* does not even represent potentially the skeleton of the higher vertebrates, inasmuch as in them it is the result not only of chrondrification and ossification of that notochord, but also of the union therewith of elements which have originated independently of the axial skeleton: *e. g.* the skull in the higher forms is composed of cartilage bones (bones formed in the cartilage), as well as membrane bones, and, in part at least, the latter are the homologues of dermal plates in the sturgeon and some other fishes. The lungs in the higher forms can be readily connected by regular gradations with the single air-bladder of fishes; and the relations which that has in the generalized or lower fishes, as well as its absence in the selachians, marsipobranchiates, and *Branchiostoma* shows that it was primitively a simple diverticulum of the alimentary canal, and consequently only potentially represented by the undifferentiated surface of the intestinal canal in *Branchiostoma*. In that form, likewise, the liver, so distinct in the higher forms, is represented by merely a diverticulum of the intestinal canal, but already specialized, so as to be actually comparable with the liver.

Causes of Morphological Correspondence.—The "reason why" of the coincidences thus indicated will naturally be called for. The older naturalists were wont to explain that they were in accordance with a "plan" instituted by the Creator in the beginning, and that the representatives of the several great branches or sub-kingdoms of the animal kingdom were constructed after an ideal pattern common and peculiar to the various members of each branch. This, however, was only another way of expressing the fact that the animals of the respective groups did agree in structure, and failed to give the wherefore, as well as in still another point. If a "plan" had been predetermined upon, and "patterns" selected for the construction of animals, any deviation therefrom would indicate subjection to a higher power and failure in ability to carry into execution the original plan. If, therefore, the plan would be evidence of prescience, the failure of execution would prove impotence in ratio to the failure. Now, as already pointed out, every type is deviated from, and innumerable exceptions interfere with every extensive generalization respecting community of structure. The idea of plan, therefore, not only fails to give any explanation for morphological correspondences, but in its actual application and failures is really in antagonism to the conception of divine creative power. The consideration of morphological problems has finally culminated in a general adoption of the theory that the correspondences in question are the results of genetic development from the most generalized common stocks; and this theory is the only one yet broached that is consistent with the deviations from, as well as conformity between, the characters common to groups, and with the subordination of teleological or physiological characters to morphological or structural ones. (See further BIOLOGY, COMPARATIVE ANATOMY, SKELETON, ZOOLOGY, etc.) THEODORE GILL.

Morphology in botany, was somewhat earlier developed than in zoology, as its foundations are perhaps more obvious. In all the higher grade of plants the structure in the vegetation is such as readily to suggest the idea of successive repetition of similar yet sometimes variant parts; and in the blossom the identity of the more prominent parts with leaves is popularly recognized in calling them the leaves of the flower. The step does not seem a long one to take which resulted finally in the morphological view now held; namely, that the upwardly growing parts of a plant—all, indeed, but the roots and mere superficial growths, such as hairs and prickles—consist of joints of stem, developed one from another, each joint bearing at its summit one, two, or more leaves, or what answer to leaves. This idea is fully exemplified in the article BOTANY, and is again referred to in the article LEAVES. A brief historical notice may here be added.

These ideas essentially began with Linnæus, who in 1750 briefly announced that flowers and leaves, flower-buds and leaf-buds, are identical in nature and origin, and that a flower-cup consists of rudimentary leaves united. Several years afterward, in a paper entitled *Prolepsis Plantarum*, he gave these conceptions a somewhat fanciful development, in which the point was lost or obscured; and he also misled his followers by an independent and incongruous speculation, suggesting that the calyx answered to the outer bark of the stem, the corolla to the inner bark, the stamens to the wood, and the pistil to the pith. His earlier and just ideas being thus overlaid, it is not surprising that they bore no fruit. In 1766, Caspar Frederic Wolf, in a second edition of his thesis of 1751, redeveloped and extended these earlier views. His thesis was a theory of generation, and was mainly devoted to animal physiology. But he clearly conceived the plant to be made up of two elements, stem and leaf, in continued succession, and regarded all the organs of the flower as modified leaves. He added an hypothesis to explain how these parts come to be developed as floral organs instead of foliage-leaves: the hypothesis was, that by a diminution of vegetative force leaves degenerate into bud-scales and the like, as in woody plants at the end of the season's growth, to be renewed in full vigor in the vegetation of the ensuing spring; and, similarly, that they degenerate into bracts, sepals, petals, stamens, and pistil, and finally seed, from which the renewed vigorous development in turn proceeds. This thesis was overlooked and forgotten. At least it was unknown to Goethe when, in 1790, he published his better-known paper on the *Metamorphosis* of plants, thus bringing in a name which has long been current, but is now little used. Without entering into details, it is sufficient to state that Goethe clearly indicated by scientific evidence the passage of leaves, or what could or might have been leaves, into bracts, sepals, and petals, and these into stamens, and showed that by retrograde metamorphosis pistils, and indeed all the other parts of the blossom, might revert to leaves. He thus established the leaf as the type from which by "metamorphosis"—or rather by development under other forms, subservient to other uses—all the organs of the flower originated. Goethe also had a gratuitous hypothesis to account for the changes; which was, that vegetable life and growth consisted of a series of successive expansions and contractions—that the plant expanded in vegetation and contracted in inflorescence, and so on—an hypothesis remarkably like that of degeneration and reinvigoration as taught by Wolf, considering that the one was unknown to the other. Goethe's ideas, if not so completely forgotten, produced for fully a quarter of a century no more fruit than those of his predecessor, Wolf. That they had taken no hold out of Germany, and but little there, appears from the fact that they were wholly unknown to De Candolle until several years after he had published the first edition of his *Théorie Élémentaire*. In this work similar notions of morphology were developed, but from a different point of view; viz. from that of a symmetrical plan in the flower—a symmetry which is seldom completely exemplified, at least to superficial inspection, owing to abortions, coalescence, union of heterogeneous parts, or other disguises, but which the instructed botanist readily discerns and interprets. By the time that De Candolle had become aware of Goethe's publication the minds of botanists were ready for morphology, and ever since it has been turned to practical account. The principal steps in its subsequent development, essentially as now received, were soon taken by Robert Brown, Dupetit-Thouars, De Candolle, Roeper, etc., and systematic as well as structural botany was placed upon a morphological foundation.

De Candolle's *Théorie Élémentaire* was the needful counterpart of the theory of *metamorphosis* of Goethe. For, preoccupied with the idea of symmetry, the former nowhere brought out the idea that the parts of the flower answer to leaves. If this idea, which Goethe put forward, had been in De Candolle's mind, he would not have failed to ask the question why flowers are symmetrical in plan, nor to have found the answer to that question already suggested, in a measure, by his father's friend, the pastor Bonnet, in his *Memoir on Leaves*, although it was completely furnished, only much later, by Schimper, Braun, and other investigators of phyllotaxy, beginning about the year 1829. The symmetry of the blossom is an obvious corollary from the symmetrical arrangement of leaves; and the test of almost every morphological interpretation of structure in a flower is its agreement or just analogy with what is true of the leaves. ASA GRAY.

Mor′phy (PAUL CHARLES), b. at New Orleans, La., June 22, 1837; exhibited from childhood surprising skill in chess, and at the age of twelve had defeated the best players of his native city; graduated at St. Joseph's College; studied law, and was admitted to the bar in 1857; at the chess congress in New York in 1857 was the victor, thereby becoming the champion player of the U. S.; in 1858 visited Europe; gained a victory over Löwenthal and others in London; defeated the best French and German players, and gave exhibitions of his ability to play eight games simultaneously without seeing the chess-boards.

On his return to the U. S. he resumed the practice of his profession in New Orleans.

Mor'rell (WILLIAM), an English clergyman who accompanied Capt. Robert Gorges to Massachusetts in 1623; resided for a year at Plymouth; returned to England, and published in 1625 a poem in Latin and English heroic verse entitled *Nova Anglia*, interesting as one of the first literary monuments of New England colonization; reprinted in *Mass. Hist. Coll.*, 1st series, i.

Mor'rill, post-tp. of Waldo co., Me., 6 miles W. of Belfast, has manufactures of cooperage and lumber. Pop. 523.

Morrill (ANSON P.), b. at Belgrade, Me., June 10, 1803; became a manufacturer and merchant; was governor of Maine 1855–57, and M. C. 1861–63.

Morrill (Rev. DAVID LAWRENCE), M. D., LL.D., b. at Epping, N. H., June 10, 1772; became a physician of Epsom, N. H., in 1793; pastor of the Congregational church Goffstown, N. H., 1802–11; a practitioner of medicine 1807–30; was many years in the New Hampshire legislature, and in 1816 was its Speaker; U. S. Senator 1817–23; president of the State senate 1823; governor of New Hampshire 1824–27, and afterwards editor of the New Hampshire *Observer;* author of addresses, pamphlets, etc. on various subjects. D. at Concord, N. H., Jan. 28, 1849.

Morrill (JUSTIN S.), b. at Strafford, Vt., Apr. 14, 1810; engaged in mercantile business, and in 1848 became a successful agriculturist; M. C. from Vermont 1855–67; chairman of committee of ways and means and author of the Morrill tariff of 1861; U. S. Senator 1867–73, re-elected in 1873 for the full term.

Morrill (LOT M.), b. at Belgrade, Me., May 3, 1813; was educated at Waterville College; became a lawyer in 1839; entered the legislature in 1854; president of the State senate 1856; governor of Maine 1858–60, U. S. Senator 1861 and 1863–69, and in 1871 was re-elected for the full term.

Mor'ris, or **Nine Men's Morris,** a game played on a board or other material upon which three squares are drawn, one within the other, and having round spots at the corners and at the middle of every side of each square, the adjoining spots being connected together by straight lines. The game is conducted by two persons, with nine pieces for each player, of similar form, and white and black, as in draughts. Each player places the pieces alternately on the spots, endeavoring to prevent his opponent from having three in a row, and the pieces being moved along the lines from spot to spot as occasion requires. When three pieces of a color are in a row, the player takes up one of his opponent's pieces, and he who succeeds in taking off all the other's pieces wins the game.

Mor'ris, county of E. Central Kansas. Area, 655 square miles. It is well watered, fertile, and adapted to grain and stock-raising. Coal and building-stone are found. The county is traversed by the Missouri Kansas and Texas R. R. Cap. Council Grove. Pop. 2225.

Morris, county of N. New Jersey. Area, 484 square miles. It is in some parts mountainous, and contains numerous mines of excellent iron ore. The scenery is often picturesque. The soil is generally well cultivated and productive. Cattle, grain, fruit, wool, and dairy products are the agricultural staples. The manufactures are very extensive, and include iron, iron goods, lumber, flour, paper, spirits, carriages, etc. The county is traversed by various railroads. Cap. Morristown. Pop. 43,137.

Morris, county of N. E. Texas. It has been recently formed.

Morris, post-v. and tp. of Litchfield co., Conn., 5 miles S. of Litchfield. Pop. 701.

Morris, city and tp., cap. of Grundy co., Ill., on the Chicago Rock Island and Pacific R. R. and the Illinois and Michigan Canal, is one of the largest grain-markets of the West, having 10 warehouses; contains 5 schools, 1 classical institute, 6 churches, school furniture, plough, and cultivator factories, extensive mines of bituminous coal, 2 banks, 2 weekly newspapers, numerous carriage and repair shops, and a steam fire-engine company. Pop. of city, 3138; of tp. 113. JOSEPH W. SIMPSON,
ED. AND PROP. "LIBERAL REFORMER."

Morris, tp. of Carroll co., Mo. Pop. 3831.

Morris, tp. of Sullivan co., Mo. Pop. 964.

Morris, tp. of Texas co., Mo. Pop. 539.

Morris, tp. of Morris co., N. J. It includes MORRISTOWN (which see). Pop. 5674.

Morris, post-v. of Otsego co., N. Y., 14 miles from the Albany and Susquehanna R. R., has 6 churches, 1 bank, 1 weekly newspaper, 2 cotton-factories, a chair-factory, 2 cheese-factories, and farm and dairy products. Pop. 2253.
L. P. CARPENTER, ED. "MORRIS CHRONICLE."

Morris, tp. of Knox co., O. Pop. 860.

Morris, tp. of Clearfield co., Pa. Pop. 1480. (See MORRISDALE.)

Morris, tp. of Greene co., Pa. Pop. 1296.

Morris, tp. of Huntingdon co., Pa. Pop. 688.

Morris, post-tp. of Tioga co., Pa., has beds of semi-bituminous coal and noble forests. Coal is mined at ANTRIM (which see). Pop. 423.

Morris, tp. of Washington co., Pa. Pop. 1050.

Morris (CHARLES), b. at Woodstock, Conn., July 26, 1784; entered the navy July 1, 1799, and served during the war with Tripoli; promoted to be lieutenant in 1807, and was distinguished in the war of 1812 as first lieutenant of the frigate Constitution, being severely wounded in the engagement of that ship with the British frigate Guerrière, Aug. 19. Received a captain's commission and took command of the Adams, in which he made a very successful cruise, but which he was compelled to destroy in 1814, while lying in the Penobscot River in a disabled condition, to prevent her falling into the possession of an expedition sent to capture her. Subsequently in command of the Brandywine, he conveyed La Fayette back to France in 1825, and later attained the rank of commodore and commanded a squadron. For many years he was in charge of various bureaus in the navy department, being chief of the bureau of hydrography at the time of his death, which occurred at Washington Jan. 27, 1856.

Morris (EDWARD JOY), b. in Philadelphia July 16, 1815; graduated at Harvard 1836; in the State legislature 1841–43; in Congress 1843–45 and 1857–61; *chargé d'affaires* at Naples 1850–54; U. S. minister to Turkey 1861–70; author of a book of travels in the Levant (1842) and of several valuable translations from the German.

Morris (FRANCIS ORPEN), b. at Beverley, Yorkshire, Mar. 25, 1810; graduated at Oxford 1833; took orders in the Church of England; became incumbent of Nunburnholme, Yorkshire, and was chaplain to the late duke of Cleveland. He has published a *History of British Birds* (1851–57), *Bible Natural History* (1852), *Records of Animal Sagacity and Character* (1861), *Natural History of British Moths* (1859–71), *An Essay on the Eternal Duration of the Earth* (1870), *Difficulties of Darwinism* (1870), *Dogs and their Doings* (1871), several monographs on the nests of British birds, on butterflies, etc., and various other works on scientific, antiquarian, social, and religious topics.

Morris (GEORGE P.), b. at Philadelphia Oct. 10, 1802; removed in early life to New York, where he soon began to write for the press; published the New York *Mirror* 1823–42; was the associate of N. P. Willis in publishing the *New Mirror* (1843), the *Evening Mirror* (1844), the *National Press* (1845–46), and the *Home Journal* (1846–64); was one of the best of song-writers; author of several volumes of prose and verse. D. in New York July 6, 1864.

Morris (GEORGE SYLVESTER), A. M., b. at Norwich, Vt., Nov. 15, 1840; graduated with highest honors at Dartmouth College 1861; served in the army; was tutor at Dartmouth 1863–64; studied theology, and spent several years in Germany, chiefly in philosophical studies; translated Ueberweg's *History of Philosophy*, with additions (1871), and became professor of modern languages and literature in the University of Michigan 1870. He has written on philosophical topics in various reviews and in the *Transactions* of the Victoria Institute, London, and is now engaged (1875) in the preparation of a textbook of the history of philosophy.

Morris (GEORGE U.), U. S. N., b. June 3, 1830, in Massachusetts; entered the navy in 1846, rose to commander in 1866, and was retired in 1874. Distinguished himself by his gallant defence of the Cumberland when attacked by the Merrimack, Mar. 8, 1862. In his report for 1862 the secretary of the navy says: "Passing by the Congress, the Merrimack dashed upon the Cumberland, and was received by her with a heavy, well-directed, and vigorous fire, which, like that of the Congress, produced but little effect. A contest so unequal could not be of long continuance, and it was closed when the Merrimack, availing herself of her power as a steam-ram, ran furiously against the Cumberland, laying open her wooden hull and causing her almost immediately to sink. As her guns approached the water's edge her young commander, Lieut. Morris, and the gallant crew stood firm at their posts, and delivered a parting fire, and the good ship went down heroically with her colors flying." D. Aug., 1875. FOXHALL A. PARKER.

Morris (GOUVERNEUR), b. at Morrisania, N. Y. (now in New York City), Jan. 31, 1752, was of a wealthy family which produced many distinguished public men of New York; graduated at King's College, N. Y., 1768; was admitted to the bar in 1771; was in the provincial congress

of New York 1775; assisted in drafting the State constitution 1776; was in the Continental Congress 1777–80; lost a leg in 1780 in consequence of an accident; became in 1781 assistant superintendent of finance, and afterwards was Robert Morris's partner in mercantile business; was one of the committee which drafted the Federal Constitution 1787; was engaged in business in France 1788–91; U. S. agent in London 1791; minister to France 1792–94; was U. S. Senator 1800–03, displaying remarkable ability and eloquence; was one of the fathers of the New York canal system, and president of the canal commission 1810–16; author of numerous essays, etc. D. at Morrisania, N. Y., Nov. 6, 1816; was a man of aristocratic tastes and great hospitality, and in politics was a Federalist.

Morris (Com. Henry W.), grandson of Gouverneur, b. in New York City in 1806; entered the U. S. navy as midshipman 1819; became lieutenant 1828, commander 1849, and captain 1856; commanded vessels on the home rendezvous and the African and Brazilian squadrons 1845–55; was fleet-captain to Com. Stringham in the Mediterranean squadron 1855–56; superintended the construction of the steam sloop-of-war Pensacola at the Washington navy-yard 1861; passed in that vessel the Confederate batteries on the Potomac Jan., 1862; joined the Gulf blockading squadron; took a brilliant part in the attacks upon Forts Jackson and St. Philip and the Chalmette batteries, which preceded the capture of New Orleans; was placed in command of the naval forces guarding that city; lost his health by arduous duty, and d. at New York Aug. 14, 1863.

Morris (John G.), D. D., LL.D., b. at York, Pa., Nov. 14, 1803; graduated at Dickinson College 1823, and in theology at Princeton 1825; was pastor of the First Lutheran church in Baltimore 1826–59, and of another church in the same city six years; was the first librarian of the Peabody Institute at Baltimore, for which he drew up a catalogue containing the titles of 50,000 volumes; published a *Popular Exposition of the Gospels* (1840), translated from the German *The Life of John Arndt* (1853), *The Blind Girl of Wittenberg* (1856), Leonhard's *Geology;* wrote *Quaint Sayings and Doings concerning Luther*, *Life of Catharine de Bora* (wife of Luther), a *Catalogue* and a *Synopsis* of the described Lepidoptera of the U. S., both published by the Smithsonian Institution; *Contributions to the Entomology of the U. S.*, in *Silliman's Journal;* papers on Martin Behaim (1855) and on the Lords Baltimore, printed by the Maryland Historical Society; has written sketches of foreign travel, numerous scientific, religious, and literary essays. He was the first editor of the *Lutheran Observer* (1831–32), and co-editor of the *Year-Book of the Reformation* (1844). He founded the village of Lutherville near Baltimore, and the flourishing female seminary at that place; was one of the founders of the *Record* of the Linnæan Society, published at Gettysburg; delivered several courses of scientific lectures at Pennsylvania College, Gettysburg, and an annual course on *The Connection between Science and Revelation* in the Lutheran seminary at the same place. He has been president or vice-president of numerous scientific, literary, and religious bodies, and is an active member of the American Association for the Advancement of Science.

Morris (John Thomas), S. J., b. at Utakamund, Madras presidency, India, July 4, 1826; became a Catholic while studying at the University of Cambridge; proceeded to Rome and completed his education at the English College; took orders; served in the diocese of Northampton, becoming canon; was for three years vice-principal of the English College, Rome, after which he was appointed secretary to Cardinal Wiseman. In 1867 he entered the Society of Jesus. Father Morris has published a *Life of St. Thomas of Canterbury*, *Condition of Catholics under James I.*, *The Letter-Books of Sir Amias Poulet, Keeper of Mary Queen of Scots* (1874), and a very remarkable work, *The Troubles of our Catholic Forefathers* (2 series, 1874), in which he casts a vivid light upon the forgotten annals of the persecution of Catholics by Queen Elizabeth.

Morris (Lewis), b. at Morrisania, N. Y., in 1671; became a judge of the superior court of New Jersey in 1692, and was prominent in public affairs; was for years chief-justice of New York and New Jersey, and acting governor in 1731; was active in the separation of New York and New Jersey 1738; governor of New Jersey 1738–46; d. at Kingsbury, N. J., May 21, 1746.

Morris (Lewis), one of the signers of the Declaration of Independence, was the eldest brother of Gouverneur Morris, b. in 1726 at Morrisania, N. Y.; graduated at Yale 1746; was in 1775 active in detaching the Indians from the service of Great Britain; was in the Continental Congress 1775–77, and afterwards a major-general of militia. D. at Morrisania Jan. 22, 1798.

Morris (L. N.), b. in New York 1800, grandson of Lewis, signer of the Declaration of Independence; graduated at West Point 1820; after twenty-five years of garrison and frontier life the war with Mexico offered an opportunity for more active duty, and at Palo Alto and Resaca de la Palma Morris nobly performed his duty, and at Monterey, on the first day of the fight, was killed while leading an assault, Sept. 21, 1846. At the time of his death he was a captain of the 3d Infantry and brevet major.

Morris (Lewis O.), b. at New York, son of the above; in 1847 entered the army as second lieutenant, and in the war with Mexico participated in the siege of Vera Cruz and subsequent operations. On the outbreak of civil war in 1861 he was in command (rank of captain) of his battery in Texas, which he refused to surrender. Appointed colonel 113th New York Vols. in 1862, his command was stationed in the defences of Washington, where it was converted into a heavy artillery regiment, and as such attained a high degree of proficiency. In May, 1864, his regiment was joined to the Army of the Potomac, and engaged in all the battles of that memorable campaign, Morris being most of the time in command of a brigade up to the battle of Cold Harbor, June 3, 1864, where, like his father, he met his death at the head of his command.

Morris (Richard), LL.D., b. at Bermondsey, Southwark, England, Sept. 8, 1833; was educated at St. John's College, Battersea; appointed lecturer on the English language and literature in King's College School in Apr., 1869, and was ordained curate of Christ Church, Camberwell, 1871. Dr. Morris has been for many years one of the most efficient members of the Chaucer, the Early English Text, and the Philological societies, and was chosen president of the latter in 1874—a high honor for so young a man, especially since he is not a graduate of either of the great universities. He has published *The Etymology of Local Names* (1857), *Specimens of Early English* (1867), *Historical Outlines of English Accidence* (1872), *Elementary Lessons in Historical English Grammar* (1874), and *Primer of English Grammar* (1875). He has admirably edited for the publishing societies numerous early texts, among which are *Early English Alliterative Poems* (1865), *Old English Homilies* (1867–73), *Legends of the Holy Rood* (1871), *Chaucer's Poetical Works* (1866), *Spenser's Works* (1869), *Selections from Chaucer's Canterbury Tales* (1867), and *Cursor Mundi* (1874–75).

Morris (Robert), b. Jan. 20, 1734. A native of England, he came with his father to America in 1747, and after serving in the counting-house of Mr. Charles Willing in Philadelphia until 1754, formed a partnership with that gentleman's son, which continued with great success until 1793. Morris strongly opposed the Stamp Act, and against his business interests signed the non-importation agreement of 1765. In 1776 he was a delegate to the Continental Congress, and, though once voting against the Declaration of Independence, signed that paper on its adoption, and was twice (1777–78) re-elected to Congress. Throughout the war the services of Mr. Morris in aiding the government during its financial difficulties were of incalculable value; he freely pledged his personal credit for supplies for the army, at one time to the amount of $1,400,000, without which the campaign of 1781 would have been almost impossible; he also established the Bank of North America, and in 1781 was appointed superintendent of finance, which post he held until 1784, continuing to employ his personal credit to facilitate the needs of his department. He was subsequently a member of the Pennsylvania legislature, of the convention which framed the Federal Constitution, and from 1786 to 1795 was U. S. Senator, declining in the mean time the proffered post of secretary of the treasury, and suggesting the name of Alexander Hamilton for that office. After engaging in the China trade, he in his later years became involved in land speculations which resulted ruinously, and the remaining days of this noble patriot were passed in confinement for debt. D. at Philadelphia May 8, 1806.

Morris (Robert Hunter), a son of Governor Lewis Morris of New Jersey; was a lawyer; for twenty-six years a councillor of New Jersey, and for twenty years its chief-justice, 1737–57; was deputy governor of Pennsylvania 1754–56. D. in New Jersey Feb. 20, 1764.

Morris (Gen. Staats Long), grandson of Gov. Lewis (1671–1746), and brother of Gouverneur, b. at Morrisania, N. Y., Aug. 27, 1728; entered the British army; became captain 1756; soon afterwards lieutenant-colonel of the 89th Highlanders; served at the siege of the French colony of Pondicherry, India, 1761; became brigadier-general 1763; married the duchess of Gordon, who d. 1770; sat in Parliament; became major-general 1777 and

full general 1786; was appointed governor of Quebec 1797, and d. in 1800.

Morris (THOMAS), b. in Virginia Jan. 3, 1776; passed his early youth in Western Virginia; removed in 1795 to Columbia, and in 1800 to Clermont co., O., where he studied law while employed as a farm-laborer; was admitted to the bar 1804; elected to the legislature 1806; was continuously a member of either the upper or the lower house for twenty-four years; became eminent as a lawyer; was elected in 1809 a judge of the supreme court of the State, and in 1832 was elected U. S. Senator as a Democrat. He distinguished himself at Washington as an opponent of slavery and a defender of freedom of the press, free speech, and the right of petition. He was consequently not re-elected, but was in 1844 the candidate of the "Liberty party" for the Vice-Presidency on the ticket with James G. Birney. D. near Bethel, O., Dec. 7, 1844, one month after the Presidential election. His *Life, Speeches, and Writings* were published in 1855 by his son, Rev. B. F. Morris.—Two other sons, ISAAC N. (b. Jan. 22, 1812) and JONATHAN D., are distinguished lawyers, have figured in public life, and have been members of Congress, the former for Illinois (1857–61), the latter for Ohio (1849–51).

Morris (THOMAS A.), D. D., b. in Kanawha co., West Va., April 28, 1794; joined the Ohio Methodist Episcopal Conference in 1816; labored as an itinerant preacher in the North-west down to 1834, when he was appointed the first editor of the *Western Christian Advocate*, the organ of his denomination in Cincinnati; in 1836 was elected bishop. He was distinguished for his prudence in counsel, the terseness and directness of his discourses, and his ability as a presiding officer. He was author of a volume of sermons and biographical sketches of his Western fellow-laborers in the ministry. D. at Springfield, O., Sept. 2, 1874. ABEL STEVENS.

Morris (THOMAS A.), b. in Nicholas co., Ky., Dec. 26, 1811; graduated at West Point June, 1834, and appointed second lieutenant of artillery; resigned from the army in 1836 to follow the profession of civil engineer, being appointed in that year resident engineer of canals and railroads in the service of the State of Indiana; was chief engineer of the Terre Haute and Richmond R. R. and of the Indianapolis Indiana and Bellefontaine R. R. 1847–52; of the Indianapolis and Cincinnati R. R. 1852–54, and president of the latter road 1854–57; president of the Indianapolis Pittsburg and Cleveland R. R. 1859–61. On the outbreak of the civil war he was appointed brigadier-general of Indiana State volunteers, and served in the West Virginia campaign of 1861 at Philippi, Laurel Hill, and Carrick's Ford. Declining the appointment of brigadier-general and major-general of volunteers, he resumed the chief engineership of the Indianapolis and Cincinnati R. R. in 1862; was president of the Indianapolis and St. Louis R. R. 1867–70; receiver of the Indianapolis Cincinnati and Lafayette R. R. 1870–73.

Morris (WILLIAM), b. in England in 1834, eldest son of a merchant who died in 1844, leaving him considerable property; educated at the Forest School, Walthamstow, at Marlborough and at Exeter colleges, Oxford; studied painting, but in 1863 devoted himself to the designing and manufacture of artistic household furniture and decorations, from which circumstance he has often been improperly called an upholsterer, his own occupation being that of a designer. In 1858 he published a small volume entitled *The Defence of Guinevere and other Poems*, and in 1867 *The Life and Death of Jason*, a narrative poem. His principal work, *The Earthly Paradise*, consisting of legendary and romantic tales in verse, appeared in 4 parts in 1868–71, since which time he has published *Love is Enough* (1873), and in connection with Eirikr Magnusson *The Story of the Volsungs and the Niblungs*, translated from the Eddas. Morris has shown great poetic talent in treating subjects drawn from Scandinavian myths and legends.

Morris (Gen. WILLIAM WALTON), b. at Ballston Springs, N. Y., Aug. 31, 1801; graduated at West Point 1820; served against the Arickaree Indians 1823; was major of mounted Creek volunteers in the Seminole war 1836–37; was engaged in the battles of Wahoo Swamp, Okeechobee, Hatcheeluskee Creek, and many others, gaining two brevets for gallant conduct, and during nine years' garrison duty (1837–46) gained a brilliant reputation as a military lawyer; was attached to the judge-advocate's department of Gen. Taylor's army on the Rio Grande 1846; was actively engaged in the battles of Palo Alto and Resaca de la Palma; was made military governor of Tampico on the occupation of that port, military governor of Puebla 1847–48; was commandant at Fort Kearney, Neb., 1853–60, and at Fort McHenry, Baltimore, 1860–61, where he promptly brought his guns to bear on the rioters in the memorable affray of Apr. 19, 1861. He was promoted to a lieutenant-colonelcy May 14, 1861, and shortly afterwards refused to answer a writ of *habeas corpus* granted by a Maryland judge, on the ground that it had become invalid by the outbreak of hostilities. He was made full colonel of the 2d Artillery Nov. 1 of the same year, brevet brigadier-general in the regular army June 9, 1862, "for meritorious services," and brevet major-general Dec. 10, 1865. He remained in command of Fort McHenry throughout the war, and d. there Dec. 11, 1865, the day following his last promotion.

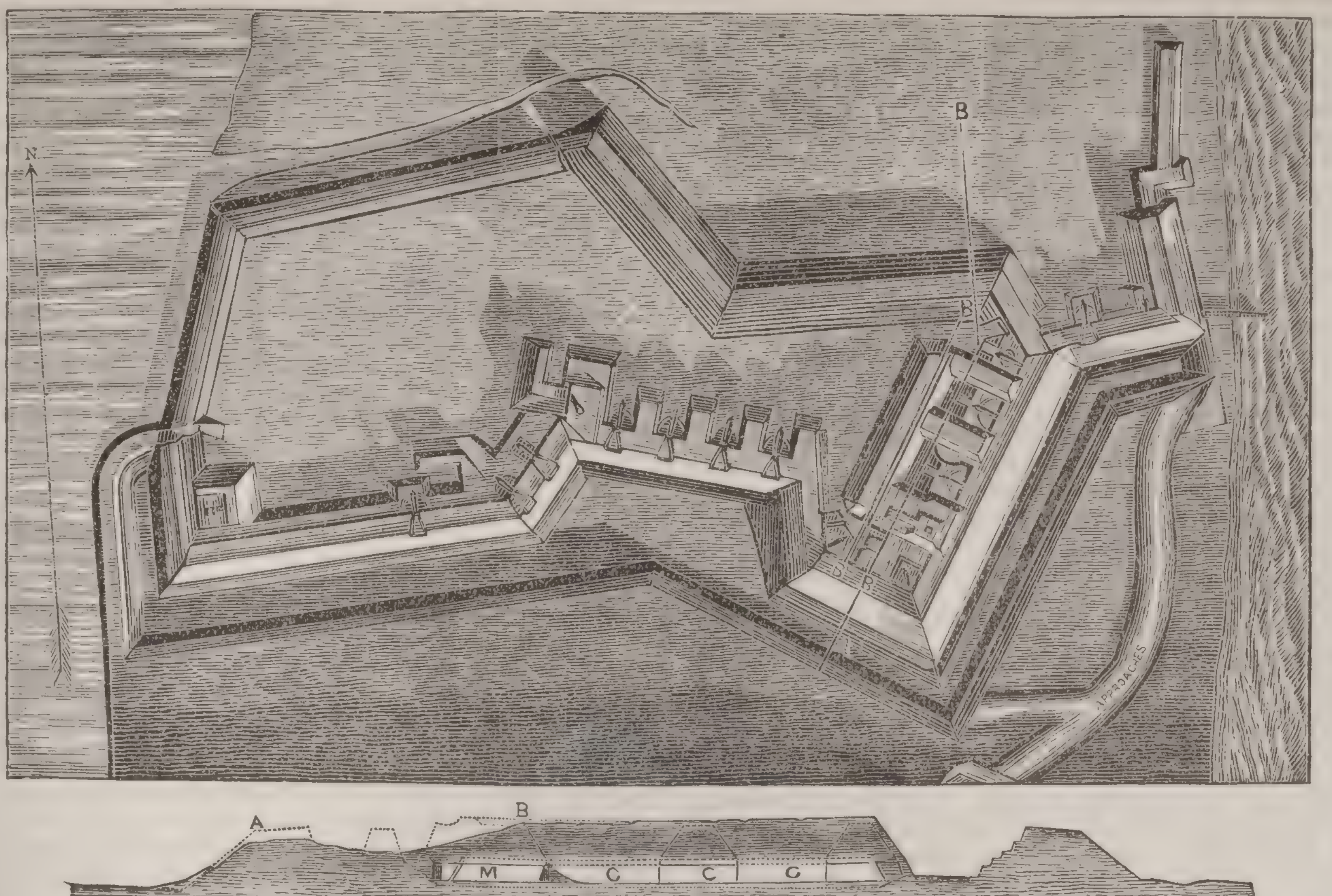
Morrisa'nia, post-v. and tp. of Westchester co., N. Y., on the Harlem River and on the New York and Harlem R. R., is connected with New York by a fine iron drawbridge, has 20 churches, many schools, a convent and academy, was on Jan. 1, 1874, attached to the county and city of New York, and contains the residences of many business-men of that city. Pop. 19,609.

Mor'risburg, port of entry of Dundas co., Ont., Canada, on the St. Lawrence, at the foot of the Rapide du Plat Canal and on the Grand Trunk Railway, 92 miles above Montreal and opposite the village of Waddington, N. Y. It has a fine water-power, well improved, and does a large shipping business. Pop. of sub-district, 1156.

Mor'risdale, a locality in Morris tp., Clearfield co., Pa., on the W. side of Moshannon Creek, and on a branch of the Tyrone and Clearfield R. R. It has mines of fine semi-bituminous coal.

Mor'ris Dance [probably *Moorish* dance], a rude dance common in England in the Middle Ages, and even now performed occasionally in the rural districts. The dragon or hobby-horse, Robin Hood, Maid Marian, and other fantastic characters often but not necessarily bore a part in the performance.

Mor'ris Island, a low narrow sand-island on the S. side of the entrance into Charleston harbor, S. C., a little more than 3½ miles long, lying broadside to the ocean. A Confederate battery on Cummings Point, at the extreme N. end of the island, aided in the capture of Fort Sumter from the Union forces, Apr. 12 and 13, 1861. After this the Confederates erected Fort Wagner and other batteries on Morris Island as part of the exterior line of defences for Charleston. The S. end of the island was captured by an assault made from small boats by the Union forces, July 10, 1863, and two unsuccessful assaults upon Fort Wagner, located near the N. end of the island, followed July 11 and 18, the object being to get within effective breaching distance of Fort Sumter, occupying an interior line about 2700 yards distant from Fort Wagner. After the assault of the 18th, it was determined to reduce Fort Wagner by a regular siege, and the first parallel, 1330 yards from the work, was opened on the 19th; on the night of July 23 the second parallel, at an average distance of 600 yards in advance of the first, was established and made strongly defensive. The creek on the left was spanned with booms to keep off boat-attacks, and on the right the parallel was extended into the surf by a defensive barricade. Ground for the third parallel was occupied on the night of Aug. 9, 500 yards from Fort Wagner. In the mean time, breaching batteries against Fort Sumter had been placed in position in the second and first parallels, and upon ground to the left and rear of the latter. From Aug. 18 to 21, during the bombardment of Fort Sumter, approaches were pushed forward from the third parallel by the full sap, and the fourth parallel was established Aug. 21 at an average of 300 yards from Fort Wagner. On the 26th a sand-ridge about 100 yards in advance of the fourth parallel and 200 yards from Fort Wagner was carried by assault, and the fifth parallel established thereon. Between this parallel and the fort the island narrowed to about 30 yards in width and 2 feet in depth above high water. In rough weather the sea passed entirely across this low neck of beach to the marsh on the left, while the front of Fort Wagner, which was 260 yards in length, kept up a converging fire of artillery and sharpshooters upon the shallow, shifting, and frequently submerged trenches of the besiegers. The navy occupied the main channel abreast the island, and rendered most valuable co-operation in keeping down the fire from the fort. In this emergency, when all further progress seemed impossible, the besiegers carried all their light mortars to the front to operate over the heads of the sappers and miners; enlarged the capacity of the fifth parallel and the advanced trenches for sharpshooters; trained upon Wagner the heavy rifled guns that had been used in breaching Fort Sumter, and placed calcium lights in front to aid their night-work and blind the enemy. The co-operation of the New Ironsides man-of-war during daylight was also secured. The final operations against the work were actively inaugurated on the morning of Sept. 5, and are described as follows in the report of the commanding general: "For forty-two con-



Plan of Fort Wagner, on Morris Island, as constructed by the Confederates. The lower engraving is a vertical section on the line A B B in the upper engraving; M, magazine; C C C, bombproof shelter.

secutive hours the spectacle presented was one of surpassing sublimity and grandeur. Seventeen siege and Coehorn mortars unceasingly dropped their shells into the work over the heads of our sappers and the guards of the advanced trenches; thirteen of our heavy Parrott rifles—100, 200, and 300 pounders—pounded away at short though regular intervals at the south-west angle of the bombproof, while during the daytime the New Ironsides, with remarkable regularity and precision, kept an almost incessant stream of eleven-inch shells from her eight-gun broadside ricocheting over the water against the sloping parapet of Wagner, whence, deflecting upward with a low remaining velocity, they dropped nearly vertically, exploding within or over the work, and rigorously searching every part of it except the subterranean shelters. The calcium lights turned night into day, and while throwing around our own men an impenetrable obscurity, they brilliantly illuminated every object in front, and brought the minutest details of the fort into sharp relief. In a few hours the fort became practically silent, exhibiting but little sign of life, and none of activity. Occasional straggling shots continued to be delivered at the New Ironsides, and one or more sharpshooters opened from time to time a hasty and ineffectual fire upon the head of the sap. The garrison had sought safety in the bombproof shelter." Under this fire the trenches were pushed forward by the evening of Sept. 6 to the outer edge of the ditch on the side next the sea, completely masking the enemy's guns, and orders were given to carry the place by assault on the following morning. During the night the enemy evacuated the fort, and the whole of Morris Island came into possession of the Union forces. Long-range guns were subsequently placed upon the N. end of the island, and used against Charleston, 4 miles distant, and also against Fort Sumter to prevent the erection of batteries upon its ruins. One of the guns used against Charleston was a 30-pounder Parrott rifle (4.2-inch calibre). It was fired 4606 times before it burst, and some of its projectiles attained a range of 5⅓ statute miles. The "Swamp Angel," so named by the soldiers, but officially called the Marsh Battery, was a battery of one 8-inch Parrott rifle constructed during the siege of Fort Wagner upon the marsh W. of Morris Island, where the soft alluvial mud was about 18 feet deep. It was distant 7000 yards from the lower end of Charleston City. On Aug. 21 a demand was made on the Confederate commander for the evacuation of Morris Island and Fort Sumter, accompanied by the assurance that the city of Charleston would be bombarded in case of refusal. No reply having been received within the specified time, a few shots were fired on the city during the night of the 21st, and resumed on the following. The gun burst at the thirty-sixth discharge, and was never replaced. In the bombardment of Fort Wagner the attempt to breach its bombproof shelter failed. The projectiles were slowly eating their way into it, although the effect of each individual shot was astonishingly slight. Indeed, the penetration of rifle projectiles fired into parapets of sand standing at a flat slope is but trifling. They are generally deflected along the line of least resistance, scooping out a small hollow and scattering the sand but a short distance. Much of it falls back, to be again and again struck by successive shots. At Fort Wagner less than 3½ pounds of sand was permanently removed by each pound of metal thrown from the breaching guns. In the accompanying vertical section the depression from A to B was the result of firing 54½ gross tons of metal at the end of the bombproof shelter. (See Gillmore's *Report on Engineer and Artillery Operations against Charleston;* see also article BOMBARDMENT, by GEN. J. G. BARNARD.)

Q. A. GILLMORE.

Mor'rison, county of Central Minnesota. Area, 1296 square miles. It is traversed by the Mississippi River, and consists generally of rolling prairie, adapted to grain-culture. Cap. Little Falls. Pop. 1681.

Morrison, post-v., cap. of Whitesides co., Ill., 127 miles W. of Chicago, on the Chicago and North-western R. R., has 7 churches, 1 national bank, 2 weekly newspapers, 3 hotels, several manufactories and mills, and stores. Pop. about 2500. CHAS. BENT, ED. "WHITESIDES SENTINEL."

Morrison, post-tp. of Brown co., Wis. Pop. 1169.

Morrison (ROBERT), D. D., F. R. S., b. at Morpeth, Northumberland, England, Jan. 5, 1782; educated at Hoxton Academy and the missionary college, Gosport; was ordained to the Presbyterian ministry in 1807, and went to Canton as a missionary of the London Society; founded the Anglo-Chinese college at Malacca 1818; published a translation of the Bible in Chinese (1810–18), *Chinese Grammar* (1815), *Chinese Dictionary* (1821). D. at Canton Aug. 1, 1834.—His son, JOHN ROBERT, b. at Macao in 1814, succeeded his father as secretary and interpreter at Canton, and wrote *Chinese Commercial Guide* (1834).

Morrison (WILLIAM), b. at Montreal, Canada, in 1785; was apprenticed in the service of the New York Fur Company at Fond du Lac 1802; soon afterwards became a partner; made extensive explorations in the N. W. territories 1803–15; was in charge of John Jacob Astor's fur-business 1816–26, after which he retired to Berthier, Canada, and d. on Morrison's Island Aug. 7, 1866. Morrison rendered many important services to geography, and was the first white man who discovered the sources of the Mississippi River. One of his sons by an Indian wife was a companion of Capt. Fremont in his exploration of California.

Morrison's, tp. of Randolph co., Ala. Pop. 707.

Mor'risonville, post-tp. of Christian co., Ill. Pop. 128.

Morris Run, post-v. of Hamilton tp., Tioga co., Pa., in Morris Run Valley and on the Tioga R. R. (Morris Run branch), has productive mines of semi-bituminous coal of fine quality, 3 churches, 3 schools, a town-hall, and a population of 2250 (estimated).

Mor'ristown, a v. (Parker P. O.) of Monroe tp., Randolph co., Ind., on the Cleveland Columbus and Indianapolis R. R. Pop. 257.

Morristown, post-v. and tp. of Rice co., Minn., 10 miles W. S. W. of Faribault, the county-seat. Pop. of v. 317; of tp. 1090.

Morristown, post-v. of Morris tp., cap. of Morris co., N. J., 31 miles from New York, on Morris and Essex division of Delaware Lackawanna and Western R. R., has good educational advantages, a public park, 2 banks, 2 saving institutions, 3 weekly newspapers, 8 churches, the Speedwell Ironworks, and stores. The town is supplied with pure spring water from an aqueduct, and has a lunatic asylum located about 2 miles distant. Morristown is the residence of gentlemen doing business in New York, and forms an attractive place during the summer months for tourists. It does a large mercantile and mechanical trade. Pop. 4398.
Vance & Stiles, Pubs. "Jerseyman."

Morristown, post-v. and tp. of St. Lawrence co., N. Y., on the St. Lawrence River, on the Morristown and Black River R. R., and opposite Brockville, Canada, with which it is connected by steam-ferry, has 9 churches, and contains Brier Hill and Edwardsville. Pop. 1954.

Morristown, post-v. of Union tp., Belmont co., O. Pop. 423.

Morristown, post-v., cap. of Hamblin co., Tenn., at the junction of the Cincinnati Cumberland Gap and Charleston with the East Tennessee Virginia and Georgia R. R., has 2 colleges, 6 churches, 1 national bank, extensive quarries of variegated marble, 2 weekly newspapers, 3 hotels, and stores. The section is rich in mineral deposits. Pop. about 2500. Mabry M. Murrell, Ed. "Weekly Spy."

Morristown, post-v. and tp. of Lamoille co., Vt., 25 miles N. of Montpelier, has manufactures of leather and lumber. Pop. 1897.

Mor'risville, post-v., cap. of Madison co., N. Y., 30 miles S. W. of Utica, on the New York and Ohio Midland R. R., has a union school, 3 churches, a national bank, 1 newspaper, a fine public hall, 3 hotels, and stores. Principal business, dairying, hop-growing, and farming. Pop. 570. E. Norton, Ed. "Madison Observer."

Morrisville, post-v. of Washington tp., Clinton co., O. Pop. 39.

Morrisville, post-b. of Falls tp., Bucks co., Pa., on Philadelphia and Trenton R. R., Delaware River, and Pennsylvania Canal, has a good trade in lumber. Pop. 813.

Mor'risville, post-v. of Morristown tp., Lamoille co., Vt., on the Vermont division of the Portland and Ogdensburg R. R., has 2 churches, 1 hotel, 1 academy, 1 weekly newspaper, and various manufactures.

Morroval'le [*Morro di Vaglia*], town of Italy, province of Macerata, pleasantly situated on a hill at the foot of which flows the Chienti. This town is believed to have been founded by Charlemagne, and was formerly much more populous than at present. Pop. in 1874, 5675.

Mor'row, county of Central Ohio. Area, 375 square miles. It is level and very fertile. Live-stock, grain, wool, and lumber are leading products. The county is traversed by the Cleveland Columbus and Cincinnati R. R. Cap. Mount Gilead. Pop. 18,583.

Morrow, tp. of Adair co., Mo. Pop. 877.

Morrow, post-v. of Salem tp., Warren co., O., on the Little Miami River and R. R., at the junction of the Cincinnati and Muskingum Valley R. R. The distillation of whisky is a leading industry. Pop. 708.

Morrow (Jeremiah), b. at Gettysburg, Pa., Oct. 6, 1771; removed in 1795 to the North-west Territory, and became one of the most prominent citizens of Ohio; was its first member of Congress 1803–13, and again 1841–43; U. S. Senator 1813–19; governor of Ohio 1822–26; often held State offices of responsibility, and was for some years president of the Little Miami R. R. D. in Warren co., O., Mar. 22, 1852.

Morse (Abner), b. at Medway, Mass., Sept. 5, 1793; graduated at Brown University 1816 and at Andover Seminary 1819; became Congregational pastor at Nantucket 1819–22, and afterward at Boundbrook, N. J., and in Indiana, where he procured the charter of a college and became a professor; delivered several courses of lectures on geology, and was author of several genealogical volumes—*Memorial of the Morses* (1850), *Descendants of Lawrence Litchfield* (1855), *Capt. John Grout* (1857), *Genealogical Register of Sherborn and Holliston*, and *Genealogy of Several Ancient Puritans* (3 vols., 1857–60). D. at Sharon, Mass., May 16, 1865.

Morse (Edward Sylvester), Ph. D., b. at Portland, Me., June 18, 1838; educated at Lawrence Scientific School, Cambridge, Mass.; was professor of comparative anatomy and zoology in Bowdoin College, Me., for several years, and lecturer on zoology at Harvard University; wrote several memoirs on the Pulmonifera of Maine, *The Tarsus and Carpus of Birds*, *Embryology of Lower Marine Forms*, and several papers on the relations of the Brachiopoda. He is a popular lecturer on scientific subjects, and resides at Salem, Mass.

Morse (Freeman H.), b. in Bath, Me., Feb. 18, 1807; served in the legislature 1840–43; was a member of Congress 1843–45; mayor of Bath three terms; again sat in Congress 1857–61; was conspicuous as a Republican; a member of the special committee of thirty-three on the rebellious States, and of the "Peace Congress" of 1861, and was consul at London during Pres. Lincoln's administration.

Morse (Isaac Edwards), b. at Attakapas, La., May 22, 1809; educated at Middletown, Conn., and at the Military Academy at Norwich, Vt.; entered the senior class at Harvard, graduating 1829; studied law at New Orleans and in Pennsylvania; travelled in Europe; served as a member of the State senate; was commissioner to New Granada under Pres. Tyler 1841–43; sat in Congress 1843–51; was subsequently attorney-general of Louisiana, and d. at New Orleans Feb. 11, 1866.

Morse (Jedidiah), D. D., b. in Woodstock, Conn., Aug. 23, 1761; graduated at Yale in 1783; was a tutor there in 1786; minister of the First Congregational church, Charlestown, Mass., 1789–1820; editor of the *Panoplist* 1806–11; one of the founders of the Andover Theological Seminary; a prominent defender by pen and voice of the Trinitarian doctrine; is chiefly remembered as the author of a series of geographies and gazetteers (beginning in 1784) which had a wide popularity; also author of a *History of New England* (1804), *Annals of the American Revolution* (1824), etc. D. at New Haven, Conn., June 9, 1826. (See his *Life*, by William B. Sprague, 1874.)

Morse (Richard Cary), son of Dr. Jedidiah, b. at Charlestown, Mass., June 18, 1795; studied at Phillips Academy, Andover; graduated at Yale College 1812; became amanuensis of Pres. Dwight and a member of his family; graduated at Andover Theological Seminary, and was licensed to preach 1817; aided his father in the preparation of one of his geographical works; joined his brother Sidney in establishing the New York *Observer* 1823; was for thirty-five years associate editor and proprietor of that paper, for which he executed many translations from the French and German; retired from active life in 1858; resided for some years at New Haven, Conn., and d. at Kissingen, Germany, Sept. 22, 1868.

Morse (Samuel Finley Breese), LL.D., b. in Charlestown, Mass., Apr. 27, 1791. He was the son of the great American divine and geographer, Jedidiah Morse, D. D., and was educated at Yale College, taking his bachelor's degree in 1810. Having a great love for art, he decided on becoming a painter, and with a view to the prosecution of his profession he went to London in 1811 with Washington Allston, to study in the Royal Academy under Benjamin West. In 1813 he received the gold medal for his first effort in sculpture, *The Dying Hercules*. Returning to America in 1815, he followed his profession, at the same time prosecuting his scientific studies, for which he had great fondness. He founded the National Academy of Design in New York, and was its annually elected president for many years. In 1829 he again visited Europe for further study in the schools of the Continent, and resided in Rome, Florence, Venice, and Paris for three years. On his voyage home in 1832, on the packet-ship Sully, he conceived and made drawings of the recording telegraph which bears his name. From this time till his death he was occupied with this invention, passing through vicissitudes of fortune, some of them of most painful experience. He was one of the first professors of the University of the City of New York, filling the chair of fine arts. In 1835, in his rooms in the university, he set up his rude telegraphic apparatus, but it was not till 1844 that he was enabled to bring his invention fully before the world. After repeated discouragements that would altogether have disheartened most men, by the aid of the American government he established a telegraphic line between Washington and Baltimore, a distance of 40 miles. Over this line, on May 24, 1844, Prof. Morse put to the test the great experiment on which his mind had been laboring for many anxious, weary years. From the rooms of the U. S. Supreme Court this message was sent to Baltimore, instantaneously received, and immediately returned: "What hath God wrought!" From this moment the triumph of Prof. Morse was complete. He passed at once into honors and riches. In his

frequent visits abroad his progress was like that of a prince in the attentions he received, rather than that of a plain American citizen. Kings delighted to do him honor, while at home every one was proud of his successes. In 1846 the degree of doctor of laws was conferred upon him by his alma mater. He became a member of many learned societies in Europe and America, and the recipient of the most flattering foreign distinctions, wearing the decorations and titles of numerous orders. But the most distinguished mark of public gratitude for his invention was that conferred upon him by a congress of representatives of ten of the governments of Europe, specially convened for the purpose in Paris in 1858, at the suggestion of the emperor Napoleon, when it was unanimously decided that the sum of 400,000 francs should be presented to him.

Prof. Morse was a man of great simplicity and energy of character, large-hearted and generous in disposition, firm in his friendships, and persistent and exhaustive in all his researches. He held the pen of a ready writer, and his genius, learning, and taste were illustrated by many and large contributions to the press, all of them evincing graceful rhetoric and elaborate argument. On the 10th of June, 1871, a bronze statue of Prof. Morse was unveiled with imposing ceremonies in Central Park, N. Y., Prof. Morse himself being present. The last time he appeared in public was at the inauguration of the statue of Benjamin Franklin in Printing-house Square in front of the City Hall, N. Y., Jan. 17, 1872; on which occasion he made the inauguration speech and unveiled the statue. D. in New York City Apr. 2, 1872. (See his *Life*, by Samuel Irenæus Prime.) FRANCIS B. WHEELER.

Morse (SIDNEY EDWARDS), son of Dr. Jedidiah and brother of S. F. B. Morse, b. at Charlestown, Mass., Feb. 7, 1794; graduated at Yale College 1811; wrote for the *Columbian Sentinel* 1812–13; studied law in Judge Reeves's school at Litchfield, Conn.; established in 1815 the *Boston Recorder*, the first religious newspaper in the country; was associated with his brother in inventing and patenting the flexible piston pump 1817; published a school geography 1820, and a larger geographical treatise 1822; founded in May, 1823, with his younger brother, Richard C. Morse, the New York *Observer*, the first religious newspaper, and now (1876) the oldest weekly newspaper, in New York; invented with Henry A. Munson the cerographic method of printing maps 1839; brought out the *North American Atlas*, the *Universal Atlas*, and a new school geography, of which 100,000 copies were sold; remained senior editor of the *Observer* until 1858, when he sold his interest to Rev. Dr. S. Irenæus Prime, his associate since 1840; spent his later years in inventing and improving a "bathometer" for deep-sea soundings, and d. at New York Dec. 23, 1871.

Morse, Sea-horse, or **Walrus** [Russ. *morss;* Lapp. *morsk;* Norse, *hval-ros,* "whale-horse;" old writers state

The Walrus.

absurdly that *morse* is from the Lat. *Mors,* "death," from its fierce character], the *Rosmarus trichecus* (for the generic name *Trichecus* properly belongs to the manatee, a sirenian, and not a seal), a large seal of the arctic regions, differing, however, from the other seals (Pinnipedia) in being chiefly herbivorous. It is the type of the family Rosmaridæ. The walrus is hunted for its coarse flesh (eaten by the northern peoples), for the excellent white ivory furnished by its great tusks (canine teeth of the upper jaw), for its rather scanty but excellent oil, which is superior to that of the sperm whale, and latterly for its hide, of which the Finns and Russians make superior cables, and the English and Americans make thick leather for buff-wheels and for heavy machine-belts. The female is very fond of its young, and both fight desperately when at bay. The largest males far exceed the ox in size. (See also PINNIPEDIA and ROSMARIDÆ.)

Morshansk′, town of European Turkey, government of Tambov, on the Tzna. It has manufactures of soap and tallow, and an important trade in corn and cattle. Pop. 19,699.

Mortality. See LIFE ASSURANCE, by PROF. J. H. VAN AMRINGE, A. M.

Mortar. See ARTILLERY, BOMBARDMENT, and APPENDIX.

Mortar. See CEMENTS, by GEN. Q. A. GILLMORE, U. S. A.

Morta′ra [*Mortis-ara—Martijara*—"altar of death"], town of Italy, province of Pavia, about 40 miles N. W. from the city of Pavia. This town, situated in a very fertile district, was the scene of a bloody battle between Charlemagne and the Lombards in 774, was a place of great strength during the Middle Ages, and has suffered cruelly from military operations even as late as 1849–59. Its massive walls and fortifications have now given place to pleasant gardens. The network of railways and provincial roads centring at Mortara gives the town considerable commercial importance. Pop. in 1874, 7408.

Mortara (EDGAR), son of a Jewish cloth-merchant in Bologna, who on June 23, 1858, was taken with force from his parents by the papal police, on orders from Padre Felletti, inquisitor-in-chief at Bologna, for the reason that he had been surreptitiously baptized into Christianity by a Roman Catholic maid-servant, and the Church considered itself under the obligation of protecting him against his parents. The boy and the parents were in despair, but addressed themselves in vain to the papal authorities. The Evangelical Alliance in London presented a protest against this outrage to the English government, but with no effect. When, in 1860, Bologna was incorporated in the kingdom of Italy, Felletti was arrested, but the boy was not returned.

Mor′tar-Vessels, in the navy, are of various kinds. The bomb-ketch was of this class, but is now disused. Sometimes steam vessels are employed. In the late civil war a class of wide, light-draught schooners, carrying each a 15-inch mortar and a 32-pound rifle gun, were used upon the lower Mississippi River. Against Island No. 10 mortar-vessels of another class were used.

Mort′gage [Fr. *mort,* "dead," and *gage,* "pledge"], in law. This topic will be considered under two principal divisions: I. Mortgages of land; II. Mortgages of chattels.

I. A mortgage of land is, when regular in its form, a conveyance of land for the purpose of securing the payment of a debt or the performance of an act at a specified time, with a condition (see CONDITION) that if the payment is made or the act performed at the time and in the mode prescribed, the conveyance shall be void. On the other hand, if payment, etc. is not made, the conveyance, strictly speaking, becomes absolute in the creditor or mortgagee, or "dead" (*mort*) in point of law to the debtor or mortgagor. There was a distinction taken from early times between a "living gage" or pledge (*vivum vadium*) and a "dead pledge (*mortuum vadium*). In the first case the debt was to be paid from the profits of the land, and the title did not pass to the creditor; in the case of the mortgage there was a conveyance of a defeasible nature, but which became absolute in the mortgagee if punctual performance was not made. By the rules of the common law the enforcement of the condition was rigorous if redemption was not made on the stipulated day, no matter how insignificant the debt might be, or how great might be the value of the mortgaged estate. It was not until the courts of equity gained a strong foothold that any modification of the severity of this doctrine took place. This result has been regarded by a competent judge as the most splendid triumph achieved by that system of jurisprudence over the harsh and forbidding theories of the early common law. The right of redemption has now become positively settled, and is regarded to be inherent in the very nature of a mortgage. The present theory in a court of equity is, that a mortgage is a mere security for a debt, and that, accordingly, any attempt on the part of the creditor to obtain more than his debt and interest from the land is in the nature of a penalty (see PENALTY), against the effect of which this court almost uniformly relieves on

payment of the amount actually due. On this theory, the debt is the principal thing, and the land accessory. When the debt is transferred the security upon the land goes with it, even without special mention; so when the debt is paid the mortgage is really extinguished, though it may in form continue. A mortgage as thus explained, and being regular in point of form, has all the requisites of a deed or conveyance of land. It is signed, sealed, and delivered. There is a clause of defeasance in the deed, or if separate it is executed with due formality. The effect of the "defeasance clause" is to declare that if the debt is punctually paid or the act performed the deed is void. There may, however, be transactions of a less formal character which will be construed as in substance mortgages. The deed may be irregular or defective in some respects. There may, for instance, be no seal, or there may be a seal on the deed and none on the "defeasance" when separate. Perhaps there is no writing at all, and the intent to mortgage is implied from the nature of the acts transpiring between the parties; or, again, a debtor may have made an executory agreement to give a mortgage. Mortgages are thus capable of division into two great classes; one is formal, regular, and complete; the other is informal and defective. Those which are executed in due form are called "legal;" those which are wanting in this respect are termed "equitable." The leading instances of equitable mortgages are (*a*) the mere deposit of title-deeds to secure a loan; (*b*) the lien of a vendor for unpaid purchase-money; (*c*) agreement to mortgage; (*d*) deeds absolute in form, but intended as mortgages; (*e*) instruments of a defective and informal nature—*e. g.* such as are without seal either upon the deed or defeasance; (*f*) cases where the property mortgaged is of an equitable nature, such as contracts to purchase land. The main importance of distinguishing between the two sorts of mortgages is in respect to their effect considered as an incumbrance upon the land. It is a cardinal rule, when two regular mortgages compete with each other for priority, that the one first in order of time is superior in point of right. This remark is made without reference to statutes of registration of mortgages, which may establish a different rule. On the other hand, an informal, defective, or "equitable" mortgage will give way to a later regular or "legal" mortgage under certain circumstances. These are when the later mortgage is taken for a valuable consideration, and without notice of the existence of the informal transaction. For example, if a person should create a mortgage lien upon his land without writing, and by the mere deposit of his title-deeds as a security for a loan, it would be valid as between him and the lender. It would, in case of his death, bind his heirs or devisees. It would charge all purchasers with notice. But if any person should by a later legal mortgage acquire the title in good faith and for a valuable consideration, he would be preferred. Similar rules would be applied in favor of a subsequent purchaser by an absolute conveyance as well as by a mortgage. Reference should be made to the mode of establishing the fact that a deed absolute on its face was intended as a mortgage. This is allowable in courts of equity on the general ground that the omission of the clause of defeasance is imputable to fraud, accident, or mistake. The law of some States—*e. g.* New York—proceeds on a still more comprehensive theory, and permits parol or oral evidence to be offered for this purpose, without reference to any element of fraud, etc., and simply on the ground that the transaction was in fact the security of a debt.

There usually accompanies a legal mortgage a bond or promissory note or other promise to pay the debt. This is advantageous to the creditor, since, if the land does not yield enough to pay the debt, he has a further remedy upon the bond or note for the deficiency. Where there is no such promise the mortgagee is usually confined in his remedies to the mortgage. It is not material which form the contract assumes. Where no negotiable note is given, the mortgage, both in the hands of the mortgagee and assignee, is subject to all the defences which are applicable to the debt, so that if the debt cannot be collected by reason of fraud or duress or want of consideration, the mortgage cannot be enforced. On the other hand, if it accompanies a negotiable note which is not yet due, it is held to be the rule in a number of the States that a transfer before maturity which would preclude a defence to the note will have a like effect upon the mortgage. It is a cardinal rule that no agreement between the parties can take away or restrict the right of redemption. Such an agreement is regarded as a "penalty," and is accordingly inoperative. This rule does not preclude an agreement that on default of payment of interest for a specified time the entire mortgage, though not yet mature, shall become due. Such a stipulation enters into the contract, and does not curtail the right of redemption. So an agreement made after the execution of the mortgage for a new and sufficient consideration that the mortgagor shall convey his interest to the mortgagee is valid, if not under the special circumstances of the case unfair and oppressive. It is necessary to carefully take a distinction between a mortgage and a conditional sale. In the one there is an inherent right to redeem; in the other there is not. By a conditional sale is meant a transfer of land upon a condition (see CONDITION) that on the happening of a specified event the vendor shall have the right of repurchase. There is no relation of debtor and creditor in this case, and the former owner must comply strictly with the contract.

It is quite common to insert in a mortgage a power of sale enabling the mortgagee to sell in case of default of payment, and thus obtain the amount of his claim. This is deemed to be a valid power. It does not resemble an ordinary power of attorney, which is revocable in its nature. This power is irrevocable, being in legal phrase "coupled with an interest"—that is, the mortgagee, having an interest in the property, has the power conceded to him as connected with his interest in order to make it more completely available. (See POWER.) Should he transfer or assign his mortgage, the power would accompany it. When the mortgage is paid the power is extinguished. A mortgagee, though having such a power of sale, is not obliged to resort to it. He may "foreclose" in the manner hereafter explained, so that the remedies become cumulative. If on the sale a surplus is received, it belongs to the mortgagor, or if he is then dead, it passes to his heirs as the proceeds of real estate. This power is of an important nature, and liable to abuse. To guard against oppression it is regulated in a number of the States by statute prescribing the mode of giving notice of the foreclosure to the mortgagor and to incumbrancers, as well as of conducting the sale and giving title to a purchaser. It is not necessary that a mortgage should be given directly to a creditor. It may be executed to some person in trust for him. This is a very common case in mortgages of railroad property. A single mortgage is given to a trustee to secure a number of bonds. The mortgagee is thus a trustee, and the bondholders are *cestui que trustent* (see CESTUI QUE TRUST) or beneficiaries. On foreclosure the trustee will hold any property acquired by him in trust for the bondholders. As between the trustee and the debtor all the ordinary relations of mortgagor and mortgagee would attach.

Reference will now be made to the rights acquired by a mortgagee. In a common-law court he is deemed to be an owner of the land by a defeasible title until the mortgage is due. After it has matured his title is absolute, subject of course to the interference of a court of equity. Confining the attention for the moment to the courts of law, it may be affirmed that, as a strict legal rule, the mortgagee may exercise the ordinary rights of ownership. He may, in the absence of statutes to the contrary, by means of an appropriate action after the debt is due eject the mortgagor and take possession of the estate. He may notify lessees whose estate has been acquired before his own to pay rent to him. So he may convey his interest to another termed an assignee, who will stand in his position and possess his rights.

A court of equity, however, will fasten a trust upon the mortgagee while thus exercising his legal right. For example, if he should be in possession of the land, then called a "mortgagee in possession," he will be declared by that court as acting not merely for himself, but as a trustee for the mortgagor and subsequent incumbrancers. He could not, as an absolute owner might do, wilfully allow the property to lie idle. He would be required to act with ordinary diligence and prudence. Should he collect any rent, it would be applied on the mortgage. After his entire claim, including interest, is paid he is a mere trustee for the mortgagor and others interested in the land.

The theory on which the court of equity in framing its rules proceeds is, that the relation of debtor and creditor exists, and that the claim upon the land is a mere security. The mortgage partakes of the nature of that which it is given to secure. When the opposing views in the two courts come in conflict, the equity doctrine *modifies* that which prevails in law.

From what has been said, it may readily be inferred that the rules concerning mortgages are complex and difficult of comprehension in all their branches to any but professional men. The decisions of the courts on a cursory examination seem strangely conflicting when they may in fact be harmonized by considering that the subject is being regarded either from the law or equity point of view. Thus, it will be found to be stated on the one hand that the mortgage is a conveyance; that the title has passed to the mortgagee, and on his death descends to his heirs; and that he can only assign it by an instrument in the nature

of a conveyance. On the other hand, it is affirmed with equal positiveness in another set of decisions (equity) that the mortgage is a mere attendant upon the debt; that the assignment of it carries the mortgage with it, even without special mention, as an incident; that the debt and mortgage both belong, in case of the mortgagee's death, not to the heirs, but to the personal representatives (executors or administrators). To reconcile these views it has only to be supposed that the equity theory fastens a *trust* upon him who would be deemed owner in a court of law. For example, a sale by a mortgagee to an assignee, though in the form of a conveyance, is accepted by him as qualified by the rights of the mortgagor. So if a mortgagee dies, his heir, if he takes the title, holds it *in trust* for the executors, etc. In some of the States, this double view has almost disappeared, and the equity rule has become so predominant as to substantially displace that of the common law. Such is the case in New York and California and some other States. These States would hold that, for nearly all purposes, the mortgagor was owner, and the mortgagee had only a lien for his debt. The only way that he could acquire any more than this would be by foreclosure. He is even prohibited by statute in New York from ejecting the mortgagor, except in connection with a foreclosure.

Something further should be said in respect to assignment. In the ordinary case of an assignment of a debt and a mortgage the rule of equity is that the assignee must abide by the position of the one of whom he buys. If he for any reason cannot enforce the claim, the assignee cannot. It is therefore a usual and wise course before purchasing to inquire of the mortgagor whether he has any defences to the claim. If he states that he has not, and the assignee purchases on the faith of the statement, the mortgagor will be estopped from denying its truth. (See ESTOPPEL.) It is judicious, though not necessary, to take the statement in writing. After the assignment notice should be given to the mortgagor, otherwise he will be allowed any payment which he may have made to the mortgagee in ignorance of the assignment. There are certain cases in which a person can compel an owner of a mortgage to make an assignment to him. An illustration is found in the case of a first mortgagee being about to foreclose, and a second desiring to take an assignment of the prior claim, in order to protect his right. There are also cases in which a court of equity will pay such attention to the intent and best interest of the parties as to convert a transaction which is in form a payment into an equitable assignment. The leading rule is, that if a person whose *duty* it is to pay off a mortgage pays it, he cannot give the transaction any other character than that of payment; on the other hand, if he is under no obligation to pay it, and does so in fact, the court under all the circumstances of the case will, if justice demands it, regard the formal payment as in substance a purchase. It is not necessary that an assignment be absolute. It may be made by way of security. In other words, an owner of a mortgage may himself mortgage it. The same trust relation will then spring up between the parties as has been already noticed. If such a mortgagee should foreclose and buy in the land, he would hold any surplus of value above what might be necessary to discharge his own lien in trust for the assignor.

Without further treatment of the rights of the mortgagee, reference may now be made to the estate of the mortgagor. In this respect legal opinions are not so divergent. It is now agreed that for most purposes the mortgagor is the owner. Thus, when a mortgagor dies his estate descends to his heirs, and his widow has dower. He can only part with his residuary interest by a regular conveyance. So the State treats him as owner in laying taxes and in taking possession of the land under the doctrines of eminent domain. A mortgagor may carve out of his estate other mortgages, which will have priority (in the absence of statutes requiring registration) in the order of their execution.

The right of redemption in the law of mortgages is of high consequence, and distinguishes the transaction from an absolute sale. Not only the mortgagor, but every one deriving an interest from him subsequent to the mortgage, may "redeem," or, in other words, may pay the debt and the interest, and thus be relieved from the mortgage. This privilege will extend to a mere speculator who may have purchased the mortgagor's estate for a nominal sum and with a view to redemption. Among those who have a right to redeem may be mentioned, by way of illustration, subsequent mortgagees and judgment creditors, heirs, tenants by the curtesy and in dower, lessees, and persons having incorporeal interests, such as easements. One who redeems must take up the entire mortgage. This rule will be applied to an owner of a fractional interest in the equity of redemption, who may then enforce against the owner of other interests such portion of his claim as is equitable and just. This right to redeem can be barred by the proceeding termed a "foreclosure," to be hereafter explained. So the right to redeem may be lost where the mortgagee is in possession by a neglect to call him to account for a considerable period of time. This time is sometimes fixed by statute; as, for instance, in New York at ten years. Still, even then, should the mortgagee by some appropriate act recognize the existence of the mortgage—as if, for example, he should commence an action to foreclose the mortgage—the right to redeem will remain.

Notice should be taken of the grounds on which a mortgage is inherently void, or, if originally valid, has lost its force and effect. A mortgage is void for any of the reasons which make contracts in general invalid, such as for want of consideration, duress, fraud, illegality, or the like. In some of the States the act of taking usury (see INTEREST and USURY) makes a contract wholly void. It is a frequent practice in these cases for the mortgagor or other person standing in his place to commence an action to set aside the invalid instrument, as being an apparent incumbrance upon the title of the owner. Mortgages having once been valid may become inoperative by reason of a material or fraudulent alteration made by the creditor, or by merger or extinguishment, by release or other discharge, or by payment, or by tender, or by lapse of time. One or two of these methods deserve explanation. A mortgagee's interest may be merged or extinguished by an acquisition of the interest of the mortgagor. As a general rule, the same person will not be regarded both as mortgagor and mortgagee. Still, it may be necessary in special cases to keep the two interests distinct. Thus, if there were a series of mortgages, and the owner of the first should become possessed of the estate of the mortgagor, the extinguishment of his mortgage would destroy the priority of his lien. This result may be prevented in a court of equity by sufficient evidence of an intent that there should be no merger. This might be shown by a clause in the conveyance to the effect that no merger should take place. By a release of a mortgage is meant a discharge of the whole or a portion of it by the mortgagee for a consideration. A sealed instrument will suffice, since a seal imports a consideration. So there may be a release of the lien of the mortgage without discharging the debt. When no rights of third persons are affected there may be a release of a portion of the premises without destroying the lien upon the residue. Payment of the debt has the effect of extinguishing the mortgage. No reconveyance to the mortgagor is in general necessary. In order to remove from the registry all appearance of a claim upon the land a written statement in a form prescribed by law, setting forth the fact of payment, is taken from the mortgagee. This is also registered. Such statement may be exacted by a court of equity should a mortgagee decline to give it. (See RECORD OF CONVEYANCES.) The tender of the amount of the debt upon the prescribed day, though unaccepted, destroys the lien of the mortgage, though it does not discharge the debt. Some of the States give the same effect to an unaccepted tender made after the mortgage has become due. Lapse of time, according to the ordinary rules of law, may lead to a presumption of payment, which may, however, be rebutted. Sometimes there is a positive bar to any claim by force of the statute of limitations. (See LIMITATIONS, STATUTE OF.) The *debt* may in some instances be barred by this statute when the mortgage is not, as where different periods of time limit the right to proceed upon the debt and the mortgage respectively. While the debt continues no change in its form is fatal to the mortgage. Thus, if a new note is given in the place of an old one, or the time of payment is extended, the debt remaining unchanged, the mortgage is still in force.

On the death of a mortgagor an important question frequently arises as to the fund from which satisfaction of the mortgage is to be made; or, in other words, whether payment is to be made from the real or personal estate. The general rule is that it must be made from the personal property rather than from the real estate, upon the principle that the personal estate was increased by the money obtained upon the loan for which the mortgage was given. As the real estate, by the rules of the common law, passes to the heirs, and the personal property to the executors or administrators, the latter are accordingly *primarily* liable to pay the debt. A result of this rule is that the heirs become "sureties" for the executors, and if they are made to pay are allowed to proceed against the personal property. This rule has been changed by statute in England and in a number of the States, and the burden of paying the mortgage cast primarily upon the heirs. Under these statutes the executors become sureties for the heirs. The rule may be affected by evidence of the intent of the mortgagor that the burden of the debt shall be cast

on either the one or the other portion of his estate. It has no application to the case of one who did not himself borrow the money, but acquired the estate subject to the mortgage, for in that instance his successor takes the property with its burdens.

Questions frequently arise as to the apportionment of the burden of the mortgage among different owners. It is a general rule that where a number of owners of land affected by a single mortgage stand in the same position as to rights they must bear its burden equally. Accordingly, if one is called upon to pay the whole, he has a right to enforce a proportionate part of the mortgage against the owners of the remaining lots. This case may be illustrated in this wise: Suppose that there is a mortgage upon a farm, which is subsequently divided into village lots, and sold in such a way to purchasers that one is entitled to no preference over another. In this case every purchaser should pay a proportional part of the mortgage. This would be plain if the lots were sold to different persons contemporaneously. If, on the other hand, they had been sold successively to purchasers paying the full price, the earliest purchasers, according to the present prevailing opinion, have a superior right or "equity" to the later ones. The lots last sold would be primarily liable to pay the mortgage. If a foreclosure should take place and a sale be had to satisfy the mortgage, the lots would be sold in the "inverse order of alienation"—*i. e.* the lots sold last by the mortgagor would be sold first on the foreclosure to pay the mortgage. The result would be that as soon as enough had been realized to pay the mortgage further sales would not take place, and the lots first sold by the owner would accordingly be altogether relieved. These principles would not be recognized in case the earlier purchaser bought subject to a portion of the mortgage or assumed its payment. In that case he would be obliged to bear the burden that he had taken upon himself.

It is proper to state more comprehensively the general effect of a purchase of land subject to a mortgage. There are several forms of expression used in conveyances which must be carefully distinguished. Thus, one may buy "subject to the mortgage," or he may "assume its payment." In the first case he is not personally chargeable. The land may be taken, but he is not required to pay from his own means. On the other hand, if he "assumes the payment" he becomes personally liable. The importance of the distinction may be seen from the following supposition: If one had bought "subject to a mortgage," and the land had diminished in worth, so that its value was greatly inadequate to satisfy the debt, the land would be relinquished, but no further charge upon the purchaser could be made; if he had "assumed the mortgage," he would be personally responsible for the deficiency. These rules will be applied if the clauses referred to are in the purchaser's deed, even though he does not attach his signature to it. He cannot take title under the instrument without accepting all its provisions.

Whenever a person holding the position of a surety is made to pay a mortgage, he is entitled to stand in the mortgagee's place and enforce the mortgage for his own benefit. This is known as the doctrine of subrogation. (See SUBROGATION.)

It only remains to refer to the matter of foreclosure. While the law gives the mortgagee and his representatives the right of redemption, it at the same time seeks to protect the creditor by giving him the power to cut off that right by an appropriate legal proceeding. If the debtor does not pay in the course of these proceedings, his right to redeem is for ever foreclosed and barred. The regular mode of foreclosure is by an action or suit in a court of equity. The creditor commences his proceedings by making parties to it all who have a right to redeem. If any are omitted, the proceedings are ineffectual as far as they are concerned. Foreclosure proceedings lead to one of two general results—either the land is vested in the mortgagee (strict foreclosure), or there is a sale, the mortgage being paid from the proceeds, and the surplus, if any, made over to the persons having the right to redeem. The creditor may at his option refrain from a foreclosure, and may collect his debt by an ordinary action. In some of the States he is allowed by statute in a single action to foreclose his mortgage and to have a judgment for any deficiency. The subject is largely regulated by statute, and is a matter of detail which must be examined in the books of practice in the respective States. After foreclosure the title vests absolutely in the mortgagor or purchaser as the case may be. There may also be a foreclosure under a power of sale. (See POWER.) There are also special statutory modes adopted in some of the States. (For further information on the general subject see Powell on *Mortgages, notes* by Coventry and Rand; Hilliard on do.; Fisher on do.; Washburn on *Real Property;* Kent's *Commentaries*, title *Mortgages.*)

II. *Chattel Mortgages.*—This subject has assumed much importance in modern times, though scarcely receiving any attention in the earlier lawbooks. A mortgage of an item of personal property or chattel is in law a conditional sale. It differs from a pawn or pledge in the fact that the latter is a bailment (see BAILMENT), the ownership remaining still in the bailor. If the debt is not paid on the appointed day, the title to the mortgaged chattel becomes, in the view of a court of law, absolute in the mortgagee. Still, even in that case a court of equity may interfere and enforce in favor of the mortgagor an "equity of redemption." Before the debt secured by the mortgage is due there is a legal interest still remaining in the mortgagor, which may be seized by a sheriff on an execution against him, and sold to pay his other debts. After the mortgage is due this is no longer true. Special clauses are frequently found in mortgage deeds giving the creditor the right to take possession of the property before the debt is matured, and retain it as a security for his debt. Such a clause would enable the mortgagee to displace the right of the sheriff to take the property for other debts.

There is not a little danger that chattel mortgages may be resorted to by unscrupulous debtors as a mere pretext, and with a view to withdraw their property from the reach of their creditors. Such an act of withdrawal would be regarded as a fraud upon the creditors, and might, at their instance, be declared void. To ensure publicity in this class of cases it is provided by legislation in a number of the States that the mortgage, when there is no change of possession, shall be filed in some public office. A failure to comply with this regulation would usually make the transaction void as to creditors and as to purchasers in good faith from the mortgagor, though the mortgage would still be binding as to the original parties and as to purchasers with notice of all the facts. It is in some instances further provided that if the debt secured by the mortgage duly filed is not paid within a brief period (*e. g.* a year), there shall be a public declaration filed by the mortgagee in the same office of the continuance of the indebtedness. A non-compliance with this regulation is visited with similar penalties.

Independently of such regulations, the fact that the mortgaged goods remain in the possession of the mortgagor is a circumstance indicative of fraud upon creditors, and requiring explanation. It is a rule in the law of sales of chattels, including mortgages (see SALE), that the retention of possession by the seller is a badge of fraud. The presumption thus created may, according to prevailing law, though with some diversity of opinion, be explained, and the possession be shown as a question of fact to rest upon grounds consistent with good faith. If no satisfactory explanation is given, the presumption becomes conclusive. It would be evidence of fraud sufficient to avoid the mortgage as to other creditors if its terms permit the mortgagor to sell the goods as his own, and appropriate the proceeds of the sales to his own use, without accounting to the mortgagee. The true theory of the transaction where the mortgagor remains in possession, and is permitted to sell, is that the sales, after deducting expenses, are to be applied to the reduction of the debt; and no other doctrine is consistent with the protection and the due enforcement of the claims of other creditors.

If the mortgage be valid, and be not paid at the appointed day, the remedy of the mortgagee to cut off the right of redemption is to foreclose by an action in equity. So he may sell under a power of sale, giving due notice to the debtor of the time and place of sale, and holding himself accountable to the mortgagor for any surplus realized above the amount of his claim. (The subject may be further pursued in the works on mortgages already referred to, and in the statutes of the respective States and in the reports.) T. W. DWIGHT.

Mortier′ (EDOUARD ADOLPHE CASIMIR JOSEPHE), duke of Treviso, marshal of France, b. at Cateau-Cambrésis, in the department of Nord, Feb. 13, 1768; received a mercantile education, but entered the army in 1791; was made a general of division in 1799 and marshal in 1804; fought with distinction in Germany, Spain, and Russia; was made duke of Treviso after the battle of Friedland 1808, and a peer of France during the first Restoration; accompanied Louis XVIII. across the frontier, but returned to Napoleon during the Hundred Days; was commander-in-chief of the fifteenth military division after the second Restoration; went as ambassador to St. Petersburg in 1831; took charge of the ministry of war for a short time in 1834, and was killed by Fieschi's "infernal machine" on the Boulevard du Temple July 28, 1835.

Mortification. See GANGRENE, by EDWARD J. BERMINGHAM, M. D.

Mor'timer (Roger), earl of March, baron of Wigmore, b. on the Welsh frontier about 1287; became a ward of Piers Gaveston 1303; was knighted, and served under Edward I. in the Scottish war 1306–07; was employed in high offices under Edward II. in Scotland and France; was lord lieutenant of Ireland 1317; joined the earl of Lancaster in his rebellion against the king's favorites 1320; was captured at the battle of Boroughbridge 1322, and imprisoned in the Tower; escaped to France by the connivance of Queen Isabella; entered the service of King Charles IV. of France, then at war with England; met Isabella at her brother's court at Paris 1325; became her paramour; plotted with her against her husband; obtained possession of the young prince Edward, heir to the throne; received aid from the count of Hainault; landed with Isabella at Orwell Sept. 24, 1326; was joined by the great nobles; deposed Edward II. Jan., 1327; proclaimed the young prince as king (Edward III.); ruled the kingdom in his name; was created earl of March and obtained the confiscated estates of the Despencers; murdered the deposed king at Berkeley Castle Sept. 21, 1327; executed the earl of Kent 1329; offended the people, the nobles, and the king by his cruelty and arrogance; was seized by the king and Lord Montacute at Nottingham Castle; attainted by a new Parliament called at Westminster, and was hung at Tyburn Nov. 29, 1330. His attainder was reversed as illegal in 1354, and the title and estates restored to his grandson, who by alliance with the royal family was ancestor of the Tudor and all later sovereigns of England.

Mort'main [Fr. *mort*, "dead," and *main*, "hand;" Lat. *mortua manus*], in law. I. *General Historical Sketch.*—In its widest signification this term may be used to describe any property the owners of which do not change, and which does not pass from hand to hand by sale or by inheritance. The word, however, is generally employed in a narrower sense, and is applied solely to lands of the Church, of religious corporations, and pious foundations. The expression *manus mortua* (Fr. *mort-main*, "dead hand"), which occurs in public documents as early as the middle of the ninth century, is derived either from the fact that land owned in this manner was inalienable, and was therefore figuratively spoken of as being in "dead hands," or, which is by far the more plausible derivation, from the fact that persons who became members of religious corporations and ecclesiastical communities were civilly dead—that is, were regarded in the law as dead, so that property held by them was literally in dead hands. The amount of the lands which during the Middle Ages and the centuries immediately succeeding thereto were possessed by ecclesiastical proprietors, by churches, cathedrals, chapters, abbeys, convents, and every other species of religious corporation, and which were thus mortmain, throughout all the countries of Europe, was enormous. The influence of the Church was constantly exerted to procure additional gifts from the laity, and its policy permitted no alienation of what had once been obtained. This vast accumulation was both a political and an economical evil, and could not fail to attract the attention of the civil authorities as soon as the true relations of the government with the state and the Church came to be even partially understood. It was justly regarded as detrimental to the prosperity of any country in which it existed; it arrested the progress of improvement in agriculture, and caused the smallest amount of productions to be obtained from cultivating the soil; it prevented the free interchange and diffusion of property; it diminished the public revenue; it perverted the religious sentiment by fostering the belief that sins could be atoned by gifts to the Church; it undermined the self-respect and self-reliance of the people by multiplying charitable institutions, which maintained multitudes of able-bodied men in idleness. From considerations of policy, therefore, political as well as economical, the governments of all countries at an early day resorted to measures against mortmain which were both repressive and preventive. The first of these legislative measures subsequent to the overthrow of the Western Roman empire was by the emperor Frederick Barbarossa, who by an edict in 1158 prohibited the transfer of fiefs to the Church without the consent of the superior lord, and the same was enacted by Louis IX. John Norton Pomeroy.

II. *Mortmain Law in England and the U.S.*—In England there has a policy prevailed from an early period in opposition to the appropriation of lands by corporations. This policy grew mainly out of feudal considerations. It was a rule of the feudal law that when an owner of land died his heirs should pay a fine called a "relief" to the feudal lord as an equivalent for taking possession of the estate. No such fine could be exacted from a corporation on account of its perpetuity. It was therefore resolved that as a prerequisite to an indefeasible title corporations should obtain a license from the king or other feudal lord; on granting this license a sufficient fee could be required. Although "religious houses" were made prominent in the preamble to the mortmain acts, yet the prohibitions were levelled against all indiscriminately, except that in *Magna Charta*, 9 Henry III. c. 36, which was directed only to religious *houses*. This provision in the Great Charter having been evaded, and being too narrow in its terms, a later statute (7 Edw. I., A. D. 1279) provided that no person, religious or *other*, should buy or sell any lands, etc., or receive them by reason of any title, so that they should come into mortmain. If this direction was transgressed, the chief feudal lord might within a specified time enter upon the land so held in mortmain, and if he neglected to do so the king might take the land. This statute was levelled at all corporations, whether religious or secular, and did not impair the capacity of the corporation to *take* the land, but only prevented it from *holding* in case the chief lord or king determined to exact a forfeiture. Similar provisions were applied by another statute passed in the same reign to collusive suits or actions which had been resorted to by way of evasion as a mode of passing title to corporations.

The effect of these acts was evaded by ecclesiastics and others by resorting to the doctrines of uses, introduced from the civil law into the common law of England. Instead of conveying land directly to the corporation, it became the practice to vest the title in some individual, who was directed to hold it to the use of, or in trust for, the corporation. The courts paid no attention to this direction, as they regarded the so-called "use" as wholly inoperative and void; courts of equity, then under the control of the clergy, on the other hand, regarded the use as affecting the conscience of the legal owner, and directed him to appropriate the rents and profits in the mode pointed out by his grantor. To meet this device an important statute was passed in the reign of Richard II. (A. D. 1391, 15 Rich. II., 2 *Statutes of the Realm*, pp. 78–80). The provisions of this act so clearly show the scope of the so-called "mortmain acts," and their application to *all* corporations, that they will be stated at some length. The preamble recites the abuse that had come to prevail, and that of late, by subtile imagination and by art and engine, religious persons had entered into lands adjoining to the churches, and by sufferance of the tenants and by bulls of the bishop of Rome had dedicated and hallowed the same, and "did make continually parochial burying *without license* of the king and of the chief lords." It was then provided that all who had become possessed of lands to the use of religious people should on pain of forfeiture amortise them before a specified time by the license of the king and the feudal lords, or else convey them to some other use. For the future it was established that no such purchase be made either for the use of religious persons or for guilds or fraternities, and that "cities, boroughs, etc. which have a perpetual commonalty be as perpetual as people of religion, and that from henceforth they shall not purchase to them and to their commons upon pains contained in the statute *De religiosis*" (7 Edw. I., before cited).

These expressions make it entirely plain that all corporations need the king's license to make a good title, but that any estate which they may acquire vests in them until it is withdrawn by legal proceedings attendant upon a forfeiture. An accurate writer, Mr. Shelford, says: "Notwithstanding this statute, grants to corporations, without any license in mortmain, are good for the purpose of vesting the land in the grantees, for corporations without such license have capacity to take, but not to retain." (See also the remarks of Wayne, J., in the case of *Perin* v. *Carey*, 24 *Howard's U. S. Reports*, 498 (A. D. 1860).)

Where the case is one of a devise to a corporation a different rule prevails. The provision is by the common law wholly void, since no devise of land can be made even to a natural person. Nor is the matter helped by the statute of wills (32 Hen. VIII.), as bodies politic and corporate are excepted from its operation. A question, however, arose after the adoption of the famous statute (43 Eliz. c. 4) known as the "Statute of Charitable Uses," whether it was not applicable to corporations, and would allow them to take the *use* of land by will, though they were debarred from taking the land itself. In fact, the question was still broader, and involved the inquiry whether even before this statute a court of chancery would not sustain in some form a devise to a corporation for a charitable purpose, though it had no capacity to take the title itself by will. The correct view undoubtedly is, that though a devise is made to a corporation unable to take real estate for a charitable use, the land itself is, by general principles of law, bound by the trust, which the court of chancery will carry out. This result was more fully recognized after the enactment of the statute already referred to, but was not created by it. During the

reign of Henry VIII., owing to some statutes growing out of the religious reformation, a distinction was taken between "superstitious" uses and those which were deemed to be truly charitable. The former were such as were supposed to be contrary to the policy of the statutes and in opposition to the state religion, and were declared void. This subject is only incidentally related to corporation law, for the test whether a use is charitable or superstitious is the same whether the title to the land is vested in a corporation or an individual trustee. This subject will be more fully considered under the topic of TRUST (which see). An important statute was passed in the reign of George II., sometimes erroneously termed a "mortmain act," which was really levelled at charitable uses created by will. It was a special law against "improvident alienations or dispositions made by languishing or dying persons, or by other persons, to uses called charitable uses, to take place after their deaths, to the disherison of their lawful heirs." The statute simply provides that no lands or tenements shall be conveyed to any person or persons unless by deed executed at least twelve months before the death of the grantor. It has no relation to a mortmain act, which is aimed solely at corporations. It permits the charitable direction by deed, complying with the statute, but does not allow it by will. It makes the use void, while the mortmain acts vest the property in the corporation until forfeiture.

In the U. S. there are no strict mortmain acts, except in one or two of the States. Corporations are generally allowed to take conveyance of land for such purposes as may be necessary. Sometimes the value of the land which they may acquire is limited. In such a case, if the value is exceeded, they still hold the land by a defeasible title until there is a forfeiture by appropriate legal proceedings on the part of the State. If the value is not exceeded at the time of acquisition, and there is a subsequent increase, there is no ground of forfeiture. Ordinary or business corporations cannot take land by devise; charitable corporations are usually allowed to take it both by deed and by will. In a few of the States there are statutes restricting the creation of charitable uses by will somewhat resembling the English statute of 9 Geo. II. Thus, it was provided in New York in 1860 that no testator leaving a wife, child, or parent should devise or bequeath to a charitable institution or association more than one-half of his property, deducting his debts. If the devise exceeds one-half of his estate, it is valid to that extent. (Consult Shelford on *Mortmain;* Boyle on *Charitable Uses;* Duke on do.; Tudor on do.; and see the article on TRUST.) T. W. DWIGHT.

Mor'ton, county of Central Dakota. It is bounded E. by the Missouri River. It is mostly rolling, and scantily supplied with timber. It is watered by Cannon Ball and Heart rivers.

Morton, post-v. and tp. of Tazewell co., Ill., on the Chicago Pekin and South-western R. R. Pop. 1228.

Morton, post-v. of Scott co., Miss., on the Vicksburg and Meridian R. R., 79 miles E. of Vicksburg.

Morton, tp. of Alamance co., N. C. Pop. 794.

Morton (CHARLES), b. in Cornwall, England, in 1626; educated at Oxford, where he became a fellow; was at first a royalist, but subsequently a Puritan; was minister at Blissland, Cornwall, until ejected in 1662 for nonconformity; established an academy at Newington Green, near London, where Daniel Defoe was one of his pupils; was subjected to such annoyances by the ecclesiastical courts that he emigrated to Massachusetts July, 1686, with his pupil, the future historian, Samuel Penhallow; was minister of Charlestown from November of that year until his death, Apr. 11, 1698. He was also vice-president of Harvard College; author of a *System of Logic,* long in use in that institution, and of several scientific works, published in England.

Morton (GEORGE), b. at York, England, about 1585; became a Puritan, and with a brother, Thomas, was among the earliest of the Pilgrims who settled at Leyden, Holland; married there in 1612; remained as the agent of the Pilgrims in London 1620; came to Plymouth, Mass., in the Ann 1623, bringing a reinforcement and supplies to the Pilgrims of the Mayflower; returned to England some years later, and d. in the N. of England. He was the editor of the first book published in England which gave an account of the planting of Plymouth colony, the work known as *Mourt's Relation* (1622), of which the best edition is that by Rev. H. M. Dexter (Boston, 1865).

Morton (HENRY), PH. D., b. in New York City Dec. 11, 1836; graduated at the University of Pennsylvania 1857, about which time he prepared for the Philomathean Society of that institution a translation of the hieroglyphic inscription of the Rosetta Stone, and executed on stone the drawings which accompanied its publication (1858), made by a committee consisting, besides himself, of Messrs. C. R. Hale and S. Huntington Jones. He pursued the study of law in Philadelphia for nearly two years, when his growing predilection for physical and for chemical science induced him to give them his entire attention. In 1863 he was elected professor of chemistry at Philadelphia Dental College; became in 1864 resident secretary of the Franklin Institute of Pennsylvania, and in April of that year began the delivery in the Academy of Music of Philadelphia of a course of sixteen lectures on light, which excited great attention both in the U. S. and in Europe, on account of the originality and brilliancy of their experimental illustrations (see *Les Mondes,* vols. xviii. *seq.*), so that several of them were repeated for the accommodation of vast audiences. In 1867, Prof. Morton became editor of the *Journal* of the Franklin Institute, and during the academic year 1867–68 filled temporarily the chair of chemistry and natural philosophy in the University of Pennsylvania. In 1869 he organized the photographic parties sent to observe the solar eclipse of Aug. 7, under the auspices of the *Nautical Almanac* office, having under his direction the three parties stationed at Burlington, Mt. Pleasant, and Ottumwa, Ia. (See *Journal of Franklin Institute,* vol. lviii.) In 1869 he was elected professor of chemistry in the University of Pennsylvania, and in 1870 was appointed president of the Stevens Institute of Technology at Hoboken, N. J., then just founded by a bequest of the late Edwin A. Stevens of that place. This institution, which is a school of mechanical engineering, has under the management of Pres. Morton achieved a high reputation, both for the instruction therein given and for the great number of scientific investigations conducted and published by members of the faculty. Pres. Morton has published a number of scientific papers in the *Journal* of the Franklin Institute, the *Chemical News,* and the *Philosophical Magazine,* several of which have been republished in the French *Moniteur Scientifique.* Among them may be noted those *On the Giffard Injector, On the Bright Line beyond the Moon's Edge in Partial Phase-Eclipse Photographs* (copied in *Comptes Rendus* of the French Academy of Sciences, vol. lxiv.), *On the Fluorescent Relations of Anthracene and Chrysogen, Do. of Some Solid Hydrocarbons found in Petroleum Distillates, Do. of Pyrene and Chrysene, On Thallene, a Solid Hydrocarbon produced in the Destructive Distillation of Heavy Petroleum Oils, On the Basic Salts of Uranium, On the Fluorescent and Absorption Spectra of Uranium Salts,* the latter comprising seven papers prepared in conjunction with Dr. H. C. Bolton (*Chemical News,* vol. xxviii., 1873; *Moniteur Scientifique,* vols. xv. and xvi.).

Morton (JACKSON), b. in Virginia about 1810; removed to Florida a few years after its annexation; became an extensive manufacturer; was U. S. Senator 1849–55, and a member of the Congress of the Confederate States. To him the country was indebted for the appointment of Mr. Buckingham Smith to an official post in Spain, which resulted in the acquisition and publication of a valuable series of manuscripts illustrating the Spanish history of Florida and Louisiana.

Morton (JAMES **Douglas**), FOURTH EARL OF, regent of Scotland, b. at Dalkeith in 1530, was a younger son of the great family of Angus; succeeded to the earldom and estates of Morton in right of his wife 1553; was a lord of the Congregation 1557; became privy councillor 1561, lord high chancellor 1563; was an accomplice in the murder of Rizzio 1566; escaped to England, but was soon pardoned and returned; was cognizant of the plot against Darnley, but refused to join it, 1567; reappointed chancellor and made lord high admiral 1568; was one of the commissioners at the conferences of York 1568; succeeded Lennox as regent Nov. 24, 1572; resigned and retired to Lochleven Castle Sept. 12, 1577; recovered his authority soon afterwards; was overthrown by the influence of the new royal favorites, Esme and James Stewart; tried and convicted of participation in the murder of Darnley, and executed at Edinburgh June 3, 1581.

Morton (JAMES ST. CLAIR), b. in Philadelphia in 1829; graduated at the U. S. Military Academy in 1851; entered the engineer corps of the army, and rose to be major of engineers in July, 1863; served as assistant engineer on the defences of Charleston, S. C., and of Fort Delaware; in 1855 was assistant professor of engineering at West Point, then engineer of the third lighthouse district, and engineer in charge of the Potomac aqueduct; led the Chiriqui expedition, Central America, in 1860, on his return resumed charge of the Potomac waterworks, and subsequently superintended the fortifications on the Tortugas; in May, 1862, reported to Gen. Buell as chief engineer of the Army of the Ohio; in Oct., 1862, was chief engineer of the Army of the Cumberland; commanded the pioneer bridge-brigade of that army, and became brigadier-general

of volunteers, dating from Nov. 29, 1862; constructed the intrenchments about Murfreesboro'; took part in the capture of Chattanooga; was wounded at the battle of Chickamauga, and superintended the engineering operations at Chattanooga under Gen. Rosecrans; in Nov., 1863, returned to the corps of engineers; in the Richmond campaign of 1864 served as chief engineer of the 9th army corps, and was engaged in the battles of North Anna, Tolopotomy, Bethesda Church, and assault of Petersburg, Va., where he was killed while leading the attack, June 17, 1864. Among his productions are *An Essay on Instruction in Engineering* (1856), *An Essay on a New System of Fortifications* (1857), *A Memoir on American Fortifications*, etc. G. C. SIMMONS.

Morton (Archbishop JOHN), CARDINAL, b. at Bere, Dorsetshire, England, in 1410; educated at Cerne Abbey and Balliol College, Oxford; became principal of Peckwater Inn, now Christ Church; was present at the battle of Towton, and escaped with Queen Margaret to Flanders; attainted of high treason 1461; pardoned and attainder reversed 1471; made master of the rolls 1472, archdeacon of Winchester 1474; appointed by Edward IV. ambassador to the emperor of Germany and the king of France; bishop of Ely and lord chancellor 1478; imprisoned by Richard III. 1483, but escaped to the earl of Richmond in Flanders; was made privy councillor by Henry VII. 1485, lord chancellor 1486, and archbishop of Canterbury in July of the same year; was made cardinal by Pope Alexander VI. 1493; and d. at Knoll, Kent, Sept. 13, 1500. The union of the houses of Lancaster and York by the marriage of Henry VII. was the work of Morton, who was also noted as the early friend and patron of Sir Thomas More.

Morton (JOHN), b. at Ridley, Pa., in 1724; was many years in public life; Speaker of the general assembly of Pennsylvania 1772–75; was sent in 1765 to the Stamp Act Congress; was high sheriff 1760–70, and became a judge in the provincial courts; was an active member of the Continental Congress 1774–76; signed the Declaration of Independence. D. Apr., 1777.

Morton (MARCUS), LL.D., b. at Freetown, Mass., Feb. 19, 1784; graduated at Brown University 1804; became a lawyer; clerk of the Massachusetts senate 1811; M. C. 1817–21; a State councilman 1823; lieutenant-governor 1824; a judge of the State supreme court 1825–39; governor of Massachusetts 1840 and 1843; collector of the port of Boston 1845–48. D. at Taunton Feb. 5, 1864.

Morton (NATHANIEL), son of George, b. at Leyden, Holland, in 1613; was brought by his parents to Plymouth, Mass., on the Ann in July, 1623; after his father's death was taken into the family of Gov. Bradford, whose wife was his mother's sister; early became assistant to his uncle in the management of public affairs, and by annual popular election was secretary of the colony from Dec. 7, 1647, until his death at Plymouth, June 29, 1685. Almost all the records of Plymouth colony during the seventeenth century (published by the government of Massachusetts in several large volumes) are in his handwriting. He acquired a good education by extensive reading, took great pains to note down the incidents of the early days of the colony from the mouths of the witnesses, and in 1669 published at Cambridge the first regular history of the colony, under the title *New England's Memoriall, or a Brief Relation of the most Memorable and Remarkable Passages of the Providence of God manifested to the Planters of New England.* Other editions were printed in London (1669), Boston (1721, with supplement by Josiah Cotton), Newport (1772), Plymouth (1825), Boston (1826, with valuable notes by Judge John Davis), and Boston (1855, with notes by the Congregational Board). The work was compiled at the request of the commissioners of the four united colonies, being chiefly based upon MSS. of Gov. Bradford, was attested as correct by the most eminent survivors of the earlier generation, and until the recovery of Bradford's own history (1856) was the chief early authority for the history of Plymouth colony. Morton also wrote in 1680 a synopsis of the Church history of Plymouth (published by Young in his *Chronicles of Plymouth*, 1841), and was author of a considerable number of occasional verses, chiefly written in commemoration of the virtues of the "Pilgrim Fathers," the best specimens being perhaps those written on the occasion of the death of his aunt, Mrs. Bradford, published at the end of Gov. Bradford's *History.* PORTER C. BLISS.

Morton (OLIVER P.), b. in Wayne co., Ind., Aug. 4, 1823; was educated at Miami University; called to the bar 1847; became in 1852 a circuit judge in Indiana; was lieutenant-governor in 1860, governor 1861–65; declined the position of U. S. minister to England in 1870; was U. S. Senator 1867–73, and in 1873 was re-elected for the full term.

Morton (PEREZ), a descendant of George, b. at Plymouth, Mass., Nov. 13, 1751; graduated at Harvard College 1771; became a distinguished lawyer and Revolutionary patriot; pronounced the funeral oration in behalf of the city authorities of Boston over the remains of Gen. Joseph Warren Apr. 8, 1776; married Miss S. W. Apthorp, the poetess, 1781; was Speaker of the Massachusetts house of representatives 1806–11; attorney-general of the State more than twenty years (1811–32), and a delegate to the State constitutional convention of 1820. D. at Dorchester Oct. 14, 1837.

Morton (SAMUEL GEORGE), M. D., b. at Philadelphia Jan. 26, 1799; received his medical degree from the University of Pennsylvania 1820, and at Edinburgh 1823; became a practitioner of Philadelphia 1826; recording secretary of the Academy of Natural Sciences 1825, its president 1840; professor of anatomy in Pennsylvania Medical College 1839–43; was widely known as one of the ablest of craniologists; author of *Illustrations of Pulmonary Consumption* (1834), *Human Anatomy* (1839), *Crania Americana* (1839), *Crania Ægyptiaca* (1844), and of a great number of valuable scientific papers upon ethnology, chemistry, zoology, geology, mineralogy, and other sciences. D. at Philadelphia May 15, 1851.

Morton (SARAH WENTWORTH **Apthorp**), called the "American Sappho," b. at Braintree, Mass., Aug. 29, 1759; married Hon. Perez Morton at Quincy 1781; acquired celebrity by her poems; contributed to the *Massachusetts Magazine* over the signature of "Philenia;" published *Ouabi, or the Virtues of Nature, an Indian Tale in Four Cantos* (1790), *Beacon Hill*, a poem in 5 books (1797), and *My Mind and its Thoughts*, a miscellany of prose and verse (1823). D. at Quincy May 14, 1846.

Morton (THOMAS), D. D., b. at York, England, Mar. 20, 1564, of the same family with Cardinal Morton; graduated at Cambridge, where he became professor of logic; was successively dean of Gloucester and Winchester, bishop of Chester 1615, Coventry 1618, and Durham 1632; was imprisoned in the Tower 1645, during the civil war; was a learned theologian and author of numerous controversial treatises. D. at Easton Mauduit, Northamptonshire, Sept. 22, 1659. He is best known as the intimate friend of Isaac Casaubon. (See biographies by Barwick (1660) and Naylor (1669); also Pattison's *Casaubon* (1875).)

Morton (THOMAS), b. in England about 1590; was a lawyer at Clifford's Inn, London; was leader of the colony sent by Weston to settle in Massachusetts June, 1622; went back to England; returned with Capt. Wollaston in 1625; settled at Mount Wollaston, now Braintree, where on May Day, 1626, he presided over a scene of merriment very obnoxious to Puritan ideas, setting up a May-pole and naming the spot Ma-re Mount or Merry Mount. The people of Plymouth, hearing of these proceedings, came in force two years later, cut down the pole, carried Morton away, and sent him back to England. He returned to Massachusetts in 1629, but was again seized and transported, and his house torn down 1630. He published a satirical work, *The New English Canaan* (1632), which contains, however, a good description of the country and of the Indians; came again to Massachusetts 1643; was imprisoned a year for his "scandalous book," and d. at Agamenticus, Me. about 1646. (See John L. Motley's novels, *Morton's Hope* (1839) and *Merry Mount* (1849).)

Morton (WILLIAM THOMAS GREEN), M. D., b. at Charlton, Mass., Aug. 9, 1819; became in 1842 a dentist and manufacturer of artificial teeth in Boston, and while attending medical lectures there conceived the idea of using ether as an anæsthetic. On Sept. 30, 1846, he successfully employed it in the painless extraction of a bicuspid tooth, and Oct. 16, Dr. J. C. Warren removed without pain a vascular tumor from the jaw of a man rendered unconscious by the inhalation of the vapor of ether. Dr. C. T. Jackson and Mr. Horace Wells each claimed the priority in the discovery of the use of anæsthetic agents in surgery. Morton patented his invention, but derived no profit from it, being involved by it in lawsuits and almost ceaseless quarrels. D. in New York July 15, 1868. (See WELLS, HORACE.)

Mor'tonsville, a v. of Deer Creek tp., Carroll co., Ind. Pop. 80.

Mor'ven, tp. of Anson co., N. C. Pop. 1325.

Mosa'ic [It. *musaico;* Fr. *mosaique;* Lat. *opus musivum;* Gr. post class. *μουσεῖον*], the art of producing geometrical figures or pictorial representations by means of small pieces of variously colored stone, glass, or other hard substance, arranged according to the design and cemented together on a solid background. At a very early period ornamental pavements made of black and white pebbles firmly imbedded, and so alternated as to exhibit geometrical forms, were common among the Oriental as well as

the more Western nations. The use of small dice-shaped pieces of colored glass, marble, or silicious stone for the same purpose can be traced to a time scarcely less remote, and with these brilliant pictorial effects were produced. The ancient Assyrians, Persians, and Egyptians practised this art, and the house of Demetrius Phalereus of Athens (300 B. C.) was adorned in this way. It was from the Greeks (Pliny, book xxxvi. ch. 28) that the Romans derived their knowledge of mosaic, to which they gave various names—*opus musivum, opus sectile, opus tessellatum, opus vermiculatum.* The general term *mosaic*, however, is usually applied to all works of this kind left to us from that age. The oldest Roman mosaic historically known to us was executed by order of Sulla in the temple of Fortune at Præneste. From this time it rose rapidly into favor. Cicero made use of it to embellish his porticoes and villas, and Cæsar, it is said, even to floor his tents. Under Augustus and his immediate successors it was lavishly employed in the decoration of palaces and temples. Some idea of the extent and perfection to which this art was carried may be formed by the many specimens left to our time. A representation of doves perched on the brim of a vase is mentioned by Pliny as of remarkable excellence, and a copy—or, as some think, the original—of this still exists at Rome. Smaller mosaics of almost microscopic fineness have also come down to us. Among larger ones may be mentioned *the Battle of Issus*, found in the House of the Faun at Pompeii, and now in the Royal Museum at Naples. No description can give an idea of this marvellously beautiful mosaic. Another scarcely less famous piece, representing the Nile and its banks, is in the Villa Barberini at Palestrina; and hardly a day passes in which the spade of the Italian laborer does not bring to light some buried treasure of this kind. The art declined in Italy with the declining Empire, and Byzantium became its chief seat. The new capital soon rivalled Rome itself in the extent and splendor of her mosaics, and in the church of Santa Sophia (erected in the sixth century) it was employed with a gorgeous profusion never before seen. The mosaics which still stand forth so wonderfully fresh and grand from backgrounds of gold in the ancient churches of Rome, Ravenna, and Venice are in part the work of Byzantine artists, then in some respects in advance of the Italians. This superiority, however, lasted but a short time, and the pupils soon surpassed their masters. The grotesque stiffness of the Byzantine school gradually disappeared, and the glorious cathedrals of S. Marco in Venice, of Monreale near Palermo in Sicily, and of Orvieto, are proofs of the astonishing skill to which the Italian mosaicists attained in the thirteenth, fourteenth, and fifteenth centuries. In more recent times this art, or rather this branch of it, has been chiefly practised at Rome, and St. Peter's and St. Paul's without the Walls are indebted to it for much of the splendor of their interiors. Laborious and expensive as these productions are, they have an immense advantage over oil-painting and fresco in point of durability, and many a famous picture will doubtless survive in its mosaic copy long after the frailer original has perished. In the Studio of Mosaic in the Vatican the processes of its manufacture may be seen; the remarkable Roman mosaic works of Dr. Antonio Salviati in Venice are also well worth a visit. At this last establishment large orders from England and other countries are executed.

The so-called Florentine mosaic (*lavoro commesso, pietre dure*), which dates from the time of the first Medici, instead of being composed of cubes of glass or marble, is made entirely of precious or semi-precious stones, such as the amethyst, lapis-lazuli, agate, onyx, jasper, etc., cut in forms best suited to produce the desired effects. The surface of this work is generally flat, but there are superb specimens, both old and new, in relief. The objects represented most frequently are birds, flowers, fruits, vases, sometimes buildings, and more rarely portraits and landscapes. The perfection of these representations is astonishing. The Medicean chapel in the church of San Lorenzo, Florence, is the finest example of this work on a great scale, but tables, cabinets, caskets, etc. of surpassing richness and beauty may be seen in the Uffizzi, Pitti, and other great Italian palaces. The royal manufactory of lavoro commesso in Florence now offers the wealthy visitor an opportunity of purchasing as magnificent objects in *pietra dura* as ever were owned by a Medici.

Much attention has lately been drawn to the famous monument of Taj Mahal at Agra in India, which is said to contain the whole Koran written in *pietre dure*, as well as to equally surprising works of the same kind at Delhi; and it is alleged that these mosaics are, in part at least, the work of Italian artists. The Bombay mosaics are made of ivory and metals; buhl, of tortoise-shell and metal. Mother-of-pearl is much used in modern Oriental mosaics. (For wood-mosaic see TARSIA.) The reader is referred to Ciampini, *Vetera monumenta, etc.* (Rome, 1690); Winckelmann, and Count Demetrio Carlo Finocchietti, *Delle Industrie, etc.* (Florence, 1869). CAROLINE C. MARSH.

Mosaic Gold. Applied to an alloy of copper and zinc, called *or molu* (see ORMOLU); and to a bisulphide of tin, prepared by heating to low redness a mixture of 12 parts tin, 6 parts mercury, 6 parts sal-ammoniac, and 7 parts flowers of sulphur. It remains behind as brilliant gold-colored scales, and is employed to coat surfaces in imitation of gilding, etc. HENRY WURTZ.

Mos'alem, tp. of Dubuque co., Ia. Pop. 972.

Mosasau'ria, a group of extinct reptiles [from *Mosasaurus*, an extinct genus of marine reptiles, first discovered in 1780 in the upper chalk of St. Pietersberg, near Maestricht in Holland, on the Meuse River, hence the name, meaning "lizard of the Meuse"]. The first known species was called *Mosasaurus Hofmanni*, and the cranium was five feet in length. A few other species have been found in the Cretaceous of England and Europe, but their remains are much more abundant in the deposits of that age on this continent, and among these two families of several genera have been recognized. They agree in having an elongated and serpent-like body, which was more or less protected by osseous dermal plates of various forms and usually imbricate arrangement. The jaws were powerful and well armed with sharp conical teeth, which were ankylosed by their bases with the jaws, and occurred also on the palatine bones in the roof of the mouth. The two rami of the lower jaw were united at the extremity only by cartilage, as in the serpents, and a further provision for the wide distension of the mouth was afforded by a joint in the side of the lower jaw at the base of the splenial element. The other bones of the skull had much resemblance to those of existing lizards. The vertebræ were concave in front and convex behind. Those of the neck were few, and the anterior of these had usually a short conical bone articulating with the lower surface of the centrum. In the posterior cervicals this hypapophysis was united with the centrum, and gradually disappeared. The scapula and coracoid were flattened bones, the latter deeply emarginate in some of the genera. The ischium and pubis were more slender, and the ilium had a rod-like shaft, probably attached by cartilage to some of the pelvic vertebræ, as there was no true sacrum. The limbs were in the form of paddles with five digits, each having from four to six phalanges. The families now known are the Mosasauridæ and the Edestosauridæ. In the former the zygosphenal articulation of the vertebræ was wanting or rudimentary; in the latter it was well developed, as in modern snakes and iguanas. The better known genera of the first family are the following: *Mosasaurus*, in which the palatine bones were united on the middle line, and the chevrons were co-ossified with the tail vertebræ; *Liodon*, with the palatines vertical, separated throughout their length; the teeth smooth and compressed; chevrons articulating with the caudal vertebræ; *Baptosaurus*, without articulating hypapophyses on the cervical vertebræ; *Lestosaurus*, with the premaxillæ forming a short obtuse muzzle; quadrate bone large, with a large posterior hook; coracoid deeply emarginate; anterior paddle much larger than the posterior; chevrons articulated; lastly, *Tylosaurus*, with the premaxillæ united into an elongated, cylindrical muzzle; quadrate with a short posterior hook; hind and fore paddles nearly equal in size; chevrons articulated. Of the second family, *Edestosaurus* had the tail long and serpent-like; chevrons co-ossified; quadrate small, with the internal angle produced. The palatine teeth were pleurodont in the anterior half of the series, and in the posterior portion had the outer dental margin protected by a low parapet of bone. The united premaxillæ formed a short, obtusely-pointed muzzle. The anterior paddle was larger than the posterior. In *Clidastes* the palatines were distinct except at their anterior extremities, and bore a long series of teeth, according to Prof. Cope, but the genus is not certainly known except from a single vertebra. More than fifty species of Mosasauria have been found in the Cretaceous strata of North America. About fifteen of these are from New Jersey, half a dozen from the Gulf deposits, and the remainder from Kansas and other parts of the West. *Mosasaurus princeps*, from New Jersey, was probably 75 feet in length, and *Tylosaurus dyspelor*, from Kansas, scarcely less gigantic. These huge reptiles, with their long heads, widely opening jaws, strong sharp teeth, and elongated bodies, protected by bony plates, must have resembled the fabled sea-serpents of modern navigators. O. C. MARSH.

Mosasaur'idæ, a family of reptiles. (See MOSASAURIA.)

Moscheles' (IGNAZ), b. at Prague May 30, 1794; d. at Leipsic Mar. 10, 1870. His father was a Jewish banker. He studied first with F. D. Weber, director of the conservatory, afterwards with Albrechtsberger and Salieri;

went to Paris in 1820, but after a short residence of one year repaired to London, where he remained twenty-five years. In 1846, after a period of professional travel in France and Germany, he established himself in Leipsic; was made director of the conservatory there, and exerted great influence on the musical education and taste of his time. Thalberg and Mendelssohn were his pupils, the only two who by general admission surpassed their master. Previous to them Moscheles ranked with the most eminent, even with Hummel and Kalkbrenner. Moscheles was a composer of sonatas, concertos, fantasias, variations, and studies for the piano. His contributions to the method of the pianoforte are considered important. His translation from the German of Schindler's *Life of Beethoven* is well known. His own *Life* was edited by his wife, in 2 vols. (Leipsic, 1872–73; London, 1873). O. B. FROTHINGHAM.

Mosch′inæ [from *Moschus*, the name of the only living genus], a sub-family of the family Cervidæ, distinguished by the absence of horns in the males as well as females, and the great development of the canine teeth of the upper jaw in the males. To it have been referred by late systematic authors two genera—viz. *Moschus* and *Hydropotes*. The former was long regarded as the type of a peculiar family (Moschidæ), with which were associated the representatives of a very different group (Tragulidæ), because they agreed with that genus in the absence of horns and the development of the upper canines. Although thus agreeing in superficial characters, the two types are, however, widely distinguished in many others. (See TRAGULIDÆ.) The two genera retained in the sub-family are by no means very closely related to each other, and it is doubtful whether the group is a natural one. The anatomy of the musk-deer has recently (1875) been examined by Prof. Flower. He finds that although the animal is essentially a deer, it offers a few peculiar characters, and indicates a low and generalized form derived from the common stock of Bovidæ, Giraffidæ, and Cervidæ, but with the closest relations to the last. The musk-deer (*Moschus moschiforus*) is an inhabitant of the mountainous wooded districts of Thibet and China, where it lives mostly in a solitary state except in the autumn. It is about the size of a six-months' old Virginia deer. The musk, from which the name of the animal is taken, is only secreted in the male; it has the consistence of honey, is of a brownish-red color, and is developed in an oval sac situated on the median line of the abdomen, between the navel and the orifice of the prepuce; the sac is flat on its adherent, but covered with hair on its free, surface; in the mature male it is about three inches in length by somewhat less than two inches in width. When the musk is dry it is almost solid and granular, and is unctuous to the touch. Formerly, it was esteemed as a stimulant for the nervous and vascular systems, and was given in doses of from 8 to 15 grains. It is now, however, very little used. The other species of the family (*Hydropotes inermis*) is found on the islands of the Yang-Tsze in China, where it lives in droves and is very prolific, and, it is reported, as many as six fœtuses have been found, in an exceptional case, in one female. THEO. GILL.

Mos′chus, a Greek bucolic poet, b. at Syracuse; flourished in the middle of the third century before Christ. Of his works, four entire idyls, three small fragments, and an epigram are still extant, generally published in connection with those of Bion, who was his friend and probably his teacher. There is an edition by Manso (Leipsic, 1807).

Mosciano Sant' An′gelo, town of Southern Italy, province of Teramo, charmingly situated about 4 miles from the Adriatic, with an industrious population, in 1874, of 6359.

Mosco′so de Alvara′do, de (LUIS), b. at Badajoz, Spain, in 1505; was a captain under the brothers Pizarro in the conquest of Peru; accompanied his relative, the adelantado Pedro de Alvarado, in his conquest of the provinces of Northern Peru 1534; returned to Spain with great wealth, most of which was soon dissipated; united with Hernando de Soto in his expedition for the conquest of Florida 1538; succeeded to the command of the expedition on the death of Soto, June 20, 1542; conducted the remnant of his followers to Mexico 1543; accompanied the viceroy Mendoza to Peru 1551, and d. there about 1561.

Mos′cow, government of Central Russia, watered by the rivers Moskva and Kliazma. Area, 12,552 square miles. Pop. 1,678,784. Its surface is an almost level plain, consisting of a clayey or sandy soil, not very fertile. The government is the most flourishing manufacturing part of Russia. Whole villages are often engaged in the manufacture of one single article—cloth, silk, brocade, paper, pins, glass, mirrors, etc.—and the manufacture of many articles is carried to a high degree of perfection.

Limestone and marble are quarried and extensively used for building purposes.

Moscow, the second capital of the Russian empire, the manufacturing and commercial centre of the country, and one of the richest and most interesting cities in the world, is situated in lat. 55° 45′ N., lon. 37° 33′ E., 400 miles by railway S. E. of St. Petersburg, in a hilly, fertile, well-cultivated, and beautiful district on the navigable river Moskva, and presents, when seen from the Sparrow Hills on its southern outskirts, a most picturesque and original view, half Asiatic and half European, its thousand gilded and brightly colored spires and domes in old Byzantine style rising beside palaces and public buildings of the modern French and Italian Renaissance, and overcrowded quarters with narrow, crooked streets, after the Oriental fashion, alternating with broad, open boulevards, after the Parisian model. Its circumference is 23 miles, including numerous large gardens, ponds and lakes, and extensive pleasure-grounds, and it consists of five different parts: I. Kremlin, the central part of the city, occupies a hill on the northern bank of the Moskva, is surrounded by heavy stone walls surmounted with towers, and consists of churches, palaces, and public buildings, which seen from some distance seem to form one gigantic but bewilderingly fantastic pile. Besides the palaces of the czar, the patriarch, and the holy synod, the arsenal with its splendid trophy of 875 cannons abandoned by Napoleon in 1812, the treasury, and other public buildings, here are the cathedral of the Assumption, in which the czars are crowned, built in the fourteenth century, and gorgeously decorated with columns of porphyry and jasper, with the floor paved with agates and carnelians, and the walls covered with costly mosaics; the cathedral of St. Michael, in which the czars before Peter the Great are buried; the tower of Ivan Veliki, 270 feet high, surmounted with a gilded dome 37 feet high, and containing thirty-two bells; the Kolokol, the largest bell in the world, weighing 448,000 pounds, is placed on a pedestal close by. II. Kitaigorod, or the "Chinese city," to the E. of the Kremlin, also surrounded by a wall with towers and gates, is the seat of the trade of the city, and contains extensive bazaars crowded with buyers and sellers from Tartary, Persia, Germany, and France. Here is the Petrovskoi cathedral, properly consisting of twenty-one chapels joined together. III. Beloigorod, or the "white city," because it is surrounded by a wall of whitish stone, encircles the Kremlin and Kitaigorod on three sides, and has many broad and elegant streets. Here are the palaces of the governor and the nobility, the university with its extensive buildings, several immense monasteries, the foundling hospital, the theatres, the post-office, and other government houses, and the famous drill-house, 560 feet long and 158 feet wide, the roof resting on the outer walls alone; during winter it is heated by numerous stoves, and affords ample room to drill for 2000 infantry or 1000 cavalry. IV. Zemlianoigorod, or the "earthen city," because it was formerly surrounded by an earthen wall, which now has been transformed into promenades. Lastly, V., the Slobodi, or suburbs. In these two parts of the city splendid mansions and magnificent monasteries, schools, hospitals, etc., surrounded with large and beautiful gardens, alternate with clusters of shanties, in which the working-people live, and with great, bustling manufacturing establishments; large tracts of waste land and commons are also found here. Among the 400 places of worship which the city contains there are chapels for the Roman Catholics, Lutherans, and other Christian denominations; also synagogues, and even mosques. The university was founded in 1755, and enjoys a high reputation. Connected with it are a library of 150,000 volumes, a printing establishment, a zoological and mineralogical museum, a botanical garden, an observatory, an anatomical theatre, and several scientific associations of high standing. Besides general schools of different grades, the city also contains special educational institutions—ecclesiastical seminaries, military schools, an academy of art, commercial and industrial schools—and its benevolent institutions are numerous and good. It has water-communication with the Baltic, the Black, the White, and the Caspian seas, and it is connected with St. Petersburg, Nizhnee Novgorod, Taganrog, and Warsaw by rail. Thus, it has become a commercial centre of great importance, and carries on an immense trade in tea, corn, fur, skins, tallow, metals, and its own productions. It is the first manufacturing place in Russia, and its factories of cotton, wool, silk, silver, and other metals employ between 30,000 and 40,000 men.

Moscow was founded in the twelfth century, and in the fourteenth it became the capital of the rising empire and the residence of the grand duke of Moscow. In 1712, Peter the Great transferred the capital to St. Petersburg, but Moscow, being a sacred city in the Russian creed, continued to stand as the first city in the estimation

of the Russian nation. It was the winter residence of the Russian nobility, and by its commerce and industry it grew rich. In 1812 it had 9158 houses and 252,609 inhabitants. Napoleon, however, when he entered it (Sept. 15, 1812), found hardly 12,000 people in the city; the rest had fled, carrying away with them all the treasures and legal documents. From the 14th to the 21st of September a horrible conflagration raged, and compelled Napoleon to abandon the city; only 2626 houses were left standing. Nevertheless, the city was soon rebuilt; it had 166,515 inhabitants in 1816, 348,562 in 1838, 611,970 in 1871.

CLEMENS PETERSEN.

Moscow, post-tp. of Sanford co., Ala. Pop. 855.

Moscow, post-v. and tp. of Muscatine co., Ia., on the Chicago Rock Island and Pacific R. R. Pop. of v. 346; of tp. 1033.

Moscow, post-v. of Hickman co., Ky., on the Mobile and Ohio R. R. Pop. 350.

Moscow, tp. of Somerset co., Me., on the E. side of the Kennebec, 30 miles above Norridgewock. Pop. 528.

Moscow, post-tp. of Hillsdale co., Mich. Pop. 1223.

Moscow, post-tp. of Freeborn co., Minn. Pop. 592.

Moscow, post-v. of Leicester tp., Livingston co., N. Y. Pop. 245.

Moscow, post-v. of Washington tp., Clermont co., O., on the Ohio River, 30 miles above Cincinnati. Pop. 443.

Moscow, post-v. of Madison tp., Luzerne co., Pa., on the Delaware Lackawanna and Western R. R. Lumber is manufactured here, and it is a place of resort for sportsmen.

Moscow, post-v. of Bell co., Tenn., on the Memphis and Charleston R. R., at the junction of the Somerville branch.

Moscow, post-tp. of Iowa co., Wis. Pop. 955.

Mosdok′, town of Russia, in the Caucasus, on the Terek, in a somewhat unhealthy locality, but has extensive silk and wine cultivation. Pop. 11,000.

Mose′ley (HENRY), D. D., F. R. S., b. in England about 1802; graduated at St. John's College, Cambridge, with high honors 1826; took orders in the Church of England 1828; was professor of natural philosophy and astronomy at King's College, London, 1831–45, was a distinguished champion of popular education, and one of the first inspectors of schools appointed by government; author of *Lectures on Astronomy* (1847), *Mechanical Principles of Engineering and Architecture* (1842), which is a textbook at West Point, and of several other works; became canon of Bristol 1853; chaplain to the queen 1855. D. at Olveston Jan. 20, 1872.

Moseley Hall, tp. of Lenoir co., N. C. Pop. 2627.

Moselle′, river of France, rises in the Vosges at an elevation of 2260 feet, and flows with a tortuous course of 330 miles through France, Belgium, Luxembourg, and Rhenish Prussia, where it joins the Rhine at Coblentz. Its broad valley is covered with vines, celebrated for the light, delicious wine they yield.

Moselle, tp. of Sheboygan co., Wis., on Lake Michigan. Pop. 1088.

Mo′senthal (SALOMON HERMANN), b. Jan. 14, 1821, of Jewish parentage, at Cassel, in the Prussian province of Hesse; studied at Marburg, and received in 1851 a position in the Austrian government at Vienna. Of his many dramas, two—*Deborah* (1850) and *Sonnenwendhof* (1856)—have been translated into English, Danish, Hungarian, and Italian, and represented with great success.

Mo′ses [Heb. משה, *Mosheh;* Septuagint and Vulgate, *Moyses;* Egyp. *Messou;* Coptic, *Moushe*] signifies "he who has been drawn out of the water," and refers to the beautiful story of his birth as told in Exodus—how the Egyptian Pharaoh had ordered that all the males among the Jewish children should be drowned; how Jochebed, the wife of Amram, succeeded in concealing her infant for three months; how she then put him in a basket of papyrus, placed the basket among the rushes of the Nile, and set his sister, Miriam, to watch from afar; how, finally, the king's daughter found the child, was struck with its beauty, determined to adopt it, and sent Miriam to fetch a Hebrew nurse, who was Jochebed. For the history of Moses there are several other sources besides the Bible. There is an Egyptian tradition (Manetho), a Jewish tradition (Midrash), Philo, and Josephus, and a Mussulman tradition in the Koran. The tradition, however, contains comparatively very little which is not simple elaboration and exaggeration of the account given in the Pentateuch, and it has generally a legendary character. The name of Moses is one of the greatest in history. He organized the Hebrew people; he formed the Hebrew character; and the influence which the Hebrew nation has exercised on the civilization of mankind, by being through many centuries the bearer of the monotheistic idea, can hardly be overestimated. According to Ex. ii. 10, Moses was adopted by the king's daughter, and according to Acts vii. 22, he was initiated in all the secret wisdom of the Egyptian priesthood; but the Bible tells nothing of his youth from his adoption by the princess to the day when he slew an Egyptian overseer for his barbarous treatment of a Jewish slave. He had then to flee from Egypt, and lived for many years in Midian with Jethro the priest, whose daughter he married and whose flocks he tended. Having been called to free his brethren from the slavery in which they lived, he returned to Egypt, but at first he was received by his countrymen with suspicion, and by the Egyptians with contempt. Nevertheless, he succeeded in his mission, leading the Jews across the Red Sea into the deserts of Arabia. The first part of the task was thus accomplished; the remaining, however, proved still more difficult. For many generations the Jews had lived in the most abject thraldom; they had lost all feeling of independence and self-confidence, and the peculiarities of their race were contaminated and perverted, instead of having been developed into a national character; they were utterly unfit for the conquest of a country, for the organization of a state, and for the part they were destined to play in history. According to the biblical narrative (in the Pentateuch and the book of Acts), Moses was 40 years old when he fled into Arabia, 80 when he led the march to Sinai, and 120 when he died on Mount Nebo. Under his leadership the Hebrew people, during their forty years of penal wandering in the desert, took on the religious and moral character which enabled them to begin their career in Palestine. (For the legislation of Moses see Warburton's *Divine Legation of Moses* (1737, 1741, 1788); Spencer, *De Legibus Hebræorum Ritualibus* (1685); Witsius, *Egyptiaca* (1683); Michaelis, *Mosaisches Recht* (1770–75); and Saalschütz, *Mosaisches Recht* (1846, 1848).)

Moshan′non Creek, a stream which constitutes a part of the boundary between Centre and Clearfield cos., Pa. It flows N. E. into the W. branch of the Susquehanna. Its valley contains valuable beds of semi-bituminous coal, now extensively wrought.

Mos′heim, von (JOHANN LORENZ), b. at Lübeck, Germany, Oct. 9, 1694; was theological professor at Helmstädt 1723–47; became in 1747 professor at Göttingen and chancellor of the university, and d. there Sept. 9, 1755. An able preacher and historian, his works are of great permanent value. The chief are *Institutiones Historiæ Ecclesiasticæ* (1726–39) and *De rebus Christianorum ante Constantinum* (1753).

Moskwa, Battle of the. See BORODINO.

Mosinee, post-v. and tp. of Marathon co., Wis., on the Wisconsin River. Pop. 334.

Mosque [Arab. *mesjid,* the "place of bowing" in prayer], a Mohammedan temple of worship. It usually consists of a series of porticoes surrounding an open court, having in its centre trees and a fountain for ablutions. The architectural character is usually peculiar; the dome (of Byzantine origin), the minaret (originally the Christian campanile, in which, however, the muezzin's cry takes the place of the forbidden bell), and the arched gateway are usual peculiarities, but the local modifications in the style of mosques are numerous. Lamps, arabesques, and passages from the Koran take the place of paintings and statues. None may enter save with unshod feet. The congregations are usually composed of males only. There are sometimes schools, dispensaries, and hospitals within the mosque. Mohammed himself built the first mosque at Medina.

Mosque′ra (RUY GARCI′A), b. in Spain in 1501; accompanied Sebastian Cabot in his voyage in the Spanish service to the Rio de la Plata 1526; discovered Paraguay, from which he brought specimens of silver; was left by Cabot in charge of the colony of Espiritu Santo; narrowly escaped massacre by the Indians; established himself at Cape Santa Maria on the coast of Brazil, and subsequently on the island of Santa Catalina, after defeating the Portuguese, and in 1535 joined Pedro de Mendoza in founding Buenos Ayres, where he d. about 1555. The influential family of Mosquera in Colombia, which has furnished during the present century several presidents, generals, ministers, and bishops, is said to trace its descent from the navigator.

Mosqui′to [Sp., dim. from Lat. *musca,* a "fly"], a name given to many biting and blood-sucking dipterous insects, mostly of the family Culicidæ, and of the genera *Culex, Anopheles, Corethra,* and many others. The female insects alone bite, or rather thrust into the flesh their awl-like bristles, massed together into a tube, through which they draw the blood. The number of these insects and the

distress they occasion are very great, not only in hot countries, but in some cold ones, like Lapland and Labrador. The use of mosquito-netting, the kindling of dense smoky fires, and the application of tar, pennyroyal oil, or decoction of feverfew to the skin, all have some effect in protecting the person from their attacks. It is not quite certain whether they really poison the wound which they inflict. The larvæ of mosquitoes constitute an important part of the food of fishes. (See GNAT.)

Mosquito, tp. of Christian co., Ill. Pop. 1270.

Mosquito Coast, or **Mosquitia,** a territory of Central America, of which it is difficult to say where it begins or ends, and to whom it belongs. It lies between Costa Rica, Nicaragua, and Honduras, extending along the Caribbean Sea, but its boundaries are not well defined; its area is variously estimated at 15,000, 25,000, and 36,000 square miles. Its inhabitants, numbering about 10,000, are mostly aboriginal Indians, whose chief calls himself king of Mosquitia. The country was under English protection until 1859, when it was ceded to Honduras, which in 1860 handed it over to Nicaragua; it is now claimed by New Granada.

Moss, tp. of Columbia co., Ark. Pop. 346.

Moss Agate. See MOCHA STONE.

Mosses [Lat. *muscus* (or in the plural *musci*); Ger. *Moos* (pl. *Moose*)], a natural order of low, tufted acrogenous plants arising from a filamentous (rarely persistent) prothallus, with a stem and distinct leaves, producing spore-cases, which usually open by a terminal lid and contain simple spores alone. Inflorescence (as in the Phanerogamia) synœcious, monœcious, diœcious, or polygamous. The male inflorescence consists of *antheridia, perigonia*—small, usually oblong-cylindrical bodies, opening at their apex at maturity for the emission of their contents, consisting of a mucous liquid filled with the very minute *sperm-cells*, which contain singly the *spermatozoids*—filiform-clavate biciliate spirally involute bodies, endowed with spontaneous motion (produced by their vibratile ciliæ), and resembling Infusoria, or more nearly the spermatozoa of animals. The antheridia are usually intermixed with hyaline articulated filaments, or *paraphyses*, and, with these, are commonly enclosed by the *perigonial leaves* in a small bud-like (*gemmiform*) or disk-like (*disciform*) flower. Their office is similar to that of the pollen-grains in the Phanerogamia. The female inflorescence consists of *pistillidia, archegonia*—small narrow, flask-shaped bodies (resembling the pistils of the Phanerogamia), also variable in number, mixed with paraphyses and surrounded with leaves of peculiar form (*perichætial leaves*). The archegonium (seldom more than one in a flower maturing) consists of an inner (at first invisible) portion (*germen*), which after fertilization becomes the fruit, and an outer, at length, membranous portion, which ruptures early near the base; its upper part is almost always carried up on the apex of the growing fruit, and becomes the *calyptra*, while its lower part is the *vaginula*, which partly encloses and partly is coalescent with the base of the fruit. The calyptra is terminated by a long and narrow funnel-mouthed tube (*style*); if it splits on one side, it is dimidiate or *cuculliform*; if not, *mitriform*. The fruit consists of a pedicel (*seta*), usually thread-form and considerably elongated, arising from the base of the interior of the archegonium; on its apex is borne the capsule (*theca*), which is rarely indehiscent or split lengthwise by four or eight valves, but usually opens by a lid (*operculum*); within or beneath the operculum are commonly one or two rows of rigid processes (collectively called the *peristome*), which are almost always some multiple of 4; those of the outer row are called *teeth*, those of the inner row, *cilia* or *processes*, their intermediate processes, *ciliolæ*; an elastic ring of cells or *annulus* usually lies between the rim of the capsule and operculum; the theca contains the sac or *sporangium*, in which the seeds (*spores* or *sporules*) are included around a central *columella*, which is, apparently, a continuation of the central portion of the pedicel through the capsule; the lower portion of the capsule is contracted into a *collum*, or neck, when the sporangium does not reach to its base; when the pedicel is uniformly enlarged under the capsule, it forms an *apophysis*; when protuberant on one side only, a *struma*. The spores consist of an outer coat (*exospore*) and an inner (*endospore*), containing usually an oleaginous or gummy substance; in germination the inner coat bursts through the outer at a certain point; the protruding portion elongating, and at length ramifying, forms the *proembryonal thallus* (*protonema, prothallus*), from which the stems arise, usually a great many from the thallus of a single spore. The plants are also often propagated by *gemmæ*, or buds, variously situated. Stems short and of a soft cellular structure, or most frequently more or less elongated, and then of a more solid and somewhat woody structure, radiculose at the base, and, when creeping, also from various points along the under side, or often densely tomentose-radiculose throughout their whole length; usually more or less (often much) branched (the branches proceeding from buds in the axils of the leaves); leafy, and besides sometimes clothed with laciniæ-like scales (*paraphylla*). Leaves sessile, never lobed or parted, but often serrate or spinulose on the margin, usually furnished with a mid-nerve (*costa*); the blade (*lamina*) rarely composed of more than one thickness of cells; surface smooth or papillose; costa often parted, sometimes lamellated above, but oftener furrowed on the lower side. Rootlets jointed and branched, often roughened or papillose, rarely tuberously thickened, and then containing starch, usually colored (brown, or not infrequently purple). Stomata are sometimes present in the capsule wall. Habitation on rocks, trees, rotten wood, dung of animals, and on the ground under extremely variable qualities and conditions of soil, in almost every latitude and climate. COE F. AUSTIN.

Mosses.

Mossing Ford, post-v. of Charlotte co., Va., on the Richmond and Danville R. R., 30 miles S. W. of Burkeville Junction.

Moss Troopers, a name applied in former days to the border-thieves and freebooters who haunted the *mosses* or swamps of the Debatable Land between England and Scotland.

Mossy Creek, post-v. of Jefferson co., Tenn., on the East Tennessee Virginia and Georgia R. R., is the seat of Mossy Creek College (Baptist), and is on a stream of the same name.

Mossy Point, a v. (MOSS POINT P. O.) of Jackson co., Miss., 6 miles from Pascagoula. Pop. 440.

Mostaganem′, town of Algeria, province of Oran, carries on some trade, though its harbor is shallow, and has some manufactures of carpets, coverlets, woollen fabrics, and jewelry. Pop. 7200.

Mostar′, town of European Turkey, eyalet of Bosnia, capital of Herzegovina, on the Narenta, which is here crossed by a celebrated Roman bridge consisting of one arch of 95 feet span. The town manufactures knife and sword blades and fine silks, and the vicinity produces an excellent wine. Pop. about 18,000.

Most Precious Blood, Congregation of the, an order of regular clerks (Roman Catholic) founded by Caspar Bufalo, who d. in 1837. They were first introduced into the U. S. in 1844.

Most Sacred Heart of Jesus, Congregation of, a society of secular priests founded at Innspruck in 1866; received the papal approbation in the same year. Their superior for the U. S. resides at Milwaukee, Wis.

Mo′sul, town of Asiatic Turkey, capital of the eyalet of Mosul, on the right bank of the Tigris, opposite the remains of the ancient Nineveh. It was formerly a manufacturing place of great importance; its fine cotton fabrics, called *muslins*, were exported to every European country. Now its manufacturing interest has completely ceased, and European goods are sold in its bazaars. It has importance only as a station of the transit-trade, and even as such it has greatly declined. Pop. about 40,000.

Motaz′ilites [from the Arab. for "sectaries"], called also **Kadarija,** "free-will men," and **Moattalites,** a former sect or body of sects among the Mohammedans. The sect originated in Mohammed's own days. Mabad, Wasil ben Ata, and Abul Hudail were its successive leaders. They opposed Mohammed's fatalism, and introduced philosophical and rationalistic discussion into the Moslem schools. There sprang from this origin numerous sects or schools—the Jobbaians, the Thamamians, the Pasharians, the Hashemites, the Mozdarians, and others. The sects called Sincere Brethren and True Friends were later developments of the Motazilite movement.

Motet′, or **Motetto** [It.], in music, a name frequently, but somewhat vaguely, given to certain compositions, chiefly

of a sacred character, which, though of considerable length, are not equal to the anthem in extent or variety of movement. Formerly, the motet had the more definite signification of an elaborate vocal composition in several parts, often founded on the words of psalms or ancient hymns, and differing chiefly in length from an anthem or a short mass.

Moth [Ang.-Sax. *mogdhe*], a perfect insect of the nocturnal Lepidoptera. They are distinguished from butterflies and sphinges by the antennæ, which are filiform or pectinate in moths, mostly knobbed in butterflies, and enlarged in the middle in the sphinges. Moths are mostly, but not always, nocturnal; sphinges mostly crepuscular (flying by twilight); and butterflies diurnal. But the sphinges are frequently known as hawk-moths. Among the best known moths are the silkworm moths (*Bombyx mori*) and the clothes moths (*Tinea flavifrontella, T. tapetzella* or carpet moth, etc.). Their larvæ attack woollens, furs, feathers, etc., and more rarely cotton goods. Goods which are exposed to their ravages should be carefully shaken and inspected about the first of June. Powdered black pepper should be strewed under the edges of carpets. Spirits of turpentine, snuff, tobacco, camphor, cedar chips, corrosive sublimate, benzine, and carbolic acid are among the agents which are useful in checking their ravages.

Mother Carey's Chicken, or **Stormy Petrel** (the *Thallasidroma pelagica*), the smallest of web-footed birds, some six inches long, and black. It nests in clefts of rocks and holes along the N. Atlantic coast. It emits much oil from the mouth when caught, doubtless from the fish with which its stomach is filled. Sailors look upon this bird as ominous of evil, but they all have a superstitious dread of injuring it. Many believe that each one contains the soul of a shipwrecked mariner; others consider them witches. It is often seen in the most stormy weather, and frequently rests upon the waves. The bird has a disagreeable smell. Mother Carey's goose is the giant fulmer (*Procellaria gigantea*) of the Pacific.

Mother-of-Pearl, a substance chiefly afforded by the shells of the pearl oyster (*Meleagrina margaritifera*), which also yields the greater part of the pearls of commerce. The shells are obtained in the Gulf of California at Panama, Cubagua, Ceylon, Madagascar, Swan River, Manila, the Society Islands, etc. Those from Manila are the best; they are of the black-lipped variety. The Society Islands furnish the silver-lipped sort, and Panama the "bullock shells." The genera *Haliotis, Turbo*, etc. also furnish some mother-of-pearl. It is principally used in knife-handles, shirt-buttons, for inlaying, etc.

Moth'erwell (William), b. in Glasgow, Scotland, Oct. 13, 1797; published *The Harp of Renfrewshire* (1819), *Minstrelsy, Ancient and Modern* (1827), and a volume of *Poems, Narrative and Lyrical* (1832). The latter contained some very fine ballads and lyrics, especially *Jeanie Morison*, which acquired great popularity. Motherwell was for some years sheriff-clerk depute of Renfrewshire and editor of the Paisley *Magazine* and *Advertiser*. He took charge of the Glasgow *Courier*, a Tory journal, in 1830, and conducted it until his death at that city Nov. 1, 1835. A new and greatly enlarged edition of Motherwell's *Poems* appeared in 1847, accompanied by a memoir, and was reprinted in the U. S.

Moth'erwort, a labiate herb, the *Leonurus cardiaca*, common in the U. S., though naturalized from Europe. It is used in domestic medicine, and prized for its sedative and diaphoretic powers, which are mild and safe in character. Its smell and taste are strong, and not pleasant.

Mo'tion [Lat. *movere, motum*, "to move"] consists in a change of position or place of a point or of a body, the successive positions of the point or body forming its path or trajectory.

There can be no definite conception of the motion of a point or body without reference of its positions to some other point or body in relation to which the motion is estimated. On the earth's surface we are accustomed to refer nearly all ordinary phenomena of motion to some point which is fixed on the earth. The motion of a person walking is unconsciously referred to the points on the ground over which he passes; the motion of a projectile is referred to the point at which it receives the impulse which produces its motion; and the conception of the motion of the solar system is possible only by referring it to some point or direction in space towards which the system as a whole is supposed to move. The fundamental idea, therefore, of a simple movement is that it is relative—*i. e.* it must have reference to some point and some direction which may be supposed fixed. The study of the principles of motion unconnected with the forces which produce it constitutes a branch of the science of dynamics to which the name *kinematics* (from a Greek word signifying "motion") has been given.

Velocity is a term which has reference to the *rate* of motion of a point or body. In popular language we speak of motion as being slow or swift, without attaching any very definite meaning to these terms, except such as belongs to the particular movement under consideration. A brook runs swiftly, and an arrow flies swiftly, but the swiftness of running water and the swiftness of an arrow represent two very different rates of motion; and although they convey quite definite ideas in one sense, yet something is still needed if we wish to compare these two motions definitely one with the other. The term *velocity* is used in such a comparison, and it may be said that the water of the brook moves with a velocity of 5 feet a second, and the arrow with a velocity of 200 feet a second, both being referred to points on the earth. The term velocity is thus employed to denote a definite measure of the rate of motion according to some particular unit of measure. The three simple units of measure by which natural phenomena are investigated are the unit of force, the unit of time, and the unit of distance or space. The two latter are employed in the determination of velocity; and from these two the measure of velocity may be obtained—viz. the space measured in units of space, passed over by a body in a unit of time. If a second be taken as the unit of time, the velocity will be the space passed over by a point or body in one second. In this manner all velocities may be compared by their measures in the same units; assuming the same interval of time for the unit of time, the velocities of bodies in motion may be compared definitely by the spaces passed over in this unit of time.

If the path or trajectory of a point is known, and its velocity given, the elements of its motion are thus completely determined. The motion is said to be *uniform* when equal portions of the path are passed over in equal times. It is *varied* when unequal portions of the path are described in equal times. It is *uniformly varied* when the successive changes of velocity, increasing or diminishing, take place by equal increments or decrements in the same time. The laws of motion require, therefore, not only that the path shall be known, but that the velocity at each point of its path, or the law by which the velocity changes, shall be known. In uniform movement this law is expressed algebraically by the expression

$$S = v\,t,$$

or $$S = v_1 + v\,t;$$

in which v_1 is the velocity which the body has at the point of its path from which the space is measured; v the constant velocity, and t the time, in seconds, during which motion has taken place from the initial point. In varied motion the velocity is continually changing, either uniformly or otherwise; and to determine the velocity of a point at any position of its path it is necessary to know the law of change. If the velocity increase or diminish at a uniform rate, the velocity at any instant t, measured from the instant at which the velocity was v_1, will be $v = v_1 + a\,t$; in which a is a constant denoting the rate of variation of the velocity, called the acceleration, and the space described will be represented by

$$S = v_1 t + \frac{a\,t^2}{2}.$$

If the velocity is neither constant nor uniformly varying, its rate of variation, and the relation between the space and time, may still be found by the methods of the differential calculus.

A point is said to have a motion of *translation* with reference to another point when the line joining the two points is altered in length. It is said to have a motion of *rotation* in reference to another point when the line joining the two points changes its direction. A point moving in a circular path has a motion of rotation with reference to the centre of motion, but no motion of translation in reference to this centre; and a point the trajectory of which is a straight line has a simple motion of translation with reference to all points in that straight line. The measure of angular movement involves the unit of time and the angle through which the body turns in a unit of time. This angle is usually estimated by the length of the circular arc passed over by a point at the distance unity from the axis, and this length is called the *angular velocity*. It results from this mode of measuring angular movement that if a represent the angular velocity, then the actual velocity of a point in the body at the distance r from the axis, in the direction of the tangent to its path, will be equal to the angular velocity multiplied by the distance from the centre of motion, or $v = a\,r$. For practical purposes, especially in the study of machines, it is often convenient to express the angular velocity in terms of the number of turns per second of the body about its axis. If N be the number of turns per second—by which it is implied that N may be a fraction or a whole number

—then $a = 2\pi N$, and $v = 2\pi Nr$ will be the actual velocity of a point at the distance r from the axis in the direction of the tangent, π being the ratio of the diameter to the circumference.

Starting thus with the general proposition that all motion is relative, the motion of one point with reference to another is usually composed of two elements—one a change of distance, and another a change of angular position. If a change of distance only takes place, the motion of either point referred to the other is a movement of translation; if a change of angle only takes place, the movement is one of simple rotation; and if both these changes occur simultaneously, the movement is a motion of translation and rotation combined. A rigid body is said to have a motion of translation when all points of the body describe parallel lines, and a motion of rotation when any line of the body changes its direction.

Relative and Comparative Motions of Points.—Two points moving in the same straight line have a *relative* motion equal to the sum or difference of their motions in reference to a third point in the same line. If the points move in the same direction, their relative motion will be the difference, and if in opposite directions the sum, of their motions in reference to the third point. If the points move with the same velocity, the distance between them will remain invariable when they move in the same direction, and will continually increase if they move in opposite directions. When two points rotate about a third, the three points lying in the same plane, if the two revolving points are rigidly connected, their angular motions and velocities will be the same; their *comparative* motions will differ only in their tangential velocities, which depend on their distances from the centre of rotation. Their *relative* motions will, however, be found to consist of a rotation about each other with the same angular velocity with which they revolve about the common central point. If two points connected together by an invariable line revolve about different centres, their relative and comparative motions may be found by the application of a theorem which forms the basis of nearly the whole theory of combination in mechanism—viz.: If two points are so connected that their distance apart remains invariable, the components of their velocities along the straight line joining them must be equal.

Composition of Translations.—If a point move over one side of a parallelogram, and then over the next adjacent side, the effect will be the same as if it had moved along the diagonal—*i. e.* its relative motion with reference to the starting-point will be the same. The two motions along the sides are called the components, and the diagonal motion the resultant motion. It follows from this that any motion of translation may be resolved into two components in any two given directions by constructing a parallelogram of which the diagonal is the original motion, the sides having the given direction. In the same manner the velocity of a point in a given direction may be resolved into two component velocities having given directions. It is only necessary to construct a parallelogram such that the diagonal shall represent by its length the velocity, and the sides drawn in the required direction will represent the component velocities. If the components are at right angles to each other, the parallelogram will be a rectangle.

Resolution and Composition of Rotations.—The rotation of a rigid body about a given axis is equivalent to the resultant of two component rotations about two axes parallel to the given axis and in the same plane, the angular velocities of each of the three rotations being proportional to the distance between the other two axes. It follows from this that if two wheels revolving about their centres remain in contact with each other, the point of contact being in the line joining the centres, the angular velocities of the wheels will be inversely proportional to their radii. This proposition forms the basis of the construction of spur-gearing. This kind of gearing illustrates the composition and resolution of parallel rotations. If one wheel be fixed, and the other roll around it, the motion of any point in the rolling wheel about the instantaneous axis or pitch-point may be regarded as compounded of the rotation about the axis of the rolling wheel and the rotation of the axis of the rolling wheel about the axis of the fixed wheel.

Rotations may be resolved and compounded in another manner. A rotation about a given axis may be regarded as equivalent to two rotations about two axes which intersect the given axis at the same point, the angular velocities about each of the three axes being proportional to the sum of the angle between the other two. This proposition is the basis of construction of bevel wheels. If one cone roll upon another having the same vertex, the surfaces of the two cones being constantly in contact along an element, any point in the rolling cone may be regarded as having a rotation about its own axis combined with a rotation of this axis about the axis of the fixed cone; or as having a simple rotation about the element of contact as an instantaneous axis. To find the diameters of two beveled wheels which shall revolve with given angular velocities about two intersecting axes, it is only necessary to draw two lines intersecting each other and making the required angle between the axes. If, then, from the point of intersection distances be laid off proportional to the angular velocities of the wheels respectively, the diagonal of a parallelogram constructed on these lines will represent the line of contact of two rolling cones. Such a construction may be called the parallelogram of rotations. This parallelogram determines the relative diameters of the bevel wheels.

Helical or screw-like motion may be regarded as either compounded of a rotation about an axis and a translation in the direction of that axis, or it may be considered as compounded of two rotations about two axes lying in different planes. The latter proposition is illustrated by the rolling of one hyperboloid upon another, their surfaces being in contact along the right-lined element which constitutes the instantaneous axis of the rolling hyperboloid. Such hyperboloids form the basis for the construction of skew-bevel wheels.

It follows from the principles of the composition of motions that the most complex motion of a rigid body may be regarded as equivalent at each instant to a rotation about an instantaneous axis, and a translation along that axis combined, each point of the body describing a helical path.

The combination of two motions of straight translation transverse to each other gives rise usually to curved trajectories. If one be a reciprocating motion of small amplitude, and the other a continuous motion, the curve takes an undulating or wave-like form. Harmonic motion is a reciprocating motion in a straight line, in which the velocity at every instant is equal to the component parallel to the straight line of another point which moves uniformly in a circle, the amplitude of the reciprocating motion being equal to the diameter of the circle. The motion of the piston of the steam-engine would be exactly harmonic if the connecting-rod were infinite in length. The motion is approximately harmonic in ordinary cases of piston-and-crank motion.

The motions of one curve rolling on another curve, or one body rolling on another body, present particular cases of the general proposition of the movement of rigid bodies, which are not only often observed, but which form the bases of useful applications. The case of a wheel rolling on another wheel has been referred to. In this case any point of the circumference of the rolling wheel describes about the instantaneous axes or point of contact a continuous curve called an epicycloid. A cylinder rolling on a plane furnishes an example in which a rotation is combined with a translation of the rotating body, the resultant motion of any point in the cylinder being a rotation about an instantaneous axis, which is the line of contact of the cylinder and plane. Any point of the cylinder describes a curve called a trochoid, and a point in the surface of the cylinder a curve called a cycloid. The crank-pin of a locomotive wheel describes a trochoid, and a point in the circumference of the wheel a cycloid, as the engine moves along the track. A point in a plane rolling on a cylinder, or a point in a string unwound from a wheel, describes an involute of the circle from which it is unwrapped.

The motion of the piston of a locomotive-engine furnishes an interesting example of comparative and relative motions of translation. In the forward motion it acts as the moving surface which gives rotation through the crank to the wheel, and in the backward motion as a point of resistance, the cylinder being pushed away from the piston; considered relatively to each other, the piston and cylinder have precisely the same motions as they would have if the locomotive were suspended from the earth. Considered with reference to the earth, the cylinder has a continuous uniform motion in a straight line, while the piston, at one point of each revolution, comes partially to a state of rest with reference to the earth. It would come to rest if the crank-pin were in the circumference of the driving-wheel. When a body is spoken of as being at rest, it is understood only as being at rest relatively to other points, there being no point of absolute rest in the universe.

It will have become apparent from this very brief discussion of the principles of motion that the actual path of a material point in space may be the result of a complicated series of motions. Leaving out of consideration the infinitesimal motions of vibration which the molecules of bodies have, and which constitute the cause or phenomena of heat, a particle may have a resultant motion

which is compounded of an almost unlimited number of separate motions. Take, for instance, a point in a projectile: it usually has a motion of rotation about an axis within the body of the projectile; it has a parabolic motion with reference to the earth, while it partakes of the motion of the earth around the sun. It is thus made clearly evident that in discussing motion it must usually be restricted to certain relative conditions which constitute the particular points of any investigation. W. P. Trowbridge.

Mo'tions, a sort of simple dramatic exhibition, generally illustrating some scriptural narrative, the characters being represented by wooden puppets, while the dialogue was spoken behind the scenes. In England they prevailed from the fifteenth to the eighteenth century.

Motley (John Lothrop), LL.D., D. C. L., b. at Dorchester, Mass., Apr. 15, 1814; graduated at Harvard in 1831; studied at Göttingen and Berlin; was admitted to the bar in 1836; became in 1841 secretary of legation at St. Petersburg; U. S. minister to Austria 1866–67; to England 1869–70. After long and exhaustive researches and manifold preparations he published in London in 1856 *The Rise of the Dutch Republic* (3 vols.), which immediately attracted great attention both in America and Europe, and has been translated into German, French, Dutch, and Danish. *The History of the United Netherlands* (4 vols.) followed from 1861 to 1868, and the *Life of John van Barneveld* in 1874, with equal success. His pictures of characters, events, and social states are complete and vivid, and breathe in general a spirit of justice and truth, in spite of the very decided love and hatred with which he paints.

Mot'mot [named from their notes], a genus (*Momotus*) of passerine birds, usually assigned to the Coraciadæ, although their place in the class of birds is by no means certain. They feed upon fruits, reptiles, and other small animals, have remarkably brilliant plumage, and inhabit tropical America. There are several species. (See Momotidæ.)

Motril', town of Spain, province of Granada, is situated on an exceedingly fertile plain where vines, cotton, sugar-cane, and maize are cultivated with great success. The town itself is well built, lively, and enterprising. Pop. about 13,000.

Mott (Gen. Gershom), b. in Mercer co., N. J., in 1822; was an officer in the Mexican war: was successively colonel of the 5th and 6th N. J. Vols. 1861–62; served in the Peninsular campaign under Gen. McClellan; was wounded at the second battle of Bull Run; made brigadier-general Sept. 7, 1862; commanded the 2d New Jersey brigade at Chancellorsville, where he was again wounded; was distinguished at Gettysburg; appointed brevet major-general Sept. 10, 1864; commanded the 2d division of the 4th corps in the final campaign against Richmond, and received the rank of full major-general Dec. 1, 1865.

Mott (Lucretia **Coffin**), b. at Nantucket, Mass., Jan. 3, 1793, of Quaker parentage; removed in 1804 to Boston, and in 1809 to Philadelphia, where in 1811 she married James Mott; became in 1817 a teacher, and soon after a preacher of the Society of Friends; adhered after 1827 to the Hicksite party; was one of the original founders of the American Anti-slavery Society (1833); for many years preached against slavery, war, and other evils, and finally became a leader in the woman-suffrage movement.

Mott (Valentine), M. D., LL.D., b. at Glen Cove, L. I., Aug. 20, 1785, was the son of Henry Mott, an able physician; was educated in New York, London, and Edinburgh; held professorships of surgery in Columbia College and the College of Physicians and Surgeons, N. Y., 1809–26 and 1830–40; in Rutgers Medical College 1826–30, and was professor of surgery and relative anatomy in the New York University Medical College 1840–60. Dr. Mott was one of the boldest and most successful surgical operators of any age or country. The pupil of Cooper, Bell, Abernethy, and the ablest surgeons of Great Britain, he was inferior to none of them in practical skill or in successful treatment after the operation. Though a friend of conservative surgery, his capital operations were counted by thousands. Among his great operations were the successful tying of the primitive iliac artery for aneurism (its first performance); the successful removal of the right clavicle, with the application of forty ligatures; the tying of the innominate artery for aneurism; the resection of two inches of the deep jugular vein; the tying (forty-six times) of the common carotid, etc. He was the inventor of valuable surgical implements; had wide fame as an *accoucheur;* was a brilliant and able lecturer; published a translation of Velpeau's *Operative Surgery,* with large additions; a volume of travels in the East (1842), a volume of published clinical lectures (1860), and many professional papers and addresses. He was the recipient of many foreign distinctions and a member of numerous learned societies. D. in New York Apr. 26, 1865.

Mot'ta di Liven'za, town of Northern Italy, province of Treviso, on the left bank of the Livenza. This place is of very ancient origin, and was not without importance during the Middle Ages. It is now an industrious and prosperous town. Pop. in 1874, 5677.

Motte (Rebecca **Brewton**), b. in South Carolina about 1740; married in 1758 Jacob Motte, a planter, by whom she had six children; was left a widow before the Revolution, at which time she resided in a fine mansion near Buck's Head Neck, on the Congaree, which was occupied by a British garrison of 150 men under Capt. McPherson, and named Fort Motte. This fort was besieged by Marion and Lee, and set on fire by shooting combustibles upon the roof, Mrs. Motte herself furnishing a fine East Indian bow and bundle of arrows for the purpose. The British then surrendered, the flames were extinguished, and Mrs. Motte presided at a dinner to which the officers of both forces sat down. D. in 1815. Two of her daughters were successively married to Gen. Thomas Pinckney, and a third to Col. William Alston. (See her *Biography,* in Mrs. Ellet's *Women of the Revolution.*)

Motte (or **Mothe**) **Cadillac, de la** (Sieur Antoine), founder of Detroit, a Gascon nobleman, b. about 1660; served in the French army in Acadia, and in 1680 was sent to France by order of Louis XIV. with information regarding the colonies; was made in 1691 lord of Bonagnat and Mount Desert, including the shores of Frenchman's Bay, Me.; became in 1694 commandant of Michilimackinac; built in 1701 Fort Pontchartrain, now Detroit; had long struggles with the Canadian authorities, the Jesuits, the Miamis, and the Natchez; became in 1711 governor of Louisiana; was one of the originators of the Mississippi scheme; returned to France in 1717, and nothing farther is known of his career.

Motterouge', De la, b. in 1802, received his military education at St. Cyr; distinguished himself as a brigadier-general in the Crimean war; became general of division 1855; commanded the first division of the corps of MacMahon in the Italian war of 1859; was placed on the reserve list in 1867, and was elected a member of the Corps Législatif in 1869 from the department of Côte du Nord. In the German war of 1870–71, after the defeat of the imperial army, he was recalled to service, and received the command in Sept., 1870, of the army of the Loire, numbering about 30,000 men. With this army he pushed forward from Orleans, met a German detachment under Gen. von der Tann, was defeated at Artenay Oct. 10, and thrown back to Orleans, and defeated once more here and compelled to retreat to Sologne, after which events he resigned his command. August Niemann.

Mott Haven, a former post-v. of Westchester co., N. Y., now included in New York City. It is on the East River, and on the New Haven and Harlem R. Rs., 5 miles from the Grand Central dépôt, N. Y. It has many suburban residences and manufacturing interests.

Mottley (John), b. in London, England, in 1692; the real author of *Joe Miller's Jests,* or *The Wits' Vade Mecum* (1739); also wrote five dramas, a volume of *Lives of Dramatic Authors* (1747), histories of Peter the Great (1739) and of the empress Catharine of Russia (1744), and other miscellaneous works. D. at London Oct. 3, 1750.

Motto'la, town of Southern Italy, province of Lecce, situated on a hill about 12 miles from the Gulf of Taranto. This town was a marquisate during the Middle Ages, and it was in its neighborhood that Dentatus obtained his great victory over Pyrrhus (275 B. C.). Pop. in 1874, 5765.

Mott's, tp. of Clarendon co., S. C. Pop. 600.

Mott'ville, tp. of St. Joseph co., Mich. Pop. 721.

Mottville, post-v. of Skaneateles tp., Onondaga co., N. Y., on the Skaneateles River and R. R., 2½ miles N. of Skaneateles. Pop. 276.

Mouflon. See Sheep.

Mould [Ang.-Sax. *molde*], a term used in common language to denote any of the smaller filamentous fungi. The word is not susceptible of scientific definition, as the fungi popularly called moulds belong to several different orders and differ widely from one another in structure. Reference to bread-mould will be found in the article on Mucorini; to lettuce and onion mould in that on Peronosporæ. W. G. Farlow.

Moulding [Lat. *modulus,* "small measure"]. The art of moulding may be called the embodiment of the varied thought of the designer in enduring material, and hence it involves processes, methods, and materials differing widely from each other in their nature and treatment. The making of the pattern or model is the first step in this

embodiment, and this often goes forward under the hand of the artist or designer himself, and sometimes by the skill of an under-workman, whose guide is the plan or sketch of the master-hand. In either case many contrivances are used for expediting the labor of the pattern-making, the necessity of this arising from the fact that a very large number of patterns are used only once or but for a very few times at most. The chief study in many patterns is to render the complex form of the design practicable at any reasonable cost, and in others to simplify the moulding so that great numbers of the castings may be produced in a brief time. The pattern for a massive bed-plate or some similar part of a marine engine may be named as an instance of the former case, and those used in the manufacture of door-hinges or of parts of stoves of the latter.

In moulding the plainer forms of castings the pattern is laid on a plane surface or follow-board, and a flask or frame of sufficient depth is placed around it. Into this flask moulding-sand is sifted, so that the fine particles shall fill all the crevices of the pattern. The sand is then rammed hard until the flask is filled, and a close board top is laid on it. The flask is then turned upside down, the follow-board is taken off, and a second, or cope-piece, of flask is laid on above what was at first the under side of the pattern. Coarse sand is then scattered over the surface which had lain on the follow-board, so that the mass of sand which is afterward rammed into the cope-flask may be neatly and perfectly separated from the first. The cope-flask, with the sand contained in it, is then lifted off, bringing in it in the sand the impression of the upper side of the pattern; and the pattern is carefully drawn out of the sand in the lower part of the flask. After a gate or passage-way, by which the metal may flow into the mould, has been cut in the sand, the two parts of the flask are put together again accurately, and the mould is complete for the reception of the metal or material from which the casting is to be made.

As castings have been made from almost every kind of metal or material which can be melted or softened by heat, so a wide variety of materials have been sought for and have been used for moulds. The idea of the moulding, however, has been substantially the same in each case, the method varying only with the special character of the pattern.

It is often needful to make openings into or through the casting; and when these are of moderate size they are made by placing cores in the cavity of the sand-mould. These are blocks or bars, which are made in suitable boxes from sand that has been moistened with a glutinous material, so that when dried the cores have a certain amount of strength. When the internal cavities are large, or the casting is of a box shape, the interior is built up or moulded in a somewhat different way from that indicated, but always so that the sections of the mould may be detached from each other and the parts of the pattern withdrawn. Many pieces of a simple cylindrical form are swept up by a method precisely analogous in the sand material to the process of turning in wood or iron. The sweep by which the outline of the mould is made is moved around the central axis, while the material is stationary, and takes the circular outline as it is built up piece by piece around the centre.

Whenever the exterior surface of the pattern has projections or parts that are under-cut, they are often made loose, so as to be left imbedded in the sand when the principal part of the pattern is drawn out, the loose under-cut parts being afterward drawn out separately.

A very large part of the work produced in leading branches of manufacture is that known as green-sand work, so called because the castings are made in sand that has been slightly dampened with water. If, however, castings are required to possess greater strength, to be more certainly free from imperfections, or if they must be large and complex in outline, they are usually made in dry moulds. For these the sand is moistened with some glutinous material, and after the mould has been completed, but before the parts of it are finally put together, it is thoroughly dried in an oven. By this means the chance is wholly removed of imperfections arising from the blowing into and through the melted metal of the vapor from the moisture contained in the damp or green sand.

It is invariably necessary to provide vents or outlets for the gases arising from the heating of the organic matter contained either in the material of the mould or of the cores, for these are likely to cause flaws in the castings if confined, or in some cases to give rise to quite disastrous explosions.

In order to give the smoothest possible surface to the castings when made in iron, the surfaces of the sand-mould are dusted over with finely-powdered coal, which is afterward smoothed down carefully. The effect of this facing is to prevent the fluid iron from burning into the sand, and thus causing an incrustation on the casting. In iron-work the metal is usually melted in a cupola furnace, which is a high vertical cylinder of sheet iron, with an interior lining of firebrick. The fuel and iron are put in together near the top, and the blast is admitted at the sides of the shell near the bottom. The melted iron is gathered in the lower part of the furnace, and is run out as required. In cases where the utmost strength is needed, as in iron guns, the metal is melted in a reverberatory furnace, in which it may be maintained in a state of fusion until, by repeated tests, it is found to be of the right quality. In this furnace the fuel and the iron are kept apart from each other, so that no injurious admixture may occur of any of the chance impurities of the fuel with the melted iron. In the melting of brass and of any fine metal a crucible is generally used for holding it, which is covered up in a furnace or melting-hole, and closely surrounded by the burning fuel. In casting from a crucible the metal may be poured directly into the mould, but from the cupola furnace the iron is run into a ladle, in which it may be taken over any distance to the mould as required.

In the management of large foundries it has been found expedient, and even necessary, to adapt special contrivances to the work of moulding, not only to save the cost of manual labor in handling the patterns and materials while making the moulds, but also to save at least a part of the cost of the patterns themselves. For this purpose very perfect machines have been devised for moulding such things as shot and shell for ordnance, hinges and locks for builders' use, and especially for such things as toothed wheels or gearing. Very costly patterns have always been made in years past for such wheels, each pattern being a complete duplicate of the proposed casting, and involving great labor and cost in its preparation. In the use of a gear-moulding machine the teeth in the mould are formed by ramming the sand around a very short section of the circumference at a time, a pattern giving the needful shape of the tooth being properly placed in the machine. The special office of the machine in this case is to enable the short piece of toothed pattern to be withdrawn accurately from the sand rammed against it, and to be moved around the exact required fraction of the circumference in readiness for another section of the moulding. In this way the great cost of making more than a very few teeth is saved, as compared with the older method of using a pattern of a full circumference. P. Barnes.

Moulins′, town of France, capital of the department of Allier, on the Allier, here crossed by one of the finest bridges in France. It is a beautifully situated and handsomely built town, with a fine cathedral, large cavalry barracks, and other public buildings, and important manufactures of cottons and cutlery. Pop. 19,890.

Moult′ing [Old Eng. *mout*], or **Exuviation**, the periodical casting off of shell, skin, horns, feathers, or other parts of the integument, such as takes place once a year or oftener (in some animals once every few days) among serpents, batrachians, spiders, insect-larvæ, etc. Birds in many cases shed their feathers annually, and many quadrupeds also shed their coat of hair nearly all at once. Deer mostly renew their horns completely every year. In man exuviation is a continual process; and this is the case with many of the lower animals.

Moul′ton, post-v., cap. of Lawrence co., Ala., has 1 female institute, 1 male academy, a colored school, 4 churches (1 colored), 1 hotel, court-house and jail, and 1 weekly newspaper. Principal occupation, farming. Pop. 2006. White & White, Pubs. "Advertiser."

Moulton, a v. of Rose tp., Shelby co., Ill., and a suburb of Shelbyville (which see). Pop. 106.

Moulton, post-v. of Appanoose co., Ia., on the St. Louis Kansas City and Northern and the Burlington and South-western R. Rs., has good schools, 3 churches, a savings bank, 2 large flouring-mills, 5 hotels, 1 weekly newspaper, and stores. Occupation, stock-raising. Pop. 678. M. C. Davis, Ed. "Independent."

Moulton, post-tp. of Auglaize co., O. Pop. 1252.

Moulton (Ellen Louise **Chandler**), b. in Pomfret, Conn., Apr. 10, 1835; married in 1855 to William U. Moulton, a journalist of Boston; has published many contributions in prose and verse to periodical literature; author of *This, That, and the Other* (1854), *Juno Clifford* (1855), *My Third Book* (1859), *Some Women's Hearts* (1874), and other works.

Moulton (Col. Jeremiah), b. at York, Me., in 1688; was taken prisoner in childhood by the Indians 1692, but restored with other children in gratitude for the release of several Indian prisoners by Col. Church; commanded

the forces which in May, 1724, destroyed Norridgewock, killing Father Sebastian Rasle, the French missionary; commanded a regiment at the capture of Louisburg 1745; was afterwards sheriff of the county, councillor, and judge of common pleas and of probate. D. at York July 20, 1765.

Moulton (Joseph White), b. at Stratford, Conn., in June, 1789; settled as a lawyer in New York City; published (with John V. N. Yates) a valuable *History of the State of New York* (2 vols., 1824–26); was author of *The Chancery Practice of New York* (3 vols., 1829–32) and *New York Seventy Years Ago* (1849), and edited John Freeman Mitford's *Treatise on Pleadings in Chancery* (6th ed. Amer. 1849), with copious annotations. D. Apr. 21, 1875.

Moul'tonborough, post-tp. of Carroll co., N. H., at the N. extremity of Lake Winnipiseogee, has manufactures of lumber, brick, etc. Pop. 1299.

Moul'trie, county of E. Central Illinois. Area, 334 square miles. It is level and very fertile. Live-stock, grain, wool, and tobacco are leading products. The county is traversed by Kaskaskia River and by several railroads. Cap. Sullivan. Pop. 10,385.

Moultrie, post-v., cap. of Colquitt co., Ga., 30 miles N. N. E. of Thomasville R. R. Station.

Moultrie, post-v. of West tp., Columbiana co., O., on the Cleveland and Pittsburg R. R. Pop. 19.

Moultrie (James), M. D., b. in Charleston, S. C., Mar. 27, 1793; graduated in the University of Pennsylvania 1812, and succeeded his father as port-physician of Charleston, physician to the jail, and also of the magazine guards; in 1821 was president of the State Medical Society; at the organization of the South Carolina Medical College (1824) was elected professor of physiology, which office he still retains; in Philadelphia in 1847, when the American Medical Association was organized, was made a vice-president, and at the annual meeting in Charleston, S. C., 1850, became president. Paul F. Eve.

Moultrie (John), b. in Scotland; came to America about 1733, and for forty years occupied a leading position as a physician in Charleston, S. C. D. 1773.—His son John obtained his degree of M. D. at Edinburgh, became eminent in his profession, and was lieutenant-governor of Florida.

Moultrie (John), grandson of Gov. John, b. in London, England, Dec. 31, 1799; was educated at Eton, where he took part with his friends, H. N. Coleridge, W. S. Walker, and W. M. Praed, in editing the *College Magazine* and the *Etonian*, for which he wrote poems of great merit; graduated at Trinity College, Cambridge, in 1823; took orders in the Church of England 1825; became rector of Rugby, which post he retained through life; married a sister of James Fergusson, the historian of architecture; published several volumes of *Poems* (collected ed. 1854) highly appreciated by cultivated critics, a volume of *Sermons* (1852), and edited the poems of Gray (1845) and the *Poetical Remains* of his college-friend, W. Sidney Walker (1852), preceded by a memoir. D. at Rugby Dec. 26, 1874.

Moultrie (William), b. in South Carolina in 1731, son of Dr. John; commanded a company against the Cherokees 1761; an ardent advocate of liberty, he was in 1775 appointed colonel of the 2d South Carolina regiment, and in that year represented St. Helena parish in the provincial congress. In June, 1776, while engaged in constructing a rude defensive work of palmetto logs on Sullivan's Island, Charleston harbor, he was attacked by a British fleet (June 28) under Sir Peter Parker; an engagement of nearly ten hours ensued, resulting in victory for the little fort, which has since borne the name of its gallant defender. In September he was made a brigadier-general, and in Feb., 1779, defeated the British near Beaufort. In May he successfully resisted Prevost's advance upon Charleston, which place he was able to hold until the arrival of Lincoln; but in 1780, upon the surrender of the place, he was made prisoner and held for nearly two years, refusing repeated offers of bribery to desert the cause of his country. After his exchange (Feb., 1782) he was made (Oct. 15) a major-general; was governor of South Carolina 1785, and again 1794–96. Author of *Memoirs of the Revolution* (2 vols., 1802). D. at Charleston Sept. 27, 1805.

Moultrie, Fort. See Fort Moultrie.

Mound, tp. of Effingham co., Ill. (P. O. Moundville, R. R. station Gillmore), on the Springfield and Illinois South-eastern and the St. Louis Terre Haute and Indianapolis R. Rs. Pop. 1211.

Mound, tp. of McDonough co., Ill. Pop. 1350.

Mound, tp. of Warren co., Ind. Pop. 394.

Mound, tp. of Miami co., Kan. Pop. 498.

Mound Bird. See Megapodidæ, by Prof. Theodore Gill, M. D., Ph. D., M. N. A. S.

Mound-Builders. See American Antiquities, by Prof. John S. Newberry, M. D., LL.D., M. N. A. S.

Mound City, post-v. of Crittenden co., Ark., on the Mississippi River, has 2 churches, a private banking-house, 1 weekly newspaper, good schools, 2 hotels, a broker's office, and stores. Principal employment, raising cotton. J. K. McLaughlin, Ed. "Mound City Post."

Mound City, post-v., cap. of Pulaski co., Ill., 7 miles from the mouth of the Ohio River, on the Cairo and Vincennes R. R., contains the Western naval station and a national cemetery, 4 churches, 2 weekly newspapers, 3 hotels, and stores. Pop. 1631.
H. F. Potter, Ed. "Mound City Journal."

Mound City, post-v. and tp., cap. of Linn co., Kan., on Little Sugar Creek, 8 miles S. W. of Pleasonton, on the Missouri River and the Fort Scott and Gulf R. R., and has 1 weekly newspaper. Pop. of v. 635; of tp. 1374.

Mound City, post-v. of Holt co., Mo. (called also Northport), 3 miles N. E. of Bigelow R. R. Station.

Mound Prairie, tp. of Jasper co., Ia. Pop. 1016.

Mound Prairie, post-tp. of Houston co., Minn. Pop. 650.

Moundsville, post-v., cap. of Marshall co., West Va., on the Baltimore and Ohio R. R., has good schools, 5 churches, large rolling-mills, 3 printing-offices, 1 weekly newspaper, 2 grist-mills, 1 woollen-mill, 2 large coal-banks, several saw-mills, 5 hotels, the State penitentiary, and the largest Indian mound in the world. Pop. 1500. It was formerly called Grave Creek, and now takes its name from a large mound in the vicinity (for a description of which see American Antiquities).
H. W. Rook, Ed. "Moundsville Reporter."

Mound Valley, post-tp. of Labette co., Kan. Pop. 275.

Mound Valley, tp. of Elko co., Nev. Pop. 88.

Mound'ville, tp. of Vernon co., Mo. Pop. 897.

Moundville, post-tp. of Marquette co., Wis. Pop. 408.

Mount (William Sidney), b. at Setauket, Long Island, N. Y., Nov. 26, 1807; studied painting at the school of the Academy of Design; became an eminent portrait-painter, and produced some highly appreciated pictures of humorous subjects, chiefly dealing with negro life. D. at Setauket Nov. 19, 1868.

Mount'ain, tp. of Clay co., Ala. Pop. 257.

Mountain, tp. of Crawford co., Ark. Pop. 508.

Mountain, tp. of Johnson co., Ark. Pop. 296.

Mountain, tp. of Montgomery co., Ark. Pop. 509.

Mountain, tp. of Pike co., Ark. Pop. 238.

Mountain, tp. of Polk co., Ark. Pop. 281.

Mountain, tp. of Scott co., Ark. Pop. 277.

Mountain, tp. of Van Buren co., Ark. Pop. 80.

Mountain, tp. of Washington co., Ark. Pop. 936.

Mountain, tp. of Yell co., Ark. Pop. 144.

Mountain, tp. of Del Norte co., Cal. Pop. 99.

Mountain, tp. of El Dorado co., Cal. Pop. 271.

Mountain, tp. of Barry co., Mo. Pop. 704.

Mountain (George Jehoshaphat), D. D., D. C. L., b. in Norwich, Eng., July 27, 1789, was the son of Bishop Jacob Mountain; was educated at Trinity College, Cambridge; took orders 1812 and 1813; held rectorships in Fredericton and Quebec, of which in 1821 he became archdeacon; was Anglican bishop of Montreal 1836–50; bishop of Quebec 1850–63; author of *Songs of the Wilderness* (1846), *Journal of a North-west Mission* (1853), etc., and founded in 1844 the Bishop's College, Lennoxville. D. near Quebec Jan. 6, 1863.

Mountain (Jacob), D. D., b. at Thwaite Hall, Norfolk, England, 1750; was educated at Cambridge, and received valuable Church preferments. In 1793 he was appointed bishop of Quebec, and was the first Anglican prelate in Canada. He was distinguished for the faithfulness with which he performed the severe duties of his ecclesiastical position, as well as the important *ex-officio* civil functions which then attached to his office. D. near Quebec June 16, 1825.

Mountain Ash, or **Rowan Tree,** the *Pyrus Aucuparia* of Europe, and the *P. Americana* and *sambucifolia* of North America, both closely allied to the first and to each other. They are small trees, often seen in cultivation, and belonging to the order Rosaceæ, suborder Pomaceæ. They have pinnate leaves, and in autumn clusters of small acid bright red fruit. The European tree is more common in cultivation than our own native species. The

wood of all is hard and suitable for turnery. The peasantry of nearly all nations of Europe ascribe supernatural qualities to the wood of the rowan tree, which is used for divining-rods and the like.

Mountain Blue, or **Chessylite,** is a carbonate of copper, composed of 25.43 per cent. of carbonic acid, 69.37 of oxide of copper, and 5.20 of water. When pure it contains 55.16 per cent. of copper. It occurs in the same localities as malachite, and results from the decomposition of other ores of copper. When crystallized it is of an azure blue, with a vitreous lustre varying from transparent to opaque. Chessylite is derived from Chessy, near Lyons, France, where it is found in blue crystals and also in a fibrous state.

Mountain City, post-v. of Elko co., Nev., 105 miles N. of Elko. Pop. 467.

Mountain City, post-v. of Hays co., Tex., 14 miles from San Marcos.

Mountain Cork, a variety of asbestos, having the appearance of cork, and, owing to its structures of interlacing fibres, of so little density as to float on water. *Mountain leather* is an equally light variety of the same mineral, occurring in flexible sheets resembling leather. (See ASBESTOS.) E. C. H. DAY.

Mountain Cove, post-tp. of Fayette co., West Va. Pop. 1923.

Mountain Creek, post-tp. of Catawba co., N. C. Pop. 1298.

Mountain Green. See CHRYSOCOLLA.

Mountain Home, post-v. of Lawrence co., Ala., 7 miles S. E. of Courtland, has a high school, a publishing-house, 1 weekly newspaper, and stores. J. M. PICKENS, ED. AND PUB. "SOUTHERN CHRISTIAN WEEKLY."

Mountain Limestone, a name given in Great Britain to the great sub-Carboniferous limestone strata. It is there metalliferous, lead being the most important ore. Fluor-spar, a little petroleum, a few small coal-seams, quarries of building-stone, and some iron and copper ore are among its economic resources. Soils resting on it are commonly very fertile.

Mountain Meadow Massacre. See UTAH.

Mountains. See EARTH, by PROF. A. GUYOT, PH. D., LL.D., M. N. A. S.

Mountains of the Moon. See AFRICA.

Mountain Spring, tp. of Lawrence co., Ala. Pop. 228.

Mountain Spring, tp. of Butte co., Cal. Pop. 264.

Mountain Springs, tp. of Franklin co., Ala. Pop. 820.

Mount Air'y, tp. of Greene co., Ill. Pop. 1320.

Mount Airy, post-v. of Surry co., N. C., has 2 churches, 2 cotton-factories, 1 flouring-mill, 1 shoe-factory, 1 planing-mill, 12 tobacco-factories, 2 wool-carding machines, 2 mineral springs, 2 weekly newspapers, and stores. Pop. 2353. THOMAS M. BROWER, ED. "SURRY VISITOR."

Mount Au'burn, post-v. and tp. of Christian co., Ill., 6 miles S. of Illiopolis R. R. Station. Pop. 1640.

Mount Auburn, post-v. of Jackson tp., Shelby co., Ind. Pop. 89.

Mount Auburn, post-v. of Watertown tp., Middlesex co., Mass., on the Watertown branch of the Fitchburg R. R., and contains Mount Auburn Cemetery, the burial-place of the dead of Boston, having an area of 125 acres, laid out in 1831.

Mount Ayr, post-v. and tp., cap. of Ringgold co., Ia., has good schools, 5 churches, 2 banks, 2 printing-offices, 2 weekly newspapers, 2 hotels, and stores, and is in a fine stock-raising section. Pop. of v. 422; of tp. 827. D. D. PRATT, ED. "RINGGOLD RECORD."

Mount Car'bon, a b. of N. Manheim tp., Schuylkill co., Pa., on a branch of the Philadelphia and Reading R. R., has productive coal-mines. Pop. 364.

Mount Carmel, Palestine. See CARMEL, MOUNT.

Mount Car'mel, post-v. of Hamden tp., New Haven co., Conn., on the New Haven and Northampton R. R.

Mount Carmel, post-v. and tp., cap. of Wabash co., Ill., at the junction of the Louisville New Albany and St. Louis Air-line with the Cairo and Vincennes R. R., has 3 schools, 6 churches, saw and flouring mills, 2 weekly newspapers, and manufacturing establishments. Pop. of v. 1640; of tp. 2520. HANNA & SON, EDS. "MT. CARMEL DEMOCRAT."

Mount Carmel, post-v. of Fleming co., Ky., 16 miles S. of Maysville. Pop. 1196.

Mount Carmel, post-v. of Union tp., Clermont co., O., 8 miles W. of Batavia. Pop. 192.

Mount Carmel, post-b. of Northumberland co., Pa., on the Shamokin Valley R. R., and on branches of the Lehigh Valley R. R., has important mines of coal. Pop. 1289; of tp. 2451.

Mount Carmel, post-tp. of Halifax co., Va. Pop. 4861.

Mount Car'roll, post-v. and tp., cap. of Carroll co., Ill., on the Western Union R. R., 140 miles W. of Chicago, has 1 female seminary, a public library, 1 flouring-mill, 5 churches, 1 weekly and 1 monthly newspaper, 1 bank, 2 hotels, and business in grain. Pop. of v. 1756; of tp. 2815. JOHN M. ADAIR, ED. "CARROLL CO. MIRROR."

Mount Chase, tp. of Penobscot co., Me., 100 miles N. E. of Bangor. Pop. 262.

Mount Clem'ens, post-v., cap. of Macomb co., Mich., 20 miles N. E. of Detroit, on the Grand Trunk R. R., has a union school, 6 churches, 2 weekly newspapers, 7 lumber manufactories, 1 furnace, 1 bank, a handsome Masonic hall, and a celebrated mineral and magnetic water-cure. Pop. 1768. S. B. RUSSELL, ED. "MT. CLEMENS PRESS."

Mount Cli'o, tp. of Sumter co., S. C. Pop. 1574.

Mount Craw'ford, post-v. of Rockingham co., Va., 15 miles S. E. of Harrisonburg. Pop. 901.

Mount Cro'ghan, post-tp. of Chesterfield co., S. C. Pop. 1682.

Mount Des'ert, post-tp. of Mount Desert Island, Hancock co., Me., occupies the central part of the island. Its principal villages are Soamesville and North-east Harbor. Pop. 918.

Mount Desert Island, a mountainous island in the Atlantic and in Hancock co., Me., is 14 miles long and 7 wide. Soames's Sound divides it nearly in two. Bar Harbor, North-east and South-west harbors, Soamesville, Seal Cove, and East Eden are among the villages. It is divided into three towns—Tremont, Mount Desert, and Eden. It abounds in beautiful lakes. The highest point is Green Mountain, 1535 feet high. The island is a favorite place of summer resort. The French settled Mount Desert in 1608. They were driven out by the English in 1616. The English settled it in 1761. Pop. 3935.

Mount Desert Rock, a small rocky islet, 20 miles S. S. E. of Mount Desert Island; lat. 43° 58′ 7″ N., lon. 68° 7′ 22″ W. It has a brick lighthouse with a fixed white dioptric light.

Mount Ea'ton, post-v. of Paint tp., Wayne co., O. Pop. 296.

Mount E'den, a v. formerly in Westchester co., N. Y., but now a part of the city of New York. Pop. 116.

Mounted Troops. See CAVALRY, TACTICS, and WAR.

Mount E'phraim, post-v. of Noble co., O. Pop. 171.

Mount E'rie, post-tp. of Wayne co., Ill. Pop. 1238.

Mount Et'na, post-v. of Huntington co., Ind., in Jefferson, Lancaster, Polk, and Wayne tps. Pop. 221.

Mount'ford (WILLIAM), b. in Kidderminster, England, May 31, 1816; was educated at Manchester College, York. Being unwilling to subscribe to the Thirty-nine Articles of the Church of England, he was forced to decline the pecuniary and social advantages of a scholarship in connection with one of the colleges of Oxford; came to the U. S. in 1849; was settled in Gloucester, Mass., 1850; married and retired from the active ministry. His present residence is in Cambridge, Mass. Mr. Mountford is the author of several books, among which *Martyria* (1846) and *Euthanasia* (1850) are worthy of special mention. He has for some time been engaged on a work about Spiritualism, to which faith he was an early convert. O. B. FROTHINGHAM.

Mount For'est, post-v. of Egremont tp., Grey co., Ontario, Canada, on the Toronto Grey and Bruce Railway, 87 miles N. W. of Toronto. It has 2 weekly newspapers and a large trade. Pop. about 1500.

Mount Gil'ead, post-tp. of Montgomery co., N. C. Pop. 1280.

Mount Gilead, post-v., cap. of Morrow co., O., 44 miles N. of Columbus, on the Cleveland Columbus and Cincinnati R. R., has good schools, 5 churches, 2 banks, 2 weekly newspapers, a carriage manufactory, several mills, and stores. Pop. 1087. W. G. BEEBE, ED. "UNION REGISTER."

Mount Gilead, post-v. and tp. of Loudon co., Va., 8 miles S. W. of Leesburg. Pop. 3537.

Mount Health'y, post-v. of Springfield tp., Hamilton co., O. (called also MOUNT PLEASANT), 7 miles N. of Cincinnati.

Mount He'bron, post-tp. of Greene co., Ala. Pop. 2049.

Mount Her'mon, tp. of Pasquotank co., N. C. Pop. 1184.

Mount Hol'ly, post-v., cap. of Burlington co., N. J., 18 miles N. E. of Philadelphia, with which it is connected by rail. There are also two rail-routes to New York. The town is supplied with water, forced to the summit of a neighboring hill for distribution, and gas. It has also good schools, 8 churches, 3 banks, 2 extensive iron-foundries and machine-shops, 4 saw and planing mills, a grist-mill, 1 large thread-mill, 2 canning-factories, 2 weekly newspapers, a children's home, the court-house and other county buildings, the jail, and a number of stores. Pop. about 4500. C. H. Folwell, Ed. "New Jersey Mirror."

Mount Holly, a v. of Jefferson tp., Knox co., O. Pop. 159.

Mount Holly, a v. of Wayne tp., Warren co., O. Pop. 205.

Mount Holly, post-tp. of Rutland co., Vt., on the Central Vermont R. R., Rutland division, has manufactures of lumber, leather, toys, chair-stock, and agricultural implements. Pop. 1582.

Mount Holly Springs, post-v. of South Middleton tp., Cumberland co., Pa., on the South Mountain R. R. (Mount Holly Station), has 1 weekly newspaper.

Mount Hope, post-tp. of Lawrence co., Ala. Pop. 1077.

Mount Hope, tp. of McLean co., Ill. Pop. 1550.

Mount Hope, post-v. of Rockaway tp., Morris co., N. J.

Mount Hope, post-tp. of Orange co., N. Y., is traversed by the Erie R. R. Pop. 1842.

Mount Hope, a v. formerly of Westchester co., N. Y., now included in New York City. Pop. 487.

Mount Hope, post-tp. of Grant co., Wis. Pop. 758.

Mount I'da, post-v., cap. of Montgomery co., Ark., 69 miles S. W. of Little Rock.

Mount Jack'son, post-v. of Shenandoah co., Va., on the Washington and Great Southern R. R., Manassas division. Pop. 270.

Mount Joy, tp. of Adams co., Pa. Pop. 1172.

Mount Joy, post-b. and tp., Lancaster co., Pa., 12 miles N. W. of Lancaster, on the through branch of the Pennsylvania Central R. R., has a male and female seminary, a soldiers' orphan school, 7 churches, 2 weekly newspapers, young men's Christian association, 4 hotels, manufactories of farming tools, 1 foundry, a steam flouring-mill, a carriage-factory, and stores. Pop. of b. 1896; of tp. 2037.
J. R. Hoffer, Ed. "Herald."

Mount Leb'anon, post-v. of Bienville parish, La., 12 miles N. of Sparta, is the seat of Mount Lebanon University (Baptist).

Mount Lebanon, post-v. of Columbia co., N. Y., 25 miles S. E. of Albany, on the Harlem Extension R. R. The population is made up of Shakers, there being 7 families, and each family a community. Agriculture, horticulture, the manufacture of brooms, etc. form the principal business of the inhabitants. Pop. about 400.
F. W. Evans, Ed. "Shaker and Shakers."

Mount Meigs, post-tp. of Montgomery co., Ala. Pop. 3999.

Mount Merid'ian, post-v. of Jefferson tp., Putnam co., Ind. Pop. 90.

Mount Mori'ah, post-v., cap. of Nevada co., Ark., 34 miles W. of Camden.

Mount Mor'ris, post-v. and tp. of Ogle co., Ill., on the Chicago and Iowa R. R., is the seat of a Methodist Episcopal seminary and collegiate institute. Pop. 1455.

Mount Morris, tp. of Genesee co., Mich.—Mount Morris Station, a flourishing post-v. on the Flint and Père Marquette R. R., is in Genesee tp. Pop. of Mount Morris tp. 1402.

Mount Morris, post-v. and tp. of Livingston co., N. Y., on the Erie R. R., has 1 academy, 1 seminary, 2 banks, 2 weekly newspapers, 2 grist-mills, 1 furnace, 1 saw and plaster mill, 6 churches, 4 hotels, and stores. Pop. of v. 1930; of tp. 3877.
William Harding, Ed. "Union and Constitution."

Mount Morris, post-v. of Waushara co., Wis. Pop. 584.

Mount Ol'ive, post-v., cap. of Izard co., Ark., on the E. bank of White River, 67 miles N. of Little Rock.

Mount Olive, post-v. of Wayne co., N. C., on the Wilmington and Weldon R. R., 13 miles S. of Goldsboro'.

Mount Ol'ivet, post-v., cap. of Robertson co., Ky., 20 miles S. W. of Maysville. Pop. 254.

Mount Olivet, a v. of Warren tp., Belmont co., O. Pop. 84.

Mount Per'ry, post-v. of Madison tp., Perry co., O. Pop. 71.

Mount Pleas'ant, tp. of Searcy co., Ark. Pop. 167.

Mount Pleasant, tp. of Whitesides co., Ill. Pop. 2553.

Mount Pleasant, tp. of Delaware co., Ind. Pop. 1880.

Mount Pleasant, post-v., cap. of Henry co., Ia., on the Burlington and Missouri River R. R., contains the Iowa Wesleyan University, 1 academy, 1 female seminary, 2 public schools, 13 churches, 2 weekly and 2 monthly newspapers, 2 national banks, 3 wagon-factories, 3 flouring-mills, 2 sash and blind factories, 1 tannery, gasworks, and stores. The Iowa State hospital for the insane is located about 1 mile from the town. Pop. 4245.
Van Cise & Throop, Eds. "Free Press."

Mount Pleasant, post-v. of Atchison co., Kan., 9 miles S. of Atchison. Pop. of tp. 1344.

Mount Pleasant, tp. of Labette co., Kan. Pop. 249.

Mount Pleasant, tp. of Cecil co., Md. Pop. 1440.

Mount Pleasant, post-v. of Frederick co., Md., 6 miles N. E. of Frederick. Pop. of district, 1565.

Mount Pleasant, post-v., cap. of Isabella co., Mich., has 2 large saw-mills, 1 grist and flouring mill, sash and door factories, 3 hotels, 2 banks, 2 weekly papers, and stores. It is the centre of a considerable lumber-trade. Pop. about 1500. J. Morgan, Ed. "Isabella Herald."

Mount Pleasant, tp. Wabashaw co., Minn. Pop. 642.

Mount Pleasant, tp. of Bates co., Mo. Pop. 2688.

Mount Pleasant, tp. of Cass co., Mo. Pop. 712.

Mount Pleasant, post-v. of Gentry co., Mo., is the seat of Mount Pleasant College (Baptist).

Mount Pleasant, tp. of Lawrence co., Mo. Pop. 1853.

Mount Pleasant, a v. of Saline tp., Miller co., Mo. Pop. 122.

Mount Pleasant, tp. of Scotland co., Mo. Pop. 1230.

Mount Pleasant, post-tp. of Cass co., Neb. Pop. 320.

Mount Pleasant, tp. of Westchester co., N. Y., on the E. bank of the Hudson River. It includes Pleasantville, Beekmantown, Sleepy Hollow, and other villages; is traversed by the Harlem and the Hudson River R. Rs., and contains several marble-quarries. Pop. 5210.

Mount Pleasant, post-v. and tp. of Cabarrus co., N. C., 6 miles E. of Concord, is the seat of North Carolina College (Lutheran). Pop. 1021.

Mount Pleasant, post-v. and tp. of Jefferson co., O., 5 miles W. of Portland R. R. Station, has a national bank, a Friends' boarding-school, 6 churches, and manufactures of woollens, etc. Pop. 563; of tp. 1564.

Mount Pleasant, tp. of Adams co., Pa. Pop. 1947.

Mount Pleasant, tp. of Columbia co., Pa. Pop. 751.

Mount Pleasant, tp. Washington co., Pa. Pop. 1321.

Mount Pleasant, tp. of Wayne co., Pa. Pop. 1952.

Mount Pleasant, post-b. and tp. of Westmoreland co., Pa., 40 miles S. E. of Pittsburg, at the terminus of the Mount Pleasant branch of the Baltimore and Ohio R. R., has 1 academy and graded public school, 8 churches, 1 weekly newspaper, 2 banks, 2 hotels, 1 mill, several tanneries, and stores. Principal employment, mining, manufacture of coke and lime, and shipping of limestone, quarried here in large quantities. Pop. of b. 717; of tp. 2547.
H. F. Cochrane, Ed. "Mount Pleasant Journal."

Mount Pleasant, post-v. and cap. of Titus co., Tex., has 1 weekly newspaper. Pop. 275.

Mount Pleasant, post-v. of San Pete co., Ut., 24 miles N. E. of Manti. Pop. 1346.

Mount Pleasant, tp. of Green co., Wis. Pop. 1164.

Mount Pleasant, tp. of Racine co., Wis., directly W. of Racine. Pop. 3560.

Mount Pulas'ki, post-v. and tp. of Logan co., Ill., 21 miles N. E. of Springfield, on the Gilman Clinton and Springfield and the Pekin Lincoln and Decatur R. Rs., has a graded school, 6 churches, 1 bank, 2 elevators, 2 mills, 1 weekly newspaper, and a number of business-houses. Pop. of v. 653; of tp. 1910. J. Dunbar, Ed. "Star."

Mountraille, Dak. See Montraille.

Mount Sav'age, post-v. and tp. of Allegheny co., Md., on the Cumberland and Pennsylvania R. R., has productive mines of semi-bituminous coal. Pop. 2051.

Mount Ster'ling, post-v. and tp., cap. of Brown co., Ill., on the Toledo Wabash and Western R. R., equidistant from Quincy and Jacksonville, has good schools, 6 churches, a fine court-house, 2 weekly newspapers, and manufactories of barrels, ploughs, wagons, and earthen-

ware. Extensive deposits of coal exist near by. Pop. of v. 1352; of tp. 2703.
G. M. Russell, Ed. "Brown County Democrat."

Mount Sterling, post-v., cap. of Montgomery co., Ky., on the Elizabethtown Lexington and Big Sandy R. R., has 4 good schools, 7 churches, 2 national and 1 exchange bank, 1 weekly newspaper, 2 grist-mills, 4 hotels, 3 manufactories, and stores. Pop. 1040.
J. R. Garrett, Pub. "Kentucky Sentinel."

Mount Sterling, tp. of Pettis co., Mo. It includes Sedalia (which see). Pop. 6305.

Mount Sterling, post-v. of Madison co., O., 22 miles S. W. of Columbus, has good schools, 3 churches, 1 newspaper, 2 saving banks. Business, farming and stock-raising. Pop. 389. M. W. Schryver, Pub. "Review."

Mount Sterling, a v. of Muskingum co., O., 7 miles W. of Zanesville, and in Hopewell tp. Pop. 210.

Mounts'ville, a v. of Homer tp., Morgan co., O. P. 33.

Mount Ta'bor, tp. of Monroe co., Ind. Pop. 66.

Mount Tabor, tp. of Rutland co., Vt., near the Harlem Extension R. R., has manufactures of lumber and leather. Pop. 301.

Mount Tir'zah, post-tp. of Person co., N. C. P. 1117.

Mount Ul'la, post-tp. of Rowan co., N. C. Pop. 1720.

Mount Un'ion, post-v. of Lexington tp., Stark co., O., 2 miles from Alliance. Pop. 315.

Mount Union, post-b. of Huntingdon co., Pa., 75 miles W. of Harrisburg, on the Pennsylvania Central R. R., has 3 churches, a town-hall, 1 bank, 1 newspaper, 2 extensive tanneries, an iron company, 2 wagon-factories, 2 hotels, and stores. Principal business, manufacturing. Pop. 535. H. E. Shafer, Ed. "Times."

Mount Up'ton, post-v. of Guilford tp., Chenango co., N. Y., on Unadilla River and the New Berlin branch of the Midland R. R.

Mount Ver'non, post-v., cap. of Washington co., Ala., on W. bank of Tombigbee River, 90 miles above Mobile.

Mount Vernon, post-v., cap. of Montgomery co., Ga., near the E. bank of the Oconee, and 20 miles N. of Lumber City R. R. Station.

Mount Vernon, post-v. and cap. of Jefferson co., Ill., on the St. Louis and South-eastern R. R., has a general manufacturing business and considerable trade, and 3 weekly newspapers. Pop. 1167.

Mount Vernon, post-v. of Black tp., cap. of Posey co., Ind., on the Ohio River and on the St. Louis and South-eastern R. R., has 7 churches, several schools, 2 banks, 1 planing, 2 flouring and 2 saw mills, and 2 weekly newspapers. Pop. 2880.

Mount Vernon, tp. of Black Hawk co., Ia. Pop. 1035.

Mount Vernon, post-v. of Linn co., Ia., 65 miles W. of the Mississippi, on the Chicago and North-western R. R., contains Cornell College, a woollen-factory, 1 weekly and 1 monthly newspaper, and stores. Pop. 910.
F. J. Sessions, Cor. Sec. "Collegian."

Mount Vernon, post-v., cap. of Rock Castle co., Ky., on the Louisville and Knoxville R. R. Pop. 252.

Mount Vernon, post-tp. of Kennebec co., Me., 20 miles N. W. of Augusta, has thriving manufactures. Pop. 1252.

Mount Vernon, a v. of Carroll co., Md. (Sam's Creek P. O.). Pop. 51.

Mount Vernon, tp. of Winona co., Minn. Pop. 559.

Mount Vernon, post-v. and tp., cap. of Lawrence co., Mo., 8 miles N. W. of the Atlantic and Pacific R. R., has good schools, 3 churches, 1 newspaper, 1 flouring-mill, and stores. Pop. of v. 558; of tp. 3030.
John Cecil, Ed. "Fountain and Journal."

Mount Vernon, post-v. of Hillsborough co., N. H., 4 miles N. of Milford, is the seat of McCollom Institute, and has 1 church and chapel, 1 hotel, box and desk factory, and stores. The village is a resort for summer tourists. Pop. 601. S. H. Keeler.

Mount Vernon, post-v. of Westchester co., N. Y., on the New York New Haven and Hartford R. R., has 3 public and 4 private schools, 8 churches, 2 banks, gasworks, a fire department, 4 hotels, 1 pen-factory, a horn and rubber jewelry factory, a glue-factory, 3 carriage-shops, 3 weekly newspapers, and stores. Pop. 2700.
Joseph S. Wood, Ed. "Chronicle."

Mount Vernon, city and cap. of Knox co., O., on Lake Erie division of the Baltimore and Ohio and the Cleveland Mount Vernon and Columbus R. Rs., contains some handsome private residences, and among its business-firms are 2 extensive machine-works, 1 railroad machine-shop, good schools, 12 churches, 2 national and 1 savings bank, 2 flouring and saw mills, a large linseed-oil manufactory, 1 flax and twine factory, several carriage and wagon factories, a fine court-house, and stores. Kenyon College is located about 6 miles E. of this place. Pop. 4876. L. Harpe, Ed. "Banner."

Mount Vernon, a v. of Titus co., Tex. Pop. 223.

Mount Vernon, tp. of Fairfax co., Va. It contains Mount Vernon, the residence of Gen. George Washington, on the Potomac, 9 miles below Alexandria. The mansion is a wooden building, erected by Lawrence Washington and enlarged by his brother and heir, the President. In 1858 it was purchased, with the tomb of Washington and 200 acres of land, by the Ladies' Mount Vernon Association for $200,000, from Mr. John A. Washington. Pop. of tp. 2233.

Mount Vic'tory, post-v. of Hale tp., Hardin co., O., on the Cleveland Columbus and Indianapolis R. R.

Mount View, tp. of Ramsey co., Minn. Pop. 215.

Mount'ville, tp. of Morris co., N. J. Pop. 1403.

Mountville, post-v. of West Hempfield tp., Lancaster co., Pa., on the Columbia branch of the Pennsylvania R. R., has a public library. Pop. 430.

Mount Wash'ington, post-v. of Bullitt co., Ky., 10 miles E. N. E. of Shepherdsville, the county-seat. P. 340.

Mount Washington, post-tp. of Berkshire co., Mass., contains Mount Everett, 2624 feet high, and is noted for its sublime scenery. Pop. 256.

Mount Washington, post-b. of Lower St. Clair tp., Allegheny co., Pa. Pop. 1988.

Mount Will'ing, tp. of Lowndes co., Ala. Pop. 2125.

Mount Zi'on, post-v. and tp. of Macon co., Ill., on the Illinois Midland R. R., 9 miles S. E. of Decatur, is the seat of a male and female seminary. Pop. 1096.

Mount Zion, tp. of Clarendon co., S. C. Pop. 440.

Mourn'ing, the official or conventional expression of grief, has varied much at different times and in different countries. The Hebrews tore the garment, cut the hair and beard, strewed ashes on the head, went bareheaded and barefooted, and lay down on the ground weeping and smiting the breast; the period of mourning was seven days, but for Moses and Aaron they mourned thirty days. The Greeks cut off the hair, put on a coarse black garment, retired into seclusion, and wailed. When a great general died the whole army cut off their hair and the manes of their horses. The period of mourning was in Athens thirty days, but in Sparta only ten. With the Romans the mourning was mostly done by the women; the men wore black clothes, but only for a few days. Public mournings often occurred in the days of the republic on the occasion of some public calamity or on the death of some great man; during the empire, on the death of an emperor. Then all business stopped; the temples, the forum, the schools, and the baths were closed. The mourning color was black under the republic, but during the empire white became the mourning color for women. The mourning rites among barbarians and half savages are often horrible. In the Feejee Islands the women burn their bodies when a chief dies, and fifty or a hundred fingers are amputated to be hung on his grave. In the Sandwich Islands the inhabitants paint the lower part of their faces black and knock out their front teeth. Among civilized nations the mourning customs have become very similar in modern times, and consist mostly in retirement within the house and avoidance of what is bright and noisy. In Europe and America the mourning color is black; in Turkey, violet; in China, white; in Egypt, yellow.

Mouse, pl. **Mice** [Lat. *mus, mures*], a name applied to the smaller rodents of the family Muridæ (which see) and of some allied families, the larger species being called rats, hamsters, etc. They are of several groups. The jumping mice are mostly of the families Dipodidæ, Jaculidæ, etc. The house mice and rats are of the family Muridæ, group Mures. Of these, the *Mus musculus*, or common house-mouse, is worldwide in its present range, though brought first from the Old World. The New-World mice are many of them of the group Sigmodontes. Such are the harvest-mice (*Reithrodon*), the white-footed mice (*Hesperomys*), etc. The field-mice (Arvicolinæ) are of many species and are found in both hemispheres. (See Field-Mice.) The so-called shrew-mice are not mice at all, nor even rodents, but Insectivores. (See Shrew.) The number of species of mice is very great. The amount of damage done to agriculturists by mice alone is simply incalculable. It is certain that the farmer has no worse enemy

The Harvest-mouse.

(except noxious insects), nor one towards which his ingenuity could be more profitably turned with a view to the abatement of the evil. THEODORE GILL.

Mousseline′, a thin cloth made of cotton, is supposed to have derived its name from *Masalia*, since called *Masulipatam*, near Madras, whence such fabrics were first imported to Europe. Up to the beginning of the present century all muslin used in Europe came from India, and the Indian fabrics of this name were often of an astonishing fineness, justifying their poetical name of "woven wind;" but since, European manufactures, English, French, Belgian, and German, have completely superseded the Indian in the markets of the world. Being made by more perfect machinery, they are much cheaper, and English cotton manufactures are now sold in the interior of Hindostan. Of late, similar fabrics have been made of wool, *mousseline de laine*, or of half wool and half cotton.

Mouth [Ang.-Sax. *mûdh*], **Diseases of.** The diseases of the lining mucous surface of the mouth are chiefly inflammatory. Inflammation of the mouth is designated stomatitis. Simple stomatitis or catarrh of the mouth results from the irritation of decayed teeth, of hot or cold food or drinks, of chemical or medicinal irritants, and by using tobacco and pipes. It occurs in infants during dentition; they may cease to nurse, and the irritation of the sensitive nerves of the mouth may cause reflex spasm or convulsions. Its symptoms are a sense of burning, tenderness, and tension, foul taste, the adherence of viscid mucus, and a diffuse redness. The treatment comprises the frequent cleansing of the mouth by cold water, alkaline gargles, as of carbonate of soda, and the correction of the known cause. Ulcerative stomatitis appears in points upon the tongue, the interior of the lips and cheeks, where mucous glands have been obstructed, swollen, and ulcerated, or inflamed in the course of catarrhal stomatitis. Aphthæ, or croupous stomatitis, present small white spots, with red borders, known as canker, and erroneously termed blisters or vesicles. They contain no fluid. The white spot is a fibrinous patch of inflammatory exudation upon the mucous membrane. This soon is thrown off, leaving a painful excoriation. Aphthæ occur most often among teething children who are poorly nourished. The spots may be numerous and isolated, or coalesce in irregular patches. Their treatment is by diet, correcting indigestion, and chlorate of potash as a specific. Diphtheritic stomatitis or *cancrum oris*, sloughing inflammation of the mouth, results from salivation and from defective hygiene in asylums for orphans and foundlings or among soldiers in barracks. With modern hygiene it has become infrequently contagious or epidemic. The first appearance of diphtheritic matter should be cleared away, chlorate of potash heroically employed, the patches cauterized with nitrate of silver, and the strength vigorously sustained. Scurvy causes stomatitis of variable severity. Nursing children contract primary syphilitic ulcers of the mouth from infected mothers or wet-nurses. Mugnet or thrush, erroneously termed aphthæ, is a parasitic disease. It occurs in infants during the first month of life, and in adults only preceding death by slow, exhaustive disease. In these two states the mouth is much opened to the air. which dries secretion, and mastication is slow. The parasitic plant *Oidium albicans* gains entrance and attachment. It develops at first in white frosty patches on the tongue and sides and roof of the mouth. It consists of round spores and delicate filaments. Later, the patches are thick, curd-like, and yellow, due to fatty degeneration. The deposits should be removed and the exposed surfaces kept clean and bathed with specific washes.

E. DARWIN HUDSON, JR.

Movable Feasts. See EASTER, by F. A. P. BARNARD.

Move′ment [Lat. *movere*], in music, a term sometimes equivalent to *motion* or progression, as when we speak of an upward or a downward movement, or one that is slow, rapid, tranquil, joyous, etc. More generally, the word "movement" signifies any particular portion, section, or complete division of a musical composition. In this respect the several movements of a composition resemble the chapters of an ordinary book. In a symphony, concerto, sonata, or other work comprising several of these divisions each one is designated according to its particular quality, as an *adagio*, an *andante* (or *allegro*, *vivace*, *presto*, etc.) movement. Any change of *time* in the course of a piece, either in quality or rapidity, is also said to be a change of movement.

WILLIAM STAUNTON.

Mo′vers (FRANZ KARL), b. at Koesfeld, Westphalia, July 17, 1806; studied theology and the Oriental languages at Münster 1825–29; was pastor of Berkum 1833–39, and then professor of theology in the Roman Catholic faculty at the University of Breslau, where he d. Sept. 28, 1856. His principal work, *Die Phönizier* (4 vols., 1840–56), is the most comprehensive and exhaustive treatment of the subject.

Mowatt (ANNA CORA). See RITCHIE.

Mowea′qua, post-v. and tp. of Shelby co., Ill., on the Illinois Central R. R. Pop. 869.

Mow′er, county of S. E. Minnesota. Area, 720 square miles. Its surface is somewhat uneven, fertile, and well adapted to grain and stock raising. It is traversed by the Southern Minnesota, the Milwaukee and St. Paul, and other railroads. Cap. Austin. Pop. 10,447.

Mower (JOSEPH A.), b. in Vermont; at the outbreak of the Mexican war entered the army as a private in the company of engineers; was commissioned second lieutenant 1st Infantry 1855, and first lieutenant 1857; captain 1861, and commanded his company at the siege and capture of New Madrid; appointed colonel 11th Missouri Vols. May, 1862, and took part in the Corinth campaign, and was conspicuous in the battle of Corinth, Oct. 4, 1862, where he was severely wounded. Promoted to be brigadier the following month, and major-general Aug., 1864. Gen. Sherman thus refers to him in the order announcing his death: "He first fell under the immediate command of the present general of the army in the Vicksburg campaign, and soon attracted his notice by deeds of personal bravery that would require a volume to record. From that date to the close of the war he was engaged in every campaign in the West—at Jackson, Vicksburg, Meridian, the Red River, in Missouri, whence he was called personally to the aid of the general at Atlanta, and accompanied him, rising through all the grades, until the end of the war, when he commanded the 20th corps." In 1866 he was appointed colonel of infantry, and placed in command in Louisiana, where he "stood at his post through pestilence and sickness" until his death, which occurred at New Orleans Jan. 6, 1870. "A better soldier or a braver man never lived than Joseph A. Mower," is the high eulogy pronounced by the present general of the army. GEO. C. SIMMONS.

Mowing-Machines. See REAPING-MACHINES.

Mow′reytown (MORYSTOWN P. O.), a v. of White Oak tp., Highland co., O. Pop. 414.

Mow′ry (SYLVESTER), b. in Rhode Island about 1830; graduated at West Point 1852; served on frontier duty at San Francisco, Cal., 1852–53; was engaged in Pacific R. R. and other explorations and surveys 1854–57; was delegate in Congress from Arizona 1857–59; U. S. commissioner to mark the E. boundary-line of California 1860–61; published a work on the *Geography and Resources of Arizona and Sonora*, and wrote in various magazines on the Western country. D. in London, England, Oct. 16, 1871.

Moxa [Fr.], a form of the actual cautery whose use was derived from the Japanese and Chinese through the Portuguese. The down from the leaves of *Artemisia moxa*, the pith of the sunflower, cotton or lint soaked in solution of saltpetre and then dried, a pledget of spider's web, or a lump of amadon is rolled into a little cone and placed upon the part which it is desired to cauterize. It is then set on fire and held in place by a hairpin or an instrument called a porte-moxa. The blowpipe may be used to hasten combustion and increase the heat. The neighboring parts are surrounded by wet lint. It is often useful in spinal disease, neuralgia, etc. After firing, the part may be dressed with ammonia or ice. This process is the *moxiburium* or *moxicausis* of professional Latin.

Mo'xos, or **Mojos,** a nation of Indians in Eastern Bolivia, converted to Roman Catholicism by the Jesuits, who went among them in 1676, and during the succeeding century established among them fifteen mission-stations and reckoned 30,000 converts. They suffered great diminution from the attacks of Brazilian slave-hunters in the last century, and numbered little over 12,000 in 1833. They are lighter in color, taller, and more industrious than the surrounding nations, and employed a kind of hieroglyphics. Their language is harmonious, abounds in frequentative words, and lacks the letters *d*, *f*, and *l*. A grammar and vocabulary by Father Marban was printed at Lima in 1701, and a history of the mission was written by Father Francisco X. Iraizos.

Moy'lan (Gen. STEPHEN), b. in Ireland in 1734; settled at Philadelphia some years before the Revolution; presented himself to Gen. Washington at Cambridge, Mass., as a volunteer, and being a gentleman of good education and address, was appointed aide-de-camp Mar. 5, 1776, commissary-general June 5; commanded the 4th Light Dragoons 1777; participated in Greene's Southern campaign 1781; was appointed brevet brigadier-general Nov. 3, 1783; became a farmer at Goshen; was register and recorder of Chester co. 1792–93; for several years commissioner of law for the district of Pennsylvania, and vice-president of the Society of Cincinnati 1800. D. at Philadelphia Apr. 11, 1811.

Mo'yock, post-tp. of Currituck co., N. C. Pop. 1204.

Mozarab'ic Liturgy. The Christian subjects of the Saracens in Spain were called *Mozarabes*, "Arabs by adoption." Their liturgy, Ephesine in its type, if not in its origin, and not called Mozarabic till after the Mohammedan conquest in the eighth century, is, in its groundwork at least, coeval with the introduction of Christianity into Spain. At Braga, in 538, it was set aside for the Roman liturgy, but restored at Toledo in 589; and at the Fourth Council of Toledo in 633, after some improvements by Leander of Seville (d. 595) and Isidore of Seville (d. 636), the use of it was extended to all Spain. Further improvements were introduced by Ildefonso of Toledo (d. 667). But in the eleventh century (in Aragon 1071, and in Castile 1074) it gave place, by royal authority, to the Roman liturgy. Through the influence and example of Cardinal Ximenes (1436–1517) the use of it was revived in Toledo (after 1502), in Salamanca (1517), and in Valladolid (1567). By the concordat of 1842 provision was made for its continuance at Toledo, but nowhere else. It has been pronounced "the richest, the fullest, the most varied of all known liturgies." It has been edited by Leslie (1755), Lorenzana (1774), and Arevalus (1804). (See Migne's *Latin Patrology* (vols. lxxxv., lxxxvi., 1850), and John Mason Neale's *Eastern Church, General Introduction* (1850), and *Liturgiology and Church History* (2d ed., 1867).)

R. D. HITCHCOCK.

Mozambique', territory of the E. coast of Africa, extending along the Mozambique Channel from Cape Delgado to Delagoa Bay, between lat. 10° 41' and 26° S., and belonging to Portugal. Its area is estimated at 283,500 square miles, its population at 300,000, but its western boundaries are wholly undefined. The coast-land is low, with a rich, humid soil and a hot, moist climate, which make it extremely fertile. Large harvests of rice, maize, millet, and all varieties of tropical fruits are gathered wherever the ground is cultivated. Hippopotami, elephants, lions, crocodiles, and flamingoes abound. On the islands and shoals with which the coast is fringed turtles are caught in great numbers, and pearl-fishing is very remunerative; tortoise-shell is a staple article of export. The interior is higher, almost mountainous, and covered with forests, which yield many varieties of excellent timber and dyewoods. The authority of the Portuguese is very slight, and mostly confined to a few settlements and ports—namely, Mozambique, Quilimane, Sena, and Tete.

Mozambique, capital of the Portuguese territory of the same name, is in lat. 15° 2' S., on a small island. It is defended by three forts, has a good harbor and some trade in rice, gum, gold-dust, ebony, tortoise-shell, and timber. Pop. 8522, of whom 7000 are slaves, 1100 Arabs, and 34 Portuguese.

Mozambique Channel, the strait between the E. coast of Africa and the island of Madagascar. It is about 1000 miles in length, with a breadth of between 500 and 600 miles at its entrances, and of nearly 300 miles in the middle. The Comoro Islands are at its northern outlet.

Mozart' (WOLFGANG AMADEUS, also JEAN CHRYSOSTOME THEOPHILE SIGISMUND), b. at Salzburg Jan. 27, 1756, and d. at Vienna Dec. 1, 1791, in his thirty-sixth year. When but an infant and without any apparent effort he absorbed a knowledge of music by listening to the lessons given his sister, Maria Anna. So precocious was he that at four years of age he played the piano with astonishing ease and expression, and composed minuets and simple pieces, dictating them to his father. When the boy was six years of age, the father, Leopold Mozart, visited Munich and Vienna with his two children, whose performances excited great admiration, particularly those of Wolfgang. Leopold brought home with them a small violin for Wolfgang, who learned by himself to play it, using it as a toy for odd moments. He had had this instrument but a few months when one night he played his part of a trio, reading at sight, without mistakes and without hesitation. In 1763, Leopold made a second tour with the children, visiting the most important cities of Europe, and although only eight years of age Wolfgang composed most of the symphonies which were played at his concerts, and which roused London to enthusiasm in 1764. Home for a few months in 1766, Wolfgang pursued the study of composition under his father. The works of Handel, which he brought from London, and those of Bach, became his classical models. He studied also some of the best Italian masters, getting from them his marvellous skill in making each of his vocal parts melodious and graceful even in the most constrained harmonic situations. In 1767, Leopold and the children went to Vienna, and remained there more than a year, hoping to improve their fortunes, but they reaped only loss and disappointment. The emperor, Joseph II., astonished at Wolfgang's genius, bantered him to compose an opera. Leopold mistook this jest for an order, and set the boy of ten years at work upon a libretto obtained after great difficulty and delay. The Italian court-musicians, piqued at this doubtful favor to the German child, even then formed their mean clique against him, and commenced the petty but effective annoyances that later marred the life they helped to shorten. The opera, covering 558 pages of MS., was never allowed a representation. From all these fruitless miseries the Mozarts escaped at last, the father and son travelling through Italy. Some idea of Wolfgang's wonderful abilities may be formed from the following programme of a concert given at Mantua Jan. 16, 1770: Two symphonies written by him; a concerto for piano that he would play at sight; a sonata that he would play at sight, transposing it into any key; he would improvise an air and its accompaniment to words given him at the concert; he would improvise a fugue and a sonata on a theme just given him; and lastly, he would complete and play on the piano a symphony at the first sight of only the part of the first violin. This programme is beyond the mature manhood of almost every other musician that ever lived. He wrote from memory, after hearing it but twice, the whole of a *Miserere* by D'Allegri. Happily, Wolfgang's facility and power in music were such that these feats were mere play to him, and even years of such performances did not impair the organization that made him the greatest of musicians. At Milan an opera by him, *Mitridate*, was brought on the stage and repeated twenty times. The whole tour was a success, and on his return he was appointed court-organist to the archbishop of Salzburg. From 1777 to 1779 he resided in Paris, where the battle between Gluck and Piccini was then raging. In 1780 he was called to Munich by Prince Charles Theodore of Bavaria to write the opera *Idomeneo*. In this entirely new creation Mozart laid the cornerstone of dramatic composition—a service which the most eminent of his successors fully acknowledge. Its originality and beauty became at once the delight of his audience, and earned him even more than his usual praises. The possession of merit was delightful to the archbishop of Salzburg; and the better to secure it, he at once had Mozart return with his honors from Munich, and in 1781 move with him to Vienna as a member of his household. The archbishop there lavished upon him the penury and ignominy with which he honored his menial servants. After a fruitless remonstrance, Mozart resigned, and unwillingly but needfully gave lessons for a living in Vienna, which thereafter was his home. In 1782 Mozart married Constance Weber, a pianist, whose care and love were his greatest help and happiness to the end of his struggling existence. Joseph II., fond of Italian music and of his Italian masters, the enemies of Mozart, was slow in granting him any privileges. Finally, *L'Enlèvement du Sérail* was ordered, and paid for with fifty ducats. The originality of this work at first hid its beauties from the people of Vienna, but the opera made a deep impression on the musicians there and on all classes in other parts of Europe. The emperor gave him the office of composer to the court and a salary of eight hundred florins, but with astonishing, lamentable indifference made his office a sinecure, for many years not asking a note from his hand. To sustain his family, he was obliged to give lessons, write waltzes and contredanses for balls, and give concerts in neighboring cities. It was not till his twenty-

eighth year (1784) that these ephemeral labors were followed by uninterrupted industry in composition, when but seven years of life remained to him. The opportunity which wealth and royalty refused to give came unsought in the libretto of *Il Nozze di Figaro*, written for Mozart by the poor poet Da Ponte in 1786. This opera, finished in six weeks, had great success throughout Europe. Many offers came to him then from various courts, but Mozart was fond of Vienna, and even of his indifferent emperor. The people of Prague deserve mention for their warm and practical appreciation of Mozart. They asked an opera, and *Don Giovanni*, the triumph of dramatic composition, was written for them in 1787. In 1788 he commenced to feel depressed by his disease of the lungs and the nerves. He wrote with feverish activity to escape melancholy. A mysterious messenger came to him and engaged him to write a *Requiem*, refusing any information as to its destination. This mystery, some presentiment, and his melancholy fancies gave him the opinion that he was writing his own funeral service. He sank lower and lower, working more and more fatally in both senses of the word. In the single year of 1791, in such depths, when death, the mysterious messenger, had waited a twelvemonth, Mozart wrote *Die Zauberflöte* for indifferent Vienna, *La Clemenza di Tito* for loving Prague, and the requiem for himself. On a dismal day of rain, unfollowed by a friend, the bodies of Mozart and fifteen other dead were hurried through the streets of Vienna to the common burying-ground of the poor; and his grave is now unknown.

Mozart is considered the greatest composer of the world from the combined versatility and power of his genius. In every kind of composition he produced works of the greatest excellence, each of which is so original and comprehensive that his successors are almost of necessity his imitators. He wrote without showing the slightest weakness anywhere, operas, oratorios, symphonies, masses, quartets, solos for diverse instruments, sonatas, and dance-music. He was the best pianist of his time in Germany. His execution was precise, elegant, fervid, and delicate in expression. Not less remarkable were his improvisations, in which his clearness of thought, richness of harmony, and vividness of fancy were beyond the finished compositions of most other men. His fecundity is perhaps without a parallel. His life was less than half the usual length; half of that short life was spent in long concert-tours, and his delicate health and his lessons and other ephemeral work sadly diminished his productiveness. Yet he wrote 626 published works, and 294 compositions either unfinished or unpublished. Even a summary catalogue of them is too long to introduce here. Neither is it practicable to name his most esteemed works, for they are nearly all esteemed. *Don Giovanni, Nozze di Figaro, Die Zauberflöte*, the requiem, the symphony in G minor, the quartets Nos. 10 and 18, are but a small fraction of the delights this most favored genius gave the world. In Mozart's character we are struck with his cheerful temper, his childlike simplicity and sweetness, his matchless facility, his perfect confidence, his fertility of fancy, his unsurpassed capacity for exquisite sentiment, his depth of feeling, and his breadth of power. His compositions, charming pictures of his charming nature, are free from troubled thoughts and tortuous texts to be resolved in wonder. In every scene through which his universal genius leads us we follow in his music the accents of a loving, harmonious, confident soul in lucid beauties breathing joy to the heart for ever. C. H. FARNHAM.

Mo'zier (JOSEPH), b. at Burlington, Vt., Aug. 22, 1812; was engaged in mercantile pursuits in New York 1831–45; then visited Europe, studied sculpture in Florence and Rome, and practised that art with success. Among his best works are *Pocahontas, The Wept of Wish-ton-Wish, The Prodigal Son, Truth, Silence, Jephthah's Daughter, The Peri*, and *Rizpah*. D. at Faids, Switzerland, Oct., 1870.

Moz'ley (JAMES BOWLING), D. D., b. in Lincolnshire 1813; graduated at Oriel College, Oxford, 1834; became a fellow of Magdalen, vicar of Shoreham 1856, canon of Worcester 1869, regius professor of divinity, Oxford, 1871; author of a work on *Predestination* (1855), works on *Baptismal Regeneration* (1856–62), *Eight Bampton Lectures on Miracles* (1865), and other works.

Mozyr, town of Russia, government of Minsk, on the Pripets, has trade in grain and cattle. Pop. 5868.

Mrs. Bell's, tp. of Tuscaloosa co., Ala. Pop. 304.

Mu'cilage [Lat. *mucus*], a solution in water of any gummy matter. (See articles on ARABINE, DEXTRINE, GLUE, GUM, STARCH, and TRAGACANTH.) C. F. CHANDLER.

Mucori'ni [Lat. *mucor*, "mould"], an order of saprophytic fungi in which the oöspores are solitary and produced by a process of conjugation, and whose conidia consist of sacs containing one to many spores. The species of this order are very widely distributed, and amongst them are many fungi known as common moulds. They frequent articles of food, excrement of animals, and, in short, are found on nearly all decaying animal and vegetable matter. One species, *Phycomyces nitens*, K.ze, grows on oily substances, an unusual habitat of fungi. As a rule, the members of this order are quite small, although *P. nitens* has been known to attain the height of a foot. The mycelium, which is often found in large masses in some of the commoner moulds of this group, not unfrequently presents a shiny appearance, whence the common German word for plants of this order, *Schimmel*, "glitter," is derived.

Inasmuch as the species of this order conform tolerably closely to the type, we may select *Mucor mucedo*, a common mould growing on dung and other substances, as an illustration of the whole order. *M. mucedo* has occupied the attention of many botanists, but the most complete account of its development was given by Dr. Oscar Brefeld in a work entitled *Botanische Untersuchungen über Schimmelpilze*, Part i., published in 1872. In this publication there appeared for the first time an account of the oöspores, as well as the conidial spores of the plant in question. If fresh horse-dung be placed in a moist place, it will soon be covered by a coating of white glistening fibres, which are the hyphæ or mycelial threads of *M. mucedo*. They soon cover the surface of the dung with a cotton-wool-like mass, more or less dense according to the moisture and amount of nitrogenous matter in the dung, from which mass project certain threads, whose tips, at first white, afterwards black, are the conidia or asexual fruit, consisting of sacs containing a large number of spores. The threads, which grow upward to bear the spore-sacs, exhibit in *M. mucedo* a marked tendency to turn towards the light. In *M. stolonifer*, the common bread-mould, a nearly-related species, the stalks of the spore-cases, on the contrary, seem to be indifferent to the action of light. A microscopic examination of the hyphæ or threads composing the mycelium shows that, as in most fungi, they branch in all directions, and are occasionally divided by cross-partitions. The contents are colorless or slightly tinged with brown or gray, and the cell-wall, although, according to De Bary, it sometimes shows the blue color given by cellulose on the application of iodine and sulphuric acid, often fails to give that color. If submerged, the hyphæ live, at least for a certain length of time, but undergo certain changes; the cross-partitions become more numerous, and the cell-walls sometimes bulge a little. It has been sometimes supposed that yeast-cells were nothing but the altered mycelium of submerged plants of *M. mucedo*. This view is not now generally accepted, and it must be admitted that we have no proof that yeast-cells either come from *Mucor* or are changed into it. When, however, the mycelium of *M. mucedo* is kept quite moist, it undergoes a modification, and we have the production of what is known to German mycologists as *Brutzellen*. These are formed in the following way: The cross-partitions increase in number, and some of the cells thus formed swell until they become nearly spherical. The protoplasmic contents of the cells then roll themselves up into round masses resembling spores, which afterward are capable of germinating. The filaments, or hyphæ, which rise above the common mass of mycelium to bear the conidia, are generally from an eighth to half an inch high, but under exceptionally favorable circumstances may be as high as six inches. The ends of the hyphæ swell into a globular-shaped sac, shown in Fig. 1. The contents of the sac are at first continuous with those of the rest of the filament, but are afterwards cut off by a partition, which is not flat, like the cross-partitions found in the ordinary mycelium, but arched, as shown in section in Fig. 2, *a*. The expanded tip of the mycelium (Fig. 2, *b*), which projects into the spore-sac, is known as the *columella*. In *M. mucedo* it is very prominent. In most of the Mucorini it is smaller, and in a few cases is entirely wanting. In that part of the sporangium or spore-sac represented by c, Fig. 2, the spores are formed by free-cell formation. In *M. mucedo* they are very numerous and of an oval shape, 0.0066–0.0099 mm. long

FIG. 1.

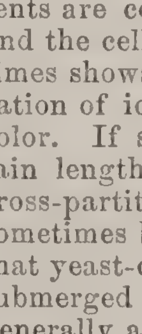


FIG. 2.

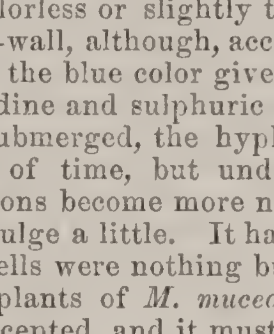


FIG. 3.

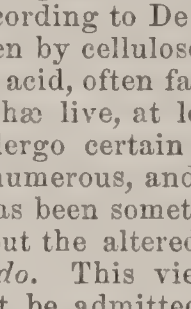
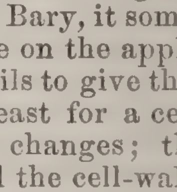


FIG. 4.



and 0.0033–0.0040 mm. broad. Their color is grayish-brown, and when seen in mass they often appear black. The external wall of the sporangium is composed of two layers, the outer of which is beset with short hairs. Within the sporangium is an expansible elastic substance, whose presence can be demonstrated before the spores are ripe by bursting open the outer wall, when the elastic substance projects as a globular mass, in which the young spores are imbedded. When ripe the spores are discharged with some violence by means of the sudden swelling of the elastic substance; the whole outer wall breaks away and disappears, except a small portion which remains, forming a rim about the base, shown in Fig. 3, *d*. This is sometimes so small that it can be seen only on close examination, and at first sight it appears as though the columella which remains were the young state of a sporangium. In *M. stolonifer* (bread-mould) it happens that not only is the outer wall of the sporangium destroyed, but the very large columella splits and collapses, falling back over the fruit-stalk like an umbrella or small toadstool, as in Fig. 4. The spores are often projected to a considerable distance, as may be shown by placing a piece of white paper two or three inches from a mass of *Mucor*, when it will soon be covered with black spots, which are the discharged spores. The spores placed on a moist surface swell to two, three, or even a greater number of times their original dimensions, but do not clearly show a division of their wall into two layers. Their germination takes place by the growth of one or more tubes, which soon assume all the appearance of the mycelium of *M. mucedo*, and in a short time, usually only a few hours, reproduce the conidia of the species.

When *M. mucedo* is cultivated on a decoction of horse-dung it only bears conidia. When growing spontaneously on horse-dung it not unfrequently produces oöspores as well. On breaking the dung open they are seen by the naked eye, looking like small round black bodies just below the surface of the dung. Their size varies from 0.0099–0.2145 mm., according to Brefeld's measurements. Examined with a rather lower power of the microscope, they are found to have two coats, the outer of which is black, opaque, and brittle, and roughened with irregular protuberances. On breaking open the outer coat, it is seen to be lined with a more delicate membrane, which fits into the inequalities of the outer layer. The inner coat is continuous; the outer is perforated by two circular openings diametrically opposite. This is where the suspensors were attached, as we shall see presently. The oöspores are produced in the following manner: Two hyphæ which are lying near one another send out lateral shoots, as shown in Fig. 5, which increase in size, gradually ap-

FIG. 5.

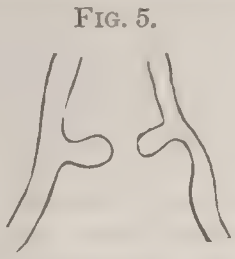


FIG. 6.

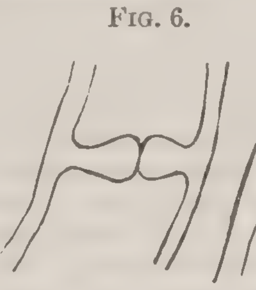
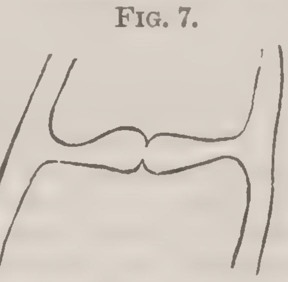
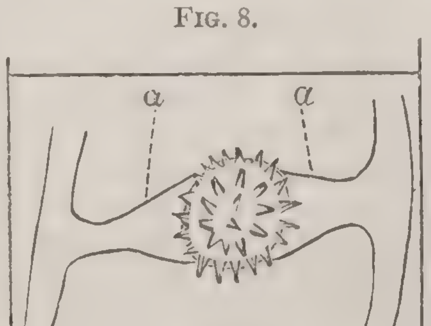


FIG. 7.



proaching one another until they meet, as in Fig. 6. The two parts in contact are next cut off by partitions from the hyphæ from which they respectively arose, as in Fig. 7. Finally, the cell-wall at the point of contact is absorbed, and the protoplasmic contents of the two cells unite into a globular mass, which afterwards becomes enveloped in a coating of cellulose and grows into a spore (Fig. 8), such as has already been described. In Fig. 8, *a a* are called the suspensors. The oöspore remains attached for some time to the mycelium, but is finally set free; generally, however, a small part of the suspensors remains attached. The oöspore germinates in the following manner: The thick outer coat opens, and from the contents of the spore there grows out a germinal tube, which soon assumes all the marks of the ordinary Mucor mycelium. This mycelium, arising directly from the oöspore, produces conidia, and sometimes almost immediately, as is illustrated in Fig. 9. No case has as yet been observed in which the mycelium from the oöspore of *M. mucedo* has produced another oöspore directly, without first having borne conidia. The oöspores of the Mucorini are called by De Bary *zygospores*, from their being produced by conjugation.

FIG. 8.

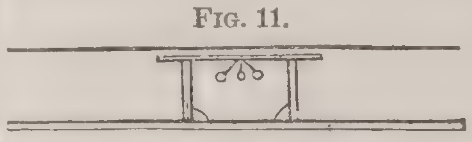


The method of production of the oöspores just described in *M. mucedo* prevails throughout all the order. The process, it will readily be seen, is similar to what is known as conjugation in certain orders of Algæ, as the Desmidiaceæ and Conjugatæ. The process consists in the direct union of the contents of two different cells, which resemble one another so closely that we cannot with propriety call one male and the other female. In the Desmidiaceæ it is the contents of two unicellular bodies which unite; in the Conjugatæ, the contents of two cells which are in different filaments. In one genus of the latter order, *Sirogonium*, we find a single filament, which bends upon itself, and the conjugation takes place between two cells of the same filament. In the Mucorini we have a conjugation between parts of different threads, but these threads may have both arisen from the germination of the same spore, so that the conjugation in this order is not necessarily between two different individuals, which must always be the case with Desmids. In those species of *Mucor* where there is a large amount of mycelium we do not know whether the mass has arisen from one or many spores; and when conjugation takes place in such cases it may have been between threads arising from different spores. Cultures of single spores have, however, been made, from which it is known that threads of the same individual may conjugate. This is shown particularly clearly in *M. syzygites*, De Bary, a common mould on toadstools, represented in Fig. 10, where the mycelium from a single spore is easily traced. It has been remarked that the two conjugating cells closely resemble one another. In *Chætocladium*, however, one of the cells is uniformly larger and of a slightly different shape from the other, but even in this case there is no distinction of antheridium and oözonium. The oöspores of the different species and genera of Mucorini vary in shape, size, and markings, but a detailed account would be out of place. The most striking form is *Phycomyces nitens*, whose oöspores are surrounded by a ring of branching processes.

FIG. 9.

FIG. 10.

FIG. 11.



The older writers had no knowledge of the mode of production of the oöspores of this group, and the only form of fruit which they regarded in their classification of this order was the asexual or conidial form; and they considered the conidial sporangia to resemble the asci of the Perisporiaceæ. Modern research has shown that this is not the case; for, while the former are produced without the intervention of any sexual action, the latter are the result of a peculiar process of fertilization. By continental writers the Mucorini are considered one of the lowest of Fungi, and are placed just below the Peronosporæ. English mycologists still adhere to the older classification.

The principal genera of the order are *Mucor* (including *Phycomyces*), *Circinella*, *Helicostylum*, *Thamnidium*, *Chætostylum*, *Chætocladium*, *Mortierella*, *Piptocephalis*, *Syncephalis*, *Kickxella*, *Cœmansia*, *Martensella*, and *Pilobolus*.

W. G. FARLOW.

Mu'cous [Lat. *mucus*] **Mem'brane,** the lining membrane of the alimentary, respiratory, and genito-urinary tracts. Anatomically, it consists of the mucous membrane proper and the sub-mucous tissues. The first is composed of the secretory tubules, follicles, and glands, situated upon a basement or limitary membrane; the second consists of elastic connective or "areolar" tissue, and contains the capillary blood-vessels and nerve-filaments by which the secretory surface is nourished and vitalized. The special function of a mucous membrane is to secrete a viscid, gelatinous substance termed mucus, and thus to protect the passages which it lines from the contact, attrition, and irritation of their moving contents, as well as to facilitate such motion. By its corrugated structure, numerous reduplications, and villous processes it affords an extensive surface for the great functional glandular processes of nutritive absorption and the elimination of effete excretory products. Its free surface is lined with epithelial cells, related to the mucous tissues beneath as the epidermic

cells, or cuticle, are to the skin. These epithelia are constantly exfoliated, and as constantly reproduced by young cells formed by proliferation in the cellular structures beneath. The secreted matter called mucus contains a limited number of mucous corpuscles, which are cast-off epithelia or escaped products of rapid cell-formation. But the homogeneous fluid portion is the peculiar secretion of the mucous follicles. It is clear, colorless, has nearly a semi-solid consistency, and consists of water, mucosine, and salts, especially chloride of sodium. When rich in corpuscles and mucosine, mucus is viscid and tenacious. It is thin and watery when salines are chiefly present, and often a rapid serous flow is scarcely more than transuded blood-serum. The mucous membrane is also the seat of glands of special function, as those producing the saliva, the gastric and intestinal digestive juices. Hypersecretion of mucus is designated catarrh. Catarrh of mucous surfaces has many causes. When the skin is chilled, or its circulation is sluggish by reason of uncleanliness or neglect of exercise, blood is determined to the internal parts. Rapid circulation of the blood and the elevated temperature of the body produce catarrhs in most acute inflammatory or febrile disorders. When large organs, as the lungs or liver, are diseased, the obstruction they offer to the circulation favors congestion of the extensive mucous surface, and catarrh. They are passively congested when the heart is dilated. Direct irritation more often causes catarrhs, as dust in the bronchi, or errors in diet producing the catarrhs of gastric and intestinal indigestion.

E. Darwin Hudson, Jr.

Mucus. See Mucous Membrane.

Mud'dy, tp. of Richardson co., Neb. Pop. 408.

Muddy Bayou, tp. of Conway co., Ark. Pop. 583.

Muddy Creek, tp. of Butler co., Pa. Pop. 972.

Muddy Fork, tp. of Pike co., Ark. Pop. 477.

Mud Fish. See Amia Calvia.

Mudge (Benjamin Franklin), b. at Orrington, Me., Aug. 11, 1817; graduated in 1840 at Wesleyan University; became a lawyer of Lynn, Mass., in 1844; mayor of Lynn 1852; engaged in chemical pursuits, and was connected with the coal-oil and petroleum industry in Massachusetts and Kentucky; State geologist of Kansas 1864–65; became in 1865 professor of natural sciences in the Kansas Agricultural College at Manhattan; has made many palæontological discoveries; became president of the State Teachers' Association in 1867 and of the Kansas Natural History Society 1868.

Mudge (Rev. Enoch), b. in Lynn, Mass., June 21, 1776; joined the itinerant ministry at the second session of the New England conference in 1793. All the other Methodist preachers in the Eastern States down to that date had gone thither from the Middle or Southern States. He travelled and preached through most of Massachusetts, Rhode Island, Connecticut, and Maine. In the latter State, which was then a province and a wilderness, he endured severe and romantic trials. He was a chief founder of its now prevalent Methodism. He was twice elected to the legislature of Massachusetts. The latter years of his life were spent in New Bedford, Mass., as chaplain to its mariners' chapel, where he was supported and beloved by all sects. He published a volume of excellent *Sermons for Mariners* and many poetical pieces of some merit. Notwithstanding his hardy early life and adventures as an itinerant, he was universally admired for the evangelical gentleness of his character. "In stature he was below the ordinary height, was stoutly framed, with a full round face, healthfully colored and expressive of the perfect benignity of his spirit. In manners he would have been a befitting companion for St. John. He was distinguished by excellent pulpit qualifications, by fertility of thought, warmth of feeling without extravagance, peculiar richness of illustration, and a manner always self-possessed and marked by the constitutional amenity of his temper." D. at Lynn, Mass., in 1850.

Abel Stevens.

Mud Springs, tp. of El Dorado co., Cal. Pop. 1572.

Mud Town, tp. of Shelby co., Ala. Pop. 1228.

Muez'zin, or **Mueddin** [Arab., from *uzn*, "ear"], an official, usually blind, who at certain hours of the day and night chants the call to prayer from the minarets (*madneh*) of the mosque in Mohammedan towns. The call is made in loud, sweet, and melodious tones. In the daytime the call *Adan* is used: "God is most great; there is no God but Allah, and I testify that Mohammed is Allah's prophet! Come to prayer! Come to security! Prayer is better than sleep!" several times repeated. After the first *Adan* (called *Fegr* or *Subh*) the last sentence is omitted. The night-cry, *Ula*, is like the *Adan*, but ends in these words: "There is no God but Allah. He has no companion! he has no companion! To him belongs dominion; to him praise is due. He confers life and causes death; he is living and shall never die. In his hand is blessing and all power." The call *Ebed* is made an hour before day. Its first words are, "I praise the perfection of God, the Eternal One—the perfection of God, the wished-for, the alone-existing, the supreme."

Muf'ti ("expounder"), or **Sheikh-ul-Islam** ("lord of the faith"), called also the **Grand Mufti,** the second in rank of the great ministers of the Turkish court, or Porte, the head of the departments of religion and law. At present, however, he is neither priest nor magistrate, but the supreme expounder or interpreter of the law. The name *mufti* is also given to the numerous jurisconsults who are attached to the government councils, general and local, throughout the empire.

Müg'ge (Theodor), b. at Berlin Nov. 8, 1806; first employed in a mercantile office; became then a soldier, determined to go to South America and fight under Bolivar, but the war was over when he reached London; returned to Berlin; studied natural science, history, and philosophy for some time; devoted himself finally to literature, and d. at Berlin Feb. 18, 1861. Of his political writings, *France and the Bourbons* (1830), *England and the Reform* (1831), and *The Censure in Prussia* (1845), attracted much attention. The best of his travelling sketches are *Die Schweitz* (1847), translated into English by Mrs. Percy Sinnet (London, 1848), and *Nordische Bilderbuch* (1856); of his romances, *Toussaint* (1840) and *Afraja* (1854), translated into English by E. J. Morris (Philadelphia, 1854). His collected works were published at Berlin in 33 vols. (1862–67).

Muggleton'ians, the followers of Ludowic Muggleton (1607–97), a journeyman tailor of London, who was himself the follower of one John Reeve, a fanatic who professed to have prophetic gifts. They published several pretended books of revelation. Muggleton's complete works appeared in 1756 and in 1832. His sect, though still in existence after 1830, is believed now to be extinct. Its peculiar doctrines were mostly absurd and ridiculous.

Mugil'idæ [from *mugil*, the Latin name of the mullet], a family of fishes of the order Teleocephali and sub-order Percesoces. The body is always more or less oblong and compressed, and covered with cycloid scales of moderate size; the lateral line is absent; the head oblong and more or less depressed, but with the eyes lateral and well developed; the opercula unarmed; the mouth terminal, with the cleft moderate and mostly transverse or scarcely extending laterally; the teeth very small or entirely absent; the branchial apertures wide; branchiostegal rays, five or six; dorsal fins two, the first always with four stout, rigid, diverging spines, the second with nine (I. 8) rays (rarely eight or ten), and far behind; the anal opposite and resembling the dorsal; the ventrals sub-abdominal, but connected with the scapular arch, and each with one spine and five rays; the vertebræ are 24 in number—12 abdominal and 12 caudal; the stomach is muscular; the pyloric cæca undeveloped. This family embraces a large number of species (rather over 100) agreeing closely in physiognomy and in most of their characters; they are most numerous in the tropical waters, in all of which they are found, but a number of species also ascend far up into the temperate zones. Although strictly salt-water fishes, they more or less seek at stated seasons fresh waters. They generally associate together in large schools; they feed on organic substances which are found in the mud or sand. Several species are found in the Atlantic and Gulf slopes of the U. S.

Theodore Gill.

Muhalitch', town of Asiatic Turkey, in Asia Minor, 13 miles S. of the Sea of Marmora, carries on a considerable trade with Constantinople. Pop. 11,000.

Mühlbach (Luise). See Mundt (Klara).

Mühl'berg, town of Prussia, province of Saxony, on the Elbe, famous on account of the battle fought here on Apr. 24, 1547, in which the army of the allied Protestant princes under Johann Friedrich was totally defeated by the imperial army. Pop. about 3500.

Muh'lenberg, tp. of Berks co., Pa. Pop. 1547.

Mühlenberg (Frederick Augustus), b. at the Trappe, Pa., June 2, 1750; held important Lutheran pastorates in Pennsylvania and in New York City; was in Congress from Pennsylvania 1779–80 and 1789–97, and was twice Speaker of the House; held also important State and Federal offices, and d. at Lancaster, Pa., June 4, 1801; was son of Dr. H. M. Mühlenberg.

Mühlenberg (Gotthilf Heinrich Ernst), D. D., brother of F. A. Mühlenberg, b. at New Providence, Pa., Nov. 17, 1753; was educated at Halle 1763–70; held Lutheran pastorates in Philadelphia and Lancaster, Pa. (1780–1815); best known as a botanist; author of a *Catalogus Plantarum*

(1813), *Descriptio Uberior Graminum* (1816), and an unpublished *Flora Lancastriensis*. The genus *Muhlenbergia*, of the grass family, was named in his honor. D. at Lancaster, Pa., May 23, 1815.

Mühlenberg (Heinrich Melchior), D. D., b. at Eimbeck, Hanover, Sept. 6, 1711; studied at Göttingen and Halle; entered the Lutheran ministry; was an instructor at Francke's orphan-house, and in 1742 was sent as a missionary to America; was stationed first at Philadelphia, and afterwards at the Trappe, Montgomery co., Pa.; travelled extensively; founded the Lutheran ministerium of Pennsylvania, the first in America, and is justly regarded as the chief founder of the American Lutheran Church. D. Oct. 7, 1787. (See Stoever, *Life and Times of Mühlenberg*, 1756.)

Mühlenberg (Henry Augustus), b. at Lancaster, Pa., May 13, 1782; was Lutheran pastor of Reading, Pa., 1802–08; member of Congress 1829–38; was twice a Democratic candidate for governor; declined the Russian mission and the secretaryship of the navy; was U. S. minister to Austria 1838–40. D. at Reading Aug. 11, 1844.—His son, Henry A. (b. July, 1823; d. Jan. 9, 1854), was a graduate of Dickinson College; a lawyer; author of a *Life of Gen. Mühlenberg;* was sent to Congress in 1854, but d. soon after, having sat but one day in Congress. He was a man of great popularity and brilliant prospects.

Mühlenberg (John Peter Gabriel), b. at the Trappe, Pa., Oct. 1, 1746, a son of Dr. H. M. Mühlenberg; was educated in Halle, but ran away from college and enlisted in the dragoons; became in 1772 Lutheran minister of Woodstock, Va.; was much in public life, and soon after the outbreak of the Revolution threw off his gown in the pulpit, displaying a military uniform, read his commission as colonel, and ordered the drums to beat for recruits; served with great distinction at Charleston, Brandywine, Germantown, Monmouth, Stony Point, and Yorktown; became a brigadier-general in 1777, and afterwards a major-general; was vice-president of Pennsylvania 1785; M. C. 1789–91, 1793–95, and 1799–1801; U. S. Senator 1801–02; became in 1802 U. S. supervisor of revenue for Pennsylvania, and in 1803 collector of the port of Philadelphia. D. Oct. 1, 1807.

Muhlenberg (William Augustus), D. D., great-grandson of Heinrich Melchior Muhlenberg, was b. in Philadelphia Sept. 16, 1796; graduated at the University of Pennsylvania in 1814, and entered the Episcopal ministry in 1817. From 1817 to 1821 he was assistant rector of Christ church in Philadelphia under Bishop White. From 1821 to 1828 he was rector of St. James's church in Lancaster, Pa. From 1828 to 1846 he was at the head of a school, afterwards called St. Paul's College, founded by him at Flushing, L. I. From 1846 to 1858 he was rector of the church of the Holy Communion, erected by his sister, corner of 6th avenue and 20th street, New York City. In 1858 he became the first superintendent and pastor of St. Luke's Hospital, which owes its existence to him. This position he still (1875) holds. The degree of D. D. was conferred upon him by Columbia College in 1834. He has published *Church Poetry* (1823), *Music of the Church* (1852), and the *People's Psalter* (1858). He has distinguished himself both as a philanthropist and a promoter of Christian union. But he will be longest remembered as the author of the hymns "I would not live alway" (1823; revised in 1865), "Like Noah's weary dove" (1826), and "Saviour, who Thy flock art feeding" (1826). R. D. Hitchcock.

Muh'lenburg, county of W. Kentucky, bounded N. E. by Green River, E. by the Muddy, and W. by Pond River. Area, 515 square miles. It is uneven, fertile, and abounds in coal and iron ore. Tobacco, live-stock, wool, and corn are leading products. The county is traversed by the Elizabethtown and Paducah and the Owensboro' and Russelville R. Rs. Cap. Greenville. Pop. 12,638.

Muhlenburg, tp. of Pickaway co., O. Pop. 957.

Mühlhau'sen, town of the German empire, province of Alsace-Lorraine, on the Ill, which divides it into the old and the new city, and is crossed here by four bridges. The old town is rather indifferently built, though its streets are neat and clean; the new town is very elegant. Even a century ago Mühlhausen was celebrated for its woollen cloths; many other manufactures have since been added, such as cotton prints, muslins, watered silks, stained paper, parchment, starch, chemicals, etc., and it is now one of the most flourishing manufacturing towns of Germany. Pop. 52,825.

Mühlhausen, town of Prussia, province of Saxony, on the Unstrut, has large manufactures of optical and musical instruments, soap, chemicals, tobacco, and linen goods. Pop. 19,516.

Mühl'heim-am-Rhein, town of Rhenish Prussia, on the right bank of the Rhine, not far from Cologne, has large manufactures of silk, satin, ribbons, and all kinds of woollen goods. Pop. 13,511.

Mühlheim-am-Ruhr, town of Rhenish Prussia, on the Ruhr, has extensive manufactures of cotton and woollen goods, and an important trade in coal and iron from the mines in the vicinity. Pop. 14,267.

Muir, post-v. of Ionia co., Mich., on the Detroit and Milwaukee R. R., has 3 schools, 1 bank, 1 weekly newspaper, and stores. Principal business, lumber manufacturing. B. Bennet, Ed. "Muir Herald."

Muir (John), D. C. L., b. at Glasgow, Scotland, in 1810; educated at Glasgow University and at the East India College at Haileybury; proceeded to Bengal as a writer in the civil service 1828; filled several important posts in the revenue and judicial departments; made a profound study of Indian languages, history, and antiquities; wrote some religious tracts in Sanskrit verse, and since retiring from the service in 1853 has devoted his time and his fortune to the promotion of Oriental studies, especially such as have a religious bearing. To this end he had offered to the University of Cambridge in 1846 a prize of £500 for the best treatise pointing out the errors of the various systems of Hindoo philosophy and expounding the principles of Christianity to learned natives of India; which was awarded to a work by Dr. Rowland Williams. In 1862 he endowed with £5000 a chair of Sanskrit and comparative philology in the University of Edinburgh. Besides various contributions to the *Transactions* of the Asiatic societies and other learned associations, Dr. Muir has published five volumes of *Original Sanskrit Texts on the Origin and History of the People of India, their Religion and Institutions*, collected, translated, and illustrated (1858–70)—a work of consummate erudition and of the utmost value to the students of Indian antiquities, mythology, and literature, particularly of the Vedic age.—Dr. Muir's brother, Sir William Muir, b. in 1819, has also risen to high rank in India; became governor of the North-west Provinces in 1868, and has published a valuable *Life of Mohammed* (2 vols., 1858).

Muir'ton, post-v. of Grundy co., Mo., 18 miles S. E. (?) of Princeton.

Muk'den [Chinese, *Fung-Thian*], town of Mantchooria, capital of the province of Leao-Tong, was the residence of the present Chinese dynasty before the conquest of China, and for that reason highly favored by the government.

Muk'wa, tp. of Waupaca co., Wis. Pop. 1819.

Mukwon'ago, post-tp., Waukesha co., Wis. Pop. 1261.

Mulatto. See Mixed Races.

Mul'berry [Ger. *Maulbeere;* Lat. *morus;* Gr. *μόρον*], a small tree of the genus *Morus*, of which there are many species. Those only which produce the leaf best adapted for the food of the silkworm are of sufficient economical importance to be noticed here. The black mulberry is doubtless indigenous to Europe, and it was cultivated by the ancients for its fruit. Its foliage is sometimes employed to feed the silkworm, though now not often used, the leaf of the white mulberry (*Morus alba*) having proved more suitable for that purpose. The leaves of both species are good fodder for cattle, and in years of scarcity of forage are gathered in the autumn to serve instead of hay, though stripping the tree a second time in the same season to feed either cattle or a late crop of worms is injurious both to its growth and to the quality of the leaf. It is a common mistake of travellers to suppose that the small trees on which vines are trained in Italy are mulberries. The mulberry is indeed sometimes, but rarely, used as a support for the vine, the trees almost universally employed being the elm and a maple often miscalled a poplar—*pioppo* or *chioppo*—in Tuscany. The white mulberry is supposed not to have existed in Europe until after the introduction of the silkworm in the sixth century. Propagation and cultivation, by different methods and under different conditions, have developed several varieties of the *Morus alba*, and the Philippine, *M. multicaulis*, has been supposed to have thus originated, though now, we believe, considered by most botanists a distinct species. The stocks preferred in Italy appear to be the common white of the varieties *Morettiano* and orange or *arancino;* but there are varieties within varieties, and the opinions of cultivators as to their comparative merits differ widely. The relative value of the different varieties of mulberry is a complicated question, depending partly on the quantity of foliage obtainable from a given number of trees; partly on the proportion of edible matter furnished the worm by a given weight of leaves; and partly on the amount and quality of silk-forming material yielded by the foliage. The leaves of some mulberries, and even of other trees—as the Osage

orange, for example—are readily eaten by the worm, but supply little and inferior silk-fibre for the cocoons. In others the proportion of stems, ribs, and other unserviceable parts is so large that an inordinate quantity of leaf is required for a moderate amount of nutriment. According to the tables of Cosimo Ridolfi, the leaf of the *arancino* contains 46 per cent., by weight, of nutritious matter, and upon a given extent of branches this variety produces five times as much leaf as the *Morettiano*, which latter yields 51 per cent. of edible substance, while the leaf of the *arancino*, weight for weight, yields but one-fourth as much silk as that of the *Morettiano*. These proportions, however, are variable, according to soil, season, and treatment, and the mere name of a variety is not a very certain indication of its properties. This should be borne in mind in attempts to introduce Italian mulberries into the U. S.; and it should further be remembered that the physical conditions of the two countries are so different that the experience of the one is of little value as a rule for agricultural practice of any sort in the other. Nothing but careful experiment and observation can guide the cultivator in the choice of the stock to propagate from, and in his modes of cultivation.

The mulberry requires a deep, light, rich soil, and thrives well neither in clay nor in sand. It is best propagated by seed, though the methods of layering and cutting are sometimes employed with the *multicaulis*, and grafting is practised with most varieties, though not often with the *multicaulis* or the *Morettiano*. Ungrafted trees yield the finest silk, but in smaller quantity than grafted. The quality of the leaf is found to depend scarcely more on the variety of stock than on the pruning and other treatment of the plant, the aim of the grower being to encourage the pushing of shoots, which of course increases the yield of tender leaf—and at the same time to produce a foliage neither so fleshy as to supply little silk, nor so fibrous as to furnish little pulpy nutriment for the worm. Irrigation may be employed with advantage to hasten the growth of young plants, but the leaf of freely-watered trees is neither a healthy food for the worm nor rich in material for silk. Water, therefore, should be applied only when clearly necessary. The mulberry may be said to be a long-lived tree, as in Italy it continues productive from the age of 5 years to that of from 50 to 110, and even more, according to soil and treatment. If stripped annually, it should yield, under the most favorable circumstances, from 11 pounds avoirdupois of green leaf at the age of 5 years, when its stem will have attained the diameter of four inches, to 110 pounds at the age of 100 years, with a trunk eighteen inches in diameter; but in inferior soils, the longevity of the tree and the quantity of the foliage are much less. (See Canevazzi, *Agrotimesia*.) The fresh leaf sells at about fifty or sixty cents per 100 pounds, and the weight of cocoons spun by the worms is about one-twentieth of that of the leaves consumed. Many high authorities maintain that it is better economy to strip the trees only in alternate years, the crop of leaf being more than double in quantity and superior in quality to that obtained by annual gathering. In Italy, where the mulberry is planted in grain-fields and other cultivated lands, about two square rods are allowed to a tree, or eighty trees to an acre; and in that climate other crops grown in the same ground do not suffer from the shade or from the spread of the roots, and the tillage of the soil is beneficial to the tree. In the Eastern U. S., however, it is doubtful whether other vegetables could be cultivated advantageously in mulberry orchards. Experiments have been made in Italy with a view of utilizing directly the fibrous material of the mulberry for industrial elaboration, but thus far without important results.

GEORGE P. MARSH.

Mulberry, post-tp. of Autauga co., Ala. Pop. 1551.

Mulberry, tp. of Franklin co., Ark. Pop. 1280.

Mulberry, tp. of Johnson co., Ark. Pop. 341.

Mulberry, post-tp. of Wilkes co., N. C. Pop. 1362.

Mulberry, post-v. of Lincoln co., Tenn., 6 miles N. of Fayetteville. Pop. 124.

Mulberry Grove, post-v. and tp. of Bond co., Ill., on the St. Louis and Terre Haute R. R., 10 miles W. by S. of Vandalia. Pop. 1738.

Mulberry, Paper, the *Broussonetia papyrifera*, a tree of the same family as the mulberry, but of a very distinct genus, indigenous to Japan, and now widely distributed through various parts of the world—a favorite shade-tree in the Southern Atlantic States, barely hardy in the Northern States. From its fibrous inner bark it is said that the tapa cloth of the South Sea Islanders was made. In Tahiti, as we are informed by Capt. Cook in his relation of his first voyage, the finest and whitest cloth, worn by the chiefs and principal persons of the island, is entirely manufactured by a simple process of beating. But it is remarkable that the naturalists of Wilkes' exploring expedition "found not a single stem of *Broussonetia*, although former visitors speak of it as the tree from which the cloth was made." The principal and a very ancient use of this fibrous bark in Japan was for the making of paper of various qualities. The paper-mulberry tree of Japan is called *kadzu*, while the common mulberry is known as *kuwa*. The former grows in a wild state in some parts of Japan, but is extensively cultivated, and the varieties of paper manufactured from it number at least 300, ranging from a leather-like quality a quarter of an inch in thickness to the most delicate gossamer. Certain provinces are famous for their superior qualities of paper, and before the late revolution it was customary for the people to pay part of their annual taxes with paper, which is manufactured to a very great extent in private houses, as well as in regular establishments devoted wholly to that purpose. The part of the tree used in making paper is the bark, and the uses to which it is applied are almost numberless, and might with propriety cause Japan to be called the "paper empire." This paper mulberry is chiefly found in the mountain-districts, attains the height of an imposing tree, and its wood is only used for fuel; but the common mulberry is highly valued for its wood, which is used in making a variety of beautiful articles, as it has a fine grain and may be highly polished. There have been several Japanese books published on the paper mulberry, but none of them have been translated.

C. LANMAN.

Mul'der (GERARDUS JOHANNES), b. at Utrecht Dec. 27, 1802; studied medicine; practised in 1825 at Amsterdam; lectured in 1827 at Rotterdam on botany and chemistry, and became in 1840 professor of chemistry at the University of Utrecht. His *Chemistry of Vegetable and Animal Physiology* (translated into German by Kolbe in 1844, and into English by J. T. W. Johnston in 1849) occasioned a hot controversy with Liebig concerning the existence of PROTEINE (which see) as an independent compound. His *Chemistry of Wine* was translated into English by H. Bence Jones (1857). He also wrote the *Chemistry of Beer*, *De Voeding in Nederland*, *De Voeding van den Neger in Suriname*, *Chemical Researches*, etc., all translated into German, some into French.

Mule [Lat. *mulus*], a name in its widest sense synonymous with hybrid, as when we speak of the mule canary-bird, but more commonly denoting the offspring of the male of the domestic ass and of the mare; the corresponding offspring of the male horse and female ass being the jennet or HINNY (which see), a very different animal. The mule is a hardy, strong, serviceable animal, peculiarly adapted to hard work in hot weather, such as would be too

The Abyssinian Mule.

hot for either the horse or ox. In Spain, Spanish America, and parts of Africa and the East mules are highly prized as saddle animals. In the U. S. they are extensively bred for use on the Southern plantations.

Mule, or Spinning-Jenny. See COTTON MANUFACTURE.

Mule-Deer. See DEER.

Mul′grave (CONSTANTINE JOHN **Phipps**), BARON, b. in England May 30, 1734; entered the navy at an early age; became post-captain 1765; commanded an exploring expedition in search of a N. W. passage 1773; reached lat. 80° 48′ N., whence an impenetrable field of ice stretched northward; published *A Journal of a Voyage toward the North Pole* (1774); succeeded to the title 1775; was commissioner of the admiralty under Lord North's administration, and an ardent politician; was raised to the English peerage in 1784, and d. at Liege, Belgium, Oct. 10, 1792.

Mulgrave (HENRY **Phipps**), FIRST EARL OF, Viscount Normanby, brother of Constantine, b. in England Feb. 14, 1755; served in the British army in America during the war of independence; succeeded to his brother's title in the Irish peerage 1792; was a member of William Pitt's cabinet; became first lord of the admiralty 1807; was a bitter opponent of Catholic emancipation, and was raised to an earldom in 1812. D. Apr. 7, 1831. His son and successor in the peerage was created in 1838 marquis of Normanby.

Mull, one of the Inner Hebrides, off the W. coast of Scotland. It is 30 miles long and 25 miles broad, high, rugged, but fertile, though not suited to agriculture on account of its climate; cattle and sheep are reared. Pop. 6834.

Mul′lan (DENNIS W.), U. S. N., b. Nov. 10, 1843, in Maryland; graduated at the Naval Academy in 1863; became a master in 1866, a lieutenant in 1867, a lieutenant-commander in 1868; served in the Monongahela at the battle of Mobile Bay, Aug. 5, 1864, and was commended for "gallantry." FOXHALL A. PARKER.

Mullan (HORACE E.), U. S. N., b. Apr. 8, 1837, in Maryland; graduated at the Naval Academy in 1860; became a lieutenant in 1862, a lieutenant-commander in 1866; was in several actions during the civil war, and served as executive officer of the Nereus in both the Fort Fisher fights. Highly commended by Com. John C. Howell in his official report of Jan. 16, 1865. FOXHALL A. PARKER.

Mulla′ny (J. R. M.), U. S. N., b. Oct. 26, 1818, in New York; entered the navy as a midshipman Jan. 7, 1832; became a passed midshipman in 1838, a lieutenant in 1844, a commander in 1861, a captain in 1866, a commodore in 1870, a rear-admiral in 1874; served on the E. coast of Mexico during our war with that country, and participated in the capture of Tabasco; commanded the Oneida at the battle of Mobile Bay, Aug. 5, 1864, where he lost his left arm. In his official report of the part taken by his own vessel, the Galena, in this signal victory, Lieut.-Com. Wells says: "Before leaving the anchorage off Mobile bar the Galena was lashed to the port side of the Oneida, and occupied the rear of the line. Both vessels were repeatedly struck, but the Oneida suffered severely, losing a number of men killed and having a number wounded. Her captain, J. R. M. Mullany, under the most trying circumstances displayed the utmost courage and gallantry, while passing through a terrific fire, and only left the deck when he had been severely wounded." FOXHALL A. PARKER.

Mul′lein [Lat. *malandrium*, a leprous disease], the common name of *Verbascum thapsus*, a plant of the family of Scrophulariaceæ or figworts, belonging to a widely-distributed genus which includes more than eighty varieties. The common mullein of the U. S. is a biennial plant attaining a height of from four to six feet, with oblong-acute leaves eight or ten inches long, covered with a soft wool-like pubescence. It is found in Europe and Asia, whence it was introduced into America, where it is a troublesome weed in the farm and garden.

Mül′ler (CHARLES LOUIS), b. at Paris Dec. 22, 1815; studied under Gros and Cogniet; began to exhibit in 1837, and was artistic director of the manufacture of the Gobelin tapestries from 1850 to 1853. His principal pictures are—*Le Martyre de Saint Barthélemy* (1838), *Episode du Massacre des Innocents* (1840), *Appeal des Dernières Victimes de la Terreur* (1850), placed in the museum of Luxembourg.

Müller (FRIEDRICH MAXIMILIAN), LL.D., known as MAX MÜLLER, a son of the poet Wilhelm Müller (1794–1827), b. at Dessau Dec. 6, 1823; studied at Leipsic, Berlin, and Paris, giving special attention to Sanskrit, under such masters as Brockhaus, Bopp, Schelling, and Burnouf; went in 1846 to England, and in 1848 to Oxford; became in 1850 deputy Taylorian professor of comparative philology; professor in 1854; curator of the Bodleian library 1856; fellow of All Souls 1858; and in 1868 received a new professorship of comparative philology. His chief works are—a translation of the *Hitopadesa* (1844), the *Meghadûta* in German (1847), *The Hymns of the Rig-Veda*, with the text and translation of the *Prâtis-âkhya* (1857), the *Rig-Veda* (Oxford, 1849 *seq.*); *History of Ancient Sanskrit Literature* (1860), *Chips from a German Workshop* (1868 *seq.*), a translation of the *Rig-Veda* (1st vol.), *Hymns to the Maruts* (1869).

Müller (GEORGE), b. at Kroppenstädt, near Halberstadt, Prussia, Sept. 27, 1805; studied at the University of Halle; was licensed as a Lutheran preacher; directed his attention to the organization of philanthropical institutions; settled in England 1829, and founded at Bristol in 1835 an orphanage, which has become celebrated from its extensive usefulness, and from being supported entirely by unsolicited voluntary contributions which Müller regards as visible answers to prayer. (See his *Narrative of the Lord's Dealings.*)

Müller (JOHANNES), b. at Coblentz July 14, 1801, in humble circumstances; began to prepare himself for the Roman Catholic Church, but abandoned in 1819 his theological studies, and devoted himself exclusively to medicine; took his degree in 1822, and became professor of physiology and anatomy in 1826 at Bonn, and in 1833 at Berlin, where he d. Apr. 28, 1858. As the founder of the physico-chemical school of physiology he enjoyed the fame of being one of the greatest physiologists of his age, and his publications, numbering about 100, and ranging over the whole field of anatomy and physiology, brought new facts and new ideas to every point of his science. His principal works are—*Elements of Physiology* (1833; translated by Dr. W. Baly, 2 vols., London, 1837–42), *De Respiratione Fœtus* (1823, his first publication), *De Glandularum Secernentium Structura* (1830), *Vergleichende Anatomie der Myxinoiden* (1835–45, etc.).

Müller (JULIUS), a brother of Karl Otfried, b. at Brieg, Silesia, Apr. 10, 1801; studied theology at Breslau, Göttingen, and Berlin; held a position as a country clergyman 1825–31, and as preacher at the University of Göttingen, where he also lectured on theology 1831–35; was appointed professor of dogmatics and ethics at Marburg in 1835, and at Halle in 1839. His principal work is *Die christliche Lehre vom Sünde* (1839), often reprinted, and translated into English under the title *The Christian Doctrine of Sin*, by W. Pulsford (1852–53). With Neander and Nitzsch he founded in 1850 the *Deutsche Zeitschrift für christliche Wissenschaft und christliches Leben*, and as a representative of the evangelical union in the Berlin synod he published in 1854 *Die Evangelische Union.*

Müller (KARL OTFRIED), b. at Brieg, Silesia, Aug. 28, 1797; was educated at Breslau and Berlin; became professor of antiquities at Göttingen in 1819, and became the leading authority in questions of Greek archæology; and while in the pursuit of his favorite studies d. at Athens Aug. 1, 1840. Author of *Ægineticorum Liber* (1817), *Geschichte hellenischer Stämme und Städte* (1820–25, incomplete), *Prolegomenen zu einer wissenschaftlichen Mythologie* (1825), *Die Etrusker* (1828), *Handbuch der Archæologie der Kunst* (1830, etc.), *Hist. of Greek Literature* (Lond. 1847).

Müller (PEDER ERASMUS), b. at Copenhagen May 29, 1776; was educated at Copenhagen; became in 1822 a bishop, and received in 1830 the see of Seeland; was long connected with the *Literary Gazette* of Denmark, and author of many religious and antiquarian works. His *Sagabibliothek* (1816–20) and *Kritisk Undersögelse af Danmarks og Norges Sagahistorie* (1823–30) are of permanent value. D. Sept. 16, 1834.

Muller (WILLIAM JOHN), b. at Bristol, England, in 1812; studied art under J. B. Pyne; travelled in Germany, Switzerland, and Italy; pursued for some time an artist's life in Bristol with slight success; visited Greece and Egypt in 1838, making a series of sketches which introduced him to public favor; settled at London 1839; published in 1841 *Picturesque Sketches of the Age of Francis I.;* accompanied the government expedition sent to Lycia in 1843 to bring the Xanthian marbles to the British Museum, and brought home a fine series of sketches, which were placed in the Royal Academy exhibition. Among his best pictures are views of Athens, of the ruins at Gornou in Egypt, of the Sphinx, of an Egyptian slave-market, of a Turkish burial-ground, and of a Xanthian tent-scene. D. at London Sept. 8, 1845.

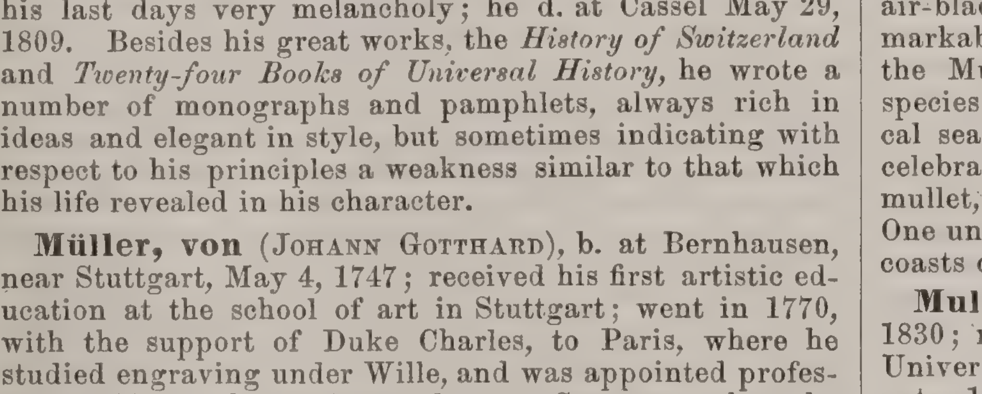
Müller, von (FERDINAND), BARON, M. D., F. R. S., b. at Rostock, Germany, in 1825; was educated at Kiel; investigated the botany of Sleswick and Holstein; emigrated to Australia 1847; made extensive botanical ex-

plorations in South Australia at his own expense 1848–52; was then made government botanist for the colony of Victoria; explored many mountain-ranges previously unknown 1852–55; was naturalist to Gregory's exploring expedition 1855–56; was director of the botanical garden at Melbourne 1857–73, raising that institution to high efficiency and usefulness in the introduction of foreign plants; published *Fragmenta Phytographiæ Australiæ* (8 vols.), *Plants of Victoria* (2 vols.), and *Flora Australiensis* (6 vols.), and other works, and was ennobled by the king of Würtemburg 1871. Many mountains, rivers, and lakes in Australia, as well as a mountain in Spitzbergen and a glacier and river in New Zealand, bear his name.

Müller, von (Johannes), b. at Schaffhausen, Switzerland; studied theology and history at Göttingen; was professor in Greek at the gymnasium of Schaffhausen from 1772 to 1774; retired into private life, and resided till 1781 in and about Geneva, occupied by preparations for his great work on the *History of Switzerland*, of which the first volume appeared at Berne in 1780; was professor of history at Cassel 1781–83, but retired again into private life, and lived at Geneva till 1786. In this year he was appointed court councillor and librarian at Mentz, and when the city was taken by the French in 1791 he repaired to Vienna, where he stayed till 1804, and was treated with much courtesy. The atmosphere of Vienna, however, he did not find congenial to him. Although he was much flattered on account of his Swiss history, he was forbidden to continue it. In 1804 he went to Berlin; was appointed historiographer to the king of Prussia, and received permission to use the Prussian archives for a history of Frederick II. Nevertheless, after the battle of Jena and the occupation of Berlin by the French, Napoleon succeeded in winning him over to his side, and in 1808 Johannes von Müller accepted a position as minister of state to the king of Westphalia. This act, and the very pronounced manner in which he extolled Napoleon, excited great indignation in Germany, and other circumstances, pecuniary embarrassments, political disappointments, etc., were added, making his last days very melancholy; he d. at Cassel May 29, 1809. Besides his great works, the *History of Switzerland* and *Twenty-four Books of Universal History*, he wrote a number of monographs and pamphlets, always rich in ideas and elegant in style, but sometimes indicating with respect to his principles a weakness similar to that which his life revealed in his character.

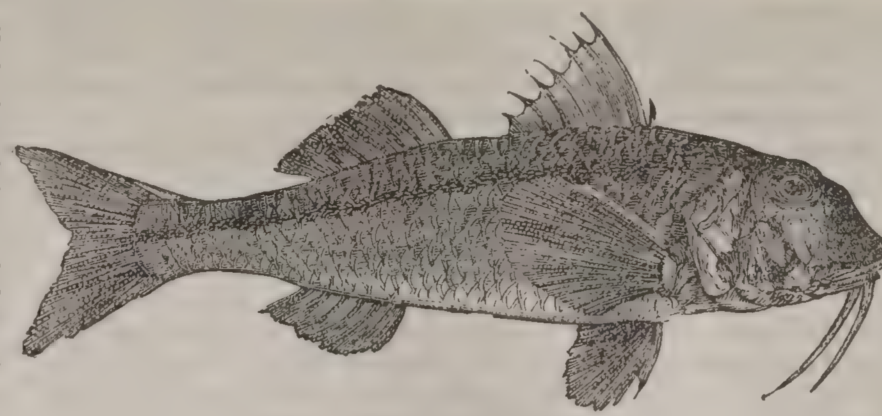
Müller, von (Johann Gotthard), b. at Bernhausen, near Stuttgart, May 4, 1747; received his first artistic education at the school of art in Stuttgart; went in 1770, with the support of Duke Charles, to Paris, where he studied engraving under Wille, and was appointed professor in 1776 at the academy of art at Stuttgart, where he exercised a great influence, had many pupils, and d. Mar. 14, 1830. Among the most celebrated engravings by him are the *Battle of Bunker Hill*, by Trumbull; the *Holy Cecilia*, by Domenichino; the *Holy Catharine*, by Leonardo da Vinci; and the portraits of Louis XVI., Dalberg, and Jerome Bonaparte.—His son, Johann Friedrich Wilhelm, b. at Stuttgart 1782, d. at Pirna, Saxony, May 3, 1816; was educated partly by the father, partly in Paris; became an equally celebrated engraver, and was professor at the academy in Dresden. His engraving after the statue *La Jeunesse* attracted great attention by the manner in which he undertook to imitate marble. But his most celebrated works are the engraving of *Madonna di S. Sisto* by Rafaello, and the portraits of Jacobi and Schiller after the busts by Dannecker.

Mul'let [Lat. *mullus*], a name common to the fishes of the family Mugilidæ (group Percesoces), and often



The Gray Mullet.

extended to the very different family Mullidæ or surmullets and to other fishes. Of the true mullets of the American Atlantic and Gulf waters, the striped mullet (*Mugil lineatus*), the white mullet (*M. albulus*), and the rock mullet (*M. petrosus*) are small but esteemed food-fishes. The seas of the Old World abound in true mullets of many species. They are generally fine for the table, and often ascend rivers, and can be naturalized in fresh water. They are caught and cured extensively in



The Striped Red Mullet.

Europe. The gray mullet (*M. capite*) is one of the best. The Mullidæ or surmullets are popularly called mullets, red mullets, etc. Of the typical genus, *Mullus*, there are several valuable marine food-fishes. *Mullus surmulletus* of Europe is the finest. It is called the striped red mullet. The red mullet of the Gulf of Mexico (*Upeneus maculatus*) is an abundant fish, caught extensively for table use, but rather soft and not excellent. (See Mugilidæ and Mullidæ.)

Mul'lica, tp. of Atlantic co., N. J. Pop. 2265.

Mull'idæ [from *mullus*, the ancient Latin name of the red or surmullet, the typical genus], a family of fishes of the order Teleocephali and sub-order Acanthopteri. All the species have the body elongated and but slightly compressed; it is covered with large and very finely serrated, or almost entire, scales; the lateral line is continuous; the head oblong, and with the profile more or less parabolic; the eyes lateral; the opercular bones almost or quite unarmed; the mouth terminal, and with the cleft lateral and rather small; teeth feeble, and variable in development; branchiostegal rays four; hyoid apparatus with two barbels pendant at the chin; dorsals two, the first with seven or eight spines, the second far behind and with few (I. 8–9) rays; the anal like the second dorsal; ventrals thoracic, with one spine and five rays. The stomach is simple; the air-bladder variable in development. This family is remarkable for its homogeneous character, but less so than the Mugilidæ, although it includes quite a number of species (about fifty), some of which are found in all tropical seas and represent several genera. To it belongs the celebrated *mullus* of the ancients, or the sur- (sure or true) mullet, which has been immortalized in song and legend. One undetermined species is an occasional wanderer to the coasts of the U. S. Theodore Gill.

Mul'ligan (Col. James A.), b. at Utica, N. Y., June 25, 1830; removed to Chicago in childhood; studied at the University of St. Mary's, of which he was the first graduate, 1850; commenced the study of law; accompanied John L. Stephens in the survey of a route for the Panama Railway in 1851; edited a weekly Catholic paper, the *Western Tablet;* was admitted to the bar 1855; appointed to a clerkship in the interior department at Washington 1857, from which he retired at the outbreak of the civil war, when he raised in a few weeks a fine regiment of Irishmen in Illinois (23d Infantry), of which he became colonel; conducted the memorable defence of Lexington, Mo., July to Sept., 1861; was at last forced to capitulate; exchanged in November; reorganized his regiment; was engaged in several hard-fought engagements in Virginia, and was mortally wounded at the battle of Winchester, and d. July 26, 1864.

Mullingar', town of Ireland, capital of the county of Westmeath, has two much-frequented horse and cattle fairs. Pop. 5811.

Mul'lins (William), b. in England about 1575; embraced the principles of Puritanism; settled with his family at Leyden, Holland, in consequence of the restrictions upon religious liberty in England; was one of the principal promoters of the colonization of Plymouth by the Pilgrims; came in the Mayflower, and was one of the signers of the "compact" drawn up on board that vessel in Cape Cod harbor Nov. 11, 1620. According to Morton's *New England Memorial*, Mullins was a man of considerable wealth and influence, and was expected to take a prominent part in the public affairs of the colony, but he d. in the spring of 1621, as also his wife and all the family except his daughter Priscilla, celebrated for her beauty, whose refusal of the hand of Capt. Miles Standish and marriage to John Alden forms the subject of Longfellow's poem, *The Courtship of Miles Standish*. The poet is a descendant of the fair Priscilla, as were also Presidents John and John Quincy Adams and many other eminent Americans.

Müll'ner (Amadeus Gottfried Adolf), b. at Langendorf, in the Prussian province of Saxony, Oct. 18, 1774;

studied law at Leipsic, and practised from 1798 as an advocate at Weissenfels, where he d. June 11, 1829. He wrote on juridical subjects, novels, dramas, and critical essays, and became famous as the author of the two monster tragedies, *February 29* (1812) and *Die Schuld* (1816), which for ten years thrilled with horror the whole public of Germany, Austria, and Scandinavia, and which are still read by all students of German literature, though mostly as objects of mirth.

Mulock (DINAH MARIA). See CRAIK.

Mul'ready (WILLIAM), R. A., b. at Ennis, Ireland, Apr. 1, 1786; went to London in boyhood; became a student of the Royal Academy at the age of fifteen; first distinguished himself in the imitation of classic types, and afterward as a colorist in the delineation of nature. His first pictures were landscapes, but he afterwards became very successful in sketching incidents of every-day life. He was chosen an associate of the Royal Academy in 1815, and an academician in 1816. His pictures gained great popularity at the annual exhibitions, and a large number were purchased for the royal collection and for the Vernon and Sheepshanks portions of the National Gallery. His illustrations to the *Vicar of Wakefield*, published in 1840, are considered among the best efforts of the kind. D. at Bayswater, near London, July 7, 1863.

Multan', or **Mooltan,** town of British India, in the Punjaub. It is a military station, fortified, interesting on account of the ruins which surround it, and of late rising into commercial consequence through the construction of railways and the opening of steamboat lines. Pop. 80,966.

Multino'mial [Lat. *multus* and *nomen*], an expression composed of several terms connected by the sign + or —. (See ALGEBRA.)

Multinomial Formula, a formula for developing any power of a polynomial without performing the successive multiplications. (See Todhunter's *Algebra*, p. 324.)

Mul'tiple [Lat. *multus* and *plicare*]. One quantity is a *multiple* of another when the former can be divided by the latter without remainder. Thus, $8a^2b$ is a multiple of $4ab$. A quantity is a *common multiple* of several quantities when it can be divided by each without remainder. Thus, $20a^2x^3$ is a common multiple of $4a^2x$ and $5ax^3$.

The *least common multiple* of several quantities is the simplest quantity that can be divided by each without a remainder. Thus, $12c^2d^2y^2$ is the least common multiple of $2c^2y$, $4cd^2$, and $6c^2d^2y^2$.

Multiple Point, a point at which two or more branches of a curve intersect each other. If *two* branches intersect, the point of intersection is a *double* point; if *three* branches intersect at the same point, that point is a *triple* point; and so on. It is a characteristic property of a multiple point that the first differential coefficient of the ordinate at that point has two or more values. Thus, the curve whose equation is $x^4 + 2ax^2y - ay^3 = 0$ has a triple point at the origin, at which point the first differential coefficient of the ordinate has the three values, $0, +\sqrt{2}$, and $-\sqrt{2}$. It may happen that two or more branches of a curve are tangent to each other at some point; this point is a species of multiple point, at which the corresponding differential coefficient of the ordinate has two or more equal values. (For the method of discovering multiple points of a curve see Courtenay's *Calculus*, p. 190.) W. G. PECK.

Multiplica'tion [Lat. *multiplicatio*], the operation of finding the product of two or more quantities. The product of two quantities is the result obtained by taking one of them as many times as there are units in the other. The quantity to be taken is called the *multiplicand*, and the quantity by which it is to be multiplied is called the *multiplier*. Both multiplicand and multiplier are called *factors* of the resulting product. In algebra the sign of the product of two factors is + when both factors have the same sign, and it is — when the factors have contrary signs. (For the methods of performing the operation of multiplication the reader is referred to the ordinary treatises on arithmetic and algebra. Also, see HORNER'S METHOD and LOGARITHMS.) W. G. PECK.

Multno'mah, county of Oregon, bounded N. by Columbia River, W. by the Willamette, and E. by the Cascade Mountains. Near the Willamette the soil is very fertile and adapted to grain, stock, and wool raising. The manufacturing interests are described in the article on PORTLAND, the capital. The county is traversed by the Oregon and California R. R. Pop. 11,510.

Mum'ble-the-Peg, tp. of Nicholas co., West Va. Pop. 996.

Mum'ford, post-v. of Wheatland tp., Monroe co., N. Y., is 2 miles N. of Caledonia R. R. Station, and has fine water-power.

Mum'fordsville, post-v. and cap. of Hart co., Ky., on the N. bank of Green River, and on the Louisville and Nashville R. R., 73 miles S. of Louisville. It was an important point during the civil war, and was captured by Gen. Bragg Sept. 17, 1862. Pop. 249.

Mum'my, a preserved corpse or body, especially Egyptian—a term derived from the Persian and Arabic *mom*, "wax," from the material used in the preservation. In Egyptian mummies were called *sahu*, and the art of making them existed from the period of B. C. 3000 to A. D. 325. According to the Greek authorities, immediately after death and the raising of the wail or dirge the bodies of males were removed to the establishments of the *taricheutai* or embalmers—those of females kept at home. A scribe then marked with a reed a line on the right flank, and an operator (*paraschistes*) made an incision along the line under the ribs with an Æthiopian stone, either a flint or obsidian knife. The internal and soft parts were then removed, only the heart and kidneys being left in the corpse; the brain was extracted by a long bronze probe through the nostrils or the foramen magnum, and the body prepared in accordance with the expense laid out upon it. The most costly of the processes then in use cost a talent of silver, about $1218, and consisted in applying drugs, powdered resins, and cassia through the orifices, and in steeping the body in palm wine and soaking it in natron for seventy days. The second style cost about $406, or a mina, and in this the brain alone was removed, the viscera being left inside, but injected with oil of cedar, and the corpse soaked in natron as before, and the viscera left to come away. In the third manner, the poorest, the body was washed with myrrh and salted. The examination of numerous mummies, however, shows that no two are prepared exactly alike, and that certain general processes were used at different periods. Those of the so-called "old empire" appear to have been less carefully preserved, for they are found as mere skeletons which emit a faint odor of bitumen: at the time of the eleventh they are often in the same condition, or else yellow, dry, and brittle, although resins appear to have been employed. Under the twelfth dynasty the mummies become black from the use of bitumen, and the skin, though flexible, dried. From the eighteenth to the twenty-first dynasty the mummies found at Memphis are black and dry, owing to the use of bitumen, while those at Thebes are yellow from the employment of wax, and shining, the nails dyed with *henné*. These styles, with some modifications, continued till the twenty-sixth dynasty. After that age the mummies become black and heavy, forming a compact mass with their bandages, and only separated by force. Those at the Roman period are gray and lissom, but some of the later time only rudely bandaged and steeped in natron. The processes were drying in the sand, steeping in natron, and then drying, boiling in resins, bitumen, or in fine resins only—differences to which the color is due. After preparation they were at the oldest age covered with a shroud and deposited in a wooden coffin, in shape of a mummy with a face, placed in a rectangular sarcophagus with a flat cover of basalt, red granite, or limestone; more careful bandaging, and deposited in a rectangular sarcophagus or coffin made out of a single tree, filled with implements and utensils, appear at the time of the eleventh dynasty; and with scarabæi and other amulets under the thirteenth, but rich coffins and inferior mummies under the subsequent lines. At the time of the eighteenth the bandaging is more perfect, the tomb filled with sepulchral figures, and the viscera, distributed into four portions, and separately embalmed and bandaged, were deposited in the so-called canopi or sepulchral vases in shape of the four mummied gods or genii of Hades—Amset, Hapi, Tuautmutf, and Kabhsenuf—who presided over the four quarters of the compass, to which the viscera were thus symbolically distributed, or, according to the Greek writers, thrown away. For these vases dummies of stone or wood were sometimes substituted by the embalmers, and they were carried in a square chest with compartments, placed on a sledge, to the sepulchre. After this period at Memphis the mummies are provided with amulets of stone and porcelain, the flank incisions covered with rectangular tin plates on which is engraved a symbolic eye, and placed in monolith sarcophagi. At Thebes the bodies are more carefully bandaged in the shape known as that of a mummy, and made symmetrical by the use of pledgets; as many as 700 yards of bandages were sometimes employed, and a papyrus generally placed with the mummy, sometimes spread over the whole form, or else in wooden figures of Osiris deposited in the tomb. They were placed in painted coffins of sycamore-wood in shape of a mummy, the face of a fine wood and the eyes

sometimes inlaid. They become more beautiful at the time of the twenty-second and following dynasties, when the exterior bandages have a kind of leather brace about an inch wide passed round the neck and edged with scarlet leather, stamped at the end with the name and titles of the reigning monarch and scenes of adoration to the god Khem. In other instances the mummies have their outer bandages encased by a cartonage or outer covering of many layers of linen plastered smoothly with a thin coat of lime, on which are painted religious scenes in gay colors *in tempera*, sometimes enhanced by varnish. These are fashioned to the form, and were laced up behind, and the mummies were then placed in coffins not very elaborately decorated, sometimes as many as three in number. The principal mummies of the twenty-sixth and following dynasties, till the conquest of Egypt by Alexander the Great, B. C. 332, come from Memphis, where, however, as at Thebes, the art of embalming was in its decadence, some of the mummies being literally boiled in bitumen and incapable of being developed. At the time of the Ptolemies some good mummies are, however, found, and the custom introduced of gilding the skin in places apparently where it had shown signs of decomposition; the jaws of Greeks were tied up, and the mouth covered with a golden plate or else one of tin. The body still preserved its conventional shape. The sarcophagi of the later period of their reign, and under the Romans, are rectangular, sometimes with a vaulted cover and four rectangular pillars at the corners, a flat board being substituted for the chest on which the mummy was laid, and covered as by a dish cover; the bodies are less carefully bandaged, and covered with another linen covering or shroud, on which is painted a representation of the deceased—when a Greek, in national costume. Sometimes, when plain bandages were used, a well-executed portrait of the dead on panel in thin cedar-wood, painted in encaustic, was placed over the head in the case of Græco-Egyptians. The art, however, rapidly declined, although some well-prepared bodies, the skin of which is well tanned by the different preparations, and the features tolerably preserved, have been found at the Roman period. At this time the hair was often separately embalmed in a mass, the viscera rolled up in packets, placed with the body, and waxen figures of the four genii of Hades placed with them or in the internal cavities of the body. Several mummies of this later period are, however, masses of bitumen adhering to charred bandages; others are prepared with the limbs separately bandaged, while some have the cartonage at the face moulded in the human shape, with Greek wreaths round the head; and at the commencement of the Christian era some few have their shrouds covered with extracts and vignettes of the ritual.

On account of the expense of the funeral, the mummies in their cases were sometimes kept in the house, and occasionally pawned or pledged. All persons, even malefactors, were mummied. It appears that the mummies even of illustrious persons were accessible, for that of Alexander the Great was handled by Augustus, and those of Antony and Cleopatra found in the time of Heraclius. Some of the Hebrews were mummied, Jacob and Joseph having received that rite. The sacred animals, birds, reptiles, and fish, were also embalmed, wrapped in linen bandages, and deposited in sarcophagi or cases, but unaccompanied by amulets. The most remarkable are those of the bulls Mnevis and Apis, coffins and bodies of the last prepared with bitumen, portions only having been found at the Serapeum near Memphis, deposited in immense sarcophagi; the sacred crocodiles from the pits at Manfalut; the cats from Abusir; the ibis deposited in red brick sugarloaf-shaped pots at Sakkara; but other mammals, as apes, the sheep, oryx, dogs, wolves, and jackals, and hawks, vultures, and varieties of snakes and fish, have been found. In the fifteenth and sixteenth centuries the bitumen and other parts of mummies, besides elixirs and preparations made from them, some spurious, formed part of the nauseous pharmacopœia of the period, and the admired dusky backgrounds of many pictures, then and later, is said to be composed of ground mummies. Spurious mummies, even, at the present day, have sometimes been made to impose on collectors of these antiques.

Some other nations practised, but by different processes, the art of embalming. The Persians used for the purpose wax, the Assyrians honey, the Hebrews spices and honey; the Romans also embalmed, but the dry climate of Egypt has alone preserved for centuries bodies so prepared. The idea of preserving the body is in fact universal, but the various means used in modern times have in very few instances kept the body for two or three, never for thirty, centuries. Some dried bodies of Spaniards and Mexicans in the New World, and others in the cloisters of Palermo in Sicily, have been preserved by natural conditions of atmosphere without artificial aid. The ancient inhabitants of the Canary Islands, the Guanches, employed, like the Egyptians, certain processes for preserved bodies or mummies, removing the viscera by an incision, inserting fat, salt, and antiseptic herbs, and after adjusting the corpse in a squatting position sewing it up in the skin of a sheep or goat. Bodies in a similar attitude, but apparently without herbs, have been found in large earthenware jars at Durango, Bogota, and the Paraiba River, and dried bodies in elegant cotton dresses and ornaments have been discovered at Arica and other sites in Peru. In Burmah bitumen has been used for preserving bodies, and cocoanut oil in Nukahiwa in the South Seas, but such temporary expedients can only class with the preservation of animal bodies in spirits of wine or other antiseptics. Some medical men have attempted for scientific illustration, and with more or less success, to preserve bodies by means imitated from the Egyptians. This mode of preservation of the body has proved of great importance for historical and ethnic problems. (See also EMBALMING.) S. BIRCH.

Mumps [Dutch *mumms*]. This is one of the infectious and contagious diseases, and belongs to the same class with whooping-cough, measles, scarlatina, etc. It is often met with when the two latter are prevailing. In some localities with a moist and cold climate it is very frequent (endemic). The principal sufferers are children (mostly male) of from seven to fourteen years, but adults are not exempt. Its period of preparatory development (incubation) lasts from one to three weeks; its principal symptoms are—moderate fever; pain on pressure over the region of the parotid gland, mostly of the left side (but of the opposite side also, and sometimes of both) in front of and below the ear; considerable swelling of that region and the whole cheek and chin; difficulty in deglutition and respiration, corresponding with the amount of swelling; change of the voice; fulness of the head, and dizziness. In many cases the spleen and numerous lymphatic glands are also tumefied. In men the testicles and seminal glands, in women the ovaries, may also swell, and catarrh of the mucous membranes of the eyelids, nose, and mouth is not unfrequent. The disease lasts from a few days to a week; the swelling will subside gradually; in some cases, however, the parts remain large and hard; in a few an abscess will form. The treatment is simple. Regulate the diet, give less meat, more milk, gruel, fruit; vegetable acids (lemonade) or dilute muriatic acid (ten to fifteen drops in a tumblerful of water) as a beverage, mild purgatives (Rochelle salts, seidlitz powder, cream of tartar). The best local applications are raw cotton and cold water; warm water or poultices only when an abscess has commenced to form. No internal treatment except quinine when the fever is high, and iodide of potassium when induration remains behind. It is understood, however, that such treatment ought to be under the superintendence of a physician. A. JACOBI.

Munch (ANDREAS), b. at Christiansand, Norway, Oct. 19, 1810; studied law at the University of Christiania; was employed at the university library from 1850 to 1860, and received in the latter year a pension as a poet from the Storthing. A collection of poems, *Sorg og Tröst* (1852), and several of his dramas, *Salomon de Caus* (1854) and *Lord William Russel* (1857), attracted some attention in the Scandinavian countries.

Munch (PETER ANDREAS), b. at Christiania, Norway, Dec. 15, 1810; studied philology and history at the university of his native city; was appointed professor of history there in 1837, and d. at Rome May 25, 1863. His principal work, *Det Norske Folks Historie* (9 vols., 1852–63), is an exceedingly interesting book, rich in original researches undertaken in Scotland, England, France, and Rome, but sometimes misleading by its audacious hypotheses and too subtle combinations.

Münch-Bellinghausen. See HALM.

Münchau'sen, von (HIERONYMUS KARL FRIEDRICH), BARON, b. of noble family at Bodenwerder, Hanover, in 1720; served in his youth in the Russian cavalry against the Turks 1737–39, and d. at Bodenwerder in 1797. The baron was throughout life accustomed to entertain his friends (in a singularly modest way and with an air of truthfulness) with wonderful tales of his exploits in the wars, and enjoyed the reputation of being the greatest liar in Germany. It is believed that the first published collection of his stories appeared in English, and was written by Rudolph Eric Raspe, a German exile, and published in 1785 in London. Many of the tales ascribed to him are very old; and it is stated that Raspe composed the work as a satire upon the *Mémoires* (1784) of the baron de Tott (1733–93).

München-Gladbach, town of Rhenish Prussia, 16 miles S. W. of Düsseldorf, is an important manufacturing

centre, especially linen and damask, but also woollen, silk, machines, etc. Pop. 26,326.

Mun'cie, post-v., cap. of Delaware co., Ind., 110 miles N. of Cincinnati, on the Cleveland Columbus Cincinnati and Indianapolis and the Fort Wayne Muncie and Cincinnati R. Rs., has fine schools, 9 churches, a city hall and court-house, 2 national banks, 23 manufacturing establishments, 3 weekly newspapers, 1 public library, a lyceum association, and stores. Pop. 2992.

J. D. WILLIAMS, ED. "MUNCIE DEMOCRAT."

Mun'cy, post-b. and tp. of Lycoming co., Pa., on the W. branch of the Susquehanna, and on the Philadelphia and Reading and the Philadelphia and Erie R. Rs., has 1 female seminary, 5 churches, 1 bank, 1 newspaper, a fire insurance company, 1 planing-mill, 3 flouring-mills, several saw-mills, 2 hotels, patent hay-fork factory, and stores. Business, farming and lumbering. Pop. of b. 1040; of tp. 978. G. L. J. PAINTER, ED. "MUNCY LUMINARY."

Muncy Creek, tp. of Lycoming co., Pa. Pop. 1510.

Muncy Station, post-v. of Clinton tp., Lycoming co., Pa., on the W. bank of the Susquehanna (W. branch), and on the Philadelphia and Erie R. R., 12 miles E. by S. of Williamsport.

Mundt (KLARA), best known under her pseudonym "Luise Mühlbach," b. at Neubrandenburg Jan. 2, 1814; married Theodor Mundt in 1839; d. at Berlin Sept. 27, 1873. She wrote about 100 volumes of romances, the greater part of which treat subjects of modern Austrian, Prussian, French, and Egyptian history.

Mundt (THEODOR), b. at Potsdam Sept. 19, 1808; studied philology and philosophy at Berlin and Leipsic; travelled much; settled in 1839 at Berlin, and began to lecture at the university on literature and history in 1842; was appointed professor at Breslau in 1848, but returned in 1850 as director of the university library to Berlin, where he d. May 30, 1861. Of his critico-historical sketches several have great value: *Charlotte Stieglitz* (1835), *Nicolo Machiavelli* (1851), *Paris and Louis Napoleon* (1858). Also some of his novels are interesting: *Thomas Munzer* (1841), *Carniola* (1844), *Mendoza* (1847). But in his last days he began to write historical romances —*Graf Mirabeau* (1858), *Robespierre* (1859), *Czar Paul* (1860).

Mun'dy, tp. of Genesee co., Mich. Pop. 1371.

Mun'ford (WILLIAM), b. in Mecklenburg co., Va., Aug. 15, 1775; graduated at William and Mary College; studied law under George Wythe; sat in the Virginia house of delegates 1797–1801, in the senate 1801–05, and in the privy council 1805–11, and was thereafter clerk of the house of delegates for the remainder of his life. In 1806 he began, in conjunction with W. W. Hening, to report the decisions of the supreme court of appeals of Virginia (4 vols. 1806–09), and afterwards published 10 volumes from his own pen, continuing that collection (1810–20); he was also one of the assistants of Benjamin Watkins Leigh in the revision of the Virginia statutes in 1819. Munford published a juvenile volume of *Poems* (Richmond, 1798). Much of his leisure throughout life was devoted to translating the *Iliad* of Homer into blank verse, which was posthumously published (1846), and was commended as a correct and sometimes a spirited version. D. at Richmond June 21, 1825.

Munfordsville. See MUMFORDSVILLE.

Mun'go (SAINT), or **Kentigern,** one of the three earliest missionaries who introduced Christianity into Scotland. Whilst his associates, Sts. Columba and Ninian, devoted themselves respectively to the tribes of the S., W., and N., Mungo was the apostle of the Welsh or British races inhabiting the districts between the Clyde and the northern boundaries of Cumberland. The son of a British prince, he was b. at Culross, on the Forth, about 514, and d. at a monastery he had founded on the site of the cathedral of the modern Glasgow about 601. Many miracles were ascribed to him, and numerous fabulous biographies are preserved.

Mun'goos, or **Mongooz** (a native Malagasey name), the name of the *Lemur mongoz*. (See LEMURIDÆ, etc.)

Mu'nich [Ger. *München*], capital of Bavaria and residence of the king, with 169,693 inhabitants, is on the Isar, 1868 feet above the sea, at the southern extremity of an extensive plain. The city proper is situated on the left bank of the Isar; only some suburbs extend along the right bank. In architectural respects it is the most beautiful and interesting city in Germany, and one of the richest in sculptures and paintings. A perfect building of almost every known style is found here. Nearly in the centre of the city, on the Max-Joseph place, which contains the bronze statue of King Max (1825) by Rauch, is the royal palace, consisting of three parts—the king's house, the banqueting-house, and the old residence. The king's house was built by Klenze 1826–35, and is an imitation of the Palazzo Pitti in Florence. Its interior is very rich in marbles and frescoes, among which are the celebrated Nibelungen frescoes by Schnorr. The banqueting-house was built by Klenze 1832–42 in Renaissance style, and has a large balcony resting on ten Ionic columns. The old residence was built at different periods, and contains many beautiful bronze statues, among which the most celebrated is the fountain group, an imitation of Benvenuto Cellini. The palace is connected by a winter garden with the theatre, which is the largest in Germany, having seats for 2500 persons; it was burnt down in 1823, but rebuilt in 1825, after plans by Fischer, and is 150 feet high, 195 feet broad, and 235 feet long. On the other side of the palace the royal garden is situated, surrounded on two sides by arcades which are connected with the banqueting-house. On the southern side of the Max-Joseph place stands the post-office, in Florentine style. The so-called generals' hall, an imitation of the Loggia dei Lanzi in Florence, was built in 1844 by Gärtner, and consists of an open hall 58 feet high, 117 feet broad, and 39 feet long, in which stand the bronze statues of Tilly and Wrede. From this building begins the Ludwig street, running northward, terminating at the Siegesthor ("Gate of Victory"), and consisting almost entirely of monumental buildings. Among these are the Odeon, built in 1828 by Klenze; the palaces of the duke of Leuchtenberg and of Duke Max; and the ministry of war—all built by Klenze; the library, built by Gärtner 1832–42, in Florentine style, and containing 800,000 volumes and 24,000 MSS.; the university, the seminary, and the Max-Joseph School, which three buildings, built in 1840 by Gärtner, form a large square. The Siegesthor, an imitation of the triumphal arch of Constantine at Rome, was commenced by Gärtner and finished in 1856 by Metzger; on its top stands Bavaria on a quadriga drawn by lions, after a design by Schwanthaler. Starting from the royal palace to the N. W., and passing by the Theatiner church, built 1661–75 in Italian rococo style, the Wittelsbacher place is reached. It contains the equestrian statue of the elector Maximilian I. by Thorwaldsen, and the Wittelsbacher palace, commenced by Gärtner and finished by Klump in 1850, in mediæval style, with pointed arches. At the end of the Brienner street is the Propylæum, built by Klenze in imitation of the Propylæum of Athens, with reliefs by Schwanthaler. On this side of the gate is the Kunstausstellungsgebäude; to the right, the celebrated Glyptothek, built 1816–30 by Klenze in Ionic style, with a portico resting on twelve columns, and a magnificent tympanum with a marble group by Wagner and Schwanthaler. Twelve rooms are arranged around a quadrangular courtyard, from which they are lighted, the building having no windows on the exterior side; eleven rooms contain antique marbles, the twelfth modern. Near by are the establishment for painting on glass and the famous Pinakothek. The old Pinakothek was built 1826–36 by Klenze in Renaissance style, is 520 feet long, and contains 1300 pictures arranged in nine large rooms lighted from above, and twenty-three smaller rooms lighted in the ordinary way. The ground floor is occupied by a collection of engravings, containing about 300,000 pieces, a collection of drawings, numbering about 9000, and a collection of Grecian and Etruscan vases. To the W. of this building is the Polytechnicum, a structure in rich Renaissance style, and to the E. the new Pinakothek, which was built 1846–53, after a plan by Voit, and contains pictures by modern artists. It comprises six large, five minor, and fourteen small rooms. The exterior of the building is covered with frescoes, executed by Nilson after Kaulbach's sketches. Other noteworthy buildings are the bronze-foundry, with a collection of models and an exposition room; the Schwanthaler Museum, containing nearly all the plaster models by this artist; the Academy of Science and Art, with an immense collection of fossils, a collection of minerals, of coins, of physical and optical instruments, etc. To the S. W. of the city, near the Karl Gate, stands the Ruhmeshalle ("Hall of Fame"), built in the form of a horseshoe, with forty-eight Doric columns, and finished in 1853 after a plan by Klenze. It contains the busts of seventy-six renowned Bavarians. In front of the buildings stands a colossal figure of Bavaria, 66 feet high, modelled by Schwanthaler. A beautiful view towards the Alps can be had from the interior of the head. The principal churches are the Frauenkirche, the metropolitan church of the archbishop of München-Freysing, built in the fifteenth century in Gothic style, and containing a beautiful monument over the emperor Ludwig of Bavaria; St. Michael's Hofkirche, built in the latter part of the sixteenth century, in Roman Renaissance style; the Auerkirche, built 1831–39 by Ohlmüller in Gothic style, with beauti-

fully painted windows; the Basilica des heiligen Bonifacius, an excellent imitation of the old Italian basilica, built by Ziebland and finished in 1850, with sixty-six columns, beautiful frescoes, and thirty-four medallion portraits of popes. Here is the tomb of Ludwig I. (Ludwigskirche), built 1829–43 by Gärtner in the Italian round-arch style. Over the portal stand Christ and the apostles by Schwanthaler; the interior contains beautiful frescoes by Cornelius and his disciples. The Allerheiligenkirche or Neu Hofkapelle, E. of the royal palace, was built in 1837 by Klenze in Byzantine style, and is a very elegant though small structure. The Protestantische Kirche was built 1827–32 by Pertsch. The city is generally well laid out, and has broad streets and many large public squares. It has grown rapidly: in 1801 it had but 40,000 inhabitants. It is thus, for the most part, a new city. The artistic epoch which King Ludwig inaugurated proved lasting. The Academy of Fine Arts, comprising three divisions — architecture, sculpture, and painting — and under the leadership of able men, attracts steadily a great number of young students. The same is the case with the famous Conservatory of Music. The city occupies also a high rank in science. The university is frequented by 1500 students. There are many scientific associations, good educational and numerous benevolent institutions. The manufacturing industry is not important, though of late several branches have been started with success in the suburbs of Thalkirchen and Haidhausen. The bronze-foundries, the porcelain manufactures at Nymphenburg, the glass-painting establishments, all founded by the government, flourish; also the optical institute founded by Fraunhofer. The breweries are very extensive; the commerce is not important; corn is the principal article.

The city appears for the first time in history in the twelfth century; in 1254 it was fortified, and from the emperor Ludwig of Bavaria it received many privileges. In 1632, Gustavus Adolphus of Sweden entered it victoriously. The elector Karl Theodor improved the fortifications at the end of the eighteenth century. In 1800 it was captured by the French. In 1814, King Maximilian I. commenced the rebuilding and beautifying, which were continued in a brilliant manner by Ludwig I. and Maximilian II. AUGUST NIEMANN.

Munic'ipal Corpora'tions. The general nature and powers of a corporation have been stated in a former article. (See CORPORATION.) It is only proposed to refer at this time to some principles of law of special value in their application to such organizations as towns, counties, cities, and villages.

The object of such institutions is to administer local government. Theoretically, the entire business allotted to cities and villages might be conducted by the central authority, or, in other words, by the state. Convenience demands that the state should refer to the people of the district the management of those public concerns which most nearly affect them, while it reserves to itself the control of those subjects of more general importance and interest in which the entire community are concerned. It will lie with each state to determine precisely where the line between general and local government is to be drawn, and what powers are to be reserved to itself and what are to be delegated to these local bodies. This delegation of powers is made by law, and may at any time be withdrawn. Whatever may have been true of municipal corporate charters in mediæval times as to their being treaties between feudal lords and commercial communities, it cannot be claimed that the organization of a city or a village by a State of this country has within it any of the elements of a contract. The State may accordingly change its so-called "charter" at will, now enlarging and again restraining its powers. There has been in some quarters a disposition to make a distinction between the power of the State to change at will the organization of the corporation, and to appropriate its property to other public uses. It is claimed that while the powers of the city, etc. are public, its property is *private*, and that it thus has vested rights which the State cannot interfere with, as they are within the ordinary constitutional restrictions. Though this distinction has considerable authority to sustain it, its inherent soundness may well be doubted. All of the city property is in the eye of reason impressed with a public use. When the State appropriates the property to other public uses than those at first designated, there is no change in the substance of the use, but only in the form of application. The other view makes the mere formal existence of the corporation the test of ownership. The more philosophical theory is, that the city is but the instrument of the State, and that all its acquisitions are State property, held by itself as a mere trustee. An important qualification of the theory is, that the State could not so interfere with the rights of the city's creditors as to prevent the municipal property from being appropriated for their benefit in a way contemplated by their contract. A cognate question may be suggested as to the right of the State to tax the inhabitants of a city or town without their consent for such public purposes as it may see fit. It would seem that this power cannot on principle be denied in those States where there is no constitutional restriction upon the capacity of the legislature to levy taxes. The legislature may in that case tax a portion of the State without taxing the residue for any purpose for which taxation is generally admissible. Of course, the rules already stated must give way when there are constitutional provisions interfering with their operation.

It is of great importance to determine what powers may properly be exercised by municipal corporations. Under a system of universal suffrage there is naturally a tendency on the part of municipal councils and managing boards to strain powers of raising and expending money to their utmost tension. It is also possible for unprincipled political leaders to turn such powers as may be under their control to purposes of personal or party aggrandizement. The question is becoming a pressing one as to the best mode of checking a truly alarming tendency to incur the most extravagant expenditure, principally in the way of incurring debts to be liquidated at a future and perhaps distant day. Constitutional restrictions will probably be the only safeguard in such cases, securing the check of the action of the entire people of the State against local wastefulness.

In considering the powers of these corporations the leading question is as to what may be fairly implied from their ordinary functions. Will they, for example, have an implied authority to borrow money for the purpose of accomplishing an object conceded by their charter? Can they give negotiable notes? Can they furnish entertainments to citizens or guests on public occasions? Can they make pecuniary grants to railway companies to aid in constructing roads which if constructed will apparently conduce to the prosperity of the municipalities? What is their police power as exercised in the way of prevention of fires, or in the establishment of quarantine laws or rules for the preservation of the health of the citizens?

In solving such questions as these it is a reasonable conclusion that whatever can be regarded as proper and necessary to carry into effect the powers granted in the charter may be implied. Thus, if a city were authorized to erect expensive public buildings, and it were necessary under all the circumstances to borrow money, the power to borrow would be granted by implication. It would be very difficult to suppose that under any usual grant of corporate powers there would be any authority to give public entertainments to citizens and others, or to render pecuniary aid in the construction of railways. There are, however, not unfrequently found in the municipal charters express provisions defining the corporate powers as to these subjects. A question of great magnitude has arisen as to the constitutional power of the legislature to authorize towns or cities to raise money for railroads. The real basis of this inquiry is, whether such aid is given for a public use. If it be, then the legislative authority may properly be regarded as an exercise of the power of local taxation. On the other hand, if the contribution to the railroad be considered as essentially a gift to a private corporation for its own purposes, then the legislative act would transcend constitutional limits. The true view is, that the subscription to the railroad is for a public purpose, and accordingly it is within the taxing power of the legislature to authorize it. Roads have always been regarded as governmental affairs, and the legislature, in the absence of constitutional restrictions, may exercise in their favor the power of "eminent domain," as well as the power to tax. Still, these views would lend no color to the proposition that the legislature might authorize a town or a city to raise money to contribute to a purpose essentially private, as to aid in fostering individual enterprise, even though that might incidentally contribute to the general prosperity. In order that the power to tax may be properly exercised, the use to which the proceeds are to be devoted must be public *in its own nature*. Guard this doctrine as we may, it is a dangerous power to trust without limitation to a State legislature. There is a growing tendency among the people of the respective States to limit by constitutional restrictions the action of legislative bodies in this respect. The experience of the last few years has been fruitful in warnings as to the evils of permitting towns at will to call upon the legislature to sanction the creation of debts which on their face appear to be incurred for objects the most meritorious and useful to the public. It is possible, however, that the magnitude of the evil will to a certain extent work out its own cure. The heavy taxation thereby occasioned is so distasteful to property-owners that it will probably become

more and more difficult to obtain legislation authorizing expenditures even for purposes so universally recognized as public in their nature as the building of railways.

It is not expedient in an article like the present to give any sketch, however general, of the specific powers conferred by legislatures upon municipal corporations. The laws upon this subject may be either general or special. In a number of the States there are general laws for the incorporation of villages. Such a system might, one would think, be advantageously applied to the cities. It would seem that a general scheme might be supplied for all such matters as the cities had in common, while special clauses might be adopted to meet any subordinate points of difference growing out of the varying circumstances of the municipalities. The time of the courts would in such a case be much less occupied with the interpretation of crude and imperfectly framed charters, and municipal government, administered in the main with uniformity throughout a State, would be more readily understood by its citizens, and defects in its practical working would be more readily supplied.

It is important to notice a fundamental distinction in the modes by which municipalities are managed. In some of them—*e. g.* the New England towns—all the members act at a regularly constituted meeting. The principle of representation is not introduced. In others the citizens select by vote (usually by ballot) members of councils, and perhaps a mayor, who, on the principle of representation, make the ordinances and more or less fully manage the business of the corporation. In this last class of cases the people at large have no authority to perform corporate acts. Their function is at an end when their representatives are elected. Legal rules are provided to fix the times and places of meeting, to supply notice when deemed necessary to the members, to regulate casting of votes, and the mode of determining the validity of an election. The details upon these points must be sought in the treatises upon this subject.

Municipal corporations, like other corporate bodies, have power to make by-laws. These often assume great importance, and are known as "ordinances." These are various in their nature. The authority to enact particular ordinances is in some instances expressly granted; in others it is inferred from the general clauses conferring powers. Where the right exists the ordinance may be enforced by a pecuniary fine, but cannot be attended with forfeiture of property or imprisonment without clear expressions to that effect on the part of the legislature. The common mode of collecting the fine is by an ordinary action in some appropriate court. There are frequently municipal courts, such as mayor's, recorder's or city courts, in which business of this kind can be transacted.

There are frequently to be found in the charters provisions not only as to the contracts which can be made, but also as to the mode of entering into them. An instance is that certain work must be done by contract made by the corporation with the lowest bidder. In such a case as this a contract made without complying with the direction is illegal and void, and cannot be enforced against the corporation. Such a provision must receive a reasonable construction, and be confined to a case where competition is possible. Accordingly, it could not be extended to a contract for lighting the streets made by the city with a gas company which had by law the exclusive right to supply gas. A very leading question on this branch of the subject has been whether a municipal body is bound by its negotiable bonds, put upon the market and transferred to holders in good faith, when they have been issued without entire conformity to the statute authorizing them. It will be conceded on all hands that if there is a *total lack of power* to issue such bonds, they are of no value in the hands even of an innocent holder, for he is bound to consult the statute to ascertain the corporate powers. The difficult point has been whether, if the power was granted subject to certain conditions, the holders of the bonds must prove affirmatively that those conditions existed, and whether the certificate of the officers empowered to issue the bonds would be sufficient to support the title of a purchaser in good faith, even though as a matter of fact the conditions had not been performed. The Supreme Court of the U. S. has gone very far in the interests of commerce and the ready circulation of such instruments in upholding their validity under such circumstances. The result of their view is, that the municipal body is *estopped* as to such purchasers as have been referred to (see ESTOPPEL) from denying the truth of the certificate granted by the commissioners having the issue of the bonds in charge that the necessary preliminary steps have been taken.

There are other points of much importance concerning the exercise of the power of "eminent domain," the control of public streets, the responsibility of the corporation for defects in highways and consequent injury to travellers, as well as of local taxation and assessments, and the rules of proceeding to divest the title of landowners in case of non-payment. It is impossible to follow these out into their details, and reference can only be made at the close of this article to accurate sources of information.

The great frauds practised by unfaithful and corrupt officials upon the city of New York have brought recently into much prominence the right of the State, as distinguished from the city, to interfere and bring an action to recover from the wrongdoers the amount misappropriated by them. The State court of appeals expressed some doubt upon the point whether a well-known rule of the English court of chancery, that the attorney-general, representing the king, may sue to enforce the execution of trusts by public corporations or their officers, prevails in the State of New York, and decided that even if it does, it does not authorize or sanction an action in a court of law as distinguished from equity to recover from a wrongdoer either money or other property belonging to the corporation, or damages for a fraud practised upon it. It has also been decided that this principle is not affected by the fact that the city and its officers, having authority to act in the premises, have with full knowledge acquiesced in the misapplication and colluded with the wrongdoer to shield him from responsibility by means of judicial remedies. A full exposition of the reasons governing the decision will be found in the cases of *The People* agt. *Ingersoll*, 58 New York Reports 1, and *The People* agt. *Fields*, ib., 491. The result of these cases, if generally acquiesced in, puts the rights of taxpayers upon a most precarious footing, and imperatively calls for well-studied and efficient legislation to render municipalities amenable to judicial investigation. It is worthy of consideration whether the doctrine underlying these decisions can be maintained—viz. that when the obligations of a municipal corporation are issued under an unfounded pretence of authority, and the moneys raised thereon paid into its treasury, they become the funds and property of the corporation invested with the security of private or individual rights. However, if this be true, as the court has determined in the absence of all legislation, it will scarcely be pretended in any quarter that the legislature cannot control and qualify municipal ownership, and impress such a trust upon it and confer such rights of action as to enable the courts to fully protect the taxpayers, and relieve them from the burdensome effects of malfeasance on the part of the corporation or its officers.

(For further information consult for the history of municipal corporations Guizot's *History of Civilization;* Smith's *Wealth of Nations;* Hallam's *Middle Ages;* Merewether and Stephens's *History of Boroughs and Municipal Corporations.* See also the treatises on general corporation law of Grant, Kyd, and Angell and Ames; the special treatises of Willcock, Glover, and Dillon on *Municipal Corporations.* Refer also to Kent's *Commentaries*, lecture 33, and Abbott's *Corporation Digest.*) T. W. DWIGHT.

Municipal Government. See MUNICIPAL CORPORATIONS, by PROF. T. W. DWIGHT, LL.D.

Municipal Law of England and the U. S. The general nature of law and jurisprudence has already been sufficiently considered in the articles on jurisprudence and law. (See LAW and JURISPRUDENCE.) The civil or Roman law, the basis of the municipal law of the states of continental Europe, has also been referred to. (See LAW, CIVIL.) The scope of this article is a general description of the municipal law of England and the U. S. This consists of the whole mass of legal rules adopted in England or in any of the States to control the civil conduct of the people. It is divided into two principal branches, common law and statute. The "common law" is supposed to consist of customs, either of general or particular application, handed down from ancient time, or, in legal phrase, from time "whereof the memory of man runneth not to the contrary." These customs are divisible into two leading classes, general and particular. The former prevail throughout the State or country; the latter are recognized in particular localities, and must be proved, as a matter of fact, to exist. The general customs are of course by far the most important. They are such general rules as these: that a deed must be in writing, sealed and delivered; that under the rules of descent land passes to the eldest son of the ancestor; that a corporation is an artificial person, capable of suing and being sued as an individual, etc. etc. There are also many maxims or enunciations of general principles that are component parts of the common law. (See MAXIMS.) When any question arises concerning these general rules, they are referred to the courts, through the medium of a controversy between particular parties known as a "case," and the judges in deciding the case apply what they deem to be a pertinent general rule to its facts. The rule thus

stated is supposed, more or less correctly, to have existed from time immemorial. Whether that be a fact or not, the enunciation of the principle becomes a rule to govern other cases presenting the same substantial facts. It is only in this way that legal rules become officially recognized. The opinions of text-writers, however convincing as arguments, do not strictly become law until they receive, in the way just pointed out, the sanction of the courts. Nor can the judges themselves, without some statutory or constitutional provision to that effect, state a legal rule except as applicable to what appears to be an actual controversy between parties. The common law thus consists of principles derived from a collation of precedents or decisions of actual cases. (See PRECEDENTS.) These decisions are collected in books called "reports" of cases, which form a large and indispensable part of every legal library. (See REPORTS.) There are undoubtedly some serious objections to this mode of generating law. Still, it has some important advantages. Chief among these are that its tendency is to elicit thorough discussion, owing to the great interests frequently involved in the controversy, and that the judiciary, instead of regarding legal questions from a purely scientific and abstract point of view, are apt to consider them in their practical bearing and their application to the wants of the people. Every careful observer is able to note a progressive tendency in the rules of the common law, and a close adaptation to the business and social movements of the age, which he would perhaps look for in vain in a non-elastic code of purely written law, under which the judges might be occupied with the mere construction of words instead of the discussion of principles.

Upon the emigration of Englishmen to this country at its first settlement it would naturally be expected that they would resort for general principles of law to the system with which they were familiar at home. This result actually followed, and they adopted such principles of the common law as were suited to their condition, while they rejected such as were not adapted to their altered states and circumstances. On similar grounds, it may be maintained that the early English statutes were adopted as part of the common law of the colonies, while the later ones could only become binding by means of an express enactment. When the Revolution occurred the American States were plainly at liberty to reject the whole body of the English law and to adopt another system. They, however, as was natural, determined, either by tacit consent or by express statutory or constitutional provision, to adhere to their ancient usages. An illustration will be found in the early New York constitution of Apr. 20, 1777. In the 30th article it is provided "that such parts of the common law of England, and of the statute law of England and Great Britain, and of the acts of the legislature of the colony of New York, as together did form the law of said colony on the 19th day of Apr., 1775, shall be and continue the law of this State, subject to such alterations and provisions as the legislature shall from time to time make concerning the same." The same clause has been inserted in later constitutions. Similar provisions in other States applicable to this subject are industriously collected by Mr. Joel P. Bishop in his work entitled *The First Book of the Law*, ch. 6, note 4 to section 58. The only State to be regarded as an exception to the general rule is Louisiana. Before the cession to the U. S. of the territory from which that State was formed it was governed by the "civil law" of Spain. This law still forms the basis of its civil jurisprudence, modified to some extent by the rules of the common law. While there is thus a common substratum of law in all of the States of the Union (excepting Louisiana), it would readily be supposed that there would be some divergence of decision among them in the development of legal principles. The courts of each State are supreme and without appeal except in matters involving the construction of the Constitution of the U. S. and of the laws and treaties made under it, in which case the Supreme Court of the U. S. is the final interpreter. The State courts of final appeal have in important instances reached conclusions upon the same state of facts diametrically opposite. Such results are highly inconvenient between States so closely allied to each other in business interests. It is to be hoped that at some not distant day measures may be adopted whereby the respective States may arrive at harmonious results upon points not involving any sacrifice of principle. This might, perhaps, be accomplished on the recommendation of a competent commission by means of supplementary legislation.

It should be added that there is no common law of the U. S. as distinguished from that of the separate States. The general government was called into being by a written constitution, which is the measure of the powers of the legislative and other departments organized under it. Although Congress may by an enactment adopt the rules of the common law as applicable to subjects coming within its power, still, in such a case, the basis of the law is the underlying statute. On the other hand, the common law of the States precedes the statute or constitutional provision which may sanction it. (Consult upon this point the case of *Wheaton* v. *Peters*, 8 Peters's Reports, 591; *Kendall* v. *U. S.*, 12 ib., 524.)

In regard to the second branch of the common law (particular customs) but little need be said. There may grow up in localities or in particular departments of trade or business special customs applicable to persons dealing in that locality or engaged in that branch of business. The validity of the custom, when proved to exist, is to be tested by established legal rules. It must be shown to have existed for a sufficient time to be notorious, and to have met with general acquiescence, to be sufficiently distinct and certain, and not to be unreasonable and contrary to justice. Knowledge of the custom must be brought home to the person to be affected by it. Such knowledge, however, may be presumed when it has become generally known to persons residing in the locality or engaged in the business to which the custom appertains. Special questions arise when it is sought to alter or add to the terms of a written instrument by evidence of a custom. (See INTERPRETATION.)

The second principal department of municipal law is statute law. In this connection reference should be made to provisions found in State constitutions which are in their nature only rules of municipal law. It can be seen at a glance that if the promoters of a mere rule of municipal law desire to give it an irrepealable character, they have no means of doing so by force of an ordinary statute. If, however, they can secure its insertion in a constitution, it will remain law until the constitution itself is amended. It may thus happen that a constitution may to some extent part with its true character as a statement of the fundamental principles of government, and become a mere repository of rules of municipal law which should regularly be found in a statute. The necessity of statutes or rules adopted by the legislature can be readily perceived to follow from the very nature of the common law. When a principle announced by the courts as fully settled is found to work a hardship or to be unsatisfactory in its nature, the people, through their representatives in the legislature, have an efficient remedy at hand. They may at once change the common law by means of a statute. Statutes are adopted in England by Parliament, in this country either by a State or territorial legislature or by Congress. They are, as it respects the persons to whom they are to be applied, either public or private; as to their nature, they are either declaratory or remedial. A statute is said to be declaratory when it reaffirms the common law, which is for some reason obscure or has perhaps fallen into disuse; it is remedial when it changes or modifies the former law, perhaps making its rules more comprehensive or restricting their operation. The general principles governing the interpretation of statutes have been stated in a former article. (See INTERPRETATION.) When a conflict occurs between the common law and a statute, the former must give way, and the same rule is applied as to inconsistencies between earlier and later statutes, or even between earlier and later clauses in the same statute. The former law, though there be no express words, is in such a case repealed by implication. No legislation is irrepealable. Each successive legislative body has control over the entire domain of legislation, except so far as there may be a restraint of a constitutional nature already referred to. It is a rule of general application that the statute, where there are no words to the contrary, acts simply within the territorial dominions of the State which enacts it. Still, in special cases, where the intent is apparent, a State may govern the acts of persons beyond its limits, assuming that they or their property at a subsequent time may come within reach of its tribunals. Statutes of a State in this country must be made to correspond both with the State and national constitutions, while the acts of Congress must correspond with the national Constitution; otherwise, they are ultra-constitutional and void. The proper tribunals have power to pass upon the question of such correspondence, the State courts in general being the final interpreters of the validity of a State law when compared with the State constitution, and the U. S. Supreme Court of the correspondence between either a State law or one of Congress in the U. S. Constitution.

It was the former practice to frame statutes in circuitous and involved forms of expression, with provisions and qualifications and many repetitions, with the design thereby of securing greater accuracy of statement. To a person not trained in the law they were obscure and forbidding, so that even an eminent English statesman is reported to have said that nothing was more distasteful to him than to

read an ordinary act of Parliament. In modern times it is quite the practice to arrange statutes in chapters and sections, and to use ordinary and familiar forms of expression. Codes of statutory law have thus been introduced under the name of "revised statutes." This is true both of statutes of the States and of the U. S. A revision of the early statutes is also making in England.

Statutes are cited in different ways—in early times by the Latin words with which they commenced, as "Quia emptores," etc. Sometimes they are referred to by the towns where the Parliament was held, as the "Statutes of Merton" or "of Gloucester." The acts passed in the interval between the execution of Charles I. and the Restoration of Charles II. are no part of the English law, but are published in a separate volume, known as *Scobell's Acts.* For many years statutes have been cited as of the year of the reign of the king or queen in which they were passed. The separate acts passed are termed "chapters." In this country they are cited under the name of the State which enacts them and of the year when passed. The annual laws are commonly termed "session laws," and are arranged for publication in the order of time of their enactment as chapters. In some of the States the annual laws are classified for publication into public and private.

Municipal law, originating in the modes which have thus been sketched, when complete supplies a legal rule to govern all the business transactions of life. Some of its most important topics will be found in this work under appropriate heads, such as AGENT, PARTNERSHIP, SALE, BAILMENT, INSURANCE, BILL OF EXCHANGE, MORTGAGE, TRUST, etc. A comprehensive division of the whole subject with which the civil branch of it has to do is rights and remedies. These are so closely connected that it is a legal maxim that "Wherever there is a right there is a remedy" (*ubi jus, ibi remedium*). It is plain that an assertion of a right is of no practical value where its violation is left without remedy. Rights may refer either to the person, without reference to the ownership of property, or they may concern such ownership. Personal rights may be strictly individual, such as the right to life, liberty, and reputation, or they may have reference to other persons under the various relations of master and servant, husband and wife, parent and child, guardian and ward. A corporation is for many legal purposes regarded as a person. The interests which one can have in property can only be accurately understood in English and American systems of law by a separate study of the rules respectively governing personal property and real estate. These branch out into great detail, and can be mastered only by long-continued and patient labor. The violation of any of these rights is regarded as a "wrong," and to vindicate the right in such a case the law establishes an appropriate remedy. The most usual course is to give the injured party pecuniary compensation. (See MEASURE OF DAMAGES.) There are, however, in certain cases, preventive remedies, such as an injunction. (See INJUNCTION.) In some instances a party to a contract is compelled to fulfil it. (See SPECIFIC PERFORMANCE.)

That important branch of municipal law known as the "criminal law" is based upon the theory that a right of society has been violated, and that the wrongdoer should consequently be punished. The true theory of punishment, and its relation to a violated rule, will be hereafter considered. (See PUNISHMENT.) It frequently happens that a violation of an individual right also affects society in such a way that the act can be regarded as a crime. In this case the act has two aspects: considered as an injury to the individual, it is a wrong (tort); regarded as an injury to society, it is a crime. The two qualities of the act are so distinct that they can be prosecuted separately. There are also cases where the crime has no such relation to an individual—*e. g.* where there is an embezzlement of public funds or a wilful destruction of public buildings by fire—that the State is attacked in such a way that it has a civil remedy for the wrong done to its property, as well as a right to prosecute criminally. It may be considered that the State in such a case has a corporate character, and that it has in that capacity been wronged as to its property, so that it is entitled to redress, as though it were an individual, by a civil action. So there may be instances where the act done is purely criminal, and without any element of a violation of right susceptible of redress by an ordinary civil action; *e. g.* treason. Considerations such as these have led authors like Blackstone to arrange the whole subject of municipal law under four principal divisions—(1) personal rights; (2) rights to property; (3) private wrongs and remedies; (4) public wrongs and their punishment. The true classification distinguishes in the civil law between rights and remedies, including in the latter modes of procedure, and in the criminal law between crimes and methods of obtaining conviction and sentence, to be followed by punishment.

(For a general historical sketch of the rise and progress of the English law see Blackstone's *Comm.*, book 4, ch. 33; Reeves's *History of English Law;* Crabb's do. On the general subject of this article consult Blackstone's and Kent's *Commentaries;* Austin on *Jurisprudence;* Pomeroy's *Introduction to Municipal Law;* Dwarris on *Statutes.*)

T. W. DWIGHT.

Munissing, tp. of Marquette co., Mich. Pop. 799.

Munjeet' [Hindu, *manjît*], **Rubia Munjista,** or **East Indian Madder,** a plant extensively cultivated in India, its root being used as a dyestuff for producing colors similar to those of common madder. It was formerly supposed to contain the same coloring-matters as madder, alizarine and purpurine. Dr. Stenhouse (*Proc. Roy. Soc.*, xii. 633; xiii. 86, 145) has shown that it contains purpurine, but no alizarine. The substance supposed to be alizarine he has shown to be a distinct body, *munjistine,* having properties very similar to those of alizarine, and giving the formula $C_8H_6O_3$, the correctness of which is doubtful. Munjistine exists in the stems and root of the plant in considerable quantities. It is extracted by boiling the powdered munjeet in a solution of 2 parts sulphate of aluminum and 16 of water, repeating two or three times. The red liquor is filtered hot, and on adding hydrochloric acid a bright-red precipitate is obtained. This is washed, dried, and digested in a percolator with boiling bisulphide of carbon. The solution is evaporated, leaving a residue which consists chiefly of munjistine and purpurine, from which the former is extracted by boiling water, precipitated by hydrochloric acid, and purified by recrystallization from alcohol. It may also be extracted directly from the munjeet by boiling water, precipitated by hydrochloric acid, and purified as above. E. Kopp's process with sulphurous acid is not applicable. Munjistine crystallizes in brilliant golden-yellow plates or scales both from alcohol and by sublimation. It is slightly soluble in cold, more readily in boiling water, forming a yellow solution, from which it separates in flocks on cooling. It is somewhat soluble in cold, much more in boiling alcohol, and is not precipitated from this solution by water. It is soluble in concentrated sulphuric acid, and the solution may be heated nearly to boiling without change; on dilution it is deposited in yellow flocks unchanged. Nitric acid converts it (like purpurine and alizarine) into phthalic and oxalic acids. With carbonate of soda it forms a bright red, with ammonia a brownish-red, with caustic soda a rich crimson solution. It dyes with alumina an orange, with iron a brownish-purple, with Turkey-red mordant a deep orange. These colors are moderately permanent, and bear treatment with bran and soap tolerably well. Munjistine resembles the *rubiacine* of Dr. Schunk, the *madder-orange* of Runge, but differs in the color of the carbonate of soda solution, in the absorption bands of the spectrum, and in the fluorescence of the ethereal solutions. Munjeet is inferior to madder as a dyestuff. The garancine from munjeet is said to yield much richer shades with alumina if a portion of the munjistine is removed by boiling water.

C. F. CHANDLER.

Munk (SALOMON), b. at Glogau, Silesia, May 14, 1805, of Jewish parentage; was educated at Berlin and Bonn; studied Oriental languages in Paris; visited Oxford in 1835; received an appointment in the Oriental department of the National Library of Paris in 1840; travelled in Syria and Egypt, and was made professor of Hebrew, Chaldaic, and Syriac in 1865 at the Collége de France, though in the mean time he had become entirely blind. From 1856 to 1866 he gave an annotated edition of Maimonides' *Doctor Perplexorum,* with accompanying French translation. Among his other works are *Palestine, Description géographique et historique* (1845), articles on Arabic and Hebrew philosophy in *Dictionnaire des Sciences philosophiques, Cours de Langue hébraique, chaldaïque et syriaque* (1865).

Munkacs', town of Hungary, on the Latorcza, manufactures alum, saltpetre, and hosiery. The surrounding districts contain iron and rock-crystals, and produce wheat and wine of superior quality. Pop. 8602.

Munns'ville, post-v. of Stockbridge tp., Madison co., N. Y., on Oneida Creek and the Midland R. R., 9 miles S. of Oneida. It has important manufactures. Pop. 313.

Muñoz' (JUAN BAUTISTA), b. at Museros, near Valencia, Spain, in 1745; studied at the University of Valencia; became a priest, and endeavored in several treatises to introduce a more liberal philosophy into Spanish theology. To this end he wrote his treatises *De recto Philosophiæ recentis in Theologia Usu* (1767), *De Scriptorum Gentilium Lectione et profanarum Disciplinarum Studiis ad Christianæ Pietatis Normam exigendis* (1768), and *Institutiones Philosophicæ*

(1768), and republished the Latin writings of Fray Luis de Granada, preceded by notable introductions. These works procured him the enmity of the ruling clergy, but recommended him to the enlightened monarch Charles III., by whom he was appointed to a post in the colonial office and made "cosmographer of the Indies." In 1779, Charles requested him to prepare a complete history of the discoveries and conquests of the Spaniards in America—a work to which he devoted the remainder of his life, but had published only the first volume of his *Historia del Nuevo Mundo* (Madrid, 1793) at the time of his death in Apr., 1800. The work was never continued, but the extensive collection of historical manuscripts classified and arranged by him have been the chief documentary sources of the important histories of Navarrete, Irving, and Prescott. (See Ticknor's *History of Spanish Literature*, vol. iii.)

Munro′ (Hugh Andrew Johnstone), D. C. L., b. at Elgin, Scotland, Oct. 14, 1819; educated at Trinity College, Cambridge, where he became a fellow 1843; published an esteemed critical edition of *Lucretius* in 1860, an entirely new edition, with a literal translation, in 1870, and a valuable edition of *Horace* in 1869. Dr. Munro was the first university professor of Latin from 1869 to 1872, when he resigned.

Munro (Sir Thomas), Bart., b. in England in 1760; went to India at an early age; was engaged in the campaigns against Hyder Ali (1780–84) and Tippoo Sultan (1790–91 and 1799); became lieutenant-colonel 1804; was knighted 1819; made governor of Madras 1820; made a baronet for distinguished service in the Burmese war 1825; was about to be appointed governor-general of India when he d. in India July 6, 1827. Sir Thomas Munro was one of the ablest generals and administrators the British government ever had in India. (See *Life*, by Rev. G. R. Gleig, 1830.)

Munroe (Nathan), b. at Minot (now Auburn), Me., Mar. 16, 1804; graduated at Bowdoin College 1830; studied theology at Andover; was licensed to preach Apr., 1834; was for some months principal of Delaware College; was pastor of the First Congregational church at Bradford, Mass., 1836–53; was for several years New England secretary of the American Sunday-School Union; editor of the Boston *Recorder*, and Boston correspondent of the New York *Evangelist*. His efforts were directed during the last three years of his life to obtaining an endowment for Bradford Academy. He was a distinguished collector of rare and valuable books, and was possessed of fine literary ability. D. at Bradford July 8, 1866.

Mun′sees, or **Minsees,** a tribe of American Indians of the Algonkin stock, long closely associated with their kindred, the Delawares, with whom they were driven to Ohio. A considerable number of Christian Munsees were killed in the massacre of 1782. We afterwards hear of them in many parts of the West. At present, some few Munsees (less than a dozen souls) occupy a poor reservation in Wisconsin with the Stockbridge Indians. Another band of Christian Munsees live with a few Chippeways on a tract of 5760 acres 40 miles S. of Lawrence, Kan. They are few in number, intelligent, and industrious.

Mun′sell (Joel), b. at Northfield, Mass., Apr. 14, 1808; removed in 1827 to Albany, N. Y.; acquired fame as a printer, publisher, journalist, and author; has written, edited, or compiled a large number of volumes containing documents and valuable materials for history, such as *Annals of Albany* (10 vols., 1850–59), *Collections on the History of Albany* (3 vols., 1865–70), *Historical Series* (10 vols.), etc.

Mun′son, tp. of Henry co., Ill. Pop. 1171.

Munson, tp. of Stearns co., Minn. Pop. 795.

Munson, tp. of Geauga co., O. Pop. 761.

Munson (Æneas), M. D., b. at New Haven, Conn., June 24, 1734; graduated at Yale College 1753; studied divinity under Pres. Stiles; was chaplain in the French war of 1755; studied medicine under Dr. John Darby; began practice at Bedford, N. Y., 1756; removed to New Haven 1760; enjoyed there a high professional reputation during a career of more than fifty years; was professor in the Yale Medical School from its first organization; was president of the Medical Society of Connecticut, and often a member of the legislature. D. at New Haven June 16, 1826.

Mun′ster, the largest of the four provinces of Ireland, bounded N. and E. by Connaught and Leinster, and S. and W. by the Atlantic. Area, 9476 square miles. Pop. 2,404,460 in 1841; 1,865,600 in 1851; 1,513,558 in 1861; 1,390,402 in 1871, of whom 1,302,475 were Roman Catholics. The province is divided into the counties of Cork, Clare, Kerry, Limerick, Tipperary, and Waterford.

Münster, town of Prussia, capital of the province of Westphalia, on the Aa, is an old but well-built and picturesque town, surrounded with beautiful promenades (its old fortifications), and containing many open places planted with trees and lined with elegant houses. The most remarkable among its buildings are the cathedral, which was the scene of the Anabaptist catastrophe in 1536, and the town-hall, in which the Peace of Westphalia was signed in 1648. From the twelfth to the eighteenth century Münster was the capital of an independent principality of the German empire. In 1719 it was merged into the archbishopric of Cologne, and in 1814 it was given to Prussia by the Congress of Vienna, together with most of its territory. It has many good educational institutions, manufactures of leather, woollens, starch, sugar, spirits, and carriages, and it carries on a considerable trade. Pop. 24,816.

Munster, post-tp. of Cambria co., Pa. Pop. 598.

Munster (George Fitzclarence), Earl of, b. Jan. 29, 1794, son of William IV. by the celebrated Mrs. Jordan; entered the army; served in the Peninsular war; went to India under Lord Hastings; distinguished himself in the Mahratta war, and carried home the overland despatches, which led to his work, *Travels in India* (1819); in 1830 was created earl of Munster, Viscount Fitzclarence, and Baron Tewkesbury; became major-general in 1841; his peculiar position in society probably led him to kill himself Mar. 20, 1842.

Muntaner′ Ramon′, an eminent Catalan chronicler, b. at Peralada in 1255, d. in 1336; the most important authority on the early history of his country, as well as one of the most valuable of mediæval annalists. After having filled many positions of trust under his sovereign, and participated in the remarkable Catalan expedition to Rumelia and Greece, Muntaner retired to Xilvella, near Valencia, and at the age of sixty years began the composition of his chronicle. His narrative covers the period between the "miraculous" birth of King Jaume I., the founder of the Catalan nationality, in 1208, and the coronation of King Alphonso in 1328, and embraces the conquest of Majorca, Minorca, and Ivica, Valencia, and Murcia from the Moors; the defeat and capture of Manfred and Conradin, and the subjugation of Naples and Sicily by Charles of Anjou; the Sicilian Vespers; the disastrous campaign of Philip the Bold in Catalonia; the Catalan expedition to the Greek empire in 1303, and many interesting episodes of contemporaneous history. Muntaner's annals of this era of stirring and feverish action are full of picturesque and romantic incident, and are composed in a fiery and enthusiastic style, well suited to so exciting a subject. There is, no doubt, a good deal of patriotic exaggeration in the way of epithet and in minor details, but the main facts are generally truly stated, and there is no room for questioning the fidelity of Muntaner's pictures of the life and manners of his time, or his substantial accuracy so far as his means of information extended. In spirit and vivacity the chivalrous Muntaner has no superior, and his chronicle is quite as good authority, in matters of fact, as the more prosaic recitals of the monkish annalists of the same period. Muntaner's chronicle was first printed at Barcelona in 1558 in a folio volume of about 500 pp., under the title *Chronica o Descripcio dels fets e hazanyes del inclyt Rey Don Jaume, primer Rey d'Arago, de Mallorques e de Valencia; feta per lo magnifich en Ramon Muntaner.* A reprint of this edition appeared at Barcelona in 1562. Lanz gave a good edition of the text in 1 vol. 8vo in the publications of the Stuttgart *Literarischer Verein* in 1844, and Bofarull has published at Barcelona the text with a Castilian version. There is a good French translation by Buchon in the *Chroniques étrangères relatives aux Expéditions françaises pendant le XIII^e Siècle* (Paris, 1841), and a German by Lanz (2 vols., 8vo, Leipsic, 1842).

George P. Marsh.

Mün′ter (Friedrich), b. at Gotha, in the duchy of Saxe-Coburg, Oct. 14, 1761; studied theology and archæology at Copenhagen and Göttingen; travelled for three years in Italy on a stipend from the Danish government; was appointed professor in theology at the University of Copenhagen in 1790, and bishop of Sealand in 1808. D. at Copenhagen Apr. 9, 1830. He published the Coptic translation of the book of Daniel (1786), the statute-book of the Templars (1794), valuable works on the introduction of Christianity into Denmark (1823–32), and of the Reformation (1802), a very learned disquisition on the religion of the Carthaginians (1823), and a work describing the symbols and artistic representations employed by Christians in the first century (1825).—His father, Balthasar Münter, b. at Lubeck Mar. 24, 1735; d. in Copenhagen Oct. 5, 1793; was minister of the German congregation at Copenhagen, and wrote *A Faithful Narrative of the Conversion and Death of Count Struensee*, translated into English by Rev. Mr. Wendeborn (London, 1774).

Munt′jak, the *Cervulus Muntjac* of India, Java, etc., a small deer, but little over two feet high. The males have small horns; the females are hornless. Their venison is

excellent. The Chinese muntjak is the *Cervulus Reevesii*, which, like the preceding, is often half domesticated, and is sometimes bred in European parks.

Mün'zer (THOMAS), b. at Stolberg, in the Harz Mountains, about 1490; studied at Wittenberg, and became preacher at Zwickau in Saxony in 1520, and in 1523 at Allstedt in Thüringia. At first he worked in unison with the Reformers, though his preaching was always strangely mixed up with mystical and fantastical ideas, but afterwards he turned, according to his own "inner light," against the "halfness" of Luther and Melanchthon, and demanded a radical reform of Church and state, which led to uproar and confusion. He entertained peculiar ideas of infant baptism, similar to those of the Anabaptists, with whom, however, he had no direct connection; his most characteristic ideas were a belief in continuous divine revelation through dreams and visions, and in the community of property, which he promulgated in speech and writings with a somewhat coarse but often very impressive eloquence. Expelled from Allstedt by the government, he went to Nüremberg, and next to Schaffhausen, but returned soon to Thüringia, and settled at Mühlhausen. Here he succeeded in overthrowing the city council and appointing another which was entirely under his control; and when in 1525 the Peasants' war broke out in Southern Germany, he instigated the whole population in and around Mühlhausen and Langensalza to rise in revolt. Murder and plunder ensued, but on May 15, 1525, it came to an encounter between the rebels and the regular troops at Frankenhausen, and after a protracted fight the peasants were totally routed; 7000 of them are said to have been killed in the battle. Münzer was taken prisoner, put to the torture, and beheaded at Mühlhausen a few days afterwards. His *Life* was written by Melanchthon (1525), Strobel (1795), Seidemann (1842), and Heinrich Leo in the *Evangelische Kirchenzeitung* (1856).

Mun'zinger (WERNER), b. at Olten in the canton of Soleure in 1832; studied natural science at Berne and Oriental languages at Munich and Paris; went in 1852 to Cairo; engaged in mercantile business in Alexandria; was sent in 1854 to Massowah as chief of a commercial expedition to the Red Sea; explored the land of the Bogos, where he resided for nearly six years; joined in 1861 the German-African expedition under Heuglin, whom he succeeded in 1862 as chief of the expedition; penetrated to Kordofan, whence he returned to Massowah in 1864; accompanied the English army during the Abyssinian war in 1868, and was appointed governor of Massowah in 1870. Besides various communications to the London Geographical Society and Petermann's *Mittheilungen*, he wrote *Sitten und Recht der Bogos* (1859), *Die deutsche Expedition in Ostafrika* (1865), and *Vocabulaire de la Langue Tigré* (1865).

Muot'ta Valley, an elevated and secluded valley of Switzerland, in the canton of Schwytz, traversed by the river Muotta, which hence flows down to the Lake of Lucerne, is famous for the sanguinary struggle which took place here in 1799 between the Russians under Suwarow and the French under Lecourbe, Mortier, and Massena. The Russians were totally surrounded and hemmed in on all sides, but by a murderous onset they broke through the French lines and escaped down the valley. The principal place of the valley is the village Muotta, with about 2000 inhabitants, and a handsome parish church containing several valuable pictures.

Mur, a river of Austria, rises in the Mureck Mountains in the district of Salzburg, enters into Styria, where it becomes navigable at Judenburg, and passes by Gratz, flows through Hungary into Croatia, and joins the Drave at Legrad, after a course of 230 miles. It receives about 100 affluents, among which are the Kainach, Lasznitz, Sulm, Pöls, and Mürz, but none of these streams is navigable.

Mur'a, de (FRANCESCO), generally called **Franceschiello** or **Franceschetto,** b. at Naples in the first half of the eighteenth century; studied painting under Solimene, and became a prominent member of the Neapolitan school. In 1730 he went to Turin on the invitation of Charles Emmanuel, king of Sardinia, in whose palace he painted his celebrated frescoes representing the *Olympian Games* and the *Exploits of Achilles*. He returned to Naples, and in the year 1743 was still engaged in painting; the date at which he died is unknown.

Murad V. (MEHEMET MURAD EFFENDI), b. Sept. 21, 1840, the eldest son of the sultan Abd-ul-Medjid; was educated outside the harem, and acquired, among other attainments, that of speaking French. On the dethronement of his uncle, Abd-ul-Aziz (May 29, 1876), he was declared sultan of Turkey, in preference to the sons of the fallen sovereign, according to the ordinances of the Koran, which fix the succession in the eldest male person living of the family of Othman.

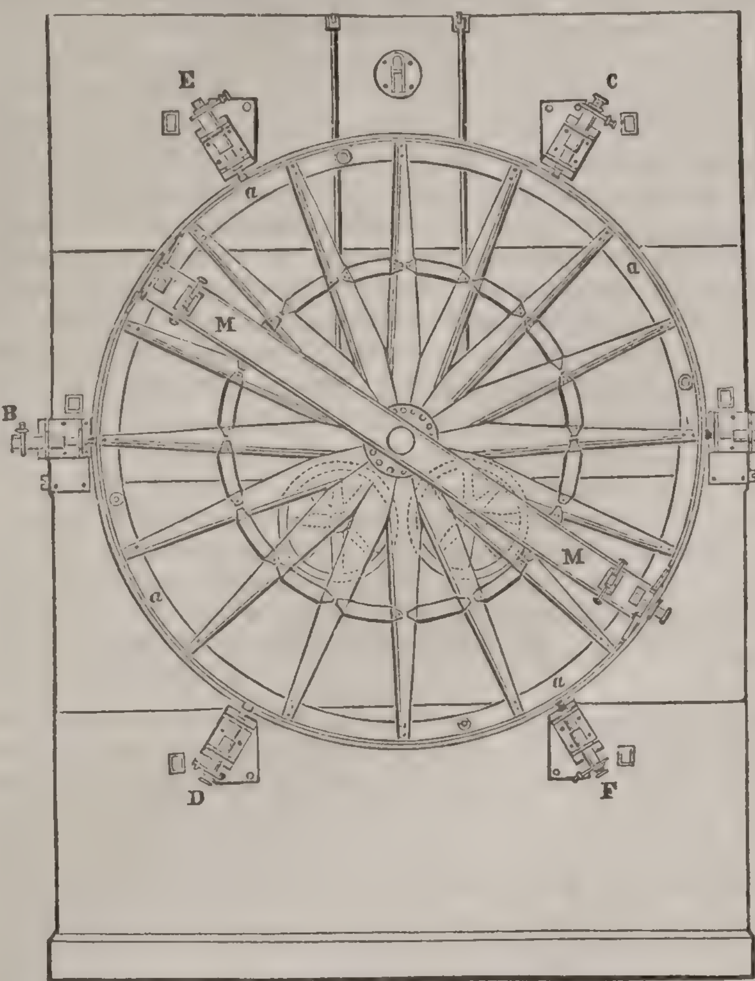
Muræ'na [Gr. μύραινα], the typical genus of the eel family of fishes (Murænidæ). It includes the *Muræna helena*, the famous muræna of the ancients, a European salt and fresh water fish, stout, heavy, and often six feet long. Its flesh is white and good, and it was artificially bred by the ancient Romans, who prized it extremely.

Murænesoc'idæ [from *Murænesox*, the chief genus], a family of apodal fishes. The family is anguilliform, and proportioned as in Murænidæ; no scales are developed; the head is moderate, and with the jaws more or less produced; the opercula little developed; the nostrils superior or lateral and entirely external; the mouth with the cleft extending well backward; the tongue not free; the dental series well developed, and generally with a greater or less number of enlarged teeth; branchial apertures lateral, but rather low down, and narrow or moderate clefts; vertical fins moderate or rudimentary, and surrounding the end of the tail; pectoral fins in some present, in others absent; the branchial openings in the pharynx are wide slits. This family is one of the groups of the Murænidæ Platyschistæ of Gunther, but differs in many respects from the typical Murænidæ. It is represented by at least five genera, which are confined to warm and tropical waters—viz. *Murænesox*, tropical seas generally; *Nettastoma*, Mediterranean Sea; *Saurenchelys; Oxyconger*, Japan; and *Hoplunnis*, Central America. As in the case of the Congridæ, the young (at least in *Nettastoma*) exhibits a leptocephalous stage, which was formerly distinguished as a peculiar genus under the name *Hyoprorus*. THEODORE GILL.

Muræn'idæ [from *Muræna*, the old Latin name of the best-known genus], a family of fishes of the order Apodes, typified by the celebrated muræna of the ancients. The body is elongated, as in the common eel; the scales absent; the head moderate; the opercular bones generally rudimentary and in part wanting; the mouth with the cleft moderately developed, or very large and extending far backward laterally; the intermaxillaries are rudimentary; the teeth well developed; the branchial apertures developed externally as lateral holes; the dorsal and anal fins variable, sometimes being well developed and sometimes nearly absent; the pectoral fins also either present or absent. The skull exhibits a number of well-marked characters, as shown by Cope; the parietals are largely in contact; the ethmoid very wide; the symplectic, maxillary, pterygoid, basal, branchihyal, and superior and inferior pharyngeal bones all wanting, except the fourth superior pharyngeal; this is jaw-like, and supported by a strong superior branchihyal; other superior branchihyals wanting or cartilaginous. The family has numerous representatives, with generally a considerable similarity to each other in the pattern of coloration, although there is much variation in this respect. This color is formed by the articulation of the lighter hues enclosing darker interspaces, sometimes by blue cross-bands, sometimes by white ocelli, and sometimes the coloration is uniform. The teeth also greatly vary, and on their modifications a number of genera have been based. The most recent authority, however, recognizes but four in the family—viz. *Myroconger*, of which the only known species has been found in the sea at St. Helena; *Muræna*, with nearly 100 species, distributed in various tropical waters; *Gymnomuræna*, chiefly represented in the Indian and Pacific oceans; and *Enchelycore*, whose single species has been found in the Caribbean Sea. The *Muræna helena* is a fish highly celebrated in ancient history, and was greatly esteemed for the table. Classical students will recall numerous anecdotes and references to it in the Latin authors. THEODORE GILL.

Mu'ral Cir'cle [Lat. *muralis*], an astronomical instrument consisting of a large graduated circle, to which is attached a telescope moving only in the plane of the meridian, and supported on the perpendicular face of a wall; whence the name. It is mainly used for the determination of the declinations of the heavenly bodies. It has of late years been superseded by the transit circle, because its unsymmetrical construction renders the determination of its instrumental errors difficult. Tycho Brahe first used a mural quadrant, and Flamsteed in 1689 had a quadrant constructed for the Greenwich Observatory. The advantages of a complete circle were so manifest, however, that on June 12, 1812, Troughton placed in the same observatory a mural circle six feet in diameter, shown in the annexed cut, which was probably the first in use. The mural circle of the Washington Observatory is mounted on the E. face of a sandstone pier, and is thus described: It is five feet in diameter, and connected with the central portion by twelve radii, strengthened on their backs by edge-bars, and united midway by a second concentric circle. To secure homogeneity if possible, all the preceding portions constitute parts of the same cast. A band of gold

and one of platinum are inlaid upon the rim perpendicular to the plane of the circle. The former band is divided into spaces of 5′, and the latter into spaces of 1°, each of which is numbered. The minute reading is secured by means of six equidistant microscopes secured to the face of the pier, and which are illuminated through apertures in the same from a gas-lamp placed to the W. of it. The instrument has a conical axis three feet long. Under the



Mural Circle.

eastern part of the latter there are friction-rollers connected with rods that pass between the circle and the face of the pier, and thence over the top to counterpoises within a cavity of the pier. Its telescope is a cylinder secured to the circle both at the centre and near the extremities. The object-glass has a diameter of four inches, and was originally of five feet focal length. (For the methods of using see TRANSIT CIRCLE; *Washington Astronomical Observations*, vols. for 1845, 1862, 1865; Pearson's *Pract. Astr.* (London, 1829), vol. ii. p. 472; Loomis's *Pract. Astr.*, p. 84; Chauvenet's *Manual of Spherical Astronomy*, vol. ii. p. 282.) LEONARD WALDO.

Murat′ (JOACHIM), b. at La Bastide Fortunière, in the department of Lot, France, Mar. 25, 1771, the son of an innkeeper; was educated at Cahors and Toulouse, where he prepared himself for the Church. Dismissed from the seminary, he entered a regiment of chasseurs, and, cashiered in the regiment, lived for some time as waiter in a café in Paris. On the establishment of the constitutional guard of Louis XVI. he became a member of that body of troops, and was afterwards transferred to a regiment of cavalry. He proved a brilliant soldier in the field; was aide-de-camp to Napoleon in 1795; accompanied him to Egypt in 1798; was made general of division in 1799; married in 1800 a sister of the First Consul, Caroline, and was made marshal of France, imperial prince, and grand admiral in 1804. In most of Napoleon's great battles, Austerlitz, Jena, Eylau, Friedland, he took a distinguished part, and the emperor loaded him with honors. In 1805 he was made grand duke of Berg, and in 1808 king of Naples under the name of Joachim I. Napoleon. But misunderstandings soon arose. Murat wished to govern his kingdom independently of France, and every attempt in this direction Napoleon frustrated with indignation. After the battle of Leipsic, Murat hastened to Italy and opened negotiations with England and Austria, which powers guarantied him, by a treaty on Jan. 11, 1814, the possession of his throne on the condition of his joining the allies against Napoleon. He marched against Prince Eugene, viceroy of Italy, but when he heard that the Bourbons insisted violently at the Congress of Vienna on his expulsion, he stopped, and when Napoleon returned from Elba he at once declared war against Austria (Mar. 31, 1815). Defeated Apr. 12 at Ferrara, and May 2 at Tolentino, he fled to France, where, however, Napoleon refused to receive him. He lived in the vicinity of Toulon, but after the battle of Waterloo he was compelled to leave France. With a few adherents he made a fantastic attempt at invading Naples, but failed utterly, was caught near Pizzo, brought to the castle, tried before a court-martial, and shot Oct. 13, 1815.

Murato′ri (LUDOVICO ANTONIO), b. at Vignola, in the duchy of Modena, Oct. 21, 1672; studied theology and history at the University of Modena; took holy orders; became keeper of the Ambrosian Library at Milan in 1694, and of the D'Este Library and the ducal archives at Modena in 1700, and d. Jan. 23, 1750. His contributions to the history of Italy are very valuable: *Rerum Italicarum Scriptores* (25 vols., Milan, 1723–51), *Antiquitates Italicæ Medii Ævi* (6 vols., 1738–42), *Annali d'Italia* (12 vols., 1744–49).

Mur′chison (Sir RODERICK IMPEY), BART., K. C. B., F. R. S., D. C. L., LL.D., b. at Tarradale, Ross, Scotland, Feb. 19, 1792; studied at the military college, Marlow, and the University of Edinburgh; was an officer in the army 1807–15, serving in the Peninsula and Sicily; was the associate of Davy; became in 1825 a fellow of the Geological Society, and in 1826 F. R. S.; aided Sedgwick and Lyell in British and continental geological studies; was one of the founders of the Royal Geographical Society, and often its president; travelled extensively in Russia, Scandinavia, etc.; was knighted 1846, made K. C. B. 1863, baronet 1866; became in 1855 director-general of the geological survey of the United Kingdom; d. at London Oct. 22, 1871. Among his leading works are the *Silurian System* (1838), enlarged to *Siluria* (1854), *Geology of Russia and the Ural* (1845), *Geological Atlas of Europe* (1856), besides numerous elaborate and valuable monographs, maps, and scientific papers. He was the recipient of numerous honors and distinctions, British and foreign. (See *Memoir of Sir Roderick Murchison*, by Archibald Geikie, LL.D., London, 2 vols., 1874.)

Murchiso′nia, a genus of gasteropod shells occurring fossil in rocks from the Lower Silurian to the St. Cassian beds of the Trias. These shells are placed with the Haliotidæ, or ear-shells, possessing, like Pleurotomaria, a deep notch or fissure in the outer lip. E. C. H. DAY.

Mur′cia, province of Spain, part of the old province of the same name, which in 1833 was divided into the present provinces of Murcia and Albacete. Area, 3360 square miles. Pop. 439,067. The surface is mountainous, forming elevated plateaus and large, deep valleys. Where water is abundant the soil is exceedingly fertile, producing wine, oil, silk, hemp, and all kinds of fruits, but in places where water is deficient the country is nearly a desert. Mineral springs abound; copper, lead, iron, and salt are found.

Murcia, town of Spain, capital of the province of the same name, on the left bank of the Segura. It is irregularly built, but its streets are clean and its houses substantial, often elegant. Its cathedral has an immensely high tower, from the top of which a most magnificent view can be had of the surrounding valley, the huerta, the river which waters it, and the lofty though naked mountains which enclose it. Murcia has manufactures of silk, linen, mats, cordage, saltpetre, and powder, and an extensive trade in the products of its immensely fertile huerta. Pop. 26,888.

Mur′der [Lat. *murdrum*]. By the common law, which prevails in this country except so far as superseded or modified by statute, there was only one degree or grade of this crime. The definition given by Lord Coke is universally accepted as accurate—namely: "When a person of sound memory and discretion unlawfully killeth any reasonable creature in being and under the king's peace, with malice aforethought, either express or implied." By examining the separate elements of this definition the various requisites of the crime will fully appear. It must be committed by a person of sound memory and discretion, which excludes idiots, lunatics, and very young children. The killing must be unlawful; that is, neither excusable nor justifiable. The person killed must be a reasonable creature in being; the killing an unborn child was therefore not embraced within the common-law offence, and in order that infanticide might be murder a living child should be fully born. "Under the king's peace" simply refers to a state of war, and prevents the killing of an alien enemy engaged in actual hostilities from being regarded as murder. By far the most important element of the crime is the final one: the killing must be with malice aforethought, express or implied. In its technical legal sense the term *malice* is used to describe any wrongful act done intentionally, without just cause or excuse. (See MALICE.) The gist of this signification is the wrongful intention. The division mentioned in the foregoing definition of express and implied malice refers not to two different species of the malice itself, but to the modes of proving its existence as a fact in any given case. The term "express" is appropriate to those cases in which the wrongful intention is inferred as

an ordinary deduction of fact—that is, through processes of reasoning unaided by any legal presumptions—from the evidence which is given for the very purpose of establishing its existence, such as lying in wait, former threats, old grudges, careful preparations, and the like. This evidence need not be direct; it may be entirely circumstantial, and yet if the existence of the wrongful intention is deduced from the probative facts by the ordinary methods of ratiocination, the malice is express. The existence of the wrongful intention is also inferred as a necessary conclusion—that is, as a legal presumption—from certain facts, so that if these facts are proved the intention follows as an inevitable consequence, and remains such unless the defendant overcomes and removes it by counter-evidence. In such instances the malice is said to be "implied." As an illustration: at the common law the wrongful intention which constitutes murder was presumed from the mere fact of killing, so that when the prosecution had established that fact, the defendant was obliged to remove the inference of his guilt by evidence showing the absence of a wrongful intent. The clause of the definition, "with malice aforethought, express or implied," as thus explained, was very comprehensive, and included many instances of homicide which have been reduced to crimes of a lower grade by modern legislation. Wherever there was a preconceived design to kill the very person whose life was taken, and the act was not excusable nor justifiable, this was plainly murder. In addition to this common case, if a person should wilfully kill in such a manner as to show him to be an enemy to mankind in general—as, for example, if he should deliberately fire a loaded gun into a crowd and kill an individual—the act would be murder, although there was no design to take the life of that particular one. Also, if while engaged in the commission of, or in the attempt to commit, a felony, the wrongdoer should undesignedly kill a person, the homicide was murder; but if the accompanying act, although unlawful, was not a felony, the unintentional slaying would only be manslaughter. It was a general doctrine of the common law that if the killing was done under great and immediate provocation, upon the spur of the moment, while the passions were inflamed, the crime was reduced to manslaughter; but no matter how great the antecedent provocation, if an interval had elapsed sufficient for the passions to cool and the reason to return, the homicide would then be murder. The foregoing general description and examples sufficiently indicate the severity of the common law and the nature of the particular cases embraced within the offence. The radical vice of this ancient law was that it included in the same grade, and made liable to the same punishment, offences that were really of very different degrees of culpability. In most if not in all of the States of this country the whole subject of homicide is now regulated by statute. The theory of the legislation which prevails most widely throughout the U. S. is the following: The common-law notions are not abrogated, but are taken as a foundation. The various cases which fell within the common-law definition of murder are classified, and are separated into two degrees, those in the first degree being punishable with death, and those in the second by imprisonment for life. Most of the statutes contain both a general definition or description of the murders embraced within the first degree, and also an enumeration of certain particular instances of homicide belonging to the same class. This general description is a substitute for the common-law requisite of "malice aforethought, express or implied;" while the special enumeration takes the place of the common-law doctrine, which declares that unintentional killing done by a person while engaged in the commission of, or the attempt to commit, a felony is murder. The characteristic feature of this general description as found in most of the statutes is the requirement of deliberate, premeditated intention to kill. The following is the statutory language employed in several of the States: "with express malice aforethought" (Maine); "deliberate and premeditated killing" (New Hampshire); "committed with deliberately premeditated malice aforethought" (Massachusetts); "wilful, deliberate, and premeditated killing" (Alabama, Connecticut, Michigan, New Jersey, Pennsylvania, Virginia); "wilful, deliberate, malicious, and premeditated killing" (Tennessee); "purposely, and of deliberate and premeditated malice" (Ohio). In the enumeration of special cases there is more diversity. The most common form includes murders done "by means of poison, or by lying in wait," or "in the perpetration of, or attempt to perpetrate, any arson, rape, robbery, or burglary" (Alabama, Connecticut, Michigan, New Jersey, Ohio, Pennsylvania, Tennessee, and with a slight variation in New Hampshire and Virginia). Another form is, "in perpetrating, or attempting to perpetrate, any crime punishable with death or imprisonment for life" (Maine, Massachusetts). All common-law murders not included within these descriptions are declared to be of the second degree. The latest legislation in New York (1873) separates murders of the first degree into three classes: (1) "when perpetrated from a deliberate and premeditated design to effect the death of the person killed or of any other person;" (2) "when perpetrated by an act eminently dangerous to others and evincing a depraved mind, regardless of human life, although without any premeditated design to effect the death of any particular individual;" (3) "when perpetrated without any design to effect death by a person engaged in the commission of any felony." When the wrongful homicide is "perpetrated intentionally, but without deliberation and premeditation," it is declared to be murder in the second degree. Notwithstanding the requirement of deliberation as well as premeditation, the courts have held almost unanimously that the intent to kill may be formed at the very instant of the killing, and the offence, nevertheless, will be murder in the first degree, although a different construction is given to the statutes in one or two States. JOHN NORTON POMEROY.

Mur'doch (JAMES EDWARD), b. at Philadelphia, Pa., Jan. 25, 1811; made his first appearance upon the stage in 1829; obtained popularity as an actor both in America and England, and a still wider reputation as an elocutionist. He published *Orthophony, or Culture of the Voice* (1845), aided by William Russell; served on the staff of Gen. Rousseau during the civil war, devoting himself to the care of the sick and wounded, and gave successful popular readings throughout the country in aid of the Sanitary Commission.

Mur'dock (JAMES), D. D., b. at Westbrook, Conn., Feb. 16, 1776; graduated at Yale College 1797; studied theology under Dr. Dwight; was Congregational minister at Princeton, Mass., 1802–15; professor of ancient languages in the University of Vermont 1815–19, and of sacred rhetoric and ecclesiastical history in Andover Theological Seminary 1819–28. In 1829 he removed to New Haven, where he devoted the remainder of his life to literature, publishing, among other works, translations of Mosheim's *Ecclesiastical History* (3 vols., 1832) and *Commentaries* (2 vols., 1852), and of the Peshito-Syriac version of the New Testament (1842), and a volume of original *Sketches of Modern Philosophy* (1842). Dr. Murdock was a frequent contributor to the religious quarterlies, and was a ripe philological scholar. D. Columbus, Miss., Aug. 10, 1856. (See biographical notice in *Brief Memoirs of the Class of 1797 at Yale College* (1848), by Thomas Day and James Murdock.)

Mure (Col. WILLIAM) OF CALDWELL, b. at Caldwell, Ayrshire, Scotland, July 9, 1799; was educated at Westminster School and at the University of Edinburgh, and subsequently studied several years in Germany, where he laid the foundations of ripe classical knowledge. He wrote articles for the *Edinburgh Review* upon the literature of modern languages, which were characterized as brilliant by Moore and Jeffrey; published *Brief Remarks on the Chronology of the Egyptian Dynasties* (1829), *A Dissertation upon the Calendar of the Zodiac of Ancient Egypt* (1832); travelled in Greece and the Ionian Islands in 1838, publishing the *Journal* of his tour in 1842; and after many years of research issued his *Critical History of the Language and Literature of Ancient Greece* (5 vols., 1850–57), which was never finished, but of which the several portions upon the epic and lyric poets and the historians may be regarded as separate works. He also edited *The Caldwell Papers* (3 vols.) for the Maitland Club. Col. Mure was an able literary critic, best known as a strenuous defender of the unity of the *Iliad* and *Odyssey*, and the identity of their authorship in the person of Homer. He sat in Parliament for Renfrewshire 1846–55, and was lord rector of the University of Glasgow 1847–48, and for many years colonel of the Renfrewshire militia. D. in London Apr. 1, 1860.

Mure'tus (MARCUS ANTONIUS), b. at Muret in the department of Haute Garonne, France, Apr. 12, 1526; attained very early great fame as an accomplished scholar in classical literature; went in 1554 to Rome, where he received employment in the service of Cardinal d'Este, and where he began to lecture publicly on Aristotle in 1563 and on law in 1567; took holy orders in 1576, and d. June 4, 1585. His editions of Latin authors, together with his lectures, exercised great influence on the revival of classical studies, and his *Variæ Lectiones* are still considered valuable. His collected works were edited by C. H. Frotscher (Leipsic, 1834, 3 vols. 8vo).

Mu'rex [Lat.], a large genus of gasteropod mollusks of the family Muricidæ. There are some 180 living species, and nearly as many fossil ones, found in the Eocene and later deposits. The living species are worldwide in distribution. *M. brandaris, trunculus,* and others furnished a part of the Tyrian purple dye of the ancients. The ani-

mals are all predatory, and many of the shells assume singular forms. One of the most remarkable is the thorny woodcock or Venus's comb of collectors (*M. tribulus*), from the Spice Islands. *M. regius* of the Pacific coast of tropical America is most splendidly colored. (See MURICIDÆ.)

Murex′ide [Lat. *murex*, "purple"], or **Purpurate of Ammonium** ($NH_4C_8H_4N_5O_6$). It is formed by the action of ammonia on alloxantine, and by other reactions. It crystallizes in four-sided prisms, which are garnet-colored by transmitted and rich gold-green by reflected light. In water it forms a splendid purple solution. With mercuric salts it produces fine red and purple colors on silk, wool, cotton, and leather, and with zinc salts orange and yellow colors. These colors are very bright and resist the action of light; they are, however, very sensitive to sulphurous acid, which rapidly discolors them. Hence, they cannot be used in cities where coal-gas is employed. A few years since murexide was extensively used for dyeing and calico-printing. It was made from the uric acid of guano. One factory in Manchester, Eng., turned out 12 cwt. weekly. It was driven out by the aniline colors. (See *Report on Murexide Dyeing*, by E. Kopp (*Rép. Chim. app.* i., 79), and Hofmann's *Report*, 1862, p. 118; also *Jahresbericht* (1857, 649; 1858, 671; 1859, 752), and *Wagner's Jahresb.* for the same years.) C. F. CHANDLER.

Mur′freesboro′, post-v. of Hertford co., N. C., 15 miles S. E. of Branchville R. R. Station. It is the seat of a Methodist female college and a Baptist female institute. The Meherrin River is navigable to this point. The town has an active trade. Pop. 753; of tp. 1961.

Murfreesboro′, post-v. and cap. of Rutherford co., Tenn., on the Nashville Chattanooga and St. Louis R. R., 32 miles S. E. of Nashville, situated in a beautiful and fertile plain, is the seat of Union University, founded by the Baptists in 1841, has Soule Female College, 1 bank, 5 churches, and 2 weekly newspapers. From 1817 to 1827 it was the capital of the State. (See MURFREESBORO′, BATTLE OF.) Pop. 3502.

Murfreesboro′, Battle of. On July 13, 1862, the place was occupied by a Union force, which was surprised and captured by a Confederate force under Gen. Forrest. Rosecrans, who had assumed command of the army of the Ohio Oct. 30, 1862, had sufficiently reorganized that army, and provided supplies at Nashville, to determine him to advance against Bragg's army, which, returning from its march through Kentucky and East Tennessee, was now posted about Murfreesboro′. Leaving Nashville at daylight on Dec. 26, 1862, in a heavy rain, by night of the 30th, and after constant skirmishing, a position was reached to the W. of Stone River, the left of the army resting on that stream and extending S. some 3 miles, McCook, with three divisions, forming the right, Thomas, with two divisions, the centre, Crittenden, with three divisions, held the left. Of Bragg's army, Hardee had the left, Polk the centre, and Breckenridge the right, and on the E. side of Stone River. Rosecrans's plan contemplated an attack in force on the Confederate right, which was inaugurated early on the morning of Dec. 31, but had not progressed far before intelligence arriving of a furious and successful attack upon his own right, caused Rosecrans to abandon the attack with his left and hasten forward assistance to the right and centre, which were being severely handled. The Confederate success was not stayed until one half the ground occupied in the morning had been lost, besides 28 pieces of artillery. Both sides had suffered severely in killed and wounded, and the next day (Jan. 1, 1863) no serious fighting occurred between the two confronting armies. On the 2d, however, a furious charge was made by the Confederates in the afternoon, with temporary success, but resulting in their being driven in turn with great loss. Darkness ended the fight, a rain setting in, and next day was passed without any general engagement. Friday morning (Jan. 4) revealed the fact that the Confederates had disappeared, and pursuit was not deemed advisable. Murfreesboro′ was at once occupied and held. Rosecrans, with a reported force of 43,400, lost 1533 killed, 7245 wounded, and some 3000 prisoners; Bragg reports his strength at 35,000, and loss at 10,000, of which 9000 were killed and wounded. This battle is also commonly known as that of Stone River.

Murfreesborough, post-v., cap. of Pike co., Ark., 45 miles W. of Arkadelphia.

Mur′free's Val′ley, post-v. of Blount co., Ala. Pop. 630.

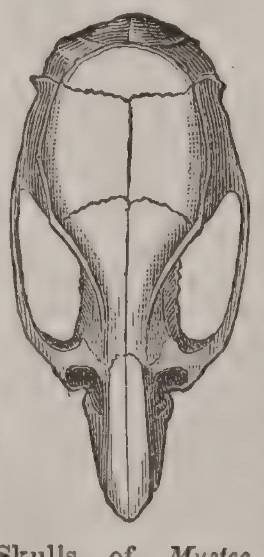
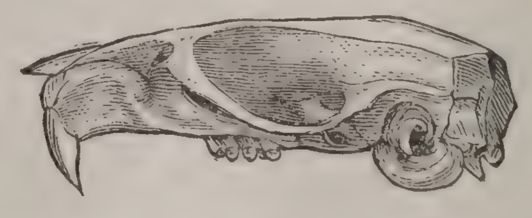
Mur′ger (HENRY), b. at Paris in Feb., 1822; received a very modest education; was clerk to a notary in his fifteenth year; had some kind of employment afterwards with the Russian count Tolstoy; engaged finally in literature and journalism as a "Bohemian," which appellation he invented; established a literary name in 1848 by his *Scènes de la Vie de Bohême*, sketches partly satirical, partly pathetic, striking as well by their realism as by their poetical humor; wrote a number of novels in the *Revue des Deux Mondes*, among which were *Adeline Protat*, *Pays Latin*, *Vacances de Camille*, etc.; also a drama in one act, *Le Bonhomme jadis*, and a volume of poems, *Les Nuits d'Hiver*, and d. at Paris Jan. 28, 1861.

Muriatic Acid. See HYDROCHLORIC ACID.

Muric′idæ, or **Muric′inæ** [from the ancient name *Murex*], a family of gasteropod mollusks of the order Pectinobranchiata and sub-order Rachiglossa. The head is small and truncated; the tentacles moderate; the eyes sessile at the outside of the bases of the tentacles; teeth of the lingual ribbon in three longitudinal rows, of which the central (rachidian) tooth is thick and quasi-prismatic, with denticles projecting from the front of the upper surface, and the lateral are simple, hook-like, and versatile; the foot is moderate and entire; the shell varies greatly in the respective genera, but is always provided with a more or less produced anterior canal, and generally has two or more varices or ridges, indicating former thickened margins of the outer lip of the aperture; the columella smooth. Two sub-families are distinguishable by differences of the operculum—Muricinæ and Purpurinæ.

The Muricinæ, the typical sub-family of the Muricidæ, have the operculum ovate and annular, but with the nucleus more or less approximated to the apex. This sub-family is a very large one, embracing numerous species, over 250 living ones being distributed in the various tropical and sub-tropical seas, and a few in the colder ones. They have been differentiated into numerous genera, among the chief of which are *Murex* (which has been subdivided into many genera), *Muricidea*, *Ocinebra*, *Eupleura*, *Trophon*, *Chorus*, and *Urosalpinx*. The numerous other genera which have been referred to this family have been excluded by Drs. Stimpson and Troschel, and relegated to the Purpuracea, Buccinidæ, etc. The most common forms upon the Northern Atlantic coast of the U. S. are *Eupleura caudata* and *Urosalpinx cinereus*. The purple of the ancients was derived from the animal of species of this family, especially *Murex trunculus*, and, according to Wilde, heaps of broken shells of the species named, and caldron-shaped holes in the rocks in which the animals were treated, still remain on the Tyrian shore. THEO. GILL.

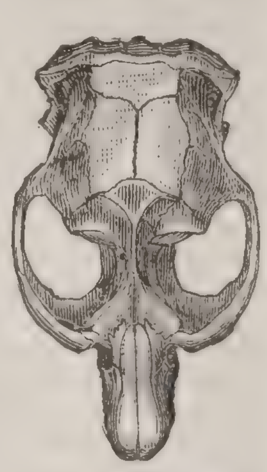
Mur′idæ [from *Mus*, gen. *Muris*, the name of the typical genus], a large family of the rodent order and simplicidentate sub-order. The skull is well developed; the infraorbital foramen large, generally pyriform and contracted into a slit below (which is typically bounded externally by a plate of bone arising from the supramaxillary), and with a portion for the masseter muscle as well as for the infraorbital nerve; the lower jaw with the coronoid and condyloid processes in nearly the same vertical plane with each other and with the descending ramus, the last more or less twisted; molar teeth generally $\frac{3}{3}$ (rarely $\frac{4}{3}$ or $\frac{2}{2}$) $\times$ 2; the hind legs are but moderately developed, and the animals normally progress by a running gait approaching to leaping; the tibia and fibula are united below; the metatarsal bones separate from each other; a cæcum is present. This family is by far the most extensive of the order, and contains about 300 species, representing about 50 genera, which have been distributed among six sub-families—viz. Murinæ, to which the Spalacinæ and Georhychinæ are adjuncts, and Arvicolinæ, with which the Siphneinæ and Ellobiinæ are nearly connected.

Skulls of *Mustectorum.*

The North American species of this family all belong to the sub-families Murinæ and Arvicolinæ. The Murinæ are animals, like the common mouse and rat, of light and supple form, quick in movement; having dark bright eyes, pointed mobile snout, permanent ears, and lengthened limbs and tail; the molar teeth have roots, and the crowns are tuberculated, and have crenate margins; the incisors are compressed and narrower than deep, and those of the lower jaw have roots which produce a protuberance on the outer side of the mandible, at the inner notch between the condylar and coronoid processes. With these are coincident other anatomical characters. To this sub-

family belong, according to Dr. Coues, nineteen U. S. species representing the genus *Mus*, typical of the group Mures, and the genera *Neotoma*, *Sigmodon*, *Ochetodon*, and *Hesperomys*, belonging to the group of Sigmodontes: the former group has no indigenous American species, those found in North America having been introduced from the Old World; the latter is characteristic of the American fauna.



Skulls of *Arvicolo Xanthognathus.*

The Arvicolinæ are distinguished by their squat and heavy shape, their dull movements, their small eyes, blunt snout, small and rudimentary ears, and comparatively short limbs; the molars are generally rootless, and always provided with flat crowns, which have serrated margins; the incisors are broader than deep, and the roots of the lower ones lengthened generally into protuberances on the outside of the mandible at the inner notch between the condylar and descending processes; this sub-family is chiefly developed in the temperate and arctic regions, some of the most northern mammals (*Myodes*) belonging to the group. The genera are *Arvicola*, or the field-mice (with four subgenera), *Evotomys*, *Synaptomys*, *Myodes*, *Cuniculus*, containing the lemmings, and *Fiber*, or the musk-rat. Eleven North American species have been recognized by Dr. Coues. (See also LEMMING, MOLE-RAT, MOUSE, MUSK-RAT, RAT.) THEODORE GILL.

Muri'llo (BARTOLOMÉ ESTÉBAN), b. at Seville, where he was baptized Jan. 1, 1618; received the first instruction in painting from his uncle, Juan de Castillo, in whose studio he worked with Pedro de Moya. In 1634, Juan de Castillo went to Cadiz, and Murillo was left without guide. He was very busy, however, and his productions found a ready market in the Spanish colonies in America. In 1640, Pedro de Moya returned from England, where he had studied under Van Dyck, and acquired that magical clare-obscure in his coloring by which the unnatural sharpness of the outlines is toned down and a true representation of the living form obtained. Murillo, to whom this method of painting was a new revelation, sat down immediately, painted a shipload of Madonnas, martyrs, street-boys, etc. for the colonies, and with the money thus earned he started for Italy in 1643. Arrived at Madrid he met with Velasquez, who received him in his academy, procured him admission to the galleries of Madrid and the Escurial; and Murillo settled down at Madrid, where for three years he studied, copying the works of Titian, Van Dyck, Ribera, and Velasquez. On his return to Seville the friars of the convent of San Francisco entrusted him with the decoration of their cloister, and the eleven pictures he painted for them at once established his fame. Orders came in multitudes, and his name spread rapidly from Spain, over all Europe. He produced a great number of pictures, which are appreciated still more in our days than in his own time; founded an academy at Seville from which many talented pupils issued; and d. in his native city Apr. 3, 1682, unanimously acknowledged as the greatest painter of his age. Pictures by him are found in all the European galleries, but he is best represented in the Pinakothek of Munich, which contains a number of his genre pictures; in the Louvre of Paris, where is found his celebrated *Madonna;* in the museum of Madrid, which possesses twenty-four excellent pictures by him; and in Seville, which still contains not only the greatest number, but also the most excellent, of his pictures. He often represented scenes of real life, and sometimes he was very bold both in the choice of the subject and in its treatment; but the representation is always very graceful and exquisitely humorous; and although Murillo's humor is something unique in its peculiarity, it seldom fails to charm. His most celebrated pictures, however, treat religious subjects, often of an entirely ideal character, and the glow and purity of the religious enthusiasm they reveal are wonderful, and made still more impressive in the representation by a coloring which, blooming in the brightest tints and melting away in the most delicate shades, seems the very medium for the expression of such ideas. Nevertheless, even his most ideal compositions never contradict his realistic sympathies; his *Madonna* is not the heavenly queen, but the beautiful woman, and everywhere his powerful genius knew how to unite the strongest differences into the most perfect harmony. CLEMENS PETERSEN.

Mu'ro Luca'no, town of Southern Italy, province of Potenza, situated on the slope of a hill about 40 miles from Melfi. It is surrounded by a wall, contains some good buildings, with a small library and several charitable institutions. In the castle of this town Joanna I. of Naples was suffocated in 1382 by order of her adopted son, Charles, duke of Durazzo. Pop. in 1874, 7954.

Murom', or **Moorom,** town of European Russia, government of Vladimir, on the Oka. It is an old and picturesque town, with large manufactures of linen and sailcloth, and extensive quarries of gypsum and alabaster in the vicinity. Pop. 10,328.

Mur'phy, post-v. and tp., cap. of Cherokee co., N. C., near the boundary-line between Tennessee and Georgia, has 1 newspaper, 4 hotels, and fine stores. Gold and a brown hematite iron ore exist. Pop. of v. 175; of tp. 1545. J. O'ROBERTSON, ED. "CHEROKEE HERALD."

Murphy, tp. of Ritchie co., West Va. Pop. 1605.

Murphy (ARTHUR), b. at Clooniquin, Ireland, Dec. 27, 1727; was educated at the Catholic college of St. Omer, France; was admitted as a student at Lincoln's Inn 1756, and called to the bar 1762, but his life was chiefly devoted to literary pursuits. He was reasonably successful as a dramatist, as an essayist, and as a political writer. He edited several papers of a Tory complexion, and received the office of commissioner of bankrupts and a pension of £200 in his old age. He is now remembered only for his *Life of Garrick* (1801) and his translations of *Tacitus* (4 vols., 1793) and *Sallust* (1807), the latter completed by the poet Moore. D. in London June 18, 1805.

Murphy (HENRY CRUDE), b. in Brooklyn, N. Y., July 3, 1810; graduated at Columbia College 1830; was admitted to the bar 1833; became city attorney of Brooklyn, mayor 1842, member of Congress 1843–49, member of the State constitutional convention 1846, minister to Holland 1857, subsequently a member of both houses of the State legislature; published translations of De Vries's *Voyages from Holland 1632–44*, *Broad Advice to the United Netherland Provinces*, *The Anthology of New Netherland, or Translations from the Early Dutch Poets of New York, with Memoirs* (1865), and *Journal of a Voyage to New York in 1679–80* (1868). He has written much in the *American Quarterly Review*, the *Historical Magazine*, and elsewhere upon the early Dutch history of New York.

Murphy (JOHN), b. in South Carolina 1786; graduated at South Carolina College 1808; removed in 1817 to Alabama; was governor of Alabama 1825–29; M. C. 1833–35. D. in Clark co., Ala., Sept. 21, 1841.

Murphy's, post-v. of Calaveras co., Cal., 14 miles S. E. of San Andreas. Near by are the Big Trees of Calaveras.

Mur'physborough, post-v. and tp., cap. of Jackson co., Ill., on the Big Muddy River and on the Grand Tower and Carbondale R. R., 6 miles W. of Carbondale and 15 miles E. of the Mississippi River, has a local trade and 2 weekly newspapers. Pop. 3464.

Mur'physburg, post-v. of Jasper co., Mo., 21 miles from Carthage.

Mur'rah (PENDLETON), b. in Alabama; graduated at Brown University 1848; was governor of Texas 1863–65; d. at Monterey, Mex., Sept. 23, 1865.

Mur'rain, a name popularly given to epizootic diseases, especially those which affect domestic animals. The term is such a loose one that it is impossible to employ it except in the most general way. It does not now designate any one specific disease.

Murray, a river of AUSTRALIA (which see).

Mur'ray, county of Georgia, bounded N. by Tennessee. Area, 400 square miles. It is mountainous, and contains much fine scenery and considerable mineral wealth. Much of the soil is fertile and adapted to corn and wheat culture. Cap. Spring Place. Pop. 6500.

Murray, county in the S. W. of Minnesota. Area, 720 square miles. It is a fine prairie-region, with many lakes, and is adapted to grain-culture. Pop. 209.

Murray, tp. of Alameda co., Cal. Pop. 2400.

Murray, post-v., cap. of Callaway co., Ky., 42 miles S. S. E. of Paducah. Pop. 179.

Murray, post-tp. of Orleans co., N. Y., on the New York Central R. R., Rochester and Suspension Bridge division, 50 miles E. of Suspension Bridge. It contains several small villages. Pop. 2522.

Murray (Com. ALEXANDER), b. at Chestertown, Md., in 1755; in early life a sailor, was commissioned a lieutenant in the Revolutionary navy 1776, but having no vessel, served in the 1st Maryland regiment in the cam-

paign of White Plains and Flatbush, receiving promotion to a captaincy. At the close of 1777 he was given command of a privateer, in which he was captured by a British squadron; was exchanged; volunteered as a lieutenant on board the frigate Trumbull, and was again taken prisoner by British vessels after a sanguinary engagement off the Capes of Delaware, on which occasion he was severely wounded. This experience did not prevent him from again taking service in the Alliance frigate, and at the end of the war he had participated in thirteen engagements in the army or navy. On the organization of the American navy in 1798, Murray was commissioned as captain; served in the West Indies and in the Mediterranean, where he fought a flotilla of seventeen Tripolitan gunboats; was appointed in his old age to the command of the Philadelphia navy-yard, where he remained until his death, Oct. 6, 1821, at which period he was the senior officer of the navy.

Murray (Alexander), D. D., b. at Dunkitterick, Kirkcudbrightshire, Scotland, Oct. 22, 1775, was the son of a shepherd, and displayed from childhood such extraordinary proficiency in the acquisition of languages, and so great a thirst for knowledge, as to attract the notice of several clergymen, by whom he was enabled to enter the University of Edinburgh at the age of nineteen. He took orders in the Church of Scotland, and after serving in several parishes was elected in 1812 professor of Oriental literature at the University of Edinburgh. His remarkable knowledge of Semitic languages procured from the widow of James Bruce a commission to classify the extensive collection of manuscripts formed by that celebrated traveller, and also to bring out a second thoroughly revised and annotated edition of his *Travels in Abyssinia*, which appeared in 1807 (7 vols.), accompanied by a *Life* of the author. In 1811, Dr. Murray was called upon to translate a letter from the king of Abyssinia to the English government, being probably the only British scholar at that time acquainted with the Geez or old literary Ethiopic language. In 1812 he published *Outlines of Oriental Philology, comprehending the Grammatical Principles of the Hebrew, Syriac, Chaldee, Arabic, and Abyssinian Languages*, a manual intended for the use of his students. D. at Edinburgh Apr. 15, 1813. He left in MS. a *History of the European Languages, or Researches into the Affinities of the Teutonic, Greek, Celtic, Sclavonic, and Indian Nations*, published at Edinburgh in 1823 (2 vols.), a work of vast learning, but rendered useless by the foundation of the new school of comparative philology.

Murray (Alexander), U. S. N., b. Jan. 2, 1816, in Pennsylvania; entered the navy as a midshipman Aug. 22, 1835; became a passed midshipman in 1841, a lieutenant in 1847, a commander in 1862, a captain in 1866, a commodore in 1871; served on the E. coast of Mexico during our war with that country, and participated in the capture of Alvarado, Tampico, Tobasco, Tuspan, and Vera Cruz; was engaged in nearly all the brilliant operations of the navy in the sounds of North Carolina in 1862, and was highly distinguished for "coolness and courage."

Foxhall A. Parker.

Murray (Sir George), K. B., F. R. S., D. C. L., b. in Perthshire Feb. 6, 1772; entered the army 1789; served with great merit in the wars against Napoleon; was governor of Canada 1813–15; was prominent in public life in England, holding positions of distinction; became a full general in the army 1841; d. at London July 28, 1846. He edited the *Marlborough Despatches* (3 vols., 1845).

Murray (Hugh), b. at North Berwick, Scotland, in 1779; became at an early age a clerk in the excise-office at Edinburgh, and devoted his leisure to literature, especially to geography. He edited the *Scot's Magazine*, contributed to the *Edinburgh Gazetteer* and the *Transactions* of the learned societies, and wrote for the Edinburgh *Cabinet Library* 7 volumes of *History of Discoveries and Travels*—namely, *Africa* (2 vols., 1817), *Asia* (3 vols., 1820), and *North America* (2 vols., 1829), and 10 volumes of descriptive geography—namely, *British India* (3 vols.), *China* (3 vols.), *U. S. of America* (3 vols.), and *Marco Polo's Travels* (1 vol., 1839). His principal work was the *Encyclopædia of Geography* (1834). D. at London Mar. 4, 1846.

Murray, or **Moray** (James **Stuart**), Earl of, known in Scotch history as the "good regent," b. about 1533, was a natural son of James V. by Lady Margaret Erskine, who afterwards married Sir Robert Douglas of Lochleven; was made by his father commendator of the priory of St. Andrew's in 1538, and subsequently acquired the priory of Pittenweem and that of Maçon in France, with a dispensation to hold three benefices, and took in 1544 an oath of fealty to Pope Paul III. In 1547 he accompanied his half-sister Mary (afterwards the celebrated "queen of Scots") to France, and in the following year repelled a descent upon the island of St. Monan, on the coast of Fifeshire, made by Lord Clinton, and drove the invaders back to their ships. In 1556 he joined the Scottish Reformers, and almost immediately assumed the political leadership of the Protestant party. He was one of the Scottish commissioners to witness Mary's marriage to the dauphin of France (1558); was appointed member of the council for civil affairs Dec., 1559, and one of the lords of the Articles June, 1560; was sent as envoy to France Apr., 1561, to invite his sister Mary to return to Scotland as queen, and on her arrival in August became her prime minister and chief adviser, protecting the Protestants in the enjoyment of their religious privileges, while he insisted upon the queen's right to worship according to her Catholic antecedents. In Feb., 1562, he was created earl of Mar, and soon afterward married Lady Agnes Keith, daughter of the earl marischal, but in the same year resigned the title of Mar in favor of his uncle, Lord Erskine, who claimed it by right, and received in its stead the earldom of Murray; defeated the rebel earl of Huntly at Corrichie, and governed Scotland with prudence, though incurring the displeasure of Knox and the extreme Protestants by his studied neutrality in the religious conflict then beginning. In 1565 he lost power by opposing Mary's marriage with Darnley, which he took up arms to prevent, but was defeated and forced to escape into England. He was recalled the following year, and arrived at Edinburgh in March, the day after the assassination of Rizzio, to which he was supposed to have been accessory, as also to the murder of Darnley in the following year, though his complicity in the latter crime is much less certain. He left Edinburgh the day before that event, and proceeded to France, also visiting Queen Elizabeth in England; returned to Scotland in July; found Mary after her marriage with Bothwell a prisoner in Lochleven Castle, where he visited her and induced her to abdicate, July 22. He was proclaimed regent Aug. 22; maintained himself by arms against his sister after her escape, defeated her forces at Langside May 13, 1568, and firmly established his authority; attended the same year at the trial of Mary at York for the murder of Darnley; gave his testimony against her, and produced as evidence the famous "casket letters," the authenticity of which has ever since been so warmly debated. Murray returned to his government, which he administered with skill, vigor, and success until he was assassinated in the streets of Linlithgow by a bullet fired from a window by James Hamilton of Bothwellhaugh, Jan. 23, 1570. Porter C. Bliss.

Murray (John), b. at Alton, Hants, England, Dec. 10, 1741; removed in youth to Cork; became an occasional preacher among the Wesleyans; adopted Universalist opinions in England somewhat later; came in 1770 to America, and travelled extensively, preaching his new doctrine, and was from time to time subjected to violence; held Universalist pastorates in Gloucester, Oxford, and Boston, Mass.; was for a time chaplain in the Revolutionary army; published several volumes, including an *Autobiography*; is regarded as the father of American Universalism. (See Universalists.) D. at Boston, Mass., Sept. 3, 1815.

Murray (John), F. S. A., b. in London Nov. 27, 1778, son of a Scotchman named John McMurray (b. in Edinburgh 1745; d. in London Nov. 16, 1793), who founded a prosperous bookselling shop in London. Succeeding at the age of fifteen to his father's business, young Murray ultimately became the friend and liberal patron of a famous circle of literary men, most of whose works he published. Among them were Byron, Moore, Campbell, Crabbe, Irving, and Gifford, the latter of whom edited for many years Murray's *Quarterly Review*, founded in 1809 as a Tory organ in opposition to the *Edinburgh Review*. In 1812, Murray removed his business from Fleet street to Albemarle street, where it still remains. D. at London June 27, 1843.—His son, bearing the same name, b. in 1808 and educated at the University of Edinburgh, has since conducted the business, maintaining the high reputation of the house. He has edited an excellent series entitled the *Home and Colonial Library*, personally superintended the preparation of the well-known *Murray's Handbooks of Travel*, and has brought out, among others, the works of Hallam, Grote, Milman, Layard, Wilkinson, Rawlinson, William Smith, Lyell, Murchison, Livingstone, and Darwin. In 1869 he established the *Academy*, the most scholarly literary and critical weekly paper ever published in England.

Murray (Lindley), b. in 1745 at Swatara, near Lancaster, Pa.; removed in 1753 to New York with his father, a Quaker merchant; was admitted to the bar in 1776; became a successful merchant of New York, and in 1784 retired from business; settled at Holdgate, near York, England, and devoted himself to literary pursuits; best known by his *English Grammar* (1795), which was for many years regarded as the best authority on the subject, and had a

prodigious currency, particularly in Great Britain; published also an *English Reader*, a spelling book, and other educational works, an *Autobiography*, and some religious works, which were popular. D. at Holdgate Feb. 16, 1826.

Murray (NICHOLAS), D. D., b. at Ballynasloe, Ireland, Dec. 25, 1803; came in 1818 to the U. S., and was apprenticed to Harper & Bros. to learn printing; graduated at Williams College 1826; studied theology without graduating at Princeton; assumed a Presbyterian pastorate at Wilkesbarre, Pa.; pastor of the First church, Elizabethtown, N. J., 1853–61. His "Kirwan" letters to Archbishop Hughes gave him fame as a polemic. Also author of an historical work regarding Elizabethtown, N. J. (1844), a volume of European sketches, *Romanism at Home* (1852), *Parish and other Pencillings* (1854), *Happy Home* (1859), and other works. D. at Elizabethtown, N. J., Feb. 4, 1861.

Murray (WILLIAM). See MANSFIELD, EARL OF.

Murray (WILLIAM HENRY HARRISON), b. at Guilford, Conn., Apr. 26, 1840; graduated at Yale in 1862; held pastorates in Connecticut, and in 1868 became minister of the Park street Congregational church, Boston, Mass.; attained a wide popularity as a preacher and lecturer; author of *Camp Life in the Adirondac Mountains* (1868), *Music-Hall Sermons* (1870), *The Perfect Horse* (1873), etc.

Murray (WILLIAM VANS), b. in Maryland in 1762; received a classical education; went to London after the peace of 1783, and studied law in the Temple for three years; was elected a member of the Maryland legislature on his return, and sat in Congress 1791–97; took a very prominent part in the infant legislation of the U. S., and had few superiors either in erudition, eloquence, wit, judgment, or skill in debate. He was appointed by Washington minister to the Netherlands 1797, and by Pres. Adams envoy to France 1799. Oliver Ellsworth and Gov. William R. Davie were afterwards associated with him as plenipotentiaries in France, but the convention signed at Paris Sept. 30, 1800, which put an end to the serious difficulties between the U. S. and France, was mainly the work of Murray. He returned to his post at the Hague, where he remained until Dec., 1801, and d. at Cambridge, Md., Dec. 11, 1803. He was the author of a treatise on *The Constitutions and Laws of the U. S.*

Murray (WILLIAM WILKINSON), M. D., b. in Southampton co., Va., July 20, 1845; graduated in Queen's College University, Dublin, Ireland; in obstetrics in the Lying-in Hospital of the same city 1868; and is now professor of materia medica and therapeutics in the College of Physicians and Surgeons, Baltimore, Md. PAUL F. EVE.

Murray River, the principal river of Australia, rises on the western slope of the Australian Alps, and falls into Encounter Bay in lat. 35° 26′ S., after a long and tortuous course. Its mouth is too shallow to be entered by large vessels, but its whole lower part is navigable.

Murshedabad′, or **Moorshedabad,** town of British India, presidency of Calcutta, on the Bhagratti. It was formerly the capital of Bengal, and is a large and straggling town, extending along the river for a distance of nearly 8 miles, but, with exception of the palace and some mosques, it is meanly built, its houses being mostly mud huts. Situated on the main road between Calcutta and the North-west Provinces, it has an important trade. Pop. 150,000, of whom 60,000 are Mohammedans and the rest Hindoos.

Murvie′dro, town of Spain, province of Valencia, on the Palancia. It occupies the site of the old SAGUNTUM (which see), and contains many interesting remains, among which is a remarkably well-preserved theatre. Pop. 6916.

Musa′ceæ [from *Musa*, the principal genus], a small natural order of endogenous herbs of very large size, all tropical. The most important products of the order are the plantain, banana, and the fibre called manila hemp.

Musä′us (JOHANN KARL AUGUST), b. at Jena 1735; studied divinity; became in 1763 governor of the court pages at Weimar, and in 1770 became a professor in the gymnasium. D. at Weimar Oct. 28, 1787. Is remembered as "the good Musäus," and as the author of *Volksmärchen der Deutschen* (1782), a collection of pleasing tales, still very popular; wrote also *Grandison der Zweite* (1760), *Physiognomische Reisen* (1778–89), against Lavater; *Freund Heins Erscheinungen* (1785), *Straussfedern* (1787–97).

Musca. See FLY.

Mus′cadine Grape (*Vitis vulpina*, Linn.), a Southern species known by the name of Bullace or Bullitt grape, not growing farther N. than North Carolina. The white scuppernong, one of its varieties, is much esteemed in the Southern States, but is not worth cultivating at the North.

Mus′cæ volitan′tes [Lat. for "flitting flies"], a name given to the black, or more rarely very bright, floating objects which sometimes seem to appear before the eyes. If fixed and permanent black spots appear, moving with one or both of the eyes, there is reason to suspect organic disease of the eye, and an expert oculist should be consulted. If the spots fall or swarm upward, it is believed that they are caused by small and unimportant opacities floating in the humors of the eyes.

Mus′cardine, one of the destructive diseases which have of late years committed such ravages among silkworms. It is characterized by a parasitic vegetation, the growth of a microscopic plant called *Botrytis Bassiana*, a fungus resembling the vegetation of mould and mildew.

Muscat′, or **Maskat,** a powerful and extensive Arabic state or imamat, which originally consisted both of African and Asiatic territories, but which in 1856, at the death of the imam Said Seid, was divided between his two sons, one receiving the African territories, extending along the eastern coast of Africa from the equator to Cape Delgado, with Zanzibar for its capital, and the other the Asiatic territory, situated in Oman, Arabia, and extending along the Persian Gulf and the Strait of Ormuz from lat. 22° 23′ to 26° 23′ N., with Muscat for its capital. The Arabian territory, or Muscat proper, to which belongs a tract of land on the opposite side of the Persian Gulf in the Persian province of Laristan, consists of a low, hot, but, if well watered, very fertile coast-land, producing cotton, sugar, rice, maize, watermelons, and bananas. Behind this coast-land rises a mountainous region consisting of bare and naked ranges enclosing beautiful and fertile valleys, where the coffee tree grows, and figs, almonds, grapes, oranges, lemons, walnuts, and apples. On the inner slope of these mountains lies a row of oases, mostly inhabited by Bedouins, and behind the oases stretch the Arabian deserts. The area and number of inhabitants of this state are unknown, though its commercial relations both with Europe and America have become very important during the last half century.

Muscat, or **Maskat,** capital of the imamat of Muscat, in a fertile plain in lat. 23° 38′ N., lon. 58° 40′ E., surrounded by gardens and plantations of date-palms, on the border of an inlet of the ocean which forms a spacious and safe harbor. The city is fortified, but rather poorly built, and its climate is extremely hot and unhealthy to Europeans. Its inhabitants, numbering about 60,000, consist of Arabs, Hindoos, negroes, and Jews, and carry on a very important trade in coffee, pearls, salt fish, dyestuffs, and other Persian and Arabian goods.

Muscatel′, Muscadel′, or **Mus′cat,** a name applied to a large class of fragrant sweet and heady wines. The name comes remotely from the Arabic *maskat*, "musky." The principal varieties are Cape muscat, the red and white wines of Roussillon in France, and the lachryma christi of Italy. The name is given to certain varieties of grape.

Muscatine′, county in the S. E. of Iowa. Area, 450 square miles. It is bounded S. E. by the Mississippi River. It is uneven and very fertile, and abounds in coal. Live-stock, grain, and wool are leading products. There are important manufactures of carriages, harnesses, metallic wares, etc. The county is traversed by various railroads. Cap. Muscatine. Pop. 21,688.

Muscatine, city of Bloomington tp., cap. of Muscatine co., Ia., 317 miles above St. Louis, on the Mississippi River, and on the S. W. branch of the Chicago Rock Island and Pacific and the Muscatine branch of the Burlington Cedar Rapids and Minnesota R. Rs., has fine schools, 15 churches, 3 banks, 2 newspapers, 4 large saw-mills, 1 wagon and plough factory. Pop. 6718.

MAHIN BROS., EDS. AND PROPS. "MUSCATINE JOURNAL."

Musch′elkalk [Ger. for "shell-lime"], in Germany, the great Middle Triassic limestone, resting, typically, upon the Bunter sandstein, and covered by the Keuper or red marl beds. It is named for its abundant fossils, and supplies lime, marl, rock-salt, gypsum, and building-stone.

Musci, plural of *Muscus*, a natural order of plants. See MOSSES, by COE F. AUSTIN.

Muscle. See HISTOLOGY, by Col. JOSEPH J. WOODWARD, M. D., M. N. A. S.

Mus′cle Fork, post-tp. of Chariton co., Mo. Pop. 710.

Muscle Ridge Plantation, tp. of Knox co., Me. Pop. 263.

Muscle Shoals, a series of rapids in the Tennessee River, in Northern Alabama. The river falls 100 feet in 20 miles. Though navigable above and below, steamboats never attempt the shoals, except in the very highest freshets and at great risk. A canal of imperfect construction was once used on the N. side, but has been long abandoned. The name is given from the vast number of fresh-water mussels here found. It is intended to construct a serviceable canal around these obstructions.

Musco'da, post-v. and tp. of Grant co., Wis., on the Wisconsin River and the Milwaukee and St. Paul R. R. Pop. 911.

Musco'gee, county of Georgia, bounded W. by Alabama, from which it is divided by the Chattahoochee River. Area, 375 square miles. It contains much exceedingly fertile land. Cotton and corn are leading products, and the manufacturing interests are important. The county is traversed by the Central Georgia and the North and South R. Rs. Cap. Columbus. Pop. 16,663.

Muscogees. See Creek Indians.

Muscon'gus Island is off the coast of Lincoln co., Me. Pop. 142.

Musco'tah, post-v. of Atchison co., Kan., is a beautiful and thriving town on the Central branch of the Union Pacific R. R. The Grasshopper River furnishes good water-power.

Mus'covite, the most common species of mica, otherwise known as biaxial or potash mica. Muscovite occurs crystallized in hexagonal prisms, belonging to the orthorhombic system; also in scales and plates, which are sometimes aggregated into stellate and plumose groups. It is remarkable for its eminent cleavage parallel to the base of the prism, the thin folia being separated easily by the thumb nail. Its hardness on the cleavage planes is from 2 to 2.5, and its specific gravity from 2.75 to 3.1; its lustre varies from pearly to metallic, and its color from white to gray, pale green, greenish-yellow, and brown. It is remarkably elastic. In composition muscovite is a silicate of alumina, potash, and iron (silica 43 to 50 per cent., alumina 31 to 39 per cent., potash 5 to 12 per cent., ferric oxide 1 to 8 per cent.). The name muscovite is from Muscovy glass, in allusion to its use in Russia as a substitute for glass in windows. With us it is largely used, under the misnomer of "isinglass," for the same purpose in stoves. It is one of the more abundant minerals, occurring in plutonic and metamorphic rocks, and also in broken flakes in many unaltered sandstones and clays, which are hence described as "micaceous." Edward C. H. Day.

Mus'covy Duck, *Anas* (*Cairina*, Fleming) *moschata*, Linn. The term is a corruption of musk-duck, a name applicable to the bird on account of the strong odor of the skin. The species, which has been extensively domesticated, was originally brought from tropical South America, where it is indigenous. Edward C. H. Day.

Mu'ses [Μοῦσαι], in Greek mythology, the divine inspirers of song. They are generally given as nine in number, daughters of Zeus and Mnemosyne. Their names are most commonly as follows: Calliope, the epic Muse; Clio, the Muse of history; Euterpe, of lyric verse; Melpomene, of tragedy; Terpsichore, of dance and song; Erato, of amatory verse; Polymnia, or Polyhymnia, of the hymn; Urania, of astronomy; Thalia, of comedy and the idyl.

Muse'um [Lat. from Gr. Μουσεῖον], a temple dedicated to the Muses, applied also by the Greeks to music-halls and philosophical schools or colleges, the most renowned of which in antiquity was that at Alexandria, founded by the Ptolemies B. C. 296, and enriched with the most celebrated library of the period, presided over by learned librarians. In modern times the term is applied to a building containing collections of works of art, ancient or modern, or those of natural products, mineralogy, geology, and zoology. After the revival of learning the first museum contained principally coins, gems, and sculptures, and Cosmo de' Medici in the beginning of the sixteenth century founded that at Florence, now in the Palazzo Vecchio; subsequently, Pope Leo X. collected that in the Vatican, which was followed at Rome by those of the Capitol, the Lateran, and others, the galleries of which are the richest in Roman sculpture in the world, and have the Apollo Belvedere, the rival of the Venus called De' Medici at Florence. Another, the Museo Borbonico at Naples, eighteenth century, consists chiefly of the objects found at Pompeii and Herculaneum and the Græco-Italian vases of Southern Italy. The museum of Turin, comprising principally Egyptian antiquities and remarkable for valuable papyri, especially for one with a list of Egyptian kings, was founded in 1832. In France the principal museum, that of the Louvre, founded during the French Directory (1793), comprising Egyptian, Assyrian, Phœnician, Greek, Roman, and Mexican antiquities, is one of the richest in Europe for sculpture of all periods. Amongst its treasures may be cited the Venus of Milo, the so-called Fighting Gladiator, the Egyptian monuments from the Serapeum at Memphis, and Assyrian sculptures from Khorsabad. Besides the Louvre there are many other museums in France of recent foundation—that of mediæval objects in the Hôtel de Cluny at Paris, one at Lyons of various antiquities, chiefly local, of the Roman period, found in the vicinity, and another at Boulogne of miscellaneous objects, besides several others in the principal towns of France. Germany also abounds in museums. That of Berlin, founded in 1828, comprises Egyptian antiquities acquired from Passalacqua and valuable monuments transported from Egypt by Lepsius, many valuable sculptures, and Greco-Italian vases. The museum at Dresden, called the Augusteum, founded by Augustus the Strong (1560), has also some fine Roman sculptures, a head of Caligula and a Venus; while two museums of Munich, called the Glyptothek and Pinacothek, contain fine specimens of ancient sculpture and pictures. These collections are comparatively of recent period. Museums of minor importance also exist at Bonn, Prague, Breslau, and Frankfort, while those of Vienna, from collections commenced by Rodolph II. (1576), are celebrated for their large and magnificent Roman camei and cabinet of medals. In Russia there are museums containing sculptures and pictures at St. Petersburg, Moscow, Dorpat, and Mithau. The progress of civilization has also caused museums to be established at Constantinople, and at Cairo exceedingly rich in Egyptian antiquities of all periods and of recent foundation. In England the first formed was that of Tradescant, a merchant in the reign of Charles I.; it was followed by that of Elias Ashmole in 1679, built at Oxford in 1683, and named the Ashmolean Collection, after him. Small in extent, it contains some remarkable objects—an Egyptian bas-relief of the second dynasty, and the jewel of King Alfred (A. D. 872). Other private collections, as that of the duchess of Portland, sold in 1786, and that of Lever in 1779, were formed in the eighteenth century. The largest public collection is the British Museum, founded in 1753, and originally placed in Montagu House, its present site, and opened in 1759. This was gradually replaced by the present edifice, constructed 1828–45. It is in the Ionic style, with a peristyle of forty-four columns with sculptured pediment. The whole covers several acres, and the collections comprise Egyptian, Assyrian, Oriental, Greek, Roman, pre-historic, and mediæval antiquities, and coins, mineralogy, geology, and zoology, and an extensive library of above 1,000,000 books, pictures, and prints. Of these it is not possible to more than mention its remarkable Oriental collection, the Greek marbles of Athens, the celebrated Portland Vase of glass cameo, the Rosetta Stone, and the Deluge Tablets. A spacious reading-room, capable of holding 300 daily students, is in the centre of the building, and the whole is open to students or the general public daily. It has cost since its foundation £3,452,863, and is maintained by an annual parliamentary grant of £100,000. There are also in London the South Kensington Museum of mediæval and other works of art, with a library and school of design and a museum of practical geology; one of the College of Surgeons, and others in the provinces. S. Birch.

Mus'grave (Anthony), C. M. G., b. in 1828, was the son of Anthony Musgrave, M. D., treasurer of Antigua. Mr. Musgrave became secretary of Antigua; was administrator of Nevis 1860–61; lieutenant-governor of St. Vincent 1861–64; was governor of Newfoundland 1864–69, of British Columbia 1869–71; lieutenant-governor of Natal 1871–73; became in 1873 governor of South Australia. He is a son-in-law of David Dudley Field, Esq., of New York.

Musgrave (George Washington), D. D., LL.D., of North Irish and German parentage, b. in Philadelphia Oct. 19, 1804; studied in the College of New Jersey and the Theological Seminary at Princeton, but on account of ill-health did not graduate at either; was licensed to preach in 1828; was pastor of the Third Presbyterian church in Baltimore 1830–52, and of the North Tenth street church in Philadelphia 1862–68; was corresponding secretary of the Presbyterian board of publication 1852–53, and of the board of domestic missions 1853–61, and again from 1868 to 1870; has been a director of Princeton Seminary since 1837, and a trustee of the college since 1859; received the title of D. D. from Princeton in 1845, and of LL.D. from the University of Indiana in 1862; is a staunch Calvinist, a zealous Presbyterian, an able debater, and took a prominent part in healing the schism of 1837–70.

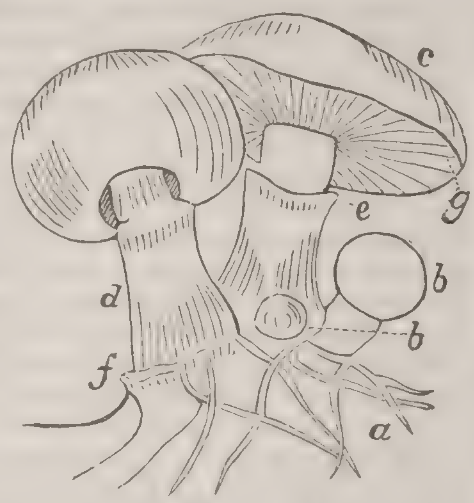
R. D. Hitchcock.

Mush'rooms. The terms *mushroom* and *toadstool* are employed to designate the more conspicuous members of the group of Fungi which have an umbrella-like shape. They belong to the order Hymenomycetes, and principally to the sub-order Agaricini. Mushrooms are popularly supposed to be edible, and toadstools poisonous. This is not, however, true. Strictly speaking, the term "mushroom" should be applied only to *Agaricus campestris*. In this country all other umbrella-shaped Fungi are known under the name of toadstools, and although some are poisonous, many are edible and quite as good as the mushroom, and a very large proportion are certainly harmless. In England a

number of species are eaten under the name of mushrooms —*e. g.* St. George's mushroom, horse mushroom—but such of these species as occur in the U. S. are here classed as toadstools from their falsely being supposed to be poisonous.

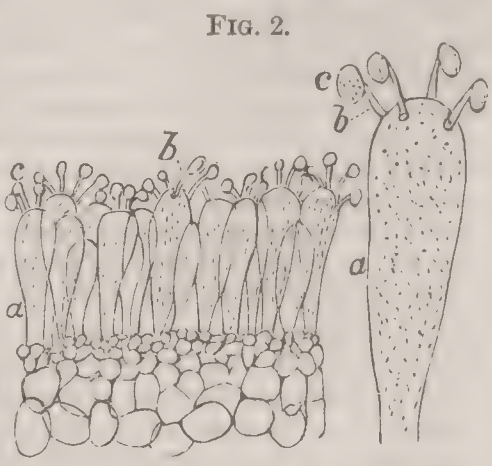
At the base of the plant, and hidden from sight by the soil, is always to be found an entangled mass of fine threads termed the *mycelium* or "spawn" (Fig. 1, *a*), which is the vegetative portion of the plant.

FIG. 1.



Under favorable circumstances of warmth and moisture this mycelium aggregates at certain centres, and sends up above the ground small roundish bodies called in popular language "buttons" (*b*, *b*), which rapidly increase in size and assume the shape of an expanded umbrella. The expanded portion has received the name of *pileus* or "cap" (*c*), and the upright stem is designated by the term *stipe* (*d*). When young, the outer edge of the pileus is united with the stipe, but as maturity is approached it breaks away, leaving a thin fibrous connection resembling a cobweb, which takes the name of *veil*. Often a portion of the pileus at its place of attachment with the stipe is left adhering in the form of a ring, termed the *annulus* (*e*). At the base of the stipe is the remains of an old covering, the *volva* (*f*), out of which the upper portion of the plant has grown. On the under side of the pileus are the *lamellæ* or "gills" (*g*), over which is spread the *hymenium* or fructifying surface.

FIG. 2.



The gills are replaced in some toadstools by *pores*, in others by small *teeth*, while still others have the surface *smooth*. Under the compound microscope the hymenium is found to consist of projecting *basidial cells* (*a*, *a*), upon which are borne the sterigmata (*b*, *b*), generally to the number of four. At the tip of each of the sterigma is formed a single reproductive body (*c*, *c*), called a *spore*. By means of the gills, pores, or teeth the hymenium is vastly increased, so that the number of spores produced by a single toadstool is truly immense. How the spores just described are produced has long been a subject of inquiry among botanists, and it is not until the recent researches of Rees * of Erlangen and Van Tieghem † of Paris that any light has been thrown on the subject. According to these observers, the antheridia and oögonia, corresponding to the stamens and pistils of higher plants, are produced on, or in, the ground from the threads of the mycelium. As the result of impregnation, the stipe and pileus, and finally the hymenium, are produced.

The mushroom, *Agaricus campestris*, is a common species of the Agaricini, the first group of the Hymenomycetes (see FUNGI), growing almost everywhere, from the chilling atmosphere of Lapland to the hot climate of the tropics, the Japan islands on the E. to California on the W. It is the famous *champignon* of the French, *pratiola* of the Italians, and was known to the ancients by upwards of a score of synonyms. The fleshy pileus is white in the young state, becoming of a yellowish-brown when mature. It usually grows in clusters and never attains a great size. The ring is present and conspicuous. Though subject to many variations, it is easily recognized by its fleshy pileus, solid stipe, and pink-colored gills, often becoming purple with age. It is the most generally eaten of esculent Fungi, though in Rome and other Italian cities it is condemned as poisonous, and its place is filled by a toadstool which the French people deem unfit for food. The mushroom is used to a great extent as an article of food in France, and especially in Paris, around which city it is largely cultivated; old deserted mining-caves have been appropriated for the purpose, and many miles of mushroom-beds are reached by the aid of ladders and lanterns. They are usually found in the wild state scattered over a rich meadow or pasture in early morning after a warm shower in the night. The mushroom is only one of over a thousand well-defined species of the genus *Agaricus*, at least one-fourth of which are not only harmless, but well worthy the time and care of the market-gardener. Closely related to the mushroom is *A. arvensis*, popularly called "meadow mushroom," from its place of growth. It is larger than *A. campestris*, stronger in flavor, and less esteemed. From its size and coarseness it has in England received the name of "horse mushroom." Specimens are mentioned weighing 14 pounds. It also shares with *Agaricus gambosus* the honorable title of "St. George's mushroom," supposed by the Hungarians, who named it thus, to be a gift of that noble saint. The two species are, however, quite distinct, as *A. gambosus* is stout and fleshy, grows in rings in early spring, with the pileus becoming cracked and giving out a strong and offensive odor. It has gained a good reputation in some parts of France, but its being an early species is the leading element of popularity. The "nail fungus," *A. esculentus*, is the smallest species used for food. The pileus does not exceed an inch in diameter, and is flat and clay-colored. It is found in fir woods, and is used largely in Vienna as a flavor for sauces under the name of *Nagelschwamm*. One of the most poisonous species of the genus is the "fly agaric," *A. muscarius*, so named because the fungus is often steeped and the solution used for the destruction of the house-fly. The pileus is raised upon a long stipe, reaching a diameter of four to six inches, having its bright red surface studded with large white protuberances. It is attractive, and as poisonous as it is beautiful. In Kamtchatka it is highly prized for its poisonous properties, producing as it does in the eater a peculiar intoxication. The fungus is gathered and dried, and when a native wishes to engage in a debauch he has but to swallow a piece, when in a few hours he will be in his glory. Very closely allied to the fly agaric is *A. cæsareus*, though not poisonous and very excellent for food. It can always be distinguished by having yellow gills, while *A. muscarius* has them of a pure dead white. The genus *Coprinus* differs from *Agaricus* mainly in the deliquescent character of the gills. *C. comatus* is the leading esculent species, and commands attention by its singular and graceful form. The whole surface is delicate and silky, the cap tinged with brown at the top and grayish at the base, soon becoming covered with scales. The gills are very close together, and pass in color from pink to brown. These plants should always be gathered before they begin to deliquesce. In the genus *Cortinarius* the veil is composed of arachnoid threads and the spores are rusty. The edible species are few in number. In *Hygrophorus* the main feature is the waxy character of the hymenium. There are three species of culinary importance, the best being the small pure white *H. virgineus*. It is common, and, like the brown *H. pratensis*, is found in open pastures. The members of the genus *Lactarius* are distinguished by the milky juice which exudes from them when bruised. *L. deliciosus* has the orange-colored pileus marked with zones of a darker color. The milk is at first yellow, soon turning green. This species deserves the name *delicious*, as it is sought for and highly prized by all lovers of edible Fungi. *Russula emetica*, as its name would indicate, acts as an emetic to most persons, though a few can eat it with impunity. It should be avoided, and may be distinguished by its rosy pileus, brittle gills, and white stipe dotted with red spots. The genus *Cantharallus* has thick branched gills, with edges blunt and roundish. *C. cibarius* is the beautiful little yellow chanterelle so highly esteemed by the French. It is easily distinguished by its bright golden-yellow color, and odor much resembling ripe apricots. In *Marasmius* the species are characterized by having a dry hymenium, folds thick and tough and acute at the edge. The species are generally quite small. *M. oreades*, from its peculiarity of growing in circles, and the early superstitious belief that these rings had some connection with elfs and goblins, has long been known as the "fairy-ring fungus." These rings are now known to be formed by the spreading out in all directions of a cluster of these plants, the result of the exhaustion of the nourishment directly beneath. It is a very small and common species, and has gained a good reputation among mushroom-eaters as furnishing a delicate dish.

In the second group of the Hymenomycetes, Polyporei, the gills of the Agaricini are replaced by *pores* or tubes. The genus *Boletus* has the pores easily separated, and furnishes a number of esculent species, of which *B. edulis* is the most important. The pileus is smooth and brown, with the tubes at first yellow, becoming green by age. The reticulation of the stem is one of the leading characteristics of the species. It is an inhabitant of the woods, and often attains the dimensions of from six to ten inches across the pileus. The Italians string and dry it for winter use. Some prefer to this the *B. æstivalis*, which is an early sum-

* *Inaugural Dissertation* (Erlangen, Dec., 1874).

† *Sur la Fécondation des Basidioycetes* (*Comptes Rendus*, Feb. 8, 1875).

mer species. *B. bovinus* is a gregarious species, growing in fir woods, and much sought for as an article of food. The pileus is reddish-gray, sometimes tinged with purple, and the angular tubes are of a grayish-yellow, becoming rusty-brown. *B. luridus* is sometimes eaten without harm, but should not rank among the foremost esculent species. It is common in woods in summer, with a pileus three to six inches broad, and varying in color from a brick-red to brown. The flesh is at first yellow, changing to blue. The genus as a whole is a dangerous one, and the species should be well understood before being used for food. In the genus *Polyporus* the pores are not easily separated, and many of them are without stems. A few species are of worth as articles of diet. *P. giganteus* and *P. intybaceous* are of very large size, sometimes a single individual weighing 40 pounds. They both, like many other species of the genus, grow upon the trunks of trees. In gathering them for food it is best to select the younger species, and use only the inner portion. *P. fomentarius* is touch-wood or "punk," and grows to a great extent on the trunks of dead and decaying trees. The property of its being luminous in the dark has long been known, and is often the subject of much wonder to the young. Amadon or German tinder is a commercial product from this and several other species of *Polyporus*. It consists of slices of the plant beaten out in thin strips and saturated with a solution of nitrate of potash. It is used as a rapid and easy means of starting a fire. The last genus of Polyporei is *Fistulina*, characterized by having the hymenium inferior and a papellated surface when young, which changes into tubes bearing the spores. *F. hepatica*, so named from its resemblance to the liver, is fleshy and juicy, and very appropriately bears the common name of beefsteak fungus. It assumes a great variety of forms, from that of a strawberry to that of a tongue. When cut it resembles a beet-root. It grows upon trunks of trees throughout the summer, and is eagerly sought for and greatly relished by all who know its fine qualities.

The third group of the Hymenomycetes is termed Hydnei, in which the leading characteristic is the numerous projecting spines or teeth, over the surface of which the hymenium is spread. The most common edible species is *Hydnum repandum*, found in woods and shady places. The pileus is fleshy, regular, and red-lobed or undulated, spines pale-yellow, stem two inches long. When raw it has a peppery taste and the odor of horse-radish. Less common, *H. coralloides* in its young state much resembles a cauliflower, because of its peculiar branching. It is a tree-inhabiting plant, and esculent, though quite rare. *H. caput-Medusæ*, as its name would suggest, has the branching top of the one just mentioned. Among others used for food are *H. subsquamosum* and *H. rufescens*. The members of the group Clavariei are easily recognized by being club-shaped, fleshy, and branching. Among these are found a number of edible species. The most beautiful colored species is *Clavaria amethystina*. It is of a fine violet color, and is seldom found in large quantities. Dr. Curtis enumerates thirteen species of *Clavaria* eaten in Carolina, but they are generally little known. In the group Tremellini, or the gelatinous Fungi, only one species has received much attention as an article of food—viz. the curious "Jew's ear," *Hirneola auricula-Judæ*. It gets its name from its strong resemblance to the human ear. This species is collected in large quantities in Tahiti and shipped in a dried state to China, where it is used for soup.

It is to be expected that in an article on mushrooms rules will be laid down for distinguishing esculent from poisonous species. There are no short and simple rules that may be taken as infallible guides here, any more than in the higher plants. If any rules are given, they can only be of a general character, having some exceptions. By a careful survey of the whole ground it might be said in a general way: 1st, *avoid bright colors:* this would throw out the highly-prized chanterelle of the French and several other species; 2d, *avoid those that change color when cut or broken;* 3d, *avoid those with a milky juice* (*Lactarius deliciosus* has a milky juice, and is still delicious); 4th, those that *deliquesce should be avoided;* the *Coprinus comatus* is a grand exception to this rule. The safest of all rules is, never to use a fungus about which there is any doubt: this will require a thorough acquaintance with at least a few of the edible species, which will take no more time than to become familiar with the same number of shrubs or trees. Care should also be exercised to gather only the fresh plants, and they should not be allowed to remain a long time before being eaten. Climate and the seasons seem to exert an influence over Fungi as regards their edible qualities. A much larger per cent. of the spring species are edible than those of autumn.

Most Fungi require for their best development a moist atmosphere, with the exclusion of bright sunlight. The common and most successful method of cultivating the mushroom and edible toadstools is to mix fresh horsedung with loam in such proportions as to prevent too violent fermentation, when it is put in long narrow beds of a foot or eighteen inches in height in the centre, into which the mycelium or spawn is placed, and the whole coated over with a layer of loam. These beds are usually protected from the light and drying influence of the sun by low sheds, having the roofs thatched to prevent too rapid evaporation of moisture. A covering of hay or straw is often placed directly upon the beds. (For extended information on this subject the reader can consult Robinson *On Mushroom-Culture* (London, 1870); Cuthill *On the Culture of the Mushroom* (1861). A few of the more important works are: *Abbildungen und Beschreibungen der Schwämme*, Krombholz (Prag, 1831); *Traité sur les Champignons comestibles*, C. H. Persoon (Paris, 1818); *Hist. et Descr. des Champignons alimentaires et vénéneux*, F. S. Cordier (Paris, 1836); *Treatise on the Esculent Funguses of England*, Dr. Badham (London, 1863); *British Fungi*, M. C. Cooke; *Illustrations of British Mycology*, Mrs. T. J. Hussey (London, 1855); *Iconographie des Champignons*, J. J. Paulet (Paris, 1855).)

W. G. Farlow.

Mu'sic [Lat. *musica;* Fr. *musique*], a succession or combination of sounds arranged with such connection and mutual relation as to express to the ear some distinct form or train of thought, and awaken certain corresponding emotions. Sounds when thus regulated affect the mind through the *ear*, as painting and sculpture under similar conditions affect it through the *eye*. The latter, however, deal with tangible objects, or with ideas formed from material types and their attributes, while the agency of music is limited to certain relations existing between sounds, variously ordered and combined, and the inward springs of emotion. In all time past, and even among the rudest tribes and nations, we find traces of effort to make both the eye and the ear subservient to the stirring up of pleasurable or other feelings. To some such impulse it is most natural to refer not only the production of the rough drawings, chiselings, and carvings often found among tribes and nations of barbarians, but also the varied and persevering attempts of the same untutored races to find gratification for the ear amid the din and clang of their imperfect musical instruments. The results in both cases could not be otherwise than strange in their conception and often marvellous in their ugliness. From this state of primitive rudeness the progress of the finer arts to higher stages of cultivation was not equally rapid. All historical records, and the still existing monuments and relics of antiquity, bear evidence that architecture, painting, and sculpture gradually rose to perfection, while music still remained a subject of dark and confused speculation. For long ages, and even through the most brilliant periods of ancient civilization and intellectual splendor, it was the fate of music to be an enigma defying all solution; and we read of no master-minds springing up to reveal its long-hidden beauties or to discover and systematize its real principles till near the close of the Middle Ages. The music of the present day, both as a science and an art, is therefore a growth of the last three or four centuries; and (with a rapidity equalled only by the rise and advance of Gothic architecture) it has already reached so high a stage of development as seemingly to leave little room for further discovery, either in its scientific, creative, or practical and mechanical departments.

In the present article it is purposed to give in a brief and simple manner a general view or outline of the musical system as now ordinarily understood and received; and as it is presumed that the reader already possesses some elementary knowledge of music, it will be the less necessary to enter into details on Notation, Scale, Mode, and other preliminary matters, concerning which full information will be found under their respective heads in the present work. To several other articles the reader will at times be referred as supplementary to points necessarily stated with brevity in the present article.

Sounds may conveniently be regarded as either musical or unmusical. This distinction is irrespective of their several qualities as loud or soft, harsh or smooth, etc.; for certain sounds which are essentially musical may nevertheless be painful to the ear, while, on the contrary, others which are strictly *un*musical may have no such unpleasant effect. The radical peculiarity or mark of a musical sound is that it possesses a definite *pitch* (or intelligible grade of acuteness), arising from the number, equality, and permanance of the vibrations given forth by the body from which the sound proceeds. The pitch (*i. e.* the degree of acuteness or gravity) of any such sound is dependent on the rapidity of the vibrations excited by the sonorous body. It is estimated that a string or the column of air in a pipe giving the sound represented by C C C C will make 32 vibrations

in a second of time; for the octave above—viz. C C C—the vibrations will be 64, or double the original number; for C C the vibrations are quadrupled in rapidity, being 128 in a second; and so on for the still higher octaves. These various octave sounds differ from each other only in their relative acuteness, just as the letters A, A, A differ only in point of size. The intermediate sounds passed over in rising from one C to another have also their proportionate rates of vibration; and when theoretically considered such intermediate sounds may be almost infinite in number. But for practical purposes the system of music is founded on a select number of these possible musical sounds, forming a scale or series; and it is found, both by experiment and by a certain demand of the human ear, that the degrees or intervals thus selected must follow each other in a certain order, number, and inequality of distance to fit them for musical use. These intervals, counting upward from a root or starting-point, are known as the second, third, fourth, fifth, sixth, and seventh, and they are commonly ascertained by dividing a sounding string into one-half, one-third, one-fourth, etc. of its length, thus gaining all the sounds necessary for the filling up of the octave. (In the article MONOCHORD this process is described at some length, with observations on a few difficulties which arise in the formation of the scale by this method.) The notes or sounds thus obtained are named after the first seven letters of the alphabet, the letters being repeated for each successive octave. In Ex. 1 an octave of this scale (called the *diatonic* scale) is represented according to the order in which the large and small intervals stand to each other:

Ex. 1.

1	2	3	4	5	6	7	8
C	D	E	F	G	A	B	C

Here it will be seen that in the compass of the octave there are five *whole* degrees or "tones," and two *half* degrees or "semitones," and that in a series commencing on C these two semitones fall between the third and fourth and the seventh and eighth degrees. It will also be noticed that in the space from the first to the third degree two whole tones are comprised, making a "major" or greater third. All music written on a scale thus constructed is said to be in the *major mode;* and no similar scale can be formed from the notes in their common order by commencing elsewhere than on C. But another series of notes equally well fitted for the expression of musical ideas may be obtained by commencing on A instead of C. In this the positions of the tones and semitones are widely different, as shown in Ex. 2:

Ex. 2.

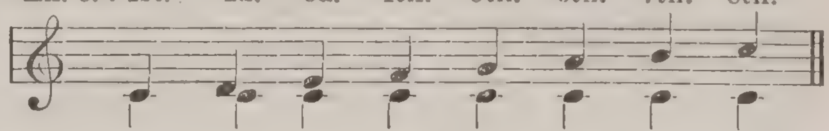
1	2	3	4	5	6	7	8
A	B	C	D	E	F	G	A

Here the semitones are from the second to the third and from the fifth to the sixth. This kind of scale constitutes the *minor mode,* and in the natural order of the notes it can commence only on A. The minor mode is less perfect than the major, as the whole tone between the seventh and eighth in the *ascending* scale is offensive to the ear, and needs to be raised one semitone higher. But in doing this it becomes necessary to elevate the sixth also. This subject of the modes, with special reference to these peculiarities of the minor, is illustrated in the article MODE, to which we refer the reader.

Thus far we have noticed only the *diatonic* scale, which consists of a mixture of tones and semitones in the order described. But as each whole tone in this scale admits of division into two semitones, we obtain by such a division another form of scale (called the *chromatic*), consisting of a complete series of twelve semitonic intervals in the compass of the octave. The chromatic scale may be variously written, either by the use of flats or sharps. These two scales (the diatonic and chromatic) furnish all the material from which modern music is constructed. However varied, discursive, or even capricious, a composition may be, either in melody or harmony, all its tonal degrees are derived from the simple elements of one or other of these scales. It remains here to be noted that before the rise of the modern system of music several other "modes," different from the major and minor, were in common use. The ancient Greeks recognized three genera of scales and intervals—viz. the diatonic, the chromatic, and the enharmonic, the last consisting of quarter tones. Of these genera, however, the diatonic alone appears to have formed the basis of all the music in actual use, or which was capable of being conceived and performed with any approach to accuracy of intonation. (For a more extended view of the formation and characteristics of the ancient scales the curious reader is referred to the article MODES, ECCLESIASTICAL.)

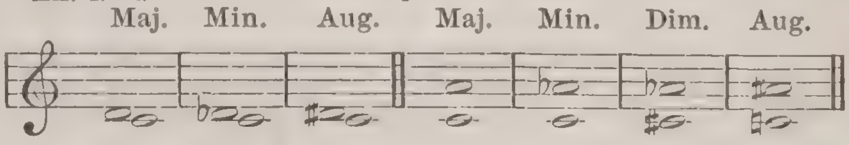
The term "interval" is used to denote the distance of one sound or note from another as reckoned by the degrees of the diatonic scale. Counting upward from any given degree, the intervals and their names are as represented in Ex. 3:

Ex. 3. . 1st. 2d. 3d. 4th. 5th. 6th. 7th. 8th.



Simple intervals are those which lie within the compass of one octave, as those in the example. *Compound* intervals are those which reach beyond the limits of an octave, as the ninth, tenth, eleventh, etc. On the diatonic-chromatic scale the interval of a semitone admits of the distinction of major or diatonic, and minor or chromatic. The *major* semitone is that which involves two different degrees of the scale, as B, C or E, F; but the *minor* semitone has both of its terms on the same degree, as C, C♯, or B, B♭. Each of the other intervals may be various in the number of tones and semitones comprised in it. Thus, a second may be either major, minor, or augmented, and a sixth may be similarly varied, and also diminished, though the notes representing them remain on the same degrees. These differences are created by the elevation or depression of the terms of those intervals by the occurrence of sharps or flats. In illustration of this see at *a* in Ex. 4 the major, minor, and augmented second; and at *b*, the major, minor, diminished, and augmented sixth:

Ex. 4.—*a* Maj. Min. Aug. *b* Maj. Min. Dim. Aug.



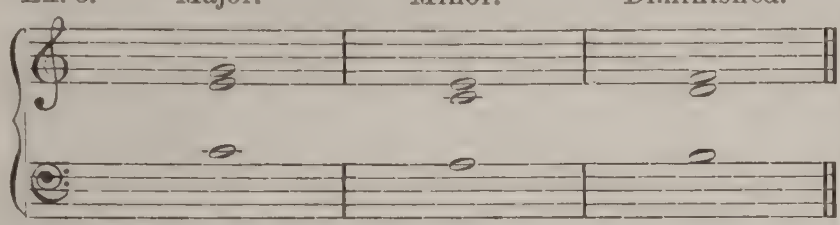
On examining the *contents* of these several intervals it will be found that the minor is one semitone less than the major, the diminished one semitone less than the minor, and the augmented one semitone greater than the major; in other words, the major sixth contains nine semitones, the minor contains eight, the diminished only seven, and the augmented ten. Though all the intervals may thus be subject to modification, and may be viewed in several aspects, yet the unison, octave, fifth (and the fourth as the inversion or complement of the fifth) are those alone which are called "perfect," because they are producible on the scale in only one form, as C C, D D, etc., or C — G, D — A, etc. The only exception is the imperfect fifth, B — F, which, however, is treated as perfect in the progressions of the *minor* scale, as will be seen hereafter. In the article INTERVAL, at Ex. 3, all the intervals of the octave (including also the ninth), as now in use, with their several names, are given in their proper order and relations; a reference to which will save repetition.

Certain names are also given to the intervals within the octave, to indicate their relations to the root, prime, or keynote. Thus, the keynote itself is called the *tonic;* the fifth above is the *dominant;* and the third midway between these is the *mediant.* Similarly, the fifth below the tonic is the *subdominant,* and the third between it and the tonic is the *submediant;* the note immediately above the tonic is called the *super-tonic,* and the interval directly below the tonic is the *sub-tonic* or *leading-note.* Intervals are also classified as consonant and dissonant, fundamental and inverted, etc.; these distinctions will also be found explained in the article INTERVAL.

The intervals just enumerated are the elements of all musical compositions. When arranged in a continuous series of single sounds, selected and properly linked together, the composition so made is called a *melody,* and the union of two or more melodies in simultaneous utterance is called *harmony.* The subject of MELODY the reader will find already discussed in this work under its appropriate head, and attention will now be given to that far more intricate and extensive branch of the science which relates to *harmony.* The great primal maxim which forms the basis of the modern structure of harmony is thus expressed by an able writer of the German school: "All musical harmony arises from *two chords,* called the *fundamental concord* and the *fundamental discord,* and from the different uses that can be made of them by *inversion, suspension, anticipation,* and *transition.* And all musical harmony, even the most complicated, if only regular, is reducible to the said *two chords,* the fundamental note of which is called the *fundamental bass.*" These two chords are the *triad* and the *chord of the seventh,* of each of which there are several varieties. From these also spring certain accidental and "anomalous" chords, easily remembered, of which due notice will be taken in their proper places. Any of these chords may be used in a complete or an incomplete form; *i. e.* with *all* their terms or intervals expressed, or with one or more omitted. The *triad,* which

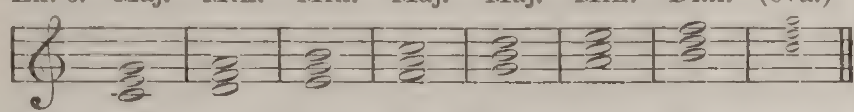
we are now to consider, is the first and simplest of the two fundamental chords. It consists of a bass, with its third and fifth, and may be major, minor, or diminished; the first having a major third, the second a minor third, and the last a minor third with a diminished fifth. These three triads are shown in Ex. 5:

Ex. 5. Major. Minor. Diminished.



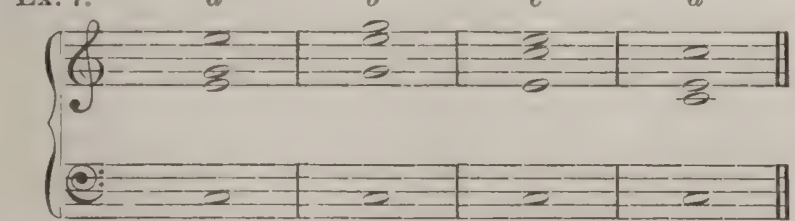
A triad may be built on each of the natural degrees of the scale; and on experiment it will be seen that three of these triads are major, three are minor, and the remaining one is the diminished triad. (See Ex. 6.)

Ex. 6.—Maj. Min. Min. Maj. Maj. Min. Dim. (8va.)



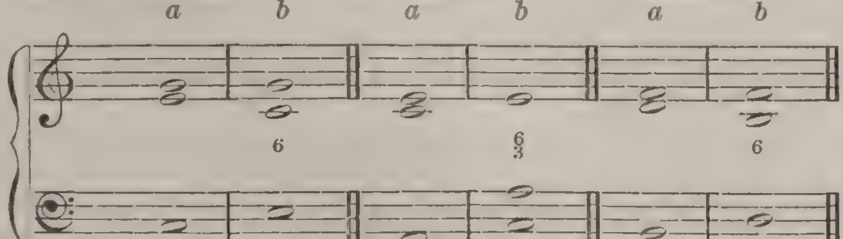
In this normal or original form of the triad the lowest note or term is the root or "fundamental bass;" and so long as this lowest term remains unchanged it is a matter of indifference whether the other terms (the third and fifth) stand in close or dispersed relation to it. One or more of the intervals of a triad may also be *doubled* (either on the unison or the octave), or in certain cases one of the terms may be omitted, as already stated. An illustration of all this, taken from Kollmann, may be seen in Ex. 7, where at *a* the octave of the root is omitted and the third doubled; at *b* the octave is omitted and the fifth doubled; at *c* the fifth is omitted and the third doubled; and at *d* the fifth is omitted and the octave doubled:

Ex. 7. *a* *b* *c* *d*



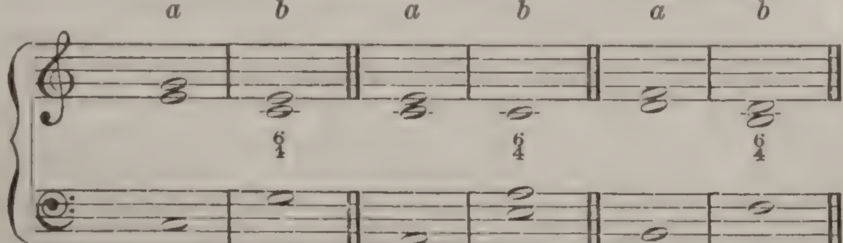
It is not to be understood that in composition all these forms are equally good; and they are here adduced merely to show what changes may take place among the *upper* intervals of the triad while the fundamental bass remains the same. When the root or fundamental bass is no longer the *lowest* term of a chord, but one of the higher terms is substituted for it, the chord is said to be *inverted;* and there can be as many inversions of a chord as there are intervals to change places with the bass. As a triad consists of two such intervals besides the root—viz. a third and a fifth—it follows that it is capable of two inversions. (See INVERSION.) The first inversion of the major, minor, and diminished triads (in which the original third becomes the bass) may be seen at *b, b, b* in Ex. 8, with their respective fundamental forms prefixed at *a, a, a:*

Ex. 8. Major. Minor. Diminished.
a *b* *a* *b* *a* *b*



As the triad originally consisted of a bass, third, and fifth, it assumes in this inversion the form of a bass, third, and sixth. Hence it is represented by the figures $\frac{6}{3}$ or 6. In the second inversion, the original fifth becomes the bass, while the former third makes the interval of a sixth, and the octave of the fundamental stands between them as a fourth, as in Ex. 9, at *b, b, b:*

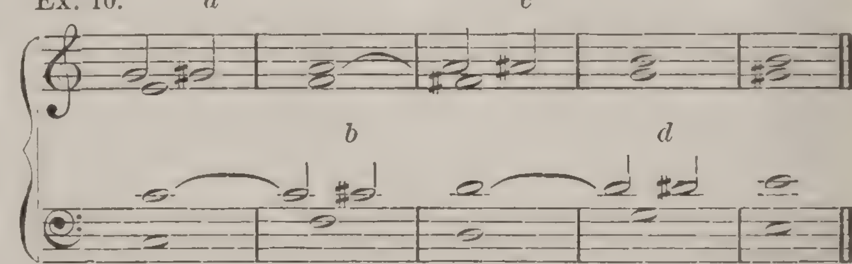
Ex. 9. Major. Minor. Diminished.
a *b* *a* *b* *a* *b*



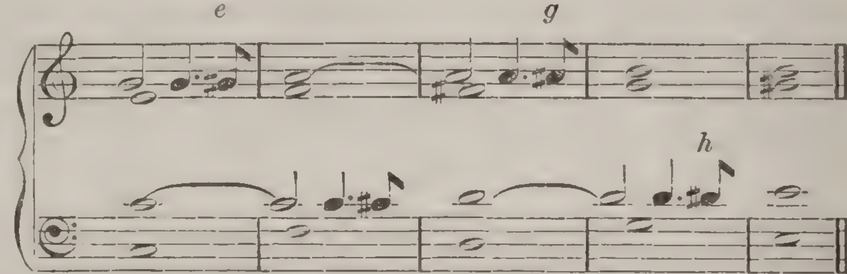
The triad thus inverted is indicated by the figures $\frac{6}{4}$. Inversions are not to be confounded, as we have said, with mere "changes of position" among the *upper* parts of a chord. These changes, however various, do not affect the real nature and quality of a chord, or its standing in relation to its fundamental bass. But an *inversion* involves a radical change of that relation, and is productive of new and often far richer effects than those ordinarily attending the uninverted chord. Hence, the large number of inverted chords in all compositions which rise above the rank of the simple choral or the plain ecclesiastical chant. Inverted *triads* have also a property—somewhat analogous to that of the chord of the seventh—of suggesting to the mind an idea of *progress* or continuance; and this oftentimes with such definiteness as to lead the hearer to anticipate, in a measure, the course of the ensuing progression, and to keep his thoughts in a sort of protracted suspense till the harmony brings the ear into repose on some expected turn or cadence. Impressions of this kind are not usually excited by triads in their original form, as each *such* triad has in itself a certain element of finality or conclusiveness, which either disappears or is not sensibly felt when the chord is inverted.

Besides the three *fundamental* triads, there are several others which are termed "anomalous," of which mention has already been made. Among these is the *augmented* triad, which has a major third and an augmented fifth. This augmentation is effected by an accidental sharp or its equivalent; and therefore, as *this* term of the chord is foreign to the diatonic scale, the real origin and nature of the augmented triad admit of a ready explanation. "This triad," says a writer, "is nothing else than the real *perfect major triad,* with a transient semitone added by anticipation to the perfect fifth to render its progression to the note above it more conspicuous." On this theory the augmented triads at *a, b, c,* and *d* in Ex. 10 will appear as mere prolongations of the transient semitones added to the fifths, as shown at *e, f, g,* and *h:*

Ex. 10. *a* *c*

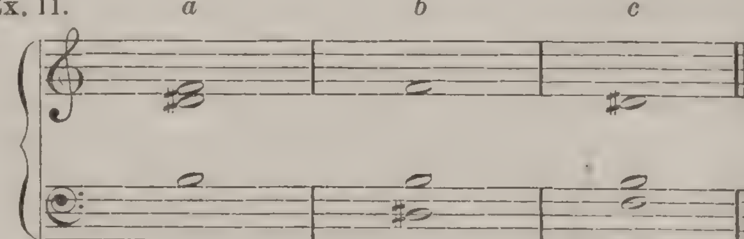


Explanation.
e *g*



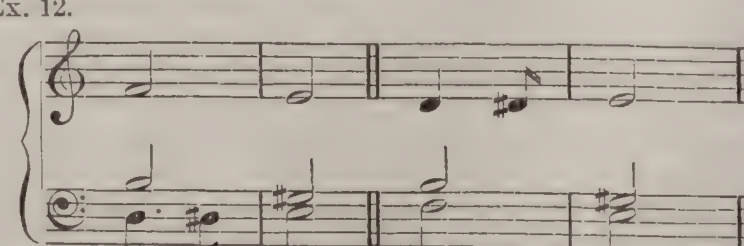
In this triad the elevated fifth becomes a "leading-note" to the succeeding chord, and therefore always *ascends,* as in the example. (See LEADING-NOTE.) The second of the anomalous triads is that which consists of a bass with a major third and diminished fifth. This is a modification of the imperfect or diminished triad, by the accidental elevation of its third from minor to major. (See this chord with its two inversions at *a, b, c* in Ex. 11.)

Ex. 11. *a* *b* *c*



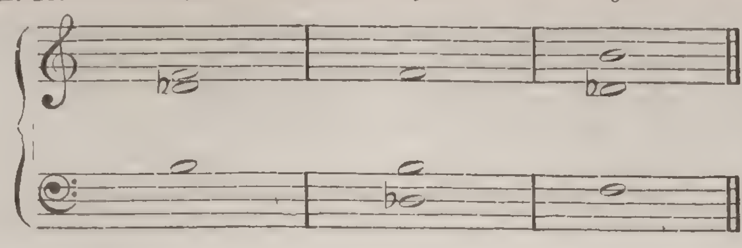
The progression of this altered third is always *upward,* and it is evidently nothing more than a transient "help-note," as shown in Ex. 12:

Ex. 12.



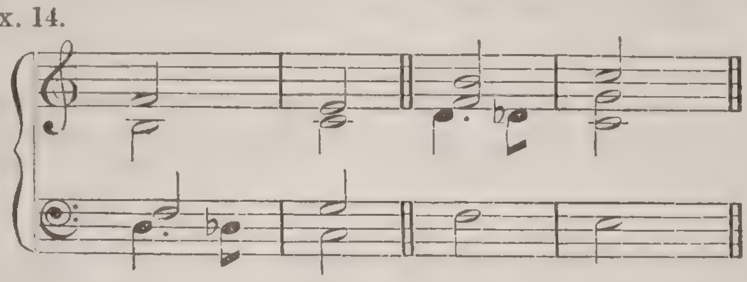
The same explanation will apply to another anomalous triad, formed by the contrary process of *depressing* or flattening the third in the diminished triad. This chord (like the above) belongs to the minor mode, and its inversions resemble the "extreme sharp sixth" both in appearance and progression. Its original form and two inversions are given at *a, b, c* in Ex. 13:

Ex. 13. a b c



The derivation of this chord from mere transient or passing notes will appear from an inspection of Ex. 14:

Ex. 14.



In all these "anomalous" triads the altered notes (which constitute their peculiarities) may be restored to their original form by omitting the accidentals, without producing any essential change of the harmony.

From this review of the triad we now proceed to the *chord of the seventh.* This is formed by adding a third to the triad, thus making it a chord of four parts or terms—viz. a bass, third, fifth, and seventh. As each degree of the diatonic scale may be the basis of a triad (see Ex. 6), so by the addition of a third to each triad we obtain an equal number of chords of the seventh, as will appear from Ex. 15:

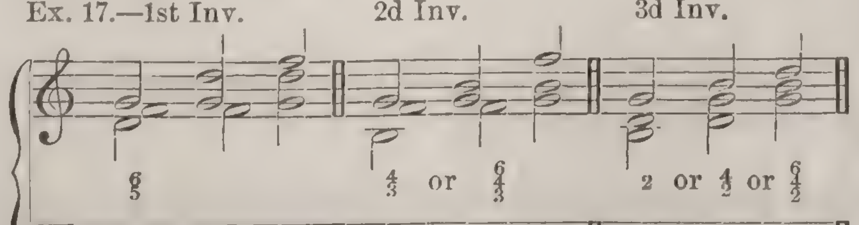
Ex. 15.

As all these are composed of major and minor thirds variously combined—several of them also being identical in structure—we may classify them thus: (1) that with a major triad and minor seventh—viz. G; (2) those with a minor triad and minor seventh—viz. D, E, and A; (3) that with a diminished triad and minor seventh—viz. B; and (4) those with a major triad and major seventh—viz. C and F. From the ordinary degrees of the scale we have thus four different forms of this chord, which for convenience' sake may be referred to as the sevenths on G, A, B, and C. These four kinds of sevenths are called *fundamental,* but the most important is that founded on the dominant of the key or tonic, as it is not only the most pleasing to the ear, but also the chief agency in the formation of cadences and in digressions from one key to another. All the fundamental sevenths are, for the most part, subject to the same rules and are capable of the same inversions, which are three in number. (The *diminished* seventh has not here been mentioned, as from its very peculiar form and character it is reserved for treatment elsewhere.) In the three *inversions* of the chord of the seventh, the third, fifth, and seventh become successively the bass, and the other parts (including the octave of the root) will stand to the new bass in the order (1st) of a third, fifth, and sixth; (2d) a third, fourth, and sixth; and (3d) a second, fourth, and sixth, as in Ex. 16, where *a* is the fundamental position of the chord, *b* the first inversion, *c* the second, and *d* the third:

Ex. 16. a b c d

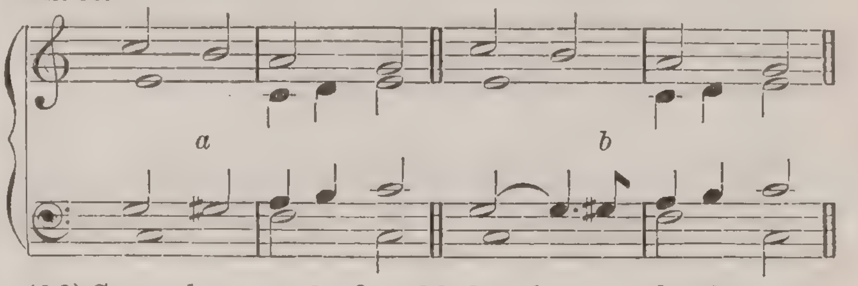
When represented by figures, the first inversion is known as the "chord of the fifth and sixth:" the second, the "chord of the third and fourth;" and the third, the "chord of the second;" these names being derived from the new positions assumed by the intervals of the chord under its several inversions. (See Figured Bass.) The above example is given in "close" harmony to show more clearly the nature of the changes made by inversion. But in each inversion the upper parts may be "dispersed," or taken at greater distances from the bass, without in any way affecting the nature of the inversion itself. (See Ex. 17.)

Ex. 17.—1st Inv. 2d Inv. 3d Inv.



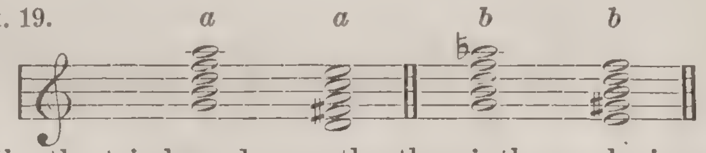
The "anomalous" chords of the seventh are (1st) that consisting of a major third and seventh, with an augmented fifth; for instance, C, E, G♯, and B. By referring to what has already been said of the augmented *triad,* the origin of this chord will be perceived. It is simply one of the four fundamental sevenths, with the fifth transiently raised as a passing note. (See the chord itself at *a* in Ex. 18, and its explanation at *b.*)

Ex. 18.



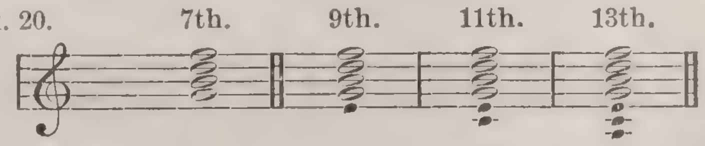
(2d) Sevenths may also be added to the two other irregular triads noted in Exs. 11 and 13; and the elevation or depression of the fifths in such chords by an accidental is to be viewed as a transient change not affecting the fundamental and permanent elements of the chord.—Besides the triads and the chords of the seventh there are three other combinations yet to be noticed, on account of their frequent occurrence and the different theories adopted for their explanation. These are the chords of the ninth, eleventh, and thirteenth. The chord of the ninth differs from the seventh by the addition of a third above. The ninth itself may be either major, as at *a, a* in Ex. 19, or minor, as at *b, b:*

Ex. 19. a a b b



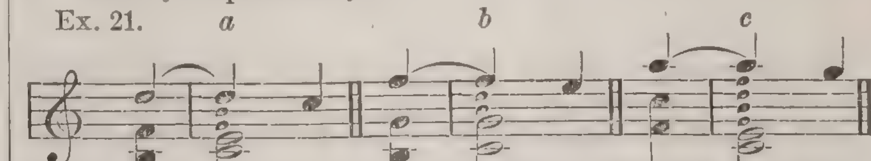
Like the triads and sevenths, the ninth may be inverted, but several of its inversions are harsh, except in rapid movements, and therefore little used. Ordinarily, one (or more) of the middle intervals is omitted, and the effect of the chord is generally more pleasing when thus incomplete. The "chord of the *eleventh*" exceeds the ninth by the addition of another third, and the "chord of the *thirteenth*" extends beyond the eleventh by the addition of still another third. Respecting the origin of these three chords there are two principal theories: first, that of Rameau, under which they are called "chords by *supposition,*" or chords formed by *supposing* one, two, or three thirds added *below* a chord of the seventh. Thus, by supposing a third to be placed below such a chord, the *ninth* is formed; by adding to this another third, we obtain the *eleventh;* and by yet another, the chord of the *thirteenth.* This process is exhibited in Ex. 20, where the thirds thus supposed are marked by black dots:

Ex. 20. 7th. 9th. 11th. 13th.



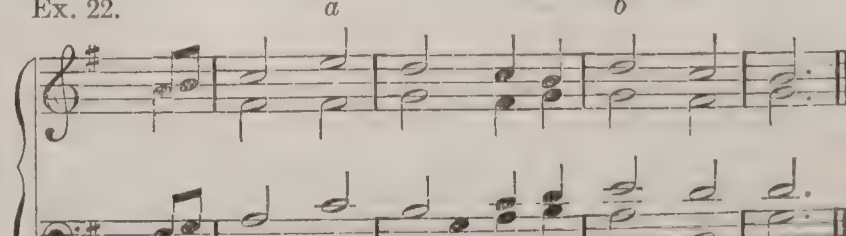
To this system it is objected (1) that there is no apparent reason why those thirds should be supposed at all; (2) that such a theory ignores the natural bearings of the *sound* of the chords in question, and their possible relation to other sounds into which they may be resolved, and offers instead of this a mere mathematical calculation. On the other theory, that of Kirnberger, these chords are not considered as fundamental, but having their origin in *suspensions;* and when so regarded their explanation is rendered both easy and satisfactory. To illustrate this as briefly as possible, we give at *a* in Ex. 21 the ninth as suspension of the octave; at *b* the eleventh as suspension of the tenth; and at *c* the thirteenth as suspension of the twelfth; the dots are merely explanatory:

Ex. 21. a b c



It is to be observed, however, that though these chords have thus their *origin* in suspensions, yet they often occur independently—*i. e.* unconnected with actual or apparent suspensions. (See Ex. 22 at *a* and *b.*)

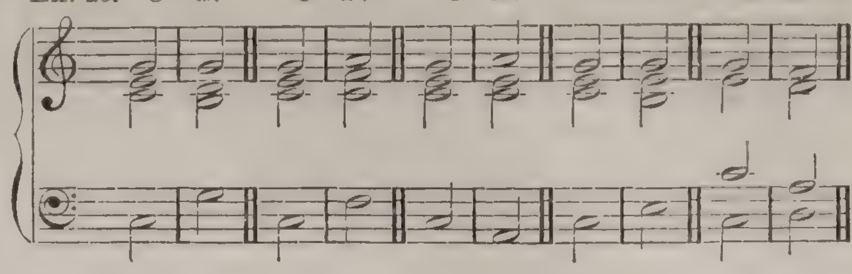
Ex. 22. a b



In this respect they resemble many other harmonic combinations, which are traceable only to the numerous forms generated by anticipations, transitions, etc.

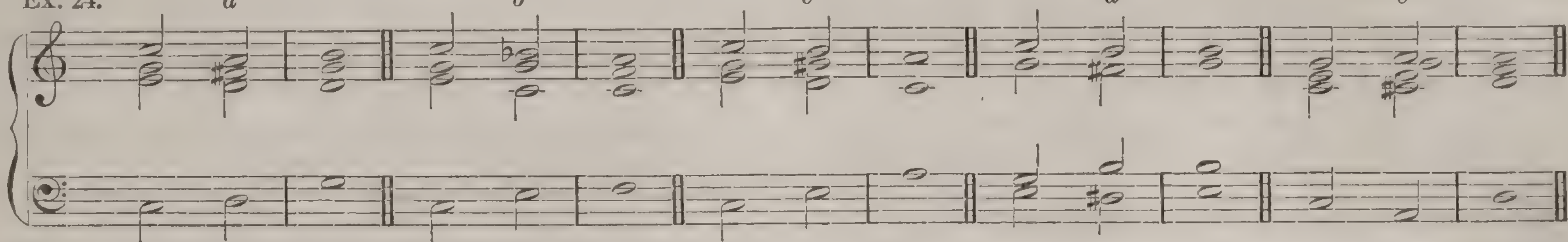
The *progressions* of the fundamental triads and chords of the seventh are next to be noted. "Progression" is the movement from one chord to another more or less related to it. We shall first consider the ordinary progressions of the *triads*. From a major triad (that of C, for example) we may proceed to the triads and inversions of the dominant (G), the subdominant (F), the relative minor (A), the mediant (E), and the super-tonic (D), these being the most nearly-related triads to that of C. (See Ex. 23.)

Ex. 23. C—G. C—F. C—A. C—E. C—D.



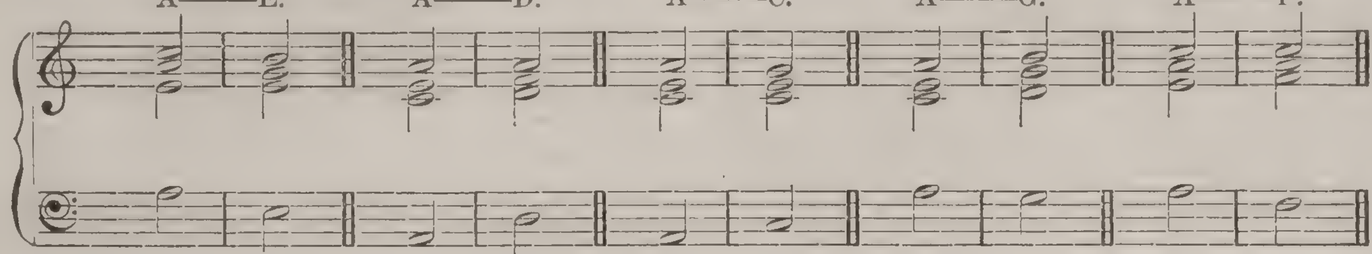
Also to the *leading chords* of these related triads, with or without the seventh, as at *a, b, c*, etc. in Ex. 24:

Ex. 24. a b c d e



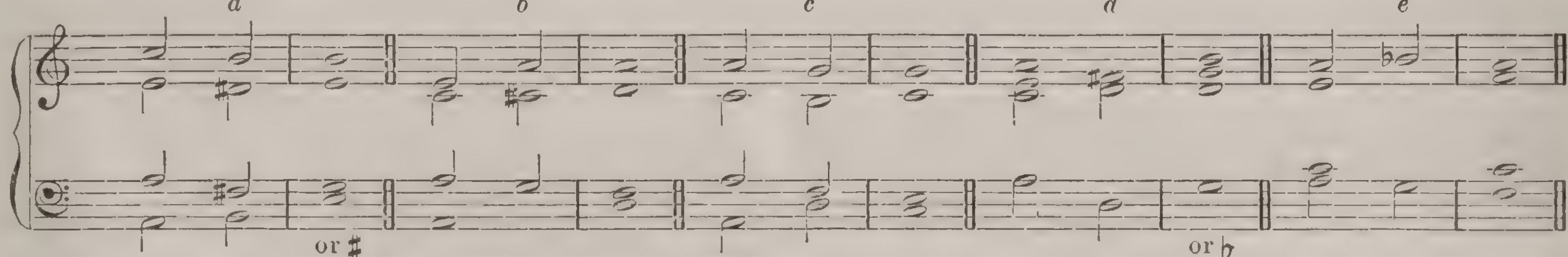
From a *minor* triad we may proceed in like manner, the *order* of the related keys being slightly different. (See Ex. 25.)

Ex. 25. A——E. A——D. A——C. A——G. A——F.



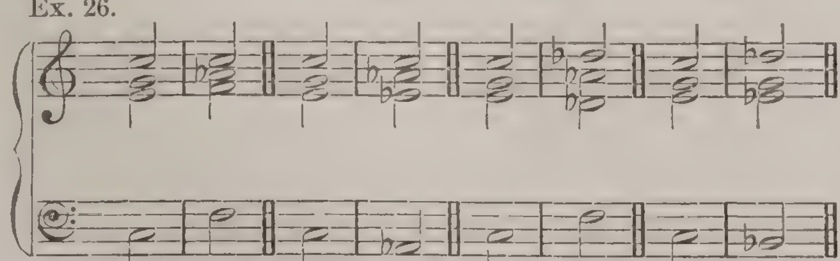
Or thus with leading chords:

a b c d e



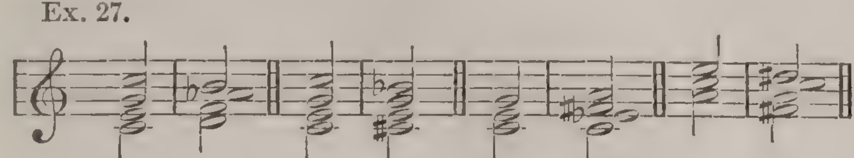
Besides these *natural* progressions, there is another class called the *abrupt*, in which the triad proceeds to chords more or less unrelated or remote. These progressions generally imply the omission of some intermediate chord; and sometimes the first chord is assumed to be not the tonic, but the dominant of its scale. (See Ex. 26.)

Ex. 26.



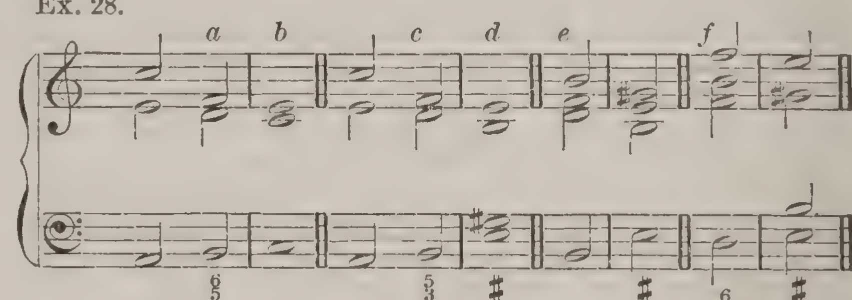
From a triad, either major or minor, we may proceed directly to any chord of the diminished seventh or its inversions, as in Ex. 27:

Ex. 27.



The progressions of the *diminished* (or imperfect) *triad* are peculiar, and require special notice, as the resemblance of that chord to an incomplete chord of the seventh often leads to mistakes. This triad consists of a bass, with a minor third and imperfect fifth. It has its place or seat on the second degree of the minor scale and the seventh of the major. The bass or root is therefore the leading-note in the major scale, and a triad so placed consists of precisely the same notes or intervals as the first inversion of the seventh on the dominant with the root omitted. Hence, such a chord is ambiguous, and its real nature can only be determined by its connection and the harmony immediately following it. This will be apparent from Ex. 28, where the notes at *a* and *c*, though the same, are shown by their progressions at *b* and *d* to be essentially different chords, the first being an incomplete inversion of the seventh, and the other the real diminished triad:

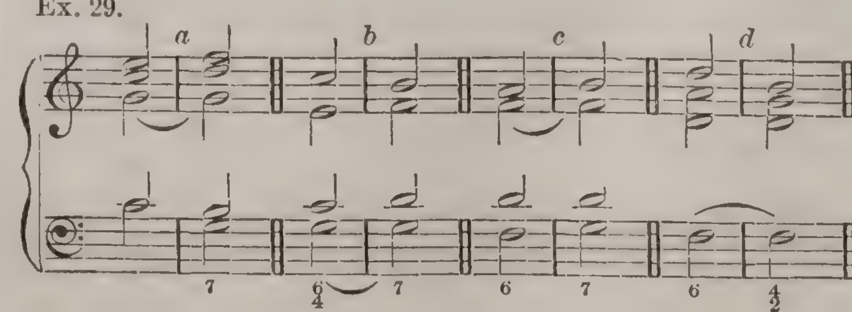
Ex. 28.



The difference between these two chords is evident, as the bass and fifth at *a* in the example cannot be doubled (the one being the leading-note and the other the essential seventh), though either of these intervals may be doubled in the case of the diminished triad, as shown at *e* and *f*. The diminished triad is simply the supertonic harmony in the *minor* scale, and its treatment is in most respects similar to that of the supertonic of the *major* scale.

In the progressions of the *chord of the seventh* and all dissonances two points are to be noted—viz. *preparation* and *resolution*. Any such chord is said to be "prepared" when one of its terms (usually the fundamental bass or the dissonant interval) forms a component part of the chord immediately preceding. For illustration under this head and that of resolution we shall take the principal chord of the seventh (G, B, D, F) and its inversions, of which G is the lower term or root, and F the higher. In Ex. 29 the chord of the seventh is thus prepared in the *lower* term at *a* and *b*, and in the *higher* term at *c* and *d*, as indicated by strokes:

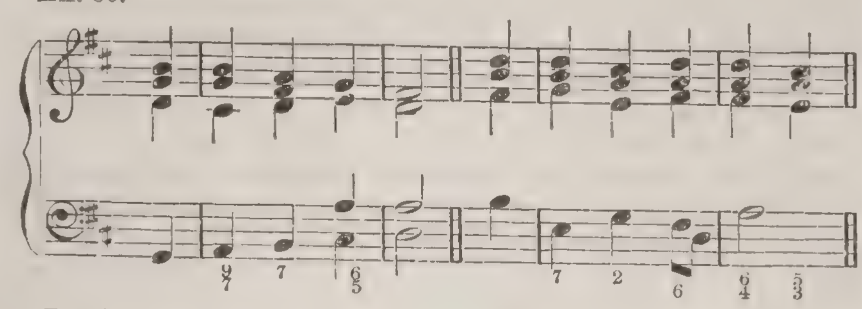
Ex. 29.



In the strict style of composition this rule was held to be obligatory, except in a very few cases, but in the free style numerous instances of unprepared dissonances occur in the

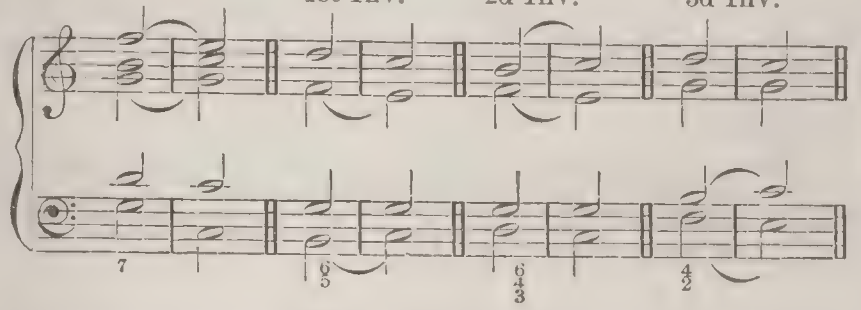
writings of the best composers. Like several other rules which have been modified or abrogated under the advances of modern harmony, that of preparation has lost much of its stringency, and is frequently overlooked in cases where it can add nothing to the clearness or compactness of the harmony. Such instances of unprepared sevenths as the following (Ex. 30) are frequent, and are approved by Albrechtsberger and other theorists:

Ex. 30.



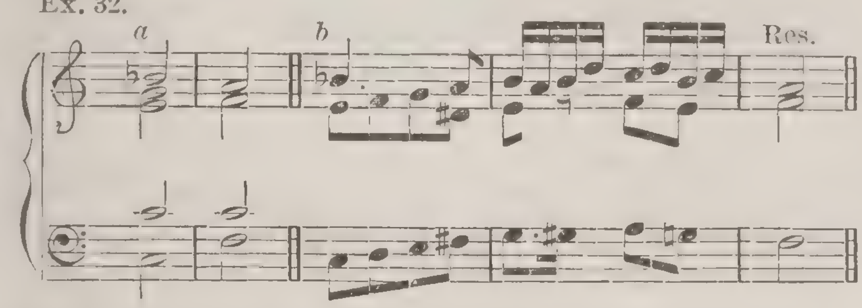
In the *resolution* of the chord of the seventh the general rule is that the third (from the root) moves one degree upward, and the seventh one degree downward, the fifth being unlimited. The fundamental bass also usually rises a fourth or descends a fifth. (See Ex. 31.)

Ex. 31. 1st Inv. 2d Inv. 3d Inv.



The resolution does not always take place on the very next note, but may be delayed by the intervention of several notes and even extraneous harmonies. (Compare *a* and *b* in Ex. 32.)

Ex. 32.

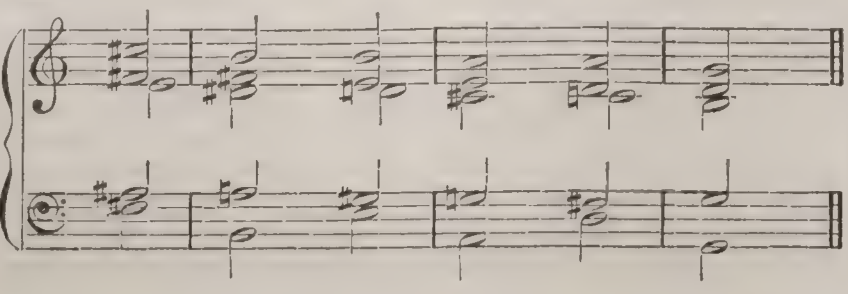


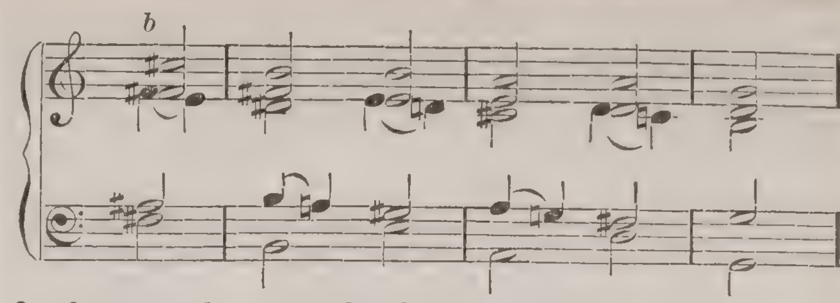
It is not necessary that the resolution should always occur in the *same part* which makes the dissonance, for any part may move from its own to another term of the chord by an exchange of place with some other part; but in all cases the resolution must finally take place. Thus, in Ex. 33 at *a*, the third (or leading note) is in the bass, and the fifth in the treble; but at *b* these two parts make an exchange, and the resolution proceeds accordingly. At *c* the seventh in the treble is transferred to the alto at *d*, and the treble takes the leading-note, which before was in the tenor:

Ex. 33.

A seventh, instead of resolving into the perfect triad, may be succeeded by another seventh, and this also by another, thus forming a train ending with the usual resolution, as at *a*, in Ex. 34. Theorists explain this kind of progression by supposing that the ear perceives a transient resolution after each seventh, which immediately passes into the next dissonance. This is shown by the crotchets at *b* in the example, which make each chord first a triad and then a seventh:

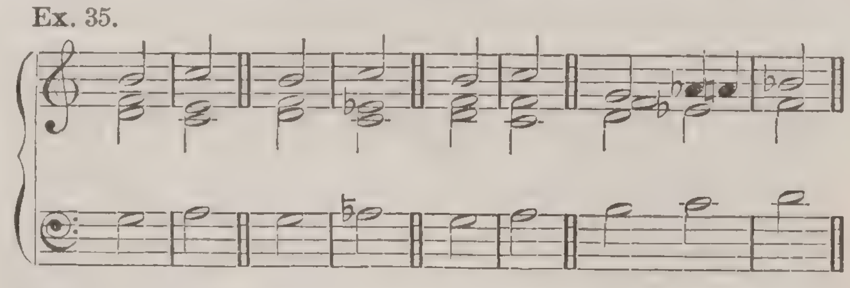
Ex. 34.—*a*





On the same theory of the skipping or omission of some intermediate note numerous other progressions of the seventh are to be explained. Several of these are given in Ex. 35:

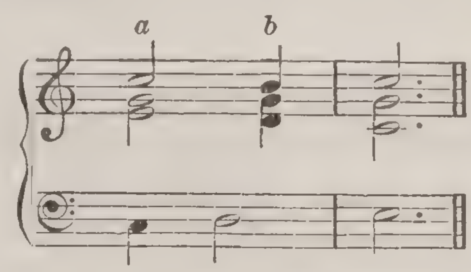
Ex. 35.



That the sevenths may proceed at once, like the triads, to any chord of the diminished seventh, will need no demonstration.

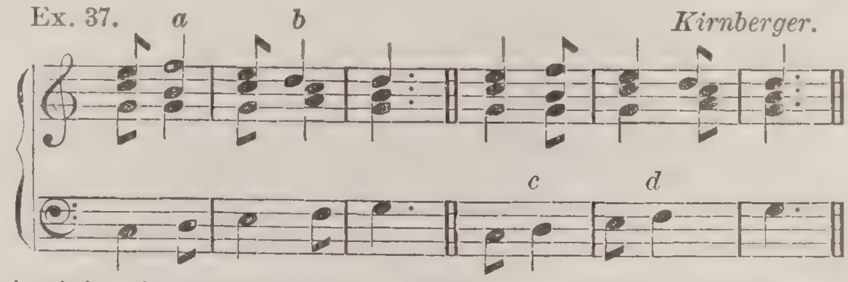
To the chords already described must be added those accidental combinations called *anticipations* and *suspensions*. An "anticipation" is the premature advance of one of the terms of a chord by which it intrudes (as it were) upon the next chord. An instance of this may be seen at *a* in Ex. 36, where the second note of the bass, by moving one crotchet too soon, comes in collision with the triad of C in the upper parts, and *anticipates* the harmony at *b* to which it properly belongs:

Ex. 36.



In Ex. 37, at *a* and *b*, the upper parts make anticipations by moving one quaver in advance of the bass; and at *c* and *d* the bass moves similarly in advance of the upper parts:

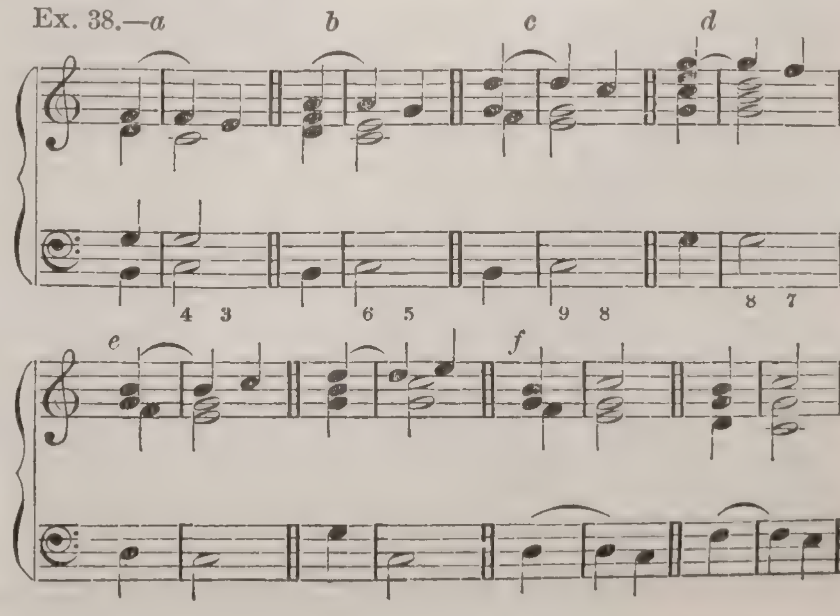
Ex. 37. *Kirnberger.*



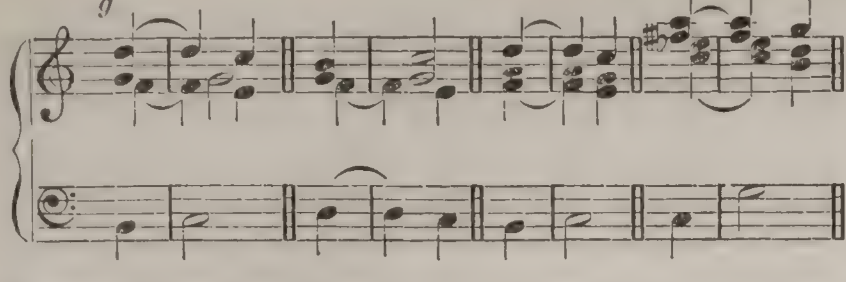
Anticipations are for the most part discordant, as they bring a foreign element into the harmony, but in some cases they contribute to the smoothness and elegance of a movement.

Suspensions are the reverse of anticipations. They occur "when one or more notes of a *preceding* chord are carried into a *succeeding* one to which they do not belong." Any one of the intervals of a triad or chord of the seventh (or two or more together) may be suspended. These suspensions are always on the accented part of a bar or note, and are resolved on the unaccented. A note may be suspended either from above or below. Illustrations are given in Ex. 38, where at *a* the third in the upper part is suspended from above by the fourth; at *b* the fifth is suspended by the sixth; at *c*, the octave by the ninth; and at *d*, the seventh by the octave. At *e* the suspensions are from below, and at *f* they occur in the bass. Instances of double, triple, and quadruple suspensions are added at *g*:

Ex. 38.—*a*

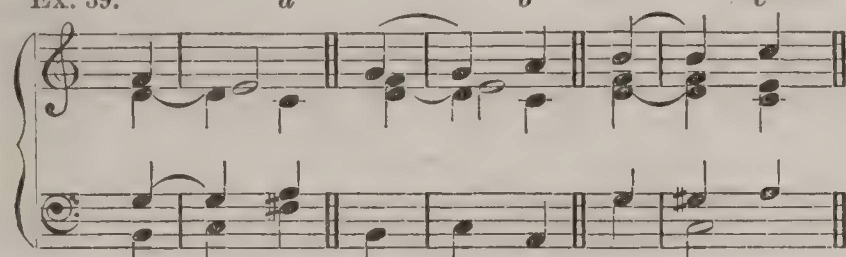


g



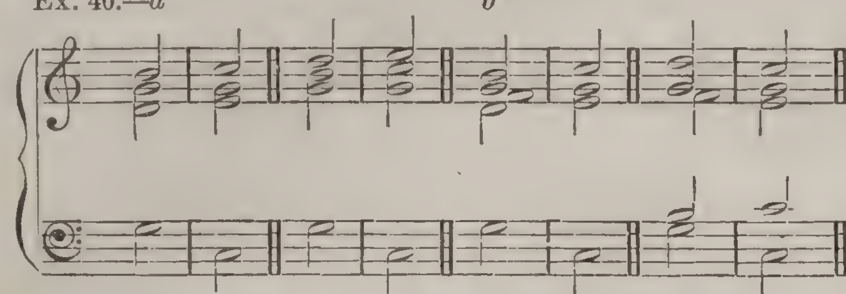
Suspensions are not always resolved on their own proper triads, but another fundamental harmony is substituted, as in Ex. 39 at *a*, *b*, and *c* :

Ex. 39. a b c



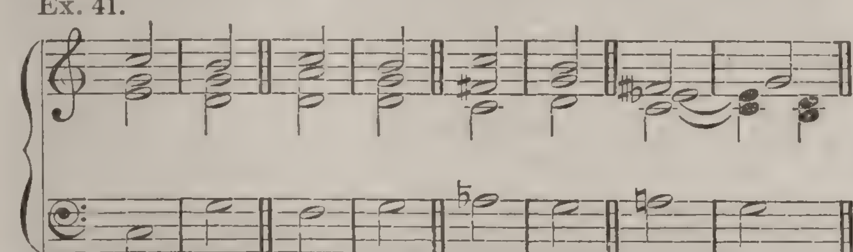
Cadences are terminations, closes, or boundaries of musical ideas. In their simple or radical form they consist of a leading chord and a major or minor triad. Cadences are perfect, imperfect, interrupted, and extended; also medial or final. The *perfect* cadence consists of the triads of the dominant and tonic, or the principal seventh and the triad of the tonic. (See both forms at *a* and *b* in Ex. 40.)

Ex. 40.—a b



Almost all compositions end with this cadence, as its effect on the ear is final and satisfactory. That it admits of numerous inversions will be understood without examples; but as these inversions are not conclusive, they are seldom used as terminations where there are more than two parts or voices. The *half* or *imperfect* cadence has various forms, all ending not with the tonic but the dominant harmony. They are suitable only for such closes as are not final. (See several forms of the half-cadence in Ex. 41.)

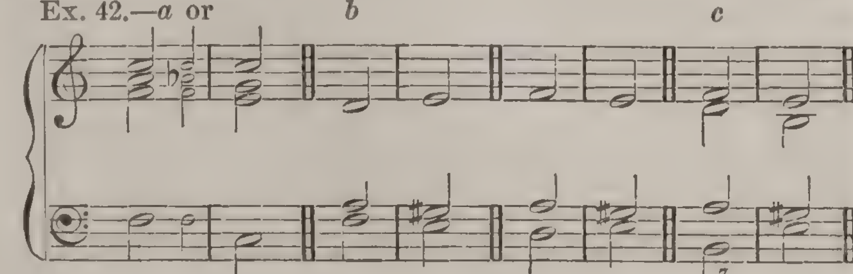
Ex. 41.



or A♭

The first of the two cadences in Ex. 42 is variously known as the "real imperfect," the plagal, and the ecclesiastical; the second (at *b*), called the "Phrygian," is merely an incomplete form of the ordinary minor progression at *c*, with the fundamental note omitted:

Ex. 42.—a or b c

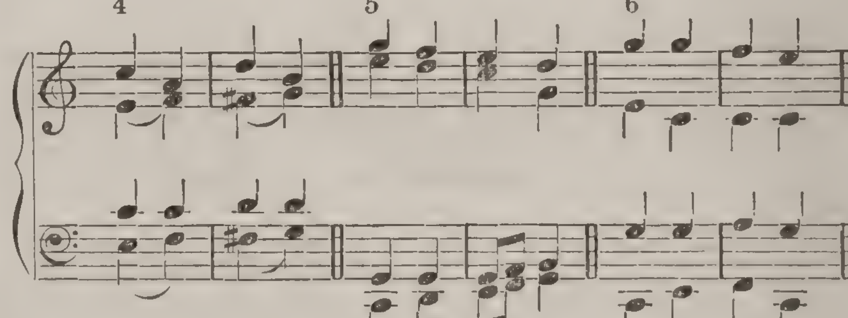


Interrupted cadences are those in which the leading chord is not followed by that which it naturally suggests, but another more or less foreign to the ear. (See Ex. 35, in which each progression is essentially a cadence of this kind. For examples of the *extended* cadence see the articles FUGUE and ORGAN-POINT.)

After this general view of chords and their inversions, suspensions, and cadences, we come to their use and treatment in composition, concerning which we here refer the reader to some introductory and historical remarks in the article HARMONY. Preliminary to all study of the use of chords is that of their *duration*, and the mode by which the time of any series of musical sounds is regulated and expressed. On this subject, however, some elementary details have been offered in the article MEASURE, and a more particular exposition will be found under the head of TIME. On the kindred subject of RHYTHM also, of which only a brief notice could here be taken for want of room, a more extended treatment is given under its proper caption. *Counterpoint*, or the harmonizing of a given melody, is the setting of note against note, formerly written in points. *Simple* counterpoint comprises all those compositions, whether plain or florid, in which the parts are not invertible, but fixed. In *double* counterpoint the parts are so constructed by special rules that two or more of them may be inverted, the higher part changing place with the lower. (See the latter part of the article INVERSION.) In simple counterpoint the following general rules are to be observed: (1) Two perfect *fifths* in direct motion and succession, and in the same parts, are usually of bad effect, and should be avoided. (2) Two or more successive *octaves* in the same parts are inadmissible, except in special cases where it is desirable to strengthen the bass or make some idea particularly prominent. (3) As the third is the only discriminating term or element in triads by which we know whether they are major or minor, it should rarely be omitted. (4) Where two or more successive chords contain doubled intervals, care should be taken not to double the *third* when it is leading-note to the next chord, as the result would be consecutive octaves. (5) The two higher and two lower parts in a composition should not be placed at an excessive or disproportionate distance from each other. (6) The same rule applies to passages in dispersed harmony, as the effect is thin and unsatisfactory when the parts are widely separated. Instances of violation of these rules are severally given in Ex. 43:

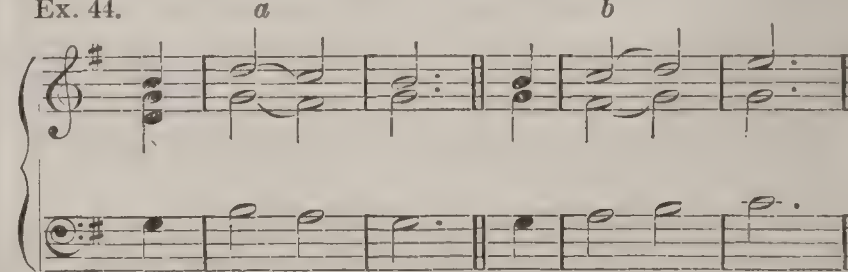
Ex. 43.—1 2 3

4 5 6



The rule respecting consecutive fifths is not violated when the first fifth is perfect and the second imperfect, as at *a* in Ex. 44. In modern music the contrary order frequently occurs, in which the imperfect fifth precedes the perfect, as at *b* in the example:

Ex. 44. a b

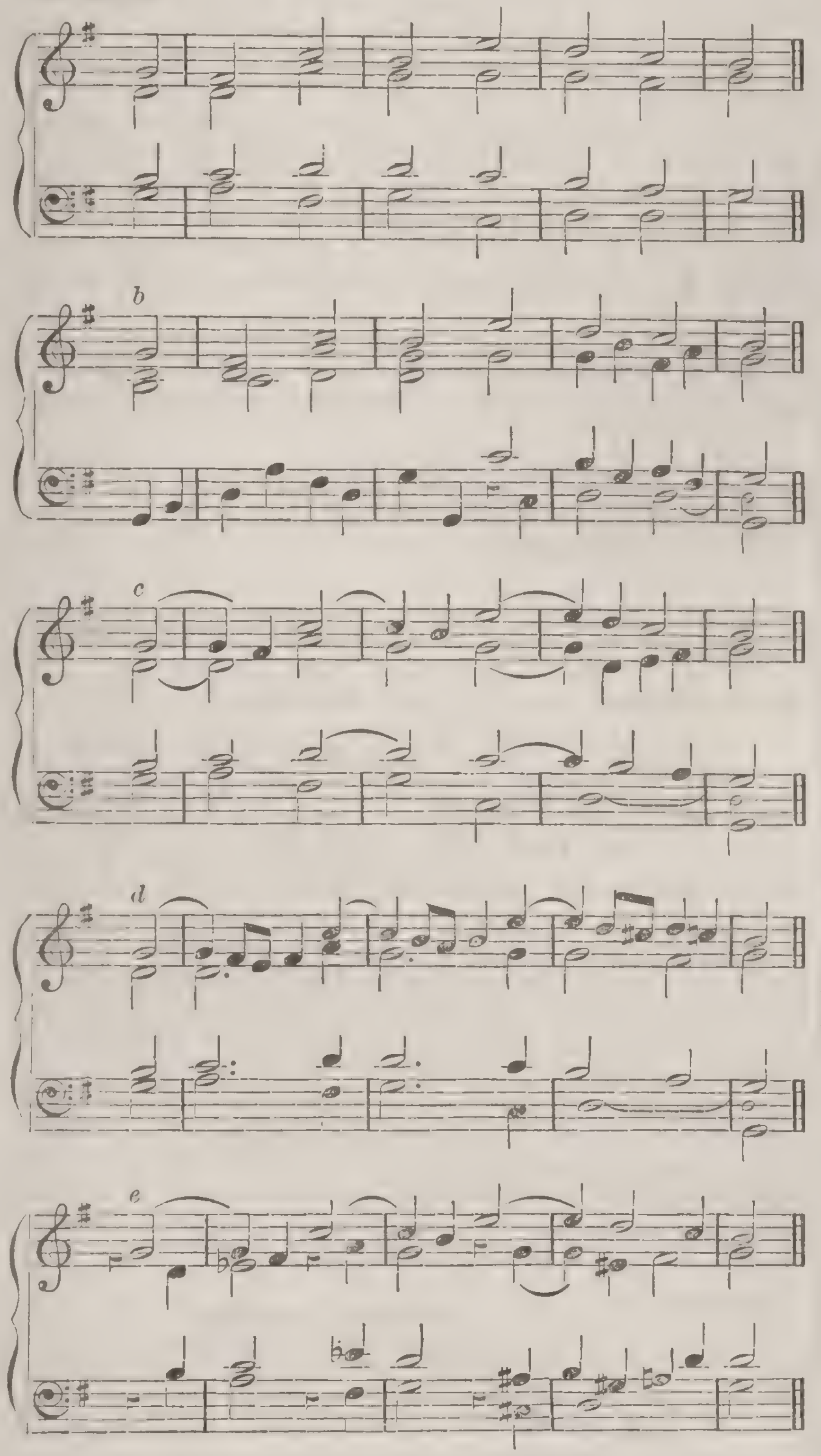


Successive fifths are not prohibited when the parts are in *contrary* motion, provided that the texture of the harmony is so woven as not to render them too prominent. Some hints concerning implied or concealed fifths will be found in the article HIDDEN. In free composition the rule of the fifth is so far modified as to admit of numerous exceptions. (See LICENSE.)

In two-part exercises every triad and chord of the seventh must necessarily be incomplete through the omission of one or more of their intervals or terms. In triads the third (or its inversion, the sixth) should be most frequently used, the fifth less freely, and the octave and unison only occasionally. In chords of the seventh, the seventh itself should rarely be omitted, as the chord would thereby be reduced to a triad. When there are three parts each *triad*, as a general rule, should be complete; and of the *seventh*, the omitted interval may be the fifth, or less frequently the third or the root. In four parts each chord may appear complete in all its intervals. In triads one term will necessarily be *doubled*, either in the unison or the octave, and one of the terms may even be tripled or omitted, as shown already in Ex. 10 and its context. The third and seventh in the chord of the seventh, being its characteristic intervals, should not be doubled unless in exercises of five, six, or more parts, but the doublings should occur on the fundamental bass or the fifth. In harmonizing a plain theme

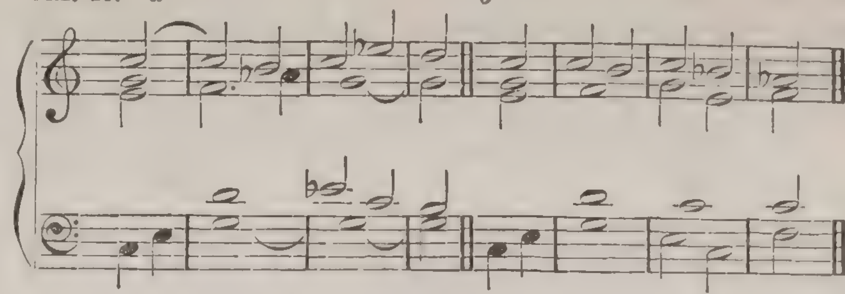
in four parts each part should as much as possible have its own distinct quality, and more or less of a melodious progression. The simplest practical exercises are those having notes of equal length, confined to a single key, and consisting chiefly of triads and the principal chord of the seventh, with their inversions. A short theme thus treated is given at *a* in Ex. 45. (The example is merely elementary, for from such plain forms "simple counterpoint" extends to an area of almost unlimited expansion, freedom, and variety, including compositions oftentimes far more complex and ornate than ordinary exercises in *double counterpoint.*) The first step in the elaboration of the theme in the example is shown at *b*, by the introduction of two notes against one; at *c* and *d* a further advance is made by suspensions and other devices; and at *e* the theme receives additional ornament from chromatic harmony, syncopations, and variations of the time and movement of the parts:

Ex. 45.—*a*



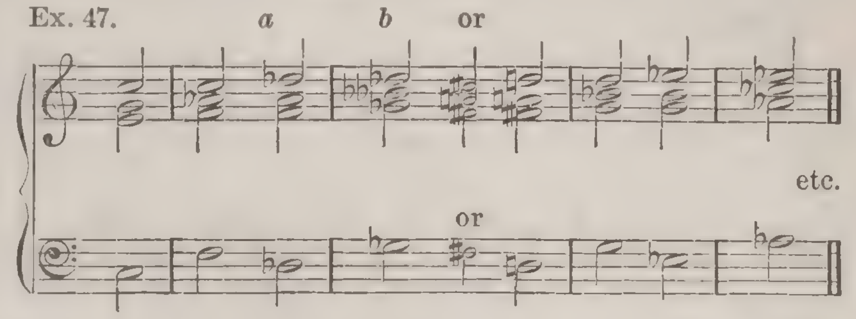
Though a piece of some length may be written in a single key, yet digressions into other keys, near or remote, are ordinarily essential to the beauty and interest of a composition. This passing from one key to another constitutes *modulation;* and it is generally effected by the introduction of the leading-note or the minor seventh of the new key, the former generally requiring an accidental ♮, ♯, or ×, and the latter a ♮, ♭, or ♭♭. Instances of such changes of key or mode may be seen in Exs. 24 and 25. More strictly, however, a modulation occurs only when a regular cadence in some new key is made at the close of a phrase or period. Modulation is of three kinds—viz. *natural, abrupt*, and *enharmonic*. The first of these is illustrated in Ex. 45, and has already been considered in the article Modulation, which the reader should here consult. *Abrupt* modulations are so called because they proceed to foreign or unrelated keys or modes, and not on account of anything rough or strange in their effect. The simplest kind of abrupt modulation is that consisting of a mere change of *mode*, as from major to minor, or *vice versâ*, while the keynote remains the same. In Ex. 46, at *a*, see a modulation from C major to C minor, and at *b* a change from C major to F minor, where both mode and key are relinquished:

Ex. 46.—*a* *b*



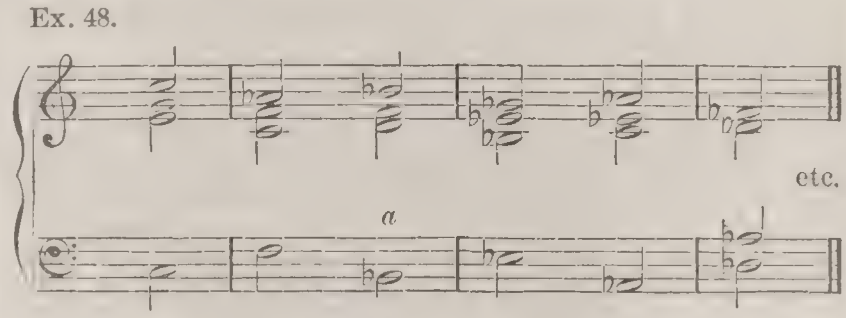
The latter modulation will be found on analysis to consist essentially of the triads of C major and F minor, the first and last notes; and the progression is one which furnishes the key to many developments both curious and important in abrupt modulation. Some of these we shall briefly notice. For instance, the C major triad is the leading chord to the F minor triad, the bass rising a fourth. From the latter triad we may then proceed by ordinary rule to the major triad of D♭, as at *a* in Ex. 47; which triad being treated as a leading chord (like the former C) is followed at *b* by the minor triad of its fourth—viz. G♭ minor (otherwise F♯ minor); and by *repeating* this process continually we may proceed through the whole circle of the keys, as partly shown in the example:

Ex. 47. *a* *b* or



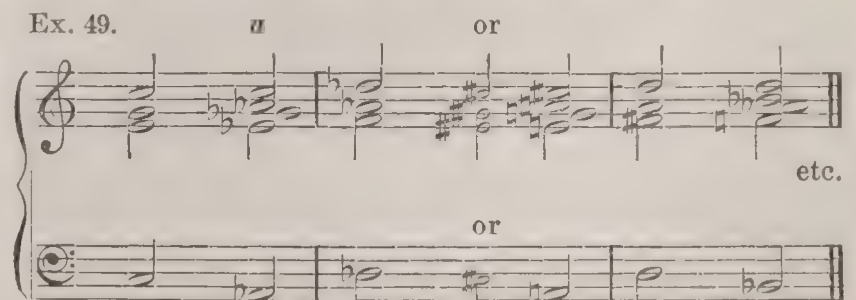
But the progression from the second chord (F minor) may also be to the major triad of B♭, the bass descending a perfect fifth, as at *a* in Ex. 48, on which another chain of harmonies may be formed, thus:

Ex. 48.



From these suggestions the student will be able to construct many other circular progressions or chains of cadences. In some cases the modulation seems to imply the omission of an intermediate note, instances of which are given in Ex. 26. In this class may be placed the very abrupt but useful progression at *a* in Ex. 49, where the upper note of the tonic harmony (octave of the root) is taken as a *new leading-note* (with or without the seventh), and resolved in the usual manner. Of course, the process may be repeated indefinitely, as in the former examples:

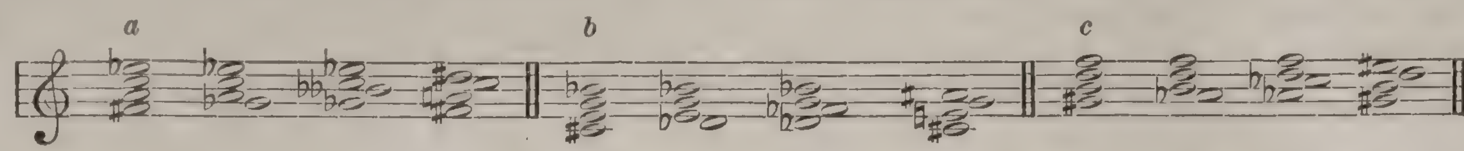
Ex. 49. *a* or



Modulation by *enharmonic changes* is chiefly effected by means of the chord of the diminished seventh. This chord consists of three minor thirds—*i. e.* a minor third, an imperfect fifth, and a diminished seventh. And as a minor third contains only three semitones, it follows that only three different diminished sevenths are possible, for, after building the chord on three successive grades of the chromatic scale, a fourth grade would produce simply a replication or inversion of the first. The peculiarity of this chord lies in a certain mysterious, dreamy, and equivocal quality which for the time so entrances the ear as to involve all sense of key and mode in a sort of bewildering obscurity. Hence the use of this chord in rendering digressions into remote keys both easy and graceful. Its enharmonic quality arises from the circumstance that each of its elements may be regarded and treated as two entirely different notes or intervals—viz. as sharp of the note below, or flat of the note above, or in both cases as natural instead of sharp or flat. Consequently, each of the three diminished sevenths may be written in four or more differ-

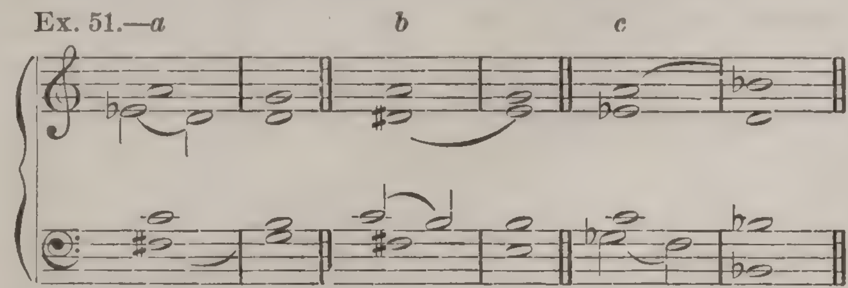
ent ways, according to the key or scale to which they belong. This will be evident on an inspection of Ex. 50, where four various forms of each seventh are given at *a*, *b*, and *c*, respectively:

Ex. 50.



Two other points also are to be observed: 1st, that each of these forms contains a *leading-note* into some particular key; and 2d, that any such form may become the principal (or dominant) *seventh of that key* by dropping another of its terms a semitone lower. (In illustration of this see Ex. 51, which is an exercise on the first of the above sevenths, with the parts distributed.) At *a* the lower term (F♯) is the leading-note, and by dropping the E♭ of the alto to D the chord becomes at once an inversion of the ordinary seventh on D, and resolves into the key of G (either major or minor). At *b* the alto, now written D♯, is the leading-note, and the tenor being lowered a semitone, we have an inversion of the minor seventh on B, which resolves into the key of E. At *c* the upper part is leading-note, and the F♯ of the bass (now become G♭ by enharmonic change) descends a semitone, forming the minor seventh on F, which resolves into the triad of B♭:

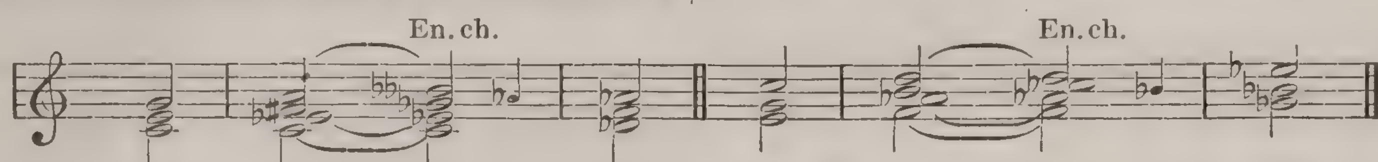
Ex. 51.—*a*



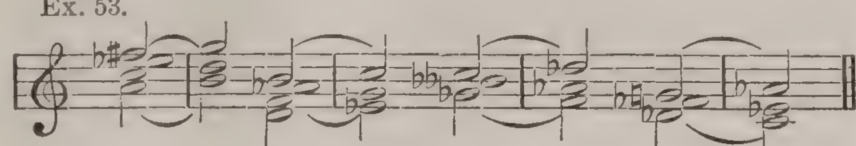
By this simple process we may readily pass from any key to any other (major or minor) without going through a tedious succession of intermediate chords or annoying the ear by a sudden plunge into a foreign scale. To become familiar with this species of modulation it is necessary to keep in mind the distinction between F♯ and G♭, C♯ and D♭, F and E♯, etc., as these two names or forms of expression indicate relations to two different keys. The actual *sound*, however, remains the same, and is in most cases equivocal till the progression decides its character. If, then, we wish to proceed from C major, for instance, to some other key, we select that particular diminished seventh which contains the *leading-note* of such other key; and this will form the link connecting the two keys. Suppose the new key to be D♭ major or E♭ minor: of these, the leading-notes will of course be C and D, and we accordingly select the diminished sevenths in which they are found. By interposing these between the tonic harmony of C and that of the new keys, the modulation is effected at once, because the middle term in each case is on one side related to C, and on the other (by enharmonic change) to D♭ or E♭. (See Ex. 52.)

Though in the examples already given one of the intervals of the diminished seventh is dropped a semitone to make the ordinary minor seventh of the new key, yet this is not really necessary, as this chord often proceeds *directly* to its resolution, as in Ex. 53:

Ex. 52.



Ex. 53.



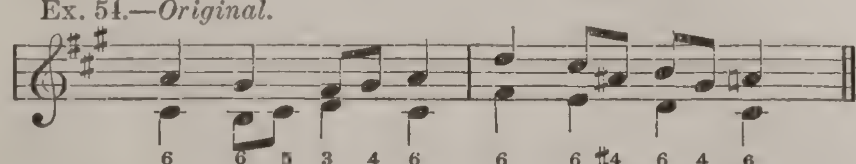
Frequently, also, two or more diminished sevenths occur in succession before the modulation is effected. (For other points more or less pertaining to simple counterpoint see the articles Imitation, Mixed Modes, Mode, Scale, Sequence, Transposition, and Variation.)

Double counterpoint is that species of composition in which the parts or voices are susceptible of *inversion*, the higher part thus becoming the lower, and *vice versâ*. Of such counterpoints there are several varieties—viz. that of the *octave*, when one of the parts is moved an octave higher or lower than its original place, while the other part retains its position; and those of the *tenth*, *twelfth*, etc., in which the inversion takes place at those distances respectively. Each of these varieties has special rules in addition to those of "simple" counterpoint. The intervals of the original composition become thus different by reason of their inversion. For instance, in "counterpoint of the *octave*" the octave becomes a unison, the second a seventh, the third a sixth, etc., as shown in the following scheme:

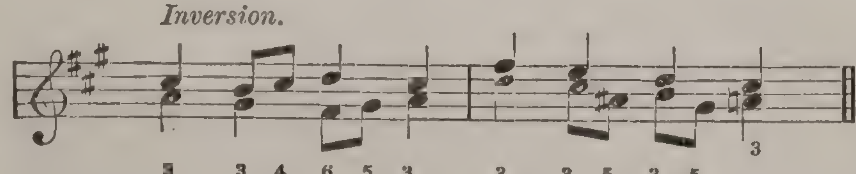
Original, 8 7 6 5 4 3 2 1.
Inversion, 1 2 3 4 5 6 7 8.

This will also be evident on observing the notes and figures in Ex. 54, where the lower part becomes the higher by inversion:

Ex. 54.—*Original.*

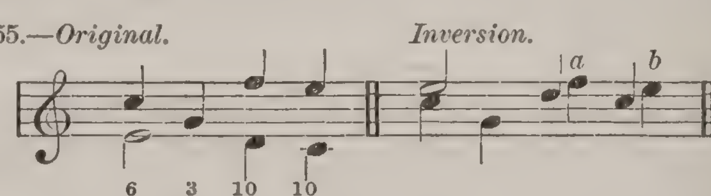


Inversion.



In counterpoint of the *octave* no greater interval than an octave is admissible between the two parts, as every note that exceeds an octave will remain uninverted. This fault will be noticed at *a* and *b* in Ex. 55, where two notes are unchanged in the inversion because they violate the rule:

Ex. 55.—*Original.*



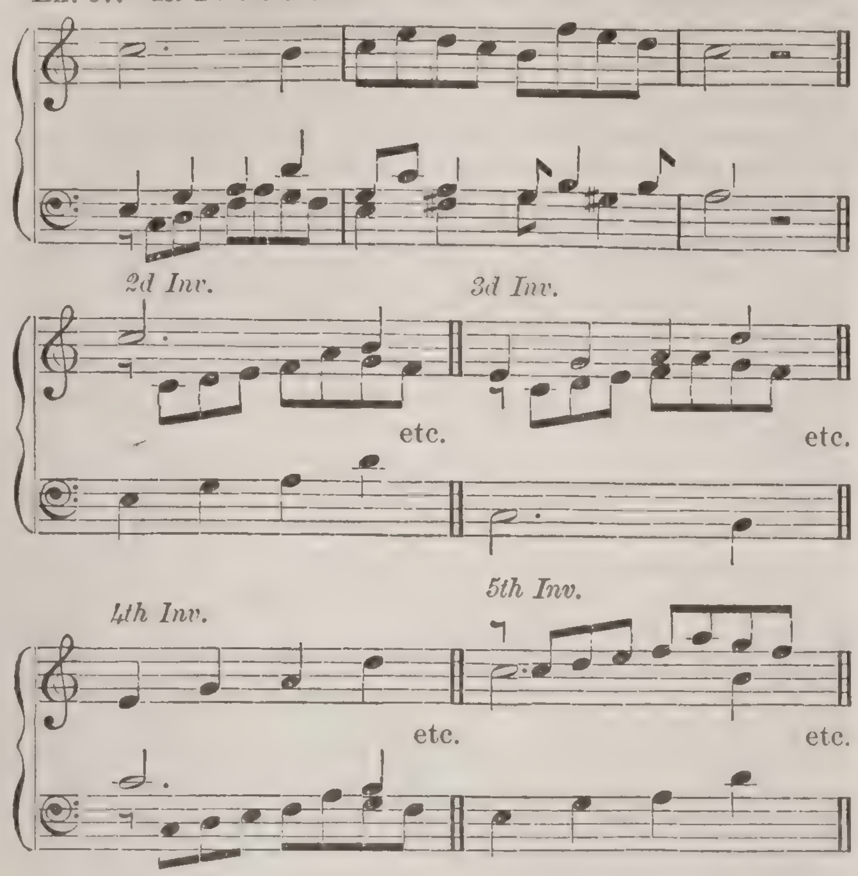
Two perfect fourths in succession are to be avoided, because in the inversion they become two fifths; but two fourths, of which the last is augmented, may be admitted. The two parts should also be various in quality of notes for the sake of distinction. By observing these rules many new and striking effects may be produced from a subject apparently insignificant. To illustrate this very briefly we shall take the following simple theme, and treat it in counterpoint of the octave. In Ex. 56 see the theme at *a*, with an under part in small notes; at *b* is the first inversion, in which the lower part is moved an octave *upward*, thereby becoming the higher; at *c* and *d* are two other inversions, though the first is the only *real* one:

Ex. 56.—*a*

In the latter case, however, the effect is thin and unpleasant, owing to the great distance between the parts. And this very fault suggests another feature—viz. the introduction of a *third* part to fill up the vacant space; which new part we have inserted in small notes. This middle part is also constructed in such a manner as to be capable of inversion like the other parts, and thus several new and beautiful changes may be produced by carrying out the inversions. These inversions are five in number, of which

we give the first entire, and the others with only a few notes to indicate the positions which the several parts will assume. (See Ex. 57.)

Ex. 57.—*1st Inversion.*



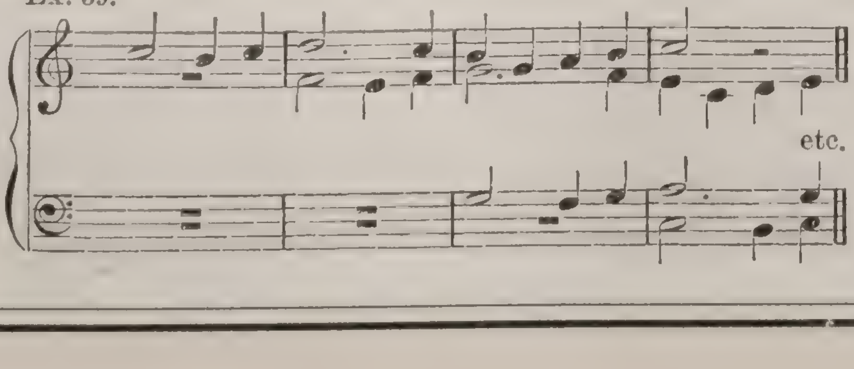
To afford room for inner parts the inverted part may be set at the distance of *two* octaves, as in the above example and also in the next following.—To a two-part counterpoint of the octave two other parts, consisting *entirely of thirds*, may be added by observing the following rules: (1) The original parts should always proceed by contrary or oblique motion; (2) only thirds, sixths, and octaves should be used on the essential or strong parts of the harmony; (3) if a leading-note occurs in the lower part, and its third above in the higher, the latter must be resolved downward. We may then form two new parts by writing thirds *above* all the notes of the original parts, as in Ex. 58, where the added parts are given in small notes:

Ex. 58.

The rules for the other counterpoints are in like manner deduced, for the most part, from a comparison of the intervals in the composition before and after inversion. Thus, in counterpoint of the *tenth*, as thirds, fourths, sixths, and tenths become by inversion octaves, sevenths, fifths, and unisons, two of them in succession are not allowable, except in certain cases when such sevenths or fifths are not of the same quality. In counterpoint of the *twelfth*, successive fourths and sixths are forbidden except under similar limitations, as they produce ninths and sevenths in the inversion. To all these counterpoints two middle parts may be added, either as "free" or as parts capable of inversion. And when a composition has four parts of the latter construction, it may be inverted *twenty-three times* by merely arranging the four parts in correspondence with the changes which can be made with the numbers 1, 2, 3, 4—viz. 1, 3, 2, 4—2, 1, 3, 4, etc. Double counterpoint thus throws open a rich field of ideas which would never occur to a composer whose studies had been confined to the simpler departments of harmony.

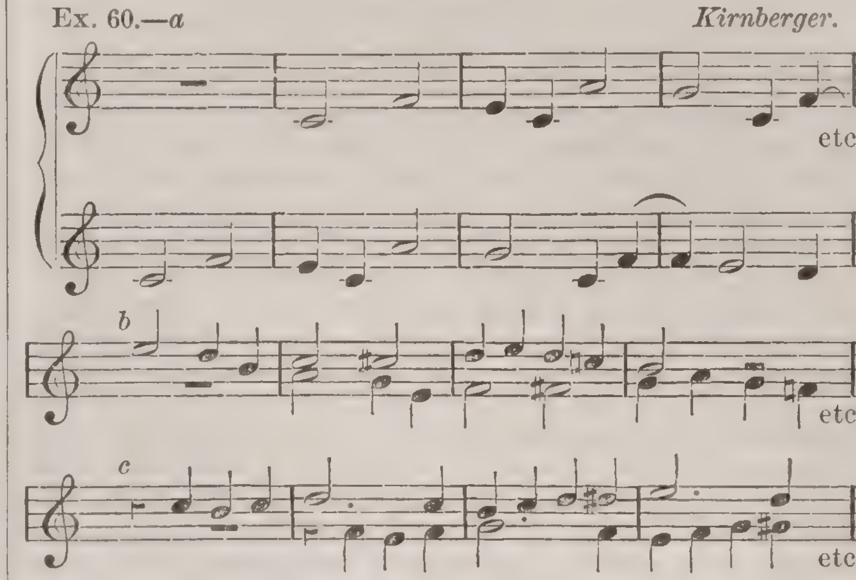
The subject of FUGUE, which comes next in order, has already received attention under its own proper head, and we shall close the present article with a few lines on the nature and structure of *canon*. A canon is a composition in which the several parts are substantially one and the same train of notes, one part commencing, and the others falling in successively at certain prescribed distances, as in Ex. 59:

Ex. 59.



The parts thus formed by mere imitation of the first may be exact repetitions in unison, or less exact by answering in the second, third, fifth, etc. of the original. But in all cases the answer should conform to the theme in motion and in length of notes. "The truest, easiest, and at the same time strictest canons," says Albrechtsberger, "are those in the unison and in the octave; for only on these intervals can the answers correspond exactly as to all the half and whole tones, although those on the fifth and fourth may be made to correspond sufficiently well." In Ex. 60 see the openings of three two-part canons, in which at *a* the answer is in the unison, and *b* in the third below, and at *c* in the fifth below:

Ex. 60.—*a* *Kirnberger.*



Canons are said to be *finite* when provided with a proper termination or ordinary ending. On the contrary, an *infinite* canon is one in which there is no such conclusion, but a constant circular repetition, which is usually terminated by a signal agreed upon by the performers.

Among the works extant on musical science, embracing both the strict and free schools, the following may here be mentioned: Kirnberger's *Die wahren Grundsütze zum Gebrauch der Harmonie;* Albrechtsberger's *Collected Writings on Thorough-bass, Harmony, and Counterpoint;* Cherubini's *Cours de Contrepoint* and *Marches d'Harmonie;* Reicha's *Traité de Haute Composition* and *Traité d'Harmonie;* Fétis's *Traité du Contrepoint;* Vernevil's *Grammar of Harmony, Counterpoint, etc.;* Coussemaker's *Histoire de l'Harmonie;* Beethoven's *Studien im Generalbass, Contrapunkt, etc.;* Weber's *Theory of Musical Composition;* Mozart's *Succinct Thorough-bass School;* Kollmann's *Essay on Musical Harmony;* and Marx's *Universal School of Music.* WILLIAM STAUNTON.

Mu'sical Boxes, mechanical contrivances for playing tunes automatically, are constructed on the same principle as barrel or hand organs and chimes of bells. The chief parts of the mechanism are the comb, whose metal tongues of different length and thickness give out, when put in vibration, different tones, and a cylinder of brass provided with small steel pins fixed in a certain order, which, when the cylinder revolves, strike the tongues of the comb in a certain succession, and thereby produce a tune. The pins are so arranged that by moving the cylinder forward or backward the same cylinder is able to produce several different tunes; and by changing cylinders modern musical boxes are made to play more than 100 melodies. Automatic musical instruments were produced soon after the construction of clocks, but the invention of musical boxes, properly so called, and their general introduction, belong to the latter part of the eighteenth century. Their construction has since been much improved; the number of melodies which one box can play has been much increased, and bells, drums, castanets, and other accompaniments are often attached to the box. Geneva in Switzerland is one of the principal centres of this branch of manufacturing industry.

Musi'cian, one who understands and devotes himself to the study and practice of music; more particularly, one who has adopted music as his profession or avocation. This term is applicable to three classes of persons—viz. (1) *theorists*, or those conversant with musical science; (2) *composers*, or musical authors, who originate and write music; and (3) *performers*, or practical musicians, who execute, either by instrument or voice, music already written, or that which results from extemporaneous suggestion. There is no necessary connection between the theoretical, the creative, and the practical departments of music. It is quite probable that several of the profoundest theorists, men familiar with the most abstruse and intricate questions relating to canon, fugue, and double counterpoint, were of very limited ability either as composers or performers. On the contrary, it is not uncommon to find performers of very high rank who are so imperfectly acquainted with musical

science as to be unable to detect grammatical faults, or even typographical errors, in the music they execute. Composers also of considerable merit and learning are often entirely unskilled in the use of instruments, and are thus in many cases incapable of playing even their own compositions. There are also *un*learned composers—men of strong imaginative powers, refined in taste, and not wanting in invention—who can readily originate musical ideas, which for want of scientific knowledge they are unable to express correctly or even intelligibly in writing. The thorough musician is one who unites in himself the several qualities of the theorist, the composer, and the performer; and it is the union of these in their perfection which constitutes the distinction of those illustrious men familiarly known as great masters. WILLIAM STAUNTON.

Musk [Lat. *moschus*], a concrete, strong-smelling, brownish, inflammable substance extensively employed in medicine and in perfumery. It is brought to market from China, Russia, and Calcutta, and is obtained from a sac beneath the abdomen of the MUSK-DEER, *Moschus moschatus* (which see). The musk-deer ranges from Siberia to Tonquin, but the musk of the warmer regions is by far the best. The price of musk is very high, and it is in consequence excessively adulterated. Some similarly-smelling animal products (as the perfume of the desman, etc.) are sold for it. The volatile oils of some musky plants, such as *Malva moschata* (Malvaceæ) and *Mimulus moschatus* (Scrophulariaceæ), are found to possess its odor and its medicinal qualities, which are strongly antispasmodic and stimulant. Artificial musk is a yellow resinous substance, having the smell and the general properties of real musk. It is obtained by treating rectified oil of amber with strong nitric acid. It is superior to much of the sophisticated musk of commerce, but not equal to the genuine article. It has a limited use in medicine. The drug sambul or sumbul is also a good musk-substitute.

Musk-Deer, the *Moschus moschatus*, a small, hornless deer of Central Asia, inhabiting lofty mountain-ranges.

The Musk-Deer.

It is a timid, active creature of nocturnal habits, and is much hunted for its yield of MUSK (which see). This is obtained from a postomphalic sac on the male alone. The flesh is esteemed, though that of the male is very rank and musky. (See also MOSCHINÆ.)

Muske'go, tp. of Waukesha co., Wis. Pop. 1409.

Muske'gon, county of Michigan, bounded W. by Lake Michigan. Area, 525 square miles. It is well-timbered, and has a soil adapted to grain, and especially fruit-culture. The lumber-trade is the great industry of the county, which is traversed by White and Muskegon rivers and by the Michigan Lake Shore and Chicago and the Michigan Lake Shore R. Rs. Cap. Muskegon. Pop. 14,894.

Muskegon, post-v. and tp., cap. of Muskegon co., Mich., on the Chicago and Michigan Lake Shore, the Grand River Valley division of the Michigan Central, the Michigan Lake Shore, and the Muskegon and Big Rapids R. Rs. It has excellent schools, 10 churches, a fine court-house, an opera-house, 4 Masonic lodges, 3 Odd Fellows lodges, 2 banks, 3 newspapers, gasworks, 30 large saw-mills, 3 foundries and machine-shops, 5 planing-mills and dry-kilns, 1 grist-mill, 2 lime-kilns, 1 saw-factory, a paid fire department, and a large number of business-firms and mechanical shops. Lumbering is the chief stimulus to industry. Pop. of v. 6002; of tp. 401.

F. WELLER, ED. "MUSKEGON NEWS AND REPORTER."

Mus'ket [Fr. *mousquet*], now known as the arm of the infantry soldier, whether smooth-bored or rifled. (See SMALL-ARMS.)

Musketoon' [Fr. *mousqueton*], a short-barrelled musket, formerly carried by foot-artillery and engineer soldiers; not now made. (See SMALL-ARMS.)

Musking'um, county in S. E. Central Ohio. Area, 615 square miles. It is somewhat uneven, with a fertile clayey soil. It is traversed by the navigable Muskingum River and by various railroads. Coal is mined. Live-stock, grain, and wool are leading products. The manufactures include stone and earthenware, carriages, flour, clothing, metallic wares, saddlery, etc. Cap. Zanesville. Pop. 44,886.

Muskingum, tp. of Muskingum co., O. Pop. 1078.

Muskingum, tp. of Washington co., O. Pop. 1136.

Muskingum River, the longest stream wholly in Ohio, is formed at Coshocton by the confluence of the Tuscarawas and the Walhonding rivers. Thence it flows, generally S. E., 112 miles to the Ohio at Marietta. Zanesville is on its banks. The river is navigable by slackwater improvements 90 miles to Dresden. It is 225 yards wide at its mouth. Its valley is fertile and beautiful. Its whole course is above the level of Lake Erie. From Dresden to its mouth it falls 130 feet. It flows through a coal-country.

Musko'ka, a provisional district in the northern part of Ontario, Canada, lying E. of Georgian Bay, Lake Huron, and S. of Parry Sound district. Its soil, though somewhat rocky, is quite fertile, and its numerous lakes and streams abound in trout. It is being rapidly settled upon free grants of the public lands. Its winter climate is intensely cold. Pop. 5400. Timber is extensively exported.

Musk-Ox. See OVIBOS.

Musk-Rat, a name applied in different countries to several small rat-like mammals, distinguished by musky exhalations. (1) In North America it is conferred on the *Fiber zibethicus* (by some called also musquash), a rodent of the family Muridæ and the group which contains the field-mice. It is larger than most of the family, being some fifteen inches in length, with a tail of ten inches. It is aquatic, sometimes building houses like those of the beaver, and oftener burrowing in river-banks. It is abundant in many parts of North America. Its fur (the "river sable" of commerce) is extensively sold in Europe. The creature has a strong smell of musk. (2) In India the name is given to the *Crocidura myosurus*, a large rat-like shrew, which possesses and communicates to whatever it touches an intolerable and nearly indelible musk-like smell. (3) It is also applied to the European *Myogale moschata*, or desman, a representative of the family of Talpidæ or moles.

Musk-Wood, the wood of *Guarea grandifolia* and *Moschoxylon Schwartzii*, meliaceous trees of the West Indies whose wood is finely redolent of musk. The name is also given to *Aster* (*Haxtonia*) *argophyllus*, a composite-flowered shrub of Tasmania, sometimes cultivated.

Muslin. See MOUSSELINE.

Musophag'idæ [from *Musophaga*], or **Plantain-Eaters,** a family of coccygomorph birds. The bill is moderately broad at the base, much compressed towards the tip, with the culmen curved, and the tomia or cutting margin of the upper mandible emarginate behind the tip; the nostrils are near the middle of the upper mandible, oval, and exposed; the wings more or less rounded; the tail long, with the feathers broad; the tarsi covered in front with broad transverse scales; the toes four in number, and the fourth versatile or capable of being turned backward, like the first. The family is not distantly related to the Cucculidæ or cuckoos. It is a characteristic African form, a number of species being found in that continent. They are of considerable size, being all more or less larger than the cuckoos. Most of them have crests. Green is a predominant color, and the primaries of the wings have usually a brilliant spot, often of a red color. Fruits are their principal food, and the name of the typical genus is derived from its love for the plantain (*Musa*, the plaintain tree, and φαγεῖν, to "eat"). G. R. Gray has rec-

ognized in the family three genera—viz. (1) *Musophaga*, with two species; (2) *Turacus* (= *Corythrix*), with eleven species; and (3) *Schizorhis*, with five species. A large folio monograph has been published by Schlegel and Westermann (*De Törakos*) with figures of all the species.
THEODORE GILL.

Mus'pratt (JAMES SHERIDAN), PH. D., M. D., F. R. S. E., b. at Dublin Mar. 8, 1821; studied chemistry at the Andersonian University, Glasgow; became when sixteen years old chemist for a large manufactory of chemicals in Manchester; tried mercantile life in the U. S. without success; studied chemistry under Liebig 1843–45, graduating as Ph. D. at Giessen; made numerous discoveries, chiefly in organic chemistry; married in 1848 Miss Susan Cushman, an American actress; founded the Liverpool College of Chemistry, and became a professor there. Among his works are a valuable translation of Plattner on the blowpipe (1844), *Outlines of Qualitative Analysis* (1849), and a *Dictionary of Chemistry* (1854 *seq.*). D. at West Derby Feb. 3, 1871.

Musquash. See MUSK-RAT.

Mus'sel, or **Muscle** [Lat. *musculus;* Ger. *Muschel*], a popular name for many conchiferous mollusks. (1) The

marine species are chiefly of the family Mytilidæ and genus *Mytilus*, of which there are numerous species of worldwide distribution. The edible mussel of Europe and America, *Mytilus edulis*, is extensively used as food, but is sometimes very poisonous. It is also used as fish-bait. The mussels often contain small pearls. The horse-mussels (genus *Modiola*) are also numerous in species. Like the former, they attach themselves by a byssus. *Modiola modiolus* is a common and valuable bait-fish on our Atlantic coast.

The Mytilidæ, a family of conchiferous mollusks, to which allusion is made above, have the posterior muscle well developed, the anterior small and far forward, and the pedal muscles large; the foot is small, grooved, and byssiferous; the gills two on each side, elongated, and behind united with each other and to the mantle, and the dorsal margins of the outer and innermost laminæ are free; the mantle has its opposite margins free, except behind, where they more or less unite; the labial palpi are elongated, pointed, and free. The shell is variable in form, but the apex is generally more or less approximated to the anterior end, and it has a thickness and often filamentous epidermis; the ligament is internal and sub-marginal; the hinge edentulous. The family includes a large number of genera, with numerous species variously distributed in all the salt waters of the globe, and many are found in the cold and arctic seas. The most familiar genera are *Mytilus* and *Modiola*, including the common salt-water mussels. The LITHODOMUS (which see), also belonging to this family, is remarkable for its property of boring into stone, and there making its home.

(2) The fresh-water mussels of North America belong to the family Unionidæ, and are extremely numerous. Several species produce fine pearls, and many afford fish-bait. In 1857 a pearl was found in a fresh-water mussel at Paterson, N. J., which was sold for $2200. They are not often if ever eaten. (See UNIONIDÆ.) THEODORE GILL.

Mus'selburgh, town of Scotland, county of Edinburgh, at the mouth of the Esk. It has manufactures of sailcloth and leather, and exports much coal. Pop. 7506.

Musset', de (LOUIS CHARLES ALFRED), b. at Paris Nov. 11, 1810, and educated in the Collége Henri Quatre; studied first medicine, then law, finally art; was for some time engaged in a banking-office, but devoted himself after 1830 exclusively to literature; was appointed librarian in the ministry of the interior by Louis Philippe and reader to the empress by Napoleon III., and d. in Paris May 1, 1857. His *Œuvres Complètes*, published at Paris in 10 vols. (1865), contain poems, lyrical and narrative, of which *Les Nuits*, first published in the *Revue des Deux Mondes* (1835–37), *Lettre à Lamartine*, and his answer to Becker's German war-song in 1840 ("Nous l'avons eu, votre Rhin Allemand") are the most celebrated; dramas and proverbs, of which *Un Caprice* (1847), *Il faut qu'une parti soit ouverte ou fermée* (1851), and *On ne badine pas avec l'Amour* (1861) belong to the gems of the French dramatic literature; and novels, the most remarkable of which are *Fréderic et Bernerette* (1840) and *Confessions d'un Enfant du Siècle*, which latter called forth the novel by George Sand, *Elle et Lui*, and caused some scandal. Musset made a sensation at his very first appearance in literature in his *Les Contes d'Espagne et d'Italie* (1830) and *Le Spectacle dans un Fauteuil* (1833), but in the beginning he also gave offence. Afterwards he became one of the chief representatives of the romantic school in the French literature, and by his countrymen he was of all living poets the most beloved. He occupied a position in the French civilization similar to that Byron held in the English and Heine in the German. The same passionate though somewhat feverish enthusiasm for the ideal, for all that is great and good, burnt in his genius as in theirs, but he, like them, lacked strength of character to govern the passions and follow the ideals. Hence arose with him, as with them, a skepticism not with respect to the ideals themselves, but with respect to the part they have played and will play in the history of mankind; and thus his enthusiasm for the ideals often turned into satire on the reality. He is nobler than Heine, but he has not Heine's wit; he is more tender and sincere than Byron, but he has not Byron's lofty intellect. With respect to the artistic character of his works, he is much more refined and exquisite than Byron, and he has none of the artificiality and affectation of Heine.

Mus'sey, tp. of St. Clair co., Mich. Pop. 1117.

Mussey (REUBEN DIMOND), M. D., LL.D., b. at Pelham, N. H., June 23, 1780; graduated at Dartmouth in 1803, at Philadelphia Medical school 1809; practised at Salem 1809–14; professor of physic at Dartmouth 1814–19, of anatomy and surgery 1819–38; professor of surgery in Ohio Medical College 1838–52; held the same chair in Miami Medical College 1852–60, and afterwards resided in Boston, Mass., where he d. June 28, 1866. Dr. Mussey was a bold and remarkably successful operative surgeon. He was the first to tie both common carotids, which he did with success; he also removed with the happiest results (in 1837) an entire scapula and clavicle together, probably the first operation of the kind ever performed. He was a man of remarkable benevolence and of abstemious habits—habits which he followed from principle, and which he strove to have others imitate. He published, besides addresses, *Experiments and Observations on Cutaneous Absorption* (1809), and *Health: Its Friends and its Foes* (1862).

Mussome'li, town of Sicily, province of Caltanessetta. About a mile from the town there is a grand old castle, and in the neighboring fields are found curious remains of ancient dwellings. Pop. in 1874, 8675.

Mus'tang, a name applied to the small wild horses of Texas and to the ponies of the Indian tribes of the S. W. of the U. S., which are of one and the same stock. They are hardy and spirited, but often very fractious unless carefully handled. The mustang is the descendant of horses of Spanish importation. Mustangs associate in large troops, are caught for use by the riata or lasso, and are easily broken to the saddle, though it is often done in a very imperfect fashion.

Mus'tard [Fr. *moutarde*]. There are two principal kinds of mustard, white and black, so designated from the color of the seeds. Black mustard is the seed of *Sinapis nigra*, and white that of *S. alba*, both annual plants of the natural order Cruciferæ, native in all parts of Europe and cultivated in our gardens. Black-mustard seeds are small, globular, of a deep-brown color externally and yellow within. The white are larger, and of a light color externally. Flour of mustard consists of a mixture of the two kinds of seeds, ground and sifted. As sold in the shops, it is generally adulterated with wheat flour and turmeric. Such adulteration is infallibly detected by finding the presence of starch-grains, which are absent in pure mustard. Mustard-seeds are very complex in composition. Both contain a bland fixed oil and a substance called *myrosine*, which, when the mustard flour is moistened with water, determines the decomposition of another principle contained in the seeds, whereby the peculiar pungent, irritant principle is developed which gives mustard its value as a food and medicine. In the case of black mustard this new product is a volatile oil;

with the white, a non-volatile but equally acrid, oily liquid. Mustard flour is a popular condiment, and was known to the ancients. It has also medicinal uses. The moistened flour applied to the skin is a powerful irritant and vesicant, and is much used as a counter-irritant application to relieve internal pains and spasms. Swallowed in any quantity, as a tablespoonful diffused in a tumbler of water, it acts as a prompt non-nauseating emetic, valuable in cases of poisoning from its always being at hand. EDWARD CURTIS.

Mustard, Oil of. See MUSTARD, by E. CURTIS.

Mustel'idæ [from *Mustela*, the name of the typical genus], a family of mammals of the order Feræ or Carnivora, comprising many species, such as the weasels, skunks, badgers, otters, etc. The form is very variable according to the genus, in some, such as the small weasels, the trunk being very much elongated, and in others, such as the gluttons and badgers, being comparatively concentrated and robust; the teeth are adapted to a purely carnivorous diet, the molars of the upper jaw and the last premolar of the upper jaw being typically sectorial, or adapted for cutting. The true molars are reduced in number to one above and two (or, as in *Mellivora*, one) below. The skull exhibits many characters in common; the paroccipital process is closely applied to the auditory bulla; the mastoid process prominent, and projecting outward or backward behind the external auditory meatus; the carotid canal is distinct, and more or less in advance of the foramen lacerum posticum; the condyloid foramen is distinct from the latter; the glenoid foramen is generally well defined; the intestinal canal has no cæcum; the prostate gland is not salient, being contained in the thickened walls of the urethra; Cowper's glands are not developed; the os penis is large. The family in most of the characters thus referred to exhibits affinity decidedly with the bears, raccoons, and allied forms, and not at all with the cats and dogs, agreeing with the last simply in adaptation for carnivorous diet. It contains numerous species, which have been distributed among eight sub-families—viz. (1) Mustelinæ, including the genera *Mustela—i. e.* the large weasels; *Putorius—i. e.* the small weasels; *Galictus—i. e.* the weasels of tropical America; and *Gulo—i. e.* the gluttons or carcajou; (2) Melinæ, with the genera *Meles* and *Arctonyx* or Old-World badgers; *Mydous*, or African teledu, and Taxidæ, or American badgers; (3) Mellivorinæ, with its single genus, *Mellivora—i. e.* the African and Indian ratels or honey-badgers; (4) Mephitinæ, or the American skunks, including the genera *Mephitis, Conepatus*, and *Spilogale;* (5) Ictonychinæ, with the South African genus *Ictonyx* or *Zorilla;* (6) Helictidinæ, with the Asiatic genus *Helictis;* (7) Lutrinæ, with the various genera of fresh-water otters of all parts of the world; and (8) Enhydrinæ, with the genus *Enhydris*, or the sea-otters of the North Pacific. THEODORE GILL.

Mus'ter [remotely from the Lat. *monstrare*, to "show"], in the army and navy, the assembly of officers and men for special purposes, especially for the inspection and payment of the forces and the verification of the returns, called muster-rolls. The muster-in and the muster-out of officers or forces (into or out of the service) are under the direction of special staff officers called commissaries of musters.

Mute, a consonant formed by closer organs than the liquids require, such as *p, f, v, b, m* (a nasal *b*), *t, th, d, n* (a nasal *d*), *s, z, sh, zh, k, gay, ng* (a nasal *gay*). (See LIQUID.)

Mu'tiny was formerly used in a much more comprehensive sense, both in England and in America, than that which is now given to it; thus, in England, it formerly comprised even the so-called crime of speaking disrespectfully of the king and the royal family. At present it is confined to certain offences committed by sailors and soldiers, and subversive of discipline and duly-established authority. The offence is defined by act of Congress of Mar. 3, 1835, and punishment provided for by acts of Congress of Apr. 10, 1806, and Apr. 23, 1800.

Mutis (JOSÉ CELESTINO), M. D., b. at Cadiz, Spain, in 1732; professor of anatomy at Madrid 1757; accompanied the viceroy of Peru to South America as his physician 1760; was the first to distinguish between the varieties of cinchona; became director of the Academy of Natural History at Bogotá, 1790, and d. there in 1808, leaving unfinished a vast work on the *Flora of New Granada.*

Mutton Hill, a v. of Montgomery co., Pa. Pop. 50.

Mut'tra, town of British India, in the North-western Provinces, on the banks of the Jumna, in lat. 27° 30′ N. It is built on high and hilly ground, with magnificent flights of steps, adorned with temples, leading down to the river, which is kept sacred by the Hindoos, and annually attracts vast numbers of pilgrims. But the enormous riches which the town formerly contained have been carried away by various conquerors, its fortifications have fallen into ruins, and nothing is left but the steep, narrow, dirty streets, which swarm with sacred apes, parrots, peacocks, and bulls. Pop. 51,540.

Muys'cas, or **Chibchas,** a nation of Indians within the limits of the republic of Colombia, S. A., who at the time of the Spanish conquest numbered between one and two millions, and occupied a rank immediately after the Aztecs and Peruvians in point of civilization. They consisted of three independent nations, whose capitals were respectively Funza, Tunja, and Sogamoso, the latter nation being governed by a high priest. Like the Aztecs and Peruvians, they worshipped the sun in common with many other divinities, and sometimes, though rarely, offered human sacrifices to the solar god, their principal temples being at Suamoz and Leiva. Corresponding in their mythology to the Manco Capac of the Incas was a legendary ancestor named Nemterequeteba, who was regarded as the author of their civilization. They were skilful agriculturists, workers in metal, weavers of cotton, and artificers in bone, wood, and stone; built wooden houses with conical roofs, surrounded by palisades; had a rude commercial currency; buried their dead in caves, and had a week of three days, a month of ten weeks, a year of twenty months, and an age of twenty years. Succession to the chieftainship was in the female line. The Muyscas formerly occupied the whole table-land of Bogotá and Tunja, and held many tribes in subjection. They readily accepted Christianity, and were rapidly fused with the whites, losing their national language about the middle of the last century, though it is still spoken by some tribes on the river Meta. The language had no *d, l,* or *r,* and was of extremely simple structure. (See the grammars of Lugo (1619) and Uricochea (Paris, 1871).)

Muzarabic Liturgy. See MOZARABIC LITURGY.

Muz'zey (ARTEMAS BOWERS), b. at Lexington, Mass., Sept. 21, 1802; graduated at Harvard College 1824, at Cambridge Divinity School 1828; became pastor of Unitarian churches at Framingham 1830, Cambridgeport 1834, Cambridge 1846, Concord, N. H., 1854, and Newburyport 1857, retiring from the latter post 1865. He has written tracts, sermons, essays, Sunday-school volumes, etc.

Myacites, a name originally employed for supposed fossil *Myas*, but subsequently adopted (by Munster in 1840) for a genus of extinct species of the family Anatinidæ. The species are numerous. The genus, according to Week, "probably first appeared during the Triassic epoch, though we are not sure that some of the species usually referred to *Allorisma* from the older rocks are really generically distinct. It seems to have reached its maximum development during the deposition of the Jurassic rocks, and continued to exist until after the commencement of the Cretaceous epoch."

My'att, tp. of Fulton co., Ark. Pop. 516.

My'atte, tp. of Howell co., Mo. Pop. 421.

Myc'ale [Gr. Μυκάλη, now *Samsum*], the westernmost branch of Mount Mesogis in Lydia, Asia Minor, terminating in the promontory called Trogylium (now Cape Sante Maria). In the narrow channel between this promontory and the island of Samos the Persian fleet was defeated and destroyed by the Greeks in 479 B. C.

Mycene, or **-næ** [Gr. Μυκήνη, or -κῆναι], one of the oldest cities of Greece, was situated on a rocky eminence in the plain of Argos, in the Peloponnesus. It was the residence of the Pelopidæ, and at the time of Agamemnon it was the principal city of Greece. In 468 B. C. it was totally destroyed, and it was never rebuilt, but the remains of it, the cyclopean walls, the "gate of lions," and the "treasury of Atreus," are among the grandest and most interesting antiquities in Greece. The ruins are near the little village of *Charvati*, 1 hour and 20 minutes from Argos. (See Leake's *Travels in the Morea* (1830), ch. xx.)

Mycet'inæ [from *Mycetes—μυκήτης*, a "bellower or howler"—the only known genus], a sub-family of South American monkeys of the family Cebidæ, and including the largest species of that group. The distinctive characters are as follows: The cerebrum is contracted backward, the posterior lobes being abbreviated, and scarcely covering the hindmost parts of the cerebellum; the hyoid bone and thyroid cartilage are greatly developed; the former is extended into a sub-globular drum with thin osseous walls, and the larger cornua of the apparatus project backward, the lesser being obsolete; the incisors are vertical. With the modification of the thyrohyal apparatus is connected the power of producing the loud and resonant cries for which the species of the genus are celebrated, and which have obtained for them the name of "howlers." The species are not yet satisfactorily determined, but ten species have been recognized by the latest writer on the group—

John Edward Gray—of which eight have been attributed to Brazil, one to Colombia, and one to Caracas. A species of the genus also extends up into Central America.

THEODORE GILL.

Myeli'tis [Gr. μυελός, "narrow"], inflammation of the substance of the spinal cord. At the beginning of this century nearly all affections of the spinal marrow were classified under the title *myelitis*, but some progress has been made in separating these various diseases. Our knowledge is, however, as yet very imperfect, and in the classification offered below there are doubtless some errors. Forms of myelitis may be best classified, according to the product of the inflammatory process, into softening myelitis, purulent myelitis, hyperplastic myelitis, and degenerative myelitis. The first of these forms, softening myelitis, is closely allied to non-inflammatory softening (from thrombosis, embolism, etc.), and it is probable that future researches will reduce the frequency of its recurrences. After death a small part of the spinal cord, usually a segment involving all its columns and the gray matter, is found softer than usual, or even in a semi-fluid state, reddish or reddish-yellow in color, sometimes white or yellowish. The substance of the spinal marrow is disintegrated, and a microscopic examination shows the presence of altered nerve-fibres and cells, granular bodies, fatty detritus. The symptoms during the life of the patient consist in impairment or loss of the power of motion and of sensibility in all parts of the body below the softened spot. For example, a focus of myelitis in the middle dorsal region will cause paralysis of the lower limbs (paraplegia), and of the bladder and lower bowel; a focus in the upper cervical region will produce palsy of the entire body except the diaphragm. The symptoms may be developed rapidly, with pain and spasm, loss of function being complete in a few days, or during many months the patient complains of increasing numbness, loss of sensibility and power. The prognosis is worse in proportion to the acuteness and to the higher location of the focus. Treatment occasionally arrests the disease, but probably never cures it. (*b.*) Suppurative myelitis is exceedingly rare, and we do not know any symptoms which can serve to distinguish it from any acute myelitis. The purulent matter is collected in the shape of small abscesses, or purulent elements are found diffused among the nervous fibres and cells. (*c.*) Hyperplastic myelitis is relatively common, and is that which gives rise to the various forms of "sclerosis." The initial lesion in these cases is increased activity and volume of the neuroglia or framework of the spinal cord, with consequent wasting of the nervous anatomical elements. Later, products of degeneration appear in the shape of granular and amyloid bodies. The affected portion of the spinal cord is found hardened, like boiled white of egg or soft cartilage; it is grayish or yellowish in color, and presents a translucent instead of the normal dead-white appearance. The microscope shows increased neuroglia, disintegrating nerve-fibres and cells, granular bodies (especially around the blood-vessels), and amyloid bodies. Sclerosis of the spinal cord may be classified, according to its distribution in the organ, into (1) striped sclerosis, which may extend upward and downward in any of the columns—in the posterior columns producing the disease clinically known as locomotor ataxia; in the anterior or antero-lateral columns produce paraplegia, with loss of motion alone or chiefly; in the lateral part of the antero-lateral columns giving rise to contracture of the limbs. There may be (2) a limited sclerosis, involving the several columns and the gray matter at any part of the spinal cord, producing a chronic paraplegia; and (3) nodular (or insular) sclerosis, *sclérose en plaques*, in which the disease affects a number of spots upon or in the spinal cord (and brain), the nodules being distributed in a wholly irregular manner. The symptoms produced by nodular sclerosis are very irregular, depending upon the location of the first and of the largest nodules; there are observed loss of power and sensibility (rare) in the limbs, mental and sensorial symptoms. (*d.*) Degenerative myelitis includes two principal forms: (1) a parenchymatous inflammatory (?) change in nerve-fibres or ganglion-cells; and (2) the changes which occur in the spinal cord in consequence of a lesion in the brain or in the spinal cord. Under the first head are to be classed those changes in the anterior horns of the spinal cord which give rise to paralysis accompanied by wasting of the affected muscles, or to wasting of the muscles primarily; acute, sub-acute, and chronic spinal paralysis (infantile spinal paralysis, spinal paralysis with atrophy in the adult), progressive muscular atrophy, labio-glosso-pharyngeal palsy. The lesion consists in a clouding and granular disintegration of the ganglion-cells of the anterior horns, with some as yet ill-understood change in the substance in which they are imbedded. Occasionally this lesion involves the greater part of the anterior horns in a longitudinal way, and soon leads to death by asphyxia (acute ascending palsy). In some of these forms sensibility is relatively little impaired, in others not at all. The degenerative myelitis which is caused by some other lesion of the nervous centres, consists in wasting of the nerve-fibres and the deposit of numerous amyloid and granular bodies, and some thickening of the neuroglia; it is always in the white columns of the cord, is symmetrically arranged, and is found in the lateral columns when caused by a brain-lesion; when produced by a spinal lesion it extends above the lesion in the posterior columns—below it in the lateral columns. The forms of myelitis last described are closely allied to non-inflammatory degeneration. Any classification of forms of myelitis is at the present day necessarily a provisional one. The treatment of myelitis is exceedingly unsatisfactory; at best a checking or limiting of the disease can be looked for. The fatal issue is brought about by exhaustion (from bed-sores), inflammation of the urinary tract, pulmonary phthisis, or asphyxia.

E. C. SEGUIN.

Myensk, town of European Russia, in the government of Orel, on the Zusha. Its thirteen churches, with their many towers, give it a very picturesque appearance; has a lively trade in spirits, soap, hemp, and dried fruits. Pop. 12,775.

My'er (ALBERT J.), b. at Newburg, N. Y., Sept. 20, 1828; graduated at Geneva College 1847; M. D. in the University of Buffalo 1851, and in 1854 was appointed assistant surgeon U. S. army; in 1860 chief signal-officer with the rank of major, serving as such throughout the war (with the rank of colonel Mar., 1863, to July, 1864), and gaining the brevets of lieutenant-colonel, colonel, and brigadier-general. In July, 1866, he was again placed at the head of the signal-office, with the rank of colonel, and in 1870 charged with taking meteorological observations at the military stations and other points in the interior of the continent, and giving notice by telegraph or signals on the northern lakes and seaboard of the approach and force of storms; and in 1873 was authorized to extend his posts of observation to such lighthouses and life-saving stations as suitable. Author of *Manual of Signals for the U. S. Army and Navy* (1868).

My'ers, tp. of Carroll co., Md. Pop. 1953.

Myers (EDWARD HOWELL), D. D., b. in Orange co., N. Y., June 9, 1816; taken to Florida before it was transferred from Spain to the U. S.; graduated at Randolph-Macon College, Va., in 1838, under Dr. Garland; in 1839 was elected tutor in the Georgia Conference Manual-labor School, and in 1840 tutor of mathematics in Emory College, Ga.; joined the Georgia Methodist Episcopal conference in 1841; in 1845 was elected to the chair of natural science in Wesleyan Female College, Macon, and president in 1851; in 1854 was elected editor of the *Southern Christian Advocate;* in 1871 resumed the presidency of Wesleyan Female College, but resigned in 1874 to take charge of Trinity church, Savannah; was an efficient member of the General Conferences of 1858, 1866, 1870; has published some valuable pamphlets, etc., and *The Disruption of the M. E. Church, 1844–46.*

T. O. SUMMERS.

Myers (Rev. LEWIS), b. in South Carolina May 7, 1775; entered the ministry in the South Carolina Methodist Episcopal conference in 1799. At his death (in Georgia Nov. 16, 1851) he was an honored patriarch of the Georgia conference. He was in the front rank of the heroic pioneers of Methodism in the South.

T. O. SUMMERS.

Myers (PETER HAMILTON), b. at Herkimer, N. Y., in Aug., 1812; is author of several successful novels upon American subjects, among which are *The First of the Knickerbockers* (1848), *The Young Patroon* (1849), *The King of the Hurons* (1850), *The Prisoner of the Border* (1857), and a volume of poems, *Ensenore, a Romance of Owasco Lake.* He was for some years a lawyer at Brooklyn, and subsequently settled at Auburn, N. Y.

My'erstown, post-v. of Jackson tp., Lebanon co., Pa., on the Lebanon Valley R. R. It is the seat of Palatinate College (German Reformed). Pop. 1323.

My'ersville, a v. of Carroll co., Md. Pop. 159.

Myersville, post-v. of Frederick co., Md., 13 miles N. W. of Frederick. Pop. 139.

Myia [Μυῖα], daughter of the celebrated Pythagoras and Theano, and wife of Milo of Crotona, was, like her mother, distinguished in philosophy. There is extant a letter ascribed to Myia, addressed to one Phyllis, on the choice of a nurse; it is printed in the *Fragmenta Mulierum Græcarum* of J. C. Wolf (Göttingen, 1739). (See Ménage, *Hist. Mul. Philos.*, § 86.)

H. DRISLER.

Myliobat'idæ [from the generic name, *Myliobatis*], a family of the class of selachians and order Raiæ, or rays. The disk formed by the union of the pectoral fins with the

body is very broad, by reason of the lateral extension of the latter, and the tail is very long and attenuated; the dorsal fin is developed near its root, and behind it is one or a pair of spines serrated at their lateral edges; the pectoral fins are atrophied at the sides of the head, but at the extremity of the snout are developed as a pair of detached cephalic fins; the skin is smooth and destitute of spines; the head quite deep; the mouth inferior and tranverse; the teeth have flat grinding surfaces, and are quadrangular or hexangular, and in one or several interlocking longitudinal rows. The family is divisible into two sub-families—viz. (1) Myliobatinæ, in which, besides a median row of teeth, there are several lateral rows, which alternate and interlock with the adjoining ones, to which belong the genera *Myliobatis*, *Rhinoptera*, *Mylorhina*, and *Mylomesus*; and (2) Ætobatinæ, whose teeth are broad and in a single row, answering to the median row in Myliobatinæ, embracing but one genus, *Ætobatis*. On the coast of the U. S. are found several species; on the eastern coast, *Myliobatis Fremenvillei*, *Rhinoptera quadriloba*, and *Ætobatis narinari*, and on the western coast *Myliobatis Californicus*. The *Rhinoptera quadriloba* is sometimes called "clamcracker," "the stingray," and "cow-nose ray;" the *Myliobatis Fremenvillei*, "sharp-nosed ray," and the *Myliobatis aquila* is in England known as "eagle ray."

THEODORE GILL.

Mylit'ta, the Greek name for BELTIS or BILIT, a goddess worshipped in Babylon, Assyria, and Persia, and corresponding to the Greek Aphrodite, though in a coarse and barbarous form. Thus, her worship demanded that every Babylonian woman should once in her life give herself up to a stranger who desired her, and bring the money to the altar of the goddess.

My'lodon [Gr. μύλη, "mill," and ὀδούς, "tooth"], a genus of extinct Quaternary mammals from North and South America, allied to the sloths. (See MEGATHERIIDÆ.)

Mynpuri, town of British India, in the presidency of Agra, on the Esun, an affluent of the Ganges, contains several temples and has 20,891 inhabitants.

Myocon'cha, a genus of fossil shells found in Secondary and Tertiary rocks, and variously assigned to the Cyprinidæ or to the Astartidæ. E. C. H. DAY.

Myox'idæ [from *Myoxus*, the classical name of the genus], a family of the order Rodentia and sub-order Simplicidentati. The skull resembles that of the rat; the infraorbital foramen is moderate, vertically fusiform, and without any external maxillary laminar boundary; the lower jaw has the coronoid and condyloid processes in nearly the same plane with each other and with the descending ramus, which last is scarcely twisted; molar teeth $\frac{4}{4} \times 2$; the hind limbs are moderately elongated; the tibia and fibula united below; the metatarsal bones separate from each other; no cæcum is developed. The species considerably resemble the squirrels in physiognomy, and, as in them, the tail is provided with more or less elongated distichous or laterally spreading hairs, but generally to a less extent than in the typical squirrels. The family is confined to the Old World —Europe, Asia, and Africa—and contains about twelve species, which have been grouped under four sections—viz. *Glis*, *Muscardinus*, *Eliomys*, and *Graphiurus*—which by some are regarded as distinct genera, and by others as sub-genera of *Myoxus*. The common dormouse of Europe (*Myoxus avellanarius*) is the best-known species, and is noticeable on account of its hibernating or winter sleep.

THEODORE GILL.

Myria [Gr. μύριοι, "ten thousand"], a prefix used in the French metric system to denote ten thousand times the measure indicated by the word to which it is prefixed; as, MYRIAGRAMME, ten thousand grammes, is equal to 22.0462 pounds avoirdupois; MYRIALITRE, ten thousand litres, is equal to 2641.8635 gallons; MYRIAMÈTRE, ten thousand mètres, is equal to 6.2138 miles. (See METRIC SYSTEM.)

Myr'iapods [Gr. μύριοι, "ten thousand," and πούς, "foot"]. The myriapods, of which the centipedes and thousand-legs are familiar examples, may be recognized by the long, worm-like body, consisting of many segments or rings, each bearing a pair of legs. Though they are true insects, breathing by tracheæ, with a distinct head comparable with that of the winged insects, one genus even (*Cermatia*) having compound eyes, yet the body behind the head is not divided into distinct thoracic and abdominal regions, thus resembling caterpillars and the larvæ of other insects; for this and other reasons they are regarded by some as forming a distinct class of articulated animals, equivalent to the insects. But we shall, for the reasons above given, regard them as forming a subdivision of the class of insects—a sub-class or order, as the reader pleases. This view is borne out by the fact that when hatched the body of the chilognathic myriapods is short, has but few segments, no more than nine (in *Pauropus* only five), besides the head, and but three pairs of legs. On this account they may also be regarded as a subdivision of the true insects, though in *Geophilus*, a chilopod, the young are hatched with nearly the full number of feet. The body is composed of from 9 to 200 segments, the number varying greatly in the different genera; for example, in *Pauropus*, a minute form, the body consists of 9 segments besides the head; in *Lithobius*, the so-called earwig, there are 15, while in *Geophilus* there are 200. How closely the myriapods are related to the winged insects may be seen by a glance at the head of *Cermatia*, the most highly organized myriapod known. The head is larger than usual in the centipedes, and there is a pair of compound eyes, while in all other myriapods they are either scattered and simple or collected into irregular patches, scarcely coming under the head of compound eyes. The antennæ are also longer than usual, and the palpi are well developed, being like those of insects. The head and antennæ of *Scolopendrella* are almost exactly like those of some *Thysanura* (Campodea), while the young *Pauropus* is remarkably like *Podura*. The head is, as in insects, normally composed of four segments, and the appendages of the head have much the same form as in the larvæ of many insects, such as the beetles. The mandibles are of the usual form, the accessory jaws (maxillæ) are provided with palpi, and the second maxillæ (labium) are united and provided with palpi. The legs are, like those of the larvæ of the winged insects, composed of five joints.

The English anatomist Newport has shown that in their internal anatomy—*i. e.* the nervous, digestive, respiratory, and reproductive systems—the myriapods closely resemble the larvæ of many insects. Beginning with the nervous system, the first to be developed of all the systems, Newport states that it approaches in its simplicity that of the higher worms (annelids), rather than that of the larvæ of insects. "In the Chilopoda (centipedes) it has the form of a double cord connected by large ganglia in each segment, as in most of the Annelida, Crustacea, and Insecta; but in the vermiform Chilognatha (thousand legs, etc.), which former researches have proved to me are most nearly connected to the Annelida, the two parts of this double cord are so closely united laterally as to appear like a single cord, that gives off a multitude of small nervous trunks at its sides throughout its whole length, but without distinct ganglionic enlargements at their origin." The brain is composed of at least four pairs of ganglia. (*Newport.*) Our account of the alimentary canal is condensed from Leidy's account of that of *Julus marginatus*, a common American thousand-legs. There are four long tubular salivary glands and two short pyriform conglomerated glands placed on each side of the œsophagus. This latter is pyriform and capacious; the crop (proventriculus) forms nearly half the length of the alimentary canal, its lower extremity constricted into six rings; just beyond, at the extreme end of the crop, open two biliary tubes. The beginning of the stomach is surrounded by a broad fatty band, apparently representing the *rete adiposa* of insects. The stomach forms about one-sixth the length of the whole alimentary canal, and is simple and narrower than the crop. The large intestine begins abruptly, being at first nearly twice the breadth of the ventriculus and narrowing posteriorly. The rectum is short and elliptical.

The circulatory system consists of a dorsal vessel, the so-called heart, with very numerous chambers, nearly corresponding to the segments of the body, and connecting with another system of vessels lying on the under side of the body, between the alimentary canal and the nervous cord, forming "a vascular collar around the anterior part of the alimentary canal." This disposition of the vessels reminds one rather of the circulatory system of the higher worms than of the larvæ of insects, as Newport states. The tracheæ are arranged much as in the winged insects, and the stigmata have the same relative position, but are placed on alternate segments of the body. In the centipedes (Chilopoda) the sexual organs are much as in the six-footed insects, and the orifices are placed at the end of the body. The ovary is a long single tube, which opens in the last ring of the body. In the lower group of Chilognatha (thousand-legs) there is only a single long ovarian tube, provided with two short oviducts, which open on the third segment of the body from the head. The male organs in the centipedes and allies are much more complicated than in the other myriapods, and the two or three, or even the single testicular tube, open on the end of the body, while in the chilognaths, such as *Julus*, there are two testes, which lead out by a *vas deferens* to the orifice situated on the third thoracic ring.

Our *Cermatia forceps*, found in the Middle and Southern States, is poisonous, though its bite is not dangerous. The bite of the centipede is very dangerous—more so, perhaps,

than that of the scorpion. The poison is secreted from two glands in the throat, and flows into the wound along a canal in the jaws.

The eggs of *Julus* are laid in the earth about an inch below the surface. The egg undergoes total segmentation, and the primitive band rests on one side of the egg. The first maxillæ do not develop, these organs wanting in the adult. The embryo *Julus* would easily be mistaken for a young *Poduran*, so much alike are the two animals before hatching. It is a curious fact, first observed by Newport, that the egg-shell splits asunder, while the embryo, encased in its embryonal membrane, is retort-shaped, and remains thus for seventeen days before running about. Before this membrane is thrown off the embryo moults, and six new segments appear between the penultimate and last segment. While the *Julus* is at first but six-legged, with but seven body-rings, and passes through a true metamorphosis, the centipede, as observed in *Geophilus* by Metschnikoff, after passing through the early embryonic stages, as in the chilopods, acquires over forty pairs of legs, and is nearly of the form of the adult before hatching. The mouth-parts are much as in the winged insects. The body, cylindrical in the embryo, becomes flattened later in life. Dr. Wood has observed that the female of *Scolopocryptops*, a centipede-like genus, guards her young by lying on her side, and, coiling her body, passes them along by a "rapid cilia-like action of her feet," thus arranging them satisfactorily to herself. Wood also describes the mode of moulting in the same genus of centipedes: "The skin had been crowded back so as to cover only the last two or three rings. The cast skin contains the skin of the head and all its appendages, even to the maxillæ and maxillary palpi. The anterior portion of the skin was so torn as to show that the process of shedding probably began by the creature's withdrawing its head from its case, and then thrusting it out between some of the anterior sterna, completing the process by pushing the skin back with its legs, and aiding them by a peculiar wriggling motion. The exuvia had most of the posterior segments entire, showing that the occupant had been withdrawn from it like a hand from a glove."

The Myriapoda are among the oldest insects known, occurring in the coal formation of Europe and this country. A species of *Julus* occurs in the coal formation of Germany. In Nova Scotia, Dr. J. W. Dawson discovered the remains of a galley-worm, allied to *Julus*, in a stump of Sigillaria, which he described under the name of *Xylobius sigillariæ*. On subjecting the fragments collected by Dr. Dawson to further examination, Mr. S. H. Scudder has found, besides the original species, three other species of *Xylobius*, and the type of a new family which he terms Archiulidæ, the species itself being termed *Archiulus xylobioides*. A very singular myriapod was discovered by Messrs. Meek and Worthen in the Carboniferous formation of Illinois, and described under the name of *Euphorberia armigera*. It is apparently related to the centipedes. Another species of this genus was afterwards found in the coal-measures of Scotland, and named by Mr. H. Woodward *Euphorberia Brownii*. While several of the myriapods are known to be blind, a few blind species are peculiar to caverns in this country; a blind, hairy form, *Spirostrephon Copei* Pack., occurs in the Mammoth Cave; on the other hand, another form, *Scoterpes cavernarum* Cope, found in caverns in Virginia and Tennessee and Wyandotte Cave, Ind., is said to have well-developed eyes. Other eyeless forms are found among the sucking forms (Siphonantia). In these myriapods the head is very small, and concealed beneath the segment behind. The parts of the mouth are fused and united into a sucking-tube for the imbibition of fluids. The most remarkable as well as smallest form is the genus *Pauropus*. Lubbock regards it as a connecting link between the chilopods and chilognaths, and also as bridging over to a certain extent the great chasm which separates them from other Articulata. Our American species is *Pauropus Lubbockii* Pack.

The following is a tabular view of the sub-orders and families of the myriapods, in ascending order:

Sub-order Chilognatha.

Body consisting of double segments, bearing two pairs of legs; antennæ short, with few joints.

1. Head small; mouth-parts forming a sucking-tube: *Siphonantia*.
2. Body cylindrical; sterna very small: *Julidæ* (thousand-legs).
3. Like Julidæ, but body tapering more towards each end; fossil: *Archiulidæ*.
4. Body flattened; sterna overarching the scuta: *Polydesmidæ*.
5. Body very short, half cylindrical, of twelve to thirteen rings: *Glomeridæ*.

Sub-order Chilopoda.

Each ring simply flat, bearing a single pair of feet; head divided into two regions, one placed before, the other behind the mouth; sexual outlet situated at the end of the body.

1. Body minute, consisting of 9 segments besides the head; antennæ five-jointed: *Pauropodidæ*.
2. Body very long, with from 30–200 segments; no ocelli: *Geophilidæ*.
3. Body with 21–23 feet-bearing segments: *Scolopendridæ* (centipedes).
4. Body with 15 feet-bearing segments: *Lithobiidæ*.
5. Head large, with compound eyes; 15 feet-bearing rings: *Cermatiidæ*. A. S. Packard, Jr.

Myrmecobi'idæ [from the generic name, *Myrmecobius*, μύρμηξ, "ant," and βιός, "life"], a family of marsupial mammals represented in Australia, and distinguished especially by the numerous teeth. The skull has rather slender bones; the auditory bullæ are large; the palatine vacuities are almost obliterated; the intermaxillaries are not united at their symphysis; the lower jaw has very slender and straight rami, and the descending rami points backward. The teeth are very small, and there are I. $\frac{4}{3}$, C. $\frac{1}{1}$, M. $\frac{8}{9} \times 2 = 52$; the molar teeth have slight prickly points or cusps. The animal somewhat recalls by its form that of the rosses and genets (Viverridæ), having a long body and comparatively short legs, and with a long hairy tail; the muzzle is quite elongated, the muffle naked, and the nostrils lateral; the ears are moderately pointed; the tongue is very long and slender; the fore feet have five toes, the hind ones four; the nails are compressed and curved. The female has no pouch; the mammæ (apparently eight in number) are arranged in a circle. A single species is known (*Myrmecobius fasciatus*), which inhabits Western and Southern Australia. Its gait reminds one of the squirrel; when running on the ground it progresses by successive leaps, and carries its tail slightly elevated, and every once in a while raises its body and rests on its hind legs. It is supposed to feed upon ants, and hence the generic name has been conferred upon it. The ground-color is light-reddish, with transverse white and blackish bands behind the middle, and a bridle-like black line runs from the snout through the eyes to the base of the ears.

Theodore Gill.

Myrmecophag'idæ [from the name of the typical genus, *Myrmecophaga*], a family of edentate mammals including the true ant-eaters of South America. They have a more or less elongated tail; the snout pointed; the feet club-footed (*i. e.* with the external edges turned inward), and provided with large claws for digging; the skull is more or less elongated and smooth; the supraoccipital projects forward, and is provided with a median protuberance; the squamosal bone (with which are ankylosed the periotic and tympanic) has a very small zygomatic process at the antero-superior angle; the supramaxillary bones are elongated; the intermaxillaries very small; the palate is very much elongated by the extension backward of the pterygoids; the nasals are simple, rather long, and nearly uniform in width, and emarginated at the ends; the orbits and temporal fossæ are continuous; "the malar bone reduced to a slender stylet free at the posterior end;" "the postero-palatal foramen single, or wanting;" "the foramen rotundum included in the foramen spheno-orbitarium;" the lower jaw has very slender and elongated rami, which are destitute of coronoid processes. The family is divisible into two sub-families: (1) Myrmecophaginæ, including the genera *Myrmecophaga* and *Tamandua;* and (2) Cyclothurinæ, with the genus *Cyclothurus*. *Myrmecophaga* embraces the great ant-eaters; *Tamandua*, the yellow ant-eaters; and *Cyclothurus*, the small, two-clawed species with prehensile tails. Both the *Tamanduæ* and *Cyclothuri* are arboreal species; the latter is especially so, and has a prehensile tail, by means of which it is able to hang from the branches of trees, and in commemoration of this capability the generic name *Cyclothurus* (*i. e.* "twisted tail") has been given. Theodore Gill.

Myrmeleon. See Ant-Lion.

Myrmid'ones, the followers of Achilles in the campaign against Troy, came originally from Ægina, and received their name from μύρμηκες, "ants," because Zeus changed all the ants of the island into men, and thus peopled it. Peleus led them into Thessaly, where they settled.

Myrob'alan [Gr. μυροβάλανος], a drug formerly much used in medicine as an astringent, and now used by tanners, dyers, and ink-makers for the tannic acid it contains. Myrobalans, sometimes called white galls, are the fruit of *Terminalia Bellirica* and *T. Chebula* (East Indian trees of the order Combretaceæ), of *Phyllanthus Emblica*, a euphorbiaceous plant, and of other trees of tropical regions. There is much variation in the appearance and industrial value of myrobalans.

My'ron, b. at Eleutheræ, a town in North-western Attica, near the Bœotian frontier, about 480 B. C.; became one of the most celebrated sculptors of antiquity. The most famous of his works were his *Cow*, his *Runner*, and his *Discobolus*, of which there still exist several copies both in bronze and marble. He worked generally in bronze.

Myronic Acid. See MUSTARD, by EDWARD CURTIS, M. D.

Myrosine. See MUSTARD, by EDWARD CURTIS, M. D.

Myrrh [Heb. *mar*, "bitter"], the concrete juice of one or possibly two trees whose botany is not yet entirely certain. One source of myrrh at least is the *Balsamodendron myrrha*, a small tree growing in Arabia. Myrrh is exported from the East Indies, and is in the form of reddish-brown, brittle, resinous lumps, of a fragrant odor and bitter aromatic taste. Its principal constituents are a gum and a resin. Myrrh has been known from the earliest ages, being used as a constituent of incenses, perfumes, and salves. Taken internally, myrrh resembles other acrid resinous substances in tending to correct a feeble, relaxed condition of the mucous membranes, and in small dose to promote digestion and quicken the action of the heart. It is very little used as an internal medicine in this country. Locally, an emulsion of myrrh makes an agreeable mouthwash for spongy gums and sore throat and dressing for indolent ulcers. EDWARD CURTIS.

Myrta'ceæ [from *Myrtus*, one of the genera], an important natural order of exogenous trees and shrubs, of tropical and warm temperate regions, distinguished on the whole, the entire leaves dotted with pellucid glands, containing an aromatic oil, no stipules, mostly numerous stamens, and an inferior compound ovary surmounted by a single style. None are indigenous to the U. S., excepting half a dozen West Indian *Eugenias* and the like on the keys of Florida. Europe has only the classical myrtle in the Mediterranean region. A peculiar portion of the order, embracing a majority of the species, is Australian, conspicuous among which are the "gum trees" and "stringy-bark trees," the genus EUCALYPTUS (which see). Within the tropics the fleshy or berry-fruited genera prevail. The order is important for its useful products, such as CLOVES and ALLSPICE, GUAVAS and ROSE-APPLES, BRAZIL-NUTS (the product of a peculiar sub-order), CAJUPUT OIL, etc., all described under their several heads. The eucalyptus trees furnish one kind of kino, tannin, valuable and rapidly-grown timber, various essential oils, and a febrifuge principle used as a substitute for quinia. Besides the common myrtle, callistemous and several Australian shrubs and small trees are cultivated for ornament. A. GRAY.

Myr'tle [Gr. μύρτος], a genus (*Myrtus*) of trees and shrubs, mostly tropical and evergreen, none North American. The *Myrtus communis*, the common European myrtle, is a fine aromatic shrub whose berries yield a pleasant cordial. The leaves produce an aromatic oil, and water distilled with the flowers is the agreeable perfume known in France as *eau d'ange*. Several tropical species are cultivated. The name is popularly but incorrectly extended to other evergreen shrubs.

My'sia [Gr. Μυσία], an ancient territory of Asia Minor, bordering N. on the Hellespont and Propontis, and bounded S. by Lydia and Phrygia. Among its mountains was Mount Ida; among its rivers, the Scamander, Simois, and Granicus; among its cities, Troja; but its interest is more legendary than historical.

Mysore', an independent state of India under English protectorate, is situated between lat. 11° 35′ and 15° N., and between lon. 74° 45′ and 78° 45′ E., bounded on all sides by the territory of the presidency of Madras. Area, 30,886 square miles. Pop. 3,460,696. It is an elevated table-land, rich in gold-dust and salt, and producing, besides the common Indian grains, pepper, cardamoms, cinnamon, and coffee; but water is often very scarce, and the country is infested with tigers and leopards. In one year (1835–36) no less than 349 tigers, 479 leopards, and 113 bears were killed.

Mysore, the capital of the principality of Mysore, is situated in lat. 12° 19′ N. and lon. 76° 42′ E., at an elevation of 2330 feet above the sea. It is fortified, and contains the palace of the rajah and the residence of the English governor. Its splendid aqueduct has now fallen into ruins, and great trouble is often caused by lack of drinking-water. Carpets are manufactured here. Pop. 54,729.

Mys'teries, Mir'acle-Plays, and **Moral'ities** denote the three earliest stages in the development of the modern drama, and their history forms the history of the modern theatre before its existence as an independent institution in society. The mysteries originated very early, before the ninth century, in the divine service of the Christian Church. They were performed in the church building by the clergy, and treated exclusively biblical subjects. At first they were simply symbolical representations of the biblical narratives, but soon they became complete dramatizations. On Good-Friday the cross was taken from the altar and carried in a solemn procession, with loud lamentations, to a side chapel, where it was deposited as in a grave. Early on Easter morning it was carried back to the altar with hymns of joy and songs of triumph, and thus the crucifixion and resurrection of Christ were symbolically represented. Later, the chapel was decorated as a sepulchre, the young priests were disguised as the Roman guard, the women who came to anoint the corpse of Christ were the angels who sat at the grave, and the biblical dialogue was expanded into arias, choruses, etc. To a congregation whose members could neither read nor understand the Latin words of the common divine service, and very few of whom had received any regular religious instruction, while all embraced whatever they picked up of the sacred history with passionate belief, these mysteries were an effective means of education—the more so as the impression they made was one of devotion, not of entertainment. But in course of time elements of superstition and amusement, worldly vanities, and even profane jestings, crept in, and in 1210, Pope Innocent III. forbade the performance of mysteries in the churches and by the clergy; in 1225 the Council of Treves confirmed this verdict; and in 1252, Alfonso X. of Aragon enforced the prohibition in his state. Thus abandoned by the clergy, the mysteries were taken up by the citizens. They were removed from the church to the market-place, and here they grew into huge compositions, comprising the whole history of mankind, from the Creation to Doomsday. Immense scaffoldings were erected, divided into three floors, the lowest representing hell, the middle the earth, the uppermost heaven, and the performance generally lasted several days and often required the assistance of more than 1000 people. But by this movement the mysteries changed character, and assumed a form under which they are commonly called *miracle-plays*. They still remained something sacred, something pertaining to religion, but the subject of the representation was now the miracles of God's power, not the mysteries of his grace, and the impression was wonder rather than devotion. The central idea of these plays was the situation of man between God and Satan, and their interest consisted in the realism of the description of the temptations which Satan sent in the way of man, and the magnificence of the picture of the miracles by which God crushed Satan and saved man. Christ was generally impersonated by a priest—Satan by a *homo vagus*, a hired mountebank. What God said was sung by a trio; Christ appeared in a garment of undressed lambskin; Herod and Pilate were dressed as Turks, Satan as a leper; the principal temptation of a woman's life came from the monks, who visited her while her husband was absent on a crusade. Thus, the ideas of the day, not those of the Bible, ruled in the miracle-plays. In the management of these representations there were certain peculiar features which gave rise to new modifications and further development, corresponding to the growth of the spirit of the age. Each act or scene of a miracle-play was represented by a separate corporation or guild, which defrayed all the expenses. The carpenters represented the birth of Christ; the jewellers, the adoration by the kings, etc. Hence, the practice of erecting separate stages for each scene, either movable or fixed, in front of the guild-houses. In the fifteenth century these stages were moved from the streets into the guild-halls, the lives of the patron saints of the respective guilds took the place of the biblical events, allegorical representations of Virtues and Vices were substituted for God and Satan; and the whole ended with a practical moral lesson instead of doomsday. The miracle-play was thus transformed into a morality; and the circumstance that an entrance fee was paid at these performances soon led to the formation of associations which received the exclusive privilege of exhibiting theatrical representations; at which point the modern theatre may be said to have been established. The first organization of this kind was the Confrérie de la Passion, which received a privilege at Paris in 1402. In Oberammergau, in the Bavarian highlands, the Passion-play mystery is still performed by the peasants in old style every tenth year, in consequence of a vow, and attracts a vast number of visitors from Europe and America. (See OBERAMMERGAU.) (See Onésime Leroy, *Études sur les Mystères* (1838); *Mystères inédits du quinzième Siècle*, by Achille Jubinal (1837); *Deutsche Schauspiele des Mittelalters* (1841); Alt, *Theatre und Kirche* (1854); *The Chester Mysteries* (1818); *The Towneley Mysteries* (1836); H. N. Oxenham, *Oberammergau in 1871.*)

CLEMENS PETERSEN.

Mystic, post-v. of Stonington tp., New London co., Conn., on the E. bank of Mystic River, 3 miles N. of Mys-

tic Bridge. It is the site of a home school for deaf mutes. Near by is Pequot Hill, where the Pequot Indians were massacred May 26, 1637.

Mystic Bridge, a v. of Stonington tp., New London co., Conn., on the E. bank of Mystic River, opposite Mystic River Village. It has a national bank, a high school, and important shipbuilding interests, and is on the Shore Line R. R.

Mystice'te [μύσταξ, "moustache," and κῆτος, "sea-monster" or "cetacean"], a sub-order of cetaceans containing the whalebone whales. The intermaxillaries are narrowed forward, forming only the point of the upper jaw, and are underlaid by the supramaxillaries, which form the entire lateral margin of the jaw; the supramaxillaries are not extended backward from the frontal bones, but produced outward in front of the orbits. The olfactory organ is distinctly developed, and the nasal bones project forward, and are not overlapped at their distal ends. The rami of the lower jaw are simply connected by fibrous tissue, and not by suture. No teeth are functionally developed, for, although present in the fœtus, they are absorbed and disappear before birth; instead thereof plates of whalebone are developed from each side of the axis of the roof of the mouth which project beyond the sides of the jaws. The sub-order includes three families—viz. Balænidæ, including the great bow-head or right whale; Balænopteridæ, including the fin-backs; and Cetotheridæ, whose species are all extinct. THEODORE GILL.

Mys'ticism [Gr. μυστικός, "belonging to secret rites"], in theological usage designates the contemplation of mysteries, especially those relating to divine things, by an internal illumination, either the soul's own or from God. The spiritual nature is released from the shackles of the body, sometimes by overcoming it, sometimes by giving loose rein to it. It is antithetical to reception on authority (*pistis*, "faith"), and to the recognition of truth by the ordinary use of the faculties (*gnosis*, "knowledge"); but in its soberer forms it takes both into its service, holding them in a relative subservience. The Germans distinguish between *Mystik*, the legitimate, and *Mysticismus*, the spurious. Mysticism, whether in the Vedas, in the Platonists, or in the Hegelians, is neither more nor less than ascribing objective existence to the subjective creations of our own faculties, to ideas or feelings of the mind, and believing that by watching and contemplating these ideas of its own making it can read in the world without. (Mill, *Logic*.) In the common use of the term it involves a morbid inclination to the mysterious, a giving play to the fancy in the realm of the supersensuous, and is often a synonym of the vague and senseless. Nevertheless, mysticism, even in its extravagance, has often been but the reaction against more dangerous extravagances, and in its highest and purest forms it has been and will ever be characteristic in some degree of all the deeper religious thinking and feeling of the race. It will furnish again, as it has furnished before, to the heart-sick and yearning a refuge from the unscrupulous ecclesiasticism, the formalism, and superficialism of eras of decline in religious life, or of hollow and noisy attempts at restoring it; and, if incapable of producing reformation, will at least herald its way. It is wholesome to know that there are some to whom the world we see is nothing, and the world we do not see is everything. Mysticism has been classified as theopathetic, theosophic, and theurgic, as philosophical and theological, as the mysticism of feeling or faith, of cognition and of will; and in other ways, for it is, after all, but a longing, and its hues shift in every new light. In its older historical divisions we have mysticism Oriental, Neoplatonic (Pseudo-Dionysius), Christian in the Greek and Latin churches. In the Middle Ages it is represented in Hugo de St. Victor (d. 1141), Herman von Fritzlar, Bonaventura (d. 1274), Ruysbroek (d. 1381), Eckart (d. about 1328), Tauler (d. 1361), Suso (d. 1365), Gerson (d. 1429), Thomas à Kempis (d. 1471), Geiter von Kaisersberg, Catharine of Siena (d. 1380), and others. The grades of mysticism were purification, illumination, ecstatic union, and absorption. It was generally theistic, but in no small number of cases pantheistic; as, for example, in Scotus Erigena (d. 872), Schmid (1825), Pfeiffer (1845–57). Among the modern mystics the most distinguished in the Roman Catholic Church are St. Theresa (d. 1582), Francis of Sales, John of the Cross (d. 1591), Angelus Silesius (d. 1677), Poiret; and in the peculiar type of QUIETISM (which see), Molinos (d. 1697), Madame Guyon (d. 1717), Fénelon (d. 1715). Among Protestants, Jacob Boehme is the greatest of mystics. In Swedenborg the mystic and rational were in extraordinary equipoise. Modern Mohammedanism has revealed mysticism in the form of SUFISM (which see) (Tholuck, 1822–25). Mysticism in the later philosophy was represented in Paracelsus, Bruno, Campanella, and others, and showed itself in the main in attempts to construe physics by the processes of an abstract metaphysics, which dictated to nature instead of learning from her (Carrière, 1847). Jacobi and the whole school of belief in philosophy, and the entire body of theologians who have resisted RATIONALISM (which see), have been grouped as mystics (Ewald, 1822). (See Heinroth (1830), Helfferich (1842), Goerres (1836–42), Noack (1853), Vaughan (1856), Migne (1858). For a full list of works see Walch, *Bib. Theol. Lib.*, ii. (1178); Danz, *Univ. Wörterb.* (1843); Hagenbach, *Encyklop.* (9th ed. 1874, 94, 248, 255).)

CHARLES P. KRAUTH.

Mystic River, post-v. of Groton tp., New London co., Conn., on the Mystic River, opposite Mystic Bridge, and 8 miles E. of New London. It is on the Shore Line R. R., and has a national bank.

Mythol'ogy. It is the most characteristic mark of a myth, properly so called, that nobody knows by whom, or at what time, or under what circumstances it was originated: it is simply what people have always "heard tell," as the primary sense of the Greek word μῦθος is simply "word," "speech." But while, by the time a myth has become recognized as such, it does not command belief, yet at the outset it was quite otherwise. Originally, myths were not told with a shrug of the shoulders, but they were told to be believed, and they were believed by those who told them. To disbelieve in the myths currently accepted was to be an infidel, a heretic, a blasphemer—to draw down upon one's self and one's kindred the vengeance of the gods, or at least the anathemas of society. A myth, therefore, is a story of obscure origin which embodies some belief now become antiquated, or which has its root in some habit of contemplating nature that is now outgrown and perhaps hardly intelligible. A collection of such stories belonging to a particular age or people is called "a mythology," and the science or branch of inquiry which describes, classifies, and interprets them is also called "mythology."

The study of this science, when conducted on proper methods, throws great light on some of the early thoughts of mankind, giving us glimpses of the way in which people reasoned about things before there was any such knowledge of nature as we are accustomed to call scientific. It is only within the present century, however, that the subject has been studied to any purpose, and it is only now that philosophical explanations of the myth-making tendency are beginning to be offered. According to the theory of Euhemeros, still advocated by the Abbé Banier about 100 years ago, a myth is simply a bit of exaggerated or distorted history, and when the supernatural or extraordinary features of the story are stript off we have a residuum of genuine history. Zeus and Wodan, for example, were ancient monarchs or heroes who underwent a *post-mortem* process of deification like the early Cæsars, only with more lasting effect; and Herakles was a stalwart pioneer, addicted to hunting wild animals, who once broke into a garden and stole the oranges which had been guarded by powerful dogs. Such a theory originated, of course, in an age in which historical criticism was unknown. The process of eliminating history from legendary narrative by simply winnowing out the credible parts from the incredible is entirely inadmissible; for in order that a historic narrative be regarded as authentic, it is not enough that the events it contains should be perfectly credible; it is also necessary that they should be attested by contemporary records. The explanation is further contradicted by the myths themselves, which do not describe Wodan and Zeus and Herakles as human beings, but as belonging to a higher sphere of existence: the supernatural or marvellous element, which Euhemerism seeks to winnow out, is really the essential part of the story, without which the remainder would be worthless either as history or as legend. But the Euhemeristic explanation is still more completely discredited by its inability to account for a class of phenomena which were unknown at the time when it was suggested—the substantial identity of the principal mythical personages of Greece and India with each other and with those of Scandinavia, and the diffusion of certain myths all over the world.

The Euhemeristic theory is perhaps worthy of this explicit mention by reason of the great reputation which it once enjoyed and the length of time during which it held its ground. The rival theory, that myths are allegories in which are enshrined profound scientific or philosophical mysteries apprehended by the "wisdom of the ancients," has found its supporters even within the present century; but it may be here passed over without comment, since this and all other arbitrary theories characteristic of the infancy of modern scholarship have been once for all set aside by the results of the application of the comparative method to the myths of antiquity and the primitive beliefs of contemporary savages.

Comparative mythology is the department of study which aims at interpreting the mythical stories of different peoples by comparing them with one another, so that, wherever possible, a story carrying its meaning on its face may throw light upon some parallel story, the meaning of which could not well be detected but for some such comparison. This modern branch of study is primarily an offshoot from comparative philology, and it came into existence as soon as the philological interpretation of the Vedas had proceeded far enough to enable scholars to compare the myths of Greece with those of ancient India. As the Sanskrit language has in most cases preserved its roots in a more primitive form than the other Aryan languages, so in the Rig-Veda we find to some extent the same mythic phraseology as in Homer and Hesiod, but in a much more rudimentary and intelligible condition. Zeus, Eros, Hermes, Helena, Ouranos, and Cerberus reappear as Dyaus, Arusha, Sarameias, Sarama, Varuna, and Çarvara, but instead of completely developed personalities they are presented to us as vague powers, with their nature and attributes dimly defined, and their relations to each other are fluctuating and often contradictory. There is no theogony or mythologic system thoroughly worked out, as in Hesiod. The same pair of divinities appear now as father and daughter, now as brother and sister, now as husband and wife; while every now and then they quite lose their personal shapes and appear as mere elemental forces or vivified phenomena of nature. Coupled with this is the fact that in the Vedas the early significance of the myths has not faded, but continually recurs to the mind of the poet; while in the Homeric poems this early significance is almost entirely lost sight of, save in so far as it may sometimes appear, unknown to the poet himself, to determine the current of his narrative. Looking, then, to the Vedas to see what light they throw upon the true meaning of ancient myths in general, we find that the divinities and heroes of the Vedas usually exhibit themselves plainly as personifications of the great phenomena of nature; and this character is, at the outset, distinctly implied in their names. The name of Dyaus, for example, is derived from the root *dyu*, the same root from which comes the verb *dyut*, meaning "to shine." *Dyu*, as a noun, means "sky" and "day"—that is, "the brightness" or "the bright time." There is a passage in the Rig-Veda where Dyaus is addressed as the Sky, in company with Prithivi the Earth and Agni the Fire; and there are many such passages where the character of Dyaus as the personified sky or brightness of daytime is unmistakably brought out. Here we have a key which opens at once some of the secrets of Greek mythology. So long as there was for the word *Zeus* no better etymology than Plato's guess, which assigned it to the root *zen*, "to live," the real elemental character of Zeus remained undetected. But when it was shown, in accordance with the canons of comparative linguistics, that the word *Zeus* is simply the Greek pronunciation of the same word which the Brahman pronounced as *Dyaus*, it followed at once that the supreme god of Greek mythology was originally the personified sky, and thus was revealed the literal meaning of such expressions as Horace's "sub Jove frigido," and the Attic prayer, "Rain, rain, dear Zeus, on the land of the Athenians and on the fields." The root *dyu* is again seen in *Jupiter*, which is identical with the Sanskrit *Dyaus pitar*, or Jove the Father. The same root can be followed into old German, where *Zio* is also the god of day, and into Anglo-Saxon, where *Tiwsdaeg*, the day of Tiws or Zeus, is the ancestral form of *Tuesday*. Again, in Sanskrit the root *dyu* assumes the form *div*, whence *devas*, "bright" or "divine," and the Lithuanian *diewas*, Latin *deus*, and Greek *theos*, all meaning God. Clearly, then, without the help of the Sanskrit root *dyu*, combined with the character assigned to Dyaus in the Vedas, we should be unable to interpret any of the names belonging to the chief deity of the early Indo-Europeans; but with this clue we not only understand these names, but we also perceive that there was once a time when our ancestors could speak of the bright sky as of a superhuman personality fit to be worshipped. And when the comparison is further extended from the names of the gods to the narratives of their adventures, it becomes apparent, as M. Bréal has shown by his admirable treatment of the story of Hercules and Cacus, that the same mythical ideas, and often the same mythical personages with the same or equivalent names, run through all these webs of popular fancy.

But with all the help thus afforded by philological and literary comparison our conception of the true character of a myth is still incomplete. It is a great step in advance when we are able to say that Zeus was not some apotheosized Cretan king, but the personification of daylight, or when we can trace the legend of Hercules and Cacus back to its more primitive version in the victory of Indra over the Panis. But a further step needs to be taken. What is, after all, the meaning of this way of speaking of the sky as a bright hero and the darkness as a three-headed monster? Is it mere poetical personification or ingenious allegory, or, if not thus explicable, in what peculiarities of ancient culture are we to look for the explanation? The suggestion of allegory or poetic license is not in harmony with the fact that the myths were literally believed. Men do not believe allegories and metaphors. A more plausible explanation was offered by Max Müller in his famous essay on comparative mythology, published in 1856. A myth, he says, is a metaphorical saying of which the metaphorical character has been forgotten, so that it has come to be accepted literally. That is, Dyaus was originally a common noun signifying "sky," and when the old Aryan said "Dyaus rains," he only stated the literal fact that the sky pours down rain. But in later ages, when the Greek had forgotten the meaning of Zeus, the expression "Zeus rains" conveyed the notion that there is a person named Zeus who sends down the rain. And after this manner all mythology grew up. Now, there is no doubt that such a personification as Zeus or Dyaus is enabled to survive until a much later stage of culture when its physical meaning is forgotten than if it were remembered. If it had been remembered that Zeus was but a name for the sky, Zeus would no doubt have lost his godship when people became too cultivated to personify natural phenomena. So far, there is a germ of truth in Müller's theory. But it does not account for the personification of Dyaus in the first place. How did the sky ever get so thoroughly anthropomorphized that people came to forget what its name Zeus originally meant? To this question Müller affords no answer, and in order to understand what mythology is we must go farther. As I have elsewhere said, "The principles of philological interpretation are an indispensable aid to us in detecting the hidden meaning of many a legend in which the powers of nature are represented in the guise of living and thinking persons; but before we can get at the secret of the myth-making tendency itself we must leave philology and enter upon a psychological study. We must inquire into the characteristics of that primitive style of thinking to which it seemed quite natural that the sun should be an unerring archer, and the thundercloud a black demon or gigantic robber, finding his richly-merited doom at the hands of the indignant Lord of light." For the purposes of such an inquiry as this one must take into the account the legends and superstitions of barbarous races. In the quaint but not illogical fancies of uncivilized men we may trace the processes of thought which gave rise to the elemental deities of Olympus and Valhalla, and to the heroes which figure in classic epos or humble fairy-tale.

Strange as old superstitions are apt to seem after they have once been entirely outgrown, there is perhaps no superstition so fantastic that we may not understand how it could once have been believed if we only take the trouble to realize how differently situated the mind of the savage is from our own. It is quite natural to all men, whether savage or civilized, whether illiterate or cultivated, to draw conclusions from analogy, and to imagine intimate relations between phenomena that are in the habit of occurring simultaneously or in close succession. Newton's theory of gravitation was at the outset a case of reasoning from analogy, and so is the notion of the Zulu who chews a bit of wood in order to soften the heart of the man with whom he is about to negotiate a trade. The superior correctness of the scientific conclusion is due to the fact that the civilized man has learned to exclude as preposterous a great many guesses which the barbarian has not learned to exclude. Long ages crowded with experiences have taught us that there are many associations of ideas which do not correspond to any connection of cause and effect among external phenomena; and the same long succession of experiences has permanently established in our minds a great number of associations of ideas with which it is needful that new notions should harmonize before we can accept them. But the savage has had but little of this sort of training in sifting his experiences, and such experiences of the world as he gets are but few, monotonous, and narrow. In his mind that enormous mass of associations answering to what we call "laws of nature" have not been formed, and hence when he tries to reason about what he sees there is little but the most superficial analogy to guide his thoughts hither or thither, and it is inevitable that he should arrive at many conclusions which to us seem quaint or grotesque. To him the visions seen and the voices heard in sleep possess as much objective reality as the gestures and shouts of waking hours. In relating his dream he tells how he *saw* certain dogs or demons, or *fought with* certain dead warriors, last night, and the implication, both to himself and to his hearers, is "that his

other self has been away, and came back when he awoke." The immense mass of evidence collected by Mr. Tylor shows that all uncivilized people have framed this notion of *another self*, and the hypothesis which serves to account for the savage's wanderings during sleep in strange lands and among strange people serves also to account for the presence in his dreams of parents, comrades, or enemies known to be dead and buried. The other self of the dreamer meets and converses with the other selves of his dead brethren, joins with them in the hunt, or sits down with them to the wild cannibal banquet. Thus arises the belief in an ever-present world of ghosts—a belief which the entire experience of uncivilized man goes to strengthen and expand. The weird reflection of his person and imitation of his gestures in rivers or still woodland pools is interpreted by the savage as an appearance of his other self; in the echo he hears the mocking voice of this phantom double, and as his fantastic shadow he sees it dogging his footsteps. Usually, if not universally, in barbaric thought the other self is supposed to resemble the material self with which it is customarily associated. For example, the Australian, not content with slaying his enemy in battle, cuts off the right thumb of the corpse, so that the departed soul may be incapacitated from throwing a spear. Very different is this from the modern philosophic conception of the soul as immaterial. And the difference is again strikingly illustrated when, taking a step farther, we observe that primitive culture makes no such distinction as that between the immortal man and the soulless brute, but speaks of the other selves of beasts in the same terms which are used of human ghosts. The Assamese believe that the ghosts of slain animals will become in the next world the property of the hunter who kills them. Even plants are accredited with souls, so that the Talein will not cut down a tree without first seeking to propitiate its ghost by laying the blame on some one else. But the matter does not end here. Not only the horse and dog, the bamboo and the oak tree, but even lifeless objects, such as the hatchet, or bow and arrows, or food and drink of the dead man, possess other selves which pass into the world of ghosts. Fijians and other contemporary savages expressly declare that this is their belief: "If an axe or chisel is worn out or broken up, away flies its soul for the service of the gods." In this, as I have elsewhere urged, "we see how simple and consistent is the logic which guides the savage, and how inevitable is the genesis of the great mass of beliefs, to our minds so arbitrary and grotesque, which prevail throughout the barbaric world. However absurd the belief that pots and kettles have souls may seem to us, it is nevertheless the only belief which can be held consistently by the savage, to whom pots and kettles, no less than human friends or enemies, may appear in his dreams; who sees them followed by shadows as they are moved about; who hears their voices, dull or ringing, when they are struck; and who watches their doubles fantastically dancing in the water as they are carried across the stream." This is exemplified in the argument of the Algonkins, who insisted to Charlevoix that since hatchets have shadows as well as men, therefore the shadow or soul of the hatchet must accompany the shadow or soul of the warrior to the spirit-land.

Now, when this general theory of object-souls, universal among uncultured men, is expanded into a still more general theory of indwelling spirits, we have before us a set of phenomena which go very far toward explaining the personifications of mythology. To quote again from my work on this subject: "When once habituated to the conception of souls of knives and tobacco-pipes passing to the land of ghosts, the savage cannot avoid carrying the interpretation still farther, so that wind and water, fire and storm, are accredited with indwelling spirits akin by nature to the soul which inhabits the human frame. That the mighty spirit or demon by whose impelling will the trees are rooted up and the storm-clouds driven across the sky should resemble a freed human soul is a natural inference, since uncultured man has not attained to the conception of immaterial force acting in accordance with uniform methods, and hence all events are to his mind the manifestations of capricious volition. The various theories of embodiment show how thoroughly the demons or deities which cause disease are identified with human ghost-souls. On the one hand, in Australasia it is a dead man's ghost which creeps up into the liver of the impious wretch who has dared to pronounce his name; while conversely in the well-known European theory of demoniacal possession it is a fairy from Elf-land or an imp from hell which has entered the body of the sufferer. In the close kinship, moreover, between disease-possession and oracle-possession, where the body of the Pythia or the medicine-man is placed under the direct control of some great deity, we may see how by insensible transitions the conception of the human ghost passes into the conception of the spiritual numen or divinity."

Thus, by a somewhat circuitous process we have at last reached something like a consistent and satisfactory explanation of the true nature of mythology. On the one hand, philology has shown that a myth is an attempt to explain some natural phenomenon by endowing with human feelings and capacities the senseless factors in the phenomenon, as when the ancient Hindoo explained a thunderstorm as the smiting of Vritra by the unerring shafts of Indra. On the other hand, a brief survey of barbaric superstitions has shown how uncultured man, by the best use he could make of his rude common sense, has invariably come to regard all objects as endowed with souls, and all nature as peopled with suprahuman entities shaped after the general pattern of humanity. Thus, is suggested a natural mode of genesis for the personifications of which mythology is made up. We see, moreover, that these personifying stories are not parables or allegories, but sober explanations of natural phenomena. Where we have recourse to some elaborate scientific theorem the ancient was content with telling a myth. Thus, the study of mythology is by no means to be set down as a profitless comparison of ridiculous or trivial fables. When pursued on the wide scale indicated in the present article, it is a study of the greatest and most serious importance, since it throws light of no uncertain character on the thoughts and mental habits of primitive men, as well as on countless superstitious beliefs and customs which have survived in relatively high stages of culture. And perhaps there is no better evidence of the profoundly philosophic character of contemporary scholarship than the pains which it is taking to investigate methodically the legends and sayings which formerly were either thought unworthy of serious study or were but treated as subjects for idle and arbitrary speculation. JOHN FISKE.

Mytile'ne, or Mityle'ne [Μυτιλήνη], an important ancient Greek city of the island of Lesbos. Mytilene has uninterruptedly flourished down to the present time. It anciently had a large commerce, and was famed for its beauty and military strength. It is at present called Mitilen or Castro, is under Turkish rule, and is the seat of a Greek metropolitan. Pop. 6000.

Mytilene (the island). See LESBOS.

Mytilidæ. See MUSSEL.

Myxin'idæ [from the generic name *Myxine*], the typical family of the HYPEROTRETI (which see). The body is very long, eel-like, naked, and slimy; the cranial cartilages are comparatively well developed; the branchial apparatus is composed of six branchial sacs on each side, which severally communicate by separate short ducts with the œsophagus from the internal sides, and from the external by short canals, with a lateral longitudinal canal, which discharges by a single orifice on each side, but near the median surface; the introferent duct of the œsophagus is between the external branchial apertures, but nearer the left, and passes in front of the heart to the œsophagus; the branchial artery gives off directly separate branches to each pair of branchial sacs; the ovary is single and on the right side; and the eggs, according to Putnam, "are developed along the free edge of the ovary, which extends as a fringe as the eggs increase in size, and the eggs of several stages of growth are always at the free edge;" the nearly mature eggs range from ten to eighteen in number, but are generally about sixteen, and are comparatively very large; the eggs when deposited are encased in an elongated oval hairy shell, provided at each end with a tassel of tubular filaments; the males are very few in proportion to the females. Representatives of the family are found in the cold waters of both the northern and southern hemispheres (*i. e.* North Atlantic and South America), but differ so inconsiderably that they have been differentiated by Putnam as mere varieties of one species, *Myxine glutenosa*. They prefer muddy bottoms, and live chiefly on dead animal matter. Apparent adults vary between a foot and sixteen inches, rarely more. The genus *Bdellostoma*, generally included in this family, is distinguished by the presence of numerous (6–10) lateral branchial apertures corresponding with the number of branchial sacs, and therefore belongs to a distinct family, the Bdellostomidæ. The fishes of this family are celebrated in connection with the researches of Johannes Müller, who in a series of monographs on their anatomy (1834–43) considered the modification of the several systems of organs in all the groups of fishes. (See Putnam, *Proc. Boston Soc. Nat. Hist.*, vol. xvi. pp. 127–135, 156–60, 1874.) THEODORE GILL.

Myxolyd'ian, the name of one of the ancient ecclesiastical modes or scales. It differs from the modern scale of G in having a minor instead of a major seventh, thus resembling the scale of the dominant in C major.

N.

N, a nasal dental consonant, being a nasal *d*. In English and Latin the letter also represents the sound heard in *ink, anchor,* a sound represented by *ng* in *sing, singer.* N. stands for nitrogen, north, new, note, notary, Nepos, (n.) noun, neuter, (n. d.) no date, (Nat.) nativity, natural.

Naansay, tp. of Kendall co., Ill. Pop. 918.

Nablus′, Nabulus, or **Napolose,** the ancient *Sychem,* town of Palestine and the ancient capital of Samaria, situated 30 miles N. of Jerusalem, on the watershed of the narrow valley between Ebal and Gerizim, 1½ miles W. of Jacob's Well, which is at the mouth of the valley. It is one of the greenest and most fertile spots in Palestine, abounding in figs, grapes, oranges, and olives. The chief productions are cotton, oil, and soap. It has a population of about 10,000, 500 of whom are Christians, 150 Samaritans, 100 Jews, and the rest Moslems, who used to be noted for their fanaticism. R. D. HITCHCOCK.

Na′bob [Urdu, *nawâb,* a "deputy," plural for *nayib,* the less formal singular number], under the Moguls in India, a viceroy or governor of a province. It afterwards became a mere title of high rank, without office. In process of time many of the nabobs became virtually independent monarchs. It was the mutual jealousy of the nabobs that made India the comparatively easy prize of British adventurers.

Nabonas′sar, Era of, employed in the Chaldæan and Alexandrian Greek chronology and in Berosus, was reckoned from the accession of King Nabonassar to the Babylonian throne, which took place Feb. 26, 747 B. C., as shown by astronomical records.

Nach′tigal (GUSTAV), b. at Eichstedt, Prussian Saxony, Feb. 23, 1834; studied medicine at Berlin, and practised for some time at Cologne; went in 1860 to Algeria on account of some pulmonary complaint; entered the service of the bey of Tunis in 1863, and went in 1869 to Kooka to convey presents from the king of Prussia to Sheikh Omar of Bornoo. On Feb. 18, 1869, he started from Tripoli, and reached on Mar. 27, Moorzook, where he stopped till Apr. 18, 1870, exploring the country of the Tibboos in the mean time, and arrived at Kooka July 6. He returned by Waday and Darfoor, and reached Cairo in Nov., 1874, having explored the countries belonging to Baghirmi. The results of his explorations he communicated in 1874 in Petermann's *Mittheilungen* and London *Geographical Magazine.*

Nacogdo′ches, county of E. Texas, bounded S. W. by Angelina River. Area, 886 square miles. It has a fine reddish, loamy soil, is heavily timbered, and produces cotton, live-stock, corn, etc. Iron ore and petroleum have been found. Cap. Nacogdoches. Pop. 9614.

Nacogdoches, post-v., cap. of Nacogdoches co., Tex., 53 miles N. E. of Crockett, and in a fertile region. Pop. 500.

Na′dal (BERNARD H.), D. D., LL.D., b. in Maryland in 1815; graduated at Dickinson College; became a preacher of the M. E. Church in Maryland, Virginia, and Delaware; professor in the Indiana Asbury University about 1850; was a prominent writer on church history in the Methodist *Quarterly Review* and other periodicals; filled pulpits in New Haven, New York, Brooklyn, Philadelphia, and Washington; was at one time chaplain of the national House of Representatives; was the first professor of church history at Drew Theological Seminary, and on the death of Dr. McClintock became acting president. Dr. Nadal was long known as an opponent of slavery, a skilful debater, and a powerful writer. D. at Madison, N. J., June 20, 1870.

Na′dir Shah, or **Kuli Khan,** b. near Kelat, in the province of Khorassan, Persia, in 1688; became while still a young man the leader of a gang of robbers, whose number gradually increased to 3000, and by whose aid he captured and held several towns and fortified places in Khorassan; espoused the cause of Tamasp, the legitimate ruler of Persia, against the Afghan invaders; was appointed commander-in-chief by Tamasp in 1727; defeated the Afghans repeatedly, and succeeded finally in driving them entirely out of the country in 1730. Tamasp now made him governor of the provinces of Khorassan, Mazanderan, Seistan, and Kerman, and he assumed the name of Tamasp Kuli ("Tamasp's slave"), to which the shah added the title of khan. In 1731 he fought against the Turks and defeated them, and when in 1732, during his absence on a campaign against the Afghans, Tamasp was defeated by the Turks and concluded a dishonorable peace with them, ceding several provinces, Kuli Khan deposed him, and raised his son, Abbas III., a child, to the throne. The war with the Turks was renewed and carried on with great success, and when Abbas III. died in 1736, Kuli Khan was crowned shah of Persia under the name of Nadir Shah. His reign was very brilliant in a military respect, especially his expedition into Hindostan. He defeated the Great Mogul, captured Delhi, and carried away to Persia an enormous booty. He restored to Persia her old boundaries from the time of the Sassanides, but in course of time he became greedy, suspicious, and a merciless tyrant; whole cities were put to the sword. In the midst of his brilliant career he was assassinated June 20, 1747. His *Life* was written in Persian by Mirza Mohammed Mahadi Khan, and translated into French by W. Jones (1770). (See also Fraser, *History of Nadir Shah,* 1742.)

Nadudvar′, town of Hungary, in a very fertile district on the Kösely, has 7351 inhabitants.

Næ′vius (CNEIUS), b. in Campania about 274 B. C.; served in the First Punic war, and became famous as a writer of tragedies and comedies. He belonged to the plebeian party, attacked the nobility with great virulence, was driven into exile, and d. in Utica, Africa, about 204 B. C. A few insignificant fragments of his epic poem on the Punic war, and of his dramas, are still extant, and were collected by Klussmann (Jena, 1843).

Næ′vus [Lat.], birth-mark, mother's mark, a discolored spot on the skin of a human being, usually characterized by the presence of numerous enlarged blood-vessels (more especially venous), and popularly believed to be the result of some ungratified longing on the part of the mother during gestation. Some nævi disappear spontaneously; others remain unchanged; still others grow rapidly, and sometimes inflame and slough. They may be treated by cold and pressure, by vaccination of the spot, by cautery, by excision, by ligation, or by other obliterative methods. Some cases yield readily to one kind of operation, while others may require very different treatment.

Nâ′ga [Sansk., "a serpent"], in Indian mythology, a race of serpents supposed to be endowed with divine qualities who figure largely in the earliest folk-lore of the Aryan races. The Nagas are sometimes identified with the savage non-Aryan hill-tribes of the Deccan; they were said to be descended from the gods Kasyapa and Kadru, and had for their king Sesha or Sesha-naga, the hooded cobra di capello or sacred serpent of Vishnu.

Nâgarjuna, or **Nâgasena,** the thirteenth teacher or patriarch of the Booddhist religion; lived in the first or second century B. C.; was born of a Brahmanical family in the S. of the peninsula. He became deeply learned in the four Vedas and in all the sciences of the time; travelled much, performed miracles, founded the Mâdhyamika school of philosophy, and had among his disciples Aryadeva and Booddhapalita, who propagated his doctrines throughout Southern India. (See Spence Hardy's *Manual of Booddhism,* 1853.)

Nagasa′ki, town of Japan, situated in lat. 32° 43′ N., on a peninsula of the island of Kiu-Siu, has an excellent, spacious, and safe harbor, which since 1859 is open to foreigners. In 1862 tea, wax, isinglass, and camphor to the value of £399,579 were exported from this port, and rice, cotton, firearms, and woollen goods to the value of £1,181,022 were imported. Pop. about 30,000.

Nag′lee (Gen. HENRY MORRIS), b. at Philadelphia, Pa., Jan. 15, 1815; graduated at West Point 1835; resigned Dec., 1835; served in the Mexican war as captain of New York volunteers; engaged in commerce in San Francisco, Cal.; was appointed lieutenant-colonel of the 16th Infantry May, 1861, brigadier-general of volunteers Feb., 1862; was engaged in the first campaigns on the lower Potomac and on the Peninsula; commanded a division in the North Carolina and Southern departments 1863; took command of the 7th army corps July, 1863; was mustered out of the service Apr., 1864, and became a banker in San Francisco, Cal.

Nagore′, a considerable town of Joodpoor, one of the Rajpootana states of Hindostan, subject to Great Britain. It manufactures articles of iron and brass, and is said to have 40,000 inhabitants.

Nagoya, city of Japan, on the main island, in a great plain at the head of the Owari Bay, is well built, has many

temples, monasteries, a government college, and a telegraph-station, manufactures fans, lacquered goods, and porcelain, and carries on a considerable inland trade. Pop. estimated at about 400,000.

Nagpoor′, or **Nagpore,** town of British India, cap. of the province of Berar or Nagpoor, situated in lat. 21° 9′ N., lon. 79° 11′ E., 430 miles E. N. E. of Bombay, with which it is connected by railway. It is 7 miles in circumference, poorly built, containing no buildings of interest, and consisting mostly of mud huts. The ground on which it stands is swampy and unhealthy. But its manufactures of cotton cloths, coarse and fine chintzes, woollens, silks, and brocades are important. In 1740 it became the seat of an independent Mahratta prince; in 1853 it was incorporated with the British dominions. Pop. about 115,000.

Nag's Head, tp. of Dare co., N. C., is a portion of the island which separates Albemarle Sound from the Atlantic. Pop. 1000.

Nagy Ban′ya [*Nagy* (*nâdy*, monosyllable), "great," *bânya*, "mine"], town of Hungary, near the Transylvanian frontier, has manufactures of earthenware, rich gold and silver mines in the vicinity, and a large trade in wine. Pop. 7197.

Nagy Enyed′ [Ger. *Egidistadt*], town of Transylvania, on the Maros, has a Protestant college, barracks, and 5448 inhabitants.

Nagy Karoly′, town of Hungary, has a fine palace with garden and park, large manufactures of leather and shoes, and extensive cultivation of wine, maize, and tobacco. Pop. 10,670.

Nagy Körös′, town of Hungary, has 19,954 inhabitants, mostly employed in agriculture, vine-cultivation, and sheep-breeding.

Nahant′, post-tp. of Essex co., Mass., consisting of a peninsula extending into Massachusetts Bay and forming the E. side of the harbor of Lynn. It is connected with the mainland by a long, narrow isthmus. Nahant has 2 churches, 2 schools, and many fine residences. It is a favorite summer resort. Pop. 475.

Na′hum, one of the minor Hebrew prophets, is called an Elkoshite, but no place called Elkosh is now known. Jerome identified it with a town of Galilee; Ewald and others with a place near Nineveh, where "Nahum's tomb" is still shown, but Layard declares the structure to be comparatively modern. Nahum prophesies after Sennacherib's invasion (700 B. C.) and before the destruction of Nineveh (625 B. C., Rawlinson, or 606, Oppert and Lenormant). His Hebrew is of the most classical style.

Nahun′ta, tp. of Wayne co., N. C. Pop. 1874.

Na′iades, the Lamarckian name for the fresh-water mussels forming the family of the Unionidæ. (See UNIONIDÆ.)

Na′iads [plu., Lat. *Naiades;* Gr. Ναϊάδες], in the ancient Greek mythology, the nymphs of fountains, lakes, and streams, represented as youthful female beings possessed of certain divine attributes, such as the power of conferring prophetic gifts.

Naile (FREDERICK J.), U. S. N., b. Oct. 11, 1841, in Pennsylvania; graduated at the Naval Academy in 1861; became an ensign in 1862, a lieutenant in 1864, a lieutenant-commander in 1866; retired, owing to "physical disability," in 1871; served in the Oneida at the passage of Forts Jackson and St. Philip and the capture of New Orleans, and in the passage of the Vicksburg batteries in 1862, and was in various engagements on the Western waters in 1863–64. Commended for "courage, coolness, and skill." FOXHALL A. PARKER.

Nails (*ungues*), the plates of horny epidermis which in man grow upon the dorsal aspect of the distal phalanges of fingers, thumbs, and toes. They are the homologues of the hoofs and claws of the lower animals. They consist each of a free extremity, of which both sides are exposed; of a body, having one side exposed; and of a matrix or root, of which both sides are concealed in the skin. At the base of the nail appears a crescent-shaped patch of lighter color than the rest, called lunula or albedo.

Nails [Ang.-Sax. *nägel*]. Nails are classified by the U. S. patent-office as cut, wrought, horseshoe, shoe, barbed, composition, button, carpet, coffin, sheathing, galvanized, harness, leather-work, picture, siding, slating, trunk, upholstery, weather-tiling, and screw nails. Of these, the cut, wrought, and horseshoe nails are by far the most important. Formerly—*i. e.* in the beginning of the present century—nails were ordinarily manufactured by hand-forging, usually by women and children, the degradation of the nailmakers forming one of the saddest phases of English industrial life. The application of machinery to the fabrication of all the more important varieties of nails is essentially American in its inception and development. This was a natural result of the universal use of wood for buildings, fences, etc. In 1810 an American machine made cut nails at the rate of 100 per minute. The rough surface of a cut nail where no clinching is required adds about 20 per cent to the holding power. For uses requiring clinching a tapering hand-forged nail, termed the "German wrought," was used until within the past fifteen or twenty years, when manufacturers began to anneal common cut nails, giving them a bending quality; and these have practically driven the others from the market. Were there any occasion, however, for the "German wroughts," there would now be but slight difficulty in making them by machinery, slightly modified from horseshoe-nail machines, which have now reached a very near approach to perfection. The importance attached to the manufacture in this country may be inferred from the fact that previous to 1874 upward of 300 patents were issued for improvements in making cut and forged nails, of which 23 were granted before the beginning of the present century. These embraced the germinal ideas of the present machinery for *cutting* nails, while an earlier English patent, that of William Finch of Wimboorne, Staffordshire, comprised the use of tilt-hammers, the rapid and forcible striking of which enabled several nails to be made from the rod with one heat, whereas by hand the rod required to be reheated previous to the forging of each nail. But Finch's machine divided the work among three attendants, and his description of this improvement over the method then common throws a strong side-light on the condition of the industrial classes: "One man, woman, or child to carry the heated rod to the man, woman, or child stationed before the hammer, which man, woman, or child, by mere activity, will, with one hand, not only form the largest-sized nail, but a far greater number in the same given time, when the third man, woman, or child will, with the same kind of hammer, head and finish a number of said shanks together, leaving them truer and better made for use than the present mode." Trace the progress of nail-forging mechanism from this crude beginning to the automatic horseshoe-nail machinery hereinafter described, and a parallel advance will be found in the liberation of women and children from the stunting labor of the anvil and forge.

The principle of operation in machines for making cut nails is comparatively simple, but the details of construction are numerous, and too complex for explanation without diagrams elaborately described. The iron is first rolled into plates having a thickness corresponding to that of the nail to be made, measured from one flat side to the other, and a width somewhat greater than the length of the finished nail. When the nails are to be annealed for clinching, the length of the plate is transverse to the grain of the iron, in order that the grain may be lengthwise of the finished nail to ensure greater flexibility in clinching. The plate is then placed in a feeding device, which feeds it forward to dies or cutters, which cut a tapering blank from the end of the plate. This blank is then gripped by holding-jaws, which clamp it firmly while a punch or header abuts against the widest end of the blank and upsets a sufficient portion of the metal to form the head. In order to secure the tapering form of the blank without waste of material, the plate is turned laterally, so that its end is at a slight angle to the cutting devices or dies, first in one direction and then in the other, the head of each alternate nail being formed at that lateral edge of the plate opposite that at which the head of the previous nail was made. In some cases the same result has been secured by giving the lateral movement to the cutting dies while the plate is made to travel in a straight line. In one somewhat noted machine the plate is made of a width sufficient to permit blanks for a number of nails to be cut simultaneously from its end. In this apparatus rotating cutting dies, instead of vibrating or reciprocating ones, are used to sever the blanks from the plate, and the nails by this machine are made with chisel-shaped points.

The following, written by the writer hereof immediately after a careful personal examination of the machinery and processes of the North-western Horsenail Co. of Chicago, about four years since, is an accurate sketch of the *modus operandi* of the most approved manufacture of horseshoe nails: "The nail-rod, heated at one end for about a foot in length, has its free or outer end steadied by the hand of an attendant, but is gripped near its inner end by an intermittent feeding device which feeds it inward to the hammering mechanism. This latter comprises a fixed anvil, the face of which corresponds to the contour of one of the flat sides of the nail, and which has at one edge a fixed die arranged vertically at right angles to its face, and corresponding in its form to one of the curved lateral edges of the nail. At the opposite side of the anvil is a moving die having a face the same shape as that of the anvil, but attached to

one end of a rocking lever, the opposite arm of which is connected by a universal joint, a rod, and strap with an eccentric on a rock-shaft provided transversly above the parts just noticed. On this shaft, immediately over the anvil, is a disk upon the periphery of which is arranged a roller, which serves the purposes of a striker. As the nail-rod is fed inward, with its heated extremity upon the anvil, the rotation of the striker impinges longitudinally upon the heated end of the rod, striking a 'drawing' blow, which of course elongates the metal. As soon as the striker, carried away by the continued rotation of the disk, has been brought out of contact with the metal, the moving die moves inward, compressing the flattened part to bring its lateral surfaces to the shape required in the edges of the nail. This done, the striker strikes again, to be followed by another action of the dies, until after sixteen blows of the striker the nail is complete so far as the hammering is concerned. But the process of shaping does not end here. The 'point' of the nail at this stage is an eighth of an inch wide, and is rough and jagged. The nail is, moreover, three-fourths of an inch longer than when finished. To complete the work, a little device, termed a 'poker,' bends the point or tip sidewise until one edge intercepts (at a proper place along the length) an imaginary line drawn axially through the nail. This done, a cutter at the opposite side traverses a path corresponding to the curvature just given by the bending to the edge just previously referred to, and cuts off the surplus metal from the tip. This causes the point of the nail to be formed in exactly the proper place, and also ensures a very close approximation to uniformity in the length of the nails. When the nail is thus formed, suitable mechanism gives a retrograde movement to the nail-rod, which brings it into proper relation with a cutter which severs the nail from the rod, the nails as fast as formed dropping to the floor. When the heated portion of the nail-rod is worked up, the rod is returned to the furnace, and another, previously heated, is put in its place in the machine. The shaft that carries the disk with its striker makes about 2000 revolutions per minute, and each machine requires about two horse-power to drive it." Only the best brands of iron are suitable, and of this the waste in working up is about 10 per cent., mainly in the portions cut off in pointing the nails. These fragments are utilized in the manufacture of steel, but it is manifest that only a fraction of the original cost of the metal is saved in this manner.

Of the minor varieties of nails may be mentioned garden nails, made of cast iron and frequently toughened by annealing; screw nails, made with flat shanks, to which a spiral twist, from a half to a full turn, is given; and barbed nails, notched or provided with notches or with spurs to increase their hold on the wood. Shoe nails are headless tapering nails cut, the smaller sizes, from sheet zinc, the larger from iron. Ornamental nails, such as are used for pictures, coffins, etc., are made with wrought shanks and porcelain or stamped sheet-metal heads, the latter attached by being screwed upon the shanks or by soldering with soft metal. JAMES A. WHITNEY.

Nain, a village of Palestine, in Galilee, 6 miles S. E. of Nazareth, is mentioned in the New Testament (Luke vii.) as the place in which Christ raised the widow's son from the dead. The rocks in its neighborhood contain several sepulchral caves.

Nairne (Lady CAROLINA **Oliphant**), BARONESS, b. at Gask, Perthshire, Scotland, July 16, 1766; was called in her youth the "flower of Strathearn," from her great beauty; married in 1806 Capt. W. Murray Nairne, afterward Lord Nairne; belonged to a prominent Jacobite family; wrote *The Laird o' Cockpen, The Land o' the Leal,* and other popular Scotch ballads, the authorship of which was kept secret until shortly before her death, which occurred at Gask Oct. 27, 1845. It is said that her poetical productivity was first started by the offence she took at the coarse and rough words of the common popular songs. She undertook to lay new words under the beautiful tunes, and she succeeded eminently. She also wrote some political songs. (See the *Lays from Strathearn,* edited by Finlay Dunn (1846), also her *Memoir and Complete Lyrical Compositions,* by Charles Rogers (1869).)

Nairne (CHARLES MURRAY), M. A., L. H. D., b. Apr. 15, 1808, at Perth, Scotland; graduated M. A. at St. Andrew's University, and afterward at Edinburgh 1830 and 1832; came to New York 1847; was occupied as lecturer and teacher till chosen professor of philosophy and belles lettres in Columbia College, N. Y., in 1857, a position he still holds. Author of *Lectures* and *Orations.*

Nairn'shire, county of Scotland, bordering on the Moray Frith, Elginshire, and Inverness-shire, and comprising an area of 215 square miles, with 10,225 inhabitants in 1871. The coast is low and sandy, the interior elevated and hilly; most of the ground is covered with forest; only 22 per cent. is cultivated. The capital is Nairn, at the mouth of the river Nairn, with a good harbor, protected by a breakwater; population, 4207, chiefly engaged in herring-fishing. Near by is the village of Cawdor, with the castle of the same name, in which, according to tradition, Macbeth murdered Duncan; the present building, however, is not older than the fifteenth century.

Naj'idæ [from the name of the typical genus], a family of poisonous serpents of the sub-order Proteroglypha (the intermaxillary bones being horizontal, and not reaching the premaxillary anteriorly, in contact with the prefrontals, and bearing a perforated and usually grooved tooth), with the caudal hypapophyses bifid and neural spines and pleurapophyses short, and distinguished by the development of distinct postorbitals; the head is regularly plated above; there are no anteorbital pits. The family, thus limited by Prof. Cope, includes some of the most poisonous serpents of India, among which is the *cobra de capello,* or hooded serpent of India (*Naja tripudians*), and the asp of Egypt (*Naja hage*), celebrated in connection with Cleopatra. This family is most closely related to the Elapidæ, or *coral snakes,* and is confined to Asia, Africa, and Australia. (See ASP and COBRA DE CAPELLO.) THEO. GILL.

Nakamoora Masauwo was of the samuari class, and b. in Tokio, Japan, about 1826; after being thoroughly educated in his native language and literature he acquired a complete knowledge of Chinese, and then added to that the English language. Under the government of the late tycoon he had the management of various private schools and was a professor in the College of Yedo; in 1866 went to England, where he had charge of several Japanese students, and remained two years. On his return home he published a large number of books intended to reflect, by his comments and copious translations, the intellectual characteristics of the Western nations, and was the first man to translate into Japanese the Constitution of the U. S. and the more famous writings of Washington, Franklin, Stuart Mill, Smiles, and many other noted men; resigned his former rank and classed himself with the common people; in 1875 was placed at the head of the newly-established normal school for the education of girls, which had been founded by the empress of Japan.

F. A. P. BARNARD.

Nakhitch'evan, town of European Russia, government of Yekaterinoslav, on the Don, 30 miles from its mouth, was founded in 1780 by a colony of Armenians; is the seat of the Armenian patriarch of Russia, and has some manufactures of cotton and silk and an extensive trade. Pop. 16,584.

Naksha'tra [Sansk. *naksha,* "night," and *tra,* "protecting"], a term originally meaning "star," was applied in Hindoo astronomy to denote the asterisms lying in the moon's path, or mansions in which the moon was supposed to rest. These mansions numbered twenty-seven, and afterwards twenty-eight, and were converted by mythologists into daughters of the patriarch Daksha, who became wives to the moon (which in India is considered masculine). This peculiar system of astronomy was supposed by Biot to be derived from the Chinese, but his arguments were satisfactorily refuted by Prof. W. D. Whitney in his notes to Burgess's translation of the *Sûrya Siddhânta* (New Haven, 1860), and by Max Müller in the preface to vol. iv. of the *Rig-Veda* (1862), where it was proved that the system of Nakshatras was original with the Hindoos.

Nakshivan', town of Asiatic Russia, in Armenia, stands on the Arras, at the foot of Mount Ararat, and boasts of having been founded by Noah when he issued from the ark after the Flood. The surrounding districts are rich in salt and produce excellent grapes. Pop. 5745.

Nal'a, one of the most famous of the legendary heroes of India, was king of Nishadha, and married Damayanti, daughter of Bhima, king of Vidarbha. The loves and romantic adventures of Nala and Damayanti form the subject of the most beautiful episode of the national epic (see MAHABHARATA), of which there are many translations in German, and a fine poetical version in English by Dean Milman. Two other famous Indian poems, the *Nalodaya* and *Naishadharita,* deal with the same subject.

Nama'quas, the principal tribe of the Hottentot race. They differ widely from the Bushmen, being tall and well-proportioned, but they have all the general characteristics of the race—the olive complexion, the oblique eyes, and the thin, tufted hair; their language also is somewhat different from that of the other tribes. They inhabit the territory around the Orange River, and live as nomads; rearing cattle is their principal occupation, hunting and robbery their chief amusement. Those living in Cape Colony S. of the Orange River are generally Christians and

live as workmen. Some of them own horses and cars, and are engaged in the transportation of copper ore from the mines to the port.

Namaycush, or **Mackinaw Salmon** (*Salmo namaycush*), the largest of the Salmonidæ. It is caught by the spear mostly, and inhabits the upper lakes of the St. Lawrence basin. Specimens are reported which have weighed 120 pounds, but they do not often exceed 50. The flesh is good, but not of the first quality.

Name, a word or term of designation. It may be applied to a person or to a thing. Derived from the Sanskrit *nâman* ("name") or some earlier Aryan source, it has passed into many languages; *e. g.* Zend, *nâman;* Persian, *nam;* Afghan, *num;* Armenian, *anum;* Greek, *onoma;* Latin, *nomen;* Italian, *nome;* French, *nom;* Gothic, *namo;* Anglo-Saxon, *nama;* Old German, *namo;* Mod. German, *Name;* Danish, *navn,* resembling the Kurdish *nave* and the Gypsy *nav.* With regard to the names of persons among savages with whom general social relations and history are in an undeveloped condition, a single appellation derived from some association is enough for a name. He who kills a wolf under striking circumstances is called Wolf, and the man who dreams of an eagle is named Eagle. Among certain tribes in North America the animal-spirit peculiar to each Indian is the first creature which appears to him in a dream after fasting and seclusion, and this, his *totem,* gives him a name. The first distinction recognized is that of proper and common names, or that of the individual as distinguished from the family and tribe. As there is something reserved and sacred often attached to the former, there was often a mystery associated with it; and as Schoolcraft observes, "An Indian will tell his specific name with great reluctance, but his generic or family name he will declare with pride."

Among the ancient Egyptians the king had two names—one a prænomen or solar title, in connection with the sun, assumed after he came to the crown. This custom began with the sixth dynasty, as Ra-meri, "beloved of the sun," prænomen—Pepa-Phiops, the family name of that ruler. Egyptian monarchs had also three other royal titles, and foreign princes changed their names to Egyptian. Individuals had often two names, the second called the good, or surname, as Aahmes or Amosis—second name, Panishim. These are found at an early period, but the Egyptians generally used only one. Persons were called by the names of deities, as Har or Horus, Heri or Isis, At-har or Athor; or by some particular condition of the god, as Amenemapt, "Ammon in Thebes;" or by some link connected with the name of a god, as Heriptah, "beloved of Ptah;" Rames, "born of the sun;" Paserienχon, "the son of Chon;" Nsa-Amen, "attached to Ammon;" Mutketp, "the peace of Muth" (a goddess). Many names were derived from animals, as Mau, "lion;" Tamai, "cat or puss." Other names were from qualities, as Se-nefer, "good brother;" Sat-bal-ban, "leading away the evil eye." Few names were derived from places, but all things had their names—not only men and women, but cattle, horses, cows, buildings, tools, etc. Among the Chinese the emperors, besides their proper names, take, on their ascension to the throne, a *neen-hauou,* or yearly appellative, in which the years of their origin are dated, as Taw-Kwang, "reason-glory," A. D. 1830; Kwang-Choo, "the glorious succession," the name of the present emperor. These names are rarely changed during life; after death they assume the *meaau-taou,* or templar appellation, by which they are known in history, as Tae-t-Soo, the name after death of the celebrated Hung-Woo of the Ming dynasty. The family names were originally only 100, but the single names now number 438, to which must be added 30 double names, as Sze-ma, etc., making in all 468, which comprise all that are truly Chinese. Persons of the same name must not marry. These names are derived from various objects, such as Lung, "dragon;" Ma, "hemp;" Shury, "water;" Hwang, "yellow;" Luy, "thunder;" Wang, "prince;" and always precede the after-appellative. At birth a *jov-keaou* or milk-name is given to the child. To distinguish the individual, a surname, *ming,* sometimes double, is given, which is placed after the name, besides which there is a *peaou-tsze,* an agnomen or appellative. To this may be added a *hwan-ming,* a sobriquet. Names are not derived in China from places. The early Hebrews gave an infant a name as soon as it was born from some striking accident relative to it. It thus became commemorative of the history of the family. When Eve bore her first son she said, "I have *gotten* a man from the Lord," whence he was called Cain, meaning "gotten" or acquired. Noah signifies "comfort" (Gen. v. 29). (For texts referring to bestowing the names of the patriarchs of the tribes of Israel see Genesis, chs. xxix., xxx., and xxxv., verses 16, 17, 18.) The vigor and intelligence shown in our Scripture names were remarkable. They greatly influenced Hebrew literature, and are the finest of antiquity. Those of the women were derived from character and circumstance; *e. g.* Adah or Ada, "ornament;" Leah, "weary;" Deborah, "a bee." The names of the patriarchs generally had a mystical meaning. Elijah and Joel are composed of two names of God; Josaphat and Saphatias indicate the judgment of God; Johanan or John of Hanania, his mercy; Nathaniel, Elnathan, Jonathan, and Nathania, all mean "the gift of God," as *Devadatta* was Sanskrit, and as *Theodore,* Greek. Among the Arabs names are few and simple. As Mohammed said, "Give your sons the names of prophets," the result has been an interminable repetition of Mohammed, Ahmed, Mahmoud, Hamet, or Achmet; of Ibrahim (Abraham), Moussa (Moses), Suleiman (Solomon), Dauoud (David), and Aïssa (Jesus). Then come the names of their heroes, such as Osman, Ali, Omar. In a third category are the names beginning with Abd, a "servant," as Abd-el-Kader, "servant of the All-Powerful," Abd-Allah, "servant of God." To these follow names ending in *din,* "religion," as Saladin, "restorer of religion." Some names consist of these elements composed, as Hamet-el-Abd, "Mohammed the servant," and others are merely adjectives, as Saïd, "happy or fortunate," Hassan, "handsome," Hussein, "powerful," Reshid, "just judge," Mustapha, "elected of God." To indicate men more accurately, surnames are often added—*e. g.* El Kebir, "the great;" words of relationship—*e. g.* Abu or Bu, "father," Abu-Nebas, "the father of the race." Among the feminine names are Lulu, a "pearl," Zarifa, "beauty." Girls are also called after the wives or female relatives of the Prophet. Men take as surnames appellations relating to their country, birthplace, origin, family, sect, trade, or occupation. The Greeks in the time of Aristotle gave a child its name on the seventh day after birth. It was afterwards given on the tenth day. It was derived from some quality, such as piety, a great event, a striking personal quality, a happy presage; from some virtue or physical advantage, from friendship, or by chance. The grandson took his name from his grandfather or the nephew from his uncle, and to prevent confusion another name, such as the father's, was added, or else one derived from the calling of the bearer, from his birthplace, or a nickname. The father's name was, with a slight change, also given to one child; *e. g.* Chryseis, "daughter of Chryses." In later times names of people were taken from the gods; *e. g.* Apollodorus, "gift of Apollo." Though denied by many writers, it is evident that something like a generic name was applied to many families; *e. g.* the Heraclidæ, the Cecropidæ, the Atridæ, the Alcmeonidæ. Many of the Greek names were very beautiful—*e. g.* Aphrodite, "foam of the sea;" Artemas (m.), "perfect," Artemisia (f.), "perfect;" Diana, "bright as day;" Diomede, "dear to Jupiter;" Zenobia (f.), "life," from Zeno, the lord of life; Spiridion, "breath of the gods;" Isidore (m.), Isidora (f.), "gift of Isis;" Heliodorus, "gift of the sun;" Zeno, "life" (the lord of); Zoë, "life;" Amaranth, "unfading flower." The Romans, like ourselves, had a family name, called the *nomen gentilitium,* generally ending in *ius, eius,* or *aius.* This, derived from the gens, "clan or tribe," was the *nomen* or name proper. As the clan was divided into families, there was also the hereditary *cognomen,* while the *prænomen* distinguished the individual. Sometimes, by way of further distinction, a second cognomen, called the *agnomen,* was borne. This was often an honorable title derived from some great exploit. The *prænomina* or "Christian names," so to speak, were not more than thirty in number, whence the constant repetition of Marcus, Decimus, Florus, Caius, etc. Romans often took their names from their order of birth, as Primus, Secundus, Tertius ("first," "second," "third"), and cognomens were derived from the months in which they were born or from some personal peculiarity; from being a twin or a posthumous child; from a city, river, or country. The daughter's name was the feminine form of that of the father; *e. g.* Julia from Julius, Octavia from Octavius. To distinguish the individual, she also received another name grown hereditary in the family, as Julia *Agrippina.* But the surname was often fanciful, as *Felicula,* "little cat" or "puss." Nicknames were common. After marriage a Roman lady bore the name of her husband in feminine form, whence it was usual to say at marriage, "Where you are Caius, I will be Caia." Many Roman names were from Etruscan or other old Italian sources; some were from the most trifling or undignified personal peculiarities or occupations. With the Northern invaders came chiefs proud of their own ancient Gothic names and families; that of Theodoric gloried in the recollection of Amal, whence Amalaric, Amalafride, Amalaberg. With Christianity came names from the Bible, but the old heathen family appellations "died hard." St. John Chrys-

ostom in the fourth century complained of this obstinacy, as did St. Gregory in the sixth century. Such were the names Wolf, and those founded on Ans or As, indicative of a god; *e. g.* Anselm, Esmond, Oscar or Elf, Hildebrand, "war-sword," Bertha, "the bright goddess" (Albert, Bertram), Gertrudis, etc. All of these were sources of pride, owing to age and associations.

The entire history of Indo-European names is that of a growth from a condition like that of the Arab and Indian to the one now prevalent among us. Those of the Anglo-Saxons were imposed, says Sharon Turner, as with us, in their infancy by their parents. They were frequently compound words, rather expressive of caprice than of appropriate meaning. The following are specimens: Æthelwulf, "the noble wolf;" Æthel or Ethel, Adel, and Adeline, meaning "noble;" Bertwulf or Bertolf, "illustrious wolf;" Eadwulf, "the prosperous wolf;" Æthelwyn, "noble joy;" Eadric, "happy and rich;" Ælfred, an "elf (*i. e.* shrewd) in council;" Sigeric, "victorious and rich;" Æthelred, "noble in speech" (German, *Rede*); Eadmund or Edmund, "prosperous patron;" Eadwin, "prosperous in battle;" Dunstan, "mountain-stone;" Ethelbald, "noble and bold;" Eadward, "prosperous guardian;" Ethelstan, "noble rock" (or stone); Ethelbert, "noble and illustrious." These names partially remain to-day. Many Anglo-Saxon names were wild and strange; *e. g.* Beanhelm, "helmet of the nobles;" Eardwulf, "wolf of the earth or province;" Werburg, "hedge of the city;" Sigfred, "peace of victory;" Beonheat, "the soaring bee;" Beagstan, "bracelet stone;" Wulfheah (wolf-high), "tall wolf;" Beornoth, "noble's oath;" Wine, "the dear one," which often forms a part of many names; Sæfreth, "freedom of the sea;" Ceolmund, "protecting ship." Female names were not less fanciful. Thus, Dudda, meaning the "family stem," was a father who had three daughters—Deorwyn, "dear to man" or "dear love," Deorswythe, "very dear," and Golde, "golden." A father, Æthelwyn ("noble joy"), had four sons—Æthelwold, "noble governor," Alfwold, "ruling elf," Athelsin, "always noble," and Æthelwyn. It is not settled whether the Anglo-Saxons always used surnames. Many certainly had appellations added to their original names. Thus, there was Wulfsic se blaca, or "the pole," and Thurceles hwitan, or "the white." These were, however, among the Saxons, as for many centuries later in England, derived from many causes, as from the place of residence—*e. g.* Ælfric at Bertune; or from the father, as Elfgare Ælfan suna, "Elfgare, son of Ælfan," or, more shortly, Wulfrig Madding, Badenoth Beotting. Office, trade, affinity, or possession often bestowed a name, as Leofwine ealdorman ("alderman"), Sweigen scyldwirtha ("the shield-bearer"), Eadwig, "his maeg," Ægelifrig munuc ("monk"), Osword, "priest." In the course of time, though very rarely among the Anglo-Saxons, these became family names, and as such still exist. Among women's names are Ethelswytha, "very noble;" Selethrytha, "a good threatener" (Anglo-Saxon ladies appear to have excelled as scolds); Editha, "the blessed gift;" Elfhilda, "elf of battle;" Beage, "bracelet;" Ethelfritha, "noble and powerful;" Adeleva, "noble wife;" Heaburga, "high tower" (a tall lady); Adelfleda, "noble pregnancy;" Elfgiva, "elf favor;" Edgiva, "happy gift;" Ethelgiva, "noble gift;" Wynfreda, Winifrede, "peace of man;" Ethelhilda, "noble war-goddess;" Elfthrythe, "threatening as an elf." Saxon is the stock on which the English and American names of the present day are formed. Next to these come the Norman, but it must be remembered that both were in a great degree founded on a common Teutonic origin. Though the Anglo-Saxons very rarely employed a regular system of family nomenclature similar to our own, they attempted to show relationship by the use of similar personal names. Thus, in one family we find Wigmund, Wig-helm, Wig-laf, Wih- (or Wig-) stan, and the nineteen descendants of Alfred had their names beginning with *Ead* ("prosperous"). The termination *-ing*, as in Brening, Dering, Whiting, means a descendant, or "born of." Surnames were not common before the eleventh century, though they were used, hereditarily, occasionally both by lords and common men. Among the oldest of these family names were the names Liniet (Linney), Grimkelson, Dubbe, Tuk (or Tuckey), Pincebek, and Gamelson. The ingress of the Normans introduced the use of Scripture names. During three centuries after the Conquest people of rank began to gradually assume first some surname of place or characteristic, and then one of family. The younger branches of a family often laid aside the father's name and took one from the place where they lived, and thus (in Cheshire) in three descents as many surnames are found in the same family. Several brothers often assume different surnames. Hence, it is difficult to trace the pedigree of any family beyond the thirteenth century. The roll of Battle Abbey, containing the names of those who fought at the Conquest, gives the cream of the Norman aristocracy, so that a biographer of Chaucer declared that all names to be found in it ennobled their descendants. (For different versions of this roll, see Lower.) The Normans introduced the title *de* ("of" or "from") as indicating the names of their estates; *e. g.* Le Sire de Vitry, Paennel du Monstier-Hubert. The mingling of Norman with English names soon formed a sad chaos, many callings, places, and nicknames being translated into French and thence Anglicized, while the confusion was worse confounded by the latinization of others. *At*, meaning the same as *de*, or indicating residence, enters into many English names; *e. g.* Athill, Atwood. In Norman names many old Norse words became French. Thus, *ey* or *ö*, "island," became *eu* (Cantaleu); *flôt*, a river, *fleur* (*e. g.* Harfleur); *bo* or *by*, an "island," *bœuf* (Painbœuf); *garth* became *gard* (Epegard), etc.

Celtic names were originally formed on the same principles as the Saxon, the affix *Mac*, denoting "son," being usually assumed in Scotland, as was *O'* ("grandson") among the Irish, and *Ap* with the Welsh. The head of a clan in Scotland is spoken of as *The*—*e. g.* The Macgregor—and he is addressed by the name alone, without an article. The entire clan usually bore the chief's name. Among Celtic names are Angus, "firm;" Fingal, "strongest of the strong;" Brian, "chief;" Fergus, "strong arm or man;" Arthur, "a bear;" Griffith, "a dragon;" Hugh, "mighty, indomitable;" Murdock, "great chief;" Owen (John), "a lamb;" Dugald, "black-haired;" Rowena, "the white-necked" (?); Brenna, Brenda, "raven-haired;" Cordelia, "token of the flowing;" Morgiana, "lady of the sea."

There are in Great Britain nearly 50,000 surnames, derived from every conceivable source, such as animals, offices, saints, traders' signs, virtues, and even from oaths and salutations, such as Bigot, from "by God;" Pardoe, from "par Dieu;" Godsall, from "God's soul;" Olyfader, from "Holy Father;" and Belcher, from "*belchère*." The commonest name is Smith; the next in order Jones, Taylor, Williams, Brown, Davies, Thomas, Robinson. Of the second class as to number are Baker, Clark, Cooper, Davis, Edwards, Evans, Green, Hall, Harris, Harrison, and others, in apparently the same proportion as in America.

In Wales there are districts in which family surnames are not yet known, and there are places all over Great Britain in which nicknames or sobriquets like those of the Middle Ages are in general use. It has been frequently asserted that French names introduced at the Conquest may be known by such prefixes as *de, du, des, de la, saint,* or by the suffixes *font, ers, faut, beau, age, mont, ard, aux-bois, ly, eux, et, val, court, lay, fort, ot, champ,* and *ville;* but this is far from being the case, since very soon after the Conquest these terms came into such general use as to make distinctions almost impossible. The Norman term *fitz* is believed to *always* signify illegitimate descent, but this was by no means invariably the case, the word itself meaning simply *fils*, or "son." Its continued application to legitimate children would have been absurd.

In many European countries the husband adds his wife's name to his own, and in Spain, if the mother is of better family than the father, the children take her family appellation. In inheriting Scotch estates it is a very common condition that a certain name shall be taken with the property.

The study of the names of places is hardly less important than that of persons. From the earliest times men have retained the names of towns, hills, or rivers given by earlier races, so that it often happens, as in the case of the Picts, that all that is known of their language and origin is embraced in these terms. Again, in migrating to other lands the old place-names have always been transferred to new localities, in illustration of which the reader may consult *India in Greece, or Truth in Mythology*, by Edward Pococke (1852), a work in which the author has endeavored to prove that Aryan-Indian names were taken to the West. In like manner the Celt, the Saxon, the Pict, Romans and Normans left their language in such words as *tam, tav,* or *cluyd,* meaning "river or water," whence the Thames, Tavy, and Clyde (Celt.); in *burg,* "a hill," and *bricg,* "bridge" (Saxon); in *Penval,* "the head of the wall" (Pictish); in *castrum,* "a camp," whence *caster* (Roman). In *The Norman People* (London, 1874) it is shown that 124 common English names of places are also to be found in Scandinavia.

(Among the many books on the subject of names the reader may refer with advantage to *The History of Christian Names*, by Miss Yonge; also, *English Surnames*, by Beardsley, 2d ed. 1875.) C. G. Leland.

Namozine′, tp. of Dinwiddie co., Va. Pop. 3310.

Na′mur, province of Belgium, situated on the French frontier, and intersected by the Meuse. Area, 1413 square

miles. Pop. 314,718. It consists of large, densely-wooded hills, offshoots of the Ardennes, and rich in coal, iron, copper, lead, sulphur, alum, marble, and slate; and beautiful and exceedingly fertile valleys, yielding fine pastures and large crops of wheat, oats, hops, and flax. Besides agriculture and mining, a large manufacturing business is carried on, especially in paper, hardware, and cutlery.

Namur, town of Belgium, capital of the province of Namur, at the confluence of the Sambre and the Meuse. It is fortified, and has an elegant cathedral and many good educational institutions, large breweries, and celebrated manufactures of cutlery and leather, which latter branch of industry gives employment to more than 2000 persons. It was formerly a very strong fortress; was taken by Louis XIV. in 1692, and retaken by William III. in 1695. Joseph II. demolished the fortifications, and, although they were restored in 1817 during the union with the Netherlands, they were demolished again in 1866 with the exception of the citadel. Pop. 25,883.

Nanafa′lia, tp. of Marengo co., Ala. Pop. 724.

Nancy′, town of France, capital of the department of Meurthe, on the left bank of the Meurthe. It is beautifully situated at the foot of a range of wooded and vine-clad hills, and is one of the finest built towns of France, with many broad and straight streets lined with magnificent houses, and many public squares adorned with fountains and gardens. It owes much of its beauty to Stanislaus Leczinsky, ex-king of Poland, who resided here from 1735 to 1766, and whose statue is in the Place Royale. It has a celebrated school of medicine and pharmacy, and another of forestry, a lyceum, a library of 26,000 volumes, several scientific societies, and many other excellent educational institutions, and large museums and collections both for scientific and artistic purposes. Its manufactures of cloths, woollens, and candles enjoy a high reputation, and its embroideries in all kinds of stuffs are celebrated. It was the capital of the former duchy of Lorraine, and in its immediate vicinity was fought the battle between Charles the Bold of Burgundy and René II. of Lorraine, in which the former was defeated and killed Jan. 5, 1477. At the death of Stanislaus, who held the country after the Peace of Vienna in 1735, the city was incorporated with France (1766). Pop. 52,978.

Nand′idæ [from the generic name *Nandus*], a family of East Indian fresh-water fishes. The body is oblong, compressed, and covered with ctenoid scales of moderate size; the lateral line is interrupted; the head compressed; the opercular bones generally more or less armed; the nostrils normal; the mouth with a lateral oblique cleft; the jaws very protracted; teeth small and developed on the jaws as well as palate; branchial apertures large; branchiostegal rays six in number; the dorsal fin is long, with its spinous portion much longer than the soft; the anal with its soft part opposite to and like that of the dorsal, and preceded by three spines; pectorals with branched rays; ventrals thoracic, and each with one spine and five rays; stomach with no pyloric appendages. The family is represented by three genera—(1) *Badis*, (2) *Nandus*, and (3) *Catopra*—whose representatives are found in the fresh waters of India and the adjoining archipelago. In aspect the species resemble somewhat the rock-basses and sunfishes of the American streams, and attain about the same size. THEODORE GILL.

Nan′du, Rhe′a, or **American Ostrich,** the *Rhea Americana*, a bird of the family Rheidæ, a native of Patagonia and the Argentine Republic. It is about five feet high. It is polygamous, and the several females lay their eggs together, to be hatched by the male. It is a swift runner, but cannot fly. It swims readily. The flesh is very good; and the birds are hunted for their feathers, which are not used as ornamental plumes, but are extensively employed in the manufacture of feather dusters. (See also NANDIDÆ and RHEIDÆ.) THEODORE GILL.

Nan′ek, founder of the important modern sect of the Sikhs of the Punjaub, b. at Talwendy, near Lahore, in 1469, was son of Kalu of the Kshatriya caste; showed an early tendency to mysticism; associated with the fakirs; studied the religious books both of the Brahmans and of the Mohammedans; distributed his property to the poor; visited Mecca and Medina, and wandered through India in quest of a "vision of truth," which he ultimately attained, and thenceforth propagated a new religion with great success, being presented to the emperor Baber in 1527. Nanek taught the unity of God, insisted upon faith in God and love to man, rejected monasticism, and instituted a very simple form of worship, which has since been considerably overlaid by the innovations of his successors. The object of Nanek was a reconciliation of Booddhism with Mohammedanism, and he embodied his doctrine in a book entitled *Adi Granth*, now the Bible of the Sikhs. D. at Kirtipur, on the banks of the Ravi River, in 1539. His tomb has been swept away by the river, but the locality is still a place of pilgrimage.

Nanekism. See NANEK.

Nankeen′ [from the city of Nanking in China], a cotton cloth of a buff-yellow color, which is very enduring. It is made in Asia from a variety of cotton whose fibre is of this color. Artificially-colored nankeens are made from ordinary cotton, and have nearly superseded the real article.

Nankin′, post-tp. of Wayne co., Mich. Pop. 2955.

Nanking′, or **Nankin** ("southern capital"), city of China, capital of the province of Kiang-Su, generally called by the Chinese Kiang-Ning-Fu since the removal of the court to Peking (the "northern capital"), is situated in lat. 32° 2′ N., lon. 118° 49′ E., on an affluent of the Yang-tse-Kiang, 3 miles from this river, and 200 miles from its mouth, in a marshy and swampy plain whose excessive moisture makes the place very unhealthy for Europeans, and even for natives from other districts. According to Chinese accounts, it had once 4,000,000 inhabitants, and remains of its ancient wall show a circumference of 35 miles. But the present wall, 40 feet high, has only a circumference of 18 miles, and large parts of the space it encloses are unoccupied. By the removal of the capital to Peking, Nanking lost its chief source of prosperity, and it began to decline. Nevertheless, its monuments, the imperial palace and tombs, the porcelain tower, etc., its libraries and other institutions of learning, its commerce and manufactures, especially of the so-called nankeen, made it an important city. But on Mar. 19, 1853, it was taken by the Tai-Pings, who held it for eleven years and made it the capital of the rebellion; and when it was retaken by the imperialists July 19, 1864, its monuments had been destroyed in the mean time and its commerce and manufactures ruined; the famous porcelain tower had gone. It was built by the emperor Yungkoh (1413–32) in commemoration of his mother. It was octagonal, 322 feet high, slightly tapering, and consisted of nine stories, each provided with a gallery and a projecting roof, from whose corners bells were suspended. In the interior a spiral staircase led to the summit, formed by an elegant spire, on the top of which rested a ball of brass overlaid with gold. The imperial tombs are remarkable for the avenue of colossal sepulchral statues which leads to them, but the place is much disturbed. Of the palace only a few ruins are left. The square tower, 50 feet high, on the top of which is placed a gigantic statue of a turtle, is still standing. The imperial government has made several attempts to revive the manufacturing industry of the place, but without success. Although the city has been made a free port, its commerce is inconsiderable; it is visited by very few foreigners. Its present population is estimated at 300,000.

Nan′semond, county of S. E. Virginia, extending N. from the North Carolina line to James River. Area, 375 square miles. It is bounded W. by the Blackwater River. The S. E. portion is a part of the Dismal Swamp. Live-stock and corn are leading products; but of late attention is given to raising fruit and vegetables for the Northern markets. The county is traversed by Nansemond River, Jericho Canal, and the Atlantic Mississippi and Ohio and the Seaboard and Roanoke R. Rs. Cap. Suffolk. Pop. 11,576.

Nansemond River, a small stream of Nansemond co., Va., whose lower course becomes a wide tidal estuary opening into Hampton Roads. It is navigable 20 miles to Suffolk.

Nantahala, tp. of Macon co., N. C. Pop. 383.

Nantes [anc. *Condivincum* or *Namnetes*], city of France, capital of the department of Loire-Inférieure, stands on the right bank of the Loire, 34 miles from its mouth, at the influx of the Erdre and the Sèvre-Nantaise, and communicates with Brest by a canal. The quays, boulevards, and promenades along the Erdre are very elegant, and the whole modern portion of the city is regular and handsome. The most remarkable architectural monuments are—the cathedral, built in the fifteenth century, with its towers hardly rising above the roof, but containing the splendid monuments of Queen Anne, of Francis II., the last duke of Bretagne, and his wife, Margaret of Foix; the castle, commenced in 938, in which Henry IV. signed the Edict of Nantes Apr. 13, 1598, and in which many of the French kings resided temporarily; the bourse, a modern building, and one of the finest of its kind in France, etc. The city has a lyceum, which among other disciplines also gives lectures on botany, a school of navigation, different commercial and industrial schools, a

public library, a botanical garden, a museum of antiquities, and an art-gallery. The principal branch of the industry of Nantes is shipbuilding and the production of all kinds of objects necessary to the outfit of a vessel—anchors, cables, cordage, sailcloth, biscuits, preserved meat, etc. In 1865 the city possessed, besides coasters and river-craft, 745 ships, of 134,962 tons burden. Sugar-refining and the manufacture of linen and cotton fabrics, calicoes, flannels, musical, mathematical, and optical instruments, chemicals, leather, brandy, etc., are also extensively carried on. The commerce is very considerable. The harbor, formed by an arm of the Loire, can accommodate 200 vessels, and recent improvements in the river-bed have made it possible for large vessels, which formerly were compelled to load and unload at Paimbœuf at the mouth of the river, to reach the harbor. Pop. 118,517.

Nan'ticoke, tp. of Sussex co., Del. Pop. 2076.

Nanticoke, tp. of Broome co., N. Y. Pop. 1058.

Nanticoke, post-v. of Hanover tp., Luzerne co., Pa., on the S. bank of the E. branch of the Susquehanna, and on a branch of the Lehigh and Susquehanna, 10 miles by rail from Wilkesbarre. West Nanticoke is on the opposite side of the river, in Plymouth tp., and on the Lackawanna and Bloomsburg R. R., 24 miles S. W. from Scranton. Both places have coal-mines.

Nantuck'et, county of S. E. Massachusetts, consists of the island of Nantucket and four smaller islands. The islands have a light soil, and are nearly destitute of trees. The county contains but one township, that of NANTUCKET (which see). Area, 60 square miles. Pop. 4123.

Nantucket, post-v. and tp., cap. of Nantucket co., Mass., on an island 28 miles from Cape Cod peninsula. It has 2 banks, 1 weekly newspaper, several hotels, and stores. It was formerly extensively engaged in the whale fishery. Pop. 4123. ED. "INQUIRER AND MIRROR."

Nant'wich, town of Cheshire, England, is noted for its salt-works and manufactures of cheese, shoes, and gloves. Pop. 6825.

Nan'uet, post-v. of Clarkstown tp., Rockland co., N. Y., on the Piermont branch of the Erie R. R. and on the Hackensack and New York Extension R. R., 11 miles N. W. of Piermont.

Na'pa, county of California, extending N. from San Pablo Bay. Area, 703 square miles. It is traversed by mountain-ridges and deep, beautiful, and fertile valleys. Grain, wool, fruit, and wine are leading products. The county is traversed by the California Pacific R. R. Cap. Napa City. Pop. 7163.

Napa City, post-v. and tp., cap. of Napa co., Cal., 40 miles by rail from San Francisco. It has good educational advantages, 9 churches, a public library, 1 plough factory, 2 tanneries, a saw and planing mill, 1 daily and 2 weekly newspapers, and 2 fire companies. The State insane asylum is 1¼ miles from the city. Pop. of v. 1879; of tp. 3791. A. A. R. UTTING, ED. "NAPA REPORTER."

Napanee', post-v., cap. of Lennox co., Ont., Canada, on the navigable Napanee River and the Grand Trunk Railway, 26 miles W. of Kingston, contains a court-house and an exhibition building; has a large trade, a number of mills and factories, and 3 weekly newspapers. Pop. of sub-district, 2967.

Na'perville, post-v. and tp. of Du Page co., Ill., on the Du Page River and on the Chicago Burlington and Quincy R. R., has 1 weekly newspaper, and is the seat of Northwest College, under the direction of the Evangelical Association, and founded in 1861. Pop. of v. 1713; of tp., exclusive of part of v., 1226.

Naph'tali [Heb. נַפְתָּלִי], the sixth son of Jacob, by Bilhah, the handmaid of Rachel. The tribe of Naphtali numbered 53,400 fighting-men before Sinai, and 45,400 at the entrance into the promised country. It was settled in Northern Galilee from the foot of Anti-Lebanon to Lake Genesareth; Kedesh was its principal town.

Naph'tha [Gr. νάφθα], a name formerly applied to a great variety of volatile, mobile, strong-smelling, inflammable liquids, chiefly ethers, as the ethylic sulphate, nitrate, and acetate, which were called *Naphtha vitrioli*, *N. nitri*, *N. aceti*. METHYLIC ALCOHOL (which see) is still known as *wood-naphtha*. More recently the term "naphtha" has been restricted to the liquid hydrocarbons, the natural petroleum, or some of its more volatile products, or to the inflammable liquids produced by the dry distillation of organic bodies. The following are the more important naphthas: (1) *Mineral* or *native naphtha*, petroleum (see PETROLEUM); (2) *petroleum naphtha*, the more volatile portion of petroleum, which is collected separately during the distillation, and either sold as crude naphtha or fractioned into gasoline, refined naphtha, and benzine. (See PETROLEUM.) (3) *Shale naphtha*, obtained by the distillation of bituminous shales or schists. (See KEROSENE, OIL FROM SHALE.) (4) *Boghead or Bathgate naphtha, photogen, paraffine oil, kerosene*, etc., similar to shale naphtha, distilled from boghead shale of Torbam Hill, Scotland. (See OIL FROM SHALE.) (5) *Coal oil, photogene, kerosene*, etc., distilled from bituminous coals, as the Breckinridge coal of Kentucky, or from rich asphaltic minerals, as the albertite of Nova Scotia, the grahamite of West Virginia, or the Hartley mineral of Australia. (See OIL FROM COAL.) (6) *Coal-tar naphtha*, the more volatile portions of coal-tar, consisting chiefly of benzol, toluol, xylol, etc. (See TAR and GAS-LIGHTING.) (7) *Bone naphtha, bone oil, Dippel's oil*, a mixture of hydrocarbons with certain organic bases, pyrrol, pyridine, etc., obtained from the tar of bones and other animal substances. (See TAR.) (8) *Oil of wood-tar* is properly a naphtha, being the more volatile portion of wood-tar. (See TAR.) (9) *Caoutchouc naphtha, caoutchoucine*. (See INDIA-RUBBER.)

All these naphthas, except methylic alcohol (*wood-naphtha*) and caoutchoucine, consist of hydrocarbons, belonging chiefly to the marsh-gas series or the benzol series; the former when found in nature (*petroleum*) or produced at low red heats (*shale oil, coal oil*, etc.), the latter when formed at high temperatures, as coal-tar naphtha. C. F. CHANDLER.

Naphtha Gas. See PETROLEUM.

Naph'thalene ($C_{10}H_8$), a hydrocarbon found among the products of the destructive distillation of bituminous coal. (See GAS-LIGHTING and HYDROCARBONS.) It occurs in Rangoon petroleum and the tar of shale oil. According to Berthelot, it may be formed synthetically by substituting 2 equivalents of acetylene (C_2H_2) for 2 of hydrogen in benzol (C_6H_6). It is formed by passing the vapors of several other hydrocarbons through a red-hot tube, as toluene (C_7H_8), xylene (C_8H_{10}), cumene (C_9H_{12}), or mixtures of ethylene (C_2H_4) with benzol (C_6H_6), cinnamene (C_8H_8), anthracene ($C_{14}H_{10}$), or chrysene ($C_{18}H_{12}$). Alcohol and ether vapor, and even ethylene and vapors of acetic acid, petroleum, essential oils, etc., yield some naphthalene when passed through red-hot tubes. Soot and lampblack contain naphthalene. Sulphide of carbon vapor mixed with sulphuretted hydrogen, or both mixed with carbonic anhydride (CO_2), yield naphthalene when passed over spongy iron or copper at a dull red heat. Protochloride of carbon (C_2Cl_2), when passed through a red-hot tube with hydrogen, yields naphthalene.

Preparation.—Crude "dead oil," the heavy oil of coal-tar, deposits large quantities of impure naphthalene, which constitutes the material from which naphthalene is prepared by a simple process of purification by sublimation. By treatment with acids and alkalies the last traces of impurity are removed. (See *J. pr. Chem.*, cii. 29.)

Properties.—Naphthalene appears in brilliant white, scaly crystals, very friable, strongly and unpleasantly odorous. The disagreeable odor is said by Ballö to be due to leucoline oil, which can be separated by boiling it with strong sulphuric acid and precipitating the resulting brown solution with ammonia. Specific gravity 1.153. It melts at 174.5° F. (79.2° C.), and boils at 424.5° F. (218° C.). It sublimes at low temperatures and evaporates in the air. It is insoluble in cold, and almost insoluble in boiling water, but dissolves readily in alcohol, ether, fatty and essential oils, and most oils (naphthas) obtained by destructive distillation, in acetic and oxalic acids. It is one of the most stable of the more complex hydrocarbons, and withstands very high temperatures without decomposition, provided oxygen be absent. It dissolves in warm sulphuric acid, forming two crystallizable acids—sulpho-naphthalic or naphthalene-sulphonic acid ($C_{10}H_7HSO_3$) and disulpho-naphthalic or naphthalene-disulphonic acid ($C_{10}H_6(HSO_3)_2$). Naphthalene unites directly with 4 atoms of chlorine and bromine. Chlorine also produces substitution products, replacing from 1 to 8 atoms of hydrogen; bromine replaces from 1 to 4 atoms. Derivatives containing both Cl and Br are known as $C_{10}H_3Br_2Cl_3$. All these substitution products unite with 4 atoms of chlorine or bromine. Nitric acid produces three substitution products, replacing 1, 2, or 3 atoms of hydrogen with a corresponding quantity of nitryl (NO_2). The first nitro-naphthalene ($C_{10}H_7NO_2$) is converted by reducing agents into naphthylamine ($C_{10}H_7NH_2$), which bears the same relation to naphthalene that aniline does to benzol. The nitro-naphthalenes correspond to nitro-benzol, nitro-cellulose (gun-cotton), nitro-glycerine, and nitro-phenol (picric acid). By an indirect process H_2 in naphthalene may be replaced by O_2, producing naphthaquinone ($C_{10}H_6O_2$), which bears the same relation to naphthalene that quinone bears to benzol and anthraquinone to anthracene. (See ANTHRACENE and ALIZARINE.) Some years since Roussin prepared a substance which he sup-

posed to be artificial alizarine, the most important coloring-matter of madder. Alizarine was at that time supposed to be a derivative of naphthalene, as both yield phthalic acid. Roussin's product was not alizarine, and has not proved to possess any value as a dye. It is called naphthazarine, and is dioxynaphtho-quinone ($C_{10}H_4O_2(OH_2)$.)

Naphthalene Colors.—Many of the derivatives of naphthalene exhibit beautiful and intense colors, but a few only have been found available as dyes. (1) Martius yellow, Manchester yellow, *jaune d'or*, is the ammonium calcium or sodium salt of dinitro-naphthylic acid. It is prepared by treating hydrochlorate of naphthylamine with nitrite of potassium, and heating the resulting diazonaphthol with nitric acid:

$$\underset{\text{Naphthylamine.}}{C_{10}H_9N} + HNO_2 = 2H_2O + \underset{\text{Diazonaphthol.}}{C_{10}H_6N_2}.$$

$$\underset{\text{Diazonaphthol.}}{C_{10}H_6N_2} + 2HNO_3 = 2N + H_2O + \underset{\text{Binitro-naphthylic acid.}}{C_{10}H_6(NO_2)_2O}.$$

Martius yellow imparts to wool and silk, without the aid of a mordant, yellow hues from lemon-yellow to golden-yellow, which are not affected by steaming. Picric acid imparts similar tints, but it is volatilized by steam. Martius yellow is not only used for dyeing yellow, but also to modify the hue of aniline red. (2) Victoria yellow or dinitronaphthol ($C_{10}H_5(NO_2)_2OH$) is isomeric with binitro-naphthylic acid, and is also a beautiful yellow dye which requires no mordant for either silk or wool. It is prepared as follows: "One part of naphthalene is mixed with two parts of concentrated sulphuric acid, and heated on a water-bath until the solution is complete; the sulphonaphthalic acid so obtained is saturated with soda, and the solution is evaporated to dryness. The sulpho-naphthalate of soda is next fused with caustic soda, and the mass resulting from this operation is dissolved in water and supersaturated with HCl, whereby naphthol, or hydrate of naphthyle, is separated. This substance is next boiled with a mixture of sulphuric and nitric acids, yielding binitronaphthol, the yellow coloring-matter; this substance is chemically different from, but, after all, isomeric with, the so-called Martius yellow, or binitro-naphthylic acid. The formula $C_{10}H_6N_2O_4O_2$ answers for both equally well; industrially speaking, both substances approach each other to such a degree that they may be considered identical; both are best used in the state of ammoniacal salt, this being the most readily soluble salt for each. These materials are employed at Paris for the adulteration of gamboge, and very largely used for the coloration of artificial flowers, leather gloves, etc." (3) Magdala red, naphthalene red, naphthylamine red, roseo-naphthalene, is generated from 3 molecules of naphthylamine by the elimination of 3 molecules of hydrogen:

$$\underset{\text{Naphthylamine.}}{3C_{10}H_9N} - 3H_2 = \underset{\text{Magdala red.}}{C_{30}H_{21}N_3}.$$

This change is effected by treating naphthylamine with stannic or mercuric chloride, mercuric nitrate, etc., the reagents which are employed to produce aniline red by a similar reaction. The process is somewhat uncertain. A better process consists in first converting the naphthylamine into azodinaphthyl-diamine by the action of nitrous acid:

$$\underset{\text{Naphthylamine.}}{2C_{10}H_9N} + HNO_2 = \underset{\text{Azodinaphthyl-diamine.}}{C_{20}H_{15}N_3} + 2H_2O.$$

By the action of naphthylamine this compound is converted into magdala red:

$$\underset{\text{Azodinaphthyl-diamine.}}{C_{20}H_{15}N_3} + \underset{\text{Naphthylamine.}}{C_{10}H_9N} = NH_3 + \underset{\text{Magdala red.}}{C_{30}H_{21}N_3}.$$

The product appears in commerce as a dark-brown, somewhat crystalline powder, which is the chloride of the base. In tinctorial power it equals aniline red, while it surpasses it in being a very fast color. It can be readily distinguished from aniline red by the following reaction: On pouring a few drops of its concentrated solution into a cylindrical vessel filled with alcohol, a liquid is formed perfectly transparent, with light rose-color by transmitted light, but exhibiting in reflected light a strong and peculiar fluorescence, giving an appearance of opacity, as if a precipitate were being formed, and diffusing itself through the liquid in clouds of a fiery-red color. (4) Naphthylamine violets and blues are produced by the same reactions employed in converting aniline red into violets and blues (see ANILINE COLORS); *i. e.* replacing in magdala red 1, 2, or 3 atoms of hydrogen by methyl, ethyl, phenyl, etc. They may also be produced by treating naphthylamine with mercuric nitrate (*Wilder*); by substituting the radical naphthyl ($C_{10}H_7$) for hydrogen in aniline and toluidin (*J. Wolff*); from rosaniline and mono-bromnaphthalene, and from rosaniline and naphthylamine (*M. Ballò*). Blumer-Zweifel (*Dingl. polyt. J.*, cxcvi. 66) produces naphthylamine violet directly on the fibre by printing linen or cotton stuffs with a solution containing in a litre of suitable thickening material 30 grammes of naphthylamine hydrochloride and 15 grammes of cupric chloride solution of 15° B. For dyeing the thickening material is omitted, and the cupric chloride is reduced by a fourth. By increasing or diminishing the quantity of naphthylamine salt the color may be made darker or lighter. The printed or dyed stuffs are left for two or three days in the oxidizing chamber at a temperature of 77° F. (25° C.), and the colors fixed by washing with soap-water. Alkaline baths render the color reddish, acid baths make it bluish. A. Kielmayer (*Dingl. polyt. J.*, cxcvi. 67) has given a similar process, using chlorate of potassium instead of cupric chloride. (5) Chloronaphthalic or chlor-oxynaphthalic acid ($C_{10}H_5ClO_3$). When naphthalene is heated with chlorate of potassium and hydrochloric acid, a mixture of chloro-naphthalene and bichloro-naphthalene is obtained. By heating these with nitric acid a mixture of phthalic acid and chloride of chlor-oxynaphthyl is produced. The latter compound, on being heated with an alkali, is converted into the new acid. In a free state the chlor-oxynaphthalic acid is yellow; it forms beautifully-colored salts with baryta, zinc, and copper. It dyes wool scarlet without a mordant, but scarcely produces any change on cotton mordanted with alumina or iron. This acid almost rivals turmeric and litmus in its sensibility to alkalies. Paper stained with a very dilute alcoholic solution assumes a red color in ammoniacal vapors.

Benzoic Acid, from Naphthalene.—By converting the phthalic acid mentioned above into a calcium salt and heating with slaked lime to 662° or 698° F. (350°–370° C.), it is converted into benzoate of calcium, from which the acid is easily separated. The preparation of benzoic acid and chloro-naphthalic acid by these processes is carried out on a large scale in France.

Literature.—Watts's *Dict.* and supplements; Wagner's *Technology* and *Jahresbericht; Jahresbericht der Chemie;* Th. Chateau, *Couleurs d'Aniline, d'Acide phénique, et de Naphthaline* (Paris, 1868); M. Ballò, *Das Naphthalin und seine Derivate* (Braunschweig, 1870); Dr. P. A. Bolley, *Die chemische Technologie der Spinnfäsern;* M. P. Schützenberger, *Die Farbstoffe* (Berlin, 1868–70); W. Crooks, *Handbook of Dyeing and Calico-Printing* (London, 1874).
C. F. CHANDLER.

Naphthalization of Gas, or **Carburetting Gas,** the process by which the illuminating power is increased by adding to it a small quantity, 10 to 40 grains per cubic foot, of coal-tar naphtha (benzol) or petroleum naphtha. (See article GAS-LIGHTING.) C. F. CHANDLER.

Naphthylamine. See NAPHTHALENE.

Na'pier, tp. of Bedford co., Pa. Pop. 1825.

Napier, an eminent noble family of Scotland whose principal peerage dates in that country from 1627. The peerage of Napier of Magdala was created in 1868 (United Kingdom). Besides the eminent names mentioned below, other important members of the family have been Sir CHARLES JAMES NAPIER, b. Aug. 10, 1762; the conqueror of Scinde, an able writer, distinguished in the Peninsula, in North America (1813), and in India. D. Aug. 29, 1853.—Rt. Hon. Sir JOSEPH NAPIER, Bart., P. C., Q. C., D. C. L., LL.D., b. Dec. 25, 1804; was attorney-general for Ireland 1852, and lord chancellor of Ireland.—WILLIAM JOHN, ninth Baron Napier (1787–1834), a distinguished naval officer, who commanded in the war of 1834 in China, and d. there.

Napier (Admiral Sir CHARLES JOHN), K. C. B., son of Capt. Charles Napier, R. N., and grandson of Francis, fifth Lord Napier, b. at Merchiston Castle, Stirlingshire, Scotland, Mar. 6, 1786; entered the navy at the age of thirteen; was appointed lieutenant in 1805; made commander of the Recruit (18 guns) in 1808; was distinguished in naval engagements with French vessels and at the capture of Martinique, obtaining a post-captaincy for his gallantry (Apr., 1809); served as a volunteer in the British army in Portugal, in company with his three cousins, who were known as "Wellington's colonels;" became commander of the Thames (32 guns) in 1811, and inflicted great damage upon the French in the Mediterranean; was engaged in the British naval operations in the Potomac and against Baltimore in 1814; settled in Paris after the peace, and established the first steamers on the Seine; was placed on naval duty on the coast of Portugal in 1829; accepted from Dom Pedro in 1833 the command of the squadron of the young queen; inflicted upon the fleet of Dom Miguel a decisive defeat off Cape St. Vincent July 5, for which he was made Viscount St. Vincent in the Portuguese nobility and admiral-in-chief of the Portuguese navy. In 1839 he resumed service in the British navy; was engaged as commodore on the coast of Syria in 1840, when he stormed Sidon with a land-force, captured Acre, blockaded Alexandria, and concluded a convention with Mehemet Ali, for which services he was knighted. He sat in Parliament 1841–47; was appointed rear-admiral of the blue, and given command of the Channel fleet in 1847; made vice-

admiral May, 1853; commander of the Baltic fleet in the war with Russia 1854, and captured Bomarsund, but failed to realize the expectations formed from his brilliant antecedents; was made admiral of the blue 1858, and sat in Parliament for Southwark from 1855 till his death, which occurred at Merchiston Hall, Hampshire, England, Nov. 6, 1860. He wrote *An Account of the War in Portugal* (1836) and *The War in Syria* (1842), and furnished materials for a *History of the Baltic Campaign* (1857). (See his *Life and Correspondence*, by Maj.-Gen. E. Napier, 1862.)

Napier (Sir Francis), tenth Baron, K. S., P. C., Bart., b. Sept. 15, 1819; succeeded his father 1834; British minister at Washington 1857–58; at the Hague 1858–60; was sworn of the privy council 1861; was British ambassador to Russia 1861–64; at Berlin 1864–66; governor of Madras 1866–72.

Napier (John), laird of Merchiston, b. at Merchiston Castle, near Edinburgh, Scotland, in 1550; studied at the University of St. Andrew's; spent several years in travels in France, Spain, and Italy, and on his return entered upon a life of studious leisure. He first became known as an author by his *Plain Discovery of the Whole Revelation of St. John* (1593), giving in the dedication some wholesome advice to King James upon the reform of his "house, family, and court." About this time he was engaged in researches into the construction of warlike machines, and a letter to Anthony Bacon, dated in 1596, describes his invention of a mirror to set fire to ships by reflecting the rays of the sun, and of an instrument for scattering shot over a wide area; but these inventions seem never to have been tested or even perfected. In 1614 he published his great discovery of logarithms in a work entitled *Mirifici Logarithmorum Canonis Descriptio,* which, according to Kepler, he had indicated as early as 1594 in a letter to Tycho Brahe. In 1617 he published *Rabdologiæ, seu Numerationis per Virgulas Libri duo,* describing the invention known as Napier's Bones (which see). He d. at Merchiston Apr. 4, 1617. His son Robert published 1619 a posthumous work, *Mirifici Logarithmorum Canonis Constructio,* explaining the method of constructing tables of logarithms. Archibald, his eldest son, was created Lord Napier in 1627, and was ancestor of the Napiers of military and naval celebrity in modern times. Biographies of Napier were published by the earl of Buchan (1787) and by Mark Napier (1834).

Napier (Macvey), b. in Stirlingshire, Scotland, Apr. 12, 1776; studied law; became writer to the Signet 1799; published in 1817 an essay on the *Philosophical Writings of Lord Bacon;* edited the *Supplement* to the *Encyclopædia Britannica* (6 vols., Edinburgh, 1815–24); appointed professor of conveyancing in the University of Edinburgh 1825; edited the *Edinburgh Review* for seventeen years (1829–46); superintended the 7th ed. of the *Encyclopædia Britannica* (1830–42); was for many years librarian to the Society of Writers to the Signet, and became in 1837 one of the principal clerks to the court of sessions. D. at Edinburgh Feb. 11, 1847. A posthumous work by Prof. Napier, *Lord Bacon and Sir Walter Raleigh,* appeared in 1853.

Napier (Robert), b. at Dumbarton, Scotland, June 18, 1791, was the son of a blacksmith, and was apprenticed to that trade; set up a blacksmith's establishment at Glasgow in 1815; engaged in iron-founding and engineering in 1821; began to construct engines for steamers in 1823, and laid the foundations of an extensive business; established in 1830 a steam-packet company; built in 1834 the machinery for the vessels of the Dundee and London Steamship Company; in 1836 fitted out the Berenice steamer for the East India Company; equipped the British Queen to ply to New York in 1839, and in 1840 furnished to the Cunard Company its first four vessels. In 1853 he fitted out the Duke of Wellington, then the largest vessel in the British navy; admitted his sons into partnership in the same year; built for the British admiralty the Black Prince, of 6100 tons, in 1859, and the Hector, of 4060 tons, in 1860, and has constructed many steam-rams and iron-clad ships of war for foreign governments. Mr. Napier received the great gold medal of honor at the Paris Exposition of 1855, and has been president of the Institution of Mechanical Engineers.

Napier (Lieut.-Gen. Sir William Francis Patrick), K. C. B., b. at Castletown, Kildare, Ireland, Dec. 17, 1785, son of Col. George Napier, great-grandson of the fifth Lord Napier, brother of Sir Charles James and Col. George, and cousin of Admiral Sir Charles Napier, who together constituted a remarkable assemblage of military, naval, and literary talent, all being descendants of the laird of Merchiston, the inventor of logarithms. He entered the army in 1800; became captain 1804; served at the siege of Copenhagen 1807; accompanied Sir John Moore to Portugal 1808; was wounded at Almeida 1810, and at Cazal Nova 1811; was engaged in the battles of Busaco 1810, Fuentes de Onoro 1811, Salamanca 1812, Bidassoa 1813, and Orthes 1814, besides many minor actions; became major 1811, and lieutenant-colonel 1813, and wrote a *History of the War in the Peninsula and in the South of France from 1807 to 1814* (6 vols., 1828–40), which has been very variously judged, but is admitted to be one of the most remarkable military histories of modern times. He was supplied with important materials by the duke of Wellington, Marshal Soult, and many eminent officers, both French and English. His wife, a niece of Charles James Fox, greatly aided him by translations from the French, especially the cipher correspondence between Napoleon and his brother Joseph, king of Spain. This history called forth a large number of replies and criticisms from officers alluded to in the text, and the later editions contain replies printed under the title *Justificatory Pieces.* Napier was made colonel in 1830, major-general 1841, lieutenant-governor of Guernsey 1842, knighted 1848, and made lieutenant-general 1851. He devoted his later years to the illustration of his brother's exploits in the East, publishing *The Conquest of Scinde* (1845), *Administration of Scinde* (1851), and *The Life of Sir Charles Napier* (1857); he also issued in 1855 *English Battles and Sieges in the Peninsula,* consisting of passages from his larger history, revised and sometimes rewritten. D. at Scinde House, Clapham, Feb. 12, 1860. The accomplished Lady Napier d. a few weeks later.—Capt. Henry Edward Napier, youngest brother of Sir Charles and Sir William, b. Mar. 5, 1789, served in the navy, wrote an extended *Florentine History* (6 vols., 1846–47), which was highly commended, and d. Oct. 13, 1853.

Napierian Logarithms. See Logarithms, by Prof. W. G. Peck, LL.D.

Napier of Magdala (Robert Cornelius Napier), Baron, b. in Ceylon, in 1810, son of Major C. F. Napier of the Royal Artillery; was educated at the Military College at Addiscombe, and entered the Royal Engineers as second lieutenant in 1826; served throughout the Sutlej campaign of 1845–46, as chief engineer in the battles of Moodkee and Ferozeshah (severely wounded), and as brigade-major of engineers at the battle of Sobraon; served in the Punjaub campaign of 1848–49; was chief engineer and wounded during the siege of Mooltan 1849; commanding engineer of the right wing at the battle of Goojerat and pursuit of the Sikh army; actively engaged throughout the Indian mutiny campaigns; chief of staff to Outram in 1857, and distinguished in the actions leading to the first relief of Lucknow and subsequent operations; brigadier and chief engineer at the siege and capture of Lucknow; commanded a brigade at the capture of Gwalior, reducing the fort of Powrie Aug., 1858; commanded a division in the China expeditionary force, and distinguished throughout the campaign resulting in the surrender of Pekin, and promoted to be major-general; appointed lieutenant-general in 1867, and commanded the Abyssinian expedition resulting in the capture of Magdala and release of the British prisoners. (See Abyssinia and Magdala.) In 1868 he was raised to the peerage for his eminent services, and nominated a G. C. B., having previously been made C. B. and K. C. B. for his services during the Indian mutiny. Was governor and commander-in-chief of India 1870–76, when he was transferred to Gibraltar as governor. In 1874 he was commissioned general.

Napier's Bones (or **Rods**), a set of tablets of bone, horn, ivory, or other material, invented by the mathematician Napier for facilitating multiplication and division. They are of no practical use, and are only interesting as a mathematical curiosity.

Na'pierville, county of Quebec, Canada, in the S. W. of the province. It is intersected by the Montreal Lachine and Province Line Railway. Cap. Napierville. Pop. 11,638.

Napierville, post-v., cap. of Napierville co., Quebec, Canada, 27 miles S. of Montreal. It has a convent. Pop. about 1000.

Na'ples [It. *Napoli;* Gr. *Neapolis*], the largest and most magnificently situated town of Italy, lying on the bay of the same name, in lat. 40° 50′ N., lon. 14° 16′ E., and enjoying a climate of rare perfection. From the curving line of the bay the city ascends from the Castello dell' Ovo to the top of the Capodimonte, a distance of more than 3 miles, and then sweeps round the summits of the semicircular hills down to the extreme points of the bay, thus forming a crescent, which, beheld from the sea, presents a picture almost unrivalled in its kind. Nothing, however, can exceed the view from the heights above the town, the city itself and its populous suburbs extending for miles and miles along the bending shore, the purple waters of

the bay and the sea beyond, out of which rise Ischia and Capri and the shining points of Castellamare, Sorrento, etc.; while on the left Somma and Vesuvius, with all their grand and tragic associations, are glowing in the light of a southern sun. Extensive as is the bay, the harbor is very limited, and ships of war and other large vessels find safer anchorage near Baiæ. The city is dominated (rather than defended) on the W. by the castle of St. Elmo, once of immense strength, which crowns the hill of Sant' Erasmo or Santermo; on the seaside are the fortresses of Castello Nuovo, often compared to the Tower of London, and adorned with a triumphal arch in honor of Alfonzo of Aragon (1442); the Castello dell' Ovo, with its absurd traditions about Virgil, but which was probably built by the Norman William I. (1150); also many batteries. There is regular steam-communication by water between Naples and all the principal Mediterranean ports, and railways connect it with Central and Northern Italy. The city is divided into the Old, or E., and the New, or W., towns by the ridge extending from the palace of Capodimonte to the sea, thus forming a kind of double crescent. The modern streets are broad and well paved, while the older thoroughfares, lined by houses of great height, are, the Toledo excepted, extremely narrow, and sometimes very steep and crooked, and the glimpses caught of them in driving through the wider avenues are strikingly picturesque. The principal streets of Naples are the Via Roma (formerly the Toledo), a grand street intersecting the old town; the Chiaja, or Riviera di Chiaja, which, passing the charming gardens of the Villa Nazionale on the left and a row of fine buildings on the right, winds for several miles along the curving, undulating western shore of the bay, and is the fashionable promenade of the city; the Vittorio Emmanuele, which skirts and crosses the higher portions of the town, commanding views of surpassing loveliness; the Corso Garibaldi; the Molo, etc. The lower part of the Toledo (now unfortunately trying to be called Roma) formerly offered to the visitor the most animated pictures of Neapolitan habits, where the whole domestic life of the poorer classes might be studied in the open air. Here they dressed and undressed their children, boiled their maccaroni, fried their fish, roasted their chestnuts, ate and drank, quarrelled and sang, worked and begged. All this has greatly changed since the unification of Italy and the consequent reduction—one might almost say annihilation—of the *lazzaroni*. The public squares, called *larghi*, are irregular, and, though flanked by showy edifices and decorated with fountains, are not generally attractive. The churches are numerous (over 300), some very quaint and curious in their construction, with domes glittering with gilded and colored tiles, which give them a semi-Oriental aspect, but as a whole they have more archæological interest than architectural merit. In the sacristy of the gorgeous church of San Gennaro is the almost priceless treasury of the saint; here also are the *ampolle* or small phials said to contain the blood of St. Gennaro, which is believed to liquefy twice every year. Among other prominent churches are the Incoronata, founded by Joanna I., with damaged frescoes attributed to Giotto; Santa Chiara, with fine frescoes and curious old monuments; San Domenico Maggiore, very rich; the church of the Gerolomini, one of the finest in the city; San Francesco di Paola, the cupola of which is surpassed in size and boldness of execution only by that of St. Peter's in Rome and the Duomo in Florence. The convents, including those recently suppressed, number more than 100, exclusive of those in the suburbs, and among these the monastery or Certosa of San Martino, near the castle of St. Elmo, is the most conspicuous. Of the fourteen theatres, San Carlo is the largest and most elegant, and, next to the Scala of Milan, ranks as the first in Europe. The National Museum is one of the most interesting in the world. It contains a great number of objects found in Pompeii and its neighborhood, statues and bas-reliefs in marble, mosaics and mural frescoes of the highest interest, more than 3000 specimens of ancient glass, an immense collection of small antique bronzes, painted vases, etc. The precious objects, such as cameos, engraved gems, gold and silver ornaments, number about 2000, chiefly of Greek and Roman workmanship. The Egyptian collection is extensive. The library contains 160,000 volumes, besides many manuscripts on parchment and paper, and no less than 1800 from Herculaneum on papyrus; the Pinacoteca, nearly 1000 pictures. Naples is well provided with the higher institutions of learning, and has always been distinguished for the number and extent of its charitable organizations; but the poverty and beggary for which it has been no less remarkable are a proof of bad management in these latter institutions. Besides countless hospitals and other *ricoveri*, the Reale Albergo de' Poveri, with its dependencies, has sometimes sheltered as many as 4000 persons, and yet the streets of Naples were at the same time hideous with misery. Outside of the Capuan gate is the cemetery of the non-Catholics, remarkable for the simplicity and elegance of the monuments. The old Campo Santo, that of the victims of the cholera, and the new Campo Santo, are all on the road to the Poggio Reale. The new Campo Santo is of great extent, is laid out with taste, and shows an immense improvement in public sentiment. Among the many objects of interest in the immediate vicinity of Naples is the grotto of Posilipo, the work of Lucullus or of Agrippa. This is a gallery cut through the rocky promontory of Posilipo, about 1850 feet long, 17 or 18 in width, and at the extremities above 50 feet in height, though much lower towards the centre. Just over the E. entrance is the reputed tomb of Virgil. The new marine aquarium, constructed by Dr. Dohrn, is very interesting.

The foundation of Naples is pre-historic, and of course uncertain. The still older town, *Parthenope* or *Palæopolis* (the site of which was probably Posilipo), was, according to the legend, named from the siren Parthenope, here vanquished by Ulysses. Both towns were Greek colonies, and Greek continued to be spoken until the second century of the Christian era. The ancient city was small, but well fortified, and first appears in history as an ally of Rome against the Samnites. It continued faithful to the Romans in their wars with Hannibal, and eventually became the favorite resort of the Roman aristocracy, the ruins of whose splendid villas still meet the eye in every direction. These beautiful shores were then not only the theatre of literary leisure and social pleasures, but of some of the most frightful crimes in the history of the world. After suffering much from the barbarians, it was besieged (537) by Belisarius, who, entering the town through an aqueduct, gave it up to his soldiers. Totila, who took it afterwards, treated it more humanely. Later it became the capital of a dukedom, gradually extending over the neighboring towns and islands, but always partially dependent upon Sicily. The duchy of Naples had fierce conflicts with that of Benevento, sustained itself against the Saracens, and finally employed them as allies in spite of papal excommunication. In 1037 the city fell into the hands of the Normans under Ruggiero, and was well governed by him and his successors as a part of their kingdom. The Suabian dynasty followed in 1194, and in 1250 Naples rebelled unsuccessfully against Conrad, the son of Frederic, but in 1268, at the instigation of the pope, Conradine, the last of his house, was taken prisoner and beheaded by Charles of Anjou, on whom the pope had bestowed the kingdom of Naples. Charles beautified the city and made it his capital. The weakness of Joanna I., the assassination of her husband, etc. brought upon Naples the vengeance of Louis of Hungary, who, entering it preceded by a black flag, treated it with terrible severity, and for a century the greatest disorder and misery prevailed. In 1442, Alfonzo of Aragon besieged the city and entered it through an aqueduct, as Belisarius had done before him. In 1495, Naples joyfully opened her gates to Charles VIII. of France, who, however, was soon forced to share his prize with Spain. Francis I. vainly endeavored to recover it from his rival, Charles V. In the siege of 1528 both besieged and besiegers suffered cruelly from plague and famine. Under the government of the Spanish viceroys Naples presented a scene of disorder and squalor not to be described, while churches were multiplied and convents occupied the most beautiful and healthy positions in the city. Strong efforts were made by the best citizens and the purest ecclesiastics to introduce the Reformed religion, and a popular tumult in 1547 forced Charles V. to annul the order for the establishment of the Inquisition. But cruel religious persecution under other forms and the most intolerable despotism finally brought about (1647) the famous insurrection of MASANIELLO (which see). Not long after, a terrible plague appeared, during which 30,000 persons perished in six months. In 1701 the nobility attempted to overthrow the existing government and place an archduke of Austria at its head. When Charles III. entered the city (1734) he is said to have found 16,500 priests and 30,000 thieves. During the wars of the French Revolution, Naples was several times taken, lost, and re-taken by the French. In 1815 the Bourbons were once more restored; the citizens endeavored to obtain reforms, and the government promised them, but they never came. Remonstrance was followed by repression, resistance by fair promises and foul treachery, until 1860, when, on Sept. 7, Garibaldi entered the city, and the people, being called upon to decide their own destiny, voted for the annexation of Naples to the constitutional kingdom of Victor Emmanuel II. Since then marked changes for the better have taken place; extensive machine-factories (the result of English enterprise) are in operation; native industries are multiplying; common schools have been established; and, though in the neighborhood of the Porto may still be seen too much of that mad gayety

clothed in filthy rags which has made Naples notorious, yet on the whole there is an aspect of greater decency and greater comfort. Trade is increasing; the number of vessels, coasting and others, which enter the port annually exceeds 10,000. The imports consist chiefly of grain, sugar, tea, coffee, spices, and foreign manufactured goods; the exports are fruits, wines, olive oil, madder, and various manufactures of the city and province. The tortoise-shell and coral ornaments made here are very beautiful, and the gloves famous for their cheapness. Naples, however, lacks commercial facilities, is without docks, without magazines for merchandise, etc., and traffic with the interior languishes from insufficient and insecure communication. It is to be hoped that a wiser municipal policy will soon correct these evils; for, notwithstanding the ignorance and degradation of the lowest stratum of society, and the obscurantism of the highest, there is a large and intelligent class among the citizens, and even among the priests, who manifest a keen interest and are ready to take an active part in every true reform. Pop. 448,335.

CAROLINE C. MARSH.

Naples, post-v. of Scott co., Ill., on the E. bank of the Illinois River and on the Hannibal and Naples division of the Toledo Wabash and Western R. R., 46 miles by rail E. of Hannibal, Mo., and 4 miles from the main line of the railroad. Pop. of tp. 597.

Naples, post-tp. of Cumberland co., Me., 30 miles N. W. of Portland, on the N. shore of Sebago Lake. Pop. 1058.

Naples, post-v. and tp. of Ontario co., N. Y., at the head of Canandaigua Lake, has an academy, 4 churches, 3 mills, 2 hardware and 2 drug stores, and repair-shops. It is in a fine fruit-growing section. Pop. of v. 902; of tp. 2188. S. L. DEYO & Co., PROP. "NAPLES RECORD."

Naples, tp. of Buffalo co., Wis. Pop. 1009.

Naples, Bay or **Gulf of,** a portion of the Mediterranean on the S. W. coast of Italy, running inland about 10 miles between Cape Miseno and Cape Campanella, 20 miles distant from each other. Its shores have a world-wide reputation for beauty of scenery and charm of climate.

Naples, Kingdom of, one of the old political divisions of Italy. (See ITALY, also SICILY.)

Napo'leon, post-v., cap. of Desha co., Ark., on the Mississippi, at the mouth of the Arkansas, has important commercial interests on both rivers; has a U. S. marine hospital, churches, schools, etc. It is 628 miles by water above New Orleans.

Napoleon, post-v. and tp. of Jackson co., Mich., on the Michigan Southern R. R., Jackson branch, 10 miles S. E. of Jackson. Pop. 1030.

Napoleon, post-v. and tp., cap. of Henry co., O., 35 miles S. of Toledo, on the Toledo Wabash and Western and the Mansfield Coldwater and Lake Michigan R. Rs., has 1 union school, 6 churches, 2 banks, 2 newspapers, 2 mills, 1 distillery, 2 hotels, machine-shops and a foundry, and stores. Pop. of v. 2018; of tp. 3334.

ORWIG & WISLER, EDS. "DEMOCRATIC NORTH-WEST."

Napoleon I., b. at Ajaccio, in the island of Corsica, Aug. 15, 1769, was the second son of Carlo Bonaparte (1746–85), a man of elegance and ability, but of limited means, and Letizia Ramolino (1750–1836), a lady of great beauty, extraordinary mental vigor, and virtue: he had three sisters and four brothers. Through the influence of Count de Marbœuf, French governor of Corsica, he obtained a free place at the military school of Brienne in 1780, and here, as in Paris, whither he was removed in 1784, the small, thin, sallow-faced Corsican boy with the large black eyes attracted much attention by his talent for mathematics, by the clearness and power of his perceptions in general, and by the imperturbability of his temper. In 1785 he was made a sub-lieutenant of artillery, and in the following years saw some active service in his native country. On the rising of Paoli, who hoped by English support to wrench Corsica from France and make it independent, the family of Bonaparte joined the French party, and Napoleon served against the rebels. But in 1792 the whole family was driven out of the island, and moved in great poverty and distress to Marseilles. In 1793, Napoleon was made a captain, and having taken part with honor in the pacification of Marseilles, he was sent the same year as lieutenant-colonel to the besieging army before Toulon. On Sept. 12 he received the command, and Dec. 19 the English and Spanish, who occupied the city, were compelled to abandon it, although the conquering army was a wretched horde, miserably armed, poorly trained, and without discipline, while the vanquished was a regular corps of high standing. He was made a brigadier-general Feb. 6, 1794, and sent by the Convention to the army in Italy, where he soon acquired great influence with the military commission, especially through young Robespierre. This connection with the son, however, implicated him in the fall of the father (July 28); he was called to Paris, and even imprisoned, and although he was liberated after a couple of weeks, the active command was taken from him. A new period of misery followed. He was so poor that he could not afford to wear gloves or to have his boots blackened, and dangerous visions began to haunt his mind. He thought of going to Asia. "Asia contains 600,000,000 men," he said; "there something can be done; Europe is worn out." He felt inspired at the idea of acting with 600,000,000 men; his enormous energy dared to measure itself with such enormous tasks. He did not go immediately, however. He was too practical a man not to wait for the proper opportunity. The Directory knew about him, and when it saw itself beleaguered in the Louvre by the Parisian mob, and its very existence endangered by the insurrection of the national guard, it sent for him. On Oct. 4, 1795, he received the command of the garrison of Paris, and the next day he cleared the streets with grapeshot, pursued the rioters into their hiding-places, disbanded the national guard, disarmed the populace, and ended the French Revolution. On Mar. 9, 1796, Napoleon married Josephine Beauharnais, widow of Gen. Beauharnais, who had been guillotined in the Reign of Terror. She was not remarkably beautiful, but she had grace; nor was she very accomplished, but she was brilliant. And the deep affection which Napoleon felt for her, and always continued to feel, she returned with a romantic enthusiasm, which on some occasions rose into a most touching devotion. She was rich and somewhat extravagant. Her household was arranged in great style, and her receptions gathered all the celebrities of the day. It was chiefly due to her influence and her intrigues that Napoleon was appointed commander-in-chief of the army in Italy. On Mar. 21, eleven days after his wedding, he left Paris, and now followed till Apr. 18, 1797, the most brilliant campaign the world ever saw. The French army sat perched somewhere on the rocks of the Maritime Alps, watched by the allied Austrian and Sardinian armies—sick, naked, starving, defeated, and demoralized, numbering hardly one-third of the force of the enemy. With this army Napoleon descended from the Alps, defeated the Austrians at Montenotte and Millesimo (Apr. 11 and 15), beat the Sardinians at Ceva and Mondovi (Apr. 20 and 22), defeated the Austrians at Lodi (May 10), shut them up in the fortress of Mantua, and conquered Lombardy in a few weeks. At the end of July a new Austrian army under Wurmser appeared in the field, purposing to relieve Mantua. It was beaten at Lonato and Castiglione (Aug. 3 and 4), at Roveredo and Bassano (Sept. 4 and 8), and Wurmser too was shut up in Mantua. A third and a fourth Austrian army were defeated at Arcole (Nov. 17) and Rivoli (Jan. 14); Mantua was compelled to surrender (Feb. 2), and Napoleon broke into Styria, approaching Vienna. His progress was stopped by the preliminary treaty of Leoben (Apr. 18, 1797), which was followed by the Peace of Campo Formio (Oct. 17). Austria ceded the Netherlands and Lombardy. On Dec. 5 he returned to Paris, and was received with boundless enthusiasm. His genius and his fortune, his youth and his energy, and, more than anything else, the nobleness of his ambition, made him a national hero. The soldiers had seen how entirely he forgot himself in the battle in order to do his duty to France, and the Directory knew that he had behaved in the same manner not only in all diplomatic negotiations, but also in all the enormous money transactions which had taken place through him. The French people heard that "le petit caporal" was as disinterested as he was brave, and he became their idol. The Directory, however, began to fear this man, whose genius and popularity placed him entirely beyond its control; and when he himself proposed an invasion of Egypt, with a further design of conquering the English possessions in India, it readily assented to his plans, and fitted out a magnificent fleet and army for the purpose. On May 18, 1798, he set sail from the harbor of Toulon, and on July 2 he landed at Alexandria, allured thither by the shadow of Alexander the Great. How soon he understood that he was running after a dream is uncertain, but he discovered it early enough not to be lost in the illusion. After the battle at the Pyramids (July 21) he entered Cairo, conquered Egypt, and began a series of reforms which looked like the foundation of a new empire. But when in the spring of 1799 he pushed forward into Syria, he was stopped at St. Jean d'Acre. The siege would be long and difficult, the capture would not be worth anything, the soldiers murmured, and he returned to Cairo. In Egypt, however, he could not remain. Although the army which the Turkish sultan landed at Abukir was not only defeated, but routed and massacred (July 25, 1799), all communication with France had been cut off by the English fleet since Aug. 1, 1798, and his situation was not

only difficult, but it was barren. In the fall of 1799 he gave up the command to Gen. Kleber, secretly left Egypt on a small vessel, escaped happily from the English cruisers, and appeared unexpectedly (Oct. 14) in Paris. The Directory labored at this time not only under great political, financial, and military difficulties, but also under internal dissensions between its members. Napoleon allied himself with the party of Sieyès, and on Nov. 9, 1799, the government of the Directory was overthrown. On Dec. 27 a new constitution was promulgated, and shortly after sanctioned by the French people by a majority of over 3,000,000 votes. Napoleon became first consul, with the whole administration, civil and military, in his hands, and with the power of appointing all public officers and proposing all public measures. He was from this moment the ruler of France. In Jan., 1800, he moved into the Tuileries, where Josephine presided over a gay, elegant, and exceedingly extravagant court.

The first period of Napoleon's government was marked not only with vigor, order, and honesty in the administration, but also with wisdom and sagacity in its measures. The concordat with the pope was concluded and the Church re-established; the lists of emigration were closed, and about nine-tenths of the emigrants returned; the Bank of France was founded, and the finances brought into order; the *Code Napoléon* was produced, and a truly popular scheme of education was started. The beneficial influence of these measures was felt the more vividly that France was undisturbed by wars for two years. Peace was concluded with Austria at Lunéville Feb. 9, 1801, after the brilliant campaign across the Alps and the battle of Marengo, June 14, 1800, and with England at Amiens Mar. 25, 1802. France was increasing without and recovering within, and when Napoleon on Dec. 2, 1804, crowned himself emperor of France in the church of Notre Dame, he acted not only on the basis of a majority of 3,572,329 votes, but also in accordance with the noblest instincts and wisest ideas of this majority. In 1805 the war recommenced. A coalition was formed between England, Russia, Sweden, and Austria. The reason of this war was partly the policy of aggrandizement which France pursued, partly senseless jealousy; and the reduction of France to her boundaries of 1792 was fixed as the purpose of the coalition. But Napoleon literally overwhelmed his enemies before any of them could strike a blow. On Sept. 24 he crossed the Rhine; on Oct. 20 he compelled the Austrian army to surrender at Ulm; on Nov. 13 he entered Vienna, and on Dec. 2 he completely routed the allied Russian and Austrian armies at Austerlitz. Austria had to sue for peace, and bought it at Presburg (Dec. 26, 1805) by ceding all her Italian possessions and Tyrol. Napoleon now endeavored to secure his position as master of Central and Southern Europe by establishing one of his brothers, Joseph, as king of Naples; another, Louis, as king of Holland; his stepson, Eugene, as viceroy of Italy; and his brother-in-law, Joachim Murat, as grand-duke of Berg; and this brought him into collision with Prussia. On Sept. 25, 1806, he left Paris; on Oct. 14 he utterly defeated the Prussian army at Jena; on Oct. 27 he entered Berlin; and the Russians, who hastened to the support of Prussia, were defeated at Eylau (Feb. 8, 1807) and at Friedland (June 14). On July 9 the Peace of Tilsit was concluded, the kingdom of Westphalia was erected for Jerome Bonaparte, the dukedom of Warsaw for the king of Saxony, and the whole northern part of Germany was to remain occupied by French troops. It seems as if Napoleon and Alexander I. of Russia, on their meeting at Tilsit, had come to a sort of understanding with respect to a division of Europe. At least Napoleon's actions indicate such an agreement. One morning (Nov. 13, 1807) the *Moniteur* announced that the dynasty of Braganza had ceased to reign. Next year (May 8, 1808), the Spanish king was compelled to abdicate. Joseph was made king of Spain, Murat of Naples. In Spain, however, the population rose against the arrangement, and Napoleon had to go thither himself to quell the insurrection. Meanwhile, Austria again began war against France. But Napoleon hastened back through France to Germany, took the command Apr. 17, 1809, defeated the Austrians at Thann, Landshut, Eckmühl, and Regensburg (Apr. 19–23), pursued them farther along the Danube, and entered Vienna May 13. On May 21 he was defeated himself at Aspern and Eslingen, but on July 6 he nearly routed the Austrian army at Wagram, and peace was concluded at Vienna Oct. 14, 1809, Austria again ceding large parts of its territory, this time its Polish possessions. On his return to Paris, Napoleon was divorced from Josephine (Dec. 16, 1809)—a step which cost him as well as her great pangs, but which probably seemed to him to be necessary for the consolidation of his dynasty. She had borne him no children, and a connection with one of the old royal families might put a stop to many dangerous intrigues. On Apr. 2, 1810, he married the Austrian archduchess Marie Louise, daughter of the emperor Francis, and on Mar. 20, 1811, she bore him a son, the king of Rome.

This moment is generally considered as the culmination of the career of Napoleon. It appears so, though in reality he was already far down the descent. He had promised a hero—he turned out a business-man, and the higher classes of the French people knew it. That innocence of genius which inspires enthusiasm had gone, while that dignity of character which awakens reverence had never come. He used people, though he knew they were rascals, such as Fouché, Barère, and a thousand others, and he employed means which he knew were despicable, such as the whole police institution of the empire. This reacted on himself. He became false, he told lies, and his falsity again affected his friends. Some of them became traitors, as, for instance, Bernadotte and Murat; his brothers left him; Joseph wished to abdicate, Louis did abdicate. But the worst was that he had made a mistake, and, as business-men are often apt to do, he staked his whole fortune on the blunder. He had no other means of carrying on war against England than starvation, and no other means of starving her than to exclude her from the Continent. This plan was consequently adopted, but, unfortunately, the measure worked both ways; in starving England the Continent was starved. The emperor Alexander of Russia at last refused to carry through the system. Napoleon then gathered on the Russian frontier the largest army Europe had ever seen, consisting of 500,000 men, the flower of the youth of France, with contingents from Germany, Italy, etc., and on June 24, 1812, he crossed the Niemen. On Sept. 15 he entered Moscow, but between the 15th and the 20th three-fourths of Moscow was burnt to the ground, and after lingering for a month among the ruins, for overtures of peace from St. Petersburg, he began the retreat (Oct. 19). The winter was uncommonly severe, and the Russian hordes followed him like a whirlwind. When he left Smolensk he had only 40,000 fighting-men, after crossing the Beresina hardly more than 25,000. Leaving the command to Murat, he hastened to Paris, where he arrived Dec. 18. A new conscription was made, and in the spring of 1813 he again stood at the head of an army of 350,000 men. But the Russian disaster had broken the spell. His enemies, Russia, Prussia, Austria, Germany, gathered around him, and the battle of Leipsic was lost (Oct. 19). He retreated, and the allied armies followed him into France. A new army of 300,000 men was raised during the year 1813, though France was drained nearly to the bottom, and in Jan., 1814, he began operations against the invading enemies. But on Mar. 30 they captured Paris, and on Apr. 4, Napoleon abdicated at Fontainebleau. He descended into the court of the palace to bid farewell to the Old Guard; the Old Guard wept, and there is still a large part of Europe which weeps when it looks at this picture, while another part wonders how the man could live, feels indignant because he did not fall on his sword, and considers the scene an offence against the dignity of human nature. And still there was an afterpiece. The island of Elba was erected into a sovereignty and given him for a residence, together with a very large appanage from France. But he stayed here only from May 3, 1814, to Feb. 26, 1815. Secretly he left the island, and landed (Mar. 1) at Frejus. All France rushed to meet him, the church-bells pealed throughout the country, and his march to Paris was one long triumph. The assembled sovereigns at Vienna began to tremble. After the first effervescence, however, it became evident to him that he had nothing to lean on but the blind instinct of the lower classes and the bad passions of the higher; and even his firmest adherents noticed with anxiety that he slept more and showed a tendency to buy the enforcement of his will. On June 18 he lost the battle of Waterloo, and as he understood very well that it would be impossible now to make terms with his enemies, he went on board the English man-of-war Bellerophon and surrendered himself to his lifelong foe. The English carried him to St. Helena, a lonely rock 1000 miles from the nearest coast, and here he d. May 5, 1821, and was buried under two willow trees. But the grand picture of Prometheus chained to the rocks, a catastrophe worthy of the opening chants, was piteously destroyed by his friends, who filled Europe with stories of his daily quarrels with Sir Hudson Lowe, his jailer. In 1840 his remains were carried to Paris and entombed under the dome of the Hôtel des Invalides. CLEMENS PETERSEN.

Napoleon II. (FRANCIS JOSEPH CHARLES), the only child of Napoleon I. by Marie Louise of Austria, b. in the Tuileries Mar. 20, 1811, and baptized June 9 as king of Rome. After the defeat at Waterloo, Napoleon I. abdicated in favor of his son, and proclaimed him emperor of France (June 22, 1815) under the title of Napoleon II.,

but the allied powers paid no regard to this arrangement. While, in the spring of 1816, Marie Louise went to Parma, which was given her as a sovereignty, but to which her son had no right of succession, the child was brought to Vienna to be educated under the immediate tutelage of his grandfather, the emperor Francis. The boy was entered in the Austrian almanac of state without the name of Napoleon, and his official title was duke of Reichstadt, after a small estate in Bohemia. Many singular rumors spread through Europe concerning the young duke, but they seem to have had no foundation. He was instructed in military science, and in 1830 was made major of a battalion of the regiment Giulay. In Apr., 1832, he was suddenly seized with consumption, and the progress of the disease was so rapid that his mother had hardly time to reach Vienna before his death; he d. in her arms June 22, 1832. As Napoleon III. ascended the French throne, the duke of Reichstadt is generally reckoned among the French sovereigns, under the title of Napoleon II., though he never actually occupied the throne.

Napoleon III. (Charles Louis), the youngest son of Louis Bonaparte, king of Holland, and Hortense Beauharnais, the stepdaughter of Napoleon I., b. at Paris Apr. 20, 1808. The parents lived separately, the children with the mother. After the fall of Napoleon I., Queen Hortense repaired in 1816 to Arenenberg in Thurgau, and Louis frequented for eight years the gymnasium of Augsburg, and after 1824 for some time the military school of Thun. The first part of his public life was somewhat adventurous. He took part in the Italian revolution of 1831, and when this was put down by the interference of France and Austria, he hastened to Poland, but in Dresden he heard of the fall of Warsaw. After the death of his elder brother in 1831, and of the duke of Reichstadt in 1832, he became the bearer of the idée Napoléonienne and the heir of its destiny. He had at first a somewhat fantastic conception of his position. A sort of conspiracy in Strasburg proclaimed him emperor Oct. 30, 1836, but only for two hours. He was brought to Paris, but the government found it too ridiculous to prosecute him; he was sent to America. On Aug. 6, 1840, he landed at Boulogne with 50 men and conquered the tollgates. This time, however, he was sentenced to imprisonment for life, and he remained in the citadel of Ham till May 25, 1846, when he succeeded in making his escape. Nevertheless, the idée Napoléonienne was more than a phantasm, and he himself more than an adventurer. His pamphlets, *Rêveries Politiques* (1832), *Des Idées napoléoniennes* (1839), *De l'Extinction du Paupérisme* (1844), contain much good sense and very little hypocrisy, and in Arenenberg and London, where he lived for a long time and was well known, he was liked and respected. The revolution in Paris of Feb., 1848, brought at once the name of Napoleon into the foreground. But the position which he now took was a little reserved, and his manœuvres against the National Assembly, which tried to exclude him from France, were very shrewd. He was recalled by the French people. On Sept. 25 he took his seat as a member of the Assembly, and on Dec. 20 was elected president of the French republic by a majority of 6,048,872. The relations, however, between him and the Assembly continued disagreeable. He wished his term of office extended to ten years, and his appanage increased to 6,000,000 francs; the Assembly refused. Then he demanded a revision of the constitution and the establishment of universal suffrage; the Assembly refused again. At last, when the candidature of the prince of Joinville for the next presidential election began to show itself as a probability, he dissolved the Assembly (Dec. 2, 1851) and appealed directly to the people, putting down with merciless severity all opposition. But his measures were sanctioned by an overwhelming majority, and on Jan. 14, 1852, a new constitution was promulgated—an imitation of the constitution of 1799—by which he actually became the ruler of France. The transition from this form of government to the imperial monarchy was easy, and took place Dec. 2, 1852, without any disturbances. On Jan. 30, 1853, he married Eugénie de Montijo, and on Mar. 16, 1856, she bore him a son.

While the first part of the life of Napoleon III., before Dec. 2, 1852, shows no other plan than that of acquiring a throne, more especially that of France, it seems impossible to explain the latter simply as a series of manœuvres for the purpose of consolidating this throne. Many of his actions have, and can have, no bearing on his dynastic plans, but all of them have an aspect of incompleteness, as if they were performed by a great man of grand ideas, but whose hands were bound by bad associates, or by a small man of no ideas, but stimulated into action now and then by some mysterious influences. The impression of his life as a whole is not unlike that of the life of his uncle, only on a smaller scale, and with the difference that the uncle started as a genius, the nephew only as a name. The position he occupied in Europe was at one time brilliant. The Crimean war (1854–56), which was only a half success, immensely expensive, and small in its results, brought him into intimate intercourse with the other sovereigns. The Italian war (1859), although likewise only a half magnificence, made him immensely popular. The Mexican war (1862–63) was showy enough, as far as it gave him a crown to dispose of, but from this time people began to entertain certain doubts. His singular stopping short in the very midst of an action had hitherto been explained as depending on some secret wisdom, but it began now to receive explanations of another kind; and although he entertained Europe well enough by the opening of the Suez Canal, the World's Exposition, the rebuilding of Paris, by congresses and visits, yet for the last five or six years of his reign he was felt pressing on the development of Europe like a nightmare. When, after the battle of Sadowa, the Austrian emperor telegraphed and ceded Venetia to him, Europe laughed and felt the trick, and when in 1870 he declared war against Germany, many expected his fall, though none so piteous an exit. (See Franco-German War.) Died at Chiselhurst, in England, Jan. 9, 1873. Clemens Petersen.

Napoléon Vendée. See Bourbon Vendée.

Napo'li, post-tp. of Cattaraugus co., N. Y. Pop. 1174.

Nap'pe, one sheet of a surface. Thus, if an hyperbola is revolved about its conjugate axis, it will generate a surface which is everywhere continuous; this surface is an hyperboloid of *one* nappe; if the curve is revolved about its transverse axis, it will generate a surface composed of two parts or sheets; this surface is called an hyperboloid of *two* nappes. If an indefinite straight line revolve about another line, which it intersects, it will generate a cone of two nappes, with a common vertex. W. G. Peck.

Naquet' (Alfred Joseph), b. at Carpentras, in the department of Vaucluse, France, Oct. 6, 1834; studied medicine at Paris, and was appointed professor at the medical school in 1863. His principal scientific works are *Principes de Chimie fondés sur les Théories Modernes* (1865), *De l'Atomicité* (1868), *Précis de Chimie legale* (1872). He has become famous, however, by his participation in radical political movements. He was one of the organizers of the congress of Geneva, and his speeches on this occasion cost him fifteen months' imprisonment, besides a fine. For his *Réligion, Propriété, Famille* (1869) he was also punished by imprisonment and a fine. In 1873 he published *La République radicale.*

Naraka, the general term used by the Brahmans of India for hell, in which they enumerate twenty-one or twenty-eight separate divisions, besides an indefinite number of others not separately named. In the *Institutes of Menu* and the *Vishnu-Purana* may be found elaborate descriptions of the varied and ingenious punishments which there await the impious.

Narbonne', town of France, department of Aude, 8 miles from the Mediterranean. It is an old town, and was known to the Greeks 500 B. C. In 118 B. C. it was colonized by the Romans, and in the times of the emperors it became a magnificent city, the capital of Gallia Narbonensis, adorned with temples, triumphal arches, and amphitheatres, and famous for the purity and salubrity of its air. Three emperors, Carus (282–283) and his two sons, Carinus and Numerianus (283–284), were born here. In 719 the Saracens took and burnt it; in 859 the Northmen took and plundered it; yet in the twelfth and thirteenth centuries it was a city with 40,000 inhabitants and extensive commercial connections; in 1271 it began building its magnificent Gothic cathedral, but it never finished it. The city sank suddenly. All its splendor has now shrunk into a collection of antiquities. Even its pure air has been spoiled by swamps in the vicinity filling it with their poisonous gases. Its only celebrity at the present time is its honey, which is the best in France, both in color and flavor. Pop. 17,172.

Narcis'sus, a genus of bulbous plants of the order Amaryllidaceæ, natives of the Old World. The genus includes the garden and green-house plants called jonquil, narcissus, daffodil, and polyanthus, cultivated for ornament. They mostly have handsome flowers, appearing in spring, and many are very fragrant.

Narcissus, in Greek mythology, a son of the river-god Cephissus and the nymph Liriope; was celebrated for his beauty, but was punished by Nemesis for his vanity by falling in love with himself on seeing his image in a fountain. Pining away with this love-sickness, his body was metamorphosed into the flower which bears his name. There are other versions of the myth, but the above was the most common, though hardly the oldest.

Narcot′ics [Gr. *νάρκη*, "numbness"], a term used in medicine to refer generically to such drugs as have the power of stupefying the cerebral faculties, or inducing sleep, or deadening ordinary sensibility. No exact division of narcotics can be made, but such drugs as opium, belladonna, stramonium, henbane, Indian hemp, chloral, and the ethers are those to which the term is commonly applied. (For the properties and uses of these drugs see the individual headings.) EDWARD CURTIS.

Nar′do, town of Southern Italy, province of Lecce, about 4 miles from the Gulf of Taranto and 12 from Gallipoli. It is a very ancient city, mentioned both by Ptolemy and Pliny, and its intrenched walls with their twenty-four towers, as well as the old castle, still recall the feudal age. The episcopal palace, a modern building, is very fine, and the cathedral contains some pictures of interest. The University of Nardo had a high reputation from the tenth to the fifteenth century, but at the present day its only literary boast is two small libraries—one, of about 4000 volumes, belonging to the episcopate; the other, consisting of the slender collections found in the lately suppressed convents, and making in all about the same number, has been given to the municipality by the government. The inhabitants of this town are mostly engaged in agricultural and pastoral pursuits, and even the beautiful cotton counterpanes for which it was famous thirty years ago are no longer made here. Pop. 10,220.

Nares (EDWARD), D. D., b. at London in 1762; educated at Christ Church, Oxford, and became fellow of Merton College 1788; took orders in the Church of England 1792; married a daughter of the duke of Marlborough 1797; became rector of Biddenden, Kent, 1798; Bampton lecturer 1805, and professor of modern history at Oxford 1814. He published, among other works, *The Plurality of Worlds* (1802), *Thinks I to Myself*, a novel (1811), *Elements of General History* (1822), and *Memoirs of William Cecil, Lord Burghley* (3 vols., 1828–31). D. at Biddenden Aug. 20, 1841.

Nares (ROBERT), F. R. S., b. at York, England, June 9, 1753; was educated at Christ Church, Oxford; took orders in the Church of England 1778; became rector of Sharnford, Leicestershire; assistant librarian at the British Museum 1795–1807; preacher at Lincoln's Inn 1788; canon of Lichfield 1799; archdeacon of Stafford 1800; prebendary of Lincoln and rector of All Hallows, London. With Mr. Beloe he founded and edited the *British Critic* 1793–97; was a contributor to the *Classical Journal;* was vice-president of the Royal Society 1823; published several volumes of sermons and theology, and was author of *Elements of Orthoepy* (2d ed., Lond., 1794) and a valuable *Glossary, or a Collection of Words, Phrases, Names, and Allusions, etc. which have been thought to require illustration in the Works of English Authors* (1822), of which a new edition was published by J. O. Halliwell and Thomas Wright (2 vols., 1861). D. at London Mar. 23, 1829.

Nar′ni [anc. *Narnia*], town of Italy, province of Perugia, about 8 miles from Terni, picturesquely situated almost on the crest of a rocky hill washed by the Nera. Striking as is the aspect of the town from below, it contains no buildings of interest except the very ancient cathedral, the communal palace, and the old castle, now a prison. In its vicinity, crossed by the railway, are the remains of a magnificent Roman bridge built by Augustus; also portions of a very old aqueduct about 14 miles in length, passing through mountains E. of Narni. Here too are the famous thermal springs praised by Pliny the Elder under the name of Carestia. Narni, named from the Nera or Nar, resisted Hannibal successfully; was occupied by the duke of Spoleto in the ninth century; was cruelly sacked and burned at a later period, and never after recovered its prosperity. It was the birthplace of the emperor Nerva. Pop. 10,000.

Na′ro, town of Sicily, province of Girgenti, about 15 miles from the town of Girgenti. It is well built, and contains some fine churches and an old feudal castle with four towers. In the neighborhood are remains of ancient aqueducts, grottoes, and sepulchres. There are also productive sulphur-mines in the vicinity. Naro is said to have been built by the Saracens on the ruins of the ancient *Motyum.* Tasso in his *Gerusalemme* calls it *Naja.* Pop. 10,336.

Narragan′sett Bay reaches N. 28 miles from the Atlantic into the State of Rhode Island. It is deep and well sheltered from the sea, containing the islands of Aquidneck (or Rhode Island proper), Conanicut, Prudence, and other smaller ones. Its climate is mild as compared with the rest of New England. It has valuable fisheries, and receives the noble estuaries of the Providence and Taunton rivers.

Narragansett Pier, post-v. of South Kingston tp., Washington co., R. I., 7 miles E. of Kingston, the county-seat. It is on the seashore, and is a popular place of summer resort.

Narragansetts, a tribe of Algonkin Indians who at the settlement of New England possessed a territory nearly the same as the present State of Rhode Island, and gave their name to its magnificent bay. For some years, under their chief Canonicus, they refrained from hostilities, were friendly to Roger Williams, with whom they made a treaty 1536, aided the colonists against the Pequots, ceded a large tract of land to Gorton in 1644, and took up arms in 1645, but soon made peace. In the great war with King Philip (1675) they were suspected of aiding that chieftain, and were consequently twice attacked in force. On the second occasion their swamp-fortress, within the present township of South Kingston, was taken by storm and the tribe nearly annihilated. They subsequently remained at peace, became civilized, gradually intermarried with the whites, and have lost their native language. A remnant numbering about 150 still resides at Charlestown, R. I. A grammar of their language was printed by Roger Williams—*Key into the Language of America* (London, 1643).

Nar′rows, tp. of Macon co., Mo. Pop. 1132.

Nar′rowsburg, post-v. of Tusten tp., Sullivan co., N. Y., at the Narrows of the Delaware River, known also as the Big Eddy. It is on the Erie R. R., 122 miles from Jersey City. The river is here crossed by a fine bridge of a single span of 184 feet.

Nar′ses, b. in the latter part of the fifth century, probably in humble circumstances; was a eunuch and a slave in the palace of the Byzantine emperors. His talents attracted the attention of Justinian, who made him keeper of the privy purse and a member of the council. In 538 he went to Italy as commander of a force sent either to reinforce or to watch Belisarius, but he was recalled in 539. Nevertheless, after the death of Belisarius he was made commander-in-chief in Italy in 552, and his success as a general was most brilliant. At Sentaglio he defeated the Gothic king Totila, who was killed in the battle. He then conquered Rome; defeated Teias, Totila's successor, on the banks of the Sarna, and completely crushed the power of the Goths in Italy. Justinian made him governor of Italy with the title of exarch. He fixed his residence at Ravenna, and governed the country with much severity, but also with much wisdom. Nevertheless, after the death of Justinian and the accession of Justinus II., he was ignominiously deprived of his office in 565, and d. in retirement at Rome in 568. It is said that the invasion of the Lombards, which took place shortly before his death, was an intrigue by him to get revenge on the court of Constantinople.

Nar′va, town of Russia, government of St. Petersburg, on the Narova. On Dec. 30, 1700, Charles XII., with 8000 Swedes, here defeated Peter the Great, with 80,000 Russians. Pop. 6175.

Narvaez′, de (PANFILO), b. at Valladolid, Spain, about 1480; went to the West Indies soon after their discovery by Columbus; took an active part in the conquest of Santo Domingo, Jamaica, and Cuba; was sent in 1520 by Velasquez, in command of an expedition to Mexico, with orders to supersede and imprison Cortés, but was surprised and taken prisoner by the latter at Zempoalla, losing an eye in the engagement; his followers were incorporated with the victors, and rendered essential aid in the conquest of the Aztec empire. On recovering his liberty after five years' captivity, Narvaez unsuccessfully appealed to the Spanish government for the punishment of Cortés. In 1528 he was given command of an expedition of 400 men with which to found a colony in Florida; discovered Tampa Bay; landed Apr. 16, 1528; engaged in hostilities with the natives, and while coasting in boats along the N. shore of the Gulf of Mexico perished in a storm near the mouths of the Mississippi, Sept., 1528. The only survivors were Alvar Nuñes, Cabeza de Vaca, and three companions, who after eight years' wanderings reached Mexico through Texas and Sonora, 1536.

Narvaez (RAMON MARIA), duke of Valencia, b. at Loja, Spain, Aug. 4, 1800; entered the army in youth, and in the first Carlist war attained the position of captain-general of Old Castile. He took part in an attempted revolution against Espartero in 1839, and had to take refuge in France, where he plotted with the ex-queen, Maria Christina, in whose interest he placed himself at the head of an expedition with which he penetrated to Madrid in 1843 and overthrew the government of Espartero. In the following year he became prime minister; was created field-marshal, count of Cañadas Altas, and duke of Valencia, and effected the formation of a new constitution (1845), suppressing with rigor all opponents. In 1846 he quarrelled with the ex-queen, resigned his post, and went as ambassador to France; resumed power in 1847, but soon lost it again for

the same reason as before. In 1849 he was again at the head of the government during the diplomatic quarrel with England which culminated in the withdrawal of the British ambassador, Sir Henry Bulwer. In 1851 he went as ambassador to Vienna; became again prime minister in 1856; repressed several revolutionary outbreaks and took stringent measures against the press; was overthrown Nov., 1857; was again prime minister from Sept., 1864, to June, 1865, and from July, 1866, until his death, at Madrid Apr. 23, 1868.

Nar'whal [Icelandic *náhvalr*], or **Sea-Unicorn** (*Monodon monoceros*, Linn.). The narwhal, belonging to the family of the Delphinidæ, or dolphins, amongst the cetaceans, has long been considered one of the great curiosities of natural history. It is most nearly related to the white whale (*Delphinapterus catodon*), and forms with it the subfamily Delphinapterinæ. Belonging to an order in which many of the members never develop teeth at all, it, of all animals, is supplied with a tooth altogether out of proportion to its size; and this tusk is moreover developed in utter contravention of the rules of bilateral symmetry, which in every other known case amongst vertebrates govern the production of the teeth. In both sexes the lower jaw is edentulous; in the male the upper jaw is provided, on the left side, with a fully-developed tusk, which attains to a length of from eight to ten feet. This tusk is straight, spirally grooved externally, and hollowed within into a persistent pulp-cavity. On the right side the corresponding tooth generally remains hidden, smooth and solid, within the jaw. These teeth are generally described as incisors, but erroneously, as the alveoli are situated at the junction of the intermaxillary and maxillary bones, and, according to Mivart, are even "embedded entirely in the maxilla." In addition to these, there are two small rudimentary molars concealed in the upper jaw. The female, although as a rule without apparent teeth, has the incipient tusks concealed in the jaw; one of these is, however, said to be sometimes developed as in the male; and in the latter also both are sometimes symmetrically produced. The narwhal in form of body resembles the porpoises; its mouth is small, and its single spiracle or blow-hole is situated on the top of the head. Its flippers or "fins" are small, and it has no dorsal fin. It attains to a length of fifteen feet, exclusive of the tusk, and in color is marbled with brown and whitish. The single species inhabits the Arctic seas, where it lives largely on cuttle-fishes, and in its turn serves an important purpose in the domestic economy of the Esquimaux, yielding them a large supply of oil, etc., and an ivory of considerable commercial value.

EDWARD C. H. DAY.

Nasawaupee, tp. of Door co., Wis. Pop. 346.

Nascapees', or **Naskapis,** an Indian tribe of Labrador, the most eastern branch of the Algonkin stock, occupying the interior table-land from Lake Mistassini to the Atlantic. They are closely related to the Montagnais in language, but, unlike them, have profited to but a very limited extent by the missions which have been sent among them at intervals for more than two centuries. They are the tribe called by Gallatin Scoffies and Sheshapootosh, but these names were entirely erroneous and are not known in Labrador. A few devotional works have been printed, and grammars of the language exist in manuscript. In 1870 they were estimated by the government at 2860.

Nas'cent State, in chemical transformations [Lat. *nascens*, "being born," "coming into existence"], a term in use in chemical writings to express the general fact that some elements and compounds manifest, when in the state of evolution from previous combination, tendencies to combine directly with, and even to decompose, bodies to which they are indifferent or upon which they are inactive, *after* actual evolution or assumption of a free state at common temperatures. The most familiar and the most remarkable examples of this class of phenomena are exhibited by the element HYDROGEN (see under this head). When evolving from combination in a diluted acid by means of a soluble metal, it is endowed with affinities so much exalted that it will not only combine with other elements that may be present, such as sulphur, phosphorus, arsenic, carbon, etc., but will in many cases decompose oxides or other compounds of these elements, combining with and carrying off the latter in gaseous or volatile forms of combination. Thus, when common iron, which contains carbon, is thus dissolved in a diluted acid, hydrocarbon gases and vapors of a very interesting kind are found mixed with the hydrogen gas, giving it the peculiar disagreeable odor with which most persons are familiar, *pure* hydrogen being odorless. In more recent chemical writings and textbooks there is often a tendency to attach but little importance to the phenomena of the nascent condition, passing them over with a brief mention and definition. This is probably because little or no progress has been made towards a clear explanation of the facts which are generalized under this term. These facts cannot thus, however, be destroyed; and the science of chemistry, properly so called, must include them and give them a most prominent place in any comprehensive theoretical view that is likely to be of permanent value and endurance. Thus, the idea may be thrown out that there should certainly be a connection with the fact that water when mixed with acids undergoes *condensation*, and that therefore water in diluted acids, and its contained hydrogen, are not specifically, either physically or chemically, the same bodies as pure water and its contained hydrogen, but have molecules more condensed—endowed, we may be sure, with some greater energies. This illustration is merely used to support the view that the so-called nascent state and its connected phenomena demand study, and cannot be ignored as a mere form of words without definite significance in science.

HENRY WURTZ.

Nase'by, a v. of England, county of Northampton, is famous for the battle (June 14, 1645) in which Cromwell utterly defeated Charles I.

Nash, county of Central North Carolina. Area, 375 square miles. It is generally level and productive. Cotton, corn, and live-stock are leading products. The county has a rich gold-field of small extent. Tar River flows through the county, and Fishing Creek is the N. boundary. Cap. Nashville. Pop. 11,077.

Nash (ABNER), b. in Prince Edward co., Va., about 1730; removed at an early age to Newbern, N. C., where he became a lawyer; was a member of the provincial congresses of 1774 and 1776, of the council 1775, and of the house of commons 1777–78; was Speaker of the senate 1779, governor 1780–81, and delegate to the Continental Congress 1782–84 and 1785–86. His first wife was the widow of Gov. Arthur Dobbs. He d. at New York Dec. 2, 1786.

Nash (Gen. FRANCIS), brother of Abner, b. in Virginia; settled in Orange co., N. C., where previous to the Revolution he was clerk of the superior court of the county; served as captain of the royal militia in suppressing the "Regulators" at the battle of the Alamance 1771; was a member of the provincial congress of 1775, by which he was appointed lieutenant-colonel; was made brigadier-general by the Continental Congress Feb., 1777; commanded a brigade at Brandywine and Germantown; was mortally wounded at the latter battle, and d. at Kulpsville, Pa., Oct. 17, 1777. A monument to his memory, voted by Congress, was never erected, but one has been placed over his grave by subscription of the citizens of Germantown and Norristown.

Nash (FREDERICK), son of Abner, b. at Newbern, N. C., Feb. 9, 1781; graduated at Princeton in 1799; became a distinguished lawyer; served frequently in the State legislature; was judge of the superior court 1818–26 and 1836–44, and of the supreme court from 1844 until his death, which occurred at Hillsborough Dec. 4, 1858.

Nash (JOHN), b. in London, England, in 1752; became a distinguished architect; obtained in 1797 a patent for improvements in the construction of the arches and piers of bridges; was much employed in designing mansions for the nobility and gentry. In 1815 he was taken into the government service, and for many years thereafter was engaged in laying out streets and public edifices in London. Regent street, the terraces of Regent's Park, Haymarket Theatre, Buckingham Palace, and the Pavilion at Brighton are favorable specimens of his skill. D. at East Cowes Castle May 13, 1835.

Nash (JOSEPH), b. in England about 1812; became distinguished as a painter in water-colors, especially as a delineator of architectural subjects, and of historical scenes in illustration of Shakspeare and Sir Walter Scott, and published *The Architecture of the Middle Ages* (folio, 1838) and *Mansions of England in the Olden Time* (4 vols. folio, 1839–49).

Nash (RICHARD), known as BEAU NASH, b. at Swansea, Wales, Oct. 18, 1674; studied at Oxford, but was expelled about 1690; held for some time a commission in the army, and began the study of law at the Temple; became famous as a diner-out, a gamester, and leader of fashionable dissipation, and in 1704 undertook the management of the balls at Bath, then the most celebrated watering-place in England. For fifty years he was master of ceremonies, acquiring a wide notoriety for his strictness in enforcing decorum in the midst of gayety and dissipation, and was popularly called "the king of Bath." He made his living chiefly by gaming, and was noted for generosity. In his old age he fell into neglect and often experienced destitution. D. at Bath Feb. 3, 1761. He was honored by a public funeral, and his *Life* was written by Goldsmith.

Nash (Thomas), b. at Lowestoft, Suffolk, England, in 1567; graduated at Cambridge 1584; settled in London in 1589; engaged in the famous "Martin Marprelate controversy," publishing several pamphlets in grotesque style upon the prelatical side, and wrote a number of dramas; he lived in extreme poverty. One of his spectacular plays, *Summer's Last Will and Testament*, was represented before Queen Elizabeth in 1592, and he aided Marlowe in his *Dido, Queen of Carthage*. D. London, probably 1601.

Nash (William), D. D., b. in Stuttgart, Germany, in 1807; educated at the University of Tübingen. While yet young became a M. E. minister in the Western U. S., and founded American German Methodism. Since 1859 has edited the German publications of the M. E. Church; is author of a German commentary, *Christological Meditations*, etc.

Nasho'ta Mission, post-v. of Waukesha co., Wis., near the Milwaukee and St. Paul R. R. It is the seat of the Nashota Theological Seminary (Protestant Episcopal), founded in 1847.

Nash'ua, tp. of Ogle co., Ill., on the E. side of Rock River. Pop. 483.

Nashua, post-v. of Chickasaw co., Ia., on Cedar Falls and Minnesota R. R., has valuable water-power, 2 banks, 1 flouring-mill, 1 newspaper, and several hotels. It is surrounded by good farming land. P. 817.
Joseph F. Grawe, Ed. "Nashua Post."

Nashua, city of Hillsborough co., N. H., on the W. bank of the Merrimack River, 35 miles S. of Concord and 40 N. W. of Boston, was incorporated as a city in 1853, and ranks second in point of manufactures, third in population, and fourth in wealth. It is the terminus of the Nashua and Lowell, the Concord Milton Worcester and Nashua, the Acton and Boston, and the Petersburg Nashua and Rochester R. Rs. It has, besides its manufactories, which produce annually goods to the value of $7,393,500, 28 schools, 11 churches, 3 banks, a public library of 6000 volumes, 2 daily and 2 weekly newspapers, and 7 printing-offices. Pop. 10,543. Ed. "Gazette."

Nashua River, rises in Worcester co., Mass., flows N. E., and falls into the Merrimack at Nashua, N. H. It affords great and well-utilized water-power.

Nash'ville, tp. of Jackson co., Ala. Pop. 557.

Nashville, post-v., cap. of Berrien co., Ga., 25 miles N. W. of Stockton, which is on the Atlantic and Gulf R. R. Pop. 95.

Nashville, post-v., cap. of Washington co., Ill., on the St. Louis and South-eastern R. R., has good schools, several churches, 2 banks, 3 mills, 3 newspapers, and 4 hotels. Pop. 1640. J. B. Matlack, Ed. "Journal."

Nashville, post-v. of Washington tp., cap. of Brown co., Ind., has 1 weekly newspaper. Pop. 270.

Nashville, post-v. of Barry co., Mich., on the Grand Rapids division of the Michigan Central R. R., has a union school, 2 churches, 1 newspaper, and manufactories. Pop. 642. Orno Strong, Ed. "Nashville News."

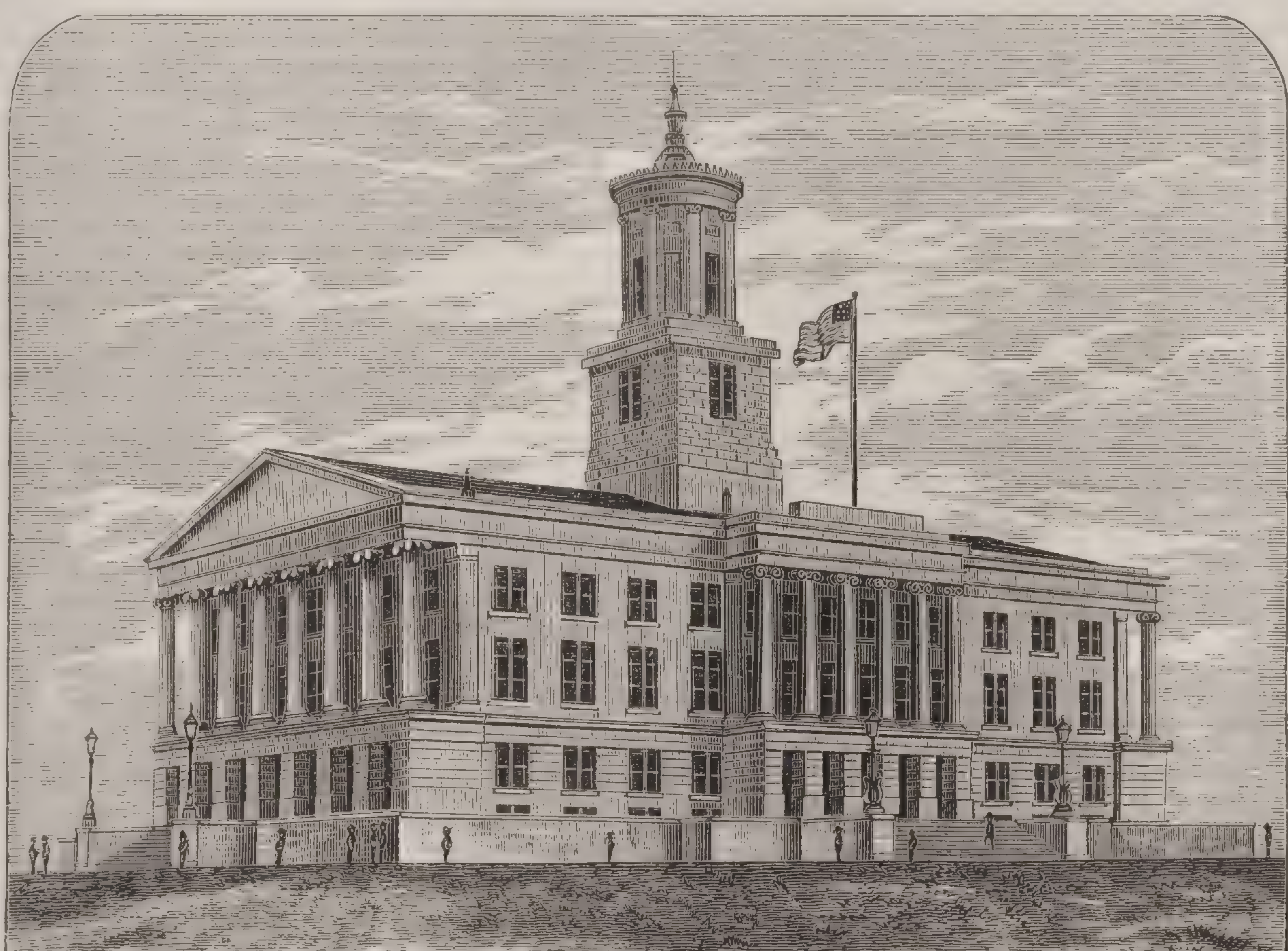
Nashville, tp. of Martin co., Minn. Pop. 508.

Nashville, post-tp. of Barton co., Mo. Pop. 466.

Nashville, post-v., cap. of Nash co., N. C., 12 miles W. by N. of Rocky Mount, which is on the Wilmington and Weldon R. R.

Nashville, post-v. of Holmes co., O., 4 miles S. of Lakeville, which is on the Pittsburg Fort Wayne and Chicago R. R. Pop. 208.

Nashville, city, cap. of Tennessee, and seat of justice of Davidson co., in 36° 10′ N. lat. and 86° 49′ W. lon., on the S. bank of the Cumberland River, 200 miles above its mouth, here spanned by a Fink truss railway bridge and a fine suspension bridge. The river is navigable below Nashville for nine months in the year, and to Carthage, several hundred miles above, for some time. The city rests on a rocky foundation, the river-bluffs rising 80 feet above low-water mark. On Capitol Hill, overlooking the city, is situated the State capitol, built of Tennessee granite, and one of the finest and costliest buildings in the U. S. The city is supplied with water and gas, has 6 public school buildings, the Vanderbilt (named in honor of Cornelius Vanderbilt of New York, who contributed $700,000 to its establishment), Fisk, and Nashville universities (see Nashville, University of), the Montgomery Bell Academy, 2 seminaries, and a medical college and hospital, 37 churches, and the publishing-house of the M. E. Church, South. Six railroads connect it with all points, and 12 macadamized turnpikes enter the city. It is the chief commercial centre and wholesale market S. of the Ohio River. It requires an average of $5,000,000 to handle the cotton crop which comes into it. It received over 2000 hogsheads of tobacco in 1873, which was doubled in 1874, and showed a greater increase in 1875, and the construction of several large tobacco warehouses. The dry goods business aggregates $4,000,000 annually; the liquor-trade about the same; the boot and shoe interest amounts to $2,000,000 annually; while the grocery, provision, drug, furniture, coal, and other trades show an actual business of over $50,000,000 annually. The city is supplied with a paid fire department, with steam-engines, an electric fire-alarm telegraph, and 6 horse-car routes. It has a cotton-factory, 7 saw and 5 flouring mills, 8 planing and sash factories, 2 cotton-seed oil-mills, 2 tanneries, 4 furniture and 4 carriage factories, 6 foundries and machine-shops, 2 daily and 21



State Capitol, at Nashville, Tenn.

newspapers of all kinds, and a number of smaller manufacturing interests. Two mineral springs (sulphur and chalybeate), located within the corporate limits, are far-famed. Pop. 25,865. ALBERT ROBERTS, ED. "AMERICAN."

Nashville, Battle of. The BATTLE OF FRANKLIN (which see) was not ended until 10 P. M. of Nov. 30, 1864, but during that night Gen. Schofield withdrew, and by noon of Dec. 1 occupied the heights surrounding Nashville, which place was now strongly fortified. Hood's advance appeared before Nashville by noon of the 2d, and by the morning of the 4th he had established his lines in front. By this time, however, the command of A. J. Smith had arrived from Missouri, and Steedman with 5000 men and Morgan's division from Chattanooga, which, with convalescents and one-year recruits, raised the effective force of Thomas to nearly that of Hood; leaving the latter, however, still superior in cavalry, Thomas having been stripped to outfit Gen. Sherman's column. Impressed with the necessity of having an effective cavalry force, Thomas used every exertion to remount his troops, and would have been ready to commence an offensive movement at an earlier day but for a storm of sleet on the night of Dec. 8, by which the armies were icebound until the 14th, when, the weather moderating and Thomas being ready, a plan of attack for the next morning, weather permitting, was agreed upon that night. A dense fog prevailed in the morning (15th), but soon lifted sufficiently to permit the movement of the troops to the positions assigned them, and the original plan of operations for the day, with but slight change, was successfully carried out, resulting in driving the army of Gen. Hood out of its original line of works, and back to a position along the base of Harpeth Hills, and the capture of 16 pieces of artillery and 1200 prisoners. His loss in killed and wounded was also heavy, while Thomas suffered but little. The battle was resumed by Thomas on the morning of the 16th, and continued until the Confederate lines were hopelessly broken and the shattered army was in full retreat, closely followed by the victors until dark. During the two days' operations 4462 prisoners were taken, 53 pieces of artillery, and many small-arms. The pursuit was continued next day, and until the 27th, when the remnant of Hood's army succeeded in crossing the Tennessee, after which pursuit was abandoned by the main army, though Col. Palmer, with a body of cavalry, starting from Decatur, overtook the flying army and destroyed over 300 wagons, 78 pontoon-boats, and 500 mules. The results of this campaign, extending from Sept. 7, 1864, to Jan. 20, 1865, were 13,189 captured Confederate prisoners, 72 pieces of artillery in good condition, 2000 deserters. The estimated loss of Thomas was 10,000 in all. Hood escaped with a mere wreck of his army, and at his own request was relieved from command Jan. 23, 1865.

Nashville, University of. The University of Nashville dates its origin more than ten years anterior to the birth of the State of Tennessee. In 1785 it was founded, incorporated, and endowed under the name of the Davidson Academy. The same institution, under one name and another, has shared the vicissitudes and fortunes of the feeble settlement, the rising city, and the growing State even to the present day. As it now approaches the close of the first century of its history, its friends may contemplate with satisfaction the benefits it has widely scattered over the land, and may point with pride to the long catalogue of those who have gone forth from its halls to the great duties of life. There are ten schools in the collegiate department. Each student selects the schools which he attends, but is required to attend at least three. They are the schools of Latin; Greek; French and German; English language and literature; mental philosophy and political economy; pure mathematics, chemistry, and natural philosophy; natural history and geology; agriculture; engineering; and architecture. The Montgomery Bell Academy is the preparatory school of the university, and had its origin in the benevolent bequest of a late worthy citizen of Tennessee, whose honored name it bears. It is largely patronized, and annually furnishes gratuitous instruction to a number of students of the State. While it supplies an excellent education to the business-man, it also qualifies the student for the studies of the college and other schools of the university. The medical department was opened in 1850. Unprecedented success gave it in 1861 the second position in point of patronage among all the medical colleges in America, and a position second to none in appliances and instruction, uniformly maintained even to the present date. Its museum is one of the largest in the U. S., and contains models of incalculable usefulness not found elsewhere. This department was never better prepared than at present for giving a thorough course of medical instruction. The number of students annually in attendance varies from 400 to 600. The expenses, including tuition, board, furnished rooms, etc., are from \$165 to \$180 per semi-annual session in the collegiate department. The tickets to the course of lectures in the medical department, \$50. The annual session opens on the first Monday in September, and the second term of the session commences on the last Monday in January of each year. The buildings, situated on an elevated campus of sixteen acres, 1 mile from the public square, consist of a large stone edifice, containing lecture, recitation, and society rooms, libraries, and offices; an imposing brick building three stories high, in which the students are quartered; a large building for the accommodation of professors and families; an edifice appropriated to the medical college, with lecture-rooms, museum, etc. [Since the foregoing was written the chancellor, Gen. E. Kirby Smith, and faculty, have resigned, and the buildings of the literary department, with the funds, increased by a Peabody donation, are devoted to normal instruction.]

Na'smyth (JAMES), b. at Edinburgh Aug. 19, 1808; was educated at the School of Arts and the Edinburgh University; removed to London, and in 1834 to Manchester, where he became a successful machine constructor and inventor. The steam-hammer, steam pile-driver, improved forms of ordnance, etc. are among his inventions. He also acquired fame as a practical astronomer, giving special attention to selenography, in which he employs telescopes and other instruments of his own construction.

Na'so, town of Sicily, province of Messina, S. of Cape Orlando, and very near the Mediterranean. The river from which this town is named flows into the Tyrrhene Sea near Cape Orlando, at a point called San Gregorio, and here vessels often seek shelter during tempests. It is much frequented by coasters trading in nuts and cocoons, and a fine harbor might be constructed here at small expense and to the great advantage of navigation in these waters. It is a walled town, and contains some churches interesting for their architecture. In 1823 it was severely injured by an earthquake. The Maria Santissima, a very old sanctuary, stands on the raised promontory of Cape Orlando. Pop. 8172.

Na'son (ELIAS), M. A., b. at Wrentham, Mass., Apr. 21, 1811; graduated at Brown University in 1835; gave much attention to the languages, music, and botany; was for a time teacher and editor in Georgia, and in 1840–49 an instructor in Newburyport, Mass.; has held Congregational pastorates in Massachusetts and New Hampshire; author of *Lives* of Sir C. H. Frankland (1868), Susanna Rowson (1870), Nathaniel Howe (1851), Charles Sumner (1874), and Henry Wilson; also of a *Gazetteer of Massachusetts* (1874) and other works.

Nas'sau, formerly an independent duchy of Germany, but since 1866 forming part of the Prussian province of Hesse-Nassau, comprises an area of 1800 square miles, with 468,311 inhabitants. The country, extending along the Rhine, the Main, and the Lahn, and traversed S. by the Taunus and N. by the Westerwald, is beautiful and rich. The mountains are covered with extensive forests abounding in game, and contain iron, lead, copper, coal, marble, and building-stone. The valleys produce wheat, tobacco, flax, and fruit of superior quality, and the choicest Rhenish wines, such as Johannisberger, Hochheimer, Rüdesheimer, and Marcobrunner. As celebrated as its wines are its mineral springs; the watering-places which are built around them, such as Wiesbaden, Ems, and Selters, are visited by people from all parts of the globe. But this land was ruled by one of the most narrow-minded and stupid of families; and its history from 1793 to 1866 is a fine bit of humor now that its blunders and calamities are past.

Nassau, town of New Providence, and capital of the BAHAMA ISLANDS (which see). It has a good harbor, is fortified and well built, and celebrated for its salubrious climate. Pop. about 9000.

Nassau, county of N. E. Florida. Area, 400 square miles. It is bounded E. by the Atlantic Ocean, N. and W. by Georgia, from which it is separated by the navigable St. Mary's River. It is heavily timbered, and has a soil of varied character, adapted to the culture of all the products of the South. The county is traversed by the Florida R. R. Cap. Fernandina. Pop. 4247.

Nassau, post-v. of Rensselaer co., N. Y., in a township of the same name. The township is diversified with hills and lakes, is traversed by the Harlem Extension R. R., contains several villages, and has considerable manufacturing interests. Pop. of v. 348; of tp. 2705.

Nasser-ed-din, shah of Persia, b. in 1829, son of the late monarch, Mehemet (or Muhammad) Shah, by Queen Velliat of the Kadjar tribe, and grandson of Abbas Mirza; succeeded to the throne Sept. 10, 1848; suppressed several revolts of the nomadic tribes; maintained neutrality dur-

ing the Crimean war, at the close of which he signed a treaty with Russia; waged a nominal war against England in 1856, which was terminated by the Treaty of Paris 1857; gave his support to the passage of the Anglo-Indian telegraph through his dominions 1866; visited the principal countries of Europe 1873, and wrote an amusing diary, which has been translated by J. W. Redhouse. The shah's desire to introduce reforms and material improvements into his kingdom actuated this visit, and was exemplified by the Reuter concession (1873), subsequently annulled, and by the fact that he has learned French and Turkish in order to familiarize himself with the history and condition of European countries.

Nas'sick, or **Nashik,** town of British India, presidency of Bombay, on the Godavery, near its sources, is one of the principal seats of Brahmanism, and contains numerous temples, generally built of black basalt, and many ecclesiastical and theological institutions. It seems also to have been a prominent Booddhist place, as it contains several very striking Booddhist monuments. Pop. about 25,000.

Nast (Thomas), b. at Landau, Bavarian Palatinate, Sept. 27, 1840; came with his father to the U. S. in 1846; received only six months' art-instruction under Theodor Kaufmann; began when fifteen years old to furnish illustrations for papers; was in Europe 1860–61, and during the war began his long series of powerful and effective political caricatures, most of which have appeared in *Harper's Weekly*.

Nastur'tium [Lat., "nose-twist," from its pungent quality], a genus of cruciferous herbs, mostly aquatic, containing many species, among which are water-cress and horseradish. (See Cress and Horseradish.) Popularly, the names nasturtium and nasturtion (often abridged to 'sturtion) are given to *Tropæolum majus*, a fine, showy climbing herb, a native of Peru, often seen in gardens. Its orange flowers are used in salads, and its pungent buds and fruit are pickled and incorrectly called capers.

Nasua (Storr), a genus of the Ursidæ or bear family. The coatis or coatimondis are closely allied to the raccoons of the U. S., which they much resemble in appearance and habits. They have, however, longer and more mobile muzzles, and are restricted to the tropical parts of America. Edward C. H. Day.

Natal', an English colony on the south-eastern coast of Africa, extending along the Indian Ocean from lat. 28° to 30° S., and bounded S. by Kaffraria, from which it is separated by the Umzimculu; N. by the Tugela River, which divides it from Zululand; and W. by the Quattilamba (or Drachenberg) Mountains, which form the boundary between it and the Orange River Free State. Area, 25,000 square miles. Pop. 130,000, of whom 10,000 are English, Dutch, and German settlers, and 120,000 aborigines, belonging to the Zulu tribe, one of the most gifted and docile of the Kaffir races. The surface rises from the low coast-land, where cotton, rice, and sugar are grown, through terraces where the common European cereals and fruits are cultivated, into an elevated table-land at the foot of the Quattilamba, where excellent pastures are found. Sugar is the chief product. Elephants, hippopotami, lions, leopards, crocodiles, and poisonous serpents are frequent in the jungles of the low coast-land. Cap. Pietermaritzburg.

Natal, or **Rio Grande do Norte,** town of Brazil, the capital of the province of Rio Grande do Norte, on the Potengi. It has a good harbor, whose entrance, however, is impeded by a sandbar, and has 10,000 inhabitants.

Natato'res [Lat. "swimmers"], an artificial combination of birds, agreeing only—and but partially even in this respect—in being adapted for swimming. It was formerly regarded as an order or sub-class, but is now discarded by the best authorities. The group is characterized by having the upper part of the "crus" (tibia and fibula) enclosed within the skin of the trunk, and by having the feet generally webbed (the toes connected together by membrane as far as the claws). In addition to the above characters, the legs are placed comparatively far backward, and are usually short; the hind toe is occasionally altogether wanting; the plumage is thick and well supplied with oil from the gland on the rump. The Natatores of Illiger (a. d. 1811), thus characterized, correspond to the "palmated birds" or "swimmers," the third division of Willoughby's (1678) water-birds, to the Anseres of Linnæus, and to the Palmipedes of Latham and Cuvier. The term Natatores is sometimes rendered into English literally as "the swimmers;" otherwise the group is known as "the water-birds." But, admirably fitted as the Natatores are for an aquatic life, there are some members of the group which have so far diverged from the typical habit as seldom to approach the water, and many sea-fowl do little more than obtain their prey from that element by darting down on it from the air. On the other hand, the more typical forms live almost altogether on the water, some flying badly, or altogether unable to fly, by reason of the shortness or rudimentary condition of their wings, and only visiting the land for temporary rest or breeding. We thus find in it illustrations of extremes of habit and of structure—penguins, with wings reduced to almost fin-like appendages, associated with the longest-winged, the most powerful, the most enduring, the most graceful, and the swiftest of flyers, such as we find amongst the frigate-birds, the albatrosses, and the terns. So also some species are carnivorous, disdaining neither fish, insect, nor carrion, whilst others are almost exclusively herbivorous; and whilst some carry food to their helpless young (*Altrices*), the young of others (*Præcoces*) are enabled to seek their own food almost as soon as hatched. So important has this last distinction seemed that some former authorities raised the question whether, after all, the group as a whole was as natural as it seemed, and whether it did not really contain the elements of two sub-classes.

The Natatores, as might be expected from their habits, are found abundantly distributed in all parts of the world, and many species have very extended ranges; thus the common skua (*Lestris catarractes*, Linn.) of Iceland and Arctic Europe has been met with in the Straits of Magellan and on the Falkland Islands. (*MacGillivray.*) Numerous as the water-fowl are in individuals, there are, according to G. R. Gray, only about 600 species, and they constitute less than one-eighteenth of known birds.

The Natatores have been variously subdivided into so-called orders and families. We give below a table of the orders of this sub-class, taken from the *Systematic Review of the Class of Birds*, by Prof. Lilljeborg of Upsala, as translated in the *Smithsonian Report* for 1865, and we have added in brackets the names of the "families" of Cuvier that correspond to these "orders:"

Table of Orders of the Sub-class Natatores (Illiger).

Bill
- without lamellæ. Section I. Simplicirostres.
  - Hind toe
    - free or absent.
      - Wings
        - short; legs posterior .... Pygopodes [= Fam. *Brachypteres*, Cuv.]
        - long; extending beyond base of tail; legs at centre of equilibrium. .... Longipennes [= Fam. *Longipennes*, Cuv.]
    - connected by membrane with inner toe, and nearly on a level with others. .... Steganopodes [= Fam. *Totipalmati*, Cuv.]
- lamellate. Section II. Lamellirostres .... Lamellirostres [= Fam. *Lamellirostres*, Cuv.]

Lilljeborg subdivides the above four "orders" into ten "families." Later authorities admit fourteen, viz.:

Pygopodes:
Fam. 1. Aptenodytidæ (= Spheniscidæ) .. Penguins.
2. Alcidæ .... Auks.
3. Colymbidæ .... Loons.
4. Podicipidæ .... Grebes.

Longipennes:
5. Procellaridæ .... Petrels and albatross.
6. Laridæ .... Gulls and terns.

Steganopodes:
7. Sulidæ .... Gannets.
8. Pelicanidæ .... Pelicans.
9. Pelicanidæ .... Pelicans.
10. Phalacracoracidæ .... Cormorants.
11. Plotidæ .... Darters.
12. Tachypetidæ .... Frigate-birds.
13. Phæthontidæ .... Tropic-birds.

Lamellirostres:
14. Anatidæ .... Swans, geese, ducks, mergansers.

Prof. Huxley has proposed a classification of birds founded upon certain osteological characters. In his system the Natatores are broken up into four groups ranged under ten primary divisions. The Cecomorphæ (including the Alcidæ, Colymbidæ, Podicipidæ, Procellariidæ, and Laridæ); and (2) Spheniscomorphæ (including Aptenodytidæ) are grouped, with others, under the name Schizognathæ; and (3) the Chenomorphæ (= Anatidæ) and (4) Dysporomorphæ (=Steganopodes) are combined with many others, as Desmognathæ; the Amphimorphæ (= Phænicopteridæ) are interposed between the Chenomorphæ and Pelagomorphæ (herons, etc.). EDWARD C. H. DAY.

Natch′ez [properly **Natches**], a tribe of Indians of the Huaxteco-Maya family, found by Spanish explorers in 1560, and by La Salle in 1683, occupying a tract E. of the Mississippi embracing the site of the present city of the same name, which was first settled by Iberville. Their customs, language, and religion differed radically from their neighbors, the Choctaws, but were akin to those of the Tensas, Natchitoches, Washitas, and Caddoes. They worshipped the sun, giving the name of "great sun" to their principal chief, whose office was hereditary in the female line, constructed mounds, and had a large temple where a sacred fire was always maintained. The Natchez possessed a civilization seemingly far in advance of the neighboring tribes, which they derived, like the Peruvians, from mythical progenitors. They were noted for licentious customs, but were brave and generally friendly to the French, although Bienville came into momentary collision with them in 1716, and again in 1722. The tyranny of Chopart, governor of Fort Natchez, occasioned a massacre of the French Nov. 28, 1729, from which few escaped. This treachery was avenged by the French, who, during the two following years, availing themselves of an alliance with the Choctaws, killed a large part of the warriors of the tribe, sold above 400 prisoners, including the "great sun" and his family, into slavery in Santo Domingo, and drove the remnant to the borders of Texas. Since that period they have resided with the Chickasaws and Muskogees, and still number 300 souls, retaining their language and governed by a "great sun." The famous account of the Natchez given by Chateaubriand is grossly incorrect. PORTER C. BLISS.

Natch′ez, post-v., cap. of Adams co., Miss., on the E. bank of the Mississippi River, in lat. 31° 34′ N., lon. 91° 25′ W., contains excellent schools, several fine churches, a Catholic cathedral, a Jewish synagogue, a Masonic temple, an Odd Fellows' hall and several lodges of each order, 1 daily and weekly newspaper, 3 orphan asylums, 2 banks, 1 steam saw and planing mill, a cotton-seed oil-factory, 2 steam-ginneries and grist-mills, an efficient steam and hand fire department, and stores and mechanical shops. Principal business, handling cotton. Pop. 9057.

PAUL A. BOTTS, ED. "DEMOCRAT AND COURIER."

Natchitoch′es, a tribe of Indians kindred to the Caddoes, the Washitas, and Capichis, and probably belonging, like the Natchez, to the Huaxteco-Maya family. They formerly lived on Red River, La., having a fortified town on an island, but being dislodged by the fugitive Natchez in 1731, they united with the Caddoes, among whom a small remnant still exists. They worshipped the sun, maintained sacred fire in their principal temple, manufactured salt, and were friendly to the French, with whom they had commercial relations.

Natchitoches, parish of N. W. Central Louisiana, traversed by Red River, and bounded E. by Bayou Saline and Le Rigolet de Bon Dieu. Area, 1250 square miles. It is level and fertile. Live-stock, corn, and cotton are extensively produced. Cap. Natchitoches. Pop. 18,265.

Natchitoches, city, cap. of Natchitoches parish, La., about 450 miles N. W. of New Orleans, has a high school and a good system of public education, 4 churches, 2 wagon, cart, and plough manufactories, 2 tinware establishments, 2 convents, 2 newspapers, the U. S. land-office for the northern district of Louisiana, a fine cathedral, and other public buildings. The surrounding country is well adapted to agricultural pursuits, and large quantities of cotton, corn, molasses, rice, and numbers of horses and cattle are sold here each winter. The city is governed by a mayor and city trustees, elected every two years. It has a large trade with Texas, distant about 25 miles. P. 1401.

J. H. COSGROVE, ED. "PEOPLE'S VINDICATOR."

Natic′idæ [from the proper name, *Natica*], a family of the class of gasteropods and order of Pectinibranchiates, distinguished at first sight by the large foot in which the shell is more or less immersed, at least in crawling. The visceral sac is curled in a more or less depressed helix; the mantle is small; the head more or less produced in an elongated and retractile muzzle; the tentacles are united by a transverse membrane; the eyes situated on peduncles immersed at the outer base of the tentacles; the radula or lingual ribbon has the teeth in seven longitudinal rows; the median is wide, has a distinct basal lamina, and is armed with three primary denticles; the inner lateral is oblique, more or less transverse, produced toward the median tooth, and armed with one strong denticle and more or less numerous smaller ones on each side; the external lateral are claw-like, the inner bifid at the extremity, the outer simple; the foot is very large, but variable in size, greatly developed in front, and there provided with a fold or veil which is reflected upon the head, and conceals in part the tentacles as well as the eyes. The shell is oval, and more or less obliquely depressed, and has an ovate aperture, which is entire in front and pointed behind. The operculum is sub-spiral, but varies in texture and development, it being in some horny and in others calcareous; in those in which the animal is only partially retractile it is quite minute. The family is an extensive one, embracing numerous species diffused throughout all seas. The following genera are now generally recognized: *Natica, Surinatia, Neverita, Polinices, Mammilla, Cernina, Amaura, Amauropsis, Naticina,* and *Sigaretus.* Most of these are represented by species on the American coast. The animals are carnivorous, and indeed quite voracious, feeding upon dead fish as well as upon other mollusks, especially the small bivalve forms. With the teeth of the lingual ribbon they are enabled to perforate shells, and in great part make the small round holes often seen in those picked up on the beach; they burrow in the sand, and almost conceal themselves therein. Some, at least, make a very singular nest; it is composed of sand, has the form of the old-fashioned lamp-shade or a broad bowl, and is quite thin; this is filled with small cells, in each of which is an egg with its embryo shell. The nest of one species thus characterized was regarded by some old naturalists as a peculiar coral animal, and named *Flustra arenosa,* etc. THEO. GILL.

Na′tick, post-v. of Middlesex co., Mass., on the Boston and Albany R. R., 12 miles from Boston, has good graded schools, 8 churches, 1 public library of 10,000 vols., 2 banks, water and gas works, 1 weekly newspaper, manufactories of hats, boxes, and carriages. Business, shoe manufacturing. Pop. 6404. HEMANWAY & MAYHEW,

EDS. AND PROPS. "NATICK BULLETIN."

Natick, post-v. of Warwick tp., Kent co., R. I., on Pawtuxet River and on the Hartford Providence and Fishkill R. R., 9 miles S. W. of Providence. It has important manufactures.

Na′tion [Lat. *natio*, from *natus*, "born"], a term used in two senses, though invariably applied to a people or a maximum body of men. In one sense, the political, it is used to designate an autonomy—that is to say, the citizens of a state or states united under one head, subject to one government, bound to obey the same laws. In the second, or ethnological sense, it means a people of one blood, one language, and having the same manners and customs. In some cases the word comprises these two meanings; thus, Italy is a nation both politically and ethnologically. But it more often happens that various races, though united under one government, and thus formed into one political nation, are, in truth, of different nationalities. Of this Russia, Austria, and, in a less degree, Great Britain, are examples. Ambitious rulers and statesmen, desirous of aggrandizing their *government,* have at all times striven to form the *political* nation, without respect for differences of race or language; while patriots, as distinct from statesmen, have sought to preserve as a nation those of one blood and speech, and thus to combine political and ethnological ties. Poles, Georgians, and Hungarians have rebelled against their Russian and Austrian conquerors not merely to resist oppression, but from a passionate desire to keep their nationality intact.

It is noteworthy that in the case of ancient Rome, and in that of modern America and Great Britain, conquered races and emigrants have with few exceptions adapted themselves to the new nationality, and felt a certain pride in becoming a part of it. The title of "Roman citizen" was esteemed by aliens and by vanquished races. Irish and German emigrants after a time call themselves Americans, and in fact do become so. The outgoers from old Rome, as those of to-day from America and England, held fast to their own nationality; thus, Canadian and Australian colonists and their descendants call themselves English, though they may never have seen the mother-country. The strongest modern illustrations of transition from the ethnological to the political view of a nation may be seen in Great Britain and France, in both of which countries peoples of a different stock, as the Scotch and the Alsatians, pride or have prided themselves on their nation as a government. The ethnological view being essentially sentimental, and the political practical, it follows that the

latter is most in accordance with the spirit of the age and with great ideas, which can be fully developed only by great nations. JANET TUCKEY.

National Banks. See BANKS, by JAMES S. GIBBONS.

National Debt. See DEBT, NATIONAL.

National Guard [Fr. *garde nationale*], a kind of militia in France, mostly recruited from the bourgeois class, and representing the burgher interests. In some of the French towns the national guards had long been known, but they were first organized in Paris in 1789 by the revolutionary Committee of Safety. There were 48,000 in Paris, 300,000 in France, and the whole were under La Fayette and carried the tricolor flag. In 1795 they were defeated and broken up by Napoleon, were reorganized by him in 1814, dissolved by Charles X. in 1827, again reorganized in 1830, and again in 1831. They fell away from Louis Philippe in 1848, were remodelled in 1852, served against the Germans in the war of 1870–71, and in the latter year a part of them took a share in the Communist struggle. In some other European countries and in some of the U. S. there are militia organizations called national guards.

National Military Homes. See SOLDIERS' HOMES.

National Parks, portions of the public lands reserved from sale and settlement on account of their interesting natural features, in order that they may be maintained as places of public resort for ever. Only two national parks have ever been made in this country by authority of the general government—viz. the Yosemite Valley and the Yellowstone National Park. The former was granted to the State of California by the Senate and House of Representatives of the U. S. of America in Congress assembled, and became a law June 30, 1864, and the tract was the "cleft" or gorge in the Granite Peak of the Sierra Nevada Mountains, in the county of Mariposa, at the head-waters of the Merced River, and known as the Yosemite Valley, with an estimated length of 15 miles, and a width of 1 mile from the main edge of the precipice on both sides. The tract was set aside for the benefit of the people, for their use, resort, and recreation, and declared inalienable for all time. At the same time, the Mariposa Big Tree Grove, comprising an area not to exceed four sections, was set apart under like legislation. These tracts have been surveyed and mapped with great care by State authority.

The Yellowstone National Park is located in the extreme N. W. corner of the Territory of Wyoming. It is 65 miles in length from N. to S., and 55 in breadth from E. to W., comprising an area of 3575 square miles. This tract was withdrawn from settlement, occupancy, or sale under the laws of the U. S. by an act of the 42d Congress, and dedicated and set apart as a public park or pleasure-ground for the benefit and enjoyment of the people. This act became a law by the approval of the President Mar. 1, 1872. The main purpose of the law was the protection of the wonderful curiosities from injury or spoliation, and their retention in their natural condition. It is probable that no other area of equal dimensions on the globe contains so many objects of wonder, as hot springs, geysers, waterfalls, cañons, etc. The natural scenery is unique, and will remain so for all time. There are more hot springs and geysers in this area than in all the remainder of the world besides. F. V. HAYDEN.

Natolia. See ANATOLIA.

Natonia, tp. of Sacramento co., Cal. Pop. 523.

Na'trolite [from *natron*, "soda," and Gr. λίθος, "stone"], a mineral belonging to the zeolitic section of hydrous silicates, and essentially a silicate of alumina and soda, with 9.5 per cent. of water. It occurs generally in slender crystals assignable to the trimetric system, also frequently in radiated fibrous masses. It is met with most commonly in volcanic rocks, but occasionally also in granite and gneiss. Bergen Hill, N. J., Copper Falls, L. S., and localities in Nova Scotia have yielded fine specimens. EDWARD C. H. DAY.

Natron. See SODA.

Natro'na, post-v. of Harrison tp., Allegheny co., Pa., on the Allegheny River, the Western Pennsylvania R. R., and the Pennsylvania Canal (W. division), has manufactures of soda and other chemicals.

Nat'terjack, the *Epidalea calamita*, a toad-like batrachian of Europe, abundant in parts of England and Ireland. It resembles the common toad in appearance, but does not hop. Its progression is by running. It frequents dry places near the sea. It is seven inches long, and has a very disagreeable odor.

Natu'na Islands, a group of islands situated in the China Sea, between Borneo and the peninsula of Malacca. Area, 600 square miles. Pop. 1300. They are high and mountainous, and produce rice, maize, sago, and cocoanuts. Fishing is the chief occupation of the inhabitants.

Nat'ural. In music, the regular notes of the scale when unaffected by sharps or flats (as in the key of C major) are said to be *natural*, or in their original and ordinary condition. And when any note has been modified by the use of a ♯ or ♭ (whether placed at the clef or occurring as an accidental), such alteration may be revoked by prefixing to the note the sign ♮. This sign is called a "natural," because it restores to the altered note its original character. The natural is a modifying sign of later date than the sharp or flat. In many compositions of the old English school the sharp is used to contradict a previous flat, and a flat to contradict a sharp, though this involved a technical error which was unavoidable at the time, but is now obviated by the use of a distinct sign to indicate the natural. The natural is also of service in cases where a change of key takes place, as at the opening of a second or third movement, where such sharps or flats in the signature as are no longer needed are revoked by the substitution of as many naturals. Double sharps or double flats are restored to simple sharps or flats by the signs ♮♯, or ♮♭. In figured bass the sign ♯ *without* a figure always means a natural *third*.—Natural *modulation* is that which is confined to digressions into such keys as are nearly related to the tonic, and is marked by an easy, fluent, and intelligible course of thought, with an avoidance of abrupt and foreign harmonies. WILLIAM STAUNTON.

Natural Bridge. (1) In Walker co., Ala., is an arch in the sub-Carboniferous conglomerate stone, here so stratified as to resemble artificial masonry. It has a span of 120 feet and is 70 feet high. There is a smaller arch in the immediate vicinity. It is in a beautiful region. (2) In Trinity co., Cal., a small creek runs for 3000 feet through an arch of 80 feet span and 20 feet in height. The bed of the stream is 170 feet below the top of the bridge. (3, 4) In Siskiyou co., Cal., the Lost River flows under two arches of sandstone 30 feet apart. The stream is 80 feet wide, and the bridges each measure about 12 feet from side to side. (5, 6) The Coyote Creek in Tuolumne co., Cal., 10 miles N. from Sonora, flows under two natural bridges. The larger one is 285 feet from side to side, but of small span. The top of the arch is 30 feet above the cavity, and 66 feet above the water. The other bridge is of about the same dimensions, and is half a mile lower down the stream. (7) A bridge in Christian co., Ky., has a span of 70 feet and is 138 feet high. (8) In Adams, Berkshire co., Mass., the Hudson Brook flows for 30 rods under an arch of white marble. The cavity is from 30 to 60 feet deep and 15 feet wide. (9) At the village of Natural Bridge, in Jefferson co., N. Y., the Indian River flows through passages under the surface-rock of coarse white sandstone. (10) The most famous of all in the U. S. is that in Rockbridge co., Va., 14 miles from Lexington. Cedar Creek here reaches the lower end of a cañon of siliceous limestone, 200 feet deep. The arch is 60 feet in spring. Its crown is 40 feet thick. It is crossed by a public road 240 feet above the water.

Natural Bridge, post-v. of Wilna tp., St. Lawrence co., N. Y., on Indian River, which here passes under ground through passages in the coarse white limestone. It is on the Black River and St. Lawrence R. R. (wooden track), and has an important lumber-trade. Many rare minerals are found here. Joseph Bonaparte once resided here.

Natural Bridge, post-tp. of Rockbridge co., Va. Pop. 2792. Here is the famous Natural Bridge, under which flows Cedar Creek. It is about 14 miles S. W. of Lexington.

Nat'ural His'tory is a term which has been used in different senses at different times and by different persons. (1) Formerly it was extended to embrace the consideration of all the objects, as well as the phenomena, of nature, and hence, in addition to mineralogy, zoology, and botany, embraced chemistry, physics, and astronomy; and protests were made by physicists at the attempt to restrict the term to its present more generally accepted sense. (2) It is now, however, limited to the history of the natural objects known under the names of minerals, plants, and animals in their normal conditions. (3) There is also a tendency to still further restrict it to zoology, for which it is frequently used in conversation, and occasionally in popular literature, as an interchangeable term. This last usage, however, is not sanctioned by good authority or by the necessities of the case, the word zoology being all-sufficient, and the common name being necessary for that branch whose objects of study belong to the three kingdoms in question. Natural history, then, properly speaking, is the history of natural objects—minerals, plants, and animals—in their various normal conditions, and has been divided (*e. g.* by Cuvier) into *General* and *Particular*. *General Natural*

History, in this acceptation of the term, embraces the consideration of all objects in their relations to each other and in the economy of nature. *Particular Natural History* is restricted to the consideration of special forms in regard to (1) the sensible properties of the entire body and its parts; (2) "the mutual relations of those parts, the motions which they produce, and the changes which they undergo whilst they remain united;" (3) "the active and passive relations of this body with every other body in the universe;" and (4) "the explanation of all these phenomena." The objects taken cognizance of by natural history fall naturally into two great groups: (1) the *Mineral Empire* or *Mineral Kingdom*, considered under the head of MINERALOGY; and (2) the *Organic Empire*, discussed under the term BIOLOGY. Biology is itself subdivided into (*a*) BOTANY, which treats of the Vegetable Kingdom, and (*b*) ZOOLOGY, which has for its domain the Animal Kingdom. Nothing can be predicated respecting characters common to all the bodies which belong to the several kingdoms indicated which does not more properly pertain to the science of somatology, which falls within the sphere of the physicist; and there is little in common even as to methods of study or terminology. THEODORE GILL.

Naturaliza'tion. Naturalization takes place when an alien transfers his allegiance from the country of his origin and the sovereign of the same to another country and sovereign. There may be *partial* or qualified naturalization, which does not make aliens completely equal in all respects to native-born citizens or subjects; thus, by the Constitution of the U. S. (Art. II. sect. 2, § 5) no naturalized citizen can become President of the U. S., and for some time in England no such person could be a member of the privy council or of either house of Parliament. Complete naturalization gives all the rights and imposes all the obligations of a native-born citizen. Most states give privileges of naturalization, but there is great difference in regard to the conditions. Hence, a conflict of laws may arise with respect to the same individual on his return to his original country. The English doctrine for a long time was that allegiance to the Crown was perpetual and indissoluble. Hence, an Englishman naturalized by the law of the U. S. was held to be still a British subject, and many such were in the early part of this century taken on the high seas out of our vessels, on the ground of owing military duty to the Crown, and were impressed into the English naval service. If the allegiance were indissoluble, *jure gentium*, it would not follow that this procedure of taking these persons out of neutral vessels was authorized; at present this claim must be abandoned as far as the U. S. are concerned, owing to the new position in regard to naturalization which treaty has imposed on Great Britain, and in regard to taking persons out of neutral vessels on the high seas, which that government took in the case of the Trent.

Naturalization involves all rights of person and property, including generally that of holding real estate, but does not extinguish claims which were in force at the time the person concerned altered his allegiance. Thus, numbers of young men have left different parts of Germany to escape from the military duty required for a certain time of all able-bodied males. The fact of passing through the forms of allegiance according to the laws of the U. S. would not protect such persons from the operation of laws to avoid which they removed from their native country.

How far the incomplete process of naturalization is to have effect in entitling a person to protection is a matter of doubt, since it depends on the person himself whether he will complete the act according to his expressed intention. The case of Koszta, who was seized in a Turkish port at the instigation of the Austrian consul-general, next was put into the hands of the French consul-general in consequence of the threat of force made by a captain of one of our public vessels then in the port, and finally set free so as to go to the U. S., is in point. This was in 1854.

In quite recent times treaties of the U. S. with German powers and with Great Britain have so defined the claims of the original and the adopted country as to prevent conflict of laws as far as possible. In the treaty with the North German confederation and in that with Bavaria made in 1868 five years of uninterrupted residence with formal naturalization constitutes citizenship on both sides. The declaration to become a citizen is of no effect. Residence is understood, as the Bavarian treaty expresses it, in the *jural* sense, so that it is not interrupted by a transient absence. A person returning to his former residence is not protected by his naturalization from responsibility for crimes committed before his emigration; and such a person residing more than two years in his original country is held to have renounced his naturalization. In the Bavarian treaty it is agreed that the treaty shall not affect a provision of the military law by which Bavarians, emigrating before the end of the prescribed military service, cannot on their return be admitted to permanent residence in the land until they shall have become thirty-two years old. The convention with Great Britain provides that the subjects or citizens of either nation, naturalized according to the laws of the other, shall be held to be for all purposes subjects or citizens of the other; that they may again exchange their nationality on terms to be agreed upon within a certain time after the date of the convention; and that on renewing their residence in either country they may be readmitted to the character and privileges of a citizen or subject, and not be claimed by either country on account of the previous naturalization.

THEO. D. WOOLSEY.

Naturalization, the conferment by a state or nation upon an alien of rights and privileges, both civil and political, which are vested in native-born citizens or subjects; the admission of an alien by due public authority to the rights of citizenship. Naturalization is effected in a variety of modes in different countries—either by letters patent of the sovereign, or by special legislative act conferring citizenship upon a particular individual, or under the provisions of general laws which establish special regulations for the removal of the disabilities of foreigners upon their own application. It will only be practicable, here, to consider the laws of England and the U. S. on this subject, and the treaties made by the U. S. with foreign nations. By the common law a foreigner while temporarily resident within the country is bound to yield a local or temporary allegiance to the state and obey its laws, and in return for this obligation is entitled to protection by its government, and may obtain redress for injuries in its tribunals. But this duty of allegiance is distinguished from that which is obligatory upon citizens, since it ceases when the residence is discontinued, together with the privilege of protection attendant upon it. The allegiance of citizens, on the other hand, is natural and permanent, and is a duty resting upon them wherever they may go or reside, of which they cannot divest themselves even by their own choice; and as incident to it they are at all times entitled to the protection of their own state, even though they may have voluntarily abandoned it and given up all intention of again residing within its limits. Allegiance by the citizen or subject and protection by the government are therefore correlative obligations, and both appertain temporarily to resident aliens as well as permanently to citizens. Foreigners are also placed under important disabilities in regard to the right to acquire and dispose of property, and to exercise political franchises; and in various other respects a discrimination is made between them and citizens to their disadvantage. (See the rules on this subject stated under ALIEN.) By the common law, therefore, the ties of natural allegiance are declared to be indissoluble, while foreigners had no means of acquiring a similar status to that of citizens otherwise than by private legislative act, or in England by grant from the Crown. During the colonial period of American history the colonies themselves exercised the prerogative of adopting naturalization laws, mainly for the purpose of promoting immigration. During the period of the Confederation, also, the several States exercised independently of each other the power of adopting naturalization laws, and as, under such circumstances, entire uniformity of legislation was practically unattainable, the diversity in the systems adopted threatened to lead to serious difficulties and embarrassments in the intercourse between the States. For it was provided by the Articles of Confederation that the free inhabitants of each State should be entitled to all the privileges and immunities of citizens in the several States. It therefore followed as a necessary consequence that those States in which the most stringent regulations were adopted in regard to the qualifications of aliens which would entitle them to become citizens were obliged to extend the privileges of citizens to foreigners naturalized in other States where citizenship might be more easily acquired. In order to avoid the difficulties arising from such diverse legislation, a clause was inserted in the U. S. Constitution providing that "Congress shall have power to establish an uniform rule of naturalization." In the exercise of this power various statutes have been passed by Congress from time to time prescribing the requisite qualifications to entitle an alien to become naturalized, and the particular methods and formalities which he must observe in making his application. It has been held by the courts that this power vested in Congress is exclusive, and that the several States have no authority to legislate upon the subject of naturalization, even though laws thus adopted may not be in contravention of Congressional enactments. But the authority conferred upon Congress by the Constitution only extends to the question of citizenship, and no restriction is therefore imposed upon the right of the States to adopt legislation removing in a greater or less degree the disabilities of aliens in regard to the acquisition, holding, and transfer of

property, or qualifying them to vote, or investing them with other similar privileges; and laws of this kind have been enacted in many of the States. (See CITIZEN.) In the establishment of naturalization laws by Congress a very liberal policy has been pursued, and aliens after a certain period of residence, which has been prescribed in order to enable them to become acquainted with our system of polity and the nature of our institutions, may be admitted to the full rights of citizenship with but very few restrictions. The disqualifications still existing are that no naturalized citizen is eligible to the office of President or Vice-President, there being a prohibition against it in the Constitution. It is also provided that no person shall be elected to the U. S. Senate who shall not have been a citizen for nine years, or to the House of Representatives unless he shall have been a citizen for seven years. But in nearly all respects naturalized citizens are placed on the same footing as those who are native-born. Thus, it is declared by the provisions of the recent amendments to the Constitution that "all persons born or *naturalized* in the U. S., and subject to the jurisdiction thereof, are citizens of the U. S. and of the State wherein they reside;" "no State shall make or enforce any law which shall abridge the privileges or immunities of citizens of the U. S." (14th Amendment); "The right of citizens of the U. S. to vote shall not be denied or abridged by the U. S. or by any State on account of race, color, or previous condition of servitude" (15th Amendment). Substantial equality of civil and political rights and privileges is thus secured to both classes of citizens. The provisions of the U. S. naturalization laws are at present (1876) as follows: The alien must declare on oath before a circuit or district court of the U. S., or a district or supreme court of the Territories, or a court of record of any of the States having common law jurisdiction and a seal and clerk, two years, at least, prior to his admission, that it is *bonâ fide* his intention to become a citizen of the U. S., and to renounce for ever all allegiance and fidelity to any foreign prince, state, or sovereignty, and particularly by name to the prince, state, or sovereignty of which the alien may be at the time a citizen or subject. But his full admission to citizenship cannot take place until he has resided within the U. S. for the continued term of five years next preceding his admission, and one year at least within the State or Territory where the court is held to which he makes application. At the time of his application to be admitted he must declare on oath before some one of the courts above mentioned that he will support the Constitution of the U. S., and that he absolutely and entirely renounces and abjures all allegiance to every foreign power, and particularly to that state of which he was before a citizen. These proceedings are duly recorded by the clerk of the court. It must be made to appear to the satisfaction of the court admitting the alien that he has duly fulfilled the prescribed qualifications in regard to the term and place of residence, and that during that time he has behaved as a man of good moral character, attached to the principles of the Constitution of the U. S., and well disposed to the good order and happiness of the same. The proof of residence must be established by other testimony than the applicant's oath, though in regard to the other facts to be proved his oath will be admissible. Generally, however, it is required that even on these points other evidence shall be introduced in corroboration of his own affidavit; the testimony of a single witness will be sufficient. If the alien has borne any hereditary title or been of any of the orders of nobility in the kingdom or state from which he came, he must also make an express renunciation of his title or order of nobility; and this renunciation is recorded in the court. If the proof required is established to the satisfaction of the court, an order is made that the alien be admitted to become a citizen, and the proceedings are duly recorded. The record, like the record of a judgment of a court of competent jurisdiction, is conclusive in collateral proceedings as to the facts stated therein, and cannot be impeached by extrinsic evidence showing that the prerequisites to naturalization have not been complied with. If the alien is a minor, the rules in regard to his admission to citizenship are somewhat different. If he has resided in the U. S. three years next preceding his twenty-first birthday, and five years (including the three of minority) before making his application to be naturalized, the residence being continuous, he is not required to make the preliminary declaration above described of intention to become a citizen; but he must make the same declaration at the time of his admission as is required of other applicants, and must further declare on oath, and prove to the satisfaction of the court, that for two years next preceding it has been his *bonâ fide* intention to become a citizen, and must in all other respects comply with the naturalization laws. But the minor children of alien parents who are naturalized become thereby citizens themselves without any application on their own part being necessary if they are then dwelling in the U. S. It has been declared sufficient under this provision in several decisions that the father should be naturalized in order to confer the rights of citizenship upon the minor children, and that the naturalization of both parents is not necessary. All children born out of the limits and jurisdiction of the U. S., whose fathers are at the time of their birth citizens thereof and have resided therein, are also declared themselves to be citizens without naturalization. So any woman who marries a husband who is a citizen of the U. S., and who might herself be lawfully naturalized, is deemed herself to be a citizen; under this provision it has been held that the husband need not be a citizen at the time of the marriage, but that a woman married to an alien becomes a citizen by the subsequent naturalization of the husband. His citizenship, whenever it exists, confers citizenship upon her. If the husband dies before he is actually naturalized, but after he has taken the preliminary oath of intention to become a citizen, his widow and children are declared to be citizens, and are entitled to all rights and privileges as such upon taking the oath prescribed by law. There are also special statutory provisions in regard to the naturalization of aliens who have served in the U. S. army, and of foreign seamen. Any alien of the age of twenty-one years and upward who, having enlisted in the U. S. army, is honorably discharged, is admitted to become a citizen upon his petition without any preliminary declaration of intention to become such, and is not required to prove more than one year's residence in the U. S. previous to his application; but due proof of residence, of the alien's good moral character, and of the fact of honorable discharge must be presented to the court admitting him. As regards seamen, it is provided that every seaman, being a foreigner, who declares his intention of becoming a citizen in any competent court, and shall have served three years on board of a merchant-vessel of the U. S. subsequent to the date of such declaration, may, on his application to any competent court and the production of his certificate of discharge and good conduct during that time, together with the certificate of his declaration of intention to become a citizen, be admitted a citizen of the U. S.; and every such seaman is deemed to be a citizen for the purpose of serving on a U. S. merchant-vessel after his preliminary declaration of intention has been made, and after such three years' service, though no further steps be taken; but such seaman shall, for all purposes of protection as an American citizen, be deemed such after the filing of his declaration of intention to become such citizen. There are also particular provisions in the naturalization laws in regard to the naturalization of aliens residing within the U. S. before Jan. 29, 1795, and of those therein residing between June 18, 1798, and June 18, 1812; but these are no longer of sufficient practical importance to require their statement in this connection. The general provisions of the naturalization laws apply to aliens of African nativity and to persons of African descent. But aliens who are citizens or subjects or denizens of a country with which the U. S. are at war at the time of their application cannot then be admitted to the rights of citizens. They cannot avail themselves of the privileges afforded by the naturalization laws until the restoration of peace.

In regard to the rights acquired by naturalized citizens, it is provided by the statutes that all naturalized citizens of the U. S. while in foreign countries are entitled to and shall receive from this government the same protection of person and property which is accorded to native-born citizens. Certain specific acts in violation of the provisions or policy of the naturalization laws are declared by statute to be crimes, subjecting the offender to prosecution by the U. S. government through its proper officials. Thus, where any oath or affidavit is to be taken under these laws, and the affiant knowingly swears falsely, he may be indicted, and on conviction punished by fine and imprisonment. It is also a crime for any person who applies to be naturalized, or any witness appearing in his behalf, to knowingly personate any other person than himself, or falsely to appear in the name of a deceased person or in an assumed or fictitious name; or falsely to make, forge, or counterfeit any oath, notice, affidavit, certificate, or other instrument, paper, or proceeding required or authorized by the naturalization laws; or to sell, dispose of, or use such oath, notice, etc. as genuine or for any unlawful purpose; or to use, attempt to use, or participate in the use of any certificate of citizenship, knowing it to be forged or counterfeit or to have been fraudulently or unlawfully procured; or to receive such a false certificate, knowing its fraudulent character; or falsely to represent one's self to be a citizen of the U. S. without having been duly admitted to citizenship, for any fraudulent purpose

whatever. Other violations of the naturalization laws are also declared to be criminal. (See *U. S. Revised Statutes*, pp. 1051, 1057, 380, and 351.)

In England no general naturalization law was enacted until the year 1844. Before that time naturalization could be effected only by special act of Parliament, but it had been provided by statute that an alien naturalized in this mode should still remain under important disabilities; he was still incapable of being a member of the privy council or of Parliament, of holding a civil or military office, or of receiving grants of land from the Crown. A practice, however, has existed from an early period for the king to grant letters of denization to aliens, which have the effect to remove an alien's disqualifications to a limited extent. A denizen is described as occupying a kind of middle state between an alien and a natural-born subject, having, as it were, an intermediate legal status. Thus, he may take lands by purchase or devise, though an alien cannot, but he cannot take by inheritance. A denizen, moreover, cannot belong to the privy council or Parliament or hold any public office of trust. A comprehensive statute in regard to the naturalization of aliens was enacted in 1870 (33 and 34 Vict. ch. 14), and this is the law at present in force. By this it is provided that an alien who has resided in the United Kingdom, or has been in the service of the Crown, for a term of not less than five years, and intends, when naturalized, to continue either his residence or his service, may apply to one of Her Majesty's principal secretaries of state for a certificate of naturalization. The applicant must present such evidence of residence or service and intention to reside or serve as the secretary of state may require, and the secretary may then, in the exercise of his own discretion, with or without assigning a reason, give or withhold a certificate, as he thinks most conducive to the public good, and no appeal lies from his decision; but such certificate will not take effect until the applicant has taken the oath of allegiance. An alien to whom a certificate of naturalization is granted is entitled in the United Kingdom to all political and other rights, powers, and privileges, and is subject to all obligations to which a natural-born British subject is entitled or subject, with this qualification, that he shall not, when within the foreign state of which he was previously a subject, be deemed to be a British subject unless he has ceased to be a subject of that state in pursuance of the laws thereof or in pursuance of a treaty to that effect. If any doubt exists in respect to the nationality of a person as a British subject, the secretary may grant to him a special certificate of naturalization, stating therein that it is granted for the purpose of quieting such doubts. Aliens naturalized before the passage of this act may obtain certificates of naturalization under its provisions upon the same terms as other aliens. The status of married women and minor children in respect to nationality follows that of the husband, and they become naturalized subjects upon his obtaining a certificate of naturalization. But after the father's death the status of the infant children is governed by that of the mother; and if she were then an alien, she might take out a certificate which would naturalize them all.

By the principles of the common law, to which reference has above been made, in regard to citizenship and allegiance, it is evident that naturalization laws merely confer a right of citizenship upon a foreigner in a country not his own, while his former duty of allegiance to his own state still remains obligatory. It thus happens that one person may be at the same time a citizen or subject of two different nations. This has sometimes led to irritating controversies between different governments, and therefore in modern times a number of civilized nations have recognized by general statute or by treaty the right of a subject to throw off his duty of allegiance to his native land upon becoming naturalized in a foreign country. This is termed the "right of expatriation," and has sometimes been claimed to be a natural right inherent in all persons, though it is now generally regarded as dependent upon the expressed will of a person's native government, and only capable of exercise when the privilege has thus been granted either by statute or treaty. (See EXPATRIATION.) The English naturalization act adopted in 1870, to which reference has above been made, also contains comprehensive general provisions declaring that any British subject who voluntarily becomes naturalized in a foreign state while he is under no disability shall from that time be deemed to have ceased to be a British subject and be regarded as an alien. It is further provided that a natural-born subject, who is also at the time of his birth, by the laws of a foreign state, a subject of that state, may, if of full age and under no disability, make a declaration of alienage before certain British officials, and thus cease to be a British subject. So a person born in a foreign country of a father who is a British subject may in a similar way make a declaration of alienage. Moreover, it is declared that a natural-born British subject who has thus become an alien in pursuance of the act may, on proper application to a secretary of state, obtain a certificate of nationality readmitting him to the status of a British subject. The secretary may, however, give or withhold such certificate in the exercise of his own discretion. (33 & 34 Vict. ch. 14.) In furtherance of the same liberal principles, a treaty has been made between Great Britain and the U. S. providing that citizens or subjects of either country naturalized as citizens or subjects of the other country shall be deemed to have divested themselves of their original nationality; the naturalization may, however, be renounced and the original nationality resumed if the person should renew his residence in his native country and apply to be readmitted to the privileges of a citizen or subject therein. (Treaty concluded May 13, 1870; see *U. S. Statutes at Large*, vol. xvi. 399; xvii. 15.) Treaties of the same general nature have been made by the government of the U. S. with Prussia (Feb. 22, 1868; see *Stat. at Large*, xv. 115), with Bavaria (May 26, 1868, *Ib.*, xv. 147), with Mexico (July 10, 1868, *Ib.*, xv. 223), with the grand duchy of Baden (July 19, 1868, *Ib.*, xvi. 329), with the kingdom of Würtemberg (July 27, 1868, *Ib.*, xvi. 333), with the grand duchy of Hesse (Aug. 1, 1868, *Ib.*, xvi. 337), with Belgium (Nov. 16, 1868, *Ib.*, xvi. 341), with Sweden and Norway (May 26, 1869, *Ib.*, xvii. 19), with the Austro-Hungarian monarchy (Sept. 20, 1870, *Ib.*, xvii. 43), with Denmark (July 20, 1872, *Ib.*, xvii. 151), with Ecuador (May 6, 1872, *Ib.*, xviii. 69). These various treaties are quite similar in their provisions, and the one concluded with Prussia may be taken for the sake of illustration as an example of them all. There are, however, in some cases important differences of detail, for which reference must be made to the statutes. By this treaty it is provided that citizens of either country who become naturalized citizens of the other, and reside therein uninterruptedly for five years, shall be held to have become citizens of the latter country, and shall be treated as such. But the declaration of an intention to become a citizen of the one or of the other country has not for either party to the convention the effect of naturalization. A naturalized citizen on returning to his original country is liable therein to trial and punishment for an action punishable by its laws and committed before his emigration, saving always the limitation established by its laws. So if a naturalized citizen renews his residence in his original country without the intent to return to the country of naturalization, he is held to have renounced his naturalization. The intent not to return may be held to exist when the person naturalized in the one country resides more than two years in the other country. This treaty between the U. S. and Prussia was to continue in force for ten years from the time of ratification. (See ALIEN, ALLEGIANCE, CITIZEN, EXPATRIATION; Cockburn on *Nationality;* Scott on *Naturalization;* Cutler on *Naturalization;* Hansard on *Aliens and Naturalization;* Wheaton on *International Law.*) GEORGE CHASE. REVISED BY T. W. DWIGHT.

Naturalization in Zoology. See ACCLIMATIZATION, in APPENDIX.

Natural Philosophy. See DYNAMICS and MECHANICS, by PROF. W. P. TROWBRIDGE, A. M., M. N. A. S.

Nat'ural Theo'logy treats of the existence and attributes of God as revealed to us in the constitution and order of the natural world. As a perfected system it results from the investigation of the two following questions: (1) Is this universe, with all its orders of being, the work of a personal creator or the result of impersonal forces? (2) The *existence* of a personal creator being proved, what can be learned from nature of his character and of his relations to his creatures?

The investigation of these questions starts with the assumption that every event must have an adequate cause, and that there may be such relations between causes and effects, such combinations of matter and manifestations of force producing specific results, that the existence of a designer may be inferred and his character revealed. Until these postulates are admitted, no step can be taken in solving the questions proposed, and such a science as natural theology is impossible. The grounds for these assumptions are found in the intuitive beliefs of the human mind. The belief in design is, by high authority, put on the same basis as belief in causation. (Porter, *Human Intellect*, ch. vi., and others.)

But natural theology embraces much more than the simple recognition of design in the universe, though such a recognition is the first step towards a full investigation of the subject. This investigation concerns itself with the complexity and perfection of means in carrying out design, and especially with the relation of design to sensitive and rational beings, as revealing the character of the designer.

The materials for this investigation are found in the whole natural world, as well as in the physical, intellectual, and moral nature of man. We are called upon to examine results only, and our reasoning on this subject can in no way be legitimately affected by any theories as to the time or secondary agencies required in producing the present order of things. The proof of design in a clock is in no way affected by a question of the time required or the instruments used in its construction. The man of common intelligence can see evidence of design in it from its results as well as the most skilful clockmaker. So in all the departments of nature the evidence of design can be judged of by results, without special reference to those recondite subjects that can be understood only by specialists.

The conditions of the problem and the opposing theories of the case may be stated briefly as follows: (1) It is now conceded by all that there was a time when there was no living thing upon the earth. (2) Since plants and animals and men are now here, there must be some cause adequate to produce them. Without any reference to the specific *method* by which the present forms of life have been produced, there seem to be but two hypotheses possible as to their origin: (1) That plants and animals have been produced through the agency of forces eternally inherent in matter; (2) that they have been produced by the design and organizing power of a personal being acting, directly or indirectly, through forces controlled by him. Both of these hypotheses have their supporters, although those who accept the latter by no means agree as to the method in which creative power has been manifested in the production of species. There are those who believe in the independent creation of each species (Agassiz and others), and some who believe in the evolution of species from lower forms according to a plan (Mivart and others).

The *method* of origin is simply a question for scientific investigation; it has, as we have seen, no legitimate bearing upon natural theology, which rests upon *results*, and not upon *methods*. It is certain that the large majority of the students of nature have seen in its different departments such combinations to produce specific results, such likeness to the works of man—contrivances differing from his only in their grandeur and perfection—that they have believed in a being who has originated by some method all the living things upon the earth. The existence of man is taken as proof of the existence of a being like him in the elements of personality, though infinitely above him in wisdom and power. *I am, therefore God is*, may be regarded as the central proposition in natural theology. If one fails to satisfy himself that this is true, it is useless for him to look farther for more convincing proof of the existence of God. All that the study of external nature can do is to multiply evidences of the wisdom, skill, and goodness of that Creator whose personality is revealed only in the creation of man or in the provisions made for him as a personal being.

It is claimed by students of natural theology that belief in the existence of a personal creator is reached in the study of man and nature through the same processes of thought by which every science has been built up and by which all conclusions of common life are reached. The necessary principles of belief, careful investigation of facts, and sound induction, are all relied upon in proving the existence of a personal creator from the works of nature, as the existence and nature of any cause would be proved from its effect. It is also claimed, as a result, that no scientific process has been more legitimate, and no inference in actual life more in accordance with the common-sense wisdom of the world, than the investigations and conclusions reached in natural theology. It claims a place, therefore, among the sciences, in virtue of the methods by which its conclusions are reached. This claim has been admitted by a large majority of the ablest students of nature and of man.

Objections.—That natural theology, as here defined, has any just claim to scientific rank is utterly denied by a class of philosophers (Positivists), who seek to limit all investigation to observed phenomena, denying or ignoring both efficient and final causes. Others, without denying the propriety of investigating final causes, affirm that we have no evidence of final cause in the works of nature. They regard the adaptation which we see in the natural world simply as the result of materials and forces mutually limited in producing the existing forms. The conclusions of such writers are well expressed in the words of Büchner: "Our reflecting reason is the sole cause of this apparent design, which is nothing but the necessary consequence of the combination of materials and forces." (*Force and Matter*, p. 90.)

History of Opinions.—The history of the race shows that there has been at all times, except among the most degraded tribes, some distinct notion of God or gods, or

of some supernatural agents to be feared and worshipped. It is claimed by Sir John Lubbock and others that the most degraded tribes are without any notion of a Supreme Being; and it is asserted that deaf mutes are in the same condition till they are instructed. Granting all the observed facts, the conclusions may be fairly questioned. It does not follow that there is no idea of God present in the mind because it has not forced its way up into language, or because it cannot be detected in our imperfect intercourse with degraded savages and uneducated mutes. (*Cousin.*)

So constantly has the belief in the existence of God prevailed in all ages that it has been claimed by some that the *idea* of God is *innate*. This doctrine, at the present time, is accepted only in this modified form, if at all—that the capabilities of the human mind are such that in its perfect development the idea of a God is surely reached in the study of nature and man.

An *a priori* proof for the existence of God has been accepted by some from the supposed power of the human mind to form a conception of a perfect being. The inference is made from this power of the mind that a being must exist to correspond to the conceptions of it. The *a priori* argument in some of its forms has been accepted and enforced by Descartes, Leibnitz, Dr. Samuel Clarke, and other eminent philosophers. As it involves subtle metaphysical distinctions, it is certainly not fitted to impress the popular mind, and it has failed to satisfy some acute metaphysicians who certainly could not be charged with undue skepticism in regard to such proof.

The *teleological* argument may fairly be made to include the study of nature, and also the study of man as a physical, intellectual, and moral being. It is simple in form, readily apprehended, finds its materials in thousands of forms, and has been illustrated and enforced by thinking men in all ages. Socrates and Cicero are well known among the ancients for their treatment of this subject. The Bible appeals to nature for illustrations of the power and goodness of God. In the New Testament especially we have the testimony of Paul to the fulness and value of this proof (Rom. i. 19, 20). Since the time of Paley, whose name is best known of all those who have entered this field, writers in large numbers have appeared who have written treatises professedly on this subject, or have treated it indirectly in connection with scientific discussions. Some of the ablest arguments have been made in this way, and of late years great additions have been made directly and indirectly to such writings.

Objections.—It has been objected to the argument from design drawn from the natural world that at best it only proves the existence of a worker or world-builder—that it is only in the creation of the mind of man that we have proof of the existence of a personal creator. (Pres. Hopkins and others.) It may be added that the creator of man is not necessarily the self-existent God. But the existence of man's creator proves that there must be a self-existent personal God. After we reach the proof that our creator is a personal being, loving justice and truth, we must wait for him to declare whether he is the Almighty or not—whether he shall swear by himself or one greater. Thus we join natural theology to revelation. Natural theology declares a creator of man, of the heavens, and of the earth. He declares himself to be the *Almighty*, which we know from the laws of belief must exist. We seek for a cause of what we see, and cannot stop till we find one adequate and necessarily eternal.

Tendencies of Present Discussions.—As already intimated, positive philosophy, of which Comte was the father, would render the science of natural theology impossible. Natural theology assumes the existence of efficient causes, and rests for proof upon final causes. Both efficient and final causes positive philosophy forbids us to name as having any relation to science. If they exist, they are to be to us as though they were not.

The doctrine of *evolution*, which in some of its forms is now accepted by many, is supposed by some to weaken or destroy the proof for the existence of a personal creator. But such a result can follow only from denying or ignoring the plainest principles of causality. For one who accepts the doctrine of causation belief in the existence and wisdom of a designer cannot be affected at all by the time required or the secondary agencies employed in producing results. The only question that could arise would be in reference to power. When a certain effect is produced, as the production of a tree or animal with all its complex relations, such an effect demands belief in a cause adequate to produce such a result; and if there is evidence of wisdom and skill in it, the evidence is there, irrespective of the time required or the secondary agencies concerned in its production. The belief that a being of low rank can be raised to a higher rank by any process of development or natural

selection without the same agency, in kind, as would be required to produce the being of high rank directly, is belief that an effect can be produced without an adequate cause. Whatever may be the final conclusions of science in regard to the origin of species, they cannot affect the argument for design as revealed in the constitution of species, nor materially change the teachings of natural theology. If any difficulty arises, it will be found in harmonizing the teachings of science with the Bible account of creation, as to the mode in which the creative power was manifested.

Natural Religion.—Natural theology and natural religion are sometimes used as synonymous terms. So far as they differ, natural religion relates to the natural proofs of man's immortality and accountability. It seeks for its proof in the religious instincts and capacities of man, and in the history of the race, as revealing the tendencies and results of conduct. While natural theology proper relates to the existence and character of God, natural religion treats of man's relations to God and duties towards him.

Literature.—The Bible enforces its teachings of God by reference to his works: Ps. xix., civ.; Rom. i. 19, 20. Xenophon's *Memorabilia;* Plato, *Laws*, book x.; Cicero, *De Natura Deorum;* Descartes; Leibnitz; Augustine's *Confessions;* Derham, *Physico-Theology;* Nieuwentyt, *Religious Philosopher;* Dr. Samuel Clarke; Paley, *Natural Theology; Bridgewater Treatises;* Chalmers, *Natural Theology;* Brougham's *Discourse;* Tulloch, *Theism;* McCosh and Dickie, *Typical Forms*, etc.; Hitchcock, *Religion of Geology;* Cooke, *Religion of Chemistry;* Agassiz, *Contributions to Nat. Hist. U. S.*, vol. i.; Dana, *Geology*, ch. "Cosmogony;" Chadbourne, *Natural Theology;* Wiseman, *Connection between Science and Revealed Religion.*

P. A. CHADBOURNE.

Na'ture-Print'ing, a process by which flat objects, like ferns, seaweeds, laces, and embroidery, may be used for preparing a plate for printing without executing any engraving, or even drawing. By one method the object to be represented is pressed with great force between a polished plate of copper and one of lead, leaving an impression upon the leaden plate. A copy of this plate is then taken by electrotype, which is used, like any other electrotype plate, for printing. This process was invented by a gentleman named Auer in Vienna about 1853; an Englishman named Aitkin also claimed the invention; and one Peter Kyle of Copenhagen many years before had described a similar process. Henry Bradbury of London was one of the most successful operators in this process.

Nau'gatuck, tp. and post-v. of New Haven co., Conn., on the Naugatuck River and R. R., 27 miles by rail N. by E. of Bridgeport, has a savings bank and manufactures of rubber goods, farming implements, woollens, etc. UNION CITY, 1 mile to the N., is a part of the same town, and has manufactures of malleable iron-castings and other goods. Pop. of tp. 2830.

Naugatuck' River rises in Litchfield co., Conn., flows S., and reaches the Housatonic at Birmingham. It affords great water-power.

Nau'heim, town of Hesse-Darmstadt, Germany, 17 miles N. of Frankfort, is noted for its saline springs, which yield annually more than 17,000 cwts. of salt. Of late the waters have also been used with good effect for bathing and drinking, and a handsome watering establishment has been built. Pop. 2500.

Nau'mann (EMIL), b. at Berlin Sept. 8, 1828; studied music under Mendelssohn, made his début as a composer in 1848 by the oratorio *Christus der Friedensbote*, and was appointed director of church music at Berlin in 1853. Among his other compositions are two operas, *Judith* and *Mühlenhexe.* He wrote several works relating to church music, and *Die Tonkunst in der Culturgeschichte* (1870).

Naumann (JOHANN FRIEDRICH), b. Feb. 14, 1780, at Ziebigk, near Köthen, Germany; was educated at Dessau; studied natural science, especially ornithology; became keeper of the ornithological museum of the duke of Anhalt-Köthen, and d. at Ziebigk Aug. 15, 1857. His *Naturgeschichte der Vögel Deutschlands* (12 vols., Leipsic, 1822–44), for which he prepared the plates himself, is very rich in observations and enjoys a great reputation.

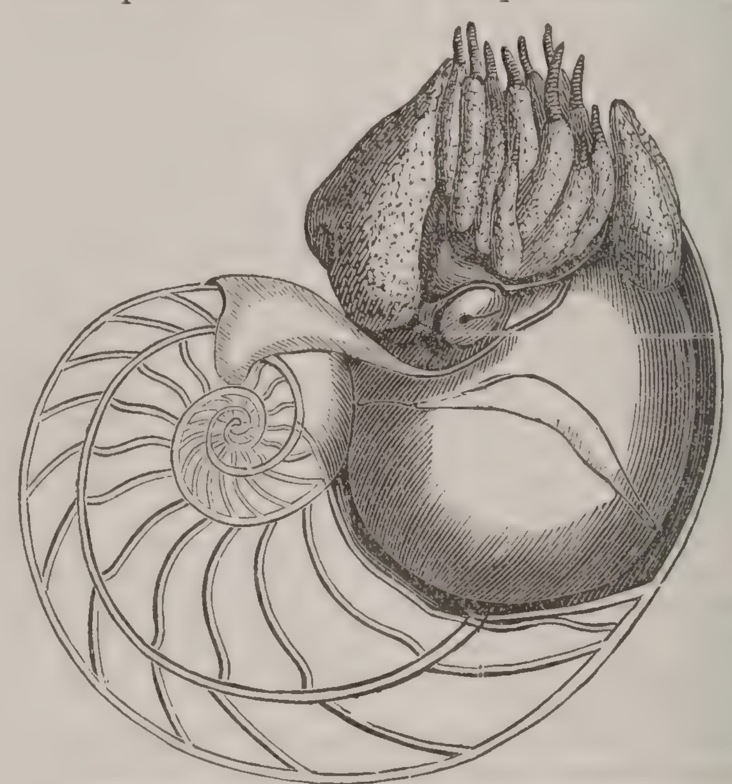
Naumann (KARL FRIEDRICH), b. at Dresden May 30, 1797; was educated at Pforta; studied mineralogy and geology at Freiberg under Werner, afterwards at Leipsic and Jena; travelled in 1821–22 in Norway, and wrote *Beiträge zur Kenntniss Norwegens* (2 vols., Leipsic, 1824); was appointed professor of crystallography at Freiberg in 1826, and removed in 1842, as professor of mineralogy and geognosy, to Leipsic, where he d. in Jan., 1874. His principal works are—*Lehrbuch der Mineralogie* (1828), *Anfangsgründe der Krystallographie* (1841), and *Lehrbuch der Geognosie* (2 vols., 1850–53).

Naum'burg, town of Prussia, province of Saxony, on the Saale, has a fine cathedral, built in 1207, and manufactures of chemicals, champagne, vinegar, tobacco, spirits, linen, and woollen goods. Pop. 15,120.

Nau'plia, or **Napoli di Romania** [so named from its being accessible to ships—ἀπὸ τοῦ ταῖς ναυσὶ προσπλεῖσθαι —*Strabo*, viii. 6, 2], a Peloponnesian city, near the head of the Argolic Gulf. At first it was independent of Argos (6 miles distant), then its port, and in the time of Pausanias (173 A. D.) was deserted (*Itinerary* of Pausanias, ii. 38, 2). Under the Byzantine emperors it revived, and was a place of great importance during the Middle Ages. It was taken by the Turks in 1460, by the Venetians in 1686, and by the Turks again in 1715. It was captured by the Greeks Dec. 12, 1822, and made after a while the capital of their new kingdom till Dec., 1834. Since then its population has declined from 12,000 to 8543 (in 1870). Its splendid harbor is defended by the two citadels of Palamidhi, 720 feet above the city, and Itskali, at the water's edge, making Nauplia the Gibraltar of Greece. (See Leake's *Morea*, ii. 356–363.) R. D. HITCHCOCK.

Nautical Almanac. See EPHEMERIS, by PROF. J. H. C. COFFIN, LL.D.

Nautil'idæ [from the name of the genus *Nautilus*], the only family represented by existing species of the class of cephalopod mollusks and order Tetrabranchiata. As limited by some authors (*e. g.* Meek), it includes species whose shell is generally curved and more or less involute upon itself (but often with the whorls free and sometimes spiral), with the outer chamber very large, and the aperture with its outer margin sinuous; the septa are simple, or at most provided with a few simple lateral lobes or



Section of a Nautilus, showing its interior.

flexures, and are convex backward towards the middle; the siphon is variable in position between the dorsal and ventral surfaces, but in the typical forms is nearly central, and is occasionally in some older extinct groups occupied by an internal organic deposit; there are two well-developed shell-layers, and a third incompletely developed one near the aperture. The animal has a mantle with an entire margin which extends about even with the border of the aperture; it also has (1) a circular fleshy lip; (2) numerous labial tentacles combined in four groups, each group having twelve or thirteen; and (3) still further outward are the "arms" or branchial tentacles, about thirty-six in number, and in two rows; of these last, the dorsal pair are extended and combined in a "hood," "which closes the aperture of the shell, except for a small space on each side, which is flat, by a pair of arms. The tentacles are lamellated on their inner surface, and are retractile within sheaths or digitations which correspond to the eight ordinary arms of the cuttle-fishes;" "besides these, there are four ocular tentacles, one behind and one in front of each eye," which seem to be instruments of sensation, and resemble the tentacles of some nudibranchiate mollusks (*e. g. Eolis* and *Aplysia*). On the side of each eye is a hollow oblique process which is not tentaculiferous, and which bears the external ears. The mandibles are to a considerable extent calcified, thus differing from those of the cuttlefishes. "The shell-muscles are united by a narrow tract across the hollow occupied by the involute spire of the shell, and are thus rendered horseshoe shaped. The siphuncle is vascular; it opens into the cavity containing the heart (pericardium), and is most probably filled with fluid from that cavity." Such are the principal

characteristics of the animal, as made known by Prof. Owen and epitomized by Mr. Woodward.

The family is at present represented by a single genus, *Nautilus*, containing several living species, but was formerly developed in numerous types, and has survived from the Silurian epoch to the present time, and, as here understood, embraces fewer genera than often are credited to it, but still has a large number. By Meek the following genera are recognized—viz. *Nautilus*, *Discitus*, *Trematodiscus*, *Temnocheilus*, *Northoceras*, *Pteronautilus*, *Litnites ?*, *Hortolus ?*, *Crytoceras*, *Clymenia*, *Subclymenia*, *Aganides* (= *Aturia*), *Nautiloceras*, *Aploceras*, and *Trochoceras*. Little is known of the habits of *Nautilus*. According to Rumphius (who wrote in 1705), "When the nautilus floats on the water he puts out his head and all his tentacles, and spreads them upon the water, with the poop of the shell above water; but at the bottom he creeps in the reverse position, with his boat above him, and with his head and tentacles above the ground, making a tolerably quick progress." Owen found the crop of a specimen dissected by himself filled with fragments of small crabs. Although the shells of one species (*N. pompilus*) are very common, the animals themselves are very rarely seen. THEO. GILL.

Nautilus Propeller, a system of propelling steam-vessels at sea by means of the expulsion of strong currents of water backward. Many of the lower animals move about in the water in this way. Several steamers for river and ocean use have been successfully built on this principle. A turbine-wheel revolves in an iron cylinder for the purpose of creating the jet which propels the ship. This mode of propulsion has not proved economical or efficient.

Nauvoo', tp. of Franklin co., Ala. Pop. 1289.

Nauvoo, post-v. and tp. of Hancock co., Ill., on E. bank of the Mississippi River, was founded by the Mormons in 1840, and afterward the home of a company of French Socialists, under M. Cabet; has several fine churches, 1 newspaper, and stores. Principal business, the growing of grapes. About 100,000 gallons of wine are produced annually. Pop. 1578. W. P. KREMER, ED. "INDEPENDENT."

Nav'ajo Indians, a tribe of the great Shoshone and Apache family. They occupy a reservation of 3,328,000 acres in the N. W. of New Mexico and the N. E. of Arizona. They were long famous for their hostility to the whites, but have now been thoroughly subjected by the U. S. troops. They are industrious, and have adopted some of the arts of half-civilized life from the Pueblo Indians. They have 130,000 sheep and goats, 10,000 horses, and are celebrated for the manufacture of "Navajo blankets," which are wonderfully warm, durable, and of such excellence as to sell for $50, or even $150. Pop. 9114.

Na'val Acad'emies. *France.*—Special instruction in the art of war as applied to navies originated in France about the year 1630, and in England about 100 years later. In France the invention of hollow projectiles by Bernard Reynaud (about 1680), and by him first put to practical use at the bombardment of Algiers in 1684, gave a fresh impulse to the cultivation of naval science, and led to the uniform organization of all the schools for naval instruction at that time established in the kingdom. Various decrees under the monarchy, the republic, and the empire improved the existing systems, until their final reorganization in 1825 upon the basis which, with very little modification, exists at the present time. In forty French ports free schools of hydrography are open to sailors of the mercantile marine, in which an annual average of about 400 men are qualified as captains and sub-officers of seagoing or coasting vessels. In 1811 the schools for naval officers were established on shipboard at the ports of Brest and Toulon, and after various modifications—among others, the substitution of a royal marine college at Angoulême in 1816—were finally united in 1830 on board the Orion at Brest. The present school-ship is the Borda, 120 guns, launched in 1847. Admission is gained to this school by a public competitive examination which is held annually. The personal qualifications are French nativity, age between fourteen and seventeen, and good bodily constitution. The mental qualifications comprise a knowledge of arithmetic, algebra, geometry, plane trigonometry, natural philosophy, chemistry, and drawing. Exercises are required in the French and English languages, a translation from the Latin, a geometrical drawing, and a free-hand drawing from a head. The course of instruction consists of navigation and astronomy, analytical and mechanical science, natural philosophy and chemistry, theory and practice of steam-engines and mechanical engineering, naval architecture, seamanship, gunnery, drawing, and the English language. These are supplemented by constant exercises with boats and other material, and an annual seagoing cruise. After two years spent at this school those who are found qualified at the annual examination are transferred to the steam-frigate Jean Bart, in which they make a foreign voyage of nearly a year's duration, at the conclusion of which they are considered eligible for active naval service. The School of Naval Architecture in Paris is under the management of the corps of marine engineers, which corps has charge of the construction of all ships and engines in the service. It is composed of 2 inspectors-general, 10 directors of naval construction, 40 marine engineers, and 75 assistant engineers. Graduates of the Polytechnic School, to the number of about 15 annually, are assigned to the School of Naval Architecture, where they remain two years and a half, spending three winters in Paris and two summers in the dockyards. The school is commanded by a director of naval construction, who gives instruction, assisted by other members of the corps and special teachers of drawing and languages. The course of instruction consists of—first winter: (1) a course on construction; (2) displacement and stability; (3) strength of materials; (4) marine architectural drawing and free-hand drawing. Second winter: (1) a practical course on steam-engines; (2) a theoretical course on steam; (3) applied mechanics and mechanics in general; (4) plan-drawing of ships and engines and free-hand drawing. Third winter: (1) displacement and stability (concluded); (2) naval architecture and naval artillery; (3) technology of workshops; (4) plan-drawing, projects, and designs for ships and engines, and free-hand drawing. At the end of the course an examination is held, and those found qualified are promoted to the corps of marine engineers as assistant engineers of the third class. There are at Brest and at Toulon schools of marine artillery and schools of practice for firing at targets, with guns both afloat and on land.

England.—The Royal Naval Academy was established at Portsmouth in 1729. Its course of instruction comprised, besides the elements of a general education, mathematics, navigation, drawing, fortification, gunnery and small-arms, principles of shipbuilding, and practical seamanship in all its branches. The number of cadets was at first limited to 40, but in 1806 it was increased to 70. Owing to jealousies arising between officers appointed from this school and those entering the service under the old system (the appointments under both systems being confined to the nobility and gentry), the academy was abolished in 1837, for in the mean time the old system of admitting midshipmen to the navy still obtained. This was under the patronage of the captains of ships, who had the nomination of an almost indefinite number of young gentlemen, who were received on board without any conditions of previous preparation, and left to their own resources and those of the ship to acquire a knowledge of their profession under the general supervision of the captains. This short and easy method of entering the service was so commonly preferred, and the number of students in the school had become so small, that it also was changed. The captains were permitted to make only one nomination, the admiralty reserving the rest. The defects of the method, even thus modified, led finally in 1857 to the adoption of a training-ship, first at Portsmouth and afterwards at Dartmouth, on board the Britannia. The course of study is limited to one year; the examinations are held quarterly, and if passed satisfactorily at the end of the year, the candidate is rated a midshipman, and is credited with one year's sea-service. To qualify a midshipman for promotion to a lieutenancy he must be nineteen years old, must have passed an examination to which he is submitted after serving two and a half years as midshipman, and must have served five and a half years as a midshipman, including the time allowed him on leaving the school.

The Royal Naval College was opened in 1839 as a school of gunnery, jointly with a school of gunnery-practice on board the Excellent for the instruction of commissioned officers. It supplied instruction in the theory of artillery, in mathematics, nautical astronomy, steam machinery, and in chemistry. The time allowed at the college was one year. Upon the introduction of steam into the navy officers voluntarily resorted to the dockyards, where instruction and facilities for experiment and study were supplied, as well as opportunities for working in the machine-shops. Most of the officers now in service have certificates of having passed this course. By an order of council dated Jan. 16, 1873, the Royal Naval College at Greenwich is reorganized, to open Feb. 1, 1874, for the instruction of officers of all branches of the naval service, including captains and excluding midshipmen. Full courses are provided in mathematics, mechanics, navigation and astronomy, marine engineering and artillery, naval architecture, drawing, and languages. The time allowed to each grade for study varies, according to the difficulty and importance of the branch studied, from six months to eighteen months. The schools of engineers and of naval architecture at

South Kensington are transferred to this college. Schools for warrant-officers, seamen, and boys are provided—(1) On all ships having a crew of 300 men, a permanent schoolmaster being generally appointed for the ship; in case the crew is less than 300 men, a petty officer of the ship gives instruction under the captain's orders, for which he is paid extra. (2) In schools on harbor-ships; four ships are specially devoted to this purpose—two at Portsmouth and two at Plymouth; boys remain in these ships one year. (3) In four schools in the barracks at Woolwich, Chatham, Portsmouth, and Plymouth, where the royal marines (artillery and infantry) are instructed, as also their children. (4) In schools for apprentices at seven dockyards—viz. Deptford, Woolwich, Chatham, Sheerness, Portsmouth, Devenport, and Pembroke; these last were established in 1840. Admission is gained by competition, and the duration of the course was five years, but in 1859 a supplementary and higher course of two years was added for the benefit of the most deserving of those who have served five years. (5) In the London and Liverpool schools of navigation, supported by the government for the instruction of the commercial marine. The number of training-ships for boys has been gradually increased to twelve, including those for harbor instruction and for practice cruising.

The governments of Austria, Russia, Bavaria, and Italy have establishments for education in naval science, and at St. Petersburg the Russian government has a very large naval academy. The course of instruction in all these resembles closely those already described.

United States.—From the first organization of the navy of the U. S. the system of appointing and training its junior officers was copied from the English navy. Lads of about fourteen years of age were appointed midshipmen and sent to sea in charge of the captains. In 1813 a law was passed authorizing the employment of a schoolmaster for each ship in which there were twelve midshipmen. The establishment of a school for naval science had in 1800 been as strongly urged by the executive department of the government as that of a military school. The latter was created in 1802; the naval school was not founded until 1845. For some years prior to that period midshipmen, at such times as they could be released temporarily from sea-service, prepared themselves for examination, and were examined for promotion at the Naval Asylum in Philadelphia. On Aug. 7, 1845, Mr. George Bancroft, secretary of the navy under Pres. James K. Polk, issued the first instructions to Commander Buchanan for the opening of the school. The war department had already transferred for that purpose the site and buildings of Fort Severn, one of the defences of Annapolis harbor, at the mouth of Severn River, in the State of Maryland. The school was formally opened on Oct. 10, 1845. The first object proposed was "to collect the midshipmen who from time to time are on shore, and give them occupation during their stay on land in the study of mathematics, nautical astronomy, theory of morals, international law, gunnery, the use of steam, the Spanish and French languages, and other branches essential in the present day to the accomplishment of a naval officer." In Jan., 1846, there were present 36 midshipmen appointed in 1840, 13 of the date of 1841, and 7 newly appointed. The latter were to remain at the school at least one year; those of 1840 and 1841 were to be drafted as required for sea-service. The instruction corps consisted of 8 persons. The buildings were found to be sufficient for the purposes of instruction, quarters, and mess. Mr. Bancroft had thus far proceeded under already existing regulations, and with such funds as were legally applicable, without calling upon Congress. The first appropriation ($28,200) was made in Aug., 1846, and a like amount was appropriated in 1847, and in December of that year the number of midshipmen in attendance was 90. In Oct., 1849, a board of officers was convened to reorganize the institution, and to make it conform as nearly as possible to the system pursued at the United States Military Academy at West Point. The course of instruction and the regulations were revised, and the title of the institution was changed from Naval School to United States Naval Academy. The duration of the course of study was fixed at *four years* in Nov., 1851. The corps of instructors was increased to 11, and the sloop-of-war Preble was assigned to the academy as a practice-ship and for the purpose of summer cruising for three and a half months each year. A board of visitors was provided for, who would inspect the academy annually and report upon its condition. Upon the breaking out of the civil war Annapolis became an important military dépôt, and on May 6, 1861, the academy, with all its apparatus and personnel, was transferred to Newport, R. I., where it remained until Sept., 1865. During this period the exigencies of a state of war interfered greatly with the system of graduation, the senior three of the four classes being sent to sea on active service. After the return to Annapolis in Sept., 1865, the programme of studies at the academy was rearranged upon the basis which, with very little modification, exists at present (1875). The course of instruction embraces the following departments: Seamanship, mathematics, gunnery, steam-engineering, astronomy, navigation and nautical surveying, natural and experimental philosophy, including analytical mechanics and chemistry, law, history, and English studies, French and Spanish languages and literature, drawing, art of defence, swimming, and gymnastics. In 1865 two classes of cadet engineers, not to exceed 50 in the aggregate, were added to the body of pupils at the Naval Academy. The duration of their course was until June 1, 1873, two years. By act of Congress approved Feb. 24, 1874, their course was lengthened to four years and the number of classes increased to four. The studies consist of mathematics, analytical mechanics, theory and practice of steam-engineering, chemistry and physics, the French language, drawing, designing of engines, and practice in the workshops. During the summer months the engineer classes make a cruise in a steamship, and visit the government workshops at the principal U. S. navy-yards. The academic year begins on Oct. 1, and ends May 30 of each calendar year. The summer months are employed in cruising at sea. The year is divided into two academic terms, the first term extending from Oct. 1 to Jan. 30. Each of the classes is divided into a convenient number of sections of 9 to 12 members, and no student is required to attend more than three recitations during the day; so that, besides the evening study-hours, one hour of each period (except drawing) may be devoted to study.

On Mar. 3, 1873, Congress passed a law changing the duration of the course for cadet midshipmen from four years to six years, to apply to the class admitted in 1873 and to all subsequent classes. The disposition to be made of the additional two years has not yet been fixed upon. The system of examinations comprises *monthly, semi-annual*, and *annual* examinations, all of which are conducted *in writing*, the same questions being proposed to each individual of a class of examinees. The relative merit determined by each monthly examination is combined with that denoted by the class-room daily record, and the monthly relative merits of a term are combined to form a term-record, which latter are again combined to form the annual record. Candidates for the classes of cadet midshipmen are nominated by the members of the House of Representatives in Congress (each member being entitled by law to one nomination), and are admitted to the academy between the ages of fourteen and eighteen years, provided they exhibit a good moral standing and sound physical condition. They must also pass a satisfactory examination in arithmetic, English grammar, geography, reading, writing, and spelling. The examinations of candidates for the classes of cadet engineers are competitive. Candidates must be between eighteen and twenty-two years of age and of sound body. They must possess, besides a fair English education, some knowledge of algebra and geometry and of steam machinery. They apply to the navy department for permission to present themselves for examination. Those examined are arranged in order of general merit, and are admitted in the order of their positions on that roll.

On Dec. 31, 1873, the personnel of the academy was as follows: commanding officer and staff, including medical and pay staff and chaplain, 10; instruction staff proper (comprising, besides 31 commissioned officers, 20 civilians), 51; civil officers, such as secretary, librarian, clerks, etc., 8; officers of the marine corps, 2; total staff of the academy, 71. Number of cadet midshipmen, 241; of cadet engineers, 39; total of students, 280. Aggregate, 351. The list of successive superintendents is as follows: (1) Commander Franklin Buchanan, 1845–47; (2) Commander George P. Upshur, 1847–50; (3) Captain C. K. Stribbling, 1850–53; (4) Captain L. M. Goldsborough, 1853–57; (5) Commodore George S. Blake, 1857–65; (6) Vice-Admiral D. D. Porter, 1865–69; (7) Rear-Admiral John L. Worden, 1869–74. In Oct., 1874, Admiral Worden was succeeded by Rear-Admiral C. R. P. Rogers as the eighth superintendent.

The departments of study are amply illustrated by models and apparatus. The seamanship museum exhibits the rise of naval art and its progress up to the present time, and is very rich in models, the latest one being a fully-equipped model 45 feet long of the second-rate war-steamer Antietam. In the gunnery department every form of great guns and small-arms is displayed. In the department of steam engineering every kind of marine engine is illustrated in detail and by working-models; besides which there is a complete marine engine, with two boilers—one for getting up steam, and a similar one for instruction in detail. This department has also a com-

plete workshop, foundry, and forge, all well supplied with apparatus and tools. The departments of philosophy and chemistry are furnished with the newest apparatus and materials for illustration and analytical study. The observatory contains a large collection of instruments, including an equatorial telescope. The library contains nearly 17,000 volumes, chiefly historical, scientific, and professional. The U. S. wooden sailing vessels Santee and Dale and the iron-clad Lehigh are stationed permanently at the academy for the purposes of instruction during the two academic terms in great guns and in sails, spars, etc. The ship Constellation is temporarily commissioned for the summer cruise of the first and third classes of the cadet midshipmen. The second class are permitted to visit their homes during the summer, and the fourth class, admitted in June, are quartered on board the Santee for practical instruction until Sept. 30.

By an act of Congress approved June 20, 1874, the U. S. government took a very important step towards encouraging popular nautical education. By this law the secretary of the navy is authorized to furnish a suitable vessel of the navy, completely equipped with charts, books, and instruments, to be used for the benefit of any nautical school established at each or any of the ports of Boston, New York, Philadelphia, Baltimore, Norfolk, and San Francisco. The President is also authorized to detail proper officers of the navy as superintendents of, or instructors in, such schools. R. S. SMITH.

Na′val Administra′tion. The navy department, one of the executive branches of the Federal government, has for its head or chief a civil officer called the secretary of the navy, who receives his appointment from the President, by and with the advice and consent of the Senate, and is a member of the President's cabinet. His salary is $8000 per annum, without allowances of any description. As the President is, under the Constitution, the commander-in-chief of the army and navy of the U. S., the secretary of the navy is in reality his representative in the navy department. He may be called the organ of the President for the business of the government pertaining to that department and to the navy, and, with the exception of cases in which independent powers are specially invested in him by law, his acts are with the authority of the President, are regarded as having his direction and sanction, and have full force and effect as such. In matters of great moment it is not unusual for the President to give special instructions for the secretary's guidance, or for the latter to consult the former and ascertain his views or wishes.

As a separate and independent branch of the government, the navy department was established by an act of Congress approved Apr. 30, 1798. Prior to that time the administration and management of naval and maritime affairs were entrusted to committees, agents, and boards constituted and appointed under resolutions and acts of both the Continental and the Federal Congress, and for nearly ten years to the secretary of war. The protection of the colonies against acts of Great Britain suggested and prompted the first legislation towards the formation of a navy or the creation of a navy department. This provision for naval defence was the passage of a resolution on Oct. 13, 1775, directing the appointment of a committee of three prominent members of the Continental Congress, with authority to fit out two sailing vessels. This committee was on the 30th of the same month increased to seven members, and the number of vessels to four. The next legislation, a resolution of Nov. 10, 1775, directed two battalions of marines to be raised, to be composed of good seamen or persons so acquainted with maritime affairs as to be able to serve to advantage by sea when required, and to continue in service, unless sooner dismissed by order of Congress, during the war between Great Britain and the colonies. About the same time provision was made respecting the seizure and disposition of vessels, men, and materials belonging to Great Britain that should be captured by cruisers operating under commissions from Congress, and rules and orders for the navy of the United Colonies were agreed on. On Dec. 11, 1775, a committee was appointed, composed of one member for each colony, to devise ways and means to furnish the colonies with a naval armament, and to report with all convenient speed. On the report of this committee thirteen vessels were ordered to be equipped at a cost of $866,666⅔. Mar. 23, 1776, still further measures for naval defence were enacted, which authorized the inhabitants of the colonies to fit out armed vessels to cruise on the enemies thereof. Apr. 3, following, resolutions were passed to send to the general assemblies of the colonies blank commissions for private ships of war and letters of marque and reprisal, signed by the president of Congress, to be filled out for those desiring them. By this time or soon after a number of officers of high rank had been appointed, the pay, rank, etc. of the officers of the navy and marine corps had been fixed, also the pay of seamen, bounty for captures, etc., and about twenty-five vessels of different classes were in the course of construction. From these several measures chiefly sprang the navy and private armed vessels which were engaged in the war of the Revolution.

The boards, etc. afterwards successively appointed and established until the organization of a navy department were—I. Nov. 6, 1776, Continental navy board of three persons, to be subordinate to the marine committee of Dec. 11, 1775. II. Oct. 28, 1779, a board of admiralty, to superintend the naval and marine affairs of the U. S., to consist of three commissioners not members of Congress, and two that were. III. Feb. 7, 1781, creating a secretary of marine to execute all the duties and powers specified in the act of Congress constituting the board of admiralty. IV. Aug. 29, 1781, the appointment of an agent of marine, with authority to direct, fit out, equip, and employ the ships and vessels belonging to the U. S., according to such instructions as he should from time to time receive from Congress. Until this agent was appointed the duties assigned to him were devolved upon the superintendent of finance. V. Aug. 7, 1789, the establishment of the department of war, to the secretary of which was entrusted, in addition to the matters pertaining to military affairs, all those respecting naval affairs.

The subject of establishing a navy department and creating a sufficient naval force to protect an active external commerce was repeatedly brought to the attention of Congress about this time. Washington in his annual message (1796) urged that the U. S. should take means and set about the gradual creation of a navy. The elder Adams, a warm advocate of the navy, in a special message to Congress May 16, 1797, strongly recommended naval means of defence against depredations on American commerce, and urged the necessity of equipping the frigates and providing vessels of inferior power. The importance of a separate department and more particular attention to naval interests was recognized in the act of Apr. 30, 1798, establishing an executive department, to be denominated the department of the navy, the chief officer thereof to be called the secretary of the navy, whose duty it should be to execute such orders as he should receive from the President of the U. S. relative to the procurement of naval stores and materials, and the construction, armament, and equipment of vessels of war, as well as other matters connected with the naval establishment of the U. S. It is from this act, through the President, that the general powers of the secretary of the navy are derived. An act of Feb. 7, 1815, added to the navy department a board of commissioners, to be appointed by and with the consent of the Senate, of three officers of the navy not below the rank of post-captain, to be attached to the office of the secretary, and, under his superintendence, to discharge all the ministerial duties of said office relative to the procurement of naval stores and materials and the construction, armament, equipment, and employment of vessels of war, as well as all other matters connected with the naval establishment of the U. S. The act also gave the board authority to prepare rules and regulations so as to secure uniformity in the several classes of vessels and their equipments and in repairing and refitting them, and responsibility in subordinate officers and agents. It also furnished estimates of expenditures. Aug. 31, 1842, the act creating the board of navy commissioners was repealed, and the navy department was reorganized by the establishing of, and attaching to it, five bureaus—viz.—yards and docks; construction, equipment, and repair; provisions and clothing; ordnance and hydrography; and medicine and surgery. The chiefs thereof, appointed by and with the advice and consent of the Senate, were selected, as the law prescribed, from captains for yards and docks and ordnance and hydrography; from the surgeons for medicine and surgery; a skilful constructor for construction, equipment, and repair; while for provisions and clothing no official designation was made. A regular naval constructor was not appointed to the bureau of construction, etc. until the passage of an act providing for it, Mar. 3, 1853. By an act of July 31, 1861, an additional office was created, that of assistant secretary of the navy, the appointment to be made by and with the advice and consent of the Senate, and the duties to be such as the secretary, for whom he should act during his absence, should prescribe. This office was abolished on Mar. 3, 1869. July 5, 1862, the department was again reorganized by creating three additional bureaus and changing the titles of others. That organization is now maintained, the bureaus being yards and docks, equipment and recruiting, navigation, ordnance, construction and repair, steam engineering, provisions and clothing, and medicine and surgery—the new bureaus of equipment and recruiting, navigation, and steam engineering assuming such of the duties pertaining to their respective

branches as were formerly under other bureaus. The chiefs of these bureaus are commissioned, by and with the advice and consent of the Senate, for four years, and receive the highest pay of their grades in the navy. For yards and docks, navigation, equipment and recruiting, and ordnance the selection must be from officers of the line not below the grade of commander; for medicine and surgery, from the list of surgeons; and for provisions and clothing, from the list of paymasters of not less than ten years' standing; for construction and repair a skilful naval constructor must be selected, and for steam engineering a skilful engineer from the list of chief engineers. This act provides for an assistant to the bureau of medicine and surgery, and also provided for an assistant to the bureau of ordnance, which latter office was, however, abolished Apr. 17, 1866. An act of Mar. 2, 1865, created an additional office, that of solicitor and judge-advocate-general, temporary in its character, limiting it to the end of the rebellion and one year after. It was, however, provided for by annual appropriations until June 22, 1870, when it was made permanent, and transferred, under the title of naval solicitor, to the department of justice. The naval solicitor maintains a twofold relation, being under the department of justice, but continuing his office in the navy department, and to him is submitted by the secretary of the navy for opinion many questions which from their nature would formerly have been referred directly to the attorney-general. He stands in the light of a law-officer or legal adviser of the navy department.

The duties of the office of the secretary of the navy are performed under his immediate supervision. There is attached to the office a chief clerk of the department and 14 other clerks. The chief clerk has the care and custody of the files and records of the office and the general supervision of the duties of the other clerks and the subordinate employés thereto attached. JOHN W. HOGG.

Na′val Architect′ure. The present century will always be distinguished in history for the successful application of philosophical knowledge and the exact sciences to mechanical arts, and for the great benefits that have resulted to all civilized nations therefrom. At the present day a rapid development of new resources is going on in all directions, and the forces of nature are being brought more under man's control, and made available according as the increase of scientific knowledge renders their plan of action and character better known. In the art of naval construction there seems to have been no less advance than in any other, which is due principally to the growth of enlightened ideas and the successful application of abstract science. At the present day nothing will compensate the naval architect for the want of a sound and accurate knowledge of mechanics, and without such knowledge he will only be able to imitate vessels that have had or are in being, more or less approved; and if he attempt to depart from them, he runs a great risk of falling into great, perhaps fatal, errors. Construction by the rule of thumb is nothing more than the adoption of some approved plan with perhaps some slight modification; and while those who resort to this may be, and generally are, on the safe side, and generally obtain very satisfactory results, they add nothing to professional science; and if this course is adhered to, and improvements are not accepted on account of constructors being unable to judge of their merits, the practice of naval construction must come to a standstill; and the nation which allows this state of things to exist must expect to see her ships surpassed by those of others where science is in more request and the highest standard of professional and scientific requirements is required in their naval architect. It is the height of folly to think of building a vessel, especially a war-vessel, without a previous and thorough calculation of her requirements in every respect. During the past sixty years improvements of unparalleled importance and magnitude have been made in the construction of vessels of war, and at the present day naval architects are able to bring to bear the great resources that have grown out of the discoveries that have been made in all branches of science to which the profession is united. It is asserted by Prof. Inman, whose authority none disputes, that "at the commencement of the present century there was hardly an individual in England who knew correctly even the first elements of the displacement of a ship, either loaded or light." What has the world witnessed since then? The sailing qualities of vessels greatly improved; steam applied as a motive or auxiliary power to ships of war and merchant vessels; the old sailing vessels of the navies of the civilized world ignored and steam navies constructed; and, finally, the production of the iron-clad vessels of our own and foreign navies.

A ship must have buoyancy, to enable her to carry the weight intended when immersed to the required depth in the water; stability, that she may tend to "right herself" when inclined from the upright position by some disturbing influence, deviating no farther from that position than is consistent with safety, and that her movements may not be such as to damage the vessel or cargo; speed sufficient to meet the requirements of the owner or owners and the purpose for which she is designed; and, finally, be able to work well under steam or sail. These qualities are mainly dependent on forces that are exerted between the ship and the surrounding fluids—*i. e.* water and air; consequently, the means of obtaining them depend mainly on the principles of "hydrostatics," or the balance of fluids, and hydrodynamics, or the motion of fluids, the applications of which are known by the term "hydraulics." One of the elementary laws of hydrostatics is that no matter what the shape of a body floating *in equilibrio* in a fluid, the weight of the fluid displaced is equal to the weight of the body, and the straight line joining the centres of gravity of the body and fluid displaced is vertical. The quantity of water displaced by a ship is called her *displacement*, and is expressed as being so many tons, a ton being the weight of 35 cubic feet of sea-water or 35.9 cubic feet of fresh water. To find the weight of a vessel by computing the parts comprising it would be a task of great magnitude, but after the vessel is launched, since it is known that her weight is equal to that of the water she displaces, we have only to find the cubic contents of the part immersed, multiply it by a unit of volume of water, and the product is the weight of the ship. It is always possible to find a single point in any body in which the weight or pressure is concentrated: in the case of a body's weight, it is called the *centre of gravity*; in case of pressure, *centre of pressure*; and when the pressure is that of a fluid in which a solid body rests, *centre of buoyancy*, generally known as the *centre of gravity of displacement*.

Next to the determination of the displacement, and the securing that the ship shall float with the proposed draught of water fore and aft, the most important point is the determination of the stability—*i. e.* the measure of the force which tends to bring the vessel back to the upright position when by any cause it has been inclined from that position. Stability is of two kinds—*statical* and *dynamical*. The former measures the force necessary to retain the ship inclined at some finite angle—as, for instance, 7°—or that with which, on any slight displacement, it tends to regain its upright position. Dynamical stability is measured by the number of units of work which are requisite to heel a ship over through a given angle. If, therefore, the work capable of being developed by a sudden gust of wind or blow of a wave, or any cause, be known, it is proposed by dynamical stability to determine the angle through which the vessel will be inclined; and the point in construction would be to determine that in heeling through this angle it does not reach a new position of equilibrium, which would be one of instability, and consequently does not overset. For sailing vessels statical stability is beyond a doubt the most important element, as the chief qualities of the vessel depend on it.

The disturbances in a ship's position called *heeling*, *pitching*, and *sending* are all disturbances of angular position, and the ship's stability, as opposed to them, depends on similar principles. Stability against heeling is explained as follows: In order that a pair of forces applied to one body may balance each other, they must be equal and opposite to each other, but directly opposed—that is, they must act against each other in the *same* straight line. When a pair of equal forces act in opposite directions in *parallel* though not identical lines, they do not balance each other, but constitute what is called a *couple*, tending to turn the body in a new angular position. When the angular position of such a body as a ship is disturbed, the weight and the supporting pressure, which originally were a pair of directly opposed equal forces, producing balance, become a couple, and the body is stable or unstable according as that couple is a *righting couple* or an *upsetting couple*. Take two blocks having a rounded base, and rest them on a level surface. By placing either of these blocks so that the upward pressure of the surface they rest on, exerted against the point of support, may act in a line passing through the centre of gravity of the block, they may be balanced. If a block with a narrow and sharp curved base is disturbed, the weight, acting through the centre of gravity, and the pressure exerted at the point of support, will form an *upsetting couple*, and make it fall down on its side. If a broader one is disturbed, the weight, acting through the centre of gravity, and the pressure at the point of support, form a *righting couple*, and the block will return to its position of balance. The stability of a ship may be compared to the last illustration.

The stability of a floating body is regarded by some persons as like that of the common pendulum, in which the centre of gravity hangs below the point of support.

As the pendulum swings, the force of gravity, acting vertically downward through the centre of gravity, always tends to make it return to its position of equilibrium. If this were correct, the point of suspension would be represented by the centre of buoyancy, and the centre of gravity of the ship would of course correspond to the centre of gravity of the pendulum. According to this view, the condition of stable equilibrium for every ship would be that her centre of gravity should be below her centre of buoyancy, and the degree of her stability would be in exact proportion to the distance below the centre of buoyancy at which her centre of gravity is situated. To show the incorrectness of this view it is only necessary to point out that no ship in the navy, whether modern iron-clad or old wooden ship, can ever have had her centre of gravity below her centre of buoyancy. The centre of gravity of the unarmored line-of-battle-ship Conqueror was 9 feet above her centre of buoyancy, and by no practicable arrangement could the centre of gravity of a ship of this class be brought below her centre of buoyancy. The armor-plated ship Prince Consort, whose stability is considered to be in excess, has her centre of gravity 8 feet above the centre of buoyancy. The Warrior, the first of the iron-clads, had her centre of gravity 8 feet above the centre of buoyancy. In no one of these cases would it be practicable to bring the centre of gravity below the centre of buoyancy. It is therefore quite clear that the stability of a ship does not depend upon the centre of gravity being below the centre of buoyancy.

There is another erroneous notion, as to the height of the centre of gravity in the iron-clads being excessive, and making it difficult, if not impossible, to give them as much stability as might be desired. This will be seen to be an error when it is remembered that the old line-of-battle-ships were higher by many feet than the modern iron-clads. The iron-clad carries her armor in lieu of the upper decks, with their guns, etc., which were carried by the old wooden three-decker and two-decker; and the armor is lower than the top-weights of the old-fashioned ships, for which, in this sense, it is a substitute. For instance, the Howe had her spar-deck 27 feet above the water. The spar-deck of the Hercules iron-clad is about 18 feet above the water. For this reason we should expect to find the centre of gravity of the Howe higher than that of the Hercules. We do not know the precise position of the centre of gravity of the Howe, but the centre of gravity of the Conqueror was found by experiment to be about 10 inches below the water. In the following iron-clads the centre of gravity is considerably more below the water, as shown against their names:

Warrior	2.285	feet below.	Hercules	1.367	feet below.
Prince Consort	2.15	" "	Bellerophon	2.03	" "
Captain	2.92	" "	Minotaur	1.99	" "

It is quite plain, therefore, that the absolute height of the centre of gravity in the iron-clads can cause no difficulty in the way of giving them sufficient stability. But, further, if the centre of gravity had been higher in the modern ships, there would be no difficulty in giving them the requisite stability (with the usual freeboard), beyond the difficulty there may be in the way of increasing the breadth. The Bermuda dock, when floating without water in its compartments, has its centre of gravity 20 to 30 feet above the water, yet it is by its great breadth made amply stable to carry a ship of the largest size quite up out of the water.

A few illustrations will now be given, independently of the preceding, to indicate the nature of stability, and show how it is secured in ships in which the centre of gravity is always above the centre of buoyancy, which is the point of support. Many find it difficult to understand how this arrangement can exist between the centre of buoyancy and the centre of gravity, because they think only of the pendulum, in which the point of support is a fixed point; in which case, of course, if the centre of gravity is placed above the point of support, the result is a position of instability. The centre of buoyancy is, however, not a fixed point, but it moves from side to side as the ship rolls, in a manner which is governed by her form and dimensions. The case is something like that of a man balancing a pole. The pole can be kept in the upright position if, when the centre of gravity receives any motion, the point of support is dodged beyond in the same direction. A very simple illustration is found in the case of a circular cylinder floating at any water-line, and let it represent a cross-section of a vessel. If the cylinder be homogeneous, its centre of gravity will coincide with its centre of figure. In this case it is sufficiently plain that the centre of buoyancy is in the vertical line through the centre of gravity. And this would continue to be so if the cylinder were made to roll quite round. The line of support, therefore, would always pass through the centre of gravity, and it would float in equilibrium in any position. This kind of equilibrium is what is called *indifferent equilibrium.* It has neither stability nor instability belonging to it. When a small displacement takes place from one position of equilibrium, the upward pressure of the water and the downward pressure of the weight of the floating body always act in opposite directions in the same vertical line, and have, therefore, no tendency to bring the body back to the position from which it started, nor to continue its rotation. But suppose the cylinder to be loaded on one side, so as to bring the centre of gravity out of the centre of figure. Now, if the cylinder be put in the water so that the centre of gravity is vertically below the centre of the figure, it will be vertically over the centre of buoyancy, and the cylinder will float in equilibrium. But now suppose it to be placed in the water so that it has the right displacement, but with the centre of gravity out of the vertical through the centre of the figure. It is then plain that the opposite forces acting through the centre of buoyancy and the centre of gravity, two parallel forces not acting in the same line, will cause the cylinder to revolve until the centre of gravity is in the line joining the centre of buoyancy and the centre of the figure, about which it will oscillate till it settles in the position of equilibrium. This will be a position of stable equilibrium. Again, suppose the cylinder to be placed in the water with the proper amount of displacement, but with the centre of gravity vertically over the centre of the figure. In this case the body would float in momentary equilibrium. But on any slight disturbance taking place the forces acting will cause the body to revolve away from the position of momentary equilibrium till it settles into that position of equilibrium in which the centre of gravity is vertically below the centre of the figure. Hence, the position in which the centre of gravity is unstable vertically over the centre of the figure is one of *unstable equilibrium.* In these cases it will be seen that the centre of gravity is above the centre of buoyancy, and yet the equilibrium may be stable, unstable, or indifferent. These cases, therefore, show that there is very little resemblance between the stability of floating bodies and that of the common pendulum. (See the article on HYDROSTATICS (*Stability of Floating Bodies*) for an illustration of this subject.)

It is clear that the stability of ships bears a very remote resemblance to that of the common pendulum, in which the point of support is fixed and is always above the centre of gravity. In a ship the usual position of the centre of gravity is necessarily above the point of support, and the point of support is a movable and not a fixed point. This kind of stability very nearly resembles that of a circular cylinder loaded on one side and resting on a horizontal floor. This cylinder will be in stable equilibrium when the centre of gravity is vertically below the centre of figure, and therefore vertically over the point of support. It will be seen in this case that any small disturbance from the position of rest causes the centre of gravity to move out of the line of support in such a way as to introduce an unbalanced force, whose tendency is to turn the body back to its position of rest from which it was disturbed. Here the point of contact with the floor, which is the point of support, takes the place of the centre of buoyancy, and the centre of the cylinder corresponds to the meta-centre. The moment of stability in this case is expressed by $W \times CG \sin \phi$.

The foregoing considerations are, we think, sufficient to indicate the mechanical and geometrical principles which are our guides in calculating the stability of ships. The formula for the moment of stability for any angle $\phi = Aa - Dd \sin \phi$, which is of general application, enables us to calculate with accuracy the righting force for any angle of inclination when the position of the centre of gravity is known. But for ships with high freeboard the height of the meta-centre above the centre of gravity is a sufficient guide to their stability. To obtain this height it is necessary to find by calculation the position of three points—the centre of buoyancy, the meta-centre, the centre of gravity. The centre of buoyancy is readily found, as it is the centre of gravity of a homogeneous solid of the form of the immersed portion of the ship. The height of the meta-centre above the centre of buoyancy is found from the formula—

$$\frac{2}{3}\frac{\int y^3 dx}{D},$$

which is derived immediately from the investigation given for the centre of a prismatic form. This determines the position of the meta-centre in the ship, and, if the position of the centre of gravity is known, the height of the meta-centre above the centre of gravity; and to this the gunwale. The only difficulty is to find the centre of gravity of the ship if the design is of a new type. To do this by taking into account the weight and position of every part

of the hull, as well as of the equipment and lading, is a very laborious and tedious operation, and would consist of so many parts, and be so liable to error, that we prefer to estimate the centre of gravity of the general framework of the hull by means of a few sections, and then, by a separate calculation, to put in the exceptional parts of the hull (such as armor, etc.) and the lading. But even this mode of calculating the centre of gravity involves considerable time, and it of course requires great care to avoid serious error. These calculations enable us to determine the stability of ordinary ships when inclined in smooth water, and to this extent the results are founded on well-established scientific principles.

If we could calculate the forces which tend to incline a ship with the same accuracy as those which tend to right her, we should have no difficulty in pronouncing on a given design whether the ship had sufficient stability and would be safe or not. But, unfortunately, we have no trustworthy data to enable us to approximate even the amount of upsetting force which the wind exerts on the sails with winds of various intensities and with corresponding different amounts of sail. We have no means of calculating the pressure of the wind when a given ship would carry only double-reefed topsails, nor what proportion of this pressure is effective in inclining the ship, taking into account the bellying of the sails and the degree of sharpness with which the yards are braced up. And we have no definite knowledge of the amplitude through which the given ship would be made to roll under the influence of the waves in which she may find herself in the breeze referred to. Thus science enables us to estimate accurately the righting force which a given design will have under a given angle of inclination in smooth water, but no science that we have ever heard of will enable us to say that this amount of stability is sufficient. Actual trial only can decide this part of the matter.

In the old sailing men-of-war and in the more modern steam navy a type of ship has been settled upon in each class which was well known to have sufficient stability to carry the sail belonging to it, and the naval officers who acquired their experience from service in such ships knew exactly what sail it was proper to carry in all sorts of weather, and knew when and to what degree it was necessary to shorten sail to save their ship or to save their spars. It may be thought that the more stability ships have the safer and better they are. It has, however, been long known that ships having very great stiffness under canvas were immoderate rollers in a sea-way, and the ships which rolled most moderately in a sea-way had the smallest amount of stiffness under sail. Mr. Froude has shown that the ship having very large stability in still water is not only a quick roller, but also, by reason of that quickness, a heavy roller in a sea-way. The rolling of a ship in the trough of the sea depends not upon the impulse of a single wave, but upon the repeated impulses of a succession of waves. Every ship has a certain time of oscillation in accordance with her stability, with her dimensions, and with the amount and distribution of her weights. If the ship is placed in the trough of the sea in a uniform series of waves whose time of passing through the distance from crest to crest is the same as her time of oscillation, she would be caused to roll most heavily, if not to upset altogether, by the action of the waves alone, without the aid of wind or sails. This bad effect would always be produced in a greater or less degree in proportion as the ship's time of oscillation approaches the periodic time of the waves she meets with. To make a ship steady in a sea-way it is necessary to make her time of oscillation as different as possible from the periodic time of the waves she is likely to meet with. The ship with large stability will have a short time of oscillation, while the ship with smaller stability will have a greater time of oscillation. It is, therefore, desirable not to give a ship more stability than is necessary to make her safe under sail in a sea-way, in which her motions will depend upon the combination of the inclination due to the action of the winds on the sails and the rolling caused by the waves. We have already pointed out that our calculations do not enable us to determine what is the minimum amount of stability which is necessary for a ship to render her safe as a seagoing sailing ship. We can merely compare the amount in one ship with that in another. If we know of a ship which has been already tried and found successful, we can design a ship which will have the same amount of stability. Or if the trials of a ship have shown that she has more than enough of stability to carry her sail, and too much for steadiness in a sea-way, we can design a ship with somewhat less stability without much risk. And while the ships have the usual freeboard the simple calculation of the meta-centre is sufficient for making the comparison, because in the case of two such ships, if they have the same righting power at a small angle, they will have the same or nearly so at all angles of inclination.

The plans made use of, and from which measure-

FIG. 3. FIG. 1.

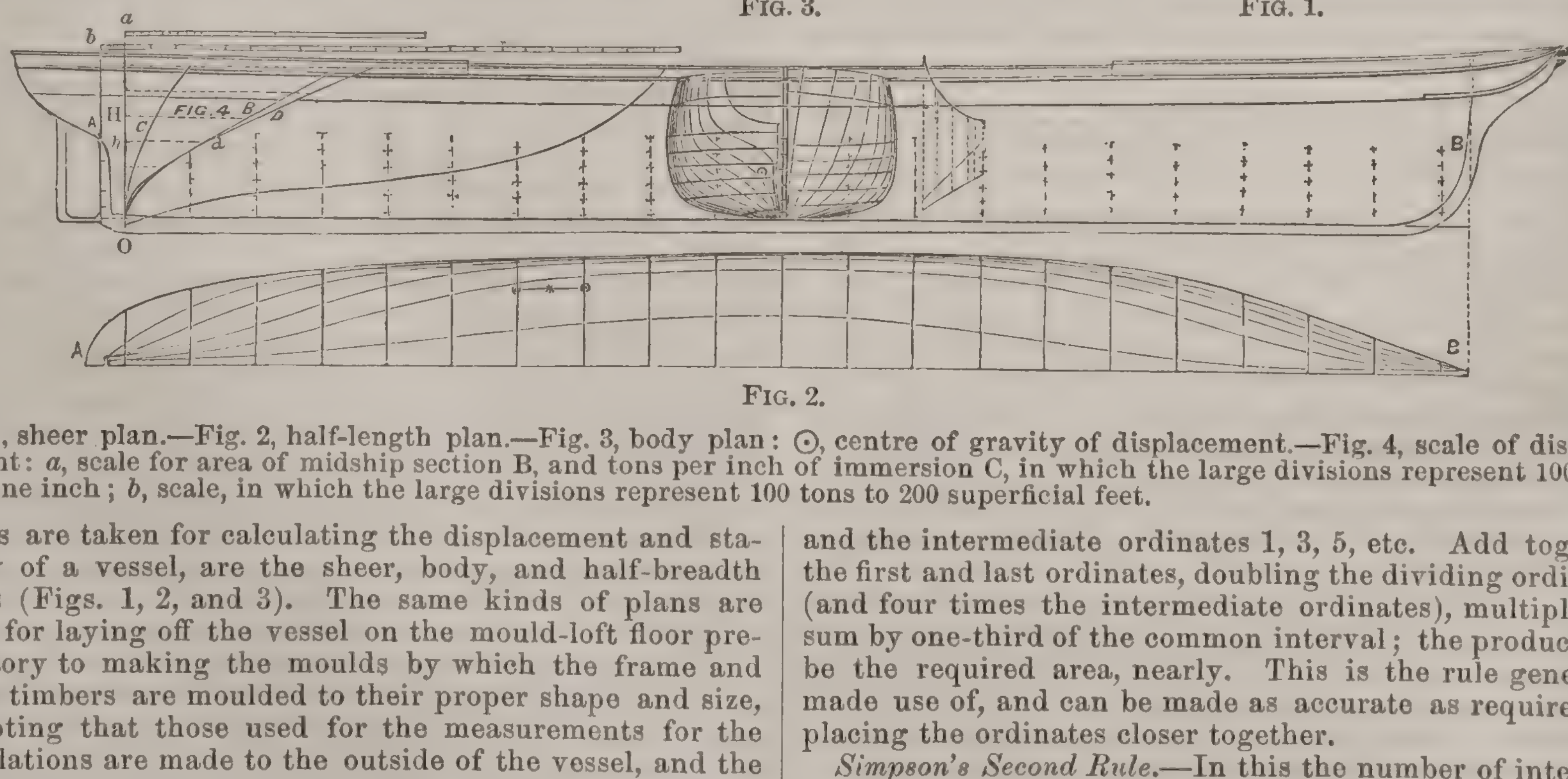


FIG. 2.

Fig. 1, sheer plan.—Fig. 2, half-length plan.—Fig. 3, body plan: ⊙, centre of gravity of displacement.—Fig. 4, scale of displacement: *a*, scale for area of midship section B, and tons per inch of immersion C, in which the large divisions represent 100 tons to one inch; *b*, scale, in which the large divisions represent 100 tons to 200 superficial feet.

ments are taken for calculating the displacement and stability of a vessel, are the sheer, body, and half-breadth plans (Figs. 1, 2, and 3). The same kinds of plans are used for laying off the vessel on the mould-loft floor preparatory to making the moulds by which the frame and other timbers are moulded to their proper shape and size, excepting that those used for the measurements for the calculations are made to the outside of the vessel, and the others to the outside of the frame only. The area of any water-line or cross-section of a vessel is found by measuring a sufficient number of parallel and equidistant ordinates, conceiving the figure to be divided by certain of those ordinates into figures of the parabolic kind, computing the areas of these figures, and adding them together.

Conceive Fig. 2 to be divided into twelve equal intervals, to which either of the rules given below can be applied. The ordinates into which the figure is divided will be called dividing ordinates, and all others, except the first and last, intermediate ordinates.

Trapezoidal Rule.—Here all excepting the first and last ordinates are dividing ordinates. Add together all the dividing ordinates, and one-half of the first and last ordinates; multiply the sum by the common interval, and the product will be the required area, nearly.

Simpson's First Rule.—The number of intervals must be even, therefore the dividing ordinates are 2, 4, 6, 8, etc., and the intermediate ordinates 1, 3, 5, etc. Add together the first and last ordinates, doubling the dividing ordinates (and four times the intermediate ordinates), multiply the sum by one-third of the common interval; the product will be the required area, nearly. This is the rule generally made use of, and can be made as accurate as required by placing the ordinates closer together.

Simpson's Second Rule.—In this the number of intervals must be a multiple of three, being marked 3, 6, 9, etc., and the intermediate ordinates, 1, 2, 4, 5, etc. Add together the first and last ordinates; double the dividing ordinates and three times the intermediate ordinates; multiply the sum by three-eighths of the common interval; the product will be the required area, nearly.

In the sheer, body, and half-breadth plans (Figs. 1, 2, and 3) the water-lines are drawn to the outside of plank. The sixth water-line is the *load water-line*.* The depth between the top of the keel and the load-line is divided into a number of equal intervals by other water-lines, which may be numbered 1st W. L., 2d W. L., 3d W. L., etc. As a starting-point or base-line for all the measurements, there is taken the centre line of the load or 6th W. L., marked B A in the sheer and half-breadth plans (Figs. 1 and 3). It extends from the fore edge of the rabbet of the stem at B to the after edge of the rabbet of the stern-post at A; and that distance

* Outer line of all from centre line.

is divided up into a sufficient number of equal intervals. The relative capacities of the fore and after bodies may be calculated separately if their relative capacities are required, but in the calculations appended this has not been done. The ordinates of a ship are all half-breadth measurements, taken from the plane traversing the axis A B to the outside surface of the plank of the ship. Each ordinate belongs at once to the water-section and to the vertical section of which it is the intersection, and has therefore two multipliers by Simpson's rules, according as it is to be used in computing the area of the water-section or that of the vertical section. There are *two* processes of computing the displacement—one by *vertical sections,* and the other by *water-sections.* Both are necessary in the subsequent operations of finding the centre of buoyancy, and should be gone through with, because independent of this their final results are a check on the accuracy of the calculations, both results having to agree. The area of a given water-section represents the displacement in cubic feet per vertical foot of immersion, and this being divided by 12, gives the displacement in tons per inch immersion. Referring to the scale of displacement (Fig. 4), the displacements corresponding to the different draughts of water are laid down as the horizontal ordinates of a curve, O *d* D. The ordinate H D represents the load displacement, and the ordinate *h d* the displacement at the draught O *h*. A scale of tons is marked above the ordinate, H D. As the vertical cross-sections consist of two halves similar in form, the computations are made for the half areas, and the results multiplied by 2 to obtain the whole. In a similar manner the half areas of water-sections are computed first, and finally multiplied by 2. The computations for the load-displacement are performed by treating the areas of the water-sections just the same as the ordinates are treated in computing the areas of the cross-sections, the series of multipliers being the same as was then used. In computing the series of displacements up to the other water-sections the rule must be varied to suit the circumstances of the particular calculation. The volume of any even number of equally deep areas can be computed by Simpson's first rule, and, if three equally deep layers are required, by Simpson's second rule. The volume of the keel, stem, and stern-post, known as appendages, must be separately calculated and added to the main part of the displacement, but as this is of little account, it is often omitted. As the immersed portion of the vessel floating upright consists of two symmetrical halves, one on each side of the plane which traverses B A, it necessarily follows that the centre of buoyancy of the ship when floating upright must be in that plane; in order to find the position of that centre, it is necessary to find its horizontal distance from the forward perpendicular (in the case in point) through B and its vertical distance below the load-line. To find its horizontal distance from the transverse vertical plane through B, the area of each cross-section is to be multiplied by its distance from B, and the products treated as the ordinates of a new curve. The moment thus found, divided by the volume of the displacement, gives the distance required. The depth of the centre of buoyancy below the load-line is found by computing the moment of the volume of the displacement relatively to the plane of that section; or, in other words, the area of each water-section is multiplied by its depth below the load water-section, and the products treated as the ordinates of a new curve. The moment thus found, divided by the volume of the displacement, will give the depth required. Time is saved in the above calculations by not multiplying by the leverages themselves, but by the number of intervals to which these intervals are proportional, and afterwards performing a multiplication by the common interval after the addition is made; and in the appended calculations for displacement and centre of buoyancy this has been done.

The calculations of displacement, and of the positions of the centre of buoyancy and meta-centre, can be conveniently combined in one tabular arrangement for practical purposes. The methods of doing this are, of course, all identical in principle, but during the progress of naval architecture they have varied considerably in detail, and have been from time to time rendered more simple and concise. The arrangement adopted in this calculation is the most simple and concise yet known.

The cross-sections are numbered from 1 to 21, commencing at the bow. The ordinates or half-breadths at the intersections of the cross-sections and water-sections having been measured, are set down in the table given on the next page. The column on the extreme left of that table contains the numbers of the cross-sections, 1, 2, 3, 4, etc. The next column contains Simpson's multipliers in their order, agreeably to the rule. Then follow the columns containing the ordinates. Of these columns there are as many as there are water-sections; that is, in the present case, seven, including the base-line. The columns containing ordinates are headed at the top with the numbers of the water-sections, and immediately below these with Simpson's multipliers. The ordinates are ranged in as many lines as there are cross-sections; that is, in the present case, twenty-one, being at whole intervals apart.

*Arrangement of Results of Calculation.**—Immediately *to the right* of each ordinate is written, in differently-sized figures, its product by the Simpson's multiplier proper to the *line* to which the ordinate belongs. Immediately *below* each ordinate is written, in differently-sized figures, its product by the Simpson's multiplier proper to the *column* to which the ordinate belongs. For example, at the intersection of the line belonging to the cross-section 3 (for which the Simpson's multiplier is 2) and the column belonging to the water-section 3 W. L. (for which the Simpson's multiplier is 4) is the ordinate 3.83. Immediately to the right of that ordinate is written its product by the multiplier 2—viz. 7.66; and immediately below it is written its product by the multiplier 4—viz. 15.32. The products written *below* the ordinates are added in *lines;* and the sum of each line of products is written in the column headed "Half-areas $\div \frac{\text{V.I.}}{3}$," under the general heading "Vertical sections." The numbers in this column are proportional to the areas of the several vertical cross-sections; but to give the absolute values of those areas they still require to be multiplied by 2 and by one-third of the vertical interval of the ordinates (abbreviated into $\frac{\text{V. I.}}{3}$). Each of those numbers proportional to the areas of the cross-sections is then multiplied by the proper Simpson's multiplier, found in the second column from the extreme left of the table, and the products are written in the column headed "Multiples of areas." These multiples being added up, their sum (viz. 8766.98) is written at the foot of the column. It is then multiplied successively by one-third of the vertical interval $\left(\frac{\text{V. I.}}{3} = \frac{2}{3}\right)$, and by one-third of the horizontal interval $\left(\frac{\text{H. I.}}{3} = \frac{9.08}{3}\right)$. The product (17689.8073) is one-half of the load-displacement in cubic feet, which, being multiplied by 2, gives 35379.6146 cubic feet, the *whole load-displacement;* and this, being divided successively by 7 and by 5, gives 1010.8461, the load-displacement in tons. Each of the numbers in the column headed "Multiples of areas" is next multiplied by the proper "multiplier for leverage," contained in the column on its right. The multiplier for leverage for a given cross-section is the number of intervals by which that cross-section is distant from the first cross-section or commencement of the base-line. The products are set down in the column headed "Moments;" and having been added up, their sum (89580.72) at foot of column is multiplied by the horizontal interval (H. I. = 9.08). The product (813392.9376) is not the absolute value of the moment of the displacement relatively to the first cross-section, but it bears the same proportion to that moment which the sum of the column headed "Multiples of areas" (8766.98) bears to the displacement. Dividing, therefore, that product by that sum, the quotient (92.77 feet) is *the horizontal distance in feet of the centre of buoyancy abaft the first cross-section,* or No. 1.

Returning to the columns containing the ordinates, the products written immediately to the *right* of the ordinates are added in *columns,* and the sum of each column of products is written at the foot of the column, in the line marked "Half water-sections $\div \frac{\text{H. I.}}{3}$." The numbers in this line are proportional to the areas of the several water-sections; but to give the absolute values of those areas they still require to be multiplied by 2, and by one-third of the horizontal interval between the ordinates (here abbreviated into $\left.\frac{\text{H. I.}}{3}\right)$. Each of those numbers proportional to the areas of the water-sections is then multiplied by the proper Simpson's multiplier, as written in the line below it. The products are written in the next line again, marked "Multiples of water-sections," and being added together, their sum (8766.98) is written to their left. If the calculations have been correctly made, that sum ought to agree *exactly* with the sum of the column headed "Multiples of areas."

* This method was devised by the late Mr. John Wilson, chief draughtsman in the surveyors' department of the English admiralty.

No. of cross-sections.	Simpson's multipliers.	Keel. 1		1st water-line. 4		2d water-line. 2		3d water-line. 4		4th water-line. 2		5th water-line. 4		6th water-line. 1		Half areas ÷ V. I./3	Multiples of areas.	Multiples for leverage.	Moments.	Cubes.	Multiples of cubes.
1	1	.00 **.00**	.00	.00 **.00**	.00	.00 **.00**	.00	.00 **.00**	.00	.00 **.00**	.00	.00 **.00**	.00	.54 **.54**	.54	.54	.54	0	....	.15	.15
2	4	.38 **.38**	1.52	.54 **2.16**	2.16	1.12 **2.24**	4.48	1.79 **7.16**	7.16	2.39 **4.78**	9.56	3.00 **12.00**	12.00	3.58 **3.58**	14.32	32.30	129.20	1	129.20	45.88	183.52
3	2	.54 **.54**	1.08	.54 **2.16**	1.08	2.37 **4.74**	4.74	3.83 **15.32**	7.66	5.00 **10.00**	10.00	6.00 **24.00**	12.00	6.83 **6.83**	13.66	63.59	127.18	2	254.36	318.61	637.22
4	4	.54 **.54**	2.16	.79 **3.16**	3.16	4.29 **8.58**	17.16	6.45 **25.80**	25.80	7.95 **15.90**	31.80	9.06 **36.24**	36.24	9.87 **9.87**	39.48	100.09	400.36	3	1201.08	961.50	3846.00
5	2	.54 **.54**	1.08	1.45 **5.80**	2.90	6.79 **13.58**	13.58	9.16 **36.64**	18.32	10.60 **21.20**	21.20	11.54 **46.16**	23.08	12.16 **12.16**	24.32	136.08	272.16	4	1088.64	1798.04	3596.08
6	4	.54 **.54**	2.16	2.33 **9.32**	9.32	9.16 **18.32**	36.64	11.39 **45.56**	45.56	12.58 **25.16**	50.32	13.25 **53.00**	53.00	13.62 **13.62**	54.48	165.52	662.08	5	3310.40	2526.56	10106.24
7	2	.54 **.54**	1.08	3.41 **13.64**	6.82	10.87 **21.74**	21.74	12.89 **51.56**	25.78	13.79 **27.58**	27.58	14.20 **56.80**	28.40	14.37 **14.37**	28.74	186.23	372.46	6	2234.76	2967.36	5934.72
8	4	.54 **.54**	2.16	4.60 **18.40**	18.40	11.91 **23.82**	47.64	13.79 **55.16**	55.16	14.50 **29.00**	58.00	14.70 **58.80**	58.80	14.81 **14.81**	59.24	200.53	802.12	7	5614.84	3248.36	12993.44
9	2	.54 **.54**	1.08	5.79 **23.16**	11.58	12.58 **25.16**	25.16	14.20 **56.80**	28.40	14.79 **29.58**	29.58	14.95 **59.80**	29.90	15.06 **15.06**	30.12	210.10	420.20	8	3361.60	3415.66	6831.32
10	4	.54 **.54**	2.16	6.58 **26.32**	26.32	12.83 **25.66**	51.32	14.29 **57.16**	57.16	14.85 **29.70**	59.40	15.04 **60.16**	60.16	15.12 **15.12**	60.48	214.66	858.64	9	7727.76	3456.64	13826.56
11	2	.54 **.54**	1.08	6.83 **27.32**	13.66	12.87 **25.74**	25.74	14.25 **57.00**	28.50	14.79 **29.58**	29.58	15.00 **60.00**	30.00	15.08 **15.08**	30.16	215.26	430.52	10	4305.20	3429.28	6858.56
12	4	.54 **.54**	2.16	6.62 **26.48**	26.48	12.66 **25.32**	50.64	14.12 **56.48**	56.48	14.66 **29.32**	58.64	14.83 **59.32**	59.32	15.08 **15.08**	60.32	212.54	850.16	11	9351.76	3429.28	13717.12
13	2	.54 **.54**	1.08	6.16 **24.64**	12.32	12.35 **24.70**	24.70	13.89 **55.56**	27.78	14.45 **28.90**	28.90	14.62 **58.48**	29.24	14.70 **14.70**	29.40	207.52	415.04	12	4980.48	3176.52	6353.04
14	4	.54 **.54**	2.16	5.50 **22.00**	22.00	11.72 **23.44**	46.88	13.50 **54.00**	54.00	14.16 **28.32**	56.64	14.37 **57.48**	57.48	14.45 **14.45**	57.80	200.23	800.92	13	10411.96	3017.19	12068.76
15	2	.54 **.54**	1.08	4.58 **18.32**	9.16	10.62 **21.24**	21.24	12.83 **51.32**	25.66	13.70 **27.40**	27.40	14.06 **56.24**	28.12	14.14 **14.14**	28.28	189.20	378.40	14	5297.60	2827.14	5654.28
16	4	.54 **.54**	2.16	3.52 **14.08**	14.08	8.75 **17.50**	35.00	11.60 **46.40**	46.40	13.04 **26.08**	52.16	13.58 **54.32**	54.32	13.72 **13.72**	54.88	172.64	690.36	15	10358.40	2582.63	10330.52
17	2	.54 **.54**	1.08	2.43 **9.72**	4.86	6.25 **12.50**	12.50	9.62 **38.48**	19.24	11.87 **23.74**	23.74	12.79 **51.16**	25.58	13.20 **13.20**	26.40	149.34	298.68	16	4778.88	2299.96	4599.92
18	4	.54 **.54**	2.16	1.50 **6.00**	6.00	3.85 **7.70**	15.40	6.87 **27.48**	27.48	9.87 **19.74**	39.48	11.62 **46.48**	46.48	12.41 **12.41**	49.64	120.35	481.40	17	8183.80	1911.24	7644.96
19	2	.54 **.54**	1.08	.95 **3.80**	1.90	2.14 **4.28**	4.28	3.72 **14.88**	7.44	6.66 **13.32**	13.32	9.58 **38.32**	19.16	11.25 **11.25**	22.50	86.39	172.78	18	3110.04	1423.82	2847.64
20	4	.54 **.54**	2.16	.70 **2.80**	2.80	1.08 **2.16**	4.32	1.75 **7.00**	7.00	2.54 **5.08**	10.16	5.37 **21.48**	21.48	8.85 **8.85**	35.40	47.91	191.64	19	3641.16	693.15	2772.60
21	1	.54 **.54**	.54	.54 **2.16**	.54	.58 **1.16**	.58	.91 **3.64**	.91	.87 **1.74**	.87	.54 **2.16**	.54	.54 **.54**	.54	11.94	11.94	20	238.80	.15	.15

	Keel.	1st water-line.	2d water-line.	3d water-line.	4th water-line.	5th water-line.	6th water-line.
Half water-sections........ H. I./3	31.22	195.54	463.74	571.89	638.33	685.30	720.70
Simpson's multipliers....	1	4	2	4	2	4	1
Multiples for water-sections, sum, 8766.98	31.22	782.16	927.48	2287.56	1276.66	2741.20	720.70
Multiples for leverage.....	6	5	4	3	2	1	0
Moments. Sum, 19965.24	187.32	3910.80	3709.92	6862.68	2553.32	2741.20	0

V. I. = 2.
8766.98)39930.48
4.55
Centre of buoyancy below load water-line.

7.45
4.55
2.90 feet.
Meta-centre above load water-line.

31.22
782.16
463.74
1277.12
V. I. = 2.
3.)2554.24
851.41
H. I. = 9.08
681128
766269
3.)7730.8028
2576.9342
2.
35.)5153.8684 cubic ft.
147.2533 tons.
Displacement to 2d water-line.

463.74
2287.56
638.33
3389.63
V. I. = 2
6779.26
2554.24
3.)9333.50
3111.16
H. I. = 9.08
2488928
2800044
3.)28249.3328
9416.4442
2.
35.)18832.8884 cubic ft.
538.0825 tons.
Displacement to 4th water-line.

638.33
2741.20
720.70
4100.23
V. I. = 2.
8200.46
9333.50
3.)17533.96
5844.65
H. I. = 9.08
4675720
5260185
3.)53069.4220
17689.8073
2.
35.)35379.6146 cubic ft.
1010.8461 tons.
Displacement to 6th water-line.

	2d water-line.	4th water-line.	6th water-line.
Displacement per inch at lines....	12.27	44.84	84.23
Middle section at lines..........	54.30	167.18	287.00

8766.98
V. I. = 2.
3.)17533.96
5844.65
H. I. = 9.08
4675720
5260185
3.)53069.4220
17689.8073
2.
7.)35379.6146 cubic ft.
5.)5054.2306
1010.8461 tons.

Displacement to load water-line, or to a mean draught of 12′ 3″ above base-line or lower side of keel.

215.26
2
3.)430.52
143.50
2
287.00 sq. ft.

Area of midship section to load water-line.

89580.72
H. I. = 9.08
71664576
80622648
813392.9376

$\frac{813392.9376}{8766.98}$ = 92.77 ft.

Centre of buoyancy aft of section No. 1.

720.70
H. I. = 9.08
576560
648630
3.)6543.9560
2181.3186
2.
4362.6372 sq. ft. Area of load water-section.

130802.80
H. I. = 9.08
104642240
117722520
3.)1187689.4240
395896.4746
2
3.)791792.9492
263930.9830

$\frac{263930.98}{35379.61}$ = 7.45 feet.

Meta-centre above centre of buoyancy.

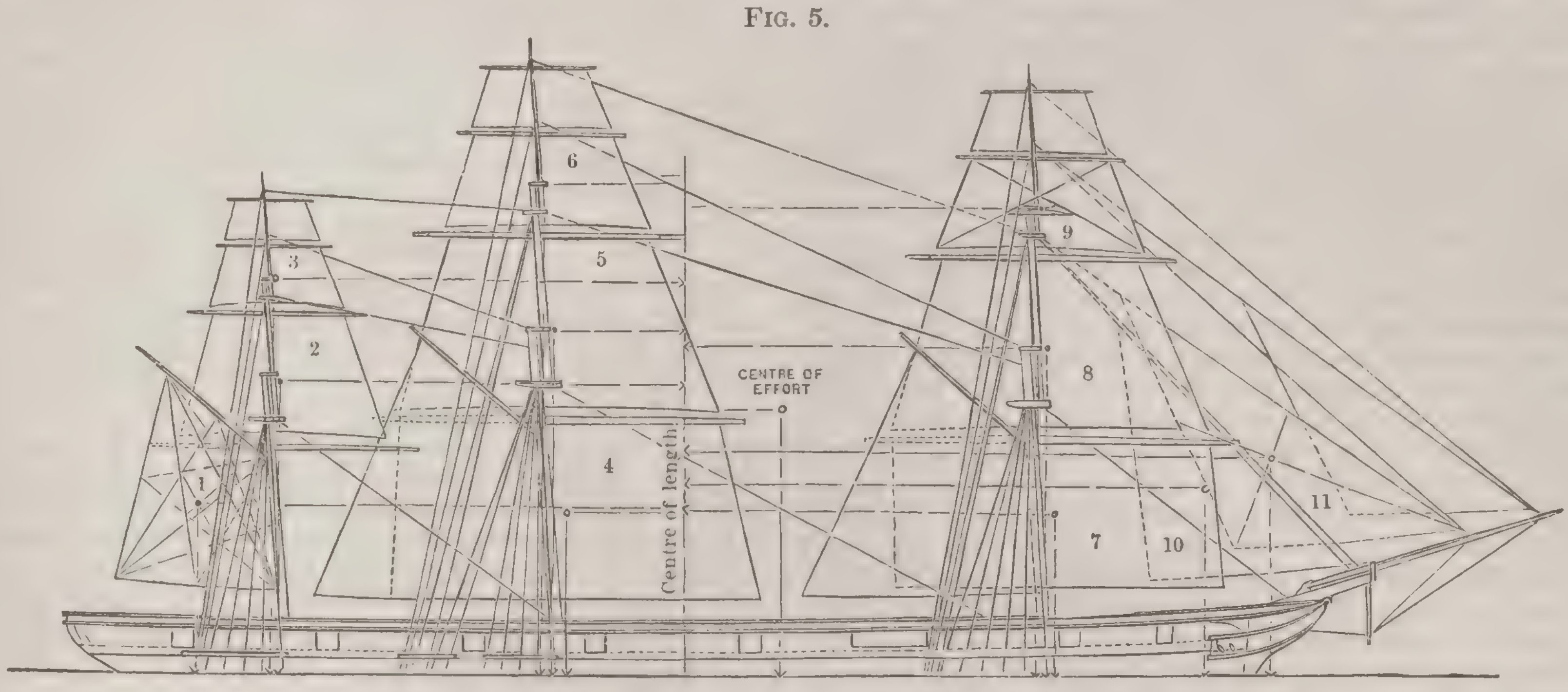
Each of the numbers in the line of "Multiples of water-sections" is next multiplied by the proper "Multiplier for leverage" contained in the line immediately below. The multiplier for leverage for a given water-section is the number of intervals by which that water-section is below the load water-section. The products are set down in the line marked "Moments;" and having been added together, their sum (19965.24) at the left end of the line is multiplied by the V. I. = 2. The product (39930.48) is not the absolute value of the moment of the displacement relatively to the load water-section, but it bears the same proportion to that moment which the sum of the line marked "Multiples of water-sections" (8766.98) bears to the displacement. Dividing, therefore, that product by that sum, the quotient (39930.48 ÷ 8766.98 = 4.55) is *the depth, in feet, of the centre of buoyancy below the load water-section.*

Below the calculations of moments just described are written the calculations of the *displacement up to the several water-sections* between the load water-section and the keel. The calculator here employs various rules according to his judgment, so as to save labor as much as possible. In the present case the displacement up to the second, fourth, and sixth water-sections is computed by Simpson's first rule. The area of each water-section in square feet being divided by 35, gives the *tons displacement per foot of immersion*, which is divided by 12 for the *tons displace-*

ment per inch of immersion. The *areas of the midship-section* (No. 11) up to the several water-lines are computed from its ordinates, just as the displacements are computed from the water-sections, and those areas are written at the foot of the table. The two columns at the right-hand side of the table headed "Meta-centre" contain the *calculations of stability,* estimated from the expression $\frac{2}{3}\frac{\int y^3 dx}{D}$, in which y = the ordinates of the half-breadth, load water-section; dx = the increment of the length of the load water-section; D = displacement of the immersed portion of the body in cubic feet.

The first of those columns headed "Cubes" contains the cubes of the ordinates or half-breadths of the load water-section. Each of those cubes is multiplied by the proper Simpson's multiplier (found in the second column from the left of the table), and the products are written in the column headed "Multiples of cubes." Those products having been added up, their sum (130802.80) is multiplied by one-third of the horizontal interval $\left(\frac{\text{H. I.}}{3} = \frac{9.08}{3}\right)$, giving the area of the curve whose ordinates are the cubes of the half-breadths (395896.4746). Two-thirds of that area is the *coefficient of surface stability* (263930.9830); which, being divided by the displacement in cubic feet (35379.61), gives

Fig. 5.



Calculations for Determining the Position of the Centre of Effort of the Sails of a U. S. Steam Sloop-of-War (Fig. 5). *Areas and Position of the Centre of Gravity and Moments of Sail.*

No. on Plan.	Species of sails.	In relation to the load water-line.			In relation to a section passing through the centre of the load water-line.		
		Areas.	Height of centre of gravity.	Moments.	Distance of centre of gravity from the centre in feet.	Moments before.	Moments abaft.
1	Spanker	631.41 ×	28.33 =	17887.8453	79.08*a*	....	49931.9028
2	Mizzen topsail	573.08 ×	48.41 =	27742.8028	65.33*a*	....	37439.3164
3	" top-gallant sail	187.50 ×	64.83 =	12155.6250	66.50*a*	....	12468.7500
4	Main sail	1615.44 ×	27.58 =	44553.8352	18.66*a*	....	30144.1104
5	" topsail	1232.15 ×	56.83 =	70023.0845	20.75*a*	....	25567.1125
6	" top-gallant sail	424.40 ×	80.41 =	34126.0040	22.33*a*	....	9476.8520
7	Fore sail	1259.88 ×	27.83 =	35062.4604	60.16*b*	75794.3808	
8	" topsail	1221.62 ×	54.33 =	66370.6146	58.58*b*	71562.4996	
9	" top-gallant sail	440.43 ×	77.41 =	34093.6863	57.66*b*	25395.1938	
10	Jib	680.00 ×	32. =	21760.0000	85.16*b*	57908.8000	
11	Fore topmast staysail	844.67 ×	37.41 =	31599.1047	95.66*b*	80801.1322	
	Totals	9110.58	....	395375.0628	....	311462.0064	165028.0441

$$\text{Height of the centre of effort above the load water-line} = \frac{395375.0628}{9110.58} = 43.39 \text{ feet.}$$

$$\text{Centre of effort before the centre of the load water-line} = \frac{146433.9623}{9110.58} = 16.07 \text{ feet.}$$

the *height of the meta-centre above the centre of buoyancy* (7.45 feet). From that height, at the lower left-hand corner of the table, is subtracted the depth of the centre of buoyancy below L. W.-L. (4.55 feet); leaving the *height of the meta-centre above* L. W.-L. (2.90 feet).

Experience has proved that the best fore-and-aft position for the centre of pressure of the wind on the sails of a ship is that which will tend slightly to make her fly up in the wind when sailing with the wind before the beam. The course taken by a ship when sailing with the wind before the beam is necessarily at an angle with the line of her keel, the pressure producing a motion which tends to drive her bodily to leeward as well as ahead. This angle, called the angle of leeway, depends on the form below water and the bracing of the yards. In order that this point may be in the best fore-and-aft position for sailing, it is usual in designing ships to arrange the sail-plan so that the point on it known as the *centre of effort,* which is taken as an approximation to the centre of pressure of the wind on the sails, shall be a certain distance before the centre of gravity of the immersed longitudinal section, usually called *centre of lateral resistance.* To secure *handiness* under sail, in addition to the centre of effort being properly located, it is necessary that the masts should occupy certain positions with regard to the length of the ship, and the sail be duly proportioned on them. But as no definite or correct rule can be given for their position, we are obliged to be guided by the arrangements existing in ships of known good qualities, and to change the positions from those which have shown bad qualities, so as to remedy the fault complained of. In our old sailing ships the foremast was much farther forward and the mizzenmast much farther aft than in our present steam navy. The masts of most of our sharp vessels have to be placed nearer amidships on account of the fineness of the extremities; and where the bow is very sharp the foremast has to be kept well out of the bow; this often renders the sail less effective on this mast, especially in wearing ship; and the only way to remedy this, and at the same time secure a good balance of sail for keeping steadily on a course, is to trim the vessel by the stern. The working qualities of the ship are materially affected by her trim or the position in which she floats. Every one of the qualities sought in a ship is more or less affected by every circumstance in the model and dimensions of the ship, the way in which her weights are distributed, and the means of her propulsion; and the constructor must bear all these qualities and circumstances in mind in making the designs for any vessel, and he must demand the fullest information which his design is required to fill. No ship can be properly designed unless the guns of which it is to be the floating carriage and the work which it is expected to perform be definitely settled. The question as to the number of guns, distance of the ports apart, speed required, and whether steam or sail is to be the auxiliary power, being settled, and if steam, how many days' coal are to be carried, the designer is prepared to go to work on his design.

Having made the principal calculations on the immersed

portion of the ship or her displacement, the quantity of sail and its distribution, or the moving force required with relation to the form of the vessel, is the next subject that demands attention. A plan of the sails having been drawn (Fig. 5), the areas of the several sails, centres of gravity, and centre of effort, or the centre of pressure of the wind on them, must be obtained. The rules for obtaining the areas are as follows: *Square Sails.*—Multiply the depth by half the sum of the breadths at the head and foot. *Triangular Fore-and-Aft Sails.*—Multiply any side by half its perpendicular distance from the opposite corner. *Four-Sided Fore-and-Aft Sails.*—Multiply either diagonal by the half sum of its perpendicular distance from the opposite corner. The centre of each sail is then found, as shown in Fig. 5. The areas of the sails and their centres having been determined by the above rules, the centre of effort of them is found by assuming an initial plane passing through the centre of the length of the load water-line, which will be seen represented in Fig. 5. From this plane the distances are measured by a scale rule to the centres of the respective sails shown on the plan, which distances, when multiplied into the respective areas of the sails, give the moment of the sail from the assumed plane; the difference in the moments of those that are before and those that are abaft the initial plane, divided by the total area of the sails, will give the distance of the common centre of gravity of the sails from it. This gives the position of the centre of effort with relation to the length of the load water-line. To find its height from the load water-line, the height of each sail's centre is taken from the load-line; this distance, multiplied by the area of the same, will give its moment of height from that line; and the sum of all the moments being divided, as before, by the total area of sail, will give the height of the centre of gravity of them from the load-line. The position of the centre of effort of them will thus be fixed. (See table of calculations for a U. S. sloop-of-war on previous page.) As a rule, there should be given about 36 square feet of plain sail to every square foot of midship section.

Calculations for Position of Centre of Weights made for U. S. Steam Sloop-of-War of 1238 tons.—Figs. 6, 7.

No. to be referred to on plan.	Species of weights.	Weights.	Distance of weights from the forward perpendicular.	Moments.
		lbs.	feet.	
1	General stores, berth-deck....	3,920	13.	50,960
2	" " hold.....	4,015	19.	76,285
3	Two (2) anchors on bow........	4,360	28.5	124,260
4	Sails, hold..........................	3,850	29.25	112,612
5	Provisions, stores, cables, etc., hold..........................	42,326	42.5	1,798,855
6	Sheet anchor in fore-hatch...	2,180	46.	100.280
7	Shot, grape, etc. on berth-deck	7,020	47.	329,940
8	Men and their effects............	24,560	49.	1,203,440
9	Tanks and water in hold......	22,759	53.25	1,211,916
10	Chain cables.........................	36,980	58.41	2,160,001
11	Tanks, powder, etc., magazine	12,559	64.75	813,195
12	Boat-ammunition and ordnance stores......................	2,500	70.	175,000
13	Shell in shell-room................	26,536	72.5	1,923,860
14	100-pdr. pivot gun and gear...	20,865	73.75	1,538,793
15	Coals in forward bunker.......	147,840	89.	13,157,760
16	2 VIII.-inch broadside guns and gear..........................	16,860	103.25	1,740,795
17	1 26-foot cutter, stowed in the waist..............................	2,000	108.25	216,500
18	1 30-foot launch, stowed do...	4,000	110.25	441,000
19	Boilers, water, sm.-stack, etc.	275,363	114.	31,391,382
20	2 VIII.-inch guns, broadside, and gear..........................	16,860	129.25	2,179,155
21	Coals over the boilers............	305,880	129.75	39,687,930
22	Engine, etc..........................	164,578	149.	24,522,122
23	1 24-foot cutter....................	1,500	158.25	237,375
24	2 VIII.-inch guns, broadside, and gear..........................	16,860	159.	2,680,740
25	1 26-foot cutter....................	2,000	159.	318,000
26	Engineer's stores..................	16,860	161.5	2,722,890
27	Stores in after-hold...............	12,043	172.	2,071,396
28	Paym'ster's stores, berth-deck	1,418	179.	253,822
29	Sails, " " ..	5,432	181.	983,192
30	Paymaster's stores, hold........	2,280	183.5	418,380
31	Officers and effects................	6,400	184.	1,177,600
32	Shaft-alley, pillow-blocks, shaft, etc..........................	28,426	185.	5,258,810
33	Stores, berth-deck.................	5,300	188.	996,400
34	Whaleboat and gig................	2,400	192.25	461,400
35	Bread, etc............................	12,319	197.5	2,433,002
36	Cabin stores.........................	800	207.	165,600
37	Propeller.............................	5,100	218.5	1,114,350
38	Metal rudder and gear..........	6,267	223.	1,397,541
	Totals..................................	1,273,216	......	147,645,539

$147645539 \div 1273216 = 115.95$ distance in feet of the centre of weights from the forward perpendicular.

Number of areas..........			15 or aft.		14		13		12		11	
Depth....................			0		7.90		12.28		13.19		13.40	
Common interval between the breadths............			0		1.97		3.07		3.29		3.35	
	Number.	Multiple.	Ordinate.	Product.	Ordinate.	Product.	Ordinate.	Product.	Ordinate.	Product.	Ordinate.	Product.
	1	1	0 0	0 0	8.59	8.59	10.55	10.55	11.85	11.85	12.79	12.79
	2	4	0 0	0 0	7.30	29.20	9.48	37.92	11.28	45.12	12.58	50.32
	3	2	0 0	0 0	4.70	9.40	6.80	13.60	9.70	19.40	11.68	23.36
	4	4	0 0	0 0	2.55	10.20	3.32	13.28	6.12	24.48	8.87	35.48
	5	1	0 0	0 0	.82	.82	.88	.88	1.15	1.15	1.40	1.40
Sum of products..........			....			58.21		76.23		102.00		123.35
⅓ common interval......			....			.66		1.02		1.09		1.12
						34926		15246		91800		24670
						34926		76230		102000		12335
												12335
						38.4186		77.7546		111.1800		138.1520
						2.		2.		2.		2.
Areas.........			....			76.8372		155.5092		222.3600		276.3040

Number of areas..........			10		9		8		7		6	
Depth....................			13.32		13.30		13.40		13.48		13.60	
Common interval between the breadths............			3.33		3.32		3.35		3.37		3.40	
	Number.	Multiple.	Ordinate.	Product.	Ordinate.	Product.	Ordinate.	Product.	Ordinate.	Product.	Ordinate.	Product.
	1	1	13.55	13.55	13.90	13.90	14.05	14.05	13.69	13.69	13.10	13.10
	2	4	13.59	54.36	14.15	56.60	14.25	57.00	13.89	55.56	13.05	52.20
	3	2	13.04	26.08	13.80	27.60	13.95	27.90	13.50	27.00	12.40	24.80
	4	4	11.30	45.20	12.55	50.20	12.80	51.20	12.08	48.32	10.42	41.68
	5	1	1.65	1.65	1.70	1.70	1.75	1.75	1.70	1.70	1.60	1.60
Sum of products..........				140.84		150.00		151.90		146.27		133.38
⅓ common interval......				1.11		1.11		1.11		1.12		1.13
				14084		15000		15190		29254		40014
				14084		15000		15190		14627		13338
				14084		15000		15190		14627		13338
				156.3324		166.5000		168.6090		163.8224		150.7194
				2.		2.		2.		2.		2.
Areas.........				312.6648		333.0000		337.2180		327.6448		301.4388

Number of areas..........			5		4		3		2		1	
Depth....................			13.85		13.96		13.92		13.18		0	
Common interval between the breadths............			3.46		3.49		3.48		3.29		0	
	Number.	Multiple.	Ordinate.	Product.	Ordinate.	Product.	Ordinate.	Product.	Ordinate.	Product.	Ordinate.	Product.
	1	1	11.96	11.96	10.20	10.20	7.85	7.85	4.70	4.70	0 0	0 0
	2	4	11.68	46.72	9.65	38.60	7.09	28.36	3.86	15.44	0 0	0 0
	3	2	10.84	21.68	8.65	17.30	5.90	11.80	2.94	5.88	0 0	0 0
	4	4	8.38	33.52	6.18	24.72	3.90	15.60	1.88	7.52	0 0	0 0
	5	1	1.45	1.45	1.30	1.30	.70	.70	.50	.50	0 0	0 0
Sum of products..........				115.33		92.12		64.31		34.04		
⅓ common interval......				1.15		1.16		1.16		1.09		
				57665		55272		38586		30636		
				11533		9212		6431		34040		
				11533		9212		6431				
				132.6295		106.8592		74.5996		371036		
				2.		2.		2.		2.		
Areas.........				265.2590		213.7184		149.1992		74.2072		

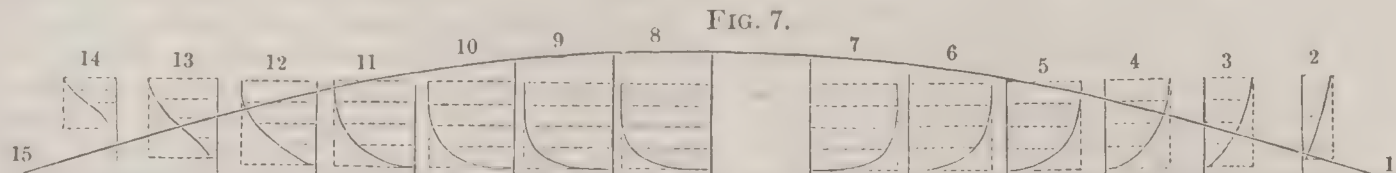
In order to calculate the position in which a ship will trim, it is necessary to ascertain the common centre of gravity of all the weights in a fore-and-aft direction. The weights of all the objects she is designed to carry are ascertained, and their individual centres of gravity of weight marked upon a plan like Fig. 6, in the position that they are to be placed or permanently located when the vessel is fully equipped for service. As these weights act at detached points, their common centre of gravity can be found by choosing a fixed vertical plane to which to refer the position of the weights. Measure the distance of each weight's centre from this plane, and multiply the weight by its distance, which will give its moment; divide the sum of the moments by the sum of the weights, and the quotient will be the common centre of gravity from the fixed plane. The fixed plane in this case was the *forward perpendicular;* the sum of the moments was 147645539, which being divided by the sum of the weights (1273216), the quotient (115.95 feet) indicated the distance that the common centre of gravity of the weights was abaft the forward perpendicular, which was 7.95 feet abaft the centre of length between perpendiculars. If it were desired to find what would be the effect upon the position of the centre of gravity of a set of weights of shifting one of those weights into a new position, the distance through which the weight has been moved multiplied by the weight, and divided by the sum of all the weights, will give the distance through which the centre of gravity has been shifted in a direction parallel to that in which the weight is moved. If it is only desired to find how far a single weight must be moved to move the common centre of gravity through a given distance,* multiply the sum of the weights by the distance through which their common centre of gravity is to be moved, and divide by the single weight.

Statement of Dimensions, Weights, etc., for a Wooden Screw Sloop-of-War of 1238 tons.

Length between perpendiculars	216 ft. 0 in.
Breadth moulded	30 "
" extreme	30 " 10 "
Depth in hold	13 " $8\frac{1}{2}$ "
Burden in tons	1238
Area of the midship section in square feet	321
Height of midship port-sill	5 " 0 "
Engines, 36-inch cylinders, 36-inch stroke.	
Revolution	70
Cut-off at two-thirds of the stroke.	
Steam pressure	30 lbs.
Maximum horse-power	1000
No. of tons of coal carried	200
Complement of men	160
Diameter of the propeller	12 ft. 3 in.
Pitch of propeller, expanding 21 to 23 feet.	
Provisions for three months.	
Armament, 6 VIII.-inch shell guns, 1 100-pdr. Parrott rifle (pivot).	
Draught of water ready for sea { forward	12 " $3\frac{1}{2}$
Draught of water ready for sea { aft	13 " 3

In every registered U. S. ship or vessel the number denoting the total registered tonnage in tons of 100 cubic feet shall be deeply carved or otherwise permanently marked on the face of the beam in the main hatch, and shall be so continued; and if at any time it cease to be so continued, such vessel shall no longer be recognized as a registered U. S. vessel. Fig. 7 shows the dimensions as taken, and the calculations for the register tonnage computed for the U. S. steam sloop-of-war Resaca, in accordance with the act of Congress passed May 6, 1864: U. S. screw-steamer Resaca, built at navy-yard, Portsmouth, N. H., has two decks and a round stern—

FIG. 7.



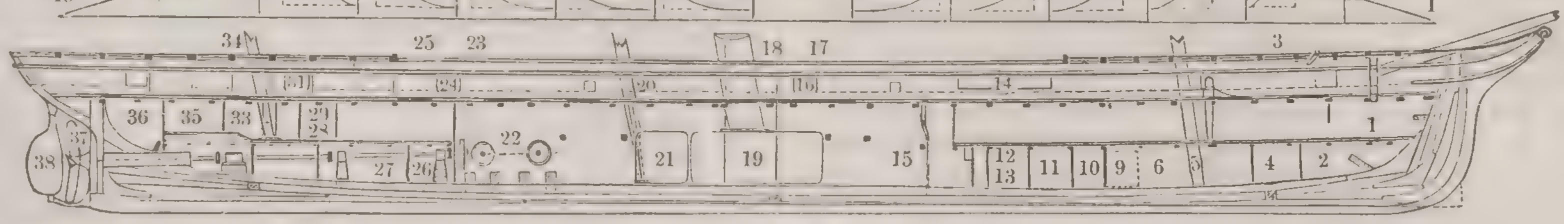


FIG. 6.

Length on the tonnage-deck, from outside of plank at the bow to the back of the stern-post.......216 feet.
Extreme breadth from outside of plank....... 31.25 "
Hold, from under side of tonnage-deck to limber-strake (four inches allowed)....... 13.50 "

Dimensions for Calculations for the Tonnage.

Length from the inside of the inner planking at the bow to the inner side of the inner planking at the stern, at the lower side of the tonnage-deck plank..215.88 feet.
This length divided into fourteen equal parts (class 5).
The common interval between the areas will be......... 15.42 "
The middle depth, being less than sixteen feet, will be divided into four equal parts.

Contents under Poop-Deck.

Mean length	56 feet.
Common interval between the breadths	14 "
Height above tonnage-deck	6–.5

Number.	Multiplier.	Breadths.	Products.
1	1	12.25	12.25
2	4	11.45	45.80
3	2	10.16	20.32
4	4	8.28	33.12
5	1	2.75	2.75

Sum of products	114.24
Multiply by ⅓ common interval	4.66
	68544
	68544
	45696
	532.3584
	2.
	1064.7168
Multiply by height	6.5
	53235840
	63883008
Cubic contents	6920.65920
Divided by	100)6920.6592
Tonnage of poop	69.20 tons.

* Rankine.

Cubic Contents and Register Tonnage under Tonnage-Deck.

Number.	Multiples.	Areas.	Products.
1	1	.00	.00
2	4	74.20	296.80
3	2	149.19	298.38
4	4	213.71	854.84
5	2	265.25	530.50
6	4	301.43	1205.72
7	2	327.64	655.28
8	4	337.21	1348.84
9	2	333.00	666.00
10	4	312.66	1250.64
11	2	276.30	552.60
12	4	222.36	889.44
13	2	155.50	311.00
14	4	76.83	307.32
15	1	0.00	.00

Sum of products	9167.36
⅓ common interval	5.14
	3666944
	916736
	4583680
Cubic contents	47120.2304
Divide by	100.)47120.2304
Tonnage under-deck	471.20 tons.
" of poop "	69.20 "
Total tonnage	540.40 tons.

A knowledge of the position of the centre of gravity of a ship when fully equipped for service is of great importance, and attempts were made to find this point by direct calculation as early as the latter part of the seventeenth century, but for several reasons the centre of gravity could not be ascertained by that method with any great degree of accuracy. Still, in any questionable or very novel design, in order to arrive at any conclusion as to the qualities of the vessel, the approximate position of the centre of gravity should be ascertained by direct calculation. The centre of gravity of any vessel may be found by experiment by altering *the line of support—i. e.* the vertical line through the centre of gravity and buoyancy—and obtaining the point in which two such lines intersect. The rationale of this method of conducting the experiment will be found in the *Annual of the Naval Institute* for 1874, it having been tried on the U. S. steamer Shawmut at the navy-yard in Washington by the writer. T. D. WILSON.

Na'val Sig'nals. It is a curious fact in relation to the general subject of signals that God himself deigned to prescribe a regular code for the Israelites. He said unto Moses, "Make thee two trumpets of silver, for the calling of the assembly." "And if they blow but with one trumpet, then the princes of thousands [generals of divisions] shall gather themselves unto thee. When ye blow an alarm, the camps that lie on the east parts shall go forward. When ye blow an alarm the second time, the camps that lie on the south side shall take their journey," etc. (Num. x.). For night-signals the Jews had an iron framework surmounting a pole. In this, as in a sort of chafing-dish, they used fire. (See Calmet, *Dict. of Bible.*) To signals made by these means, the trumpet and the fire signal, constant reference is made throughout the sacred writings. Beginning with the earlier profane historians, we find frequent mention made of signals used in the fleets of the ancients. (See Herodotus and Thucydides.) The emperor Leo VI. (A. D. 900), in his chapter on naval tactics (ch. xix.), describes almost exactly Myer's army code, concluding with the remark, "as the ancients did." None of the ancient writers describe their method of signalling by day. Polybius refers to signals, and describes two rather clumsy methods of night-signalling. One is taken from Æneas, called Tacitus, who composed a work on the art of war; the other was invented by Cleoxenus or Democlitus, "but perfected by myself," he says (bk. x. ch. vii.). Trumpets continued to be used down to the time of Richard I. of England as a means of making signals in the fleet, and are spoken of as in use in the time of Edward III. (1337). They (or bugles) are still used on board ship for making signals to the crew, but not to other ships. Flags were used by the Romans for making signals, but the signal code in which flags of various shapes and colors take part was first regularly systematized about the time of George III.

The code of day and night signals used in the U. S. navy is contained in two volumes—the *General Signal-book*, and the *Tactical Signal-book*. The first contains about 7000 words and sentences arranged alphabetically and regularly numbered. This is supposed to be ample for the conveyance of any kind of information likely to be required at sea or in port during peace or war. Lest it should fail, however, to supply the necessary words, resort is had to a vocabulary of some 10,000 conversational words, to which is added an alphabet and a geographical list of nearly 11,000 places, each letter and word having its appropriate number. The *Tactical Signal-book* relates to the tactical formations of a fleet or squadron. Now, every vessel in the navy having a set of these books, it is only necessary, in order to signal a message from one ship to another, to indicate the volume and the number in that volume corresponding to the required words or sentences. To do this there are nine rectangular signal-flags representing the digits, one to stand for zero or ten, and three triangular pennants called *repeaters*, wherewith to make duplicate numbers. The sentence, for example, "Anchor in the order of sailing," may stand opposite No. 112 in the signal-book. To make this we first bend on signal-flag No. 1, next the first repeater, and lastly No. 2. Had the signal been No. 122, we should first bend on signal-flag No. 1, then No. 2, and lastly the second repeater, because the second number in the hoist is to be repeated; and so on. The lowest flag in the hoist represents the units. Besides the above-named flags there are the "cornet," the "danger-signal," the "guide-flag," the "annulling flag," the "telegraph flag," the "despatch," "quarantine," and "convoy" flags; also the "answering" pennant, the "preparatory," "interrogatory," "numeral," "geographical," and "position" pennants, their names suggesting their uses, save the cornet, which indicates a vessel's number in one case, and serves as a "recall" in another. *Night-signals* are made by what are known as "Coston lights," in which combinations of white, red, and green lights take the place of the white, red, and blue colors of the day-signals. A rocket takes the place of the cornet, etc. etc. *Fog-signals* are made by firing guns, blowing horns and the steam-whistle.

The army code, as it is generally called, invented by Gen. A. J. Myer, U. S. A., has been adopted as part of the naval signal system. By this method the signalman spells each word of the message, shortening the process by abbreviations. The letters of the alphabet are represented by signs, each sign and its corresponding letter having an arbitrary number assigned to it. A, for example, may be represented by 22, B by 2112, C by 121, etc. The usual manner of making these numbers is by a flag attached to a staff and waved by the signalman. At night the staff is surmounted by a torch. The signalman, facing the point of communication and holding the staff in a vertical position to his front centre, dips his flag to the right to represent 1, to the left for 2, and to his front for 3, each dip describing the quadrant of a circle. Nos. 1 and 2 are made in a vertical plane at right angles to the line of communication; No. 3 in a vertical plane in that line. All the letters of the alphabet are made up of combinations of 1 and 2, No. 3 being used to mark the end of a word, and when repeated the end of a sentence or message. Two practised signalmen can communicate freely by this method, transmitting with accuracy and expedition long messages. Its great advantage consists in not requiring any apparatus or signal-book.

The International code of signals furnishes a species of universal language to the entire maritime world. One system of flags having been adopted by all nations, and each one having a signal-book common to all, printed in its own language, it is plain that on the meeting of two ships at sea signals may be made and understood whatever their respective nationalities. A full explanation of the system may be found in the preface of *International Code*, together with a description of "distance signals," "semaphore," "boat," and "weather" signals. S. B. LUCE.

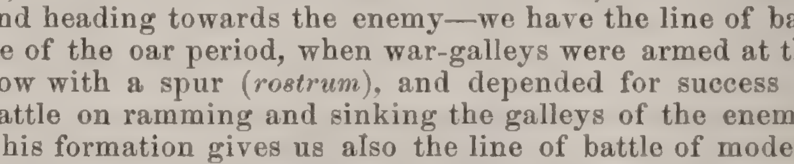
Na'val Tac'tics is the art of bringing ships into action or of moving them in the presence of the enemy. The subject may be divided into grand tactics, or the tactics of battles, and elementary tactics, or the tactics of instruction. The history of naval tactics can very properly be separated into three grand divisions. The first, which we may call the *oar period*, commences where tradition merges into authentic history, and ends about the time of the battle of Lepanto (1571), covering a period of about 2000 years. The second, or *sail period*, may be said to be embraced between Lepanto and the battle of Lissa (1866), lasting only 295 years, since which time we have known only the *steam period*, which is yet in its infancy. The sail period having completely passed away, and the tactics under oars being based upon the same general principles as steam tactics, we shall refer to the latter alone.

The key to any system of naval tactics is the line of battle. If in the line of battle the vessels are all "in line"—or, as it was called in the tactics under sail, "line abreast" and heading towards the enemy—we have the line of battle of the oar period, when war-galleys were armed at the bow with a spur (*rostrum*), and depended for success in battle on ramming and sinking the galleys of the enemy. This formation gives us also the line of battle of modern fighting ships, whose power lies in their ram (the *rostrum* of the ancients). If, however, the power of the ship lies in her broadside (artillery placed on the side of the ship), it is obvious that such ship must present her broadside to the enemy, in which case the line of battle must be the "line ahead," or, as it is now properly called, in "column." In addition to the above, there are certain "orders" in which it is convenient for a fleet or squadron to navigate the sea, to go in and out of port, to anchor, and to get under way. To change from one of these orders to another, or to change from any given order of steaming to the order of battle, constitutes elementary tactics.

Fleet Tactics under Steam.—Avoiding details, it may be stated briefly that an assembly of twelve or more ships of the line, or vessels of equal military value, takes the name of fleet, and is separated into three divisions of one, two, or three squadrons each, each squadron comprising not less than four vessels. The commander-in-chief commands the entire fleet; the second in command, the van division (or right when in line); the third, the rear division (or left when in line); and the fourth, the centre.

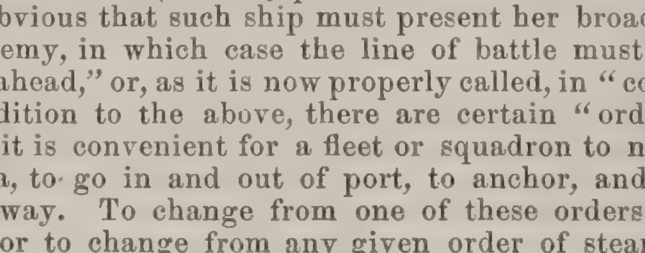
The line, the order of battle for iron-clads, rams, and torpedo-vessels, is formed as in Fig. 1.

FIG. 1.



Column, the order of battle for vessels whose power is in their broadside batteries. (Fig. 2.)

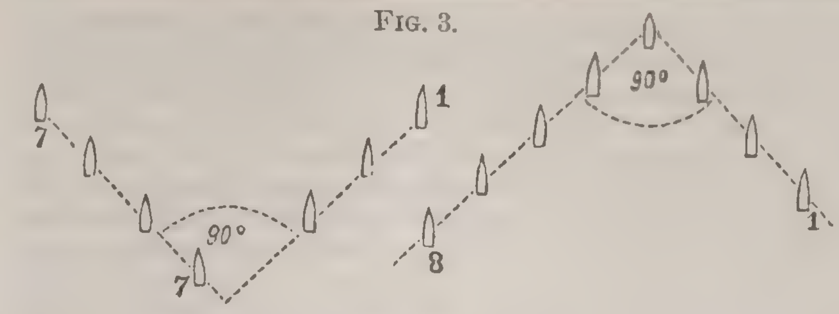
FIG. 2.



Échelon, orders offensive and defensive for vessels of all descriptions. (Fig. 3.)

Vessels are said to be in direct échelon when, steering the same course, each bears from its next astern at an angle

Fig. 3.



of 45° (four points) from the course; consequently, the wings of a fleet in double échelon form a right angle. One vessel should always be designated by signal to act as guide, by which the movements of the other vessels are to be governed, and should wear a guide-flag at the main. When manœuvring, the vessel upon which a formation is made must necessarily be the guide. When the fleet is "in line" in natural order, the van squadron is on the right. (Fig. 4.) This was the line of battle formed by Callicratidas, the Spartan, at the battle of Arginusæ, his fleet being composed of 300 galleys. The fleet in column is in the natural order when the van squadron is leading.

Fig. 4.

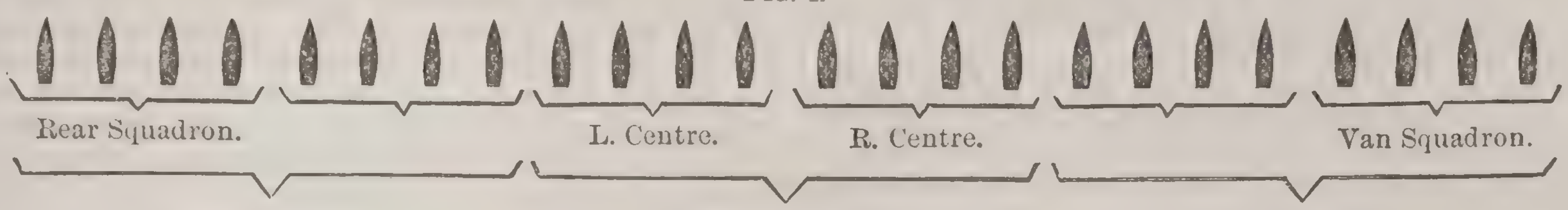
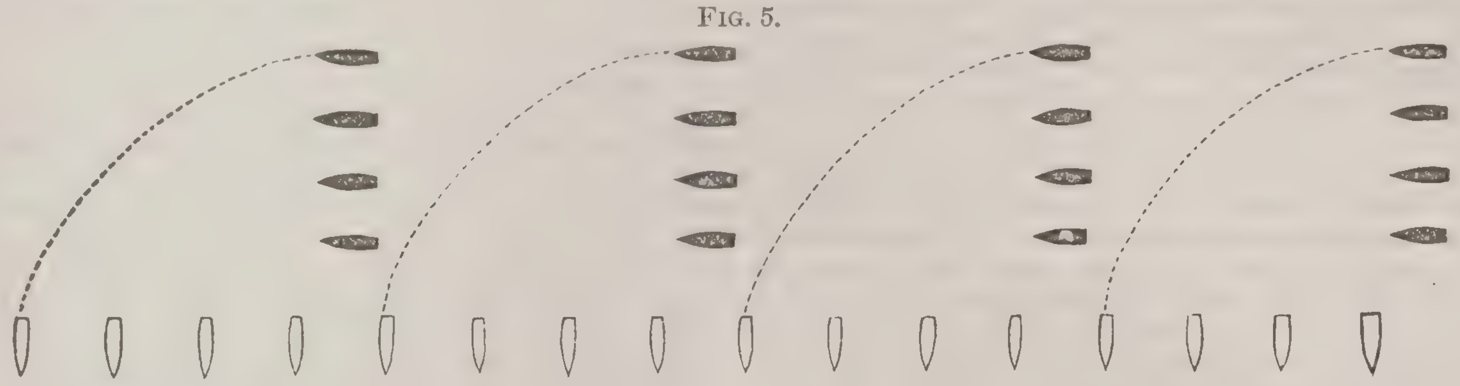


Fig. 5 exhibits the fleet in "column of squadrons" or of "fours." Should Signal No. 419, "By fours, left wheel," be made, each squadron on coming into line must find its place in the line without crowding or confusion. It was this evolution that was performed by Cnemus, commander of the Lacedæmonian fleet, in the battle in the Crisean bay, when he engaged the force under the skilful Athenian tactician, Phormio, then guarding Naupactus, the modern

Fig. 5.



Lepanto. These several examples sufficiently illustrate the system of tactics under steam.

(For further information the reader is referred to *Fleet Tactics under Steam*, by Foxhall A. Parker, Commodore U. S. N.) S. B. Luce.

Navari'no, a small town of Greece, in the province of Messenia, Morea, on the Bay of Navarino. Here the allied Russian, French, and English fleets utterly defeated the Turkish and Egyptian fleets on Oct. 20, 1827. Pop. about 2000.

Navarino, post-v. of Onondaga co., N. Y. Pop. 83.

Navarre', province of Spain, bounded N. by the Pyrenees, which separate it from France, E. and S. by Aragon, and W. by the Biscays. Area, 4069 square miles. Pop. 318,687. The whole country is mountainous, traversed by branches of the Pyrenees, whose tops generally are bare and naked, while their sides are covered with forests of beech trees or afford excellent pastures where numerous cattle and sheep are reared. The mountains, which contain much iron and salt, enclose many beautiful and fertile valleys, such as that of Roncesvalles and Roncal, which produce wheat, olive oil, figs, grapes, walnuts, and many varieties of fruits and legumes. The inhabitants are an almost pure Basque race, speaking the Basque language, and very jealous of their old customs and privileges; they are a hardy, industrious, hospitable, and honest people. Besides agriculture, cattle-breeding, and manufactures of iron, glass, paper, and soap, they are much engaged in hunting and smuggling, the mountain-forests abounding in bears, wolves, deer, and all kinds of game, and the dangerous, almost inaccessible, passes which connect the country with France offering too alluring opportunities for this kind of mercantile enterprise. Navarre, which successfully resisted the invasions of the Saracens, formed an independent kingdom until Ferdinand and Isabella conquered it in 1512 and annexed it to Aragon; it still preserves many peculiar privileges, however.

Navarre, post-v. of Bethlehem tp., Stark co., O., on the Ohio and Erie Canal, 5 miles from Massillon; also on the Lake Shore and Tuscarawas Valley R. R.

Navarre'te, de (Domingo Fernandez), b. at Peñafiel, Spain, in 1610; became a monk of the Dominican order; went to the Philippine Islands in 1647; became instructor in theology at Manila; went to China in 1659 as superior of his order, and penetrated into the interior, but was arrested during a persecution and taken to Canton, whence he escaped to Macao; sailed for Europe 1673, and immediately proceeded to Rome and entered complaint to the papal court against the practice of the Jesuits in China of accommodating the Christian religion to the beliefs and superstitions of the natives. He published a valuable work, *Historical, Political, Ethical, and Religious Treatises upon the Chinese Monarchy* (Madrid, 1676), of which two other volumes were written, but never allowed to appear; was appointed archbishop of Santo Domingo 1678, and d. there in Dec., 1689. An English translation of his *China* appeared in Churchill's *Collection of Voyages and Travels* (1704).

Navarrete, de (Martino Fernandez), b. at Abalos, Spain, Nov. 9, 1765; entered the Spanish navy 1780; participated in the attack upon Gibraltar Sept., 1782; served against the Moorish and Algerine pirates, and subsequently against the French naval forces in the Mediterranean; was in 1797 appointed to an office in the ministry of marine, and spent many years in collecting documents illustrative of the early annals of Spanish maritime discovery. His labors resulted in the publication of an important work, *Coleccion de los Viajes y Descubrimientos que hicieron por mar los Españoles desde fines del Siglo XV.* (5 vols., 1825–37), of which the first two volumes were the basis of Irving's *Life of Columbus.* Navarrete was a distinguished member of the Spanish Academy, and devised the system of orthography adopted by that body in its dictionary. D. at Madrid Oct. 8, 1844. Among his other works were a treatise on Spanish discoveries on the Pacific coast of North America, prefixed to the *Voyage of the Sutil and Mexicana on the Coasts of California* (1802), a *Life of Cervantes* (1819), a *Dissertation on the History of Spanish Navigation* (1846), and *Spanish Maritime Library* (2 vols., 1851), the two latter works posthumous; and was the projector and first editor of the valuable series, *Collection of Unpub. Docs. for the History of Spain,* of which 5 vols. appeared 1842–44, and which has been extended since his death to many volumes.

Navar'ro, county of N. E. Texas. Area, 1040 square miles. It is nearly all arable and very fertile. The county is bounded N. E. by Trinity River, is well timbered, and is traversed by the Houston and Texas Central R. R. Cotton, live-stock, and corn are leading products. Cap. Corsicana. Pop. 8879.

Nav'asink, post-v. of Middletown tp., Monmouth co., N. J., on the Port Monmouth branch of the New Jersey Southern R. R.

Navaso'ta, post-v. of Grimes co., Tex., on the Houston and Texas Central R. R., 70 miles N. of Houston, has 1 academy, 1 seminary and several good schools, 5 churches, 1 weekly newspaper, 1 bank, 1 exchange-office, 4 cotton-warehouses, 3 grist-mills, 1 flouring-mill, 1 cotton-seed oil-factory, 1 carriage and wagon factory and saw-mill, 3 hotels, and stores and repair-shops. Pop. 1509.

John W. Callahan, Ed. "Weekly Tablet."

Na'vesink (or **Neversink**), **Highlands of,** a range of hills on the S. side of Sandy Hook Bay, in Monmouth co., N. J. They are important landmarks to ships approaching New York. The highest point, Mount Mitchell,

is 282 feet high. Two first-class lighthouses, 53 feet high, stand 100 feet apart on ground 195 feet high. The south-easternmost tower is in lat. 40° 23′ 43″ N., lon. 73° 58′ 49″ W. Both show fixed white lights.

Na′veu, a strongly-marked variety of the turnip, having a white, parsnip-shaped root and a strong flavor. It is common in cultivation in some parts of Europe, but is seldom seen in the U. S. or in Great Britain. It does best in dry sandy soils.

Navic′ula [Lat., a "little ship," so named from the shape of the frustules], a genus of diatomaceous plants. Some of the species are well-known test-objects for the microscope, only high powers being capable of resolving the markings on their frustules.

Navic′ular Bone, more often called, in human anatomy, the **Scaphoid,** or more rarely the **Cymbiform Bone** (all three names alike signifying the "boat-shaped" bone, from a fancied resemblance to a boat in form), the first bone of the proximal row of wrist-bones, and the corresponding one in the foot. The name "navicular" is the one commonly used by farriers to designate the bone homologous to this in the horse's foot.

Navicular Disease, in horses, is a form of founder. It is an inflammation whose seat is in the navicular bone and the strong flexor tendon near this bone. It may sometimes be cured when taken in season by perfect rest and thorough poulticing for a time, followed by six months' feeding in a soft pasture; but usually the disease goes from bad to worse.

Navigable Streams. See International Law, Summary, by Pres. Theodore D. Woolsey, S. T. D., LL.D.

Naviga′tion [Lat. *navigare*, "to sail"], the art which instructs the mariner how to proceed from port to port and across the ocean with safety and despatch. To ancient Sidon belongs the credit of having been the pioneer in this important branch of human knowledge; but, passing over the history of its development to its present advanced state, this article simply proposes to show how a vessel is navigated in our day, referring the reader who desires a complete understanding of the theory and practice of navigation to Bowditch's *Navigator*, Chauvenet's *Spherical and Practical Astronomy*, and Coffin's *Navigation and Nautical Astronomy*.

Before going to sea care should be taken that the ship is provided with a good reflecting instrument (a sextant or octant), a chronometer whose error and rate are carefully determined, a compass fitted with attachments for observing the azimuth of the sun, a nautical almanac for the current year, and a chart of the ocean to be traversed. When the cargo is on board and stowed, and the compass is mounted in the position in which it is to remain while in use, the ship should be *swung* for the local deviation of her compass, full directions for which will be found in the admiralty *Manual of Compass Deviation.* Then, when passing from the bay or harbor into the ocean, the bearings of two landmarks whose positions are noted on the chart are taken with the compass, and these compass-bearings having been corrected for both local deviation and variation, the true bearings are laid down on the chart, the lines passing through the points observed. The intersection of these two lines gives the position of the ship for the instant when the bearings were noted. This is called taking *a departure.* The course is shaped, and upon the log-slate is recorded for every hour the compass-course steered, the rate of the ship found by the *log,* and the amount of leeway made. We will suppose it now to be daybreak. At or about 8 A. M., or better still when the sun is on or nearest to the prime vertical (that is, bears most nearly E.), and yet has sufficient altitude, say 10°, to avoid the irregular refraction near the horizon, its altitude is observed with the sextant, and the instant of observation is noted by the chronometer or by a watch carefully compared with the chronometer. Then, with the ship's latitude and longitude at the time of taking the departure, and with the courses and distances sailed corrected for variation, leeway, and deviation up to the time of taking the observation, the ship's position by *dead reckoning* is found. Now, from the observation we have the altitude of the sun, from the nautical almanac its declination, and from the dead reckoning the approximate latitude, data which give the three sides of the astronomical triangle and the hour-angle of the sun or the local apparent time may be readily computed. By comparing the local with the Greenwich time, as given by the chronometer, the longitude *by observation* is obtained. At the same time at which the observation is made the bearing of the sun by the compass should be noted, and with the same data as above its *true* bearing may be computed; and by comparing the compass-bearing with the true the combined variation and deviation of that compass for that particular heading of the ship is obtained.

Near noon the observer commences to observe again the altitude of the sun, and continues to do so as long as the altitude increases, and notes the maximum altitude which it attains. In technical language the body is said to *dip* when its altitude commences to decrease. The maximum altitude is assumed to be the meridian altitude, which is correct to within very small limits. With this meridian altitude (corrected as altitudes taken at sea have to be for semi-diameter, parallax, dip, refraction, and index error), and with the declination of the sun for that instant, the declination of the zenith is readily found, which is the latitude of the place. The reckoning worked from the departure gives the latitude and longitude by dead reckoning; from the time of the A. M. sight, gives the longitude observed; and the meridian altitude gives the latitude observed. If there is any difference between the ship's position by observation and dead reckoning, it is ascribed to current, and its amount and direction are found by computing the bearing and distance of the position by observation from the position by reckoning. From the latitude and longitude observed as worked up to noon the reckoning begins again. In the afternoon the observation for longitude and for variation is repeated, and these operations continue throughout the voyage.

But should the ship be a long time out of sight of land, or should any accident befall the chronometer, then the longitude is obtained by a "*lunar.*" The moon's angular distances, as seen from the earth's centre, from the sun, from the principal planets, and from several selected stars, are given in the nautical almanac for every three hours of Greenwich mean time. If, then, we measure with our sextant carefully any of these angular distances, we find by appropriate reductions what that angle would have been had we been at the centre of the earth. Then, if we compare our reduced angle with the one given for that body observed in the almanac, we find the Greenwich mean time; and having at the same time taken the observation for the local time, the difference between the two times is the longitude in time from Greenwich. The calculation for time by a "lunar" is long and laborious; the several corrections have to be made with great refinement, and the observation with great accuracy; so that "at the present time lunar distances are used not so much for finding the longitude as for finding the Greenwich mean time with which to compare the chronometer. They may thus serve as checks upon it, which in protracted voyages may be much needed. If the chronometer correction thus determined agree with that derived from the original correction and rate, the chronometer has run well, and its rate is confirmed; if otherwise, more or less doubt is thrown upon the chronometer according to the degree of accuracy of the lunar observation itself. If the discordance is not more than twenty seconds of time, it is well still to trust the chronometer, as the best observed single set of distances may give a result in error to that extent. If it is larger, then by repeated measurements of lunar distances, differing in magnitude, and especially on both sides of the moon, and carefully reduced, the chronometer correction can be found quite satisfactorily."

Should the sun be obscured, the stars or the planets can be resorted to for determining the longitude by chronometer, and the latitude; but the difficulty of seeing the sea-horizon at night throws more or less doubt on all observations made after dark. And further, as the body observed for latitude may just at the time of its meridian passage be obscured by clouds, it is often necessary to resort to another method than the one noticed for finding the latitude; and appropriate formulæ have been deduced for this by considering in the astronomical triangle the co-altitude, the co-declination, and the hour-angle, the last of which at sea is always in more or less doubt; but small errors in the hour-angle when the angle itself is small producing but slight errors in the latitude, good results can be obtained by taking, under most circumstances, the observation within an hour of the time of transit.

So far we have treated of the methods of finding the position of a point on the earth's surface by the two co-ordinates, *latitude* and *longitude;* and therefore in these methods the required position is determined by the intersection of two circles, one a parallel of latitude and the other a meridian. This position can be determined by circles oblique to the parallels of latitude and the meridians by a method which, while long known in principle, owes its value as a nautical method to Capt. Thomas H. Sumner, who published a book on the subject in Boston in 1843, and is now known as "Sumner's Method." It is, that if an altitude of the sun or any heavenly body be observed and reduced to the *true* altitude, and the Greenwich time noted, and if the position of the body at that time be plotted by its hour-angle from Greenwich and declination on a globe, and if from this as a centre a circle be de-

scribed with a radius equal to the body's zenith distance, then the observer is situated at the instant of observation somewhere on this circle, and his place is as well determined as if either his latitude or longitude was alone known. Now, if some time after, the observer remaining stationary, the same body be again observed, and a second circle be plotted as before, then, as he is now at the same time on the circumferences of two circles, he must be at one of their intersections. As the observations are so taken as to make these intersections far apart, no difficulty is experienced in knowing at which intersection the observer is situated, and his position is well determined. Should the observer have changed his position between the sights, his first zenith distance can, by appropriate reductions, be changed to what it would have been had it been taken from the same position as the second, and the intersection is then his place at the time of the second observation. Instead of observing the same heavenly body at different times, two bodies may be observed at the same time. The scale upon which the largest globes are constructed is much smaller than that of the working charts used by navigators. But on a Mercator's chart the circle of position will be distorted by the character of that projection, and can only be laid down by points; and as the line in practice is projected on these charts instead of on globes, it is necessary to select that part of the circle which embraces the ship's latitude. Then, by assuming latitudes embraced within this belt, and computing as in the sight above noticed the corresponding longitudes, the points of the circle of position where it crosses these assumed latitudes are fixed; and when plotted on the chart a line called the *line of position* may be traced through them. Should this be done with the second circle, it would give a second *line of position*, and their intersection when prolonged, if necessary, would be the position of the ship at the second observation. In practice, it is customary to select two latitudes only, embracing between them the ship's probable position, and to find two points of the circles of position as above, and to project them on the chart. Each pair of points being joined by a straight line, the intersection of the two lines is very nearly the ship's position. It is evident that the point of intersection is most accurately determined when the direction of the two lines is most nearly at a right angle to each other; and as the *heavenly body's bearing is at right angles to the line of position*, the second observation should, if possible, be taken when the body has changed its azimuth about 90°.

The most useful application of the *line of position* is in finding the bearing of the port in approaching land. For instance, suppose that a single line has been determined as above and plotted on the chart, and that it passes 20 miles N. of the port which you wish to enter. Now, the ship is somewhere on this line, but the distance from the port may be unknown. Let us sail due S. for 20 miles, and through the ship's new position draw a line parallel to the first. As the magnetic direction of the two lines will be the same, and as the second line passes through the port, the course to the port from the ship is known, and from the character of the bottom or the depth of water obtained by the lead the distance may perhaps be settled.

In complying with the requirements of *speed* in making passages it is necessary to consider the winds and currents to be encountered by the way. "These control the mariner in his course, and to know how to steer his ship on this or on that voyage so as always to make the most of them is the perfection of navigation." The voluminous works of Horsburgh, Findlay, Kerhallet, and Maury furnish this information, and especially the wind-charts of the latter, which, with their accumulation of data, the result of persistent industry continued through many years, have now been graphically represented by the British board of trade, and leave but little to be desired in that direction. ALEXANDER H. MCCORMICK.

Navigation, Freedom of. While the jurisdiction over the sea, near the land, and within bays and gulfs enclosed within not very remote headlands, is conceded to the territorial sovereign, it is admitted now on all hands that the open or high sea is common to all nations. Yet this rule has not always been admitted. Thus, Portugal claimed the exclusive use of the African seas, together with the empire of Guinea, under a bull of Pope Nicholas V., given out in 1454. The pope's claim to do this seems to have been connected with his being the vicar of Christ, to whom the heathen were given "as an inheritance and the uttermost parts of the earth as his possession." The bulls of Alexander VI., issued in 1493, soon after Columbus had discovered America, carried out this assignment of parts of the world still farther. One of them granted to Spain the lands lying W. of a meridian drawn 100 leagues W. of the Azores, and another divided the occupation of the seas between Spain and Portugal. Other nations, especially Protestant ones, paid no regard to these grants, but the English in the seventeenth century claimed property in the narrow channels adjoining Great Britain, and on that account demanded that especial respect should be paid to their flag. This brought on war with Holland. In the peace of 1674 it was stipulated that even fleets should furl the flag and lower the topsails in honor of any English vessel of war between Cape Staten in Norway and Cape Finisterre in North Spain—quite beyond the claim of jurisdiction. Russia at a much later date claimed exclusive jurisdiction to the Pacific, N. of the 51st degree of latitude, on the ground that its territory, and no other, bordered on the ocean beyond that line. But this claim was abandoned in treaties made with the U. S. in 1824, and with Great Britain in 1825. All such claims may be considered as being now mere matters of history. THEO. D. WOOLSEY.

Navigation, Inland (Canals). Among the ancients, when civilization was confined almost entirely to the neighborhood of the ocean, inland navigation was very limited, and means of overcoming differences of elevation were unknown. The first canals were built for purposes of irrigation, and their enlargement to form navigable channels was an afterthought. The royal canal of Babylon, so enlarged about 600 B. C., is among the earliest recorded. Among the projects for connecting rivers and oceans by canals among the Egyptians, Greeks, and early Romans, we may mention the canal of Marius (B. C. 102; see FOSSA MARIANA), connecting the lower Rhone with the Mediterranean; the canal of Alexandria (B. C. 332), by which the port of the new city founded by Alexander was put in navigable communication with the Nile, all the mouths of which were obstructed by impassable bars. About the Christian era the emperor Claudius, on account of the obstruction of the port of Ostia, connected the Tiber with the Mediterranean by a short canal, and the new ports of "Claudius" and of "Trajan" were made at its termini. About the fourth century the Romans made improvements connecting rivers in Lombardy, and in the fifth century Odoacer built a canal from the sea to the Mentone, above Ravenna. Charlemagne in the eighth century began canals joining the Main and the Rhine with the Danube, and the ocean with the Black Sea. In China the Grand Canal, joining the Pei-Ho and the Yang-tse-Kiang, 500 miles apart, was built in the eighth century. This great work, itself about 650 miles long, makes, with its connecting rivers, an inland navigation of nearly 1000 miles. Its depth is 5 to 6 feet. Changes of level are surmounted by drawing the boats up inclined planes. The boats are either rowed or dragged by hand. Several canals were built in Holland and in Italy from the eleventh to the fifteenth century. About 1400 A. D., in Spain, the Moors built a canal from Granada to Cadiz, but after their expulsion internal improvements languished. In the early part of the sixteenth century the Ebro and Castile canals were partly built, but not completed. The spirit which dominated this nation is thoroughly exemplified in a decree of the council about 1680 regarding a project for improving certain rivers, which stated that "if it had pleased God that these rivers should have been navigable, he would not have wanted human assistance to have made them such; but that, as he has not done it, it is plain that he did not think it proper that it should be done. To attempt it, therefore, would be to violate the decrees of his providence and to mend the imperfections which he designedly left in his works."

In 1481 the invention of locks for passing from one elevation to another rendered canal navigation much more generally available. This invention, made by two engineers of Viterbo in Italy, at once gave an impetus to canal construction. Several important channels of communication were opened in Italy. The first French canal was that of Briare, built 1605–42. The Orleans canal was built in 1675. The greatest work of that age was the Languedoc canal, from Narbonne to Toulouse, 150 miles, its summit-level being 500 feet above the sea (built 1667–81). In 1700, Peter the Great began the immense system of canal navigation in Russia which connects St. Petersburg with the Caspian Sea and inland districts, forming a continuous navigation of 1434 miles. Ludwig's Canal in Germany, 108 miles long, built in ——, united the Danube and the Rhine. The Danish canal, 100 miles long, finished in 1785, unites the North Sea and the Baltic. In Prussia water-communication is had by canals and river improvements between Hamburg and Dantzic. In Bavaria a canal from Dietfurth to Bamburg, 112 miles, finished in 1846, connects the Danube and the Main. The Gotha canal in Sweden, one of the largest European works of this class, was planned in 1716, the first part opened in 1810, and completed in 1832. It crosses Sweden from Stockholm to Gothenburg, is 280 miles long, and at its greatest elevation is 308 feet above the sea. There are altogether 800 miles of canals in Sweden.

From a very early period extensive canals were used in India for purposes of irrigation. Some of these have in later times been enlarged for navigation. A canal for irrigation and for navigation by steamboats from Soonkelassa to Cuddapar, 190 miles, was built in 1861–71.

The first navigable canal in England was that utilizing Sanky Brook in Lancashire, built in 1760. In 1758 the duke of Bridgewater procured a grant from Parliament for the construction of canals, and for forty years there was as great a rage for canals as in the second quarter of the present century for railroads. The canal excitement continued, somewhat subdued, however, for thirty years during this century. South of Durham no place in England is more than 15 miles from navigation. During the same period several short canals were constructed in Scotland. The CALEDONIAN CANAL (which see) is properly classed under the head of *ship-canals*. In Ireland the height of extravagance was attained. The Grand Canal from Dublin to Ballinasloe, 164 miles in length with its connections, 40 feet wide, and 6 feet deep, was built in 1765. Immense sums were thrown away in carrying this canal across the Bog of Allen. In 1792 the Royal Canal, from Dublin to Tormansburg, 92 miles, was built of excessive size and nearly parallel to the Grand. The result is, that neither of them has ever produced any revenue. In Great Britain 4713 miles of navigable canals exist.

"The means of transportation in the Connecticut Valley had always been limited and difficult. As enterprise sprang into new life upon the close of the long decade of war and disturbance, this lack of means for the transportation of merchandise, lumber, etc. was severely felt, and the leading men, not only of Hampshire, but Berkshire, joined in the project of increasing them by one of the most remarkable enterprises that had, at that day, been planned in America —viz. the construction of a canal around the falls at South Hadley, and around Turner's Falls at Montague. On Feb. 23, 1792, the Massachusetts legislature passed 'An act incorporating the Hon. John Worthington, Esq., and others therein named, for the purpose of rendering Connecticut River passable for boats and other things from the mouth of Chicopee River northward throughout this commonwealth, by the name of the Proprietors of the Locks and Canals on Connecticut River.' . . . Soon after their incorporation the company commenced operations at South Hadley, Benjamin Prescott of Northampton, subsequently the superintendent of the U. S. armory in Springfield, being the engineer. In the planning and execution of this work he had no precedent, it is believed, in this country. It is supposed that this was the first canal, of any importance at least, attempted to be built in the U. S. The Middlesex Canal Co. (for a canal from Boston to Lowell) was not incorporated until a year or more afterward." Money was scarce in those times, and it soon became evident that the cost had been under-estimated. It is curious at this day to learn that for this earliest work of "internal improvement" recourse was had—by no means an unusual case since—to Holland; and that this first "placing" of funds in our canal-stocks returned as little interest on capital as many subsequent larger operations. "In the mean time, the practical difficulties that stood in the way of the enterprise had been comprehended, and by an act passed June 21, 1793, the proprietors were released from the obligation to build their canals and locks of the capacity agreed upon, that capacity being reduced to the reception of boats and rafts forty feet in length and sixteen feet in width." "The style of the locks and the machinery used at that time are worthy of description, and show how little was then known of the proper structure of canals. At the point where boats were to be lowered and elevated was a long inclined plane, traversed by an immense car of the width of the canal, and of sufficient length to take in a boat or a section of a raft. At the top of this inclined plane were two large water-wheels, one on either side of the canal, which furnished, by the aid of the water of the canal, the power for elevating the car and for balancing and controlling it in its descent. At the foot of the inclined plane the car descended into the water of the canal, becoming entirely submerged. A boat ascending the river and passing into the canal would be floated directly over and into the car, the brim of the latter, of course, being gauged to a water-level by its elevation aft in proportion to the angle of inclination of the traverse way. The boat being secure in the car, the water was let upon the water-wheels, which, by their common shaft, were attached to the car through two immense cables, and thus, winding the cables, the car was drawn up to a proper point, when the boat passed out into the canal above. The reverse of this operation, readily comprehended by the reader, transferred a boat or the section of a raft from above downward." The canal was subsequently lowered four feet, the cars and cables discarded, and the ordinary canal-lock introduced, under the direction of Ariel Cooley, a man of a great deal of energy and ingenuity. "The construction of the dam at Montague was first attempted some 2 miles below the falls, at Smead's Island, by Capt. Elisha Mack of Montague, who operated either as engineer for the corporation or a contractor for its work. After a season of unsuccessful effort the point was abandoned, chiefly on account of the depth of the water." . . . "In 1793, Capt. Mack succeeded in constructing a dam at Turner's Falls. It stood one year on trial, as it was doubted whether it would be able to withstand the spring freshets, but it sustained the test. In the course of the following year the canal was commenced, but it was not completed for the passage of rafts and boats until two or three years afterward. In the mean time, the lumbermen were obliged to 'draw by,' or take their raft-boxes in pieces above the dam, and cart them to a point below, where they were again committed to the river, and reconstructed for the remaining passage downward. This canal is three miles in length." (Holland's *History of Western Massachusetts*.) These works are now used only for water-power. The valley of the Mohawk, affording opportunity for connecting the lakes and the Hudson, early attracted attention. Gen. Washington examined it during the Revolutionary war. In 1792 the Western Inland Navigation Lock Co. was formed. By 1797 they had completed 6 miles of canals around rapids on the Mohawk, making a passage for 15-ton boats from above Little Falls to Lake Ontario. The State of New York bought their works. In 1808, Simeon De Witt, the surveyor-general of New York, was directed to survey a route for a canal from the Hudson to Lake Erie. James Geddes, the first engineer appointed by him, made his report on Jan. 20, 1809, on canal routes from Oneida Lake to Oswego and to Lake Erie. On Mar. 13, 1810, the legislature appointed a canal commission of seven members, at the head of which was Gouverneur Morris, to whom is attributed the first suggestion of the Erie Canal in 1803. These commissioners made several reports, but no decisive action was taken until Apr. 7, 1816, when a law was passed authorizing the construction of the Erie and Champlain canals. The first ground was broken at Rome, N. Y., July 4, 1817, and the canal was opened on Nov. 4, 1825, from Buffalo to Albany, 352 miles. (See CLINTON, DE WITT.) As first constructed, it was 40 feet wide at top, 4 feet deep, and was navigable for 76-ton boats. Between 1835 and 1862 it was enlarged, and is now generally 70 feet wide, 7 feet deep, and navigable for boats of 240 tons burden. Before the construction of this work the time occupied between Buffalo and Albany was 20 days, and the cost of freight $100 per ton. The opening of the canal reduced the time to ten days, and the cost to $10 per ton, and afterward to $3 per ton, from Buffalo to New York. An immense impetus was given to the cause of internal improvements, and enormous projects were undertaken by several of the States. Pennsylvania and Maryland began to connect their tidewaters with the Ohio River; Virginia undertook the construction of two canals from Chesapeake Bay to the Ohio; Ohio and Indiana strove to connect the lakes with the Ohio River, and Illinois to join the lakes and the Mississippi.

Several canals in Pennsylvania had been undertaken by private companies between 1790 and 1816, but little was done by them. Between 1816 and 1824 the Union Canal, 82 miles long, from Reading to Middletown on the Susquehanna, was constructed. In 1826 the State began the construction of water-routes from Pittsburg to Philadelphia and to Lake Erie, and built 608 miles of canals and navigable feeders. The main route across the Alleghany Mountains was broken by a portage railroad 37 miles long, and the eastern terminus was on the Susquehanna, 82 miles from Philadelphia. The improvement of the navigation of the Lehigh River was caused by the necessity for cheap transportation of coal to tidewater. Two iron manufacturers at the Falls of Schuylkill, near Philadelphia, discovered in 1817 that anthracite coal could be made available for smelting, and to obtain a supply cheaply leased a large tract of coal-land near Mauch Chunk, and obtained a charter for improving the Lehigh River. This was done first by wing-dams, afterward by pools and sluices, the coal being carried in "arks," which were built in the woods and broken up at their destination. In 1827 the State began the Delaware Division Canal from Easton to Philadelphia, and the Lehigh Company constructed a slackwater navigation by dams and locks from White Haven to Easton. On June 4, 1862, a heavy freshet carried away eighteen out of twenty dams between Mauch Chunk and White Haven, and these have never been restored. Below Mauch Chunk the damage done was repaired. There were built altogether in Pennsylvania 974 miles of canal, of which 934 miles are still in operation.

Ohio built two canals of limited capacity from the Ohio River to Lake Erie, and others of minor importance, 795

miles in all. Indiana, conjointly with Ohio, built the Wabash and Erie Canal from Toledo to Evansville, 461 miles. Mismanagement and neglect have brought much of this to ruin, and the lower portion of it has been for some years abandoned. In Virginia, a board of public works, established in 1816, furnished State aid to internal improvements. A favorite project since the days of Washington has been a water-route from the James River to the Ohio *viâ* the Kanawha. (See JAMES RIVER AND KANAWHA CANAL.) This route is the most important one for water-transportation between the West and the Atlantic seaboard south of the Erie Canal. It is peculiarly valuable from the fact that it would be available at the season of the year when the need for transportation of Western products is greatest and the Northern water-routes are closed by ice. It involves the piercing of the largest tunnel ever yet projected, $7\frac{8}{10}$ miles long, under the Tuckahoe and Katis mountains, at an elevation of 1700 feet above the sea. As compared with a double-track freight railroad over the same route, while the cost of the water-line would be double, its carrying capacity would be also double, and the maintenance and running expenses less.

One of the very earliest projects was the connection of the Potomac and Ohio rivers by a navigable canal; and the improvement of the Potomac River (navigable by ships to Georgetown) to the foot of the Alleghanics was one of the first steps considered. In the year 1784 a charter was granted for this purpose by Maryland and Virginia conjointly; a company was organized, which up to the year 1822 had expended $730,000 in locks, dams, etc. The result, however, was unsatisfactory, and after a prolonged investigation the substitution of an independent canal from Georgetown to Cumberland was recommended (1823) by the engineers, Messrs. Moore and Briggs, appointed by the two States, 182 miles long, 30 feet wide at surface, and 3 feet deep, with 63 locks, at an estimated cost of $1,575,094. About this time the general government inaugurated its so-called system of internal improvements by act of Apr. 30, 1824, the first measure of which was the creation of a board of engineers for internal improvements, consisting of two distinguished officers of the corps of engineers and one civil engineer, whose principal work in the years 1824–25 was upon this project. The entire route to the Ohio at Pittsburg was surveyed, and the board rendered a report Oct. 23, 1826, embracing the following general results: Eastern division, from Georgetown to Cumberland, 186 miles, 598 feet ascent, locks 74; estimated cost, $8,177,081. Middle division, Cumberland to the Youghiogheny, 70 miles, with ascent and descent of 1961 feet, locks 246, a tunnel 4 miles long; cost, $10,028,000. Western division, to Pittsburg, $85\frac{1}{4}$ miles, descent 619 feet, locks 78; cost, $4,170,000. Canal to be 48 feet and 33 feet wide at surface and bottom, 5 feet deep. The amount of money required was inordinate for that early day. It was urged that the estimates were too high, and that for the eastern division was revised by Messrs. Geddes and Roberts, who cut it down to $4,400,000. Congress then (1829) authorized a subscription for 10,000 shares of stock; the city of Washington, 10,000; Georgetown and Alexandria, 5000; and the States of Maryland and Virginia, 7186 shares; the remainder being taken by individuals. The first blow struck for the actual construction was July 4, 1828, by the President of the U. S., John Quincy Adams. Under the revised plans of the engineers last mentioned the dimensions were increased to 60 and 42 feet surface and bottom width, depth to 6 feet. It was decided in 1829 to extend the canal to Alexandria. The aqueduct by which it was carried across the Potomac at Georgetown, constructed (1832–40) under direction of Major Turnbull, U. S. Engineers, was one of the most important engineering constructions at that date undertaken in this country. The main portion consists of a wooden trunk resting on twelve masonry piers founded by coffer-dams on rock averaging 28 feet, and toward the western shore 40 feet, below the surface, covered by 15 to 20 feet of mud. (See *Reports on the Construction of Piers of the Aqueduct*, etc.) Up to the year 1845 there had been expended on the canal $9,502,345, and subsequently about $1,500,000; besides, charges of interest, loss on sale of bonds, have carried the aggregate expenditure to $15,000,000 and upward. Its main business has been the transport of coal to tide-water at Georgetown, of which it transports by recent statements (*Poor's Manual*) about 750,000 tons per annum. The Baltimore and Ohio R. R. transports double that quantity. Recent surveys have been made to determine the practicability and cost of carrying out the original project, continuing the canal to Pittsburg, and making this one of the great *through lines* of transportation, showing that this route can be made available by using inclined planes in place of locks, and piercing a tunnel $3\frac{75}{100}$ miles long at an elevation of 1944 feet above tide-water. From the summit the descent to the westward would be 1000 feet in 55 miles, connecting there with slackwater navigation.

In the early years of Western settlement, when the great rivers formed the *only* vehicle of transportation, an obstruction to navigation so grave as that made by the rapids known as the Falls of the Ohio at Louisville could not fail to compel early attention. In 1825 the State of Kentucky authorized a private corporation to construct a lateral canal (known as the *Louisville and Portland*), which was completed in 1830 at a cost of about $1,000,000. Length, $1\frac{7}{10}$ miles; width, 64 feet; with three locks, each 200 feet long and 50 feet wide; lift, $8\frac{3}{4}$ feet. In 1860 an enlargement, planned by T. R. Scowden, was undertaken, and $1,800,000 expended, the civil war interrupting the work. The Ohio being a great national highway, this work was deemed a proper object for governmental care, and in 1868 was placed in charge of the chief of engineers U. S. A., and carried on by appropriations of public money by Congress. A new enlarged canal was opened to navigation in Feb., 1872, and entirely completed Nov., 1873; the extra cost of enlargement (including the $1,800,000 already mentioned) was $3,250,000.

The present canal leaves the Ohio River in front of the city of Louisville, passes in a westerly direction around the falls, and enters the river just above Portland, Ky. Its length is $2\frac{1}{10}$ miles, and its general width $86\frac{1}{2}$ feet. The upper entrance is 400 feet wide, and suitable turn-out basins are provided. A dam on the crest of the falls will give, when completed, a minimum depth in the canal of 6 feet. The depth depends upon the stage of water in the river; the least depth being 6 feet, and the greatest depth known about 42 feet 8 inches. The great expense of this work is due to the fact that its bed is cut through hard limestone rock, and its sides are protected by stone walls, above which rise earthen parapets to a height of 44 feet above canal bottom and $1\frac{1}{2}$ feet above highest known flood. A set of guard-gates at the head provides for shutting off water when necessary. At the lower end are the old locks, still preserved as originally constructed, and the two new locks which form the outlet of a short branch. These new locks are the pioneers of their size in the world; they have lifts of 12 and 14 feet, their length between mitre-posts is 372 feet, available length 335 feet, width 80 feet.

The guard- or flood-gates at the head of the locks are $47\frac{3}{4}$ feet long and 46 feet 11 inches high. The upper lift-gates are $47\frac{3}{4}$ feet long, $24\frac{3}{4}$ feet high, and built of a combination of oak and pine. The middle and lower lift-gates are $47\frac{3}{4}$ feet long, 31 feet $2\frac{3}{4}$ inches and 27 feet 2 inches high, respectively. They are built entirely of oak, except planking, which is of pine. The heavy pressure brought on these gates and their enormous size (the weight of each in the middle set being 89 tons) necessitate great strength.

Except during high water, when there are ten feet or more at the head of the falls, the entire commerce of the Ohio River passes through the canal. During the year 1875, 2880 boats passed through the locks.

The Chesapeake and Delaware bays were at an early day connected by a canal through Delaware 26 miles long. This work was aided by the U. S. government. In New Jersey the Delaware and Raritan Canal, built in 1831–34, 43 miles long, connects Delaware and Raritan rivers, making an inland navigation from New York to Philadelphia. The Morris Canal, 101 miles long, built about 1830, connects the coal-regions of Pennsylvania with New York harbor. (For account of this canal and its *inclined planes* see APPENDIX.) In the Southern States there are no important canals, though about 250 miles in all have been built. (See ILLINOIS AND MICHIGAN CANAL, by W. H. SWIFT; CANALS OF CANADA, by A. J. RUSSELL; and JAMES RIVER AND KANAWHA CANAL, by J. G. BARNARD.)

The speculation in canals which began in 1820–21 was checked by the introduction of railroads, and of more than 5000 miles projected and begun, less than 3000 were built. A very small proportion of these have paid interest on the money invested. The New York State canals were built by the State government. Of 906 miles built, 500 miles are operated at a loss, the current expenses being in excess of the tolls. The net profits of all the canals during the 26 years ending 1872 were equivalent to an annual dividend of $3\frac{2}{10}$ per cent. per annum on their cost. During the same period the Erie Canal proper paid 4 per cent. on its cost, and for the whole 52 years of its operation has paid $3\frac{1}{2}$ per cent. per annum on the cost of construction. The actual expense of the canals to the State up to Oct. 1, 1875, has been $28,596,228 in excess of all revenue derived therefrom. This sum represents the premium which the people of New York have paid in taxes to secure and encourage the use of these waterways for purposes of transportation—the equivalent of an annual subsidy of over

$560,000. The Ohio canals, built by the State government, were a continual source of expense, and in 1861 were leased to private parties for an annual rental of about one-tenth of 1 per cent. on their cost.

The cause of the failure to be remunerative of through routes of canal transportation has apparently been the insufficient channel dimensions which for economy were given them, and the consequent small loads which could be carried. Experience has proved that with an enlarged section of canal prism, accommodating larger boats, the carrying capacity is three times as great, while the towing expenses are increased less than 50 per cent., making the cost per ton per mile on a large canal 41½ per cent. of what it is on a small one. The carrying capacity of a canal accommodating boats of a given size depends upon the number of lockages which can be made in a given time. Increase of speed between the locks, while it lessens the time of transit on a canal worked to less than its maximum capacity, will not increase the volume of traffic. It is of the first importance, therefore, that the time of lockage should be decreased. Practically, the former consideration is first attended to, however, as no canals are as yet worked to their full capacity. The economical rate of speed for boats towed by horses is two miles per hour. The time lost by slowing up on approaching locks, the stoppage in locks, and the getting under way again reduces the average rate of speed to 1.7 miles per hour. The first cause of detention at locks cannot be avoided. For lessening the second and third, the use of inclined planes instead of locks, up which the boats are drawn by machinery, and passing over a summit descend into the upper level with an initial velocity greater than the average, has been found effective on the Morris Canal in New Jersey. Inclined planes instead of locks were used in England on the Ketling Canal in 1789. High velocities between locks have not been attained, the chief obstacle thereto being the greatly-increased tractive force required. A method of propulsion used to a considerable extent in Belgium and France is by an endless chain along the bottom of the canal, driven by stationary engines. To this chain the boats are attached. It is alleged that this method cannot be advantageously used on the U. S. canals, where the curves are much more frequent and sharp than in those of the countries where the system has been successfully applied. Another method recently introduced on some Belgian canals is by a locomotive on the towpath, running on a single rail. When two boats meet they exchange locomotives, the latter returning until another boat is met. In the U. S. steam propellers have been used for some years on the Delaware and Raritan Canal. In 1871 the New York legislature offered rewards for the best motive-power other than animals for propulsion of boats on canals, excluding the Belgian system; 700 communications were received in reply, resulting in twelve steamers being placed on the canal for trial, of which three fulfilled the first test required. The result of experiments was so satisfactory that a number of self-propelling boats are now on the New York canals, running at an average rate of speed of 2¾ miles per hour, including detentions.

The means of transportation of the products of the Western States to the seaboard have not kept pace with the increase of those products. In consequence, the existing lines have been overcrowded, freights have been carried at less than remunerative prices, and yet great quantities of produce have been unable to reach a market at all, causing demands from the producers for more transportation facilities and cheaper rates. A committee of the U. S. Senate made on Dec. 5, 1873, an exhaustive report on this subject, recognizing the necessity for additional routes from the West to the ocean, and recommending the examination of four routes as the most feasible and advantageous channels of commerce. (See CANALS.)

The cost of transportation by steam on canals is now reduced to less than 3 mills per ton per mile. The cost of through transportation on railroads is 7 mills per ton per mile. These prices do not include the interest on capital, nor profits. Both may be reduced somewhat by good management, but the proportion between the two cannot be much changed. (For SHIP-CANALS see that head; also CALEDONIAN CANAL, NORTH HOLLAND CANAL, NORTH SEA CANAL.) J. J. R. CROES.

Navigation, Inland (Rivers and Lakes). There is no portion of the world's surface that has been favored by nature with a better system of inland water-communication than that part of the North American continent which is included within the limits of the U. S. and the Dominion of Canada. Wholly within the U. S. is the magnificent combination of the Mississippi and its tributaries, several of which, such as the Ohio, the Missouri, the Arkansas, and the Red, are in themselves great rivers, as indeed are the Tennessee, the Cumberland, the Kanawha, the Alleghany, and the Monongahela, all of which are tributaries to a tributary, the Ohio. Partly in the U. S. and partly in Canada is the magnificent chain of fresh-water lakes, Superior, Michigan, Huron, Erie, and Ontario, which empty into the ocean through the great river St. Lawrence, navigable for ocean-vessels to the wharves of Montreal.

River Navigation.—The lengths of the Mississippi and its chief tributaries are as follows: main Mississippi, 1268 miles; Missouri, 2908; upper Mississippi, 1330; Ohio, 1265; Arkansas, 1514; Red River, 1200. The total area drained by the Mississippi is 1,244,000 sq. m., which is more than that of all Europe, omitting Russia, Sweden, and Norway. Almost the entire area of the U. S. lying between the Alleghany and the Rocky Mountains drains into the Gulf of Mexico through the Mississippi, and a large portion of this area is thus made accessible to water-craft. It is worthy of note, however, that all the tributaries from the West flow for a considerable distance through dry or desert lands, and as a rule these tributaries are unnavigable except after they have entered more fertile regions. The Missouri, though much longer, is less navigable than either the Ohio or the upper Mississippi, and none of its tributaries, except the Yellowstone and the Osage, are navigable at all, and they only partially. The heads of navigation during ordinary low stages are Sioux City on the Missouri, St. Paul on the upper Mississippi, and Pittsburg on the Ohio, though none of these points can be reached at such stages by the large boats that run between New Orleans and St. Louis or Cincinnati. The Ohio has the largest commerce, and it consists chiefly of iron and its products, salt, lumber, petroleum, furniture, pork, liquors, groceries, and coal. On the upper Mississippi the chief articles of commerce are lumber, grain, flour, pork, and groceries. On the Missouri commerce by river has nearly died out, but above Sioux City there is during the spring a heavy traffic in merchandise for the Montana mines. On the main Mississippi the down-stream freight is composed of grain and other Northern products, and the up-stream of sugar, molasses, cotton, tropical fruits, and of coffee and other foreign products imported through New Orleans. It is difficult to estimate the value of this commerce, as no accurate records are attainable, but the best authorities place that of the Ohio and its tributaries at $700,000,000, and put the whole commerce of the Mississippi and tributaries in round numbers at $2,000,000,000. Of late years the character of Western river commerce has materially changed. The multiplication of railroads has greatly reduced the passenger travel by river, and steamboats are seldom used except for pleasure and to reach towns not yet touched by railroad lines. On the other hand, the commerce in heavy commodities, especially in coal on the Ohio, has greatly increased, and it is estimated that 100,000,000 bushels of coal annually pass Cincinnati, of which about half comes from Pittsburg, and the remainder from the mines on the Kanawha and on the Ohio itself. This coal is all brought out in coal-boats and barges, which are made up into fleets and pushed down-stream by towboats whenever there is 6 feet or more of water in the channel. The records show that on an average such a stage or higher may be expected at Pittsburg for 163 days in the year. During lower stages the coal-barges lie in harbor waiting for a rise. A coal-*boat* is a rectangular box with strong bottom and light sides, 26 feet wide and 170 feet long, and carrying about 22,000 bushels, or 850 tons, on a draught of 7 feet. Such boats require 8 feet of water in the channel. They seldom return, but are usually broken up and sold for lumber. Coal-*barges* have a scow-bow at each end, and their sides are solidly built up of 8-inch timber. Their average size is 130 by 25, and they carry 11,000 bushels, or 425 tons. An ordinary tow from Pittsburg to Louisville consists of from ten to sixteen barges, carrying from 4250 to 6800 tons, and pushed by a single towboat. At Louisville the tows for towns below are usually doubled in size. The largest recorded tow was taken to New Orleans by the steamer Ajax, and consisted of 32 coal boats and barges, whose total contents aggregated 21,400 tons, and covered a surface, including towboat, of very nearly 3 acres. At 10 tons to a car, this amount of coal would have required 2140 railroad cars for its transportation.

A large commerce, especially on the Mississippi, is carried on in "model barges," or barges with regularly modelled double-end hulls. These barges are formed into fleets and pushed by powerful towboats. They have but one deck, and this is usually covered over by a house or cargo-box. They are much used for the transportation of grain in bulk. Of late years a number of freight-steamers have been built which are fully supplied with machinery for handling freight, but are entirely without accommodation for passengers. These steamboats are said to pay very well, while as a rule passenger-steamboats do not, thus

showing that river-traffic will soon, in all probability, be confined to the transportation of bulky articles of freight. On the Ohio the rafting of timber is usually done by floating with the current; on the upper Mississippi rafts are generally pushed by small steamboats.

The official statistics for the year ending June 30, 1875, show that the commerce of the Western rivers was carried on by

212 sailing vessels, of	3,321 tons.
1070 steamboats	236,313 "
842 barges	179,331 "
2124	418,965 tons.

The estimated average cost of transporting freight (other than coal) on the Western rivers is 4 mills per ton per mile. The cost of transporting coal varies from two-thirds of a mill to 2 mills, the greater price corresponding to the shorter distance.

Lake Navigation.—The larger portion of the enormous surplus of grain that is raised in the States bordering on and W. of the Mississippi is carried to tide-water by way of the great lakes. From Chicago or Milwaukee the route is through Lakes Michigan, Huron, and St. Clair to the E. end of Lake Erie. The statistics of 1872 show that of the 68,000,000 bushels of grain that arrived by water, 47,750,000, or 70 per cent., went E. by the Erie Canal from Buffalo, and that of the remaining 30 per cent. which passed into Lake Ontario by the Welland Canal, 14,333,000, or 21 per cent., descended the St. Lawrence to Montreal, 6 per cent. went East from Oswego by rail, and 3 per cent. by water through the Oswego branch of the Erie Canal. It is proper to state that during the same time the railroads transported to the Atlantic 109,000,000 bushels of grain, or about twice as much as the water-lines, and that the railroads are annually increasing these figures, owing chiefly to the greater convenience of receipt and delivery and greater speed of transport. The average rate in 1873 of transportation of grain by water was 7½ cents per bushel from Chicago to Buffalo, and 13¾ cents from Chicago to Oswego. These are equivalent to 2⅔ and 3¾ mills per ton per mile respectively.

Besides grain, there is a heavy business in lumber, coal, salt, iron ore, and manufactured iron. It is estimated that in 1872 there passed Detroit 972,000,000 feet of lumber, 1,100,000 tons of coal, somewhat more than 1,000,000 tons of crude and manufactured iron, and nearly 1,000,000 tons of general merchandise; the total commerce passing Detroit being over 9,000,000 tons, carried in 2205 vessels. The lake passenger business is now limited to places inaccessible by railroad.

In 1875 the commerce of the lakes was carried on by

1710 sailing vessels, of	339,787 tons.
891 steam-vessels	202,307 "
193 barges	45,140 "
2794	587,234 tons.

The tonnage on the northern lakes is steadily increasing from year to year.

Other Rivers and Lakes.—Besides these two great systems of inland navigation, there is a heavy commerce on the Hudson River, some of which is local, but as the Hudson is the direct continuation to the sea of the Erie Canal, the greater portion of its commerce consists of freight on its way to New York. The canal-boats are made up into fleets and towed by powerful towboats, one boat frequently towing three fleets—one in immediate contact, and the other two at long distances astern. The other navigable waters of the U. S. may be briefly named: The Penobscot does a large lumber business below Bangor. The Kennebec below Augusta has a large commerce in ice and lumber. The Connecticut up to Hartford had a business in 1867 of 616,000 tons and 63,000 passengers. The Potomac affords transportation to large quantities of coal coming from Western Maryland to Georgetown by the Chesapeake and Ohio Canal. The James connects at Richmond with the James River and Kanawha Canal, and has a large commerce in grain, tobacco, and other Virginia products. The Alabama River and its branches bring out each year a large supply of cotton. A large amount of business is done on the Sacramento River in California, but its amount is not reported. The commerce of the San Joaquin is reported at 400,000 tons per annum. The Columbia River drains an immense area, but its navigation is impeded by numerous falls and rapids; only 18,000 tons were transported on it in 1874. The Willamette River afforded transportation for 73,000 tons during the year ending June 30, 1875.

Through Transportation Routes.—A committee of the U. S. Senate, appointed in Dec., 1872, in obedience to the popular demand for cheap water-transportation, recommended the construction or improvement of a number of through water-lines, and the cost of these improvements was subsequently carefully determined by the U. S. engineers in charge. The routes and estimated costs of these lines are as follows:

Mississippi Route.—The opening of the mouth of the river so as to permit the free passage of vessels drawing 28 feet (by act of Congress approved Mar. 3, 1875, James B. Eads is authorized to create and maintain a channel out of the South Pass of the Mississippi, having the ultimate depth of 30 feet); construction of reservoirs at the sources of the river (estimated cost, $488,551); improvement to give 3 to 5 feet above the Falls of St. Anthony (estimated cost, $2,100,000); 4½ to 6 feet from Falls of St. Anthony to St. Louis (estimated cost for 4½ feet from Falls to La Crosse, $348,670; for 6 feet at Rock Island Rapids, $2,404,000; for 6 feet at Des Moines Rapids Canal, $953,134; for 6 feet between mouth of Illinois and St. Louis, $1,000,000); 8 to 10 feet from St. Louis to New Orleans (estimated cost of 8 feet from St. Louis to Cairo, $6,160,000—no engineer's estimate below Cairo; committee's estimate from St. Louis to New Orleans, $5,000,000).

Northern Route.—Improvement of Fox and Wisconsin rivers so as to give 5 feet from the Mississippi to Green Bay (estimated cost, with locks 160 by 35 and 6 feet of water on Fox, $3,600,000); construction of a canal from Rock Island on the Mississippi to Hennepin on the Illinois (estimated cost, with locks 170 by 30, $4,541,000); enlargement of the Erie Canal from Buffalo to Albany (estimated cost, on supposition that only one set of locks is enlarged to 225 by 26, $6,676,231); enlargement of the Oneida Lake Canal from Oswego to Albany (estimated cost, with locks 185 by 29 and 9 feet of water, $25,213,857); Champlain Canal, from Lake Champlain to deep water on the Hudson (estimated cost for a canal with locks 270 by 45 and 12 feet of water between Whitehall and Fort Edward, and for a slackwater thence to Albany, $14,115,893). Total cost of northern route, $54,146,981.

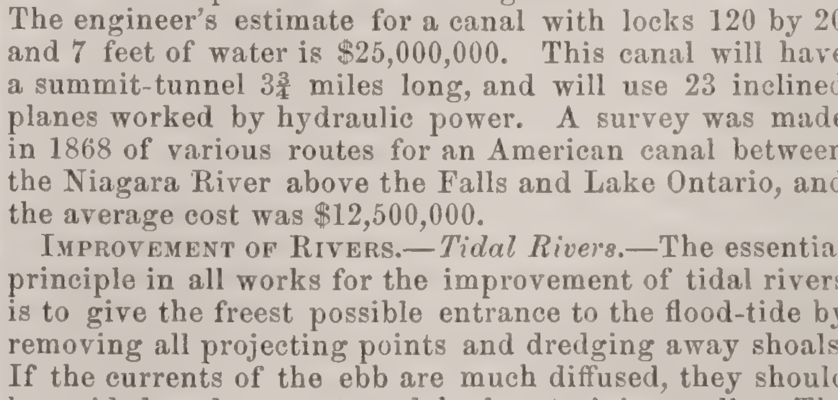
Central Route.—Improvement of the Ohio River from Pittsburg to Cairo so as to give 6 to 7 feet of water (estimated cost, with locks 680 by 78 and movable dams, $40,000,000); improvement of the Kanawha River up to Great Falls, so as to give 6 feet of water (estimated cost, with locks 300 by 50, 3 permanent dams, and 9 movable ones, $4,071,216); a connection by canal or freight-railway from the Kanawha or Ohio to tide-water in Virginia (estimated cost of canal, with locks 120 by 20 and 7 feet of water, about $55,000,000 (see James River and Kanawha Canal); this includes a summit-tunnel 7.8 miles long and the improvement of the New and Kanawha rivers; the estimated cost of a single-track freight-railway from Charleston (on the Kanawha) to Newport News (near the mouth of the James River) is $36,364,136, without equipment). Total cost of central route, $99,071,216.

Southern Route.—Improvement of the Tennessee from its mouth to Knoxville, so as to give 3 feet in low water (engineer's estimate not yet completed; committee's estimate, $5,000,000); canal or freight-railway from the Tennessee River to the Atlantic Ocean by shortest route (engineer's estimate for canal, $35,612,000, for railway not yet completed; committee's estimate for freight-railway, $30,000,000).

Other Routes.—A survey was also made for the extension to Pittsburg of the Chesapeake and Ohio Canal, which is in operation from Georgetown to Cumberland. The engineer's estimate for a canal with locks 120 by 20 and 7 feet of water is $25,000,000. This canal will have a summit-tunnel 3¾ miles long, and will use 23 inclined planes worked by hydraulic power. A survey was made in 1868 of various routes for an American canal between the Niagara River above the Falls and Lake Ontario, and the average cost was $12,500,000.

Improvement of Rivers.—*Tidal Rivers.*—The essential principle in all works for the improvement of tidal rivers is to give the freest possible entrance to the flood-tide by removing all projecting points and dredging away shoals. If the currents of the ebb are much diffused, they should be guided and concentrated by low training-walls. The best example of an improved tidal river is the Clyde in Scotland, which in 1755 only admitted a draught to Glasgow of 15 inches in low water of spring tides, and 39 inches

Fig. 1.



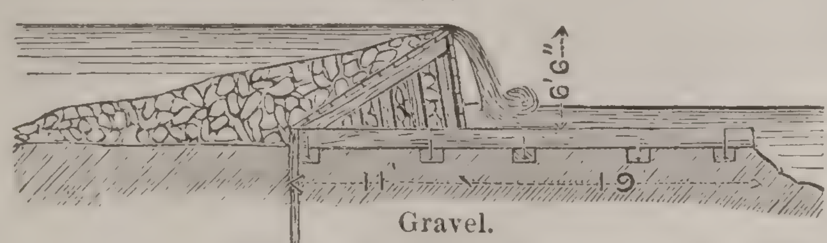
Dam on Schuylkill.

in high water of spring tides; now vessels can ascend to Glasgow drawing 22 feet.

Non-tidal Rivers.—Rivers with currents that flow constantly in one direction may be improved by assisting the natural navigation or by canalizing.

Natural navigation is assisted by building dikes or wing-dams to contract the river where it is too wide, by dredging shoal places, by protecting caving banks, and by removing loose rocks, snags, and wrecks. For removing snags on Western rivers the U. S. government has built a number of powerful steam snag-boats, each one having two bows, connected a little above the water-line by a very heavily-built beam. Snags are butted with this beam until sufficiently loosened, and are then hoisted up and cut into lengths by steam saws. The roots are dropped into deep holes and the tops allowed to float away. A river is canalized when it is divided by dams or weirs into a number of

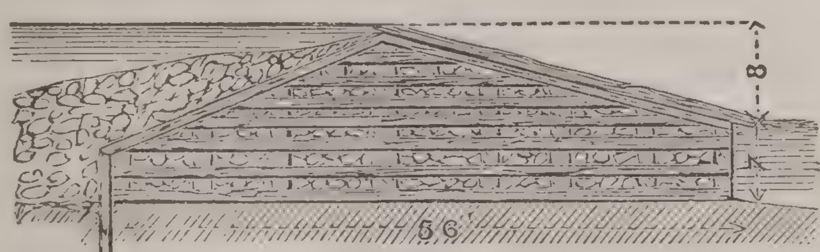
FIG. 2.



Dam on gravel foundation.

navigable reaches or pools. Boats pass from one pool into another by one or more locks in each dam. Figs. 1, 2, and 3 show three general styles of dam, all of them being of timber with backing of gravel, and two of them being filled with loose stone. When a dam is built on anything but hard rock, special precautions must be taken to prevent undermining. The dam shown in Fig. 2 had to be strengthened at the lower end of the apron by a line of cribwork extending across the river. The latest improvement in canalizing rivers is to build movable dams (*barrages mo-*

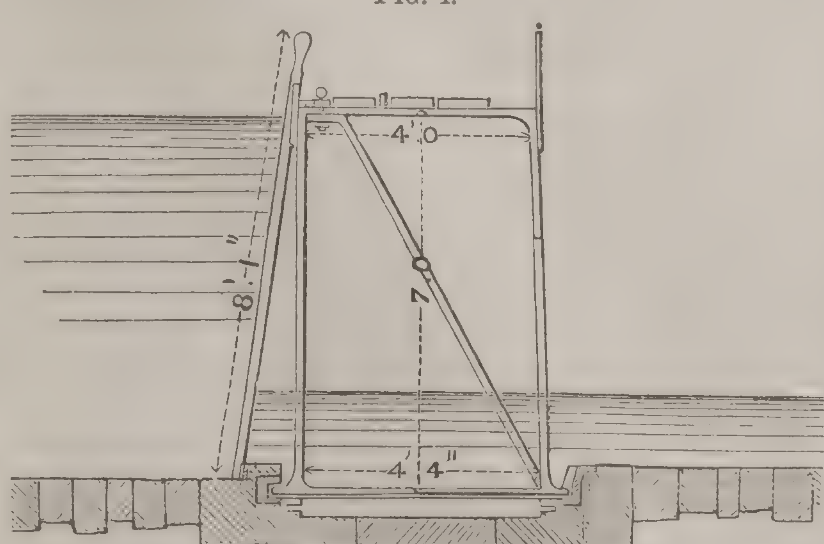
FIG. 3.



Dam on Monongahela.

biles), that can be lowered on the bed of the river when not needed. Fig. 4 shows the Poirée needle-dam, which consists of a trestle bridge with pieces of scantling (technically "needles") resting against its upper side. As the discharge of the river increases, the needles are gradually removed, until finally none are left, and then the trestles are dropped into a recess made in the bed of the river and

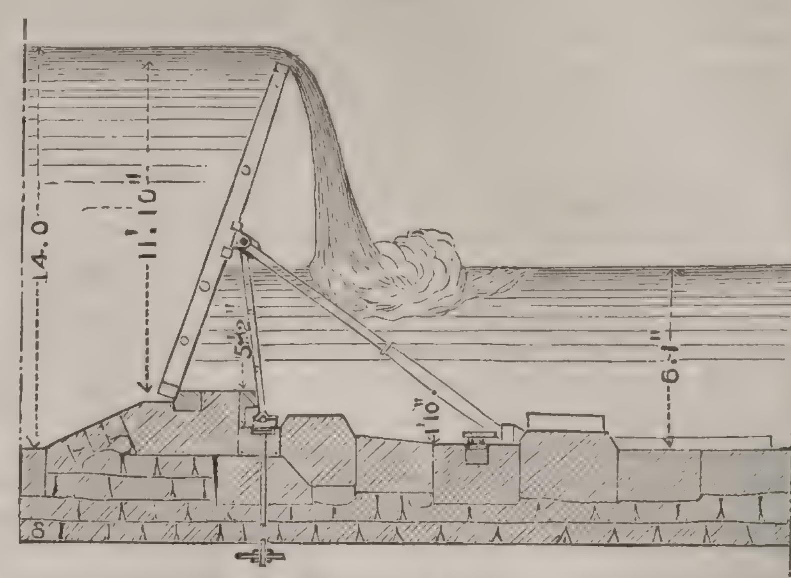
FIG. 4.



Poirée needle-dam.

extending from bank to bank. The Chanoine wicket, shown in Fig. 5, may be described as a door supported by a prop. It is connected with the floor by an iron horse, which is hinged to the wicket at the same place as the prop, and is likewise hinged to the floor. The wicket can revolve on the upper axle of the horse, and the latter can revolve on its lower axle. A wicket is usually $3\frac{1}{2}$ feet wide, and a series of them extends across the channel and forms the dam. The wickets are thrown down by a tripping-rod that lies horizontally on top of the floor and is provided with projections. The rod is worked from the lock or from a pier, and the projections on the rod push the feet of the props away from their supports; the pressure of the water at once forces the wickets down. They are raised by means of a small boat with a windlass that lifts one at a time. The Girard shutter, shown in Fig. 6, is a much wider door, which is hinged to the masonry floor, and is raised or lowered by a hydraulic jack. All the jacks are connected with

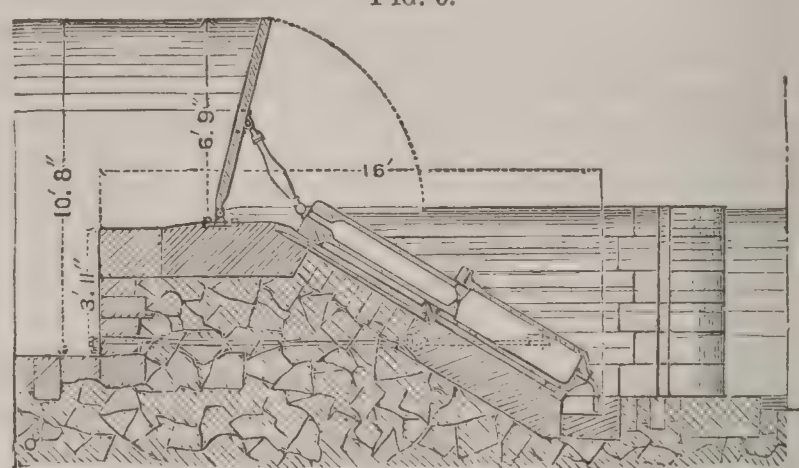
FIG. 5.



Chanoine wicket.

air and water pumps placed in a pump-house on shore, and power is obtained from a turbine worked by the fall at the

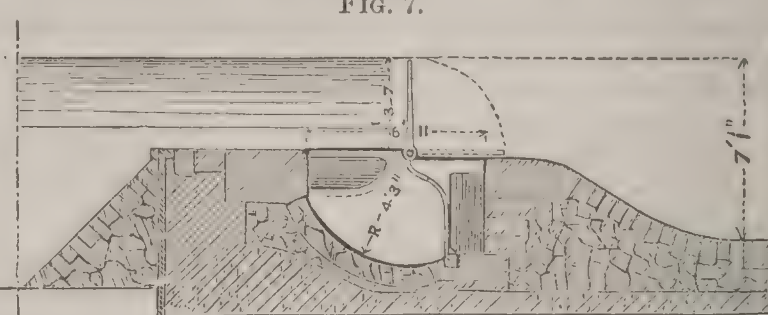
FIG. 6.



Girard's hydraulic shutter.

dam. This system can only be used where the floor is above the bed of the river. The Desfontaines drum-wickets, shown in Fig. 7, are worked entirely by the difference in pressure of two contiguous pools. Water from the upper

FIG. 7.



Desfontaine's drum wickets.

pool is admitted so as to press on the lower part of the wicket, and this pressure, being greater than that on the upper part of the same wicket, makes the wicket rise and become a dam. When this pressure is taken off by closing connection with the upper pool, and opening communication with the lower one, the wicket falls.

Of the systems of movable dams thus concisely described the Poirée and Chanoine are in very general use in many French rivers, the Girard is used on one weir on the Yonne, and the Desfontaines on several weirs on the Marne. The Chanoine system has been adopted in the U. S. for use in the improvements contemplated on the Ohio and Kanawha rivers.

It not infrequently happens that the navigation of great rivers is obstructed by rapids of limited extent, for which a resort to lateral canals is compulsory. Such works, though coming under the head of canals, are properly works of river improvement. There are two conspicuous examples in the U. S.—the Louisville and Portland Canal (see NAVIGATION, INLAND, CANALS) and the St. Mary's Falls (Sault Ste. Marie) Canal (for which see ST. MARY'S RIVER).

A review of inland navigation by rivers and lakes would be quite incomplete without allusions to projects for grand systems of water-communication which might be effected by establishing brief artificial links of connection between natural reaches of river, lake, or sound navigation. Borrowing from our early engineers, the authors of the report (on permanent defences, etc.) No. 86, 37th Congress, 2d Sess., H. R., we epitomize them: "The chain of interior water-communications which can so easily be established from the Bay of New York and of the St. Lawrence, stretching through the lakes, and, by their

union with the Mississippi River, to New Orleans, to St. Paul, Pittsburg, and the foot-hills of the Rocky Mountains, discloses a remarkable feature in the geographical formation of our country, and brings to mind another equally singular and important fact often referred to by our engineers, and worthy of consideration in this connection. It is what might be called a second coast-line, created by making a navigable channel near to and parallel with the coasts on the Atlantic and Gulf, and having numerous connections with those waters. . . . An interior channel, beginning in the Mississippi River" (and thus connecting with the chain above referred to, and uniting its extremities into a *circuit*) "above New Orleans, opening up the bed of the Iberville River (closed by Gen. Jackson in 1812–15, and not since opened), may be continued along the coast between the islands and the main land, *viâ* Mobile and Pensacola (crossing Florida with a ship-canal), Savannah, Charleston, Beaufort, Norfolk, near Baltimore, Philadelphia, New Brunswick, and New York (through Long Island Sound, Narragansett and Buzzard's Bays, and by a short canal) to Massachusetts Bay. There is *at this time* in operation, between the lower waters of New York harbor and the Delaware River, a canal—the Delaware and Raritan—43 miles long and 7 feet deep. It is navigated by small propellers and sloops. The Chesapeake and Delaware Canal connects Philadelphia, on the Delaware, and Baltimore, on the Chesapeake. It is only 13½ miles long, and is 10 feet deep. The Dismal Swamp Canal is 22 miles long, and connects Chesapeake Bay with Albemarle Sound. Here, then, is an interior channel, which, when the coasts have been put in a defensible condition, will be a safe one along an extensive and exceedingly important part of our coast, from New London to Beaufort, directly communicating with several of our largest States and cities. To make this extensive portion available both in peace and in war requires an *enlargement* of three short and inexpensive canals, of an aggregate length of but 78½ miles." . . . "Thus, with a few slight interruptions where it might be necessary to venture upon the open sea, an interior line of water-communications can be established from New Orleans to New York and to Boston;" and this may be continued along the Louisiana and Texas coast to the Rio Grande. A recent report of the chief of engineers (*Ex. Doc. No. 157*, 44th Congress, 1st Sess., H. R.) treats with great particularity the "water-communication between the Mississippi River and Atlantic Ocean," or that part of the above commencing in the Mississippi, skirting the Gulf, and crossing the isthmus of Florida by a canal.

Inland Navigation in Foreign Countries.—Inland navigation in Great Britain is composed of canals, and rivers made navigable by locks and dams. The largest canal, the Caledonian in Scotland, connects a number of lakes, and makes a water-line between the Irish and the North seas. A similar inland lake-navigation with short stretches of canal is found in Sweden and Norway. In France all the rivers have been improved, the latest practice being to use movable dams, of which the Seine is the best illustration. Movable dams, which are exclusively French in their origin, have also been used on rivers in Germany and in Russia. The latter country has a very extensive system of inland navigation, but not much is known of its details. A great deal of work has been done on the Rhine on the system of closing duplicate channels and rectifying abrupt bends, and on the Danube large sums are now being expended, especially at the "Iron Gates." Egypt is contemplating measures for extending the navigation of the Nile by devising means for getting over the rapids. In the East Indies the rivers are not navigable. China has many large rivers and canals, but they are not well known to foreigners. (For reference consult *Report of Senate Committee on Transportation, Reports of Chief of Engineers, Annales des Ponts et Chaussées.*) W. E. MERRILL.

Navigation Laws. See INTERNATIONAL LAW, SUMMARY, by PRES. THEODORE D. WOOLSEY, S. T. D., LL.D.

Navigation, Ocean Steam. There is no doubt that America may fairly claim the merit of having sent the first steamboat across the Atlantic, the Savannah having passed in twenty-six days from the U. S. to Liverpool in 1819; and that this success was not followed up at once with vessels fitted for such voyages (which the Savannah was not) can only be accounted for by the fact that the Americans were for some years more directly interested in pressing on their grand system of river and lake communication by steam vessels than in providing others for Transatlantic purposes. The Baltimore clippers were then and for many years later unrivalled on the Atlantic, and for this reason, probably, the want of steam between America and England was less felt. Something, too, is perhaps due to the opposition of so-called men of science, such as Dr. Lardner, who long resisted the idea that steam could ever impel vessels for a distance of 3000 miles. Ten years, therefore, elapsed before the next experiment, when the Curaçoa, an English-built vessel of 350 tons (50 more than the Savannah), made in 1829 several successful voyages between Holland and the Dutch West Indies. Yet even then nearly another ten years passed away before steam was energetically applied for ocean purposes. In 1838, however, the Sirius started from London on Apr. 4 and the Great Western from Bristol on Apr. 7, the first vessel accomplishing her voyage in seventeen days, the second in fifteen. These voyages—more rapid, too, on their return to England—settled the question of the practicability of crossing the Atlantic in steam-driven vessels; and if the Atlantic, why not any other seas, provided sufficient dépôts for coal could be established at convenient intervals? The Sirius and Great Western were soon after followed by other similar ships, as the Royal William in July, 1838, the first steamer from Liverpool to New York, the complete success of these vessels at the same time showing the necessity of sending the mails in future by steamboats. The same year saw the commencement of the Cunard line. Mr. (afterwards Sir Samuel) Cunard had as early as 1830 contemplated a line of mail steamers between Liverpool and Halifax, and on July 4, 1840, the Britannia left Liverpool on her first voyage, a subsidy (first of £55,000 per annum, and subsequently of about £81,000) being granted by the English government for carrying the mails. The next important vessel was the Great Britain, which was launched July 19, 1843, from the same yard at Bristol (Mr. Patterson's) which had turned out the Great Western; and she forms an era in shipbuilding, from the fact that she was built of iron and fitted with the newly-invented screw-propeller. She is still (1875) employed regularly in the trade between Liverpool and Australia, and is believed to be as sound as when launched thirty-two years ago. In 1845 the Americans, finding that their magnificent "liners" were not a match for the steamships from Liverpool, adopted the plan of "auxiliary screws," sending forth from Boston the Massachusetts, a vessel of great beauty, power, and speed, and still in existence under the name of the Alaska. But, though the Massachusetts beat the sailing vessels, she was not sufficiently speedy, so a line of steamers was established between New York and Bremen, calling at Southampton, the Washington, the first ship of this line, being started in June, 1847, from New York. The Britannia for Liverpool was started on the same day, and this was the first ocean-race between American and English vessels. The Britannia won on this occasion by two days. Not long after this the Collins line was proposed, it being seen that American interests suffered from the fact that smaller vessels of the Cunard Company carried letters, etc. between Halifax, New York, Bermuda, and St. Thomas, with subsidies from the English government. The first four ships sent forth in 1850–51, the Arctic, Baltic, Atlantic, and Pacific, were splendid ships of their class, and in many ways superior to any English merchant-ships then afloat. The subsidy supplied to the Collins line was enormous—as much, indeed, as $858,000 (about £178,000) per annum, and for four years, owing to their great speed, this line was decidedly preferred by passengers. It met, however, shortly after this with great misfortunes in the foundering of the Arctic and Pacific, and was ultimately relinquished in 1858. In 1841 two other considerable companies arose—one, the Royal West India Mail Company; the other, the Pacific Steam Navigation Company. The well-known Peninsular and Oriental Company, too, though then in existence, could hardly be called an ocean company till their ships from Aden eastward were in working order; while the Messageries (first Impériales) and Maritimes did but little extensive business till the Crimean war of 1854–56. The West India Company, with a fleet at present of 22 vessels and a gross tonnage of 49,219 tons, has met with many and serious disasters, especially in the loss of no less than seven of their finest ships. Their present ones are nearly all screws. The Pacific Company (now of greater importance than the old West India Mail Company) owes its creation to Mr. Wheelwright, an American citizen and the U. S. consul for Panama, who after six years' incessant labor obtained a charter from the English government in Feb., 1840. These vessels by their contract were not to touch at any places in Her Majesty's dominions. The progress of this company was slow, and for some years almost unremunerative; and this the more so as they seem to have built more vessels than were required for their trade. Another and most important, though more recent, undertaking may be mentioned here as connected with Central America on the one side and Panama and the W. coast on the other. This was formed by the combination of three separate companies, and bears the name of the West India and Pacific Steamship Company. Having

started in 1864, it now owns 13 vessels of 24,680 tons register, and the average run of these ships from Liverpool to St. Thomas is eighteen days, and to Colon twenty-two. With them may also be noticed another but private company, formed in 1865, the chief shareholders being Messrs. Lawport and Holt of Liverpool, with the title of the Liverpool, Brazil, and River Plate Steamship Company. This company now possesses 39 vessels of 49,294 tons burden. Some of their vessels start, in turn, from London, Antwerp, and Havre.

The remarkable success of the early lines soon led to the creation of others of scarcely less commercial value. Among these must be recorded the Liverpool, New York, and Philadelphia Company (better known as the Inman Line) in 1850, which, on the collapse of the Collins Line, carried the U. S. mails with great regularity—twice a week latterly, at least during the summer months; the Allan or Canada Line in 1853; the National Steam Navigation Company in 1863, with a weekly service (this year) to New York from Liverpool, and a fortnightly one from London *viâ* Havre; the Guion Line in 1863, started by Mr. Guion himself and his co-partners, being all American citizens; the Mississippi and Dominion Company in 1870, chiefly owned by Americans, and plying during the summer between New Orleans and Canada, and in the winter between New Orleans and Liverpool, calling on their southward voyages at Bordeaux, Corunna, Lisbon, and Havana; the White Star Line (originally a fleet of fast-sailing American clippers to Australia) in 1870, one of their vessels, the Adriatic, having attained the highest speed yet known in Atlantic voyages; these steamers run in connection with the Erie R. R. from New York; the Pennsylvania and Liverpool Company, another entirely American company, commenced in 1873, and now carried on with great spirit; the Anchor Line, with a fleet, at present, of 71,328 tons; the Hamburg American Steam-Packet Company; and the North German Lloyds, a comparatively old company, trading between Bremen and New York, with recent extensions, however, to the West Indies and Brazil. It would be impossible here, within a limited space, to even enumerate the principal ocean lines now (in 1875) in full operation. There are, however, a few to which we *must* call attention. Since the opening (in 1869) of the Suez Canal the Peninsular and Oriental Company, which previously had almost a monopoly of the passenger and most valuable traffic between the Red Sea, India, and the further East, has vastly extended their operations, and with the Messageries Maritimes send their steamships to almost all places of importance in Indian, Chinese, or Pacific waters, such as Calcutta, Calicut, Ceylon, Hong-Kong, Shanghai, Yokohama, etc. The last-named company, which owes much to the exertions of Napoleon III., is entirely under the French government control and very largely subsidized. In the North Pacific the Americans have started from San Francisco, in connection with the Rocky Mountains R. R., the North Pacific Transportation Company, and this, with the vast commerce opening out with Japan and China, *viâ* Honolulu, bids fair to be one of the largest and most successful companies. Excellent vessels are supplied for the W. coast of Africa, and as far as Natal, by the Cape of Good Hope Steamship Company, the Union Steamship Company, and the African Steamship Company. In India itself a gigantic undertaking exists with the name of the British India Steam Navigation Company, which has extended its wide arms over the whole of the Indian and African oceans, from Bassora and Zanzibar on the one side to Penang and Singapore on the other. This company at present owns 42 iron screws, of 57,000 gross tonnage, placed on thirteen different lines. Its origin was due to an advertisement of the East India Company in 1855 for mail steamers between Calcutta and Burmah. About 1,100,000 miles are now annually traversed under its contracts. The Netherlands Steam Navigation Company was started in 1866, and now owns 23 steamers, of about 20,000 gross tonnage, trading between Singapore, Batavia, and the Dutch ports, and thence through Torres Straits with Brisbane, Sydney, and Melbourne. Most recently (in Feb., 1875) a line of steamers has been commenced by Japanese merchants, called the Mitsu-Bashi Steam Navigation Company, with four steamers and a weekly service between Nagasaki, Hiogo, Imioseki, and Yokohama, their captains and engineers being American or English, but the sailors Japanese. A company of Chinese merchants also met in the spring of this year to organize a similar company for China, but we are not aware that any vessels are yet afloat for this purpose. W. S. W. Vaux.

Nav′igator's (or **Samoan**) **Islands,** a group of six islands, comprising an area of 2650 square miles, situated in the Pacific Ocean, between lat. 13° 30′ and 14° 30′ S., and between lon. 168° and 170° W. They are high, mountainous, of volcanic origin, with a rich soil, a hot, moist climate, and a luxuriant vegetation, forests of palms, bread-fruit trees, cocoanut trees, and bananas covering the mountains. Coffee, sugar, yams, and nutmeg are produced. The inhabitants are a well-formed and good-natured tribe of the Polynesian race, and different Christian missions work with considerable success among them. The largest island is Sawaii; the most fertile and most peopled is Tutuilla (which see).

Na′vy [Lat. *navis*, a "ship"], a word formerly used to express any large assemblage of ships, whether of war or of commerce. In the older English histories it was used in the sense of fleet or squadron. At present the word *navy* is applied exclusively to the war marine of a state. The Latin races generally and properly call a navy a *sea-army* (*armée de mer, armada*, etc.), applying the same term, in a technical sense, to a fleet. (See Naval Tactics.) The Anglo-Saxons use the word *fleet* (*flota*, to "float") as synonymous with navy, though in a stricter sense it is understood to apply to a naval force of definite magnitude. (See Tactics.) A navy is also called the military marine to distinguish it from the mercantile marine, and the vessels composing it are in general called "men-of-war."

The military value of a navy was demonstrated in the earliest pages of its history. Not to mention the Trojan war, when the Greeks were transported by means of a numerous fleet to the shores of Ilium, we may cite the first Persian invasion of Greece as the earliest case in point. Defeated at Marathon, the Persians hastily took to their ships, and rounding "Sunium's marbled steep" threatened Athens. Having no navy to oppose them, it was only by the rapid march of Miltiades that the barbarians were prevented from again landing. The facility with which the Persians transported a large army to a great distance by means of their fleet; the advantage they enjoyed of striking the coasts of Greece at any particular point, and of afterwards transferring the field of operations to distant parts, imposing toilsome, protracted, and exhaustive marches on their enemies, taught the Greeks the necessity of a floating force—a lesson they hastened to profit by. The Athenians were among the first known to authentic history to maintain a navy respectable in its character and distinguished for its organization, its discipline, and its efficiency. By a skilful use of this arm during the Peloponnesian war they were enabled to hold certain strategic points, giving them great advantage over their enemies: as the holding of Sestos, by which they kept control of the Hellespont and the corn-trade of the Euxine. The importance of the latter will be understood when it is known that Attica depended for subsistence entirely on that trade. The skilful movement of the Athenian fleet on Sphacteria (modern *Navarino*) succeeded as a diversion, and compelled the Spartans to abandon their campaign in Attica. But no event in ancient naval history is so instructive in all its aspects as the battle of Salamis and the strategic operations which immediately preceded it. It was at this time that the term "wooden walls" was first applied to a navy. While the victorious Persians were advancing by land and by sea, the Greeks were divided in opinion as to the course they should pursue. Seeking advice of the Delphic oracle, reliance was counselled in their "wooden walls." What these were no one knew till Themistocles, to whom the Pythia was probably indebted for the inspiration, named the fleet. The interpretation was at once accepted and the advice followed. Every Athenian capable of bearing arms repaired on board the ships of the fleet, while the old men, the women, and the children, abandoning their beautiful city to the barbarians, sought refuge on the island of "sea-born Salamis," placing themselves literally behind the wooden walls of the fleet. In the splendid victory of Salamis we learn the value of discipline and laborious training, for it was a victory gained by the disciplined valor of a small Greek fleet over the misguided fury of the Persian hosts.

Navies have grown out of either military necessities or the requirements of an ocean commerce obstructed by pirates. Trade and navigation may be said to be the parents of navies, those countries most largely interested in the former generally boasting of the most powerful fleets. While foreign trade produces wealth, and at the same time trains a class of men to the hardships of the sea, it requires protection and assistance in return. This is rendered by the military marine, whose service is largely recruited from the commercial: the benefits conferred are reciprocal. The Carthaginians, descended from the Phœnicians, were the most successful navigators of their day, their powerful navy being but the natural offspring of an extensive ocean trade. The Romans, on the other hand, were not a commercial people. Their navy was forced into existence as an implement necessary in the great game of war, but it

ever suffered the cold and unsympathetic regard of a step-child.

Though a navy is well called a sea-army, it yet differs from an army proper in the important particular of being unobjectionable on political grounds. While an army may be feared as dangerous to civil liberty, the example is yet wanting of the supreme power of the state being subverted by its navy. Moreover, a navy proportioned to the commercial tonnage of a country and the extent of its shore-line is the best and least expensive protection to the coasts and commerce of that country. While standing armies have always been regarded with jealousy, every maritime state, even from the earliest times, has found it expedient to maintain a permanent navy. Besides the ordinary duties of policing the seas to keep down piracy and of affording a moral support to ministers at foreign courts and merchants in foreign trade, navies are constantly engaged in the fields of science, some of the most important discoveries, and such as have contributed most generously to the common stock of knowledge and the advancement in civilization, being due to their labors. While this keeps a navy well occupied, and enables it to render during peace a return for its cost, it at the same time maintains in active service a corps of experienced men always ready for the sterner duties of war. An efficient naval force cannot be improvised. Instances are given by the naval historian of opposing fleets where seasick men and inexperienced officers have been called upon to contend against veritable "tars" under officers who, bred from childhood to the sea, prided themselves upon their skill as seamen. The results of such conflicts could never be doubtful.

From these general views the reader may understand how and why navies have come into existence. To render it clearer many examples might be drawn from modern history, but we may cite the origin of the U. S. navy alone as a fair illustration. In Sept., 1775, the British troops, closely invested in Boston, could receive supplies only by water. To intercept these, Gen. Washington, by virtue of his commission as commander-in-chief of all the Continental forces, detailed certain of his officers and men familiar with nautical pursuits to operate afloat in small armed cruisers. Vessels were purchased, fitted out, armed, and manned by the hardy seamen of New England, and cruised in Massachusetts Bay with such success that, while depriving the enemy of necessary supplies, they furnished the American army with such materials of war as alone rendered the successful prosecution of hostilities possible. The measures adopted by Washington being confirmed by Congress, other vessels were soon added to the list by legislative authority, prize-laws enacted, and a navy gradually formed. The country was so exhausted by the struggle that on the termination of the Revolutionary war the navy for a time passed out of existence. Its re-establishment under the present Constitution furnishes another illustration. American commerce having spread to every sea, the new flag was regarded by the old habitués of the ocean with no little curiosity. Finding it without protection, however, it was regarded with little respect by either civilized or uncivilized states: the former disregarded its neutral rights, the latter hesitated not to offer it insult. The U. S. were bound, therefore, in the interests of peace and civilization, to create a navy. Peace with Algiers put an end for a time to naval preparations, when our statesmen were again admonished of the necessity of an armed force on the ocean by the depredations of French cruisers. But as hostilities with France were of short duration and never fully recognized, the first notable service of our present navy was to fulfil the mission for which it was primarily created by putting down the Barbary powers, who had been plundering our merchantmen, imprisoning our citizens, and to whom we had, in our weakness, been paying tribute. The successful prosecution of the war with Tripoli, by which the dey was compelled to recognize the laws of nations, redounded greatly to the credit of the young navy. And it is a fact of no little interest that our navy gained its reputation first on the classic waters of the Mediterranean—the scene of so many great conflicts—and in combating the descendants of Zebulun, who "dwelt at the haven of the sea, whose borders were unto Zidon." The war of 1812 with Great Britain was the next in which the navy was called to take a prominent part. Although the U. S. had nothing on the ocean that could contend against the powerful fleets of England, yet the few single engagements that were fought discovered so much professional skill on the part of the officers, such fine qualities on the part of the seamen, that the country soon saw itself possessed of all the elements for one of the finest navies in the world. On the lakes, where the forces of the two countries were more on a par, this was still more manifest, for the results of the victories gained on Erie and Champlain were immediate and important, the English themselves admitting that they lost there all but their honor. During the Mexican war and the civil war the field of operations of the navy was confined to blockading and operating on shore, there being no seagoing ships on either occasion to contend against our own.

Though justly proud of the achievements of their little navy, the people of the U. S. should bear in mind that it has never been opposed, in a military sense, to any other navy. The single fights of isolated cruisers, however heroic, rarely have any effect upon the ultimate results of a war. The real strength of a navy is measured by its line of battle. Now, the U. S. have never had a line of battle; so that in reality their strength as a naval power has never been tested. What we may justly pride ourselves upon, therefore, are the indications we have discovered of a capacity for naval power, rather than upon the power itself. By keeping this fact in prominent view we may be able to appreciate the true value of our small navy, and in contemplating a maritime war cease to indulge expectations which cannot by our present policy be realized.

Navies have their triumphs of peace as well as of war. The U. S. Exploring Expedition and that to Japan, the interoceanic canal surveys, Arctic voyages, and those for deep-sea soundings, the Pacific explorations for hidden dangers, and the distant voyage of the Swatara (which, like that of the celebrated Cook to Otaheite in 1769, was undertaken for the purpose of observing the transit of Venus), show how valuable may be the returns made to the country in time of peace by a well-employed navy, while the Naval Observatory, the Coast Survey, Hydrographic Office, Torpedo station, and Naval Academy are all working their way in the broad domain of scientific research and adding daily to the common stock of useful information.

Organization of the U. S. Navy.—The Constitution imposes on Congress the duty of providing and maintaining a navy, and of making rules for the government and regulation of the naval forces. It declares the President to be commander-in-chief of the army and navy, and requires him to commission all officers of the U. S. Such commissions continue in force only during the pleasure of the President of the U. S. for the time being. The secretary of the navy presides over the navy department, and is the duly-constituted adviser of the President on all questions relating to naval affairs. In his former duties he is assisted by the chiefs of eight bureaus, as follows: equipment and recruiting, yards and docks, navigation, ordnance, medicine and surgery, provisions and clothing, steam engineering, and construction and repairs. The chiefs of bureaus are appointed by the President, with the sanction of the Senate, for a term of four years, and while so acting have the relative rank of commodore, unless already holding a higher grade. The law declares that the orders of the chiefs of bureaus shall be considered as emanating from the secretary of the navy, "and shall have full force and effect as such." The active list of the line-officers is divided into eleven grades. The relative rank between officers of the navy and army on the active or retired list is as follows:

The admiral of the navy	to	rank	with general of the army.	
The vice-admiral	"	"	lieutenant-general	"
10 rear-admirals	"	"	major-generals	"
25 commodores	"	"	brigadier-generals	"
50 captains	"	"	colonels	"
90 commanders	"	"	lieutenant-colonels	"
80 lieutenant-commanders	"	"	majors	"
280 lieutenants	"	"	captains	"
100 masters	"	"	first lieutenants	"
100 ensigns	"	"	second lieutenants	"
—— midshipmen.				

The offices of admiral and vice-admiral expire on the death of the present incumbents.

All staff officers are appointed by the President with the sanction of the Senate. The active list of the medical corps consists of 15 medical directors, 15 medical inspectors, 50 surgeons, and 100 assistant surgeons, with the relative rank respectively of captain, commander, lieutenant-commander or lieutenant, and of master or ensign. The pay corps consists of 13 pay directors, 13 pay inspectors, 50 paymasters, 30 passed assistant paymasters, and 20 assistant paymasters, having relative rank with captains, etc., as before. The engineer corps consists of 70 chief engineers (10 having the relative rank of captain, 15 of commander, and 45 that of lieutenant-commander), 100 passed assistant engineers, and 100 assistant engineers. The law authorizes the appointment of 24 chaplains, who are permitted to conduct public worship according to the manner and forms of the Church of which they are members. The law also authorizes the appointment of 12 professors of mathematics, and as many naval constructors as the service may require. The foregoing officers are commissioned. The President is authorized to appoint for vessels in actual

service as many boatswains, gunners, sailmakers, and carpenters as may, in his opinion, be proper. These are called warrant officers. All officers not entitled to hold commissions or warrants, except secretaries and clerks, are called petty officers. The number of enlisted persons in the navy, including seamen, ordinary seamen, landsmen, mechanics, firemen, coal-heavers, apprentices, and boys, is limited by act of June 17, 1868, to 8500.

The pay of all officers of the navy is fixed by law, and may be seen by reference to the *Navy Register* issued for the year. The pay allowed to petty officers (excepting mates), and the pay and bounty upon enlistment of seamen and others of inferior rating, is left by Congress to the President, with the sole proviso that the total amount of pay for officers and seamen shall not exceed the amount appropriated for that purpose.

The marine corps forms part of the naval organization, and is composed of 1 commandant with the rank of colonel (act of June 6, 1874), 1 colonel, 2 lieutenant-colonels, 4 majors, 1 adjutant and inspector, 1 paymaster, 1 quartermaster, 2 assistant quartermasters, 20 captains, 30 first lieutenants, 30 second lieutenants, and a proportionate number of non-commissioned officers and privates. (See MARINE CORPS.)

Naval discipline is maintained by the code embraced in the "act for the better government of the navy of the U. S.," commonly known as the "Articles of War," characterized by Lord Mansfield as "a sea military code formed by the wisdom of ages."

The vessels of the navy are divided into four classes: *First rates* (including iron-clads), of 3000 tons and upward, to be commanded by commodores; *second rates*, from 2000 to 3000 tons, including sailing frigates commissioned for sea-service, to be commanded by captains; *third rates*, between 800 and 2000 tons, to be commanded by commanders; *fourth rates*, steamers below 800 tons, small iron-clads, store-ships, etc., to be commanded by lieutenant-commanders. Vessels are named by the secretary of the navy, under direction of the President, as follows: First rates after the States of the Union, second rates after rivers, third rates after principal cities, and fourth rates as the President may direct.

The act of Apr. 21, 1806, authorizes the President to keep as many ships in commission during peace as he thinks proper, but Congress practically limits the number by the amount annually appropriated for the maintenance of the navy. Vessels of the navy are further distinguished by classes, a particular type of vessel giving her name to a class; thus, we have the "Colorado and class," the "Lancaster and class," etc., the sixty steamers on the navy list having as many as twelve different classes.

Navy-yards.

	Acres.	Dry-docks.	Ship-houses.	Slips.
Portsmouth, N. H.	164	1	3	
Boston	83⅛	1	3	3
New London	71¼			
New York	193¼	1	2	1
Philadelphia	20	To be discontinued.		
League Island	923	4*	2	
Washington	42	...	2	
Norfolk	109	1	...	4
Pensacola	83¼			
Mare Island	900	1†	...	1

S. B. LUCE.

* Projected. † Another one building.

Nax'os, an island belonging to Greece, the largest and most fertile of the Cyclades, is 20 miles long and 14 miles broad, and has about 11,000 inhabitants. Anciently it must have had 100,000. It is high and mountainous, but contains many beautiful, well-watered, and fertile valleys, which produce wheat, wine, figs, and olives in abundance and of superior quality. Naxos, situated on the north-western coast of the island, is the capital, and has about 5000 inhabitants. There was a duchy of Naxos which lasted (from 1206 A. D.) 360 years, giving place to the Turkish dominion in 1566.

Nay'ler (JAMES), b. at Ardsley, Yorkshire, England, about 1616; was a quartermaster in the Parliamentary ranks during the great civil war 1643–51; was one of the early converts to Quakerism 1651; became an itinerant preacher; claimed to be inspired and to be a sign of Christ's second coming, for which profession he was imprisoned at Exeter, condemned by Cromwell's Parliament Dec. 17, 1656, to stand in the pillory, to be whipped at the cart's tail, to have his tongue pierced by a hot iron and his forehead branded with a B (blasphemer), and to be kept in prison for an indefinite period. The sentence was executed at Bristol, and he was confined in the Bridewell, London, until the Long Parliament released him Sept. 8, 1659, and he d. in Huntingdonshire in 1660. He wrote a number of tracts, which were reprinted in 1716; a *Memoir* was published in 1719, and another by J. G. Bevan in 1800.

Nazareans. See MENDÆANS.

Nazarene' [Gr. Ναζωραῖος or Ναζαρηνός], a term employed in several significations in the New Testament and in ecclesiastical history. As first used (Matt. ii. 23), it is applied to Christ's residence at Nazareth as the fulfilment of a prophecy that "he shall be called a Nazarene;" but as no such passage occurs textually in the Old Testament, the term has been referred to the Nazarites; or to *Netser*, "the Branch" (Isa. xi. 1); or, rather, it expresses reproach, Nazareth being a proverbially contemptible place (John i. 46). Where Jesus "of Nazareth" is mentioned the correct translation is *Nazarene*, and might therefore have a signification distinct from that of "inhabitant of Nazareth." Theodore Keim, a recent German writer, in his *History of Jesus of Nazara*, derives the name from Nazara, a village in Judæa, basing his argument upon the reading given by Tischendorf (8th ed.) in Matt. iv. 13. A powerful Christian sect (referred to Acts xxiv. 5), found chiefly in Egypt, bore this name in the second century, having a Gospel of their own, called indifferently "of the Egyptians" or "of the Nazarenes," numerous passages of which were preserved in the writings of the earlier Fathers. The name has been a common one in India and the East generally as applied to all Christians (see MENDÆANS), and has been assumed in recent times by a sect which originated in Hungary in 1857. PORTER C. BLISS.

Naz'areth, village of Palestine, in the ancient district of Galilee, 70 miles N. of Jerusalem, in the modern eyalet of Beyroot, is celebrated as the place of the Annunciation and the abode of Christ during most of his life. The Roman Catholics have erected a church on the spot where the angel came to Mary to announce the birth of the Saviour, and the Greeks another church on another spot where the event took place, according to their belief. Chapels have also been built over Joseph's workshop and over Christ's table where he used to eat with his disciples. The village is in a little valley about a mile long and a quarter of a mile wide, just N. of the Plain of Esdraelon. From the hill overlooking the village is one of the finest prospects in Palestine. The present pop. is about 5000, and is steadily increasing. Besides Mohammedans (about 2000), there are orthodox Greeks, Roman Catholics, Roman Catholic Greeks, Maronites, and Protestants.

Nazareth, post-b. of Upper Nazareth tp., Northampton co., Pa., 9 miles N. W. of Easton, established in 1739 by George Whitefield, who intended to found here a school for Africans, but it was purchased by Zinzendorf, and became the site of a celebrated Moravian academy for boys. Pop. 949.

Naz'arite, more properly **Naz'irite** [Heb. *nâzar*, "to separate"], among the ancient Hebrews an ascetic of either sex who had taken a vow to abstain from wine, strong drink, and everything that is made of the vine, to let the hair grow, and to touch no dead body. Naziritism is older than the time of Moses. The vow might be either for a specified time or for life. Samson and Samuel were Nazirites for life, and so was John the Baptist. R. D. HITCHCOCK.

Neagh, Lough, a lake of Ireland, in the province of Ulster, 17 miles long, 10 miles broad, and covering an area of 153 square miles. It receives from the S. the Upper Bann and the Blackwater, and communicates on the N. with the Atlantic by the Lower Bann. In some places the waters of this lake show remarkable petrifying qualities.

Nea'gle (JOHN), b. at Boston, Mass., Nov. 4, 1799; was apprenticed to a coach-painter in Philadelphia; began in 1818 to paint portraits, and achieved a considerable success and reputation. Among his portraits are those of Washington in Independence Hall, Gilbert Stuart, Matthew Carey, Henry Clay, and Com. Barron. He married a daughter of the artist Sully. D. at Philadelphia in 1865.

Neal (DANIEL), b. in London, Eng., Dec. 14, 1678; studied at the universities of Utrecht and Leyden; became a dissenting minister in London 1703; preached at Lorimer's Hall 1706–07, and to a congregation in Jewin street from 1707 until his death, which occurred at Bath Apr. 4, 1743. Besides minor writings, he published a *History of New England* (2 vols., 1720) and a *History of the Puritans* (4 vols., 1732–38). The latter work was reprinted in 1754, 1759, 1793–97 (with *Memoir* by Joshua Toulmin), 1822, and 1837, and an American edition, revised, corrected, and enlarged, was issued by Rev. J. O. Choules (New York, 2 vols., 1844). Many replies to Neal appeared, the chief being by Bishop Isaac Madox and Dr. Zachary Grey, and Neal published several rejoinders. The *History*, though little more than a digest of Strype's voluminous writings, may still be consulted with advantage.

Neal (John), b. at Portland, Me., Aug. 25, 1793; was brought up in the Society of Friends, but left them when twenty-five years old; became a shop-boy at twelve, and afterwards a peddler; a dry-goods jobber in Boston and New York 1814–15; was John Pierpont's business-partner in Baltimore; failed in 1816; was admitted to the Maryland bar in 1819, having previously begun to write for the press; was in Europe, most of the time the associate of Bentham, 1824–27, and a correspondent of *Blackwood;* returned to Portland, and has been engaged as editor, lecturer, lawyer, poet, novelist, and teacher of gymnastics, fencing, sparring, drawing, and writing. Among his works are *Keep Cool,* a novel (1817), *The Battle of Niagara, Goldau and Other Poems* (1818), *Otho,* a tragedy (1819), *Brother Jonathan* (1825), *Rachel Dyer* (1828), *Bentham's Morals and Legislation* (1830), *The Down-Easters* (1833), *True Womanhood* (1859), *Wandering Recollections of a Somewhat Busy Life* (1870), and a very large number of other works.

Neal (Joseph Clay), b. at Greenland, N. H., Feb. 3, 1807; resided at Portsmouth, N. H., and Pottsville, Pa.; removed in 1831 to Philadelphia; became editor of the *Pennsylvanian,* a Democratic journal, and 1844–47 edited the *Saturday Gazette.* He was the first husband of Mrs. Alice B. Haven (which see). Author of *Peter Ploddy* (1844), 2 volumes of *Charcoal Sketches,* and other humorous writings. D. at Philadelphia June 18, 1847.

Neale (John Mason), b. in London, Eng., Jan. 24, 1818; graduated at Trinity College, Cambridge, 1840; took orders in the Church of England 1842; was made incumbent of Crawley in Sussex, and warden of Sackville College, East Grinstead, May, 1846. He became one of the literary champions of the "High Church" party, and was the founder of the sisterhood of St. Margaret 1856; obtained the Seatonian prize at Cambridge for an English sacred poem on nine occasions between 1845 and 1861. He published nearly seventy volumes, chiefly upon theological and ecclesiastical subjects, of which the best known were *The History of the Holy Eastern Church, the Patriarchate of Alexandria* (4 vols., 1847–51), *Mediæval Preachers* (1857), *History of the so-called Jansenist Church of Holland* (1858), *Essays on Liturgiology and Church History* (1863), *Mediæval Hymns from the Latin,* and *Hymns of the Eastern Church* (1871). He also published an expurgated edition of Bunyan's *Pilgrim's Progress* (1853) for the use of children, and his notes to that work gave rise to much controversy. Wrote the popular hymns on the New Jerusalem ("Jerusalem the Golden," etc.). D. at East Grinstead Aug. 6, 1866.

Neale (Leonard), D. D., b. in Maryland Oct. 15, 1746; was consecrated a Roman Catholic bishop and made coadjutor to Archbishop Carroll in 1800; became archbishop of Baltimore 1815. D. at Georgetown, D. C., June 15, 1817.

Neale (Rollin Heber), D. D., b. at Southington, Conn., Feb. 23, 1808; graduated at Columbian College, D. C., 1829; became in 1838 pastor of the First Baptist church, Boston, Mass.; author of several published sermons and religious works.

Nean'der (Johann August Wilhelm), b. at Göttingen Jan. 17, 1789, of Jewish parents and in humble circumstances; was educated in Hamburg, where he frequented the Johanneum; embraced Christianity in 1806; studied theology at Jena and Göttingen, and was appointed professor of church history in 1812 at the University of Berlin, where he d. July 14, 1850. He was unmarried, and a very peculiar man in personal appearance, manners, and habits, but with an enormous learning and decided genius he connected great simplicity of character, earnestness and enthusiasm. By his works he won the title of the "father of church history," and he deserved it. The old conception of history as a mere concatenation of individual exertions he abandoned, and represented the history of the Christian Church as a general process by which a divine force works its way into the life of the human race. By this idea, first developed by Hegel and afterwards manifoldly elaborated by the romantic school, Neander remodelled or regenerated the science of church history; and he was prominent in that circle of theologians whose centre was Schleiermacher, and which, in the earlier part of this century, awakened the educated classes of the German nation from their rationalistic indifference and led them back to Christianity, without throwing them into the arms of Romanism, as the romantic school did. As a writer of history he lacks dramatic power, and his style is heavy. His principal work is his *General History of the Christian Religion and Church,* from the close of the apostolic age to the Council of Bâle in 1431 (6 vols., in 11 parts, 1825–52), translated into English by Prof. Torrey. But several of his monographs, on Julian the Apostate (1812), St. Bernard (1813), Gnosticism (1818), St. Chrysostom (1821), are models of that kind of composition. He also wrote *History of the Apostolic Age* (2 vols., 1832), *Life of Jesus Christ,* in refutation of Strauss, etc. A complete edition of his *Works* appeared at Gotha in 13 vols. (1862–66). His library was purchased after his death for the theological seminary of Rochester, N. Y. Clemens Petersen.

Near'chus, one of the generals of Alexander the Great, commanded the fleet during the Indian expedition, and conducted it at the end of the campaign from the mouth of the Indus, across the ocean, through the Persian Gulf, to the mouth of the Tigris. Of his journey he wrote an account, Παράπλους, of which the substance has been preserved in Arrian's *Indica.*

Neath, town of England, county of Glamorgan, South Wales, on a river of the same name. It exports much coal, copper, tin, iron, and bricks. Pop. 9134.

Neave, tp. of Darke co., O., on the Columbus Chicago and Indiana Central R. R. Pop. 1093.

Neb'-neb, the dry pods of a gum-arabic tree, *Acacia Arabica,* imported for tanners' use. They contain much tannic acid, and are chiefly used in Egypt.

Ne'bo [Accadian, *Nabiu;* Assyrian, *Nabu*], one of the principal divinities of the Babylonian pantheon, generally identified with the Egyptian Thoth and the Greek Hermes. His greatest temple was at Borsippa (Birs-Nimrud). (See Myth.)

Nebras'ka, one of the central States of the American Union, lying wholly W. of the Missouri River, between the parallels of 40° and 43° N. lat., and between 95° 23′ and 104° of W. lon. from Greenwich. It is bounded N. by Dakota; E. by the Missouri River, which separates it from Iowa and Missouri; S. by Kansas and Colorado, the parallel of 40° forming the conventional line of separation between it and Kansas to the E. line of Colorado, where the boundary turns due N. on the meridian of 102° W. to

Seal of Nebraska.

the 41st parallel, and thence westward on the 41st parallel to the 104th meridian; W. it is bounded by Wyoming and Colorado. Its length from E. to W. is about 412 miles, and its breadth from N. to S. 208 miles. Its area is 75,995 square miles, or 48,636,800 acres.

Face of the Country, etc.—Nebraska has no mountains, though the north-western portion, bordering upon what are known as "The Bad Lands" (Mauvaises Terres), has some hills of considerable height, the result of erosion. The river-beds and their basins or bottom-lands are deeply eroded by the action of water, as in Iowa, and the high bluffs with which they are lined give an appearance of hills where none in reality exist. The greater part of the State is a rolling prairie, rising gradually toward the W. to the foot-hills of the Rocky Mountains in Colorado. The eastern portion is well drained and watered, the Missouri, which forms the entire eastern boundary, receiving two large rivers, the Niobrara and Nebraska or Platte, and several smaller streams, as the Great Nemaha, Little Nemaha, and Weeping Water rivers; the Republican Fork of the Kansas also drains the southern part of the State, and receives numerous tributaries. The Big Blue, another large branch of the Kansas River, drains several counties in the S. and S. E., and receives a number of smaller streams. The Nebraska or Platte, a broad and majestic but not a navigable river, is the principal stream, and traverses the entire State from W. to E., its N. fork having its source in Wyoming and its S. fork rising near the centre of Colorado. It has numerous important branches, all, with one exception, joining it from the N. bank.

Wood River, Loup Fork, Elkhorn River, and others are the principal of these. The Niobrara or Eau-qui-Court River also traverses nearly the entire State from W. to E., receiving several considerable affluents. The Republican River, or Republican Fork of the Kansas, is of great value to Southern Nebraska, both from its great length and broad stream and from its numerous tributaries. There are no lakes of importance in the State, a few salines and one or two groups of fresh-water ponds in the N. W. being all that can lay claim to the title.

Geology and Mineralogy.—The geological structure of the State is very simple. In the S. E. a triangular tract, extending W. as far as where the Little Blue River crosses the southern boundary of the State, and having the apex of the triangle at the point where the 42d parallel of latitude crosses the Missouri River, is distinctly identified with the Upper Carboniferous formation. It is covered to a depth of from 20 to 80 feet by a yellowish marl, but the rocks below belong to the coal-measures. There are thin strata of coal of good quality, but ranging from 5 to 22 inches—not sufficient to pay for extensive mining—and clays, limestones, and sandstones belonging to the Carboniferous era make up the remaining thickness of the coal-measures, in some instances 120 feet or more. Prof. Hayden believes this deposit to be the western margin of the great coal-basin of Missouri and Iowa, and thinks that the coal is so much thinned out by pressure from above that it will not prove profitable to mine it largely in this State. W. of these coal-measures is a narrow belt of Permian rocks, and to this succeed the Cretaceous deposits, having a breadth of 70 or 80 miles. W. of this the whole surface-rocks and soil of the State belong to the Tertiary period. In the S. W. portion of the State the Tertiary formation has large deposits of lignite of excellent quality. The mineral wealth of the State consists mostly of coal from the upper coal-measures, and not of sufficient thickness to furnish more than a local supply; this coal is confined to the Upper Carboniferous region along the Missouri River, and mostly below the Platte River; the lignite-beds in the Tertiary of the S. W. part of the State will probably prove a more profitable source of supply of coal. Lime, sandstone, limestone, and marble for ornamental purposes, gypsum, and especially salt, are the other principal minerals. There are numerous salt-basins in the central and western parts of the State. The most extensive is in Lancaster co., in a district of 12 by 25 miles surrounding Lincoln, the capital of the State. The springs contain 29 per cent. of salt, and the salt is manufactured by solar evaporation. The salt is said to be the purest in the world, being $98\frac{3}{10}$ per cent. of pure chloride of sodium. The sandstone belongs to the age of the Seneca or Potomac sandstone, is very soft at first, but hardens on exposure to the air, and becomes an excellent building material. The limestones are the blue Trenton limestone, a fair building-stone, and a gray magnesian limestone, susceptible of a fine polish and as enduring as the Italian marble.

Soil and Vegetation.—The eastern part of the State is well watered, and the soil of the Missouri bottoms and the whole region S. of the Platte and E. of the 99th meridian is a rich black vegetable mould from two to ten feet deep, slightly impregnated with lime, entirely free from stones and gravel, and easily ploughed to any depth. The subsoil is mostly yellow clay, but is not impervious to water. The wild grasses grow luxuriantly both upon the bottom and table lands, yielding from one and a half to three tons of hay per acre, and are more nutritious and better adapted to the raising of sheep and cattle than the cultivated grasses of the Eastern States. All of these, however, yield large crops of hay. The soil readily withstands the extremes of drought and rain, the crops being abundant in either case. There is but a limited supply of timber, and that along the water-courses; but this natural lack is in a fair way of supply from the planting of trees in very large quantities all over the State. The western portion of the State is not well watered. With the exception of the two forks of the Platte and the Niobrara, and a few small affluents of each, there is a lack of running streams. Western Nebraska at one time formed a portion of that mythical region, the "Great American Desert." It has been found, however, that even in the most sterile portion trees will grow, and that by their growth they attract the clouds, the rainfall increases, and this region becomes exceedingly fertile. Wherever irrigation has been tried, these lands, efflorescent with alkalies, yield astonishing crops. The region N. of the Niobrara and along its banks is a country of sand-dunes, sandhills, or heaps of fantastic forms, and a little farther N. is succeeded by the "Bad Lands," those extraordinary masses of clay which by erosion or denudation have taken the forms of castles, towers, city walls, etc., and which seem to have been the place of sepulture of an infinite variety of fossil mammals and reptiles. This portion of the State is barren and worthless for cultivation. N. of the Platte and W. of the 99th meridian the river-bottoms are the only arable portions of land, and it is hardly possible that irrigation will greatly benefit this region, though some of it may answer for grazing.

Zoology.—The wild animals of the Plains are all found here. The buffalo still roams over the western prairies of the State, though in diminishing herds; the grizzly bear, black and brown bears, the big-horn or Rocky Mountain sheep, antelopes, deer, elk, panthers, wolves, otters, lynxes, coyotes, and the army of rodents, as well as the mink, raccoon, opossum, skunk, muskrat, and beaver, furnish abundant supplies of peltry to the hunter and trapper. Reptiles are not so numerous as in more densely wooded countries, but there are two species of venomous serpents and a considerable number of harmless ones. Toads, frogs, and lizards are found in most parts of the State. There is a great variety of game birds, including wild-turkeys and several species of grouse, and all the birds of prey, singers, and birds of fine plumage pertaining to the Rocky Mountain region. The Missouri and most of its tributaries have a fair supply of fish, and some attention is paid to fish-breeding.

Climate.—Nebraska has a fine climate. The gradually increasing elevation from E. to W. secures excellent drainage, and though the winds which sweep across its prairies are strong, they are healthful. The climate is essentially a dry one, though the rainfall is not much less than in the East. The winters are not so rigorous as in the States and Territories farther N., though the temperature is occasionally low. The summers are long and warm, but the prairie-breezes greatly modify and temper the extreme heat. The mean temperature during the winter months ranges from 22° to 30°; that of the spring, from 47° to 49°; the summer, 70° to 74°; and the autumn, 49° to 51°. A weather-record of seven years (1863–69) at Nebraska City gives the mean annual rainfall as 30.36 inches, of which 20.87 inches fell between the 1st of April and 1st of October, and only 9.49 inches between October 1 and April 1. The following table gives meteorological data in regard to five places in different sections of the State. It must be stated, however, that these do not give a fair idea of the climate of the W., N. W., and S. W. portions of the State, which are as yet too new to have a sufficient number of observations to determine accurately the character of their climate and the amount of rainfall:

STATIONS.	Highest temp. of year.	Lowest.	Mean.	Range.	Highest temp. of spring.	Lowest.	Mean.	Range.	Highest temp. of summer.	Lowest.	Mean.	Range.	Highest temp. of autumn.	Lowest.	Mean.	Range.	Highest temp. of winter.	Lowest.	Mean.	Range.	Average annual rainfall.	Rainfall of spring.	Of summer.	Of autumn.	Of winter.	Prevailing winds.
	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	in.	in.	in.	in.	in.	
Omaha, lat. 41° 16′ N., lon. 96° W.; elevation, 1046 ft.	98	−20	47.96	118	86	−3	47.1	89	98	51	75.7	47	91	19	48.1	72	57	−20	21	77	28.98	9.86	11.73	6.62	0.77	N., S., N. W., S. E., calm.
Omaha Agency, lat. 42° 8′ N., lon. 96° 23′ W.; elevation, 1053 ft..........	98	−5	49.6	103	91	−5	49.6	96	98	48	75	50	85	9	46.1	76	58	−5	27.9	63	32.85	5.20	13.06	10.43	4.14	N., N. W., S., S. E., calm.
Dakota, lat. 42° 24′ N., lon. 96° 27′ W.; elevation, 1071 ft............	99	−19	45.5	118	89	−8	46.9	97	99	54	71.3	45	90	7	47.8	83	56	−19	18.2	75	30.46	4.32	13.16	10.33	2.65	N. W., S., N., S. E., S. W.
Nebraska City, lat. 40° 40′ N., lon. 95° 54′ W.; elevation, 993 ft...........	99	−2	55.8	101	80	−2	55	82	99	52	75.2	47	84	20	51.7	64	64	−2	29.3	66	46.24	8.60	22.98	8.63	6.03	S., S. E., N., N. W., S. W.
Fort Kearney, lat. 40° 37′ N., lon. 99° W.; elevation, 1247 ft............	100	−30	44.7	130	..	...	....	..	..	..	....	..	..	..	....	..	..	....	....	..	24.10	3.67	12.13	5.12	3.18	N., N. W., W., S., S. W.

Agricultural Products.—The soil of Nebraska is admirably adapted to withstand drought, being, except in the N. W. and S. W. portions, a deep rich loam underlaid by a porous clayey subsoil, which absorbs moisture and retains it sufficiently to nourish the roots of plants in time of drought, while in the prolonged rains which sometimes visit Eastern Nebraska this subsoil absorbs the surplus waters and frees the loam from an excess of moisture. In 1874 the county clerks reported 11,000,579.50 acres of land under cultivation, almost one-fourth of the surface of the State aside from the town-lots. They reported this land for assessment at probably about 35 per cent. of its real value, making the assessed value $43,004,800, and assessing the town-lots at $9,941,809. We have no statistics of the principal crops later than those of 1873 and 1874, and these are the estimates of the agricultural bureau, which are in most instances below the official returns. These estimates were as follows: Indian corn, in 1873, 7,000,000 bushels, an average yield of 35 bushels to the acre, valued at $1,960,000; in 1874, for reasons presently to be noticed, only 3,500,000 bushels, but valued at $2,555,000; wheat, in 1873, 3,584,000 bushels = 15.5 bushels to the acre, valued at $2,688,000; in 1874, 3,619,000 bushels, valued at $2,171,400; rye, in 1873, 30,000 bushels, worth $15,900; in 1874, 32,000 bushels, valued at $23,680; oats, in 1873, 2,400,000 bushels = 30 bushels to the acre, worth $624,000; in 1874, 1,944,000 bushels, valued at $972,600; barley, in 1873, 355,000 bushels = 30 bushels to the acre, worth $291,100; in 1874, the same amount, but valued at $305,300; buckwheat, in 1873, 2600 bushels, worth $1742; potatoes, in 1873, 383,000 bushels = 28 bushels to the acre (a very small yield), worth $375,340; in 1874, 275,000 bushels = 33 bushels to the acre, worth $283,250; hay, in 1873, 198,400 tons = 1.40 tons to the acre, worth $892,800; in 1874, 180,500 tons, worth $855,570. The total value of these eight crops in 1873 was estimated at $6,848,882, in 1874 at $7,166,200, and the value of other crops not enumerated was certainly as much more. The value of all farm productions, according to the census of 1870, was $8,604,724. The years 1873 and 1874 had been years of serious disaster to the crops in the State, the first being a year of intense drought, with a partial visitation of the grasshoppers or locusts, and the second marked by locust devastation, especially of the corn crop in the western and central counties, reducing that crop to one-third of its usual amount. But the crop of 1875 is represented as a most bountiful one. The live-stock report from the clerks of the counties for the year 1874 is not quite complete, but gives 87,449 horses, valued at $3,906,778; 7615 mules, valued at $417,911; 229,469 neat cattle, valued at $2,973,221; 30,329 sheep (15 counties not reporting), valued at $42,557; and 233,652 swine (5 counties not reporting), valued at $367,577.

Population.

Census year.	Aggregate population.	Males.	Females.	Whites.	Colored.	Indians.	Natives.	Foreigners.	Density.	Ratio of increase.	Illiteracy.	Of school age, 5–20.	Of military age, males, 18–45.	Of voting age, males, 21 and over.	Citizens.
1855	4,494	3,061	1,433												
1860	28,841	16,760	12,081	28,696	82	63*	22,490	6,351	0.38	....	634	8,671	9,023	9,907	
1870	122,993*	70,425	52,568	122,117	789	6,416*	92,245	30,748	1.62	326.45	4,861	41,325	35,677	39,080	36,169
1874	230,007‡	....	....	....	......	....	....	....	......	....	....	72,991			

Manufacturing Industry.—As yet, manufacturing in the State is in its infancy, but it is an infancy full of promise. In 1870 there were 670 manufacturing establishments, employing 2665 operatives and $2,169,963 capital, using $2,902,074 of raw material, and producing annually goods to the amount of $5,738,512. Of these, the most important were flour and meal, carpentry and building, boots and shoes, distilled and malt liquors. These amounts have been greatly increased within the past five years. There are now extensive carworks, foundries, gasworks, flouring-mills, distilleries, breweries, pork-packing establishments, carriage, wagon, and agricultural implement factories, soap-works, broom-factories, and large smelting-works which in 1874 separated and refined 7000 tons of base bullion and smelted 2000 tons of ore, producing $1,350,000 worth of gold and silver, and 6500 tons of lead, valued at $800,000. The value of manufactured products in 1875 was not less than $15,500,000.

Churches.—The following table presents the different denominations, and their statistics for 1870 and 1874:

Denominations.	Church organizations, 1870.	Church edifices, 1870.	Sittings, 1870.	Church property, 1870.	Church organizations, 1874.	Church edifices, 1874.	Ministers, 1874.	Church members, or communicants, 1874.	Adherent population, 1874.	Church property, 1874.
All denominations	181	108	32,210	$386,000	514	279	365	22,749	103,440	$665,150
Baptists	26	15	5,400	64,800	90	63	46	3,052	15,000	127,500
Christians or Disciples	9	4	1,550	14,500	15	7	10	750	3,800	27,550
Congregationalists	10	7	2,050	38,500	65	33	48	1,613	8,000	79,600
Protestant Episcopalians	15	12	3,500	31,000	26	20	25	1,294	6,290	57,000
Evangelical Association	5	3	600	7,000	10	7	6	650	3,000	14,500
Lutherans	14	7	2,000	27,900	30	13	7	2,870	12,000	43,000
Methodists	50	36	10,150	113,400	94	50	124	8,693	32,000	235,000
Presbyterians	24	9	3,125	48,300	78	46	47	2,381	10,000	83,500
Roman Catholics	17	11	2,935	34,900	18	16	14	....	6,000	50,000
Unitarians	3	3	700	4,500	3	3	3	225	1,250	5,000
United Brethren in Christ	4	.....	....	....	84	20	33	1,205	6,000	40,000
Universalists	3	.....	....	....	1	1	2	16	100	2,500

There was also in 1870, 1 Mormon congregation, with 1 house of worship, 200 sittings, and congregational property valued at $1200.

Railroads.—On Jan. 1, 1875, there were 1107.69 miles of completed railroads in the State—the Union Pacific, 459.90 miles; Burlington and Missouri River in Nebraska, 190.75; Atchison and Nebraska, 110.78; St. Joseph and Denver, 88.50; Midland Pacific, 83; Omaha and Southwestern, 47.05; Fremont Elkhorn and Missouri Valley, 50.75; Omaha and North-western, 40; Sioux City and Pacific, 26.96; Brownville and Fort Kearney, 10. The assessed value of these roads in 1874 was $11,183,114. The sidings and branches made the whole number of miles operated at that date 1396.25 miles, and the cost of roads and equipment, according to the reports of the companies, was $53,727,833. The Union Pacific traverses the entire State from E. to W.

Telegraphs.—There were in the State Jan. 1, 1875, 863.18 miles of telegraph, of which 737.18 belonged to the Western Union and 126 miles to the Great Western Company.

Finances.—The total debt of the State Dec. 1, 1874, was $352,400, of which $342,957.34 was a permanent debt to the State permanent school fund, on which interest was paid semi-annually. The sessions of the legislature being biennial, the reports are made up in periods of two years. The receipts of the two years ending Dec. 1, 1874, including balance previously on hand, were $1,667,695.69, and the disbursements for the same period, $1,433,152.28. The assessed valuation of the State in 1874 was $81,218,813.42, from which, for purposes of taxation, $464,769.25 was deducted, being the amount of exemption for the planting of 4647.6925 acres with trees during the year. In his message of Jan. 1, 1875, the outgoing governor, R. W. Furnas, declares that there is not less than $300,000,000 worth of property in the State which should be made to yield revenue. The assessment seems to be laid at from 33⅓ to 40 per cent. of the real value, and there are large exemptions and evasions of taxation, especially of railroad property and lands.

Commerce.—Nebraska has no direct foreign commerce. Her internal commerce, except that portion shipped on the Missouri, passes over the railroads of the State; its amount cannot be definitely ascertained.

Banks.—On Nov. 1, 1874, there were 10 national banks in operation in the State, having an aggregate capital of $1,025,000, $1,060,000 bonds on deposit, and $895,900 of circulation outstanding; 7 State banks, with an aggregate

* To these are to be added 6329 Indians sustaining tribal relations, included in the column of "Indians."
† Tribal Indians not enumerated in 1860.
‡ Exclusive of tribal Indians.

capital of $575,000; 1 savings bank; and 22 private banking-houses.

Insurance.—There are no fire or life insurance companies incorporated in Nebraska, but 37 fire and 22 life insurance companies from other States and countries were authorized to do business there in 1874.

Education.—The State superintendent of schools gives in the summary of his report for 1874 the following items to the close of 1874: Number of school districts, 2215; number of children of school age (5–21), 72,991; number of children attending school, 47,718. Total number of teachers, 2735, of whom 1252 were males and 1483 females; total amount paid to teachers as salary or wages, $342,806.26, of which $171,776.86 was paid to male and $171,029.40 to female teachers; average monthly wages of male teachers, $37.98; of female teachers, $32.12. Whole number of school-houses, 1516, of which 1345 were stone, brick, or frame, and 171 log, sod, or dug-outs. The value of school-houses and sites was $1,546,480.73. The total receipts for school purposes from all sources were $988,740.20, and the total expenditures, $1,004,957.03. The school fund, including notes properly secured for school-lands, was in Nov., 1874, $1,390,240.44. Not all of this as yet yields an income, but the greater part is invested at 10 per cent. interest. The number of private schools is 30, and of pupils in private schools 863. There are graded schools in twelve towns, and high schools in all. Omaha and Lincoln have city school-systems of their own. Teachers are trained in teachers' institutes, of which 20 were held in 1874, 4 of which were normal institutes, which were continued for two weeks or more. A more extended training is given in the very successful State Normal School at Peru, which had 10 instructors and 87 students in the normal and 144 in the preparatory department. Its expenditures are about $12,250 per annum.

Higher Education.—The State University at Lincoln, which includes also the State Agricultural College, organized in 1871, is in a prosperous condition. It had in 1874 a faculty of 8 professors and 114 students, of whom 53 were in the collegiate course, 55 in the Latin school, and 6 in the agricultural college. The value of its buildings and grounds was $175,000. It has an income from special funds and State appropriation of about $27,500, a library of over 1200 vols., and cabinets, museums, and herbaria of great value. An experimental farm of 320 acres in fine culture is attached to the agricultural college. There are also 2 colleges under denominational control—viz. Nebraska College at Nebraska City, organized in 1865 and chartered in 1868, under the control of the Protestant Episcopal Church: it had in 1874, 10 professors and 92 students, of whom 88 were in the preparatory and 4 in the collegiate course; the value of grounds, buildings, etc. was $23,000, and it received $8000 from tuition fees. Its libraries contained 1700 volumes. Doane College at Crete, organized in 1873, is under the control of the Congregationalists: it had in 1874, 3 professors and 53 students, of whom 45 were in the preparatory and 8 in the collegiate course; its buildings, grounds, etc. were valued at $50,000, and it had $20,000 of productive funds; its receipts from all sources were $2500, and it had a library of 200 volumes. This college receives students of both sexes. The Deaf and Dumb Institute at Omaha, organized in 1869, is a State institution. It had in 1874, 4 teachers and 39 pupils; the current expenditure is about $15,000 per annum.

Charitable Institutions.—The Nebraska Hospital for the Insane at Lincoln was organized in 1871. It has a staff of 4 resident officers, and had under treatment, in 1874, 75 patients, of whom 18 were discharged or died during the year, 12 being discharged cured, 6 improved, 1 eloped, and 4 died. Its current expenses are about $30,000 per annum.

Prisons and Penitentiaries.—The Nebraska State prison at Lincoln, though its buildings are not yet complete, is well managed, its warden being a very capable and intelligent man who has made prison management a study, and is desirous of making the prison reformatory as well as penal; the inspectors are zealously co-operating with him. Number of prisoners Dec. 1, 1874, 54, of whom 35 were under contract. The whole number which had been received or were previously in the prison for the two years ending Dec. 1, 1874, was 91; of these, 22 had been discharged by the expiration of their sentence, 9 pardoned, 4 released on commutation of sentence, 1 died, and 1 was returned for a new trial. Of those remaining, 53 were males and 1 female; 46 were whites, 4 Indians, and 3 negroes. Expenses for maintenance, salaries, etc., about $27,000 per annum, of which about $5075 is income from labor of prisoners.

Newspapers.—In 1870 there were 42 newspapers in Nebraska, having an aggregate circulation of 31,600, and issuing annually 3,388,500 copies. In 1875 the number of papers and periodicals had increased to 77, of which 10 were dailies, 62 weeklies, 1 semi-monthly, and 4 monthlies; 3 (all monthlies) of the number were educational, 4 were agricultural, 4 devoted to nationalities, and the remainder were either political or literary and miscellaneous. The circulation had largely increased, but we have not exact statistics of it. The dailies had increased from 7 to 10, the weeklies from 30 to 62.

Counties.—In 1875 there were 63 organized and 7 unorganized counties in the State, whose population and valuation are as follows:

COUNTIES.	Pop. 1874.	Pop. 1870.	Males, 1870.	Females, 1870.	Pop. 1860.	True valuation, 1870.	Assessed valuation, 1874.
Adams	2,694	19	12	7	......	$89,876	$1,122,071
Antelope	1,387	New	county	......	......	....	347,967
Blackbird, not yet org.	......	31	19	12			
Boone	798	New	county	......	......	....	373,705
Buffalo	2,106	193	139	54	114	784,569	1,406,559
Burt	3,866	2,847	1,550	1,297	388	1,471,796	1,255,864
Butler	4,027	1,290	705	585	27	217,341	1,380,834
Cass	10,397	8,151	4,699	3,452	3,369	3,199,856	4,125,691
Cedar	1,817	1,032	588	444	246	437,333	1,034,483
Chase	No ret	urns.	New	county			
Cheyenne	449	190	148	42	......	279,013	1,390,711
Clay	3,622	54	32	22	165	....	1,316,853
Colfax	3,458	1,424	825	599	......	1,497,878	1,315,099
Cuming	3,644	2,964	1,694	1,270	67	1,282,653	1,380,579
Dakota	2,759	2,040	1,103	937	819	814,206	676,822
Dawson	800	103	76	27	16	....	1,320,739
Dixon	3,842	1,345	738	607	247	656,662	707,620
Dodge	6,803	4,212	2,368	1,844	309	2,776,000	2,273,338
Douglas	22,670	19,982	12,049	7,933	4,328	18,055,609	9,075,472
Dundy	Nó ret	urns.	New	county			
Fillmore	4,380	238	131	107	......	....	1,264,113
Franklin	1,821	26	21	5	......	....	501,975
Frontier	128	New	county	......	......	....	54,800
Furnas	1,342	New	county	......	......	....	197,642
Gage	5,290	3,359	1,881	1,478	421	1,636,355	2,145,304
Grant, not yet org	......	484	395	89			
Greeley	209	New	county	......	......	....	258.323
Gosper	100	New	county				
Hall	3,842	1,057	647	410	116	1,287,607	1,554,955
Hamilton	3,186	130	83	47	......	533,164	1,056,788
Harlan	1,847	New	county	......	......	....	220,010
Harrison, not yet org	......	631	488	143			
Hitchcock	No ret	urns.	New	county			
Howard	1,339	New	county	......	......	....	562,318
Holt	No ret	urns.	New	county			
Jackson, not yet org.	......	9	9				
Jefferson	3,375	2,440	1,417	1,023	122	964,237	1,196,520
Johnson	4,644	3,429	1,800	1,629	528	1,289,325	1,321,243
Kearney	327	58	43	15	474	....	604,074
Keith	95	New	county	......	......	....	549,425
Lancaster	14,308	7,074	4,269	2,805	153	1,505,790	4,359,685
L'Eau-qui-Court, now Knox	1,133	261	144	117	152	62,915	493,855
Lincoln	2,555	17	15	2	......	2,748,758	1,249,230
Lyon, not yet org	......	78	72	6			
Madison	3,335	1,133	659	474	......	143,236	646.403
Merrick	3,092	557	341	216	109	1,409,600	1,778,543
Monroe, not yet org	......	235	202	33			
Nemaha	8,202	7,593	4,057	3,536	3,139	3,707,610	2,759,981
Nuckolls	942	8	4	4	22	....	661,511
Otoe	12,380	12,345	6,802	5,543	4,211	6,445,852	5,013,022
Pawnee	5,057	4,171	2,222	1,949	882	1,548,344	1,383,261
Phelps	101	New	county	......	......	....	542,493
Pierce	557	152	83	69	......	21,960	537,230
Platte	3,944	1,899	1,154	745	782	2,348,592	1,937,208
Polk	2,764	136	83	53	19	....	743,300
Red Willow	545	New	county	......	......	....	66,318
Richardson	15,000	9,780	5,400	4,380	2,835	5,500,000	3,114,725
Saline	7,718	3,106	1,715	1,391	39	650,460	2,256,062
Sarpy	3,164	2,913	1,753	1,160	1,201	1,217,628	1,536,705
Saunders	8,754	4,547	2,582	1,965	......	2,000,000	2,161,006
Seward	7,429	2,953	1,703	1,250	......	295,507	1,430,224
Sherman	460	New	county	......	......	....	376,535
Stanton	1,135	636	345	291	......	300,000	648,736
Thayer	1,781	New	county	......	......	....	1,135,338
Taylor, not yet org	......	97	84	13			
Valley	264	New	county	......	......	....	347,002
Washington	5,304	4,452	2,451	2,001	1,249	1,702,767	1,660,782
Wayne	272	182	101	81	......	219,984	579,839
Webster	2,250	16	8	8	......	....	391,307
York	4,593	604	330	274	......	175,000	941,845
Unorganized territory	1,600	310	186	124	2,292	Add true exemption	464,769
Total	230,007	122,993	70,425	52,568	28,841	$69,277,483	$81,218,813

Principal Towns.—Lincoln, the capital, had in 1870 but 2441 inhabitants, but has since grown rapidly; Omaha, the largest city in the State, had 16,083 inhabitants in 1870, and now claims 25,000; the only other considerable towns in 1870 were Nebraska City, 6050 inhabitants; Plattsmouth, 1944; Brownville, 1305; Fremont, 1195. Kearney, Crete, Rulo, Beatrice, Tecumseh, Tekamah, West Point, Falls City, and Grand Island are growing towns.

Constitution, Government, Courts, etc.—A constitutional convention was held in 1875, by which a new constitution for the State was prepared, and the same adopted by the people in Nov., 1875. This constitution provides that every male person of the age of twenty-one years and upwards, who is a citizen of the U. S., or of foreign birth who has declared his intention of becoming a citizen thirty days previous to an election, and every elector in the actual military service of the U. S. or of the State who is not in the regular army, who shall have resided in the State six months, and in the county, precinct, or ward for such period as is prescribed by law, shall be an elector, with the following exceptions:

all persons who are *non compos mentis*, all who have been convicted of treason or felony under the laws of the State or the U. S., unless restored to civil rights, and all soldiers, seamen, or marines in the army and navy of the U. S. who may be on duty in this State. The executive department of the State consists of a governor, lieutenant-governor, secretary of state, auditor of public accounts, treasurer, superintendent of public instruction, and commissioner of public lands and buildings, who are to be elected on the Tuesday after the first Monday in November of the even years, and to hold office for two years from the first Thursday after the first Tuesday in January next succeeding their election. The legislature has the usual two houses, and until 1880 will consist of only 30 senators and 84 representatives, but the number is not to be increased beyond 33 senators and 100 representatives. They are elected for two years. The judicial power of the State is vested in a supreme court of three judges, elected for six years; six district courts, with one judge for each, elected for four years; county courts, each presided over by a single judge, whose term of office shall be two years. The supreme court has original jurisdiction in cases relating to the revenue, civil cases to which the State shall be a party, mandamus, quo warranto, habeas corpus, and appellate jurisdiction, as provided by law. The district courts have both chancery and common-law jurisdiction, and appellate jurisdiction from the county courts. Justices of the peace and police magistrates are appointed to try minor cases. The State is entitled under the apportionment of 1872 to but one Representative in Congress.

History.—Nebraska was a part of the Louisiana territory ceded to the U. S. by France in 1803. It was traversed by Lewis and Clarke in 1804–05, and they are believed to have been the first white explorers who had passed through it from E. to W. In 1812 it formed a part of Missouri Territory, and being occupied by strong and warlike Indian tribes, it was not regarded as desirable for emigrants for many years. In 1844, Senator Douglas introduced a bill for the establishment of a Nebraska Territory, including Kansas, Dakota, and portions of Colorado and Wyoming, and the following year an amended bill on the same subject; but nothing was done in regard to it. In 1848 he introduced another bill, which was reported the following April, and recommitted in December, but not acted upon. In 1853–54 the subject assumed a new interest, and the Kansas-Nebraska bill was introduced, which in effect repealed the Missouri Compromise and permitted the inhabitants to decide whether slavery should be admitted into their respective Territories. This doctrine, known as "squatter sovereignty," exerted an untoward influence on Kansas, inducing much disturbance there, but had no effect in Nebraska, which was organized as a Territory in 1854, and included part of Dakota, Montana, most of Wyoming, and the N. E. portion of Colorado. This region was given up to be free territory by common consent. In 1861 and 1863 the extent of Nebraska Territory was greatly diminished by the setting off of Dakota, Colorado, Wyoming, and Montana Territories. Its population increased very slowly at first, as it had little or no gold or silver; but as the Pacific R. R., which had its eastern terminus at Omaha, stretched westward, it began to fill up, and its great advantages for agricultural purposes, its rich soil, and genial climate attracted great numbers of immigrants. Its principal growth has been from 1867 to the present time. It was supposed to have had at the close of 1875 not less than 300,000 inhabitants. It was admitted into the Union in Feb., 1867, and lived under the constitution then adopted until the close of 1875, when a new constitution was ratified by the people, to take effect in 1876. There are several Indian reservations in the State, occupied by the Otoes, Arapahoes, Pawnees, and Omahas, but none of the more powerful tribes. The State is a very desirable one for agricultural emigrants from its climate, soil, water, the moderate price of its lands, and its accessibility to good markets.

Governors of the Territory and State.

Territory.

Francis Burt.............. 1854–54
T. B. Cuming (acting).. 1854–55
Mark W. Izard............ 1855–58
William A. Richardson. 1858–58
J. Sterling Morton (acting).......................... 1858–59
Samuel W. Black......... 1859–61
Alvin Saunders........... 1861–66
David Butler............... 1866–67

State.

David Butler 1867–71
William H. James (acting)......................... 1871–73
Robert W. Furnas....... 1873–75
Silas Garber............... 1875–

Presidential Elections, Electoral and Popular Vote.

Elect. year.	Candidates who received the electoral vote.	Elect. vote.	Popular vote.	Opposition candidates.	Popular vote.	Minority or third-party candidates.	Popular vote.
1868	Ulysses S. Grant P............ Schuyler Colfax V.-P.......	3	9,729	Horatio Seymour P......... Francis P. Blair, Jr.,V.-P.	5,439		
1872	Ulysses S. Grant P............ Henry Wilson V.-P..........	3	18,245	Horace Greeley P............ Benj. Gratz Brown V.-P...	7,705	Charles O'Conor P...........	No report.

(For much valuable statistical and other information respecting Nebraska the writer is under obligations to His Excellency Hon. Silas Garber, governor of the State.)

L. P. Brockett.

Nebraska, tp. of Livingston co., Ill. Pop. 1162.

Nebraska, tp. of Page co., Ia. Pop. 620.

Nebraska City, city of McWilliams tp., cap. of Otoe co., Neb., E. terminus of the Midland Pacific R. R., on the Missouri River, 35 miles S. of Omaha and 45 miles E. of Lincoln, beautifully situated on high ground in the midst of a productive farming country, has 13 churches, 4 weekly newspapers, 3 banks, 4 large public schools, a Catholic convent, a public library, good public buildings, an opera-house, city gasworks, several flouring-mills and manufactories, and a large and increasing trade. It is the seat of Nebraska College, an Episcopal institution founded in 1865, which has (1876) 10 professors and instructors and about 100 students. The Kansas City St. Joseph and Council Bluffs and the Burlington and Missouri R. Rs. form a junction on the opposite bank of the Missouri River. Pop. in 1860, 1922; in 1870, 6050.

Nebuchadnez'zar [in the Babylonian cuneiform texts *Nabu-kuduri-ussur*, "Nebo protects the crown"], the greatest of the kings of Babylon, son and successor of Nabopolassar, the founder of the empire; was of marriageable age at the time of his father's revolt against Assyria (B. C. 625), at which time Amuhia, daughter of the Median king, was betrothed to him; is supposed to have commanded the Babylonian auxiliaries in Cyaxares's war against Lydia, and to have brought the hostilities to a close by his mediation on the occasion of the famous eclipse foretold by Thales, B. C. 610; regained Carchemish on the Euphrates from the Egyptian king 605; subjugated Syria and Palestine, carrying the principal Jews into captivity in the same year; succeeded to the throne 604; besieged Tyre 598; completed the reduction of Judæa 586; destroyed Tyre after a siege of thirteen years 585; invaded and ravaged Egypt some years later; rebuilt in a splendid manner all the cities of Upper Babylonia; constructed vast temples, aqueducts, and palaces, of which the ruins still testify to his grandeur. D. about 561. (See Rawlinson's *Five Great Monarchies*, and for his relation to biblical history see the book of Daniel.)

Neb'ulæ, the name given to a class of celestial objects characterized by a certain cloudy aspect resembling the light of the Milky Way or the Magellanic clouds, or in numerous cases the diffused light of a comet's tail. Many bodies having this nebulous appearance can by means of powerful telescopes be shown to be merely clusters of apparently faint stars, whose light, commingling together, gives in the feebler telescopes a hazy or nebulous appearance, nor does there appear at present any impropriety in treating of clusters and nebulæ under one general name —nebulæ. The nebulæ are distinguished from the fixed stars by their apparent diameter, since the latter bodies appear, even under the most powerful magnifying powers, without sensible magnitude. They are, on the other hand, distinguished from the planetary and cometary disks, not only by their peculiar lustre, but by their immobility, since, as yet, a proper motion has not been demonstrated for any nebula except the trifid (*G. C.* 4355), although changes are known to have occurred within the body of one nebula and perhaps others. (See Holden in Silliman's *Am. Jour.*, 1876, May.) On account, therefore, of their fixity in position, it has always been considered that the nebulæ belong to the regions of space very far removed from our solar system. Our knowledge of these celestial bodies has been peculiarly dependent upon the successful construction of large telescopes, and is therefore almost exclusively the result of the labors of modern astronomers, beginning with Sir William Herschel. In treating of the nebulæ and allied celestial objects we shall confine ourselves to a general review of the principal labors of astronomers in discovering and describing them, and shall give such items of our knowledge respecting them as can be safely gathered from the mass of generalizations, hypotheses, and theories that have been framed in regard to these bodies.

The term "cloudy stars" is first found in the catalogue of Ptolemy, but each of the five objects so named by him is now known to be a coarse cluster of stars, easily resolvable into its elements by feeble telescopes. The Arabian astronomer Sufi in the middle of the tenth century makes mention of the Magellanic clouds and of the Andromeda nebula. The first recorded telescopic observation of a true nebula is by Simon Marius, who in 1612 had appropriately described the great nebula in Andromeda as appearing to the naked eye like the flame of a candle seen through a semi-transparent sheet of horn. In 1656, Huyghens recorded the discovery of a similar nebulous body in Orion, which had been discovered without the use of a telescope by Cysat in 1619. In 1714, Halley gave an account of 6 nebulæ. In 1733, Durham contributed to the *Philosophical Transactions* a list of 22 nebulæ, 16 of which had been observed by Hevelius. In 1755, La Caille communicated to the Paris Academy of Sciences a catalogue of 42 nebulæ discovered by him at the Cape of Good Hope. These had been found by La Caille in the course of his observations of fixed stars. The important memoir of Le Gentil was published in the *Mem. Paris Acad.*, 1759; Schröter's observations in 1779. The largest general collection of nebulæ previous to the time of Sir William Herschel was that published by Messier, whose first catalogue (published in 1771) contained 45 nebulæ and clusters; while his second and third catalogues, published respectively in the *Conn. des Temps* for 1783 and 1784, contained 103. Sir William Herschel (b. 1738, d. 1822) having in 1781, with a seven-foot reflector of his own construction, discovered the planet Uranus, which he named Georgium Sidus, after his patron, George III., king of England, received from the latter both homestead and pension and other needed assistance, and was able subsequently to construct telescopes of twenty and forty feet focal length, having reflectors of from twenty to forty-eight inches diameter. By means of these telescopes he discovered several thousand new nebulæ and clusters, the places of which, with appropriate descriptions, were communicated by him to the Royal Society of London in successive memoirs—the first in 1786, 1000 new nebulæ and clusters; the second in 1789, a second 1000 additional nebulæ and clusters; and the third in 1802, a third catalogue of 500 of these bodies. The next great work by way of observation of the nebulæ is due to Sir John F. W. Herschel, son of Sir William (b. 1792, d. 1871), who in 1825 to 1830, with a twenty-foot reflector, revised a portion of the work of his father in the northern hemisphere, compiling a catalogue of 2306 nebulæ, of which 500 were new. He then transported his telescope and other apparatus in 1833 to the Cape of Good Hope, and devoted the years 1834 to 1838 inclusive to a "telescopic survey of the whole surface of the heavens." Of the seven portions into which this great work was divided, the first, on the nebulæ of the southern heavens, contained a catalogue of 2049 nebulæ, of which about 500 were new. Some of the nebulæ in the southern hemisphere observed by Sir John Herschel had also been catalogued by Dunlop, who in 1828 had presented to the Royal Society a catalogue (full of errors, however) of 629 nebulæ and clusters observed at Paramatta.

Equally brilliant have been the labors of William Parsons, earl of Rosse (b. 1800, d. 1867), who applied reflecting telescopes of three and six feet diameter and thirty and fifty-three feet focal length to the study of the nebulæ, and whose labors have been directed rather to the minute study of interesting objects than to the discovery of new ones. Besides several earlier smaller papers, he communicated in the *Philosophical Transactions* for 1844 and 1850 the results of his examinations of several of the nebulæ observed by Sir John Herschel, and in this paper, among other interesting phenomena, announced the existence of spiral nebulæ. Further observations were published by him in 1860 and 1861. The astronomical labors of the earl of Rosse have been worthily continued by his eldest son, the present earl. Equally effective have been the labors of Lassell, who by the establishment of a magnificent reflector of four feet aperture at Malta contributed greatly to this branch of astronomy. The *Memoirs of the Royal Astronomical Society*, vols. xxiii., xxxvi., contain his work on this subject, as well as that of his assistant Mr. Marth, who discovered about 600 new nebulæ. The great reflectors at Melbourne, Australia, and at Paris and Toulouse, France, are also devoted to the nebulæ.

While the British observers of nebulæ have preferred the use of large reflectors, those of other nations have been slow to adopt them; the only important observations made by others in which reflectors have been used, at least so far as yet published, are contained in the memoir of E. P. Mason of New Haven, Conn., printed in the 7th volume of the *Transactions of the American Philosophical Society.*

Extensive works have, on the other hand, been undertaken by continental and American astronomers with refracting telescopes. The interest in these subjects is more especially shown by the accurate observations of Schönfeld at Mannheim (1857 and 1875), D'Arrest at Leipsic (1855–61), and subsequently at Copenhagen (1861–75), Vogel at Leipsic (1867 and 1876), Auwers at Königsberg (1862), Laugier at Paris (1853), and Schultz at Upsala (1874). All of these have extended their observations to the most exact determination of the positions of a greater or less number of nebulæ, in hopes thereby to lay a foundation for our knowledge of the movements of these bodies with reference to the fixed stars. Besides the discovery of new nebulæ, admirable monographs of special nebulæ have been published by G. P. and W. C. Bond at Harvard College, Otto Struve at Pulkova, Liapounoff at Kazan, Mason at New Haven, and Holden at Washington, as well as Sir John Herschel, Lord Rosse, Lassell, Abbott, and others before mentioned.

FIG. 1.

The Nebula in Orion (*G. P. Bond*).

The most comprehensive list of nebulæ and clusters that has as yet been published is the General Catalogue of Sir John Herschel in the *Philosophical Transactions* of 1864, in which work he has combined in one catalogue all the observed positions of nebulæ accessible to him in 1863, to the number of 5079, which by a comprehensive system of references and synonyms enables one to recognize by whom a given nebula was first observed, and what is its general appearance. Since the publication of this catalogue the following, among others, have appeared: D'Arrest, *Siderum Nebulosorum* (Copenhagen, 1867); Schultz's *Micrometrical Observations of 500 Nebulæ* (Upsala, 1874); Vogel, *Beobachtungen* (Leipsic, 1867 and 1876), and others by Stephan of Marseilles, Borelly. To the preceding list of those who have detected or have carefully observed the positions of nebulæ should be added, especially now, the name of Huggins, who by applying (in 1864) spectrum analysis to these bodies opened a new field of investigation; some results of the labors of Huggins, D'Arrest, Secchi, Bredichin, and others in this field will be mentioned in the following portion of this article. Rutherfurd of New York since 1860 has successfully photographed a number of clusters of stars, and thus approached the more difficult problem of the nebulæ.

If we pass now from a chronological statement of the works of astronomers relative to the discovery of nebulæ to a systematic arrangement of some portions of our knowledge of these bodies, we have at once to remark that our knowledge of them is in great part a statement merely of apparent forms and superficial features, and our classification of them has been as arbitrary as the classifications which the earlier naturalists imposed upon the animal

kingdom, and has been at times as much affected as those by arbitrary hypotheses and theories. In 1755, La Caille subdivided the nebulæ known to him into three distinct classes, which may be described as—first, the irresolvable; second, the resolvable; and third, nebulous stars. The term "resolvable" is applied to a nebula whose light can, by using sufficiently powerful telescopes, be seen to be actually resolved into a mass of bright points or stars. By "nebulous star" is understood a bright star or point surrounded by haze. These latter objects were supposed by La Caille to be accidental associations of nebulæ and stars, the latter being apparently between the observer and the more distant nebulæ.

The extensive catalogues of Sir William Herschel were accompanied by systematic and detailed descriptions of the nebulæ embraced therein, which were separated by him into classes and species, pretty much as follows: first, clusters of stars, subdivided into globular and irregular clusters; second, resolvable nebulæ, or such as may be expected to be resolved into distinct stars by some increase in the optical power of the telescope; third, nebulæ properly so called, in which there is no appearance whatever of stars; fourth, planetary nebulæ; fifth, stellar nebulæ; and sixth, nebulous stars. In this classification it will be noticed that the passage from clusters of stars to nebulæ is by insensible gradations

Fig. 2.

The Spiral Nebula 51 M Canum Venaticorum (*Earl of Rosse*).

from one to the other. This classification, so far as it was based upon the observations of Sir William Herschel and the knowledge available fifty years ago, was one of convenience rather than one based upon any law of nature (except so far as we adopt Herschel's views of the construction of the universe), since what seems a nebula or a cluster to an observer on the earth might easily become, inversely, a cluster or a nebula to an observer on some distant star. Herschel's classification of both nebulæ and clusters into orders, defined by their actual shapes, is one more philosophical and equally instructive. Thus, we have first, circular; second, elliptic; third, annular; fourth, long or ray-like; fifth, spiral; and sixth, very irregular nebulæ.

Again, if we classify them according to the number of nuclei, we have those of a single nucleus, including the nebulous stars or planetary nebulæ; those of two nuclei, including many elliptic and very much extended nebulæ; third, a few tri-nuclear; fourth, those having many nuclei, including in the latter most of the very irregular nebulæ, such, for instance, as the great nebula in Orion.

Another equally suggestive classification has regard to the distribution of light over the apparent disk of the nebula; in respect to this, we find, first, the perfectly uniform, under which we include in strictness only a few mostly so-called planetary nebulæ; second, those which exhibit a decided increase of brightness toward the centre, in which class would be enumerated the stellar nebulæ and the nebulous stars, together with numerous clusters and irregular nebulæ; third, those in which an increase of brightness takes place as we proceed from the centre outward, under which must be included the annular nebulæ and some of the more complicated forms, as, for instance, the double annulus in Toucani.

If, again, we study the relation of the nebulæ to the stars about them, we find that while the majority of these bodies appear to be indiscriminately distributed among the stars in their neighborhood, there is yet a large number of cases in which nebulæ are located in regions of comparatively few stars, and other cases in which the reverse takes place, the nebulous matter being apparently at the centre of a region in which the stars are especially numerous: the great improbability of the accidental origin of such collocations of stars and nebulæ shows that these bodies must be intimately associated together.

Again, within an irregular nebula it is found with equal frequency either that on the one hand the stars in the midst of the nebulous light seem to be surrounded by a region of little or no nebulosity, or on the other that they are centres of specially bright nebulosity—appearances which, though they may be partially, cannot be wholly, due to the effects of contrast. The classification of nebulæ according to their apparent brightness and according to their apparent size has an important bearing on the question of their actual distribution in space, notwithstanding our ignorance of their real dimensions and nature; and it is sufficient to say that while six or eight of the brightest are barely visible to the naked eye, a large majority (those which are designated as very faint nebulæ) are difficult objects with powerful telescopes. Argelander in his *Durchmusterung des nördlichen Himmels* enumerates only 64 nebulæ as visible in a telescope of three inches aperture and capable of showing stars of the tenth magnitude. As regards their apparent size, it is sufficient to add that the smallest subtend angles of from three to ten seconds in their respective dimensions, while the larger nebulæ extend over areas of one or more square degrees; in certain portions of the heavens nebulous streaks seem in powerful telescopes to connect together those nebulæ which as seen in smaller telescopes appear to be isolated. Evidences are at hand of slight variations in brightness, size, and form of a few nebulæ. The frequent occurrence of double nebulæ suggests the classification of these objects in this regard, and we find in the General Catalogue of Sir John Herschel, above mentioned, out of 5079 objects, of which 4050 are unresolved or true nebulæ, 229 double nebulæ, 49 triple, 30 quadruple, and 11 more or less complex multiple nebulæ. D'Arrest remarks that among nebulæ the double and probably binary nebulæ occur more frequently than do similar stellar combinations in comparison with the total number of fixed stars.

There remains an important class of observations by means of which we may be led to another system of classification—viz., that afforded by the application of spectrum analysis to these bodies. This difficult branch of observational astronomy we owe to William Huggins of London, who in Aug., 1864, first turned his delicate spectroscope and moderately powerful refracting telescope upon the planetary nebulæ. Secchi, D'Arrest, and, to a less extent, a few others, but especially Bredichin of Moscow and the younger (or Lieutenant) John Herschel, have also contributed to our knowledge of this subject. It is apparent from the observations of these spectroscopists that among the nebulæ we find some whose spectra have the characteristics belonging to the spectra of gases, and this almost entirely irrespective of the apparent resolvability or stellar nature of the nebulous mass. Other nebulæ have the equally characteristic spectra peculiar to glowing solids. In a third and numerous class of nebulæ we place all those whose spectra combine the characteristics of both the preceding classes. The relative motions of the earth and some nebulæ are also indicated by Huggins's later observations.

Fig. 3.

The Annular Nebula 57 M Lyræ (*Earl of Rosse*).

Our study of the nebulæ need not, however, be confined to the simple consideration of the merely superficial results of observation, but our knowledge of these bodies has been considerably advanced by the more careful processes of reasoning. Thus, the consideration of the imperceptible gradation that exists as we pass from the faintest, most diffuse, and most irregular, by insensible gradations, down to the well-defined, brightest, and smallest of the planetary nebulæ, led Sir William Herschel to imagine, most naturally, that the fixed stars, our sun, and the planets of our solar system were but the results of the systematic operations of evolution by means of which inhabitable worlds endowed with warmth, light, and life were brought forth

out of primitive and gaseous matter; and, however much of hypothesis may be inherent in such a system as this, or however little ground there may have been for belief in the nebular hypothesis as first advanced by Herschel, and subsequently elaborated by Laplace, there would seem at the present day to be no reason to reject all of its propositions.

One of the most suggestive of the methods of study (applied to the stars and nebulæ in a somewhat fanciful manner by Swedenborg, Wright, Kant, Lambert, Mitchel, Boscovich, and others, but more philosophically by Sir William Herschel, John Herschel, Struve, and others) consists in the analysis of the laws according to which the nebulæ appear to be distributed over the celestial vault. From this distribution Herschel, like Lambert, Kant, etc., attempted to form some idea as to their actual distribution in space, and to supplement the earlier speculations by reliable observations and rational philosophy. On this point his conclusions seem to have been in part, if not wholly, modified during his own lifetime, and at present, instead of defending the idea held by him originally, that certain classes of nebulæ are external to the stellar system, while others form part thereof, it seems to the present writer more proper to conclude that throughout infinite space both stars and clusters and gaseous nebulæ are intermingled with each other; not necessarily in equal proportions, nor even indiscriminately, but yet so thoroughly that it is improper to describe the universe, as is frequently done, as a collection of nebulæ, of which the Milky Way is one, and which are themselves composed either on the one hand of gaseous matter, or on the other hand of stars, of which our sun is one. The fancy which makes our sun revolve about some distant star, and these both revolve, with all the members of the Milky Way, around some common centre, while the Milky Way as a whole revolves with other nebulæ around the centre of the universe, must be looked upon as a poetical conception that finds no base in philosophy and no realization in nature.

The main features of the apparent distribution of the nebulæ were made known by the Herschels. The consideration of this subject is at present made comparatively an easy matter by the publication of Sir John Herschel's General Catalogue of Nebulæ; and, based thereon, the present writer, as well as Mr. Richard A. Proctor, has ventured some speculations. (See *The Monthly Notices of the Royal Astronomical Society*, 1867–75. See also Prof. Stephen Alexander in Gould's *Astr. Journ.*, vol. ii., 1852.) In respect to all such views, it is not unfair to say that it has as yet been

Fig. 4.

The Great Nebula in Andromeda (*G. P. Bond*).

given to no one to do more than to suggest hypotheses and suspicions concerning the organization of the universe of stars, clusters, and nebulæ, nor can much progress be expected until we know with certainty something concerning the relative distances of some of these bodies. The determination of nebular parallax has been attempted by D'Arrest. C. Abbe.

Neb'ular Hypoth'esis, an hypothesis proposed by Swedenborg (1734), whom Buffon (1749) closely followed, and by Kant and Wright, but elaborated by Laplace and William Herschel, and modified by later writers, according to which the present state of the universe is explained as the result of a process of gradual condensation and evolution from a primordial chaotic gaseous matter. Laplace, in the earliest editions of his *Système du Monde*, conceived that an atmosphere might originally have surrounded the sun extending to beyond the limits of the solar system; that it contracted with the loss of heat by radiation, and threw off in its rotation about a central axis certain rings of matter, which subsequently broke up into the planets and their satellites. He did not suppose that this primordial gas still existed, but that the nebulæ were aggregations of stars. Herschel, who in 1794 at first also supposed the nebulæ to be composed of stars, finally in 1811 and 1814 read before the Royal Society two memoirs in which he advanced the conclusion, based on his studies among the nebulæ, that some, and especially the irregular nebulæ, must be in part at least composed of nebulous matter, a remnant of an original vapor or gas, and that from this primordial matter there were by a process of condensation still being formed irregular nebulæ, nebulous stars, stars, etc. etc. in the order here given. These two theories being thus complementary of each other, Laplace, in subsequent editions of his *Système du Monde*, adopted Herschel's primordial nebulous matter and its actual present existence, and extended his own theory so as to include a cosmogony of the entire universe.

These views, advocated by Humboldt, Arago, and others, have been generally tacitly assumed to afford the most plausible philosophical view of the subject at present known; and within the past sixty years the beautiful experiments devised by Plateau; the discovery of the ring of asteroids; the observations of the zodiacal light; the demonstration by means of the spectroscope that certain nebulæ (not, however, those predicted by Herschel) have some of the characteristics of gases; and some other phenomena,—have, it is claimed, given additional support to slightly-modified forms of this theory.

Some of the objections to the nebular hypothesis are, however, very grave, and in the present state of our knowledge we are forced to decline to accept certain details as propounded by Herschel and Laplace, either substituting therefor ideas derived from the meteoric and cometic theories of Schiaparelli, etc., or from the molecular theories of Clausius, etc., or in other points acknowledging our complete ignorance.

Of recent general writers upon this subject we refer especially to Herbert Spencer (*Westminster Review*, 1858) and R. A. Proctor. The dynamic principles involved in the formation and preservation or disruption of revolving rings have been treated of by Maxwell, Peirce, and Hirn in memoirs on Saturn's rings, and especially in some remarkable memoirs on *Vortex Rings* by Helmholtz and Thomson, and on *Molecular Vortices* by Rankine, which latter works have a direct bearing on this subject, although perhaps not so intended by their authors. C. Abbe.

Nece'dah, post-v. and tp. of Juneau co., Wis., on Yellow River, 10 miles from Germantown on the Wisconsin River. Pop. 944; of tp. 1180.

Neces'sity [Lat. *necessitas*], **Doctrine of,** treats of the essential relation which a being has towards another. It has importance theologically, morally, and scientifically. On it hinge the questions of God, freedom, and immortality, their solutions being determined affirmatively or negatively according to the type of necessity which is assumed as predominant in the universe. Three kinds or species of necessity may be enumerated as including the manifold distinctions under this head: (*a*) *Physical or causal necessity*, whereby a somewhat is subject to external constraint, determined to be what it is by another outside it. This necessity is founded on causation, and is known also under such designations as "fate" (εἱμαρμένη of the Stoics), "destiny" (*necessitas consequentis* of the Schoolmen), "natural selection" (of the Darwinians and ancient Epicureans and atomists); such epithets as "material," "natural," "blind," "brute" (necessity) are given to it. (*b*) *Logical or substantial necessity*, called also "ideal" or "formal," "absolute," "metaphysical or mathematical" (Leibnitz), *necessitas consequentiæ* (Schoolmen), is variously defined as "that which cannot but be in the nature of things;" "connection between parts of mental or verbal propositions;" "that the opposite of which implies contradiction." This form of necessity is founded on substantiality, "the connection of existence and essence," and is first a subjective necessity, the opposite of which is inconceivable, and, secondly, the condition also of objective reality. It is exemplified in "necessary truths" or "necessary ideas," the contrary of which cannot be conceived. (*c*) *Moral or teleological necessity* is defined as "connection of end and means," "moral obligation or conscience," "that of mo-

tives," "that of rational determination or freedom." It is called in its various phases "categorical imperative" (Kant), "hypothetical necessity" (applied by Leibnitz to the divine predetermination), "overruling Providence" (πρόνοια of the Stoics). It is founded on Final Cause, and embraces phases of manifestation within the consciousness of man, as well as those based upon the divine will; hence the wide differences in the above definitions and epithets. Logical necessity, as the distinctive characteristic of *a priori* truth, was first enunciated by Leibnitz (*Nouveaux Essais*), and afterwards made the basis of the critical system by Kant. In his *Critic of Pure Reason* Kant places the category of Necessity after those of Possibility and Reality, as forming their identity. A reality which has unrealized possibilities is contingent (this is Kant's thought), while a reality that has realized all of its possibilities is a necessary being, and cannot be otherwise, having no other possibilities. They who set up physical or material necessity as the highest principle, if consistent, make God to be a blind force, mind to be an emanation from matter, and deny freedom and immortality. They who make moral or teleological necessity the first principle hold God to be personal, and interpret nature and history as stages in the realization of free, personal beings. Logical necessity is held to be identical with God's moral necessity by some. Psychologically, the perception of necessity marks the entrance into the stage of reflection. Sense-perception perceives no necessity; to it all is contingent. Each individual is to it independent and valid by itself. Without transcending experience one cannot perceive necessity (although this is denied by Occam, the great nominalist). Reflection throughout all its stages is dominated by the idea of necessity. Each thing is dependent upon others—upon all others. In this principle are contained antinomies or unavoidable contradictions which it is the object of philosophy to solve. The process of their evolution and solution is called *dialectic*. By it the subsidiary character of physical necessity may be shown. It proves to be only a phase in the process of moral or teleological necessity, which is free-will. The following is an outline of the dialectic statement of the attitudes successively assumed by consciousness towards necessity: (*a*) All things are necessitated; each is necessitated by the totality of conditions; hence whatever is, must be as it is, and under the conditions cannot be otherwise. (This is the standpoint of complete fatalism; its incompleteness and inadequateness is seen when applied to explain change.) (*b*) But things change—something new begins and something old ceases; according to the principle of necessity, the new must be necessitated by the totality of conditions, just as the old was. If the same totality of conditions necessitates both states (the new and the old), it follows that it is adapted to both, and hence indifferent to them; it allows one to pass into the other, and therefore does not absolutely condition or constrain either. Hence, there must be two totalities of conditions, or indeed a new one for every change in the world, for the totality of conditions includes the reality of each thing, and therefore changes whenever anything changes. (*c*) Since every change involves change in the totality of conditions according to the principle of necessity, and inasmuch as all external necessity is included within the totality of conditions, it follows that this totality is its own internal necessity, moves or changes itself, originates its own action, is *causa sui*, spontaneity, freedom. The presupposition lying behind any form of physical necessity is therefore self-determination, which is discovered to be moral necessity (divine or in God) when carefully considered. WILLIAM T. HARRIS.

Ne′cho, in the Bible called **Pharaoh Necho** and in the hieroglyphics **Neku,** king of Egypt, belonged, according to Herodotus, to the twenty-sixth dynasty, a son and successor of Psammetichus I., and reigned, according to Rawlinson, from 610 to 594 B. C. He defeated Josiah, king of Judah, and penetrated into Babylon, but was afterwards routed by Nebuchadnezzar, and lost all his conquests. A canal connecting the Nile with the Arabian Gulf was commenced by him, and by his aid the Phœnicians undertook a circumnavigation of Africa.

Neck, tp. of Dorchester co., Md., a peninsula between the Choptank and Little Choptank rivers. Pop. 1280.

Neck′ar, a river of Germany, rises in the Schwarzwald Mountains, on the frontier of Würtemberg and Baden, flows with a tortuous course of 210 miles through a beautiful tract of land between low, vineclad hills, and joins the Rhine at Mannheim. It receives from the left the Eng, and from the right the Jaxt, but it is shallow and difficult of navigation.

Neck′er (JACQUES), b. at Geneva Sept. 30, 1732; went in 1750 to Paris as a clerk in a banking-house; established afterwards a business of his own, and accumulated a great fortune during the Seven Years' war. In 1764 he retired from business, but continued to reside in Paris as the diplomatic representative of his native city, and acquired great authority in financial matters by his *Éloge* on Colbert and *Essai sur la Législation et le Commerce des Grains*. After the removal of Turgot in 1776 and the short administration of Clugny, Necker was appointed director-general of the finances in 1777, and the results of this appointment were both immediate and brilliant. Confidence was restored among capitalists, order was established in the administration, and economical reforms were introduced. These reforms, however, by which the expenses of the court were curtailed, in connection with a certain conceitedness and vanity in his personal bearing, made him much hated among the courtiers, and after the publication of his *Compte Rendu au Roi sur les Finances de l'État* in 1781 he was suddenly dismissed. He returned to Geneva, and bought Coppet, an estate in its vicinity, where he resided for several years, and whence he published in 1784 his *Administration des Finances*. Meanwhile, the administration of Fleury, Calonne, and Loménie de Brienne had brought financial matters in France to a crisis, and on Aug. 25, 1788, Necker was recalled and made comptroller-general and minister of state. His popularity was at this moment immense, and when the king once more dismissed him, on July 11, 1789, because he declined to participate in a royal measure by which the constitution of the third estate as a national assembly was to be annihilated, Paris rose in insurrection, and he returned to his office in triumph after an absence of eighteen days. He was, however, a good banker rather than a great financier, and as a statesman he was wholly unequal to the task set before him. In the National Assembly he was completely outshone, not only in political but even in financial questions, by Mirabeau and others, and when he resigned (Sept. 4, 1790) he had entirely lost not only his popularity as a hero of freedom, but also the respect he enjoyed as a financial authority. He lived afterwards at Coppet, half forgotten by the world, and d. there Apr. 9, 1804. His *Œuvres Complètes* were published in 17 vols. at Paris in 1822.

Neckere, de (LEO R.), D. D., b. in Belgium June 6, 1800; became a Roman Catholic priest of the Vincentian congregation; was in 1830 consecrated bishop of New Orleans. D. Sept. 4, 1833.

Necromancy. See MAGIC.

Necro′sis [Gr. νέκρωσις, a "killing"], the death of a large piece of bone or of a whole bone in the living subject, as distinguished from *caries*, the ulceration or molecular death of bone. Necrosis may result from injury, from periostitis, from phosphorus-poisoning, and from syphilis. It may be superficial, central, or total. Necrosis almost always calls for surgical interference for its complete cure. The dead bone finally separates as a *sequestrum* from the living bone, and until it is quite detached it is worse than useless to attempt to operate. The sequestrum is usually enclosed in a case of new bone, which must be cut through before the removal can take place. If the patient be young and otherwise healthy, the removal of the sequestrum is usually followed by recovery. In all cases a generous diet, with appropriate tonic treatment, is called for.

Nec′tarine [Old Fr. *nectarin*], a tree and its fruit, differing from the peach, from which it is undoubtedly derived, mainly in having a smooth skin instead of a downy one. In some instances nectarines have smooth stones, thus approaching still nearer the apricot than the peach. There are numerous sub-varieties, of which some three-fourths are freestones, the remainder being clingstones. The nectarine is a delicious fruit (in its best varieties), but more delicate than the peach, and much exposed to the attacks of the curculio.

Ned′jed, an Arabian word signifying "table-land" or "elevated land," is by Arabian writers used in connection with other names, as the Nedjed of Yemen or the Nedjed of Oman, but is by European writers generally applied only to the large table-land of the Arabian peninsula belonging to the WAHABEES (which see).

Need′ham, post-v. and tp. of Norfolk co., Mass., 11 miles W. of Boston, on the Woonsocket division of the New York and New England R. R., has 6 churches, 17 public schools, glue, hosiery, and paper factories, a savings bank, 1 newspaper, and the Wellesley Female College. Pop. 3607.
G. W. SOUTHWORTH, ED. "NEEDHAM CHRONICLE."

Nee′dle [Gothic, *nethla*; Ang.-Sax., *nædl*; Icelandic, *nál*, from the Sanskrit *nah*, *naddha*, to "bind," whence the Latin *neo* and *nexus*, and Old Ger. *nahan*, to "sew"], in its common acceptation, a small instrument of wire pointed at one end and pierced at the other so as to receive a thread.

The needle, being required for fashioning even the rudest garment, must of necessity be contemporary if not with the first clothed man, at least with the first who strove to shape clothing to his figure. In its earliest form it was doubtless a strong thorn or a sharp splinter of bone, wood, or stone, with which the skins intended to be joined were perforated along their edges, these being afterwards laced together by hand. The next step was to make an eye in the splinter, so that one operation should pierce the material and carry the thread through it; and by degrees needles came to be smoothed and finished with much neatness, as is shown by some excellent pre-historic specimens made of horse's bone which were found in a cave near Bruniquel, France, and are preserved in the British Museum. Many bronze needles have been found, varying in length from one to eight inches, the longest having probably been used for hair-pins; those discovered in Egyptian tombs are invariably coarse, though Wilkinson (*Ancient Egyptians*, iii., 384) assures us that finer kinds must have existed.

All through the Middle Ages needles must have been made, and of no coarse quality, judging by the delicate embroidery handed down to us. We read of their manufacture at Nuremberg during the fourteenth century. It was introduced into England under Queen Elizabeth, and the manufacture seems to have flourished, for about 1597 the "Pinners and Needlers" petitioned against the importation of foreign pins and needles. The English needle manufacture is now carried on chiefly at Redditch (Worcestershire) and the neighboring villages, where over 10,000 persons are employed, and where the weekly production of needles amounted to 70,000,000 in 1865, since which time it has considerably increased. The best foreign needles are made at Aix-la-Chapelle, but they do not rival those of English manufacture.

The needle-manufacturer buys his wire in large bundles, each consisting of several coils. The coils are placed on a conical reel, whence they are wound off upon a wheel of eight spokes, so constructed that the wire can, when wound, be easily removed. The large coil thus formed is cut by strong shears, usually worked by machinery, first into two half circles, then into lengths, each of which is a little longer than two needles of the size proposed. A workman can cut 400,000 such lengths, making 800,000 needles, in a day of ten hours. The cut wires, technically called *blanks*, having been taken from a round coil, are slightly bent; the next process, therefore, is to straighten them. About 5000 or 6000 are enclosed in two strong iron rings (Fig. 1), then heated red in a furnace, and allowed to cool gradually. When cool they are removed to an iron plate and rubbed backward and forward with an instrument called a *smooth file*, consisting either of one broad curved bar which is introduced between the two rings or of three narrow bars joined at the ends, into the intervals of which the rings fit. (Fig. 2.) The smooth file is sometimes worked by machinery, in which case the operation of straightening is much facilitated.

FIG. 1.

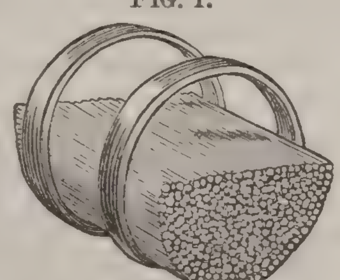
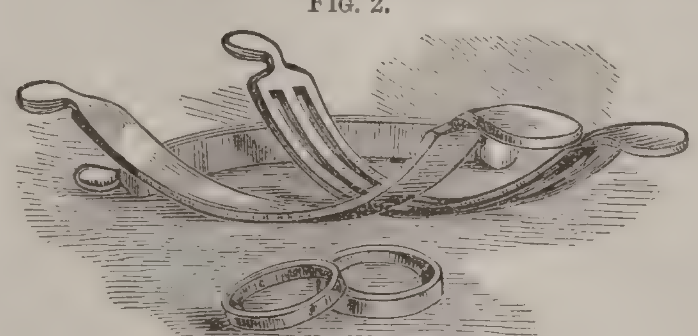


FIG. 2.



The blanks are next pointed on small gritstones, of which there are usually about thirty in a grinding-room, placed in two rows and worked by a water-wheel or by steam. A grinder, seated before his rapidly-revolving stone, takes fifty or sixty wires between his thumb and forefinger, and with his thumb, which is protected by a leather shield, presses them against the stone, at the same time causing them to rotate, so as to produce on each a conical point. The wires being pointed at one end, he turns the other and repeats the process. The double-pointed blanks are next flattened in the centre and marked with eye-cavities. A bed of iron supported on a heavy wooden block, which in its turn rests upon one of stone or brick, contains the lower half of a die, the upper half being fixed to a hammer of twelve pounds' weight, movable by a lever. The "stamper," having raised the hammer by means of a treadle communicating with it, lays one blank at a time upon the iron bed, pushing it against a metal guide, so that the centre of the blank comes exactly to the lower half die; he then lets the hammer fall quickly, and the two raised faces of the die produce two opposite indentations on each side of the wire, at the same time flattening out a portion of its substance. Some needles are formed with a gutter below the eye, in which case a different die is used. *Eyeing* is done with a small hand-press, the arm of which is attached to a lever and furnished with two steel piercers or "cutters." A boy takes a number of needles and places them one by one in a notch formed in a small iron slab directly under the cutters; holding his head close to his work, he brings the arm down rapidly, and two eyes are punched out; he then raises the arm and shifts the wires so as to bring another under the press. (Fig. 3.) The needles are now strung or "spitted" upon two fine wires (Fig. 4), the "burrs" or projections caused by stamping are filed off, and the double needles are divided between the eyes by being gently bent to and fro. Each row, still strung on its wire, is grasped by the points in a sort of vise (Fig. 5), and the heads are laid upon a raised plate of metal and filed into shape. Having been much bent by the above processes, the needles are next given to the "soft-straightener," generally a female, who rolls them backward and forward on a plate of steel with the convex face of a smooth steel file; a few turns render them quite straight. Now begin the finishing processes, called "bright work." The needles are heated red in a furnace, then cooled suddenly in water or oil, and so rendered excessively brittle. They are next tempered by exposure to slow heat, during which they are stirred about with a shovel until a blue oxide forms on them, when they are removed and allowed to cool gradually. Each one is next examined by being rolled with the finger on a smooth steel slab, and any that do not roll truly are "hard-straightened" by hammering on an anvil: this work is generally done by women in their own homes. For cleaning or scouring, about 50,000 or 60,000 needles are made into a bundle in the following manner: Several strings are laid across a long wooden tray open at the sides, and over them is placed a large piece of canvas, upon which the needles are arranged in rows and sprinkled with a mixture of oil, soft soap, and emery-powder. The canvas is then rolled up after the manner of a "roly-poly" pudding and secured by the strings. A workman next coils a length of strong twine closely round the roll, removing the temporary strings, and thus forms a firm bundle (Fig. 6), which is put with others in a kind of mangle (Fig. 7), and rolled backward and forward for at least fifty hours. As such incessant friction wears the canvas, the bundles are withdrawn and unmade every eight hours, and the needles, having been washed in soap and water, are repacked in fresh wrappers, putty-powder being substituted for the soft soap and emery. In some factories the needles are "barrel-scoured;" that is, first washed in a slowly-revolving copper barrel containing soap and water, then dried

FIG. 3.

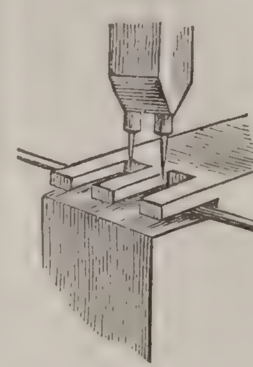


FIG. 4.

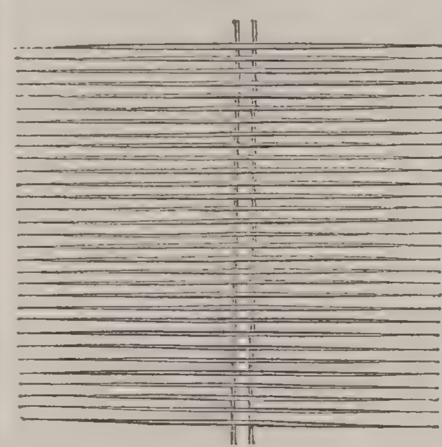


FIG. 5.

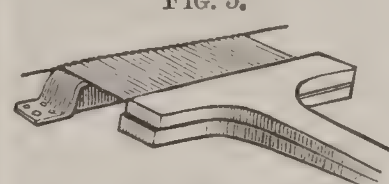


FIG. 6.

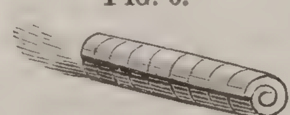
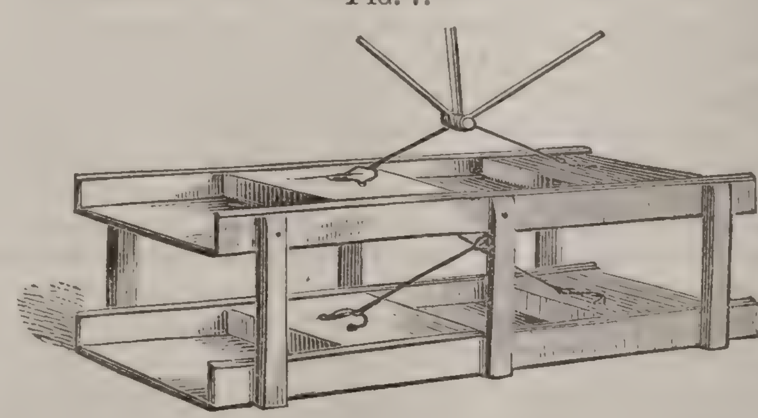


FIG. 7.



in a more rapidly-turning wooden cask half full of sawdust, and finally winnowed by fans. The needles, placed on trays, are now taken to the "bright-shop," where a little girl called the "header" arranges them with their points all one way. Then they are again examined, and broken or defective ones are removed. The eyes are next drilled, for which process they are prepared by annealing. A row of needles are laid on a steel slab, with their eyes projecting over its edge, and a red-hot plate is approached to the eyes until they assume a dark-blue color. The drill, a minute three-sided instrument, attached horizontally to a small quickly-turning wheel, is used by a young woman, who, sitting before it, takes a number of needles and applies it to the eye of each one. The eye is first "countersunk" or bevelled at its lower edge; the drill is then rapidly passed round it, and the needle being deftly turned, the same process is performed on its other side. Drilling is painful work, as there is a constant strain on the sight, and the operator is obliged to maintain a stiff position. The points are now "finished" on a rapidly-revolving honestone, and polished on leather-covered wooden wheels smeared with polishing-paste. The needles are finally counted in quarters of a hundred and made up for sale in numbered packets. Those intended for exportation are packed in air-tight cases.

Many of the needle-making processes are performed at a great saving of time by a machine invented in 1869 by W. Lake. "The wires or 'blanks' for two needles are thrown into a hopper connected with a feeding device, which conveys one blank at a time to the first set of a series of progressive carrying rollers, which take up the blanks in turn and convey them from one to the other. While being so carried the needle-blanks are stamped, the eyes are punched and tested by a 'feeler,' which detects one not properly eyed and stops the mechanism for its removal. The needle is next conveyed to two parallel rotating carrying screws, which conduct it over pointing-grinding rollers that turn the needles while pointing them. They are next carried to a cutter-wheel, which separates the needles, at the same time removing the burr from their heads, and finally they are discharged at the end of the machine." (*Specification of Patent.*) Variations of the ordinary needle are used in sailmaking, bookbinding, glove-sewing, darning, staymaking, etc. JANET TUCKEY.

Needle-Gun [Ger. *Zündnadelgewehr*], a form of breech-loading small-arms designed for military use, and at present the regulation weapon of the German infantry. It is the invention of Nicolaus Dreyse, and is extensively manufactured at Sömmerda, Prussia, his native town. Its efficiency has been demonstrated in all the German wars since 1848. As in the Chassepot, the cartridge is exploded by means of a needle thrust into the detonating mass along the bore of the piece. Though clumsy and complicated, it is a model for precision and rapidity of discharge.

Needles, The, a cluster of rocks on the W. extremity of the Isle of Wight, which take their name from their pyramidal shape. Five in number, they are composed of chalk, dotted with thin strata of flint. The violent wave-action here is constantly changing the form of these rocks, but three of which now rise to any considerable height above the water. The "Needles Light" is situated on the outer part of the farthest of these celebrated rocks, which was previously levelled nearly to the water's edge to receive it.

Neefs (PIETER), b. at Antwerp about 1570; d. in 1651; was a celebrated architectural painter, representing views of the interior of churches and other buildings, sometimes by torchlight or moonlight. The figures in his pictures are generally painted by other masters, sometimes by Breughel and Teniers.

Neele (HENRY), b. in London, England, June 29, 1798; studied law, which he abandoned for literary pursuits; published *Odes and Other Poems* (1817), *Dramatic and Miscellaneous Poetry* (1823), and *Romance of English History* (3 vols., 1827), which were all favorably received and thought to display high genius. In 1826–27 he delivered a course of lectures on the English poets, which, with another volume of tales and miscellanies, were published posthumously as his *Literary Remains* (1830), preceded by a biographical notice, from which it appears that he committed suicide during a fit of insanity Feb. 7, 1828.

Neely (HENRY ADAMS), D. D., b. at Fayetteville, N. Y., in May, 1830; graduated at Hobart College 1849; was tutor there until 1851; ordained in the Protestant Episcopal Church 1852; became rector of Calvary church, Utica, and of Christ church, Rochester, 1855–62; minister of Trinity chapel 1862, and was consecrated bishop of Maine Jan. 25, 1867.

Neely (PHILIP P.), D. D., b. in Tennessee Sept. 9, 1819; d. in Mobile, Ala., Nov. 9, 1868; joined the Tennessee M. E. conference in 1837; was a man of commanding presence and an eloquent preacher; his style was ornate and gorgeous; did much to promote the interests of education, having had charge of the Columbia Female College and acting as agent for Transylvania University; was a member of the Mobile conference at his death. A volume of his sermons has been published. T. O. SUMMERS.

Nee'nah, post-v. and tp. of Winnebago co., Wis., on the Chicago and North-western, the Milwaukee Northern, and the Wisconsin Central R. R., has abundant water-power, a handsome park, and stores. It is a great summer resort for tourists. Pop. of v. 2655; of tp. 3123.
G. A. CUNNINGHAM, ED. "NEENAH GAZETTE."

Neer, van der (AART), b. at Amsterdam in 1613 or 1619; d. about 1683; was a celebrated landscape painter. His representations of conflagrations at night, of the slow streams between low banks, peculiar to Holland, moonlight scenes, etc. are excellent.

Nees von Esenbeck (CHRISTIAN GOTTFRIED DANIEL), b. at Reichenberg, Westphalia, Feb. 14, 1776; studied medicine at Jena, and was appointed professor in botany at Erlangen in 1818, and at Breslau in 1830, but was deprived of his office in 1852 on account of his participation in the movements of the laboring classes; and d. Mar. 16, 1858. He treated almost every branch of the science of botany, from analytical descriptions of single plants to philosophical speculation on the vegetable kingdom. The principal of his works are—*Das System der Pilze und Schwamme* (1816), *Systema Laurinarum* (1836), *Agrostologia Brasiliensis* (1829), *Die Entwickelung der Pflanzensubstanz* (1819), *Die Naturphilosophie* (1841).

Ne Exeat Regno, Writ of [Lat., "let him not go out of the kingdom"]. According to the rules of early English law, the king by virtue of his prerogative might issue a writ prohibiting a subject from going abroad without license. It has been thought that this was not a rule of the common law, but that it was established in the reign of Henry II. by the Constitutions of Clarendon. A section of King John's Great Charter allowed subjects to depart from the kingdom at their pleasure. In later charters this provision was not found, and it came to be understood as law that a subject did not possess the right of leaving the realm without the king's license. It followed that if a departure without license was intended by a subject, a writ could be issued requiring security that he would not leave the kingdom until such a license was obtained. This rule has now practically become obsolete, subjects being allowed freely to leave the kingdom except in time of war and public danger.

At the present time the writ of *ne exeat* is used simply as a judicial proceeding in the ordinary administration of justice. It is issued by a court of chancery (or equity) to prevent a party to a suit from withdrawing from the jurisdiction of the court, and thus rendering its decree ineffectual. The substance of the matter is, that the defendant becomes liable to give bail or security that he will not withdraw himself from the power of the court to compel him by its process to abide its order. By its aid, bail is obtained in equitable cases, as it is in courts of law, by an order of arrest. It can only be resorted to for the purpose of enforcing equitable demands, except in the case of alimony and of an action for an account. Alimony in the case of a partial divorce was granted in England by the ecclesiastical court, which had no power of exacting bail. The courts of equity, to prevent a failure of justice in such a case, interfered and aided the plaintiff by means of this writ. In the case of mutual account the court of equity has concurrent jurisdiction with the courts of law, and is thus, having jurisdiction, not debarred from issuing the *ne exeat*, though a court of law also has power over the case. It should be added that the claim must be pecuniary in its nature, and so far mature that present payment or performance can be rightly demanded. The court has power to proceed in this manner on the application of a foreigner as well as of a citizen, or where the question is between two foreigners, even though the debt was contracted abroad. All that is necessary to give the court jurisdiction is the presence of the defendant. Accordingly, if a foreign administrator should bring with him into any state trust funds which he had received abroad, and should be about to depart, he might be arrested and compelled to give security.

The equity courts of the respective States assume the same power over this subject that is exercised by the English courts of chancery, except where their inherent authority has been taken away by statute. It has been claimed by some jurists that in the assimilation of the law and equity modes of procedure by the code of New York, the writ of

ne exeat republicâ has been abrogated by force of express statutory provisions. The better construction would seem to be that it still exists, and can be resorted to in a class of equitable demands not embraced within orders of arrest as usually issued by courts of law. Where this remedy exists it may be granted in the form of an order as well as of a writ. (For details of practice refer to Daniell's *Chancery Practice*, Barbour's do., Wait's do. *in the Courts of Record of the State of New York*.) T. W. DWIGHT.

Negapatam′, or **Nagapatnam,** town of British India, presidency of Madras, situated in lat. 10° 46′ N., on the low shore of the Indian Ocean, has a tolerably good harbor and carries on some trade with Ceylon. Pop. 10,000.

Neg′ative Quan′tity, a quantity taken in a sense opposite to that which we have agreed to call *positive*. The terms *positive* and *negative* are correlative; if we agree to consider a quantity taken in any sense as positive, it will be negative when taken in a contrary sense. Thus, if we agree to call distance estimated to the right *positive*, then will distance estimated to the left be *negative*. (See IMAGINARY.) W. G. PECK.

Negau′nee, post-v. and tp. of Marquette co., Mich., on the Chicago and North-western and the Marquette Houghton and Ontonagon R. Rs., has extensive iron-mines, several churches, 1 newspaper, a bank, and a large mercantile interest. Pop. of v. 2559; of tp. 3254.

C. G. GRIFFEY, ED. "NEGAUNEE IRON HERALD."

Neg′ley (Gen. JAMES S.), b. at East Liberty, Pa., Dec. 22, 1826; educated at Western University; was a private soldier in the Mexican war; raised a brigade of three months' volunteers in eight days, and was commissioned brigadier-general Apr. 19, 1861; served in Alabama and Tennessee with the Army of the Ohio; commanded at the battle of Lavergne, Oct. 7, 1862, in which he defeated Anderson and Forrest; was made major-general for gallantry at Stone River; was engaged in the Georgia campaign; resides at Pittsburg, which city he represented in Congress as a Republican 1869–75.

Neg′ligence [Lat. *negligentia*], in law, is the absence of that care and caution, without any positive intent to do injury, which under the circumstances of the particular case a person either assumes by contract or is bound by a rule of law to take as to the person or property of another. If this want of care results in an injury to another, he may have an action for damages; if it involves a wrong done to society, it may constitute a crime. The full treatment of the subject accordingly requires a reference both to the rules of civil and criminal law.

I. *Negligence considered as an Element in a Civil Action.*—The fact that negligence may arise from a breach of contract, or from an act wholly independent of contract, leads to a possible arrangement of the whole subject into two classes of cases, one of which would be negligence arising out of a contract, and the other tortious or purely wrongful negligence. For some purposes this distinction is important. Thus, an infant, having no general capacity to contract, cannot commit an act of negligence depending upon a contract, which he is not authorized to make; on the other hand, he might be liable for acts of tortious negligence wholly unconnected with a contract. Another distinction is, that where an act of negligence occurs in the performance of a contract, no one, in general, can sue upon it except one who is a party to the contract itself or within its purview, though indirectly sustaining damage; while if the negligent act were purely wrongful, any one injured by it, towards whom it was shown that a duty to exercise care existed, might have a remedy.

The subject of negligence is one of great magnitude and importance, having its application to the performance of contracts and to almost every conceivable social relation. The leading principles can only be stated in this article, and reference made to the subjects of most common occurrence. The course of treatment will be to enumerate some of the principal propositions in this branch of the law, and to make such an exposition and application of them as may seem necessary.

(1) Negligence is not to be confounded with fraud. In the case of negligence there is no bad purpose or intent; there is a want of that care and caution which the law under the circumstances requires. In gross cases negligence may be evidence of fraud, but it is not of itself fraud.

(2) The party charged with an act of negligence must have been under a *duty* to the injured party to exercise care. This duty may have been assumed by contract or may be imposed by law. It is frequently created by statute. Wherever the duty to exercise a certain amount of care exists, and through neglect it is not exercised, a party injured in consequence of the breach of duty has his remedy. On the other hand, there might be the same neglect, and one be injured to whom no duty was owing, in which case no action would lie. Thus, if a person should, without paying his fare and without the knowledge of the conductor of a railway train, and against the company's rules, ride upon the train, and a collision should occur through the neglect of the servants of the company, and such person should receive an injury, he would have no action against the company, as there would be no duty to exercise care toward him, as under the circumstances of the case the relation of carrier and passenger would not exist. Assuming that a duty exists, a person from whom it is owing is not allowed to shift off responsibility by delegating its performance to servants or agents. In the event of his employing them he is bound to see that his own obligation is properly discharged. Nor could he be discharged by employing contractors, unless they fulfilled the measure of his duty. Thus, a city bound to repair its streets will be responsible for the acts of its contractors, though in some instances (see MASTER AND SERVANT) an employer is not liable for the acts of a contractor.

(3) An injury occasioned to a person by an act purely accidental on the part of another who was at the time exercising due care is not actionable. Nor is it always so, though there may have been *some* want of care or neglect. There must be that want of care which under the circumstances the law regards as culpable. There is much nicety to be observed in considering in any particular case the question whether there has been culpable neglect. This will depend upon all the facts in the case. Such elements as these must be taken into account: Whether the nature of the act manifestly required much circumspection in its exercise. Thus, the care of a diamond would necessarily be greater than that of a wooden box; the caution to be observed in the transportation of passengers would be increased according to the danger which there might be of possible injury to life or limb. So the surroundings of the parties must be considered; the same article when exposed to loss by theft must be more closely guarded in a city than in the country. In a similar way, as the modes of ensuring safety in railway passenger business become more efficient, it may be negligence not to make use of them after they have generally come into use. The rule in all such cases is that the same care should be taken as a man of ordinary prudence—and in some cases of extraordinary caution—would take, under the same circumstances, in the management of his own affairs.

There has been much question whether the matter of care is not susceptible of precise and arbitrary division in the following manner: slight, ordinary, and great. On this basis, great care is such as is usually exercised under the particular circumstances by men of unusually careful and prudent habits as to their own interests; ordinary care is that which is used under the same circumstances by the majority of the community; and slight care that which is exercised by men of common sense, but careless habits. The absence of these degrees of care would respectively constitute slight, ordinary, and gross negligence. It has been objected to this classification that though it may be philosophically correct, it furnishes no clear and definite rule in the practical administration of justice—that the distinctions are subtle and perplexing, and cannot be explained to the comprehension of an ordinary jury. It is, however, undoubtedly true in some cases that the utmost diligence must be used, while in others this extreme severity is relaxed. For instance, a borrower of a valuable book is justly held to a higher degree of care than if the same article were received by him as a mere depositary at the solicitation of the owner. Still, the depositary must take some care, and not be guilty of extreme negligence. A judge, after stating these and similar distinctions to a jury, may properly ask them if the defendant has taken that care which under all the circumstances men of prudence and caution would take in the conduct of their own affairs. It would not be proper, even where the lowest degree of diligence is to be exercised, to ask them whether the party charged with negligence had taken the same care as he did of his own, but always to refer the standard to that of some class in the community, such as men of average prudence.

(4) The act of negligence complained of must be the proximate cause of the injury sustained. It is not, however, necessary that it should be the sole cause. It frequently happens that the injury would not have happened except from concurring acts, one of which is negligent and the other accidental, or both are negligent. In such a case the inquiry is as to the true cause of the loss, and one or both actors in the result will be liable or not liable as the case may show unavoidable accident or negligence. There has been an important question as to whether this principle would be varied by a fiction of the identification of the injured party, though personally free from fault, with one in whose custody or care he was, and who was himself negligent. Thus, if at a railroad crossing of different lines there

should be a collision occasioned by mutual neglect of the managers of the respective trains, and a passenger upon one of them should be injured, could it be said that he was so identified with the train upon which he was that if the owners of it could not sue for the injury sustained to their vehicles he would also be debarred? The English courts adopt this conclusion, and under such circumstances deny the injured party relief. In the U. S. the question is still unsettled, though in some of the courts (among them, those of New York) the doctrine of the English tribunals is denied. It would, however, be generally conceded that if a person injured by negligence, though himself free from fault, was unable to take care of himself—as being, *e. g.*, a young child or insane—the negligence of the parent or guardian in whose custody he was would be imputed to himself, and there could be no recovery, on the ground of "contributory negligence," to be hereafter noticed. (See subdivision (6) of this article.)

(5) In the practical administration of justice it is an important inquiry whether negligence is to be disposed of as a matter of law or of fact. Another form of statement is, Should it be disposed of at a trial by the judge or decided by the jury? The rule is that in some cases, where the evidence of negligence is plain and uncontradicted, the judge may as matter of law dispose of the whole subject; on the other hand, if the testimony be contradictory, or the decision of the question depend upon a variety of circumstances, or upon the point whether the party charged has exercised the care which men of ordinary prudence in such cases use, the judge should submit the case to the jury, with such instruction upon the rules of law as might be necessary. It may be added that he who charges negligence must prove it, at least so far as to raise a presumption which the person charged is called upon to explain or rebut. It is not necessary that this proof should be supplied by direct evidence. The circumstances under which the injury happened may lead to a presumption of negligence, casting upon the person charged the burden of proof to rebut the imputation. Thus, where the wall of a building standing upon the line of a city street fell into the street on a still day, and without any apparent external cause, and injured one lawfully in the street, it was decided that the facts raised a presumption of negligence either in the construction or proper care of the building, and that if the owner could not rebut this presumption he was chargeable. (*Mullen* v. *St. John*, 57 N. Y., 567.)

(6) Though a person may have sustained an injury which if free from fault he could have made the basis of an action, the law will deny him redress if his own negligence contributed to the injury. This rule depends upon a principle, of public policy. It is in the highest degree expedient that justice should be so administered as to furnish strong inducements to those exposed to danger to use suitable care to guard themselves against its effects. The rule in question has this strong reason to recommend it. Moreover, if the negligence be in the correct sense "contributory"—that is, if the act of neglect be such that without it the injury would not have been sustained—it seems illogical to give the plaintiff a cause of action for a loss or damage which he has brought upon himself. This rule has met with some dissent, and an attempt has been made in some quarters to introduce a doctrine of comparative negligence, holding that if the carelessness of one party was much greater than that of the other, there might be a cause of action. The grounds of this distinction are not satisfactory, and the rule of contributory negligence may now be regarded as quite firmly settled. The mere fact that the act of the plaintiff is contributory to the injury is not sufficient to debar him of remedy. There must be *negligence* on his part, and not merely that of third persons, contributing to the injury. Negligence is not enough unless it is also "contributory." Questions immediately present themselves as to the amount of care which the plaintiff must have taken to avoid the damage. This will largely depend upon the circumstances of the case. He must have used due and reasonable care. If there was danger to be foreseen, he should resort to reasonable means to avoid it. Thus, if he were crossing a crowded street, he should look to see if vehicles were passing with which he might come in contact. If he were crossing a railway, he should in like manner look for a passing train if it could be seen, and take reasonable means to avoid it. But he would only be held to ordinary care. In the case supposed he would not be required to stop his carriage and to alight, or even to stand up in it, for the purpose of satisfying his mind whether a train was approaching, although a very cautious man might do these acts from considerations of personal safety. The defence of "contributory negligence" is extremely common, and the courts have found great difficulty in disposing of certain questions growing out of it. One of these is, whether the burden of proof is on the plaintiff to show due care or on the defendant to prove the want of it. It would seem sufficiently plain that the absence of care is not to be presumed. On the contrary, the fair inference is that the injured party has acted with ordinary care. Some evidence should accordingly be offered of want of care. It is not necessary that this evidence should be direct. Contributory negligence, as well as any other form of carelessness, may be inferred from circumstances. Another point of difficulty has been whether this variety of negligence is to be disposed of as matter of law or whether it is a question of fact. Where a number of circumstances are to be taken into account, it is frequently a matter of fact, though not necessarily where the facts are undisputed. Thus, if a plaintiff should, without any special circumstances justifying his act, leave a railway car when in motion, his act might be so plainly negligent that the court would instruct the jury that he could not prevail. These principles will frequently preclude a child or other person not capable of exercising care from maintaining an action when the proper custodian is guilty of neglect. Thus, if a young child were permitted to play in a city street unattended, and were injured by neglect, it might be precluded from all recovery on account of the neglect of a parent. Still, if the child should unexpectedly be exposed to danger by its own act and without the parent's fault, a different rule might prevail. Persons who are engaged in employments hazardous to others, such as railway companies, are bound to exercise more care towards young children than towards adults, and cannot expect from them the same circumspection in avoiding collisions, or that they will in the same manner be alert to escape from danger. There are cases in which when an adult is unnecessarily exposed to danger by the negligence of others, on the impulse of the moment he acts, as it were, instinctively, and in his efforts to avoid apprehended injury sustains actual harm from another source. Such a case cannot be deemed contributory negligence. The law regards as the true cause of the injury the negligent act of the wrongdoer. For example, if a driver of a stage-coach should drive so carelessly that the coach appeared in imminent danger of oversetting, and a passenger should instinctively leap from the coach and break his limb, he would have his action, though the coach did not turn over and other passengers who remained in it were uninjured.

The rules which have thus been stated as to contributory negligence do not prevail in collisions at sea. (See ROAD, LAW OF.) The regular rule of the admiralty law is that in cases of collision by mutual fault the loss is to be divided.

On principles similar to those prevailing as to contributory negligence it is a rule of the common law that though the injured party was not at fault, he cannot recover for any portion of his loss connected with the principal injury which is attributable to his own neglect. Thus, if one be personally injured, he is not to unreasonably neglect to have suitable medical treatment and nursing. So, if his property be deteriorated, he should take reasonable measures to prevent any unnecessary diminution of value. If one knew that the gate from the highway to his cornfield had been carelessly left open by his neighbor, and that his crop was exposed to the incursions of cattle, his duty in general would be to close the gate, and if he failed to do so the loss that he might sustain would be fairly chargeable to his own neglect. This salutary rule of law is applied by the courts with increasing rigor, even to cases of injuries sustained by acts of wilful wrongdoing and open violence. Even in such extreme cases as these the injured party, after the act of violence has passed, should use reasonable means to confine the damages sustained within bounds. If he neglect to use ordinary precautions, the enhanced damages may fairly be regarded as attributable to his own misconduct, rather than as being the legitimate results of the act of the wrongdoer.

At the common law, if an injury occasioned by negligence caused death, no civil action could be brought, although in some instances a criminal proceeding might be instituted. It is plain that no action could be brought in the name of the person killed. Other persons are not pecuniarily damaged, as they could only claim compensation on the ground of loss of service, and the *relation* of master and servant, whether expressly created or implied from that of husband and wife or parent and child, is at an end. This defect in the law was remedied in England by "Lord Campbell's act" (9 & 10 Vict. c. 93; see also 27 & 28 Vict. c. 95), the provisions of which have been substantially re-enacted in this country in most of the States. It extends to cases of death caused not only by negligence, but by other wrongful act, though the great majority of cases to which the statute is applied in the practice of the courts are those of neglect. The substance of the statute is, that the action is to be brought by the executor or administrator of the person killed, for the benefit of the husband or wife or

next of kin. The amount to be recovered depends upon the *pecuniary damages* sustained. In some of the States the recovery is limited to a specific sum; *e. g.* \$5000. The same general elements are necessary to sustain the action as in cases where the neglect causes injury instead of death.

The principles already referred to in this article will be found applicable, among other instances, to the following: (A) Liability for the proper use of one's individual property, whether land or personal estate. The fact of the ownership of property attaches to it responsibilities both towards individuals and the public. Thus, the owner of real estate is bound to keep it in such a condition that it will not, by reason of any neglect on his part, cause injury to adjoining owners or to persons passing along a highway. The same rule would be applied if persons were invited by him to come upon his premises for purposes of business or pleasure. He would not be under the same obligations to a mere trespasser. If an owner of an open field should leave a pit in it unguarded, and trespassers should cross the field in the night, not knowing of the danger, and be injured, it could not be claimed that the owner was negligent as to them, since he was under no duty to fence the excavation. It would be quite a different case if the pit were so near an unfenced highway that one lawfully passing along it might, while using ordinary care, mistake his way and fall. It is not settled how far from an unfenced highway a pit must be, in order that it may safely be left unguarded. In England there is a statute regulating the subject. Great discussion has taken place upon the question whether if a person should collect upon his land substances which might be the source of danger to others—as, *e. g.*, a large volume of water—he would be *absolutely* bound to keep it there so as not to injure his neighbor, or only bound to use a reasonable amount of care to prevent its escape. After some vacillation of judicial opinion the latter view has gained general recognition.

In regard to personal property the same general rules would apply. An illustration may be found in the case of the ownership of animals. When there is no wilful act of wrong, liability in such a case usually turns upon the question of negligence. The owner of a domestic animal, where it is not a trespasser, is not absolutely bound to prevent its causing injury to others. Knowledge of its vicious propensities must be shown, and consequent negligence inferred in suffering it to go at large or to be in a position to cause injury. The owner of savage animals is conclusively presumed to have knowledge of their vicious propensities, and is accordingly bound so to keep them that they will not damage persons not themselves in fault. In some instances, by statute, owners of animals are made absolutely responsible for their acts causing damage. An instance is that of a dog worrying sheep. If an owner of an animal, knowing it to have a contagious disease, should by negligence allow it to come in contact with the animals of others without sufficient warning, and they should in consequence be infected, he would be responsible. (B) Liability for the due management of public property and public affairs. An important class of cases falls under this general head. These will simply be enumerated, without an attempt to develop them. The class would include such cases as the management by cities of their streets and other public works. The city, being a municipal corporation, would be liable for a culpable want of care causing injury. Similar rules would be applied to towns where they have a corporate character, as in the New England States, for defect in the highways attributable to negligence. (See Towns.) The same general rule is to be applied to public officers who are guilty of neglect in the management of their public duties. A distinction is taken in this respect between judicial officers and those who perform mere "ministerial" functions. The latter class is illustrated by the instance of a sheriff or clerk who merely obeys the directions of a court, without exercising discretion. (See Officers.) No action will lie against a judicial officer of the higher grade of courts, known as a court of record, so long as he has jurisdiction, though he act not only negligently, but even wilfully or corruptly. The remedy in such a case is an impeachment or other process authorizing his removal. This rule is deemed indispensable to his independence in exercising his judicial functions. Minor judicial officers are liable to an action when they act with malice and bad faith. The rule of protection accorded to judicial officers is not extended to those having ministerial duties to perform. Where a positive duty is imposed upon them by law, and they have the means at their command to enable them to perform it, they are liable to those who suffer damage from a failure to perform their duties. This same principle would manifestly apply where, having entered upon the performance of their assigned duties, they acted with negligence. In some instances official duties partake both of a judicial and ministerial character. So far as they are judicial and honestly exercised the officer may be protected, though he err in judgment; as to the non-performance of the ministerial branch of his duties, he may be absolutely responsible for neglect. As a general rule, ministerial officers of a higher grade, having power to appoint subordinates necessary to their efficient transaction of business, are not responsible for the neglect of their subordinates as long as they act with due care in making the appointment or in retaining them in office. Thus, a city postmaster is not liable for the abstraction of money from a letter by one of his clerks so long as he is guilty of no neglect in designating him for his position, while at the same time he is liable for any personal act of negligence. (C) Negligence by persons engaged in a profession, trade, or business. This is a topic of a very extensive nature, and would include medical men, attorneys-at-law, bankers and bill-collectors, notaries public acting in a character not strictly official, mechanics, and agents of all sorts in relation to their employers. The general rule as to the obligations of these persons towards those who employ them is to perform their engagements with a reasonable amount of skill, depending upon the nature of the employment. They are bound to possess the average knowledge and skill of men of their trade and profession, and to exercise it in the cases entrusted to them. In respect to notaries public (see Notary Public) it may be remarked that for some purposes they are ministerial public officers and fall within the rules already stated. (See subdivision B.) For other purposes they are merely the private agents of those who employ them, and are liable on like grounds. (D) Cases of persons exercising a *quasi* public authority. Under this head may be grouped railway, telegraph, canal, bridge, and gas companies. These are to a certain extent regulated by statute. The subject is complex, as questions frequently arise as to their duties to the public or to individuals who are mere strangers, or to owners of land adjoining or otherwise affected by their work, and also to their employers or customers. In regard to their duties to the public, reference may be made to their interference in the matter of construction with public highways or bridges. It is, in general, their duty to restore these so far as possible to their original condition. In regard to adjoining owners, it is incumbent upon them to follow the legal maxim, "So to use their own as not to injure another." They should so make excavations as not to cause adjacent lands to fall. Although allowed under statutes, justified by the rules of "eminent domain," to take such land as may be necessary, they are bound to make due compensation. In agricultural districts railroad companies are commonly required by statutes to build the fences between their track and the land of adjoining proprietors, though in the absence of a statute they are under no such obligation. Accordingly, they are not liable in that case for the act of killing a domestic animal trespassing upon the track, without showing some act of negligence beyond the failure to build the fence. As soon as the duty to build the fence is prescribed by statute their failure to construct it becomes an act of negligence, for the natural consequences of which they become responsible. In regard to mere strangers, the rules already stated as to negligence and contributory negligence are sufficiently full for a comprehension of their duties; as to their customers, the law of common carriers of goods or passengers or of bailees will be applicable. These rules will be specially applicable to railway and telegraph companies. (See Bailment and Carriers, Common.) Railway companies carrying passengers are held to an extraordinary amount of care, owing to the dangerous nature of their employment. (E) The rule of "*respondeat superior*" in its relation to negligence by an inferior. It was stated in the law of Master and Servant (which see) that the master was liable for the acts of a servant done in the scope of his employment. This doctrine has a very close and constant bearing upon the subject of negligence. Many of the topics already referred to are largely influenced by it. The negligence of owners, or of municipalities, or of railways or telegraph and other corporations, is in the large majority of cases really that of their servants, which is, however, imputed to themselves under the theory that the employer is responsible for the acts of the servant. This theory does not, however, relieve the servant. If the master is obliged to pay for his negligence, there is a remedy in his behalf against the servant. (A more full view of this subject will be found in the article Master and Servant.) (F) Miscellaneous cases. Under this head may be collected such cases as the act of ordinary driving or riding on a highway, navigating vessels at sea, the management of fire, firearms, and combustible materials, the sale of substances dangerous to life or health, the use of water-courses, construction of sewers and private drains, the use of machinery, and the like. The subject of driving ve-

hicles on the highway or navigating vessels at sea is governed by well-settled rules, and in the latter case provided by act of Congress. (See ROAD, LAW OF.) Many questions arise as to negligence occasioning the destruction of property by fire. An owner of property has a legal right to destroy it so long as he does not injure another. If he wilfully and recklessly sets fire to his own house or goods, and thereby causes the loss of his neighbor's property, he is responsible. The same rule will apply to the case of culpable negligence. Undoubtedly, an owner may lawfully burn brush, and other substances of which he desires to be rid, upon his own land, and if he uses due care he will not be responsible for any injury which may unexpectedly be caused to his neighbor. This proposition would not justify a plain act of negligence. It may also be said that if a stranger wrongfully sets fire to land not his own, he is responsible for all the proximate consequences of the unlawful act, both as to the property of the party directly injured and to that of adjoining owners. This matter is in some of the States regulated by statute, particularly as connected with railways. The subject of the correct management of water-courses is one of great magnitude, and will be treated of in a separate article. (See WATER-COURSES.) (The subject may be further examined in the treatises of Shearman and Redfield, and in Wharton on do., Campbell on do., Saunders on do. Reference may also be made to Addison on *Torts*, Hilliard on do., and to the digests and reports of cases.)

II. *Negligence as an Ingredient of a Crime.*—It is a general rule of law that an intent is an essential element in the commission of a crime. Still, there are cases in which carelessness or negligence will stand in the place of an evil intent. These seem principally to be cases where a person, being under a public or private duty, neglects to perform it, and thus causes an injury to society. Though there is no positive intent to do wrong, there is culpability in the failure to discharge the duty. Thus, a public officer, being under a public duty to keep a prisoner safely, is criminally liable if he by neglect permit him to escape. Statutes sometimes declare that official neglect in specified cases shall constitute a crime of a particular grade. The same general rule would be applied to a violation of a private obligation causing a wrong to society. Thus, a neglect to cleanse the bed of a river, whereby adjoining lands are overflowed, may constitute a public nuisance. It is a well-known rule in the law of homicide that an act of neglect causing death may amount to the crime of manslaughter, while a positive intent to kill will constitute murder. (See MANSLAUGHTER. See on this general subject Russell on *Crimes*, Bishop on *Criminal Law*, and other works cited in the article CRIME.) T. W. DWIGHT.

Nego'tiable Pa'per. It is unnecessary to consider this subject at length, as it is involved to a considerable extent in the topics of BILL OF EXCHANGE and PROMISSORY NOTES (which see). It may, however, be useful simply to point out the meaning of the phrase as applied to the law of commercial paper, and refer to some cases which are not strictly included within the articles to which reference has just been made.

The expression "negotiable paper" is employed to indicate the fact that there are certain rights of action which are capable of such transfers that the transferee becomes the owner in a court of law, and is able to sue by its rules in his own name. A distinction of great consequence is thus created between rights of action which are *negotiable* and those which are *assignable*. By the general rule of law a right of action is simply assignable in equity, and not capable of transfer in the view of a court of law; negotiable paper is to be regarded as an exception, and is transferable both in law and in equity. In order to make promises "negotiable" they must be made to a person and to his order or to bearer, and must be payable in money, free from all contingency as to the fact of payment or as to the fund from which it is to be made. It will be noticed that if a promise is made by A "to B or to his order," if B orders the amount to be paid to C there is by the very terms of the contract a promise to pay to C, and he may accordingly sue in his own name. Where the promise is not thus negotiable the assignee cannot sue in a court of law in his own name, but must use the name of the assignor. The practical result is, that the assignee must take the claim subject to all defences which might have been urged by the debtor against the assignor. (See ASSIGNMENT.) On the other hand, in the case of negotiable paper, if the transfer is made before maturity, in good faith and for a valuable consideration, the buyer takes it free from all defences which might have been set up as between the original parties, unless the instrument is declared void by statute, in which case it is invalid even in the hands of the purchaser. So if such paper be stolen, a thief may transfer complete title to a purchaser under similar circumstances. The fact that a purchaser acts imprudently or negligently will not, according to the prevailing opinion, affect his title, except so far as such acts may, under all the circumstances of the case, be indicative of bad faith. His ownership depends upon his intent when the paper was acquired. If the stolen paper is acquired after maturity, his title will fail, as suspicion is now cast upon it from the fact that it is still outstanding and not paid when due. The rule that a purchaser of stolen negotiable paper can under any circumstances obtain a good title is exceptional in its nature, and cannot be extended to ordinary chattels. (See SALE.) It has been stated that no one can avail himself of the peculiar rule applied to negotiable paper unless he is a purchaser for a valuable consideration. This fact raises the very important inquiry as to the meaning of the phrase "purchaser for a valuable consideration." Is it necessary that there should be money or its equivalent advanced at the time of the transfer, or will it be enough if the holder took the paper on account of an antecedent debt? It is claimed by some jurists that a transfer on account of an existing debt is not a purchase, since the creditor parts with nothing as a condition of acquiring the paper. They urge that there can be no purchase unless something is parted with at the time of the acquisition. They would admit that if a creditor had at the time of the transfer surrendered something of value, such as a note of his own debtor's, he might be regarded as a purchaser. On the other hand, if he had merely taken the note of another from his debtor by way of security for his indebtedness, and without any surrender or other act amounting in the law of contracts to a new consideration, he could not be regarded as having made a purchase. This is the view of the New York courts and of those in some other States. There are other highly respectable courts that hold that such a transaction is in substance a purchase and precludes all inquiry into the circumstances under which the note so transferred was originally given. It is greatly to be regretted that there should be so little harmony of opinion upon a subject of so much practical importance.

There has been much discussion in recent times upon the point whether the doctrines of negotiable paper can be extended to public bonds, such as those issued by the U. S. or by a State or city, or to bonds of certain corporations—*e. g.* railroads. The inquiry has grown out of the fact that by the rules of the common law a sealed instrument is not in general negotiable, and the question is, whether cases of this kind are to be treated as exceptional. The prevailing opinion now is that the seal upon these public and cognate bonds does not deprive them of negotiability if they otherwise comply with the definition of commercial paper. The fact of their currency in the money-market is sufficient to make it highly convenient and useful to attach to them the ordinary incidents of commercial paper. The same general view should be taken of interest warrants or coupons when they usually pass from hand to hand like money. It is fortunate that the courts have arrived at conclusions so convenient and satisfactory as to the protection of purchasers of property in this country reaching such vast proportions as are included within our governmental, municipal, and corporate indebtedness.

T. W. DWIGHT.

Negri'llos, Negritos, Alfooroos, Arafuras, names given to the various tribes of the Melanesian or Papuan race. Some of the hill-men of Farther India, and possibly the Andaman Islanders, are of this stock. The wild-men of the Philippines are the typical Negrillos. They have woolly hair, longer and less crisped than the negroes. The hair of some tribes grows in patches, like that of some South Africans. The features of most are of a decidedly African cast, but their languages are clearly not African. The skin is sometimes perfectly black. It seems generally but not universally admitted that the straight hair and less uniform features of the black Australian natives, with their peculiarities of language, separate them from the true Negrillo stock. The whole race are referred by Latham to the "Oceanic Mongolidæ." Their languages seem to have some verbal roots in common with the Malays. (See Wallace, *Malay Archipelago; Asiat. Researches*, iv. 393; x. 218.)

Ne'gro [derived through the Spanish or Italian from the Latin *niger*, "black"], the name of one of the prominent races or species of mankind. This race is indigenous to the tropical portions of Africa, and extends from about the fifteenth degree of N. lat., or the southern boundary of the Sahara Desert, to the twentieth degree of S. lat., or the country of the Hottentots and Bushmen, and in the W. from the Atlantic Ocean to near the borders of the Indian Ocean toward the E. It is perhaps the most distinct of all the races, and that in which are perceptible the most generalized characters, or at least those which are most indicative of affinity to and derivation from the apes, of the

human genus. These characters are evidenced both superficially and anatomically, as well as morally and physically. The color, as indicated by the name, is very dark, and enough so to have caused the bestowal of the name "blacks" on the race; the mouth is protuberant, on account of the forward trend of the jaws and the thick and outward turned lips; the nose is broad and flat; the forehead flat and receding backward; the hair short and very curly, and commonly designated as woolly, although having no resemblance to true wool, and simply differing from the hair of the white race by the compression and curliness of the filaments; the hair of the face is rather scanty; the thorax more compressed than in the white race; the nates comparatively flattened, and meeting the thighs at nearly a right angle instead of a curve; the arms relatively larger in comparison with the legs, and the distal segments of both (arms and legs) comparatively larger than the proximal (*i. e.* humerus in arm and femur in leg); the knees are more bent outward; the calves weak; the ankles lower; the foot comparatively flat, and the heels longer; the great toes freer and more opposable to the others. Such are the features externally visible claimed by most observers as distinctive of the negro; these are co-ordinated with more deep-seated ones only visible on dissection.

The skeleton furnishes some: The bones are, on the whole, heavier and whiter; the skull is generally high and narrow, the average ratio of breadth to length being between 68 and 71 to 100, although sometimes falling as low as 63, and at others reaching 78; the projecting jaws entail a low facial angle, this being about 65° to 70°; the pelvis is of the oblong type, according to Weber, and is narrow, conical, or cuneiform, and small in all its diameters; the calcaneum or heel-bone is in nearly a continuous straight line with the other bones of the foot, and projects farther backward. The muscles of the limbs (arms and legs) have shorter bellies and longer tendons than in their correspondents in the white race, and those of the calves are less developed.

The brain is essentially similar to that of the white race, but as a rule the gyri and sulci seem to be more symmetrically developed, as well as less numerous and more massive, and the nerves are larger, in proportion to the brain, than in the European. The average size is less. Numerous observations have been made on this organ, and the importance of this subject demands a more extended notice. The following results are epitomized from Drs. Morton and Russell: According to Morton, the average capacity in cubic inches of the cranial cavity of 62 native African negro skulls was 83 inches, and of 12 American negroes 82 inches. Dr. Sanford B. Hunt, surgeon of U. S. volunteers in the late civil war, has recorded the results of autopsies of the brains of 405 whites and negroes made by Surgeon Ira Russell. The conclusions which he drew from these observations were: "(1) The standard weight of the negro brain is over five ounces less than that of the white. (2) *Slight* intermixture of white blood diminishes the negro brain from its normal standard, but when the infusion of white blood amounts to one-half (mulatto), it determines a positive increase in the negro brain, which in the quadroon is only three ounces below the white standard. (3) The percentage of exceptionally small brains is largest among negroes having but a small proportion of white blood."

The following table furnishes the basis for these generalizations:

Number of autopsies	Grade of color.	Average weight of brain.	Maximum weight of brain.	Minimum weight of brain.	Weight of brain. 60 ounces and over.	55 and under 60 ozs.	50 and under 55 ozs.	45 and under 50 ozs.	40 and under 45 ozs.	35 and under 40 ozs.	Less than 35 ounces.
		oz.	oz.								
24	White.	52.06	64	$44\frac{1}{4}$	1	4	11	7	1		
25	$\frac{3}{4}$	49.05	61	40	1	...	10	12	2		
47	$\frac{1}{2}$	47.07	57	$37\frac{3}{4}$	...	2	13	19	12	1	
51	$\frac{1}{4}$	46.54	59	$38\frac{1}{2}$	...	2	10	22	11	6	
95	$\frac{1}{8}$	46.16	57	$34\frac{1}{2}$	...	1	15	50	21	7	1
22	$\frac{1}{16}$	45.18	$50\frac{1}{2}$	40	...	...	3	10	9		
141	Black.	46.96	56	$35\frac{3}{4}$	...	5	42	51	38	3	
405	....	......	...	......	2	14	104	171	94	17	1
Autopsies of others.											
278	White.	$49\frac{1}{2}$	65	34	7	28	99	97	39	7	1

Such are the principal characteristics that have been attributed to the negro in contradistinction at least to the European. Most of them hold good as average characters, but it is doubtful whether any are absolute, and some of them are very difficult to gauge and appreciate. Not only are varietal differences observable between the inhabitants of the different parts of Africa, but the individual differences in one and the same tribe are not inconsiderable. All, therefore, that can be justly claimed is that the characters enumerated are expressive of the typical negro, which may severally fail if we examine special individuals of the race.

The larynx of the negro, according to Dr. George D. Gibb (*Memoirs of the Anthropological Society*, ii. pp. 322, 323, 1864), is distinguished by "the invariable presence of the cartilages of Wrisberg [little bodies like small round peas at the top of the back of the larynx, not commonly seen in other races of mankind], the oblique or shelving position of the true vocal cords, and the pendent position of the ventricles of Morgagni;" it is "fairly developed, not unusually prominent in the neck, and the vocal cords are not, perhaps, of the full length of those in the European races, nor of the Tartars."

Numerous physiological characters have also been attributed to the negro as distinctive of his race. It has been claimed that there is a greater uniformity of temperament, and that only the choleric and phlegmatic are developed in the race; that the negro is only capable of a minor degree of cultivation; and that he is less subject to malarious diseases than the white race. These statements are also to be accepted as only generalities, and not as absolute. It is indisputable that the negro in his average characters deviates less from the ape tribe than any other race, and that no high state of civilization has ever originated from among the race. Many tribes exhibit, however, considerable skill in the erection of their huts and the weaving of cloths, etc., as well as in the manufacture of implements for household economy and for war and the chase. Most are fond of music, and have much aptitude for its cultivation, although their taste is different from that of the cultivated European. Their religious ideas are vague. They believe in the doctrine of a future life, but not apparently (or at least to a very uncertain extent) in a system of future rewards and punishments. By some, at least, the idea of the transmigration of souls seems to be entertained. They are very superstitious, and have generally intense belief in charms and witchcraft. These are the typical characteristics of the wild Africans.

The system of slavery has resulted in the alienage of large numbers of the race from their country and transportation to foreign lands—mostly to the southern part of the U. S., the West Indian islands, and Brazil and Guiana. In all these countries they have largely increased, readily assumed the habits and language, as well as religion, of the citizens, and exhibited frequently considerable aptitude for higher cultivation. Although their powers of origination seem to be comparatively small, they readily copy the manners of their superiors, and frequently display much superficial polish. They are very emotional, and chiefly select those religions which appeal most strongly to the senses, such as the Roman Catholic and the Methodist. On some the religion thus adopted appears to have a serious and effective influence, and to regulate their daily life; while on others the effect is very superficial, and extreme religious exaltation does not appear to be incompatible with low moral ideas and actions.

As a natural result of the transportation of large numbers of the race to foreign countries, there has been an intermixture between representatives of the race and those of the dominant races of the countries to which they have been carried. The offspring between the two races are called mulattos. Many generalities have been enunciated respecting the structural and physiological attributes of these mulattos, but often with a very unsatisfactory basis. They are to a certain extent intermediate as to their characters between the two races, but perhaps on the whole exhibit more of the features of the father than of the mother. They are reputed to be bad breeders, but the exceptions at least are numerous. They are said also to be ugly and revengeful in disposition, but this is probably more the result of a feeling of wrong to themselves than an innate peculiarity of race. It is further claimed that they are less hardy than either parent race, and that they very soon die, but on this very point exact and numerous statistics are needed. THEODORE GILL.

Negro Hill, post-v. and tp. of White co., Ark., on White River, 12 miles N. of Des Arc. Pop. 57.

Negropont. See EUBŒA.

Nehemi'ah [Heb., "the Lord consoles him"], **Book of,** a historical book of the Old Testament. Its author lived in the fifth century B. C. He was a Jew, with the title of *tirshatha* ("cup-bearer") to Artaxerxes Longimanus, and governor of Judæa under the Persian rule after the restoration of the Jews. His work is a continuation of that of Ezra, and is the last in historical order of the Old Testament narratives.

Nehiroirini, or **Montagnais,** a tribe of Algonkin Indians in Canada, closely related to the Nascapees, and occupying the N. bank of the St. Lawrence from the Saguenay River to the Straits of Belle Isle. At the time of the first French voyages to Canada, in the sixteenth century, they occupied the region around Quebec, but were driven eastward by the Iroquois, and drove the Esquimaux before them into Labrador; were friendly to the French; have had Catholic missionaries since the time of Champlain, and have learned to read and write. Their principal villages are Point Bleu, Chicoutimi, Moisie, and Cascapediac; they numbered 1700 in 1872, and lived chiefly by hunting the caribou.

Nehlig′ (Victor), b. in Paris, France, in 1830; studied painting under Abel de Pujol and Cogniet; resided for a time in Havana, Cuba, and ultimately settled in New York, where he obtained great applause by his pictures illustrative of American history, romance, and poetry, among which are *Gertrude of Wyoming*, *Hiawatha and Minnehaha*, and *Pocahontas*. He was chosen in 1870 a member of the National Academy of Design, and in 1872 visited the studios and galleries of London.

Neilgher′ry Hills, an almost isolated group of mountains in Southern Hindostan, between lat. 11° 10′ and 11° 38′ N., and between lon. 76° 30′ and 77° 10′, and covering an area of 700 square miles. They consist of granite, covered with a layer of rich black soil ten feet deep, and rise in the highest peak, Dodabetta, to the height of 8760 feet. Their sides are covered with impenetrable jungles of tropical forests, hot, unhealthy, and swarming with wild animals—elephants, tigers, and leopards; but at an elevation of about 5000 feet they form a table-land remarkable for its beautiful and healthful climate, and on this account much frequented by Europeans. Ootacamund is a town situated nearly in the centre of the plateau.

Neill (Edward Duffield), b. at Philadelphia, Pa., in 1823; studied at the University of Pennsylvania and graduated at Amherst College in 1842; became a Presbyterian minister at St. Paul, Minn., 1849; was private secretary to Pres. Johnson 1867–68, and afterward appointed consul at Dublin, Ireland; has been a frequent contributor to the religious magazines, and has published *Annals of the Minnesota Historical Society* (1856), *History of Minnesota* (1858), *History of the Virginia Company* (1869), *The Fairfaxes of England and America* (1868), *Terra Mariæ, or Threads of Maryland Colonial History*, and *English Colonization of America during the Seventeenth Century* (1871).

Neill (Thomas H.), b. in Pennsylvania in 1825; graduated at West Point, and was assigned to the infantry (brevet second lieutenant) July, 1847; served mainly on frontier duty and at West Point previous to 1861; in the civil war he organized the 23d Pennsylvania Vols., which he commanded throughout the Virginia Peninsular campaign of 1862; appointed brigadier-general of volunteers Nov., 1862, he commanded a brigade (6th corps) at the battle of Fredericksburg, Dec., 1862; at the storming of Marye Heights, May, 1863; at Gettysburg, July 2–3, 1863; and in command of a division during the Richmond campaign of 1864 and siege of Petersburg; engaged in the battle of Winchester Oct. 19, 1864; brevetted from major to major-general for gallantry. In 1870 he was transferred to the 6th Cavalry with the rank of lieutenant-colonel, and after an active campaign against the Indians was in 1875 assigned to West Point as commandant.

Neill (William), D. D., b. near Pittsburg, Pa., in 1779; graduated at Princeton 1803; was tutor there 1803–05; was for several years Presbyterian pastor at Cooperstown, N. J., Albany, and Philadelphia; president of Dickinson College 1824–29; secretary and general agent of the Presbyterian Board of Education 1829–31; minister at Germantown 1831–42; editor for some years of the *Presbyterian Magazine*, and author of *Lectures on Biblical History* (1846), *Exposition of the Epistle to the Ephesians* (1850), *Divine Origin of the Christian Religion* (1854), and *A Ministry of Fifty Years, with Anecdotes and Reminiscences* (1857). D. at Philadelphia in 1860.

Neill's Creek, tp. of Harnett co., N. C. Pop. 1137.

Neills′ville, post-v., cap. of Clark co., Wis., on Black River, has schools, 2 churches, 1 bank, 2 newspapers, 12 manufactories, mills, 2 hotels, telegraph-office, and stores. Pop. about 1500. D. T. Lindley, Ed. "Republican."

Nei′sse, town of Prussia, province of Silesia, at the influx of the Biela in the Neisse. It is a fortress of second rank, and contains many military establishments, schools, barracks, magazines, etc. It has large breweries and distilleries, and extensive manufactures of arms, chemicals, tobacco, and linen and woollen fabrics. Pop. 19,376.

Ne′ive, town of Italy, province of Genoa, about 8 miles E. of the city of Genoa. It lies on the seashore at the foot of Monte Moro, which encloses it semicircularly and protects it from the N. wind, and the consequently mild climate makes it a favorite winter-retreat for invalids. The roadstead is not easily accessible, but there is safe anchorage about half a mile from the shore, and, besides an active coasting-trade, many vessels leave this port for America, the Black Sea, etc. Lord Bentinck here embarked his troops for his assault upon Genoa. Pop. 5186.

Nek′imi, post-v. and tp. of Winnebago co., Wis., 15 miles S. W. of Oshkosh. Pop. 1278.

Nélaton′ (Auguste), b. at Paris June 17,1807; studied medicine; became professor in clinical surgery in 1839; invented a new method of extracting calculi, which he applied with great success. D. Sept. 21, 1873. His principal work is *Éléments de Pathologie chirurgicale* (5 vols., 1844–60).

Ne′ligh, county of Central Nebraska. Area, 576 square miles. It is drained by affluents of the Pawnee Loup, and is chiefly adapted to pasturage.

Nelles (Samuel Sobieski), D. D., LL.D., b. at Mt. Pleasant, Ont., Canada, Oct. 17, 1823; graduated in 1846 at Middletown, Conn.; became a Wesleyan preacher in Canada, and in 1850 president of Victoria College, Cobourg.

Nellore′, town of British India, presidency of Madras, capital of a district of the same name, is on the Pennar near its mouth, in lat. 14° 27′ N. It is not well built, but is clean, airy, and healthy. Pop. about 25,000.

Nel′son, town of New Zealand, on the northern extremity of Middle Island, at the head of Blind Bay, has a good harbor. It is well built, and its surroundings are very fertile and beautiful. Pop. about 6000.

Nelson, county of Central Kentucky. Area, 400 square miles. Its S. W. border is washed by Salt River. Its surface is diversified and the soil is excellent. Live-stock, grain, wool, and lumber are leading products. The county is traversed by branches of the Louisville and Nashville R. R. Cap. Bardstown. Pop. 14,804.

Nelson, county of Central Virginia. Area, 325 square miles. It extends S. E. from the Blue Ridge to James River. It is broken by mountain-ridges and hills, and has beautiful and fertile valleys. Tobacco and corn are leading products. It is traversed by the Atlantic Mississippi and Ohio R. R. Cap. Lovingston. Pop. 13,898.

Nelson, post-v. and tp. of Lee co., Ill., on Rock River and the Chicago and North-western R. R. Pop. 600.

Nelson, post-tp. of Kent co., Mich. Pop. 1102.

Nelson, post-v., cap. of Nuckalls co., Neb.

Nelson, post-v. and tp., Cheshire co., N. H. Pop. 744.

Nelson, post-v. and tp. of Madison co., N. Y., on the Syracuse and Chenango Valley R. R. Pop. 1730.

Nelson, post-v. and tp. of Portage co., O. Pop. 1355.

Nelson, post-v. and tp. of Tioga co., Pa. Pop. 456.

Nelson, tp. of York co., Va. Pop. 2218.

Nelson, post-v. and tp. of Buffalo co., Wis. Pop. 1291.

Nelson (David), M. D., b. near Jonesborough, Tenn., Sept. 24, 1793; graduated at Washington College, Va., 1810; studied medicine at Danville, Ky., and at Philadelphia Medical School; served in Canada as surgeon during the war of 1812; was for some years a skeptic upon religious topics, but ultimately became a Presbyterian minister (1825) in Tennessee, Kentucky, and Missouri; was the founder and first president of Marion College, near Palmyra, Mo., 1830, which, however, existed but a few years; established near Quincy, Ill., an institution for the training of students for the ministry, which also failed; was actively engaged in the anti-slavery cause, and was author of a once popular work, *The Cause and Cure of Infidelity*, which passed through many editions, and continues to be circulated. D. at Oakland, Ill., Oct. 17, 1844.

Nelson (Horatio), Viscount Nelson of the Nile, duke of Bronté, b. at Burnham Thorpe, Norfolkshire, England, Sept. 29, 1758, was the fourth son of Rev. Edmund Nelson, rector of the parish; attended school at Norwich and at North Wolsham; obtained at the age of twelve an appointment as midshipman; accompanied Capt. Phipps's Arctic expedition 1773; served in the East Indies 1775–76; became lieutenant Apr. 8, 1777, and post-captain July 11, 1779; given command of a man-of-war, with which he proceeded to San Juan del Norte, Nicaragua; took Fort San Carlos in the San Juan River; cruised in the North Sea 1781–82; served again in the West Indies 1782–87; was stationed for the protection of trade near the Leeward Islands; captured four American vessels for violation of the navigation laws, for which conduct he was subsequently prosecuted by their captains; married Mrs. Nesbit, the widowed daughter of Gov. Herbert, at Nevis, Mar., 1787;

served under Lord Hood in the Mediterranean 1793–94, at which time he was sent with despatches to Naples, and first made the acquaintance of Sir William and Lady Hamilton; commanded a small squadron on the coast of Corsica which co-operated with Paoli, and took Bastia May, 1794; aided in the siege of Calvi, where he lost an eye; participated in Admiral Hotham's victory over the French squadron Mar. 15, 1795; took the island of Elba; blockaded Leghorn Apr. to Oct., 1795; was made commodore 1796; distinguished himself under Admiral Jervis in the naval victory over the Spanish fleet off Cape St. Vincent Feb. 14, 1797; was appointed rear-admiral Apr., 1797; took part in the blockade and attempted bombardment of Cadiz May to July, and in the unsuccessful attack upon Santa Cruz, Teneriffe, July, 1797, where he lost his right arm; was made a knight of the Bath and received a pension of £1000; took command of the Mediterranean squadron off Toulon May, 1798; followed Napoleon's expedition to Egypt, and destroyed the French fleet at the Bay of Abookeer (generally called the battle of the Nile), being wounded in the engagement, Aug. 1, 1798, for which victory he was made Baron Nelson of the Nile, and received an additional pension of £2000; proceeded to Naples in September; occupied Leghorn in November; aided the government of Naples in resisting the French invasion and in recovering the capital after it had been taken, but stained his reputation by violating the capitulation concluded June 23, 1799, and hanging Caraccioli, the insurgent admiral; was made duke of Bronté (Sicily); aided in the siege of Malta; returned to England in company with Sir William and Lady Hamilton Nov., 1800; was received with unbounded popular enthusiasm; separated from his wife on account of his attachment to Lady Hamilton; was made vice-admiral Jan., 1801; was second in command of the Baltic fleet in the naval battle of Copenhagen, Apr. 2, for which he was made viscount; took command of the squadron for the defence of England against the contemplated French invasion in July; attacked the French flotilla off Boulogne Aug. 15; resided with the Hamiltons at their seat in Merton, Surrey, during the Peace of Amiens, 1802–03; was appointed commander of the Mediterranean fleet on the resumption of hostilities May, 1803; blockaded Toulon; unsuccessfully pursued a French fleet to the West Indies May, 1805; returned to England in July; again took command of the Mediterranean fleet, and inflicted a total defeat on the combined French and Spanish squadrons off Cape Trafalgar, losing his life in the engagement, Oct. 21, 1805. Lord Nelson was buried in St. Paul's cathedral, Jan. 8, 1806, his funeral being the most magnificent ever seen in England. (See *Lives* by Southey, Pettigrew, and De Forgues, and his *Letters and Despatches*, edited by Sir N. Harris Nicolas (7 vols., 1844–46).) PORTER C. BLISS.

Nelson (JOHN), b. in Frederick, Md., in 1791; graduated at William and Mary College 1811; was a member of Congress 1821–23, chargé d'affaires to the Two Sicilies 1831–33, and attorney-general of the U. S. under Pres. Tyler's administration from Jan. 2, 1844, to Mar. 5, 1845. D. at Baltimore Jan. 8, 1860.

Nelson (SAMUEL), LL.D., b. at Hebron, N. Y., Nov. 10, 1792; graduated at Middlebury College in 1813; was admitted to the bar in 1817; became a successful lawyer of Cortland co., N. Y.; judge of the circuit court 1823–31, of the State supreme court 1831–37, its chief-justice 1837–45; in 1845 was appointed a judge of the U. S. Supreme Court, from which he retired in 1872; member of the joint high commission to settle the Alabama claims 1871. D. at Cooperstown, N. Y., Dec. 13, 1873.

Nelson (THOMAS), b. in York co., Va., Dec. 26, 1738; was educated at Trinity College, Cambridge, and before his return, when just twenty-one, was chosen to the house of burgesses of Virginia; was a member of the Williamsburg convention 1774, of the convention of 1775, and of the Virginia constitutional convention of 1776; was in Congress 1776–77 and 1779; signed the Declaration of Independence; served as colonel, and afterwards as a general officer, in the army; was governor of Virginia in 1781; expended his great fortune for the cause of liberty, and at the siege of Yorktown directed the artillery to play upon his own mansion, the supposed head-quarters of Cornwallis. He d. in comparative poverty Jan. 4, 1789.

Nelson (THOMAS A. R.), b. in Roane co., Tenn., Mar. 19, 1812; graduated at East Tennessee College in 1828; was admitted to the bar before he had attained the age of twenty-one, and was appointed district attorney for the first district of Tennessee in 1833; in 1844 he canvassed his district as elector for Henry Clay, and in 1848 for Gen. Taylor; in 1851 was appointed commissioner of the U. S. to China, but for private reasons declined to accept; in 1859; was elected to the U. S. Congress; he adhered to the cause of the Union during the civil war, yet at its close stood a tower of strength for his vanquished South; was one of the counsel who defended Pres. Johnson upon his impeachment in 1868; in 1870 was elected one of the six judges of the State supreme court under the new constitution, but resigned after a little more than a year's service on the bench. D. at Knoxville, Tenn., Aug. 24, 1873. JAMES D. PARK.

Nelson (THOMAS HENRY), b. in Mason co., Ky., about 1824; studied law at Maysville; removed in early manhood to Rockville, and subsequently to Terre Haute, Ind., where he became a political leader of the Whigs and one of the founders of the Republican organization; was several times delegate to national and State conventions, candidate for Presidential elector, for Congress, and other offices, but usually defeated, as he resided in a strong Democratic district; was minister to Chili 1861–66, where he achieved a great personal popularity; was conspicuous in the rescue of numerous victims at the burning of the Jesuits' church at Santiago Dec. 6, 1864; took an active part as mediator between Chili and Spain in the war of 1864–66; was envoy to Mexico 1869–73, and has since resided as a lawyer at Washington, D. C.

Nelson (Gen. WILLIAM), brother of Thomas Henry, b. at Maysville, Ky., in 1825; entered the navy in 1840; participated in the siege of Vera Cruz 1847; served in the Mediterranean and South Pacific squadrons; was made lieutenant-commander in 1861, and commanded the gunboats on the Ohio River, but soon exchanged the naval for the military service; was made brigadier-general Sept. 16, 1861; organized Camp Dick Robinson, and another at Washington, Mason co.; successful in engagements in Eastern Kentucky; commanded the 2d division of Gen. Buell's army at Shiloh; wounded at the battle of Richmond, Ky.; placed in command at Louisville when threatened by Gen. Bragg; made major-general of volunteers July 17, 1862, and in an altercation at the Galt House Sept. 29, 1862, was shot dead.

Nelson (WOLFRED), M. D., b. at Montreal, Canada, July 10, 1792; became a physician 1811; was surgeon to a Canadian battalion during the war with the U. S. 1812–15; elected to the Canadian Parliament for Sorel 1827; engaged in a rebellion against the British government 1837; won an engagement at St. Denis on the Richelieu River, but was captured and exiled to Bermuda; settled at Plattsburg, N. Y., 1838; returned to Montreal 1842 on the amnesty; was member of Parliament 1844–46; became inspector of prisons 1851; was president of the College of Physicians and Surgeons; twice mayor of Montreal. D. at Montreal June 17, 1863.—His brother ROBERT NELSON, also a physician, headed an insurrectionary party in 1838, and subsequently resided in California and in New York.

Nelsonville, p.-v. of York tp., Athens co., O., on the Columbus and Hocking Valley R. R., 60 miles from Columbus, in the midst of the great coal-region of Ohio, has good schools, 3 churches, 1 newspaper, 2 mills, 1 cigar manufactory, 3 furniture-factories, and 1 bank. P. 1080.

J. A. STRAIGHT, ED. "OHIO MINING GAZETTE."

Nelum'bium, an interesting genus of water-plants, akin to the water-lilies (Nymphæaceæ), by some ranked as a separate order, the Nelumbiaceæ, by others as a sub-order. The genus contains only two or three species. The *Nelumbium speciosum* (the Egyptian bean, nelumbo of the Ceylonese, lotus of Thibet and India) furnishes in China and the East much food. Its seeds, roots, and stalks are cooked, and are very palatable, abounding in starch. This plant is nearly or quite extinct in Egypt, where it was once worshipped. The *N. luteum* of the U. S. has dull yellow flowers (those of the preceding generally are rose-colored). Its roots and seeds (water-chinquapins) are very palatable. It grows in shallow waters.

Ne'maha, county of N. E. Kansas. Area, 720 sq. m.; is bounded N. by Nebraska; is undulating, fertile, and has good water-power, coal, timber, limestone, and gypsum. It is adapted to grain and live-stock, and is traversed by Central branch of Union Pacific R. R. and St. Joseph and Denver City R. R. Cap. Seneca. Pop. 7339.

Nemaha, county of S. E. Nebraska. Area, 400 sq. m.; is bounded E. by the Missouri River, and traversed by the Little Nemaha. Coal is mined in this county. The soil is adapted to grain and stock raising. There is considerable timber. Traversed by Brownville Fort Kearney and Pacific R. R. Cap. Brownville. Pop. 7593.

Nemaha, tp. of Nemaha co., Kan. Pop. 491.

Nemaha, post-v. and tp. of Nemaha co., Neb., on the Little Nemaha River, 2 miles from its entrance into the Missouri, and 27 miles S. W. of Nebraska City. Pop. 628.

Nemaha, tp. of Richardson co., Neb. Pop. 404.

Nematel'mia [Gr., "thread-worms"], an order of worms, mostly parasitic (entozoic), having cylindriform

bodies, an animal distinctly unisexual. Sight, hearing, and respiration appear to have no special organs. One group, the Acanthocephala, contains organisms which resemble cestoid worms in having no alimentary canal. The Gordiacea or hair-worms resemble the trematode worms in having no vent to the intestine. The typical Nematelmia are called nematoid worms (Nematoidea), and have a perfect alimentary canal with both mouth and vent, and suspended in the somatic cavity, and distinct sexes. The three groups indicated above may be regarded as three sub-orders, though many writers apply the name Nematelmia to the last-mentioned group alone.

Nematog'nathi [from νῆμα, νήματος, "thread," and γνάθος, "jaw," in allusion to the filamentous extension of the maxillary bones], an order of teleost fishes distinguished by many peculiarities of the skeleton and brain. The skull has a nearly rectilinear dorsal outline, there being no anterior geniculation; the supra-occipital is confluent with the parietals; the pteriotic bone is simple; no symplectic bone is differentiated; the intermaxillary bones are attached to the inferior surface of the ethmoid; the supramaxillaries are styliform, articulated at their bases, and enclosed in filamentous extensions of the skin, developed as the supramaxillary barbels; the suboperculum is wanting; in the branchial apparatus (according to Cope) the third superior pharyngeal bone is wanting or small, and resting on the fourth, the second directed backward; one or two pairs of basibranchihyals and two pairs of branchihyals are developed; the branchiæ are pectinated; in the scapular arch the coracoid elements are soldered with the proscapula (clavicle of some), and the mesocoracoid is represented by a bridge-like arch; "interclaves" are developed; the post-temporal (supra-scapula of some) is co-ossified with the skull; no postero-temporal or supraclavicle is represented; the brain has an immense cerebellum, which extends forward over the optic lobes; the optic lobes are quite peculiar in their thalami; the heart has no bulbous arteriosus; the air-bladder connects by a duct with the roof of the œsophagus. These and other characters unite to distinguish the catfishes and related forms from all other types as an independent order. The order is represented by numerous species, most of which are found in the fresh waters of almost all warm and temperate countries, but some are also marine. Although, apparently, in many respects, an ancient type, no forms that can be certainly referred to it have been found in the older rocks. The order has been differentiated into the families: (1) Trichomycteridæ, (2) Siluridæ, (3) Chacidæ, (4) Plotosidæ, (5) Clariidæ, (6) Callichthyidæ, (7) Argiidæ, (8) Loricariidæ, (9) Lisoridæ, (10) Hypophthalmidæ, (11) Aspredinidæ. Of these, the first nine (1–9) have a well-developed operculum, and the four anterior vertebræ coalesced into one; the tenth (10) has also an operculum, but the anterior vertebræ are distinct; while in the eleventh (11) the operculum is wanting, although the anterior vertebræ are modified as in most of the order. The first, sixth, seventh, eighth, tenth, and eleventh families are peculiar to South America; the third, fourth, fifth, and ninth are peculiar to the fresh waters or seas of the tropical parts of the eastern hemisphere; and the second is cosmopolitan. All the North American species belong to the SILURIDÆ (which see). THEODORE GILL.

Nematoid Worms. See NEMATELMIA.

Nemean Games. See GRECIAN GAMES.

Nemesia'nus (MARCUS AURELIUS OLYMPIUS), a Latin poet, b. at Carthage in the middle of the third century of our era, flourished at the court of the emperor Carus, and wrote didactic poems on hunting, fishing, etc., of one of which, *Cynegetica*, a fragment, consisting of 325 hexameters, is extant, and was edited by Stern (Halle, 1832).

Nem'esis [Gr. Νέμεσις], the Greek goddess who personifies the idea of strict divine retribution. In the earlier writers she stands for the guilty conscience, and later she appears as the just dispenser of good and ill fortune.

Neme'sius, a Christian philosopher of whose life nothing is known, except that he was bishop of Emesa and lived about 400 A. D., but of his works one is still extant—Περὶ Φύσεως Ἀνθρώπου. It was for a long time attributed to Gregory of Nyssa, and under his name translated into Latin. The Greek text was first published under the true author's name in 1565 by Ellebodius, afterwards by Matthäi (Halle, 1802). It was translated into English by George Wither (1636), into German by Osterhammer (1819), and into French by J. B. Thibault (1844).

Nemichthy'idæ [Gr. νῆμα, "thread," and ἰχθύς, "fish"], a family of fishes of the order Apodes, represented by a single species, distinguished by its thread-like body and snipe-like bill. The body is extremely elongated and band-like, with the tail tapering into a point, and the anus not far behind the throat, the abdominal cavity, however, extending much farther back; the skin is naked; the head is very much elongated, and the jaws extended into a long and slender bill; the upper mandible is formed by the vomer and intermaxillaries; the teeth are villiform, and on the roof of the bill-like upper jaw, as well as the lower; the branchial apertures are wide and nearly confluent; branchiostegal rays 9 or 10 and extremely attenuated; dorsal and anal fins with simple rays, the former commencing near the occiput, the latter farther back, and with its rays more elongated (the connecting membrane imperfect or very delicate); the caudal obsolete. The single species (*Nemichthys scolopaceus*) for which this family has been constituted is an inhabitant, apparently, of the depths of the Atlantic Ocean at widely distant places, the original specimen having been obtained in the South Atlantic, another one off Madeira, and a third on or near the Banks of Newfoundland. The genus was originally supposed to be related to the swordfishes (Xiphiidæ), but by later writers has been regarded as most nearly allied to the Murænidæ, and even (by Günther) as a member of that family. It attains a length of nearly three inches, and probably more. THEODORE GILL.

Nemours', de (LOUIS-CHARLES-PHILIPPE-RAPHAEL D'ORLÉANS), DUKE, second son of King Louis Philippe, though born (1814) sixteen years before the revolution which placed the head of the house of Orleans on the French throne. He served with his elder brother at the siege of Antwerp, and in 1836 and 1837 in the two expeditions against Constantine, in the latter of which he commanded one of the three brigades upon which fell the heaviest part of the short but bloody siege; commanding also the rear-guard on the return march, during which great ravages were made in the ranks by the cholera, the prince endeared himself to his soldiers by his self-exposure and devotion to the sick. The occasion of his marriage the year after with a princess of Saxe-Coburg (a relative of the late Prince Albert) became the cause of the deposition of the Soult ministry, owing to the rejection by the French Chambers of a bill of "dotation" which the ministry had brought in. The event was one of the earlier ominous signs of incipient discontent with the reigning family. As the eldest living son, the regency by law devolved on him on the abdication of the king, but the act of the French people which caused the abdication was itself *hors la loi*, and neither the duke nor his junior brothers, then (see JOINVILLE) in high command in Africa, were disposed to have recourse to what might result in civil war. He assumed command of the troops then in the court of the palace of the Tuileries; protected the widowed duchess of Orleans and her children, whom he advised to withdraw at once to St. Cloud, or if needs be to the neighboring stronghold of Mont Valérien. After the fruitless and hazardous appeal by her personal presence in the French Chamber of Deputies, he took measures for the safe withdrawal from France of herself and all the members of the royal family, after which he succeeded himself in reaching England. His life of exile in England was passed in great seclusion, and was marked by devotion, during the continuance of their lives, to the ex-king and queen. Since the abrogation of the decree of exile he has been restored (as likewise the Duke d'Aumale) to his former rank of *général de division* in the French army. Four children, the Comte d'Eu, the Duc d'Alençon, the Princess Marguerite (married in 1872 to the Prince Ladislas Czartoryski), and the Princess Blanche, are living. The duchess d. suddenly Nov. 10, 1857. J. G. BARNARD.

Ne'nagh, town of Ireland, county of Tipperary, has a neat appearance and a lively inland trade. Pop. 5581.

Nen'nius, the supposed author of the *Historia Britonum* or *Eulogium Britanniæ*, a Latin history of Britain from the arrival of Brutus the Trojan, grandson of Æneas, to A. D. 655. According to several passages of this work, the writer was a monk of Bangor, Wales, but no particulars of his career are known, and it is even disputed whether he belonged to the seventh or the ninth century. The best edition of Nennius is that edited by Rev. Joseph Stevenson for the English Historical Society (1838). A translation by Rev. W. Gunn forms a volume of Bohn's "Antiquarian Library" (1848).

Neode'sha, post-v. of Wilson co., Kan., on the Leavenworth Lawrence and Galveston R. R., has good schools, 4 churches, a fine city-hall building, 1 grist-mill, 3 public halls, 2 hotels, 1 newspaper, a savings bank, and water-power. Pop. 1145. G. P. SMITH, ED. "FREE PRESS."

Neo'ga, post-v. and tp. of Cumberland co., Ill., on the Illinois Central R. R. Pop. of v. 540; of tp. 2285.

Neol'ogist, the name with which in the middle of the eighteenth century the old orthodox party in the Protestant

churches designated the champions of the new rationalistic movement. The word was formed in Germany, and means one who introduces new doctrines which have no other recommendation than their novelty. The Neologists in their turn called the orthodox *Palæologists*—that is, people who cling to old ideas which have no other foundation than their antiquity. The position of the two parties was curious, though not without danger to the orthodox, and even to Christianity itself. They both agreed that Christianity was the greatest blessing ever conferred on mankind, and that the Bible was the highest Christian norm, the *regula fidei*. But there the harmony ceased. The Neologists considered education and enlightenment as the only means of progress—yea, of salvation—and anything which could not be acquired by education or grasped by an enlightened understanding they denounced first as a dangerous mysticism, and later as a wicked lie. In this spirit they undertook to interpret the Bible. They never said that it contained anything which was untrue, but they asserted loudly that it contained much which had hitherto been wholly misunderstood. They did not deny the miracles, as far as regarded their historical reality; they only refused to acknowledge their supernatural character. The supernatural, of which they had no need, they explained away, and, shielded behind their high-sounding declamations about the sublimity of Christianity and the great benefit which the human race had derived from it, they nearly succeeded in explaining away Christianity itself without anybody noticing it. The first generation of Neologists taught that when the angels ate with Abraham they dissolved the meat into its last elements and caused it to disappear, thus producing an appearance of eating. The next generation explained that when the angel came to the Virgin Mary it was an inner vision which arose in her soul, very much like the common poetical enthusiasm, only stronger and assuming the character of reality in the uncultivated mind of the maiden. At last, the third generation proposed to use the church buildings as storehouses and magazines, and transform the office of the Christian minister into that of a teacher of useful knowledge—a proposition which was actually made in Denmark, and, what is more singular, actually taken into grave consideration by the government. Against such a proceeding the orthodox were entirely without weapons; they could not even denounce it as heresy or skepticism or atheism; they could do nothing but shake their heads and call their adversaries by the very mild name of Neologists. On the contrary, the Neologists were themselves the accusers, and the orthodox the accused. And it was simply its own shallowness which at last turned the whole movement into ridicule. In the second decade of the nineteenth century all those "Christian" ministers who used the pulpit to lecture on artificial manuring, etc. disappeared, at least in Denmark. It must be observed, however, that *neologism* is not synonymous with *rationalism*, though both terms refer to the same historical phenomenon; they denote different spheres. Rationalism is a theological school with a scientific method; the Neologist—he may be a minister, a bookseller (*e. g.* Nicolai in Berlin), a secretary of state, or anything else—is simply a practical man with common sense for his method. CLEMENS PETERSEN.

Ne'ophyte [Gr. νεόφυτος, "newly planted"], in the early Christian Church, a person newly converted and baptized. Before baptism he was called a catechumen.

Neo-Pla'tonism, in the more limited sense of the word, is the name of a philosophical school which originated in Alexandria in the third century after Christ, was founded on the doctrines of Plato, and denotes the last attempt of the speculative spirit of the Greek civilization to establish a scientific basis for its development. The school was founded by Ammonius Saccas (241 A. D.), further developed by Plotinus (205–270), and continued by Porphyrius (233–305), Iamblichus, Proclus (412–485), and others. In a wider sense, the name is applied to the whole speculative tendency which grew up in Alexandria from the amalgamation of Greek philosophy, Oriental theosophy, and Jewish and Christian theology, and of which the above-mentioned philosophical school is only one individual manifestation, while it produced most remarkable intellectual characters in the most different fields of speculation. Thus, Philo Judæus (42 A. D.), Clemens Alexandrinus (220), Origen (185–254), and the Gnostics are severally representatives of the Neo-Platonic form of speculation. (For the general character of this tendency, and the special ideas of the school, see the articles on the above-given names.)

Neo'sho, county of S. E. Kansas. Area, 576 square miles. It is traversed by Neosho River, and by the Missouri Kansas and Texas and the Leavenworth Lawrence and Galveston R. Rs. It is undulating and fertile, and abounds in coal, timber, water-power, and building-stone. Live-stock, corn, and lumber are leading products. Cap. Osage Mission. Pop. 10,206.

Neosho, tp. of Cherokee co., Kan. Pop. 900.

Neosho, tp. of Coffey co., Kan. Pop. 604.

Neosho, tp. of Labette co., Kan. Pop. 515.

Neosho, tp. of Morris co., Kan. Pop. 825.

Neosho, tp. of Neosho co., Kan. Pop. 997.

Neosho, post-v. and tp. of Newton co., Mo., 315 miles S. W. of St. Louis, on the Atlantic and Pacific R. R., has good public schools, 6 churches, 1 bank, 2 newspapers, several manufactories, and 2 hotels. It is in the heart of the S. W. lead-mines of Missouri. Pop. of v. 875; of tp. 2022. A. M. SEVIER, ED. "TIMES."

Neosho Falls, post-v. and tp., cap. of Woodson co., Kan., on the Neosho River and the Missouri Kansas and Texas R. R., 46 miles S. E. of Emporia. Recently founded and rapidly becoming an important commercial centre; has 1 weekly newspaper. Pop. of v. 532; of tp. 1406.

Neosho River rises in Morris co., Kan., flows generally S. S. E., enters the Indian Territory, and joins the Arkansas near Fort Gibson. It is some 300 miles long. Its chief tributary, the Cottonwood, is much larger and longer than the Neosho above the junction.

Nepaul', or **Nepal,** an independent state of Hindostan, situated between Thibet and British India, and between lon. 80° and 88° E. Area, 53,000 square miles. Pop. 1,940,000. The southern part of the country consists of a belt of low land covered with tropical forests, which yield many sorts of valuable timber, but which is hot, utterly unhealthy, and infested with wild animals, such as elephants, tigers, and leopards. From this low land the ground gradually rises, first into hills, where rice, maize, millet, sugar, indigo, and coffee are cultivated, mostly on artificial terraces along the hillsides; then into mountains, in whose elevated valleys wheat, oranges, walnuts, grapes, and other kinds of fruits are grown; and then into alps, among which are the highest peaks of the Himalaya—as, for instance, Mount Everest—and on whose pastures large herds of cattle, sheep, and goats are reared. Iron, copper, lead, tin, zinc, and salt have been found and are mined; cotton cloths and earthenware are manufactured; timber, hides, ivory, fruits, sheep, cattle, and elephants are exported. The inhabitants consist of several tribes, of which the Gorkhas, who are of Hindoo descent and faith, form the warrior-caste and hold the government, while the Newars, who are of Mongolian origin and Booddhists, make the artisans of the country; a third tribe, the Marmi, have retired to the mountains, where they live as agriculturists. Between the various tribes there exists a great difference, not only in character and religion, but even in language; but they all have succumbed to the conquering tribe of the Gorkhas, which invaded the country in the middle of last century. Cap. KHATMANDOO (which see).

Nepen'thes, a remarkable genus of pitcher-plants (the sole type of a peculiar order, Nepenthaceæ) of over thirty species, all natives of the southern tropical region of which the Indian Archipelago is the centre, ranging from Madagascar to New Caledonia. Several are cultivated as curiosities in conservatories. They are all woody climbers, with apetalous and inconspicuous diœcious flowers. Their peculiarity is in the leaves; these are rather long and narrow, traversed by a very strong midrib, which is prolonged into a tendril serving for climbing, the apex of this developed into a tubular or oblong pitcher, closed with a hinged lid. Until the pitcher is full grown the lid closes the orifice. A watery liquid, having a slight acid reaction, is secreted in the pitcher in small quantities. At maturity the lid opens, and remains so, more or less elevated on its hinge; the watery secretion still continues, especially if animal matter is introduced, but it may now escape by evaporation. About the rim of the pitcher a sweet secretion forms under favorable circumstances, which is attractive to insects; and dead insects generally abound in the pitcher. The recent researches of Dr. Hooker nearly prove that the liquid within possesses digestive properties, and that its powers of dissolving animal matter are augmented by a peculiar secretion which is hardly if at all poured out until insects or other animal substances are introduced. (For analogous cases see art. PITCHER-PLANTS.) *Nepenthes destillatoria* of Ceylon was the earliest known species. *N. phyllamphora* and *N. ampullaria* of the Archipelago have also been long known in cultivation. Some species are now known from Borneo with pitchers a foot or two in length. A. GRAY.

Nepeuskin, post-v. and tp. of Winnebago co., Wis., on the Horicon division of the Milwaukee and St. Paul R. R. Pop. 1129.

Nephe'line [Gr. νεφέλη, "cloud"], a silicate of alumina, soda, and potash, crystallizing in the hexagonal system and allied to the feldspars. It occurs in volcanic rocks; in some instances so completely taking the place of feldspar as to form a nepheline rock. *Davyne* and *elæolite* are varieties of nepheline, elæolite deriving its name from its greasy lustre (ἔλαιον, "oil"). EDWARD C. H. DAY.

Neph'rite [Gr. νεφρός, "kidney," so named from being formerly worn as a remedy for diseases of the kidneys], or **Jade,** a compact translucent stone, generally greenish in color, variable in composition, but essentially a variety of hornblende. On account of its compactness, excessive toughness, and splintery fracture it is much valued amongst savage peoples as the best material for stone weapons; hence it is sometimes known as axe-stone.

EDWARD C. H. DAY.

Ne'pi [the ancient *Nĕpĕte*], a small but very ancient town of Italy, province of Rome, about 40 miles from the city of Rome, on the post-road to Foligno. It was an important Etruscan town, took part with Veii against Rome, and only became a Roman colony in 400 B. C. It continued a flourishing town till the fall of the Roman empire, and as a distinct duchy plays no inconsiderable part in the mediæval history of Rome. Many antiquities of great interest have been found here. Pop. 2382.

Ne'pomuk (JOHN), a saint of the Roman Catholic Church, the patron saint of Bohemia, b. at Nepomuk, Bohemia, about 1330; studied at the University of Prague; became rector of the church of St. Gall in that city, and was appointed court-preacher to the emperor Wenceslas in 1378. In this position he opposed and reproved with undaunted courage the suspiciousness and cruelty of Wenceslas, but at last, in 1373, he was imprisoned, tortured, and thrown into the Moldau. His body was found and buried; many miracles were wrought at his grave; legends gathered around his name, and on Mar. 19, 1729, he was canonized by Pope Benedict XIII. The cathedral of Prague contains a magnificent monument of marble and silver to his honor. His festival is held on May 16. (See Abel, *Die Legende des heiligen Nepomuk*, Berlin, 1855.)

Nepon'set, post-v. and tp. of Bureau co., Ill., on the Chicago Burlington and Quincy R. R. Pop. 1510.

Nepon'set Vil'lage, a v. of Norfolk co., Mass., on Dorchester Bay, near the mouth of Neponset River, and on the Old Colony R. R. It is a place of considerable trade, and a port of delivery for the collection district of Boston.

Ne'pos (CORNELIUS), a Roman historian of whose life nothing is known but that he was a friend of Atticus, Cicero, and Catullus; d. under Augustus; wrote various works, all of which have been lost with the exception perhaps of parts of his *De Viris Illustribus*. The work *Vitæ Excellentium Imperatorum*, now commonly used as a schoolbook, and generally ascribed to Cornelius Nepos, was first printed in 1471 under the name of Æmilius Probus, an obscure writer of the fourth century. But in a new edition of 1569, Dionysius Lambinus claimed the authorship of the book for Cornelius Nepos, and identified it as a part of his lost *De Viris Illustribus*, chiefly on the ground that the purity of the language and the simplicity of the style would be impossible with a writer of the fourth century; and this opinion, modified by various hypotheses, has been generally accepted. Editions and translations are very numerous. Among the most useful editions are those of Van Staveren, revised by Bardili (2 vols., Stuttgart, 1820), of Bremi (Zurich, 1827), of Siebelis (6th ed. 1867), and of Nipperdey (5th ed. 1868).

Nep'tune [Lat. *Neptunus*], the principal sea-god of the ancient Romans. Little is known of his original character and myth, as he is completely identified in later times with the Greek Poseidon, who was the god of the Mediterranean, the creator of the horse, and one of the great gods of the maritime Greeks. He was the son of Cronos and Rhea, and the husband of Amphitrite. He is depicted as armed with the earth-shaking trident and attended by a train of sea-nymphs and Tritons.

Neptune. The discovery of this planet is justly regarded as the most remarkable astronomical achievement of the century. Up to about the beginning of the present century it was found that the motions of all the planets could be perfectly accounted for by the attraction of the sun and their mutual attraction on each other. But when, about 1820, Banvard proceeded to construct tables of Uranus, then the outermost known planet, an apparent exception presented itself, and the observations could not be reconciled with the motions computed from the attraction of the sun, Jupiter, and Saturn. We remark that although this planet was discovered by Sir William Herschel in 1781, it was afterwards found that a number of astronomers had actually seen it and observed its position before that time, supposing it to be a fixed star. One of these observations was by Flamsteed as far back as 1695. Banvard, finding that he could reconcile the observations made after 1781 with the theory, omitted the older ones entirely, leaving it to the future to find why they could not be so reconciled. But it was soon found that the planet began to deviate from the tables much more rapidly than could be accounted for by the necessary uncertainty of the data on which the tables were founded. The cause of this deviation was a subject of consideration among astronomers, and it seems to have occurred to several that it might be due to the action of an unknown planet beyond Neptune. But the problem of finding this planet was one which for some time no one ventured to attack. In 1840, however, the deviations had become so wide, amounting to two minutes of arc, that they attracted more attention than before, and three astronomers took up the problem of tracing them to their cause. The first of these was the illustrious Bessel of Königsberg, who commenced work about 1840 by making a critical examination of the correctness of Banvard's computations, and setting one of his assistants, Fleming, at the work of making a careful reduction of the Greenwich, Paris, and Königsberg observations. But the death of Fleming and the ill-health of Bessel prevented the work from being carried further. Mr. John C. Adams was then a student at Cambridge. In the summer of 1841 he became acquainted with the state of this question by reading a report of Mr. Airy, and it occurred to him that it ought to be within the power of mathematics to calculate the position and movements of the disturbing planet from the observed deviations of Uranus, and he determined to undertake the problem as soon as his studies would permit. In the autumn of 1845 he had so far advanced as to have computed an approximate orbit of the hypothetical planet, and about the end of October of that year he communicated the position of the planet to Prof. Airy, within a degree and a half of the real position of Neptune. Had an expert astronomer pointed a telescope of six inches aperture in the direction indicated by Mr. Adams, and swept for the planet, he must have recognized it by its disk after a few minutes' examination. But Prof. Airy had so little confidence in the prediction that he did not take the trouble to look for the planet. In the mean time, a third person entered the field. This was Mr. U. J. Leverrier, then a young man of little over thirty, who had proved his mathematical ability by a very important paper on the secular variations of the orbits of the planets. In June, 1846, he presented to the Paris Academy of Sciences a paper in which he assigned an approximate position of the planet, agreeing very nearly with that already found by Adams. After Airy heard this he began to consider the planet worth looking for, and at his suggestion Prof. Challis, director of the Cambridge Observatory, commenced a search. Instead, however, of trying to recognize the planet by its disk, he commenced the work of preparing an extensive catalogue of the stars in a space of several degrees each side of the computed place of the planet, which would necessarily occupy a considerable time. Meanwhile, Leverrier was engaged in determining more accurate elements, which he communicated to the Academy about the end of August. Being now entirely confident that the planet must be very near the assigned place, he wrote to Dr. Galle of Berlin requesting him to search for it. Galle received the letter on Sept. 23, 1846, and the very same evening went to the telescope, proceeded to compare the stars in the neighborhood of the assigned place with a star-chart of that region which had just been finished. He soon found a star of the seventh or eighth magnitude which was not on the chart, within a degree of the position sent by Leverrier. As it presented a sensible disk, there could be no reasonable doubt that it was the object sought. But, desirous of proceeding with caution, he waited till the following night, when he found that it had actually changed its position among the stars. There was no longer any doubt of the reality of the discovery. After considerable discussion astronomers in general agreed upon the name Neptune for the newly-discovered planet.

Subsequent investigations of the motions of Neptune have been made almost entirely by American astronomers. The first one in the field was Sears C. Walker, then astronomer at the Naval Observatory, Washington. He computed an accurate orbit of the planet from all accessible observations, and then proceeded to inquire whether it had not been observed as a star at some former time, as Uranus had been. Computing the place of the planet for those previous years in which its path was known to have been swept over, he found that on May 10, 1795, Lalande had observed a star almost exactly on the path of Neptune, which was now missing from the heavens, and which must have been the planet. When the news of this discovery reached Europe, search was made among the original

manuscripts of Lalande, and it was found that the planet had also been observed on May 8, but finding the two observations discordant, owing to the motion of the planet during the interval, he had rejected his first observation entirely. These observations have been very valuable in fixing the orbit of the planet. This planet, which, so far as is yet known, is the most remote from the sun of all the members of the solar system, moves in an orbit nearly circular, having an eccentricity of only 0.00872; yet on account of the vastness of the dimensions of this orbit, the absolute eccentricity in miles exceeds 25,000,000, and the difference of its distances from the sun in aphelion and perihelion is more than 50,000,000. The inclination of the orbit to the ecliptic is 1° 47′, and its mean radius about 27,746,000,000 miles. The period of revolution of the planet is about $164\frac{3}{5}$ years, and its diameter about 37,000 miles. Its bulk is therefore more than one hundred times that of the earth, but its density is so much less ($\frac{1}{6}$th) that it has only about $16\frac{35}{100}$ths times as great a mass. (For the more exact statement of its element see SOLAR SYSTEM.)

Neptune has a single satellite, discovered in 1847 by Mr. Lassell of Liverpool. Its period is *5d. 21h. 2m. 44s.*, and its mean distance from the planet about 230,000 miles. S. NEWCOMB.

Neptune, post-v. of Centre tp., Mercer co., O., 6 miles from Celina. Pop. 96.

Neptu′nian, a name formerly given to a school of geologists who maintained that all rocks were of aqueous origin, in opposition to the Plutonic theory, that many rocks were undoubtedly of igneous origin. At a later date these terms were applied respectively to the rocks of aqueous and of igneous origin.

Nérac′, town of France, department of Lot-et-Garonne, on the Baise, has distilleries, wool-spinning factories, and a trade in corn, hemp, linen, etc. Pop. 7717.

Nerbud′da, a river of Hindostan, rises near Ammerakante, in lat. 22° 40′ N. and lon. 81° 52′ E., crosses the peninsula with a nearly straight westward course of 620 miles, and falls into the Bay of Cambay, forming a large estuary. It is a broad and deep river, but its navigation is much impeded by rocks and cataracts.

Ne′reids [Gr. Νηρεΐδες, plu. of Νηρεύς], the fifty daughters of the sea-god Nereus by Doris, his wife. The ancients regarded them as the nymphs of the Mediterranean Sea, as opposed to the Oceanids, nymphs of the ocean-stream or outer sea. They were worshipped by mariners, and were represented as beautiful and youthful maidens, commonly nude. They are sometimes figured as half woman and half fish, like the mermaids of our later myths. Their names are variously given.

Nereids. See SEA-MOUSE.

Ne′ri, de′ (FILIPPO), known in English as ST. PHILIP NERI, b. at Florence, Italy, in July, 1515; was adopted by a wealthy uncle as his heir; secretly went to Rome to study theology and canon law; distributed his property to the poor 1538; devoted himself to the care of pilgrims and the destitute sufferers in hospitals, in which work he was associated with Ignatius Loyola; took holy orders 1551, and founded the order of "Priests of the Oratory," approved by Gregory XIII. in 1575. D. at Rome May 26, 1595, and was canonized 1622. (See article ORATORY, and Faber's *Spirit and Genius of St. Philip Neri*, 1850.)

Neriad′, town of British India, presidency of Bombay, stands in a fertile and densely-peopled district, and forms the centre of an extensive tobacco-manufacturing industry. It is well built and healthy. Pop. about 40,000.

Ne′ro, Roman emperor from 54 A. D. to 68, b. at Antium, on the coast of Latium, Dec. 15, 37 A. D., a son of Cn. Domitius Ahenobarbus and Agrippina, a daughter of Germanicus Cæsar and a sister to the emperor Caligula. His true name was L. Domitius Ahenobarbus, but one year after his mother's marriage with her uncle, the emperor Claudius, he was adopted by him in 50, and assumed the name of Nero Claudius Cæsar Drusus Germanicus. In 53 he was married to Claudius's daughter, Octavia, and on Oct. 12, 54, he succeeded to the imperial throne by the intrigues of his mother, who kept Claudius's son, Britannicus, concealed in the palace until Afranius Burrhus, *præfectus prætorio*, had got Nero elected emperor by the prætorian guard. The principal events of his reign were the long war with the Parthians, successfully conducted by Domitius Corbulo; the insurrection of the Jews, put down by Vespasian; the rebellion in Britannia under Boadicea, suppressed by Suetonius Paulinus; the conflagration in July, 64, by which two-thirds of the city of Rome was burnt down, and of which the people accused the emperor, while he accused the Christians, who suffered for it; the rebuilding of the city by the emperor on a magnificent scale, and especially the construction of the new imperial palace, the *Aurea Domus*, etc. But the personal character of the emperor absorbed attention so absolutely that all public events which were not immediately connected with his person, and did not serve to explain his character, were recorded in a confused manner or forgotten. Even his own time, which had borne and educated him, considered him a monster. The most groundless suspicions and the most unnatural jealousies—moods which pass even through the most ill-regulated minds only as fugitive caprices—settled in his soul, and drove him to actions which the cruelest tyrants never have committed save in the frenzy of passion. He killed those whom he feared, Britannicus and his own mother; those who in any manner stood in the way of his whims, among whom were his first two wives, Octavia and Poppæa Sabina; and at last he killed everybody who attracted his attention. In 65 a conspiracy was formed against him, but it failed; Seneca, his old tutor, and Lucanus were sacrificed. But in 68, when he had just returned from a journey in Greece, where he had appeared as a singer on the stage, he was overwhelmed by an insurrection in Gaul, Spain, and Rome itself. He fled, and killed himself in the house of one of his freedmen, a few miles from Rome, June 11, 68.

Nertchinsk′, town of Asiatic Russia, government of Irkootsk, at the junction of the Nertcha and the Shilka. It is the centre of an important mining-district, yielding yearly 2100 pounds of gold, 8500 pounds of silver, and 1,200,000 pounds of lead. Pop. about 5000.

Ner′va (MARCUS COCCEIUS), Roman emperor from 96 to 98 A. D., b. at Narnia, in Umbria, in 32 A. D.; was elected emperor by the senate on the death of Domitian, Sept. 18, 96; carried through some beneficial reforms in the administration; adopted Ulpius Trajanus, commander of the army of the Rhine, and d. Jan. 27, 98.

Nerve-Fibre and Cell. See HISTOLOGY, by COL. JOSEPH J. WOODWARD, M. D., M. N. A. S.

Nerves [Gr. νεῦρον, "nerve"] are the cords of communication between the central nervous system and the peripheral parts—the skin, internal surfaces, muscular apparatus, organs of special sense. These cords vary in diameter from a microscopic dimension to ten millimètres; their length also varies immensely, from a few lines to two feet and more. Every nerve, whether microscopic or larger in size, is a compound structure made up of nervous and of connective tissue. The nervous tissue constitutes the nerve-fibres, and the connective tissue makes up the internal and external sheaths of the nerves, enveloping them, and separating the bundles or fasciculi of fibres in the interior of the nerve. Nerve-fibres are of two kinds—such as are simple bands of nervous matter, and those which are composed of three parts. The former sort (so-called fibre of Remak, amyelinic fibre) is found chiefly in the sympathetic nervous system, appearing under the microscope as simple, flattened, ribbon-like bands of nervous matter, bearing nuclei at certain intervals (diameter 3 to 6 mmm.). These fibres are bound together to form nerves by very delicate connective tissue in relatively small amount. Nerve-fibres of the second kind (so-called common or myelinic fibres) are composed of a central round cord of nervous matter (perhaps analogous to the preceding kind of fibre), the axial cylinder, which extends uninterruptedly from the central nervous organs (brain and spinal cord) to peripheral organs—muscles, skin, special sense apparatus. About this is a layer (relatively large) of fatty nervous matter, the myeline or medulla, which we now know, by the researches of Prof. Ranvier of Paris, not to be an uninterrupted casing for the axial cylinder, as formerly taught, but to be completely interrupted by constrictions at intervals of about 1 mm. The third part of the myelinic fibre is the membrane of Schwann, a delicate tube of homogeneous tissue which encloses the myeline, and is constricted with it. The membrane of Schwann and the myeline are thus disposed in short segments around the continuous axial cylinder; and upon each of these segments is found a nucleus belonging to the membrane of Schwann. The diameter of myelinic fibres varies from 3 to 16 mmm. In the large nerves of the extremities these fibres are united into bundles by delicate connective tissue, and these bundles joined together to form the nerves; a relatively thick and strong sheath of this tissue enclosing the entire nerve. In the connective tissue blood-vessels run, and in it there are lymphatic spaces in communication with the sub-arachnoid space of the spinal cord. The terminal parts of nerves consist of various forms derived from the axial cylinder. Such forms are the terminal motor plates in striped muscular fibres, the sharp points in unstriped muscular fibres, points, knobs, and coils in the skin, special organs in the tongue, nose, eye, and ear.

The functions of nerves are general and special. As general functions or properties are recognized—(1) conductibility, (2) excitability. By the former, sensory impressions are conveyed from peripheral parts through nerve-fibres centripetally to the nervous centres; the spinal cord and brain are thus affected by the external world. Again, conduction takes place in a centrifugal direction, motor excitations being sent from the nervous centres to peripheral apparatus; the activity of the organism is made externally manifest. Excitability is the property which nerves have of reacting to impressions independently of the nervous centres—a property which, after section of a nerve, survives for about three days in the distal portion. The special functions of nerves are treated of under other headings. (See SENSATION, EYE, EAR, TASTE, etc.) Nerves are liable to various diseases, such as inflammation (neuritis), tumors (neuroma), and often receive injuries. (See also HISTOLOGY.) E. C. SEGUIN.

Ner'vii, an ancient Belgic race, probably of Germanic or Dutch stock, who desperately opposed Cæsar in several bloody wars (57–52 B. C.). Their chief towns were *Bagacum* (Bavai) and *Camaracum* (Cambrai).

Nerv'ous Diseas'es, affections of the nervous system, which are either organic or functional; *i. e.* diseases produced or accompanied by an anatomical alteration which can be recognized with the naked eye or the microscope, and such as are caused by morbid states not accompanied by any such alterations. It is, however, probable that intimate chemical changes, not to be recognized with our present means of observation, occur in organs which are "functionally" diseased. The growth of physiological and psychological knowledge in the last few years has caused mental affections to be classed with nervous diseases. Besides these, there are the following principal morbid states (many of which are treated of separately in this work under appropriate headings): anæmia, hyperæmia, mal-nutrition of the great nervous centres; hysteria, spinal irritation, epilepsy, chorea, neuralgia, tetanus, catalepsy; inflammations of the brain, spinal cord, and nerves (and their envelopes); tumors and injuries of the same; apoplexy. It should be borne in mind that many nervous diseases, so called, are only expressions of general pathological states, or sympathetic reactions to local morbid states of non-nervous organs. It has been thought that certain nervous diseases, such as insanity, hysteria, epilepsy, etc., become more frequent with increasing civilization. This is not fully established, and yet there can be no doubt that the strains of social life, the struggle for existence, the enormous striving of ambition, the intemperate use of sensual gratifications, cause the above diseases in a more or less direct manner. Nervous diseases—or, more exactly speaking, the liability to nervous diseases—are very easily transmitted from parents to their children, this being most strikingly shown in insanity, hysteria, epilepsy, neuralgia, apoplexy. An important factor in the development of nervous diseases is wrong education, the cultivation of the mental powers during the age of growth; not enough rest, and insufficient (especially fatty) food being allowed. The evil effects of school-life are seen in both sexes, though perhaps more often in the female. *Mens sana in corpore sano* is not a mere adage, but a physiological truth. E. C. SEGUIN.

Nervous System. See COMPARATIVE ANATOMY, by PROF. EDWARD D. COPE, M. D., M. N. A. S.; HISTOLOGY, by COL. JOSEPH J. WOODWARD, M. D., M. N. A. S.; and NERVES, by PROF. E. C. SEGUIN, M. D.

Nervous System, Ganglionic. See GANGLIONIC NERVOUS SYSTEM, by PROF. E. C. SEGUIN, M. D.

Nes'copeck, post-v. and tp. of Luzerne co., Pa., on the Susquehanna River, at the mouth of Nescopeck Creek. A bridge across the river connects it with Berwick. Pop. 968.

Neshan'nock, tp. of Lawrence co., Pa. Pop. 1132.

Neshko'ro, post-v. and tp. of Marquette co., Wis., 70 miles N. of Madison. Pop. 436.

Nesho'ba, county of Central Mississippi. Area, 576 square miles. It is undulating and fertile. Cotton and corn are leading products. The county is traversed by Pearl River. Cap. Philadelphia. Pop. 7439.

Nesho'noc, tp. of La Crosse co., Wis. Pop. 869.

Ne'smith, tp. of Winston co., Ala. Pop. 380.

Nesmith (JAMES W.), b. in Washington co., Me., July 23, 1820; removed in youth to New Hampshire, in 1838 to Ohio, thence to Missouri, and in 1843 to Oregon; served as an officer in Indian wars; was U. S. marshal for Oregon 1853–55; was Democratic U. S. Senator from Oregon 1861–67; was elected to Congress in 1873, and has held other important offices in Oregon.

Nesmith (JOHN), b. in Londonderry, N. H., Aug. 3, 1793; began his career with few resources, but became a successful merchant of New York with his brother Thomas; removed in 1831 to Lowell, Mass., where he became a prominent manufacturer, real-estate owner, and inventor; was one of the founders of Lawrence, Mass.; was lieutenant-governor of Massachusetts 1862, and held other important positions; was distinguished for liberality in charitable causes. D. Oct. 15, 1869.

Ness, county of Central Kansas. Area, 900 square miles. It is rolling and adapted to stock-raising. It is watered by Walnut Creek and its branches and the Pawnee fork of the Arkansas River. Pop. 2.

Nes'selrode, von (KARL ROBERT), COUNT, b. Dec. 14, 1780, at Lisbon, where his father was Russian ambassador; entered very early on a diplomatic career; gained the confidence of the emperor Alexander; was made minister of foreign affairs in 1812, vice-chancellor of the empire in 1829, chancellor in 1844, and governed the relations of Russia with foreign powers to 1856, when, after signing the Peace of Paris, he retired into private life, and d. at St. Petersburg Mar. 23, 1862. He played a prominent part in all the diplomatic negotiations which preceded and followed the downfall of Napoleon I.; adhered stubbornly to the policy of the Holy Alliance; was peaceable, illiberal, a skilful administrator, a shrewd negotiator, very rich, and a great gourmand; but he had no ideas, and the increased influence of Russia during this period was due to favorable circumstances and the personal character of Alexander I. and Nicholas, rather than to the talent of the chancellor. His *Autobiography*, written in French, was published after his death.

Ness, Loch, a lake of Scotland, in the county of Inverness, in the valley of Glenmore, is 23 miles long and $1\frac{1}{2}$ miles broad, and communicates with the Moray Frith by the river Ness.

Nes'tor [Νέστωρ], the friend of Hercules, the aged hero of the Greeks at the siege of Troy, distinguished alike for valor, wisdom, justice, and eloquence; he reconciled Achilles and Agamemnon. He was a native of the Messenian Pylos, and in his youth fought against the Centaurs. In extreme age he was honored by those seeking advice and direction as though he were of equal authority with the immortal gods.

Nestor, b. in 1056, entered the Petcherskoi convent of Kiev, and d. in 1114. His *Annals of Russia*, the earliest historical work in the Russian literature, written in the Old Slavonian dialect, and commencing with the year 852, is of great interest for the history of Northern Europe, though it has been much interpolated and mutilated by later writers. The best edition of the text is that by Bykkoff (St. Petersburg, 1873). There is a translation into Latin by Miklosisch (Vienna, 1860), and into German by Schlözer, accompanied by commentaries and notes (Göttingen, 1802–09).

Nesto'rians, a portion of the Oriental Church, adherents of Nestorianism (dioprosopysm, two-person-ism), a Christological theory which takes its name from Nestorius, who was not its first nor ablest, but became its most renowned, representative. I. Nestorius was a native of Germanicia in Syria, became a pupil of Theodorus of Mopsuestia (393–428), and from him received the views characteristic of the school of Antioch with which his own name was to be identified. First a monk, then a presbyter in Antioch, his ascetic piety and gifts as a preacher caused him to be chosen patriarch of Constantinople, the great calamity of his life (428–431). Like no few of the great heresiarchs, he began as a zealot of orthodoxy and as a persecutor of heretics. The new patriarch and his presbyter, Anastasius, whom he had brought with him, heard in Constantinople on every hand the darling phrase of the school of Alexandria, "Mary, mother of God"—a phrase which, except with explanations and limitations which totally changed its meaning, the extreme wing of the school of Antioch would not tolerate. The presbyter (428) assailed this phrase and the theology it represented. Proclus, the unsuccessful rival of Nestorius for the patriarchate, eagerly caught at the opportunity of assailing Nestorius through his presbyter. Nestorius stood by Anastasius. Dorotheus, the court-bishop, pronounced an anathema against those who should style Mary the mother of God. At the festival of the Annunciation (429) Nestorius and Proclus preached in the same church against each other. The monks and people rose in fury, renounced fellowship with the patriarch ("We have an emperor, but no bishop"), and treated him with such insolence that in his anger he had the monks scourged, and at a local synod convened in 429 anathematized his opponents as Manichæans.

II. There entered now into the conflict the most for-

midable foe encountered by Nestorius. This was Cyril, bishop of Alexandria (412–444). His theology was antagonistic to that of Antioch, and his see was the rival of Constantinople. Nestorius afforded him the opening for dealing one decisive blow against both the objects of his dislike. It was a contest between a great theologian and a shallow popular orator, between a sagacious, unscrupulous man of the world and a monk whose excellencies and defects showed the traces of the passiveness and the narrowness of the cloister. Worst of all for Nestorius, there was a statement, necessarily crude in certain aspects, yet in the main strong and sharply defined, of the logical result of the dominant movement of the mind of the Church for ages, over against a set of clumsy propositions, which never touch the real question in discussion, but persistently misstate it, and whose precise force in various respects is an object of dispute to this hour. Cyril charged Nestorius with making two persons, of two natures, and thus denying the proper personal deity of Christ, making him in one person God, in another person man, and not, as he was in truth, in one person, the God-man, so that every act and every passion was personal, though it were according to one or the other nature. Nestorius was charged with teaching a moral, ideal, voluntary *connection* (συνάφεια) of two persons, instead of the natural, real, and inseparable *union* (ἕνωσις) of two natures into one person. At the synod of Alexandria (430) Cyril issued twelve anathemas, to which Nestorius replied in the same form.

III. The third Œcumenical Council was convened by the desire of both parties at Ephesus (431). The emperor Theodosius II., who called it, was friendly to Nestorius. After a delay of fifteen days, in consequence of the involuntary detention of John and the other Syrian bishops, the council proceeded in their absence, in a very hurried way, to condemn and depose Nestorius and fifty bishops who sympathized with him. It acknowledged the anathemas of Cyril as the true doctrine of the Church. The delayed bishops held a separate council, and made decisions reversing all that had been done by the other. Nestorius voluntarily retired to his old cloister. The emperor attempted to unite the parties at the Council of Chalcedon (432), but without success. The deposition of Cyril, Memnon, and Nestorius had been pronounced in form by the emperor, but only in the case of Nestorius did it take effect. The overthrow of Nestorius made it safe for Cyril to accept the advances of the emperor toward a settlement of the controversy. A formula was prepared by Theodoret (433) which confessed that there is, without confusion, such a union of the two natures in the one Christ as to justify the language that Mary is the mother of God. This was signed by Cyril on the one side, and on the other side John of Antioch concurred in the anathema pronounced on Nestorius. Many of the earnest men on both sides, but especially those of the school of Antioch, were dissatisfied with the compromise. The emperor urged it. Theodoret yielded on condition that he should not be required to sign the condemnation of Nestorius. Meletius and Alexander continued their resistance, and were deposed. Nestorius had now lost all favor with the emperor. Even the poor shelter of the cloister was denied him, and he was hunted from one place of exile to another until his death (440).

IV. The Nestorian party did not, however, become extinct. Their school at Edessa, a daughter of the school at Antioch, trained men for the priesthood of the Church in Persia. Ibas, bishop of Edessa (436–457), was one of its great names. Thomas Barsumas, bishop of Nisibis (435–489), labored to secure a permanent place for Nestorianism in Persia. He established a patriarchate in Seleucia, and when the school at Edessa was destroyed by order of Zeno (489) he founded a school at Nisibis. It was the policy of the Persian kings to foster the division between their own Christian subjects and the Christians of the Roman empire. The Nestorians established a distinct church government, and called themselves not Nestorians—which was the title by which their enemies stigmatized them—but Chaldee Christians, with reference to their earlier home and the language which they employed in their church service. At the Council of Seleucia-Ctesiphon (498–99), a statement of their doctrine and of its divergency from what claimed to be orthodox was made, and the Church of Persia was formally separated, making its doctrinal basis the assertion that Christ consists of two substances, two natures, and of two persons or hypostases, in one "partsupo" of filiation, the natures continuing to subsist unchanged, and the persons also. The term "partsupo" (parsopa) has been the subject of a good deal of dispute, as more than any other determining the orthodoxy or heterodoxy of the Nestorians. There is no reason to doubt that it is formed from the Greek πρόσωπον. The Peschito-Syriac uses it to render that word in its sense of face, appearance, outward appearance, manifestation of presence, person (in the popular sense), and in the Nestorian usage it often corresponds with Asseman's definition of it, "nature manifested to the senses." But in connection with "filiation" it seems to correspond very nearly with what is called "hypostatical relation," and would mean that though there are two persons in Christ, there are not two sonships, but that the human derivative sonship coincides so far with the divine essential Sonship as to stand in the unity of the *relation* of the Son, though not in the unity of his *person*—in unity of the partsupo, but not in unity of the qitomo (chauma-hypostasis). The metaphysical difficulty running through the entire Christological controversies of the ancient Church connected itself with the identification or distinction of the ideas of nature and person. Nestorianism affirmed the concrete identity of the two. (See MONOPHYSITES, MONOTHELITES. See Weismann, *H. N. J. I.*, 632; Schröckh, *K. G.*, xviii. 311; Badger, *Nestorians and their Rituals* (1852), ii. ch. vi.)

V. In the sixth century Nestorianism spread into Egypt and Arabia. At the beginning of the eleventh century we find Nestorians in Tartary. (See JOHN, PRESTER.) They ultimately established congregations in India and China. The Nestorian patriarch Zesuzabes entered into a formal compact first with Mohammed, and subsequently with Omar. During the Arabian domination the high places of state were open to them. In the tenth century they were oppressed, and from that time there has been a decline in their intellectual and theological activity.

VI. The Nestorians remained under one ecclesiastical head until in the sixteenth century. In the thirteenth, Innocent IV. and Nicholas IV. had made attempts, which were not successful, to bring about a union of the Nestorians with the see of Rome. The influence of Rome, however, was sufficient to divide them in the choice of their iazelich (the catholic—their name for their patriarch) in 1551. One party favored Sulakas, who under the name of John had been consecrated by Julius III. The others adhered to Simeon Barmas. The partisans of John went over to the Church of Rome, and form the United Nestorians, or, as they are not infrequently named, giving them the title of the ancient undivided body, Chaldee Christians. They number about 90,000 souls, acknowledge the primacy of the pope and the seven sacraments, and observe the ritual of the Greek Church. Their patriarch has his see at Diarbekr. The non-united Nestorians acknowledge three sacraments only, baptism, the Lord's Supper (in both kinds and without solitary masses), and ordination. They have been styled for these and other reasons "the Protestants of the East." They have no pictures or images. Their clergy are allowed to marry. They have a population of about 70,000. The internal energy which once marked the Nestorian churches has almost vanished. The Nestorians of India are called the Christians of St. Thomas, or Syrian Christians. Those on the coast were brought into nominal union with the see of Rome in 1599. These have nearly 100 churches, a population of about 150,000, and a theological seminary at Pulingunna. The Christians of St. Thomas in the interior declined the union with the pope, and when a renewed effort was made in 1653 to bring them into it they fled to the Ghauts and placed themselves under the protection of the rajah. They have between sixty and seventy churches, and number about 70,000. The Nestorian monks and nuns observe the rule of St. Anthony. Their centre is the cloister of Hormoz. Their vows are not strict. It is possible to be freed from them and to marry. In addition to their religious duties, the monks occupy themselves with manual labor; lay sisters provide their support. Some of the cloisters have the monks and nuns in separate cells, under one roof. Flesh, butter, and milk are forbidden. The costume of the brethren and sisters consists of a black upper robe and skirt. The brethren wear a blue turban, the sisters a black veil.

VII. Missions have been attempted by Americans among the Nestorians in Turkey and Persia. Among the laborers in this work the most distinguished has been Dr. Perkins since 1834. The Jesuits are charged with having been at the bottom of the outbreak in which the Kurds and Turks waged a war of extermination against the Nestorians of the mountains in 1843, and by which the Protestant missions were swept away in 1846. Mission efforts have since been renewed with happy results.

VIII. The older literature is given in Walch, *Bibl. Theol. Sel.;* Winer, *Handb.*, and Danz, *Univ. W. B.* (See Smith and Dwight, *Researches* (1833); Grant's *Nestorians* (1841); Wiggers, *Statistik* (1842); Perkins (1843); Wingard, *Pres. State of the Church* (from the Swedish, 1845); Layard, *Nineveh* (1849); *Woman and her Saviour in Persia* (1863); *Christian Year-Book* (1868); R. Anderson, *History of Missions to the Oriental Churches* (1873); Laurie, *Dr. Grant and the Mountain Nestorians* (1874).)

C. P. KRAUTH. √

Nests of Birds. The class Aves, or birds, is conspicuously distinguished from all other animals by various peculiarities of form, structure, and manner of life. These combine to make their organization at once the most interesting and—with the exception only of that of man himself—the most striking in its wonderful design in the broad domain of nature. And of all the features that characterize bird-life, and separate it in the most marked manner from every other form of vitalized existence, the most distinguishing are what we call their *nests*. By this term is to be understood not merely the various structures erected by themselves, but whatever else is used by them to promote the development of their matured *ova* or eggs, and by a large portion for the temporary shelter of the young bird after it has been hatched. The employment of nests is universal, and in a certain sense is a peculiarity shared with them by no other class.

Every female bird deposits her matured egg without any apparent development of its hidden germ. The design is obvious and wonderful. By means of its admirable system of air-cells each bird is able, under all circumstances, to avail itself of the peculiar lightness and buoyancy of frame which are so essential to its animal economy. They are necessary for its flight in the air; they alone can secure its freedom of motion on land or in the water. Equally necessary for the continued existence of this class is its means of abundant and uninterrupted reproduction. In the species where these conditions have been incomplete, as in the cases of the dodo, the great auk, and others, the birds have become extinct. Its many exposures of life, its numerous enemies, and the constant dangers to which it is subjected render a large propagation necessary for its preservation. Any manner of reproduction at all resembling the gestation of Mammalia would be wholly incompatible with these requirements, and would interfere with its lightness of body, prevent freedom of motion, hinder it in procuring necessary food, and thus render impossible either its successful reproduction or even its existence.

The common *Ortyx Virginianus*, or quail, of Eastern North America has been known to have thirty-six eggs in a single nest, and even though these may have been the contribution of more than one female, such a case strikingly illustrates the peculiar advantages of this manner of reproduction, for the weight of the aggregate product of one nest before maturity is many times that of the parent. To provide for even a single bird of this numerous flock by any internal organ would be inconsistent with its safety. It is all the more apparent that to rear so large a brood requires a receptacle wholly separate and external. This external shelter we call a nest, even though it may be nothing more than the bare rock or the flat housetop on which the common nighthawk (*Chordeiles popetue*) deposits its eggs without any addition to or change in the original condition of the spot. Some nests are wonderful in their design and beautiful in their structure. Others are simple and even rude in form, and many are an unchanged place, suitable in itself and without additional adaptation. Each is complete in itself for its purpose.

The nest, in the economy of the bird, corresponds in its uses and its duties with the uterine organs of all mammals and the marsupial pouches of certain others. It becomes to the bird an external organ for continuing the means of reproduction distinct and separate, and is indispensable for the proper development of the immature young from the first appearance of the germ in the egg to a maturity more or less advanced. This degree of maturity varies immensely, according to the peculiarities of the family. Thus, the young ostrich comes into the world able to shift for itself from the very shell, while the nearly blind and naked offspring of the pigeon is so tender and helpless that it requires to be fed with food prepared for its peculiar wants within the inner organs of its parents. For the preservation of the egg and for the proper development of the young germ there are necessary, besides this external receptacle or nest in which the eggs may be collected, preserved, and hatched, a certain amount of constant and uniform heat. Except in a very few—and these remarkably abnormal cases—the supply of warmth is generated by contact with the body of the parent. In some this is aided by the heat of the sun, and also by the reflected warmth of surrounding objects. In a few very remarkable instances the necessary warmth for the hatching of the egg is derived from vegetable decomposition, and in others from the sun's rays, without any parental intervention except the mere deposition of the egg.

Ingenious attempts have been made to classify the various features and peculiarities, architectural and otherwise, exhibited by different birds in the construction of their nests or in the substitutes made use of in their stead. These have been necessarily incomplete, and only in part successful. In some respects the grouping of these variations of habit and design are not without interest, though the lines of distinct separation cannot always be well defined. Birds classed as "ground-builders," for instance, do not always build on the ground, but very many species, whom natural instincts would thus prompt, are not unfrequently taught by the insecurity of this position to nest elsewhere. One of the most remarkable of these instances is that of the American herring-gull (*Larus Smithsonianus*), which naturally makes a scanty nest and deposits its eggs on the ground. After having been from time to time despoiled of its treasures, it is driven to construct its nest, with much labor and at great inconvenience, among the high branches of a tree. Again, ground-birds may be also what are classed as "miners," or "mound-builders," or may deposit their eggs on the bare surface, making no nest whatever. "Masons" may be also "cementers." Some, without being "miners" in the exact sense, always make use of excavations in the earth, and others, without being themselves "carpenters," usually accept and make use of holes in trees, natural or artificial. Some are true "parasites," always dependent upon other birds for rearing their young, or are only partially so; and again others are at times partially parasites, and on other occasions provide for themselves with remarkable ingenuity and in the most thorough manner. The house-sparrow is a well-marked case of the latter—at times appropriating the nests of other birds, more frequently building its own, and occasionally constructing an elaborate dome-shaped structure.

The "ground-building birds," including all that occupy its surface or penetrate within it, and those that resort to high cliffs and to remote islands, comprise, with more or less exactness, not far from one-half of all the several species, including all the diving birds, nearly all the swimmers, and a large proportion of the shore-birds and waders. The ground-breeding birds that build within the earth are separated into a group by themselves, known as "miners." These include both those which dig out their own burrow and those that make use of natural cavities or of holes made by other animals. Prominent among the true "miners" is the common sand-martin (*Cotyle riparia*). This familiar

FIG. 1.

Cotyle riparia (sand-martin).

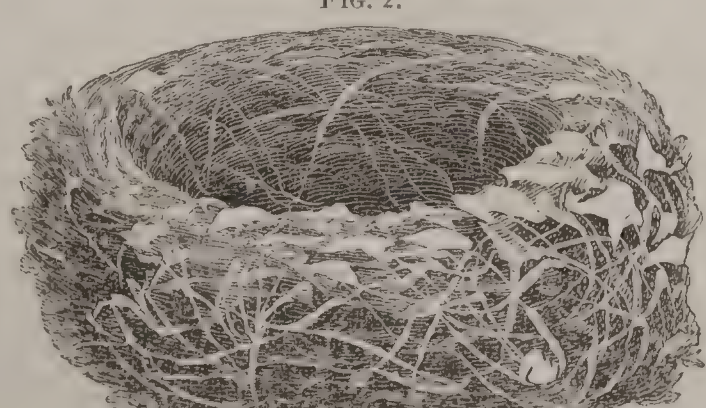
species, abundant in both the old and the new hemispheres, is found in large colonies, and excavates its burrow on the steep face of a sandbank or a gravel-bed. Its hole is usually not more than two and a half or three feet in depth, yet where its excavation has been dug through a bed of coarse gravel, the channel has been known to be nine or ten feet deep. But this apparently inconsistent action is accounted for by the supposition that the swallow digs on until it finds a locality sufficiently safe for its nest, which is not the case where the gravel is large and coarse, and liable to fall down upon and break the eggs. This bird commences its excavation, clinging with its sharp claws to the side of the bank, by pecking at the sand with its closed bill, wielding it as a miner would use his pickaxe. While standing on the outer edge of its opening the swallow cannot use its claws, but after the hole has been extended a few inches, the loose sand is removed by the mingled action of the feet and wings. Where the firmness of the sand permits, these holes are as circular as if planned with a pair of compasses. The galleries are usually more or less tortuous, and are at their termination enlarged into a chamber in which is placed a loose but soft and warm nest. The kingfisher (*Ceryle alcyon*) is another typical miner, and mines a long tortuous gallery about five feet in length, which is sometimes wholly in one direction, but usually turns at a right angle when at the depth of three feet—sometimes to the left, and at others to the right; at the end of the gallery it excavates a small chamber, in which it deposits its eggs on the bare earth. Occasionally, if the earth is damp, it makes a small floor of miscellaneous materials. The common fork-tailed petrel (*Thalassidroma Leachii*) of our coast is a very interesting "miner" of pe-

culiar habits. It digs a winding and intricately tortuous burrow, often of great length, turning now this way and now the other, and at last causing its channel to descend and to double directly under its first gallery, making a large chamber at its terminus, which not unfrequently is directly under the opening, though separated from it by the intervening floor of earth. It makes no nest, but lays its single egg on the bare soil. The ground burrowed by this bird is strongly impregnated with an intense musky odor which betrays its presence, and indicates its locality quite a distance.

The burrowing owl of North and South America, though able to dig for itself when necessity compels, is usually a parasitic miner. There are two species, but their habits are identical. The northern species is found W. of the Missouri Valley from California to Mexico. It lives together in communities, and is often very abundant. It takes possession of the burrows of several species of small quadrupeds where these offer, chiefly occupying those of the prairie dog, which exist in large villages, spread over the country for miles together. The owl lives in these burrows in common with their owners, but is supposed to be an unfriendly companion. In Texas it dwells in deserted rat-holes, and in Northern California in the burrows made by two large species of ground-squirrel. In South America, wherever the biscada is found, this owl makes use of its burrows. In the Banda Oriental, according to Darwin, it depends upon its own labor, and excavates its own burrow on any level spot of sandy soil.

Another marked group of birds which occupy the ground are those which usually construct no nest. In this may be included birds of very different forms and habits. The whip-poor-will (*Antrostomus vociferus*) and all the kindred genera, so far as is known, deposit their eggs on dry beds of leaves in the dark recesses of the forests: the more common nighthawk usually leaves its eggs, that resemble pebble-stones, on the bare rock, to which in color they are closely assimilated; in Philadelphia and in Boston it nests on the flat roofs of stores and dwellings. The loon (*Colymbus torquatus*) chooses a receptacle for its egg on the edges of islands in fresh-water lakes, so near the water that if disturbed it can plunge from its nest directly into and under it. Other divers, as the auks, the penguins, the guillemots, nest in communities, using the bare surface of rocky cliffs or crevices in the rocks, but make no nest. A few of these, like the puffins, burrow into the ground in sandy places to shelter themselves and their eggs from birds of prey and gulls. The gulls and terns nest on the ground, but differ in regard to nest, some building an elaborate one, and others having hardly more than a hollow in the bare sand. Nearly all the waders nest on the ground, and all or nearly all have usually a mere depression in the ground. These are placed usually near marshy grounds or water, though the plovers and a few other kinds prefer higher and dry situations. The whole tribe of grebes nest on the ground, building nests of coarse reeds and water-plants near the edges of water. Occasionally these are overtaken by floods and float. This has caused the impression that they purposely build floating nests, but this is not the fact. With very few exceptions nearly all the North American sparrows breed on the ground. All the species of the several genera of *Ammodromus, Junco, Plectrophanes, Zonotrichia, Melospiza*, etc., with only individual exceptions, nest on the ground. All or nearly all the titlarks, true larks, buntings, and similar forms, the world over, nest on the ground. A few are exceptions. The common house-sparrow and all its congeners nest in various manners, but not on the ground. Some species exhibit the singular peculiarity of always nesting on the ground in certain localities, and in other regions as invariably building in bushes or trees high above it. Thus, the prairie lark-finch in Illinois and Wisconsin always nests on the ground. On the Pacific coast the same species usually nest in trees. The same is noticed in the black-throated bunting, which at the East nests on the ground, but in the Mississippi Valley usually a few feet above it. All the *Spizellæ* nest in trees or bushes with one marked exception. The *S. monticola* always nests on the ground, yet in books this species is called the tree-sparrow.

Fig. 2.



Spizella monticola (called tree sparrow).

A few among the slender-billed oscines always build on the ground, and some among them nest indifferently on the ground or in different situations. The common brown thrush of North America (*Harporhynchus rufus*) is a remarkable instance of this, in some localities usually nesting upon the ground, and in other districts always above it. *Turdus aliciæ* nests sometimes on the ground, and occasionally in more or less elevated situations. The robin redbreast (*Rubecula familiaris*) of Europe nests naturally on the ground, but there are many instances recorded of striking deviations from these selections. In one a pair of these familiar birds built their nest within the hollow of a Bible that was lying open on the pulpit of an English church. It was left undisturbed, and for several Sundays the birds sat upon the eggs or fed the young during the divine services.

Among our American thrushes, *Turdus fuscescens, T. Pallasi, Cinclus Mexicanus*, etc., always nest on the ground. All the species of the genera *Myiodioctes, Oporornis, Seiurus, Mniotilta, Geothlypis, Helmintherus*, and *Helminthophaga*, except *H. laciæ*, build on the ground. The large family of *Dendroicæ*, except *D. palmarum*, nest in elevated situations, so far as is known. Many ground-building birds resort to means of concealment quite ingenious and interesting. The common quail and the meadow-lark, and other species, sink their nests by the side of a high tussock of grass, and form an archway over the nest with the natural growth. The common snow-bird and the savanna-sparrow often build their nest on the steep side of an excavation under a projecting sod. The song-sparrow and the grass-finch often construct a covered approach to the nest, which is hidden in high grass or by bushes. The Canada fly-catcher, so far as is known, always selects a large tussock of grass in the midst of boggy and almost impassable ground, and in this spot, almost sure to be unapproached, hides treasures rarely found even by the naturalist.

The large families of the sea-ducks, swans, geese, the gulls, terns, albatross, and all the marine birds with hardly an exception, resort to the ground to construct their nests. A very few build in trees, either exceptionally as individuals or as species. Wood-ducks of all kinds, and several of those that frequent lakes and rivers, nest in hollow trees. A few, like the dusky duck, nest indifferently on trees or on the ground, usually selecting the latter. Several kinds of sea-ducks are noted for adding to their nests a warm lining of the softest down plucked from their own breast. This is done by the long-tailed duck, by the smew, by the king-duck, the Pacific eider (*Somateria V.-nigra*), and by the common eider. Of these, however, the smew always nests in hollow trees. Owing to the commercial value and importance of its down the eider (*Somateria mollisima*) is the best known of these, and is cherished and protected in Iceland and on the north-western coast of Europe. It usually constructs in the first place, a rough platform nest of various marine plants, both sexes working in concert, piling up a rude foundation of drift. Over this rough mattress the female spreads a bed of the finest down, freely and liberally taken from her own breast. Sometimes two females make use of the same nest, each freely contributing a supply of down. When the nest is robbed, and the females have no more down to supply, the male bird contributes the needed protection. This is easily recognized by its whiteness. Each female contributes five eggs, and where two share together the same nest, there are usually ten. In islands on the coast of Iceland where the eider has been encouraged and protected for centuries it has become almost domesticated. Mr. C. W. Shepherd, in an account of a recent visit to that island, describes one of these eider settlements on the island of Vigr, on the N. coast. The ducks and their nests were everywhere, on the housetops, on every outbuilding, on the walls, the doorstep—in short, in every conceivable place. They were so tame that they permitted themselves to be stroked on the nest, and even to be robbed of their eggs, a large proportion of which were always taken. And not only is it common to find two female eiders amicably occupying the same nest, but Mr. Shepherd also twice found two pairs of very different species making a common use of the same nest. On an island in an inland lake he found a pair of long-tailed ducks and a pair of scaup-ducks occupying one nest. Not only were there eggs of both species in the nest, but both ducks were actually sitting together upon them in the most friendly manner. On another island in the same lake a pair of Barrow's golden-eye ducks and one of the red-breasted merganser were using together the same nest.

Very many shore-birds, waders, grebes, etc., and also birds which nest on the ground in swampy places, construct large and elaborate nests of reeds, rushes, and other water-plants in a moist and decaying state, chosen because of their pliable condition, and not because a moist nest is de-

sired. On the contrary, notwithstanding the prevalent error, these nests are not used until they are dry, and are abandoned when, owing to rains or floods, they become so damp that they can no longer be occupied. Such nests as those of the willet, the grebes, the bitterns are of this description. Very many of our land-birds, as the song-thrush, the robin, etc., use moist materials in building their nest, but only occupy it when it has become dry. The robin (*T. migratorius*) always works from preference in rainy weather. All or nearly all the Gallinæ occupy nests on the ground, some making a rude nest, others only using a hollow in the earth. The wild-turkey uses great precaution to conceal her nest alike from birds of prey and prowling animals, and from her own mate, hostile to his own progeny. When forced to leave them in search of food, she covers her eggs with leaves, and if approached when on the nest the faithful mother will die sooner than leave her charge.

Fig. 3.

Somateria mollissima (eider duck).

Fig. 4.

Turdus migratorius (robin).

By far the most remarkable group of ground-nesting birds are the "mound-builders" of Australia and the eastern archipelagoes of Asia, known as the brush-turkey in Australia. All the species of this family belong to the order Megapodiidæ, and are all more or less remarkable for the manner in which the hatching of their eggs is effected. The *Talegalla Lathami* when about to deposit her eggs collects an incredible heap of decaying vegetable matter as their depository, and trusts entirely to the heat engendered by the process of decomposition for the development of her offspring. These heaps are collected by the joint labors of several pairs; they are so large as frequently to contain several cartloads of material, and are always constructed in a perfectly pyramidal form. After the heap has been formed, and a sufficient time has intervened for the generation of the required heat, the eggs are deposited and buried to the depth of two or more feet. The chick when produced is fully feathered, and able to provide for its own wants from the shell. The heat in the centre of these heaps ranges as high as 95° F. Another of this interesting group (*Leipoa ocellata*) deposits her eggs in mounds of sand alternating with layers of dried leaves and grasses. The rays of the sun, added to the heat engendered by vegetable decomposition, supply the necessary warmth. These mounds are nine feet in diameter and three in height. The *Megapodius tumulus* constructs large mounds of earth, often of an immense size, varying from twenty to sixty feet in circumference and from five to fifteen in height. In these the eggs are carefully buried to the depth of six feet. Of the other species of this singular family, some merely deposit their eggs in holes excavated on the seashore to the depth of three feet, but nearly all the members of this family are more unequivocally mound-builders.

Several species belonging to different genera have been grouped together in some systems as "masons," so called because they knead together, in the manner of the house-builder, a rude mortar of tempered earth or clay. It is not a well-marked group, and all its members might claim a place in other connections. Among these French naturalists class the European nuthatch (*Sitta Europæa*), which is properly a "carpenter," or its parasite, because, like the woodpecker, it always nests in holes in trees. This bird contracts the entrance to its burrow by an ingenious protection composed of earth or mud neatly kneaded together with the skill of the potter, and this is strengthened by the addition of small stones. This is used only at the entrance, never within, no matter how large the cavity. The cliff-swallow (*Hirundo lunifrons*) of North America is a true typical "mason," building a remarkably symmetrical nest of plastic earth or clay by the united and industrious efforts of several working in concert where they are in societies, sometimes by only the solitary pair. These nests are constructed with a wonderful celerity by these industrious artisans. In large colonies it is a very interesting sight to witness the rapid construction of one of these nests, a large number working together, but always under the leadership of the female proprietor of the construction, who very evidently directs all their movements. The normal shape of the nest is that of an inverted retort, the larger portion being attached to the cliff or side of a building. It is arched over at the top, and extends down in front in a covered passage-way open at the bottom. In the wild state on the sides of high cliffs the nest is an elaborate and ingenious structure, sheltering its inmates from the weather and from their enemies. Under the shelter of man all this protection is not needed, and under the eaves of barns and other buildings these birds build a simpler, easier, and equally safe nest, but always of kneaded earth. The barn-swallow of America, the house-swallow of Europe, and several other species of *Hirundines* are also true masons. Our own *Hirundo horreorum*, which once nested only in caves or under overhanging cliffs, now attaches its elaborate and curiously wrought nest to the sides of rafters in barns, under the protection of their roof, and even to the porches of dwellings. These are made of the finest mason-work, are put together in the most artistic manner, piece by piece, with an order and a regularity quite curious. And

attached to the nest there is often an equally elaborate extra platform designed for the use of the mate, on which

FIG. 5.

Hirundo horreorum (barn-swallow).

it can sit when not collecting food, and where, when the young no longer require the cover of a parent, the latter may stay and keep them company.

A small but well-marked group of remarkable nest-builders are by some known as the "carpenters." Of these the woodpecker family is the most conspicuous. The bird hollows in the limbs or trunks of trees, with its sharp strong bill, deep excavations for its abode and nest, often using no other material than the hollow wood. Grouped around the true carpenters are a number of species which make use of similar cavities, but either never or only rarely construct them for themselves. The true carpenters are restricted to a few families, and of these the woodpeckers are the most conspicuous. The nuthatches, the wrynecks, and a large proportion of the titmice belong to this group. A few others, the habits of which are imperfectly known, such as the remarkable family of toucans, whose singular large and feeble bill does not favor the idea, are also said to excavate their nests in hollow trees. Woodpeckers, all the world over, are true "carpenters," and all, with only individual exceptions, cut out their nests in wood and bore into trees for their food. Occasionally, a few make use of natural hollows, and on the Western Plains, where trees are wanting, the *Colaptes Mexicanus* is known to dig into the sides of cliffs and to make its nest in the earth. The ivory-billed woodpecker, which is our largest and most powerful "carpenter," digs into the highest and hardest trees of the Southern forests, chiefly breeding in the large cypresses, where, the pair working together, they alternately dig out a capacious cavity in the living wood, which is said to be sometimes five feet in depth.

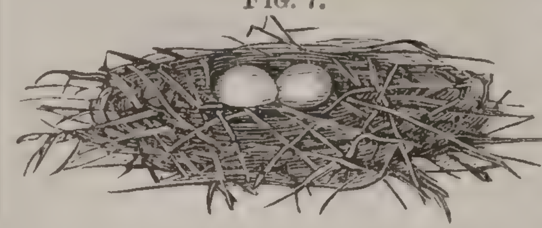
Certain classes of birds build what are styled "platform nests." They are found among only a few families, and their character varies very essentially, some being remarkably large structures, others being of the most frail description. Of the one kind are the huge platform structures of eagles—of the other, the slight nests of the doves and the American cuckoos. All or nearly all the eagles are true platform-builders, the only exceptions being those that use cliffs as substitutes for platforms and add little to their natural advantages. Others, like our own white-headed eagle, when they build in trees, construct large and massive structures of five or six cubic feet, and almost as solid as the natural rock-platform of the golden eagle. The nest

FIG. 6.

Haliaëtus leucocephalus (bald eagle).

of the martial eagle of Southern Africa (*Aquila bellicosa*), as described by Vaillant, is built on the tops of the loftiest trees—flat, constructed in the manner of a level floor, without any perceptible hollow, and made so firmly as to bear the weight of a man without yielding in any part. Strong rafters of various lengths to fit the spaces between the branches are firmly laid for the foundation; these are interwoven with smaller branches, bound strongly together, and over these are heaped a quantity of miscellaneous materials, covered at the top with a smooth flooring of flat pieces of wood closely fitted together like mosaic. In striking contrast with these are the slight nests of nearly all the Columbidæ, the cuckoos, etc. These are platforms of the frailest description, made of a few sticks loosely laid together, and as loosely crossed with other sticks, the whole so rudely made as apparently not strong enough to keep together, and not suitable to preserve the egg from falling to the ground. An example is the nest of the Carolina dove. More substantial than these are the platform nests of nearly all the different species of true herons, but not equal to those of birds of prey in size or strength, and like them having no cavity or depression in the centre. The group of herons known as bitterns, however, are exceptional, and usually nest on the ground.

FIG. 7.



Zenaidura Carolinensis (Carolina dove).

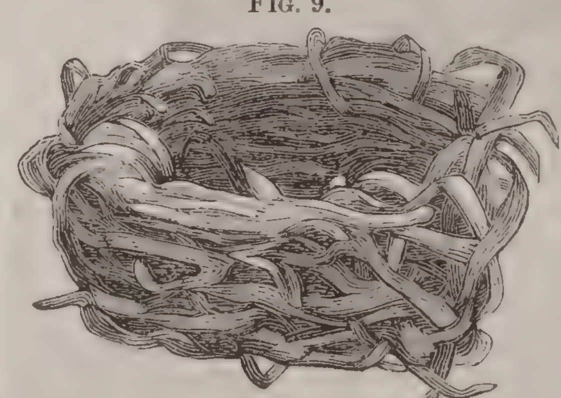
A large group of nest-makers are classed together by Prof. Rennie as "basket-makers." It is not very well marked, and its members are not always distinguishable from other groups known as "weavers," "tailors," and "felt-makers," but it is designed to include birds which, like our common mocking-bird, the cedar-bird, the Bohemian chatterer, the European bullfinch, and others, construct a rude basketwork of sticks, not unlike the common baskets of osier. In these are placed more carefully woven nests of softer materials. Some of these are mere open baskets placed on a flat limb; others are interwoven with the smaller twigs of a branch. The mocking-bird builds as an outer framework for its nest a strong barricade of brambles and thorns, and places within this rude basket an elaborately woven structure made of the finest roots. The common

FIG. 8.

Mimus polyglottus (mocking-bird).

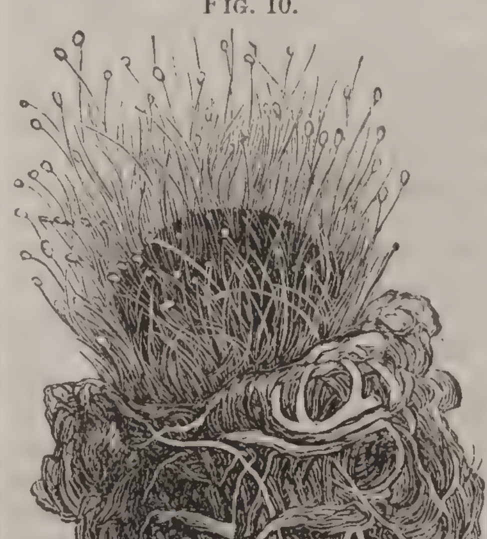
bullfinch (*Pyrrhula vulgaris*) of Europe builds a typical open basket placed on a platform of her own rearing of birch-twigs, or on a flat branch of a spruce tree she weaves a loose basket of flexible, fibrous roots. The yellow-headed blackbird (*Xanthocephalus icterocephalus*) exhibits great ingenuity, variety, and skill in the construction of elaborate basket-like structures. The *Turdus bicolor* of Southern Africa unite in communities to build a huge basket-like structure, with numerous cells or apartments for the nests of different pairs. These are like an aggregation of smaller baskets, each a separate nest with a tubular gallery leading into it from the outer side. The number of these cells varies from six to twenty, and over all is woven an inverted basket for a roof, wrought of twigs. We include among basket-makers the remarkable nest of the Mexican fly-catcher (*Pitangus Derbianus*), more striking for the use made of it by other and smaller species than for its own peculiarity of structure and disproportionate size. This bird, not larger than our common king-bird, builds a structure of enormous size, sometimes three or four

FIG. 9.



Xanthocephalus icterocephalus (yellow-headed blackbird).

FIG. 10.



Pitangus Derbianus (Mexican fly-catcher).

feet in length and about two in breadth. The cavity is on the top and of suitable size. The huge structure is loosely made of coarse materials, twigs, dried plants, leaves, etc. In its chinks and cavities smaller birds seek shelter, and are permitted to build their own nests in peace and safety, the warlike proprietor of the whole "driving far off each thing of guilt and sin" in the form of hawk, owl, or other bird of prey, but never molesting its tenants who seek shelter for themselves and offspring within its walls. The magpies, both of Europe and America, build a curious

FIG. 11.

Pica caudata (magpie).

basket barricade around their nest, evidently as shelter against birds of prey.

The "weaving" birds construct nests, for the most part,

FIG. 12.

Icterus Baltimore (Baltimore oriole).

more or less pensile, but of very various styles and shapes. Among the most familiar of these may be mentioned the orchard oriole and the Baltimore oriole of Eastern North America, and Bullock's oriole of the Pacific coast. All the orioles are first-class weavers, and their nests partake somewhat of the peculiarities of the basket-makers and the so-called tailor-birds, and are all conspicuous for the wonderful skill with which they are wrought, their beauty of design, and the strength with which the materials are intricately woven together. The nests of the orchard oriole are hemispherical in shape and open at the top; they are suspended from small twigs at the ends of branches, while the materials of which they are made are woven and interwoven through and through in a manner truly wonderful, and with as much intricacy and exactness as if sewed with a needle. Taking one of these nests to pieces, Wilson found that one of the fibres of dry grass of which the nest was woven, and which was thirteen inches in length, had been hooked through and returned no less than thirty-four times. The nests of both the Baltimore and of Bullock's

FIG. 13.

Vireo solitarius (solitary vireo).

oriole are pendulous and nearly cylindrical pouches, interwoven to and suspended from the extremities of hanging

FIG. 14.

Ploceus oryx (pensile grosbeak).

branches, and constructed by the interweaving of the filaments of several flax-like plants into a fabric of surprising strength. The nests of the Baltimore orioles are woven with incredible rapidity, the bill of this bird having curiously articulated jaws, enabling it to interweave the materials with a facility and celerity that would seem almost impossible. The Vireos, of which there are in North America sixteen different species, all, so far as we know, construct a curious pensile nest, hemispherical in shape and peculiar to the genus. Simpler in design than the nests of the *Icteri*, they are still structures of remarkable beauty and ingenuity. They are wrought into the shape of a deep cup, and are usually suspended from the fork of two twigs, around and over which the upper margin of the nest forms a continuous covering. Working down from this fold, the materials are neatly woven into a hemisphere truncated at the top. The pensile grosbeak of Africa (*Ploceus oryx*) suspends a very curious basket, woven of straw and reeds, from the end of a branch, usually over a stream of water. This is in shape like an oblong bag, with the entrance from below. Within and on one side of this is the real nest. These birds build in communities, according to earlier writers, of several hundred pairs. This is probably exaggerated, as Pringle, the African traveller, does not mention a larger number than twenty seen together. Their obvious design is to secure the offspring from the dangers of the weather and from various enemies, such as hawks, snakes, monkeys, etc. The entrance is always from below, and is through a long cylindrical gallery fifteen inches in length, that hangs down from the spherical nest like the tube of a chemist's retort. The bottle-nest sparrows of India have nests of equal ingenuity and better known. These are made pendent to branches of trees by small loops, and are formed in a very ingenious manner of a peculiar kind of long grass woven together in the shape of a bottle. These swing from the ends of long flexible branches, and effectually secure their inmates from harm. Their entrance is from below. Besides this curiously pensile nest, the male birds also construct an elaborate covered roost, which is wrought of the same kind of long, flexible, tough grass. This is a bottle-shaped basket,

FIG. 15.

Ploceus Bengalensis (bottle-sparrow).

having a thatched roof, which covers a perch open at the bottom and suspended from the small end or neck of the bottle. This roost is occupied by the male, and hangs by the side of the real nest, in which are his mate and family. The object is protection from sun and rain, and from various kinds of enemies. Another remarkable species of the weaving grosbeaks (*Loxia socia* of Linnæus) greatly excel all of the family, at least in the extent of their workmanship. They build an enormous structure, in shape resembling an open umbrella, wrought, in the manner of a

FIG. 16.

Ploceus socius (social weaver).

thatched roof, of Bushman's grass without any intermixture, and so completely woven as to be impervious to rain. Under the shelter of this canopy each pair build their own particular nest, placed under the eaves. Each individual nest is three or four inches in diameter; they are all in contact with one another around the eaves, and each nest has its own individual aperture forming the entrance.

The tailor-bird of India, which enjoys a somewhat exaggerated reputation for ingenuity and skill, owing to accounts now believed to be more fanciful than real, is at least known to bend over one end of a leaf and to sew it securely to the stem-end, and to place its tiny nest in the hollow thus created. However curious and ingenious, this is not more remarkable than the contrivances of many other less noted species. Thus, our own Northern blue yellow-backed warbler (*Parula Americana*) constructs its

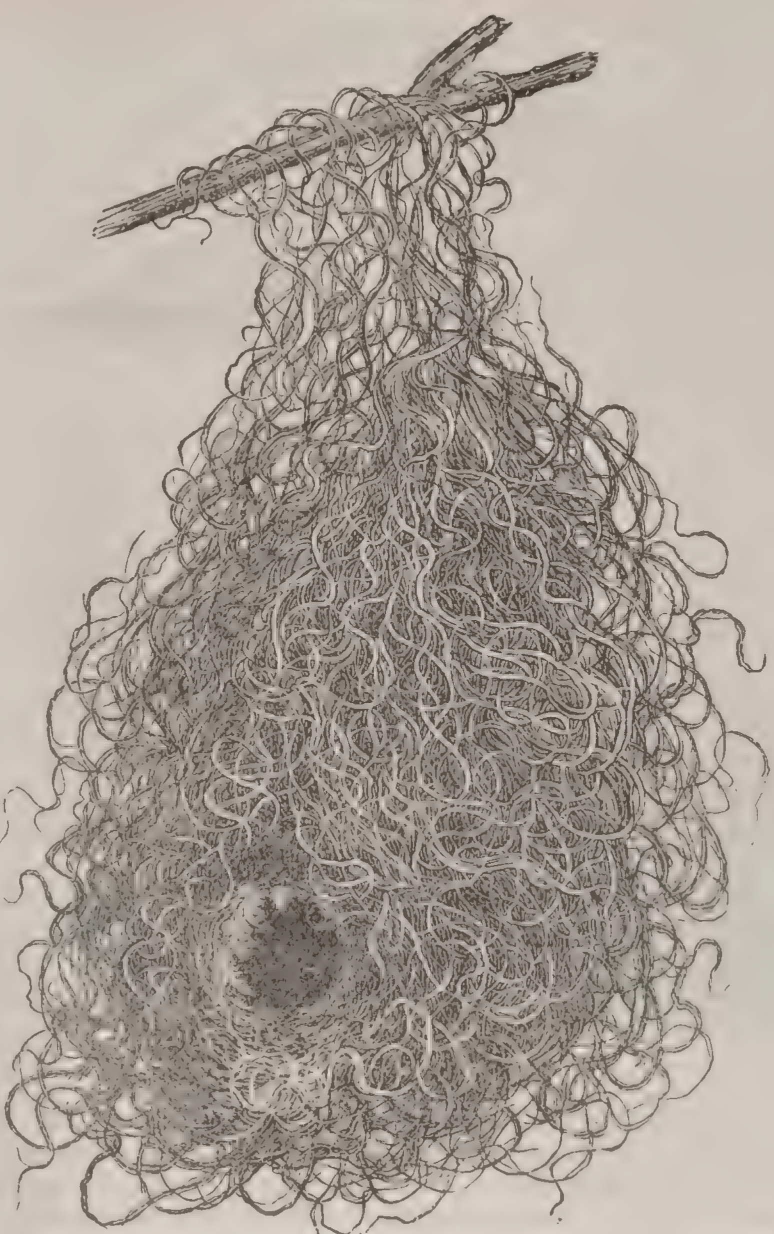
FIG. 17.

Parula Americana (blue yellow-back).

nest of the long gray lichens of our Northern forests, gathering up and fastening together in a loop the long hanging branches of this moss to make its nest, often using no other material, and in this manner creating a very beautiful structure, the entrance to the cavity being usually on one side. Even more strikingly beautiful is the nest of the yellow-throated warbler of the Southern States (*Dendroica dominica*), of which our cut presents a remarkable illustration. Here the long pendent moss of the Southern swamps is carried up and fastened in loops; mosses three feet in length are fastened together into a woven bag of half the original length. In the centre of this curious structure, the natural appearance of which is unchanged, is hidden the tiny nest wrought of the softest vegetable down. The wonder is how such a nest can ever be discovered by human eyes.

Another interesting group, styled by Prof. Rennie the "felt-makers," is distinguished not so much by the architectural peculiarities of their nests as by the remarkable changes they create in the character of the materials they use. These are included in only a few families, but the latter are individually very numerous. The group includes two kinds, the true felt-makers, who create a composite material, and those that use only a single material. There is, however, very little difference in the appearance of the product, and many species indifferently use a single or a composite felting. The finches of both the Old and the New World are typical felt-makers. Of these the canary, the several goldfinches, and the chaffinches may be mentioned as examples. Fine wool, of either vegetable or animal origin, serves as the base of this felting, and with this various other substances, such as mosses, lichens, spiders' webs, bits of cotton, bark, etc., are intermingled, and with won-

FIG. 18.



Dendroica dominica (yellow-throated warbler).

derful exactness felted and compacted together into a texture apparently homogeneous and uniform. With some,

FIG. 19.

Fringilla cœlebs (chaffinch).

these felted nests are wholly composed of this single material, as in the nests of various humming-birds, where, besides an external covering of lichens, a means of concealment rather than an essential part of the nest, the whole is made of this one material. In the nests of the finches there is always an external framework, filled out and lined with felting. In these greater strength is given to the fabric by

FIG. 20.

Carduelis tristis (goldfinch).

binding the whole with strong wiry grasses, fibrous roots, etc., and especially by binding the nest firmly into the fork by twining among the twigs bands of strong felting. The nest of our goldfinch (*Carduelis tristis*) is a striking illustration. All the Polioptilæ of North America and the West Indies are superior felt-makers. Their nests are large for the birds, remarkably deep, and with thick soft walls made of downy materials, but abundantly strong for the occupants, which are among our smallest species. The nests are models of architectural beauty and ingenuity of design. They are deep and purse-like in shape, not pensile, but interwoven with small upright twigs, usually near the tree-top, swaying with every breeze, but the depth of the cavity and the small diameter at the opening prevent the eggs from rolling out. The black-capped species of St. Lucas (*Polioptila melanura*) uses the living tendrils of a

FIG. 21

Polioptila melanura.

wild vine as the framework of its nest, interweaving with them its soft felted nest so intricately as to render them inseparable.

Prof. Rennie recognizes as a distinct group what he calls "dome-builders," but nearly all might easily be ranged in one of the other groups. They consist of a great number of species and belong to a variety of families, and either occasionally or uniformly construct covered nests entered by holes in their sides. With many species the domed cover of their nest is not a uniform feature. The Carolina wren at times builds a domed nest, and quite as frequently constructs one open at the top. The golden-crowned thrush

FIG. 22.

Seiurus aurocapillus (golden-crowned thrush, or oven-bird).

and the black and white creeper have almost always a covered nest, yet both occasionally build without any cover. The house-sparrow usually has an open nest, but also occasionally builds one with an arched covering. In the West Indies, and in tropical countries generally, domed nests are a predominating feature, and are undoubtedly an instinctive provision against the violence of tropical rains. Travellers in South America describe the nest of a common species known locally as the baker-bird, so called because it constructs a nest in the form of a baker's oven. This is placed in the most exposed situations, but at a considerable height. The nest is described as made of tempered clay, and as having a lateral opening twice as high as wide, and in the interior divided into two chambers by a partition beginning at the entrance.

The *Cinclus Mexicanus* of North America builds a domed nest of a very peculiar and striking character. It is hemispherical in shape, of uniform contour, and usually built on a rock on the edge of a mountain-stream. Externally, it is composed of green moss in a living state, having within a strong, compactly built apartment arched over and supported by twigs, with a cup-like depression at the bottom composed of fine roots and twigs firmly bound together. These structures are a little less than a foot in diameter and from six to eight inches in height. Both spe-

FIG. 23.

Cinclus Mexicanus (water-ouzel).

cies of cactus-wrens of California and Cape St. Lucas build curious domed nests of great size and purse-like in shape. These are composed of long flexible grasses, and are lined

FIG. 24.

Campylorhynchus affinis (cactus-wren).

FIG. 25.

Cistothorus palustris (marsh-wren).

with feathers. Both species of *Cistothorus* build circular domed nests, that of *C. stellaris* ingeniously interwoven, externally of long wiry grasses and finer sedges, lined with soft vegetable down. That of *C. palustris* is a stronger structure, built in higher situations of coarse sedges firmly interwoven and cemented with mud.

Another singular peculiarity, found only in species belonging to a few genera, is the employment of cement-like secretions in the construction of their nests, and these are grouped together as "cementers" in certain systems. In some cases it is difficult to determine whether the birds generate their own cement or make use of adhesive substances that exist in nature. Thus, we find the nests of humming-birds and of several other kinds of birds covered over with a coating of lichens and mosses, and thus made to resemble the moss-covered bark of the trees on which they are built, and apparently this covering is made to adhere by means of some adhesive cement; but that this is secreted by the bird itself we do not know. We infer, rather than know, that certain swallows temper the earth of which they construct their nests with their own adhesive secretions. In regard to other cases our knowledge is more positive. The chimney-swallow fastens its simple cradle of twigs against the inner walls of a hollow tree or the inside of the chimney, and glues together, twig by twig, the nest itself, by means of a powerful cement which it secretes from its own throat. The edible nests of the esculent swallow are without doubt constructed with the aid of similar secretions. These nests are apparently made of some homogeneous material, and this is presumed to be the product of some glutinous marine-plants. It is also supposed that this material is prepared within the internal organs of the swallow, but this, though probable, is rather conjecture than ascertained fact.

This article would be incomplete without some reference to the various forms of parasitic reproduction found among birds, by means of which they wholly avoid and throw upon strangers the rearing of their offspring. Some are only parasitic in so far as they appropriate the nests of strangers. Of these the most take possession of deserted nests of other birds. Some only occasionally drive off the rightful owners and possess themselves of their property. A few kinds are not known to build any nests of their own, but always take possession of the nests of others, and therein deposit their eggs and rear their young. Of this last class is the brown jay of Central America. A few very remarkable parasitic forms, like many of the cuckoos of the Old World and all the *Molothri* of America, after the deposition of the egg in the nests of other birds, take no charge of their own offspring, but leave them entirely to the nurture of strangers. T. M. BREWER.

Netawa'ka, post-v. of Jackson co., Kan., on the Central branch of the Union Pacific R. R., has a graded school, 2 carriage manufactories, 1 newspaper, a home for the friendless, a Masonic hall, a public library, and a park. Pop. about 525. S. L. ROBERTS, ED. "CHIEF."

Neth'erlands, The [Dutch, *Nederlanden*; Fr. *Pays Bas*], kingdom of Western Europe, situated between lat. 50° 45′ and 53° 35′ N., and between lon. 3° 24′ and 7° 12′ E., bounded W. and N. by the North Sea, which forms two large inlets, the Zuyder-Zee and Dollart Bay, E. by Germany, and S. by Belgium, comprising an area of 12,680 square miles, with 3,716,002 inhabitants, and consisting of the following 11 provinces:

	Area.	Population.	Capital.
North Brabant	1,980	443,045	Bois-le-Duc.
Gelderland	1,964	441,088	Arnheim.
South Holland	1,155	721,464	The Hague.
North Holland	1,054	610,990	Amsterdam.
Zealand	680	182,365	Middleburg.
Utrecht	534	179,465	Utrecht.
Friesland	1,264	307,390	Leeuwarden.
Overyssel	1,282	260,533	Zwolle.
Groningen	885	232,739	Groningen.
Drenthe	1,031	109,454	Assen.
Limburg	851	227,469	Maestricht.

Its connection with Luxemburg is merely a dynastic union, the king of the Netherlands being also grand duke of Luxemburg, which country he received in 1815 as a compensation for Nassau; but the Netherlands possess extensive and important colonies in the East Indies, Java, Madura, Bali, Lombok, Ternate, Amboyna, Banda, Timor, and parts of

Sumatra, Borneo, and Celebes, with a population estimated at 24,000,000; and in America, Surinam or Dutch Guiana, Curaçoa, St. Eustatius, Aruba, Bonaire, St. Martin, and Saba, with a population estimated at 100,000. The country is low and flat, and forms the delta of the Rhine, Meuse, and Scheldt. Where the Rhine enters the Netherlands from Germany it is a powerful stream, half a mile broad, but after sending to the S. the Waal and the Leck, which connect with the Meuse, and to the N. the Yssel and the Vechte, which fall into the Zuyder-Zee, it disappears among the sandbanks of the North Sea. The Meuse and Scheldt divide also into different arms, and cut up their basin into a number of islands; indeed no other country is so peculiarly intersected by rivers and canals. Of the canals, constructed partly for drainage, partly for communication, may be mentioned as important for traffic the North Holland Canal, 52 miles long, 120 feet broad, 20 feet deep, constructed 1819–25, and connecting Amsterdam with the North Sea, and the Voorne Canal, from Voorne to Helvoetsluis, shortening the outlet from Rotterdam. Far more important is the NORTH SEA CANAL (which see). In many cases the river-bottom is higher than the adjoining surface, and large tracts of the country lie below the level of the ocean. Along the sea the land is in some places protected against inundation by lines of naturally formed sandbanks, the so-called dunes, but in places where no such sandbanks exist, and along the rivers, it has been necessary to construct huge dikes, 30 feet high, 70 feet broad at the base, and built of granite brought from Norway, or of clay, peat, and timber. By these dikes, which must be watched very closely or the sea and the rivers which formed the country will again destroy it, by a thorough system of canals, and by a number of ingenious and expensive hydraulic works, the Netherlanders have succeeded in reclaiming the whole delta and transforming it from a swamp to a highly productive soil. There are some tracts of waste land in Drenthe and Overyssel, but otherwise the country consists of fine meadows and fields. In 1870 the live-stock comprised 252,054 horses, 1,410,822 cattle, 900,187 sheep, and 329,058 hogs, and the production of cheese, butter, and meat of excellent quality is one of the principal occupations of the people. The fields are generally divided into small holdings and cultivated like gardens. Rye, barley, and wheat are raised, but more especially oil-seeds, tobacco, hemp, flax, and vegetables. The cultivation of flowers and garden-vegetables was introduced into England, the Scandinavian countries, and Russia from the Netherlands. The country is naturally treeless, but plantations are frequent. Peat is generally used as fuel. The only other mineral of special importance found in the country is a peculiar kind of clay well adapted for pottery. Of the manufactures, the most celebrated are those of linens (Hertogenbosch), earthenware (Delft), gin (Schiedam, Rotterdam, and Weesp); but those of paper, leather, oil, sugar, cottons, silks, powder, etc. are also very extensive. The motive-power most generally used is the windmill, which forms a prominent feature in every Dutch landscape. The fisheries are very important. Herring, cod, turbot, ling, anchovies, oysters, etc. are taken in the adjacent parts of the sea, and it is estimated that about 20,000 families support themselves by this industry. In the present century, however, the herring fisheries have declined somewhat. Between the fourteenth and sixteenth centuries the herring shoaled in the Danish waters; afterwards it moved to the northern coast of the Netherlands; now it is found on the south-western coast of Norway. Yet 25,240,000 herrings were taken in 1861 in the Zuyder-Zee. The commerce of the country, at one time the most important in the world, has also declined during the last two centuries, though it is still very extensive and active. It is principally carried on between the colonies of the country and the coasts of the Baltic. In 1871 the value of imports amounted to 586,800,000 florins; that of exports to 460,500,000. In 1873 the Dutch ports were entered by 8762 vessels, of 2,968,404 tons burden, and cleared by 8765, of 3,029,646 tons burden. In 1874 the mercantile marine of the country comprised 1804 vessels, with a tonnage of 495,285. The interior traffic is carried on to a great extent on waterways, and in 1859 no less than 6684 vessels were inhabited by families. The general aspect of the country is one of comfort and happiness. The inhabitants, of whom 1,956,852 are Dutch Reformed, 1,307,765 Roman Catholics, 107,123 Christian Reformed, 64,478 Jews, 44,227 Mennonites, etc., are characterized by industry, cautiousness, perseverance, frugality, the utmost cleanliness, and a certain sedateness of manners. There is great wealth among them, and it is well diffused. The same may be said of their intellectual fortune. The three universities of Leyden, Utrecht, and Groningen are celebrated institutions, and the part which Dutch scholars have played in the development of modern civilization is very conspicuous. At the same time, the mass of the people is better instructed in the Netherlands than in any other European country. There is a standing army of 62,000 men; the navy comprises 84 steamers, 16 sailing vessels, and 70 gunboats, carrying 773 guns and manned by 6886 men. In 1874 the public debt amounted to 937,020,076 florins; the receipts to 93,742,143; the expenditures to 160,243,980. The receipts from the colonies were 124,908,632 florins, the expenditures 114,761,528.

Language and Literature. (See DUTCH LANGUAGE AND LITERATURE.)

History.—The Netherlands or Low Countries denoted, when first spoken of in history, the whole plain extending from the foot of the Vosges and the Ardennes to the North Sea, and comprised not only the present kingdom of the Netherlands, but also Belgium and the northernmost parts of France. It was inhabited by three distinct though kindred tribes—the FRISIANS (which see) to the N., the Batavians, of Germanic stock, in the centre, and the Belgæ, of Gallic stock, to the S. The Belgæ were subjugated by Cæsar; the Batavians were at first allies of Rome, but after the unsuccessful attempt of Claudius Civilis in 67 A. D. to unite the Batavian communities into an organized empire, they too were conquered by the Romans; the Frisians submitted after repeated defeats and rebellions. In 357 the Batavians are spoken of as forming part of the Roman army in the battle of Strasbourg against the Germans, and as displaying great valor. But after this time their name disappears from history. The Belgæ gave way to the Franks; the Saxons pushed onwards from the E.; new though kindred tribes took possession of the soil; only the Frisians withstood. On the establishment of the great Frankish empire under the Carlovingians the whole plain was incorporated and the population christianized. But by the division of the empire of Charlemagne the country was divided, the southern part falling to France, the central to Lothringia, and the northern to Germany, and for centuries the different parts followed the different destinies of the main bodies to which they belonged. Meanwhile, the feudal system got a foothold in the country. Dukedoms, Brabant, Limburg, Luxemburg; countships, Artois, Flanders, Holland; bishoprics, Mechlin, Utrecht, etc., were formed, and the remote position of the country made the feudal lords more independent of the royal or imperial power here than anywhere else. On the other hand, the situation on the ocean and the mouths of three great rivers invited to commerce, and alongside the feudal lordships flourishing cities grew up and surrounded themselves with strong fortifications. By a marriage the countship of Flanders became united to Burgundy in 1384, and subsequently the Burgundian dukes succeeded, partly by force, partly by craft, in gaining possession of the whole country, which they governed well. By another marriage the Netherlands, with the other Burgundian dominions, came into the possession of the house of Hapsburg in 1477, and Charles V. took a great interest in the development of Dutch industry and commerce. By the division of his empire between Austria and Spain the Netherlands fell to Spain, and it was a good consequence of this combination, so fatal in other respects, that the Dutch retained their full share in the new commerce which was opened up by the discovery of America and the establishment of the Spaniards in the East Indies. On the whole, it was not so much the interests of the two countries which clashed as the different character of the people and its ruler. The Reformation had made a deep impression and spread widely in the Netherlands, and Philip II. determined to root it out. The result was a war which lasted over eighty years (1566–1648), and ended with the humiliation, not to say the ruin, of Spain, and the establishment of the Netherlands as one of the principal powers of Europe. The salient points of this struggle were the formation at Utrecht (Jan. 23, 1579) of a union between the seven northern provinces, Holland, Zealand, Utrecht, Friesland, Groningen, Overyssel, and Gelderland, and the recognition by Spain of this union by the armistice of twelve years concluded in 1609. (For further details see the articles on MARGARET OF PARMA, ALVA, THE DUKE OF, JOHN (DON) OF AUSTRIA, FARNESE (ALEXANDER), the Spanish governors, and WILLIAM OF NASSAU and MAURICE OF NASSAU, the Dutch leaders.) By the Peace of Westphalia (1648) the independence of the republic of the United Provinces was formally acknowledged, while the southern provinces, nearly corresponding to the present kingdom of Belgium, remained with Spain and within the Roman Catholic Church. The prosperity of the young state was prodigious. For about a century it was absolute master of the sea. It crushed the Spaniards and acquired possessions in America and the East Indies. It checked the Portuguese and kept down the English. After the battle of Goodwin Sands (Nov. 29, 1652) its admiral, Van Tromp,

paraded a broom at his masthead along the English coast as a token that he had swept the Channel, and in June, 1667, De Ruyter sailed up the Thames and blockaded the port of London. In the Baltic also the Netherlands became perfect masters by the Peace of Copenhagen (1660), by which the Swedes held the one coast of the Sound and the Danes the other, thus leaving the course tolerably easy for the Dutch; and at the same time that they actually held in their hands the commerce of the world, their achievements in science (philology, theology, natural philosophy) and art (painting) gained the admiration of all Europe. Their resistance to the arrogance of Louis XIV. was their greatest glory. (Details of this contest will be found in the articles on LOUIS XIV., WILLIAM OF NASSAU, TURENNE, etc.) After that period the importance of the republic gradually decreased, not because its activity and prosperity really declined, but simply because it was superseded by England; and when in 1782, led by jealousy and considering the opportunity good on account of the American Revolution, it declared war against England, its maritime supremacy received a final blow from which it never recovered. Meanwhile, two parties had developed in the interior politics of the state—one not unwilling to raise the office of the stadtholder into royalty and make it hereditary in the family of Orange-Nassau, while the other, the so-called "patriots," strove to abolish it altogether and establish a pure republic. When in the winter of 1794–95 the French army, after conquering the Spanish Netherlands, entered the territory of the United Provinces, it was hailed by the patriots; the stadtholder, William V., fled to England, and the Batavian republic was proclaimed May 16, 1795. The country paid dear, however, for its new constitution, which, moreover, was changed several times according to the whims of Napoleon. In 1806 the Netherlands was made a kingdom under Louis Bonaparte (the kingdom of Holland); in 1810 it was incorporated with France. Meanwhile, the state of its finances had become nearly desperate. The Congress of Vienna established the kingdom of Holland once more, gave the crown to the house of Orange-Nassau, and joined the former Spanish Netherlands with it. But this last measure proved a new source of trouble. The southern provinces were agricultural, Roman Catholic, and French or Flemish speaking. The discrepancy between the two parts of the new state, both in political interests and in national character, was so palpable that when in 1830 the southern provinces rose into rebellion the great powers of Europe immediately consented to the separation, and the kingdom of BELGIUM (which see) was erected, though not until much blood and more money were squandered by the attempts of the king of Holland at maintaining his government. The revolutionary movement of 1848 finally occasioned some change in a liberal direction in the constitution, but since that period the country has been quiet, prosperous and progressing. (See Bilderdijk, *Geschiedenis des Vaderlands* (12 vols., 1832–39); Motley, *The Rise of the Dutch Republic* (3 vols., 1856); *The History of the United Netherlands* (4 vols., 1860–67); *The Life and Death of John of Barneveld* (2 vols., 1874).) CLEMENS PETERSEN.

Neth'er Prov'idence, tp. of Delaware co., Pa. Pop. 1448.

Nets are made simply by the aid of a flat piece of wood and a needle with two eyes, and a notch at each end. The strings are wound from end to end of the needle, the notches preventing the twine from slipping as it is slowly looped and knotted around the flat piece of wood. The process of netmaking is thus very simple, but tedious and slow. In 1802 the French government awarded a prize of 10,000 francs to M. Buron for an automatic machine to make nets, but the machine does not appear to have come into practical use. In 1820, Mr. James Paterson of Musselburgh, near Edinburgh, invented a net-loom, and in this place a netmaking establishment now runs 300 of these looms, somewhat modified and perfected.

Nettement' (ALFRED FRANÇOIS), b. at Paris July 22, 1805; became a frequent contributor to various papers and periodicals of critical and literary sketches written from a legitimistic standpoint; founded in 1848 *L'Opinion publique,* which was suppressed after the *coup d'état* in 1852; concentrated himself on larger historical works—*Histoire de la Littérature française sous la Royauté de Juillet* (2 vols., 1854), *Histoire de la Conquête d'Alger* (1856), *Histoire de la Restauration* (8 vols., 1860–72), and d. at Paris, Nov. 15, 1869.

Net'tle [Ang.-Sax., *netele*], a popular name for many plants, mostly covered more or less densely with poisonous stinging hairs. They belong to the order Urticaceæ, and mostly to the genus *Urtica.* The species are very numerous, and many are tropical, some of the latter having severe and even dangerous stinging powers. The stalks of some kinds abound in a strong fibre, which, especially in Asia, has a considerable use in the arts. The common nettle-fibre is employed like hemp in Italy. This species (*Urtica dioica*) is naturalized in the U. S. from Europe. Its young shoots make an excellent potherb, and when older are sometimes put into beer. The most common stinging nettles of the Eastern U. S. are, besides the above, the *U. urens,* also European, *U. chamædryoïdes, capitata,* and *gracilis,* and *Laportea Canadensis,* which last is reported to yield a good fibre. The false nettle of the U. S. is *Bœhmeria cylindrica,* a stingless herb. The so-called DEAD-NETTLE (which see) is not a nettle at all. In the East Indies the Neilgherry nettle, *Girardinia Leschenaultii,* one of the most actively stinging of the true nettles, yields an excellent fibre, which brings a high price in England.

Nettle Creek, tp. of Grundy co., Ill. Pop. 916.

Nettle Creek, tp. of Randolph co., Ind. Pop. 1459.

Nettle-Rash, or **Hives** [Lat. *urticaria*], consists of elevations of the skin of the size of a pea or bean or larger. These elevations are usually white, or white with a red centre, or white with a red margin, or red, or white with a small vesicle in the centre. The disease is of an acute character; the elevations spring up quite suddenly, and disappear after hours or days. Frequently they return; some people do not get rid of the predisposition to them for many years. They return in irregular, sometimes in regular intervals, daily or every two days, without, however, having anything in common with intermittent fever. The anatomical condition of the skin is that of an inflammation with effusion. The cause of this is either external or internal. External causes are the contact with nettles, the influence of insects, a hot bath, the sun, mechanical and chemical influences of different character. In predisposed persons gentle pressure with the finger, or friction, or irritation by a subcutaneous injection of an indifferent medicine, is sufficient to produce it. Internal causes are such as irritate the nerves of the digestive organs, the genito-urinary organs, or the blood-vessels, certain articles of food, such as champagne, beer, sausage, strawberries, raspberries, currants, oysters; medicines, such as quinine or cod-liver oil. The recurrence of menstruation, the application of leeches to the womb, are causes which are frequently observed. Now and then nettle-rash can be traced to no cause, and in such cases a general irritability of the nervous system must be assumed to produce it. Not infrequently, therefore, it sets in with fever, sometimes with a chill, always with burning and itching. The treatment is simple, but not always efficient. Locally, the use of glycerine, cold-cream, mild solutions of carbolic acid in water (1 or 2 : 100), salt-water bathing will relieve the itching. The diet must be regulated—no coffee, spice, beer, not much meat. The stomach must be improved by alterative treatment or bismuth or muriatic acid, according to circumstances. Mild purgatives will be beneficial—in very bad cases now and then an emetic. Insects must be removed and menstruation regulated. In chronic cases arsenic has been given with but little effect. When a paralytic condition of the nerves of the blood-vessels is the cause, a physician may feel induced to give quinine or ergot. A. JACOBI.

Net'tleton (ASAHEL), D. D., b. at North Killingworth, Conn., Apr. 21, 1783; graduated at Yale College 1809; studied theology at New Haven; was licensed to preach in 1811, and ordained in the Congregational denomination in 1817. Declining all offers of settlement over churches, he devoted himself to labors as a travelling evangelist, and in the course of ten years (1812–22), he had labored with great zeal, eloquence, and success in revivals in nearly forty towns in Western Massachusetts, Connecticut, and New York. He edited a popular collection of *Village Hymns* (1824), visited Virginia 1827–28, again preached in New England and New York 1829–30, preached in Great Britain and Ireland 1831, and was appointed professor of pastoral duty at the newly-founded theological seminary at East Windsor, Conn., in 1832. He declined the office, but settled at East Windsor, and lectured occasionally to the students for several years. Dr. Nettleton's sermons were chiefly extemporaneous, and in theology he was a prominent ally of Dr. Bennet Tyler in his opposition to the "New Haven school" of Congregational doctrine, then represented by Dr. N. W. Taylor. D. May 16, 1844. His *Remains and Sermons* were edited by Dr. B. Tyler, who also published a *Memoir* (1844), republished at Edinburgh under the title *Nettleton and his Labors* (1854), revised by Dr. A. A. Bonar, who added numerous extracts from Nettleton's sermons and addresses.

Net'tle Tree, a name of the *Celtis australis,* a handsome tree of S. Europe, belonging to the Ulmaceæ, formerly regarded as a part of the collective order Urticaceæ, and valued for its wood, much used in turnery. It has

several congeners in various parts of the Old and New Worlds, the common species of the U. S. being called HACKBERRY (which see). In Australia, etc. there are nettle trees more properly so called, with very sharply stinging leaves and shoots.

Neu-Bran'denburg, town of Germany, in the grand duchy of Mecklenburg-Strelitz, on Lake Tollens. It is a handsome and well-built town, with breweries, distilleries, manufactures of paper and cards, and a fine ducal palace. Pop. 7245.

Neu'burg, town of Bavaria, on the Danube, has breweries and distilleries and manufactures of porcelain and saltpetre. Pop. 8260.

Neufchatel', Neuchatel, or **Neuenburg,** a canton of Switzerland, bounded by France and the Lake of Neufchatel. Area, 306 square miles. Pop. 100,000. It is traversed by several ranges of the Jura Mountains, separated by longitudinal valleys stretching from the S. W. towards the N. E. The lower parts of these mountains are generally well adapted to the cultivation of wheat, wine, and fruits; the higher afford good pasturage, where many cattle are reared and much cheese is produced, or they are covered with forests yielding good timber. But the chief occupation of the inhabitants is nevertheless manufacturing, especially watchmaking, which employs about 12,000 persons. The first watch made here was in 1681; in 1752 the country had 464 watchmakers; 3456 in 1792; 3744 in 1814. About 900,000 watches are made annually, of which about 30,000 are exported to the U. S. Up to 1848 the country formed the principality of Neufchatel, and belonged to the king of Prussia; in that year it became a member of the Swiss confederacy. The population is French and Protestant, and is distinguished for its ingenuity, its industry, and the moral standard of its character.

Neufchatel, town of Switzerland, capital of the canton of the same name, is beautifully situated on the shore of the Lake of Neufchatel. It is well built, and has important manufactures of watches and laces, and a large trade in wine. Pop. 10,382.

Neufchatel, Lake of, in Switzerland, 25 miles long and from 3 to 5 miles broad, sends its waters through the Aar to the Rhine.

Neu'haus, town of Bohemia, on the Nezarka, has 7300 inhabitants.

Neu'hausel, town of Hungary, on the Neutra, was formerly an important fortress, but its fortifications have been demolished. Pop. 7622.

Neu'hof, von (THEODOR), BARON, b. in 1686 in Westphalia; studied at Cologne, whence he fled on account of a duel; fought in the Spanish army in Africa, and was taken prisoner by the Moors in 1717. Eighteen years afterwards, when the Corsicans rose in rebellion against the Genoese and asked for help from the dey of Algiers, two regiments were sent to their support under the command of Neuhof, and in November of the next year (1736) the Corsicans chose him their king, under the name of Theodore I. He succeeded in negotiating a Dutch loan, and maintained himself for two years; but having been expelled by the French in 1738, he fled to England, was imprisoned in London by his creditors, and not liberated until a short time before his death (Dec. 11, 1756) by a subscription headed by Sir Robert Walpole.

Neuilly', town of France, department of Seine, 1½ miles from the W. extremity of Paris, on the right bank of the river Seine, which is here crossed, on the prolongation of the avenue through the Champs Elysées, by the noble stone bridge built by Perronet. (See BRIDGE.) It was the favorite summer residence of Louis Philippe, who occupied the royal château erected in the reign of Louis XV., which was destroyed by the mob Feb. 25, 1848, the right wing alone being saved, which yet forms an object of interest to visitors. The beautiful grounds about Neuilly, once the favorite resort of Parisians, are now laid out in walks skirted by charming villas. Neuilly has a varied manufacturing industry, comprising starch, chemicals, straw goods, porcelain, etc. Pop. 16,475.

Neu'komm (SIGISMUND), b. at Salzburg, Austria, July 10, 1778; received for some time the instruction of Haydn; was director of the German opera and music-teacher in St. Petersburg, Moscow, Paris, Rio Janeiro, etc.; lived generally, when he was not travelling in Germany, Switzerland, Algeria, etc., in the house of Prince Talleyrand in Paris and London; produced about 800 compositions—operas, oratorios, symphonies, cantatas, etc.—and d. at Paris Apr. 3, 1858. His oratorios, *David* and *Mount Sinai*, are often performed in England.

Neu'mann (JOHANN NEPOMUK), D. D., b. in Bohemia Mar. 28, 1811; educated at the University of Prague, and in 1834 came to the U. S.; was ordained a Roman Catholic priest at New York in 1836, and entered the Redemptorist order. In 1852 he was consecrated bishop of Philadelphia; in 1855 was named a domestic prelate of the pope; founded various schools and church institutions. D. Jan. 5, 1860.

Neumann (KARL FRIEDRICH), b. at Reichmannsdorf, Bavaria, Dec. 22, 1798, of Jewish parents; studied at Heidelberg, Munich, and Göttingen, and was converted to Lutheranism; went in 1827 to Venice to study Armenian in the convent of San Lazaro, thence to Paris to study Chinese; made a journey to India and China in 1829–30; brought back a large collection of Chinese and Hindoo books, which are now partly in Berlin and partly in Munich; was appointed professor of Oriental languages at Munich in 1831, but dismissed in 1852 on account of his liberal views in politics; removed in 1863 to Berlin, and d. there Mar. 17, 1870. He was a very prolific writer on various topics. His principal works are—*Mémoires sur la Vie et les Ouvrages de David, Philosophe Armenien* (1829), *Lehrsaal des Mittelreichs* (1836), *Asiatische Studien* (1837), *History of Vartan by Elisæus*, and *Chronicle of the Armenian Kingdom in Cilicia, by Vahram* (1830), translated from the Armenian; *Catechism of the Shamans* (1831), translated from the Chinese. He also wrote *Geschichte der Vereinigten Staaten von Amerika* (3 vols., 1863–66), and *Hoein Schein, or the Discovery of America by Buddhist Monks* (1874).

Neu'münster, town of Prussia, province of Holstein, has large breweries, dyeworks, tanneries, and manufactories of woollen and linen fabrics. Pop. 9045.

Neural'gia [Gr. νεῦρον, "nerve," and ἄλγος, "pain"]. Pain in the course of a nerve is a symptom of many morbid conditions. The track and distribution of a cerebral, spinal, or visceral nerve may be the seat of the pain, which is sharp, occurs in paroxysms repeated at intervals of a few seconds or a day, the pain between the paroxysms disappearing or being replaced by soreness or dull pain. The suffering is often very intense. One curious feature of neuralgic pain is its occurrence on one side of the body only at any one time. Usually no redness or inflammation is visible in the affected region, though an exception to this rule is observed in neuralgia of the face, during attacks of which the eye is red and lachrymose. The parts which are the seat of pain are usually over-sensitive during the paroxysms, and numb between them; there may even be loss of sensibility. Along the track of the affected nerve one or more tender points are usually found. Neuralgias are divided (1) on the basis of their distribution, (2) on the basis of their causes. The former, or topographical classification, includes the following varieties among others: facial, occipital, brachial, intercostal neuralgia, sciatica. According to the second or ætiological classification, there are—malarial, gouty, anæmic, hysterical neuralgias; neuralgias from injuries to nerves, from inflammation of nerves, and from disease of the nervous centres. Besides, in the present state of science, there are cases of neuralgia for which no cause can be made out—idiopathic neuralgia. The rational treatment of neuralgia consists in treating the pathological states which cause it. E. C. SEGUIN.

Neuri'tis [Gr. νεῦρον, "nerve"], inflammation of nerves. Neuritis presents itself as (1) parenchymatous neuritis, (2) interstitial neuritis, and (3) peri-neuritis. Parenchymatous neuritis consists in a multiplication of the nuclei of the membrane of Schwann of common nerve-fibres, with simultaneous disintegration of the myeline and destruction of the axial cylinder, the connective tissue between and around the fibres undergoing relatively little change. This lesion is seen in the Wallerian degeneration of nerves after section, and has been observed (Charcot) after disease of the spinal cord. (2) Interstitial neuritis consists in the development of young cells from the nuclei of the connective tissue of the nerves, and the formation of more connective tissue from these young cells, the increase of connective tissue causing compression of the nerve-fibres. To the naked eye the nerve appears larger, more or less translucent (instead of dead white), and is tougher. Such a neuritis is produced by injuries, extension of inflammation from other parts; it is found in the Greek elephantiasis. The neuritis may be localized, but tends to extend above and below the starting-point; it may lead to myelitis. (3) Peri-neuritis is that form of inflammation of nerves in which the general sheath of the nerve and the circumjacent connective tissue are the seat of trouble. There occur increased cell-formation, effusion of lymph or serum, and escape of the white globules of the blood. The nerve appears to the naked eye larger, reddened, œdematous, and may be unnaturally fixed in its bed of connective tissue. The causes of peri-neuritis are partly unknown; cold may cause it, as well as injuries, and it is possible that the gouty disposition produces it. The symptoms of neuritis are pain, numbness, loss of function, expressed by paralysis and anæsthesia. E. C. SEGUIN.

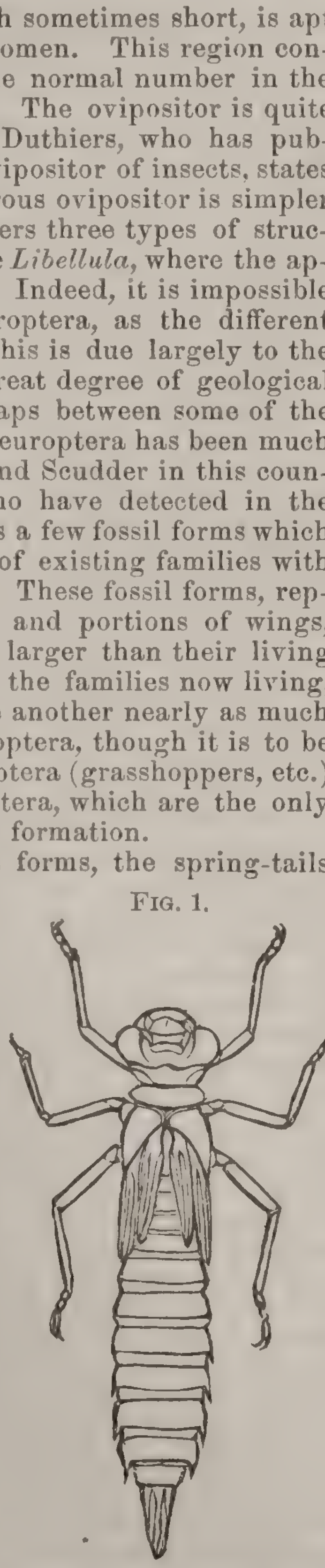
Neu'rode, town of Prussia, province of Silesia, has manufactures of flannels. Pop. 5800.

Neurop'tera [Fr. *névroptère*]. The net-veined insects or Neuroptera (*νεῦρον*, a "nerve;" *πτερόν*, a "wing") comprise the white ants, the May-flies, dragon-flies, and ant and aphis lions, and caddis-flies. They are usually recognized by the large net-veined wings, the cross or smaller veins being usually very numerous, and the hinder pair of nearly the same shape as the anterior pair, though sometimes the hinder pair are very small or wanting, as in some May-flies (*Cloë*, etc.). The mouth-parts are constructed on the same type as the Orthoptera and Coleoptera; the mandibles are usually large and adapted for biting; the first maxillæ are well developed, while the second maxilla, or labium, is in the dragon-flies enormously developed, and the palpi or feelers are converted into hooks for seizing and retaining other insects. Great changes in form occur in the thorax, but it may be said to be unusually large, with all three segments quite equally developed, as in the lace-winged flies and their allies (Hemerobiidæ); but in the dragon-flies and May-flies the prothorax (or first thoracic ring) is very small, and in the dragon-flies the flanks of the middle thoracic segment almost take the place of the prothorax. The legs are generally weak, not adapted for walking, the Neuroptera depending mostly on their wings as locomotive organs. In a few cases, as the *Mantispa*, a form mimicking the *Mantis*, an orthopterous insect, the fore legs are, as in that insect, large and spiny, adapted for seizing and retaining their prey, consisting of other insects.

The body of Neuroptera, though sometimes short, is apt to be very long, especially the abdomen. This region consists of eleven rings, ten being the normal number in the higher groups of winged insects. The ovipositor is quite varied in structure, and Lacaze-Duthiers, who has published an extensive work on the ovipositor of insects, states that the structure of the neuropterous ovipositor is simpler than in other insects. He discovers three types of structure, the simplest occurring in the *Libellula*, where the appendages form a pair of pincers. Indeed, it is impossible to satisfactorily define the Neuroptera, as the different groups vary so much in form. This is due largely to the lowness of the type, and to the great degree of geological extinction, which has left great gaps between some of the families. Our knowledge of the Neuroptera has been much extended by the labors of Dana and Scudder in this country, and by others in Europe, who have detected in the Carboniferous and Devonian rocks a few fossil forms which combine some of the characters of existing families with peculiar characters of their own. These fossil forms, represented by imperfect fragments and portions of wings, rarely perfect, were usually much larger than their living descendants. So far as concerns the families now living, they differ in some cases from one another nearly as much as the Neuroptera from the Orthoptera, though it is to be borne in mind that no true Orthoptera (grasshoppers, etc.) occur as low down as the Neuroptera, which are the only insects yet found in the Devonian formation.

A number of strange wingless forms, the spring-tails and bristle-tails (Thysanura), though wingless and differing in some important characters, separating them from the other Neuroptera, yet have some fundamental characters which seem to unite them with the latter. The mouth-parts, which vary greatly, when well developed are framed like those of the Neuroptera; the bristle-tail is much like a larva of *Perla*, and seems to bear the same relation to the winged *Perla* and other Neuroptera that the wingless lice do to the higher Hemiptera, of which they form the lowest division. The earliest changes of the embryo in the spring-tails or Podurans (*Isotoma*) are nearly identical with those of the thousand-legs or myriapods. The yolk undergoes total subdivision as in the latter, the eggs of no other insects being known to undergo total segmentation. In this respect, and in the fact that one pair of jaws (maxillæ) are wanting in the embryo, the Poduræ closely resemble the millipedes, though not the centipedes. For this and other reasons the *Thysanura* should perhaps form a group equivalent to the Neuroptera, instead of a subdivision of the latter. In most works the Thysanura are not included among the Neuroptera. They differ, besides the want of wings, in most of the genera having the mouth-parts very imperfect and drawn within the heads, or, as in *Anura*, quite wanting; and in the presence of the spring, which is, however, one pair of blades of the ovipositor of other insects—an organ wanting in some Thysanura (*Anura* and *Lipura*).

Fig. 1.



Larva of a dragon-fly.

The winged Neuroptera are divided by some writers into the so-called Pseudo-neuroptera (including the families Termitidæ, Perlidæ, Psocidæ, Embidæ, Ephemeridæ, Libellulidæ) and the true Neuroptera, comprising the Sialidæ, Hemerobiidæ, Panorpidæ, and Phryganeidæ; but we regard the so-called Pseudo-neuroptera as comprising the most typical Neuroptera—*i. e.* the dragon-flies and May-flies.

The nervous system of the Neuroptera differs much in different groups. In *Corydalus* Leidy describes, besides the brain (supra-œsophageal ganglion), which is relatively much smaller than in other insects, the optic and antennal nerves proceeding from the brain. There are three thoracic and eight abdominal ganglia, which are of very uniform size and connected by double commissures. The alimentary canal in most of the genera which have been studied, especially in *Corydalus*, is divided into a long œsophagus, which widens posteriorly into a spacious crop (proventriculus), which extends as far back as the fifth abdominal segment. The large intestine has a large twist, and abruptly dilates into an oval or pyriform cæcum. In some genera there is a sucking stomach opening into the œsophagus, as in the Lepidoptera and Hymenoptera. It is an interesting fact that in *Corydalus* this sucking stomach is only present in the pupa, and is aborted in the imago or adult. The crop or gizzard is often large, and armed internally with teeth, as in the grasshoppers. In the larva of *Corydalus*, which is carnivorous, the stomachal teeth—*i. e.* those of the crop—are present, but in the pupa, which is inactive, taking no food, they are wanting, but reappear in the winged adult. In *Perla* there is no gizzard, nor is there any in the dragon or May flies, while in the rapacious Panorpidæ the round gizzard is lined internally with a brown chitinous membrane covered with stiff hairs. In *Lepisma* (Thysanura) the gizzard is provided with six teeth. The two salivary glands differ much in the Neuroptera. There are generally six or eight long, flexuous urinary tubes. The ovaries consist of many-chambered tubes, and the testes consist in many species of two tufts of long or round follicles.

Fig. 2.

Adult, larva, and egg of *Chrysopaperla* of Europe.

The Neuroptera comprise a less number of species than any of the other groups except the Orthoptera. A large proportion, more so than in any other sub-order, are aquatic in their early stages. Out of twelve living families, five pass their larval stage in the water. This is a very large proportion of aquatic forms. This fact leads us to the consideration of the various modes of respiration among these forms. The terrestrial species and those forms which are aquatic only in the larva state breathe in the normal manner through the breathing-holes (stigmata) in the side of the body, but in the aquatic larvæ there are usually external appendages, either leaf-like or simply filiform, which are permeated by tracheal branches which absorb the air and convey it to the body. In the larvæ of the caddis-flies (Phryganeæ), which are long and slender, somewhat like caterpillars in appearance, there are a number of fleshy filaments scattered in groups over the body. In *Perla* the bunches of breathing filaments are attached to the under side of the body of the larva and pupa, and in *Pteronarcys*, a large Perla-like form, the gill filaments are even retained in the adult or winged state—an exception in this respect to all other insects. In the May-flies the so-called gills are beautiful objects, being broad, delicately fringed, leaf-like organs attached to the sides of the abdomen. In the smaller dragon-flies (*Agrion*, etc.) the body terminates in three leaf-like appendages permeated by tracheæ, but in the larger forms (*Libellula*, etc.) there is a strange modification of the respiratory organs. The rectum itself is provided internally with numerous folds, which are traversed by a large number of fine tracheal branches. The water is admitted into the alimentary canal, the oxygen absorbed, and the water then expelled as if by a syringe, and with sufficient force to propel

the creature forward several times its own length. Thus, the apparatus combines both respiratory and locomotive functions. In a singular genus of May-flies (*Bætisca*) the branchiæ are also internal. The larva of *Corydalus* has both branchiæ and spiracles with large and numerous tracheæ. The reason for this unusual combination is given by Hagen, who says "that it lives, like *Sialis*, some weeks out of the water before its transformation." Among the more remarkable forms of Neuroptera, and of most interest as foreshadowing the social ants, is the termes or white ant. Not only are there two kinds of males and females, as Fritz Müller has lately shown, but the neuters or soldiers are both male and female, according to the same authority. Smeathman has given us the best account of the vast colonies of white ants found in Africa. Besides the males and females, he has indicated two wingless forms—the soldiers, which have large square heads and long powerful mandibles, and the workers, which have small round heads and minute mandibles. Certain of the workers have a horn on the head (*Nasuti*). Müller says of a Brazilian species that "besides the winged males and females, which are produced in vast numbers, there are wingless males and females, which never leave the termitary where they are born, and which replace the winged males or females whenever a community does not find in due time a true king or queen." In some species, according to F. Müller, the laborers (*Calotermes*) and in others (*Anoplotermes*) the soldiers are wanting. Müller believes that the wingless forms are modified larvæ. Müller also confirms Smeathman's statement that in the company of the queen there always lives a king. *Termes fatalis* Linn. raises conical hillocks of great strength and solidity, often ten or twelve feet high. Our American species is *Termes flavipes* of Kollar. It is frequently injurious in houses, and bores out grapevines and decaying trees.

The May-flies are interesting from the short life of the imago, and from the nature of the mouth-parts, which are partly aborted and unfitted for taking food. They live but a few hours or a single day after acquiring wings, but in the early stages two or three years. The dragon-flies are beneficial as scavengers, both in the larval, pupal, and winged states, as they spend their lives in devouring smaller insects. They lay their eggs in masses attached to floating objects. The larva is remarkable for the large labium, forming a mask which covers the face. It is let down, exposing the jaws, when the insect seizes its prey. The pupa is active, as in the grasshoppers. Another neuropterous insect of a good deal of importance in an economical point of view is the aphis-lion, or larva of the lace-winged fly (*Chrysopa*). It is armed with powerful jaws, within which, in a groove, slide the accessory jaws (maxillæ). With these sabre-like jaws they pierce the body of the aphis, holding them aloft, and suck their blood. The eggs are laid on long stalks among the aphides. The larva spins a spherical white silken cocoon, the pupa being inactive and rudely resembling that of a fly, while the adult insect is green, with beautiful gauze wings and golden eyes.

Another type of Neuroptera is the caddis-fly. Some of the smaller forms so closely resemble some of the smaller moths (Tineæ) that they would be easily mistaken for them. The larvæ often resemble caterpillars in form, except that they have no abdominal legs. They have the curious habit of constructing cases of bits of leaves, pieces of stick, or grains of sand. The case of *Helicopsyche* is often mistaken for a snail-shell. When about to transform into the pupa state, the larva closes the mouth of its case with a grating or a silken lid, or spins a silken cocoon.

Synopsis of the Families of Neuroptera.

1. Wingless, minute, with the ovipositor changed into a spring; mouth-parts internal: *Poduridæ* (spring-tails).
2. Wingless, mouth-parts partly external; body long, ending in two bristles or a forceps: *Campodeæ*.
3. Body long, covered with scales, and ending in three long bristles: *Lepismatidæ* (bristle-tails).
4. Moth-like, wings folded on the sides; larva in cases: *Phryganeidæ* (caddis-flies, case-worms).
5. Mouth-parts forming a beak; tail ending in a forceps; or wingless: *Panorpidæ* (scorpion-fly).
6. Wings gauzy; larva with long jaws: *Hemerobiidæ* (aphis and ant-lions).
7. Prothorax large and square; wings large, net-veined: *Sialidæ*.
8. Wings very large, both pairs alike; larva with a mask: *Libellulidæ* (dragon-flies).
9. Wings large, net-veined; prothorax square. Species fossil: *Hemeristina*.
10. Wings very unequal in size; mouth-parts aborted; larva with broad leaf-like fringed gills along sides of abdomen: *Ephemeridæ* (May-flies).
11. Perla-like, but with raptorial, spiny fore legs. Fossil: *Palæopterina*.
12. Body flattened; prothorax large; wings folded flat on the back; abdomen ending in two long caudal filaments: *Perlidæ*.
13. Aphis-like; prothorax small; wings small, with few veins, or wingless: *Psocidæ* (death-tick, etc.).
14. Body linear, flattened; wings with few veins: *Embidæ*.
15. Body ant-like; wings long and large, parallel and finely net-veined; social, workers and soldiers, besides true males and females: *Termitidæ* (white ants).

A. S. Packard, Jr.

Neurot'ics [Fr. *névrotique;* Gr. νεῦρον, a "nerve"], a term lately introduced into medicine to refer generically to such drugs as are capable of primarily affecting the functions of intellection, sensibility, or motility. Alcohol, the ethers, chloral, potassium bromide, amyl nitrite, the drugs of the opium type, quinine, strychnine, hemlock, Calabar bean, aconite, digitalis, etc., are all prominent examples of the character of such drugs. Edward Curtis.

Neu'satz, town of Austria, province of Serbia, on the Danube, opposite to Peterwardein. In 1849, during the Hungarian revolution, it was almost wholly destroyed, but it is now once more a flourishing town. Pop. 19,119.

Neuse River, formed by the union of Eno and Flat rivers in Wake co., N. C., flows in an indirect S. E. course for about 300 miles to Pamlico Sound. It is navigable except at low water by steamboats to Waynesborough, and at high water to a much higher point.

Neu'siedl, Lake of, in Hungary, near the north-western frontier, is 23 miles long and 7 miles broad. Its water contains much soda, vitriol, and salt, and has a brackish and loathsome taste. The western bank is hilly, the eastern bank is low and marshy. The lake sometimes dries up entirely, as was the case in 1693, 1738, and 1865; but in 1870 the basin again became filled with water through the Hàuzàg marsh. Under sudden risings of the water a canal conducts it to the river Rabuity.

Neu'sohl, town of Hungary, at the confluence of the Gran and Bestritza, is in a rich mining-district, with manufactures of arms and of beetroot-sugar. Pop. 5661.

Neuss, town of Rhenish Prussia, on the Erft, here connected with the Rhine by a canal, has manufactures of woollens, cotton, and leather. Pop. 13,992.

Neu'stadt, or **Wie'ner-Neu'stadt,** town of Lower Austria at the commencement of the canal of same name, and on the Vienna and Grätz Railway, 26 miles S. of Vienna. It is surrounded by a wall and a deep ditch. In 1834 the town was nearly destroyed by fire. It has since been handsomely rebuilt, and is the seat of a military academy founded by Maria Theresa. (See Olmutz and Znaim.) It possesses the largest sugar-refineries in Austria, and its manufacturing interests are rapidly increasing. Pop. 14,544.

Neustadt, town of Prussia, province of Silesia, has manufactures of linen fabrics, especially damask. Pop. 7980.

Neustadt, a German village of Normanby tp., Grey co., Ont., Canada, has a weekly newspaper. Pop. about 600.

Neustadt-an-der-Hardt, town of Rhenish Bavaria, on the Speyerbach, has manufactures of gold and silver ware, oil, vinegar, paper, and leather. Pop. 7150.

Neu'stadt-E'berswalde, town of Prussia, province of Brandenburg, on Finnow Canal, has a copper-mill, and manufactures of iron, steel, and brass ware. Pop. 6441.

Neu'städtl-an-der-Waag, town of Hungary, on the Waag. It carries on a considerable trade in corn, wool, wax, and sheep skins. Pop. 5500.

Neu-Stettin, town of Prussia, province of Pomerania, manufactures woollens, linens, and tobacco. Pop. 6364.

Neu-Stre'litz, capital of the grand duchy of Mecklenburg-Strelitz, is a handsome and well-built town, contains a fine palace with a library of 80,000 volumes, a theatre, and educational and benevolent institutions. Pop. 8470.

Neu'titschein, town of Austria, province of Moravia, on the Titsch, has manufactures of linens, woollens, and flannels. Its vicinity produces cattle and flax. Pop. 7907.

Neu'tra, town of Hungary, near the Moravian frontier, on the Neutra, is the seat of several civil and ecclesiastical authorities, and has a fine old castle. Pop. 10,683.

Neutrality. See International Law, by Pres. T. D. Woolsey.

Neutral Trade. The liabilities and rights of neutral trade, altogether the most important title of international law for nations that have any maritime commerce, have been considered in International Law. We add here but a single remark, that war must inevitably interrupt the

intercourse not only between belligerents, but between either of them and neutrals. In former times this was of great importance, but by no means of so great as at present. By the rules of the Declaration of Paris in 1856 for all the nations that are parties to them, these inconveniences of war to neutrals are in some degree counterbalanced by settling the rule that an enemy's goods, if not contraband, are safe on a neutral vessel not intending to break blockade. But whether other rules are not desirable to prevent trade in contraband articles with the ports of either enemy, may well be questioned. To the writer of this article some such rules seem to be highly necessary. T. D. Woolsey.

Neu'wied, town of Rhenish Prussia, on the right bank of the Rhine. It is regularly built, has manufactures of cloth, woollens, leather, tobacco, and hardware, and has schools in care of the Moravians. Pop. 8664.

Neva'da, one of the Pacific States of the Union, lying between the parallels of 35° and 42° N. lat., and between the meridians of 114° and 120° W. lon. from Greenwich. It is bounded N. by Oregon and Idaho, E. by Utah and Arizona, S. W. and W. by California. The Colorado of the West forms its S. E. boundary till that river crosses the

Seal of Nevada.

meridian of 114° W. lon., and its S. W. boundary is defined as extending from the crossing of the 39th parallel of latitude with the 120th meridian of W. lon. to Fort Mohave on the Colorado in lat. 35°. Its extreme length from N. to S. is 483 miles, and its greatest breadth from E. to W. 423 miles. Its area is 104,125 square miles.

Face of the Country.—The greater part of Nevada is included in what is known as the Great American Basin, which has for its walls the Sierra Nevada on the W. and the Wahsatch Mountains on the E. It is bounded N. and S. by cross ranges, and has no outlet for its waters. This vast basin is a tableland about 4000 feet above the sea, and mountains, either in ranges or isolated summits, rise from 1000 to 8000 feet above its level. About 12,000 square miles in the S. E. of the State are outside of this basin, and belong to the Colorado River Basin, whose lofty mesas or table-lands and deep cañons have been elsewhere described. The Sierra Nevada Mountains constitute the western boundary of the State, their eastern slopes only being included within it. They throw out one spur, however, the Washoe Mountains, which have a N. E. direction. Most of the mountain-chains are parallel to each other, and have a general course from N. to S. The principal chains, beginning at the W., are the Virginia Mountains, W. of Pyramid Lake and extending S. nearly to Carson City; the Lake range, between Pyramid and Winnemucca lakes; the Truckee Mountains, E. of Winnemucca Lake; the Trinity and Antelope Mountains, which form the western boundary of the Lower Humboldt River and Lake valley; the West Humboldt Mountains, and, separated from these by a broad valley, the East Humboldt Mountains; S. of the Humboldts and nearly equidistant from the two, blocking up the southern expansion of the broad valley of which we have spoken, are the Toyabe Mountains, and a parallel range, the Santa Rosa, whose lower summits extend up the valley and cross the Humboldt River. The Pah-Ute and Coyote Mountains, also outliers of the Toyabe range on the W., extend northward toward the Humboldt River and Lake. E. and S. E. of the East Humboldt range are the Edwards Creek Mountains, the New Pass range, the Shoshone and Reese River ranges, the Hot Creek, Reveille, and Smoky ranges, the Diamond, Egan, Ungoweah, and Goshoot mountains, parallel ranges, with valleys of greater or less width between them. In the S. W. is an isolated range, the White Mountains. The Colorado valley has numerous abrupt ranges rising from its plateaux, and three peaks of considerable height, viz. Tem Piute, Pahranegat, and Picohe. The most important ranges of the Colorado region are the Muddy, Vegas, Spring Mountain, and Kingston Mountains. Some of the peaks of the West Humboldt and Southern Toyabe ranges rise to the height of 10,000 to 12,000 feet. The eastern slope of the Sierra Nevada and the Humboldt, East Humboldt, and Toyabe ranges have a considerable number of streams, which, however, disappear very suddenly from the surface and reappear as lakes or pools farther on. The valleys watered by these streams are in part fertile, but their lowest portions are occupied by muddy pools, impassable in winter from the depth of the mud, and forming in summer alkali flats, crusted over with crude soda. The principal rivers are the Truckee, which rises in Tahoe Lake and flows N. E. and N. W. into Pyramid Lake; the Humboldt, which is formed by the confluence of several small streams in the N. E. of the State, and after a general S. W. course falls into Humboldt Lake; Walker River, in the S. W., which, after a circuitous course, falls into Walker Lake; Carson River, discharging into Carson Lake; Quinn's River in the N. W., Reese River in the central portion of the State; the Rio Virgin in the S. E., and the Colorado, which forms for a considerable distance a part of the S. E. boundary. The principal lakes are—Pyramid, 33 miles long and 14 wide; Walker, nearly as large; Carson, 12 miles in diameter; Humboldt, somewhat smaller; Winnemucca, 18 miles long, 8 wide; Lake Tahoe, one-third of which is in Nevada, 1500 feet deep, 6000 feet above the sea, and numerous shallow lakes of large extent in the rainy season, but dry or nearly so in the dry season. Among these are several known as mud lakes, Franklin Lake, Preuss Lake, Pahranegat Lake, etc. The approximate amount of land of the different qualities is thus stated by the State surveyor at the close of 1874: Agricultural or arable land, at present taken up as such, 1,505,000 acres; grazing lands, 22,210,276 acres; timbered lands, 3,699,700 acres; mineral lands, 2,582,720 acres; these are only such as have had mines opened upon them. The entire amount of mineral lands is supposed to exceed 6,000,000 acres. The agricultural lands are estimated at 17,608,960 acres; reclaimable swamp-lands, 74,880 acres, mountain-range lands only available for grazing, and that only during a part of the year, 21,520,280 acres, and barren and worthless sandy lands, 2,151,680 acres.

Geology.—It is doubtful whether there are, or have been within the last hundred years or more, any active volcanoes in Nevada, though some of the peaks have shown symptoms threatening eruption; but no one can traverse its mountains and valleys without finding abundant evidence of the great extent of volcanic action in the past. The surface of the valleys and plains is almost entirely Tertiary, Quaternary, or alluvial in some of the lower portions of the valleys, but everywhere the numerous mountain-ranges have a uniform constitution, the Azoic and Metamorphic rocks being upheaved, granite or gneiss and trachyte, rhyolite, and basalt above, and every ridge is crowned with Silurian rocks, limestone, sandstone, etc., all crystallized by the intense heat through which they have passed. On many of the bleak and bare mountain-sides, utterly devoid of vegetation, the lava is still visible, though of course changed by the lapse of time. This great basin must have been in ancient geologic time the bed of a vast sea until the subsequent upheaval, which may have been aided by some subterranean drainage of the waters, left it thus furrowed and remarkable in its character. The region outside of the great basin belonging to the Colorado basin is Eozoic and Silurian in about equal areas. Here there are also marked evidences of volcanic action, all the rocks being Metamorphic, and a part of them stratified in such a way as to indicate that the volcanic action took place under water. Crystallized limestones, granite, syenite, serpentine, and arenaceous and chloritic slates, with frequent dykes and overflows of trachytic lava and basaltic trap, constitute the principal rocks of this region.

Mineralogy.—Gold, except in combination with silver, is not an abundant metal in Nevada, but some of the argentiferous ores contain a large amount of gold in combination, and this seems to increase with the depth of the mines. The percentage of gold in these ores varies from 21 to 52 per cent. of the entire metallic product. The Comstock lode and the consolidated companies, since the great progress made in the Sutro Tunnel, are yielding increased amounts of gold, much free gold being found in the ore veins. In the Humboldt and Walker River regions gold-quartz veins of considerable promise have been discovered. Silver is, however, the staple mineral product of Nevada, and the yield of this metal is increasing with great rapidity. The silver lodes are found in almost every part of the State, some yielding from \$65 to \$100 to the ton, others ranging from \$450 to \$2500 or more to the ton. Of these the mines on the Comstock vein or lode have proved the

most valuable. The number of mines in the State is very large, and new mines are constantly being opened. In the autumn of 1874 the number of mines was 243 in twelve counties, and the product of gold and silver for that year was $35,402,263, of which $22,000,000 came from the Comstock lode. The Sutro Tunnel is 3½ miles in length, and passes through all the ramifications of the Comstock lode in Virginia City and Gold Hill, draining the mines at a depth of nearly 3000 feet. It had been completed to the distance of a little more than 2 miles in Dec., 1875, and it was believed would be finished before Jan., 1878. The other minerals of Nevada are—lead and copper in various forms, iron in numerous forms, as magnetic, spathic, specular, common iron pyrites, arsenical and magnetic pyrites, etc.: it is not as yet mined to any extent; antimony, arsenic, possibly quicksilver, manganese, sulphuret of zinc, graphite or plumbago, sulphur, pure; gypsum, rock salt, nitrate of potassa, carbonate of soda, in immense quantities, borax, lignite or brown coal, kaolin, sulphate of magnesia, agates, amethysts, epidote, tourmaline, chalcedony, jasper, carnelian, fluor-spar, selenite, etc. There are numerous mineral springs and some geysers in the State.

Soil and Vegetation.—We have already given in general terms the character of the soil. While the State will never be largely agricultural, it possesses a sufficiency of arable lands to supply, with the aid of irrigation, and possibly without, the needs of such a population as it is destined to have; and its mountain-slopes and some of its valleys will prove to be among the best grazing-lands of the Pacific region. Its timber-lands proper, those on which grow the lofty pines of the sierras, are of very moderate extent, not exceeding 400,000 acres, and much of this is being cut off to supply the demands of the mining districts. A part of the lower portions of the mountain-regions and some of the valleys, along which the rivers flow, are covered with a smaller growth of piñon or nut-pine, cottonwood, birch, willow, dwarf cedar, etc. The flora of the State, except on the sierras, differs materially from that of California. Of the 65 natural families of plants catalogued in the State, many are represented by a large number of genera and species. Lupines, clovers, vetches, and nutritious grasses are the most characteristic plants of the State.

Zoology.—The animals are those of the Pacific slope: the grizzly bear, the Mexican bear, cougar, wild-cat, lynx, Rocky Mountain sheep, antelope, deer, two or three species, and most of the smaller game, including the sage-hare, sage-grouse, etc. etc., are the most characteristic mammals. The birds and reptiles do not differ materially from those of California. The larger lakes are stocked with trout, salmon trout, etc.; but in the shallow lakes these do not succeed well, owing to the alkaline character of the waters.

Climate.—We cannot learn that meteorological tables have been kept continuously in this State for any year since its settlement. From the State mineralogist's reports we glean the following items in regard to the climate: It is characterized by great extremes. In winter snow falls upon the summits of the mountains, though there is not much in the valleys. The air is dry, the winds strong, and though the sunshine is bright and pleasant at midday, the nights are often intensely cold. In January the mercury falls to from 10° to 16° below zero in the valleys and much lower in the mountains, but this severe cold lasts but a few days, though it may be repeated. The last of February the approach of spring is announced, though there may be piercing winds and sharp frosts, chilling rain, and snow in March or even April. Thunder-storms of great severity occur in April and May and into June. When these have passed away, the dry season prevails until October throughout the western, central, and northern parts of the State. The air becomes heated, and whirlwinds and spiral columns of dust are raised to great heights. The temperature rises to 100° or 105°, but usually only for a few days. It falls every night to between 70° and 80°, and does not average in July and August more than 90° at midday. In the eastern part of the State there are frequent thunder-storms in summer and till Sept. 15, and the heat is longer continued and more oppressive. There is less intense cold, very little snow or frost in winter in S. E. Nevada, and the culture of cotton and the sugar-cane has been attempted there. The climate is remarkably healthy and invigorating.

Agricultural Products.—In 1874 the State surveyor-general made the following report of agricultural industry: Lands enclosed, 106,218 acres; lands cultivated, 77,564 acres; wheat grown, 73,600 bushels; barley, 506,790 bushels; oats, 74,695 bushels; rye, 1000 bushels; Indian corn, 13,960 bushels; buckwheat, 200 bushels; peas, 3450 bushels; beans, 590 bushels; potatoes, 292,108 bushels; sweet potatoes, 24 bushels; onions, 4210 bushels; hay, 77,626 tons; beets, 314 tons; turnips, 320 tons; pumpkins and squashes, 5352 tons; butter, 227,240 pounds; cheese, 22,200

pounds; wool, 668,738 pounds; honey, 7400 pounds; fruit trees, 21,788 apple, 5067 peach, 2874 pear, 3364 plum, 1506 cherry, 276 nectarine, 316 quince, 158 apricot, 97 fig, a few lemon, orange, and prune trees, 80 mulberry, 23 almond, 347 English walnut, 32,526 grapevines, 74,100 strawberry, 18,524 gooseberry and raspberry plants, 200 gallons wine made, 1425 shade-trees planted. The live-stock in the State Jan., 1875, was—22,131 horses; 4732 mules and asses; 49,895 milch cows, 28,005 calves, 75,082 beef cattle, 5793 oxen—a total of 181,891 cattle; 185,486 sheep, 2439 Cashmere and Angora goats, and 5290 hogs.

Manufacturing Industry.—In 1874 there were 14 grist-mills in the State; 31,050 barrels of flour and 3200 bushels of corn-meal were produced; there were 27 saw-mills, which in 1873 produced 19,806,000 feet of lumber, and in 1874 only 3,480,000 feet; 161 quartz-mills, of which only 143 were in operation, and these crushed 621,442 tons of quartz. There were 7 mining ditches, the entire length of which was 35 miles, and 561 irrigating ditches, worth $66,000, which irrigated 101,699 acres of land; 100 tons of coal were mined, worth $1000. There were 4 planing-mills, 1 framing-mill, 7 breweries, making 67,854 barrels of beer. Of course, there are many minor manufactures, such as blacksmithing, clothing, boots and shoes, brickmaking, etc., which are not represented. The census of 1870 states the number of manufacturing establishments as 330; hands employed, 2859, all men but 3; capital, $5,127,790; wages, $2,498,473; raw material, $10,315,984; annual product, $15,870,539. Of this product milled quartz included $12,119,719; pig lead, $894,600; iron castings, $641,250; machinery, $273,500; lumber, $447,500; gold and silver, reduced and refined, $260,000.

Mining.—We have already given the statistics of the yield of the precious metals. The other mining products are lead, smelted and separated, to the amount of $2,000,000 annually; copper, mostly shipped in the ore or partly reduced; borax, salt of excellent quality, largely used in the mines; crude carbonate of soda, and sulphur.

Railroads.—According to the surveyor-general's report, there were in Jan., 1875, 14 railroads, a part or the whole of whose track was in the State. Their entire mileage was 603.06 miles, and their value (probably only the value of their real estate, as it was for taxation purposes alone that it was estimated) was $3,082,570. In his message of Jan., 1875, His Excellency Gov. Bradley states the real value of the Central Pacific alone in the State at $14,592,000, and urges that it should pay taxes on that amount. *Poor's Manual* states the number of miles of railroad in Nevada, Jan. 1, 1875, at 654.25 miles, and the cost of roads and equipment at $53,722,719. A considerable number of the local roads are narrow gauge—3 feet.

Finances.—The State debt Jan. 1, 1875, was $660,000. The assets applicable to its reduction were (exclusive of the school fund) $471,835.67, leaving a net indebtedness of $188,164.33. The balance in the treasury at the same date was $517,639.39, of which $488,356.28 was coin, and there were outstanding coin warrants to the amount of $45,284.27, and currency warrants to the amount of $1022. The assessed valuation of real and personal property for the year 1874 was $26,630,279.22, and the increased production of the precious metals was likely to enhance materially the valuation for 1875.

Commerce.—As an interior State, Nevada has no direct foreign commerce. Through the ports of San Francisco and New York she exports largely of bullion and coin, as well as copper ores, lead, and borax, and imports machinery, clothing, dry goods and groceries, produce, etc.

Banks.—There were in Jan., 1875, one national bank, which was closing and had only $7864 of the circulation outstanding; one State bank, at Lincoln, with $50,000 capital; two agencies of the Bank of California, and fifteen private banking-houses. Since that time a branch of the Gold Bank and Trust Co. of San Francisco has been established there. There are no savings banks or life or fire insurance companies.

Education.—The State school fund Jan. 1, 1875, amounted to $250,000. The amount expended for school purposes in 1874 was $154,812.43. The total number of persons between 6 and 21 years of age was 6656. Total number of children enrolled, 4811; average attendance, 2884. Number of school districts, 71; of school-houses, 59; rented 26. Male teachers, 35; female teachers, 80; whole number of teachers, 115. Average monthly wages of teachers, $100.56, or about $108 for male teachers and $95 for females. There were 21 primary schools, 4 intermediate, 69 unclassified, 12 grammar, and 2 high schools. The length of schools averaged 7 months and 11 days.

Higher Education.—A State University has been located at Elko, and the inhabitants of that town presented it with 20 acres of land eligibly situated, and a good and commodious building erected at a cost of about $15,000. The

university is entitled to the proceeds of the university lands—72 sections; and when it shall have established a mining and agricultural school, to the interest of the proceeds of the agricultural college grant of 90,000 acres. The preparatory department of the university was opened in Oct., 1874, with 12 pupils. There is no other college or collegiate institution in Nevada. Three deaf-and-dumb pupils are supported by the State at the Oakland, California, Institute for Deaf Mutes.

The following are the statistics of the population:

Census year.	Aggregate population.	Males.	Females.	Whites.	Colored.	Indians.	Natives.	Foreigners.	Density.	Ratio of increase.	Illiteracy.	Of school age, 5–20.	Of military age, 18–45, males.	Of voting age, 21 and over, males.	Citizens.
1860	6,857	6,137	720	6,812	45	....	4,793	2,064	0.06	....	150	500	5,149	5,699	5,301
1870	42,491*	32,359	10,112	38,959	3,509‡	16,243*	23,690	18,801	0.41	519.67	872	6,950	24,762	26,920	18,652
1875	52,540*	37,541	14,999	48,127	4,413†	....	....	....	0.66	17.11	.....	......	....	....	16,952

Charitable Institutions.—The State has a State Orphans' Home at Carson, in which there were, Jan. 1, 1875, 40 children, 31 half orphans, and 9 whole orphans, with suitable teachers and a good farm. The institution seems to be well conducted; expenses, about $12,000 per annum aside from the produce of the farm. The indigent insane of the State are now maintained by contract at a private asylum in Woodbridge, Cal., where, at the beginning of 1875, there were 61 patients; but the State commissioners report decidedly in favor of a State hospital.

Penal Institutions.—The present State prison at Carson is well managed, but its capacity is inadequate to the needs of the State, and the erection of a new prison has been commenced at Reno. On the completion of this, about Jan., 1877, it is proposed to refit the prison at Carson for a State insane hospital. The number of convicts in the prison Jan. 1, 1875, was 133; 59 had been received and 39 discharged and pardoned during the year. The current expenses of the prison were about $30,000 per year.

Newspapers.—In 1870 there were 12 newspapers in Nevada, having an aggregate circulation of 11,300 and a total annual issue of 2,572,000 copies. Of these 5 were daily, with 7500 circulation, 2 semi-weekly, with 950 circulation, and 5 weekly, with 2850 circulation. In 1875 the number was 22—12 daily, 1 semi-weekly, and 9 weekly.

Religious Denominations.

Denominations.	Ch. organizations, 1870.	Ch. edifices, 1870.	Sittings, 1870.	Ch. property, 1870.	Ch. organizations, 1874.	Ch. edifices, 1874.	Ministers, 1874.	Members or communicants, 1874.	Adherent population, 1874.	Ch. property, 1874.
All denominations..	32	19	8,000	$212,000	44	32	37	1,132	10,900	$301,450
Baptists............	..	..	....	....	3	3	3	50	300	16,000
Congregationalists..	..	..	....	....	1	1	1	12	100	6,000
Prot. Episcopalians.	5	3	1,100	30,000	9	6	9	269	1,400	48,000
Methodists..........	11	7	2,550	50,500	11	10	12	496	2,500	76,250
Presbyterians.......	5	3	1,100	18,500	5	3	3	169	1,000	21,200
Roman Catholics ...	10	6	3,250	113,000	13	7	6	....	5,000	134,000

Constitution, Courts, Representatives in Congress, etc.—The constitution provides that every male citizen of the U. S. twenty-one years old and upwards, who has actually resided in the State six months, and in the district or county thirty days next preceding an election, shall be entitled to vote, with the usual exceptions of idiots, insane persons, and felons who have not had their civil rights restored. The senate consists of 18 members, elected for four years; the assembly of 36 members, elected for two years. The sessions of the legislature are biennial; the elections are held in the even years, and the sessions of the legislature in the odd years. The executive officer is the governor, who, with the lieutenant-governor, secretary of state, treasurer, comptroller, surveyor-general, attorney-general, and superintendent of public instruction, is elected by the people for four years. A State mineralogist is appointed by the governor, with the advice and consent of the senate. The judicial authority is vested in a supreme court, district courts, and justices of the peace. The supreme court consists of a chief-justice and two associate justices, elected by the people for six years. The court has appellate jurisdiction in all cases of equity, and in civil cases involving real estate and mining claims, and in all criminal cases where the charge amounts to a felony. There are nine judicial districts, each presided over by a single judge. The district judges are elected for four years. The State is entitled to one representative in Congress.

Counties.—Of these 14 are organized and 1 unorganized.

Counties.	Aggregate pop., 1870.	Males, 1870.	Females, 1870.	Pop., 1875. Males.	Pop., 1875. Females.	True valuation, 1870.	Assessed valuation, 1874.
Churchill	196	142	54	186	89	$524,836	$429,871
Douglas......	1,215	886	329	1,285	433	762,864	921,786
Elko..........	3,447	2,776	671	2,588	1,014	3,397,086	2,780,240
Esmeralda ...	1,553	1,253	300	979	309	1,174,242	622,211
Eureka.......	New	co.	......	4,152	877	....	2,783,329
Humboldt....	1,916	1,548	368	1,795	662	2,335,131	2,327,576
Lander.......	2,815	2,204	611	1,672	708	4,766,947	1,546,544
Lincoln	2,985	2,119	866	1,904	849	253,474	1,195,208
Lyon	1,837	1,389	448	1,484	637	1,546,023	1,315,638
Nye..........	1,087	887	200	1,345	372	967,707	1,647,432
Ormsby......	3,668	2,798	870	1,981	1,181	2,096,578	2,404,381
Roop, not org.	133	115	18				
Storey	11,359	7,864	3,495	13,415	6,113	6,343,948	4,959,542
Washoe.......	3,091	2,173	918	2,767	1,186	2,397,300	2,511,475
White Pine...	7,189	6,225	964	1,988	569	4,567,876	1,185,046
Totals......	42,491	32,379	10,112	39,541	13,999	$31,134,012	$26,630,279

Principal Towns.—Carson City, the capital, had in 1870 a population of 3042; Virginia City, the largest city in the State, had 7048; the other principal towns were: Gold Hill and Hamilton, each having from 4000 to 5000 inhabitants; Treasure City, with about 2000; and Elko, Pioche City, and Reno, between 1000 and 2000. Austin, Dayton, Winnemucca, and Shermantown are all thriving and growing towns.

History.—Nevada is a part of the territory ceded to the U. S. by Mexico by the treaty of Guadaloupe Hidalgo Feb. 2, 1848. It was at first a part of California territory, and was subsequently attached to Utah; it was constituted a territory in Mar., 1861, with somewhat smaller boundaries than at present, its eastern line being 115° W. lon. and its south-eastern not taking in, as now, a portion of the Colorado valley. In 1862 it was granted this tract, and also one degree of longitude farther E., making its boundary on the E. the 114th meridian W. from Greenwich. Its admission as a State was discussed in 1863, and a convention called to form a constitution, but the constitution was rejected on the ground that the population was insufficient for the maintenance of a State government. In 1864 an enabling act was passed, under which a constitutional convention was called, met July 4, 1864, and agreed upon a constitution under which the State is still governed. The constitution was ratified and Nevada admitted into the Union as a State Oct. 31, 1864. Additions were made to its territory by congressional enactment in 1866. Though its population was small, it furnished a brave body of soldiers to the Union army, and sent to the Sanitary Commission fair its donation of $51,000 in silver bricks. Its immense mineral wealth foreshadows for it a brilliant future.

Governors of Territory and State.

Territory.		*State.*	
James W. Nye	1861–64	Henry G. Blaisdell	1864–71
		Louis R. Bradley	1871–

Electoral and Popular Vote for President and Vice-President.

Year of election.	Candidates who received the electoral vote of the State.	Elect. vote.	Popular vote.	Opposition candidates.	Popular vote.	Minority or third-party candidates.	Popular vote.
1864	Abraham Lincoln P......... Andrew Johnson V.-P.....	3	9,826	George B. McClellan P... George H. Pendleton V.-P.	6,594		
1868	Ulysses S. Grant P............ Schuyler Colfax V.-P........	3	6,480	Horatio Seymour P......... Francis P. Blair, Jr., V.-P.	5,218		
1872	Ulysses S. Grant P............. Henry Wilson V.-P..........	3	8,413	Horace Greeley P............ Benj. Gratz Brown V.-P...	6,236	Charles O'Conor P...........	No report.

For valuable statistical and other information relative to Nevada we are under obligation to His Excellency Hon. Louis R. Bradley, governor of Nevada. L. P. BROCKETT.

*To these are to be added 16,220 Indians sustaining tribal relations, included in column of Indians 1870.

†Includes 3152 Chinese. ‡Includes 3919 Chinese.

Neva′da, county of S. W. Arkansas. Area, 625 square miles. It is bounded N. by the Little Missouri River. It is uneven, well wooded, and generally fertile and adapted to cotton and corn culture. Cap. Mount Moriah. This county has been formed since the census of 1870.

Nevada, county of California, extending S. W. from the Nevada State line to the middle fork of Yuba River. Area, 1100 square miles. It is very mountainous, but has fertile valleys. It is traversed by the Central Pacific R. R. Gold-mining is a leading pursuit. Lumber and malt liquors are the principal articles of manufacture. Cap. Nevada City. Pop. 19,134.

Nevada, post-v. and tp. of Livingston co., Ill., on the Chicago and Alton R. R. Pop. 877.

Nevada, tp. of Palo Alto co., Ia. Pop. 142.

Nevada, post-v. and tp., cap. of Story co., Ia., on the Chicago and North-western R. R., has 2 churches, 2 banks, a soap-factory, a steam flouring-mill and elevator, 3 hotels, 1 newspaper, and stores. The State Agricultural College is located 9 miles W. Principal business, stock and corn raising. Pop. of v. 982; of tp. 1611.
W. H. Gallup, Ed. "Representative."

Nevada, post-v. of Dicksville tp., Mercer co., Ky., 6 miles from Harrodsburg. Pop. 14.

Nevada, post-v. and tp. of Mower co., Minn., 6 miles S. W. of Adams, on the Chicago Milwaukee and St. Paul R. R. Pop. 637.

Nevada, post-v., cap. of Vernon co., Mo., on the Sedalia division of the Missouri Kansas and Texas R. R., 90 miles S. W. of Sedalia, has manufactories and business-houses, and 4 weekly newspapers. Pop. about 1000.

Nevada, post-v. of Wyandot co., O., on the Pittsburg Fort Wayne and Chicago R. R., has good union schools, 3 churches, a deposit bank, 1 newspaper, 1 hotel, and stores. Principal business, farming and stock-raising. Pop. 828.
A. B. Kirtland, Ed. "Nevada Enterprise."

Nevada City, post-v., cap. of Nevada co., Cal., 16 miles from the Central Pacific R. R., with which it is connected by a branch track, has good school advantages, a court-house, 1 bank, 1 newspaper, hotels, several dry-goods stores, 6 quartz-mills in constant operation, and stores and shops. More gold is now taken from the rock than ever before. All of the secret orders are represented. The climate is unsurpassed. Pop. 3986.
Brown & Watson, Eds. "Nevada Transcript."

Nevers′, town of France, capital of the department of Nièvre, stands on the Loire, here crossed by an elegant stone bridge of twenty arches. The town is old and ill built, with narrow, crooked streets, but it has beautiful promenades, extensive manufactures of iron goods, copper ware, chemicals, porcelain, cloth, and linens, and large tanneries, breweries, and cannon-foundries. It contains several good educational institutions—a college, a female seminary, and a polytechnic school. Pop. 22,276.

Nev′ersink, post-v. and tp. of Sullivan co., N. Y., on the Neversink River, 16 miles from Monticello on the Erie R. R., has 7 churches, and carries on lumbering, tanning, and dairying. Pop. 2458.

Neviansk′, town of European Russia, government of Perm, on the eastern side of the Ural Mountains, is the centre of a very rich mining district, producing gold, copper, platinum, and iron of superior quality. Pop. 20,000.

Nev′ille, post-v. of Washington tp., Clermont co., O., on the Ohio River, 33 miles S. E. of Cincinnati. Pop. 422.

Neville, tp. of Allegheny co., Pa., on the Pittsburg Fort Wayne and Chicago R. R. Pop. 289.

Nev′in (John Williamson), D. D., LL.D., b. in Shippensburg, Franklin co., Pa., Feb. 20, 1803; graduated at Union College 1821; studied theology at Princeton Seminary, where he remained as tutor, and wrote his *Biblical Antiquities* (2 vols., 1828). He was professor of Hebrew and biblical literature in the Presbyterian Theological Seminary at Allegheny City (1829–39), where he edited a weekly literary journal entitled *The Friend* (1833–34); became president of the Mercersburg Theological Seminary 1840, and was president also of Marshall College 1841–53. He published in 1843 *The Anxious Bench,* which occasioned much controversy on the subject of revivals; and in 1844 a translation of Dr. Schaff's inaugural address, *The Principle of Protestantism,* which gave rise to what is known as the "Mercersburg theology," of which Dr. Nevin continues to be the chief exponent. Also *The Mystical Presence* (1846), which increased, in its doctrinal aspect, the controversy alluded to; *The History and Genius of the Heidelberg Catechism* (1847), and *Antichrist, or the Spirit of Sect and Schism* (1848). Dr. Nevin edited the *Mercersburg Review* (quarterly, 1849–53); resigned the direction of the Theological Seminary 1851, and the presidency of Marshall College on its removal to Lancaster and consolidation with Franklin College in 1853. He was afterwards elected president of Franklin and Marshall College, a position which he still holds.

Nev′ins, tp. of Vigo co., Ind., on the Indianapolis and St. Louis R. R. Pop. 1299.

Nev′is, one of the Lesser Antilles, in the West Indies, belongs to Great Britain, and comprises an area of 45 square miles, with 11,735 inhabitants. Sugar, molasses, and rum are the chief products; Charlestown is the principal town.

New (John C.), b. in Vernon, Jennings co., Ind., July 6, 1831; graduated at Bethany College, Va., in 1853; began the study of law in Indianapolis, but was never admitted to the bar. He served as State senator and as adjutant-general of Indiana, and subsequently became cashier of the First National Bank of Indianapolis. In the spring of 1875 he was appointed by Pres. Grant U. S. treasurer.
J. B. Bishop.

New Al′bany, city, tp., port of delivery, and cap. of Floyd co., Ind., on the Ohio River, 3 miles below Louisville, on the Louisville New Albany and Chicago R. R., and on a branch of the Jeffersonville Madison and Indianapolis R. R., is finely situated, has costly and splendid public buildings, including a court-house, city hall, opera-house, Masonic and Odd Fellows halls, has a fine railroad dépôt, 3 large hotels, 10 public-school buildings, 3 newspapers, 30 churches, several banks, a female college, an excellent fire department, a street railroad, gasworks, market-houses, a large river commerce, and 142 manufacturing establishments supplied with unrivalled water-power from the falls of the Ohio, 2 miles distant. Pop. of city, 15,396; of tp. exclusive of city, 2297.

New Albany, tp. of Story co., Ia. Pop. 1003.

New Albany, post-v., cap. of Union co., Miss., 192 miles N. E. of Jackson, has an academy, 2 churches, 1 Bible depository, Masonic lodge, chapter, and council, 1 weekly newspaper, a court-house and jail; incorporated in 1850. Pop. about 482.
Joel A. Hearne, Ed. "New Albany Union."

New Albany, post-v. of Green tp., Mahoning co., O., 3 miles from Salem. Pop. 100.

New Al′bion, post-v. and tp. of Cattaraugus co., N. Y., on the Erie R. R., has 5 churches, several mills, a bank, a tannery, and stores. Pop. 1487.

New Alexan′dria, post-v. of Cross Creek tp., Jefferson co., O., 8 miles from Steubenville. Pop. 167.

New Alexandria, post-b. of Derry tp., Westmoreland co., Pa., on the Loyalhanna Creek, 8 miles N. of Latrobe, has an active trade. Pop. 305.

New′ark, town of England, in the county of Nottingham, on a navigable branch of the Trent, carries on a very large trade in malt, flour, corn, wool, and cattle. Pop. 12,218.

Newark, post-v. of White Clay Creek hundred, Del., on the Philadelphia Wilmington and Baltimore R. R., is the seat of Delaware College and Delaware Agricultural College, and has an academy, 3 churches, and a bank. Pop. 915.

Newark, post-v. of Big Grove tp., Kendall co., Ill., 2 miles from Millington, on the Fox River branch of the Chicago Burlington and Quincy R. R., contains an educational institute.

Newark, post-v. and tp. of Worcester co., Md., on the Worcester line of Wicomico and Pocomoke R. R. Pop. 941.

Newark, post-tp. of Gratiot co., Mich., adjoining Ithaca, the county-seat. Pop. 1006.

Newark, post-v. of Knox co., Mo., on the South Fabius River, 17 miles from Edina, has a church and stores. Pop. 354.

Newark, city and port of entry, cap. of Essex co., N. J., on the Passaic River, 9 miles from New York City, with which it is connected by four different railroads. The city has an abundant supply of water (taken from the Passaic River above tide-water), an academy, high school, and 25 public schools, 104 churches, 9 horse railways, 11 banks of deposit, 5 savings banks, 3 trust companies, 15 fire insurance companies (representing a capital of $5,681,426), 4 life insurance companies (representing $30,141,486), a paid fire department, and an electric fire-alarm telegraph. Its municipal government consists of a mayor, common council (one-half of which are elected annually), an educational board, water and tax commissioners, and an excise board. There are a number of handsome and costly public buildings. Its manufactures represent an extensive industry, embracing hats, carriages,

jewelry, leather, saddlery, harness, brass and iron castings, thread, springs, and axles. The Newark Industrial Institute is an organization of mechanics and manufacturers (chartered in 1873), which has for its object the encouragement and advancement of manufactures and the mechanical arts. Newark also has a board of trade. Its shipping interests are quite extensive; it has a line of docks over a mile in length. The streets are paved with Telford granite and round stones, and the drives, especially to Lewellyn Park, 4 miles distant, are interesting. The annual report for 1873 shows nearly 10 miles of streets opened, 16½ miles improved, and over 6 miles of sewers laid. Expense of the city government for 1873, $1,037,000; rate of taxation, 2 per cent.; tax valuation, about two-thirds the real value. Pop. 105,059.

O. Woodruff, Associate Ed. "Daily Advertiser."

Newark, post-v. of Wayne co., N. Y., situated on the Erie Canal and the New York Central and Hudson River and the Sodus Point and Southern R. Rs., has a German college, an academy and union school, 10 churches, 2 banks, 2 newspapers, 2 furnaces, a glove-factory, 1 canned-fruit factory, several tanneries, malt-houses, flouring and planing mills, and stores and shops. Pop. 2248.

J. Wilson, Ed. "Newark Courier."

Newark, city and tp., cap. of Licking co., O., on the Licking River, the Ohio and Erie Canal, the Baltimore and Ohio and the Pittsburg Cincinnati and St. Louis R. Rs., 33 miles N. E. of Columbus, is well situated and well built in the midst of a fertile agricultural region, near extensive coal-fields, has a graded school system, 2 banks, several churches, 2 newspapers, important manufactures, and a flourishing trade, chiefly in coal, grain, and live-stock. Pop. 6698; of tp. 7617.

Newark, post-v. and tp. of Caledonia co., Vt., 4 miles from West Burke on the Passumpsic R. R., has a church and lumber business. Pop. 593.

Newark, post-v. of Wirt co., West Va., on the Little Kanawha River, and 8 miles from Kanawha Station on the Parkersburg branch of the Baltimore and Ohio R. R. Pop. 580.

Newark, tp. of Rock co., Wis. Pop. 1074.

Newark Valley, a v. of White Pine co., Nev. Pop. 75.

Newark Valley, post-v. and tp. of Tioga co., N. Y., on the Owego Creek and the Southern Central R. R. The township also contains the villages of Ketchumville (P. O.) and West Newark (P. O.), and has 4 churches, several mills, and a tannery. Pop. 2321.

New Ash'ford, post-tp. of Berkshire co., Mass., 7 miles from South Adams, on the Boston and Albany R. R., has 1 church, 2 public schools, marble and limestone quarries, a remarkable cave 130 feet in extent, and farming, lumbering, and charcoal-burning are carried on. Pop. 208.

New Ath'ens, post-v. of St. Clair co., Ill., 28 miles S. E. of St. Louis, on the St. Louis and Cairo Short Line R. R., has good schools, 2 churches, 2 large flour-mills, 1 newspaper, 3 hotels, 2 extensive wagon-factories, and stores and repair-shops. Extensive deposits of coal underlie this section. T. D. Shoupe, Ed. "Era."

New Athens, post-v. of Athens tp., Harrison co., O., 8 miles from Cadiz, seat of Franklin College. Pop. 354.

New Au'burn, post-v. and tp. of Sibley co., Minn., 21 miles N. W. of Le Sueur. Pop. 300.

Neway'go, county in the W. of the S. peninsula of Michigan. Area, 864 square miles. It is nearly level, fertile, and adapted to grain and fruit culture, is heavily timbered; the lumber business is the chief industry. It is traversed by Muskegon River and the Big Rapids branch of the Chicago and Michigan Lake Shore R. R. Cap. Newaygo. Pop. 7294.

Newaygo, post-v., cap. of Newaygo co., Mich., on the Grand Rapids Newaygo and Lake Shore R. R., has excellent schools, 2 churches, 1 newspaper, 2 saw and shingle mills, a sash-factory, and flouring-mill; it has the best water-power in the State. Pop. about 1300.

E. O. Shaw, Ed. "Republican."

New Bal'timore, post-v. of Macomb co., Mich., 5 miles from the station (New Haven P. O.) on the Grand Trunk R. R.

New Baltimore, post-v. and tp. of Greene co., N. Y., on the Hudson River, 15 miles S. of Albany. It contains the village of Medway (P. O.), and has considerable business. Pop. 2617.

New Baltimore, a v. of Crosby tp., Hamilton co., O., on Great Miami River, 10 miles from Hamilton. Pop. 96.

New Barba'does, tp. of Bergen co., N. J., adjoining Hackensack. Pop. 4929.

New Bed'ford, city, one of the capitals of Bristol co., Mass., 55 miles S. of Boston, in lat. 41° 38′ N., lon. 70° 55′ W., and on the Acushnet River. It was formerly the chief seat of the American whale fishery; has 24 public schools, a Friends' academy, 27 religious societies, a domestic missionary society, St. Joseph's Hospital, an orphan asylum, a free public library of 30,000 vols., a paid fire department with steam fire-engines, an electric fire-alarm telegraph, and 1 street railway. The city is supplied with water and gas, and has railroad connection with Boston by two routes, and a line of propellers to New York. Its industries include a cotton-mill, print cloth-works, an iron-foundry, copper-sheathing works, gas, cordage, twist drills, Prussian blue, paraffine candles, 4 oil and candle works, 5 shoe-factories, 2 manufacturing photographic establishments, glass-works, 1 tannery, 2 flour-mills, 3 paint-works, and a number of stores and mechanical shops. There are 4 national and 2 saving banks, 1 fire and 1 marine insurance company, 2 daily and 2 weekly newspapers. Pop. 21,320.

Henry Willey, Ed. "Daily Evening Standard."

New Ber'lin, post-v. and tp. of Sangamon co., Ill., on the Toledo Wabash and Western R. R. It has 1 weekly newspaper. Pop. 954.

New Berlin, post-v. and tp. of Chenango co., N. Y., on the Unadilla River and the New Berlin branch of the New York and Oswego Midland R. R., 20 miles from Sidney Plains, has 1 weekly newspaper and the usual number of business-houses. Pop. 2460.

New Berlin, post-b. of Union tp., Union co., Pa., on Penn's Creek, 12 miles from Northumberland, has several churches and stores. Pop. 646.

New Berlin, post-tp. of Waukesha co., Wis., 7 miles from Waukesha. Pop. 1809.

New'bern, post-v. and tp. of Hale co., Ala., on the Selma Marion and Memphis R. R. Pop. 2400.

Newbern, post-v. of Dallas tp., Marion co., Ia., 10 miles from Chariton. Pop. 190.

Newbern, post-tp. of Dickinson co., Kan. Pop. 583.

Newbern, post-v., cap. of Pulaski co., Va., on the Atlantic Mississippi and Ohio R. R., in the "blue-grass" district of S. W. Virginia, has a court-house, 2 churches, 3 hotels, 1 newspaper, and stores and shops. Pop. 1919.

C. A. Heermans, Ed. "Virginia People."

Newberne, city and tp., cap. of Craven co., N. C., 90 miles from Hatteras Inlet, on the Atlantic and North Carolina R. R., was settled by the Swiss in 1710, and contains a free academy, 15 churches, 2 tobacco-factories, several lumber-mills and turpentine distilleries, 1 monthly, 2 daily, and 6 weekly newspapers. It is a port of entry, the custom-house for Pamlico district being located here. A large traffic in early vegetables for the Northern markets is carried on. Pop. of city, 5849; of tp. exclusive of city, 1606. E. Hubbs, Ed. "Newberne Daily Times."

New'berry, county of Central South Carolina. Area, 616 square miles. It is bounded N. E. partly by the Broad River and S. by the Saluda. It is uneven and productive; cotton and corn are leading products. It is traversed by the Greenville and Columbia R. R. Cap. Newberry Courthouse. Pop. 20,775.

Newberry, tp. of Miami co., O., on the Pittsburg Cincinnati and St. Louis R. R. Pop. 3565.

Newberry, post-v. of Old Lycoming tp., Lycoming co., Pa., and near the Susquehanna River and the Canal.

Newberry (P. O. Newberrytown), tp. of York co., Pa., on the Northern Central R. R., the Susquenanna River, and Conewago Creek. Pop. 2412.

Newberry, post-v. and tp., cap. of Newberry co., S. C., 47 miles N. W. of Columbia, has 2 academies, 6 churches, a national bank, 2 weekly newspapers, 2 steam-mills, 2 tanneries, hotels, and stores. Pop. of v. 1891; of tp. 2792.

Thos. F. Greneker, Ed. "Newberry Herald."

Newberry (John Strong), M. D., LL.D., b. Dec. 22, 1822, at Windsor, Conn., of an old and distinguished Puritan family. He graduated from Western Reserve College in 1846, and from Cleveland Medical College in 1848. The years 1849 and 1850 were spent in travel and study in Europe. In 1851 he established himself as a physician in Cleveland, where he soon acquired a large practice. Finding that the cares and duties of his profession left no time for the scientific studies to which he had been devoted from boyhood, in 1855 he accepted an appointment as acting assistant surgeon in the army, and accompanied as surgeon and geologist the expedition under Lieut. R. S. Williamson, U. S. A., in the exploration of the territory lying between San Francisco and the Columbia River. In 1857–58 he was attached, in the same capacity, to the expedition under

Lieut. J. C. Ives, U. S. A., which made the first exploration of the Colorado River, the most interesting and important of the surveys of our Western territory. In 1859, Dr. Newberry accompanied Capt. J. N. Macomb, U. S. Engineers, in the exploration of the country bordering the upper Colorado and San Juan rivers—a region found to be of peculiar interest from its remarkable topographical features, its geological structure, and the extensive ruins scattered over it.

The publications of Prof. Newberry have been numerous and valuable. They are chiefly in the departments of geology and palæontology, but also include papers on botany and zoology. The most important are—a report *On the Geology, Botany, and Zoology of Northern California and Oregon* (4to, pp. 300, pl. 48), *The Geology of the Colorado Expedition* (4to, pp. 148, 1860), *Geology of the San Juan Expedition* (4to, pp. 200, 1875), *The U. S. Sanitary Commission in the Valley of the Mississippi* (8vo, pp. 536, 1871), *Reports of the Geological Survey of Ohio*, *Our Later Extinct Floras* (1869), *Catalogue of the Plants of Ohio* (1860), *Fossil Plants collected on the N. W. Boundary Commission* (1863), *The Rock Oils of Ohio* (1859), *Fossil Plants from Chinese Coal-bearing Rocks* (1865), *Circles of Deposition in American Sedimentary Rocks* (1873), *Iron Resources of the U. S.* (1874), *Surface Geology of Ohio* (1874), *The Structure and Relations of Dinichthys* (1875), etc. Dr. Newberry has been honored with membership in most of the learned societies of this country and in many of Europe; was one of the original incorporators of the National Academy of Sciences; has held the office of president of the American Association, and is now president of the New York Academy of Sciences.

New Beth'lehem, post-b. of Porter tp., Clarion co., Pa., on Allegheny Vall. R. R. and Red Bank Creek. Pop. 348.

New Bloom'field, post-v., cap. of Perry co., Pa., has 4 churches, 4 newspapers, 1 foundry, 1 carriage manufactory, and stores. Principal employment, agriculture.

F. Mortimer, Ed. "Bloomfield Times."

New Bos'ton, post-v. and tp. of Mercer co., Ill., on the Chicago Burlington and Quincy R. R., and on Sturgeon Bay and the Mississippi River, has an active business and is the shipping-point for produce of the surrounding country. Pop. of v. 779; of tp. 1758.

New Boston, post-tp. of Hillsborough co., N. H., 6 miles W. by S. of Goffstown. The village is pleasantly situated in a deep valley, and has 2 churches, 2 chapels, and a town-house. The town has manufactures of lumber, paper, furniture, organ and piano frames, cotton batting, etc. Pop. 1241. S. H. Keeler.

New Boston, a v. (Dallas P. O.) of Paint tp., Highland co., O., 5 miles from Hillsborough. Pop. 111.

New Brad'ford, a v. of Monon tp., White co., Ind., on the Louisville New Albany and Chicago R. R. Pop. 196.

New Brain'tree, post-tp. of Worcester co., Mass., on the Ware River, 6 miles from West Brookfield, has a church, a fine public hall, and a hotel. Farming is the general occupation. Pop. 640.

New Braun'fels, post-v., cap. of Comal co., Tex., on the Comal River, has an academy, 3 churches, a banking-house, several commission-houses, 1 wool manufactory, flour-mills, carriage-shops, 1 newspaper, good hotels, and stores. Principal business, farming and stock-raising. Pop. about 3000, mostly German.

A. Eiband, Ed. "New Braunfels Zeitung."

New Bre'men, post-tp. of Lewis co., N. Y., on the Black River, 5 miles from Lowville, contains Dayansville, and has 4 churches, 3 cheese-factories, a tannery, a mill, and stores. Pop. 1908.

New Bremen, post-v. of German tp., Auglaize co., O., on the Miami Canal, 12 miles S. W. of Wapakoneta. Pop. 528.

New Brigh'ton, post-v. of Castleton tp., Richmond co., N. Y., on Staten Island, also containing West New Brighton P. O. It has 9 churches, a paper-hanging factory, a fancy dyeing establishment, a silk-printing factory, and a dyeing and printing establishment, probably the largest in the U. S. Here are the "Sailor's Snug Harbor" for aged mariners and an institution for destitute children of seamen. There are many fine residences of New York business-men in the village. Pop. 7495.

New Brighton, post-b. of Beaver co., Pa., on Beaver River, 29 miles N. N. W. of Pittsburg, on the Pittsburg Fort Wayne and Chicago R. R., has one of the best water-powers in the U. S., a public library, 8 churches, 1 newspaper, 1 extensive chain manufactory, 1 woollen and 1 twine factory, a lead-keg factory, a pottery, 3 machine-shops and foundries, 3 flouring and 1 planing mill, a moulding factory, an extensive greenhouse, and stores. Pop. 4037.

F. S. Reader, Ed. "Beaver Valley News."

New Brit'ain, a group of islands in the Pacific Ocean, lying E. of New Guinea, between lat. 4° and 6° 30′ S., and between lon. 148° and 152° 30′ E. The group consists of several small islands and one large one, named New Britain, and comprising an area of about 10,000 square miles. They are all mountainous and contain active volcanoes, but fertile, covered with forests, and producing palms, sugar-cane, and bread-fruit trees. They are inhabited by a Polynesian tribe of very dark complexion, but in a somewhat more advanced state of civilization than the Polynesian tribes generally. The islands were first visited by Dampier in 1616.

New Britain, city and tp., Hartford co., Conn., 9 miles S. W. of Hartford, on the Hartford Providence and Fishkill R. R., has a public library of 4000 vols., a park containing 74 acres, the State Normal School, gas and water works, manufactories of iron, brass, and compressed bronze castings, builders' hardware, cutlery, hosiery, joiners' tools, white lead, etc., 1 weekly newspaper, 1 national and 1 savings bank, 3 hotels, and stores. Pop. 9480.

S. C. Dunham, Ed. "New Britain Record."

New Britain, post-v. and tp. of Bucks co., Pa., on the North Pennsylvania R. R. Pop. 1707.

New Bruns'wick [named in honor of the house of Brunswick, the present royal family of Great Britain], a province of the Dominion of Canada, British North America, bounded on the N. by the province of Quebec and the Bay of Chaleurs, on the E. by the Gulf of St. Lawrence, Northumberland Strait, and the Bay of Fundy, on the S. by the Bay of Fundy, and on the W. by the State of Maine. It lies between 44° 30′ and 48° 5′ N. lat. and 63° 47′ and 69° 5′ W. lon.; area, 27,037 square miles.

Surface.—New Brunswick has been described as a "flat sandstone plain." There are, however, ranges of hills in various parts, sometimes high enough to be called mountains. W. of the river St. John, along the coast, the country is in some places arable, but in others hopelessly barren. (*Report of Geological Survey of Canada*, 1870–71.) N. of this there is a range of hills which supports some inhabitants. Still farther N. there is a rather level plateau containing extensive peat-swamps. This region has some excellent soil and is well peopled. E. of the St. John the surface is more broken and the coast is bold. The isthmus that joins Nova Scotia to this province is only 13½ miles across, and is quite low and level. N. of the isthmus the coast abounds in good harbors. The highlands of Eastern New Brunswick have occasional bodies of heavy timber-growth, but the soil is generally thin; the valleys, however, are remarkably fertile. Notwithstanding the great extent of comparatively worthless land, New Brunswick is an important agricultural province. It is well watered, and produces excellent crops of wheat, oats, barley, buckwheat, fruit, potatoes, root-crops, peas, and especially hay. Farming has, however, been too generally conducted in a slovenly and wasteful manner, but is now improving. The forests contain great quantities of pine, spruce, fir, hemlock, cedar, larch, ash, beech, birch, maple, and other valuable trees, from which there is a very large supply of timber and firewood.

Geology.—Two-thirds of the surface of New Brunswick, including the part nearest Nova Scotia, is of the Carboniferous formation. The strata are very flat, and the coal is near the surface, but the coal-seam is thin, and is only wrought at one point, near Grand Lake in Queen's co., where the seam is twenty-two inches thick and yields a good quality of bituminous coking coal. Albert co. has, however, a valuable and very remarkable product known as albertite coal, which is not a true coal, but a solidified asphalt, and is the richest gas-producing substance yet found. It yields about 57 per cent. of very valuable illuminating gas—14,500 cubic feet per ton, or its equivalent, 100 gallons of crude distilled oil. It leaves an excellent coke. It is mined chiefly at Hillsborough on the Petitcodiac River, near the head of the Bay of Fundy. (It is also found at points in Ritchie co., West Va., and in Colorado, always occurring in veins, and never in beds like true coal.) It is a beautiful substance, and leaves but little ash. It is exported in large quantities. Carleton co. affords excellent iron and manganese. Plumbago, copper, and lead are found. Limestone, gypsum, sandstone, marble, and roofing-slate are extremely abundant, and some of them are quite extensively wrought. The salt-springs, bituminous shales, and various mineral waters have a prospective rather than a present value. Freestone of great beauty is quarried and sold extensively in the U. S.

Zoology.—New Brunswick abounds in wild animals. Bears, wolves, deer, moose, caribou, wolverenes, lynxes, and various other game and fur animals are found. Ducks, geese, grouse, and a great variety of seafowl are abundant. The smaller birds are in general much the

same as those of Northern New England. Among the sea-fish may be mentioned the cod, herring, mackerel, haddock, hake, lobster, bass, and smelt, while trout and salmon are very numerous in the fresh waters. The Bay of Fundy abounds in the lower forms of animal life, and is a favorite dredging-ground for naturalists.

Waters.—The bays of Fundy, Verte, Chaleurs, and Miramichi are remarkable for their excellence as fishing-grounds, and the first mentioned no less so for its marvellously high tides. The rivers St. Croix, St. John, Petitcodiac, Miramichi, and Restigouche are all navigable to a greater or less extent, and most of them in their lower courses are noble salmon-streams. They are all very useful in floating down timber, and many streams have falls and rapids which furnish unfailing water-power. The more important bays and rivers are described under their alphabetical heads.

The *climate* is much like that of Maine, but much more foggy and moist, especially along the Bay of Fundy. The climatological reports of the director of the magnetic observatory at Toronto furnish excellent means of comparison of the ranges of temperature and of the rainfall in New Brunswick with those of Ontario and Quebec. By this it appears that while its summers are much cooler than those of Canada in general, its winter temperature is not nearly as low as that of Quebec and Montreal. The rainfall is much greater than in any other part of the Dominion except Nova Scotia and the Pacific coast.

Public Health.—In general the province is very healthful. Nearly one-third of the mortality is from consumption. Pneumonia, bronchitis, throat diseases, influenza, and rheumatism are the next diseases in prevalence. Skin diseases abound, especially among the inhabitants of French descent, and the excessive use of buckwheat as food is the cause popularly assigned. Leprosy has also its victims, and for these the government has a lazaretto at Tracadie.

Internal Improvements.—Among these may be enumerated the European and North American Railway, from St. John to Bangor, Me., of which 91 miles are in New Brunswick; the Fredericton Railway to the last-named road is 22 miles long; the New Brunswick and Canada Railway, from St. Andrews to Woodstock and to Houlton, Me., having with its branches over 113 miles of track in this province; the Intercolonial Railway, from St. John to Halifax, N. S., has in this province a total of over 140 miles completed, and the work of extending the road through to the N. part of the province, to connect with the Grand Trunk system, is being pushed forward in spite of many obstacles. St. John has street railways running to its principal suburbs. Horse railways are seen in the mining districts, and carry the products in some instances to tide-water directly from the mines. The provincial and Dominion governments make handsome appropriations for the construction and repair of roads, bridges, and river and harbor improvements. In this connection notice should be taken of the laudable measures passed by the legislature to preserve the fisheries, game, and forests of the province. There are great areas of crown-lands which the government sells to actual settlers on the most liberal terms. The Canadian canal commission recommend the construction of a canal from Bay Verte to the Bay of Fundy, 15¼ miles long, 40 feet wide, and 15 feet deep, to cost $3,250,000. This would save 600 miles of dangerous navigation for vessels going from St. John to the Gulf of St. Lawrence.

Industries.—This article has already incidentally indicated the more important industries—the collection and manufacture of lumber and other forest products, the fisheries, agriculture, and mining of coal, building-stone, and ores. There are also some manufactures of woollens, leather, iron, oils, etc. The building of ships is also an important pursuit. In 1871–72 (one year) there were 108 vessels built, with an aggregate capacity of 33,353 tons. Commercial pursuits are quite important. In 1871–72 New Brunswick collected 19.43 per cent. of the customs duties of the Dominion. The rearing of domestic animals is an important industry. The fisheries in 1871 employed 5161 men, and yielded $1,185,033 worth of fish.

The *government* of the province consists of a lieutenant-governor, a council of 9, consisting of a president, an attorney-general, a secretary, a surveyor-general, a chief commissioner of the board of works, and four councillors; the legislature consists of 18 members of a legislative council or upper house, and 41 members of the house of assembly. There is also a full staff of officers for the administration of the provincial government. New Brunswick sends 12 senators and 12 members of the house of commons in the Canadian Parliament.

Finances.—The receipts of the province are from the Dominion subsidy, from crown-lands, fees, rates, and export and import duties, etc. The chief expenses are for public works, education, benevolent objects, etc. The finances are in a very sound condition. Taxation is merely nominal.

Counties and Population.—New Brunswick is divided into 14 counties, as follows:

Counties.	Population.
St. John	52,303
Charlotte	25,882
King's	24,593
Queen's	13,847
Sunbury	6,824
York	27,140
Carleton	19,938
Victoria	11,641
Restigouche	5,575
Gloucester	18,810
Northumberland	20,116
Kent	19,101
Westmoreland	29,335
Albert	10,672
Total	285,777

Of the population of New Brunswick, a large percentage is of French descent, coming from the old Acadian stock. Another large proportion of the people are descended from the loyalists or Tories who left the U. S. during and just after the Revolutionary war. There are quite a number of Indians, who are partly civilized, very peaceable, and are mostly Roman Catholics. Of religious denominations, the Roman Catholic has a plurality, but the Anglicans, Baptists, and various branches of the Methodists are influential and numerous. The chief towns are St. John, the largest city, Portland, St. Andrew, Fredericton, the capital, and Woodstock.

Education is liberally provided for by the province and the parishes. The public schools are under a provincial board of education, and the representatives in the federal Parliament have successfully resisted the attempt of certain parties in the Parliament to interfere with the affairs of the provincial schools. The University of New Brunswick is situated at Fredericton, the capital. Mount Allison Wesleyan College at Sackville and a Roman Catholic college near Memracook are reported to be prosperous. There are several flourishing schools, academies, and seminaries, sustained by denominational and private enterprise. A training school for teachers has been established. There are also common, superior, grammar, and model schools. There were in 1873, 26 newspapers in New Brunswick.

History.—New Brunswick was formerly a part of Acadia, an old colony of France, which included Nova Scotia also. It was first colonized in 1604. At the capture of Quebec it passed into the hands of Great Britain, to which it has always been loyal. Miramichi was settled by Scotch immigrants in 1762. New Brunswick was set off as a province from Nova Scotia in 1784. One of the greatest disasters which ever befell the colony was the great forest-fire of Miramichi in 1825, which burned over 6000 square miles of timber, destroying several fine towns, many vessels, and probably not less than 160 human lives. The first railroad was opened in 1860. New Brunswick entered the Dominion of Canada at its inauguration in 1867.

CHARLES W. GREENE.

New Brunswick, city and tp., cap. of Middlesex co., N. J., in 40° 30′ N. lat. and 74° 30′ W. lon., 30 miles from New York City, on the S. W. bank of the Raritan River, at the head of navigation, at the E. terminus of the Delaware and Raritan Canal, and on the New York division of the Pennsylvania R. R. It is favorably located, the upper portion being well laid out and containing many fine residences. It is the seat of Rutgers College, with a library of 12,000 volumes, and of a theological seminary, with a library of 5000 volumes, both under the Reformed (Dutch) Church. It has 16 churches, a grammar school, 2 private classical schools for boys, a seminary for females, a free school, a public school, 3 hotels, a Masonic hall, 2 banks, 3 building and loan associations, 4 factories of India-rubber goods, 3 of paper hangings, 4 machine-shops, 3 foundries, and various other manufactures. There are 1 monthly, 2 weekly, and 2 daily evening newspapers, and the Rutgers College periodical. Pop. 15,058.

New Bu′da, post-tp. of Decatur co., Ia. Pop. 547.

New Buf′falo, post-v. and tp. of Berrien co., Mich., on Lake Michigan, at the mouth of Galien River, and at the junction of the Chicago and Michigan Lake Shore R. R. with the Michigan Central R. R. It is 63 miles from Chicago, and, being near the heart of the famous fruit-region of Michigan, is a fruit and lumber dépôt for that city. Pop. of v. 683; of tp. 1289.

New Buffalo, post-v. of Watts tp., Perry co., Pa., on the Susquehanna River, and on the Susquehanna division of the West Branch and Susquehanna Canal, 2 miles from Halifax. Pop. 259.

New Buffalo, tp. of Sauk co., Wis., on the Wisconsin River. Pop. 956.

New'burg, post-v. of Addington co., Ont., Canada, 6 miles N. E. of Napanee, has a great water-power, important manufactures, an academy, and 1 weekly newspaper. Pop. of sub-district, 828.

Newburg, post-tp. of Franklin co., Ala. Pop. 725.

Newburg, a v. of Posey tp., Clay co., Ind., on St. Louis Vandalia Terre Haute and Indianapolis R. R. Pop. 200.

Newburg, post-v. of Ohio tp., Warrick co., Ind., on the Ohio River, 13 miles E. of Evansville. It has an active commerce and 1 weekly newspaper. Pop. 1464.

Newburg, a v. and tp. of Mitchell co., Ia. Pop. 536.

Newburg, tp. of Pike co., Ill. Pop. 1540.

Newburg, post-v. and tp. of Penobscot co., Me., 15 miles from Bangor, has 4 churches, 1 hotel, several schools, and manufactures of carriages, satinets, etc. Pop. 1115.

Newburg, post-v. and tp. of Cass co., Mich., on the Michigan Central R. R. Pop. 1314.

Newburg, post-v. and tp., Fillmore co., Minn. Pop. 1047.

Newburg, city and tp., one of the capitals of Orange co., N. Y., on the W. bank of the Hudson River, 60 miles N. of New York City, in lat. 41° 31′ N., lon. 74° 1′ W., contains a public library, a free academy, 4 grammar schools, 22 churches, 3 national and 1 savings bank, a home for the friendless, a hospital and home for aged women, extensive machine-shops, steam-engine manufactories, 1 cotton and saw mill, a lawn-mower manufactory, a bleachery, ship-yard, and various smaller manufacturing interests. The theological seminary of the Associate Reformed Church is located here. The city has 2 daily and 3 weekly newspapers, and connection is made with New York City by numerous steamboat lines and a branch of the Erie R. R., while on the opposite side of the river the New York Central and Hudson River and the New York Boston and Montreal R. Rs. offer facilities for reaching all points. The old Hasbrouck house, which was occupied by Gen. Washington during the Revolutionary war, and at which place the proclamation disbanding the army was promulgated, is located here. Pop. of v. 17,014; of tp. 3541.

N. H. Schram, Ed. "Newburg Telegraph."

Newburg, post-v. and tp. of Cuyahoga co., O., on the Mahoning branch of the Atlantic and Great Western and the Cleveland and Pittsburg R. Rs., 5 miles S. E. of Cleveland. Pop. of tp. 6227.

Newburg, post-b. of Hopewell tp., Cumberland co., Pa., 7 miles from Shippensburg. Pop. 392.

Newburg, post-v. and cap. of Lewis co., Tenn., 25 miles from Columbia. Pop. 11.

Newburg, post-v. of Preston co., West Va., on the Raccoon Creek and the Baltimore and Ohio R. R.

New Bur'lington, part of post-v. of Chester tp., Clinton co., O., on Cæsar's Creek, 8 miles from Xenia. Pop. 184.

New Burlington, part of a v. of Spring Valley tp., Greene co., O., on Cæsar's Creek, 8 miles from Xenia. Pop. 43.

New'burn, a v. of Washington tp., Shelby co., O., 5 miles from Sidney. Pop. 239.

New'bury, town of England, in the county of Berks, on the Kennet, has 6602 inhabitants.

Newbury, tp. of La Grange co., Ind. Pop. 1159.

Newbury, post-v. and tp. of Wabaunsee co., Kan., on Mill Creek, 12 miles from Wamego, on the Kansas Pacific R. R. Pop. 475.

Newbury (P. O. Byfield), tp. of Essex co., Mass., intersected by the Eastern and Maine Central and the Boston and Maine R. Rs., and by Parker's River. It is separated by Plum Island Sound from Plum Island, which forms the ocean frontage. It is the seat of Dummer Academy, and has 3 churches, 7 school districts, a good town-house, a hotel on Plum Island, 1 saw, 1 paper, and 3 grist mills. Agriculture is the general occupation. Pop. 1430.

Newbury, post-v. and tp. of Merrimack co., N. H., on Concord and Claremont R. R., and Sunapee Lake. Pop. 601.

Newbury, tp. of Geauga co., O. Pop. 861.

Newbury, post-v. and tp. of Orange co., Vt., on the Connecticut River and on the Passumpsic R. R., has 4 churches, an academy, 4 hotels, and is celebrated for its sulphur springs. Pop. 2241.

New'buryport, a city and seaport of Essex co., Mass., 35 miles N. E. of Boston, on the Eastern R. R., contains the University of Modern Languages, the Putnam Free School and several public schools, a public library and free reading-room, 4 national and 2 saving banks, 5 extensive cotton-mills, 8 shoe manufactories, an iron-foundry, a distillery, manufactories of carriages, hats, combs, silver ware, steam-engines, pumps, etc. The city has a horse railway, 18 churches, 1 daily, 1 semi-weekly, and 1 weekly newspaper. There are 16 ships, 16 barques, 3 brigs, 59 schooners, and 3 steamboats owned here, and some of the finest ships afloat are launched from the four yards. Pop. 12,595.

Nathan N. Withington, Ed. "Daily Herald."

New Caledo'nia, an island in the South Pacific Ocean, belonging to France, lies between lat. 20° and 22° 30′ S., and between lon. 164° and 167° E. It is 220 miles long and 30 miles broad, high, mountainous, and containing several active volcanoes in the interior, but surrounded by sandbanks and coral-reefs along the coasts. The valleys are fertile; bananas, bread-fruits, cocoanuts, and sugar-canes abound, and the vine grows wild. The inhabitants, numbering about 29,000, consist of different tribes, some of which are very savage. The island has two good harbors—Port Balade on the N. E. coast, and Port St. Vincent on the S. W.

New Cam'bria, post-v. of Macon co., Mo., on the Hannibal and St. Joseph R. R., 186 miles N. of St. Louis, has 1 school-house, 2 churches, 2 hotels, 1 newspaper, 1 flouring-mill, and stores. Pop. about 300.

Thos. Berry, Ed. "Enterprise."

New Ca'naan, post-v. and tp. of Fairfield co., Conn., on the New Canaan R. R. Pop. 2497.

New Can'ada, tp. of Ramsey co., Minn. Pop. 789.

New Carlisle', post-v., cap. of Bonaventure co., Quebec, Canada, on Bay of Chaleurs, has court-house, town-hall, and jail, and is a fishing town. Pop. about 400.

New Carlisle, post-v. of St. Joseph co., Ind., on the Lake Shore and Michigan R. R. (Carlisle Station).

New Carlisle, post-v. of Bethel tp., Clark co., O., on Honey Creek, 7 miles from Osborn.

New Car'thage, a v. (Carthage Landing P. O.) of Fishkill tp., Dutchess co., N. Y., on the Hudson River and on the Hudson River R. R. (Low Point Station). Pop. 241.

Newcas'tle, a port of entry, capital of Northumberland co., New Brunswick, on the left bank of the Miramichi, 30 miles from its mouth. The river is to this point navigable for large ships. Its shipbuilding, lumber-trade, and fisheries are important. Salmon, herring, bass, mackerel, oysters, and lobsters are largely exported. The town is well lighted with gas. Pop. about 1500.

Newcastle, post-v. of Clarke tp., Durham co., Ontario, Canada, on Lake Ontario and the Grand Trunk Railway, 48 miles E. by N. of Toronto. It has a good harbor, fine woollen mills and other manufactures, and a postal savings bank. Pop. of sub-district, 1109.

New' Castle, county of N. Delaware. Area, 525 square miles. It is bounded N. by Pennsylvania, E. by the Delaware River, and W. by Maryland. It is generally level and fertile. Live-stock, grain, and fruit are leading products. The county is well watered, and has fine water-power. Among the manufactured articles are flour, carriages, clothing, metallic wares, leather, cigars, railroad cars, cotton goods, gunpowder, iron, woollen goods, machinery, ships, etc. The county is traversed by various railroads. Wilmington is the largest town. Cap. New Castle. Pop. 63,515.

Newcastle, post-v. of Placer co., Cal., on the Central Pacific R. R., 30 miles from Sacramento. Pop. 551.

New Castle, post-v. and hundred, cap. of New Castle co., Del., on the Delaware River and on the Philadelphia Wilmington and Baltimore R. R., has several churches, a court-house, public library, and 2 hotels. Pop. of v. 1916; of hundred, 3682.

New Castle, tp. of Fulton co., Ind. Pop. 1262.

Newcastle, post-v. of Henry tp., cap. of Henry co., Ind., at the intersection of the Fort Wayne Muncie and Cincinnati with the Pittsburg Cincinnati and St. Louis R. R., 83 miles S. E. of Fort Wayne, has 2 weekly newspapers and several manufactories. Pop. 1556.

New Castle, post-v., cap. of Henry co., Ky., 4 miles N. of Eminence, on the Louisville Cincinnati and Lexington R. R., has a large trade in live-stock. Pop. 670.

New Castle, post-v. and tp. of Lincoln co., Me., on the Damariscotta River, and on the Knox and Lincoln R. R., has 3 churches, an academy, 1 national bank, a tannery, manufactures of bricks and shoes, and is engaged in shipbuilding and lumber. Pop. 1729.

New Castle, post-v. and tp. of Rockingham co., N. H., 5 miles from Portsmouth. Pop. 667.

New Castle, post-v. and tp. of Westchester co., N. Y., traversed by the New York and Harlem R. R., and bordering on Croton Lake. Pop. 2152.

New Castle, post-v. and tp. of Wilkes co., N. C. Pop. 1120.

New Castle, post-tp. of Coshocton co., O. Pop. 1005.

New Castle, a v. (Laing's P. O.) of Green tp., Monroe co., O. Pop. 99.

New Castle, a v. (Neelysville P. O.) of Meigsville tp., Morgan co., O. Pop. 57.

New Castle, post-b., cap. of Lawrence co., Pa., on the Pittsburg Fort Wayne and Chicago R. R., has 2 colleges, 3 public-school buildings, an opera-house, 11 churches, 7 blast-furnaces, 2 rolling-mills, 3 foundries, 2 sheet and plate mills, 2 nail-factories, 1 paper-mill, 1 window-glass factory, 2 grist and 2 planing mills, 2 breweries, 5 banks, good hotels, and stores. The neighboring hills are rich in deposits of coal, iron ore, limestone, and fire-clay. Pop. 6164. Wm. S. Black, Ed. "Gazette."

New Castle, tp. of Schuylkill co., Pa. Pop. 2229.

New Castle, post-v. and tp., cap. of Craig co., Va. Pop. of v. 199; of tp. 1189.

Newcas'tle-under-Lime, town of England, in the county of Stafford, is a queer old place, with large manufactures of hats and some silk and cotton factories. Its vicinity is celebrated for its pottery. Pop. 15,948.

Newcastle-upon-Tyne, city of England, in the county of Northumberland, in lat. 54° 58′ N., lon. 1° 35′ W., on the left bank of the Tyne, 8 miles from its mouth in the German Ocean, opposite Gateshead, on the right bank of the river, which, although belonging to another county, virtually forms a part of it. The city is built on three steep hills, and one of its most prominent features is the double bridge across the Tyne built by Robert Stephenson, and containing a carriage-way 90 feet above the water, by which the precipitous streets on both sides of the river are avoided, and a railway viaduct at a height of 118 feet from the water. The old part of the city has a very antiquated appearance, but since the conflagration in 1854 most of the city has been rebuilt in a modern and elegant style. St. Nicholas church, in the Decorated style, is a very fine structure; also the Moot Hall, the dépôt, etc. The various scientific, educational, and benevolent institutions also occupy handsome buildings, and several streets are lined from one end to the other with magnificent mansions. The principal branch of the manufacturing industry is iron. Since the discovery of the Cleveland ironstone, 600,000 tons of iron are annually produced by the furnaces of Newcastle, and 3000 tons of steel. The Elswick iron-works, for the manufacture of guns, shot, shell, iron bridges, and armor for iron-clad ships, cover an area of 11 acres. Lead and copper are also produced. Next to the iron industry ranks the shipbuilding, especially iron vessels; then come the manufactures of earthenware, fire-brick, cement, glass, paper, leather, etc. The principal article of trade is coal. More than 60,000 men are employed in the adjacent collieries, and 22,000,000 tons of coal are annually raised; it is shipped mainly to Hamburg, the Baltic, and the Mediterranean. The value of exports amounted in 1873 to £6,803,819; that of imports, consisting of meat, grain, wine, colonial produce, etc., to £5,018,926. In the same year 5225 vessels, with a tonnage of 1,442,081, entered the harbor, and 7661, with a tonnage of 2,444,169, cleared. In the time of the Romans the city formed a stationary camp, *Pons Ælii*, one of the forts along the line of the Wall of Hadrian. After the withdrawal of the Romans the city was for a long time occupied by a colony of monks, and was called *Monkchester.* Robert of Normandy, a son of William the Conqueror, built a castle here, whence the present name of the city. It soon became widely known for its exports of coal and lead. Pop. 128,443.

New Cen'treville, a b. of Somerset co., Pa. Pop. 196.

New Cham'bersburg, post-v. of West tp., Columbiana co., O. Pop. 131.

New Ches'ter, post-tp. of Adams co., Wis. Pop. 329.

New Chica'go, Kan., now called Chanute (which see).

New Colum'bia, a v. of Harlan tp., Warren co., O. Pop. 70.

New Colum'bus, a v. of Adams tp., Madison co., Ind. Pop. 135.

New Columbus, post-v. of Huntington tp., Luzerne co., Pa. Pop. 250.

New'comb, post-tp. of Champaign co., Ill. Pop. 897.

Newcomb, post-tp. of Essex co., N. Y. Pop. 178.

Newcomb (Harvey), D. D., b. at Thetford, Vt., Sept. 2, 1803; was for eight years teacher at Alfred, N. Y.; edited the *Western Star* at Westfield, N. Y., 1826–28, the Buffalo *Patriot* 1828–30, and the Pittsburg *Christian Herald* 1830–31; was for several years in the employ of the American Sunday-School Union, engaged in preparing or editing works suitable for juvenile readers; was licensed to preach in 1840; became pastor of Congregational churches in Roxbury, Needham, and Grantville; was one of the editors of the Boston *Traveller* 1849, and of the New York *Observer* 1850–51; was for many years a regular contributor to the Boston *Recorder*, the *Youth's Companion*, and other religious papers; wrote 178 volumes, mostly for children, of which the most important was the *Cyclopædia of Missions* (1855). In his later years he preached for a time at the Park street mission church, Brooklyn, N. Y., and at Hancock, Pa. D. at Brooklyn Aug. 30, 1863. (See *Congregational Quarterly*, Oct., 1863.)

Newcomb (Simon), F. R. A. S., b. at Wallace, N. S., Mar. 12, 1835; came to the U. S. in childhood; taught school in Maryland for several years, and displayed so great a talent for mathematics as to be employed as a computer on the *Nautical Almanac* for 1857. In the following year he first gave special attention to theoretical astronomy; was appointed in 1861 professor of mathematics in the navy, and stationed at the Naval Observatory, for which he supervised the construction and erection of the great telescope; was secretary and chief director of the commission created by Congress in 1871 for the observation of the transit of Venus, Dec. 9, 1874, and organized the numerous expeditions sent to remote quarters of the earth upon that occasion. Prof. Newcomb was chosen in 1872 a foreign associate of the Royal Astronomical Society of England, which in 1874 awarded to him a gold medal for his tables of Uranus and Neptune. He has published a number of astronomical memoirs, written *A Critical Examination of the Financial Policy during the Southern Rebellion* (1865), and contributed articles on political economy to the *North American Review* and other magazines.

New'come (William), D. D., b. at Abingdon, Berkshire, Eng., Apr. 10, 1729; was educated at Oxford; was successively bishop of Dromore, Ossory, and Waterford, and became archbishop of Armagh 1795. D. at Dublin Jan. 11, 1800. Among his works were *The Harmony of the Gospels* (1778) and a *New Critical Version of the Twelve Minor Prophets and Ezekiel* (1785–88).

New'comerstown, post-v. of Tuscarawas co., O., at the junction of the Pittsburg Cincinnati and St. Louis and the Marietta Pittsburg and Cleveland R. Rs.; has a Lutheran college, 3 churches, several large flouring-mills, a good hotel, extensive blast-furnaces, and stores and shops. Pop. 791. John A. Buchanan, Ed. "Argus."

New Con'cord, post-v. of Union tp., Muskingum co., O., on the Central Ohio division of the Baltimore and Ohio R. R. (Concord Station), is the seat of Muskingum College. Pop. 488.

New Creek, post-v., cap. of Mineral co., West Va., on the Baltimore and Ohio R. R., has 4 church organizations, good school advantages, and stores. The largest round-house on the Baltimore and Ohio R. R. is located here. Pop. 1120. Ed. "West Virginia Tribune."

New Cum'berland, post-v. of Warren tp., Tuscarawas co., O. Pop. 160.

New Cumberland, post-b. of Lower Allen tp., Cumberland co., Pa., on the Susquehanna River and the Northern Central R. R. Pop. 515.

New Cumberland, post-v. of Hancock co., West Va., on the Ohio River.

New Den'mark, tp. of Brown co., Wis. Pop. 815.

New Design', post-v. and tp. of Monroe co., Ill. Pop. 2016.

New'digate (Sir Roger), Bart., b. at Arbury, Warwickshire, England, May 30, 1719; educated at Westminster School and University College, Oxford; sat in the House of Commons for Middlesex 1751–80; d. Nov. 25, 1806, leaving liberal bequests to the University of Oxford for founding annual "Newdigate prizes" for the best English verses on subjects connected with sculpture, painting, and architecture.

New Dig'gings, post-v. and tp. of La Fayette co., Wis., near Fevre River, 8 miles from Galena, Ill., and in the lead-mining region. Pop. 1794.

New Dungeness', post-v. and cap. of Clallam co., Wash., on the Strait of San Juan de Fuca, at the mouth of the Dungeness River.

New Dur'ham, tp. of La Porte co., Ind., contains Westville City (which see). Pop. 1984.

New Durham, post-v. and tp. of Strafford co., N. H., on the Dover and Winnipiseogee R. R. Pop. 973.

New Ed'inburgh, post-v. of Carleton co., Ontario, Canada, is an important suburb of Ottawa, from which it is separated by the river Rideau, here crossed by a suspension bridge, over which the street-cars pass. It has a beautiful park, and contains the fine cataract of the Rideau, which affords a great water-power. There are many man-

ufactories. The village contains Rideau Hall, the residence of the governor-general. Pop. of sub-district, 596.

New E'gypt, post-v. of Ocean co., N. J., on the Amboy division of the Pennsylvania R. R.

New'ell, tp. of Vermilion co., Ill. Pop. 1909.

Newell, post-v. of Buena Vista co., Ia., on the Illinois Central R. R., is one of the finest farming and grazing sections in the U. S. Large quantities of grain and pork are shipped. Pop. about 500. W. WHITE, ED. "MIRROR."

Newell (ROBERT HENRY), b. in New York City Dec. 13, 1836; received a liberal education; was for a time engaged in mercantile life; was in 1858–63 literary editor of the New York *Mercury*, to which he contributed a series of sketches signed "Orpheus C. Kerr" (*i. e.* office-seeker), which procured him some note as a humorist, and were republished in 4 vols. He removed to California in 1863; has published several volumes of prose and verse; was one of the editors of the New York *World* 1869–74, and has since become editor of *Hearth and Home*, a weekly literary journal.

Newell (SAMUEL), b. at Durham, Me., July 24, 1784; graduated at Harvard in 1807; studied theology at Andover Seminary; was one of the signers of the memorandum (dated June 27, 1810) from students of that institution which led to the formation of the American Board of Commissioners for Foreign Missions; was ordained as a foreign missionary at Salem with four associates Feb. 5, 1812; sailed for Calcutta with Judson; in the same month was ordered to retire by the English authorities of Bengal; went to the Isle of France, thence to Ceylon, and settled at Bombay in 1817, where he wrote, with his companion missionary, Gordon Hall, a work entitled *The Conversion of the World, or the Claims of Six Hundred Millions* (Andover, 1818), which had an extensive circulation, and prepared a memoir of his young wife, HARRIET (ATWOOD) NEWELL, who d. at the Isle of France Nov. 30, 1812, at the age of nineteen years—a work which had a wide popularity, and was translated into several languages. Mr. Newell d. at Bombay May 30, 1821.

Newell (WILLIAM A.), M. D., b. in Ohio; graduated at Rutgers College 1836; was in Congress from New Jersey 1847–51 and 1865–67; governor of New Jersey 1857–60.

New England, comprising the States of Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, and Connecticut, was originally called North Virginia, when granted in 1606 by James I. to the Plymouth Company for colonization, but received subsequently its present name from Capt. John Smith, who explored it in 1614, and made a map of the coast.

New England Village, post-v. of Grafton tp., Worcester co., Mass., near the Boston and Worcester division of the Boston and Albany R. R.

New Fair'field, post-v. and tp. of Fairfield co., Conn. Pop. 870.

New'fane, post-v. and tp. of Niagara co., N. Y., on Lake Ontario, has 5 churches and 2 woollen-factories. Pop. 3097.

Newfane, tp. of Windham co., Vt. Pop. 1113.

New'field, post-v. and tp. of York co., Me., has 3 churches, several carriage, axe, and other factories, and 1 hotel. Pop. 1193.

Newfield, tp. of Oceana co., Mich. Pop. 265.

Newfield, post-v. of Gloucester co., N. J., on the West Jersey R. R., is a manufacturing place, and has a fruit-trade and 1 weekly newspaper.

Newfield, post-v. and tp. of Tompkins co., N. Y., on the Geneva Ithaca and Athens R. R. Pop. 2602.

New Flor'ence, post-v. of Montgomery co., Mo., on the St. Louis Kansas City and Northern R. R., has an active produce-trade.

New Florence, post-b. of St. Clair tp., Westmoreland co., Pa., on the Conemaugh River and on the Pennsylvania R. R. Pop. 333.

New'foundland, a British colony, consisting chiefly of the great island of that name, lying E. of the Gulf of St. Lawrence, between 46° 30′ and 51° 39′ N. lat., and 52° 15′ and 59° 39′ W. lon. Area, 40,200 square miles. To this are attached a great number of small adjacent islands and a principal part of the coast of LABRADOR (which see). The island is roughly triangular in outline, its eastern and southern coasts being much broken by deep bays. Placentia Bay on the S. and Trinity Bay on the E. approach to within 4 miles of each other, almost severing the peninsula of Avalon. The extreme length of the island from N. W. to S. E. is 350 miles, the average breadth 130 miles. The coast abounds in good and accessible harbors. The shore-line is usually bold and rocky, with little shoal-water near it. The interior is in great part very uneven, having some hills over 1000 feet high. There are numerous lakes, and some streams deserving to be called rivers. Of these, the river of Exploits, which nearly bisects the island, is by far the longest. The trees near the shore are often stunted and too small for service as timber, but along the larger streams, and especially inland, there is much excellent timber, consisting of fir, spruce, birch, pine, juniper, poplar, tamarack, etc. A great part of the island is quite uninhabited save by a few wandering Micmac Indians from the mainland, for the aboriginal red Indians are believed to have become extinct from disease. The interior is not very well known. In 1833, and again in 1865, geological surveys were commenced, but the published statements of the results are very general. It appears that a large part of the interior consists of great marshy savannas, based upon great deposits of peat, sometimes as much as 100 feet deep. These marshes are the abode of deer and moose, and produce grapes, sedges, heathworts, and other berry-bearing and procumbent plants, as well as witch-hazels, mountain-ash, willows, alders, etc. But along the streams there is much excellent land. The climate, too, is much pleasanter than along the foggy and bleak coast. But the great difficulty of making good roads is a serious obstacle to settlement. The greater part of the population is confined to the Avalon peninsula and the eastern and southern coasts. The inhabitants are mostly engaged in the cod and other fisheries, and in seal-catching along the coast of this island and of Labrador. Agriculture is beginning to receive considerable attention. Hay, oats, turnips, potatoes, and other crops are raised, and from the abundance of sea-manures farming ought to become profitable, since Newfoundland has long been a heavy importer of provisions. The island has abundant water-power. The manufacture of seal and fish oils, the working of mines, and, along the Humber River, the cutting and floating of timber, receive some attention. The latest geological survey reports 726 square miles of crown-lands as available for settlement.

The *geology* of Newfoundland is now tolerably well understood from the labors of Mr. Murray in connection with the survey undertaken in the face of very great difficulties in 1865. The Long Range of hills, extending E. by N. from Cape Ray, is of Laurentian age. This formation is here often disposed into a surface corrugated into deep troughs and high ridges. It is composed of metamorphic rocks, much broken by dykes of unstratified rock. The Cambrian-Huronian rocks are found in the eastern peninsulas, and contain lead, iron, and copper ores. The Lower Silurian is extensively found, and is highly metalliferous; Upper Silurian and Devonian rocks have also been recognized. The Cape Breton coal-measures are represented in the S. W. part of the island by three areas (one of which, at George's Bay, is estimated to contain 38 square miles, with a seam of coal about three feet thick). The rocks here are the same as at Cape Breton. Of the Drift period there are remains which have not been well studied. The useful minerals thus far found are iron ores, coal, lead, copper, graphite, nickel, gypsum, marbles, oil-shales, petroleum, roofing-slate, kaolin, and ornamental building-stones of almost every sort. Gold, silver, and numerous other metals are sparingly found. Copper and nickel are mined successfully. The nickel ore at Tilt Cove is found in a regular lode, probably the only known instance of the kind. The mineral wealth of the island is unquestionably very considerable.

Ecclesiastical Affairs.—The Roman Catholic Church was founded in the island first by Calvert at Ferryland or Avalon in 1623. From 1762 to 1784 the Roman Catholic Church was not tolerated. In 1784 the diocese of St. John's was established, in 1856 that of Harbor Grace, and in 1870 that of Placentia. The population are very largely of Irish descent, and the Roman Catholic Church has a plurality of the population. The first Anglican bishop was appointed in 1844. Wesleyan Methodism has existed in the island since 1776. Its organization is more efficient than that of any other denomination in the island, and its growth has been very remarkable. There were in 1869 reported to be 58,091 persons in the Roman Catholic Church, 50,683 belonging to the Church of England, and a Wesleyan membership and population of 28,639, and about 1000 persons attending Presbyterian and Congregational churches.

Currency.—Newfoundland has a decimal coinage and a bank-note currency in dollars and cents, but the dollar is rather larger than those of Canada and the U. S. The American gold dollar is worth a small fraction over 98 cents, Newfoundland coinage. There are two banks of discount at St. John's, issuing paper money. There are government savings banks at St. John's and Harbor Grace.

Education.—The colonial government pays liberally for the support of public schools, which are all denominational. There are several academies and literary institutes. There

is an Anglican theological school and a Roman Catholic college at St. John's. The school system is in a very unsatisfactory condition.

Statistics.—The island is divided into 11 electoral districts, exclusive of the "French Shore," a strip of coast on the N. E. and W. sides of the island, upon which the French, its ancient possessors, by treaty have the right of curing and drying fish. The total population of the colony in 1785 was put down at 10,224; in 1845, 96,265; in 1851, 101,600; in 1857, 124,288; in 1861, 122,252; in 1869, 146,536, inclusive of 2479 persons who were returned as a part of the inhabitants of Labrador. The population of Newfoundland and the adjacent islands in 1869 was therefore 144,057. This remarkable increase since 1861 must be attributed to the use of a steam marine for fishing and sealing, the increased attention to agriculture and manufactures, the more enlightened policy of the government in attention to public works, and to the stoppage of the U. S. fishing bounties, which have encouraged the growth of colonial interests at the expense of the U. S. But the public debt, which in 1850 was only $487,975, amounted in 1869 to $1,047,669. In nearly every intermediate year the receipts fell short of the expenditures. Nearly all the revenues are derived from customs duties. In the year 1869, when the last colonial census was taken, though Newfoundland had 26 ports and outports of entry, 673 of the 1200 entries were at the port of St. John's. Harbor Grace, La Poile, Channel, English Harbor, and Burin were next in the importance of their trade. In 1870 there were 196 vessels, averaging nearly 100 tons in capacity, engaged in seal-hunting. Of these, 13 were steamers, of which the number is stated to be much increased. The number of fishing vessels, large and small, engaged in the "bank" and "shore" cod fisheries is not stated, but in 1870 the exports of cured codfish alone amounted to 223,039 quintals, sent chiefly to Spain, Portugal, Brazil, and the West Indies. Seal and cod oils, seal skins, mackerel, herring, and salmon make up the more important of the other exports. The imports include provisions, salt, and clothing, and ordinarily fall considerably below the exports in value. The great import trade is with Great Britain, the U. S., and Canada.

History.—Newfoundland was first discovered, probably, by the Northmen of Iceland in the tenth century, and was visited probably in the year 1000 by Leifr, son of Eric the Red. There are some theories extant as to its having been also early known to the Basque fishermen. Be that as it may, John and Sebastian Cabot visited the coast in 1497, and almost immediately there sprang up here a great cod fishery, in which Portuguese, Spanish, French, and English extensively engaged. The well-known attempts of Gilbert (1579 and 1583), of Lord Bacon's company (1610), and of Calvert (1622) were more or less complete failures, but permanent and unauthorized settlements were made at many points at unknown but very early dates, so that the province claims with probable justice to be the oldest British North American colony. In 1629 the French established themselves at Placentia, and attempted to conquer the island, which they had long claimed. During the wars between Great Britain and France in the seventeenth century there were many bloody events in Newfoundland, which, however, in 1713, was ceded to Great Britain by the Treaty of Utrecht. Twice since then the French have invaded the island, but with no great permanent advantages. They still retain the right of curing fish on a part of the coast. The American Revolutionary war almost completely cut off the supplies of the inhabitants. The island was first made a province in 1728, but grudgingly, and it was not till 1826 that anything like a generous policy was adopted by the home government towards this poor country, the colonization of which Great Britain strangely opposed. Since that time progress has been, on the whole, very steady, though fierce storms and destructive fires have from time to time occurred, greatly to the detriment of the general prosperity. C. W. Greene.

Newfoundland Dog. See Dog.

Newfoundland, post-v. of Morris co., N. J., on the New Jersey Midland R. R.

New Frank'fort, a v. of Johnson tp., Scott co., Ind. Pop. 79.

New Frank'lin, a v. of Franklin tp., Howard co., Mo. Pop. 227.

New Gal'ilee, post-v. of Big Beaver tp., Beaver co., Pa., on the Pittsburg Fort Wayne and Chicago R. R. Pop. 241.

New Gar'den, post-v. and tp. of Wayne co., Ind., on the Cincinnati Richmond and Fort Wayne R. R. (Newport Station). Pop. of v. 343; of tp. 1519.

New Garden, post-v. and tp. of Chester co., Pa. Pop. 1790.

New Garden, post-v. and tp. of Russell co., Va. Pop. 2380.

New'gate Prison, in London, at the W. end of Newgate street, opposite the Old Bailey, is mentioned as a prison in 1207. It was at the new gate of the city. In the fifteenth century Sir Richard Whittington in his will left funds to rebuild it. In 1666 it was again rebuilt after the great fire. In 1780 it was destroyed by the No Popery rioters, and was again rebuilt. In 1808, Mrs. Fry commenced her labors for the improvement of the horrible condition which had for centuries characterized the place. Debtors ceased to be sent there in 1815; since that time the institution has gradually become, in many respects, a model one of its kind.

New Ger'mantown, post-v. of Toboyne tp., Perry co., Pa. Pop. 133.

New Gla'rus, post-v. and tp., Green co., Wis. P. 958.

New Glas'gow, post-v. of Pictou co., N. S., on the Nova Scotia Railway, 9 miles S. E. of Pictou, on East River, has shipyards, foundries, tanneries, and other manufactories, and several important coal-mines. It has 1 weekly paper. Pop. of sub-district, 2498.

New Glouces'ter, post-v. and tp. of Cumberland co., Me., on the Grand Trunk R. R. Pop. 1496.

New Got'tingen, a v. of Richland tp., Guernsey co., O. Pop. 33.

New Granada. See Colombia, United States of.

New Guinea. See Papua.

Newhall (Fales Henry), D. D., b. at Saugus, Mass., June 19, 1827; graduated in 1846 at Wesleyan University; entered the Methodist Episcopal ministry (after teaching 1846–53); was professor of rhetoric and English literature in Wesleyan University 1863–71; studied in Europe 1867–68; became president of Ohio Wesleyan University in 1873.

New Ham'burg, a German village of Wilmot tp., Waterloo co., Ont., Canada, on the Grand Trunk Railway, 75 miles W. of Toronto. It has a large foundry and other manufactories, and has a semi-monthly and a weekly newspaper. Pop. of sub-district, 1003.

New Hamburg, post-v. of Poughkeepsie tp., Dutchess co., N. Y., on the Hudson River and on the New York Central and Hudson River R. R. Pop. 400.

New Hamp'shire, one of the New England or Eastern States, and one of the original thirteen, lying between the parallels of 42° 42′ 30″ and 45° 18′ N. lat., and between the meridians of 70° 43′ 40″ and 72° 33′ W. lon. from Greenwich. It is nearly triangular in shape, the base of the triangle being on the S., where its breadth is a little more than 90 miles, while at the extreme N. it is not more than 3 or 4 miles in breadth. Its average breadth is about 45 miles, and its extreme length 178 miles. It is bounded on the N. and N. N. W. by the province of Quebec, Dominion of Canada, Hull's Stream, one of the affluents of the Connecticut, forming a part of the N. N. W. boundary;

Seal of New Hampshire.

on the E. by Maine and the Atlantic Ocean, the Piscataqua River forming the division-line from Portsmouth harbor to the lat. of 40° 33′ N.; Massachusetts forms its S. S. E. and S. boundary, and Vermont the W., the Connecticut River being the dividing-line through the whole distance. Its area is 9280 square miles, or 5,939,200 acres.

Face of the Country.—New Hampshire has but 18 miles of sea-coast, extending from the southern line of Seabrook to the estuary of the Piscataqua, and Portsmouth is the only good harbor for large vessels. The Isles of Shoals, a group of eight rocky islands, the largest having but 350 acres, lie about 8 or 9 miles from the shore; three of them

belong to New Hampshire. They are inhabited by fishermen engaged in the cod fishery. The sea-coast is low and level, and a portion of it marshy for twenty or thirty miles inland; but with this exception the surface of the State is broken and mountainous. The Appalachian range of mountains enters the State from Maine, and forms a plateau varying in elevation from 800 to 1500 feet through nearly the entire length of the State, from which rise at irregular intervals numerous summits, some of them the highest on the Atlantic coast except the Black Mountains in North Carolina. That portion of this plateau occupying the southern part of Coos and the northern portion of Grafton and Carroll counties has a great number of lofty peaks, and is known by the general name of the White Mountains, though it is locally divided into the White and Franconia ranges, which are connected with each other by the plateau. Mt. Washington, the highest of these peaks, and the loftiest summit of the Northern or North-eastern States, is 6285.4 feet in height. It is situated in the township of that name in the S. part of Coos co. The Ammonoosuc River flows through the valley immediately N. of Mt. Washington. N. of this stream are the following, all visible from Mt. Washington: Mt. Clay, 5553 feet; Mt. Adams, 5714 feet; Mt. Jefferson, 5794 feet; and Mt. Madison, 5365 feet. S. of the Ammonoosuc, and S. and S. W. of Mt. Washington, are Mt. Monroe, 5384 feet; Mt. Franklin, 4904 feet; Mt. Pleasant, 4764 feet; Mt. Clinton, 4320 feet, and Mts. Jackson and Webster. To the E. and S. E. are Mts. Moriah, Carter, and Baldface. S. and S. W. of these, in the towns of Jackson, Chatham, and Bartlett, is another extensive group, though of inferior height; among these are Double Head, Tin Mountain, Iron Mountain, Dandy Mountain, the Giant's Stairs, Mt. Resolution, Mt. Crawford, Hart's Ledge, etc., and to the S. E. Kearsarge, 3358 feet high. To the W. of Mt. Washington, rising from the plateau which connects the White Mountains proper with the Franconia range, are Mt. Deception and Cherry Mountain, and S. and S. E. of these Twin Mountain and Willey Mountain; while S. W. the summits of the Franconia range, lying between the E. and W. branches of the Pemigewasset, rise to view. The principal of these are Little Haystack, Bald Mountain, Eagle Cliff (3446 feet), Great Haystack or Mt. Lafayette (5290 feet), Flume Mountain (about 4500 feet), Black Mountain, and Kinsman's Mountain. Still farther W. are Landaff Mountain in Landaff, and Iron Ore Mountain and Blueberry Mountain in Lisbon. But while these are the principal summits of the White Mountains proper and of the Franconia Mountains, there are other peaks scattered over the State scarcely inferior to these in altitude, and which from their isolated positions seem higher than they really are. Among these are Chocorua in Albany township (3358 feet), Conway Mountain and Mote Mountain in the same township, Carr's Mountain in Ellsworth, Ossipee Mountain near Lake Winnipiseogee, Sunapee Mountain near Lake Sunapee, Moosehillock in Benton (4636 feet), Woodstock Mountain, Sandwich Mountain, and Grand Monadnock in the S. W. corner of the State, 3450 feet in height. Between these mountain-summits are many beautiful valleys, some of them containing lakes, others watered by the numerous streams of the State, and most of them fertile and yielding abundantly such crops as the somewhat severe climate will permit. There is a moderate slope from N. to S., and most of the streams have considerable falls in their course.

Rivers and Lakes.—The Connecticut River is the longest, though not the largest, river in the State, rising in the extreme northern limit of the State, and forming after its union with Hall's Stream the western boundary throughout the entire length of the State; only the affluents of the E. bank belong to New Hampshire, except near its source; these are, Perry's Stream, Indian Stream, Hall's Stream, Mohawk River, Sims's Stream, the Upper Ammonoosuc River, Lower Ammonoosuc or Mink River, Mascomy River, Sugar River (the outlet of Sunapee Lake), and Ashuelot River. The Merrimack River, formed by the union of the Winnipiseogee River (outlet of Winnipiseogee Lake) and the Pemigewasset River, both having several tributaries, drains the southern half of the State; it receives from the W. the Contocook, Piscataquoi, and Sowhegan rivers; from the E., the Suncook River. It passes into Massachusetts from the S. E. part of Hillsborough co. The Piscataqua River, which forms a part of the S. E. boundary of the State, rises in East Pond, which is partly in Maine and partly in New Hampshire. It receives the Salmon Falls and Cocheco River. The Saco and Androscoggin Rivers have their sources and receive several affluents in New Hampshire. None of these rivers, except the Piscataqua, are navigable in the State, and that only for a few miles. New Hampshire is noted for the number and beauty of its lakes. Of these, Winnipiseogee Lake is the largest, and from its beauty received from the Indians its name, which signifies "the smile of the Great Spirit." Squam Lake, Lakes Ossipee and Sunapee, Umbagog, partly in this State, Connecticut (the source of the Connecticut River), Massabesic, Mascomy, Little Sunapee, and many other lakes and ponds, give variety and beauty to the scenery.

Geology and Mineralogy.—The greater part of the State is Eozoic or archaic, the surface-rocks being granite, gneiss, mica, quartz, etc.; there is a narrow belt of the Silurian formation along the Connecticut River, and a somewhat more extended tract in the S. E. of the State, which, however, along the seashore, as well as in the valley of the Merrimack, is intersected by Tertiary and Quaternary beds. The valley of the Merrimack has some very fertile alluvial deposits, and the shores of Lake Winnipiseogee are also alluvial. Iron is found in the form of magnetic and specular ores in Grafton and Carroll cos., and in bog-iron ore all over the State. There are iron furnaces at Franconia, near one of the largest mines, but the ore is less rich than in some of the deposits in other States, and at the present low price of iron its production is not profitable. Silver, copper, lead, zinc, graphite, and tin are also found, but except the graphite, which is largely in demand for crucibles, the ores are not rich enough to be worked to advantage. Mica or isinglass of great purity and in sheets of considerable size is obtained at Alstead and Grafton. There are quarries of steatite or soapstone at Francestown and Oxford, and a large deposit of the mineral usually known as Bath brick not far from Manchester. Building-granite of excellent quality abounds. The other minerals are gneiss, crystallized quartz, ochres, different kinds of spar, talc, terra sienna, tourmalines, beryls, garnets, jasper, amethysts, asbestos, manganese, sulphur, and magnesia.

Vegetation.—The northern portion of the State and the mountainous regions are covered with heavy forests of oak, pine, beech, sugar-maple, birch, etc. The southern portion has less timber, having been longer under cultivation; but along the streams there are heavy growths of deciduous trees, more especially of the chestnut, elm, poplar, locust, hornbeam, hickory, willow, sugar-maple, butternut, alder, etc. The flora is to a large extent alpine and sub-alpine.

Climate.—The climate is cold, the winters long and severe, but the warm season is pleasant and genial. Owing to the general elevation of the State, it is somewhat colder than Maine in the same latitude. It is, however, very healthful, and enjoys a remarkable exemption from epidemics. The following table gives the meteorological data of five points in the State, covering a distance of about 113 miles:

Stations.	Annual temp.				Spring temp.				Summer temp.				Autumn temp.				Winter temp.				Rainfall.					Barometer.			
	Mean temp. of year.	Highest.	Lowest.	Range.	Mean temp. of spring.	Highest.	Lowest.	Range.	Mean temp. of summer.	Highest.	Lowest.	Range.	Mean temp. of autumn.	Highest.	Lowest.	Range.	Mean temp. of winter.	Highest.	Lowest.	Range.	Annual rainfall.	Spring months.	Summer.	Autumn.	Winter.	Mean pressure spring.	Mean pressure summer.	Mean pressure autumn.	Mean pressure winter.
	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	in.	in.	in.	in.	in.	in.	in.	in.	in.
Mount Washington, lat. 44° 16′ 25′ N., lon. 71° 16′ 26″ W.; elevation, 6285.4 ft.	25.6	63	−43	106	19.8	59	−31	90	45.1	63	20	43	28	61	−22	83	9.4	42	−43	85	82.97	18.98	30.92	20.25	12.82	29.864	30.222	29.998	29.796
Stratford, lat. 44° 43′ N., lon. 71° 35′ W.	40.4	86	−18	104	36.3	83	−22	105	62.4	86	41	45	43.2	83	8	75	19.7	44	−18	62	47.74	10.05	9.92	14.81	12.96				
Shelburne, lat. 44° 22′ N., lon. 71° 10′ W.	40.8	96	−26	122	37.1	90	−24	114	64.3	96	38	58	47.9	82	16	66	13.8	38	−26	64	38.91	8.06	13.36	11.98	5.51				
Concord, lat. 43° 12′ N., lon. 71° 32′ 30″ W.	46.4	96	−16	112	45.4	82	10	72	68.2	96	50	46	49.3	81	12	69	22.7	56	−16	72	33.94	8.18	9.05	8.42	8.29				
Goffstown Centre, lat. 43° 1′ 30″ N., lon. 71° 33′ W.	45.4	98	−1	99	40.7	87	−1	88	65.9	98	42	56	48.6	87	18	69	26.5	50	−1	51	47.50	8.30	7.58	22.31	9.31				

The prevalent winds of New Hampshire are, in the order of their frequency, N. W., W., S. W., N., S. E., and S. The mean temperature of the State averages 43° 4′, ranging from 38° in the White Mountain region to 47° in the south-

ern portion of the State. The highest temperature in seven years was 98°, the lowest —30°, and the range 128°. The average rainfall over the entire State in 1869 was 47.16 inches. The heaviest rainfall occurs in the autumn, and usually in October; the lightest in the summer, generally in July.

Zoology.—In the northern and the mountainous portions of the State the bear, panther, lynx, wild-cat, and wolf, fox, as well as the mink, marten, raccoon, and skunk, are found in considerable numbers; deer, and rarely the elk and moose, as well as smaller game, are also found in that section, as well as around the lakes, and game and aquatic birds are plentiful, as are birds of prey and the various song-birds common to New England. Reptiles are not numerous. The rattlesnake is the only venomous snake. The lakes and rivers are well stocked with choice fish, and considerable attention has been paid to fish-culture.

Agricultural Products.—In 1870 the total land in farms was 3,605,994 acres, of which 2,334,487 acres were improved, and 1,271,507 unimproved. This was about three-fifths of the entire surface of the State. The value of these farms was estimated at $80,589,313, and the value of farming implements and machinery at $3,459,943. The value of all farm productions for the year was $22,473,547; of animals slaughtered, etc., $3,720,243; of home manufactures, $234,062; of forest products, $1,743,944; of market-garden products, $119,997; of orchard products, $743,552; and the wages paid to agricultural laborers, $2,319,164. The crops of the State in 1869–70 were, in cereals, wheat, 193,621 bushels; rye, 47,420; Indian corn, 1,277,768; oats, 1,146,451; barley, 105,822; and buckwheat, 100,034; hay, 612,648 tons; hops, 99,469 pounds; tobacco, 155,334 pounds; maple-sugar, 1,800,704 pounds; maple-syrup, 16,884 gallons; potatoes, 4,515,419 bushels; 58,375 bushels of beans and peas; wax, 2668 pounds; honey, 56,944 pounds; domestic wine, 2446 gallons; clover, flax, and grass-seed, 2388 bushels. The value of all kinds of live-stock the same year was $15,246,545; it included 43,335 horses, 37 mules, 90,583 milch cows, 40,513 working oxen, and 91,705 other cattle; 248,760 sheep, and 33,127 swine. Of many of these items we have later reports in the estimates of the department of agriculture. According to these, the crops of 1874 were—Indian corn, 1,239,000 bushels, valued at $1,387,680; wheat, 174,000 bushels, worth $269,700; rye, 41,000 bushels, worth $49,200; oats, 1,033,000 bushels, worth $671,450; barley, 84,000 bushels, worth $85,680; buckwheat, 86,000 bushels, worth $53,320; potatoes, 3,400,000 bushels, worth $2,006,000; tobacco, 180,000 pounds, worth $36,000; hay, 767,200 tons, worth $10,073,336. The year 1874 was not an exceptional year in regard to these crops, and unless—which is possible—the amounts above are under-estimated, we can hardly draw any other conclusion than that, with the exception of the hay crop, which seems to be slowly but steadily increasing, most of the agricultural products of New Hampshire are gradually but uniformly diminishing in quantity. The agricultural report estimates the live-stock of the State on Jan. 1, 1875, as follows: horses, 47,000, valued at $4,341,860; milch cows, 95,400, worth $3,774,978; oxen and other cattle, 116,900, worth $4,584,818; sheep, 242,400, worth $882,336; swine, 37,000, worth $523,550. The total value of live-stock was $14,107,542—not a material change in numbers, but a falling off of $1,133,000 in value.

Manufactures.—For a small State, New Hampshire is largely engaged in manufactures. The census of 1870 gives the following summary of the manufacturing enterprise of the State: number of manufacturing establishments, 3342; hands employed, 40,783, of whom 25,829 were men, 12,775 women, and 2179 children. The amount of capital invested was estimated at $36,023,743; of wages paid, $13,823,091; raw material used, $44,577,967; amount of annual product, $71,038,249. Of this amount, the manufacture of cotton goods furnished the largest single item, $16,999,672—almost one fourth; woollen and worsted goods were produced to the value of $10,150,729; lumber, $3,920,522; boots and shoes, $4,780,020; printing cotton and woollen goods, $4,670,333; iron, rolled and castings, $1,369,568; furniture, $1,732,162; leather, tanned and curried, $3,686,096; machinery of all kinds, $3,003,563; paper, $1,088,285; carriages, wagons, and cars, $1,286,084; flouring-mill products, $1,270,226; hosiery, $1,757,445.

Railroads.—On May 1, 1875, there were 933.66 miles of railroad in operation in the State, the cost of which, with the equipment, was $33,179,315. The principal lines were the Boston Concord and Montreal, 160 miles; Boston and Maine, 34.75 miles; Cheshire, 42.81 miles; Portsmouth Great Falls and Conway, 72.20 miles; Atlantic and St. Lawrence, 52 miles; Portsmouth Railway, 59 miles; Concord Railway, 35 miles; Manchester Lawrence and North Weare Railway, 41.39 miles; Northern Railway, 82.50 miles; Nashua and Rochester R. R., 49 miles; Eastern Railway and Conway division, 89 miles; Dover and Winnipiseogee, 28.50 miles.

Finances.—In 1870 the assessed value of the real and personal property of the State was $149,065,290, and the true valuation $252,624,112. The State debt June 1, 1875, was $3,775,457.35, or deducting the funds in the treasury, $3,741,330.45. It is funded, and will mature in nearly equal instalments in about thirty years. The total revenue of the State for the year ending June 1, 1875, was $505,654.21, and the expenditures for all purposes, $420,394.64. Of the balance, the greater part was used in reducing the principal of the debt.

Commerce and Navigation.—The foreign commerce of the State is small. Portsmouth, its only port of entry, received in the year ending June 30, 1874, imported goods to the amount of $41,388, and exported only $180. The number of vessels which entered and cleared from the port in 1874 was as follows: American vessels entered 8, tonnage 2061, crews 54; cleared 17, tonnage 3898, crews 105; foreign vessels entered 46, tonnage 7733, crews 303; cleared 45, tonnage 5471, crews 251; total entrances and clearances 116 vessels, tonnage 19,163, crews 713.

Banks.—There were in the State on Jan. 1, 1875, 44 national banks, of which 43 were in operation, having a capital of $5,365,000 and bonds on deposit of $5,342,000, with an outstanding circulation of $4,707,365; 2 State banks and trust companies, with $175,000 capital; and 68 savings banks, with 96,938 depositors and deposits to the amount of $30,214,585.71.

Insurance.—In Jan., 1875, there were 17 fire insurance companies in the State, of which 16 were mutual. The single stock company had a capital of $200,000 and assets amounting to $393,337. The reported assets of the 16 mutual companies were $18,837, which, however, included premium notes in every case. There were no life insurance companies in the State.

Population.—The table below gives the population, its density and rate of increase, with other interesting results:

Census year.	Aggregate population.	Male.	Female.	White.	Colored.	Native.	Foreign.	Density.	Rates of increase.	Illiterate.	Of school age, 5–20.	Of military age, males, 18–45.	Of voting age, males, 21 or more.	Citizens.
1790	141,885	71,294	70,605	141,097	788*	....	....	15.29						
1800	183,858	91,548	92,210	182,998	860	....	....	19.81	29.61					
1810	214,460	106,242	108,118	213,490	970	....	....	23.11	16.67					
1820	244,161	119,649	124,512	243,236	786	....	....	26.31	13.98					
1830	269,328	131,459	137,866	268,721	607	....	....	27.94	10.47	....	96,243			
1840	284,574	139,252	145,322	284,036	538	....	....	30.67	5.69	1,442	97,731			
1850	317,976	156,220	161,756	317,456	520	303,563	14,413	34.26	11.76	3,009	104,220	63,726	86,320	82,123
1860	326,073	159,816	166,257	325,579	494	305,135	20,938	35.14	2.55	4,717	99,168	64,154	92,103	84,726
1870	318,300	155,640	162,660	317,697	603†	288,689	29,611	34.30	Dec. 2.38	9,926	78,766	60,684	91,016	83,361

Education.—Our latest report is to June 30, 1875. There were then 2149 districts and 2599 public schools in the State. Of these, 403 were graded schools, and 964 were small schools, having 12 scholars or less. The average duration of the schools was 20 weeks = 5 months. The whole number of teachers was 3669, of whom 503 were males and 3166 females. The wages of male teachers averaged $42.61 per month, including board; of female teachers, also including board, $25.54. The number of children of school age in the State was 76,272, of whom 68,751 (viz. 35,901 boys and 32,850 girls) were registered as attending the schools at some time during the year. The average attendance was 48,288. There were 4164 children between the ages of 5 and 15 in the State who attended no school. There are 50 academies, seminaries, and private schools, with about 160 teachers and about 3300 pupils. The total amount of receipts from all sources for school purposes for the year was $621,649, of which $539,165 was raised by taxation, $27,340 from the literary fund, and $25,348 from local funds, while $31,284 was contributed from other sources. The entire amount expended for public schools the same year was $742,854, and the average appropriation

* 158 slaves in 1790, and 8 in 1800. † Including 23 Indians.

for each registered scholar was $7.08. The estimated value of school-houses and lots in the State was $2,228,905, and of school apparatus $29,154; 276 school-houses had been built or repaired during the year at a cost of $264,246. There are 39 high schools as a part of the graded system. There is a State normal school at Plymouth, organized in 1870, with 13 teachers and 155 students (44 male, 111 female), and a model school with 120 pupils. There were 34 graduates from the normal school in 1875. Teachers' institutes are held in most of the counties, and with good results. There are several excellent schools for secondary instruction, most of them being in some sense preparatory schools for students intending to enter college. Phillips Exeter Academy is one of the oldest and most famous of these, having been founded in 1781. It is largely endowed, and maintains a high reputation. The New London Literary and Scientific Institute at New London is a collegiate school of high grade, and is fairly endowed; the Kimball Union Academy at Meriden, founded in 1813, is also a good school and well endowed, as is St. Paul's at Concord. There is but one college in the State—Dartmouth College at Hanover—but this is to all intents and purposes a university, having in addition to its undergraduate course a school of science, a school of civil engineering, a school of agriculture, a school of medicine, and having just founded in 1875 a school of law. The following table gives the particulars respecting this college and its several post-graduate or extra-graduate schools. The law school is but just organized.

Institutions.	Location.	When organized.	Under what control.	No. of professors.	No. of students.	No. of years course.	Value of buildings, grounds, and apparatus.	Amount of endowment.	Income from productive funds.	Income from all sources.	Volumes in library.
Dartmouth College	Hanover	1770	Cong	20	265	4	$160,000	$400,000	$11,489	$32,514	53,100
Schools of Science:											
Chandler Scientific School of Dartmouth College	"	1852	Not sect	17	77	4	10,000	100,000	7,000	11,592	
N. H. College of Agric. and Mech. Arts of Dartmouth College	"	1868	State	13	33	3	116,000	114,000	6,840	12,100	1,400
Thayer School of Civil Engineering of Dartmouth College	"	1870	Not sect	4	6	2	3,000	55,000	3,500	3,740	2,000
School of Medicine:											
Medical Department of Dartmouth Col.	"	1796	Trustees	8	78	3	30,000	....	....	4,000	1,400

Charitable and Penal Institutions.—The New Hampshire asylum for the insane at Concord is a well-conducted institution. It is well endowed, and has a farm of 125 acres, well stocked, and employs such of its inmates as are able to work in farm-labor. It had May 1, 1875, 261 patients, the average of the year having been 275. Its receipts from all sources for the year ending May 1, 1875, were $91,141.58, its expenditures $87,256.31. The State has an efficient historical society with a large library. The State Reform School at Manchester, founded in 1855, in 1875 had 14 teachers and officers (5 male and 9 female) and 139 inmates—122 boys and 17 girls, 138 white, 1 colored, 48 natives, and 91 foreigners; 800 had been committed since its opening. It had a library of 3000 volumes. The annual cost of instruction and care was $22,965.71, or $164 to an inmate, and the average annual earnings were $7878.88, or $59 per head. The State prison at Concord was reported as being in a prosperous condition, and seems to have been so financially, for the earnings of the prisoners for the year exceeded the expenses by $15,692.46. It had May 1, 1875, 127 inmates.

Newspapers.—In 1870 there were 51 newspapers and periodicals published in the State, having a circulation of 173,919, and issuing annually 7,237,588 copies. Of these, 7 were dailies, with 6100 circulation; 37 weeklies, with 75,819 circulation; 1 semi-monthly, with 25,000 circulation; and 6 monthlies, with 67,000. The increase has been very gradual. In 1874 there were 61 papers, the number of dailies remaining the same, the number of weeklies, semi-monthlies, monthlies, bi-monthlies, and quarterlies having received some addition.

Churches.—The various denominations, with their adherent population, church property, etc., for the years 1870 and 1874, are as follows:

Denominations.	Church organizations, 1870.	Church edifices, 1870.	Sittings, 1870.	Church property, 1870.	Churches, 1874.	Church edifices, 1874.	Ministers, 1874.	Church members, 1874.	Adherent pop., 1874.	Church property, 1874.
All denominations	633	624	210,090	$3,303,780	650	653	586	53,550	293,875	$3,912,200
Baptists, Regular	102	90	31,935	492,200	86	90	85	8,355	40,000	520,000
Free-will Baptists	82	82	19,990	167,300	80	82	70	5,127	25,000	176,500
Christians	19	19	4,600	42,400	18	19	16	1,146	6,000	47,500
Congregationalists	169	172	67,951	1,150,380	194	190	181	18,646	90,000	1,350,000
Protestant Episcopalians	21	22	7,475	203,800	23	22	23	1,575	7,800	231,500
Friends	13	13	3,585	15,500	13	13	...	1,125	5,500	18,000
Methodists	118	118	36,351	475,000	128	128	127	12,273	60,000	859,500
Presbyterians	7	7	3,170	65,000	5	5	11	804	4,000	70,000
Roman Catholics	17	16	8,945	267,500	31	24	17	.....	25,000	307,000
Second Adventists	21	20	4,405	25,200	20	20	14	1,520	6,000	28,000
Shakers	2	2	300	1,800	2	2	...	275	800	2,200
Unitarians	23	22	7,830	207,000	22	22	20	1,600	8,000	227,000
Universalists	24	23	8,812	154,200	15	18	17	535	2,675	140,000
Union	12	16	4.066	29,500	10	15	9	600	3,000	25,000

There were also in the State in 1870, 1 New Jerusalem or Swedenborgian congregation, with 1 church edifice, 275 sittings, and $2000 of church property; 1 Spiritualist congregation.

Constitution, Courts, Representation in Congress, etc.—The governor, five councillors, the railroad commissioner, and the members of the senate and house of representatives are annually elected by the people on the second Tuesday of March. The governor must be thirty years of age, of the Protestant religion, and must have been an inhabitant of the State for seven years next preceding his election. The councillors are an advisory body, elected to aid the governor in his executive duties by their advice. The secretary of state, treasurer, and commissary-general are chosen by the legislature in joint convention, as are the governor and railroad commissioner when there fails to be an election by the people. All the judicial officers—the attorney-general, solicitor, sheriffs, coroners, registers of probate, and general field officers of the militia are appointed by the governor and council. The legislature, or, as it is legally styled, "the General Court of New Hampshire," is composed of a senate of 12 members, elected annually by districts, and a house of representatives, composed of 1 member for every parish, town, or place having 150 ratable male polls, and an additional member for every 300 ratable male polls in excess of the first 150. Towns containing less than 150 polls are classed together and elect representatives by turns. Of course, the number of members of the house varies with nearly every year; in 1874 it was 333. The judiciary consists of a superior court, with a chief-justice and two associate justices, and a circuit court, also with a chief-justice and two associates. The circuit court has appellate jurisdiction, and the superior court general jurisdiction. There are also probate courts and inferior courts of record. The State has three members of Congress under the last apportionment.

Counties.—The State is divided into ten counties, as follows:

Counties.	Pop. in 1870.	Males in 1870.	Females in 1870.	Pop. in 1860.	True valuation in 1870.	Assessed valuation in 1870.
Belknap	17,681	8,588	9,093	18,549	$10,751,983	$6,451,190
Carroll	17,332	8,758	8,574	20,465	10,457,441	5,748,334
Cheshire	27,265	13,653	13,612	27,434	23,062,485	13,837,491
Coos	14,932	7,955	6,977	13,161	11,176,643	4,722,934
Grafton	39,103	19,816	19,287	42,260	26,453,595	15,872,157
Hillsborough	64,238	30,021	34,217	62,140	59,050,708	35,430,425
Merrimack	42,151	20,718	21,433	41,408	33,274,316	19,964,590
Rockingham	47,297	22,853	24,444	50,122	39,691,670	23,815,002
Strafford	30,243	14,448	15,795	31,493	23,935,710	14,361,430
Sullivan	18,058	8,830	9,228	19,041	14,769,561	8,861,737
Totals	318,300	155,640	162,660	326,073	$252,624,112	$149,065,290

Principal Towns.—Concord, the capital, has a population of 12,241; Manchester, the largest city, had in 1870 a population of 23,536; Nashua, Dover, and Portsmouth have from 10,000 to 12,000 each; Keene, about 6000; Somersworth, Rochester, and Claremont, from 4000 to 5000; Exeter, Gilford, and Lebanon, between 3000 and 4000; while Milford, Littleton, Lancaster, Pembroke, Peterborough, Laconia, Newport, Franklin, Haverhill, Hanover, Farmington, Winchester, and Weare have each from 2000 to 3000 inhabitants.

History.—The region N. of the Merrimack River was first visited by Europeans in 1614, and a settlement made at Strawberry Bank (now Portsmouth) in 1623. In 1629 the Plymouth Company granted to Capt. John Mason, one of their members, the lands lying between the Merrimack and Piscataqua rivers. Capt. Mason encouraged emigration and settlement, but for some years the colonists were mostly fishermen and exiles from Massachusetts Bay. In 1635 the Plymouth Company divided up their property in New England among themselves before surrendering their charter to the king, and the whole of the present State of New Hampshire fell to the lot of Capt. Mason. There were settlements at this time at Exeter, Dover, and Strawberry Bank, but the Indians troubled them greatly, and Capt. Mason not possessing the ability to defend them, the colonists in 1641 voluntarily sought the protection and alliance of Massachusetts, and remained a part of that colony until 1679, when King Charles II. made it a separate royal province, with a president and council appointed by the Crown, and an assembly chosen by the people. In 1689, however, it again joined Massachusetts, and the same year the Indians attacked and burned Dover and killed many of its inhabitants. Some years later, under the policy of consolidation of the colonies, New Hampshire was for a time subject to the government of New York. Settlements proceeded slowly. In 1714 there were but eight towns in the colony, and several of these were little more than hamlets. Within the next fifty years, however, there was a gradual extension of the population westward, and the colonial governors claimed that their territory extended to the New York line, and granted lands W. of the Connecticut River. What subsequently became the State of Vermont was known for some years as the "New Hampshire Grants," while New York also laid claim to the territory. The difficulties and bitter feeling induced by these rival claims were not fully quieted until the admission of Vermont into the Union as a State in 1790. In 1741 the old controversy with Massachusetts in regard to boundary was finally settled. New Hampshire took an active part in the war of the Revolution, and though her soil was not invaded her sons were prominent in every action from 1776 to 1781. She was also prominent in the Continental Congress, but had no constitution until Oct. 31, 1783, when a convention which had held many sessions succeeded in perfecting one, under which, with some amendments, the State is still governed. On June 21, 1788, the State in convention ratified the Constitution of the U. S. by a vote of 57 to 46. Concord was made the capital in 1807. The State took an active part in the war of 1812, but again escaped any invasion of its soil. In 1834 there was a serious disturbance in the northern part of the State, the settlers claiming that they were not subject to the jurisdiction of the State. The military were called out, but the trouble was quelled without bloodshed. In the late civil war New Hampshire sent her full quotas, and her troops were distinguished for bravery and good conduct.

Governors of the State.

Josiah Bartlett	1792–94	Henry Hubbard	1842–44
John Taylor Gilman	1794–1805	John H. Steele	1844–46
John Langdon	1805–09	Anthony Colby	1846–47
Jeremiah Smith	1809–10	Jared W. Williams	1847–49
John Langdon	1810–12	Samuel Dinsmoor	1849–52
William Plumer	1812–13	Noah Martin	1852–54
John Taylor Gilman	1813–16	Nathaniel B. Baker	1854–55
William Plumer	1816–19	Ralph Metcalf	1855–57
Samuel Bell	1819–23	William Haile	1857–59
Levi Woodbury	1823–24	Ichabod Goodwin	1859–61
David L. Morrill	1824–27	Nathaniel S. Berry	1861–63
Benjamin Pierce	1827–29	Joseph A. Gilmore	1863–65
John Bell	1829–30	Frederic Smyth	1865–67
Matthew Harvey	1830–31	Walter Harriman	1867–69
Jos. M. Harper (acting)	1831–31	Onslow Stearns	1869–71
Samuel Dinsmoor	1831–34	James A. Weston	1871–72
William Badger	1834–36	Ezekiel Straw	1872–74
Isaac Hill	1836–39	James A. Weston	1874–75
John Page	1839–42	Person C. Cheney	1875–

Electoral and Popular Vote for President and Vice-President.

Year of election.	Candidates.	Electoral vote.
1788	George Washington P. John Adams V.-P.	5
1792	George Washington P. John Adams V.-P.	6
1796	John Adams P. Oliver Ellsworth V.-P.	6
1800	John Adams P. C. C. Pinckney V.-P.	6
1804	Thomas Jefferson P. George Clinton V.-P.	7
1808	C. C. Pinckney P. Rufus King V.-P.	7
1812	De Witt Clinton P.	8
	Jared Ingersoll V.-P.	7
	Elbridge Gerry V.-P.	1
1816	James Monroe P. D. D. Tompkins V.-P.	8
1820	James Monroe P. D. D. Tompkins V.-P.	7
	John Quincy Adams P. Richard Rush V.-P.	1

Year of election.	Candidates who received the electoral vote.	Electoral vote.	Pop. vote.	Opposition candidates.	Pop. vote.	Third-party or minority candidates.	Pop. vote.
1824	John Quincy Adams P.	8	4,107	Andrew Jackson P. John C. Calhoun V.-P.	643		
	John C. Calhoun V.-P.	7					
	Andrew Jackson V.-P.	1					
1828	John Quincy Adams P. Richard Rush V.-P.	8	24,076	Andrew Jackson P. John C. Calhoun V-P.	20,692		
1832	Andrew Jackson P. Martin Van Buren V.-P.	7	25,486	Henry Clay P. John Sergeant V.-P.	19,010		
1836	Martin Van Buren P. Richard M. Johnson V.-P.	7	18,722	William H. Harrison P. Francis Granger V.-P.	6,228	Daniel Webster P. John Tyler V.-P.	about 8,000
1840	Martin Van Buren P. Richard M. Johnson V.-P.	7	32,761	William H. Harrison P. John Tyler V.-P.	26,158		
1844	James K. Polk P. George M. Dallas V.-P.	6	27,160	Henry Clay P. T. Frelinghuysen V.-P.	17,866	James G. Birney P.	4,161
1848	Lewis Cass P. Wm. O. Butler V.-P.	6	27,763	Zachary Taylor P. Millard Fillmore V.-P.	14,781	Martin Van Buren P. C. Francis Adams V.-P.	7,560
1852	Franklin Pierce P. Wm. R. King V.-P.	5	29,997	Winfield Scott P. Wm. A. Graham V.-P.	16,147	John P. Hale P. George W. Julian V.-P.	6,695
1856	John C. Fremont P. William L. Dayton V.-P.	5	38,345	James Buchanan P. J. C. Breckenridge V.-P.	32,789	Millard Fillmore P. A. J. Donelson V.-P.	422
1860	Abraham Lincoln P. Hannibal Hamlin V.-P.	5	37,519	Stephen A. Douglas P. H. V. Johnson V.-P.	25,881	John C. Breckenridge P. Joseph Lane V.-P.	2,112
						John Bell P. Edward Everett V.-P.	411
1864	Abraham Lincoln P. Andrew Johnson V.-P.	5	36,400	George B. McClellan P. George H. Pendleton V.-P.	33,034		
1868	Ulysses S. Grant P. Schuyler Colfax V.-P.	5	38,191	Horatio Seymour P. Francis P. Blair V.-P.	31,224		
1872	Ulysses S. Grant P. Henry Wilson V.-P.	5	37,168	Horace Greeley P. Benj. Gratz Brown V.-P.	31,425	Charles O'Conor P.	100
						——— Black P., Temp.	200

L. P. Brockett.

New Hamp'ton, post-v. and tp., cap. of Chickasaw co., Ia., on the Chicago Milwaukee and St. Paul R. R., has 3 churches, good schools, 1 bank, 1 newspaper, and stores. Principal industry, farming. Pop. of v. 455; of tp. 947.
Geo. M. Reynolds, Ed. "Courier."

New Hampton, post-v. and tp. of Belknap co., N. H., on the Merrimack River, contains the New Hampton Literary and Biblical Institution. Pop. 1257.

New Han'over, county of S. E. North Carolina. Area, 850 square miles. It is generally level, and is in some parts sandy and in others swampy. It is bounded S. E. by the Atlantic Ocean, and W. by Cape Fear River and its branches. It is traversed by N. E. Cape Fear River and by the Wilmington and Weldon R. R. It contains large pine forests, and affords lumber and naval stores. Livestock, corn, and rice are leading products. Cap. Wilmington. Pop. 27,978.

New Hanover, tp. of Burlington co., N. J. Pop. 2536.

New Hanover, post-v. and tp. of Montgomery co., Pa. Pop. 1900.

New Har'mony, tp. of Chambers co., Ala. Pop. 1240.

New Harmony, post-v. of Harmony tp., Posey co., Ind., on the Wabash River, 23 miles N. W. of Evansville, noted for the settlement made there in 1815 by the "Harmonists" under George Rapp, transferred to Robert Owen in 1824 for an experiment in socialism, and subsequently the seat of a "school of industry" founded by William Maclure. None of these enterprises have proved very successful. A newspaper is published here. Pop. 836.

New Hart'ford, post-v. and tp. of Litchfield co., Conn., on the Connecticut Western and the Collinsville branch of the New Haven and Northampton R. Rs. Pop. 3078.

New Hartford, post-v. of Butler co., Ia., on the Iowa division of the Illinois Central R. R.

New Hartford, post-v. and tp. of Winona co., Minn. Pop. 692.

New Hartford, post-v. and tp. of Oneida co., N. Y., on the Utica branch of the New York and Oswego Midland R. R. and the Utica division of the Delaware Lackawanna and Western R. R. Pop. of v. 743; of tp. 4037.

New Ha'ven, county of Connecticut, bounded S. by Long Island Sound. Area, 625 square miles. Its surface

is much diversified by hills and fertile valleys. Even the less fertile plains are generally well cultivated and productive. Tobacco, live-stock, wool, potatoes, and grain are leading products. The county has very extensive manufacturing interests. Carriages, hardware, brick, buttons, cutlery, paper, edge tools, furniture, cotton and woollen goods, lumber, metallic wares, castings, machinery, clocks, wire, pins, etc. are among the manufactured articles. The county is traversed by several railroads. Cap. New Haven. Pop. 121,257.

New Haven, city and tp., cap. of New Haven co., Conn., on a sandy plain at the head of a shallow harbor, between West and Mill rivers, including also the neck between Mill River and the Quinnipiack, where the part of the town called Fair Haven is situated. Formerly the city and the town had distinct limits; now they have the same by the extension of the city organization over a larger area. The population of the town in 1850 was 20,345; in 1860, 39,267; in 1870, 50,840, of whom 14,356 were foreign-born; and in 1874—as estimated by the increase of children between the ages of four and sixteen—55,667. The government of the *town*, according to a general law which points back to the organization of the early settlements in the colonies of New England, is in the hands of selectmen, not more than seven in number, with whom are elected grand jurors, constables, assessors, a board of relief, a town-clerk, a registrar of births, etc., a treasurer, a collector of taxes, etc. The *city* has a special charter, which has been often changed in its details. It is now divided into ten wards, each of which sends two aldermen and three councilmen to the boards of aldermen and the common council. A mayor, chosen, like these boards, annually, and now having in his hands the nomination of the principal administrative boards, presides at the meetings of the aldermen. The police of the city is entrusted to a chief, several subordinates, 81 patrolmen, and others for special occasions. The arrests made by the police in 1874 were 5109 —viz. for drunkenness, 2196; for assault and battery, 760; for breach of peace, 318. Of the arrested, 666 were women. The administration of justice for smaller offences is vested in the city court, where in 1874 more than 3000 cases were tried. Various other higher courts both of the State and the U. S. hold sessions in the city. New Haven is well supplied with common schools under an elected board having control over teachers, studies, and expenses. In 1874 the schools cost $62,000, the number of teachers under the board was 204, and the number of scholars admitted was 9835. Many of the school-houses, of which there are in all about 25, are commodious and handsome buildings. A number of private schools, the Hopkins Grammar School, the public high school, with the various departments of YALE COLLEGE (which see), complete the system of education. The property in New Haven, according to its assessed value in 1873, was $56,556,179. The rate of taxation for all purposes was 16 mills on the dollar—2½ mills for the schools. For lighting the streets the expenses in 1874 were $44,497; the police cost nearly $100,000; and the fire department about $95,000. The receipts into the city treasury in all were during the same year $752,485.73, and the disbursements, $784,436.01. The city debt is $760,000, of which $500,000 is for a very important system of sewerage begun a few years ago, and now well on its way towards completion; $200,000 was advanced in aid of the Derby R. R.; and there remained the balance of a debt contracted for building the city hall, an imposing structure facing the public green. The city is now engaged in building a new bridge over the Quinnipiack near its mouth, which will cost nearly $136,000. The expenses for the poor are about $46,000, from which, however, are to be deducted some $12,000 as profits of labor at the almshouse. The deaths in New Haven for 1873 were 1073, and the death-rate 18.2 to 1000. New Haven is well supplied with railroads. There are the roads to New York; to Hartford and Springfield, now consolidated into one; the canal road to Northampton; the New London; the air-line to Willimantic *viâ* Middletown, and the Derby. New Haven is a port of entry, and has a considerable trade both with other parts of the U. S. and with foreign parts. Its manufactures are its principal source of prosperity, the most important being the making of carriages, of rifles, and other works in iron. There are in the town about 40 churches—viz. 13 Congregational, 7 Episcopalian, 6 Roman Catholic, 5 Methodist, 3 Baptist, 1 Universalist, besides several where German is the language of the service, and several consisting of colored members.

New Haven was the principal settlement in the colony, originally independent, which was founded by Theophilus Eaton, Rev. John Davenport, and their associates, men of more than the ordinary wealth of colonists, in 1638. Other settlements were made on land purchased from the Indians, as was the case at Quinnipiack, at Guilford, Milford, Stamford, and Branford, which, with Yennicock or Southhold on Long Island, joined the principal settlement under a constitution made by the inhabitants without royal charter. The independence of this colony continued until the charter of Connecticut, procured from the king, Charles II., in 1662, included the New Haven colonists under the same jurisdiction. Some of the settlements were ready enough to come under the new charter. But several years passed before it was accepted with content by the others. Under this charter Hartford and New Haven were made joint capitals, the legislature meeting alternately at each place, until in 1873, by an amendment of the constitution, Hartford was made the sole seat of government.

T. D. WOOLSEY.

New Haven, post-v. of Gallatin co., Ill. Pop. 356.

New Haven, post-v. of Allen co., Ind., on the Wabash and Toledo and Western R. R., has 2 public-school buildings, 4 churches, 3 large stave manufactories, several lumber-yards and saw-mills, 1 hotel, flouring-mills, 1 newspaper, and stores. Pop. about 1400.

T. J. FOSTER, ED. "NEW HAVEN PALLADIUM."

New Haven, post-v. of Nelson co., Ky., on the Knoxville branch of the Louisville and Nashville R. R. Pop. 99.

New Haven, tp. of Gratiot co., Mich. Pop. 586.

New Haven, post-v. of Lenox tp., Macomb co., Mich., on the Grand Trunk R. R. (formerly NEW BALTIMORE STATION). Pop. 413.

New Haven, tp. of Shiawassee co., Mich. Pop. 999.

New Haven, tp. of Olmsted co., Minn. Pop. 860.

New Haven, post-v. of Franklin co., Mo., on the Missouri River and the Pacific R. R. (MILLER'S LANDING STATION).

New Haven, post-v. and tp. of Oswego co., N. Y., on the Rome Watertown and Ogdensburg R. R. Pop. 1764.

New Haven, a v. of Crosby tp., Hamilton co., O. Pop. 161.

New Haven, post-v. and tp. of Huron co., O., on the Lake Erie division of the Baltimore and Ohio R. R. Pop. 1221.

New Haven, a b. of Dunbar tp., Fayette co., Pa. Pop. 333.

New Haven, post-v. and tp. of Addison co., Vt., on the Rutland division of the Central Vermont R. R. Pop. 1355.

New Haven, post-v. of Graham tp., Mason co., West Va., on the Ohio River. Pop. 489.

New Haven, post-v. and tp. of Adams co., Wis. P. 894.

New Haven, tp. of Dunn co., Wis. Pop. 554.

New Heb'rides, a large group of islands in the Pacific Ocean, situated between lat. 14° and 20° S., and between 168° and 170° E. Their area is estimated at 5700 square miles, their population at 134,000. The largest and best-known of them is Tanna, with the harbor Erupabo; Santo, Mallicolo, and Erromango have also been visited by Europeans, though the extreme savageness of the inhabitants makes all intercourse very difficult. The islands are volcanic and fertile, covered with forests of sandal and other valuable trees. The inhabitants belong to the Papuan race, and are cannibals. On the island of Anatom, however, Christian missionaries have worked with success.

New Holland. See AUSTRALIA.

New Hol'land, post-v. of Perry tp., Pickaway co., O., on the Cincinnati and Muskingum Valley R. R. Pop. 326.

New Holland, post-v. of Earl tp., Lancaster co., Pa., 13 miles E. of Lancaster, on the East Brandywine and Waynesburg R. R, has a public-school building, 4 churches, 1 newspaper, an extensive coach manufactory, several hotels, and stores. P. 778. G. H. RAUCK, ED. "CLARION."

New Hol'stein, post-v. and tp. of Calumet co., Wis., on the Wisconsin Central R. R. Pop. 1813.

New Hope, tp. of Union co., Ia. Pop. 299.

New Hope, post-v. of Hurricane tp., Lincoln co., Mo. Pop. 186.

New Hope, tp. of Chatham co., N. C. Pop. 1760.

New Hope, post-v. and tp. of Iredell co., N. C. Pop. 871.

New Hope, tp. of Perquimans co., N. C. Pop. 1933.

New Hope, tp. of Randolph co., N. C. Pop. 1095.

New Hope, tp. of Wayne co., N. C. Pop. 1520.

New Hope, post-v. of Scott tp., Brown co., O. P. 145.

New Hope, post-b. of Solebury tp., Bucks co., Pa., on the Delaware River. Pop. 1225.

New Hope, tp. of Orangeburg co., S. C. Pop. 951.

New Hope, post-v. and tp. of Portage co., Wis. P. 751.

New Hud'son, post-v. and tp. of Allegany co., N. Y. Pop. 1142.

New Ibe'ria, post-v., cap. of Iberia parish, La., on the Bayou Teche, 55 miles W. S. W. of Baton Rouge, surrounded by extensive sugar and cotton plantations, has 6 weekly newspapers and a considerable trade. Pop. 1472.

New'ington, post-v. and tp. of Rockingham co., N. H. Pop. 414.

Newington Junction, post-v. of Wethersfield tp., Hartford co., Conn., on the New York New Haven and Hartford and the Hartford Providence and Fishkill R. Rs. (NEWINGTON STATION).

Newington Society, a v. (NEWINGTON P. O.) of Wethersfield tp., Hartford co., Conn., 2 miles from Newington Junction. Pop. 778.

New Ips'wich, post-v. and tp. of Hillsborough co., N. H., is the seat of Appleton Academy (Congregationalist), founded in 1787. Pop. 1380.

New Jas'per, post-v. and tp. of Greene co., O. Pop. 1084.

New Jer'sey, one of the Middle Atlantic States, and one of the original thirteen, situated between the Delaware River and Bay and the Atlantic Ocean and Hudson River, and within the following limits of latitude and longitude: between the parallels of 38° 55′ 50.42″ and 41° 21′ 19″ N. lat., and the meridians of 73° 53′ 51.25″ and 75° 33′ 02.74″ W. lon. from Greenwich. It is bounded on the N. by New York, the boundary-line being a straight line from the W. bank of the Hudson River, in lat. 41° N., to a point on the

Seal of New Jersey.

N. bank of the Neversink River, where it enters the Delaware; on the E. by the Hudson River, Staten Island Sound, Raritan Bay, and the Atlantic Ocean; S. by Delaware Bay; and W. by the Delaware River, which separates it from Delaware and Pennsylvania. Its extreme length from Carpenter's Point to Cape May is $167\frac{3}{8}$ miles; its greatest breadth is 59 miles, and its least 32 miles. Its area is 7576.68 square miles, or 4,849,069 acres.

Face of the Country.—The northern half of the State is traversed by three distinct ranges of mountains; two of them, the Kittatinny or Blue Mountain, called Shawangunk in New York, and the Highland Range, belong to the Appalachian chain, while the third and lower range lies between the Highlands and the ocean, and is a part of the low mountain-range which descends from Massachusetts through New York and enters New Jersey below the Palisades. The interval between the second and third ranges of mountains is throughout most of its extent largely charged with trap-rock, which at times, as at the Palisades, completely obscures its matrix and appears as an independent line of basalt. The Blue or Kittatinny range is somewhat the highest, rising to a height of not far from 1800 feet at High Point, near the New York line. It forms an almost unbroken ridge from the New York State line to the Delaware Water Gap. Its eastern slope is steep, though not, for the most part, precipitous; the western slope is gentler, but continues in much lower but broken and rocky hills W. to the Delaware. The top of this ridge is flat and generally covered with a heavy forest-growth. The Highland range is composed of a great number of mountain-ridges, extending over a belt of country 22 miles wide at the New York line and 10 miles wide on the Delaware. It has really no long unbroken ridges except the Green Pond Mountain range, and its subordinate ridges are not really in line with each other or parallel with the axes of the main range. It is possible to cross from one side of the range to the other in a N. N. E. direction without surmounting any considerable elevation, though in any other direction numerous steep hills would have to be ascended. The highest point on any of these ridges is Rutherford's Hill on Hamburg Mountain, 1488 feet above the sea, though Wawayanda Mountain, near the New York line, is 1450 feet. Schooley's Mountain and the Musconetcong Mountain, both favorite summer resorts, are two of the many ridges of this range. They are mostly arable, though a few are covered with loose stones and bare rock, and can only be left to forest-growths. Most of them slope gently to the general level on their N. E. faces, while the S. W. terminate abruptly and sometimes precipitously. The trap ridges, occurring in the Red Sandstone region, are irregularly distributed, but generally occur in long and narrow stretches in the midst of a rich and highly productive agricultural region. The longest and most widely known of these trap ridges is that generally known as Palisade Mountain, which, commencing between 8 and 9 miles W. of the Hudson River, in Rockland co., N. Y., reaches the river by a bold curve, and thence follows the W. bank down in the almost perpendicular and frowning Palisades, but at Weehawken, Hoboken, Jersey City, Bergen, and Bayonne leaves an alluvial tract between it and the river and bay; it is broken through by the Kill von Kull, but resumes its course on Staten Island, terminating at last on the shores of the Arthur Kill. This dyke or ridge has been bored for the Bergen Tunnel, the new tunnel of the Delaware Lackawanna and Western R. R., and the deep open cut of the New Jersey Central. Nearly parallel with this ridge, and from 10 to 18 miles W. of it, are the First, Second, and the less continuous Third Mountains, which, though broader and somewhat higher than the Palisades, are not so long. They include the Orange Mountain, Fairmount, etc. S. W. of these, in Hunterdon and Mercer cos., are other less extensive but prominent trap ridges known as Rocky Hill, Ten-mile Run Mountain, Long Hill, Sourland Mountain, Goat Hill, and further N. Round Mountain and a large horseshoe-shaped mass of trap rising 767 feet above the sea, and known as Pickle Mountain. These trap ridges all have their eastern front abrupt and almost perpendicular, while on the W. side they slope gradually toward the plain. The southern half of New Jersey has no rocky eminences or any elevations deserving the name of mountains. The Highlands of Navesink, S. of Sandy Hook, the first lands seen in approaching New York from the sea, are about 400 feet high. The rounded hills are earthy, and are results of denudation or erosion. Only two of them are above 300 feet in height, and even these are not 200 feet above the surrounding country. All of Southern Jersey is a gently-undulating plain in the centre, 150 to 190 feet above the sea, and sloping gradually to the ocean on one side and Delaware River on the other. The mountain-ranges and the numerous rivers give rise to very many valleys and plains, which we have only space to group into a general classification. The valley of the Delaware River, from the New York State line to the Delaware Water Gap, a distance of 40 miles, varies in breadth from half a mile to three miles, and possesses great beauty and a rich and productive soil. At the Water Gap the Kittatinny or Blue Mountain crosses the river, and from that point the valley is broader and not so well defined, though the Highland ridges press closely to its shores to about the parallel of 40° 35′. Below this the valley stretches out in wide plains of sandy loam, broken only by occasional trap-dykes, as far as Trenton, when clay deposits take the place of sand as far S. as Elsinborough, when the sand again resumes its sway. The Kittatinny Valley lies between the Kittatinny Mountain and the Highland Range; it is 39 miles in length in the State, and about 10 miles in breadth, elevated from 500 to 650 feet above the sea, and is everywhere noted for its rural beauty and agricultural wealth. The valleys which separate the subordinate ranges and some of the numerous ridges of that chain of hills, though not generally of great extent, are fertile, and some of them remarkable for their fine scenery. Berkshire Valley, Longwood Valley, and the unnamed valley which stretches onward to Greenwood Lake and into New York, are the most remarkable. Before the eruption of the trap rocks the whole Red Sandstone region was a valley, having the Highland Range for its N.W. border, while the Hudson River and the ridge of gneiss in Staten Island, and a line running thence S. W. to Trenton, formed its S. E. border. From the southern half of this the sandstone has been washed away and replaced by a later white clay. This portion has become a broad plain with a moderately undulating surface and crossed by a few abrupt ridges. The valley of the Passaic is a part of this plain, and rises from 160 feet on its eastern side to 400 feet on the W. The valley between the Palisades and the First Mountain, and extending from the New York line almost to the Raritan, is also a part of it. The southern half of New Jersey may be considered as a great plain which has a few low hills, and whose surface has been eroded in some parts to a considerable depth by the streams which drain it. There are

along the Atlantic coast and the bays in its neighborhood and the Delaware River and Bay 295,474 acres of tide-marshes in the State. They are usually covered with grass and sod, and their upper surface is near the level of high water, but underneath the sod there is soft mud and mire, varying in depth from 6 inches to 30 feet, below which is fine gravel or sand. By ditching and banking much of this has been rendered productive, and the railway companies are now using large tracts for their coal-trains, storage-houses, etc. etc.

Rivers, Bays, Lakes.—New Jersey is a well-watered State. Its river-system seems at first rather complicated, but by referring all the rivers to five drainage basins it is simplified. The Hudson River, which bounds the State for 28 or 30 miles, is the first of these. It receives from this State only the Wallkill River, with three small affluents of that stream; Newark Bay, the second drainage basin, receives the Passaic and the Hackensack rivers, with their affluents. The principal tributaries of the Passaic are the Pompton, which itself has three branches, the Rockaway, and the Whippany River; the Hackensack has the Saddle River. Raritan Bay receives the Raritan River, with its N. and S. branches, and three other tributaries and three affluents of these. The Atlantic Ocean, through Staten Island Sound, Sandy Hook Bay, Shark River Inlet, Manasquan Inlet, Barnegat Bay, Great Bay, and Egg Harbor, receives the Rahway River, Navesink and Shrewsbury rivers, Shark River, Manasquan River, Metedeconk and Tom's rivers, and Cedar Creek, Little Egg Harbor or Mullica's River, with three tributaries, and Great Egg Harbor River, with its branch, the Tuckahoe River. Delaware Bay, the last of these drainage basins, receives the Delaware River, with its fifteen tributaries and four affluents of these, only four of them attaining to the dignity of rivers, and these small; and in the extreme S. of the State Cohansey Creek and Maurice River, as well as a number of smaller streams. These rivers and creeks drain about 4471 square miles, and the remaining area is drained by numerous smaller streams, which discharge directly either into the Atlantic or some of the numerous bays along the coast. These bays, besides Delaware Bay and Newark, Raritan, and Sandy Hook bays, are sometimes called bays, sometimes harbors or sounds. They form a line of internal water communication along the Atlantic coast from Metedeconk River to Cape May for vessels of light draught. The principal are Barnegat Bay, Little Egg Harbor, Great Bay, Little Bay, Grassy Bay, Reed's Bay, Absecom Bay, Lake's Bay, Great Egg Harbor, Peck's Bay, Ludlam's Bay, Townsend's Sound, Styles's Sound, Leaming's Sound, Jenkins's Sound, Grassy Sound, Richardson's Sound, Jarvis's Sound, and Cape Island Sound. There are numerous lakes and ponds in the State, but few of them are of considerable size. Greenwood Lake, partly in New York, is from one-third to one-half a mile wide and 7 or 8 miles long. Lake Hopatcong in Morris co. is 5½ miles long and from one-third to 1¾ miles wide. Budd's Lake is nearly 2 miles long and three-quarters to 1 mile wide. Green Pond, also in Morris co., between Green Pond and Copperas Mountains, 1044 feet above the sea, is a beautiful sheet of water 3 miles long and from a quarter to half a mile in width.

Geology.—With the exception of the Carboniferous, Permian, and Jurassic, all the geological formations are represented in the rocks and soils of New Jersey. Her geology has been carefully studied, even to its minutest details, by Prof. Henry D. Rogers, Prof. Kitchell, and the present eminent State geologist, Prof. George H. Cook. The Azoic and Palæozoic formations are to some extent interlaced with each other, and together occupy the entire N. W. portion of the State. The Azoic rocks (granite, crystalline limestone, and gneiss) underlie the S. E. portions of Sussex and Warren counties, almost all the northern and western parts of Passaic, a strip on the W. border of Bergen, the N. W. portion and three-fourths of the area of Morris, most of Bernard township in Somerset co., and a small area across the N. end of Hunterdon co. The boundaries of this formation are coterminous with those of the Highland range, though some of the included valleys between the subordinate ranges contain rocks of the Palæozoic age. The Palæozoic formations—under which are included, in New Jersey, the Potsdam sandstone, the slaty grits and conglomerates of the Green Pond Mountain, magnesian limestone, fossiliferous or Trenton limestone, shales, roofing slates, and slaty sandstones of the Hudson River group, sandstone and conglomerate of the Kittatinny and Shawangunk Mountains, and red slates and sandstones, all members of the Niagara group, the various limestones, firestones, and water limestones of the water lime and lower Helderberg groups, the Oriskany sandstone, the Cauda-Galli grit, Onondaga limestone, and cherty limestone of the Corniferous group, and the Marcellus shales of the Hamilton group—are found occupying the N. W. portions of Warren and Sussex cos., the Green Pond Mountains in Passaic and Morris cos., and the limestone valley of the South Branch in Morris and Hunterdon cos. The Triassic formation, which comprises the red sandstone, with its eruptions of trap and basalt already described, as well as some thick beds of shales and conglomerates, underlies a belt of country which crosses the State from N. E. to S. W., adjoining the Highland Range in the S. E. Almost the whole of Bergen, half of Passaic, all of Essex and Union, a part of Morris, most of Somerset and Hunterdon, and considerable portions of Middlesex and Mercer cos., belong to this geologic age. Its S. E. border is a nearly straight line between Jersey City and Trenton. The Cretaceous formation, which includes the greensands, chalks, and lower marls, or, according to the more detailed division of Prof. Cook, plastic clays, lignite beds, clay marls, laminated sands, a lower marl-bed, red sand, a middle marl-bed, and yellow sand, is found immediately S. E. of the Red Sandstone, in a long narrow strip reaching from Raritan and Sandy Hook bays to the head of Delaware Bay near Salem. Parts of Middlesex, Mercer, Monmouth, Ocean, Burlington, Camden, Gloucester, and Salem cos. belong to this geologic period. The Tertiary and Quaternary formations occupy the whole S. and S. E. of the State below the Cretaceous, covering the cos. of Atlantic, Cumberland, Cape May, and most of Ocean, as well as parts of Burlington, Camden, Gloucester, and Salem and a little of Monmouth. The alluvium or Quaternary also overlies most of the Red Sandstone region. Prof. Cook includes in the deposits of the Tertiary and Quaternary the upper marl-bed, astringent clays, white sand, marls and clays not stratified, glass sand, drift gravel, loam, and humus.

Mineralogy and Economic Geology.—The mineral products of the State which are of use in the arts and in mechanics and agriculture are very numerous. The clay marls, pure marls, and shell marls of the State are used to the amount of more than 200,000 tons per annum, and have had the effect of rendering the farming lands of New Jersey of a higher average value than those of any State in the Union; lime, also, for fertilizing purposes, working admirably either alone or in connection with the marl, marsh mud, peat both as a fertilizer and fuel, not to speak of the great variety of marine products, partially mineral, used for fertilization, building materials, including a very fine gneiss, white and blue limestones, Potsdam sandstone and the great variety of New Jersey free or sandstones, of which that of Belleville is one of the best, roofing and writing slates of the best quality throughout the Kittatinny valley, and flag and paving stones of large size and excellent durable material, are abundant along and near the Hudson. Hydraulic lime and clay suitable for brick-making are plentiful and largely used. New Jersey has vast beds of the best iron ores. In 1874 there were 214 mines of the magnetic iron ores, and the number is still increasing. There are 12 mines of red and brown hæmatite iron ores, all of them on a very large scale. These occur in the magnesian limestones, in the Medina sandstone, and the white crystalline limestone. Bog iron ores are found in wet meadows, bogs, and swamps all over the State. The amount of iron ore mined in the State in 1874 was 525,075 tons; in 1873 it was 665,000 tons, and in 1872, 600,000 tons. There are in Somerset co. and elsewhere in the State, veins of copper ore which have been worked in the past; but they would not now prove profitable, yielding only 9 or 10 per cent. of pure copper. Zinc ores have been found only in two localities in Sussex co., but they are of excellent quality, and supply $\frac{7}{10}$ of the zinc oxide and more than ½ of the metallic zinc produced in the U. S. The quality of both is said to be much superior to the imported. Prof. Cook states that 25,000 tons of zinc ores were raised in Sussex co. in 1868. There has been a gradual falling off in the product since that time, 17,500 tons being raised in 1873, and but 13,500 in 1874. Lead ore—galena—occurs at several localities, but is not sufficiently abundant to pay for working. Nickel has also been found in small quantities. Porcelain and potter's clays of excellent quality are dug annually to the extent of nearly 300,000 tons. Kaolin is also found in extensive deposits, but not of the best quality, and infusorial earth, in demand for polishing purposes and for the preparation of dynamite or giant powder, in Morris co. A pure white sand, equal to any known for glass-making purposes, abounds in S. Jersey, and is largely used in the glassworks of Glassboro' and Millville. Moulding sand of good quality, and sand for making the brick for reverberatory furnaces, are found in Burlington and Morris cos. Graphite or plumbago occurs in several parts of Morris and Passaic cos.; it has been mined with profit. Sulphate of baryta, manganese, molybdenum, iron pyrites, used largely for producing sulphuric acid, and greensand for chemical purposes and glass-making, are among the other mineral products of the

State. Besides these, mineralogists give a list of 154 of the rarer minerals, which are mainly of scientific value, and some of which are not found in the U. S. elsewhere.

Soil and Vegetation.—We have already partly described the soil in discussing the geology of the State. Though much of it is a light sandy loam, it is easily tilled, and by the addition of rich marls, lime, and marsh-mud of the tide-washed portions of the State it has attained to a higher value per acre than the farm lands of any other State. According to the census of 1870, the average value of farming land was $86.14 per acre, and it has now advanced to very nearly $100 per acre. The lands in the Highland valleys, the Kittatinny Valley, and the Red Sandstone region are of somewhat better natural quality than the sandy plains, but they do not yield larger crops than the plain under its effective and thorough culture. Taking all parts of the State, the forest area may be calculated as comprising about one-third of the State, though portions of this are scrub. The prevalent timber of the southern part is pine, with some cedar in the swamps; the northern portion, and especially the forests on the hills, are composed mostly of oak, hickory, chestnut, hornbeam, tulip tree, basswood, dogwood, sassafras, with wild cherry and some ash and elm. The *Magnolia glauca* is found in the swamps. Wild grapes, cranberries, whortleberries, blackberries, and raspberries are abundant, and the bitter-sweet, wax-berry, button-bush, shad-bush, and box-elder are plentiful. The flora of the State is very large, and many of the flowers are of great beauty.

Zoology.—The zoology of New Jersey has been very fully explored and catalogued by Dr. C. C. Abbott. He reports among the mammals 7 species of bats, 5 moles and shrews, the wild-cat, now very rare, a red and a gray fox; of the *Mustelidæ*, the fisher, weasel or stoat, mink, otter, and skunk; the black bear and the raccoon; the opossum; 7 species of squirrels; the wood-chuck or ground-hog; 6 or 7 species of rats and mice; the muskrat; the common rabbit; a few deer; the black whale, and 4 species of dolphin, of which only the porpoise is plenty. The birds are very numerous, comprising the turkey-buzzard and black vulture; 2 species of eagle; 12 falcons, hawks, and fish-hawks; 10 species of owl; 2 cuckoos, 7 woodpeckers, the humming-bird, the swift or chimney swallow; whippoorwill and night-hawk; the king-fisher; 8 fly-catchers, 8 thrushes, including the robin, and several species of wren; 36 wood warblers; 6 swallows; 2 waxwings; 7 shrikes, 10 mockers, including the cat-birds and some of the wrens; 3 creepers; 3 titmice; the shore-lark; 28 finches, including the sparrows; 8 orioles; 3 crows; the bluejay, the turtle dove, and the wild pigeon; the ruffed grouse and the quail; 8 herons; the ibis; 6 plovers; 2 oyster-catchers; 2 avosets; 3 phalaropes; 26 snipes, curlews, and woodcock; 9 rails; the swan; 3 species of wild geese; 30 species of duck, brant, teal, etc.; 3 petrels; 20 gulls and terns; the pelican and the gannet; 2 cormorants; 8 loons and divers; 6 auks and guillemots. Of reptiles, there are 13 turtles, terrapins, and tortoises; 2 lizards; the rattlesnake, copperhead, and large milk-adder, with 14 species of harmless snakes, including the blacksnake and the watersnake, both belonging to the boa family; 15 salamanders, 7 frogs, 5 tree-toads, and 1 toad. The number of fishes is enormous, comprising 8 of the perch family; 9 sun-fishes, 5 darters; the tautog or black-fish, and the cunner or conner; 5 sheepshead and porgies; 2 rare fish of the mænoid and zenoid families; 6 species of redmouth; 10 of the weak-fish or drum family; 3 angel-fish; the surgeon; the pilot; 4 species of the harvest or rudder-fish; the ribbon-fish; the little barracuda; 24 species of the mackerel family, including the common and Spanish mackerel, bonito, tunny, spinous dory, and blue-fish; 3 species of remora, the sword-fish; 2 species of gar or bill-fish; 3 flying-fish; 2 pipe-fish; 5 sticklebacks; 4 species of mullet; 2 silver-sides, 2 sand-larices; the red sea-perch; 4 bullheads and sculpins; 4 gurnards; 2 star-gazers; the toad-fish; the goby; 6 blennies; 4 anglers and mouse-fish; the lamp-fish; 8 genera of the cod family; 7 species of flounder, including the halibut; 8 killie-fish; salmon, brook-trout, and smelt; the soury; 9 genera of the shad and herring family, including several species of herring, the common shad, alewife, moss-bunker, and anchovy; 3 pikes and 2 gars; 13 or 14 species of chubs, minnows, dace, and shiners; 3 suckers; 4 species of eels; 5 catfish; 6 file-fish; the trunk-fish; the head-fish, globe-fish; 2 balloon-fish, and 2 puffers; the pipe-fish and sea-horse; 2 sturgeons; 10 species of shark; 6 species of ray; the devil-fish, and 3 species of lamprey.

Climate.—The climate of the State is in general healthy, differing in the character of its winds on the sea-coast from that in the interior, milder and with somewhat less range in the southern than in the northern counties. Where there are extensive marshes, there is sometimes malaria, but generally the State has a high reputation for healthfulness. The following table gives the temperature, the rainfall, and the barometer-pressure for the year, and for each season of the year, for three different parts of the State:

METEOROLOGICAL DATA.	Newark, lat. 40° 44′ 30″ N., lon. 74° 10′ W.; elevation, 35 feet.	New Brunswick, lat. 40° 29′ N. lon. 74° 16′ 40″ W.; elevation, 75.8 feet.	Sandy Hook, lat. 40° 28′ N., lon. 74° 1′ W.; elevation, 23 feet.
Temperature:	°	°	°
Mean temperature of year	51.25	51.1	49.9
Highest " "	98.5	101	97
Lowest " "	—12.5	−12	7
Range of " "	106	113	90
Mean temperature of spring	48.48	49.9	42.4
Highest " "	85.5	84	89
Lowest " "	15.2	17	12
Range of " "	70.3	67	77
Mean temperature of summer	70.4	71.2	69.8
Highest " "	98.5	101	97
Lowest " "	48.8	53	49
Range of " "	49.7	48	48
Mean temperature of autumn	54.8	54.2	54
Highest " "	84	84.2	86
Lowest " "	22	23.2	23.4
Range of " "	62	61	62.6
Mean temperature of winter	28.9	29.1	33.1
Highest " "	59	62	71
Lowest " "	−12.5	−12	7
Range of " "	71.5	74	64
Rainfall:	Inches.	Inches.	Inches.
Rainfall of the year	54.73	49.32	52.99
" spring	13.52	10.82	18.55
" summer	24.12	24.38	6.87
" autumn	7.79	6.20	16.98
" winter	9.30	7.92	10.59
Barometer:			
Annual mean pressure	......	......	30.093
Mean pressure of spring	......	......	29.990
" " summer	......	......	29.997
" " autumn	......	......	30.024
" " winter	......	......	30.089

Agricultural Products.—The agricultural products of the State are very large in proportion to its cultivated area. The cash value of its farms and farming implements in 1870 was $265,411,367, and the total value of products of agriculture and betterments for the year was $42,725,198, undoubtedly an undervaluation, as the orchard, small fruit, and market-garden products, as well as the cereals and root crops for the year, were not, when the census was taken, put upon the market, and the recollection of the previous year's products was, in many cases, very vague. New Jersey ranks second, if not first, in the peach culture, first probably in pear culture, and first also in the small fruits, of which she supplies the markets of New York and Philadelphia with their principal stock for nearly two months of each summer; her market-garden products are also of very large amount, and constantly increasing. Aside from these she produces largely of the cereals and of the principal root-crops, sells much butter and milk, and cuts more hay than she needs for her own consumption. The value of her orchard products, as stated by the census of 1870, was $1,295,282; of market-garden products, $2,978,250; of animals slaughtered and sold for slaughter, $6,982,162. The value of her live-stock was estimated at $21,443,463. This included 79,708 horses, 8853 mules, 133,331 milch cows, 3830 working oxen and 60,327 other cattle, 120,007 sheep, 142,563 swine. The amount of butter produced was 8,266,023 pounds; of cheese, 38,229 pounds; of milk sold, 5,373,323 gallons; the amount of hay cut was 521,975 tons. The same year the wheat crop was reported as 2,301,433 bushels; rye, 566,775 bushels; Indian corn, 8,745,384 bushels; oats, 4,009,830 bushels; buckwheat, 353,983 bushels; common potatoes, 4,705,439 bushels; sweet potatoes, 1,550,784 bushels; wool, 336,609 pounds. Of some of these crops and products we have later statistics in the estimates of the Agricultural Department. According to these, the crop of Indian corn in 1874 was 9,397,000 bushels, worth $7,705,540; of wheat, 1,986,000 bushels, worth $2,581,800; of rye, 480,000 bushels, worth $441,600; of oats, 3,284,000 bushels, worth $1,970,400; of barley, 7300 bushels, worth $8760; of buckwheat, 267,000 bushels, worth $234,960; of potatoes (Irish), 2,919,000 bushels, worth $2,276,820; of hay, 520,300 tons, worth $8,439,266. The cranberry crop of the same year was stated at about 123,000 bushels, worth at the nearest market $358,000. Of the fruit crop we find no satisfactory estimates. The live-stock report of the department for Jan., 1875, gives 115,700 horses, worth $13,778,713; 15,000 mules, worth $2,024,550; 147,900 milch cows, worth $7,025,250; 839,000 oxen and other cattle, worth $3,053,121; 127,100 sheep, worth $667,275; 164,600 swine, worth $2,045,978, making an aggregate value of live-stock of about $28,500,000.

Manufactures.—In the census of 1870, New Jersey ranks seventh in the list of manufacturing States, having 6636 manufacturing establishments, employing 75,552 hands (58,115 men, 11,198 women, and 6239 children). The capital invested in manufactures was estimated at $79,606,719, the wages paid annually at $32,648,409, the raw ma-

terial used at $103,415,245, and the annual product at $169,237,732. This was an advance of about 120 per cent. on the report of 1860, and the increase since 1870 has been still more rapid. The items of silk manufacture, glass, machinery, locomotive and stationary engines, leather and preparations of leather, India-rubber goods, and iron in all forms, etc. etc. have greatly increased since 1870. The annual product at the present time must now materially exceed $200,000,000. The following were the largest branches of manufacture in the State in 1870: molasses and sugar, refined, $11,199,740; flouring-mill products, $10,557,070; iron and iron manufactures, $13,611,271; machinery of all kinds, $8,818,123; leather, tanned, curried, morocco, and enamelled, $9,307,948; hats and caps, $5,007,270; printing cotton and woollen goods, $5,005,997; silk goods and sewing-silk and twist, $4,527,664 (in the year ending Dec. 31, 1874, the silk manufactures were officially reported at $6,097,692); bleaching and dyeing, $4,889,695; cotton goods, thread, and yarn, $4,065,228; trunks, valises, and satchels, $3,793,000; clothing, $3,346,125; jewelry, $3,315,679; glass, window, and hollow ware, $2,805,726; boots and shoes, $2,830,322; liquors, malt and distilled, $3,674,218; carriages and wagons, $2,281,643; India-rubber and elastic goods, $2,224,839; sash, doors, and blinds, $2,160,795; woollen and worsted goods, $2,415,805; lumber, planed and sawed, $3,097,891; paper of all kinds, $1,862,321; saddlery and harness, $1,732,305; brick, $1,695,530; tin, copper, and sheet-iron ware, $1,667,020; soap and candles, $1,606,234; steel, cast, and springs, $1,847,887; hardware and saddlery hardware, $2,182,395; bread and other bakery products, $1,377,336; paints, lead, and zinc, $1,203,082; stone and earthen ware, $1,106,985.

Railroads.—There were in the State, in 1875, 50 railroads, of which seven were under lease to the Pennsylvania Railroad Co., or rather to the united railroad companies of New Jersey. These railroads had in Jan., 1875, an aggregate length of 2514.40 miles, and the cost of roads and equipment was $156,324,108. There were also five horse-car railroad companies, the cost of whose railroads, equipment, etc. was about $1,550,000. There are two important canals in the State, the Morris Canal and the Raritan Canal. The latter is leased by the united railroad and canal companies of New Jersey. Its length is 66 miles. The Morris Canal Co. has also banking powers. Its length is 101 miles, and its cost was $3,432,474. It pays large dividends.

Finances.—The finances of the State are in a very satisfactory condition. The receipts to the close of the fiscal year 1874 were $3,538,126.97, and the disbursements for the same year $3,265,266.16, leaving a balance to the credit of the treasury of $272,860.81. The State debt was about $2,500,000, towards which there were $1,300,000 in the sinking fund; and the State held, besides, nearly $1,000,000 in railroad stocks and bonds, which, however, it was in contemplation to expend upon her new State insane hospital. Her assessed valuation in 1874 was $619,057,903; and as much property was omitted, and the valuation was on a basis not exceeding 60 per cent. of actual value, her true valuation at the close of 1875 was probably nearly $1,200,000,000. The true valuation, according to the census of 1870, was at that time $940,976,064.

Population.

Year of census.	Total pop.	Male.	Female.	White.	Free colored.	Slave.	Native.	Foreign.	Density.	Ratio of increase.	Illiteracy.	Of school age, 5–20.	Of military age, 18–45, males.	Of voting age, 21 and upwards, males.	Citizens, males.
1790	184,139	94,188	89,951	169,954	2,762	11,423	....	....	22.12						
1800	211,149	108,899	103,050	194,325	4,402	12,422	....	....	25.38	15.10					
1810	245,562	125,811	119,744	226,868	7,843	10,851	....	....	29.51	15.86					
1820	277,575	140,097	137,478	257,409	12,460	7,557	....	....	33.36	13.04					
1830	320,823	163,089	157,734	300,266	18,303	2,254	....	....	38.56	15.58	11,076	113,602			
1840	373,306	188,138	185,168	351,588	21,044	674	....	....	44.87	16.36	12,695	128,292			
1850	489,555	245,346	244,209	465,509	23,810	236	429,176	59,948	58.84	31.14	18,665	165,881	97,866	123,459	87,165§
1860	672,035	335,051	336,984	646,699	25,318	18	549,245	122,790	80.77	37.27	23,081	224,056	138,162	171,732	132,126§
1870*	906,096	449,672	456,424	875,407	30,658†	....	717,153	188,943	108.91	34.83	54,687	262,862‡	180,987	231,862	194,109

Commerce.—New Jersey has six customs districts, viz. Bridgeton, Burlington, Great Egg Harbor, Little Egg Harbor, Newark, and Perth Amboy, and the two largest importing and exporting districts in the U. S., New York and Philadelphia, are at her doors, and many of their ocean steamers lie at her wharves and piers. These great ports overshadow her customs districts, and her imports through her own ports in the year ending June 30, 1874, were but $77,841, and her exports, of domestic goods and produce only, $87,632. The greater part of her actual imports and exports were received and shipped either at New York or Philadelphia. The navigation statistics of the State were: Foreign vessels entered and cleared 61; tonnage 9707; crews 401; entered and cleared, American vessels, 35; tonnage 6043; crews 221; total entered and cleared foreign and American vessels 96; tonnage 15,750; crews 622. The total registered, enrolled, and licensed tonnage of the U. S. belonging in New Jersey customs districts June 30, 1874, was 1196 vessels, measuring 102,100.28 tons. The steam tonnage of the State was 90 vessels, aggregating 17,518.69 tons. The number of vessels built during the year was 75, having an aggregate tonnage of 8301.78.

Banks.—There were on the 1st of Jan., 1875, 62 national banks in operation, having an aggregate capital, paid in, of $13,908,350; bonds on deposit, $12,552,650; circulation outstanding, $11,092,810. There were also 12 banks and trust companies organized under State laws, having aggregate assets of $5,203,951.74, and 40 savings banks, with aggregate assets of $34,246,942.85.

Insurance.—In 1874 there were 29 fire and marine insurance companies in the State, of which 10 were mutual companies. The others had an aggregate capital of $2,550,715 and assets amounting to about $7,375,000. There were at the same time two mutual life insurance companies, one founded in 1845, the two having aggregate assets of $27,842,565.

Education.—From the report of the State superintendent of schools presented to the legislature in Jan., 1875, we gather the following items: Number of children of school age in the State (between 5 and 18 years), 298,000; total enrollment in the public schools, 186,392; average attendance, 96,224; accommodation for scholars in the public schools, 155,152; number attending private schools, 36,507; number attending no schools, 71,895; number of townships and cities, 258; number of school districts, 1369; number of school buildings, 1493; number of school departments, 2835; number of sectarian private schools, 101; of unsectarian, 253; value of school property, $6,000,732; amount raised during the year for school purposes, $2,304,398.13, all except $31,573.41 by taxation; number of teachers, 3216 (960 males, 2256 females); average monthly salary of male teachers, $65.77; of female teachers, $38. The teachers' certificates are of three grades. There were 1754 granted during the year, of which 96 were granted of the first grade, 166 of the second grade, and 1492 of the third grade; 655 were given to male teachers and 1099 to female teachers. Teachers' institutes were held in 18 of the 21 counties, and were well attended. Most of the cities have a separate city organization of their schools, with a city superintendent, who is, however, to some extent under the control of the State superintendent. There are county superintendents in each county. The State Normal School is at Trenton; it has connected with it a model school, a graded school of great excellence and having a department for training pupils to enter the normal school, and, at Beverly, the Farnum Preparatory School, which trains pupils either for the normal school or for business purposes. The attendance in the normal school in 1874 was 269, of whom 35 were males and 234 females; it has 12 teachers. The model school had 18 teachers and 443 pupils, 175 boys and 268 girls. The Farnum Preparatory School had 6 teachers and 161 pupils. The Normal School and the two subordinate schools were prosperous and well managed, and exerted a beneficial influence upon the progress of education in the State.

Higher Education.—There are in the State 4 colleges, 4 collegiate schools for the instruction of women, 3 scientific schools, one of them the State agricultural and scientific college, connected with Rutgers, and 4 theological schools. There are besides these a number of collegiate schools of high grade for the instruction of boys or of both sexes. The following table gives the name, location, date of organization, value of buildings, income from all sources, etc. of these several institutions for 1874:

*The returns of the State census of 1875, not yet quite complete, indicate that the population of the State in 1875 was, as estimated by Prof. Cook, 1,015,370.

†In 1870 there were 15 Chinese and Japanese and 16 Indians in the State.

‡5 to 18 years. §Whites only.

Higher Education.

Name of institution.	Location.	Date of organization.	No. of professors and teachers.	No. of students.	Value of buildings, grounds, and equipment.	Endowment.	Income from endowment.	Income from all sources.	Volumes in library.
Preparatory Schools of the Highest Grade:									
Peddie Institute	Hightstown	1864	7	85	$150,000	....	....	$19,000	
Stevens High School	Hoboken	1870	6	32	....	Large.	....	4,636	
Rutgers College Grammar School	New Brunswick	1770	10	140	35,000				
Princeton Preparatory School	Princeton	1873	4	40	35,000				
Colleges for Women:									
Bordentown Female College	Bordentown	1851	8	104	30,000	....	....	....	1,000
Ivy Hall	Bridgeton	1861	9	60	20,000	....	....	14,000	1,000
St. Mary's Hall	Burlington	1837	28	199	....	....	....	....	2,000
Pennington Seminary and Female Collegiate Institute	Pennington	1840	9	181	100,000	....	....	....	2,000
Colleges:									
Burlington College	Burlington	1846	7	65	....	$1,200	....	15,000	2,000
Rutgers College	New Brunswick	1770	13	178	400,000	405,150	$15,347	20,286	9,300
College of New Jersey	Princeton	1746	19	438	500,000	785,000	48,000	66,200	44,000
Seton Hall College	South Orange	1856	32	105	....	....	....	....	8,000
Schools of Science:									
John C. Green School of Science	Princeton	1873	14	45	140,000	200,000	7,000	8,367	
Stevens Institute of Technology	Hoboken	1871	10	139	500,000	500,000	40,000	44,175	5,000
Scientific School of Rutgers College (State Agric. and Scientific College).	New Brunswick	1864	11	62	....	116,000	6,960	....	8,800
Schools of Theology:									
Drew Theological Seminary (Meth.)	Madison	1867	18	118	300,000	250,000	17,500	....	15,000
German Theological School of Newark Presbytery	Bloomfield	1869	6	23	30,000	20,000	700		
Theological Seminary of Reformed Church in America	New Brunswick	1784	5	38	300,000	220,000	12,500	....	20,000
Theological Seminary (Presb. Church)	Princeton	1812	7	116	200,000	450,000	29,000	....	26,000

Special Instruction.—The deaf mutes of the State of suitable age are instructed and educated at the New York Institution for the Deaf and Dumb and at the Buffalo Institution, at an expense, in 1874, of $16,283.21; the blind are educated in about equal numbers at the New York Institute for the Blind and the Pennsylvania Institution at Philadelphia, at an expense, in 1874, of $14,260.11; and the feeble-minded and idiotic children are provided for in the Pennsylvania training-school at Media, Pa., at an expense, in 1874, of $7,393.77. The question of organizing State institutions for these classes has been agitated, but at present the existing arrangements are regarded as satisfactory. There is a well-managed home for soldiers' children at Trenton, with a branch for orphans of colored soldiers at Bridgewater, which in 1874 had 4 teachers and 153 children. The expense for the year was $30,544.23, of which $29,462.50 was received from the State. There are several orphan asylums in the State, but none of them under State patronage or control. The Industrial School for Girls at Trenton is a State institution. In 1874 it had 4 teachers and managers, 19 girls, and since its organization in 1872 had had 40 under its care. It has been very successful in reforming these girls. It has a farm property valued, with its buildings and furniture, at $42,652, and its current expenses in 1874 were $7759, which was paid by the State. The New Jersey State Reform School for Juvenile Delinquents, situated near Jamesburg in Middlesex co., was established in 1865. It has a farm of 490 acres and suitable buildings. It had had up to Oct. 31, 1874, 534 boys committed, of whom 350 had gone out, leaving 184 in the school. It has 3 teachers besides the superintendent, and instruction is also given in trades to enable the boys to earn an honest livelihood. Its expenses in 1874 were $33,873, of which, however, over $2000 was for arrearages of previous year; $25,000 was appropriated by the State, and the remaining expenditure was made up by the receipts for work, farm products, money received from parents and guardians, and miscellaneous sources.

Churches.

Denominations.	Church organizations, 1870.	Church edifices, 1870.	Sittings, 1870.	Church property, 1870.	Church organizations, 1874.	Church edifices, 1874.	Ministers, 1874.	Church members, 1874.	Adherent population, 1874.	Church property, 1874.
All denominations	1,402	1,384	573,303	$18,347,150	1,504	1,455	1,421	185,160	943,275	$19,043,510
Baptists	164	164	61,913	2,376,400	169	169	178	28,296	117,000	2,843,500
Freewill Baptists	4	4	1,200	20,500	5	4	4	412	2,000	25,450
Christians	10	10	3,430	54,000	12	10	8	840	3,900	58,000
Congregationalists	14	9	5,050	335,500	20	20	28	2,558	10,000	483,600
Episcopalians	128	122	34,800	2,586,000	129	126	144	12,116	54,000	2,637,000
Friends	63	63	28,750	448,450	65	65	.....	5,850	20,000	481,500
Jews	1	1	300	8,000	2	2	3	300	1,500	23,500
Lutherans	19	19	6,750	111,500	28	25	21	2,951	9,000	146,450
Methodists	518	518	196,860	4,493,650	523	519	383	71,431	285,000	5,346,000
Moravians	4	4	1,300	16,500	4	4	5	473	1,725	18,300
New Jerusalem Church	6	.....	....	5,000	6	4	6	300	1,500	6,500
Presbyterians*	250	250	127,700	3,616,025	257	257	359	40,093	200,000	3,873,050
Reformed Ch. in America (late Dutch)	97	99	54,800	2,540,825	120	121	146	18,640	88,000	2,953,760
Reformed Ch. in the U. S. (late German)	6	6	1,800	17,000	8	7	5	750	3,550	21,400
Roman Catholics	107	107	45,400	1,590,000	147	115	125	....	140,000	1,780,000
Spiritualists	2	2	800	3,300	2	2	.....	....	4,000	4,500
Unitarians	1	1	400	10,000	1	1	1	....	350	11,000
Universalists	5	2	1,100	103,000	4	2	3	....	1,000	105,000
Union	2	2	450	4,500	2	2	2	150	750	5,000

Charitable Institutions.—The New Jersey State Lunatic Asylum, at Trenton, is an excellent institution, but is greatly overcrowded. In 1874 it had under treatment 840 persons (401 men and 439 women), and at the close of the year 655 remained (312 men and 343 women); 52 had been discharged as recovered, 85 as improved, 14 as unimproved, 1 escaped, 1 proved not to be insane, and 32 died, making in all 185. Of the inmates, 21 were State patients, 528 county patients, and 106 private or pay patients. The crowded state of the asylum had necessitated the refusal to admit many more recent cases, and many were obliged to find a place in county, city, or private hospitals for the insane. The expenses for the year were $185,175.06, of which $34,112 was paid by the State, $116,973 by the counties, and the balance from pay patients and incidentals. The overcrowding of the asylum at Trenton led to the appointment by the State in 1871 of a commission to select a site and build a new hospital for the insane. They fixed upon Morristown as the site, and have erected and partially completed an immense hospital, which, when finished, will be ample for the needs of the State for some years to come. This, though economically managed, will be a very costly building for the State, the bills already paid exceeding $1,000,000. There is a home for disabled soldiers at Newark, which had 371 inmates Nov. 1, 1874, and had cared for nearly 1000 more during the year. Its expenses were $47,307.65.

Penal Institutions.—The New Jersey State prison, at Trenton, is a well-managed institution so far as its finances are concerned, and its discipline is good, but if it is con-

*There was also in 1870 a Presbyterian church not connected with the General Assembly (probably Associate or Reformed), with one church edifice, 500 sittings, and $7000 of church property.

ceded that the State prison should be reformatory as well as penal in its character, it is to be feared that its rank would be somewhat low. There were in the prison from Oct. 31, 1873, to Nov. 1, 1874, 1025 prisoners. During the year 372 had been discharged or died, leaving in the prison Oct. 31, 1874, 653 prisoners. The daily average was 615. The entire expenditure for the State prison for the year ending Nov. 1, 1874, for all purposes, was $192,136.63; of this nearly one-half was for permanent improvements, shops, furniture, etc. The convicts' labor realized $101,813.71, more than sufficient to defray all expenses of subsistence and salaries, and, deducting the subsistence and incidentals only, leaving a net profit of $45,234.93. The provisions for the moral instruction of the prisoners, for their health and treatment when insane, and for the comfort and welfare of the warden or keeper and his numerous deputies, are by no means so good as they should be. There is no chapel, no adequate provision for intellectual or moral instruction, and no sufficient hospital. Some of the county jails and penitentiaries are well managed; others are in a deplorable condition.

Newspapers.—In 1870, New Jersey had 122 newspapers of all kinds, having an aggregate circulation of 205,500 and a total issue of 18,625,740 copies annually. Of these, 20 were dailies, with a circulation of 38,030; 95 weeklies, with 120,670 circulation; 7 monthlies, with 46,800 circulation. Two years later there were 21 dailies, 1 semi-weekly, 98 weeklies, 1 bi-weekly, 1 semi-monthly, and 16 monthlies, making 138 in all. There has since been a considerable increase, mainly in the weekly and monthly periodicals, the dailies having remained nearly stationary.

Constitution, Courts, Representatives in Congress, etc.—The constitution under which New Jersey is governed was adopted by the people of the State in Aug., 1844, but was materially amended, and ratified as amended in Sept., 1875. It provides, in regard to suffrage, that every male citizen of the U. S. of the age of 21 years, a resident of the State for one year and of the county for five months next preceding the election, shall be entitled to vote for officers to be elected by the people, except persons in the military, naval, or marine service of the U. S. who claim their residence only by reason of that service, and except also pauper idiots, insane persons, or persons convicted of felonious crimes; and if the legislature so direct, persons convicted of bribery shall forfeit the right of suffrage. No elector in the actual military or naval service of the U. S. or of the State shall be deprived of his vote by reason of absence on such service. The legislative power is vested in a senate and general assembly. The senators are elected, one from each county, for three years, and must be thirty years of age or over, and citizens of the State for four years and of the county for one year next before their election. The present number of senators is 21. The whole number of members of the general assembly shall never exceed 60. Each county shall always be entitled to at least one member, and the members shall be elected annually according to an apportionment made by the legislature at its first session after each U. S. census. The executive power is vested in the governor, who is elected by the people for three years, or, in default of an election by the people, by the two houses of the legislature in joint convention. He must be at least thirty years of age, for twenty years a citizen of the U. S., and for seven years a resident of New Jersey, unless he shall have been absent during that time on public business of the U. S. or the State. There is no lieutenant-governor. The State treasurer and comptroller are elected by the legislature in joint convention, and hold office for three years. The attorney-general, secretary of state, superintendent of schools, prosecuting officers, and clerk of the supreme court are appointed by the governor, with the advice and consent of the senate.

Judiciary.—In the judicial system of New Jersey the administration of law and equity is in distinct tribunals. The court of chancery is still in existence, and is presided over by a chancellor. The practice in all the higher courts is based upon the English common law, although it has been modified considerably by statute to make it less technical and more practical. The judges are not elected, but are appointed by the governor, with the advice and consent of the senate. The chief courts besides the court of chancery are the court of errors and appeals in the last resort, in all causes: this consists of the chancellor, the justices of the supreme court, and six judges, all appointed for six years; the prerogative court, of which the chancellor is judge; the supreme court, which has a chief-justice and four associate justices, and its circuits; and in the counties the court of oyer and terminer, common pleas, consisting of not more than five judges, orphans' court, and court of general quarter sessions of the peace. There may be from two to five justices of the peace appointed in each township or city ward, according to the population of said township or ward. The pardoning power is lodged in a court of pardons, consisting of the governor, the chancellor, and six of the judges of the court of errors and appeals, the governor's vote being necessary to a pardon. Law in this State is firmly and faithfully administered, and the wrong-doer when convicted has little chance of escape from the just reward of his deeds.

There are 21 counties, whose statistics are as follows:

COUNTIES.	Pop. 1870.	Males, 1870.	Females, 1870.	Pop. 1860.	True valuation, 1870.	Assessed valuation, 1874.	Pop. in 1875,* State census.
					$	$	
Atlantic....	14,093	7.167	6,926	11,786	6.687,491	4,617,151	14,978
Bergen.....	30,122	15,113	15,009	21,618	35,649,660	23,436,518	35,357
Burlington..	53,639	26,175	27,464	49,730	46,984,047	27,501,000	52,662
Camden....	46,193	22,704	23,489	34,457	31,328,554	20,000,000	53.746
Cape May..	8,349	4,135	4,214	7,130	5,599,383	3,250,000	8,199
Cumberland	34,665	17,626	17,039	22,605	21,776,415	13,472,000	35,348
Essex......	143,839	70,058	73,781	98,877	160,269,082	132,844,000	169,056
Gloucester.	21,502	11,044	10,518	18,444	18,737,720	14,742,794	24,466
Hudson.....	129,067	64,022	65,045	62,717	135,139,369	95,271,985	170,859
Hunterdon..	36,963	18,320	18,643	33,654	48,142,051	30,163,487	*38,801
Mercer.....	46,386	22,837	23,549	37,419	62,364,494	33,547,686	*49,169
Middlesex..	45,029	22,427	22,602	34,812	53,355,097	23,567,000	48,280
Monmouth..	46,195	23,001	23.194	39,346	50,948,795	28,158,172	*48,967
Morris......	43,137	21,767	21,370	34,677	38,567,026	27,331,089	*43,569
Ocean......	13,628	7,042	6,586	11,176	6,884,378	3,934,921	*13,764
Passaic.....	46,416	22,985	23,431	29,013	43,177,638	33,321,059	53,793
Salem......	23,940	12,085	11.855	22,458	32,392,190	14,479,477	24,305
Somerset...	23,510	11,615	11,895	22,057	30,420,071	17,449,400	*23,745
Sussex......	23,168	11,663	11,505	23,846	22,446,043	16,058,491	24,436
Union......	41,859	20,161	21,698	27,780	50,219,382	31,808,600	*44,371
Warren....	34,336	17,725	16,611	28,433	39,887,178	24,103,153	37,499
Total...	906,096	449,672	456,424	672,035	940,976,064	619,057,903	1,015,370

Principal Towns.—Trenton, the capital, had in 1870 a population of 22,874. The largest cities are Newark, population in 1870, 105,059; Jersey City, 82,546; Paterson, 33,579. Elizabeth, Hoboken, and Camden had each between 20,000 and 30,000 inhabitants; New Brunswick between 15,000 and 20,000; Orange about 10,000; Millville, Rahway, Bridgeton, and Burlington between 6000 and 10,000 each; Plainfield, Union, Salem, and Harrison between 4000 and 6000 each; Gloucester and Lambertville between 3000 and 4000 each, and Princeton, Keyport, Newton, Somerville, and Red Bank between 2000 and 3000 each.

History.—The historians are not agreed concerning the early settlements in the territory now occupied by New Jersey, but it is probable that somewhere between 1614 and 1620 a few Dutch traders established themselves in Bergen. The whole region was claimed by the New Netherlands colonists, and in 1623 a fort was established four miles below Philadelphia, on the Delaware. The region along the Delaware was granted in 1634 to Sir Edmund Ployden, who called it New Albion, and attempted to plant an English colony there about 1638. The same year the Delaware River was visited by a party of Swedes and Finns, who purchased land from the Indians and planted a colony, to which they afterwards made considerable accessions, calling it New Sweden. They drove away the English settlers, and in 1655 a Dutch force, headed by Petrus Stuyvesant, governor of the New Netherlands, attacked and conquered the Swedish colony, which thenceforth rendered its allegiance to the Dutch. In 1664 the Dutch were conquered by an English force sent by Charles II., who had granted the entire region between the Delaware and Connecticut rivers to his brother, the duke of York. Some New England colonists the same year obtained a grant from Col. Richard Nicolls, the duke's governor, and settled at Elizabethtown. In this or the following year the duke of York conveyed the present territory of New Jersey to Lord Berkeley and Sir George Carteret, and it was called New Jersey, in compliment to Sir George Carteret, who had held the Isle of Jersey as royalist governor for Charles II. Sir George sent out his brother, Philip Carteret, in 1665 to be governor, but his administration proved unpopular; and the Elizabethtown colonists refused to pay rental to him, alleging their previous purchase from Nicolls. In 1670 he was obliged to leave the colony, and a natural son of Sir George was for a short time governor. Having obtained some promises and concessions from his brother and Lord Berkeley, Philip Carteret returned to the colony, which he governed until 1674, when the Dutch recaptured New York and New Jersey. Their triumph was, however, but of short duration, and the whole region the same year reverted to its English owners. The same year Lord Berkeley sold his half to two members of the Society of Friends, Fenwick and Byllinge, who after a time sold first a part, and finally the whole, to William Penn and his associates. The colony was now divided into Eastern and Western Jersey by a line drawn from Little Egg Harbor to a point on the Delaware in lat. 41° 40′ N. The sale to Penn was effected in 1682.

* Estimated for 7 counties by Prof. Cook.

There had previously been two or three legislative assemblies of the colonists convened, one in 1668 and another in 1675. The former had passed a very severe criminal code, inflicting the punishment of death for many offences. New Jersey did not escape the complications with the tyrant Sir Edmund Andros with which the other colonies were visited. He claimed supreme jurisdiction, arrested the governor, Philip Carteret, took him to New York, and imprisoned him. Andros was removed in 1681 and Carteret restored. In 1682 or 1683 Penn purchased for himself and associates all Carteret's rights in East Jersey, and under a governor of their appointment, one Robert Barclay, the colony became a refuge for the persecuted Friends. In 1702 the difficulties incident on a divided ownership led the proprietors to relinquish the government to the Crown; and though maintaining a separate legislature, New Jersey was united with New York under the government of Lord Cornbury. Its population at this time was 20,000. In 1708 it had increased to 40,000, and the inhabitants petitioned for a distinct government, which was granted and Lewis Morris appointed governor. The colony had no Indian troubles, and its growth was rapid until the Revolution, in which a majority of its inhabitants took an active part. The last royal governor was William Franklin, a natural son of Benjamin Franklin, and a bitter Tory; he became governor in 1763. Active preparations were made for the coming conflict by the New Jersey patriots; they were represented in the Continental Congress, and on the 2d of July, 1776, two days before the adoption of the Declaration of Independence, their provincial congress reported and adopted a constitution for an independent State, which was ratified on the 18th of July following, and under which the State was governed until 1844, when its present constitution was adopted. On the 25th of June, 1776, Gov. Franklin, who had opposed this action, was deposed and sent under guard to Connecticut as a prisoner. William Livingston was elected governor Aug. 31, 1776, and re-elected for fourteen years. During the war, New Jersey suffered severely from the incursions of British troops and Tories, and the important battles of Trenton, Princeton, Millstone, Red Bank, and Monmouth were fought within the State. The Federal Constitution was adopted by a unanimous vote Dec. 18, 1787. It is worthy of notice that the State constitution of 1776 allowed universal suffrage, both male and female, white and colored, and that by subsequent explanatory acts this was rendered more explicit. Women continued to vote when they chose till 1807, when, scandalous frauds having occurred from their voting, the legislature suspended this provision of the constitution, and it was never again practised. The constitution of 1844 restricts suffrage to white males over twenty-one years, and this provision was modified subsequently to accord with the U. S. constitutional amendments. During the late civil war New Jersey furnished her quotas promptly, and her sons distinguished themselves in the field. Her growth for the last four decades has been very rapid and her condition prosperous.

Governors of the State.

William Livingston......1789–94	William Pennington......1837–43
William Patterson.........1794–94	Daniel Haines...............1843–44
Richard Howell.........1794–1801	Charles C. Stratton.........1844–48
Joseph Bloomfield.........1801–12	Daniel Haines...............1848–51
Aaron Ogden................1812–13	George F. Fort..............1851–54
William S. Pennington.1813–15	Rodman M. Price............1854–57
Mahlon Dickerson..........1815–17	William A. Newell.........1857–60
Isaac H. Williamson......1817–29	Charles S. Olden 1860–63
Peter D. Vroom............1829–32	Joel Parker...................1863–66
Samuel L. Southard......1832–33	Marcus L. Ward............1866–69
Elias P. Seeley..............1833–33	Theodore F. Randolph...1869–72
Peter D. Vroom............1833–36	Joel Parker....................1872–75
Philemon Dickerson.....1836–37	Joseph D. Bedle.............1875–

Electoral and Popular Vote for President and Vice-President.

Year of election.	Candidates.	Electoral vote.
1788	George Washington P......	6
	John Adams V.-P...........	1
	John Jay V.-P................	5
1792	George Washington P.... John Adams V.-P.........	7
1796	John Adams P............. Thomas Pinckney V.-P...	7
1800	John Adams P............. C. C. Pinckney V.-P......	7
1804	Thomas Jefferson P....... George Clinton V.-P......	8
1808	James Madison P.......... George Clinton V.-P......	8
1812	De Witt Clinton P......... Jared Ingersoll V.-P......	8
1816	James Monroe P........... D. D. Tompkins V.-P.....	8
1820	James Monroe P........... D. D. Tompkins V.-P.....	8

Year of election.	Candidates for whom the electoral vote was cast.	Electoral vote.	Pop. vote.	Opposition candidates.	Pop. vote.	Minority or third-party candidates.	Pop. vote.
1824	Andrew Jackson P........ John C. Calhoun V.-P....	8	10,985	John Quincy Adams P... Nathan Sanford V.-P....	9,110	William H. Crawford P.. Nathaniel Macon V.-P...	1,196
1828	John Quincy Adams P... Richard Rush V.-P.......	8	23,758	Andrew Jackson P....... John C. Calhoun V.-P...	21,950		
1832	Andrew Jackson P........ Martin Van Buren V.-P..	8	23,856	Henry Clay P............. John Sergeant V.-P......	23,393	William Wirt P.......... Amos Ellmaker V.-P.....	No report.
1836	William H. Harrison P... Francis Granger V.-P....	8	26,132	Martin Van Buren P..... Richard M. Johnson V.-P.	25,572	Hugh L. White P......... John Tyler V.-P..........	1,535
1840	William H. Harrison P... John Tyler V.-P..........	8	33,351	Martin Van Buren P..... Richard M. Johnson V.-P.	31,034		
1844	Henry Clay P............. T. Frelinghuysen V.-P....	7	38,318	James K. Polk P.......... George M. Dallas V.-P....	37,495	James G. Birney P.......	No report.
1848	Zachary Taylor P......... Millard Fillmore V.-P.....	7	40,015	Lewis Cass P............. Wm. O. Butler V.-P......	36,901	Martin Van Buren P..... C. Francis Adams V.-P..	849
1852	Franklin Pierce P........ Wm. R. King V.-P........	7	44,305	Winfield Scott P......... Wm. A. Graham V.-P...	38,556	John P. Hale P.......... George W. Julian V.-P..	350
1856	James Buchanan P....... J. C. Breckenridge V.-P..	7	46,943	John C. Fremont P....... William L. Dayton V.-P..	28,338	Millard Fillmore P....... A. J. Donelson V.-P.....	24,115
1860	Abraham Lincoln P...... Hannibal Hamlin V.-P...	4	58,324	Stephen A. Douglas P.... H. V. Johnson V.-P......	62,801 3 el. v.	John Bell P............ Edward Everett V.-P... John C. Breckenridge P. Joseph Lane V.-P......	No report. No report.
1864	George B. McClellan P.... George H. Pendleton V.-P..	7	68,020	Abraham Lincoln P...... Andrew Johnson V.-P....	60,723		
1868	Horatio Seymour P........ Francis P. Blair, Jr., V.-P.	7	83,001	Ulysses S. Grant P...... Schuyler Colfax V.-P....	80,121		
1872	Ulysses S. Grant P....... Henry Wilson V.-P.......	9	91,661	Horace Greeley P........ Benj. Gratz Brown V.-P..	76,801	Charles O'Conor P.........	630

For much valuable information, many documents, and especially for the article on the judiciary, we are indebted to His Excellency Hon. Joseph D. Bedle, governor of New Jersey, and for the geology, topography, and many statistics, to Prof. George H. Cook, State geologist of New Jersey.

L. P. BROCKETT.

New Jersey, College of, founded under the auspices of the Presbyterian synod of New York, which then included New Jersey. Chartered by New Jersey in 1746, it was opened in Elizabethtown in May, 1747, received a more liberal charter in 1748, was removed to Newark, and finally to Princeton in 1757, where a large college was erected named Nassau Hall, in memory of William III. of the house of Nassau. It was occupied as a barracks and a hospital both by the American and the British troops in the Revolution. Gen. Washington drove the British from its walls Jan. 3, 1777. The Continental Congress met in it in 1783. The Congress and Gen. Washington attended the commencement in that year. Gen. Washington presented fifty guineas to the trustees to repair the damages of war, which were appropriated for a portrait of Washington by the elder Peale. Dr. Witherspoon and two of the alumni, Richard Stockton and Benjamin Rush, were signers of the Declaration of Independence. Rev. Jonathan Dickinson was the first president from May to Oct., 1747. Rev. Dr. James McCosh was elected president in 1868. Active and energetic, his reputation has greatly advanced the interests of the college. The faculty has been enlarged, the number of students increased, new studies introduced, five large buildings erected, and the funds largely augmented. Among its benefactors have been Messrs. James Lenox, John J. Blair, and N. Norris Halsted, the last gentleman having erected the observatory, and the former two having endowed professorships; Messrs. John C. Green, Henry G. Marquand, and Robert Bonner. Mr. Green gave $750,000 to found a scientific school, erect a library (Dickinson Hall), a building for recitations and for other objects.

The college year is divided into three terms; some of the studies are elective in the junior and senior years. There are many prizes and fellowships, the recipients of the latter being required to pursue a prescribed course of study for one year after graduation. The John C. Green School of Science is now in operation. The faculty consists of the president, 16 professors, and 4 other instructors. There are (1875) 483 students, viz.: fellows, 8; seniors, 109; juniors, 108; sophomores, 92; freshmen, 121; scientific students, 45. The college and society libraries contain 44,000 volumes. The whole number of graduates is about 4850, among whom have been some of the most distinguished men both in Church and in State, the most eminent being James Madison, the fourth President of the U. S. The various endowments amount to about $600,000. The buildings are mostly of stone, and occupy the campus, which runs parallel with the main street of the town. The grounds are shaded with fine trees. Nassau Hall, East and West colleges, the American, Whig, and Cliosophic halls form a fine quadrangle, within which are planted two Revolutionary cannon. The other buildings lie chiefly to the E. and W. of this quadrangle. The geological and archæological museum in Nassau Hall and the museum of natural history in the School of Science are rapidly growing in importance.

HENRY C. CAMERON.

New Jersey Tea. See CEANOTHUS.

New Jerusalem, p.-v., Rockland tp., Berks co., Pa.

New Jeru'salem Church. This is the name given by Emanuel Swedenborg (see SWEDENBORG, EMANUEL) to the Church which he declared it to be his mission to found. In his writings he says no word, and to those who accepted his doctrines during his life he gave no advice, looking to a separate and distinct organization of the New Church at that time. A few years after his death some of those who had received his doctrines associated in London and took the name of "The New Church signified by the New Jerusalem in the Revelation." This organization has continued in England with changes from time to time, and now embraces many societies, which meet in a "General Conference" annually in different parts of the kingdom. In this country there is a "General Convention of the New Jerusalem in the U. S. of America," which holds annual meetings at different places. It is incorporated by the State of Illinois, and is composed of associations, other collective bodies of the Church, and isolated receivers. Its constitution provides for its membership, its organization, and its ministry. In many other countries there are societies or individual receivers. The New Church does not regard itself as a sect, or as one more added to the churches of Christendom. It believes itself to rest upon a wide system of religious doctrine, which accepts all the truth in existing beliefs, and provides the means of discerning and refuting their errors, and is therefore gradually to become the prevailing system of faith in the Christian world. The essentials of this Church, as stated by Swedenborg himself, are—I. The divinity of our Lord and Saviour Jesus Christ; II. the holiness of the Word; III. a life of charity. Whoever holds these in faith and in life is thereby a member of the New Church, whatever may be his or her theological name or place. They who hold and profess these doctrines, and desire to separate from other churches, unite together to help each other in learning the truth now revealed, and living and loving it. Thus united, they take the name of the New Church, but not in a sectarian, exclusive, or self-commendatory spirit.

All that Swedenborg teaches in his voluminous theological writings may be considered in reference to the three essentials above stated.

I. *The Divinity of the Lord.*—Swedenborg utterly rejects the doctrine of three persons in one God, and the connected doctrines of election, predestination, and salvation by faith alone. He holds that this doctrine of a personal Trinity has no distinct and apprehensible meaning, or else it teaches three Gods. At the same time he asserts a trinity of essence, but not of person, in God. It may assist us to comprehend this Trinity if we look at the corresponding trinity in man, who is made in the image and likeness of God. The soul is by itself inconceivable and without shape or force. But the soul forms and fills a body—a material body while we live on earth, and a spiritual body afterwards. (See SWEDENBORG.) The soul is manifested in and by the body, and acts through it as its instrument. Here we have soul, body, and action, and these three make up the living man. Jehovah, the Father, is in himself as utterly inaccessible to thought as he is to sight or touch. He is for ever in the Divine Humanity, and through this Divine Humanity is known and becomes an object of thought and faith and love. Through this Divine Humanity he acts, and this action or operation is of the Holy Spirit. God is a divine and infinite man. Before his incarnation his Divine Humanity made itself known, as far as was then possible, by various revelations, and he was worshipped under the idea of a divine man, which idea took various forms in different ages and nations. Since that event he, as our Lord and Saviour Jesus Christ, is the only proper object of love and worship for all who know him. The doctrine of our Lord runs through Swedenborg's writings, receiving illustration everywhere. Jehovah, the Father, assumed a human nature, and was born of the Virgin Mary. This human nature was full of germs of evil which she had inherited. Jesus Christ was tempted through them, but overcame them all; and as each evil was overcome and put away, the opposite good took its place, until the indwelling divinity filled the assumed humanity, and made it divine and one with the Father. While these temptations were going on, our Lord, in the moments of conflict and suffering, spoke of himself as distinct from the Father, and in the intervals of rest and peace spoke of himself and the Father as one. These temptations were all caused by evil spirits exciting the proclivities to evil he inherited from his mother. By victory in these temptations these evil spirits were overcome and completely subjugated, and man was redeemed from bondage to evil, and his spiritual freedom for ever secured. The glorification of the assumed humanity is a perfect type of the regeneration of man—with the difference that in our Lord all evils were excited and all overcome, because through the Father within he had infinite power, while in every man, whose power is necessarily finite, evil spirits are permitted to excite only those of his inherited evils, which he can overcome in his own freedom. All good springs from the love of the Lord and of the neighbor; all evil springs from the love of self and the love of the world for the sake of self. The character of every man consists of all the good and all the evil which he has done in freedom and from the love of it; and it abides for ever. If when he dies his ruling love is for good, he goes to heaven among his like; if his ruling love is for evil, he goes to hell among his like.

Swedenborg's doctrine of "Proprium" (this Latin word being retained in the English translations) is important, and near the centre of his system. The word may be translated "Ownhood;" and the doctrine, briefly stated, is this: Life flowing into man from the Lord, constantly and incessantly, is given to him to be his own, that he may be in actual freedom. He is in no sense and no measure independent of God, for every thought and every feeling or affection comes to him from God. It is given to him to be his own; and by this gift of the ownhood of his life man is himself and free, and not a mere channel through whom divine action flows. Hence, what a man loves and does from love he, in Swedenborg's language, appropriates; that is (*approprio* being from *ad* and *proprium*), adds to his ownhood, or to the life that is his own. By this doctrine of man's ownhood of life Swedenborg explains the origin of evil. Man, being actually free, may turn to evil or to good, and may pervert the life he receives by influx. He did and does turn himself to evil; he did and does pervert this influent divine life; and thus evil originated and continues. Nevertheless, the Lord gave and gives him freedom, for he desires to give him the greatest possible happiness a created being can enjoy; and this comes from the free and voluntary choice of good rather than evil. Children inherit the qualities of their parents and ancestors. By this inheritance man's natural "proprium" is full of proclivities to evil; and the whole effort of Divine Providence in relation to every man is to cleanse and vivify this ownhood.

The Lord alone is life, and has life in himself. All life is derived from him; and whatever exists, exists because he imparts to it his life and being. In everything which is, this life becomes what it is determined to be by the inmost form or nature of the thing itself; which form or nature is given to it by the Lord, that it may be what it is. He gives his life to man to become man's own life, that man may be himself and free. And because entire moral freedom is given to man, this influent divine life becomes in him whatever he chooses to make it, the Lord ever doing all that can be done without impairing his freedom to lead and guide him to goodness. But this freedom he never takes away. Hence, it results that the Lord cannot give any truth or any goodness to man which he does not receive willingly, for there must be voluntary reaction on the part of man, in his freedom, to meet the divine action. In the degree in which man, thus in his freedom, permits this influent divine life to be in him pure and unperverted, he is good; if he perverts it, he is evil. If in this way he is good, he finds his place in heaven, where angels are blessed in the consciousness that all their life and affections and thoughts are from God in them, and are in them their own by his gift. If he becomes evil, he goes among those who believe that they live of and from themselves, and who are ruled compulsively by infinite mercy for their own sakes. All angels and evil spirits began life on this or some other earth.

There are three heavens. The life of the highest or heavenly heaven is love to the Lord; of the middle or spiritual heaven, it is charity or love to the neighbor; of the lowest or natural heaven, it is simple obedience. Each heaven consists of innumerable societies, every angel living in that which is in accordance with his character. Opposite to each heaven is a hell. Few persons go to heaven or to hell immediately upon their resurrection from the dead material body. (For an account of the spiritual body, and the substance of which it is formed, see article on SWEDENBORG.) They remain for a while, but not more than thirty years, in the "world of spirits," where their ruling love is liberated from conflicting or disguising elements of character; and when this is accomplished each one goes to his or her place in heaven or hell. But no one goes to hell who has not voluntarily rejected the good influences which would have saved him, and thereby confirmed himself in evil. Only those who reach adult age have power to do this, and therefore they who die before maturity are saved.

II. *The Holiness of the Word.*—The Bible is the word

of God, uttered by him through writers who were fully inspired, and whose minds he used as his instruments. It was so written that it might be the expression of infinite and divine wisdom. This word, or wisdom, is in the heavens, a perpetual source of light for all angels. Upon earth it is expressed in human language, that it may give the light of life to all who live on earth. Within the literal sense is the spiritual sense, in which the Word is read by those in heaven; and this internal sense is adequately expressed by the literal sense, because this literal sense corresponds perfectly to the spiritual sense. This can be understood only so far as we understand the relation between natural things and spiritual things. The natural world is a world of effects, of which the causes are in the spiritual world; and the effects correspond to the causes. Hence, everything in nature corresponds to something in spirit, and when used in Scripture represents and signifies what it corresponds to. The whole end of Divine Providence in all its working is to bring men into a condition in which they may be happy for ever. In this work the Word is the chief instrument of the Lord. By means of correspondence it is in the literal sense brought down to all possible conditions of human character, so that it may reach every man wherever he stands and help him to ascend from his low estate. The fear of God is the beginning of wisdom; and if this lead to obedience, the first upward step is taken; and if it be followed, the fear of the Lord is at length converted into the love of him. This doctrine of correspondence is a vast subject in itself, and but little can be said of it here. Many correspondences are obvious, and constantly occur in common language. Heat corresponds to love or affection, light to truth or wisdom. And as all things in the spirit of man refer either to his will and affections, or else to his thoughts and understanding, so all things in nature refer and correspond to affections of some kind or character, or else to thoughts of some kind or character. Most of Swedenborg's theological writings are devoted to an exposition of the spiritual sense of Scripture, by applying thereto the doctrine of correspondence, and in all his works this subject is frequently referred to. Of our common Bible, the books of Ruth, Chronicles, Ezra, Nehemiah, Esther, Job, Proverbs, Ecclesiastes, and the Song of Solomon in the Old Testament, and the Acts and Epistles in the New, have no continuous spiritual sense, and were not written under the same full inspiration as the books which contain this sense. The first chapters of Genesis have only spiritual truth, the historical truth beginning with the account of Terah; and some statements in the Word—as, for example, that the sun and moon stood still—are true only in their spiritual sense.

III. *A Life of Charity.*—This word does not mean with Swedenborg eleemosynary gifts or acts. These are good, and should be done when and as they are called for. But charity is the love of the neighbor; and this is heavenly and leads to heaven when it is founded upon love to the Lord. Its highest and truest work is the faithful discharge of our daily duty in all the things required of us by the place or position which Providence has assigned to us. So it is we may do the most good to others, and manifest our love to Him who has given us this way of being useful, and therefore happy; for all happiness is founded upon usefulness.

Another doctrine of the New Church should be noticed—that of conjugial love. Of the two Latin words *conjugalis* and *conjugialis*, Swedenborg preferred the latter, and the common English translations retain this term. He strongly inculcates the sanctity of marriage, deducing this from its foundation in the perfect union of love and wisdom in the Divine Being, whence comes a union of corresponding nature, but infinitely diversified in form, throughout creation. Everywhere we find an image or resemblance of marriage. In the animal kingdom it is obvious; in the vegetable, less obvious, but as certain; and throughout creation we find a conjunction of two, diverse but adapted to each other, causing production. A man is in all particulars of body or mind a man, and a woman is a woman. Each is imperfect without the other. United, they form a one, and the marriage relation, which exists naturally in the natural world and spiritually in the spiritual world, is the instrument by which Infinite Love gives the highest and purest happiness created beings can receive; while unchastity and impurity of every kind, and most of all adultery, destroy all good in the will and all wisdom in the understanding of those who give themselves up to these infernal lusts.

The number of those who, professing the doctrines of the New Jerusalem, have separated from the former Church, is not large. But that of those who in all the churches have more or less knowledge of and respect for these doctrines is believed to be very large. THEOPHILUS PARSONS.

New Kent, county of E. Virginia. Area, 125 square miles. It is bounded N. by Pamunkey and York rivers, and S. by the Chickahominy. It is nearly level and naturally quite fertile. Grain and tobacco are leading products. The county is traversed by the Richmond and York River R. R. Cap. New Kent Court-house. Pop. 4381.

New Kent Court-house, post-v. and cap. of New Kent co., Va.

New′land, tp. of Pasquotank co., N. C. Pop. 1481.

New Leb′anon, post-v. and tp., Columbia co., N. Y., on Harlem Extension R. R. The township includes Lebanon Springs, in the E. part of the town, celebrated for its thermal springs, Tilden's, New Lebanon Centre, West Lebanon, and New Britain. It has good schools, 8 churches, a female seminary, a glass manufactory, a vinegar factory, 1 grist and 4 saw mills, 2 machine-shops, and 2 newspapers. Pop. 2124. EDS. "DRUGGIST."

New Lebanon, post-v. of Mill Creek tp., Mercer co., Pa. Pop. 273.

New Len′ox, post-v. and tp. of Will co., Ill., on the Chicago Rock Island and Pacific R. R. Pop. 1121.

New Le′on, a state of the Mexican Confederation, is bounded by San Luis Potosí, Tamaulipas, and Cohahuila, and comprises an area of 16,837 square miles, with 145,000 inhabitants, most of whom are whites and mestizoes. The surface is elevated, hilly, or mountainous, the climate hot but healthy, and the soil very fertile and well adapted for agriculture. The state has suffered very much, however, from military disturbances, and its natural riches are developed only on a very small scale. Cap. Monterey.

New Lex′ington, post-v. and tp. of Tuscaloosa co., Ala. Pop. 557.

New Lexington, a v. of Fairfield tp., Highland co., O., on the Cincinnati and Muskingum Valley R. R. Pop. 242.

New Lexington, post-v., cap. of Perry co., O., on the Pittsburg Cincinnati and St. Louis R. R., has 6 churches, 2 banks, 2 newspapers, 2 mills, 1 foundry, 1 planing-mill, 3 hotels, 2 tanneries, and stores. Pop. 953.
J. F. MCMAHON, ED. "TRIBUNE."

New Lib′erty, post-v. of Owen co., Ky. Pop. 304.

New Light, post-v. and tp. of Wake co., N. C. Pop. 798.

New Lim′erick, post-v. and tp. of Aroostook co., Me. Pop. 308.

New′lin, tp. of Chester co., Pa. Pop. 775.

New′lin's, tp. of Alamance co., N. C. Pop. 862.

New Lis′bon, tp. of Stoddard co., Mo. Pop. 1182.

New Lisbon, post-v. and tp. of Otsego co., N. Y. Pop. 1545.

New Lisbon, post-v., cap. of Columbiana co., O., on the Niles and New Lisbon R. R., has fine waterworks, 6 churches, 2 banks, several large manufacturing establishments, and stores. Pop. 1569.
R. W. TAYLER, JR., ED. "BUCKEYE STATE."

New Lisbon, post-v. of Juneau co., Wis., on the Chicago Milwaukee and St. Paul R. R., 134 miles W. of Milwaukee, possesses fine water-power, good schools, 4 churches, 1 flouring and 2 lumbering mills, 1 sash, door, and blind factory, 1 brewery, 1 farm-implement manufactory, 1 newspaper, and stores. Pop. 1221.
M. F. CARNEY, ED. "ARGUS."

New Lon′don, the south-easternmost county of Connecticut. Area, 650 square miles. It is bounded E. by Rhode Island, S. by Long Island Sound, and W. partly by the Connecticut River. It is hilly, and in parts very stony, but has a generous soil. Live-stock, grain, hay, wool, and dairy products are the agricultural staples. The manufacturing interests are important, and include the making of carriages, clothing, cotton and woollen goods, shipping, flour, furniture, iron, India-rubber goods, metallic wares, fish-oil, machinery, paper, etc. The county is intersected by the river Thames and by various railroads. Caps. Norwich and New London. Pop. 66,570.

New London, city, port of entry, one of the capitals of New London co., Conn., on the Thames River, 3 miles from its entrance into Long Island Sound, and on New London Northern R. R., has water and gas, several fine schools, 8 churches, 5 national banks, 1 trust company, 1 daily and 1 weekly newspaper, 2 extensive iron-foundries, a woollen-mill, a cotton-gin factory, 1 fruit-canning establishment, 1 tannery, 1 silk and 1 shirt factory, a cracker bakery consuming 100 barrels of flour daily, and stores. It has daily communication with New York City by steamboat, and with both New York and Boston daily by rail. It is much frequented in summer by tourists, and its harbor is one of the finest on the Atlantic coast. Fort Trumbull is located here. Pop. 9576.
JOHN A. TIBBITS, ED. "TELEGRAM."

New London, post-v. of Monroe tp., Howard co., Ind. Pop. 240.

New London, post-v. and tp. of Henry co., Ia., on the Burlington and Missouri River R. R. Pop. 1746.

New London, tp. of Monongalia co., Minn. Pop. 319.

New London, post-v., cap. of Ralls co., Mo., 10 miles S. of Hannibal, on the St. Louis Hannibal and Keokuk R. R., and is the terminus of the Ralls County branch R. R., has a graded school, 1 newspaper, 2 churches, 1 flouring-mill, 1 hotel, and stores. Pop. 410.

DODGE & MAYHALL, EDS. "RALLS CO. RECORD."

New London, post-v. and tp. of Merrimack co., N. H., is the seat of the New London Institution, founded in 1853. Pop. 959.

New London, post-v. of Verona tp., Oneida co., N. Y., on the Erie Canal. Pop. 453.

New London, post-v. and tp. of Huron co., O., 47 miles S. W. of Cleveland, on the Cleveland Columbus Cincinnati and Indiana R. R., has a school building, 2 churches, a national bank, 1 newspaper, and stores. Principal business, merchandising and dairying. Pop. of v. 678; of tp. 1475. G. W. RUNYAN, ED. "NEW LONDON RECORD."

New London, post-v. and tp. of Chester co., Pa. Pop. 911.

New London, post-v. of Mukwa tp., Waupacca co., Wis., on Wolf River, just below the mouth of the Embarras, 40 miles S. W. of Green Bay and 48 miles N. W. of Fond du Lac, is a station on the Green Bay and Lake Pepin R. R., has 2 weekly newspapers and several manufactories, stores, churches, and schools. Pop. 1015.

New Lots, tp. of Kings co., N. Y. Pop. 9800.

New Lyme, post-v. and tp., Ashtabula co., O. P. 708.

New Mad'ison, post-v. of Harrison tp., Darke co., O., on the Pittsburg Cincinnati and Indiana Central R. R. Pop. 452.

New Madrid', county of S. E. Missouri, on the Mississippi River. Area, 880 square miles. It is well wooded, and in large part occupied by swamps, lakes, and bayous. The land was formerly much higher, but was sunk in the earthquakes of 1811–12. It is nevertheless susceptible of drainage, and is highly fertile. The county affords great quantities of corn and pork. Cap. New Madrid. Pop. 6357.

New Madrid, post-v. and tp., cap. of New Madrid co., Mo., on the Mississippi River, 40 miles S. W. of Cairo, Ill., and 280 miles S. E. of Jefferson City, has an extensive river-trade, chiefly in shipping corn, lumber, and cattle to Southern markets; has a weekly newspaper and several schools, stores, and churches. New Madrid is one of the oldest towns of the upper Mississippi, having been settled under the Spanish government of Louisiana in 1780, and has suffered from earthquakes, especially those of 1811, for which reason the houses are built of wood. Pop. of v. 634; of tp. 2861.

New'man, post-v. and tp. of Douglas co., Ill., on the Indiana and Illinois Central R. R. Pop. 1077.

Newman (EDWARD), F. L. S., b. at Hampstead, England, May 13, 1801; began in childhood to study natural history, especially entomology; established and edited the *Entomological Magazine* 1833, the *Entomologist* 1840, the *Zoologist* 1843, and the *Phytologist* 1844; became in 1840 a publisher, and issued, besides many popular works by other writers, his own *History of British Ferns* (1840), *Dictionary of British Birds* (1866), *Illustrated Natural History of British Moths* (1869), *Illustrated Natural History of British Butterflies* (1871), and several minor treatises. He gave almost exclusive attention for several years to insects injurious to vegetation, and made discoveries important to the agriculturist and fruit-grower.

Newman (FRANCIS), one of the early settlers in New Hampshire (1638), and subsequently at New Haven; was secretary under Gov. Eaton: was in 1653 a commissioner to the Dutch government at Manhattan to complain of encroachments upon the rights of the colony; was chosen assistant governor 1653, commissioner of the united colonies 1654 and 1658, and was governor of New Haven from 1658 to his death, Nov. 18, 1660.

Newman (FRANCIS WILLIAM), LL.D., b. in London June 27, 1805; studied in a private school at Ealing; graduated with double first-class honors at Worcester College, Oxford, 1826; was fellow of Baliol 1826–30, when he resigned on account of theological objections to subscribing the Thirty-nine Articles; proceeded with Mr. Graves and others on a kind of mission to the Mohammedans; resided a considerable time at Bagdad and travelled extensively in the Levant, acquiring a familiar knowledge of Arabic and of Oriental literature, but gradually becoming widely alienated from Anglican theology; was classical tutor in Bristol College from 1834–40, professor of classics at Manchester New College, London, 1840–46, and professor of the Latin language and literature at University College, London, 1846–63, since which time he has devoted himself exclusively to literature. Similar in mental characteristics to his celebrated brother, Mr. Newman has diverged from the Church of England in precisely the opposite direction, though the title of his first book betrays the same longing for ecclesiastical unity which led Dr. J. H. Newman to the Church of Rome. Author of *Catholic Union: Essays toward a Church of the Future and the Organization of Philanthropy* (1844), a scholarly *History of the Hebrew Monarchy* (1847), *The Soul, its Sorrows and Aspirations* (1849), a remarkable autobiography entitled *Phases of Faith, or Passages from the History of my Creed* (1850), *Lectures on Political Economy* (1851), *Regal Rome* (1852), *The Odes of Horace translated into unrhymed English Metres* (1853), *The Iliad of Homer translated into unrhymed English Metres* (1856), *Theism, Doctrinal and Practical* (1858), *Textbook of Modern Arabic* (1866), *A Grammar of the Berber Language*, *Europe of the Near Future* (1871), and an English-Arabic *Dictionary* in Roman type, now (1876) nearly completed, besides treatises on many other subjects, including mathematics, social science, politics, elocution, philology, and general literature, which exhibit great scholarship and wonderful versatility. PORTER C. BLISS.

Newman (JOHN HENRY), D. D., brother of F. W. Newman, b. in London Feb. 21, 1801; was educated at Ealing and at Trinity College, Oxford; graduated B. A. 1820; was chosen a fellow of Oriel; took Anglican orders 1824; was vice-principal of St. Alban's Hall 1825–26; tutor of Oriel 1826; opposed Catholic emancipation 1829; was one of the university preachers 1830; joined with Hurrell Froude in forming a conservative Anglo-Catholic party within the Church of England; visited Rome and Sicily 1832–33; took part with Keble and Pusey in originating the "Oxford Movement;" was a leader in the propaganda of "High Church" doctrines by means of the celebrated *Tracts for the Times;* rapidly developed his tendencies toward Roman Catholicism; was in 1828–43 incumbent of St. Mary's, Oxford, and chaplain of Littlemore, and acquired great fame as a preacher and writer; founded at Littlemore in 1842 a community of ascetics. In 1845 he joined the Roman Catholic priesthood, and became head of the Oratorian establishment at Birmingham; was rector of the Roman Catholic University, Dublin, 1854–58, and then became head of the Roman Catholic school at Edgbaston. Author of *Tract No. 90*, *Parochial Sermons*, *Essay on Development of Christian Doctrine*, *Arians of the Fourth Century* (1833), *Theory of Religious Belief* (1844), *Callista, a Sketch of the Third Century*, *Loss and Gain* (1848), *Apologia pro Vita Sua* (1864), *An Essay in Aid of a Grammar of Assent* (1870), *A History of Arianism* (1875), several series of sermons, lectures, and essays, and many other works, including a reply to Gladstone's pamphlet on the *Vatican Decrees* (1875) and *A Letter addressed to His Grace the Duke of Norfolk*. A collected edition of his works, begun in London in 1870, has reached nearly 30 vols.

Newman (JOHN P.), D. D., b. in New York City Sept. 1, 1826; educated at Cazenovia Seminary; became a minister of the Methodist Episcopal Church; was for several years pastor of the Metropolitan M. E. church, Washington, D. C., and chaplain to the U. S. Senate 1869–74; is a member of the Society of Biblical Archæology, and author of *From Dan to Beersheba* and *The Thrones and Palaces of Babylon and Nineveh* (1875), works of Oriental travel presenting observations made on an official tour of inspection of the U. S. consulates in Asia.

Newman (SAMUEL), b. at Banbury, Oxfordshire, England, in 1602; graduated at Oxford 1620; took orders in the Church of England; came to Massachusetts 1636; preached nearly two years at Dorchester; was pastor of the church at Weymouth 1638–43, and removed in 1644, with a portion of his church, to Seconet, where they founded the town of Rehoboth, then embracing Seekonk and Pawtucket, R. I. D. at Rehoboth July 5, 1663. Author of a *Concordance for the Bible* (Lond., 1643; Camb., 1683; 5th ed., Lond., 1720), known as the *Cambridge Concordance*, and formerly supposed to be the first work of the kind.

Newman (SAMUEL P.), son of Mark H. Newman, the publisher, b. at Andover, Mass., in 1796; graduated at Bowdoin College 1816; was professor of rhetoric in that institution 1824–39, and principal of the Massachusetts State Normal School 1839–42. D. at Barre, Mass., Feb. 10, 1842. Author of *Elements of Political Economy*, *The Southern Eclectic Readers* (3 parts), and *A Practical System of Rhetoric*, of which more than 60 eds. were issued in the U. S. and in England.

New'manstown, a v. of Mill Creek tp., Lebanon co., Pa. Pop. 250.

Newmar'ket, town of England, partly in the county of Cambridge, partly in that of Suffolk, is the seat of the

most famous race-course in England, and has about 4000 inhabitants, most of whom are jockeys, grooms, trainers, and stablemen. Pop. 4534.

New′market, post-v. of York co., Ontario, Canada, on the Northern Railway, 34 miles N. of Toronto, has 2 weekly newspapers, important manufactures and trade. Pop. of sub-district, 1760.

New Mar′ket, post-v. and tp., Madison co., Ala. P. 2825.

New Market, post-v. and tp., Frederick co., Md. P. 3476.

New Market, post-v. and tp., Scott co., Minn. P. 472.

New Market, post-v., Greene tp., Platte co., Mo. P. 167.

New Market, post-v. of Rockingham co., N. H., 38 miles S. E. of Concord, on the Boston and Maine R. R., has a public library, 4 churches, 2 banks, 1 newspaper, 4 cotton-mills, 3 hotels, and machine-shops. Pop. 1987.

New Market, post-v. of Piscataway tp., Middlesex co., N. J., near the Central R. R. of New Jersey.

New Market, post-v. and tp., Randolph co., N.C. P. 1297.

New Market, post-v. and tp. of Highland co., O. Pop. of v. 143; of tp. 1107.

New Market, post-v. of Jefferson co., Tenn., on the East Tennessee Virginia and Georgia R. R. Pop. 926.

New Market, post-v. of Shenandoah co., Va., 50 miles S. of Winchester, near the Harper's Ferry and Harrisonburg branch of the Baltimore and Ohio R. R., has a polytechnic institute, a female seminary, 3 public schools, 5 churches, 1 bank, a book and job printing-office, 3 newspapers, and stores and repair-shops. Pop. 600.
S. Henkel, Ed. "Our Church Paper."

New Marl′borough, post-v. and tp. of Berkshire co., Mass., is the seat of South Berkshire Institute, chartered 1856, under direction of the Congregationalists. Pop. 1855.

New Mar′tinsville, post-v., cap. of Wetzel co., West Va., 40 miles S. of Wheeling, on the Ohio River, has a public school, 1 church, a woollen-factory, a printing-office, 2 hotels, several mills, and stores. Pop. 260.
Daniel Long, Ed. "Labor Vindicator."

New Mays′ville, post-v. of Jackson tp., Putnam co., Ind. Pop. 109.

New Met′amoras, or **New Matamoras,** P. O. name of Matamoras, O. (which see).

New Mex′ico, a south-western Territory of the U. S., lying between the parallels of 31° 20′ and 37° of N. lat. and 103° 2′ and 109° 2′ W. lon. from Greenwich. It is bounded on the N. by Colorado; on the E. by the Indian Territory and Texas; on the S. by Texas and Mexico; on the W. by Arizona. Its length from N. to S. varies from 345 miles on the E. side to 380 on the W. side, and its breadth from E. to W. varies with the decreasing width of the degrees of longitude from 330 miles on the northern line to 352 on the southern. The area, according to the U. S. Land Office report of 1874, is 121,201 square miles, or 77,568,640 acres.

Face of the Country.—New Mexico forms a part of the lofty table-land which is the foundation of the Rocky Mountain ranges, as well as those of the Sierra Madre. This table-land, which in Colorado is from 6000 to 8000 feet above the sea, at Santa Fé 6862 feet, and in the upper valley of the Rio Grande is from 5000 to 6000 feet in altitude, gradually slopes southward, being 4800 feet at Albuquerque, and sinks to 3500 or 3000 feet on the Llano Estacado or Staked Plain and at El Paso. The Llano Estacado is a broad, almost level, treeless, and waterless plain, extending over three or four degrees of longitude and nearly as many of latitude, which is apparently barren, but produces abundantly the mesquite, a small but deep-rooted and valuable shrub of the acacia family, and is capable, if by any means it can be irrigated, of yielding large crops. From the elevated table-land described there rise hundreds of summits of the Rocky Mountains and the outlying chains, which, though known by other names, belong to the Rocky Mountain system, and W. of the Rio Grande the peaks of the Sierra Madre lift themselves from 3000 to 10,000 feet above the *mesa* or plateau. The mountain-chains E. of the Rio Grande valley, which thrust themselves out in all directions from the main range of the Rocky Mountains, are known locally as the Guadalupe, Sacramento, and Organ Mountains, and still farther E. the Sierras Blanca, Hueca, Capitana, etc., which form the western boundary of the valley of the Rio Pecos. W. of the Rio Grande the Sierra Madre is divided into numerous chains and some isolated peaks, connected only by the plateau, or separated by intervening elevated valleys, mostly sterile and forbidding in their character. The principal of these mountain-chains are the Sierra San Mateo, the Zuni Mountains, the Sierra del Datil, and the Sierra Mimbres. Still farther W. the San Juan Mountains enter the Territory from Colorado, and the heavy masses of the Mogollon Mountains and the Pinaleno, Peloncito, and Chiricahua Mountains from Arizona. So far as is known, the loftiest summits in the Territory are those of Mount Taylor in the Zuni Mountains, nearly due W. of Bernalillo, and Topped Peak in the N. W. part of the Territory, in the same range of mountains. The height of Mount Taylor is vaguely stated at 10,000 feet above the plateau, which at that point must be between 5000 and 6000 feet. Topped Peak must be somewhat lower, though rising from a more elevated plain. The principal river of New Mexico is the Rio Grande, which has a general direction from N. to S. in its course through the Territory, about three-fifths of the area of which lies E. of it and two-fifths W. The Rio Grande is not navigable in any part of its course through New Mexico, but it flows through a valley usually nearly 20 miles in width, though occasionally narrowed by outjutting spurs of the mountains. It receives from the W. two tributaries, the Rio Chama and the Rio Puerco, and from the E. several smaller streams. The Rio Pecos, a large affluent of the Rio Grande, drains the south-eastern and eastern portion of the Territory, and the Canadian River and two or three of its branches the N. E. The W. portion is drained by the large tributaries of the Colorado River and their affluents, and particularly by the San Juan, Little Colorado, and Gila, each of which has three or four considerable tributaries. No lakes of considerable size have been thus far discovered in the Territory.

Geology.—The surface rocks of the vast plateau belong to the Cretaceous period, except those in the S. W. and W., which are a part of the plateau of the Sierra Madre and are distinctly Eozoic. The mountain-chains of the Rocky Mountain system, as well as those of the Sierra Madre, are also Eozoic, but their summits are Metamorphic rocks, chiefly porphyry, trap, and basalt; but three considerable tracts, one in the Zuni Mountains, between the Rio Puerco and the Rio San Jose, including Mount Taylor, and the other E. of and parallel to the Rio Grande, and nearly 140 miles in length, and a third near the northern boundary of the Territory, along the W. bank of the Rio Grande and extending to the Rio Chama, are volcanic and covered with lava not apparently more than a few centuries old. The tract E. of the Rio Grande is called Mal Pais (bad country), and besides the lava has a broad expanse of volcanic sand, alternating with salt marshes. The valleys of the Rio Pecos and of the Canadian River and its branches are Triassic or Jurassic, and at some points are possibly underlaid with coal at such depth as to be accessible. The valley of the Rio Grande, above the 35th parallel, is Tertiary; below that parallel it partakes of the general character of the plateau and is Cretaceous. The foot-hills of the eastern slope of the Guadalupe Mountains are Triassic. There are two considerable tracts of Tertiary in the N. E. portion of the Territory, the larger of the two lying between the head-waters of the Cimmaron and N. fork of the Canadian rivers, and the smaller between two of the affluents of the Canadian.

Minerals.—Gold and silver are both abundant in this Territory. The inroads of the Comanches and Apaches and the uncertainty in regard to titles of land have materially interfered with mining, but these obstacles are gradually disappearing, and now new mines are opening in all directions. For the most part, the lodes and veins are what would be denominated in Nevada "base" ores; *i. e.* they do not generally yield more than $50 to $75 per ton, though a few reach $100. But the ores are not so refractory as in Colorado, yielding up easily and readily the precious metals. The oldest mining districts are the Old and New Placers, Pinos Altos, Cimmaron, Arroya Hondo, Manzano, and Moreno, and tracts in the Organ Mountains, the Sierras Blanca, Carriza, Jicarrilla, and the Mogollon and Magdalena Mountains. New claims to the extent of twelve or fifteen are entered every year. Copper is found in very rich ores in several parts of the Territory, the Santa Rita mine in Grant co. producing 3000 pounds of copper per week. Galena mines in the Organ Mountains yield 80 per cent. of pure lead, besides about $50 worth of silver to the ton. Iron and salt are abundant, and there is ample evidence from Prof. Hayden's reports of the existence of lignite or brown coal, bituminous coal, and anthracite in veins of sufficient size to pay for working in different parts of the Territory. The anthracite, so far as known, is found only in the Placiere Mountains, on the eastern border of the Rio Grande valley, 30 or 40 miles S. S. W. of Santa Fé, the bituminous at various points in cañons in the Cretaceous plains, where by erosion the strata have been cut through to the coal measures, and the lignites in the Tertiary beds of the northern part of the Territory. There are numerous mineral springs in New Mexico, and the Hot Springs, about 5 miles from Las Vegas, have a very high reputation. The temperature varies from 80° to 140° F.

The waters are similar in analysis and probably equal in curative power to those of the Arkansas hot springs.

Soil and Vegetation.—The mountain-ranges are partially covered (where they are not basaltic) with pine, cedar, spruce, and other evergreens, not of as gigantic growth as those of the Pacific States, but constituting fair forest growths. The foot-hills have extensive tracts of piñon or nut pine and a smaller cedar, and in the river bottoms are belts of cottonwood, sycamore, and other deciduous trees. In the southern part of the Territory there are numerous groves of oak and walnut; in the Llano Estacado the mesquite grows to a varying height of from 5 to 20 feet, but thrusts its long and powerful roots downward and outward to an extent of from 40 to 80 feet. In the southern and south-western portions of the Territory the tree cactus is, as in Arizona, a marked feature in the landscape. There are many indigenous grasses in the Territory, the most widely spread and valuable of them all being the nutritious mesquite or gama-grass, which grows during the rainy season of July and August, ripens in the autumn, and dries on its stalk, furnishing to cattle, in its stalks and rich seeds, a valuable natural hay, of which they are exceedingly fond. The mildness of the seasons is such that the cattle and sheep can forage for themselves throughout the winter, and, feeding on the gama-grass, they become very fat. The arable soils, under the influence of irrigation, yield fair crops, 25 bushels of corn to the acre, and sometimes more; but the soil is not remarkable for fertility.

Zoology.—Animal life is not remarkably prolific in this region; but the fauna belong about equally to the two regions, the Rocky Mountain and the Pacific. The deer, elk, big-horn, wild-hog, antelope, cougar or panther, ocelot, lynx, the grizzly, Mexican, or brown and the black bear, the coyote, wolf, marmot or gopher, beaver, skunk, weasel, rabbit, hare, and squirrel are the principal quadrupeds, while vultures, hawks, turkeys, geese, swans, brant, ducks, and teal are the most common birds, and scorpions, lizards, and horned frogs are the most abundant reptiles. Centipedes are not uncommon.

Climate.—The climate of New Mexico, though varied, is dry. In the N. the range of the thermometer is between 10° and 75° F., the low latitude being balanced by the great elevation. In the S. the temperature is very mild, the thermometer rarely indicating as low a temperature as 32°. The rainy season in the southern part of the Territory is in the months of July and August. In Santa Fé in 1873–74, according to the observations of the U. S. Signal Service, the mean temperature of the year was 48.8°; the maximum, 89°; the minimum, 0°; the range, 89°; the mean of the spring months, 46°; the mean of the summer, 70°; of the autumn, 51°; of the winter, 28°. The amount of annual rainfall was 15.80 inches, divided among the seasons as follows: spring, 3.92 in.; summer, 6.19 in.; autumn, 1.87 in.; winter, 3.82 in. The annual mean pressure of the barometer was 29.792, and not once during the year did it rise to 30, 29.879 being the highest and 29.617 the lowest. The prevalent winds were E., S. E., S. W., W., and N., but there were 101 days wholly or partly calm. The climate has justly a high reputation for healthfulness. Pulmonary diseases are readily relieved and often cured, and malaria is unknown.

Agricultural Products.—The Territory will probably not be remarkable for its agricultural products, though it will undoubtedly eventually be one of the best grazing States of the West. In 1870 it had 833,549 acres of land in farms; of this, 143,007 were under cultivation. The grazing lands are open and common. The value of its farms was estimated at $2,260,139, and of its farming implements and machinery $121,114. The total estimated value of all farm products was $1,905,060; of orchard products, $13,609; of market-garden products, $64,132; of home manufactures, $19,592; of animals slaughtered or for slaughter, $224,765. The value of all its live-stock was $2,389,157; it consisted of 26,500 horses, 6141 mules and asses, 16,417 milch cows, and a total of 186,301 neat cattle, 619,438 sheep, 11,267 swine. Its crops consisted of 352,822 bushels of wheat; 640,823 bushels of Indian corn; 67,660 bushels of oats; 3876 bushels of barley; 8587 pounds of tobacco; 684,930 pounds of wool; 28,856 bushels of peas and beans; 3102 bushels of Irish potatoes; 19,686 gallons of wine; 12,912 pounds of butter; 27,213 pounds of cheese; 813 gallons of milk; 4209 tons of hay; 1765 gallons sorghum molasses.

Manufactures.—In 1870, New Mexico had 182 manufacturing establishments of all kinds, employing 427 hands; the estimated amount of capital used was $1,450,695; wages paid, $167,281; amount of raw material used, $880,957, and annual product, $1,489,868. Of these the most important were flouring-mill products, $581,040; quartz milled, $399,712; lumber, $121,225; woollen goods, $21,000; liquors, $27,000; printing, $30,175.

Mining Industry.—In 1870 the mining products of New Mexico reported were only those of the gold mines, and the yield of the year 1869–70 was stated at $343,250. At the close of 1874 Mr. Rossiter W. Raymond states that the gold product of that year was, in round numbers, $500,000; we have no statistics of the value of the product of the silver, copper, lead, and coal mines, all of which are worked now more largely than in 1870.

Railroads.—As yet no railroads are reported as actually in operation in New Mexico, though the Denver and Rio Grande, a narrow-gauge road, must be nearly ready as far as Santa Fé; its ultimate destination is to El Paso. The Atchison Topeka and Santa Fé also expected to reach Santa Fé by Jan., 1876. The Atlantic and Pacific is projected, to follow the valley of the Canadian River into the Territory and reaching the Rio Grande near Bernalillo to cross it on the 35th parallel. It is to cross both New Mexico and Arizona. The Texas Pacific enters the Territory opposite El Paso, where it crosses the Rio Grande, and will traverse only the S. W. corner, near which it enters the valley of the Gila.

Commerce.—The Territory has no foreign commerce, having neither navigable rivers nor railroads. There is a considerable business done by wagons from Santa Fé, and the mineral products of the Territory are sent to Denver, and thence to St. Louis or San Francisco.

Finances.—We have no account of the finances of the Territory later than 1873. At that time the bonded debt was about $60,000, and there were nearly $30,000 of outstanding warrants due; but this amount was more than covered by taxes collectible, but as yet uncollected. The expenses of the year were about $80,000. The assessed valuation of 1874 was $7,603,772, and this is said by the territorial secretary to be about 30 per cent. of the true valuation.

Banks.—There were, Jan., 1875, two national banks in the Territory, both at Santa Fé. Capital, $300,000; bonds, $300,000; outstanding circulation, $267,900. There were five private banking-houses in the Territory at the same date. No savings banks and no insurance companies.

Population.

Census year.	Total pop.	White.	Colored.	Indian.	Native.	Foreign.	Male.	Female.	Density.	Ratio of increase.	Illiteracy.	Of school age, 5–20.	Of military age, 18–45.	Of voting age, 21 and upwards.	Citizens.
1850	61,547	61,525	22	10,317	59,261	2,286	31,742	29,805	0.30	......	25,089	22,774	12,698	13,920	10,871
1860	93,516	82,924	85	10,507	86,793	6,723	49,091	44,425	0.36	51.94	32,785	32,796	21,371	25,483	23,781
1870	111,303*	90,393	172	20,738	86.254	5,620	47,138†	44,739†	0.76	19.02	52,220	29,312	20,070	23,332	22,442

In 1873 the Indian population was estimated by Ex.-Gov. Arny at 14,389 Utes, Apaches, and Navajoes, of whom 4278 were warriors, 5326 women, and 4745 children, and 7683 Pueblo or village Indians, who occupied 20 villages mainly in the county of Santa Fé and were the descendants of the Aztec or the Toltec races. These are quiet, intelligent, and loyal Indians. The Utes and Apaches are very often hostile and thievish; the Navajoes have been very generally friendly, though not always to be trusted. Of the white population about nine-tenths are Mexicans, but the congressional delegates have frequently been of Anglo-American birth and education.

Education.—The educational condition of the Territory is very low, but improving. Five-ninths of its inhabitants, excluding tribal Indians, cannot read or write. A few schools were established in 1822 or 1823, but these were only of the most primary character, and after the transfer of the Territory to the U. S. in 1848 all attempts at public school education were abandoned until 1872. There are now 128 public schools, established under the law of 1871–72 as modified in 1873–74, having 143 teachers and 5420 children in attendance. The teachers receive average wages of $26.25 per month, and the schools are maintained an average period of five months and three days during the year. Of these schools 40 are English and Spanish, and 88 Spanish exclusively. Very few of them are above the grade of primary schools. The school fund, raised by tax, amounted in 1874 to $28,523.34, and if it had been fully collected would have reached $37,171.55. Four schoolhouses only were owned by the districts, the others

* Including 19,429 Indians sustaining tribal relations.
† Sex of tribal Indians not given.

being rented. The value of school property was $4300. There were also 31 private schools, with 68 teachers and 988 scholars; of these 31 schools, 21 were English and Spanish and 10 Spanish only. Of the whole number 21 are primary and 10 devoted to secondary education, at least in part. Of these 10, 7 are under the management of Catholic religious orders, the Christian Brothers and the Sisters of Loretto, and three more were to be opened by the Sisters of Loretto and the Jesuit Fathers. The other three advanced schools, as well as several of a more primary character, are under the management of missionary teachers of the Presbyterian Board of Foreign Missions and the Methodist Episcopal Missionary Board. A large proportion of the public schools are controlled by the Jesuit Fathers, and all their schools, whether public or private, receive assistance from the public school funds, while the Protestant mission schools are denied participation in them. There are also 8 schools among the Pueblo Indians and 2 among the Navajoes on their reservations. Of these schools the expenses are paid by the U. S. government, except $300 from the Presbyterian Board of Foreign Missions. There are no colleges in the Territory, though the Jesuit Fathers give the name of St. Joseph's College to a school of secondary instruction which they opened in 1875 at Las Cruces. There are no institutions for deaf mutes or blind, and no insane hospital. The territorial prison is at Santa Fé, and there are jails or lock-ups in the several counties.

Newspapers.—In 1870, New Mexico had 5 newspapers, with an aggregate circulation of 1525 copies and an aggregate annual issue of 137,350 copies. One of them was a daily with 225 circulation, and 4 weeklies with 1300 circulation. There has been some increase in their circulation since, but not, we believe, in their number.

Churches.

DENOMINATIONS.	Organizations, 1870.	Ch. edifices, 1870.	Sittings, 1870.	Ch. property, 1870.	Ch. organizations, 1874.	Ch. edifices, 1874.	Ministers, 1874.	Ch. members, 1874.	Adherent population, 1874.	Value of church property, 1874.
All denominations	158	152	81,560	$322,621	208	179	95	..	89,040	$365,500
Baptists..........	1	1	300	800	1	1	1	20	150	1,000
Episcopalians....	3	...	......	....	4	3	2	70	350	
Methodists.......	1	1	300	1,500	2	2	1	40	200	2,500
Presbyterians....	1	1	250	7,000	3	3	5	68	340	12,000
Roman Catholics.	152	149	80,710	313,321	198	170	86	..	88,000	350,000

Government, Courts, etc.—Like all the Territories, New Mexico has a territorial government, in which the governor, secretary of state, superintendent of Indian affairs, and purveyor of public funds are appointed by the President of the U. S., by and with the advice and consent of the Senate. The legislature consists of 13 senators and 26 representatives. Its sessions are biennial. The members of both houses are elected by the people. The judiciary consists of a supreme court with a chief-justice and two associate justices, which has chancery and common-law jurisdiction, both original and appellate, and three district courts, presided over in turn by the justices of the supreme court. The district courts have chancery and common-law jurisdiction. Like the other Territories, it elects a delegate to Congress, who has the right to speak, but not to vote.

COUNTIES (13).	Pop., 1870.	Males, 1870.	Females. 1870.	Pop., 1860.	True valuation, 1870.	Assessed valuation, 1870.
Bernalillo...	7,591	3,727	3,864	8,769	$2,350,000	$1,941,645
Colfax.........	1,992	1,290	702	....	6,171,135	2,503,585
Doña Aña...	5,864	2,875	2,989	6,239	1,250,000	786,493
Grant.........	1,143	850	293	....	1,342,400	167,195
Lincoln......	1,803	1,064	739	....	570,351	258,201
Mora	8,056	4,291	3,765	5,566	2,190,907	1,095,149
Rio Arriba..	9,294	4,570	4,724	9,849	675,000	418,398
San Miguel.	16,058	8,305	7,753	13,714	4,250,000	2,205,850
Santa Aña...	2,599	1,278	1,321	3,572	750,000	309,114
Santa Fé.....	9,699	4,742	4,957	8,114	4,250,000	2,608,865
Socorro	6,603	3,412	3,191	5,787	3,500,000	3,150,984
Taos	12,079	5,960	6,119	14,103	1,550,000	807,863
Valencia.....	9,093	4,771	4,322	11,321	2,500,000	1,530,672
Totals......	91,874	47,135	44,739	93,516	$31,349,793	$17,784,014

Principal Towns.—Santa Fé, the capital, had 4765 inhabitants in 1870. The Red Willow Pueblo reservation had 1600 inhabitants, and the San Juan Pueblo 1031. The other principal towns, each having a population between 1000 and 1800, were Lower Las Vegas, Las Cruces, El Rancho, Fernando de Taos, Ocate, La Junta, Albuquerque, Mora, and Tomé.

History.—At the time of the discovery of the American continent, New Mexico had a large and industrious population, either Aztec or Toltec, who had their walled towns, their stone dwellings, several stories in height, their manufactures of cotton and wool, their rude but effective weapons of war, and who cultivated and irrigated the soil and gathered therefrom large crops. They were idolaters, or rather, perhaps, sun-worshippers, and had their temples and places of worship to their deity. That they offered human sacrifices is probable, though by no means so certain as that the Mexicans generally did so. The Spanish adventurers Alvar Nunez, Marco de Niza, and Coronado penetrated to this region in 1537, 1539, and 1540. The last named was accompanied by a historian, Castaneda, the accuracy of whose descriptions leaves no room for doubt that he visited the country. In 1581 the country was explored by Capt. Francisco de Bonillo and his comrades, all Spanish adventurers, through whose account of it it was named New Mexico. In 1582 two attempts were made to plant Spanish colonies there, but these were but partially successful. Between 1595 and 1599, Juan de Oñate was sent thither by the viceroy of Mexico to establish forts, colonies, and missions, and to take possession of the whole country in the name of his master, the king of Spain. Oñate was successful, and the Roman Catholic missionaries who went with him converted many of the Indians to the Roman Catholic faith. Many missions were established, the mineral wealth of the country was discovered, and the colonists opened and worked the mines, enslaving the Indians and exacting from them the severest and most constant toil. At length, wearied with their oppression, the patient Indians rose against their taskmasters, and after several ineffectual efforts drove the Spaniards out of the country in 1680. For eighteen years they remained independent, thwarting all efforts of the Spaniards to re-enslave them. At length, in 1698, the Spaniards regained a portion of their former power, but used it less oppressively than before, though the *peons* were to all intents slaves. In 1822 the inhabitants of New Mexico united with the other inhabitants of Mexico in throwing off the yoke of Spain, and thenceforward until 1846 they were governed in the same way with the other states of Mexico. In 1846, Gen. Stephen Kearny with a small U. S. force captured Santa Fé, and soon after conquered the whole territory and raised the American flag there. In 1848 it was ceded to the U. S. by the treaty of Guadalupe Hidalgo. The present territorial government was organized Sept. 9, 1850. By the treaty of Dec. 30, 1853, what was known as the Gadsden purchase was added to it. It then comprised the whole of Arizona and a portion of what is now Colorado. Arizona was set off from it in 1863, and the portion of Colorado in 1865. During the early part of the late civil war New Mexico was the scene of a protracted and bloody strife. Several of the officers in command of regiments, battalions, or companies of the regular army sympathized very strongly with the Confederacy, and endeavored to turn over their commands and stores to it; and a Confederate force of 2300 men, under command of Gen. H. F. Sibley, undertook in Jan., 1862, the conquest of the Territory. A sufficient time had elapsed, however, before their approach, for Gen. E. R. S. Canby, who was in command of the department, to rouse the loyal spirit of the people and make such preparations as were possible for defence. His troops were mostly untrained, and the New Mexican volunteers, though loyal, were timid and unreliable in battle. In Feb., 1862, the battle of Valverde was fought, and after some hard fighting the Confederates prevailed through the cowardice of the supporting Federal force. Canby's soldiers retreated to Fort Craig, which Sibley did not attempt to attack. They captured Albuquerque, and on the 24th of March were met at Apache Pass by Col. Slough with 1300 Colorado volunteers and a few regulars. After a short but sharp action the Confederates again prevailed, though with heavy loss, and two or three days later Gen. Sibley entered Santa Fé in triumph; but on the 12th of Apr., 1862, he was obliged to evacuate that town, and, threatened by Canby, retreated over the mountains with great suffering till he reached Fort Bliss, Texas, denouncing the country as not worth a quarter of the blood expended in its conquest. He had lost one-half of his original force in dead, wounded, and prisoners. In 1859 the territorial legislature had passed a law recognizing the existence of slavery in the Territory, but this was repealed in 1861, at the suggestion of Gen. Canby, and with it was abolished the system of peonage, a modified slavery which had existed for two centuries and a half. The Territory is growing slowly, and, with a larger infusion of American enterprise, it will prove one of the best States of our Western domain.

Governors of New Mexico.

James S. Calhoun.........	1851–52	Henry Conolly............	1861–65
William C. Lane..........	1852–53	Robert B. Mitchell.......	1865–67
Solon Borland..............	1853–53	Wm. F. M. Arny (act.)..	1867–69
David Merriwether......	1853–57	William A. Pile...........	1869–71
Abraham Rencher.......	1857–61	Marsh Giddings...........	1871–76

L. P. BROCKETT.

New Middletown, post-v. of Springfield tp., Mahoning co., O. Pop. 147.

New Mil'ford, post-v. and tp., Litchfield co., Conn., 36 miles N. of Bridgeport, on the Housatonic River and R. R., contains the Adelphic Institute, 5 churches, 2 navy-button factories, 1 weekly newspaper, several good hotels, an efficient fire department, a park association, and is one of the largest tobacco-packing towns in New England. Pop. 3586. J. R. JOHNSON, ED. "NEW MILFORD JOURNAL."

New Milford, post-v. and tp., Winnebago co., Ill. P. 915.

New Milford, post-b. and tp. of Susquehanna co., Pa., on the Delaware Lackawanna and Western R. R. Pop. of b. 600; of tp. 1647.

New Milton, post-v. and tp., Doddridge co., West Va. Pop. 1777.

New Mon'mouth, post-v. of Monmouth co., N. J., on the sea-coast and on the New Jersey Southern R. R. (HIGHLAND STATION), 6 miles N. of Long Branch, has 1 bi-weekly newspaper.

New Mount Pleas'ant, a v. of Washington tp., Hocking co., O. Pop. 67.

New'nan, post-v. and cap. of Coweta co., Ga., on the Atlanta and West Point and the Savannah Griffin and North Alabama R. R., is a manufacturing town, and has 1 weekly newspaper. Pop. 1917.

New Or'egon, post-v. and tp. of Howard co., Ia. P. 996.

New Or'leans, cap. of the State of Louisiana, chief city, commercial metropolis, and port of entry of the Gulf States, and tenth city of the U. S. in population, is situated upon both sides of Mississippi River, but chiefly on the left or northern bank, 115 miles above its mouth, embraces nearly the whole of Orleans parish, with parts of Jefferson and Plaquemine, reaching on the N. and E. to Lakes Pontchartrain and Borgne, covering a statutory area of about 150 sq. m., though the settled area within the drainage districts comprises only 40 sq. m. The greatest length from W. to N. E. is 22 miles, and greatest breadth across the N. E. peninsula 10 miles. The lines of lat. 30° N. and lon. 90° W. of Greenwich intersect in its lower suburbs, 1 mile from the river. The general course of the river is from W. to E. past the city, which, however, occupies a curve or bend in the shape of an S 10 miles in length along the N. side of the river, giving it the appropriate name of "the Crescent City." The boundary, about 4 miles below the city, is the parish of St. Bernard, and that above it is the upper line of Carrollton, 6½ miles, running back 5 miles to Lake Pontchartrain. The recently-annexed suburbs of Gretna and Algiers occupy the S. side of the river. The city lies 1040 miles below the mouth of Ohio River, and is 1396 miles by railway from Washington. It is built entirely on the alluvial bank, and is wholly below high-water level of the river. It is protected from yearly floods by a levee raised in front along the river-bank and extended back to the lake above the city, and also along the lake front as a precaution against the back-water caused by storm-winds on the lake and Gulf. A system of drainage-canals, with powerful machinery, drives out into the lake the rainfall, sewage, and seapage of the city. The elevation of the flood-water of the river in front of the city is 15 feet above the level of the lake and Gulf. The climate is not extreme, frosts being rare, and the temperature averaging about 69° F. The vicinity of marshes and shoal-water lakes produces a high degree of water-saturation, and consequently an annual mean rainfall of 65 inches. The mean annual height of the barometer is 30.075 inches, with a range of 1.31 inches. Temperature, 1872, 71.99°; 1873, 69.10°; 1874, 71.01°; 1875, 66.23°; mean, 69.71°; average minimum, 47.43°; average maximum, 90.48°.

The city is reached both by river and railway, with a constant arrival and departure of steamboats and trains. The river abounds in boats of all dimensions, plying for trade and travel both up and down, and the packet lines running to the nearer river-cities are of a magnificence and elegance unequalled on any other waters. There are steamship lines to New York, Boston, Philadelphia, Baltimore, Havana, Key West, and Florida ports, Vera Cruz, Texas ports, Liverpool, Havre, and Bremen, and a daily packet line to the various coast ports, across Lake Pontchartrain, and also an indefinite number of small vessels, both sail and steam, engaged in the trade and travel of that lake. Three important railroads enter from the N. W., N., and W.—namely, the New Orleans and Mobile, the New Orleans St. Louis and Chicago, and Morgan's Louisiana and Texas, each having two passenger-trains daily and a great number of freight-trains.

The original plat of New Orleans was laid out in 1718 under Gov. de Bienville, and was less than 1 mile square, the streets crossing at right angles, with the cathedral at the front-centre, facing the river. As the city extended in the bend of the river, it became necessary to conform the streets to its peculiar shape; hence, in the upper and lower additions they meet and diverge in a very irregular and abrupt manner. The streets in the original or French part of the city are very narrow, chiefly 40 feet wide. Canal street, the dividing-line between the old French and what is now called the American part of the city, is a boulevard of great beauty, 150 feet in width; so also are Claiborne, Rampart, Esplanade, St. Charles, and other avenues. There are 11 public parks and squares in the city, 3 canals for commercial purposes, 10 or 12 draining ones, and 16 markets. The public buildings of greatest interest are—the U. S. custom-house, the cathedral and court-halls, facing Jackson Square, the city hall, fronting La Fayette Square, the university buildings on Common street, the charity hospital, the marine hospital, the Hôtel Dieu, and the St. Charles and St. Louis hotels (now the State-house). There are several churches of considerable architectural elegance, as well as several well-built banking-houses. The street railroads render intercourse between all parts of the city and its suburbs easy and cheap. The extent of track is about 67 miles, under the operation of eight companies. All except the Carrollton road charge a fare of 5 cents, and that has double distance and fare. It is on this road that the fireless engine has been introduced. Ten of these "dummies" run from Carrollton to the half-way-station at Napoleon avenue. The steam-supply is obtained at the Carrollton dépôt, where the receivers are charged. They run down 3 miles and back with this charge of 120 pounds of steam, having 60 pounds of excess. They have now (1876) been more than two years in operation without accident or interruption, and have demonstrated the usefulness of the invention. Two sets of gasworks formerly supplied the city with gas. Recently, they have been consolidated into one interest, and furnish the city with light at $4 per 1000 feet. The waterworks amply supply the middle and lower parts of the city, but the upper districts are without their benefit. The water is pumped into the reservoir from the river at 1000 feet distance, and is partly settled before passing into the pipes. This water is used freely for drinking purposes, but cisterns to collect the rain-water are used in all portions of the city for drinking, especially in the upper districts. The river-water is considered equally healthy, but is less palatable. The public wharves are divided into 12 sections; the landings are 14 in number. Steamers, sail-vessels, and all crafts are duly assigned their places. The ferries along the river-front are 11 in number, of which 8 are steam-ferries and 3 skiffs.

The commercial position and trade of New Orleans are of the highest interest. Situated near the mouth of a river that gives secure harbor for vessels of all draughts known to navigation, the city concentrates the ocean and coast-bound commerce of 100 navigable rivers and more than 20,000 miles of navigable channel. The area of the Valley of the Mississippi is 1,240,000 sq. m., with a population, largely agricultural, of more than 17,693,180 souls. New Orleans has long been the chief cotton-mart of the world, and one of the chief sugar-marts. Its greatest commerce, as indicated by these two staples, was reached in 1861, when there were received 2,255,448 bales of cotton and 460,000 hhds. of sugar. The following statistics will illustrate the present magnitude of the trade of New Orleans: In the years 1874–75 there were received from the interior 1,157,597 bales of cotton from a total crop of 4,170,000 bales; sugar, 154,779 hogsheads and 337,916 barrels of molasses; rice, 104,415 barrels; tobacco, 8636 hogsheads; flour, 917,982 barrels; wheat, 145,000 bushels; hay, 60,000 bales; pork, 72,000 barrels; bacon, 25,000 casks; lard, 27,000 kegs. The total foreign imports of 1873–74 were $14,506,940; duties, $2,992,593. Chief articles of import: coffee, $4,031,782; hardware, $1,084,206; cotton goods, $1,039,655; sugar, $2,827,017. Total foreign exports, 1873–74, $93,259,289. Chief articles of export, 1874–75: cotton, 999,492 bales, value $67,275,000; staves, $662,000; tobacco, $1,214,794.

Entrances, foreign tonnage	487,019	
" coastwise "	258,649;	total, $745,664.
Clearances, foreign "	525,861	
" coastwise "	248,649;	total, $774,511.

Vessels entered this year were 293; tonnage 188,540. Vessels cleared 297, of 202,420 tons.

Manufactures.—In the absence of good water-power and of available skilled labor the manufactures of New Orleans are neither extensive nor valuable. Though the separate establishments, so styled, numbered 911 in 1870, most of them have no real claim to the title. There were 517 steam-engines employed, and 5640 operatives. The total capital invested was $5,751,985.

City Government.—The administration of the city affairs is committed to a mayor and 7 officers styled adminis-

trators, who hold their offices for two years, aided by a board of health with a president, 5 directors, and 5 sanitary commissioners; a surveyor, city attorney, superintendent of fire-alarm telegraph, 2 coroners, a superintendent of the insane, superintendent of house of refuge, warden of the workhouse, a librarian, and a superintendent

City Hall.

of schools. Most of these have their offices in the city hall. The city hall is an elegant white marble building fronting on La Fayette Square. It contains the public library of the common schools, with 7000 volumes, which suffered during the war, and has not grown since.

Metropolitan Police.—The police of the city is under 3 commissioners, with a superintendent or chief of police, 2 sergeants, and about 375 privates. The city is divided into 8 precincts, and 2 suburban precincts served by mounted policemen. A fire-alarm telegraph is under the direction of the police. It has about 94 stations or boxes, reaching within two squares of any portion of the city. The Firemen's Charitable Association has entire charge of the fire department; the police give the alarm. The city and underwriters contribute to the expense of supporting the organization, but no pay is received by the members. There is a chief engineer and 4 assistant engineers. There are 80 companies in the 7 districts, Carrollton included.

The *judicial department* of Louisiana consists of 5 supreme judges, a superior court, and a superior criminal court, all located in New Orleans. The district courts are 7 in number. The first district is a criminal court, and all the rest have general jurisdiction. The 7 courts are served by one criminal and one civil sheriff. Justices' courts and municipal courts for the execution of the city ordinances are also established. The city prison, known as the "Calaboose," is 123 by 129 feet, and cost $200,000. It is very secure, and very healthful, having been several times exempt from yellow fever when the disease was epidemic.

City Assessment.—1860, $121,038,650; 1861, $124,174,403; 1863, $100,869,098; 1865, $98,788,335; 1870, $139,844,204; 1875, $118,637,715. *Debt.*—1865, $7,492,250; 1875, $22,002,030. *Items of Expenditure.*—Firemen's Charitable Association, $169,000; lighting the city with gas, $177,000; police, $479,000; city debt interest, $1,307,500. The city debt, exclusive of all other debt, State, railroad, etc., amounts to nearly 2 per cent. of the entire property. The debt prior to the war was $\frac{8}{10}$ths of 1 per cent.

Religious Sects.—The French, Italian, Spanish, and Irish population of New Orleans is largely Roman Catholic, while most of the American and German residents are Protestants. The various sects in New Orleans have lived without fanatical rancor or bigotry, and in business or friendly associations there appear to be no discriminations on account of creed. The churches (142 in number) are in the main elegant buildings. Those of the Roman Catholics and Episcopalians may be ranked first in architectural elegance. The value of the Roman Catholic churches and school buildings far exceeds that of all the other church property in New Orleans. There are 36 Roman Catholic churches; 25 Baptist, of which 12 are colored; 11 Episcopal; 5 Evangelical Protestant; 1 Greek; 3 Lutheran; 19 Methodist Episcopal, of which 12 are colored; 11 Methodist, of which 1 is colored; 12 Presbyterian, 1 Swedenborgian, 1 Unitarian, and 6 Hebrew.

Among the institutions of learning is the University of Louisiana—law professors 4, medical faculty 10; the literary department is placed at Baton Rouge, and is under military discipline. The Mechanical and Agricultural College has 5 professors; the Dental College 7 professors. The Jesuit College is a flourishing institution. There are several schools and convents under the patronage of the Roman Catholic Church. There is a series of schools, under the care of the Roman Catholic Church, which corresponds to our free schools, as that denomination does not send its children to the public schools. The Peabody Institute, consisting of a high school with 70 pupils, and a normal school with 60 pupils, is in very successful operation. There is one Hebrew educational institution, and two institutions of collegiate grade for the education of colored students are in process of organization. The public schools of New Orleans have justly been a source of pride to the people. They were established about the year 1840, and were in complete operation in 1844. Since emancipation, schools for blacks have been put on the same footing as those for whites, and they have been extensively attended. The number of public schools is 147; teachers, 471; pupils, 14,235. The cost of supporting them, which is an *ad-valorem* tax upon all property in the city, amounts to $460,128 yearly. The schools are under the direction of a superintendent and 19 directors.

There are 24 newspapers—6 daily (1 in the French language) and 18 weeklies; 3 are devoted to the interests of the Grangers. There is also 1 monthly review.

Asylums and Hospitals.—The asylums of the city comprise 46, of very various character and management. Among the most noted of these are several large orphan asylums, Roman Catholic and Protestant, the Widows' Home, and the Asylum for the Old and Infirm. These various benevolent institutions are partly supported at the city's expense. The number of inmates for which the city makes provision is 2345, and the monthly contribution by the city is $3065. The Widows' Home was founded, supported, and is now endowed exclusively by the late Dr. William Newton Mercer of New Orleans. The hospitals of the city are 8 in number, and are variously supported; but the charity hospital is of general jurisdiction, at once a beneficence and an honor to the city. There are 4 others of specific character, and 3 infirmaries.

Hotels and Clubs.—The St. Charles Hotel has long been ranked as one of the first in the U. S. It was destroyed by fire in 1850, but rebuilt in 1852 with greater elegance, being noted for its spacious balcony, portico, and rotunda ornamented with Corinthian pillars. The St. James and the City hotels are spacious and comfortable. The St. Louis, formerly a rival of the St. Charles, has been used as

a State-house since 1874. The restaurants are reputed the best in America, especially those which preserve the "famous creole *cuisine* of ante-war times." There are 20 clubs, literary, dramatic, or social, among which the most notable are the Pickwick, Boston, Jockey, and Shakspeare.

Cemeteries.—Of these there are 33. The oldest ones are situated in the lower part of the city, and belong to the Roman Catholic population. Of late years higher grounds have been selected for the purpose on the ridge-lands of Metairie Bayou on the outskirts of the city. New Orleans is peculiar in the disposition of its dead. The lowness of the ground, being below the flood-level of the Mississippi, renders it impracticable to bury in the earth; hence all interments have to be in sepulchres of some sort. The devices of these are as various as the means and taste of the builders suggest, from the tomb of simple brick masonry to the costly sculptured marble. The general form of the most expensive class is that of a miniature temple, the opening like a door in the front, upon which is placed the inscription. These grounds are laid out in right angles, and the tombs ranged upon the intersecting avenues as streets, realizing more perfectly than anywhere else the idea of "cities of the dead." These avenues are lined with trees of the evergreen class, and wherever practicable are ornamented with cultivated flowers, and around many of the tombs there are little flower-gardens of exquisite beauty. It is obvious that such tenements as these need care and protection against the ravages of time. Consequently, the festival of All Saints' Day (Nov. 1) has a twofold value—to keep in tender recollection those passed from sight, and to keep in repair their resting-places. For a week or two previously, all needful repairs are made, all clearing up, cleaning, and resetting of plants, etc., and on the grand festival-day the whole city unites in its floral decorations. It is a truly beautiful and impressive sight.

The Masons have a grand lodge and 15 subordinate lodges; the Independent Order of Odd Fellows has a grand lodge and 20 subordinate lodges and an encampment; the Heptasophs have 1 grand lodge and 16 subordinate lodges; the temperance organizations have 8 divisions and 6 temples of honor, and there are 5 encampments of Knights Templar, 1 Independent Order of Temperance, 1 division of United Brethren, a grand grove of United Druids and 12 subordinate groves, with a "Norma" or supreme Irish chapter, 10 lodges of Knights of Pythias, 2 of Good Fellows, 1 of United Order of Red Men, and the Hibernian Aid with 16 branches. To these we add 36 independent benevolent associations, and among them the Howards and the Firemen's Charitable Association. Many of these associations have burying-places and mausoleums of their own, and are active in their attention to all strangers and other needy persons coming within their orders.

Defences.—The two principal defences of New Orleans are Forts Jackson and St. Philip on opposite banks of the Mississippi, 83 miles below the city, captured by Gen. Butler in Apr., 1861. Fort Pike is situated on the marsh at the Pontchartrain end, and Fort Macomb at the Lake Borgne end of the Rigolets Pass; Fort Wood is on the W. border of Bayou Chef Menteur; and Fort Macomb, 6 miles S. E. of Fort Pike, is surrounded by unhealthy marshes and has been virtually abandoned. There are 7 admirably disciplined and accoutred military companies.

Of the public monuments of the city, the first in interest is that in honor of the victory of 1815, erected on the old battle-ground, just below the lower boundary of the city. It is a plain granite shaft 100 feet high. An equestrian statue of Gen. Andrew Jackson, cast from the cannon captured by him at the battle of New Orleans, is erected on a granite pedestal in the centre of Jackson Square, formerly the Place d'Armes, opposite the old cathedral. A colossal bronze statue of Henry Clay stands in the attitude of oratory at the intersection of St. Charles and Canal streets. One of Benjamin Franklin, in La Fayette Square, fronting the city hall, is of Powers's finest workmanship. A marble shaft in honor of Gov. Allen of Louisiana stands in Washington Cemetery, and a monument of white marble to the "Confederate dead" in Cypress Grove Cemetery.

The U. S. custom-house, a solid building of Quincy granite, covering an entire square, is, next to the U. S. Capitol, the largest public edifice in the U. S. It contains the offices for the customs, the post-office, the U. S. courts, the internal revenue, the surveyor-general's office, and the receiver and register of the land-office.

Mardi Gras.—The festival preceding the first day of Lent, or Ash Wednesday, is one of special interest in New Orleans, and the city is distinguished for the splendor she gives to her favorite holiday, the "Mardi Gras" or "Fat Tuesday." Most of the distinctive ceremonies now annually performed were originally introduced by the French population as early as 1827, and for many years their celebration was confined chiefly to them. One of the leading features has been the procession of the "Bœuf Gras," the ox gorgeously dressed and attended through the streets with much pomp by large numbers of gayly and grotesquely masked butchers. Everything pertaining to these festivities now comes within the control of an elaborate organization. The day, Mardi Gras, is a legal holiday, and the whole city is for the time ostensibly placed under the control of a King of Carnival, the mysterious and mighty "Rex." There are two principal pageants. The first, in the daytime, is the escort of the "beloved Rex" through his favorite city. He is seated on a magnificent car, high above the heads of the people, his approach heralded as only royalty used to be, attended by his own special guard and foreign soldiery, as well as by the U. S. military and marines. The illusion of a powerful monarch visiting his dominions is most curiously sustained to the minutest detail. The night pageant is known as the "Mystick Krewe of Comus." This has a character altogether unique. The first display was in 1857. The proceedings are kept entirely secret; nothing is known but that the Krewe will again make their appearance, but whence they come, of whom composed, and what is to be the character of the entertainment is kept in profound mystery till they suddenly reveal themselves to the curious and always delighted spectators. It is a series of tableaux, drawn upon immense floats brilliantly illuminated, illustrative of great classic poems or striking events in the world's history, ancient and modern—as "Paradise Lost," "the Iliad," the "Historic Characters of America," "Audubon and his Birds," and the last one "Scenes from the Ancient Scriptures." These displays evince a rare combination of classic erudition, taste, and ingenuity, presented with a completeness and gorgeousness as bewildering as it is beautiful. The day's pageants close with combination tableaux at the theatre, with a ball, and with the grand court-ball of "Rex," at which he chooses a queen, who shares his greatness for the evening. On Twelfth Night (Jan. 6) the "Knights of Momus" have a display analogous to the Mardi Gras, but more exclusively burlesque, in which they satirize the follies of the age.

Health of New Orleans.—Although the liability to yellow fever and to malarial diseases has given New Orleans a reputation for unhealthfulness, the tables of mortality show the city health to be very good. Since the year 1797 there have been 27 epidemics, chiefly of yellow fever, in New Orleans, and since the year 1842 there have been but 9—in the last 18 years only 2; and the great decrease of frequency gives strong hopes that the disinfectants successfully used may enable the city to entirely escape their recurrence. In 1855 the present quarantine was established. It is executed with much rigor; but after disinfectants have been used a few days, the severity is relaxed.

Vital Statistics and Yellow Fevers of New Orleans.

Year.	Population.	Total deaths.	Deaths by yellow fever.	Death-rate.	Death-rate by yellow fever.
1847	120,000 est.	9,336	2804	0.08	0.023
1848	123,500 "	8,191	872	0.06	0.006
1849	127,000 "	10,661	752	0.08	0.006
1853	140,000 "	15,683	7849	0.11	0.056
1854	146,600 "	10,800	2425	0.075	0.016
1855	148,400 "	9,000	2670	0.06	0.018
1858	160,000 "	11,721	4855	0.07	0.030
1867	182,000 "	10,096	3107	0.055	0.020
1873	205,000 "	7,995	226	0.040	0.002

The history of New Orleans dates from 1718, when De Bienville, the newly-appointed governor, ordered the engineer De la Tour to lay it out and to build a levee to protect it from the floods. He built a levee and rampart around the front and on Canal, Esplanade, and Rampart streets—a mile in front and three-fourths of a mile in depth. With various vicissitudes, but always growing slowly, it contained in 1785 about 4780 inhabitants. In 1804, Louisiana was transferred to the U. S. The city was made a port of entry. It contained 10,000 persons, one-half of whom were colored. After the introduction of the steamboat in 1812–20, and the battle of New Orleans in 1815, a stimulus was given to the growth of the city, and her progress to commercial supremacy was very rapid. The ease with which she could now stem the tide of the Mississippi River enabled her to import goods and distribute them to the Mississippi Valley. The telegraph only remained necessary to complete her capacity to take rank among the foremost in commercial position, and that was opened to New York in 1847.

Table of Population.

Year.	Black.	White.	Total.
1830	21,280	25,530	49,826
1860	25,428	149,063	174,491
1870	50,490	142,293	191,413
1876	54,000	161,000	215,000

C. G. Forshey.

New Ox'ford, post-v. of Oxford tp., Adams co., Pa., on the Hanover junction of the Hanover and Gettysburg R. R.

New Paltz, post-v. and tp. of Ulster co., N. Y., 85 miles from New York City, on the Wallkill Valley branch of the Erie R. R., has an academy, 3 churches, 2 newspapers, 2 banks, several hotels and stores. Pop. of v. 425; of tp. 2040. RALPH LEFEVRE, ED. "INDEPENDENT."

New Par'is, post-v. of Jackson tp., Elkhart co., Ind., on the Cincinnati Wabash and Michigan R. R. Pop. 145.

New Paris, post-v. of Jefferson tp., Preble co., O., on the East Branch of Whitewater River and on the Pittsburg Cincinnati and St. Louis R. R.

New Pe'tersburg, post-v. of Paint tp., Highland co., O. Pop. 216.

New Philadel'phia, post-v., cap. of Tuscarawas co., O., in the heart of the Tuscarawas coal and iron ore region, 100 miles W. of Pittsburg, on the Cleveland and Pittsburg and the Lake Shore and Tuscarawas Valley R. Rs., has 2 banks, 1 agricultural tool manufactory, 2 foundries, 1 woollen and 3 flouring mills, 1 boiler and machine works, a salt manufactory, 2 planing-mills, a match-factory, 3 carriage-shops, 1 paper-mill, 3 newspapers, and stores. Pop. 3143. J. L. MCILVAINE, ED. "ADVOCATE."

New Philadelphia, a b. (SILVER CREEK P. O.) of Blythe tp., Schuylkill co., Pa., on the Schuylkill Valley R. R. Pop. 558.

New Philippines. See CAROLINE ISLANDS.

New Plym'outh, post-v. of Brown tp., Vinton co., O., has an academy.

New'port, town in the Isle of Wight, England, on the Medina, which is navigable here. Pop. 7976.

Newport, town of England, in the county of Monmouth, on the Usk, has a very large export-trade in coal and iron, extensive shipbuilding docks, iron-foundries, and manufactures of nails, anchors, etc. Pop. 26,957.

Newport, the south-easternmost county of Rhode Island. Area, 135 square miles. It includes part of the mainland E. of Narragansett Bay, several islands in that bay, and Block Island in the Atlantic Ocean. The soil is generally good, especially that of Aquidneck or Rhode Island, which gives its name to the State. This island has mines of a very hard anthracite coal. Grain, fruit, and wool are leading products. The manufactures include flour, shipping, fish oil, cotton goods, carriages, furniture, etc. The county is traversed by the Old Colony and Newport R. R. Cap. Newport. Pop. 20,050.

Newport, post-v. of Christiana hundred, New Castle co., Del., on the Philadelphia Wilmington and Baltimore R. R.

Newport, post-v. and tp. of Lake co., Ill. Pop. 1289.

Newport, post-v., cap. of Vermilion co., Ind., 1 mile W. of the Wabash River, on the Evansville Terre Haute and Chicago R. R., has 1 seminary, 2 churches, 1 bank, a town-hall, 1 Masonic temple, 1 weekly newspaper, and a hotel. Pop. 398. S. B. DAVIS, ED. "HOOSIER STATE."

Newport, a v. (NEW GARDEN P. O., which see) of Wayne co., Ind. Pop. 343.

Newport, post-v. and tp. of Johnson co., Ia. Pop. 814.

Newport, city, cap. of Campbell co., Ky., on the S. bank of the Ohio River, opposite Cincinnati, and separated from Covington by the Licking River on the W., was first settled in 1791, and is now the third city in the State, the population being 19,802; has a court-house, and the various courts are held alternately in Newport and Alexandria, 16 churches, and a large number of schools and benevolent societies. The principal manufactures are—Swift's iron and steel works, recently enlarged for the manufacture of "chrome steel;" the Anchor iron and steel works; Gaylord's iron and pipe factory and blast furnace; Pomeroy, Peckover & Co.'s stove manufactory; Livezey's steam saw-mill, etc. A detachment of U. S. troops are stationed here. The Louisville Cincinnati and Lexington R.R. passes through the city. A suspension bridge connects this place with Covington, and a railroad bridge supplied with roadways and footways unites it with Cincinnati; two steam ferryboats ply between here and Cincinnati. A street railroad passes through Newport over the Licking River suspension bridge to Covington, and thence over the suspension bridge to Cincinnati; another runs from Newport to Dayton. There are 1 weekly newspaper, 2 banks, a paid fire department, steam fire-engines, and fire-alarm telegraph. J. B. QUINBY, ED. "WEEKLY LEADER."

Newport, post-v. and tp. of Penobscot co., Me., on the Sebasticook River and on the Eastern and Maine Central R. R. Pop. 1559.

Newport, post-v. and tp. of Washington co., Minn., on the Chicago Milwaukee and St. Paul R. R. Pop. 307.

Newport, post-v. and tp., cap. of Sullivan co., N. H., on the Sugar River and on the Concord and Claremont R. R., has 4 churches, schools and high schools, a national and a savings bank, and manufacturing interests. P. 2163.

Newport, post-v. and tp. of Herkimer co., N. Y. Pop. of v. 651; of tp. 1954.

Newport, post-v. and tp. of Carteret co., N. C., on the Newport River and on the Atlantic and North Carolina R. R. Pop. of v. 121; of tp. 968.

Newport, a v. of Cynthiana tp., Shelby co., O., on the Miami Canal and Loramie Creek. Pop. 307.

Newport, post-v. and tp. of Washington co., O., on the Ohio River. Pop. 2002.

Newport, tp. of Luzerne co., Pa. Pop. 1279.

Newport, post-b. of Perry co., Pa., 28 miles W. of Harrisburg, on the Pennsylvania R. R., has 3 banks, 1 newspaper, 1 planing and 2 saw mills, 2 tanneries, 5 churches, 1 furnace, 1 grist-mill, and stores. Pop. 945. H. B. ZIMMERMAN & SON, EDS. "NEWPORT NEWS."

Newport, city, cap. of Newport co. and one of the capitals of Rhode Island, situated near the head of Narragansett Bay, 30 miles S. of Providence. The city has 1 endowed high and several public and private schools, 2 libraries, 5 national, 3 State, and 3 saving banks, 14 churches, 2 societies of Friends, 2 cotton-mills, 1 brass-foundry, the repair-shops of the Old Colony Steamboat Company, 1 daily and 2 weekly newspapers, and a paid fire department with 4 steam and 3 hand engines. Newport is connected with Boston by the Old Colony R. R., with New York by the Old Colony steamboats, and with Providence by the American line of steamers. The U. S. torpedo station is located on an island in Newport harbor. Fort Adams, one of the largest fortifications in America, is situated on a point 1½ miles S. W. of the city. Newport has many antiquities; she claims the oldest newspaper extant in the U. S., the *Mercury,* started in 1758 by James Franklin, nephew of Benjamin; the oldest Methodist Episcopal church building, the Redwood Library (1750), the Statehouse (1742), city hall (1763), besides Revolutionary relics. Hundreds of families spend the summer here. The Society of Friends have had their annual meetings here for over 230 years. Pop. 12,521. F. P. POWERS, ED. "NEWS."

Newport, post-v. and cap. of Cocke co., Tenn., on the Cincinnati Cumberland Gap and Charleston R. R. (NEWPORT DÉPÔT). Pop. 281.

Newport, post-v. and tp., Orleans co., Vt., at head of Lake Memphremagog and on the Passumpsic and the South-eastern R. Rs., has 1 weekly newspaper. Pop. 2050.

Newport, post-v. and tp. of Giles co., Va. Pop. 1007.

Newport, tp. of Isle of Wight co., Va., contains SMITHFIELD (which see). Pop. 2906.

Newport, tp. of Warwick co., Va. Pop. 733.

Newport, a v., Winfield tp., Marion co., West Va. P. 68.

Newport, tp. of Columbia co., Wis., contains KILBOURN (which see). Pop. 1702.

Newport (Capt. CHRISTOPHER), b. in England about 1565; was selected for the command of the squadron which conducted the first permanent English colony at Jamestown, Va., May 13; returned to England in June, and brought over in the following year additional emigrants and fresh supplies; accompanied Capt. John Smith on visits to Powhatan; returned to England; made another voyage to Virginia in 1608, and came again in the fleet bringing the new charter and Lord Delaware as governor 1610; returned to England about 1612, and wrote *Discoveries in America,* republished in the *Archæologia Americana.* The subsequent career of Newport is unknown.

Newport Dépôt, a v. of Cocke co., Tenn. (also called NEWPORT, which see).

New Port'land, post-v. and tp., Somerset co., Me. Pop. 1454.

New Pres'ton, post-v. of Washington tp., Litchfield co., Conn., contains Waramany Academy, founded in 1856, and under the direction of the Congregationalists.

New Pros'pect, tp. of Hale co., Ala. Pop. 1280.

New Prov'idence, tp. of Greene co., Ill. Pop. 480.

New Providence, post-v. and tp. of Union co., N. J., on the Delaware Lackawanna and Western R. R. Pop. 934.

New Read'ing, a v., Reading tp., Perry co., O. P. 95.

New Rich'land, post-v. of Woodville tp., Waseca co., Minn. Pop. 532.

New Rich'mond, post-v. of Clermont co., O., 20 miles N. of Cincinnati, on the Ohio River, has schools, 7 churches, 1 chair-factory, a distillery, woollen, saw, and grist-mills, 1 tobacco-factory, 1 brewery, a public hall, 1 weekly newspaper, 1 national bank, and a loan association. Pop. 2516. WINTHROP FRAZER, PUB. "INDEPENDENT."

New Richmond, post-v. of St. Croix co., Wis., on the North Wisconsin R. R., has 1 weekly newspaper.

New Rie'gel, a v., Big Spring tp., Seneca co., O. P. 236.

New Rochelle', post-v. and tp. of Westchester co., N. Y., on Long Island Sound and on the New York New Haven and Hartford R. R., 20 miles N. E. of New York, has 6 churches, several schools, 5 hotels, and 1 weekly newspaper. Pop. 4194.

New Roe, post-v. of Allen co., Ky. Pop. 145.

New Ross, town of Ireland, county of Wexford, on the estuary of the Barrow. It is an old town, surrounded with walls built in the thirteenth century; it carries on a lively trade and has a good harbor. Pop. 6738.

New Rut'land, post-v. of La Salle co., Ill., 25 miles S. of La Salle, on the Illinois Central R. R., has a graded school, 1 newspaper, 2 wagon manufactories, 1 mill, 2 grain-elevators, 4 churches, several hotels, a coal-mining company, a harness manufactory, and stores. Pop. about 3000.

John Wadleigh, Ed. "New Rutland Journal."

New'ry, town of Ireland, partly in the county of Armagh and partly in that of Down, on the Newry, has iron-foundries, cotton-mills, tanneries, coach and car manufactories, and a lively trade. Pop. 14,181.

Newry, post-v. and tp. of Oxford co., Me. Pop. 416.

Newry, post-v. and tp. of Freeborn co., Minn. Pop. 596.

New Sa'lem, tp. of McDonough co., Ill. Pop. 1233.

New Salem, post-v. and tp. of Pike co., Ill., on the Hannibal and Naples branch of the Toledo Wabash and Western R. R. Pop. of v. 316; of tp. 1418.

New Salem, post-v. and tp. of Franklin co., Mass., on the Springfield Athol and North-eastern R. R. Pop. 987.

New Salem, post-v. of New Scotland tp., Albany co., N. Y. Pop. 219.

New Salem, post-v. and tp., Randolph co., N. C. P. 931.

New Salem, tp. of Union co., N. C. Pop. 2191.

New Salem, post-v. of Walnut tp., Fairfield co., O. Pop. 177.

New San'dec, town of Austria, in Galicia, on the Dunajec, seat of several civil, military, and ecclesiastical authorities, with good educational institutions. Pop. 7079.

New Scot'land, post-v. and tp. of Albany co., N. Y. Pop. of v. 103; of tp. 3411. The tp. also contains Clarksville and New Salem (which see).

New Sew'ickley, tp. of Beaver co., Pa. Pop. 1602.

New's Ferry, post-v. of Halifax co., Va., on the Richmond and Danville R. R.

New Sha'ron, post-v. of Mahaska co., Ia., 12 miles N. of Oskaloosa, on the Central R. R. of Iowa, possesses good schools, 2 churches, a printing-office, and several mills and hotels. The neighboring soil is well adapted to agriculture. H. J. Vail, Ed. "Star."

New Sharon, post-v. and tp. of Franklin co., Me., on Sandy River, whose falls afford excellent water-power, utilized by various manufactures, and in the vicinity is a fine granite-quarry.

New Shore'ham, post-v. and tp. of Newport co., R. I., comprising Block Island, on the eastern shore of which is the village. Pop. 1113.

New Sibe'ria, a group of islands in the Arctic Ocean, situated N. of the mouth of the Lena, East Siberia, between lat. 73° and 76° N. They are uninhabited, and covered with snow and ice all the year round, but they are interesting, and even important, on account of the remains of vegetable and animal life which they contain; large quantities of ivory are dug out of the ground every year. Indeed, some of the islands are believed to be nothing but an accumulation of drift-timber and bodies of mammoths and other antediluvian animals frozen together.

New Site, post-v. and tp. of Tallapoosa co., Ala. P. 800.

New'som's, v. (Newsom's Dépôt P. O.) and tp., Southampton co., Va., on the Seaboard and Roanoke R. R. P. 1883.

New South Wales, a colony of Great Britain in the south-eastern part of Australia, extending along the South Pacific Ocean from Point Danger, in lat. 28° 8′ S., to Cape Howe, in lat. 37° 31′ S., and stretching inland to the 141st meridian, bounded by the colonies of Queensland, South Australia, and Victoria. Area, 308,560 square miles, of which, however, only a very limited part is regularly settled. Pop. 539,190, most of whom are of English descent, some Germans, and a larger proportion of Chinese and aborigines. The whole district is traversed from N. to S. by a range of mountains running parallel with the coast at a distance of from 100 to 150 miles from the shore. The northern part of this range is called the Liverpool Hills, the middle the Blue Mountains, and the southern, which contains the highest peak, Mount Kosciusko (6500 feet), the Australian Alps. Though these mountains everywhere indicate the presence of immense volcanic powers, they contain no active volcanoes. Towards the coast they present a steep and rugged face, rent with frightful fissures and crags, rising into fantastic peaks, and sending out a multitude of high, wild spurs, from which many short but deep and rapid rivers rush to the ocean; as, for instance, the Richmond, Clarence, Manning, Hunter, and Shoalhaven. Towards the interior, on the contrary, they slope gradually, forming the large basin of the rivers Murray and Darling, whose numerous affluents during the dry season generally form only strings of pools. They are very rich in coal, copper, lead, and tin, and gold is found in many places. The coal-fields around New Castle are considered almost inexhaustible, and the coals are of superior quality; in 1867 no less than 5,000,000 tons were raised. Gold was first discovered in 1851, and the value of that exported increased in the second year from £468,336 to £2,660,946, and in 1871 to £2,347,000. The soil is everywhere rich. In the northern and hotter part of the colony cotton, sugar, rice, and other tropical products are raised; in the southern and more temperate part wheat, oranges, peaches, grapes, and mulberries are grown. Wine and silk culture has succeeded very well. There are circumstances, however, which have hitherto prevented agriculture from becoming the principal industry of the colony. Severe droughts seem to be periodical, and occur every tenth or twelfth year. Rain often fails to come for long periods, and when it does come it pours in torrents. Hot winds often rise over the deserts of the inland and sweep down on the lower country, raising the thermometer to 120°, and making the grass dry as hay; the leaves turn yellow and the grapes shrivel and fall. The chief industry is sheep-breeding, carried on on the western slopes of the mountains; 48,748,000 pounds of wool were exported in 1871, amounting to £11,974,000. The value of the exports was in the same year £14,558,000. The colony was founded in 1788 as a penal establishment; transportation ceased, however, in 1840. To the discovery of the gold-mines the colony is indebted for its rapid progress. Chief town, Sydney, with 134,756 inhabitants.

Newspaper. See Journalism.

New Spring'field, post-v. of Springfield tp., Mahoning co., O. Pop. 142.

New'stead, tp. of Erie co., N. Y. Pop. 3380.

New Straits'ville, post-v. of Salt Lick tp., Perry co., O., on the Columbus and Hocking Valley R. R.

New Stras'burg, v. of Amanda tp., Fairfield co., O. P. 44.

New Swe'den, tp. of Nicollet co., Minn. Pop. 568.

Newt, a vernacular name in England employed for the aquatic Gradientia or salamanders—*i. e. Triton cristatus* and *Lissotriton punctatus*—and extended sometimes to related forms.

New Testament. See Bible, The.

New'ton, county of N. W. Arkansas. Area, 800 square miles. It is hilly, with fertile valleys. Lead and other metals abound. Corn, tobacco, and live-stock are leading products. Cap. Jasper. Pop. 4374.

Newton, county of Central Georgia. Area, 400 square miles. It is uneven and fertile. Cotton and corn are staple products. The county is traversed by the head-streams of the Ocmulgee River and by the Georgia R. R. Cap. Covington. Pop. 14,615.

Newton, county of N. W. Indiana, bounded W. by Illinois. Area, 430 square miles. It is level and fertile, but its N. part contains extensive marshes. Corn and oats are leading products. The county is traversed by the Columbus Chicago and Indiana Central R. R. Cap. Kentland. Pop. 5829.

Newton, county of Central Mississippi. Area, 576 square miles. It is uneven and fertile. Cotton and corn are leading products. The county is traversed by the Vicksburg and Meridian R. R. Cap. Newton. Pop. 10,067.

Newton, county of S. W. Missouri. Area, 650 square miles. It is bounded W. by Kansas and the Indian Territory. It is fertile, well timbered, and abounds in lead, zinc, and other ores. Live-stock, corn, and tobacco are leading products. The county is traversed by the Atlantic and Pacific R. R. Cap. Neosho. Pop. 12,821.

Newton, county of S. E. Texas, separated from Louisiana by the Sabine River. Area, 964 square miles. It is heavily timbered. Cotton, corn, pine and cypress lumber, and live-stock are among the leading products. Cap. Newton. Pop. 2187.

New'ton, post-v. and tp. of Dale co., Ala. Pop. 640.

Newton, tp. of Conway co., Ark. Pop. 514.

Newton, post-v. and cap. of Baker co., Ga., on Flint River. Pop. 145.

Newton, post-v., cap. of Jasper co., Ill., on the Mattoon and Grayville R. R., has 2 school-houses, 3 churches, a people's bank, 2 newspapers, steam, water, saw, and grist mills, several good hotels, and stores. Pop. about 1000. E. GORRELL, ED. "CLIPPER."

Newton, tp. of Whitesides co., Ill. Pop. 880.

Newton, tp. of Jasper co., Ind. Pop. 468.

Newton, tp. of Buchanan co., Ia. Pop. 981.

Newton, tp. of Carroll co., Ia. Pop. 400.

Newton, post-v. and tp., cap. of Jasper co., Ia., 35 miles E. of Des Moines, on the Chicago Rock Island and Pacific R. R., has 7 churches, 1 national and 2 private banks, 3 newspapers, 2 flouring-mills, several hotels, and stores. Pop. of v. 1983; of tp. 2686.
W. S. BENHAM, ED. "FREE PRESS."

Newton, post-v., cap. of Harvey co., Kan., 135 miles S. W. of Topeka, on the Atchison Topeka and Santa Fé R. R., has a fine school building, 2 churches, 1 newspaper, 1 bank, railroad machine-shops, a brick-kiln, several good hotels, and stores. Pop. about 1200.
H. C. ASHBAUGH, ED. "KANSAN."

Newton, city and tp., Middlesex co., Mass., on the Charles River and on the Boston and Albany and the Boston Hartford and Erie R. Rs., 8 miles W. of Boston, is in a healthy and beautiful region, well supplied with water and gas, has 27 churches, 53 public schools, the NEWTON THEOLOGICAL INSTITUTION (which see), Laselle Female Seminary, 2 academies, a lyceum, a free and 3 other libraries with about 12,000 volumes, 2 asylums, a national and a savings bank, a fire department, a large number of manufactories, 2 weekly newspapers, and a cemetery in the centre of the city of about 90 acres. Pop. 12,825.

Newton, post-v. and tp., Calhoun co., Mich. Pop. 975.

Newton, post-v. of Newton co., Miss., 64 miles E. of Jackson, on the Vicksburg and Meridian R. R., is located in a fine cotton-growing section, and has 2 schools, 3 churches, 1 bank, 1 mill, 1 cotton-gin, 1 newspaper, and stores. Pop. 154. R. H. HENRY, ED. "NEWTON LEDGER."

Newton, tp. of Barton co., Mo. Pop. 802.

Newton, tp. of Shannon co., Mo. Pop. 193.

Newton, tp. of Taney co., Mo. Pop. 603.

Newton, post-v. and tp. of Rockingham co., N. H., near the Boston and Maine R. R. Pop. 856.

Newton, tp. of Camden co., N. J. Pop. 8437.

Newton, post-v., cap. of Sussex co., N. J., on the Sussex and the Morris and Essex R. Rs., 62 miles from New York City, has excellent schools, a collegiate institute, a public library, 2 newspapers, 5 churches, 2 banks, 1 shoe and 1 spoke factory, and stores. Pop. 2403.
R. F. GOODMAN, ED. "SUSSEX REGISTER."

Newton, post-v. and tp., cap. of Catawba co., N. C., on the Western (N. C.) R. R., 50 miles W. of Salisbury. Pop. of v. 323; of tp. 1695.

Newton, tp. of Licking co., O. Pop. 1283.

Newton, tp. of Miami co., O. Pop. 2241.

Newton, post-v. and tp., Muskingum co., O. Pop. 2389.

Newton, tp. of Pike co., O. Pop. 1138.

Newton, tp. of Trumbull co., O. Pop. 1280.

Newton, tp. of Cumberland co., Pa. Pop. 2345.

Newton, tp. of Luzerne co., Pa. Pop. 1057.

Newton, post-v. and cap. of Newton co., Tex., on Caney Creek.

Newton, tp. of Manitowoc co., Wis. Pop. 1992.

Newton, tp. of Marquette co., Wis. Pop. 609.

Newton (CHARLES THOMAS), b. at Bredwardine, Herefordshire, in 1816; was educated at Shrewsbury School and Christ Church, Oxford, graduating with honors 1837; was appointed in 1840 assistant curator of antiquities in the British Museum, which post he held until 1852, when he obtained the appointment of vice-consul at Mytilene, Asia Minor; spent several years in exploring the islands and coasts of the Ionian Archipelago; discovered at Boodroom in 1856 the site of the mausoleum erected by Queen Artemisia at Halicarnassus; made extensive excavations at Cnidus and Branchidæ, depositing in the British Museum the fine collection of sculptures, vases, coins, and inscriptions acquired by excavation or purchase. In 1860 he became British consul at Rome, and in 1861 keeper of the Greek and Roman antiquities in the Museum.—His wife, ANN MARY, daughter of the painter Joseph Severn, noted as the friend of Keats, b. in 1832, was an accomplished artist, endowed with great skill in portrait and figure drawing, and made admirable copies of the sculptures discovered by her husband. She d. at London Jan. 2, 1866.

Newton (GILBERT STUART), b. at Halifax, N. S., Nov. 2, 1794, son of Henry, a loyalist from Boston; became a pupil of his uncle, Gilbert C. Stuart, the distinguished artist, at Boston; studied for a time in Italy; accompanied C. R. Leslie to Paris and London in 1817, and remained in the latter capital, where he became known as a fine colorist; displayed genius, humor, and pathos in his pictures, excelling in *genre* painting, especially scenes from *Gil Blas* and Molière. He was, however, indolent, unambitious, and fond of society, and consequently effected little. In his later years he suffered from a mental disorder. D. at London Aug. 5, 1835. (See the *Memoir* of Washington Irving and the *Autobiography* of C. R. Leslie.)

Newton (HUBERT ANSON), A. M., LL.D., b. at Sherburne, N. Y., Mar. 19, 1830, and graduated at Yale College, Conn., 1850; became mathematical professor in Yale College in 1855; has written in the *Am. Journal of Science*, and is a member of various scientific bodies.

Newton (Sir ISAAC), b. Dec. 25, 1642 (old style), at Woolstrop, Lincolnshire, England; d. Mar. 20, 1727. He was a posthumous and only child, of excellent family, though greatly reduced in means. He was so small at his birth that he "could easily be put in a quart pot," and so feeble that it was thought he would not survive. At three years of age he was consigned to the care of his maternal grandmother, his mother having married again. He was early sent to the village school, and afterwards to the free grammar school at Grantham. His mother's only wish was to give him sufficient education to enable him to fulfil with credit the duties of a country squire. She therefore removed him early from school, and entrusted him with some share in the management of his own estate of Woolstrop. The boy's passion for mechanics and science was so strong that he entirely neglected his less congenial duties. He constructed mechanical toys of great delicacy; one sundial, made in his boyish days, is still in the house at Woolstrop, and another in the Royal Society rooms. His mother, wisely regarding his passion for study, sent him again to school, and in 1660 he was entered at Trinity College, Cambridge. The same year Dr. Barrow was appointed professor of Greek; Newton soon found in him a safe guide and cordial helper, not only in the classics, but also in mathematics. A story is told to the effect that Newton, after having examined the earlier propositions in Euclid, cast it aside as too easy to be worth while studying; but this is probably false. He regretted in his after life not having given to geometry the close attention it merited, but without some knowledge of its fundamental truths and its modes of reasoning he could never have attained the heights which he so early reached. When Newton entered Cambridge the philosophy of Descartes reigned supreme; one of the first books read by the student was undoubtedly Descartes's *Analytical Geometry*. This new application of algebra to geometry had opened up a whole world of new possibility and beauty. Yet, strange to say, Newton scarcely speaks of the Cartesian method, and later, in his *Optics*, fails to do simple justice to Descartes in regard to the theory of the rainbow. Newton had the habit of noting down, as he read, points which admitted of further development. His jottings and the subsequent developments of certain points in Wallis's *Arithmetica Infinitorum* led him to many remarkable discoveries. (See BINOMIAL and FLUXIONS.) These discoveries with which he enriched mathematical science were made before he had completed his twenty-fourth year. It would seem that he recognized the powerful instrument which lay in his hand for the solution of the many problems in physical science, for he neither published his discoveries nor made them known to his friends. Having secured these treasures, he turned his attention toward natural philosophy. In 1661 he had been made sub-sizar, and in 1664 scholar; in 1665 he took his degree as B. A.; in 1667 became junior fellow and M. A.; in 1668, senior fellow; and in 1669 he succeeded Dr. Barrow as Lucasian professor of mathematics. The plague in 1665 drove him to his country-seat at Woolstrop; while there he turned his attention to the subject of *gravity*. Whether the story of the falling apple be true or not, he certainly began to connect the mysterious force which draws bodies toward the centre of the earth with that which holds the stars and planets in their orbits. Taking the known velocity of falling bodies, he made a calculation upon the force necessary to deflect the moon from a right line and make it revolve in its orbit round the earth. One of the quantities in this problem is the length of the earth's radius, of which he took the then accepted measurement. There was a discrepancy between the results of his calculation and the known facts amount-

ing to about one-sixth, which caused him to reject his theory as incomplete, and the magnificent discovery of *universal gravitation* lay neglected for sixteen years. In 1668, Mercator published his *Logarithmotechnia*. His quadrature of the hyperbola involved some of the first principles of the method long before perfected by Newton. Mercator's discovery was sent by Collins to Barrow, and shown by Barrow to Newton. At once the young mathematician laid before his master his own MSS. Barrow was struck by the riches of the collection, and wrote to Collins of it. The copy made at that time was found among Newton's papers at his death; the MSS. were sent to Collins, and their value at once acknowledged by the first mathematicians of the age; but he still refused to publish. Newton's attention was now directed toward the subject of light. We find that as early as 1666 he was engaged in grinding lenses for refracting telescopes. The whole difficulty was then supposed to be due to spherical aberration. (See ABERRATION.) By repeated experiment Newton became convinced that light is not homogeneous, but that a ray of white light is the resultant of innumerable rays of light possessing different colors, rates of vibration, and refrangibility. He assumed, without sufficient ground, that all media possess equal refractive and dispersive powers. He therefore believed that if spherical aberration were obviated by the perfecting of the form of the lenses, chromatic aberration (see ABERRATION) would still render the image dim; he therefore looked upon the perfection of refracting telescopes as hopeless. Newton generally based every theory upon a patient and profound investigation of facts; his one departure in the assumption just mentioned proved a serious stumbling-block in the way of progress in the science of optics, especially in the invention of achromatic telescopes. In 1672 he was elected a member of the Royal Society of London. His first paper was upon some invention in connection with the reflecting telescope. Soon after a communication on light was read before the Royal Society, which stirred up a violent controversy. Newton advocated the material or corpuscular theory; Hooke, the undulatory theory of light. Newton brought forward many remarkable experiments and much mathematical knowledge to his support. Hooke had little more than an hypothesis to offer. The undulatory theory has since been accepted as the true one, though its foundation is far deeper and surer than that laid by its earlier advocates. In 1671, Newton completed a reflecting telescope made with his own hands, which is still in the library of the Royal Society. About this time, in investigating the colors of thin plates, he invented his very ingenious hypothesis of "fits of easy reflection and transmission." In 1682 a new measurement of an arc of the meridian came to his knowledge; this gave him the requisite information to make again his calculation relative to gravity. As he approached its completion his agitation became so great that he was forced to entrust it to a friend to finish. The result justified his intense feeling; observation and calculation corroborated each other; the crowning glory of Newton's life, the magnificent theory of universal gravitation was complete. (See GRAVITY.) His discovery was given to the world under the title *Philosophiæ Naturalis Principia Mathematica* in 1687. This work treats of unresisted motion, of resisted motion, and from them deduces the order of the physical universe. So new and startling an exposition of truth, and one so at variance with preconceived notions, roused vigorous opposition. It was half a century after the publication of Newton's *Principia* before the French mathematicians fully accepted its teachings. In Great Britain the Newtonian philosophy, in spite of its profundity, was early introduced. St. Andrew's College adopted it in 1690, Cambridge in 1699, and Oxford in 1704. For many years his means had been very limited—so much so at times that it is upon the records of the Royal Society of 1674 that the usual dues were not required of him, on account of his inability to pay them. In 1689 he became M. P. for Cambridge. At the expiration of the year Parliament was dissolved. In 1692 an accident, by which he lost the fruit of twenty years of labor, undermined his health and impaired his intellect for a time. The story of this loss—that it was occasioned by a favorite dog which upset a burning candle among his papers and reduced them to ashes—is credited by Biot and pronounced a fiction by Brewster. In 1695 he was appointed warden of the mint, with a salary of from £500 to £600 per annum, and in 1699 he was promoted to the mastership of the mint, with a salary of from £1200 to £1500 per annum. The duties of this office he fulfilled with great ability. For twenty years before his death his niece, Mrs. Conduitt, took charge of his establishment in London. His health became greatly impaired, and in 1625 he went to Kensington to live, and the duties of his office were performed by Mr. Conduitt. On Feb. 28 he presided for the last time at a meeting of the Royal Society; the fatigue produced an accession of his disorder, and he d. in the following month, and was buried with great pomp in Westminster Abbey. Two controversies which embittered Newton's life have not been mentioned—the one with Leibnitz in 1676 in regard to the authorship of the binomial theorem and the infinitesimal method, where both were independent discoverers; and another with Flamsteed, the first astronomer-royal, in his later years. The following is a list of his works, with the dates of their publication: (1) *Principia* (1687); (2) *Optics* (1704); (3) *Arithmetica Universalis* (1707); (4) *Analysis per Equationes Numero Terminorum Infinitas* (1711); (5) *Methodus Differentialis;* (6) *De Mundi Systemata* (1728); (7) *The Chronology of Ancient Kingdoms Amended* (1728); (8) *Table of Assays;* (9) *Optical Lectures* (1728); (10) *Observations on the Prophecies of Daniel and the Apocalypse of St. John* (1733); (11) *A Method of Fluxions and Analysis of Infinite Series* (1736); (12) *A Historical Account of Two Notable Corruptions of Scripture* (1754). The principal works of Newton have been collected and reprinted by Dr. Horsley under the title of *Newton opera quæ extant omnia* (1779–85, 5 vols.). His various communications to the Royal Society are to be found in vols. vii.–xi. of its *Transactions*. S. B. HERRICK.

Newton (ISAAC), b. at Schodack, N. Y., Jan. 10, 1794; became a distinguished naval architect, and constructed more than ninety vessels, including the fine Hudson River steamers Hendrick Hudson and New World. D. in New York City Nov. 22, 1858.

Newton (JOHN), b. at London, England, July 24, 1725; was the son of a sea-captain, with whom he made several voyages to the Mediterranean; was pressed into the navy as a seaman in 1744; became a midshipman; exchanged into a vessel engaged in the slave-trade at Madeira; resided some time near Sierra Leone in the employ of a slave-dealer; returned to England 1747, and for four years thenceforward commanded a Liverpool slave-ship, feeling, as he subsequently said, no scruples as to the nature of his occupation; obtained the surveyorship of the port of Liverpool (then a small place) in 1755; taught himself Latin, Greek, and Hebrew; was deeply affected by the religious movement directed by Wesley and Whitefield; took orders in the Church of England 1764; became soon afterwards curate of Olney, Buckinghamshire, where he formed a close intimacy with the poet Cowper; published a *Narrative* of his early life and remarkable religious experience, and with Cowper wrote the *Olney Hymns*, many of which have passed into popular use in public worship; became in 1779 rector of St. Mary Woolnoth, London; was a leader of the Calvinistic or evangelical party in the Church of England, and author of numerous religious treatises, which at the time enjoyed great popularity, and were collected as his *Works* (6 vols., 1816). D. in London Dec. 31, 1807. (See his *Life*, by Rev. Richard Cecil, London, 1808.)

Newton (JOHN), b. in Virginia in 1823; graduated at West Point, and was appointed second lieutenant of engineers July, 1842; with the exception of some three years at West Point as professor of engineering and while chief engineer of the Utah expedition of 1858, he was engaged in the construction of fortifications on the Atlantic and Gulf coasts until the outbreak of civil war in 1861, when, after serving as chief engineer of the department of Pennsylvania and of the Shenandoah, he was, in Aug., 1861, appointed a brigadier-general of volunteers, and commanded a brigade in the defences of Washington, at the same time performing the duties of an engineer in the construction of those works, until the spring of 1862. With the Army of the Potomac he led his command in the expedition to West Point, at Gaines's Mill, and at Glendale, Va., at South Mountain and Antietam, Md., and at Fredericksburg, Dec., 1862, where he commanded a division; promoted to be major-general Mar., 1863, he commanded the 3d division of the 6th corps in the storming of Marye Heights May 3, 1863; at Gettysburg he succeeded to the command of the 1st corps July 2, 1863, which he retained until the reorganization of the army Mar., 1864, when he was transferred to the West, where he led a division of the 4th corps in the campaign which resulted in the capture of Atlanta., Sept., 1864; commanded various districts in Florida from Oct., 1864, to Jan., 1866, when he resumed duty with his corps, in which he had risen to be lieutenant-colonel, and since that date has been charged with important engineering duties—in removing the obstructions at Hell Gate and other points on the East River, the proposed enlargement of the Harlem River, the improvement of the Hudson from Troy to New York, and of the channel between New Jersey and Staten Island, and of harbors on Lake Champlain.

Newton (ROBERT), b. at Roxby, Yorkshire, Sept. 8, 1780; received a limited education; became a Methodist preacher 1798; became a noted pulpit-orator and evan-

gelist, and for fifty years was constantly engaged in laboring from place to place in Great Britain, chiefly in the service of the British and Foreign Bible Society and the missionary associations. He was four times president of the British Methodist Conference; visited the U. S. in 1839, and attracted great attention by his eloquence. D. in England Apr. 30, 1854.

Newton (THOMAS), D. D., b. at Lichfield, England, Jan. 1, 1704; graduated at Trinity Còllege, Cambridge, where he obtained a fellowship; took orders in the Church of England 1729; became curate of St. George's, Hanover Square, London, afterwards of Grosvenor chapel; was made rector of St. Mary-le-Bow 1744, lecturer at St. George's 1747, prebendary of Westminster 1757, bishop of York 1761, and dean of St. Paul's 1768. He edited Milton's *Poetical Works* (1749–52), with critical and variorum notes, and published *Dissertations on the Prophecies* (3 vols., 1754–58), once considered extremely valuable, but now superseded. D. in London Feb. 14, 1782. His autobiography was printed the same year, and his *Works* appeared in 3 vols., 1783.

Newton Centre, post-v. of Newton tp., Middlesex co., Mass., on the Woonsocket division of the New York and New England R. R., contains the NEWTON THEOLOGICAL INSTITUTION (which see).

Newton Falls, post-v. of Newton tp., Trumbull co., O., on the Ohio Canal.

New'ton Ham'ilton, post-b. of Wayne tp., Mifflin co., Pa., on the Juniata River, the Pennsylvania Canal, and the Pennsylvania R. R. Pop. 350.

Newto'nia, post-v. and tp. of Newton co., Mo. Pop. of v. 463; of tp. 1609.

New'ton-in-Mack'erfield, town of England, in Lancashire, has iron-foundries, glassworks, corn-mills, and manufactures of bricks, tiles, and pottery. Pop. 5909.

Newton Lower Falls, post-v. of Newton tp., Middlesex co., Mass., on the Boston and Albany R. R.

Newton's Rings. See THIN PLATES, COLORS OF.

Newton Stewart, post-v. of Jackson tp., Orange co., Ind., on Patoka Creek. Pop. 90.

Newtonsville, post-v., Wayne tp., Clermont co., O. Pop. 120.

Newton Theological Institution, Baptist, located in Newton Centre, Mass., was commenced Nov. 28, 1825; the act of incorporation was passed Feb. 22, 1826. The first professorship established was that of biblical theology, and the first professor was the Rev. Irah Chase. Revs. Henry J. Ripley, James D. Knowles, Barnas Sears, Horatio B. Hackett, Robert E. Pattison, Alvah Hovey, Albert N. Arnold, Arthur S. Train, Geo. D. B. Pepper, Galusha Anderson, Oakman S. Stearns, Heman Lincoln, and Ezra P. Gould have been professors in the institution. The last three, with Alvah Hovey, the president, and S. L. Caldwell, lately elected, are now holding offices as professors in the institution. This seminary is pleasantly located, 7 miles from Boston, has four public buildings and two dwelling-houses; the library of 12,000 volumes is well selected and constantly increasing; and the funds of the institution amount to about $300,000. It was the first Baptist theological seminary in America.

Newton Upper Falls, post-v. of Newton tp., Middlesex co., Mass., on the Woonsocket division of the New York and New England R. R.

Newtonville, post-v. of Newton tp., Middlesex co., Mass., on the Boston and Albany R. R.

Newtown, post-v. and tp. of Fairfield co., Conn., on the Housatonic R. R. Pop. 3681.

Newtown, tp. of Livingston co., Ill. Pop. 1114.

Newtown, post-v. of Coston tp., Worcester co., Md., on the Pocomoke R. R., is engaged in the lumber, fruit, and produce trade, and has 1 weekly newspaper. Pop. 1195.

Newtown, post-v. and tp. of Queen's co., N. Y., 5 miles from New York City, on the Flushing and North Side R. R., has fine educational advantages, 22 churches, 1 savings bank, an extensive iron-foundry, several ropewalks, 3 newspapers, the largest oilcloth-factory in the U. S., several cemeteries, and stores. Principal industry, garden-farming. Long Island City, including Hunter's Point and Astoria, was a part of Newtown until 1871, when they were set off by legislative act. Pop. 20,274.
GEO. T. WHITE, ASST. ED. "REGISTER."

Newtown, v. of Washington tp., Tuscarawas co., O. P. 98.

Newtown, post-v. and tp. of Bucks co., Pa., 22 miles N. E. of Philadelphia, has a boarding school, a national bank, a State bank, an insurance company, 1 newspaper, an agricultural tool manufactory, a public hall, 4 churches, several hotels, and stores. Pop. of v. 859; of tp. 933.
E. F. CHURCH, ED. "NEWTOWN ENTERPRISE."

Newtown, tp., Delaware co., Pa. Pop. 748.

Newtown, a v. (NEWTOWN STEPHENSBURG P. O.) of Opequan tp., Frederick co., Va., on the Harper's Ferry and Valley branch of the Baltimore and Ohio R. R. Pop. 625.

Newtown, post-v. and tp. of King and Queen co., Va. Pop. 2647.

New'town-Ardes, town of Ireland, county of Down, has several spinning and weaving factories, and considerable trade. Pop. 9437.

Newtown Stephensburg. See NEWTOWN, Va.

Newtownville. See NEWTOWN, Queens co., N. Y.

New Trier, tp. of Cook co., Ill. Pop. 1105.

New Troy, post-v. and cap. of La Fayette co., Fla.

New Ulm, post-v., cap. of Brown co., Minn., on the Minnesota River and the Winona and St. Peter R. R., has 4 churches, a Catholic nunnery, 1 bank, 2 weekly newspapers, 2 flouring-mills, 1 foundry, 5 breweries, and stores. Pop. 1310. L. S. WISNIOWSKI, ED. "HERALD."

New U'trecht, post-v. and tp. of Kings co., N. Y., on the W. extremity of Long Island, facing the Narrows, and on the Brooklyn Bath and Coney Island R. R. Pop. 3296.

New Ver'non, post-v. and tp., Mercer co., Pa. P. 796.

New Vien'na, post-v. of Clinton co., O., 50 miles E. of Cincinnati, on the Cincinnati and Marietta R. R., contains a Friends' publishing-house, a large graded school, 5 churches, 1 bank, 2 mills, 3 newspapers, and stores. Pop. 573. HILL & HUSSEY, EDS. "OLIVE LEAF."

New'ville, post-v. and tp., De Kalb co., Ind. Pop. 842.

Newville, post-v. of Danube tp., Herkimer co., N. Y. Pop. 112.

Newville, post-b. of Cumberland co., Pa., 30 miles W. of Harrisburg, on the Cumberland Valley R. R., has 7 churches, 2 banks, 1 newspaper, 2 hotels, several flour and 1 paper mill, and stores. Principal business, farming. Pop. 907. J. B. MORROW, ED. "STAR OF THE VALLEY."

Newville, v. of West Donegal tp., Lancaster co., Pa. Pop. 133.

Newville, tp. of Sussex co., Va. Pop. 1369.

New Vine'yard, post-v. and tp., Franklin co., Me. Pop. 755.

New Virgin'ia, tp. of Meeker co., Minn. Pop. 428.

New Wash'ington, post-v. of Cranberry tp., Crawford co., O., on the Mansfield Cold Water and Lake Michigan R. R. Pop. 273.

New Washington, post-v. of Burnside tp., Clearfield co., Pa. Pop. 211.

New Wil'mington, post-v. of Wilmington tp., Lawrence co., Pa.

New Win'chester, post-v. of Marion tp., Hendricks co., Ind. Pop. 124.

New Winchester, a v. of Whetstone tp., Crawford co., O. Pop. 52.

New Wind'sor, post-v. of Rivoli tp., Mercer co., Ill., on Galva and Keithsburg branch of Chicago Burlington and Quincy R. R., has 1 weekly newspaper. Pop. 379.

New Windsor, post-v. and tp. of Carroll co., Md., on the Western Maryland R. R., is the seat of Calvert College. Pop. of v. 396; of tp. 2134.

New Windsor, tp. of Orange co., N. Y. Pop. 2482.

New Wine, tp. of Dubuque co., Ia. Pop. 2046.

New Wood'stock, post-v. of Cazenovia tp., Madison co., N. Y.

New Year's Day. The custom of keeping the first day of the year as a day of festivity is a widely prevalent one, but the day on which the year commences varies much in different countries. In the Roman Catholic Church, since the establishment of the Gregorian year (or new style), it falls upon the festival of the Circumcision, a holiday of obligation, which also is the feast-day of several saints, of whom St. Sylvester is the most widely honored. In the other churches it has no specially religious character. It is a widespread custom to make calls upon one's acquaintances on this day.

New York, "the Empire State," one of the Middle States of the Atlantic slope, and one of the original thirteen of the Revolutionary confederation, extends from the parallel of 40° 29′ 40″ to 45° 0′ 42″ N. lat., and between the meridians of 71° 51′ and 79° 45′ 54.4″ W. lon. from Greenwich. The State is nearly triangular in shape, aside from Long Island, which stretches E. from the S. E. angle of the triangle for 116 miles. It is bounded on the N. and N. W. by the Dominion of Canada, from which it is partly separated by St. Lawrence River, Lake Ontario, Niagara

River, and Lake Erie; also on the N. by Long Island Sound, which washes the N. shore of L. I., and the Atlantic Ocean; E. by Vermont, from which Lake Cham-

Seal of New York.

plain partly separates it, by Mass. and Conn., the lower N. Y. Bay, and the Atlantic Ocean; S. by the Atlantic Ocean, the lower Bay, and the States of N. J. and Penn.; and W. and N. W. by Penn., Lakes Erie and Ontario, and Niagara River, which divide it from the Dominion of Canada. Its greatest length from N. to S. is 311⅝ miles; its greatest breadth from E. to W., including L. I., is 412 miles. Its area is 47,000 sq. m., or 30,080,000 acres, including its share of the great lakes—45,658 sq. m. without them.

Face of the Country.—The topography and physical geography of Long Island are fully described under that title. (See Long Island.) The surface of New York is greatly diversified. It has numerous chains of hills and mountains, many beautiful valleys, much gently-rolling land, and some extended plains. For topographical purposes it is divided into three sections of unequal size by the deep depression of Lakes Champlain and George and the Hudson River, and by the narrower valley at right angles with this, through which the Mohawk flows, and which furnishes the natural route for the Erie Canal. These sections are—E. of the Hudson, N. and S. of the Mohawk and Erie Canal, and are designated E., N., and S. sections. E. of the Hudson there is a continuation of the Green and Hoosac ranges southward, reaching the Hudson in Putnam co., opposite West Point, reappearing on the W. side of the river as the Kittatinny Mountains. The northern section has 6 distinct and nearly parallel ranges of mountains, besides two ridges or plateaus of lower altitude. These ranges all trend from N. E. to S. W., and at their eastern termini abut either on Lake Champlain, Lake George, or St. Lawrence River or its tributaries. They are, beginning at the S. E.—(1) the Palmertown range, from the vicinity of Whitehall S. W. to the lower part of Saratoga co. (2) The Kayaderosseras or Luzerne Mountains, beginning at Ticonderoga, passing along the W. side of Lake George through Warren and Saratoga cos. to Montgomery co. (3) The Clinton or Adirondack range, proper, beginning at Point Trembleau on Lake Champlain, passing through Essex, Warren, Saratoga, Hamilton, Fulton, and a part of Montgomery co. to Mohawk River. This range contains the highest summits in the State—Mount Marcy or Tahawas, whose height is variously stated at from 5379 to 5467 feet; Dix Peak, 5200 feet; Mount McIntyre, 5183 feet; Sandanoni and Mount McMartin, each about 5000 feet; Dial Mountain, about 4900 feet. It also forms the watershed between the tributaries of the St. Lawrence and those of the Hudson and Mohawk. (4) The Au Sable or Peru range, beginning still higher on Lake Champlain, near the mouth of Au Sable River, and trending S. W. through Essex, Hamilton, and Fulton cos. into Montgomery. White Face is the highest mountain of this range, its altitude being 4855 feet, while Mounts Pharaoh and Taylor are each about 4500 feet. (5) The Chateaugay range, which commences near the northern extremity of Lake Champlain in Canada, passes through Clinton, Franklin, and Hamilton cos. to Herkimer co. and the Mohawk River. It maintains an average height of nearly 2000 feet through its whole course, while Mount Seward is 5100 feet, and several of its summits approach 4000 feet in height. (6) The St. Lawrence range, parallel with the last and about 10 or 12 miles N. of it, follows the course of the southern shore of the St. Lawrence. The broad plateau known as the Highlands of Black River is about 60 miles in length and from 1200 to 1600 feet in height. Between these Highlands and the Mohawk is a ridge about 20 miles long, nearly 9 miles broad at its base, and having a general elevation of 800 or 900 feet, known as Hassencleaver Ridge. The section S. and S. W. of the Mohawk and the Hudson may be divided into two sub-sections—the eastern, which includes three distinct ranges of mountains: viz. (1) the Highlands of Orange and Rockland cos., having a general N. E. direction and coming to the W. shore of the Hudson; (2) back of these, the Shawangunk Mountains, skirting the valley of the Rondout; (3) and most considerable, the Kaatsberg or Catskills, called the Helderberg Mountains near the Mohawk. The Catskills are rather a group of mountains than a chain. They cover a region of somewhat more than 500 square miles, having between 30 and 40 peaks, the most noted of which are Round Top, High Peak, Black Head, Overlook, and Pine Orchard, which range from 3000 to 3900 feet in height. The Helderbergs are lower. The Shawangunk summits do not rise above 2000 feet, and the Highlands range from 1100 to 1700 feet. S. W. of these, in Sullivan and Delaware cos., the Blue Mountains—or Delaware Mountains—take their rise. Near their junction with the Kaatsbergs their summits are 2700 or 2800 feet, but elsewhere not above 1400–1600 feet. The western sub-section of this southern section is a series of terraced plateaus rising from the shore of Lake Ontario, first, to the Ridge Road—supposed to have been the ancient southern shore of Lake Ontario, and now 300 feet above it: this terrace extends from the Genesee to the Niagara above the Falls; second, from the Ridge Road to the falls of the Genesee at Nunda and Portageville, where there is an abrupt wall of rock about 300 feet in height, and the entire height is about 900 feet; from this point there is a gradual ascent to the summit-level at a height of from 1500 to 2000 feet in Chautauqua, Cattaraugus, Allegany, and Steuben cos., the water-courses having eroded the limestones, through which they passed, at numerous points, making beautiful waterfalls, some of them of great height, as the Taghkanic and Watkins Glen falls. The greater portion of these terraces are fertile and beautiful plains. The valleys of the Mohawk, of the upper Hudson, and of the Delaware, Susquehanna, etc. are also very beautiful and fertile.

Rivers, Lakes, Bays, etc.—The Hudson River is the principal river. It is navigable to Troy, nearly 160 miles. It has many tributaries, of which the Mohawk is the most important. The others are Schroon, Hoosick, Battenkill, Kinderhook, and Croton on the E., and Wallkill, Rondout, Esopus, Kaaterskill, and Sacandaga on the W. The Chazy and Saranac are the largest streams flowing into Lake Champlain. St. Lawrence River washes the northern boundary of the State for nearly 100 miles, and has several important affluents from the State, among which are the Oswegatchie, Indian, Grasse, Racket, St. Regis, and Salmon. Oswego River—which was the original outlet of the lakes in Central New York, and, in connection with the Oswego Canal and River improvement, is navigable for canal-boats and steamers for 120 miles—Black River, and the Genesee all flow into Lake Ontario, the last furnishing immense water-power and being the outlet of four or five small lakes; Niagara River, connecting Lakes Erie and Ontario; the Alleghany, one of the constituents of Ohio River, has a course of 50 miles in the State; the Susquehanna, with its tributaries, the Tioga and Chenango; and the Delaware, with its E. and W. branches, and its affluents, the Little Delaware, Mongaup, and Neversink,—are the most important of the other rivers which drain the State. It is stated that there are 281 miles of river-navigation for steamboats in the State. *Lakes.*—The State is remarkable for its lakes. Many of these are navigable, there being 352 miles in length of lake-navigation. The eastern end of Lake Erie, one-half of Lake Ontario, and one-half of Lake Champlain belong to New York. In the N. E., Lake George, Schroon Lake, and about 200 smaller lakes, in Warren, Essex, and Hamilton cos., add great beauty to the landscape. In Central New York there are three groups of lakes, the easternmost consisting of Otsego, Schuyler, Cazenovia, and Summit. Farther W. commences a chain consisting of Oneida, Onondaga, Otisco, Cross, Skaneateles, Cayuga, Seneca, Crooked or Keuka, and Canandaigua lakes. Still farther W. is another chain of 5 lakes—Owasco, Honeoye, Canadice, Conesus, and Silver Lake. In the S. W. corner of the State is Chautauqua Lake. There are numerous smaller lakes in the S. E. counties, and two or three on Long Island. A remarkable feature of the natural scenery of New York is its waterfalls. The Falls of Niagara need no description, and those of Trenton, the Watkins Glen, the Taghkanic, and the numerous falls near Ithaca are equally noteworthy in their kind. The falls of the Genesee at Rochester, and the High Falls in the same river at Portage, the falls at Ticonderoga and those in the Adirondacks, are worthy of mention. *Islands.*—The most important islands are Man-

hattan, Long Island, and Staten Island; numerous smaller islands surround these, as Randall's, Ward's, Blackwell's, Governor's, Bedloe's, and David's around New York—Coney Island, Fire Island, Shelter Island, and a great number of islands in Long Island Sound. There are many small islands in the Hudson River; about 1500 in the St. Lawrence, of which one-half belong to New York; many in Lakes Erie, Ontario, and Champlain; and about 400 in Lake George. *Bays, Sounds, etc.*—The bays belonging to Long Island have been already described. The upper and lower New York bays form one of the finest approaches to a great harbor in the world. Staten Island Sound is rather a strait than a sound, as is also the East River, but Long Island Sound beyond it is almost an inland sea. The Hudson River forms a broad expanse near Haverstraw, known as the Tappan Zee. There are several small bays and harbors on the New York coast of Lake Ontario, and Buffalo and Black Rock harbors on Lake Erie.

Geology and Mineralogy.—The geology of New York is peculiar. While in some parts of the state nearly every formation is found from the lowest Eozoic rocks to the recent alluvium, the whole Carboniferous era, as well as the upper members of the Devonian and the Permian and Jurassic formations, have no place in its geology, and very little of the Lower Tertiary deposits occurs. There are traces of anthracite coal, an inch or two in thickness, found between the strata of older rocks, but nowhere is there evidence of the existence of the coal-measures. The following table gives the various formations of the State in their order:

QUATERNARY	Alluvium, marsh-mud, and sand.	
TERTIARY	Drift.	
	Pleistocene, boulders, clays, and sands.	
	New red sandstone?	
CRETACEOUS	Lower Cretaceous, mostly on N. shore of Long Island.	
DEVONIAN	Old red sandstone.	
	Catskill group, conglomerates of the Catskills.	
	Portage group	Portage sandstone,
		Gardeau flagstone,
		Coshaqua shales.
	Genesee slate.	
	Tully limestone.	
	Hamilton group	Moscow shales,
		Encrinal limestone,
		Ludlow shales.
	Marcellus shales.	
	Corniferous limestone.	
	Onondaga limestone.	
	Schoharie grit.	
	Cauda-Galli grit.	
	Oriskany sandstone.	
UPPER SILURIAN	Upper pentamerous limestone.	
	Delthyris shaly limestone.	
	Pentamerous limestone.	
	Tentaculite limestone.	
MIDDLE SILURIAN	Water-lime group.	
	Onondaga salt group	Gypsum,
		Green shales,
		Red shales.
	Niagara group, coralline limestone.	
	Clinton group.	
	Medina sandstone.	
	Oneida conglomerate, Shawangunk grit.	
	Hudson River group.	
LOWER SILURIAN	Utica slate.	
	Trenton limestone.	
	Black River limestone.	
	Birdseye limestone.	
	Chazy limestone.	
	Quebec group, including roofing-slate.	
	Calciferous sandstone.	
	Potsdam sandstone.	
EOZOIC	Huronian rocks, specular ore-beds of St. Lawrence and Jefferson cos.	
	Granite, gneiss, hypersthene.	
	Volcanic and metamorphic rocks, Palisades, etc., trap and porphyry.	

With a few words on the distribution of these formations we must refer our readers to the elaborate treatises on New York geology. The Eozoic rocks are found in the S. E. portion of the State, in a part of Rockland, Putnam, Westchester, and New York cos., and also occupy a large tract in the N. E. of the State, including a part of Clinton and Franklin, the whole of Essex, Warren, and Hamilton, the greater part of Herkimer, and a part of Lewis, St. Lawrence, Jefferson, Fulton, Saratoga, and Washington cos. The Potsdam sandstone occupies a narrow belt immediately N. of this Eozoic region, and also a small tract in Jefferson co. The Lower Silurian groups—the Calciferous sandrock, Quebec group, and Chazy limestone—are found along the W. shore of Lake Champlain, the S. shore of the St. Lawrence to a point a few miles above Ogdensburg, and the region E. of the Hudson from Whitehall to Putnam co., and there crossing the Hudson reappear in Orange co. The Lower Silurian—Birdseye, Black River, and Trenton limestone—occupy more than one-half of Jefferson co., and thence extend in a narrow belt around the lower edge of the great Eozoic tract already described. The Utica and Lorraine slates occupy the region between the last formations and the Mohawk River to Utica, and thence both sides of the Mohawk and the W. side of the Hudson as far N. as Sandy Hill, and S. to a short distance above Poughkeepsie, where they turn W. in a broad belt into Orange co. The Oneida conglomerate and Medina sandstone of the Middle Silurian are found from Oneida Lake on the E., along the S. shore of Lake Ontario to the Canada line, extending in breadth to the Ridge Road. S. of this, and parallel with it in a narrow belt, the Clinton and Niagara groups extend E. to Schoharie, and the Onondaga salt group follows in a more irregular but somewhat wider belt. The four lower groups of Devonian—Lower Helderberg, Oriskany sandstone, Cauda-Galli grit, and Upper Helderberg—are found in a band, not more than 5 miles wide, extending from Buffalo to Albany co., and thence S. W. to Delaware River at Port Jervis; and immediately S. of this the Marcellus shales, Hamilton group, and Genesee slate occupy a broader and irregular belt, dipping S. around the shores of the Central New York lakes through Madison, Otsego, and Schoharie cos., and, like the preceding, turning S. W. till they reach the Pennsylvania line. S. of this the whole southern tier of counties belongs to the Portage and Chemung groups, except a few outcrops of the Catskill red sandstone. The new red sandstone only makes its appearance in the S. part of Rockland co., and as it approaches Hudson River, the trap and porphyry which constitute the Palisades have forced their way through it. The Cretaceous formations come to the surface only on the northern shore of Long Island, while Drift and Alluvium overlie the other formations in much of the State. *Minerals.*—The most important of these is iron, of which there are magnetic, red and brown hæmatite, specular, and bog-iron ores, and, in Dutchess, Essex, and Clinton cos., carburet of iron or plumbago. Galena or lead ore is found in St. Lawrence and other cos. in large quantities. Zinc, copper, arsenic, manganese, barytes, strontian, and alum occur in various parts of the State, but do not possess much economic value. Salt springs, from which a vast amount of salt is made, occur along the line of the Onondaga salt group, especially in Onondaga co. Gypsum and water-lime accompany them. The State abounds in building material; its granite, white and colored marbles, Potsdam and Medina sandstones, and gray and blue limestones, as well as its excellent clay and sand for brick, furnish a sufficiency of material for its dwellings; but while it exports some of these, it imports more from other States and countries. Its quarries furnish also large quantities of slate, and flagging-stones, and trap-rock for paving purposes. Serpentine, soapstone, talc, asbestos, amianthus, magnesia in several forms are among the minerals of merely scientific value. The State has numerous mineral springs of high repute—the chalybeate and saline at Saratoga, sulphur in Madison and Monroe cos., acid in Genesee, Erie, and Orleans, those evolving nitrogen gas, as in Columbia, Rensselaer, and Seneca cos., and those possessing magnetic or electrical qualities, as in Tompkins co. In Chautauqua, Dutchess, Oneida, and Monroe cos. are illuminating gas-springs. Fredonia, in Chautauqua co., has utilized this gas for lighting its streets and dwellings, and the lighthouse at Barcelona in the same county is illumined by it.

Soil and Vegetation.—Notwithstanding the mountainous and broken character of much of its surface, the greater part of the soil of New York is arable, and some of it very fertile. Most of the mountainous districts are fine grazing-lands, and yield the best milk, butter, and cheese. The plains and valleys are adapted to the culture of cereals, and the N. and N. W. counties to root-crops. Oneida, Madison, Otsego, and a part of Chenango are engaged in hop-culture. Tobacco is cultivated in several counties, grapes on the islands of the Hudson and on the shores of the Central New York lakes, and Indian corn in almost every part of the State. Market-gardening is extensively practised in the vicinity of the large cities, and great quantities of fruit are grown in the central counties. The forest trees of the State present a great variety, and a few years ago nearly one-half the area of the State was covered with forests, but the great demand for timber, lumber, and hemlock and oak bark, for building ships, houses, railroads, and for tanning purposes, has much reduced the forest area. The State has ten genera of the pine family, including the hemlock, balsam fir, black and white spruce, and tamarack, and the allied species of red and white cedar, arbor vitæ, and Canada yew. There are ten species of oak, of which the white oak is the most valuable and the most abundant; three species of elm, three of ash, five of maple, the sugar-maple being the most plentiful; the black walnut and butternut, and four species of hickory;

the beech, chestnut; three species of birch; the sycamore, several species of poplar, numerous willows; the robinia or locust; the tulip tree or whitewood; the linden or bass-wood; the ironwood or hop hornbeam; the ailanthus and its cousins, the sumachs; the *Magnolia glauca*, the cornel or dogwood, and various alders, elders, the buttonbush, the shadbush, and spicewood, are the principal other forest growths.

Zoology.—The State, in its geological and natural history survey, ordered in 1836, included the geology, mineralogy, palæontology, agriculture, botany, and zoology of the entire State, and the results were given in a series of magnificent quarto volumes fully illustrated, of which 22 have been published, and others are yet to come. The zoology occupies 5 volumes. According to this work, there are among the mammals 1 species of opossum, 5 bats, 2 moles, 6 shrews, the black bear, raccoon, wolverine, skunk, fisher, Pennant's marten, pine marten, 2 weasels, the ermine-weasel or stoat, the mink, the otter; 30 varieties of dogs, 5 of them native; 2 species of wolf, the gray and black; the panther, Canada lynx, wild-cat or bay lynx; the seal, hooded seal, and walrus. Of rodents, there are the gray fox, the red or common fox, 4 species of squirrel, the woodchuck, the Labrador rat, the beaver, muskrat, porcupine, the Norway or brown rat, 2 species of black rat, 8 species of mice, the gray rabbit, and the prairie hare. Of hoofed animals, besides the domestic animals, there are the fallow-deer, the elk, moose, stag, and reindeer. There are nine cetaceans in the waters of the State—6 whales, 2 porpoises, and the grampus. The number of fossil mammals is increasing by frequent discoveries. Three of the elephant family have been found in the State—the original fossil elephant, the American elephant, and the mastodon; of the latter, nearly 20 skeletons, more or less perfect, have been exhumed. Fossil skeletons of several other animals occur. Six orders of birds are found in the State—birds of prey, birds of passage, the cock tribe, waders, lobe-footed birds, and swimmers. Of the birds of prey, there are 3 families and 26 species; of the birds of passage, 20 families and 146 species; of the Gallinæ or cock tribe, 2 families and only 6 species of undomesticated birds; of the waders, 7 families and 57 species; of the lobe-footed tribe, 1 family and 5 species; of the swimmers, 6 families and 65 species. There are three orders of reptiles—the turtle, lizard, and serpent tribes. There are 17 species of turtles, tortoises, and terrapins, 2 of lizards, and 2 venomous and 17 or 18 harmless serpents. Of the Amphibia or batrachians there are four families—the frog tribe, comprising 12 species; the salamander tribe, of which there are also 12 species; the triton tribe, 4 species; and the proteus tribe, 2 species. The number of fishes is very large. The bony and cartilaginous fishes are both represented, the first by 6 orders, and the second by 3. Of the first, there are 28 families and about 270 species. Of the second, there are 4 families and over 30 species. The crustaceans include 10 orders and about 60 species. Of mollusks, there are 6 orders and a large number of species, many of them edible.

Climate.

METEOROLOGICAL DATA.	Moriches, Suffolk co., lat. 40° 48′, lon. 72° 50′; elev., about 40 ft.	New York City, lat. 40° 42′ 43″, lon. 74° 00′ 03″; elev., 165.60 ft.	Albany, lat. 42° 40′, lon. 74° 45′; elev., 174 ft.	Oneida, Madison co., lat. 43° 04′, lon. 75° 42′; elev., 430 ft.	Rochester, lat. 43° 08′, lon. 77° 51′; elev., 584 ft.	Buffalo, lat. 42° 53′, lon. 78° 55′; elev., 662 ft.	Oswego, lat. 42° 28′, lon. 76° 35′; elev., 299 ft.	Gouverneur, St. Lawrence co., lat. 44° 19′ 30″, lon. 75° 27′; elev., —.	Ludlowville, Tompkins co., lat. 42° 34′, lon. 76° 34′; elev., ——.	Little Genesee, Allegany co., lat. 42° 02′, lon. 77° 46′; elev., ——.
Temperature:	°	°	°	°	°	°	°	°	°	°
Annual mean temperature..	54.2	51.4	47.3	46.4	46.5	45.7	46.5	44.1	46.1	44.4
Highest temp. of year......	102	93	92	90	96	87	94	90	96	92
Lowest " "	−10	4	−16	−26	−5	2	0	−28	−2	−18
Range " "	112	89	108	116	101	85	94	118	98	110
Mean temp. of spring......	49.6	46.2	41.3	43.5	41.2	38.9	40.9	41.6	43.6	40.5
Highest " "	79	86	85	84	87	77	86	85	88	85
Lowest " "	20	15	5	10	7	9	10	0	6	−18
Range " "	59	71	80	74	80	68	76	85	82	103
Mean temp. of summer.....	73.2	71.7	68.1	67.1	68.1	67.2	66.5	66	66.5	65.9
Highest " "	102	93	92	90	96	87	94	90	96	92
Lowest " "	26	50	44	42	45	45	47	40	38	42
Range " "	76	43	48	48	51	42	47	50	58	50
Mean temp. of autumn......	58.4	52.2	45.2	51.7	48.1	48.2	49.5	47.1	45.9	43.6
Highest " "	90	86	86	90	90	84	86	81	89	85
Lowest " "	20	20	19	14	14	16	13	16	8	2
Range " "	70	66	67	76	76	68	73	65	81	83
Mean temp. of winter.......	33.2	34 3	27.4	23.5	28.5	28.5	29.3	18.1	28.0	27.1
Highest " "	62	69	57	51	69	60	64	52	60	60
Lowest " "	−10	4	−16	−26	−5	2	0	−28	−2	−6
Range " "	72	65	73	77	64	58	64	80	62	66
Rainfall:	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
Annual rainfall.............	71.38	42.63	48.00	77.36	47.17	39.37	41.22	40.21	49.37	36.50
Rainfall of spring..........	19.56	11.03	9.26	13.48	10.87	6.56	5.98	7.78	11.97	6.55
" " summer........	11.36	8.62	13.43	27.75	8.00	6.60	12.89	8.68	10.01	12.91
" " autumn.........	23.46	13.64	14.24	22.97	14.64	13.62	11.54	13.57	15.54	9.81
" " winter..........	17.00	9.34	11.07	13.16	13.66	12.59	10.81	10.18	11.85	7.23

The mean temperature of the State, derived from about 1500 observations at 59 localities in the State, is 46° 49′; the mean annual maximum of heat from the same number of observations is 92°; the mean annual minimum is −12°; the annual range of the thermometer is 104°. The average date when robins were first seen, from 266 observations, was Mar. 19; the shadbush commenced blooming May 1; peaches in bloom (southern and middle portions of the State, only 175 observations) May 2; currants, plums, cherries, apples, and lilacs in bloom in this order from May 4 to May 15; strawberries ripe June 9 to 12; hay-harvest commences (average of the State) July 8; wheat-harvest commences July 25; first killing frost (471 observations) Sept. 23; first fall of snow (536 observations) Nov. 5. The climate is generally healthy; the death-rate, even in the large cities, is below the average of the country. Diseases of the throat and lungs, and in the summer diseases of the bowels, are most fatal in the E. counties, while bilious affections are more prevalent in the W. counties.

Agricultural Productions.—In the value of her farms and general farm-products New York is the first State in the Union. The following table gives the statistics of the value of her farms, etc. and the amount of her principal crops and her live-stock, according to the U. S. census of 1870 and the agricultural report of 1874:

CROPS, ETC.	Census of 1870.	Report of 1874.
Value of farms..........	$1,272,857,766	
Value of farming implements, etc..........	45,997,712	
Value of farm productions for the year....	253,526,153	
Animals slaughtered or sold for slaughter	28,225,720	
Home manufactures..........	1,621,621	
Forest products..........	6,689,179	
Market-garden products..........	3,432,354	
Orchard products..........	8,347,417	
Wages paid for farm-labor, includ'g board.	34,451,362	
Wheat for year, bushels..........	12,178,462	9,161,000
Rye " "	2,478,125	1,834,000
Indian corn " "	16,462,825	16,807,000
Oats " "	35,293,625	30,302,000
Barley " "	7,434,621	6,463,000
Buckwheat " "	3,904,030	2,917,000
Flax " pounds..........	3,670,818	
Wool " "	10,599,225	
Hops " "	17,558,681	
Hay " tons..........	5,614,205	5,291,800

CROPS, STOCK, ETC.	Census of 1870.	Report of 1874.
Tobacco for year, pounds..........	2,349,798	1,593,000
Maple-sugar " "	6,692,040	
Sorghum and maple syrup, gall's..	53,880	
Irish potatoes, bushels..........	28,547,593	25,423,000
Peas and beans, "	1,152,541	
Beeswax, pounds..........	86,333	
Honey, "	896,286	
Value of all live-stock..........	$175,882,712	$153,006,101
Number of horses..........	856,241	665,800
Number of mules and asses..........	4,407	18,500
Number of milch cows..........	1,350,661	1,467,000
Number of working oxen..........	64,141	669,900
Number of other cattle..........	671,428	
Number of sheep..........	2,181,578	1,996,400
Number of swine..........	518,251	
Dairy products, butter, pounds....	107,147,526	
" " cheese, "	22,769,964	586,300
Milk sold, gallons..........	135,775,919	

Manufactures.—The manufacturing industry of the State is of vast amount, New York being in this the first State in the Union. The statistics of her manufactures in 1875 are not yet revised for the State census of that year, but

we give those of 1865 and 1870, and the leading articles in parallel columns in the table below. In 1865 there were 17,525 manufacturing establishments in the State, employing 170,811 persons, using $227,674,187 capital and $280,690,812 of raw material, and producing goods to the value of $457,133,717. The U. S. census of 1870 showed a great advance on these figures. There were 36,206 manufacturing establishments, employing 351,800 persons (267,378 men, 63,795 women, and 20,627 children); the amount of capital reported was $366,994,320; wages paid, $142,466,758; raw material, $452,065,452; goods annually produced, $785,194,651.

MANUFACTURES.	Hands employed, 1870.	Capital invested, 1870.	Annual product, 1870.	Hands employed, 1865.	Annual product, 1865.
		$	$		$
Agric. imps	4,953	7,824,656	11,847,037		
Bleaching and dyeing	398	482,050	2,938,345		
Bookbinding	2,261	1,685,078	4,557,119		
Boots, shoes, and findings	11,730	4,967,606	18,196,938		
Boxes, packing and paper	2,812	1,202,900	3,837,860		
Bread and bakery products	3,457	2,673,142	9,566,153		
Brick	6,728	3,416,280	4,483,202		
Brooms	3,026	1,084,345	3,135,723		
Carpets	3,424	4,251,750	4,976,835		
Car'ges and cars	9,800	7,571,140	13,018,974		
Cheese-factories	2,934	2,329,400	12,164,065		
Clothing, ready-made	31,984	15,887,477	50,098,916		
Coal oil, etc	183	699,500	2,702,680		
Coffee and spices roasted, etc	309	1,513,600	4,706,200		
Collars and cuffs, linen & paper.	4,207	992,650	3,198,678		
Confectionery	1,398	1,377,700	3,942,391		
Cooperage	4,332	2,223,366	4,945,434		
Cotton goods	9,144	8,511,336	11,178,211	4,651	10,863,125
Drugs & chem'ls	1,046	2,299,700	4,578,857		
Flour-mill prods	3,810	16,844,970	52,636,861	4,134	45,400,045
Furniture	9,634	9,078,363	16,275,111		
Furs dressed	2,029	2,183,917	7,028,488		
Glass, all sorts	2,373	1,272,176	2,433,623		
Gloves and mit.	3,112	2,071,350	3,507,795		
Grease & tallow	110	201,800	3,316,207		
Hardware, all sorts	2,280	2,313,385	3,145,397		
Hats, caps, etc	5,870	3,020,983	10,686,073		
Hoop-skirts and corsets	2,480	1,079,000	2,866,619		
Hosiery	3,741	3,318,700	5,528,742		
India-rubber & elastic goods	1,008	1,777,000	3,076,720		
Iron and iron manufactures.	22,537	29,859,200	48,047,079		
Jewelry	3,618	5,124,250	9,757,856		
Lead, manufs. of	103	1,073,000	12,188,300		
Leather, tanned and dressed	8,069	16,116,228	36,507,800	5,802	24,971,708
Liquors dist'ed, malt & vinous	3,331	14,283,662	19,297,274		
Lumber, planed and sawed	13,268	15,541,897	25,038,045	10,067	13,987,564
Machinery	11,488	13,910,230	20,584,656		
Malt	824	3,647,066	6,052,132		
Marble-w'k, etc.	3,188	2,831,750	6,200,209		
Molasses and sugar refined.	864	6,375,000	42,837,184		
Musical ins., etc.	2,860	3,344,150	5,452,923		
Oils, an. and veg.	2,701	1,136,615	4,828,924		
Paints	572	1,817,500	3,350,500		
Paper	4,085	7,164,100	10,557,563	2,245	5,315,056
Patent med., etc.	646	1,552,250	3,322,467		
Printing goods	590	280,000	3,317,100		
Printing & pub.	6,301	7,402,017	14,854,573		
Saddlery & har.	3,239	1,743,080	3,660,929		
Sash, doors, and blinds	3,632	3,637,966	6,138,771		
Sewing-mach'ns and fixtures	3,667	3,019,576	7,606,448		
Shipbuild'g, etc.	2,448	2,449,350	4,973,805		
Soap and candles	1,019	2,360,575	6,125,018		
Starch	1,348	1,895,375	4,678,413		
Tin, copper, and sh't-iron ware	5,013	4,372,821	8,130,944		
Tobac. & cigars.	10,243	6,226,046	18,940,658		
Upholstery	1,600	1,941,700	2,923,251		
Wooll'n g'ds, etc	8,834	10,101,032	14,707,485	4,992	7,410,882

Railroads and Canals.—(1) *Railroads.*—There were on Jan. 1, 1875, 164 railroads operated with steam in the State; the total length of these roads was 11,019.47 miles; the length in the State 9217.69 miles, including sidings. The length of roads in operation in the State was 7615.48 miles; of these, 3670.25 were double track. The length of equivalent single track would have been 12,507.77 miles. The total cost of construction and equipment was $598,543,930.24. The amount of capital stock authorized was $611,298,810; the amount of capital stock paid in was $402,365,070.95; the amount of funded debt, $291,681,017.17, and of floating debt, $30,801,657.06; funded and floating debt together, $324,454,408.91. The number of miles run by freight trains was 43,953,254, and the amount of freight transported, 33,555,595 tons. The gross earnings of the year were $97,951,073.94, and the expenditures except for dividends and surplus, $86,481,988.14; $11,712,066 was paid in dividends, and $3,151,958.62 was carried to surplus fund. Some of the roads earned less than their expenses. There were at the same date 76 street railroads, having a total length of 489.50 miles, the actual length traversed being only 396.57 miles; of this, 253.45 was double track. The number of passengers carried on these roads was 228,372,112. The amount of capital stock authorized was $48,861,500; paid in, $22,408,825; funded and floating debt, $16,991,937.06. The total cost of construction and equipment was $36,600,357.64. The total earnings of the year were $13,195,851.56; the total payments, including dividends, $1,253,073, were $13,237,178.92. (2) *Canals.*—There are 11 canals owned by the State. These with their navigable feeders have a total length of 906.95 miles, and had cost the State, with their equipment, up to Jan., 1875, $100,717,995. The receipts from tolls, etc. for the year 1874 were $2,947,972.91, of which $2,672,787.22 was from the Erie Canal. The expenditure for ordinary and extraordinary repairs, etc. was $2,696,357.30, of which $1,674,889.77 was for the Erie, leaving a surplus of $997,897.45 for the Erie Canal, while all the others had expended more than their income, and $773,474.51 was taken from the earnings of the Erie Canal to supply their deficiency. Besides these State canals, there are two others, partly in this State, which belong to corporations—viz. Delaware and Hudson Canal, of which 87 miles are in this State, and the Junction Canal, 18 miles long. The canal debt outstanding Sept. 30, 1874, was $10,230,430, of which $65,430 was not paying interest. There was in the sinking funds $1,561,018.99 for the reduction of this debt.

Finances.—The State debt on Sept. 30, 1875, was $28,328,686.40, less the amounts held by the different sinking funds, which at that date were $13,581,382.14, reducing the actual debt of the State to $14,747,304.26. The bounty debt of $15,054,500 will be extinguished in 1877, and the canal debt much reduced. The State tax of 1875 raised the sum of $14,206,680.61, and the appropriations of the year were $13,172,805.43, leaving a balance in the treasury, applicable to the reduction of the debt, of $1,033,875.18. There had been great abuses and frauds in the management of the canals and State prisons during several years past, but these have mostly been detected and prevented. The building of the new Capitol and of several insane hospitals and a reformatory had been attended with lavish expenditures, the former, though not half finished, having cost more than $6,000,000, and the latter $3,319,547.79; but so vast are the resources of the State that with economy the debt may be entirely extinguished by 1880.

Immigration.—For the statistics of the commissioners of emigration, see New York City.

Banks.—There were Jan. 1, 1875, 276 national banks doing business in the State; the aggregate capital was $106,004,691; their loans and discounts, $281,459,269.71; the amount of bonds deposited for circulation, $64,414,350; their surplus fund, $32,353,124.47; their undivided profits, $16,681,627.07; specie, $16,118,122.82; their legal-tender notes, $25,099,955; U. S. certificates of deposit, $23,550,000; individual deposits, $269,178,942.51. For the year ending Oct. 1, 1875, there were 84 State banks in operation. The amount of their capital was about $27,000,000; of their loans and discounts, not quite $70,000,000; and the amount due depositors, about $63,000,000. The number of savings banks in July, 1875, was 160; entire number in operation Jan. 1, 1876, was 150. The aggregate assets of these banks July 1, 1875, were $336,308,236.43. They had 891,992 depositors, and the amount of the deposits was $316,335,617.82.

Trust, Loan, and Indemnity Companies.—There were on Jan. 1, 1876, 12 of these companies doing business in the State; 1 was organized Sept., 1875; the other 11 had an aggregate capital paid in of $11,584,475, the total amount of their assets was $69,654,948, and the amount due from them to their depositors was $50,365,569.

Insurance Companies.—On Nov. 19, 1875, there were in the State 102 joint-stock fire insurance companies, 8 mutual fire, 9 marine insurance companies, 22 life insurance companies, and 1 plate-glass insurance company. The balance-sheets of these fire insurance companies for 1875 are not yet reported; for 1874 they were, for joint-stock fire and marine insurance companies, total assets, $55,985,676.01; total liabilities, including capital, $41,227,279.20; surplus over liabilities, $14,771,948.43;

amount of paid-up capital, $26,307,020; premiums received in 1874, $13,398,443.06; losses paid and incurred in 1874, $3,620,564.61; estimated expenses, $4,056,630.77; making a total of $7,677,195.38, and leaving a net profit of $5,721,247.68, and a net loss of $9971.22. The entire amount of risks written was—fire, $1,921,237,417; marine and inland navigation, $49,860,633. The mutual marine insurance companies (not fire and marine nor joint-stock), 9 in number, reported net assets of $21,087,483.27; gross cash income for the year, $11,209,753.59; gross cash expenditures (including dividends of $3,138,625.10), $9,622,772.86; risks in force, $175,561,504; mutual fire companies, net assets, including premium notes, $2,276,691.13; risks in force, $54,045,208; gross cash income, $137,861.66; gross cash expenditures, $117,133.66. The assets of the 22 life insurance companies in the State, Gov. Tilden says, amount to nearly $200,000,000, the amount insured by them to $1,000,000,000, and their annual receipts to more than $60,000,000.

Commerce.—New York receives, and sends from its ports by far the largest part of the foreign commerce of the nation, and by its canals and trunk-lines of railroad it also conveys a large proportion of the internal commerce of the country. The following table gives the imports and domestic and foreign exports at each of the ports or customs districts of the State for the year ending June 30, 1874, and for that ending Jan. 1, 1875, together with the entrances and clearances for the year ending June 30, 1874:

Customs districts and ports.	Imports for year ending June 30, 1874.	Domestic exports for year ending June 30, 1874.	Foreign exports for year ending June 30, 1874.	Imports for year ending Jan. 1, 1875.	Domestic exports for year ending Jan. 1, 1875.	Foreign exports for year ending Jan. 1, 1875.	Entered.			Cleared.		
							Vessels.	Tonnage.	Crews.	Vessels.	Tonnage.	Crews.
	$	$	$	$	$	$						
Buffalo Creek.	2,916,406	460,473	53,949	2,791,211	583,288	7,306	780	241,456	4,888	704	224,130	4,316
Cape Vincent.	524,480	113,110	....	504,230	288,786	....	753	106,217	8,278	736	102,886	8,151
Champlain	2,176,784	1,041,154	34,957	2,083,015	1,144,623	....	1,707	136,870	5,213	1,798	145,612	5,346
Dunkirk	8,628	....	....	4,930	....	....	18	1,258	82	15	957	69
Genesee.........	429,472	367,527	38	393,074	793,301	38	614	67,945	7,558	580	91,577	7,422
New York......	395,133,622	340,360,269	14,633,463	390,938,533	332,447,002	13,361,294	6,723	5,049,618	148,246	6,103	4,837,218	142,062
Niagara..........	4,579,846	351,078	65,371	3,240,297	412,026	68,013	219	45,220	3,249	215	44,827	3,229
Oswegatchie...	1,977,751	605,233	136,264	1,923,601	638,951	183,000	434	88,380	4,877	434	88,856	4,789
Oswego..........	7,200,952	1,724,651	187	6,686,785	1,684,266	43,629	2,613	438,855	18,462	2,463	373,015	17,528
Totals.........	414,947,941	345,023,495	14,924,229	408,565,676	337,992,243	13,663,280	13,861	6,185,819	200,753	13,048	5,909,084	192,922

Internal Commerce.—This can only be estimated in gross, and at best not very accurately. Many of the smaller and more costly articles of merchandise are transported by express companies or as personal baggage, and their value cannot be determined. The value of the tonnage moved on the canals of the State in 1874 is officially estimated by the auditor as $196,674,322. As the freight transported by the canals in 1874 was but 5,804,588 tons, and that of the railroads of the State (exclusive of express freight) was 33,555,595 tons—which being transported at higher rates may fairly be presumed to be of greater value—we are safe in estimating it as at least six times the value of the canal freight—viz. $1,180,045,932—or an aggregate of $1,376,720,254. This does not include that which passed over the Delaware and Hudson and Junction canals, nor the large amounts conveyed by steamers on Hudson River, Long Island Sound, and the lakes. As most of the costlier freight and all the bullion from the mining-regions is moved by express, the total amount of this internal commerce probably exceeds $2,000,000,000.

Population.

Census year.	Total population.	Male.	Female.	White.	Free colored.	Slave.	Native.	Foreign.	Density.	Ratio of increase.	Illiteracy.	Of school age, 5–20.	Of military age, 18–45.	Of voting age, 21 and upward.	Citizens.
1790	340,120	175,597	164,623	314,142	4,654	21,324	....	....	7.24						
1800	589,051	312,667	274,692	557,731	10,417	20,903	....	....	12.53	72.51					
1810	959,049	493,821	465,228	918,699	25,333	15,017	....	....	20.41	63.45					
1820	1,372,812	698,215	674,597	1,332,744	29,279	10,088	....	....	29.21	43.14					
1830	1,918,608	975,796	942,812	1,873,663	44,870	75	....	....	40.82	39.76					
1840	2,428,921	1,231,268	1,197,753	2,378,890	50,027	4	....	....	51.68	26.60					
1850	3,097,394	1,567,941	1,529,453	3,048,325	49,069	....	2,436,771	655,929	65.90	*27.52	78,619	1,053,585	621.904	809,643	598,721
1855	3,466,212	1,729,650	1,738,562	3,417,175	49,037	....	2.528,444	939,768	73.75	11.90	96,489	1,127,868	739,812	895,064	652,322
1860	3,880,735	1,933,532	1,947,203	3,831,590	49,005†	....	2,879,455	1,001,280	82.57	*25.29	72,054	1,255,673	741,856	1,006,326	846,273
1865	3,831,777	1,878,641	1,949,177	3,783,110	44,708	....	2,880,852	948,157	81.53	‖1.26	95,865	1,256,914	712,805	975,884	823,484
1870	4,382,759	2,163,229	2,219,530	4,330,210	52,081‡	....	3,244,406	1,138,353	93.25	§12.93	239,271	1,230,988	881,500	1,158,901	981,587
1875	4,705,208	....	....	....	....	....	....	....	100.11	7.36	....	¶1,579,504	....	....	1,138,330

Education.—(1) *Common Schools.*—The school fund proper on Jan. 1, 1875, was $3,054,772.10, and the revenue from it was $178,813.72. The income of the U. S. deposit fund, which in this State amounts to $4,014,520.71, is also applied to educational purposes, a part of it being applied to increase the amount of the capital of the school fund, and a part to increase its revenue; $165,000 was thus applied in 1874, making the entire amount applicable to common schools from these funds in 1874, $392,372.45. But by far the largest part of the expenditure for common schools is raised by taxation, and in some cases this is supplemented by local funds. The entire receipts for school purposes in 1875 were $12,516,362.96, and the entire expenditure, $11,365,377.79. Of this there was paid for teachers' wages, $7,843,231.67; for school-houses, repairs, furniture, etc., $1,844,347.20. The estimated value of school-houses and sites was $36,393,190. The total number of school-houses was 11,787; number of teachers employed at the same time for the full legal term of school, 19,157; number of teachers employed during any portion of the year, 29,977, of whom 7387 were males and 22,590 females. The average monthly wages was for the cities, $72.28; for the towns, $33.92; for the entire State, $46.68. The difference between the salary of male and female teachers is not given. The number of children attending the common schools was 1,058,846; the average daily attendance, 515,225; the number of persons between 5 and 21 years of age, 1,579,504; the number of persons attending normal schools, 6207; the number of children of school age in private schools, 135,093. The number of private schools was 1436.

* Ratio of increase for ten years.
† Also 140 Indians.
‡ Also 439 Indians and 29 Chinese.
§ 5 to 18.
‖ Decrease.
¶ 5 to 21.

(2) *Academies.*—There were in the State Jan. 1, 1875, 240 academies and academical departments of union schools. These are under the care of the board of regents of the University of the State of New York, an organization consisting of 23 persons, 4 of them State officers *ex-officio*, and 19 appointed by the governor and senate, which superintends the educational condition of the State, holds examinations at the academies and colleges, and an annual convocation of the heads and professors of colleges and academies, and apportions the income of the literature fund annually. The board of regents do not engage in actual teaching, nor perform the usual duties of a university, but they are of great service to the educational interests of the State. They have the power of conferring degrees, but this power is but sparingly exercised. Of the academies, some are of very high grade, and not only prepare students for college, but for business or professional life. The greater part are for pupils of both sexes, but a considerable number are confined exclusively to male or to female pupils. These academies had about Jan. 1, 1876, over 1400 teachers, 25,620 pupils, and received from the literature and U. S. deposit funds about $185,000 annually, aside from their tuition and endowment income.

Besides the following normal schools, there are city normal schools attached to most of the larger city school systems; 108 academies, etc. in the State were authorized in 1874 to instruct teachers' classes; of these, 92 maintained such classes, instructing 2044 teachers (644 males and 1400 females), for which the State paid $29,337.62; 59 teachers' institutes were conducted during the year and attended by 11,478 teachers, at a cost to the State of $18,000; the annual expenditure of the State for the education of its teachers being nearly $290,000.

Normal schools.	When opened.	Instructors.	Normal students.	Pupils in lower departments.			Whole number of graduates.	Value of school property.	Annual receipts.	Annual expenditures.	Volumes in library.
				Academic.	Intermediate or model.	Primary.					
Albany	1844	15	544	.....	145	63	2,041	$84,000	$21,931.50	$21,519.68	2,500
Brockport	1867	18	291	223	187	170	105	140,000	20,514.74	20,275.21	5,507
Buffalo	1871	16	303	.....	7	267	57	127,039	18,510.84	18,481.24	164
Cortland	1869	14	399	27	164	381	120	104,616	20,272.26	17,952.94	6,500
Fredonia	1868	17	237	118	169	239	133	107,750	22,196.31	21,254.45	1,500
Geneseo	1871	17	307	157	188	189	26	93,430	21,162.49	20,819.63	2,500
Oswego	1863	15	429	.....	238	278	587	84,500	17,861.14	17,861.14	2,941
Potsdam	1869	16	365	173	143	114	59	95,004	19,654.38	19,601.13	
New York City	1870	32	971	189	.....	.....	.....	390,000	82,000.00	81,500.00	3,000
Totals	....	160	3,846	887	1,241	1,701	3,128	$1,226,339	$244,103.66	$239,265.42	24,612

Colleges and Collegiate Institutions.

Colleges, etc.	Location.	Date of organization.	Professors and instructors.	Students in preparatory department.	Students in collegiate department.	Value of buildings, grounds, and apparatus.	Endowment.	Income from endowment.	Income from all sources.	Volumes in library.
Colleges for Women:										
Vassar College	Poughkeepsie	1865	35	146	265	$697,347	$331,000	$19,670	$169,894	9,000
Elmira Female College	Elmira	1855	12	81	45	154,800	100,000	7,000	39,500	3.700
Packer Collegiate Institute	Brooklyn	1845	37	662	96	350,000	40,000	3,000	90,000	·5,000
Rutgers Female College	New York	1838	13	84	.....	150,000	....	....	17,824	5,000
Wells College	Aurora	1868	12	.....	76	300,000	100,000	7,000	22,200	3,000
Ingham University	Le Roy	1835	19	85	71	75,000	....	....	9,000	4,600
Colleges, etc., for both Sexes:										
Alfred University	Alfred	1857	22	293	114	80,700	70,000	3,770	9,526	3,400
Cornell University and Sage College for Women	Ithaca	1868	54	.....	.....	850,000	2,753,999	83,635	135,224	48,000
Syracuse University	Syracuse	1871	11	.....	162	300,000	316,187	19,478	23,286	2,500
Colleges for Young Men:										
St. Bonaventura College	Allegany	1859	20	150	80	....	....	....	....	3,000
St. Stephen's College	Annandale	1860	7	22	42	140,000	....	....	23,000	2,000
St. John's College	Fordham	1840	6	.....	120	150,000	....	....	10,000	1,500
St. John's College	Brooklyn	1870	6	.....	120	150,000	....	....	....	150
Canisius College	Buffalo	1870	16	.....	141	....	....	....	....	5,000
St. Joseph's College	Buffalo	1861	23	200	60	75,000	....	....	....	3,500
St. Lawrence University	Canton	1866	9	.....	46	38,750	89,472	6,230	6,707	7,108
Hamilton College	Clinton	1812	13	.....	150	320,000	300,000	18,300	24,800	18,000
Hobart College	Geneva	1824	7	.....	53	67,862	249,814	13,244	13,879	11,970
Madison University	Hamilton	1832	11	.....	101	102,500	344,395	20,199	24,942	10,000
College of the City of New York	New York	1847	39	448	316	275,000	....	....	150,000	19,500
College of St. Francis Xavier	New York	1847	42	242	77	428,000	172,000	....	36,084	16,000
Columbia College	New York	1754	10	.....	172	787,700	4,581,694	208,502	302,937	16,985
Manhattan College	New York	1863	40	420	222	345,000	....	....	62,343	6,500
University of the City of New York	New York	1830	16	.....	146	500,000	100,000	12,000	36,646	4,694
University of Rochester	Rochester	1850	9	.....	156	335,274	170,000	10,000	17,000	12,400
Union College	Schenectady	1795	15	.....	151	400,000	665,000	22,000	28,795	18,000
St. Francis College	Brooklyn	......	14	.....	215	100,000	....	....	33,796	13,970

Scientific and Professional Schools.

Name of scientific or professional school.	Location.	Date of organization.	Number of instructors.	Students, regular course.	Under what control.	Value of buildings, grounds, and apparatus.	Amount of endowment.	Income from funds.	Total annual of income.	Volumes in library.
Schools of Science:						$	$	$	$	
College of Agric. and Mechanic Arts, Cornell Univ.	Ithaca	1868	25	409	State	With Univer'y.				
Department of Science, Univ. of City of New York	New York	1871	4	24	Univ. City of N. York	With Univer'y.				
Engineering School, Union College	Schenectady	1845	15	47	Union College	With College..	......	......	......	3,000
Rensselaer Polytechnic Institute	Troy	1824	13	190	Private	76,000	25,000	......	38,000	3,200
Brooklyn Polytechnic Institute, Scientific Dep't	Brooklyn	1855	5	180	Private	164,064	......	......	65,089	3,000
Columbia College, School of Mines	New York	1863	14	206	Columbia College	With College..	......	......	20,525	5,798
U. S. Military Academy	West Point	1802	46	278	U. S.	....	......	......	......	25,000
Schools of Theology:										
De Lancey Divinity School	Geneva	1860	4	2	Protestant Episcopal..	....	25,796	1,680	......	100
General Theological Sem. Prot. Episcopal Church	New York	1821	6	69	Protestant Episcopal..	650,000	138,750	8,600	......	15,000
Hamilton Theological Seminary	Hamilton	1820	5	42	Baptist	34,000	61,550	1,785	6,000	
Hartwick Seminary	Hartwick	1815	3	4	Lutheran.					
Theological Department, Martin Luther College	Buffalo	1854	4	10	Lutheran	13,000	......	......	......	300
Newburg Theological Seminary	Newburg	1822	3	17	United Presbyterian..	25,000	41,000	3,800	......	3,500
Rochester Theological Seminary	Rochester	1850	7	58	Baptist	75,000	225,000	......	......	9,000
St. Joseph's Provincial Seminary	Troy	1864	6	125	Roman Catholic	......	......	......	......	8,000
Seminary of Our Lady of Angels	Niagara Falls.	1857	17	59	Roman Catholic	150,000	......	......	......	3,000
Auburn Theological Seminary	Auburn	1821	5	48	Presbyterian	150,000	295,500	20,500	......	10,000
Theological Department, Lawrence University	Canton	1858	3	...	Universalist	22,500	92,777	6,494	......	6,682
Union Theological Seminary	New York City	1836	12	116	Presbyterian	200,000	800,000	56,000	......	33,000
Tabernacle Lay College	Brooklyn	1870	9	230	Non-sectarian	80,000				
Schools of Law:										
Albany Law School, Union University	Albany	1851	5	109	Union University	......	......	......	......	5,000
Columbia College Law School	New York	1858	5	522	Columbia College	......	......	......	41,826	4,100
Department of Law, University of City of N. Y.	New York	1857	5	51	Univ. City of N. York	......	......	......	3,100	1,200
Law School of Hamilton College	Clinton	1870	2	13	Hamilton College	......	......	......	780	5,000
Schools of Medicine:										
Albany Medical College, Union University	Albany	1839	8	117	Union University	25,000	......	......	7,202	5,115
Bellevue Hospital Medical College	New York City	1861	18	472	Bellevue H'sp. M. Coll.	......	......	......	50,000	
College of Physicians and Surgeons	New York City	1807	30	452	Coll. Phys. and Surg..	165,000	......	......	31,115	500
Coll. of Physicians and Surgeons, Syracuse Univ..	Syracuse	1872	16	60	Syracuse University..	16,000	......	......	2,000	2,000
Free Medical College for Women	New York	1871	12	48	Free Medical College..	26,500				
Long Island College Hospital	Brooklyn	1860	20	97	Long I. Coll. Hospital.					
Medical Department University of Buffalo	Buffalo	1847	9	101	University of Buffalo..	20,000	......	......	8,454	
Medical Department University of City of N. Y.	New York City	1841	23	360	Univ. City of N. York	50,000	......	......	63,000	
Woman's Medical College of New York Infirmary..	New York City	1864	21	30	N. Y. Infirm. Hospital	2,500	......	2,500	4,500	
Eclectic Medical College of New York	New York City	1865	8	55	Trustees	15,000	......	......	2,500	400
New York Homœopathic Medical College	New York City	1860	20	131	Trustees	10,000	......	......	12,056	
New York Medical College and Hospital for Women	New York City	1863	15	21	Trustees	150,000	......	......	3,375	200
New York College of Dentistry	New York City	1866	18	68	Trustees	......	......	......	5,678	
College of Pharmacy of City of New York	New York City	1829	4	137	Trustees	......	20,000	1,200	7,000	1,000

Special Education.—The institutions for special education in the State are—(1) The New York Institution for the Instruction of the Deaf and the Dumb, in New York City, founded in 1817, which had in Jan., 1875, 18 teachers and instructors, 584 pupils, of whom 337 were males and 247 females, and received from the State for the support of its State pupils, in 1875, $121,819.97. (2) The New York Institution for the Improved Instruction of Deaf Mutes, in New York City, intended to teach articulation and lip-reading; it had in Jan., 1875, 92 pupils; 103 (55 males and 48 females) had been taught during the year. The State appropriation for 1875 was $18,586.66. (3) Le Couteulx St. Mary's Institution for the Improved Instruction of Deaf Mutes, at Buffalo, a private institution, but re-

ceiving State and county pupils since 1872. It had Jan. 1, 1876, 72 pupils (37 males and 35 females), and had 32 State and 20 county pupils at that date, and received from the State $9400, besides the payments from the counties. There are also 2 private institutions for deaf mutes, which do not receive State aid—viz. the School of Articulation, at Aurora, with 2 teachers and 6 pupils, and St. Joseph's Institution, at Fordham, with 6 teachers and 40 pupils. Another institution for deaf mutes is proposed, to be located at Rome, N. Y., for the northern counties, but has not yet been organized. (4) The New York Institution for the Blind, at New York City, which had Jan. 1, 1875, 173 pupils, of whom 147 were State pupils; it received from the State, in 1875, $43,899.32, and $84,000 from other sources; it had 60 teachers and other employés. (5) The State Institution for the Blind, at Batavia, having 150 pupils, and 31 teachers and other employés; it received from the State $52,000, and from other sources $9525. (6) The State Asylum for Idiots, at Syracuse, which had in Jan., 1875, 164 pupils, and received from the State for 1875, $37,500. There are two or three private or city institutions for idiotic, imbecile, feeble-minded, and paralytic children in the State.

Reformatories, Industrial Schools, etc.—With the exception of the State Reformatory at Elmira, now in course of construction, and the Thomas Orphan Asylum for Indian children, on the Cattaraugus reservation near Versailles, none of these are strictly and wholly State institutions, yet the House of Refuge for Juvenile Delinquents, on Randall's Island, and the Western House of Refuge, at Rochester, receive large sums from the State (the former $71,000, and the latter $44,199, in 1875), and nearly all the rest have an appropriation from the educational fund or some other State aid each year. There are 25 or 30 reformatories, industrial schools and mission schools for vagrant children, etc. in New York City (for a fuller account of which see New York City). There are 4 or 5 institutions within a moderate distance from the city which receive considerable numbers of these vagrant children from New York City. Brooklyn and Kings co. have 9 or 10 of these reformatories and asylums. There are local institutions belonging to this class in all the larger and most of the smaller cities of the State.

Charitable Institutions, not Educational.—Of asylums and homes for the aged and infirm there are very many in the State. In the counties of New York, Kings, Richmond, and Suffolk there are 21, and perhaps more; 2 in Utica, 2 in Rochester, and several in other cities and towns. Of hospitals the number is still larger, some of them city or county institutions, but the greater number endowed by some denomination or nationality or by individuals. There are 33 in New York, Kings, and Richmond cos., and one or more in most of the other cities of the State. Of hospitals for the insane the State has 5—viz. the State Lunatic Asylum at Utica, the Willard Asylum for the Insane at Ovid, the Hudson River State Hospital for the Insane at Poughkeepsie, the Buffalo State Asylum for the Insane at Buffalo, the Homœopathic Asylum for the Insane at Middletown, and in addition a hospital for insane convicts at Auburn. There are also county hospitals for the insane in 11 or 12 of the larger counties. There are also corporate institutions, like the Bloomingdale Hospital for the Insane, the Emigrants' Insane Hospital on Ward's Island, and private hospitals for the insane at Flushing, Hyde Park, and elsewhere. The State hospitals received in 1875 $473,600. The New York State Inebriate Asylum at Binghamton has been under the care of the State since 1868. Its annual expenses, paid by the State, are about $10,000. There are several county inebriate asylums, some of them on a large scale.

Penal Institutions.—There are 3 State prisons in the State—Auburn, Clinton, and Sing Sing. On Oct. 1, 1875, there were 1312 prisoners in Auburn, 553 in Clinton, and 1616 in Sing Sing—a total of 3481; and their expenditure for the year previous, including the asylum for insane convicts, was $949,510.44, while the earnings of the prisoners amounted to $368,978.51, leaving an excess of expenditures of $580,531.93. Most of the more populous counties have large penitentiaries, and in 4 or 5 of these State convicts are also placed when the State prisons become too full. The county penitentiaries are usually well conducted, but the county jails, especially in the less populous counties, are often badly managed, and unsafe for the confinement of desperate criminals.

Newspapers and Periodicals.—In 1870 there were 835 periodicals of all classes published in the State, issuing annually 471,741,744 copies, and having an aggregate circulation of 7,561,497. Of these, 87 were dailies, having a circulation of 780,470; 5 tri-weeklies, with 5800 circulation; 22 semi-weeklies, with 114,500; 518 weeklies, with 3,388,497 circulation; 21 semi-monthlies, with 216,300 circulation; 163 monthlies, with 2,920,810 circulation; 19 quarterlies, with 135,120 circulation; and 6 annuals, with 766,000 circulation. Of the whole number, 17 were advertising sheets, 10 agricultural, 12 organs of benevolent or secret societies, 50 commercial or financial, 103 illustrated, literary, or miscellaneous, 6 devoted to nationality, 487 political, 90 religious, 4 sporting, and 56 technical and professional. In 1875 the number of periodicals, according to the *American Newspaper Directory*, had increased to 1086; and while the proportions of the different classes were not greatly changed relatively, there were 100 dailies, 5 tri-weeklies, 15 semi-weeklies, 690 weeklies, 5 bi-weeklies, 27 semi-monthlies, 218 monthlies, and 26 quarterly publications. The number of annuals is not given, but these had increased to 12 or 13. The aggregate circulation of all classes of periodicals was also very largely augmented.

Churches.

Denominations.	Church organizations, 1870.	Church edifices, 1870.	Sittings, 1870.	Church property, 1870.	Church organizations, 1875.	Church edifices, 1875.	Clergymen, 1875.	Church members, 1875.	Adherent population, 1875.	Church property, 1875.
All denominations	5,627	5,474	2,282,876	$66,073,755	6,357	6,057	6,115	555,049	3,934,690	$79,924,896
Baptists	817	795	309,311	7,439,350	898	849	776	114,863	570,400	8,772,450
Freewill and Seventh-Day Baptists	85	84	23,375	162,925	99	97	86	8,146	40,000	273,300
Christians	95	95	28,175	224,850	107	100	89	9,378	45,000	295,250
Congregationalists	268	256	111,785	2,732,500	259	259	219	29,964	149,400	3,127,500
Protestant Episcopalians	475	465	204,290	7,211,150	596	585	709	72,768	360,000	8,318,000
Evangelical Association	25	25	7,300	228,350	31	30	24	3,215	15,000	297,000
Friends	89	87	24,910	596,300	95	93	......	3,788	17,000	718,500
Jews	47	33	21,400	1,831,950	51	40	46	7,642	35,000	2,167,300
Lutherans	190	182	70,133	1,560,500	257	241	129	21,185	84,000	2,271,500
Methodist Episcopalians	1,745	1,702	606,098	11,768,290	1,676	1,648	1,426	164,853	821.500	17,432,996
Methodists, M. Protestants, Free Meths.	......	......	....	....	278	246	267	31,750	150,000	1,157,600
Miscellaneous	4	2	1,000	30,600	4	3	4	350	1,200	35,000
Moravians	6	6	3,000	134,600	7	7	8	750	3,800	160,000
New Jerusalem Ch. (Swedenborgians)	4	3	1,950	175,000	6	5	6	600	3,000	237,000
Presbyterian Church	672	656	325,780	12,786,900	} 738	729	987	113,881	566,440	14,580,000
Pres., United, Associate, Reformed	54	49	24,090	644,140						
Reformed Church (late Dutch)	304	300	147,033	7,076,250	277	278	299	42,545	210,250	7,350,000
Reformed Church (late German)	9	8	3,450	134,000	12	10	8	1,000	5,000	180,000
Roman Catholics	455	453	271,285	8,558,150	704	609	791	....	790,000	10,371,500
Second Adventists	17	11	3,120	45,650	19	13	12	1,723	6,800	50,000
Shakers	3	3	2,300	23,000	3	3	......	950	1,400	28,000
Spiritualists	3	2	580	31,000	3	2	......	500	2,500	30,000
Unitarians	22	19	8,850	715,200	24	21	23	2,100	10,000	810,000
United Brethren in Christ	7	6	1,850	10,200	30	12	26	3,010	12,000	37,000
Universalists	124	120	41,610	1,155,950	89	81	100	4,390	15,000	1,200,000
Local missions	14	14	7,000	580,900						
Union churches	93	98	32,801	216,050	95	98	80	5,700	20,000	225,000

Constitution, Courts, Representatives in Congress, etc.—Under the constitution of 1846, which, as amended, is the governing law of the State, every male citizen of the age of 21 years (except such as may be idiotic or insane, and such as have been convicted of bribery, larceny, or any infamous crime), who shall have been a citizen for 10 days, an inhabitant of the State for 1 year next preceding any election, and for the last 4 months a resident of the county and for 30 days of the ward, district, or precinct in which he may offer his vote, shall be entitled to vote for all officers elected by the people. All elections are by ballot. The legislative power of the State is vested in a senate

and assembly, the former consisting of 32 members chosen for two years; the latter of 128 members, chosen for one year. The executive power is vested in a governor elected for two years. He must be 30 years of age or more, and have been a resident of the State for at least five years next preceding an election. He is chosen at a general State election for the election of members of assembly; and at the same times and places a lieutenant-governor, holding office also for two years. In the alternate years a secretary of state, comptroller, treasurer, attorney-general, State engineer, and surveyor are chosen, also for two years; and at the same times and places 3 canal commissioners and 3 inspectors of State prisons, one of each, each year, for the term of 3 years. The judiciary consists of a court of appeals, composed of a chief judge and 6 associated justices, elected by the people for 14 years, which court has appellate jurisdiction only; of a supreme court in each of the 8 judicial districts into which the State is divided, consisting of 5 justices in the New York district and 4 in each of the others, all elected for 14 years; these courts have general jurisdiction in law and equity. There are also county courts, superior courts, surrogates' courts, and in the cities city courts, courts of general sessions, of oyer and terminer, and police courts. In New York City there is also a marine court and a recently-established court of arbitration.

Counties (60).—

Counties.	Pop. 1870.	Males, 1870.	Females, 1870.	Pop. 1875.	Assessed valuation, 1875.	True valuation, census of 1870.
					$	$
Albany......	133,052	64,775	68,277	147,530	54,636,234	152,055,765
Allegany....	40,814	20,493	20,321	41,721	9,511,099	23,893,857
Broome......	44,103	22,019	22,084	47,913	10.567,500	21,521,822
Cattaraugus.	43,909	22,178	21,731	48,477	19,199,817	20,620,578
Cayuga......	59,550	29,953	29,597	61,213	20.772,208	65,120,255
Chautauqua.	59,327	29,501	29,826	64,869	18,532,112	48,607,170
Chemung....	35,281	17.588	17,693	41,879	10,533,677	22,374,820
Chenango....	40,564	20,379	20,185	39,937	13,274,437	28,396,584
Clinton......	47,947	24,320	23,627	49,761	6,956,450	12,327,960
Columbia....	47,044	23,001	24,043	47,756	23,836,836	45,603,545
Cortland	25,173	12,549	12,624	24,500	7,014,354	11,374,827
Delaware....	42,972	21,929	21,043	42,149	9,705,049	23,305,734
Dutchess	74,041	36,368	37,673	76,056	35,888,103	90,903,798
Erie.........	178,699	89,530	89,169	199,570	61.834,512	162,698,478
Essex........	29,042	14,719	14,323	34,474	6,568,163	10,262,516
Franklin	30,271	14,991	15,280	31,581	5,826,815	17,403,342
Fulton.......	27,064	13,349	13.715	30,188	4,076,541	11,714,680
Genesee......	31,606	15,703	15,903	32,551	14,829,493	45,355,321
Greene	31.832	15,555	16,277	32,544	6,771,129	25,173,279
Hamilton....	2,960	1,638	1,322	3,482	610,187	1,494,320
Herkimer....	39,929	20,152	19,777	41,692	11,905,207	30,931,054
Jefferson	65,415	32,434	32,981	65,362	17,518,436	40.019,235
Kings	419,921	202,024	217,897	509,216	217,867,485	700,000,000
Lewis........	28,699	14,762	13,937	29,236	4,624,742	11,129,312
Livingston...	38,309	18,919	19,390	38,564	15,238,146	44,086,217
Madison......	43.522	21,920	21,602	42,490	11,592,189	13,349,705
Monroe	117,868	58,105	59.763	134,534	42,107,964	82,561,640
Montgomery..	34,457	17,293	17,164	35,200	10,760,890	19,992,006
New York....	942,292	457,117	485,175	1,046,037	1,205,531,580	3,484,268,700
Niagara	50,437	25,010	25,427	51,904	16,076,703	44,959,654
Oneida	110,008	54,022	55,986	113,967	33,665,579	45,912,258
Onondaga ...	104.183	51,960	52,223	113,223	36,770,451	99,658,400
Ontario......	45,108	22,348	22,760	47,730	19,361,602	56,948,816
Orange	80,902	40,146	40,756	85,252	31,936,453	86,267,635
Orleans......	27,689	13,752	13,937	29.977	11,255,641	31,532,509
Oswego......	77,941	38,907	39,034	78.615	16,773,627	44,094,043
Otsego.......	48,967	24,432	24,545	49,815	13,865,043	30,474,171
Putnam......	15,420	7,652	7,768	15,811	5,965,232	13,192,769
Queens......	73,803	36,717	37,086	84,131	32,320,796	26,026,645
Rensselaer...	99,549	48,731	50,818	105,053	31,515,833	110,939,126
Richmond....	33,029	16,164	16,865	35,241	9,151,590	14,444,276
Rockland....	25,213	12,798	12,415	26,951	10,598,851	10.979,456
Saratoga	51,529	25.267	26,262	55,233	14,430,096	36,797,898
Schenectady.	21,347	10,481	10,866	22,892	6.501,649	15,651,240
Schoharie....	33,340	16,603	16.737	32,419	5,944,824	9,948,844
Schuyler	18,989	9,370	9,619	18,928	4,575,161	9,901,295
Seneca	27,823	13,691	14,132	27,299	10,586,912	33,479,935
Steuben......	67,717	34,048	33,669	73,923	14,928,161	36,573,915
St. Lawrence	84,826	42,007	42,819	84.124	16,044,343	51,074,369
Suffolk	46,924	23,295	23,629	52,088	12,642,474	30,317,006
Sullivan	34,550	17,908	16,642	34,935	3,238,977	15,076,043
Tioga........	30,572	15,250	15,322	31,744	7,075,484	15,025,923
Tompkins....	33,178	16,592	16.586	32,915	9,316,916	19,078,639
Ulster........	84,075	42,612	41,463	88,271	15,532,069	45,536,460
Warren......	22,592	11,440	11,152	23,295	3,208,040	7,989,885
Washington..	49,568	25,068	24,500	48,167	15,080,420	45,345,288
Wayne	47,710	23,715	23,995	49,882	16,706,515	46,081,326
Westchester*	131,348	65,739	65,609	100,660	56,167,089	158,410,460
Wyoming....	29,164	14,514	14,650	30,595	9,069,807	27,717,538
Yates........	19,595	9,726	9,869	19,686	8,382,409	14,858,922
Totals......	4,382,759	2,163,229	2,219,530	4,705,208	2,367,780,102	6,500,841,264

Principal Cities and Towns.—Albany, the capital of the State, had in 1875 a population of 86,013; New York, its great metropolis, had the same year 1,046,037; Brooklyn, 484,616; Buffalo, with 134,573 inhabitants, was the only other city in the State having over 100,000. Rochester had 81,673; Syracuse and Troy, not quite 50,000 each; Utica, 32,070; while Yonkers, Newburg, Cohoes, Auburn, Poughkeepsie, Kingston, Elmira, and Oswego ranged between 17,000 and 23,000; 10 cities and towns—viz. Rome, Ogdensburg, Lockport, Schenectady, East New York, Hempstead, Flushing, Binghamton, Long Island City, and Johnstown—range between 12,000 and 16,000; 20 more, including the cities of Kingston and Hudson, and the incorporated villages of Catskill, Plattsburg, Middletown, Newtown, Amsterdam, Oswego, Saratoga Springs, etc., ranged between 8000 and 12,000; and 54 other towns of the State had from 5000 to 8000.

History.—The bay of New York was first discovered in 1524 by Juan de Verrazano, a Florentine navigator in the service of France. In Sept., 1609, Hendrik (or Henry) Hudson, a navigator in the service of the States General of Holland, again discovered the bay, and ascended both it and the Hudson River to a point a little below Albany. On his return, landing in England, he despatched to Holland an account of his discoveries. In 1610 some Amsterdam merchants sent a small vessel to the Hudson River to trade with the Indians for furs, etc. In 1613 two small trading-forts were built on the river and 4 houses erected on Manhattan Island. In 1614 an expedition consisting of 5 vessels was sent out by the States General to explore this region. These explorers ran along the whole length of Long Island, ascended the strait now known as the East River, entered the Sound, and also passed up the Hudson, and along the Jersey coast to the Delaware River, which they ascended for some distance. In Oct., 1614, the States General granted to the explorers the exclusive right to trade between the Delaware and Connecticut rivers for 3 years from that date. In 1615 a fort and trading-house were erected just below the present site of Albany, another on Manhattan Island, and messengers were despatched to the Indian tribes to induce them to trade with the company which they had organized as the United New Netherlands Company. On the expiration of their grant the States General refused to renew it, but they continued to trade thither until about 1623 or 1624, when the Dutch West India Company, a powerful mercantile association chartered in 1621, took possession of the lands temporarily granted to their predecessors. In 1623 they erected Fort Nassau on the Delaware River, and Fort Orange on the site of Albany. In 1624, Peter Minuit was appointed director of the New Netherlands, and brought over colonists who settled on Long Island. Staten Island and Manhattan Island were purchased from the Indians, the latter for $24. Up to 1629 the settlements were simply trading establishments. In that year the West India Company's council granted to certain individuals extensive seigniories or tracts of land with feudal rights over the lives and persons of their subjects. Under this grant Kiliaen van Rensselaer, a pearl-merchant of Amsterdam, secured in 1630 and subsequently a tract of land 24 by 48 miles in extent, composing the present counties of Albany, Rensselaer, and part of Columbia; Michael Paauw purchased Staten Island, Jersey City, and Harsimus; and others, other tracts of great extent. Minuit's administration came to an end in 1632, and he was succeeded by Wouter van Twiller. Van Twiller extended the colonies, planted a new one on the Connecticut River on the site of Hartford, erected a fort there, and furthered the interests of the company. He was succeeded in 1637 by William Kieft, whose administration of 8 years was one of constant turbulence and trouble with the colonists, with the Indians, and with the English settlers on Long Island and in Connecticut. Meanwhile, the colony of the patroon Van Rensselaer at Rensselaerwyck prospered and extended. In 1645, Petrus Stuyvesant was appointed director in Kieft's place, and for 19 years ruled the colony with great ability, though not without many troubles. In Sept., 1664, the colony of New Netherlands, which, in violation of all national comity, Charles II. had granted to his brother, the duke of York, was conquered by the capitulation of New Amsterdam, and its name changed to New York, as was that of Beverwyck to Albany. Col. Nicolls, who had effected the capture, remained governor until 1667, when Col. Francis Lovelace succeeded him. In Aug., 1673, the colony was recaptured by the Dutch, and remained in their possession until the following February, when it was restored to the English by treaty. The feudal relations of the patroons or seigneurs and their tenants and subjects were not materially changed during this period; indeed, other manors were granted with similar privileges. Our space does not permit us to go into the details of the 100 years of colonial rule very fully; elsewhere we have given the names and terms of service of the governors who successively ruled the colony. But few of them possessed conspicuous abilities, and of these few the greater part were constantly involved in controversies with the council or assembly. Governors Hunter, Burnet, Montgomerie, Clarke, De Lancey, Clinton, Moore, and Colden were deserving of respect, and some of them secured the affection of the people. Gov. Tryon, who was governor from 1771 to Oct., 1775, was an able man, but an intense Royalist. On July 9, 1776, the provincial congress, which had been organized in May, 1775, reassembled at White Plains and took the title of "The Representatives of the State of New York." At the same session they approved the Declaration of Independence, which had just reached

* Three towns, whose population in 1875 was 36,206, were set off from Westchester and annexed to New York co. Jan. 1, 1874.

them. New York had from the first taken an active part in the movements which led to the Revolution, though there were many Tories in the State. The earliest captures of British forts, as Ticonderoga, Crown Point, and Skenesborough (Whitehall), were within her limits, while the disastrous battle of Long Island (see LONG ISLAND), the minor actions of Harlem Heights, White Plains, and the capture of Forts Washington and Lee were among the early misfortunes of the New York patriots. New York City and the Hudson below Peekskill, as well as Staten Island and most of Long Island, were occupied by the enemy, the northern border was held by British troops from Canada, and the eastern central counties, along the Mohawk, Schoharie Creek, and the Delaware, were ravaged by Tories and Indians under the leadership of Sir John and Sir Guy Johnson, the bloodthirsty Butlers, and the Indian chief Brant. Yet occasionally the patriots were cheered by success. Burgoyne, descending upon the State from Quebec with a fine army, was harassed, defeated, and compelled to surrender Oct. 17, 1777, near Schuylerville, Saratoga co. The Indian and Tory raids and massacres continued at intervals, but eventually these cowardly foes suffered so severely that they were glad to be quiet. The frequent incursions of Gen. Lord Howe up the Hudson and on Long Island were not productive of very serious losses, and even the treason of Arnold was discovered too soon to cause serious disaster. Its army-quota was kept full through the able management of its governor, George Clinton. Its first State constitution was adopted Apr. 20, 1777, and Gen. Clinton was elected its first governor, and continued in office till 1795. The Articles of Confederation for the States were approved by New York in Feb., 1778. Both in the army and the Continental Congress the State was represented by men of rare ability and patriotism. In the constitutional convention which formed the Federal Constitution her delegates were Messrs. Yates, Lansing, and Alexander Hamilton. The Constitution was ratified by New York July 26, 1788. John Jay, already illustrious as a statesman, was chosen governor in 1795. The practicability of steam navigation was demonstrated on the Hudson in 1807 by Robert Fulton. In the war with Great Britain (1812–15), New York took an active part, and, aside from the victories gained by her heroes on the ocean, many of the minor conflicts and the important land and naval battle of Plattsburg were fought along its northern and north-western frontier. The battle of Lundy's Lane, one of the most decisive of the war, was fought on the Canada side of Niagara River, less than 2 miles from the Falls. Soon after the war the project for a canal from Albany to Buffalo, which had been previously broached, was revived, and in 1817 both the Erie and the Champlain canals were commenced and pushed forward to completion, the latter in 1823, and the former, with great rejoicings, in 1825. A constitutional convention was held in 1821, and a new constitution adopted and ratified by the people. The anti-Masonic excitement in 1826 caused a great commotion and many political changes in the State. The popularity of the Erie and Champlain canals led to a great pressure upon the State for the construction of other canals, unwarranted by the business of the regions through which they were to pass. In an evil hour they were commenced, and have ever since been a constant source of loss to the State. The enlargement of the Erie Canal, begun in 1835, has increased the cost of that great work to $100,000,000, but with advantages perhaps commensurate with its cost. In 1846 another constitutional convention was held, and a new constitution, differing materially from the preceding, adopted and ratified by the people. The interest in public schools continued to increase, and the appropriations voted and taxes levied for their promotion were enlarged every year. In 1845 the annual expenditure for public schools was $1,240,000; in 1875, as we show elsewhere, $11,365,000, or nearly tenfold. The collection of rate-bills was finally abolished in about 1850, and the schools sustained wholly by tax and appropriations from funds. At the commencement of the late civil war New York took an active and prominent part in its aid, and her people were to a greater extent than those of most of the States united in sustaining the government. Her immense quotas were promptly filled, and the State paid $40,000,000 in bounties to its volunteers. The so-called "draft riot" of 1863 in New York City (see NEW YORK CITY) was prompted by other causes than fear of the draft, and was promptly suppressed. In her liberality and bountiful care of her own wounded or sick soldiers during the war, and of their suffering families, the State was not surpassed by any other. In 1867 another constitutional convention was held and a new constitution promulgated, which was, however, rejected by the people, except the articles on the judiciary, which were incorporated into the constitution of 1846, which is yet the governing law of the State, though some further amendments have been adopted.

Governors of the Colony and State.

(Those marked with a star (*) died in office.)

(1) *Under the Dutch.*

Peter Minuit.................1624–33
Wouter van Twiller.......1633–37
Willem Kieft.................1637–47
Petrus Stuyvesant..........1647–64

(2) *Under the English.*

Richard Nicolls.............1664–67
Francis Lovelace...........1667–73

(3) *Dutch administration resumed.*

Anthony Colve..............1673–74

(4) *English administration resumed.*

Edmond Andross...........1674–83
Thomas Dongan.............1683–88
Edmond Andross...........1688–89
Jacob Leisler.................1689–91
Henry Sloughter*.........1691–91
Richard Ingoldsby.........1691–92
Benjamin Fletcher.........1692–98
Rich., Earl Bellemont*1698–1701
John Nanfan.................1701–02
Lord Cornbury..............1702–08
John, Lord Lovelace*...1708–09
Richard Ingoldsby.........1709–10
Gerardus Beekman.........1710–10
Robert Hunter...............1710–19
Peter Schuyler..............1719–20
William Burnet*...........1720–28
John Montgomerie*......1728–31
Rip van Dam.................1731–32
William Cosby*............1732–36
George Clarke...............1736–43
George Clinton..............1743–53
Sir Danvers Osborne*....1753–53
James de Lancey...........1753–55
Sir Charles Hardy.........1755–57
James de Lancey*.........1757–60
Cadwallader Colden.......1760–61
Robert Markton............1761–61
Cadwallader Colden.......1761–65
Sir Henry Moore*.........1765–69
Cadwallader Colden......1769–70
John, Lord Dunmore.....1770–71
William Tryon.............1771–77

(5) *Governors of the State.*

George Clinton.............1777–95
John Jay....................1795–1801
George Clinton.............1801–04
Morgan Lewis...............1804–07
Daniel D. Tompkins......1807–17
De Witt Clinton............1817–22
Joseph C. Yates............1822–24
De Witt Clinton*..........1824–28
Nathaniel Pitcher.........1828–29
Martin Van Buren.........1829–29
Enos T. Throop.............1829–33
William L. Marcy.........1833–38
William H. Seward........1838–42
William C. Bouck.........1842–44
Silas Wright, Jr.............1844–46
John Young..................1846–49
Hamilton Fish...............1849–51
Washington Hunt..........1851–53
Horatio Seymour..........1853–55
Myron H. Clark............1855–57
John A. King................1857–59
Edwin D. Morgan..........1859–63
Horatio Seymour..........1863–65
Reuben E. Fenton.........1865–69
John T. Hoffman..........1869–73
John Adams Dix...........1873–75
Samuel J. Tilden..........1875–77

Electoral and Popular Vote for President and Vice-President.

Election year.	Candidates who received the electoral vote.	Elect. vote.
1792	George Washington P.. / John Adams V.-P......	12
1796	John Adams P........... / Thomas Jefferson V.-P.	12
1800	Thomas Jefferson P.... / Aaron Burr V.-P.......	12
1804	Thomas Jefferson P..... / George Clinton V.-P....	19
1808	James Madison P....... / George Clinton V.-P....	13
	George Clinton P.........	6
	James Madison V.-P......	3
	James Monroe V.-P.......	3
1812	De Witt Clinton P...... / Jared Ingersoll V.-P....	29
1816	James Monroe P........ / D. D. Tompkins V.-P...	29
1820	James Monroe P........ / D. D. Tompkins V.-P...	29
1824	John Quincy Adams P...	26
	John C. Calhoun V.-P....	29
	William H. Crawford P...	5
	Henry Clay P.............	4
	Andrew Jackson P........	1
	Nathan Sanford V.-P.....	7

Election year.	Candidates who received the electoral vote.	Elect. vote.	Pop. vote.	Opposition candidates.	Pop. vote.	Third-party or minority candidates.	Pop. vote.
1828	Andrew Jackson P........ / John C. Calhoun V.-P....	20	140,763				
	John Quincy Adams P.... / Richard Rush V.-P.......	16	135,413				
1832	Andrew Jackson P........ / Martin Van Buren V.-P..	42	168,497	Henry Clay P............ / John Sergeant V.-P......	154,896	William Wirt P.......... / Amos Ellmaker V.-P.....	No report.
1836	Martin Van Buren P...... / Richard M. Johnson V.-P..	42	166,815	William H. Harrison P.. / Francis Granger V.-P...	138,543	Daniel Webster P........ / John Tyler V.-P..........	No report.
1840	William H. Harrison P... / John Tyler V.-P..........	42	225,817	Martin Van Buren P..... / Richard M. Johnson V.-P.	212,527	James G. Birney P....... / Thomas Earle V.-P......	2,798
1844	James K. Polk P........... / George M. Dallas V.-P.....	36	237,588	Henry Clay P............ / T. Frelinghuysen V.-P...	232,482	James G. Birney P....... / Thomas Morris V.-P.....	15,812
1848	Zachary Taylor P......... / Millard Fillmore V.-P.....	36	218,603	Martin Van Buren P..... / C. Francis Adams V.-P..	120,510	Lewis Cass P.............. / Wm. O. Butler V.-P......	114,318
1852	Franklin Pierce P........ / William R. King V.-P.....	35	262,083	Winfield Scott P......... / Wm. A. Graham V.-P...	234 882	John P. Hale P........... / George W. Julian V.-P..	25,329
1856	John C. Fremont P........ / William L. Dayton V.-P...	35	276,007	James Buchanan P...... / J. C. Breckenridge V.-P.	195,878	Millard Fillmore P....... / A. J. Donelson V.-P.....	124,604
1860	Abraham Lincoln P...... / Hannibal Hamlin V.-P...	35	362,646	Stephen A. Douglas P.... / H. V. Johnson V.-P......	312,510	John C. Breckenridge P. / Joseph Lane V.-P......	No report.
						John Bell P............ / Edward Everett V.-P...	No report.
1864	Abraham Lincoln P....... / Andrew Johnson V.-P.....	33	368,735	George B. McClellan P... / George H. Pendleton V.-P.	361,986		
1868	Horatio Seymour P....... / Francis P. Blair, Jr., V.-P.	33	429,883	Ulysses S. Grant P...... / Schuyler Colfax V.-P....	419,883		
1872	Ulysses S. Grant P....... / Henry Wilson V.-P.......	33	440,736	Horace Greeley P........ / Benj. Gratz Brown V.-P..	387,281	Charles O'Conor P....... / ——— V.-P.......	1,454

(For many important documents and statistics used in the preparation of this article the writer is indebted to His Excellency Hon. Samuel J. Tilden, governor of New York.)

L. P. BROCKETT.

New York, county of S. New York, comprising the city of NEW YORK (which see), and having the same limits, population, etc. as the city.

New York, tp. of Yuba co., Cal. Pop. 542.

New York, tp. of Caldwell co., Mo. Pop. 857.

New York [the *New Amsterdam* of the Dutch], the chief commercial city in the U. S., and the most populous, is situated at the junction of the Hudson or North River and the extension of Long Island Sound, familiarly known as the East River. The limits of the city and county (of the same name) are identical, and include the southern portion of the mainland (late part of Westchester co.), known as the towns of Morrisania, West Farms, and King's Bridge, together with the islands Manhattan, Blackwell, Ward, Randall, Bedloe, Ellis, and Governor's, of which the three last named have been ceded for Federal purposes to the government of the U. S. Its extensive and sheltered harbor, 18 miles distant from the Atlantic Ocean at Sandy Hook, is known all over the world for its natural beauty and great commercial advantages. An observation taken by the distinguished astronomer Mr. Lewis M. Rutherfurd at his observatory, corner of Second avenue and Eleventh street, gives lat. 40° 43′ 48″ + 0″.31 N., lon. W. 4h. 55m. 55.73s. from Greenwich. Its distance from Albany, the capital of the State, is 150 miles.

Area.—The total area of the city before the recent additions from Westchester co. was 22 square miles, or 14,000 acres. The additions amount to 13,000 acres. That of Manhattan Island, the seat of population, and divided from the mainland by the Harlem River, is 22 square miles and 20,424 square yards. Of this, 8,712,000 yards are devoted to public parks. The length of the island is 13½ miles, its width averages 1⅝ miles. It is by survey divided into 141,486 lots. The outlying islands are set aside for public purposes, almshouses, penitentiaries, etc. They contain about 300 acres—those ceded to the government, 100 acres. By Gov. Montgomerie's charter, Jan. 15, 1730, the city was divided into 7 wards, which were respectively named West, South, Dock, East, North, Montgomerie, and the Out ward. It is now divided into 24 wards, which are designated by their numbers, 1, 2, etc. The population by decennials is reported by the U. S. census as in

1790	33,131	1840	312,710
1800	60,489	1850	515,547
1810	96,373	1860	813,669
1820	123,706	1870	942,292
1830	197,112		

Of the last statement, 419,094 were foreign-born—234,594 British and Irish and 151,216 German; the rest of other nations. The U. S. census of 1870 gave a total population in the then 22 wards of 942,292, distributed as follows:

1st Ward	14,463	12th Ward	47,497
2d "	1,312	13th "	33,364
3d "	3,715	14th "	26,429
4th "	23,748	15th "	27,587
5th "	17,150	16th "	48,359
6th "	21,153	17th "	95,359
7th "	44,818	18th "	59,593
8th "	34,913	19th "	86,090
9th "	47,609	20th "	75,407
10th "	41,488	21st "	51,703
11th "	64,230	22d "	71,347

The returns of the State census of 1875 will not be made before Jan. 1, 1876.

Commerce.—Nearly 60 per cent. of the foreign trade of the country passes through this port. Of the total imports for the fiscal year ending June 30, 1874, amounting to $595,861,248 for all the U. S., $395,133,622 were by New York, against $200,727,626 for all other ports; of the total exports, amounting to $704,463,120 for all the U. S., $340,360,260 were by New York, against $364,102,851 for all other ports; the total aggregate of inward and outward trade being for all the U. S. $1,300,324,368, of which New York had $735,493,882, and all other ports, $564,830,477. This foreign trade was in the fiscal year ending June 30, 1874, divided geographically as follows: imports from the American continents, $117,524,419; exports to same, $45,999,356; total American foreign trade, $163,523,775. Imports from Europe, $245,130,885; exports to same, $288,581,107; total European trade, $533,711,992. Imports from Asia, $31,275,679; exports to same, $4,823,683; total Asian trade, $36,099,362. Imports from Africa, $1,202,639; exports to same, $956,123; total African trade, $2,158,762. The importation of sugar at the port of New York for the same fiscal year was valued at $49,293,625; of molasses, at $3,066,551; of coffee, at $33,485,559; of tea, at $15,024,794. Imports of wool, raw, $3,956,458, and manufactured, $37,191,046; of silk and silk manufactures, $24,155,711; of manufactures of cotton, $23,709,180; of flax, $14,376,173; of iron and steel, $17,783,924. The principal exports for the same period were of cotton, valued at $41,499,597; of wheat and wheat flour, $77,273,214; of Indian corn and meal, $14,876,603; total breadstuffs, $91,332,669; cheese, $11,624,406; bacon and hams, $23,202,938; beef and pork, $5,366,603; lard and tallow, $20,319,514; of tobacco, $16,117,749; of illuminating oils, $23,121,059. The imports of coin (larger than for some years previous, in consequence of the commercial depression of 1873), $18,401,242, and the exports $50,359,394. Of the total imports, $280,187,426 were of duty-paying articles, and $114,946,196 of articles free of duty; of the duty-paying articles, $276,770,129 were entered for immediate consumption, and $113,351,459 were entered for warehouse. The proportion of imports in cars and vehicles was $70,039; of imports in American vessels, $90,131,181; and in foreign vessels, $304,932,402. Of the total exports, $54,436,965 were exported in American vessels, and $285,923,304 in foreign vessels. The number of entrances of American and foreign vessels, ocean, steam, and sail, at the port of New York for the year ending June 30, 1874, was 6723, tonning 5,049,618 tons, and handled by crews amounting in the total to 148,246 men; of the vessels, 4290 were foreign and 2433 American. Of ocean steam vessels there were entered 1108, tonning 2,792,367, and with crews amounting to 88,042 men; of these steam vessels, 877 were foreign and 231 American.

The most numerous entrances of vessels were from England, 1087, tonning 1,725,272; from Cuba, 1375, tonning 593,476; from Germany, 412, tonning 678,287; from Scotland, 197, tonning 363,797; and from France, 266, tonning 237,105 tons. Of the 877 entrances of foreign steam vessels, there were 386 from England, tonning 1,275,072 tons; 168 from Germany, of 524,451; 133 from Scotland, of 332,339; and 33 from France, of 113,449 tons. Of the 231 entrances of American vessels, all, with one exception, were from the West Indies and South America. The registered tonnage of the customs district of New York was 6630 vessels, of 1,318,523.34 tons, of which 558 were licensed under 20 tons. Of these there were 2810 sailing vessels, with a tonnage of 600,020.42; 788 steam vessels, tonnage 351,686.06; 546 barges, tonnage 123,535.58; 2486 canal-boats, tonnage 243,281.18. The coastwise trade engaged 2742 vessels, tonning 1,774,181 tons, of which 1583 were steam vessels, with a tonnage of 1,517,481, and 1159 sailing vessels, tonning 256,700. The shipbuilding for the year ending June 30, 1874, comprised 89 sailing vessels, 60 steam vessels (of which 39 were for river purposes and 21 for ocean navigation), 196 canal-boats, and 51 barges; a total of 396 of all kinds, tonning 64,001.55 tons.

The transportation to tide-water on the canals from Western States and the interior of New York State amounted in the year 1874 to 3,323,112 tons, and the returns from tide-water to the interior to 753,981 tons. This transportation has been maintained with moderate fluctuations for many years.

The arrivals of immigrants at the port were in 1874, from all ports, 149,762, against 266,449 in 1873, 294,581 in 1872, 228,962 in 1871, and 209,788 in 1870. Of the arrivals in 1874, 41,368 were from Germany, 41,179 from Ireland, 19,822 from England, and 7723 from Russia. A new feature in American immigration is the religious movement of Mennonites, whose faith forbids their taking military service.

Manufactures.—No returns of the State census of 1875 have been officially given showing the amount of manufactures of different kinds in the city of New York. The following are taken from the U. S. census of 1870: There were then 7624 establishments, 1261 steam-engines, 16 water-wheels, employing 129,577 hands, at an annual outlay in wages of $63,824,049, and a capital valued at $129,952,262. The cost of materials used was $178,696,939, and the annual product $332,951,520.

Finances.—The official valuation of the property of the city for the purposes of taxation was for 1875—real, $883,643,845; personal, $217,300,154; total, $1,100,943,699. The taxes levied were—for State purposes, $8,012,386; for county and city, $28,159,086.23; for deficiencies, $196,272.52; total, $36,367,744.75. The total expenditures for the city government were $32,171,472.23; of which the principal items were—for interest on city debt, $9,300,000; for redemption of same, $1,454,763.33; public works, $1,582,000; public charities and corrections, $1,183,000; police department, $3,387,325; fire department, $1,316,000; board of education, $3,583,000; asylums, etc., $825,905; street cleaning, $800,000.

There are 59 banks in the city of New York, with a capital on Dec. 31, 1874, of $85,166,100, a circulation of $24,977,300, and deposits to the amount of $165,918,700. These banks are associated in a clearing-house for their daily exchanges. The transactions of this organization from Oct. 1, 1873, to Oct. 1, 1874, amounted to $20,850,681,962.82. There is also a gold exchange con-

nected with the clearing-house, the transactions of which amounted to the sum of $2,226,832,247.89 for the year 1874. There are also 44 savings banks in New York City, with deposits amounting to $180,010,703 from 494,086 depositors. There are 9 marine insurance companies, with assets reported Dec. 31, 1874, as $25,035,785.62. There are 74 fire insurance companies, with assets reported Dec. 31, 1874, at $44,696,827.73. There are also 20 life insurance companies, with assets reported Dec. 31, 1874, at $189,813,949.93; these companies issued 16,197 policies in 1874, for $41,388,349, and had outstanding at the close of the year 99,737 policies, for an amount of $279,811,858. The business of Brooklyn companies is not here included, nor that of companies of other States or foreign companies, either fire, marine, or life, the city details of which are not reported.

City Courts.—The U. S. circuit court for the southern district of New York has ten counties under its jurisdiction, and holds two general terms and one criminal and equity term each year. The U. S. district court holds a general term monthly and a special term weekly. Both of these courts will occupy rooms in the new post-office. The courts under State law are elected under a general judiciary law, and are the supreme court, the superior court, the court of common pleas, the New York marine court, criminal courts of oyer and terminer, and of general sessions. In addition, there has been established during the past year by act of legislature the court of arbitration of the Chamber of Commerce of the State of New York, the purpose of which is to provide for legal arbitration between all parties making voluntary submission. The cases are heard by the official arbitrator alone or aided by two other arbitrators selected by the parties in dispute. The police courts were remodelled in 1873. They are now under the control of eleven police justices. In the year closing Oct. 31, 1874, the whole number of cases recorded at special sessions for trial was 5567, of which 4869 were of males and 698 of females. Of these, 3205 were convicted, 869 acquitted, 1366 cases dismissed, 121 transferred or pending. The total number of arrests by the police department in 1874 was 90,030, of which 71,260 were for intoxication and disorderly conduct; for crimes of violence, 7860; commitments to the city prisons, 51,466. Of those committed, 41,514 were of intemperate habits. The police furnished 185,124 lodgings at its stations. The cost of the police system is about $4,000,000 a year. The commissioners of public charities and correction have made no official report since 1871, but some details are to be found under another head.

Education.—The public instruction of the city of New York is under the charge of a board of education consisting of 21 commissioners of common schools, which has charge of all the common schools and such corporate schools as share in the school moneys of the State. This board reported the whole number of schools within their jurisdiction Dec. 31, 1874, as 287, including 57 grammar schools for males, 45 for females, 11 for mixed sexes, 47 primary schools, and 64 primary departments. There is 1 female normal school, 1 normal school for teachers, and 1 model training school in connection with the normal college; and there are 13 corporate schools. The public schools are held in 121 buildings, of which 67 are for grammar, 48 for primaries, and 6 for colored. The whole number of scholars taught in 1874 was 251,545, and the average attendance 117,239. The whole number of teachers employed, 3215, of which over 3000 are females. The expense of teachers amounted to $2,433,418.08, and the total cost of the system $3,475,313.20. The amount of State school-tax paid by the city of New York in 1874 was $1,381,445.86, and the total amount received from the State for the schools of the county, $554,191.99. The normal college, the normal school for teachers, and the model school gave instruction to 1996 persons. Of the 512 attendants at the college sessions, 187 were graduated with diplomas. There is also an evening high school, attended chiefly by adults, at which the higher branches of education are taught. In 1873 the board of education was authorized to establish a nautical school, and in 1874 Congress authorized the secretary of the navy to furnish a suitable vessel. A vessel was designated, and the school is now in operation. An act of compulsory education was passed in 1874, and Randall's Island set aside for the reception of delinquents between the ages of eight and fourteen. The College of the City of New York, better known as the Free Academy, is a part of the general system of public instruction, an attendance of one year at some one of the public schools being requisite to admission. It has been in successful operation for twenty-six years. The Roman Catholics have 20 select schools, averaging 1600 pupils, and about 50 parochial schools, with over 20,000 pupils. Of Jewish education there are no returns made public. They chiefly avail themselves of public schools. The Hebrew Free School Association limits its instruction to the Hebrew language. There are two important literary colleges, both of which make annual reports to, and are subject to the visitation of, the regents of the University of the State of New York. The older, Columbia College, was established under the name of King's College by royal charter in the year 1754, and its privileges were confirmed by an act of the State Apr. 13, 1787, and by subsequent acts of the legislature. In the college proper there are 9 professorships and 2 tutorships; in the school of mines there are 8 professorships; in the school of law, 4 professorships, including one of medical jurisprudence. The number of students, undergraduates, in the college in the year 1873 was 123; the number of graduates in the month of June the same year, 21; the number of graduates in the school of mines, 5; the number of graduates in the school of law (bachelors of law), 138. The charge for tuition in the college and school of law is $100 per annum; in the school of mines, $200 per annum. The old site of King's College was on the beautiful square between Murray, Church, Barclay, and Chapel streets (the latter now known as West Broadway). This college, now known as Columbia, occupies an equally beautiful site at the corner of Forty-ninth street and Fourth avenue. The value of the grounds and buildings now occupied is estimated at $800,000, and the total value of its property at $4,582,000. Its revenues reach the sum of $303,000, and its expenditures $208,000. The second of the literary institutions is the University of the City of New York. It has four departments—arts, sciences, medicine, and law. The first two named are directed by 14 professors; the number of undergraduates in 1873 was 121, of graduates 10. The third, of medicine, is directed by 14 professors; number of students, 217. The fourth, of law, by a president and 4 professors; number of students, 35. Instruction is free in the departments of arts and sciences to all who pass the preliminary examinations, no charge being made beyond an incidental fee of $15 per annum. For the department of medicine the charge is $140, for that of law, $100. The revenue of the University was $36,646.57, and its expenditure $36,646.57. Besides these widely-known institutions there are—the College of St. Francis Xavier: number of professorships, 10; number of students in 1873, 80; number of graduates, 21; value of buildings and adjuncts, $228,000; of other property, $172,000; revenue, $36,084; expenditure, $31,084; price of tuition, $60 per annum. Manhattan College: number of professorships, 10; number of students in 1873, 80; in preparatory department, 467; in commercial department, 126; total, 673; no degrees given in the year named; value of buildings and adjuncts, $233,300; other property, $112,000; revenue; $62,343.34; expenditures, $65,357.59; tuition, including board, $600 per annum. The Rutgers Female College: instructors, 12; number of students, undergraduates, in 1873, 68; graduates, 8; no building owned; revenue, various sources, $17,824.45; expenditure, $19,376.14. In addition to these seminaries of general learning there are several medical colleges, first among which is the College of Physicians and Surgeons, medical department of Columbia College (already named above): number of professors, 19; number of students in 1873, 396; number of graduates, 99; value of building and grounds, $154,000; other property, $11,000; revenue, $12,142.50; expenditure, $15,366.59; price of tuition, $140. The Homœopathic Medical College of the State of New York in the City of New York: students, 100; graduates in 1873, 38. The New York Medical College and Hospital for Women, New York City: professorships, 12; number of students in 1873, 25; graduates, 9; value of building and adjuncts, $63,500; of other property, $17,500; revenue, $3375; expenditure, $5740; price of tuition, $70. The Eclectic Medical College, New York City: professorships, 8; number of students, 37; of graduates, 21; value of property (no building), $15,000; revenue, $755; expenditure, $755; price of tuition, $100. The New York College of Dentistry: professorships, 10; number of students, 39; graduates, 10; revenue, $5677.99; expenditure, $6129.76; price of tuition, $100 per annum. New York Free Medical College for Women: professorships, 14; number of students, 43.

Summary.—Instructors, 3365; number of students, 277,310; cost of instruction, $3,808,381.

In addition to these institutions, incorporated by the State or making report to constituted authorities, there are numerous schools for the education of both sexes in the highest departments of knowledge, some of which are as extensive and well known as the colleges. Mr. Peter Cooper has also established an institution for the education of the working classes, which is under the charge of a board of trustees, and to this he has given a building valued at $500,000 and made other munificent donations. The instruction includes engineering, the arts of design and modelling. The tuition and lectures are free.

There are twenty-three libraries of circulation and ref-

erence, several of which have reading-rooms attached. The principal is the Astor Library, founded on a bequest of John Jacob Astor, organized under a board of trustees in 1848, and opened in 1854 with a collection of 70,000 volumes, made by the distinguished Dr. Joseph G. Cogswell, with a view to the providing of a reference library of works not otherwise of easy access. The original building, 65 feet front by 120 feet deep, is situated on Astor Place. William B. Astor, son of the founder, has since added a second building of similar size, and the number of volumes had increased to 150,306 on Jan. 1, 1875. The buildings are elegant and commodious. The books are free to the public, for use only in the library. The only other free library is the Lenox, incorporated Jan. 21, 1870, for which a large and beautiful building has been recently completed, covering the whole front of the block on the Fifth avenue between Seventieth and Seventy-first streets, and commanding a fine view of Central Park. In it the large and valuable collection of the founder, James Lenox, whose munificent gift includes also the real estate and buildings, will be deposited. It is the largest and finest collection of books on early American history ever formed. There will be also a fine-art gallery and a collection of curiosities. The New York Historical Society occupies a fine building on the corner of Eleventh street and Second avenue, the capacity of which it has for some years outgrown. It has a collection of historical works, newspapers from 1704 to the present date, manuscripts, public and private documents of great value, and is the favorite receptacle for family papers of historical importance. The collection of books reaches 60,000; of newspapers bound, 2319. It has also a large collection of American antiquities, the famous Abbot Egyptian collection, the Lenox Nineveh marbles, and one of the most extensive and finest art collections in the country. It is supported by a large membership of the leading citizens. The oldest library in the city is the New York Society Library, situated in University Place between Twelfth and Thirteenth streets. It was organized in 1740, and incorporated in 1754, has a collection of about 70,000 volumes for circulation and reference, and has a reading-room. It is maintained by annual dues. The Mercantile Library Association, Clinton Hall, Astor Place, originally organized for the benefit of merchants' clerks, to whom access is given at a merely nominal charge, has a very large collection of current literature, 158,034 volumes, and a fine and extensively used reading-room, where both foreign and domestic reviews, magazines, and periodicals are amply supplied. The library is chiefly used for circulation. In addition, there is an admirable system of lectures and classes. The American Geographical Society has rooms in Cooper Institute. It has a good library of books on geography and a valuable collection of charts, maps, and other documents. It is the only institution in the country wholly devoted to geographical science. The Union Theological Seminary has a large and noted collection, chief among which are early American tracts. The Episcopal Theological Seminary has also a large collection. The American Institute is particularly strong in works on mechanics and engineering. The Apprentices' Library, free to this class and female employés, has a large assortment of general literature. The Law Institute has a carefully selected library, and a reading-room attached for the use of the bar. The Chamber of Commerce has a small but extremely valuable collection of works on finance and subjects of commercial interest.

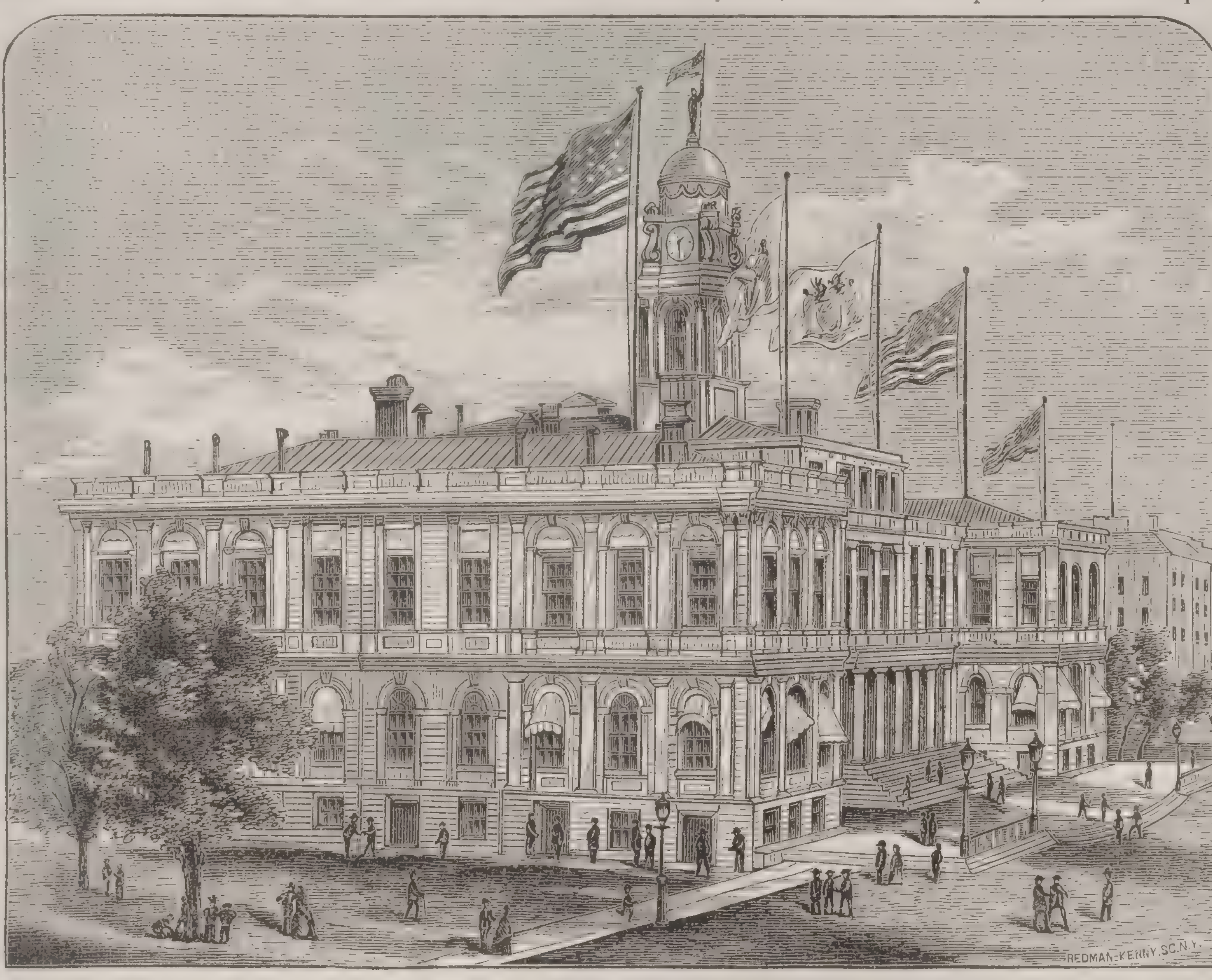
There are several societies for the promotion of the fine arts. The National Academy of Design, instituted in 1826, owns a building on the corner of Twenty-third street and Fourth avenue, and has large and valuable collections. The Metropolitan Museum of Art, incorporated in 1870, occupies an elegant building on Fourteenth street between Sixth and Seventh avenues. It has a carefully selected and choice collection of antiquities and curiosities, some of great value, chief among which is the Cesnola Collection. A building for the accommodation of this museum is now being erected in Central Park. A Studio Art-Building Association was organized in 1865, and is located on Tenth street near Sixth avenue; it is mainly used by artists for studios.

There are 444 newspapers and periodicals published in the city of New York. Of these, 28 are daily, 8 semi-weekly, 187 weekly, 22 semi-monthly, 180 monthly, 3 bi-monthly, and 16 quarterly; 32 are in foreign languages—16 German, 9 Spanish, 3 French, 2 Scandinavian, 2 Swedish; 99 have a circulation of over 5000 copies. The ten leading newspapers are the *Daily News*, one cent, with a daily circulation of 127,360; the *Sun*, two cents, daily circulation 119,792, weekly 73,533; the *Herald*, four cents, daily 65,000, weekly 15,000; the *Tribune*, four cents, daily 43,833, semi-weekly 10,000, weekly 48,000; the *Times*, four cents, daily 42,000, weekly 30,000; the *Staats Zeitung* (German), daily 30,000, weekly 15,000. Of the illustrated papers, *Harper's Weekly* has a circulation of 100,000; *Frank Leslie's Illustrated News*, weekly, 50,000; the *Graphic*, daily, 11,000. Of the literary papers, 2 are devoted to stories and tales—the *New York Ledger*, with a circulation of 300,000, and the *New York Weekly*, with a circulation of 180,000. Of the religious papers, the *Christian Union*, weekly, has a circulation of 78,333; the *Christian Advocate*, 45,000; the *Catholic Review*, 20,000; the *Sunday-school Journal*, monthly, 75,000; the *Methodist Episcopal Church Missionary Advocate*, 100,000. Of the magazines, *Harper's Monthly* has 130,000; *Scribner's Monthly*, 48,000; *St. Nicholas*, a child's magazine, 40,000; *The Galaxy*, 18,000.

Churches.—New York is largely provided with churches. The total number, together with mission organizations, is 470, of which 344 have edifices of their own, with accommodations for 350,000 persons, and valued at $28,800,000. Of the organizations, 92 are Protestant Episcopal, 70 Presbyterian, 58 Methodist Episcopal, 46 Baptist, 40 Roman Catholic, and 27 Jewish. In the Protestant churches, chapels, etc. there are seats for 250,000 persons, but it is estimated that the average attendance does not exceed 150,000. Of the Protestant churches, 240 are regularly incorporated, with an average membership of 300, giving a total of 72,000 communicants. There are in addition 140 Protestant missions, where religious instruction and services are regularly maintained. The latest census gives 356 Protestant Sabbath schools, with 88,237 scholars on roll, and an average attendance of 56,187; and of Roman Catholics, Jews, etc. there are 59 Sabbath schools, having 27,589 scholars on roll, and an average attendance of 18,274. The total number of missionaries is 266, who make 800,000 visits a year, besides hundreds of tract visitors, poor visitors, and other humbler agents. There are 5 free reading-rooms for seamen and 15 for workingmen, and 10 daily prayer-meetings. The churches most famous for their size, cost, and architectural beauty are Trinity, Grace, St. George's, the new Fifth avenue Presbyterian, the Reformed Collegiate, and the Jewish synagogue; a new cathedral is also being erected by the Roman Catholics, which will exceed in size and splendor any church in the city. It is of white marble, covers an entire block, and is in the Gothic order.

Charities.—New York is famous for its munificent and cosmopolitan charities, both at home and abroad. It has never failed to respond to an appeal for aid, and the eyes of suffering nations and communities are first turned to her. Ireland in its famine, France in its floods and desolation, England in its manufacturing distress, even in time of war found a ready response. And so has every American city in its days of distress—witness Portland, Chicago, Boston, etc. The municipal charities of New York are entrusted to a board of management entitled the Commissioners of Public Charities and Corrections, who have charge of all the criminals, paupers, and public sick of the city. The prisons, hospitals, asylums, almshouses, nurseries, etc., numbering 27 institutions (viz. the Almshouse, Hospital for Incurables, Asylum for the Blind, Bellevue Hospital, City Prison, Randall's Island hospitals, Workhouse, Charity Hospital, Fever Hospital, Smallpox Hospital, Infants' Hospital, Inebriate Asylum, Asylum on Ward's Island, Lunatic Asylum, Epileptic and Paralytic hospitals, Penitentiary, Randall's Island Nursery, Free Labor and Intelligence Bureau, Industrial School, Hart's Island, and School-ship Mercury), received last year 153,271 subjects. The department for the outdoor poor gave relief to 22,782. Correct conclusions cannot, however, be drawn from these figures, as the same persons appear more than once upon the register. The money expended in sustaining the board amounted to $1,541,685.50. The immigrants are under the care of the Commissioners of Emigration: of the 267,901 alien passengers landed in 1874 at the port of New York, 51,871 were relieved, forwarded, or provided with employment by the commission; 12,586 were cared for in the refuge and hospital on Ward's Island—an institution supporting an average of about 2000 persons. The total expenses of the commission were $466,108.22. Besides these public there are numerous private institutions, endowed by the voluntary benefactions of the citizens, in some cases aided by State or municipal appropriations. The Association for Improving the Condition of the Poor expends about $50,000 annually, and relieves about 5000 families. Last year, being a year of extraordinary suffering, aid was given to 24,091 families. The New York City Mission gave aid to 2500 families in 1874. The Howard Mission and the House of Industry disburse large sums. The Prison Association, the Home for Female Prisoners, and the Midnight Missions are humane reformatories. There are 27 hospitals in the city, of which 15 have large and commodious buildings, the recent erections being admirably adapted to sanitary and curative purposes. The

oldest of these institutions is the New York Hospital, founded under a colonial charter in 1771. The large and beautiful site which it occupied for nearly a century has been sold, and this favorite institution has lost its old prestige. The Bloomingdale Asylum for the Insane, located at One-hundred-and-seventeenth street, between Tenth and Eleventh avenues, is a branch of the New York Hospital. A farm of 300 acres has been purchased at White Plains, and suitable buildings will shortly be ready for the reception of patients. St. Luke's Hospital occupies spacious buildings on the corner of Fifty-fourth street and Fifth avenue. The property of this institution was exempted from taxation and assessment by legislative act in 1870. Mt. Sinai Hospital, formerly known as the Jews' Hospital, was established in 1852. It occupies a large building on Lexington avenue from Sixty-sixth to Sixty-seventh street. The Roosevelt Hospital, a bequest of James H. Roosevelt, who died in 1863, has extensive buildings erecting on Ninth avenue, corner Fifty-sixth street. There are, besides, the German Hospital, incorporated 1866; St. Francis's Hospital, 1866, under charge of the Poor of St. Francis; St. Vincent's, 1849, under the Sisters of Charity; the Presbyterian Hospital, 1868; Women's Hospital for Surgical Treatment of Women, 1855; New York Asylum for Lying-in Women, 1822; New York Society for the Relief of Ruptured and Crippled, 1863; New York Infirmary for Women and Children; New York Homœopathic Infirmary for Women; the Hahnemann Hospital; Hospital for Diseases of the Nervous System; Metropolitan Medical and Surgical Institute; Strangers' Hospital. There are four eye and ear infirmaries: the New York Eye and Ear Infirmary, founded 1820; in 1874 there were treated 10,486 patients, of whom 7464 were for diseases of the eye, 2439 of the ear, 583 of the nose and throat. The expenses for the same year were $28,011.70. Manhattan Eye and Ear Hospital; New York Ophthalmic Hospital; New York Ophthalmic and Aural Institute. There are 7 city dispensaries, which supply gratuitously medicines and medical and surgical attendance, and are mainly supported by subscriptions and gifts from the legislature. Besides these there are several supported by private contributions. The New York Dispensary, corner of Centre and White streets, established 1790, supplies an average of 40,000 patients at an expenditure of $10,000. The Central Dispensary, the Demilt, the Eastern, the Manhattanville, Northern, North-eastern, North-western, Western, Harlem, Hoffman, German, Orthopædic, Dispensary for Diseases of the Skin, Bond street, New York Homœopathic, Homœopathic Medical College, Metropolitan Homœopathic, North-western Homœopathic, Western Homœopathic, Western Dispensary



The City Hall.

for Women and Children, Eclectic. There are two institutions for the deaf and dumb: the Institution for the Deaf and Dumb, incorporated in 1817, occupies buildings 650 feet in length, covering 2 acres, and accommodating 450 pupils; the Institution for the Improved Instruction of Deaf Mutes. There are three institutions for the blind: the New York Institution for the Blind, which receives pay pupils and others at State charge for $300 per annum; the Blind Mechanics' Association, which secures employment for blind adults; the Holy Light Home for the Blind, for the support of the aged and infirm, without regard to religion or nationality. There are 26 religious, educational, and other Roman Catholic organizations, reformatory and charitable. Of benevolent societies there are 51, of trades' unions about 50, and of secret and benefit societies about the same number. Besides these there are 75 other charitable institutions. The Society for the Reformation of Juvenile Delinquents, House of Refuge, Randall's Island, occupies two large structures, 1000 feet in length, in the Italian order of architecture; the workshops 30 by 100 feet, three stories high; connected therewith a school for seamanship. The New York Juvenile Asylum receives truant and friendless children; accommodates 500 inmates; the city pays $110 for each child supported. The Children's Aid Society seeks to secure homes for friendless children in country families; schools are attached which educate from 9000 to 10,000 scholars annually. A newsboys' lodging-house is connected with the society, which has provided over 70,000 boys with permanent homes and employment. The New York Catholic Protectory has extensive buildings in Westchester county. The Hebrew Benevolent and Orphan Asylum has a large building, and supports about 200 children annually. There is also an Industrial Home for Jewesses, and the Noah Benevolent Widows' and Orphans' Association. The Colored Orphan Asylum, whose premises were destroyed during the riots in July, 1863, has since erected new buildings; the average number cared for is 260. The Five Points Mission provides food and clothing for the poor and temporary shelter for the homeless; its school attendance over 400. There are several institutions for seamen—the American Seamen's Friend Society, the Sailors' Home, etc.; and a Society for the Prevention of Cruelty to Animals. The foregoing include the best known of these numerous and valuable institutions, all of which draw largely from the private munificence of the charitable community of New York. The organized local charitable societies and institutions receive and disburse annually $2,500,000.

Public Buildings.—The most noted buildings are the City Hall, in the Park, erected in 1803, a graceful and ele-

gant structure. Adjoining is the new Court-house, a large edifice, notorious as the means by which the city treasury was robbed of a large amount of money. They are both in marble, except the rear of the City Hall, which is brownstone, the authorities having then no idea that the city limits would extend any higher. The Custom-house, formerly the Merchants' Exchange, is an immense and massive structure of Quincy granite. The columns are 38 feet in height and 4½ feet in diameter. The Sub-treasury occupies the old Custom-house, a beautiful and spacious building in white marble. The new Post-Office, the finest public structure in the city and admirably adapted for its purpose, was begun in 1869 and finished in 1875. It occupies the southern angle of the Park. The Western Union Telegraph Company and the *Evening Post* occupy fine structures of brick with stone trimmings upon Broadway, below the Park. The New York *Tribune* Association has lately completed a brick building on Printing-house Square, with a tower of enormous height, which has attracted attention and comments. Of the new buildings in the upper part of the city, the Grand Central Railroad Dépôt, the Windsor Hotel, the Gilsey House, and the Buckingham are the most prominent. The Albany and the Saratoga are large structures of flats on the French plan, now rapidly growing in favor. The Lenox Library has already been noticed.

A marked feature of the social life of the city is the prevalence of clubs, of which there are forty, including literary and sporting associations for friendly intercourse. The most celebrated of these are the Union, limited to 1000 members, with a full membership, and occupying an elegant building on Fifth avenue; the Union League, with a roll even more extensive, and a fine house on Madison Square; the New York, Knickerbocker, Travellers', Century, Lotos, and the German Club on Reservoir Square. These institutions are provided with restaurants, and are daily and numerously attended.

The city is admirably provided with parks, which have been aptly termed the "lungs" of cities. The Central Park is noticed elsewhere. (See CENTRAL PARK.) There are also the Battery, the Bowling Green, the City Hall Park —all historical ground—Tompkins, Washington, Union, Madison, and Reservoir Squares, and at the northern end of the island Mount Morris Square and High Bridge and Morningside Parks. The total area in acres and thousandths is 1007.251.

The lower part of the city is quite irregularly built, but from Houston street, about a mile N. of the City Hall Park, the construction is regular, with long avenues running to the northern end of the island, and laterally traversed by streets which, like the avenues, are designated by numbers. Broadway, the most famous of the avenues, is an exception to this rule, and in its long extent of six miles crosses five of the avenues in a north-westerly direction. Broadway is lined with shops and hotels, and is one of the gayest streets in the world. Fifth avenue, with its magnificent private residences, churches, and club-houses, is one unbroken series of architectural display. The natural advantages of this fine avenue, which runs along the ridge of the island, make it the favorite site for residence. Broad and extensive boulevards have been recently laid out in the upper part of the island, which, connecting with the Central Park, offer long and agreeable drives. The first city railroad was chartered in 1852, since which the system of travel by horse-cars has largely increased. There are now railroads in all the longitudinal avenues except the Fifth avenue and Broadway below Union Square, and there are also numerous transversal lines connecting the ferries of the East and North rivers. The commissioners appointed by the mayor of the city, under authority of the legislature, have now under advisement plans for rapid transit to the northern limits, now become indispensable to the growth and prosperity of the metropolis. The New York Central, Hudson River, Harlem, and New Haven R. Rs. have their terminus in this city at the Grand Central Dépôt, and bring in and take out a large number of suburban residents who have their places of business in the city. The report of the State engineer and surveyor for 1872 gives the business of the city horse-railroads as follows: horse-car passengers carried, 134,588,877, at fares varying from five to eight cents each; steam elevated roads, 167,153, at a fare of ten cents. There are 23 ferries connecting New York with the W. shores of the Hudson, Hoboken, and Jersey City, Staten Island, and Long Island. The boats to Brooklyn and Hoboken run every ten minutes by day and every fifteen or twenty minutes by night; fares, from two to four cents each passenger. The number of passengers carried in 1868, the last year of official returns, was 82,321,274. The ferries are all under city supervision, but, owing to the policy adopted a few years since of leasing this valuable franchise for terms of years, no returns supplying statistical information are now made. The natural increase would carry the number to 100,000,000 at the lowest estimate. Reviewing the car and ferry traffic, it will be seen that the centre of city travel of New York and its natural suburbs is not far removed from the City Hall Park.

Waterworks.—The city is supplied with water by the Croton Waterworks, the most extensive and costly in the U. S. The supply is drawn from the Croton River, a clear, pure stream of remarkable quality in Westchester county, which is conducted to the city by an aqueduct of solid masonry 40½ miles in length, 8 feet 5½ inches high, 7 feet 5 inches wide at the widest point, and dropping 13 inches to the mile. It has a capacity of 106,000,000 gallons a day. It crosses the Harlem River on the High Bridge, a structure of granite 1450 feet long, 21 wide between parapets, 114 feet high; is received in two great basins in Central Park, and is distributed by two reservoirs through 350 miles of pipe. These works are under the supervision of the Department of Public Works, a bureau created under the new charter in 1870.

Five principal gaslight companies supply the city. The Manhattan Company has two works, which deliver gas through about 170 miles of street-mains to 30,000 private consumers and 7000 street-lamps. The others are the New York, Metropolitan, Mutual, and the Harlem. The mains of these companies are being constantly extended as new avenues and streets are opened.

The system of sewerage is totally unworthy of a metropolitan city with unequalled opportunities for drainage, the rivers surrounding providing ample outlet for all detritus, but there has as yet been no effort made to introduce the scientific plans of which Paris presents so excellent an example. The paving of the city is hardly better than the sewerage. For this, however, some excuse may be found in the severity of the winters and the long lay of snow upon the ground. Various tentative experiments have been made: cobble-stones have given way to wood; wood in turn, after having been tried in various forms, has yielded to trap-block, which is now the favorite mode.

Markets.—The market system is absolutely disgraceful, and with hardly an exception the buildings are rather public nuisances than public benefits. Those owned and rented by the city are 13 in number, of which Washington, Fulton, and Clinton are the most important. With a more bountiful supply of provisions of necessity and luxury than can be had in any city of the world (a remark especially true of its fish, which has developed into a separate trade under the control of a fishmongers' corporation), there is no capital city where the market accommodations for both producer and consumer are so badly managed. The sales of food during the past year (1874) for cash are reported by the efficient superintendent, Col. De Voe, at $130,000,000, of which Washington received $108,000,000, Fulton, $16,000,000, and Clinton, $1,500,000. Besides these sales for household purposes, it is estimated by the same competent authority that 1,350,000 persons dine or lunch every business-day in the city of New York. Not less than 300,000 of these are daily visitors, who leave the city nightly for neighboring towns, and there is an average of 50,000 visitors at the hotels.

The *Fire Department*, formerly a volunteer organization, has at last passed into the control of a board of commissioners, with salaried employés. The modern system of steam, with engineers and officers and telegraphic signals, has entirely done away with this formerly prominent feature in the life of the metropolis.

The *Police Department* is under the control of a board of commissioners, and occupies 34 different stations, which are connected by telegraph wires, and a large commodious head-quarters. The force numbers 2503. As a system of protection it can never be thoroughly efficient until withdrawn from the domain of politics, but it is slowly and steadily improving. Its main deficiency, as compared with European systems, is the want of efficiency in the detective force.

Post-Office.—The business of the post-office is enormous. Besides the great building, there are 20 branch stations, of which 12 are on Manhattan Island, A to L, and 8 in the newly-annexed towns of Westchester. The number of superintendents and clerks employed at the general office is 648, at stations 86; of regular letter-carriers at the general post-office, 100, at stations, 329; of substitutes, 30; total force, 1193. There are 7 daily deliveries by carriers, and 14 collections from 986 street letter-boxes. In the year 1874 there were delivered by carriers 33,689,117 mail letters and postal cards, and 19,634,457 city letters. There were despatched 8,589,790, and received 7,664,335. In the same year there were 67,856 domestic money-orders issued, for the sum of $1,342,557.70, and paid 594,684, for the sum of $6,751,189.16. In the same period there were 20,521 foreign orders issued, for the sum of $412,561.32, and paid

The Post-Office.

8567, for the sum of $157,767.30. In 1874 postage-stamps, postal cards, and stamped envelopes were sold to the amount of $2,589,384.94. The weight of newspapers and periodicals mailed by publishers to regular subscribers from Jan. 1 to Sept. 30, 1874, was 17,392,691 pounds, and the postage prepaid on same, $249,952.17.

History.—Immediately after the discovery of Hudson in 1609, the Dutch undertook the occupation and settlement of Manhattan Island, and in 1614 erected a fort and trading-house at the south-western extremity of the island, to which they gave the name of New Amsterdam. In 1614 an expedition from South Virginia, despatched by Sir Thomas Dale, took possession of the infant colony, which then consisted of only four houses outside the fort, but an amicable settlement was soon made between the respective governments, and the Dutch remained in possession of the island and neighboring country. In 1652 the city of New Amsterdam was incorporated. In 1656 it had increased to 1000 inhabitants and 120 houses; in 1677 it contained 368 houses. The city remained under the peaceful rule of the Dutch for about a half century, when, Charles II. coming to the English throne, the territory occupied by the Dutch was granted by royal charter to his brother, the duke of York, Mar. 12, 1664, and an English fleet took unopposed possession in August of the same year. Cols. Nicoll and Lovelace ruled the settlement for ten years in the name of the duke, and the name of the city was changed in his honor to New York. In Aug., 1673, a Dutch fleet recaptured the city, which it held in the name of the States General of Holland, changing the name again to New Orange, in compliment to the prince of Orange. It was again restored to English rule by treaty in 1674, and resumed its name. In 1686 the municipal rights of the free city were confirmed and enlarged to cover all vacant land on Manhattan Island to low-water mark, by charter from Gov. Dongan. In 1708 certain ancient rights of ferry were also confirmed by new charter from Gov. Cornbury, but the charter upon the foundation of which, as Chancellor Kent remarks, the city of New York is at present governed, was that of 1730, as granted by Gov. Montgomerie. This charter recites the former charters, confirms the privileges of the city, and defines the water-boundary as extending to low-water mark on the opposite shores of Long Island and New Jersey. This claim of New York gave occasion to long litigation with the State of New Jersey, until the boundary-line was happily settled by commissioners mutually appointed by each State in 1833. This settlement leaves the exclusive jurisdiction of the waters to the State, and consequently to the city, of New York, while the right to the land under water and the wharves which may be built thereon on the Jersey shore is vested in New Jersey, subject only to the quarantine and health laws of the city. An act of confirmation was passed by the assembly Oct. 14, 1732. Under these royal charters the mayor, sheriff, recorder, and other officers were appointed by the governor of the colony. This mode of appointment continued until the Revolution, when the power of appointment was by the constitution of 1777 vested in the governor and council until otherwise ordered by the legislature. Under the amended constitution of 1821 the mayor was directed to be appointed annually by the common council, and the other officers to be chosen triennially by the electors of the city. This mode continued until the act of Mar. 3, 1834, directed that the mayor be annually chosen by the electors of the city. In 1849 important alterations were made in the creation of executive departments, the chief officers of which to be elected by the people. The police department, however, was continued, the mayor being designated as its head, but a bureau established under the control of a chief of police. In 1852 a further amendment instituted a board of 60 councilmen, to be chosen from 60 districts of the city, in place of the board of assistant aldermen of the wards. In 1857 a further radical change was made. The act of this year repealed all the amendments of 1830, 1849, 1851, 1853, only continuing in force the ancient Dongan and Montgomerie charters. The amended charter divided the city into 17 aldermanic districts, from each of which an alderman was to be chosen, to serve two years; the board of councilmen to be composed of 6 members elected annually from each of the senatorial districts of the city; the mayor, comptroller, and counsel to the corporation to be elected by the people, the mayor for two, the counsel for three, the comptroller for four years—all three removable by the governor for cause; and the heads of departments were made removable by the board of aldermen without consent of the mayor. The powers of the street department were increased, and a number of executive departments abolished. This act, restricting the powers of the mayor, was resisted by him as unconstitutional, and popular disturbances ensued. The same legislature had placed the police force of the city and the neighboring counties under a metropolitan commission. The two forces met in violent struggle. Resort was finally had to the court of appeals, which fully sustained the constitutionality of the

new charter. By an amendment passed in 1863 the term of office of the several heads of department was extended to four years. The board of councilmen was abolished after 1869. On Apr. 5, 1870, further and thoroughly radical changes took place, the city government being essentially withdrawn from any control of the State authorities, and the executive power vested in a mayor and eleven departments, the mayor to be elected for two years, heads of departments to be appointed by the mayor. The police was withdrawn from the metropolitan commission and became one of the new departments. Earnest protest had been made against the passage of the charter of 1870, but few alterations were consented to, a few modifications only being made by the act of Apr. 18, 1871, with regard to the school officers and Central Park commission. The abuses and reckless expenditure which followed this change in municipal rule became so enormous and flagrant that there was a great reaction in public opinion. The amendment again reorganizing the local government was passed June 13, 1873, and is now in force. It abolished the board of assistant aldermen, constituted a new common council of 21 aldermen, to be elected at the general State election the next year; three members to be elected in each senatorial district; six aldermen at large, to hold office for one year; and the mayor to be elected for two years.

In reviewing these changes in the form of administration of the city government it is interesting to notice the tentative process by which a solution has been diligently sought for the problem of a city government where population is subject to such increase—a population at once uneducated and unaccustomed to self-government. And it is not too much to say that only with a constitution and manners as free and liberal as those which prevail in the State of New York could the principle of universal suffrage have endured the severity of the strain.

The most important events in the history of the city since the English occupation have been the usurpation of the government by Leisler in 1689, and his trial and execution by Gov. Sloughter in 1691. The same year the laws of the duke of York and provincial laws were framed. The first assembly met in the city Apr. 9. In 1696 the first Trinity church was built. In 1712 the negroes rose in insurrection, set fire to the city, and killed several persons; nineteen of the negroes were subsequently executed. In 1725, Bradford established the New York *Gazette*. In 1729 a city library was founded. In 1740 the New York Society Library was organized. In 1741 the famous delusion known as the "Negro Plot" occurred; the city was in the greatest consternation, and a large number of negroes were executed, and together with them a Catholic priest; when reason asserted itself no real grounds could be discovered for any alarm. In 1750 a theatre was established. In 1754, King's (now Columbia) College was chartered. In May, 1763, the Sandy Hook lighthouse was first lighted. In 1765 the famous congress known as the Stamp Act Congress met in the city; delegates were present from all the colonies, and a bold declaration of rights and grievances was adopted. The Sons of Liberty were organized, with affiliations throughout the colonies. The Stamp Act was burned, and an agreement not to import goods from Great Britain until the repeal of the obnoxious act signed by a large concourse of merchants. On the 1st of November, amid great excitement, the effigies of Gov. Colden and the devil, holding the Stamp Act, were burned on the Bowling Green. On the 5th, the excitement continuing and the citizens threatening to storm the fort and seize the stamps, the paper was delivered by the governor to the mayor, John Cruger, and taken to the city hall for safe-keeping. On May 20, 1766, the news of the repeal of the act reached the city, and the assembly was petitioned to erect a statue to William Pitt. In 1768 the Chamber of Commerce was organized at the Queen's Head Tavern, kept by Bolton & Sigel —a building better known later as Fraunces' Tavern, and which is still standing at the corner of Pearl and Broad streets, and now called Washington's Head-quarters, this being the spot where he bade adieu to his officers at the close of the Revolution. On May 14, 1770, a statue to William Pitt was erected in Wall street, at the intersection of William, then Smith street. On Apr. 18, 1774, the Nancy arrived with a cargo of tea; the vessel was not permitted to land her cargo nor to make entry at the custom-house. News reaching the city of the closing of the port of Boston in May, 1774, a committee of correspondence was organized. The non-importation agreement was again proposed, but declined, and a "congress of the colonies" insisted upon by the merchants. To their persistent adherence to this scheme the first Congress was mainly due. In the same month strong resolutions of resistance were adopted by a great meeting on the Common, now the Park. The colonial assembly finally adjourned Apr. 3, 1775. Delegates were elected to the Continental Congress July 25, same year. On Aug. 22, Congress having ordered the withdrawal of the cannon to the interior, the Asia man-of-war fired upon the city. In Jan., 1776, a detachment of militia took possession of the city, and in the spring the American army followed. On the 8th of July the Declaration of Independence was proclaimed, and read to the army. On the 26th of August, after the battle of Long Island, the city fell into the hands of the British. On the 21st of September a destructive fire consumed an eighth of the city, destroying 492 houses. On Nov. 25, 1783, the British evacuated the city, and Gen. Washington entered at the head of the American army. In Jan., 1785, Congress removed from Philadelphia to New York, and met in the City Hall, corner of Wall and Nassau streets, now the site of the U. S. Sub-treasury. The Bank of New York was organized this year, and a manumission society was established. On July 26, 1788, the new Constitution of the U. S. was adopted by the legislature and celebrated by a grand procession. On Apr. 30, 1789, Gen. Washington was inaugurated President of the U. S. on the gallery in front of the old City Hall, facing Broad street. On Dec. 4 the adoption of the new Federal Constitution was ratified by an immense procession, in which all the professions and trades were represented. In 1792 the Tontine Coffee-house was built; June 1, 1795, the Park Theatre was erected. In 1799 the Manhattan Company was chartered to supply the city with water; the Bronx River was proposed as the source of supply, and was surveyed. In 1801 the total valuation of the real and personal estate of the city and county was $21,964,037, and a tax laid of 1 mill on the dollar. In 1804 hackney coaches were first licensed. July 11 of this year Alexander Hamilton fell in a duel with Aaron Burr. In 1805 the winter was one of intense severity. This year the New York Free School was incorporated, and also the Tammany Society or Columbian Order. In 1806 steam navigation was first successfully inaugurated on the Hudson River by Robert Fulton. In 1807 the city was surveyed and laid out by a commission of the legislature consisting of Gouverneur Morris, De Witt Clinton, and others. Their plan has been substantially adhered to with the exception of the late new improvements. In June, 1812, on the declaration of war against Great Britain, a large number of privateers left the city, and became the terror of British traders till the peace. This year the first steam-ferry was established to Jersey City. On Aug. 31, 1814, the scarcity of specie and the drain upon the banks brought about a suspension of specie payments, which lasted till July, 1817. On Feb. 12, 1815, the first news of the treaty of peace was received at New York with great enthusiasm. In 1824 the House of Refuge for the reformation of juvenile delinquents was established and a building erected by private subscription. This was the beginning of a new order of correction of the vices of the young. On Aug. 15, 1824, Gen. La Fayette arrived in the city, and was welcomed with great rejoicings as the guest of the city and nation. The quintal of 100 instead of 112 pounds was voluntarily adopted by the merchants as the new measure for purchase and sale after Jan. 1, 1825. Gas was first introduced in this year, and mains laid in Broadway. On Oct. 26, 1826, the sound of cannon, commencing at Buffalo and repeated from point to point, announced the completion of the Erie Canal and the final union of the lakes with the Atlantic—the presage of the coming power and wealth of the city as the great gateway between the Western and Eastern hemispheres. On Nov. 11 the arrival of the first canal-boat was the occasion of a grand aquatic and civic pageant, in which the "commingling of the waters" was typically illustrated by the pouring by Gov. Clinton, the father of the canal, of a keg of fresh water of Lake Erie into the Atlantic Ocean at the Narrows. In 1832 the Asiatic cholera ravaged the city. Hardly had its effects been recovered from when the city was prostrated, Dec. 16, 1835, by a terrible and disastrous conflagration, which raged three days and destroyed more than 600 buildings and property to the value of over $20,000,000. Close upon this calamity followed the commercial distress and financial panic of 1836–37, which spread over the whole country and swept countless prosperous firms out of existence. The banks suspended specie payments under authority of the legislature, and resumption was only effected with great difficulty in 1839. The Croton Aqueduct was completed in 1842, and the health and comfort of the city assured by this colossal and beneficent monument of the enterprise and foresight of the citizens. In the year 1844 began the enormous immigration—first from Ireland, in consequence of the famine, and later from other parts of the Continent, consequent on political disturbance—a movement which mainly passing through New York has greatly added to her wealth and population. On July 19, 1845, another disastrous fire destroyed several million dollars' worth of property. In

1849 a disturbance known as the Astor Place Riot, springing from a quarrel between theatrical partisans, cost the lives of several citizens, and was only suppressed by the interference of the militia. In the month of Dec., 1851, Kossuth, the Hungarian patriot, received an enthusiastic public welcome. On July 14, 1853, an exhibition of the industry of all nations was opened in a building of extreme beauty of iron and glass on Reservoir Square. The building was soon after destroyed by fire. On July 2, 1855, the Central Park was selected by the commissioners appointed by the supreme court. (See CENTRAL PARK.) In the summer of 1857 a financial crisis swept over the commercial world of both hemispheres. The business of the city was prostrated, the banks suspended specie payments, all enterprises were stopped, and the working classes thrown into a state of destitution to which a severe winter soon added fresh terrors. Relief was provided by the municipal authorities by labor on public works and distribution of food. In Aug., 1858, the successful laying of the Atlantic cable was announced, and on Sept. 1 was celebrated by a holiday and a grand public demonstration. During the display of fireworks the City Hall was badly injured by a conflagration. In 1860 the city was visited by the Japanese embassy, which was entertained with great splendor by the municipal authorities. The prince of Wales was officially received the same year with a military display and welcomed by an immense concourse of citizens. In the fall of this year the secession of South Carolina arrested business. The winter of 1860–61 was one of unquiet and distress. The attack upon Fort Sumter in Apr., 1861, aroused the spirit of the people, and was responded to by a spontaneous uprising of the loyal element, which resulted in a meeting upon Union Square and a demonstration surpassing in magnitude and enthusiasm any public assemblage in this country. Its effects were instantly felt in every part of the Union. The work of organizing regiments was at once undertaken; the banks pledged enormous sums for the support of the government, and the whole city set itself to the stern suppression of the Southern revolt. In 1861 the banks, which had already loaned $150,000,000 in coin to the government, suspended specie payments. On July 13, 1863, the militia of the city having been sent to Pennsylvania, and the U. S. authorities undertaking to enforce the draft, an insurrection took place, no doubt instigated by agents of the Southern rebels, which turned almost immediately into a furious attack upon the negro population of the city. The elements of disorder and crime common to large cities were combined in this movement. For a few days there was universal consternation. The courageous action of the police, supported by the U. S. troops, soon restored order. During each year of the war repeated large out-door manifestations were made in support of the government, of which those in Union Square, July 15, 1862, and Apr. 11, 1863, were the most conspicuous. In 1865, upon the news of the capture of Lee and the overthrow of the rebellion, great preparations were undertaken for the celebration of peace, but the assassination of the President turned the universal joy into mourning. The body was brought to the city on its way to the West, and lay in state in the City Hall, where it was visited by a continuous stream of mourning citizens. On the 25th of April the remains were escorted to the Hudson River Dépôt by an enormous and imposing procession, through streets densely lined with sorrowing spectators. Such a spectacle had never been seen in New York. During the war the city furnished 116,382 troops to the government. On July 12, 1871, the Orangemen, an association of Protestant Irishmen, undertaking to celebrate the "battle of the Boyne," were attacked by the opposite party, the Ribbonmen, a Roman Catholic association, and a riot ensued, which was only put down by the use of military force. This disgraceful occurrence ended in the loss of numerous lives. In 1872 the citizens combined against the public plunderers who had for years controlled the city government; a committee of seventy was appointed and the leaders of the "Ring" brought to justice. In 1873 the business of the city was again paralyzed by a panic of unusual length and severity. Great corporations closed their doors and went into bankruptcy. So universal was the want of confidence that the Stock Exchange for the first time in its history suspended all transactions. The effects of this panic are still evident, and the present depression of business may be rather considered as its continuation than its result; nor can any improvement be looked for until the currency of the country be arranged on a permanent and stable basis. JOHN AUSTIN STEVENS.

New York Mills, post-v. of Whitestown tp., Oneida co., N. Y., on Sauquoit Creek, has very large cotton-factories. Pop. 1264.

New York, University of the City of. This institution was incorporated in 1831, and opened for the reception of students in Oct., 1832. Its building, on Washington Square, was occupied for purposes of instruction in 1835. By its charter it is unsectarian, and therefore does not embrace in its corps of professors a theological faculty. Its corporate functions are entrusted to a council consisting of thirty-two members, elected every year in classes or sections of eight members each for four years. To these are added, *ex-officio*, the mayor of the city, and by election four from the common council of the city. A chancellor is the head of its professorial corps, which was originally distributed into a faculty of science and letters, a faculty of law, and a faculty of medicine. From its first organization to the year 1871 its course of instruction was in harmony with and parallel to that pursued in the leading colleges of the country, differing therefrom only in the provision made for students who desired to pursue only selected portions of its courses. Since 1871 the faculty of science and letters has been more distinctly divided into a faculty of arts and a faculty of science, and parallel full courses of instruction have been given by the faculty of arts in the usual collegiate studies, including the ancient languages, and by the faculty of science in the subjects taught in the best scientific schools (or *Realschulen*), together with civil engineering and analytical chemistry. In this department French and German also take the place of Greek and Latin. There are two literary societies sustained by the students, each possessing a fair working library. These hold meetings once a week during the university terms for practice in debate, in elocution, and in literary efforts of various kinds. The library of the university is still small, as are also its collections of cabinet materials for illustration; but its apparatus and means of instruction are adequate to its present necessities, and constantly increased as required. The university formerly had under its management and supervision a grammar school of a high grade and large numbers.

The original basis upon which the university was founded was a stock subscription of $100,000. The stockholders vote at the annual election for members of the council. It has from time to time received large gifts from a few liberal friends. George Griswold, John Johnston, John C. Green, and Loring Andrews may be mentioned among those who are now deceased; among the living the name of John Taylor Johnston is most conspicuous. In the year 1871–72 was first introduced the distinctive feature of the university, by which its courses in the arts and sciences were made gratuitous. All its undergraduate students therefore now receive their instruction without charge for tuition. In the professional schools of medicine and law the students pay an annual fee. This in the department of medicine is $185, including the matriculation and graduation fees and the fee for instruction by the demonstrator with material. In the department of law the fee for the year is $100. By statute graduates of this school are admitted to the bar of New York without further examination. The law library, through the liberality of John Taylor Johnston, Esq., is large and well selected. There is also a school of art connected with the department of science, in charge of the professor of art. The degrees conferred are the following: bachelor of arts; bachelor in science, and to students who have completed the course in civil engineering the degree of civil engineer. The fee for each of the above is $7; bachelor of laws, fee $5; master of arts and master in science, fees $10 each; doctor of medicine, fee $30. The honorary degrees of doctor of laws, doctor of divinity, doctor of philosophy, etc. are conferred. The university has three fellowships, the annual value of which is $300, $200, and $100, respectively.

New Zea'land, a group of islands lying in the South Pacific Ocean between 34° and 48° S. lat., and between 166° and 179° E. lon., and forming a colony of Great Britain. The group consists of three large islands, respectively called Northern, Middle, and Southern Island, and a number of islets, comprising an area of 106,259 square miles, with a population of 303,211, of whom 36,359 are natives. Northern and Middle Islands, which are by far the largest and most important, are divided from each other by Cook Strait, which is 18 miles wide at its narrowest passage, but in all physical relations they are very similar. They are of volcanic origin, and Tongariro, a peak on Northern Island 6000 feet high, is still an active volcano. A lofty range of mountains, which on Northern Island reaches a height of 9000 feet (Mount Ruapahu), and on Middle Island a height of 14,000 feet (Mount Cook), traverses them from N. to S., covering Northern Island with alpine regions and forming table-lands on Middle Island. The soil is everywhere fertile, and the climate is probably the most healthful and delicious on earth. The difference between the highest and lowest temperature is hardly 20°; fresh winds from the ocean are always blowing, and rains are abundant. Large tracts, especially of

the mountain-regions, are covered with forests of evergreen trees which yield excellent timber. The flora of the islands presents many peculiar species, among which is the celebrated New Zealand flax, but all varieties of European grains and fruits succeed eminently well and develop luxuriantly. When Cook first visited the islands in 1770 the dog and the rat were the only quadrupeds he found, but since then pigs, sheep, cattle, horses, deer, quails, pheasants, partridges, etc. have been introduced and thrive very well. The country is in every respect well suited to agriculture and cattle-breeding, and these two occupations form, consequently, the chief branches of industry carried on. The islands are divided into nine provinces. The chief towns are AUCKLAND, DUNEDIN, and CHRISTCHURCH (which see).

New Zi′on, post-v. and tp., Clarendon co., S. C. P. 640.

Ney (MICHEL), duke of Elchingen, prince of Moskva, marshal and peer of France, b. at Saarlouis Jan. 10, 1769, in humble circumstances; entered the French army in 1787; was made a captain in 1794, brigadier-general in 1797 after the battle of Neuwied, general of division in 1799 after the capture of Manheim, and marshal in 1804. He commanded in the Austrian, Prussian, and Spanish campaigns, and distinguished himself at Elchingen, Austerlitz, and Friedland. But his greatest exploits were the battle of Borodino while the grand army crossed the Moskva, his command of the rear-guard during the retreat from Moscow, and his exertions in order to organize a new army. After the abdication of Napoleon he submitted to the Bourbons, and was well received by Louis XVIII. When Napoleon returned from Elba, Ney repaired to Paris, assured the king of his fidelity, and received the command of a corps of 4000 men, with which he marched against the emperor, purposing to capture him and carry him to Paris. But when he saw the enthusiasm with which Napoleon was received everywhere he yielded to the demands of his soldiers and went over to the side of the emperor. After the second restoration he fled from Paris, but was captured, arraigned for high treason, and placed first before a court-martial, which declared itself incompetent, and then before the Chamber of Peers, which by a large majority condemned him to death. He was shot Dec. 7, 1815, in the garden of the Luxembourg, where a monument now stands in his honor. (See *Histoire complète du Procès du Maréchal Ney*, 2 vols., 1815.)

Nezheen′, or **Nejin,** town of European Russia, government of Tchernigov, on the Oster. It has many good educational institutions and a very large trade in tobacco. Pop. 17,981.

Nez Percé Indians [the "pierced noses," so named by the Canadian *voyageurs*], properly **Sahaptins,** a tribe of Indians of Northern Idaho, belonging to what is called the Sahaptin stock, remarkable for certain grammatical peculiarities in their languages. They occupy a reservation of 1,344,000 acres, to which they were removed from Oregon and Washington Territory. They are generally friendly to the whites, but there are several hundred who are discontented and refuse any favors from white men. The "treaty" Nez Percés number 2807, and are somewhat prosperous.

Nez Percés, county of N. Idaho. Its E. part is mountainous and abounds in gold-mines and forests. In the centre is Camas Prairie, a fine farming region. W. of this is the Nez Percé reservation, which is well wooded, with fertile valleys. Still farther W. there is a good farming region. The N. abounds in noble red-cedar forests. Cap. Lewiston. Pop. 1607.

N'ga′mi, a lake in the interior of Southern Africa, between 20° and 21° S. lat., and between 22° 10′ and 23° 30′ E. lon., at an elevation of 2500 feet. It is mostly surrounded with sandbanks and salt flats, and receives some few sluggish rivers. It is shallow, and seems to be only a reservoir for the surplus waters of the periodical inundations.

Ngan-Hwi′, province of China proper, between lat. 29° and 34° N. and lon. 113° and 119° E., comprises an area of 48,461 square miles, with 49,201,992 inhabitants. It is traversed by the Yang-tze-Kiang. Green tea and silk are extensively cultivated, copper and salt are produced, and ink and varnish manufactured. Cap. Ngan-King-Foo.

Ngan-King′, town of China, the capital of the province of Ngan-Hwi, on the Yang-tze-Kiang, manufactures cloth and porcelain and carries on a very extensive trade. The number of its inhabitants is unknown, but it is believed to be a very large and wealthy city.

Niag′ara, a port of entry of Lincoln co., Ontario, Canada, on Lake Ontario, at the mouth of the Niagara River, on a beautiful plain, is well laid out and is a fine summer resort. It is on the Great Western Railway, and is 14 miles below Niagara Falls. It has 1 weekly newspaper. Pop. 1600; inclusive of Niagara tp. 3693.

Niagara, county of W. New York, bounded N. by Lake Ontario, W. by Niagara River, and S. by Tonawanda Creek. Area, 558 square miles. It is for the most part nearly level, and is very fertile and well cultivated. Cattle, grain, wool, hay, potatoes, fruit, and dairy products are the agricultural staples. The manufactures are extensive, and include cooperage, lime, cement, lumber, flour, carriages, metallic wares, saddlery, clothing, etc. The county has good railroad facilities, and is traversed by the Erie Canal. Cap. Lockport. Pop. 50,437.

Niagara, frontier tp. of Niagara co., N. Y., bounded on S. and W. by Niagara River. The soil is specially adapted to the growth of cereals, maize, and fruit. P. 6832. Within its limits are the villages of Niagara Falls and Suspension Bridge. GEORGE W. HOLLEY.

Niagara, a river of North America, forming the boundary between the State of New York, U. S., and the province of Ontario, Canada, and connecting Lake Erie with Lake Ontario, is 36 miles long, and has a total fall of 333 feet. It is navigable in its upper course from its issue from Lake Erie to the commencement of the rapids at Niagara Falls, a distance of 16 miles, during which its fall is only 20 feet; and in its lower course from Lewiston to Lake Ontario, a distance of about 8 miles, during which its fall is only 2 feet. Along its middle course, which contains the celebrated Niagara Falls and is crossed by two suspension bridges, on the Canadian side is the Welland Canal, through which the navigation interrupted by the rapids and falls of the middle course of the river is carried on. In its upper course it forms many islands, and its average depth is 25 feet. In its lower course, from Lewiston to its mouth in Lake Ontario, its depth varies from 100 to 150 feet.

Niagara City, a former v. of Niagara tp., Niagara co., N. Y., now called SUSPENSION BRIDGE (which see). Pop. 2276.

Niagara Falls received their name from the Iroquois Indians, in whose language the word *Niagara* signifies the

Niagara Falls, from the American side.

"thunder of water." The name is very appropriate, as that feature of the whole grand phenomenon which strikes the senses first and most powerfully is the tremendous roar of the falling waters, filling the air for a distance of several miles. With respect to height and picturesqueness of surroundings, Niagara Falls are surpassed by several Swiss and Norwegian falls, not to speak of certain less-known falls in the Himalaya Mountains or in the north-eastern part of Central Africa. It is the immense volume of water which makes Niagara Falls unique, about 2,000,000 tons being hurled every minute over the ledge of the rock into the chasm below. Hence the explanation of the observation often made, that the first view of Niagara Falls is rather disappointing, while a closer acquaintance with the true character of the phenomenon, the awful and frantic forces which here are let loose, and the calm, irresistible power which holds every minute particle of this boiling chaos and bends it into a regulated course, leaves in the mind an everlasting impression of the sublime.

During the first 16 miles of its course after issuing from Lake Erie the Niagara River has a fall of only 20 feet,

and below Grand Island it resembles a lake rather than a stream; it is from 2 to 3 miles wide, and presents a calm surface studded with islands. But at this point, about 16 miles below Lake Erie and a little more than 1 mile above the great cataract, it contracts into a narrow current, and before it makes the great leap it descends 52 feet over a series of rapids. At the edge of the cataract the width of the river is about 4750 feet, but the edge itself does not form one straight line. First, it is broken by Goat Island, which, about 1000 feet wide and 2000 feet long, rises 40 feet above the water and extends out to the very brink, thus dividing the fall into two. Next, it forms between Goat Island and the Canadian shore a large curve, bent inward, which, resembling a horseshoe, gives this part of the fall the name of the Horseshoe Fall. The height of the cataract is 164 feet on the American side of Goat Island and 150 on the Canadian. From the foot of the fall to Lewiston, a distance of 7 miles, after which it enters a level region, the river descends 104 feet, running through a deep and narrow gorge, whose width varies from 200 to 400 feet, and whose sides rise almost perpendicularly, so that access to the river can be had only by stairways. About one-eighth of a mile below the falls a suspension bridge is thrown across the river, 190 feet above the water, 1190 feet from cliff to cliff and 1268 feet from tower to tower; it was finished in 1869, and presents a magnificent view of the falls. In 1855 another suspension bridge was constructed across the river about 2 miles below the falls, 245 feet above the water and 821 feet from tower to tower. About 3 miles below the falls the great "Whirlpool" is formed by a sudden turn in the narrow channel, forcing the water with great violence into a depression on the Canadian shore, and thence immediately back again to the American side. The power of this whirlpool is immense. Huge tree-trunks, from 2 to 3 feet in diameter and 50 feet long, are drawn down lengthwise, submerged for a time, and then ejected with great force, only to resume their monotonous "rounds," in which they are detained from four to six weeks before they finally escape to the channel below. It has happened several times—last in 1856—that in very cold winters the ice below has increased to immense thickness by the frozen spray and formed a bridge across the river.

The first notice of Niagara Falls which exists is due to the French missionary Father Hennepin, and was made in 1678, containing a view and a description. The aspect of the falls, such as they are represented by this view, shows one striking difference from the present aspect—namely, a third fall formed on the Canadian side by a huge rock which divided and turned the current. In a description published in 1751 in the *Gentleman's Magazine* by a Swedish naturalist, Kalm, who visited the falls in 1750, this rock is said to have fallen down a few years previously. Other and very considerable changes have taken place quite recently. In 1818 large parts of the edge of the precipice broke down on the American side of the falls; in 1828 on the Canadian side, and again in 1855. But it is due to very minute and careful scientific researches, especially those of Prof. James Hall, who in 1842 undertook a trigonometrical survey of the falls for the State geological survey, and made an accurate map, that a vivid and exact idea has been formed of the enormous mechanical powers which are at work here, uninterruptedly, in every second, and which have been so for centuries past. The falling water acts as a huge saw, cutting a channel in the rock at the rate of about one foot a year. It began its work at Lewiston, on the edge of the plateau which bears Lake Erie and faces with a bold terrace the low land extending around Lake Ontario. The immediate cause of the formation of the cataract was the filling up of the old channel of Niagara River. There is a lateral valley leading from the Whirlpool through the Queenstown precipice at a point a few miles W. of Lewiston. This valley formed the old gorge of Niagara River, but it became blocked up with drift of the Glacial period, and thus the river, when again in action, was compelled to open a new passage. It succeeded in bursting through at Lewiston, and set the saw agoing. The result of its labor, so far, is the gorge through which it flows from the present site of the falls to Lewiston, and through which the Maid of the Mist, a small but powerful steamboat, was safely brought down from the foot of the fall to Lake Ontario in 1861. If the rate of retrocession is computed at 1 foot a year, it will have required over 31,000 years to make this distance. But Mr. Desor, after studying the falls, came to the conclusion that the rate of retrocession was more nearly 3 feet a century than 3 feet a year; and if the rate is estimated at 1 inch a year, or 8½ feet a century, the distance made will have required 380,000 years. The manner in which the retrocession takes place may be described as follows: The edge of the precipice is formed, on the present site of the cataract, of a layer from 80 to 90 feet thick of the so-called Niagara limestone. Below this are shaly layers of the same formation, softer and more easily hollowed out by the action of the spray. Thus has been formed the so-called "Cave of the Winds," which runs behind the falling waters along the wall of the precipice, and connects the Canadian shore with Goat Island by a rough, slippery, half-subterranean, half-submarine pathway. But one day the roof of this cave may give way, and the falls recede many feet in one minute. There is, however, farther back in the course of the river, a point where the cataract will meet a solid bed of sandstone, and become stationary or nearly so. (See *Travels in North America*, by Sir Charles Lyell, 1845.) CLEMENS PETERSEN.

Niagara Falls, p.-v., Niagara tp., Niagara co., N. Y., 20 miles N. of Buffalo, on the New York Central, the Erie, and the Buffalo and Niagara Falls R. Rs. It contains 2 union schools, 5 churches, 1 weekly newspaper, an extensive car manufactory and repair-shop, 1 paper-mill, 2 grist-mills, and a machine-shop. The great falls bound the village on the S., while above are the rapids with Goat, Luna, and other islands. The Niagara Falls suspension carriage bridge is 50 rods below the American Fall, and is the longest of its kind in the world, being 1200 feet between the towers and its road-bed 230 feet above the water. A steam-elevator on the Canadian side enables travellers to reach the top, from which an extensive view is obtained. The existence of the rapids is due to an angle which the river makes to the left as one looks up-stream, so that the channel above the falls is now *rising* on the *dip* of the bed-rock which underlies it; whereas before this change of direction the channel was concurrent with the dip, and the water above the precipice, being deeper than at its edge, was unbroken at its surface, as that in a mill-pond above its dam. Bath and Goat islands are reached by means of iron-frame bridges resting on piers, the latter being one of the most attractive spots about the great cataract. It contains nearly 70 acres, and is 150 rods long by 70 rods wide. The old stone tower which formerly stood in the rapids near its S. W. corner has been removed. Near the centre of the lower end is the "Biddle Stairway," by which access is gained to the "Cave of the Winds." This is an irregular arch about 50 feet wide, 70 feet high, and 30 feet deep, formed by the detrition and crumbling away of the perpendicular face of the rock at the foot of Luna Island. Visitors provided with oilskin dresses and attendant guides make the tour of the cave, which forms an exciting and novel amusement. P. 3006. GEORGE W. HOLLEY.

Nian'tic, post-v. of East Lyme tp., New London co., Conn., on Niantic Bay and on the Shore Line division of the New York New Haven and Hartford R. R.

Niantic, post-v. and tp. of Macon co., Ill., has 1 weekly newspaper. Pop. 977.

Niare, Zamouse, or **Bush Cow,** the *Bos brachyceros*, a species, or probably a marked variety, of wild-ox, having a wide range in Africa. It has no dewlap, has sharp, crooked, and short horns, large and finely fringed ears, and a fierce disposition. It is of a rather small size.

Nias', an island of the Malay Archipelago, is a short distance to the W. of Sumatra, near the equator. It is 70 miles long, with an average breadth of 16 miles; high, mountainous, surrounded with coral-reefs, but fertile and producing rice, sugar, and large quantities of pepper. The inhabitants, numbering about 110,000, are of the Malay race, well-built, peaceable, and industrious. A considerable slave-trade is carried on here, partly by the connivance of the Dutch government, partly covered by legal enactments, which produce the state of slavery without employing the name. The insolvent debtor is doomed to a certain number of days of forced labor, and the European immigrants to Sumatra buy such forced labor from the Dutch government of Nias by paying the debt on it.

Ni'belungen-Lied, or **Lay of the Nibelungers,** an anonymous epic of the Old High German, and the longest, most complete, and most artistic of the ballads or popular songs (Ger. *Volk-lieder*) of the Middle Ages. In its present form the poem dates from that age which was so fruitful of ballads and minstrels, the latter part of the twelfth or the beginning of the thirteenth century. But this is believed to be only a reproduction or recomposition from earlier songs. Long forgotten, brought to light again and printed for the first time in 1757, it was received with great enthusiasm in Germany, where it is still much admired and studied as a classic. The metrical form of the poem is easily reproduced in English verse. It consists of strophes or stanzas, each of four iambic and trochaic lines in rhymed couplets, with a strongly-marked feminine cæsura in the middle. It contains nearly 6000 lines, and so is not far from two-fifths of the length of Homer's *Iliad*.

It is divided into thirty-nine books or sections called Adventures, which might be sung in separate lays like the rhapsodies of the Homeric poems. It further divides itself into two nearly equal parts, in the first of which the scene is laid on the Rhine, chiefly at Worms, the ancient capital of Burgundy, but partly also in the Netherlands or Low Countries, towards the mouth of that river; in the other, on the Danube, at Vienna and Buda, chief cities of Attila, king of the Huns. The chief subject of the first part is the love, courtship, and marriage of Siegfried, prince of the Netherlands, to Kriemhild, a Burgundian princess, and of Günther, king of Burgundy and brother of Kriemhild, to Brunhild, a heroine of the fabulous North; together with the journeys, marches, and adventures, the festivities, tournaments, wars, and battles, which preceded or attended them, and the envy, jealousy, and contention which ensued first between the two brides, and consequently between the bridegrooms and among their friends and followers, and the tragical issue in the murder of Siegfried by Hagen, Kriemhild's uncle, at the instance of Brunhild and with the consent of Günther. The subject of the second part is the wrath and vengeance of Kriemhild; her marriage to Attila, simply that she may have the means of avenging herself on the murderers of her former husband; the chivalrous and romantic march of Günther with his younger brothers (Gernot and Geiselher), his uncles (Hagen and Dankwart), and a retinue of 60 heroes, 1000 select warriors, and 9000 ordinary ones, from Worms to Vienna, at the invitation of Kriemhild and Attila, and the slaughter of them all to a man, with a still larger number of Huns and their allies, at a festival which ends in a *mêlée* and a battle or massacre; and, finally, the slaying of Kriemhild herself, leaving only Attila and his friend Dietrich (the Theodoric of history) to lament the dreadful catastrophe. Well might the poem close with these lines, which contain the moral of the tale:

> "The feast of royal Etzel was thus shut up in woe:
> Pain in the steps of pleasure treads ever here below."

The leading characters, including Rüdiger of Bechelaren, who was manifestly a personal favorite of the author, and who is therefore drawn *con amore* as the noblest man, though not the greatest warrior and hero, of the poem, are all historical, and most of them appear again and again in the Eddas, in the Troubadours and Trouvères, in the mediæval myths and ballads of Northern and Southern as well as Middle Europe. Yet the poem abounds in anachronisms and historical and geographical inaccuracies. And well it may, for it was not composed until 700 or 800 years after the actors had passed off the stage, and the scene shifts from the Rhine in the S. W. and the Danube in the S. E. to that cloudland of the North from which the Nibelungers probably derived their name (Ger. *nebel*, "cloud"), and which was as little known to the author of the *Nibelungen* as the Western Mediterranean was to the author of the *Odyssey*.

No scholar can read a single Adventure of the *Nibelungen* without being often reminded of the *Iliad* and *Odyssey*. If the subject of the *Iliad* is "the wrath of Achilles," the vengeance of Kriemhild is more manifestly the theme of the second part of the *Nibelungen*. The ancient and the modern epic are alike objective. The author keeps *himself* entirely out of sight; and the same German critics who have annihilated Homer and disintegrated his poems have attempted the same work of destruction, but with even less success, on the *Nibelungen-Lied*. The episodes which narrate the story of the original Nibelungers, their conquest, and the capture of their fabulous treasure by Siegfried, and the ruin in which that treasure involves all its possessors, vie in romantic interest with the adventures of Ulysses and the far-famed "Tales of Alcinous" in the *Odyssey*. The giant and the dwarf who had charge of the treasure are a fair counterpart to the Cyclops and the Læstrygonians, and the magic cap and cloak and mighty sword which Siegfried wrests from them remind the reader of the cup of Circe, the song of the Sirens, and the bag of the winds which Æolus puts into the hands of Ulysses. The tragical and sanguinary scene at the conclusion also suggests the slaughter of the suitors and the battle of the gods near the close of the *Iliad* and the *Odyssey*; only it is far *more* tragical and bloody; it is monstrous, prodigious, shocking to the taste as well as the sensibilities of the modern reader. The society and manners of the Homeric age, the feudal chieftains and their retainers, the kind of armor and mode of warfare, the duels of individual heroes in the midst of great battles, the festivals and games,—these are all more or less repeated under exaggerated forms in the Middle Ages, and reproduced in the *Nibelungen-Lied*. Some of the characters tower far above any in the *Iliad* and *Odyssey* in true nobility, in knightly courtesy, and generosity. Both poems are highly dramatic. But the German wants the simple ease and grace of the Grecian, as well as its inimitable elegance and flexibility and affluence of language, and the abundance and aptness of its similes and other illustrations. The later epic is also inferior to the earlier in that nice discrimination and delineation of character by action and dialogue and descriptive epithets in which the Homeric poems stand without a peer and almost without a rival in the history of epic poetry. (See Grimm's *Deutsche Heldensage*; Carlyle's *Essays*; Fauriel's *Hist. of Provençal Poetry;* Ludlow's *Pop. Eps. of Mid. Ages;* translations into English verse by Birch and Lettsom, and German eds. or versions by C. H. Müller, Lachmann, Braunfels, Simrock, Pfitzer, Marbach, and Beta.)

W. S. Tyler.

Nicara'gua, republic of Central America, between lat. 10° 45′ and 14° 55′ N., and between lon. 83° 15′ and 87° 38′ W., bounded N. by Honduras, E. by the Caribbean Sea, S. by Costa Rica, and W. by the Pacific. Area, 58,000 square miles. Pop. about 250,000, of which more than one-half are Indians, and the rest mestizoes, with comparatively few pure whites or pure negroes. A branch of the Cordilleras traverses the central part of the country, sending numerous spurs towards the Caribbean Sea. Another range—or rather series of isolated mountains, most of which are volcanoes, some still active (Cosequina, 3835 feet high; violent eruption in 1835)—runs parallel with the Pacific at a distance of from 10 to 20 miles. Between these two mountain-ranges extend the basins of the lakes of Nicaragua and Managua, surrounded by high plains, which afford excellent pasturage; here large herds of cattle are reared. The soil of the low Pacific coast is very fertile. All tropical plants grow abundantly—cacao, one of the principal products of the country, sugar, yielding two and even three crops annually, cotton, indigo, coffee, tobacco, rice, maize, vanilla, ginger, sarsaparilla, breadfruits, bananas, citrons, etc. The Caribbean coast is also very low, and along the rivers is swampy and unhealthy. The principal rivers are the Coco or Segovia, which forms the northern boundary, and the San Juan, which forms the southern; the mouth of the latter affords the only good harbor of the country on the Caribbean. The region between the eastern coast and the Cordilleras is covered with vast forests, yielding excellent timber, fine cabinet woods, mahogany, and rosewood, dyewoods—logwood, fustic, sandal, and Nicaragua-woods—and many medicinal trees. In the mountains of the northern part of the country gold, silver, and other metals are found, and coal, marble, alabaster, sulphur, alum, and other minerals are abundant. But these, as all the other rich resources of the country, are entirely undeveloped. For the last thirty years it has been distracted by revolutions and counter-revolutions. Its population, industry, and commerce are decreasing, and its principal interest to the civilized world is in the different schemes of forming a passage through it from the Atlantic to the Pacific. Cap. Managua.

Nicaragua, or **Rivas,** town of the republic of Nicaragua, Central America, near the western shore of the lake of the same name, consists of seven Indian villages, without any noticeable public buildings and presenting a general appearance of decay and destruction, produced partly by earthquakes and partly by the civil wars. But the plain in which it stands is extremely fertile, and its one-story houses are surrounded with the most luxuriant gardens of oranges, citrons, bananas, and palm trees. Pop. about 10,000, of whom about 7000 are pure Indians.

Nicaragua, Lake, a lake of Central America, in the republic of Nicaragua, is 90 miles long and 40 miles broad, separated from the Pacific only by a line of active volcanoes, and connected with the Caribbean Sea by the river San Juan de Nicaragua. It forms the basis of a great project of connecting the Atlantic with the Pacific by a canal, but the plan, though its practicability is admitted by all and its usefulness evident, has as yet led to no practical results. On an island, Pensacola, situated nearly in the centre of the lake, have been found some very interesting Indian antiquities, sculptures of black basalt, and exhibiting another style and a different kind of workmanship from those found in Yucatan.

Nicas'sio, post-v. and tp. of Marin co., Cal. Pop. 592.

Nicas'tro, town of Calabria, province of Catanzaro, situated on the flank of the Apennines at the head of the lovely bay of Sant' Eufemia. It rises cone-like towards the top of a hill crowned by the ruins of an old castle, but the lower portions of the town often suffer severely from torrents. Nicastro is the centre of trade for all the little communes around the Gulf of Sant' Eufemia. It possesses many churches, an episcopal palace, and extensive buildings formerly used as convents. Nicastro occupies the site of the ancient *Numistro*, and it was in the castle of this town that Frederick II. made his rebel son Henry a prisoner. Near this place Cicero had his villa *Ipponio*,

to which he retired when persecuted by Clodius. Pop. 13,181.

Niccoli'ni (Giambattista), b. in 1782 at the Bagni di S. Giuliano; d. in Florence in 1861; studied at the University of Pisa, and profited much from his acquaintance with scholars, especially with Ugo Foscolo, who was strongly attached to him. Many have supposed Niccolini to be intended by the "Lorenzo" of the *Ultime Lettere di Jacopo Ortis*. Foscolo, when already very eminent, dedicated to the youthful Niccolini his translation of the *Hair of Berenice* by Callimachus. In 1804, on the occasion of the plague at Leghorn, Niccolini wrote a beautiful poem entitled *La Pietà;* then followed his tragedies, *Polissena, Medea, Edipo, Ino e Temisto, Matilda*, and the translations of the *Seven from Thebes* and of the *Agamemnon* of Æschylus. Under the government of Élise Bonaparte Niccolini was made professor of history and mythology. His lectures made an epoch in the Tuscan literary history of this century. Niccolini's tragedy of *Nabucco*, an allegory of the fall of the Napoleonic empire, was printed at London at the expense of the Marchese Gino Capponi, an intimate friend of the poet. In 1827 his new tragedy, *Antonio Foscarini*, was represented with great success in Florence. In 1830 he took a bolder step; his *Giovanni da Procida* was a revolutionary outcry. His highest fame was acquired by his bold and eloquent dramatic poem, *Arnaldo da Brescia*, printed at Marseilles in 1843, in which he combated the Guelph ideas then prevalent in Italy. The appearance of this poem was an event of real political importance for Italy. In 1847 he published his tragedy *Filippo Strozzi;* then his *Beatrice Cenci*, an imitation of Shelley; and a national tragedy, *Mario ed I Cimbri*. In 1858 the theatre of the Cocomero of Florence changed its name to that of Niccolini in the presence of the poet. After his death a monument (not yet erected) was decreed to him in the church of Santa Croce. A complete edition of his works has been undertaken in Milan by Prof. Corrado Gargiolli.

Ni'ce, or **Nicæa** [Gr. Νίκαια, "city of victory;" now *Isnik* = εἰς Νίκαιαν], an ancient city of Bithynia, at the E. end of the Lake Ascanius (10 miles long and 4 miles wide), 44 miles S. E. of Byzantium. According to Strabo (*Geog.*, xii. 4. 7), it was founded by Antigonus (d. 301 B. C.), and rebuilt by Lysimachus (d. 281 B. C.), who changed its name from Antigonia to Nicæa, the name of his first wife. It was rectangular, 16 stadia in circuit, and surrounded by massive walls with four gates. From 1204 to 1261 A. D. (while Constantinople was held by the crusaders), it was the capital of the Greek empire. Its chief historic renown is due to the two œcumenical councils that were held there—the first, of 318 bishops, mostly from the Orient, who in 325 condemned Arianism; and the other (the seventh of twenty in all), of 350 bishops, who in 787 sanctioned the use of images. Isnik, which contains about 100 families, occupies only a small portion of the old site. The ruins of walls, towers, gates, and buildings are still imposing. The first council is supposed to have met in the now ruined mosque of Orchan. A rude picture of the council may be seen in the one solitary Christian church (of the twelfth century) which still remains. (See Leake's *Asia Minor* (1824); Sir Charles Fellows's *Asia Minor and Lycia* (1852), and Stanley's *Eastern Church*, Lect. v. (1861).)

R. D. Hitchcock.

Nice, town of France, capital of the department of Alpes-Maritimes, is beautifully situated at the foot of the Alps, on both sides of the mouth of the Paglione. It consists of the old town, the new town, and the port, and the three divisions have very different appearances, but they are all connected with each other and surrounded by most beautiful promenades, drives, and public gardens, which, together with the exceedingly mild and salubrious climate, yearly attract thousands of foreigners who spend the winter here. It has several military magazines, tanneries, spinning and weaving factories, and manufactures of wax, essences, and preserved fruit. Its trade in wine, oil, hemp, silk, and fruits is very considerable. It belonged to the family of the duke of Savoy until 1388, but was in 1860 ceded to France. Pop. 52,377.

Nice, Councils of. See Council, Œcumenical, and Nice.

Ni'cene Creed. See Creed.

Nich'ol (John), LL.D., son of Prof. John P. Nichol, b. at Montrose, Scotland, Sept. 8, 1833; educated at the universities of Glasgow (1848–55) and Oxford (1855–59); became professor of English literature in the University of Glasgow 1861; has been tutor to a large number of candidates for honors at Oxford; has been a popular lecturer on literature, especially to classes of ladies, in various cities of England and Scotland; was noted for his advocacy of the Union cause during the American civil war, and for his so-called "Broad Church" theology; has been a frequent contributor to the *Westminster, North British*, and other reviews; wrote for the eighth and is writing for the ninth ed. of the *Encyclopædia Britannica;* published a volume of essays entitled *Fragments of Criticism* (1860) and a classical drama, *Hannibal* (1872).

Nichol (John Pringle), LL.D., b. at Brechin, Scotland, Jan. 13, 1804, the son of a bookseller; taught school in early life; studied for the ministry of the Scottish Church, and was licensed to preach, but soon devoted himself to science; became a successful popular lecturer upon astronomy, in which capacity he visited the U. S., and professor of practical astronomy in the University of Glasgow. Among his works were *Views of the Architecture of the Heavens* (1838), *The Stellar Universe* (1848), *The Planetary System, its Order and Physical Structure* (1851), and *Cyclopædia of the Physical Sciences* (1857). D. at Rothesay Sept. 19, 1859.

Nich'olas, county of N. E. Kentucky. Area, 290 square miles. It is uneven and generally very fertile. Tobacco, live-stock, grain, and wool are leading products. The county is traversed by Licking River and the Maysville and Lexington R. R. Cap. Carlisle. Pop. 9129.

Nicholas, county of West Virginia, in the S. central portion. Area, 600 square miles. It is hilly and mountainous, but generally fertile. Corn and wool are leading products. Coal and iron abound. The county is traversed by Gauley River. Cap. Summerville, or Nicholas Courthouse. Pop. 4458.

Nicholas I., Pope (858–868), a Roman by birth, an imperious and energetic character; asserted the papal authority with great success against the metropolitan in his controversy with Hincmar of Rheims, and even against the royal and imperial power, compelling Lothaire, king of Lorraine, who was supported by his brother, the emperor Louis, to abandon his mistress, Walrada, and reinstate his legitimate wife, Theutberga, in her rights as queen. Less successful was his contest with the patriarch of Constantinople, Photius, who had usurped the see after the deposition of Ignatius by the emperor. Nicholas excommunicated Photius and demanded the reinstatement of Ignatius, but the emperor, Michael III., supported Photius, who in his turn excommunicated Nicholas, arguing that the highest ecclesiastical authority had been transferred from the see of Rome to that of Constantinople by the transference of the imperial residence.—Nicholas V., Pope (1447–55), b. at Pisa in 1398, a peaceable and kind-hearted man, with great interest in learning; reorganized and enlarged the Vatican library and the University of Rome, and gathered in Rome a great number of the most celebrated scholars of the age, among whom were many Greeks who fled to Western Europe on the downfall of the Eastern empire.—In 1328, Louis of Bavaria raised Peter de Corbario as antipope to John XXII., under the name of Nicholas V., but he d. shortly after in the papal dungeon, and is not counted in the papal succession.

Nicholas I. (Nikolai Paulovitch), emperor of Russia (1825–55), b. at St. Petersburg July 7, 1796, the third son of the emperor Paul. On the death of Alexander I., the elder brother, Constantine, resigned the crown, and thus Nicholas succeeded to the throne. A formidable military conspiracy, which endangered not only his succession, but the very existence of the empire, he put down with admirable courage and presence of mind, but also with a relentless severity which almost resembled cruelty; and a similar hardness he showed after the suppression of the Polish rebellion in 1830. He was cold and despotic, but within the narrow compass of his ideas he was just. He had no pity, but he was free from caprices—a man of simple habits, industrious and trustworthy. During the reign of Alexander he had no share in the government. He travelled, visited England, married in 1817 the eldest daughter of Frederick William III. of Prussia, and lived at St. Petersburg in domestic retirement, occupied by military studies. In the wars, however, which Russia carried on during his own government in Central Asia, the Caucasus, Turkey, Hungary, Poland, and with the Western powers, he took no part personally, and military authorities found his ideas and views of military matters deficient. As an administrator he had a decided talent. That huge bureaucratic engine, with its foundation of a strong standing army and its appendage of a secret police, by which Russia has been governed during the last fifty years, was entirely his fabric; and being a man of immense working power, he managed the engine well; the country prospered and progressed. Systematization was his great idea. Protestants, Jews, etc. were harassed, even persecuted, for there ought to be only one Church in Russia; and after the suppression of the Polish rebellion he actually undertook to annihilate the Polish nationality and Russianize

the country. As a diplomat he had also some talent. For several years after 1849, Russia occupied the first place in the political system of Europe, and her plans with respect to Turkey were rapidly maturing when they received a sudden check from Napoleon III. by the alliance between England, France, Sardinia, and Turkey, and the ensuing Crimean war. The misfortunes of the Russian arms during this war were a great humiliation to this haughty man, and are said to have shortened his life; d. Mar. 2, 1855.

Nicholas (George), son of Judge R. C. Nicholas, was b. at Hanover, Va.; graduated in 1772 at William and Mary College; served with distinction in the Revolutionary war, and exercised afterwards a remarkably wide influence in the public affairs of Virginia; removed in 1790 to Kentucky; was the principal author of its constitution (1792) and its first attorney-general. D. 1799.

Nicholas (Robert Carter), b. in Virginia in 1715; was educated at William and Mary College; became a prominent lawyer of James City; was appointed in 1779 a chancery judge, and was the father of several prominent statesmen. D. in Hanover co., Va., in 1780.

Nicholas (Thomas), Ph. D., F. G. S., b. in Pembrokeshire, Wales, in 1820; studied in Lancashire College and in Germany; became professor of biblical literature at Caermarthen College 1856; projected and founded the University College of Wales, an unsectarian institution which aims to assimilate the education of Wales to that of England; published *Middle and High Schools and University Education for Wales* (1863), *The Pedigree of the English People* (1868; 4th ed. 1874), *Annals and Antiquities of the Counties and Families of Wales* (1872), and a *History of the County of Glamorgan* (1874). Dr. Nicholas has made many translations from the German for periodicals, and is known as an ethnologist by his advocacy of the doctrine that the English people are traceable chiefly to a Celtic ancestry.

Nicholas (Wilson Cary), a son of Judge R. C. Nicholas; was educated at William and Mary College; served with distinction in the Revolution, in which he commanded Washington's body-guard; was in Congress 1807–09; U. S. Senator 1799–1804; U. S. collector at Norfolk 1804–07; governor of Virginia 1814–17. D. at Milton, Va., Oct. 10, 1820.

Nicholas Court-house, the P. O. name of Summerville, a v. of Summerville tp., cap. of Nicholas co., West Va., 48 miles E. of Charleston.

Nicholasville, post-v., cap. of Jessamine co., Ky., 12 miles from Lexington, on the Covington and Lexington R. R., has 1 academy and 1 seminary, 8 churches, 2 banks, several mills, 1 newspaper, and stores. Pop. 1089.

J. M. Parris, Ed. "Journal."

Nich'ols, post-v. and tp. of Tioga co., N. Y., on the Susquehanna River and on the Chenango Extension Canal. Pop. of v. 281; of tp. 1663.

Nichols (Edward Tatnall), U. S. N., b. Mar. 1, 1823, in Georgia; entered the navy as a midshipman in 1836; became a passed midshipman in 1842, a lieutenant in 1850, a commander in 1862, a captain in 1866, a commodore in 1872; commanded the Winona at the passage of Forts Jackson and St. Philip and the Vicksburg batteries in 1862, and commended for "ability, steadiness, and sound judgment."

Foxhall A. Parker.

Nichols (Ichabod), D. D., b. at Portsmouth, N. H., July 5, 1784; graduated at Harvard College 1802; was mathematical tutor there 1805–08; was ordained associate pastor with Rev. Dr. Deane of the First Congregational church (Unitarian) at Portland, Me., Jan. 7, 1809; was sole pastor from 1814 to 1855, when he received a colleague, and removed to Cambridge, Mass, where he d. Jan. 2, 1859. For many years he was a trustee of Bowdoin College and vice-president of the American Academy of Arts and Sciences. In 1830 he published a work on *Natural Theology*, characterized by originality both in ideas and exposition. A posthumous work, *Hours with the Evangelists* (2 vols., 1859–64), is mainly addressed to the refutation of the views of Strauss. A volume entitled *Remembered Words from the Sermons of the Rev. I. Nichols* appeared at Boston in 1860.

Nichols (John), F. S. A., b. at Islington, a suburb of London, England, Feb. 2, 1745; was apprenticed to the eminent printer William Bowyer; became his partner, successor, and biographer, and was a distinguished benefactor to English letters, not only by the enterprise and liberality displayed in several costly undertakings, but by his careful editorship of numerous works and by his own learned writings. Nichols printed in 1778 for private distribution a little brochure of 52 pages, *Brief Memoirs of Mr. Bowyer*, which was soon expanded into a quarto volume, *Biographical and Literary Anecdotes of William Bowyer, Printer, F. S. A., and of Many of his Learned Friends* (1782); and the latter work became so popular as to be ultimately recast into the valuable series entitled *Literary Anecdotes of the Eighteenth Century* (9 vols. 8vo, 1812–15), and was followed by *Illustrations of Literary History* (8 vols. 8vo, 1817–58), completed by his son, John Bowyer Nichols. From 1778 until his death Mr. Nichols was the editor and publisher of the *Gentleman's Magazine*. Among his elegant volumes upon English local history were *Bibliotheca Topographica Britannica* (52 Nos., 1780–90); *The Progresses, Processions, Festivities, and Pageants of Queen Elizabeth* (4 vols., 1788–1821) and of *King James I.* (4 vols., 1828), and *The History and Antiquities of the Town and County of Leicester* (7 parts, 8 vols., 1795–1815). D. in London Nov. 26, 1826.

Nichols (John Bowyer), F. S. A., son of John, b. in London July 15, 1779; was educated at St. Paul's School; became an assistant in his father's publishing-house 1796, to which he succeeded in 1826, and maintained its reputation by producing a large number of magnificent topographical works, among which may be mentioned Ormerod's *Cheshire*, Surtees' *Durham*, Baker's *Northamptonshire*, Hutchin's *Dorset*, Hoare's *South Wilts*, and Hunter's *South Yorkshire*. Besides continuing his father's *Literary History*, he wrote *A Brief Account of the Guildhall in the City of London* (1819), *Historical Notices of Fonthill and its Abbey* (1836), and several other works; was editor of the *Gentleman's Magazine* (1833–56), and printer to the House of Commons. D. at Ealing, near London, Oct. 19, 1863.

Nichols (John Gough), F. S. A., son of John Bowyer Nichols, b. in London in 1806; was educated at Merchant Taylors' School, and followed the precedent established by his father and grandfather in uniting authorship with the business of publisher. He was editor of the *Gentleman's Magazine*, of the *Collectanea Topographica et Genealogica*, of the *Topographer and Genealogist*, of the *Herald and Genealogist*, and of many of the publications of the Camden and Roxburghe Clubs. Among his original works were the biographies accompanying the *Autographs of the Royal, Noble, Learned, and Remarkable Persons in English History* (1829), *Monuments of the Beauchamp Chapel, Warwick* (1833), and *London Pageants* (1837). D. at Holmwood, near Dorking, Nov. 14, 1873. (See his *Memoir*, by his brother, R. C. Nichols, 1874.)

Nichols (Mary Sergeant **Gove**), M. D., b. in Goffstown, N. H., in 1810; studied medicine, and became widely known while Mrs. Gove as a lecturer and writer upon the water-cure system. Mrs. Gove also wrote several tales and sketches under the *nom de plume* of "Mary Orme;" contributed to Godey's *Lady's Book* and to the *American Review*, and published *Lectures to Ladies on Anatomy and Physiology* (1844). She has since become the wife of Thomas L. Nichols, M. D., of New York City, who is author of *Woman in all Ages and Nations* (1849) and of *Esoteric Anthropology* (1853).

Nichols (Rebecca S. **Reed**), b. at Greenwich, N. J., about 1818; married Mr. Willard Nichols at Louisville, Ky., 1838; resided for a time in St. Louis, and then settled at Cincinnati. She wrote verses for the Louisville papers about 1840, contributed to several magazines, edited a literary newspaper, *The Guest*, 1844, and published volumes of poems in 1844 and 1851.

Nichols (Richard), b. in England about 1620; was sent in 1664 as one of the four commissioners to inquire into the state of the American colonies and to organize an attack upon the Dutch at Manhattan; arrived at Boston in July; was present at the surrender of the Dutch in August; assumed the administration both of New York and New Jersey; resigned the latter to Carteret in 1666, and was succeeded in the former by Col. Lovelace in 1667. The administration of Gov. Nichols was characterized by prudence and integrity. He returned to England, and his subsequent history is unknown.

Nichols (Gen. William A.), b. in Pennsylvania in 1817; graduated at U. S. Military Academy 1838; served in the Mexican war; became lieutenant-colonel 1861; served throughout the civil war in the adjutant-general's department, rendering important though unobtrusive services; was promoted to be colonel and brevet brigadier-general 1864, and brevet major-general Mar. 13, 1865. Subsequently he became adjutant-general of the military department of the Missouri, and d. at St. Louis, Mo., Apr. 8, 1869.

Nich'olson, tp. of Fayette co., Pa. Pop. 1359.

Nicholson, post-v. and tp., Wyoming co., Pa., on an affluent of the Susquehanna River, and on the Delaware Lackawanna and Western R. R., has 1 weekly newspaper. Pop. 1546.

Nicholson (Alfred O. P.), b. in Williamson co., Tenn., Aug. 31, 1808; graduated at the University of North Carolina, Chapel Hill, N. C., in 1827; studied medicine at Columbia, Tenn., and attended a course of lectures at Philadelphia in 1828; abandoned medicine in 1829; studied law, and commenced practising in 1833; in 1830 edited the *Western Mercury*, published at Columbia, in conjunction with the late chancellor, S. D. Frierson; was elected in 1833 to the house of representatives, and was re-elected in 1835, and again in 1837; upon the death of Felix Grundy, in 1840, was appointed by Gov. James K. Polk to fill the vacancy thereby occasioned in the U. S. Senate; served until the meeting of the legislature; was not a candidate for election; in 1843 was elected a member of the State senate; in 1845 removed to Nashville and became the editor of the Nashville *Union;* was here appointed a director of the Bank of Tennessee, and subsequently elected president; in 1850 returned to Columbia, and was appointed a chancellor by Gov. Trousdale, but resigned at the end of a year. Became in 1853 the editor of the *Union*, a newspaper published at Washington, D. C., the proprietor of which was public printer, and upon his death was elected public printer; conducted the *Union* for James Buchanan in 1856, and upon his election to the Presidency retired and returned to Columbia, Tenn.; in 1857 was elected to the U. S. Senate, and remained a member of that body until the State seceded from the Union in 1861; took part in all the proceedings of the extra session of the Senate called upon the inauguration of Pres. Lincoln, but did not return to the Senate at the extra session of Congress in July, 1861, for the reason that Tennessee, in June, 1861, decided to secede. Judge Nicholson was twice arrested at Columbia, and imprisoned as a sympathizer with the Southern Confederacy—first by Gen. Negley, who sent him S. of the Federal lines of occupation, and again, on his return in 1864, by Gen. Thomas, who imprisoned him in the penitentiary at Nashville. In 1870 he was elected a member of the convention to revise the constitution of the State, and in the same year was elected one of the six judges of the supreme court, and was by the judges elected chief-justice, which office he filled until his death, Mar., 1876. James D. Park.

Nicholson (Sir Francis), an English soldier, who was lieutenant (acting) governor of New York for Andros 1687–89; governor of Virginia 1690–92 and 1699–1705, of Maryland 1694–99, of Nova Scotia 1714–17, of South Carolina 1721–25; commanded the Port Royal expedition 1710; was knighted 1720; returned to England 1720; became a lieutenant-general 1725. D. London Mar. 5, 1728.

Nicholson (Commodore James), b. at Chestertown, Md., in 1737; was trained to the sea with his brothers Samuel and John, afterwards captains in the navy; was engaged in the capture of Havana 1762; took command in 1775 of the Defence, a small Maryland vessel, with which he recaptured several prizes from the British; was appointed June, 1776, to the command of the Virginia (26 guns), and in Jan., 1777, succeeded Commodore Esek Hopkins as commander-in-chief of the Continental navy, which post he retained throughout the war; was engaged with his crew as volunteers in the battle of Trenton; fought a severe but indecisive engagement with the British ship Wyoming June 2, 1780, and was taken prisoner after a gallant resistance with his vessel, the Trumbull (38 guns), in Aug., 1781, by the British vessels Iris and General Monk. After the war he became commissioner of loans in New York City, where he d. Sept. 2, 1804. One of his daughters married Albert Gallatin.

Nicholson (Gen. John), b. at Dublin, Ireland, Dec. 11, 1821; entered the military service of the East India Company in 1838: was engaged in the disastrous campaign of Afghanistan 1840–42, and for some months a prisoner to the Afghans; took part in the Sikh war of 1845; became assistant resident at Lahore; rendered important services in the Sikh war of 1848, after which he became deputy commissioner of the Punjaub, and acquired such influence over the savage tribes of the frontier that he became the object of a kind of hero-worship among a sect which sprang up called the "Nekkul-Seynees," which insisted upon paying him the honors of a prophet despite his energetic refusal, carried to the point of inflicting floggings to cure his misguided worshippers of their delusion. With Sir John Lawrence, Nicholson divides the honor of having saved the Punjaub to British allegiance during the great mutiny of 1857; raised the famous "movable column," with which he destroyed all the rebel forces between Lahore and Delhi, and was assigned the post of honor in the final assault upon Delhi, in which he was mortally wounded Sept. 14, and d. Sept. 23, 1857.

Nicholson (Com. John B.), b. at Richmond, Va., in 1783; entered the U. S. navy as midshipman 1800; was engaged in several naval actions during the war of 1812 as an officer of the United States and the Peacock; rose to be captain 1828, subsequently taking rank as commodore. D. at Washington, D. C., Nov. 9, 1846.

Nicholson (J. W. A.), U. S. N., b. Nov. 10, 1821, in Massachusetts; entered the navy as a midshipman Feb. 10, 1838; became a passed midshipman in 1844, a lieutenant in 1852, a commander in 1862, a captain in 1866, a commodore in 1873; commanded the Isaac Newton at the battle of Port Royal, Nov. 7, 1861, and the monitor Manhattan at the battle of Mobile Bay, Aug. 5, 1864; commended for "coolness, skill, and gallantry" by both Flag-Officer Dupont and Rear-Admiral Farragut.

Foxhall A. Parker.

Nicholson (Capt. Samuel), brother of James, b. at Chestertown, Md., 1743; was a lieutenant with Paul Jones on board the Bon Homme Richard; was made captain Sept. 17, 1779; cruised with the frigate Deane (32 guns) in 1782, capturing three sloops of war, besides other prizes, and was the first commander of the frigate Constitution. He was commissioned captain in the reorganized navy June 10, 1794, and was the senior officer of the navy at the time of his death, which occurred at Charlestown, Mass., Dec. 29, 1811.

Nicholson (Com. William Carmichael), b. in Maryland in 1800; entered the navy as midshipman June 18, 1812; was on board the President, commanded by Decatur, in the action off Long Island in Jan., 1815, when that vessel was captured by a British fleet; was made lieutenant 1821; served successively in all the squadrons; became fleet-captain of the Pacific squadron 1855; was in command of the Naval Asylum at Philadelphia 1861; served in important commands during the civil war, especially as captain of the steam-frigate Roanoke 1861; commissioned commodore July 16, 1862, and was retired in 1864, after a longer period of service than that of any other officer of the navy. D. Philadelphia July 25, 1872.

Nichol'ville, post-v. of Lawrence tp., St. Lawrence co., N. Y., on the St. Regis River, has 1 weekly newspaper. Pop. 300.

Ni'cias, an Athenian statesman and general from the period of the Peloponnesian war; very wealthy, the leader of the aristocratic party after the death of Pericles, and the fierce opponent of Cleon; wary, cautious, and superstitious, but prudent and energetic. His military successes—the capture of Minoa in 427, of Melos in 426, of Sphacteria in 425, of Cythera in 424—enabled him after the death of Cleon to negotiate a peace of fifteen years between Athens and Sparta in 421, which received his name. Neither of the parties, however, fulfilled the conditions, and in 415 Alcibiades induced the Athenians to make an expedition against Sicily. Nicias tried to dissuade the people from the undertaking, but in vain. He then accepted the command—first in connection with Alcibiades, afterwards alone—and laid siege to Syracuse. Reinforcements were sent to the city from Sparta. The Athenian fleet was defeated and destroyed, and when Nicias retreated with his troops to the interior, he was soon compelled to surrender, and he himself was put to death (413). Plutarch has written a very interesting sketch of his life and character.

Nick'el (symbol, Ni.; at. weight, 58.01; sp. gr., 8.97–9.25), a metal allied to cobalt and to iron, but much less abundant than the latter, and of annually increasing importance in the arts. Nickel has been long known, but it was only in 1751 that Cronstedt proved it to be a distinct element. It is associated with iron and cobalt in terrestrial ores, and is found in considerable amount in almost all aërolites or meteoric stones, the percentage in these sometimes rising to from 9–12. The terrestrial sources are the ores known as white nickel pyrites, or chloantite (diarsenide of nickel), nickel-bloom, or annabergite (arsenate of nickel), breithauptite (antimonide of nickel), gersdorffite, or nickel-glance (arsenio-sulphide), ullmanite (antimonio-sulphide), capillary pyrites, or millerite (oxide, sulphide), grunanite (sulphide of nickel and bismuth), emerald nickel (carbonate), pyromeline (sulphate), pimelite (silicate of nickel), and less important compounds, as nickel ochre. Kupfer-nickel contains 43.5 per cent. of nickel; chloantite, 27.8 per cent.; nickel speiss-glance, 31.4 per cent.; nickel-glance, 35.1 per cent.; and antimonial nickel-glance, 27.6 per cent. of the metal. Nickel is tolerably widely diffused, and is worked in England, Germany, Austria, Russia, Sweden, and the U. S., especially at Lancaster, Pa. Siegenite, a complex sulphide of nickel, cobalt, and iron, has been found in Missouri and Maryland. The methods of smelting and working nickel ores are various and complicated, and while some are well known, others are still kept a secret. Occasionally, nickel is produced from smelting products, and in rare cases the ores

are worked directly for the production of the metal, without the previous formation of a speiss or matt. The following is a brief sketch of the ordinary methods.

(1) *Concentration Smelting of Nickel Ores for the Production of Matt.*—This process depends upon the fact that the oxidized iron in the ores upon smelting with quartz or some silicious substance, after roasting, becomes scorified, while the oxide of nickel, which is formed by the roasting process, and which is somewhat easier to reduce than the oxide of iron, becomes reduced to metallic nickel, and concentrates in a matt formed of the undecomposed metallic sulphides and those sulphides which have been reduced from sulphates. After being concentrated in a cupola furnace, the matt is submitted to an oxidizing blast-smelting in order to extract the iron as perfectly as possible; and this is sometimes effected in a reverberatory furnace with the addition of quartz, heavy spar (or sulphate of soda), and coal. The coal transforms the heavy spar into sulphide of barium; this reacts upon the oxidized copper and nickel, and forms baryta, and this earth unites with the quartz and protoxide of iron, forming an easily fusible slag. Iron pyrites containing 44.52 per cent. of iron, 6.13 of nickel, 5.39 of copper, and 43.96 of sulphur, are roasted in mounds four or five days, and then smelted with coke in a channel furnace, some slag from a previous process, with limestone and quartz, being added if the ores do not contain silica, alumina, and lime enough to form a slag with the protoxide of iron. This produces about 20 per cent. of a raw matt containing 13 per cent. of nickel. This raw matt is resmelted with nickel slags and quartz, producing a concentration matt of 24 to 25 per cent. of nickel. This new matt then gets an oxidizing smelting to reduce its iron and its sulphur and bring the nickel up to 35 per cent.

Arsenical nickel ores are smelted without being dressed with fluor-spar, alumina, quartz-sand, and slag, and what is known as speiss—viz. a mixture of metallic arsenides—in which the nickel collects, owing to its greater affinity for arsenic than for sulphur. A speiss is sometimes obtained containing 60 per cent. of nickel with only half of 1 per cent. of iron and copper, respectively. Furnace ends and residues resulting from the oxidizing smelting of copper give a slag containing nickel to the amount of 2.5 per cent. This is smelted with 10 per cent. of iron pyrites and from 10 to 40 per cent. of arsenical pyrites, until a speiss containing 26 per cent. of nickel and a matt containing 6 per cent. are obtained. This speiss is roasted and smelted with arsenical pyrites, heavy spar, copper slag, and lead slag until a refined speiss of 35 per cent. of nickel is obtained.

Production of Nickel in the Dry Way.—The production of metallic nickel in the dry way—*i. e.* by smelting alone—is rarely attempted.

Production of Nickel in the Wet Way.—This process depends upon such a treatment of ores or ore-products as will give a nickel salt soluble in water, and from which the metal may be cheaply precipitated as an oxide. Ores, matt, and speiss are first roasted—in order, first, to put the iron into the state of an insoluble oxide; and, second, to make the copper, nickel, and cobalt soluble (a) in water, by transforming them into sulphate, or (b) in sulphuric and muriatic acids, by transforming them into oxides or basic salts. The following facts lie at the basis of the treatment of nickel-giving products. If a matt containing iron, copper, nickel, and cobalt be submitted to an oxidation-roasting at a gradually increasing temperature, with or without the addition of oil of vitriol, the sulphate formed will be decomposed in the following order: iron, copper, nickel, and cobalt. Most of the cobalt and nickel, with some copper, may be extracted from such a mass by water. Dilute acids attack the oxide of copper the most readily, oxide of nickel with more difficulty, while the oxide of iron is practically insoluble. However well the speiss may be roasted, it will always retain some arsenic; and this may be converted into arseniate of soda by roasting with saltpetre and soda and lixiviating the mass.

Precipitation of the Nickel.—An acid solution of nickel (and its allied metals) having been obtained, precipitation of the metal by some cheap reagent is the next step. Among these reagents are—(1) Carbonate of lime, which is used in the form of pulverized chalk, and which should be as free as possible from iron. From a solution containing oxides of iron, copper, nickel, and cobalt, carbonate of lime precipitates, at common temperatures, chiefly hydrated peroxide of iron, with some oxide of copper and a little hydrated oxide of cobalt. If arsenic be present, it goes down as arseniate and arsenite of iron. At 40° C. and above the carbonate of lime throws down the copper, some of the cobalt and nickel, and all the iron; so that if we use a solution of a sulphate, a nearly pure solution of nickel results, mixed with some gypsum. (2) Chloride of lime may be employed after the iron has been precipitated by carbonate of lime. It transforms the protoxide of cobalt to sesquioxide, and throws it down, any manganese possibly present going down as peroxide. (3) In the use of carbonate of lime in precipitating from a sulphuric acid solution, the nickel contains gypsum, which is hard to separate, lime almost inevitably accompanying the reduced metal. On this account carbonate of soda, though more expensive, is sometimes used, and with it we can make fractional precipitations, as with carbonate of lime, getting first a basic salt of iron, then a mixture of the oxides of iron and copper, then one of the oxides of copper and nickel, and lastly, oxide of nickel, with some oxide of cobalt. Arsenic goes down with the peroxide of iron, and no nickel is precipitated with the copper so long as there is 3 or 4 per cent. of copper in the nickel solution. (4) Hydrosulphuric acid is sometimes used to separate copper, lead, antimony, arsenic, and bismuth from their acid solutions; iron is used for precipitating copper; acid sulphate of potash is used for precipitating nickel from solutions containing cobalt; and nitrite of potash or soda for separating cobalt from nickel, a double nitrite of cobalt and potash being formed as a precipitate. Any approximately pure solution of nickel having been obtained, the hydrated oxide is precipitated by lime-water, filtered, pressed, dried, and heated. Its gypsum is extracted by a four days' treatment with weak muriatic acid. It is then ready for reduction to metal.

Metallic nickel is usually sold in the form of small cubes, and these cubes are obtained in the following manner: Hydrated oxide of nickel, obtained as above, is made into a paste with 5 per cent. of flour, some beet-root-syrup, and water. From this stiff mass cubes of one inch or less are cut, and quickly dried. The dried cubes are packed in crucibles or clay tubes with coal-dust, and the metal reduced at a comparatively low temperature, and then made to cake together by a very high one.

Pure nickel, or the metal obtained by galvanic deposition from a solution as pure as possible, is a silvery-white metal with a strong lustre, not tarnishing on exposure to the air. It can be polished so as to be deceptively like polished silver. It is very ductile, hard, and tenacious. A nickel wire of a certain diameter will sustain $1\frac{1}{2}$ times the weight required to break an iron wire of the same size. The specific gravity of nickel varies, according to different observers, between 8.27 and 8.93. Its malleability is diminished by an admixture of carbon or manganese. It is attracted by the magnet, and may be rendered magnetic by the same means as iron, its magnetic power compared with that of iron being given as 35 : 55, or as 8 : 9, or as 2 : 3. Repeated ignition destroys its magnetic property, and it loses this power at a lower temperature than iron. Nickel is very difficult of fusion. Adams succeeded in fusing *pure* nickel in a sealed porcelain crucible lined with pure alumina and bedded in a Hessian crucible at a heat which fused platinum. Crookes and Rohrig put its melting-point at 1900°–2100° C. Nickel is soluble in dilute sulphuric and hydrochloric acids, but it dissolves in these slowly and with comparative difficulty. Nitric acid attacks and dissolves it readily, as does aqua regia. Strong nitric acid renders it passive. It combines directly with chlorine, bromine, iodine, sulphur, phosphorus, fluorine, and arsenic, forming soluble compounds. Pure nickel may be obtained by electrolysis (the presence of cobalt only to be guarded against in this case), or by solution in nitric acid in the presence of excess of metal, evaporation taking up the residue with water, separation of foreign metals by sulphuretted hydrogen, formation of insoluble oxalate of nickel, and calcining this out of the air in a double-lined crucible. Nickel so prepared may contain .1 per cent. of copper and .3 per cent. of silicium, giving 99.40 per cent. of pure metal. The atomic weight of nickel has been the subject of painful researches by various scientists, with results from 58.01 to 59.20. The lowest number—that obtained by Lee, viz. 58.01—agrees closely with Schneider's (58.04) and Sommarugo's (58.026) determinations, and may be accepted as nearly correct. The prevailing color of the hydrated salts of nickel, and of course of their solutions, is green; those containing an excess of ammonia are bluish or violet, while the anhydrous salts are yellowish. From their solutions the fixed alkalies precipitate a hydrate, and the alkaline carbonates a basic carbonate, both of a pale-green color. There are two oxides, the olive-green protoxide, obtained by heating the nitrate or the carbonate, and the black sesquioxide, obtained by heating the nitrate at a lower temperature.

Of the crystallized soluble salts of nickel the most familiar are the sulphate, nitrate, chloride, and the double sulphate of nickel and ammonia, this latter being now prepared and sold in large quantities for the purposes of nickel-plating. Nickel is a bivalent metal, quadrivalent

in the sesquioxide, but acting in the double atom (Ni_2) as a sexivalent radical. Nickel is very closely allied to cobalt, but, while presenting many remarkable points of resemblance, is yet abundantly different. The two metals are sufficiently alike to form in modern chemistry a group by themselves, with a general resemblance to iron and manganese.

Uses.—Until within a few years the use of nickel was confined to the purposes of coinage and the making of certain alloys. In Jamaica, Belgium, Switzerland, and the U. S. small coins have been made with an alloy of nickel with zinc and copper, pure nickel being altogether too hard for this use. An alloy is made called *tiers argent,* which consists in 100 parts of—silver, 27.56; copper, 59.06; zinc, 9.57; nickel, 3.42; total, 99.61. The U. S. cent, authorized by the act of Feb. 21, 1857, consisted of 88 parts of copper and 12 of nickel. Since 1850, in Switzerland, small coins (*monnaie billon*) have been issued of the following composition in 1000 parts:

	Silver.	Copper.	Zinc.	Nickel.
20-Kappen piece.........	150	500	250	100
10- " "	100	550	250	100
5- " "	50	600	250	100

These coins do not turn red by wear, but become yellowish. In Belgium, 5, 10, and 20-centime pieces are made of an alloy of 25 parts of nickel and 75 of copper. Up to 1875 the U. S. mints had issued $5,000,000 worth of the 5-cent copper-nickel coins.

Nickel has been, and is now, largely used in the preparation of German silver or nickel silver. This may be looked upon as a brass to which one-sixth to one-third of nickel has been added. Tradition tells us that this alloy has been in use in China from a remote period; its use in Europe has become common within thirty years. The white copper, or *pakfong,* of the Chinese contains 40.4 parts of copper, 31.6 of nickel, 25.4 of zinc, and 2.6 of iron. German silver should be, approximately, 1 part of nickel, 1 of zinc, and 2 of copper. For casting purposes a little lead is sometimes added. A cheaper kind contains 8 parts of copper, 2 of nickel, and 3.5 of zinc. If the amount of nickel fall below 2 parts in 11–12, the silver produced will be little better than brass; 8 parts of copper, 3 of nickel, and 3.5 of zinc make a beautiful alloy closely resembling silver. The preceding, with 4 parts of nickel, makes a very beautiful compound having a faint shade of blue. The Chinese *tutenag* has 8 parts of copper, 3 of nickel, and 6.5 of zinc. This alloy is fusible, hard, and not easily rolled. The color of good German silver is nearly silver-white, its fracture small-grained, specific gravity 8.4 to 8.7. It is as ductile as ordinary brass, but harder and capable of being polished. In making it, the three metals should be granulated and well distributed through the crucible, covered with charcoal, and well stirred while in fusion.

The following table shows the price of nickel, in large lots:

1870......................................	$1.25,	gold,	per	pound.
1871......................................	1.50	"	"	"
1872......................................	2.25	"	"	"
1873......................................	3.25	"	"	"
1874......................................	2.80	"	"	"
1875......................................	3.00	"	"	"

The chief use of nickel, developed within a few years, is for nickel-plating, or the electro deposition of nickel upon other metals. For many years the fact was well known that a brilliantly white deposit of metallic nickel could be obtained by the electrolysis of a solution of any one of many nickel salts, but no practical lesson was deduced from it, nor was the possibility of electro-*plating* with nickel (as distinguished from the mere obtaining a brilliant deposit of metal) demonstrated, until Dr. Isaac Adams, Jr., solved the problem and created, in fact, a new art. Former experimenters had indeed obtained a deposit of a white and brilliant metal, but had never been able—and perhaps had never tried—to produce this deposit continuously from a bath or solution which should maintain its strength and work practically year in and year out. Until Dr. Adams showed the way, no method was known—or only the most impracticable, and in workshops impossible—of supplying a nickel-plating solution regularly and continuously with the metal, regularly and continuously withdrawn from it. The use and value of nickel on account of its hardness, beauty, lustre, and the polish which it takes were rapidly recognized as soon as nickel-plated ware became common. Gas-fixtures, arms of railway-seats, chandeliers, bits, buckles, surgical instruments, skates, knives, forks, metal rollers for calico-printers, thermometer-scales, tea-sets, builders' hardware, lockets, and trinkets are a few of the common articles to which a coating of nickel is given.

In all electro-plating, or giving one metal a coating of another, the essentials of the process are a battery, a proper solution, a cathode—the object to be plated—and an anode, or plate of metal forming the positive pole of the battery. The solution having been prepared, the object to be plated is suspended in it, and opposite to it is hung the anode, and the two being connected respectively with the two poles of a galvanic battery, a deposition of metal upon the cathode takes place. This deposition goes on so long as the battery power is maintained and metal supplied as the anode dissolves off. This is a brief outline of the process of electro-plating; and what has been said applies in a general way to the metal nickel. But in practical working a great number of points arise which enhance the difficulty of plating with nickel, and render it a distinct art. These difficulties relate to the preparation of the proper solutions for electro-plating, to making them, and keeping them when made, free from any injurious admixture of foreign substances, etc. In fact, plating with nickel is, chemically speaking, a process of no little difficulty and delicacy. It is in this respect broadly distinguished from the ordinary processes of electro-plating with copper and silver. To make a plated metal of any value in the arts, it must be deposited upon suitable objects in what is known as the reguline state—*i. e.* that which exhibits fully the ordinary desirable qualities of the metal. The best practical solution for nickel-plating is a solution of the double sulphate of nickel and ammonia. If properly prepared and used, this solution has the property of giving a deposit with a smooth surface which can be polished with little labor, and —what is of consequence with a metal so hard as nickel —it gives a very thick deposit before it acquires a rough or matted surface. The solution should be of a salt as pure and neutral as possible, and kept free from substances which would impair its working properties, chief among which are nitric acid, the alkalies, and lime. Nitric acid and caustic alkali are used for cleaning goods about to be plated, and hence, without scrupulous care, a little nitric acid or alkali will find its way into the plating-vat. Nitric acid in very small quantities ruins the vat, the work coming out black and streaked. The presence of potash or soda is at once manifested by a deposit of green oxide or sub-oxide of nickel upon the article being plated. Copper, zinc, and arsenic are also detrimental, and must be excluded or their bad effects neutralized. Commercial nickel almost always contains the above-named metals, as well as some of the reagents employed in the complicated process of its manufacture, as sulphate of lime, sulphide of calcium, sulphides of sodium and potassium, common salt, and alumina. All these injurious substances must be removed in preparing a salt fit for plating purposes, and the introduction of any of them or their congeners into the solutions carefully guarded against.

While in electro-plating an anode of pure metal is convenient and useful, in working out the problem of nickel-plating Dr. Adams brought to light the curious fact that a plate of pure metallic nickel—used as an anode—does not satisfy the conditions requisite to successful plating. Such a plate does not dissolve regularly in the solution; or, in other words, it does not furnish from itself as much metal as is deposited upon the objects plating. The nickel salt in the solution has to furnish the metal, and consequently the solution becomes weaker, and finally runs out. If, on the other hand, a plate of nickel combined with carbon—a carbide of nickel—be employed, the metal will be fed into the solution on one side just as fast as it is deposited out on the other, and thus the great desideratum attained—viz. the possibility of continuous and uniform work. Such cast-nickel plates, or anodes, are now successfully made, and form an article of commerce; and it is by the use of them that we now have a process of nickel-plating which is continuous and uniform.

Among the recent applications of nickel-plating no one is of more direct and obvious utility than its use in the case of the rollers used in calico-printing. These engraved rollers are of copper, a comparatively soft metal, and have to be continually touched up and repaired, and when worn so as to produce imperfect impressions are turned down and re-engraved. A large print-works in Massachusetts owning 2351 copper rollers turned down for re-engraving 2768 in one year, showing that over 400 rollers were so treated twice. The giving to such rollers before use a good coating of nickel adds enormously to their working life and lessens the cost of printing, a nickel-plated roller doing three or four times the work done by a copper one.

J. M. Merrick.

Nickel-plating. See Nickel.

Nic'obar Islands, a group of islands in the Indian Ocean, N. W. of Sumatra. They comprise an area of about 1300 square miles, with 6000 inhabitants belonging to the Malayan race, occupying only a low state of civilization. The islands are very fertile, producing cocoanuts, sugar, rice, tobacco, bamboo, and oranges in abundance, but are

so unhealthful that all attempts to colonize them have proved vain. They belong to Denmark.

Nicode'mus, a member of the Sanhedrim, mentioned thrice in the Gospel of John—iii. 1–21, as coming to Jesus by night; viii. 45, as demanding that Jesus should be heard before being judged; and xix. 38–42, as assisting Joseph of Arimathea in laying out the body of Christ.

Ni'colai (CHRISTOPH FRIEDRICH), b. at Berlin Mar. 18, 1733; took charge in 1759 of his father's bookstore and publishing-office, which he conducted till his death, Jan. 8, 1811. He founded, with Moses Mendelssohn, *Bibliothek der schönen Wissenschaften* (1757); with Lessing, *Briefe, die neueste Literatur betreffend* (1759); and alone, *Allgemeinen deutschen Bibliothek* (1765). He wrote *Anecdoten von Friedrich II.* (1785), several humorous works and large romances, and a multitude of critical essays against Kant, Fichte, Goethe, Herder, and the romantic school.

Nicolai (KARL OTTO EHRENFRIED), b. at Königsberg June 9, 1810; studied music under great difficulties; lived after 1830 at Berlin as a music-teacher; became organist to the ambassadors' chapel at Rome in 1834, director of the opera at Vienna in 1839, and of the royal orchestra at Berlin in 1848, and d. there May 10, 1849. Of his numerous compositions, one has become somewhat popular, the opera *The Merry Wives of Windsor.*

Nic'olas (Sir NICHOLAS HARRIS), F. S. A., b. at East Looe, Cornwall, England, Mar. 10, 1799; entered the British navy at an early age; became a lieutenant 1815; studied law; was called to the bar 1825; devoted his attention chiefly to peerage-claims before the House of Lords, and became profoundly versed in every branch of antiquarian literature, especially history, genealogy, and heraldry; was joint editor of the *Retrospective Review* 1826 and of the *Excerpta Historica* 1831; made a knight of the Hanoverian Guelphic order 1831, chancellor of the Ionian order of St. Michael and St. George 1832, of which he became grand cross 1840. D. at Cape Curé, near Boulogne, France, Aug. 3, 1848. Among his works are *Synopsis of the Peerage of England* (1825), *History of the Battle of Agincourt* (1827), *The Chronology of History* (1835), *History of the Orders of Knighthood of the British Empire* (4 vols., 1841–42), *Despatches and Letters of Lord Nelson* (7 vols., 1844), *Memoirs of Sir Christopher Hatton* (1847). At the time of his death he was engaged in arranging for publication *The Letters and Journals of Sir Hudson Lowe,* which appeared under the editorship of William Forsyth Harris (3 vols., 1853).

Nicola'us, post-v. and tp. of Sutter co., Cal., on the Feather River. Pop. 799.

Nicole' (PIERRE), b. at Chartres, department of Eure-et-Loire, France, Oct. 19, 1625; studied theology at Paris; joined the community of Port Royal; fled in 1679 from the persecutions of the Jesuits to the Netherlands; returned in 1683 to Paris, and d. there Nov. 16, 1695. He translated Pascal's *Provincial Letters* into elegant Latin under the pseudonym of "William Mendrock," wrote *Essais de Morale et Instructions théologiques,* and had a share in the authorship of several of Arnauld's works.

Nicolet', a fertile county of Quebec, Canada, on S. shore of the St. Lawrence, is traversed by a branch of Grand Trunk Railway. Cap. Becancour. Pop. 23,262.

Nicolet, post-v. of Nicolet co., Quebec, Canada, on Nicolet River, near S. shore of the St. Lawrence, 81 miles below Montreal, has a Roman Catholic college, founded 1803, with library of 10,000 volumes, also a seminary, ladies' academy, and manufactures. Pop. about 1200.

Nicollet', county of Central Minnesota. Area, 450 square miles. Bounded S. W. and E. by Minnesota River. Is traversed by the Chicago and North-western R. R. Is uneven and generally fertile. Wheat and oats are leading products. Cap. St. Peter. Pop. 8362.

Nicollet, post-v. and tp. of Nicollet co., Minn., on the Minnesota River. Pop. 658.

Nicollet (JEAN NICOLAS), b. at Cluses, Savoy, France, July 24, 1786; was a pupil of Laplace, secretary and librarian of the observatory at Paris in 1817; came to the U. S. 1832; explored the Southern States, especially the basins of the Red, Arkansas, Missouri, and upper Mississippi rivers; collected valuable materials illustrative of Indian history, customs, and languages, as well as notices of the geology and natural history of the regions visited; and was sent by the war department on a second exploration of the Territories for the purpose of preparing a map and presenting a general report, on which occasion Lt. John C. Fremont was his assistant. D. Washington, D. C., Sept. 11, 1843. Author of scientific treatises in French.

Nicomedi'a, the capital of ancient Bithynia, at the head of the Gulf of Astacenus, founded by Nicomedes I. (278–248 B. C.) in 264 B. C., after the destruction of Astacus (a little to the S. E. of it) by Lysimachus. From 292 to 330 A. D. it was the capital of the Eastern Roman empire, and contained many splendid buildings. It has suffered very severely from earthquakes, as in 358 and 362 A. D. Arrian was born, Hannibal died, and Diocletian abdicated here. Constantine died at his Villa Ancyron, close by. The modern Turkish village of *Ismid,* which occupies the old site, has a population of about 3000.

R. D. HITCHCOCK.

Nicop'oli, town of European Turkey, eyalet of Widdin, on the Danube, is beautifully situated, but its fortifications are decaying and its trade and manufactures are inconsiderable. Pop. 10,000.

Nicop'olis [Gr. Νικόπολις, "city of victory"], the name of ten ancient cities (one in Egypt, four in Asia, and five in Europe), the most important of which was the one in Epirus, founded by Augustus to commemorate his great naval victory at Actium, Sept. 2, 31 B. C. It soon became a large and splendid city, more, however, through imperial favor than by reason of its natural advantages. Already in the time of Julian (361–363 A. D.) it had declined, and was restored. Early in the sixth century it was plundered by the Goths (Procopius, *De Bello Gothico,* iv. 22), and restored again by Justinian (527–565 A. D.). After this it gradually decayed, and died a natural death. St. Paul wintered here (Tit. iii. 12), perhaps in the year 67–68 A. D. R. D. HITCHCOCK.

Nicosia. See LEFKOSIA.

Nicosi'a, town of Sicily, province of Catania, about 44 miles N. W. of Catania. This very old town is situated on two high hills in the midst of a most fertile district. It is an episcopal see—has a cathedral and four other large churches, in all of which are good pictures. It has also a considerable library, a small college, and some communal schools, but the state of education may be inferred from the fact that 94 per cent. of the inhabitants of this commune are unable to read. The town carries on an active trade in grain, wine, oil, and cattle, but there are no home manufactures. Nicosia was nearly destroyed by the Arabs, was restored by the Normans, suffered severely in the later civil wars, and was so wasted by the plague in 1624 that it has never recovered its prosperity. Pop. 14,789.

Nicot' (JEAN), b. in France in 1530; was sent as ambassador by Francis II. to Lisbon, where he procured seeds of the tobacco-plant from Florida, and introduced them into France, whence the botanical *Nicotiana* given to the tobacco-plant. D. at Paris May 5, 1600.

Nico'tera, town of Calabria, province of Catanzaro, near the Ionian Sea. It enjoys a climate of great perfection, and in fine nights the fires of Stromboli, 50 miles distant, are distinctly visible. The principal buildings are the cathedral and the episcopal palace. This town was wasted by the Saracens in the ninth century, by the French in the fifteenth, and partially destroyed by an earthquake in 1783. Pop. 6347.

Nicotine or **Nicotia.** See TOBACCO.

Nie'buhr (BARTHOLD GEORG), b. at Copenhagen Aug. 27, 1776, was a son of Karstens Niebuhr (b. Mar. 17, 1733; d. Apr. 26, 1815), who from 1761 to 1767 accompanied a scientific expedition to Arabia and South-western Asia, sent out by the Danish king, Frederick V., and described his travels in *Beschreibung von Arabien* (1772) and *Reisebeschreibung von Arabien und andern umliegenden Ländern* (1774–78). The father held a government office in Meldorf, Holstein, and here the son was educated. He afterwards studied law and philosophy at Kiel and Göttingen; was appointed private secretary to Count Schimmelmann, Danish minister of finance in 1796, and next year secretary to the royal library in Copenhagen; visited England in 1798, and entered the civil service of the Danish government in 1799. But his enthusiasm for England and hatred to Napoleon made it very unpleasant for him in Copenhagen, and in 1806 he removed to Berlin, where from this year till 1809 he held various offices in the financial department of the Prussian government. He was an able business-man, and rendered good services, but he was strongly opposed to those almost violent measures of reform which the desperate situation of the Prussian state made necessary, and his temper was nervous and impatient. He fell out first with Stein, then with Hardenberg, and finally resigned his offices. Having been appointed historiographer to the king of Prussia, he delivered in 1810–11 a course of lectures on the history of Rome at the newly-established University of Berlin, and in this sphere his brilliant genius and immense learning at once found their proper application. From 1816 to 1822 he resided in Rome as Prussian ambassador to the papal court, though in reality wholly occupied by scientific studies; and in the latter year he removed to Bonn as professor

at the university. Here he developed a great literary activity; founded *Rheinisches Museum* (1827), superintended the new edition of *Corpus Scriptorum Historiæ Byzantinæ*, published a number of minor philological and archæological essays, and continued his great work, *Römische Geschichte.* But under the violent impression which the French revolution of 1830 made on him he broke down mentally and physically, and d. Jan. 2, 1831. His *Römische Geschichte* (3 vols., 1811–32), translated into English, the two first volumes by J. C. Hare and Connop Thirlwall, the third by Dr. L. Schmitz, is, so far as it goes—namely, to the First Punic war—a complete reconstruction of the history of Rome. All those legends which since the days of Livy composed the first chapters of the Roman history, and which were generally accepted as history, he discarded after a thorough critical analysis as myths and fables; and from mostly new materials, won by independent researches, philological, archæological, juridical, etc., he built up the true course of the history of Rome. But his book was not only a reconstruction of the Roman history; it was a reconstruction of historical study in general. Some of his hypotheses have been rejected, such as that of the origin of the early Roman legends; others have been modified, such as that of the origin of the *plebs;* but the fundamental distinction between history and legend, and the method corresponding to this distinction, inaugurated a new epoch in the study of history, and his wonderful intuition into the correlation between the various elements of which a social organism is composed, as well as the astonishing power of imagination with which from a few scanty remnants he constructed the whole organism, will always bear witness to his eminent genius. His *Kleine historische und philologische Schriften* (2 vols.) were published at Bonn (1828–43), *Nachgelassene Schriften* at Hamburg (1842), *Lebensnachrichten* (2 vols.) at Hamburg (1838), three courses of lectures at Bonn; German, by Isler; English (8 vols.), by Dr. L. Schmitz. (See also F. Lieber, *Reminiscences of Niebuhr*, and Susanna Winkworth, *Life and Letters of B. G. Niebuhr.*) CLEMENS PETERSEN.

Nie'dermeyer (LOUIS), b. at Nyon, in Vaud, Switzerland, Apr. 27, 1802; studied music in Vienna under Moscheles and Forster, in Rome under Fioravanti, in Naples under Zingarelli; brought his first opera on the stage at Naples; went in 1822 to Paris, where he composed several operas with mediocre success; founded a school of religious music in 1853. D. Mar. 14, 1861. Of his compositions, the opera *Stradella* (1836) and a number of songs to texts by Lamartine, Hugo, Manzoni, and others, became celebrated. His best work is his *Mass*, performed by the Church Music Society in New York in 1872.

Niel (ADOLPHE), b. at Muret, department of Haute-Garonne, France, Oct. 4, 1802; was educated at the École Polytechnique of Paris and the Military Academy of Metz; distinguished himself in the expedition against Constantine 1836, and was made commander of the engineering corps in Algeria; took part in the expedition against Rome in 1849; conducted the siege of Bomarsund in 1854, and planned the operations which led to the fall of Sebastopol; distinguished himself in the Italian campaign of 1859, was made a marshal of France after the battle of Solferino, and minister of war in 1867. D. Paris Aug. 13, 1869.

Niel'lo-work, a kind of ornamental work in which plates of gold or silver are first engraved by cutting ornamental figures upon them. The lines are then filled with a black alloy, and the whole is burnished. The art is scarcely practised at present. Some of the earliest and best niellos are Byzantine; the finest are Italian of the Cinque-cento period.

Niemce'wicz (JULIAN URSIN), b. at Skoki, in Lithuania, in 1757; received a military education, but left the service in 1788, and entered into Polish politics as a deputy from Lithuania; fought in 1794 at the side of Kosciusko; was carried, together with him, as a prisoner to St. Petersburg; accompanied him to the U. S.; lived for some time in Washington's house, and married an American lady. In 1807 he returned to Poland, and played a conspicuous and noble part in the politics of his native country till 1830. Shortly before the fall of Warsaw he went to Paris, where he resided till his death, May 21, 1841. In the Polish literature he became very celebrated as the author of *Historical Songs of the Poles* (1816), *Reign of Sigismund III., Lithuanian Letters*, a novel in letters, etc. After his death his *Notes sur ma Captivité à St. Pétersbourg* was published at Paris (1843).

Nie'men [Ger. *Memel*], a river of Prussia, rises in Russia, becomes navigable at Grodno, and divides at Winge into the Russ and the Gilge, both of which fall into the Kurisches-Haff, respectively through seven and nine mouths. It is 640 miles long, navigable 400 miles from its mouth, and is of considerable commercial consequence.

Nieuwer Amstel, town of the Netherlands, in the province of North Holland, has 6171 inhabitants, and some manufactures on a small scale.

Nièvre', department of Central France, situated along the Loire and its two affluents, the Allier and Nièvre, and the Yonne, an affluent of the Seine. It is mountainous, and not very fertile. Wine is extensively cultivated, but wheat is not raised in sufficient quantity for home consumption. Timber and minerals are abundant. Iron, copper, lead, and silver are mined; coal is raised and marble is quarried. Area, 2595 square miles. Pop. 339,917. Out of 48,538 children, 17,562 received no school education in 1857. Cap. Nevers.

Ni'ger, a great river of Western Africa, also called **Joliba** or **Quorra,** which different names are only different expressions of the same idea, "the river," applied to the stream in the different regions it traverses—Joliba to its upper and Quorra to its middle course. It rises in the Kong Mountains, in lat. 9° 25' N. and lon. 9° 45' W., and flows first in a north-eastern direction, passing Timbuctoo, and then in a south-eastern direction, until it enters the Gulf of Guinea through a large delta between the Bights of Benin and Biafra, after a course of about 2500 miles. Only parts of it have been thoroughly explored; in most places it flows through broad and fertile valleys, and presents low shores covered with shrubs or overgrown with reeds.

Night'-Hawk, a name applied in North America to the species of *Chordeiles*, a genus of the family Caprimulgidæ or goatsuckers. They are sometimes popularly but incorrectly confounded with the whip-poor-will. The eggs are laid upon the bare ground, without a nest. The birds are well known by their sharp cry and the loud booming sound produced at twilight by the rapid rush through the air, with the bill open to seize their insect prey. Several closely-allied species or varieties are found in the W. and S. W. of the U. S. These are *C. popetue* (the common Eastern species), *C. Henryi* (a rarity), and *C. Texensis.* The night-hawk or night-jar of England is the common GOATSUCKER (which see).

Night'-Heron, the *Nyctiardea Gardeni*, a common wading bird of the heron family, found in both the Old

The European Night-Heron.

and New Worlds. The birds build their nests in groups or communities, called heronries. In the U. S. the night-heron is often called *qua* or *quawk*, from its hoarse nocturnal cry. The yellow-crowned night-heron of the Southern States is *Nyctherodius violaceus.* Still other species are described.

Night'ingale, the *Philomela luscinia*, the finest of European song-birds, common in favored localities in a large part of Asia and Europe. It belongs to the family Sylviadæ. It is a homely bird, not larger than the American bluebird. It feeds principally upon worms and insect larvæ. Its delightful song is heard chiefly in still nights of May and June, but also during the day. It is the bulbul of the poets, but in the East that name is now generally given to the *Pycnothous hæmorrhous*, a very different bird. The nightingale of the East Indies is the *Kittacincla macrura*, a bird resembling the true nightingale. It sings by night or in a darkened cage, and its song is regarded as equal to that of the true nightingale.

The Nightingale.

Nightingale (Florence), b. in May, 1820, at Florence, Italy, of wealthy English parents. Prompted by philanthropic instincts, she early turned her attention to the relief of humanity, and in 1851 went to the Kaiserswerth institution on the Rhine for practical instruction as to the best means of carrying on her work. During the Crimean war she was sent by the British war department, at the head of a band of select nurses, for the relief of the sufferings of the sick and wounded, and in this position displayed marvellous energy and ability; and the testimonial of £50,000 subscribed for her by a grateful public she devoted to the founding of a training-school for nurses. Her chief writings are—*Notes on Hospitals* (1859), *Notes on Nursing* (1860), *On the Sanitary State of the Army in India* (1863), *Notes on Lying-in Institutions* (1871), and a confidential report on the medical service in the Crimean war.

Night'mare (*Ephialtes, Hypnophobia, Incubus, Succubus*), a terrific dream in which there appears to be a disagreeable object, as a person, animal, or goblin, present and often upon the breast of the sleeper, accompanied by the inability to cry out, move, or call for help. Some patients have merely a sense of terror, oppression, and inability to call, without any dream. It is often ascribable to heart-disease or asthma, more frequently to obstruction in the circulation caused by the pressure of food or flatulency in the alimentary canal, especially when the sleeper lies upon his back and the weight of the overloaded viscera falls upon the aorta. Many of the symptoms of nightmare may occur to nervous and anxious patients in a half-wakeful state just after retiring to bed. The careful voluntary suspension of the effort to think (a suspension often difficult to accomplish) will usually prevent these attacks, which seem to be due to the performance of the function of thinking at a time when the supply of blood to the brain is deficient. The ancients believed that devils and witches were present during an attack of nightmare. They affirmed that the evil spirits which placed themselves upon the patient were males, called *incubi*, while female spirits and witches, *succubi*, were thought to lie beneath the sleeping sufferer.

Night'shade, a popular name for many plants, mostly solanaceous and often poisonous. (See Belladonna, Circæa, Bittersweet.)

Nijmwegen. See Nymwegen.

Nikolaevsk, town of Eastern Siberia, on the Amoor, in lat. 53° 15′ N., lon. 140° 35′ E., was founded in 1851, and has now over 5000 inhabitants. It is the seat of the civil administration, is fortified, and forms the centre of an extensive and increasing trade.

Nikolaiev′, or **Nikolaief,** town of European Russia, in the government of Kherson, at the confluence of the Bug and Ingul. It was founded in 1790, and grew rapidly on account of its large shipbuilding facilities. It is fortified, and has an excellent harbor, in which the Russian fleet of the Black Sea is stationed. It contains barracks, arsenals, magazines, a school of navigation, an observatory, and many other naval establishments, and in its spacious dockyards a large number of excellent ships is built every year. Pop. 67,972.

Nik'olsburg, or **Mik'ulov,** town of Austria, in Moravia, at the foot of the Polaver Hills, celebrated for their excellent red wines. It contains a magnificent old castle belonging to the prince of Dietrichstein, and has some manufactures of woollens, cotton, and silk. Pop. 8758.

Niko'pol, town of Southern Russia, in the government of Yekaterinoslav, on the Dnieper, about 200 miles from its mouth in the Black Sea. It consists mainly of foreign settlements, and forms the centre of a fertile and busy district. Pop. 5295.

Nile, The, a river of North-eastern Africa, and one of the most powerful, most interesting, and most celebrated rivers on our globe, is formed by the junction of the Bahr-el-Azrek (or the Blue Nile) and the Bahr-el-Abiad (or the White Nile) at Khartoom, the capital of Nubia, in lat. 15° 35′ N., at an elevation of 1188 feet above the level of the sea. From Khartoom it flows northerly to El Damer, in lat. 17° 45′ N., where it receives its last tributary, the Atbara or Bahr-el-Aswad (or the Black River), after which junction it makes a great bend into the Nubian deserts, descending the Nubian terraces through several cataracts, the last of which is formed at Assouan, in lat. 24° 10′ N., on the boundary between Nubia and Egypt. From Assouan it flows with a steady northerly course, with an average fall of two inches to a mile and a mean velocity of three miles an hour, through Egypt to the Mediterranean, separating in lat. 30° 10′ N. into two branches, those of Rosetta and Damietta, and forming a delta 150 miles broad at the ocean, and intersected in all directions by a bewildering number of branches and canals. To find the sources of the Nile was for centuries the highest goal of geographical ambition, and more than once the world was congratulated on the discovery of this secret. A glance over the maps and descriptions of the last explorers shows, however, that our knowledge of this subject is not yet what we could wish it to be, though many questions have been satisfactorily settled. Thus, it is sure that the true Nile is not the Blue Nile, as once believed, but the White Nile; and, further, that the White Nile originates from Victoria Nyanza, a large lake situated under the equator at an elevation of 3740 feet above the level of the sea. Its upper course from its issue from the lake to its junction with the Sobat, in lat. 9° 1′ N., is imperfectly known, but it generally shows the character of a rapid and vigorous stream. Its lower course, from the junction of the Sobat to the confluence with the Blue Nile at Khartoom, is better known, and here it presents a rather sluggish appearance, often widening into large lakes without any perceptible current except in times of flood. The Blue Nile has its sources in the alpine regions of Abyssinia, at an elevation of 9000 feet, from which it descends with immense impetuosity and carrying a tremendous volume of water. The Atbara is also a vigorous river; it receives its name, the "Black River," from the mud and slime which it carries along with it, and which, when deposited by the Nile on the plains of Egypt, forms the manure and true fertilizer of that country. Although the Nile receives no affluent for a distance of nearly 1500 miles, from its junction with the Atbara to its mouth, and although it flows through a land whose burning sun and hot, sandy soil drink its waters with avidity, yet it continues a powerful stream during its whole course, able to inundate the plains of Egypt every year, thereby transforming these rainless deserts into some of the most productive regions on earth. During its whole lower course it is followed on both sides

by ranges of high, naked rocks enclosing a broad valley, whose soil is naturally arid and barren, and in which there never falls rain. This valley it inundates every year at a fixed time and in a fixed measure, and it has done so for thousands of years. Generally on June 25th the waters begin to rise, and continue rising until the 21st of September. At Thebes the flood reaches 40 feet, at Cairo 27, at Rosetta 4, the whole plain being one sheet of water, on which the houses and villages form islands. After the equinox the waters gradually retreat, leaving behind them the mud and the moisture, which soon produce a most luxuriant vegetation. For thousands of years this valley has been densely peopled, and here sprang up one of the earliest and one of the most powerful forms of human civilization. As these people began to understand that not only their abundance and luxuries, but their very lives, depended on the wonderful workings of this river, they bowed in gratitude to their benefactor and worshipped the Nile as a god. REVISED BY A. GUYOT.

Nile, tp. of Scioto co., O. Pop. 1473.

Niles, post-v. and tp. of Cook co., Ill. Pop. 1791.

Niles, tp. of Delaware co., Ind. Pop. 1140.

Niles, tp. of Floyd co., Ia. Pop. 561.

Niles, post-v. and tp. of Berrien co., Mich., on the Michigan Central R. R., 90 miles E. of Chicago, has a public high school, 6 churches, 3 banks, 1 furniture-factory, 1 paper and 1 pulp mill, 2 large wagon and carriage factories, a pill-box factory, 2 iron-foundries, 4 flouring-mills, several good hotels, 2 newspapers, and stores. It has ample water-power. Pop. of v. 4630; of tp. 1909.
HORN & HERN, EDS. "DEMOCRAT."

Niles, post-v. and tp. of Cayuga co., N. Y. Pop. 1912.

Niles, post-v. of Weathersfield tp., Trumbull co., O., on the Mahoning and Musquito rivers and on the Ashtabula Youngstown and Pittsburg and the Atlantic and Great Western R. Rs., has 1 weekly newspaper.

Niles (HEZEKIAH), b. in Chester co., Pa., Oct. 10, 1777; learned the printing trade; became member of a publishing firm at Wilmington, Del., about 1800; edited a daily paper at Baltimore six years; founded at Baltimore in 1811 *Niles' Register*, a weekly paper, which he edited until Aug., 1836, and which was considered so valuable a source of information upon American history that the first thirty-two volumes were reprinted. He advocated the protective system, and wrote a work entitled *Principles and Acts of the Revolution* (1822). D. at Wilmington, Del., Apr. 2, 1839. The *Register* was continued by W. O. Niles and others until June 27, 1849, making 76 volumes.

Niles (JOHN MILTON), b. at Windsor, Conn., Aug. 20, 1787; became a lawyer and an active Democratic politician of extreme principles; founded the Hartford *Times*, for which he wrote during thirty years; was for several years a judge of the Hartford county court; appointed postmaster at Hartford by Gen. Jackson 1829; was U. S. Senator 1835–39 and 1843–49, and postmaster-general under Pres. Van Buren from May, 1840, to Mar. 6, 1841. Among his writings were a *Gazetteer of Connecticut and Rhode Island* (1819), *Lives of Perry, Lawrence, Pike, and Harrison* (1820), a *History of the Revolution in Mexico and South America, with a View of Texas* (1839), and *The Civil Officer;* published in 1842, a new edition of Archibald Robbins's *Journal of the Loss of the Brig Commerce upon the West Coast of Africa* (see RILEY, CAPT. JAMES); d. at Hartford May 31, 1856. Senator Niles bequeathed his valuable library to the Connecticut Historical Society, and left $20,000 to be held in trust for the poor of Hartford.

Niles (NATHANIEL), b. at South Kingston, R. I., Apr. 3, 1741; graduated at Princeton 1766; studied medicine, law, and theology, and was licensed to preach, but was never pastor of a church; settled at Norwich, Conn.; invented a process of making wire from bar iron by water-power, and connected it with a wool-card manufactory. After the Revolution he settled at West Fairlee, Orange co., Vt.; was Speaker of the lower house of the legislature 1784; several years judge of the supreme court, a member of Congress 1791–97, a censor for the revision of the State constitution, and six times Presidential elector; was author of addresses, religious treatises, and of the Sapphic ode, *The American Hero*, a popular war-song during the Revolutionary war. D. at West Fairlee Oct. 31, 1828.

Niles (SAMUEL), b. at Block Island, R. I., May 1, 1674; graduated at Harvard University 1699; preached at Kingston, R. I., 1702–10; was pastor of the Second church, Braintree, Mass., from May 23, 1711, to his death, May 1, 1762; author of several doctrinal treatises, of a poem, *God's Wonder-working Providence for New England in the Reduction of Louisburg* (1747), and of an unfinished *History of the French and Indian Wars*, printed in the *Mass. Hist. Coll.*, 3d series, vol. vi.

Nil-Ghau, or **Nyl-Ghau** [Hind. "blue cow;" *nil* being "blue," and *ghau*, "cow"], a large antelope of the jungles of India, carrying the head some five feet high. It is of a blue-gray color when full grown. It is very wild, courageous, and resolute, and hunting it is dangerous to any but skilled hunters, who never assail it openly. It has never been thoroughly tamed. The flesh is very poor, but the hides have a limited use in the arts. The nil-ghau is the *Portax tragocamelus* of authors.

Nils'son (CHRISTINE), b. at Hussaby, in Southern Sweden, Aug. 3, 1843, of a peasant family, which, father and son, maintained itself by making music at peasant festivities in the neighborhood; attracted the attention of Count Tornërhjelm by her playing and singing in a public market-place, and went by his aid to Halmstad, Stockholm, and Paris, where she finished her musical education by three years' study under Wartel, and made her début with eminent success at the Théâtre Lyrique Oct. 24, 1864, in *La Traviata*. In 1867 she visited London for the first time, and in the following season she made a great sensation in Paris by her representation of Ophelia in Ambroise Thomas's *Hamlet*. In 1870 and 1871 she visited America; in 1874, St. Petersburg, exciting great enthusiasm everywhere. In 1872 she was married to a Paris banker, Mr. Rouzaud.

Nil'wood, post-v. of Macoupin co., Ill., on the Chicago and Alton R. R., has 1 weekly newspaper.

Nim'bus, in religious art, the halo of light which surrounds the head of a sacred personage. If it envelop the whole body, it is called an aureole; if the head and shoulders, a glory.—NIMBUS, in meteorology, designates the rain-cloud.

Nimes [anc. *Nemausus*], city of France, capital of the department of Gard, beautifully situated in a valley between hills covered with vineyards and orchards, is the seat of a bishop, has many excellent educational institutions, and its manufactures of cottons, lace, vinegar, brandy, and especially of silks, belong to the most important in France, and employ about 10,000 persons. The old portion of the city is poorly built, but in the three modern suburbs, which form the larger part of the town, there are several elegant quarters and beautiful promenades, and the architectural monuments which the city contains from the Roman period are of the highest interest. The Maison Carrée is a beautiful Corinthian temple, well preserved, thoroughly restored since 1789, and now used as a museum of paintings and antiquities. Les Arènes is the best preserved amphitheatre which exists, containing from thirty-two to thirty-five ranges of seats. In the early Middle Ages it was employed repeatedly as a stronghold; afterwards poor people used it as a sort of free tenement-house. When in 1809 it was cleared by order of the magistrates it was found to contain about 2000 inhabitants. Since 1858 it has been completely restored. Pont du Gard, the magnificent aqueduct, is in the vicinity of Nimes. The Romans occupied the city in 121 B. C., and during the first emperors it was a magnificent city. Subsequently it suffered much from the Visigoths, Saracens, and Normans, and in the fourteenth century it was nearly deserted. Under Francis I. it rose again, and although it suffered much by the Revocation of the Edict of Nantes and during the Revolution, it is now very prosperous. Pop. 63,394.

Nimishil'len, tp. of Stark co., O. Pop. 2645.

Nim'rod, a son of Cush, a grandson of Ham, was "a mighty hunter before the Lord" (Gen. x. 8–12), and soon became a "mighty one in the earth." He founded an empire in Shinar, whose principal towns were Babel, Erech, Accad, and Calneh, and extended this empire along the Tigris over Assyria, where he built the towns of Nineveh, Rehoboth, Calah, and Resen. Although these events from the biblical record correspond with the salient points in the earliest stages of the Babylonian empire, it has as yet not been possible to identify Nimrod with any person known to us either from inscriptions or from classical writers.

Nimroud, the modern Arabic name of the site of an ancient Assyrian city on the E. bank of the Tigris, about 20 miles below Mosul. The ruins of Nimroud are situated on the fork formed by the junction of the Zab with the Tigris, and consist of the remains of a city about 5 miles in circumference. The principal ruins lay at the S. W. of the city, on the palace platform, which is about 600 yards from N. to S. and 400 yards from E. to W. Here are situated the sites of the various palaces and temples of the city and the ruins of the ziggurrat or tower, now forming a cone 140 feet high. The whole city was enclosed by a wall with towers at intervals and gates; remains of these defences lie round nearly all the city. Excavations were

made at Nimroud by Mr. Layard, Mr. Hormuzd Rassam, Mr. Loftus, and Mr. George Smith. These excavations revealed the existence of the following buildings: (1) A tower on the N. W. corner of the mound, faced with stone to the height of 20 feet, 167 feet 6 inches each way, built by Shalmaneser II. (B. C. 860–825). (2) Temples round the tower built by Assur-nazir-pal (B. C. 885–860). (3) The N. W. palace (S. of the tower), about 350 feet square, built by Assur-nazir-pal, repaired by Sargon (B. C. 722–705). (4) The centre palace (S. of the N. W. palace), built by Shalmaneser II. (B. C. 860–825), added to by Vul-nirari III. (B. C. 812–783), dismantled by Tiglath-Pileser II. (B. C. 745–727), who rebuilt it; destroyed by Esarhaddon (B. C. 681–668). (5) The S. W. palace (S. of the centre palace), built by Esarhaddon (B. C. 681–668) out of materials of the N. W. and centre palaces. (6) The S. E. palace (E. of the S. W. palace), built by Shalmaneser II. (B. C. 860–825). (7) Temple of Nebo (N. of the S. E. palace), built by Vul-nirari III. (B. C. 812–783), restored by Assur-ebil-ili (B. C. 625). These ruins represent the Assyrian city of Calah, mentioned in Gen. x.

According to the Assyrian inscriptions, the city was founded by Shalmaneser I. (B. C. 1320), but afterwards fell into decay, and was destroyed during subsequent troubles in Assyria. Assur-nazir-pal, king of Assyria, on ascending the throne (B. C. 885), resolved to rebuild the site and make it one of his capitals; from the time he commenced this work the city became the principal residence of the Assyrian kings, and retained this position about 170 years. Assur-nazir-pal made many successful wars against the Zamua S. E. of Assyria, Nairi on the upper Tigris, the Suhi (or Shuites) on the Khabour, and across the Euphrates to Lebanon, the Orontes, and the Mediterranean. Captives from the conquered countries were settled in Calah.

On the death of Assur-nazir-pal, his son, Shalmaneser II., succeeded (B. C. 860). He conquered the region of the Euphrates, and advancing into Syria (B. C. 854), met a confederacy of Syrian kings at Aroer on the Orontes. Among these monarchs were Ben-hadad of Damascus, Irhulena of Hamath, Ahab of Israel, and Baasha son of Rehob, of the Ammonites. These kings were defeated by the Assyrians. In B. C. 852–851, Shalmaneser took part in a civil war in Babylonia between two claimants for the crown; he defeated and killed one of these, and then took tribute from the Chaldeans. In B. C. 850, 849, and 846 he again defeated Ben-hadad. In B. C. 852 he attacked Hazael of Damascus, defeated him at Shenir in Lebanon, and besieged him in Damascus, afterwards taking tribute from Tyre, Zidon, and Jehu, son of Omri (supposed to be Jehu, king of Israel). In B. C. 839 he again attacked Hazael, and in B. C. 836 he warred with the Medes and Persians. Shalmaneser II. resided at Calah, and late in his reign (about B. C. 828) the cities of Nineveh and Assur, jealous of the rise of Calah, headed a revolt to set his son, Assur-dain-pal, on the throne. The revolt was suppressed by Samsi-vul, another son of Shalmaneser, who ascended the throne B. C. 825. He restored the Assyrian boundaries, and made expeditions against Media, Nairi, and Babylonia. Vul-nirari III., son of Samsi-vul IV., reigned B. C. 812; he made great conquests, and entered the city of Damascus in triumph, receiving tribute from all Palestine except Judah. In this reign the governor of Calah dedicated some statues to Nebo, giving Sammuramat (Semiramis) as the name of Vul-nirari's queen. Shalmaneser III. (B. C. 783) was engaged in wars with the Armenians. Assur-dan III. (B. C. 773) made few expeditions; in his time happened a great solar eclipse (B. C. 763). Under Assur-nirari II. (B. C. 755) the empire declined, and a revolt took place at Calah B. C. 746, after which Tiglath-Pileser ascended the throne (B. C. 745). In B. C. 745 he conquered part of Babylonia; in B. C. 744 he invaded Media and Persia; in B. C. 743 he defeated Saduri, king of Armenia, and then invaded Syria to B. C. 740; in B. C. 738 he invaded Hamath and defeated Azariah of Judah, taking tribute from Hiram of Tyre, Rezin of Damascus, and Menahem of Samaria; in B. C. 737 he invaded a second time Media and Persia; in B. C. 736, 735 he ravaged the northern nations, including Armenia, as far as Lake Van; in B. C. 736 he was called into Syria against a coalition headed by Rezin of Damascus (this was probably the war to assist Ahaz, king of Judah; see 2 Kings xvi.); he subdued various Philistine princes, defeated Rezin, and besieged him in Damascus, which city he captured B. C. 732. Next year he attacked Babylonia, subduing most of it, and unsuccessfully besieging Sapiya, the capital of the Chaldean king, Kinziru. In B. C. 729, 728 he engaged in great solemnities at Babylon. Among his later tributaries he counts Yahuhazi (Ahaz) of Judah, Hoshea of Samaria, Matgenus of Tyre, the kings of Gaza, Askelon, Ekron, Ashdod, Moab, Ammon, and Edom, and Samsi, queen of Arabia. Tiglath-Pileser died B. C. 727, and was succeeded by Shalmaneser IV. (B. C. 727–722), who was engaged in suppressing revolts in Palestine, and late in his reign laid siege to Samaria, which was taken by his successor, Sargon (B. C. 722). (See NINEVEH.) The seat of empire was now removed from Calah, and, although Esarhaddon built a palace here, it never again became the capital. The city was destroyed at the final conquest of Assyria by the Medes and Babylonians, but continued to exist as a village until recent times.* GEORGE SMITH.

Nine-Mile Prairie, tp. of Callaway co., Mo. Pop. 3679.

Nine-Pins, or **Ten-Pins,** a game called **Skittles** in Great Britain. It is played in a covered alley, called a skittle-ground or bowling-alley. Nine or ten wooden pins or skittles are set up at one end of the alley, and the player bowls at them with a ball of lignum-vitæ, standing fifty or sixty feet distant. Success in the game requires the knocking down of all the pins in one or more throws. The rules vary in different places.

Nines, Properties of. The number 9 possesses some remarkable properties, one of which, and perhaps the most important one, we shall proceed to explain. If any number is divided by 9, the resulting remainder is called the excess of 9's; if the quotient is rejected, the remainder alone being retained, the operation is called casting out the 9's. A number expressed by 1, followed by any number of 0's, may be written—

$$100\ .\ .\ .\ 00 = 99\ .\ .\ .\ 99 + 1. \qquad (1)$$

If we multiply both members of (1) by the numbers 2, 3, etc., up to 9, we have—

$$\left.\begin{array}{l} 200\ .\ .\ .\ 00 = 2 \times 99\ .\ .\ .\ 99 + 2 \\ 300\ .\ .\ .\ 00 = 3 \times 99\ .\ .\ .\ 99 + 3 \\ 800\ .\ .\ .\ 00 = 8 \times 99\ .\ .\ .\ 99 + 8 \\ 900\ .\ .\ .\ 00 = 9 \times 99\ .\ .\ .\ 99 + 9 \end{array}\right\} \qquad (2)$$

The second member of each equation of group (2) is composed of two terms, the first of which is exactly divisible by 9, and the second is consequently the excess of 9's of the first member, except in the last equation, in which the excess is 0; that is, the excess of 9's in a number expressed by a digit followed by any number of 0's is denoted by that digit. Now, any number, as 3425, may be written under the form—

$$3000 + 400 + 20 + 5 = 3 \times 999 + 4 \times 99 + 2 \times 9 + 3 + 4 + 2 + 5,$$

or $$3425 = 9 \times (333 + 44 + 2) + 3 + 4 + 2 + 5.$$

Since the first term of the second member is divisible by 9, the excess of 9's in the given number is equal to the excess of 9's in the sum of its digits. This principle, which is perfectly general, is the basis of several practical rules sometimes used in arithmetic for testing the accuracy of operations in addition, subtraction, multiplication, and division. (For the methods of applying the principle the reader is referred to Davies's *University Arithmetic*, pp. 37, 46, 59, and 72.) W. G. PECK.

Ninety-Six, post-v. and tp. of Abbeville co., S. C., on the Greenville and Columbia R. R. Pop. 2586.

Nin'eveh, the greatest city in Assyria, and for some time the capital of the country, was situated on the eastern bank of the Tigris at its junction with the stream of the Khosr. It is now represented by the mounds of Kouyunjik or Telarmush, Nebbi Yunas, and some surrounding remains. The circuit of the walls measures about 8 miles; on the side next the Tigris, opposite the modern town of Mosul, stand the palace-mounds, the principal of which is Kouyunjik. Excavations were made here by M. Botta, Mr. Layard, Mr. Hormuzd Rassam, Mr. Loftus, and Mr. George Smith. These operations brought to light the following buildings: (1) Three ruined temples, built and restored by many kings in different ages. (2) A palace founded by Shalmaneser I. (B. C. 1320), restored by several subsequent monarchs, destroyed by Sennacherib. (3) A palace founded by Vul-nirari III. (B. C. 812–783), restored by Sennacherib and Esarhaddon. (4) A palace built by Tiglath-Pileser II. (B. C. 745–727). (5) Temple of Nebo and Merodach, restored by Sargon (B. C. 722–705). (6) The S. W. palace, built by Sennacherib (B. C. 705–681). (7) The N. palace, built by Sennacherib, restored by Assur-bani-pal (B. C. 668–626). (8) The city walls, built by Sennacherib, restored by Assur-bani-pal.

Nineveh was one of the most ancient cities in Assyria, and was an important place in the nineteenth century B. C. According to Greek writers, Nineveh was founded by Ninus, whom they represent as the first king of Assyria. Nothing has been discovered of Ninus in the inscriptions; Samsi-vul was the first Assyrian monarch known to have built at Nineveh; he restored the temple of Ishtar. This temple

* See *Ancient History from the Monuments—Assyria*, by George Smith, of the department of Oriental antiquities, British Museum.

was again restored by Assur-ubalid (B. C. 1400), a celebrated sovereign who gave his daughter in marriage to the king of Babylon. The Babylonians, disliking this alliance, killed Kara-hardas, grandson of Assur-ubalid, and set up Nazi-bugas as king. Bel-nirari, king of Assyria B. C. 1380, defeated the Babylonians and placed Kuri-galzu on the throne. Budil (B. C. 1360) conquered several tribes round Assyria. Vul-nirari I. (B. C. 1340) defeated the Babylonians and conquered the region of the Khabour. Shalmaneser I. (B. C. 1320) again restored the temple of Ishtar at Nineveh; he also built a palace there, and made Nineveh the capital of the empire. Shalmaneser conquered Nairi as far as the sources of the Tigris, and founded Calah, about 18 miles S. of Nineveh. Tugulti-ninip I. (B. C. 1300) made additions to the temple of Nineveh; he conquered Babylonia and added it to his empire. Bel-kudur-uzur (B. C. 1270) was killed in battle by the king of Babylon. Ninip-pal-uzur (B. C. 1240) repulsed the Babylonians and restored the empire. Assur-dan I. (B. C. 1210) invaded Babylonia. Mutaggil-nusku (B. C. 1180) restored the palace at Nineveh. Assur-risilim (B. C. 1150) defeated two attacks made by the king of Babylon; he restored the temple of Ishtar and rebuilt the palace at Nineveh. Tiglath-Pileser I. (B. C. 1120) carried the Assyrian arms from Babylon to the Mediterranean; he defeated Merodach-nadin-ahi, king of Babylon. Assur-bel-kala (B. C. 1100) made a treaty with the king of Babylon, but on a revolution taking place afterwards invaded that country. Samsi-vul III. (B. C. 1080) restored the temple of Ishtar at Nineveh. Assur-rabu-ibdir (B. C. 1000) was defeated by the Syrians and lost all the western provinces. Assur-dan II. (B. C. 940) restored the empire. With Vul-nirari II. (B. C. 913) commences the Assyrian official yearly chronology, called the "Eponym canon." Tugulti-ninip II. (B. C. 891) conquered the region at the head-waters of the Tigris; his son, Assur-nazir-pal (B. C. 885), removed the capital to Calah. (See NIMROUD.) Sargon, who reigned B. C. 722–705, recommenced the adorning of Nineveh at the beginning of his reign; he besieged and captured Samaria, carrying the Israelites into captivity. In B. C. 721 he defeated Humba-nigas, king of Elam, and Merodach Baladan of Babylon; in B. C. 720 he conquered Hamath, and defeated Sevechus, king of Egypt; in B. C. 717 he put an end to the Hittite kingdom of Carchemesh; in B. C. 719–718 and 716–712 he was engaged in long wars with Ursa of Armenia and various Median and northern kings; in B. C. 711 he suppressed the revolt of the Philistines, Jews, Edomites, and Moabites; in B. C. 710 he defeated Merodach Baladan of Babylon and Lutruk-nanhundi of Elam, conquering Babylonia. Through most of his reign he was building a new city called Dur-Sargina (now Khorsabad), N. E. of Nineveh. On the death of Sargon, his son Sennacherib succeeded (B. C. 705–681); he raised Nineveh to the highest pitch of splendor. In B. C. 704 he reconquered Babylon; in B. C. 702 he invaded Media; in B. C. 701 he attacked Lulia of Zidon, deposed him, marched along the coast of the Mediterranean, subdued the Philistines, defeated the Ethiopians and Egyptians, and overran Judah. Hezekiah, king of Judah, then submitted and gave tribute. In B. C. 700 he again subdued Babylonia, setting on the throne his son, Assur-nadin-sum. Subsequently he attacked Asia Minor, Elam, and Babylon, which he destroyed. Sennacherib was murdered by two of his sons B. C. 681, and after a civil war Esarhaddon ascended the throne; he rebuilt Babylon, subdued the Chaldeans, destroyed Zidon, defeated the Medes, and in B. C. 672 attacked Tirhakah, king of Ethiopia and Egypt, conquering all Egypt up to Thebes. Subsequently, Tirhakah regained Egypt, and Esarhaddon having associated his son, Assur-bani-pal, on the throne, died B. C. 668. Assur-bani-pal expelled Tirhakah from Egypt, restoring the twenty district kings appointed by his father. Egypt being again lost, he made a second expedition, and defeated and expelled Undamane, nephew of Tirhakah and son of Sabaco. He reduced Tyre by blockade, and took tribute from Gyges of Lydia and the rulers of Tubal, Cilicia, and other places in Asia Minor. Later, he defeated the king of Minni, and afterwards engaged in a long war with the Elamites. His brother, Saulmugina, king of Babylon, revolting and being supported by Elam, Syria, and Arabia, he conquered Babylon B. C. 648, wasted Elam, and invaded Arabia. Assur-bani-pal was the Sardanapalus of the Greeks; the most splendid sculptures and works of art at Nineveh were executed during his reign; he died B. C. 626. Two or three obscure monarchs followed—Bel-zakir-iskun, Assur-ebil-ili, and perhaps Esarhaddon II., the Saracus of the Greeks, in whose time a coalition was made against Assyria by the Medes under Cyaxares, the Babylonians under Nabopolassar, and the Egyptians under Necho. The Medes and Babylonians besieged Nineveh for two years, when a great inundation of the Tigris carried away part of the wall and the enemy marched in through the breach. The king of Nineveh in despair set fire to his palace and perished in the flames. The Assyrian empire was now destroyed, and Nineveh became a cluster of small villages, which dwindled until the place was ruined. GEORGE SMITH.

Nineveh, tp. of Bartholomew co., Ind. Pop. 767.

Nineveh, post-v. (also called WILLIAMSBURG) and tp. of Johnson co., Ind. Pop. 1650.

Nineveh, post-v. and tp. of Adair co., Mo., near the Chariton River. Pop. 420.

Nineveh, post-v. of Colesville tp., Broome co., N. Y., on the Susquehanna River and on the Albany and Susquehanna R. R. Part of the village lies in Afton tp., Chenango co., N. Y. Pop. 127.

Ningpo, city of China, in the province of Chi-Kiang, situated in lat. 29° 51′ N., lon. 121° 32′ E., on the Ningpo River, 12 miles from its mouth, in an exceedingly fertile and densely-peopled plain. It is surrounded with a wall nearly 6 miles in circumference and 25 feet high, is generally well built, and contains many handsome public buildings and temples, among which is a hexagonal tower of seven stories and 160 feet high, built of brick and provided with an interior spiral flight of steps leading to the summit. The manufactures of silk, cotton, woollens, and salt are extensive, and the traffic with the interior considerable; but, although Ningpo was one of the five ports opened to foreigners by the treaty of Aug. 26, 1842, the importations are inconsiderable, owing to the proximity of Shanghai. Both Protestants and Roman Catholics have mission-stations here. Pop. about 500,000.

Ninigret, an Indian chieftain of the Narragansett tribe, sachem of Niantic and uncle of Miantonomoh, was neutral during the Pequot war of 1632, but aided the colonists in that of 1637. Having afterwards visited the Dutch at Manhattan and the Western Indians, he was suspected of plotting against the colonists, and war was declared against him by the commissioners of the united colonies 1653, but it was not immediately carried into effect. Meanwhile, Ninigret waged war upon the Indians of Long Island, and having refused to obey a summons to Hartford in 1654, Major Simon Willard was sent against him, and he was forced to flee. In 1660–62 he sold a large portion of his territory to the colonists, abstained from participation in King Philip's war 1675–76, and d. soon afterwards.

Nininger, post-v. and tp. of Dakota co., Minn., on the Mississippi River. Pop. 400.

Ni'ño (PEDRO ALONZO), known as EL NEGRO ("the black"), b. in Andalusia, Spain, in 1468; a distinguished navigator, companion of Columbus in his third voyage, and afterwards conducted explorations of the coasts of South America. D. about 1505.

Ninon de l'Enclos. See L'ENCLOS.

Ni'obe [Νιόβη], in the old Greek legend, was the mother of six sons and six daughters. Feeling a sense of triumph over Leto, who had but two children, Apollo and Artemis, the gods slew all her offspring, and she was transformed by grief into a stone. Her myth is told in many ways, and is the subject of a celebrated group discovered at Rome in 1583, and now at Florence in the Uffizi Gallery. Some of the figures are extremely fine. The work as it now exists is considered a copy of an original by Scopas, or perhaps by Praxiteles, which once stood in the temple of Apollo Sosianus at Rome.

Niobra'ra, a missionary diocese of the Protestant Episcopal Church, bounded E. by the Missouri River, S. by the line between Dakota and Nebraska, W. by the 104th meridian of longitude, and N. by the 46th degree of N. lat. The episcopal residence is at Yankton Agency, Dak. Its first bishop, Dr. W. H. Hare, was consecrated 1873.

Niobrara, post-v., cap. of Knox co., Neb., 40 miles S. W. of Yankton, Dak., has an academy, a newspaper, 1 grist and 1 saw mill, 3 hotels, a U. S. land-office, and stores. Principal employment, farming and stock-raising. Pop. 171. E. A. FRY, ED. "PIONEER."

Niobrara River, or **L'Eau qui Court,** a tributary of the Missouri, rises in Laramie co., Wy., and flows 450 miles to the E., through Northern Nebraska, in its lower course separating Dakota from Nebraska. It is a shallow and very rapid stream. Its upper valley is treeless pasture-land. It next traverses the Great Sandhill region, believed to be almost valueless. It then flows through a rocky region with fertile, well-timbered ravines, and its lower valley is good farming land, with abundant trees.

Niort', cap. of the department of Deux-Sèvres, France, on the Sèvre-Niortaise, is a handsome town with beautiful promenades and many elegant buildings. Its tanneries, dyeworks, and manufactures of chamois, gloves, and shoes are important. Pop. 21,344.

Nip'issings, an Algonkin tribe of Indians residing on the lake of the same name in Canada, engaged in the fur-trade with Cartier and the early French explorers, by whom they were regarded as sorcerers on account of their singular "feast of the dead" and the number of their "medicine-men," who, however, did not prevent the tribe from being nearly exterminated by diseases introduced by Europeans. They were driven by the Iroquois from their original seats to the region N. of Lake Superior, and were there visited by French missionaries. They subsequently returned eastward, and joined the Iroquois and Algonkins gathered by the Sulpician Fathers at the Lake of the Two Mountains, where the three united bands numbered 515 in 1873.

Nipon', or **Niphon',** the largest of the Japan Islands, bounded by the Japan Sea and the Pacific Ocean, and separated N. from Yesso by the Strait of Matsumai, and S. from Kiusiu by the Sea of Suonada. It is 900 miles long, its greatest breadth is 284 miles, and its area is estimated at 42,000 square miles. It is high, mountainous, with deeply-indented coasts, but very little known to Europeans. It contains the famous volcano FOOSEE (which see), and earthquakes are almost daily occurrences. Principal towns, Yedo and Miako. (See JAPAN.)

Nip'penose, post-v. and tp. of Lycoming co., Pa. Pop. 567.

Nirvâ'na [Sansk. *nir*, "out," and *váňa*, "blown," literally meaning "extinction"], is the term employed by the Booddhist philosophers to signify the highest good attainable by mortals. Though usually regarded as synonymous with "annihilation," it is probable that the "extinction" proposed by Sakya Muni to his followers as the goal of their aspirations was not an absolute extinction of being, but a release from the "law of continual births" imprisoning all sentient beings, from the highest divinity to the lowest animalcule, in a circle of transmigrations, which is held to be the great evil of existence, and which can only be broken through by patient striving through many recurrent phases of being. Undoubtedly, certain schools of philosophy corrupted this doctrine into a teaching of positive annihilation as the supreme good, but many considerations concur to prove that such was not the doctrine of the founder of Booddhism nor of any of his authorized successors. The question of the real meaning of Nirvâna has been closely examined and critically discussed by many recent Orientalists, and the balance of authority has been inclined in favor of the view above stated.

Nisard' (JEAN MARIE NAPOLÉON DÉSIRÉ), b. at Chatillon, in the department of Côte-d'Or, France, Mar. 20, 1806; became in 1826 a contributor to the *Journal des Débats*, and after the revolution of July, 1830, to the *National*, whose department of literary criticism he edited. In 1835 he was made professor at the Normal School of Paris, and in 1844 at the Collége de France, and he held, besides, various government offices up to the revolution of Feb., 1848. After the *coup d'état* in 1852 he received various high positions in the department of public education, and in the same year he succeeded Villemain at the Sorbonne. His principal works are—*Les Poëtes latins de la Décadence* (1834), *Histoire de la Littérature française* (4 vols., 1844–61), two collections of *Études* (1858 and 1859, etc.), in which he defends the literary standpoint and artistic taste of the classical period of the French literature, and attacks the romantic school (*littérature facile*). He is a man of comprehensive knowledge, exquisite taste in details, and elegant style.

Nis'bet (CHARLES), D. D., b. at Haddington, Scotland, Jan. 21, 1736; graduated at Edinburgh University 1754; was for many years a distinguished clergyman at Montrose; came to the U. S. in 1785 as president of Dickinson College, Pa., and lectured at the same time on logic, mental philosophy, belles-lettres, and systematic theology. D. at Carlisle, Pa., Jan. 18, 1804. Dr. Nisbet was a man of excellent education and keen wit. His *Posthumous Works* were published in 1806, his *Memoirs* by Dr. Miller in 1840.

Nisbet (EUGENIUS ARISTIDES), LL.D., b. near Union Point, Green co., Ga., Dec. 7, 1803; graduated in 1821 at the University of Georgia in Athens; studied law; was admitted to the bar before he was twenty-one years old, and represented his county in the house and senate of the State legislature for several years; from 1838 to 1841 was a member of the Federal Congress; in 1845 was appointed justice of the supreme court of the State. In politics was a strict constructionist, but supported Harrison in 1840 and Clay in 1844. In 1855 was a leader of the American party, and in 1860 supported the Bell-Everett ticket; in 1861 was a member of the State secession convention, of the Confederate provisional congress, and after the suspension of the writ of *habeas corpus* in the Confederate States was appointed commissioner under that act. In 1839 moved his residence to Macon, and here d. Mar. 18, 1871. A. H. STEPHENS.

Nisce'mi [anc. *Nixemum*], town of Sicily, province of Caltanissetta, pleasantly situated in a very fertile district, about 11 miles from the Tyrrhene Sea. Its old walls have been destroyed by successive assaults of Arabs, Normans, and Turks, but remains of ancient dwellings exist. Pop. 10,750.

Nishapoor', town of Persia, province of Khorassan, on the Seka, is a large city surrounded with walls and ditches, but poorly built and partly in ruins. The surrounding plain, however, situated at an elevation of 2500 feet, is densely peopled and well cultivated. Pop. of the town, about 8000.

Nishnabato'na, post-v. and tp. of Atchison co., Mo., on the Nishnabatona River and on the Kansas City St. Joseph and Council Bluffs R. R. Pop. 1250.

Ni'si Pri'us [Lat., "unless before"], a term used in law to denote the trial of issues of fact in civil cases before a judge and jury. The rulings and opinions rendered by the judge in trials of this kind are termed *nisi-prius* decisions, in distinction from the decisions rendered in the determination of issues of law by the court sitting *in banco*, or in full bench, for the hearing of appeals. (See COURTS.) The origin of this peculiar technical phrase is as follows: By the ancient English practice actions of various kinds were tried only in the superior courts sitting at Westminster, and it was therefore necessary for parties and counsel to resort thither from all parts of the realm to attend to the hearing of the causes in which they were interested. In order to remedy this inconvenience, it was provided by Magna Charta that actions of certain kinds should be triable in the county where the cause of action arose, before justices to be sent into each county once a year. Subsequently, this system of local trial was extended to other actions, till it became the uniform practice to try all common-law actions (as distinguished from suits in courts of equity) in the first instance before a judge and jury in the county where the cause of action arose. But the action was still nominally instituted, as before, in the superior court, and the jury were summoned by writ to appear there, "unless before" (*nisi prius*) the day appointed the justices came into the proper county to hold a session of court. These important Latin words in the writ then became a convenient designation for the system of trial. The phrase is also commonly employed in the U. S. to denote a similar mode of trial, though in some States the expression "trial at circuit" is used with synonymous meaning. *Nisi-prius* decisions are more commonly reported in England than in this country. As they are often rendered on the spur of the moment, and therefore without deliberate reflection, they are not generally deemed to have as high value and authority as decisions rendered by an appellate court. Their weight and importance of course vary greatly with the ability and reputation of the presiding judge. The most valuable English *nisi-prius* reports are those of Peake, Espinasse, Campbell, Carrington and Payne, and Foster and Finlason. There are also various treatises on nisi-prius law, as, *e. g.*, those of Archbold, Selwyn, Stephens, etc. GEORGE CHASE. REVISED by T. W. DWIGHT.

Niskayu'na, post-v. and tp. of Schenectady co., N. Y., on the Mohawk River. Pop. 1105.

Nis'sa, or **Nish** (anc. *Naissus*), city of European Turkey, on the Nissava, an affluent of the Morava, 70 miles S. W. of Widdin, is fortified, contains 11 mosques, carries on a brisk trade in agricultural produce, and is celebrated for its hot mineral springs and as the birthplace of Constantine the Great. Pop. 16,000, of whom 6000 are Mussulmans.

Nithisdale (WILLIAM **Maxwell**), EARL OF, b. in Scotland about 1670; succeeded to the title 1685; married Lady Winifred Herbert, daughter of the earl of Powis; took part in the rebellion headed by the earl of Mar 1715; fell into the hands of the government at Preston; was committed to the Tower of London, and condemned to death; escaped from the Tower disguised in the clothes of the countess, who paid him a visit and remained in his stead; took refuge with the Venetian ambassador, and made his way to the Continent. D. at Rome in 1744. The countess d. in 1749.

Nitrate of Silver. See NITRIC ACID.

Nitrates. See NITRIC ACID; also NITRE.

Ni'tre [synonyms, *niter*, *saltpetre*, *nitrate of potash*; Gr. *νίτρον*, which, however, means, properly, carbonate of soda, whence *natron*; the Latin *nitrum* was used by Pliny to designate true saltpetre]. The word *saltpetre* means "salt of stone," and was doubtless derived from the fact that it sometimes forms an efflorescence on porous stones contain-

ing alkaline matters which are exposed to the agency of decomposing nitrogeniferous organic matters like urine, etc. (For nitre see *Nitrates*, under NITRIC ACID.)

HENRY WURTZ.

Ni'tric Acid [Fr. *acide nitrique, acide azotique;* Ger. *Salpetersäure;* synonym, *aqua fortis*]. The name is derived from *nitre*, the material whence it is obtained. Nitric acid, known to chemists of the present day as *nitric hydrate*, is a compound with water of a certain oxide of nitrogen, containing the maximum proportion of oxygen, and called *nitric anhydride*, N_2O_5. This substance was discovered in 1849 by H. St. Claire Deville, who produced it by the action of chlorine upon dry nitrate of silver:

$$Ag_2O,N_2O_5 + Cl_2 = N_2O_5 + 2AgCl + O.$$

It is crystalline, colorless, and quite unstable, so that it cannot be preserved. It sometimes explodes of its own accord. Common nitric acid, the hydrate (H_2O,N_2O_5), is stated by some to have been known to the Arabian chemists even anterior to the days of mediæval alchemy. Other historians, however, ascribe its discovery to the alchemist Raymond Lully in the thirteenth century. Cavendish first analyzed it in 1784. The alchemists appear to have procured it by the rude method of distilling saltpetre with clay at a temperature above the fusing-point of the saltpetre, the action being a formation of aluminate of potash and the evolution of a red fuming nitric acid, highly charged with nitrous acid. To Glauber is attributed the highly-important invention of our present method of making nitric acid by distilling saltpetre with sulphuric acid. Instead of common saltpetre, at the present day the so-called "Chili saltpetre" (nitrate of soda) is generally employed, being both cheaper and much richer in nitric acid than the nitrate of potash. Nitric acid, although made up of the most common and universally-diffused substances, the nitrogen, oxygen, and water of the air, is not, strictly speaking, as yet a product of human art. The nitrates found in nature, its only sources, are engendered by processes which, so far from being imitated by man, are not yet clearly understood, and remain still, in the present state of chemical science, subjects of investigation and of controversy. No practicable mode of obtaining nitric acid from its elements, which are literally as free as air, has yet been discovered or is even hinted at up to this day. (For the occurrence of nitric acid as *nitrates* in nature, see below; also under NITRE.) In decomposing nitrate of potash by distillation with sulphuric acid in earthenware or iron retorts it is found advantageous to use enough of the latter to form *bisulphate* of potash, it being thus possible to obtain the whole of the nitric acid at so low a temperature that little or none of it is decomposed into nitrous acid and free oxygen. More acid, of a lighter color and better quality, thus results. The reaction is as follows:

$$K_2O,N_2O_5 + 2(H_2O,SO_3) = H_2O,N_2O_5 + H_2O,K_2O,2SO_3.$$

When pure saltpetre is employed, pure nitric acid may thus be made fit for all uses. With Chili saltpetre, however, the complete decomposition takes place at a lower temperature, and hence but half the sulphuric acid is needed. Hence another reason for the employment of the sodic nitrate. As this, however, is liable to be contaminated with common salt, the nitric acid made from it will contain muriatic acid as an impurity, which unfits it for most chemical uses. The Chili saltpetre also contains *iodate of potash*, and the nitric acid made from it is hence contaminated with iodic acid. Pure nitric acid, fit for use in the laboratory, should be colorless, and after dilution with distilled water should give no opalescence with a solution of silver. It should always be kept in a dark closet, as light decomposes it, causing it to turn red from the formation of lower oxides of nitrogen. When as free as possible from water (containing, according to Carius, but 0.5 per cent.), its density, according to Kirwan, is 1.554. J. Kolb, however, obtained acid of a percentage 99.84 of nitric hydrate, and density = 1.559. When long boiled its density always reaches 1.443, a stronger acid growing weaker and a weaker acid stronger. This constitutes a definite hydrate, $H_2O,N_2O_5,3H_2O$, according to a determination of the present writer (confirming the old view, which Roscoe has controverted). The preceding figures are of recent and very careful determination by Kolb, as to the relations of density and composition in nitric acid. The figures here given are selected from a very much larger number.

Percentages of Pure Nitric Hydrate, corresponding to Densities given.

Densities, at melting ice.	Percentages.	Densities, at melting ice.	Percentages.
1.560	100.00	1.300	45.00
1.557	99.52	1.267	40.00
1.542	95.27	1.234	35.00
1.522	90.00	1.200	30.00
1.503	85.00	1.171	25.71
1.484	80.00	1.132	20.00
1.465	75.00	1.099	15.00
1.450	71.24	1.075	11 41
1.420	65.07	1.050	7.22
1.393	60.00	1.026	4.00
1.365	55.00	1.013	2.00
1.334	49.97		

Nitric hydrate, when strong, is a liquid intensely caustic and corrosive. It produces upon the skin, by the most transient contact, a bright yellow stain of the most indelible character, due to the formation of a curious and little-known compound called *xantho-proteic acid*, whose color is indestructible by any other known agent, short of actual solution or removal of the cuticle. Nitric acid is one of the most convenient and powerful agents of oxidation in the laboratory, having the power to oxidate many metallic sulphides, to dissolve silver, and to make, in admixture with muriatic acid, a liquid which will dissolve gold and platinum. When hot it destroys cellulose, sugar, starch, and other vegetable matters, with the formation chiefly, with some other minor products, of *oxalic acid*. When cold and concentrated, however, it acts upon cellulose to form nitro-cellulose or *gun-cotton*, and with glycerine it forms the still more valuable explosive *nitro-glycerine*. For preparing these explosive agents its energy is usually exalted by mixing with oil of vitriol, which, through its affinity for water, virtually concentrates the nitric acid to the condition of pure nitric hydrate.

Detection.—To detect nitric acid when present in considerable traces, probably the most convenient reagent is *sulphate of indigo*, which is bleached by it when hot. This test is somewhat delicate when used by tinging the liquid to be tested slightly, then adding suddenly a considerable volume of concentrated pure sulphuric acid. When present only in minute traces—as in an analysis of a natural water, for example—the nitric acid is first converted into ammonia and the Nessler test then applied. The water is first boiled with sodic carbonate to expel all ammonia already present, then digested at the ordinary temperature with pure caustic soda and shavings of metallic *aluminum*, which mixture reduces the N_2O_5 to $2NH_3$. The latter is then carefully distilled off and the Nessler test applied.

Nitrates.—The nitrates of *potash* (see NITRE), *soda, lime*, and *magnesia* occur as native minerals, that of soda being the most abundant and important. It is imported from Peru into North America and Europe in enormous quantities, being known by the misnomer of "Chili saltpetre." It is also called *cubic nitre*. Its locality is the province of Tarapaca in Peru. The country or table-land, which lies 3300 feet above the sea-level, has over some hundreds of square miles beds of this salt and of earthy deposits from which it is richly obtained by lixiviation. Its origin is still a matter of conjecture only. In other parts of the world the soil is found in many places to contain ordinary saltpetre and other nitrates in sufficient quantity to make its lixiviation profitable. Earth is found abundantly in some limestone caves, as in the Mammoth Cave in Kentucky, the Big Bone Cave in Tennessee, and multitudes of others, which yields on lixiviation nitrates, generally of lime. Few of the nitrates, except those of potash and soda, are of much practical importance. Nitrate of *silver*, or "*lunar caustic*," is one of considerable value in the arts and in medicine; nitrate of *lead* is largely sold to dyers and calico-printers; nitrates of *baryta* and *strontia* are used in pyrotechny, nitrate of *bismuth* in medicine, and nitrate of *cobalt* in the laboratory.

HENRY WURTZ.

Ni'trite of Am'yl, an amber-colored, highly volatile liquid, smelling like ripe bananas, insoluble in water, but soluble in alcohol. It is obtained by the action of nitric acid on amylic alcohol or "fusel oil." Its formula is $C_5H_{11}NO_2$. Amyl nitrite was discovered in 1844, but was not used as a medicine till 1865, when it was brought to notice by Dr. B. W. Richardson of London. If two or three drops of amyl be poured on a handkerchief and the vapor inhaled, almost immediately the blood-vessels of the head, face, and neck are felt to throb rapidly and violently; the face becomes crimson and hot, and the head aches from the sensation of fulness. Simultaneously, there is felt an indescribable commotion within the chest, with a feeling of breathlessness and oppression, which the experimenter has no difficulty in referring to a violent and disorderly throbbing of the heart, of which he is painfully conscious. These effects come on within a few seconds after breathing the fumes of the amyl nitrite, and disappear entirely within a few minutes, unless an overdose be taken. Physiologically, the singular symptoms are largely referrible to paralysis of the unstriped muscular elements in many parts of the body. Hence, in spasmodic affections of these parts this substance has lately been tried medicinally, and, as experience has proved, with the greatest benefit. In an-

gina pectoris, or "breast-pang," and in spasmodic asthma it often relieves with a suddenness and completeness almost magical. It is given by inhalation or internally.
EDWARD CURTIS.

Nitrites. See NITROUS ACID AND NITRITES.

Ni'tro-ben'zol, Nitro-benzene, or **Essence of Mirbane** ($C_6H_5NO_2$); discovered in 1834 by Mitscherlich; produced by treating benzol with strong nitric acid. On mixing the two liquids, they become warm, assume a brown color, and soon emit red fumes and boil. The color becomes finally orange. On adding water the nitro-benzol separates and settles to the bottom of the vessel. A mixture of sulphuric acid and nitrate of soda is preferred to nitric acid: $C_6H_6 + HNO_3 = C_6H_5NO_2 + H_2O$. The nitro-benzol is washed with water, a trace of free acid neutralized by a very dilute solution of soda, unchanged benzol distilled off by steam, and the liquid freed from moisture, which makes it turbid, by filtration over dry powdered chloride of sodium (common salt). It appears as a heavy yellow liquid, smelling like bitter almonds, whence it is often called improperly artificial oil of bitter almonds. It is extensively used as a perfume for soap. Its chief importance is due, however, to the fact that it is converted by reducing agents into aniline: $C_6H_5NO_2 + H_6 = C_6H_7N + 2H_2O$. (See ANILINE, ANILINE COLORS, and BENZOL; also *Am. Chemist*, i. 83.) C. F. CHANDLER.

Ni'tro-cel'lulose, a general term for the product resulting from the treatment of cellulose, as cotton, wood-fibre, etc., with a mixture of strong nitric and sulphuric acids, whereby one or more atoms of hydrogen are replaced by an equal number of molecules of nitryl (NO_2). Several varieties are known. Hadow (*Chem. Soc. Qu. Jour.* vii. 201) gives the formulæ of three as follows:

$C_{18}H_{21}(NO_2)_9O_{15}$ or $C_6H_7(NO_2)_3O_5$,
$C_{18}H_{22}(NO_2)_8O_{15}$,
$C_{18}H_{23}(NO_2)_7O_{15}$, Gladstone's cotton xyloïdin.

The first is called trinitro-cellulose, and is chiefly used as an explosive. The gun-cotton for photographers' collodion consists of mixtures of the last two, probably of lower degrees of nitration. (See EXPLOSIVES, by H. L. ABBOT, U. S. A.) E. WALLER.

Ni'trogen [Gr. νίτρον, "nitre," and γεννάειν, to "engender." Synonyms, *azote*, a French name conferred by Lavoisier, derived from the Greek α priv. and ζωή, "life," because it is destitute of life-sustaining power when breathed; Ger. *Stickstoff*, "suffocating matter," a name similar in origin to *azote*]. This is one of the elements of matter, forming four-fifths, or, more closely, from 79.1 to 79.2 per cent., by volume, of the atmosphere or aërosphere of the earth. It is also found, in small but essential proportion, in the bodies of all living beings, animals and plants, and hence in all their remains, and in those constituents of the solid earth which are formed from their remains, such as *coal* and other apozoic mineral matter. In the earth and waters it occurs also, though in relatively very minute proportion, in the forms of nitrates and of ammonia.

Before 1772 air was considered homogeneous and elementary, being convertible by continued respiration wholly into *carbonic acid*, then called "fixed air" and by several other names. At that date, however—which was two years previous to the discovery of oxygen by Priestley—the English chemist Rutherford discovered that after separating from air that had been repeatedly breathed all its carbonic acid, a peculiar irrespirable gas was left. Hence, this chemist is recorded as the *discoverer of nitrogen*.

Preparation.—Nitrogen gas, nearly pure, may be prepared by separating from atmospheric air its other constituents, which are oxygen, carbonic acid, and water. Oxygen, constituting a little over one-fifth of the volume, is the largest, and of course the most troublesome, constituent to remove. By passing air over some metals at incandescence the oxygen may be abstracted. On a small scale, metallic *copper* in wire or turnings is used, but *iron* may also be used, and is much cheaper, but may give nitrogen contaminated with carbonic oxide. Small remaining traces of oxygen, together with carbonic acid, which is always present, are most certainly removed by passing through a potash or soda ley to which has been added some *pyrogallol*. If the nitrogen is required to be anhydrous, oil of vitriol or chloride of calcium must also be employed to make it so. These modes of obtaining nitrogen from its most abundant source, the atmosphere, are, however, the most troublesome and expensive modes of all. It is much easier and cheaper to obtain it from a nitrite, *nitrite of potash* being generally used. This is mixed in solution with sal-ammoniac and boiled, when pure nitrogen gas comes off:

$$2NH_4Cl + K_2O,N_2O_3 = 2KCl + 4H_2O + N_4.$$

Nitrite of ammonia, when heated, breaks up entirely into pure nitrogen and water:

$$(NH_4)_2O,N_2O_3 = N_4 + 4H_2O;$$

but this salt is more expensive. Common *nitrate of ammonia*, heated dry with sal-ammoniac, gives a mixture of nitrogen and chlorine gases, the latter of which may be removed by a caustic alkali; but this process is not to be recommended. The method with nitrite of potash and sal-ammoniac is the best.

Nitrogen when pure is a gas, colorless, inodorous, and tasteless, of density = .97 (air = 1). It is dissolved by 5000 times its volume of ice-cold *water*, and by 800 times its volume of ice-cold *alcohol*. Chemically, nitrogen has an exceptional inertness towards most other substances; but some metals, as *titanium*, *tungsten*, and a few others, combine powerfully with it, even with combustion. By the electric spark it may be made to combine with oxygen directly to form nitric acid; and Bunsen found that when 100 volumes of air were mixed with 226 volumes of the explosive mixture (in the proportion to form water, 2 : 1) of hydrogen and oxygen, and the whole exploded, 11.5 per cent. of the air at once disappeared, combining to form nitrogen acids. During electric storms nitric acid is believed to be formed in the air in small proportion. Nitrogen and carbon may be made to combine directly to form *cyanogen*, by heat in the presence of an alkaline substance. Baryta performs this function best, and it has even been proposed to use this method for the manufacture of ammonia, which is easily obtained from the cyanide of barium.

In nature, the most important function of nitrogen is merely negative or passive, as a *diluent* of the oxygen of the air to make it fit to sustain life. This, however, is by no means an unimportant function, for it is now well known that the limits of oxygenation of the atmosphere in either direction, to fit the extremely delicate relations of air to animal blood, are surprisingly narrow, and that the smallest variations in this respect, such as will even tax our present analytical skill to determine with precision, are not without grave influences upon bodily health and comfort. Nitrogen performs, however, other functions in living nature of the greatest importance. The so-called "plastic" constituents of animal bodies, which form their solid tissues, including what are called the *proteids* (see article ALBUMINOIDS, by PROF. CHANDLER), also the important substance *gelatine*, and others, contain nitrogen as an essential element, this being so characteristic a fact that these bodies are often classed together as the *nitrogenous* constituents of living bodies. In plants they occur also, as well as in animals, but in the former they are not entitled to the term "plastic." These nitrogenous constituents of organic beings agree in the peculiarity of being truly *amorphous* (or, as it was termed by Graham, *colloid*) bodies, rarely, or possibly never, assuming a *crystalline* character. In this respect we may also class with them the plastic constituents of plant-life, cellulose, starch, etc., which are not nitrogenous, but which are also amorphous or colloid in their nature. Nitrogen combines with hydrogen to form the important gas ammonia, and with oxygen to form a series of oxides, of which NITRIC and NITROUS ACIDS are described by us under other heads. NITROUS OXIDE, also called "laughing-gas," is another familiar compound of oxygen and nitrogen. (See that head.) HENRY WURTZ.

Nitro-glycerine ($C_3H_2(NO_2)_3(OH)_3$). See EXPLOSIVES.

Ni'tro-Muriat'ic Acid [syn. *aqua regia*; Fr. *eau régale*; Ger. *Königswasser*, *Goldscheidewasser*, *Salpetersalzsäure*]. This name is applied to the product of mixing together strong nitric and muriatic acids. The name *aqua regia*, "royal water," refers to the power of such mixture to dissolve gold, the "king of metals"—a power which neither of the acids possesses alone. Aqua regia fumes in the air, has a deep yellow or red color, and evolves two gaseous substances when heated, which were identified and analyzed by Gay-Lussac, and are known as chloro-nitrous oxide (NOCl) and chloro-nitric acid ($NOCl_2$). Chlorine gas also appears, at least at certain stages of the operation. It appears to be regarded as yet as undecided whether the agent which converts gold, platinum, and other metals of this group into chlorides, and thus dissolves them, is the free chlorine only or the chloro-nitric acid ($NOCl_2$). *Aqua regia* is highly valuable in the arts and in the laboratory in operations with gold and platinum. It is also used in the destruction of organic bodies in the wet way, as when a mineral poison is to be isolated from a stomach or other viscus in toxicological cases, though more powerful agents are sometimes substituted in this case. A somewhat cheaper substitute for the ordinary *aqua regia* may be made by dissolving nitrate of soda in strong muriatic acid. H. WURTZ.

Ni'tro-Pruss'ides, a peculiar class of compounds discovered by Dr. Lyon Playfair, as formed by the action of nitric acid upon the "prussiates" of potash, red and yel-

low. They are generally viewed, by the prevailing school of chemists, as derived from the ferridcyanides, the general formula of which is $R_3,FeCy_6$, by replacing molecules of RCy by molecules of N_2O_2, deutoxide of nitrogen, the latter being looked upon as a compound radical, and called *nitrosyle;* though why such a compound radical should not replace the cyanogen itself, the other known compound radical, and why a molecule of basylic metal or radical should be required to go with it, does not appear. Special interest is conferred upon the nitro-prussides by the fact that they have for soluble sulphides a very delicate and characteristic reaction, producing a most beautiful violet tint, the cause of which is not clearly known. It furnishes, however, the most delicate test yet discovered for sulphur in minute traces. The *nitro-prusside of sodium*, the compound employed in the laboratory for this test, is prepared by treating 2 parts of yellow prussiate of potash with 5 of nitric acid and 5 of water, until ferrous solutions give no longer a blue precipitate. The liquid, cooled, filtered, neutralized with carbonate of soda, and filtered again, yields on evaporation mixed crystals of nitrates and of the ruby-colored nitro-prusside of sodium, which latter may be picked out by hand and recrystallized if wanted pure. H. WURTZ.

Nitro-toluol ($C_7H_7NO_2$), a body resembling nitro-benzol, prepared in the same manner from toluol; important as a source of toluidine. (See NITRO-BENZOL.) C. F. CHANDLER.

Ni'trous Ac'id and Ni'trites. According to the prevailing nomenclature, nitrous acid, properly so called—which would be the hydrate of nitrous anhydride, N_2O_3—is but doubtfully known, as N_2O_3 and water react to form nitric acid and nitric dioxide: $3N_2O_3 + H_2O = 2HNO_3 + 2N_2O_2$. N_2O_3, or nitrous anhydride, is a very curious compound. At ordinary temperatures it is gaseous and of a deep-red color, but at a temperature just about the Fahrenheit zero (—18° C.) it condenses to a *blue* liquid. At temperatures below zero it will mix with water to a blue solution, which may contain the hydrate, but this has not yet been settled. It may be procured in a pure state by warming strong nitric acid with ordinary white arsenious acid, which converts the latter into arsenic acid, being itself reduced to nitrous anhydride gas. Nitrites of potash or soda, in solution, may be formed by passing this gas into solutions of caustic potash or soda. Common starch may be substituted for the arsenious acid when it is not necessary the nitrite should be perfectly pure. Such solutions of nitrites are used as sources of pure nitrogen gas, as explained under the head of NITROGEN. Impure nitrites may be obtained also by fusing the alkaline nitrates, with certain precautions, with metals, as copper and iron. Nitrites sometimes occur in natural waters, particularly in well-waters, doubtless as products of putrefactive processes; and it has been recently announced by an American chemist that they occur, in proportions by no means trifling, as normal ingredients of the circulating fluids of certain plants. H. WURTZ.

Ni'trous Ox'ide, Nitrogen Monoxide, or **Laughing-Gas,** a colorless, transparent, nearly odorless gas, having a sweet taste, and freely soluble in cold water. It is obtained from ammonium nitrate, which by being heated in a retort breaks up into water and nitrogen monoxide. This gas supports combustion nearly as energetically as pure oxygen, but its most interesting and important property is its anæsthetic effect on the animal system when breathed instead of ordinary atmospheric air. Being free from all irritant or offensive properties, it is as readily inhaled as air, but being incapable of decomposition in the body, it furnishes no oxygen for the needs of the blood. Inhaling the gas thus amounts to temporarily totally cutting off the usual supply of oxygen through the breath, while not interfering with the respiratory movements or the elimination of carbonic acid. The result is that the individual, without any distress or disagreeable sensation whatever, becomes speedily asphyxiated into complete unconsciousness. In this condition anæsthesia is perfect, and surgical operations can be performed without pain, as by the use of chloroform or ether. On withdrawing the gas and allowing air to be breathed, the blood becomes immediately re-arterialized. The recovery of consciousness is then as swift as its loss, and there are no unpleasant after effects. The advantages of nitrous oxide as an anæsthetic in surgery are its great swiftness of action and entire freedom from all unpleasant effects upon the patient. When pure and intelligently given, it is perfectly manageable, and therefore safe; but of course if the gas be continuously breathed too long, the asphyxia will end in death. When breathed diluted with air an exhilarating or intoxicating effect is produced, under the influence of which the experimenter is irresistibly impelled to do all kinds of silly and extravagant acts; hence the old name of "laughing-gas." Nitrogen monoxide can be liquefied and solidified by pressure, and in this state a large supply can be conveniently kept for use in a small iron cylinder. For use in surgery the gas is inhaled from a bag through a mouthpiece so made that the expired gases do not mix with the contents of the bag. EDWARD CURTIS.

Nitryl, or **Nitric Peroxide** (NO_2), a monatomic chlorous radical, analogous to chlorine, bromine, etc. It exists in nitric acid ($H - O - NO_2$), and is capable of replacing one or more atoms of hydrogen in various compounds, chiefly organic, atom for atom, as nitro-benzol ($C_6H_5NO_2$), trinitro-cellulose ($C_{18}H_{21}(NO_2)_9O_{15}$), picric acid ($C_6H_3(NO_2)_3O$), etc. C. F. CHANDLER.

Nitzsch (KARL IMMANUEL), b. at Borna, Saxony, Sept. 21, 1787; studied theology at Wittenberg, and was appointed professor at Bonn in 1822, and in 1847 at Berlin, where he d. Aug. 21, 1868. His principal works are—*System der christlichen Lehre* (1829), often reprinted (English translation, 1849), *Praktische Theologie* (3 vols., 1847–67), and various collections of sermons. He belonged to the same group of theologians as Schleiermacher and Neander.

Nivelles', town of Belgium, in the province of South Brabant, on the junction of the Thines and Dodaine, has an interesting church of the eleventh century, and manufactures of linen and woollen fabrics and paper. Pop. 9050.

Nivernois', an old province of France, corresponding exactly to the present department of NIÈVRE (which see).

Nix, or **Nix'ie** [Ger. *nix*], in the popular mythology of the Teutonic races, a water-spirit, usually malignant, and often assuming the human form, though able to take any other shape at will. Nixies were resorted to to determine the future, and their good-will might be obtained by gifts. From the same etymological root we have "Old Nick" as a name for the devil.

Nix'burg, post-v. and tp. of Coosa co., Ala. Pop. 2249.

Nix'on, tp. of De Witt co., Ill. Pop. 649.

Nixon (Gen. JOHN), b. at Framingham, Mass., Mar. 4, 1725; served in the colonial forces at the capture of Louisburg 1745, and at the battles of Ticonderoga and Lake George; led a company of minutemen at Lexington, commanded a regiment and was severely wounded at Bunker Hill; was made brigadier-general Aug. 9, 1776; commanded the 1st Massachusetts brigade at Stillwater; resigned his commission from ill-health 1780: removed to Middlebury, Vt., 1803, and d. there Mar. 24, 1815.

Nixon (THOMAS), b. in South Carolina Oct. 22, 1793; d. in Mississippi Mar. 4, 1872; joined the Tennessee M. E. conference in 1812, and in 1816 was one of nine who composed the first conference in Mississippi; possessed a strong mind, and was a good theologian, though self-educated. He performed laborious services in Tennessee, Mississippi, Alabama, and Louisiana, and was a member of the Mississippi conference at the time of his death. T. O. SUMMERS.

Nix'onton, tp. of Pasquotank co., N. C. Pop. 1626.

Niz'am's Dominions, the largest native state of Hindostan, subsidiary to Great Britain, occupies the centre of the Deccan, from lat. 15° to 21° 30′ N., and from lon. 75° to 81° 30′ E., between the presidencies of Bombay and Madras. Area, 95,000 square miles. Pop. 10,666,080. The country is an elevated table-land, with a slightly undulating surface and an exceedingly fertile soil, watered by the Godavery and the Kistnah, with their numerous tributaries. The climate is not so excessively hot as in Bengal, and it is healthful except in places where marshes and jungles poison the air. The land is generally not well cultivated, though with moderate care it is capable of yielding annually two crops of rice, wheat, and maize. Sugar, cotton, indigo, fruits, oil-bearing plants, and mustard are grown. Large pasturages are found on which herds of cattle and sheep are reared. Coal and iron abound. Silk, brocade, and leather are the chief manufactures. Cap. Hyderabad.

Nizh'nee-Lomov', town of Russia, in the government of Penza, on the Lomov, has several educational institutions and 8206 inhabitants.

Nizh'nee-Novgorod', or **Nijnii-Novgorod,** government of Central Russia, along the Volga and its affluents, the Oka and the Vetlooga. Area, 18,636 square miles. Pop. 1,262,913. The surface is mostly level; the soil is not very fertile, but excellently cultivated; large quantities of grain, hemp, and flax are raised. In the northern part extensive forests are found, which have given rise to considerable shipbuilding and manufactures of all kinds of wooden implements. On the whole, the government is a manufacturing district. Almost every kind of industry is carried on in its populous and enterprising villages, and

some of its manufactures—as, for instance, its Russian leather, soap, and iron works—are of superior quality.

Nizhnee-Novgorod, tp. of Russia, capital of above government, on the right bank of the Volga, at its confluence with the Oka. The town is divided into two parts, the principal one being situated on the steep promontory, triangular in shape, and 400 feet high, at the apex of which, on the highest point, stands the Kremlin or citadel, surrounded by a wall thirty feet in height. This portion of the town is mainly made up of three handsomely built streets; the low town consists of one long street along the Volga. The whole town is built of wood, and has few attractions. It is remarkable, however, for the great fairs held here in July and August of each year, on a triangular space formed by the junction of the left bank of the Oka with right bank of the Volga, and so low as to be often entirely inundated; but at the season when the fair is held the rivers are low. The ground is laid out for streets, and a system of permanent sewerage extending from river to river has been of late years established by the Russian government, which is in itself an object of interest. As the time for the fair approaches a great town springs up, with churches, theatres, hospitals, etc., all built of wood and in a substantial manner. Hundreds of thousands of people flock here on these occasions, the only means of access from the town being by a bridge of boats across the Oka. The waters are almost completely covered with boats engaged in conveying goods and people, and a large number of people occupy their boats as residences during the fair. In 1839 during the short season of the fair it is said that a business of upwards of £6,000,000 sterling was transacted. But the extension of railroads and perfection of other means of internal communication through Russia and contiguous portions of Asia, does away in a considerable degree with the motive for "fairs" of this kind, and this at Nizhnee is diminishing in importance. Pop. 40,742.

Nizh'nee-Tagilsk, or **Nijnii-Tagilsk,** town of Russia, government of Perm, is situated in the Ural Mountains, in a district exceedingly rich in iron, copper, lead, and platina, and contains a mining school, extensive forges, and manufactures of machinery. Pop. 25,000.

Niz'za Monferra'to, town of Northern Italy, province of Alessandria. This was a strongly fortified place during the Middle Ages, and resisted successfully a forty days' siege on the part of Charles of Anjou, but it suffered cruelly afterwards, both from the Spanish and French armies. Pop. 5302.

No'ah, the patriarch who was saved by God from the Deluge on account of his piety, and thus became the second founder of the human race, was a son of Lamech, and the father of Shem, Ham, and Japheth. (See DELUGE.)

Noah (Major MORDECAI MANUEL), b. in Philadelphia, Pa., July 19, 1785; became a lawyer at Charleston, S. C.; engaged actively in politics as a Democrat; went as consul to Riga 1811, to Morocco and Algiers 1813–15; settled in New York, and was connected as editor or proprietor successively with seven newspapers, of which the most important were the *National Advocate* and the *Enquirer* (1826), afterwards merged in the *Courier and Enquirer.* Soon after his return from Morocco, Major Noah endeavored to form a Jewish colony upon Grand Island in the Niagara River, where they were to build a "New Jerusalem" under his administration as "judge in Israel," but few of the Hebrew race responded to the invitation. Noah was elected sheriff of New York, and subsequently appointed surveyor of the port and judge of the court of sessions. He published several successful dramas, a volume of *Travels* (1819), a translation of a spurious *Book of Jasher* (1840), a *Discourse on the Restoration of the Jews* (1845), *Gleanings from a Gathered Harvest* (1845), and other miscellaneous works, chiefly speeches. D. in New York City Mar. 22, 1851.

Noailles', de (LOUIS MARIE), VISCOUNT, b. in France Apr. 17, 1756, was second son of the Marshal de Mouchy and a brother-in-law of La Fayette, with whom he served in the American war of independence; was a good tactician; commanded the Soissonnais regiment at the siege of Yorktown, and was one of the commissioners to receive the capitulation of Cornwallis. He bore a patriotic part in the National Assembly of 1789, enjoying great influence; received an important command in the army, but resigned in May, 1792, in despair for the cause of liberty, and came to the U. S., while the viscountess, remaining in Paris, became a year later a victim to the Revolutionary tribunal. In 1803, Noailles re-entered the French army, went to St. Domingo, was mortally wounded in an engagement with an English vessel, and d. at Havana Jan. 9, 1804.

Noank', post-v. of Groton tp., New London co., Conn., at the mouth of the Mystic River, and on the Stonington and Providence R. R.

Nobil'ity, in its usual sense a state of social dignity and political privilege peculiar to certain families, and not transferable like property and the advantages arising therefrom. In ancient Egypt, as now in India, nobility was inherent in the highest castes, the sacerdotal and the military. In Greece warriors originally held the chief place: they were lords of the soil in their several states, and formed an order of hereditary nobility. In Rome the patricians formed for a long time an exclusive caste, allowing no intermarriage with inferiors, and possessing nearly all the political power. But after the plebeians had (B. C. 366) gained equal political rights, those among them who became curule magistrates were not only accounted noble themselves by virtue of their office, but also transmitted dignity to their descendants. Nobility in the old German tribes meant freedom and the ownership of land, and was not hereditary, so that the weak son of a powerful father, if unable to keep his estates, lost also the dignity which went with them. Gaul, conquered by the Franks, was by them divided into governments over which various officers were appointed—dukes (from Lat. *dux*, a "leader"), counts (from *comites*, "companions"), and marquises (guardians of the frontier "marches"). Both provinces and titles, at first given but for life, became in time hereditary, and the French nobility grew so powerful as to be able to set their nominal sovereigns at defiance. They made independent war, coined money, and were supreme judges in their own fiefs, even the lower nobles having power of life and death over their people. A baron's gallows was, however, distinguished by four posts, while a châtelain's had but three, and an inferior lord's only two. In England, where William the Conqueror made every vassal dependent on the king, no such irresponsible power was ever gained by the barons. Surnames and armorial bearings, adopted in the eleventh and twelfth centuries, and soon becoming general, increased the exclusiveness of the nobles, especially in France and Germany. In the latter country a child could inherit no fief of the empire unless both his parents were of pure blood; and in France, though the son by marriage of a noble father and a mother of ignoble birth might inherit property and receive knighthood, he could enter no order of chivalry. When the poverty of a noble forced him to sell his lands to a *roturier* (person of low rank, derived, according to Ducange, from Mid. Lat. *rupturarius*, "peasant"), the low-born purchaser had to give precedence to knights of ancient lineage, and was subject to taxes, from which they were exempt. The aristocracy had many privileges besides freedom from taxation; they alone were allowed to hunt; their goods could not be confiscated except for treason; the highest offices, civil and military, were reserved for them; if condemned to death, they were beheaded, not hanged; they only could be buried within the choir of a church. The granting of letters of nobility was a blow to aristocratic exclusiveness. This was first done in France by Philip the Bold, who in 1270 thus ennobled Raoul, his goldsmith. French sovereigns often replenished their treasury by compelling rich subjects to buy letters of nobility, as English kings obliged people to purchase knighthood. Under Louis XIV. and his two successors persons desiring a title purchased the place of royal secretary, a nominal office conferring nobility on its possessors, so that at one time the king had 206 secretaries; this custom is alluded to by Boileau (*Satire X.*). Louis XIV. created over 500 nobles, and so many persons usurped titles that a new verb, *s'enmarquiser* (to "make one's self a marquis"), was coined. The title of *duke* was, however, the only one giving political eminence. Nobility was abolished in France June 19, 1790, and the title of noble became a title to banishment or the guillotine. In 1806, Napoleon founded a new nobility, creating princes, dukes, counts, barons, and chevaliers. The imperial noblesse, generally a reward for services rendered to France, was the only kind acknowledged, and edicts were issued against usurpers of titles. At the Bourbon restoration the old noblesse was again recognized, and that of Napoleon's creation was suffered to remain. In 1848 nobility was abolished by the provisional government, to be once more restored by Napoleon III.

The Italian nobility lived generally in strong castles, and were feared by the people, who, when it was possible, excluded them from political power, as in Florence and Genoa, where high birth was a disqualification for government. At present, Italian nobles are of two kinds—those of ancient lineage, and others, who, having bought estates, take the titles belonging thereto. Titles descend to the eldest son only, but the younger children are called by courtesy *dei principi*, *dei duchi*, etc. Spanish nobility is very ancient: being *hijo d'algo* ("son of somebody") implies noble birth, and entitles a gentleman to be called *don*, which name, however, is, like our *esquire*, very generally given. The higher nobles are called grandees, and their

estates and titles are entailed. Russian nobility was formerly patriarchal, but Peter the Great introduced the European system of titles. In England political nobility is said to be derived directly from the sovereign, who is therefore called the "fountain of honor." It comprises dukes, marquises, earls, viscounts, barons, and baronets. The title of duke was first used in England under Edward III., who created his eldest son duke of Cornwall, and was reserved for royal princes until the reign of Edward VI. That of marquis was given first by Richard II. That of earl, says Blackstone, "is so ancient that its original cannot clearly be traced out. This much seems tolerably certain, that among the Saxons they were called *ealdormen*, and also *shiremen*. On the irruption of the Danes they changed the name to *eorles*. After the Norman Conquest they were for some time called counts or *countees*, but they did not long retain that name, though their shires are called counties to this day." Viscounts were first created in England in 1440. The title of baron was in the Middle Ages given to all nobles, whence arose the strange custom of bestowing it on saints. There were barons by tenure, barons by writ, and barons by letters patent. Baronet, the lowest title of honor hereditary in England, was created by James I., ostensibly for the settlement of Ulster, really for raising money, it being sold for £1000, though only to persons of quality. (Sir J. Lawrence, *On the Nobility of the British Gentry*; C. F. Menestrier, *Les Diverses Espèces de la Noblesse* (Paris, 1683); *Le Blason de la Noblesse* (Paris, 1683).) Janet Tuckey.

No'ble, county of N. E. Indiana. Area, 348 square miles. It is partly level and partly hilly, and well wooded. The soil is fertile. Cattle, grain, and wool are leading products. Lumber and carriages are important articles of manufacture. The county is traversed by the Lake Shore and Michigan Southern and the Grand Rapids and Indiana R. Rs. Cap. Albion. Pop. 20,389.

Noble, county of S. E. Ohio. Area, 450 square miles. It is uneven, fertile, and abounds in coal. Live-stock, wool, grain, and tobacco are leading products. There are quite important manufacturing interests; manufactories of harnesses and saddlery are the most numerous. The county is traversed by the Marietta and Pittsburg R. R. Cap. Caldwell. Pop. 19,949.

Noble, post-v. and tp. of Richland co., Ill., on the Ohio and Mississippi R. R. Pop. of v. 380; of tp. 1333.

Noble, tp. of Cass co., Ind. Pop. 904.

Noble, tp. of Jay co., Ind. Pop. 1218.

Noble, tp. of La Porte co., Ind. Pop. 1008.

Noble, tp. of Noble co., Ind. Pop. 1013.

Noble, tp. of Rush co., Ind. Pop. 1203.

Noble, tp. of Shelby co., Ind. Pop. 1733.

Noble, tp. of Wabash co., Ind. Pop. 4485.

Noble, tp. of Branch co., Mich. Pop. 756.

Noble, tp. of Auglaize co., O. Pop. 1159.

Noble, tp. of Defiance co., O. Pop. 857.

Noble, tp. of Noble co., O. Pop. 1121.

Noble (Louis Legrand), b. in Otsego co., N. Y., Sept. 26, 1811; removed in his twelfth year to Michigan; graduated at the New York Theological Seminary; was ordained in 1840 to the ministry of the Protestant Episcopal Church; officiated for some years in North Carolina and at Catskill, N. Y.; became in 1854 rector of a church at Chicago, Ill.; was settled at Fredonia, N. Y., 1856, at Jersey City 1858, and in 1874 became a professor at St. Stephen's College at Annandale, N. Y. He was literary executor of Thomas Cole, the painter, of whom he published a *Memoir*, with selections from his writings (1853), made an Arctic journey with Church in 1860, of which he wrote an account, and has published two volumes of *Poems*.

No'bleborough, post-v. and tp. of Lincoln co., Me., on the Knox and Lincoln R. R. Pop. 1150.

No'bles, county of S. W. Minnesota, bounded S. by Iowa. Area, 720 square miles. It is rolling and fertile, being well adapted to grain-culture. It is traversed by the Sioux City and St. Paul R. R. Cap. Worthington. Pop. 117.

No'blesville, post-v. and tp., cap. of Hamilton co., Ind., on the White River and on the Indianapolis Peru and Chicago R. R., has 1 weekly newspaper. Pop. of v. 1435; of tp. 3568.

Noblesville, a v. of German tp., Clarke co., O. Pop. 60.

Noce'ra Inferio're [*Nuceria Alfaterna*], town of Southern Italy, province of Salerno, situated in a district particularly suited to the raising of sheep and cattle. The cheese made here is excellent, and the woollen manufactures are extensive. Nocera was destroyed by Carthage for taking part with Rome, flourished again, and was again destroyed by the Normans, who drove the inhabitants into the neighboring hamlets, or *pagi*, and from this fact the town is now often called *Nocera dei Pagani*. It was here that Urban VI., besieged by Carlo di Durazzo (1385), vainly endeavored to drive off his assailant by hurling at him from the castle four times daily, and accompanied by the solemn tolling of the bells, the deadliest anathemas of the Church. Near this town has been disinterred a large building of the time of Constantine, evidently a manufactory of some sort, and below a portion of the pavement was found a collection of pagan statues, some of merit, probably concealed to await the expected restoration of the old religion. Pop. 13,149.

Noce'ra Superio're, small t. near the above. Pop. 624.

Noce'ra Um'bria [*Nuceria Camellaria*], town of Italy, province of Perugia, situated on a slope of the Apennines about 14 miles from Foligno. The streets of this old town are rough and steep, and the cathedral and episcopal palace occupy the highest point. The *bagni* or baths, famous in the Roman period as a cure for dyspepsia, are about 2 miles distant. Pop. 6277.

Noce'to, town of Italy, province of Parma, situated in a fertile region, with fine country-seats near it. Pop. 5980.

No'ci, town of Southern Italy, province of Bari delle Puglie, which takes its name from an immense walnut wood near it. The inhabitants are active and industrious. Pop. 7989.

Nockamix'on, post-v. and tp. of Bucks co., Pa. Pop. 1528.

Noctilion'idæ [from the generic name *Noctilio*], a family of insectivorous bats (Cheiroptera) without nasal appendages. The ears are moderate, and provided with a distinct tragus to each; the tail perforates the interfemoral membrane through its upper surface, or, when that is truncated, is produced beyond it; the intermaxillary lines are generally united (sometimes separated); the molars are large and have W-shaped ridges; the incisors are variable ($\frac{2}{1}$, $\frac{1}{1}$, $\frac{0}{2}$, or $\frac{1}{3} \times 2$); the middle finger has two phalanges; the stomach is sacciform and its extremities inclined toward each other. The species are mostly confined to the tropical regions of both hemispheres. According to Dobson (*Ann. and Mag. Nat. Hist.*, Nov., 1875), who names the family "Emballonurinæ," and unites it with the "Molossinæ" in a family, "Emballonuridæ," there are four primary groups: (1) Emballonuræ, with the genera *Juria*, *Saccopteryx*, *Rhynchanycteris*, and *Emballonura*; (2) Taphozoi, with the Eastern hemisphere genera *Coleura*, *Taphozous*, and *Diclidurus*; (3) Rhinopoma, with the Eastern genus *Rhinopoma*; and (4) Noctiliones, with the American genus *Noctilio*. Whether all these are naturally allied is, however, questionable. Theo. Gill.

Noctilucine, a name given by T. L. Phipson to an organic substance supposed to cause the production of light in phosphorescent fish, insects, and decaying matter. At ordinary temperatures it is semi-fluid and whitish in color. It contains nitrogen and water. It dries up readily, yielding amorphous films. Noctilucine is slightly soluble in water and insoluble in alcohol and ether. Sulphuric and nitric acids dissolve it with decomposition. When moist it absorbs oxygen and evolves carbon dioxide. In ozone it is more luminous than when in oxygen, the luminosity apparently being due to oxidation. The spectrum of the light emitted is nearly monochromatic. Noctilucine is secreted in a pure form by the luminous centipede, *Scolopendra electrica*. (*Chem. News*, xxvi. 130, No. 668; *Am. Chem.* iii. 244; *Comptes Rendus*, lxxv. No. 9; Watts's *Dict.*, 2d Supplement, p. 861.) E. Waller.

Nod'away, county of N. W. Missouri, bounded N. by Iowa. It is well timbered, fertile, and somewhat diversified. Cattle, grain, wool, and lumber are leading products. The county is traversed by a branch of the Kansas City St. Joseph and Council Bluffs R. R. Area, 825 square miles. Cap. Maryville. Pop. 14,751.

Nodaway, tp. of Adams co., Ia. Pop. 628.

Nodaway, tp. of Page co., Ia. Pop. 2150.

Nodaway, tp. of Taylor co., Ia. Pop. 422.

Nodaway, post-v. (also called Nodaway City) and tp. of Andrew co., Mo., on the Missouri and Nodaway rivers, and on the Kansas City St. Joseph and Council Bluffs R. R. Pop. of v. 286; of tp. 2363.

Nodaway, tp. of Holt co., Mo. Pop. 2055.

Nod'dy, the *Megalopterus stolidus*, a sea-bird of the tern family, approaching the character of the gulls. It is found in nearly all parts of the world, often alights on ships, and lets itself be captured without resistance or attempt at escape. Its eggs are eaten in great numbers, and are very good.

Nodal Points or Lines. See Vibration.

Nodes [Lat. *nodus*, a "knot;" Fr. *nœud*], the points in which the path of any planetary or cometary body intersects the plane of the ecliptic; also the points in which the orbit of any satellite intersects the plane of the orbit of its primary. Nodes are distinguished as *ascending* and *descending*. The ascending node is that through which the body passes from the S. to the N. side of the plane of reference; the descending, that through which it passes from N. to S. The first is denoted by the sign ☊, the second by the sign ☋. From the definition it is evident that the earth's orbit has no nodes. The nodes of every other member of the solar system undergo gradual displacement in the heavens, making, in a period of time longer or shorter, a complete revolution. The period for the moon is short, being but about $18\frac{2}{3}$ years, but for the planets it reaches many thousands of years, being nearly 130,000 for Mercury and 36,000 for Uranus. The direction of nodal movement is generally retrograde, or from E. to W.

F. A. P. Barnard.

Nodier' (Charles), b. at Besançon Apr. 29, 1780; studied at Strasbourg, and led subsequently an errant and adventurous life, first as an ardent republican, then as a zealous royalist, writing sentimental novels, as *Stella* (1802), after the model of Werther, and satires against Bonaparte, as *La Napoléone* (1802), and editing *Telegraph Illyrien* in 1814 under the auspices of Junot and Fouché; became contributor to the *Journal des Débats* in 1815; librarian to the library of the arsenal of Paris in 1824, and d. in that city Jan. 26, 1844. He was a very prolific writer, and touched almost every field of literature from lexicography to satire. Some of his works have an interest still: *Dictionnaire des Onomatopées françaises* (1808), *Histoire des Sociétés secrètes de l'Armée* (1815).

Noé (Amedée de). See Cham.

No'el (Hon. and Rev. Baptist Wriothesley), M. A., a brother of the first earl of Gainsborough, b. July 10, 1799, at Leightmont, Scotland; graduated at Trinity College, Cambridge, 1826; became one of the queen's chaplains, and in 1848 left the Established Church and became a Baptist minister. He was an eloquent preacher; published a number of volumes of sermons, besides many other works, chiefly religious, and was distinguished for philanthropic labors among the poor of London. D. Jan. 20, 1873.

Noë'tians, followers of Noëtus, a Patripassian who flourished probably about 200 A. D. (instead of 230, the date formerly given). All we know of him is derived from Hippolytus (d. 236), Epiphanius (d. 403), and Theodoret (d. 457, 8), and they do not quite agree in their statements, Hippolytus and Theodoret saying he was born at Smyrna, and Epiphanius calling him an Ephesian. Perhaps he was born at Smyrna and lived at Ephesus. He was excommunicated for his heresy, which Hippolytus connects with the pantheism of Heraclitus. Through his disciples, Epigonus and Cleomenes, the Roman bishops Zephyrinus (202–218 A. D.) and Callistus (218–223 A. D.) were carried over into the same heresy. (See Patripassians.)

R. D. Hitchcock.

Nogent-le-Rotrou', town of France, department of Eure-et-Loire, on the Huine, manufactures serges, candles, spirits, umbrellas, etc., and has 7105 inhabitants.

Noicatta'ro, town of Southern Italy, province of Bari delle Puglie, situated about 9 miles S. E. of Bari. The inhabitants are chiefly occupied in growing cotton. Pop. 7270.

Noko'mis, post-v. and tp. of Montgomery co., Ill., on the Indianapolis and St. Louis R. R., has 5 churches, 2 large flouring-mills, a national bank, 3 grain-elevators, 2 hotels, 1 newspaper, and stores. Principal business, farming and fruit-raising. Pop. of v. 893; of tp. 2738.

H. F. White, Ed. "Gazette."

Noko'mus, tp. of Buena Vista co., Ia. Pop. 278.

No'la, town of Southern Italy, province of Caserta, about 14 miles N. E. of Naples. The Castello Cicala and the ex-convent of the Capuchins on a hill above the town give it a picturesque aspect, but the interior has a desolate appearance. Of the sixteen churches, the old Italian Gothic cathedral is the only one of interest. This cathedral, built in great part of the marbles taken from an amphitheatre, contains some objects of artistic merit, and the Italian government has appropriated a considerable sum to rebuild the lofty tower, accidentally burned in 1860. Nola was one of the most ancient and renowned cities of Campania, being of older origin than Rome itself. The Samnites first conquered the Pelasgian settlers, were in turn driven out by the Romans, but recovered it during the Social wars, and the inhabitants burned it rather than yield to Sulla; Spartacus occupied it afterwards. In the time of Vespasian it was called *Augusta Felix*, and this was its most flourishing period. It was strongly walled, had twelve gates, magnificent temples, and two large amphitheatres, between which rose the temple of Augustus, said to have been erected on the site of the house in which that emperor died. In 1664 the Carafa and Orsini completed the destruction of the amphitheatres to build their own palaces, one at Nola, the other at Naples. Objects of Italo-Greek and Roman art, especially vases, are still disinterred in great numbers in and near this town. Pop. 11,395.

Nöl'deke (Theodor), b. at Harburg, Germany, Mar. 2, 1836; graduated at Göttingen 1861; devoted himself to Oriental and biblical studies, in which he soon achieved great prominence; was professor of the University of Kiel from 1864 to 1872, when he was engaged as one of the faculty of the new German university at Strasbourg, and has become known to English readers through frequent critical articles on Oriental subjects contributed to the London *Academy*. Author of numerous and important German works, among which are *History of the Koran* (1860), *Life of Mohammed* (1863), *Poetry of the Ancient Arabs* (1864), *Old Testament Literature* (1868), *Grammar of Modern Syriac* (1868), *Researches in the Criticism of the Old Testament* (1869), and *The Inscription of Mesha, King of Moab* (1870).

Nol'lekens (Joseph), R. A., b. in London, England, Aug. 11, 1737, son of a painter from Antwerp; became a pupil of the sculptor Schumaker; afterwards studied at Rome, where he remained ten years; was very successful in executing bas-reliefs, groups of figures, and busts; settled at London 1770; made busts of George III., Fox, Pitt, Warren Hastings, Johnson, Garrick, and the principal celebrities of the time, which were generally considered excellent likenesses; executed numerous commissions for public monuments and statues, as well as mythological groups; married a lady of rank, and accumulated a handsome fortune. D. at London Apr. 23, 1823.

Nol'le Pros'equi [Lat. "to be unwilling to prosecute"], a declaration or undertaking by the plaintiff or prosecuting officer in an action or prosecution at law that he will discontinue further proceedings in the cause against the defendant. It is entered upon the records of the court, and puts an end to the particular proceeding or litigation in the course of which it is introduced, but does not prevent a new suit or prosecution for the same cause at a subsequent time. It was formerly a common practice to enter a *nolle prosequi* both in civil and in criminal cases, but in civil actions other modes of effecting a discontinuance of the proceeding are now more generally adopted. In criminal prosecutions, however, the former practice still remains commonly in force. It usually lies in the discretion of the prosecuting officer to enter a *nol. pros.* (as the phrase is commonly abbreviated), but it is sometimes provided that he must obtain the leave of the court before such a course can be taken. The causes which most frequently induce such action are, that there is an insufficiency of evidence to procure the defendant's conviction, or that the testimony of one of several defendants who have been indicted is desired to be introduced against the others. Such a step might also be taken because, on account of the state of public opinion at a particular time, it was improbable that a jury could be obtained which would be likely to convict the prisoner, or because the trial would be detrimental to the public interests. The *nolle prosequi* does not operate as an acquittal, but only as an indefinite suspension of the proceedings, and the prosecution may be again instituted against the defendant when the prosecuting officer deems it desirable.

George Chase. Revised by T. W. Dwight.

Nom'bre de Di'os, town of the Mexican confederation, state of Durango, on the Rio del Tunal, in a fertile valley rich in cattle and maize. Pop. about 7000.

Nome'idæ [from *Nomeus*, the chief genus], a family of teleocephalous fishes related to the mackerels. The body is oblong, compressed, and covered with cycloid scales; the lateral line continuous and unarmed; the head compressed; the opercula unarmed; the nostrils double; the mouth with a lateral cleft, upper jaw scarcely protractile; teeth small and conical, on the palate as well as jaws; branchial apertures extensive; branchiostegal rays five or six; dorsal more or less divided, and with the spinous portion shorter than the soft. The skeleton has numerous vertebræ (in *Nomeus* 16 + 25); the stomach very numerous pyloric appendages. This family has been constituted for the reception of several genera, at one time referred to the Scombridæ—viz. *Nomeus*, *Gasterochisma*, *Cubiceps*, *Neptomenus*, and *Platystethus*. The species are all marine, and found in tropical or warm temperate seas. The last two are represented in the Australian and Polynesian waters.

Theodore Gill.

Nomenclat'ure, in Chemistry. The history and discussion of chemical nomenclature would be virtually the history of the science itself, and the utmost that space in

this case will justify is a brief glimpse of the systems at present in use, with some few critical observations upon their merits and demerits.

Although great numbers of new classes of compounds have required the invention of new names and new classes of names, more especially in the department of organic chemistry, yet there has been no really revolutionary change in chemical nomenclature since 1787, when the general principles of the present system were chiefly enounced—according to popular report by Lavoisier, but in reality by a coalition of French chemists, including Lavoisier, De Morveau, Berthollet, and Fourcroy, and among whom it appears doubtful whether Guyton de Morveau does not deserve the first mention, rather than Lavoisier. The inevitable division of compounds into the three great natural groups of *acids*, *bases*, and *salts*, and the distinction between different orders of oxides and acids of the same base by the terminations *-ous* and *-ic*, with the corresponding terminology of the salts of these two orders of acids in *-ite* and *-ate*, originated at that time, and still remain. The system of *prefixes* derived from Latin and Greek numerals, exemplified in the terms *protoxide*, *protochloride*, *deutoxide*, *bichloride*, *sesquioxide*, *perchloride*, was a very important improvement introduced in 1804 by Dr. Thomas Thomson; and is of such moment that the name of this chemist should certainly be placed next to those of De Morveau and Lavoisier as a useful inventor in this field.

A few further modifications of the original system have crept into use—whether *all* of them improvements or not may be well doubted. Thus, the application of the terminations *-ous* and *-ic* to cases of binary compounds of electro-negative elements other than oxygen—as, for example, *ferrous* and *ferric chlorides*, *mercurous* and *mercurous iodides*, and so on—is an innovation which is commendable from its great convenience in many cases. The extension of the termination *-ide*, first confined to binary compounds of oxygen and the halogen elements, also to the sulphur group, making the terms *sulphide*, *selenide*, *telluride*, does not seem objectionable; but when the same plan is extended to all binary compounds whatever, and we are forced to sanction a terminology which confounds together utterly dissimilar groups, with the terms *hydride* and *carbide*, *nitride*, *phosphide*, *arsenide*, *antimonide*, and *bismuthide*, remonstrance should certainly be made, and some attempt to return, at least for the triadic group, to the older and far preferable terms *nitruret*, *phosphuret*, *arseniet*, *antimoniet*, and *bismuthet*. Another probably useful recent innovation is the confinement of the term *acid* altogether to hydrogenated compounds; but this great improvement has been accompanied by the introduction, for the anhydrous oxygen acids, of the word *anhydride*, which certainly appears far from unobjectionable. If there must be an equivalent term, *anhydrate* would appear preferable—*anhydride* having no analogy to support it. Another innovation consists in disusing altogether, in naming salts, the familiar names of their basic oxides, as potash, lime, soda, and so on, and using the name of the metal; thus, sulphate of calcium for sulphate of lime, phosphate of sodium for phosphate of soda, and the like. The reasons assigned are attainment of uniformity with terms like sulphate of iron, phosphate of copper, etc., and the awkwardness that would arise from any attempt at such uniformity in the opposite way by using expressions like sulphate of protoxide of iron and phosphate of protoxide of copper. Most of these latter cases, however, are provided for simply by another very common innovation, which seems to be gaining ground greatly at the present day, and which is but an extension of the device before referred to of indicating the degree of saturation with chlorous elements in binary compounds by the terminations *-ous* and *-ic*. According to this, we now say "ferrous sulphate" and "cupric phosphate;" and the same plan may be extended with perfect uniformity to salts of potash, soda, lime, etc. Thus, we may say "calcic sulphate" and "sodic phosphate," and so on.

One more quite recent innovation has been made which seems of the highest value, and deserving, in a general way certainly, of the most unqualified commendation. This consists in the use of the Latin or Greek prefixes as applied to both the acidic and basic elements or constituents, not only of haloid compounds, but of oxygen salts and a number of other classes of compounds, the result often being quite compact and convenient names, which may be made to convey the maximum of information about the constitution of the compound in the fewest possible words. By this system we may have, for example, such cases as the following:

Mn_2O_3	Dimanganese trioxide.
Cl_2O_3	Dichlorine trioxide.
Pb_3O_4, minium	Tri-lead tetroxide.
Cb_2O_5	Dicolumbium pentoxide.
$POCl_3$	Phosphorus oxy-trichloride.
Si_2OCl_6	Disilicon oxy-hexachloride.
FeK_3Cy_6, red prussiate of potash	Iron tripotassium hexacyanide.
TiK_2F_6	Titanium dipotassium hexafluoride.
$2SO_3.H_2O$, Nordhausen acid	Disulphuric monohydrate.
$Co_2O_3.2H_2O$	Sesquicobaltic dihydrate.
$2Fe_2O_3.3H_2O$, limonite	Diferric trihydrate.
$3Na_2O.7WO_3$	Trisodic heptatungstate.
$4ZnO.SO_3.4H_2O$	Tetrahydrate of tetrazincic monosulphate.
$(NH_4)_2O.2H_2O.P_2O_5$	Ammonium dihydrogen phosphate.
$3Al_2O_3.2P_2O_5.12H_2O$, wavellite	Dodecahydrate of trialuminic diphosphate
$3MgO.2SiO_2.2H_2O$, serpentine	Dihydrated trimagnesic disilicate.
$2ZnO.SiO_2.H_2O$, calamine	Monohydrated dizincic silicate.

Nomenclature in Organic Chemistry.—This is a branch of science which is constantly expanding and changing, and hence an account given of the modes of nomenclature at present in vogue might a few years hence be altogether out of date. Especially may it be asserted that the system of nomenclature founded upon the so-called compound hydrocarbon radicals, *methyl*, *ethyl*, *propyl*, *butyl*, *amyl*, and the rest, which but a few years since was regarded as definitely established for all time, is now fast becoming obsolete, and will soon fade out of memory almost altogether. It is even now a question whether it would not be best in the naming of the series of common alcohols, for example, to drop the common names *methylic*, *ethylic*, *propylic*, *butylic*, and *amylic*, and substitute terms derived from the Greek numerals, and based upon the number of carbon equivalents, such as *monohol*, *deutohol*, *tritohol*, *tetrohol*, *pentohol*, *octohol*, etc. In the mean time, it is quite advisable and unobjectionable to designate every such series by the unmistakable terms *one-carbon alcohol*, *two-carbon alcohol*, *three-carbon alcohol*, and so on. In the case of the ethers, of the fatty series, we may also call methylic ether *two-carbon ether*, common ether *four-carbon ether*, and so on. In every homologous series (see HOMOLOGY) the same general plan is admissible, and has already been adopted in many cases, as in the case of the paraffines or marsh-gas homologues, where all except the three lower members, *marsh-gas* itself, *ethane* and *propane*, have received names based upon the Latin numerals for the carbon equivalents, as *quartane*, *quintane*, *sextane*, and so on; and no reason exists why the first three should not be designated likewise, particularly if the *Greek* numerals were used instead of the Latin, as being much better adapted to this use. The tabulation of hydrocarbons given now in many of the textbooks from Hoffmann, in which the vertical columns are series of homologues and the horizontal lines series of isologues, and which he proposed to make the basis of a system of nomenclature in organic chemistry, if translated from Hoffmann's Latin into more euphonious Greek names, would be—

Monane (marsh-gas). CH_4	Monene. CH_2				
Deutane. C_2H_6	Deutene. C_2H_4	Deutine. C_2H_2			
Tritane. C_3H_8	Tritene. C_3H_6	Tritine. C_3H_4	Tritone C_3H_2		
Tetrane. C_4H_{10}	Tetrene. C_4H_8	Tetrine. C_4H_6	Tetrone. C_4H_4	Tetrune. C_4H_2	
Pentane. C_5H_{12}	Pentene. C_5H_{10}	Pentine. C_5H_8	Pentone. C_5H_6	Pentune. C_5H_4	C_5H_2
Hexane. C_6H_{14}	Hexene. C_6H_{12}	Hexine. C_6H_{10}	Hexone. C_6H_8	Hexune. C_6H_6	C_6H_4

Hoffmann's plan of nomenclature assumed all these hydrocarbons as compound radicals, each one constituting the basis of great numbers of series of compounds, according to the other elements or groups of elements associated with it. To follow the subject would require too much space.

Many other systems of nomenclature of narrower scope have been proposed, one of the most curious of which is that of Kolbe for the alcohols, which is founded partly upon the old compound radical theory, and considers wood-spirit, which Kolbe calls "carbinol," to be marsh-gas, in which the hypothetical radical hydroxyle (HO) has replaced one atom of hydrogen. Common or ethylic alcohol then becomes "methyle-carbinol," or a product of a second replacement of another hydrogen-atom by methyle. Therefore, *ethylic* alcohol by this view contains no ethyle, but does contain methyle. There would be no advantage, in the opinion of the writer, in occupying space further in this work in explaining the present methods of nomenclature in organic chemistry, which are confessedly founded on generalizations of a fragmentary nature, and which must soon, in the natural advancement of the science, be displaced by some system founded upon a nearer and more

comprehensive view of the true molecular constitution of carbon and hydrogen compounds. HENRY WURTZ.

Nom'inalists, those Schoolmen who held the doctrine that universals (general notions, such as those of man, animal) have no real existences corresponding to them, but are mere names or words (*flatus vocis*). Nominalism is distinguished from CONCEPTUALISM (which see), the doctrine which holds that universals are not mere words, but have a subjective existence as ideas in the mind. Both agree in denying objective, independent existence to them (universals), and in this respect they stand opposed to REALISM (which see), the doctrine which attributes to them (universals) the only real being, and makes particular individuals (things) to be derivative and dependent (upon universals —*i. e.* processes, forces). The chief Nominalists were Roscellinus and William of Occam. In modern times their doctrine has been adopted by Thomas Hobbes and John Stuart Mill. Abelard was a Conceptualist or moderate Nominalist, and in this class we are to place John Locke, Thomas Reid, Dugald Stewart, Dr. Thomas Brown, Sir William Hamilton, and other modern psychologists. (For the origin and significance of the scholastic disputes regarding Nominalism and Realism see PHILOSOPHY, HISTORY OF.) WILLIAM T. HARRIS.

Nomina'tion, the technical term for an incomplete act of designation to office, the ratification of which depends upon another person or body of persons. The President of the U. S. *nominates* to the Senate the incumbents of high Federal offices, and makes out the *appointment* only after approval. The head of an executive department *nominates* to the President those whom he desires as his subordinates, and a national, State, county, or town convention of a political party *nominates* its candidates for office in anticipation of the elections.

Nonan'tola, town of Italy, province of Modena, about 6 miles N. E. of the city of Modena. This town, now one of the richest in the province, lies in what was a low marsh until the beginning of the ninth century, when an abbey was erected here, which, favored by princes, soon became one of the most renowned of the age. (See TIRABOSCHI.) From 1441 it belonged to the house of Este. Pop. 5696.

Non-commis'sioned Of'ficers are soldiers inferior in rank to the commissioned officers. In the navy they are called warrant officers. The regimental staff is attended by a sergeant-major, quartermaster-sergeant, and hospital steward. The general staff has ordnance sergeants. The company has one first sergeant, four sergeants, and eight corporals.

Nonconform'ists, or **Dissent'ers,** a name applied to those not connected with the Church of England. It is said that there are between thirty and forty denominations in England. The larger and more important may be traced back to the Presbyterians, Brownists, Anabaptists, and Romanists of the sixteenth century, or to the Methodists, who arose a little more than 100 years ago. The Presbyterians were the descendants or disciples of the Protestants who fled to the Continent in the reign of Mary, and returned in that of Elizabeth imbued with the teachings which they had learned in Holland or Geneva. They did not, however, separate from the Church until 1661, but for several generations tried to establish within it the form of government which had been set up by Calvin in Geneva and Knox in Scotland. They were so far successful that Presbyterianism actually became the established religion for a short time under the Commonwealth. The Brownists (afterwards called Independents or Congregationalists) derived their name from their founder, Robert Brown, rector of a church in Northamptonshire. Their doctrine was much the same as that of the Presbyterians, but they differed in their idea of church government. Their leading tenet was the independence of every congregation. They formed a large sect in the time of Queen Elizabeth. During the civil war the Presbyterians and Independents had filled many of the parishes, in many cases dislodging the regular incumbents. After the restoration of Charles II. attempts were made to include, or, in the language of the times, to "comprehend," them within the Church. These attempts failing, about 2000 of their ministers were ejected or withdrew in 1662 from the livings which they held, and the connection of these bodies with the Church was finally terminated. The Independents are now a large body, including, it is said, about 750,000 of the population. They are also extremely numerous in New England, where, however, like the English and Swiss Presbyterians, many of them are adopting Unitarian doctrines. The Anabaptists had their origin in Germany about 1523, and were first found in England in the beginning of the next century. They derived their name from their practice of rebaptizing those who had been baptized in infancy. They have broken up into numerous sects, of which the largest, the "Calvinistic Baptists," have about 2000 meeting-houses in England, and the rest about half as many more. The Romanists, or Roman Catholics, separated from the Church of England in 1570. Their principles are much the same as those of the Church of England before its reformation, except that they prefer submission to a foreign pontiff to communion with the ancient Church of their country. The Quakers, or Friends, were founded by George Fox about 1644. He was himself an uneducated man, but full of zeal and energy. His "Society" soon fell under the guidance of such men as William Penn and Barclay of Urie, who gave it a temporary prominence. Its aim was to develop the spirituality of the Church; the means which it employed were the abandonment of all external ritual. A society so constituted might gain an immediate but hardly an extended influence, and though a respectable it never became a very numerous body. The Wesleyans, or Methodists, had their origin in an attempt of John and Charles Wesley to induce a better observance of religious duty within the Church. During the lifetime of their more celebrated leader, John Wesley, they continued in the communion of the Church, though they had "meeting-houses" for prayer and preaching. After his death they formed a separate denomination, which has broken up into many fragments. The theology of the original, or "Wesleyan Methodists," nearly approaches that of the Low Church school, except that the former reject the Calvinistic doctrine of predestination. Besides these historical denominations, there are in England many minor sects, such as Irvingites, Swedenborgians, Moravians, and some ancient foreign congregations of French Huguenots and others. The stringent penal laws by which (from a real or imaginary political necessity) the Nonconformists were formerly restrained have been one by one repealed, and they are now in the full enjoyment of civil and religious liberty. The number of dissenters in England, including all who do not belong to the Established Church, is probably a little less than 10,000,000. B. R. BETTS.

Nonju'rors, those members of the Church of England who refused to take the oath of allegiance to William and Mary. When it was tendered to Sancroft, archbishop of Canterbury, he, with several of the bishops and about 400 priests, declined to take it, upon the ground that they were already bound by their oath of allegiance to King James II. In consequence of their refusal they were deprived by act of Parliament in 1691 of their ecclesiastical preferments. The deprived bishops were Sancroft, Turner, Frampton, White, Ken, and Lloyd. Many of the laity, regarding the deprivations as unlawful, adhered to these prelates and formed a religious communion, which they called the faithful remnant of the Church of England. The earlier Nonjurors were not Jacobites. On the contrary, many of them had opposed the violent measures of King James, and most of them were disposed to submit peaceably to the new settlement of the succession. They were willing to live as orderly citizens, but not to bind themselves by new oaths during the life of King James, nor to recognize the claims of Parliament to deprive bishops of their sees. Some of the chief men in the kingdom in influence and learning were among the Nonjurors. The motives of the first Nonjurors appear to have been strictly religious; those of their successors were political. After the death of James II. and of Lloyd and Ken, the last of the deprived bishops, many of them returned to the Established Church, while the rest, looking forward to the possible restoration of the exiled royal family, determined to keep up an episcopal succession. Dissensions, however, arose among them, and they were divided into two communions. Gordon, the last bishop of the original line, died in 1779, and Boothe, the last bishop of the Nonjurors of the Separation, in 1805. Nonjuring congregations continued to exist a little longer; and it is said that a nonjuring clergyman was living as lately as 1815. The regular body adhered strictly to the doctrine and discipline of the Church of England, but the separation introduced many changes. A book of *Devotions for Primitive Catholicks*, compiled by Dr. William Deacon, one of their bishops, was used for some time in the congregations of the latter body. It differs widely from the Book of Common Prayer. The Nonjurors, being to a great extent cut off from active life, devoted themselves to literature. The celebrated historian, Collier, was one of their bishops. Leslie, the controversialist, and Robert Nelson, the well-known commentator on the feasts and fasts, belonged to their communion. Among the more celebrated of their writings were Deacon's *Devotions*, already mentioned, a treatise on the *Intermediate State*, by Archibald Campbell, a Scottish bishop resident in London, and a learned and elaborate folio called *The Hereditary Right of the Crown of England*. This is believed to have been written by Harbin, a nonjuring clergyman, during the reign of Queen

Anne, at a time when the restoration of the Stuarts was thought to be possible. Hilkiah Beaford, however, another nonjuror, assumed the responsibility of it, and was fined and imprisoned for publishing a seditious libel. A history of the Nonjurors was published in 1845 by the Rev. Thomas Lathbury. B. R. BETTS.

Non'nus, a Greek poet of the fifth century after Christ, b. at Panopolis in Egypt. The details of his life are unknown, but two of his works are still extant—namely, a huge epic, Διονυσιακά, in 48 books, edited by Graefe (Leipsic, 1819–26, 2 vols.), and by Köchly (Leipsic, 1859), and a transcription of St. John in Greek hexameters, edited by Passow (Leipsic, 1834), and by Marcellus (Paris, 1861).

Non-Residence. See CITIZEN.

Non'suit. A "judgment of nonsuit" in law is a judgment allowing or compelling the plaintiff to discontinue or abandon the further prosecution of the action which he has instituted, and is granted generally on the ground of a default or insufficiency of evidence to maintain his case. A form of judgment having the same effect is also granted at common law when the plaintiff neglects to proceed with the trial of the cause after issue has been joined; this is called a "judgment as in case of nonsuit." A nonsuit may be either voluntary or involuntary. It is voluntary when the plaintiff at his own election and by his own act causes a discontinuance or dismissal of the action; it is involuntary or compulsory when the dismissal is ordered by the court in the exercise of an independent discretion or upon motion of the defendant. When the plaintiff finds that his evidence is insufficient to support the action, he may elect to be nonsuited, in order that he may not be deprived, by reason of the rendition of a verdict, of the power of suing the defendant upon the same cause of action when better evidence is procurable; for a nonsuit, being merely a default, is no bar to another action on the same ground. The plaintiff may submit to a nonsuit by failing to appear for the trial of the cause or by absenting himself when the verdict of the jury is about to be rendered. As the judgment of nonsuit in such a case is the result of his voluntary act, he cannot appeal on this ground and obtain a reversal of the judgment. According to the English practice until recently, a compulsory nonsuit, on the ground of the insufficiency of the evidence, could not be ordered by the court against the plaintiff, but he might insist that the case should go to the jury, and thus run the risk of securing a verdict in his favor. It was usual, however, for the plaintiff in such a case to submit to a nonsuit, with leave to make a motion to the full court to set the judgment aside. But by a late statute it is provided that "the court or a judge may before, or at, or after the hearing or trial, upon such terms as to costs, and as to any other action, and otherwise, as may seem fit, order the action to be discontinued, and that if the plaintiff does not appear when the action is called for trial, the defendant shall be entitled to judgment dismissing the action." It is also provided that any judgment of nonsuit, unless the court otherwise directs, shall have the same effect as a judgment upon the merits for the defendant, except in cases of mistake, surprise, or accident, when it may be set aside. (*Supreme Court of Judicature Act,* amended 38 and 39 Vict. ch. 77, 1875.) The former English practice still prevails in the U. S. courts of this country and in several of the States, and no nonsuit can be ordered without the consent of the plaintiff. But in other States the plaintiff can be compelled to be nonsuited if the evidence offered by him appears to the court clearly insufficient to maintain his action. Thus, in New York it is held to be the duty of the court to direct a nonsuit if the evidence will not authorize the jury to find a verdict for the plaintiff, or if the court would set it aside, if so found, as contrary to evidence. If such a judgment be improperly granted, the plaintiff may move to have it set aside. In case of a nonsuit the plaintiff pays the defendant's costs. In New York and in those States which have adopted its code of civil procedure a nonsuit is also called a "dismissal of the complaint."

GEORGE CHASE. REVISED BY T. W. DWIGHT.

Non'yl (C_9H_{19}), improperly called Pelargonyl, which is properly $C_9H_{17}O$, an acid radical. Nonyl is the ninth term of the series of alcohol radicals (C_nH_{2n-1}). It has not yet been isolated. Hydride of nonyl (C_9H_{20}) is one of the constituents of petroleum; it boils between (134°–137°C.). C. F. CHANDLER.

Nonylene (C_9H_{18}), **Pelargonene,** or **Elaene,** the ninth term of the olefines. It is found, with hydride of nonyl, among the products of the destructive distillation of amylic alcohol with chloride of zinc. It is a colorless liquid, lighter than water. C. F. CHANDLER.

Noor-ed-Deen' Mahmood, or **Malek al Adel,** b. at Damascus Feb. 21, 1116; succeeded in 1145 his father, who had established an independent Mohammedan empire in Northern Syria. Noor-ed-Deen defeated Count Joscelin of Edessa, then Louis VII. of France, who commanded in the second crusade, then the princes of Tripolis and Antioch, and after ten years' war against the Christians he was in possession of the whole of Syria. Although defeated in 1159 by Baldwin III., king of Jerusalem, near the Lake of Gennesareth, he soon resumed the offensive, and invaded Palestine again. His attention was averted, however, from Palestine to Egypt, where internal dissensions offered him a good opportunity; and before his death, which took place at Damascus May 15, 1174, Egypt was conquered by his general, Saladin. Noor-ed-Deen was a man not only of great talent, but also of noble character, and he was as much admired by his Christian adversaries as he was loved by his Moslem subjects.

Noot'ka Dog, a large dog found among the Indians of Vancouver's Island, British Columbia. Its long woolly hair is spun and woven into cloth by the natives, and the introduction of the breed for industrial purposes into other countries has been proposed.

Nootkas, or **Ahts,** a family of Indian tribes inhabiting Vancouver Island and the shores of the sound of the same name, embracing the Ahts proper, who live on the W. side of the island and number 3500; the equally numerous Quakewlth, subdivided into many tribes, living on both sides of the island and on the mainland; and the Cowichans, on the E. of the island, numbering 7000. The latter have been partially civilized by both Protestant and Roman Catholic missions.

No'ra, post-v. and tp. of Jo Daviess co., Ill., on the Illinois Central R. R. Pop. 1046.

Nora, tp. of Pope co., Minn. Pop. 99.

Nora Springs, post-v. of Floyd co., Ia., on the Chicago Milwaukee and St. Paul R. R., has 1 flouring-mill, ample water-power, 2 newspapers, and stores. Pop. about 1000. ED. "FLOYD CO. PRESS."

Nor'borne, post-v. of Sugartree Bottom tp., Carroll co., Mo., on the St. Louis Kansas City and Northern R. R. Pop. 148.

Nor'cia [anc. *Nursia*], a walled town of Italy, province of Perugia, situated in a highly-cultivated region about 28 miles from Spoleto. The inhabitants, owing to the abundance of oaks in the vicinity, give themselves mostly to the raising of swine, and in the provinces of Rome and Tuscany a swineherd is often called a *Norcian.* This town is also famous for the size and quality of the truffles grown here, some weighing as much as two pounds apiece. The Nursians were allies of the Sabines, but in the times of Scipio and Augustus they were reckoned among the bravest of the Roman soldiers. This town belonged for a while to the duchy of Spoleto, but in 1100 it declared itself a republic, and for centuries maintained its independence, though in the end forced to submit to Rome. Norcia was the birthplace of the wives of several of the emperors and of many other distinguished Romans. Pop. 8687.

Nor'cross, post-v. of Gwinnett co., Ga., 20 miles N. E. of Atlanta, on the Atlanta and Richmond Air-line R. R., has a high school, 1 church, 1 newspaper, a furniture-factory, a good hotel, and stores. Principal business, farming and merchandising. Pop. about 600.

JAMES U. VINCENT, ED. "ADVANCE."

Nord, the most northerly department of France, bounded N. E. by Belgium and N. W. by the Straits of Dover. Area, 2170 square miles. Pop. 1,447,764. The ground is generally low and the surface flat, with the exception of the south-eastern part, where some hills and low mountains occur which are rich in coal and iron. The soil is fertile and excellently cultivated, yielding large crops of wheat, hemp, flax, beet-root, tobacco, and fruits. The Aa and the Scheldt, with their numerous tributaries, all navigable, pass through the country, which, moreover, is traversed by several canals. Manufacturing of linen, cambric, lace, beet-root-sugar, and iron is extensively carried on, and the inhabitants enjoy the reputation of being the most intelligent and industrious part of the French people.

Nor'den, town of Prussia, in Hanover, on a small inlet of the sea, has breweries, distilleries, boatbuilding slips, manufactures of yarn and tobacco, and trade in horses and cattle. Pop. 6199.

Nor'denskjöld (ADOLF ERIK), b. at Helsingfors, Finland, Nov. 18, 1832; was appointed superintendent of the mineralogical museum of Stockholm in 1858; accompanied Torell on his Arctic expeditions in 1859 and 1861; led similar expeditions himself in 1864, 1868, and 1872, and made a scientific journey to Greenland in 1870. The results of his researches he communicated in a number of geographical and mineralogical monographs, and more especially in his *Redogörelse for en Expedition till Grönland* (Stockholm, 1871).

Nord′hausen, town of Prussia, province of Saxony, at the foot of the Harz Mountains, on the Zorge. It has large distilleries, manufactures of wax, soap, linen, and leather, and an active trade. Pop. 21,273.

Nordhausen Sulphuric Acid. See SULPHURIC ACID.

Nord′hoff (CHARLES), b. at Erwitte, in Westphalia, Prussia, Aug. 31, 1830; brought to the U. S. at the age of four; at the age of fourteen went to sea, and was a sailor for nine years. Between 1861 and 1871 he was editorially connected with the New York *Evening Post*, and subsequently served as a correspondent of the New York *Tribune*. He has written and published *Man-of-War Life*, *The Merchant Vessel*, and *Whaling and Fishing* (Cincinnati, 1855–56), *Cape Cod's all along Shore*, a collection of stories (New York, 1868), *California for Health, Pleasure, and Residence* (New York, 1872), *Northern California, Oregon, and the Sandwich Islands* (New York, 1873), *The Communistic Societies of the United States* (New York, 1874), and *Politics for Young Americans* (1875). J. B. BISHOP.

Nörd′lingen, town of Bavaria, on the Eger, has a fine old church with many interesting paintings, several good educational institutions, manufactures of linen fabrics and carpets, and a lively trade in cattle, geese, and feathers. It was the scene of a great battle in the Thirty Years' war. Pop. 7081.

Nor′folk, county of England, bordering on the North Sea, and comprising an area of 2116 square miles, with a population of 438,511. The surface is level or slightly undulating; the soil consists mostly of a sandy loam, and is watered by the Ouse and the Yare. Barley is the chief agricultural product, and cattle and poultry, especially geese and turkeys, are extensively reared for the London market. Cap. Norwich.

Norfolk, a fertile and level county of Ontario, Canada, on Lake Erie. Area, 600 square miles. It has two ridings. Cap. Simcoe. Pop. 30,760.

Norfolk, county of E. Massachusetts. Area, 500 square miles. It extends S. W. from Massachusetts Bay to the State of Rhode Island. There is a small detached portion to the E. It is uneven, but well cultivated and fertile. Market-garden products, fruits, and milk are the agricultural staples. Cotton, woollen, and metallic goods, paper, boots and shoes, thread, straw goods, hosiery, building-stone, and many other articles are extensively manufactured. A part of the county has been set off to Suffolk county since the last census. The county is traversed by numerous railroads, and contains many country residences of persons doing business in Boston. Cap. Dedham. Pop. 89,443.

Norfolk, county of S. E. Virginia, bounded N. by Hampton Roads and S. by North Carolina. Area, 480 square miles. It has a light, productive soil. Corn, early garden products, and fruit for the Northern markets are extensively raised. The S. W. portion is occupied by a part of the Dismal Swamp. The county is traversed by several railroads and navigable streams. Cap. Norfolk. Pop. 46,702.

Norfolk, post-v. and tp. of Litchfield co., Conn., on the Connecticut Western R. R. Pop. 1641.

Norfolk, post-v. and tp. of Norfolk co., Mass., on the eastern division of the New York and New England R. R. Pop. 1081.

Norfolk, post-v. and tp., cap. Madison co., Neb. P. 593.

Norfolk, post-v. and tp. of St. Lawrence co., N. Y., on the Racket River. Pop. of v. 540; of tp. 2441.

Norfolk, city and cap. of Norfolk co., Va., on the Elizabeth River, an arm of Chesapeake Bay, about 18 miles from Fortress Monroe, has a fine harbor, safe, commodious, and of sufficient depth to admit the largest vessels. Before the war of 1812 it had some importance as a commercial port, both foreign and domestic traffic being carried on, and of late this industry has been to some extent revived. Two railroads, 2 canals, and several lines of steamers to different ports in the U. S. tend to make Norfolk a commercial city of no mean importance. It is the largest naval station in the U. S., it has an excellent free-school system, churches of all denominations, 4 daily, 3 tri-weekly, and 3 weekly newspapers, 2 national and 10 smaller banks, 2 theatres, several halls, a paid fire department with 3 steam-engines, which are only used in the suburbs, owing to the water-supply existing in the city, a well-organized police force, finely-paved streets, and a horse railway. Norfolk is not a manufacturing city, but her facilities for manufacturing are large and inviting. The climate is genial, and her health-list will compare favorably with that of any place S. of Mason and Dixon's line. Pop. 19,229.
JOHN R. HATHAWAY, ED. "DAY BOOK."

Norfolk, DUKES OF (1483), earls of Arundel (1139), of Surrey (1483), and of Norfolk (1644), a family of the English nobility which enjoys the distinction of hereditary earl-marshal, premier duke, and premier earl of England. The earldom of the East-Angles was conferred by Henry I. (1135) upon Hugh Bigod, who lost that title by rebellion against Stephen and Henry II., but was reconciled to the latter monarch and made earl of Norfolk 1167. His grandson, Roger, was made earl-marshal on the failure of the male line of the earls of Pembroke 1225, but both titles became extinct on the death of his nephew, of the same name, 1307. After having been held by Thomas of Brotherton, brother of Edward II. (1313–38), and by Thomas Mowbray (1386–1413), both titles were granted by Richard III., June 28, 1483, to JOHN HOWARD, lord admiral of England, France, and Aquitane, a distinguished statesman and military leader, who was killed at the battle of Bosworth Field, Aug. 22, 1485, and attainted shortly afterwards.—His son, THOMAS HOWARD, who had been ennobled (as earl of Surrey) at the same time as his father, whose attainder he also shared, was restored to his original title 1488; distinguished himself in war and diplomacy; was made earl-marshal 1510, and second duke of Norfolk Feb. 1, 1514, as a reward for having gained the battle of Flodden Field, and d. at Framlingham May 21, 1524.—His son, THOMAS HOWARD, third duke, in many respects the most noted member of the family, b. about 1474, took a very prominent part in public affairs; repeatedly commanded armies of invasion against Scotland; presided over the court which sentenced Queen Anne Boleyn to death, May 19, 1536; suppressed the rebellion known as the "Pilgrimage of Grace" 1537; was thrown into the Tower Dec., 1546, sentenced to death and attainted Jan. 27, 1547, but escaped through the opportune death of Henry VIII. on the following day; had his title restored by Queen Mary, and d. Aug. 25, 1554. The cause of his fall might doubtless be traced to the previous misconduct and disgraceful death of his niece, Catharine Howard, third queen of Henry. —His brother, Lord EDWARD HOWARD, had been lord high admiral of England, and was killed in an attempt to destroy the French fleet 1513; while his eldest son, HENRY HOWARD, celebrated as a poet under the title of earl of Surrey, aspired to the hand of the Princess Mary, and was beheaded on Tower Hill Jan. 19, 1547.—Surrey's son, THOMAS HOWARD, b. about 1536, became fourth duke; intrigued for the hand of Mary, queen of Scots, and was beheaded at London June 2, 1572.—His grandson, THOMAS HOWARD, b. 1592, was restored in blood by act of Parliament as earl of Arundel and of Surrey 1603; was distinguished in the service of Charles I.; was restored to the earldom of Norfolk 1644, and is known to history under the title of Arundel, through the great collection of Grecian marbles made in his name. The title of duke was restored to his son, and is now enjoyed by HENRY HOWARD, the fifteenth duke, b. 1847, who, like his ancestors, is a Roman Catholic. PORTER C. BLISS.

Norfolk Island, an island in the Pacific Ocean, in lat. 29° 10′ S. and lon. 167° 58′ E., 5 miles long and $2\frac{1}{2}$ miles broad. It belongs to Great Britain, and was used for a penal establishment from 1825 to 1855.

Nor′icum, province of the Roman empire, extending between the Danube and the Save, and bounded E. by Pannonia and W. by Vindelicia and Rhætia. It corresponded nearly to the modern provinces of Upper and Lower Austria and Styria. It was conquered under Augustus, at which time it contained only one large city, Noreia (*Neumarkt*). The Romans formed several prosperous colonies, of which the most remarkable were Juvavia (*Salzburg*), Lentia (*Lintz*), and Lauriacum (*Lorch*). It was afterwards divided into two provinces.

No′rium, a metal which was supposed to have been identified as peculiar by the chemist Svanberg, who found it in zircons. Another chemist, Berlin, has denied Svanberg's conclusions, and the controversy which has arisen cannot yet be regarded as settled, the existence of norium remaining therefore a matter of uncertainty.

Nor′mal [Lat. *norma*], in mathematics. A normal to a plane curve is a straight line in that plane perpendicular to a tangent at the point of contact. The equation of the normal is

$$y - y' = -\frac{dx'}{dy'}(x - x'),$$

in which y' and x' are the co-ordinates of the point of contact or point of *normalcy*. When the length of a normal is spoken of, we generally mean the distance from the point of normalcy to the point in which the normal cuts the axis of x. In this case the formula for the length is

$$N = y'\sqrt{1 + p'^2},$$

in which y' is the ordinate of the point of contact, and p' the corresponding value of the first differential coefficient of the ordinate. The distance from the point of contact to the centre of the corresponding osculatory circle is sometimes taken as the length of the normal, in which case this length is given by the formula

$$N = \frac{(1 + p'^2)^{\frac{3}{2}}}{p''},$$

p' having the same signification as before, and p'' being the corresponding value of the second differential coefficient of the ordinate.

A normal to a curve of double curvature is a straight line lying in the osculatory plane and perpendicular to the tangent at the point of contact. In this case the length of the normal is the same as the length of the radius of the osculatory circle to the curve at the point of contact. A plane is said to be normal to a curve at any point when it is perpendicular to the tangent at that point. A normal line to a surface is a straight line perpendicular to a tangent plane to the surface at the point of contact. Any plane through a normal line to a surface is a *normal plane*.

W. G. PECK.

Normal, post-v. and tp. of McLean co., Ill., at the junction of the Chicago Alton and St. Louis and the Illinois Central R. Rs., 2 miles N. of Bloomington, is the seat of the State Normal University and the Soldiers' Orphans' Home, and has, besides several excellent schools, a street railway to Bloomington, and stores. Pop. of v. 1116; of tp. 3156. AARON GOVE, ED. "SCHOOLMASTER."

Normal School [Lat. *normalis*, from *norma*, "rule," "pattern"], an institution for the training of teachers, a teachers' seminary; originally, a pattern or model school, an elementary institution in which the best methods of instruction and discipline were practised, and to which candidates for the office of teacher resorted for the purpose of learning by *observation* the most approved modes of conducting the education of children and youth. Such were the schools of Neander, established at Ilefeld, Germany, about the year 1570, as also those of the Abbé de La Salle, canon of the cathedral at Rheims, France, in 1681. These schools, with numerous others of a similar character successively established prior to the eighteenth century, were not simply institutions for the education of children, but were so conducted as to test and exemplify principles and methods of instruction, which were perpetuated and disseminated by means of books in which they were embodied, or of pupils and disciples who transplanted them to other places. They served the purpose of preparing the way for the more complete and efficient institutions of the same designation at a later day.

According to the present acceptation of the term "normal school," as used in many European countries, it denotes an establishment composed of young men or women who have passed through an elementary or even superior school, and who are preparing to be teachers by making additional attainments and acquiring a knowledge of the human mind, of the principles of education as a science, and its methods as an art. The normal schools of the present day generally include the model or pattern school of earlier times. They thus combine theory with practice, these "model," "experimental," or "practice" schools, as they are variously called, being established in connection with them in order to test practically the professional character of their students and the modes of instruction inculcated.

The normal schools of the U. S. usually comprehend—*first*, the model or pattern school of the former period; *secondly*, the professional characteristics of the European establishments of the present day, so far as circumstances will permit; and, *thirdly*, the academical features of the ordinary school. They are compelled, by reason of the superficial instruction imparted in too many of the elementary schools, to assume, to a considerable extent, the work of the latter. They are forced to exhaust much of their strength in imparting a knowledge of subjects which should be thoroughly mastered elsewhere. In the Prussian normal schools a high standard of literary qualifications is required of a candidate as a condition of admission. In most cases the examinations for admission are practically competitive, since the schools are small, the applicants numerous, and the number received rarely exceeding seventy. Nor is this all. Preparatory schools exist in which not only is the requisite amount and quality of scholarship imparted to the student, but his peculiar adaptation to the calling of a teacher is thoroughly tested before he is permitted to become a candidate for the teachers' seminary. These advantages enable the normal schools of that country to give a much stronger professional cast to their training, and to dwell more extensively upon the science of education and the art of teaching which constitute their special field of labor. The embarrassments which the American normal schools at present experience will, however, eventually disappear. By elevating the standard of instruction in the lower schools they are gradually correcting the evils arising from the deficient preparation of their students. They are rapidly increasing also, and are introducing better methods of teaching into the public schools of the country, while the latter are reciprocating by sending to the normal schools candidates with superior attainments and more elevated aims.

The teachers' seminary founded by the Abbé de La Salle at Rheims was afterwards, in 1684, placed in charge of a benevolent organization known as the "Brothers of the Christian Schools." In 1697, Augustus Herman Franke, a German philanthropist, established, in connection with his orphan school at Halle in Hanover, a teachers' class, composed of pupils who assisted him at stated times, and twelve of whom, in 1704, he constituted his *Seminarium Preceptorium* or "teachers' seminary." This was the first German normal school. After being trained for two years in the principles and practice of teaching, these twelve pupils, with their successors in the seminary, went forth as missionaries of the new gospel of education, until the leading minds of all the German states were at length thoroughly aroused to the importance of the work thus feebly begun. In 1735 a seminary for teachers was established on a more liberal scale at Stettin in Pomerania, and in 1748 still another at Berlin by Frederick the Great, who by 1752 had become so deeply impressed with the importance of such institutions that by a royal decree of that date he directed that thenceforth all vacancies occurring in the schools established on the crown-lands should be filled by teachers selected from the pupils of this seminary. He also provided an annual stipend for twelve of the most worthy graduates to aid in their support until employed as teachers in the school. This institution, ably managed by Hecker, a former pupil of Franke, did a great work in the infancy of the normal-school movement, and by its success, with that of its predecessors, contributed to the eventual establishment of others of the same class, not only in Germany, but in other countries, Austria following in 1767, Switzerland in 1805, France in 1808, Holland in 1816, the U. S. in 1839, England in 1840, Belgium in 1843, Canada in 1846, and the Argentine Confederation, South America, during the year 1871.

The subjoined statement exhibits the number now in existence in the several countries named, according to the most reliable data at present attainable: Prussia and the German states, 116; Austria, 11; Switzerland, 31; France, 141; Holland, 2; Denmark, 8; Sweden, 5; Russia, 1; Italy, 53; Spain, 32; Greece, 1; England and Wales, 23; Scotland, 2; Ireland, 1; Dominion of Canada, 6; Argentine Confederation, 2; total in foreign countries, 435.

The following table gives, chronologically, the location and number of State, county, and city normal schools in each of the U. S., so far as they have been established therein, with the date of their organization, the current annual appropriations for their support, the *per capita* cost of each pupil for 1872, and the presiding officer of each institution, so far as the facts can be reliably ascertained. In this table the letter *S.* indicates State, *C.*, city, and *Co.*, county normal schools:

Location.	Date of organization.	Amount appropriated.	Per capita cost.	Presiding officers, 1874.
Massachusetts:				
Framingham.....*S.*	1839	$10,000	$102	Annie E. Johnson.
Westfield ....*S.*	1839	12,648	89	J. W. Dickinson, A. M.
Bridgewater.......*S.*	1840	12,500	80	A. G. Boyden, A. M.
Salem ....*S.*	1854	10,894	68	D. B. Hagar, Ph. D.
Worcester.........*C.*	1868	1,200	......	E. H. Russell.
Boston ....*C.*	......	....	......	Larkin Dunton.
New York:				
Albany ....*S.*	1844	18,000	......	J. Alden, D. D., LL.D.
Oswego.............*S.*	1861	18,000	69	E. A. Sheldon, A. M.
Brockport.........*S.*	1866	18,000	......	Charles McLane.
Buffalo...............*S.*	1867	18,000	110	H. B. Buckham, A. M.
Cortland ....*S.*	1869	18,000	64	J. H. Hoose, A. M.
Fredonia...........*S.*	1869	18,000	170	J.W. Armstrong, D. D.
Potsdam............*S.*	1869	18,000	......	M. McVicar, LL.D.
New York City..*C.*	1870	....	......	Thos. Hunter, A. M.
Geneseo............*S.*	1872	18,000	......	Wm. J. Milne, A. M.
Michigan:				
Ypsilanti..........*S.*	1847	20,000	80	J. Estabrook.
Connecticut:				
New Britain......*S.*	1860	12,000	90	Isaac N. Carlton, A. M.
New Jersey:				
Trenton............*S.*	1855	15,000	60	L. M. Johnson, A. M.
Beverly ....*S.*	1856	2,400	......	" " "
Iowa:				
Iowa City......*S. U.*	1855	....	......	S. N. Fellows, A. M.
Illinois:				
Normal.............*S.*	1857	28,795	68	R. Edwards, LL.D.
Englewood......*Co.*	1867	12,000	82	D. S. Wentworth.

Location.	Date of organization.	Amount appropriated.	Per capita cost.	Presiding officers, 1874.
Illinois:				
Peoria............*Co.*	1868	4,600	53	S. H. White.
Carbondale ....*S.*	1874	....	......	Robert Allyn.
Chicago............*C.*	1871	....	......	E. C. Delano.
Pennsylvania:				
Philadelphia.....*C.*	1848	....	......	George W. Fetter.
Millersville.......*S.*	1859	15,000	......	Edward Brooks, A. M.
Edenboro'.........*S.*	1861	....	......	J. A. Cooper.
West Chester.....*S.*	......	....	......	Geo. L. Maris, A. M.
Mansfield..........*S.*	1862	....	......	J. N. Fradenburg.
Kutztown..........*S.*	1866	900	......	A. R. Horne.
Lower Oxford...*S.*	1867	2,500	......	J. B. Randall.
Bloomsburg.......*S.*	1869	25,000	......	T. L. Griswold.
Shippensburg.....*S.*	1873	....	......	George P. Beard.
California:				
San José............*S.*	1861	17,000	......	Charles H. Allen.
San Francisco...*C.*	1869	....	......	Ellis H. Holmes.
Minnesota:				
Winona.............*S.*	1864	12,000	33	Wm. F. Phelps, A. M.
Mankato...........*S.*	1868	10,000	44	D. C. John.
St. Cloud...........*S.*	1869	10,000	76	D. L. Keile.
Maine:				
Farmington.......*S.*	1864	6,000	......	C. C. Rounds.
Castine ....*S.*	1867	5,000	......	G. T. Fletcher.
Maryland:				
Baltimore..........*S.*	1864	2,000		P. J. Doran.
Baltimore..........*S.*	1865	9,500	......	M. A. Newell.
Kansas:				
Emporia............*S.*	1865	11,000	67	C. R. Pomeroy, D. D.
Leavenworth......*S.*	1870	6,000	......	John Wherrell.
Wisconsin:				
Platteville ....*S.*	1866	12,240	98	E. A. Charlton.
Whitewater.......*S.*	1868	13,693	74	Oliver Arey, A. M.
Oshkosh ....*S.*	1871	15,910	100	George S. Albee.
River Falls.........*S.*	1875	....	......	W. D. Parker.
Indiana:				
Terre Haute.......*S.*	1867	10,000	63	W. A. Jones, A. M.
Vermont:				
Johnson.............*S.*	1867	1,000	......	H. S. Perrigo.
Randolph Cent...*S.*	1867	1,000	......	E. Conant.
Castleton............*S.*	1869	400	......	Edward J. Hyde.
Missouri:				
Kirkville............*S.*	1867	5,000	......	J. Baldwin.
Warrensburg.....*S.*	1871	5,000	......	J. Johonnot.
Cape Girardeau.*S.*	1874	....	......	L. H. Cheney.
St. Louis............*C.*	1857	15,000	......	Louis Soldan.
West Virginia:				
Fairmont ....*S.*	1867	3,500	......	J. G. Blair, LL.D.
Huntington.......*S.*	1868	....	......	A. D. Chesterman.
Harper's Ferry..*S.*	1868	5,500	......	N. C. Brackett.
West Liberty.....*S.*	1870	2,000	......	J. E. Morrow.
Ohio:				
Cincinnati ....*C.*	1869	6,000	......	Delia A. Lathrop.
Dayton..............*C.*	1870	....	......	Jane Blackwood.
Cleveland ....*C.*	1874	....	......	Alex. Forbes.
New Hampshire:				
Plymouth..........*S.*	1870	13,000	......	H. O. Ladd.
Mississippi:				
Holly Springs....*S.*	1870	5,000	......	Wm. B. Highgate.
Tougaloo............*S.*	1871	4,000	......	L. A. Darling.
Kentucky:				
Louisville..........*C.*	1871	9,000	......	Hiram Roberts.
Rhode Island:				
Providence.........*S.*	1871	12,000	71	J. C. Greenough.
South Carolina:				
Columbia ....*S.*	1874	20,000		M. A. Warren.

According to this table, there are 70 public normal schools in the U. S., to which add 435, the number in foreign countries, and we have a total of 505, so far as is known, that are supported wholly or in part at public expense. Besides the foregoing, there are not far from 40 private institutions bearing the name, most of which are in the Northern States. Perhaps a majority are "normal departments" rather than fully organized schools.

While in Prussia, Saxony, Switzerland, and some other European countries a further increase in the number of normal schools is scarcely demanded by the interests of elementary education, since those already established are quite competent to supply teachers for all the vacancies occurring in the schools of this grade, in the U. S., on the contrary, the movement must be regarded as but just in its infancy. Says Dr. Hoyt, U. S. commissioner to the Paris Universal Exposition of 1867, in his report to the secretary of state: "The movement is a progressive one, every day awakening fresh enthusiasm and gaining new strength. It is an essential part of the scheme of universal education, and is bound to go on until every State in the Union is provided with well-endowed, ably-officered, and thoroughly-managed normal schools, sufficient in number to educate all the teachers required for their numerous public schools."

The conditions of admission to our American normal schools do not greatly vary in the different States, and may be thus summarily stated: (1) The candidate to be not less than sixteen years of age; (2) to possess sound health and a good moral character; (3) to be able to pass a satisfactory examination in reading, spelling, writing, arithmetic, and the elements of English grammar; (4) to sign a declaration of intention to teach for a certain specified time, generally two years, in the common schools of the State. The courses of study are principally limited to the branches required to be taught in the public schools, together with a thorough theoretical and practical preparation for the special duties of the teacher. In some cases the classics and modern languages are admitted into the course. The best schools have provided an elementary (two years) and a higher course (two years), in order to meet the wants of the several grades of the public-school system. (Further information upon this important subject may be sought in the works of Henry Barnard, LL.D., entitled, *Education in Europe* and *Normal Schools*, or in the valuable report of Dr. J. W. Hoyt, U. S. commissioner to the Paris Universal Exposition.) William F. Phelps.

Nor'man, tp. of Grundy co., Ill. Pop. 417.

Norman, tp. of Dent co., Mo. Pop. 730.

Norman (Benjamin Moore), b. at Hudson, N. Y., Dec. 22, 1809; became a clerk in New York City, and a bookseller successively at Hudson, Philadelphia, and New Orleans; was noted for his philanthropy during the epidemic of yellow fever at New Orleans in 1841, at which time he lost his wife by that disease; travelled in Yucatan and Mexico; published *Rambles in Yucatan* (1842), *Rambles by Land and Water* (1845), and *New Orleans and its Environs* (1845); and d. near Summit, Miss., Feb. 1, 1860.

Norman (John Paxton), b. at Exeter, England, in 1819; graduated at Exeter College, Oxford, 1841; studied law at the Temple; was for several years a special pleader; called to the bar 1852; was joint editor of the annual *Exchequer Reports*, and author of valuable treatises on the *Law and Practice of the Copyright of Designs* (1851) and *Law and Practice relating to Letters-Patent for Inventions* (1853), the latter reprinted in Philadelphia; was appointed a judge of the high court of Bengal 1861; acted temporarily as chief-justice 1864, and again 1871, and was assassinated at the door of his court-room by a native Wahabee (Mohammedan) fanatic, Sept. 20, 1871.

Nor'manby (Constantine Henry **Phipps**), Marquis of, eldest son of Henry Phipps, first Earl Mulgrave, b. at Mulgrave Castle, Yorkshire, May 15, 1797; was educated at Harrow and Cambridge; entered Parliament 1818; was an advocate of Catholic emancipation and of Parliamentary reform; succeeded his father as Earl Mulgrave Apr., 1831; was governor of Jamaica 1832–33, where he carried into effect the recent legislation for the abolition of slavery, and succeeded in quietly suppressing a dangerous military revolt; became lord privy seal 1833, lord lieutenant of Ireland 1835–39; created marquis of Normanby June 25, 1838; was for a short time secretary of state for the colonies 1839; home secretary 1839–41; ambassador at Paris 1846–52; made a knight of the Garter 1851; was envoy to Florence 1854–58; became a privy councillor, and a constant opponent of the foreign policy of Lord Palmerston, and d. at Kensington July 28, 1863. He was author of some political pamphlets, of several youthful novels, *Clarinda*, *The Prophet of St. Paul's*, *Matilda*, *Yes and No*, and *Contrast*, and of *A Year of Revolution, from a Journal kept at Paris in the Year 1848* (1857), in which he severely criticised the French republic of 1848, and thereby elicited Louis Blanc's *Historical Revelations, inscribed to Lord Normanby* (1858).—His son, the present marquess, George Augustus Constantine Phipps, b. July 23, 1819, was lieutenant-governor of Nova Scotia 1858–63, and governor of the colony of Queensland, Australia, 1871–74.

Nor'mandy, an old province of France, bordering on the English Channel, and comprising an area of 10,534 square miles, is now divided into the departments of Seine-Inférieure, Eure, Orne, Calvados, and Manche. The ground is naturally fertile, and the inhabitants, who are descendants of the old Normans (which see), and who show evidence of their Scandinavian origin both in their features and in their characters, have made the land a garden, where rich crops of corn, hemp, fruits, and vegetables are gathered, besides having built up an important cattle-rearing, fishing, and manufacturing industry. When, in 1066, their duke, William II., conquered England, Normandy entered into a close political relation to that country, which continued, generally as a formal union, until, in 1204, Philip Augustus conquered the province and made it a part of France. After the battle of Agincourt, in 1415, the English once more held it, but only till 1449, when Charles VIII. finally united it to France.

Norman French is a dialect of old French which has exercised great influence upon English, and which became the Anglo-Norman of England. The Conquest dates from the year 1066, and the subsequent fusion of Norman with the existing Ænglisc (Anglish, Anglo-Saxon) has produced a language which deserves to become the universal

medium of communication in learning, literature, and commerce.* The presence of Norman opened the way to French and Latin, and there are now 5000 words common to French and English, most of which, under a slight disguise, are recognizable as Latin also; consequently, English has advantages over languages the vocabularies of which were not Latinized at the revival of learning. And yet there is an English scholar (W. Barnes, B. D.) who would turn the language back to a spurious and factitious antiquity by using words like "fore-note" ("note" being Latin) for *preface*, "outdrive" for *expel*, "clipping" for *consonant*, and "voicing" for the equally Latin *vowel* (where "clinker" was at hand in imitation of the Dutch), and he intimates that "talecraft" might be used for *arithmetic*, "swarthen" for *eclipse*, "raft" for *excite*, and "jenny" for *machine*, but no equivalents are offered for *mechanic*, *mechanism*, *machinist*, *machinery*, etc.

There is much in English for which literary French cannot account, and for which we must go to Norman. Here we have little or no nasality, and the Italian and Norman *tsh*, *dzh* (as in *chair*, *judge*) add an agreeable variety to French *ch*, *j* (*sh*, *zh*) of *chaise*, *juge*. In numerous cases the Anglish *c* (*cay*, with the single Latin power of *k*) fell into Norman *ch* (*tsh*); at a later period French *ch* (*sh*) came in, and as the Latin *cay*-sound continued to exist, English acquired the triple phonetism heard in *cavalry* with Latin *cay*, *chivalry* with Norman *tsh*, and *chevalier* with the French *sh*-sound; and in such cases the historic and proper difference of pronunciation shows that *chandler*, *champion*, *chivalry*, *chair* came into English much earlier than *chandelier*, *champaign*, *chevalier*, *chaise*.

The British sovereigns have had the custom of opening Parliament in a speech purporting to be Norman, and various sentences are used, as in giving assent to a bill of supply, when the words spoken are: "Le roy remercie ses bons subjects, accepte leur benevolence, et ainsi le veult." The title of a book of law-cases is given thus: *Le primer Report des Cases et Matters en Ley resolves et adjudges en les courts del Roy en Ireland, collect et digest per Sr. John Davys* (1628). It contains "Le case de mixt moneys," "Le course de Trial de legitimacy," etc. A good dictionary of the language is wanted. Kelham's (1779) is of little value, and Métivier's *Dictionnaire Franco-Normand* (London, 1870) is restricted to the living dialect of Guernsey.

S. S. HALDEMAN.

Normans. I. *The Northmen.*—Toward the end of the eighth century Western Europe began to be scourged by the inroads of Scandinavian pirates, known to the inhabitants of the British isles as "East-men" and "Danes"—to those of the Continent as "North-men." These Northmen were of Germanic stock, a vigorous, seafaring race, not yet christianized, peopling the coasts of the Baltic and of the two peninsulas which form the Norway and Sweden and the Denmark of to-day. Need and the national thirst for adventure and for strife drove forth from the thickening population down upon the sunnier, richer, weaker South swarms of Vikings—*i. e.* warriors—who scoured the coasts of England, Germany, and France, pressed with their small, sharp, open vessels up the narrowest streams, burned, slew, and plundered, and sailed away laden with booty and with slaves. About the middle of the ninth century these raids began to assume an altogether new character and importance. The consolidation of the three great Scandinavian kingdoms broke the power of the petty kinglets and independent nobles, and drove many a Jarl forth with his followers to seek a freer life in some new home. Northmen threw themselves in larger bands upon England, which the Wessex kings had not yet fairly centralized; upon the Frankish kingdoms, fast falling asunder under the later Karlings; harried the country, besieged and sacked the cities, wintered at the mouths of the rivers, and by the end of the century had wrested from Alfred half his kingdom, and had begun to plant colonies upon the coasts of France. Northmen ravaged Spain and the shores of the Mediterranean, fell upon Western Italy, penetrated Greece and Asia Minor, and there met others of their countrymen who had pressed down through Russia. For in the Russia of that day, under the name of Varangians, Northmen had become the ruling class, a military aristocracy; while those who made their way still farther S. had formed the famous Varangian body-guard of the Byzantine emperors, which maintained its existence and its distinctive character for five centuries. During the latter half of the ninth century, also, Scandinavians, sailing westward, found and settled Iceland, where the old free Germanic community-life held for nearly 400 years; whence Greenland was visited and colonized; whence, also, it seems, navigators made their way farther down the North American coast to a "Vinland" where settlements were attempted, and to a still more southerly "Hvitramanaland."

With the establishment, early in the tenth century, of settlements upon the Continent, with the occupation Scandinavian energy now found at home in wars between the three new kingdoms, and with the gradual triumph of Christianity in the North, Europe gained, at last, comparative rest. England's period of misery and humiliation under Ethelred the Unready (979–1016), ended by the establishment of a Danish dynasty (1017–42), marks the last great outburst of the pent-up heathenism.

II. *Normandy.*—Of all the settlements of the Northmen, one alone was destined to play a really important part in history. By the treaty of Claire-sur-Epte (912) Charles the Simple enfeoffed a Viking, Rolf or Rollo, with the lands upon either side of the Seine of which he and his followers were in actual possession, the new duke of the Northmen, in return, recognizing the Karolingian king as his overlord and receiving baptism. It seemed hardly possible but that this latest Teutonic settlement would prove a powerful diversion in favor of the waning authority of the Frankish kings of Laôn against the increasing influence of the French duchy of Paris, which had first risen to importance as a mark against the Northmen, and at whose expense the "Terra Northmannorum" was now created. Duke Rolf, indeed, remained loyal to his Karolingian lord, and, fighting in his cause, won for himself the Bessin. But William "Longsword" (927–943), who added to his domains the Cotentin, was largely French in feeling, and his allegiance to the Karlings was a wavering one. The third duke, Richard "the Fearless" (943–996), became the "man" of Hugh the Great of Paris, and, later, of his son "Capet," to whose establishment upon the throne he lent decisive aid. It was thus the settlement of these northern pirates, says Freeman, which finally made Gaul French in the modern sense. It was at the same time the alliance with Romanic France which brought the Northmen fully under the influence of French language, law, and custom, which made them "*Normans*," the foremost apostles alike of French chivalry and of Latin Christianity. Under Richard "the Good" (996–1026) Norman arms began to be borne beyond the borders of the Norman duchy. Robert of Toesny warred against the infidel in Spain; Rainulf began his career of conquest in Apulia. To the brothers Richard III. (1026–28) and Robert "the Devil" (1028–35) succeeded the "Bastard of Falaise," William the Conqueror. The duchy of Normandy—which before his conquest of England (1066) he had widened by the winning of Maine (1063)—he left at his death (1087) to his first-born Robert, from whom it was wrested (1106) by his brother, Henry I. of England, and held thenceforth by the English kings until its seizure by the French crown in 1203.

III. *The Normans in the Sicilies.*—The Sicilies at the beginning of the eleventh century were divided and disputed between Longobards, Greeks, and Saracens. A band of Norman knights, entering Apulia upon a pilgrimage, lent their aid to the former, the Latin Christians, in an attempt to expel the Greeks. This enterprise miscarried, but the reckless courage and strict discipline of the Normans brought their further assistance into great demand, and won them soon no little fame and influence. In 1030 they built the city of Aversa; eight years later their leader Rainulf received from Conrad II. of Germany the title of count. Such beginnings drew from overcrowded Normandy fresh swarms of adventurers, with whose aid the Greek viceroy won from the Moslems (1038) the greater part of the island of Sicily. Swindled in the sharing of the booty, the Normans attacked the Greek possessions in Southern Italy with such success that their leader, William "Iron-arm," son of Tancred d'Hauteville, soon styled himself count of Apulia; in which title we find his brother and successor, Drogo, confirmed by the German emperor, Henry III. With the third Apulian count, Humphrey, Pope Leo IX. came into strife over Benevent. Defeated and captured in the battle of Civitate (1053), the pontiff was fain to strike a peace upon the condition of Norman vassalage to the Holy See. Still another son of Tancred, the famous Robert Guiscard, succeeded his brother Humphrey (1056). "By the grace of God and of St. Peter, duke of Apulia and Calabria," he spent the first twenty years of his long rule in making good his title over Greek, Longobard, and Norman. Meanwhile, his younger brother, Roger, passing with a few hundred knights into Sicily, won a series of brilliant victories, and finally, with Robert's aid, made himself master of the island. In 1081, Robert invaded Greece and defeated the East Roman emperor at Durazzo. Already, Byzantium trembled, when disturbances in Apulia and the repeated summons of the pope, in hot strife with Henry V., drew the Guiscard back to Italy. Bursting into the Campagna with 6000 horse and

* See an interesting article in the *Smithsonian Annual Report* for 1874, *On a Dominant Language for Science*, by M. de Candolle of Geneva.

30,000 foot, he pressed back the German emperor, delivered Gregory (besieged in St. Angelo), and sacked Rome (1084). Dying the next year, he left the ducal title to his second son, Roger. His first-born, Boemund, won great fame in the first crusade and established an independent principality in Antioch. In 1127 the Guiscard line became extinct, and Roger, second count of Sicily, united the conquests of the house of Tancred, reigning as king of Sicily and Naples; as also his son and grandson after him, William I. (1154–66) and William II. (1166–89). From the raising of the siege of St. Angelo, through all the conflicts between the papacy and the German imperium, the former found in the Sicilies, under the Norman supremacy, its firmest support. But in 1186, through the marriage of Henry VI. of Germany with Constance, aunt and heiress of the childless William II., the succession to the Sicilian throne passed over to the imperial house of Hohenstaufen. Upon William's death (1189) the pope and the Norman nobility set up the illegitimate Tancred, but in 1194, invading the Sicilies with a German army, Henry crushed out all opposition. His son by Constance, Frederick II., afterward united and ruled both realms. Under the Norman kings and the half-Norman Frederick the Sicilies furnished the one example of the time of full religious toleration. Greek and Saracen dwelt together in the enjoyment of civil equality and freedom of faith. The art and the learning of both races found generous encouragement. The island sprang into new life and bloom. Sicily and Spain, the points at which the Eastern civilization touched the Western most closely, became the centres from which the culture of the Saracen and the reawakening of scientific study spread throughout Europe. In 1266, Charles of Anjou, in league with the papacy, defeated and slew King Manfred, Frederick's son, and made himself master of the Sicilies. After the overthrow of their supremacy, the Normans, as in France and in England, became blended with the races they had ruled.

IV. "*The Norman Conquest of England* is the great turning-point in the history of the English nation"—a nation whose development had thus far been purely Germanic, but in which the old German community-constitution had fallen into decay even more speedily than upon the Continent. As "folk-land" passed into "book-land"—private estates of more and more unequal extent—landless freemen and little freeholders, unable longer to discharge their old duties in army and in court, lost their old rights and were slowly forced into a sort of feudal dependence upon a warlike, land-and-office-holding nobility, the "thaneship." Society shaped itself into rough class-distinctions. The state tended steadily toward oligarchy. The arrest of this process was the problem to be solved by the English kingship: the thorough redistribution of state burdens according to actual ability to bear the same was the one possible solution; and to that the Church, allied by rich endowments with the landed interest, made successful resistance. The Danish invasions and conquest revealed and hastened the social and political disintegration. With the degradation of the common freemen, with the decay of the folk-court and the folk-army, with the triumph of a factious Church-and-lay-aristocracy over a weakening dynasty, sank the national feeling and the national power. The accession of the half-Norman "Confessor" was the beginning of the Conquest. Norman adventurers filled and ruled court, Church, and state. At length, however, the English party won the upper hand, and upon the death of the childless king (Jan. 5, 1066) placed upon the throne their leader, Earl Harold Godwinsson. William of Normandy at once protested, declaring himself Edward's legal successor. He based his title upon hereditary right, through his paternal aunt's marriage, upon an alleged promise of the Confessor, and upon a solemn oath of fealty which Harold was asserted to have sworn. Gaining the sanction of the pope, and drawing recruits from every quarter by promises of booty, the duke made ready to enforce his claims. On Sept. 28 the Norman troops disembarked at Pevensey, encountering no resistance. An almost simultaneous Norwegian invasion of Yorkshire had stripped the Channel coast of its defenders. Fresh from the hard-won victory of Stamfordbridge, Harold met the duke on Oct. 14 upon the slope of Senlac, near Hastings, with his veteran house-carls and the ill-armed levies of the Southern Saxon earldoms. His defeat and death decided the fate of England. William was crowned in Westminster the following Christmas. Four more years of conquest, revolt, reconquest, and devastation with fire and sword established fully his supremacy.

Held in armed occupation by conquerors alien in blood, speech, and law, England underwent a complete social revolution, out of which grew changes of the greatest moment in every department of the state-life—above all, in the character of the kingship. Claiming to reign as the Confessor's heir, William pledged the retention of the laws of Edward—*i. e.* of Anglo-Saxon forms and precedents. Thus only could he hold in check his own victorious army. But this very fiction of legality paved the way for the greatest immediate changes demanded by the fact of conquest. Branding Harold's reign as usurpation, all support thereof and all later resistance and revolt as treason, it gave the Crown legal pretext for wide-reaching—in the end practically universal—confiscation of land, whose reassignment, upon military tenure, made state and kingship for the first time thoroughly feudal. The *Domesday Book*, William's famous property-survey, divides the land into 60,215 "knight-fees"—28,015 of which are in the hands of the Church—each being pledged to knight (or equivalent foot) service and to all the precedented feudal taxes and tributes, liable also to escheat and forfeiture. These feoffs or fees are held from the Crown (1) by a score or so of great secular vassals, magnates of Normandy, leaders of the conquering army, invested with large but scattered "complexes;" (2) by several hundred lesser chief-tenants or crown-vassals, nearly all Normans; and (3) by the higher clergy, Norman and Saxon. From these, again, hold by re-enfeoffment 7871 after-vassals—half Saxon thanes, left in possession under Norman overlords, half Norman soldiers, sharing with their leaders the lands they had helped to win. These, too, are sworn "men of the king," levied and led, not by their lords, but by the royal viscounts, constables, and marshals. Instead of the earlier, irregular folk-service, stood now a strong feudal militia, paid with land and under the full control of the monarch from whom they held their pay, making England's rulers for the first time full lords of the island, and England, from the side of power, at least, a thoroughly united state.

Into the forms of legal administration drew at first less change. The thanes still sat, dispensing justice, amid the remnant of the common freemen, in the courts of the county, still held manorial jurisdiction over their serfs and villans, and often over neighboring little freeholders. But among these "law-giving thanes" were now some thousands of foreign soldiers; and in the old folk-courts, instead of the Saxon sheriff, presided the revenue-farming, army-and-police-administering royal viscount. Norman arrogance and native jealousy, confusion of language, contradictions, above all, of Saxon and feudal law and process, made the whole system an engine of injustice and oppression. In the conflict of two constitutions the folk ceases to be the bearer of the legal consciousness; the creation by uniform precedent of new law comes only from the single central will. In England, therefore, centuries earlier than upon the Continent, was established, under the later Norman and Norman-Plantagenet monarchs, the determination of law at the court of the king, and its administration throughout the land by royal judges. With the folk, however, remained the settling of the question of fact; and out of this right, with the decay of the rough mediæval systems of compurgation, duel, and ordeal, grew the jury trial. To the police power of the Norman kings, also, race-hate and resultant lawlessness gave an extraordinary development. Summary "amercements"—in particular, for breach of the king's peace and contempt of royal authority, valid against the mightiest in the land, laid repeatedly upon whole hundreds and counties—widened themselves into a means for enforcing all administrative processes, for guiding the whole mechanism of the absolute state. In the amercements, again, as in every department of the administration, the fiscal spirit of the Norman régime comes prominently forward. Every financial claim of the Anglo-Saxon crown, every revenue of the Norman feudal supremacy, every new right that could be drawn from the centralization of the military, judicial, and police power, was utilized to its utmost capacity. A thoroughly organized system of "farming," guided and held to strict account by a central exchequer, became the foundation of the first enduring official regulations of the Anglo-Norman régime.

To the English Church, upon whose support depended at first the permanence of the conquest, and to Rome, in return for the recognition of his title, the Conqueror made certain concessions. The Church gained even richer endowment than in the Anglo-Saxon time, received separate ecclesiastical jurisdiction, and was brought into closer conformity with Romish usage. On the other hand, royal supremacy over Rome itself on English soil was held fast, and the clergy were fully subjected to all feudal burdens and to the power of the throne. The first three Norman kings reigned full lords of the Church.

Out of the antagonism of two races, by which both were weakened—out of the clashing of English law and of feudal precedent, in which each suffered partial destruction—the Crown thus won a practically unlimited authority in army, court, and Church. From a duchy, where his power

was checked by a strong court-baron. William came into a kingdom, whose "Witenagemote" had reduced the kingship to a shadow; and yet neither in his reign nor in those of his immediate successors is there any trace of a legislating and tax-voting "Parliament." A few score Norman magnates, ignorant of English law, robbed, by the uprooting of all old bonds, of that firm fealty of the under-vassal in which they had been wont to find their power, standing among several hundred lesser crown-tenants, from whom no legal line divided them, but in whom they could recognize no actual equality,—these could form neither law-giving Witenagemote nor Norman court-baron—could hardly find, for generations, a tie of class-unity for any purpose whatever. Thrice yearly William's vassals drew together in splendid pageantry for military review. Then were edicts often made public, with, perhaps, the never-withheld "consent of my barons." So, while the power of the thaneship had wrecked the Anglo-Saxon state, while the dynasties of the Continent struggled for centuries to win back to the Crown and to the Tiers État the rights of which the nobility had robbed both, the Norman kings, subjecting all classes alike to the authority and to the burdens of the state, gave to England a wholly other development. Unable to make separate head against the overwhelming power of the king, the English nobility came forward in corporate capacity, in co-operation with English knight and burgess, in sympathy with the whole people, not to win privilege for a class, but right for all—not to shake off the supremacy of the state, but to gain first for themselves, and so, ultimately, for the people, a share in the legal exercise of that supremacy. They became the leaders of the nation in that long constitutionalizing struggle in which Magna Charta marks the first great victory. The new bond of common resistance to common oppression, together with the separation of England and Normandy, hastened in turn the disappearance of race-hate and race-distinctions. In the gradual blending of the two nationalities the older elements won again the mastery. But the rule of the Norman has left deep traces in the altered traits, the mingled speech, the revolutionized social and state life of the more enduring race in which he himself was merged. E. Munroe Smith.

Nor'næ [Icelandic, *Nornir*], in Scandinavian mythology, the goddesses of fate, sitting under the world tree Yggdrasil, whose roots they sprinkle with water from Urdar wells that it may not wither. Their number was originally three—Urðr (Past), Verðandi (Present), and Skuld (Future), but later it increased indefinitely. They seem to have been confounded with the Valkyries, Elves, *Fylgjur*, and *Völur*, and to have assumed by degrees the character of abstract ideas; each man had his own norn.

Nor'ridgewock, post-v. and tp., cap. of Somerset co., Me., on the Kennebec River, 5 miles S. W. of Skowhegan. Pop. of v. 546; of tp. 1756.

Nor'ris, tp. of Edgefield co., S. C. Pop. 1485.

Norris City, post-v. of Indian Creek tp., White co., Ill., on the Cairo and Vincennes R. R., at the intersection of the Springfield division of the Ohio and Mississippi R. R., has 1 weekly newspaper.

Nor'ristown, post-b., cap. of Montgomery co., Pa., on the Norristown and Germantown branch of the Philadelphia and Reading R. R., about 16 miles from Philadelphia, has a good school system, churches of all denominations, an opera-house, 3 banks, 3 daily and 4 weekly newspapers, 3 blast-furnaces and rolling-mills, several large iron-working establishments, 7 cotton and woollen mills, the usual public buildings, and a jail. It is in a rich farming and mineral district. Pop. 10,753.
Ed. "Daily and Weekly Herald."

Nor'riton, tp. of Montgomery co., Pa. Pop. 1335.

Norr'kjöping, town of Sweden, in lat. 59° N., near the Baltic, at the Motala, which here is crossed by several substantial bridges and lined with commodious quays and spacious docks. It has important shipbuilding and sugar-refining establishments, a salmon fishery, and manufactures of starch, paper, leather, linen, and woollen goods, etc. Pop. 25,685.

North, tp. of Sharpe co., Ark. Pop. 295.

North, tp. of Stanislaus co., Cal. Pop. 223.

North, tp. of Lake co., Ind. Pop. 1593.

North, tp. of Marshall co., Ind. Pop. 1484.

North, tp. of Labette co., Kan. Pop. 581.

North, tp. of Dade co., Mo. Pop. 725.

North, tp. of Harrison co., O. Pop. 1202.

North (Christopher). See Wilson, John.

North (Edward), L. H. D., b. at Berlin, Conn., Mar. 9, 1820; graduated with the highest honors at Hamilton College 1841; was elected professor of ancient languages in that institution 1843; has occupied the chair of Greek since 1863, and has been absent from his post only two terms during more than thirty years of professional service, this absence having been occasioned by a visit to Greece in the winter of 1871–72. Prof. North was chosen president of the New York State Teachers' Association; was chairman of the executive committee of the University Convocation of the State of New York; has been for twenty-five years chairman and necrologist of the alumni association of Hamilton College; has edited during nearly the same period the triennial catalogue; is now (1876) engaged upon a biographical catalogue of the Hamilton alumni; is senior editor of the *School Bulletin*, published at Syracuse, N. Y.; has been for many years an occasional contributor to the *North American Review* and other standard periodicals; is favorably known as a lecturer on literary themes, and noted for his devotion to the interests of the cause of education, and to those of Hamilton College in particular, as evinced by the above notice of his past and present educational labors, which were recognized in 1869 by the University of the State of New York by conferring upon him the honorary degree of "Doctor of Literature" (L. H. D.), the first ever granted in America.
Porter C. Bliss.

North (Francis), Baron Guilford, son of the fourth Baron North, b. in England Oct. 22, 1637; studied at Cambridge and at the Middle Temple; was called to the bar 1661; was retained by the Crown in important cases; was knighted and became solicitor-general 1671; appointed attorney-general 1673, chief-justice of the common pleas 1675, privy councillor 1679, lord keeper of the great seal 1682; created Baron Guilford Sept., 1683, and d. Sept, 5, 1685.—Of his brothers, Sir Dudley, b. May 16, 1641, was a wealthy Turkey merchant and M. P., author of some treatises upon political economy, and d. Dec. 31, 1691.—John, b. in London Sept. 4, 1645, became a fellow of Cambridge, professor of Greek, master of Trinity College, doctor of divinity, and editor of Plato's *Dialogues;* d. at Cambridge Apr., 1683.—Roger, b. Sept. 3, 1651, became attorney-general under James II., was author of biographies of the above three brothers (1740–42) and of several treatises on law, politics, and music; d. Mar. 1, 1734.

North (Frederic), earl of Guilford, best known as Lord North, eldest son of Francis, the first earl, b. in England Apr. 13, 1733; educated at Eton and at Trinity College, Oxford; entered the House of Commons as a Tory at an early age; became a lord of the treasury 1763, in which year he was the mover of the expulsion of John Wilkes; supported the American Stamp Act 1765; became joint paymaster of the forces 1766; became chancellor of the exchequer and leader of the House of Commons on the death of Charles Townshend 1767; first lord of the treasury and prime minister 1770; proposed the colonial tea-duty 1773, and the Boston Port Bill Mar., 1774; retired from office Mar., 20, 1782, on the adoption of a policy of peace with the U. S.; became joint secretary of state with Fox in the "coalition ministry" 1783; became blind 1787; succeeded to the earldom 1790, and d. Aug. 5, 1792.

North (Simeon), D. D., LL.D., b. at Berlin, Conn., about 1802; graduated at Yale College 1825; was a tutor there 1827–29; professor of languages at Hamilton College 1829–39, and president of that institution 1839–57, since which time he has resided at Clinton.

North (Gen. William), b. at Fort Frederick, Pemaquid, Me., in 1755; entered the Revolutionary army 1775; became aide to Baron Steuben 1779, aiding him to introduce discipline in the army, and so won the heart of the baron that the latter on his death in 1794 left half his estate to Gen. North, who was conspicuous as a Federal politician, Speaker of the New York assembly, and U. S. Senator 1798. D. New York Jan. 3, 1836.

North Ab'ington, post-v. of Abington tp., Plymouth co., Mass., on the Plymouth branch of the Old Colony R. R.

North Ad'ams, post-v. of Adams tp., Berkshire co., Mass. (See Adams.)

North America. See America.

North Am'herst, post-v. of Amherst tp., Hampshire co., Mass., on the New London Northern R. R.

North Amherst, post-v. of Amherst tp., Lorain co., O., on the Toledo division of the Lake Shore and Michigan Southern R. R.

Northamp'ton, or **Northamptonshire,** an inland county of England, comprises an area of 985 square miles, with a pop. of 243,896. The surface is finely diversified with richly wooded hills and well-watered valleys, and the soil, mostly consisting of a black mould or a brown loam, is very fertile. Wheat and beans are the common crops;

breeding of horses and feeding of cattle and sheep are extensively carried on.

Northampton, town of England, the capital of the county of Northampton, on the Nene. Its manufactures of hosiery and lace have declined, but those of leather, boots, and shoes are very important; also its breweries, iron-foundries, and corn-mills. Pop. 41,168.

Northampton, county of North Carolina, bounded N. by Virginia and S. W. by the river Roanoke. Area, 350 square miles. It is uneven and fertile. Live-stock, corn, and cotton are leading products. The county has good railroad facilities. Cap. Jackson. Pop. 14,749.

Northampton, county of E. Pennsylvania, bounded E. by New Jersey, from which it is separated by the Delaware River. Area, 325 square miles. The Lehigh River forms a part of its W. boundary, and afterwards traverses the county, the greater part of which is somewhat level and very fertile. Live-stock, grain, and wool are leading products. The manufacturing interests are very important, and include lumber, iron, zinc, leather, flour, slates, lime, brick, carriages, metallic wares, clothing, saddlery, cordage, etc. The county is traversed by various railroads. Iron is mined. Cap. Easton. Pop. 61,432.

Northampton, county of Virginia, bounded E. by the Atlantic Ocean and W. by Chesapeake Bay, and including several islands in the Atlantic. Area, 320 square miles. It has a light and generally productive soil. Corn and oats are leading products. Cap. Eastville. Pop. 8046.

Northampton, post-v. and tp., cap. of Hampshire co., Mass., 17 miles N. of Springfield, on the Connecticut River and the New Haven and Northampton R. Rs. It has excellent waterworks, 1 female seminary, 1 high school, and 30 district schools, 8 churches, 3 national and 3 savings banks, a public library, a fire department, and a horse-railway to Florence. Its manufactures include sewing-machines, baskets, pocket-books, cutlery, hoes, silk, paper, buttons, brushes, woollen and cotton goods, etc. The State lunatic asylum is located here. It has 2 newspapers, the Smith Charities, a benevolent institution, the Smith College, among the foremost of its kind established for women, and the Clarke Institute, for deaf mutes. The township includes Florence, Leeds, and Smith's Ferry. Pop. 10,160. G. R. Edwards, Ed. "Journal and Free Press."

Northampton, tp. of Burlington co., N. J. Pop. 4018.

Northampton, post-v. and tp., Fulton co., N.Y. P. 1927.

Northampton, tp. of Summit co., O. Pop. 982.

Northampton, tp. of Bucks co., Pa. Pop. 1896.

Northampton, tp. of Somerset co., Pa. Pop. 1137.

Northampton (Spencer Joshua Alwyne **Compton**), second Marquis and tenth Earl of, b. in England Jan. 2, 1790; educated at Trinity College, Cambridge; entered Parliament 1812; succeeded to the marquisate May, 1828; invariably voted in the House of Lords for all liberal measures, but otherwise took no part in politics; was chosen successor of the duke of Sussex as president of the Royal Society 1838; signalized his occupancy of that post by a zealous performance of its duties and by brilliant reunions of scientific and literary men at his mansion in Piccadilly; retired from the presidency 1849; d. at his family seat, Castle Ashby, Northampton, Jan. 17, 1851.

North An'dover, post-v. and tp. of Essex co., Mass., on Merrimack River, traversed by the Boston and Maine R. R. (North Andover Dépôt, which see). Pop. 2549.

North Andover Dépôt, post-v. of North Andover tp., Essex co., Mass., on the Merrimack River and on the Boston and Maine R. R. (North Andover Station).

North Ann'ville, tp. of Lebanon co., Pa. Pop. 1910.

North An'son, post-v. of Anson tp., Somerset co., Me., on the Kennebec River, has 1 newspaper and a large trade in lumber. Pop. about 1200.

North Attleborough, post-v. of Attleborough tp., Bristol co., Mass., on the Boston and Providence R. R.

North Bay, post-v. of Vienna tp., Oneida co., N. Y., on the New York and Oswego Midland R. R. Pop. 348.

North Beaver, tp. of Lawrence co., Pa. Pop. 1983.

North Bend, tp. of Starke co., Ind. Pop. 505.

North Bend, post-v. and tp. of Dodge co., Neb., on the Union Pacific R. R. Pop. 809.

North Bend, post-v. of Miami tp., Hamilton co., O., on the Ohio River, and on the Ohio and Mississippi and the Indiana Cincinnati and Lafayette R. Rs. This was the residence of Gen. William Henry Harrison, President of the U. S., whose tomb, built of brick, simple in design, and placed upon a knoll a short distance from the bank of the river, is visible for miles up and down the Ohio. The beautiful surroundings make it also a place of interest.

North Ben'nington, post-v. of Bennington tp., Bennington co., Vt., on the Harlem Extension R. R.

North Ben'ton, post-v. of Smith tp., Mahoning co., O. Pop. 138.

North Ber'gen, tp. of Hudson co., N. J. Pop. 3032.

North Ber'wick, post-v. and tp. of York co., Me., on the Eastern and Maine Central and the Boston and Maine R. Rs. Pop. 1623.

North Bil'lerica, post-v. of Billerica tp., Middlesex co., Mass., on the Boston Lowell and Nashua R. R.

North Bloom'field, tp. of Morrow co., O. Pop. 1194.

North Bloomfield, post-v. of Bloomfield tp., Trumbull co., O.

North Blue, tp. of Polk co., Neb. Pop. 92.

North'boro', post-v. of Worcester co., Mass., 9 miles E. of Worcester, on the Boston Clinton and Fitchburg R. R., has a free public library, a town-hall, 1 bank, 1 newspaper, a soldiers' monument, 2 woollen mills, a manufactory of shell jewelry, a bone and phosphate manufactory, mills for spokes, shingles, boxes, sawing and grinding, combs, and other industries. It has good water-power. Pop. 1504. R. D. Pratt, Ed. "Northboro' Farmer."

North Branch, post-v. and tp., Lapeer co., Mich. P. 762.

North Branch, post-v. and tp. of Isanti co., Minn., 4 miles from North Branch Station (Chisago co.), on the Northern Pacific R. R. Pop. 224.

North Branch, tp. of Wyoming co., Pa. Pop. 358.

North Bran'ford, post-v. and tp. of New Haven co., Conn. Pop. 1035.

North'bridge, post-v. and tp. of Worcester co., Mass., on the Providence and Worcester R. R. Pop. 3774.

North Bridgewater, the former name of a thriving city in Plymouth co., Mass., now Brockton (which see, in Appendix).

North Brook, post-v. and tp. of Lincoln co., N. C. Pop. 625.

North'brook (Francis Thornhill **Baring**), first Baron, b. at Winchester, England, in 1796, eldest son of Sir Thomas Baring, Bart., and grandson of Francis Baring, founder of the banking-house of Baring Brothers; was educated at Winchester School and Christ Church, Oxford; was called to the bar 1823; entered Parliament as borough member for Portsmouth 1826; continued to represent that city thirty-nine years, in constant allegiance to the Whig party; was a lord of the treasury under Earl Grey (1830), joint secretary of the treasury under Lord Melbourne, chancellor of the exchequer 1839–41, first lord of the admiralty 1849; retired from official life 1852; was raised to the peerage as Baron Northbrook of Stratton Dec., 1865. D. suddenly at Stratton Park, Sept. 6, 1866.

Northbrook (Thomas George **Baring**), eldest son of the first baron, b. at Stratton Park, near Winchester, in 1826; graduated at Christ Church, Oxford, 1846; was successively private secretary to Mr. Labouchere at the board of trade, to Sir George Grey at the home office, to Sir Charles Wood at the India board and at the admiralty; entered Parliament in the liberal interest 1857; was a lord of the admiralty 1857–58, under-secretary of state for India June, 1859–Jan., 1861, for war from the latter date to June, 1866, and again on the accession of Mr. Gladstone, Dec., 1868, till Feb., 1872, when he was appointed viceroy and governor-general of India, having succeeded to the barony in Sept., 1866.

North Brook'field, post-v. and tp. of Worcester co., Mass. Pop. 3343.

North Brookfield, post-v. of Brookfield tp., Madison co., N. Y., on the Utica division of the Delaware Lackawanna and Western R. R. Pop. 226.

North Bruns'wick, tp., Middlesex co., N. J. P. 1124.

North Buf'falo, post-v. and tp. of Armstrong co., Pa. Pop. 1057.

North Cai'ro, tp. of Alexander co., Ill. Pop. 58.

North Ca'naan, tp. of Litchfield co., Conn. Pop. 1695.

North Cape. See Cape North.

North Caroli'na, one of the Southern Atlantic States and one of the original thirteen, is bounded on the N. by Virginia, W. by Tennessee, southward by South Carolina and Georgia, and on the E. by the Atlantic Ocean; embraced between 33° 49′ 45″ and 36° 33′ N. lat., and between 75° 25′ and 84° 30′ W. lon. from Greenwich, its greatest width from N. to S. is 180 miles, and its greatest length from E. to W. 480 miles; the State has an area of 50,707 sq. m., or 32,450,560 acres.

Face of the Country, Soil, etc.—Beginning at the Virginia line, a fringe of narrow, low sand-islands, or "banks,"

stretch southward along the whole seaboard, with three dangerous promontories jutting into the Atlantic—Cape Hatteras, 35° 15′ N. lat., lon. 75° 30′ 34″; Cape Lookout,

Seal of North Carolina.

34° 37′ 16″ N. lat., lon. 76° 31′ 04″; Cape Fear, lat. 33° 49′ 45″, lon. 77° 57′ 20″. Separating these "banks" from the main is a chain of sounds—Currituck, Albemarle, Pamlico, Cove, and Bogue—from 10 to 20 miles broad, full of shoals, but affording sheltered interior water-communication, with occasional outlets to the sea, such as Oregon, Hatteras, and Ocracoke inlets. The State falls into three natural subdivisions—the eastern, middle, and western. Eastern North Carolina, deeply indented at the coast-line by Albemarle Sound, the broad estuaries of the Neuse and Pamlico rivers, and by many creeks, is low and level, a broad expanse of from 40 to 60 miles toward the interior of pine forests, intersected by cypress morasses, such as the Great and Little Dismal swamps, embracing an area of 3,000,000 acres. To a large extent the soil of this zone is sandy and barren, but covered with forests of the pitch-producing pine; on the banks of the streams, however, the land is remarkably productive, and here the vine flourishes. The middle division extends back to the mountains, a broad area of undulating country, either cultivated or covered with deciduous trees, affording well-watered, rich, arable land—the region of corn, cotton, and tobacco, and of wheat toward the mountains. This region, resting upon granite and gneiss, abounds in water-power, is rich in minerals, and is highly favorable for orchards and vineyards. Western North Carolina embraces the mountains and high table-land, no part of which is less than 1500 feet above tide-water. The Appalachian Mountains here reach their greatest elevation, several of the peaks being the loftiest E. of the Mississippi River. The range nearest the coast is known as the Blue Ridge, while the other is designated in different sections as the Black, Smoky, Iron, and Unaka mountains. The lowest points or gaps in the Black Mountains are nearly as elevated as Mount Washington, while Mount Mitchell, according to the measurement of Prof. Guyot, is 400 feet higher, or 6707 feet above the level of the sea; five other peaks of the same range are also higher than Mount Washington—Mount Guyot (6672), Black Brother (6619), Cattail Peak (6611), Hairy Bear (6610), and Mount Gibbs (6591 feet above tide-water). Clingman's Dome of the Smoky is 6660 feet high, and a number of other summits of the range exceed 6000 feet. The Blue Ridge reaches an elevation of about 6200 feet in Mount Hardy. All these mountains, fertile to their summits, are clothed with magnificent forests. The table-land between the ridges—a mountain-plateau from 2000 to 3000 feet above the level of the Atlantic—is broken into a series of separate well-watered valleys of great fertility. This region is adapted to grazing, as well as the growth of cereals, vegetables, and all the fruits of the temperate zone. Embracing fifteen counties, it is one of the most salubrious and picturesque sections of the U. S.

Rivers, Lakes, etc.—North Carolina is well watered, but, owing to shifting sandbars at their mouths, and rapids and waterfalls in their descent from the hills to the lowlands, few of her rivers are navigable except for small craft. The Cape Fear River, formed by the confluence of the Haw and Deep rivers, is the largest in the State—250 miles in length, navigable to Wilmington, 34 miles, and for sloops and small boats to Fayetteville, 86 miles farther; the Roanoke, formed by the union of the Dan and Staunton rivers, is 150 miles long, navigable for 30 miles, and for small steamers 90 miles farther; the Neuse and Tar rivers, both discharging their waters into Pamlico Sound, are each navigable for small steamboats 100 miles or more; the Chowan, emptying into Albemarle Sound, has about 75 miles of similar navigation; the Pasquotank, a smaller stream, also falls into Albemarle Sound; the Yadkin, Catawba, and French Broad, draining the W. part of the State and traversing South Carolina on their way to the Atlantic, are not navigable in North Carolina. There are several small tributaries of the Tennessee River in the western part of the State, and the affluents of the Great Pedee, Congaree, etc. have their sources in the mountain-region. Large tracts of the lowlands are covered with swamps, as the Great Dismal, the Little Dismal or Alligator, the Catfish, Gum, and other swamps, and most of them enclose lakes of greater or less extent. Some of these lakes are navigable by small steamers. They are most numerous in Washington, Hyde, Jones, and Carteret cos.

Geology.—The coast zone is a deposit of sand underlaid with the Tertiary (Eocene and Miocene) formation, including shell and marl-beds rich in phosphates, fossiliferous limestone, and bog-iron ores. Full one-half of the State is embraced within the Quaternary formation, for it extends in a belt across from the Virginia to the South Carolina line, from 100 to 125 miles broad, parallel with the coast. In these gravelly strata there are frequent outcrops, at or near the banks of water-courses, of the Tertiary in the form of marl-beds, chalk, and limestone. Along the rivers in the S. E. the Cretaceous formation is found in the shape of greensand. The Eozoic and Silurian systems in alternate broad and narrow belts of Laurentian (gneiss and granite) and of Huronian (slates) occupy the W., except two narrow tracts of the Triassic (new red sandstone)—one, from 5 to 15 miles broad, extending nearly across the State from the N. E. toward the S. W., and the other, from 4 to 6 miles wide, extending nearly E. and W. along the valley of Dan River.

Mineral Resources.—These, slightly developed as yet, are enormous, embracing not only coal and iron of superior quality, but the precious metals. The richest gold-mine known in the U. S. before the acquisition of California was in Rowan co., which in 1840 yielded $500 to the bushel of earth, or $3,000,000 in all, when the mine became flooded. In 1799 a nugget found in Cabarrus co. weighed 78 pounds. For years a number of gold-veins and *placers*, or gravel deposits, were extensively worked over a large territory on both sides of the Blue Ridge. Silver, lead, and zinc occur in association, notably in Davidson co. In some places the same vein presents rich deposits of native silver, with highly argentiferous galenite. Silver ores, intermixed with lead or copper, are found in Burke, Caldwell, Gaston, Wilkes, and other interior counties. Copper ores, chiefly pyrites, are spread over a wide field. All the gold is more or less associated with pyritic copper ore, as in Cabarrus, Chatham, Guilford, and Mecklenburg cos. All the Azoic rocks of the State supply veins of this copper pyrites, frequently quite large; a valuable copper-mine is worked in Ashe co. Mica of a very superior quality is mined among the coarse-grained granites of Cleveland, Mitchell, and Yancey cos. Diamonds of fine water, of from one-half to two carats, have been found in Franklin, Lincoln, Mecklenburg, and Rutherford cos.; and fine detached crystals of zircon, garnets, and graphite occur in the gneissoid rocks—the graphite in Alexander, Cleveland, Person, and Wake cos. North Carolina is a chief source of supply of granular or crystalline corundum or emery. Arsenic, antimony, bismuth, cobalt, and nickel are also met with. But the chief mineral wealth of the State is in its coal and iron. The coal, mostly bituminous, of the Triassic not Carboniferous formation, is of the same age as that near Richmond, Va. There are two fields—that of Dan River, in Stokes and Rockingham cos., with an area of 30 sq. m., and that of Deep River, in Chatham and Moore cos., with an area of 40 sq. m., of which each square mile is estimated to contain 6,000,000 tons of coal of the best quality, suited for smelting purposes and the production of gas, and near valuable beds of the best iron ore, as well as convenient for transportation. These coal-measures consist of strata of slate, calcareous shales, alternating with beds of argillaceous carbonate of iron and seams of coal, the whole enclosed between two beds of red sandstone. Even near the outcrop the Deep River coal yields from 11.44 to 13.56 per cent. of ash, 75.96 to 76.56 per cent. of fixed carbon, and 12 per cent. of volatile matter. The slate associated with it yields from 30 to 40 gallons of crude petroleum per ton. The whole of the Eozoic region, from the navigable waters of the Roanoke and Cape Fear rivers westward to Cherokee co., is rich in beds of iron ore, including the pure magnetic, titaniferous, and chromiferous magnetic and hæmatite ores. One of these in Mitchell co., the "Cranberry" mine, is the purest magnetic ore yet found in the U. S., yielding in the furnace 66.56 per cent. of

metallic iron, and producing iron of great tenacity and strength.

The *climate* varies with the physical diversities of the country. In the mountains buckwheat flourishes, while oranges grow at Wilmington. The temperature of the lowlands is hot and humid, with a tendency to bilious diseases, but in the interior, particularly in the Piedmont and mountain section, the air is singularly pure, dry, and elastic. The heat of the summer day is succeeded by cool, refreshing evenings and nights; the winters are mild and genial, except at rare intervals, when the cold has been severe, as in 1703, when Albemarle Sound was frozen across. Peaches and apricots blossom in Middle North Carolina late in February, and the apple early in March. Wheat is harvested early in June, and Indian corn in September. The average rainfall is about 45 inches. The mean temperature for the year at Chapel Hill is 58° 46′; at Asheville, 48° to 50°; at Raleigh, 60°; at Smithville, mouth of Cape Fear River, 64° 13′; at Wilmington, 63.1°; maximum temperature, 97.5°; minimum, 18.5°; range 79°; at Beaufort the mean temperature of the year was 61.8°. Annual rainfall at Wilmington, 56.02 inches; at Raleigh, 46.15 inches; and at Asheville, 44.03 inches.

Vegetation.—Relatively, the forests are in their primitive condition. The vegetable growth ranges from the balsam, from 4000 to 6500 feet above tide-water, to the tropical palm on the lower Cape Fear River, with the cypress, juniper, white and red cedars, evergreen oaks, and the long-leaf pine in the coast zone, the swamp-lands of which abound with undergrowth of cane, affording succulent food for cattle in winter: grapevines and other trailing plants and a parasitic moss drape the trees of that region. In the interior there are white and yellow pines; black, chestnut, red, Spanish, and white oaks, ash, birch, chestnut, dogwood, elm, black and white gum, hickory, laurel, locust, maple (sugar), black, red, and white mulberry, sycamore, and other deciduous trees and shrubs. The State is prolific of indigenous grapes, and three of the native species in highest repute in the U. S., the Catawba, Isabella, and Scuppernong, had their origin in North Carolina. Several varieties of the honeysuckle, the fragrant yellow jessamine, and scarlet trumpet-vine are among the varied flora, while the mountains are full of medicinal plants, particularly ginseng and gentian.

Zoology.—The swamps afford haunts for bears, the otter, beaver, and muskrat; the extensive forests and mountains have preserved the wolf, deer, opossum, four species of squirrels, the raccoon, gray, black, and red fox, with several species of rabbits. The sounds, swamps, and streams of the coast-belt abound in turtles, terrapin, and water-snakes, with large flocks of swans, geese, brant, a great variety of ducks, the pelican, and other aquatic birds, as well as immense numbers of valuable fish, such as Spanish mackerel, shad, sheepshead, blue, red, and black fish, bass, flounders, soles, mullet, and herring. Serpents, such as the rattlesnake, king, green, chicken, and cow snakes, with the viper and others, are numerous. The bald and gray eagle, fishing-hawks, and several species of falcons, the buzzard, raven, crow, and blackbird, pheasant and quail, woodcock, snipe, plover, curlew, dove, pigeon, whippoorwill, lark, mocking-bird, and other genera and species of birds are widely spread.

Productions.—The rich alluvial lands upon the rivers and swamps of the coast-region produce rice, cotton, and Indian corn, with a second crop the same year either of peas or sweet potatoes. Cotton was grown as early as 1731; indigo was profitably cultivated in colonial times, but was given up because of the unhealthy process of cultivation; corn and tobacco are staples in all parts of the State; and that the State to a large extent is highly favorable to wheat and other cereals, as well as to grazing, will be seen by the following table:

Year.	Cotton, pounds.	Tobacco, pounds.	Rice, pounds.	Wool, pounds.	Butter, pounds.	Honey, pounds.	Wax, pounds.	Domestic wine, gallons.	Hay, tons.
1840	34,437,581	20,026,830	3,224,132	625,044	....	....	118,923	28,752	101,369
1850	29,538,000	11,984,786	5,465,868	970,750	4,146,290	....	512,000*	11,058	145,653
1860	58,165,600	32,853,250	7,593,976	883,500	4,735,495	2,050,000	170,500	54,000	181,365
1870	57,974,000	11,150,087	2,059,287	799,667	4,297,834	1,500,000	109,050	62,000	83,540
1874	25,879,063	8,500,000	2,163,000	....	....	....	....	....	104,800

Year.	Wheat, bushels.	Rye, bushels.	Oats, bushels.	Indian corn, bushels.	Sweet potatoes, bushels.	Irish potatoes, bushels.	Peas and beans, bushels.	Distilled and crude turpentine.	Total value of farm products.	Total value of forest products.
								$	$	$
1840	2,183,026	256,765	3,836,729	23,893,763	2,609,239					
1850	2,130,102	230,100	4,852,078	27,941,051	5,095,709	620,318	1,584,000			
1860	4,743,706	436,856	2,781,860	30,078,564	6,140,000	830,565	1,932,000	5,500,000		
1870	2,859,879	352,006	3,220,105	18,454,215	3,072,000	738,803	540,000	2,338,309	57,845,940	1,089,115
1874	2,878,000	334,000	3,083,000	22,186,000	3,167,000	702,000	617,000	....	49,624,284	

Years.	Horses.	Asses and mules.	Working oxen.	Milch cows.	Other cattle.	Sheep.	Swine.	Value of live-stock.	Value of slaughtered animals.
	No.	No.	No.	No.	No.	No.	No.	$	$
1850	148,693	25,259	37,309	221,799	434,402	595,249	1,812,813	17,717,647	5,767,866
1860	150,661	51,388	48,511	228,623	416,676	546,744	1,083,204	31,130,805	14,725,945
1870	114,406	50,684	45,408	193,731	279,023	463,535	1,075,215	21,993,967	7,983,132
1874	133,100	49,300	42,500	197,100	277,600	275,700	806,800	24,134,988	

Manufactures and Mining Industry.—There were, in 1870, 3642 manufacturing establishments in the State, employing 13,622 hands, of whom 11,339 were men, 1422 women, and 861 children; the amount of capital reported invested was $8,140,473; wages paid, $2,195,711; raw material used, $12,824,693; annual product, $19,021,327. These returns, there is good reason for believing, are much below the truth in all particulars. The most important items reported were tar and turpentine works, 147 establishments, employing 959 hands and producing $2,338,309; flouring and grist mills, 227, employing 483 hands and producing $2,232,404; lumber, sawed, 104 establishments, employing 1176 hands and producing $1,500,539; cotton-mills, 33, employing 1453 hands and producing cotton goods and yarns worth $1,345,052; tobacco-factories of all kinds, 110, employing 1464 persons and producing $717,665; 1 zinc smelting and rolling works, employing 17 hands and producing zinc to the value of $522,000; and 130 carriage and wagon factories, employing 462 hands and producing carriages and wagons to the amount of $340,284. The census also reports 17 mines and quarries, employing 482 hands, having $1,853,100 of capital invested, and producing annually $638,302, and 42 fisheries, employing 1606 hands, $211,100 capital, and producing annually $265,839.

Finances.—The debt of North Carolina, incurred for the benefit of her railroads and internal improvements, and consisting of bonds issued in aid of them and accrued but unpaid interest on these bonds, has increased rapidly since the close of the war. In 1870 it was $29,900,045; in 1874 it was officially stated to amount, with the unpaid interest, a part of which was funded, to $38,921,848. To meet this debt, the State holds railroad preferred and common stocks, canal and navigation company's stocks, and bonds of several railroads and of the city of Raleigh, with interest coupons for more than $1,000,000 of past due interest, the whole having a nominal value of $26,694,430, but which would not bring one-third of that sum. The interest or dividends on some of these are pledged to the education fund. As the interest on this was much more than the annual receipts of the State treasury, the legislature passed in 1874 a scaling act, acknowledging the validity of about $24,000,000 of these bonds, being all except special tax bonds and the interest accrued on them, and for the $24,000,000 proposed to issue consolidated bonds for $8,000,000, provided for by a special tax levy. These bonds were to be offered to the creditors for the old bonds, three of those for one of the consolidated bonds. With this measure were coupled provisions in relation to the North Carolina and Western North Carolina R. Rs., and the proposed consolidation of the debt was made dependent upon the ability of the State to carry out these provisions. The assessed valuation of property in 1870 was

* Beeswax and honey together.

$130,378,622, and the true valuation was $260,757,244. The amount raised by tax for State purposes is about $1,200,000, and aside from the heavy burden of interest her finances are well managed.

Commerce.—The following table gives the imports and domestic and foreign exports of the customs districts of North Carolina for the year ending June 30, 1874, with the navigation statistics for the same time:

Customs districts.	Imports for year ending June 30, 1874.	Domestic exports, year ending June 30, 1874.	Foreign exports, year ending June 30, 1874.	Entered.			Cleared.			Sailing vessels owned in district.		Steam vessels owned in district.		Total vessels owned in district.	
				Vessels.	Tonnage.	Crews.	Vessels.	Tonnage.	Crews.	Vessels.	Tonnage.	Vessels.	Tonnage.	Vessels.	Tonnage.
	$	$	$												
Albemarle	274	....	....	1	99	6	......	....	....	55	1,033.09	5	429.76	60	1,462.85
Beaufort	3,362	31,965	....	2	440	16	3	1,109	28	67	1,412.18	...	....	67	1,412.18
Pamlico	3,569	8,643	....	5	389	29	8	632	43	95	1,727.59	3	376.81	98	2,104.40
Wilmington	136,812	3,541,010	....	211	57,729	2,050	278	74,913	2,571	45	2,762.84	22	1,854.48	67	4,617.32
Totals	144,017	3,581,518	....	219	58,657	2,101	289	76,654	2,642	262	6,935.70	30	2,561.05	292	9,596.75

Banks.—There were in the State Jan. 1, 1875, 11 national banks, having an aggregate capital of $2,200,000, and an outstanding circulation, secured by U. S. bonds, of $1,824,545; 8 State banks, having an aggregate capital of $1,697,000; and 3 savings banks, loan, and trust companies, with an aggregate capital of $180,000. The Bank of North Carolina and its branches has been wound up. There are 7 private banking-houses.

Population.

Census-year.	Whites.			Slaves.			Free colored, total.	Aggregate.	Density to sq. mile.	Ratio of increase.	Natives.	Foreigners.	Illiterate.	Of school age, 5 to 20.	Of military age, 18 to 45, males.	Of voting age, 21 and upward, males.	Citizens, males.
	Males.	Females.	Total.	Males.	Females.	Total.											
1790	147,494	140,710	288,204	......	......	100,572	4,975	393,751	7.76								
1800	171,649	166,116	237,764	......	......	133,296	7,043	478,103	9.43	21.42							
1810	188,632	187,778	376,410	......	......	168,824	10,266	555,500	10.95	16.19							
1820	209,644	209,556	419,200	106,551	98,466	205,017	14,612	638,829	12.59	15.00							
1830	235,954	236,889	472,843	124,313	121,288	245,601	19,543	737,987	14.55	15.52							
1840	240,047	244,823	484,870	123,546	122,271	245,817	22,732	753,419	14.86	2.09							
1850	273,035	280,003	553,028	144,581	143,967	288,548	27,463	869,039	17.14	15.35	866,241	2,798	80,423	345,448	133,011	182,862	
1860	313,670	316,272	629,942	166,469	164,590	331,059	30,463	992,622	19.58	14.20	989,324	3,298	74,977	389,587	156,254	216,004	
					Free colored. Males.	Females											
1870	325,705	352,765	678,470	......	192,418	199,232	391,650	1,071,361	21.13	7.83	1,068,332	3,029	397,690	359,930	174,825	217,813	214,224

Education.—As early as 1825 the general assembly created a literary fund for the support of public schools, setting aside for that purpose certain stocks owned by the State in banks and navigation companies, with all moneys paid into the public treasury for entries of swamp and other vacant lands, and all fees for licenses to auctioneers and retail venders of ardent spirits. The board originally formed for the control of this fund was reorganized in 1835, to consist of the governor with three commissioners. At the same time the fund was enlarged by additional bank stock and railway shares, with all swamp-lands not already disposed of, with $200,000 to make the same marketable. In 1840 this permanent school fund was $2,000,000, yielding an income of $120,000, which was supplemented in each county by a special tax; so that between 1840 and 1861 the amount annually expended in public instruction was about $250,000. This fund was lost during the war, and public schools were closed until 1870. By the constitution of 1868, 75 per cent. of the entire State and county capitation tax was dedicated to the support of public instruction, besides 8⅓ cents out of every $100 of the property tax collected in the State, together with certain fines, forfeitures, and penalties, and the other special resources set apart for the same purpose anterior to 1861. In this way the public school income is about $300,000 a year, and public schools have to be maintained for four months in the year; if the fund prove insufficient in any county, it is the duty of the school commissioners to submit the question of levy of tax to make up the deficiency to the electors. The Peabody fund aids materially to keep up for ten months in a year 20 to 30 "graded schools," each having from 100 to 500 pupils. Every town or city of 2000 or more inhabitants may by a majority vote levy a tax sufficient to maintain one of these graded schools for ten months instead of four. Something of the state of public instruction past and present in the State of North Carolina may be seen by referring to the following table:

Years.	Public.	Private normal and grammar.	Total all classes.	Teachers.			Pupils.			Income.				Number of children between 5 and 20 years.
				Public.	Private.	Total.	Public.	Private.	Total.	Endowments.	Taxation and other.	Private and other.	Total.	
1850	2,657	272	*2,934	2,730	403	*3,162	104,095	7,822	*112,430	$28,822	$140,314	$217,776	$386,912	345,448
1860	2,994	434	*3,444	2,928	661	*3,683	105,025	13,169	*119,734	45,602	250,974	461,868	758,444	389,587
1870	1,435	725	2,161	1,818	1,776	2,994	41,912	13,046	64,958	9,160	232,104	394,628	635,838	†359,930
1874	2,018	.....	....	2,453	....	....	166,000	....	....	‡12,300	300,000	....	....	348,603

A State superintendent of instruction, elected biennially, assisted by county commissioners and district school committees, at present has control and supervision of the system. In 1874, of 348,603 children, white and colored, between the ages of six and twenty-one years, only 166,000 were at school not quite three months during the year. At the same time the money raised in various ways, by capitation tax, swamp-lands, licenses, etc., and local taxation, amounted to about $500,000, of which, however, only about $300,000 was expended.

Colleges.—Before the war the University of North Carolina, opened 1793, was a highly respectable and flourishing seat of learning, with a considerable endowment, which was swept away by the war, and the institution was suspended until Sept., 1875, when it reopened. The following table shows the condition of the colleges of the State in 1874–75:

Name of College.	Location.	No. of faculty.	Students.		Property and income.					Volumes in library.
			Preparatory schools.	Collegiate.	Value of property.	Value of buildings and apparatus.	Endowments.	Income from productive fund.	Income from all other sources.	
Shaw University (colored)	Raleigh	5	65	......	....	$100,000	....	....	$2,000	1,150
Davidson College	Mecklenburg co.	7	......	113	$240,000	150,000	$90,000	$6,000	10,000	9,000
North Carolina College	Mount Pleasant	4	195	20	....	15,000	11,000	....	2,075	1,650
Rutherford (male and female) College	Excelsior	9	238	......	....	4,000	....	....	1,400	3,200
Trinity College	Trinity	6	......	92	25,001	30,000	....	....	7,200	10,000
Wake Forest College	Wake Forest co.	5	48	42	50,000	20,000	30,000	1,600	4,500	8,000
University of North Carolina	Chapel Hill	...	......	......	....	150,000	....	....	....	22,000

Scientific and Professional Instruction.—There are two institutions for training teachers—the Ellendale Teachers' Institute at Little River, which in 1874 had 2 resident teachers and 22 male and 12 female students, but its buildings and library were unfortunately burnt in Sept., 1874, and its instruction was suspended for a time; and the nor-

* Includes colleges. † 5 to 18 years. ‡ From Peabody fund.

mal department of Shaw University, which trains teachers for the colored schools, and has 3 instructors and 60 students in this department. The Agricultural and Mechanical College of the State is suspended. There are two theological schools, both in a tentative condition—the School of Biblical Literature of Trinity College (Methodist Episcopal), not reporting any students in 1874; and the theological department of Shaw University (Baptist), intended for training young men of color for preachers, and which in 1874 had 2 instructors and 50 students. There are also two law schools projected, though that connected with Rutherford College is not yet in operation; the law department of Trinity College had in 1874 two professors and 25 students.

Special Education.—There is an institution for the deaf and dumb and the blind at Raleigh, founded in 1847, and supported by the State. In 1874 it had 7 teachers and 138 pupils (77 males and 61 females), of whom 77 were blind and 61 deaf mutes. Its buildings and apparatus were valued at $50,000, and it received $40,000 per annum for its expenses from the State. There are two orphan asylums in North Carolina, at Oxford and Mars Hill, having 10 teachers and 220 children; their receipts are about $10,800, and their expenditures $10,500 per annum. There is a State lunatic asylum at Raleigh, said to be very well managed.

Penal Institutions.—The State penitentiary is also at Raleigh. It has about 400 convicts.

Insurance.—There were in Jan., 1874, 2 fire insurance companies—one at Raleigh, the other at Warrenton—with assets amounting to $264,827; and 1 life insurance company at Raleigh, with $200,000 capital and $212,000 assets.

Railroads and Canals.—There were Jan. 1, 1875, 1488.96 miles of railroad in operation in the State, the cost of which, for road and equipment, was $40,019,687. In these were included the North Carolina R. R., 223 miles in length; the Western North Carolina, nearly 250 miles in length; the Wilmington and Weldon, with its branch 181 miles in length; the Atlantic and North Carolina, 95 miles long; the Raleigh and Gaston, 97 miles long; the Wilmington and Columbia, S. C., 65 miles within the State; and 10 other roads. Canals were constructed in North Carolina by State aid at an early day. These include the Dismal Swamp Canal, connecting the waters of the Pasquotank and Elizabeth rivers, incorporated in 1790; the Cape Fear Navigation Co., chartered to improve the navigation of that river from Averysboro' to the confluence of the Deep and Haw rivers; the Roanoke Navigation Co.; the Clubfoot and Hollow Creek Canal, chartered in 1826; and the Neuse Navigation Co., chartered in 1850.

Newspapers and Periodicals.—In 1870 there were 64 papers published in North Carolina, having an aggregate circulation of 64,820, and issuing annually 6,684,950 copies. Of these, 8 were dailies, with 11,795 circulation; 3 tri-weeklies and 5 semi-weeklies, circulating 6450 copies; 44 weeklies, with 43,325 circulation; 1 semi-monthly, with 1250; and 3 monthlies, with 1900 circulation. In 1874 the number had increased to 96, of which 10 were dailies, 80 semi-weeklies and weeklies, 2 semi-monthlies, and 4 monthlies. The aggregate circulation had largely increased.

Counties (94).—The following table shows the population of each county by sexes in 1870, the population in 1860, and the assessed and true valuation in 1870:

COUNTIES.	Pop. 1870.	Males, 1870.	Females, 1870.	Pop. 1860.	Assessed valuation, 1870.	True valuation, 1870.
					$	$
Alamance......	11,874	5,598	6,276	11,852	1,631,020	3,262,040
Alexander......	6,868	3,183	3,685	6,022	652,908	1,305,816
Alleghany......	3,691	1,831	1,860	3,590	524,777	1,049,554
Anson...........	12,428	5,910	6,518	13,664	1,415,202	2,830,404
Ashe.............	9,573	4,651	4,922	7,956	833,209	1,666,418
Beaufort........	13,011	6,487	6,524	14,766	1,508,035	3,016,070
Bertie...........	12,950	6,181	6,769	14,310	1,998,179	3,996,358
Bladen..........	12,831	6,372	6,459	11,995	1,239,700	2,479,400
Brunswick.....	7,754	3,808	3,956	8,406	924,426	1,848,852
Buncombe......	15,412	7,519	7,893	12,654	1,905,057	3,810,114
Burke...........	9,777	4,601	5,176	9,237	1,015,506	2,031,012
Cabarrus........	11,954	5,762	6,192	10,546	2,320,916	4,641,832
Caldwell.........	8,476	3,954	4,522	7,497	953,982	1,907,964
Camden.........	5,361	2,738	2,623	5,343	394,109	788,218
Carteret.........	9,010	4,472	4,538	8,186	644,497	1,288,994
Caswell..........	16,081	7,896	8,185	16,215	1,528,279	3,056,558
Catawba.........	10,984	5,093	5,891	10,729	1,579,918	3,159,836
Chatham........	19,723	9,518	10,205	19,101	2,457,791	4,915,582
Cherokee.......	8,080	3,903	4,177	9,166	683,666	1,367,332
Chowan.........	6,450	3,049	3,401	6,842	524,646	1,049,292
Clay..............	2,461	1,225	1,236	....	168,609	337,218
Cleveland	12,696	6,052	6,644	12,348	1,420,450	2,840,900
Columbus	8,474	4,436	4,038	8,597	797,754	1,595,508
Craven	20,516	9,842	10,674	16,268	2,091,019	4,182,038
Cumberland...	17,035	8,106	8,929	16,369	2,163,105	4,327,410
Currituck......	5,131	2,640	2,491	7,415	581,899	1,163,798
Dare	2,778	1,406	1,372			
Davidson.......	17,414	8,415	8,999	16,601	2,113,842	4,277,684
Davie	9,620	4,637	4,983	8,494	1,036,954	2,073,908
Duplin...........	15,542	7,596	7,946	15,784	1,164,960	2,329,920
Edgecombe....	22,970	11,572	11,398	17,376	4,525,041	9,050,082
Forsythe........	13,050	6,016	7,034	12,692	2,160,658	4,321,316
Franklin.......	14,134	6,854	7,280	14,107	1,822,006	3,644,012
Gaston...........	12,602	5,951	6,651	9,307	1,149,302	2,298,604
Gates.............	7,724	3,677	4,047	8,443	610,966	1,221,932
Granville.......	24,831	11,972	12,859	23,396	3,419,077	6,838,154
Greene..........	8,687	4,254	4,433	7,925	1,209,873	2,419,746
Guilford.........	21,736	10,253	11,483	19,754	3,695,151	7,390,302
Graham.........	New	co.				
Halifax	20,408	10,106	10,302	19,442	2,713,175	5,426,350
Harnett.........	8,895	4,411	4,484	8,039	745,815	1,491,630
Haywood.......	7,921	3,835	4,086	5,801	804,192	1,608,384
Henderson.....	7,706	3,751	3,955	10,448	1,083,707	2,167,414
Hertford	9,273	4,410	4,863	9,504	1,068,105	2,136,210
Hyde.............	6,445	3,293	3,152	7,732	576,776	1,153,552
Iredell	16,931	7,908	9,023	15,347	2,039,936	4,079,872
Jackson.........	6,683	3,298	3,385	5,515	564,857	1,129,714
Johnston........	16,897	8,352	8,545	15,656	1,888,022	3,776,044
Jones.............	5,002	2,510	2,492	5,730	687,540	1,375,080
Lenoir	10,434	5,084	5,350	10,220	1,168,883	2,337,766
Lincoln	9,573	4,472	5,101	8,195	1,370,792	2,741,584
Macon	6,615	3,197	3,418	6,004	598,624	1,197,248
Madison.........	8,192	4,053	4,139	5,908	408,940	817,880
Martin...........	9,647	4,842	4,805	10,195	1,578,912	3,157,824
McDowell	7,592	3,913	3,679	7,120	722,500	1,445,000
Mecklenburg..	24,299	11,869	12,430	17,374	4,305,923	8,611,846
Mitchell.........	4,705	2,332	2.373	....	330,246	660,492
Montgomery..	7,487	3,584	3,903	7,649	719,080	1,438,160
Moore	12,040	5,723	6,317	11,427	950,560	1,901,120
Nash..............	11,077	5,266	5,811	11,687	1,317,850	2,635,700
New Hanover	27,978	13,465	14,513	21,715	4,996,465	9,992,930
Northampton.	14,749	7,171	7,578	13,372	2,377,100	4,754,200
Onslow...........	7,569	3,665	3,904	8,856	854,175	1,708,350
Orange...........	17,507	8,218	9,289	16,947	2,040,903	4,081,806
Pamlico	New	co.				
Pasquotank ...	8,131	4,010	4,121	8,940	1,118,414	2,236,828
Pender...........	New	co.				
Perquimans ...	7,945	3,927	4,018	7,238	946,114	1,892,228
Person............	11,170	5,381	5,789	11,221	1,294,321	2,588,642
Pitt	17,276	8,514	8,762	16,080	1,949,137	3,898,274
Polk	4,319	2,022	2,297	4,043	425,878	851,756
Randolph	17,551	8,334	9,217	16,793	2,322,805	4,645,610
Richmond......	12,882	6,434	6,448	11,009	1,426,905	2,853,810
Robeson.........	16,262	8,009	8,253	15,489	1,471,181	2,942,362
Rockingham ..	15,708	7,569	8,139	16,746	2,330,465	4,660,930
Rowan...........	16,810	7,904	8,906	14,589	2,396,306	4,792,612
Rutherford	13,121	6,169	6,952	11,573	1,321,351	2,642,702
Sampson	16,436	7,954	8,482	16,624	1,285,111	2,570,222
Stanley..........	8,315	3,939	4,376	7,801	682,613	1,365,226
Stokes	11,208	5,451	5,757	10,402	1,045,122	2,090,244
Surry	11,252	5,428	5,824	10,380	1,302,930	2,605,860
Swain	New	co.				
Transylvania.	3,536	1,701	1,835	....	375,978	751,956
Tyrrell...........	4,173	2,096	2,077	4,944	405,036	810,072
Union	12,217	5,860	6,357	11,202	1,686,923	3,373,846
Wake	35,617	17,344	18,273	28,627	6,129,676	12,259,352
Warren	17,768	8,720	9,048	15,726	1,898,361	3,796,722
Washington...	6,516	3,131	3,385	6,357	621,297	1,242,594
Watauga........	5,287	2,571	2,716	4,957	482,489	964,978
Wayne...........	18,144	8,915	9,229	14,905	2,737,752	5,475,504
Wilkes...........	15,539	7,258	8,281	14,749	1,067,865	2,135,730
Wilson...........	12,258	5,916	6,342	9.720	1,478,116	2,956,232
Yadkin..........	10,697	5,080	5,617	10,714	965,803	1,931,606
Yancey..........	5,909	2,909	3,000	8,655	430,506	861,012
Totals.........	1,071,361	518,704	552,657	992,622	130,378,622	260,757,244

Principal Cities and Towns.—Raleigh, the capital of the State, had 7790 inhabitants in 1870; Wilmington, the principal city, 13,446; New Berne, the next town in size, about 6000; Fayetteville and Charlotte had between 4400 and 6000; Beaufort and Washington, between 2000 and 3000; Asheville, Plymouth, Tarboro', Goldsboro', Kinston, and Edenton, from 1200 to 2000 each.

Constitution, Courts, Representatives in Congress, etc.—The constitution of 1868 makes the executive branch of the State government to consist of a governor, a lieutenant-governor, a secretary of state, an auditor, a treasurer, a superintendent of public works, a superintendent of instruction, and an attorney-general, all elected by the people for four years. The legislature consists of a senate of 50 members, and a lower chamber of 120, with biennial sessions. The electoral qualification is extended to embrace all male persons, natives of the country or legally naturalized, who have resided in the State twelve months, and thirty days in the county where offering to vote. Atheists are disqualified for office, as also all convicted of treason, perjury, or other infamous crimes since becoming citizens of the U. S., unless legally restored to the rights of citizenship. The maintenance of free public schools and of the State University is provided for. A homestead and dwelling with personal property, in all to the value of $1500, are exempted from sale under any legal process for

the collection of debts. The *judiciary* consists of a supreme court, with appellate jurisdiction, presided over by a chief-justice and two associates; superior courts for nine judicial districts, for each of which a judge is elected, but who severally serve in rotation in each district. The supreme and superior court judges are elected for eight years. There are also inferior courts of justices of the peace in the several counties and of the chief magistrates of the several cities. Under the apportionment of 1872 the State of North Carolina is entitled to 8 Representatives in Congress.

Churches.—The following table gives the statistics of the religious denominations in the State in 1870 and in 1874–75:

Denominations.	Church organizations, 1870.	Church edifices, 1870.	Church sittings, 1870.	Church property, 1870.	Church organizations, 1875.	Church edifices, 1875.	Ministers, 1875.	Church members or communicants. 1875.	Adherent population, 1875.	Church property, 1875.
All denominations	2,683	2,497	718,310	$2,487,877	3,276	3,050	2,052	263,468	1,041,450	$3,078,150
Baptists, regular	951	910	243,920	578,050	1,437	1,363	848	118,914	456,000	895,000
Baptists, other	34	28	5,845	5,235	40	33	19	2,800	9,000	10,000
Christians	66	60	16,200	24,377	76	67	40	3,850	13,000	36,500
Congregationalists	1	1	150	1,500	6	5	5	168	700	6,400
Episcopalians (Protestant)	77	68	22,955	403,450	81	73	57	4,211	18,000	430,500
Friends	28	27	11,250	21,485	29	28	......	2,250	9,000	25,500
Jews	1	1	200	500	1	1	1	....	750	1,500
Lutherans	73	70	23,290	96,550	76	72	43	5,600	20,000	106,750
Methodists	1,193	1,078	300,045	775,805	1,298	1,189	816	107,560	448,000	926,000
Moravians	10	10	3,300	81,000	10	10	16	2,150	6,300	95,000
Presbyterians, regular	185	182	69,205	375,200	209	197	94	16,081	56,000	450,000
Presbyterians, other	19	19	7,950	20,275						
Reformed (late German)	31	29	9,300	23,400	33	31	19	1,950	8,000	29,000
Roman Catholics	10	9	3,300	64,100	11	11	7	....	1,600	69,000
Universalists	2	2	600	700	2	2	2	150	500	1,000
Union churches	3	3	800	16,250	3	3	2	170	700	16,000

History.—The coast of North Carolina was explored in 1584 by two vessels sent out by Sir Walter Raleigh. In Apr., 1585, Raleigh, having received a favorable report from his first expedition, sent out a second with a colony of 108 persons. This expedition planted a colony (the first English colony on this continent) at Roanoke Island, but the colonists returned the next year. In 1587, Sir Walter sent out a second colony of about the same number, with John White as governor. White soon returned to England, leaving 106 colonists, among them his own daughter and his granddaughter, Virginia Dare (the first child of English parentage born in the New World), who was born in Aug., 1587. Raleigh, absorbed in the wars in Europe, neglected his American colony, and when he sought for it some years later all traces of it had disappeared. No subsequent effort was made to plant a colony within the limits of North Carolina until 1653, when some colonists from Virginia pushed southward and made a settlement at Durant's Neck, in what is now Perquimans co. In 1662, Charles II. made a grant to the duke of Albemarle (Gen. Monk), the earl of Clarendon, Sir H. Berkeley (then governor of Virginia), and five others, of all lands lying between the 31st and 36th degrees of N. lat., westward to the Pacific Ocean. The grantees, organized as "Lords Proprietors of the Province of Carolina," were to have political control over the colonies which should be planted there. The portion of these lands lying between the Virginia line and Cape Fear River was designated as Albemarle co. Gov. Berkeley visited the colony already planted at Durant's Neck, and appointed William Drummond its governor, which office he held till 1667. Great efforts were made by the lords proprietors to draw colonists to Carolina, lands being liberally granted, taxation made very light, and complete liberty of conscience guarantied. Colonies of French, German, and Swiss Protestants were sent over, and New Berne founded by the latter, and three other towns incorporated. There was a short but fierce war with the Tuscaroras and other Indians (1711–13), but it terminated successfully for the colonists, and for sixty years they had no further trouble from the Indians. Yet the colony in 1729 had but 4 towns and only 13,000 inhabitants. About 1700 the colony was divided into North and South Carolina, and separate governments were organized. In 1729 the rights, interests, and franchises of the lords proprietors were purchased by the Crown, and the colony passed under royal control. The house of delegates was chosen by the people, but the members of the council and the colonial judiciary were appointed by the king. Gabriel Johnston, the second and best of the royal governors, ruled for nineteen years, and under his sway the colony grew very rapidly. Large bodies of emigrants from the N. of Ireland, from the Scottish Highlands, and a band of Moravians settled in the colony. The passage of the Stamp Act and the attempt to enforce it in the colony in 1765 met with such determined opposition that it was abandoned by the royal officers. In 1771 there was an insurrection of some of the inhabitants of Alamance co., professedly to resist what they considered excessive taxation. The insurgents called themselves "Regulators," and on May 16, 1771, a battle was fought between about 2000 of them, and the colonial militia, under the command of Gov. Tryon in person. The "Regulators" were defeated and dispersed, and some of their leaders were captured, tried, and executed. Gov. Tryon was succeeded by Josiah Martin, whose petulant and impolitic administration hastened the crisis which was already imminent. The last legislature which recognized the royal authority was that of Mar., 1774. The following August a provincial congress was called by the people, and appointed delegates to the Continental Congress to meet at Philadelphia. In Apr., 1775, a second provincial congress was called to meet in the following August, and in spite of Gov. Martin's protests the delegates were duly chosen, and the governor, alarmed, took refuge on board a British ship-of-war in Cape Fear River in July, 1775. The provincial congress met in August and organized a provisional government for the colony and a committee of safety, and provided for raising several regiments for public defence. In May, 1775, a few of the inhabitants of Mecklenburg co. assembled and formed an association for the assertion of political rights in the colony, and in an address delivered on the occasion renounced allegiance to the British crown; this movement, which has been spoken of as the "Mecklenburg Declaration of Independence" by some historians, did not receive either prompt or general support even in Mecklenburg co., and met with strong opposition in other parts of the State. Nearly a year later the colonial congress, on Apr. 12, 1776, empowered its delegates to the Continental Congress at Philadelphia to concur with those of other colonies in declaring independence and forming foreign alliances. The Declaration of Independence was ratified by North Carolina Aug. 1, 1776. On Dec. 18, 1776, a convention met at Halifax and framed a constitution for the State, which remained the organic law of the State until 1835. During the war North Carolina furnished her full quota of troops, but suffered little from actual warfare except from the frequent uprisings of the loyalists or Tories in the State. On several occasions these Tory parties were met and, after sharp engagements, defeated, their leaders captured and hanged. In Mar., 1781, occurred the battle of Guilford Court-house, between Gen. Greene on the American side with 4500 men, mostly raw militia, and Lord Cornwallis, with about 2000 disciplined British troops. Gen. Greene was defeated, but the losses were heavy on both sides. The Constitution of the U. S., framed by the convention of 1787, was rejected by North Carolina in 1788, but the following year it was ratified by the State. The same year the general assembly, "to aid in extinguishing the public debt of all the States and to promote harmony among the people of the U. S.," ceded to the general government all the right, title, and claim of the State to both the sovereignty and the lands W. of its present western boundary-line. During the war of 1812, North Carolina had no battles or serious losses on her own territory. After the election of Pres. Lincoln in Nov., 1860, many of the citizens sympathized with the secession movement; yet when, late in Dec., 1860, certain of its citizens took forcible possession of the U. S. forts Caswell and Johnston, within the limits of the State, their action was apologized for by the governor, but the forts were not restored to the Federal authorities. The general assembly which met in Jan., 1861, called a convention to meet in the following May to consider the question of secession. The questions of "convention" or "no convention" and of the election of delegates were submitted to the people at an election held Jan. 30, 1861, and while a large majority

of the delegates elected were opposed to secession, the total vote showed a majority against a convention of 651. After the surrender of Fort Sumter and the declaration of war, Apr. 15, 1861, Gov. Ellis called the legislature together again in extra session on Apr. 26, 1861. This legislature called another convention, the delegates to which were elected on the 13th of May, and the convention met on the 20th. On the day of its assembling this convention passed an ordinance of secession, and adopted and ratified the constitution of the Confederate States framed at Montgomery, Ala. Provision was made soon after for the representation of the State in the Confederate Congress at Richmond. The State responded very promptly to all calls for Confederate soldiers. But it was destined to have large home-experience of the disasters of war. In Aug., 1861, Forts Hatteras and Clark were seized by a Federal expedition; Roanoke Island and New Berne were captured by Burnside's expedition on Feb. 7 and 8, 1862; the region about Plymouth, Kinston, and Washington was taken and held in 1862–63; Fort Fisher was attacked, but unsuccessfully, under Butler and Admiral Porter in Dec., 1864, but captured after a desperate battle by Gen. Terry and Admiral Porter Jan. 15, 1865; and the surrender of Wilmington, which for 18 months had been the chief port of the blockade-runners from abroad, followed soon after. In Mar., 1865, Gen. Sherman entered the State in his march northward, the battles of Averysboro' and Bentonville occurred in the same month, and the negotiations for a capitulation by Gen. J. E. Johnston, and the final surrender at Greensboro' within the next thirty days. On Apr. 28, 1865, Gov. Vance issued a proclamation announcing that the war was at an end—that it was the duty of all good citizens to accept the result and unite with the civil authority in restraining disorders and violence. Maj.-Gen. Schofield, then in command of the military district, responded by a conciliatory general order, followed soon after by others regulating the labor relations of the freedmen and the people. The two parties accepted the situation in good faith. W. W. Holden was appointed provisional governor of the State in June, 1865, and in August an election of delegates to a constitutional convention at Raleigh was ordered. This convention met on Oct. 2, 1865, repealed the ordinance of secession, and formally declared that slavery and involuntary servitude should be and were for ever prohibited within the State. These acts of the convention were submitted to the people. An election was held soon after, and a governor, legislature, and members of Congress chosen. In May, 1866, the constitutional convention was again convened, and made some radical changes in the State constitution, which were rejected by the people. At the annual election in Aug., 1866, the governor (Worth) was re-elected and a new legislature chosen, which refused to ratify the Fourteenth amendment to the Constitution of the U. S., but professed its submission to Federal authority and its desire to be restored to relations of peace and concord with all. By the Reconstruction act of Congress of Mar., 1867, North Carolina was declared to be still under military authority, and all existing governments to be provisional till the State, by adopting the course prescribed by the act, should be qualified for readmission to the Union. Another convention was called, and delegates elected to it in accordance with the provisions of the Reconstruction act, Nov. 20, 1867. The convention met at Raleigh Feb. 14, 1868, and adopted a constitution which was ratified by the people. This constitution was approved by Congress June 23, 1868, and the Fourteenth amendment being ratified by the legislature, the State was restored to the Union in July, 1868. Since that time North Carolina has been slowly regaining its former prosperity.

Governors of the Colony and State.

(1) *Under the Lords Proprietors.*

George Drummond........1663–67
Samuel Stevens.............1667–74
——— Cartwright...........1674–77
——— Miller...................1677–78
John Culpepper............1678–80
John Harvey ‡...............1680–81
John Jenkins................1681–83
Seth Sothel....................1683–89
Philip Ludwell..............1689–93
Alexander Livingston...1693–95
Thomas Harvey.........1695–1705
Henderson Walker........1705–09
William Grover............1709–10
Edward Hyde...............1710–22
Thomas Pollock ‡..........1722–22
William Reed...............1722–24
George Burrington........1724–25
Sir Richard Everhard...1725–30

(2) *Under the Crown.*

George Burrington........1730–34
Gabriel Johnston..........1734–53
Nathaniel Rice..............1753–54
Matthew Rowan............1754–54
Arthur Dobbs...............1754–65
William Tryon..............1765–71
Josiah Martin...............1771–75

(3) *Governors of the State.*

Richard Caswell............1777–79
Abner Nast...................1779–81
Alexander Martin.........1782–84
Richard Caswell............1784–87
Samuel Johnston...........1787–89
Alexander Martin.........1789–92
Richard D. Spaight.......1792–95
Samuel Ashe.................1795–98
William R. Davie..........1798–99
Benjamin Williams....1799–1802
James Turner................1802–05
Nathaniel Alexander....1805–07
Benjamin Williams.......1807–08
David Stone..................1808–10
Benjamin Smith............1810–11
William Hawkins..........1811–14
William Miller..............1814–17
John Branch..................1817–20
Jesse Franklin...............1820–21
Gabriel Holmes.............1821–24
Hutchings G. Burton....1824–27
James Iredell.................1827–28
John Owen....................1828–30
Montfort Stokes............1830–32
David L. Swain.............1832–35
Richard D. Spaight........1835–37
Edward B. Dudley.........1837–41
John M. Morehead........1841–45
William A. Graham......1845–49
Charles Manly...............1849–51
David S. Reid................1851–55
Thomas Bragg...............1855–59
John W. Ellis ‡..............1859–61
H. T. Clark (acting)......1861–62
Zebulon B. Vance..........1862–65
Wm. W. Holden (prov.).1865–65
Jonathan Worth............1865–68
William W. Holden §.....1868–71
Tod R. Caldwell.............1871–74
Curtis H. Brogden.........1874–

Electoral and Popular Vote for President and Vice-President.

Elect. year.	Candidates for whom vote of State was cast.	Elect. vote.	Elect. year.	Candidates for whom vote of State was cast.	Elect. vote.	Pop. vote.	Minority candidates.	Pop. vote.
1792	George Washington P. George Clinton V.-P.	*12	1824	Andrew Jackson P. John C. Calhoun V.-P.	15	20,415	William H. Crawford P.	15,621
1796	John Adams P. Thomas Pinckney V.-P.	*12	1828	Andrew Jackson P. John C. Calhoun V.-P.	15	37,857	John Quincy Adams P.	13,918
1800	Thomas Jefferson P. Aaron Burr V.-P.	*†12	1832	Andrew Jackson P. Martin Van Buren V.-P.	15	24,862	Henry Clay P.	4,563
1804	Thomas Jefferson P. George Clinton V.-P.	14	1836	Martin Van Buren P. Richard M. Johnson V.-P.	15	26,910	William H. Harrison P.	23,626
1808	James Madison P. Charles C. Pinckney P.	11 3	1840	William H. Harrison P. John Tyler V.-P.	15	46,376	Martin Van Buren P.	34,218
1812	George Clinton V.-P. Rufus King V.-P.	11 3	1844	Henry Clay P. Theo. Frelinghuysen V.-P.	11	43,232	James K. Polk P. George M. Dallas V.-P.	39,287
1812	James Madison P. Elbridge Gerry V.-P.	15	1848	Zachary Taylor P. Millard Fillmore V.-P.	11	43,550	Lewis Cass P. William O. Butler V.-P.	34,869
1816	James Monroe P. Daniel D. Tompkins V.-P.	15	1852	Franklin Pierce P. William R. King V.-P.	10	39,744	Winfield Scott P. William A. Graham V.-P.	39,058
1820	James Monroe P. D. D. Tompkins V.-P.	15	1856	James Buchanan P. J. C. Breckenridge V.-P.	10	48,246	Millard Fillmore P. A. J. Donelson V.-P.	36,886
			1860	John C. Breckenridge P. Joseph Lane V.-P.	10	48,339	John Bell P. Edward Everett V.-P. S. A. Douglas P. H. V. Johnson V.-P.	44,990 2,701
			1868	Ulysses S. Grant P. Schuyler Colfax V.-P.	9	96,769	Horatio Seymour P. Francis P. Blair, Jr., V.-P.	84,601
			1872	Ulysses S. Grant P. Henry Wilson V.-P.	10	94,769	Horace Greeley P. B. Gratz Brown V.-P.	70,094

NOTES.—1. No vote in 1788, as the State had not ratified the U. S. Constitution.—2. No vote cast in 1864, as the State was out of the Union.

THOMAS JORDAN. REVISED BY L. P. BROCKETT.

North Carolina, tp. of Russell co., Ala. Pop. 720.

North Cas'tle, post-v. and tp. of Westchester co., N. Y. Pop. 1996.

North Chel'sea, tp. of Suffolk co., Mass. Pop. 1197.

North Chi'li, p.-v. of Chili tp., Monroe co., N. Y. P. 104.

North Codo'rus, tp. of York co., Pa. Pop. 2476.

North Col'lins, post-v. and tp., Erie co., N. Y. P. 1617.

North Con'way, post-v. of Conway tp., Carroll co., N. H., on the East Branch of the Saco River, and on the

* At elections thus marked the old system prevailed—candidate receiving highest vote, President; next highest, Vice-President.
† No choice by people.

‡ Died in office. § Impeached and deposed.

Eastern and Maine Central and the Portland and Ogdensburg R. Rs.

North'cote (Sir Stafford Henry), Bart., F. R. S., b. in London, England, Oct. 27, 1818; graduated with honors at Baliol College, Oxford; was called to the bar at the Inner Temple 1847; was one of the secretaries of the Universal Exhibition of 1851; entered Parliament as a Conservative 1855; took an active part in all questions relating to art and education; was president of the board of trade in Lord Derby's third administration 1866, secretary of state for India Mar., 1867–Dec., 1868; was a member of the high joint commission which drew up the treaty of Washington 1871, and became chancellor of the exchequer in Disraeli's cabinet Feb., 1874. He published *Twenty Years of Financial Policy* (1862); was elected governor of the Hudson's Bay Company Jan., 1869, and presided over the Social Science Association of the same year.

North Cove, post-v. and tp., McDowell co., N. C. P. 874.

North Cov'entry, p.-v. and tp., Chester co., Pa. P. 1251.

North Crafts'bury, p.-v., Craftsbury tp., Orleans co., Vt.

North Dans'ville, tp., Livingston co., N. Y. P. 4015.

North Digh'ton, post-v. of Dighton tp., Bristol co., Mass., on the Old Colony R. R.

North Dolan, tp. of Cass co., Mo. Pop. 903.

North East, tp. of Yuba co., Cal. Pop. 363.

North East, tp. of Adams co., Ill. Pop. 1521.

North East, tp. of Orange co., Ind. Pop. 930.

Northeast, post-v. and tp. of Cecil co., Md., on the North-east River and on the Philadelphia Wilmington and Baltimore R. R. Pop. of v. 748; of tp. 3645.

Northeast, tp. of Dutchess co., N. Y. Pop. 2179.

Northeast, tp., Erie co., Pa., on Lake Erie. P. 2213.

North-east, post-b. of Northeast tp., Erie co., Pa., on the Lake Shore and Michigan Southern R. R., 15 miles E. of Erie, contains the Lake Shore Seminary, 8 churches, 1 newspaper and job printing-office, 3 banks, 1 furnace, a paper-mill, a woollen-factory, a barrel-factory, a fine park, 1 wooden-ware manufactory, and stores. Pop. 900.
Cushman Bros., Eds. "Sun."

North Easton, post-v. of Easton tp., Bristol co., Mass., on the Dighton and Somerset branch of the Old Colony R. R., 24 miles S. of Boston; noted for the extensive shovel manufactories, the largest in the world, established by the brothers Oliver and Oakes Ames, who were natives of this village. It has various other manufactures, 1 newspaper, a splendid town hall (the gift of the Messrs. Ames), a good public library, 3 churches, and a beautiful cemetery. Pop. about 2000.

North Eau Claire, a v. and tp. of Eau Claire co., Wis., on the Chippewa River. Pop. of v. 965; of tp. 1127.

North El'ba, post-v. and tp., Essex co., N. Y. P. 349.

Northern Indians. See Migrations of the American Aborigines, by Hon. Lewis H. Morgan.

Northern Lights. See Aurora Borealis.

Northern Reese River Valley, a v. of Lander co., Nev. Pop. 106.

North Ev'ans, post-v., Evans tp., Erie co., N. Y. P. 150.

North Fair'field, post-v. of Fairfield tp., Huron co., O.

North Fay'ette, tp. of Allegheny co., Pa. Pop. 1482.

North Fer'risburg, post-v. of Ferrisburg tp., Addison co., Vt., on Rutland division of Central Vermont R. R.

North'field, tp. of Cook co., Ill. Pop. 1705.

Northfield, post-v. and tp., Washington co., Me. P. 190.

Northfield, post-v. and tp. of Franklin co., Mass., on the Connecticut River and on the New London Northern line of the Central Vermont R. R. Pop. 1720.

Northfield, tp. of Washtenaw co., Mich. Pop. 1300.

Northfield, post-v. of Rice co., Minn., on the St. Paul and Milwaukee R. R., 40 miles S. of St. Paul, has a good school system, 6 churches, is the seat of Carleton College, has 2 newspapers, 2 banks, and manufacturing interests. The country is adapted to agriculture. Pop. 2278.
W. H. Mitchell, Ed. "Northfield Standard."

Northfield, tp. of Merrimack co., N. H. Pop. 833.

Northfield, tp. of Richmond co., N. Y. Pop. 5949.

Northfield, post-v. and tp. of Summit co., O. Pop. 1009.

Northfield, post-v. of Washington co., Vt., on the Central Vermont R. R., 10 miles S. of Montpelier, has good graded and high schools, the Norwich University, 5 churches, several quarries of argillaceous slate, and stores. Pop. 3410. C. Dole, Ed. "Reveille."

Northfield, tp. of Jackson co., Wis. Pop. 499.

North Fork, tp. of Izard co., Ark. Pop. 454.

North Fork, tp. of Pope co., Ark. Pop. 215.

North Fork, tp. of Trinity co., Cal. Pop. 461.

North Fork, tp. of Marion co., Ill. Pop. 822.

North Fork, tp. of Delaware co., Ia. Pop. 912.

North Fork, post-v. and tp., Stearns co., Minn. P. 280.

North Fork, tp. of Barton co., Mo. Pop. 544.

North Fork, tp. of Jasper co., Mo. Pop. 868.

North Fork, post-v. and tp., Ashe co., N. C. P. 951.

North Fork, tp. of Washington co., Va. Pop. 2058.

North Fork of Big Creek, tp., Ellis co., Kan. P. 33.

North George'town, post-v. of Knox tp., Columbiana co., O. Pop. 173.

North Gran'ville, post-v. of Granville tp., Washington co., N. Y., contains a ladies' seminary.

North Green'bush, tp., Rensselaer co., N. Y. P. 3058.

North Had'ley, post-v. of Hadley tp., Hampshire co., Mass., on the Connecticut River.

North Hamp'ton, post-v. and tp. of Rockingham co., N. H., on the Eastern and Maine Central R. R. Pop. 723.

North Hampton, post-v., Pike tp., Clark co., O. P. 205.

North Ha'ven, post-v. and tp., New Haven co., Conn., on New York New Haven and Hartford R. R. Pop. 1771.

North Haven, post-v. and tp. of Knox co., Me., comprises North Fox Island in Penobscot Bay. Pop. 806.

North Haven, v., Southampton tp., Suffolk co., N. Y. Pop. 112.

North Hav'erhill, post-v. of Haverhill tp., Grafton co., N. H., on the Boston Concord and Montreal R. R.

North Hei'delberg, p.-v. and tp., Berks co., Pa. P. 979.

North Hemp'stead, tp., Queens co., N. Y. P. 6540.

North Hen'derson, post-v. and tp., Mercer co., Ill., on Rockford Rock Island and St. Louis R. R. Pop. 1062.

North He'ro, post-v., cap. of Grand Isle co., Vt., 51 miles N. W. of Montpelier, has good schools, several churches, 1 newspaper, and stores. Pop. 601.
J. M. Hawrican, Ed. "Grand Isle Co. Clerk."

North Hol'land, Canal of. In the sixteenth century Amsterdam was one of the first commercial ports of Europe. The gradual advancement of the art of navigation, together with the increase in draught of vessels, demanded an access more favorable than was afforded by the difficult and shoal channels through the Zuyder Zee. To supply such an access, the North Holland Canal was cut from Buiksluyt, opposite Amsterdam, to the Helder, a distance of 51 miles. It is 124 feet broad at the surface and 31 feet at the bottom, and is available for vessels drawing 18 feet of water. The open sea can be reached in a time varying from eighteen hours to two days. But in winter even this great highway is blocked up by ice. Moreover, its capacity is not equal to that of the largest sea-going commercial vessels now in use. Hence the recent construction of the North Sea Canal (which see).
J. G. Barnard.

North Ho'mer, part of South Homer tp., Champaign co., Ill. Pop. 641.

North Hous'ton, v. of Loramie tp., Shelby co., O. P. 44.

North Hud'son, post-v. and tp., Essex co., N. Y. P. 738.

North Hunt'ington, tp., Westmoreland co., Pa. P. 3493.

North Jud'son, post-v. of Starke co., Ind., on the Pittsburg Cincinnati and St. Louis R. R., 70 miles from Chicago, has 3 churches, 3 hay-presses, 2 hotels, 1 grist-mill, 1 newspaper. Business, stock-raising and dairying. Pop. 115. J. L. Sweney, Ed. "Courier."

North Kings'town, tp., Washington co., R. I. P. 3568.

North Kings'ville, post-v. of Kingsville tp., Ashtabula co., O., on the Lake Shore and Michigan Southern R. R., and near Lake Erie.

North La Crosse, post-v. of Cambpell tp., La Crosse co., Wis., on the Mississippi River and on the Chicago Milwaukee and St. Paul R. R. Pop. 1494.

North Law'rence, post-v. of Grant tp., Douglas co., Kan., on the Kansas River, opposite Lawrence, and on the Kansas Pacific R. R.

North Lawrence, post-v. of Lawrence tp., St. Lawrence co., N. Y., on Deer River and the Ogdensburg and Lake Champlain R. R. Pop. 550.

North Leb'anon, tp. of Lebanon co., Pa. Pop. 2263.

North Leom'inster, post-v. of Leominster tp., Worcester co., Mass., on the Fitchburg R. R.

North Lewis'burg, post-v. of Champaign co., O., 14 miles N. E. of Urbana, on the Atlantic and Great Western R. R., has a public-school building, 6 churches, 3 hotels, 1

bank, 2 flouring-mills, and stores. Principal business, stock-raising and farming. Pop. 733.
F. S. Fuson, Ed. "North Lewisburg Press."

North Lib'erty, post-v. of Liberty tp., St. Joseph co., Ind. Pop. 223.

North McGreg'or, post-v. of Mendon tp., Clayton co., Ia., on the Mississippi River, 1 mile N. of McGregor and on the Chicago Milwaukee and St. Paul R. R.

North Mad'ison, post-v. of Madison tp., Jefferson co., Ind., on the Jeffersonville Madison and Indianapolis R. R., 2 miles from Madison. Pop. 1007.

North Maho'ning, tp. of Indiana co., Pa. Pop. 1263.

North Man'chester, post-v. of Manchester tp., Hartford co., Conn., on Hartford Providence and Fishkill R. R.

North Manchester, post-v. of Wabash co., Ind., on the Cincinnati Wabash and Michigan and the Detroit Eel River and Illinois R. Rs., 14 miles N. E. of Wabash, has 1 academy, 3 churches, 1 bank, manufacturing interests, 2 printing-offices, 3 hotels, 1 newspaper. Pop. about 1800.
M. E. Pleas, Ed. "Manchester Republican."

North Man'heim, tp. of Schuylkill co., Pa. P. 2420.

North Man'itou Island, a v. of Galilee tp., Manitou co., Mich. Pop. 91.

North Mid'dleborough, post-v. of Middleborough tp., Plymouth co., Mass.

North Mid'dleton, tp., Cumberland co., Pa. P. 1223.

North Mid'dletown, p.-v., Bourbon co., Ky. P. 320.

North Mil'ford, v. of Milford hundred, Kent co., Del. Pop. 1150.

North More'land, tp. of Wyoming co., Pa. Pop. 831.

North Mud'dy, tp. of Jasper co., Ill. Pop. 867.

North Mur'derkill, hundred, Kent co., Del. P. 3631.

North Nor'wich, post-v. and tp. of Chenango co., N. Y., on the Utica division of the Delaware Lackawanna and Western R. R. Pop. 1075.

North Pel'la, v., Lake Prairie tp., Marion co., Ia. P. 87.

North Plains, p.-v. and tp., Iowa co., Mich. P. 1976.

North Platte, post-v. and cap. of Lincoln co., Neb., situated on the Union Pacific R. R., 300 miles W. of the Missouri River, has good schools, 4 churches, the repair-shops of the Union Pacific R. R., and stores and shops. The town derives its maintenance from the railroad employés and track-hands, who number several hundred. Stock-raising constitutes the leading industry. Pop. about 1100. A. H. Church, Ed. "Republican."

North'port, post-v. and tp. of Tuscaloosa co., Ala. Pop. of v. 604; of tp. 2273.

Northport, post-v. and tp. of Waldo co., Me., on Penobscot Bay. Pop. 902.

Northport, post-v. of Leelenaw tp., cap. of Leelenaw co., Mich., at the N. extremity of the peninsula, which projects into Lake Michigan W. of Grand Traverse Bay. Pop. 238.

Northport, post-v. of Suffolk co., N. Y., on the Jefferson and Northport branches of the Long Island R. R., and on Northport harbor, an arm of Long Island Sound, has 3 churches, 3 shipyards, 2 newspapers, 4 brickyards, 3 hotels, deposits of fire-sand and clay, 1 mill, and stores. Pop. 1060. C. H. Davids, Ed. "Advertiser."

North Prov'idence, tp., Providence co., R.I. P. 20,495.

North Read'ing, post-v. and tp. of Middlesex co., Mass., on the Salem and Lowell R. R. Pop. 942.

North River. See Hudson River.

North River, tp. of Augusta co., Va. Pop. 4163.

North'rop (Birdsey Grant), A. M., b. at Kent, Conn., July 18, 1817; graduated at Yale in 1841; studied divinity at New Haven; Congregational pastor at Saxonville, Mass., 1846–57; agent of the Massachusetts board of education 1857–66; became secretary of the Connecticut State board of education 1869; residence, New Haven.

Northrop (George Washington), D. D., b. Oct. 15, 1826, at Antwerp, Jefferson co., N. Y.; graduated at Williams College (Mass.) 1854, Rochester Theological Seminary 1857; was first instructor, then professor of church history, in Rochester Theological Seminary till 1867; then elected president and professor of Christian theology in the Baptist Union Theological Seminary, Chicago, Ill.

North Sa'lem, post-v. of Eel River tp., Hendricks co., Ind. Pop. 261.

North Salem, post-v. and tp., Linn co., Mo. Pop. 953.

North Salem, post-v. and tp. of Westchester co., N. Y. Pop. 1754.

North San Die'go, post-v. of San Diego co., Cal.

North San Juan, post-v. of Nevada co., Cal., 13 miles N. of Nevada City, has good schools, 1 church, a banking-house, 3 hotels, 1 newspaper and job printing-office, and stores. Stages make daily connection between Nevada City and other important places. It is one of the best hydraulic-mining sections in the State. Pop. about 1000. Editors "Times."

North Scit'uate, post-v. of Scituate tp., Providence co., R. I., is the seat of Lapham Institute.

North Sea, or **German Ocean** (anc. *Mare Germanicum*), lies between Great Britain and the continent of Europe, having the former and the Orkney and Shetland Isles on the W., and Norway, Denmark, Hanover, Belgium, and part of France on the E. and S. Its extreme length from Dover Straits to the most northern of the Shetland Isles, between which and the coast of Norway it merges into the North Atlantic, is about 700 miles; greatest breadth about 420 miles. By the "Skager Rack" Inlet and its extension, the "Kattegat," between the coasts of Denmark and of Norway and Sweden, it communicates with the Baltic Sea. By the Straits of Dover and English Channel (which see) it has its southern communication with the Atlantic. The depth varies from 66 to 500 feet, the greatest depths being in the northern portions between the N. of Scotland and Norway. (See *Johnston's Physical Geography.*) If a line be drawn from the N. point of Denmark to the mouth of the Humber, all S. has 30 fathoms or less, which is said to be the average depth. A line from the same point to Edinburgh will leave S. of it nearly all the 50 fathom depths. Farther N. the depth increases rapidly, and is said to attain 190 fathoms near the Norway coast. The bed of the sea is traversed by several vast shoals, the greatest of which, the Dogger Bank, occupies the centre of the sea from lat. 54° 10′ to 57° 24′ N., lon. 1° to 6° 7′ E.; another extends from the Firth of Forth, Scotland, in a N. E. direction a distance of 110 miles, while others run from Denmark and Jutland more than 100 miles to the N. W. The great oceanic tidal wave, deflected around the British Isles, enters this sea from the N. Pursuing its course southward, it rules the tides as far S. as the Thames and opposite coast, sensibly affects the tides of the Continent through the Channel, but, encountering the tide wave from the English Channel in the southern portions, the tidal phenomena are there the result of the conflict, or rather the union, of the two distinct waves, each exaggerated by a shelving bottom and the contraction between converging shores. At the Orkneys the rise is but 12 feet; at the mouth of the Humber and Thames 18 to 20 feet. Washing the shores of populous empires, the North Sea, notwithstanding the manifest dangers due to its currents, fogs, banks, and contracted area, teems with shipping, and has been, indeed, the cradle of navigation to the northern nations, as was the Mediterranean to the ancients. Its fisheries of cod, mackerel, herring, etc. are important, and contribute in no small degree to the wealth and characteristic development of its marginal population. The island of Heligoland (which see) is the only one which properly belongs to the North Sea. The numerous islands along the coast of Norway, Denmark, and Holland are rather fragments of a broken coast-line than islands in the sea. One-ninth of the total river discharge of Europe is received by the North Sea from the Humber, Thames, the Rhine and Scheldt, Eider, Elbe, Weser, etc., and from the "firths" and "fiords" of the Scotch and Norway coasts. The Zuyder Zee (which see), which is entered from the North Sea at the Helder, is separated by the chain of sand islands, Texel, Terschelling, etc., which are the existing fragments of the ancient coast-line. The great work of modern hydraulic and maritime engineering, the North Sea Canal (which see), makes Amsterdam virtually a seaport of the North Sea. (See *Zur Physik des Meeres*, by Dr. Meyer, from the second annual report of the Kiel commission for investigation of the German seas. Berlin, 1874.) J. G. Barnard.

North Sea Canal of Holland (called in Holland **The Amsterdam Canal**). Even before making the North Holland Canal (which see) it had been proposed to connect Amsterdam directly with the North Sea. That work answered the existing exigencies, but it was found not to answer those arising from the modern developments of commerce. The bold project of a *direct* water communication with the North Sea through the Y (Dutch Ij), the Wijkermeer, and across the very narrow neck of land (*Holland op zijn Smalst*) which separates the latter from the sea, was revived in 1854. The difficulties were great. Nine different "commissions" of engineers and other experts successively studied and reported upon the subject; and it was not until Jan., 1863, that the law authorizing the construction was perfected and the work undertaken. The project involves not only the canal itself, with its sea-locks and harbor, but the shutting off of the Y at its east-

ern end from the Zuyder Zee by a dam one mile in length with locks adequate to the purposes of all the coasting-trade of the Zuyder, and of the lighter draught vessels for the North Sea, which still may enter by the Helder. The formation of this dam and the construction of its triple locks,* founded by means of a coffer-dam 550 feet in diameter in 18 feet of water on 9000 piles, are among the most remarkable works of hydraulic engineering of recent times.

The canal has a bottom width of 27 mètres (90 feet, about) and a depth of 7½ mètres, or 25 feet; it is carried by embankments dredged from the bottom or brought from the land through the Y and Wijkermeer (the depth of which averages about six feet) and by an excavation (4 miles) through the sand *downs* of the isthmus; total length, 23,700 mètres (14⅘ miles). The great sea-lock is situated two-thirds of a mile from the shore-line. It has a double (in length) lock-pond of 120 mètres (400 feet, nearly) in total length, 60 feet width, with 25 feet depth on the lock-sills. It is founded at 36 feet below mean low water in the sand of the coast downs, "a depth never before drained in the Netherlands." An artificial harbor has been constructed at the sea entrance (for which see HARBOR, vol. ii., p. 792). This great work is drawing nigh to completion. The Orange locks have been long in use. The sea-locks are completed, and most of the canal trunk. The waters of the Y and Wijkermeer are to be drained into the canal (mostly accomplished), furnishing extensive *polders* of arable land. The canal also receives the drainage which was formerly thrown into these waters, which by powerful Appold centrifugal and force-pumps at the Orange locks it discharges into the Zuyder Zee.† (For further particulars see *Professional Papers* No. 22, Corps of Engineers, U. S. A., by the writer, and the work of M. Croizette Desnoyers, ingénieur-en-chef des ponts et chausées.)

J. G. BARNARD.

North Sew′ickley, p.-v. and tp., Beaver co., Pa. P. 1108.

North Shade, tp. of Gratiot co., Mich. Pop. 890.

North Shenan′go, p.-v. and tp., Crawford co., Pa. P. 901.

North Smith′field, tp. of Providence co., R. I. Pop. 3052.

North Som′erville, a v. of Somerville tp., Middlesex co., Mass., 3 miles from Boston.

North Spring′field, post-v. of Greene co., Mo., on the Atlantic and Pacific R. R., 241 miles S. W. of St. Louis, has a union school building, Drury College, 1 bank, 1 newspaper, the machine-shops of the A. and P. R. R., 1 woollen and 1 flouring mill, and the usual stores.

Z. T. HEDGES, ED. "SOUTH-WEST."

North Star, post-v. and tp., Gratiot co., Mich. P. 846.

North Sto′nington, post-v. and tp. of New London co., Conn. Pop. 1759.

North Strabane′, tp. of Washington co., Pa. P. 1273.

North Syd′ney, a port of entry of Cape Breton Island and county, on the N. W. arm of Sydney Harbor, 18 miles N. of Sydney. Coal is extensively shipped here. There is a marine railway, a U. S. consulate, a weekly newspaper, manufactures of leather, shoes, shipping, etc. Steamers connect with Sydney. Pop. about 1000.

North Tar′rytown, post-v. of Westchester co., N. Y.

North Tope′ka, post-v. of Shawnee co., Kan., on the Kansas Pacific R. R. and opposite Topeka, on the N. bank of Kansas River; has 1 newspaper. P. about 1000.

North Towan′da, tp. of Bradford co., Pa. Pop. 592.

North Troy, post-v. of Orleans co., Vt., on the Southeastern R. R., has 1 academy, 3 churches, 1 foundry, a large hotel, 1 bank, 1 newspaper, and stores. Pop. about 1500. M. T. HATCH, ED. "PALLADIUM."

Northum′berland, the northernmost county of England, is bounded E. by the North Sea and N. by Scotland. Area, 1952 square miles. Pop. 386,959. The western part of the country is covered with the bare and naked Cheviot Mountains or occupied by wild moorlands. Towards the E. coast the land opens in large, fertile valleys, with good pasturage and soil fitted for tillage. The principal source of wealth, however, is the rich mines of lead, copper, and coal, which are worked in the Cheviot Mountains and which yield annually 20,000,000 tons of coal.

Northumberland, a large county of New Brunswick, Canada. Its surface is fertile and heavily timbered. It is traversed by the navigable Miramichi River, flowing into Miramichi Bay. The fisheries are important. Shipbuilding, lumbering, and agriculture are largely carried on. The county is intersected by the Intercolonial Railway. Cap. Newcastle. Pop. 20,116.

* Called the "Orange locks" (*Oranje Sluizen*), after the reigning family.

† At brief intervals natural drainage can be effected into the North Sea through the sea-lock.

Northumberland, a fertile county of Ontario, Canada, lying on the N. side of Lake Ontario. It has 2 ridings, and is associated with Durham co. for judicial purposes. It is traversed by the Grand Trunk and other railways. Cap. Coburg. Pop. 39,085.

Northumberland, county of Central Pennsylvania, bounded W. by the Susquehanna and its W. branch, and traversed by the E. branch of the Susquehanna. Area, 300 square miles. It is traversed by steep mountain-ridges, and has some rich valleys. Cattle, grain, and wool are leading products. The mining of anthracite coal, iron, and limestone are important pursuits. The manufactures include lumber, leather, flour, lime, brick, carriages, metallic wares, furniture, iron, clothing, saddlery, etc. The county is traversed by various railroads. Cap. Sunbury. Pop. 41,444.

Northumberland, county in the "Northern Neck" of Virginia, bounded N. E. and E. by the Potomac River and Chesapeake Bay. Area, 300 square miles. It is rather level, and has a light, productive soil. Corn is the leading product. Cap. Heathsville. Pop. 6863.

Northumberland, post-v. and tp of Coos co., N. H., on the Connecticut River and on the Grand Trunk R. R. Pop. 955.

Northumberland, post-v. and tp. of Saratoga co., N. Y., on the Champlain Canal. Pop. 1655.

Northumberland, post-b. of Northumberland co., Pa., on the Philadelphia and Erie and the Lackawanna and Bloomsburg R. Rs., at the confluence of the N. and W. branches of the Susquehanna River, has a fine park, 7 churches, 1 bank, a rolling-mill and nail-factory, 1 very large furnace, 1 planing, 1 flouring, and 2 saw mills, 1 newspaper, car-shops, and a farm-implement manufactory. Pop. 1788. C. W. GUTELIUS, ED. "PRESS."

Northumberland (ALGERNON **Percy**), FOURTH DUKE OF, second son of the second duke, b. in England Dec. 15, 1792; educated at Eton; entered the navy in childhood; retired 1815; was created Baron Prudhoe 1816; spent many years in travel, especially in Egypt and other Eastern countries; collected a magnificent Oriental museum; founded churches, schools, and charitable institutions, and promoted historical, philological, and archæological research; married Lady Eleanor Grosvenor, daughter of the marquis of Westminster, 1842; succeeded his brother Hugh in the dukedom 1847; restored and decorated upon a splendid scale the ancient seat of the family, Alnwick Castle; was first lord of the admiralty 1853; made a knight of the Garter 1858; was F. R. S., F. S. A., D. C. L., and president of the Royal Institution. D. at Alnwick Castle Feb. 12, 1865.

Northumberland (JOHN **Dudley**), DUKE OF, b. in England in 1502; commanded the English squadron during the war with France 1544–45; was an executor of the king's will 1547; intrigued against the protector Somerset 1549; acquired chief power in the council 1550; was created earl of Northumberland, lord high steward, and earl marshal 1551; married his fourth son, Lord Guilford Dudley, to Lady Jane Grey, May, 1553; prevailed on Edward to adopt Lady Jane as his successor, June; placed her on the throne July 10, and was executed as a traitor Aug. 22, 1553.

Northum′bria, the largest kingdom of the Saxon Heptarchy, embracing, as its name imports, the region N. of the Humber, and at one time extending to the Forth in Scotland. It was formed into a kingdom by Ida about 547 by the union of Bernicia and Deira. The kingdom was divided at the death of Ida, but reunited under Ethelfrith 593, became the leading British power under Oswald 634–42, and was extinguished by Egbert 827, when the name of England was first applied to the kingdom resulting from the aggregation of the minor states to Wessex and Northumbria. The present county of Northumberland shows a survival of the name of a kingdom many times greater in extent.

North Un′ion, tp. of Fayette co., Pa. Pop. 1683.

North Union, tp. of Schuylkill co., Pa. Pop. 666.

North Uniontown, p.-v., Jackson tp., Highland co., O. Pop. 8.

North Vas′salborough, post-v. of Vassalborough tp., Kennebec co., Me.

North Ver′non, post-v. of Jennings co., Ind., on the Jeffersonville Madison and Indiana and the Ohio and Mississippi R. Rs., 72 miles W. of Cincinnati, has a large academy, 7 churches, 2 newspapers, 4 furniture-factories, a woollen-mill, 2 flouring-mills, several hotels, and stores. Pop. 1758. R. A. CONNER, ED. "PLAINDEALER."

North Versailles′, tp., Allegheny co., Pa. Pop. 2461.

North′ville, post-v. and tp., La Salle co., Ill. Pop. 1187.

Northville, post-v. of Plymouth tp., Wayne co., Mich., on the Rouge River, and on the Flint and Pere Marquette and the Holly Wayne and Monroe R. Rs.; has excellent water-power, manufactories, and 1 newspaper. Pop. 626.

Northville, post-v. of Northampton tp., Fulton co., N. Y., on the Sacondaga River.

North Wales, post-b. of Montgomery co., Pa., on the North Pennsylvania R. R., 21 miles from Philadelphia, contains excellent schools, 4 churches, 1 large mill, 1 sash-factory, 3 hotels, 1 newspaper, and stores. Principal employment, farming and dairying. Pop. 407.

J. Howard Marlin, Ed. "North Wales Record."

North West, tp. of Orange co., Ind. Pop. 879.

North West, tp. of Brunswick co., N. C. Pop. 2030.

North'west, post-v. and tp., Williams co., O. P. 1521.

Northwest Corner, tp. of Rice co., Kan. Pop. 5.

North-western University, an institution of learning of the M. E. Church, situated at Evanston, Cook co., Ill., on the shore of Lake Michigan, 12 miles N. of Chicago. Chartered in 1851 and formally opened in 1855, it now (1876) consists of seven distinct colleges, namely, of literature and science, literature and art (for women), technology, music, theology, law, and medicine, besides a preparatory department. The theological department, known as Garrett Biblical Institute, was established in 1856; the medical and legal departments are located at Chicago, having been assimilated to the university in 1869 and 1873, in which years the ladies' college at Evanston was also brought under the same management and the technological department was begun. There are three principal buildings, one of which, University Hall, is a solidly-built and elegant structure, containing the chapel, library, museum, and recitation-rooms. The library possesses a fund of $60,000, and now consists of 30,000 volumes, chiefly German works; the museum contains 15,000 specimens. All the courses of instruction are open to both sexes. There are now above 60 instructors in the various departments, and an aggregate of above 800 students.

Northwest Fork, hundred and tp. of Sussex co., Del. Pop. 2071.

Northwest Fork, tp., Dorchester co., Md. Pop. 1652.

North-west Passage, a communication by sea between the Atlantic and Pacific oceans, which from the sixteenth to the middle of the nineteenth century was vainly sought by scores of navigators. (See Polar Research, by Judge Charles P. Daly.)

Northwest Prov'inces, or **Agra,** a great political division of British India, situated around the upper and middle course of the Ganges, and bounded by Kumaon, Nepaul, Gwalior, and Rajpootana. They consist of the provinces of Delhi, Merut, Rohilcund, Agra, Allahabad, and Benares, and comprise an area of 83,573 square miles, with 30,777,941 inhabitants, of whom one-sixth are Mohammedans and the rest Brahmanical Hindoos. Cap. Allahabad.

Northwest Ter'ritories, a general name for all that part of the Dominion of Canada lying W. and N. of the provinces of Quebec and Ontario, but excluding the provinces of Manitoba and British Columbia. That part whose waters flow into Hudson's Bay is officially called "Rupert's Land." Area, about 2,880,000 square miles.

Face of the Country, Climate, etc.—Though this region has been long known as the "Hudson's Bay Company's Territory," and has been long traversed by trappers, hunters, and fur-traders, comparatively little has been published with regard to it. The western limits of the Hudson's Bay basin are reported to be in part marked off by hills of metamorphic rock, but in general the valleys of the Mackenzie and Red River may be said to be continuous with that of the Mississippi. The iron and lignite-bearing beds of Colorado and Wyoming in the U. S. appear to continue northward to the Arctic Ocean. The country S. and W. of Hudson's Bay is generally well wooded, and has a fair soil, but the severe and long winters will probably always prevent the general settlement of this part. There are great tracts called "barrens," where the hardy lichen called *tripe de roche* (*Gyrophora pustulata*) alone furnishes a poor and scanty food for the lost *voyageur*. In geology, area, soil, and climate the valley of the Nelson resembles that of the Volga. That of the Athabasca is quite as favorable for settlement. The Peace River country has a better climate than that of Manitoba or Northern Minnesota, and is also well watered and timbered, while the soil is not excelled by any. Northward, to within 800 miles of the Arctic Ocean, the western part of the country is generally arable, and one-half will probably be suitable for wheat-growing. The Mackenzie River is navigable for seagoing ships to Fort Simpson. Above the Stony Rapids at this point it is again navigable into Great Slave Lake.

Population and Industrial Pursuits.—The scanty population is mostly Indian. The mission of the late Hudson's Bay Company was a peaceful one, but little was done in the way of colonization. Hence, there were few collisions with the aborigines. The presence of Canadian French *voyageurs* and trappers and of Scotch traders has given origin to a small class of half-breeds. The chief support of the natives and whites has been hunting and trapping for furs. Buffalo, beavers, sables, martens, wolves, foxes, bears, otters, fishers, etc. are very numerous, making this the most important fur-producing region in the world. The musk-ox and some species of deer are abundant, the former north-eastward, the latter more generally towards the S. and W. Geese, ducks, swans, and various kinds of grouse are abundant game-birds. Fish abound in the numerous lakes and streams.

Religion.—The Anglican bishop of Rupert's Land has his see-house at Fort Garry, Manitoba. The Roman Catholic archbishop of St. Boniface resides in Manitoba. His two suffragans (at present the bishops of Anemurium and of Satala *in partibus*) are stationed respectively in the N. and in the S. parts.

Government.—The governor of Manitoba is at present also governor of the North-west Territories, and is assisted by an executive council of three. Pop. about 68,000.

North Wey'mouth, post-v. of Weymouth tp., Norfolk co., Mass., on Massachusetts Bay and on the South Shore R. R.

North White'hall, p.-v. and tp., Lehigh co., Pa. P. 4170.

North Wo'burn, p.-v. of Woburn tp., Middlesex co., Mass.

North'wood, post-v. and tp., cap. of Worth co., Ia., on the Central R. R. of Iowa and the Shell Rock River, has a high school, 3 churches, 1 bank, extensive flouring, saw, and carding mills, 1 newspaper, a book and job printing-office, 2 hotels, and stores. Pop. of v. 289; of tp. 725.

A. T. McCargar, Ed. "Pioneer."

Northwood, tp. of Rockingham co., N. H. Pop. 1430.

North Wood'berry, tp. of Blair co., Pa. Pop. 953.

North Wood'bury, v. of Ferry tp., Morrow co., O. P. 118.

North Yar'mouth, post-v. and tp. of Cumberland co., Me., on the Grand Trunk R. R. Pop. 940.

Nor'ton, county in the N. W. of Kansas, bounded N. by Nebraska. Area, 900 square miles. It is rolling, and well adapted to stock-raising. Cap. Norton.

Norton, post-v. and tp. of Kankakee co., Ill. Pop. 1180.

Norton, post-v., cap. of Norton co., Kan., on Prairie Dog Creek (also called Norton Centre).

Norton, post-v. and tp. of Bristol co., Mass., on the Boston Clinton and Fitchburg R. R. Pop. 1821.

Norton, tp. of Muskegon co., Mich. Pop. 688.

Norton, tp. of Summit co., O. Pop. 1821.

Norton, tp. of Essex co., Vt. Pop. 303.

Norton (Andrews), b. at Hingham, Mass., Dec. 31, 1786; graduated at Harvard College 1804; studied theology; was tutor at Bowdoin College 1809–10, at Harvard 1811–12; edited the *General Repository* 1812; became lecturer on biblical criticism and librarian 1813. On the organization of the Harvard Divinity School (1819) he became Dexter professor of sacred literature; resigned the office of librarian 1821, and the professorship 1830, on account of ill-health; devoted the remainder of his life to literary pursuits; wrote some devotional poems, many reviews and essays, and several controversial treatises in support of Unitarian theology and against infidelity; edited the works of Charles Eliot (1814) and Levi Frisbee (1823); aided Charles Folsom in conducting the *Journal of Foreign Literature* (1833), and published an elaborate and learned work, *The Genuineness of the Gospels* (vol. i. 1837; vols. ii. and iii. 1844; vol. iv., posthumous, 1855). D. at Newport, R. I., Sept. 18, 1853, leaving in MS. a *Translation of the Gospels* (1855). Prof. Norton was universally recognized as a leader of conservative Unitarianism.

Norton (Caroline Elizabeth Sarah **Sheridan**), a granddaughter of R. B. Sheridan, was b. in 1808; in 1827 married the Hon. G. C. Norton, brother and heir-presumptive of Lord Grantley. Their only son was born in 1831, and in 1836 she was accused of adultery, tried, and acquitted, but the parties have since lived apart. She is the author of several volumes of poems, a number of powerful novels, and of various letters concerning the condition of the poor, the laws relating to women, and other prominent social questions.

Norton (Charles Eliot), son of Andrews, b. at Cambridge, Mass., Nov. 16, 1827; graduated at Harvard Col-

lege 1846; engaged in commerce in Boston; went to India as supercargo of a ship 1849; travelled there extensively; returned home through Europe 1850; wrote *Considerations on some Recent Social Theories* (1853); edited, with Dr. Ezra Abbot, his father's posthumous writings (1855); resided in Europe 1855–57; published *Notes of Travel and Study in Italy* (1860); edited the papers of the Loyal Publication Society 1861–65; was associate editor of the *North American Review* (1864–68); issued a translation of Dante's *Vita Nuova* (1867); again in Europe 1868–73; resides now in Cambridge.

Norton (John), b. at Stortford, Hertford, England, May 6, 1606; educated at Cambridge; became curate of Stortford; came to Plymouth, Mass., 1635; preached there during one winter; became minister of the church at Ipswich 1636; was a prominent member of the convention which formed the "Cambridge Platform" 1648; became colleague of Rev. John Wilson as minister of the First church at Boston 1652, and went to England with Gov. Bradstreet as agent of the colony to present an address to Charles II. D. at Boston Apr. 5, 1663. He wrote a large number of works. His *Life* was written by Rev. A. W. McClure in vol. ii. of the *Lives of the Chief Fathers of New England.*

Norton (John Pitkin), b. at Farmington, Conn., 1822; graduated at Yale College 1846; became first professor of agricultural chemistry in that institution 1847; published many scattered essays on scientific and agricultural subjects, and was author of *Elements of Scientific Agriculture* (1850) and the *Appendix* to Stephens's *Book of the Farm* (2 vols., 1858). D. at New Haven Sept. 5, 1852.

Norton (Sidney Andrews), b. at Bloomfield, O., in 1835; graduated at Union College 1856; studied at Bonn, Leipsic, and Heidelberg; taught at Poughkeepsie, N. Y., Hamilton, Cleveland, and Cincinnati, O., and then became professor of chemistry at Miami Medical College; author of a series of textbooks on chemistry and physics.

Norton (William Augustus), A. M., b. at East Bloomfield, N. Y., Oct. 25, 1810; graduated at West Point 1831; was assistant professor of natural philosophy at West Point 1831–33; professor of natural philosophy and astronomy in the University of New York 1833–39; in Delaware College 1839–50; president of Delaware College 1850–52; became professor of civil engineering in 1852; author of textbooks on astronomy, physics, etc., and of scientific papers.

Norton (William E.), b. in Boston, Mass., June 28, 1843; was apprenticed in youth to a house, sign, and fresco painter; went to sea at eighteen, and at twenty-two began a successful career as a marine painter, in which department he has produced several highly commended pictures.

Nor'walk, post-b. and tp., Fairfield co., Conn., 42 miles by rail from New York City, the S. terminus of the Danbury and Norwalk and Shepaug Valley R. Rs., contains an excellent harbor, 4 public halls, fine schools, public and private, with several institutes and seminaries, a public library, 14 churches, 3 national and 3 savings banks, 2 fire insurance companies, 2 newspapers, good hotels, 3 carriage-factories, 2 shipyards, 1 marine and 1 horse railway, an abundant supply of water and gas throughout the city, 2 felt-mills, 2 iron-foundries, 2 planing and 4 grist mills, chemical works, an iron bolt and screw factory, and several other manufacturing interests of importance. The Norwalk lockworks and the Norwalk ironworks are among the largest establishments of the kind in the country. Norwalk sends many flowers to New York during the winter months, and the manufacture of the Velocity lawn-mower has recently been established here. The oyster-trade of Norwalk is extensive, a capital of over $2,000,000 being invested in this industry. Numbers of New York residents make this place their summer abode, and the growth of the place is rapid. Pop. 12,119.

A. H. Byington, Ed. "Norwalk Gazette."

Norwalk, post-v. and tp., cap. of Huron co., O., equidistant from Cleveland and Toledo, has good union schools, 11 churches, 3 weekly newspapers, 1 knitting and sewing machine factory, 2 planing and 2 grist mills, 1 shoe-factory, 2 breweries, and stores and repair-shops. Principal industry, farming. Pop. of v. 4498; of tp. 5752.

Jas. H. & C. H. Rule, Eds. "Experiment."

Nor'way [Dan. *Norge;* Ger. *Norwegen*], an independent kingdom of Europe, united with Sweden under the same royal dynasty, forms the western part of the Scandinavian peninsula, and extends from lat. 57° 58′ N. to lat. 71° 10′ N., a distance of about 1080 miles, with a breadth of 270 miles in lat. 61° N., but only 20 miles in lat. 67° N. It is bounded E. by Sweden and Russia, S. by Skagerrack, W. by the Atlantic, and N. by the Arctic Ocean, and in its whole length its coast-line is fringed with innumerable islands and indented with long, narrow fjords, of which the most remarkable are Christianiafjord from the Skagerrack, Bukkefjord, Sognefjord, Hardangerfjord, and Tronhjemsfjord from the Atlantic, and Porsang and Warangerfjords from the Arctic Ocean. North Cape forms its northern extremity, Cape Lindesnäs its southern. Area, 122,279 square miles. The Scandinavian peninsula is one continuous mass of mountains, the main axis of which is the Kjöll, which, running in a nearly southern direction, forms the boundary between Norway and Sweden, until in lat. 63° N. it turns into Norway, in a nearly western direction, under the name of Dovrefjell. In lat. 62° N. the Dovrefjell resumes the southern direction, and under different names, Langefjell, Fillefjell, Sognefjell, Hardangerfjell, etc., it covers the whole southern part of Norway, ending in Cape Lindesnäs. The Kjöll, Dovrefjell, etc. are not exactly mountain-ranges, but rather elevated plateaus of considerable breadth, from which bold and majestic peaks rise isolated, and which, to the E., slope down towards the Baltic and the Danish seas through large terraces or tracts of table-land, intersected by broad valleys, or now and then broken up by the rivers into regions of alpine character; while to the W. the plateaus generally extend to the ocean, facing the Atlantic with steep, rocky coasts, and rent to the bottom with frightful fissures, which, with their blue fjords and dark, forest-clad sides, form valleys of a peculiarly wild, romantic beauty. The average height of the plateaus in the Kjöll is 2000 feet, and in the Dovrefjell and Langefjell 4000 feet. The highest peaks are—in the Kjöll, Sulitelma, 6342 feet; in the Dovrefjell, Sneehätten, 8115 feet; in the Langefjell, Skagstölstind, 8390 feet; and in the Fillefjell, Gousta, 6000 feet. The principal valleys of the eastern slope of the plateaus are Ostredalen and Guldbrandsdalen; the most beautiful vale of the western part is that around the Hardangerfjord. The chief river is the Glommen, which after joining the Lougen is called Stor-Elven, forms the beautiful fall Sarpfossen, and falls into the Skagerrack. Besides this, Norway has many smaller streams, of which, however, none are navigable on account of the rapids, cataracts, and falls which generally occupy their whole course. They are, nevertheless, of great industrial importance, as they float down the timber to the ports, and afford most of the power with which the mining and milling machinery of the country is worked.

On account of the great extent of the land from S. to N., and on account of the great difference in the elevation of the surface, the climate of Norway differs considerably in different places. But, considering that one-third of the country is situated within the Arctic zone, and the whole of it has a considerable elevation, the climate must be called peculiarly mild. Cultivation of grain, which in Siberia ceases at lat. 60° N., extends in Norway to lat. 70° N. The snow-line descends in Norway in lat. 61° N. only to a point 5500 feet above the sea, and in lat. 70° N. to one 3500 feet above the sea, while in Siberia the marshes on a level with the sea are frozen many fathoms deep in lat. 70° N. This mildness of the Norwegian climate is due to the presence of the Gulf Stream close to its shores; if the Gulf Stream were to turn its course towards Greenland, civilized life would immediately die out in Norway. According to its climate and vegetation, the country may be divided into three belts—the agricultural belt, where a little wheat, more rye, and much barley, oats, and potatoes are raised, and where the apple and cherry tree, the rose and the lilac, are grown among patches of forests and pasture-land; the forest belt, where the ground is covered with one continuous forest of fir, pine, and birch, with patches of cultivated land along the fjords and rivers, and fields of pasture-land on the heights; and the pasture belt, where the trees, even the shrubs, disappear, where no grain, hardly a berry, will ripen, where nothing will grow but a little grass or moss and lichens, on which the reindeer feed. These three belts may be observed both by moving from S. to N. and by ascending from the fjord to the plateau.

Although agriculture, the rearing of cattle, sheep, and goats, and dairy-farming are carried on with great industry and perseverance, and in many cases—as, for instance, with respect to irrigation—also with great sagacity, still, the country does not produce food in sufficient quantity; grain, meat, butter, and cheese are imported. The chief sources of wealth which Norway possesses are its timber, fisheries, and mines. The annual export of timber amounts to 200,000 lasts, having a value of nearly $2,000,000. In some places the forests were formerly cut down ruthlessly, and the effect was that in the vicinity the glaciers descended much lower, and large fields of good pasture-land were buried for ever under the ice and snow. Great care is now taken not to destroy the forests, and the supply of timber is actually inexhaustible; the only difficulty is how to get at it, as no roads lead, or ever will lead, into the crags and

clefts where it grows. Still more important are the fisheries. They yield an annual revenue of $3,000,000 or $4,000,000. All the rivers teem with salmon and salmon-trout; rich oyster-beds are found all along the coasts; lobsters of the finest quality abound; the cod-fisheries at Lofoden give an annual return of 9000 tons of dried fish, besides 22,000 barrels of oil and 6000 barrels of roe, and the herring fisheries along the south-western coast yield annually between 500,000 and 600,000 tons of fish. Of the mines, the copper-works at Röraas, the ironworks at Laurvig, and the silver-mines at Kongsberg are the most remarkable; a return valued at from $600,000 to $800,000 is annually obtained from them. The only branch of manufacturing industry which is developed to some degree of perfection and extensively carried on is shipbuilding. The Norwegian merchant fleet consisted in 1868 of 6909 ships, with a tonnage of 225,903 lasts, and manned by 47,570 of the best sailors in the world; and in 1873 the vessels numbered 7447, of 1,243,433 tons burden, and manned by 56,147 men. The timber is mostly exported to Holland and France, the dried, salted, and smoked fish to the Mediterranean.

The population of Norway numbers 1,763,000, of whom about 25,000 are Lapps and Finns, living in the northernmost portion of the country. The Norwegians are a strongly-built race, of middle size, with light complexion, light hair, and blue eyes. They are passionate, but self-controlled; audacious, but calm; often shrewd, sometimes false. They have great respect for religion, without being superstitious, and great respect for law, though they are very independent. The established religion is the Lutheran, but other religions are tolerated. Education is very general and very good, although the official system is antiquated and insufficiently carried out. But in a Norwegian family the father never ceases to learn from religious, political, agronomic tracts and pamphlets, which form a characteristic feature of Norwegian literature; and he is always anxious to teach his children what he has found to be sound knowledge.

The earliest history of the Norwegian people has two salient points—the colonization of Iceland in 974, with the visits to Vinland, and the conquest of Normandy in 912; but besides these two great and striking events its domestic history and the history of its daily intercourse with its neighbors have no general interest, though very remarkable when studied in details—astonishing on account of the vitality and animal spirits shown, and interesting on account of the brilliant characters and sublime ideas depicted. In the fourteenth century, however, the people became exhausted. From 1387 to 1814 it was united to Denmark, from which it received very little attention. At the end of the eighteenth century the Norwegian people awakened once more, and when (in 1814) Denmark was compelled to cede Norway to Sweden, thus paying England's and Russia's debt to Bernadotte for his treachery to Napoleon, the Norwegians protested in a dignified and determined manner against being disposed of in such a summary manner; the result of which protest was that Norway to-day is not a province of Sweden, but an independent kingdom, enjoying a free and liberal constitution and progressing in every respect. CLEMENS PETERSEN.

Norway, post-v. of La Salle co., Ill.

Norway, tp. of Winnebago co., Ia. Pop. 214.

Norway, post-v. and tp. of Oxford co., Me., 42 miles from Portland, on the Grand Trunk R. R., has a high school, 2 churches, a national and savings bank, a woollen, 1 paper, and 2 pulp mills, 2 flouring-mills, 2 tanneries, 1 newspaper, a large shoe-factory, carriage, hub, and shovel-handle establishments, a pianoforte, organ, and melodeon manufactory, and 1 key-factory. Pop. of v. 916; of tp. 1954. S. DRAKE, ED. "ADVERTISER."

Norway, tp. of Fillmore co., Minn. Pop. 1380.

Norway, post-v. and tp., Herkimer co., N. Y. P. 1117.

Norway, tp. of Racine co., Wis. Pop. 1040.

Norway Lake, tp. of Monongalia co., Minn. Pop. 669.

Norwe'gian, tp. of Schuylkill co., Pa. Pop. 1390.

Norwegian Language and Literature. The separation of Norway from Denmark in 1814 was accompanied by the establishment of an independent government in Norway under a free constitution and in a merely dynastic union with Sweden. It was expected that this great change in the social and political position of the country would soon be followed by the awakening of a national life among the people, and it was hoped that in the course of time this life would present itself to the world in an original literature. These expectations were not disappointed. Hardly half a century had passed ere a truly national literature arose, which from its very beginning commanded the respect of the two other Scandinavian countries, and soon attracted considerable attention in Germany and in England. But the introduction to this literature was strange and exceedingly noisy.

When the separation took place, all civilization in Norway was Danish—church and school, courts and newspapers, society and business. Under this layer of Danish ideas and Danish language moved the large mass of the people—farmers, sailors, miners, fishermen, and mechanics—speaking various dialects of the old Norse or Icelandic language, and living with the same ideas as their ancestors 1000 years before. Such a state of affairs was intolerable, and the first to break it was Henrik Wergeland (1808–45). Wergeland was a highly gifted man, of a strongly-framed mind, but his habits were wild and his temper uneven, always swinging between enthusiasm and hatred. His theoretical standpoint was the rationalism and philanthropism of the eighteenth century, and his practical purpose the expulsion from Norway of everything Danish. His opposition to Denmark was confused in its measures and uncouth in its manners, but its principle was just and its influence sound. He wrote many volumes of lyrics, epics, dramas, etc., but only a few pages of these have any æsthetic worth. Two small tales, one love-song, some sailors' chants, some children's prayers, and one patriotic song—that is all, but that is of the most exquisite beauty. Meanwhile, Danish literature had made a great step onward with Adam Oehlensläger. Its ideas had become modern, its imagination romantic. And soon this movement reached Norway, where it was represented by J. S. Welhaven (1807–72). It was by no means Welhaven's idea to support that which in Norway was Danish, still less to make the Norwegian civilization a branch of the Danish; he was too patriotic, too proud a man, and had too cultivated a mind. But to the eyes of his adversaries it looked so when he attacked Wergeland and ridiculed his crude and antiquated ideas of art, his narrow patriotism smelling of the village. The contest was really between the eighteenth and the nineteenth centuries, but people were told that it was between Norwegian and Danish, and people became furious. Welhaven's writings, both in prose and in verse, were always elegant in form and rich in ideas. He had a brilliant imagination, a biting sarcasm, and no inconsiderable power of reflection. The most perfect of his productions are two ballads, *Asgaardsrejen* and *Protesilaus*, and a didactic poem, *Epistle to a Young Poet*. The contest between Welhaven and Wergeland, beginning in 1834, lasted for many years, and was exceedingly bitter, as literary quarrels always are when the position of the combatants is ill defined and their principles misunderstood, and when they condescend to use popular prejudices as weapons and horse-whips as arguments. Much, however, was made clear to the Norwegian people through this protracted and noisy embroilment, and it forms the introduction to Norwegian literature. About 1840 a number of Norwegian philologists and historians concentrated their enthusiasm and their talent on the study of the old Norse language and the history of Norway before the union with Denmark; and their works formed not only a most valuable part of the Norwegian literature in the wider sense of the word, but also a direct preparation for a literature proper; they created the national spirit. Nothing is of more importance or of greater influence in the formation and development of the national character than a striking picture of the primitive type; around it people gather instinctively, and they model themselves unconsciously after it. Such an image was produced by the writings of Faye, Unger, Munch, Keyser, Bugge, and others, and living blood was infused into this image by the labors of Asbjörnsen, Moe, Eilert Sundt, and Ivar Aasen—men of quite another stamp, but not of less, or less beneficial, influence. Asbjörnsen and Moe collected the popular tales which still lived on the lips of the people, and the product was most charming; a certain tone of calm, dry humor occurring in some of the tales is especially irresistible. The collection was read by everybody in Norway, and by everybody with delight. Eilert Sundt is a statistician, but he studies not so much the fact as its cause, and he writes not so much in figures as in pictures. He wanders from North Cape to Christiansand, climbing every rock, creeping into every vale where a countryman of his has settled, and everywhere he looks, asks, listens till he understands. Then he sometimes publishes a book, or rather a pamphlet, the effect of which is similar to that produced by those famous Latin epistles by which the world is informed that the laws of gravitation or the relation between electricity and magnetism have been discovered. Ivar Aasen is a philologist, and his grammars, dictionaries, and linguistic essays give a clear and complete account of the present state of the different dialects spoken in Norway, and of their relation to each other and to the old Norse. Thus were produced that knowledge, understanding, and sympathy which make the inhabitants of a country a nation,

and which made it possible that in 1856 such a book as *Synnöve Solbakken* could be written, and immediately acknowledged as the beginning of Norwegian literature. As this literature is not more than twenty years old, it has, of course, not yet a history; but how rich and valuable it has already become may be gathered from the articles on BJÖRNSTJERNE BJÖRNSON and MAGDALENE THORESEN, whose works are also partially known to English readers.

The language in which this literature is written differs from the Danish partly in its vocabulary, which is purer, more powerful, and more impressive—partly in its style, which is shorter more compact, and more emphatic. But the difference is very slight. The dramas of Björnson and Ibsen have been performed in Danish theatres by Danish actors, without the alteration of one word. It is probable, however, that a greater difference will be developed in the course of time. There is in the Norwegian literature a party—not represented by any authors, but to some degree supported by Ivar Aasen—which purposes to form a new Norwegian language of elements taken from the different dialects; and when this new language is ready, the Norwegian nation, young and old, will be invited to sit down with grammar and dictionary to learn this its mother-tongue or native language. Of course, it is only in a very young nation that such ideas can be pursued in earnest for a long time, or be allowed to overawe everything else with its noise. But the youth of the nation is not only an excuse for its extravagances; it indicates also, that in the extravagances themselves there may be some truth which the future will develop. CLEMENS PETERSEN.

Nor'wich, a large, old, and prosperous, but (with exception of its fine market-place) rather indifferently built town of England, the capital of the county of Norfolk, on the Wensum, near its junction with the Yare. It has several interesting buildings, among which is the cathedral, built in 1094, with a noble tower and spire 315 feet high; large manufactures of worsted, silk, and cotton fabrics, especially crapes, gauzes, muslins, bombazines, and damasks; and a lively export and import trade. Pop. 80,390.

Norwich, a city and tp., cap. of New London co., Conn., at the head of the Thames River, 15 miles from Long Island Sound, has a free academy, a good common-school system, embracing a series of graded schools, 23 churches, 7 national and 3 savings banks, fine waterworks, manufactories of cotton and woollen goods, paper, firearms, wood-working machinery, wood type, envelope-printing presses, bar iron, printing-presses, and machinery. Its cotton, woollen, and paper mills are among the largest in the U. S. The water-power formed by three streams which go to make up the Thames is calculated to be greater than that of the whole State of Rhode Island. The city contains 2 public squares, a horse railway, 2 daily and 2 weekly newspapers; and, having excellent means of communication with Boston and New York, the future of Norwich is likely to be one of great promise. The city is supplied with gas. Pop. 16,653.

JOHN W. STEDMAN, LATE ED. "ADVERTISER."

Norwich, post-v. and tp., cap. of Chenango co., N. Y., on the Chenango River and Canal, the New York and Oswego Midland, and the Utica division of the Delaware Lackawanna and Western R. Rs.; includes several villages, has a weekly newspaper and extensive manufactories of harnesses and pianos. Pop. 4279.

Norwich, tp. of Franklin co., O. Pop. 1632.

Norwich, tp. of Huron co., O. Pop. 1172.

Norwich, post-v. of Union tp., Muskingum co., O., on Central Ohio division of Baltimore and Ohio R. R. P. 268.

Norwich, post-v. and tp. of McKean co., Pa. Pop. 257.

Norwich, post-v. and tp. of Windsor co., Vt., on the Passumpsic R. R. Pop. 1639.

Norwich Crag, a local shelly deposit found on the E. coast of England, and belonging to the Later Pliocene. The term "fluvio-marine crag," also applied to it, indicates the conditions under which it originated, and its fossils compared with those of the "red crag," upon which it rests, mark the gradual advance of the cold epoch that culminated in the glacial period. EDWARD C. H. DAY.

Norwich Town, post-v. of New London co., Conn., on the New London Northern R. R.

Nor'wood, post-v. and tp. of Norfolk co., Mass., erected from Dedham and Walpole tps., and incorporated Feb. 23, 1872, is on the Neponset River and on the Eastern division of the New York and New England R. R.

Norwood, post-v. and tp. of Charlevoix co., Mich., on Grand Traverse Bay. Pop. 182.

Norwood, post-v. of St. Lawrence co., N. Y., on the Central Vermont R. R.; has a good graded school, 2 churches, extensive water-power, several mills and machine-shops, 1 newspaper, a wagon hub factory, and stores. Principal business of neighborhood, dairying. Pop. 966.

J. D. TRACEY, ED. "COMMERCIAL ADVERTISER."

Norwood, post-v. of Nelson co., Va.

Norwood (THOMAS MASON), b. in Talbot co., Ga., Apr. 26, 1830; received an academic education at Culloden, Monroe co., and graduated at Emory College, Oxford, Ga., in 1850; was admitted to the bar in Feb., 1852; opened an office at Savannah in Mar., 1857; was a member of the State legislature from the county of Chatham in 1861–62; was alternate elector for the State at large on the Seymour and Blair ticket in 1868, and was elected to the U. S. Senate for six years from Mar. 4, 1871. His seat was contested by Foster Blodgett, but was finally awarded to Mr. Norwood Dec. 19, 1871. Mr. Norwood is a Democrat. As a writer and an orator he is distinguished by purity of language and elegance of style, as well as scholarly attainments. His newspaper articles in the political canvass of 1870, over the signature of "Nemesis," are among the finest specimens of polished invective of this generation. The same may be said of his two speeches delivered in the U. S. Senate during the 43d Congress. A. H. STEPHENS.

Nose. See NOSTRILS, DISEASES OF.

Nosol'ogy [Gr. νόσος, "disease," and λόγος, "discourse"], the doctrine of diseases, that branch of medical science which treats of the classification and nomenclature of diseases. The object of nosology is to arrange diseases in accordance with some definite law by their peculiar nature or by the prominent characteristics by which we distinguish one from the other. The classification and nomenclature of diseases have changed with the successive theories of the indefinite periods of medicine: with the development of anatomy and physiology, and especially of pathology, the classification of diseases has been based upon the known morbid changes and the organ or apparatus involved, with symptoms peculiar to the disease or causes if known. The object of nomenclature in modern times is to obtain groupings of some diseases indicative of their sameness in cause and nature, and exponent of our positive knowledge, and of others by known characteristics, and thus to afford a uniform nomenclature for medical literature and further study and record, and an artificial aid in comparing them and arriving at correct diagnosis.

The theory of Hippocrates was, that disease was due to perversion of one or more of the "four humors." The "Methodists" of the Egyptian school and early Roman period believed that external matter was related to the pores of the body, which admitted atoms to circulate through the organism. Hence, all diseases were states of relaxation or contraction. Aretæus, of the Arabian school, divides diseases into the acute and chronic only.

Attempts at systematic classification of disease are of modern date. Sauvages, professor of botany and medicine at the celebrated school of Montpellier, France, was the first nosologist of eminence. His first classification, published in 1731 with the approval and supervision of the great Boerhaave, divided diseases only into genera. He studied thirty years upon this, and in 1763 published, in five volumes, his complete classification, including diseases in species. Sauvages' method was very defective, including as diseases many symptoms, as weakness, pains, discharges, which were effects only of disease. Linnæus, the great botanist, attempted in 1763 a classification of diseases upon the method of known causes and similar manifestations—a system necessarily as incomplete as the knowledge upon which it was based. Vogel in 1764, Sagar in 1776, McBride in 1772 produced classifications. The classification of Dr. Cullen, published in 1772, has many adherents to this day. He divides diseases into four great classes: (1) Pyrexiæ, including all fevers and diseases with increased heat; (2) Neuroses, diseases in which the nervous system is affected; (3) Cachexiæ, diseases of bad habit or condition of the body; (4) Locales, diseases of special parts or organs disconnected with general causes or constitutional disturbance. Each of these classes has several orders. Thus, the class Pyrexiæ includes Order I., Febres, the fevers; Order II., Phlegmasiæ, the inflammations, as of the brain, heart, lungs, or liver; Order III., Exanthemata, the eruptive disorders, as measles, scarlatina, and smallpox; Order IV., Hemorrhaginæ, hæmorrhages, as nose-bleed, spitting of blood, hæmorrhoids; Order V., Profluvia, or mucous fluxes, as catarrhs and dysentery. Thus, of each class there are several orders, each having groups of allied diseases—in all 150. Swediaur in 1812, and many others, have modified the original tabulations of Cullen. Pinel supplanted it by a classification, also based upon symptoms, issued in 1813, and long popular in France. A new method of classification, however, became popular. Known as the physiological method, it was based

upon the derangements observed in the properties, powers, or functions of single organs or systems of organs. Such was the method of Ploucquet in Germany, and of Young (1813) and Good (1817) in England. Thus we find in Good's celebrated method, Class I., Cœliaca, or diseases of the digestive functions; Class II., Pneumatica, or diseases of the respiratory functions, and so on—classes for the perversion of the circulation of the blood, the nervous system, the sexual organs, and glands for secretion and excretion. Each of these classes has further subdivisions of orders, genera, and species. Dr. Good further endeavored to distinguish the different orders and genera by terminations designating the peculiar kind of perversion which the organ or function had undergone, and to distinguish the species in each individual disease by a special descriptive name. Thus, an ordinary diarrhœa or catarrh of the bowels would be found in Class I., Cœliaca, since the digestive functions were disturbed; in Order I., Enterica, as the intestines were the special seat of the disease; in Genus 8, Diarrhœa, a looseness or flowing through; and in Species 3, Diarrhœa mucosa, since the evacuations were of mucus. Of all such systems, most of them at present obsolete, it may be said that, while possessing serious errors and defects, they led men to observe and reflect upon the nature and cause of disease, and educated a school of thorough symptomatologists, close observers of the symptoms by which early and correct diagnosis is to be attained. A congress to secure a uniform nomenclature for the record of deaths and diseases throughout Europe was convened at Paris in 1855, at Brussels in 1856, and at Vienna in 1857. Although the nomenclatures in the several countries of continental Europe and in England are not absolutely uniform, they are nearly so and easily convertible. The system of Dr. William Farr, as the most useful and practical system of record, and as embodying established and recognized laws of the origin of diseases where they are known, has been modified and adopted by the Royal College, and is that employed by the registrar-general of England, the U. S. census bureau, and the boards of health of New York and other cities, with immaterial modifications. The classification, as employed by the board of health of New York City, is as follows: *Class I., Zymotic Diseases* (*zymosis* signifying the multiplication or ferment of a source of disease within the body): *Order 1, Miasmatic diseases*, smallpox, varioloid, measles, scarlatina, diphtheria, quinsy, croup, whooping-cough, typhus fever, typhoid fever, erysipelas, carbuncle, dysentery, diarrhœa, cholera morbus, cholera, cholera infantum, entero-colitis, cerebro-spinal meningitis, intermittent fever, yellow fever, pyæmia, septicæmia; *Order 2, Enthetic and inoculated diseases*, syphilis, malignant pustule, gangrene, hydrophobia; *Order 3, Dietic diseases*, inanition, dyspepsia, scurvy, purpura, alcoholism. *Class II., Constitutional Diseases; Order 1, Diathetic diseases*, gout, rheumatism, dropsy, cancer, noma (gangrene of mouth), mortification; *Order 2, Tubercular diseases*, scrofula, marasmus, phthisis pulmonalis, hydrocephalus, psoas abscess. *Class III., Local Diseases: Order 1, Nervous diseases*, meningitis, encephalitis, softening of the brain, progressive locomotor ataxia, apoplexy, paralysis, insanity, epilepsy, chorea, sunstroke, convulsions, tetanus, congestion of brain, hemiplegia, paraplegia: *Order 2, Circulatory diseases*, pericarditis, aneurism of the heart, aneurism of the aorta, diseases of the heart, phlebitis, angina pectoris, epistaxis (nose-bleed), hæmorrhage from the ear; *Order 3, Respiratory diseases*, laryngitis, bronchitis, pleuritis, hydrothorax, pneumonia, asthma, gangrene, congestion and hæmorrhage of lungs; *Order 4, Digestive diseases*, gastritis, enteritis, peritonitis, ascites, ulceration of intestines, obstruction of intestines, stricture of intestines, hernia, cirrhosis of liver, ileus (colic), lead colic, lead disease, intussusception, fistula in ano, ulcer of the stomach, obstruction of gall-duct, hepatitis, jaundice, liver disease, anæmia, hæmatemesis; *Order 5, Urinary diseases*, nephritis, nephria (Bright's disease), diabetes, cystitis, disease of the kidney, disease of prostate gland, Addison's disease, stricture of the urethra, retention of urine, uræmia; *Order 6, Generative diseases*, ovarian dropsy, ovarian tumor, uterine tumor, uterine disease, metritis, metro-peritonitis, puerperal peritonitis, pelvic cellulitis, ovaritis; *Order 7, Locomotory diseases*, arthritis, hip-joint disease, disease of spine, caries, necrosis, rachitis, osteomyelitis; *Order 8, Integumentary system*, phlegmon, ulcer, tumor, abscess, pemphigus, sclerema, herpes. *Class IV., Developmental Diseases: Order 1* (children), premature birth, still-birth, convulsion of new-born, hæmorrhage of cord, cyanosis, spina bifida, atelectasis of lungs, malformations, teething; *Order 2* (women), childbirth, puerperal convulsions, flooding, miscarriage, puerperal mania, phlegmasia dolens; *Order 3* (age), old age, senile gangrene; *Order 4* (nutrition), atrophy, debility. *Class V., Death by Violence: Order 1* (accident), fractures, wounds, burns and scalds, poison, drowning, suffocation; *Order 2*, homicide; *Order 3*, suicide.

This classification includes the causes of death during one year. Dr. Farr's complete classification includes many more, indigenous in Europe and in the British East Indies, but unknown in this country. All classifications of disease and deaths for public purposes are necessarily practical rather than accurately scientific. Thus, apoplexy or hæmorrhage in the brain is enumerated in the same group with hemiplegia, its usual result. But hemiplegia has other causes than apoplexy, which are often obscure; hence, the diagnosis is confined to the condition. A practical classification for public record takes cognizance often of the immediate method of disease and death where the first and true cause was unknown or overlooked by carelessness or ignorance. Thus, nose-bleed as a cause of death may have resulted from injury, excited circulation, mitral disease of the heart, or the perverted state of the blood in disorganizing febrile disease. In exceptional cases it retains old names of diseases, well recognized, but having an unknown or unsettled pathology, as "phlegmasia dolens," or milk leg. The value of a generally accepted nomenclature and classification of diseases is great. Published reports exhibit at a glance the class of diseases most prevalent and fatal in different seasons in different communities and sections of the country, and point to the sources which sanitary science may remove. With the progress of pathology and a further insight into the nature of diseases, many will change location, diseases now classified as functional or local being traced to a cause and ranked with organic and constitutional diseases. Diphtheria would formerly be classed as a local ulcerous sore throat; it is now ranked as a zymotic disease, as it is conceded to be a general blood disease, having as one of its symptoms the diphtheritic exudation in the throat.

E. Darwin Hudson, Jr.

Nos'toc, a genus of Algæ growing in fresh water or in damp places on the ground. The genus contains a number of species, all of which are composed of threads, consisting of small globular cells, between which are inserted, at intervals, larger cells called *heterocysts*. The threads are intricately wound round one another and the whole surrounded by a mass of jelly. No mode of sexual reproduction has yet been discovered in the Nostocs. An asexual method of reproduction has been described by Thuret (*Sur la Réproduction du Nostoc verrucosum, Annales des Sciences naturelles*, 1844) and Janchewski (*Observations sur la Réproduction de quelques Nostochacées, Ann. des Sciences naturelles*, 5 série, tome 19). The Nostocs have given the name to a group of rather ill-defined genera, which form a suborder of the Phycochromaceæ. Some lichenologists, as Prof. T. M. Fries, do not regard the Nostocs as algæ, but as the Gonidia which have escaped from some species of Collema, a genus of lichens where the Gonidia resemble the chains of Nostoc. Others, including De Bary, Bornet, Schwendener, and most of the leading botanists of France and Germany, regard the Nostocs as Algæ, and consider that in Collema we have an example of a fungus parasitic upon an alga.

Nostrada'mus, whose true name was Michel de Notredame, was b. Dec. 14, 1503, at St. Rémi, in Provence, of Jewish parents; studied medicine at Avignon and Montpellier, and settled as a physician first at Agen, in the present department of Lot-et-Garonne, and afterwards at Salon, near Aix, where he d. July 2, 1566. He was a good physician, and during the time of the plague, which at this period twice visited Southern France, he rendered great service. His immense fame, however, was built on a less solid foundation—on his capacity as an astrologer. In 1555 he published his *Prophéties*, written in quatrains, and giving in an obscure and enigmatical manner prophecies concerning the coming centuries. The book made an immense sensation and was much studied. Many royal persons—Catharine de' Medici, Henry II., Charles IX., and others—consulted him and loaded him with presents; the last mentioned even made him his life-physician. In after times the book also found students and admirers; the latest is M. E. Bareste, whose *Nostradamus* appeared at Paris in 1842. In 1781 the book was forbidden by the pope, as it was found to contain a prophecy of the abolition of the papal authority. Nostradamus also published an almanac containing weather prophecies.

Nos'trils, Dis'eases of. The nostrils or nares are divided into the anterior nares, which can be seen by external inspection of the openings of the nose, and the posterior nares, to be seen only by aid of small circular mirrors placed in the back of the throat to reflect light, admitted through the mouth, to the nasal cavities above. The most common of their diseases is catarrh. Nasal catarrh is produced by cold air, by insufflating dust, or by

irritants. It is the beginning of many cases of laryngitis and bronchitis. It is the chief catarrhal condition in influenza, in which disease catarrh extends through the nasal ducts to the eyes, the Eustachian tubes to the ears, and into the frontal sinuses. Simple recent nasal catarrh produces a watery, alkaline serum. When more pronounced the catarrhal flow is less serous, contains mucous corpuscles, and is viscid or even tenacious—is yellowish and purulent in color. Chronic catarrh may result in constriction of the anterior nares, in the development of exuberant granulations, and polypus. In the posterior nares, by extension to the throat, it more often results in permanent or obstinate naso-pharyngeal catarrh. Such chronic catarrh may give rise only to habitual coughing and hawking of mucus, but it often impairs the hearing by tumefaction at the aperture of the Eustachian ducts or by extension to the middle ear. Nasal polypus is an attached tumor in the nostrils, originally a small projecting mass of granulations or enlarged glandular tissue. When chronic nasal catarrh has resulted in ulceration and death of the cartilages or bones of the nose, the discharge is often offensive, and is known as œzena. Close examination will discover particles of necrosed matter. Œzena is more often the result of nasal catarrh in strumous, tubercular, and syphilitic persons. Epistaxis or nose-bleed is the result of local causes, as irritating or picking the nostrils; it is a frequent occurrence in persons having disease of the mitral valve of the heart; it is a symptom peculiar to typhoid fever; it is often due to excessive exercise and to excitement. The catarrhal diseases of the nostrils are treated by topical applications, inhalations, and sprays. Ozæna demands the insufflation or injection of antiseptic washes or the surgical removal of dead bone. Polypus is removed by cutting or tearing. Nose-bleed is checked by cold applications on the nose, by plugging the nostril with lint, or the introduction of styptics, as tannic acid, pernitrate and persulphate of iron. In extensive bleeding from the nose the nostrils have to be plugged from behind. E. DARWIN HUDSON, JR.

No'ta (ALBERTO), a distinguished Piedmontese author of comedies, b. in Turin in 1785; d. in the same city in 1847. At the age of eighteen he received his legal degree from the university of his native town. Besides his literary labors, he acted as librarian, first to Prince di Carignano, then to the king, Carlo Alberto, and occupied successively many highly honorable offices in the civil magistracy. Nota was called the Piedmontese Goldoni, but he differs as widely from Goldoni as does Terence from Plautus. The plot of his comedies is correct and regular, the style sustained and almost elegant, but one rarely finds in them either originality, fire, or the true *vis comica*. The best comedies of Nota are the following: *I Primi Passi al mal Costume, La Fiera, L'Irrequieta, Il Progettista, L'Oppressore e l'Oppresso, La Lusinghiera, Educazione e Natura.*

Not'ables, in France, comprised not only the born nobility, but also persons who enjoyed certain social privileges and immunities on account of the office which they held. When in course of time the États Généraux came into frequent collision with the royal power, the kings convoked in their stead Assemblées des Notables, and as these assemblies were composed of persons who were dependent on the court or had the same interest as it, they proved much more manageable. The last Assemblée des Notables met Nov. 6, 1788, to discuss the forms under which the États Généraux should be convened.

Notacanth'idæ [from *Notacanthus*], a family of fishes of the order Opisthomi. The body is elongated (but not eel-like), and the tail tapers strongly backward; it is covered with very small cycloid scales; the lateral line is conspicuous; the head is conic, and the snout more or less produced; the mouth is inferior, the cleft moderate, and the lower jaw quite movable; the teeth are minute and pointed; the branchial apertures are normally extended; there are about eight branchiostegal rays; the dorsal fin is only represented by a number (7–30) of short disconnected spines about the middle of the length; the anal is elongated, and armed with numerous (12–15) spines in front; the caudal small and (typically at least) connected with the anal; the pectorals are well developed, and the ventrals are abdominal and composed of spinous (2–4) and articulated (7–8) rays. Five species are known—viz. *Notacanthus nasus*, Greenland; *N. Bonapartii* and *N. Mediterraneus; N. sexspinis*, Australia; and *Zanotacanthus Rissoanus* (*Notacanthus Rissoanus*, Fil. & Ver.), Mediterranean. The last species is generically distinguished by the numerous (over 30) dorsal spines and proboscis-like snout. THEODORE GILL.

Not'ary Pub'lic. This is an officer known to all civilized nations, and who existed under the rules of the civil or Roman law. His principal duties are to protest bills of exchange and to make such other protests or declarations as accord with the usage of merchants. Other duties are frequently added by statute, such as to demand payment of promissory notes and to make protests in case of non-payment, so as to charge indorsers, to administer oaths or affirmations, and to take acknowledgments of deeds or other instruments. The term "protest," as here used, means an official declaration by the notary of the existence of a fact connected with the performance of his duties. This certificate, when authorized by law, is in general presumptive evidence that the facts certified to took place. Thus, a "protest" of a foreign bill of exchange for non-acceptance or non-payment is sufficient evidence on the trial of an action to charge the drawer or indorsers.

A notary is a ministerial officer, and is liable to a party injured by the negligent performance of his duties. Statutes also frequently declare his responsibility for misconduct, both civil and criminal. It is clear that in the absence of any statute his conduct is governed by that general rule of law which prescribes that any person who enters upon an undertaking requiring ordinary care and skill is bound to use ordinary diligence, and is liable to any one injured by the want of it. Still, if under the direction of an employer he commit an error in such an act as protesting a bill of exchange, the fact that he follows such direction will be a sufficient excuse.

When called upon to perform a strict notarial act he must in general perform it personally. He cannot delegate it to any other person, as, for example, to a clerk. This proposition is but a branch of a wider rule that an agency requiring trust and confidence cannot be delegated. If, however, there is a settled commercial usage in the place where a foreign bill of exchange is payable that protest may be made by a notary's clerk, evidence of such usage is admissible to establish it, and thus give the sanction of law to the notary's delegation of authority. This last proposition proceeds upon the ground that the necessity of protest in the case of foreign bills is a matter of mercantile usage, and a special custom in a particular place may enlarge or qualify ordinary practice. It frequently happens that when a bill of exchange is given to an agent for collection, that person employs a notary to make a protest who is guilty of negligence, and thus discharges the drawer and indorsers. The question then recurs whether the principal may sue the agent, or whether his remedy is against the notary. Upon this point there is much divergence of judicial opinion. Some courts take a distinction between the case where the act is strictly notarial and where it is not. In the former case they hold that the notary is liable directly to the original employer or principal. In the latter case—*e. g.* giving notice of the non-payment of an inland bill of exchange (an act which any person though not a notary may perform)—he is simply the agent of his immediate employer, and cannot be sued by the person for whose benefit the notice was to be given. It is, however, held in a considerable number of the States that when a banker or other person acting as collecting agent has employed a competent notary who is guilty of an act of negligence, the remedy of the injured party is solely against the notary, without reference to the fact whether the act is strictly notarial or not. The distinction between the liability of a notary for strictly notarial and non-notarial acts has been taken in other instances. Thus, it has been said that in the case of a foreign bill not only should protest be made, but notice should be given by him to all the antecedent parties, but that in the case of inland bills it is not his duty to give notice of dishonor to any one but the person from whom he received it. It is desirable that where such a distinction exists, as it tends to confuse and mislead, it should be remedied by statute. It is well settled that where a statute enjoins upon a notary in protesting promissory notes, etc. the duty of giving notice of dishonor to antecedent parties, he is bound to notify them, and is liable to an action on the part of one who may be injured by his neglect. T. W. DWIGHT.

Notasul'ga, post-v. of Macon co., Ala., on the Western R. R., has 3 churches and 1 newspaper. Pop. 1691.
JOHN C. BURNESS, ED. "UNIVERSALIST HERALD."

Nota'tion [Lat. *notatio*], in chemistry, an ingenious system of abbreviating and condensing statements of the chemical composition of bodies, and of their changes and transformations, by means of *symbols*. From the earliest days of the science, even in alchemical times, various methods of accomplishing this have been attempted, but the first useful basis of the present system was laid, curiously enough, in the same identical year in which the present system of nomenclature (that of Guyton de Morveau and Lavoisier) was founded—1787—(see NOMENCLATURE) by Hassenfratz and Adet. These chemists first used the initial letters of the Latin names to express the metals, surround-

ing each, however, with a *circle*, which was their general symbol for a metal. Dalton, when he founded the atomic theory, adopted these symbols, circle and all, as he considered the atoms probably spherical in form. Berzelius in 1815 brought the symbolic notation into its present form, by introducing coefficients to indicate the numbers of equivalents, with a number of other important devices.

While speaking of the initiation of the invention of chemical symbols, it should be mentioned that Hassenfratz and Adet, in their original symbols, introduced features, now entirely forgotten, to which in this age of science we shall unquestionably have to return. They had a symbol to express caloric or heat, and their symbol for water admitted of three modifications for its three known states of ice, water, and steam. We shall soon doubtless have to introduce into our chemical notation such symbols, to express, probably, not exactly *quantities* of heat involved and engendered, but at least amounts of thermodynamic *energy*. One of our most acute American scientists, H. F. Walling, at the meeting of the American Association in 1875, brought this matter forward and urged strongly its necessity.

In the article on CHEMISTRY will be found a tabulation of the symbols of Berzelius, as still used throughout the world. Each symbol, alone, stands for one equivalent weight, and a numerical coefficient placed before or after it multiplies it by so much. When a compound is to be represented, made up of two or more other compounds, a *comma* or *period* is used—the latter being generally the most approved—to represent the secondary combination. Thus, common copperas or green vitriol is thus represented: $FeO.SO_3.7H_2O$; meaning a compound of iron and oxygen, combined with another compound of sulphur and oxygen, combined again with 7 equivalents of water. When a small coefficient is placed *after* the symbol, as in O_3 and H_2 in this case, it applies to that one symbol only; but when a larger coefficient is placed *before* a group of symbols, as in the $7H_2O$, it multiplies them all, at least up to the next period. The sign + is often used to express combination, but not by recent correct and critical writers, being reserved by such entirely for use in expressing chemical *reactions*, to indicate the mere *bringing together* of the reacting substances within the sphere of possible reaction, and the mere state of *admixture* or juxtaposition of the resulting products. Thus, $FeO.SO_3 + Na_2O.CO_2 = Na_2O.SO_3 + FeO.CO_2$, means that the previous mixture of *ferrous sulphate* and *sodic carbonate* produces *sodic sulphate* and *ferrous carbonate*. Berzelius devised also, for the important purpose of abbreviating long and complex formulæ, particularly in mineralogical chemistry, two kinds of symbols, called "dotted symbols" and "cross-barred symbols." In dotted symbols equivalents of oxygen are represented by so many dots placed over the symbol of the element with which it is combined; thus:

$\dddot{Si}$, silica,

$\dddot{S}$, sulphuric acid,

$\overset{\cdot\cdot\cdot\cdot\cdot}{P}_2$, phosphoric acid.

The cross-barred symbol simply indicates *two equivalents* of the element for which it stands. Sometimes he combined the dots and cross-bars, representing, for example, alumina, Al_2O_3, by $\dddot{\text{Ɫ}}$; ferric oxide, Fe_2O_3, by $\dddot{\text{Ƒ}}e$; phosphoric acid by $\overset{\cdot\cdot\cdot\cdot\cdot}{\text{Ᵽ}}$; and so on.

A good deal of use is made at the present day of *parentheses* in our notation, in writing out complex formulæ, the different simpler molecules contained or supposed to be contained in the more complex compound being enclosed in separate parentheses; and when a coefficient is then placed either before or after such a parenthetic collocation of symbols, it multiplies all those, and only those, within the parentheses. Thus, for example,

Common alum, $(K_2O.SO_3)(Al_2O_3.3SO_3).24H_2O$;
Zinc-ethyle, $(C_2H_5)_2.Zn$;
Stanno-dimethyle-diethyle, $(CH_3)_2(C_2H_5)_2.Sn$;
Sugar of lead, $Pb(C_2H_3O_2)_2.3H_2O$.

Sometimes parentheses are used within parentheses:

Microcosmic salt, $(Na_2O.(NH_4)_2O.H_2O)P_2O_5.6H_2O$.

In the representation of compounds according to the theories of types and substitutions, which play so large a part in the chemical literature of the present day, other devices are used: thus, the element or radical supposed to have been substituted for one or more hydrogen-equivalents is placed *over* the remaining hydrogen in the symbol. Hydrate of potash, considered as belonging to the water-type, would thus be written $\begin{matrix}K\\H\end{matrix}O$, water itself, for comparison, being written $\begin{matrix}H\\H\end{matrix}O$. Ammonic hydrate would be $\begin{matrix}NH_4\\H\end{matrix}O$. Sometimes a brace is used in this kind of formulation for the sake of distinctness. Thus, propylamine, according to this system, might be written $N\begin{cases}C_3H_7,\\H,\\H,\end{cases}$ and methyl-ethyl-amylamine, $N\begin{cases}CH_3,\\C_2H_5,\\C_5H_{11}.\end{cases}$ Wood-spirit and common alcohol, regarded as substitution-products of the marsh-gas type, and containing "hydroxyl," will be $C\begin{cases}HO,\\H,\\H,\\H,\end{cases}$ and $C\begin{cases}CH_3.\\HO.\\H.\\H.\end{cases}$

An important invention in notation is the use of *bonds* between elemental symbols, to express the relations of equivalence, sometimes called "atomicity." The affinity of a monad element is represented by one dash, of a dyad by two, of a triad by three, and so on. Water is represented by placing the dyad oxygen between the two hydrogen monads; thus, H—O—H, the two dashes representing the two bonds of affinity of dyadic oxygen, supposed to be saturated, in water. They represent likewise each the total affinity of one of the hydrogen monads, which are therefore also both satisfied or saturated. One more example may be given in carbonic acid gas, represented thus, O=C=O, the tetradic carbon having four bonds and the oxygen dyads two each. By following out this system very curious results are obtained in the shape of hypothetical "constitutional formulæ" for compounds of all degrees of complexity. To explain these would take very large space, and, as has been elsewhere stated, they are liable to the great objection that they inculcate the idea of construction of molecules (which in nature must have geometrical structure) *on the same plane*, involving thus a gross absurdity. HENRY WURTZ.

Notation [Lat. *notatio*]. Mathematical notation is a conventional method of representing quantities and operations by means of symbols. It explains the meaning of individual symbols, both of operation and of quantity, and shows how to combine them so as to express in the simplest manner every mathematical operation. A simple and comprehensive system of notation is essential to the progress of every science, but in no branch is a complete system more necessary than in mathematics, and in no branch has there been a greater diversity of systems proposed. Our present system is the result of the labors of many men, living in different ages, speaking different languages, and possessing different habits of thought; from these diverse sources a mathematical language has sprung up, defective in many respects, and yet sufficiently simple and copious for most of the purposes of analysis and investigation. Each department of mathematics has its own notation; in this article will only be considered the notation of arithmetic, or the method of writing numbers.

There are at present in general use only two systems of arithmetical notation, the *common* system and the Roman; in addition to these we shall also explain the method of the ancient Greeks.

(1) *The Common System*.—This is sometimes called the *Arabic*, because the figures which it employs were introduced into Europe by the Arabs. The following figures, expressing values regularly increasing by one from nothing to nine, are used in this system: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9. These figures, taken separately, are called *digits*. The first one, named *naught*, is also called a *cipher* or *zero*; it stands for no number. The remaining ones are called *significant* figures. All integral numbers are expressed by writing the proper digits in a line. The digit on the right is said to stand in the *first* place, the one preceding this in the *second* place, the next preceding in the *third* place, and so on. This order of arrangement is called the *scale* of the system. The same digit always indicates the same number of units, but the value of the unit indicated depends on the place it occupies in the scale. If a digit stands in the first place, it expresses simple units or *ones*; if in the second place, it expresses *tens*; if in the third place, it expresses *hundreds*; the value of the unit in any place is always ten times that of the unit in the next lower place. Thus, the combination 376 stands for 3 *hundreds*, 7 *tens*, and 6 *ones*, or for the number *three hundred and seventy-six*. If we place a point—which we call the decimal point—on the right of the first place, we may continue the scale downward to any extent: in this case, the digit on the right of the point is said to stand in the *first place of decimals*, the next stands in the *second place of decimals*, the next in the *third place*, and so on. The unit of the first place of decimals is *one-tenth*; that of the second place, *one-hundredth*; that of the third place, *one-thousandth*; and so on. Thus, the combination .325 stands for 3 *tenths*, 2 *hundredths*, and 5 *thousandths*, or for the number 325-*thousandths*. The scale thus completed is called the decimal scale; it will be noted that this scale is continuous throughout; that is, in proceeding from right to left the unit of each place is ten times that of the preceding place. If we place a cipher in each place, we may write the decimal scale as follows:

	Period of billions.			Period of millions.			Period of thousands.			Period of units.				Period of thousandths.			Period of millionths.			
etc. etc.	hundreds of billions,	tens of billions,	billions,	hundreds of millions,	tens of millions,	millions,	hundreds of thousands,	tens of thousands,	thousands,	hundreds,	tens,	units,	*Decimal point.*	tenths,	hundredths,	thousandths,	ten-thousandths,	hundred-thousandths,	millionths,	etc. etc.
	0	0	0,	0	0	0,	0	0	0,	0	0	0	.	0	0	0,	0	0	0	

For convenience of reading, the scale is separated into periods, each of which embraces three places, and is named as shown above. The denominations above billions are trillions, quadrillions, quintillions, etc., deriving their names from the Latin numerals. If a digit is written in the place of any cipher in the blank scale above given, it will express a corresponding number of units of the name indicated; thus, the combination 326,812,435.278,812, expresses the number 326 *millions*, 812 *thousands*, 435 *units*, and 278 *thousandths*, 812 *millionths*. It will be observed that the unit of each place is some power of 10: thus, the unit of the first place is 10^0, or 1; that of the second place is 10^1, or 10; that of the third place is 10^2, or 100; and so on. In like manner the unit of the first decimal place is 10^{-1}, or $\frac{1}{10}$; that of the second place of decimals is 10^{-2}, or $\frac{1}{100}$; that of the third place is 10^{-3}, or $\frac{1}{1000}$; and so on. It is from this law of relation that we name the scale a *decimal* scale; for like reason we call this system of indicating numbers the *decimal system*. In the system just explained the units corresponding to the different places are in geometrical progression, the *base* or *radix* of which is 10. Similar scales might be constructed having any other number as a *radix*, but such scales are not in common use.

(2) *The Roman Method.*—In the Roman method of notation seven capital letters are used. These letters and the values they express are shown below:

Letters, I., V., X., L., C., D., M.
Values, 1, 5, 10, 50, 100, 500, 1000.

Other numbers than those above are expressed by combining these letters according to the following laws: 1st, If a letter is repeated, the number that it denotes is repeated. 2d, If a letter is written after another which denotes a greater number, the value of the latter is increased by that of the former. 3d, If a letter is written before one that denotes a greater number, the value of the latter is to be diminished by that of the former. Thus, III. denotes 3, and XXX. denotes 30; VI. denotes 6, and LX. denotes 60; XC. denotes 90, and IX. denotes 9. The combination MDCCCLXXV. is read 1875. This system is only used for dates, headings of chapters, and the like. It is a very cumbrous system, and is by no means adapted to the ordinary requirements of numerical computation.

(3) *The Grecian Method.*—The ancient Greeks represented numbers by means of the letters of their alphabet, to which they added the three obsolete characters ϛ', ϙ', and ϡ. Thus, the consecutive numbers from 1 to 9 were represented by the characters α, β, γ, δ, ε, ϛ, ζ, η, and θ—*simple units*; the tens from 1 ten to 9 tens, or the numbers from 10 to 90, were represented by the characters ι, κ, λ, μ, ν, ξ, ο, π, and ϙ—*tens*; and the hundreds up to nine hundred were represented by the characters ρ, σ, τ, υ, φ, χ, ψ, ω, and ϡ—*hundreds*. Thousands were expressed by a subscript dash; thus, the number 3000 was written ,γ. The letter M written below any symbol increased its value ten thousand times; these conventional principles enabled them to write any number up to 1,000,000,000. The following examples show how numbers were expressed in this system:

,θ ϡ ϙ θ', *nine thousand nine hundred and ninety-nine.*
,δ τ π β', *four thousand three hundred and eighty-two.*
,γ α', *three thousand and one.*

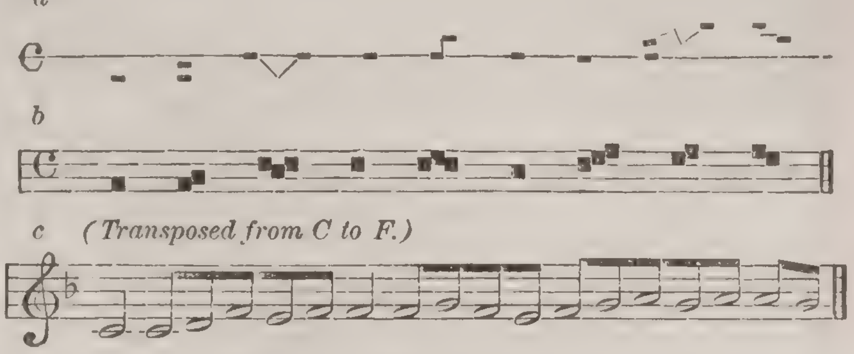
Other devices for expressing numbers were conceived by Archimedes, Apollonius, and others, but the entire system was, like that of the Romans, extremely unwieldy and ill fitted to practical computations. W. G. Peck.

Notation [Lat. *notatio*]. In music this term is now commonly used in a larger sense than formerly, to denote the mode or system by which musical thoughts are represented in writing, including all the signs, characters, figures, and arbitrary marks necessary to render such thoughts intelligible and expressive of the author's conceptions. The system now in use is mainly a product of the last three or four centuries, and is remarkable as possessing many of the properties of a universal language. In all civilized nations musical symbols are the same, and musical compositions when correctly written receive everywhere substantially the same interpretation. In ancient times the recording of musical ideas, however simple they might be, was a subject of perplexity and uncertainty, even among those who could give expression to other forms of thought in refined, exact, and appropriate language. To convey from one mind to another a clear idea merely of the *pitch* and the *duration* of several tones or sounds, though comprising only a very limited series, required of course certain signs or symbols which should possess a fixed and recognized meaning. The earliest signs adopted for this purpose seem to have been the letters of the alphabet, which were sometimes placed erect, sometimes inverted, mutilated, commingled, or cast into various fanciful forms, so that by degrees more than 100 of such characters came into use. After this, greater simplicity was secured by the use of only a few Roman letters, the lower octave being represented by capitals, the second octave by small letters, and the third by small letters doubled. Besides the letter system, another mode of representing musical sounds came into use, the leading feature of which was a single straight line—black, red, or yellow—above and below which the various sounds were indicated chiefly by dots, either on the line or more or less distant from it. An illustration of this is given at *a* in the following example, taken from a work by Padre Martini, with its interpretation in black notes at *b*, and in modern notes at *c*:

a

b

c (*Transposed from C to F.*)



As late as the thirteenth and fourteenth centuries numberless crooked marks, loops, curves, hooks, wavy lines, and other signs, besides the dots, were used with the single straight line, forming a most intricate and curious system, not easy to be interpreted even by the most skilful of modern musicians. The introduction of *several* lines with their spaces, and notes of fixed form and duration, was the next important step. The lines were at first only four in number, though we sometimes find the staves belonging to two or three voices (with their proper clefs) so crowded together as to look like one stave of eight or twelve lines. (The ancient *notes* belonging to the four-line stave have already been described in the article Large, to which the reader is referred.) To indicate the *pitch* of the notes, two clefs were used—viz. one to mark the place of middle C, and the other that of the F below. These clefs were not permanently fixed on any particular line, but placed on such a line as would serve most conveniently to keep the notes within the bounds of the stave and the spaces above and below. The stave now in universal use consists of five lines, that number being found most convenient for the eye; and to each stave is prefixed a clef to designate, as from a starting-point, the various degrees of acuteness or gravity of the notes employed. Of these clefs, that of F for the bass and that of G for the upper parts are of most frequent use in modern music, the C clef being reserved for certain orchestral parts, and also occasionally used for the tenor and alto in church music. Instead of the cumbrous notes formerly employed, with square, oblong, and lozenge shapes, the round-headed form, both white and black, is now exclusively used, the old square breve seldom appearing except in the music of the church. "The invention of the minim, crotchet, quaver, and semiquaver is ascribed to John de Muris, a doctor of the Sorbonne, who made this important addition to notation . . . in the year 1338. The demisemiquaver first appeared in the seventeenth century." (*Penny Cyclopædia.*) Of these notes, the semibreve is now taken as the standard of unity or the note of longest duration, but the *extent* of that duration is not determined by clock-time, but by the will of the composer or performer. The actual speed of a piece of music is indicated by regulative terms or signs at the commencement, or is left to the discretion of the performer; but in all cases the time given to the semibreve determines the time of each minim, crotchet, quaver, etc., because these notes stand to it in the relation of $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, $\frac{1}{16}$, etc. Intervals of silence also, corresponding in duration with the several kinds of notes, are indicated by characters called *rests*. To meet the want of notes bearing other ratios to the semibreve, as $\frac{3}{4}$, $\frac{3}{8}$, $\frac{3}{16}$, etc., the simple process of adding a dot to a note was adopted, whereby its duration became one-half longer—a dotted minim, for instance, being $\frac{3}{4}$ of a semibreve, a dotted crotchet $\frac{3}{8}$, etc. The dot

is sometimes doubled; in which case the time expressed by the first dot is increased one-half. These dots are equally applicable to the rests or marks of silence. To the moderns must also be ascribed the systematic and rhythmical division of music into phrases, sections, periods, and measures or bars, and the marks by which the latter are represented—viz. bar-strokes of various kinds. The use of bars was not general till about the middle of the seventeenth century, and to the same period is to be referred the grouping of quavers, semiquavers, etc. by ties or ligatures connecting their stems. Under the head of notation are also comprised the numerous signs of expression, emphasis, loudness and softness, retardation and acceleration of speed, various kinds of ornament, and all the marks belonging to the province of harmony. WILLIAM STAUNTON.

Note Engraving. See BANK-NOTE ENGRAVING.

Notes [from Lat. *nota;* Fr. and Ger. *note,* a known "mark" or "sign"], in music, the characters by which the relative *duration* of the several sounds is expressed; thus, a semibreve occupies as much time as two minims, four crotchets, etc. The *pitch,* or degree of acuteness or gravity of the sounds represented by these characters, is not determined by their *form,* but by their *position* on the lines or spaces of the stave. (See NOTATION.) In a less accurate sense, the term "note" is often used for the *sound* of which it is the representative, as when we say a high note or a low note, meaning a high or low sound. Though not strictly correct, this usage of the word is common even in scientific works and in ordinary converse, through a defect or want in the vocabulary of musical terms.

WILLIAM STAUNTON.

Nothop'idæ [from *Nothopsis*—νόθος, "false" or "spurious," and ὄψις, "appearance"—the only certainly known genus], a family of non-venomous snakes related to the boas and pythons, but of small size. The body and tail are compressed, covered with subequal scales, with the gastrosteges (abdominal plates) narrow and angulate and the urosteges (sub-caudal plates) in two rows; the head is flat, oval, and moderately distinct, and covered with small scales above; the post-frontal is of considerable size, "and sends forward along the margin of the frontal a process as far as the prefrontal;" the lower jaw resembles that of the Colubridæ in lacking the coronoid bone; the teeth are present on the intermaxillaries, as well as maxillaries and mandible, and are entire; no posterior extremities or hooks are developed. This family has been established by Prof. Cope for a peculiar generic type (*Northopsis rugosus*) made known by himself. According to this zoologist, "its superficial characters remind one at once of the Peropoda (*i. e.* pythons and boas), and the double urosteges suggest the Pythons." In the development of the post-frontal bone, however, it recalls the Achrochordidæ. The only known species is an inhabitant of Central America, and has a strange resemblance in coloration to the young of *Trygonocephalus atrox,* from the same country, and the *T. neovidii* of Brazil. "This is so marked as to constitute a case of mimetic analogy. But few cases of the mimicry of *crotaline* venomous snakes are to be observed in S. America, the imitations being chiefly of the other venomous group, *Proteroglypha,* as represented by *Elaps.*" In allusion to this mimicry or false characters the type has received its generic name. THEO. GILL.

No'tice, in law. This word is sometimes used as equivalent to the act of giving information of some fact. At other times it means information or knowledge obtained in whatever way. Considered as knowledge, it is of two general kinds—*actual* and *constructive.* "Actual" notice includes cases where information of a fact is given directly to a party or one who represents him. "Constructive" notice takes place when a person gains information from which he ought to have derived knowledge of a principal fact by means of an inquiry, or when a positive rule of law on grounds of public policy charges him with knowledge. In the variety of constructive notice first stated there is an element of negligence or lack of good faith. Thus, if a person in taking a conveyance should find in it a clause which pointed to some other conveyance for information as to points in the line of his title, there would be a want of diligence on his part in not referring to the latter, and the law would charge him with all the knowledge that he would have obtained from a diligent examination of the instrument to which the reference was made. An instance of the other branch of constructive notice is that of the pendency of a suit in a court of equity, the regular rule in that court being that while a suit is pending no change can be made in the state of things by the introduction of succeeding parties, and every one who may purchase the property in question is bound to know of the existence and state of the litigation until final decree is rendered. Another instance of importance is that of the registration of deeds and conveyances in general, and the docketing of judgments in accordance with law. Every person acquiring the title is charged by law with the knowledge of these claims. (See RECORDING OF DEEDS.)

Some of the leading cases of the act of giving notice will now be stated. It may be premised that as notice consists simply in communicating information, no writing is in general necessary unless the notice be made requisite by statute. On grounds of expediency, in cases of importance written notices should be adopted.

(1) *Notice of Dishonor of Commercial Paper.*—In order to charge a drawer or an indorser of a bill of exchange or an indorser of a promissory note, it is necessary when a demand for acceptance or payment has been made of the drawee or acceptor of the bill or maker of the note, and either acceptance or payment has been refused, to give prompt notice of such refusal. A failure to comply with this rule discharges the parties entitled to notice from all liability. (See BILL OF EXCHANGE and PROMISSORY NOTES.)

(2) *Notice to Quit.*—This is a request from a landlord to a tenant to leave premises under lease, and to give up the possession at a specified time. No such notice is necessary when the time for the expiration of the lease is fixed. On the other hand, when the lease is for an uncertain period or at the will of both parties, such notice is requisite. It emanates from the owner or his agent, is addressed to the tenant, and is delivered to him personally if he can be found at his usual place of abode, and if not there to some member of his family of suitable age and discretion. A specified time (six months) must in general be allowed to expire between the giving of the notice and the termination of the tenancy, which in some cases must occur at the end of the year. (See TENANCY FROM YEAR TO YEAR.) This time is sometimes changed by statute. Any act on the part of the landlord recognizing the tenant's continuance in the premises beyond the specified time is a waiver of the notice. It may be added that statutes in a number of the States provide for giving notice in case of non-payment of rent as a basis for evicting the tenant by summary proceedings before a magistrate; and a similar practice exists for terminating the tenancy itself. (For details the statutes must be consulted.)

(3) *Notice in other Cases as an Element in a Contract and as a Condition to its Formation or Performance.*—It may be stated generally that when notice is expressly required in a contract, or impliedly called for by the circumstances of the case, it becomes a condition to the formation of the agreement or to its performance, and must be proved by the party bound to give it. There is but little difficulty, of course, where notice is expressly required. Much uncertainty attends the point when the duty to give notice is to be implied. This seems in many instances to turn upon the inquiry whether the act on which the right to demand performance is perfectly indefinite, or whether it is specific. If it be *indefinite*—as, *e. g.,* "to pay for certain stacks of grain as much as the plaintiff sold such grain for to any other man"—notice of the price paid by the other person is necessary. Accordingly, notice is in general necessary where the act is to be done at the option of the plaintiff. On the other hand, if the act agreed to be done be *specific,* such as to pay $1000 on the marriage of A, notice is not requisite. Where an act is to be done upon notice, there may be a question as to the time which should be allowed to intervene between the giving of the notice and the performance of the act. This will depend upon circumstances. Thus, if on the illness of an actor notice were to be given to another performer to assume a part in which he had acquired celebrity, time (in the absence of an express agreement) would need to be allowed for preparation proportioned to the reputation at stake.

(4) *Notice by an Assignee of a Claim.*—It is a general rule of law that if a creditor assign a claim, the debtor will not be affected by the assignment without notice of it. This rule has an important application in the case of an assignment of a mortgage. The debtor must be allowed all payments made by him to the mortgagee until notice is given. After that he must pay the assignee.

(5) *Notice as bearing upon the Good Faith of a Purchaser of Property.*—This is a subject of great magnitude, and growing day by day of more consequence. There is a large class of cases in which a contract or transaction is capable of being set aside or repudiated as long as the original parties to it or those who immediately represent them are solely concerned. On the other hand, when a purchaser in good faith intervenes, the transaction cannot be disturbed. If, however, though a purchaser for value, he have notice of the fraudulent or unfair element in the original transaction, he must stand in the position of the one from whom he buys. Instances of the application of this doctrine are found in negotiable paper fraudulently obtained or stolen, and in the case of lands or chattels to

which an apparent title has been obtained by fraud, or to which a trust has been attached unknown to the purchaser. Notice in all these will fasten upon the purchaser the consequences of the fraud or breach of trust, so far as these may affect the ownership of the property acquired by him. It may be either actual or constructive, as already explained. A common instance of "constructive" notice in this class of cases is that afforded by possession of the property in litigation on the part of the person claiming against the purchaser. Thus, if one should obtain a contract from the owner of land and go into possession, the owner still having the title, and the latter should convey to a purchaser for value, there would be sufficient notice of the contractor's rights to be derived from his possession. Notice may be given to an agent, such as an attorney employed in the business, as well as to the principal. When given to an agent it must in general be communicated to him at the time and in the course of the transaction. Assuming that the information is duly given to the agent, it is immaterial whether the principal is actually apprised of the facts or not.

(6) *Notice in Legal Practice or Procedure.*—This subject is of prime consequence as a branch of procedure. It is a general rule that no step of importance can be taken by one party in a cause, and affecting the other, without giving him notice. The details of the matter are regulated by rules of court or statute. If a proceeding is allowed in the first instance without notice (*ex parte*), an opportunity is afforded for a hearing at some subsequent stage of the cause. Notice affords an important topic in the introduction of evidence. (See EVIDENCE.) It is a general rule in that branch of the law that if a written instrument is to be made use of, the instrument itself, and not a copy, is to be introduced. If that cannot be had, a copy may be offered, or even oral proof of the contents. This is secondary evidence. To lay a foundation for these, if the instrument is in the possession of the opposite party he must have timely notice to produce it. If he fail to comply with the notice, secondary evidence may be resorted to. (For further information on the various topics referred to in this article, consult (*lis pendens*) BILL OF EXCHANGE, LANDLORD AND TENANT, EVIDENCE, EQUITY, FRAUD, and the textbooks and authorities therein referred to.) T. W. DWIGHT.

Notidand′idæ [from *Notidanus*—νῶτος, "back," and ἰδανός, "comely"—one of the general, a family of selachians of the order Squali or sharks, distinguished from all others by the increased number of branchial apertures. In the form of the body they resemble the typical sharks: the skin is shagreen-like; the head depressed, oval, with the snout protuberant; the eye has no nictitant membrane; the nostrils are inferior and distant from the mouth; the mouth has a crescent-like cleft; the teeth are very unlike in the opposite jaws, those in the upper jaw being broad and armed with several cusps, one of which extends beyond the others, but in the lower jaw are six pectinated teeth on each side forwards, and several smaller posterior ones; the branchial apertures are six or seven in number; small spiracles are persistent on each side of the neck; the dorsal fin is single and inserted far backwards behind the ventrals; the anal is well developed and behind the dorsal; the pectorals have an anterior edge straight from the base; the ventrals normal. The family is distinguished, in addition to the peculiarities enumerated, by a number of others, and is composed of three genera, *Hexanchus* and *Heptanchus*, represented by species in the Mediterranean and Atlantic Ocean, and *Notorhynchus*, with representatives in the S. African seas and on the western coast of N. America. THEODORE GILL.

No′to, town of Sicily, province of Syracuse, about 19 miles S. W. of the city of Syracuse, stands on a hill not far from the Ionian Sea, and commands a charming valley, watered by the stream to which the town gives its name. The old town, built on the ruins of a still older (*Neëtum* or *Netum*, 448 B. C.), flourished during the Roman empire, shared the changing fortunes of the island in the Middle Ages, but was completely destroyed by a terrible earthquake in 1693. The new town is about 4 miles from the old site; the buildings are comparatively modern and the streets broad. It carries on a considerable trade in grain, wine, oil, and fruits. Pop. 16,590.

Not′ochord [νῶτος, "back," and χορδή, a "cord"], or **Chorda Dorsalis,** a cellular rod of soft cartilaginous or semi-cartilaginous consistency that appears in the embryo beneath the primitive groove, forming the floor of the cerebro-spinal canal and supporting the cerebro-spinal nervous centres. It thus corresponds in position to the front part of the spinal column. In most vertebrates it is gradually surrounded and ultimately more or less completely obliterated by the growth of cartilaginous plates destined finally to become the ossified bodies of the vertebræ; in some types, however, as the lancelet (*Amphioxus*), the sturgeons, and the lampreys, the notochord is persistent; and this was much more generally the case with the fishes of the early geological periods. EDWARD C. H. DAY.

Notopter′idæ [from *Notopterus*—νῶτος, "back," and πτερόν, "fin"—the typical genus], a family of teleocephalous fishes of the suborder Phyzostomi, distinguished by many peculiar characters. The body is elongated and tapers backwards; the abdomen is armed with a double serrature; the scales are small, the lateral line distinct and slightly incurved from the back; the head is rather small, compressed, and conical; the opercular apparatus incomplete, the sub-operculum being atrophied; the nostrils double; the mouth has a lateral oblique cleft; the margin of the upper jaw is formed by the intermaxillaries towards the middle and the maxillaries on the sides; the teeth are small and developed in a narrow band or series on the jaws as well as palate and sphenoid bones; branchial apertures not confluent, the membrane being partially attached; branchiostegal rays 3–9; dorsal small; inserted back of the middle of the back, or entirely wanting; and fin very long and united with the caudal; ventrals rudimentary (in which case they are a little before the vent, and united) or wanting. The skeleton has a number of peculiarities; the pteriotic is external, annular, and encloses a large cavity; the basis cranii is double; there are 70 or more vertebræ; the caudal vertebræ are nearly equally developed above and below; the stomach has no blind sack, but two pyloric appendages are developed; the air-bladder is divided in the interior; the ovaries discharge their eggs directly into the abdominal cavity, from which they are afterwards excluded. The family is composed of fresh-water fishes, attaining considerable size, and peculiar to the fresh waters of India and Africa. There are two very distinct genera: (1) *Notopterus*, in which the dorsal fin is developed, and (2) *Xenomystus*, in which it is absent. The latter is represented by a single species, which has, as yet, been found only in the river Niger. THEO. GILL.

Notor′nis. Amongst the bones of extinct birds found in New Zealand by Mr. Mantell were some of a bird of about the size of a fowl, which Prof. Owen named *Notornis*. The interest attaching to the species was subsequently greatly enhanced when Mr. Mantell obtained the skin and bones of a bird recently killed, which proved to belong to the same species as the semi-fossil bones. The notornis appears to belong to the Rallidæ or rail family, approaching nearest to the coots, but differing from all its known relatives, and singularly agreeing with the other ancient birds of New Zealand in the remarkably feeble structure and small dimensions of the wings. When shown to the natives, Mr. Mantell says, "No one had seen such a bird, but all agreed that it was the traditional *moho*, or *takahé*, which they had believed utterly extinct." (See MOA.) EDWARD C. H. DAY.

Nototheni′idæ (from *Notothenia*—νοτόθεν, "southern" —the typical genus), a family of teleocephalous fishes, of the suborder Acanthopteri, representing in the southern seas to some extent the codfishes of the northern. The body is elongated; the scales ctenoid, regularly imbricated, and of moderate size; the lateral line runs high on the side near the dorsal fin, and is either interrupted or continued into the upper half of the caudal; the head is oval and scarcely compressed; the opercula normally developed and unarmed; the nostrils double between the eyes and snout; the mouth terminal, with the cleft lateral; the upper jaw little protractile, with the supramaxillaries retractile in part under the preorbital; teeth acute, present on the jaws as well as palate; branchial apertures extending forwards; branchiostegal rays six; dorsal fins two, the anterior short, with comparatively few spines, the posterior very long; anal little shorter than the second dorsal; caudal moderately developed; pectorals with the rays branched; ventrals jugular, each with a spine and five rays. The vertebræ are developed in increased number (in *Notothenia purpuriceps* 15 + 31); the stomach is moderate and cæcal, and the pyloric appendages present in small number (3 to 5). The family is composed of several genera, which have been differentiated among two subfamilies, viz. *Nototheniinæ*, in which the lateral line is interrupted, including *Notothenia* and *Macronotothen*, and *Eleginiinæ*, in which the lateral line is divided, and including *Eleginus* and *Eleginops*. The species are all inhabitants of the southern seas. The greatest number of species belong to the typical genus (*Notothenia*), and some of them are abundant on the southern coasts of S. America, and contiguous islands, as well as Kerguelen's Land, Australia, etc. THEODORE GILL.

Notre Dame′, post-v. of St. Joseph co., Ind., 1 mile N. of South Bend, on the Michigan Central R. R., contains the University of Notre Dame du Lac, the St. Joseph's

Manual Labor School, and St. Mary's Academy, 2 newspapers, and stores. Pop. about 800.

Notre Dame, School Sisters of, founded in 1597 by Peter Fourier (1565–1640) and Alice Leclerc (1576–1622). In 1832 the order was restored; introduced in 1847 to the U. S., and received new papal confirmation. It has many houses in the U. S.

Notre Dame, Sisters of, a Roman Catholic sisterhood founded 1804 by Julie Billiart (1751–1816) and by J. D. Varin, a French Jesuit; have houses in the U. S. Another congregation of this name has its mother-house at Namur, and has houses in the Pacific States, to which it was introduced by P. J. de Smet in 1844.

Notre Dame, Sisters of the Congregation of, or **Congregational Nuns,** founded at Montreal in 1653 by Margaret Bourgeoys; found in Canada and the U. S.

Nott (Abraham), b. at Saybrook, Conn., in 1767; graduated at Yale College 1787; studied theology; taught school in Georgia; was admitted to the bar at Camden, S. C., 1791; settled on a plantation on the Pacolet River; was a member of Congress 1799–1801; practised law with great success at Charleston 1804–10, when he was elected a judge of the court of appeals, and retained that post until his death, at Fairfield, S. C., June 19, 1830.

Nott (Eliphalet), D. D., LL.D., b. at Ashford, Conn., June 25, 1773; graduated at Brown University 1795, in which year he was licensed to preach, and settled at Cherry Valley, N. Y., uniting the duties of pastor of a Presbyterian church with those of principal of an academy; was pastor of a church at Albany 1798–1804, acquiring celebrity as a pulpit-orator, especially by a sermon on the death of Alexander Hamilton; was elected president of Union College, Schenectady, N. Y., 1804, retaining that post more than sixty years, until his death, Jan. 29, 1866. Dr. Nott acquired a considerable fortune by several inventions in stoves and other apparatus for warming buildings, and gave large sums for the endowment of Union College and the foundation of scholarships for poor students. Among his publications were *Counsels to Young Men* (1810) and *Lectures on Temperance* (1847).

Nott (Gustavus Adolphus), M. D., b. in Columbia, S. C., was a younger brother of the distinguished Josiah C. Nott; d. June 6, 1875, in Montgomery, Ala.; received the degree of M. D. from the medical college of his native State; in 1839 was elected professor of anatomy in the medical department of the University of Louisiana; in 1848 was transferred to that of materia medica and therapeutics, and in 1849 made dean of the faculty. He was a surgeon in the Confederate army. Paul F. Eve.

Nott (Henry Junius), son of Judge Abraham, b. on the Pacolet River, Union district, S. C., Nov. 4, 1797; graduated at South Carolina College 1812; visited Europe; was admitted to the bar 1818; became partner with David J. MacCord, with whom he edited 2 vols. of law-reports; went again to Europe for his health 1821; was elected during his absence professor of criticism and logic in South Carolina College; filled that post with ability until 1834; wrote many essays for the *Southern Review;* published in other periodicals a series of humorous sketches, collected at New York under the title *Novelettes of a Traveller* (2 vols., 1834); visited New York in 1837, where with his wife he embarked for Charleston on the steamer Home, and both perished in the shipwreck of that vessel on the coast of North Carolina Oct. 13, 1837.

Nott (Josiah Clark), M. D., son of Judge Abraham, b. at Columbia, S. C., Mar. 31, 1804; graduated at South Carolina College 1824, and in medicine at Philadelphia 1827; was two years demonstrator of anatomy to Dr. Physick; commenced practice at Columbia; spent two years in Europe studying medicine and natural history 1835–36; settled as a physician at Mobile, Ala., where he established a medical college; was for a short time professor of anatomy in the University of Louisiana (1857), and removed to New York City in 1868. D. at Mobile Mar. 31, 1873. Besides many scientific articles in medical journals and other periodicals, Dr. Nott was author of *Two Lectures on the Connection between the Biblical and Physical History of Man* (1849), *The Physical History of the Jewish Race* (1850), *Types of Mankind* (1854), and *Indigenous Races of the Earth* (1857).

Nott (Samuel), D. D., brother of Dr. Eliphalet, b. at Saybrook, Conn., Jan. 23, 1754; graduated at Yale College 1870; became pastor of the Congregational church at Franklin, Conn., Mar. 18, 1782, and filled that pulpit seventy years, until his death May 26, 1852. Dr. Nott was somewhat prominent as a theological instructor, and was long the patriarch of the clergy of New England.

Nott (Samuel), son of Dr. Samuel, b. at Franklin, Conn., in 1788; graduated at Union College 1808, and at Andover Theological Seminary 1810; was ordained Feb. 6, 1812, as one of the first band of missionaries sent to India by the A. B. C. F. M.; returned on account of ill-health 1816; was a teacher in New York until 1822; pastor of a church at Galway, N. Y., 1823–29, at Wareham, Mass., 1829–49; after which he established and conducted until 1858, with great success, a private academy at Wareham. The last eleven years of his life were passed with a son at Hartford, Conn., where he d. June 1, 1869. Author of *Sixteen Years' Preaching and Procedure at Wareham* (1845) and of *Slavery and the Remedy* (1856).

Nott (Sir William), K. C. B., b. at Carmarthen, Wiltshire, England, Jan. 20, 1780; entered the military service of the East India Company 1800; retired with the rank of major after a service of thirty-six years, and settled near his native place; but the loss of his fortune by the failure of a Calcutta bank induced him to return to India at the age of fifty years. In 1842 he had the good fortune to extricate the British army from its peril in Afghanistan by holding Candahar, retaking Ghuznee, Sept. 6, and re-entering Cabool with Gen. Pollock Sept. 15; for which services he received the rank of major-general, the thanks of Parliament, the highest order of knighthood, and an annuity of £1000 from the East India Company. D. at Carmarthen Jan. 1, 1845.

Not'tawa, post-v. and tp. of St. Joseph co., Mich., on the Grand Rapids and Indiana and on the Michigan Central R. Rs. Pop. 1868.

Not'tingham, or **Nottinghamshire,** or the county of **Notts,** county of Central England, comprising an area of 822 square miles, with a population of 319,956. The eastern part, the vale of the Trent, is level and low; the rest is hilly, partly consisting of moorland, partly covered with remnants of the famous old Forest of Sherwood, the haunt of Robin Hood. The cultivation of hops is carried on extensively, but the principal industry of the inhabitants is the manufacture of lace and of cotton hosiery, which two branches are developed more extensively and to a higher degree of perfection than in any other part of England. Much of the surface is laid out for gardening purposes.

Nottingham, town of England, the capital of the county of Notts, on the Leen, near its junction with the Trent. It has a large and handsome market-place, but is otherwise indifferently built. It has good educational and benevolent institutions, and its manufactures of cotton and silk hosiery and of bobbinet and lace are most important. Its iron and brass works, its malting business, and its trade in corn and cattle are extensive. Pop. 86,621.

Nottingham, post-v. and tp., Wells co., Ind. P. 1432.

Nottingham, post-v. and tp. of Prince George's co., Md., on the Patuxent River. Pop. 2476.

Nottingham, post-v. and tp. of Rockingham co., N. H. Pop. 1130.

Nottingham, tp. of Harrison co., O. Pop. 921.

Nottingham, tp. of Washington co., Pa. Pop. 924.

Nottingham (Custis Bell), b. in Northampton co., Va., May 21, 1818; received his classical education in Dickinson College, and graduated M. D. in the Jefferson Medical College, Philadelphia, 1844; practised in Houston co., Ga., nine years, and then removed to Macon. He has performed ovariotomy and lithotomy, and has been president of the Georgia Medical Society. Paul F. Eve.

Nottingham (Heneage **Finch**), D. C. L., first Earl of, son of Sir Heneage Finch, recorder of London, b. in Kent Dec. 23, 1621; educated at Westminster School and at Christ Church, Oxford; studied law and was called to the bar at the Inner Temple 1645; was a member of the Convention Parliament Apr., 1660; made knight, baronet, and solicitor-general by Charles II. June, 1660; was returned to Parliament for the University of Oxford 1661; became attorney-general May, 1670; lord keeper of the privy seal, with the title of Baron Finch of Daventry, Nov., 1673; lord high chancellor of England Dec. 19, 1675; presided at the trial of Lord Stafford 1680; was created earl of Nottingham May 12, 1681, and d. in London Dec. 18, 1682. Famed in his own time for powers of oratory, his portrait was given by Dryden under the character of Amri in his *Absalom and Achitophel.*—His son and successor in the earldom, Daniel Finch, b. about 1647, educated at Christ Church, Oxford, became a privy councillor and first commissioner of the admiralty 1679; was one of the commissioners to treat with William, prince of Orange, 1688; was secretary of state under William and Mary 1689–93; attended William to the congress at the Hague 1690; quarrelled with Admiral Russell 1672; was again secretary of state under Anne 1702–04; became one of the lords justices for the administration of affairs 1714; was lord president of the council Sept., 1714–Feb., 1715;

wrote an answer to Whiston on the Trinity (1721), for which he was thanked by the University of Oxford; succeeded to the earldom of Winchelsea 1729, and d. Jan. 21, 1730.

Not'tla, post-v. and tp., Cherokee co., N. C. Pop. 940.

Not'toway, county of Central Virginia. Area, 300 square miles. It is uneven and has a good soil. Tobacco and grain are leading products. The county is well wooded, with pleasant scenery. It is traversed by the Southside R. R. Cap. Nottoway Court-house. Pop. 9291.

Nottoway Court-house, post-v. and cap. of Nottoway co., Va., on the South Side division of the Atlantic Mississippi and Ohio R. R.

Nottoways, a tribe of American Indians of the Huron-Iroquois family, resided on the river of the same name in Virginia, where a small remnant remained and preserved the language until within the present century. The Nottoways of full blood are now extinct, as well as their language, which was related to the Huron and Susquehanna.

Nou'kha, town of Asiatic Russia, government of Trans-Caucasia, at the foot of the Caucasian Alps. The inhabitants, numbering about 12,000, and consisting mostly of Tartars and Mohammedans, are engaged in breeding silkworms; the vicinity is one garden of mulberry trees.

Noun [from Lat. *nomen*, a "name"], in grammar, the name of a class of words which denote persons, things, or ideas. In the first case, a noun is called *proper*, as John, Peter, etc.; in the second, *common* or *concrete*, as horse, church, etc.; in the third, *general* or *abstract*, as virtue, goodness, etc. The common or concrete nouns are called *appellative* when they denote the material, as milk, dust, etc.; and *collective* when they denote a whole consisting of many single individuals, as mankind, cavalry, etc. In the different systems of grammar and logic many other divisions and subdivisions are to be found, but they are generally of subordinate importance. Nouns admit of three kinds of modification or inflection—*gender*, masculine, feminine, neuter; *number*, singular, dual, plural; and *case*, nominative, genitive, dative, accusative, vocative, ablative. But the inflection of nouns is of very different extent in the different languages, some languages having no gender, others only two numbers, and others no cases, or only two, or even more than those above mentioned. The difference between the noun or substantive and the two other principal classes of words, adjectives and verbs, may be defined thus: the noun denotes an object in fact, the adjective a quality of the object, and the verb the state in which it is considered. (For further information see the respective articles on GENDER, INFLECTION, LANGUAGE, etc.)

Noureddin. See NOOR-ED-DEEN.

Nourse (J. E.), b. in Washington, D. C., Apr. 17, 1819; graduated at Jefferson College, Pa., 1837; taught school in Washington 1840–50, when appointed professor of ethics and English studies at the U. S. Naval Academy, having been meanwhile (1852) ordained minister in the Presbyterian Church: ordered to U. S. Naval Observatory in 1865. Author of various professional works, including a *Memoir of the Suez Canal*, of the *Founding and Progress of the Naval Observatory*, etc.

Novac'ulite, an argillaceous slate containing a very large proportion of silica, perfectly compact and homogeneous, with a splintery fracture. It is highly valued for sharpening tools, and is commonly known as whetstone, whetslate, honestone, and oilstone. EDWARD C. H. DAY.

Nova'lis, the pseudonym under which FRIEDRICH VON HARDENBERG is generally known in German literature, where he occupies a conspicuous place as one of the leaders of the romantic school. He was b. May 2, 1772, at Wiedestedt, a family estate situated in the countship of Mansfeld in Saxony; studied jurisprudence, chemistry, and mathematics at Jena, Leipsic, and Wittenberg; attended the mining school of Freiberg; held a position at the salines of Weissenfels, of which his father was director; and d. at Wiedestedt Mar. 25, 1801. His works, consisting of an unfinished romance, *Heinrich von Ofterdingen* (translated into English, Cambridge, Mass., 1842), a number of lyrical poems, especially hymns, and fragments on philosophy and religion, were published by his friends, Friedrich von Schlegel and Tieck (Berlin, 1802), and have been often reprinted. Besides the Bible, his favorites were Böhme, Zinzendorf, and the Neo-Platonists; the deep religious enthusiasm of his heart is often singularly mixed with mystical and fantastical flights of imagination.

Nova'ra, town of Italy, province of Novara, in lat. 45° 26′ N., lon. 8° 37′ E., about 30 miles W. of Milan, on a rising ground in the midst of the great fertile plain between the Sesia and the Po, and commands a fine distant view both of the Alps and the Apennines. Thirty years since this town was surrounded by lofty bastions and entered only by four low gates of rude architecture, so that it had altogether the aspect of a fortress. Now the walls, towers, and gates are demolished, the streets widened and paved, and the city wears a cheerful look. The cathedral of Novara rivals St. Ambrogio of Milan in antiquity, being founded A. D. 400, and is of much interest; there are also other noteworthy churches, besides numerous fine public buildings and private palaces. Charitable institutions of all sorts abound, and the provision for general education is liberal. Novara is the largest grain-market in Piedmont, and the manufactures of the town are numerous and extensive. Among these are cotton and linen cloths, starch, candles, sausages, earthenware, hides, etc. Novara is of pre-Roman origin; its inhabitants were noted for their industry in the time of Pliny; it played no inconsiderable part in the mediæval history of Northern Italy, and has been the theatre of important events in modern times. In 1500, Ludovico il Moro was held a prisoner here; in 1513 Novara was the scene of a battle that ended in the expulsion of the French from Italy; in 1821 the constitutional troops were here defeated by the Austrians; and here again, in 1849, the Austrians once more triumphed over the Sardinian army, after which the unhappy Charles Albert gave over his crown to his more fortunate son, Victor Emmanuel. Pop. 29,516.

Novara di Sicil'ia, town of Sicily, province of Messina, about 15 miles S. W. of Castroreale. There are silver, copper, and lead mines near it. This was one of the first towns occupied by the Normans under Roger. Pop. 7772.

Novar'ro, v., Big River tp., Mendocino co., Cal. P. 315.

No'va Sco'tia [Lat. for "New Scotland"], a province of the Dominion of Canada, consisting of the peninsula of Nova Scotia proper (area, 15,627 square miles), with the island of Cape Breton and numerous small islands adjacent to the mainland. Total area, 18,746 square miles. Sable Island in the Atlantic, lat. 43° 59′ N., lon. 59° 47′ W., belongs also to Nova Scotia. It is 85 miles distant from the mainland. Nova Scotia proper is a roughly-shaped parallelogram, extending 280 miles from N. E. to S. W. It is from 50 to 120 miles wide, and is joined to New Brunswick by an isthmus, which at its W. extremity is low and only 13 miles wide. It has been proposed to cut a canal through the isthmus from the Bay of Fundy to Baie Verte. The Minas Channel and Basin and Cobequid Bay extend from the Bay of Fundy nearly 80 miles into the province. The coast-line measures over 1200 miles, and is everywhere broken into deep bays and noble harbors. One of the most remarkable of these is the tideless Bras d'Or of Cape Breton, which, with the newly-constructed St. Peter's Canal, half a mile long, now quite bisects that island.

Surface, Geology, and Minerals.—The formations from the Laurentian to the Carboniferous prevail, but are much broken by dykes of unstratified rock. Ranges of low hills extend lengthwise through the country. The valleys are naturally fertile; the hill-country is often rocky and poor. The dyked marsh-lands near the Bay of Fundy are remarkably fertile. Among the mineral products are bituminous coal, oil-shales, iron, gold, gypsum, and fine sandstone for building purposes and for grindstones. The coal-fields of Cumberland, Pictou, and Cape Breton are of remarkable geological character, but are smaller and less valuable than was once believed. They are quite extensively wrought. The coal of Glace Bay, C. B., is highly prized as a gas-coal. The Nova Scotia gold-field occupies fully one-third of the area of the province. There has been considerable capital invested in gold-mining, and the results have shown that with proper treatment both the quartz and the placer mines could be rendered profitable. The gold-bearing quartz has been shown to average considerably richer than that of Australia. Between 1861 and 1871 over $4,000,000 worth of gold was mined in the province.

Industrial Pursuits.—Besides the working of coal, iron, and gold mines and quarries of gypsum, grindstone, and building-stone, which are largely exported to the U. S., there is to that country a heavy export of fire-wood, tanner's bark, potatoes, hay, oats, and other products. The country is heavily timbered, and forest products are shipped extensively to Great Britain. Shipbuilding is an important industry. The waters, salt and fresh, teem with fish. Codfish, herring, hake, haddock, salmon, lobsters, halibut, and other fish are very extensively caught and exported. The manufactures include fish and seal oils, lumber, leather, and castings, with some woollen and other goods for home consumption.

Climate.—The influence of the Gulf Stream renders the winters rather milder than those of Quebec, or even those

of New England in general. But the coasts in winter are often enveloped in fogs and rain-clouds. In summer the climate is delightfully cool, and the abundance of trout and salmon and of forest game renders the province an agreeable summer resort for sportsmen and others. The northern coast is much obstructed in winter by ice.

Inhabitants, Religion, etc.—The people are in part descendants of the old Acadian or French colonists. Another part are descended from early colonists from Great Britain and Ireland. In the N. the Gaelic and Irish are quite extensively spoken. At the time of the American Revolution a great number of loyalists, or "Tories," emigrated to the province from the U. S. The British troops carried considerable numbers of negroes from Savannah and Charleston to Nova Scotia at the close of that war; here their descendants still live. Many Germans and Swiss settled at Lunenburg and vicinity in 1753; their descendants form a large and respectable body of citizens. There are some 1400 Micmac and other Indians, who are peaceable and partly civilized; they are Roman Catholics. The Anglican Church is under the lord bishop of Nova Scotia and Prince Edward's Island. The see-house is at Halifax. The Roman Catholics are under the archbishop of Halifax and the bishop and coadjutor-bishop of Arichat. The other churches are the Kirk of Scotland, the Presbyterian Church of the Lower Provinces, the Methodist Church, the Methodist Episcopal, and African Methodist, the Baptist and the Congregational churches, with a few Christians, Lutherans, Universalists, Adventists, and others.

Railroads.—There are 341 miles of railway in Nova Scotia, exclusive of mining and local tramways. A great part of the railways is owned by the Dominion government.

Education.—An effective system of public education has been established. There are county normal and training schools, and various academies and denominational schools. The Anglicans have a university, and the Roman Catholics, Methodists, and Baptists each a college.

History, Government, and Statistics.—Nova Scotia, with New Brunswick and a part of Maine, once constituted the French colony of Acadia (*Acadie*). Attempts were made to colonize it in 1518 and 1598. In 1604 a settlement was established at Port Royal by the Sieur de Monts, a Huguenot gentleman. But religious differences among the colonists and the attack in 1613 by the Virginians under Sir Samuel Argall broke up the colony for the time. During the numerous wars between the French and English the Acadians were more than once mostly expatriated by the English colonists. The last and most famous event of this kind occurred in 1755. James I. and Charles I. of England each granted Nova Scotia to Englishmen, and the latter organized a body of baronets of Nova Scotia, each of whom agreed to furnish six colonists, and was in return to receive 16,000 acres of land, but few if any ever received their land. The final cession of Nova Scotia to Great Britain occurred in 1713, and the third and most nearly complete expatriation of the French-speaking colonists in 1755 was, as it now appears, an act of military necessity. In 1763, Cape Breton, thrice attacked and thrice taken from the French, was annexed to Nova Scotia. It was detached in 1784, and re-annexed in 1819. Prince Edward's Island was separated in 1770, and New Brunswick in 1784. Nova Scotia joined the Dominion in 1867, though a strong party opposed the union. The debt of Nova Scotia was assumed by the Dominion, and the annual Dominion subsidy pays the principal part of the expenses of the provincial government. There is also a handsome royalty on mines and on coal, and a good income from the sale of crown-lands. The province sends 12 senators and 19 representatives to the Dominion Parliament. The province has a lieutenant-governor and an executive council of eight, including the treasurer, attorney-general, secretary, and commissioner of public works. The legislature has 18 members of the upper and 38 of the lower house. There are 18 counties—viz. Hants, King's, Annapolis, Digby, Yarmouth, Shelburne, Queen's, Lunenburg, Halifax, Cumberland, Colchester, Pictou, Antigonish, Guysborough, Inverness (C. B.), Victoria (C. B.), Cape Breton (C. B.), and Richmond (C. B.). The population of each county is given under its alphabetical head. The population of Nova Scotia in 1851 was 276,117; in 1861, 330,857; in 1871, 387,799. Nova Scotia has for many years been quietly and steadily advancing in wealth, population, and intelligence, but on account of the low price of labor thousands of her sons and daughters have emigrated to the U. S., where they are generally industrious, thrifty, and respected citizens. The number of senators from Nova Scotia and New Brunswick to the Dominion Parliament has been reduced (1873) to 10 each. CHAS. W. GREENE.

Nova'tian [Lat. *Novatianus*], a schismatic Roman bishop of the third century, sometimes called the first false pope, founder of the rigorous Puritanic sect called Novatians. Perhaps he had been a Stoic philosopher. He was learned and eloquent, but of melancholic temperament; was baptized clinically, and soon after became a presbyter. In 251 he was persuaded by Novatus from Carthage (with whom he is not to be confounded) to be made bishop in opposition to Cornelius. Socrates (*Hist.* iv. 28) says he suffered martyrdom in the reign of Valerian (253–260 A. D.). We have a letter of his to Cyprian, in the name of the presbyters and deacons of Rome (*Ep.* xxxi.). He wrote also *De Cibis Judaicis* (about 250) and *De Trinitate* (about 256), a very valuable treatise. There is an excellent edition of his writings by Welchman (1724), but the best is by Jackson (1728). The sect spread E. and W., and continued till after 450 A. D. R. D. HITCHCOCK.

Novatianism. See NOVATIAN.

Nova'tion, in law. The doctrines of novation were derived from the civil or Roman law. Its general meaning in that system of jurisprudence is the act of substituting one contract for another. This might be either by putting a new contract of the debtor himself in the place of an existing one, or that of a third person, the original debt in either case being discharged. The first case was more strictly termed *novation;* the second, *delegation.* The "novation" of the English and American law corresponds to the "delegation" of the Roman law, which is described by Domat to be "the change of one debtor for another, when he who is indebted substitutes a third person, who obliges himself in his stead to the creditor, so that the first debtor is acquitted and his obligation extinguished, and the creditor contents himself with the new debtor." (Sec. 2318.) This is a correct definition of novation as now understood, and requires the assent of all the parties concerned. Thus, if A owes $1000 to B, and the latter owes the same amount to C, by mutual agreement the existing contracts may be extinguished by means of a new contract on the part of A to pay C. The inquiry may be made as to what is the consideration of the new contract. The answer is, that the act of C in surrendering his claim against B is a sufficient consideration. (See CONSIDERATION.) On the other hand, if C still retains his claim against B, the promise of C is without consideration and void. Some doubt has been entertained whether the rules of "novation" can be extended to a case where the debts are unequal in amount. Thus, if, in the case supposed, A owed B $1000 and B owed C $2000, would the same rules be applied as if the debts were equal in amount? The answer is, that if the parties intend to extinguish the larger debt by the substitution of the smaller one in its place, their intent will be carried out. On the other hand, they may so make their novation that $1000 of the claim against B will be extinguished by the promise of A, and the balance remain due from B. Under these rules, if an order be written by a creditor to his debtor requesting him to pay the amount of the debt to his own creditor, there is no novation until the debtor's assent is obtained and the creditor surrender his claim against the person on whom the order is drawn. A novation must be carefully distinguished from the assignment of a debt. In the latter case the purchaser obtains no new contract, but merely acquires by transfer the right of the existing creditor; while in the former the fundamental fact is that the old debt is wholly or partially extinguished, and a new contract substituted in the place of that which has been surrendered. A novation can only be made with the debtor's assent; an assignment may be made without it. An assignment to become complete requires notice to the debtor; a novation does not. An assignee takes the claim subject to any equitable defences which the debtor has against the claim. One who acquires by novation becomes a holder for a valuable consideration as against the promiser, and any defences which that person may have had against the original creditor can no longer be urged. T. W. DWIGHT.

Nova'to, tp. of Marin co., Cal. Pop. 417.

No'va Zem'bla, a group of islands situated in the Arctic Ocean in lon. 52° E. and lat. 71° N., and belonging to Russia. They are uninhabited, but visited during the summer by whalers and hunters of bears and reindeer.

Nov'el. This form of fictitious writing is peculiarly the outgrowth of modern civilization. When life was more purely external, and heroic deeds were acted upon the stage or celebrated by wandering bards, as was the case in the earlier ages of the world, the epic, the drama, and the lyric were the natural vehicles of narrative. As manners and customs lost their picturesqueness, the peculiar literary expression which had fitted the needs of earlier times was superseded. Rhythm, which adds so much to narrative spoken or sung, is a trammel to narrative written. As the whole character of modern life became more subjective, as thought turned inward for its material instead of outward, the expression of thought changed. Poetry, like every

other fine art, is peculiarly unfitted to become the vehicle for analysis and for didactic teaching, and poetry, therefore, in this age of self-contemplation, is superseded by prose, the epic and the drama (except for stage representation) by the novel. What the drama was to the ruder and more excitable period of the earlier and less conventional past, the novel aspires to be for us. The imaginative spirit which characterizes a nation in its youth requires a poetical medium. The drama, with its picturesque effects, its scenery, and its action, possesses a certain power in the characterization of manners and the display of the comic side of character. As society becomes more decorous and oddities of manner are smoothed down, the delineator of life must go below the surface, and seize for his material upon the salient points of character rather than upon any external traits. The modern novel of the highest type therefore depends for its interest upon a close analysis of human motive, a delineation of that inner life of joy and sorrow, the ecstasy or tragedy which for ever ebbs and flows with no less power and passion because it is hidden beneath the mask of conventionality. The whole character of fictitious narrative therefore changes with the changing life which it depicts.

The transition from the earlier to the later form of narrative is marked by the rise of the romance, a prose fiction whose interest turns mainly upon marvellous incident. The natural reaction—out of which the modern novel was born—from the stilted heroic romance and absurd sentimental pastoral of the seventeenth century was towards the commonplace and even vulgar. A few noted writers who have been either the founders or the most characteristic representatives of certain schools may be briefly mentioned. Daniel De Foe (1661–1731) was the first of the extreme realists who attained any celebrity. Except as the author of *Robinson Crusoe* he is scarcely known to modern readers, but in all his writings there is a marvellous verisimilitude, an air of absolute truth "resembling that of a deposition upon oath," which defies the skepticism of the reader. His stories are generally laid among outlaws, in the very purlieus of society, and have—with the exception of *Robinson Crusoe*, which is saved from the objectionable features of his other works by its peculiar character—been forgotten. His apparition of Mrs. Veal, which was published as a sort of prelude to a stupid volume, *Drelincourt on Death*, caused the whole edition to be sold. His stories were again and again received as veritable histories, with nothing to recommend them to the public belief but their wonderful air of veracity. This effect was produced by an accumulation of details, and often by such a multitude of irrelevant statements as would be used by an uncultivated narrator. Richardson uses much the same means to paint his picture of a higher life, and to paint it with a higher ideal of his art. He strives to individualize character rather than to make vivid mere incident. The vast accumulation of details is more than modern readers will endure. Richardson, though his aim was higher, both as regards the matter and the manner of his writing, never attained to De Foe's peculiar excellency; in whatever he writes the writer is always present. In humor and quiet satire, in the power to seize the salient points of character, and in the ability to give a characteristic portrait with a few skilful touches, Fielding far surpassed Richardson. Smollett, with whom Fielding is always associated, chooses exceptional absurdities rather than ordinary characters, manners, or incidents as the materials out of which his novels are made up; it is only his strong humor which redeems them from contempt. Both Smollett and Fielding are far inferior to Richardson in morality and refinement. Fielding as greatly excelled Smollett in plot as Smollett excelled him in humor and wit. Sterne, whose productions are now very little read, presents a curious mixture of genius, sentimentality, oddity, insufferable affectation, and indecency. His humor is exquisite, differing from that of Smollett in being the result of a quick insight into human follies and absurdities, rather than in a mere combination of circumstances. These, with Goldsmith, who is too well known, through his exquisite story of *The Vicar of Wakefield*, to need comment, are the five great novelists of George II.'s reign.

The season of romance had seemed fairly over, but in 1769 came its Indian summer. The old stories of terrors and escapes, of heroic deeds and impossible complications of circumstances, of unfathomable mysteries and supernatural appearances, were revived. The best specimens of this class of fiction are to be found in Horace Walpole's *Castle of Otranto*, Mrs. Radcliffe's *Mysteries of Udolpho*, Clara Reeve's *Old English Baron*, and M. G. Lewis's *Monk*. The works of Miss Burney (Madame d'Arblay) created a very great sensation at the time of their appearance—a sensation which does not seem justified by their intrinsic merit. After her day the realistic school again appears in force in the works of Miss Austen and Miss Edgeworth. These novels are marked by sound sense, shrewd insight, keen humor, and high moral tone, but are lacking (in Miss Edgeworth to an unpardonable degree) in the glorifying power of the imagination. In 1814 came the "Great Wizard of the North" to overturn traditions and to give a color and character to novel-writing which it had before lacked. Walter Scott represents perfectly the transition period from the romance to the novel: adventures, marvels, escapes, even a strong flavor of the supernatural, are to be found in most of his fictions. Yet these materials, artistically used as they are, do not constitute his chief claim to glory. The work is lifted up from the plane of the romance to the higher level of the novel by his delicate discriminations, his exquisite touches of character, the vivacity of the conversations, the poetic descriptions of nature, apart from its mere value as scenery, as an accessory to the incident. Scott has, however, never written in the truly modern style: he is never didactic. While he is always moral, he has no distinct moral purpose in his writings. He is moral because, like Shakspeare, he paints life truly, and at the same time from a high moral standpoint. He does not go into the minute analysis of human motive, the close scrutiny of mental processes, which we find in the best of our late novelists, such as Kingsley, Bulwer, Thackeray, and George Eliot. But it is with Scott, as the founder of a school, as a great reformer in his own department of literature, that we have mainly to do. The historical novel proper is his creation. It had made some pretensions to existence in *The Recess* of Miss Lee and the *Scottish Chiefs* of Miss Porter—romances in which the names were historical, and pretty much all the rest fictitious. It is not so much that Scott has had worthy imitators as that he gave a new impulse to novel-writing and lifted it upon a higher plane; that he gave to it a new dignity; that he proved how much simplicity, purity of style, and conscientious study of character could effect with the most ordinary material.

The most modern school of English novels defies classification. We have historical, political, dramatic, and legal novels, novels of society, novels with a didactic purpose, novels of foreign life written in English, and many which are *sui generis*. The most distinguished names which have adorned the annals of the present should perhaps be mentioned: Sir Edward Bulwer-Lytton, Charles Kingsley, Charles Dickens, Charles Reade, William Makepeace Thackeray, Samuel Warren, Charles Lever, Benjamin Disraeli, Baroness Tautphœus, Anthony Trollope, George Eliot, James Fenimore Cooper, and Nathaniel Hawthorne. Some of the names enumerated are chiefly distinguished as the founders of a peculiar style, others as pre-eminent in a school already in existence.

All art teaches us that ideal truth is a far more important element in our mental development than mere mechanical accuracy. The bare facts of history have a far less value in mental training than those great principles of human nature which underlie and make the facts. A genuine work of art in the department of novel-writing is history—the manners and customs of a certain period, life itself, compelled by the power of genius to yield up its secret. It is mental and moral philosophy; it is political economy; it is the wisdom gathered by bitter suffering and painful discipline made incarnate and compelled to speak for the world's behoof. In proportion as the evil of false art and false morality in this department of letters is deadly, so is the benefit of true art and high morality incalculably great. (See APPENDIX. S. B. HERRICK.

Novel'da, town of Spain, province of Alicante, on the Vinolapo, has corn and oil mills and large distilleries. Pop. 5431.

Novella'ra, town of Italy, province of Reggio nell' Emilia. It is situated on a plain between the Enza, the Po, and the Secchia, is a walled town, and has a large crenellated castle with a lofty tower, the former residence of the great Gonzaga family, and containing some of the works of Correggio. The archives are very curious and valuable. The parochial church also contains objects of much interest. Pop. 7087.

Novel'lo (VINCENT), b. in London, England, Sept. 6, 1781, was of Italian descent; became organist of the Portuguese chapel at an early age; was one of the members of the Royal Society of Musicians and a founder of the Philharmonic Society; was a voluminous editor of old musical classics and composer of numerous pieces of considerable merit. D. at Nice, France, in Sept., 1861.—His daughter, CLARA ANASTASIA, b. in London June 15, 1818, a distinguished soprano singer and prima donna, retired from the stage in 1848 on her marriage with Count Gigliucci, an Italian nobleman.—Another daughter is the distinguished Shakspearean scholar, MRS. MARY COWDEN CLARKE.

Novells. See Law, The Civil.

Novem'ber [Lat., from *novem*, "nine"] was formerly the ninth month in the year, but in the present or Gregorian year (new style) it is the eleventh month.

Noves'ta, post-v. and tp., Tuscola co., Mich. Pop. 105.

Nov'gorod, government of European Russia, bounded W. by the government of St. Petersburg, and comprising an area of 47,356 square miles, with a population of 1,016,414. The ground is low, the surface mostly undulating, the soil not very rich, and the climate cold. Lakes and navigable rivers are numerous, and connected with each other by canals. Rye, barley, and oats are grown. Large forests and meadows are found, and timber and hay are the chief articles of export.

Novgorod, town of European Russia, capital of the government of Novgorod, on the Volkhov near its issue from Lake Ilmen. It is an old town, and was in the fifteenth century the largest and most important town of Northern Europe. It is now entirely depending for its trade on St. Petersburg and Archangelsk. Pop. 16,781.

Novgorod-Sjewersk, town of European Russia, government of Tschernigov, on the Desna, has many educational institutions, both elementary, mechanical, and theological. Pop. 10,544.

Novgorod-Wolynski, town of Russian Poland, government of Volhynia, on the Slatch, has some manufactures and 7464 inhabitants.

No'vi, post-v. and tp. of Oakland co., Mich., on the W. branch of the Rouge River and on the Flint and Père Marquette R. R. Pop. 1351.

No'vi di Mo'dena, town of Italy, province of Modena, the scene of much civil strife during the Middle Ages. The country around is rich in grain, vines, mulberries, etc. Pop. 7418.

No'vi-Bazar', or **Jenipazar,** town of European Turkey, in the eyalet of Bosna, on the Rashka, an affluent of the Morawa, is wretchedly built, consisting mostly of narrow, filthy streets lined with mud huts, but its trade is important and its fairs much frequented. Pop. 15,000.

Nov'ikoff (Nikolai Ivanovitch), b. at Tikhvensk, near Moscow, Apr. 26, 1744; served for some time in the imperial guard at St. Petersburg, but abandoned afterwards the military career in order to devote himself exclusively to literature, and settled at Moscow, where he d. July 31, 1818. He edited the Moscow *Gazette*, founded the first circulating library in Russia, published the *Old Russian Library* (10 vols.), a most valuable collection of historical documents, and wrote *Russian Biographies* (19 vols.), also a very valuable work. His *History of the Jesuits*, published in the *Gazette*, gave umbrage to Catharine II., who finally threw him into prison as a revolutionist and confiscated his property. On the accession of Paul he was liberated, however, and reinstated in his patrimony.

No'vi Li'gure, town situated on the northern slopes of the Apennines, at the head of a wide and fruitful plain. It was formerly strongly fortified, having four gates with drawbridges. Of the four principal squares, that of the Duomo is the most attractive, being flanked by fine buildings and containing a fountain of excellent water. The three parochial churches are not without architectural merit, and many of the great Ligurian families have palaces here. Over the beautifully wooded hills near the town are scattered truly palatial country-seats. Novi contains a public library, museum, literary and artistic academies, and a valuable private picture-gallery to which strangers may have access. The silk manufactories here are of great extent, and the silk of Novi is preferred in France and England to that of Lombardy or Piedmont. Novi is said to have been destroyed by Attila; in 999 it is spoken of as *Corte Nova* or *Castro Novo*, and from that time till 1447, when it gave itself to Genoa, it maintained a semi-independence, though its castle was sometimes in the hands of the lords of Milan or of Monferrato. This town gave its name to the battle of Aug. 15, 1799, between the French and Russians, in which the French general, Joubert, lost his life. Pop. 12,162.

No'vo-Georg'ievsk, town of Russian Poland, government of Plocki, 19 miles N. W. of Warsaw, at the confluence of the Bug and the Vistula, is strongly fortified and has 9886 inhabitants. It was founded by Napoleon in 1809 under the name of Modlin. In 1831, after its occupation by the Russians, it received its present name.

No'vo-Moskovsk', town of European Russia, government of Yekaterinoslav, on the Samara, an affluent of the Dnieper, has large cattle and horse markets and manufactures of leather and tallow. Pop. 10,138.

No'vo-Tcherkask', town of Russia, the capital of the Country of the Don Cossacks, on the Don, was founded in 1805. It is finely built, is the see of an archbishop, and has a large cathedral, extensive manufactures, and a lively trade in cattle, corn, and wine. Pop. 27,918.

No'vum Or'ganum [*i. e.* "new instrument"* or "new method"], the name given by Bacon to his great work treating of the proper mode of studying nature in order to extend the dominion of man over the inanimate world. Bacon's great aim was to recall the minds of men from what he deemed the vain and useless speculations of the ancient philosophers to the pursuit of the practical and useful. In order to present the different points of his subject in a manner at once comprehensive and striking, he has given them in the form of aphorisms. In the second aphorism of his first book he tells us that as the naked hand is often unable to perform its proper work without the aid of an instrument, so the human intellect, left to itself, is comparatively inefficient, and needs the help of instruments no less than the hand. To supply this need he composed his great work (published in 1620), comprising the ripe and rich results of a life of study. "In our judgment," says Macaulay, "Bacon's greatest performance is the first book of the *Novum Organum*. All the peculiarities of his extraordinary mind are found there in the highest perfection. Many of the aphorisms, but particularly those in which he gives examples of the influence of the *idola*, show a nicety of observation that has never been surpassed. Every part of the book blazes with wit, but with wit which is employed only to illustrate and decorate truth. No book ever made so great a revolution in the mode of thinking, overthrew so many prejudices, introduced so many new opinions. Yet no book was ever written in a less contentious spirit. . . . What we most admire is the vast capacity of that intellect which without effort takes in at once all the domains of science—all the past, the present, and the future, all the errors of 2000 years, all the encouraging signs of the passing times, all the bright hopes of the coming age." (*Essay on Lord Bacon*, 2d part, where will be found many eloquent and admirable passages upon the philosophy of Bacon, though the remarks of the critic on the ancient philosophers, particularly Plato, are to be received with great allowance.) J. Thomas.

Now'ell (Increase), b. in England about 1590; was chosen an assistant governor of Massachusetts Colony 1629, previous to its actual foundation; came with Winthrop in 1630; was ruling elder of Wilson's church 1630–32; one of the founders of the church in Charlestown 1632; commissioner for military affairs on the occasion of the first Pequot war 1634, and secretary of the colony 1636–49. D. at Boston Nov. 1, 1655.—His son Samuel, b. at Charlestown Nov. 12, 1634; graduated at Harvard College 1653; became chaplain in Philip's war, and assistant governor 1680–86. D. in London, Eng., Sept., 1688.

Nox'ubee, county of Mississippi, bounded E. by Alabama. Area, 800 square miles. It is very fertile. Live-stock, cotton, and corn are leading products. Flour is the chief article of manufacture. The county is traversed by the Mobile and Ohio R. R. Cap. Macon. Pop. 20,905.

Noyes (Eli), D. D., b. at Jefferson, Me., Apr. 27, 1814; was self-educated; began preaching in 1834; went as a Free-will Baptist missionary to Orissa, India, 1835; was successful both as an evangelist and as a teacher; became a skilful linguist, and published a Hebrew grammar and reader. Returning home with impaired health in 1841, he was for some years a pastor at Boston, afterwards, for ten years, editor of the *Morning Star*, the Free-will Baptist organ, and published *Lectures on the Truths of the Bible* (1853). D. at Lafayette, Ind., Sept. 10, 1854.

Noyes (George Rapall), D. D., b. in Newburyport, Mass., Mar. 6, 1798; graduated at Harvard in 1818, and studied divinity at Cambridge, Mass.; was tutor there 1825–27; held pastorates (Unitarian) at Brookfield and Petersham, Mass.; was Hancock professor of Hebrew, etc., and Dexter lecturer on biblical literature, 1840–68; published translations of Job, the Psalms, Proverbs, Prophets, Ecclesiastes, the Canticles, and the New Testament, besides numerous reviews, sermons, and other works. D. at Cambridge, Mass., June 3, 1868.

Noyes (James O.), M. D., b. at Owasco, N. Y., in 1829; became a surgeon in the Turkish army; was correspondent of the New York *Tribune* and the London *Chronicle*; published *Roumania, or the Border Land of the Christian and Turk: comprising Adventures of Travel in Eastern Europe and Western Asia* (1857); *The Gypsies; their History, Origin, and Manner of Life* (1858); wrote for several magazines, and became in 1858 proprietor and editor of the *Knickerbocker*.

* *Organum* is the Latin form of the Greek ὄργανον, literally an "instrument," but applied to Aristotle's system of logic regarded as the instrument (or method) of all reasoning.

Noyes (John Humphrey), b. at Brattleboro', Vt., Sept. 3, 1811; graduated at Dartmouth College in 1830; studied divinity at New Haven, Conn.; founded in 1838 a community of Perfectionists at Putney, Vt.; removed in 1847 to Lenox, Madison co., N. Y., where he established the Oneida Community (which see), and subsequently established another branch at Wallingford, Conn.; author of various works sustaining his peculiar views.

Noyes (Josiah), M. D., b. in New Hampshire about 1780; graduated at Dartmouth College 1801; was tutor there 1801–03; studied medicine; became professor of chemistry and pharmacy at Fairfield College, and on the organization of Hamilton College, N. Y., became professor of chemistry and natural science, till 1830. Dr. Noyes was a lifelong friend of Daniel Webster, his college classmate, after whose death he furnished the literary executors of that statesman with reminiscences of his college career. D. at Clinton, N. Y., Nov. 1, 1853.

Noyes (Nicholas), b. at Newbury, Mass., Dec. 22, 1647; graduated at Harvard College 1667; was pastor at Haddam, Conn., thirteen years; afterwards minister of Salem from 1683 to his death, Dec. 13, 1717. He had much to do with promoting the lamentable witchcraft delusion, and at a later period publicly confessed his error.

Noyes (William Curtis), LL.D., b. at Schodack, N. Y., Aug. 19, 1805; was admitted to the bar 1827; took high rank as a lawyer in Oneida co.; removed to New York City 1838; was engaged in codifying the laws of the State of New York; was prominent as a Whig and as a Republican; was a member of the Peace convention of 1861, and chosen president of the New England Society the day before his death, at New York Dec. 25, 1864. He bequeathed his valuable law library to Hamilton College, New York.

No'yo, post-v. of Big River tp., Mendocino co., Cal. Pop. 80.

Noyon', town of France, department of Oise, has large manufactures of fine linen and cotton fabrics. Charlemagne resided here, Hugo Capet was crowned here, and it was the birthplace of John Calvin. Pop. 6498.

Nu'bia, the *Ethiopia* of the Romans and the *Cush* of the Bible, a territory of North-eastern Africa, between lat. 11° and 24° N., bounded N. by Egypt, E. by the Red Sea, S. by Abyssinia, and W. by Darfoor and the desert of Sahara, and belonging to Egypt since 1821, when it was conquered by Ibrahim Pasha. Area, 35,000 square miles, with a population estimated at 400,000. The surface presents a series of elevated plains—that of Sennar, 1377 feet above the level of the sea, and that of Khartoom, 1263 feet, forming terraces on which the Nile descends from Abyssinia to Egypt, and which on both sides are framed in by low mountain-ranges, which respectively separate Nubia from the Red Sea and from the desert of Sahara. The soil is not very rich; the climate is extremely hot, though not unhealthy; and the ground is cultivable only in the valley of the Nile, which here is considerably narrower than in Egypt. The products are the same as in Egypt, only that here the giraffe and several species of antelopes and birds which belong to the central plateau of Africa are found. The inhabitants form a mixed population of negroes, Arabs, and descendants of the old Ethiopians. They hold the Mohammedan creed, and speak either the Arabic or the Ethiopian language. They live partly as agriculturists in well-built habitations, or as nomads in tents of a coarse black fabric made of camel's hair. The transit trade in the products of Central Africa is very important.

Nuck'olls, county of Nebraska, bounded S. by Kansas. Area, 576 square miles. It consists of rolling, fertile lands adapted to grain and stock raising. Cap. Elkton. Pop. 942.

Nudibranchia'ta (from *nudus*, "naked," and *branchiæ*, "gills"), an order of gasteropod mollusks of the sub-class *Opisthobranchiata*. The sexes are united in the same individual; the heart has a single auricle; the branchiæ are exposed and arranged in fascicles on the back or atrophied; the otocysts are connected with the supracœsophagal ganglia, and sessile; the shell is developed in the embryo, in which it is spiral, but is soon lost, and the animal is naked throughout the rest of its life. The order is represented by numerous forms, all of which are inhabitants of the sea, in which they are found at all depths, from between tidemarks to at least more than 50 fathoms; and a few are pelagic, living at or near the surface of the open sea. There is great variation among the different members in the development of the branchiæ. The principal modifications in this respect are those which distinguish the primary groups or sub-orders of the order. In the Pygobranchia the gills are towards the middle of the hinder part of the back and distributed in a branched or plumose mass around the anus, and in many instances retractile within a sheath; in the Polybranchia the gills are variously distributed on the surface of the mantle, and in Pellibranchiata they are more or less atrophied, and the function of respiration is chiefly formed by the skin.

Theodore Gill.

Nue'ces, county of S. Texas, bounded E. by the Gulf of Mexico and N. E. by the Nueces River. Area, 3450 square miles. It is level, but is deficient in fresh water and fuel. It is principally a cattle and sheep range. Valuable salt lagoons abound. Cap. Corpus Christi. Pop. 3975.

Nu'gent (Sir George), Bart., b. in England June 10, 1757; educated at the Military Academy at Woolwich; joined the 7th regiment as lieutenant at New York Sept., 1777; was present at the storming of Forts Montgomery and Clinton; aided in suppressing the Irish rebellion 1798; became a baronet 1806; was commander-in-chief in India in 1811, and attained the rank of field-marshal in 1842. D. in England Mar. 11, 1849.

Nugent (George Nugent **Grenville**), Baron, second son of the marquis of Buckingham, b. at Buckingham Castle, England, Dec. 30, 1788; educated at Oxford; entered Parliament under the courtesy title of Lord George Grenville in 1812; succeeded to an Irish barony on the death of his mother in 1813; published a poem on the English campaigns in Portugal; was an active promoter of the Reform Bill for years before its passage; became a junior lord of the treasury in the Whig administration of 1830; lord high commissioner of the Ionian Islands 1832–35; published *Oxford and Locke* (1829), *Memorials of Hampden* (1831), *Lands Classical and Sacred* (1841); was again in Parliament in 1847. D. Nov. 26, 1851.

Nuggi'na, town of British India, presidency of Agra, is situated in lat. 29° 27′ N., and manufactures firearms. Pop. 14,000.

Nui'sance, in law. This is a term of much breadth of meaning, and includes all structures, employments, or acts that in a manner not authorized by law are prejudicial to health, or that so incommode or offend as to render the exercise of personal rights or the use of property uncomportable. The subject will be considered in this article under two divisions: I. General principles; II. Remedies and criminal proceedings.

I. Nuisances are arranged by law-writers into two principal classes, public and private. These do not necessarily differ in their nature. The general distinction between them concerns the persons affected by the wrongful act. Thus, a nuisance may be purely public, or it may be both public and private, or it may be strictly private. A nuisance purely public affects the neighborhood or community, without being specially injurious to any particular person. Instances are the exercise of offensive trades causing noisome odor, the erection of gunpowder-mills, the act of keeping gunpowder-magazines, or disorderly houses of any kind, such as places for gaming or unlicensed exhibitions of showmen and mountebanks. It has even been held that the act of making use of a building for the purpose of carrying forward for profit sports or amusements having no useful end —as, for example, a bowling-alley kept for gain or hire— is a public nuisance, even though gambling is prohibited. It is of the essence of a nuisance that the act complained of, or at least the mode of its exercise, should be unlawful. Accordingly, if permitted by statute it becomes lawful, and though all the other qualities of a nuisance be present no redress can be had. When unlawful, responsibility will not only attach to the author of the wrong, but to any one who, having control of the property upon which the nuisance is erected, continues it, at least after notice and request to remove it. So one who has erected a nuisance may be liable in some cases for its continuance, though he has parted with his estate.

Somewhat akin to a public nuisance is a *purpresture.* The more specific meaning of this term is an "enclosure" (*pourpris*, Fr.), and it refers to the act of enclosing public property for private purposes, as, for example, an encroachment by an adjoining owner upon a highway. Such an act may be both an encroachment and a public nuisance, or it may be simply an encroachment. Presumptively, an individual who appropriates any part of a public street or harbor to his own use without the consent of the proper authorities is guilty of a nuisance, and the burden of proof will devolve upon him to show that it is no injury to the public, and that a public right has not been violated. It has been decided by high authority that the erection of a crib or pier in such a harbor as that of the city of New York without competent authority is a nuisance in law, and that it is not so in fact is no defence.

A public nuisance will also be private when the unlawful act is specially injurious to some particular individual, or even to a number of persons having distinct rights. An unlawful disturbance of a public street might produce an in-

jury to an adjoining owner of land far beyond that sustained by the rest of the community, and peculiar to himself, in which case he would have his separate remedy. Where, however, the unlawful act is of a public nature, without especially affecting any particular person, there will be no remedy allowed to individuals, but only a public prosecution can be had.

A nuisance is strictly private when only an action will lie at the suit of some private person. There are many acts which are ranked in the law as "nuisances" simply because they are unjustifiable interferences with the ordinary rights of enjoyment of private property. This is particularly true of encroachments upon incorporeal rights. (See HEREDITAMENTS, INCORPOREAL.) Thus, if one be the owner of a right of way, or of light, or of a right to draw water from a stream, or of a franchise, such as a ferry, and there is an unjustifiable interference by another with the exercise of his right, he may regard the unlawful act as in the nature of a nuisance. It is scarcely necessary to multiply instances by way of illustration. (Detailed information is to be sought in the reports and in the treatises upon torts and crimes. See TORT and CRIME.)

II. There is quite a variety of remedies allowed by law in order to do complete justice to parties injured by a nuisance, as well as a criminal proceeding with a view to deter offenders from encroaching upon the rights of the public.

(1) *Indictment.*—A public nuisance is in law a crime of the grade of a misdemeanor. If the defendant is convicted on the trial, he is liable to punishment by fine and imprisonment. Still, the chief end of the criminal prosecution is the removal of the nuisance, and the court will so adapt its judgment as to accomplish that result. Accordingly, where it appears that the nuisance continues to exist at the time of the prosecution, the defendant may be commanded to remove it at his own cost. He would only be required to do so much as to remove what was offensive; for example, if a noisome trade was carried on in a building, he would not be directed to destroy the building itself, but would only be prevented from using it for the purpose of the trade. If the party does not abate the nuisance in accordance with the order, the sheriff will be directed to do it at the defendant's cost.

(2) *Abatement without Legal Proceedings.*—This is one of the exceptional cases in which a person may take the law into his own hands and take away or remove the nuisance, so long as he commits no breach of the peace. Blackstone gives as the reason of this rule that such injuries as obstruct or annoy such things as are of daily convenience or use require an immediate remedy, and cannot wait for the slow progress of the ordinary forms of justice. This law of abatement would seem to be generally applicable to cases of private nuisance. On the other hand, where the nuisance is simply public, a private person would, according to the better opinion, have no right to proceed in this manner. He should await the ordinary course of criminal justice. If the act complained of is both a public and a private nuisance, the person specially injured by it would have a right of abatement. The act of abatement does not prevent the injured party from maintaining an action for damages.

(3) *Action at Law for a Removal of the Nuisance.*—This remedy is known as a "writ of nuisance" or "assize of nuisance." Under it the sheriff summons a jury to view the premises, and if the plaintiff is successful he has judgment both to have the nuisance abated and to recover damages. This proceeding can be instituted both against him who originated and him who continues the nuisance. This writ is only resorted to where the plaintiff has a freehold interest in land affected by the nuisance, and the defendant has a similar estate in the land upon which the unlawful act is performed. This writ is substantially in force in some of our States (*e. g.* New York), though modified as to its ancient forms.

(4) The more common remedy in a court of law is an action simply for damages, known as an "action on the case." This is governed by rules much less technical than those prevailing under the writ of nuisance. It is not necessary to consider this case in detail, as it is governed by ordinary rules prevailing in courts of law as to injuries of an indirect kind, and the plaintiff will be entitled to recover whatever damages he may prove himself to have sustained.

(5) *Suit in Equity.*—Courts of equity have jurisdiction over this class of cases in many instances, and may grant relief by the special process known as an injunction. (See INJUNCTION.) The jurisdiction of the court embraces public nuisances and purprestures, as well as encroachments upon private rights. In the case of a purpresture or public nuisance the attorney-general, acting in behalf of the State, files an information. (See INFORMATION.) The main ground of interference by this court is that it gives a more complete and perfect remedy than is attainable in a court of law, and is able more effectually to suppress vexatious litigation. By the grant of a perpetual injunction final relief is granted to the public, whereas an indictment at the common law only disposes of the particular case then before the court. When an individual sustains from a public nuisance an injury peculiar to himself, he has the like remedy in equity on his own application. It is necessary for the plaintiff in this class of cases to establish his claim by clear and satisfactory evidence. An injunction may also be had to restrain the continuance of a nuisance simply of a private character if it be injurious to property. A recent illustration is found in the case of a market-gardener whose garden was seriously damaged by noxious vapors and smoke issuing from neighboring gasworks. The plaintiff was awarded a perpetual injunction to restrain the further manufacture of the gas in a manner injurious to his crops. The instances that might be cited are very numerous both as to corporeal property and incorporeal rights. They all resolve themselves into cases where the injury caused by the nuisance cannot be adequately compensated by money or the unlawful act from its nature must occasion a continuing damage, which can only be prevented by the peculiar remedies of this court. In certain cases, where the act is plainly a nuisance, the court will proceed without the aid of a jury; in other cases, where the act is apparently lawful, but may become unlawful from negligence or mismanagement, the question of unlawfulness may be submitted to a jury through the medium of a court of law, and the equity court will make use of the verdict as establishing the requisite facts. So, where the injunction is asked for in aid of a legal right, unless that is clear, it must first be settled by an appropriate proceeding in a court of law. (Consult Gibbons on *The Law relative to Nuisances*, Yool's *Remedies in Equity*, and the works on *Equity Jurisprudence* of Story, Adams, or Willard (Potter's ed.).) T. W. DWIGHT.

Nu'kha, town of Asiatic Russia, government of Baku, Transcaucasia, is surrounded with a wall, and is celebrated for its production and manufacture of silk. Pop. 23,371.

Nullifica'tion [from the Lat. *nullifico*, used with *nullificatio* by Tertullian] is the act of making void or invalid. The word acquired no rights in the English language, we believe, although *nullify* occurs in Jeremy Taylor, until it became necessary in our political history to devise a term which should signify the so-called right of one or more of the States in the American Union to declare a law passed by the national legislature unconstitutional, and to refuse to be bound by such legislation. In other words, the right was asserted to belong to the States to interpret the Constitution each one for itself, and thus to impose a check of a new description on the general law-making power. The doctrine of the Constitution had been held to be, that if the House of Representatives, the Senate, and the President should together assent to an act of legislation, it should become a law; nay, further, that if the President objected to the bill and two-thirds of each of the houses should still sanction it, it should become a law notwithstanding his objections. In other words, it was a law in such a sense that all executive officers and others concerned with the laws should regard it to be such, and enforce it, excepting the single case in which constitutional objections should be formally made before the proper court. Should this occur, the ultimate decision would rest with the Supreme Court of the U. S., and if the decision there was adverse to the constitutionality of the law, there would be no adequate ground for prosecutions on the part of the government or of any official or private person against a person refusing to be bound by the law in question. Thus, there were conceivably four parties whose opinion needed to be taken before a law was sure of a place on the statute-book—the two houses, the chief magistrate, and the Supreme Court. The doctrine of nullification sought to add to these a fifth—the judgment of a State as expressed in a constitutional way. And it was held that the State thus nullifying an act or law of Congress was still in the Union, entitled to all its former privileges, although refusing obedience to the law or act in question. Should the general executive, however, make attempts to enforce such act or law within the territory of the nullifying State, then an unconstitutional wrong would begin, and the State would have the right to retire from the Union, while the U. S., of course, could have no right to obstruct the exercise of its will in this respect. The framers of the ordinance of nullification seemed to have been simple enough to suppose that such opposition would put an end to the attempt at force; probably they thought some compromise would be the natural issue of such a quarrel, and perhaps they hoped for support from one or more of the neighboring States.

But it is time to go into some details respecting the origin

and occasion, as well as the result, of the controversy between South Carolina and the general government. In doing this we must avow our conviction that the tariff legislation had been unwise, one-sided, and adverse to the interests of the Southern States; and we trust that this confession will free us from suspicion of partiality while we give as brief a sketch of this history as possible.

The division of opinions in regard to the form of constitution most desirable for the Union gave rise, soon after the Constitution was accepted and went into operation, to a division in respect to its interpretation. This spirit appears especially in the Kentucky resolutions of 1798, followed by those of Virginia in 1799, during the great party strifes of the administration of John Adams. In the first of the resolutions just named, after the harmless declaration that the general government is one of limited powers, it is said that the government created by the compact between the States "was not made the exclusive or final judge of the extent of the powers delegated to itself, but that, as in all other cases of compact among powers having no common judge, each party has an equal right to judge for itself as well of infractions as of the mode and measure of redress." And they express the hope that the other States, "returning to their natural rights in cases not made federal, will concur in declaring [the alien and sedition laws] void and of no force, and will each take measures of its own in providing that neither these acts, nor any others of the general government not plainly and intentionally authorized by the Constitution, shall be exercised within their respective territories." These resolutions were written by Mr. Jefferson, as afterward appeared, and were the first act in the drama of opposition to the avowed and received sense of the Constitution which ended in secession and war in 1861. The Democratic party, which opposed the Constitution and feared consolidation, came into power at the expiration of Mr. Adams's term of office, and continued to manage the government for many years. In 1819 the struggle attending the admission of Missouri into the Union unless a line should be drawn limiting slavery, showed that new issues were coming before the people—that the Democratic party itself would not always be loyal to its Southern leaders. Then came the revival of manufactures after the peace with England of 1815, and the various tariff laws, which were claimed to be oppressive to the interests of the Southern States. The tariff of 1828 called up again the theory of making U. S. law void by State power; which theory was advocated by Mr. Hayne in the Senate of the U. S., and was shown in its danger and absurdity by Mr. Webster in his speech of Jan. 26, 1830.

It was within less than three years after this that the experiment of nullification was made by the State whose principal politicians had been imbuing the Southern States with the doctrine for a long time. In Nov., 1832, soon after Gen. Jackson's second election to the office of President, a convention, summoned to meet at the capital of South Carolina, drew up and unanimously reported the ordinance of nullification. In this ordinance the existing tariff, which, in a somewhat milder form, agreed with that of 1828, was pronounced "null and void, and no law, nor binding on this State, its officers, or citizens," and no duties on imports were to be paid within the State after Feb. 1, 1832. The ordinance also contained the provision that no appeal to the Supreme Court of the U. S. against its own validity should be permitted, and that any appeal from a decision of a court of the State upholding this ordinance should be treated as contempt of the court from whose decision such appeal should be taken. All officers and jurors in the State were required to obey the ordinance and all legislative acts made to keep it in force. And any measures of force adopted by the general government for the purpose of levying duties on the foreign commerce of South Carolina would justify the State in regarding itself no longer a member of the Union. (Cf. Greeley's *Amer. Con.*, p. 93.)

It was a great blessing to the Union that Gen. Jackson, a Southern man of vast popularity, a hero of the war of 1812–15 with Great Britain, was President; and we may add that it helped the cause of the Union that he had a feud with Mr. Calhoun, the prime author of nullification. He was not the equal of Mr. Calhoun in ability, but he had much more common sense; this quality enabled him to see through the web of sophistries of which the extreme States Rights doctrine was composed, after having been, as it would seem, on the side of nullification when it was first agitated. He acted with his usual energy. At a very early date he wrote to the collector of Charleston, giving him orders to employ the revenue cutters of his district and other means within his control in order to secure and protect from the State authorities vessels with cargoes liable to pay duties. And not long after the meeting of Congress in Dec., 1832, he sent to the houses his long state paper on nullification, in which he declared his intention to treat all armed resistance under the ordinance of South Carolina as treason against the U. S., and treated at large of the fallacies of the doctrine. This remarkable paper was not, it is altogether probable, his own production. Indeed, to compose it was beyond his ability and statesmanship. A versatile and able man, Edward Livingston, the author of the Louisiana code, then secretary of state, was the writer. But that Jackson, if he ever had fallen into the theory embodied in the Kentucky and Virginia resolutions, and appearing in a mature shape in the nullification ordinance, now saw its fallacies and dangers, is quite certain. And no one could say this with the same impressiveness as the hero of New Orleans. The teachings of this proclamation have entered to such a degree into the thinking of the country, and are now regarded as so manifestly just, that it is hardly necessary to make any quotations from it. We shall content ourselves with a single one, which shows that what was afterward called *secession* was here identified with the proceedings in South Carolina: "The Constitution of the U. S. forms a government, not a league; and whether it be formed by compact between the States or in any other manner, its character is the same. Each State having expressly parted with so many powers as to constitute, jointly with the other States, a single nation, cannot from that period possess any right to secede, because such secession does not break a league, but destroys the unity of a nation; and any injury to that union is not only a breach, which would result from the contravention of a compact, but is an offence against the whole Union. To say that any State may at pleasure secede from the Union is to say that the U. S. are not a nation, because it would be a solecism to contend that any part of a nation might dissolve its connection with the other parts, to their injury or ruin, without committing an offence."

Gen. Jackson's measures, his proclamation, just described, and his special message to Congress of Jan., 1833, on the same subject, turned the tide so far in favor of his views of constitutional law that the other Southern States, as well as the Northern, decidedly approved of his course. South Carolina, propitiated by a modification of the tariff—Mr. Clay's Compromise, so called—abandoned the ordinance of nullification, and the heresy slept awhile to awake again, revived and more intense, after a generation. T. D. Woolsey.

Numan'tia, an ancient city of Spain, the capital of the Celtiberian Arevaci, was situated on the Douro, near the present Soria in Old Castile, and became very celebrated on account of the heroic valor with which it defended its independence against the Romans. Of its population, 8000 men were capable of bearing arms, and with this force it fought successfully against Quintus Fulvius Nobilior in 153 B. C., Quintus Cæcilius Metellus in 143, Quintus Pompeius in 141, Marcus Popilius Lænas in 139, and Cneius Hostilius Mancinus in 137. But in 134, Publius Cornelius Scipio the Younger received the command. With an army of 60,000 men he laid siege to Numantia, and enclosed it completely. All sallies were in vain; escape was impossible; of help there came none. But still his propositions of surrender were rejected. The siege lasted for fifteen months. Then, one day Scipio marched his army into the city. No resistance was offered. The houses were closed. The streets were silent. The echo of the tramping columns and the croak of the carrion-crow were the only sounds heard, for the city was dead. Those whom plague and famine and the arrows of the besiegers had spared had fallen upon their own swords. Scipio stood in a tomb. He felt that he himself had been utterly defeated, and in his fury he levelled the vacant houses with the ground. Clemens Petersen.

Nu'ma Pompil'ius, the successor of Romulus, reigned from 715 to 672 B. C. All the ecclesiastical institutions which formed the basis of the religious ceremonial of the Romans were ascribed to him, and he also improved the social and political institutions of Rome.

Num'ber [Lat. *numerus*]. Abstractly considered, number is the measure of the relation between quantities of the same kind; in this sense it is identical with the term *ratio* or *quotient*. Technically considered, it is a *single* thing, or a *collection* of things of the same kind; it is in this sense that the term is generally employed in mathematics. By an extension of meaning always permissible in the use of mathematical terms, the term *number* is made to include 0, ∞, and also all *surds;* we shall use the term in this extended signification in the following article.

The thing taken as the basis of the collection is called a *unit*. If the logical character of the unit is specified, the number is said to be concrete; if the nature of the unit is not specified, the number is said to be abstract; thus, 7 *feet* is a concrete number, and 7 is an abstract number. So far as arithmetical computation is concerned, there is no difference between concrete and abstract numbers,

provided we omit the name of the unit. The only difference in the final result is one of interpretation. Thus, if we have to multiply 7 *feet* by 5 *feet*, we neglect the name of the unit and multiply 7 by 5; we then take into account the nature of the concrete factors and interpret the result as 35 *square feet*. As the value of the unit of a number is in a measure arbitrary, we may, if we please, transform any given number into an equivalent one having a different unit; thus, the number 200 may be regarded as 20 *tens*, 2 *hundreds*, or as 400 *halves*. A great portion of arithmetical operations is concerned with such transformations, which are known under the general name of "reduction." In treating of numbers we regard the unit 1 as the primary *base* of the collection, in which case fractions are to be regarded as collections of equal parts of that base; thus, the fraction $\frac{3}{8}$ may be regarded as a collection of 3 units, each equal to $\frac{1}{8}$, and $\frac{5}{7}$lb. may be regarded as a collection of 5 units, each equal to $\frac{1}{7}$lb. The same principle enables us to express a number partly in terms of one unit and partly in terms of another, giving rise to compound and mixed numbers; thus, the expression £4 12*s.* is a compound number made up of 4 units, each equal to £1, and 12 units, each equal to 1*s.*; the mixed number 3\frac{2}{7}$ is composed of 3 units, each equal to \$1, and 2 units, each equal to $\frac{1}{7}$. From this point of view we may regard every simple number, whether abstract or concrete, as a species of monomial in which the unit of the number corresponds to the literal part of the monomial; we may also regard compound and mixed numbers as species of polynomials. Thus regarded, all kinds of numbers become subject to the algebraic rules for treating monomial and polynomial expressions.

Classes of Numbers.—Numbers are divided into classes in many different ways, according to their different properties. The names of some of these classes are given below, with a brief statement of their peculiar properties.

(1) *Odd and Even Numbers.*—The series of integers, 0, 1, 2, 3, 4, etc., called the series of *natural numbers*, is subdivided into two series—the series of *odd numbers*, 1, 3, 5, 7, etc., none of which is exactly divisible by 2, and the series of *even numbers*, 0, 2, 4, 6, etc., each of which is exactly divisible by 2. The following are some of the properties of these two classes of numbers: 1st, the sum or the difference of any two even numbers, or of any two odd numbers, is always an even number; 2d, the sum of any number of even numbers, or the sum of an even number of odd numbers, is an even number, but the sum of an odd number of odd numbers is an odd number; 3d, the product of any number of even numbers is an even number, and the product of any number of odd numbers is an odd number; 4th, all the integral powers of even numbers are even numbers, and all the integral powers of odd numbers are odd numbers, and consequently the difference between any power of an odd number and the number itself is an even number.

(2) *Prime and Composite Numbers.*—A *prime* number is one that cannot be exactly divided by any other number except 1; all numbers that are not prime are said to be composite—that is, composed of two or more factors; thus, 2, 3, 5, 7, etc. are prime numbers; 4, 6, 9, etc. are composite numbers. (See Prime Numbers.)

(3) *Figurate Numbers.*—Figurate numbers are those which can be derived from the general form

$$\frac{n\,(n+1)\,(n+2)\;.\;.\;.\;(n+m)}{1\;.\;2\;.\;3\;\;.\;.\;.\;(m+1)}$$

by making particular suppositions on the arbitrary integers m and n. If we assume m equal to any whole number, and then make $n = 1, 2, 3$, etc., we shall have one series of figurate numbers; by giving to m every value from 0 up, we obtain in succession an infinite number of figurate series. (See Figurate Numbers.)

(3) *Polygonal and Pyramidal Numbers.*—These numbers are so named because they express the different numbers of equal spherical balls that can be symmetrically arranged so as to form certain polygonal and pyramidal figures. The polygonal numbers are formed by taking the successive sums of the terms of an arithmetical progression whose first term is 1; if the common difference is 1, we have triangular numbers; if the common difference is 2, we have square numbers; if the common difference is 3, we have pentagonal numbers; and, in general, if the common difference is $m-2$, we have m-gonal numbers. Thus,

{ *Arithmetical series*, 1, 2, 3, 4, 5, 6, 7, etc.;
{ *Triangular numbers*, 1, 3, 6, 10, 15, 21, 28, etc.

{ *Arithmetical series*, 1, 3, 5, 7, 9, 11, etc.;
{ *Square numbers*, 1, 4, 9, 16, 25, 36, etc.

{ *Arithmetical series*, 1, 4, 7, 10, 13, 16, etc.;
{ *Pentagonal numbers*, 1, 5, 12, 22, 35, 51, etc.

Pyramidal numbers are derived from polygonal numbers according to the same law. Thus,

{ *Square numbers*, 1, 4, 9, 16, 25, etc.;
{ *Square pyramidals*, 1, 5, 14, 30, 55, etc.

The last line of numbers gives the number of equal spherical balls that can be piled in different pyramids having square bases. It is a general principle, though not capable of rigorous demonstration, that any whole number is equal to the sum of 1, 2, or 3 triangular numbers, or to the sum of 1, 2, 3, or 4 square numbers, or to the sum of 1, 2, 3, 4, or 5 pentagonal numbers, etc. Thus, the number 23 is equal to $21+1+1$, or to $9+9+4+1$, or to $22+1$, etc.

(4) *Redundant, Defective, and Perfect Numbers.*—If the sum of all the divisors of a number (except itself) is greater than the number, it is said to be *redundant*; thus, 12 is a redundant number, because $1+2+3+4+6>12$. If this sum is less than the number, it is said to be *defective*; thus, 10 is a defective number, because $1+2+5<10$. If this sum is just equal to the number, it is said to be *perfect*; thus, 6 is a perfect number, because $1+2+3=6$. If (2^n-1) is a prime number, then is $2^{n-1}(2^n-1)$ a perfect number; thus, 2^7-1, or 127, is prime, and $2^6(2^7-1)$, or 8128, is a perfect number.

(5) *Amicable Numbers.*—Two numbers are said to be amicable when each is equal to the sum of all the divisors of the other. Thus, 284 and 220 are amicable numbers, as are 17296 and 18416, and also 9363583 and 9437056.

(6) *Bernouilli's Numbers.*—These are the coefficients of the different powers of x in the series obtained by developing the expression $x\,(e^x-1)^{-1}$. These numbers are used in the higher branches of applied mathematics, and for this reason they have been computed and tabulated. (The general forms of Bernouilli's numbers may be found on page 247 of De Morgan's *Calculus*. For a complete discussion of the theory of numbers the reader is referred to Gauss's *Disquisitiones Arithmeticæ* or to Legendre's *Essai sur la Théorie des Nombres.*)

Expression of Numbers in Different Scales.—The same number can be expressed in many different ways, without departing from the principles explained under the title Notation. If we represent any number by N, we may write the equation

$$N = ar^n + br^{n-1} + \text{, etc., } + kr + l, \qquad (1)$$

in which r is the radix of the system, and a, b, etc., k, l, are whole numbers, equal or unequal, but always less than r. The number of characters required to write any number in any system is equal to r. If $r=2$, the corresponding system is called the *binary* system; if $r=3$, the corresponding system is called the *ternary* system; if $r=10$, we have the common or decimal system; if $r=12$, we have the duodecimal system; and so on. The expression for a number may be transformed from one system to another by a few simple operations. The method of making this transformation will be illustrated by showing how a number may be transformed from the decimal to the duodecimal system, and the reverse. Since the number of characters required in any system is equal to the numerical value of the radix, we must have twelve characters to express a number in the duodecimal system. Let us, therefore, adopt the character ϕ to denote 10 units in the system, and the character π to denote 11 units. Let it be required to transform the number 6894 from the decimal to the duodecimal system. An examination of equation (1) shows us that if we divide any number by the radix of the required system, the remainder will be equal to the number of units in the first place; if we divide the quotient obtained by the radix, the remainder will be the number of units in the second place; and so on. Hence, the operation of transformation is as shown below:

Decimal to Duodecimal.	*Duodecimal to Decimal.*
12)6894	$6 \times 1 = 6$
12)574 . . . 6	$10 \times 12 = 120$
12)47 . . . $10 = \phi$	$11 \times 144 = 1584$
3 . . . $11 = \pi$	$3 \times 1728 = 5184$
	∴ 6894 *Ans.*
∴ $3\pi\phi6$ *Ans.*	

In like manner, a number in the decimal system may be transformed to an equivalent number in any other system, and the reverse. W. G. Peck.

Num'bers, Book of, so called because it contains an account of the second census of the Hebrews, made at Sinai in the second month of the second year of the Exodus (ch. i.). It also contains (ch. xxvi.) an account of a third census, thirty-eight years later. It is the fourth book of the Pentateuch and of the Old Testament. Its contents treat largely of the history of the tribes in the journey through the wilderness. It also contains portions of the Mosaic Law. (See Pentateuch.)

Nu'merals [Lat. *numerus*], the characters by means of which we express numbers. Thus, in the common system the numerals are 1, 2, 3, etc.; in the Roman system the numerals are I., V., X., etc.

Nu'meration [Lat. *numeratio*], the art of reading numbers when expressed by means of numerals. (See NOTATION.)

Nu'merator, that term of a fraction which indicates the number of fractional units that are to be taken. In a common or vulgar fraction the numerator is the number written above the horizontal line; in a decimal fraction it is the number that follows the decimal point. Thus, in the fraction $\frac{3}{4}$ the numerator is 3; in the decimal .0314 the numerator is 314. W. G. PECK.

Numer'ical. The term *numerical* in analysis stands opposed to the term *literal;* it implies that the quantities considered are expressed by figures and not by letters. A *numerical equation* is an equation in which all the quantities except the unknown or the variable quantities are numerical. The *numerical value* of an expression is the result obtained by assigning numerical values to all the quantities which enter it, and then performing the indicated operations. Thus, the numerical value of $a^2b - c^2d$ is 10, when $a = 2$, $b = 3$, $c = 1$, and $d = 2$. The term *numerical* sometimes stands opposed to the term *algebraical;* thus, the numerical value of -5 is 5. W. G. PECK.

Numid'ia, that part of the northern coast of Africa which extended between Mauritania in the W. and *Africa Propria*, the ancient territory of Carthage, in the E., corresponding nearly to the modern Algeria. It was inhabited by the same race of people as Mauritania, the Moors, the ancestors of the modern Berbers, and it was divided between many different tribes. By the help of the Romans, as a reward for his support in the wars against Carthage, Massinissa succeeded in uniting the tribes and establishing an empire, several of whose rulers became famous in the Roman history; as, for instance, Jugurtha and Juba. In 46 B. C. Numidia was made a Roman province, and the Romans formed several colonies here, of which Hippo Regius was the most noticeable.

Numid'idæ [from *Numida—i.e.* Numidian—the generic name of the guinea-fowl), a family of gallinaceous birds typified by the well-known guinea-bird. The general form is familiar to all, and in this respect all the species of the family agree, the body being squat, with the head small and the neck comparatively long, but not as much so as in the turkeys; the head is always more or less wattled and naked; the bill moderate; the nostrils large, oval, and partly covered by a membrane; the tarsi moderately long; the hind-toe a little elevated; the tail depressed or bent downwards. The family is sustained, according to Prof. Huxley, by a number of osteological characters. It differs from all others by the absence in its representatives "of any backward process of the second metacarpal, and in the obtuseness and somewhat outward inclination of the costal processes. The acromial process of the scapula is also singularly recurved." In most other respects, however, it agrees essentially with the *Meleagridæ* and *Phasianidæ*, having the same kind of sternum, skull, etc., but slightly modified. The family is peculiar to Africa. The species are chiefly found in the woodlands, and especially along the margins of rivers, and congregate in flocks of 200 and 300 individuals, scattering along in search of food, which consists of insects (grasshoppers, ants, etc.) as well as small grains. The eggs are numerous and laid in a rude nest, generally concealed in the bush. According to G. R. Gray, there are eleven species, representing three genera, viz.: (1) *Numida*, with ten species, including the common guinea-fowl (*Numida meleagris*); (2) *Agelastes*, with one species; and (3) *Phasidus*, also with one species. These nearly average in size the domestic species. THEO. GILL.

Numismat'ics [Gr. νόμισμα, "coin"] comprehends all about coins; as such it deals with stamped pieces of metal of known weight and authoritative issue, implying as a science definite rule and civilization as opposed to barter and barbarism; and as such it tends to illustrate and confirm history. It has been usual to divide coins for purposes of study (omitting minor details) into three grand classes: (1) *Ancient*, from their earliest existence in the seventh century B. C. to the deposition of Romulus Augustulus (A. D. 476); (2) *Mediæval*, from this period to the Reformation (A. D. 1517); (3) *Modern*, from the Reformation to the present time. Each of these has its own sub-arrangements and characteristics, but the *ancient* and *mediæval* so far agree that their coins are mercantile rather than commemorative. In the first class scarcely any coins would answer to that we call "*medals;*" while in the second distinctive *medals* have little more than commenced.

To take first *ancient* coins: these are classed under (1) Greek, (2) Roman, (3) Græco-Oriental or Byzantine, under each of which it is customary (following the arbitrary arrangement proposed by Eckhel of Vienna) to take the countries in their order from W. to E., the cities of each country being placed alphabetically. Of the three, the Greek are unquestionably the most important. Greek coins are found in Europe in Spain, Gaul, Britain, Italy, Sicily, Thrace, Macedonia, Thessalia, Attica, Bœotia, and the Peloponnesus; and in Asia in Ionia, Phrygia, Lydia, Caria, Cilicia, Phœnicia, and Egypt. Besides these as authorities, there is Epaminondas on Bœotian, Herodotus on Halicarnassian, and Cicero on Magnesian money; sometimes, too, celebrated games—*e. g.* those of Olympia—are commemorated, as in the chariot-race types of Syracuse, or well-known myths, as that of the Labyrinth on coins of Cnossus in Crete. Maritime states are often denoted by dolphins and other fish; rivers, like the Achelous, by bulls with human heads. The material of coins is gold, silver, bronze, electrum, an alloy (sometimes natural) of silver with gold, or potin or billon, bronze or copper washed with silver. It is supposed that the metal was first formed in roundish lumps and then struck cold, but no ancient die, so far as we know, exists in any museum; the materials, however, for coining, the hammer, the anvil, and the tongs, may be seen on a denarius of the Roman family Carisia. Inscriptions on Greek coins are generally in the genitive, on Roman and Oriental in the nominative, the word νόμισμα ("coin") being in the first case understood. The finest period of Greek art scarcely lasts longer than sixty or seventy years—say, from B. C. 460 to B. C. 390—and is nearly coincident with the best period of sculpture; and, as a rule, the colonial coins of Italy and Sicily indicate great wealth and luxury, their finish being unrivalled; they are, however, surpassed in grandeur by the money of some of the parent cities. In one instance, that of Athens, the coins remain to the last rude and ugly, perhaps owing to their great commercial importance. Thus, in modern times the Chinese long refused any European coin except the Spanish "pillar" dollar, while the Abyssinians declined quite recently any type but the dollar ("thaler") of Maria Theresa of 1782. In weight, Greek coins are generally very accurate, but different countries and towns preferred the different standards of the Phœnician, Aginetæ, or Attic talent. No less than thirteen multiples or submultiples of the Athenian drachma (67.5 Troy grains) are known; and of these, 100 went to the *mina*, and 60 minæ to the talent. The double (didrachm) and the quadruple (tetradrachm) are the most usual sizes, the gold generally following the standard of the silver. Bronze coins are usually submultiples of the *obelos*, itself one-sixth of the drachma.

In point of art there is nothing noticeable in those of Spain, Gaul, or Britain; but in the first the elder have some interest, as retaining the old Celtiberian alphabet and a few words of the Basque language. British coins are copied from those of Gaul, and these again from the types of Philip of Macedon; but none of these are probably earlier than B. C. 250. On British coins are some historical names, as Cunobelinus (Shakspeare's Cymbeline), the father of Caractacus, and the towns of Verulamium and Camalodunum (St. Alban's and Colchester, respectively). In Italy we find magnificent specimens of the Greek colonial coinage at Heraclea, Metapontum, Neapolis, Pandosia, Tarentum, Terina, Thurium, and Rhegium; of very early types at Caulonia, Croton, Pæstum, Populonia, and Sybaris; of the ancient mode of writing, from right to left, on some of the earliest; and of the use of the digamma at Heraclea. The Samnite coins point to a confederacy of states and give examples of Oscan characters. The finest coins of Sicily are in like manner colonial, with some resemblance to those of Italy, the earliest ascending in date to B. C. 490 or 480. The most usual type is that of the chariot, either moving slowly or at great speed, and in many instances, as at Camarina, Catana, Messana, and Syracuse, unquestionably refer to the Olympic games; indeed, on those of Catana the goal may be noticed, and on the largest of Syracuse a suit of armor, with the word ἆθλα (the "prizes of victory") inscribed. Moreover, of Pindar's fourteen odes, it must be remembered that six refer to victories in the games won by Sicilians; while at Messana the *biga* (or chariot with two mules) refers to a victory won by Anaxilaus of Rhegium. At Agrigentum the name of the people is written *boustrophedon—i. e.* from right to left and from left to right, as an ox ploughs. The Syracusan decadrachms represent the largest of ancient Greek coins, and, though very fine, are not equal to the best of Greece proper; at Syracuse, too, the name of two artists, Cimon and Enænetus, have been preserved on the money. Connected with Sicily are some very fine coins bearing Phœnician inscriptions, sometimes attributed to Carthage; indeed, there is no doubt the best specimens were struck for that great city in Sicily at Panormus and other places, and by Greek artists. The beautiful coins of Philistis commemorate a lady not mentioned in history, but believed to be the wife of Hiero II., as her name is found carved on a seat in the theatre at Syracuse.

Proceeding to Greece proper, we find very early and beautiful specimens of Greek art at Abdera, Œnos, and Thasos, and in various towns of Macedonia and its neighborhood, as Acanthus, Amphipolis, Chalcidice, Lête, and Neapolis. The types in many cases refer to old and well-known myths, as the Gorgon's head at Neapolis. The lion seizing the bull on those of Acanthus confirms the story of the lions who attacked the baggage-horses of Xerxes at about the same time as these coins were struck. Two remarkable coins exist of Geta, king of the Edoni, both of which were found in the Tigris, and therefore may have been carried back to Persia after the defeat of Xerxes. Of Philip and Alexander the Great coins abound in gold and silver, but are less frequent in bronze, the former being of good art, and the latter confirming the extent of his conquests; while those of Lysimachus, king of Thrace, are noteworthy for the portrait they exhibit of Alexander himself, with the symbols of the Young Ammon. Thessaly exhibits some good specimens in the money of Larissa, with some resemblance in fabric to those of Sicily; and Epirus offers the beautiful series from Ambracia, with the noble head of its king, Pyrrhus, treated as the Jupiter of Dodona. The coins of Pyrrhus were probably struck at Tarentum or Syracuse. Corcyra, Acarnania, Ætolia, and Locri are also well represented; and in Bœotia we find a series of remarkable archaic coins (as at Tanagra and Thespiæ), and one reading ΕΠΑΜΙ, reasonably attributed to the celebrated Epaminondas. Athens naturally affords the largest series of Greek coins, but, as we have said, her money has no artistic merit; some specimens, however, are as early as B. C. 500. Those of the adjacent island of Ægina are very interesting from their antiquity, and from the tradition that Pheidon, king of Argos, first struck coins here in the eighth century B. C. In the Peloponnesus the series of the money of Corinth claims especial attention from its great extent and long-preserved excellence. Here, too, we find archaic specimens, with the old form of the κ (ϙ) preserved on them. Achaia records its celebrated league, and Sicyon is justly famous for the beauty of its money. At Elis we find the digamma on early types of the time of Xerxes, and a magnificent series of the finest period, with the head of Juno and her name, ΗΡΑ, inscribed on a bandeau over her forehead. These are as fine as any of the purely Greek coinage; and with these may be ranged scarcely less noble specimens from Trazene, Arcadia (with the head of Zeus Ætophoros), and Stymphalus—the latter possibly Cretan. Sparta naturally records her famous ruler, Lycurgus, though on a late copper coin. Mantinea and Heræa have good archaic types.

Of the islands, Crete takes the lead, and in the abundance of her fine coins gives ample evidence of her ancient wealth and of the skill of her artists. It has been thought, however, that the Cretan style is too pictorial. Local myths largely prevail in the types, as those of Europa and Minotaur, and of the Labyrinth or Maze. Very fine specimens exist of Chersonesus, Hierapytna, Phæstus, Cnossus, Gortyn or Gortyna, and of Cydonia, all in this island. On one of Gortyna we find the word σαιμα (σῆμα, "the badge"), referring probably to the actual type. Those of Phæstus are of especial beauty. Over the islands of the Archipelago we need not linger, though some of the coins of Tenos are fine, while Cyprus offers us an Oriental alphabet only slowly yielding to the genius of the decipherer.

Asia Minor to the N. has little of interest, excepting one magnificent head of Mithridates VI. of Pontus; in Mysia, we have, however, a unique series of *electrum* coins, called *staters* of Cyzicus, with other splendid trophies of Greek art, in the money of Cyzicus, Phocæa, and Pergamus. The tetradrachms of the last place are called, from their peculiar type, *cistophori*. Ilium in Troas naturally records its local traditions, placing Hector (ʽΕΚΤΩΡ) on its money, and Æneas carrying Anchises and leading Ascanius. Lydia comes next, with its rude and archaic gold coins, probably, as we have noted, the really earliest specimens of Greek numismatic art, though those of Ægina could not have been much later; then comes Ionia, with its great series of Smyrna and Ephesus, and the noble coins of Clazomenæ. Of this town a very rare tetradrachm exists with an inscription on it, Θεοδοτος εποιει ("Theodotus made me"). Magnesia records its river by the type of a bull butting within the pattern, hence called "Mæander." Early coins of Phocæa exhibit the seal, whence its name; and Chios, Samos, Calymna, and Cos many very early and curious specimens. The coins of Rhodes have an importance of their own, confirming, as they do remarkably, the statements of history. In remote times the three towns of Lindus, Ialysus, and Camirus struck their own money. They then combined and built Rhodes about B. C. 450. We have no coins of Rhodes before that time, but immediately after very fine specimens, with the head of Apollo, probably the same type as was afterwards known as the Colossus of Rhodes. On the opposite coast Lycia and Pamphylia afford a remarkable series; the elder ones inscribed in the local character and language; Side in the latter province having some especially fine tetradrachms, with the pomegranate fruit (Σιδή) as their type; whence, too, the name of the place. In Pisidia we have curious locally inscribed coins at Selge, resembling those of Aspendus in Pamphylia. Phrygia offers several coins of interest of the imperial times with local myths, such as that of Deucalion and Νωε, and Cilicia some remarkable coins inscribed with Phœnician characters and struck by the Persian rulers of that district. These are called "satrap" coins. There are also some interesting types at Tarsus, bearing legends similarly written. These, and the types prevailing along the coast of Syria, at Sidon, Tyre, Aradus, and Byblus, together with the early money of the Bactrian series, might perhaps best be termed Græco-Oriental. With the well-known series of "Antiochia ad Orontem," of the Seleucid kings of Syria, of the Ptolemies in Egypt, and of Cyrene in Africa, we close our brief notice of the Greek series. The native coins of Carthage and Judæa must be called Oriental; they do not exhibit anything worthy of remark, except, perhaps, the earliest "shekels" of Judæa, which were probably struck soon after the return of the Jews from Babylon.

The second great subdivision of numismatics, the Roman, commences about 230 or 240 B. C. with a massive copper coinage, termed, technically, "*æs grave*," having the As for its largest size, and the *uncia* (or ounce) for its unit. At first, the As actually weighed one pound, and hence was called "*As libralis*," the ounce being its twelfth part; but it was soon and rapidly reduced. The leading types of the Roman As are the "*Janus bifrons*" and the prow of a galley. Other and similar coins were struck in the adjacent towns of Etrusia and in Umbria and Apulia. All were on Greek models. About B. C. 170 gold, silver, and copper coins were issued by various Roman families, who were permitted by the state to strike coins—often, too, beyond the bounds of Italy; and with Julius Cæsar commenced the imperial series, which lasted, as we have stated, till A. D. 476. The main characteristic of Roman art is individuality as opposed to idealism; faithful portraiture, often exceedingly good, as in the cases of Antonia, Nero, the Antonines, Faustinas, etc., with a remarkable permanence of religious types on the reverses. Many historical events are recorded on them, as the crowning of Ptolemy Epiphanes by Lepidus, the introduction of elephants into Rome by Metellus, the construction of the port of Ostia and of the Colosseum by Nero and Vespasian respectively, and the overthrow of Judæa by Titus.

It is probable that all the finest Roman coins were executed by Greek artists, and their chief value for study is the illustration they afford of contemporary sculpture, and the influence they have exercised over mediæval and modern art. After Julius Cæsar the senate reserved to itself the striking of the copper money, which for a long time is always marked with S. C. (*senatûs consultu*). Names for Roman coins are scarce, but we know that the earlier gold and silver coins were termed, respectively, *auræ* and *denarii*, the latter of which has been preserved through the Middle Ages as the *denier* of France. In later times the *solidus* was introduced, and this likewise has become the *sol-d'or* of France (ultimately *sou*) and the *soldo d'oro* of Italy, whence *soldato* ("soldier"), meaning the "hireling." Besides the regular coins, the Romans had also what are termed *medallions*, which in some degree resemble modern *medals*, and *contorniates*, which were probably tickets of admission to the theatres or games. Christian types, as the *labarum* or standard bearing the cross, are found from Constantine downward, and on one of Vetranis are seen the celebrated words, "*Hoc signo victor eris.*" With the imperial Roman it is usual to class the *imperial Greek* coins, struck by nearly every emperor in the Greek cities of the empire, and in some cases, as at Antioch and Alexandria, forming a series unrivalled in number and duration. Artistically, this class has no value, but it is rich in its records of ancient myths and in historical allusions.

The third, or Græco-Oriental series, mainly consists of the coinage of the Byzantine emperors to the capture of the city by the Turks in 1453; but some writers class under the same head coins inscribed with Phœnician or other Oriental characters, and the darics of Persia, but these are best kept separate. The Byzantine series is generally supposed to commence with Anastasius in A. D. 491. The inscriptions on it are at first in Latin, thence continuously in Greek, its varying orthography showing the gradual change of the language. The Byzantine coinage is mostly in gold, and its chief interest is that it was the principal coinage of Middle and Eastern Europe till the introduction of the florins and ducats of the Italian republics; and, further, because the money of the Vandals in Africa, of the Ostrogoths in Spain,

and of Nicæa, Thessalonica, and Trebizonde, was framed on Byzantine models.

Over the remaining leading divisions of numismatics, the mediæval and the modern, it is not necessary to detain the reader very long; indeed, they might well be taken together. It is necessary, however, to state, generally, that the early mediæval types are a barbaric imitation of the Roman, their art being progressively worse as they were removed farther and farther from Italy, which always retained some traces of her earlier civilization. The earliest mediæval coins are those of the Lombard and Merovingian kings and of the dukes of Benevento, and in Britain the small silver pieces called "*sceatas*." Thence gradually arose an improved system, led by the German empire in Northern Italy, Germany, and France, and by the Scandinavians in England. In this system, which continued little changed till the revival of learning, the *denier* and the *penny-sterling* (*i. e.* "Easterling") were the common and the most important coins. Coins were (except in England, where the right of striking coins was always much restricted) issued by princes and ecclesiastics, as well as by kings, and somewhat later by free cities and corporations. The first really good coins are those of the Italian republics and of Frederick II., and henceforward they have some value in the history of art, though by no means so much as seals. In the middle of the fifteenth century medals, in our sense of the word, begin, and hold an important place in the art of Italy, and subsequently of France and Holland. The art of engraving medals, which occupied the talent of some of the greatest artists of the day, is strictly comparable with the painting and sculpture of the same period, and thus forms the true school in which the modern medallist should be trained. The last great series of medals issued are those recording the victories and other achievements of Napoleon I.

It seems unnecessary to give details here of the modern coinage of Europe and other countries, but we must state that besides the various series enumerated there exists a vast number of coins struck by different Oriental rulers from the commencement of the empire of the khalifs to the present day. These coins are worthless in the history of art, but very valuable in determining the dates of dynasties; as a rule, with the exception of the Chinese, they are written in the characters of the Mohammedan conquerors, or in some modification of the Devanâgari (or Sanskrit) alphabetic system. W. S. W. VAUX.

Nummulite. See FORAMINIFERA.

Nunda′, post-v. and tp., McHenry co., Ill., 2 miles N. E. of Crystal Lake, on the Chicago and North-western R. R. Pop. 1548.

Nunda, post-v. and tp., Freeborn co., Minn. Pop. 675.

Nunda, post-v. and tp. of Livingston co., N. Y., 60 miles E. of Buffalo, on the New York and Erie R. R., has 1 academy, a fine public hall, an academy of music, 1 tannery, several good hotels, 2 newspapers, 6 churches, 2 banks, and stores. Pop. of v. 1189; of tp. 2686.

C. K. SANDERS, ED. "NUNDA NEWS."

Nu′ñez (ALVAR), called **Cabesa de Vaca,** b. in Spain about 1490; was second in command in the expedition of Panfilo de Narvaez to Florida 1527–28; escaped from the shipwreck near the mouths of the Mississippi, and after wandering eight years reached Sonora 1536; was entrusted in 1540 with the government of Paraguay; after a turbulent administration of two years was sent to Spain a prisoner, and banished to Africa, but subsequently regained favor and became a magistrate at Seville, where he d. 1564. He wrote a narrative of his adventures in Florida, entitled *Naufragios* (1544), and his secretary, Fernandez, compiled a volume of *Comentarios* (1544), giving an account of his travels in Paraguay.

Nuo′ro, town of Sardinia, province of Sassari, situated in a magnificently wooded region about 2000 feet above the sea. Its position is healthy, and the neighborhood abounds in delicious game and trout. The streets are generally paved and the buildings are mostly of granite. Among the objects of interest in the vicinity are a balanced granite boulder, or "rocking stone," of great size; twenty-four *nuraghi*, or round towers, the origin or purpose of which has been much discussed; remains of an ancient construction resembling a fortress, in which lead pipes are said to have been found, and near which are four of those huge stone sarcophagi known as *sepulturas de gigantes;* also a series of those small chambers cut in the solid granite which have been called *virghines* or *domos de janas*, and the uses of which are equally unknown. Pop. 5739.

Nu′remberg [Ger. *Nürnberg*], town of Bavaria, on the Pegnitz, was once the wealthiest and most important of the free imperial cities of Germany, and although it suffered greatly during the Thirty Years' war, and gradually declined until in 1806 it lost its independence and was annexed to Bavaria, it is still a great and rich town. Its fortifications, consisting of a double wall and a moat, were demolished during the occupation by the Prussians in 1866, and have been transformed into promenades. Of all German cities, it is the most interesting and characteristic with respect to its architecture; its streets look like incarnations of mediæval legends. The houses face the street with their gables, and balconies profusely ornamented with carvings in stone or wood overhang the sidewalks. Also it is very rich in splendid mediæval monuments which show that its ancient fame of being the commercial, industrial, and literary centre of Germany was not vainglorious. Of its many remarkable buildings, the richest and most striking is the church of St. Sebald, a Gothic structure of perfect elegance, ornamented with paintings by Albert Dürer, and containing the famous tomb of St. Sebald executed in bronze by Peter Vischer, who with his five sons worked on it for nearly thirteen years. The town-hall, the largest building of its kind in Germany, with subterranean dungeons and torture-chambers, the castle, and the church of St. Lawrence are also fine and interesting edifices. In the *Albrecht Dürer Platz* was raised a statue of Albrecht Dürer in 1840. The principal manufactures of Nuremberg are carvings in wood, bone, and metals, children's toys, and dolls, lead pencils, chemicals and ultramarine, looking-glasses, watches, carriages, and machinery. Its trade is very extensive. Pop. 83,214.

Nurpur′, town of British India, in the Punjaub, at the foot of the Himalaya Mountains, in lat. 32° 12′ N., lon. 75° 40′ E., has well-stocked bazaars and large shawl manufactures. Pop. between 6000 and 8000.

Nurse, a popular name for several sharks; *e. g.* on some parts of the New England and colonial coasts it is applied to the *Somniosus microcephalus;* in Florida, Jamaica, etc., to the *Ginglymostoma cirratum;* and in Australia to the *Cestracion Philippi*, the box or Port Jackson shark, a remarkable fish of the Pacific Ocean.

Nusairieh, Ansyreeh, or **Ansonians,** the name of a Mohammedan sect which branched off from the Shiites by adopting various Jewish, Christian, and pagan ideas. They inhabit the lower Ansyrean mountain-range between Lebanon and Antioch in Syria, and also some towns and villages along the coast. They are ignorant, superstitious, and thievish, and very little is known of their doctrines, as they keep their religious tenets concealed from all foreigners, though in other respects they are very hospitable and communicative. Their prophet, Nusair, taught that God had appeared eleven times in human form—in Abraham, Moses, Jesus, Mohammed, Ali, and the other imams—and would appear once more in Mahdi or Messiah. He also taught the transmigration of souls. Those who neglect their religious duties, and especially those who betray their religious secrets, are transformed into Jews, Mohammedans, Christians, or animals. The religious rites of the sect are said to be very licentious.

Nut Bush, tp. of Warren co., N. C. Pop. 2430.

Nut′cracker, a name applied to *Nucifraga columbiana*, a bird of the Pacific States, and to *N. caryocatactes*, its European and Asiatic representative. They are of the crow family, and approach the jays in habits. They are noisy, shy birds, feeding on seeds, pine cones, grubs, and other articles of food. The Old-World species nests like the woodpecker, in a hole excavated in a dead tree.

Nutgalls. See GALL-NUTS, GALLS, GALL INSECTS, and GALLOTANIC ACID.

Nut′hatch, a genus (*Sitta*) of birds of the family Paridæ, sub-family Sittinæ. There are many species found in various parts of the world. The typical species is *Sitta Europæa*. The U. S. have *S. carolinensis* (white-breasted nuthatch), *S. canadensis* (red-bellied nuthatch), besides *S. aculeata, pusilla, pygmæa*, etc. They feed on seed, nuts, insects, grubs, etc.

Nut′meg, the kernel of the seed of *Myristica moschata*, and sometimes of *M. fatua* (long nutmeg), trees which are natives of the Eastern Archipelago and belong to the order Myristicaceæ. Besides these, several other trees of this order furnish inferior nutmegs. The true nutmeg is now successfully cultivated in India and tropical America. Nutmegs are principally used as a spice in cooking, but are employed in medicine also. They are aromatic and stimulant, with somewhat narcotic properties. The aril which surrounds the nutmeg constitutes MACE (which see). Nutmegs yield on pressure a half-solid fixed oil, called oil of mace from its peculiar flavor; they yield on distillation an abundant volatile oil which has exactly the flavor of the nutmeg.

Nutria Fur. See COYPU.

Nutri′tion [Lat. *nutrire*, "to nourish"], "that function by which the nutritive matter already elaborated by the various organic actions loses its own nature and assumes that of the different living tissues, to repair their losses and maintain their strength." (*Dunglison.*) In its widest sense, "it comprises the history of the proximate principles, their source, the manner of their production, the proportions in which they exist in different kinds of food and drink, the processes of digestion and absorption, and the constitution of the circulating fluids; then the physical phenomena of the circulation, and the forces by which it is accomplished; the changes which the blood undergoes in different parts of the body; all the phenomena, both chemical and physical, of respiration; those of secretion and excretion, and the character and destination of the secreted and excreted fluids." (*Dalton.*)

The exact manner in which the nutritive process is accomplished is not positively known. The blood is chiefly concerned in the maintenance of this function, and in order to understand it thoroughly it will be necessary to study the composition of the blood and the phenomena of the circulation. As the blood circulates in the living body it is composed of two essential parts—a thin, transparent, colorless fluid known as *liquor sanguinis*, in which float a vast number of small red bodies known as the *red blood-corpuscles*, in contradistinction to the *white corpuscles*, which are also found, but in very much smaller numbers. The human red blood-corpuscles are small, circular, biconcave bodies of a faint yellow color when viewed alone, but of a deep red, giving the color to the blood, when seen collectively; they vary in diameter from $\frac{1}{3000}$th to $\frac{1}{2800}$th of an inch. The white corpuscles are somewhat larger, and present an irregular surface. They are supposed by some to be primitive red corpuscles. When the blood has been drawn from the body and allowed to stand, it coagulates, forming at first a jelly-like mass, which after a while separates distinctly into a *clot*, which grows constantly smaller; and a fluid, known as *serum*. When the clot is examined under the microscope, it is seen to be composed of a number of fibrillæ entangling the red corpuscles. The fibrillæ are known as *fibrine*, which in the living blood is held in solution in the liquor sanguinis or *plasma*, but which begins to coagulate immediately after it is drawn from the vessels or whenever the circulation is arrested. The serum is merely liquor sanguinis deprived of its fibrine. The distribution of the constituents may be seen by the following table:

Living blood.....	Liquor sanguinis....	Fibrine, Albumen, Water, Salts,	in solution.
	Corpuscles suspended in liquor sanguinis.		
Dead blood.......	Clot..........................	Fibrine, Corpuscles.	
	Serum	Albumen, Salts, Water,	in solution.

The composition of the blood is as follows:

Water..........		796.93
Solid matters:		
Fibrine..........	1.95	
Corpuscles..........	103.23	
Albumen..........	70.75	
Extractive matters and salts..........	27.14	— 203.07
		1000.00

We must now take a glance at the process of DIGESTION (which see). We have, as its result, albuminose, glucose, and fat in a state of emulsion, all in the upper part of the intestinal canal, and ready to be absorbed into the general system. The process of absorption is effected chiefly by the villi of the small intestine; these are minute conical projections, most numerous in the upper part of the intestinal canal, and gradually diminishing in number until they entirely disappear at the beginning of the large intestine. Each villus is about $\frac{1}{25}$th of an inch in length, and is composed of a network of blood-vessels—the commencing rootlets of the portal vein—through the centre of which runs a lymphatic vessel ending in a blind extremity, the whole covered with cylindrical epithelium. These blood-vessels and lacteals (as the lymphatic vessels are called) absorb the prepared ingesta by a process of ENDOSMOSIS (which see). That portion absorbed by the blood-vessels is taken immediately into the portal circulation, thence to the liver and heart; that absorbed by the lacteals is carried by them to the receptaculum chyli (a pouch situated in the back part of the abdominal cavity against the spinal column); from here it passes through the thoracic duct, and enters the circulation through the left subclavian vein, thence to the heart. The ingested materials may be recognized in the circulation shortly after they have been absorbed, but they are soon transformed into other substances, and become incorporated with the blood-corpuscles; so that we are seldom able to recognize them after the blood has passed through the lungs.

Another important change intimately connected with the process of nutrition, and which takes place in the lungs, is the aëration of the blood. The circulating fluid, in passing through the lungs, becomes changed from venous to arterial, loses carbonic acid (an effete matter which has been given up to it from the tissues during its passage through the capillaries), and absorbs oxygen, which is appropriated by the tissues for their nutrition.

Ingesta serve for the formation and maintenance of the different parts of the body, and therefore must contain all the elements entering into its composition. We have traced these through the various transformations until they were incorporated with the blood, which thus becomes enriched with all the compound principles of which the tissues are formed; and the process by which each particular tissue selects from the circulating fluid (which is brought into intimate contact with it through the agency of the capillaries) the materials necessary for its maintenance and growth is called *assimilation*. But simultaneously with this is going on a process known as *destructive assimilation*, by which the various tissues are undergoing disintegration and waste; new substances are formed, which enter the circulation, and are carried to the lungs, kidneys, skin, etc. Here they are filtered from the blood and discharged from the economy. They are known as *excretions*, and embrace urine, sweat, fæces, carbonic acid, etc. EDWARD J. BERMINGHAM.

Nut′tall (THOMAS), b. in Yorkshire, England, in 1786; was brought up a printer; came to the U. S. in youth; devoted much time to botanical and ornithological studies; travelled in nearly every State of the Union; explored the great lakes, the upper courses of the Missouri and Arkansas rivers; crossed the country to Oregon, the Sandwich Islands, and California; published, among other works, *The Genera of North American Plants* (2 vols., 1818), *A Journal of Travels into the Arkansas Territory* (1821), *A Manual of the Ornithology of the U. S. and Canada* (1832–34), and *The North American Sylva* (3 vols., 1842–49), being a continuation of F. A. Michaux's work on the same subject. Nuttall was curator and lecturer at the botanic garden of Harvard University at Cambridge 1822–28; returned to England about 1841 on inheriting an estate, and d. at St. Helen's, Lancashire, Sept. 10, 1859.

Nut′ter's, tp. of Wicomico co., Md. Pop. 870.

Nux Vom′ica [Lat.], an important drug consisting of the seeds of the *Strychnos nux-vomica*, a small tree of the natural order Loganiaceæ, growing in the coast-districts of India. The seeds are gray, disk-shaped, a little less than an inch in diameter, and about a quarter of an inch in thickness. They have a very bitter taste and are exceedingly poisonous, both these qualities depending on the presence of three alkaloids—strychnine, brucine, and igasurine. Of these, strychnine is the most powerful and important. It is a white powder, almost wholly insoluble in water, odorless, but of an intensely bitter taste. It is highly poisonous, producing in poisonous dose, within half an hour after taking, violent tetanic spasms, the body during the paroxysms being arched backward, with every muscle convulsed and stiff. The mind is unaffected. Death occurs within an hour or two. There is no certain antidote, but drugs producing motor paralysis, such as calabar bean, hemlock, tobacco, the anæsthetic ethers, etc., are useful in mitigating the severity of the spasms. Medicinally, strychnine and preparations of nux-vomica seeds are used in small repeated doses in cases of nervous debility and paralysis of various kinds, to help in restoring proper functional activity in the affected muscles or organs. EDWARD CURTIS.

Ny′ack, post-v., lying principally in Orangetown and partly in Clarkstown tps., Rockland co., N. Y., situated on the W. bank of the Hudson River, 28 miles from New York City, on the Northern R. R. of New Jersey, has daily connection with New York by steamers, and with Tarrytown across the river by ferry. There are 5 schools, 7 churches, 2 banks, 2 weekly newspapers, several fine hotels and private boarding-houses, manufactories of shoes, cedar pencils, tubs, churns, an efficient fire department, gas, a good supply of water, and a young men's Christian association, which has a library of 1200 vols. Pop. 3438.

JOHN CHARLTON, ED. "ROCKLAND CO. JOURNAL."

Nyan′za, a general word in Africa for large bodies of water, and especially applied to two great lakes in E. Equatorial Africa, the *Victoria Nyanza*, or *Ukerewe*, and the *Mwutan*, or *Albert Nyanza*. The Victoria Nyanza is a large fresh-water lake between lat. 2° 31′ S. and 0° 21′ N., and E. lon. 31° 35′ and 34° 45′. Its estimated area is 25,000 sq. m.; its height above the sea 3808 feet, and its greatest depth, as far as known by soundings taken at its

northern extremity, is 275 feet. About three-fourths of its coast-line has been explored, and is irregular, being indented with small bays and openings formed by the mouths of rivers. At its south-eastern extremity there is a large gulf, about 25 miles wide, to which the name has been given of Speke Gulf, formed by a promontory, Uriwi, which stretches westward, and by the large island of Ukerewe to the W. of this promontory. The Victoria Nyanza has eleven large islands lying close to the coast-line —Ukerewe, Ukara, Ugingo, Usugura, Uvuma, Namungo, Bugeyeya, Wanzi, Lalamba, Sasse, and Bumbireh, the largest of which is Sasse—and many small ones. Whether there are other islands in the central part of the lake is not known, as it has not been explored. The lake, though of large extent, is supposed to be shallow. Its principal affluent is the river Shimiyu, which enters near the south-eastern extremity with a width at its mouth of about a mile, but which soon contracts to 400 yards. The source of the Shimiyu, and, as far as known, the remotest source both of the lake and of the Nile, is the Liwumba, a river which rises in a hilly country in about the 5th degree of S. lat., and a little E. of the 34th degree of E. lon. This stream in the more northerly part of its course is known as the Monungah. Two other rivers, the Luwamberri and the Duma, flow into it, the former from the S., and the latter from the E., and from its junction with the Duma to the lake it is known as the Shimiyu. Eight other rivers flow into the Victoria upon its E. side, the largest of which is the Ruana; and five enter it, as far as known, upon the W. and S.W. sides, the largest being the Katera or Kitangule, which, as an affluent, is second only to the Shimiyu. The outlet of the lake is at its northern extremity, in about 33° 40′ E. lon., and is known by the several names of the Somerset, the Victoria Nile, and the White Nile, the latter of which will probably be ultimately adopted. This outlet or river flows out of a bay called Napoleon Bay, and in the commencement of its course has a fall known as Ripon Falls, from whence it runs in a north-westerly direction, entering a large sheet of water found by Col. Long in descending the river in 1874, which may be either a permanent lake or simply a depression in the land subject to a temporary overflow. From thence the river continues first north-easterly, thence north-westerly, and thence due E., until, at Magunga, about 2° 25′ N. lat. and 31° 40′ E. lon., it enters the Mwutan, or Albert Nyanza, a large lake, the north-eastern part of which, from 1° to 2° 30′ N. lat., and from 31° to 31° 40′ E. lon., is alone known, but which is supposed to extend as far S. as the equator. Whether its greatest extremity, however, is in that direction or toward the W. is yet in doubt, Col. Gordon, from recent inquiries made in the vicinity, being inclined to the opinion that the latter supposition is the true one. It is assumed that a river, the Bahr-el-Gebel, which is one of the western branches of the Nile, is the outlet of this lake at its northern extremity, but the fact yet remains to be established.

The Victoria Nyanza was discovered by Capt. J. H. Speke in 1858, upon the return of the expedition in which he and Col. R. Burton discovered Lake Tanganyika. From what Speke saw he was impressed with a conviction, which subsequent explorations have confirmed, that the Victoria Nyanza was the great reservoir of the Nile. Upon that occasion he explored only a portion of the southern extremity. In 1861 and 1862, Speke, together with Major J. A. Grant, in an expedition chiefly at the expense of the British government, after many trials and difficulties, explored the country lying W. of the lake until they reached the capital of M'tesa, the king of Uganda, the country surrounding the north-western part. Their journey was around the S. W., the W., and the N. W. parts of the lake; during which, however, they were frequently in view of it, and were able to estimate its length with tolerable accuracy, and to form some conception of its general extent. They found the country W. of the lake hilly, well wooded, healthy, and exceedingly fertile, with low, swampy plains stretching as far as the eye could reach to the lake, interspersed with patches of water. These plains, they were assured, had formerly been covered by the water of the lake, when it was navigable to the base of the hills, showing that the lake had shrunk away from its original margin. In 1874, Col. Long reached the northern shore of the Victoria, and made a partial exploration of that vicinity, returning with the erroneous impression that the lake was not more than 25 miles wide. He afterward descended the White Nile, finding the large body of water or lake before referred to, and explored the river to the Karuma Falls, thereby proving its connection with Lake Mwutan (Albert Nyanza). In 1875, H. M. Stanley, at the head of an expedition the expense of which was borne by the New York *Herald* and the London *Telegraph*, after losing nearly half his men by disease and hostile attacks of the natives, succeeded in reaching the south-eastern extremity of the Victoria Nyanza from Zanzibar in the short space of 90 days, more than two-thirds of the journey being through a country wholly unknown. In a small vessel, which had been carried in separate parts by his men and put together on the lake, he carefully explored every portion of the south-eastern, eastern, and northern parts of the coast, reaching Ulagalla, the capital of King M'tesa, on Apr. 14, 1875. He found the country E. of the lake in some parts mountainous, but consisting chiefly of level, well-watered, and fertile plains, stretching far inward, and in parts densely populated.

The present opinion is that these two lakes are the principal reservoirs of the Nile, and that the remotest source of that river is the Liwumba, before referred to, in 5° S. lat. Several prominent geographers and travellers regard the great mountain-chain which lies midway between the Victoria and the E. coast of Africa, and extends from Abyssinia to about 5° S. lat., as the chief source of the streams that flow into this lake. This mountain-range is the highest land in Africa, and is capped by two great snow-crowned peaks, Kenia and Kilmanjaro. The supposition is, that the heavily-freighted etesian winds which in their course along the Nile valley deposit no portion of their moisture upon the land beneath are arrested by this great mountain-barrier, and with the clouds that break against its sides and upon its summits, aided by the melting of the snows under the equatorial heat of summer, cause in this region heavy tropical rains, which swell the water-courses, rivers, and lakes, and thus become one of the chief agents in producing the remarkable phenomena of the annual inundation of the Nile. CHARLES P. DALY.

Nyas'sa, a lake in the interior of Africa, situated in lat. 14° 15′ S., 350 miles from the coast of Mozambique, was discovered in 1861 by Dr. Livingstone.

Nyáya, the logical school. See HINDU PHILOSOPHY.

Nycticeb'inæ (from *Nycticebus*—νύξ, νυκτός, "night," and κῆβος, "monkey"—a genus of the group), a sub-family of Lemuridæ or half monkeys. They have 36 teeth, viz. M. $\frac{3}{3}$; P. M. $\frac{3}{3}$; C. $\frac{1}{1}$; I. $\frac{2}{2} \times 2$; the neural spines of the dorsal and lumbar vertebræ are inclined backwards; the tail is either short (*i. e.* always shorter than half the length of the body) or rudimentary; the hind and fore limbs are not very unequal, although the hind ones are longest; the ears in the typical forms are small, with the helix little marked, and the tragus and antitragus absent. The sub-family is composed of four genera, of which two (*Perodicticus* and *Arctocebus*) are inhabitants of Africa, and the others (*Nycticebus* and *Loris*) of the East Indies. The species are small, nocturnal, with staring eyes, live in trees, and feed on insects and small birds.

THEODORE GILL.

Nye, county of S. Nevada, consisting of a large area covered by N. and S. ranges of parallel mountains, with wide and sometimes fertile intervening valleys. Silver-mining is the leading industry. There are considerable tracts where agriculture is successfully carried on. Cap. Belmont. Pop. 1087.

Nye (JAMES W.), b. in Madison co., N. Y., June 10, 1815; became a distinguished lawyer and political speaker, noted for humor; was governor of Nevada Territory 1861–65; U. S. Senator 1865–73.

Nyir-Egyha'za, t. of Hungary, manufactures spirits, soda, and oil, and carries on an active trade. Pop. 17,487.

Ny'kerk, or **Nieuwkerk,** t. of Netherlands, province of Gelderland, on Zuyder-Zee, has a good harbor and considerable trade in tobacco, grain, and cattle. Pop. 7428.

Nylghau. See NILGHAU.

Nymphs [Gr. νύμφη], in Greek and Roman mythology, a numerous class of inferior divinities, imagined as beautiful maidens, not immortal, but always young, inhabiting rivers and streams (naiads), forests and groves (dryads), etc. They were considered as tutelary spirits not only of certain localities, but also of certain races and families, and sacrifices of goats, lambs, fruit, and oil, but never of wine, were made to them. They occur generally in connection with some other divinity of higher rank, and they were believed to be possessed of the gift of prophecy and of poetical inspiration.

Nym'wegen, or **Nijmwegen** [Fr. *Nimègue;* Ger. *Nimwegen*], town of the Netherlands, province of Gelderland, on the Waal. It is an old and interesting town, fortified, and important on account of its commanding position on the Rhine and Waal, and carrying on a lively trade and extensive manufactures of beer, brandy, eau de cologne, tobacco, and cigars. A treaty of peace was concluded here between Holland and France (Aug. 11, 1678), between Holland and Spain (Sept. 17, same year), and between France and Germany (Feb. 5, 1679). Pop. 22,785.

O.

O, a vowel, stands in English for not less than four distinct sounds—those heard in *rove, nor, move, love;* while *oo* has as many as three sounds, as shown in *moon, book, blood.* In the digraphs *o* has various powers. As an abbreviation, O. stands for Ohio; O in chemical notation is the symbol of oxygen; on the mariner's compass it stands for east (orient).

Oaja'ca, or **Oaxaca,** a state of the Mexican confederation, bordering on the Pacific Ocean and the Gulf of Tehuantepec. Area, 31,822 square miles. Pop. 490,000, mostly consisting of mestizoes and different tribes of native Indians. The surface is mountainous and the soil very fertile; when irrigated sufficiently, two crops of wheat and maize are produced annually without any manure. Sugar, coffee, cotton, indigo, tobacco, and many varieties of fruits are grown. The forests yield excellent timber and different kinds of dyewoods. Minerals are found, but the mines are very imperfectly worked. Cattle-breeding is carried on to some extent, but the principal product of the country is cochineal. The climate is delicious and healthful, rain frequent, and the heat seldom oppressive.

Oajaca, or **Oaxaca,** town of Mexico, the capital of the state of Oajaca, is beautifully situated and well built, its houses being surrounded by gardens, orchards, and whole plantations of cochineal. Its trade and manufactures are not important, but it has several good educational institutions, and is the residence of many wealthy families. Pop. 25,000.

Oahu. See Hawaiian Islands.

Oak [Ang.-Sax. *ac;* Ger. *Eiche*]. The oak family, or order Cupuliferæ (a part of the great order Amentaceæ), comprising the oak, the chestnut, the beech, and the hazel, is found everywhere throughout all temperate regions. In the northern temperate zone it is abundant, and it occurs, though not in great numbers, also in the southern. A few species are found upon the mountains within the tropics, but none in the valleys. As now constituted, it is a strictly natural family. Most of the trees belonging to it are remarkable for their thick and rugged bark and for the great abundance of tannin which it contains. They have large and strong roots, penetrating very deeply or extending very far horizontally. The trunks are distinguished for their massiveness, and for the weight, strength, and, in most cases, the durability of their wood. Their branches are strong and irregular, and form a broad head. The buds are fitted for a climate with severe winters, the plaited or folded leaves being covered by imbricate external scales, and often still further protected by a separate downy scale surrounding each separate leaf. The leaves are plane and alternate, and usually supported by a footstalk, at the base of which are two slender scales or stipules, which for the most part fall off as the leaf expands. The fruit is valuable to man and animals. The fruits of the chestnut and hazel have been long cultivated on the Eastern continent, and much improved in size and quality.

The genera found in the northern part of the U. S. are the oak, the chestnut, the hazel, and the beech. The oak (*Quercus*) is found growing naturally in all parts of the northern temperate zone, and in all contributes to the subsistence of a great variety of animals. De Candolle, in the *Prodromus*, published in 1868, describes more than 280 oaks, of which 33 or 34 are found within the limits of the U. S., 90 in Mexico and Central America, 21 in Europe, 2 in Africa, 28 in China and Japan, 60 in continental Asia, 26 in Java, 14 in Sumatra, 6 in Hong-Kong, 3 in Borneo, 1 in the Moluccas. Several have since been found on the Pacific slope within the U. S.; Dr. Gray finds 16 in the Northern U. S. In Europe the stag, the roebuck, and the wild-boar winter upon its fruit. In Asia, pheasants and the wood-pigeon share it with animals of the deer kind. In our own native forests the bear, the raccoon, the squirrel, the wild-pigeon, and the wild-turkey delight in various kinds of acorns, and swine, hardly less wild, fatten upon them. In England, the tree was once prized only for the acorns, which were the chief support of those large herds of swine whose flesh formed a considerable part of the food of the Saxons. The oak is subject to the attacks of insects, causing a variety of galls, some kind being found in almost every part of the tree, and some of which were once supposed to be the fruit of the tree. (See Gall Insects.) The most important are known in commerce as Gall-nuts (which see), and imported in large quantities into this and other countries from Aleppo and other ports in the Levant. Oak-galls are amongst the most powerful vegetable astringents known, and form the basis of many styptics and astringent medicines. An infusion of them is said to be the best antidote for an overdose of ipecacuanha. Galls contain a peculiar astringent principle called gallic acid, which strikes a deep purple color, gradually becoming black, with the soluble salts of iron. This property renders them a valuable dyestuff. They also form the basis of the common black ink. The bark of most species of oak contains abundance of tannin. That of the common black (*Quercus tinctoria*) is used for tanning and for dyeing. The bark of the cork oak of Spain (*Quercus suber*) furnishes cork.

Yet the great value of the oak in all countries is for its wood. It is applied to a greater variety of important uses than that of any other tree. With the exception of the teak tree, it makes the best ship-timber known, and for this purpose the American white oak is perhaps equal to the English oak, and surpassed only by the live-oak. For

The Oak.

thorough hardness, toughness, and durability united it is unsurpassed, though each of these properties singly is found more abundantly in some other wood. It is almost indispensable in the manufacture of implements of husbandry and all kinds of wheel-work. When employed for ornamental uses the wood should be cut obliquely, to exhibit the rich reddish-silver grain.

The oak is distinguished from all other trees by the acorn, for which the fruit of no other tree can be mistaken. The leaves of the commoner species are larger towards the extreme end; in some they are more or less deeply lobed, with rounded or blunt lobes; in others, toothed with large round teeth; in others, deeply cut, with the divisions terminating in a long, bristle-like point. The flowers of both sexes are on one plant; the sterile, disposed in long, slender, pendulous catkins, which are in groups; the fertile flowers, in a bud-like, scaly cup. The seed-vessel of the fertile flower is divided into three compartments or cells, in each of which are two embryo seeds; but only one in one of the cells comes to perfection, whence the acorn is a one-celled, one-seeded nut, surrounded at the base by the enlarged scaly cup. The acorns of some species come to maturity in a single season, but many of the American species require two seasons to ripen. There is scarcely any seed in which the vitality is so transient. Few of them will germinate after having been kept a year, and must therefore be planted at once. Most of the American oaks must be

trees of considerable height and age before they begin to bear, but they become more fruitful as they grow older, and continue bearing till the last. The rate of growth of the oak is very different in the different species. Slow in the early stages of its growth, it continues to make steady progress for many years, and requires 100 or 150 years to come to perfection. The average growth of the white oak is found to be not far from two inches in diameter in ten years after it has been growing thirty or forty years. An oak of thirty years may be eight inches in diameter and forty feet high. An easy calculation shows that, although its apparent growth after that age is less than before, the real growth of each individual tree is greater. In ten years more it will be ten inches in diameter. Two inches will have been added throughout the whole forty feet, and, as the circles of annual growth enlarge in the proportion of their diameter, the 64 of the former years will have become as 100 for the ten years' growth, and the successive additions in periods of ten years will be as the numbers 36, 44, 52, 60, etc. A tree of thirty years, therefore, will in ten years increase 56 per cent.; in the next similar period, 68 per cent.; in the third, 79; in the fourth, 93; in the fifth, 106. That is, an oak of eighty years of age grows more in ten years than it did in the first thirty; and an oak of 130 more than it did in the first forty. When, therefore, it is desirable to keep the forest for timber, the process of thinning may be continued with strict economy, as the increase of the thirty or forty trees left on the acre will counterbalance in a great degree the loss in numbers. Some acres in every large forest should be thus left for the use of the shipbuilder. Those species of oak most analogous to our white oak are known in Europe to continue to grow and flourish for centuries. There are oaks in Britain which are believed to have been old trees at the time of William the Conqueror; some are supposed to be 1000 years old. For planting, the largest acorns should be selected, and such as have grown upon the most vigorous trees. They should be sown as soon as possible and covered in light soil to the depth of an inch. The largest and most thriving plants alone should be selected for transplanting, and to secure good roots the plants should be removed before their final planting from one part of the nursery to another, after having the long tap-roots cut off. This induces a mass of fibrous roots. They should be planted out at the age of three, four, or five years. For successful planting it is safest to have pines, larches, or other trees intermingled among the oaks. GEORGE B. EMERSON.

Oak, tp. of Mills co., Ia. Pop. 748.

Oak, tp. of Stearns co., Minn. Pop. 478.

Oakal'la, p.-v. of Loda tp. Iroquois co., Ill., on Chicago and Cairo line of Illinois Central R. R. (LODA STATION).

Oak Apple. See GALL INSECTS and GALL-NUTS.

Oak Bow'ery, tp. of Chambers co., Ala. Pop. 1144.

Oak Creek, tp. of Butler co., Neb. Pop. 119.

Oak Creek, post-v. and tp., Milwaukee co., Wis., on the Milwaukee division of the Chicago and North-western R. R. Pop. 1959.

Oak'dale, post-v. of Washington co., Ill., on St. Louis Vandalia Terre Haute and Indianapolis R. R. Pop. 116.

Oakdale, tp. of Howard co., Ia. Pop. 176.

Oakdale, post-v. of West Boylston tp., Worcester co., Mass., on the Worcester and Nashua R. R.

Oakdale, post-v. and tp., Washington co., Minn., on the St. Paul Stillwater and Taylor's Falls R. R. Pop. 456.

Oakdale, post-v., cap. of Antelope co., Neb., on the Elkhorn River, has 1 weekly newspaper.

Oakdale, tp. of Monroe co., Wis. Pop. 619.

Oakes (Gen. JAMES), b. in Pennsylvania about 1825; graduated at West Point 1846; served through the Mexican war; made brevet captain for gallantry at Molino del Rey Sept. 8, 1847; became major and lieutenant-colonel of cavalry 1861; participated in the battles of Shiloh and Corinth; was made brevet brigadier-general Mar. 30, 1865, and colonel of 6th Cavalry July 31, 1866.

Oakes (URIAH), D. D., b. in England in 1631; came to Massachusetts 1634; graduated at Harvard College 1649; published at Cambridge a volume of mathematical calculations; became a clergyman at Fitchfield, England; was silenced for nonconformity 1662; afterwards preached to another congregation; returned to Massachusetts; became pastor of the church at Cambridge Nov. 8, 1671; took charge of Harvard College Apr. 7, 1675, and was formally installed president Feb. 2, 1680. D. July 25, 1681.

Oak'field, post-v. and tp., Audubon co., Ia. Pop. 405.

Oakfield, post-v. and tp., Kent co., Mich. Pop. 1092.

Oakfield, p.-v. and tp., Genesee co., N. Y., is seat of Carey Collegiate Seminary (Protestant Episcopal). P. 1471.

Oakfield, post-v. and tp., Fond du Lac co., Wis., on Horicon Lake, and on the Green Bay and Lake Superior line of the Chicago and North-western R. R. Pop. 1361.

Oakfield Plantation, a v. (OAKFIELD P. O.) of Aroostook co., Me. Pop. 559.

Oakfus'ka, tp. of Tallapoosa co., Ala. Pop. 417.

Oak Galls. See GALL INSECTS and GALL-NUTS.

Oak Glen, tp. of Steele co., Minn. Pop. 344.

Oak Grove, tp. of Calhoun co., Ala. Pop. 520.

Oak Grove, tp. of Benton co., Ind. Pop. 1239.

Oak Grove, post-v. and tp., Anoka co., Minn. P. 198.

Oak Grove, tp. of Oregon co., Mo. Pop. 1081.

Oak Grove, tp. of Seward co., Neb. Pop. 213.

Oak Grove, tp. of Wake co., N. C. Pop. 2075.

Oak Grove, post-v. and tp., Dodge co., Wis. Pop. of v. 80; of tp. 2105.

Oak Grove, a v. and tp., Eau Claire co., Wis. Pop. of v. 376; of tp. 895.

Oak Grove, tp. of Pierce co., Wis. Pop. 839.

Oak'ham, post-v. and tp., Worcester, Mass. Pop. 860.

Oak Har'bor, post-v. of Ottawa co., O., on the Northern division of the Lake Shore and Michigan Southern R. R., has 1 union school, 3 churches, a fire department, 4 saw and two planing mills, 1 stave manufactory, 1 weekly newspaper, and repair-shops. It is 26 miles E. of Toledo. Pop. about 1400. G. GOSLINE, ED. "PRESS."

Oak Hill, post-v. of Scarborough tp., Cumberland co., Me., on the Eastern and Maine Central R. R.

Oak Hill, post-v. and tp., Crawford co., Mo. Pop. 707.

Oak Hill, p.-v. and tp., Granville co., N. C. P. 2183.

Oak'ington, a v. of Hall's Cross-roads tp., Harford co., Md. Pop. 158.

Oak'land, county in the S. E. of Michigan. Area, 900 square miles. It is level and fertile. Live-stock, grain, wool, hay, and dairy products are the agricultural staples. The manufactures include carriages, flour, saddlery, cooperage, castings, etc. The county is traversed by the Holly Wayne and Monroe and the Detroit and Milwaukee R. Rs. Cap. Pontiac. Pop. 40,867.

Oakland, p.-v. and tp., Lauderdale co., Ala. P. 2887.

Oakland, post-v. and tp., cap. of Alameda co., Cal., 6 miles E. of San Francisco, with which it is connected by steamboat and rail, is the W. terminus of the Central Pacific R. R. The city is divided into East and West Oakland by an estuary of San Francisco Bay 40 rods wide. It contains academies, seminaries, and graded schools, 2 libraries of 6000 volumes, 3 street railways, 17 churches, 2 savings banks with an aggregate capital of $2,500,000, 2 Chinese missions, 4 benevolent societies, rhetorical, harmonic, protective, and horticultural societies, a paid fire and police department, 4 daily, 2 weekly, and 2 monthly papers, 16 incorporated companies with a capital of $6,000,000, and other business-houses. Oakland has 2 flouring and 2 planing mills, 2 potteries, marble and iron works, a cordage-factory, 3 tanneries, a jute-factory turning out 5,000,000 sacks annually, metallurgical works, smelting and refining works, a quartz-mill, 1 fruit-preserving establishment, manufactories of windmills, carriages, and other commodities. The city is supplied with water and gas, and is governed by a mayor and city council. Pop. of v. 10,500; of tp. 11,104.

Oakland, post-v. of East Oakland tp., Coles co., Ill., on a branch of the Embarras River and on the Illinois Midland R. R.

Oakland, tp. of Schuyler co., Ill. Pop. 1026.

Oakland, tp. of Franklin co., Ia. Pop. 319.

Oakland, tp. of Louisa co., Ia. Pop. 604.

Oakland, post-v. and tp., cap. of Garrett co., Md., 243 miles W. of Baltimore, on the Baltimore and Ohio R. R., has 1 woollen-mill, 2 newspapers, several saw-mills, and stores. It is a resort for summer tourists. Pop. 1396. C. T. ABELL, ED. "GAZETTE."

Oakland, tp. of Oakland co., Mich. Pop. 1086.

Oakland, post-v. and tp., Freeborn co., Minn., on the Southern Minnesota R. R. Pop. 412.

Oakland, post-v. of Yalabusha co., Miss., on the Mississippi and Tennessee R. R., is the seat of Oakland College (Presbyterian), founded in 1830.

Oakland, post-v. and tp., Burt co., Neb. Pop. 227.

Oakland, tp. of Chatham co., N. C. Pop. 1593.

Oakland, a v. of Clear Creek tp., Fairfield co., O. Pop. 152.

Oakland, post-v. of Douglas co., Or., on the Oregon and California R. R.

Oakland, tp. of Butler co., Pa. Pop. 926.

Oakland, tp. of Susquehanna co., Pa. Pop. 1106.

Oakland, tp. of Venango co., Pa. Pop. 1082.

Oakland, post-v., cap. of Mason co., Wash. Pop. 59.

Oakland, p.-v. and tp., Jefferson co., Wis. P. 1071.

Oak Lawn, tp. of Greenville co., S. C. Pop. 995.

Oak'ley, post-v. and tp., Macon co., Ill., on the Toledo Wabash and Western R. R. Pop. 1137.

Oakley (Thomas Jackson), LL.D., b. in Dutchess co., N. Y., in 1783; graduated at Yale College 1801; became a lawyer at Poughkeepsie, N. Y.; became surrogate of Dutchess co. 1810; a member of Congress 1813–15 and 1827–29; member of the New York assembly 1815–16; attorney-general of the State 1819; appointed judge of the superior court of New York City 1828, and became chief-justice 1846. D. in New York City May 12, 1857.

Oak Park, post-v. of Cook co., Ill., on the Omaha and California line of the Chicago and North-western R. R., 8 miles W. of Chicago.

Oak Ridge, post-v. of Cape Girardeau co., Mo., 20 miles N. W. of Cape Girardeau City, has a high school, 2 churches, 1 flouring-mill, a good hotel, 1 newspaper, and stores and mechanical shops. Pop. about 300.

D. T. Stanley, Ed. "School Record."

Oak Ridge, post-v. and tp., Guilford co., N. C. Pop. 1022.

Oak Run, tp. of Madison co., O. Pop. 456.

Oak'um, the fibre of old tarred or untarred rope, used chiefly for calking ships. It was once always picked by hand, but a number of machines have been invented to perform the work.

Oak'ville, post-v. of Trafalgar tp., Halton co., Ontario, on Lake Ontario, at the mouth of Sixteen-mile Creek, which makes a good harbor, and near the Grand Trunk Railway, 22 miles E. by N. of Toronto. It is in a good agricultural region, and exports much produce. It has some shipbuilding. There is 1 weekly newspaper. Pop. of sub-district, 1684.

Oakville, post-v. and tp., Lawrence co., Ala. Pop. 1709.

Oakville, post-v., cap. of Live Oak co., Tex., 85 miles S. W. of San Antonio, has a good school, churches, 1 newspaper, a Masonic hall, 3 hotels, and stores. Pop. about 400.

E. Lawley, Ed. "Oakville Tribune."

Oak'wood, post-v. and tp., Vermilion co., Ill., on the Indianapolis Bloomington and Western R. R. Pop. 2364.

Oan'nes, the man-fish god of the Babylonians, resembling Dagon of the Philistines. He is said to have issued from the Persian Gulf, and to have founded the civilization of Lower Chaldæa. As represented by art, a man's head was under that of the fish, and a woman's feet were joined to its tail.

R. D. Hitchcock.

Oar, the long lever of ash, beech, or Norway fir by which vessels are rowed. Long oars for heavy vessels are called *sweeps;* those for sculling a boat are called *sculls.* The part of the oar which dips into the water is called the *blade;* the other end is the *handle;* next to this comes the *loom.* (For the use of the oar see Rowing.)

O'asis [from the Coptic word *ouahe,* a "resting-place," or simply an "inhabited place"] is a word now used as a general term denoting any cultivated or cultivable spot in a desert, but was by the ancients applied only to the four spots of this character found in the Libyan desert, along the Egyptian frontier. These four oases are—(1) Oasis Ammonia, the modern *El Siwah,* the first discovered, though the most distant from the Nile, situated in lat. 29° N., lon. 26° E., 6 miles long, 3 miles broad, and containing the ruins of the famous temple and oracle of Ammon, and the celebrated Fountain of the Sun, whose waters are "warm in the morning and evening, but cool at noon." (2) Oasis Magna, the modern *El Kargeh,* 80 miles long, 10 miles broad, stretching 90 miles W. of the Nile, from lat. 25° to 26° 6′ N., and abounding in ruins of the Greek, Roman, and early Christian period. (3) Oasis Parva, the modern *El Kasr,* five days' journey S. E. of El Siwah. (4) Oasis Trinytheos, the modern *El Dakleh,* situated in lat. 28° N., and containing several artesian wells. The history of these oases is very obscure, but is of great importance. The gigantic ruins show that they must have been inhabited very early, and attained, somehow, a prominent place in ancient civilization. They are never spoken of with indifference by the ancients. There was something about them which fired the imagination of the writers. Alexander's visit to the oracle of Ammon was considered as one of the greatest events of his life. Later, the Roman emperors used them as places of banishment—Juvenal was sent hither—and the Christians in their sectarian strifes often used them as places of refuge; Athanasius lived here, also Nestorius. At present they are possessed by a vigorous tribe of Arabs subject to Egypt, and contain several towns, of which *El Kargeh* is the most noticeable. With regard to the formation of these oases the ancients seem to have entertained very wrong ideas. They considered them as islands in a sea of sand, but they are rather lakes on a plateau. They are always formed by depressions in the surface, in which a layer of sand and clay is capable of retaining the water gathering at the bottom. Their "blessedness," although generally described with glowing colors, is comparative only. Their soil is often rich, and produces wheat, rice, maize, millet, dates, and other fruits, but as often it has a swampy character. They cannot be visited during summer and autumn, on account of the unhealthiness of their atmosphere.

Oasis, post-v. and tp., Waushara co., Wis. Pop. 634.

Oat, or **Oats** [from the Ang.-Sax. *ata,* "food"], a genus of grasses, *Avena,* containing many species, and generally characterized by having the spikelets in loose panicles, the glumes as long as the florets, the paleæ firm and almost cartilaginous, and the outer one of each floret provided with an awn, which is twisted at the base, but this generally disappears in cultivation. The cultivated oat (*Avena sativa*) is an annual, though the genus contains several perennial species, and is characterized by a very loose panicle, spreading on all sides, having two or three fertile florets in each spikelet, but not more than one floret awned. It is probably a development of the wild oat (*Avena fatua*) found in Europe, where it is considered a weed, and now wild in California, where it often spreads over large tracts of land and yields a good hay. The wild oat is characterized by having the inner palet and the grain covered with hair, and the outer palet provided with a very long awn, twisted near the base and bent in the middle. Experiments made by Prof. J. Buckman at the Royal Agricultural College, England, have shown that seeds of this species, when gathered ripe and sown next spring, produce a grain differing considerably from the mother-grain; and when this difference is further developed a grain is produced which has a strong resemblance to certain varieties of the cultivated oat. The most remarkable of these varieties are the potato oat, the black Poland oat, the naked oat (much esteemed in Ireland), the Tartarian or Hungarian oat, etc.; but the richest and most perfect variety is probably that raised in Scotland. The oat is decidedly a northern plant, though it does not reach so far to the N. as barley. It succeeds best in the northern part of the temperate zone; when brought farther S. and raised under a hotter summer, it degenerates very rapidly. The weight of a bushel of American oats varies between 30 and 35 pounds; that of a bushel of Scotch oats, between 40 and 50 pounds. The entire production of oats in the U. S. amounted in 1870 to 282,107,157 bushels, of which 42,780,851 bushels were raised in Illinois, 36,478,585 in Pennsylvania, 35,293,625 in New York, 25,347,549 in Ohio, etc. The awn or beard of all species of oat twists or untwists hygrometrically with varying humidity or dryness. This in some long-awned species, such as *Avena sterilis* (the animated oat), produces such free and active movement that it seems as if alive. Several species of oats are useful, not for their grain, but as fodder, such as the downy and the yellow oat-grass.

Oates (Titus, *alias* Ambrose), b. at London, England, about 1620; educated at Merchant Taylors' School and at Cambridge; took orders in the Church of England; held benefices in Kent and Sussex; became a chaplain in the navy; was dismissed from that post on a charge of disgraceful conduct; professed conversion to Roman Catholicism; became a Jesuit; resided some months in the colleges at Valladolid and St. Omer; was expelled from both institutions for alleged misconduct; returned to England 1678, and gave information to the authorities of the existence of a "Popish plot" for the extirpation of Protestantism in England, accusing several of the Roman Catholic nobility and gentry of participation in the pretended conspiracy. The admitted zeal for Roman Catholicism displayed by James, duke of York, and the suspected inclination of King Charles II. to the same faith, gave color to the charge, and the murder of Sir Edmondbury Godfrey, the magistrate before whom Oates's testimony was taken, produced conviction in the popular mind. Oates thereupon developed his original testimony into a circumstantial account of the intended burning of London and the shipping in the Thames, a massacre of Protestants, and a landing of a French army in Ireland, adding that the pope had entrusted the government of England to the Jesuits, that the chief offices of state had already been parcelled out among the great Roman Catholic lords, that the king was to be as-

sassinated, and that the queen was privy to the plot. An unexampled excitement was the result; the houses of Roman Catholics were searched, and extraordinary precautions taken against the supposed danger. Oates was lodged in Whitehall with a pension of £1200, and had guards assigned him. The accused Roman Catholics were put on trial Nov., 1678; several were convicted and executed; and fresh victims were added from time to time for two years. After the execution of Lord Stafford, Dec., 1680, there was a revulsion of public sentiment; the bad character of Oates was exposed; the duke of York obtained a verdict of £100,000 against him for defamation (1685), and he was imprisoned as a debtor. On the accession of James II. severer measures were taken; Oates was convicted of perjury, sentenced to stand in the pillory five times a year in as many different towns during his life, to be whipped from Aldgate to Newgate, and thence to Tyburn, and to be imprisoned for life. Public sentiment being now fiercely against him, he was mobbed and nearly killed at the first pillory, and received 1700 lashes at the whipping. After the accession of William and Mary, Parliament declared the conviction of Oates illegal, he was pardoned, received a pension of £400 per annum, and survived in obscurity seventeen years longer, dying at London July 23, 1705. ✓

Oath [Ang.-Sax., *âdh*], in law. This is an open declaration or promise before some officer or court authorized to take it, accompanied by an appeal to the Supreme Being to attest the truth or sincerity of the declaration or promise. It is essential that the oath should be authorized by law. If not, it is termed *extra-judicial*, and has no legal validity, however it may affect the conscience. The principal distinction in this branch of the law is between oaths which assert an existing fact and oaths which are promissory in their nature. An instance of the latter is an oath of office, to the effect that the appointee will discharge its duties faithfully, or that an alien on being naturalized will support the Constitution of the U. S.

The true nature of the oath has elicited much discussion. Some jurists are of the opinion that the address to the Supreme Being is in the nature of an imprecation invoking His vengeance in case the attestation is wilfully false. Others—and apparently with more reason—maintain that it is in the nature of a warning or suggestion to man that the Deity will in the administration of His government fitly punish false swearing. Perhaps the reconciliation of the opposing views is to be found in the fact that on the institution of the oath in the early periods of the law the former view prevailed, while in its modern developed condition the latter has insensibly supplied its place.

The form of the oath varies in different states and countries. When a witness is called upon to testify in a court of justice, and he does not accept the prevailing religion, he is allowed to take that form which according to his view is the most binding upon his conscience. The rule is well expressed by Lord Starr in his *Institutes of the Laws of Scotland*: "It is the duty of judges in taking the oaths of witnesses to do it in those forms that will most touch the conscience of the swearers according to their persuasion and custom, and though Quakers and fanatics, deviating from the common sentiments of mankind, refuse to give a formal oath, yet if they do that which is materially the same, it is materially an oath." (See also the very able and luminous opinion of Chief-Justice Willes in *Omichund* v. *Barker*, Willes's Reports, 538.) Accordingly, if the witness should be a Gentoo, and should think the oath only binding on his conscience upon kissing the hand or foot of a Brahman, it should be administered in that manner. However, if the legislature should prescribe that a particular form of oath should be adopted, the direction must be followed if there be constitutional power to make the provision. Thus, where an act of Parliament required that a member of the House of Commons should take an oath "upon the true faith of a Christian," it was decided that as the plain intent of the legislature was to make that an essential part of the oath, it must be followed, even though it might exclude a Jew from sitting as a member of the House.

No one can properly take an oath unless he believes in a Supreme Being who will inflict punishment in case of wilful false swearing. There has been much diversity of opinion upon the point whether it is necessary that the belief should be in punishment in a future state. The better opinion is that this is unnecessary, and that it will suffice if there be a belief of future punishment in this world. Some courts go so far as to hold that it is enough if the punishment simply consist in the disapproval of one's conscience, though the soundness of this view is open to question. It will be assumed that the witness believes in the Christian religion unless there is some evidence to the contrary. The proper evidence is his own antecedent declaration. There are some courts that allow an interrogation of the proposed witness by the judge before he is sworn to testify. Other tribunals, with better reason, deem this proceeding inquisitorial, and not in accordance with the spirit of our institutions. If former declarations are used to show disbelief, the same kind of statements made subsequently must be allowed to prove that the condition of disbelief has ceased, and that belief has taken its place. It is maintained by some that when the person is offered as a witness, and objected to, he may then affirm that he is now a believer, and thus become competent. The objection to this view is that a declaration made under such circumstances is likely to be a mere device used on the spur of the moment and for the purpose of becoming a witness.

In some of the States there is a rule that a witness is not to be excluded on the ground of his religious belief. In New York there is the following sentence in the constitution: "No person shall be rendered incompetent to be a witness on account of his opinions on matters of religious belief." (Art. I., § 4.) It has been decided in the supreme court that this provision only prevents the exclusion on the ground specified of the person offered as a witness, and that his want of religious belief may still be used to affect his credibility before the jury, and that he may be interrogated before them for this purpose. It is open to doubt whether this construction was foreseen in the framing of the constitution, as it certainly much impairs the effect of the clause. The constitution of Michigan, as interpreted by the courts, adopts a more comprehensive rule, when it establishes the proposition that a witness can neither be excluded on the ground of religious belief nor examined with regard to it for the sake of impeaching his credibility.

It is common to provide in the statutes of the respective States different forms of oaths to meet to some extent the varying religious views of witnesses, and also modes of affirmation for those who do not think it lawful to take an oath. Thus, in New York the regular mode of administering an oath is for the person who swears to lay his hand upon and to kiss the Gospels. However, if one desires he may take the oath in the following form: "You do swear in the presence of the ever-living God," and while so swearing may or may not raise his hand at his discretion. And where a person shall declare that he has conscientious scruples against taking any oath or swearing in any form he shall be permitted to make his solemn declaration or affirmation in a specified manner.

The laws of the U. S. provide that in certain cases an oath of allegiance shall be taken in a prescribed form. These are cases where any person is elected or appointed to any office of honor or profit (1 R. S., §§ 1755, 1756), or where a person petitions to be declared a bankrupt (*Id.*, § 5018), or a person prosecutes claims as an attorney or on his own account before any of the departments or bureaus of the U. S. (§ 3478). Members of State legislatures and executive and judicial officers must declare upon oath that they will support the Constitution of the U. S. (*Id.*, § 1836). So an alien on becoming naturalized must take a similar oath, and must renounce and abjure all allegiance to every foreign prince or potentate (*Id.*, § 2165). T. W. DWIGHT.

Oaxaca. See OAJACA.

Ob, or **Obi**, a river of Western Siberia, rises in the Altai Mountains within the Chinese dominions, and flows in a northern and north-western direction, with a tortuous course of 2000 miles, into the Gulf of Obi, an inlet of the Arctic Ocean on the northern shore of Siberia. The Ob receives from the left the Irtish, which also rises in the Altai Mountains and joins the Ob 200 miles below Tobolsk. The Ob, navigable for more than 1600 miles, forms the commercial highway between China and European Russia.

Obadi'ah, one of the minor Hebrew prophets, of whom we know absolutely nothing. His book, the shortest in the Old Testament, is a fragment. Delitsch and Keil think it the oldest of the prophetical books; De Wette and Bleek think its author was an exile at Babylon; but we have absolutely no data for forming an opinion on the time when he lived. This book contains a remarkable passage parallel to Jer. xlix. 7–22. It is impossible to say which of the two prophets made use of the other's work.

Obeid', El, town of Central Africa, the capital of Kordofan, in lat. 13° 11′ N., lon. 29° 35′ E., on the Bahr-el-Abiad, is miserably built, but has some manufactures of plated works and silverware which evince both skill and taste, and carries on a considerable trade in gums, ostrich feathers, ivory, and tamarinds. Pop. about 20,000.

O'Beirne' (THOMAS LEWIS), D. D., b. in Longford co., Ireland, in 1748; educated at the Catholic college of St. Omer, France; became a Protestant; took orders in the Church of England; was chaplain on Lord Howe's fleet

at the beginning of the American war; preached at St. Paul's church, New York City, 1776; was private secretary of the lord lieutenant of Ireland 1782; received livings in Northumberland and Cumberland 1783; became chaplain to Earl Fitzwilliam; bishop of Ossory 1796; was translated to the see of Meath 1798, and d. there Feb. 15, 1823. Author of a poem, *The Crucifixion*, of a *Vindication* of the conduct of General and Admiral Howe in America, of political pamphlets, and of three volumes of sermons.

Ob'elisk [from the Greek *obeliskos*, a "spit," applied to square monolith columns terminating in a pyramidal apex and placed on a pedestal before Egyptian doorways]. Obelisks were called in Egyptian *teχen*, and capped (*ben-ben*) with gold, copper, or iron. The material of which they were made was limestone, basalt, red granite, or syenite, and their four sides inscribed with vertical lines of incused hieroglyphs recording the titles and merits of the person by whom dedicated and of the deity to whom they were sacred. Occasionally, they were uninscribed, but they generally have one, and often three, lines of hieroglyphs on each side, besides pictures of the monarch adoring the deity on the apex and sides. Obelisks were the prototypes of the triumphal columns of the Romans, and used for the same purposes, erected, it appears, at the temples only in honor of illustrious monarchs. Small obelisks of limestone with sepulchral dedications are found in the tombs of the fourth dynasty, but none of the great obelisks are older than the twelfth dynasty, one of which, of Osortesen I. of that line, is still extant at San, the ancient Heliopolis. From that period (1800 B. C.) to the time of Hadrian (A. D. 138) obelisks were in use. The proportions of these monuments were that the base was one-tenth the breadth of the elevation up to the top of the apex, and the pyramidion at the summit had the same height. They were placed upon bases also tapering from below, and stood in pairs, one before each jamb of a doorway. The tallest remaining, that of the Lateran at Rome, is 105 feet 7 inches high, and the shortest, that of the Florence Museum, 5 feet 10 inches. The Greek and Roman writers considered that they represented a sunbeam, and mention those set up by the kings they call Mesphres, Sothis, and Ramses, one of whose, 120 cubits high, was said to have employed 120,000 men in its construction and erection, to secure which the son of the monarch is said to have been tied to the apex. The prophet Jeremiah speaks of those of Heliopolis, called in hieroglyphs "the city of obelisks," from their great number. The Egyptians were averse to the erection of obelisks by their foreign rulers, and positively refused the honor to Darius. Ptolemy Euergetes II. and his wife, Cleopatra, however, erected two obelisks at Philæ of red granite, 22 feet high, before the temple in honor of Isis. The mode by which they were erected in Egypt is not known. It is supposed that they were floated in boats or on rafts during the high Nile to their destination, and then raised by inclined planes of woodwork and ropes. The Romans built for those transported to Rome special rafts or flat-bottomed boats of great size, rowed by as many as 300 oars, and elevated them by cords, pulleys, and frames by the labor of thousands of men. The principal architects who replaced them on their pedestals at Rome in the papal times were Fontana, Antinori, Laurent Bernin, and Camerti, who used similar machinery for the purpose. The obelisk of Luxor was removed from Egypt in 1833, and set up in the Place de la Concorde at Paris in 1834 by M. Lebas. The obelisks at Catania in Sicily and at Arles in France are not Egyptian. The Assyrians also used obelisks of smaller sizes and proportions, terminating in tops step-shaped four sides. One of Assur-nazir-pal (B. C. 880), 9 feet 4 inches high, found in the palace of Kouyunjik or Nineveh, is of white stone ornamented at the sides with reliefs. Another, of Shalmaneser (B. C. 850), of black marble, found at Nimrood, the ancient *Calah*, 6 feet 6 inches high, has at the sides reliefs recording the submission of Jehu, and an inscription, the annals of thirty-one years of his reign. Fragments of others have been discovered, and obelisks were not unknown in India, some having been set up at Seringapatam in the last century. SAMUEL BIRCH.

O'ber-Am'mergau, a v. of Bavaria, beautifully situated on the Ammer, 46 miles S. W. of Munich, is celebrated for the performance of a mystery representing the passion and death of Christ, which takes place here every ten years. The custom originated in 1634, when the population made a vow to this effect if the village escaped from the plague, which prevailed in the vicinity. The performance requires 350 actors, who are chosen among the inhabitants themselves, lasts from 8 A. M. to 4 P. M., is repeated on twelve succeeding Sundays, and attracts generally very large audiences, as it is the only place in which mysteries are still performed in true mediæval style. (See Eliza Greatorex, *The Homes of Ober-Ammergau* (New York, 1873), and Holland, *Das Ammergauer Passionsspiel im Jahre 1870.*)

O'ber-Brem'en, a v. of German tp., Auglaize co., O. Pop. 423.

O'berlin, post-v. of Lorain co., O., 35 miles S. S. W. of Cleveland, on the Lake Shore and Michigan Southern R. R., contains Oberlin College, 2 business colleges, a telegraph school, a national bank, 1 weekly newspaper and a college semi-monthly paper, and stores. Pop. 2888.
J. H. BATTLE, ED. "OBERLIN NEWS."

Oberlin (JEAN FRÉDÉRIC), b. at Strasbourg Aug. 31, 1740; early evinced a remarkable degree of benevolence; was educated at the Strasbourg University; was ordained to the Lutheran ministry; became in 1767 pastor of Steinthal or the Ban de la Roche, a wild district in the Vosges Mountains. Here, under his unselfish and wisely-directed care, the desert soon began to blossom; deep ignorance was succeeded by general intelligence; moral darkness gave place to prevalent piety, pure morals, and a remarkable improvement in the industry and thrift of the community. The Ban de la Roche was visited by great numbers of philanthropists, to whom Oberlin's work served as a model. Died at Walbach June 1, 1826. His biography has been written in France, Germany, England, Denmark, etc., and by H. Ware, Jr. (Boston, 1845).

Oberlin (JÉRÉMIE JACQUES), brother of J. F. Oberlin, b. at Strasbourg Aug. 7, 1735; educated at the Strasbourg University, where he became librarian in 1763, professor of rhetoric 1770, and professor of logic and metaphysics 1782; published works on *Roman Rites* (1774), on the *Minnesingers of Alsace* (*De Poetis Alsatiæ Eroticis*, 1786), Latin texts for schools, etc. D. at Strasbourg Oct. 10, 1806.

Oberlin College, at Oberlin, O., was founded in 1833 by Rev. John J. Shipherd and Philo P. Stewart. It was chartered Feb. 28, 1834, as Oberlin Collegiate Institute, which name it retained until 1850, when it was changed to Oberlin College. The plan was to establish a Christian school for the liberal education of both sexes, encouraging students to assist themselves by manual labor. By 1835 there were theological, college, ladies', and preparatory departments; with the addition, since 1867, of a conservatory of music. The theological seminary has an intimate but not organic relation to the Congregational churches of the land. The seminary building contains accommodations for 60 students, besides the chapel and lecture-rooms. In the department of philosophy and the arts there are (1) the classical and scientific, or "college," course, and (2) the literary. The studies of the former are so arranged that after the freshman year the student can give a classical or a scientific character to his course by a system of elections. The literary course omits all the Greek and part of the Latin and mathematics. The department of preparatory instruction embraces (1) a classical school with a three years' course, and (2) an English school. The faculty consists of the president, 12 professors, 3 principals, and 14 lecturers, tutors, and instructors. In the preparatory schools there are about 40 teachers. Graduates from theology receive the degree of B. D.; those from college that of A. B. The productive endowment for the theological department is $30,000; for the other departments, $115,000. Scholarships rent for $9 a year, and incidentals are $9 more. The college library contains 11,000 vols.; literary societies have a library of 3600 vols. The long vacation has always been in the winter, to accommodate the large number of teachers among the students. The year ends the first week of August. Rev. Asa Mahan was president from 1835 to 1850; Rev. Charles G. Finney, from 1851 to 1866, when Rev. James H. Fairchild was appointed. The board of trustees is a close corporation of 18 members. Since 1835 no student has been rejected on account of his color; 28 persons of color have received the degree of A. B., and 21 have completed the literary course. ALBERT A. WRIGHT.

Obes'ity [Lat. *obesitas; synonyms, Polysarcia, Corpulence*], an abnormal deposit of adipose tissue under the integument and around the viscera. The amount of adipose tissue in the organism may be considerably augmented without giving rise to any inconvenience on the part of the individual in the way of encumbering his movements or interfering with the functions of the viscera, etc.; but such a condition would not come within the scope of this article. It is still a condition of health, and the term *obesity* should only be applied to those cases where the deposit of fat is so great as to incommode the patient. Of the causes of obesity we may mention, first, *hereditary susceptibility*. It is not at all uncommon to meet certain families in which most of the members are corpulent, and sometimes the tendency to become so may be traced through several successive generations. Inactivity and sedentary occupations exert a very material influence over the production of fat, especially when combined with a rich diet. In women the predisposition to corpulence exists in the first years of child-bearing, and again after the "change

of life;" in men, between the ages of forty and sixty. The exciting cause is generally found to be malassimilation, due to some derangement of the digestive organs. We mostly find it in individuals who indulge in a rich diet, and especially if it contains fatty matters. Articles abounding in sugar and starch and alcoholic and malt liquors seem to favor the production of fat to no inconsiderable extent. The symptoms of obesity may be enumerated as follows: Diminution of mental and bodily activity, impeded action of the viscera, the organs of respiration, circulation, and digestion. The slightest exertion will bring on panting; the blood is comparatively deficient in quality and quantity, and, as a result, the muscles become weak and flabby. The countenance becomes bloated and sallow, and the patients are liable to suffer from a variety of affections which depend on malassimilation, as gout, rheumatism, etc. Often fatty degeneration of the heart or liver coexists, and we then have the symptoms of these maladies superadded. Mr. Harvey has shown, in his late work on corpulence, that the senses of *hearing, taste, smell*, or *sight* are often absent altogether or blunted to a very annoying extent in corpulent persons. In the treatment of obesity alkalies internally and alkaline baths have long occupied a prominent place, and even at the present advanced stage of medical science we hear physicians daily prescribing small doses of soda, potassa, etc., with a view to procure a saponification of the fat in the interior of the body. Such a course of treatment is simply ridiculous. If a jockey wishes to "condition" a horse that has acquired too great a deposit of adipose tissue, does he administer small doses of the bicarbonate of soda or bathe him in alkaline water? Certainly not. The course he adopts is a well-known one, and is pursued also by professional pedestrians, gymnasts, etc. It consists of a regulated diet and systematic exercise in the open air. The case of corpulence treated successfully which has gained the greatest notoriety is that of Mr. Banting. He adopted a regular course of dieting, in which there was an absence of fatty, starchy, and saccharine matters. This should be rigidly adhered to, and in addition no alcoholic or malt liquors should be partaken of whatever. Above all other things, both body and mind should be exercised daily. EDWARD J. BERMINGHAM.

O'bi, or **Obeah,** a form of pretended witchcraft practised by persons of African descent in the West Indies, and to some extent in the Southern U. S. Obeah men and women have often a great influence over the degraded of their race. The practice is often attended with great excesses.

Obi'on, county in the N. W. of Tennessee, bounded N. by Kentucky and W. by Reelfoot Lake and River. It is level and very fertile. Tobacco, cotton, corn, and live-stock are the staple products. The county is traversed by the Mobile and Ohio, the Nashville and North-western, and other railroads. Area, 500 square miles. Cap. Troy. Pop. 15,584.

Ob'iter dictum [Lat.], a remark or suggestion made by a judge or a court in disposing of a question which is not necessary to its decision, sometimes termed a *dictum*. Such a suggestion is not regarded as authoritative when the point comes up for positive decision. A *dictum* may, however, have much influence from its reasonableness or from the high reputation of the tribunal from which it emanates. Much law is generated in this manner, one court uttering dicta and another at a later date embodying them into decisions. It is not uncommon for reporters of decisions to call attention to *dicta* in the abstracts made by them of the substance of judicial opinions. The technical way of showing that the remark is a dictum is to employ the phrase "it seems." In the early reports the equivalent expression is "*Semble.*" T. W. DWIGHT.

Oblates' [Lat. *oblatus*, "offered"], in the Roman Catholic Church, are persons of either sex associated after the manner of monks or nuns, but without solemn vows. Some oblates are secular priests; others are without orders.

Oblates of Mary Immaculate, a congregation of regular clerks, founded in 1815 by Bishop Mazenod of Marseilles. They visit the poor and the prisons.

Oblate Sisters of Providence, a sisterhood of the Roman Catholic Church, founded in 1825 at Baltimore.

Obliga'tion. The ordinary meaning of this term in the common law is a bond containing a penalty; with a condition annexed for the payment of money or the performance of covenants. It is an instrument under seal, whereby a person binds himself under a penalty to do something. The meaning of the word *obligatio* ("obligation") in the Roman law is much more comprehensive. In that system of jurisprudence it refers to the legal tie or bond which obliges to the performance of some act. According to Justinian, *Obligatio est juris vinculum qua necessitate adstringimur alicujus solvendæ rei, secundum nostræ civitatis jura.* In other words, it is the legal bond by force of which we are bound to perform an act according to the laws of the state. Such an obligation might arise either from the assent of parties according to prescribed forms, and constituting a contract, or from a delict (or wrong). This last signification of the word "obligation" sheds light upon an expression in the U. S. Constitution, "the obligation of contracts." T. W. DWIGHT.

Obliga'tion of Contracts. The U. S. Constitution (Art. I. Sec. 10) contains a clause that "No State shall pass any law impairing the obligation of contracts."

I. *What are the Contracts embraced within the Prohibition?*—All executory contracts between private individuals, whether express or implied, are clearly protected by the constitutional provision. The same is true of all grants, conveyances, and other executed contracts; and it is fully settled that statutory and other grants made by a State through its legislature or otherwise are also executed contracts, and cannot be repealed by subsequent laws. As a corollary from the general proposition, the Supreme Court of the U. S., against the strong and repeated protests of the State tribunals, has firmly established the doctrine that charters of private corporations are contracts in the nature of grants, and cannot be repealed or modified unless the power to do so has been reserved in the manner hereinafter described. This general subject of private charter involves three distinct questions: Whether the charter in its general scope, as a gift of franchises to the corporation, is a contract? Whether the special stipulations in it, not necessary to its existence, which restrict the State in the exercise of its governmental powers, are contracts? And whether any contract on the part of the State can be implied from the terms of the charter? These questions have been fully discussed and answered, and are now put at rest. In the celebrated and leading case of Dartmouth College (1819) the Supreme Court decided that such a charter is a contract between the State and the corporation, and this ruling has been reaffirmed in every subsequent judgment involving the subject-matter down to the present time. The second question has been passed upon in a no less definite manner. The collateral stipulations usually contained in charters which have received a judicial construction are of two classes—those which restrain the State's power of taxation over the newly-created corporation, and those which limit the exercise of its power of eminent domain toward that body; as illustrations, a clause in a bank-charter exempting it from taxation either entirely or beyond a specified amount, and a provision in the charter of a toll-bridge that no other bridge shall be constructed or authorized within a certain distance up and down the stream. Through a long succession of decisions the U. S. Supreme Court has uniformly upheld these collateral stipulations—has declared them contracts binding upon the State and completely protected by the constitutional guaranty. In opposition to this view it has been contended that the States cannot thus bargain away their highest governmental functions; but the dissent of the State tribunals has, for the present at least, been entirely overcome. Whether a State may alienate its police power by contract has not yet been finally determined; so far as the State courts have spoken, they have answered the question with an emphatic negative. In the third place, it is the settled doctrine that no contract can be implied from the charter; in order to be binding upon the State the agreement must plainly appear in the express language of the instrument. The following conditions, relations, and arrangements are not contracts within the meaning of the constitutional prohibition: Marriage, although often called a contract, is not, according to the decided weight of authority, protected or affected by the provision. It is also established beyond a doubt that all arrangements which are political in their nature, and to which the State is a party, are not contracts, and do not fall within the guaranty. Of these the most important are the charters of municipal corporations. Over such corporations and their charters the legislature, unless restrained by the State constitution, has complete power. Public offices, licenses to carry on particular trades, and the like, statutory permission to sue the State, grants of authority to establish lotteries, are not contracts between the State and the individuals holding the privilege, and may therefore be abolished or changed by subsequent legislation. It should be observed, however, that when the prior power to do so has been reserved by a State, it may to a certain extent interfere with contracts made while such reservation is in force.

II. *What is the Obligation of Contracts?*—The true interpretation of this phrase has been finally determined by the national court of last resort. The principal question which had been at issue was, whether the obligation includes the remedy given by the law to enforce a contract, as well as the rights and duties of performance arising from its very terms; and the doctrine is now most right-

eously established that it does. In a recent judgment of the U. S. Supreme Court the results of the prior decisions were summed up as follows: "These propositions may be considered consequent axioms of our jurisprudence. The laws which exist at the time and place of making the contract and where it is to be performed enter into and form a part of it. This embraces alike those which affect its validity, construction, discharge, and enforcement. Nothing is more material to the obligation of a contract than the means of its enforcement. The ideas of validity and remedy are inseparable, and both are parts of the obligation which is guarantied by the Constitution against impairment. The obligation of a contract is the law which binds the parties to perform their agreement. Any impairment of the obligation of a contract—the degree of the impairment is immaterial—is within the prohibition of the Constitution." The obligation is not simply what the parties have in terms agreed; it is the legal effect given to those agreements by the whole of the existing law applicable to the contract—the rights and duties which the law creates from the fact of the contract being made.

III. *What State Laws impair the Obligation of Contracts?*—Three general principles must furnish the correct answer to this question in each particular instance of State legislation. (1) The prohibition is not against destroying, but impairing. Destroying the obligation of course impairs it, but impairing does not necessarily destroy. (2) In order that a statute may impair their obligation it must operate upon contracts existing at the time of its passage; and so far as it purports to accomplish this result it is void. (3) When a legislature has passed laws affecting contracts, such as insolvent, exemption, stay, appraisement, redemption, limitation laws, and the like, or when it has reserved in prior general statutes or otherwise, the authority to repeal or modify the charters of corporations, the operation of such statutes, and the legislative acts done under such reservation, do not impair the obligation of contracts subsequently made or of charters subsequently granted. All laws which can impair the obligation of contracts must apply either to the very terms of the agreements, or to the remedy by which they may be enforced. With the first class there is no difficulty. They are so plainly prohibited that, with two notable exceptions, they have seldom been enacted. These exceptions are statutes providing for the discharge of insolvent debtors and those repealing or altering private charters. Insolvent laws cannot operate upon past contracts, but may be valid in respect to those made subsequent to their passage. Nothing additional need be said concerning the repeal or modification of charters. The exercise by a State of its functions of taxation, eminent domain, or police, although contracts may be indirectly affected thereby, does not fall within the constitutional guaranty, since all private rights of property are held subject to these powers. In relation to the second class of laws the following fundamental principles are now settled: Statutes which deal simply with the modes of procedure whereby the real remedy is obtained do not affect the obligation. Statutes which act upon the remedy itself—the relief given by the law when the contract was made—and take away, diminish, or render it of substantially less value, do impair the obligation; but they are valid so far as they apply to contracts made after their passage. Among such laws the most important and common are those staying execution or judgment; those requiring property to be sold on execution at an appraised value or to be accepted by the creditor at such valuation; those exempting the debtor's property from liability; those authorizing the judgment-debtor to redeem his property; statutes of limitation which do not leave a reasonable time within which to sue, and the like. These various classes of statutes, passed in aid of debtors, have been sustained by many State courts, but the principles established by the U. S. Supreme Court plainly and inevitably condemn them all so far as they purport to operate retrospectively upon existing agreements. How far the power of a State legislature extends, under the usual reservation of authority over charters, has not been fully determined. A State cannot, under color of such a reservation, impair the validity of all contracts, and thus completely evade the inhibition, nor can it abrogate agreements made between private persons and corporations, even though the latter are municipal. The franchises conferred upon a private corporation may be revoked or changed, but how much further a legislature may proceed by virtue of its reserved power of repeal and amendment remains to be determined by the highest court of the nation. JOHN NORTON POMEROY.

Oblique′. In music, the motion or onward progress is said to be "oblique" when one of the parts ascends or descends, while another part, with which it is compared, remains stationary.

Ob′long, post-v. and tp., Crawford co., Ill. Pop. 1490.

O′boe, or **Hautboy** [Fr. *hautbois*], a musical wind-instrument of an elongated conical form and with a high piercing tone, ranging from C below the treble clef to G, the fourth line above the staff. It was formerly used only in military music, but is now, especially since Weber and Meyerbeer, much used in all compositions for orchestra.

Ob′olus (Eichwald) and **Obolella** (Billings), small discoidal shells of the family Lingulidæ amongst the Brachiopoda, so named from their resemblance in form to a small Greek coin. Several species of the former occur in both Upper and Lower Silurian rocks, but the latter has only been found in the Potsdam sandstone at the base of the series. EDWARD C. H. DAY.

Obolus [Gr. ὀβολός, fr. ὀβελός, a "spit"], a Greek coin, first made of iron and copper in the form of the head of a spit, but afterwards struck of silver and in the ordinary round shape. The obolus was one-sixth of a drachm, and in value equal to 1⅝*d.*

Obooki′ah (HENRY), b. in Hawaii in 1792; came on a merchant vessel to New Haven, Conn., 1809; was placed in an academy; educated for the ministry; translated the book of Genesis into Hawaiian, and d. at Cornwall, Conn., Feb. 17, 1818. He was the cause of the establishment of American missions in the Sandwich Islands.

Oboyan′, town of Russia, government of Koorsk, on the Pola, has a considerable trade in corn, cattle, wax, bristles, and hemp. Pop. 5000.

O'Bri′en, county in the N. W. of Iowa. Area, 576 square miles. It is undulating, fertile, and adapted to grain-culture. Timber is deficient, the streams abound in fish, and the fertile prairies are resorted to for game. Cap. Pringhar. Pop. 715.

O'Brien, post-v. of Liberty tp., O'Brien co., Ia., on Little Sioux River. Pop. 79.

O'Brien (FITZ-JAMES), b. in Ireland in 1829; came to the U. S. in 1850; became a journalist and writer for magazines; contributed some brilliant sketches and poems to the *Atlantic Monthly;* volunteered into the New York 7th Vols. Apr., 1861; became a member of Gen. Lander's staff; displayed intelligence and courage as a soldier; was wounded in a skirmish Feb. 16, and d. in Virginia Apr. 6, 1862, from lockjaw resulting from a surgical operation.

O'Brien (Capt. JEREMIAH), b. at Cork, Ireland, 1740; settled at Machias, Me., before the Revolution, and was the leader of the party which captured the British armed schooner Margaretta in Machias Bay, May 11, 1775, the the first act of hostility by sea during the war. He received a commission as captain of privateers, and took several British vessels; was captured and confined a year in England; afterwards collector at Machias, where he d. Oct. 5, 1818.

O'Brien (WILLIAM SMITH), b. at Dromeland, county Clare, Ireland, Oct. 17, 1803, son of a baronet of ancient lineage; educated at Harrow and at Trinity College, Cambridge; entered Parliament for the borough of Ennis 1826. Though at first a Tory and warm opponent of O'Connell, he was returned in 1832 as an advanced Liberal for the county Limerick, which he represented thirteen years; was active in support of Catholic emancipation, and became a prominent leader in the agitation for the repeal of the legislative union between Great Britain and Ireland. Confined for a few days in May, 1846, for refusing to serve on committees of the House of Commons, he became identified with the revolutionary party in Ireland, where it was proposed to establish a republic; went to Paris Apr., 1848, as a representative of the Irish Confederation to solicit aid from the French republic; aided in convoking an Irish national convention (May), which was not allowed to meet; was tried for sedition in the same month, but acquitted; attempted a rising among the peasantry at Mullinahone, in the S. of Ireland, July, but was compelled to flee; was captured at Thurles Aug. 5; tried and convicted by a special commission at Clonmel, with T. F. Meagher and MacManus, on a charge of high treason (Oct. 9); sentenced to be hanged, drawn, and quartered; was transported for life to Tasmania July, 1849; faithfully observed a promise not to try to escape; was pardoned 1856; travelled in the U. S. 1859; published a manifesto to the Irish in America in favor of the seceding States 1861, and d. at Bangor, North Wales, June 17, 1864.

Obsequies. See FUNERALS.

Observan′tine Friars and Nuns [*Fratres strictioris observantiæ*]. The primitive rule of St. Francis, like that of many other orders of monastics, having been modified by various popes on account of the extreme severity of its discipline, there arose within the order a new party desirous of returning to the austere rule of former days.

Certain followers of the severe rule in 1368, under Paoletto di Foligno, were organized as a separate congregation, called "Brethren of the Stricter Observance," or Observantines; these are now, as they have long been, far more numerous and influential than the Conventuals, or followers of the mitigated rule. The Capuchins and other congregations follow a still severer rule, and are called "Brethren of the Strictest Observance."

Observ'atory [Lat. *observare*], **Astronomical.** By observation, in the scientific or otherwise philosophical sense, is to be understood an attentive and scrupulous notice of phenomena; and an observatory is a place fitted for making such observations. As astronomy is the oldest of the physical sciences, so astronomical observations in some form have been early in use, previously even to the device or the arrangement of any special place for making them. Among the simple instruments first employed was the gnomon—*i. e.* a perpendicular post of some determinate height, by the measurement of which, and of the length of its shadow, the sun's angular distance from the zenith was determined. Observations of some sort, and even some sort of observatories, would seem to have been early in use in China. The great Egyptian pyramids are, as is well known, so placed that the outlines of their bases mark the four cardinal points, N. and S., E. and W.; and of nine of these pyramids still existing at Gizeh, the six largest have the narrow passages by which alone they can be entered opening in their northern sides, and inclined downward at nearly the same angle in every case. From the mean of the measurements of Col. Vyse it results that this angle is 26° 47′, "and of the two pyramids of Abousseir also, which alone exist in a state of sufficient preservation to admit of the inclination of their entrance passages being determined, one has the angle 27° S., the other 26°." At the bottom of every one of these passages, therefore, the *then* pole-star must have been visible at its lower culmination—a circumstance which can hardly be supposed to have been unintentional, and was doubtless connected (perhaps superstitiously) with the astronomical observation of that star, of whose proximity to the pole at the epoch of the erection of these wonderful structures we are thus furnished with a monumental record of the most imperishable nature." (Sir J. Herschel, *Outlines of Astronomy* (319 and 320).) The star here spoken of is *α* Draconis, which at the epoch of the erection of the Great Pyramid must have had at its lower culmination an altitude not far from 26° 16′.

FIG. 1.

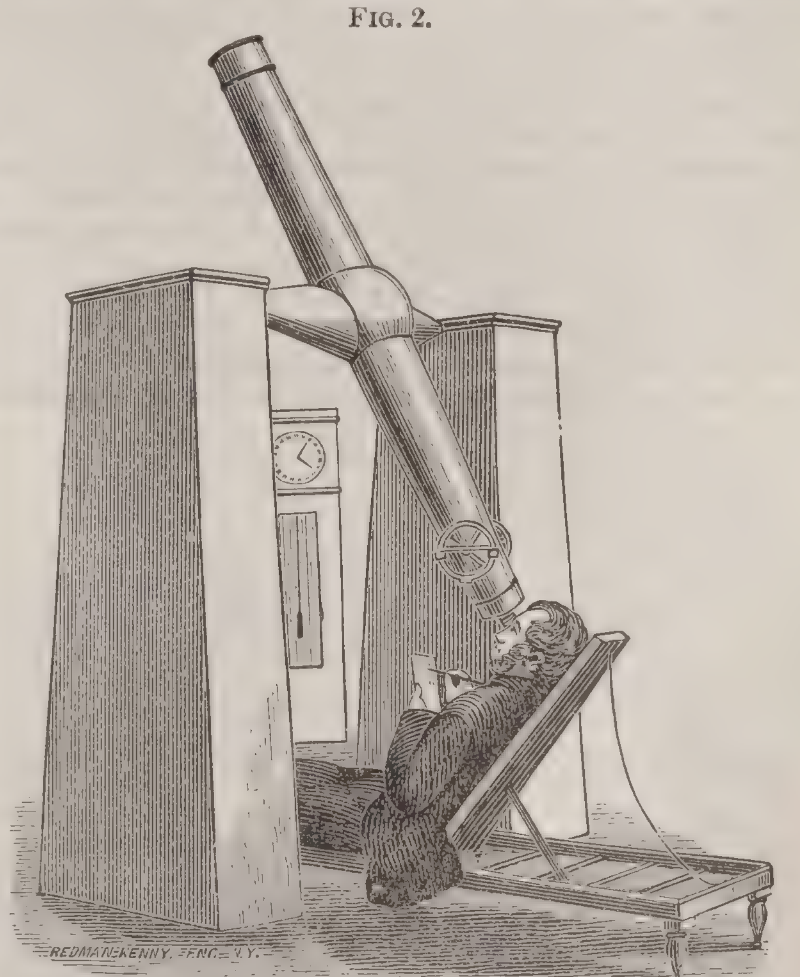
Tycho's Observatory.

After the death of Alexander the Great, Egypt, in the division of his empire, fell to the lot of Ptolemy Soter, himself an eminent patron of science. His son, Ptolemy Philadelphus, presented to the scientific men of Greece, who flocked to his kingdom, a vast edifice located at Alexandria which contained an *observatory*, and also the famous library collected, with great care and expense, by Demetrius of Phaleria. Thus was founded the Alexandrian school. Its first observers were Aristillus and Timocharis, about 300 years before the Christian era. Their observations were 150 years afterward made use of by Hipparchus in his determination of the precession of the equinoxes. These astronomers were succeeded by Aristarchus of Samos (about 281 B. C.), and he again by Hipparchus of Bithynia (about 150 B. C.), as already intimated, who would have been a man distinguished in any age. He, if any one, is regarded as the father of the veritable science of astronomy. After Hipparchus in the Alexandrian school came Ptolemy, who, in his great work, the Μεγάλη Σύνταξις—styled by the Arabs *Almagest*—has collected and discussed what seemed to him valuable in the acquisitions of his predecessors, in so far as he could attain unto them. Our space admits of but a bare mention of the ancient observatories of the Arabs and others—viz. two at Cairo; one at Bagdad; that at Meragha, under the charge of Nazir-ed-Deen; and that of Olug Beg at Samarcand.

After the revival of letters in Europe the first regular observatory, according to Weidler, was that erected by William, landgrave of Hesse, at Cassel in 1561. Under the patronage of Frederick III., king of Denmark, Tycho Brahe constructed and maintained his observatory at Uraniberg, on the island of Huen, in the Baltic, near Copenhagen. Tycho commenced his observations there in 1582, and he continued them in the same place till 1593. Driven thence by official jealousy and interference, he afterward formed the acquaintance of Kepler, to whom he furnished the valuable observations afterward made use of by Kepler in the discovery of his famous three laws. Tycho died in 1601. The instruments which he employed were of vast size, and they were subdivided with more care than had heretofore been usual. (Tycho's observatory is represented in Fig. 1.) It was in Denmark also that was established the earliest *national* observatory of modern Europe—viz. the observatory of Copenhagen, which was commenced in 1637, though it was not completed till 1656. The first astronomer appointed to the directorship of the observatory was Longomontanus, himself the pupil of Tycho Brahe.

The telescope was invented in 1609, and in 1640 Gascoigne applied the telescope to the quadrant and the micrometer to the telescope. The Royal Observatory of Paris was constructed in 1667–71. The Greenwich Royal Observatory was established in 1675, and it began its operations in 1676. The Tusculan Observatory in Copenhagen was built in 1704 for Römer, the discoverer of the velocity of light. Peter the Great caused an observatory to be constructed at his capital in 1725; the observatory at Dorpat was in active operation in 1811; and in 1839 the observatory at Pulkowa, near St. Petersburg, was erected by the order of the emperor Nicholas. The observatory at Königsberg dates about 1813, and that at Berlin about 1834. The observatory at the Cape of Good Hope was in existence in 1821. Not to mention others here, the Royal Observatory of Edinburgh was in use about 1825; the observatory at Sydney (formerly at Paramatta) in Australia dates from 1820; the U. S. Naval Observatory dates from 1842. (Extensive lists of public and private observatories, with their geographical positions, are annually published in the English *Nautical Almanac* and in the American *Ephemeris and Nautical Almanac*.)

FIG. 2.



The Transit Instrument.

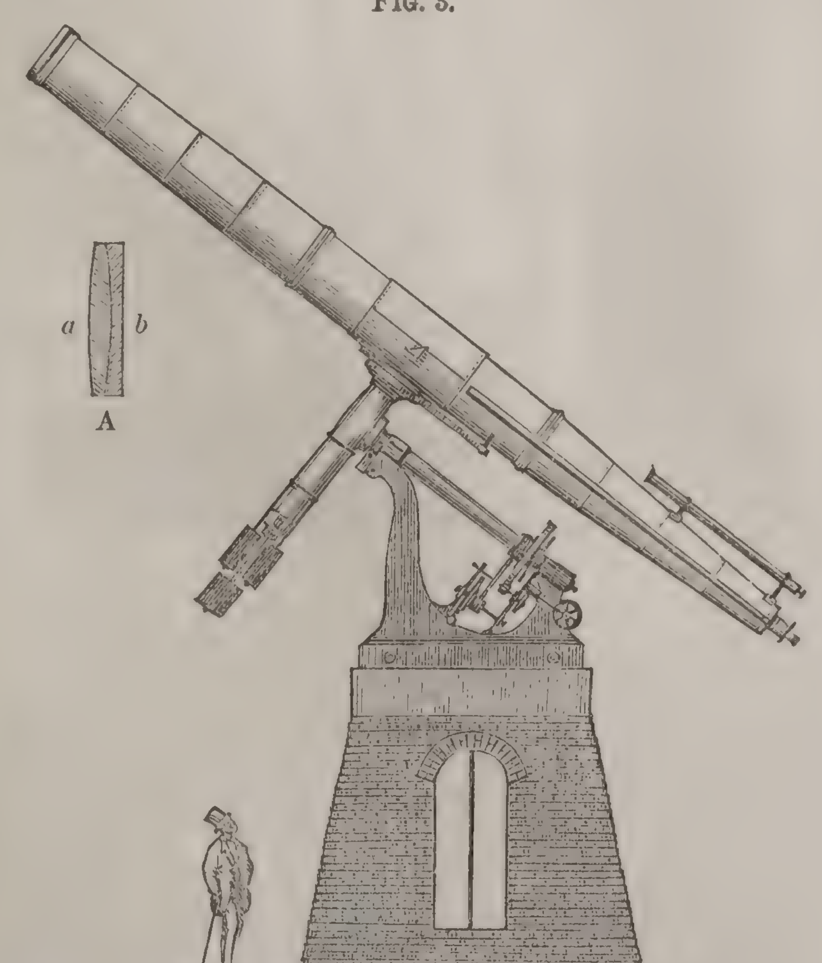
Among the most useful instruments employed in the modern observatory are the transit instrument, the equa-

torial, and, as timekeepers, the clock keeping sidereal and that keeping mean solar time. (For distinction of solar and sidereal time see article MOON.) The transit instrument is so constructed and mounted as to move accurately in the plane of the meridian. It is furnished with several levels and a circle for measuring altitudes. The front of the eyepiece of the telescope is a reticule—*i. e.* an arrangement of actual spider's-lines, or else of very fine wires or tubes (see MICROMETER), of which, commonly, at least five are vertical and one horizontal, the vertical lines or wires being placed symmetrically, so that one of every corresponding pair of them is at the same distance on the one side of the middle one that the other is on the other. The middle one of the five is adjusted to be and to move in the plane of the meridian; and the apparent transit of a heavenly body taking place, as respects the vertical pairs, at one is as much earlier as at the other it is later than the middle time, the mean of all the five times of transit should coincide with that of the middle spider-line or wire. The position of an observer while taking observation of a transit is shown in Fig. 2.

The practice of observing transits across five vertical wires was first introduced by Dr. Maskelyne, the English astronomer-royal at Greenwich, who was also the first to note transits to tenths of a second. When the altitude circle of the transit instrument is greatly enlarged, it is then known as a meridional or transit circle. Among the finest examples of this are those in the Royal Observatory at Greenwich, that in the U. S. Naval Observatory at Washington, and that in the Dudley Observatory at Albany, N. Y.

In the equatorial instrument the telescope is mounted on an axis pointing to the pole of the heavens, and in its rotation around that axis the telescope thus mounted will mark out and follow the apparent diurnal course of a heavenly body in the equinoctial (*i. e.* the great celestial equator) or a parallel to the same. Fig. 3, here inserted, is a representation of the great equatorial at Washington, the telescope of which has an aperture of 26 inches, and a focal distance of object-glass of 33 feet. The equatorial instrument at Chicago, Ill., has an aperture of 18 inches; and that of the observatory at Cambridge, U. S., has an aperture of 14.95 inches, and a solar focus of 22 feet 6 inches. The equatorial instrument, like other instruments employed in careful measurements, is armed with a micrometer, which, as its name implies, is an instrument for the measurement of small quantities—of small angular quantities when it is used for astronomical purposes. With the micrometer the angular distance of any planetary body from a neighboring fixed star of ascertained position is determined.

FIG. 3.



The Washington Telescope: A, section of objective; *a*, front of telescope, crown glass; *b*, flint.

For the more accurate observation of transits or other observations of a like kind, it is now not unusual to connect with the timekeeper an apparatus for alternately joining and breaking the circuit of an electro-magnet, and thus marking every alternate second on a paper band which is unwound at a uniform rate. Then the precise moment of a transit is indicated on the same band of paper by a breaking of the circuit, by means of a key under the control of the observer. This arrangement permits the second-spaces on its record to be subdivided into 100 parts, and thus observations noted to hundredths of second. And, in addition to this, the arrangement admits of a largely increased number of the parallel wires in the telescope, as was indicated by the late Sears C. Walker. This method of observation is known as the American method, it having been first introduced under the superintendence of, and in connection with, the American Coast Survey arrangements. The first attachment to a clock-pendulum for forming and breaking circuit was that devised by the late John Locke, for which he was rewarded by Congress.

FIG. 4.

Observatoire National, Paris.

Of all the various astronomical observatories, national or otherwise, that at Greenwich, as it is one of the oldest, is also one of the most, if not *the* most, memorable. The observations of its astronomer-royal, Bradley (1750–62), furnished Bessel with the material which he made use of in the determination of his *Fundamenta Astronomiæ pro anno 1755, deducta ex observationibus viri incomparibilis, James Bradley in specula Grenovicensi per annos 1750–62, institutis.* (Bradley is the well-known discoverer of aberration and nutation.) For more than half a century Dr. Maskelyne was astronomer-royal at Greenwich. His observations were mainly those of the sun, moon, and planets, and a select number of stars. When the French astronomers issued new tables of the sun and moon, a number of copies were sent to Dr. Maskelyne, who in the note of presentation was characterized as being the author of the most precious collection of observations then existing. Dr. Maskelyne died in 1811. The present astronomer-royal, Sir George B. Airy, has introduced into the observatory a practice which he began when astronomer at Cambridge—viz. that of reducing all observations as soon as they were made. Upon his recommendation the lords commissioners of the admiralty defrayed the expenses of reducing all the observations of the moon and planets made at Greenwich from 1750 to 1830. Quite recently, M. Leverrier, in his communication to the French Academy on a comparison of the theory of Saturn with observations, makes the statement that the tabular comparison which he gives is entirely based upon the Greenwich observations, the only observatory at which a series is found extending without interruption for 120 years—from 1751 to 1869.

Our limits do not permit us to speak particularly of the labors of Struve at Dorpat, of Bessel at Königsberg, and those of other astronomers. But mention should at least be made of the observations of Sir William Herschel at his own observatory at Slough, where he discovered the planet Uranus in 1781, and of his extended observations of planets, their satellites, the binary stars, and nebulæ, as also of the labors of his even more distinguished son at his station for eight years at the Cape of Good Hope, the results of which appear in his volume of *Cape Observations.* The observations of the late earl of Rosse at his observatory (now located at Birr Castle, Ireland) with his great reflector—viz. observations of clusters and nebulæ—deserve more than a passing notice. On the night of Sept. 19, 1848, an eighth satellite of Saturn was detected simultaneously (within the same hour) by Mr. William C. Bond at the Cambridge (U. S.) Observatory and Messrs. Dawes and Lassell, observing together, in Mr. Lassell's observatory at Starfield, Eng.; and at the Cambridge (U. S.) Observatory Nov. 11, 1850, Prof. George P. Bond discovered the dusky ring of Saturn. The planet Neptune was discovered at the National Observatory at Berlin by M. Galle, Sept. 23, 1846.

The U. S. Naval Observatory at Washington has always shown great activity, and the results of its labors are not only to be learned from its published observations, but also from the publications with which it has enriched the volumes of the *Smithsonian Contributions to Knowledge.* The observatories at Hamilton College, Clinton, N. Y., and that at the University of Michigan at Ann Arbor, have become noted for the discovery of minor planets, Prof. Peters being the observer at Clinton, and Prof. Watson at Ann Arbor. S. ALEXANDER.

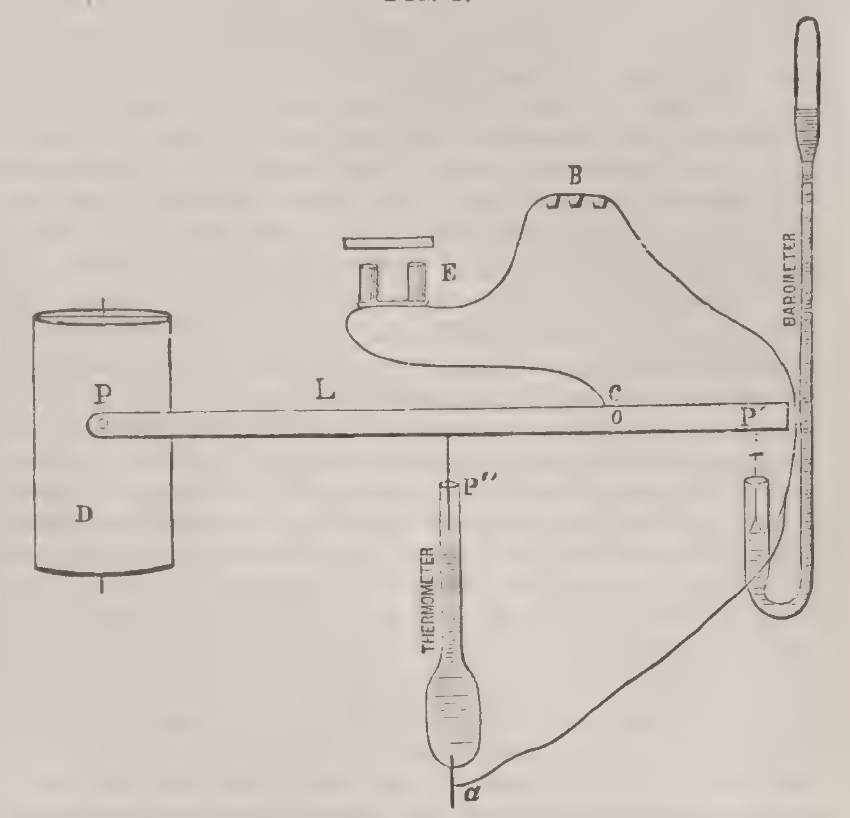
Observatory, Meteorological. The usefulness of automatic meteorological instruments cannot be overestimated, since it is only from the study of continuous and minute changes that the meteorologist can ever hope to discover the laws appertaining to the ever-changing phenomena of the atmosphere. A meteorological observatory, fully equipped, should be provided with instruments capable of registering the following: Pressure; temperature; moisture; direction of the wind; velocity of the wind; rainfall; evaporation. Automatic mechanism for the registration of the direction and the velocity of the wind and the fall of rain has long been in successful operation, since in all of these cases there is sufficient *mechanical* force to operate mechanism without introducing a serious error in the results. But the automatic registration of pressure and temperature is a more difficult problem, and it is only within a recent period that meteorologists have succeeded in devising methods and mechanism of sufficient delicacy to meet the demands of modern science.

Methods.—The methods of registration employed by meteorologists may be divided into four general classes: (1) Records made mechanically by force derived directly from the changing medium; (2) Continuous records made photographically on a moving sheet of paper; (3) Discontinuous records made at stated intervals by means of electro-magnetism; (4) Continuous records similarly made, together with results printed in ordinary numbers at definite intervals. For the mechanical registration of the barometer numerous devices have been contrived. In case a siphon is employed, the recording pencil is moved by means of a float resting on the surface of the mercury in the open leg, and made to press against the paper at definite intervals. All instruments of this class are simply modifications of the wheel barometer. Since the record on the recording sheet has a scale several times greater than the fluctuation of the column, the *mechanical* force controlling the pencil is less than five grains for a change of pressure of one-hundredth of an inch in a tube of one inch. Hence, owing to the friction and inertia of the float-mechanism, such machines can only give approximate results. In case a cistern barometer is employed, the tube is suspended on a lever, with the lower end resting in a fixed cistern of mercury. As the pressure varies, the lever on which the tube is balanced changes its inclination, and by attaching a registering pencil the fluctuations are recorded on a moving cylinder. The same objection as in the preceding case is applicable to this form of apparatus, since the register-ing point is urged forward by the weight of a section of the fluctuating column corresponding to the change to be recorded. In this case, however, the mechanical force is double that for a siphon of the same area, but the inertia is increased a hundred fold. The mechanical registration of temperature has been accomplished by the use of a metallic thermometer, consisting of a combination of brass and steel rods, a spiral composed of two metals, or a single wire of considerable length. Records from metallic thermometers, however, are of but little scientific value, since it is nearly impossible to maintain a fixed zero of reference.

Photographic Registration.—The registration of the barometer and wet and dry thermometers has been accomplished with sufficient precision by means of photography; but owing to the great labor and expense requisite for securing the records and measuring up the photograph sheets, it may readily be imagined that this method can never be generally adopted by meteorologists.

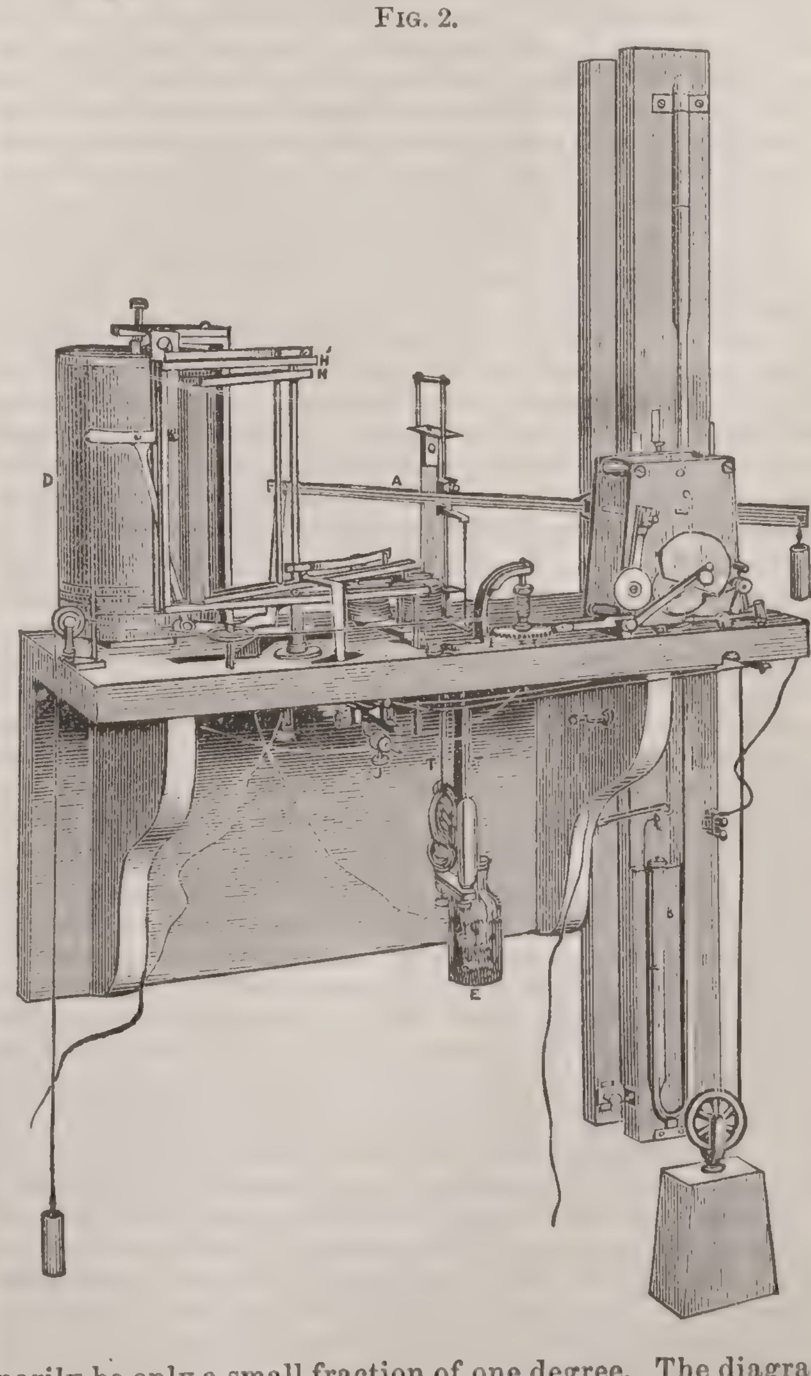
Meteorograph of G. W. Hough.—The method of registration at definite intervals by means of electro-magnetism was first proposed by Wheatstone, but was never put in practical operation by him. It has been applied, however, in various ways by meteorologists to the registration of nearly all atmospheric phenomena. The following diagram (Fig. 1) exhibits the method of Prof. G. W. Hough of Albany for registering the barometer and thermometer on a single sheet. D is a revolving drum, six inches in diameter and seven inches in height, covered with a sheet of ruled paper; L is an iron bar, 24 inches in length, mounted on an axis, passing through the point *c;* P is a steel pen attached to the end of the lever, projecting over the centre of the drum; P′ and P″ are platinum wires attached to the lever 3 inches on either side of the axis *c;* P′ is over the shorter leg of a siphon barometer, and P″ passes into the end of an open mercury thermometer. Now, if L be elevated at the end P, the wire P′ will touch the top of a float in the shorter leg of the siphon barometer. If, then, a battery B and electro-magnet E be arranged as in the diagram, when contact is made with the float the circuit will be closed, and E will operate. At this moment a blow struck on the pen P by a hammer unlocked by E will indicate the height of the barometer. When the lever L is depressed till P″ touches the surface of the mercury

FIG. 1.



in the thermometer, the circuit will be again established, and the pen P will record the thermometric height. The thermometric record cannot be as accurate as that of the barometer, since the magnetic circle is not so certainly completed when platinum touches fluid mercury as when it touches polished platinum. However, in a thermometric scale of two or three inches for 100° F., the error will ordinarily be only a small fraction of one degree. The diagram above represents a meteorograph constructed for the U. S. Signal Service, which registers hourly the barometer and wet and dry bulb thermometers.

FIG. 2.



The ingenious meteorograph constructed by Father Secchi of Rome records on ruled sheets of paper the indications of the following instruments: On one sheet the barometer, thermometer, direction and velocity of the wind, and the time and duration of rain; on another the barometer, wet and dry thermometers, and the quantity of rain. Besides the records on the sheets, the total wind, as well as the total for different directions, is indicated by dials. The whole apparatus is about 8 feet high, 3 feet wide, and 6 feet in length at the base. The barometer is a steel tube of large cross-section, contracted in the middle portion, and suspended on a lever arm over a fixed cistern of mercury. A pencil connected with the arm is continually pressed against the moving sheet and traces the fluctuations of the column. The thermometer is a brass or composition rod about 0.2 inch in diameter and 60 feet in length, attached at one end to the outside of the building and at the other to a bent lever, and extended by means of a heavy weight suspended from an arm of the lever. By suitable mechanism the changes in the length of the rod are transmitted to a pencil pressing on the sheet and tracing the fluctuations of the temperature. The psychrometer consists of two mercury thermometers of the same dimensions, open at the top. A sliding bar holding two platinum wires, which enter the open ends of the tubes, is attached, by means of a fine brass wire, to a carriage carrying a recording electro-magnet. Every fifteen minutes the clock gives motion to the carriage sufficient to cause the platinum wires to descend from the top to the bottom of the tubes and return. So soon as the wire touches the mercury in the dry thermometer, the circuit is closed and a pencil begins to trace a line on the sheet, which continues until the second wire touches the mercury in the wet thermometer, when the circuit is opened by causing it to pass through a relay magnet, thereby interrupting the record of the pencil. The length of the line, therefore, will indicate the difference between the wet and dry thermometers. The time of the beginning of rain is shown by causing the circuit through a recording magnet to be closed and broken by the revolution of a small water-wheel placed under the eaves of the building, while the total amount of water is measured and recorded by receiving it in a cylindrical vessel, in which is inserted a float in connection with the recording pencil. The direction of the wind is shown by the markings of four electro-magnets placed side by side, indicating respectively N., S., E., W. The frequency of the markings made by any two of the magnets indicates approximately the true direction. The velocity of the wind is shown on the sheet by the distance traversed hourly by a recording pencil in magnetic connection with Robinson's anemometer. A seconds pendulum clock of large dimensions, including a striking train, gives motion to the recording tables and psychrometer carriage. The electro-magnets are operated by 60 cells of the sulphate of copper (sand) battery.

Prof. Hough has also devised a variety of meteorological instruments designed to print periodically, in common type, records of the barometer, the thermometer, the anemometer, and the evaporator and rain-gauge. Descriptions of these varieties of apparatus may be found in full in the publications of Dudley Observatory at Albany. The printing barometer gives hourly the barometric pressure to a thousandth of an inch. It gives also a record of the total disturbance or fluctuation of the column for two entire days and for each hour successively, and curves of pressure, showing the changes in the height of the column continuously. The printing thermometer prints hourly the thermometric record to the tenth of a degree F., and gives also a continuous curve of temperature. The evaporator gives hourly the height of the water in the evaporating vessel, and indicates changes to one thousandth of an inch in its height. The anemograph gives the direction and the velocity of the wind for every hour. Besides these recording meteorological instruments, others have been devised by Mr. Hipp of Neufchatel, Switzerland; Mr. Gros-Claude of Geneva; Messrs. Hasler and Escher of Berne, Switzerland; J. Salleron of Paris; Prof. Wild of Berne; Dr. J. Gibbon of the U. S., and many others. These inventors have generally confined themselves to particular instruments, the barometer, thermometer, or the wind-gauge, but some have combined several instruments in the same apparatus.

George W. Hough.

Obsid′ian [Gr. ὀψιανός], a volcanic rock belonging to the trachyte group, and composed of alumina and 80 per cent. of silica. When pure it is a perfect volcanic glass of dark color, and in this form is much used by savage races for the manufacture of stone implements; it also occurs porphyritic from an admixture of crystals of minerals. When the same kind of lava from which obsidian is formed becomes very vesicular, it gives rise to *pumice*.

Edward C. H. Day.

Obstet′rics, Obstet′ricy, or **Tocol′ogy** [Lat. *ars obstetricia, ob* and *stare*, to "stand before;" Gr. Μαιεία; Fr. *art des accouchements, science obstétricale;* Ger. *Geburtshülfe, Entbindungskunst*], the branch of medical science embracing the knowledge of the processes accompanying the reproduction of the human species, the assistance to be rendered the mother before, during, and after labor, both natural and irregular, and the care to be taken of the child during the first weeks of its life; also called **Midwifery** [Sax. *mid*, "with," and *wif*, "wife"], particularly in Great Britain. Although nature has adapted woman to bring forth children without any other assistance than that afforded her by her own inherent powers, still, from the very earliest ages, it has been found agreeable and beneficial to a woman in labor to offer her sundry more or less important services in her hour of need, by which present discomforts might in a measure be removed or possible future accidents averted. The earliest records which we find of such assistance show it to have been rendered exclusively by women. Thus, the Jews employed women, called *mejelledeth;* the Greeks first made use of old female nurses, who lived in the house and took care of the children. These nurses were called *mæa* (grandmother, nurse), and subsequently, when their practice rose to the dignity of a profession, they were known as *mæeutriæ*. A special tutelary divinity (Eileithypia or Arthemis) protected the art. These women appear, however, to have been unlucky in their practice, for at an early period a law was passed in Athens prohibiting women from practising physic in any of its branches. As early as the time of Hippocrates (about 400 B. C.) we therefore find men (*mæeutai, mæeuteres*) called in as assistants in difficult cases; and somewhat later, Herophilus is mentioned as a teacher of obstetrics at Athens. In the writings attributed to Hippocrates is found the first evidence of scientific research into and rational understanding of the phenomena of childbirth. Among the Romans, women (*obstetrices*) likewise assisted in confinements; but the emperor Augustus is reported to have called the physician Antonius Musa to attend the empress Livia in a difficult labor, and this precedent has been followed in many countries even to the present time. At the time of Pliny the royal law (*lex regia*) already provided for the performance of Cæsarean section after the death of women during pregnancy and labor. Celsus and Rufus Ephesus, during the first century of the Christian era, and Galen, Ætius, and Paulus Ægineta some 500 years later, wrote works on obstetrics. During the Middle Ages medical science remained at a stand-still in Europe, but among the Arabs and Persians considerable progress was made in obstetrics, which was practised by women alone, physicians being called in only as consultants. The writings of Rhazes of Bagdad (A. D. 800), Avicenna of Ispahan (A. D. 900), and Abulcasem (A. D. 1100) became celebrated and were generally accepted throughout Europe as well as in the East. Up to the sixteenth century very indefinite ideas had existed as to the shape and capacity of the bony canal (pelvis) through which the child has to pass in order to be born; in 1543 Andrew Vesalius gave the first correct description of the normal pelvis, and 200 years later (1754) Levret in France and Smellie in England (1751) completed the description by stating the exact dimensions of the various diameters of the pelvic cavity. The great surgeon Ambroise Paré (1550) was, however, the first actual exponent of modern scientific obstetrics—"the famous restorer and improver of midwifery," as Smellie aptly calls him. He first recommended turning the child by the feet. His successors Guillemeau, and especially Mauriceau, worthily developed and improved on the teachings of Paré. That most valuable of obstetrical instruments, the forceps, was discovered by an Englishman, Paul Chamberlen, about 1647; it has since been greatly modified and improved. In Germany the first scientific work on obstetrics was published by Eucharius Rösslin in 1513; and in 1690, Justine Siegemund, court-midwife at the electoral court of Brandenburg, became celebrated through her book on midwifery. Although numerous careful observations and studies had been made by Smellie and Ould (1742) in England, who described the manner of the entrance of the child's head into the pelvis, by Levret (1747), Solayrés de Renhac (1771), Baudelocque (1781), Madame Lachapelle (1795) in France, and Boër (1791) and Schmitt (1804) in Germany, Naegele the elder (1819) was the first to give a clear, systematic, and tolerably correct explanation of the mechanism of labor; that is, of the manner of passage of the various parts of the child through the pelvic canal. From him dates, in a great degree, the present elevated condition of obstetrical science; for on the accurate comprehension of this mechanism depends in a large measure the correct appreciation of the means to be employed in abnormal cases. Among the more important improvements in the art and practice of obstetrics during the present

century are the following: The use of the ear (auscultation) to detect the presence of a living child in the womb; the perfection of the knowledge of the mechanism of labor; the induction of premature labor; the more frequent use of the forceps and the less frequent employment of craniotomy (perforation of the child's head); the substitution of turning and extraction by the feet for forceps and craniotomy in many cases of pelvic deformity; the employment of chloroform in natural labor. Obstetrical science and practice have long been taught at all medical universities, and in some countries (Austria) physicians are required to take degrees as master or doctor in obstetrics in addition to the ordinary degree of doctor in medicine and surgery. Hospitals for the accommodation of women during the lying-in state—so-called lying-in hospitals—have been instituted in many cities of Europe, and in a less degree in the U. S. They are almost invariably connected with medical schools, and afford excellent opportunities for the study of the obstetrical art. The largest lying-in hospital at present is in Vienna, in which about 10,000 women are confined annually; others are at Paris, Berlin, Dublin, etc. Societies devoted solely to the advancement of the department of obstetrics—obstetrical societies—exist in London, Berlin, Edinburgh, Dublin, New York, Philadelphia, Boston, and other cities. Journals containing only articles on obstetrical topics are published in Germany, France, Great Britain, and the U. S. On the European continent, and to a certain degree in Great Britain, women in labor are attended only by midwives (*sâge-femmes, Hebammen*), who are taught in special schools to perform the minor duties of an obstetrician, such as to separate the child from the mother by tying and dividing the umbilical cord, removing the afterbirth, and caring for the comfort of the mother and the child. Physicians are called in only in difficult cases. In the U. S., however, and among the better classes of Great Britain, the safer plan is followed of entrusting every confinement, whether natural or abnormal, to the care of an educated physician, who is assisted by a competent nurse, and who, in case of need, may be able to foresee and prevent accidents which the superficial and inferior teaching of a midwife would incapacitate her from perceiving or avoiding. At the present time an obstetrician, in the true sense of the word, can no longer be a simple looker-on at a process which Nature is entirely competent to complete herself, or a mere mechanical assistant to that process: he must be a man of scientific education, well endowed with physical and moral power, patience, and determination, thoroughly conversant with the physiology and pathology of the function which he is called upon to superintend. On his wisdom alone often rest the lives of two persons and the happiness of a family; he must be both physician and surgeon, and his intellectual culture and ability must be on a par with the important relation which his department holds to society. Among the men who have become prominent as teachers and writers or as practitioners of obstetrics during the past generation may be mentioned: in the U. S., Dewees, Meigs, Hodge, Eliot (all died within a few years), Barker, Goodell, Thomas, Isaac E. Taylor; in Great Britain, Sir James Simpson (d. 1870), Mathews Duncan, McClintock, Leishman, Churchill, Braxton Hicks, Barnes; in France, Cazeaux, Dubois, Depaul, Pajot; in Germany, Scanzoni, Credé, Martin, Carl Braun, Spiegelberg, Schroeder, and many others.

The study of obstetrics is divided into three chapters: 1, The anatomy of the organs taking part in the process of reproduction in the female; 2, the functions of those organs during reproduction: their physiology; 3, the disorders and diseases affecting these and other organs during the same period: their pathology.

1. *Anatomy.*—In the bony receptacle (pelvis) at the end of the trunk are situated the female generative organs, viz. the two ovaries, containing the female germs or ova; between them the womb or uterus, to which they are attached; on either side also the two Fallopian tubes, opening into the uterus; finally, the vagina or passage leading from the mouth of the womb to the external organs. The breasts, although coming into function only after the birth of the child, are generally included in this list.

2. *Physiology.*—The functions of these organs are menstruation, conception, gestation or pregnancy, labor or parturition, and lactation. They are limited to a certain period of life, generally beginning with the twelfth to the fifteenth year and continuing till the forty-fifth or forty-eighth year. The youngest authentic case of parturition on record occurred at the age of nine years, the oldest at fifty-four years. Menstruation and reproduction are generally coincident, although cases are reported in which repeated impregnation took place without menstruation having ever occurred. Conception having taken place, the impregnated ovum passes through one of the Fallopian tubes to the uterus, where it becomes attached and grows and develops (its nourishment being derived from the mother through a convolution of vessels called the afterbirth or placenta, from which a cord of vessels, the umbilical cord, runs to the abdomen of the child), until at the end of a period varying from 275 to 280 days it is ready to be expelled by the contractions of the powerful muscular fibres of the womb (labor-pains). In occasional rare cases the term of pregnancy may be prolonged to 300 or 306 days; but most statements of this kind by women are not reliable and usually depend on errors of reckoning. The signs of pregnancy are manifold. The chief symptoms are: Cessation of the menses, nausea, particularly in the morning, enlargement of the abdomen and the breasts, discoloration of the space around the nipple; later, the movement of the child (or fœtus) and the pulsations of the child's heart, audible only to a practised ear applied to the abdomen. A physical examination of the abdomen and genital organs will at all times reveal the state of affairs; still, only in exceptional cases is it possible to decide upon the existence of pregnancy before the beginning of the third month. Enlargement of the abdomen from dropsy, ovarian and other tumors, may simulate pregnancy. The part of the child presenting itself at the mouth of the womb during pregnancy or labor is called the presentation. During pregnancy the child frequently changes its position voluntarily; during labor, however, the part originally presenting generally remains. The most frequent position of the child in the womb is the longitudinal, corresponding with the long axis of the mother, and by far the most common presentation is that of the head (96 in 100), generally the crown or vertex, seldom the face (1 in 200); much less frequent is the presentation of the other extremity of the child, the breech or feet (3 in 100). A transverse presentation, when the long axis of the child crosses the long axis of the mother, is met with about once in 200 labors, and always requires artificial rectification. Labor or parturition is the act of delivery of the fœtus and its appendages (the placenta and the membranes enclosing the child) through the natural passages. It may be divided into three stages: 1. From the first pains till the complete dilatation of the mouth of the womb; 2. The birth of the child; 3. The expulsion of the afterbirth and membranes. *First stage.*—At the end of pregnancy labor is ushered in by so-called premonitory pains, resulting from the commencing contractions of the womb and lasting an indefinite time, several hours or days. A mucous, slightly bloody discharge accompanies these pains, which gradually become more severe; the mouth of the womb becomes fully dilated, and the bag of waters (in which the child floats) is protruded. *Second stage.*—The bag ruptures, the waters are discharged, the pains become still more severe, the presenting part of the child passes through the pelvic canal, always adapting its longest diameter to the longest one of the pelvic cavity, and is expelled through the external orifice, being rapidly followed by the remainder of the child's body. The *third stage* comprises the delivery of the placenta and membranes, which generally takes place within thirty minutes. The average duration of labor in first confinements is twelve hours, although eighteen to twenty-four hours would not be considered abnormal; women who have had children are generally delivered more rapidly, within six or eight hours. After labor the lying-in state commences, during which the function of lactation is inaugurated, and the womb gradually returns to its natural size and configuration before conception, which latter event ordinarily takes place within six weeks. The child, having been separated from its connection with the mother by the ligation and division of the umbilical cord, is washed, dressed, and applied to the breast as soon as the mother has recovered from her exertions. By an early application of the child the febrile excitement known as "milk-fever," ordinarily occurring on the third or fourth day, with the flow of milk into the breasts, is in a great measure avoided. The period which a woman after labor is confined to her bed varies in different countries: while in civilized communities seven to ten days is considered the proper time, in the East and among savage races the mother resumes her daily avocations immediately after delivery, and among the lower classes in Europe and this country puerperal women very frequently leave their beds on the third or fourth day without evil consequences.

Pathology.—Pregnancy does not always last the stated time of 280 days, but is often interrupted at an earlier period, either by causes depending on disease of the mother or of the fœtus and its appendages, or by accident or intention. Such interruptions may occur at any time, and during the first six months are called abortion or miscarriage, during the last three premature delivery. A fœtus born before the twenty-eighth week is ordinarily not viable, although several instances have occurred in which children born as early as the twenty-sixth week were by

extraordinary care raised to maturity. The danger to the life of the mother from abortion may at times be great, either from uncontrollable loss of blood or from inflammation of the uterus or bowels (peritonitis). This is particularly liable to be the case when the abortion has been forcibly induced, as by sudden shock or with a criminal purpose. Tardieu relates thirty-four cases of criminal abortion, in which the death of the mother resulted in twenty-two. The danger is greatest during the third, fourth, and fifth months; during the first two months the impregnated ovum often escapes almost unperceived. A common cause of abortion is disease of the placenta. The physiological discomforts of pregnancy, such as nausea, neuralgic pains, constipation, may occasionally become so aggravated as to be actual sources of danger, and the pregnant woman is liable to dropsy, hemorrhoids, congestion of the kidneys, and numerous other complaints. Occasionally the impregnated ovum does not pass into the uterus, but becomes attached in the Fallopian tube or drops into the abdominal cavity and develops there. This condition is called extrauterine pregnancy (tubal or abdominal), and generally ends fatally about the third or fourth month by rupture of the tube or peritonitis. In rare cases the child has been retained until term and removed by operation alive or dead, or it has died and been discharged piecemeal through the bowel, vagina, etc.

Labor is either natural or preternatural—natural when nothing occurs to mar the progress of the unaided birth of the child and appendages, preternatural when the assistance of art, either manual or instrumental, is required. The causes of preternatural labor may lie either in the mother or the child. *The mother.*—Deformities of the pelvis or of the soft genital organs, rupture of the uterus, vagina, or the external parts (perineum), flooding (either during labor, when the placenta is situated over the mouth of the womb and is detached during dilatation of that orifice—placenta prævia—or after labor from the open vessels of the normal placental attachment), convulsions, inversion of the uterus. *The child.*—Too large size, monstrosity, abnormal presentation, transverse or oblique (requiring manual or instrumental interference), compression and protrusion of the umbilical cord (dangerous to the life of the child, but not to the mother, and not impeding delivery), too firm attachment of the placenta. The operations which may become necessary during pregnancy or labor are: The induction of abortion, when the preservation of the life of the mother renders it imperatively necessary that the pregnancy be interrupted, and of premature delivery, when the birth of a fully-developed child at term is impossible on account of pelvic deformity; Cæsarean section, the removal of the child and appendages through an incision in the abdomen and uterus, in cases where the pelvic deformity is so aggravated as to preclude the natural or instrumental delivery of even a mutilated child by the natural passages; the child is generally born alive, the mother usually succumbs (62 per cent.), but cases are on record in which the operation has been successfully performed on the same woman as often as four times; the extraction of the child with the forceps; version or turning, and manual extraction by the feet, when it is desired to change the position of the child and accomplish rapid delivery; craniotomy, the perforation of the head and removal of the brain of the living or dead child to enable the passage of the diminished head through the contracted pelvis, thus sacrificing the child for the sake of the mother, etc. Of the dangers which assail the woman after delivery the most frequent are sore nipples and inflammation of the breasts—the most dangerous and fatal, childbed or puerperal fever. The latter is an inflammatory, infectious disease, the exact nature of which is still a matter of dispute. The mortality from it is greater than from all other puerperal accidents combined. The general mortality during parturition has decreased during the last thirty years from year to year, in consequence of the improvement in the study and practice of obstetrical science. According to a compilation by Winckel (*Path. and Therap. of the Puerperal State*, 1869) from more than a million labors, it averages about 6 in 1000 cases in private practice, and 30 in 1000 cases in lying-in hospitals, the large mortality in the latter institutions being mainly due to the epidemics of puerperal fever breaking out in them from time to time, the disease being rendered particularly virulent by the generally poor physical condition of the patients and the necessary crowding to which they are more or less subjected. PAUL F. MUNDÉ.

Ocala, post-v., cap. of Marion co., Fla., 5 miles from Silver Spring, has 5 churches, 1 newspaper, 2 hotels, and repair-shops; is the centre of the orange belt of the Peninsula. Pop. 600. F. E. HARRIS, ED. "BANNER."

O'Cal'laghan (EDMUND B.), M. D., LL.D., b. at Mallow, Ireland, about 1804; studied two years at Paris; went to Quebec 1823; was admitted to the practice of medicine 1827; became a member of the provincial assembly of Lower Canada 1836; editor of the Montreal *Vindicator* 1834–37; figured in the revolutionary movement of 1837, in consequence of which he removed to New York; became a diligent student of the early history of New York, especially of Dutch and French sources; published a valuable *History of New Netherlands* (2 vols., 1846–48), edited the *Documentary History of New York* (4 vols. 4to, 1849–51), *Documents relating to the Colonial History of New York* (11 vols., 1855–61), and numerous other translations from MSS. in foreign languages or reprints of rare historical documents. For some years he was employed in the office of the secretary of state at Albany.

Oc'cam (or **Ock'ham**), WILLIAM OF, a Scholastic philosopher, b. at Occam in the county of Surrey, England; d. in Munich, Bavaria, in 1347, at an advanced age. He was educated first at Oxford, and, after he became a Franciscan, in 1319, at Paris under the famous Duns Scotus. He rejected the realism of his master, and became the most eminent of Nominalists. Throughout his life, consistent with the strictest tenets of his order, he strenuously contested the pretensions of the pope to political power and secular possessions, first taking the side of Philip the Fair against Boniface VIII., and subsequently opposing John XXII., by whom he was summoned to trial before an ecclesiastical court at Avignon, whence he took refuge in 1328 with the emperor Louis of Bavaria, just then in the midst of his struggle with the pope. He promised his pen in support of that monarch in return for his own protection ("*Tu me defendas gladio, ego te defendam calamo*"). No other scholar since the days of Abelard had applied himself so zealously to logic. His skill in handling logical weapons, his acuteness in making distinctions, his fertility in inventing reasons, gave him the name of *Doctor invincibilis*. His careful discrimination between the logical, real, and grammatical significance of terms enabled him to silence his opponents. The hypostatic entities of the Schoolmen before him were disposed of by his doctrine of the subjective nature of thought. His favorite principle was, "Entia non sunt multiplicanda præter necessitatem." In his *Centilogium Theologicum* the greater part of his hundred demonstrations attempt to prove that theological dogmas, such as the existence, unity, or infinity of God, the Trinity, creation, incarnation, transubstantiation, etc., involve contradiction of logical principles, are irreconcilable with reason, and to be accepted only by faith. This doctrine struck a fatal blow at Scholasticism. That form of philosophy had arisen solely out of the necessity which was felt of proving the rationality of the dogma. If the objects of faith could not be proved by philosophy, nor even reconciled with reason, Scholasticism had no task to fulfil except the negative one of destroying what illusions it had already created. Its decline was rapid. The chief works of Occam are—(*a*) *Tractatus Logices*, (*b*) *Quodlibeta Septem*, (*c*) *Super quatuor libros Sententiarum*, (*d*) *Expositio Aurea super totam Artem Veterum*. Besides these there were commentaries and polemics. WILLIAM T. HARRIS.

Occa'sional Caus'es, Doctrine of, was invented by the Cartesians to explain the action of mind and matter upon each other. Their theory was that God, the First Cause, on the *occasion* of certain volitions within the mind, produces certain actions or motions of the body; since, said they, the soul, a thinking substance, cannot act upon matter, which is pure extension. This doctrine was first fully set forth by Geulincx.

Occipital Bone. See OSTEOLOGY, by PROF. E. D. COPE.

Oc'com, or **Occum** (Rev. SAMSON), a celebrated Presbyterian Indian preacher of the Mohegan tribe, b. in New London, Conn.; educated at the Rev. Ebenezer Wheelock's Indian school at Lebanon; in 1766 accompanied Rev. Nathaniel Whitaker, D. D., who was sent on a mission to Scotland, England, and Wales to raise funds for the establishment of schools for the education and christianization of the North American Indians. Being the first preacher of these aboriginal tribes who had visited Great Britain, he created a sensation, and drew large audiences everywhere. He officiated in George Whitefield's chapel in Tottingham Court before an immense audience, and greatly contributed to the success of Dr. Whitaker's mission. The projected school subsequently became Dartmouth College, N. H. After his return to America he continued in the ministry, preaching chiefly to the Indians, until his death, probably in 1792. He wrote an account of the Montauk Indians, published by the Massachusetts Historical Society (1st series, x. 106); and wrote the Hymn, *Awaked by Sinai's Awful Sound.* A. H. STEPHENS.

Occonee'chee, tp., Northampton co., N. C. P. 1944.

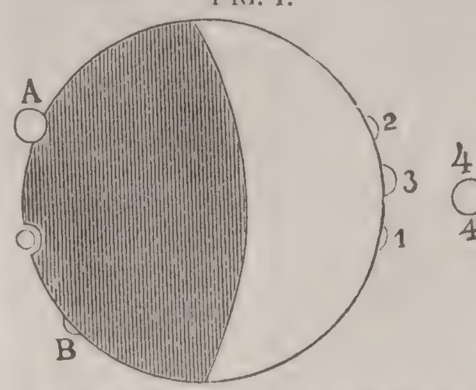
Oc'coquan, post-v. and tp., Prince William co., Va., on the Occoquan River. Pop. of v. 228; of tp. 891.

Occulta'tion [Lat. *occultare*, "to conceal"]. So far as the etymology would indicate, the word occultation might be applied astronomically to designate the concealment of any heavenly body, but usage has confined its application to the eclipse of planets or of fixed stars, the moon being in most cases the eclipsing body. Very rarely a *planet* occults a star; and the occultation of a planet by another planet is almost unexampled in the history of astronomy. Yet Mercury was occulted (or, we might rather say, eclipsed) by Venus May 17, 1737, and we have reports of similar concealments of Mars by Venus Oct. 3, 1590, and of Jupiter by Mars Jan. 9, 1591; but as these were before the invention of the telescope, the supposed eclipses may have been only near appulses. No little interest attaches to the careful observation of occultations, whether of stars or planets, by the moon, inasmuch as from the phenomena presented at the immersion or emersion of the star or the planet some indication may be looked for either of the existence or else of the absence of a lunar atmosphere; *i. e.* of an atmosphere of sufficient density or extent either to refract or to absorb light. With respect to a *diminution of light*, Mr. Ramage of Aberdeen says that "previously to his observation of the occultation of Jupiter, Apr. 5, 1824, there were several occultations of fixed stars of the seventh and smaller magnitudes, which instantly disappeared on coming into contact with the dark limb of the moon; one of them, however, on entering upon the extreme edge of the cusp, very near to the juncture of light and darkness, and on *reappearing twice* from between the tops of lunar acclivities, presented an evident diminution of light." (*Memoirs of the Royal Astronomical Society*, vol. ii. p. 87.) The effect of the glare of moonlight would seem in this instance to have been nearly excluded, so that there is some probability of the diminution of light being real. The telescope employed was a 25-foot reflector. (For occultations of Saturn and Uranus, see the *Memoirs* quoted, vol. vi. p. 187, vol. ii. p. 91; and of five stars, vol. iii. p. 335.)

Next as to the phenomenon of *an apparent projection* of a star or some portion of a planet on the moon's disk (as if between the moon and the earth), or that of *a seeming adhesion* to the disk, at the time of immersion or of emersion. In the third volume of the *Memoirs of the Royal Astronomical Society*, Mr. (afterwards Sir James) South has specified and tabulated a variety of instances of these phenomena. At the close of his statement he remarks that "on referring to this table it will be seen that upwards of twenty stars have from time to time been observed as exhibiting peculiarities at or on the moon's limb prior to immersion behind it or emersion from it; it will be found also that the anomalies are not confined to stars of a certain magnitude or color, nor are they governed by any particular age of the moon." The tabulated arrangement here referred to has been largely extended and classified by Prof. (now Sir George B.) Airy as follows:

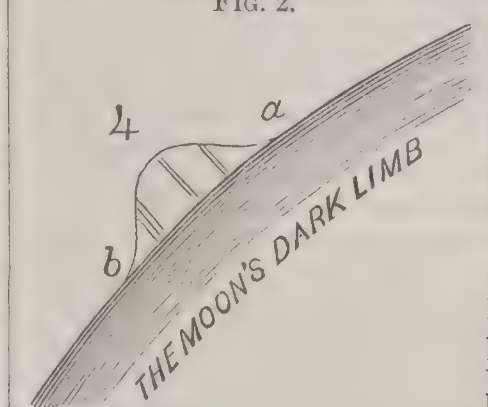
A. Where there is a distinct record of observed projection; B. Where there is a record of hanging on the limb in a form which negatives projection; C. Where there is a distinct record of no projection or hanging; D. Where accounts at the same place or in the same vicinity are contradictory, some being of Class A or B, while others are of Class C (*Memoirs*, vol. xxviii. p. 176). Prof. Airy's list extends to 233 occultations. The following are among very curious instances of projection: At the occultation of Jupiter, already alluded to as observed by Mr. Ramage of Aberdeen, Apr. 5, 1824: "On the approach of Jupiter's satellites no diminution of their light was perceptible. On coming into contact with the moon's limb they did not disappear instantly, like fixed stars, but formed an indentation or notch in the limb, as if imbedded in it, but at the same time *separated from it by a fine line of light*. This indentation continued visible till about half their diameters were immersed, when it disappeared. All the satellites presented this phenomenon, which is represented in the figure" (which is here reproduced with a part of another figure combined), "but the fourth and third with the greatest distinctness. On Jupiter's approach, no difference in his light or shape was perceptible; after the contact had taken place, he appeared to exhibit no deficiency of disk, but, on the contrary, presented a complete figure, as if placed between the moon and earth (see Fig. 1, A): this appearance continued for a few seconds. When nearly altogether immersed, his retiring limb was seen considerably elongated, as if forming a segment of a much larger sphere" (as seen at B). "When Jupiter's satellites are viewed through this reflector" (25-foot reflector), "even with low magnifying powers, they always exhibit planetary disks, and thus allow a short time for observing any phenomena of the above kind; whereas a fixed star, appearing only as a point of light, vanishes instantly on coming in contact with the moon's limb." Observation of the occultation of Jupiter by Capt. (afterward Sir John) Ross: "Capt. Ross, who, from the state of the weather, could not distinguish the immersion, was fortunate enough to observe the emersion, of the planet, which put on the several appearances represented (at 1, 2, 3) in figure." The following is from Mr. Compfield of Northampton, England, describing the occultation of Jupiter (telescopes Newtonian and Gregorian; apertures, between 7, 8, and 9 inches respectively): "The appearance was evidently an elongation of Jupiter when in apparent contact as nearly as I can delineate in this form, which I should not have mentioned had it not been recently affirmed positively that the moon has no atmosphere: *a* and *b*, Fig. 2" (reproduced here), "were evidently adhesions or prolongations of the light of Jupiter at the points of contact; and when nearly disappearing behind the moon, the figure of the section was elongated, so as to deviate greatly from a circular of the same diameter as the planet." These last three accounts of observations are all from the *Memoirs*, vol. ii., pp. 87–89.

FIG. 1.



1, When first seen; 2, A few seconds after; 3, When half the diameter became visible; 4, When wholly seen.

FIG. 2.



In view of these and similar anomalies, E. Neisson, Esq., in his discussion of the limit of a possible lunar atmosphere (*Monthly Notices of the Royal Astronomical Society*, Nov., 1873), says: "There can be no question but that the main circumstance limiting the density of any possible atmosphere is the refraction of the rays of light it would cause. From what we know on the subject, as there can be no doubt but that it must be of comparatively small density, it is evident that we have only to deal with the horizontal refraction, as the refraction must practically vanish for any beyond very low altitudes." Regarding the different values given by the telescopic and occultation determination of the semi-diameter of the moon as affording the process best adapted to detect the horizontal refraction, from an elaborate investigation founded on such data, he concludes that the horizontal refraction of the moon's atmosphere has different values in accordance with the great vicissitudes of temperature to which the moon is subjected and the action of her feeble gravity. (See MOON.) The mean value of Mr. Neisson's results for the horizontal refraction does not differ much from one second. Mr. Neisson, moreover, remarks that "it will also be apparent that for the density of the supposed atmosphere no distortion of a star could possibly occur, and the same applies to the occultation of a planet such as Jupiter or Saturn; the maximum effect would be to increase the size of the planet by about one-thousandth, but in no case to distort it." He makes, moreover, the maximum effect of irradiation to be 0.5″. The very short duration of the effect of the lunar refraction also comes in, and that would render that effect in such a fashion the more difficult to observe. An atmosphere of great rarity, controlled in its extent by a feeble gravity, and often of very low temperature—itself would *therefore* be the more extensive, and its existence under those circumstances be consistent with some absorption of light, such as was observed in the instances of the fixed stars. Along the rough edge of the moon, moreover, the phenomena of diffraction and other effects must take place on an extensive scale, and the *angular* displacement due to them be sensible even at the distance of the earth. The peculiar action thus arising, as to its influence on the light of the body occulted, may be *specific*, arising especially in some peculiarity of the light as it *issues from its source*. Guided by what we know of the changes which may be experimentally made in the exaltation or degradation of luminous vibrations, we may well conceive of this difference at the very origin of the light at the surface of a star, or even also of that which comes from near the border of the sun's disk in *annular or in total eclipses of the sun*. The action in this latter case seems to be analogous to that on the light of the fixed stars or that of the planets, after the manner already specified. Accordingly, the author of this article, in his

memoir presented at the hundredth anniversary of the American Philosophical Society in May, 1843, referred what are styled "the Baily beads" to an action similar to that which produces *the projections and adhesions* of stars in occultations, the rounded, bead-like portions being the result of so many *projections*, and the filamentous connections of those portions indicative of intermediate *adhesions*. Then the projections were themselves referred to an action producing a bending of the *starlight* the *negative* of that which would be due to refraction, denominated by the author *the distortion inward;* but local and efficient on light (starlight or border sunlight; *i. e.* light from near the border of the sun's disk), which light was *specifically* subject to such action, from a cause (as heretofore stated in this article) originating at the surface of the star, or near the border of the sun's disk. That the action was specific is confirmed by the various observations of the annular eclipse of Sept. 18, 1838, the peculiar phenomena in question being especially manifest when viewed with screens of some particular color, through the red screens above all.

When the time of immersion or that of emersion has been carefully observed, and the corrections dependent on the moon's distance and the hour of the day applied (for parallax), the difference of that time and that by computation, for the first meridian, gives the longitude of the place of observation. STEPHEN ALEXANDER.

Occupa'cia, tp. of Essex co., Va. Pop. 3270.

Oc'cupancy, in law. This is one of the modes of obtaining title to property, both real and personal. The notion that title can be obtained in this manner is derived from the Roman law. In that system it was supposed that occupancy was a mode of ownership derived from the law of nature, and was particularly applicable to those things which by general rules belong to no one (*res nullius*), but are open to all. It was deemed to be natural that the things which God had created for particular persons, and which had not as yet passed into the possession of anybody, should belong to those who were the first to discover and make use of them. Accordingly, those who first entered into lands which were not inhabited, and took possession of them, became justly masters of them. So if fish were taken from the sea and birds from the air.

The theory of the Roman law, that the rule of occupancy is to be derived from the law of nature, has not only had its effect upon the private law of modern times, but has exercised great influence in forming the rules of international law. The rule that capture in time of war gave title to the captor is probably to be referred to the idea that the belligerents stood towards each other in a state of nature, when the one, being under no duty to respect the property of the other, could lawfully retain whatever he could seize upon and had sufficient power to hold. But its leading effect is to be found in the recognition by the nations of modern times of the principle that the discovery of uninhabited lands, or of what was deemed equivalent, inhabited only by savages, gives sovereignty to the nation to which the discoverer belongs, provided the discovery is followed up by exploration and settlement. Here, again, the notion seems to have been that the respective nations were related to each other as individuals would be in a "state of nature" and outside of the pale of society. However convenient this assumption may have been, it would seem to be a pure fiction. Mr. Maine in his work on *Ancient Law* has made it highly probable that the earliest form of ownership was that held by village communities, and was not of an individual, but of a corporate nature, and that it was only after a course of experience that separate ownership of property emerged from the common ownership of the village or corporation. It is impossible to deny that the development of the theory of the Roman jurists has led to great confusion and uncertainty. It has been extremely difficult to determine what kind of occupancy gave a secure title to the nation of the discoverer, and how completely and how soon it must be followed by exploration and settlement. (See Maine's *Ancient Law*, ch. viii.)

When reference is had to individual title to land within the boundaries of any particular nation, it may be observed that there was but little room for the theory of title by occupancy after the feudal system had become fully established. (See FEUDAL SYSTEM.) Under that system the title to land was supposed to be vested in the king, who parcelled it out to inferior owners upon certain conditions, who in turn, by the process of subinfeudation, could parcel it out to others. The entire land of the state thus became vested in ownership, and there was in general no mode of acquiring it except from the former owner, unless by the doctrine of "adverse possession" or "disseisin." (See DISSEISIN.) This is not to be confounded with title by mere occupancy. In the latter case the title is acquired in vacant property instantly and by the mere fact of occupancy. Adverse possession requires a peaceable and notorious possession for a *length of time*, is urged against an existing owner, and is founded upon rules of public policy to promote security in titles. In this country the king was supposed before the Revolution to be the owner of the land, and titles of individuals were obtained by grants from him. Since the Revolution the title is derived either from a State or the U. S. government. The courts will take no notice of any title to land not originating in the act of one of these governments, or at least not sanctioned by one of them. Even though the land be in one sense owned by Indians, their ownership is not inconsistent with a title on the part of the government within whose jurisdiction the land is situated. The right of discovery, as recognized by the various civilized nations, is understood to give to the U. S. the exclusive right to acquire from the Indian tribes all the lands belonging to them, and not embraced within grants already made by the U. S. or sanctioned by treaty or otherwise, and not within the territory belonging to the original thirteen States. This proposition does not deny that the Indian tribes are owners, but affirms that they can only sell to the U. S. Any rule which would permit them to convey to any other nation would be fraught with danger to our government, and would be plainly subversive of the recognized rights depending upon discovery and settlement.

Owing to these considerations, titles to land by occupancy can only arise in special cases. One of these is that of accretion or gaining land from the ocean or a lake or a navigable stream, where the soil left bare by the water may be regarded as an incident to the principal ownership of the upland. When an island arises in the ocean or in a navigable stream it belongs to the state. The same result follows in cases of addition to the mainland, where the increase is sudden and perceptible. The rule of accretion, as applying to the adjoining owner, refers to increments gradually made, so that the rate of increase is imperceptible to the eye.

Another instance in which the title to land may still be gained by occupancy, if there be no statute to the contrary, is one depending upon an imperfect rule of common law as to the devolution of legal estates in case of an owner's death. The case is an estate granted to A for the life of B. Should A die before B, intestate, the law provides no one upon whom the unexpired portion of the estate shall devolve. It cannot pass to the heir of A, since it is not an estate of inheritance or fee (see FEE); it cannot belong to the executor (see EXECUTOR), since it is real estate; it cannot revert to the grantor until B dies, since he cannot derogate from his own grant. The law having thus provided no owner, the estate may be seized by any person who may be able to take possession of it. Such a person is called a "general occupant." In some instances the grant, instead of being made to A for the life of B, is made to A and his *heirs* during the life of B. In that case the heirs take the unexpired residue, not as *heirs* (for the estate is not inheritable), but because they are specially named, and are thence called "special occupants." These rules are in a number of the States changed by statute. It is sometimes provided that the unexpired portion of A's estate shall be regarded as a chattel, and shall pass to his personal representatives.

Passing to the subject of personal property, it is to be noticed that there are still several instances in which title by occupancy takes place. One is that of property taken from an enemy in time of war. According to the law of nations, this property belongs to the sovereign of the state of which the individual captor may be a member. It is, however, quite usual for the state to provide rules whereby the captors may be rewarded for their exertions by giving them a portion or the whole of the captured property. A distinction is taken between booty (property taken on land) and prizes taken at sea. In the case of property taken at sea the practice of the law of nations now demands that there should be an adjudication by a competent prize court organized under the authority of the belligerent claiming the property. In the case of booty no such adjudication is necessary. Undisturbed possession for a brief period is sufficient to confer a title. There may be cases, however, where prize and booty are so intimately blended that a prize court will have jurisdiction over both. (See remarks of Lord Mansfield in *Lindo* v. *Rodney*, Douglas Reports, 592.) There is some reason for believing that at an early day questions concerning booty were brought before the now obsolete court of the "constable and marshal" of England. (2 Knapp, Privy Council Rep., pp. 149, 151.) The present mode in which booty is distributed in England among the actual captors is to refer their petition to the lords of the treasury, who commonly recommend that a grant be made of it to trustees appointed by the Crown, who after receiving it distribute it according to principles submitted to them by the officials of the treasury. The scheme prepared

by the trustees must receive the royal assent. (2 Phillimore, *Int. Law*, 185.)

Another instance of title by occupancy is that of finding property upon land. (See FINDING.) Blackstone places under this general head also the case of accession, or the addition of value made by one person to the goods of another. (See ACCESSION.) Confusion may also be ranked under this head of title. The theory of title by confusion is that where a wrongdoer, with intent to commit a fraud, mingles his goods with those of another so that they cannot be distinguished, the innocent party becomes the owner of the entire subject-matter. The law will not compel him to separate the goods of the wrongdoer from his own, but will require that act of the defrauder; and as by the hypothesis the separation is impossible, the title to the goods is acquired by the fact of occupancy. The same writer refers the title to works of literature and art to the same source. Perhaps it would be more exact to say that they are cases of property acquired by one's own art or power of origination. (See LITERARY PROPERTY.) The property in trade-marks (see TRADE-MARK) is an instance of title acquired by occupancy. A person using a word or device to mark his ownership of goods or of a business becomes the owner of the so-called "trade-mark" itself. The title to wild animals (see FERÆ NATURÆ) is also gained by occupancy. The property or ownership in this case having once been gained remains imperfect so long as the animal has the capacity to resume its original wildness. Should it escape without any disposition to return (*animus revertendi*), the ownership is lost, and the law of title by occupancy may again be called into requisition in favor of one who may first take possession. On the other hand, if all capacity to escape had been lost, the ownership gained by occupancy would be absolute.

T. W. DWIGHT.

Occupa'tion. In Roman law this word was used of the act of taking possession. The possession thus acquired, if the law allowed, could end in full ownership. Thus, *occupaticius ager*, in one of the old Latin grammarians, denotes land deserted by its own cultivator and occupied or taken possession of by another. The principal objects which could by Roman law be thus taken possession of were, (1) wild animals, which in their free state were held to be without an owner, and wherever taken belonged to the *captor*. If, after being taken, they recovered their freedom, they again became without an owner and could belong to a new *captor*. (2) Things abandoned by an owner with the intention of giving up his ownership and without intending to transfer his right to another. (3) Treasure-trove belonged by Roman law to the finder in certain cases only, as where it had been hid in an unusual way and so long that the owner was not to be discovered. Where it was found by a man on his own ground or on ground without an owner, it belonged wholly to him. Where it was found on the ground of another, it went half to the finder, half to the proprietor of the soil; to the state if the land was public. (4) In war the foe was looked on as without rights, and thus his property was without an owner and capable of acquisition. Things taken from a public enemy during war, however, went first to the state, which could give rights over them to others, as to the captors.

There is a kind of military occupation, which international law has to do with, and which presents to us some peculiar difficulties. For those which arise out of the public actions of the occupant during his occupation, in case he afterwards relinquishes his hold on the place or district occupied, we refer to vol. ii., page 1254, col. 1, and to Phillimore, there cited. A question, however, may be asked to which we will attempt to give a succinct answer —namely, What is occupation of a country or a district by an invading belligerent? Such occupation, then, implies the termination of all political or municipal authority on the part of the former holders of power, except so far as such authority is consented to by the occupant invader. This is a result of military power and a fact. But it is not necessary that every part of the district should be held in control by a force on the spot; all that is necessary seems to be that the army should be so distributed as to have direct communication between its parts and detachments, and to have sufficient force to put down any insurrection within the district. Occupation must be effective, like blockade; but as a blockade may be raised by a superior force from without or run through by stealth, so, in the same way, the objects of an occupation may be defeated by an attack from without, or the lines be broken through by even a weak force where they are weakest. An occupied district is under military law exercised by the commander of the invading army (comp. sec. 1 of the instructions for the government of armies of the U. S. in the field), who may, if he sees fit, allow the ordinary laws of the land to take their course under control and supervision of military officers of his appointment. What proceedings within the occupied district on the part of discontented inhabitants should be punished with severity it is not easy to define by general rules. Thus much, however, may be said—that guerilla warfare by parties who have no uniform, or who put on and take off a uniform at pleasure, and are without any connection with the national army, is, and on account of the atrocity and insidiousness with which such warfare is apt to be carried on ought to be, punished with severity.

T. D. WOOLSEY.

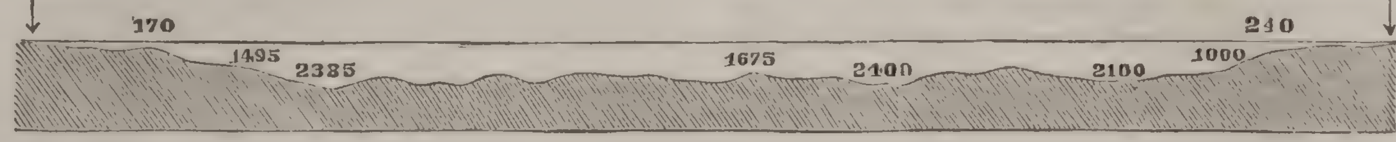
O'cean [Lat. *Oceanus;* Gr. Ὠκεανός]. The waters of the sea are divided by the solid lands into a few large basins or oceans, which are the counterpart of the continents. The Pacific, the Atlantic, and the Indian oceans correspond to the three worlds, and separate them from one another. Each of them is again subdivided into a northern and southern basin, except the Indian Ocean, which, on this account, is only a half ocean. The Arctic Ocean is properly a continuation of the Atlantic, but, surrounded as it is by the coasts of the three northern continents, it has a physiognomy of its own. As to the Antarctic Ocean, being bounded by no lands, it may be considered less as an ocean by itself than as the common root from which they all radiate. The three great oceans have a wide opening toward the south, and become gradually narrower toward the north, just the reverse of the continents. But they differ in general form. The Pacific Ocean is an oval, nearly shut up in the north, where the opposite coasts approach each other, so as to leave between Asia and America only the narrow passage of Behring Straits, by which it communicates with the Arctic Ocean. The Atlantic Ocean has been likened by Humboldt to a long valley with parallel sides, the projecting body of Africa fitting into the vast recess of the Gulf of Mexico and the Caribbean Sea, as South America and Cape St. Roque into the Gulf of Guinea. It is the only ocean widely open at the north, stretching from pole to pole, the only ready channel for the exchange of the polar and equatorial waters. The Indian Ocean has the form of a triangle, the vertex of which is turned to the north, but without communication with the northern waters. The Pacific Ocean contains more than one-half of all the waters of the sea. It is pre-eminently the great ocean. Its extent, its compact form, the direction of its longer axis from east to west, make it the counterpart of the Old World. The Atlantic has only half the size of the Pacific, and one quarter of all the water surface; by its narrow and slender form, its direction from north to south, it corresponds to the New World, as the Indian Ocean to Africa.

The Bed of the Ocean.—The basins of the oceans are depressed below the face of their waters as the continents are elevated above the same surface level. As they form nearly three-quarters of the relief of the earth's crust, a knowledge of their configuration would be of great interest, but very little is known on this subject. Numerous soundings, however, made in the shallow seas along the coasts of the continents for the wants of navigation, deep-sea soundings taken in the heart of the ocean from purely scientific motives, and recently similar observations for the laying of telegraphic cables across the Atlantic and the Mediterranean, have given us an approximate idea of the nature of the beds of these two seas which are the best known. The main feature of the Atlantic basin seems to be a deep valley which runs, with an average depth of 20,000 feet or more, along and parallel to the coasts of the New World. A large swell over 10,000 feet higher, bearing, perhaps, the islands of Tristan da Cunha, St. Helena, Ascension, and in the North Atlantic the Azores, separates it (as seen in Fig. 1, *b*) from another valley only 15,000 feet deep, which stretches along and close to the coast of Africa. Both valleys rise northward, and are confounded in one basin on the so-called telegraphic plateau between Newfoundland and Ireland, whose average depth is about 12,000 feet, and the greatest 2400 fathoms, or 14,000 feet, as seen in Fig. 1, *a*. Toward the northward the depth is gradually reduced to 8000 and 9000 feet, between Greenland and Iceland, while on the European side the depth averages hardly 1500 feet. In the Arctic Ocean the depth is still less considerable, but very irregular. In the neighborhood of the continents the seas are often shallow for a long distance, and their bottom seems only the continuation, by gentle slopes, of the continents which border them. Thus, from Newfoundland, along the line of the cables (Fig. 1, *a*), the submarine plain extends for 140 miles before reaching the depth of 1000 feet, but beyond it falls rapidly within a few miles to a lower terrace of 9000 feet. By another rapid step a still lower plain is attained, having a depth varying from 12,000 to 14,000 feet, and stretching with inconsiderable variations through 1700 miles, across the whole basin of the Atlantic. This is the so-

Fig. 1.—Sections across the Basin of the Atlantic Ocean.
Depth in Fathoms.

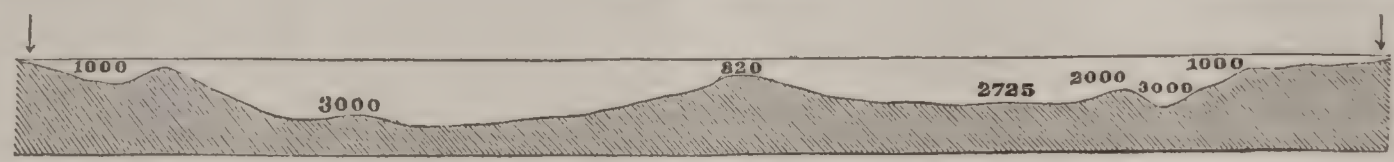
a. From Newfoundland to Valentia Island on the line of the Telegraph Cables.

Newfoundland. Length 1850 Miles. Valentia Island.



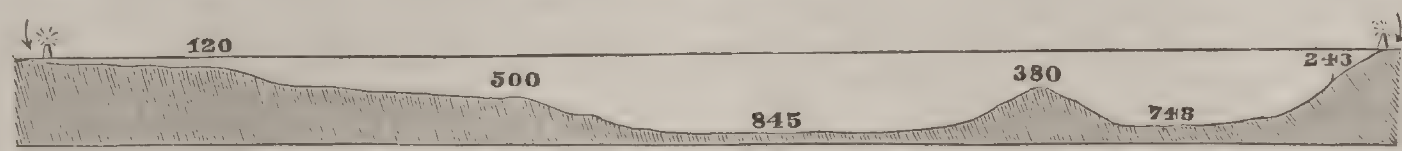
b. From Cape St. Roque, Brazil, to Cape Palmas, Western Africa.

Cape St. Roque. Length 1860 Miles. Cape Palmas.



c. From Sand Key to Havana.

Sand Key. Length 83 Miles. Havana.



called telegraph plateau. At about 230 miles from the coast of Ireland it ascends again, by similar steps, to the border of the submarine plateau on which rest the British Isles. A similar structure is found in other parts of the basin. From Cape Race, Newfoundland, southward for 200 miles across the Great Bank, the depth of the sea never exceeds 100 fathoms, when it plunges suddenly by two terraces into the deepest part of the North Atlantic, where the soundings give from 25,000 to 30,000 feet. From the New Jersey shore, according to the observations of the Coast Survey, the slope of the bottom of the sea is only 5 feet in a mile, but beyond 100 miles it descends suddenly 400 feet in a mile. About 114 miles from the coast a submarine plain begins at the depth of 6000 feet, and another, 12,000 feet deep, at a distance of about 300 miles. These facts, and the absence of any oceanic island other than volcanic or coralline, disprove the idea, often advanced, that the bed of the oceans is, like the surface of submerged continents, full of valleys and mountain-chains. It seems far more uniform. Extensive plains and huge table-lands predominate. True mountain-chains are only found near the continents, as parts of their structures, and when reaching above the surface form chains of continental islands. But these submarine plains and plateaus are gigantic compared with those above water. Nowhere on dry land do we see plateaus of 15,000 to 20,000 feet above the surrounding plains.

The Bed of the Pacific Ocean is much less known than that of the Atlantic. In the absence of soundings, which are few, its average depth has been inferred from the velocity of the tide and earthquake waves which often cross it from E. to W., this velocity depending upon the depth of the basin in which the waves move. From this kind of evidence Prof. Bache, superintendent of the Coast Survey, makes the depth of the Pacific between Japan and the coast of California from 12,000 to 14,000 feet. Prof. Hochstetter, using the waves raised by the great earthquake of South America in 1868, calculated the depth between the coast of South America and the Chatham Isles in the South Pacific at 11,500 feet. Both results agree with the soundings. The central axis of the ocean, free from islands, is probably deeper; some uncertain soundings exceed 40,000 feet. Similar depths are given for the Indian Ocean.

The inland and border seas properly belong to the continents. Around the British Isles and in the German Sea the depth rarely exceeds 600 feet, and is often much less. The continent of Europe is here prolonged in the form of a submarine plateau. The Baltic Sea, being a simple depression in the continent, is only a few hundred feet deep. The border-seas of Asia, inside of the chains of continental islands, hardly exceed a few hundred feet, while outside, the rapid slopes and deep ocean begin. The Mediterranean and Gulf of Mexico, being in the zone of broken lands, are much deeper. The first is divided into two basins by a high neck stretching between Sicily and the African shore, at the slight depth of 50 to 500 feet. The western basin has a depth of over 9000 feet, and the eastern, S. of the Ionian Sea, even 13,000 feet. The Gulf of Mexico, as shown in Fig. 1, *c*, has a depth of over 5000 feet. The Caribbean Sea averages 6000 feet, and reaches near Darien at least 10,000 feet. Still, outside of the Lesser Antilles the basin of the ocean proper sinks to 18,000 feet and more. The greatest depths of the ocean have been observed in the South Atlantic. West of St. Helena James Ross found no bottom with a line of 27,600 feet. West of the island of Tristan da Cunha, Capt. Denham touched the bottom at 46,000 feet. Captain Parker found even 50,000 feet in the same region. But from the difficulty of such measurements those figures can hardly be accepted as correct. On the whole, the ocean basins become less deep toward the north pole, just as the lands become lower toward the same region. A. Guyot.

Ocean, county of New Jersey, bounded E. by the Atlantic Ocean. Area, 683 square miles. It is generally low, level, and covered with pitch-pine forests and cedar swamps. Bog-iron ore and valuable greensand (known as marl, an excellent fertilizer) are obtained. Indian corn and lumber are leading products. Cap. Tom's River. Pop. 13,628.

Ocean, tp. of Monmouth co., N. J. Pop. 6189.

Ocea'na, county of Michigan, bounded W. by Lake Michigan. Area, 550 square miles. It is level, well-wooded, and adapted to grain and fruit raising. The lumber manufacture is the leading industry. The county is traversed by the Chicago and Michigan Lake Shore R. R. Cap. Hart. Pop. 7222.

Oceana, tp. of Muskegon co., Mich. Pop. 919.

Oceana, post-v. and tp., cap. of Wyoming co., West Va. Pop. 791.

Ocean Grove, post-v. of Ocean tp., Monmouth co., N. J., on the sea-coast, 6 miles S. of Long Branch.

Ocea'nica, the name given by modern geographers to all the islands or groups of islands situated between the south-eastern shore of Asia and the western shore of America, and consisting of the Malay Archipelago, Australasia, and Polynesia.

Ocean Navigation. See Navigation, by Lt.-Com. Alexander H. McCormick, U. S. N.

Ocean Springs, post-v. of Jackson co., Miss., on the New Orleans and Mobile R. R. Pop. 560.

Ocean Steam Navigation. See Navigation, Ocean Steam, by W. S. W. Vaux.

Ocel'lus Luca'nus, a Greek philosopher, b. in Lucania, Italy, probably in the fifth century B. C. Of his life nothing is known, and it has been much disputed whether the treatise Περὶ τῆς τοῦ Παντὸς Φύσιος ("On the Nature of the Whole"), written in the Ionic dialect, is a genuine work by him or not. There is a good edition of it by Mullach (Berlin, 1846), and an English translation by Thomas Taylor (1831). The treatise is remarkable, because it argues that the *whole* has had no beginning and will have no end.

O'celot [Aztec, *ocelotl*, from *oça*, "to paint"], a name applied to the *Felis pardalis*, one of the handsomest of the cat family, found in America from Louisiana and Texas S. to Patagonia. It is some three feet long, extremely agile and graceful, nocturnal in its habits, and a good climber of trees. It is easily tamed, and greatly resembles the common cat in its habits. Its skin is prized in commerce. It is gray, marked with black and fawn-colored lines. The painted ocelot (*Felis pictus*) and the gray ocelot (*F. armil-*

lata) are South American animals of similar size, habits, and appearance. Still other species or well-marked varieties are known.

O'chre. Clays colored by hydrated peroxide of iron in variable proportions, and thus yielding shades of yellow from pale yellow to deep orange, are largely used as pigments in the arts under the name of ochre, but the term is also more broadly applied to any clay richly colored by peroxide of iron. "Reddle," or "red chalk," is a variety of ochre consisting of decomposed *hematite*. In mineralogy, earth varieties of *hematite* or iron-peroxide, if bright tinted, are known as "red ochre," whilst argillaceous and decomposing *limonites*, or hydrated peroxides, give rise to "brown ochre." The term is moreover used in that science, in combination, to express the earthy, pulverulent, decomposing oxides of other elements.

Ocklawaha River, a navigable branch of the St. John's River, rises in the lakes of Orange and Sumter cos., Fla., and traverses Marion and Putnam cos., in a northward course. It has regular steam navigation.

Ock'ley (Simon), b. at Exeter, England, in 1678; studied at Queen's College, Cambridge, distinguishing himself by his attainments in the Oriental languages; took orders in the Church of England; became vicar of Swavesey, near Cambridge, 1705; published a Latin *Introduction to the Oriental Languages* (1706), a *History of the Jews* (1707), translated from the Italian of Rabbi Leon of Modena, with an original *Supplement concerning the Caraites and Samaritans*, and several translations from Oriental manuscripts; became professor of Arabic at Cambridge 1711; issued the first volume of his great work, the *History of the Saracens*, in 1708, and the second in 1718. D. at Swavesey Aug. 9, 1720.

O'Cle'ry (Michael), b. at Kilbarron, near Ballyshannon, Ireland, about 1575; entered the Franciscan order as a lay brother; resided during much of his life in the Irish convent at Louvain; was sent to Ireland to collect materials for Hugh Ward's *Lives of the Irish Saints*, and spent fifteen years in accumulating antiquarian documents. With the aid of Conary O'Clery, Cucogry O'Clery, and Forfeasa O'Mulconry, he compiled the *Annala Rioghachta Eireann*, or *Annals of the Kingdom of Ireland*, a valuable work usually known as *The Annals of the Four Masters*. (See O'Donovan, John.) O'Clery published an Irish dictionary and other works, and d. at Louvain in 1643.

Ocmul'gee River rises in the central part of Georgia by several head-streams, flows in a generally S. S. E. course, and above Colquitt joins the Oconee to form the Altamaha River. Small steamboats ascend to Macon. Its lower course is through sandy pine woods; its upper, through a granite region, where its many rapids might be utilized for water-power. It is 300 miles long.

Oco'nee, a new county in Georgia, near the headwaters of the Oconee River, formed from the southern part of Clarke co. Cap. Watkinsville.

Oconee, the westernmost county of South Carolina. Area, 550 square miles. It is hilly, and in part mountainous, with much mineral wealth. It is fertile, especially in the valleys. Corn and cotton are leading products. The county is traversed by the Blue Ridge R. R. Cap. Walhalla. Pop. 10,536.

Oconee, post-v. and tp., Shelby co., Ill., on the Northern division of the Illinois Central R. R. Pop. 1558.

Oconee River rises in Morgan co., Ga., and flows S. by E. Below Colquitt it unites with the Ocmulgee to form the Altamaha. Steamboats have ascended in high water to Milledgeville.

O'Con'nell (Daniel), the great Irish agitator, was b. at Carhen, county Kerry, Aug. 6, 1775, the son of a gentleman of small estate, but of ancient family; was educated at St. Omer and Douay, and in 1794 began to study law at Lincoln's Inn; in 1798 was called to the bar; rose at once to distinction as a barrister, and very soon became prominent in Irish politics, addressing himself to the work of the emancipation of the Roman Catholics and of Ireland. In 1815 he was challenged by Alderman d'Esterre of Dublin, whom he mortally wounded; and a duel with Mr. Peel was soon after prevented by the police. In 1828 he was chosen to Parliament from county Clare, but was excluded by the Test oath, but in 1829 the Roman Catholic emancipation took place, and O'Connell entered the House of Commons. His life-work was one of agitation, both among the people and in the House of Commons, for the repeal of the Union. In 1842 he began to hold "monster meetings" in Ireland, and in 1843 he was arrested on a charge of conspiracy and sedition, convicted, and fined heavily; but the Lords reversed the judgment Sept. 7, 1844. In 1845, when it was shown that O'Connell, who had long received a large yearly income from a popular subscription, was also acting as a middleman and collecting money from the tenants of another, his influence began to decline, and in 1846 his support of the Whig ministry tended to the same end. In 1847, enfeebled by overwork and by anxiety for Ireland, where the famine had broken out, he started to make a pilgrimage to Rome, but d. at Genoa May 15, 1847.

O'Con'nor (Gen. Arthur), b. at Bandon, near Cork, Ireland, July 4, 1767; was admitted to the bar 1788; sat in the Irish Parliament 1789–96; entered into the conspiracy of the United Irishmen; became one of the five members of their Directory; was imprisoned six months for publishing a so-called seditious pamphlet; went to France with Lord Edward Fitzgerald to negotiate an alliance for Ireland against England; concerted with Hoche the French invasion of Ireland; was arrested in England Feb. 27, 1798, tried for high treason at Maidstone, Kent, but acquitted May 22; rearrested in the court-room on another charge; kept five years a prisoner in Fort George, Scotland; was released June, 1803, on condition of perpetual exile from Ireland; went to Paris; was appointed by Napoleon general of division Feb. 29, 1804; sent to the coast of Scotland in command of the Irish brigade; married, in 1807, Elisa de Condorcet, only daughter of the philosopher; withdrew from the French army 1815; was naturalized as a French citizen 1818; edited with Arago the works of Condorcet (Paris, 12 vols., 1847–49), and wrote a number of controversial pamphlets. D. at Bignon Apr. 25, 1852.

O'Connor (Feargus Edward), b. at Dangan Castle, county Meath, Ireland, in 1796; entered Parliament for Cork 1832; took part in the socialistic agitations, making addresses at many places in England; edited a newspaper of violent tone, the *Northern Star;* was for a time regarded as the leader of the "Chartist" party, which elected him to Parliament from Nottingham 1847; visited the U. S. soon afterwards; became insane in 1852, and d. at Nottinghill, near London, Aug. 30, 1855.

O'Connor (Michael), D. D., b. at Cork, Ireland, Sept. 27, 1810; studied at Queenstown, and in 1824 entered the Propaganda, and in 1833 received the doctorate; became in 1838 president of the Roman Catholic seminary of St. Charles Borromeo, Philadelphia, Pa.; was consecrated bishop of Pittsburg in 1843; translated to the see of Erie, Pa., in 1853, but was referred to his former diocese in 1854. In 1860 he resigned the bishop's office and entered the Society of Jesus. D. at Woodstock College, Md., Oct. 18, 1872.

O'Connor (Roderick), popularly called Rory, the last independent king of Ireland, b. in Connaught in 1116; succeeded to the throne of Connaught on the death of his father, Turlogh O'Connor, 1156; disputed the supremacy for several years with the O'Neals and the O'Briens; assumed the title of king of Ireland 1166; assembled a parliament of lords and clergy at Athboy 1167; aided in the expulsion of Dermot, king of Leinster, 1168; defeated the English invaders under Strongbow in several engagements, but subsequently came to terms with them and reinstated Dermot in his kingdom; afterward carried on war with the English with varying success, until in 1175, after an interview with Henry II. of England, he acknowledged that monarch as lord paramount of Ireland, retaining for himself his ancestral kingdom of Connaught. His sons having revolted against him, Roderick retired in 1186 to a monastery, where he d. in 1198.

O'Connor (William Douglas), b. at Boston, Mass., in 1833; was educated for an artistic career; became associate editor of the Boston *Commonwealth* 1853, and of the Philadelphia *Saturday Evening Post* 1854–60; became clerk of the lighthouse board at Washington 1861, chief clerk 1873, librarian of the treasury department 1874; has written poems and tales for magazines, and published romance, *Harrington* (1860), *The Good Gray Poet* (1866), being a vindication of Walt Whitman, and *The Ghost* (1867).

Oconom'owoc, post-v. and tp. of Waukesha co., Wis., on the La Crosse division of the Chicago Milwaukee and St. Paul R. R., 30 miles W. of Milwaukee, is noted for its numerous lakes, fine drives, and the excellence of its hotels. It is called the "Saratoga of the West." Pop. of v. 1408; of tp. 2931. A. D. Harger, Ed. "Times."

O'Con'or (Charles), LL.D., b. in New York City in 1804, son of an Irish gentleman of education; received a common-school education; was admitted to the bar 1824, and by his untiring industry made his way to the leadership of the legal profession in that city, which he long held, having been retained in many of the most important cases since 1840. Always a Democrat, he never held office except that of district attorney for a few months during the

administration of Pres. Pierce, and that of member of the constitutional convention of 1864. In 1868 he was nominated for the Presidency by the extreme Democrats, and received complimentary votes in several States.

Ocosin'go, a considerable town in the state of Chiapas, Mexico, 70 miles S. E. of Ciudad Real, chiefly noted for extensive ruins, resembling those of Palenque, described by Dupaix and by John L. Stephens in his *Central America, Chiapas, and Yucatan.* Pop. about 5000.

Ocon'to, county of Wisconsin, bounded N. by Michigan and E. by Michigan and Green Bay. Area, 2268 square miles. It abounds in streams, lakes, and forests. Pine lumber is the principal product, and its preparation is the leading industry. The county is traversed by Chicago and North-western R. R. Cap. Oconto. Pop. 8321.

Oconto, post-v. and tp., cap. of Oconto co., Wis., on the Chicago and North-western R. R., 30 miles N. of Fort Howard. It has a public library, 11 public schools, 7 churches, 1 bank, 3 newspapers, a paid fire department, a public park, several hotels, and a number of stores. It owes its prosperity to the lumber trade. Pop. of v. 2655; of tp. 3278. J. W. Hall, Ed. "Lumberman."

O'cracoke, post-v. and tp., Hyde co., N. C. Pop. 368.

Ocracoke Inlet, a passage from the Atlantic to Pamlico Sound, between two of the long low coast-islands of North Carolina. It lies 23½ nautical miles S. W. of Cape Hatteras. On its N. side stands a brick lighthouse 65 feet high; lat. 35° 6′ 28″ N., lon. 75° 58′ 51″ W. It admits only light-draught vessels.

Octahe'dron [Gr. ὀκτώ, "eight," and ἕδρα, "base"], a solid bounded by eight triangular planes. If regular, its faces are equilateral. It has twelve edges and six solid angles, each formed by four equal plane angles. Its solid contents are equal to the cube of one of its edges multiplied by .4714045.

Octane, C_8H_{18}, the eighth of the marsh-gas series, a liquid, sp. gr. 0.7032, at 17° C.; boiling-point, 119° to 125°. It occurs naturally in American petroleum. It may be produced by the dry distillation of the lime-soap of menhaden oil, by passing the vapor of the thirteenth of the same series, tridecane, $C_{13}H_{28}$, through a red-hot tube, and also from octyl iodide, phthalic acid, indigo blue, acenaphthene, etc. By long-continued fractional distillation it may be separated into two hydrocarbons, having different boiling-points, but the same composition. E. Waller.

Oc'tave [Lat. *octavus;* Fr. and Ger. *octave*], in music, an interval eight degrees above or below some other on the scale, as from C to the next C, or F♯ to F♯, etc. Also, the series of notes included in such an interval, as when we speak of a voice or instrument having a range of so many octaves and fractions of octaves.

Octa'via, sister to Augustus, was first married to C. Marcellus, and after his death to Mark Antony. She was a woman of perfect beauty and great accomplishments, and her life shows an almost heroic nobleness of character. She bore to Marcellus two daughters and a son, and to Antony two daughters. Of the latter, the elder was married to L. Domitius Ahenobarbus, and became the grandmother of Nero; the younger was married to Drusus, and became the mother of Claudius and the grandmother of Caligula. Her son, M. Marcellus, was adopted by Augustus, but died young. She also educated the children of Antony by Fulvia and Cleopatra. She d. in 11 B. C.

Octene, C_8H_{16}, **Octylene,** or **Caprylene,** the eighth of the series of olefines. The name was proposed by Hofmann in 1863. Boils at about 118° to 120°; is prepared by the distillation of pelargonic and other fatty acids with lime. Octene is a mobile liquid, insoluble in water, very soluble in alcohol and ether; burns with a bright smoky flame, and is violently attacked by nitric acid, yielding nitro compounds. E. Waller.

Octo'ber [Lat., from *octo,* "eight"], the eighth month of the old style, or Julian year, and the tenth in the Gregorian year.

Octop'oda [from ὀκτώ, "eight," πούς, ποδός, "foot"], a sub-order of cuttle-fishes (class *Cephalopoda*) of the order Dibranchiata, in which the body is sacciform, the head united with the body by a broad cervical band and surrounded by eight fleshy arms; the arms are furnished with sessile cup-like suckers destitute of horny rings; the eyes fixed in the skin and incapable of rotation; the gill chamber longitudinally divided by a muscular partition; the siphuncle entire; oviduct double; no rudimental gland developed, and there is no true shell. The sub-order is exhibited in four living families: (1) *Octopididæ;* (2) *Cyrotupidæ;* (3) *Philonexidæ,* and (4) *Argonautidæ.* The first two are chiefly represented by species inhabiting the shallow waters or near the coast, and the last two by those living in the open sea. The males of all the species are distinguished by a peculiar generative economy; the males and females differ little from each other in general appearance, but in the former one of the eight arms becomes developed in a peculiar manner, supplied with semen, and, in fact, modified as a copulatory organ, and capable of performing the generative function. It then becomes detached from the animal, and may lead for a time an independent life, but at length, in some cases, it is received by a female, and serves to impregnate her. This function was for a long time unknown, and the arm so modified and detached was supposed to be a peculiar parasitic worm, and named *Hectocotylus.* The arm in question is not always the same, in some species one arm being so developed and in others another. The arm so modified is known as a hectocotylized arm. It is periodically renewed and detached. Theo. Gill.

Octopod'idæ [from the generic name *Octopus*], a family of Cephalopods of the order Dibranchiata and sub-order Octopoda (which see). The body is oval and generally destitute of fins; the mantle separated by fleshy bands; the arms with two rows (rarely one) of cups and united at the base by a slight or moderate web, with or without distinct equiferous cells between the bases of the arms. The family includes the common cuttlefish of the European coasts, and one representative is found in deep water off the eastern N. American coast. Some of the species attain a very large size, and exaggerated accounts may be found of their ferocity and size in many popular works. Theodore Gill.

Octroi' [Fr., remotely from the Lat. *auctoritas,* "authority"], a toll in money or in kind levied upon farm and garden produce at the gates of some European towns.

O'Cur'ry (Eugene), b. at Dunahu, near Carrigaholt, county Clare, Ireland, in 1796; received a liberal education; was employed in the archæological department of the ordnance survey of Ireland 1834–41; was then engaged by the Royal Irish Academy and the corporation of Trinity College, Dublin, in cataloguing and transcribing their ancient Gaelic MSS.; discovered and deciphered valuable remnants of the ancient Brehon laws, which he with Dr. O'Donovan was commissioned to edit and translate by the Brehon law commissioners 1853; became professor of Irish history and archæology in the newly-established Roman Catholic university at Dublin 1854; contributed to the *Transactions* of learned societies; edited works for the Celtic Society and the Irish Archæological Society, and published *Lectures on the Manuscript Materials of Ancient Irish History* (1861). Prof. O'Curry's labors constituted the foundation of Sir H. S. Maine's *Lectures on the Early History of Institutions* (1875). D. at Dublin July 30, 1862.

Odd Fel'lows, Independent Order of, a secret benevolent and beneficial association which had its origin in London, England, about 1745. The character attributed to the earliest societies or lodges of Odd Fellows is that of assemblages mainly for social purposes, having an initiation ceremony, and a collection being made to aid needy members.

About the year 1800 the lodges in London and Liverpool were known as "The London Order." In 1809 a member of a London lodge removed to Manchester and introduced the order into that city, where it was so favorably received that several lodges were speedily organized, and in 1814 the lodges in Manchester and vicinity were consolidated under the title of "The Independent Order of Odd Fellows of the Manchester Unity." A grand lodge, composed of those who had filled the chair of noble grand (the presiding officer) a regular term in a subordinate lodge, was organized and assumed supervision of the subordinates. The London associations and other lodges throughout the country refused to acknowledge the authority of the Manchester organization, and several other "Unities" sprang into existence. The Manchester adherents attained greater prosperity than any of their rivals, and the increase of lodges in Great Britain determined the Manchester authorities to organize an "annual movable committee" to take the place of the local grand lodge, the first meeting of which was held at Hanley in the Potteries, Staffordshire, May 19 and 20, 1823, and was attended by 98 deputies, representing the several subordinate lodges. The early laws were crude and imperfect, the receipts being inadequate to meet the authorized disbursements. The annual movable committee eventually established a system of rates based on the experience acquired, which enabled the subordinates to meet the relief requirements and accumulate a reserve fund ample for all probable demands.

The condition of the Manchester Unity, the largest and most important body of Odd Fellows in Europe, is exhibited in the following statement, made Jan. 1, 1875: Lodges, 4029; members, 496,559; lodge funds, $16,809,670; receipts, including interest on investments, in the ten years

1865–75, $24,554,085; paid for sick and funeral benefits 1865–75, $15,392,582. Accurate statistics of the other Unities cannot be obtained, but it may be safely assumed that the various branches in Great Britain aggregate 5000 lodges and 700,000 members. The Manchester Unity has organized lodges in England, Scotland, Wales, Ireland, France, Turkey, Africa, North and South America, East and West Indies, and Australasia.

Societies or lodges of Odd Fellows were organized in New York and other cities in the U. S. as early as 1806, but had a brief existence. On Apr. 26, 1819, Thomas Wildey and four others, who had been members of Odd Fellows lodges in England, organized a lodge in Baltimore, Md., calling it Washington Lodge No. 1. A member of a lodge at Preston, England, visited this self-instituted body in the latter part of the year 1819, and on his return to his home procured from the Duke of York's Lodge of the Manchester Unity, located at Preston, a document dated Feb. 1, 1820, clothing the American organization with the powers of a grand as well as a subordinate lodge, under the title of "No. 1, Washington Lodge, the Grand Lodge of Maryland and of the U. S. of America." This action of a subordinate was subsequently confirmed by the grand committee of the Manchester Unity. On Feb. 22, 1821, Washington Lodge surrendered the English charter to a "body of past grands," and "the Grand Lodge of Maryland and the U. S." was regularly organized, the members of Washington Lodge receiving a subordinate charter from the new grand lodge. In 1823 the self-instituted lodges in Philadelphia, New York, and Boston were induced to recognize the Maryland organization, and that body immediately forwarded charters to the subordinates, as well as grand lodge charters for Pennsylvania, New York, and Massachusetts. On Apr. 15, 1824, it was deemed advisable to separate the powers of the national from the State organization, and the project was consummated Feb. 22, 1825, when the first meeting of the Grand Lodge of the U. S. was held. In 1826, Thomas Wildey, the presiding officer of the Grand Lodge of the U. S., known as the "grand sire," visited England and obtained from the grand committee of the Manchester Unity an independent charter, granting to the Grand Lodge of the U. S. authority "to conduct the business of Odd Fellowship *without the interference of any other country*, so long as the same is administered according to the principles and purity of Odd Fellowship." Intimate relations between the two grand bodies continued for several years, but in 1842, after fruitless efforts on the part of the heads of the order in England and the U. S. to reconcile, by correspondence, vital differences in the work which had arisen, James L. Ridgely, grand corresponding and recording secretary, and Isaac D. Williamson, grand chaplain of the Grand Lodge of the U. S., were commissioned as special deputies to the Manchester Unity to adjust the matters in dispute. The commissioners attended the meeting of the annual movable committee at Wigan May 16, 1842, and after a conference continued through several days found that their efforts for harmonious co-operation were futile. The commissioners presented an elaborate report of their proceedings to the Grand Lodge of the U. S. in Sept., 1842, and that body adopted a series of resolutions on the subject. The hostilities of the Manchester Unity, threatened in 1842, and consummated in 1843 by their attempt to institute lodges in the U. S., resulted in an entire severance of the existing relations.

The objects of American Odd Fellowship are "to visit the sick, relieve the distressed, bury the dead, and educate the orphan." It seeks "to improve and elevate the character of man, imbue him with proper conceptions of his capabilities for good, enlighten his mind, enlarge the sphere of his affections, and lead him to a cultivation of the true fraternal relation designed by the great Author of his being." The motto "Friendship, Love, and Truth" was known and used in connection with the order in 1775. The organization for attaining these objects has two branches, closely connected, yet entirely distinct—lodges and encampments.

To become a member of a lodge under the jurisdiction of the Grand Lodge of the U. S. the applicant must be a free white male of good moral character, who has arrived at the age of twenty-one years, and who believes in a Supreme Being, the Creator and Preserver of the universe. Five or more members holding withdrawal cards granted by legal lodges may apply to the grand lodge of the State or Territory in which it is proposed to locate, for a charter for a lodge; and when instituted, such subordinate is invested with the power to initiate and confer the five degrees on persons regularly proposed and elected residing within the district assigned to it. No one but a member who has attained the fifth or scarlet degree in a lodge is eligible to membership in an encampment, and can remain a member of the encampment only so long as he continues in good standing in his lodge. An encampment confers three degrees; and seven or more members, having the third or Royal Purple degree and holding legal withdrawal cards, may petition the grand encampment of the State or Territory in which it is proposed to locate, for a subordinate encampment. Application for a lodge in a State or Territory in which no grand lodge has been organized must be made to the Grand Lodge of the U. S., and the same rule applies to a petition for an encampment. On the petition of ten or more lodges the Grand Lodge of the U. S. will issue a warrant for a grand lodge of the State, Territory, or province in which the petitioning lodges are located, or for a grand encampment on a similar application by five or more subordinate encampments. A grand lodge or encampment is composed of the past presiding officers of its subordinates, and the representatives of the several grand bodies constitute the U. S. Grand Lodge. Lodges and encampments have the power to regulate the fees for initiation, degrees, and weekly dues, and may determine the amounts to be paid for weekly benefits to sick or disabled members, funeral benefits, etc.; but such amounts must not be less than the minimum prescribed by the grand body having jurisdiction.

The statistics from 1830 (previous to which they are incomplete) to 1875 are as follows: Initiations, 979,428; members relieved, 724,285; widowed families relieved, 97,065; members buried, 64,654; receipts, $59,850,774.31; paid for sick and funeral benefits and the care of widows and orphans, $22,081,772.12. According to the returns of 1874 and the reports so far as received, the following is the present condition of the order in the U. S.: grand lodges, 54; subordinate lodges, 6558; lodge members, 463,087; grand encampments, 40; subordinate encampments, 1761; encampment members, 87,253; receipts, $4,590,000; members relieved, 38,400; widowed families relieved, 6000; members buried, 4000; paid for relief of members and widowed families, burial of dead, education of orphans, $1,590,000.

The Grand Lodge of the U. S. has organized grand lodges in every State and in most of the Territories of the U. S., the provinces of Canada, Switzerland, Australia, Chili, S. A., and a grand lodge of the German empire, which has five grand lodges under its jurisdiction. Subordinate lodges have been organized in the Sandwich Islands, Peru, S. A., and London, England. Grand and subordinate encampments have been instituted in nearly every locality where lodges are established. Nine monthly and twelve weekly periodicals in the interest of the order are published—twenty in the U. S. and one in Germany.

Theodore A. Ross.

Revised and approved by James L. Ridgely, *Grand Corresponding and Recording Secretary R. W. G. L. U. S.*

Ode [Gr. ᾠδή, fr. ἀοιδή, a "song"], in the modern use, signifies a lyric piece of more dignified character than the song, and usually one in which profound feelings are expressed. The ancients originally included under this name all kinds of lyric verse. Pindar, Alcæus, Anacreon, Sappho, and Simonides among the Greeks, and Horace among the Romans, were the chief writers of odes.

Odell′, post-v. and tp. of Livingston co., Ill., on the Chicago Alton and St. Louis R. R., 82 miles from Chicago, has 3 churches, 1 newspaper, and 1 hotel. Large quantities of corn are shipped from this point. Pop. of v. 739; of tp. 1455. W. D. Wilson, Ed. "Weekly."

O′den, tp. of Chicot co., Ark. Pop. 1523.

O′denheimer (William Henry), D. D., b. at Philadelphia, Pa., Aug. 11, 1817; graduated at the University of Pennsylvania 1835; took orders in the Protestant Episcopal Church 1838; became rector of St. Peter's, Philadelphia, 1840, and bishop of New Jersey Oct. 13, 1859. Author of *Jerusalem and Vicinity* (1855), and several liturgical and theological works.

O′denkirchen, town of Rhenish Prussia, has cotton-spinning and silk, linen, and cotton-weaving factories, and large dyeworks. Pop. 7211.

O′dense, town of Denmark, on the island of Fünen, is an old but prosperous city, with good educational institutions and an active trade. Hans Christian Andersen was born here. Several large sugar-refineries and iron-foundries are in operation. Pop. 18,500.

O′denwald, a mountain-region of Germany, occupying the southern part of Hesse-Darmstadt, and extending for a distance of about 45 miles from the Neckar, which to the S. separates it from the Black Forest, to the Main, which to the N. separates it from the Spessart Mountains. Its western declivities towards the plain of the Rhine are abrupt, but to the N. it slopes down through several terraces, and to the S. E. it gradually disappears in the

level plains. Its highest peaks rise to about 2000 feet, but its general character is very friendly and inviting. It is covered with pine, oak, and beech, and its valleys with orchards and vineyards. Besides its natural beauty, it has great historical interest on account of its many remains from the Roman period and from the Middle Ages.

O′der, a river of Germany, rises in Moravia at an elevation of 1000 feet above the sea, enters Prussian Silesia, where it becomes navigable at Ratibor, traverses the provinces of Brandenburg and Pomerania, and, after a course of 550 miles, empties through the Stettiner Haff into the Baltic. Its navigation is difficult, and along its lower course expensive embankments are required to protect the surrounding country against inundation; as a route of commerce it is of great importance.

Oder′zo [anc. *Opitergium*], town of Northern Italy, province of Treviso, about 14 miles N. E. of the town of Treviso. It is a place of very active traffic, and contains some fine palaces with elegant gardens. Some of these palaces are rich in pictures by Bassano, Paris Bordone, Palma il Giovine, etc. The Villa Colfrancui contains many interesting antiquities, inscriptions, architectural fragments, bas-reliefs, cippi, etc., which have been disinterred in the neighborhood. *Opitergium* is mentioned by all the early Latin historians, and they state that 1000 young soldiers from this town belonging to the army of Cæsar, having fallen into the hands of Pompey, slew themselves rather than remain prisoners. The population at its most flourishing period is said to have reached 50,000, and the beautiful objects in gold, ivory, bronze, etc. which have been found here confirm the story of its former importance. Its later Roman and mediæval history is full of vicissitudes, and its modern fortunes have been those of Venice. The first bishop of Oderzo was Epodius of the fifth century. Pop. 6434.

Odes′sa, town of Russia, government of Kherson, is situated in lat. 46° 29′ N., lon. 30° 44′ E., on a bay of the Black Sea, midway between the mouths of the Dnieper and Dniester. The Turks had here only a small fortress, but after the cession of the territory to the Russians by the Peace of Jassy, Catharine II. founded the present town in 1794. Alexander I. made it a free port for thirty years in 1817, and under the wise administration of its governor, the duke of Richelieu, it increased rapidly, and ranks now as the third commercial town of the Russian empire, and as the first port of the Black Sea, communicating by regular steamship lines with Constantinople, Trieste, Marseilles, Barcelona, Lisbon, Bordeaux, Havre, Antwerp, and London. It stands on a plateau about 200 feet high, which sinks abruptly towards the sea, leaving only a very small belt of shore, occupied by barracks, bathing establishments, and shipping facilities. Along the edge of the plateau runs a very elegant boulevard, planted with trees, lined with palatial houses, and communicating with the beach by a magnificent flight of granite steps. The city is generally well built, with broad and straight streets, and the immediate neighborhood contains many orchards and vineyards, while the plateau farther behind is a sterile steppe. Its benevolent and educational institutions, among which is a university founded in 1865, are numerous and good. It has also important breweries, woollen-mills, and manufactories of sailcloth, cordage, soap, candles, etc. But it is especially as a commercial place that the town has acquired importance. Its harbor is spacious, convenient, safe, and frozen only for a very short time during midwinter; 1253 vessels, of 722,979 tons burden, entered it in 1872, and 1286, of 752,816 tons burden, cleared it. The value of exports amounted during the same year to $34,380,000; that of imports to $40,720,000. The principal articles of exportation are grain, timber, tallow, and wool. The value of wheat exported in 1872 amounted to $25,580,000. Pop. 121,335, containing many Greeks, Armenians, Tartars, Italians, Germans, and Jews. Odessa was subjected to a bombardment by the allied fleets in 1854. (See BOMBARDMENT.)

Odessa, post-v. of St. George hundred, New Castle co., Del. Pop. 695.

Odessa, tp. of Ionia co., Mich. Pop. 959.

Od′ic Force, a term originally applied by Reichenbach to a peculiar iridescence which some people could see about the arms of a magnet. It has been the favorite catchword of humbugs, and applied to everything mysterious. It has received the synonym *psychic force* from Crookes, who performed several startling experiments with Home, the spiritualist, Sergeant Coxe, and others. A lever 36 inches long was fastened at one end to the wall, and upon this a heavy man sat. Home held the tips of his fingers against the distal end of the board, and the board retained its horizontal position, meanwhile supporting the person who sat upon it. Several equally wonderful performances were shown to a number of intelligent and honest people, who authenticated the report of Crookes and others. It is difficult to believe that any such force exists—at any rate, no general attention has been paid to the subject; and it may safely be considered a humbug till some reasons can be given for its physical production.

ALLAN MCLANE HAMILTON.

O′din, the Old Ger. *Wuotan*, the Saxon *Wotan*, occupies in the Scandinavian mythology the same position as Zeus in the Greek. He is the creator of the world, the father of the gods, and, being possessed of the deepest wisdom, he holds the highest power. In battle he gives the victory and sends forth the Valkyries; in council he gives the decision and the expedient; in every-day life he makes the field fertile, the wind and the waves favorable, etc. Behind and above the special gods he is the supreme ruler. The peculiar features under which he was imagined by his worshippers are often vague, sometimes even childish, but generally not without a certain suggestiveness. He had only one eye; the other he had pledged to Mimer, of whose fountain he drank wisdom. Two ravens sat perched on his shoulders—Huginn, the mind as perceiving, and Muninn, the mind as retaining; they flew every day through the world, and whispered in his ear what they saw. But the general idea of him as the god of the heaven, the sky, the wind, riding through space on his eight-footed horse, wrapped in his cloud mantle, and holding the lightning in his hand, is as magnificent as that of the serene Zeus enthroned in brightness, and as characteristic of the climate and the race. He never reached that perfect individualization which distinguishes Zeus, perhaps because the Scandinavian mythology was broken off in the middle of its course without ever ripening into maturity, perhaps because its ideas by their very nature were unfit for a thorough artistic development. But the attempts of mythologists to analyze the myth-forming process, and extract the materials which entered from reality into the mythical creation, may prove more successful with Odin than with Zeus.

Odin, post-v. and tp., Marion co., Ill., on the Illinois Central and the Ohio and Mississippi R. Rs. Pop. 1268.

Odin′ (JEAN MARIE), D. D., b. at Ambierle, France, Feb. 25, 1801; joined the Lazarists in his youth; came to the Lazarist community of the Barrens, Mo., in 1822, and soon afterwards became a priest. In 1842 was made bishop of Claudiopolis *in partibus infidelium* and vicar-apostolic of Texas. In 1847 was translated to the see of Galveston, and in 1861 became archbishop of New Orleans. In 1869 repaired to the Vatican Council, but by reason of infirm health was excused from attendance. D. at Ambierle, France, May 25, 1870.

Od′ling (WILLIAM), M. D., F. R. S., b. at Southwark, England, Sept. 5, 1829; studied medicine at Guy's Hospital and at the University of London; became lecturer on chemistry at St. Bartholomew's Hospital 1863, professor of the same science at the Royal Institution 1868, and at the University of Oxford 1872; author of a *Manual of Chemistry* (1861), *Lectures on Animal Chemistry* (1866), and of various scientific memoirs on chemical theory, of which he is regarded as one of the ablest living exponents.

Odoa′cer, king of Italy from 476 to 493 A. D., was educated in the camp of Attila, but entered afterwards the service of the West Roman empire, and held a high position in the imperial guard when (in 475) Orestes, commander-in-chief of the army, deposed the emperor, Julius Nepos, and placed his own son, Romulus Augustulus, on the throne. The army, consisting of barbarian mercenaries, now demanded of Orestes that one-third of the soil of Italy should be given up to them for permanent settlement; and when Orestes refused, the soldiers chose Odoacer for their leader, and a war broke out which ended with the defeat and death of Orestes and the abdication of Romulus. Aug. 25, 476, the Roman senate declared the West Roman empire dissolved, constituted the kingdom of Italy; and gave the crown to Odoacer, the first barbarian who wore it. He was acknowledged by Zeno, the Byzantine emperor, took up his residence at Ravenna, and governed with energy and moderation. For several years Italy enjoyed peace. The laws and institutions were maintained, the Church was respected, and several campaigns in Dalmatia and Noricum were successfully carried through. Meanwhile, Theodoric, the king of the Ostrogoths, crossed the Alps, instigated and perhaps supported by Zeno, and in three great battles Odoacer was defeated, and finally shut up in Ravenna. Here he held out for more than two years, but capitulated on the condition that he and Theodoric should rule as joint kings. The agreement was confirmed by a solemn oath, but a few days afterwards Theodoric had Odoacer put to death, Mar. 5, 493.

Odom'eter, or, more correctly, **Hodom'eter** [Gr. ὁδός, a "way," and μέτρον, "measure"], an instrument by means of which the distance travelled by a carriage or other vehicle, or even a person walking, is registered.

O'Don'nell (Leopold), Marshal, duke of Tetuan, count of Lucena, and captain-general in the army of Spain, b. Jan. 12, 1809, at Santa Cruz in Teneriffe, was the son of Lieut.-Gen. Carlos O'Donnell, a descendant of an Irish gentleman exiled with James II.; entered the army; became a colonel, and for his services against the Carlists at Lucena (1839) was made a grandee and lieutenant-general. In 1840 he abandoned the cause of Espartero, his patron, by whom he was twice driven into exile; but in 1843, after Espartero's fall, he was made captain-general of Cuba, where he became moderately wealthy. In the insurrections of 1854 he took a prominent part; was for the time reconciled with Espartero, and thenceforth often war-minister and a leading conservative politician at Madrid. In 1859–60 he commanded in Morocco; captured Tetuan Feb. 6, 1860; retired from public life in July, 1866. D. at Biarritz Nov. 5, 1867.

O'Don'ovan (John), LL.D., b. at Atateemore, county Kilkenny, Ireland, July 9, 1809, son of a small farmer; was employed about 1830 in the historical department of the ordnance survey of Ireland, with the object of settling the orthography of places on the ordnance maps by the testimony of Gaelic MSS. and local traditions; repeatedly visited every county in Ireland in executing this commission; was called to the bar 1847, but never practised law; published a *Grammar of the Irish Language* (1845); edited *The Book of Rights* (1847), the superbly printed work *The Annals of Ireland by the Four Masters, from the Earliest Historic Period to A. D. 1616, consisting of the Irish Text from the Original MS., and an English translation*, etc. (Dublin, 3 vols. 4to, 1848–51; 2d ed. 7 vols., 1856; see O'Clery, Michael); became professor of the Irish language, history, and archæology at Queen's College, Belfast (1849), with a salary of only £100; aided Prof. Eugene O'Curry in editing the Brehon laws (1853); was editor of several curious works for the Irish Archæological and Celtic societies. D. at Dublin Dec. 9, 1861. A work prepared by him for the press, O'Clery's *Martyrology of Donegal, a Calendar of the Saints of Ireland* (Dublin, 1864), has been issued since his death.

Odontaspid'idæ [from *Odontaspis*—ὀδούς, ὀδόντος, a "tooth," and ἀσπίς, a "buckler"—the typical genus], a family of sharks most nearly related to the mackerel sharks; the body is, however, in shape more like that of the ordinary sharks, the tail being much prolonged backwards; the head is depressed, oval, and with the snout pointed; the eyes have no nictitant membrane; the nostrils are simple and remote from the mouth; the mouth inferior and with a wide gap; the teeth are nail-like and with basal cusps in both jaws, and in the upper jaw on each side, near the symphysis, are small ones; the opercular apertures are of moderate width, five in number, and all in advance of the pectorals; minute spiracles are persistent and far behind the eyes; the dorsal fins are two, the first in advance of the ventrals, the second at least partly anterior to the anal; the caudal has a small inferior lobe; the tail has no pits at the root, and no lateral keels. The family has but few, and perhaps not more than two, living species, *Odontaspis ferox*, an inhabitant of the Mediterranean Sea, and *Eugomphodus litoralis*, a denizen of the east coast waters of the U. S., and, according to Günther, also represented at the Cape of Good Hope and in the Tasmanian seas. The American species is popularly known as sand-shark. Theodore Gill.

Odontoglos'sa [from ὀδούς, ὀδόντος, "tooth," and γλῶσσα, "tongue"], a group of pectinibranchiate gasteropods, of the sub-order Rhachiglossa, distinguished by the dentition. The radula or lingual ribbon has three longitudinal rows of teeth, the central of which is narrowest and fixed, and the lateral, also fixed, are broad and armed with numerous denticles. It includes the families *Fasciolariidæ* and *Mitridæ*. Theodore Gill.

Odontol'ogy [from ὀδούς, ὀδόντος, "tooth," and λόγος, "discourse"], that branch of zoology which treats of the structure and development of the teeth arming the mouth of vertebrate animals. (See Teeth.) Theo. Gill.

Odontop'teris [Gr. ὀδούς, "tooth," and πτέρις, "fern"], a genus of fossil ferns occurring in the Carboniferous rocks, so called from the tooth-like form of their pinules. Their fronds are usually bipinnate, the pinules adherent by their entire base, without midrib, and supplied with nerves which spring from the rachis along the entire base.

J. S. Newberry.

Odontor'nithes [ὀδούς, "tooth," and ὄρνις, "bird"], an extinct group of birds with teeth, as yet known only from the Cretaceous of Kansas, where their remains have been found in excellent preservation. These birds are divided into two well-marked orders—Odontotormæ and Odontolcæ, from the Greek word for tooth combined with τόρμος, "socket," and ὁλκός, "furrow" or "groove." The Odontotormæ have the teeth small, compressed, and pointed, directed more or less backward, and set in distinct sockets. The order contains, as far as known, only two genera. The first and best-known genus is *Ichthyornis*, so named from the vertebræ, which, even in the cervical region, have their articular faces biconcave, as in fishes. The wings are well developed, and the scapular arch and bones of the legs conform closely to the true bird-type. The sternum is keeled, and has elongated grooves for the expanded coracoids. The sacrum, as in living birds, is composed of a large number of co-ossified vertebræ. The length of the tail is unknown. These birds were carnivorous and probably aquatic. *Ichthyornis dispar*, Marsh, was about the size of a pigeon, and *Apatornis celer*, Marsh, was about as large, but of somewhat more slender proportions. The Odontolcæ have the teeth in grooves. This group is represented by the *Hesperornis regalis*, Marsh, a large bird measuring between five and six feet from the bill to the toes, and in many points of structure closely resembling the loons of the present day. It was not, however, a flying bird, as the wings were small or rudimentary, and the sternum was destitute of a keel. The pelvis resembles in a side view that of the cassowary, but is much more slender. The ilium, ischium, and pubis are separate at their posterior extremities, and the acetabulum is closed internally by bone, except a foramen that perforates the inner wall. The vertebræ are of the ordinary bird-type, but those of the tail are provided with elongated and flattened transverse processes, and the flattening even includes the terminal co-ossified vertebræ, so that there is no true ploughshare-bone. The tail was not long, but may have been of use in swimming, as in the beaver. No other birds are known to possess teeth, as the supposed teeth of *Archæopteryx*, upon the slab containing that fossil, belonged, as stated by Owen, to a fish; and the *Odontopteryx*, described by that author from the Eocene clay of London, has only serrations on the bony jaw, similar to those found, in a less degree of development, in the jaws of the merganser and other living birds.

O. C. Marsh.

Œcolampa'dius (Johannes), whose true name was Hans Hussgen, b. at Weinsberg, Suabia, in 1482; studied first jurisprudence at Bologna, then theology at Heidelberg, subsequently Greek under Reuchlin at Stuttgart, where he also learned Hebrew from a Spanish Jew, and received an appointment as teacher in 1516 at Bâle, where he assisted Erasmus in his *Annotations* on the New Testament. Luther's writings immediately made a very deep impression on him, and for some time he lived in the castle of Ebernburg as chaplain to Franz von Sickingen. In 1522 he returned to Bâle as preacher and professor in theology, and after the disputations at Baden (1526) and Berne (1528) he succeeded in introducing the Reformation in Bâle and Ulm. In the controversy between Luther and Zwingli concerning the Lord's Supper he gradually adopted the views of Zwingli, which he maintained in his *De Genuina Verborum Domini, "Hoc est Corpus meum," Expositione* (1525), and in his disputation with Luther at Marburg in 1529. He was an accomplished scholar, and a character of great gentleness, which procured for him the name of the "Swiss Melanchthon." He was married, and d. at Bâle Nov. 24, 1531. Besides the above-mentioned dissertation he wrote *De ritu paschali; Epistola canonicorum indoctorum ad Eccium*, and several commentaries and introductions to the books of the Old Testament. There are biographies of him by Hess (Zurich, 1791), Herzog (Bâle, 1843), and Hagenbach (Elberfeld, 1859).

Œcumenical Council. See Council, Œcumenical.

Œde'ma [Gr. οἴδημα, "swelling"], in pathology, a term denoting a puffed and swollen state of any tissue or organ, most commonly caused by the exudation of fluids into the œdematous tissue. If œdema is caused by obstruction to the circulation, by a watery state of the blood, resulting in disturbed relations between the tissues and the blood in respect to osmotic action, or by any other than a strictly local cause, it is called passive œdema; if associated with local inflammation, it is active œdema.

Oe'denburg, town of Western Hungary, near the Lake of Neusiedl, 37 miles S. E. of Vienna, with which it communicates by railway. Its old fortifications have been demolished with the exception of a huge watch-tower, the highest in Hungary; remains of the Roman time are also found, and the town is generally well built. P. 21,208.

Œd'ipus, in Grecian mythology, a son of Laius, king of Thebes, and Jocasta, was exposed by his father on ac-

count of an ill-boding oracle, but was saved by a shepherd and brought to Corinth. Misunderstanding another oracle, he left Corinth and went to Thebes: on the way he unawares slew his father, and at Thebes married his mother. She bore him two sons, Eteocles and Polynices, and two daughters, Antigone and Ismene; but the hidden horrors of his life were subsequently revealed to him. Jocasta hanged herself; between Eteocles and Polynices there was a deathly hatred, and they slew each other; Œdipus put out his own eyes and wandered blind, guided by Antigone, from Thebes to Colonus in Attica, where he died in the grove of the Eumenides. The legends of Œdipus, of which the two baneful oracles and his meeting with the Sphinx, whose enigma he unriddled, form the mystical but singularly suggestive centre, were often treated by the Attic tragedians, and there still exist two tragedies on this subject by Sophocles, *King Œdipus* and *Œdipus at Colonus*.

Œ'gir, in Scandinavian mythology, the god of the ocean, did not belong to the Asa family, nor did he live in Asgaard. He descended from the dark ages before Odin slew Ymer, and was a jotun himself, but he stood in friendly relation to Odin.

Œh'lensläger (ADAM GOTTLOB), b. Nov. 14, 1779, at Frederiksberg, a suburb of Copenhagen, where his father was steward of the royal summer palace; received a rather desultory education; tried various occupations; studied jurisprudence for some time under the direction of his friend, A. S. Oersted, and adopted finally poetry as his calling. In this he was not mistaken. His first publications, *Digte* (1803), a collection of poems, containing the dramatic sketch *St. Hans Aften Spil*, and *Poetiske Skrifter* (1805, 2 vols.), containing *Vaulundurs Saga* and *Aladdin*, made a deep impression on his countrymen. The young generation received an awakening and inspiring influence from these books, and it soon became evident that with them a new period was inaugurated in Danish literature, in Danish civilization. With a stipend from the government he travelled from 1805 to 1809 in Germany, France, Switzerland, and Italy; lived for some time at Halle with Steffens, at Weimar with Goethe, at Coppet with Madame de Staël; and wrote some of his finest tragedies, *Hakon Jarl*, translated into English by F. C. Lascelles (1874), *Palnatoke*, *Correggio*, translated into English by Theodore Martin (1854). On his return to Copenhagen he was appointed professor in æsthetics at the university in 1810. Meanwhile, a controversy between the old rationalism of the eighteenth century and the new romantic school broke out on almost every field of spiritual life in Denmark, and by degrees it formed itself into a contest between Baggesen and Œhlensläger, which grew very hot and lasted for several years, till Baggesen left Denmark in 1820. Œhlensläger did not take part personally in the controversy. He wrote during this period *Helge*, *Hroars Saga*, and *Nordens Guder* (1819), one of his principal works, a cycle of ballads representing the Scandinavian mythology, translated into English by W. E. Frye (1845). But he suffered much, and of his numerous and varied productions (twenty-four tragedies) written after 1820, none can compare with the works of his youth. But his disciples carried farther, with great success, what he had begun. (See DANISH LITERATURE AND LANGUAGE.) He d. at Copenhagen Jan. 20, 1850. A complete edition of his works was published at Copenhagen in 32 vols. (1857–65). Selections from his works are very numerous.

Oels, town of Prussia, in the province of Silesia, on the Oelse. It has manufactures of linen and cotton fabrics, leather, and tiles, and flax of a superior quality is extensively cultivated in its vicinity. Pop. 8124.

Œnan'thic E'ther and **Acid.** Œnanthic ether was a name given by Liebig and Pelouze to an ether existing in all wines, giving them their characteristic odor. It remains behind as an oily liquid when large quantities of wine are distilled; obtained in larger quantities by distilling wine-lees after mixing with half their bulk of water. Thus prepared, it is an oily liquid with a strong vinous odor, of a gravity of 0.862, very soluble in alcohol and ether, boiling between 225° and 300° C. According to Liebig and Pelouze, the constitution is $C_{18}H_{36}O_3$; Delffs considers it identical with ethyl pelargonate, $C_9H_{17}(C_2H_5)O_2$. The vapor density rather favors the former views. By treating œnanthic ether with an alkali and decomposing by sulphuric acid, an acid is obtained, which solidifies at 13° C. to a buttery mass above that temperature, being of an oily consistency and soluble in alkalies, ether, and alcohol. Pelouze and Liebig assigned the formula $C_{14}H_{28}O_3$, and called it œnanthic acid; and while Delffs claims that it is pelargonic acid, Fischer claims that it is a mixture of capric and caprylic acids. (Pelouze and Liebig, *Ann. Ch. Pharm.* xix. 241; Delffs, ibid., lxxx. 290; Fischer, ibid., cxv. 247.) A solid substance called œnanthic ether, which is manufactured in Bavaria and used for flavoring inferior wines, was exhibited in the International Exhibition of 1862. (Hofmann's *Report*, p. 113.) E. WALLER.

Œnop'ides (Οἰνοπίδης), a Grecian astronomer and philosopher of Chios, who is commonly supposed to have been a contemporary of Anaxagoras; is named among the Greeks who visited Egypt and became acquainted with the learning of the Egyptians; is said to have claimed the discovery of the obliquity of the ecliptic; invented a cycle for bringing into agreement the solar and lunar year, which invention he inscribed on a brazen tablet and set up at Olympia. He proposed also a theory of the rise and fall of the waters of the Nile, and an explanation of the Milky Way as the original pathway of the sun. H. DRISLER.

Œnothera. See PRIMROSE.

Oe'rebro, town of Sweden, at the influx of the Swartelf into the Hjelmar Lake, manufactures carpets, waxcloth, woollen goods, and guns. Pop. 8990.

Oer'sted (HANS CHRISTIAN), b. at Rudkjöbing, in the Danish island of Langeland, Aug. 14, 1777. His father was an apothecary, and in the shop he made his first studies and experiments. In 1794 he repaired to the University of Copenhagen, together with his elder brother, Anders Sandöe (b. Dec. 21, 1778; d. May 1, 1860), who became a celebrated jurist and a statesman of great influence in Danish politics. In 1799 he took the degree of doctor of philosophy, on which occasion he wrote the *Architectonics of Natural Metaphysics*. After travelling from 1801 to 1803 in Holland, Germany, and France, he was appointed extraordinary professor in natural philosophy at the University of Copenhagen in 1806, and his lectures soon attracted attention on account of their lively and popular form, and their latent though omnipresent enthusiasm. To awaken the interest of his countrymen for the study of nature, and to spread among them some knowledge of this science, were the aim of his life, and he succeeded in establishing a polytechnic school in Copenhagen, of which he was director from 1829, and in introducing natural science as an element of instruction in the Latin schools. During a scientific journey in Germany in 1812 and 1813 he wrote an essay on the identity of chemical and electrical forces, in which he for the first time shadowed forth his ideas of the unity of electricity and magnetism which he had entertained since 1800. But his great discovery on this point was not made until 1819, and was communicated to the world in a little pamphlet in 1820: *Experimenta circa efficaciam Conflictus electrici in Acum magneticam.* The discovery was immediately accepted, and honors were showered on the discoverer. His other writings comprise a large number of minor essays, most of which were translated into German, and two larger works, *Naturlärens mechaniske Deel* ("Manual of Mechanical Physics") and *Aanden i Naturen*, which latter has been translated into English by Miss Horner under the title *The Soul in Nature.* It contains many details of great logical sharpness and delicate poetical sense, and as a whole it makes a refreshing impression of clearness and repose. D. in Copenhagen Mar. 9, 1851.

Oe'sel, an island of Russia, in the Baltic and belonging to the government of Livonia. Area, 1200 square miles. Pop. 46,000. Wheat, rye, oats, and barley are raised, cattle, sheep, and horses are reared, and considerable fishing is carried on.

Œsoph'agus [Gr. οἰσοφάγος], the gullet, that part of the alimentary canal that leads from the pharynx to the stomach. In the adult man it is nine inches long, extending in a nearly vertical line from the fifth cervical vertebra through the posterior mediastinum and through the œsophageal foramen of the diaphragm, ending in the cardiac orifice of the stomach. It has an outer or muscular coat, containing an outer layer of longitudinal muscle-fibres, and another of similar annular fibres, the upper fibres being chiefly striped and partly voluntary in the upper part, but entirely involuntary and non-striated in the lower portion. The middle or cellular coat abounds in glands which open by a long duct. The innermost or mucous coat is lined by scaly epithelium. In calibre the œsophagus is the smallest part of the alimentary tube. In the lower animals the œsophagus has several modifications, the most remarkable of which is that singular dilatation which is called the *crop*, and which is observable in gallinaceous and vulturine birds, etc. Most articulate and many molluscous organisms have also a so-called œsophagus.

O'Fal'lon, a v. (O'FALLON DÉPÔT P. O.) of St. Clair co., Ill., on the Ohio and Mississippi R. R., has 1 weekly newspaper. Pop. 1117.

O'Fallon (Col. JOHN), b. at Louisville, Ky., Nov. 23, 1791; served under Gen. Harrison in the war of 1812; was severely wounded at Tippecanoe; became a merchant at St. Louis, Mo.; acquired great wealth; endowed the

O'Fallon Polytechnic Institute with property worth $100,000, and was a liberal benefactor of Washington University and other educational and charitable institutions, having spent more than $1,000,000 in this manner.

Ofan'to, the ancient *Aufidus*, a river of Southern Italy, rises 6 miles E. of Monte Marano, enters the Adriatic 4 miles N. W. of Barletta, after a course of 75 miles. The battle of Cannæ was fought on its right bank near its mouth.

Of'fa, king of Mercia, succeeded Ethelbald 755, after defeating his rival Beornred; defeated Cynewulf, king of Wessex, thereby annexing the districts of Oxford and Gloucester; conquered the "Welsh march-land," between the Severn and the Wye, 779, which he peopled with Saxon colonies, and constructed for its protection the celebrated dike, 100 miles long, known by his name, which for several centuries was the boundary between England and Wales; established an undisputed suzerainty over the Heptarchy; murdered Ethelbert, king of East Anglia, and took possession of his kingdom 792; founded the abbey of St. Alban's; drew up a code of laws. D. 794.

Of'fenbach, town of Germany, grand duchy of Hesse-Darmstadt, on the Main. It has extensive manufactures of carriages, musical instruments, jewelry, carpets, hosiery, paper, tobacco, and pipes. Pop. ~~22,691~~. 1885, 31,000

Offenbach (Jacques), b. at Cologne June 21, 1819, of Jewish parentage; studied from 1835 to 1837 at the Conservatory of Paris; played afterwards the violoncello in the orchestra of the Théâtre Comique; became in 1847 leader of the orchestra of the Théâtre Français; established in 1855 the Bouffes Parisiens, and composed a great number of burlesque operas and scenes, of which *Barbe bleue*, *Orphée aux Enfers*, *La Belle Hélène*, and *La Grande Duchesse*, were the most applauded.

Of'fenburg, town of Baden, Germany, on the Kinzig, carries on a considerable trade in grain and wine, and has 5756 inhabitants. In 1853 a statue of Sir Francis Drake was erected here in commemoration of his introduction of the potato into Europe.

Office, in law. This consists in the right and obligation of one or more persons to exercise the duties of a place of public or private trust, and to receive the compensation attached to it. An office is either judicial or ministerial. The one requires the exercise of judgment and discretion; the other involves obedience to the direction and judgment of others. The two classes of duties are sometimes combined, so that the office may be partly judicial and partly ministerial. A ministerial office of a public nature may be in England the subject of ownership: the office of high sheriff may thus be hereditary. In this country no such view prevails. An office is deemed to be held for the benefit of the public, and it has in it no element of property. Unless protected by the Constitution, it may be abolished by the legislature, so as to displace an existing incumbent, and he will have no legal remedy. There is an important distinction between judicial and ministerial offices in the matter of acting by deputy. In the former class of cases official acts must be performed personally. A judge, even though for the time being incapable of acting, cannot summon a member of the bar, however learned and experienced, to take his place. The public have stipulated for his personal skill and judgment. In the case of ministerial offices a different rule prevails. The duties of a sheriff or of a clerk of a court are largely discharged by deputy, the principal officer remaining responsible for a proper discharge by the deputy of his duties. This doctrine cannot be extended so far as to permit the sheriff or other ministerial officer to make a sale of the office. This is not only contrary to the policy of the common law, but was at an early day prohibited in England by statute, followed in some of the States of this country. It is important to distinguish accurately between such a sale and the act of creating a deputy. In a strict sale the officer would place the purchaser in possession of the office, who would act in his place and in his own name. On the other hand, as it would usually be impracticable for such an officer as a sheriff to perform personally all the duties pertaining to his office, he is allowed to select subordinate officers, called under-sheriffs, deputies, or jailers, who will act in his stead, and perform duties in his name. They are merely instruments for the performance of his duties. If the high sheriff dies or is removed, his deputies cease to have an official existence except so far as statutes may otherwise provide. (See Sheriff.) The law does not even allow the office of a deputy to be made the subject of sale by the principal officer. Thus, to continue the illustration from the same office of sheriff, that official would not be allowed, in general, to farm out the office of deputy sheriff for a fixed sum, though he might take a percentage of the profits or returns, except that if the compensation of the deputy was itself fixed by law, the sheriff could not lawfully, in making an appointment, stipulate to receive a portion of it. The test is whether the fees belong to the sheriff before any selection of a deputy is made. If they do, he may lawfully agree for a percentage of them. As an appointment to public office involves considerations of importance to the State, the law will tolerate no contract looking to the employment of irregular influences for obtaining it. Any secret agreement whereby the emoluments are to be divided between the officer and a person who may procure or solicit the appointment is deemed to be a fraud upon the appointing power, and accordingly void as between the contracting parties. In some instances an office is held by a number of persons, and this may be true whether it be public or private. It is the common rule, in a public office, in this case, that all must meet for deliberation, while a majority may act; while in the case of a private office, all must both meet and concur in a conclusion. The rule is sometimes modified by statute. Thus, in the case of a court consisting of a number of persons, it is frequently provided that a majority shall form a quorum, and of the number present a majority may decide a cause. The common law rule is found in many instances to be too rigid for the purposes of practical convenience. There was a special rule in the common law designed to secure an impartial and intelligent administration of justice in the courts. It provided that no judicial office should be held in reversion (or to commence at a future day), nor should it be created for a term of years, but at most for life or during good behavior. The reason of these rules is sufficiently obvious. If a judicial office were to commence hereafter, there would be no certainty that competency to perform its duties would then exist. If an office of this kind were granted for a fixed time, the incumbent might die before the fixed period had elapsed, and the residue of the term would pass to executors, etc. who might not have the requisite qualifications. However, this last difficulty may be readily obviated by a provision that the term of years shall not exceed the life of the appointee. The judges of the highest courts in some of our States are chosen in this way by the people. The present tenure in New York is fourteen years, limited by the life of the incumbent, as well as by his attaining the age of seventy. The question of the incompatibility of offices is sometimes important. The same person may seek to hold an office both under the State and Federal government, or two or more offices under the same government. There are some cases in which it is plain that both offices cannot be held at the same time by one person. One cannot be both judge and sheriff; an acceptance of one office would be an implied resignation of the other. In other cases the legislature have power to declare that the holding of one office is inconsistent with the enjoyment of another. It may accordingly declare, where constitutional provisions do not conflict, that a person holding an office under the U. S. government shall not hold a State office, or that the acceptance of one office under a State government shall preclude an appointment to another. There are instances in which State constitutions provide that all votes cast for the higher judges of the courts by the legislature or at a State election for any office of trust and profit other than judicial shall be inoperative and void. Though this provision in form operates upon the electors, in substance it disqualifies the judge from accepting while in office any other office of trust, etc. (For other topics affecting this subject see Officer, Information, Quo Warranto.)

T. W. Dwight.

Office Found. See Inquest of Office.

Officer, in law, one who holds an office. (See Office.) The subject will be considered under the following divisions: I. The different kinds of officers, including officers *de facto* and *de jure*; II. The mode of appointment, including official oaths and bonds and removal; III. Tenure of office; IV. The effect of their acts, including liability for misconduct; V. Compensation.

I. While the various powers of government are either legislative, executive, or judicial, it is common only to consider those as officers who attend to judicial and executive duties. Members of the legislature are not in general called officers. Thus, sec. 4 of art. ii. of the U. S. Constitution, which provides that all "civil officers" of the U. S. shall be removed from office on conviction upon an impeachment, does not apply to members of the legislature. However, if the intent be sufficiently plain, it is not to be doubted that members of the legislature may be designated by this term. The word "officers," as used in this article, will only include persons having executive and judicial duties to perform. A distinction is frequently taken between officers *de facto* and *de jure*. By the latter expression is meant one who is rightfully in office; by the former, one

who actually fills the place, although he may be a usurper. A person is with a certain looseness of expression sometimes called an officer *de facto* who is rightfully an officer and has all the evidences of lawful appointment, but who has committed an act whereby his office may be forfeited. It is, however, conceived that the correct term then is an officer *de jure* having a defeasible title. No one can raise a question as to the act of forfeiture except the State by an appropriate legal proceeding. It may waive the forfeiture, whereupon the officer's tenure is indefeasible and absolutely perfect. On the other hand, when an office is usurped it originates in a wrong and can have no element of right in it, even though some statute of limitation may prevent its rectification. The acts of an officer *de facto* are upheld as far as the public or third persons are concerned, although, as between him and the true officer, they may be nugatory; so, when an officer *de facto* is plaintiff and suing for property in his official character, he might be precluded from all recovery on account of the vice or infirmity in his appointment. But it would be plainly contrary to public policy and subversive of the ends of justice to maintain that the acts of an officer *de facto* should be wholly nugatory. It would, then, happen that the acts of a judge who happened to have received a certificate of an election to office, when in fact he was not elected, would be so completely nugatory that all judgments which he had rendered would be absolutely void, and all criminals who had been imprisoned or executed under his order would have been unlawfully bereft of liberty or murdered under forms of law. No such doctrine could, of course, be tolerated. If, however, a legal controversy takes place between an officer *de facto* and *de jure* as to the lawfulness of the former's title, the whole question of the right to the office must be considered as though he had never exercised official functions. This may take place by an appropriate legal proceeding, such as a writ of *quo warranto* or an information in the nature of a *quo warranto*.

II. The general mode of selection of officers in use in this country is either appointment by the U. S. or State executive, or election by the people or some part thereof. Under the U. S. Constitution, it is provided that the President shall nominate, and with the advice and consent of the Senate appoint, ambassadors, other public ministers and consuls, judges of the supreme court, and all other officers of the U. S. whose appointments are not in the Constitution otherwise provided for and which shall be established by law. To this direction there is a qualification to the effect that Congress may by law vest the appointment of such inferior officers as they think proper in the President alone, in the courts of law, or in the heads of departments. There is thus a distinction taken between "inferior" officers and those of another and superior class. The Constitution, however, points out no mode of distinguishing between the two. It is certainly reasonable to consider that all those specially named in the clause referred to—viz. ambassadors, public ministers, etc.—are not inferior officers, and, accordingly, Congress has no power to affect the mode of appointment by the nomination of the President and the advice of the Senate. It will be observed that in the case of the so-called "inferior" officers Congress can only vest the appointment in one of three agencies pointed out in the Constitution—either in the President alone or in the courts of law or in the heads of departments. It follows that it would not be lawful to provide for an election of these officers by the people directly. The theory of the Constitution is to adopt for the selection of judicial and administrative officers the mode of appointment rather than of election. On the other hand, under the State constitutions, a different theory is in general adopted. The plan of election of officers either by the entire people of the State or by a certain portion of them, as represented in city, village, and town organizations, usually prevails. In many of the States this is true even of judicial officers of the highest grade. It is commonly required that officers should take an oath of office before entering upon their duties. (See OATH.) In many instances, particularly where the receipt and disbursement of money are involved, or where the acts of the officer may be such as to affect the persons or property of individuals so as to give them a right of action, an official bond is required. There has been much discussion upon the point whether those acts are of such a nature as to precede the vesting of the powers and duties of the office, or whether the office vests before they are performed, and a failure to fulfil these requirements of the law is to be regarded as a ground of forfeiture. On this latter view the appointee would have the office, but would hold it by a defeasible title, subject to legal proceedings for a forfeiture. The decision of this question will depend much upon the language of the statute creating the office. If an officer was prohibited from *holding* the office before taking the oath or filing the bond, those acts would be vital to his existence as an officer; but if the language is that before he enters upon the duties of his office he must give a bond, etc., he will be an officer, though liable to have his office withdrawn by appropriate proceedings.

The power of removal from office is closely connected with that of appointment. The exact nature of its connection is a matter of great magnitude under the provisions of the U. S. Constitution, as there is no specific mention of the power of removal. It is clear that, as to all officers whose term of office is not explicitly mentioned in the Constitution, there is a power somewhere vested to remove them at pleasure. The only point of difficulty is as to the branch of government invested with its exercise. Is the power of removal vested in the President alone, or is it in him in conjunction with the Senate? As to the "inferior" officers already referred to, so far as Congress has power to regulate the mode of appointment, it may prescribe the term of office as well as the manner of removal. But in the absence of authorized legislation the stress of the inquiry is whether the sole power of removal is vested in the President alone, or in the President in conjunction with the Senate. It can scarcely be said that this question is as yet definitely determined. It has been claimed, on the one hand, that the power of the President to nominate, and with the advice of the Senate to appoint, involves the power to remove, and that this power of removal is vested solely in him. It is argued that removal is in its nature an executive act, and that it is indispensable to the right administration of public affairs that the President, who is responsible to the country for the proper management of the various departments of government, should be able to displace at once men who have proved incapable or unfaithful. Without this power of removal he cannot be held responsible for the misconduct of his subordinate; with it, the people may directly fasten upon him the consequences of mismanagement or corruption. If it be said that too vast a power is thus conferred upon him, the answer is that he is under the check of impeachment and removal from office, and that of public opinion acting promptly and efficiently by reason of our system of frequent elections. On the other hand, it is urged that the power of the President to *nominate* does not include the power to remove, and that this latter power can only be implied from that of *appointment*. Any implication of removal derived from that power would include the Senate, since the appointment is not complete by the action of the President alone. If this view be correct, wherein the power to appoint is vested in the President, by and with the advice and consent of the Senate, removal can only take place by the action of the President with the same advice and consent. The former view prevailed in the time of Washington in both houses of Congress by a narrow majority; in the House of Representatives by a vote of thirty-four members against twenty, and in the Senate by the casting vote of the Vice-President. It is a matter of recent history that this question led to a great struggle between the houses of Congress and President Andrew Johnson. It is not necessary to enter into the details of the contest. Prior to the accession of President Grant (Mar. 2, 1867) an act was passed by Congress regulating the tenure of certain civil officers. (See also the act of Apr. 5, 1869.) These statutes are in substance re-enacted in the *Revised Statutes of the U. S.*, §§ 1767–1775. These sections provide that every person holding any civil office to which he may be appointed with the advice and consent of the Senate shall be entitled to hold the office for the term for which he was appointed, unless sooner removed with the same advice and consent. This general rule is qualified by the further provision that (with the exception of the judges of the U. S. courts) there may be, during the recess of the Senate, a suspension by the President of any civil officer appointed as before stated until the end of its next session, and in the mean time some other person may be designated by the President to perform the duties of the suspended officer. Within thirty days after the commencement of the session the President is to nominate persons to fill the place of all officers suspended; and if the Senate, during the session, shall refuse to advise and consent to an appointment in the place of any suspended officer, then, and not otherwise, the President shall nominate another person as soon as practicable to the same session of the Senate for the office. The President has power by the Constitution and laws to fill all vacancies which may happen during the recess of the Senate by reason of death or resignation or expiration of term of office, by granting commissions which shall expire at the end of the next session. Nominations to permanently fill these offices should regularly be made to the Senate for confirmation within thirty days after the commencement of the next session after the vacancy is filled. If no appointment is

made during that session, the office remains in abeyance, without any salary, fees, or emoluments. The same rule is applied to all the offices in question vacant at the commencement of the session and not filled by temporary appointment. (*Revised Statutes*, § 1769.) The power of removal by the executive of a State is to some extent regulated in the State constitutions. It is impossible to refer to these provisions in detail. As to the large number of State offices which are filled by election for a definite term, the governor would not in general have any power of removal unless for good cause, and the officer would have a right to be heard by way of defence. As to those which are directly filled by appointment of the executive, with the advice and consent of the State senate, the same general questions as to the power of removal might be presented as have been referred to in connection with the office of the President of the U. S. Removal from a private office, such as that of a president of a university, is governed by different considerations. Such an appointment may assume the form of a contract, and may be governed by the rules upholding the obligation of contracts. (*Allen* v. *McKeon*, 1 Sumner's Reports, 276.)

III. When the term of office is fixed by the constitution, it cannot, of course, be reduced by the action of legislative bodies. It has also been decided that if the constitution declares an office to be elective, but leaves the length of the term to the discretion of the legislature, and this is subsequently fixed and an officer elected, his term of office cannot be extended by legislative act, since for the extended period he would not hold by election. (*People* v. *Bull*, 46 New York Reports, 57.) In other cases the term is in the discretion of the legislature. There are but few offices under the U. S. Constitution in respect to which the term is prescribed. The judges of the supreme and inferior courts hold during good behavior. This is not true of the territorial judges. Territorial courts, not being provided for in the Constitution, but being established by Congress, are not protected by the constitutional provision. The practice has been to appoint them for a term of years. All offices specifically created by the U. S. Constitution not being judicial in their nature are established for a term of years. The same term is usual in the State constitutions, and is largely made applicable even to judicial offices. Where no term is fixed by a constitution, the whole subject is under the control of the legislature, which may at any time abolish the office without making compensation to the officer. So it may enlarge official functions without making an increase of compensation.

IV. The duties of a public officer of course depend upon the law under which he is created. It is not within the scope of this article to state the various requirements of the statutes. It is only of importance to refer to general principles of law governing official conduct. The presumption of law is that official duties have been rightly performed. There is in general a presumption of authority, and not of usurpation. If a statute gives an officer discretionary power to be exercised by him upon his own opinion of certain facts, the prevailing rule of construction is that the statute makes him the exclusive judge of the existence of the facts. This rule is not to be applied to subordinate officers, who possess no authority except such as is conferred upon them by statutes, and their right to act is made to depend upon the existence of some fact. If they erroneously determine that such fact exists, and they act accordingly, their acts are void, and they may become personally liable for the consequences. The acts of a public officer when unlawful may either cause an injury to an individual or to society at large. In the former case the law gives a remedy to the individual by action; in the latter case the State may proceed against the wrong-doer by indictment or by impeachment. It is no defence to an officer, when called upon to answer in a court of justice for an illegal act, that he acted under the orders of the head of an executive department, nor is it important that he acted upon the high seas under color of naval discipline. This rule was applied in a case where a naval officer illegally assaulted and imprisoned one of his subordinates. In the great mass of cases coming before the courts the act complained of is one of negligence. (See NEGLIGENCE.) For personal neglect involving a breach of duty the officer is in general responsible, as where a superintendent of a canal negligently permits a sunken boat to remain in the canal, whereby damage is caused to the complainant. Still, public officers are not in general liable for the neglect or wilful acts of their subordinates, causing damage to individuals, where they have used reasonable care in their selection of servants. Thus, the postmaster of a city is not liable for the misconduct of a clerk in purloining money from letters, unless personal misconduct or neglect can be brought home to the postmaster himself. Some suggestions should be made as to the power of public officers to bind the government by contracts. It is well settled that they cannot bind the government by any acts beyond or contrary to the authority given them by law. The government is to be regarded as the principal and the officer as an agent; and if the government has limited its liabilities by statute, the restrictions are binding upon all who deal with the officer, as they are bound to take notice of the statute. Thus, the head of an executive department can bind the government by contract only when expressly authorized by law, or where an appropriation is made to be expended by him for a specific purpose. In this last case the officer acts without authority if he exceeds the appropriation. It is a further rule that the officer is not personally liable if he acts in the line of his duty and in the course of his authority. His engagements are binding upon the government, and not upon himself. This is true though he affix his own private seal to the contract. A public officer may, if he see fit, by the use of appropriate language, make himself exclusively liable or jointly with the government. Whenever he acts without authority he fails to bind the government, and will in general make himself personally liable.

There are some acts of the official heads of executive departments acting as instruments of the President of the U. S., which are not the subject of judicial cognizance. Whether this be the case or not must depend upon the nature of the act to be done. If one of the heads of departments is acting as the political or confidential agent of the executive merely to execute his will or to perform some matter in which there is a discretionary authority, his act cannot be examined judicially, though a different rule prevails where a specific duty is assigned by law and individual rights depend upon the performance of the duty. In this last case an individual who deems himself to be injured may have recourse to the law for redress. Questions frequently arise as to the liability of a ministerial officer, such as sheriff or constable, acting at the time under the order of a court. The real inquiry is whether the order will protect the officer. The general rule is that if the magistrate or court has jurisdiction (see JURISDICTION) over the subject, and an execution (see EXECUTION) regular in its form is issued, the officer cannot be held liable as a wrong-doer for rendering obedience to the order. A different rule will prevail if there is a want of jurisdiction. The order of the court to seize a debtor's property and to sell it to satisfy the debt does not point out the debtor's property, but leaves it to the sheriff's judgment to ascertain what can be properly regarded as belonging to the debtor. The officer in that respect acts at his peril, and can be sued by any party injured by a wrongful seizure. On the other hand, if the court itself points out specifically what property is to be taken by an officer, he has no discretion. He must obey, and can shield himself under the judicial mandate. Public officers are also criminally liable in certain cases for neglect of duty or oppression or extortion. These offences are in general misdemeanors. They may also be urged as grounds for a forfeiture of the office in the course of an appropriate legal proceeding. (See INFORMATION and QUO WARRANTO.) The great frauds and embezzlements recently practised by municipal and other officers have led in some of the States to stringent legislation. Thus, in New York the act of wrongfully obtaining and converting to one's use public money with intent to defraud, or wilfully paying or auditing a false claim whereby such money shall be obtained and converted, is made a felony, and punishable by imprisonment in a State prison (chap. 19, laws of 1875). The delinquent officer may also be liable to impeachment (see IMPEACHMENT), and also, in some instances, to removal from office by the action of the executive on due notice and hearing. (For these points, the constitutions and statutes of the respective States must be consulted.)

V. There are some important points to be noted concerning the compensation of officers. In some instances they are paid by fees; in other cases there is a compensation fixed by law and paid out of the public treasury. On an appointment to office compensation does not in general commence until the officer is liable to duty. Thus, if an officer in the navy should receive an antedated commission, he is not entitled to pay from the time of the date, but only from the time of his acceptance of the office. So, if an officer be suspended under the authority of the U. S. from service, and be subsequently restored, he is not entitled to compensation during the period of the suspension unless the order is revoked as made without cause and by mistake. If an officer be removed by the appointment of another, he practically continues in office until he receives notice of the appointment of his successor, and is entitled to compensation up to that time. There is quite a number of provisions in the statutes of Congress affecting the compensation of officers. (*Revised Statutes*, §§ 1760–1766,

§ 1782, § 1784, § 1790.) The principal of these are that no person who holds an office under the U. S. government, the annual compensation attached to which amounts to the sum of $2500, shall receive compensation for discharging the duties of any other office unless expressly authorized by law, and that no allowance or compensation shall be made to any officer or clerk by reason of the discharge of duties which belong to any other officer or clerk in the same or any other department, and that no allowance or compensation shall be made for any extra services whatever which any officer or clerk may be required to perform, unless expressly authorized by law, and finally that no officer in any branch of the public service or any other person whose salary or pay is fixed shall receive any additional pay or compensation in any form for the disbursement of public money or other service unless the same is authorized by law, and the appropriation therefor explicitly states that it is for such additional pay or compensation (§§ 1763–1765). Under provisions of law similar to these, it has been decided by the supreme court of the U. S. that the government is not liable upon an agreement by the head of a department to pay a clerk who continues to hold his place and draw pay as a clerk in the department for services rendered outside of the scope of his employment; *e. g.* making inquiries and collecting information in a foreign country. As a general rule of law, and without reference to prohibitory legislation, a salaried officer cannot claim compensation for additional duties imposed upon him by the legislature (*Smith* v. *New York*, 37 New York Reports, 518), nor can he claim extra compensation on the ground that he has performed the duties of his office with extraordinary diligence.

(Further information as to the subject of this article may be sought in the statutes of the respective States, and in Cole *On the Law and Practice of Quo Warranto* and in Tancred on the same.) T. W. DWIGHT.

Off'set, in surveying. An offset is a short course measured at right angles to a longer one. The method of surveying by offsets is used when the lines to be determined are irregular. It is also used in locating the positions of prominent objects lying near the principal lines of a survey. The method of determining the position of an irregular line by means of offsets is to run a straight course in the general direction of the line, and at suitable points of this course to measure offsets to the line in question; then, knowing the distance of each offset from the origin of the auxiliary course, the length of each offset, and its direction, whether to the right or left, the corresponding points of the line in question may be plotted. The irregular line found by giving these points will be an approximate representation of the line to be determined; the more numerous the offsets, the closer will be the approximation. The method of offsets is particularly valuable in filling in the outlines of a topographical survey, and especially in tracing the courses of roads, streams, and coast-lines.

Og'den, post-v. of Boone co., Ia., on the Chicago and North-western R. R., has good schools, 2 churches, 3 grain-elevators, a steam flouring-mill, 3 hotels, 1 bank, 1 newspaper, and stores. It is situated in a rich farming section. Pop. about 600. CARL BILLINGS, ED. "REPORTER."

Ogden, post-v. and tp., Riley co., Kan., on the Kansas Pacific R. R. Pop. 530.

Ogden, post-v. and tp., Lenawee co., Mich., on the Canada Southern R. R. Pop. 1515.

Ogden, post-v. and tp., Monroe co., N. Y. Pop. 2874. The township is intersected by the Erie Canal and the New York Central and Hudson River R. R. (ADAMS BASIN STATION).

Ogden, a v. (OGDEN CITY P. O.) and cap. of Weber co., Ut., at the junction of the Weber and Ogden rivers, at the mouth of Ogden Cañon, at the junction of the Central Pacific, the Union Pacific, the Utah Central, and the Utah Northern R. Rs., has large agricultural and mining interests, and 1 weekly newspaper. Pop. 3127.

Ogden (AARON), LL.D., b. at Elizabethtown, N. J., Dec. 3, 1756; graduated at Princeton 1773; served gallantly through the Revolution, in which he was successively aide-de-camp to Lord Stirling and to Gen. Maxwell, and was distinguished at Yorktown; became a lawyer after the peace; was boundary commissioner for New Jersey; was U. S. Senator 1801–03, governor 1812–13; commanded the New Jersey militia during the war of 1812, and became president-general of the Society of Cincinnati. D. at Jersey City Apr. 19, 1839.

Ogden (DAVID), b. at Newark, N. J., in 1707; graduated at Yale College 1728; studied law in New York; became the head of his profession in New Jersey; became judge of the Supreme Court 1772; was regarded as a Tory, though anxious for an equitable settlement of the questions between Great Britain and the colonies; took refuge in New York 1776; retired to England 1783, his property having been confiscated; returned to the U. S. 1790, and d. in Queens co., L. I., in 1800.

Ogden (JOHN), A. M., b. at Mount Vernon, O., in 1824; removed in childhood to what is now Crestline, O.; was educated by his own efforts; studied at Wesleyan University, Delaware, O., and for three years was principal of its normal department, and then for three years principal of the McNeely (O.) State Normal School; was principal of the State Normal School, Winona, Minn., 1859–62; served in the U. S. volunteers 1862–65; was the founder of Fisk University, Nashville, Tenn., and for a time its principal; afterwards became connected with the normal school at Worthington, O.; author of *The Science of Education.*

Og'densburg, city of St. Lawrence co., N. Y., on the St. Lawrence River, at the mouth of the Oswegatchie River, and on the Central Vermont R. R., and the terminus of the Rome Watertown and Ogdensburg R. R., 72 miles below Lake Ontario. It was incorporated in 1868. It is the head-quarters of the Northern Transportation Company's line of 20 screw-steamers plying between Chicago and intermediate lake ports. It contains 9 public schools, 6 churches, a paid fire department, good water-power, finely-shaded streets laid out at right angles, a post-office and U. S. court-rooms costing $275,000, 1 daily and 2 weekly newspapers, a good supply of water, 3 fine parks, a marine railway, and 3 banks. It has considerable commerce, and is a port of entry. Pop. 10,076.
N. H. LYTLE, ED. "DAILY JOURNAL."

Ogee'chee Lime, the *Nyssa capitata*, a small tree of the order Cornaceæ, growing in wet places in the Southern States. It has a soft wood and a remarkably sour edible red fruit about an inch long.

Ogeechee River rises in Green co., Ga., flows in a course generally parallel to that of the Savannah River, and falls into Ossabaw Sound. Its lower waters are navigable for steamers, and a large part of its course for keel-boats.

O'gemaw, county of Michigan. Area, 576 square miles. It is densely timbered, and has a good soil, but its resources are but little developed. Pop. 12.

Ogham is the name of a secret alphabet once in use by the Irish and other Celtic nations, but neither the origin nor the meaning of the name is known. The alphabet is often used on tombstones, but the inscriptions seldom contain more than a name. Such stones are frequent in Ireland, and a few are found in Scotland and Wales.

O'gilby (JOHN), b. in Edinburgh, Scotland, Nov., 1600; translated Homer, Virgil, and several other classic authors; published a number of atlases of various regions of the world, and was author of *America, being the most accurate Description of the New World* (London, folio, 1671); conducted the poetical part of the coronation pageantry 1661; erected a printing-house in London 1667, and was appointed royal cosmographer. D. at London Sept. 4, 1676.

Ogilby (JOHN D.), D. D., b. about 1808; graduated at Columbia College, N. Y., 1829; was rector of the grammar school of that institution 1829–30; professor of languages at Rutgers College 1832–40; became a clergyman of the Protestant Episcopal Church, and was professor of ecclesiastical history in the general theological seminary, New York, from 1841 until his death at Paris in 1851. Author of *An Argument against the Validity of Lay Baptism* (1842), and of *The Catholic Church of England and America* (1844).

O'gilvie (JAMES), b. in Scotland about 1760; came to America about 1785; established a classical academy at Richmond, where Winfield Scott, the future general, and other celebrated men were his pupils; retired to the backwoods of Kentucky, where in a log cabin he composed a series of lectures afterwards delivered with success in the Atlantic States; went to Scotland to lay claim to a peerage about 1819, and d., probably by his own hand, at Aberdeen Sept. 18, 1820. He published *Philosophical Essays* (1816).

O'gle, county of N. Illinois. Area, 576 square miles. It is rolling and very productive. Live-stock, grain, and wool are leading products. There are manufactures of carriages, wagons, etc. The county is traversed by Rock River and by various railroads. Cap. Oregon. Pop. 27,492.

O'gle (BENJAMIN), b. in Maryland in 1749; was in the provincial council before the Revolution; was governor of Maryland 1798–1801; d. at Annapolis July 6, 1809.—SAMUEL OGLE, proprietary governor of Maryland 1735–42, and 1747–52, had previously held office in Ireland. D. 1751.

O'glesby, post-v. of La Salle co., Ill., on the Illinois Central R. R.

Oglesby (RICHARD JAMES), b. in Oldham co., Ky., July 25, 1824; left an orphan at the age of eight years, he re-

moved to Decatur, Ill., in 1836; learned the carpenter's trade, which, with farming, occupied his time until 1844, meanwhile studying law, and in 1845 was licensed and commenced practice at Sullivan. In 1846 he returned to Decatur, and was commissioned first lieutenant in the 4th Illinois regiment (Col. E. D. Baker's), and with which he participated at Vera Cruz and Cerro Gordo. Resuming his practice at Decatur in 1847, he pursued a course of study at the Louisville Law School, graduating in 1848; in 1849 he journeyed overland to California and engaged in mining until 1851, when he again resumed his residence and practice at Decatur. In 1858 he was defeated for Congress, but was elected to the State senate in 1860, which seat he resigned, and accepted the coloneley of the 8th Illinois Volunteers; commanded a brigade at capture of Forts Henry and Donelson, and made brigadier-general Mar. 21, 1862, remaining in command of brigade until the battle of Corinth, where he was severely wounded, and disabled until April, 1863, when he returned to duty, having meanwhile (Nov., 1862) been promoted to be major-general, and was assigned to the 16th corps. Resigned May, 1864, and in November of that year was elected governor of Illinois (1865–69); re-elected in 1872, but chosen U. S. Senator Jan., 1873.

O'glethorpe, county of N. E. Georgia. Area, 480 square miles. It is uneven and generally very fertile. Cotton and corn are staple products. It is traversed by a branch of the Georgia R. R. Cap. Lexington. Pop. 11,782.

Oglethorpe, post-v., cap. of Macon co., Ga., on the Flint River and on the Georgia Central R. R. Pop. 400.

Oglethorpe (James Edward), b. in London Dec. 22, 1696; entered the army 1710; went to Oxford 1714; served under Prince Eugene and Marlborough 1715–17; entered Parliament in 1722 for Haslemere; obtained a charter in 1732 and a grant for the founding of Georgia and the colonization of poor debtors in that province; founded Savannah 1733; received the Protestant emigrants of Salzburg 1734, and soon after revisited England, but returned to Savannah with John and Charles Wesley in 1735; in 1736 he took a regiment of troops thither; became in 1737 a colonel and commander-in-chief in Carolina and Georgia; made an unsuccessful attack on St. Augustine 1739–40, and in 1742 repelled by stratagem the attack of the Spaniards upon Georgia; returned finally to England 1743; served as major-general against the Pretender 1745; was court-martialled for misconduct 1746, but acquitted; became lieutenant-general 1747, and general 1765, when he retired upon half pay. D. at Cranham Hall, Essex, July 1, 1785. (See his *Life*, by Robert Wright, 1867.)

O'glio [anc. *Ollius*], a river of Northern Italy, rises in the Rhætian Alps, flows through Lombardy, and joins the Po, after a course of 150 miles, near Borgoforte, 10 miles S. W. of Mantua.

O'Gor'man (James), D. D., b. in Ireland in 1814; came to the U. S., and 1859 was consecrated Roman Catholic bishop of Rhaphanea *in partibus infidelium*, and appointed vicar-apostolic of Nebraska. D. July 4, 1874.

Ogowai, a river of Western Africa, is formed in lat. 40′ S., 100 miles from the coast, by the junction of the Okanda and the N'gooyai, and has been explored up to this point. In the dry season it is navigable for light-draught steamers up to Goombi, 95 miles from the coast, but in the wet season it rises 15 feet and carries an immense quantity of water to the Atlantic through its several mouths.

Og'yges, in Greek mythology, the first king of Thebes, whose oldest gate was called after him the Ogygian. During his time the waters of Lake Copais rose above its banks and inundated the whole valley of Bœotia. An Ogygian deluge is also spoken of in Attica, and Ogyges himself is sometimes represented as a Bœotian authocthone, sometimes as an Egyptian king, and was brought into manifold connections with the earliest legendary history of Greece.

Ohatch'ie, tp. of Calhoun co., Ala. Pop. 857.

Ohi'o, one of the central States of the American Union, lying between the great lakes and Ohio River. It is between the parallels of 38° 23′ and 41° 58′ N. lat., and between the meridians of 80° 31′ and 84° 48′ W. lon. from Greenwich. It is bounded on the N. by Michigan and Lake Erie, on the E. by Pennsylvania and West Virginia, on the S. by West Virginia and Kentucky, from which it is separated by Ohio River, and W. by Indiana. Its greatest length from N. to S. is about 210 miles, and from E. to W. it has a breadth of 195 miles. Its area is 39,964 sq. m., or 25,576,960 acres.

Face of the Country, etc.—The State has no mountains, but the greater part of its surface is a table-land elevated about 1000 feet above the sea-level, rising to a height of 1300 or 1400 feet on the divide or watershed which separates the waters flowing into Lake Erie from the tributaries of Ohio River, and attaining nearly the same height in the line of hills which crosses the State just below the parallel of 40°. From this table-land there is a gentle de-

Seal of Ohio.

scent to Lake Erie on the N. (the lake-shore being about 650 feet above the sea), and a somewhat more rapid descent to Ohio River on the S., that river being 414 feet above the sea at Cincinnati and 680 at Pittsburg. Between the two nearly-parallel ridges named, which have a general direction from E. to W., there is a level and at times marshy tract. In the N. and N. W. parts of the State there are prairies of considerable extent. The streams flowing into the Ohio have cut deep channels of erosion in the southern part of the State through the soft and disintegrating limestones and sandstones, and have thus created apparent high bluffs along their banks. The lake-shore of the State is 230 miles in extent, and Ohio River has a course of 436 miles of navigable waters along the S. and S. E. The *rivers* of the State are the Ohio, and its tributaries on the N. bank—viz. the Mahoning, the Muskingum (formed by the junction of Walhonding and Tuscarawas rivers), the Scioto, and its principal affluent, the Olentangy or Whetstone River, the Little Miami, and the Great Miami. The Hockhocking and Brush are smaller streams. These rivers drain about three-fourths of the State, and have about 285 miles of navigable waters aside from those of the Ohio. The principal rivers flowing into Lake Erie are the Maumee, Sandusky, Huron, Vermilion, Black, Rocky, Cuyahoga, Chagrin, Grand, Ashtabula, and Conneaut. The Maumee is the only one of these streams which is navigable, and this usually only to Perrysburg (18 miles), though in high stages of water steamboats go to Defiance, 42 miles farther. The lake-shore has not many bays or indentations, but there are good harbors at Cleveland, Sandusky, and Maumee Bay. Sandusky Bay, the largest of these, extends nearly 20 miles inland, and in the bay and in the lake near it are a number of islands of considerable size. Some of these have extensive vineyards. There are no large lakes in the State, but several small ones in Mercer, Shelby, and some of the other western counties.

Geology.—The whole State, except in the mere surface-soil, belongs to the Palæozoic system. No formations above the coal-measures are found within its limits until we come to the Quaternary; the Permian, Triassic, Cretaceous, and Tertiary systems having no representatives in the State. Nor does the Eozoic system come to the surface at any point, the different groups and strata of the Carboniferous, Devonian, and Silurian systems being all that are found in the State, except the surface-soil, which is Quaternary, and a large proportion of it Drift. These Quaternary deposits Prof. Newberry regards as having covered a very long period, during which there were several alternations of elevation and subsidence and of an arctic and a very mild climate. The lowest of the Drift or Quaternary deposits were the result of general glaciated action, which furrowed and striated the rocks and excavated valleys, channels, and lake-basins to a great depth, most of which were subsequently filled up, wholly or in part, by later deposits; while this same glaciated action threw down a tough blue unstratified clay known as *boulder clay*, or hard pan; upon this was deposited a finely-laminated clay known as the *Erie clay;* next above came a layer of carbonaceous matter, called the *Forest bed*, which was a deposit from a growth of vegetation covering a large part of the area previously covered by the ice-sheet. This is the source of many of the peat deposits of Southern Ohio. Above this come in successive layers the stratified deposits of the *Lacustrine drift*, the scattered boulders, blocks, cobble-stones, and sometimes masses of iron and copper, which constitute the *Iceberg drift*, with occasional deposits of hills, ridges, and banks corresponding to the "Kames"

and "Eskers" of the Old World Drift; and finally, above all these, and more recent than any of them, the *Lake ridges*, embankments of sand, gravel, and clay which run imperfectly parallel with the present margin of Lake Erie. These are six or eight in number, the lowest being 100 feet, and the highest about 250 feet, above the present level of the lake. The Carboniferous system as developed in Ohio is a portion of the great Appalachian coal-field, which extends through Western Pennsylvania, West Virginia, Eastern Kentucky and Tennessee, Northern Alabama, and Central Mississippi. It occupies in Ohio about 12,000 sq. m., or nearly one-third of the area of the State. But though all the groups found in this area belong to the Carboniferous system, they are by no means all of them coal-bearing. Beginning with the western border of the coal-field, a short distance E. of Portsmouth, and following a nearly N. N. E. line almost to Lake Erie—along which line the Carboniferous rocks first show themselves as overlying the Devonian system, which occupies the central N. E. and N. W. portions of the State—the strata are developed in the following order: the Waverley group, succeeding immediately to the Erie shale (the highest member of the Devonian), and consisting of the Cuyahoga shale, the Berea grit, the Bedford, Cleveland, and other shales; next above this comes the Lower Carboniferous limestone, succeeded by a thick conglomerate; and next in order the lower coal-measures, in which, interstratified with fire-clays, sandstones, limestones, and shales, the Ohio geological survey have found seven distinct veins of coal of different qualities, but all or nearly all valuable either for combustion, smelting, or gas-producing purposes. The lower coal-measures have an average thickness of about 400 feet. Next to these succeed the lower barren measures, also about 400 feet thick, in which there are local seams of coal occurring among the beds of limestones, sandstones, and shale. The upper coal-measures come next, about 350 feet in thickness, and, like the lower coal-measures, containing, interstratified with sandstones, limestones, clays, and shale, six more coal-veins, some of them of great value. Still above this are found irregular deposits, in some places attaining a thickness of 300 feet, of what are known as the upper barren measures, containing thin local seams of coal. The aggregate thickness of all the workable beds of coal is estimated by Prof. Newberry at about 50 feet, of which perhaps not more than 30 feet can be conveniently wrought. The amount of coal in this district is roughly calculated at 3,000,000,000 tons. The annual product for several years past has been from 2,500,000 to 3,000,000 tons. The Devonian system comes to the surface in immediate connection with the Waverley group, which forms the rim of the coal-basin on its western side. Here we have in descending order the Erie shales, the shales, flagstones, limestones, and water-lime of the Portage and Chemung groups; the slates, shales, and limestones of the Hamilton group, a narrow belt of the Utica shales; and the Silurian system comes to the surface with its limestone and sandstone strata of the Niagara group, underlaid immediately by the Helderberg limestones, the Onondaga salt group not appearing in Ohio. In the S. W. corner of the State still older rocks make their appearance, members of the Trenton group of limestones and of the Black River and Birdseye limestone groups. In the N. W., as in the N. E. of the State, the Devonian system overlaps the Silurian, and the Oriskany, Corniferous, and Hamilton groups extend into the State from Indiana and Southern Michigan.

Minerals.—We have already spoken of the abundance of coal in the State. Several of the large veins are excellent for smelting purposes, containing very little sulphur and hardly a trace of phosphorus. Iron ore of excellent quality is equally abundant, extending over an area of nearly 12,000 miles in the southern part of the State, where the coal is readily accessible. The amount of iron ore mined annually must exceed 600,000 tons, as the production of pig iron in 1872 and 1873 exceeded 400,000 tons per annum. Salt is also largely produced from salt springs, the yield in 1873 being 1,400,000 barrels, and that of 1874 a larger amount. Petroleum is produced to the extent of about 1,500,000 gallons in the State; lime is burned to the amount of 500,000 barrels, and water-cement to a moderate extent. There are numerous quarries of excellent sandstone and limestone for building, and grindstones and burr or mill stones. There are numerous mineral springs in the State, and large deposits of marl in the Maumee Valley and elsewhere.

Soil and Vegetation.—In 1873 the amount of woodland or forest in the State was reported at 5,650,000 acres, a reduction of more than 1,000,000 acres in twenty years. In 1820 nearly four-fifths of the surface of the State was covered with forests; now there is but little more than one-fifth. The principal forest trees are, among the evergreens, a few pines, hemlocks, tamaracks, cypresses, and spruce, mainly found in the northern portions of the State, and some of them only in the swamps; and of deciduous trees, white, red, Spanish, black, burr, swamp, jack, and swamp white oak; blue, white, and black ash; beech; black, sugar, and red or swamp maple; bitternut, shagbark, thick shellbark, mockernut, and pignut hickory; white, red or slippery, and water elm; sycamore, hackberry, dogwood, ironwood, hop hornbeam, black walnut, butternut, yellow poplar or tulip tree, buckeye (which gives its popular name to the State), pawpaw; 5 species of poplar, including the white poplar, quaking ash, cottonwood, balsam poplar or tacamahac, and balm of Gilead; the red and wild or black cherry; the linden; 5 species of thorn; the honey locust, the box elder, redbud, Kentucky coffee tree; several species of mulberry; the gum tree, sassafras, etc. The flora of the State is extensive and varied; it includes most of the flowering plants common to the Eastern States, and a large proportion of those peculiar to the Mississippi Valley. Among the medicinal plants, ginseng, valerian, colombo, gentian, cohosh, mandrake, blood and snake roots are indigenous.

Climate.—We give below our usual statistics of temperature and rainfall for nine places of observation, covering as many different sections of the State:

METEOROLOGICAL DATA.	Cleveland, lat. 41° 30′, lon. 81° 47′; elevation, 685 feet.	Hudson, lat. 41° 15′, lon. 81° 30′; elevation, 1137 feet.	Little Mountain, lat. 41° 38′, lon. 81° 17′; elevation, 1180 ft.	Toledo, lat. 41° 40′, lon. 83° 32′; elevation, 602 feet.	Urbana, lat. 40° 06′, lon. 83° 44′; elevation, 1044 feet.	Massillon, lat. 40° 47′, lon. 81° 37′; elevation, 982 feet.	Marietta, lat. 39° 25′, lon. 81° 30′; elevation, 640 feet.	Portsmouth, lat. 38° 45′, lon. 82° 54′; elevation, 523 feet.	Cincinnati, lat. 39° 06′, lon. 84° 26′; elevation, 523 feet.
	°	°	°	°	°	°	°	°	°
Mean temperature of the year.	45.87	49.51	48.98	49.55	48.30	52.06	50.56	55.83	51.37
Highest " " "	96	98	95	100	96	99	101	104	103
Lowest " " "	8	2	—5	—16	—12	—8	4	8	6
Range of annual temperature..	88	96	100	116	108	107	97	96	97
Mean temperature of spring...	44.39	44.17	43.40	47.45	49.49	47.12	50.80	55.71	51.59
Highest " "	86	88	83	88	88	86	90	96	94
Lowest " "	15	14	9	15	10	15	17	23	19
Range of spring temperature.	71	74	74	73	78	71	73	73	75
Mean temperature of summer	70.52	71.63	69.50	71.99	75.11	72.92	74	78	77.50
Highest " "	96	98	95	100	96	99	101	104	103
Lowest " "	44	41	37	44	47	50.51	52.50	59	56
Range of summer temperature	52	57	58	56	49	48.49	48.50	45	47
Mean temperature of autumn.	53.06	52.73	53.03	51.27	54.07	55.23	53.79	57.95	56.53
Highest " "	87	89	81	90	82	83	89	93	92
Lowest " "	17	13	11	11	22	25	13	17	14
Range of autumn temperature	70	76	70	79	60	58	76	76	78
Mean temperature of winter..	31.08	29.51	29.97	26.99	32.66	32.99	37.08	40.81	35.33
Highest " "	66	63	60	63	61	62.50	65.50	70	69
Lowest " "	8	2	—5	—16	—12	—8	4	8	6
Range of winter temperature..	58	61	65	79	73	70.50	61.50	62	63
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
Mean annual rainfall............	38.43	34.74	44.45	38.64	39.78	32.44	39.57	38.32	36.49
Rainfall of spring..................	6.65	8.35	10.35	11.78	7.42	7.22	7.39	9.18	9.41
" summer	10.24	7.10	10.15	10.87	10.62	9.15	10.56	11.62	8.77
" autumn................	10.24	7.77	9.56	9.72	6.91	6.30	6.85	6.38	7.99
" winter.................	11.30	11.52	14.39	6.27	14.73	9.77	14.77	11.14	10.32

There is a very marked difference between the climate of the northern and southern portions of the State: the former is characterized by rigorous winters and generally a heavy fall of snow, which lies long on the ground (longer a few miles S. of the lake-shore than in the immediate vicinity of the lake). The summers and autumns are temperate and agreeable. In the southern part the summers are long, and characterized often by intense heat. The

winters are usually mild, with but little snow. The State is very healthy, and malarious diseases, which in its early history were quite prevalent, have almost entirely disappeared.

Zoology.—Very few of the larger wild animals are left in the State. The bear is nearly extinct; the large or gray wolf and the coyote or prairie wolf are rare; deer are occasionally seen, and the raccoon, opossum, skunk, weasel, ground-hog, as well as rabbits, hares, squirrels, and the smaller rodents, are abundant in some parts of the State. Game-birds are plentiful in their season, and most of the birds of prey and song-birds found in New York and Pennsylvania are found in Ohio. Of the reptiles, the number and species are those common to Pennsylvania and the States of the Mississippi Valley. Most of the streams are stocked with trout, black bass, perch, roach, and other fresh-water fish, considerable attention having been paid to fish-culture. Lake Erie has a bountiful supply of the lake white-fish and the salmon or lake trout, as well as many other fish.

Agricultural Productions.—Ohio has a very large proportion of arable land, as well as excellent grazing lands. It has been for many years one of the leading States of the Union in the production of cereals, and also largely engaged in stock-raising. The census of 1870 gives the value of the farms of the State at $1,054,465,226; of farming implements and machinery, $25,692,787; the value of all farm products, $198,256,907, ranking below New York and Illinois in this particular; of animals slaughtered and sold for slaughter, $40,498,375, Illinois alone having a larger amount; the forest products were $2,719,140; the market-garden products, $1,289,272; the orchard products, $5,843,679; and wages paid to farm laborers, $16,480,778. The following table gives the comparative quantities of the principal crops and live-stock statistics for 1870, 1872, and 1874:

Crops, etc.	Amount in 1870.	Amount in 1872.	Amount in 1874.
Wheat..................bushels...	27,882,159	18,087,664	26,896,818
Rye...................... " ...	846,890	295,843	235,435
Indian corn.......... " ...	67,501,144	103,053,234	101,815,494
Oats...................... " ...	25,347,549	25,825,742	19,557,014
Barley.................. " ...	1,715,221	1,528,266	1,233,934
Buckwheat .... " ...	180,341	266,807	240,015
Flax ....pounds...	17,880,624	9,060,588	6,233,341
Hemp .... " ...	50,000		
Wool.................... " ...	20,539,643	17,536,209	16,684,276
Hay......................tons........	2,289,565	1,763,350	1,508,385
Hops.....................pounds...	101,236		
Tobacco .... " ...	18,741,973	34,900,996	9,245,520
Maple-sugar......... " ...	3,469,128	2,834,714	1,248,955
Sorghum and maple molasses ....gallons...	2,376,039	1,324,450	1,244,364
Irish potatoes.......bushels...	11,192,814	7,832,297	7,348,907
Sweet potatoes...... " ...	230,295	215,023	170,502
Peas and beans..... " ...	45,443	46,250	43,580
Apples .... " ...	11,012,582	21,632,475	15,918,974
Peaches............... " ...	309,639	405,619	2,235,574

Crops, Live-Stock, etc.	Amount in 1870.	Amount in 1872.	Amount in 1874.
Pears....................bushels...	67,047	153,968	136,587
Grapes ....pounds...	15,853,719	9,616,427	17,965,604
Beeswax............... " ...	22,488		
Honey .... " ...	763,124		
Domestic wine, includes vineyards..........gallons...	2,577,907	425,923	1,078,056
Clover-seed...........bushels...	102,355	308,903	194,066
Flax-seed.............. " ...	631,894	457,379	368,800
Grass-seed............ " ...	48,811	51,110	62,817
Butter ....pounds...	50,266,372	45,413,066	44,335,657
Cheese.................. " ...	8,169,486	34,403,857	33,123,880
Milk sold..............gallons...	22,275,344	23,785,115	25,112,000
Value of all live-stock.........	$120,300,528	$117,700,746	$130,148,655
Horses................number...	704.664	724,602	738,839
Mules and asses... " ...	16,065	22,958	26,312
Milch cows........... " ...	654,390	....	778,500
Working oxen...... " ...	23,606	1,765,331	894,700
Other cattle.......... " ...	758,221		
Sheep .... " ...	4,928,635	4,464,898	4,333,868
Swine.................... " ..	1,728,968	2,315,554	1,778,399

Among the special agricultural productions which have attained prominence in Ohio is the culture of flax, in which it leads all the other States, and the culture of the grape for the production of wine. There are two distinct wine-districts in the State—one on the Ohio River, in the vicinity of Cincinnati, noted for many years past for its Catawba wines; the other on the shores and islands of Lake Erie, in and near Sandusky Bay. The island climate has proved very favorable to the production of wine-grapes, and from the two districts from 1,000,000 to 2,000,000 gallons of wine are annually produced.

Manufacturing Industry.—No complete statistics of the manufactures of Ohio have been published since the census of 1870. A few industries have reported, but even these very imperfectly. We are therefore under the necessity of giving the figures of 1870 for the industrial products of the State. There were in that year 22,773 manufacturing establishments in Ohio, employing 137,202 hands (119,686 men, 11,575 women, and 5941 children); the amount of capital reported was $141,923,964; wages paid, $49,066,488; raw materials used, $157,131,697; and annual product, $269,713,610: the State ranks fourth in the amount of her manufactures. No portion of the census statistics is so unreliable as those of manufactures, and this is especially true of the larger States. Could a really accurate census of these productions have been taken in 1875, the amount of annual production would doubtless have been more than double that stated above. The leading branches of manufacture were the following: iron, and all manufactures of iron, $37,239,685; of these there were 65 furnaces for making pig iron, and their product was $10,956,938; in 1874 the number of furnaces was 81 and of stacks 94, and the production a little more than 400,000 tons or about $13,500,000. Flouring-mill products in 1870 employed 699 mills and produced of flour and meal $24,965,629; 953 establishments produced clothing to the value of $13,194,998; 219 factories produced agricultural implements to the amount of $11,907,366; 227 machine-shops turned out machinery valued at $11,248,402; 1280 saw and planing mills produced lumber valued at $10,820,562; 58 packing-houses put up meats and pork to the value of $10,655,950. In 1875, 93 packing-houses put up of pork products alone $16,597,490, besides other meats. 915 furniture warehouses produced furniture to the amount of $6,801,085; 300 establishments produced distilled, malt, and vinous liquors to the amount of $13,085,697; 882 tanning and currying establishments produced leather to the value of $7,263,332; 452 tobacco and cigar factories produced tobacco, cigars, and snuff to the value of $5,307,591; carriages and cars were produced in 1232 establishments to the amount of $7,605,435; sash, doors, and blinds, in 142 establishments, to the value of $3,416,998; coal oil was rectified in 25 establishments to the amount of $5,388,473; casks, barrels, tubs, and kegs were produced in 658 shops to the amount of $3,554,171; tin, copper, and sheet-iron ware, in 652 shops, produced $3,214,285; woollen goods, in 191 mills, to the amount of $3,187,815; printing, newspaper, job, and publishing, in 187 offices, to the amount of $4,228,948; soap and candles, in 42 establishments, $2,976,544; boots and shoes, 164 shops, $2,866,803; cheese, 195 factories, $2,287,804; bread and other bakery products, 279 bakeries, $2,202,818; saddlery and harness, 787 shops, $2,074,268; oils, animal and vegetable, in 38 refineries, $3,803,283; marble and stone work, including monuments and tombstones, 197 establishments, $2,221,023; brick, 331 kilns, $1,252,857; hardware, 36 establishments, $1,048,960; hubs and other wagon material, 58 factories, $1,712,208; malt, 34 establishments, $1,129,695; paints, lead, and zinc, 14 mills, $1,061,280; patent medicines and compounds, 17 establishments, $1,004,200; stone and earthen ware, 170 potteries, $970,749 (this was reported in 1873 as exceeding $2,000,000).

Mining and Fishery Products.—The census of 1870 reports 535 mines, quarries, oil-wells, and peat-cutting establishments in Ohio, employing 11,241 hands, having a capital of $9,017,197, paying wages to the amount of $4,682,571, using raw material of the value of $437,714, and producing annually $7,751,544. The State inspector of mines gives, as the result of careful inquiry and returns from the greater part of the coal-mines in the State, the production of coal in the State in 1872 and 1873 at a little more than 5,000,000 tons each year—in 1874 not quite so much; at the average price of $3 per ton, which for the entire State is a very fair average, this would make the coal production alone over $15,000,000. From 280,000 to 340,000 tons of iron ore are raised annually, and perhaps half as much more smelted in favorable seasons; the production of pig iron in 1874–75 was said to be 419,052 tons. The amount of petroleum, salt, building-stone, etc. produced is very large, and all the items included under the head of mining products in 1875 must have exceeded $50,000,000. The products of the fisheries are understated in the census of 1870. Its report gives 106 fishing establishments, employing 565 hands, $262,000 capital, $14,512 of material, and putting up fish to the amount of $383,121. The actual export of white-fish, lake trout, etc. from the lake ports considerably exceeds $1,500,000, aside from the amounts consumed at home.

Railroads and Canals.—There were in the State Jan. 1, 1876, 56 lines of railroads operated by steam, having an aggregate length of main tracks and branches of 5650 miles, equivalent to 7218 miles of single track, and the entire length of the main track and branches of the roads

which pass through the State, or those which have the whole of their course in the State, is 7809 miles. The proportion of capital, debts, and cost of roads and equipment for which Ohio was responsible was—of capital stock paid in, $151,386,011.98; of funded and floating debt, $164,290,040.62; total stock and debt, $315,676,052.60. The actual cost of roads, equipment, etc. for the Ohio portion was $282,937,812.29; the proportion of gross earnings for Ohio was $35,254,117.60; of operating expenses, $25,573,058.14; of net earnings, $9,681,059.46. All the great trunk-lines across the continent have a portion of their route through Ohio, and the four great lines, New York Central, Erie, Pennsylvania Central, and Baltimore and Ohio, lease directly or indirectly the Ohio lines which form parts of their through routes. Most of the lines running from N. to S. through the State also have connections with the S. or S. E., and nearly all of them will eventually, if they do not now, form parts of railway lines extending to the Gulf of Mexico, or to Savannah, Charleston, Wilmington, or Richmond and Norfolk; while the E. and W. lines all connect directly or by a moderate circuit with Chicago, St. Louis, and Omaha.—The *canals* of the State have an aggregate length of 736 miles. They are—Ohio and Erie, extending from Cleveland to the valley of the Muskingum, to Columbus, and thence down the Scioto Valley to Portsmouth; Wabash and Erie, which follows the Maumee Valley to Fort Wayne, and thence extends to Terre Haute, Ind.; Miami Canal, which branches from the Wabash and Erie a few miles N. of Defiance, follows the valley of the Auglaize up to the watershed, and, crossing that, passes down the Miami Valley to Hamilton and Cincinnati.

Finances.—The State debt amounted on Nov. 15, 1875, to $7,949,920.12, of which $4165 bears no interest. Except $1665, which bears no interest, it is held out of the State. There are also school and trust funds on which the State pays interest, the principal of which amounts to $4,121,393.52, and which together constitute what is known as the irreducible State debt. The entire indebtedness of the State therefore amounts to $12,071,373.64. The sinking fund meets the interest on this entire debt, and had Nov. 15, 1875, a balance of $1,131,078.64 toward the principal of the funded debt. The actual receipts into the treasury in the year ending Nov. 15, 1875, were $5,325,192.03, and the actual disbursements were $4,707,810.70. The capital of the school fund proper Nov. 15, 1875, was $2,917,567.37, and of other educational funds $1,203,826.15.

Commerce.—There are four customs districts in the State. We give below the imports and domestic and foreign exports of each for the year ending June 30, 1875, the entrances and clearances for the year ending June 30, 1874, and the shipping registered, enrolled, and licensed as belonging to each port, for the same year:

Customs Districts.	Imports for year ending June 30, 1875.	Domestic exports for year ending June 30, 1875.	Exports of foreign goods for year ending June 30, 1875.	Entrances of vessels for year ending June 30, 1874.			Clearances of vessels for year ending June 30, 1874.			Total entrances and clearances of vessels, year ending June 30, 1875.	Total tonnage of vessels entered and cleared, year ending June 30, 1875.	Vessels registered, enrolled, and licensed, year ending June 30, 1874.	Tonnage of such vessels.
				Vessels.	Tonnage.	Crews.	Vessels.	Tonnage.	Crews.				
Cincinnati	$656,354*	....	......	......	....	....	......	....	....	......	....	220	67,750.71
Cuyahoga	348,025	$747,360	$6,032	924	198,676	8,069	947	189,587	7,780	1,871	388,266	466	86,519.67
Miami	164,525	1,729,187	......	302	69,517	2,610	286	71,339	2,645	588	140,856	170	13,945.99
Sandusky	17,867	86,406	.....	136	12,089	631	155	14,332	737	291	26,421	100	16,618.03
Totals	$1,186,771	$2,562,953	$6,032	1,362	280,282	11,310	1,388	275,258	11,162	2,750	555,543	956	184,834.40

Banks, Savings Banks, etc.—There were on Jan. 1, 1876, 171 national banks doing business in Ohio, besides 13 closed or closing. Of these, 5 were in Cincinnati and 6 in Cleveland. The resources of the whole were $106,132,031.98; their aggregate capital was $29,546,000; their undivided profits, $9,503,094; and their other liabilities, $67,083,837.98. There were, besides these, 20 incorporated banks, with a capital of $525,503; 22 savings banks, with a capital of $1,879,324 (these had in Nov., 1875, assets amounting to $3,894,049.52, and liabilities, including capital, dividends of profit, etc., $4,293,671.96). Their capital was $1,274,280. There were 198 private banks; capital, $6,561,743.

Insurance.—There were on Jan. 1, 1875, 37 joint-stock fire and fire marine insurance companies in Ohio, having an aggregate capital of $5,157,500, all paid up except $153,047.55 in stock notes; their gross assets were $8,472,839.61; their liabilities, including capital, were $7,255,371.35; income for the year, $3,469,602.46; their expenditures, $2,898,760.99; their surplus over liabilities and capital, $1,217,468.26; the aggregate risks in force at that date, $220,910,039.01; and the amount of dividends paid, $412,836.65. There were at the same time 17 mutual fire companies in the State, holding $4,571,840.06 in premium notes, and reporting assets, including premium notes, at $5,782,973.34; their liabilities were stated at $899,432.44, their income for the year at $554,102.09, their expenditures at $394,130.05, and the risks in force Jan. 1, 1875, at $186,564,372.65. At the same time, 105 companies from other States and countries were doing business in Ohio, and during the year took risks in the State amounting to $203,166,398.47. *Life Insurance.*—There were in Ohio Jan. 1, 1875, 6 life insurance companies, but only 3 of them were doing business; these had an aggregate capital of $320,000; admitted assets were $1,252,122.49; unadmitted assets, $118,238.77; liabilities, $892,232.48; income, $564,537.81; expenditures, $384,437.44; number of policies in force, 7023; amount of same, $12,600,796; number of policies lapsed during the year, 1120; amount of same, $1,938,515. At the same date 47 companies from other States and countries were insuring lives in Ohio. These companies had admitted assets amounting to $393,636,236.08, and had 847,901 policies in force, calling for the sum of $2,114,978,134.96, while the lapsed policies of the year amounted to 70,536, covering an amount of $177,524,207.96.

Population.

Year of census.	Total pop.	Males.	Females.	White.	Colored.	Natives.	Foreigners.	Density.	Ratio of increase.	Illiteracy.	Of school age, 5 to 20.	Of military age, males, 18 to 45.	Of voting age, males, 21 years and upward.	Citizens.
1800	45,365	24,613	20,752	45,028	337	....	....	1.13						
1810	230,760	120,626	110,134	228,861	1,899	....	....	5.77	408.67					
1820	581,434	303,130	278,304	576,572	4,723	....	....	14.55	151.96					
1830	937,903	484,502	453,395	928,329	9,574†	....	....	23.46	61.31	58,411	371,771§			
1840	1,519,467	784,100	735,367	1,502,122	17,345‡	....	....	38.02	62.01	67,851	618,932§			
1850	1,980,329	1,016,808	963,521	1,955,050	25,279	1,757,746	218,193	49.55	30.33	66,020	767,267	379,519	411,170	381,790
1860	2,339,511	1,190,162	1,149,349	2,302,808	36,673	2,011,262	328,249	58.54	18.14	64,828	864,582	444,095	519,524	480,122
1870	2,665,260	1,337,550	1,327,710	2,601,946	63,213	2,292,767	372,493	66.59	13.90	173,172	959,640	501,750	640,820‖	592,350

Education.—The following items are from advanced sheets of the superintendent of schools' report for the year ending Nov. 15, 1875: Number of persons of school age (6 to 21 years), 1,017,726; number of school-houses, 11,834; number of new school-houses built in 1875, 146; number of pupils enrolled in the schools, 712,129; average number of pupils in daily attendance, 433,814; number of different teachers actually employed, 22,492; number necessary to supply the schools, 14,763; cost of school-houses erected within the year, $1,046,918; value of school-houses and grounds in the State, $19,876,504; total amount of receipts for school purposes, including balance on hand Nov. 15, 1874, $11,803,077.64; total expenditures for school purposes, $8,170,959.98. Average number of weeks the schools were in session, 29.3; average cost for each child enrolled, $17.29; average monthly wages of male teachers, $59.50; of female teachers, $45. Number of private schools reported in 1874, 220; number of teachers of such schools reported, 265; number of pupils, 13,066.

* Dutiable goods in the year ending June 30, 1874.
† Including 6 slaves. ‡ Including 3 slaves. § Whites only.
‖ The enumeration of these in 1875 was 647,226.

Normal Schools.—There are 10 normal schools and normal institutes in the State. Two only receive aid from public funds—viz. the Cincinnati normal school and the North-western normal school at Fostoria. The following table gives the statistics of the 10 schools, so far as they can be ascertained:

Title of School, etc.	Location.	When founded.	How supported—by State, private funds, or tuition.	Instructors.	Students. Male.	Students. Female.	Model-school pupils.	No. of graduates past year.	Value of property.	Income from all sources.	Annual expenditures.	Volumes in library.
									$	$	$	
Cincinnati Normal School.	Cincinnati	1868	City aid..........................	9	...	85	.....	45	....	8,411	8,400	200
N. W. Ohio Normal School	Ada, Hardin co.	1871	Tuition and endowment...	8	43	29	244	11	26,000	4,375	4,617	700
North-western Nor. School	Fostoria.........	1870	Part State.........................	9	250	150	.....	6	....	....	....	200
Hopedale Normal School..	Hopedale.......	1855	Tuition and private funds	9	98	71	.....	2	47,000	3,300	3,300	1,600
National Normal School*..	Lebanon........	1855	Tuition and private funds	17	51	42	250	60	90,000	25,709	24,850	3,500
Western Reserve Normal School..........................	Milan............	1832	Tuition and private funds	3	75	68	.....	.....	5,000	....	....	
Mount Union Nor. School	Mount Union.	1846	Tuition..............................	12	63	48	234	.....	....	....	....	1,446
Orwell Normal Institute..	Orwell	1865	Tuition and private funds	3	100	92	.....	12	6,000	....	....	325
Ohio Central Nor. School..	Worthington.	1871	Tuition and private funds	12	95	100	20	17	15,000	3,600	3,600	1,600
Nor. and Training School of Wilberforce Univ.....	Near Xenia...	1872	Connected with university	6	10	12	.....	4				
Totals..........................	....	......	....	88	785	697	748	157	189,000	45,395	44,767	9,571

In 1874, 75 teachers' institutes were held, at an expense of $15,318.81, of which $3526.65 was paid by the teachers themselves or their friends, and $11,792.16 from the teachers' institute fund, derived from examination fees of teachers.

Higher Education.—The following table gives the particulars for 1874–75 in regard to the colleges and scientific and professional schools of the State, so far as they are ascertainable:

Colleges, Universities, Scientific and Professional Schools.	Location.	Date of organization.	Under what control.	Professors and instructors.	Students. Preparatory.	Students. Collegiate, scientific, or professional.	Value of buildings, grounds, apparatus, etc.	Amount of productive endowment.	Income from endowment.	Income from all sources.	Amount of scholarship funds.	Number of volumes in library.
I. *Colleges and Universities:*							$	$	$	$	$	
Antioch College..................................	Yellow Springs.........	1853	Unitarian	9	60	39	80,000	123,000	9,888	14,612	......	5,700
Baldwin University	Berea....................	1846	Meth. Episcopal..	10	140	39	94,500	54,300	3,300	......	3,000	1,200
Buchtel College................................	Akron....................	1871	Universalist......	15	100	112	250,000	40,000	2,400	6,000	20,000	1,100
Capital University............................	Columbus	1850	Evang. Lutheran.	6	....	80	100,000	....	......	......	......	3,000
Cincinnati University........................	Cincinnati	1873	Non-sectarian	5	....	55	......	....	29,424	68,598		
Cincinnati Wesleyan University (female).....	Cincinnati..............	1842	Meth. Episcopal..	18	106	114	225,000	....	......	32,000		
Dennison University...........................	Granville	1831	Baptist...........	11	106	62	90,000	150,000	11,400	15,160	10,500	11,000
Farmers' College of Hamilton co..............	College Hill............	1848	Non-sectarian	9	45	14	20,000	67,000	4,000	......	......	2,000
Franklin College...............................	New Athens............	1825	United Presb.....	8	121	27	10,000	....	......	......	......	3,000
Geneva College.................................	West Geneva...........	1849	Reformed Presb..	5	170	....	10,000	....	......	3,000	......	350
German Wallace College........................	Berea	1864	Meth. Episcopal..	6	69	42	43,703	37,000	3,566	3,648	24,930	900
Heidelberg College.............................	Tiffin	1850	Reformed German	9	104	71	40,000	70,000	5,000	6,172	60,000	2,000
Hiram College..................................	Hiram	1867	Disciples.........	9	199	26	45,000	50,000	3,000	6,000	......	2,500
Kenyon College.................................	Gambier................	1825	Protestant Epis...	8	13	53	260,000	240,000	7,000	7,700	......	19,000
McCorkle College..............................	Bloomfield..............	1873	Presbyterian.....	3	40	12	8,000	8,760	640	905	......	76
Marietta College...............................	Marietta................	1835	Presbyterian.....	11	117	85	130,000	115,000	8,500	......	38,000	26,000
Mount St. Mary's of the West..................	Cincinnati	1851	Roman Catholic..	18	39	42	170,000	.....	......	12,000	......	14,500
Mount Union College...........................	Mount Union...........	1846	Meth. Episcopal..	23	492	317	100,000	351,225	......	27,540	......	4,168
Muskingum College.............................	New Concord...........	1837	Non-sectarian	5	42	44	22,000	....	......	1,650	......	900
Oberlin College................................	Oberlin	1834	Congregational...	20	258	215	170,000	115,000	8,000	20,603	......	12,000
Ohio Central College..........................	Iberia...................	1854	United Presb.....	5	112	33	15,000	....	......	......	......	900
Ohio University................................	Athens..................	1804	Non-sectarian	6	69	36	50,000	75,000	4,262	6,866	......	7,600
Ohio Wesleyan University......................	Delaware...............	1844	Meth. Episcopal..	12	193	180	177,000	244,000	15,000	16,500	40,000	14,100
One-Study University..........................	Scio, New Market Station, Harrison co.	1866	Meth. Episcopal..	4	....	175	25,000	....	......	3,000	......	800
Otterbein University..........................	Westerville.............	1847	United Brethren..	9	150	75	75,000	50,000	4,500	8,000	......	1,500
Richmond College..............................	Richmond...............	1815	Non-sectarian....	4	121	....	25,000	....	......	1,270	......	200
St. Xavier College.............................	Cincinnati..............	1842	Roman Catholic..	20	114	155	150,000	....	......	11,000	......	19,000
University of Wooster.........................	Wooster.................	1866	Presbyterian	12	72	149	140,000	....	......	......	......	3,000
Urbana University.............................	Urbana..................	1850	New Church (Swedenborg).	4	14	9	15,000	25,000	5,000	6,000	......	5,000
Western Reserve College.......................	Hudson	1826	Presbyterian	10	58	65	90,000	207,000	13,193	16,513	......	10,000
Wilberforce University........................	Near Xenia.............	1863	African M. E.....	12	153	12	72,950	20,000	......	2,141	6,300	4,000
Willoughby College............................	Willoughby	1865	Methodist	5	120	24	75,000	....	......	......	......	3,000
Wilmington College............................	Wilmington.............	1871	Friends	4	....	12	50,000	....	......	......	......	502
Wittenberg College............................	Springfield.............	1844	Evang. Lutheran.	13	49	78	75,000	125,000	12,000	15,500	......	7,000
Xenia College..................................	Xenia..................	1850	Meth. Episcopal..	5	45	122	25,000	....	......	2,500	......	300
II. *Scientific Schools:*												
Ohio Agricultural and Mechanical College....	Columbus...............	1870	State.............	9	....	59	300,000	700,000	30,000	30,500	......	1,000
Scientific department Dennison University...	Granville	1831	Dennison Univ...	Re	por	ted wi	th colle	ge.				
" " Oberlin College........	Oberlin	1834	Oberlin College...	"	"	"	"					
Toledo University of Arts and Trades.........	Toledo	1872	Trustees..........	1	....	89	15,000					
III. *Schools of Theology:*												
German M. E. Seminary (Ger. Wallace College)	Berea	1864	Meth. Episcopal..	5	....	12	......	12,070	960			
Heidelberg Theological Seminary.............	Tiffin	1850	Reformed German	2	....	15	......	23,000	1,600	......	......	2,700
Lane Theological Seminary....................	Cincinnati...............	1832	Presbyterian	5	....	49	150,000	250,000	17,000	......	......	12,000
Theological dept. Mount St. Mary's of the West	Cincinnati..............	1851	Roman Catholic..	7	....	34						
St. Mary's Theological Seminary..............	Cleveland...............	1849	Roman Catholic..	3	....	28	75,000					
Theological Seminary of St. Charles Borromeo	Carthagena	1860	Roman Catholic..	8	....	52	25,000	....	......	......	......	4,800
Theol. Sem. of Evan. Joint Synod of Ohio....	Columbus	1830	Evang. Lutheran.	6	....	30	80,000	....	......	......	......	3,500
Theological department of Oberlin College....	Oberlin	1834	Congregational...	10	....	40	70,000	40,000	3,200			
Theological department of Wittenberg College.	Springfield.............	1845	Evang. Lutheran.	2	....	16	......	....	......	......	......	2,000
Theological School of Wilberforce University.	Xenia...................	1863	African M. E. Ch.	5	....	8						
Union Biblical Seminary......................	Dayton..................	1871	United Brethren..	3	....	19	10,000	25,000	5,000	......	......	200
United Presbyterian Theological Seminary...	Xenia...................	1794	United Presb.....	5	....	29	......	45,000	2,900	......	......	3,500
IV. *Schools of Law:*												
Law School of Cincinnati College............	Cincinnati..............	1833	Cincinnati College	4	....	66	......	....	......	2,500	.... .	1,500
" " Wilberforce University........	Xenia...................	1872	Wilberforce Univ.	2	....	1						
Ohio State and Union Law College............	Cleveland..............	1856	Trustees..........	8	....	....	......	....	......	......	......	3,000
V. *Schools of Medicine:*												
Cincinnati College of Medicine and Surgery..	Cincinnati..............	1851	Trustees..........	12	....	108	30,000	....	......	......	......	500
Cleveland Medical College....................	Cleveland....	1843	Trustees..........	15	....	70	100,000	....	......	3,500	......	2,000
Medical College of Ohio.	Cincinnati..............	1819	Trustees..........	10	....	252	......	....	......	......	......	5,000
Miami Medical College.........................	Cincinnati............ .	1852	Trustees..........	11	....	130	35,000					
Medical department of University of Wooster.	Cleveland...............	1869	Trustees..........	12	....	90	40,000					
Starling Medical College and Hospital........	Columbus...............	1847	Trustees..........	9	....	138	200,000	....	......	......	......	300
Eclectic Medical Institute....................	Cincinnati..............	1843	Trustees..........	7	....	143	80,000					
Homœopathic Hospital College................	Cleveland...............	1849	Trustees..........	17	....	65	50,000	....	......	......	......	1,000
Ohio College of Dental Surgery..............	Cincinnati..............	1845	Trustees..........	7	....	24	15,000	....	......	......	3,000	75
College of Pharmacy of Baldwin University..	Berea	1867	Trustees..........	3	....	4	......	....	......	......	200	
Cincinnati College of Pharmacy..............	Cincinnati..............	1849	Trustees...... .	3	....	153	2,000	....	......	......	......	100

Special, Charitable, and Reformatory Education.—The Ohio Asylum for the deaf and dumb was founded in 1826 at Columbus. In 1829 the State purchased 10 acres of land and commenced the erection of buildings for it. In the forty-eight years which followed, the expenditure for additional land, buildings, repairs, and betterments was $727,237.26. Buildings for printing and bookbinding are connected with the asylum. Its current expenses are about $81,000 annually. The number of pupils in attendance in

*This school has also a collegiate department and business college, attended in 1874 by 1314 students.

1874 was 468—272 males and 196 females; the average daily number 400; average daily expense per head 56 cents. The asylum for the blind is also at Columbus. It was established in 1837, but its present buildings and site were not provided till after 1847. It has 17½ acres of land, and its buildings and repairs, with the land and permanent improvements, have cost about $421,100. The number of pupils in 1874 was 169—males 94, females 75; average attendance, 119; annual expenses, $32,275. The Ohio State Asylum for idiotic and imbecile youth is also at Columbus. It was founded in 1857, but occupied rented buildings till 1868, when it removed into the buildings erected for it. It has 187⅓ acres of land, and the expenditures for buildings, land, and permanent improvements have been about $437,100. Its current annual expenses are about $69,100. It had 386 children under its care in the year 1874, and an average daily number of 352. It had 19 teachers, instructors, and assistants. The Ohio Soldiers' and Sailors' Orphans' Home is on a farm of 100 acres near Xenia, donated for the purpose in 1870, and $245,463.15 were expended for buildings and permanent improvements on it up to 1875. The current expenses in 1874 were $61,051.75. There were 14 teachers and other officers, and 555 children were under instruction, 218 of them received during the year. The average daily number was 520. The Ohio State Reform Farm is near Lancaster. The farm contains 1170 acres of land, purchased in 1857. The expenditures for buildings, farm, and betterments to 1875 were about $220,000, and the current expenses about $49,000 in the year 1874. During the year 636 boys were in the institution, and the average daily number was 460. The farm is conducted on the *family* plan, each family numbering from 30 to 60 boys. The results have been very satisfactory. The Girls' Industrial School, established 1869, is at White Sulphur Springs; the farm consists of 180 acres. The land and buildings had cost to 1875 about $100,000. The annual expenses in 1874 were $20,202. The whole number of girls in the school in 1874 was 166; average daily number, 143.

Charitable and Penal Institutions not Educational.—There are 4 State hospitals for the insane in Ohio, and 2 others which receive State patients—viz. the Western Ohio Insane Hospital, at Dayton; the Northern, at Newburg, near Cleveland; the Central, at Glenwood, near Columbus (now in course of erection, the former hospital having been destroyed by fire); and the South-eastern, at Athens. The Longview Hospital near Cincinnati receives both white and colored patients from the State, and the Lucas Co. Hospital at Toledo also receives State patients. The insane population of these 6 hospitals, taking the number treated through the year, is over 3000, and the average number under treatment at any one time not far from 2000. The current expenses and ordinary repairs of these asylums cost the State about $420,000 annually, aside from the cost of buildings and grounds. The State penitentiary at Columbus is apparently well conducted. It had Nov. 1, 1874, 1005 prisoners; 509 had been received and 371 discharged during the year. Notwithstanding heavy losses from fire and the depression of business, the receipts from the convicts' labor, U. S. prisoners, visitors' fund, etc. exceeded the entire expenditure by $7412.02, the total receipts being $179,367.33, and the total expenditures $171,955.31. The prison manufactures gas for the other public institutions of Columbus, and a part of the convicts are employed in cooperage, in the manufacture of enamelled hollowware, and other labor for contractors.

Newspapers.—In 1870, Ohio had 395 newspapers and periodicals, having an aggregate circulation of 1,388,367, and issuing annually 98,548,814 copies. Of these, 26 were dailies, having 139,705 circulation; 8 tri-weeklies and 3 semi-weeklies, with 20,760 circulation; 299 weeklies, with 923,502 circulation; 8 semi-monthlies and 47 monthlies, with a circulation of 293,800; 2 bi-monthlies and 2 quarterlies, with 10,600 circulation. In 1875 the number had increased to 537, of which there were 35 dailies, 10 tri-weeklies, 5 semi-weeklies, 407 weeklies, 1 bi-weekly, 12 semi-monthlies, 63 monthlies, 1 bi-monthly, and 3 quarterlies.

Churches.

Denominations.*	Church organizations, 1870.	Church edifices, 1870.	Sittings, 1870.	Church property, 1870.	Church organizations, 1875.	Church edifices, 1875.	Ministers, 1875.	Members or communicants, 1875.	Adherent population, 1875.	Value of church property, 1875.
All denominations	6,488	6,284	2,085,586	$25,554,725	8,120	6,830	5,391	513,566	2,524,820	$33,328,000
Baptists (regular)	555	545	164,020	2,533,000	735	725	437	49,469	225,000	3,871,500
Baptists, Free-Will, Seventh-Day, Tunker, etc	158	157	38,850	225,500	178	175	128	10,680	41,500	391,400
Christian Connection (including also Disciples)	681	610	167,625	1,366,990	753	678	476	48,793	290,870	1,987,500
Congregationalists	198	195	87,150	1,385,585	227	222	196	19,278	78,000	1,873,000
Protestant Episcopalians	114	112	51,150	1,343,280	114	114	112	10,122	42,000	1,820,000
Evangelical Association	157	140	33,500	338,500	180	160	133	14,450	57,500	577,500
Friends	91	91	26,050	218,770	95	95	......	7,200	28,000	260,000
Jews	7	7	4,000	360,584	8	8	8	1,600	6,400	400,000
Lutherans	477	476	131,050	1,392,975	563	559	409	33,780	135,000	1,864,000
Methodists	2,161	2,115	714,146	6,540,910	2,572	2,509	1,715	161,428	645,200	8,143,500
Moravians	4	4	1,200	14,000	4	4	7	600	2,500	18,000
New Jerusalem (Swedenborgians)	8	6	1,350	55,000	9	7	7	700	2,800	70,000
Presbyterians (regular)	628	625	233,945	3,580,756	741	716	598	75,409	312,000	4,328,000
Presbyterians (United, Associate, Cumberland, etc.)	164	165	60,000	564,970	180	178	123	17,425	70,000	729,500
Reformed Church (late Dutch)	2	2	700	9,500	2	2	2	300	1,200	10,200
Reformed Church (late German)	288	266	88,900	887,700	309	298	217	21,630	86,450	1,008,000
Roman Catholics	295	295	160,700	3,959,970	545	506	377	....	410,000	4,997,800
Shakers	4	4	2,100	16,000	4	4	......	900	2,000	20,000
Spiritualists	4	3	850	4,100	4	3	......	750	3,000	5,000
Unitarians	8	8	3,100	60,000	9	9	9	800	3,200	75,000
United Brethren in Christ	370	344	85,350	484,310	710	623	346	30,207	120,800	612,500
Universalists	78	78	20,750	175,950	98	96	60	4,445	18,000	224,600
Union churches	33	33	8,600	34,775	40	39	31	3,600	14,400	48,000

Constitution, Courts, Representatives in Congress, etc.—The executive authority of the State is vested in a governor, lieutenant-governor, and treasurer, each elected for two years; a secretary of state and attorney-general, elected for the same period, but on alternate years to the first-named officers; a comptroller of the treasury and State school commissioner, each elected for three years; a board of three commissioners of public works, elected for the same period, but one going out of office each year; and finally of an auditor of state, elected for four years. The legislature is composed of a senate of varying numbers (its present number of members being 37) and a house of representatives, which also differs with different years, according to a schedule in the act of apportionment; the present number is 111. The judicial power is vested in a supreme court, having both appellate and original jurisdiction, of 5 judges, chosen for five years, one judge retiring from office each year, and the judge having the shortest term to serve being chief-justice; of a superior court, with 6 or 7 judges; of 10 courts of common pleas, with 50 or more judges, elected for five years in their several districts and sub-districts (Hamilton co. constituting one district, and the other districts being divided into three sub-districts). These judges also hold county courts and district courts, in which one of the supreme court judges presides, in every county in the State. There are also probate judges for each county, and justices of the peace for each township. Suffrage is allowed to all male citizens of the U. S. 21 years of age and residents of the State for a year, soldiers, marines, idiots, insane persons, and those convicted of infamous crimes being excluded. The State is entitled to 20 Representatives in Congress.

Cities and Towns.—Columbus, the capital of the State, in 1870 had 31,274 inhabitants, and Cincinnati, the chief city of the State, 216,239; Cleveland had 92,829; Toledo and Dayton, from 30,000 to 32,000 each. Springfield, Hamilton, Portsmouth, Zanesville, and Akron, from 10,000 to 15,000 each; Canton, Chillicothe, Mansfield, Steubenville, and Youngstown, from 8000 to 10,000 each; Circleville, Delaware, Fremont, Ironton, Lancaster, Marietta, Massillon, Mount Vernon, Newark, Piqua, Pomeroy, Tiffin,

*There was also in 1870, 1 Second Advent church, with one church edifice, 300 sittings, and $1000 of church property.

Wooster, Xenia, and East Cleveland, between 5000 and 8000 each; Bellair, Gallipolis, Lima, Urbana, Warren, Alliance, Galion, Norwalk, Painesville, and Salem ranged between 3500 and 5000 inhabitants; Ashland, Bellefontaine, Bucyrus, Defiance, Elyria, Findlay, Greenville, Hillsboro', Kenton, Lebanon, Marion, Middletown, New Philadelphia, New Richmond, Oberlin, Sidney, Troy, Upper Sandusky, and Van Wert, from 2500 to 3500 inhabitants; and Barnesville, Bryan, Cambridge, Crestline, East Liverpool, Jackson, London, Middleport, Napoleon, Piqua (Franklin co.), Putnam, Ravenna, Ripley, Wapakoneta, Washington, Willsville, and Wilmington, each exceeded 2000 inhabitants.

Counties.—The number of counties is 88, as follows:

Counties.	Pop., 1870.	Males, 1870.	Females, 1870.	Pop., 1860.	True valuation, U.S. census, 1870.	Assessed valuation, 1875.
					$	$
Adams	20,750	10,297	10,453	20,309	9,555,481	6,099,889
Allen	23,623	11,949	11,674	19,185	12,664,050	10,817,590
Ashland	21,933	10,830	11,103	22,951	16,067,439	13,239,444
Ashtabula	32,517	16,071	16,446	31,814	19,425,000	16,435,712
Athens	23.768	11,955	11,813	21,364	10,474,263	8,821,395
Auglaize	20,041	10,275	9,766	17,187	8.642,293	7,869,800
Belmont	39,714	19,730	19,984	36,398	29,547,000	21,389,140
Brown	30,802	15,221	15,581	29,958	15,961,419	11,275,178
Butler	39,912	20,017	19,895	35,840	42,000,000	33,750,805
Carroll	14,491	7,195	7,296	15,738	13,650,000	8,981,058
Champaign	24,188	12,151	12,037	22,698	19,648,235	21,317,153
Clarke	32,070	16,201	15,869	25,300	37,905,000	27,672,900
Clermont	34,268	16,887	17,381	33,034	22,611,631	15,018,690
Clinton	21,914	11,064	10,850	21,461	20,733,702	14,662,371
Columbiana	38,299	17,064	19,235	32,836	36,257,471	23,571,397
Coshocton	23,600	11.808	11,792	25,032	20,791,461	13,682,770
Crawford	25,556	12,866	12,690	23,881	24,786,902	15,483,060
Cuyahoga	132,010	66,725	65,285	78,033	106,575,000	92,359,728
Darke	32,278	16,612	15,666	26,009	30,436,350	19,368,985
Defiance	15,719	8,047	7,672	11,886	7,940,596	5,744,293
Delaware	25,175	12,748	12,427	23,902	25,035,973	16,499,982
Erie	28,188	14,252	13,936	24,474	15,276,166	12,222,642
Fairfield	31,138	15.762	15,376	30,538	27,305,235	18,404,630
Fayette	17,170	8,847	8,323	15,935	16,637,986	14,607,049
Franklin	63,019	31.967	31,052	50,361	66,546,900	50,649,291
Fulton	17,789	9,083	8,706	14,043	6,616,103	5,111,878
Gallia	25.545	12,839	12,706	22,043	9,415,259	7,863,277
Geauga	14,190	7,114	7,076	15,817	11,029,795	8,206,698
Greene	28,038	14,012	14,026	26,197	31,498,478	23,291,280
Guernsey	23,838	11,609	12,229	24,474	12,567,368	10,935,968
Hamilton	260,370	128,530	131,840	216,410	341,250,000	222,930,563
Hancock	23.847	11,943	11,904	22,886	18,064,233	12,328,921
Hardin	18,714	9,545	9,169	13,570	26,741,519	9,226,930
Harrison	18,682	9,191	9,491	19,110	13,619,073	13,292,130
Henry	14,028	7,295	6.733	8.901	6.417,713	4,511,710
Highland	29,133	14,468	14,665	27,773	24,243,858	15,743,493
Hocking	17,925	8,987	8,938	17,057	8,423,962	7,774,999
Holmes	18,177	9,103	9,074	20,589	11,630,473	8,408,792
Huron	28,532	14,503	14,029	29,616	26,831,575	18,332,400
Jackson	21,759	11,125	10.634	17,941	8,400,000	5,156,493
Jefferson	29,188	14,211	14,977	26.115	28,931,260	20,023,480
Knox	26,333	13,060	13,273	27,735	23,702,975	16,728,601
Lake	15,935	7,785	8,150	15,576	14,171,449	10.473,555
Lawrence	31,380	16,030	15,350	23,249	11,334,186	9,100,487
Licking	35,756	17,526	18,230	37,011	38,437,990	27,088,271
Logan	23,028	11,469	11,559	20.996	22,177,673	14,193,760
Lorain	30,308	15,158	15,150	29.744	24,879,670	18,434,021
Lucas	46,722	23,673	23,049	25,831	32,287,500	24,265,190
Madison	15,633	7,791	7.642	13.015	22,036,807	14,892,730
Mahoning	31,001	15,619	15,382	25,894	27,510,000	19,599,858
Marion	16,184	8,328	7,856	15,490	18,649,693	13,216,671
Medina	20,092	9,984	10,108	22,517	20,712,540	13,116,577
Meigs	31,465	15,873	15.592	26,534	15,437,670	9,720,988
Mercer	17,254	8,826	8,428	14,104	5,515,078	4,685,230
Miami	32,740	16,363	16,377	29,959	30,927,538	22,238,254
Monroe	25,779	12,941	12,838	25,741	8,047,939	5,925,672
Montgomery	64,006	32,800	31,206	52,230	68,775,000	46,605,410
Morgan	20,363	10,073	10,290	22,119	10,282,582	8,474,881
Morrow	18,583	9,228	9,355	20,445	18.254,095	12,663,326
Muskingum	44,886	21,899	22,987	44,416	25,031,981	26,430,390
Noble	19,949	10,039	9,910	20,751	8,810,543	6,539,488
Ottawa	13,364	7,011	6,353	7,016	4,601,810	5,205,465
Paulding	8,544	4,466	4,068	4,945	4,725,000	2,473,266
Perry	18,453	9,060	9,393	19,678	13,247,489	8,884,322
Pickaway	24,875	12,728	12,147	23,469	36,562,734	19,989,515
Pike	15,447	7,711	7,736	13,643	9,660,000	5,209,637
Portage	24,584	12,311	12,273	24,208	19,919,420	16,633,145
Preble	21,809	10,847	10.962	21,820	29,665,461	18,117,650
Putnam	17,081	8,687	8,394	12,808	8,472,202	5,909,756
Richland	32,516	16,195	16,321	31,158	24,184,794	22,091,000
Ross	37,097	18,406	18,691	35,071	32,824,329	22,075,759
Sandusky	25,503	12,936	12.567	21,429	17,353,597	13,264,643
Scioto	29.302	14,785	14,517	24,297	19,624,631	12,023,183
Seneca	30,827	15,508	15,319	30,868	23,133,987	17,615,666
Shelby	20,748	10,525	10,223	17,493	15,487,565	10,178,581
Stark	52,508	26,444	26,064	42.978	47,884,648	33,749,100
Summit	34,674	17,441	17,233	27,344	39,661,650	22,699,865
Trumbull	38,659	19,635	19,024	30,656	34,941,818	20,679,795
Tuscarawas	33,840	17,013	16,827	32,463	20,200,145	17,387,091
Union	18,730	9.424	9,306	16,507	14,115,946	10,725,695
Van Wert	15,823	8,136	7,687	·10,238	7,513,837	6,445,799
Vinton	15,027	7,486	7,541	13,631	5,583,937	4,246,684
Warren	26,689	13,342	13,347	26,902	35,496,536	22,156,399
Washington	40,609	20,460	20,149	36,268	17,161,659	13,683,681
Wayne	35,116	17,467	17,649	32,483	28,213,234	24,169,708
Williams	20,991	10.730	10,261	16,633	11,406,819	7,602,381
Wood	24,596	12,566	12,030	17,886	11,908,537	9,624,259
Wyandot	18,553	9,466	9,087	15.596	12,749,284	10,256,313
Totals	2,665,260	1,337,550	1,327,710	2,339,511	2,235,430,300	1,598,575,862

History.—The first explorations of the present territory of Ohio were made by the French under La Salle about 1680, and, though they made no actual settlement, yet they claimed the territory and planted their military posts on the Ohio, never relinquishing their claim till 1763. Prior to La Salle's discovery the greater part of what now constitutes the State of Ohio was inhabited by tribes of Indians superior in intelligence and civilization, and probably also in religious knowledge and in military skill, to the aborigines found here by the French, and later by English settlers. Their mounds and fortifications, whether intended for defence or for burial-places for their great chieftains, were constructed with an artistic skill as well as a high degree of culture to which the Indians of the last two or three centuries can lay no claim. Many of these mounds have been opened and their contents examined, but it has not been satisfactorily settled where among the prominent races of the human family the Mound-builders belonged. Some have believed them to be the lost tribes of Israel; others, with more probability, have regarded them as of the same race as the Moquis of Arizona, or perhaps as either Toltecs or Aztecs. But when the French soldiers passed through the country, or the American trappers and hunters visited it, they found there tribes of Indians differing in no respect from those of New York or Pennsylvania, though perhaps they were not so warlike or revengeful as their neighbors in the adjacent States. There do not seem to have been any white settlers within the limits of the State previous to Apr., 1788, when a colony from New England founded Marietta. In December of the same year a settlement was made on the present site of Cincinnati. Virginia, Massachusetts, Connecticut, and New York all laid claim to portions of the territory, their claims being based on their chartered grants, but all eventually ceded the right of eminent domain to the U. S., Virginia and Connecticut reserving, however, the ownership of about 3,700,000 acres each—the Connecticut lands forming what was called the Western Reserve, and the Virginia the region about the Falls of the Ohio, which eventually became a part of Indiana. The Western Reserve began to be settled about 1800, and by that time there were in the present bounds of the State, then a part of the North-west Territory, about 45,000 inhabitants. They suffered from Indian incursions from 1792 till about 1799. In 1802, Ohio was admitted into the Union as a State with nearly its present boundaries. During the war of 1812 it suffered from repeated raids of British and Indian bands, and Major Croghan, then a youth of twenty-one, gained a high reputation for his gallant defence of the fort at Sandusky with 100 men against Proctor with 500 British troops and a considerable force of Indians. The most noteworthy action of that war, however, so far as Ohio was concerned, was the battle of Lake Erie, fought Sept. 10, 1813, at Put-in Bay, in which the gallant commodore O. H. Perry defeated a superior British squadron in a desperate battle. The growth of the State since that time has been rapid but uneventful. During the late civil war it sent into the field its full quotas of brave and gallant troops; and through the energy and patriotism of its chief magistrates they were well equipped and provided for the great conflict, while the noble women of the State with untiring zeal and industry cared for the sick and wounded with an ample and almost lavish generosity. From no other State of the Union was there so long or so grand a list of the foremost actors in the great struggle. During the war one of her most honored citizens was secretary of the treasury, and subsequently chief-justice of the U. S.; another was secretary of war; another was the first general-in-chief. The State was twice subjected to raids from Confederate bands, the second time at the hands of the guerilla chief, Gen. John H. Morgan.

Governors.

I. *Territorial.*

Arthur St. Clair..July, 1788–1802
Charles W. Byrd (acting)....1802–03

II. *State.*

Edward Tiffin....1803–07
Thomas Kirker (acting).1807–08
Samuel Huntington....1808–10
Return Jonathan Meigs.1810–14
Othniel Looker (acting)..1814–14
Thomas Worthington....1814–18
Ethan Allen Brown....1818–22
Allen Trimble (acting)...1822–22
Jeremiah Morrow....1822–26
Allen Trimble....1826–30
Duncan McArthur....1830–32
Robert Lucas....1832–36
Joseph Vance....1836–38
Wilson Shannon....1838–40
Thomas Corwin....1840–42
Wilson Shannon....1842–44
Thomas W. Bartley (acting)....1844–44
Mordecai Bartley....1844–46
William Bebb....1846–49
Seabury Ford....Jan., 1849–50
Reuben Wood....1850–July, '53
William Medill (acting), July, 1853–Jan., '54
William Medill....1854–56
Salmon P. Chase....1856–60
William Dennison....1860–62
David Tod....1862–64
John Brough *....1864–65
Charles Anderson (acting)....1865–66
Jacob Dolson Cox....1866–68
Rutherford B. Hayes....1868–72
Edward F. Noyes....1872–74
William Allen....1874–76
Rutherford B. Hayes....1876–

* Died in office.

Electoral and Popular Votes for President and Vice-President.

Year of election.	Candidates for whom the electoral vote of the State was cast.	Electoral vote.	Pop. vote.	Candidates of the opposition.	Pop. vote.	Third-party candidates.	Pop. vote.	Fourth-party candidates.	Pop. vote.
1804	Thomas Jefferson P..... George Clinton V.-P....	3	Unknown.	Charles C. Pinckney P... Rufus King V.-P........					
1808	James Madison P....... George Clinton V.-P....	3	Unknown.	Charles C. Pinckney P... Rufus King V.-P.........					
1812	James Madison P....... Elbridge Gerry V.-P....	7	Unknown.	De Witt Clinton P....... Jared Ingersoll V.-P.....					
1816	James Monroe P........ D. D. Tompkins V.-P...	8	Unknown.	Rufus King P............ John E. Howard V.-P....					
1820	James Monroe P........ D. D. Tompkins V.-P...	8	Unknown.	John Quincy Adams P... Richard Rush V.-P.....					
1824	Henry Clay P.......... Nathan Sanford V.-P...	16	19,255	Andrew Jackson P....... John C. Calhoun V.-P...	18,457	John Quincy Adams P... John C. Calhoun V.-P...	12,280	William H. Crawford P.. Nathaniel Macon V.-P...	No report.
1828	Andrew Jackson P...... John C. Calhoun V.-P..	16	67,597	John Quincy Adams P... Richard Rush V.-P......	63,396				
1832	Andrew Jackson P...... Martin Van Buren V.-P.	21	81,246	Henry Clay P............ John Sergeant V.-P......	76,539	William Wirt P.......... Amos Ellmaker V.-P.....	No report.		
1836	William H. Harrison P. Francis Granger V.-P..	21	105,405	Martin Van Buren P..... Richard M. Johnson V.-P.	96,948	Hugh L. White P........ John Tyler V.-P..........	No report.	Daniel Webster P........ Francis Granger V.-P...	No report.
1840	William H. Harrison P. John Tyler V.-P........	21	148,157	Martin Van Buren P..... Richard M. Johnson V.-P.	124,782	James G. Birney P....... Thomas Earle V.-P......	903		
1844	Henry Clay P........... T. Frelinghuysen V.-P..	23	155,057	James K. Polk P......... George M. Dallas V.-P...	149,117	James G. Birney P....... Thomas Morris V.-P.....	8,050		
1848	Lewis Cass P........... Wm. O. Butler V.-P....	23	154,775	Zachary Taylor P........ Millard Fillmore V.-P....	138,360	Martin Van Buren P..... C. Francis Adams V.-P..	35,354		
1852	Franklin Pierce P...... William R. King V.-P...	23	169,220	Winfield Scott P......... Wm. A. Graham V.-P...	152,526	John P. Hale P.......... George W. Julian V.-P..	31,732		
1856	John C. Fremont P...... William L. Dayton V.-P.	23	187,497	James Buchanan P...... J. C. Breckenridge V.-P.	170,874	Millard Fillmore P....... A. J. Donelson V.-P.....	28,126		
1860	Abraham Lincoln P.... Hannibal Hamlin V.-P.	23	231,610	J. C. Breckenridge P..... Joseph Lane V.-P........	11,303	Stephen A. Douglas P.... H. V. Johnson V.-P......	187,232	John Bell P............. Edward Everett V.-P.... Gerrit Smith P...........	12,193 136
1864	Abraham Lincoln P..... Andrew Johnson V.-P...	21	265,154	George B. McClellan P... George H. Pendleton V.-P.	205.568				
1868	Ulysses S. Grant P..... Schuyler Colfax V.-P...	21	280,223	Horatio Seymour P....... Francis P. Blair, Jr., V.-P.	238,606				
1872	Ulysses S. Grant P..... Henry Wilson V.-P.....	22	281,852	Horace Greeley P........ Benj. Gratz Brown V.-P..	244,321	Charles O'Conor P.........	1,163	James Black P........... and scattering...........	2,162

(For valuable statistical and other documents used in the preparation of this article we are indebted to Hon. William Bell, Jr., secretary of state of Ohio.)

L. P. Brockett.

Ohio, S. E. county of Indiana, bounded E. by the Ohio River, which separates it from Kentucky. Area, 90 square miles. It is in great part very hilly, but is fertile, producing good crops of grain; and has some manufactures. Cap. Rising Sun. Pop. 5837.

Ohio, county of Central Kentucky. Area, 625 square miles. It is partly bounded S. by Green River. It is uneven, fertile, and abounds in bituminous coal and iron ore. Tobacco, live-stock, corn, and wool are leading products. The county is traversed by the Elizabethtown and Paducah R. R. Cap. Hartford. Pop. 15,561.

Ohio, county in the "Panhandle" of West Virginia, bounded E. by Pennsylvania and W. by the Ohio River. Area, 175 square miles. It is hilly and highly fertile. It is celebrated for its fine wool, but also produces grain, fruit, coal, iron ore, etc. It has important manufactures of iron, metallic wares, cigars, clothing, carriages, glass, lumber, leather, etc. It is traversed by the Baltimore and Ohio and the Hempfield R. Rs. Cap. Wheeling. Pop. 28,831.

Ohio, post-v. and tp., Bureau co., Ill., on the Mendota and Clinton branch of the Chicago Burlington and Quincy R. R. Pop. 1137.

Ohio, tp. of Bartholomew co., Ind. Pop. 747.

Ohio, tp. of Crawford co., Ind. Pop. 1078.

Ohio, tp. of Spencer co., Ind. Pop. 3843.

Ohio, tp. of Warrick co., Ind. Pop. 3290.

Ohio, post-v. and tp., Madison co., Ia. Pop. 705.

Ohio, tp. of Franklin co., Kan. Pop. 575.

Ohio, tp. of Mississippi co., Mo. Pop. 632.

Ohio, tp. of Richardson co., Neb. Pop. 622.

Ohio, post-v. and tp., Herkimer co., N. Y. Pop. 1009.

Ohio, tp. of Clermont co., O. Pop. 3381.

Ohio, tp. of Gallia co., O. Pop. 978.

Ohio, tp. of Monroe co., O. Pop. 1801.

Ohio, tp. of Allegheny co., Pa. Pop. 685.

Ohio, tp. of Beaver co., Pa. Pop. 1534.

Ohio Grove, tp. of Mercer co., Ill. Pop. 1125.

Ohio River, the largest of the affluents of the Mississippi in respect to its discharge of water, which averages 158,000 cubic feet per second, that of the Missouri being but 120,000 feet. The Ohio originates at Pittsburg, Pa., in the confluence of the Allegheny and Monongahela rivers. Its length below Pittsburg is 975 miles; total length to its ultimate source, 1265 miles. A straight line from Pittsburg to Cairo, Ill., at its mouth, measures 615 miles. Its drainage area is 202,400 square miles, according to Ellet, or 214,000, according to Humphreys. Its elevation at Cairo is 322 feet; at Pittsburg, 1021 feet. Its mean fall is .72 of a foot to the mile. Its mean rate of flow is about 3 miles an hour. Its mean rise in flood is some 30 feet above extreme low water; its maximum rise exceeded 60 feet. Above Cincinnati it is in many places fordable at low water, and is then for six or eight weeks scarcely navigable. It usually freezes in its upper course for some four weeks. It has two classes of islands; one kind is fertile, and the other mere sandbanks, called "tow-heads" by boatmen. With its numerous tributaries (some of them navigable the year through), it has fully 5000 miles of high-water navigation. It has no important rapids except at Louisville, Ky., where it falls 22½ feet in 2 miles. It was discovered in 1680 by the French under La Salle, and was called by them *La Belle Rivière* ("the beautiful river").

Ohio Wesleyan University, located at Delaware, O., was founded in 1843. Its presidents have been Rev. Edward Thomson, LL.D., elected in 1844, resigned 1860; Rev. Frederick Merrick, elected 1860, resigned 1873; Rev. Fales H. Newhall, D. D., elected 1873. Its faculty consists of the president, 8 professors, 2 tutors, and a principal of the preparatory department. The whole number of graduates in the classical course has been 550. Attendance the past year (1872–73), classical, 145; scientific, 28; unclassified, 23; preparatory, 180; graduating class, 46. The institution is liberally endowed, and is furnished with commodious and substantial buildings. The grounds, which are extensive and beautifully diversified, are tastefully laid out and planted with over 500 varieties of trees and shrubs, constituting an *arboretum* of rare excellence. This, when completed, is designed to contain a specimen of every species, native and foreign, which can be secured and made to grow in the latitude of its location. The museum of the university comprises two distinct cabinets: (1) the Prescott Cabinet, devoted to the general department of natural history; the zoological department contains over 6000 specimens; the botanical department has extensive collections of woods, grasses, and mosses; the mineralogical department has over 4000 specimens, arranged in the natural order. (2) The Mann Cabinet, devoted to the illustration of geology, contains several thousand valuable specimens, together with Ward's extensive collection of casts. Other departments are opening, and to all valuable additions are annually made. The laboratory is well furnished with chemicals and apparatus for a full analytical course. In the other departments the facilities for illustration are also ample. The location of the institution is pleasant, healthy, and easy of access, its courses of study are full and thorough, and its charges exceedingly moderate. From the first it has enjoyed a high degree of prosperity.

F. Merrick.

Ohm. See Electricity, by Prof. Henry Morton, Ph. D., M. N. A. S.

Ohm (Georg Simon), b. at Erlangen, Bavaria, Mar. 16, 1787; studied in his native city, and was appointed professor in physics in 1817 at the Jesuit college of Cologne, director of the Polytechnic School in Nuremberg in 1833, and professor in 1849 at Munich, where he d. July 7, 1874. He discovered the so-called Ohm's Law (which see), set forth in his *Galvanische Kette, mathematisch bearbeitet* (Berlin, 1827), which was translated into English in Taylor's *Scientific Memoirs* (vol. xi., London, 1841), and was rewarded with the Copley medal by the Royal Society of

London. Besides his principal work, *Beiträge zur Molecularphysik* (Nuremberg, 1849), he has written, among others, *Bestimmung des Gesetzes, nach welchem die Metalle die Contact-Elektricität leiten* (1826). He has also made important contributions to the subject of acoustics.—His brother, MARTIN OHM, b. at Erlangen May 6, 1792, studied at Berlin, and was appointed professor in mathematics in 1817 at Thorn, and in 1822 at Berlin, where he d. Apr. 1, 1872. He published *Versuch eines vollkommenen consequenten Systems der Mathematik* (9 vols., Nuremberg, 1822–52), and *Geist der mathematischen Analysis* (2 parts, 1842–45), of which the first part was translated into English by A. J. Ellis (London, 1843).

Ohm's Law. See ELECTRICITY.

Oil, tp. of Perry co., Ind. P. 1440.

Oil-Cake, the residue which is left after the expression of fixed oils from crushed or ground seed of any kind. It is used both as food and as a direct fertilizer. The cake is frequently pulverized before using, and is then called *oil-meal.* Linseed-oil cake is valuable for fattening cattle. It is largely exported from the U. S. to Great Britain. *Cotton-seed meal* is used for feeding cattle, and is a valuable manure. Rape-cake and colza-cake are fed to sheep or applied directly to the land. Stale and rancid cakes are fit only for manure. Well-selected linseed-oil cake is one of the best fattening materials for neat cattle, and its use is sadly neglected in the U. S.

Oil City, post-b. of Oil Creek tp., Pa., on the Allegheny River, is located in the centre of the oil district of Pennsylvania, and is the terminus of four railroads. It has 2 large schools, 11 churches, 5 banks, 2 oil-refineries, an oil exchange, barrel-works, several hotels, 1 daily and 1 weekly newspaper, and the usual stores. Pop. of b. 2276; of tp. 5098. FRANK H. TAYLOR, ED. "DAILY DERRICK."

Oil, Cod-liver, a fixed oil obtained from the liver of the common cod (*Gadus morrhua*) and other species of *Gadus.* Cod-liver oil is prepared on the coasts of Newfoundland, Nova Scotia, and New England in our own country, and of Britain and Norway abroad. Since its large consumption in medicine, much better means of obtaining the oil pure and sweet have been adopted than were formerly employed. For this purpose the fish caught in boats near the shore are promptly landed, and the oil is obtained from the perfectly-fresh livers by various processes involving the application of heat and expression. Oil thus prepared is called "shore oil" and "pale oil." It is a clear, light-yellow, thick oil, of a perfectly bland taste, but of a disagreeable fishy flavor and smell. Other varieties of oil are called "straits" and "banks," or "light-brown" and "dark-brown" oil from their respective colors. They are prepared from livers which are not perfectly fresh or have actually begun to putrefy; they have a rancid, offensive flavor, and are unfit for use in medicine. Cod-liver oil is a very complex substance, containing, besides the usual ingredients of fats, certain biliary principles and small quantities of iodine, bromine, chlorine, and phosphorus. It is used largely in the arts, especially in the preparation of leather. For over 100 years the oil has been employed more or less for rheumatism, gout, scrofula, etc., but its present prominence in medical practice is principally due to a treatise on the oil by Dr. J. Hughes Bennett of Edinburgh in 1841. It is now a staple remedy in consumption and the above-named diseases, and for all conditions where there seems to be a dyspepsia for ordinary forms of fat, with emaciation and anæmia. When the oil acts favorably, the patient grows fatter and ruddier and the morbid symptoms tend to recede. Apparently, the virtues consist simply in the fact that cod-liver oil is an animal fat which, for some unknown reason connected with its peculiar composition, can be digested and assimilated under circumstances where the ordinary fats of food cannot. Cod-liver oil may be taken in quantities of a tablespoonful two or three times a day, and its fishy taste is best disguised by enveloping the dose in the froth of porter. EDWARD CURTIS.

Oil Creek, post-b. and tp., Crawford co., Pa. Pop. of b. 428; of tp. 2041.

Oil Creek, tp. of Venango co., Pa. Pop. 5098.

Oil from Coal. See PETROLEUM, by C. F. CHANDLER.

Oil from Shale. See PETROLEUM, by C. F. CHANDLER.

Oil Gas. See GAS-LIGHTING, by C. F. CHANDLER.

Oil, Genesee, a local name for petroleum.

Oil, Mineral. See PETROLEUM, by C. F. CHANDLER.

Oil of Lin'seed has been mentioned before. (See LINSEED OIL.) We add that in the U. S. this industry is divided between the seaboard, where India seed is almost exclusively employed, and the interior, where the domestic seed is consumed. The total product of seed grown in the U. S. in 1875 is estimated at 2,500,000 bushels of 56 pounds. The India seed imported in 1875 was about 1,000,000 bags of 3 bushels each, or 3,000,000 bushels, making the total quantity of linseed prepared in the U. S. in 1875 = 5,500,000 bushels. The American seed yields from 28–29 per cent. of oil; the India seed, 33½ per cent. The oil of American seed is darker and heavier-bodied than that from Indian seed, which is preferred for some purposes. It has been observed that the oil from India seed exposed to a cold of $-6°$ to $-9°$ F. is congealed, and if in this state it is subject to agitation in transportation by railroad it is permanently injured, never returning to a completely homogeneous state again. The oil from American seed is not so affected. The importation of linseed into the U. S. is of comparatively recent origin. The first cargo came in 1838–39 from Odessa by the ship Hercules. The India trade followed in ships used for carrying out ice to Calcutta. The foreign seed costs in New York about $2, gold, per bushel. The total product of oil from both foreign and domestic seed is about 47,600 tons. The oil-value of a bushel of seed is about $1.50, currency, and the value of the cake from the same 89 cents, and the cost of its manufacture is 40–45 cents. The cake is very largely exported to London, and is worth about $45, gold, per ton. The process employed in the manufacture of linseed oil in the U. S. is almost exactly that described in Muspratt's *Chemistry,* and more fully in Ure's *Dictionary.* (The above facts are in a private communication to the writer from a well-known manufacturer in New York.)

The composition of linseed is given by Way in the *Journal of the Roy. Agr. Soc.,* x. pt. 2, from four sources, as follows:

	Nitrogen, per cent.	Fat, per cent.	Ash, per cent.	Water, per cent.
From Riga	3.60	34.70	5.25	9.45
" Memel	3.33	36.00	3.56	8.74
" the Black Sea	3.31	38.42	5.64	10.22
" England, 1847	4.60	36.66	2.68	12.33
" " 1848	4.29	38.11	4.03	8.37

Anderson (*Highland Agr. Soc. J.,* 2d series, No. 69, p. 376) found in linseed oil 24.44 per cent of albuminous substance, 34.00 oil, 30.73 gum, sugar, and cellulose, 3.33 ash, and 7.50 water = 100. Meurin (*J. Pharm.* [3], xx. 96) has analyzed the several parts of linseed, as follows:

Episperm...	Gum and soluble salts	14	
	Soft resin and fixed oil	1	
	Water	2	
	Matter insoluble in water and ether..	4	= 21
Edosperm..	Soft resin and fixed oil	6	
	Water	2	
	Soluble in water	3	
	Insoluble in water	12	= 23
	Fixed oil	30	
	Water	5	
	Matter soluble in water	3	
	" insoluble in water and in ether...	18	= 100

Linseed also contains a large quantity of mucilage, which is in the outer layers of cells of the epidermis, and swells up when macerated in water, bursting the cell-walls; 1 pint of linseed boiled in 16 of water gives a mucilage so thick as to draw out in threads and form a dark-colored mass when dry. This contains, besides mucilage, legumine, albumen, an organic acid, perhaps malic acid, and ash of lime, potash, iron, partly as phosphates, partly carbonates. (*Schmidt,* as quoted by Watts.)

The so-called "caoutchouc of oils" may be prepared in several ways, as by exposing linseed oil in thin layers it dries up to a transparent, resinous, moderately elastic mass resembling caoutchouc, which does not melt by heat, but carbonizes and burns. Linseed oil, nut oil, or poppy oil, heated to about 600°–700° F., takes fire and burns quietly until only tar or coal remains. If the burning be arrested by closing the vessel, a brown turpentine-like body, adhesive as bird-lime, remains. This substance, boiled continuously with water containing nitric acid (more water being added from time to time to check the too rigorous action of the nitric acid), acroleine is evolved, and the body becomes solid of the consistence of plaster, resembles caoutchouc, and does not adhere to the fingers. It is then fusible only in part; forms an emulsion in carbon disulphide; shrinks when boiled with concentrated caustic alkali; dissolves only on addition of water; and is reprecipitated by acids; it is soluble in alcoholic potash, swells in ether free from alcohol, and partly dissolves in a larger quantity of ether; alcohol precipitates it from this solution. It swells without dissolving in petroleum, but dissolves completely in an excess of turpentine, which in small quantity only softens it. Its solution in turpentine remains unaltered on evaporation.

Chloride of sulphur in the proportion of 12–15 parts to

100 of linseed oil produces caoutchouc-like products which more of the sulphur compound hardens; dilute acids and alkalies do not attack them, but they are saponified by concentrated alkaline solutions. B. SILLIMAN.

Oil of Tar. See TAR, by C. F. CHANDLER.

Oil of Turpentine. See TURPENTINE, by W. H. CHANDLER.

Oil of Tur′pentine, Medicinal Uses of. This oil is a powerful irritant, speedily producing redness and burning pain if kept too long in contact with the skin. Given internally, its most striking effect is a tendency in anything like overdose to cause great irritation, and even congestion, of the kidneys and urinary passages, with scanty and bloody urine, and severe pain in passing the same. Large doses act as an irritant poison, although death is rare. Oil of turpentine is used externally as a rubefacient to relieve pain or spasm of internal parts. For this purpose flannels wrung out in hot water are dipped in the oil previously slightly warmed, and after being again wrung dry are laid upon the skin. They should not be applied longer than from ten to twenty minutes, for fear of blistering or inflammation of the skin. Internally, the oil is given to control hæmorrhages, for which purpose it is often very efficacious. It is specially useful in bleedings from the stomach and bowels and in the ulceration of the latter organs in typhoid fever. Oil of turpentine is also used as a vermifuge and as an ingredient in cathartic enemata. The dose by the stomach ranges from a few drops to a fluidrachm, to be given in emulsion. The fumes of the oil, volatilized by the heat of boiling water, are inhaled to check bleeding from the lungs. EDWARD CURTIS.

Oil, Olive, is obtained from the fruit of the European olive (*Olea Europæa*), a tree grown for this purpose from the most ancient times, both in Europe and Asia Minor. Over thirty varieties of the olive are grown in France, a catalogue of which is given in the new *Duhamel.* The wild olive has no value except as a stock on which approved sorts are engrafted. In the several departments of Southern France, where the famed virgin oil of Aix is made, the olives are gathered in November and December, when about two-thirds ripe. The favorite olive of this district is called *caïion;* another sort is called *brun* (the brown sort). When ripe this fruit is of mixed red, green, and purple color. The fruit is crushed entire in an edge-wheel mill of stone, driven by animal power usually, care being taken not to crush the stones or kernels, which contain a bitter principle and a poor oil. The virgin oil is dipped out of the mill after the fruit is reduced to a pulp, and is seldom sold in commerce separately, bearing the highest price, and used either by the proprietors of estates or for enriching poorer sorts. After removing the virgin oil, the pumace or *marc* is placed in coarse linen bags or preferably in circular mats of palm-leaf, called *coussins* (cushions), which have a central opening and are about eighteen inches in diameter. These bags are then piled on each other, the bottom of each one closing the opening of that beneath, to the number of ten to twenty or thirty, as may be. The screw-press is then applied, and the oil trickling down is collected by a circular gutter and runs into a tank. This gives the best market oil, and is called *première qualité.* The marc is then taken from the coussins, broken to powder by flat wooden shovels, and repacked in a second set of bags. This process is twice repeated on the dry marc, and a little additional oil obtained each time. After the third pressing about two quarts of boiling water are poured in each coussin, and the fourth pressing then yields a considerable volume of a lower-grade oil, which is used either to mix with other oils or for lubricating and burning oils and in soap manufacture. This treatment by boiling water gives the oil known as *au chaud,* and the process may be repeated, but always with an inferior quality of oil. The total quantity of oil obtained by the four pressings in the department of Var is from 40 to 50 litres for each 5 bushels of fruit, or about 3 imperial gallons to the Winchester bushel. This includes the first *chaud,* but not the subsequent pressings. "The mean produce of a tree in France is about 10 pounds of oil, and in Italy 15 pounds, but single trees have been known in fruitful seasons to produce 300 pounds of oil." (*Hillhouse.*) Even the purest virgin oil is turbid when first pressed. It clears itself by simply standing in the tanks, which on large estates are masonry cisterns underground, where the oil is kept at an even temperature for a long time, air being excluded, the feculence settling. The color of the best oil of Aix and of Tuscany is greenish.

The adulteration of olive oil is made chiefly at Marseilles by adding colza, rape, sesame, cotton-seed, and above all groundnut oil. The groundnut (American peanut, *Arachis hypogea*) is grown extensively on the African coast expressly for its oil, which is often sold in commerce under the name of olive oil, and, while bland and inoffensive, has nothing of the fruity flavor of the genuine olive oil. The "sweet oil" of olives has a peculiar flavor, due to the fruit, not to be mistaken, and, like other acquired tastes, much in favor. In all Southern Europe it replaces butter and other animal fats for table and culinary use, and its production is a very important industry. The trees attain a great age and large dimensions, and do not come to full bearing under thirty years; they are all grafted varieties. Some groves have an historic celebrity, and are preserved with scrupulous care by stringent laws. Severe pruning is needed to develop the best fruit.

The pickled olive is an important article of commerce. The commoner sorts are simply treated with brine made aromatic with fennel, coriander-seed, cumin, and rosewood. But the *picholines* of Provence (so named from the *Picciolini,* who invented the process), the best pickled olives, are gathered green in October, and after selecting the finest are thrown into a weak alkaline liquor prepared from soda made caustic by lime. In this solution they remain eight or ten hours, till the pulp ceases to adhere to the stone. They are then steeped during a week in cold water renewed daily, and after this treatment (which removes the bitterness of the unripe fruit) they are transferred to an aromatic brine. For luxury the stones are sometimes removed, and the fruit stuffed with capers, truffles, or minced sardines, and closed air-tight in bottles of the finest oil. The picholine is the fruit of Duhamel's eleventh variety (*Olea oblonga*), the *Olea minor lucensis.* N. D., ninth variety, is also esteemed for pickling. (For an extended account of the olive consult Augustus L. Hillhouse in Michaux's *North American Sylva,* i. 50–88.)

In the U. S. the olive is successfully grown in Southern California, where the Franciscan monks planted oliveyards near the close of the last century. Humboldt (*On the Geographical Distribution of Plants*) says the olive requires a climate of a mean temperature of 57.17°, and that its coldest month must not fall below 41.5°. Such a climate is found in California, but nowhere on the eastern coast of North America. New Smyrna in Florida was founded for the cultivation of the olive by an adventurer who led thither a colony of Greeks about the middle of the last century, but in 1783 hardly a trace of this settlement remained, although Bartram, who visited it in 1775, describes it as a flourishing town. There is, however, every reason in respect of fitness of soil and climate for the successful culture of the olive in California. The olive tree is usually, almost uniformly, a biennial, fruiting only in alternate years; but at Aix, where the olive-harvest is in November, it is annual and uniform. In California, where nearly all fruit trees bear twice yearly, the olive is a perpetual bearer. (For many of the facts in reference to the department of Var in this article the writer is indebted to an intelligent American long resident in Southern France.) B. SILLIMAN.

Oil, Palm. See ELÆIS and PALM OIL.

Oils [Lat. *oleum;* Gr. ἔλαιον]. The oils are liquid fats (see FATS) existing ready formed in nature. They are mostly fluid at ordinary temperatures, unctuous to the touch, stain paper with a permanent greasy spot, are insoluble in water, little soluble in alcohol (castor oil excepted), completely dissolved by ether, often, but not always, tasteless and odorless, and form soaps with alkaline bases, setting free glycerine. In short, the oils are glycerides, and fall under the general designation of fat-oils, including certain pasty sorts, like palm oil, cocoa oil, and other butter-like vegetal fats. The fat vegetal oils are all fixed, while the essential oils are all volatile. The volatility of some of the fatty acids forms no exception to this statement. The essential or volatile oils mostly exist ready formed in plants, from which they are obtained by distillation. They are distinguished from the fat-oils not more by their volatility and odor than by their action with alkaline bases, not being capable of saponification. The volatile oils are therefore separately considered (III.), while the fixed fat-oils are conveniently grouped with reference to their origin, as I. VEGETABLE OILS, and II. ANIMAL OILS.

I. *Vegetable Oils.*—In plants the fat-oils exist ready formed, secreted chiefly in the seeds, sometimes in the flesh or pulp about the seeds, as in the olive, dogberry, etc., and much more rarely in the roots, as in the earth-almond (*Cyperus esculentus*), which contains 26 per cent. of oil disseminated in minute globules in the cellular tissue. In the oil-producing seeds the oil is often associated with albuminous matters, gum and mucilage; as in linseed, for example. When such seeds are bruised or ground and diffused in water, these albuminous bodies suspend the oil, entangled in a milky *emulsion* of a glairy and mucilaginous consistency. Linseed is a prominent example of this sort of seeds. The vegetal oils are usually divided into two

groups: (1) *The drying oils*, like linseed oil, which on exposure to air absorb oxygen and dry to a resinoid surface or varnish; and (2) *the fatty or non-drying oils*, of which olive oil is an example. The latter class become rancid on exposure to air, but as a rule such oils do not dry up, although many of them thicken. This grouping of the vegetal oils is that usually adopted, and in its support is adduced the chemical evidence that there is a corresponding difference in the primary organic nucleus or molecular grouping of the atoms of carbon and hydrogen. Thus, the primary nucleus of the drying oils is $C_{32}H_{38}$, and its acid *linoleic acid*, $C_{32}H_{28}.O_4$, or, in the present notation, $C_{16}H_{28}.O_2$; while in the fatty or non-drying oils the primary nucleus is $C_{36}H_{34}$, giving *oleic acid* $C_{36}H_{34}.O_4 = C_{18}H_{34}.O_2$. (See LINOLEIC and OLEIC ACIDS, beyond.) Cloëz, who has elaborately investigated the fat-oils of plants (*Ann. de Ch. et Phys.* and *Bull. Soc. Ch.*, 1865), concludes that this distinction is one of degree rather than of kind, since he finds in the case of fifty oils of his own preparation, exposed during eighteen months to air, that all were changed, not only by absorbing oxygen (the usual statement), but also by losing carbon and hydrogen. In the so-called drying oils this change is much greater than in fatty oils, like olive oil. Cloëz has by proximate analyses determined the amount of oil present in over 200 sorts of grains or seeds, and has tabulated the results with reference to the weight of the hectolitre, the amount of water lost at 100° C., the ash, the quantity of oil in the normal and dry seed, and the density of the oil. Cloëz in his researches on the oils used an improved form of displacement apparatus, employing carbon disulphide in the state of vapor as the solvent. Ether, benzine, and chloroform also may be used to exhaust or displace oil from seeds, but are less efficient and otherwise less desirable than carbon disulphide, which also dissolves far less of the foreign bodies present than any other known agent. This agent may be completely freed of the disgusting odor of the commercial product (due to a sulphuretted hydrocarbon) by distilling it from caustic lime in powder (Silliman) or by digesting it for a time on powdered mercuric chloride (Cloëz). The use of carbon disulphide for removing the oil of corn (*Zea maïs*) before its treatment in the mash-tub, for producing whisky, with a view to improving the quality of the liquor, has been perfected by the Messrs. Tracy of New York, and is the subject of a patent. The following table, condensed from the memoir of Cloëz, presents his results upon fifty oils, showing the gain in weight of ten grammes of each oil exposed for eighteen months in tarred capsules of glass, and weighed every three months. These were covered with disks of filter-paper to exclude dust, and each oil was subjected to ultimate analysis both before and after the exposure. Some of the analytical results are cited in the large table on next page.

We select four examples of the analyses of oils by Cloëz, which show the gain in oxygen and the loss of carbon and hydrogen in each oil after eighteen months' exposure to air. Ten grammes of each oil were taken, and the gain in weight of this quantity is shown in the fourth column, and the differences in the fifth:

1. *Oil of Sesame.*

	Fresh oil.	Aërated oil.		
Composition	in 100 parts.	Pr. 100 p'ts.	Pr. 104.83 gr.	Diff.
Carbon	78.670	70.705	74.12	− 4.55
Hydrogen	11.678	10.636	11.15	− 0.528
Oxygen	9.652 = 100	18.695 = 100	19.56 = 104.83	+ 9.918

2. *Castor Oil.*

Carbon	74.361	72.125	74.058	− 0.303
Hydrogen	11.402	11.108	11.405	− 0.003
Oxygen	14.237 = 100	16.767 = 100	17.217 = 102.680	+ 2.980

3. *Linseed Oil.*

Carbon	77.57	67.55	72.299	− 5.271
Hydrogen	11.33	9.88	10.574	− 0.756
Oxygen	11.10 = 100	22.57 = 100	24.157 = 107.030	+ 13.057

4. *Poppy Oil.*

Carbon	77.497	66.68	71.381	− 6.116
Hydrogen	11.398	9.94	10.641	− 0.757
Oxygen	11.105 = 100	23.38 = 100	25.028 = 107.05	+ 13.923

It is plain from these analyses that the oils all absorb oxygen and eliminate carbon and hydrogen. A part of the loss is doubtless in the form of carbonic acid and water, but Cloëz remarks also the production of a volatile hydrocarbon analogous to acroleine, irritating, and staining the paper covers of the glass vessels of a brown color, resembling the like coloration seen on the pages of old books, in which, by a like process of oxidation of the oil in the printer's ink, a suffocating odor is evolved familiar to those who consult these volumes. Old engravings are stained by the same volatile hydrocarbon, doubtless.

Cloëz has also determined the ratio existing between the amount of oil present in the seed, as fixed by analysis, and that obtained by pressure and left entangled in the oil-cake ("*Tourteau*"). In well-regulated manufactories in France the oil left in the cake is about 10 per cent. of the total quantity in the seed. The following table condenses the results obtained in the treatment of five sorts of the more important oil-producing seeds, and shows the application of a formula deduced from experiment, capable of use in any case of a seed in which analysis has determined the total quantity of oil it contains:

Name of oil-producing seeds.	H.	R.	Oil produced by pressure.		Oil retained in cake.	
			Calculated.	Experiment.	Calculated.	Experiment.
Colza of Vendée	44.20	55.80	38.00	37.69	6.20	6.19
Gold-of-pleasure seed (Camelina)	31.64	68.36	24.05	27.27	7.59	5.26
Poppy	44.00	56.00	37.77	37.29	6.23	6.83
Linseed	37.95	62.05	31.06	30.15	6.89	7.81
Peanut (groundnut)	44.10	55.90	37.89	37.10	6.21	6.49

NOTE.—H = oil contained in 100 parts of seed; $R = 100 - H$; T (the weight of the cake) $= R + \frac{R}{9}$; hence $T = \frac{R}{9} + R = \frac{10R}{9}$, and the quantity of oil (h) to be obtained in pressing 100 parts of seed will be $h = H - \frac{R}{9}$.

Purification of Oils.—The crude oils come from the press more or less changed by the heat employed, and contaminated by albumen, resinous and coloring matter, which must be removed to fit the oils for nice purposes. The treatment originally proposed by Thénard in 1801 is still in general use—mixing the oil with 2 or 3 per cent. of concentrated sulphuric acid in a lead-lined vat, stirring it until it assumes a greenish tint, and finally as the mucilage is carbonized the whole mass blackens. After twenty-four hours' repose about 2 per cent. of its volume of water, of about 170° F., is added, and the whole agitated vigorously until the liquid appears milky, when the mixture is transferred for rest to large reservoirs at a constant temperature of about 80° F. After some days' rest the clear oil is decanted and filtered either through cotton, carded wool, or flannel, sometimes through river-sand and branches of trees free of leaves. The saturation of the acid is accomplished after Dubrunfaut by chalk without the use of so much water. The oil-cake itself is sometimes employed in a state of dry powder, to avoid filtration, 50 kilogrammes of the powdered cake being capable of clarifying 200 hectolitres of oil in successive portions of about 6 hectolitres each. Oils like cotton-seed and palm oil are treated in England by a mixture of nitric acid and potassic chlorate, which rapidly oxidizes the coloring-matters. About 1 to 2 per cent. of this mixture suffices, and an excess of chlorate is to be avoided as well as of nitric acid, which with alkalies gives a strong red color to the oil, very objectionable when used to make soaps. Many other methods of purification have been proposed for oils, of which we mention only that of *air-treatment* with acid by M. C. Michaud, who proposed in 1869 to blow air through the oil, while the acid is permitted to fall in, in numerous small streams. The oil charged with air forms with the feculence a mixture of less density, which gathers as a bulky scum on the surface, which is skimmed off, while the operation is repeated until this scum ceases to appear. The oil is then treated by a current of steam until it is warmed to 212°, and with a diminishing quantity of steam it is in half or three-quarters of an hour ready to separate from the water and filter.

Physical Properties.—All the oils are lighter than water (see the column of sp. gr. in the following table), but their densities vary greatly with temperature; *e. g.* olive oil at 12° C. has sp. gr. .919; at 26°, .911; and at 94°, .862. The congealing points of the oils vary also greatly, being for olive oil 2° (C.); colza, − 6.25°; groundnut, − 7°; almonds, − 10°; grape, − 16°; poppy and castor, − 18°; linseed, − 27.6°; pine, − 30°. The oils vary equally in electric conductivity, that of olive oil being 677 times less than the others. This peculiarity was made the basis of Rousseau's *diagometer*, an instrument designed to detect adulteration in olive oil by the varying intensity of an electrical current moving a magnetic needle.

Chemical Properties.—The effects of air upon the vegetable oils have already been given. In general, the non-drying, both vegetable and animal, become rancid by exposure to air, while the drying oils become gummy or resinous. This effect is quickened or intensified by boiling them with oxide of lead, peroxide of manganese, and borate or acetate of manganese—an operation attended with the production of a high color. For colorless varnishes drying oils are treated in the cold by oleate of lead prepared after the method of Bouis by acting on oleic acid by litharge. The same result is obtained by the use of protoxide of

manganese, precipitated by an alkali from a protosalt of manganese, rapidly washed, and incorporated with the oil. On driving into the mixture a finely-divided current of air the manganese is peroxidized in the midst of the oil, giving after washing with oil a colorless and very drying oil. The action of acids and alkalies upon oils is considered under OLEIC ACID, OLEINE, and also under SAPONIFICATION and SOAP. (For a fuller list of oils than above given see Watts's *Chemical Dictionary*, art. "Oils." For CASTOR OIL, LINSEED OIL, OIL, OLIVE, etc., see those articles.)

Table of Analyses of Fifty Species of Oleaginous Seeds, with the Results of their Exposure to Air for Eighteen Months. By M. S. Cloëz (*Bull. de la Soc. Chem.*, iii. 46, 1865).

Names of plants.	Weight of 1 hectolitre of grain.	Fatty matter— in 100 parts by weight.	Fatty matter— in volume per hectolitre.	Loss in water at 100° C.	Ash in 100 parts.	Density of oil at 15° C.	Weight of 10 gr. of oil after 18 months' exposure to air.	Condition of the oil after exposure to air.
	kil.	gr.	gr.	gr.	gr.		gr.	
Cocoanut oil (*Cocos nucifera*)	57.84	69.300	42.900	5.04	1.36	0.934	10.280	No change in appearance.
Cardon oil (*Cynara carduncudus*)	64.80	20.010	14.005	9.02	3.46	0.926	10.758	Nearly solid, surface wrinkled.
Bardane oil (*Arctium lappa*)	51.64	19.032	10.559	11.12	3.08	0.930	10.776	" " " undulated.
Oil of madi (*Madia sativa*)	45.69	32.700	16.079	8.34	4.16	0.929	10.699	" " " wrinkled.
Sunflower (*Helianthus annus*)	44.00	21.810	10.374	9.30	3.20	0.925	10.689	" " " "
Ram-till (*Guizotia oleifera*)	66.80	35.100	25.414	7.94	3.84	0.923	10.733	" " " even.
Dulcamara (*Solanum dulcamara*)	48.75	23.86	12.524	7.44	2.82	0.929	10.802	" " " much wrinkled.
Stramonium (*Datura stramonium*)	58.48	25.00	15.940	8.56	2.92	0.922	10.698	Solid surface uniform.
Paulownia (*P. imperialis*)	6.70	21.98	1.592	10.18	3.15	0.925	10.812	Very thick, irregular surface.
Sesame of India (*S. Indicum*)	62.20	53.95	36.311	5.24	5.68	0.924	10.483	Thick uniform surface.
Oil of *Dracocephalum moldavicum*	64.00	21.32	14.634	10.04	5.60	0.932	10.835	Nearly solid, surface much wrinkled.
Olives (*Olea Europea*)	67.10	39.45	28.883	29.20	1.79	0.916	10.372	Liquid, scarcely thickened.
Holly (*Ilex aquifolium*)	59.80	25.905	16.796	7.62	1.96	0.922	10.802	Very thick, surface uniform.
Cotton (*Gossypium herbaceum*)	63.00	23.675	15.931	9.30	3.76	0.936	10.397	Liquid, hardly thickened.
Euphorbia (*E. lathyris*)	56.82	43.75	26.842	7.34	2.76	0.926	10.438	" " "
Bancoul-nuts (*Aleurites moluccana*)	46.87	62.12	31.166	5.14	3.18	0.934	10.742	Solid, wrinkled.
Castor oil (*Ricinis communis*)	56.10	68.81	40.073	3.76	2.56	0.963	10.268	Liquid, hardly thickened.
Croton (*C. tiglium*)	48.73	37.03	19.142	6.48	2.72	0.942	10.476	Very thick, uniform surface.
Linseed (*Linum usitatissimum*)	69.62	37.95	28.253	7.84	3.90	0.935	10.703	Solid, very wrinkled.
Pistachio-nuts (*P. vera*)	62.60	5.40	35.034	8.10	2.60	0.918	10.505	Liquid, little thickened.
Horse-chestnut (*Æsculus hippocastanum*)	57.40	5.215	3.243	12.65	1.75	0.923	10.542	" thickened.
Spindle tree (*Euonymus europæus*)	57.60	44.80	26.961	7.74	3.06	0.957	10.391	" slightly thickened.
Thlaspi oleifera	73.14	18.45	14.619	12.76	5.50	0.923	10.812	Solid, uniform.
Gold-of-pleasure seed (*Camelina sativa*)	67.04	31.64	22.784	8.84	4.16	0.930	10.810	Nearly solid, surface undulated.
Cress-seed (*Lepidium sativum*)	75.39	23.97	19.507	10.40	4.66	0.926	10.856	" " " uniform.
Colza (spring), (*Brassica c. oleif. præcox.*)	62.25	39.50	26.997	8.84	3.30	0.910	10.566	Liquid, thickened.
Colza (in season), (*B. campestris oleifera*)	68.80	43.42	32.770	7.64	3.56	0.912	10.572	" "
Cabbage (*B. sempervirens*)	69.87	39.25	29.721	9.08	3.60	0.922	10.536	" "
Rutabaga (*B. napobrassica*)	66.60	39.10	28.428	8.44	2.68	0.916	10.542	" "
Winter cabbage (*B. napus oleifera*)	66.79	40.97	29.891	8.70	3.36	0.915	10.537	" "
Summer cabbage (*B. asperifolia oleifera*)	69.93	40.62	30.98	8.72	3.32	0.916	10.539	" "
Turnip (*B. rapa*)	70.70	37.60	29.09	9.10	3.80	9.917	10.542	" "
Mustard (*Sinapis arvensis*)	72.55	25.70	20.24	7.74	4.36	0.921	10.524	" "
Mustard, black (*S. nigra*)	72.60	31.92	24.82	8.24	9.90	0.933	10.572	" "
Mustard, white (*S. alba*)	75.42	31.27	25.59	8.42	3.30	0.921	10.527	" "
Radish (*R. oleifera*)	68.60	36.13	26.57	8.40	4.16	0.932	10.537	" "
Glaucium flavum	65.00	37.75	26.84	6.84	8.40	0.924	10.773	Solid, very much wrinkled.
Red glaucium (*G. corniculatum*)	65.84	27.08	19.26	7.24	11.16	0.925	10.696	" " "
Poppy (*Papaver* ————)	60.80	42.30	27.74	7.40	6.48	0 927	10.705	" " "
Flax (Chènvre)	56.00	31.50	18.95	8.80	4.70	0.930	10.778	"
Cucumber (*Cucurbita perennis*)	38.70	39.22	16.23	6.44	3.96	0 934	10.740	Nearly solid, smooth, uniform.
Evening primrose (*Œnothera biennis*)	40.05	21.83	9.47	10.68	4.52	0.929	10.682	" " wrinkled.
Sweet almonds	58.92	55.69	35.88	5.64	2.85	0.918	10.459	Liquid, little thickened.
Apricot almonds	57.56	43.63	20.66	7.28	2.46	0.915	10.547	" " "
Groundnuts (*Arachis hypogœa*)	62.15	50.50	34.18	5.26	1.62	0.918	10.426	" " "
Groundnuts, without shells	44.16	64.32	30.58	4.68	2.00	0.928	10.747	Solid, very wrinkled.
Beechnuts (*Fagus sylvatica*)	63.45	43.52	30.05	9.14	3.30	0.918	10.621	Very thick, even surface.
Filbert, shelled (*Corylus avellana*)	54.45	60.35	28.37	6.64	2.16	0.919	10.434	Liquid, hardly thickened.
Spruce fir (*Abies excelsa*)	55.00	32.40	19.05	9.12	3.90	0.935	10.785	Solid, much wrinkled.
Pignon fir (*Pinus parviflora ?*)	54.80	44.73	26.30	7.88	4.10	0.919	10.825	Very thick, even surface.

II. *Animal Oils.*—The animal oils and fats have a constitution closely identical with the non-drying vegetal oils. They are in general propenylic ethers of the fatty acids (see FATS and GLYCERINE), so rich in oleic acid as to remain fluid at ordinary temperatures, while the corresponding glycerides of palmitic and stearic acids are more or less solid fats, as tallow, mutton suet, lard, etc. The animal oils have, as a class, a characteristic and very persistent odor, referable to their origin, which in some of the fish oils is peculiarly offensive. This animal odor adheres to the soaps made from even the sweetest animal oils with great obstinacy. The liquid animal oils are largely derived from marine animals. *Sperm oil* occurs in the cavity of the head of the sperm whale (*Physeter macrocephalus*), mixed with spermaceti, from which it is separated by crystallization and pressing in the cold. It is saponified with difficulty by potash, yielding the same fatty acids as spermaceti fat, with which it appears to be isomeric. It is esteemed the most valuable of animal oils, and bears the highest price. *Whale* or *train oil* is obtained from the blubber of the right whale (*Balæna misticetus*), from the black-fish, and from other species of whales. Its sp. gr. varies from .919 to .929. Dolphin oil and porpoise oil contain a peculiar fat called delphinin, phocenin, or dolphin fat. It is a neutral, very mobile oil, of sp. gr. 0.948–0.954, of a faint, peculiar, somewhat ethereal odor, like that of valeric acid. Phocenin is regarded as a mixture of valeveriens, and has been separated by Berthelot into valeric acid and glycerine. Seal oil, shark oil, sea-calf oil are fat oils obtained from the blubber of these animals, and having characteristics in common with whale oil. The menhaden of the Atlantic coast are extensively taken for the oil they furnish and the *fish-guano* produced from the compressed fish after boiling to separate the oil.

Cod-liver Oil. (See OIL, COD-LIVER.)

III. *Essential or Volatile Oils.*—The group or natural family of hydrocarbons which is known as the *aromatic group* embraces benzole and its homologues (see BENZOLE); hydrocarbons of the naphthalene series, C_nH_{2n-8}, and the terpenes, $C_{10}H_{16}$, of which turpentine oil and its isomeres are members, including also caoutchouc and gutta-percha. The volatile oils form a sort of appendix to the aromatic group, and to this appendix are referred also, properly, the resins and balsams, the bitumens, and allied substances. We restrict our remarks here to the volatile oils and essences found already formed in plants. The essential oils of plants consist chiefly of mixtures of hydrocarbons with acid or oxygenized bodies of the same class. They are mostly isomeric or polymeric with oil of turpentine, represented by $C_{10}H_{16}$. Turpentine oil is the product of various species of Coniferæ, and is obtained from wounds or incisions in the bark, from which it exudes in combination with the resin and other vegetable juices, and is separated from them by distillation. While all the volatile oils thus obtained from coniferous plants are alike in general properties, as of odor, solvent power, etc., they really differ much in density, and more especially in optical properties, some revolving the polarized beam to the right (dextro-rotatory), while others revolve it to the left (lævo-rotatory), and in unlike degrees. Most kinds of turpentine oils are mixtures of two or more isomeric or polymeric hydrocarbons, differing in physical and sometimes in chemical properties. The oxidized constituents of the essential oils are sometimes the direct products of the oxidation of the hydrocarbon itself, in which

case they are usually viscid resins; while in other cases the two classes appear distinct—*i. e.* not derivative of the same primary nucleus. Gladstone has lately carefully studied the volatile oils in view of their specific gravity, boiling-points, and optical properties (*Journ. Chem. Soc.*, 1864, xvii. 1, and again *Ibid.* [ii.], x. 1, 1872). The hydrocarbons from essential oils may be arranged in three polymeric groups, having the formulæ, respectively, $C_{10}H_{16}$, $C_{15}H_{24}$, $C_{20}H_{32}$. The first group comprises the greater number of these bodies—turpentine, orange, caraway, nutmeg, anise, thyme, etc.; the second, those from cloves, rosewood, cubebs, calamus, etc.; while the last group has only one representative, colophene. These groups are distinguished by the vapor-densities of the bodies belonging to them—viz. the first group requires a theoretical vapor-density of 4.71, while actual experiment on oil of turpentine, pepper, juniper, lemon, orange, etc. gives closely approximate results. For calamus and patchouli oils Gladstone got densities of 6.80 and 7.2, respectively, while theory requires for the formula $C_{15}H_{24} = 7.06$ sp. gr. Gmelin (*Handbook*) gives an experimental density for colophene greater than is required by the formula $C_{20}H_{32}$.

The volatile oils generally absorb oxygen rapidly, rarefying and gaining color in the process, and sometimes forming crystals of camphor-like bodies. Oil of turpentine in four months absorbs twenty times its volume of oxygen, and in forty-three months 128 volumes; it thus acquires the properties of ozone, and its bleaching power is seen on the cork used to stop the bottle containing it. Chlorine, bromine, iodine, and hydrochloric acid gas are all absorbed by turpentine and other oils of that group, which are thus changed generally into resins, balsams, or camphors. The oils of lemon, orange, etc. by exposure seem spontaneously to lose their delicate perfume and change to the odor of turpentine.

The volatile oils are generally obtained by distilling the parts of plants in which they exist, as the leaves, bark, roots, and even wood, either alone or more usually with water, the vapor of which carries over mechanically the oils of a higher boiling-point, which usually emit at 212° a vapor of considerable tension, which gives the characteristic odor of the plant, and is condensed with the steam, separating in the receiver into a milky or turbid layer, usually, but not always, lighter than the water. Many oils of delicate perfume, like oil of lemons, orange, etc., exist in cells in the skin of the fruit and leaves in a state sufficiently abundant to permit their separation by mechanical pressure, while heat would impair their delicacy. The *essences* are only the watery solutions of essential oils, and are often prepared in domestic economy, as rose-water, essence of pennyroyal, mint, etc., by distillation or by addition of the oils to a sufficient quantity of water to hold them in emulsion or hydration, forming the so-called *distilled waters* of the apothecary.

Some of the volatile oils contain acids, aldehydes, etc., the study of which has shed important light on organic chemistry—*e. g.* oil of winter-green (*Gaultheria procumbens*) and meadow-sweet (*Spiræa ulmaria*) furnishing salicylate of methyl and salycylic aldehyde. Bitter almonds furnish benzoic aldehyde, and aldehydes of analogous constitution are obtained from the essential oils of cumin (*Cicuta virosa*), oil of cinnamon and cassia, etc. Sulphur exists in certain oils, as of garlic and mustard. The number of the volatile oils of vegetable origin is very large. Gmelin describes over 170 in his *Handbook*. There are large areas of the earth where plants with a terebinthine or balsamic odor abound almost exclusively, as in portions of Nevada and California. The properties of the plants referred to remain, for the most part, to be investigated. A peculiar turpentine of the Sierra Nevada, called "theoline," and derived chiefly from *Pinus ponderosa* and *P. Sabiniana*, has a density of only about 690, ordinary turpentine being 870 or over.

The odors of volatile oils are by no means all agreeable. Many are pungent, irritating, and even repulsive; their taste is usually aromatic, often burning. Alcohol and ether are their proper solvents. Many volatile oils are the result of decomposition of other compounds by heat, fermentation, and the action of acids; such are eupione, creosote, naphthaline, fusel oil, oil of wine, etc.; while others which exist ready formed in plants, like those of *Spiræa ulmaria* and *Gaultheria procumbens*, may be formed artificially. There are some volatile oils of animal origin, as in ants, castoreum, skunk, etc.

The adulteration of volatile oils is often practised with fixed oils, when it may be detected by a permanent greasy stain left on paper after evaporation and warming; by distilling off the volatile oil, leaving the fixed oil behind; or by dissolving the volatile oil in three or four volumes of 80 per cent. alcohol, when the greater part of the fixed oil remains behind. Alcohol is also a frequent adulterant, and may, when the quantity is large, be detected by dilution of the adulterated oil with water, when it becomes very turbid. Oil of turpentine is often used to adulterate the costly oils of the same series, as of orange, lemon, neroli, etc. It may often be detected by the smell, or after setting fire to it and then blowing it out.

The odor of volatile oils is closely connected with their oxidation. Oil of turpentine, lemon, clove, and the like, when distilled in carbonic acid or nitrogen, and over lime, are nearly odorless. Air restores the odor. Moisture seems essential also to the development of the odor of volatile oils. All odorous flowers are more fragrant when moistened with dew, and in dry climates roses and other fragrant blooms are scentless after the dry season sets in and dew no longer falls. Violets dried over calcium chloride under a bell lose all odor, but regain it completely when moistened again with water; and paper moistened with a volatile odor and then perfectly dried ceases to emit odor until it is again moistened with a little water. Rose-leaves and other fragrant petals yield a much stronger water if distilled from a bath acidulated with sulphuric acid—a fact noticed by Albertus Magnus. It is a curious fact that many distilled waters when kept in well-closed bottles become slimy, lose their proper odor, and acquire an offensive smell; whereas if kept in loosely-covered vessels they remain unchanged, or even recover their proper odor when exposed, after change, to air again. Gmelin suggests that this is due to albuminous and mucous matters carried over in the distillation, which, when they putrefy, rob the volatile oil of a portion of its oxygen, depriving it of its proper odor. B. SILLIMAN.

Oil, Seneca, a local name for petroleum.

Oils, Essential. See OILS.

Oils, Volatile. See OILS.

Oint'ment [Lat. *unguentum*], a pharmaceutical preparation designed to be applied externally, and usually mixed with oily matter, but less fluid than a liniment. Ointments are often very useful local anodyne applications, are employed also as discutients, astringents, stimulants, and are especially useful in the treatment of skin diseases.

Oise, a river of France, rises in Belgium, in the Ardennes, and joins the Seine after a course of 158 miles, half of which is navigable.

Oise, department of France, along the Seine and the Oise. Area, 2218 square miles. Pop. 396,804. The surface is flat, and the soil rich and very well cultivated. The wine is of inferior quality, but large crops of wheat are raised, and enormous quantities of fruit and vegetables are brought to the market of Paris. Of 40,436 children, only 4191 remained without school education in 1852. Cap. Beauvais.

Oje'da, de (ALONSO), b. at Cuenca, Spain, about 1465; accompanied Columbus in his second voyage to America 1493; led a party of exploration to Cibao and through the interior of Hispaniola, or Santo Domingo, then supposed to be Cipango; explored the Vega Real in a second expedition (Apr., 1494); obtained command of an independent exploring expedition; set sail May 20, 1499, accompanied by Americus Vespucius; discovered in June the country which he named Venezuela, and returned to Spain; in 1501, again accompanied by Vespucius, made another voyage and discovered the Gulf of Uraba; returning to Spain in 1508, he obtained a royal grant of Nueva Andalucia (now Colombia); set out with 300 men, among whom was Francisco Pizarro; founded the town of San Sebastian on the Gulf of Darien; embarked for Hispaniola in quest of reinforcements; was put in irons by the treacherous owner of the vessel and carried to Cuba; was for some time engaged in toilsome wars with the Indians of that island; ultimately reached Hispaniola in broken health and spirits, and d. there in 1510 or 1511.

Ojibways. See CHIPPEWA INDIANS.

O'ka, a river of Central Russia and the chief affluent of the Volga, rises in the government of Orel, becomes navigable at the city of Orel, and joins the Volga at Nizhnee-Novgorod, after a course of 837 miles. As it runs through some of the most fertile and densely-peopled regions of Russia, it is of great importance as a road of traffic.

Okanagans, or **Cutsanim,** a tribe of American Indians residing upon a river of the same name in Washington Territory, E. of the Cascade Mountains. They belong to the Shushwap branch of the Selish family; have always been friendly to the white settlers; have become semi-civilized by missions established among them in 1846; have made some progress in agriculture, and number little over 300.

O'Kane (JAMES), U. S. N., b. Nov. 11, 1839, in Indiana; graduated at the Naval Academy in 1860; rose to commander in 1874; served in the Brooklyn at the passage of Forts

Jackson and St. Philip in 1862, and was wounded soon after the action commenced; and commanded the sailor infantry at the battle of Tulifinty Cross-roads, Dec. 6, 1864.

Foxhall A. Parker.

O'kaw, tp. of Bond co., Ill. Pop. 945.

Okaw, tp. of Coles co., Ill. Pop. 1711.

Okaw, tp. of Shelby co., Ill. Pop. 1280.

Okecho'bee, Lake, the largest lake in the Southern U. S., lies in Southern Florida, and mostly in Brevard co. It is 40 miles long, 25 miles wide, and only 12 feet in maximum depth. It contains but few fishes. It receives several streams, of which Kissimee River is the most important. A large part of the lake is grown up with grass and weeds. Its waters are discharged through the Everglades without any discoverable stream which can be called an outlet. Nearly all the shores of the lake are impenetrable, swampy jungle, and the lake itself is nearly inaccessible. It contains a few low islands. The reports of ruined buildings upon these islands are false. Area, 1200 square miles.

O'Keefe (John), b. at Dublin, Ireland, June 24, 1747; became an actor and a prolific dramatic author. Several of his comedies were very popular at the close of the eighteenth century, especially *Wild Oats, The Castle of Andalusia, The Poor Soldier, The Young Quaker*, and *Peeping Tom.* In 1808 he became blind, received a pension from the Crown, published *Autobiographical Memoirs* in 1826, and d. at Southampton Feb. 4, 1833.

Okefino'kee Swamp, one of the largest swamps of the U. S., covers a large area in Charlton, Ware, and Clinch cos., Ga., and Baker co., Fla. It includes numerous lakes and forests of heavy timber, and is the abode of countless rattlesnakes, moccasins, and alligators, besides many species of game-birds.

O'ken [originally Ockenfuss], (Lorenz), b. at Bohlsbach, Würtemberg, Aug. 1, 1779; studied medicine and natural science at Würzburg and Göttingen, and was appointed professor of medicine at Jena in 1807 and of natural science in 1812. In 1816 he commenced the publication of *Isis*, a periodical of a miscellaneous character, though chiefly devoted to natural history and philosophy. Some political criticisms which it contained gave the government an opportunity of interfering, and in 1819 Oken resigned his office and lived as a private teacher till 1828, when he received a professorship at Munich. In 1832 he removed to a similar position in Zürich, where he d. Aug. 11, 1851. His principal works are—*Lehrbuch der Naturphilosophie* (1808–11), translated into English by Dr. Tulk (London, 1847), *Lehrbuch der Naturgeschichte* (1813–27), *Die Zeugung* (1805), *Ueber die Bedeutung der Schädelknochen* (1806), etc. As a pupil of Schelling, the general character of Oken's works has not been acceptable to naturalists, speculation having been cultivated too much at the expense of observation, and his hypotheses now exist chiefly as a warning against "transcendental" excesses. Even the hypothesis of the vertebral composition of the skull, which he developed, after but independently of Goethe, has little in common with that now generally accepted.

Okhotsk', Sea of, a large inlet of the Pacific Ocean on the eastern shore of Asia, between the island of Saghailin, Siberia, Kamtchatka, and the Kurile Islands. Its northern part is frozen from November to April.

Okobo'ji, tp. of Dickinson co., Ia. Pop. 236.

Okolo'na, post-v. and cap. of Chickasaw co., Miss., on the Ohio and Mississippi R. R., has 2 weekly newspapers. Pop. 1410.

Okra. See Gumbo.

Oktib'beha, county of Central Mississippi. Area, 550 square miles. It is somewhat level and very fertile. Live-stock, corn, and cotton are leading products. Cap. Starkville. Pop. 14,891.

Okubo (Jusammi Toshimichi), b. in the province of Satsuma, Japan, about 1829; belonged to the class of Retainers; received a good native education; early took an interest in the welfare of the empire, and was a counsellor of the prince of Satsuma; when the tycoon abdicated in 1868 became a national counsellor; was a member of the embassy which visited America and Europe in 1872; in 1874 was instrumental in putting down an insurrection at Saga; when the difficulty with China about Formosa was attracting universal attention took upon himself the task of carrying out the policy of the cabinet; went to China as a special ambassador, and was successful in securing an honorable peace and an indemnity, for which service he was greatly honored throughout the Japanese empire. He does not speak English, but is a profound Oriental scholar; is an advocate of education and agriculture, a leader in the national council, and at the present time minister of the interior. F. A. P. Barnard.

O'laf, Saint, the patron saint of Norway, b. about 995, a son of Harald Gränske, a grandson of Harald the Fairhaired, commanded a viking fleet when twelve years old, and was one of the most famous and most dreaded seakings of the North before he was nineteen. In 1014 he returned from a pillaging jaunt along the coasts of France and Spain, and installed himself in his patrimony, the throne of Norway. He now set about introducing Christianity among his countrymen, but his measures were so severe and violent that the Norwegians rose in rebellion against him, and when in 1028, Knud (Canute) the Great, king of Denmark and England, who laid claim to Norway, landed with an army near Drontheim, Olaf was compelled to flee to Russia. Two years afterwards he returned with aid from Russia and Sweden, and gave battle at Stiklestad, near Drontheim, July 29, 1030, but his army was routed, and he himself slain and buried on the spot. Subsequently, when Norway became thoroughly Christianized, his body was brought to the cathedral of Drontheim and enshrined behind the high altar. Great miracles were reported; crowds of pilgrims journeyed to his shrine; legends and folk-lore gathered around his name; and in the following century he was solemnly canonized and declared the patron saint of the country. Aug. 21, 1847, King Oscar I. instituted the order of St. Olaf.

O'land, an island of Sweden, in the Baltic, opposite the city of Kalmar. Area, 608 square miles. Pop. 40,000. It is well wooded and affords good pasturage, and has rich alum-mines and still richer fisheries.

Ola'the, post-v. and tp., cap. of Johnson co., Kan., 21 miles S. W. of Kansas City, has a commercial college, good public schools, 7 churches, 2 weekly newspapers, a deaf and dumb asylum, 3 railroads, 2 grist-mills, and stores. Pop. of v. 1817; of tp. 3022.

M. V. B. Parker, Ed. "Mirror and News Letter."

Ol'bers (Heinrich Wilhelm Mathias), b. at Arbergens, near Bremen, Oct. 11, 1758; studied medicine at Göttingen, and practised as a physician at Bremen, where he d. Mar. 2, 1840. His leisure hours he gave to the study of astronomy, especially comets. He invented a new method of calculating the orbits of comets from three observations, which proved easier and more accurate than the old one; and his calculations and observations of the comets of 1798, 1802, 1804, 1815, and 1821, collected and published in Bode's *Annuaire* (1782–1829) and in Encke's (1833), enjoy a great reputation. Of the planets between Mars and Jupiter, which were eagerly sought after by the astronomers in the beginning of the present century, he discovered two—Pallas, Mar. 28, 1802, and Vesta, Mar. 29, 1807. His excellent library on comets was bought by the Russian government, and is now at Pulkova.

Old'bury, town of England, county of Worcester, on the Tame. The vicinity is rich in coal and iron mines, and the town has extensive manufactures of iron and steel goods, locomotive engines, and machinery. Pop. 15,615.

Old'castle (Sir John), Baron Cobham, popularly known as "the good Lord Cobham," b. in England about the middle of the fourteenth century; fought with credit in the French wars; obtained the title of baron by marriage; was an early convert to the doctrines of Wycliffe; took part with John of Gaunt, duke of Lancaster, in his efforts to promote ecclesiastical reform, presenting a remonstrance on the subject in Parliament, entitled *Twelve Conclusions addressed to the Parliament of England;* wrote a number of discourses and satirical verses; declared the pope to be Antichrist; was consequently accused of heresy, and thrown into the Tower in the first year of Henry V. (1413); escaped to Scotland, and thence into Wales; was falsely accused of raising an army of 20,000 "Lollards" to overthrow the king; was thereupon outlawed by Parliament and a price set on his head. Being captured in Wales, he was hung in chains alive upon a gallows and burned to death by a slow fire at St. Giles's Fields, London, Dec. 25, 1417. (See his *Life*, by Gilpin, 1808.)

Old Catholics. See Roman Catholics.

Ol'denburg, grand duchy of Germany, consists of Oldenburg proper, bordering N. on the German Ocean and surrounded on the other sides by Hanover, and comprising an area of 2149 square miles, with 243,978 inhabitants; the principality of Lubeck, wholly enclosed by Holstein and comprising an area of 180 square miles, with 34,353 inhabitants; and the principality of Birkenfeld, situated in Rhenish Prussia, and comprising an area of 143 square miles, with 36,128 inhabitants. Oldenburg proper is low and flat; large dykes have been erected along the shores of the ocean and the rivers Weser and Jahde. The soil is partly marshy, partly sandy, in some places covered with extensive forests, in other with heath. Agriculture and cattle-breeding are the chief occupations; of manufactures

there are none. Oldenburg was established as an independent state, ruled by a count, at the end of the twelfth century; in 1773 it was made a duchy, and in 1815 a grand duchy.

Oldenburg, city of Germany, capital of the grand duchy of Oldenburg, has several good educational institutions, museums, and scientific collections; a fine ducal palace with beautiful gardens; two large and much-frequented cattle and horse fairs; and an active trade on the river Hunte, here navigable for small vessels. Pop. 14,928.

Oldenburg, p.-v. of Ray tp., Franklin co., Ind. P. 160.

Old Field, tp. of Ashe co., N. C. Pop. 595.

Old Field, tp. of Wilson co., N. C. Pop. 1165.

Old Fort, p.-v. and tp., McDowell co., N. C. P. 1280.

Old'ham, town of England, county of Lancaster, on the Medlock, 6 miles from Manchester. In 1760 it consisted of only 60 houses, but the discovery of rich coal-mines in its immediate vicinity occasioned the establishment of large factories, and soon it became one of the leading manufacturing towns of England. Besides the cotton manufacture, several large machine-shops and brass and iron foundries are in operation. Pop. 82,619.

Oldham, county of Kentucky, bounded N. W. by the river Ohio, which separates it from Indiana. Area, 200 square miles. It is partly hilly, especially in the N. W., but is very productive. Tobacco, live-stock, wool, corn, and oats are leading products. The county is traversed by the Cincinnati and Louisville and the Louisville and Lexington R. Rs. Cap. La Grange. Pop. 9027.

Oldham (Capt. John), b. in England about 1590; came to Plymouth, Mass., 1623; intrigued with Lyford to set up a separate worship 1624; lived afterwards at Hull and Cape Ann; represented Watertown in general court 1634; visited the Connecticut River country 1633; returned there with a vessel to trade with the Indians 1636, and was killed by them, the event leading to the first Pequot war.

Oldha'mia, a peculiar organism having a branching, plant-like form, thought by some to be a polyzoon, by others a vegetable; found in the Cambrian rocks of Ireland, and interesting as one of the first-known forms of life. It was named after Dr. Oldham, late director of the geological survey of India. J. S. Newberry.

Old Harbor Isle, tp. of Hancock co., Me. Pop. 13.

Old Lutherans. See Separate Lutherans.

Old Lycom'ing, tp. of Lycoming co., Pa. Pop. 475.

Old Lyme, tp. of New London co., Conn. Pop. 1362.

Oldmix'on (John), b. at Bridgewater, England, in 1673; became collector of the customs at his native place; is thought to have visited America; wrote some dull plays and several historical works, among them *The British Empire in America* (2 vols., 1708), *A Critical History of England, Ecclesiastical and Civil* (2 vols., 1726), and a *History of England* (3 vols., 1730–39) comprising the period from Henry VIII. to George I., inclusive. Having attacked the literary merits of Swift, Gray, and Pope, the latter poet retorted by making him one of the heroes of the *Dunciad.* D. in London July 9, 1742.

Old Perlican, port of entry on Trinity Bay, Newfoundland, 28 miles from Heart's Content. Pop. 868.

Old Point Comfort, post-v. of Elizabeth City co., Va., on Hampton Roads, the estuary of James River, and in which is situated Fort Monroe (which see). The place belongs to the U. S. government. Pop. 313.

Old Red Sandstone, a name formerly used to designate the members of the Devonian system in Scotland and Wales. Here the most characteristic element in the formation is Red Sandstone, and the term Old Red was applied to this to distinguish it from the Triassic red sandstones, which overlie the carboniferous system, and which received the name of the New Red Sandstone. Later geological investigations have shown that the group of rocks which in other countries are the equivalents in age of the Old Red Sandstones of Scotland sometimes contain no red sandstone, and consist of limestones, shale, etc. The term which has been made so familiar through the writings of Hugh Miller has therefore been generally superseded by that which Sir R. Murchison first suggested, and "the Old Red Sandstone group" is now generally known as the Devonian system. The Old Red Sandstone series of Scotland has been estimated to have a thickness of from 6000 to 10,000 feet. According to Hugh Miller, it consists of the following members:

3. Upper.
- 3. Yellow sandstone, containing *Holoptychius,* etc.
- 2. Concretionary limestone.
- 1. Red sandstone and conglomerate.

2. Middle.
- Gray sandstones and shales, containing *Onchus, Ctenodus, Osteolepis, Pterichthys,* etc.

1. Lower.
- 3. Red and variegated sandstone.
- 2. Bituminous schists, containing *Dipterus, Pterichthys, Coccosteus, Cephalaspis;* also the crustaceans *Eurypterus, Pterygotus,* etc.
- 1. Conglomerate and red sandstone.

As is shown in the above table, the Old Red Sandstone series of Scotland consists mainly of mechanical sediments deposited in shallow water, and were formed by the wash from near and older land; Prof. Ramsey has suggested that they were formed in bodies of circumscribed and perhaps fresh water. The characteristic fossils of the formation are fishes and large crustaceans. The fishes include many genera and species, of which graphic descriptions have been given by Hugh Miller in his charming books *The Old Red Sandstone* and *Footprints of the Creator.* There are also found here many traces of land-plants, but the flora of the age is much better represented in the Devonian rocks of other countries. In the S. of England, in Central Europe, and in N. America the Devonian system includes heavy beds of limestone, which are open-sea deposits and contain great numbers of mollusks, corals, etc., forming a very different fauna from that of the Old Red Sandstone of Scotland. Fishes are, however, the most characteristic fossils of the group wherever it has been examined. These were the highest forms of life which existed during the Devonian age, and they were so numerous and varied and attained so large size that this well deserves the name applied to it in geological history, *the age of fishes.* The first knowledge obtained of this remarkable fish-fauna was supplied by the admirable studies made by Hugh Miller of the Old Red Sandstone of Scotland. (See Geology and Fossil Fishes.) J. S. Newberry.

Old Rich'mond, post-v. and tp., Forsyth co., N. C., on the Yadkin River. Pop. 833.

Old River, tp. of Arkansas co., Ark. Pop. 981.

Olds, tp. of Greene co., N. C. Pop. 2931.

Olds (Gamaliel S.), b. at Granville, Mass., in 1777; graduated at Williams College 1801; was a tutor there, and then (1806–08) professor of mathematics; was a Congregational minister of Greenfield, Mass., 1813–16; mathematical professor in the University of Vermont 1819–21, in Amherst College 1821–25, and later in the University of Georgia; removed in 1841 to Ohio, where he was a preacher. D. at Circleville, O., June 13, 1848.

Old Say'brook, tp., Middlesex co., Conn. Pop. 1215.

Old Store, post-v. and tp., Chesterfield co., S. C. Pop. 1921.

Old Tex'as, tp. of Monroe co., Ala. Pop. 1067.

Old Town, tp. of Conecuh co., Ala. Pop. 1749.

Old Town, tp. of Dallas co., Ala. Pop. 983.

Old Town, tp. of McLean co., Ill. Pop. 1109.

Old'town, post-v. and tp., Penobscot co., Me., on the Penobscot River and on the European and North American R. R., has a large lumber-trade. Pop. 4529.

Old Town, tp. of Alleghany co., Md. Pop. 851.

Old Town, post-v. and tp., Forsyth co., N. C. P. 860.

Old Town, post-v. and tp., Grayson co., Va. Pop. 2240.

Ol'dys (William), b. in London, England, July 14, 1696; assisted in editing the *Harleian Miscellany;* appointed Norroy king-at-arms 1755; distinguished for his bibliographical knowledge, accuracy, and integrity; author of *The British Librarian* (1737) and *A Life of Sir Walter Raleigh* (1740), besides contributions to magazines and biographical dictionaries, and left a valuable collection of MSS. D. at London Apr. 15, 1761. (See James Yeowell's *Memoir of Oldys,* 1862; also Disraeli's *Curiosities of Literature.*)

Olea'ceæ [from *Olea,* one of the genera], a natural order of exogenous trees and shrubs, now extended so as to include the jessamine family, mostly natives of warm temperate and tropical climates, the ash alone having a higher northern range. The leading character of the order is that of having regular monopetalous or sometimes polypetalous flowers, with the parts of the calyx and corolla four and hypogynous, while the stamens are only two, and the ovary 2-celled; but some are apetalous. The olive tree is far the most important representative of the order, and next to it the ash trees with their excellent tough timber, one species also yielding manna. Among the small trees or shrubs cultivated for ornament are lilacs, privet, fringe tree, Forsythia, and jessamine.
A. Gray.

Oleacin'idæ [from *Oleacina*, the name of one of the genera], a family of terrestrial gasteropod mollusks of the order Pulmonata and sub-order Geophla. The animal has a long hernia-like protrusion of the viscera into a spiral sack enveloped in the shell; the mantle is thin; the respiratory orifice on the right side, beneath the margin of the foot; the head has a projectile and retractile buccal sack, and is furnished with peculiar labial processes developed as outwardly curved, fleshy, and elongated triangular feelers; there are four retractile tentacles, the two longer ones posterior and bearing eyes at their extremities, the shorter anterior; the lingual ribbon is long and narrow, armed with numerous nearly uniform sigmoidally curved and pointed teeth, with their apices directed backwards, and arranged *en chevron;* the jaw is wanting; the foot elongated and narrow, without any independent locomotive disk, and simple posteriorly; the vent is near the respiratory orifice, the orifice of the reproductive organs on the right side, some distance behind the occuliferous tentacles. The shell is spiral, and in most oblong and with a narrow aperture in some, but is depressed and heliciform, with a wide aperture. The family includes numerous species, and is distinguished by characteristics of the animal, especially the labial palpi, the absence of the jaw, and the peculiar dentition. The animals thus organized are disguised in quite different shells, some being like those of ordinary snail-shells and others most like actinias. The American species all have an oblong shell, and belong to the restricted genus Glaudina. By Messrs. Binney and Bland eight species are recognized as inhabitants of the southern or south-western sides of the Union. THEODORE GILL.

Olean', post-v. and tp., Cattaraugus co., N. Y., on the Alleghany River and the Genesee Valley Canal, and on the Buffalo New York and Philadelphia and the Erie R. Rs., has a large lumber and produce trade, and 1 weekly newspaper. Pop. of v. 1327; of tp. 2668.

Olean'der [Fr. *oléandre*], the *Nerium oleander,* an evergreen shrub of the order Apocynaceæ, a native of warm parts of the Old World, and now extensively cultivated. In colder regions it thrives as an ornamental shrub, but requires protection from frost. Its flowers are usually of a rich pale red, but are sometimes white. *N. odorum,* the fragrant oleander, a native of India, is a more tender species, with sweet-scented flowers. The wood and all parts have a poisonous action resembling that of digitalis, best treated by a judicious use of stimulants.

Oleander, post-v. and tp., Marshall co., Ala. Pop. 870.

Oleas'ter [Lat.], *Elæagnus angustifolia,* a small tree of the order Elæagnaceæ, a native of warm regions in the Old World, is planted as an ornamental tree for its silvery foliage. Its flowers are exceedingly fragrant.

Ole Bull. See BULL, OLE BORNEMANN.

Olefiant Gas. See ETHYLENE.

Olefines, hydrocarbons of the general formula C_nH_{2n}, homologous with ethylene, C_2H_4, so called from their property of forming oily compounds with chlorine, like Dutch liquid, $C_2H_4Cl_2$. They are found among the products of destructive distillation, and may be formed by the exposure of paraffines to high temperatures under pressure; thus:

$$\underset{\text{Butane.}}{C_4H_{10}} = \underset{\text{Ethane.}}{C_2H_6} + \underset{\text{Ethene.}}{C_2H_4}.$$

(See ETHYLENE, HYDROCARBONS, PARAFFINES, and TAR.) C. F. CHANDLER.

Oleg'gio, town of Northern Italy, province of Novara. It is a place of lively trade and much industry, and the silk and cotton factories are extensive. The churches are much praised for their architecture, and many fine old conventual buildings are now used for secular purposes. This town, first mentioned in the eleventh century, was fortified by the Visconti, and these defences have only recently been demolished. Pop. 8058.

O'leic Ac'id ($C_{18}H_{34}O_2$). This monatomic acid, discovered in 1811 by Chevreul, is the most important of the group of fatty acids of the general formula $C_nH_{2n-2}O_2$, set free by the saponification of olein, the fluid component of most oils and natural fats. It is obtained by treating olive oil, almond oil, or animal oils by a caustic alkali, preferably by potash, decomposing the resulting soap by tartaric acid and heating the fatty acid, after first washing it with water in the water-bath with half its weight of oxide of lead in fine powder for some hours. The oleate of lead, separated by ether and filtration from the stearate, is decomposed by dilute hydrochloric acid in deficiency, and the ethereal solution of oleic acid is then separated from the acid-water, washed, and the ether distilled from it. Oleic acid is soluble in alcohol, and crystallizes from it on cooling in brilliant crystals which melt at 57° F. to a clear colorless oil. At 39° F. this fluid acid solidifies to a hard white crystalline mass, which expands as it cools. Oleic acid distils over unchanged in a vacuum, and is even soluble in strong sulphuric acid at ordinary temperatures without decomposition. It is without smell or taste when pure, and is insoluble in water. Alcohol and ether dissolve it in all proportions, and in solutions it reacts neutral. By air it is slowly oxidized at ordinary temperatures, but it rapidly absorbs oxygen when melted, becoming rancid both to smell and taste, and then develops a strong acid reaction. It dissolves the solid fats, and is itself dissolved by coleate of soda (as in bile), forming a soap with an acid reaction.

Very large quantities of crude and high-colored oleic acid are produced in the lime saponification of lard and tallow by Chevreul's method in the manufacture of stearine candles. The insoluble lime-soap formed in this process is decomposed by dilute sulphuric acid, and the cake of fatty acids which forms on the surface of the cooled mother-liquor holds the oleic acid entangled in the stearic and margaric acids, from which it is in great part freed by filtration at 32° in the hydraulic press. This impure oleic acid, which is found in commerce under the name of *red oil,* yields pure oleic acid after separation from its lead-salt, after a second saponification with an alkali, and is salted out with sodium chloride mixed with sodium carbonate, by which means only can it be freed from the associated coloring-matters. At 66° F. the sp. gr. of oleic acid is 0.898. Oleic acid burns when heated in air, combines with sulphur when distilled dry with that element, yielding a red-brown, bad-smelling oil, with evolution of much H_2S. With bromine and chlorine in presence of water, oleic acid forms dibromoleic and dichloroleic acids. Iodine does not act upon it. Tribromoleic acid ($C_{18}H_{31}Br_3O_2$) is formed when bromine falls drop by drop into oleic acid. Nitrous acid converts oleic acid into elaidic acid, an isomeric form of oleic acid, without forming a second decomposition product. Nitric acid acts on oleic acid with violence, evolving volatile acids of the general formula $C_nH_{2n}O_2$—namely, acetic, butyric, propionic, caproic, etc.—and mixed acids of the general formula $C_nH_{2n-4}O_2$, such as suberic, pimelic, adipic, etc.; the number and proportion of these depending on the activity and duration of the reaction. With the metals oleic acid forms neutral oleates $M'(C_{18}H_{33}O_2)$ or $M''(C_{18}H_{33}O_2)_2$, according to the equivalence of the metal. The neutral oleates of the alkali metals are soluble in water, and are not completely thrown down from solution, as are the stearates and palmitates, by the addition of another soluble salt. The acid oleates are liquid and insoluble in water. Absolute alcohol and ether dissolve the oleates in the cold, by which reaction they are distinguished and separable from the stearates and palmitates. By heating oleic acid in sealed tubes with glycerine in varying proportions three glycerides are produced—viz. *monoleine* $(C_3H_5)'''(OH)_2C_{18}H_{33}O_2$; *dioleine* $(C_3H_5)'''(OH)(C_{18}H_{33}O_2)_2$; and *trioleine* $(C_3H_5)'''(C_{18}H_{33}O_2)_3$. The two first are solids at 60° F. The olein of various non-drying oils which become rancid or are converted into viscid masses with an acid reaction, as olive oil and some other vegetal and animal oils, appears identical with trioleine. Olive oil at and below 40° F. deposits a large quantity of curdled fat, mainly palmatine, and the liquid oil filtered from it is mainly oleine. Submitted to destructive distillation, oleine yields acroleine, sebacic acid, and gaseous and liquid hydrocarbons. The drying oils, as linseed, castor, nut, poppy, etc., as already observed, contain a different primary nucleus, and contain the glycerides of other series. We may here consider, out of its alphabetical order—

Linoleic Acid (*Papeveroleic Acid, Trockenölsäure*), $C_{16}H_{28}O_2$.—This monatomic acid of the fatty group exists in linseed and poppy oil, from which it is obtained by saponification with potash, and purified by repeated treatment with salt, and thrown down by chloride of calcium. The precipitated lime-salt is washed, pressed, and digested in ether, which dissolves out the linoleate of lime and leaves the salts of the solid fatty acids undissolved. The ethereal solution is decomposed by cold hydrochloric acid, whereby the linoleic acid is separated and remains dissolved in the ether; the solution is drawn off, and the ether distilled at as low a temperature as possible in a stream of hydrogen gas. Linoleic acid then remains as a dark-yellow liquid, soluble in alcohol, but precipitated by ammonia and baric chloride. The barium salt, washed and pressed, is dissolved in ether, and the granules gradually formed in the solution are repeatedly crystallized from ether. The acid is separated from its barium salt by agitating with ether and hydrochloric acid, withdrawing the ethereal solution and distilling off the ether; it is dried over oil of vitriol in a vacuum and a mixture of ferrous sulphate and lime. Linoleic acid is a limpid oil, more so than poppy oil, of sp. gr. 0.92 at 14° C., of a faint yellow color, a slight acid

reaction, and a high refractive power. It remains liquid even at —18° C. Taste, at first mild, becomes soon harsh. Its formula calls for carbon 76.19, hydrogen 11.11, oxygen 12.70 = 100. It absorbs 2 per cent. of oxygen by long standing, and thickens so that it will hardly flow, but remains colorless, and forms a varnish on wood, but on glass merely becomes tough. Linoleic acid is insoluble in water. The linoleates of sodium, barium, lime, zinc, magnesium, lead, and silver have all been studied; they are soluble in alcohol and ether, are white, for the most part uncrystallizable, and separate from their hot solutions in flakes; by spontaneous evaporation they are obtained in the form of a jelly.

Palmitic Acid ($C_{16}H_{32}O_2$), (otherwise known as *Cetylic Acid, Ethalic Acid, Olidic Acid*).—As already mentioned under FATS, Chevreul distinguished in 1820 the solid fatty acids resulting from the saponification of fats as *margaric acid* and *margarous* (afterward *stearic*) *acid*, the former melting at 60° C., the latter at 75°, and solidifying at 70°. Chevreul did not consider the difference between the two acids as fully established, but suggested that margaric acid might be a mixture of stearic acid with another more fusible acid and richer in oxygen. Accordingly, Heintz in 1852 showed the margaric acid of Chevreul to be a mixture of about 90 per cent. of *palmitic acid* and 10 per cent. of stearic acid. Meantime, palmitic acid and various mixtures of that with stearic acid and other acids received peculiar names. Heintz proved that (1) all the acids obtained in the saponification of fats contain an even number of carbon atoms divisible by 4 without remainder; (2) the margaric acid of most chemists is separable into palmitic and stearic acids; (3) fatty acids may be mixtures, and not definite compounds, even though neither their composition nor their melting-points can be altered by recrystallization; (4) such mixtures may, however, be separated by partial precipitation; (5) they differ from pure acids as regards their melting-points and mode of solidifying. (*Gmelin*, xvi. 351.) Palmitic acid is universally distributed in the fats of the animal and vegetable kingdoms. Combined with glycerine, it occurs abundantly in palm oil, the fat of certain palms, in Chinese tallow, in Japanese wax, and the wax of *Myrica cerifera*. (*G. E. Moore*.) In the animal kingdom it is combined with ethal in spermaceti (*J. L. Smith*); in the melissine of beeswax, etc. It is easily prepared from palm oil by saponification with caustic potash, decomposing the soap with sulphuric acid, and recrystallizing the fatty acid several times from hot alcohol till it gives a steady melting-point. From oleic acid it may be evolved, along with acetic acid, by fusion with potassium hydrate, $C_{18}H_{34}O_2 + 2KOH = KC_{16}H_{31}O_2 + KC_2H_3O_2 + H_2$. Palmitic acid is a colorless solid, lighter than water, crystallizes in small shining scales, and is without odor; insoluble in water, but freely so in hot alcohol and ether. The solutions are acid, and if concentrated solidify on cooling, or if dilute yield tufts of slender needles with an acid reaction. This acid may be distilled unchanged, and, gently heated, evaporates without residue from an open dish. It burns like other fats with a light smoky flame, and is attacked by warm chlorine with evolution of HCl and the formation of substitution products. It forms with the alkali metals acid-salts analogous to the acid-acetates, and it forms normal or neutral salts with other metals according to their equivalence. The potassium and sodium palmitates are soluble in water and alcohol; the rest are insoluble.

Palmitines or *glyceric palmitates* are ethers known as *mono-*, *di-*, and *tri-palmitine*, all crystalline fats which are artificially formed, of which the last is natural palmitine from palm oil and other fats.

Palm Oil comes chiefly from the African coast, and is an important article of commerce for the production of candles. When fresh it has an agreeable odor and a deep orange-red tint, which it loses by exposure to light and air, becoming at the same time rancid and developing both glycerine and oleic acid, with palmitic acid—a change analogous to saponification. B. SILLIMAN.

Oleine. See OLEIC ACID.

Ole′na, post-v. of Henderson co., Ill. Pop. 127.

Oleo-Margarine. See BUTTER.

Oleo-Phosphoric Acid, a phosphuretted fatty acid found in the brain. It is a yellow, gummy body, containing 1.9 to 2.0 per cent. of phosphorus. By long boiling with water or alcohol, more quickly with acidulated water, it gradually forms a pure oleine, while the liquid becomes decidedly acid from the phosphoric acid set free. Alkalies form oleates and phosphates with free glycerine. All parts of vertebrate animals contain this body, and a similar substance is found in the yolk of the eggs of cartilaginous fishes and other animals. (See article LECITHINE; also Frémy, *Ann. Ch. Phys.* [3] ii. 474, l. 172, Diaknow, *Zeit. f. Chem.* [2] iv. 154, and Strecker, *Zeit. f. Chem.* [2] iv. 437.) C. F. CHANDLER.

Oleo-Resins, natural mixtures of fixed or volatile oil with resins. The most important are those of capsicum, cubebs, the male fern, lupuline, black pepper, and ginger. They are prepared by exhausting the portion of the plant containing them with ether, and subsequently evaporating off the solvent. C. F. CHANDLER.

Oléron′, an island of France, lies opposite to the mouth of the Charente, and belongs to the department of Charente-Inférieure. It is 20 miles long, 5 miles broad, and has a population of 16,800. It is fertile, produces wheat, maize, wine, and fruits, and has important salt-works and fisheries. It contains three lively and thriving towns, with from 3000 to 5000 inhabitants each, and considerable trade in corn, wine, salt, and fish—Château d'Oléron, St. Georges d'Oléron, and St. Pierre d'Oléron.

O′ley, post-v. and tp., Berks co., Pa. Pop. 1986.

Olhao′, town of Portugal, province of Algarve, on the Atlantic, has a good harbor and valuable fisheries, in which almost all its inhabitants are engaged. Pop. 7025.

Olib′anum (*incense, frankincense*), a gum resin which exudes from a tree growing in Arabia and India. It occurs in oblong or rounded laminæ, opaque, of yellow or reddish color, dull and waxy on the fracture. It melts with difficulty and imperfectly when heated, and burns with a bright flame. It has a balsamic, resinous smell and an acrid bitter taste. Triturated with water, it forms a milky, imperfect solution. Alcohol dissolves nearly three-fourths of it. Braconnot (*Ann. Chim. Phys.* [2] lviii. 60) found 100 parts of it to yield 8 of volatile oil, 56 of resin, 30.8 of gum, and 5.2 of a glutinous body insoluble in water and alcohol, with some mineral matter. It is used for fumigation and in the preparation of plasters. It has been burned from antiquity in religious ceremonies. (See *U. S. Disp.; Jahresb.*, 1858, 482; *Ann. Chem. u. Pharm.*, xxxv. 306; *Zeit f. Chem.* [2] vii. 201.) C. F. CHANDLER.

Ol′ifant's River, or **Elephant's River,** a river of South Africa, flowing through the territory of Cape Colony, and entering the Atlantic in lat. 31° 38′ S. It is impeded by rocks, and not navigable, but its waters are available for irrigation.

Ol′igarchy [Gr. ὀλιγαρχία, "government by a few"] differs from aristocracy solely in the extent of the governing class. In an aristocracy a body of nobles or one of the estates or leading interests of the realm have a controlling voice in the management of affairs. In an oligarchy the ruling class is small. In point of fact, oligarchies have usually been among the most unjust and oppressive of governments. They have been usually gotten up by "rings" or cabals, by means of *coups d'état*, and have almost always been short-lived and unpopular.

Oligoch′ætæ [Gr. ὀλίγος, "few," and χαίτη, "lock of hair" or "bristles"], an order of the class of worms or annelids, including the common earth-worm and fresh-water worms, and distinguished by the union of the two sexes in the same individuals. The form exemplified in the familiar species is repeated in all; *i. e.* the body is elongated, cylindrical, and distinctly articulated, or ringed; each ring is furnished with setæ generally combined in a dorsal and an abdominal pair of setæ or bristles of variable length; the mouth is terminal or sub-terminal; the anus is at the posterior extremity; the alimentary canal straight and differentiated into a pharynx, œsophagus, and intestine; the nervous system has pre-oral cerebral ganglia, and is continued backwards along the inferior portion of the body into a double chain of ganglia closely united together; the sexes are combined in the same individual and situated towards the fore part of the body, the male organs anterior, the female a little farther behind. The order includes quite a large number of species, which have been grouped into two families, distinguished by the distribution of the setæ: (1) Lumbricidæ, with simple setæ, including the earth-worms, and (2) Naidæ, with bifid or hair-like setæ, embracing the fresh-water species. In the earth-worms (Lumbricidæ, Lumbricinæ) the setæ are isolated or grouped two by two; in the Lumbricidæ, Enchytræinæ, they are three or four in number, in bundles; in the Naidæ, Naiinæ, they are in four rows (exceptionally bi-serial), and then all hair-like; and in the Naiidæ, Chætogastrinæ, they are bi-serial, but never hair-like. Such is the division proposed by Vaillant (1868), who has recognized in the several groups twenty-five genera from various parts of the world, which are represented in nearly all regions of the globe. THEODORE GILL.

Olig′oclase [Gr. ὀλίγος, "brittle," and κλάσις, "fracture"], one of the feldspars, crystallizing in the triclinic system, and essentially a silicate of alumina and soda.

O'lin, post-v. and tp., Iredell co., N. C. Pop. 920.

Olin (Abraham B.), LL.D., b. at Shaftesbury, Vt., 1812, son of the late Judge Gideon Olin, one of the founders of Vermont; graduated at Williams College 1835; became in 1838 a lawyer of Troy, N. Y., where he was three years city recorder; was in Congress 1857–63; became in 1863 judge of the supreme court of the District of Columbia.

Olin (Henry), b. in Vermont in 1757; was a member of the general assembly continuously from 1799 to 1825, except four years; of the constitutional conventions of 1814, 1822, and 1828; associate judge of Addison co. 1801–06; chief-judge 1807 and 1810–24; member of Congress 1824–25; lieutenant-governor 1827–29, and councillor 1820–22. D. at Salisbury in 1837.

Olin (Stephen), D. D., LL.D., son of Judge Henry Olin, b. at Leicester, Vt., Mar. 3, 1797; graduated at Middlebury College 1820; entered the Methodist Episcopal ministry 1824; labored two years in Charleston, S. C.; was president of the Abbeville Seminary; held the chair of English literature in Franklin College, Ga., 1826–33; president of Randolph-Macon College 1832–37; was in Europe 1837–41; a delegate to the Evangelical Alliance 1846; president of the Middletown Wesleyan University from 1842 until his death, Aug. 16, 1851. He wrote *Travels in the East;* his works were published in New York in 1852, and *Life and Letters* in 1853.

Olin'da, town of Brazil, province of Pernambuco, on the Atlantic, is one of the oldest, and was in the sixteenth and seventeenth centuries one of the most flourishing, towns of the country. But it suffered much during the wars between the Dutch and the Portuguese, and when Recipe was founded it lost its trade. It is now a decaying, half-deserted place; no vessels visit its harbor, cattle feed in its streets. Pop. about 7000.

Olinda (Pedro de Araujo **Lima**), Marquis of, b. at Pernambuco, Brazil, in 1790; educated at the universities of Pernambuco and Coimbra; was a member of the Constituent Assembly of Portugal 1821; member of the Brazilian Parliament more than a third of a century; president of the Chamber of Deputies 1825–27, 1831–33, and 1835–37; one of the cabinet ministers 1823, 1827, 1832, and 1837; twice regent of the empire during the minority of Dom Pedro II.; made Viscount Olinda 1841, marquis 1854, and member of the council of state 1842. D. at Rio Janeiro June 7, 1870.

O'lio, tp. of Woodford co., Ill. Pop. 2508.

Oliphant (Carolina). See Nairne.

Ol'iphant (Laurence), b. in England in 1829, son of Sir Anthony Oliphant, who was appointed chief-justice of Ceylon 1838; educated in England; went to Ceylon in youth; accompanied Jung Bahadoor, the Nepaulese ambassador in London, on his return to his own country in 1850; wrote *A Journey to Katmandu, or the Nepaulese Ambassador at Home* (1852); studied law at the University of Edinburgh; made an extended journey in Southern Russia and the Crimea a few months previous to the Crimean war, which circumstance gave occasion to a large sale for his next book, *The Russian Shores of the Black Sea* (1853); became private secretary to Lord Elgin, governor-general of Canada; was subsequently superintendent of Indian affairs in Canada; travelled extensively in the U. S.; published *Minnesota, or the Far West* (1855); wrote an anonymous pamphlet, *The Coming Campaign*, soon afterwards re-issued under the title *The Trans-Caucasian Provinces the Proper Field of Operations for a Christian Army* (1855); accompanied the army of Omar Pasha to the region in question; wrote *The Trans-Caucasian Campaign of Omer Pasha* (1856); accompanied Lord Elgin as private secretary on his mission to China in 1857; wrote *A Narrative of the Earl of Elgin's Mission to China and Japan* (1860); was chargé d'affaires in Japan 1861, at which time an attempt was made upon his life by assassins; entered Parliament 1865; joined the semi-religious community established in 1868 by Thomas L. Harris in the township of Portland, Chautauqua co., N. Y., which he has continued to make his permanent residence; was correspondent of the London *Times* in Paris at the outbreak of the Franco-German war (1870), and was manager of the American interests of the Direct Cable Company, a submarine telegraphic enterprise, 1873–75. He has published two novels, *Patriots and Filibusters* (1861) and *Piccadilly* (1870).

Oliphant (Margaret **Wilson**), b. in Liverpool, England, about 1818; has published a large number of successful novels, consisting chiefly of delineations of Scottish life and character, most of which have been republished in the U. S. Among them are *Adam Graeme of Mossgray* (1852), *The Chronicles of Carlingford* (1863), *Salem Chapel, The Perpetual Curate* (1864), *The Minister's Wife* (1869), and *A Rose in June* (1864). She has also written biographies of Edward Irving (1862), St. Francis of Assisi (1870), and Count Montalembert (1872), and *Hist. Sketches of Reign of George II.* (2 vols., 1869).

Oliphant (Thomas Lawrence Kington), b. at Henleaze, near Bristol, England, Aug. 16, 1831; educated at Eton and at Baliol College, Oxford; studied law; was called to the bar at the Inner Temple, and inherited the estate of Gask, Perthshire, Scotland, in 1867. Author of a *Life of the Emperor Frederick the Second* (1862), *The Sources of Standard English* (1873), and *The Duke and the Scholar, with other Essays* (1875), the latter work chiefly biographies of the French archæologist, the duke de Luynes, and his secretary, M. Huillard-Bréholles.

Oli'va, town of Spain, province of Valencia, beautifully situated near the Mediterranean. Pop. 6984.

Ol'ive [Lat. *oliva*], an evergreen fruit and oil-producing tree, the *Olea Europæa* (but not originally European), of which many varieties have been developed by cultivation and differences of soil and climate. The olive is supposed to be indigenous in Northern India and in other temperate Asiatic regions, and there are large forests of wild olives on the southern flanks of the Himalayas. There are wild olive woods in the Tuscan Maremme and in the island of Sardinia also, but there are historical reasons for believing that all the olives of Europe, as well as of Northern Africa, are descended from plants originally introduced from Asia Minor by human industry. The tree and its oil were known in Palestine in very remote ages, and are familiarly spoken of by the Old Testament writers, the oil (which belongs to the class called *fixed*) being used for food, for anointing the hair and person, for sacrificial libations, and for illumination. They are also mentioned not infrequently by Homer, in whose time, however, oil seems to have been a comparatively rare and costly product among the Greeks, not employed as food, but only for simple anointing and as an ingredient in perfumed unguents. Neither the old Jewish nor the most ancient Greek writers, so far as we have been able to discover, refer to the drupe or berry as an edible fruit, and the art of pickling it for the table belongs apparently to later ages. The wood of the olive tree is often noticed by the ancients as fine-grained, hard, and durable, as well as beautiful. The slow growth of the olive made its wood rare and costly, and this quality, with the evergreen foliage and apparent imperishability of the tree and the importance of its annual products, rendered the olive not merely valuable, but even sacred, in the eyes of the ancient world. The olive-branch was the symbol of peace, and the destruction of the tree by a public enemy was regarded as a barbarous violation of the usages of civilized warfare. The olive tree occupies a conspicuous place in Roman agricultural literature and in the Carthaginian authors, whose works on rural husbandry were so highly prized by the Roman conquerors. For several centuries before the Christian era the olive subserved a vast variety of uses in most of the countries subdued by Rome. Its berries were pickled for the table, and the oil was employed for all the purposes for which it is now used, except for the manufacture of soap—an article not known to the ancient Roman toilet or laundry. In fact, olive oil was relatively much more important in Roman than in modern domestic economy, for butter was scarcely used in the Roman *cuisine*, and according to Pliny no "artificial" oils were known until after Cato's time, the oil of the olive being considered the only *natural* oleaginous fluid. Even in Pliny's days the few other oils manufactured in Italy or introduced by foreign commerce were neither abundant nor much used for economical purposes, though some of them, as well as other fragrant and spicy substances, were employed to give a piquant flavor to olive oil and to the olive berry. The Romans, as well as the Greeks, thought frequent anointing the body with olive oil highly conducive to health, and the consumption of it for this purpose, as well as for illumination, cooking, and other uses, was such as to give it, next to breadstuffs, perhaps the highest rank among agricultural products. At the present day, although lard is preferred for cooking, as more nutritious, and great quantities of it are imported from America and exchanged for oil in the southern provinces of Italy, yet olive oil is very generally used for frying the everlasting *frittata, frittella*, and *frittura*, as well as in dressing macaroni and other dishes of Italian tables; and it is almost the only fluid employed by the poorer and middle classes in that country for illumination, as well as generally for most purposes to which other fixed oils are applied elsewhere.

The olive is now extensively cultivated in Asia Minor and in Syria; in Tunisia, Algeria, and Morocco, where it is extremely productive; in all Southern Europe, including the Mediterranean islands, the Slavonic provinces on the

Adriatic coast, and even the Crimea, where a variety is grown which is alleged to be hardy enough to resist the severest winters of that climate. In Spain and Portugal the berry is large and superior to all others for the table, and the oil wants only more careful preparation to be of equal excellence. Much of the Hispanic peninsula is too elevated and too arid for the olive, but wherever the local conditions are favorable it thrives luxuriantly. In France its growth is confined to the southern departments, and though the olives and oil of Provence are in high repute, it is seriously questioned whether the cultivation of the olive is, on the whole, profitable even there, for the tree will not have repaid the cost of its cultivation before its thirtieth year, and it is cut down by frost as often, upon the average, as once in forty years. The severe winter of 1709 is often said to have killed all the olives in France and in the adjacent Italian provinces, but many trees must have escaped, for there are on the Ligurian coast, near Nice, olives of five, six, and even above seven feet in diameter, which must be the growth of several centuries. France produces but a small proportion of the olive oil it consumes, importing it largely from Algeria, from Sicily and the Neapolitan provinces, and from the Greek islands. In Italy the olive is cultivated extensively in all the provinces not too distant from the Mediterranean—for this tree loves the sea-air—except in those watered by the lower Po and those so elevated as to be much exposed to frost, which, even at inferior levels, kills the foliage and the young shoots as often as once in two or three generations, and occasions the loss of one, and sometimes, though rarely, of several successive crops.

Of all fruit trees, the olive is doubtless the hardiest, for scarcely any amount of mutilation, any severity of frost, or even sharp scorching by fire, suffices to destroy the life of the tree. The smallest strip of green wood or living bark, or, in the absence of that, the roots, throw out new shoots, and the stock becomes again productive. Nor does the olive seem liable to perish from natural decay. Such is its tenacity of life that it still survives for centuries after the heart and all but the outer layer of young wood are rotten and gone, and one may often see a large trunk not only hollow in the middle, but split vertically into several distinct stems, all alike flourishing and productive. The olives now standing in what is called the garden of Gethsemane at Jerusalem are alleged to be identified by tax-rolls as existing 1000 years ago, and the tradition which makes them contemporaneous with the Founder of the Christian religion is not altogether improbable.

The ancient methods of cultivating the tree and preparing the berry and the oil for use were much the same as those now followed, but if Hesiod was right in saying that no man ever lived long enough to gather fruit from an olive he had himself planted, the habits of the tree have been modified since his time, for it now produces berries at the age of seven years, and shoots grafted on old stocks bear much sooner. Columella describes ten varieties of the olive, and Pliny speaks of a kind grown in Africa and in Portugal, the dried berries of which were sweeter and more palatable than raisins. More than twenty varieties are now recognized in Italy, but only five or six are thought specially worthy of propagation. In Europe the olive does not often exceed fifteen, or at most twenty, feet in height, and for the convenience of gathering the fruit a low, spreading growth of the crown is preferred and promoted by pruning, but in Palestine and in some of the Mediterranean islands there are olives as lofty as the tallest oak, and apparently quite sound in trunk and ramification. Both ancient and modern writers speak of this tree as producing fruit only biennially, but in the opinion of good authorities the failure of the crop in the alternate year is the effect of bad husbandry in tillage and in pruning, and especially of the practice of beating the branches to shake off the fruit, by which the young shoots and buds designed by nature to bear the following year are bruised and made unproductive. The olive is propagated by sowing the stone or kernel of the berry; by grafting or budding, generally on a wild stock; by slips, and by planting the knots or eyes found in the trunk near the surface of the ground. The trees are planted at from fifteen to twenty or twenty-five feet apart, and the ancient writers recommend even a much greater distance. When the surface is not too rough it is usually cultivated for some annual field-crop, but, though the stirring of the soil may be advantageous to the trees, the abstraction of nutritive matter from the earth by the roots of small plants grown between them is believed to be injurious to their product. It is generally thought, however, that the damage to the olive-crop is compensated by the harvests yielded by grain or other vegetables cultivated in the olive orchards. Under exceptionally favorable conditions of soil, exposure, and treatment a well-manured tree may yield twenty-five pounds avoirdupois of oil, but according to Cosimo Ridolfi the average product in Tuscany is not above two pounds and a half. The best table oil is that of Lucca in Central, and that of Bari in South-eastern, Italy. The land occupied by olive orchards in Italy is estimated at 1,235,000 acres, and the quantity of olive oil annually produced at from 30,000,000 to 40,000,000 gallons. England imports from the Mediterranean countries about 20,000 tons of olive oil per year.

The olive prefers light, rich, warm ground—does not thrive on alluvial soils, but grows well on hilly and rocky surfaces. Hence, much land too rugged for other crops is turned to profitable account by olive plantations, and the steep mountain-slopes rising by narrow terraces, supported by dry walls, to the height of many hundred feet and clothed with the olive, form one of the most picturesque features in Italian scenery. The height to which these orchards can be carried is limited by the liability to frost. A temperature of 19° F., or 13° below the freezing-point, especially if accompanied with *vetronè* or glazed frost, or followed by alternate thawing and freezing, is injurious to the tree, and if the thermometer falls to 14° F., or 18° below freezing, and remains any length of time at that degree, the young shoots, and even well-grown branches, are generally killed.

For the table the berries are gathered when fully grown, but still quite green; steeped for twenty or twenty-four hours in weak ley of wood-ashes or lime-water; then in fresh water changed every twelve or twenty-four hours for four or five days, or until they have lost their bitter flavor and the water runs off clear and tasteless. They are now salted or pickled in strong brine, in which they are kept for use in close vessels, though sometimes preserved in oil. The harvest of the berries for oil begins as soon as the skin has turned to a dark wine color, and good husbandry requires that it be finished in two or three months; but in ordinary practice it is continued, according to convenience, through the whole winter, and even into spring. The berries are spread for a short time to dry off moisture from the surface, and immediately pressed, the best table oil being obtained from unground fruit. They are then ground, but as the oil is found only in the pericarp or pulp, the millstones should not be heavy enough to crush the hard kernel. They are now subjected to repeated pressure, sometimes aided at last by pouring warm water on the mass, an inferior quality of oil being produced by every repetition of these processes. Oil is also extracted from the *sansa*, or pomace, by mechanical and chemical means. The total yield of oil is estimated at from one-eighth to one-ninth of the weight of the berries. Oil for the table, for illumination, and some other purposes is refined by settling, filtering, washing, and by various chemical processes. French chemical skill imitates table oil by manipulating American lard, which is then re-exported from Marseilles to the U. S. as oil of Lucca or Provence. GEORGE P. MARSH.

Olive, tp. of Elkhart co., Ind. Pop. 1149.

Olive, tp. of St. Joseph co., Ind. Pop. 1560.

Olive, tp. of Clinton co., Ia. Pop. 1580.

Olive, tp. of Clinton co., Mich. Pop. 1156.

Olive, tp. of Ottawa co., Mich., on the Chicago and Michigan Lake Shore R. R. Pop. 612.

Olive, post-v. and tp., Ulster co., N. Y., on Esopus Creek and on the Ulster and Delaware R. R. Pop. 3083.

Olive, tp. of Meigs co., O. Pop. 1863.

Olive, tp. of Noble co., O. Pop. 1810.

Olive Hill, post-v. and tp., Person co., N. C. Pop. 1439.

Oliven'za, town of Spain, province of Badajoz, near the Portuguese frontier, is fortified. Pop. 5717.

Olive Oil. See OIL, OLIVE.

Ol'iver, tp. of Adams co., O. Pop. 1069.

Oliver, tp. of Jefferson co., Pa. Pop. 1117.

Oliver, tp. of Mifflin co., Pa. Pop. 1355.

Oliver, tp. of Perry co., Pa. Pop. 511.

Oliver (ANDREW), b. at Boston, Mass., Mar. 28, 1706; graduated at Harvard College 1724; was a representative of Boston in the general court 1743–46; member of the council 1746–65; secretary of the province 1756–70; distributor of stamps 1765, but compelled to resign that post at the "Liberty Tree;" succeeded his brother-in-law, Hutchinson, as lieutenant-governor 1771, sharing his opinions and political conduct. D. at Boston Mar. 3, 1774.

Oliver (ANDREW), son of Lieut.-Gov. Andrew, b. at Boston, Mass., Nov. 13, 1731; graduated at Harvard College 1749; possessed considerable literary and scientific talent; was an original member of the American Academy of Arts and Sciences, to whose *Transactions* he was a frequent contributor; author of an essay *On Comets* (1772); was a judge of common pleas for Essex county, member

of the general court for Salem 1766, and was a loyalist during the Revolution. D. at Salem Dec., 1799.

Oliver (Benjamin Lynde), son of Rev. Thos. F. Oliver and grandson of Judge Andrew, b. at Marblehead, Mass., in 1788; graduated at Harvard College 1808; became a lawyer; was author of several excellent legal treatises, and noted for his skill as a chessplayer. D. in 1843.

Oliver (Daniel), M. D., LL.D., grandson of Lieut.-Gov. Andrew and brother of B. L. Oliver, b. at Marblehead, Mass., Sept. 9, 1787; graduated at Harvard College 1806; practised medicine some years at Salem; was lecturer on chemistry 1815–20; professor of the theory and practice of physic in Dartmouth Medical School and of intellectual philosophy in Dartmouth College 1820–37; professor in the Medical College at Cincinnati, O., from 1840 until Mar., 1842; author of *First Lines in Physiology* (Boston, 1835). D. at Cambridge, Mass., June 1, 1842.

Oliver (George), D. D., b. at Papplewick, England, in 1782; graduated at Trinity College, Cambridge, 1803; took orders in the Church of England; became head-master of King Edward's grammar school at Great Grimsby 1809; became vicar of Scopwick 1831, incumbent of Wolverhampton 1834, and rector of South Hykeham, Lincolnshire, 1847; filled high posts in the Masonic order, and wrote several works upon Masonry which met with wide acceptance. Among them are *Historic Landmarks of Freemasonry, The History of Initiation, Antiquities of Freemasonry,* and *Institutions of Masonic Jurisprudence.* D. at Lincoln Mar. 3, 1867.

Oliver (Peter), LL.D., brother of Lieut.-Gov. Andrew, b. at Boston, Mass., Mar. 26, 1713; graduated at Harvard College 1730; held several offices in Plymouth county, and was appointed a justice of the supreme court Sept., 1756; became chief-justice 1771; was impeached by the house of representatives 1774 for refusing to subscribe an engagement to receive no pay or emolument except from the assembly; accompanied the British troops on their retirement from Boston 1776; subsisted some years in England on a grant from the Crown, and d. at Birmingham Oct. 13, 1791. Author of various political writings and of some poems.

Oliver (Peter), son of Prof. Daniel, b. at Hanover, N. H., in 1821; educated for the bar; edited his uncle, B. L. Oliver's, *Practical Conveyancing;* wrote a number of articles for the New York *Church Review* under the name of "William Pynchon Oliver," and d. in 1855, while on a voyage for his health. A posthumous work, *The Puritan Commonwealth* (1856), edited by his brother, Fitch Edward Oliver, exhibited historical research and literary skill in a criticism of the Puritan founders of New England. An answer was published by J. W. Thornton in 1857.

Oliver (Thomas), b. at Dorchester, Mass., Jan. 5, 1734; graduated at Harvard College 1753; was a distant relative of Andrew Oliver, on whose death he succeeded to the office of lieutenant-governor of Massachusetts and president of the council. Compelled by the people to resign his seat at the council board Sept., 1774, he took refuge with the British troops at Boston, and accompanied them finally to England. D. at Bristol, Eng., Nov. 29, 1815. Author of *Poem XXIX.* in the *Pietas et Gratulatis* (Boston, 1764).

Olives, Mount of, or **Mount Olivet,** now **Jebel et-Tûr,** is on the E. of Jerusalem, from which it is separated by the narrow valley of Jehoshaphat, and rises 2786 feet above the level of the sea, 453 feet above the valley, and 190 feet above the most elevated part of Jerusalem. It forms the middle summit of a ridge of hills which to the N. expands into a large elevated table-land, but which here contracts and terminates in a row of three hills. The southernmost of these hills is now called the "Mountain of Offence," because Solomon here instituted the pagan worship for his concubines. The northern hill was the place where Titus encamped when he came before Jerusalem. The middle summit is the proper Mount of Olives. At its foot, near the bridge over the brook of Kedron, lies the garden of Gethsemane. Its swelling sides are streaked with patches of bare rock between the olive groves, which are planted in terraces. The church of the Ascension, built upon its top by Helena, which was seen by Sir John Mandeville in 1327, has disappeared, and in its place is a small octagonal chapel within a paved court, connected with a mosque.

Ol'ivet, post-v. and cap. of Hutchinson co., Dak.

Olivet, post-v. of Walton tp., Eaton co., Mich., on Battle Creek and on the Peninsular division of the Chicago and Lake Huron R. R., has 1 monthly paper, and is the seat of Olivet College. Pop. 526.

Olivet (Joseph Thoulier), Abbé d', b. at Salins in 1682; entered the Society of the Jesuits; about 1714 abandoned them, and devoted himself to letters; was admitted a member of the French Academy in 1723, and took an earnest part in the discussions. His devotion to Latin literature enrolled him on the side of the defenders of the study of the classics. Among his numerous works may be mentioned an edition of Cicero with useful notes (Paris, 1740–42, 9 vols.; reprinted, Geneva, 1758, 9 vols., 4to, the notes separately in 3 vols., 8vo, London, 1819); translations of Cicero's *De Natura Deorum* and *Catilinariæ Orationes,* and of the *Philippics* of Demosthenes; *Poemata Didascalica,* and a history of the French Academy. Voltaire was received into the Academy by Olivet. D. 1768. Henry Drisler.

Oliv'etans, or **Brethren of our Lady of Mount Olivet,** a congregation of Benedictine monks, whose first general was John Tolomei, chosen in 1319 by authority of Pope John XXII. The congregation spread rapidly, but long since declined, and now numbers but very few houses.

Oliv'idæ [from *Oliva—i. e.* olive-shaped—the representative genus], a family of gasteropod mollusks of the order Pectinibranchiata, and sub-order Rhachiglossa, having polished shells much sought after by collectors. The animal varies considerably; the mantle is moderate, and has an elongated posterior filament fitting into a notch and groove round the spire; the siphon is recurved; the head small; the tentacles pointed; the eyes present on peduncles, connate with the external margin of the tentacles or wanting; radula with the teeth in three rows, the median or rachidian variously armed, the external versatile and with a single recurved or hook-like apex; foot very large, more or less covering the shell in extension (and producing the polished coat of the shell), and with a cross groove in front on each side. The shell is sub-cylindrical, smooth, and polished, with a short spire, whose sutures are channelled or covered with callus, with the aperture narrow, and with the pillar-lip obliquely plaited in front. The family is quite an extensive one, embracing species that closely agree among themselves in their shells, the chief differences being expressed in the form of the mouth (whether linear or expanded forwards) and the length of the spire. Three quite distinct types, however, are differentiated by the teeth of the lingual ribbon. (1.) In one (Olivinæ), the rachidian tooth is broad and convex, and armed at the middle with three teeth (the internal of which is smallest), and the lateral tooth is broad, with its extremity flexed inwards; this includes the large and most familiar species of the family. (2.) In the second (Ancillinæ) the teeth essentially agree with those of the first, but the median denticle of the rachidian tooth is enlarged, and between it and the lateral smaller ones intervene. (3.) In the last (Olivellinæ) the rachidian tooth has a convex base, is narrowed sideways, and has the margin armed with numerous denticles, and the lateral teeth are claw-shaped and recurved outwards, and at their bases square supplementary pieces. Theodore Gill.

Ol'ivine [Lat. *oliva*], a name given to an olive-green variety of chrysolite, a natural silicate of magnesia and protoxide of iron, glass-like in appearance. It occurs commonly in many basalts and lavas. Olivine has also been met with in meteorites. E. C. H. Day.

O'lla Podri'da ["putrid, ripe, or seasoned pot;" Fr. *pot pourri*], the Spanish name of a *ragout* or stew made of many ingredients. Hence a literary work of extremely miscellaneous character.

Ollivier', (Émile), b. at Marseilles July 2, 1825; studied law, and began to practise as an advocate at Paris in 1846. In 1848 he was sent as commissary-general to Marseilles to pacify the city, and shortly after he was appointed prefect, but in 1849 returned to his business in Paris. In 1857 he was elected a member of the Legislative Assembly, and made himself conspicuous by his courageous and eloquent opposition to the government of Napoleon III. Gradually, however, the emperor succeeded in winning him over to his side, and he was generally considered a political renegade, when on Jan. 2, 1870, he became Napoleon's prime minister. He was president of the cabinet when the war was declared against Prussia, but he retired Aug. 9, after the first reverses of the French arms.

Olm'stead, post-v. and tp., Cuyahoga co., O., on Rocky River, and on the Cleveland Columbus Cincinnati and Indianapolis and the Lake Shore and Michigan Southern R. Rs. Pop. of v. 383; of tp. 1570.

Olm'sted, county of Central Minnesota. Area, 648 square miles. It is fertile and somewhat uneven. Live-stock, grain, and wool are largely produced. The county is traversed by the Winona and St. Peter R. R. Cap. Rochester. Pop. 19,793.

Olmsted (Denison), LL.D., b. at East Hartford, Conn., June 18, 1791; graduated at Yale 1813; was a college tutor 1815–17; became in 1817 professor of chemistry, mineralogy, and geology, and executed what is believed to

have been the first State geological survey in this country (report published 1824–25); became in 1825 professor of mathematics in Yale College, and in 1836 professor of astronomy and natural philosophy; published in 1831, 1832, and 1842 textbooks on natural philosophy, several works on astronomy for schools, and a number of biographical memoirs; made important observations on hail, on meteors, the aurora borealis, etc.; his conclusions regarding the latter phenomenon are in vol. viii. of the *Smithsonian Contributions*. D. at New Haven, Conn., May 13, 1859.

Olmsted (Frederick Law), A. M., b. at Hartford, Conn., Apr. 26, 1822; studied agricultural science and engineering at Yale 1845–46; became a practical farmer, first in Central New York, and then on Staten Island; was appointed, with Mr. Calvert Vaux, to superintend the construction of the Central Park, N. Y. (see Central Park), a work upon which he was several years employed. In 1874 he was appointed to superintend the reconstruction of the grounds about the Federal Capitol, Washington; author of *Walks and Talks of an American Farmer in England* (1852), *Journey in the Seaboard Slave States* (1856), *Journey through Texas* (1857), *Journey in the Back Country* (1860), the *Cotton Kingdom* (1861); is widely known as a pungent writer and a skilful landscape-gardener.

Ol′mütz, city of Austria, province of Moravia, on the Marsch, is strongly fortified, and was the place of imprisonment of La Fayette. It is the see of an archbishop. It has a well-attended university, two military academies, a polytechnic school, extensive manufactures of linens, cloths, and porcelain, and a large trade in corn and cattle. Pop. 15,231.

Ol′ney, post-v. and tp., Pickens co., Ala. Pop. 959.

Olney, post-v. and tp., cap. of Richland co., Ill., on the Ohio and Mississippi and the Grayville and Mattoon R. Rs., has good schools, 11 churches, 2 newspapers, a national bank, several mills, 4 hotels, a fine court-house. Pop. of v. 2680; of tp. 1412.

H. H. Lusk, Ed. "Olney Ledger."

Olney (Jesse), A. M., b. at Union, Tolland co., Conn., Oct. 12, 1798; exhibited in childhood a remarkable fondness for geography, as well as aptness in classical studies; was for twelve years a teacher in the Hartford Grammar School, where he was the first American teacher to introduce the method, now generally adopted, of separating geography from astronomy, and beginning the former study by familiarizing the pupil with the description and surroundings of his own town, county, and State, advancing thence to national and foreign geography. His school *Geography and Atlas*, first issued in 1828, almost immediately became a standard throughout the country, has had a sale of several millions of copies, and has been the model of which all subsequent school geographies have more or less been imitations. In 1831 appeared the *National Preceptor*, a reading manual far superior to any predecessor in the U. S., which was followed by a series of readers and outline maps, an arithmetic, and a school *History of the U. S.* Mr. Olney was also author of a small volume of poems, anonymously published at Hartford. To perfect himself in his favorite studies he visited Europe several times, residing at Paris for considerable periods. Residing at Southington 1834–54, and at Stratford for the remainder of his life, he served ten terms in the Connecticut legislature, where he was an active worker in behalf of educational interests, and was elected State comptroller of public accounts in 1867. D. at Stratford July 30, 1872.

Ol′neyville, post-v. of Providence co., R. I., on the Hartford Providence and Fishkill and the Providence and Springfield R. Rs.

Olonetz′, government of European Russia, S. W. of the government of Archangel, around the Lake of Onega. Area, 59,567 square miles. Pop. 302,490. The ground is low, flat, and marshy, containing many large lakes, and covered with immense forests. Rye, hemp, and flax are produced; marble and slate are found, but timber and furs are almost the only articles exported. Cap. Petrozavodsk.

Oloron′-Sainte-Marie, town of France, department of Basses-Pyrénées, on a river of the same name, has tanneries, dyeworks, wool-spinning factories, and manufactures of paper, linens, and horsecloth. Pop. 9362.

Olot′, town of Spain, province of Gerona, stands on the Fluvia, at the foot of the Pyrenees, in a volcanic district, and carries on a lively manufacturing industry, comprising silken, woollen, and cotton fabrics. Pop. 9984.

Oloz′aga (Salustiano), b. at Logroño, Spain, in 1803; educated for the bar; elected to the Cortés 1833; reporter of the constitutional commission 1837, when he insisted on the retention of the senate; proposed and carried laws providing for electoral reform, the suppression of monasteries, the abolition of ecclesiastical tithes, and a general amnesty; was ambassador to France three times; was the chief author of the constitution of 1855; retired from political life on the triumph of O'Donnell in 1856, but continued to reside in France; president of the Cortés Mar., 1869, and Apr., 1871. D. at Enghien, Belgium, Sept. 26, 1873.

Ols′hausen (Hermann), b. at Oldeslohe, Holstein, Aug. 21, 1796; studied theology at Kiel and Berlin, and was appointed professor in 1821 at Königsberg, and in 1834 at Erlangen, where he d. Sept. 4, 1839. His *Biblischer Commentar über sümmtliche Schriften des neuen Testaments*, published posthumously in Germany, has been (in part) translated into English for Clark's *Foreign Theological Library*, and a revised edition of it (by A. C. Kendrick, D. D.) published in New York (6 vols.) in 1858.

Olug Beg. See Ulugh Begh.

Olve′ra, town of Spain, province of Cadiz, has some very picturesque ruins of a Moorish castle. Pop. 6492.

Olym′pia, a plain in Elis, Peloponnesus, on the banks of the Alpheus, where the Olympic games were held, containing the Altis or sacred grove, which was said to have been enclosed by Hercules, and which contained the temple of the Olympian Zeus, with his statue by Phidias, and many other public buildings. Connected with the Altis were the stadium and the hippodrome. (See Grecian Games.) At the time of the Elder Pliny (23–79 A. D.) about 3000 statues were standing; now the space is occupied with cornfields, with a few scattered ruins. The German government, by an agreement with the Grecian authorities, has sent an expedition to explore the site of Olympia. (See E. Curtius, *Internat. Rev.*, Nov., Dec., 1875.)

Olympia, city, cap. of Washington Territory, and seat of justice of Thurston co., on the De Chutes River, at its entrance into Budd's Inlet, the southern projection of Puget Sound, in 47° 3′ N. lat. and 122° 55′ W. lon., and 15 miles N. of Tenino, a station on the Pacific division of the Northern Pacific R. R. Turnwater, on the opposite side of the river, is connected with the city by a bridge 520 feet long, and another bridge connects the city with the western shore of the inlet, 2030 feet long. It was first settled in 1846, incorporated in 1859, is well laid out, the streets broad and regular, shaded with elms and maples, the residences generally surrounded with gardens, has good waterworks, the capitol, at present a two-story structure of wood, city hall, court-house, jail, 6 churches, an academy, 2 public libraries, with about 12,000 volumes, 2 public and 3 private schools, 1 private bank, 4 hotels, fine water privileges, utilized by several factories and mills, and 5 weekly newspapers. It is in communication by steamers with Victoria, on Vancouver Island, is the manufacturing and commercial centre for the surrounding country, and is in the midst of grand mountain-scenery. Pop. about 1500. Francis H. Cook, Ed. "Echo."

Olym′piad [Ὀλυμπιάς], the period of four years between any two celebrations of the Olympic games. The Olympiad was early adopted as an æra for the recording of the dates of events. The Olympiads were designated by number, the first being reckoned from the victory of Corœbus in the foot-race, B. C. 776; or, again, they took the name of the principal victor in the next previous Olympic games. Events are recorded as having happened in such and such an Olympiad, or in such a year of a certain Olympiad. A new æra of Olympiads was established in the Roman empire in 131 A. D., which was sometimes used. (See Grecian Games.)

Olympic Games. See Grecian Games.

Olym′pus, the modern *Elymbo*, was the ancient name of a lofty range of mountains which separated Thessaly from Macedonia. Their sides are clad with beautiful forests, but the tops are covered with snow for nine months of the year. The highest peak rises 9754 feet, and on its broad, cloud-veiled summit stood, according to the oldest myths of Greece, the palace of Zeus and the other gods. Later, the abode of the gods was moved by a more refined sentiment to the celestial spheres, but Mount Olympus still retained its charm for the imagination.

Olyn′thus, now *Aio Mamas*, an ancient city of Macedon, on the Toronaic Gulf, was at different periods dependent on Athens or Sparta, acquired great wealth from its excellent commercial position, but was taken in 347 by Philip of Macedon, who sold the inhabitants as slaves and destroyed its buildings.

Ol′yphant, post-b. of Blakely tp., Luzerne co., Pa., on the Delaware and Hudson R. R. Pop. 2327.

Omadi, tp. of Dakota co., Neb. Pop. 552.

O′maha, city and cap. of Douglas co., Neb., situated on the W. bank of the Missouri River, 950 feet above sea-level, was laid out in 1854, and is now one of the leading

railroad centres of the North-west. The city contains a high school and several public schools, churches representing all denominations, a public library, gasworks, extensive machine and car shops, oilworks, silver-smelting works, foundries, pork-packing establishments, furniture-factories, several street railways, a fire department possessing 3 steam fire-engines, and a system of electric fire-alarm signals. The U. S. custom-house, post-office, Grand Central Hotel, and numerous private residences are examples of fine architectural skill and beauty. Omaha has 3 daily, 7 weekly, and several monthly papers, with a large number of business-houses, and a commercial industry employing an immense capital. Pop. 16,083.

Andrew Rosewater, Ed. "Omaha Bee."

Omaha Agency, post-v., Blackbird co., Neb. Pop. 31.

Omaha Indians, a tribe of the Dakota stock, occupying a reservation of 295,000 acres in Blackbird co., Neb., their ancestral abode. They are peaceable, honest, and generally industrious. They number 969 souls.

Oman', a large territory of South-eastern Arabia, extending from the Arabian Sea to the Persian Gulf along the Sea of Oman, and divided into several states, of which the most important is Muscat.

O'mar (Abu Hafsah Ibnul-Khattab), the second caliph of the Moslems, a relative of Mohammed, b. about 581; was at first one of the bitterest adversaries of the Prophet, but became after his conversion one of the most zealous apostles of Islam. In 634 he succeeded Abubekr, assumed the title of *Amîr El-Mumenîn* ("commander of the faithful"), and by his great talents, both as a military commander and as a civil governor, he laid the foundation of the vast Arabian empire. In 637, Syria and Palestine were conquered, and a mosque was built on the spot where once stood Solomon's temple; in 639, Egypt was subdued; in 642, Persia. He kept standing armies on pay, instituted a city police, regulated the relation between master and slave, etc., and under his rule an internal consolidation of the empire went along with the conquests. In 644, while at prayer in the mosque of Medina, he was stabbed by a Persian slave (a magian) for not remitting or lessening a daily tax imposed upon him for adhering to a false religion. Omar was buried at the side of the Prophet.

O'mar Pa'sha, b. at Plaski, Croatia, in 1806, a son of an Austrian officer; was educated at the military school of Thurn, and served for some time as a cadet in one of the Austrian frontier regiments; but fled in 1833 to Bosnia, changed his true name, Mikail Lattas, embraced Mohammedanism, and became tutor to the sons of Hussein Pasha. With them he went to Constantinople, became teacher in a military school, and writing-master to the heir-apparent, Abd-ul Medjid, and when, in 1839, Abd-ul Medjid ascended the throne, Omar rose rapidly. In 1842 he was appointed military governor of Lebanon; in 1843 he was made a pasha, and in the following years he distinguished himself by putting down with great skill and energy the rebellions in Albania, Bosnia, Koordistan, and other places. In the war between Turkey and Russia he commanded the army on the Danube, defeated the Russians several times, compelled them to give up the siege of Silistria, and finally to withdraw from the principalities. In the beginning of 1855 he then transferred his army to Eupatoria, repelled with great success a Russian attack, but failed in relieving Kars, whither he was sent in the same year. After the peace he was appointed governor of Bagdad, but having been accused of maladministration he was discharged, and even banished to Kharpoot in 1859. He was soon recalled, however, and sent to Bosnia in 1861, and to Crete in 1867, to put down rebellions. In 1869 he had charge for a short time of the ministry of war, and continued a member of the council of the sultan to his death, Apr. 18, 1871.

Ombay', an island of the Malay Archipelago, N. of Timor, in lat. 8° 2′ S. and lon. 124° 17′ E., is 50 miles long, 30 miles broad, high, volcanic, and inhabited by savage tribes of a mixed negro and Malay origin. At Alor the Dutch have a settlement and carry on some trade in wax, edible birds'-nests, and pepper. The pop. of the island is estimated at 194,000.

O'Mea'ra (Barry Edward), M. D., b. in Ireland about 1780; entered the British army as assistant surgeon to the 38th regiment; served in Italy and Egypt; was surgeon to the man-of-war Bellerophon in 1815; became medical attendant to Napoleon at St. Helena; obtained his friendship; quarrelled with Sir Hudson Lowe in consequence of his treatment of his prisoner, which he denounced to the admiralty, and published several books relating to the captivity of Napoleon. D. at London June 3, 1836.

Ome'ga, post-v. and tp., Marion co., Ill. Pop. 1298.

O'men [Lat.], among the ancient Romans, a sign by which the gods were believed to indicate their favor or opposition to any proposed public or private action. The omens were publicly observed by the magistrates, assisted by haruspices and augurs, the former observing signs of the first, the latter of secondary importance. In the time of Cicero, and even before it, the whole matter of taking omens, of divining, soothsaying, and the like, had fallen into disrepute among the intelligent, but with the vulgar these arts grew in importance as the empire sank in corruption. Ancient Greece abounded in oracles, soothsayers, interpreters of dreams, and the like. Chaldæa, Persia, Egypt, and Etruria were also celebrated for the attention they gave to these arts. In more recent times judicial astrology was cultivated with similar objects. Such pursuits are at present chiefly confined to half-civilized, barbarous, and savage races, but among enlightened peoples such superstitions are not unknown. It is remarkable that in modern India many of the old Roman omens are still observed.

Omen'tum, a membranous sheet extending between certain abdominal organs and distinguished as the great omentum, a quadruple fold protecting the small intestine; the gastro-hepatic, a double fold extending from the liver to the stomach; and the gastro-splenic, a double fold extending from the great pouch of the stomach to the spleen.

Omish. See Mennonites.

Ommy'iades [from *Ommeyah*, one of their ancestors], the second dynasty of the Arabian caliphate. They were fourteen in number; reigned at Damascus from A. D. 661 (41 Hejira) till 750. Moawiyah I. was the founder (reigned 661–680); Abd-ul-melek (685–705) and Walid I. (705–716) were the most powerful of the family; and Merwan II. (744–750) was the last of the dynasty. There were, however, twenty-seven Ommyiade caliphs in Spain (755–1031), and others in the S. E. of Arabia. In the latter region they maintained a limited authority until after 1500. After the final overthrow of the Damascus caliphate in 750, the Abbasides came into power, and transferred the seat of government to Bagdad.

Omnibus. See Carriages, by L. P. Brockett, A. M., M. D.

Omnis'cience, an attribute of God, in consequence of which he knows of all that has been, all that is, and all that shall be. In its last phase, as Foreknowledge (which see), it has occasioned several very subtle theological distinctions.

Om'ro, post-v. and tp., Winnebago co., Wis., on the Milwaukee and St. Paul R. R., 10 miles W. of Oshkosh. It has 2 schools, 5 churches, 3 saw and shingle mills, 1 planing and 1 grist mill, an elevator, 2 carriage-factories, 1 woollen-mill, a glass manufactory, 1 newspaper, and stores. Pop. of v. 1838; of tp. 3216.

Reynolds & Worcester, Eds. "Weekly Journal."

Omsk, town of Asiatic Russia, government of Tobolsk, is situated at the confluence of the Om and the Irtish, in lat. 54° 57′ N. and lon. 73° 40′ E. It is fortified, and the seat of the governor-general of Western Siberia. It has several military schools, manufactories, and mining-works, and carries on a considerable trade. Pop. 26,722.

Onagra'ceæ [from *Onagra*, a former genus], a natural order of exogenous herbs and shrubs which are found mainly in temperate climates, and especially in America. It is distinguished from related polypetalons with inferior ovary by having the lobes of the calyx valvate and the petals convolute in the bud, a single slender style, stamens only as many, or twice as many, as the calyx-lobes, and seeds without albumen. The leading genus is *Œnothera*, or evening primrose (the English name alluding to the resemblance of the corolla of the earliest known and commonest species to a primrose, and to the time when it opens), a specially American genus, of which many ornamental species are familiar in cultivation. *Fuchsia*, a well-known genus of shrubs, in which the calyx is as showy as the corolla, is still more important and familiar in horticulture. The order is destitute of active properties; one or two herbaceous species have been somewhat used as potherbs. An aquatic form, *Trapa*, of Europe and Asia, produces a large fleshy embryo, which is used for food under the name of water-chestnut. The Halorageæ, a group of mostly water-plants, long regarded as a degraded form of Onagraceæ, are referred to a separate order. A. Gray.

Onalas'ka, post-v. and tp., La Crosse co., Wis., on the Mississippi River and the Minnesota division of the Chicago and North-western R. R. Pop. 1532.

Onan'cock, post-v. of Accomack co., Va., on the bay of the same name, has 1 weekly newspaper.

Onar'ga, post-v. and tp., Iroquois co., Ill., on the Illinois Central R. R., 85 miles S. of Chicago. It contains a

public library of 1000 vols., the Grand Prairie Seminary, 7 churches, an incorporated live-stock importing company, 1 newspaper, 3 grain-elevators, lodges of Masons, Odd Fellows, and Good Templars. Incorporated in 1863. Pop. 2822. M. H. MESSER.

Onawa, post-v., cap. of Monona co., Ia., on the Sioux City and Pacific R. R., 3 miles from the Missouri River, has a good school, 3 churches, 1 bank, a newspaper, 1 manufactory, several hotels, and stores. Principal employment, farming and stock-raising. Pop. about 1000. MCCASKY & ALDRIDGE, EDS. "GAZETTE."

On Bow'ie, a v. of Perry co., Miss. Pop. 360.

Onchid'idæ [ὀγχιδίον, a "little tubercle," from the wart-like tubercles], a family of gasteropod mollusks of the order Pulmonata and sub-order Geophila, including naked slug-like forms. The body resembles that of the ordinary garden-slugs, but has a large, shield-like, coriaceous mantle, which entirely covers the back; the respiratory orifice is posterior, at the right side and under the margin of the mantle; the vent posterior; head continuous with the body; the eyes at the extremity of non-retractile cylindrical peduncles, arising near the antero-lateral margins; tentacles none; lingual ribbon broad, with the teeth nearly uniform, "in numerous straight, transverse rows; the central, single, short, narrow, equilateral; the lateral numerous row nearly equilateral, with a broad, flat, sub-central tip," foot narrow, elongated, simple posteriorly; shell completely wanting. The family includes several genera, the species of which, for the most part, live in damp places near the water, either fresh or salt, and are supposed to be herbivorous. The species are mostly inhabitants of the tropical or warm countries. One species, however (*Peronia celtica*), is British. THEODORE GILL.

Onck'en (JOHANN GERHARD), b. at Varel, Oldenburg, Germany, about 1800; was in early life a domestic servant; lived for a time in England, where he married and became a member of an Independent church; opened a bookstore at Hamburg as agent of the Edinburgh Bible Society and the Lower Saxony Tract Society; organized a Baptist church, of which he became pastor 1834; was appointed a missionary of the American Baptist Convention 1835; visited many parts of Germany, Austria, Switzerland, and Denmark, preaching, baptizing, distributing the Scriptures, founding churches, and promoting the erection of chapels; was several times imprisoned; edited religious journals in English and German; visited the U. S. in 1852 and in 1865, had established 76 churches, with a membership of more than 11,000, and nearly a hundred Sunday schools.

On'derdonk (BENJAMIN TREDWELL), D. D., LL.D., b. in New York City in 1791; graduated at Columbia College in 1809; was ordained to the Protestant Episcopal priesthood 1813; was a professor in the General Theological Seminary 1826–30; bishop of New York 1830–45, when he was suspended by the House of Bishops. D. in New York Apr. 30, 1861.

Onderdonk (HENRY, JR.), b. at Manhasset, N. Y., June 11, 1804; graduated at Columbia College 1827; was principal at Union Hall Academy, Jamaica, L. I., 1832–65; author of a series of works of value, mostly illustrative of the history of Long Island.

Onderdonk (HENRY USTICK), M. D., LL.D., b. in New York Mar., 1789; graduated at Columbia College 1805; studied medicine in London and took his medical degree at Edinburgh 1810; was for a time associated with Dr. Valentine Mott in the editorship of the N. Y. *Medical Journal;* was ordained in 1815 as deacon in the Protestant Episcopal Church; was engaged in labors at Canandaigua, N. Y., 1816–20; rector of St. Ann's, Brooklyn, N. Y., 1820–27; consecrated assistant bishop of Pennsylvania 1827; on the death of Bishop White became bishop of Pennsylvania; suspended 1844, restored 1856, but never resumed episcopal functions. D. at Philadelphia Dec. 6, 1858.

O'Neal', tp. of San Joaquin co., Cal. Pop. 1719.

O'Neal, tp. of Greenville co., S. C. Pop. 1348.

O'Neall (JOHN BELTON), LL.D., b. at Bush River, S. C., Apr. 10, 1793; graduated at South Carolina College 1812; was a teacher in the academy at Newberry, S. C.; served for a time in the war of 1812–15; came to the bar in 1814; was four times sent to the South Carolina legislature, and twice chosen its Speaker; became a judge 1828, a judge of the court of appeals 1830, presiding judge of the courts of errors and appeals 1850; later was chief-justice of South Carolina. Author of a *Digest of Negro Law* (1848), *Annals of Newberry, S. C., Biographical Sketches of the Bench and Bar* (1859), etc. D. near Newberry Dec. 27, 1863.

O'Neal's, tp. of Johnston co., N. C. Pop. 1294.

One'co, post-v. and tp., Stephenson co., Ill. Pop. 1401.

One'ga, a large lake in the government of Olonetz in Western Russia. Next to Lake Ladoga, it is the largest lake of Europe, covering an area of 4830 square miles. It is connected with the Volga and the Dwina by canals, and communicates with Lake Ladoga by the Sweer. It is very rich in fish.

One'glia [*Unelia*], a maritime town of Italy, in the province of Porto Maurizio, in lat. 45° 53′ N., lon. 8° 9′ E. The old harbor of this town was destroyed in the wars of the seventeenth century, but the new one has been constructed since 1825, and about 2000 vessels, total tonnage 100,000, now enter this port annually. The commerce and industry of the place are thriving. Some of the churches and other public buildings are very respectable, and the charitable institutions numerous and well endowed. The neighboring country is very fertile, and the hills that partially encircle the town are terraced with rich gardens and olive orchards. Oneglia originally stood at some distance from the sea, but being destroyed by the Saracens in 935, its fugitive inhabitants sought the seashore for food, and here rebuilt their town, which afterwards shared the prosperity and reverses of other Ligurian towns. Pop. 8047.

Onei'da, county of S. E. Idaho. It is mostly mountainous, but contains some fertile valleys well adapted to grazing and farming. The county contains medicinal, thermal, and salt springs of much prospective value. Cap. Malade City. Pop. 1922.

Oneida, county of Central New York. Area, 1215 square miles. Its centre is occupied by a broad and very fertile valley, extending E. and W. The N. and S. parts are hilly. The county is traversed by the Mohawk River, the Erie and other canals, and the New York Central and many other railroads. Building-stone, iron ore, gypsum, marl, peat, etc. are produced. Live-stock, wool, hops, grain, hay, and dairy products are among the great agricultural staples. The manufactures include furniture, wooden wares, lime, cement, cotton, woollen, and metallic goods, machinery, saddlery, farming tools, boots, shoes, lumber, carriages, flour, leather, and many other goods. In wealth and prosperity this is one of the first counties in the State. Caps. Utica and Rome. Pop. 110,008.

Oneida, post-v. of Ontario tp., Knox co., Ill., on the Chicago Burlington and Quincy R. R. Pop. 1034.

Oneida, tp. of Delaware co., Ia. Pop. 1484.

Oneida, tp. of Tama co., Ia. Pop. 715.

Oneida, tp. of Eaton co., Mich. Pop. 2047.

Oneida, post-v. of Lenox tp., Madison co., N. Y., at the junction of the New York Central and Hudson River and the New York and Oswego Midland R. Rs., in a fine farming region, noted for hop-raising, has 2 banks, 5 churches, 3 weekly newspapers, a seminary, and a brisk trade. The celebrated ONEIDA COMMUNITY (which see) is in the immediate vicinity. Pop. 3262.

Oneida, tp. of Huntingdon co., Pa. Pop. 386.

Oneida Castle, post-v. of Vernon tp., Oneida co., N. Y., has 1 church and 1 academy, and is the residence of a small remnant of the Oneida tribe, one of the "Six Nations" of Indians. Pop. 262.

Oneida Community, a communistic society established on Oneida Creek, Lenox tp., Madison co., N. Y., and constituting the chief establishment of the religious organization known as BIBLE COMMUNISTS or PERFECTIONISTS. They are the disciples of John Humphrey Noyes, who made a first unsuccessful attempt to found a community at New Haven, Conn., in 1834, organized the existing association at Putney, Vt., 1837, and removed to the present locality in 1847. The Community numbers about 300 members, owns a fine estate of 650 acres, has a commodious mansion, several mills and manufactories, and is understood to be in prosperous circumstances, the chief industrial occupations being the manufacture of traps and the preservation of fruits. Another smaller community, with about 60 members, is settled at Wallingford, Conn. The distinctive doctrines of the society are stated by the founder to be the same as those of the Gospels and the writings of Paul, and his own agency to be confined to a restoration of the primitive Christian ideal, which ceased to exist about 70 A. D., at which date Mr. Noyes places the second advent of Christ. The cardinal principles are four in number: I. Reconciliation to God, II. Salvation from sin, III. Recognition of the brotherhood and equality of man and woman, and IV. Community of labor and its fruits. The latter item embraces a scheme of "pantagamy," by which all the male and all the female members of the community are held to be in a sense married to each other—a circumstance which has exposed them to the obnoxious name of "free-lovers," but the system as regulated by the "principle of sympathy," and controlled by that free pub-

lic opinion which constitutes the supreme government of the society, is far from being amenable to the reproach of immorality, in any ordinary sense of the word. A distinguishing feature of the religious belief of the "Bible Communists" is their rejection of all laws and rules of conduct, except those which each believer formulates for himself, subject to the free criticism of his associates. They hold that the Mosaic law and ordinances were abrogated by the second coming of Christ, at which time the reign of sin was concluded, and the true believers have since been free to follow the indications of the Holy Spirit in all things, nothing being good or bad in itself. The great object to be attained is holiness, which consists in the entire extinction of all selfish desires, and this goal is thought to have been reached by a large number of the Community. (See Hepworth Dixon's *New America* (1867), J. H. Noyes's *History of American Socialisms*, and C. Nordhoff's *Communistic Societies of the U. S.* (1875).) PORTER C. BLISS.

Oneida Lake, in Oneida, Oswego, Madison, and Onondaga cos., N. Y., is 20 miles long and 6 miles wide. Its surface is 369 feet above the sea and 141½ above Lake Ontario. It abounds in fish. It formerly, with its outlet, Oneida River, was the channel of an important navigation, but it is superseded by railroads. The river is a deep, sluggish, tortuous stream, 18 miles long, with low banks. It falls into Oswego River.

Oneidas, one of the Five Nations of the Iroquois confederacy, resided in Central New York near the lake and in the county to which they have given name; were engaged, like the other allied nations, in protracted hostilities with the Hurons and the Canadian French, but were less warlike and better disposed towards the French than their neighbors, and at different periods allowed the residence of Jesuit missionaries among them. During the French wars of the eighteenth century they were faithful allies of the English, but joined with the Tuscaroras in refusing to fight against the colonists during the war of the Revolution, owing to the influence of the missionary Kirkland, who had resided some years among them. Their lands and homes were consequently ravaged by the British and Tories, for which they received compensation from the U. S. government in 1794. They ceded most of their lands to the State of New York by treaties of 1785 and 1788, retaining a reservation at Oneida Castle, where about 250 still reside. A large number emigrated to the Thames River in Canada, and subsequently, in 1821, to Green Bay, Wis., where they have a large reservation. There are now about 650 Oneidas on the Thames and 1250 at Green Bay, making a total of above 2000, or more than double the number at the close of the Revolution. They have become Christians, maintain schools and churches, and are well advanced in the arts of civilization, as well as the Brotherton and Stockbridge Indians, who reside with them.

Oneida Valley, post-v. of Lenox tp., Madison co., N. Y. Pop. 273.

O'Neil (CHARLES), U. S. N., b. in 1842 in England; entered the navy as a master's mate in 1861; became an acting master in 1862, an acting volunteer lieutenant in 1865, a lieutenant in the regular navy in 1867, a lieutenant-commander in 1868; served on board the Cumberland when sunk by the Merrimack, Mar. 8, 1862, and in the Rhode Island participated in both attacks on Fort Fisher, "discharging his duty with special credit."

FOXHALL A. PARKER.

O'Neill (CHARLES), b. at Philadelphia, Pa., Mar. 21, 1821; graduated at Dickinson College 1840; was admitted to the bar 1843; was a member of the Pennsylvania house of representatives 1850–52, of the State senate 1853; again a member of the lower house 1859–60; was a Republican member of Congress for the 2d Philadelphia district 1863–71; again elected 1872, and re-elected 1874.

Onekama, post-v. and tp., Manistee co., Mich. Pop. 255.

Oneon'ta, post-v. and tp., Otsego co., N. Y., on the W. bank of the Susquehanna River and on the Albany and Susquehanna R. R., has a union school, 5 churches, 1 opera-house, several hotels, 2 weekly newspapers, 2 banks, 1 grist and 1 saw mill, a sash and door factory, 1 foundry. The round-house, repair and machine shops of the Delaware and Hudson Canal Company are located here. Pop. of v. 1061; of tp. 2568.

J. L. BURTIS, ED. "ONEONTA COMMERCIAL."

Oneo'ta, post-v. and tp., St. Louis co., Minn., on St. Louis Bay and on the Lake Superior and Mississippi and the Northern Pacific R. Rs. Pop. 594.

On'ion [Lat. *cepa; unio*], a cultivated biennial herb and its bulbous foot, the latter composed of leaf-elements in a thickened condition; the *Allium cepa*, a plant of the order Liliaceæ, cultivated in Egypt and Asia from immemorial time, and thence introduced into nearly all civilized countries. The onion differs from the garlic especially in having the elements of its bulb disposed in concentric layers and not in separate cloves. There are many varieties, all milder in flavor than the garlic. Among the marked varieties are the potato onion, grown from off-set bulbs growing near the root, and the top onion, produced from similar bulbs growing at the top of the flower-stalk. Ordinary onions are raised in the first season from seed, or in the second year from the small *sets* or imperfectly-grown bulbs of the previous year's crop. Danvers, Mass., Wethersfield, Conn., and the Bermuda Islands are famous for their onions. The onion has an aromatic sulphur-oil containing allyl. The bulb is highly nutritious, and is eaten raw, or cooked in various ways. The crop requires a mellow, fertile soil and clean culture. In medicine it is a stimulating expectorant, valued in domestic practice, and especially in diseases of children.

Onomatopœ'ia [from the Gr. ὄνομα, a "name," and ποιεῖν, to "make"] means, in grammar, the formation of a word—in rhetoric, of a whole sentence—imitating the natural sound of the object spoken of. Such words are, in the English language, cuckoo, pewit, pee-wee, buzz, hum, hiss, crackle, crash, whirl, etc.; instances of onomatopoetic sentences may be found, some of wonderful power, in Edgar Allan Poe's *Bells*, others of exquisite delicacy in Tennyson's *Brook*. The ancient rhetoricians considered onomatopœia as an ornament of speech of high rank; instances both striking and curious are of frequent occurrence with Homer, Aristophanes, Virgil, Plautus, and Ovid. The following verse by Ovid,

Quamvis sint sub aqua, sub aqua maledicere tentant,

imitating the croaking of the frogs, was very famous in olden times. And the Greek grammarians considered onomatopœia as the fundamental principle in the formation of language, or, rather, they believed that all primitive words were onomatopes.

Ononda'ga, county of Central New York. Area, 812 square miles. It is level in the N., but hilly in the S. The soil is generally very fertile. The county contains great amounts of limestone, peat, gypsum, and marl, and has very valuable salt springs, the property of the State. The streams in the N. are deep and sluggish. The county abounds in deep lakes with precipitous sides, their stagnant green waters many feet below the general surface. The county produces great quantities of grain, fruit, dairy products, live-stock, wool, hay, etc. The manufactures include salt, lime, cement, cooperage, carriages, flour, clothing, lumber, furniture, saddlery, metallic and wooden wares, agricultural tools, brick, castings, malt liquors, etc. The county is traversed by the Erie Canal and by numerous railroads. Cap. Syracuse. Pop. 104,183.

Onondaga, post-v. and tp., Ingham co., Mich., on the Michigan Central R. R. Pop. 1229.

Onondaga, post-v. and tp. of Onondaga co., N. Y. There are five post-villages within the township, and a reservation on which some hundreds of the Onondaga Indians reside. Pop. of v. 176; of tp. 5530.

Onondaga Lake, in Onondaga co., N. Y., is 5 miles long, 1 mile wide, and has a maximum depth of 65 feet, but its S. part is very shallow. Its waters are stagnant, and their level is 361 feet above tide. They flow into Seneca River. The lake has a natural puddling of marl, which keeps the brine of the Onondaga limestone from its waters. The lake was probably formed by the dissolving out of salt rock, and the subsequent falling in of the roof of the cavern thus formed.

Onondagas, one of the Five Nations of New York, often called **Iroquois,** resided chiefly within the county and township to which they have given their name, their capital being Onondaga Castle, 5 miles S. of Syracuse, where a remnant of about 350 still reside. This locality was also the place of meeting of the whole Iroquois confederacy, the Onondagas, or "Men of the Mountain," being charged with the custody of the "long house" and the wampum-belts and the maintenance of the council-fires. Though less numerous than the Senecas or the Mohawks, the Onondagas seem to have occupied the most honorable position in the confederacy, of which their *atotarho,* or great sachem, is regarded as having been the head, and their language, used at the grand councils, was deemed the noblest of the kindred dialects. They waged implacable war with the Hurons and Algonkins of Canada, and afterwards with the French, and their territory was repeatedly devastated by formidable expeditions from Montreal, which were repaid in kind. They were allies of the English during the French war of 1756–63 and in the Revo-

lutionary war, in which they suffered heavily, and in 1788 ceded most of their lands to the State of New York; 400 members of the tribe now reside in Ontario, Canada.

Onondaga Valley, post-v. of Onondaga tp., Onondaga co., N. Y., has 2 churches and an academy. Pop. 571.

Ono'ta, post-v. and tp., cap. of Schoolcraft co., Mich., on the S. shore of Lake Superior, near Grand Isle and the Pictured Rocks.

O'noville, post-v. of South Valley tp., Cattaraugus co., N. Y., on the Alleghany River.

Ons'low, county of North Carolina, bounded S. E. by the Atlantic Ocean. Area, 700 square miles. Part of its surface is covered with pine forests and a part is marshy. Corn, cotton, and forest products are the staples. Cap. Onslow Court-house (Jacksonville P. O.). Pop. 7569.

Onslow (George), b. July 27, 1784, at Clermont, Auvergne, France; lived mostly on his estate near Clermont, occupied with musical studies, and d. there Oct. 5, 1853. His three operas, *L'Alcalde de la Vega* (1824), *Le Colporteur* (1827), and *Guise* (1837), are now forgotten, but his quintets, quartets, and concertos for pianoforte, with orchestra accompaniment, are often performed and heard with great interest.

Onslow Court-house, a v. (Jacksonville P. O.) of Jacksonville tp., cap. of Onslow co., N. C., on New River. Pop. 60.

Onta'rio, one of the provinces of the Dominion of Canada, British North America, comprising all the Canadian part of the valley of the St. Lawrence lying W. of the river Ottawa (which separates it from Quebec), except the counties of Vaudreuil and Soulanges, which occupy the S. E. angle, formed by the Ottawa and the St. Lawrence, and belong to the province of Quebec. Ontario was formerly called Upper Canada or Canada West. It is the most populous, but not the largest, of the Canadian provinces. Area, 121,260 square miles. Its eastern boundary, the river Ottawa, and southern and western, the St. Lawrence and the great lakes, afford a great extent of navigable waters, and many of its lakes and rivers are also navigable; so that few lands are so favored with natural facilities for commerce—an advantage which has been greatly increased by artificial means. (See art. Canals of Canada, by A. J. Russell, C. E.)

Geology and Description of the Country.—A spur of the Laurentian hills N. of the province of Quebec runs southward and joins the Adirondacs, dividing the valley of the St. Lawrence from that of the great lakes. From near Kingston these hills are continued westward to the S. W. angle of Georgian Bay (Lake Huron), constituting the great northern hill-region, with its boundless supplies of timber and its splendid mineral wealth. Among these hills of hard Laurentian rock are belts of calcareous and fertile valley-land, which are well settled. The N. W. has a region of Huronian formation, much resembling the Laurentian. S. of these regions lies the Great Plain of Canada West, an extremely fertile and valuable region underlaid by Silurian and Devonian limestones, sandstones, and shales, on which are found beds of clay and gravel. Excepting the prairie along Lake St. Clair, which is often overflowed, nearly all this splendid region is naturally or very easily drained. It abounds in hard-wood forests, and is fertile in wheat, corn, and all kinds of farm products. Among the mineral products of Ontario are white marl (valuable as a fertilizer on some soils), gypsum, crystalline limephosphate (Laurentian), brick, pottery, and drain-tile clays, limestone, hydraulic lime, building-stones of all the best kinds, marble, roofing-slate, iron ores, copper, silver, sheet-mica, burr-millstone, lithographic stones, hones and grinding stones, ornamental stones of many kinds, etc. Of late the silver, copper, and other mines of the Lake Superior (Huronian) region have been yielding handsome returns, scarcely if at all inferior to those of the Northern Michigan mining-region. The lower Devonian limestones of S. W. Ontario produce considerable petroleum.

Natural History.—Among the animals of Ontario are the common deer, elk, cariboo, beaver, musquash, mink, marten, raccoon, otter, fisher, wolverene, fox, wolf, hare, bear, porcupine, various squirrels, mice, and other rodents. Among the valuable food-fishes are trout, whitefish, black bass, the great Huron and other catfishes, the muscalonge and other pikes. The salmon and shad have lately been introduced into the streams flowing into the great lakes. Wild-turkeys, grouse, ducks, swans, geese, and partridges are among the game-birds.

Vegetation.—In general character the flora is much like that of the Northern U. S., but especially in the northern hill-country it has sub-arctic elements, though far less so than has the flora of Quebec. The coniferous trees grow most abundantly in the hill-country, the hard-wood in the plains. On the Laurentian hills the timber is often stunted except in the ravines and hollows. The forests of Ontario, like those of the other provinces, are under legal supervision and protection, as are its game and fur-bearing animals and fishes. The prospect is that the forests and their animals, as well as the streams and their inhabitants, will, under proper care, long continue to be, as at present, great sources of wealth to Ontario as in the U. S.

Ecclesiastical Affairs.—The Methodist Church of Canada and other Methodist bodies constitute the leading denomination. The M. E. Church in Canada and the British M. E. Church have each a bishop. The Anglicans have three dioceses—Toronto (with a see-house at Toronto), Ontario (see-house at Kingston), and Huron (see-house at London). The Roman Catholics have an archbishop at Toronto, and bishops at London, Hamilton, Kingston (Regiopolis), and Ottawa. The Presbyterians, Baptists, Congregationalists, and many minor bodies are also quite numerous.

History.—Ontario was a part of French Canada, and in 1760 passed with the rest of that province into English possession. Previously, it had been the theatre of much activity on the part of Roman Catholic missionaries. There were a few forts and trading-posts established by the French. Champlain visited Lake Ontario and Lake Nipissing in 1615. Lake Superior was visited by traders in 1660. Perrot took possession of the Lake Huron country in 1671. La Salle founded Niagara in 1679, and in the same year the lakes were explored to Lake Michigan. The fort at Toronto was built in 1749. After 1760, the Indians, who had been generally friendly for many years to the French, mostly accepted the friendship of the English, their old enemies, and in the war with the U. S., which soon followed, the Indians generally joined the English and Canadians against the more southern colonists. Ever since then the Indians have been generally very peaceable. Upper Canada was the field of a number of engagements during the war of 1812–15 between the British and the U. S. In 1837 the Canadian rebellion broke out, but was soon quelled. The provinces of Upper and Lower Canada were united in 1840. In 1867 they were separated as provinces, but with New Brunswick and Nova Scotia they were united into the new Dominion of Canada. (See Canada, Dominion of.)

Government.—Ontario has 24 senators in the Dominion Parliament, appointed by the governor-general, and 82 elective members of the House of Commons. The provincial government is under a lieutenant-governor, who is appointed by the governor-general of the Dominion. The legislative assembly of Ontario consists of but one house, of 82 elective members. The province contains the following counties and other divisions: *Counties.*—Essex, Kent, Bothwell, Lambton, Elgin, Middlesex, Norfolk, Oxford, Brant, Haldimand, Monck, Welland, Lincoln, Wentworth, Huron, Bruce, Perth, Waterloo, Wellington, Grey, Halton, Peel, Cardwell, Simcoe, York, Ontario, Durham, Victoria, Northumberland, Peterborough, Prince Edward, Hastings, Lennox, Addington, Frontenac, Leeds, Grenville, Dundas, Stormont, Glengarry, Cornwall, Prescott, Russell, Carleton, Lanark, and Renfrew; and the provisional districts of Algoma, Muskoka, Parry Sound, and Manitoulin. Some of the above counties are for judicial purposes united in such a way that two are as one. In other cases one county is divided into two or three ridings. The principal cities are Toronto, the capital of the province; Ottawa, the capital of the Dominion; London, Kingston, Hamilton, Brockville, Cobourg, Belleville, Cornwall, etc. Each of the counties, cities, and principal towns is described in this work under its own head. The population of Canada is largely of English, Irish, and Scotch descent. Many loyalists from the U. S. settled here during the Revolutionary war. The French language is by no means as prevalent in any part of the province as in Quebec and parts of some other provinces. The people of different nationalities are far from being as much blended as in the U. S. There are numerous public schools, supported partly by public moneys, partly by assessments and fees, and partly by private liberality. The "separate system," which gives to schools established by each denomination their appropriate share of the school moneys, has prevailed since 1851.

Internal Improvements.—In addition to the great system of canals (see Canals of Canada, by A. J. Russell, C. E.), which has done so much to increase the prosperity of Canada, Ontario has a fine system of railways, which is rapidly extending. Besides the completed roads, the Canadian Pacific Railway will traverse the province from Mattawa, on Ottawa River, to the W. boundary of the province. The population of what is now Ontario was in 1852, 952,004; in 1861, 1,396,091, and in 1871, 1,620,847. The increase per annum between 1852 and 1861 was 4.34 per cent.; from 1861 to 1871, 1.61 per cent. The reason

of this decline in the rate of increase was principally the suspension of the reciprocity treaty with the U. S. But the natural resources of the province are so great that, beyond question, Ontario has a brilliant future before her. Her increase in intelligence, wealth, liberal public spirit, and true independence has been greater than in any previous decade, and cannot be estimated by any census reports. CHARLES W. GREENE.

Ontario, a fertile county of Ontario, Canada, extending between Lakes Ontario and Simcoe. It is traversed by the Grand Trunk Railway, and is divided into two ridings. Cap. Whitby. Pop. 45,890.

Ontario, county of Central New York. Area, 640 square miles. Its surface is finely diversified, and in part broken. The soil is varied in character, but for the most part highly fertile. Live-stock, fruit, grain, wool, hay, and dairy products are the leading agricultural staples. The manufacturing interests are of secondary importance, but include lumber, carriages, flour, cooperage, saddlery, agricultural implements, metallic wares, etc. The county contains several beautiful lakes, much resorted to in summer. It is traversed by the New York Central, the Northern Central, and other railroads. Cap. Canandaigua. Pop. 45,108.

Ontario, post-v. and tp., Knox co., Ill. Pop. 1942.

Ontario, post-v. of Lima tp., La Grange co., Ind. Pop. 277.

Ontario, post-v. and tp. of Wayne co., N. Y., on the Ontario Shore branch of the Rome Watertown and Ogdensburg R. R., 50 miles from Oswego, has 2 churches, 1 newspaper, 1 foundry, 1 mill, 2 hotels, and a number of stores and repair-shops. It is located in the fruit-region of Northern New York; considerable deposits of iron ore exist here. Pop. 2295.—ONTARIO CENTRE, 1 mile distant, contains 2 churches and stores. Pop. 2295.
G. M. HARDY, ED. "ONTARIO SUN."

Ontario, Lake, the easternmost and smallest of the great lakes of the St. Lawrence system, has the Canadian province of Ontario on the N. and W. and the State of New York on the S. and E. It has an area of 7300 square miles. Its mean elevation above tide is 233½ feet, which is 334 feet below that of Lake Erie, although both are subject to variations of surface — a slight *annual* variation, due to rains and droughts, a larger *secular* variation, occurring in the course of several years, and certain sudden and unexplained changes, due perhaps to strong winds. The Niagara River is its principal feeder, and from its lower extremity the St. Lawrence arises. It is 190 miles long, 55 miles in maximum breadth, and 606 feet in maximum depth. It is, except in winter, the channel of an extensive commerce. It seldom freezes except near the shore. Its fisheries are of much importance.

Ontelau'nee, tp. of Berks co., Pa. Pop. 1339.

Onteníen'te, town of Spain, province of Valencia, on the Albayda, has extensive manufactures of woollen and linen fabrics, paper, brandy, and cloth. Pop. 7793.

Ontol'ogy [from ὄν and λόγος, "science of being"], the science of being in general or of the essence of things. It is sometimes identified with metaphysics, but is usually made one of its divisions, and co-ordinate with rational psychology, cosmology, and theology, according to the nomenclature of Wolf, who established this fourfold division of metaphysics. The earlier Aristotelians and the Scholastics treated under physics the problems of rational cosmology, and under metaphysics those of ontology. Aristotle called the latter πρώτη φιλοσοφία, and included under it also theology. His *De Anima* may be regarded as the first work (and as still the best, according to some) on rational psychology. But psychology was generally classed among the natural sciences by his followers. Logic, however, as treating of the mere forms of thought, should belong under psychology, and be contrasted with ontology, which treats of real being and of the essence of things: (*a*) *of being*, as quality, quantity, infinite and finite, etc.; (*b*) *of essence*, as identity and difference, form and matter, ground and sequence, noumenon and phenomenon, cause and effect, substance and attribute, possibility and necessity, and similar relations. The general problem of ontology is to find the highest principle, or that which is true in and for itself—the Absolute. Inasmuch as psychology, with the problem of certitude, has come to the front rank in modern philosophy, it has happened that the latest systems of ontology, notably those of Germany since Kant, have striven to unite ontology with psychology, and thus create an ontological logic which should give the *a priori* laws and conditions of thought and being. Kant's work was negative in this respect, and denied the possibility of knowing things in themselves; it confined all *a priori* knowledge to the forms of the mind, and made all objects of knowledge subjective and phenomenal. But since he included among these subjective forms of the mind such universal, logical conditions of existence as time and space, quality, quantity, relation, and mode—these categories being the *a priori* conditions of existence *for us*—it was possible to construct a science of ontology within the subjective or psychological province. In fact, no room was left for the possibility of objective being outside of mind. Hence arose the systems of Schelling and Hegel and their followers, whose ontology is based on psychology.
WILLIAM T. HARRIS.

Ontonag'on, county of Michigan. Area, 2300 square miles. It is uneven and covered with forests. Copper-mining is the leading industry. The county is bounded N. by Lake Superior and S. by Wisconsin. Cap. Ontonagon. Pop. 2845.

Ontonagon, post-v., cap. of Ontonagon co., Mich., on the Marquette Houghton and Ontonagon R. R., has a good school, 1 newspaper, 2 saw-mills, a tannery, copper-smelting works, 5 hotels, and stores. It is the shipping-point for the copper-mines of the county, and has a fine harbor. Pop. 739. ALFRED MEADE, ED. "MINER."

Ont'wa, tp. of Cass co., Mich. Pop. 995.

Onus'tidæ [from the generic name, *Onustus*], a name used sometimes for the family PHORIDÆ (which see).

Onychoteuth'idæ [from ὄνυξ, ὄνυχος, a "claw," and τευθίς, a "squid"], a family of cuttle-fishes (cephalopods), of the order Dibranchiata and sub-order Sepiophora. As limited by Adams and some others, it includes those forms which have the eyes naked with a sinus above, an internal shell, which is horny, solid and very elongated or lanceolate; the body variable in form, being in some quite elongated and with a terminal fin only, in others short and with a lateral fin extending more or less upon the back; the mantle with three internal cartilages, one dorsal and two ventral; the siphuncle provided with a valve, and the head moderate and sub-cylindrical; the arms are provided, to a greater or less extent, with claw-like hooks (and hence the name), and in the typical forms the long tentacular arms have, besides the ordinary cups, a simple unarmed sucker at the bases of the expanded extremities, by which, when applied to one another, according to Owen, "the tentacles are firmly locked together at that part, and the united strength of both the elongated peduncles can be applied to drag towards the mouth any resisting object that has been grappled by the terminal hooks." The family thus defined includes rather heterogeneous forms, which will probably be eventually separated into two or more families. *Onychoteuthis*, *Abralia*, *Ancistroteuthis*, and *Enoploteuthis* are like the common cuttle-fishes (*Loligo*) in form; *Ancistrocheirus* is pointed behind, and has dorso-lateral fins; *Octopodoteuthis* has a thimble-like body with lateral fins; and *Ommastrephes* has an elongated body, and includes the forms known to sailors as "flying-squids" or "sea-arrows." The last is represented by a species (*O. Bartramii*) which is largely used as bait for codfishes on the Banks of Newfoundland. THEODORE GILL.

O'nyx [from ὄνυξ, a "finger-nail"], a variety of chalcedonic quartz composed of parallel layers of chalcedony of different colors, generally some shade of brown, but sometimes shades of green or red, alternating with layers of white. When the red is a rich brownish-red chalcedony (*sard*) and the white bands pure and translucent, the variety is known as *sardonyx*. The varieties of onyx, valued somewhat at the present day, and much used in jewelry, were highly prized by the ancients for the manufacture of cameos, one of which, said to be the largest known, measuring eleven inches by nine, is preserved in the Museo Borbonico at Naples. EDWARD C. H. DAY.

O'olite ["egg-stone," so called because it seems to resemble petrified fish-roe], (1) a variety of limestone, magnesian or otherwise, which appears to be composed of spherical granules, which are sometimes solid and sometimes hollow. Some oolites are prized for building purposes and others for lime-burning. (2) A name given in Europe to the Jurassic strata above the Lias and below the Wealden. There are three principal groups of the Oolite, called the Lower, Middle, and Upper groups. The oolitic strata yield lime, cement, building-stone, slate, fuller's earth, oil-shale, pyrites, etc., and at Brora in Scotland the Lower Oolite affords a supply of good coal. In Australia and South America the corresponding strata are coal-bearing also. In North America the Oolite is but little developed.

Oor'fa, or **Urfa,** the ancient EDESSA (which see), a town of Asiatic Turkey, situated 78 miles S. W. of Diarbekir, in lat. 37° 8′ N., lon. 38° 5′ E., on the river Daisan, surrounded with wheat-fields, orchards, vineyards, and plantations of olive and mulberry trees. It is substan-

tially built, consisting of about 6000 stone houses. Silk and yellow morocco leather are manufactured, and a considerable traffic is carried on between Syria and Mesopotamia. Pop. estimated at 30,000.

Oos'terhout, town of the Netherlands, province of North Brabant, has large breweries and tanneries, manufactures of tiles and pottery and important cattle-markets. Pop. 8669.

Opah. See KINGFISH.

O'pal [Gr. ὀπάλλιος], natural soluble silica, generally combined with water up to as much as 11 per cent. Several varieties of opal are recognized; of these *precious opal* is the most highly esteemed, stones of moderate size having realized as much as diamonds of the same dimensions. Its value arises from the property it possesses of displaying within itself a remarkable and indescribable play of colors. This appearance is known as opalescence, and is not seen in *common opal*. Fire opal is a variety presenting hyacinth-red and yellow reflections. *Wood opal* is a variety of *semi-opal* (a common opal deficient in translucency), presenting tracts of ligneous structure, and in many localities, as in Egypt, Tasmania, etc., fossil trees, the remains of ancient forests preserved in this mineral, occur in great abundance. Precious opal and common opal are met with in volcanic, amygdaloidal, and porphyritic rocks, the former being principally obtained from Hungary, Honduras, Mexico, Ceylon, and the Faroe Islands. Fire opal has been obtained in the U. S. from Washington co., Ga. (See HYALITE.) EDWARD C. H. DAY.

O'patas, a nation of American Indians, living in the southern part of the State of Sonora, Mexico, near the Gulf of California, and chiefly upon the rivers Yaqui and Mayo, by which names they are frequently known. They are peaceful agriculturists, have made some progress in civilization, preserve their independence, and number about 30,000.

Opeli'ka, post-v., cap. of Lee co., Ala., 20 miles from West Point, Ga., and 28 from Columbus, is the great railroad centre of the State, has an extensive commercial trade, and is the main distributing point in the State for dry goods and groceries. Large quantities of cotton are sold here annually. It contains 2 seminaries, 5 churches, 2 national banks, 6 extensive cotton-warehouses, 1 carriage repository, 2 weekly newspapers, a large flouring-mill, a skating-rink, a fire department, 1 wagon and carriage manufactory, and numerous other industries. Pop. 5085.
THOMAS E. GORMAN, M. D.

Opelou'sas, post-v., cap. of St. Landry parish, La., about 250 miles from New Orleans, has an academy and several schools, 5 churches, 2 weekly newspapers, a convent, a hotel, and stores. Principal business, farming and stockraising. Pop. 1546. LEONCE SANDOZ, ED. "COURIER."

O'pequan, tp. of Frederick co., Va. Pop. 4414.

Opequan, tp. of Berkeley co., West Va. Pop. 1665.

Op'era [It.] is the name given by the Italians, and after them by other nations, to a drama which is sung with accompaniment of instrumental music. Dramas occasionally interspersed with songs to familiar airs are called vaudevilles; dramas occasionally accompanied by symphonical music are called melodramas. On its dramatic side the form of the opera does not differ widely from that of the spoken drama. Inasmuch, however, as it is to be sung, the text of an opera, the *libretto*, must be of much smaller extent than that of an ordinary drama.

It is on its musical side that the opera presents its most clearly-marked peculiarities of form. To speak first of the vocal part of operatic music, we find that there are several sharply-distinguished forms which serve to make up the composition. The chief of these are recitative, aria, duet, trio, and chorus. The recitative is the least elaborated musical form of the opera, and is designed for the more rapid prose passages of the dialogue, as opposed to the finished lyrical parts. It is not, strictly speaking, melody at all, but the voice moves through a few notes only, including frequent chromatic intervals, and having little unity of key or tonality. Moreover, there is no clear division of time, such as is secured by the division into bars, but the series of notes proceeds with abruptly changing movement, divided merely by a few strongly accentuated resting-points. The aria is a theme for a solo voice, being a complete melodic subject, and having divisions of strophe, verse, etc. Duets and trios (*duetti, terzetti*) are combinations of two or three voices in a complete melodic subject. In addition to these there are the ensemble pieces, in which all the principal actors and singers (commonly from four to six in number) unite in some harmonized strain. The finale is an example of an ensemble movement. Lastly, there is the full mass of harmonized voices as given in the chorus. In this the several parts are each rendered by a number of voices, supplied by a band of subsidiary actors specially set apart for this purpose. The instrumental part of operatic music is rendered by a band of musicians, the orchestra. Orchestral instruments include string and the several varieties of wind, both in wood and in metal. The orchestra furnishes a continuous accompaniment to the several vocal parts of the opera, this accompaniment being highly finished in the case of the aria, the chorus, etc., and consisting of only a few leading chords in the case of the recitative. In addition to supplying an accompaniment to the vocal parts, the orchestra has to perform independent compositions, the principal of which is the overture. This piece resembles other instrumental compositions, such as many of the opening allegro divisions of the symphony and the grand sonata, and is built according to what is called the "sonata-form" of composition. This form falls into three movements, of which the first sets forth the leading theme and counter-theme, the second "develops" these elements into a variety of shapes, and the third constitutes a final reversion to the opening theme. Besides the overture, the orchestra supplies a musical introduction or prelude to each succeeding act of the opera.

The opera is pre-eminently a modern art, being developed, as might be expected, later than the simple forms of modern music itself. It grew up in Italy at the beginning of the seventeenth century, during the period of the Renaissance, and when polyphonic music had pretty well exhausted its resources, and a basis had been laid by Palestrina for our present system of harmony. It was in Florence, about the year 1600, that the first opera appeared. Certain patrons of art set themselves in the spirit of the Renaissance to rediscover the vocal music of the Greek drama, and by the help of certain singers and composers, among whom were Caccini and Peri, they invented recitative as the nearest representative of Greek dramatic intonation. This first opera, the earliest known example of which is a piece entitled *Eurydice*, consisted of recitative, or, as the Italians called it, *aria parlante*, choruses, a few duets and trios, together with instrumental prelude and interludes. This early recitative has more of equal-time division than our present mode. The instruments used for accompaniment are, oddly enough, assigned in lots to the different *dramatis personæ*. Thus, Orpheus has two stringed instruments, and Pluto four trombones. For fifty years this opera remained the luxury of nobles, being performed only before courts during special festivities; after that it gradually became a popular entertainment. The instrumental part of the opera was greatly improved by Monteverde, who added the overture (*toccata*). Later in the century the melody of the aria was enriched by two composers named Cavalli and Cesti. It was indeed in connection with the opera that our modern style of melody developed itself. Before the invention of this new form of art music had consisted almost exclusively of skilful combinations of distinct themes in intricate contrapuntal arrangements, with little regard to harmony and no thought of a single ruling melody. The opera, by stimulating solo-singing and by reviving a taste for the beauties of popular melody, supplied the necessary incentive for the elaboration of sweet-sounding and finished melodic themes. In the following (the seventeenth) century A. Scarlatti clearly marked off the aria from the recitative, and gave it the triple division which it retained for nearly a century. The later Italian operas—namely, the works of Piccini, Paesiello, and Cimarosa, and those of the numerous composers of the present century—do not display any great change of style.

In France the earliest operas, those of Lulli (end of the seventeenth century) and of Rameau (beginning of the eighteenth century), were little more than imitations of the Italian style. The basis of French opera was laid by Gluck (1773–87), who set himself to rectify the evils of the existing Italian opera by confining the exercises of the vocal art within due limits, and by bringing into greater prominence the dramatic character of opera. Thus, he shortened the aria-form, and expunged the numerous bravura passages with which it was laden. Further, he reduced the number of airs in the opera by elevating the recitative to a higher rank, rendering it much richer in a musical aspect and more impressive dramatically. Gluck also greatly improved the quality of the operatic chorus, and made it a much more conspicuous element of the opera. Lastly, he added considerably to the instrumental part of the opera, seeking to bring it into closer unity with the dramatic subject. The French classic opera ("grand opera") after Gluck scarcely fulfils the expectations raised by such an admirable foundation. At the same time, it must be admitted that the French school has always been faithful to the teaching of Gluck in seeking to do justice to the dramatic claims of opera. More especially, the French recitative is characterized by great energy and freedom of movement, and admirably adapted to dramatic effect.

Among those composers who have written solely or mainly for the French stage are Méhul, Cherubini, Spontini, Meyerbeer, Rossini, and among contemporary composers Gounod and Thomas. Perhaps, however, it is in the lighter style of opera that the French have excelled. The early vaudeville, which is the forerunner of the opera bouffe, was light, graceful, and piquant. Rousseau's *Devin de Village* is a good example of this genre. The first composer of the opera comique, strictly so called, was A. F. Boieldieu. Other writers of this lighter style of French opera are Hérold, Halévy, Auber, Adam, and in recent times Offenbach.

In Germany the opera has perhaps been marked by less of national originality than in France. Passing over the earliest writers, such as Keiser, who did little more than carry out Italian traditions, we come to Mozart as the first great opera-writer in Germany. Mozart united Italian sweetness of melody with German richness and depth of harmony, and his operatic music, as pure music, has never been surpassed, or even equalled. Passing by Beethoven's *Fidelio*, we find that the German opera after Mozart sank for a while to a low ebb. The one worthy attempt to raise its character came from the Romanticists—namely, Spohr, Weber, and Marschner—who sought to give a national tone to German opera by taking half-legendary subjects from early German history. Wagner is, in a sense, a follower of the Romanticists, since he selects his subjects from the obscure and legendary periods of German history. He inherits something of his force and vivacity of dialogue and of his scenic splendor from the French school, more especially Meyerbeer. JAMES SULLY.

Ophidi′idæ [from *Ophidium*, ὄφις, "serpent," and εἶδος, "likeness"], a family of teleocephalous fishes belonging to the suborder Acanthopteri, and distinguishable from all others by a peculiar modification and position of the ventral fins. The body is more or less elongated, little tapering, and compressed, with the caudal portion forming nearly or quite two-thirds of the length; the scales small but conspicuous; the lateral line concurrent with and near the back, obsolete behind; the head more or less compressed, oblong, oval in profile; opercula unarmed; nostrils two on each side and approximated; teeth villiform on the jaws as well as palate; branchial apertures ample, arched over above by the membrane which is attached near the axilla of the pectoral fin; branchiostegal rays seven; dorsal and anal elongated and united with the caudal; pectorals with branched rays; ventrals bifid, articulated, inserted under the chin and in advance of the eye; the stomach destitute of pyloric appendages. The family is composed of three very distinct genera: (1) *Ophidium*, with a number of species in the European and American seas, especially the warmer ones; (2) *Leptophidium*, with a single species (*L. profundorum*), the only known specimen of which was obtained with a sounding-line at the depth of 30 fathoms off the coast of Florida; and (3) *Genypterus*, one species of which has been obtained at the Cape of Good Hope and others on the western coast of South America. The several species of *Ophidium* are extremely alike in external appearance, but (some at least) are differentiated by remarkable modifications of the air-bladder. THEODORE GILL.

Ophid′ians [ὄφις, "snake," and εἶδος, "likeness"], an order of reptiles. (See SERPENTS.)

Ophiocephal′idæ [from *Ophiocephalus*—ὄφις, "serpent," and κεφαλή, "head"—the chief genus], a family of teleocephalous fishes of the suborder Acanthopteri, distinguished by a peculiar union of characters. The body is elongated and anteriorly subcylindrical; the scales of moderate size; the lateral line with an abrupt curve; the head depressed, oval above, and covered with shield-like scales; the eyes lateral; the opercula unarmed; the nostrils ——————; dorsal and anal fins long, and without spines; caudal round, separated from the dorsal and anal; pectoral fins with branched rays; ventrals thoracic (and composed of one simple but partly articulated and five branched rays) or absent. The skeleton has numerous (52–61) vertebræ; the caudal are provided with ribs, the abdominal cavity being continued to below the caudal portion; four gills are developed, but no pseudo-branchiæ; a cavity accessory to the gill cavity is developed, in which water is retained, but no super-branchial organ is present; pyloric appendages may be either present (two in number) or absent. The family is composed of fresh-water fishes peculiar to Southern and South-eastern Asia. Above thirty species are known, which belong to two genera: (1) *Ophiocephalus*, in which the ventrals are present and two pyloric cæca are developed, and which includes almost all of the species, and (2) *Channa*, which is destitute of ventrals and without pyloric appendages, with a single species (*C. orientalis*), found in Ceylon. The peculiar accessory gill cavity contains a supply of water, which serves to keep moist the gills of the fish for a long time after being taken out of water. The species are therefore well adapted to withstand prolonged deprivation from that element.
THEODORE GILL.

O′phir, the name (in Gen. x. 29) of the eleventh of the thirteen sons of Joktan, all of whom appear to have settled in Arabia. Also the name of a place or region famous in the commercial history of the Hebrews, from which, or perhaps only by way of which, came gold, almug-wood, and precious stones (1 Kings x. 11). The voyage thither and back, or perhaps the voyage which only took Ophir in its way, required three years (1 Kings x. 22). Ophir can hardly have been a general name for remote southern countries, nor can it have been any such far-off place as Peru, but should be looked for either in Africa (Bruce, Robertson, Petermann), or in India (Vitringa, Reland, Ritter, Ewald), or, more probably, in Arabia (Michaelis, Niebuhr, Forster, Knobel, Kalisch). R. D. HITCHCOCK.

Ophir, a famous volcano of the island of Sumatra, lies directly under the equator, and is 9939 feet high. It is cultivated from its basis to its peaks.

Ophir, tp. of Butte co., Cal. Pop. 2430.

Ophir, tp. of La Salle co., Ill. Pop. 1085.

Ophir, tp. of Washoe co., Nev. Pop. 110.

Ophir, post-v. of Tooele co., Ut., has rich gold-mines.

O′phites [Gr. ὄφις, a "serpent"], or **Serpent-Worshippers,** a sect of Gnostics who joined the worship of the serpent to the general characteristics of the faith and practice of other Gnostics. They honored the serpent because he tempted Eve to eat of the forbidden fruit—an act which they believed to be highly advantageous to the human race. They kissed the serpent and fed it with the Eucharistic bread; but others rejected Christianity, and honored Cain, Judas Iscariot, and other wicked personages.

Ophiurans. See STAR-FISH.

Ophor, tp. of Montgomery co., N. C. Pop. 451.

Ophthal′mia [Gr. ὀφθαλμός, "eye"], inflammation of the eye. This term, once widely comprehensive, is now usually restricted to inflammations of the membrane lining the eyelids and covering the exposed surface of the eyeball, the conjunctiva. It is divided into (1) catarrhal, (2) granular, (3) purulent.

Catarrhal Ophthalmia, or conjunctivitis, is the mildest form of inflammation of the conjunctiva. It may be caused by over-use of the eyes, by the application of the catarrhal discharges of "sore eyes," by the contact of dust, smoke, or any irritating substance, by riding in the wind, or by "catching cold." Its most common symptoms are inability to use the eyes, an itching, smarting, or burning sensation, an unpleasant dryness of the eyes, or, on the other hand, an unusual quantity of mucous secretion, causing the lids to adhere to each other. The eyeballs usually become red, and upon everting the eyelids their lining membrane is found to be still more reddened. This affection does not imperil the eyesight if properly treated.

Granular Ophthalmia, or granular lids, as it is popularly called, is a much more serious affection. It may be brought on by any of the causes which produce catarrhal ophthalmia, and is also contagious, being carried from eye to eye through the medium of towels, wash-basins, etc. It is characterized by numerous small elevations or granulations upon the conjunctiva of the lids, producing a roughness. These granulations act as a foreign body, and by rasping the sensitive surface of the cornea during the act of winking produce a superficial inflammation of the cornea called *pannus*. The sight is then obscured, the eyes are lachrymose, painful and sensitive to light, and sometimes, resisting all treatment, go on to hopeless blindness.

Purulent Ophthalmia, or conjunctivitis, is a more dangerous disease. About 10 per cent. of the eyes affected with it are lost. It is usually produced by contagion, but may come from "a cold." It is characterized by great swelling and tenderness of the eyelids, and by a very copious discharge of a thick, purulent secretion from between the lids.

The first of these affections—viz. catarrhal ophthalmia—usually demands very little treatment beyond simple cleansing of the eyes with tepid water. Maltreatment often aggravates the affection. Every form of poultice, such as bread and water or milk, alum curds, slippery elm, etc., should be scrupulously avoided, as they weaken the inflamed membrane and convert a simple, self-limiting malady into a destructive one. The "best eye-wash" in existence is water containing in solution common table-salt in the proportion of a teaspoonful to the pint. Its effects may be indefinitely varied by changing its temperature from 32° to 100° F., and usually the patient may be al-

lowed to choose that temperature which gives the most comfort. In granular ophthalmia long and careful treatment is required at skilful hands. In purulent ophthalmia the treatment must be prompt and vigorous from the start. In that of infants almost incessant cleansing is needed; and here the best wash is warm water, followed once or twice a day by a solution of one or two grains of nitrate of silver dissolved in an ounce of pure water, or five or ten grains of alum in the same quantity of water. Competent advice should, however, be early sought to apply more active measures in bad cases. In the purulent ophthalmia of adults, whether "Egyptian" or gonorrhœal, active treatment is needed early—leeches, ice, nitrate of silver. Where the lids are much swollen, and by their stiffness and weight prevent free cleansing or the easy escape of pus, an incision at the outer angle of the eyelids horizontally down to the temporal edge of the orbit should be early made. Such an incision "lets blood" freely, and relieves the eyeball from damaging pressure. The occurrence of catarrhal, purulent, or granular ophthalmia in a school, reformatory, or other public institution among children or adults is usually due to ignorance or carelessness on the part of some one responsible for the police of said institution, and should be subjected to rigid inquiry and correction. Many scores of children contract eye diseases in the schools and reformatories of our large cities which ultimately result in hopeless blindness. Overcrowding and insufficient provisions for isolating initial cases are mainly to be blamed for this sad result. So great is this evil in some of the large institutions near this city (New York) that it becomes a grave question whether on the ground of economy, to say nothing of humanity, it would not be well to scatter the inmates in rural families that are ready to take them, and abolish the institutions. C. R. AGNEW.

Ophthalmol′ogy [Gr. ὀφθαλμός, "eye," and λόγος, "discourse"], the science of the eye. The eyeball, which is nearly spherical in shape, rests upon a cushion of fat in the orbital cavity of the skull. It is moved freely about a centre by means of six muscles, four of which are called straight from their course, and two oblique. The eyelids, the bony rim of the orbit, and the nasal bones protect it from direct blows. A mucous membrane called the conjunctiva covers the exposed portion of the eyeball and lines the eyelids. The lachrymal gland, lodged behind the supero-temporal edge of the rim of the orbit, pours its secretion, the tears, by several openings upon the conjunctiva. This moisture aids that which the conjunctiva itself produces in lessening the friction in the movements of the eyeball, and in washing away such foreign substances as may have passed the eyelashes and lodged behind the eyelids. At the nasal angle of the edges of the eyelids are two minute openings called *puncta*, communicating with the tear-sac by two canals. The tear-sac empties its contents into the cavity of the nose through the nasal duct. The canals, sac, and duct are lined with mucous membrane.

The eyeball consists properly of three layers or coats—(1) the sclerotic, (2) the choroid, (3) the retina. The sclerotic is the hard or firm layer, and is completed in front by the cornea, which is transparent. It is perforated behind by the optic nerve. The choroid, which lines the sclerotic from the optic nerve entrance to the edge of the cornea, is largely composed of blood-vessels, and contributes in a great degree to the nutrition of the organ. The iris, a continuation of the choroid, is a diaphragm suspended in the anterior part of the eye in front of the crystalline lens. It is perforated at its centre by the pupil, the function of which is to regulate, by its muscular mobility, the amount of light admitted to the eye. The iris and choroid are so darkened by pigment in their substance as to prevent annoying transmission and reflection of the rays of light. The retina lines the choroid, and receives visual impressions. The fibres of the optic nerve which are widely distributed through the texture of the retina conduct these visual impressions to the brain. Behind the cornea is a chamber filled with the aqueous humor. Behind the iris, and imbedded in the front of the vitreous humor, is the crystalline lens. The vitreous humor occupies the greater part of the cavity of the eye. The cornea, aqueous humor, crystalline lens, and vitreous humor are the refractive media of the eyeball, and together maintain its shape.

Refraction.—The normal or emmetropic eye, in a state of rest, unites parallel rays upon its retina. An eye which in a state of rest would bring parallel rays to a focus posterior to the retina is said to be hypermetropic, while one whose focus for parallel rays is anterior to the retina is called myopic. An eye whose different meridians have different foci is said to be astigmatic. Persons under the age of forty with emmetropic eyes usually do not need spectacles. All persons with hypermetropic eyes should wear convex glasses sufficiently strong to correct the hypermetropia. The glasses selected for constant use in these cases should be the strongest with which the person can see distinctly in the distance. Persons with myopic eyes should select the weakest concave glasses with which they can see well in the distance. These may be worn constantly, or may be removed while engaged in work requiring near vision, whichever is most agreeable to the individual. Persons with astigmatic eyes should be fitted with glasses after the most careful examination by an expert physician. Many myopic eyes are diseased, and when the myopia becomes progressive it is a most serious malady. When a young person discovers that his nearsightedness is increasing, he should cease all use of his eyes for near vision, and seek competent advice without delay. A prolific and preventible cause of nearsightedness is too much eye-work by the young at the near point of vision.

Accommodation.—All eyes not diseased have the power of so increasing their refraction that the farthest point of distinct vision is brought nearer to the eye. This is called the power of accommodation, and is brought about by the contraction of the ciliary muscle and the consequent increased convexity of the crystalline lens. As we grow older and the crystalline lens becomes harder our power of accommodation gradually diminishes, until at about the age of forty the nearest point of distinct vision in emmetropic eyes usually recedes to beyond eight inches, and we need the aid of weak convex glasses for reading. Persons with hypermetropic eyes will then require stronger glasses for reading than for the distance, while persons with myopic eyes may need concave glasses for distant vision, and at the same time convex glasses for near vision. When old persons find it necessary to change their spectacles frequently for stronger or weaker glasses, they should suspect some grave disease of the eye and consult a physician. Persons with "weak eyes" should suspect some error of refraction and seek competent advice.

Conjunctivitis.—Persons who "catch cold in their eyes," the eyes becoming reddened, "running water and matter," frequently apply poultices to their eyes, and the eyes are almost invariably made worse. Such persons should bear in mind the adage, "Poultices spoil eyes." The only application for such eyes until a physician can be consulted is water, warm, tepid, or cold, according to the sensibilities of the patient. The water may be rendered more soothing by the addition of one teaspoonful of common salt to the pint. Proprietary eye-washes should be avoided. If simple or catarrhal conjunctivitis is neglected, it is apt to go on to granular lids, an obstinate and dangerous disease.

Foreign Bodies.—If a cinder or speck of dirt lodge upon the eyeball or beneath the eyelid, the latter should be turned inside out and the irritating substance carefully removed by means of the corner of a handkerchief or a little flock of raw cotton twisted about the end of a small stick. Eyestones, so called, are to be avoided. If a foreign body, such as a bit of metal or stone, enter the eyeball, no time should be lost in consulting a physician, as it may be necessary in such cases to remove the eyeball containing the foreign body in order to avoid blindness from sympathetic inflammation of the fellow eye. The foreign body can sometimes be removed without destruction of the eye.

RULES FOR THE USE OF THE EYES.—(1) In reading, the book should be held at a distance of from twelve to sixteen inches from the eye. (2) A stooping posture should be avoided in reading and writing. It is better to read with the head erect, or thrown a little back, so that the circulation of blood may be free. (3) The position of the person reading should be such that the light may shine over the left shoulder upon the page. (4) Reading by insufficient light is bad. (5) Dark rooms and colored glasses should, as a rule, be avoided, except after certain operations upon the eye. (6) "Eye-sharpeners" and patent eye-salves should be eschewed as dangerous. (7) Blackboards, charts, diagrams, and large objects should be more constantly used in the machinery of schools, and thus the exercise of the eyes upon the printed or written page be greatly shortened. When the nearsightedness-rate in a school rises above 6 or 8 per cent. there is a grave fault somewhere—in the method of instruction, in the sanitary conditions of the schoolroom, in the home habits of the scholars, or in all combined. More teaching and less mere lesson-hearing is greatly needed in schools and colleges to arrest the alarming increase of eye diseases among the young.

C. R. AGNEW.

Ophthal′moscope [Gr. ὀφθαλμός, "eye," and σκοπεῖν, to "view"], invented by Heinrich Helmholtz, professor of physics in the University of Königsberg, in 1851. The discovery of the principles upon which this invention was based was the result of close observation, careful experiment, and mathematical calculation. "Its origin," says Zander (*The Ophthalmoscope*, 1864), "may be traced to successive endeavors to solve two problems—the first being why the eyes of men and animals sometimes shine with a

reddish lustre; and the second, why the interior of an eye more usually appears dark." Among those who aided in the solution of these problems may be mentioned the names of Prevost, Rudolphi, Gruithuisen, Esser, Hassenstein, Behr, Cumming, Brücke, Coccius, Méry, De la Hire, and Kussmaul. Since its invention this instrument has undergone numerous modifications. The most important of these was by a mechanician named Rekoss, who adjusted to it what is called the Rekoss disk. The latest improvements have consisted principally in modifications of this disk, and in adding to the number of lenses it originally contained.

Description of the Instrument.—The ophthalmoscope, in its simplest form, consists of a small circular mirror with a central perforation. That in most common use, Liebreich's, is a concave mirror of 8 inches focal length, with a central perforation about 1 line in diameter, mounted on a handle about 6 inches long. If we place back of this mirror a Rekoss disk, its margin set with numerous convex and concave lenses of suitable focal lengths, and so made to revolve that each of these lenses may be readily brought opposite to the central hole in the mirror, we have an ophthalmoscope of the most approved pattern.

Uses.—In examining the eye with the ophthalmoscope, the interior of the organ is illuminated by reflecting through the pupil, by means of the ophthalmoscopic mirror, the rays from an argand-burner placed a little behind and to one side of the patient's head, in such a position that the light falls upon his temple, but not upon the eye. If the observer thus illuminates the eye, resting the rim of the ophthalmoscope against his brow and looking through the hole in its centre, the pupil of the illuminated eye will appear red. This is the reddish reflex from the bottom of the eye. Let the observer now approach to within one inch, or less, of the eye he is examining, keeping the red reflex in view, and (there being no error of refraction or exercise of accommodation in either the observed or the observing eye) he will distinctly see a small portion of the fundus under an enlargement of some seventeen diameters. This is called the *direct* method, and the image seen is called the *virtual* erect or upright image. If the observer places his eye at a distance of twelve or fifteen inches from the observed eye, and, having obtained the red reflex, interposes a two-inch double convex lens at a little less than its focal distance from the eye, he will see a much larger portion of the fundus than by the method already described, but much less magnified, the enlargement being only about three diameters. This is called the *indirect* method, and the image seen is the *real*, inverted, aërial image. By these methods we may examine the crystalline lens, the vitreous humor, the optic nerve, the retina, and the choroid, and any deviation from a condition of health may be readily detected. The optical condition of an eye may also be determined by means of the ophthalmoscope, independently of the statements of the patient. This is of great advantage in examining the eyes of young children, as well as eyes that are partially or totally blind. In examining the interior of the eye for the causes of impairment of vision, we not infrequently find appearances which lead to the detection of grave diseases of other important organs, as, for instance, the kidneys and heart. Anomalies of refraction are also frequently discovered by means of the ophthalmoscope which would otherwise remain undetected, and by a suitable combination of spherical and cylindrical glasses good sight is restored.

Wonderful as are the results obtained by the use of this instrument, it is, nevertheless, a mistaken idea, now somewhat popular, that we can with it readily determine the state of the health of the brain. Light may be thrown by the ophthalmoscope upon the diagnosis of cases of tumor of the base of the brain and of inflammatory changes at the base of the brain. But inflammation of the optic nerve, a disease of frequent occurrence, is rarely accompanied by mental aberration. Many of the statements of those who profess to determine questions of insanity by the use of the ophthalmoscope as a method of ascertaining the vascular condition of the brain, are entirely destitute of scientific basis. DAVID WEBSTER.

O'pie (JOHN), b. at St. Agnes, near Truro, England, in 1761; gave proofs of artistic talent in childhood which attracted the attention of Dr. Wolcott of Truro ("Peter Pindar"), by whom he was carried to London; acquired great fame by his skill in portraiture; was called the "Cornish wonder;" received from leading members of the nobility more commissions than he could execute; acquired a handsome competence; married the daughter of a wealthy pawnbroker, from whom he was soon divorced; married as his second wife (1798) Miss Alderson, a celebrated authoress; devoted himself successfully to severe study to correct the defects of his earlier style of painting, which were now sufficiently obvious; produced several admired historical pictures; became professor of painting at the Royal Academy 1806, and commenced a series of lectures Mar., 1807, but d. at London, before completing the first course, Apr. 9, 1807. Four *Lectures* were published, with a memoir by his widow, in 1809.—His wife, AMELIA ALDERSON OPIE, b. at Norwich Nov. 12, 1769, acquired a great reputation by her delineations of English home-life in a series of novels long since forgotten; joined the Society of Friends after her widowhood. D. at Norwich Dec. 2, 1853.

Opisthobran'chiates [ὄπισθε, "behind," and βράγχια, "gills"], a name given to certain gasteropods, distinguished by the posterior position of the gills. (See GASTEROPODS, and also NUDIBRANCHIATA and TECTIBRANCHIATES.)

Opisthocom'idæ [after *Opisthocomus*—ὄπισθε, "behind," and κόμη, a "lock of hair"—the only genus], a family of birds represented by a single S. American species, concerning whose affinity great doubts and much diversity of opinion have prevailed. In form it resembles a small pheasant about as much as any other bird; the head is moderate and feathered, except round the eye, and provided with a recurved crest (whence the name); the bill is moderate, rather broad at the base, with the culmen decurved towards the tip, over the lower mandible; the gomys of the latter is short, ascending, and terminates in a strong angle posteriorly; the nostrils are lateral, sub-median in the bill, round, and enclosed in a membrane; the wings have their quills graduated towards the sixth and longest; tail lengthened towards the middle; legs with robust tarsi, which are covered by reticulated scales, and with the toes long and slender; the posterior insistent or on a level with the anterior; the claws long and rather curved. By some writers this form has been referred to or near the Musophagidæ, or plantain-eaters, and by others to or near the gallinaceous birds or between the pigeons and typical Gallinacea. The most recent and elaborate exposition of its affinities has been published by Prof. Huxley, who appears to have demonstrated that it is on the whole most closely related to the gallinaceous types, but marked by its peculiarities as a type of an independent group or superfamily (Heteromorphæ) of equal rank with the Gallinacea (Alecteromorpha), pigeon-like forms (Peristromorphæ), and Pteroclomorphæ. The skull most resembles that of the gallinaceous birds, and especially in the imperfect development of the maxillo-palatines, the femur that of the pigeons; the leg is also like that of the pigeons in the femur and tarso-metatarsus; "the last very closely resembles that of the pigeons, though the form of the distal articular surface of the metatarsal of the hallux is more like that of corax;" the pelvis is quite different, and the sternum and its appendages peculiar. The only known species (*O. cristatus*), known under the name hoatzin, lives in small troops on or near the banks of rivers, which, when alarmed, fly for a short distance to a tree, on the branches of which they huddle close together. They feed by preference on the leaves of an arum tree (*A. arborescens*), which imparts to their flesh a strong musky smell. (See Huxley, *Proc. Zool. Soc.*, London, 1868, pp. 304–311.) THEODORE GILL.

Opisthomes, a recently created order of the typical fishes or TELEOSTS (which see).

Opisthomi [ὄπισθε, "behind," and ὦμος, "shoulder"], an order of fishes of the sub-class of teleosts, distinguished by the separation of the shoulder-girdle or scapular arch from the head, and its consequent posterior position, whence the name. The skull has its several bones developed in nearly the same manner as the ordinary Teleocephali; the supraoccipital projects forwards between the parietals; the jaws are normally developed, the maxillary arch being bounded above by the premaxillary, and at the sides by the supramaxillary bones; a distinct symphitic bone exists; the branchial apparatus is complete, the superior branchihyal and pharyngeal bones ossified, four superior pharyngeals, three basal branchihyals, and a pair of inferior pharyngeals being developed; the scapular arch is entirely dissevered from the connection exemplified in most fishes, and (in some cases at least) is connected with the anterior vertebræ; the mesocoracoid is absent; no interclavicles are developed; the ventral fins either abdominal (the pubic bones being far removed from the scapular arch) or wanting. The order is represented by two families, Mastacembelidæ and NOTACANTHIDÆ (which see). THEODORE GILL.

O'pitz (MARTIN), b. at Bunzlau, Silesia, Dec. 23, 1597; studied at Frankfort-on-the-Oder and Heidelberg; lived as secretary, historiographer, court-poet, diplomatic agent, etc. at the courts of the duke of Liegnitz, Bethlen Gabor of Transylvania, Karl Hannibal of Dohna, the emperor Ferdinand II., Ladislaus IV. of Poland, etc., and d. of the plague at Dantzic Aug. 20, 1639. He wrote several large poems, among which the *Trostgedanken in Widerwärtigkeit-*

en des Kriegs is the best, and he enjoyed a great fame as a poet. Nevertheless, his poems cannot be read now without weariness; they belong to that kind of poetry which originated with the revival of letters in Europe, and which generally was written in Latin or Greek, produced by scholars and formed in close imitation of classical models. But Opitz wrote in his vernacular tongue; bestowed great attention, knowledge, and taste on the use of the German language; established the metrical system, employed after him in all Teutonic languages, weighing syllables according to their accentuation, instead of simply counting them; founded a school of educated men who extended his views; and thereby gained the title of the "Father of German poetry."

O′pium [Gr. ὄπιον, "poppy-juice"], a well-known drug, being a concrete juice obtained from the unripe capsules of the poppy (*Papaver somniferum*). Opium has been known as a drug from a remote period, distinct accounts of its collection as a branch of industry in Asia Minor being found in the writings of Dioscorides, about the year 77 B. C. From the countries bordering on the Mediterranean the use of opium was carried East throughout Asia, probably by the Arabians. Though the poppy is naturalized as a garden flower in Europe and America, yet opium is produced as an article of commerce only in India, Persia, Egypt, and Asia Minor. Our own market is supplied almost exclusively from the latter locality through Smyrna and Constantinople. China is supplied partly by importation from India and Asia Minor, and partly by her own production. Opium is obtained by making a shallow horizontal incision in the unripe poppy-head a few days after the fall of the petals. This is done in the afternoon, and the milky juice that oozes from the cuts is scraped off next morning and made into lumps of varying size, ranging in weight from an ounce to several pounds. Good Turkey opium is a hard, tenacious solid of compact texture and a reddish-brown or fawn color. It has a strong, peculiar odor and a rather bitter, somewhat acrid, taste. Opium is an exceedingly complex body. Its medicinal virtues reside in certain alkaloids, of which *morphine* is the most important, as it occurs in greatest quantity and most perfectly represents the properties of the crude drug. This alkaloid was discovered by Sertürner, an apothecary in Hanover, in 1816. It exists in opium combined with a peculiar acid called *meconic*, and in good Turkey opium is found in the proportion of from 12 to 15 per cent. Pure morphia is in small, colorless, shining crystals—is inodorous, but of a bitter taste. It is almost wholly insoluble in water, but its salts are readily soluble, and hence are used in medicine in preference to the pure alkaloid. The acetate, sulphate, and chloride (muriate) are officinal in the U. S. Pharmacopœia. The other alkaloids of opium known to affect the human system are *codeine*, *narceine*, and *papaverine*, but besides these no less than twelve others have been obtained from the drug. For various reasons these seem to be only chemical and physiological curiosities. The most interesting are *thebaine* and *cryptopine*, which by experiments on the lower animals are found to produce effects quite opposite to those of opium or the alkaloids of the morphine type on man. Thus, thebaine produces simply violent tetanic convulsions, and cryptopine wild delirium with *dilated* pupils. Besides these sixteen alkaloids, a neutral principle, *meconine* or *opianyl*, and pectine, albumen, mucilage, sugar, and wax are all constituents of opium. The effects of opium upon the animal system are as complex as the composition of the drug, and cannot be summarized in any single expression. In general, the influence of the drug falls upon the nervous system, the symptoms being all functional nerve-disturbances, and these prove by their peculiar character that, in kind, the opium influence is a conjoint irritation and paralysis. The resultant clinical effect of this singular duplex influence varies in different parts of the nervous system, and also is modified by circumstances of dose, individual idiosyncrasy, temperament, habit, etc. The symptoms produced by opium under ordinary circumstances are briefly as follows: With a small dose there is little experienced beyond relief from any feelings of discomfort that may be present at the time of taking. Physical fatigue, mental exhaustion or distress, small pains and aches, hunger, etc. all tend to disappear, leaving a feeling of general comfort, calm, and peace. When these effects have passed away there may be some little tendency to loss of appetite, coated tongue, slight headache, and constipation, as after-results. With larger quantities the feeling of relief from discomfort is speedily succeeded by the characteristic feature of opium narcosis—namely, a conscious intellectual dulness, accompanied by a drowsiness, which upon every opportunity casts the subject into a state of unconsciousness analogous to ordinary sleep in very many respects, but differing from it in certain others. When thus affected the perceptive cerebral centres are plainly blunted, since a pre-existing severe pain will now not be so acutely felt. After a number of hours, varying with the dose, the taker awakes to a feeling of general misery, with disordered stomach, dry coated tongue, headache, and constipated bowels. Indeed, under the opium influence all the natural secretions, save that of the skin, tend to diminish. But all these symptoms vary widely according to many circumstances, most notable of which is the influence of temperament or idiosyncrasy. Thus, many persons of very "nervous" temperament, instead of experiencing calm followed by drowsiness, are thrown by opium into a state of morbid wakefulness with excessive agitation, their minds being filled with horrible imaginings. So great is the distress experienced that persons thus affected will endure almost any pain rather than seek relief from opium. Others, of highly imaginative temperament, like the Orientals, pass into a beatific state of mind, with pleasing fancies and visions of delicious and gorgeous imagery, as so graphically described by De Quincey. But with matter-of-fact Americans these tempting effects are rarely produced, simple progressive stupefaction being the whole expression of the cerebral influence of the drug. Still others, especially among children, manifest a strong convulsive tendency, which may even culminate in severe general convulsions, with tetanic rigidity of the whole body. And it is interesting to note that in some of the lower animals, as in frogs, tetanus is the normal expression of the opium influence. Intolerable itching of the whole skin, vomiting, syncope, are severally other abnormal effects of opium occurring in certain individuals. The influence of bodily state and habit upon the effects of the drug is truly astonishing. In severe pain, in the prostration from great loss of blood, and other morbid states, the relation between dose and effect changes so that quantities fatal in health may produce no more than a mild opium influence. Precisely the same result follows the habitual taking of opium, and confirmed opium-eaters often take in a day enough to kill ten or twenty ordinary persons. Of the alkaloids, the effects of morphine differ only in minor points from those of crude opium, and those of narceine and codeine also conform to the same general type. The properties of papaverine are not yet thoroughly known. But none of these alkaloids compare with morphine in power or general usefulness. Large doses of opium or morphine may be fatally poisonous, though many circumstances conspire to make the effects exceedingly uncertain, such as vomiting or non-absorption of the whole quantity taken. Enormous draughts of opiates, administered with deadly intent, are therefore often recovered from. But generally four grains of opium or their equivalent are reckoned as a dangerous quantity, and five grains have killed. The salts of morphine are estimated as six times more powerful than the same quantity of opium. Children, it must be remembered, are proportionately more susceptible to the poisonous effect of opium than adults. The prominent symptoms of opium-poisoning are deep coma, with flushed or pale and ghastly face, contracted pupils, slow, stertorous breathing, and slow, full pulse. Death occurs from stoppage of breathing through paralysis of the "respiratory centre" in the brain. The treatment, after evacuation of the poison left in the stomach through emetics or the stomach-pump, is especially directed towards keeping up the breathing. For this end the great desideratum is to keep the patient from sinking into stupor. Hence he is to be aroused by any means, however rough, such as the cold douche, forced walking, shouting, thrashing, and the like. If he can swallow, strong coffee is to be given freely. If in spite of all means he sink into coma and the respirations begin to fail, artificial breathing and hypodermic injections of atropine (a powerful excitant of respiration) are to be cautiously employed. No case should be given up till actual death. Opium is used as a medicine, and also, but principally among the Orientals, as an article of luxury and debauch. In India, besides its use as a mere luxury, the drug is much employed in non-narcotic doses simply to sustain the strength in lieu of food and sleep during hard physical work. In China opium is consumed to an enormous extent by all classes, the mode of taking it being to smoke an aqueous extract in a peculiarly formed pipe. Opium-smoking began in China in the latter half of the seventeenth century, and in spite of all government efforts to prevent it rapidly spread till it may now be called a national practice. China thus consumes nine-tenths of all the opium exported from India, besides considerable from Asia Minor, and the whole of that produced within her own dominions. In medicine opium and morphine fulfil a variety of purposes, some of which could hardly be divined from the effects of the drug on the healthy system. These may be summarized as the support of life, and invigoration and maintenance of the heart's action in cir-

cumstances of great prostration and where ordinary food cannot be digested; the cure or relief of pain, spasm, and general nervous irritability; the induction of sleep; repression of excessive secretion, as in diarrhœa, and curative influence of an unknown character in certain inflammatory diseases. In the fulfilment of most of these indications the induction of the physiological narcotic effects of opium is both unnecessary and harmful. The pharmaceutical preparations of opium are very numerous: the two most familiar are *laudanum*, a simple tincture of opium, of which thirteen minims (about twenty-five drops) is the equivalent of a grain of opium; and *paregoric*, a camphorated tincture, compounded of opium, camphor, benzoic acid, oil of anise, honey, and dilute alcohol. Half a fluid ounce of this tincture represents very nearly the virtues of a grain of opium. The salts of morphia are also very largely used, and their administration in solution by hypodermic injection has in certain circumstances advantages over opiates given by the mouth. EDWARD CURTIS.

Opobalsamum. See MECCA BALSAM.

Opodel′doc, the common name of the "camphorated soap liniment" of the *U. S. Pharmacopœia* of 1850. It is compounded of common soap, camphor, oil of rosemary, oil of origanum, and alcohol. When cold, it has the consistence of a soft ointment. It is essentially the same thing as the "soap liniment" of the present *Pharmacopœia*, and may be used as an anodyne and gentle rubefacient application in sprains, bruises, etc. EDWARD CURTIS.

Opop′anax [Gr. ὀποπάναξ], the inspissated juice of the *Pastinaca opoponax*, a plant closely resembling the common parsnip. It is a fetid gum-resin, resembling assafœtida in its powers, but much feebler. It has a very limited use in medicine. The best comes from the Levant.

Opor′to, city of Portugal, capital of the province of Entre Minho e Douro, is situated on both sides of the Douro, 2 miles from its mouth. The entrance into the Douro is difficult on account of a shifting sandbank in its mouth, but at Oporto it forms an excellent harbor, lined with elegant quays and crossed by many beautiful bridges. Oporto is one of the most picturesque cities in the world, built on a steep acclivity, which it climbs through terraces covered with strikingly colored houses. Some of the streets are narrow, crooked, dirty, and so steep that no carriage can pass through them, but others are broad, airy, clean, and lined with magnificent houses. Its manufactures of gold and silver ware, glass, pottery, leather, linen, woollen, silk, and cotton fabrics are not unimportant; upwards of 6000 people are employed in its industrial establishments. But its chief importance Oporto derives from its commerce. In 1857 the value of its imports amounted to 46,529,000 francs, and that of its exports to 39,984,000 francs. Its trade is chiefly with England and Brazil, and the principal article of exportation is wine, the so-called port wine, red and white, of which 40,483 pipes in 1866 and 34,679 pipes in 1867 were exported to Great Britain. Pop. 89,194.

Opos′sum [a word derived from the American Indians], the name of the *Didelphis Virginiana* and other animals of the same genus, North and South American marsupial mammals of the family Didelphidæ. The common opossum of the U. S. is found in most of the States, except in New England, where no opossums exist, and in Texas and the Pacific States, where the smaller *D. Californica* takes its place. These animals have a well-developed pouch, a prehensile tail, and a remarkable habit of feigning themselves dead when captured. The opossum is much relished as food. It is omnivorous, and about the size of a large cat. There are numerous South American species, some of them with no pouch. The skins have become an important article of commerce.

The Common Opossum.

Op′peln, town of Prussia, province of Silesia, on the Oder, has some manufactures of linen, leather, pottery, and tiles, and an important trade in timber and cattle. Pop. 11,879.

Op′penheim, post-v. and tp., Fulton co., N. Y., has several cheese-factories. Pop. 1950.

Op′pert (JULES), b. July 9, 1825, at Hamburg, of Jewish parentage; studied first law at Heidelberg, then Oriental languages at Bonn and Berlin, where in 1847 he published *Das Lautsystem des Altpersischen;* was appointed professor in German at the lyceum of Laval in 1848, and at that of Rheims in 1850; accompanied the scientific expedition to Mesopotamia, sent out in 1851 by the French government, and was appointed professor in Sanskrit at the schools of the national library in 1857, devoting himself chiefly to the study of the cuneiform inscriptions. His principal works are—*Les Inscriptions des Achéménides* (1852), *L'Expédition scientifique de France en Mésopotamie* (1858–64), *Grammaire sanscrite* (1859), *Grande Inscription du Palais de Khorsabad* (1864), *Histoire des Empires de Chaldée et d'Assyrie* (1866), *L'Immortalité de l'Âme chez les Chaldéens* (1875).

Oppia′nus, b. at Anazarba, Cilicia; flourished in the latter part of the second century of our era, and is the author of a didactic poem on fishing, Ἁλιευτικά, in 3500 Greek hexameters. Another didactic poem on hunting, Κυνηγετικά, containing a little over 2100 Greek hexameters, but much inferior in style to the former, was for a long time ascribed to Oppianus, but is now generally believed to have been written by a younger poet who bore the same name. Editions of both poems by J. G. Schneider (Leipsic, 1813) and Lehrs (Paris, 1846).

Op′pido Mamerti′na, town of Southern Italy, province of Reggio di Calabria, in an unhealthy position at the root of the Aspramonte. The old town, not on the present site, was entirely destroyed by an earthquake in 1783. It is a bishop's see. Pop. 6494.

Op′tics [Gr. ὀπτικός; pl. τὰ ὀπτικά, "things relating to vision"], the science which treats of light and vision. The subject admits of being considered from two points of view. 1. The laws and properties of light, as ascertained by observation, may, by applying the principles of pure geometry, be employed to explain the phenomena; or, 2. A definite theory having been adopted in regard to the nature of the luminiferous medium, the phenomena may be expounded as the necessary consequences of their assumed physical cause. In the first aspect, the several branches into which the subject naturally divides itself are considered in this work under their appropriate heads, as REFRACTION, REFLECTION, DISPERSION, SPECTRUM, DIFFRACTION, RAINBOW, POLARIZATION; THIN PLATES, COLORS OF; DOUBLE REFRACTION, etc., and the titles of the several optical instruments; and in the second under LIGHT, INTERFERENCE, UNDULATION, UNDULATORY THEORY, VIBRATION, etc. The present article will be confined to a brief outline of the history of optical discovery.

A notion was for a very long time prevalent among the ancients that vision is effected by means of rays proceeding from the eye to the object. This idea is not found in Aristotle, but it was introduced into the school of Plato, and continued to be received for many centuries. The persistency of the doctrine is remarkable, inasmuch as the light which is self-evidently indispensable to vision proceeds from sources foreign to the observer. The element-

ary phenomena of reflection and refraction suggest a natural division of the science of optics into two principal branches; and this distinction is made by the earliest systematic writer on the subject whose works have descended to us. This was Euclid, supposed to have been the geometrician of that name, who lived about 300 years before our era. The general laws which govern the reflection of light, being comparatively easy of detection, were stated by him with tolerable correctness; but what he has written on refraction is of little value. Ptolemy, the astronomer of Alexandria, who was born about the year 70 of our era, attempted to discover the law of refraction by experiment. His apparatus was ingenious, and was not different in principle from that which has been employed by Silbermann, Soleil, and others, in our own time, for the same purpose. He measured the angles of refraction corresponding to various angles of incidence, between 0° and 90°, for both water and glass, and left his measurements recorded in his *System of Optics*. We may judge of the degree of accuracy attained by him by comparing the indices of refraction (see REFRACTION, INDEX OF) deducible from his determinations with those of the same bodies fixed with severe exactness by more modern observers. The ascertained index of refraction for water is 1.33582. If we make a computation of its value from the measured angles of Ptolemy, we find a mean of 1.30147. But if we take his measurements at the incidence of 50°, where the relative variations of the angles of incidence and refraction are most marked and most easily measured, we obtain 1.33555, which is exceedingly near the truth. The true index of refraction for glass is between 1.48 and 1.60, according to the materials and density. Crown glass varies from below 1.50 to about 1.525. Ptolemy's mean determination would be 1.484. But at 50° he approaches nearer the truth, his angles giving 1.5321. For rays passing from water to glass the relative index computed from his measurements would be 1.1390, the true being 1.14145. The near agreement of these numbers with modern determinations is remarkable, especially considering that Ptolemy's measures are given only to the nearest half degree. Ptolemy was unable, however, to derive any practical advantage from these results, since the magnitude of the angles seemed to be governed by no law which he could detect, and in this unsatisfactory condition the whole subject of refraction remained for the fifteen succeeding centuries. As an astronomer, Ptolemy could hardly fail to notice the effect of atmospheric refraction upon the apparent positions of the heavenly bodies; and he has the merit of having recognized the fact, which others after him disputed, that the displacement is always in a vertical plane, and also that it attains its maximum in the horizon and is zero in the zenith. About half a century later than Ptolemy flourished Claudius Galen, the celebrated Greek physician. In a treatise on the uses of the members of the human body he speaks at some length of the phenomena of vision, and lays down the fundamental law, on which the stereoscope has been very recently constructed, that the picture which we see of a solid body is made up of two pictures dissimilar to each other, one seen by each eye separately.

But it was impossible that optical science should make any important progress so long as the law which determines the path of a ray in passing from one medium to another remained unknown. We are compelled, therefore, to descend to the earlier portion of the seventeenth century before we find a practicable ground on which to build a systematic science. In 1626, Willebrord Snellius, professor of mathematics at Leyden, died at an early age, leaving behind him manuscripts, among which was contained a statement of the important law in question, which he expressed as follows: When a ray passing from one medium to another undergoes refraction at the common surface, the ratio of the co-secant of the angle of incidence to the co-secant of the angle of refraction is constant. As the co-secants of angles are inversely as the sines of the same angles, the law may be more conveniently expressed by saying that, in the circumstances supposed, the *sines* of the angles mentioned are in a constant ratio. It was in this form that the law was first published by Descartes, eleven years after the death of Snellius. It is, therefore, frequently referred to as the law of Descartes. It may be proper to mention that, previous to the discovery of this important law by Snellius, it had been remarked by the illustrious Kepler that for incidences below 30° a ratio almost constant exists between the angles of incidence and of refraction themselves. This is true, because for small angles the increments of the arc and of the sine are nearly proportional. But when the incidence is moderately large, the divergency of the two ratios becomes very wide.

The next important step in the progress of optical discovery, after the detection of the general law of refraction, was made by the illustrious Newton, who in 1672 communicated to the Royal Society the experimental researches by which he established the compound nature of light and the unequal refrangibility of its component rays. He held that the common white light of the sun is made up of elementary rays differing at the same time in color and in refrangibility. The number of tints which he considered sufficiently distinct to be regarded as independent components is seven. It seems unnecessary, however, to suppose the existence of more than three elementary colors, it being possible, by mingling these in various proportions, to produce all the rest, while the degrees of refrangibility between the extreme limits vary through an infinite number of infinitely small differences. This phenomenon of the separation of the component colors of light by refraction has been called *dispersion*. Newton was of opinion that the dispersive powers of all bodies are equal, or, in other words, proportional to their refractive powers, and that, the mean refractive powers of two bodies being equal, their refractive powers for each particular color must be equal also. Both these suppositions were ascertained by subsequent discovery to be incorrect.

The dispersion of light by refraction furnishes an easy explanation of the interesting natural phenomenon of the rainbow. This beautiful meteor had before Newton's time been the subject of many unsatisfactory speculations; and though De Dominis, as early as 1611, had conceived a true theory of the manner of formation of the inner bow, he had not been able to account for its colors. He showed that there is a certain incidence at which, if the parallel rays of the sun fall upon the anterior surface of a transparent globe, they will be reflected from within so as to emerge, still parallel to each other, at a point on the other side of the centre. The emergent rays will form a constant angle with the incident rays, and, entering the eye of the observer standing with his back to the sun, will form the same angle with a line supposed to be drawn from the sun through the eye. This line from the sun through the eye being made an axis, and the above supposed reflected ray being revolved around it, there will be traced out in the heavens a circle, from every part of which, if raindrops are present, there will come an amount of light above that which is reflected from the surrounding cloud. This explanation satisfactorily determines the *locus* of the bow, but it fails to account for its tints or the extent of surface over which they are spread. It would require that the arc should be white, and that it should be no broader than the sun; that is to say, that its breadth should be only about half a degree. The actual breadth of the inner bow is, however, two degrees and a quarter, and that of the outer three degrees and three-quarters. Newton's discovery furnished the necessary supplement to the theory.

In 1665 there was published at Bologna a posthumous work by Francis Maria Grimaldi, an Italian Jesuit, in which were for the first time described certain phenomena now very familiar under the name of *diffraction*. He stated that if any very small object be placed in a pencil of divergent light, admitted through a minute aperture into a dark room, its shadow will appear materially larger than it ought if light passes its edges in straight lines, and, moreover, that any opaque object, large or small, exhibits along the edges of its shadow a border of at least three distinctly tinted fringes, the brightest and broadest of which is next the shadow. He also observed that when two minute pencils of light are admitted through apertures very near to each other, the screen on which the blended pencils fall, and which, as he supposed, ought to be uniformly illuminated with a light equal to the sum of the two intensities, is streaked with lines absolutely dark. He was led by this observation to announce the paradoxical proposition that there are circumstances in which the union of two rays of light produces darkness. Bold as this announcement must have originally appeared, the progress of scientific discovery has fully confirmed its truth. This phenomenon, being attributed to the bending of the rays of light in the immediate vicinity of the opaque body, was distinguished by the name *inflection* or *diffraction*. It was carefully studied by Newton and others, and has occupied a prominent place in all the discussions which have since arisen in regard to the nature of light.

Not far from the time of the discovery of Grimaldi, just mentioned, the attention of the scientific world was called to a case of new and extraordinary refraction observed to take place in crystals of carbonate of lime—a species of refraction which, from the circumstance of its dividing an incident beam into two beams entirely distinct, or of presenting two images of any object seen through the crystal, has been called *double refraction*. The first publication on this subject was made by Erasmus Bartholinus, a physician of Copenhagen, who gave to the mineral the name of Iceland spar, from the circumstance that his specimens

had been obtained from that island. It is now known that this property of double refraction is exceedingly common, being possessed by most crystallized bodies, and capable of being produced, transiently or permanently, in any transparent solid whatever, whether organic or mineral, in which it does not naturally exist. It is only in Iceland spar, however, that it manifests itself in a degree remarkable enough to attract the attention of a casual observer, and in most cases it can only be detected by special arrangements. Soon after his announcement of the compound nature of light, Sir Isaac Newton made public the results of his ingenious investigations in regard to the colors exhibited by *thin plates* of transparent substances, such as soap-bubbles, films of moisture upon glass and upon polished opaque solids, laminæ of air confined in fissures of transparent minerals, etc. He showed that the tints displayed by such thin plates, when viewed in common light, depend upon three conditions, viz. the thickness of the plate, its refracting power, and the obliquity under which it is viewed.

The next important step in the progress of optical science was the discovery of the progressive motion of light and the determination of its velocity. Though every theory which had ever been suggested to account for the phenomena of light presumed that there must be a progress from the luminous origin, and therefore that time must be an element in the solution of every optical problem, still so nearly instantaneous are all the effects produced at the distances to which our ordinary observation extends as apparently to render hopeless any plan for experimentally determining the velocity. This circumstance rendered the efforts made by the celebrated Galileo and by the academicians of Florence to settle the question completely nugatory. The method of proceeding adopted by Galileo was to place himself upon an eminence opposite to an assistant observer something more than a mile distant, both being provided with lanterns which could be darkened by a slide. The lights being arranged, Galileo darkened his lantern, and the assistant, immediately on noticing its disappearance, darkened his also. Apparently both were extinguished at the same instant. The Florentine academicians repeated the experiment, increasing the distance between the stations, but the result was the same. The problem remained unsolved; but its solution came at last, when demanded by the exigencies of a higher branch of science. In 1675, Roemer, an astronomer of Copenhagen, in his observations upon the eclipses of the first satellite of Jupiter, became perplexed by irregularities for which he could conceive no means of accounting. It was suggested by Dominic Cassini that these difficulties might perhaps be removed by supposing that the time occupied by light in passing through the vast distance between Jupiter and our planet may be large enough to be appreciable, and therefore that, as our distance varies, this time must vary also. Assuming this hypothesis to be true, and that the epoch on which our computations of future eclipses are founded is the date of some eclipse actually observed when the two bodies were occupying their points of nearest approach, it will follow that if the accuracy of the determination is affected only by the motion of light, all subsequent eclipses, observed when the distance is the same as at the epoch, will agree with the prediction, and all others will be in retardation by an amount of time equal to that which light requires to pass over the space by which the distance has been increased. In like manner, if the epoch had been an eclipse observed in the position of greatest distance between the bodies, subsequent eclipses would be in advance of the prediction; and if the epoch had been an observation made from some position intermediate between the points of greatest and least distance, the eclipse afterwards occurring would be sometimes in advance and sometimes in retardation. The test of the correctness of the hypothesis would be a careful comparison of the observed irregularities of time with the variations of distance—a comparison involving no slight labor. Cassini, with whom the idea originated, seems to have abandoned it, but Roemer followed it up with such perseverance as at length conclusively to establish its truth. He demonstrated that the time occupied by light in passing over the entire diameter of the earth's orbit is 16 minutes and 26 seconds. But at that period the dimensions of the earth's orbit were not accurately known, and this determination was insufficient to fix the absolute value of the velocity of light. Assuming the sun's mean parallax to be 8.88″, the mean diameter of the orbit must be about 184,000,000 of miles, and this number, divided by 986, the number of seconds in 16 minutes and 26 seconds, gives for the velocity in miles 192,700. The velocity of light has, since the time of Roemer, been ascertained, with a probably near approximation to the truth, by other independent methods, and the results of all these are substantially in harmony, 187,000.

The next discovery of importance in the progress of optical science was made near the close of the last century by Dr. Wollaston in his observations upon the prismatic spectrum. He discovered that by employing a pencil of light very narrow in the direction of the plane of refraction, but broad parallel to the axis of the prism, five well-defined dark straight lines could be distinguished crossing the spectrum at right angles, and maintaining invariably the same positions relatively to the colors. This number he afterwards increased to seven. These lines may very easily be distinguished by holding a prism near the eye, parallel to any small fissure through which light makes its way into a dark room. By aiding the eye with a telescope the number discovered becomes surprisingly great. M. Fraunhofer of Munich enumerated 590, and Sir David Brewster afterward increased this number to 2000. The eight principal lines are distinguished by the letters A to H, of which the line A is at the beginning of the red and the line H about the middle of the violet. The positions of these lines being definitely fixed among the colors of the spectrum, they furnish valuable aid in comparing the refracting powers of different bodies, and have served to reveal the fact that bodies whose *mean* refractive powers are equal do not always equally refract the several elementary rays. The line A is not among the most easily discernible, but Sir David Brewster has discovered others in the almost imperceptible light below A, and Sir John Herschel, and especially Prof. Stokes, have discovered many others still beyond the violet. By his curious discovery of *fluorescence*, or the property possessed by some substances of rendering sensible to vision rays beyond the limit of the ordinary spectrum, Prof. Stokes has, in fact, quadrupled its length.

In the year 1808 the French Academy of Sciences proposed the problem of the double refraction of light as the subject of a prize to be awarded two years thereafter. The successful competitor for this prize was Malus. To him is due the polarization of light by reflection. He was led to this remarkable discovery by an accident. In observing, through a prism of Iceland spar, the light reflected to his windows from those of the palace of the Luxembourg, he was surprised to see that, as he turned the prism around the ray, one of the two images vanished at every quarter revolution. By following up the indication thus given, he arrived at the important law that when light is reflected from glass at an angle of 54° 35′, or from water at an angle of 52° 45′, it possesses all the properties which belong to the pencils into which a ray of ordinary light is divided by a double refracting crystal. This remarkable condition of light was distinguished by the name *polarization*. It was the conclusion of Malus that the angle of polarization of a given body is independent both of its refractive and of its dispersive power. Dr. Brewster, however, demonstrated that this angle depends on the refractive power, and is connected with it by the law that "the index of refraction of any body is the tangent of the angle of polarization."

A remarkable fact in regard to the condition of light emitted at great obliquity from luminous solids or liquids was discovered by M. Arago. Whenever the light of an incandescent body of either of these classes is examined as it proceeds directly from the body and with no great inclination to the luminous surface, it is found to be unpolarized. But when the rays whose obliquity to the surface is very considerable are the subject of examination, they are found to be partially polarized. The inference is that these rays have been polarized by refraction, and hence that they must have originated beneath the surface of the luminous body. The light of flames and incandescent gases exhibits no such polarization. The light of the sun is always unpolarized, whether it be examined at the limb or at the centre of the disk. From this observation Arago was led to consider the luminous envelope of the sun to be gaseous, and not liquid or solid, thus corroborating incidentally the ingenious suggestion of the elder Herschel in regard to the constitution of the solar photosphere.

In the year 1811, M. Arago communicated to the Academy of Sciences of Paris one of the most remarkable and beautiful discoveries which has ever been made in the history of optics. Upon examining thin plates of certain transparent crystals, such as mica, selenite, or quartz, by means of transmitted polarized light, he found that when the light was received upon the eye through a prism formed of Iceland spar, the richest conceivable colors made their appearance, which were complementary to each other in the two images, and which varied in intensity with the azimuth of the laminæ or of the prism. The colors thus seen in crystalline laminæ recur in several successive series as the thickness of the laminæ is increased. Another class of chromatic effects produced by crystalline plates viewed in polarized light was first observed by Dr. Wollaston in

Iceland spar, in which the display is perhaps the most brilliant. In these cases the crystal is cut perpendicularly across the axis. In examining plates of quartz cut across the axis as above described, M. Arago observed a peculiarity of a remarkable kind, which is scarcely found in any other natural crystal. The centre of the field was not dark in any position of the analyzer, but was deeply and uniformly colored with a tint which varied as the analyzer was turned. When a bi-refringent prism was employed as an analyzer, the two images seen were constantly complementary in color, and as the analyzer was turned they ascended in tint, in the order of Newton's scale, from red to violet. M. Biot in subsequent experiments discovered that in some crystals the ascent of the tints in the scale is produced by a right-hand rotation (the ordinary direction of a screw), and in others, by a left-hand rotation. These classes of crystals have been distinguished by the names right-handed and left-handed crystals, or *dextrogyre* and *lævogyre*. The peculiar kind of polarization produced by quartz has on this account been called *rotatory* polarization. The physical cause of rotatory polarization is unknown. M. Biot supposed it to belong to the ultimate molecules of the substance, but this hypothesis Sir David Brewster believed to be disproved by the fact that the property ceases to appear in quartz whose crystalline structure has been destroyed by fusion.

In the prosecution of his investigations, Sir David Brewster arrived at the discovery that the polarizing structure could be artificially produced in glass by heat or by rapid cooling; that this effect is transient when the heat is below the point of softening or fusing the substance; but that when it is carried beyond that point, and cooling rapidly follows, as in glass which is not annealed, the structure is permanent. He found that the same structure could be produced by pressure, by torsion, by tension, or by flexure, and traced the transient condition of the same kind produced by heat to the mechanical effects of unequal expansion. Any solid transparent substance, organic or mineral, was found by him to be capable of receiving this structure transiently or permanently. Among these may be named horn, indurated jellies, tortoise-shell, gums, resins, the crystalline lenses of fishes or animals, etc. etc.

In the year 1815, M. Biot made the remarkable discovery that many liquids possess the power of rotatory polarization—a discovery which was independently made by Mr. Seebeck; the effect was first observed in oil of turpentine, but has since been found in most essential oils, in solutions of sugar, dextrine, the vegetable alkaloids, camphoric and tartaric acids, and the tartrates. In some of these substances the plane of polarization is turned to the right and in others to the left. M. Arago early made the discovery that the light which comes to us from the atmosphere is polarized. Observations made in the vertical plane passing through the sun show sensible polarization in that plane up to about 150° from the luminary—a point which can only be observed, therefore, when the sun is low. The polarization at this point becomes zero, and it is hence known as Arago's neutral point. Below this point down to the horizon polarization is found in a horizontal plane. M. Babinet discovered a second neutral point 17° above the sun, and Dr. Brewster a third, 8° 30′ below. Neither of these is easy of observation, in consequence of the proximity of the sun himself and his great light.

Regarding atmospheric reflection of the sun's rays as the cause of atmospheric polarization, it will follow that every plane passing through the sun (in the superior portions of the atmosphere at least) must be a plane of polarization. This will, therefore, be true of the *hour-circle*, or meridian, in which the sun happens at any time to be; and as all hour-circles pass through the pole of the heavens, it results that a delicate polariscope, directed toward the pole, may follow the horary motion of this plane. Such a polariscope, furnished with a dial and index, becomes a chronometer. This is the principle of an elegant little instrument invented by Wheatstone, called the *polar clock*. When accurately adjusted, it will indicate, in the hands of a practised observer, the apparent solar time within a very few minutes. It will operate even when the sky is overcast with clouds, provided there be an unobscured spot at the pole through which the blue sky may be seen. In the foregoing very succinct outline of the history of optical discovery the object kept in view has been to present simply facts, without entering into any discussion of the physical causes to which they are to be attributed. These are considered elsewhere in this volume, especially under the titles LIGHT and UNDULATORY THEORY.

F. A. P. BARNARD.

Optima'tes and **Popula'res** were the two party names under which the old opposition in the Roman commonwealth between patricians and plebeians took a new form and kindled into a deadly struggle in the time of the Gracchi. *Optimates* denoted the conservative party, consisting of the senatorial families with their dependents, the aristocracy proper. *Populares* denoted the progressive party, consisting of the mass of the people, the old *plebs*, the freedmen, persons often of wealth, but with small personal influence, and the proletariate. Caius Gracchus at the head of the *populares* was victorious, and introduced considerable changes in the oligarchic constitution of Rome, but with Sulla the *optimates* once more came into power. In the struggle between Pompey and Cæsar the latter succeeded in fully overthrowing the old constitution, and in the confusion after his death the old party constellation disappeared, and with it the old party names.

Op'timism [Lat. *optimum*, "best," in contrast with *pessimum*, "worst"], the doctrine that the world is the best possible, or that evil is only relative and contingent, being incident to the evolution of good—that good is substantial, evil only temporary. It is the philosophical counterpart to the religious doctrine of an overruling Providence that educes good out of evil. The divine purpose in creation is held to be the bringing of good into existence where nothing existed before, and the replacing of the imperfect by the more perfect; in general, it is to change chaos to a cosmos, and make it reflect the attributes of God. Creation, evolution, change of any sort, involve contrast and the manifestation of two principles. Hence, the passive principle (chaos), which is eliminated by the activity of the good, is manifested or made apparent by the activity which annuls it. Without the activity of creation the passive or negative principle (chaos or mere potentiality) would remain a pure zero, and be neither good nor evil. In all the stages of the realization of good, from the lowest to the highest, there is contrast, and hence the phenomenon of evil; but evil or the relatively imperfect exists only as the battlefield upon which it receives defeat from the victorious higher good. This is the view *sub specie æternitatis*, as Spinoza called it. Of course, any partial view, taking its point of observation from some one imperfect being, would see in its destruction the triumph of evil rather than of good, and evil might seem predominant in the world. The optimistic theory is consistent only with theism, perhaps only with Christian theism. It finds place in the theory that God creates the world from nothing (chaos or pure space) as his manifestation or self-revelation. Opposed to this is the emanation-theory characteristic of Oriental thinking, in which the Absolute is an abstract unity devoid of attributes, impersonal, and above multiplicity. All creating is removal from unity toward multiplicity, and hence evil; it is a lapse from the Absolute, and finite existence is therefore altogether a mistake, or perhaps even a punishment for sin in a former state. The return of all finite to the infinite through absorption or annihilation is regarded as the desirable end. Nature is not a conflict of good and evil, but altogether evil. Still, the good only is, in the highest view. For all creation is *maya* or illusion of the senses and intellect. The religion of the emanation-theory lays chief stress on ascetic renunciation with a view to reabsorption into the Absolute. Even destruction of consciousness and individuality is regarded as blessedness. "The conclusive, incontrovertible, one only knowledge, is that neither I am, nor is aught mine, nor do I exist," says the *Sankhya Karika*. In contrast with this, European thought quite generally embraces optimism. From the doctrine of Plato, that God is the absolute good, and "the Good possesses not envy, and on this account has made the world most similar to itself," down to the doctrine of Hegel, that all nature and history are the celebration of God's personality, optimism accompanies the doctrine which makes man a free immortal spirit transcending nature, and nature to be the theatre best fitted for his development. The Christian philosophers have variously expanded this doctrine. St. Augustine explains that evil is only contingent or incident to finitude in its different degrees of imperfection, and that it exists only as an adjunct of the good; "as a painting with dark colors is beautiful when seen as a whole, so the sum of things when seen with one glance is good." St. Anselm adopted the same view, and asserted that the fall of man rendered him capable of attaining higher good. St. Thomas Aquinas likewise: "The infinite manifoldness in the objects of nature is requisite in order to display God's infinite perfection; evil is only the privation of perfect actuality incident to the mere participation in the divine." Malebranche says that God has used everywhere the simplest means to realize his purposes, and accordingly has admitted the fewest evils possible into the world. Leibnitz, who is the best-known defender of optimism, distinguished three kinds of evil: (*a*) metaphysical, owing to the finiteness of things: this is unavoidable; (*b*) physical evil or pain, which is conditional good, being a monitor to warn us against error; (*c*) moral evil or wick-

edness, for which man alone is responsible, being incident to freedom, which is his highest gift. "God, therefore, out of the infinite number of possible worlds which he saw, chose the one which is actually the best."

William T. Harris.

Op'zoomer (Karl Wilhelm), b. Sept. 20, 1821, at Rotterdam; studied jurisprudence at Leyden, and attracted, even while a young student, much attention by his *Letter to Da Costa* and *Examination of the Annals of Dutch Theology*, in which he attacked the so-called orthodox dogma; was appointed professor of philosophy at the University of Utrecht in 1846, and acted as a leader in all movements of reform and progress in politics, religion, and science. His principal works are—*Wetenschap en Wijsbegeerte* (1857), *Het Wezen der Kennis* (1863), *De Godsdienst* (1864), besides a number of minor essays.

Oquaw'ka, post-v., cap. of Henderson co., Ill., on the Mississippi River and the Mississippi division of the Rockford Rock Island and St. Louis R. R., has 2 newspapers and considerable trade in agricultural products. P. 1370.

Or'ache, the *Atriplex hortensis*, *A. patula*, and other species of the genus, chenopodiaceous herbs, the first mentioned a native of the Old World, the second (and others) of both hemispheres. They sometimes are cultivated, and make very good substitutes for spinach.

Or'acle [Lat. *oraculum*, from *orare*, to "entreat," derived from *os*, *oris*, "mouth," corresponding to the Sanskrit *osa*], a term applied to answers given by the ancient Egyptian and Greek deities when solemnly consulted by their votaries, and also to the places where they spoke. Oracles spoke in different ways—in some cases through a human being, who uttered words of inspiration; in others by signs, which the priests watched and interpreted. Greece and Egypt had oracles of both these kinds, while in Italy the latter only existed. The ancients consulted oracles on all important affairs, whether public or private. If, as often happened, an enterprise failed even though the gods had seemed to favor it, the oracles still lost no credit, for their answers were so ambiguous that it was no easy matter to interpret them clearly. Zeus (Jupiter), though the source of oracular inspiration, was immediately consulted less often than the minor gods, who, especially Apollo, acted as mediators between him and mankind. Nor did he reveal his will by direct inspiration, but by certain signs. His oracle at Dodona, the most ancient in Greece, spoke by sounds of the wind rustling through groves of oaks and beeches, in the branches of which were hung brazen vessels: these, striking against each other as the wind blew, rendered the god's language more intelligible. At first men were its interpreters, but in later times old women officiated. The oracle of Zeus at Olympia was chiefly consulted by persons about to take part in the Olympic games. Sacrifices were offered, from the appearance of which the priests deduced an answer. That of Zeus Ammon, situated in a Libyan oasis, was greatly venerated, and was much consulted by the Greeks: here men gave the answers. The chief oracle of Apollo was at Delphi or Pytho, on the southern slope of Mount Parnassus, and near the Castalian Spring. According to legend, it was discovered by some shepherds, whose sheep, having approached a chasm from which smoke issued, were seized with convulsions. Human beings, affected in like manner, uttered prophecies, so that the place came to be regarded as holy and under the influence of Apollo, to whom a temple was built over the chasm. Among other oracles of Apollo were—that of Abæ in Phocis, where a priest was the medium; of Ismenion in Bœotia, where the god spoke by the appearance of the victims; of Claros, in the territory of Colophon, where a man became inspired by drinking of a sacred well; of Delos, consulted only in summer; of Patara, in Lycia, consulted only in winter.

While the oracles of Zeus and Apollo pronounced on all important matters, the other gods and heroes were questioned on those subjects only over which they were supposed to preside. Thus, Æsculapius was consulted only by the sick: he had many oracles, the most renowned of which was at Epidaurus. The oracle of Ceres, in Achaia, was also consulted only by sick persons, who, after performing various ceremonies, were shown in a mirror either dead or restored to health. At Nysa, in Caria, was an oracle of Pluto, where priests cured the sick with remedies revealed to them in dreams by the god. Hermes (Mercury) had an oracle in the market-place of Pharæ, in Achaia: the question was whispered in the god's ear, and the applicant went out of the temple and took the first chance remark he heard as a divine reply. In Thrace there was an oracle of Bacchus, where the priests drank abundantly of wine, and, thus inspired, answered the inquirer. At Aphaca, in Cœle-Syria, stood a temple of Venus near a lake into which persons consulting the oracle threw presents: these sank if acceptable to the goddess, and floated if rejected by her. The oracle of Trophonius, at Lebadeia, was very famous. The votary, after purification and prayer, entered the hero's cave, where he saw visions, from which, he having described them to the priests, an answer was deduced. At Bura, in Achaia, the oracle of Herakles answered by painted dice which were thrown by the questioner. Somewhat after this manner Fortuna was interrogated by the Italians: slips of oak board, graven with sacred characters, were shaken together by a boy, and one was drawn by the consulter. Among lesser forms of oracle were those "of the dead," by which departed spirits were consulted. The "Urim and Thummim" of the Jews, and also the *Bath Kol*, or echo, were species of oracle. Eusebius and many subsequent Christian writers affirmed that with the birth of Christ all oracles ceased. In the later times of oracles little real respect was paid them by the more enlightened pagans.

Janet Tuckey.

Oraga'wa, town of Japan, on the south-eastern side of the island of Niphon, and forms the port of Jeddo. It is said to have about 20,000 inhabitants.

Or'amel, post-v. of Caneadea tp., Allegany co., N. Y., on the Genesee Valley Canal. Pop. 289.

O'ran, province of Algeria, bounded N. by the Mediterranean, E. by the province of Algiers, S. by the desert, and W. by Morocco. Area, 111,831 square miles. Pop. 513,492, of whom 411,874 were natives, 51,729 French, and 47,433 foreigners. Large tracts of this province are uncultivated and unfit for cultivation; others are cultivated with the utmost care, and wheat, maize, cotton, and wine are grown with great success. The climate is very hot, but not unhealthy.

Oran, town of Algeria, capital of the province of Oran, on the Mediterranean. It is surrounded with walls and defended by several strong forts; the streets are generally broad and airy, the houses spacious and elegant, and the promenades beautiful. Its harbor is naturally poor, but has been greatly improved of late, and large quantities of French cotton goods, hardware, wine, and wheat are here exchanged for gold-dust, ivory, ostrich feathers, gums, etc. Pop. 40,674.

Oran, tp. of Logan co., Ill. Pop. 769.

Oran, post-v. and tp., Fayette co., Ia. Pop. 715.

Or'ange [Fr.], the well-known and delicious fruit of many varieties of the genus *Citrus*, which, although much confused, are probably all referable to *Citrus aurantium*. *Citrus* is a genus formerly placed in the order Aurantiaceæ, but now included in Rutaceæ. It embraces trees and shrubs, all exotic, and in our northern climate unable to cope with winter cold. In our extreme Southern States the orange is productive. The foliage is fragrant, and the pure white flowers are odorous and beautiful. Wherever known throughout the world they are regarded as the appropriate ornaments of a bride. These flowers have from twenty to sixty or more stamens, sometimes in sets, and have one style. There are from four to eight, usually five, petals. The filaments of the stamens are more or less united, and the ovary many-celled, with a prominent disk at the base. The fruit is a juicy and luscious berry with a leathery rind, usually of that color known as orange. This rind contains little cysts or cells filled with a fragrant and volatile oil which is easily inflammable. The branches of the tree are spiny and the leaves in reality compound; that is, they consist of a single leaflet, as is shown by the articulation between the blade and the petiole. The latter is generally winged.

It is supposed, although the fact is not decided, that the original of the orange came from the East Indies or from China. Species of *Citrus*, indicating the origin of *Citrus aurantium*, have been found in the foot-hills of the Himalaya. Of whatever country it is native, it has now spread over all the warmer regions of the earth. It has an astonishing productiveness, one tree sometimes yielding in favorable localities as many as 20,000 marketable oranges. No cultivated fruit is more liable to degeneration, and for this reason it is seldom grown from seed. The trees we meet with in conservatories usually bear a bitter, unpalatable fruit, and are chiefly grown for ornament. They are not only evergreen, but bear simultaneously the golden fruit and the perfumed blossoms. The leaves are fragrant also, and have a limited use in medicine in cases of hysteria, when they are employed instead of tea. Oil of neroli is prepared from orange-flowers, and is the basis of the popular perfume known as eau de cologne. The fruit contains citric acid, but not in so large proportion as the lemon. The numerous seeds often contain more than one embryo. Sicily, Malta, Spain, the Azores, Portugal, and Cuba furnish most of the oranges of commerce. Of late years, Florida has begun to export fine fruit, and

the cultivation is profitably conducted in California. The orange is of very great importance, as the fruit of some varieties is easily transported from one climate to another without damage. The rind enters into various articles of confectionery, and is used for flavoring. An orange tree will live to a very great age. W. W. Bailey.

Orange, town of France, department of Vaucluse. It is old, ill built, and dirty, but it has several well-preserved and interesting remains from the Roman time (a triumphal arch and a theatre), some manufactures of linen and cotton fabrics, and a large trade in honey, wine, spirits, essences, oil, truffles, saffron, and madder. The old province of Orange fell in 1531 by marriage to the princes of Nassau, but was recovered by France at the Peace of Utrecht in 1713. Pop. 10,622.

Orange, or **Gariep,** a river of South Africa, rises in the mountains which separate Natal from the Orange River Free State, flows in a nearly western direction and with a tortuous course, and falls into the South Atlantic Ocean in lat. 28° 38′ S. Its shores are covered with extensive forests yielding excellent timber and many different sorts of valuable wood, and rich copper ores have been found in its vicinity; the country between its basin and the Cape Colony is a naked desert.

Orange, county of E. Florida, bounded on the E. by St. John's River and the Atlantic Ocean. Area, 2450 square miles. It abounds in lakes, which are surrounded by fertile hummock-lands. The county has large forests of pine, cedar, and cypress. The land is in great part elevated and rolling. It is adapted to the culture of oranges, cotton, sugar-cane, rice, etc. Cap. Orlando. Pop. 2195.

Orange, county of S. Indiana. It is uneven, has dense forests and a fertile soil. Area, 400 square miles. Live-stock, wool, tobacco, and grain are leading products. The N. part is traversed by the Louisville New Albany and Chicago R. R. Cap. Paoli. Pop. 13,497.

Orange, county of S. New York, bounded E. by the Hudson River. Area, 838 square miles. It extends S. W. to New Jersey and Pennsylvania. A considerable part of the county is broken and even mountainous, but as a whole it is remarkably fertile. Iron ore, flagging and building stones are extensively obtained. The county is famous for its milk, butter, cheese, etc. Live-stock, grain, hay, and market-garden products are largely raised. The county is traversed by the Delaware and Hudson Canal and by various railroads, mostly operated as branches of the Erie R. R. There are important manufactures of flour, hats, iron, machinery, woollen goods, spirits, leather, carriages, metallic wares, harnesses, clothing, furniture, etc. Caps. Newburg and Goshen. Pop. 80,902.

Orange, county of N. North Carolina. Area, 630 square miles. It is somewhat uneven, very fertile, and abounds in good iron ore. It is traversed by the North Carolina R. R. Live-stock, corn, and tobacco are leading products. Cap. Hillsborough. Pop. 17,507.

Orange, county of S. E. Texas, bounded E. by the Sabine River (which separates it from Louisiana), on the S. by Sabine Lake, and on the W. by the Neches River, all navigable the year round. It is also traversed by the Texas and New Orleans R. R. The county is level, very fertile, and well timbered. Cotton, corn, tobacco, rice, and live-stock are produced. Area, 350 square miles. Cap. Orange. Pop. 1255.

Orange, county of E. Vermont, bounded E. by the Connecticut River, which separates it from New Hampshire. Area, 640 square miles. It is hilly and in part mountainous, but generally well adapted to farming. Grain, hay, and wool are leading products. Lumber, farming implements, harnesses, carriages, etc. are manufactured. The county is traversed by the Connecticut and Passumpsic Rivers R. R. Cap. Chelsea. Pop. 23,090.

Orange, county of Central Virginia. Area, 300 square miles. It is bounded N. by the Rapidan River. It is in part mountainous, but has a productive soil, especially in the valleys. Grain and tobacco are leading products. Flour is the principal article of manufacture. The county is traversed by the Washington City Virginia Midland and Great Southern R. R. Cap. Orange Court-house. Pop. 10,396.

Orange, post-v. and tp., New Haven co., Conn. Pop. of v. 782; of tp. 2634.

Orange, post-v. and tp., Clark co., Ill. Pop. 924.

Orange, tp. of Knox co., Ill. Pop. 1167.

Orange, post-v. and tp., Fayette co., Ind. Pop. 881.

Orange, tp. of Noble co., Ind. Pop. 2066.

Orange, tp. of Rush co., Ind. Pop. 1273.

Orange, tp. of Black Hawk co., Ia. Pop. 864.

Orange, post-v. and tp., Clinton co., Ia. Pop. 1018.

Orange, tp. of Guthrie co., Ia. Pop. 212.

Orange, post-v. and tp., Franklin co., Mass., on the Vermont and Massachusetts R. R. Pop. of tp. 2091.

Orange, post-v. and tp., Ionia co., Mich. Pop. 1382.

Orange, tp. of Douglas co., Minn. Pop. 178.

Orange, tp. of Grafton co., N. H. Pop. 340.

Orange, city, Essex co., N. J., on the Morris and Essex division of the Delaware Lackawanna and Western R. R., 13 miles W. of New York. The city stands on rolling ground 190 feet above tidewater, and is very picturesquely located. Its streets are laid out at right angles, and the more important ones are paved with "Telford." The chief industry of Orange is hatting, which is carried on to a large extent. Llewellyn Park, its most attractive feature, extends from the base to the brow of Orange Mountain, comprising 750 acres, studded with elegant residences and laid out in handsome grounds kept in common. Orange contains an orphan asylum, a hospital and dispensary, 28 school organizations, 1 national and 2 savings banks, 4 weekly newspapers, a well-organized city government, including a police and paid fire department. Horse-cars connect it with Newark, 3½ miles distant. Pop. 9348.
J. M. Reuck, Ed. "Journal."

Orange, post-v. and tp., Schuyler co., N. Y. Pop. 1960.

Orange, a v. (Nankin P. O.) and tp., Ashland co., O. Pop. of v. 271; of tp. 1485.

Orange, tp. of Carroll co., O. Pop. 1207.

Orange, tp. of Cuyahoga co., O. Pop. 812.

Orange, tp. of Delaware co., O. Pop. 1266.

Orange, tp. of Hancock co., O. Pop. 1167.

Orange, tp. of Meigs co., O. Pop. 828.

Orange, tp. of Shelby co., O. Pop. 951.

Orange, tp. of Columbia co., Pa. Pop. 905.

Orange, tp. of Orangeburg co., S. C. Pop. 1243.

Orange, post-v., cap. of Orange co., Tex., on the Sabine River, 103 miles E. of Houston.

Orange, post-v. and tp., Orange co., Vt. Pop. 733.

Orange, post-v. and tp., Juneau co., Wis., on the Chicago Madison and St. Paul R. R. Pop. 235.

Or′angeburg, county of Central South Carolina. Area, 900 square miles. It is bounded N. E. by the Congaree and Santee rivers, and S. W. by the South Edisto. It is uneven and productive. Cotton, rice, corn, and live-stock are leading products. The county is traversed by the South Carolina R. R. Cap. Orangeburg Court-house. Pop. 16,865.

Orangeburg Court-house, post-v., cap. of Orangeburg co., S. C., on the South Carolina R. R., 80 miles from Charleston, contains the South Carolina Agricultural College, Claflin University, several academies and schools, 6 churches, a fire department, 2 carriage manufactories, a shingle-factory, a brickyard, and stores. It is a large market for cotton, rice, turpentine, and lumber. Pop. 246.
Thad. C. Andrews, Ed. "Orangeburg News."

Orange City, post-v., cap. of Sioux co., Ia., near the Sioux City and St. Paul R. R., 42 miles N. of Sioux City, founded in 1870 by a colony from Pella, has 1 church, 1 grist-mill, 1 newspaper, and the usual stores. Pop. about 300. C. W. Harmon, Ed. "Sioux County Herald."

Orange Court-house, post-v., cap. of Orange co., Va. Pop. 731.

Orangemen, a political association, whose official name is **The Loyal Orange Institution,** formed in 1795 in Northern Ireland in honor of King William III., prince of Orange, in opposition to the Roman Catholic association of the Ribbonmen, and for the purpose of defending the Protestant religion in Ireland, the legislative union between Great Britain and Ireland, etc. The association spread rapidly, and it soon came to bloody conflicts between its members and those of the Roman Catholic association, which it required considerable military force to suppress. At last, in 1836, the association was dissolved, but in 1845 it was again revived, though not acknowledged by the government; its processions are still forbidden in Ireland. In 1829 the institution was transferred to British America with great success, but there too, as well as in New York, its processions have sometimes occasioned riots.

Orange Oil, an essential oil, consisting chiefly of hesperidene, $C_{10}H_{16}$, is extracted by pressure or distillation with water from orange-peel. It begins to boil at 175° C., and 97.8 per cent. goes over below 180° C.; the remainder consists of a soft yellow inodorous resin. (See *Chem. Soc. J.* [2] ix. 1186.) The flowers of the orange yield, on dis-

tillation with water, a fragrant oil, called *oil of neroli.* It consists of two oils, one readily soluble in water, the other sparingly soluble. Alcohol of 90 per cent. separates a solid neroli-camphor. (See Watts's *Dict.*, article *Citrus*, 2*d suppl.*, article *Orange-peel Oil*, and *U. S. Disp.*)

C. F. CHANDLER.

Orange, Prince of. See WILLIAM OF NASSAU.

Orange, Prince of, son of William of Nassau. See MAURICE, COUNT, of Nassau.

Orange River Free State, territory of Eastern South Africa, bounded E. by Natal, from which it is separated by the Quatlamba, Maluti, and Drachenberg mountains, S. by the Cape Colony, and N. by the Transvaal Republic. It comprises an area of about 50,000 square miles, and consists of elevated flats around the Orange and the Vaal, eminently well suited for the breeding of cattle and sheep. It is inhabited by about 37,000 Dutch settlers, who left Natal on its being declared an English colony, and formed an independent state on this territory.

Orange Springs, a v. of Putnam co., Fla. Pop. 177.

Or'angetown, tp. of Rockland co., N. Y., on the Hudson River, traversed by New York and Erie R. R. P. 6810.

Orange Valley, post-v. of Essex co., N. J.

Or'angeville, post-v. of Wellington co., Ont., Canada, on the Toronto Grey and Bruce Railway, 43 miles from Toronto, has 2 weekly newspapers and numerous manufactories of lumber, furniture, woollens, castings, bricks, pottery, etc. Pop. of sub-district, 1458.

Orangeville, post-v. of Oneco tp., Stephenson co., Ill. Pop. 255.

Orangeville, post-v. and tp., Orange co., Ind. P. 904.

Orangeville, post-v. and tp., Branch co., Mich. Pop. 1145.

Orangeville, post-v. and tp., Wyoming co., N. Y. Pop. 1217.

Orangeville, post-v. of Hartford tp., Trumbull co., O., on the Atlantic and Great Western R. R. Pop. 260.

Orang' Outang' [properly *orang-utan*, Malayan for "man of the woods"], the *Simia satyrus* of Borneo and the neighboring islands, one of the most highly developed of the anthropoid apes. It is about five feet in height, and usually is covered with reddish hair, but several varieties are reported varying in size and color. It is always strictly arboreal, being seldom seen on the ground. It does not assume an erect posture except when taught to do so in confinement. It is a fierce and dangerous animal when wild, and especially when wounded or at bay. Even when tamed it is dangerous if irritated. The male is rendered hideous by great cheek-callosities, and has large tracheal pouches, whose use is not known. This creature is omnivorous, and builds a rude shelter of branches in the tree which serves as its home.

Orato'rio [Lat. *oratorium*], an elevated form of musical composition in which voices and instruments combine to represent scenes, passages, or themes from biblical or sacred history, the text consisting of verses from the Scriptures arranged with a view to moral and spiritual effect; the music comprising chorus, recitative, aria, quartette, trio, solo—in short, all the recognized combinations of harmony and melody, with organ and orchestral accompaniment, as in opera. It differs from opera principally in being sacred instead of secular, and in being unsuited to stage or scenic representation. Oratorio is sometimes described as sacred opera. This is not, strictly speaking, correct. Oratorio, when it becomes operatic in the sense of scenic and passionate, as in the case of Rossini's *Moses in Egypt*, ceases to be oratorio. The oratorio may be classed with dramatic compositions, on condition that the element of action is omitted. The movement is subjective, the development ideal, the characterization intellectual, the spirit epical. The oratorio was never intended to do service in the offices of worship, was never written in the direct interest of Sabbath or cathedral observances. Though its name was derived from *oratorium*, a "little chapel," its modern beginnings having been laid there, it has sought unconsecrated halls for its display. It was, in fact, an effort to associate the charm of musical composition with the solemnity of sacred themes. Hence, in large measure, its popularity in England with the "evangelical" Protestants, who are forbidden by their religious feeling to attend operatic and theatrical entertainments, and with the orthodox public of the U. S. In Paris it has, in fact, no abiding-place, nor is it held in favor in Italy, where it originated. The germs of oratorio existed in the Middle Ages in the shape of *mysteries* and *moralities*—scenes from Scripture rudely dramatized, with some primitive sort of music, the design being to entertain the coarse and vacant-minded peasantry, and entice them from idleness and vicious pleasure. The steps of development in conception and form cannot be traced. In the middle of the sixteenth century, St. Philip Neri, a man of deep humor and genuine sympathy with the people, attempted to mingle instruction and entertainment by engaging the music director of St. Peter's church to aid him in his popular interpretations of sacred story. The musician introduced songs in passages of dialogue and soliloquy. That the attempt was successful appears from the fact that it was made in other places and with more art. In the year 1600 one of these musical dramas was exhibited on a stage erected in the church Sta. Maria in Valicella. It was called *Soul and Body*, was composed by Emilio del Cavalieri, and may be regarded as the first systematic production of oratorio, with chorus, recitative, and song. To these the dance was added. From this point to the time of Handel the history of oratorio is uncertain. In the seventeenth century Giacomo Carissimi composed *Jephthah* and the *Judgment of Solomon*; in the latter part of the same century Francis Federici composed two pieces, *Santa Christina* and *Santa Catharina di Siena*, which were called oratorios. Among composers of oratorio may be mentioned Alessandro Scarlatti, Alessandro Stradella (*John the Baptist*), Giacomo Perti (*Abraham*), Benedetto Marcello (*Judith*), Heinrich Schütz (*Resurrection* and *Seven Words*), all of about the same period (1645–1710). The great master in this style of composition—the creator he may justly be called of the oratorio—was Handel (1740–51). His best-known works were *Saul* (1740), *Messiah* (1741), *Samson*, *Judas Maccabeus* (1747), *Jephthah* (1751). All have English words. The greatest, *Messiah*, is considered the masterpiece of its kind. *The Creation*, by Haydn (1798), ranks next to it in popular repute. They have but one peer, Mendelssohn, whose *St. Paul* (1836) and *Elijah* (1846) are brilliant and beautiful examples of the capacity of this species of composition. With lovers of music *Elijah* is greeted with more enthusiasm than even the *Messiah*, its spirit being more modern, its musical form more flexible, its conceptions more intellectual. While the tone is purely and throughout religious, the ideas, less confined to dogma, are addressed to the imagination rather than to the heart—to the æsthetic rather than to the "spiritual" sense. The oratorios of Mendelssohn bear to those of Handel much the same relation that the new sentiment of piety bears to the old. They are an adaptation of an ancient form to modern taste and feeling.

O. B. FROTHINGHAM.

Or'atory [Lat. *oratorium*], a private chapel attached for the most part to a domestic establishment, and used sometimes for private and family devotions, and sometimes fitted up for the hearing of mass. This latter use has led to serious controversies between the bishops and parish clergy on the one hand and nobles and their chaplains on the other.

Oratory. See ELOQUENCE and RHETORIC.

Oratory, Congregation of the, a monastic order in the Roman Catholic Church, was founded in 1560 by St. Philip de Neri; established in France in 1611. Its first rule was oral, but was afterwards written out, and received papal approval in 1612. The fathers are mostly devoted to the spread of learning; they assume no vows. One of the most eminent of their number in modern times is Dr. J. H. Newman. Baronius, Bosio, Bérulle, Malebranche, Gallandi, and Massillon are among those who belonged to the order in times past. The French Oratory, called "the Oratory of Jesus," was always a distinct though kindred organization. It is now nearly extinct.

Orbetel'lo, town of Italy, province of Grosseto, on a tongue of land that rises out of the saline marsh of the same name, and is not exempted from the general unhealthiness of the region. It is about 28 miles S. W. of Grosseto, and is surrounded by a fortified wall. The town contains a church, and a penitentiary in which are 1000 prisoners. Interesting Roman and Etruscan antiquities are sometimes found in the neighborhood. Pop. 6461.

Orbigny', d' (ALCIDE DESSALINES), b. Sept. 6, 1802, at Coneron, Loire-Inférieure, France; was educated at La Rochelle; explored, from 1826 to 1833, South America from Brazil and Peru to Patagonia; was appointed professor in palæontology at the Museum of Natural History at Paris in 1852, and d. at Pierrefottes, near Paris, June 30, 1857. His principal works are—*Voyage dans l'Amérique du Sud* (9 vols., 1834–52), *Paléontologie française* (14 vols., 1840–54); he also wrote for the *Dictionnaire Universel d'Histoire naturelle*, published in 24 vols. (Paris, 1839–49) by his brother, CHARLES DESSALINES D'ORBIGNY, b. Dec. 2, 1806, at Coneron, conservator at the Museum of Natural History of Paris.

Orbiso'nia, post-v. of Cromwell tp., Huntingdon co., Pa., has 1 weekly newspaper. Pop. 177.

Orb'it [Lat. *orbitus*], in astronomy, the relative path of one body with respect to another body around which it revolves. The actual paths followed by the satellites in revolving about the planets, and by the planets in revolving about the sun, are exceedingly complicated curves, but the relative path of any body with respect to its primary is comparatively simple. Kepler showed that the orbits of the planets are ellipses having the sun in one of their foci. This principle, known as Kepler's second law, was shown by Newton to be a logical consequence of the law of gravitation; it was further shown that the law is not rigorously exact, the orbit being subject to slight irregularities in consequence of the mutual attractions of the planets on each other. These irregularities or perturbations are so small that we may neglect them in taking a general view of the motions of the bodies of the planetary system. Taking this view of the case, it may be shown that the orbit of a body projected into space with a certain velocity, and then acted upon by a central body in accordance with the Newtonian law, will be some one of the conic sections. The nature of the conic section is dependent upon the velocity of the body at some particular point of its path. The orbits of the planets, as we have seen, are ellipses; the orbits of the satellites are also ellipses; but the orbits of the comets and of the meteoric streams of meteors with which they are so closely connected may be ellipses, parabolas, or even hyperbolas. The character of the orbit of a planet or of a comet may be determined by three observations of its right ascension and declination separated by a suitable interval of time, say two or three days. The position of the orbit of a planet with respect to the ecliptic is known when we know its inclination and the longitude of its ascending node; its shape and size are known when we know its eccentricity, the mean distance of the planet, and the longitude of its perihelion. These elements being known, we may locate the planet in its orbit at any time if we have given the *epoch* (that is, the time when the planet is in perihelion) and the periodic time (that is, the time required for the planet to make a sidereal revolution about the sun). W. G. PECK.

Orca'gna (ANDREA), (ANDREA ARCAGNUOLO DI CIONE, Orcagna being a contraction of Arcagnuolo), an Italian painter, sculptor, designer, architect, goldsmith, and worker in mosaic, one of the great names in the history of art, b. at Florence 1329; d. probably in 1376; a pupil of Andrea Pisano. The frescoes of *Hell* and *Paradise* in the Strozzi palace are his work; the frescoes of the *Last Judgment* and the *Triumph of Death* in the Campo Santo at Pisa have been attributed to him, wrongly, as some think. The splendid tabernacle of the main altar of Or San Michele in Florence, described by Dr. Lübke as "perhaps the most magnificent decorative work in the world," was executed by him; also the "Loggia de' Lanzi." Rich remains of his work are preserved in the Strozzi chapel of S. Maria Novella. O. B. FROTHINGHAM.

Orcein (*Lichen-red, Flichtenroth*), $C_7H_7NO_3$, the chief ingredient of the red and purple dye-stuffs known under the name ARCHIL (which see). It is found by the action of ammonia and oxygen on orcin, $C_7H_8O_2$:

$$\underset{\text{Orcin.}}{C_7H_8O_2} + NH_3 + O_3 = \underset{\text{Orcein.}}{C_7H_7NO_3} + 2H_2O.$$

When ammonia is added to a solution of orcin, and the whole is exposed to the air, the liquid assumes a dark-red or purple tint by the absorption of oxygen. On acidulating with acetic acid a dark red precipitate of orcein is obtained. Orcein is slightly soluble in water and freely soluble in ammonia and fixed alkalies, with a purple or violet color; it is very soluble in alcohol. C. F. CHANDLER.

Orchard. See FRUIT-CULTURE.

Orch'ard-house, a green house without artificial heat, used for growing dwarfed and carefully-pruned fruit trees in pots, resting upon a rich border. In winter the plants are stored in cellars. In this way, by skilful management, a small space is made to yield a very large amount of fruit.

Orchella Weeds, certain lichens which are made to furnish, by a species of fermentation, very valuable dyes. (See ORCIN, ORCEIN, and ARCHIL.)

Or'chestra [Gr. ὀρχήστρα; Lat. *orchestra*], the place or structure occupied by performers on instruments in a theatre, music-hall, or other building fitted for concerts, oratorios, etc. In oratorios, cantatas, and other pieces with vocal parts a portion of the orchestra is also allotted to the choir. The term "orchestra," in modern use, often means the body of instrumental performers themselves, especially as distinguished from the choir or vocal department, in the execution of such works as are for voices and instruments.

Or'chestral, in music, that which relates to an orchestra, as the "orchestral parts" of an oratorio, mass, or solo with full accompaniment.

Or'chids, or **Orchidaceæ** [from *Orchis*, the typical genus], an interesting natural order of perennial endogenous herbs, found all over the world except in very cold and very dry climates. In the cooler regions they are terrestrial, while in hot countries they are oftener air-plants, growing upon stones and trees, but epiphytic rather than parasitic. They have irregular and often extremely beautiful, but sometimes very grotesque, flowers, always perfect, with a hexamerous adnate perianth, a one-celled ovary, numerous ovules, and three parietal placentæ. The stamens are one, two, or three; the pollen generally coheres in masses. Fertilization is almost always effected by the aid of insects. Many of the species have flowers singularly resembling insects in form. Not a few have very fragrant blossoms. This vast order affords but few useful plants. Among these are vanilla, faham, salep, and several medicinal products. Of late years florists have very successfully attempted the culture in green-houses of many superb tropical epiphytes of this order. The U. S. have comparatively few species of this vast order.

Orchil. See ARCHIL.

Orchom'enus, an old city of Greece, situated in Bœotia, at the entrance of the river Cephissus into the Lake Copais, was the capital of the pre-historic empire of the Minyæ, and is reported by Homer to have sent thirty ships to the siege of Troy and to have contained riches which might be compared to those of Thebes in Egypt. In the Persian wars it abandoned the national cause, and in the wars between the various Greek races it always sided with the aristocratic party. But in 367 B. C. it was taken and destroyed by the Thebans. The buildings were burnt, the men put to the sword, the women and children sold as slaves. Rebuilt by the Phocians, it was again destroyed by the Thebans in 346, and although Philip of Macedon once more rebuilt it, it never again acquired any importance. Remains have been discovered of the treasury of Minyas, probably a royal tomb, and of the wall around the acropolis; also some inscriptions referring to the celebrated festival of the Graces which was held here.

Or'cine, $C_7H_8O_2$, a diatonic phenol or oxyphenol. It appears to exist ready formed in all the lichens which are used for the preparation of ARCHIL, LITMUS, and CUDBEAR (which see), and is the product of the decomposition of certain acids present in the lichens: orsellinic ($C_8H_8O_4$), erythric ($C_{20}H_{22}O_{10}$), lecanoric ($C_{16}H_{14}O_7$), and evernic acids ($C_{17}H_{16}O_7$). Ammonia converts it into the beautiful red coloring-matter orceine. C. F. CHANDLER.

Ord (EDWARD O. C.), b. in Cumberland, Allegheny co., Md., Oct. 19, 1818; graduated from the U. S. Military Academy, and appointed second lieutenant of artillery July, 1839; served in Florida against the Seminole Indians until 1842, from which date he was mainly engaged on frontier duty, participating in various expeditions against the Indians; and at the outbreak of war in 1861 was stationed in California; appointed brigadier-general of volunteers in Sept., 1861, and assigned in November to command a brigade of Pennsylvania Reserves, he fought (Dec. 20) the battle of Dranesville. Promoted to be major-general of volunteers in May, 1862, he was in June transferred to the West, and commanded the left wing of Gen. Grant's army in Mississippi Aug.–Sept., participating in the battle of Iuka, Sept. 19–20, and while in command at the action on the Hatchie, Oct. 5, 1862, was severely wounded. Commanded the 13th army corps during the siege and capture of Vicksburg and capture of Jackson, when transferred with his corps to the department of the Gulf; commanded 8th Corps and middle department July 9–21, 1864; the 18th Corps before Richmond, July 21–Sept. 29, when again wounded in the assault and capture of Fort Harrison. On the 9th of Jan., 1865, he relieved Gen. Butler in command of the department of Virginia and North Carolina and of the Army of the James, with which army he remained throughout the siege of Petersburg and subsequent pursuit of the Confederate army of Northern Virginia, ending in the surrender at Appomattox Court-house. At the close of the war he had attained the rank of lieutenant-colonel of artillery, but continued to hold his volunteer rank of major-general, and commanded various districts and departments until Sept., 1866, when mustered out of the volunteer service, having, however, been appointed a brigadier-general (July, 1866) in the regular army; and has since commanded the departments of California, the Platte, and at present (1876) commands that of Texas.

Ord (GEORGE), b. at Philadelphia, Pa., in 1781; was an intimate friend of Alexander Wilson, the ornithologist, whom he accompanied in some of his expeditions; wrote the *Supplement* to Wilson's *American Ornithology* (Philadelphia, 1825), prefixing an excellent biography; published *Memoirs* of C. A. Le Sueur and of Thomas Say, and was

president of the American Academy of Natural Science from 1851 to his death at Philadelphia Jan. 24, 1866.

Or'deal, a word of Anglo-Saxon origin, and allied to the German *Urtheil*, denotes an appeal to the immediate judgment of God, and forms one of the most peculiar features of the jurisprudence of the Dark Ages. In difficult cases, in which the common means of evidence, such as witnesses and oath, were lacking or insufficient, and in which the judge considered himself unable to discover what was right, it was believed that God himself would reveal the truth in order to protect the innocent and punish the guilty; and accordingly trials were instituted for this purpose. There are traces of such institutions with the Jews (Num. v.) and the Greeks (Sophocles' *Antigone*). With the Germanic nations they were very common, and consisted principally in trials by battle and by lot. A place was enclosed by stones, and here the challenger and the challenged met and fought in presence of judges. He who was driven outside the pale lost; that is to say, he was considered guilty. Often the battle ended only with the death of one of the combatants. With a wild and warlike people like the Germanic race, to whom battle and the god of battle presented the highest moral ideas, such a form of the ordeal was quite natural, but by the Christian clergy it was utterly abhorred, and the trial by battle was one of the very first of the old pagan institutions which they attacked and endeavored to suppress. Nevertheless, it continued into the seventeenth century, though as an institution of chivalry it assumed a somewhat different character. The trial by lot, which Tacitus mentions as a Germanic custom, was less frequently used, and employed only as a means of discovering a thief or murderer. Its practical insufficiency for this purpose was soon understood, however, but it continued in use up to our days as a means of decision under doubtful circumstances, though in course of time it lost its character of an ordeal and became a mere expedient. Of the different ordeals introduced, or at least sanctioned, by the Christian clergy, and always administered under their superintendence, the trial by fire or iron was considered the most decisive, and used only on very solemn occasions. The accused carried a piece of red-hot iron in his hand for some distance, or put on a red-hot iron glove, or walked barefoot and blindfolded over bars of red-hot iron, or passed through a blazing fire with nothing but a thin shirt covering his body. If unhurt, he was declared innocent; if hurt, guilty. But cases in which a person was injured or killed by this ordeal were very rare, for the clergy were merciful; when they could not give the accused a victory they refused him the trial. It was often granted to noble ladies as a means of proving their chastity; in Norway, Inga carried the red-hot iron on the lawn before the cathedral of Trondhjem to prove that her son was the child of the king and the heir of the crown. The miracle with the red-hot iron glove was several times performed by Bishop Popo of Hamburg, and made a great impression on the pagan Danes. In 1498, Savonarola appealed to the trial by fire, but in the last moment he recoiled from the ordeal, and lost thereby all his influence. Much more common was the trial by water, hot or cold. The accused thrust his hand and arm into a vessel filled with boiling water to take up some small object placed at the bottom. The arm was then bound up, sealed, and examined after the lapse of three days. This ordeal was in use even in the middle of the fifteenth century, but already in the sixth century Gregory of Tours tells how a deacon who went through the ordeal had his arm prepared previously with balm. The cold-water ordeal, which consisted in throwing the accused, with the arms and legs tied together, into a pond or river, was generally used in cases of witchcraft, and applied to women; she that floated on the water was a witch and was burnt; she that sank and was drowned was innocent and became a saint. These witches' ordeals did not disappear till the middle of the eighteenth century. The ordeal of the Eucharist was mostly used among the clergy, and consisted in taking the holy sacrament under solemn imprecations of the vengeance of God if it were taken to cover a lie. This kind of trial is first mentioned in the ninth century, and Thomas Aquinas says that it fell out of use in the thirteenth. It was more common and subsisted longer under another form, as the ordeal of the *corsned*, or trial of the hallowed bread and cheese. It was believed that the guilty could not swallow the morsel without being choked; and it is told how Godwin, earl of Kent, who was accused of having killed the brother of Edward the Confessor, actually was suffocated by the trial. The ordeal of the cross was forbidden by Louis le Débonnaire in 816. The accuser and the accused were placed face to face with outstretched arms, and a cross planted between; he who first let fall his arms was guilty of falsehood. The ordeal of the bier subsisted much longer, though it soon lost its authority as an ordeal, and became simply a superstition. He who was suspected of a murder was led to the bier of the murdered and compelled to touch the corpse; if it bled or moved, he was guilty. These ordeals formed parts of the laws, and are found in the Salic, Saxon, Frisian, Anglo-Saxon, Longobardian, Visigothic, and old Scandinavian lawbooks. They were administered with great solemnity. The family and friends of the accuser and the accused were present, and in some cases, especially in the ordeal of battle or fire, the accused might undergo the trial in company with his son or friends—in some cases through a representative. But, although the ordeals became social institutions chiefly by the aid of the clergy, the Church never ceased to work against them, and their abolition is due to the Church no less than their establishment. They seem to have a natural connection with certain stages of religious development, and are found almost invariably at a certain point in the history of a civilization, often in the most curious forms. With the Hindoos the accused or suspected was carefully weighed after fasting a whole day. The accusation was then written down on a paper, which was bound on his head, and he was weighed a second time; if he weighed more, he was guilty. In Siam the accuser and the accused were both together thrown in the way of a tiger; he who was eaten was guilty. In Malabar the suspected could prove his innocence by swimming across a stream which abounded in crocodiles. But such fantastic forms of the ordeal may be found in Europe too; in Hungary witches were still weighed in the beginning of the eighteenth century; and, on the other hand, both among the Hindoos and Chinese forms of the ordeal were used very similar to the European trial by fire and water. In Africa all the negro nations to the N. of the Zambesi are described as strong believers in ordeals. A decoction from a poisonous plant is administered to the suspected, and his guilt or innocence is inferred from the effect of the potion. CLEMENS PETERSEN.

Or'der [Lat. *ordo*], in architecture, refers to the column, and comprises such differences in construction and ornamentation as constitute an individual character. As in ancient architecture the column forms the most characteristic element of the construction, its order is decisive for the style of the whole building; but in modern architecture, in which it is only of subordinate importance, the order of the columns has no influence on the style of the building. The Greeks distinguished between three different orders—the Doric, Ionic, and Corinthian—to which the Romans added two, the Tuscan and the Composite. The finest buildings in the Doric style were the Parthenon and the temple of Theseus in Athens; in the Ionic, the temple of Pallas Athene in Athens, of Bacchus at Teios, and of Fortuna Virilis in Rome; and in the Corinthian style, the Pantheon, the temple of Mars Ultor, and that of Jupiter Stator in Rome. The Tuscan and the Composite orders are hardly anything more than modifications of the Greek models, the Tuscan being a simplification of the Doric, without fluting and almost without tapering, and the Composite a combination of the Ionic and Corinthian, connecting in its capitals the volutes of the one with the foliage of the other. (See CORINTHIAN ORDER, DORIC ORDER, and IONIC ORDER.)

Order [Lat. *ordo*], a name used by zoologists and botanists for combinations of animals and plants. In zoology, it is now always used for a group more comprehensive than the family which intervenes between it and the class, but in botany usage varies. In the *Systema Naturæ* of Linnæus (who only recognized in the organic kingdoms the categories of class, order, genus, and species) the order was the only group intermediate between the class and genus, and was applied to combinations which are still recognized as natural orders, although otherwise defined. Such are the orders Glires, Cete, Coleoptera, Hemiptera, Neuroptera, Lepidoptera, Hymenoptera, Diptera, Filices, Musci, Algæ, and Fungi. Subsequent naturalists introduced other categories and modified the terms of the order. Early French naturalists had employed the name *famille* as a vernacular substitute for the *ordo* of Linnæus, and later French naturalists use both in different senses, reserving the word *ordre* for the groups recognized by Linnæus, or of the approximately equal value and restricting *famille* to subordinate ones. This custom has received the universal sanction of modern zoologists, who accept, as nearly as the present advanced condition of science permits, the Linnæan idea of orders as exhibited in the combinations of animals which he best understood, and employ the word *family* (generally with the termination -idæ) for groups of about the value of the Linnæan genus. The custom is not quite uniform in botany, and our most esteemed botanists (*e. g.* Prof. Asa Gray) use the two terms as interchangeable, adopting the word *order* in connection

with the Latin name of the group and *family* in combination with the English one, thus: "Order Magnoliaceæ, magnolia family." No definition can be given which will enable any one from such definition alone to understand orders, only acquired experience and native tact sufficing for the appreciation of the facts in the case. They have, however, been defined by Prof. Agassiz as distinguishable "by the degrees of complication of that structure" by which the including class is indicated. Prof. Agassiz's understanding of the limits of orders was quite different from Linnæus's and the great majority of modern naturalists, his groups being more comprehensive and to some extent equivalent to the sub-classes of recent zoologists.

THEODORE GILL.

Orderi'cus Vita'lis, b. at Atcham, Shropshire, England, Feb. 17, 1075; educated in Normandy, where he became a monk; spent his whole life in his monastery, and d. about 1143, leaving a Latin chronicle of ecclesiastical history, from the birth of Christ to the year 1142, of which an English translation in 4 volumes is included in Bohn's *Antiquarian Library.*

Orders in Council. This is a phrase used in England to embrace certain orders made by the sovereign in conjunction with his privy council. (See PRIVY COUNCIL.) This council, consisting of a considerable number of persons nominated by the king, transacts most of its business through committees, known as the board of council for trade, the committee for education, and the judicial committee; the proceedings of the committees are designated as "acts of the lords of the council." On the other hand, "orders in council" are made by the king, being personally present, by advice of the council. Such acts, strictly speaking, should be executive and not legislative in their nature. Still, there are extraordinary emergencies in which orders in council legislative in their nature are issued, and the parties concerned trust to an indemnity from Parliament on its meeting. A recess of Parliament might render it impossible to obtain immediate legislative sanction for an act which the interests of the state required should be at once performed. Some orders of this kind have assumed great importance in the domain of international law. These are the well-known orders of 1807 and 1809, by way of retaliation for the Berlin and Milan decrees issued by Napoleon Bonaparte. The Berlin decree (Nov. 21, 1806) made it lawful for French armed vessels to seize every neutral vessel departing from English ports with cargoes of English merchandise. The retaliatory orders of the English council (Jan. 7, 1807, and Nov. 11 and 21, 1807) declared, in the first instance, that all neutral vessels trading from one hostile port in Europe to another with property belonging to the enemy were liable to seizure, and ultimately that France and all subject states were in a state of blockade, and that all vessels might be seized which had "certificates of origin" on board, or which should attempt to trade with the blockaded ports. The "certificates of origin" referred to in this order were certificates from the enemy to the effect that particular cargoes were not of British manufacture. The Milan decree of Napoleon was issued Dec. 27, 1807, and proclaimed that the entire British dominions were in a state of blockade, and all countries were prohibited from trading in any articles of British produce or manufacture. These oppressive orders were very obnoxious to the people of this country, and in Dec., 1807, an embargo was laid on commercial vessels in our ports. In Mar., 1809, an act was passed by Congress prohibiting intercourse with France and England until their restrictions on neutral commerce were relaxed. The privy council in Apr., 1809, modified its previous orders so as only to place the ports of Holland, France, and Northern Italy under blockade. The order was rescinded June 23, 1812, after the French had rescinded their decrees. The policy of these orders in council has been strongly impugned. They had much influence in bringing about the last war of this country with England. They have been justified as a lawful exercise of the royal prerogative in time of war.

It is quite common at the present time in England for the Parliament to cause a statute to go into effect at the time that an order is issued by the privy council. Thus in chap. 53, 38 and 39 Vict., § 3 (Aug. 2, 1875), it is provided that the act of Parliament of the Dominion of Canada concerning copyright attached as a schedule to chapter 53, just referred to, shall, if assented to by the crown, come into operation at such time and in such manner as Her Majesty may by order in council direct. So, in the act of 7 and 8 Vict. c. 12 (international copyright act), there is a clause authorizing the crown by order in council to extend the privileges of British copyright to works first published in any foreign country which gives similar privileges to works of British authors. Some writers have regarded these statutes as a delegation of legislative authority to the council. The more correct view would seem to be that, while the Parliament originates the legislation, it prescribes special terms on which it shall go into effect. The order of the council is in the nature of a contingent event, so that what is done is to pass a contingent or conditional statute instead of the ordinary, absolute, and unconditional one.

T. W. DWIGHT.

Orders, Religious. See MONACHISM.

Or'dinance of 1787. The confederation of the U. S. was delayed and put in jeopardy more by a dispute as to what should be the fate of the unoccupied lands at the West than by anything else. The large States, which by their charters extended to the "South Sea," claimed to have the entire disposal of and jurisdiction over the territory within their boundaries as described in charters proceeding from the Crown of England. Some of the States not thus richly provided with unsettled lands, as Maryland and New Jersey, claimed that the States which were proprietors of them ought to yield them up as common property for the benefit of all, since the efforts of all the States had secured the acknowledgment of independence from Great Britain. In 1780, New York gave authority to its delegates in Congress to fix a limit for its western boundaries, and to cede a part of its lands for such States as should become members of the Confederation. It was not until the next year that Maryland, last of all the States, joined the new league. Soon afterward, the State of Virginia gave up her lands N. W. of the Ohio for the general benefit; but it was not until 1784 that an ordinance for the temporary government of the North-west Territory, which emanated from a committee of which Mr. Jefferson was chairman, was passed by the Congress of the Confederation. Mr. Jefferson's act provided for the formation on this soil, of States, which might be organized whenever there should be 20,000 inhabitants on the territory to be formed into a State, and which might be admitted into the Confederation on certain terms whenever their inhabitants should be equal in number to those of the smallest of the original thirteen States. It also contained this provision in its original form as presented to Congress: "that after the year 1800 there should be neither slavery nor involuntary servitude in any of the said States, otherwise than for the punishment of crimes, etc." This anti-slavery clause was lost, and the ordinance without it was passed Apr. 23, 1784, but no settlements were made within the territory in question for some years.

Two other attempts at legislating for the North-western territory were made in 1785 and 1786, and the committee raised in the latter year to consider this subject made a report which was ordered to a third reading in 1787. Very fortunately, the bill reported was laid aside, and a new committee, appointed July 9 of the same year, reported two days later the ordinance of 1787, which became a law in two days after it was submitted to Congress. This ordinance, besides defining the rights of the citizen, contained two provisions of great importance. The fourth article prohibited slavery and involuntary servitude except in punishment of crimes. Another article provided that the navigable waters leading into the Mississippi and St. Lawrence, and the carrying-places between the same, should be common highways, free to the citizens of the U. S. The importance of this ordinance in shaping the destinies of the U. S. is beyond calculation. It can scarcely be doubted that if slavery, even a small percentage of it, had been able to creep into the territory where the great free States of the West, E. of the Mississippi and N. of the Ohio, now lie, this country would now have been a slave republic. It has been generally supposed that Mr. Nathan Dane of Massachusetts, then in the congress of the Confederation and a member of the committee which reported the ordinance, was its principal author. But an article in the *North American Review* for Apr., 1876, written by W. F. Poole, conclusively shows, from documents which have not been used before, that the authorship of it must belong mainly to a Massachusetts clergyman, Rev. Manasseh Cutler, who appeared in New York, where the last Congress of the Confederation was then sitting, and who purchased 1,500,000 acres in Ohio for a company composed of officers in the then recent war living in Eastern Massachusetts, and 4,000,000 acres for other parties. For the particulars of the evidence that he principally caused this bill to be carried through Congress we must refer to the article in question. T. D. WOOLSEY.

Or'dinary, in ecclesiastical law. The meaning of the Latin word *ordinarius,* from which this term is derived, is one who has authority to decide causes of his own right and not as a deputy. In ecclesiastical law in England it means in general the bishop who is the ordinary of his own diocese. An important part of the ordinary's jurisdiction concerned the cognizance of testaments of personal prop-

erty, the administration of estates of persons dying intestate, and marriages. In the case of persons dying intestate, the rule of the early law was that the ordinary or bishop became the owner of the personal property in trust, and his duty was to apply the money to pious or charitable uses. As incidental to this jurisdiction, he had the probate of wills of personal estate, for the purpose of determining whether they were so far valid as to withdraw from him his usual power of administering upon such property. By an early statute (13 Edward I. ch. 9) these rules were so far modified that the ordinary was required to pay an intestate's debts before making the appropriation to "pious uses." By a later act (31 Edward III. ch. 11) it was required that the ordinary shall depute the nearest and most lawful friends of the deceased to administer upon his estate, by which was meant his nearest blood-relatives. By a law passed in the reign of Henry VIII. he might select either the widow or next of kin, or both, at his discretion; and where two or more persons are in the same degree of relationship, he may select between them. In this way it has happened that a peculiar system of jurisprudence has grown up in England, as applicable to wills and administration, as well as the law of contracting marriage, which were all deemed to be matters of ecclesiastical cognizance under the control of the ordinary or bishop. This law is to be collected from reports of decisions known as ecclesiastical and consistory reports. The body of this law, so far as it is applicable to wills and administration, is in use in the States of this country, except so far as it may be modified by statute. The surrogate's court, orphans', and probate courts, answer to that of the ordinary's. The term "ordinary" or "judge ordinary" is still in use in some of the States. The title "surrogate" is derived from the name of the deputy of the ordinary, who was allowed to attend to ecclesiastical matters in the ordinary's place. The ecclesiastical jurisdiction over the matters referred to was transferred in England in 1867 to a new tribunal called the "court of probate." The judge having regular jurisdiction over these subjects is known as the "judge ordinary." He is assisted in the performance of his duties by district registrars (see COURTS), who have powers to grant letters testamentary and of administration. The same officer is made judge ordinary of the court of divorce. By the recent act for the reorganization of the courts (supreme court of judicature act) the court of probate becomes a division of "the high court of justice," and the judge ordinary becomes a judge of that court. In this country, the probate courts have in general only a local jurisdiction. Thus, in New York there is a surrogate in each county. In Connecticut there are probate districts, and in a number of instances a single town constitutes a probate district. It would seem to be a desirable improvement in probate law if the business could be classified into the litigated and non-litigated, as in the case of bankruptcy proceedings. Litigated business should be referred to a judge of learning and ability, while the formal business could be transacted by probate clerks, resembling the registers in bankruptcy. Judicial force would thus be economized, the important questions being solved by competent judges and routine matters transacted by men of no high grade as lawyers, but yet skilful as clerks. The work of the courts would also be much better done than at present, as is abundantly proved by the experience of the high court of probate in England, which, since its organization under a single judge ordinary, has been conducted in the most satisfactory manner. T. W. DWIGHT.

Or'dinate [Lat. *ordinatus*], in co-ordinate geometry, one of the elements of reference used to determine the position of a point with respect to the co-ordinate axis. It is the distance of the point from the axis of abscissas, measured on a line parallel to the axis of ordinates. Every function of a single variable may be regarded as the ordinate of a point of a curve of which the variable is the corresponding abscissa. This curve is called the curve of the function. W. G. PECK.

Ordina'tion [Lat. *ordinatio*], the ceremony by which ministers of the Christian Church are dedicated to their office, is performed in a somewhat different manner, and somewhat different ideas are attached to it, in the different Christian churches; but the ceremony itself and its principal feature, the imposition of hands, are as old as the Church, and are mentioned in the New Testament (Acts vi. 1–7; xiii. 1–4; xiv. 23; 1 Tim. iv. 14; 2 Tim. i. 6). In the Greek and Roman churches ordination is considered a sacrament; that is, a special divine gift, a new spirit, a fitness for the office, is believed to be conferred by the ceremony upon the candidate, and he is thus, at once and for ever, set apart from the laity and entered among the clergy, *ordo*. In order to be valid ordination must be performed by a bishop of the Church; a priest or deacon has no power of conferring holy orders, and the ordination by a bishop of the Evangelical Church is not acknowledged as having any validity. But if once duly performed, the ordination can never be forfeited or made invalid by any act of the ordained in his after life; and it is not repeated when the candidate ascends from one rank in the Church to another. An ordination is not lawful, however, because it is valid. On the contrary, the Roman Catholic Church has enacted very strict and very minute laws concerning this point. A candidate can be lawfully ordained only by his own bishop—that is, the bishop to whom he belongs by birth, by domicile, by benefice, or by connection of personal service—and any irregularities render both the ordaining bishop and the ordained candidate liable to heavy ecclesiastical penalties. In the Protestant or Evangelical churches ordination is not considered as sacramental or indelible, though it has been questioned in the Church of England whether a bishop could be lawfully deprived of his orders as bishop. The Church of England has generally retained the regulations of the ancient canon law, according to which no one could be ordained who was not provided with some appointment in the Church capable of maintaining him, or who was disqualified by bodily infirmity, immorality, etc.; nor could the ordination take place until after an examination of the fitness of the candidate. The ordinal, as drawn up under Edward VI., then modified in the reign of Elizabeth, and finally fixed by the convocation of 1661, also resembles the ancient service, though it is simpler, and lays a particular stress on the examination. A clergyman may be suspended or deprived of his ecclesiastical benefices by his bishop without forfeiting his ordination. He is deprived of his status of priest or deacon only when he is deposed or degraded on account of his being convicted of treason, murder, or felony. In the Presbyterian Church a minister is deposed—that is, he forfeits not only his office but his clerical status—by being convicted of heresy. In the German Reformation, with its ideas of a universal priesthood and its views of the ministry as a calling rather than an office, ordination was considered simply as a solemn ceremony, conferring no special gift and establishing no special status, but beautiful by itself on account of its pious remembrance of the times of the apostles. Thus it was defined by the first Protestant theologians, Chemnitz and Gerhard, and thus it was generally considered by the Protestant churches in Germany and Scandinavia, until of late the old view of the ministry as a divine office has seemed to revive, at the same time that a desire has arisen of placing the whole liturgy on a more objective basis. Kliefoth of Schwerin became the spokesman of this tendency, and in his memorial to the conference of Dresden in 1854 he endeavored, though not with any marked success, to define ordination (like marriage and absolution) as occupying a place intermediate between a ceremony and a sacrament. Connected herewith is the question whether an ordination received within a certain state Church should be considered valid and legal in other state Churches of the same denomination—a question which has been very differently answered. CLEMENS PETERSEN.

Ord'nance. We do not propose to treat this subject historically, but to present as briefly as practicable the present state of the manufacture of heavy guns, with occasional observations upon the theory of their construction and use.

Preliminary.—Cannon were originally made of bars or staves of wrought iron, secured by hoops of the same material *shrunk on*. In some cases the staves were welded together. Cast iron came subsequently very largely into use, and, with the exception of field and siege artillery, constituted the sole material for cannon, which in general were bored from solid castings.

With reference to the projectiles to be used, we divide cannon as follows: (1) "Smooth-bore guns," for round shot or shells; (2) "rifle guns," mostly superseding the former and throwing elongated projectiles.

Smooth-bore Cannon.—The smooth-bore system has probably reached its highest standard of efficiency in the U. S. The 15 and 20 inch guns of Rodman and the IX. and XI. inch of Dahlgren have, in their respective spheres of service, fully sustained the reputation of the distinguished officers by whom they were designed and whose names they bear. The Rodman guns are cast hollow, upon the plan of interior cooling; and this is so arranged that from the time the metal is run into the mould the heat shall be wholly taken off from the interior, so that the cooling of any one portion of the gun shall precede that of the metal outside of it. To effect this a hollow cylinder, termed the core-barrel, closed at the bottom and coated on the outside with refractory material, is placed in the mould of the gun, the melted metal being run into the space between the mould and the core-barrel. At the time of casting water is conducted into the core-barrel through a pipe placed

centrally, and opening near the bottom of the core-barrel; and this water, rising between the pipe and the interior of the core-barrel, flows off from the top of the latter, thus establishing a continuous circulation of water, and cooling the gun *from the interior*. At the same time the iron flasks containing the mould are kept hot by fire applied externally, so that internal cooling is effectually secured. This mode of casting was introduced by Gen. Rodman, and the guns are said to be cast hollow with "water-core."

The Dahlgren IX.-inch and XI.-inch guns were cast solid, and in exterior form cylindrical, being made as near the finished size at the reinforce as practicable, the chase being formed by turning off the large excess of metal. This mode of casting was adopted in order to give great solidity to the lower part of the gun, where strength is required. The mould, placed before casting in a pit, was surrounded with sand—a precaution to obtain very slow cooling of the gun, which after casting was left several days in the pit. The boring was effected by cutting out a cylinder from the centre of the gun, and from this cylinder, at different points, test specimens of the metal were taken. As a general rule, the iron and treatment which had given good results at any one foundry were required to be strictly adhered to, and very great success certainly attended these guns. It can, however, hardly be doubted that for cast-iron guns of very great weight the water-core system is to be preferred.

Rifle Cannon.—The introduction of rifle cannon is of very recent date, as they were not practically successful until after the Crimean war. Rifle guns for field service were used by the French in the Italian campaign of 1859.

Advantages of Rifle Cannon.—Round projectiles thrown from smooth-bore guns are irregular in their flight from two principal causes: (1) The friction of the ball against the surface of the bore; (2) the fact that the resultant of the pressure of the atmosphere against the surface does not pass through the centre of gravity of the ball, the latter not generally coinciding with the centre of figure. The effect of these disturbing causes is to produce a rotation of the ball about an axis varying according to the amount and action of these forces, and a consequent uncertainty in the course of the projectile. It was found that by impressing upon the round projectile a rotation about an axis corresponding with that of the bore of the gun much greater accuracy of fire was obtained. This rotation was given by inclined grooves cut in the interior surface of the bore, and thus, like a screw, imparting the desired rotation to the ball, which, being a little larger than the bore, was, when of lead, forced down mechanically. The rotary movement of the ball thus obtained prevents the uncertain friction on the sides of the bore; and as to the resistance of the air, the rotation continually changing the point of application of the disturbing force, it balances itself, and the shot continues its direction subject only to the rotation due to the rifling.

This principle was soon found to apply to elongated projectiles, which were introduced in small-arms, with various devices for compelling the projectile to "take" the grooves. The introduction of the elongated projectile in small-arms was attended not only with the greater accuracy exhibited by the round ball projected from a rifled bore, but with an extraordinary increase of range. The elongated projectile, issuing from the gun without rotation about its axis, would almost immediately revolve about its shortest diameter, this being the only stable condition of its motion. To prevent this tumbling of the shot, forced rotation is given to it by rifling the gun. While the rifle projectile preserves its rotation about its axis, it moves point forward, is far less resisted by the air than the sphere of equal weight, and, by preserving its velocity, is effective at much greater ranges. The initial velocity of the shot, its rate of rotation, and its figure and weight will determine its course.

Smooth-bore small-arms are now entirely superseded by the rifle; and although the same is not true in regard to smooth-bore and rifle cannon, the latter are almost the sole subject of study and experiment, and they must of necessity be a main portion of every well-appointed armament. It may be presumed that difficulties of little consequence in the rifle musket, with a projectile of yielding material, may become very serious when we undertake rifle cannon, with their heavy charges and rigid projectiles, usually of cast iron. As the elongated shot greatly exceeds in weight the round projectile of like calibre, and is subjected both to a sliding and rotary movement, it becomes peculiarly necessary to keep the bore of rifle cannon free from foulness or accidental impediments.

Work required from Rifle Guns.—The increased weight of the rifle projectile, as well as the other considerations alluded to, make it necessary to provide for increased strength in the construction of rifle cannon. Thus, the rifle of 6.4 inches calibre, or 32-pounder smooth-bore, throws a projectile, as a rifle, of from 80 to 100 pounds; a 10-inch smooth-bore gun has a shell of 100, a solid shot of 125 pounds; the 10-inch rifle, a projectile of 250 pounds or heavier, according to its length and other dimensions. As in the steam-engine the pressure in the cylinder depends on the resistance opposed to the piston, so in the rifle cannon the charge being resisted by the greater mass in proportion to the surface on which the pressure is applied, the elastic fluid will necessarily assume a higher tension than with the spherical projectile.

Strain upon Guns considered.—In investigating the resistance of a cylinder to a pressure applied equally over its interior surface, we must distinguish two cases: *First*, when the strain is caused by a slowly-increasing force, such as that upon the cylinder of the hydraulic press produced by the repeated strokes of the pump, and when the pressure attains a maximum and is equal to the resistance of the cylinder; *second*, when the strain is more suddenly and rapidly applied, as with a charge of fired gunpowder, and time for the full development of the resistance of the cylinder is not given.

(1) *Resistance to a Slowly-increasing Force.*—We suppose the cylinder to be composed of thin concentric rings or circular layers of metal. We may premise that the strain in such cases is first felt by the inner layer, and that, if increased to the rupturing point, the interior layer will be the first to yield; but with forces not beyond the regular working resistance of the cylinder the strain will extend freely from layer to layer, and all these layers will together make up the resistance of the whole cylinder. Now, supposing the pressure to have gradually increased to its maximum, and become stationary, causing a strain in equilibrium with the resistance, how will this strain be distributed among the several layers of the cylinder? In transmitting the strain from the inner ring to the others, each will be extended in succession, and whatever of the strain is not supported by the elasticity of the first layer is transferred to the next, and so on, each layer supporting its part of the strain, and transferring the excess to those exterior to it. Thus, the outer ring is extended by its part of the whole strain; and if it were possible for the next within it to remain more strained than the outer, the latter would not be at rest, but would receive the strain and be further extended; thus we see that the extension of the several layers would be by equal forces, and the strength of the whole proportional to the number of layers or the thickness of the cylinder; and each one of the layers sustaining an equal part of the resistance, every layer will be extended, but by the same force as the others, and the extension of the several layers will be in proportion to their respective lengths or to their diameters or radii. The case is similar to that of rods of unequal length, which are extended by equal forces proportionally to their respective lengths. And if we represent by R and r the radii of the outer and inner circumferences of the cross-section of the cylinder before the pressure is applied, and by e the extension of the interior layer, that of the exterior will be $e\frac{R}{r}$.

Before extension the area of the cross-section of the cylinder will be $\pi(R^2-r^2)$. After extension the area will become—

$$\pi\left(\overline{R+\frac{Re}{r}}^{\,2}-\overline{r+e}^{\,2}\right),\text{ or}$$

$$\pi\left(R^2+2R^2+\frac{R^2e^2}{r^2}\right),\text{ or}$$

$$\pi\left(R^2-r^2\right)+2e\left(\frac{R^2}{r}-r\right)+e^2\left(\frac{R^2}{r^2}-1\right);$$

which last expression, as $\frac{R^2}{r}$ is greater than r, and $\frac{R}{r^2}$ is greater than unity, must be greater than $\pi(R^2-r^2)$, the area of sections of cylinder before pressure.

The rule of Barlow, that the resistance of the layers varies inversely with the squares of their distances from the centre, is based on the supposition that the area of the cross-section of the cylinder remains constant during the application of internal pressure. This does not appear to be the case. Although we have not considered the force as carried to the bursting-point, our views are illustrated experimentally by the trials of cylinders of cast iron described by Gen. Rodman. (*Experiments on Metal for Cannon, and Cannon Powder*, p. 156.) These cylinders were carefully prepared and burst by a slowly-increasing pressure produced by forcing beeswax into them; and the pressure under which each set was broken, and the thickness of metal, are given in the following table; also the ratio of the thickness of the metal to the bursting force:

No. of set.	Thickness of metal.	Bursting pressure per sq. in.	Ratio of thickness.	Ratio of bursting force.
1	.2 in.	9,768	1.	1.
2	.3	14,854	1.5	1.52
3	.4	20,286	2.0	2.07
4	.5	23,610	2.5	2.41
5	.6	27,404	3.0	2.80
6	.7	31,979	3.5	3.27
7	.8	36,890	4.0	3.77
8	.9	38,887	4.5	3.98
9	1.0	45,566	5.0	4.66
10	1.1	49,760	5.5	5.09
11	1.2	49,813	6.0	5.10

Although Gen. Rodman does not regard this experiment as entirely reliable, he remarks that these results are anomalous, and do not confirm the theory on this kind of resistance. Up to the ninth set, inclusive, they show the resistance to increase almost directly as the thickness of metal. They certainly are not to be reconciled with the theory of the resistance varying inversely as the squares of the distances from the centre.

It would seem that whenever there is *time* for the transmission of the force, its action will be in accordance with our views; and a remarkable example has very recently been made public. (See *Engineering*, May 7, 1875, p. 385.) A cylinder of Whitworth steel of 2.56 inches bore and 7.83 inches external diameter was closed at the ends and subjected to repeated discharges of gunpowder, the gas escaping by a small orifice 0.1 inch diameter. After forty-eight discharges the bore was found to be enlarged .0485 inch, and the exterior .1919 inch. Here even a great work of resistance appears to have been done by the external portion.

Resistance of a Cylinder to a rapidly-increasing force like that of Fired Gunpowder.—Still supposing the cylinder to be made up of successive rings or layers, we see that the first action of the powder will be upon the bore or interior layer; that the assistance which the bore will receive from the layers which follow it outwardly in succession will be greater as the force of the powder is more gradually developed; and that in general the inner layer will be most severely strained, and with forces increased to the bursting-point the fracture will begin at the bore. From observation of the effects of severe and continued firing upon cast-iron guns, it appears that injury is first shown by minute fissures produced at the surface of the bore, as if the strain was too quickly increased to admit of the support of the more distant metal. These fissures are gradually extended by repeated firing until the destruction of the gun is complete. It is well known that the part of the bore of guns exposed to severe strain by tension is small, and exceeds but little the space occupied by the powder; and we conclude that the extreme force of the powder is developed before the projectile has moved its own length from its place. A rapid accumulation of the force of the powder to its maximum, and very great reduction beyond this limit, are characteristic of all kinds of powder, but they differ widely in the mode in which they pass from first combustion to the highest tension, as well as in their continued pressure on the projectile.

If the metal of the cylinder does not act in resisting the strain of gunpowder in the same manner as with a slowly-increasing force, it is for the reason that there is not *time* to bring into action the exterior metal of the gun before the strain has passed its maximum. In this way powder may no doubt be so quick that rupture commences at the surface of the bore while it is actually unsupported by the outer metal of the gun. Not only does it require *time* to bring into action the strength of the layers of metal relatively to their distances from the bore, but the mode in which we conceive them to resist will increase that time. As in all other cases of strain, the work done by any layer will be proportional to the force multiplied by the extension produced in that layer, and the greater extension which must be given to the more distant layers will add to the time of bringing the greatest resistance to act in any given case.

Modes of obtaining Increased Strength in Cannon.—The strength evidently required in rifle cannon has not yet been obtained in cast-iron guns by increase of thickness. Probably, the laws governing the resistance to the strains of firing, as well as the nature of the material itself, will prevent the use of guns of cast iron made in a single piece, as rifle cannon. With the exception of the large smooth-bore guns before described, and some varieties of field artillery, all modern ordnance consists of cannon made of two or more separate parts, united to form the complete gun, which we denominate a *"built-up gun."* Built-up guns are as follows: (1) banded guns, (2) tubed guns, (3) guns of bands and tubes combined.

Theory of Banded Guns.—Banded guns are composed of a body, usually of cast iron, strengthened by bands or hoops, either shrunk on or forced into their places. Thus, the Parrott gun of 1860–61 consisted of a cast-iron body and a wrought-iron band or reinforce. In France and Sweden heavy cast-iron guns, hooped with steel bands, have also been used, and, as represented, with favorable results. The principle on which the banded gun depends is that of producing a tension upon the hoop or band, generally by the well-known operation of "shrinking," and thus calling forth the strength of the exterior part of the gun to meet in advance, as it were, the strain produced by firing the gun. The shrinking on of the band will necessarily produce a compression at the bore of the gun, and thus a part of the strength of the external band is made available at the first effort of the charge and at the very moment of firing. The band therefore takes a part—and it may be said the first part—in the work of resistance, and until it has yielded the metal of the bore is not in danger. This operation of the band cannot be questioned, but doubts have been suggested as to its regular and sustained action when put on "under a strain."

But we may mention, in support of the efficacy of the band, the following considerations: It cannot be doubted that bands applied with the proper *degree of tension* are a very effective mode of strengthening guns. That the bands are under a strain, and may become less effective in time, has been advanced as an objection to banded guns; but both fact and sound reasoning will show that, as in all other constructions, when proper proportions are followed, guns so made will work continuously with safety. Thus, in a large steam-engine the top and bottom of the cylinder are secured by bolts, and these are placed under strain by screwing up to make a tight joint and to meet the shock produced by the sudden admission of the steam to the cylinder; yet these bolts, if properly proportioned, go on for many millions of shocks without failure.

All constructions must consist of parts, some of which are subjected to strain; and it depends wholly on the due proportion of the parts in reference to the strains to which they are subjected whether the work can be performed safely and constantly or not. Guns, like other mechanical constructions, should be viewed in reference to the regular work they may safely perform, although guns are from the nature of the force employed more subject to be accidentally overstrained.

The theory we have advanced is the same upon which the Armstrong, Woolwich, and the Krupp guns are constructed. In all of them the external parts are placed upon the internal portion or barrel by being forced or shrunk on. The Parrott guns, altogether lighter than the more modern rifles, have presented too many cases of endurance to permit any doubt of the efficacy of bands in strengthening guns.

Tubed Guns.—Tubed guns are those in which additional strength is obtained by the insertion of a tube of wrought iron or steel, the body of the gun being usually of cast iron. Our limits do not permit us to enter into a detail of the various plans proposed, but we may say that one writer, Pallisser, advocates wrought iron, the tube being inserted from the muzzle; and Parsons prefers steel, inserted from the breech. The wrought-iron tube can be made of just sufficient exterior diameter to admit of its being pushed into the gun. By a few rounds the tube is expanded against the cast iron, by which something like the action of a band is obtained from it. The stronger material forming the actual bore is better suited than cast iron to resist the first strain, which falls upon that part. It is, moreover, a metal much less subject to fissures than cast iron or steel, and it is probable that tubed guns of this kind will be found the least costly description of the heavy rifled cannon now demanded.

Guns of Tubes and Bands Combined. (See also ARTILLERY.)—Such are the English "Woolwich guns," composed of a steel tube and large bands of wrought iron, called coils from the mode of their manufacture; also the Krupp gun, made wholly of steel, and consisting of a large barrel or centre piece and built up with heavy bands.

Rifle cannon are either muzzle-loading or breech-loading. The latter have been extensively adopted in Germany and Russia, and various devices for closing the breech have been introduced. To the success of any of these the effectual cutting off the escape of the gas is essential, and this is best accomplished by the ring of Mr. Broadwell. The protection of the gunners and the facility of loading, particularly on shipboard or in casemates, are important points in favor of breech-loading cannon.

Mortars.—These are very short pieces of ordnance, designed for throwing heavy projectiles at a high elevation, their effect being produced by the weight and velocity acquired by the projectile in its descent from a great height. Mortars in general have smooth bores and spherical projectiles. If, however, by rifling the mortar it can be made

capable of projecting masses two to three times the weight of the spherical projectile, the advantage of such a change is not to be doubted. Some experiments made in this direction indicate that favorable results can be obtained by rifling the ordinary mortar.

Projectiles.—Of these we shall only mention such as belong to rifle cannon, which may be divided into two classes —"expanding" and "non-expanding." Expanding projectiles are such as are provided with a portion of metal sufficiently yielding to the force of the powder to "take" the grooves of the gun, and thus effect the rotation of the projectile. Non-expanding projectiles are of two kinds—first, those which are fitted with projections, usually called "studs," which move in the grooves, thus giving rotation to the shot; and, secondly, projectiles for breech-loading guns, which are furnished, on their cylindrical part, with a coating of soft metal or with rings of suitable exterior diameter to fit a portion of the bore of the gun at the rear, from which the grooves have been removed. On firing the soft metal is forced through the grooves and rotation obtained. The system of *studs* is adopted in the Woolwich guns in England, the *coated projectile* of course with breech-loading guns, and the expanding system has been extensively used in the U. S.

With the projectile the rifling of the gun is closely connected, but we cannot properly consider the question of twist, number of grooves, and other points of much interest. With regard to the twist, it may be said that the increasing twist is favorable to the taking of the grooves by the expanding projectile at the first effort of the powder, and that the effect will be to relieve the gun at the moment of greatest strain. The English, as we understand, have adopted the increasing twist in the Woolwich guns, which are served with studded projectiles. If we are correctly informed, these projectiles are so arranged that they rest, when in the gun, upon the studs, which thus carry the weight of the projectile, while they must of course do the whole work of rotation. We think many of the complaints of damage to the bore of these guns are erroneously attributed to the increasing twist, and that the weight of the projectile should be supported by the bore, and the studs, entering but not reaching to the bottom of the grooves, should be confined to their proper office of giving rotation to the projectile.

Closely connected with our subject are the mounting of heavy guns and penetration of armor-plates, but to consider them would carry us beyond the proper limits of this article.

For our own country the subject of heavy ordnance has a peculiar interest. Since the peace in 1865 we have been unwilling to persevere in keeping pace with other governments in the production of the very heavy rifle cannon which during the last ten years have been so largely made in Europe. To a certain extent we have derived advantage from their experience, but at the same time we are losing the skill and the appliances for executing such work. The cost of such ordnance is undoubtedly great, but nothing to that of being found unprepared in the emergency of a foreign war. R. P. Parrott.

Ordnance Survey, British. The Ordnance Survey, so called from having been originally under the control of the board of ordnance, may be said to have had its commencement in the operations conducted by Gen. Roy in 1784 for the determination of the difference of longitude of the observatories of Greenwich and Paris, though it was only in 1791 that the systematic survey of the country with the view of producing a military map of the whole kingdom on the scale of one inch to a mile ($\frac{1}{63360}$) was commenced. The first sheet of this map was published Jan. 1, 1801, and in 1824 the work was so far advanced as to include the whole of the S. of England, with part of Wales and a small part of Scotland, when it was in a great measure suspended in order that the survey of Ireland on the scale of 6 inches to a mile might be proceeded with. In 1840, this survey of Ireland being completed, and the military map of England finished up to the southern boundaries of Lancashire and Yorkshire, the government decided on adopting the scale of 6 inches to a mile for the survey of the remaining counties of England and the whole of Scotland. In 1855 the scale was again changed, and that of $\frac{1}{2500}$ (25.344 inches to a mile) ordered for the cultivated districts of the four northern counties of England and of the whole of Scotland. The uncultivated districts were at the same time to be drawn on the scale of 6 inches to a mile ($\frac{1}{10560}$), and the $\frac{1}{2500}$th plans to be reduced to the 6-inch scale, so as to make the plans of every county perfect on that scale. In 1862 the four northern counties were finished, and in the following year the extension of the large scale to those portions of the country which had been previously surveyed on the scale of 1 inch only was ordered.

At the present moment the 1-inch map of England, with hills engraved, is complete; that of Scotland is about half completed, with hills; that of Ireland is completed and published in outline, and about one-half is engraved with hills. The south-eastern counties of England are partly finished and partly in progress on the large scale, and the survey is now being prosecuted principally in the mineral districts of the country. The survey of Scotland is completed on the large scale, with the exception of the Shetland Islands, which are in progress, and some of the southern counties, which are only on the 6-inch scale. Towns are published generally on the scale of $\frac{1}{500}$.

The sheets of the 6-inch and 1-inch map are engraved on copper. It is unnecessary here to explain the process of electrotyping by which the engraved plates are multiplied, as it is now generally known. The sheets of the $\frac{1}{2500}$-scale are zincographed. The reduction from this to the 6-inch scale is effected by photography, the relation of those two systems being that a 6-inch sheet when divided into $4 \times 4 = 16$ similar rectangles; each of these rectangles corresponds to a sheet of the large scale. The sheets of the $\frac{1}{500}$-scale used for towns are formed by dividing a $\frac{1}{2500}$-sheet into $5 \times 5 = 25$ rectangles. In some cases the town maps have been engraved, but they are generally zincographed.

The principal triangulation of Great Britain and Ireland consists of some 250 stations, the triangle sides being in some cases upward of 100 miles in length. The angles were measured with theodolites of 36, 24, and 18 inches diameter. The latitudes of 32 stations were determined by observation, and the direction of the meridian observed at 60 stations. It is a feature peculiar to the Ordnance Survey that these observations were mostly made by non-commissioned officers of Royal Engineers; and any one who examines the *Account of the Principal Triangulation* (1858) will be at least satisfied with the precision and completeness of the work. The triangulation was reduced by the method of least squares—a most laborious operation. Six base-lines were measured in the course of the work, but the final results are made to depend on the two lines —one in the N. of Ireland (8 miles long), and the other in the S. of England (7 miles long)—which were measured with Colby's "compensation bars." The latitudes of the stations were determined with the zenith sector, but the superiority of the zenith telescope for such observations has since been proved.

The British triangulation contributes an arc of more than 10° to the data for the determination of the figure of the earth, which, combined with the most recent measurements in Russia and India, gives an ellipsoid whose semi-axes are 20,926,350, 20,919,972, and 20,853,429 feet of the standard yard; the greater equatorial axis being in lon. 15° 34′ E. If, however, a solid of revolution be insisted on, the semi-axes are 20,926,062 and 20,855,121 feet.

In 1862 the English triangulation was connected through France with that of Belgium, with the view of so far completing the grand arc of parallel (which will shortly be published) between the western point of Ireland and Orsk on the river Ural. At the head-quarters office at Southampton a series of comparisons has lately been made, with the utmost attainable precision, between the standard yard of England and the geodetic standards of France, Belgium, Prussia, Austria, Russia, Italy, Spain, the Cape of Good Hope, India, Australia, and the U. S. of America. The American standards were—the mètre "No. 6" of the six mètres which were compared (*U. S. C. Survey Rep.*, 1862, App. 26) with the "committee mètre," and two standard yards for the lake surveys. The account of these comparisons will be found in the *Philosophical Transactions of the Royal Society* for 1866 and 1873, and in the volume entitled *Comparisons of Standards of Length of England, France, etc.* (London, 1866).

The principal triangulation is reduced to a secondary triangulation having sides about 6 miles long, by means of theodolites of 12 inches diameter; this triangulation is again reduced by 7-inch theodolites to sides of 1 or 2 miles in length, according to the nature of the country. The trigonometrically computed lengths of these sides form a check on the chain measurements and prevent effectually any errors. The nature of the projection used for the 6-inch county maps will be sufficiently explained by saying that the edges of the sheets are parallel and perpendicular to the central meridian of the county. The sheets measure 36 inches by 24, each showing a rectangle of 6 miles by 4. The projection for the 1-inch map of Scotland is a modification of Flamstead's.

With regard to levels. A system of initial levels executed with the greatest accuracy, covering the country and reduced by the laborious method of least squares, forms a basis on which all district levelling is founded. The

maps show elevations above the mean level of the sea, and the 6-inch maps show contour-lines drawn at 50, 100, 200 . . . . , and at intervals of 100 feet up to 1000. These contours are also inserted on outline impressions of the more recent sheets of the 1-inch map.

Besides the ordinary steady work of surveying the country, special surveys have been and are made from time to time for the war department and other services, not only in this country, but, for instance, in Canada and in Gibraltar, and trained parties from the Ordnance Survey have been employed at the Cape of Good Hope and in British Columbia and elsewhere. The surveys of Jerusalem and its vicinity and of portions of the desert of Sinai, though semi-official and paid from private subscriptions, owe much of the value that attaches to them to their connection with the Ordnance Survey.

In 1860 the process of photo-zincography, by which photographs are transferred to the surface of a zinc plate, thence to be printed from as in ordinary zincography, was introduced by Maj.-Gen. Sir Henry James, and has proved invaluable in the production of inexpensive and perfect copies of maps or other documents. At Southampton an extensive series of fac-similes of the most valuable of our ancient national manuscripts of England, Scotland, and Ireland, including the great survey of England made in 1086 by order of William the Conqueror, and known by the name of the *Domesday Book*, has been made and published, and further copies are making, including some of the very ancient Anglo-Saxon charters.

The organization of the Ordnance Survey has been steadily preserved, having been found to produce results certainly of the highest quality at moderate cost. Its essential feature is the combination of military and civil elements. There are 20 officers of the Royal Engineers, including 1 director, 4 field-officers, 7 captains, 6 lieutenants, and a quartermaster. There are four companies of Royal Engineers, which, including non-commissioned officers, amount to 372 men. The number of civil assistants and laborers is about 1450. At Southampton there are 6 officers and about 70 non-commissioned officers and men of Royal Engineers, and some 420 civil assistants and laborers. In this staff are included 100 engravers, 132 zincographic tracers and printers, 60 colorists, 50 draughtsmen and examiners of plans, 20 trigonometrical computers, 32 artificers, including 3 opticians, besides photographers, clerks, accountants, and others. The sum voted annually by Parliament for the prosecution of the survey varies from time to time; it is at present about £130,000. It would be impossible here to do more than name the several directors of the Ordnance Survey—Gen. Roy, Col. Williams, Gen. Mudge, Gen. Colby, Col. Hall, and Gen. Sir Henry James, to whose able and energetic directorship the survey owes much of its efficiency, and the present director, Maj.-Gen. Cameron, C. B., F. R. S. A. R. CLARKE.

Ordogno, the name of several kings of Asturias and Leon, of whom the first two became celebrated for their wars with the Moors. ORDOGNO I. succeeded his father as king of Asturias in 850, fortified Leon and Astorga, and conquered Salamanca in 862. D. at Oviedo in 866.—ORDOGNO II., a son of Alfonso III., succeeded Garcias I. in 913 as king of Leon and Asturias, and removed the royal residence from Oviedo to Leon. He defeated the Moors in 916 at St. Étienne de Gormaz, and took from them Talaveyra de la Reyna. D. in 923.—ORDOGNO IV., a son of Alfonso IV., fought about the crown of Leon with Sancho I., who was supported by Abd-er-Rahman, caliph of Cordova. In 960, Ordogno, who had received the surname of THE BAD, was defeated and compelled to flee. D. shortly after in a village of Andalusia.

Ore, a metal chemically combined, or in a native state, mechanically mixed with other sub-stones, which render treatment necessary to separate it. In a strictly technical sense, only those sub-stones are ores which contain the metal in sufficient quantity and of sufficient purity to make the treatment profitable. Arsenopyrite, a combination of arsenic, sulphur, and iron, contains 34.4 per cent. of iron, but is not an ore of iron, because the metal made from it is not of sufficient commercial value to pay the expenses of treating it. THOMAS EGLESTON.

O'Rea'gan (ANTHONY), D. D., a native of Ireland; became a Roman Catholic priest of the U. S.; was in 1854 consecrated bishop of Chicago; translated in 1858 to the see of Dora *in partibus infidelium*, and d. in 1865.

Örebro. See OEREBRO.

Ore Deposits. An ore deposit is any natural occurrence of metalliferous minerals from which one or more of the heavy metals can be profitably extracted. The ore may be a single native metal, or a chemical or mechanical mixture of metals, or a single mineral consisting of a metallic oxide or a metallic salt, or it may be a mechanical mixture of several of these minerals. Generally, the ore is associated more or less intimately with other minerals, which are called the gangue. The ore and the gangue together form the deposit.

Texture.—Metalliferous deposits sometimes consist solely of one ore, as in some occurrences of magnetite, hæmatite, spathic iron ore, galena, more often of two or more ores, with one or more minerals forming the gangue. The different ores may be intimately associated with each other and with the minerals forming the gangue, or they may exist separately and with a greater or less regularity of distribution. The more common varieties of texture, chiefly as given by Von Cotta, are—

Compact, when the texture is so fine that the separate particles are not visible to the naked eye: compact hæmatite.

Granular, when the particles are visibly in the form of grains: fine-grained, medium-grained, coarse-grained, are terms used to indicate the size of the individual particles: granular magnetite, granular pyrites, etc.

Micaceous or finely laminated, when the particles are in thin laminæ or scales: micaceous specular iron ore.

Disseminated, when the ore is distributed through the gangue in grains or laminæ.

Porphyritic, when the ore is distributed as integral crystals through the gangue.

Banded or combed, when the constituents—ores or gangue or both—are arranged in parallel layers. This variety, which is very common in certain kinds of deposits, is of signal interest from both scientific and economic standpoints. Deposits having this structure were formed in cavities, fissures, caves, chimneys, and the layers indicate gradual growth under more or less varying conditions. The oldest members or layers (a, a) formed on the opposite walls (Fig. 1), then b, b, c, c, till finally the two youngest members, d, d, filled the narrowed space. Frequently two contemporaneous layers, which may alone fill the vein or may form the two youngest members, consist of crystals set perpendicularly to the walls of the vein, and with their terminal faces bristling toward each other from opposite sides or interlacing ($d\,d$ in the sketch). This symmetrical repetition is sometimes interfered with by the interposition of other layers when the vein has reopened and formed a new vein between the walls of an older one. Fig. 2 represents three distinct veins, A, B, C, between the same walls.

FIG. 1.

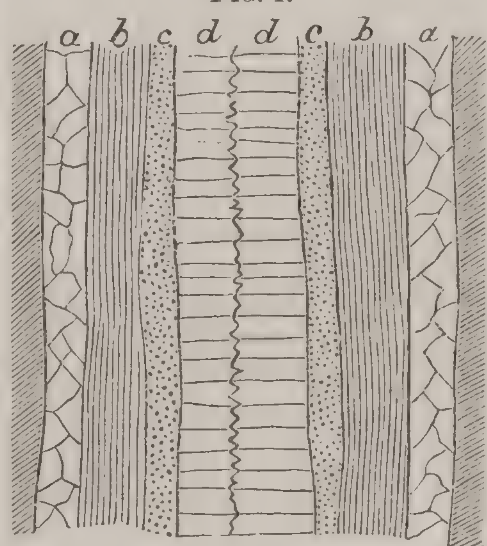
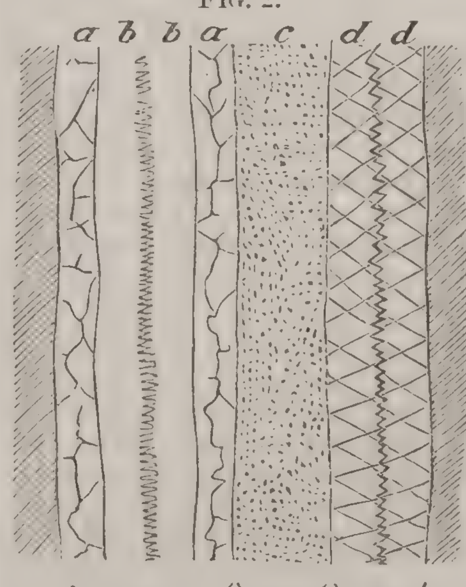


FIG. 2.



Concentric-banded, Cocardenerze, or *Ringerze*, when the bands are arranged symmetrically around a nucleus, which is often a fragment, as in Fig. 3.

Brecciated.—The deposits very often contain fragments of the enclosing rock or "country," or, also, pieces of still older ore-formations. When these are very numerous the texture is brecciated. Sometimes these fragments form nuclei, around which the minerals of the ore and gangue have crystallized, forming a massive or banded or drusy cement. Very often, especially in veins, the highly altered fragments of the wall-rock form nearly the entire filling, in which the minerals of the ore and gangue are distributed

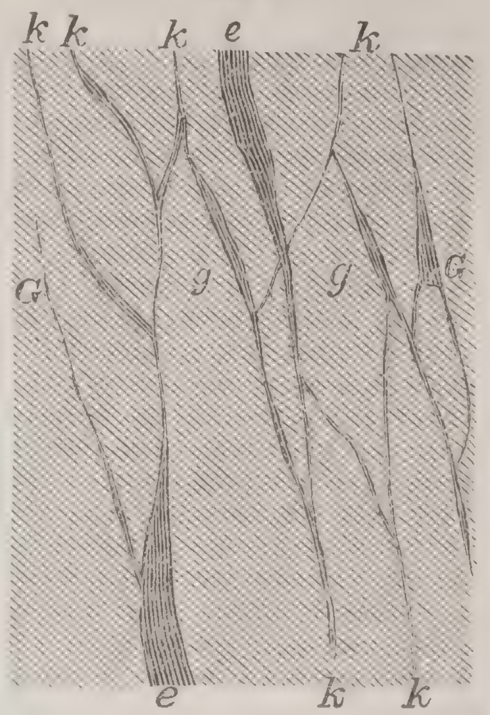
FIG. 3.

Concentric vein structure, Adalbert vein, Przibram (*Grimm*): *a*, greenstone; *b*, brown blende; *c*, galena; *d*, siderite; *e*, drusy cavities.

in thin threads and seams. (See Fig. 4.) The texture is then generally earthy-granular or flaky and lenticular.

Drusy, when the deposit contains many cavities lined with crystals.

FIG. 4.

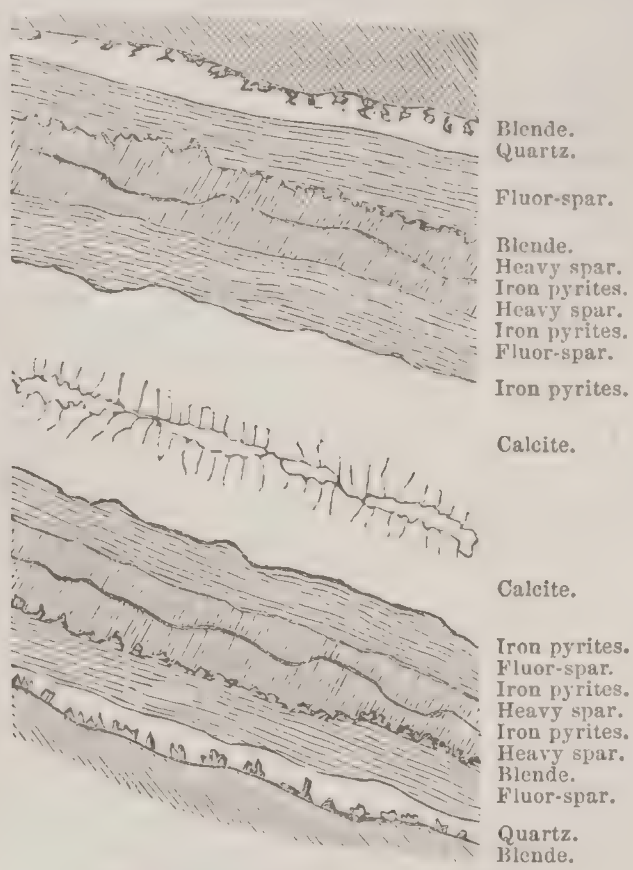


G, wall-rock; *k*, clefts; *g*, wall-rock in the lode; *e*, ore.

The boundaries of a deposit are called walls; when these are well defined, the plane between the deposit and the wall-rock is called the selvage (*Salband*); this is sometimes very smooth and highly polished (*Slickenside*).

Succession of Minerals.—The formation of any deposit was due to slowly acting causes working during long periods of time, and often under more or less varying conditions. The progress of growth is often marked by the banded structure when present, the varying conditions by the alternating constitution of the bands, and the relative ages of the constituents by their relative positions in the separate bands or by the superposition of one upon another, forming what is called a paragenetic series, as in Fig. 5. Not

FIG. 5.



Paragenetic series (*Von Weissenbach*).

unfrequently the constituents of one of the minerals have been removed in part or wholly, and other substances have taken their place, forming a new mineral, which, however, retains the external crystalline form of its predecessor; this process, called pseudomorphism, has sometimes gone so far that a new series of minerals has taken the place of the older deposit. Limonite, pseudomorphous after spathic iron ore, is one of the more frequent instances of deposits changed as regards mineral composition.

Grouping of Minerals.—Certain metalliferous substances have a tendency to occur together, either chemically combined or associated as separate minerals; for instance, ores of lead and zinc, of copper and iron, of cobalt and nickel, of iron and manganese, of tin and wolfram. A similar tendency to association exists with regard to certain gangue minerals, both among themselves and with certain ore

Two Members.	*Three Members.*	*Four or more Members.*
Galena, blende.	Galena, blende, iron pyrites (silver ores).	Galena, blende, iron pyrites, quartz, *and* spathic iron, dialagite, brown spar, calcite, *or* heavy spar.
Iron pyrites, chalcopyrite.	Iron pyrites, chalcopyrite, quartz (copper ores).	Iron pyrites, chalcopyrite, galena, blende, *and* spathic iron, dialagite, brown spar, calcite, *or* heavy spar.
Tin, wolfram.	Tin, wolfram, quartz.	Tin, wolfram, quartz, mica, tourmaline, topaz, etc.

groups. The preceding table, from Von Cotta's *Treatise on Ore Deposits* (translated by F. Prime, Jr.), illustrates some very common instances of association where the deposit consists of two, of three, or of four or more members.

Oxidation Zone.—That part of a deposit which is nearest the earth's surface is subject to changes produced by the oxidizing influence of the descending waters. This influence is especially active where portions of the deposit are subjected to constant drainage, so that water freshly charged with oxygen and carbonic acid is more or less constantly filtering through the mass. The result of this process is the oxidizing of the sulphuretted ores, and, if continued long enough, the removal of nearly all the metallic contents except the iron, which remains, chiefly as ferric oxide, and part of the precious metals, which remain in a native state. This oxidized portion is called the "gossan," "Eiserne Hut." In many regions which have been subjected to the long-continued destruction of the surface by glacial action, this oxidized zone has been wholly removed.

Classification.—The modes of occurrence of ores are so varied that it has been found necessary, both for technical and scientific purposes, to classify them. The present state of our knowledge warrants the assumption that the greater number of the varieties of deposits were not formed either previously to, or contemporaneously with, the enclosing rock, but that their forms are due to the action upon the enclosing rock of processes in some instances mechanical, in others chemical, which made room for the formation of the ore and gangue. We know, also, that all metalliferous aggregations are the result of a process, or of a series of processes, of concentration—that their constituents, existing previously in a diffused state, were moved in a fluid or gaseous condition. In circulating in the crust of the earth, whether descending or ascending, they moved along lines of least resistance, passing slowly through the capillary cracks and pores of hard rocks, and more freely in more permeable beds like sandstone, but tending always, as in all drainage, to converge from the countless minute and restricted channels to the larger and more open fissures or cavities. Wherever, in the path of this circulation, there existed a cause competent to arrest and render stable a metallic substance thus moving, there was effected a further concentration, which, if carried far enough, resulted in an ore deposit. The following classification is in harmony with the above-mentioned conditions and with our present knowledge regarding the origin of ore deposits:

I. DISSEMINATED CONCENTRATION. 1. Impregnations, Fallbands. II. AGGREGATED CONCENTRATION. 1. Lenticular aggregations and beds. 2. Irregular masses. 3. Reticulated veins. 4. Contact deposits.	Forms due to the texture of the enclosing rock or to its mineral constitution, or to both causes.
III. CAVE DEPOSITS. IV. GASH-VEINS. V. FISSURE-VEINS.	Forms due chiefly to pre-existing open cavities or fissures.
VI. SURFACE DEPOSITS. 1. Residuary deposits. 2. Stream deposits. 3. Lake and bog deposits.	

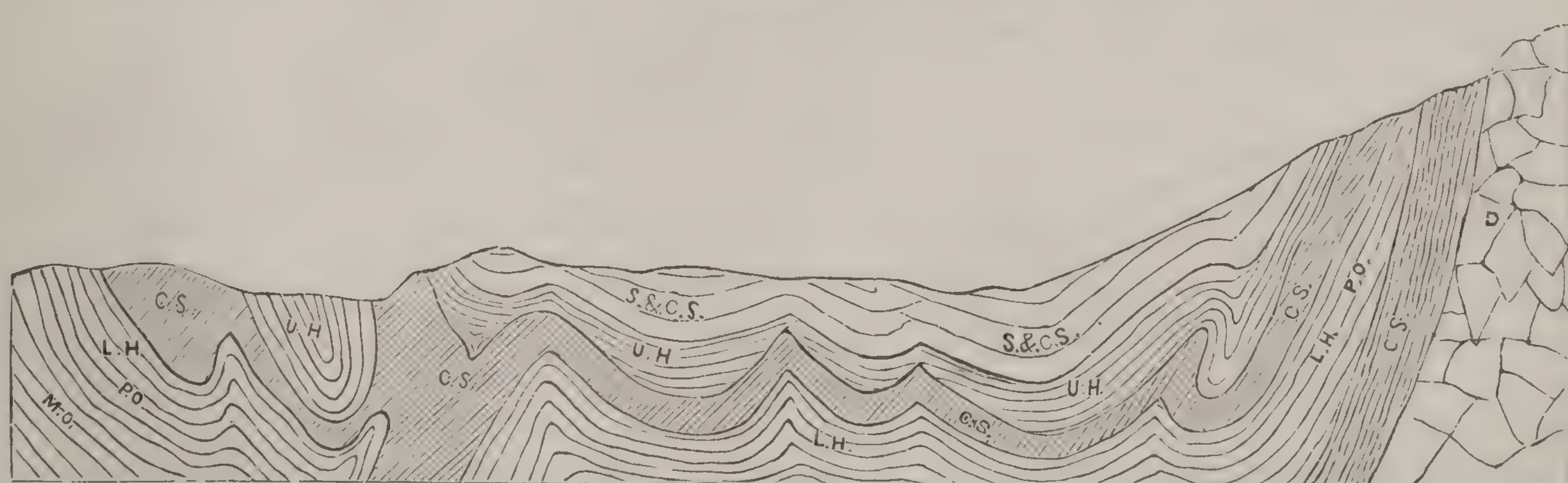
Deposits whose forms are dependent on the texture of the rock or on its mineral constitution, or on both conditions.

I. DISSEMINATED CONCENTRATION.—*Impregnations.*—The determining characteristic of this form is the dissemination of one or more metallic substances, in particles from an invisible size up to that of a pea or larger, through the rock-mass. The particles may be in flakes or grains or crystals. They may occur in any kind of rock, sedimentary, metamorphic, or eruptive. The most common illustration of this form is seen in the frequent occurrence of iron pyrites in shales and schists and in hornblendic rocks, granites, etc. When this disseminated pyrites contains gold, as is frequently the case, especially in the metamorphic schists, it sometimes becomes of economic value. The Permian sandstone and shales along the western edge of the Ural Mountains are impregnated with copper ores, as malachite, azurite, volborthite, with some cuprite, chalcopyrite, and tetrahedrite. They occur especially in the sandstone as a cement and forming films in the cracks, and they also replace the remains of plants contained in the rock. Similar occurrences in sandstone are known in different parts of Bohemia, Tyrol, Chili, and in the U. S. At Mansfeld in the Hartz, and at many points in Thuringia, the Permian limestone is associated with dark, bituminous, marly clay-slates, which are impregnated with ores of copper and of other metals, and have long been worked. The ores occurring here are pyrite, chalcopyrite, bornite, chalcocite, tetrahedrite, cuprite, melaconite, malachite, azurite, native copper, native silver (very rare), galena, brown and

black zincblende, copper-nickel, earthy cobalt, cobaltine, bismuth, antimony, arsenic, and molybdenite, the last five very rare. The other minerals are calcite, gypsum, barytes, mica, asphaltum, and coal. Very generally the organic remains, especially of plants and fishes, are changed to copper and iron pyrites. The copper ores predominate very greatly over all the others. The famous deposits of native copper on Lake Superior are in part impregnations in the amygdaloids of the melaphyr. The copper occurs as a secondary product, filling or lining amygdaloidal cavities, and as threads and films, and associated in these with quartz, calcite, iron-chlorite, green-earth, epidote, and prehnite, analcite, adularia, and laumontite, and often with native silver. It also occurs in the conglomerates and sandstones formed from the detritus of quartz-porphyry, which are interbedded with the melaphyr. In these conglomerates and sandstones the copper occurs in the interstices between the grains, often to such an extent as to form a continuous cement. In the great Calumet and Hecla mine the conglomerate is from 6 to 8 feet thick, and in the extensive areas worked in the mine the copper averages about 4 per cent. of the rock. Its associated cementing minerals are calcite, quartz, and epidote. In most instances, both in the amygdaloids and in the conglomerate, the copper has replaced older minerals. Copper ores occur also as impregnations in the extensive Lower Silurian sandstone, younger than the melaphyr, but, so far as is known, not to a workable extent. Ores of lead and of zinc also occur as impregnations. The ores of the two metals are generally associated to a greater or less extent. One of the most noted instances is that at Commern in Rhenish Prussia. The rock is the *Bunter Sandstein* (Triassic), here immediately overlying the Devonian. At the bottom it is a conglomerate of coarse Devonian fragments cemented by quartz. Above this is a fine white or yellow loose sandstone in thick beds, with numerous lenticular layers of conglomerate. The sandstone and enclosed conglomerate are very uniformly impregnated with galena, often associated with a little zincblende. The ore is in grains from the size of a pin-head to an inch or more in diameter, and these almost invariably contain sand in the interior, cemented by the ore. The galena is sometimes changed to cerusite, and the presence of a little copper is shown by stains of green and blue carbonates. The ores contain $\frac{1}{23000}$th to $\frac{1}{3200}$th of silver. Ores of lead and zinc frequently occur as impregnations to a small extent in many argillaceous rocks of different ages, as in the Chemung beds of New York and in the shales of the Carboniferous and in coal. They also occur extensively in the various lead-bearing limestones and dolomites, but, owing to the texture of these rocks, the impregnations are very subordinate to the other forms of deposits. Auriferous pyrites and native gold form typical impregnations in some metamorphic schists. Many of the occurrences of ores of cobalt and tin in quartz and mica schists and of tin in granitic rocks are other instances. This form of deposit is one of the most common in Scandinavia, where it is known under the name of *fallbands.* These are beds, or portions of beds, of metamorphic schists impregnated with sulphurets. At Kongsberg the impregnations consist especially of iron pyrites, and, with this, lesser amounts of copper pyrites, pyrrhotite and blende, and traces of silver-glance and native silver; at this point their chief importance lies in the fact that they enrich the veins which traverse them. At Skutterud and Snarum the rock containing the fallbands is a fine-grained mica-schist, forming transitions into quartzless mica-schist, quartzite, and gneiss. The ores and associated minerals are cobaltine, skutterudite, arsenopyrite containing cobalt, leucopyrite, chalcopyrite, molybdenite, pyrrhotite, pyrite, galena, chalcocite, malachite, native copper, chrysocolla, magnetite, titanite, ittrotitanite, rutile, graphite, amphibole, tremolite, anthophyllite, sahlite, actinalite, amianth, epidote, garnet, scapolite, smoky quartz, tourmaline, talc, and serpentine. The ores contain a small percentage of nickel, but they are worked especially for the cobalt.

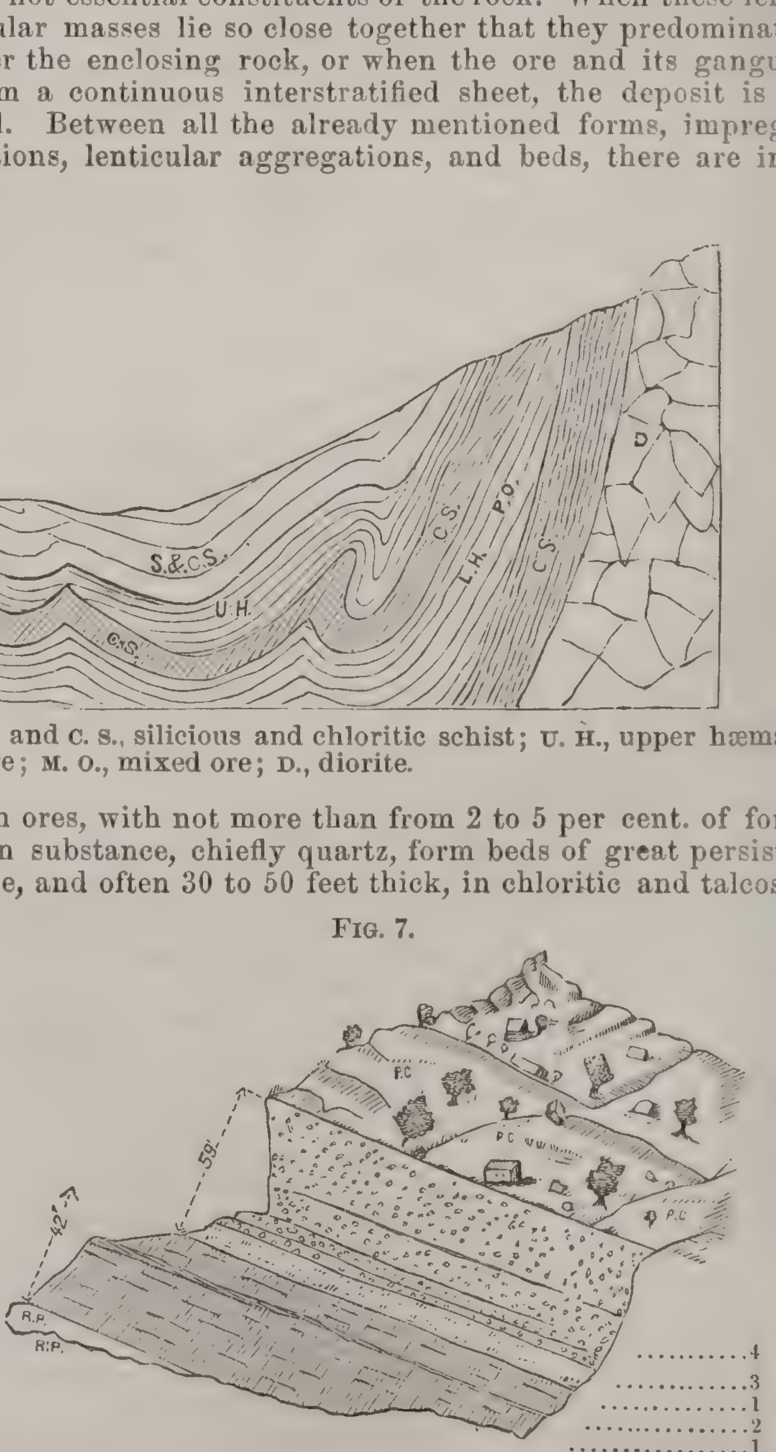
II. Aggregated Concentrations.—1. *Lenticular Aggregations and Beds.*—It frequently happens that the ores, instead of being in grains disseminated with more or less regularity throughout the rock, are aggregated into numerous masses. If the rock is stratified, these aggregations are generally lenticular and parallel to the stratification. These may consist wholly of ore, or of ore associated with the minerals forming the rock, or with minerals which are not essential constituents of the rock. When these lenticular masses lie so close together that they predominate over the enclosing rock, or when the ore and its gangue form a continuous interstratified sheet, the deposit is a bed. Between all the already mentioned forms, impregnations, lenticular aggregations, and beds, there are intermediate forms; they all sometimes occur in the same deposit, passing gradually one into the other, or the same ores occurring in the same kind of rock may in the same district be represented in each of these forms. As instances we may mention some of the occurrences of auriferous pyrites in metamorphic schists, and especially of magnetite in chloritic schists, where the three forms are rarely absent. Excepting, perhaps, tin, there is hardly any ore that does not occur in this form of deposit. The ores of the more common metals, as iron, lead, zinc, and copper, often occur each as the sole constituent of the bed; while ores of the other metals, when present, are generally subordinately associated with the more common ores or with gangue minerals. As iron is the most universally distributed metal, so it forms also the most extensive beds. As a carbonate it forms extensive and very important beds associated with the shales and limestones of the coal-measures, as well as in other formations. At Eisenerz in Styria a bed of spathic iron, in places 600 feet thick, occurs in the Devonian limestone, covered in part with Werfener strata (Triassic sandstone). The junction with the limestone is not sharply marked, but is effected by a transition, in which the limestone is seen to be mixed with spathic iron ore. The beds of hæmatite in the Archæan schists often attain to enormous dimensions. In the upper peninsula of Michigan, bordering Lake Superior, specular iron ores, with not more than from 2 to 5 per cent. of foreign substance, chiefly quartz, form beds of great persistence, and often 30 to 50 feet thick, in chloritic and talcose slates (Fig. 6). Besides these, there are beds of leaner silicious ore which aggregate many hundred feet in thickness,

Fig. 6.



Iron-ore beds, Superior Mine, Lake Superior: c. s., chloritic schist; s. and c. s., silicious and chloritic schist; u. h., upper hæmatite; l. h., lower hæmatite; p. o., pure ore; m. o., mixed ore; d., diorite.

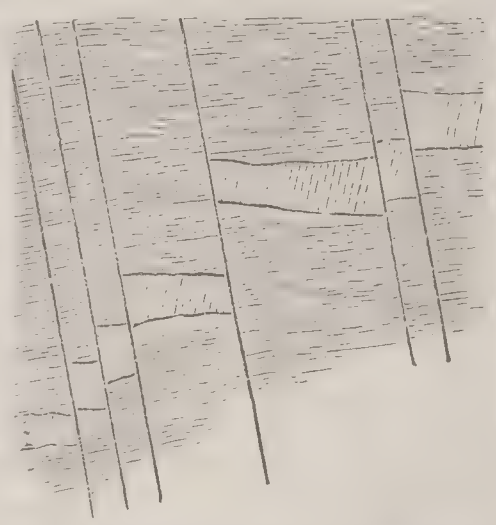
Fig. 7.



Pilot Knob: 1, 1, hard specular ore; 2, slate; 3, porphyry conglomerate with ore; 3, porphyry conglomerate with ore in matrix; p. c., porphyry conglomerate with ± ore; r. p., red porphyry.

and can often be traced continuously for many miles. At Pilot Knob in Missouri a bed of hæmatite more than 40 feet thick occurs interstratified with bedded quartziferous porphyry and porphyry conglomerate (Fig. 7). Magnetic iron also forms very large beds in gneiss in North-eastern and South-eastern New York and in New Jersey. In the upper peninsula of Michigan, magnetite also forms in chloritic slates beds of exceptional purity and richness, which in places have a thickness of 60 to 80 feet. The annexed Fig. 8 shows a much-faulted bed of magnetite 8 feet thick at the Byram mine in New Jersey. In many lead-bearing limestones and dolomites, the ore deposit assumes in places the bed form, though, owing to the tendency of these rocks to form open cavities, other forms of deposits are much more common. The great lead and nickel mines of Mine La Motte in Missouri are worked in a bed in dolomite, which belongs to the Calciferous or to an older epoch. The ores, in some places only galena, in others galena with copper, nickel, and cobalt ores, appear to be confined chiefly to one horizon in the dolomite. In this they are sometimes concentrated into a continuous layer 6 inches to 2 or 3 feet thick; sometimes they form numerous minor sheets or lenticular masses distributed through several yards' thickness of the dolomite, and accompanied in this by galena in impregnations and threads and small seams in the clefts. In part of the field, the ores of nickel and cobalt are confined to a seam of argillaceous shale rarely one foot thick accompanying the lead-bearing bed and abounding in *Lingulæ*. To give an instance of a bed of ore other than iron in metamorphic strata, we may mention the copper ores of Vermont. In Orange county a copper-bearing zone has been traced for several miles in mica slate, and has given rise to mining at several points. The ore, consisting of chalcopyrite, pyrite, and quartz, varies from 2 or 3 feet to more than 20 feet in thickness. It has often the stratified and granular structure of the schist, and consists in places of a solid bed, in others of isolated lenticular masses interstratified and overlapping each other in the mica schist.

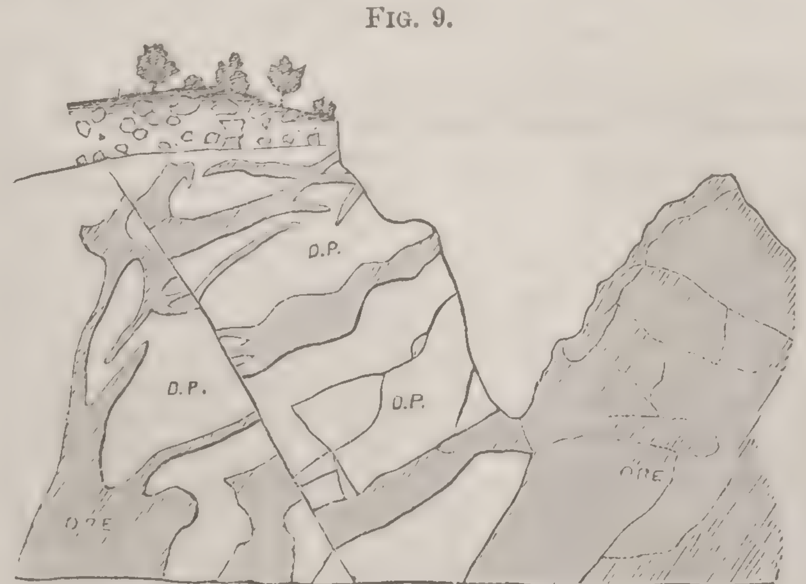
Fig. 8.



Faulted magnetite bed, Byram Mine, N. J. (*Geol. of New Jersey, 1868*).

2. *Irregular Masses* (Stœcke in part).—These are all deposits of irregular outline which have not been formed in open cavities. Such are some of the great iron ore deposits of the world, as the magnetite stock at Tagilsk in the Ural Mountains, and the hæmatite (altered from magnetite) of Iron Mountain in Missouri. At the latter place immense masses of ore of undefinable shape occur in porphyry, and this porphyry, which is partly decomposed (D. P. in Fig. 9), is besides traversed throughout by ore in veins of

Fig. 9.



Iron Mountain: D. P., decomposed porphyry.

all sizes, forming a perfect reticulation in all directions. Some deposits of this kind are formed by the union of large lenticular masses. Such seems to be the great mass of copper and iron pyrites at Rammelsberg in the Hartz, which forks in descending.

3. *Reticulated Veins*.—In this form the rock is traversed by a network of seams or veins parallel to different planes, surrounding polygonal masses of the rock; they are sometimes so close together that the entire mass has to be mined; when they are separated to such an extent that the intervening rock is not mined, they are called floors. To this class belongs the great tin Stockwerk of Zinnwald in Saxony. Here a dome-shaped mass of greissen (quartz and lithian mica) is traversed by two sets of veins, one parallel to the dome-shaped surface, dividing the rock into concentric shells, the other vertical and intersecting the first. The first set, often one foot thick, consists of symmetrically crystallized quartz and lithian mica, intimately mixed with cassiterite and wolfram. They often contain in the middle galena, tin pyrites, chalcocite, chalcopyrite, tetrahedrite, blende, fluorite, scheelite, cerusite, pyromorphite, uranite, spathic iron, heavy spar, feldspar, apatite, tourmaline, topaz, and pycnite. Sixteen of these flat veins or beds are known to exist one over the other. The vertical set are generally mere cracks or thin quartz veins with little ore, but having the wall-rocks much impregnated with tin ore and wolfram.

4. *Contact Deposits* are such as are formed along or near the plane of contact between two non-conformable rock-formations in such a manner that the determining cause of their mode of occurrence can be referred to the contact phenomena. They occur more frequently at or near the contact of limestone or metamorphic rocks (Fig. 10) with granitic rocks, and crystalline schists. Though sometimes quite extensive, they are generally very uncertain in this respect. Their outlines are necessarily very variable; when they exist in the plane of contact they are subject to all the irregularities of the plane separating two rocks of dissimilar age, and are contact masses; where the deposit is due to the mineralization of one or more beds in a series of strata near the contact (Fig. 11), the form may be that of an impregnation, or of lenticular bodies, or of a bed. Such occurrences are then contact impregnations, contact beds, etc.

Fig. 10.

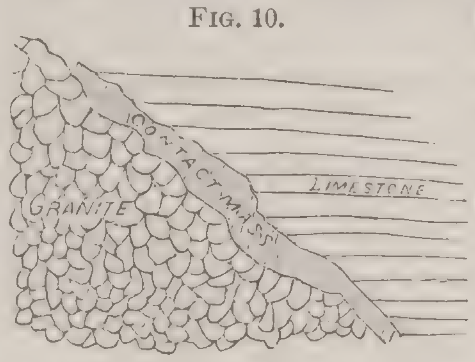
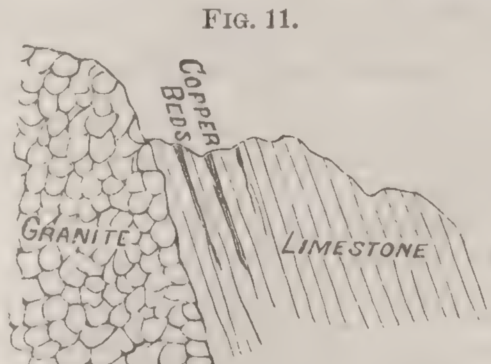


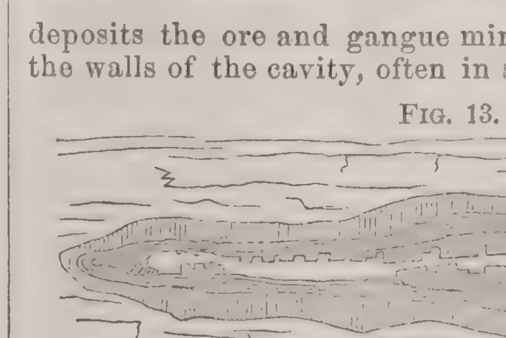
Fig. 11.



Deposits whose forms are due chiefly to pre-existing cavities or fissures.

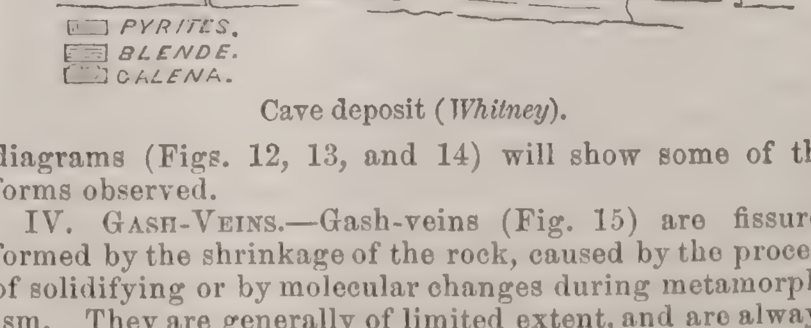
III. Cave Deposits.—Cave deposits are all occurrences in which a cavity formed by a dissolving and removal of the rock has been subsequently, partially or wholly, occupied by an ore. By the nature of the determining cause they are necessarily almost exclusively confined to limestones and dolomites. The outlines of these deposits are of the most varied and irregular shapes. Chambers isolated or connected by small passages, enlarged and contracted clefts, either vertical, inclined, or horizontal, transverse to the bedding or parallel with it, cylindrical chimneys or well-shaped cavities,—all these are frequently observed forms. In this class of deposits the ore and gangue minerals are crystallized on the walls of the cavity, often in symmetrical layers. The diagrams (Figs. 12, 13, and 14) will show some of the forms observed.

Fig. 12.



Cave deposits—chimney (*Whitney*).

Fig. 13.

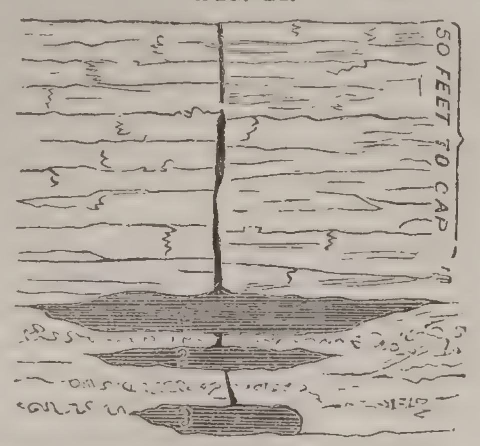


Cave deposit (*Whitney*).

IV. Gash-Veins.—Gash-veins (Fig. 15) are fissures formed by the shrinkage of the rock, caused by the process of solidifying or by molecular changes during metamorphism. They are generally of limited extent, and are always confined to one rock, often to one bed. As bearers of ore

they are most common in limestones and dolomites. They are often undistinguishable from cave deposits, for they have frequently been the starting-points in the formation of caves. They often occur filled with lead and zinc ores in the lead-bearing limestones or dolomites of Missouri and Wisconsin.

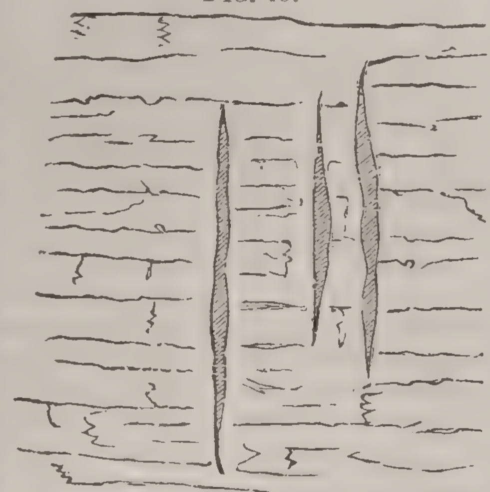
Fig. 14.



Connected caves: 1, first opening; 2, second opening; 3, third opening (*Whitney*).

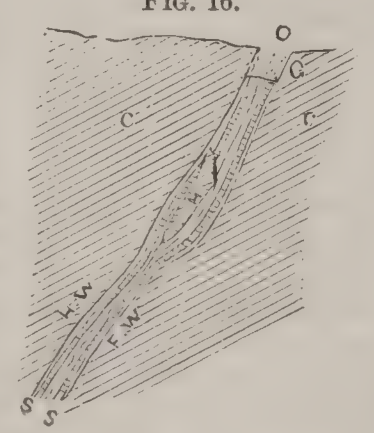
V. Fissure-Veins.—Fissure-veins (true veins, lodes) are deposits formed in fissures, the determining cause of which was the exertion of a force acting over a large area and producing one or more fissures traversing all rocks in its path. Veins generally send out minor cracks, usually at an acute angle, into the wall-rock, which are called feeders or branches. Very often the vein encloses large masses of the wall-rock or "country," which are called "horses." (Fig. 16.) The extension of a vein horizontally is called its strike, direction, course, or bearing, and is expressed in points of the compass as N. E. by N., or in degrees of the quadrant, as N. 33° 45′ E. The vertical angle which it makes with the horizon is called the dip; thus, the dip varies from 0° in a horizontal vein to 90° in a vertical one. The thickness of veins varies from a mere crack to hundreds of feet. Veins often divide into several smaller ones, which keep proximately the original strike; they are then said to split up. (Fig. 17.) In districts which contain ore-bearing veins there are almost always a number of them, and they are then often grouped in a zone of nearly parallel veins, which sometimes run together or are united by leaders. Some districts have several zones, each roughly parallel to a different direction, and the different zones are then generally of different ages and more or less different in character. It is a common occurrence to find that a vein has been subjected to an upward or downward movement of the country on one of its sides, leaving the opposite walls in different relative positions to those existing before the movement. This motion has had more or less crushing, especially of the projecting portions of the wall, for a result, and has often left highly-polished wall-surfaces. Where the fissure lay in a warped plane, the tendency of a movement was to produce a vein of irregular thickness by bringing the alternating convex portions of the two walls into opposition. An important result of this is the permanent enlargement of the fissure as a whole. (Fig. 18.) The evidence of movement having taken place in a given vein is found in the relative displacement of the opposite sides. This is marked by interruption of the continuation of individual strata if the country rock is stratified (Fig. 18), or, if the vein intersects dykes or other veins which are older, by the displacement of these.

Fig. 15.



Gash vein—Lead ore (*Whitney*).

Fig. 16.



C, country rock; O, outcrop; G, gossan; H, horse; H. W., hanging wall; F. W., foot-wall; S. S., selvage.

Fig 17.

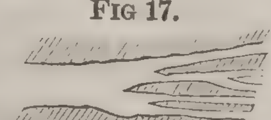
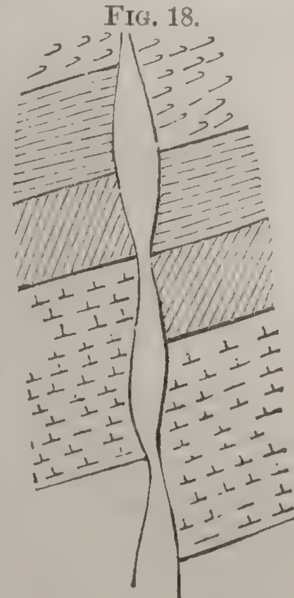


Fig. 18.



Faults.—This dislocation of strata or of dykes or veins is called faulting, and the occurrence is called a fault or throw. The appearance of a fault may, however, be produced without any sliding movement, but simply by the separation of the walls of the fissure when the vein intersects the strata or other vein under an angle of less than 90°; the apparent throw is then proportional to the width of the vein. (Fig. 19.) A vein (Fig. 20, B) may throw one vein (A), and be itself faulted by a still younger one (C). And the younger vein may intersect and throw all the older ones (Fig. 21), producing very complicated results. A throw may be only a few inches; it may also be thousands of feet. When it is found that a vein is thrown, it becomes very important to know in which direction to look for the lost continuation and the amount of the throw. It has been observed that as a rule the throw is such as would be produced by the slipping *down* of the *hanging* wall or the pushing *up* of the foot wall of the lode which produces the fault (Fig. 22). Therefore, when in the underground workings the vein is found to be cut off by a fissure, if this dips downward, away from the miner, the continuation lies below; if, on the other hand, the intersector rises away from him, the continuation lies above. In the case first supposed the continuation of the intersected vein lies in the opposite direction from that toward which it dips; in the other case it lies in the same direction. This is more clearly illustrated in the annexed diagrams (Figs. 23 and 24), where the arrow-points indicate the direction of the dip. The sections are horizontal. There are not unfrequent exceptions to the rule above given. Where two veins dipping towards each other are thrown by a third, they appear in a horizontal plan to be thrown in opposite directions (Fig. 25). This appearance is due to the fact that a horizontal plane must necessarily be nearer to the line of intersection of the two veins on one side of the faulting vein than on the other. A case has sometimes been observed in which a younger vein has apparently been thrown by an older one, as in Fig. 26. Really, the vein B intersected the vein A after this was filled, and the faulting of B was due to a subsequent movement along the wall (C C). If the vein B had thrown the older vein (A), there would be the *appearance* of two veins having thrown each other, as in Fig. 27. Next to the direction, the question of importance is the *amount* of the throw. This is generally easily determined when it is known how much the faulting vein has thrown any other vein, dyke, or bed. The elements of the calculation are then the amount of the vertical movement of the faulting vein and the angles and direction of strike and dip of all the veins, etc. in question. (For this part of the subject the reader is referred to Schmidt's *Theorie der Verschiebungen älterer Gänge* (Frankfort, 1810); Zimmerman, *Wiederausrichtung verworfener Gänge, Lager und Flötze* (Leipsic, 1828); Von Carnall in Karsten's *Archiv*, vol. ix. (1832); Combe's *Traité de l'Exploitation des Mines* (vol. i.).)

Fig. 19.

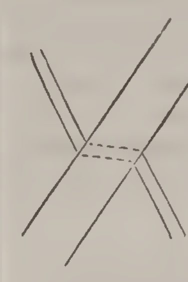


Fig. 20.

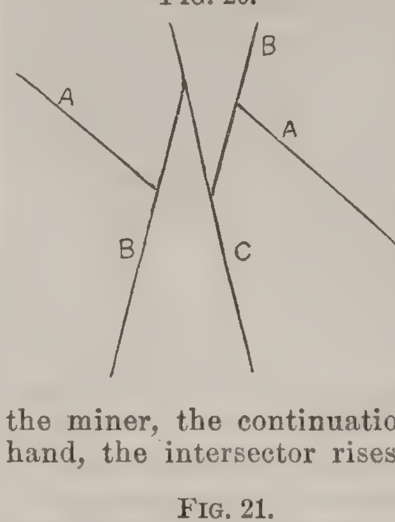


Fig. 21.

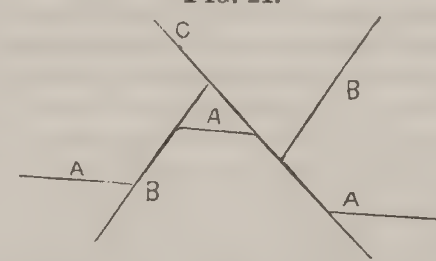


Fig. 22.

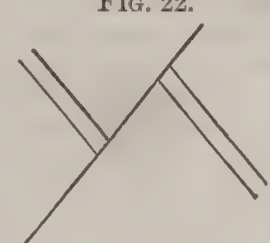
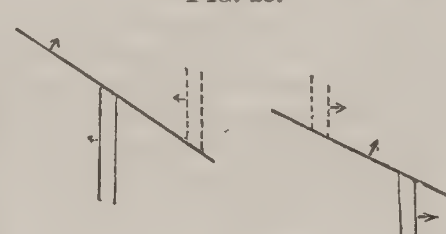
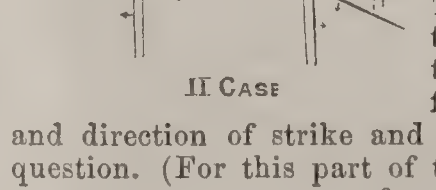


Fig. 23.



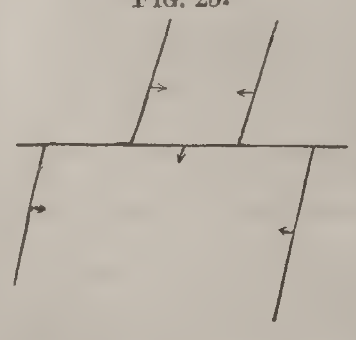
I Case.

Fig. 24.



II Case

Fig. 25.



The contents of a vein are the ore and the gangue. Some veins have a very simple character as regards the filling, containing one ore, or this and one kind of gangue. Others, again, are exceedingly complex, containing in the same part of the vein or in different

parts a great variety of metallic compounds, associated with numerous gangue minerals. Indeed, as there is probably no known element that is not contained in some veins, it is not surprising that a very large portion of the known minerals should have been formed in these laboratories. Compounds which are unstable or easily soluble in the presence of water can, as a rule, exist only in that part of the vein which lies above the drainage, and are then secondary products, formed by the alteration of the original ores of the vein. Veins are generally filled compactly with their contents, though druses sometimes exist. As has been already mentioned, the constituents—ore and gangue minerals—are often distributed in symmetrical layers parallel to the walls; they are often also heterogeneously mixed. The distribution of ore and gangue minerals is generally more or less irregular within the same vein. Sometimes the ore is concentrated at different points into bodies called bonanzas, nests chimneys, pockets, masses, etc while the rest of the vein is barren or contains only disseminated ores of the same kind or of different kinds to that of the bonanzas. This inequality of distribution is sometimes traceable to a cause. Thus, in some veins changes in the character of the wall-rock are accompanied by change in the character of the vein-filling—changes which may in one place be due to certain portions of the country rock contributing metallic solutions, in another place to parts of the country contributing a reagent capable of precipitating metals from solutions in the vein. Again, in veins of varying thickness, if the ore is one of the younger members, the older filling of the narrower parts by poor or barren material would leave room only in the wide parts for the richer member. The intersection of veins is often accompanied by enrichment. Besides changes due to local influences, there is observed in some districts a difference of character in depth. Thus, the veins of Oruro in Bolivia, which were rich in silver in their upper levels, contained ores barren of silver in depth. Veins containing both tin and copper have generally the tin ores above and copper ores below. Sometimes a dyke of eruptive rock has been altered to a considerable depth in such manner as to roughly simulate a fissure-vein. Fig. 28 represents a decomposed dyke of diabase near Przibram, in which the

FIG. 26.

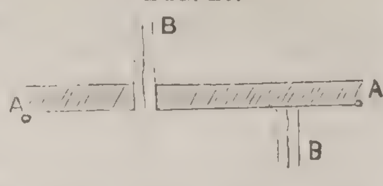


FIG. 27.

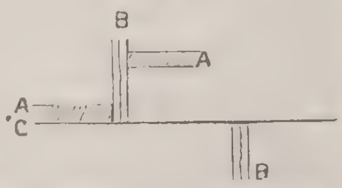
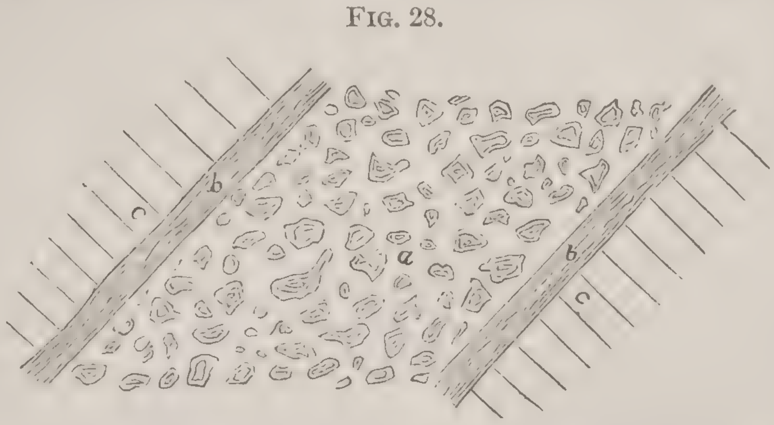


FIG. 28.



a, decomposed diabase, with lumps and threads of limonite; *b*, vein-like deposit of limonite; *c*, graywacke (*Grimm*).

iron from the augite has segregated into threads and nodules of limonite in the decomposed rock, and into vein-like bands 2 or 3 feet thick from the walls inward.

VI. SURFACE DEPOSITS.—1. *Residuary Deposits.*—When, by disintegration and erosion or by being dissolved, a rock-mass containing ore deposits of any form is removed, and the removing cause is not competent to carry away the ore, this remains in a more concentrated form and is a residuary deposit. The often important masses of magnetic iron sand which are concentrated by the wave-action on beaches from the disintegrated débris of rock-masses are of this form. On the Japanese coast workable beds of iron sand thus concentrated occur in elevated strata. Iron Mountain in Missouri was wholly mantled to a depth of from 2 to 20 feet with a loose mass consisting entirely of fragments of iron ore of all sizes. These representatives of the broken-up reticulated veins are all that remain of a large amount of porphyry, which has disappeared, leaving only the insoluble iron ore. In portions of the Western lead-regions, especially in Missouri, which have not been subjected to the destructive agencies of the Glacial epoch large quantities of galena are found in surface deposits of clay and chert, the whole representing solely the insoluble residuum of often hundreds of feet thickness of limestone and chert beds, the result of a process which has apparently been operating steadily ever since the Carboniferous period. Missouri also contains very numerous residuary deposits of limonite, derived from the pyrites left after removal of limestones.

2. *Stream Deposits.*—Stream deposits consist of loosely-aggregated material in modern or ancient water-courses, in which gold, platinum, etc. or tin ores are more or less concentrated. They are generally the lowest member of a river deposit, and owe their existence to the specific gravity and insolubility of these metals. The annexed sketch

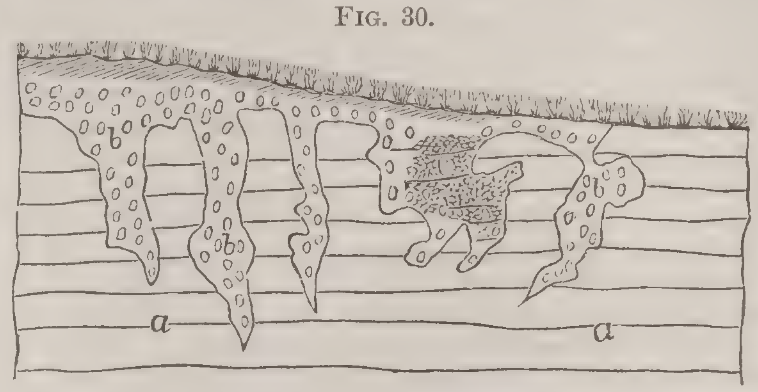
FIG. 29.

Table Mountain: *l*, lava; *s*, sandstone; *c*, *c*, auriferous channels; *a*, slate.

(Fig. 29) from Whitney (*Geol. Surv. of Cal.*) represents an auriferous stream deposit formed in a valley which, after being filled with a lava stream, became a mountain-crest by the erosion of the softer hills on either side.

3. *Lake and Bog Deposits.*—In many localities iron ore is deposited in marshes and on the bottoms of lakes. The ore is a variety of limonite called bog ore, and owes its origin to the action of decaying organic matter on ferric oxide, producing soluble ferrous carbonate, which, on entering the aërated waters of a lake, is oxidized and sinks. Under this heading come also the European deposits of

FIG. 30.



a, Jurassic or Cretaceous limestone; *b*, pisolithic iron ore; *c*, clay, earth, and sand (*Grimm*).

pisolithic iron ore, which were washed into open pit-caves in limestones. (Fig. 30.)

We have not space to describe the different views that have been held from the time of Pliny to the present day concerning the origin of ore deposits. They have been supposed to be formed in their present conditions simultaneously with the enclosing rocks; to have been injected through fissures as molten matter from below, and to have permeated the adjoining rocks; to have been sublimated from below; to have descended in solution from the surface; to have ascended in hot solutions from great depths; to have been dissolved out of the adjoining rock-masses and precipitated in their present positions. In discussing the origin of our present ore deposits we have nothing to do with the question of the final source of metals, nor with their original distribution at the time when our globe first received its solid crust—whether they were contained in the exterior or interior portions. Since that early period a considerable portion of the original crust, and also of the erupted interior, have been used up with any ores they contained in forming that part of the globe which is accessible to our observation. During this long period the constituents have undergone many cycles of chemical and mechanical transformations.

Our attempts at a theory of the mode of formation of deposits must be limited to the more immediate processes which have operated. In its most general aspect the formation of an ore deposit requires (1) sources from which the constituents are derived; (2) transportation from the source; (3) concentration; (4) arresting causes which are capable of giving fixed and solid forms to the substances that are to form the deposit. There are three possible sources—viz. the unknown original interior of the globe; the igneous rocks of the outer crust, especially granite; and the ocean. The ocean is a more immediate source for at least nearly all the important substances with which we are concerned, because it has been from early time the great reservoir into which the constituents of all rocks have found their way as detritus or in solution. And, in fact, with the exception of tin, mercury, antimony, tungsten, and bismuth, all of the most important metals with which we have to do in this discussion have already been proved to exist in the ocean. Forchhammer, Bischof, Von Bibra, and others have detected thirty of the elements

either in the water of the ocean or in marine plants or animals which must have derived them from the water. Among these there are, of the elements in ore deposits—(1) *Fluorine*, determined from the water direct, found more easily in the deposits in the boilers of ocean steamers, and by Dana in the calcareous corals. (2) *Sulphur* in organic tissues, and as sulphuric acid, free and combined with lime and magnesia. (3) *Phosphorus*, in the water and in organisms. (4) *Carbon*, as free carbonic acid, and partly in combinations with oxygen, hydrogen, and nitrogen in organisms. (5) *Silicium*, dissolved as silica, also in shells and somewhat in corals, and abundant in some sponges. (6) *Boron*, as boric acid. (7) *Silver*. Malaguti and Durocher found one centigramme to the cubic mètre of water. It is found in the ashes of marine plants and in the carbonate of lime from the lower marine animals. (8) *Gold*. Sonnstadt found one grain to a ton of sea-water off the British coast. (9) *Copper*, in the carbonate of lime of the lower marine animals and in ashes of marine plants. (10) *Lead*, in the same secretions as silver and copper, but in larger quantities. (11) *Zinc*, in marine plants. (12) *Cobalt*, in the ashes of marine plants with nickel, copper, lead, and zinc. (13) *Nickel*, in the ashes of marine plants. (14) *Iron*, in solution and in the ashes of plants and animals. (15) *Manganese*, especially in the ashes of plants. (16) *Arsenic*. (17) *Calcium*. Lime occurs only in very small quantity combined with carbonic acid, much more as a sulphate, and in organisms as phosphate and fluoride. (18) *Barium*, as sulphate in considerable quantities in the ashes of plants. (19) *Iodine*, detected by Sonnstadt in sea-water; extracted as an article of commerce, chiefly from the ashes of marine plants. Besides these, oxygen, hydrogen, chlorine, magnesium, sodium, bromine, nitrogen, strontium, potassium, aluminium, lithium. This list will undoubtedly be extended to cover many other elements when more attention is given to the subject, and when more delicate methods are applied, as, for instance, spectroscopic analysis.

While some of the metals in this list have been detected only in the organisms of plants and animals, they must have been derived from the water. The plants assimilate the metals in small quantities, as they do potassium and calcium, sulphur, phosphorus, etc., all of which are essential constituents of their tissues or fibre. We have here a very marked concentration. The animals probably derive their share of the heavy metals, as they do that of the other elements, from plants or from plant-eating animals. Here, too, there is a marked concentration. Bischof was able to detect the presence of silver in treating only $1\frac{1}{4}$ pounds of *Pocillopora alcicornis*, one of the common reef-building corals. When these plants and animals die they are buried in sedimentary deposits, and the metals they contained are converted into sulphurets through the oxidation of the organic matter in presence of the sulphates in the sea-water. The metals thus concentrated by vital force are incorporated in the sedimentary deposits at the bottom or in coral reefs. In the case of plants there is a still greater concentration, for they are carried by the great oceanic currents into the sargassum eddies, where their remains rot and sink to the bottom. Enormous quantities are, however, deposited long before these oceanic cemeteries are reached. This process of concentration by means of life is as old as plant-life on the globe; and the plant and animal life in the ocean far exceeds that on land in amount. The sediments in which these metals are thus brought together form, when solidified, argillaceous shales, marls, limestones, and sandstones, and it is from these that the crystalline schists, clay-slates, and saccharoidal limestones and dolomites have been formed by metamorphism. The source, then, for at least the greater number of the more important ores is in the sulphurets diffused through strata of marine origin, especially such as abounded in remains of plant or animal life.

The formation of ore deposits becomes, from this point on, a question of dissolving the metals, bringing them together from a very extended space into a very small one, and fixing them there in a solid form. The character of the solution varies with the different metals and the different circumstances; carbonic acid, sulphuric acid, chlorine, and water containing alkaline carbonates and sulphates are the most common solvents. Many substances which appear highly insoluble in their ordinary condition are easily soluble, as shown by Hunt, before they have assumed a more stable molecular condition; and the same chemist says that there is little doubt that every substance has a transitional state in which it is soluble with comparative ease by some reagent contained in the fluids permeating the rock-masses. Once dissolved, the metals enter the restless circulation of the waters that permeate the pores, capillary cracks, and fissures of the outer crust of the globe. These circulating waters seek the channels of freest drainage; they work their way from the minute pores and capillary cracks into the larger cracks, and from these into larger, and finally converge into the great fissures. Throughout this journey the circulating solution often passes through rocks of very varying mineral character, which react upon its dissolved salts. Where these reactions precipitate metallic compounds there takes place a concentration of the metallic substances. If, for instance, a sandstone or a shale contains organic matter, it will continuously precipitate the metals from the waters passing through it, and the result will be an impregnation of the sandstone or shale with ores. If in the course of the circulation the metalliferous solutions pass through rocks in which the channels are chiefly the cracks which intersect compact rock-masses in all directions, a precipitiation of the metals there would form reticulated segregations. If the rock traversed is a limestone or dolomite containing open crevices, gash-veins, or caves, a precipitation would form the various kinds of cave deposits in which lead and zinc ores are so commonly found. If the metals continue in solution until in their circulation they reach the true fissures, and are there precipitated, they form true fissure-veins. In the great majority of all these deposits the ores are sulphurets, a form under which they would necessarily be precipitated in the presence of organic matter, and sulphates in some instances, or in others on coming in contact with sulphuretted hydrogen gas. Both of these conditions exist in all sedimentary deposits containing remains of plants or animals, until the organic remains have been consumed, a consummation generally reached only after the lapse of geological periods. The sulphuretted hydrogen contained in the waters permeating the rocks under the Mississippi Valley would still be able to fix lead and zinc ores in the form of cave deposits in the limestones, similar to those which abound in that region. The filling of a fissure-vein is the resultant of a great variety of chemical processes, for it was the converging point of countless drainage-systems, each bringing its chemical agents, and each more or less different in this respect from the others. It is therefore natural that in this class of deposits we find the greatest complexity in the character of the ores and gangue minerals. Those deposits which were not formed in pre-existing cavities were obliged to make for themselves, step by step, the spaces they occupy. They fall under two heads in this respect: 1st. The space was obtained by mechanical displacement of the enclosing material when this was in a semifluid or plastic condition. In eruptive rocks the primary impregnations of magnetite and titaniferous iron ore were formed before the rock had hardened; the same may perhaps be true of impregnations and lenticular segregations in some metamorphic rocks. But in the great majority of cases those deposits which do not fall under the next head were segregated together while the enclosing bed was in a condition resembling ooze, or like quicksand or the plasticity of clay. The frequent quicksand beds found in sinking deep shafts through alternating clays and shales, etc. shows that this condition is a very frequent one. 2d. The space was obtained by a chemical replacement similar to that to which pseudomorphs owe their origin, and here, as there, the product is often one of "exchange," in which part of the elements of the original rock remain, while the rest has been exchanged for a substance contained in the arriving waters, and has itself gone off in solution; as, for instance, the formation of some masses and beds of sparry iron in limestone through replacement of lime by ferrous oxide. And these may be further modified by the loss of a chemical constituent—formation of limonite, hæmatite, magnetite from the carbonate by loss of carbonic acid. Or the space may be obtained by the removal, in solution, of a more soluble mineral as a whole, and its replacement by a less soluble one. Most of the irregular masses, contact deposits, and bed deposits appear to have been formed by these processes. But many of these, and especially those which contain a considerable variety of ore and gangue minerals, are the result of a long series of molecular changes, which have altered wholly the character not only of the ore deposit, but also of the rock-masses in which they occur.

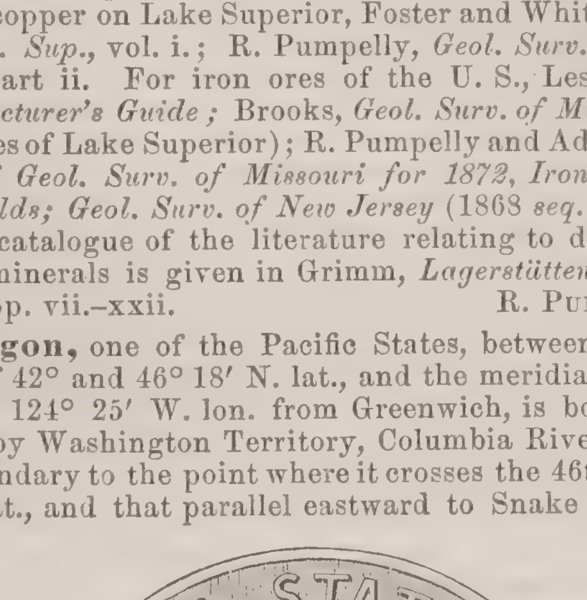
There are few ores or gangue minerals which are not found in deposits in comparatively unaltered sediments; lead, silver, zinc, copper, nickel, cobalt, barytes, fluor-spar, etc. in the horizontal limestones and dolomites of the Mississippi Valley as one out of many instances. In these instances it has been demonstrated by Whitney, and later by Schmidt, that the deposits were not filled from below. It is therefore evident that at least with regard to the formation of most ores very high temperatures and pressures and deep-seated sources are not *essential* conditions. But it is more than probable that there are instances where in forming the different minerals in a given vein, or even the

same minerals in different parts of the same vein, very different processes have operated, owing to the reverse reacting characteristics of certain reagents at different temperatures—silicic acid *versus* carbonic acid above and below 100° C.

Relative Values of Deposits.—Fissure-veins, *as a rule*, are more trustworthy, because of the continuity of the fissures, and the consequent facility offered the miner for underground prospecting. The same may be said of certain beds, while the other forms are of the most uncertain character; any given one may be an isolated occurrence or one of many, but from their nature they rarely offer clues by which the miner can work from one to another. The most productive mines of iron ore are beds and irregular masses. The most productive copper-mine is at present the Calumet and Hecla on Lake Superior, which is a bed of conglomerate impregnated with native copper. The largest production of lead has probably been from the quickly exhausted but innumerable cave-deposits and gash-veins in limestones and dolomites. The greater proportion of tin and native gold is derived from surface deposits. On the other hand, the greater part of the silver of the world is wrought from true fissure-veins; and, if we except deposits of iron and some isolated deposits of other metals, the instances of permanent ore-mining industries are found to be established on fissure-veins.

Literature.—General: Von Cotta, *Treatise on Ore Deposits* (1869), transl. by Fred. Prime from Cotta's *Erzlagerstätten Lehre;* Joh. Grimm, *Die Lagerstätten der nutzbaren Mineralien* (Prag, 1869); Von Cotta and H. Müller, *Gangstudien;* J. D. Whitney, *Metallic Wealth.* Special for U. S.: *Mining Industry*, vol. iii. of the *Geol. Surv. of the 40th Parallel, for the Comstock Lode and many Deposits in Nevada, Utah, and Colorado;* R. W. Raymond, *Mineral Resources West of the Rocky Mountains.* The occurrence of lead in the Mississippi Valley is exhaustively described by J. D. Whitney in the *Geol. Surv. of Wisconsin*, vol. i. (1862); Dr. Litton in *Geol. Rep. of Missouri* (1854); Dr. A. Schmidt in the *Geol. Rep. of Missouri* (1874). The occurrence of native copper on Lake Superior, Foster and Whitney, *Geol. Surv. L. Sup.*, vol. i.; R. Pumpelly, *Geol. Surv. of Mich.*, vol. i. part ii. For iron ores of the U. S., Lesley's *Iron Manufacturer's Guide;* Brooks, *Geol. Surv. of Mich.*, vol. i. p. i. (ores of Lake Superior); R. Pumpelly and Ad. Schmidt, *Rep. of Geol. Surv. of Missouri for 1872, Iron Ores and Coal-fields; Geol. Surv. of New Jersey* (1868 *seq.*). An excellent catalogue of the literature relating to deposits of useful minerals is given in Grimm, *Lagerstätten* (Prague, 1869), pp. vii.–xxii. R. PUMPELLY.

Or'egon, one of the Pacific States, between the parallels of 42° and 46° 18′ N. lat., and the meridians of 116° 33′ and 124° 25′ W. lon. from Greenwich, is bounded on the N. by Washington Territory, Columbia River forming the boundary to the point where it crosses the 46th parallel of N. lat., and that parallel eastward to Snake River; E.



Seal of Oregon.

by Idaho Territory, Snake River being the dividing-line to the mouth of Owyhee River, thence a line drawn due S. on the meridian of 116° 50′ W. lon. to the Nevada line; S. by Nevada and California along the 42d parallel; W. by Pacific Ocean. Its width from E. to W. is about 360 miles, from N. to S. about 275 miles, while the coast-line is about 300 miles. Its area is 95,274 sq. m.

Face of the Country.—The State is divided by the Cascade and Blue ranges into three sections, known as Western, Middle, and Eastern Oregon. The Coast Range passes through Western Oregon at from 40 to 70 miles from the coast, but its altitude nowhere exceeds 3000 to 4000 feet, and much of the fertile soil of its slope is covered with forests to the summit. The Cascade Mountains are a continuation of the Sierra Nevada range, and are about 110 miles E. of the coast. They have a mean elevation of 6000 to 7000 feet, while numerous peaks rise 4000 to 5000 feet higher. The most noted of these are—Mount Hood, altitude variously stated at 11,225 and 11,025 feet; Mount McLaughlin or Pitt, 11,000 feet; Mount Jefferson, 10,200 feet; the "Three Sisters," 9420 feet; Diamond Peak, about the same height; and Mount Thielsen, 8500 feet above the sea. The Coast Range is in some places precipitous on its western slopes, but the greater part of Western Oregon (lying between the Cascade Range and the coast), though hilly and broken at some points, is fertile and arable. Middle Oregon, between the Cascade and the Blue Mountains, is a rolling table-land, with occasional spurs from the Blue Mountains. It is not well watered, and its soil is represented as being barren. E. of the Blue Mountains lies Eastern Oregon, in the basin of Snake River—a region which, though traversed by some of the spurs of the Blue Mountains, has yet many fertile and beautiful valleys. The Willamette Valley, extending from Columbia River southward to the Callapoia Mountains, and lying between the Coast and Cascade ranges, is watered by Willamette River, is 150 miles in length and from 30 to 60 miles in width, with an area of 5,000,000 acres, nearly all of unusual productiveness. The surface of a part is gently undulating, but there is a very rich prairie in its centre, 40 miles by 30. In this valley are the principal towns of the State and almost two-thirds of its population. Umpqua Valley lies between the Callapoia and Grave Creek ranges, and extends from the Coast Range to the Cascade Mountains. It is much like the Willamette in productiveness, and has an area of 2,500,000 acres. The Rogue River Valley is in the southern part of the State, on both sides of Rogue River and between the Grave Creek and Siskiyou ranges. It is much like the preceding, and contains about 2,400,000 acres. Middle Oregon has no considerable valleys, but Eastern Oregon has several small ones, as the Grand Ronde Valley in the N. E., containing about 275,000 acres; the Powder River and Burnt River valleys; and in the S. E. the Malheur and Owyhee River valleys.

Rivers, Lakes, etc.—The largest rivers of Western Oregon are the Columbia, the Willamette, its largest tributary; Young, Clarke and Lewis or Snake rivers, also affluents of the Columbia; Umpqua, Rogue, Tillamook, Yaquina, Alseya, Siuslaw, and Coquille, discharging into the Pacific; and Tualatin, Clackamas, Yamhill, Santiam, Luckiamute, Mary, and Long Tom rivers, tributaries of the Willamette, together with the McKenzie's, Middle and Coast Forks. John Day, Des Chutes, and Umatilla rivers, all affluents of the Columbia, are the principal rivers of Middle Oregon; while Snake River and its branches, Grand Ronde, Powder, Burnt, Malheur, and Owyhee rivers, are the largest streams of Eastern Oregon. The Columbia is navigable with two interruptions (the Cascades and the Dalles) for 396 miles; the Willamette, a part of the year, for 138 miles, partly by slackwater navigation; the Yamhill and Tualatin for some distance during high water. There are numerous lakes (some of them salt) in Southern and South-eastern Oregon. The principal are the Upper and Lower Klamath, Goose, Warner's, Salt, Harney, Malheur, Albert, Summer, and Silver. *Bays, Harbors, Capes.*—The entrance to Columbia River, with its two channels 27 and 21 feet deep, is the best harbor on the Oregon coast. It is protected by Fort Stevens, built on Point Adams. Port Orford, Coos, and Tillamook bays have sufficient depth of water, but are somewhat exposed. For vessels of lighter draught the mouths of Umpqua, Yaquina, Rogue, and Coquille rivers furnish good harbors. The principal capes or headlands are—Point Orford or Cape Blanco, Cape Foulweather, Cape Lookout, Cape Perpetua, Umpqua and Tillamook heads.

Geology.—Much of Eastern Oregon has been the scene of comparatively recent stupendous volcanic disturbance. This has left deep fissures or cañons. Some of these cañons are 1500 feet in depth, the sides of which are a geologic record rarely accessible elsewhere. There are, first, the Cretaceous beds, abounding in marine shells preserved in form, though often filled with chalcedony or calcareous spar; next above, the Lower Tertiary rocks with leaf-impressions of great trees—of palms, yews, and giant ferns—as well as of the oak leaf and acorn; with these are associated the fossils of 2 species of the rhinoceros, 4 of the *Oredon*, a connecting link between the camel and tapir, and several genera of the tapir and peccary family; and with them the *Orohippus*. Upon this supervenes the period of volcanic action, with a vast overflow of lava, mud, and ashes. This region thus rent is heaved elsewhere into isolated cone-like hills or ridged with secondary rocks, piled up dike-fashion, their strata thrown into different angles or broken into chasms filled with earth or lava. Here are mountains of amygdaloid, heaps of volcanic conglomerate, and cliffs of columnar basalt lining the water-courses. In

the region of the upper Des Chutes and John Day rivers the Cretaceous formation is predominant. The Blue Mountains, however, and the Coast Range are alike Eozoic; the intermediate Cascade Mountains volcanic; while the Tertiary prevails on the narrow sea-margins W. of the Coast Range. The bed of lower Willamette River is partially basaltic, with perpendicular walls; S. of Oregon City it traverses a district of volcanic *débris;* black trap is frequently exposed. Southward of this also occur thin strata of limestone with fossil bivalvular shells, granite *in situ*, and again basalt. But the prevalent rock is trap, while at the head of the valley a light-colored clayey sandstone is found. The fossil teeth and tusks of elephants have been found at great depths in the same valley. At the Dalles, on the hillsides, are boulders of gray and of a red granite.

Mineralogy.—The mineral wealth of the State is great, but imperfectly developed. In Jackson and Josephine cos. gold-placer deposits, worked since 1851, have yielded not less than $20,000,000. Since 1862 extensive placers and quartz lodes have been developed in Grant and Baker cos., and the present annual production in that quarter is about $1,500,000. Grant co. has furnished since 1862 more than $10,000,000. The annual production of gold and silver for the past eleven years has been about $2,350,000. Placers have been worked on the ocean-beach at Coos Bay. The argentiferous formation of Nevada extends into Oregon. Argentiferous lead has also been found in Jackson, Josephine, and Douglas cos. in S. W. Oregon — copper at several points in the same quarter, not only as an ore, but in ledges. Iron ore of a superior quality exists in almost every part of the State; a large deposit at Oswego, about 6 miles S. of Portland, yields 54 per cent. of pure iron. There are similar deposits at St. Helen on the Columbia, and in Tillamook, Marion, Columbia, Clackamas, Jackson, and Coos cos. Coal also is met in beds of great thickness on Coos Bay, on Umpqua River, on the Yaquina, at St. Helen, on the line of the Oregon and California R. R., and in Douglas, Clackamas, Clatsop, and Tillamook cos. The beds on Coos Bay are extensively mined. Among the so-called precious stones, chalcedony, agates, carnelians, and jaspers of uncommon beauty are abundant on the banks of the Columbia. Salt is largely extracted for domestic consumption in Jackson and Douglas cos.

Zoology.—The largest of the fauna of the mountains of Oregon is the grizzly bear; the black and cinnamon bear are also common, with the large wolf and coyote, the panther, catamount, wild-cat, polecat, several species of deer, including the beautiful black-tailed species, antelopes, elks, and mountain sheep or bighorn of Eastern Oregon. Of the smaller animals there are species of large and small squirrels, the raccoon and porcupine, with beaver, otter, and muskrat in the streams. The mountains are the resort of some silver foxes, martens, and other small fur-bearing animals, hares, and rabbits. In the Columbia, seals are abundant, especially near the Cascades. The lower Columbia is prolific with salmon and salmon-trout. All the rivers emptying into the Pacific swarm with these fish; great sturgeons are also caught in the Columbia; halibut, herrings, smelts, and many other fish exist in these rivers in countless numbers. Above tide-water the streams and lakes teem with trout. Oysters, shrimps, and crabs of several species are found in Coos Bay, Umpqua, and other places on the coast. Among the larger birds are golden and bald-headed eagles, fish and several other hawks, and cormorants; several species of pelicans, gulls, and the albatross, with the great vulture and buzzard. Pigeons, quails of two species, robins, jays, yellowbirds, and humming-birds, the trumpeter and American swan, Canada and snow-goose, brant, many species of wild-duck, including one like the canvas-back of Chesapeake Bay.

Vegetation.—That of the coast and W. of the Cascade Mountains is dense and luxuriant, abounding in evergreens, with giant trees in girth and height, the largest of which is the redwood. The lofty Oregon cedar, often from ten to fifteen feet in diameter, is confined to the Coast Range, as are also the hemlock spruce (a graceful tree frequently 150 feet high), the red fir, white spruce, the Oregon yew. Among the deciduous trees of the same quarter are white maple, frequently six feet thick, the Oregon alder, sometimes 60 feet high, several species of pollard and balsam oaks, and on the lower Columbia and Willamette large white oaks. The willow and cottonwood occur both in W. and E. Oregon. The Oregon ash, a beautiful tree, is found on the banks of streams, and the Oregon dogwood, a much larger tree than on the Atlantic coast. The Oregon crab-apple and wild-cherry trees are both valuable to graft on. The oak occurs in rich alluvial soil. There are several species peculiar to Oregon. The broad-leafed evergreen laurel is found in the middle region of Oregon. Above the elevation of 5000 feet pines, larches, dwarf junipers, and cedars flourish to the snow-line. Arbutus, cornus, and hazels (some of these very large) form a thick undergrowth to pines and spruces, as at the head of the Willamette. The snowberry of Eastern gardens is indigenous to Oregon. The mock-orange, wild roses, woodbines, several species of honeysuckle, and other flowering plants abound. There are also lupines, columbines, a small and peculiar sunflower, wallflowers, scilla, ambrosia, asters, myrica, sweet-flowering pea, and a peculiar red clover in the small, rich moist valleys. Of roots in Western Oregon, the camas, not unlike a small onion in appearance, but in taste like the chestnut, abounds in the prairies and supplies the Indians with their bread. The bunch-grass is found in its greatest perfection in this State, and is said to cover 20,000,000 acres of its area. All the wild berries are found, and the climate, of Western Oregon especially, is admirably adapted to apples, pears, etc.

Climate.—In Western Oregon both summer and winter are materially tempered by the Pacific winds. That from the N. W. in summer carries sea-vapor inland, where it is changed to gentle rains or mist, modifying the heat. Thunderstorms are rare, and hailstorms unknown. Though the winter is a season of rains, the amount of rainfall is not excessive, and the average does not appear to be greater than 44 inches. Observations by the signal-service bureau and previously have established a mean temperature at Astoria and Corvallis in Western Oregon—at the first, for the spring, of 51.16°; summer, 61.36°; autumn, 53.55°; winter, 42.43°, and a yearly mean of 52.13° F.; at the second, of 52.19° for spring, 67.13° for summer, 53.41° for autumn, 39.27° for winter, and for the year of 53° F. Flowers and fruit trees bloom early in April, which is about the end of the rainy season, that sets in with November. In the ten years ending with 1868, at Portland 2379 days were pleasant, 637 rainy, 543 showery, with sunshine, and only 92 of snowfall. In 1874 the annual rainfall was 43.69 inches. E. of the Cascade Range, with severe, protracted winters and heavy snows, there is greater heat and dryness in summer, but cool, pleasant nights. At the Dalles (45° 40′ N. lat.) the mean temperature for the spring is 53°; summer, 70.36°; autumn, 52.21°; winter, 35.59°, and for the year 52.79° F.; and rarely does the temperature fall lower than 8° below zero. The rainfall E. of the Cascade Range does not exceed an average of 20 inches, whereas at Astoria and the mouth of the Columbia it reaches 60 inches. E. of the Blue Mountains there is the least rain, the summers are dryer, and the winters colder, with deep snow. Middle Oregon is more mild and equable. At the upper sources of the Klamath there is said to be frost almost every night of the year. Ice is rarely thicker than an inch in West Oregon, and of short duration.

Productions.—Wheat is the leading cereal crop. It is noted for its weight, frequently 65 pounds per bushel, and for the superiority of the flour made from it. Oats also weigh above the legal standard. Barley, hops, and flax are entering into the production of the State. Subjoined is a table of products for the years 1860, 1870, and 1874:

Year.	Wheat, bushels.	Oats, bushels.	Barley, bushels.	Indian corn, bushels.	Potatoes, bushels.	Flaxseed, bushels.	Apples, bushels.	Wool, pounds.	Butter, pounds.	Cheese, pounds.	Bacon and ham, pounds.	Value of live-stock.	Value of farm products.
1860	826,776	885,673	76	76,122	303,319	24,198	....	219,012	1,000,157	105,380	....	$5,946,255	$1,248,827
1870	2,346,746	2,029,909	210,736	72,736	481,710	10,988	....	1,080,638	1,418,373	79,383	....	6,828,675	7,122,790
1874	4,875,000	2,391,000	371,000	94,000	751,000	25,000	500,000	2,000,000	1,800,000	250,000	1,500,000	9,558,199	8,161,240

In 1870 the number of improved acres was reported at 1,116,290, with an estimated cash value of $22,359, and of farming implements, $1,293,713, with $719,875 expended in wages. At the same time there were owned in the State 51,702 horses, 258 asses and mules, 2441 draught oxen, 48,325 milch cows, 69,431 other cattle, 318,123 sheep, and 119,455 swine. In Jan., 1875, the number of horses was 85,500; of mules, etc., 3700; of milch cows, 76,400; of oxen and other cattle, 128,600; of sheep, 634,600; of swine, 174,600.

Manufactures.—In 1870 there were returned from Oregon 969 manufacturing establishments, employing 2884 hands, using $4,376,849 capital, paying $1,120,173 wages, consuming $3,419,756 of raw material, and producing manufactured goods to the value of $6,877,387. Flouring-mill products produced $1,530,229; lumber, $922,576; and woollen goods, $492,857. At the close of 1874 the value of flouring-mill products exported was about $4,000,000, gold, besides all that was consumed in the State; the lumber and timber trade, and the industries connected with it, exceeded

$3,000,000; and the value of the woollen goods exceeded $1,000,000. There are also several extensive foundries, rolling-mills, and machine-shops, producing iron and iron manufactures of excellent quality, as well as paper-mills, oil-mills, linen-factories, extensive tanneries, factories for agricultural implements and wooden-ware. *Fisheries.*—30 fishing and 13 canning establishments are in operation near the mouth of Columbia River, and in 1874 the exports of canned salmon alone amounted to over $1,500,000, besides what was consumed at home. *Mining.*—Coal, iron, and gold and silver are largely mined for export. The value of these products exported in 1874 was reckoned by Gov. Grover at $2,500,000.

Railroads.—There were in Sept., 1875, 265 miles of railway in operation, and 131 miles near completion. The whole cost of roads and equipment to that time was about $19,000,000. The roads were (1) the Oregon and California, beginning opposite Portland on the Willamette, and extending southward 200 miles through the Willamette and Umpqua valleys to Roseburg in the Umpqua Valley. Thence stages connect with Shasta or Redding on the Sacramento River, the present terminus of the California Northern Railway. (2) The Oregon Central, starting from Portland and crossing the Willamette, running W. to Hillsboro', then one branch going northward to St. Helen's, with Astoria as its eventual terminus, and the other southward along the W. side of the Willamette Valley to Yamhill River, 50 miles in all; it is to be extended to Junction City, 50 miles farther S., where it will join the Oregon and California. (3) A railroad of 15 miles around the Dalles of the Columbia in Middle Oregon. There is a short canal around the Cascades of the Columbia.

Finances.—The State government is economically administered, and taxation is relatively easy. On Sept. 14, 1874, the whole public debt was $596,256, of which bonds to the amount of $46,027 were then due and payable out of funds in hand; $200,000 were for bonds issued in aid of the Willamette Canal and Lock Co., which principal, payable in 1890, with 7 per cent. interest, was to be met from the proceeds of 500,000 acres of land belonging to Oregon and set aside for purposes of like internal improvements; $61,550 were wagon-road warrants, payable from special funds provided for that purpose, and $287,459 were outstanding warrants, to meet which there was over $95,000 in the treasury. Most of these warrants were for old accounts not properly provided for when due. The assessed value of real and personal estate in 1870, according to the census, was $31,798,510, with an estimated true value of $51,558,932. The State assessment for the same year was $29,587,846.25. In 1873 the assessment was $40,700,159. The receipts into the State treasury for the two years ending Sept. 14, 1874, were $628,775.01; adding to this sum the balance on hand Sept. 6, 1872—$172,597.41—the whole amount received into the treasury was $801,372.42. The disbursements for the same period of two years were $663,193.45, leaving a balance in the treasury Sept. 14, 1874, of $138,178.97.

Commerce.—The State is divided into three customs districts—S. Oregon, with Coos Bay as the port of entry; Oregon, with Astoria as the port of entry; and Willamette, with Portland as port of entry. For the year ending June 30, 1874, the importations were valued at $490,480, with a foreign exportation of $2,659,510, for the most part wheat and flour, and almost exclusively from Portland, where the imports were also received. In the same year (Dec. 31) 71 ships and barks were despatched from the same port, and the aggregate foreign entrances represented 30,064.95 tons—American, 11,771.44; foreign clearances, 42,439.17 tons—American 17,576.75; total entrances, 41,836.36 tons; clearances, 66,015.92. The coastwise entrances represented 101,025.65 tons, and clearances 85,361.94 tons, exclusive of vessels in the coal-trade between Coos Bay and like small ports with San Francisco. The value of products sent out of the State, including foreign exportations, was $10,000,000 for 1874, of which wheat and flour made up $4,000,000 in gold; salmon, $1,500,000; gold, silver, coal, and iron, $1,500,000; lumber, $1,000,000; wool, hides, meat, cattle, and horses, $2,000,000.

Banks.—There was in 1875, 1 national bank at Portland, with $250,000 capital, $250,000 bonds on deposit, $225,000 circulation, and $50,000 surplus. The State constitution prohibits State banks. There are 7 or 8 private banking-houses. There are no savings banks, trust companies, or fire or life insurance companies, though there are numerous insurance agencies for the companies of other States.

Education.—Oregon has a school fund amounting, Sept., 1874, to $504,216.46, derived from the sale of the sixteenth and thirty-sixth sections of each township surveyed or their equivalent in other lands, from the sale of other lands granted by Congress for educational purposes, on the sale of swamp-lands belonging to the State, and a percentage on the receipts from other lands. The revenue from this fund is supplemented by other sources of revenue and taxation, by the State, county, and district taxes, ratebills and other sources, and for the year 1874 amounted to $204,760.13. The school system of the State was reorganized by the school law of 1872, which provided for the first time for a superintendent of public instruction, who should devote his whole time to the work. From his report for 1874 we learn that the total expenditure of that year for school purposes was $215,107.12; the number of children of school age (4 to 20) was 40,898—21,519 males and 19,379 females; the number enrolled in the public schools was 20,680—11,138 males, 9542 females; the average attendance was 15,169—7871 males, 6874 females; number attending private schools, 2926; number attending no school, 10,711; number of teachers in public schools during the year, 860; average monthly salaries of male teachers, $45.92; of female teachers, $34.46. Number of public schools, 530; school-houses, 555; districts having six months' school or more, 288; value of school-houses, $255,086.44; of school libraries and apparatus, $1336.11; total value of school property, $332,764.34. There were also 43 private schools of primary grade, 21 of academic grade, and 6 of collegiate grade. There were in 1874, 12 public schools of the high school grade, and at least 100 in which some advanced studies were taught. Normal departments are connected with Pacific University and McMinnville College, and there were five teachers' institutes held in the State in 1874. There are 7 academies, seminaries, or high schools not public in the State, and 1 school for the superior instruction of women, St. Helen's Hall, at Portland, which has 9 teachers and 130 pupils.

Higher and Professional Education.—The following table gives the particulars of the colleges, universities, and professional and scientific schools of the State in Jan., 1875:

College, University, or Professional School.	Location.	Date of organization.	Under what control.	Professors and instructors.	Students. Preparatory.	Students. Collegiate or professional.	Male.	Female.	Value of buildings, grounds, apparatus, etc.	Amount of endowment.	Income from endowment.	Income from all sources.	Number of volumes in library.
Colleges, etc.:									$	$	$	$	
Christian College	Monmouth	1866	Christians	9	155	165	205	115	30,000	20,000	1,600	4,500	200
Corvallis College	Corvallis	1868	Meth. E. Ch., South.	6	152	.....	.....	.....	7,000	....	......	6,500	
McMinnville College	McMinnville	1859	Baptists	5	210	14	216	8	5,000	25,000	......	3,100	75
Oregon State University *	Eugene City	1875	State	...	.....	.....	.....	.....	75,000	60,000			
Pacific University	Forest Grove	1854	Evangelical	7	97	26	100	23	14,800	65,000	6,500	8,900	5,000
Philomath College	Philomath	1865	United Brethren	5	72	39	57	54	15,550	16,000	1,600	2,527	130
Willamette University	Salem	1844	Meth. Episcopal	8	282	64	242	184	123,100	38,000	3,800	8,801	2,500
Schools of Science:													
Corvallis State Agricultural College	Corvallis	1868	State and Meth. E.Ch.,S.	3	50	55	105	.....	6,000	....	......	5,000	
Scientific Department of Willamette University †	Salem	1853	Meth. Episcopal										
School of Medicine:													
Medical Department of Willamette University	Salem	1867	Trustees	7	.....	14	.....	.....	....	....	......	1,080	

Special Instruction.—There is an institution for the deaf and dumb, and one for the blind at Salem, the former organized in 1870, the latter in 1873. The former has 2 teachers and 30 pupils; the latter 4 instructors and 8 pupils. Both are supported by the State.

* Not fully organized. † Included in collegiate department.

Population.—Before 1843, including the families at Walla Walla, now included in Washington Territory, there were not more than 400 white colonists in all Oregon; at the time of the admission of the State the population was 52,465. The following table shows the population at the date of the several enumerations:

Census.	Whites. Males.	Whites. Females.	Whites. Total.	Colored. Males.	Colored. Females.	Colored. Total.	Indians taxable.	Chinese.	Aggregate.	Density.	Ratio of increase.	Natives.	Foreigners	Illiterate.	Of school age.	Males of military age.	Males of voting age.
1850	8,138	4,949	13,087	128	87	207	.....	......	13,294	0.14	....	12,081	1,213	162	4,525	4,923	5.617
1860	31,451	20,719	52,170	76	52	128	177	......	52,465	0.55	294.6	47,342	5,123	1,511	16,988	15,707	18,806
1870	49,558	37,371	86,929	219	127	346	318	3,330	90,923	0.95	73.3	79,323	11,600	4,427	29,400	23,959	28,616

In 1875 the total population was about 112,000. Besides the population given in the above table, in 1870 there were about 10,960 Indians in the State sustaining tribal relations.

Charitable and Penal Institutions.—The Oregon hospital for the insane at East Portland in 1874 had 167 patients—119 males and 58 females. Its expenses were about $61,000 per annum. The State penitentiary has been located near Salem, but a new one was built in 1873–74 at Portland. In 1874 it had 113 convicts, all males. The expenditures of the prison were for the two years ending Sept., 1874, $69,822, and the earnings, $76,026.

Newspapers and Periodicals.—According to the census returns of 1870 there were 35 periodicals and newspapers in the State, with an annual issue of 3,657,300 copies; 4 of the newspapers were dailies, 26 weeklies, and 5 monthlies. In 1874 the number had been increased to 41, of which 4 are daily, 33 weekly, 1 tri-weekly, 1 semi-weekly, and 2 monthly.

Churches.

Denominations.	Organizations.	Edifices.	Sittings.	Value of property.	Church organizations, 1874–75.	Church edifices, 1874–75.	Ministers, 1874–75.	Members, or communicants, 1874–75.	Adherent pop., 1874–75.	Church property, 1874–75.
Baptists	28	16	4,750	$29,200	59	54	47	2,052	8,000	$51,300
Christians	26	16	4,400	25,000	43	29	36	1,867	7,900	42,500
Congregationalists	8	7	2,300	49,500	11	9	11	672	3,000	61,400
Episcopalians	9	8	1,800	53,200	16	14	15	607	2,800	74,300
Evangelical Association	2	2	550	9,300	3	3	2	217	1,000	12,000
Lutherans	1	1	300	15,000	2	1	1	160	800	18,000
Methodists	97	49	15,100	113,400	121	63	140	5,871	20,170	139,500
Presbyterians (regular)	8	7	2,425	33,000	28	26	25	1,599	7,000	64,150
" (other)	12	9	3,250	11,200						
Roman Catholics	13	14	2,750	94,500	17	15	18	....	15,000	124,500
Spiritualists	2	2	800	25,000	2	2	...	....	700	27,000
Unitarians	2	1	250	10,000	2	1	2	125	700	12,000
United Brethren in Christ	10	2	500	1,200	39	20	17	811	3,200	10,000
Universalists	1	...	......	....	6	3	4	183	720	10,000
Union	1	1	250	1,600	2	2	2	160	640	6,500
Totals	224	135	39,425	$471,100	351	242	320	14,324	71,630	$652,950

Counties.—The following table gives the names and population (by sexes) of each county in 1870 and in 1860, with the assessed valuation in 1873–74, and true valuation in 1870:

Counties.	Pop., 1870.	Males, 1870.	Females, 1870.	Pop., 1860.	Assessed valuation, 1873–74.	True valuation, 1870.
Benton	4,584	2,548	2,036	3,074	$1,457,742	$2,268,000
Baker	2,804	2,152	652	......	639,038	1,093,695
Clackamas	5,993	3,345	2,648	3,466	1,958,550	3,000,000
Clatsop	1,255	774	481	498	574,594	900,000
Columbia	863	518	345	532	315,482	350,000
Coos	1,644	1,078	566	445	785,464	960,000
Curry	504	313	191	393	218,797	200,000
Douglas *	6,066	3,506	2,560	3,203	3,094,518	3,000,000
Grant	2,251	1,885	366	.....	779,676	578,440
Jackson	4,778	3,031	1,747	3,736	1,827,971	1,500,000
Josephine	1,204	827	377	1,623	268,494	300,000
Linn	8,717	4,709	4,008	6,772	3,861,253	5,500,000
Lane	6,426	3,514	2,912	4,780	2,566,414	2,100,000
Marion	9,965	5,384	4,581	7,088	3,013,381	6,325,000
Multnomah	11,510	6,800	4,710	4,150	10,804,662	11,500,000
Polk	4,701	2,597	2,104	3,625	1,632,625	2,500,000
Tillamook	408	228	180	95	86,576	118,000
Umatilla	2,916	1,763	1,153	......	867,532	1,668,507
Union	2,552	1,547	1,005	......	935,428	1,500,000
Wasco	2,509	1,480	1,029	1,689	1,297,501	1,500,000
Washington	4,261	2,391	1,870	2,801	1,617,885	2,197,290
Yamhill	5,012	2,741	2,271	3,245	1,887,633	2,500,000
Totals	90,923	53,131	37,792	52,465	$40,491,216	$51,558,932

Principal Towns.—Salem, the capital, had in 1870 about 1200 inhabitants. It was estimated to have 4000 in 1875. Portland is the largest city in Oregon. (See PORTLAND.) It had 8293 inhabitants in 1870, and about 13,000 in 1875. The other towns having a population between 2000 and 3000 are Oregon City, Albany, and Jacksonville; between 1000 and 2000, Eugene City, Harrisburg, Corvallis, Astoria, and Junction City. Roseburg, Dalles, East Portland, Powder River Valley, Walla Walla, Baker City, La Grande, Port Orford, Ellenburg, Empire City, and St. Helen's are growing towns.

Constitution, Courts, Representatives in Congress, etc.—The State constitution, adopted in 1857, provides that every male citizen of the U. S., 21 years old and upward, and six months a resident of the State, may be a voter; and foreigners (males) of the same age, who have declared their intention of becoming citizens a year previous to any election, and have resided in the State six months, are also legal voters. The executive officers of the State are a governor, secretary of state, who is also auditor, and State treasurer—all elected for four years, and eligible for only eight out of any period of twelve years. In case of a vacancy in the office of governor the secretary of state succeeds to the office, and if a second vacancy occurs the president of the senate succeeds. The legislature consists of a senate, not exceeding 30 members, elected for 4 years, and a house of representatives, of not more than 60 members, elected for two years. The legislature meets biennially. The judiciary consists of a supreme court of six judges or more, having appellate jurisdiction; of six circuit courts, each presided over by one of the supreme court judges, who also meet as the supreme court once a year at the capital; the circuit courts have civil and criminal jurisdiction and appellate jurisdiction from the county courts; these judges are elected for six years in classes, so that usually two go out of office every two years; the county court judges are elected for four years; they also exercise probate jurisdiction. There are also justices' courts. The constitution prohibits State debts exceeding in the aggregate $50,000, or county debts exceeding $5000; allows no State officer to subscribe for stock in any corporation or to subscribe for any such stock for the State; nor is any county, city, town, or municipal corporation allowed to subscribe for any such stock or bonds, or loan its credit in any way for them. The State is entitled to one Representative in Congress.

History.—So far as maritime discovery confers a title to a region of country, the first claim to Oregon and Washington Territory belonged to Spain, which, by the Greek pilot De Fuca in 1592, by Admiral Fonte in 1640, and by subsequent explorers, had visited and mapped the greater part of the coast as far as the 55th degree of N. lat. The Nootka treaty of 1790 between Spain and Great Britain only gave to the latter some fishing and trading rights in the vicinity of Puget Sound. The discovery and exploration of Columbia River by Capt. Robert Gray, an American captain, who gave the name of his ship to the river; the purchase of Louisiana and all that belonged to it to the Pacific from the French in 1803, their claim being the best, next to that of Spain; the exploration of Columbia River from its sources to its mouth by Lewis and Clarke by order of our government in 1804–05; and the treaty of limits concluded between Spain and the U. S. in 1819, by which all the territory N. of 42° N. lat. was expressly declared to belong to us,—were conclusive proofs of our title to this region. But the treaty, which the British government called a "treaty of joint occupation," concluded

* Umpqua, which had 1250 inhabitants in 1860, was consolidated with Douglas in 1862.

in 1818, gave a great deal of trouble. Without any just title Great Britain attempted to claim territory as far S. as Columbia River, and even below, and finally offered to compromise on the Columbia. Meantime, a house had been built on the Columbia in 1810 by Capt. Winship, a New Englander, but the house was carried away by a flood the same year, and the settlement given up. In 1811, John Jacob Astor established a fort and fur-trading house at Astoria, but by the treachery of the manager in charge both were given up to the English, who were then at war with the U. S., in 1813. The English named it Fort George. It passed into the hands of the Hudson's Bay Company soon after, and in 1824 some of the servants of that company set out a few fruit trees and made some efforts to cultivate the soil. In 1832 the first settlers from the U. S. arrrived. In 1834 the missionary colony led by Dr. Marcus Whitman and Rev. Mr. Spalding entered Oregon. Their wives were the first white women who had crossed the Plains, and their children the first American children born in Oregon. Others followed soon after, and in 1842 the emigration was large. In 1843 they formed a provisional government. In 1846 a treaty was concluded between the U. S. and Great Britain fixing the boundary on the 49th parallel, except at the Straits of Fuca. Oregon was formally added to the U. S., but had no Territorial government till 1849. In 1847 a considerable number of settlers were massacred by the Indians. In 1848, Oregon was created a Territory, including what is now Washington Territory. In 1849 its first Territorial governor, Joseph Lane, was appointed. He arrived in Mar., 1849, and organized the Territory, which then had 8785 inhabitants. Her population, after a little, increased so rapidly that in 1857 a convention was called, a constitution adopted, and application made for admission as a State. This was granted in 1859, and though for some years its progress was slow, yet since the opening of railroads in the Willamette Valley and the discovery of gold in Middle and Eastern Oregon its growth has been much more rapid. There have been occasional troubles with the Indians, the latest being the "Modoc war" in 1872, in the extreme southern part of the State, but most of the tribes are on reservations, and are peaceful and partially civilized.

Governors.

(1) *Provisional.*

James Shields 1848–49

(2) *Territorial.*

Joseph Lane 1849–51
John P. Gaines 1851–53
Joseph Lane 1853–53
John W. Davis 1853–55
George L. Curry 1855–59

(3) *State.*

John Whittaker 1859–62
Addison C. Gibbs 1862–66
George L. Woods 1866–70
Lafayette S. Grover 1870–78

Electoral and Popular Vote for President and Vice-President.

Year of election.	Candidates for whom the electoral vote of State was cast.	Electoral vote.	Popular vote.	Minority candidates.	Vote cast.	Total vote.
1860	Abraham Lincoln P. / Hannibal Hamlin V.-P.	3	5,270	Stephen A. Douglas P. / Herschel V. Johnson V.-P.	3,951	12,460
				John C. Breckenridge P. / Joseph Lane V.-P.	3,056	
				John Bell P. / Edward Everett V.-P.	183	
1864	Abraham Lincoln P. / Andrew Johnson V.-P.	3	9,888	George B. McClellan P. / George H. Pendleton V.-P.	8,457	18,345
1868	Horatio Seymour P. / Francis P. Blair, Jr., V.-P.	3	11,125	Ulysses S. Grant P. / Schuyler Colfax V.-P.	10,961	22,086
1872	Ulysses S. Grant P. / Henry Wilson V.-P.	3	11,818	Horace Greeley P. / Benjamin Gratz Brown V.-P.	7,740	20,147
				Charles O'Conor P.	587	

(For valuable documentary and other information relative to the productions, industry, commerce, valuation, and history of Oregon we acknowledge our indebtedness to his Excellency Lafayette S. Grover, governor of Oregon.)
THOMAS JORDAN. REVISED BY L. P. BROCKETT.

Or′egon, county of Missouri, bounded S. by Arkansas. Area, 700 square miles. It is rugged, broken, and densely timbered, with fertile valleys and ores of copper, lead, etc. Corn is the leading product. Cap. Alton. Pop. 3287.

Oregon, tp. of Butte co., Cal. Pop. 1169.

Oregon, post-v., cap. of Ogle co., Ill., on the Chicago and Iowa R. R., 100 miles W. of Chicago, has 2 public-school buildings, 4 churches, 2 banks, 2 weekly newspapers, 2 hotels, several oatmeal-mills, and stores. Pop. 1325.
C. R. HAWS, ED. "OREGON COURIER."

Oregon, post-v. and tp., Clarke co., Ind. Pop. 1360.

Oregon, tp. of Starke co., Ind. Pop. 524.

Oregon, tp. of Washington co., Ia. Pop. 1318.

Oregon, tp. of Lapeer co., Mich. Pop. 877.

Oregon, post-v. of Lewis tp., cap. of Holt co., Mo., 30 miles N. W. of St. Joseph, has a public library, the Northwest Missouri Normal School, a good graded school, 5 churches, 1 bank, a handsome court-house, park, 2 newspapers, several hotels, 1 woollen-factory, 1 flouring-mill, and stores. Principal employment, fruit-growing and agriculture. Pop. 824.

Oregon, tp. of Lucas co., O. Pop. 1863.

Oregon, tp. of Wayne co., Pa. Pop. 690.

Oregon, post-v. and tp., Dane co., Wis., on the Madison division of Chicago and North-western R. R. Pop. 1498.

Oregon City, post-v., cap. of Clackamas co., Or., on the Oregon and California R. R., 12 miles S. of Portland, has fine water-power, 2 excellent schools, 5 churches, a large woollen-factory, 2 flour-mills, 1 newspaper, and stores. Pop. about 1600.
A. NOLTNER, ED. "OREGON CITY ENTERPRISE."

Oregon River. See COLUMBIA.

Or′egonville, tp. of Rockingham co., N. C. Pop. 2561.

O′reide, an alloy of copper with tin, or more rarely zinc, composed of 100 parts of the first to 17 of the tin or zinc. These are fused together and then fluxed with lime, magnesia, argol, and sal-ammoniac. It is used for the cases of cheap watches and for ornamental castings. It resembles gold in color, and affords a good base for electro-plating with gold. It is malleable and takes a good polish.

O'Reil′ly (ALEXANDER), COUNT, b. in Ireland in 1725; entered the Spanish military service at an early age; fought in Italy during the war of the Austrian succession; served in the Austrian army against Prussia 1757–58, and was distinguished at Hochkirch; re-entered the Spanish army as lieutenant-colonel 1761; introduced German tactics into Spain; was sent to Havana as brigadier-general 1763; saved the life of Charles III. when threatened by a sedition at Madrid 1765; went to Louisiana June, 1768, to take possession of that colony, ceded to Spain by France; put to death by court-martial Lafrenière and other French leaders who had resisted the transfer of sovereignty; abolished the French laws; appointed inspector-general of all the forces in Spanish America 1770; governor of Madrid 1773; sent into exile in Galicia on an insignificant pension 1786. D. at Chinchilla, Murcia, Mar. 23, 1794.

O'Reilly (BERNARD), D. D., b. in Ireland in 1803; was consecrated (Nov. 10, 1850) Roman Catholic bishop of Hartford, Conn. D. at sea Jan., 1856.

Orel′, government of Russia, between lat. 51° 50′ and 54° N., and between lon. 33° and 39° E. Area, 18,393 square miles. Pop. 1,578,013. The surface is mostly level. The soil is fertile and well watered by the Desna, the Oka, and the Sosna. The climate is mild. Agriculture is the chief industry. Large quantities of wheat are exported, in grain and in flour, to Riga and St. Petersburg. Hemp is extensively cultivated, and oil of hempseed, sailcloth, rope, and yarn are manufactured. Some iron-mines are worked and many horses and cattle are reared.

Orel, town of Russia, capital of the government of the same name, on the Oka, is mostly built of wood, and was almost destroyed by fire on June 7, 1848. It has many educational institutions, breweries, distilleries, ropewalks, tallow-houses, and other manufactories, and an important trade in corn with St. Petersburg and Riga. It formerly formed a stronghold against Tartar invasions; its fortifications are now of no consequence. Pop. 43,575.

Orella′na (FRANCISCO), b. at Truxillo, Spain, about 1505; was one of the companions of Francisco Pizarro in the conquest of Peru; was second in command under Gonzalo Pizarro in exploring the regions E. of the Andes; descended the Amazon; obtained a commission to colonize the region he had passed through; embarked with four ships and 400 men; lost his vessels and men, and d. on the banks of the Amazonas, near Montealegre, in 1549 or 1550.

Orel′li (JOHANN KASPAR), b. at Zurich, Switzerland, Feb. 13, 1787; studied theology, but especially ancient and modern languages and literature, and was appointed *pro-*

fessor eloquentiæ in 1819 in his native city, where he d. Jan. 6, 1849. His critical editions of Horace (2 vols., 1837–38; 3d ed. 1850–52), Tacitus (2 vols., 1846–47), and Cicero (8 vols. in 12 pts., 1826–38; 2d ed. 1845–61); including *Scholiastæ Ciceronis* (1833), *Onomasticon Tullianum* (3 vols., 1836–38), are very celebrated, also *Inscriptionum Latinarum Selectarum Collectio* (2 vols., 1828).

O'renburg, government of European Russia, bounded E. by the Ural and S. E. and S. by the Caspian Sea. Area, 144,924 square miles. Pop. 840,704. The central part of the government is mountainous, covered with branches of the Ural Mountains which are very rich in iron, copper, and gold; the Crown mines yield over 1000 pounds of gold annually, and the private double as much. On both sides of the mountains are extensive steppes, in many places barren and dotted with salt lakes, but in others presenting good pasture-grounds, where immense herds of cattle, sheep, horses, and camels are reared. Besides the breeding of cattle, in which the Ural Cossacks are engaged, and mining, fishing in the Ural and the Caspian Sea and preparation of caviare form an important branch of industry. An extensive trade is carried on with Europe by means of canals —with Asia by means of caravans of camels.

Orenburg, town of European Russia, capital of the government of Orenburg, on the Ural, was founded in 1742. It is fortified, and carries on an extensive trade. Tea from China, shawls and silks from Persia, skins, tallow, and cattle from the Khirgheez and Cossacks, and metals from the Ural Mountains are brought here and exchanged. Pop. 33,431.

Orenburg Gum, a gummy and somewhat saccharine exudation collected in Siberia and Russia from the trunks of larch trees after great forest-fires have partly destroyed the trees. It is collected in large quantity, and used as a substitute for gum-arabic and to some extent as food. It has a resinous flavor, and is entirely soluble in water.

Oren'se, town of Spain, in Galicia, on the left bank of the Minho, which here is crossed by a magnificent bridge, 1400 feet long, 145 feet high, built in 1230, and spanning the river with seven arches. At the foot of the hill on which the city is built are the famous hot sulphur springs, Las Burgas. The town is also celebrated for its chocolate, hams, and wine. Pop. about 11,000.

Orense (José Maria), marquis of Albaida, b. in Spain about 1802; became a prominent republican leader; participated in several insurrections; was as often exiled and recalled, and almost constantly a member of the Cortés. After the overthrow of Isabella II. (Sept., 1868), Orense figured as the leader of the manifestations at Madrid in favor of a federal republic and the abolition of slavery in Cuba; was an earnest partisan of the French in the war of 1870–71; proposed at Tours (Sept., 1870) a federation of the "Latin races;" protested against the election of Amadeus as king of Spain (Nov., 1870); was chosen president of the Cortés on the abdication of that monarch (Feb., 1873); was dissatisfied with the republican governments of Figueras and Castelar, and withdrew from the Cortés Aug., 1873.

Oreodont'idæ [from *Oreodon*—ὄρος, "mountain," and ὀδούς, "tooth"—one of the generic names], a family of extinct mammals belonging to the order Ungulates and sub-order Artiodactyles, intermediate between the typical ruminants and hogs. In form the animals could not have resembled any living species, but must have had some general resemblance to a cow or sheep. The skull was destitute of horns; the olfactory chamber completely enclosed above by the long nasals, and on the sides by the supramaxillaries. The teeth were in full number (M. $\frac{3}{3}$, P. M. $\frac{4}{4}$, C. $\frac{1}{1}$, I. $\frac{3}{3}\times 2=44$), in series interrupted by a diastema for the reception of the canines of the upper jaw and the enlarged first molars of the lower; the true molars had double crescentiform ridges, as in the typical ruminants, and the posterior one was provided with two on the posterior as well as anterior halves; the premolars were more or less conical; the first in the lower jaw like canines; the canines of the upper jaw enlarged, those of the lower modified like the incisors. The family thus distinguished had a number of representatives in America during the Miocene Tertiary epoch, which have been differentiated into two sub-families: (1) Oreodontinæ, in which the orbits were closed behind and the lachrymal bones impressed by well-marked fossæ, including the genera *Merycoidoden* (or *Oreoden*), *Eporeoden, Merycochœrus, Merychyus*, and *Leptanchenia*, and (2) Agriochœrinæ, distinguished especially by the incomplete orbits and lachrymal bones without fossæ, limited to the genus *Agriochœrus*. The nearest representatives yet discovered of this family in Europe belong to the Hyopotamidæ, which, however, were also represented in this country. Theodore Gill.

Oreop'olis, tp. of Cass co., Neb. Pop. 249.

Ores'tes, in Grecian mythology, a son of Agamemnon and Clytemnestra; avenged the murder of his father by killing his mother and her paramour, Ægisthus, but was immediately attacked by the Erinnyes, who drove him mad, pursuing him from place to place. He sought refuge with Apollo in Delphi, but the manner in which the Erinnyes were finally appeased is variously related by the Attic tragedians, who frequently treated this myth and developed it differently. According to one version, Orestes went to Athens, where the court of the Areopagus declared him innocent through the influence of Athene. According to another, Apollo sent him to Tauri, whence he succeeded, by the aid of his sister, Iphigenia, who was a priestess there, in carrying away the image of Artemis. Of the tragedies which treated the myth, the trilogy *Orestea* by Æschylus, *Electra* by Sophocles, and *Electra, Orestes*, and *Iphigenia in Tauris* by Euripides, are still extant.

Oreus. See Histiæa.

Or'fa, Orfah, or **Urfah** [Greek *Edessa;* Arabic *Roha*], capital of the pashalic of Urfah in Asiatic Turkey, lat. 37° 8′, about 40 miles E. of the Euphrates. That it was founded by Nimrod, as stated by Isodore of Charax (about 300 B. C.), is hardly credible. The tradition which identifies it with "Ur of the Chaldees," the birthplace of Abraham, is probably not older than the fourth century of our era. Appian says it was founded by Seleucus (about 300 B. C.). It is built partly on the side of a hill looking eastward over an extensive plain. The river Kara Kozoon, spanned by three bridges, flows through it. Its streets are narrow, but clean. Its gardens resemble those of Damascus. Its mosque and pool of Abraham are famous. It has a large trade, and a pop. of about 50,000, nearly half of whom are Christians. (See Edessa.) R. D. Hitchcock.

Or'fila (Matthieu Joseph Bonaventure), M. D., b. at Mahon, Minorca, Apr. 24, 1787; studied medicine with brilliant reputation at Valencia and Barcelona, and in 1807 was sent at public cost to Paris to fit himself for a professorship at Barcelona; became in 1811 a private lecturer on chemistry in Paris; was naturalized in 1818, and became physician to the king, and in 1819 professor of medical jurisprudence; in 1823 professor of medical chemistry, and in 1830 dean of the faculty. He attained immense popularity as a physician, lecturer, and scientist, and did much to elevate the standard of medical learning. In 1848 he lost most of his distinctions at the hands of the revolutionists, but in 1851 was made president of the Academy of Medicine. D. at Paris Mar. 12, 1853. Orfila was the father of modern toxicology. His leading works are—a noble *Traité de toxicologie générale* (1813–15), *Éléments de Chimie appliquée* (1817), *Traité de médecine légale* (1823–47, 3 vols.).

Or'ford, post-v. and tp., Grafton co., N. H., on the Connecticut River. Pop. 1119.

Orford, Earls of. See Walpole.

Or'fordville, post-v. of Rock co., Wis., on the Wisconsin division of the Milwaukee and St. Paul R. R.

Or'gan [Gr. ὄργανον]. *Structure.*—The organ is a wind instrument of peculiar range, force, and complexity. Its peculiar capabilities are due to three principal properties. First of all, it includes a large number of distinct pipes, each of which is, in a sense, an independent instrument. Secondly, it contains peculiar arrangements, of which the chief is the keyboard (clavier), by which numbers of these pipes very remote from one another may be simultaneously operated on. Lastly, it substitutes for the natural production of the moving force (namely, air-currents) by the human lungs an artificial production of the same by means of a bellows; which substitution not only relieves the performer of the most fatiguing part of his work, but also increases in a vast measure the power of the instrument. By means of this large bellows, of a structure similar to that which is seen in an accordion, and worked by a lever-handle, air is forced into a closed chest or reservoir, where it can be stored up in a compressed state. In the modern bellows, the horizontal as distinguished from the old-fashioned diagonal, there are two divisions—a feeder and a temporary air-chest. The air is unable to return by the way it came, and can only find vent above through its upper floor, called the sounding-board. This sounding-board separates the air-chest from the organ-pipes, which are arranged above it. The air is admitted to the pipes by the action of certain slides and valves which are set in motion by drawing out the registers and by pressing down the keys, digitals, or pedals. The drawing out of a slide partly opens up to the air a whole set of pipes of one peculiar quality or tone, so that when any of the keys is pressed down the air finds its way into the appropriate pipe of this particular series. Of course, when more than one stop is drawn out the air is admitted simultaneously into several distinct

groups of pipes. The larger organs consist of three or more distinct partial organs, each of which has its peculiar keyboard, and a separate air-chest and sounding-board for its pipes.

The sound of an organ is produced by the vibrations of the column of air within the pipe. The compressed air of the air-chest, as soon as obstacles are removed by the action of the stop and of the key, rushes upward into the pipe, and so produces the tone. The shape of a metal organ-pipe is very much the same as that of a common tin whistle. The stem or "body" of the pipe is cylindrical. The lower part or "foot" is an inverted cone with its apex cut off. At the juncture of the body and the foot there is an opening in the side of the pipe called its "mouth." There is also a horizontal plate termed the "languid" or "language," which partly divides the foot from the body, and leaves a narrow egress for the air coming from below close to the mouth of the pipe. The wooden pipes are of a slightly different structure, being commonly square instead of round, but their mode of action is not materially different. When the air rushes up into the pipe it is driven against the upper edge or "lip" of the mouth-hole. Breaking against the sharpened edge, it produces a peculiar hissing or rushing noise, which is all we hear when the pipe does not "speak." The agitation thus set up at the mouth communicates itself to the column of air within the body of the pipe, which is thus made to vibrate with a rapidity determined by its length. The shorter the pipe the more rapid the series of vibrations, and the higher consequently the pitch of the note produced. Organ-pipes are of a great many varieties, according to the material used and the shape of their several parts. Metal pipes are made of tin, "metal" (a mixture of tin and lead), zinc, etc., while wooden pipes are generally constructed out of cedar, deal, or pine. The shape of pipes also varies considerably. Thus, among metal pipes we have the forms of cylinder, cone, and inverted cone, while among wooden pipes we have the forms of quadrilateral, trilateral, cylinder, pyramid, and inverted pyramid. Further, there is a distinction between pipes which are open and those which are stopped or plugged at their upper extremity. An open pipe produces a tone with a wave of air twice as long as the body of the pipe, and a stopped pipe produces a tone with a wave four times the length of its body. Thus, a stopped pipe is always an octave deeper than an open pipe of the same length.

The peculiar quality of sound belonging to an organ-stop is due to the structure of the pipes belonging to the stop. According to the researches of Prof. Helmholtz, the *timbre* of a musical instrument is determined solely by the number and strength of the upper partial tones which enter into the tones of the instrument. Thus, he found that wide-stopped organ-pipes have scarcely any upper partial tones at all, and that all stopped pipes are wanting in the even members of the series of upper tones. Hence, stopped pipes give a soft hollow sound, while open pipes produce a sharp brilliant style of tone. The number of partial tones, and so the timbre of a pipe, vary with the shape and size of the pipe, and also with the material of which it is made. Certain stops called "reeds" owe their peculiar character to the addition of a vibrating tongue, like those of a harmonium, to the pipe. This tongue is a thin, oblong brass plate fitted into the aperture of a cylindrical tube called a reed. The tongue in its oscillations alternately opens and closes the aperture of the tube through which the air seeks to pass. The consequence is, that the stream of air is separated into a series of individual pulses. The sound of a reed pipe is the result of these interrupted pulses of air, together with the vibrations of the metal tongue itself. Other stops having a peculiar quality of tone are in reality compound stops; that is, they bring into simultaneous action a plurality of pipes of different pitch. The twelfth, fifteenth, sesquialtera, and mixture are among the best-known compound stops. The notes of these combined pipes have the same relation to one another as the partial tones of a single musical tone. Thus, it is usual to connect the upper octave with the prime tone, and after that the twelfth. Some of these compounds give as many as the first six partial tones. The number and strength of the combining tones in the note of one of these compound stops give to it a peculiarly bright, and in some cases a dazzling and overpowering, character.

The names of the several organ-stops point partly to the quality of the sound produced, partly to the range or compass of the pipes belonging to it, and to other circumstances. Thus, the trumpet and the oboe, which are both reed-stops, are so named from the resemblance of their tones to those of these instruments. The diapason-stops again are so called because their pipes extend through the whole compass of the organ. The stop principal, which is an octave higher than the open diapason, is so named from the fact that it is the first stop tuned, and the standard, therefore, for the pitch of the remaining stops.

The organ, as may be seen from its structure, is adapted to a solemn and sustained kind of music. Unlike the pianoforte, its tones are capable of being prolonged with an even, undiminished intensity. Its limitations are those of all mechanical substitutes for human action. It is incapable of rendering the finer gradations of force, the contrast of forte and piano being attainable (except in the case of the swell organ, which is provided with a screen for breaking the sound) only by the rough device of increasing or decreasing the number of pipes sounding.

History.—The history of the organ forms a not unimportant branch of the history of music as a whole. We are able to trace back the pedigree of this instrument to the humble ancestry of the bagpipe and the pipes of Pan. It is difficult to fix the date of the first organs referred to in ancient writers, owing to the ambiguity of the word *organ* (ὄργανον), which was properly fitted to denote any musical instrument. Indeed, so late a writer as St. Augustine attempts to claim for this name the right of denoting all musical instruments alike. The organ, properly so called, originated among the Greeks of Alexandria in the second century B. C. The first species of organ of which we have a description is the water-organ, ὕδραυλος (literally, "water-flute"). It is described by Vitruvius and Athenæus as sweet though not powerful. This instrument was designed not for the church but for domestic amusement. On a Roman monument we have a bass-relief representation of a domestic organ. It contains sixteen pipes, and the performer, a lady, plays with both hands on the keyboard. It is placed on a table, and looks easily portable.

The organ is said to have been introduced into the Church by Pope Vitalian in the seventh century, but its employment in church services probably dates from a much earlier period. Organs were certainly used in churches very commonly in the time of the Carlovingians. We read of organs being sent to King Pepin and Charlemagne as presents by the Byzantine emperors. The first of these is described as a wonderful structure of the form of a tree, in the branches of which were birds of various species, each bird giving forth the note peculiar to its species. At a much later period than this we find the structure of the organ to be exceedingly rude. The keys were often from four to six inches broad, and were struck with the closed fist or in some cases with the elbow, so that only two tones could be produced simultaneously. The compass was sometimes as great as twenty-one notes, the series being that of our diatonic scale (the white notes of a piano). In addition to these more common instruments, we read of gigantic organs, such as that built for Winchester in the year 951, which is said to have contained 400 pipes and 26 bellows, requiring 70 strong men, and to have been played by two performers or four fists. From the twelfth century on we read of a light portable organ named "portative," which was distinguished from the fixed organ or "positive." The performer, who carries the instrument by means of a belt, plays with one hand, and manages the bellows with the other. Italian painters of the fourteenth and fifteenth centuries were fond of representing this instrument in the hands of saints and angels. In the fourteenth century the structure of the organ underwent certain improvements. A step had been taken before this towards enabling the organist to produce a larger number of simultaneous tones. By the invention of mixture or compound stops—which seems to have been arrived at at a very early date—two or three notes could be sounded by means of one key, the combinations being selected according to the strange ideas respecting sequence of accords prevalent at this age (as illustrated in the *Organon* or mode of harmony of Hucbald and his successors). In the fourteenth century this capability of uttering simultaneous tones was much further increased by the reduction of the size of the keys, so as to make them workable by means of the fingers. This change also involved a large extension of the compass of the keyboard. We read of organs of this period having three octaves, including semitone intervals.

The period of the supremacy of the polyphonic music of the Netherlands (1450–1550) was marked by considerable improvements both in the structure and in the art of performance of the organ. The development of the contrapuntal or fugue style of music, which was diffused from the Netherlands through Germany, Italy, England, etc., gave a great impetus to the art of organ-playing. There are still preserved volumes of organ compositions used by the German performers of this time, from which we see that organ pieces were now growing into independent productions. In Germany the art of organ-playing was diligently cultivated by a series of musicians, of whom the family of the Kochs were among the most distinguished.

Thus were laid the foundations of the art which Sebastian Bach was afterwards to carry to so high a degree of perfection. We must not forget to refer, too, to the study of the organ in England and in Italy at this period. In Italy, during the sixteenth century and at the commencement of the seventeenth, organ compositions very ornamental in design and containing the germs of our modern harmony became common. The seventeenth century, too, was marked by great progress in organ-building and in organ-playing. Germany and Holland trained builders of great eminence, whose works may be found in other countries besides, including England. Some of the finest old organs of England, including those of Westminster Abbey, the Temple church, and Durham cathedral, were erected by a German named Schmidt. The style of organ composition was greatly elevated in this century by the addition of harmony in the modern sense, of which Palestrina had laid the foundations in Italy.

From the beginning of the last century to the present date the organ has undergone a vast though gradual improvement of structure, which has served to increase its scope and variety by lessening the mechanical difficulties of performance. In this way it became possible to execute such rich and elaborate works as later composers have produced. The principal mechanical additions to the instrument have been directed to a more varied combination of pipes by compound stops, to a diminution of the labor of the manual performance by means of arrangements which facilitate the drawing of stops and the depression of keys. Among the methods used to lessen this last ingredient in the labor of the organist are pneumatic action (which is commonly adopted in the best modern organs) and electrical agency. Among the more curious recent experiments in organ-building it may be well to mention the very successful attempt of Mr. J. Baillie Hamilton, stimulated by the experiments of Mr. John Farmer, organist of Harrow School, to produce tones from strings by means of a blast of air, and so construct a "string-organ." The wire is attached in a peculiar manner to the tongue of a reed, and the current of air acting on this metal tongue causes both the tongue and the connected wire to vibrate. The tone resulting is produced by both sets of vibrations in combination, and is said to resemble very closely the tone of a metal diapason organ-pipe. This instrument may be said to be an expansion and elaboration of the Eolian harp. Though resembling the harmonium rather than the organ in construction, in quality of tone it is most closely allied to the latter instrument. An allusion may also be made to the curiosity in organ-building produced by Mr. Arthur Denny—namely, the steam-organ, in which an immense force of sound is obtained by sending a jet of steam through an organ-pipe. This instrument, the maximum sound of which is said to be audible twelve miles off, has little value in a musical point of view, but it has been turned to practical account both in America and in England as a fog-signal and as a substitute for the chime of bells. It is worth observing that a monster organ, most probably a steam organ, was invented so long ago as the year 997 by the monk Gerbert Sylvester.

Among the largest European organs still to be seen, the following may be mentioned: the Weingarten organ (66 stops and 6666 pipes), the Haarlem organ (60 stops), the organ of the church of the Cavalieri di San Stefano at Pisa (over 100 stops), that of the church of S. Alessandro in Colonna (100 stops, circa), the Crystal Palace organ, London (65 stops), and the transept organ of St. Paul's, London (60 stops).

The reader is referred to the following works on the structure and history of the organ: *The Organ, its History and Construction*, by Edward J. Hopkins, with a new history of the organ by Edward F. Rimbault (London). This is by far the most complete treatise on the subject. The nature of the sounds of organ-pipes is elucidated by Prof. Helmholtz in his great work on *The Sensation of Tones* (*Die Tonempfindungen*), recently translated by Mr. A. J. Ellis (London). In an appendix to this work Mr. Ellis gives a full account of the string-organ invented by Mr. Hamilton. Many curious chapters in the history of the organ and of organists may be found in the histories of music of Dr. Burney and Sir John Hawkins, and of the German historian Kiesewetter Torkel, and especially A. W. Ambros.

James Sully.

Organ'ic Anal'ysis, Prox'imate. This term is applied to an important branch of chemical analysis which seeks to separate and determine the *proximate* constituents of vegetable and animal matter and of products therefrom; that is, instead of separating *ultimately* the elementary constituents from each other, it is the function of proximate analysis to set apart by themselves the different important definite *compounds* which make up the immense variety of mixtures occurring in animal and vegetable structures, and the various tissues and juices thereof. This field of investigation it will be seen is of immense magnitude and importance, but of corresponding, indeed unlimited, complexity and difficulty. Nevertheless, certain general principles have been arrived at; and an American chemist, Albert B. Prescott, of the University of Michigan, has, during the past year, produced a systematic treatise upon the subject, to which the reader may be referred with confidence as well worthy of study. The subject, however, is one which has not received the attentive and systematic care from laboratory chemists that its importance demands; and it yet remains true that in proximate organic analysis success depends chiefly upon the original inventive talent and individual research of the chemist occupied therein, in too great a number of important cases that are constantly liable to turn up.

H. Wurtz.

Organ'ic Anal'ysis, Ul'timate, a special branch of chemical analysis, which may also be appropriately designated the elementary analysis of hydrocarbon compounds, as a vast majority of the bodies to which it is applicable contain both carbon and hydrogen. It is founded on the general method of burning in a close apparatus a weighed quantity of the organic substance to be analyzed, which has been previously mixed with some mineral compound of oxygen capable of furnishing the latter element to the carbon and hydrogen of the organic substance. The mineral oxygen compounds mostly used are black oxide of copper and fused yellow chromate of lead. The carbonic acid gas and water (as steam) formed in this combustion are made to pass through another apparatus, or train of apparatuses, containing chloride of calcium, to absorb all the water, and potash-ley, to absorb the carbonic acid gas. The tubes containing these latter two absorbents are weighed before and after the process, and the differences are the amounts of water and carbonic acid formed, from which the amounts of carbon and hydrogen in the original substance are readily computed. If oxygen is contained in the substance, it appears as the difference between the whole original weight and the sum of the carbon and hydrogen. If nitrogen be present, it has to be determined by a separate process, but it also necessitates certain precautions in the above process, to prevent the formation of oxides of nitrogen, which would be absorbed by the potash and vitiate the carbon determination. The products of combustion are therefore first passed over metallic copper heated to incandescence, which decomposes such oxides of nitrogen.

Determination of Organic Nitrogen.—The prevailing methods are two in number. By the Will-Varrentrapp method the nitrogen is converted into gaseous ammonia by ignition in admixture with a caustic alkali. A mixture of the hydrates of soda and lime, called "soda-lime," is used for the purpose. The ammonia is absorbed by an acid, and its amount determined by subsequent operations. By the Dumas-Melseus method the nitrogen is converted into its gaseous elementary form and measured in a eudiometer. Combustion with oxide of copper is generally employed in this method, with numerous essential precautions. Other modifications are employed when sulphur, phosphorus, chlorine, etc. are to be determined in organic compounds. To explain the apparatus required in these different methods, and the details, manipulations, and precautions necessary to practical success, would require a considerable treatise with numerous illustrations. For these it is necessary to refer, therefore, to the elementary textbooks of chemistry.

Henry Wurtz.

Organ'ic Chem'istry. This is the division of the universal science of chemistry which relates to the materials and laws that govern the transformations involved in the processes of life, death, and decay. It has of late been quite a fashionable notion among chemists that no such division exists, and that the science is a unit; but this notion does not and will not prevail, for the reason that there is an unquestionable foundation in nature for the distinction. Others, more inductively, acknowledge the distinction and seek to define it, the most prevalent definition being that "organic chemistry is the chemistry of carbon compounds," though these usually confess that they thus include carbonic acid with the carbonates, undeniably mineral bodies, besides carbonic oxide, sulphides of carbon, cyanogen, and cyanides, which are never found except as artificial products having no natural relation to life, death, or decay. The present writer believes that the difficulty will be entirely overcome by giving to organic chemistry a new definition, by calling it the "chemistry of hydrogen and its transformations and combinations." The transformations referred to are those of molecular volume. This definition includes water and ammonia as organic substances; but as water, both free and combined, is the chief constituent and the most essential substance in all liv-

ing bodies, this should present no obstacle; and as to ammonia, its functions and relations to life in nature are obvious enough. The illustrious chemist Leopold Gmelin, appreciating the difficulty above referred to in the ordinary definition as "chemistry of carbon compounds," proposed to amend the matter by excluding all carbon compounds containing but one equivalent of carbon, a subsidiary hypothesis by which he got rid of the compounds that are above referred to. But at the same time he threw out marsh-gas, a universal product of natural organic decay, and one of the most abundant. This is sufficient to invalidate the hypothesis. The great Liebig had another definition of organic chemistry, as the "chemistry of compound radicals." In a certain sense, which is quite wide, however, of the sense attached by the author, this definition may have some applicability. Though the organic radicals of Liebig, on which he founded the definition, are now matters of controversy, no doubt can be entertained of at least one compound organic radical, H_2C, as yet without a name, which plays an almost universal part in organic transformations. Unfortunately for Liebig's definition, however, there are unquestionably mineral compound radicals. Cyanogen may be considered one of these, whose existence is demonstrated, and many chemists admit many others. Upon the whole, Liebig's definition could not be regarded as conveying a generalization likely to be founded in nature. The true chemical and natural distinction between organic or zoic and azoic chemistry will be found, it is believed, in the new definition above proposed, making zoic chemistry the chemistry of hydrogen and its transformations. HENRY WURTZ.

Organic Radicals. See NOMENCLATURE, in chemistry, also ORGANIC CHEMISTRY.

Organism. See BIOLOGY.

Organization, of troops. See ARMY, ARTILLERY, CAVALRY, ENGINEERS, INFANTRY; as also TACTICS and WAR. For review of existing armies see WAR.

Organon. See NOVUM ORGANUM.

Organ-Point [Fr. *point d'orgue*], in music, a series of harmonious combinations having for its bass one long, sustained, and unvarying note. As the organ is the only instrument on which these passages can be performed with full effect, the origin of the name and of its substitute, "pedal" or "pedale," is readily explained. This holding or pedal-note is usually either the dominant or the keynote of the piece, and the upper parts consist partly of harmonies related to the bass, and partly of accidental or passing chords, serving as links in the general course of the harmony. Organ-points are of great variety in structure and duration, occupying sometimes as many as twelve or sixteen bars, and seldom less than three. They generally terminate with the perfect or imperfect cadence, or with a chord of the seventh and a pause, and may be classified as follows: (1) Those consisting of a train of simple chords, chiefly derived from the bass; (2) those formed of plain harmonies, with suspensions; (3) those which consist of a number of deceptive or interrupted cadences; (4) those formed of sequences variously elaborated; and (5) those of a more abstruse character, in which harmonies of a foreign, and even discordant, nature are introduced. An organ-point is sometimes *double*, the former part having the dominant for its bass, and the latter part the tonic or keynote. Instances are occasionally found of *inverted* organ-points, or those in which the holding-note is not in the bass, but in one or more of the upper parts. WM. STAUNTON.

Organ-Stop. See STOP.

Or'ganzine [It. *organzino*] is silk which has been wound, cleaned, thrown, and twice or thrice doubled and twisted. It is also known as "thrown silk."

Or'geat [Fr.], a flavoring substance much used in medicinal and other drinks, especially in France. It is essentially a syrup of sweet and bitter almonds, and possesses a rich almond flavor, but it is often modified by the use of other ingredients. The *Amande de terre*, the bulb of *Cyperus esculentus*, is a good substitute for true almonds in this preparation.

Orge'torix, a wealthy and noble Helvetian who formed a conspiracy among the nobility, and persuaded the people themselves to go forth from their territory with all their possessions (B. C. 61); was appointed to carry out the necessary arrangements; persuaded Casticus of the Sequani and Dumnorix of the Ædui to seize upon the supreme power in their states, assuring them that he should obtain the sovereignty of his own. His plans having been disclosed, he was brought to trial. By the aid of his friends and retainers he rescued himself, but died soon after—many thought by his own hand. HENRY DRISLER.

O'ria [anc. *Uria, Hyria*], town of Italy, province of Lecce, situated on an elevation between two lakes, about 20 miles from Brindisi. Here are cotton and other manufactories of some importance. The foundation of Oria is pre-historic. It was twice sacked and burnt by the Saracens (924–977); in the time of the Suabian Frederick II. it was a walled and fortified town; in the fifteenth century it was the chief place of refuge for Christians flying from Constantinople; later, having become a possession of the Borromeo family, St. Charles sold it for 40,000 ducats, which he distributed among the poor in a single day. It is a bishop's see. Pop. 7085.

Oria'ni (BARNABA), b. at Garegnano, near Milan, about 1750. His teacher in mathematics was Lagrange, to whom he succeeded as astronomer, and he continued the *Effemeridi Astronomiche*, which had been begun by his great master. He strove to perfect a map of the kingdom of Italy, and the observatory of Milan is largely indebted to him. Oriani was a man of very noble character, and he was complimented with various decorations and the membership of many learned societies. His principal publications are—*Lettera ad un Amico Astronomo*, etc.; *Lettere Astronomiche*, etc.; *Risposta alle Note che l'Abate Frisi fece*, etc.; *Obliquità dell'Eclittica dedotta dalle Osservazione solstiziali*, etc.; *Distanza dallo Zenit del Sole e delle Stelle fisse presso il Meridiano; Rifrazione osservata*, etc.; *Elementi di Trigonometria Sferoidica.* D. in Milan Dec., 1832.

Oriba'sius ['Ορειβάσιος], a Greek physician, b. at Pergamus (not at Sardis), according to Eunapius, who is the principal authority for his life, in the early part of the fourth century, A. D. He studied first at Pergamus, then at Alexandria under Zeno of Cyprus. He early acquired a high reputation, and was taken by Julian with him to Gaul as his physician (A. D. 355), and when Julian succeeded to the imperial throne (A. D. 361) he made Oribasius quæstor of Constantinople. Oribasius accompanied the emperor on his last fatal expedition against the Persians, and attended him on his deathbed. He was banished, with loss of property, by Julian's successors, but was afterward recalled with honor, and lived quietly to the end of the century; the exact date of his death is not known. We have from Oribasius three works; the largest and most important, which was composed at the request of and dedicated to Julian, is entitled Συναγωγαὶ Ἰατρικαί, and consists of selections from Galen and other medical writers, divided into 70 or 72 books. He also prepared an abridgment of this, entitled Σύνοψις, in 9 books, for his son, Eustathius; and a shorter condensation in 4 books, entitled Εὐπόριστα, addressed to his friend and biographer, Eunapius. Of the larger works considerable portions are lost or exist only in manuscript; the two abridgments have been published only in Latin translations. The best edition of the extant works of Oribasius is that of Bussemaker and Daremberg, with a French translation (Paris, 1851–60, 6 vols. 8vo). HENRY DRISLER.

O'riel Window [Late Lat. *oriolum*, an "opening," also a "chamber"], called also **Bow** (or **Bay**) **Window,** is a window which projects from the side of the house, and has three glazed sides. It is often divided by mullions.

O'rient, post-v. and tp., Aroostook co., Me. Pop. 219.

Orient, tp. of Osceola co., Mich. Pop. 54.

Orient, post-v. of Southold tp., Suffolk co., N. Y.

Orient (JOSEPH), b. at Burbach, Westphalia, in 1677; studied painting under Faistenberger, and was appointed vice-director of the imperial collection of pictures at Vienna, where he d. in 1737. He painted a great number of landscapes, which were much appreciated in his time, partly on account of a really effective rendering of nature, partly on account of an unusually brilliant and refined coloring. Several of his pictures were engraved by Leichsenring and Rosel, and became very popular, though they subsequently fell into neglect. (See Meusel, *Deutsche Künstler-Lexikon;* and Nayler, *Künstler-Lexikon.*)

Or'iflamme [Fr., from Lat. *auri flamma*, "golden flame"], the ancient battle-standard of France, once a banner belonging to abbey of St. Denys. After 1124, when it was adopted as a royal standard by Louis VI., it was often borne in battle, but seems never to have been employed after the battle of Agincourt in 1415. The accounts of its form and color differ considerably, but it was of flame-colored silk beautifully adorned.

Or'igen, surnamed ADAMANTIOS, which he received from his untiring energy, one of the most learned and spirited of the Christian Fathers, b. at Alexandria in 185; was early initiated both in Christianity by Clemens Alexandrinus and in Greek wisdom by his father, Leonides, who was a teacher of rhetoric. During the persecutions which took place in the reign of Severus, Leonides suffered martyrdom, and the son now undertook to maintain the family by opening a school, in which at first he simply taught the Greek language and literature, but soon also

began to expound the doctrines of Christianity with great success. He sold his library and subjected himself to the severest asceticism, at the same time pursuing his mental development with unflagging vigor. He made an exhaustive study of Greek philosophy, and became a pupil of Ammonius Saccas, and during a visit to Rome he made himself master of the Hebrew language. His school, which he still continued, prospered in spite of occasional disturbances by the pagans, and his fame increased. In 228, Demetrius, bishop of Alexandria, sent him to Greece to disperse some heresy which had lately arisen there. On his return he visited Palestine, was everywhere received with great attention and invited to preach, and at Cæsarea he was ordained a presbyter. This ordination Demetrius refused to recognize as valid, partly because it was not given by the bishop of that diocese to which Origen belonged, partly because he knew that Origen, misunderstanding the passage in Matt. xix. 12, had mutilated himself. Two synods held in Alexandria supported the bishop; and as the broad and liberal views which Origen held on many points, and the critical examination and allegorical explanation to which he subjected the Scriptures, had made him many enemies, the second synod even condemned several of his ideas as heretical, and excommunicated him. In the West, where his writings were very little known, the case attracted no attention, but the bishops of the East—of Syria, Palestine, and Arabia—declared for him, and he found refuge in Cæsarea, where he reopened his school with still greater success. During the persecutions under Maximinus he fled to Cappadocia, where he lived for two years. Under Gordianus he returned and continued his beneficial activity, but the sufferings and torture to which he was subjected during the Decian persecution broke his strength; he d. at Tyre in 254. Of his many writings (6000, it is said) only a few have come down to us. Of his *De Principiis* there exists only a free and perhaps even interpolated translation into Latin by Rufinus, edited by Redepenning (Leipsic, 1836) and by Schnitzer (Stuttgart, 1836). Of his *Hexapla*, an edition of the Old Testament in six parallel columns in Hebrew, Hebrew text in Greek letters, and in the four versions by Aquila, Symmachus, the Septuagint, and Theodotion, we have only fragments, edited by Montfaucon (2 vols. fol., Paris, 1713). The beautiful treatise on martyrdom and the celebrated eight books against Celsus, an apology for Christianity, are entire. Complete editions of what remains of his works have been given by De la Rue (4 vols. fol., Paris, 1733–59) and by Lommatzsch (25 vols., Berlin, 1831–48), and an English translation in "Clark's Library." (See Redepenning, *Origenes, eine Darstellung seines Lebens und seiner Lehre*, Bonn, 1841–46.)

Orig′inal Sin (*peccatum originale*) is that act or state of sin from which all other sins originate. It is distinguished into *original sin imputed*—*e. g.* the guilt of Adam's apostasy charged to his descendants (see IMPUTATION)—and *original sin inherent*—that innate subjective moral corruption which is inherited by all men at birth, and which is the immanent cause of all actual transgression. The term is taken in the latter sense in this article, the *peccatum habituale* as distinguished from the *peccatum actuale*. It is proposed to state in historical order the principal opinions which have been entertained, first, as to its *nature* and *extent*, and, second, as to the manner of its propagation.

I. *Its Nature and Extent.*—*Opinions prevalent* (A.) *before the Controversies of Augustine with Pelagius.*—There prevailed no definite and generally accepted views as to the nature and extent of the moral ruin wrought in human nature in consequence of Adam's sin. All agreed in the fact of a sinful taint, and of the need of redemption. The Eastern portion of the Church generally, and more particularly the Alexandrian school founded by Origen, in extreme reaction alike from Gnostic and from Neo-Platonic dualism, emphasized the self-determining power of the human will and man's responsibility, and consequently his ability to co-operate with any divine assistance vouchsafed for his recovery. On the other hand, the Latin Fathers, especially Tertullian, Hilary, and Ambrose, the immediate teacher of Augustine, emphasized hereditary sin and guilt, and the absolute dependence of the soul upon grace.

(B.) *The Opinions entertained by the several Parties to the Anthropological Controversies of the Fifth Century.*—(1) Pelagius and his party held that Adam's sin injured only himself; that men are now born in the same moral state in which they were created; that *liberum arbitrium*, the power to choose indifferently good or evil, is essential to moral responsibility in every stage of action, and an inalienable prerogative of human nature. Hence man is morally well. (2) The *Semi-Pelagians* held that human nature is seriously injured by Adam's sin, and that hereditary corruption is a fault or disease, rather than a sin properly so called, since it involves no guilt (either *reatus pœnæ* or *culpæ*) previous to actual transgression. Man can choose and attempt the good, but through weakness is unable to effect it. Hence they denied *gratia preveniens*, predisposing grace, but admitted the necessity of *gratia co-operans*, which is rendered efficient by the spontaneous co-operation of the human will. (3) Augustine taught that the apostasy of Adam, in whom all men sinned, is the common guilt of all his natural descendants, who, while retaining freedom in the sense of rational spontaneity, come into being spiritually dead, unable either to begin or to effect any really good act before God—free only to sin, and dependent for salvation upon unmerited, sovereign, omnipotent grace. Before regeneration the soul can only resist grace; afterwards, by the assistance of grace, it may co-operate with grace. Hence the necessity of *gratia preveniens*, disposing grace, *gratia operans*, regenerating grace, and *gratia co-operans*, grace assisting the regenerated to every holy act. (See G. F. Wiggers, *Hist. of Augustinianism and Pelagianism*, pt. i. and pt. ii. For the history of the condemnation of Pelagianism and the adoption of Augustinianism in the Roman Catholic Church, see ARMINIUS and CALVINISM.)

(C.) *The Tridentine Doctrine*, or the later Catholic doctrine formulated by the Council of Trent (1545–63). It is admitted that human nature bears the guilt of Adam's sin, is morally corrupted, and without grace helpless. It distinguishes, however, between the *dona naturalia*, the soul with its constitutional faculties, and the *dona supernaturalia*, the superadded gift of supernatural righteousness. In the original creation all Adam's faculties, physical, intellectual, and moral, were in perfect equilibrium, the lower held in due subordination to the higher. To confirm this equilibrium, God added the gift of original righteousness. This supplementary gift Adam lost for himself and his descendants, and this loss (1) involves guilt; (2) leaves the natural powers in a state of instable equilibrium, so that the free will certainly falls into actual transgression as soon as moral agency commences. Yet man may seek the grace offered in baptism, which effects justification *ex opere operato* in all non-resistants (*non ponentibus obicem*). "Original sin" in the Roman Church consists, therefore, in the loss of "original righteousness," which nevertheless involves "obliquity of will from God;" and yet free will must co-operate with grace. (See *Counc. of Trent*, sess. 6, 1, 3, 5, 7; Bellarmine, *Amiss.*, gr. iv. 3 and v. 17.)

(D.) *All the original Protestant Churches, Lutheran and Reformed*, agree, as to "original sin," that it includes (1) moral corruption of the whole man as well as the loss of "original righteousness." (2) This implies no physical change in the substance of the soul, but a depraved moral habit. (3) All the faculties, intellectual as well as emotional or volitional, as far as they relate to moral objects, are depraved. (4) This depravity, although admitting many civil virtues, is called total, because (1st) the whole man is involved; (2d) the breach with God is complete, and, without supernatural aid, irremediable; (3d) the tendency is ultimately to all sin. (5) This condition involves guilt (both of blame and punishment). Some say, because all sin is inherently blameworthy; others say, because it originated in Adam's abuse of free-will, for which we are all responsible. (6) Man is morally impotent to change his own general disposition to evil. Hence he cannot co-operate with grace before regeneration, but afterwards by the continued operation of grace the free will acts graciously. (See *Form of Concord* (Hase), pp. 639, 640, 645, 662, 681; *Gal. Conf.*, art. ii.; *Heidel. Cat.*, ques. 7–10; *West. Conf. Faith*, chs. 6, 9; *Thirty-nine Articles*, art. 9.)

(E.) *The Arminian Doctrine*, as held by the Dutch Remonstrants, regarded "original sin" rather as a fault or defect of nature than a sin. As held by the Wesleyans, it admits that man's nature is corrupted, indisposed, and disabled from all spiritual good. But both parties differ from the Lutheran and Reformed churches in holding (1) that it involves no guilt, since it is not brought upon us by our own agency; and (2) that every soul retains power to co-operate with the grace with which God for Christ's sake endows every soul. (*Conf. Remonstr.*, pp. 84 and 162; and Dr. D. D. Whedon in *Bib. Sacra*, Apr., 1862.)

(F.) *The Socinian and Rationalistic doctrine* is nearly the same with that of Pelagius, above stated. There is no innate corruption. Sin is propagated by example. Man always retains plenary power to do all God requires of him. There is no grace beyond providential advantages and objective instruction. (*Racov. Cat.*, p. 294 and ques. 428–430.)

II. *The Mode of its Propagation.*—(1) Origen taught the doctrine of the pre-existence of human souls, and their personal sin and *self*-corruption in a previous state of probation. This view, which denies the propagation of inherent

corruption from Adam altogether, has been revived in this age by Dr. Edward Beecher in his *Conflict of Ages.* (2) Tertullian taught the doctrine that souls as well as bodies are derived by generation from parents, and that sin, like every essential quality and many acquired accidents of nature, is propagated *ex traduce.* Augustine hesitated to decide between this origin of souls and their immediate creation. Many of the Greeks were creationists, and many of the Latins traducianists. Since the Reformation most of the Lutherans have been traducianists, and most of the Reformed creationists. (3) Jerome held that each soul was immediately created by God. Creationists account for inherent moral corruption either (*a*) *per corpus*—that is, from the union of the soul with a body in which sin is propagated by generation (*Lampe* (Utrecht, 1683–1729), tom. i., p. 572) or (*b*) *per culpam*—from the judicial withholding from the new created soul of the life-supporting influence of the Holy Ghost, as the punishment of Adam's first sin. (Dr. R. Ridgeley (Lon., 1667–1734); Turretine, L. ix. Ques. 12.) A. A. Hodge.

Orihue'la, town of Spain, province of Alicante, is on both sides of the Segura, in the middle of a most fertile plain. It has manufactures of hats, linen and silk fabrics, and paper, and many corn and oil mills. Pop. 9933.

Oril'lia, post-v. of Simcoe co., Ont., Canada, on Lake Couchiching, and on the Northern Railway, 90 miles from Toronto. It is the seat of a provincial lunatic asylum. The town is connected by steamboat with Lake Simcoe and the Muskoka country. It has a good trade, and 1 monthly and 2 weekly papers. Pop. 1322.

Orino'co, a river of South America, rises in lat. 3° 40′ N., in the Sierra Parime, flows first in a northern, and after its junction with the Apure in a western, direction, and enters the Atlantic in lat. 8° 40′ N., through a large delta. After its junction with the Apure, 777 miles from its mouth, it is navigable; above that point its navigation is made impossible by numerous rapids and cataracts. It receives 436 rivers and nearly 2000 streams, and at Bolivar, 250 miles from its mouth, it is 4 miles broad and 390 feet deep. Its waters rise from April to October, and attain their greatest height, from 30 to 36 feet, in July and August; large portions of the surrounding llanos are then overflowed. Of the cataracts of its upper course, those at Atures and Maypures are celebrated for their romantic beauty.

O'riole [Lat. *aureolus*], a name properly belonging to bright-colored Old-World birds of the genus *Oriolus* and the family Merulidæ; but in the U. S. the name is given to various brightly-colored birds of other families, especially to the Baltimore oriole. (See Baltimore Bird.) The only European oriole is the *O. galbula*, or golden oriole.

The Golden Oriole.

Ori'on [Gr. Ὠρίων]. This well-known constellation is mentioned (Job ix. 9; xxxviii. 31) by the Hebrew word *cesil*, which signifies a "fool," and also an "impious, godless man," called by the Arabs "the giant." The giant of ancient astronomy was Nimrod, who was fabled to have been bound to the sky for his impiety. The Greek mythology in various ways represents him as a giant who was slain by Diana, who in remorse placed him among the stars. The constellation is represented by the figure of a man with a sword by his side. Though a southern constellation with regard to the ecliptic, the plane of the equator passes through its middle. It contains seven conspicuous stars; the three forming the belt are also called "Jacob's staff" and the "yard wand." One of the most remarkable nebulæ of the heavens is situated in the sword-handle of Orion.

Orion, post-tp. of Pike co., Ala. Pop. 1530.

Orion, tp. of Fulton co., Ill. Pop. 1082.

Orion, post-v. of Henry co., Ill., on the Peoria and Rock Island and the Rockford Rock Island and St. Louis R. Rs., 25 miles from Rock Island, has several churches and manufactories, 1 newspaper, and the usual stores. Grain is the chief article of trade. Pop. about 1500.
Frank Seaton, Ed. "Chief."

Orion, post-v. and tp., Oakland co., Mich. Pop. of v. 304; of tp. 1151.

Orion, tp. of Olmsted co., Minn. Pop. 637.

Orion, post-v. and tp., Richland co., Wis. Pop. 697.

Oris'kany, post-v. of Whitestown tp., Oneida co., N. Y., near the mouth of the creek of the same name, on the Erie Canal and New York Central R. R. The battle of Oriskany was fought here Aug. 5, 1777. Pop. 584.

Oriskany Falls, post-v. in Augusta and Marshall tps., Oneida co., N. Y., on Oriskany Creek, has 1 weekly newspaper. Pop. 628.

Orista'no, town of Sardinia, province of Cagliari. It is situated in a well-cultivated region near the gulf of the same name, and is the residence of commercial agents of England, France, Germany, Sweden, and Norway. Of its solid old fortifications only two towers now remain, and the castle is converted into a prison. The Tirso sometimes becomes a furious torrent in winter and spring, and does great mischief to the town and neighborhood. The trade of Oristano, once comparatively flourishing, is now of little importance, owing to the lack of commercial facilities. In the fifteenth century this town was foremost in sustaining Sardinian independence. Pop. 6996.

Oriza'ba, town of Mexico, state of Vera Cruz, lies in a beautiful, forest-clad valley at the foot of the famous volcano of the same name. It has several good educational institutions, an extensive cotton-spinning factory, and other manufactures. Pop. about 20,000.

Ork'ney Islands, a group of 67 islands, of which 28 are inhabited, lie off the northern coast of Scotland, from which they are separated by Pentland Frith. They comprise an area of 244 square miles, with a population of 32,395. The largest is Pomona or the mainland; the most remarkable among the others are South Ronaldshay, Hoy, Flotta, Ronsay, and Sanda. With the exception of the Hoy, which is rocky and mountainous, its western coast reaching a height of 1600 feet, the Orkney Islands are low, presenting an irregular coastline, in some places rocky, in others sandy. The climate is mild, considering the northern latitude; frosts are very rare, but the summers are often chilly, and always moist. Agriculture produces barley, oats, and potatoes, and sheep and cattle are extensively reared. Fishing, hunting for wild birds and eggs, rearing of poultry, and distilling are important occupations; 100,000 lobsters are annually shipped to the market of

London; 20,000 gallons of whisky are annually produced from the distilleries of Kirkwall, the capital. From the earliest times the Orkney Islands were often visited by the Norwegians, who in 876 conquered them, together with the Hebrides. During the tenth and eleventh centuries they were ruled by independent Scandinavian jarls, until in 1098 they were formally annexed to the Norwegian crown. In 1397 they were united to Denmark, and in 1468 the Danish king, Christian I., gave them to the Scotch king, James III., who married his daughter, as a security for her dowry. The dowry was never paid, and in 1590 the islands were formally turned over to Scotland. The value of exports amounted in 1861 to £181,483.

Or'land, post-v. and tp., Cook co., Ill. Pop. 1130.

Orland, post-v. of Steuben co., Ind.

Orland, post-v. and tp., Hancock co., Me., on the Penobscot River. Pop. 1701.

Orlando, post-v., cap. of Orange co., Fla.

Orléanais', an ancient province of France, situated nearly in the centre of the country, bounded by the provinces of Ile de France, Champagne, Burgundy, Berry, Touraine, Maine, Perche, and Normandy, consisted of Orléanais proper, with the capital of Orléans; Beauce, comprising Pays Chartrain, Dunois, and Vendomois, with the capital of Chartres; Blaisois, with the capital of Blois; and Gatinais-Orléanais, with the capital of Montargis. Its territory constitutes the three departments of Loire-et-Cher, Eure-et-Loire, and Loiret, and parts of Indre, Indre-et-Loire, Nièvre, and Yonne.

Orléans', city of France, capital of the department of Loiret, on the right bank of the Loire, which here is crossed by a magnificent bridge of nine arches. It has many fine promenades, handsome public squares, and elegant buildings, among which the cathedral is one of the most magnificent Gothic edifices of France; but generally the town is ill built. Its educational institutions, especially its medical schools, its museums, and its collections are excellent, and its sugar-refineries and manufactures of vinegar and woollen fabrics are very extensive. It contains three beautiful statues of Joan of Arc, the "Maid of Orleans." Pop. 48,976.

Or'leans, parish of Louisiana, extending N. and E. from the Mississippi River, and bounded N. by Lake Pontchartrain and S. E. by Lake Borgne. It is low and level, and mostly subject to overflow. The leading agricultural industry is gardening for the New Orleans market. The important manufacturing and commercial interests of the parish are described in the article NEW ORLEANS (which see). The parish is traversed by several railroads, centring at New Orleans, the capital. Pop. 191,418.

Orleans, county of W. New York, bounded N. by Lake Ontario. Area, 405 square miles. It is uneven and generally fertile. Agriculture is the leading industry. Live-stock, grain, hay, wool, tobacco, dairy products, beans, potatoes, and fruit are extensively raised. Lumber, cooperage, lime, carriages, flour, etc. are leading articles of manufacture. Sandstone, hydraulic, and ordinary limestone, and salt springs are found at various points. The county is traversed by the Rochester and Niagara Falls R. R. and by the Erie Canal. Cap. Albion. Pop. 27,689.

Orleans, county of Vermont, bounded N. by Canada. Area, 700 square miles. It is hilly and in part mountainous, but is mostly a good farming region. Grain, wool, potatoes, and dairy products are the agricultural staples. Lumber, starch, carriages, are articles of manufacture. The county is traversed by the Connecticut and Passumpsic Rivers R. R. Cap. Irasburg. Pop. 21,035.

Orleans, post-v. and tp. of Humboldt co., Cal., on Klamath River, has 1 weekly newspaper and considerable mining interests. Pop. 173.

Orleans, post-v. and tp., Orange co., Ind., on the Louisville New Albany and Chicago R. R. Pop. of v. 905; of tp. 1865.

Orleans, post-v. of Washington tp., Appanoose co., Ia. Pop. 38.

Orleans, tp. of Winneshiek co., Ia. Pop. 674.

Orleans, post-v. and tp., Alleghany co., Md. Pop. 633.

Orleans, post-v. and tp., Barnstable co., Mass., on Nansett Harbor and Cape Cod division of Old Colony R. R. Pop. 1323.

Orleans, post-v. and tp., Ionia co., Mich, on the Detroit Lansing and Lake Michigan R. R. Pop. 1426.

Orleans, post-tp., cap. of Harlan co., Neb., has 1 weekly newspaper.

Orleans, tp. of Jefferson co., N. Y., on Lake Ontario, and on the Sodus Point and Southern R. R. Pop. 2445.

Orléans', Duchy of, consisting of Orléanais proper, with the capital of Orleans, formed a countship under the Carlovingian and Capetian dynasties, but was erected into a duchy in 1344 by Philip VI. of the house of Valois, and given to his son as an appanage. Subsequently, it was held in the same way by different younger branches of the reigning families of Valois and Bourbon. Thus LOUIS, the second son of Charles V. of Valois, and for a time lieutenant-general of France during the insanity of his brother the king, Charles VII., received the duchy of Orleans in 1392 as a fief, and after his death, in 1407, his son CHARLES held it to 1465; but when, in 1498, his grandson, LOUIS, ascended the throne of France as Louis XII., it returned to the French crown. In 1626 it was bestowed on JEAN BAPTISTE GASTON, brother of Louis XIII., the youngest son of Henry IV. of the house of Bourbon, and famous in history for the unflagging steadfastness with which he formed one conspiracy after the other against Richelieu, and the cynical treachery with which he every time sacrificed his accomplices; he died in 1660, leaving no male heirs. But the most remarkable of the several families which have held the title and possessions of the duchy is that descending from the younger brother of Louis XIV., PHILIP, a son of Louis XIII., b. in 1640, married in 1661 to Henrietta of England, and after her death, in 1671, to Charlotte Elizabeth of Bavaria; d. in 1701. He fought with distinction in the Netherlands, but was deprived of his command by the jealousy of Louis XIV. When the grandson of Louis XIV., the duke of Anjou, ascended the Spanish throne, he renounced his right of succession to the French possessions of the house of Bourbon, and thus the line of Orleans would be the legitimate heir of the French crown in case of the extinction of the elder Bourbon line. The second duke, PHILIP, generally known under the name of the "Regent," son of the preceding, b. in 1674, married in 1692 to Mademoiselle de Blois, a daughter of Louis XIV. and Madame de Maintenon; d. in 1723; was a man of brilliant gifts, but early ruined, bodily and mentally, by dissipation. He distinguished himself in the campaigns in Holland, Italy, and Spain, but was removed, like his father, from active service by the jealousy of the king, and at one time even banished from the court. He spent his time in the most extravagant debaucheries and in studying chemistry, which latter occupation gave rise to the rumor that he poisoned those members of the royal family who stood between him and the throne. After the death of Louis XIV. he governed France with absolute power during the minority of Louis XV., and his government shows several features which command respect. Immediately on his accession to power the Stuarts left France, the Jesuits lost all influence, the enormous standing army was dissolved, the interest on the debt was paid, an alliance with England was formed, and the intrigues and schemes of Alberoni were baffled. But, on the other hand, his participation in the financial operations of Law looks very suspicious; his notorious speculations in salt and corn were infamous; and his example dragged the morals of the French court down into utter degradation. His great-grandson, LOUIS PHILIPPE JOSEPH, fifth duke of Orleans, but best known under the name of PHILIPPE ÉGALITÉ, was b. at St. Cloud Apr. 13, 1747, and married, in 1769, Adelaide of Bourbon-Penthièvre, a great-granddaughter of Louis XIV. and Madame de Montespan, who brought him immense wealth. Between him and the queen, Marie Antoinette, there seems to have existed a natural antipathy which soon grew into hatred. He became the head of the party of the princes which was formed at the court in opposition to the queen, and it was generally believed that the libels and other humiliations which befel the queen were instigated and prepared by him. As a member of the Assembly of the Notables in 1787 he declared that the States General alone had the right of imposing taxes, and when the States General met in 1789, he was one of the first of the nobility who sided with the third estate. Thus he became immensely popular, and for a moment the opposition to the royal government actually gathered around him. But soon he was caught by the whirlwind of the Revolution and carried to destruction. He became a prominent member of the Jacobin Club, renounced his titles, and assumed the name of Citizen Égalité, and finally even voted for the execution of the king. Nevertheless he was suspected. Apr. 6, 1793, he was arrested, tried at Marseilles, and acquitted; but Nov. 6 he was brought before the Revolutionary tribunal of Paris, found guilty, and executed the same day. He had, no doubt, certain confused ideas of his own concerning liberty and equality, originating from a superficial acquaintance with the constitution of England, which country he had visited several times, and from the fantastic philanthropism inspired by his mistress, Madame de Genlis; but early dissipation and debaucheries had un-

nerved him personally, and hurt his position. His actions were governed first by ambition, afterwards by despair; he first tried to win the crown, then to save his wealth. But he ended by being a puppet in the hands of the radicals. His grandson, FERDINAND, the eldest son of Louis Philippe, was b. at Palermo, Sept. 3, 1810, and educated in Paris at the College of Henry IV. He distinguished himself greatly in Algeria, and his many noble qualities made him much beloved in France; but he was killed, July 13, 1842, by accident, his horses running wild. In 1837 he married Hélène of Mecklenburg-Schwerin, who bore him two sons —Louis Philippe, count of Paris, Aug. 24, 1838, and Robert duke of Chartres, Nov. 9, 1840. CLEMENS PETERSEN.

Orleans, Maid of. See JOAN OF ARC.

Orloff′, a Russian family, which became noted during the reign of Peter the Great, and rose to eminence by the revolution of July 9, 1762. There were five brothers, and Catharine II. made them all counts and gave them high offices, great honors, and rich dotations. The two most remarkable were GREGORI and ALEXEI. The former, b. in 1734, was the lover of Catharine, and from the son she bore him descend the Counts Bobrinski, a family still flourishing. He is said to have planned and conducted as the chief leader the whole revolution by which Peter III. was murdered and Catharine II. established on the throne; but his rudeness and violence subsequently alienated him from the empress. He was banished from the court, lived in exile at Tzarskoe Selo, travelled much, and d. insane at Moscow in 1783.—The latter, b. in 1737, is said to have strangled the emperor with his own hand, and became celebrated as commander of the Russian fleet in Archipelagus. At Tchesme he vanquished and destroyed the Turkish fleet, July 7, 1770, whence he received the surname of Tchesmenski. Under Paul he was banished from the court, and d. on his estate in 1808.—From a third brother, FEDOR, b. in 1741, d. in 1796, descend the present members of the family through his four illegitimate sons.—The most remarkable of these was ALEXEI, b. in 1787. He entered the army, served in the campaigns of the French war, became aide-de-camp to Alexander I., and distinguished himself greatly during the military insurrection at St. Petersburg Dec. 26, 1825. After that time Nicholas always showed great confidence in him, and he proved a very able diplomatist; he negotiated the treaties of Adrianople in 1829 and Unkiar-Skelessi in 1833. In 1844 he took charge of the secret police of Russia, and the ability he showed in this position was acknowledged by all. At the Congress of Paris in 1856 he represented Russia, and was made a prince. D. at St. Petersburg May 21, 1861.—The present head of the family is NIKOLAI, son of the preceding, b. in 1827, and since 1872 Russian ambassador in Paris.—There is another Russian family, the counts of Orloff-Denissoff, prominent among the Cossacks of the Don, and conspicuous in the military history of the country, but not related to the above-mentioned family.

Orme (ROBERT), F. S. A., b. at Anjenga, Travancore, India, Dec. 25, 1728, son of a physician in the service of the East India Company; educated at Harrow; went to Calcutta 1742; held various offices; settled in London 1760; appointed historiographer to the East India Company; published *A History of the Military Transactions of the British Nation in Indostan* (3 vols., 1763–78) and a volume of *Historical Fragments of the Mogul Empire* (1782), to the second edition of which (1805) a *Life* of the author was prefixed. D. at Ealing, near London, Jan. 13, 1801.

Orme (WILLIAM), b. at Falkirk, Scotland, in 1787; was minister of Congregational churches at Perth and Camberwell, and became foreign secretary of the London Missionary Society; author of *A Historical Sketch of the Translation and Circulation of the Scriptures* (Perth, 1815), *Memoir of John Owen, D. D.* (1820), and *Bibliotheca Biblica* (1824), with carefully prepared notices, biographical, critical, and bibliographical. D. at London in 1830.

Orme′a (*Ulmea, Ulmeta*), town of N. Italy, province of Cuneo, about 30 miles S. of Mondovì and 2200 feet above the sea. Its old walls are in ruins, and there are no public buildings of importance. This place was the subject of much contention among the feudal lords of N. Italy. Pop. 5308.

Ormerod (GEORGE), F. R. S., F. S. A., b. at Manchester, England, in 1785; educated at Brasenose College, Oxford; author of *The History of the County Palatine and City of Cheshire* (3 vols. folio, 1819), one of the most valuable of the English county histories; edited several volumes for the Chetham Society, and published several other works in the departments of archæology and heraldry. D. at Sedbury Park Oct. 9, 1873.

Ormolu′ [Fr., "milled gold"], or **Mosaic Gold,** an alloy of zinc and copper, containing from 25 to 75 parts of zinc in 100 of the alloy, a considerable proportion of the zinc being volatilized, unless the lowest possible temperature be employed in fusing the metals. The fused mass is kept until it takes on a white color, when it is cast at once, for if remelted it becomes a comparatively worthless kind of brass. It is largely employed in making household ornaments, which are colored by pickling in dilute oil of vitriol and then washed and varnished. (See MOSAIC GOLD.)

Or′mond (JAMES **Butler**), FIRST DUKE OF, b. at London, England, Oct. 19, 1610; educated by Archbishop Abbot as a ward of the king; succeeded to the earldom of Ormond on the death of his grandfather 1632; was commander of the royal troops in Ireland as lieutenant-general during the insurrection of 1641; was created marquis 1642; was forced to make a disadvantageous armistice with the rebels 1643; became lord-lieutenant 1644; resigned his office to the Parliamentary commissioners, and retired to France 1647; proclaimed Charles II. in Ireland, and made an unsuccessful attempt to capture Dublin 1649; was driven from Ireland by Cromwell Dec., 1650; was created duke by Charles II. 1660; was viceroy of Ireland 1662–69; Chancellor of the University of Oxford 1669; narrowly escaped assassination by Col. Blood 1670; again viceroy of Ireland 1676–85, and made a duke in the English peerage 1682. D. at Kingston Hall, Dorsetshire, July 21, 1688.

Ormond (JOHN J.), an able lawyer of Tuscaloosa, Ala., was associate judge of the State supreme court in 1837–48, and was famed for the uprightness of his decisions; a liberal Whig in politics. D. at Tuscaloosa in 1865.

Orms′by, county of Nevada, extending E. from Lake Tahoe, on the California State line, to El Dorado Cañon. Area, 200 square miles. It is mountainous, with some fertile valleys. Lumbering is the chief industry, but gold and silver quartz-mining is also carried on. Carson City is the capital of the county and State. Pop. 3668.

Ormsby, post-b. of Allegheny co., Pa. Pop. 2225.

Orms′kirk, town of England, county of Lancaster, has some manufactures of silk and cotton, and rich collieries in the vicinity. Pop. 6426.

Or′mus, a small island 12 miles in circumference, lies in the Strait of Ormus, at the entrance of the Persian Gulf, and belongs to the sultan of Muscat. It is important now only on account of its salt-works, in which some 500 men are employed, but in the sixteenth and seventeenth centuries, when it belonged to the Portuguese, it had a large and wealthy city, the entrepôt of the European-Indian commerce, fortified and with 40,000 inhabitants. In 1622 the English helped the Persians to destroy the city.

Or′muzd [from the Zend *ahurô-mazdaô*, the "Spiritual, the Creator of all Things"], in the Zend, Magian, Guebre, or Parsee religion, is the supreme principle of good and the great enemy of Ahriman, the wicked one. In the Zoroastrian writings this name designates the absolute deity, who, according to that system of theology, included in one existence both the good and evil principles; but in later times, when the dualistic doctrine took on its later developments, the name Ormuzd was used to denote the principle of good, the friend of mankind, the enemy of impurity and wickedness.

Orne, department of France, part of the old province of Normandy, comprises an area of 2329 square miles, with 398,250 inhabitants. It is traversed by a range of wooded hills rising 1370 feet above the sea and rich in iron, copper, marble, and granite. To the north and south of these hills large pasture-grounds extend, where numerous cattle and horses are reared, the breed of horses enjoying the reputation of being the best in France. Hemp is extensively cultivated, and apples and pears for the fabrication of cider. Different kinds of manufactures, especially of metal-ware, are carried on. Of 44,919 children of school age, 8636 received no school education at all in 1857. Cap. Alençon.

Orne′ville, post-v. and tp., Piscataquis co., Me., on the Bangor and Piscataquis R. R. Pop. 575.

Ornithol′ogy [Gr. ὄρνις, "bird," and λόγος, "discourse"], that branch of zoology which treats of birds and the literature respecting them. The present article must be confined to an enumeration or account of some of the principal contributions to their classification; those alone which have essentially paved the way toward the systems now generally adopted can be noticed.

We look in vain in the ancient authors for any clear idea of the relations of the various groups of this class; birds are chiefly considered (*e. g.* by Aristotle) with relation to their food and the means by which they obtain it, or (*e. g.* by Belon and Aldrovandi) with respect to their adaptation for progression and their habitat. Willoughby,*

* *Ornithologiæ libri tres* (Londini, 1676)—a posthumous work edited by Ray.

and his commentator Ray,* first gave a reasonable arrangement of the constituents of the class, dividing it, primarily, into land and water birds; the former were then differentiated into those organized as birds of prey and those adapted for a less carnivorous or for a frugivorous diet; the latter were divided into waders and swimmers. The only feature of superiority in this system above previous attempts, however, was rather in an approach to a conception of the principles of classification than as an expression of morphological facts.

Linnæus † is celebrated as a systematist, and is looked up to as the father, to a great extent, of the modern methods; it is necessary, therefore, that his system should be alluded to. In the final edition of the *Systema Naturæ* (ed. 12, 1766) he divided the class into six orders—viz. (1) *Accipitres*, in which the bill is hooked and decurved; the upper mandible projecting beyond the lower, and on each side dilated or armed with teeth; and the feet provided with acute arched claws; (2) *Picæ*, in which the bill is cultriform and with the dorsal outline convex, and the feet short and quite strong; (3) *Anseres*, in which the bill is smooth, covered with an epidermis, and enlarged at the tip; the feet webbed, and with the tibiæ compressed and short; (4) *Grallæ*, in which the bill is subcylindrical, the feet elongated and adapted for wading, and the femora partially naked; (5) *Gallinæ*, whose species have the bill convex, the upper mandible arched above the lower, and the nostrils overarched by a cartilaginous membrane, the feet adapted for walking, and the toes rough beneath; and (6) *Passeres*, in which the bill is conical and pointed, and the feet slender, with the toes separated and adapted for hopping. It will be thus seen that these groups were based entirely on the consideration of the structure of the bill and feet, the other characters enumerated by Linnæus, but not here reproduced, relating to the body, food, and nesting habits, being quite subsidiary; but this classification was generally accepted, and the views involved therein prevailed with naturalists generally until very recent times, and even with the greater portion probably to-day. Cuvier ‡ in 1797 slightly modified the classification of Linnæus in its details, but the orders were essentially the same as those of his predecessor. Lacépède in 1799 divided the birds into two classes—differentiated because in the one case the leg is furnished with feathers, and in the other destitute of them. Fourteen orders were recognized. Meyer and Wolff § in 1810 primarily divided the birds into terrestrial and aquatic species; (*a*) the former into the orders (1) *Accipitres*; (2) *Coraces*; (3) *Picæ*; (4) *Oscines*, or singing birds; (5) *Chelidones*, including the swallows, swifts, and goatsuckers; (6) *Columbæ*, or the pigeons; and (7) *Gallinæ*; (*b*) the latter into the orders (8) *Grallæ*, or waders, and (9) *Natantes*, or swimming birds.

Illiger,‖ who attempted to reform the classification as well as nomenclature of the mammals and birds, presented an arrangement of the latter in which he grouped the various genera of birds into 41 families combined under 7 orders. The orders were distinguished, as by his predecessors, chiefly on account of the feet; the families by various characters, but more especially by the form of the bill and minor details of structure of the feet and wings. As the families were for the first time systematically introduced into this work, a synopsis of the system is worthy of reproduction:

ORDER I. Scansores, with families—1, Psittacini (parrots); 2, Serrati (toucans, plantain-eaters, etc.); 3, Amphiboli (cuckoos, etc.); 4, Sagittilingues (woodpeckers); 5, Syndactyli (jacamars).

ORDER II. Ambulatores, with families—6, Angulirostres (kingfishers, bee-eaters); 7, Suspensi (humming-birds); 8, Tenuirostres (sunbirds, hoopoes, etc.); 9, Pygarrhichi (creepers, Dendrocolaptes); 10, Gregarii (orioles, starlings, etc.); 11, Canori (song-birds); 12, Passerini (sparrows); 13, Dentirostres (motmots, hornbills); 14, Coraces (Corvidæ, birds of paradise, grakles, etc.); 15, Sericati (Ampelis, Procnias); 16, Hiantes (swallows, swifts, goatsuckers).

ORDER III. Raptatores, with families—17, Nocturni (owls); 18, Accipitrini (Falconidæ); 19, Vulturini (vultures).

ORDER IV. Rasores, with families—20, Gallinacei (fowls, etc.); 21, Epollicati (Ortygis, Syrrhaptes); 22, Columbini (pigeons); 23, Crypturi (tinamons); 24, Inepti (dodos).

ORDER V. Cursores, with families—25, Proceri (ostriches); 26, Campestres (bustards); 27, Littorales (shore-birds).

ORDER VI. Grallatores, with families—28, Vaginati (Chionis); 29, Alectorides (mixture); 30, Herodii (cranes, etc.); 31, Falcati (Tantalidæ); 32, Limicolæ (Scolopacidæ, etc.); 33, Macrodactyli (jacanas, rails); 34, Lobipedes (lobe-footed birds); 35, Hygrobatæ (incongruous mixture).

ORDER VII. Natatores, with families—36, Longipennes (Laridæ); 37, Tubinares (Procellariidæ); 38, Lamellosodentati (Anatidæ); 39, Steganopodes (swimmers with four anterior toes); 40, Pygopodes (swimmers with legs far back); 41, Impennes (penguins).

Many of the families thus introduced are more unnatural even than the explanatory examples would indicate. The classification, however, is worthy of remembrance, as being the first comprehensive recognition of the necessity of a more rigorous subordination of groups than had been previously admitted.

In 1812 a German zoologist, Blasius Merrem,¶ proposed a new arrangement, which was destined to be ignored by his contemporaries, but, in its primary features at least, after being almost dormant for half a century, to be revived and quite generally accepted. Instead of differentiating the class into orders distinguished by differences of bill, wings, and feet, he took the sternum as the essential feature, and divided the class primarily into two groups—(1) Aves carinatæ, in which the sternum was produced at the median line and provided with a keel; and (2) Aves ratitæ, in which the sternum was flat toward the middle and entirely destitute of a keel. The former (1) included all the ordinary birds, which were further differentiated into aërial birds (Aves aëreæ), including the Raptores, Pici, and Passeres; terrestrial birds (Aves terrestriæ), embracing the gallinaceous forms; water-birds (Aves aquaticæ), represented by the swimming types; and marsh-birds (Aves palustres), corresponding with the waders of other authors. The latter division (2) was limited to the ostriches, nandus, cassowaries, emus, and kiwis. The only really important modification introduced into the classification was the distinction of the two primary groups.

In 1815, Temminck ** proposed a classification which he subsequently modified, and which, as thus developed, for a time his reputation as a learned ornithologist made somewhat popular. He distinguished in the class at first thirteen, and later, when he embraced the extra-European types, sixteen orders, viz.:

1. Rapaces.	9. Pigeons.
2. Omnivores.	10. Gallinacés.
3. Insectivores.	11. Alectorides.
4. Granivores.	12. Coureurs.
5. Zygodactyles.	13. Gralles.
6. Anisodactyles.	14. Pinnatipèdes.
7. Alcyons.	15. Palmipèdes.
8. Chelidons.	16. Inertes.

This cannot be considered as an improvement on the systems of Temminck's predecessors.

In 1816, De Blainville †† proposed a new arrangement; the class was named Pennifères, and divided into 9 orders, commencing with the parrots—viz.: (1) les Préhenseurs (*Prehensores*) or parrots; (2) les Ravisseurs (*Raptores*) or birds of prey; (3) les Grimpeurs (*Scansores*); (4) les Sauteurs ou Passereaux (*Saltatores*); (5) les Pigeons (*Giratores*); (6) les Marcheurs ou Gallinacés (*Gradatores*); 7 les Autruches (*Cursores*); (8) les Echassiers (*Grallatores*); and (9) les Palmipèdes (*Natatores*). There is nothing specially noteworthy in this save the recognition of the ordinal values of the groups Prehensores and Cursores, and the application of the latter name for the Ratitæ of Merrem.

Mr. N. A. Vigors in 1823 read a memoir before the Linnæan Society of London ‡‡ on the classification of the class, which deserves special mention, less because of any improvements in classification than because in it was for the first time given a uniform nomenclature of families ending in *-idæ*. Vigors applied the fanciful quinarian system introduced by MacLeay to the arrangement of the birds, and divided the class into five orders—two (Raptores and Insessores), "endowed with feet formed for grasping," and three (Rasores, Grallatores, and Natatores), "endowed with feet incapable of grasping." These were subdivided into families, and in one case (Passeres) into 5 tribes. The leading groups are as follows:

ORD. I. Raptores, with the families—(1) Vulturidæ, (2) Falconidæ, (3) Strigidæ, (4) unknown, and (5) Gypogeranidæ.

---

* *Synopsis Methodica Avium et Piscium* (Londini, 1713).

† *Systema Naturæ.*

‡ *Tableau élémentaire de l'Histoire naturelle des Animaux* (Paris, 1797).

§ *Taschenbuch der deutschen Vogelkunde* (Frankfurt-am-Main, 1810).

‖ *Caroli Illigeri Prodromus Systematis Mammalium et Avium* (Berolini, 1811).

¶ *Tentamen Systematis Naturalis Avium* (in Abhandl. K. Pr. Akad. Wissensch., 1812).

** *Manuel d'Ornithologie, ou Tableau systématique des Oiseaux qui se trouvent en Europe* (Amsterdam et Paris, 1815).

†† *Prodrome d'une Nouvelle Distribution méthodique du Règne animal*, in *Bull. Soc. Philomatique de Paris* (1816).

‡‡ *Observations on the Natural Affinities that connect the Orders and Families of Birds*, in *Trans. Linn. Soc. London* (vol. xiv. pp. 395–517, 1825).

ORD. II. Insessores, with 5 tribes (1–2 of normal group; 3–5 of aberrant group) and 25 families—viz.:

(1) Dentirostres, with the families of normal group Laniadæ, Merulidæ; of aberrant group Sylviadæ, Pipridæ, Muscicapidæ.

(2) Conirostres, with the families of normal group Sturnidæ, Corvidæ; of aberrant group Buceridæ, Loxiadæ, Fringillidæ.

(3) Scansores, with the families of normal group Psittacidæ, Picidæ; of aberrant group Certhiadæ, Cuculidæ, Ramphastidæ.

(4) Tenuirostres, with the families of normal group Cinnyridæ, Trochilidæ; of aberrant group Promeropidæ? Meliphagidæ? Nectariniadæ?

(5) Fissirostres, with the families of normal group Hirundinidæ, Caprimulgidæ; of "typical group" Todidæ, Halcyonidæ, and Meropidæ.

ORD. III. Rasores, with the families of normal group Phasianidæ, Tetraonidæ; of aberrant group Struthionidæ, Cracidæ, Columbidæ.

ORD. IV. Grallatores, with families of normal group Ardeidæ, Scolopacidæ; of aberrant group Rallidæ, Charadriadæ, Gruidæ.

ORD. V. Natatores, with families of normal group Colymbidæ, Alcadæ; of aberrant group Pelecanidæ, Laridæ, Anatidæ.

Mr. Vigors thus groups the families into normal and aberrant, in pursuance of the views of Mr. M. S. MacLeay; for it is, says he, "certainly a more scientific mode of exhibiting the series of affinities" (op. cit. p. 426); but he preferred "to view it with more perfect or typical form in the centre," "and with its less perfect forms on each side." In this way the last of the "scientific" mode became always the first of the "convenient" mode, the sequence being otherwise the same, save that it was unbroken in the latter. The arrangement, it will be seen, practically starts with the assumption that all the types, down to families at least, were known, and consequently no provision or room was made for the extinct types that were to be afterward discovered. In other respects, too, whatever may be the "philosophical" value of the scheme, it is a most inapt expression of the morphological facts of avine structure, the only true basis for scientific classification.

In 1826, Sundevall,* an eminent Swedish naturalist, introduced an entirely new idea in his proposed arrangement of the class. Recalling that some species when hatched were almost featherless, blind, and incapable of taking care of themselves, while others were covered with down or feathers, fully endowed with sight, and able to run about at once, he proposed to consider these characteristics as of primary importance in the determination of the relations of species, and therefore divided the class into two legions: (1) Altrices, including those whose young were callow and incapable of taking care of themselves; and (2) Præcoces, comprising those competent of caring for themselves. In outline his classification is as follows:

SECTION ALTRICES.
- Legion Volucres.
  - Ord. 1, Passeres (Fringillidæ).
  - " 2, Oscines.
- Legion Gressores.
  - Ord. 1, Macrochires (Cypselidæ, Trochilidæ).
  - " 2, Pici (Picidæ).
  - " 3, Psittaci.
  - " 4, Coccyges (Rhamphastidæ, Bucconidæ, Cuculidæ, Galbulidæ, Alcedinidæ, Meropidæ, Bucerotidæ, Trogonidæ, Caprimulgidæ, etc.).
  - " 5, Accipitres.
  - " 6, Pullastræ (including Cracidæ, Menuridæ, Musophagidæ, and Columbidæ).

SECTION PRÆCOCES.
- Legion Cursores.
  - Ord. 1, Gallinæ.
  - " 2, Struthiones.
  - " 3, Alectorides.
  - " 4, Grallæ.
- Legion Natatores.
  - Ord. 1, Gaviæ (= Longipennes).
  - " 2, Steganopodes (= Totipalmes).
  - " 3, Anseres (= Lamellirostres).
  - " 4, Urinatores (= Colymbidæ).

These divisions of *Altrices* and *Præcoces*, based on the physiology of the newly-hatched young, were quickly adopted by several authors. Bonaparte especially, in one of his numerous new classifications (that published in 1853†), adopted the divisions in question, and ranked the several orders of birds in parallel columns under the heads *Altrices* and *Præcoces*, considering that the orders of the one group or sub-class were, to a certain extent, represented by those of the other. Inasmuch as this is the most perfected form of the arrangement, and will give a very good idea of the relations of altricism and præcocism to structure, the classification is reproduced in the following paragraph:

AVES.

ALTRICES.	PRÆCOCES.
1, Psittaci.	
1, Americani; 2, Orbis antiqui.	
2, Accipitres.	
3, Passeres.	
1, Oscines; 2, Volucres.	
1, Zygodactyli; 2, Anisodactyli.	
4, Columbæ.	
1, Inepti.	7, Struthiones.
2, Gyrantes,	8, Gallinæ.
	1, Passeripedes; 2, Grallipedes.
5, Herodiones.	9, Grallæ.
	1, Cursores; 2, Alectorides.
6, Gaviæ.	10, Anseres.
1, Totipalmi; 2, Longipennes.	1, Lamellirostres; 2, Urinatores; 3, Ptilopteri.

In 1867‡, Prof. Thomas Henry Huxley made known a new system of classification of birds, which excited great interest, and has had a very decided influence on the recent progress of ornithology, as much by the spirit infused into the mode of investigation as by the innovations that were proposed. The author, like Merrem and Blanchard, recognized as the primary divisions of the class the *Carinatæ* and *Ratitæ*, and these, like Blanchard, he dignified as the only existing orders, degrading the subordinate groups, equivalent in rank at least to many of those which had been called orders by others, to inferior rank. Four secondary groups were distinguished among the Carinatæ, more especially by the condition of the vomer and its relation to the neighboring bones. Tertiary groups were combinations of families or peculiar isolated families, characterized by osteological and other characters of moment. This classification had the merit of being the first expression, in a rigorous systematic form, of combinations of anatomical facts, and first gave due weight to aggregates of osteological and other anatomical features characteristic of the several groups of birds. But the secondary groups of Carinatæ or sub-orders distinguished by the condition of the vomer seem scarcely to warrant the value assigned to them; indeed, the question of the natural combination of the families, or at least of super-families, into more comprehensive groups, and the determination of their exact relations, is a problem that is yet far from being solved. The following synopsis, modified from Prof. Huxley's *Manual of the Anatomy of Vertebrated Animals*, is an exhibit of the chief features of this classification:

I. ORDER SAURURÆ. The metacarpals not ankylosed together. The tail longer than the body.

1, Archæopterygidæ (extinct).

II. ORDER RATITÆ. The metacarpals ankylosed together. The tail considerably shorter than the body. The sternum devoid of a keel.

a. The wing with a rudimentary, or very short, humerus, and with not more than one ungual phalanx.

2, Apterygidæ (the kiwis).
3, Dinornithidæ (the moas).
4, Casuaridæ (the cassowaries).

b. The wing with a long humerus and with two ungual phalanges.

5, Rheidæ (the nandus).
6, Struthionidæ (the ostriches).

III. ORDER CARINATÆ. The metacarpals ankylosed together. The tail considerably shorter than the body. The sternum provided with a keel.

a. The vomer broad behind, and interposing between the pterygoids, the palatines, and the basisphenoidal rostrum.

[I. SUB-ORDER] DROMÆOGNATHÆ.

7, Tinamomorphæ (the tinamons).

b. The vomer narrow behind; the pterygoids and palatines articulating largely with the basisphenoidal rostrum.

* *Ornithologiskt System af C. J. Sundevall*, in *K. Vetenskaft Academiens Handlingar för ar 1835, 1836.*

† *Comptes Rendus.*

‡ *On the Classification of Birds; and on the Taxonomic Value of the Modifications of certain of the Cranial Bones observable in that Class*, in *Proc. Zool. Soc. London* for 1867, pp. 415–472.

a. The maxillo-palatines free.
i. The vomer pointed in front.
[II. Sub-order] Schizognathæ.
8, Charadriomorphæ (plovers, etc.).
9, Cecomorphæ (gulls, petrels, divers, and auks).
10, Sphenisomorphæ (penguins).
11, Geranomorphæ (cranes).
12, Turnicimorphæ (hemipods).
13, Alectoromorphæ (fowls).
14, Pteroclomorphæ (sand-grouse).
15, Peristeromorphæ (pigeons).
16, Heteromorphæ (hoazin).
ii. The vomer truncated in front.
[III. Sub-order] Ægithognathæ.
17, Coracomorphæ (passerines).
18, Cypselomorphæ (humming-birds, swifts, and goatsuckers).
19, Celeomorphæ (woodpeckers).
β. The maxillo-palatines united.
[IV. Sub-order] Desmognathæ.
20, Ætomorphæ (birds of prey).
21, Psittacomorphæ (parrots).
22, Coccygomorphæ (colies, plantain-eaters, cuckoos, barbets, toucans, capitonidæ, galbulidæ, kingfishers, hornbills, hoopoes, bee-eaters, motmots, coraciidæ, and trogons).
23, Chenomorphæ (anatidæ, palamedeidæ).
24, Amphimorphæ (flamingoes).
25, Pelargomorphæ (storks, ardeidæ, plataleidæ, etc.).
26, Dysporomorphæ (cormorants, pelicans, tropic-birds, darters).

In 1873 and 1874, Mr. A. H. Garrod* based a classification of birds upon the consideration of the muscles of the thigh. Among the more important of these, from a taxonomic point of view, were considered to be the femoro-caudal, the accessory femoro-caudal, the semitendinosus, and the accessory semitendinosus. But most important of all is the ambiens muscle; this arises from the tip of the short anteriorly directed spine, which is situated just above the anterior border of the acetabulum, and runs along the inner side of the thigh to the inner side of the knee, where it is covered by the sartorius, which is above it in the former part of its course. Its thin tendon then crosses the knee, running in the substance of the fascial extensor tendon, just in front of the patella, to the outer side, where it joins the fibres of the origin of the flexor perforatus digitorum. The presence or absence of this muscle determined Mr. Garrod to differentiate the class into two sub-classes. Those forms in which it is present were designated Homologonatæ, or typical kneed; while those in which it is absent were combined as Anomalogonatæ, or abnormally kneed. "There are," said Mr. Garrod, "peculiarities in the arrangement of the cæca of the intestine and of the tuft of feathers on the oil-gland which are correlatable with this presence or absence of the ambiens muscle." The secondary and tertiary groups of these sub-classes were distinguished by the combinations of the muscles already alluded to, and the presence or absence of cæca to the intestine, the development of a tufted or nude oil-gland, and the combinations in which those characters occur; and further, in the homologonatous birds, by the development of either a left or right carotid, or of both. The characters thus appreciated were generalized in the classification herewith exhibited. In this the femoral-caudal muscle is represented by the letter A, the accessory femoro-caudal by B, the semitendinosus by X, and the accessory semitendinosus by Y; the homologonatous families with an asterisk (*) affixed do not possess an ambiens muscle at all; of those with a dagger (†) only a few genera want it.

CLASS AVES.

Sub-Class Homologonatæ.
Order I. Gralliformes.
Cohort (α) Struthiones.
Family 1, Struthionidæ. B X Y.
Sub-family 1, Struthioninæ.
" 2, Rheinæ.
Family 2, Casuariidæ (*). B X Y, A B X Y.
" 3, Apterygidæ. A B X Y.
" 4, Tinamidæ. A B X Y.
Cohort (β), Gallinaceæ.
Family 1, Palamedeidæ. A B X Y.
" 2, Gallinæ. A B X Y or B X Y.
" 3, Rallidæ. A B X Y.
" 4, Otididæ. B X Y.
Sub-family 1, Otidinæ.
Sub-family 2, Phœnicopterinæ.
Family 5, Musophagidæ. A B X Y.
" 6, Cuculidæ.
Sub-family 1, Centropodinæ. A B X Y.
" 2, Cuculinæ. A X Y.
Cohort (γ) Psittaci (†). A X Y.
Order II. Anseriformes.
Cohort (α) Anseres.
Family 1, Anatidæ. A B X.
" 2, Spheniscidæ. A B X.
" 3, Colymbidæ. A B X.
" 4, Podicipididæ (*). B X.
Cohort (β) Nasutæ.
Family 1, Procellariidæ (†). A B X Y.
" 2, Fulmaridæ.
Sub-family 1, Fulmarinæ. A B X.
" 2, Bulweriinæ. A X.
Order III. Ciconiiformes.
Cohort (α) Pelargi. A X Y.
" (β) Cathartidæ. A X Y.
" (γ) Herodiones (*). A X Y or X Y.
" (δ) Steganopodes.
Family 1, Phaethontidæ. A X Y.
" 2, Pelecanidæ.
" 3, Phalacrocoracidæ. A X.
" 4, Fregatidæ. A.
Cohort (ε) Accipitres. A.
Family 1, Falconidæ.
" 2, Strigidæ (*).
Order IV. Charadriiformes.
Cohort (α) Columbæ (†). A B X Y (A X Y).
Family 1, Columbidæ.
" 2, Pteroclidæ.
Cohort (β) Limicolæ.
Family 1, Charadriidæ. A B X Y and A X Y.
" 2, Gruidæ. A B X Y.
" 3, Laridæ. A X Y.
" 4, Alcidæ (*). A B X.
Sub-class Anomalogonatæ.
Order I. Piciformes.
Family 1, Picariæ. A X Y.
Sub-family 1, Picidæ.
" 2, Ramphastidæ.
" 3, Capitonidæ.
Family 2, Upupidæ. A X Y.
" 3, Bucerotidæ. A X Y.
" 4, Alcedinidæ. A X.
Order II. Passeriformes.
Family 1, Passeres. A X Y (A X).
" 2, Bucconidæ.
" 3, Trogonidæ. A X.
" 4, Meropidæ. A X Y.
" 5, Galbulidæ. A X Y, or A X.
" 6, Caprimulgidæ. A X Y.
" 7, Steatornithidæ. X Y.
" 8, Coraciidæ. A X Y.
Sub-family 1, Coraciinæ.
" 2, Momotinæ.
" 3, Todinæ (?).
Order III. Cypseliformes.
Family Macrochires. A.
Sub-family 1, Cypselinæ.
" 2, Trochilinæ.

The chief and apparently only merit of this arrangement is the generalized information respecting the muscles in question therein conveyed. The exceptions noted above suggest the inadequacy of the combinations in question to serve as the expressions of the natural affinities of the various forms. Combined with other information, it will be of use in the construction of a more perfect system.

The most useful books for the student in general ornithology are the *Genera of Birds: comprising their Generic Characters, a Notice of the Habits of each Genus, and an Extensive List of Species referred to their several Genera*, by George Robert Gray; illustrated by David William Mitchell, in 3 vols. (London, 1844–49, 4to); *Conspectus Generum Avium*, auctore Carolo Luciano Bonaparte (Lugduni Batavorum, 1850, 2 vols. 8vo); *The Hand-list of Genera and Species of Birds, distinguishing those contained in the British Museum*, by George Robert Gray (London, 1869–71, 3 vols. 8vo); and *The Catalogue of the Birds in the British Museum*, of which two have been published—viz. *Catalogue of the Accipitres, or Diurnal Birds of Prey*, and *Catalogue of the Striges*, by R. Bowdler Sharpe (London, 1874 and 1875). There cannot be said to be any good manual expressive of the present condition of scientific ornithology. The works of Rev. J. G. Wood, Brehm, etc. are rather anecdotal than reliable for scientific information. The best epitome of facts respecting the structure of birds may be found in Huxley's *Manual of the Anatomy of Vertebrated Animals* (London, 1872).

* *On Certain Muscles of Birds, and their Value in Classification.* Part II. By A. H. Garrod, B. A. *Proc. Zool. Soc. London* (1874, pp. 111–123).

The birds of the various countries have each their special historians. The most celebrated and reliable of those of North America are L. P. Vieillot (*Histoire naturelle des Oiseaux de l'Amérique septentrionale; contenant un grand nombre d'espèces décrites ou figurées pour la première fois*, Paris, 1807); Alexander Wilson (*American Ornithology, or the Natural History of the Birds of the United States*, Philadelphia, 1828), and his continuator, Charles L. Bonaparte (*American Ornithology, or the Natural History of Birds inhabiting the United States not given by Al. Wilson*); J. J. Audubon (*The Birds of America, from Drawings made in the United States and their Territories*, illustrated by 500 finely-colored drawings, New York, 1828–30); Spencer F. Baird (*Reports of Explorations and Surveys to ascertain the most Practicable and Economical Route for a Railway from the Mississippi to the Pacific Ocean*, vol. x., by S. F. Baird); S. F. Baird, T. M. Brewer, and Robert Ridgway (*A History of North American Birds*, Boston, 1874, 4to); and Elliot Coues (*Key to North American Birds*, Salem, 1874).

The ornithological faunas of South American countries have been less studied; the chief works are on Brazilian birds, by C. H. Burmeister (*Systematische Uebersicht der Thiere Brasiliens*, Berlin, 1855–56, 8vo), and J. T. Descourtilz (*Ornithologie brésilienne, ou l'Histoire des Oiseaux du Brésil remarquables par leur Plumage, leur Chant et leurs Habitudes*, Rio Janeiro, 1854–56, fol.); also noteworthy are those of Felix de Azara (*Apuntamientos para la Historia natural de los Paxaros del Paraguay y Rio de la Plata*, Madrid, 1803, 4to) and Des Murs (in *Historia fisica y politica de Chile*, by Claudio Gay, *Zoologia*, vol. i., Paris, 1847, 8vo).

The species of Europe have had many historians; the most notable perhaps are C. D. Degland and Z. Gerbe's *Ornithologie européene, ou Catalogue descriptif, analytique et raisonné des Oiseaux observés en Europe* (Paris, 1st ed. 1849; 2d ed. 1867); John Gould's *Birds of Europe* (London), a luxurious work in elephant folio; and, lastly, *A History of the Birds of Europe, etc.*, at first by R. B. Sharpe and H. E. Dresser, and later by Dresser alone, now in course of publication. The fauna of each country, too, has been especially elucidated, generally by numerous naturalists; the most celebrated of those relating to Great Britain are P. J. Selby's *Illustrations of British Ornithology* (Edinburgh, 1821–34); William Macgillivray's *History of British Birds, indigenous and migratory, including their Organization, Habits, and Relations; Remarks on Classification and Nomenclature; an Account of the Principal Organs of Birds, and Observations relative to Practical Ornithology* (London, 1839–41); John Gould's *The Birds of Great Britain* (London, 1850–68); and *A History of British Birds*, of which a 1st ed. was issued by William Yarrell in 1839–42, and a 3d ed. is now in course of publication under the auspices of Alfred Newton.

The avifauna of Africa has also had a number of iconographic monographers. The oldest, and formerly much esteemed, is François Levaillant's *Histoire naturelle des Oiseaux d'Afrique* (Paris, 1799–1805). Among the later and more reliable works are those of G. Hartlaub (*System der Ornithologie Westafrikas*, Bremen, 1857); M. T. von Heuglin (*Ornithologie Nordost-Afrika's, der Nilquellen und Küsten-Gebietedes Rothen Meeres und des nördlichen Somali-Landes*, Erster Band, Erste Abtheilung, Cassel, 1869); O. Finsch and G. Hartlaub (*Baron C. C. von der Decken's Reisen in Ost-Afrika, Vierter Band, Die Vögel Ost-Afrika's*, Leipsic and Heidelberg, 1870); and Edgar Leopold Layard (*The Birds of South Africa, a Descriptive Catalogue of all the Known Species occurring South of the 28th Parallel of South Latitude*, Cape Town and London, 1867).

For the avifauna of Asia the most magnificent work is one by John Gould, entitled *The Birds of Asia* (London, 1850–69), in elephant folio.

On the ornithology of Australia several fine works have also been contributed; the most luxurious is by John Gould (*The Birds of Australia*, London, 1848). A noteworthy one has more recently been published by Sylvester Diggles (*The Ornithology of Australia*, Brisbane, Queensland, 1868).

The birds of Polynesia have been monographed by O. Finsch and G. Hartlaub (*Beiträg zur Fauna Centralpolynesiens. Ornithologie der Viti-, Samoa- und Tonga-Inseln*, Halle, 1867).

Numerous monographs, many of which are beautifully illustrated with life-size figures of all the species and printed in large elephant folio form, have been published on various families and other groups of the class. Aside from the earlier works of the kind by Vaillant, Desmarest, Vieillot, etc., the most notable of those by recent authors are by John Gould, *A Monograph of the Trogonidæ, or Trogons* (London, 1838); *A Monograph of the Odontophorinæ, or Partridges of America* (London, 1850); *A Monograph of the Rhamphastidæ, or Family of Toucans* (London, 1854); *A Monograph of the Trochilidæ, or Humming-birds* (London, 1861, 5 vols.); Alfred Malherbe, *Monographie des Picidées, ou Histoire naturelle des Picidés, Picamnés, Tuncinés ou Torcols* (Metz, 1861, 4 vols.); Daniel Giraud Elliot, *A Monograph of the Pittidæ* (New York, 1861); *A Monograph of the Tetraoninæ, or Family of the Grouse* (New York, 1864–65); *A Monograph of the Phasianidæ, or Family of Pheasants* (London, 1870–72), and *A Monograph of the Paradisiidæ, or Birds of Paradise* (London, 1873); C. H. T. and G. F. L. Marshall, *A Monograph of the Capitonidæ, or Scansorial Barbets* (London, 1871); and R. B. Sharpe, *A Monograph of the Alcedinidæ, or Kingfishers* (London, 1871).

It may be well to remark, in conclusion, that some of the folio monographs of birds above enumerated are rather to be admired for the beauty and often the aptness of the illustrations than for the scientific merit of the text: in truth, the most scientific and ablest of ornithologists are not those who have published the large folios. Ornithologists, however, are so numerous that it is difficult to select. Suffice it to observe that among the most active at the present time in America are J. A. Allen, Elliot Coues, and Robert Ridgway; in England, Alfred Newton, Osbert Salvin, P. L. Sclater, and R. Bowdler Sharpe; in Germany, O. Finsch and A. von Pelzeln; and in the Netherlands, H. Schlegel. These, however, are only a few of the innumerable writers that are engaged in various departments of ornithology. THEODORE GILL.

Ornithorhynch'idæ [from ὄρνις, ὄρνιθος, "bird," and ῥύγχος, "beak"], one of the two families representing the order Monotremata and sub-class Ornithodelphia, and including the "water-mole" of Australia. The general form of the body is somewhat beaver-like; the covering is a dense and soft fur; the jaws are produced into a depressed bill-like snout resembling somewhat (but only superficially) the bill of a duck; the nostrils are above and near the end of the bill; no external ears are developed; there are eight horny teeth—*i. e.* each jaw is provided on each side behind with a broad and nearly oval tooth with a flattened crown adapted for grinding, and toward the front it has a long and narrow one; the tongue is short, and covered, to some extent, with horny papillæ; the legs are short; the feet well adapted for swimming, and each provided with five toes; the anterior ones have a web extending considerably beyond the toes, and the claws are depressed; the posterior feet have webs only between the toes, and the claws are curved; in the male a spur is developed on the hinder surface of each hind leg, which has no representative in the female; the tail is rather short, depressed, and quite broad. These are the characters which at once superficially distinguish the Ornithorhynchidæ from the Tachyglossidæ, but in addition to these are numerous anatomical characters. The family is peculiar to Australia, and is represented by but a single genus containing but one certainly known species, which, however, exhibits differences which have caused a distinction, by some authors, of two species. The species was first made known in 1799 by Shaw, under the name of *Platypus anatinus*, and in the following year by Blumenbach under that of *Ornithorhynchus paradoxus*; the name *Platypus* having been previously used in ornithology, that of *Ornithorhynchus* has been almost universally retained. When first discovered, it excited great surprise, and the specimen which served for description was supposed by some to be a made-up specimen composed of the bill of some unknown duck-like bird and the body of a mammal. As indicated by the webbed feet, it is an aquatic form, living by preference in the still portions of rivers and streams, seeking its food among the plants which grow upon the river-banks, and excavating burrows in the banks, to which it retreats, and in which it forms its nest. This burrow, according to Bennett, is projected in a serpentine course into the bank, and ascends upward toward its termination, and at the end the nest is built. The nest is composed of dried grass, weeds, etc., strewn over the floor. The burrow is expanded toward the end, and measures there about a foot in length and six inches in breadth; the entire length of the burrow is considerable, sometimes being about 20 feet, and occasionally exceeding even 50 feet. Besides the principal entrance, there is also generally a second one below the surface of the water, communicating with the interior just within the aperture. The food is of an animal nature, chiefly consisting of water-insects, mollusks, and the eggs of fishes and frogs. THEODORE GILL.

Ornithorhynchus. See DUCK-BILL.

O'ro, tp. of Butte co., Cal. Pop. 281.

Orobancha'ceæ, the broom-rapes, a natural order of exogenous plants, parasitical herbs growing from the roots of other plants. Being completely parasitic, and

feeding upon the elaborated juices of the foster-plant, they are destitute of green herbage, and have dry or fleshy scales in place of leaves. This mode of life, however, is shared by a few species of related orders. This order is distinguished from the other gamopetalous families with irregular or bilabiate corolla and didynamous stamens by the 1-celled ovary with two (or by division four) parietal placentæ, innumerable small albuminous and minute embryo. Some of the broom-rapes, which abound in Europe, are injurious, especially one which lives upon clover. None are really of any economical importance, but two U. S. plants (*Epiphegus* and *Conopholis*), called beech-drops and cancer-root, have been vaunted in popular and empirical medicine.

Orodus [Gr. ὄρος, a "hill," and ὀδούς, a "tooth"], a genus of cestraciont sharks of which the remains are found in the Carboniferous rocks. The teeth have their crowns set with a series of blunt but frequently highly-ornamented cones. The spines called *Ctenacanthus* probably belonged to the same fish. Some of the species of *Orodus* must have been of immense size, as the teeth, of which the number was large, are occasionally found four to five inches broad and very massive. J. S. NEWBERRY.

Orohippus. See HORSE, FOSSIL.

Oromoc'to Village, post-v., cap. of Sunbury co., N. B., on the St. John, 11 miles from Fredericton. It has some shipbuilding. Pop. about 400.

O'rono, tp. of Muscatine co., Ia. Pop. 372.

Orono, post-v. and tp., Penobscot co., Me., on the Penobscot River and European and N. A. R. R.; seat of the State Agricultural College. Pop. 2888.

Orono, post-v. of Elk River tp., cap. of Sherburne co., Minn.

Orono'co, post-tp., Olmsted co., Minn. Pop. 753.

Orono'go, post-v., Jasper co., Mo., on the Memphis Carthage and North-western R. R., 10 miles W. of Carthage, has 2 schools, churches representing all denominations, and several stores. The principal industry is the mining of lead and zinc. Pop. about 1500.
JOHN LOWRY, ED. "ORONOGO ADVOCATE."

Orono'ko, tp. of Berrien co., Mich. Pop. 1615.

Oron'tes [Ὀρόντης], the modern *Nahr-el-Asi*, a river of Syria, rises in Anti-Libanus and flows westward into the Mediterranean, which it enters after a course of 240 miles. It is not navigable.

Oroomiah. See URUMEYAH.

O'Rorke (PATRICK H.), b. in Ireland in 1835; graduated at the U. S. Military Academy in June, 1861, at the head of his class, and entered the army as second lieutenant of engineers; served on the staff of Gen. Tyler at the battle of Bull Run July 21; subsequently assistant engineer on the defences of Washington, and at Fort Monroe till October, when he accompanied the expedition to Port Royal; for his services on this occasion he received the brevet of captain; in Sept., 1862, he was commissioned colonel of the 140th New York Vols., which regiment he led with distinction throughout the campaigns of the army of the Potomac, receiving the brevets of major and lieutenant-colonel for gallantry at Fredericksburg and Chancellorsville; and in the Pennsylvania campaign at the battle of Gettysburg, July 2, 1863, where he met his death while gallantly leading his men forward to repel an attack made upon the left of the line. G. C. SIMMONS.

Orosha'za, town of Hungary, has 12,663 inhabitants, mostly engaged in rearing cattle and cultivating vines.

Oro'sius, b. toward the end of the fourth century A. D. at Tarragona in Spain; took orders, and engaged with zeal in the controversies of his time. Having by direction of his bishop visited Africa to confer with St. Augustine, he was sent by the latter to Palestine, where Pelagius was spreading his heresies. At a synod held at Jerusalem he opposed Pelagius, and in so doing provoked the hostility of John, the bishop of Jerusalem. Orosius wrote in justification of himself a work entitled *Liber Apologeticus* (*contra Pelagium*) *de Arbitrii Libertate*. He returned to Africa, and probably to Spain, and after his return composed, at the request of his friend Augustine, or completed, his *Historiæ* (*adversus Paganos*), a "History of the World," in 7 books, from the beginning of the world to A. D. 417, against the charge of pagan writers that the calamities of Rome, especially the capture of the city (A. D. 410), were chargeable to Christianity for having abolished the worship of the old heathen gods. The date of his death is not known. The best edition is by Havercamp (Leyden, 1738, 4to; reprinted in Migne's *Patrologiæ Cursus*). King Alfred translated the history of Orosius into Anglo-Saxon, the best edition of which, with a translation into English, is that of Dr. Bosworth (London, 1856). (See Teuffel's *Hist. Rom. Lit.*, § 448; Mörner, *De Orosii Vita ejusque Historiarum Libris Septem* (Berlin, 1844). HENRY DRISLER.

Orota'va, town of the Canary Islands, on the northern coast of Teneriffe, stands in a most beautiful and fertile valley, with an elevation of 1027 feet above the sea, and is, next to Santa Cruz, the most important town of the island. Pop. 8628. Its port is situated at a distance of 2 miles (*Port Orotava*), on the shore of the Atlantic. It is fortified, and carries on a considerable trade with Europe and America. Pop. 3800.

O'roville, post-v. of Ophir tp., cap. of Butte co., Cal., 75 miles N. of Sacramento; has a ladies' library, 1 weekly newspaper, 3 churches, a Chinese theatre, extensive water-power, 1 flour and several saw mills. The Ophir Ditch and Mining Company is located here, and the largest nugget of gold cast in the U. S. was moulded at Cherokee, 9 miles distant. Pop. 1425.
JOHN C. GRAY, ED. "WEEKLY MERCURY."

Or'phan [Gr. ὀρφανός], a person not of full age who has been deprived by death of one or both parents. A child in this situation is in a condition which appeals to the best feelings of humanity. Accordingly, we find in all literature many references to the wrongs which such may suffer at the hands of the cruel or the covetous. The Bible is frequent in its denunciations of those that rob the fatherless. At Athens there were officers appointed to administer a fund for the rearing of indigent orphans, whilst the errors or misdeeds of guardians were amenable to the courts of law. The power of bringing an action of this nature was limited to a term of five years. The archon was considered to be the natural guardian of widows, orphans, etc. The Roman law preserved the right of nominating guardians to every testator. The administration of a republic, says Cicero, is like a guardianship, and ought to be managed for the profit of those who are under protection, and not for the emolument of those who fulfil the functions of protectors. The appointment of guardians for the children of intestate citizens was sometimes vested in the prætors and tribunes, and sometimes in the consuls. The misconduct of guardians was severely punished. Under Galba one who had poisoned his pupil pleaded his Roman citizenship as a reason against the shameful death of the cross, to which he had been sentenced. His plea procured him a higher cross, whited over, that his punishment might be the more conspicuous. Cicero alludes to the wards falling a certain prey to the prætors. In England the guardianship of orphans of the king's tenants was the prerogative of the Crown, the king enjoying the profits of their lands and having the disposal of their bodies until they came of age. Under the feudal system the orphan vassal was the ward of his lord. The law of wardship was no doubt productive of much hardship and injustice. The court of wards, which had jurisdiction in these matters, was abolished by act of Parliament under Charles II., having fallen into desuetude during the Commonwealth. From this time the right of appointing a guardian to an infant without one has been vested in the court of chancery, as representative of the king. By the custom of London the guardianship of orphans is vested in the city.

The defenceless position of the orphan of the poor, exposed to all the whips and scorns of fortune, has appealed to philanthropy alike in our own age and in the past. Charitable institutions for the nurture and education of orphans have existed. These orphanages vary greatly in constitution, some being catholic in plan and liberal in management, and others devised on the narrowest bases of sectarianism and party. Perhaps the most remarkable one that has ever existed is that founded at Bristol by George Müller, a native of Halberstadt in Prussia, who after a stormy youth adopted views of an extreme evangelical type, and became pastor of an "Ebenezer chapel" at Teignmouth. In 1835 he published a proposal to establish an orphan-house. This work has progressed so that in the present year 2000 children are being educated in the orphan-town of Ashley Downs. The usual methods of obtaining support are studiously avoided. There is no committee, no advertising, no patronage, no collecting. The only mode employed for its continuance and extension is prayer to God. In 1856, Mr. Müller could write that £86,441 6*s.* 3¼*d.* had been sent to him by unsolicited donors for the work he was doing. The *Narrative* he has published from time to time of the history of the orphanage records with minute particularity the gifts which had been sent. Not only money, but goods of the most heterogeneous nature have been received for the benefit of the work. WILLIAM E. A. AXON.

Or'pheus and the Orphic Poems and Mysteries. After all that has been written about Orpheus and the Orphic poems, we are still far from having arrived at any clear and distinct knowledge on this interesting but in-

tricate subject. To begin with, the etymology of the name Orpheus, unlike Musæus, Eumolpus, etc., is unknown to us; whether such a person did ever exist or not it is useless to inquire. "Certe hodie neminem tam lynceum esse existimo ut ejus cognationis aliquod vestigium possit indagare," says the latest German critic on the Orphic theogony, Schuster (1869).

No mention of Orpheus appears in Greek literature before Pindar and the dramatists. Aristophanes alludes to him as the one who brought religious rites among men and restrained them from rapine (Ran. 1032–33). In Plato, Orpheus is not only frequently mentioned, but verses by him are quoted (Cratylus, p. 402 b.; Phileb., p. 66 b.). Further, verses quoted by Plato have been identified as belonging to the fragments of the Orphic theogony that have come down to us. We find a reference in Euripides which would appear to connect together the Orphic and Pythagorean; Theseus says to his son Hippolytus, "Boast now and traffic with viands of lifeless food; take Orpheus for your master and revel, honoring the smoke of many letters" (Hippol., 952–54). The Pythagoreans made a custom of abstaining from animal food, and we learn from other sources besides Euripides that the Orphic societies had a similar custom. When we compare lines of Euripides with a reported statement of Aristotle in Cicero (N. D., I. 38, 107) "that the song ascribed to Orpheus was the work of a Pythagorean philosopher named Cercops," we shall see that there is much to support the view of K. O. Müller (Hist. Anc. Greek, lib. i. 310) that the Pythagoreans after the disestablishment of the clubs in Magna Græcia (510 B. C.) took refuge in the Orphic societies.

As to the origin and peculiar worship of these Orphic societies opinion among the ancients was widely at variance. Eratosthenes (c. 24) states, on the authority of the Bassarides of Æschylus, that Orpheus was torn to pieces by Dionysus by reason of jealousy for the excessive honor paid by the poet to Apollo or Helius. In the passage quoted from the *Hippolytus*, Euripides without doubt represents the popular feeling with regard to these Orphic mysteries in using the word *βάκχευε* (revel). We find in Herodotus (ii. 81) Bacchic and Orphic ceremonies coupled together: "*τὰ Ὀρφικὰ καλεόμενα καὶ Βακχικά.*" In the later circle of the Orphic poets the adventures of Dionysus are a constant theme; the strangest metamorphoses are related of him, capable of the most mystical interpretations. By the few fragments still extant of the Orphic theogony we see that Dionysus must have occupied in the original work a most prominent place. The question then comes, Who is this Dionysus? He was evidently not the deity ordinarily known by that name. In the usual Bacchic festivals the greatest excesses prevailed; in the Orphic rites, as we have seen, the custom was quite the opposite. It was, then, to the mystical Chthonian deity, Dionysus Zagreus, that these Bacchic-Orphic rites were paid. Thus we get a connection between the Orphic mysteries and the Eleusinian mysteries of Demeter. The whole history of the mysteries and secret societies of Greece is involved in great doubt; the ancients themselves, as we see by the various contradictory reports, had scarcely any clear knowledge on the subject. The nature of the Chthonian deities and their worship is obscure in the extreme; we only know that the worship was conducted with the greatest possible solemnity and had some reference to an existence after death.

Of the poems that have come down to us under the name of Orpheus criticism has long ago proved the larger part to have no claim to antiquity. The poem on the Argonautic expedition and that on the nature of stones (*Λιθικά*) are the works of Alexandrian grammarians; the eighty-seven or eighty-eight hymns show on every page their Neo-Platonic origin. The only portion, therefore, of the so-called Orphic poems in which we can discern any traces of antiquity is fragments. These fragments, small as they are, must be sifted still further from the interpolations of Christian and other writers before we can reach the few remains of the early Orphic poetry, the theogony, probably of Onomacritus (520–485 B. C.), extant in Plato's day. Onomacritus, according to Herodotus (vii. 6), made a collection of the oracles ascribed to Musæus, and was accused at the time of making interpolations in the collection; long afterwards Pausanias (i. 22) declared his opinion that the poems in his day ascribed to Musæus were the work of Onomacritus. Thus everything points to Onomacritus as the author of the Orphic theogony. The only question is whether the theogony of Onomacritus was an original work or a modification of an earlier one. There may have been an earlier work of the kind, itself an advance upon the theogony of Hesiod, but yet preparatory to the more elaborate system of the later poet. But such a view is purely speculative. We have not enough evidence on either side to give a decisive answer to the question. A. H. BULLEN.

Or'phic Brotherhood [Gr. *οἱ Ὀρφικοί*], in ancient Greece, a society of ascetic persons who devoted themselves to a mystical worship of Bacchus (Dionysus) and the elaboration of a system of theology under the professed guidance of the spirit of Orpheus. They dressed in white, ate no animal food, avoided all excesses, and professed to aim at purity of life, an exalted religious experience, and an immortal existence after death.

Or'piment [Lat. *auripigmentum*, "golden pigment"], synonyme **King's Yellow,** a mineral tersulphide of arsenic, As_2S_3, orthorhombic in form, lemon yellow, sometimes nearly transparent, cleaves into thin laminæ, which are flexible and non-elastic, like those of gypsum; powder has a rather pale canary yellow color; as a mineral, very rare in America; found sparingly at Edenville, Orange co., N. Y. It may be prepared artificially by precipitating a solution of arsenic with sulphuretted hydrogen gas, and by fusing together equal parts of white arsenious acid and sulphur. It is stated on good authority that, when entirely *free from arsenious acid*, orpiment is not poisonous when swallowed, owing to its insolubility even in acids. As, however, it is easily soluble in alkalies, it is a dangerous material, and should be banished from common use as a pigment by those unfamiliar with its nature. It is employed, in admixture with lime, as a depilatory, and in another dangerous way, which should be prohibited by law, as an ingredient in fireworks. HENRY WURTZ.

Orr (HUGH), b. at Lochwinoch, Scotland, Jan. 13, 1717; settled in 1740 as a gunsmith at Bridgewater, Mass.; manufactured scythes and agricultural implements; made 500 muskets for the State about 1748, believed to have been the first manufactured in New England; cast iron and brass cannon and cannon-balls during the Revolution; invented machines for cleaning flaxseed and for manufacturing cotton, and was for some years a State senator. D. at Bridgewater Dec. 6, 1798.

Orr (ISAAC), b. at Bedford, N. H., in 1793; graduated at Yale College 1818; was for some years a skilful teacher of the deaf and dumb in the asylum at Hartford; became a missionary to the colored population at Washington, D. C., and other Southern cities, in the employment of the American Colonization Society; was skilled in mathematics and physics; invented an airtight stove, and wrote in the New York *Commercial Advertiser* and the Boston *Courier*. D. at Amherst, Mass., Apr. 28, 1844.

Orr (JAMES LAWRENCE), b. at Craytonville, S. C., May 12, 1822; graduated at the University of Virginia 1842; admitted to the bar and practised in Anderson, S. C.; member of the legislature 1844–45; member of Congress 1848–59, and Speaker of the Thirty-fifth Congress; in 1860 was one of the convention that inaugurated secession, and a State commissioner to Washington to treat with the U. S. government for partition of property in South Carolina; Confederate State senator 1862–65. At the close of the war he accepted the result, and was provisional governor of South Carolina 1865–69; appointed judge of the circuit court of South Carolina 1870, and in 1873, U. S. minister to Russia. D. at St. Petersburg May 5, 1873.

Or'rery. An orrery may include parts of two or three planetary machines. These are—the *planetarium*, which is constructed to represent the motion of planets about the sun, sometimes in circular orbits, sometimes in those which are elliptical; the *tellurium*, which is made to represent the motion of the moon about the earth, the motion of the earth about the sun, the varieties in the lengths of days and nights, and the consequent vicissitudes of the seasons, and sometimes also the moon's motions as respects her perigee, nodes, etc., and the occurrence of eclipses; and the *satellite-machine*, intended to illustrate the motions of the satellites of Jupiter around their primary, and Jupiter's own motion around the sun.

Planetary machines constructed in accordance with the idea that the earth was the centre of motion were very early in use. Such were the Chinese spheres, said to have been made some 2000 years before the Christian era, and more recently the spheres of Archimedes and Posidonius, concerning which Cicero, speaking of the Epicurean philosophy, says in his treatise *De Natura Deorum* (lib. ii. cap. 34 and 35): "If the sphere lately made by our friend Posidonius, which marks the course of the sun and moon and the five wandering stars, were to be transferred into Scythia or Britain, who, even in those barbarous countries, would doubt whether reason had presided over its construction? Yet these people (the Epicureans) doubt whether the universe, whence all things arise and are made, is not the effect of chance, or of some necessity, rather than of reason and a divine mind; and they regard Archimedes as more deserving of praise in imitating the changes of the sphere than nature in producing them." (As quoted in the

Penny Cyclopædia, article "Orrery.") It is thought that the earliest machine representing the Ptolemaic system may have been that of Chromatus. This system continued to be represented in all planetary machines "until about fifty years after the death of Copernicus, when the last of the kind of any note was erected in the library of the Pantheon at Paris by Orone Finnée." (*Penny Cyclopædia.*) Machines intended to represent the Copernican system were invented in the latter part of the seventeenth century by Huyghens and Römer, Huyghens introducing a method of calculating the wheelwork with precision. His machine was named by himself the "automaton." It was moved by a spring regulated by a balance. Then Römer invented a planetarium, and also a satellite-machine, the latter "prior to the year 1679." In the edition of Desaguliers' *Lectures of Experimental Philosophy*, published in 1719, a description is given of a machine styled an *orrery*, which is attributed to Mr. Rowley. The *Penny Cyclopædia* states that the origin of the name "was given by Mr. Desaguliers in his *Course of Experimental Philosophy*" (4to, London, 1734, i. p. 431). After stating his belief that Mr. George Graham, about the year 1700, first invented a movement for exhibiting the motion of the earth about the sun, at the same time that of the moon revolving round the earth, he remarks: "This machine, being in the hands of an instrument-maker to be sent with some of his own instruments to Prince Eugene, he copied it, and made the first for the earl of Orrery, and then several others with additions of his own. Sir Richard Steele, who knew nothing of Mr. Graham's machine, in one of his lucubrations, thinking to do justice to the first encourager, as well as to the inventor, of such a curious instrument, called it an *orrery*, and gave Mr. J. Rowley the praise due to Mr. Graham."

To the astronomer James Ferguson we are indebted for an orrery, a tellurium, the calculator (viz. of new and full moons, etc.), a cometarium, and an improved celestial globe, all described in his *Treatise on Astronomy*. Perhaps the most perfect of orreries were two invented and constructed by the distinguished American astronomer David Rittenhouse, LL.D., one of which is in possession of the College of New Jersey. The date on the face of the instrument is 1768. It is fitted for exhibiting continually the motions of the moon, as well as those of the earth and other principal planets to Saturn inclusive, then the outermost known. It is furnished with dial-plate arrangements for the current month and the day of the month, as well as the passing year, and the successive positions, at the dates thus recorded, of the bodies already specified, and the years of cycles; the whole kept in motion by a clockwork attachment. The orbits of the moon and of the planets are all elliptical, and the surrounding graduated circular ring, representing the arrangement of the twelve signs, has a rackwork and a screw of slow motion attached, by which even the precession of the equinoxes is allowed for.

Orreries, planetariums, etc. are not regarded with much favor by those best qualified to judge, as it is impossible to preserve the ratio both of the sizes and the distances throughout, on any practicable scale, in the same machine, so that erroneous notions with respect to the one or to the other must almost, of course, be superinduced. Telluriums seem to meet with most favor, as giving adequate ideas of the varieties in the length of the days and the vicissitudes of the seasons. S. Alexander.

Or'rington, post-tp. of Penobscot co., Me. Pop. 1768.

Orris Root. See Iris.

Orrs'town, post-v. of Southampton tp., Franklin co., Pa. Pop. 305.

Orr'ville, post-tp. of Dallas co., Ala. Pop. 2124.

Orrville, post-v. of Green tp., Wayne co., O., on Cleveland Mt. Vernon and Delaware and Pittsburg Fort Wayne and Chicago R. Rs., in a fine farming region; has 1 weekly newspaper and a considerable trade. Pop. 745.

Orsa'ra Dan'no Irpi'na (*Ursaria*), town of S. Italy, province of Avellino, on the Apennines. Pop. 5117.

Or'say, d' (Alfred Guillaume Gabriel), Count, b. at Paris, France, Sept. 4, 1801; served in the French army; married in 1827 a daughter of the earl of Blessington by his first wife; was separated from her 1829; lived thenceforth chiefly in London, where he was regarded as a model of elegance and courtliness; was the most conspicuous member of the social circle at Gore House; was for many years a constant companion of Lady Blessington; was distinguished for a handsome person, a fascinating conversation, and artistic skill; became director of fine arts at Paris under Louis Napoleon, and d. there Aug. 4, 1852.

Orseille. See Archil.

Orsi'ni, a wealthy Roman family of princely rank; belonged to the party of the Guelphs, and became very conspicuous in the history of Rome during the Middle Ages by its perpetual feuds with the family of the Colonnas, which belonged to the Ghibelline party. It spread very widely, acquired immense possessions, and culminated in the latter part of the thirteenth century, when one of its members became pope under the name of Nicholas III. (1277–81). Of its many branches only one is still flourishing, the Neapolitan, at present represented by the dukes of Gravina. A member of this branch became pope under the name of Benedict XIII. (1724–30). The family-seat is still at Rome, where the Orsini palace stands on the spot where formerly stood the theatre of Marcellus.

Orsini (Felice), b. in 1819 at Meldola in the province of Forli, Italy, at that time a part of the papal states; joined while yet a student at the University of Bologna a secret society for revolutionizing Italy; was imprisoned and condemned to the galleys for life, but restored to liberty in 1846 by the amnesty of Pius IX.; acted as a deputy for Bologna in the constituent assembly at Rome in 1848, and after the fall of the Roman republic was an agitator in Genoa and Modena; fled in 1853 to England, but reappeared in 1854 in Italy, agitating in Parma, Milan, Trieste; was captured at Vienna and put in the fortress of Mantua, but escaped to England in 1856; repaired in 1857 to Paris, having formed a conspiracy with three others, Pieri, Rudio, and Gomez, for the assassination of Napoleon III.; on Jan. 14, 1858, he, with his accomplices, threw three explosive bombs under the carriage of the emperor in the rue Lepelletier, which killed eight persons and wounded over one hundred; was caught, condemned, and guillotined Mar. 13, 1858.

Orso'gna, town of S. Italy, province of Chieti, about 7 miles from Lanciano. The inhabitants are better educated than those of the southern provinces generally, and are distinguished for their love of music. Pop. 6216.

Or'ta, da (Garcia), best known under the Latinized form **Garcia ab Horto,** b. in Portugal about 1500; studied at Salamanca and Alcalá de Henares; became professor of mathematics at Lisbon and chief physician to the king; went to Portuguese India 1534; displayed his medical skill at the courts of the friendly princes of India; was an intimate friend of Camoens; wrote in Latin and printed at Goa in a Portuguese translation his important *Dialogues* upon the medicinal productions of India (1563), in which work the Asiatic cholera was described for the first time, and the earliest printed notice of the caves of Elephanta was given. D. probably at Goa.

Or'ta No'va, town of S. Italy, province of Foggia. Near this town is the famous Villa dell' Orta, once the valuable property of the Jesuits of Naples. Pop. 5434.

Or'ta Novare'se, town of N. Italy, province of Novara, situated on the E. shore of a most picturesque lake of the same name. This town has many superb villas in its neighborhood, and near it rises a hill known as the Sacro Monte, on which, in the midst of lofty trees, stand some 20 or 30 chapels, several oratories, and a church, all decorated by eminent artists of the sixteenth century. The view from this sanctuary is remarkably fine, and the Lago d'Orta is now much frequented by summer travellers, who should not fail to visit the old church on the island of San Giulio, containing curious documents of the ninth century and other objects of interest. Pop. 1000.

Orte'lius (Abraham), b. at Antwerp, Holland, Apr. 4, 1527; visited England in the prosecution of geographical studies; became geographer to Philip II. of Spain 1575, and published a great atlas, *Theatrum Orbis Terrarum* (1570), long the standard work on the Continent, and was author of geographical treatises. D. at Antwerp Jan. 1598.

Orth (Godlove S.), b. near Lebanon, Pa., Apr. 22, 1817; was educated at Pennsylvania College, Gettysburg; became in 1839 a lawyer of Indiana; was six years in the State senate, of which he was one year president; in 1848 a Presidential elector; captain of troops on the U. S. ram Horner in the Ohio River 1862; in Congress from Indiana 1863–75; appointed U. S. minister to Austria 1875.

Orthacan'thus [Gr. ὀρθός, "straight," and ἄκανθα, "spine"], a name given to certain defensive spines of sharks found in the coal-measures. They are slender and acute, but not always straight, though the name indicates this, and are ornamented with two rows of sharp, depressed hooks on the posterior face. They probably belong to the shark of which the teeth have received the name of *Diplodus*. J. S. Newberry.

Orthagoris'cidæ [from *Orthagoriscus*—ὀρθαγορίσκος, a "sucking-pig"—the first genus], a family of plectognath fishes, of the sub-order Gymnodontes, distinguished from all other fishes by the peculiar truncation of the posterior region of the body. The form varies, being either oblong or higher than long, but in all ends abruptly behind, and is entirely destitute of anything like a tail or caudal

peduncle; the abdomen is never distensible by air, as in the swell-fishes; the skin is rough or covered with hexagonal scutellæ; the head externally inseparable from the body, and with all the bones covered by the integument; nostrils inconspicuous; mouth terminal, small; the jaws, both upper and lower, developed into cutting ridges, and each destitute of a median suture; branchial apertures very small; slits in front of the pectoral fins; dorsal and anal fins far back, opposite each other, and developed alike, higher than long, and united with the caudal fin when present; this is absent in *Molacanthus*, but in others forms a margin to the truncated rear; pectorals well developed; ventrals entirely wanting. The skeleton is peculiar for the small number of caudal vertebræ, there being less than twenty, and in the adult of *Orthagoriscus* there are ten abdominal and about eight caudal; no pelvic bones are developed; the air-bladder is absent; many other peculiarities are observable in the anatomy. The family is represented by three well-established genera: *Mola* (= *Orthagoriscus* of some), *Orthagoriscus* (= *Ranzarea*), and *Molacanthus*. The species of the first two attain a large size, *Mola rotunda* sometimes weighing as much as 800 pounds; the last remains comparatively very small, and hence has been supposed to be the young of *Mola*, from which, however, it differs greatly. *Mola* is represented by species in the Atlantic on both sides, as well as in the seas of Southern Africa; *Orthagoriscus* occurs in both the Atlantic and Pacific, but not on the American coasts; and *Molacanthus* is represented by a small species occasionally stranded on the eastern American and probably other coasts. (See Putnam in *American Naturalist* for December, 1870.) THEO. GILL.

Orthalic'idæ [from the generic name, *Orthalicus*], a family of land gasteropods belonging to the order Pulmonata and sub-order Geophila, distinguished by the composition of the jaw. The animal is provided with a shell, and has mantle moderate; the respiratory apparatus beneath the margin of the foot; the head is continuous with the body, with a small and ovoid buccal mass, and has no labial processes; the usual four retractile tentacles are developed, the posterior with the eyes, the anterior sub-marginal and small; the lingual ribbon has numerous rows of nearly similar teeth, these being stout, blunt, and widened towards the extremities, and with their apices recurved; the jaw is crescentiform and composed of a median triangular and numerous lateral semitriangular imbricated plates; the foot has no independent disk and is simple behind; vent near the respiratory orifice. The shell is spiral and oblong, like that of *Bulimus*, and has a narrow aperture. The family is represented by tropical species in both the eastern and western hemispheres, *Orthalicus* and *Lignus* being the principal American genera, and *Perideris* an African one. Some of the species at least (*e. g. Orthalicus undatus*) inhabit trees, to which they attach themselves during hibernation, and in favorable places are found in large numbers. THEODORE GILL.

Orthez', town of France, department of Basses-Pyrenées, on the Gave de Pau. From its salt-springs is made an excellent white salt, to which the peculiar delicacy of the so-called Bayonne ham is generally ascribed. Pop. 6724.

Orth'idæ [ὀρθός, "straight," in allusion to the hinge-line], an extinct family of brachiopods abundantly represented in Palæozoic rocks by several genera, more properly known under the name STROPHOMENIDÆ (which see).

Ortho-Acids and Ortho-Salts. The prefix *ortho* [Gr. ὀρθός, "right" or "true"] was applied by Odling to the tribasic phosphates and nitrates, and extended to basic carbonates, silicates, borates, etc., the prefix *meta* (also Greek) being used for the monobasic salts and hydrates. The terms, it must be observed, are not applicable to anhydrous acids or "anhydrides," orthophosphoric acid being of course trihydric phosphate. It is unfortunate that these convenient terms are really inapplicable in the common case of nitrates, the common or normal nitrates being the monobasic or meta-nitrates, and the ortho-nitrates, unlike the tribasic or ortho-phosphates, being really exceptional. For this and other reasons that might be given, it seems better to adhere to the terms monobasic, dibasic, and tribasic salts, and in the case of acids (that is, hydrated acids) to use the word *hydric*, as monohydric, dihydric, and trihydric phosphate. In the case of salts, a very convenient device of nomenclature (see under NOMENCLATURE, CHEMICAL) is to say monocalcic, dicalcic, or tricalcic phosphate, trisodic borate, diplumbic nitrate, dimercurous nitrate, and so on. HENRY WURTZ.

Orthocerat'idæ [from *Orthoceras*—ὀρθός, "straight," and κέρας, "horn"—the representative genus], a family name under which are combined a varying number of genera belonging to the class of Cephalopods, order of Tetrabranchiates, and sub-order Nautiloidea. All have a shell furnished with numerous chambers, which extend across the axis of the shell; the septal margins are simple and the funnel-like throat more or less sub-central and directed backwards; they differ, however, in other respects. In the typical forms (Orthoceras, etc.) the shell is straight and the aperture simple: to this, by some authors, the family is restricted; others (Cyrtoceras) have the shell curved, but the aperture simple; others, again (Gomphoceras), have the shell straight, but a heterogeneous aperture; others still (Phragmoceras) have the shell curved, and the aperture is heterogeneous. The species are numerous, and lived from the Lower Silurian up to the Liassic epoch. They sometimes attained a large size, and casts of the siphuncles of some forms were at one time supposed to indicate a peculiar form of animal life, and called hyolithes by Eichwald. THEODORE GILL.

Or'thoclase [ὀρθός, "straight," and κλᾶν, to "cleave"], the most common species of the feldspar family. It is essentially a potash-feldspar, being composed of silica, 64.8 per cent.; alumina, 18.4 per cent.; potash, 16.8 per cent.; but with the potash frequently in part replaced by soda, magnesia, lime, etc. It crystallizes in the monoclinic system and has two principal distinct cleavages, one of which is very perfect, the second being somewhat less so. It occurs generally in massive cleavable forms, and varies much in color from white and gray to reddish-white and flesh-red; also to greenish and even, rarely, to bright green. Its lustre varies from glassy to somewhat pearly. Its hardness is 6, or one degree less hard than quartz. Potash-feldspar is one of the most abundant of minerals, occurring as an ingredient of the most common granitic, metamorphic, and volcanic rocks, and in its decomposition being the principal source of clay. *Adularia* is a translucent or transparent variety of high lustre, occurring in some granites, and so named from Adula, one of the highest peaks of Mt. St. Gothard in Switzerland. (See MOONSTONE.) EDWARD C. H. DAY.

Orthog'raphy, a Greek word signifying "correct writing," is the name of that part of grammar which teaches how to represent language correctly by writing, and treats of the elementary sounds of which a language consists, and the signs by which these sounds are represented—the letters; of the combination of such sounds into syllables and the correct representation of words—the art of spelling. Originally alphabetic writing was phonetic, the words being written down as they sounded. The invention of an alphabet was the invention of phonetic writing; the difference between alphabetic and pictorial or ideographic writing, depends on the introduction of the phonetic principle instead of the symbolical. Soon, however, orthography was disturbed by an additional principle, and a false one—namely, the etymological; that is, the representation, by the spelling of a word, of its physical relations to other words; and at present the orthography of many modern languages, such as English, German, French, and the Scandinavian languages, is a combination, often bewildering and inconvenient enough, of the phonetic and etymological principles. When an alphabet was transferred to a new language, such as the Phœnician alphabet to the Greek and Roman languages, and the Roman alphabet to the Gothic-Germanic languages, the new languages often contained sounds for which no corresponding signs could be found in the old alphabets, and *vice versa*.

When such discrepancies between the sounds of the language and the signs of the alphabet were wholly irreconcilable, necessary letters were invented and superfluous discarded; but the finer shades of pronunciation were generally represented by the combination of several letters, by the application of dumb letters, and by other orthographical artifices, and thus the free fluctuations of the phonetic principle were early fastened down on certain points by conventionalities. From these conventionalities arose a new principle. As writing on the phonetic principle represents language as it is spoken in a certain district, at a certain time, its practice is subject to two methods, of which Greek and Latin may be taken as the types. In the former each of the principal dialects was written in its locality, until the Attic overpowered the others through the influence of Macedonia, and the works of Plato, Demosthenes, Thucydides, Sophocles, and other great writers. On the other hand, the Latins made concessions to the language as spoken at Rome, where Cicero became the great authority. Similarly, most of the authors of Scotland make use of the English of London, because it gives them a greater number of readers; and the orthoëpists differ but little on the subject of English pronunciation. English has departed so far from its originals that an etymologic orthography is impossible, except in words taken from books, such as *latitude* and *geography*. Even in Italian *petto* must be written for Latin *pectus*, and *dito* for *digitus*, and in English we have *curr-ent*, *cor-sair*, *cour-ser*, *ed-ible*,

and *eat-able*, from the same root respectively. The relation which etymology should bear to the phonetic system, and how the dominion ought to be divided between them, is a disputed question. The orthography of the English language took its more modern form in the time of Queen Anne; that of the German language a little later; that of the French half a century earlier. In all three languages the etymological principle is at present the predominating, but both in English and German a movement is on foot in favor of phonetic reforms. REVISED BY S. S. HALDEMAN.

Orthoptera. See ENTOMOLOGY, by PROF. S. TENNEY.

Or'tolan, a name applied to several species of song-birds. In Europe it was primarily employed for the *Emberiza hortulana*, or garden bunting, common on the continent of Europe and in the Levant. It is a handsome little bird without song, and is chiefly noteworthy for its extensive use as food. Immense numbers are captured in nets, placed in dark rooms, and gorged with millet and other grain mixed with spices, until they undergo a kind of fatty degeneration. In fact, when killed the ortolan is a mere lump of fat, of a flavor highly prized by gourmands. It is some six inches in total length and attains a weight of nearly three ounces. They are potted and sold in great numbers. In some parts of the U. S. the name has been perverted to the BOBOLINK (which see).

Or'ton (JAMES), b. at Seneca Falls, N. Y., Apr. 21, 1830; graduated at Williams College 1855, at Andover Theological Seminary 1858; travelled in Europe and Asia Minor; became a Congregational minister 1860; instructor in natural science in Rochester University 1866; was at the head of the Williams College expedition, which explored the upper Amazonas 1867–68; became professor of natural history in Vassar College 1869, and ascended the Amazonas a second time in 1873, extending the exploration to Bolivia. Author of *The Andes and the Amazon* (1870); *Underground Treasures: how and where to find them* (1872); *The Liberal Education of Women* (1873); *Comparative Zoology* (1875).

Orton (JASON ROCKWOOD), M. D., b. at Hamilton, N. Y., in 1806; was for many years a physician; settled in New York City 1850, and devoted himself to literature; he had edited the New York *Weekly Review* and the Binghamton *Courier*, and wrote much for the *Musical World*. Author of *Poetical Sketches* (1829); *Arnold, and other Poems* (1854), and *Camp-Fires of the Red Men* (1855). D. at Brooklyn Feb. 13, 1867.

Orton (JOB), b. at Shrewsbury, England, Sept. 4, 1717; was educated under Dr. Philip Doddridge at Northampton, to whom he was assistant teacher 1738–39; was pastor of a dissenting congregation at Shrewsbury 1741–65; removed to Kidderminster 1766, and occupied himself with literary pursuits until his death July 19, 1783. Author of *Discourses on Eternity* (1764); *Memoirs of Dr. Doddridge* (1766); *Exposition of the Old Testament* (6 vols., 1788–91).

Orto'na, town of Southern Italy, province of Chieti, situated near the Adriatic and commanding a magnificent view. It is respectably built, and the cathedral is said to contain the body of St. Thomas the apostle. The town has been twice nearly destroyed by earthquakes (1571, 1782), but it still carries on an active trade with Dalmatia, Germany, and Greece, and important improvements are now making in the harbor. Ortona was a Roman town of some consequence, and after the fall of the empire suffered for many centuries the common calamities of siege, famine, and pestilence. It claims to have been an Episcopal see from the time of the apostles. Pop. 11,884.

Ortygia. See DELOS.

Ortyg'inæ, or **Odontophor'inæ** [from ὀδούς, ὀδόντος, "tooth," and φορέω, to "carry"], a sub-family of Tetraonidæ, including the so-called American quail and partridges, which are, however, not at all related (except within the limits of the family) to the European birds bearing those names. The Odontophorinæ, with the general characters of the Old World quails and partridges (Perdicinæ), have a much stouter and more compressed bill, and the lower mandible is armed with two slight teeth, and hence the name. There are numerous species extending over both N. and S. America, 47 species being recognized by G. R. Gray and distributed by him in five genera, viz. *Odontophorus*, peculiar to S. America, with two sub-genera and 17 species; *Dendrortyx*, with three species; *Cyrtonyx*, with three species; *Ortyx*, with two sub-genera and 17 species; and *Callipepla*, with four sub-genera (*Callipepla, Philortyx, Lophortyx*, and *Oreortyx*) and seven species. Of the species admitted by Gray, seven occur within the limits of the U. S., which have been reduced by Messrs. Baird, Brewer, and Ridgway to six. These have been apportioned by those gentlemen among five genera, and are (1) *Ortyx virginianus* (with three varieties); (2) *Oreortyx pictus* (with two varieties); (3) *Lophortyx californicus*; (4) *L. gambeli*; (5) *Callipepla squamata*; and (6) *Cyrtonyx massena*. The first species is the common quail or partridge of the eastern and southern U. S.; the others are confined to the south-western portions. The family has been the object of an elaborate folio monograph by Mr. Gould (*A Monograph of the Odontophorinæ, or Partridges of America*, London, 1850).

THEODORE GILL.

Oru'ro, town of Bolivia, South America, stands in lat. 17° 57′ S., at an elevation of 12,455 feet above the level of the sea. It was founded in 1570; and its gold and silver mines were the richest in Bolivia, next to those of Potosi. It rose rapidly, and at the end of the seventeenth century it was a large and wealthy city with 70,000 inhabitants. But when the mines became exhausted, or, at least, difficult and less profitable to work, the city sank as rapidly as it had risen, and it is now almost deserted and lying in ruins. Of its former splendor only the churches and monasteries remain. It has lately been made the seat of the Bolivian government. Pop. 7000.

Orvie'to (*Orbitum, Urbs Vetus*), town of Italy, province of Perugia, in lat. 42° 43′ N.; lon. 12° 6′ E. It crowns an abrupt volcanic hill near the confluence of the Chiana and the Paglia, about 8 miles from Lake Bolsena, and nothing can be more picturesque than the aspect of its old ivy-covered walls as one winds and zig-zags up the steep but smooth road leading to the city gate. The town contains a handsome new theatre and some fine old palaces not without artistic treasures. The Pozzo della Rocca, or the Pozzo di San Patrizio (a circular well excavated by Clement VII. in 1527 after the famous sack of Rome), is worthy a visit. This well is 42 feet in diameter, and 200 in depth; the water is reached by two flights of stairs, ingeniously interlacing and constructed at an angle which allows donkeys to ascend and descend. But the great boast of Orvieto is its marvellously beautiful cathedral, one of the finest in Italy. This church, founded in 1290 in honor of the famous miracle of Bolsena, is built of black and white marble and adorned externally with the richest sculptures and the most brilliant mosaics. The interior, though less gorgeous, is not unworthy the splendid outside. For a most full and interesting account of this remarkable cathedral see Charles E. Norton's *Notes of Travel and Study in Italy*. Orvieto is of Etruscan origin, was not conspicuous under the Romans, but on the breaking up of the empire imitated the example of other strong Italian towns by declaring itself independent, and being Guelph in its policy was long a safe refuge for fugitive popes, no less than 30 of whom are said to have found shelter here at different times either from foreign assailants or rebellious subjects. It has been an episcopal see since 590 A. D. Orvieto is now accessible by railway; it still manufactures its excellent white wine, and has considerable trade in silk, grain, and cattle. Pop. 14,455.

Or'vil, tp. of Logan co., Ill. Pop. 1196.

Or'ville, post-v., cap. of Hamilton co., Neb.

Orville, post-v. (DEWITT P. O.) of Dewitt tp., Onondaga co., N. Y. Pop. 157.

Or'well, post-v. and tp. of Oswego co., N. Y. P. 1215.

Orwell, post-v. and tp. of Ashtabula co., O., on the Ashtabula Youngstown and Pittsburgh R. R. Pop. 936.

Orwell, post-v. and tp. of Bradford co., Pa. Pop. 1296.

Orwell, post-v. and tp. of Addison co., Vt. Pop. 1192.

Or'wigsburg, post-b. of Schuylkill co., Pa. Pop. 728.

Orycterop'idæ [from ὀρυκτήρ, a "digger," and πούς, a "foot"], a family of monodelph mammals of the order Edentata, and alone representing the peculiar sub-order Fodientia. They slightly resemble a hog (whence the name aard-vark, *i. e.* earth-hog, has been given to it by the Cape of Good Hope colonists), but the snout is elongated, the ears long, and the tail stout and tapering; the hair is sparse; the skull is elongated; the frontal enlarged and smaller, with reduced post-orbital processes; the intermaxillary bones well developed, prominent below, not enclosing foramina; the supra-maxillaries lengthened and deep; the lachrymal bone enlarged; the malar also enlarged and extending much upon the face, but with the zygomatic process small and slender; the squamosal with the zygoma slender and twisted, as in the armadillos, with a strong post-articular and post-auditory process, and just within the latter a short truncated styloid process not enclosed by any vaginal process; the tympanic bone much reduced, separate; teeth in the supra-maxillaries and mandible very complicated in structure and in number generally about 26 ($\frac{7}{6} \times 2$); members well developed, each provided with five toes, all of which are armed with stout hoof-like claws admirably fitted for digging. This family, whose osteological characters have been indicated by Turner es-

sentially in the words here borrowed, has been constituted for the reception of two species of mammals confined to Africa: one species (*Orycteropus capensis*) is an inhabitant of Southern Africa, the other (*O. æthiopicus*) of Eastern Africa. They attain a considerable size (the length, including the tail, being about five feet), and live chiefly upon ants, which they obtain by demolishing ant-hills and by their elongated prehensile tongues, enabling them to lick up the insects thus exposed to view. They live in burrows made by themselves, and are nocturnal in their habits. THEODORE GILL.

Oryctol′ogy [ὀρυκτός, "dug up"], "the science of things dug up," a term formerly (1835) applied to the study of fossils, and thus to some extent equivalent to palæontology. The latter term has now altogether superseded it. EDWARD C. H. DAY.

O′ryx [Gr. ὄρυξ], a name applied by the ancients to a species of North African antelope generally supposed to have been the gazelle; but modern scientists have given this name to the gemsbok. (See GAZELLE; GEMSBOK.)

Or′zi Nuo′vi, town of N. Italy, province of Brescia, once a small but strong fortress, of which only the castle and two gates remain. Pop. 3689.

Osaga, post-v. and tp., Bourbon co., Kan., on the Missouri River Fort Scott and Gulf R. R. Pop. 1053.

Osage′, county of Central Kansas. Area, 792 square miles. It is rolling, fertile, and adapted to stock and grain raising. Coal, ochre, fire-clay, and building-stone abound. The manufacturing interests are of increasing importance. The county is traversed by the Atchison Topeka and Santa Fé R. R. Cap. Burlingame. Pop. 7648.

Osage, county of Central Missouri, bounded N. by the Missouri River and W. partly by the Osage River. It is traversed by the Missouri Pacific R. R. and the Gasconade River. Area, 560 square miles. It is hilly and has deep, fertile valleys. Tobacco, live-stock, wool, and grain are leading products. Cap. Linn. Pop. 10,793.

Osage, tp. of Benton co., Ark., includes Bentonville, the county-seat, and the battlefield of Pea Ridge or Elkhorn, fought Mar. 6, 7, and 8, 1862. Pop. 5384.

Osage, post-v. and tp., Carroll co., Ark. Pop. 842.

Osage, tp. of Newton co., Ark. Pop. 248.

Osage, post-v., Franklin co., Ill.

Osage, tp. of La Salle co., Ill. Pop. 1176.

Osage, post-v. and tp., cap. of Mitchell co., Ia., on the Illinois Central R. R. and Cedar River, has a college and public schools, 3 churches, 2 banks, 1 foundry and machine shop, 3 manufactories, 2 hotels, 2 printing-offices, 2 newspapers, and stores. Principal business, farming. Pop. of v. 1400; of tp. 2158.
A. W. CLYDE, ED. "MITCHELL CO. NEWS."

Osage, tp. of Allen co., Kan. Pop. 463.

Osage, tp. of Bourbon co., Kan. Pop. 1053.

Osage, tp. of Crawford co., Kan. Pop. 980.

Osage, tp. of Labette co., Kan. Pop. 930.

Osage, tp. of Miami co., Kan. Pop. 1396.

Osage, tp. of Bates co., Mo. Pop. 500.

Osage, tp. of Camden co., Mo. Pop. 1426.

Osage, tp. of Cole co., Mo. Pop. 604.

Osage, post-v. and tp., Crawford co., Mo. Pop. 784.

Osage, tp. of Dent co., Mo. Pop. 288.

Osage, tp. of Henry co., Mo. Pop. 828.

Osage, tp. of Laclede co., Mo. Pop. 1257.

Osage, tp. of Miller co., Mo. Pop. 695.

Osage, tp. of Morgan co., Mo. Pop. 787.

Osage, tp. of Vernon co., Mo. Pop. 1538.

Osage, post-v. and tp., Otoe co., Neb. Pop. 218.

Osage City, post-v. of Osage co., Kan., 35 miles S. W. of Topeka, in the great coal-basin of the State, has good schools, 6 churches, excellent flag-stone quarries, extensive beds of pure yellow ochre, a steam brick-mill, 1 flour, paint, and stone saw-mill, a bank, 1 newspaper, several hotels, and stores. Pop. about 1500.
W. H. MORGAN, ED. "SHAFT."

Osage Indians, a tribe of Dakota stock formerly inhabiting the valley of the Osage River and the plains beyond. They now occupy a reservation of 1,760,000 acres, bounded N. by the Kansas line, E. by the 96th degree of W. lon., S. and W. by the Arkansas River. It is a broken, hilly region without much fertile land. They have many cattle and some 12,000 horses. They are divided into eight bands: the Big Hills, Clammores, Big Chiefs, Black Dogs, White Hairs, Beavers, Little Osages, and Half-Breeds. They are not very intelligent, and have made little progress in civilization. Pop. 3956.

Osage Mission, post-v. of Mission tp., cap. of Neosho co., Kan., on the Missouri Kansas and Texas R. R., 330 miles S. W. from St. Louis; has 1 academy and 5 public schools, 2 churches, 1 steam grain elevator, 1 newspaper, a savings bank, 2 extensive flouring-mills, 2 wagon and plough factories, 1 cheese factory, and stores. Pop. 791. C. H. HOWARD, ED. "NEOSHO COUNTY JOURNAL."

Osage Orange, or **Bois d'Arc,** the *Maclura aurantiaca*, a North American tree of the Moraceæ, a division of the great order Urticaceæ. It has a handsome, tough, and durable yellow wood, which has been proposed as a substitute for fustic. The fruit is large, yellow, and not altogether unlike an orange, whence the name. It is not edible. The principal use of the tree is as a hedge-plant.

Osage River, rises in Kansas, where it is often called MARAIS DES CYGNES (which see). It traverses Missouri, and falls into the Missouri River 10 miles below Jefferson City. Its lower course is navigable.

Osaka. See JAPAN.

Osa′kis, post-v. and tp. of Douglas co., Minn. P. 400.

Osann′ (FRIEDRICH GOTTHILF), b. at Weimar in 1794; studied in Jena and Berlin; in 1817–19 travelled in England, France, and Italy; became professor at Jena in 1821, and in 1825 was made professor of ancient literature and director of the philological seminary in Giessen; published *Sylloge Inscriptionum Antiq. Græc. et Rom.* (Darmst., 1822–34, fol.), *Auctarium Lexicorum Græc.* (*ib.*, 1824, 4to), Cicero's *De Repub.* (1847), Pomponius's *De Orig. Juris* (1848), *Beiträge zur Gesch. d. griesch. und römisch. Literatur* (Darmstadt, 1835–39, 2 vols. 8vo), and minor treatises and editions. D. Nov. 30, 1858. HENRY DRISLER.

Osawat′omie, p.-tp. of Miami co., Kan. Pop. 1182.

Os′born, post-v. of De Kalb co., Mo., on the Hannibal and St. Joseph R. R.

Osborn, post-v. of Bath tp., Greene co., O., on the Atlantic and Great Western R. R. Pop. 639.

Osborn, tp. of Outagamie co., Wis. Pop. 417.

Osborn (JOHN), b. at Sandwich, Mass., in 1713; graduated at Harvard College 1735; studied divinity, and subsequently medicine; settled at Middletown, Conn., as a physician; wrote a number of songs and short poems. D. at Middletown May 31, 1753.

Osborn (SELLECK), b. at Trumbull, Conn., in 1783; received a common-school education; entered a printing-office at Danbury, Conn., at the age of twelve; became editor of the Litchfield *Witness* 1804; served as captain in the U. S. army during the war of 1812–15; afterwards edited papers at Bennington, Vt., and Wilmington, Del.; published a small volume of *Poems, Moral, Sentimental, and Satirical* (Boston, 1823), being selections from his numerous poetical pieces scattered through the newspapers he had edited. D. at Philadelphia, Pa., Oct. 1, 1826.

Osborn (Admiral SHERARD), b. in England Apr. 25, 1822; entered the British navy 1837; served in one of the expeditions in search of Sir John Franklin, in the Crimean war, and in the seas of China and Japan; accepted from the Chinese government the command of a squadron for the suppression of piracy 1862; returned to England 1864 to take command of the turreted monitor Royal Sovereign; was for several years manager at Bombay of the Great Indian Peninsular Railway; became rear admiral 1873, and was a member of the commission for fitting out the great Arctic expedition of 1875. D. in England May 6, 1875. Author of *Stray Leaves from an Arctic Journal* (1852); *A Cruise in Japanese Waters* (1859); *The Past and Future of British Relations in China* (1860), and other works.

Os′borne, county of Central Kansas. Area, 900 square miles. It is traversed by the N. and S. forks of Solomon River. It is undulating, fertile, and well adapted to stock-raising. Cap. Osborne. Pop. 33.

Osborne, post-v., cap. of Osborne co., Kan., on the central branch of Union Pacific R. R., has excellent schools, 4 churches, several mills and mechanical shops, and stores. Pop. about 200. F. H. BARNHART, ED. "FARMER."

Osborne (LAUGHTON), b. in New York about 1806; graduated at Columbia College 1827; author of *Sixty Years of the Life of Jeremy Levis* (1831); *The Dream of Alla-ad-Dean; The Confessions of a Poet* (Phil., 1835); *The Vision of Rubeta, an Epic Story of the Island of Manhattan; Arthur Carryl, a Novel; Calvary; Virginia Tragedies* (1867), and a *Treatise on Oil Painting.*

Osborne (SYDNEY GODOLPHIN), LORD, third son of the first earl Godolphin and brother of the present duke of Leeds, b. in England in 1808; graduated at Brasenose College, Oxford, 1830; took orders in the Church of England; was for several years rector of Stoke Pogis; became

rector of Durweston, Dorsetshire, 1841; visited Ireland for philanthropic purposes during the great famine of 1847, and in a subsequent year, during a cholera epidemic, visited Miss Nightingale's hospitals at Scutari during the Crimean war, rendering services for which he was thanked by the government, and was long known as a correspondent of the *Times* upon social and philanthropic topics over the signature S. G. O. Author of *Hints to the Charitable* (1838); *Gleanings in the West of Ireland* (1850); *Lady Eva* (1851); *Scutari and its Hospitals* (1855); *Letters on the Education of Young Children* (1866), and other works, besides many pamphlets in the interests of the laboring class.

Osborne (Gen. Thomas O.), b. at Jersey, Licking co., O., Aug. 11, 1832; graduated at the University of Ohio 1854; studied law, and was admitted to the bar at Crawfordsville, Ind.; settled at Chicago 1858; became colonel of the 39th Illinois regiment 1861; bore a distinguished part in several battles in Virginia, especially at Petersburg, for which he was made brevet brigadier and major-general Apr. 2, 1865. Gen. Osborne lost the use of his right arm at Drury's Bluff.

Os'cans [Lat. *Osci, Opsci*; Gr. Ὀπικοί], an Italian race which originally appears to have been the same as the Ausones. Later they became associated with the Samnites and other peoples of Southern Italy. The Oscans are chiefly interesting from their widely-spoken language, which was kindred to the Latin. No Oscan literature is extant, and the little we know of the language has been mostly gathered from coins and inscriptions.

Os'car II., b. Jan. 21, 1829, was a son of Oscar I. (b. July 4, 1799, king Mar. 8, 1844, d. July 8, 1859), and a grandson of Charles XIV. (General Bernadotte); married June 6, 1857, Sophia, a daughter of Duke William of Nassau, who bore him four sons; and succeeded, Sept. 18, 1872, his brother Charles XV. on the throne of Norway and Sweden.

Osceo'la, county of N. W. Iowa, bounded N. by Minnesota. Area, 432 square miles. It is undulating and adapted to grain culture, but its resources are not yet developed. The county is traversed by the St. Paul and Sioux City R. R. Cap. Sibley.

Osceola, county of Michigan. Area, 576 square miles. It is level and fertile, and mainly covered with dense forests. The lumber trade is the chief industry. The county is traversed by the Grand Rapids and Indiana and the Flint and Père Marquette R. Rs., and by the Muskegon River. Cap. Hersey. Pop. 2093.

Osceola, post-v., cap. of Mississippi co., Ark., 80 miles above Memphis, on the Mississippi River; has 2 schools, 3 churches, a newspaper, a Masonic hall, and stores. Principal business, cotton-growing. Pop. about 400. L. Roussau, Ed. "Osceola Times."

Osceola, post-v. and tp., Stark co., Ill., on the Rockford Rock Island and St. Louis R. R. Pop. 1278.

Osceola, post-v. and tp., cap. of Clarke co., Ia., on the Chicago Burlington and Quincy R. R., 156 miles W. of Burlington; has a good school system, 6 churches, 3 newspapers, 2 banks, several mills, and stores. Pop. of v. 1298; of tp. 1889. Ayres & Miller, Eds. "Beacon."

Osceola, tp. of Franklin co., Ia. Pop. 617.

Osceola, a v. of Bruenburg tp., Green co., Ky. P. 89.

Osceola, tp. of Livingston co., Mich. Pop. 1012.

Osceola, tp. of Osceola co., Mich. Pop. 137.

Osceola, post-v. and tp., cap. of St. Clair co., Mo., on the Kansas City and Memphis R. R., 105 miles S. E. of Kansas City; has 2 banks, 1 newspaper, the usual number of business houses and stores. Pop. of v. 331; of tp. 957. A. C. Appler, Ed. "Democrat."

Osceola, post-v., cap. of Polk co., Neb., located near the centre of Polk co.; has a newspaper and the usual business houses. F. P. Burgess, Ed. "Homesteader."

Osceola, post-v. and tp., Lewis co., N. Y. Pop. 688.

Osceola, post-b. (Osceola Mills P. O.) of Decatur tp., Clearfield co., Pa., on the Tyrone and Clearfield branch of Pennsylvania R. R.; has 1 weekly newspaper. Pop. 813.

Osceola, post-tp. of Tioga co., Pa. Pop. 523.

Osceola, post-v. and tp. Fond du Lac co., Wis. P. 1209.

Osceola (a corrupt form of his native name, signifying "Black Drink," conferred on account of his capacity for that nauseous draught—a capacity which was regarded as a proof of prowess), a Seminole chief, son of William Powell, an Englishman, by an Indian mother, born in 1804 near the river Chattahoochee. Osceola was early distinguished for ability, courage, and hatred of the whites; attained great influence among the Seminoles, and strongly opposed the cession of the tribal lands in Florida; in 1835 his wife, the daughter of a fugitive slave, was stolen as herself a slave, and Osceola, demanding her release of the U. S. agent at Fort King, used language which the latter resented, and the chief was put in irons. Six months later, Col. Thompson, the perpetrator of the outrage, was murdered; the battle on the Withlacoochie, the massacre of Dade, the assaults on Forts Micanopy and Drane, and other spirited actions followed, in which the Indians more than held their own against very great odds; but during a conference with Gen. Jessup, under a flag of truce, Osceola was treacherously seized (Oct. 22, 1837), and imprisoned at Fort Moultrie, S. C., where he d. Jan. 30, 1838.

Osceola Mills, post-v. of Milltown tp., cap. of Polk co., Wis., located on the St. Croix River at the foot of the famous "dalles of the St. Croix;" has 2 schools, 2 churches, 1 newspaper, and stores and mills. Principal business, lumbering and farming. Pop. 710.

Charles E. Mears, Ed. "Polk County Press."

Osch'ersleben, or **Gross Oschersleben,** town of Prussia, province of Saxony, on the Bode; has manufactures of linen fabrics, beet-root sugar, and tiles. P. 6234.

Os'co, post-v. and tp., Henry co., Ill., on the Peoria and Rock Island R. R. Pop. 1216.

Osco'da, county of Michigan. Area, 576 square miles. It is densely covered with forests, and is traversed by the Au Sable River, now famous among anglers for its fine grayling. Pop. 70.

Oscoda, post-v. and tp., Iosco co., Mich. Pop. 476.

Oscula'tion [Lat. *osculatio*], a contact of one curve with another of the highest order possible. (See Osculatrix.)

Os'culatory Cir'cle. A circle is said to be osculatory to a curve when it has a higher order of contact with that curve than any other circle. In the language of the infinitesimal calculus, it is a circle that passes through three consecutive points of the given curve. The first of these points is called the *point of osculation*. From the definition just given, it follows that a plane curve and its osculatory circle have three consecutive ordinates in common, counting from the point of osculation; consequently, the first and the second differential coefficients of the ordinates of the two curves at that point must be equal. Conversely, if a curve and a circle have one point in common, and if the first and the second differential coefficients of their ordinates at that point are equal, the circle is osculatory to the curve at that point. These conditions are sufficient to determine either the equation of the osculatory circle or the value of its radius. As the latter is of the greater practical importance, we append a general formula for finding it when the abscissa is taken as the independent variable; this formula is as follows:

$$R = \frac{(1+q')^{\frac{3}{2}}}{q''},$$

in which R denotes the radius of the osculatory circle, q' the first differential coefficient of the ordinate of the given curve, and q'' the second differential coefficient of the ordinate, both being taken at the point of osculation. This value of R is called the radius of curvature because its reciprocal is the measure of the curvature of the curve at the point of osculation. It is to be remarked that we cannot assign to a circle a higher order of contact with a given curve than the second; it may happen, however, that it will have a higher order of contact at particular points. This will be the case at those points where the normal divides the curve symmetrically, as, for example, at the vertices of the axis of the conic sections.

In most dynamical problems, and particularly in astronomy, the time is taken as the independent variable, in which case both the co-ordinates x and y are functions of t. In this case the formula for the radius of curvature is,

$$R = \frac{(dx^2+dy^2)^{\frac{3}{2}}}{dxd^2y - dyd^2x}.$$

In what precedes, the curves whose radius of curvature has been treated of are supposed to be plane curves, in which case the osculatory circle lies in the same plane. If the curve is one of double curvature, given by its projections on two co-ordinate planes, the most general formula for the radius of curvature is,

$$R = \frac{ds^2}{\sqrt{(d^2x)^2+(d^2y)^2+(d^2z)^2-(d^2s)^2}}.$$

In this case the osculatory circle lies in the plane passing through three consecutive points of the curve, which plane is called the plane of osculation.

If a plane curve is determined by the relation between

the polar co-ordinates of its points, r and θ, its radius of curvature is given by the formula,

$$R = \frac{(r^2 + p'^2)^{\frac{3}{2}}}{r^2 + 2p'^2 - rp''},$$

in which p' and p'' are the first and the second differential coefficients of r in terms of θ. (See OSCULATRIX.)

W. G. PECK.

Oscula'trix. If two plane curves have two consecutive points in common, the straight line passing through these points is tangent to both curves at the first point, and the two curves are said to have a contact of the first order. In general, if two plane curves have $n + 1$ consecutive points in common, they will have n consecutive rectilinear tangents in common, and the two curves are then said to have a contact of the nth order. If two curves have a contact of the nth order, they must have $n + 1$ consecutive ordinates in common, counting from the first point, and consequently they must have n successive differential coefficients of their ordinates at that point equal to each other. Conversely, if two curves have a common point, and if n successive differential coefficients of their ordinates at that point are equal, they will have a contact of the nth order. A curve which has a higher order of contact with a given curve at a given point than any other curve of the same kind is an osculatrix. This definition, together with the preceding principles, indicates the methods of solving the following problems:

1. *To find whether two given curves have any contact; and if so, to determine the order of contact.*—Combine the equations of the curves and find the values of x and y. For every pair of real values found there will be a point common to the two curves: let there be one such point, and denote its co-ordinates by x' and y'. Differentiate the equations of the curves; find the first differential coefficients of their ordinates, and in them make x and y equal to x' and y'; if the results are equal, the curves have a contact of the first order. Then find the second differential coefficients of the ordinates of the curves, and in them make x and y equal to x' and y'; if these results are also equal, the curves have a contact of the second order. Continue this operation of differentiation, substitution, and comparison, till two differential coefficients of the ordinates are found that are unequal. Then will the order of contact be denoted by the number of successive differential coefficients that have been found equal.

2. *To find the equation of a curve which is given in kind that shall be osculatory to a given curve at a given point.*—Assume the most general form of the equation of the curve which is given in kind, and suppose that it contains n arbitrary constants. Substitute in it for x and y the co-ordinates of the given point, denoted by x' and y'. The resulting equation will express the condition that the curves shall have a common point. Find the first differential coefficients of the ordinates of the two curves, and in them make x and y equal to x' and y', and place the results equal; the equation thus found will express the condition that the two curves have a contact of the first order. Continue this operation till $n + 1$ equations of condition have been found. Then combine these equations and find the values of the arbitrary constants, which substitute in the equation of the curve that was given in kind, and the resulting equation will be that of the required osculatrix.

The most general form of the equation of a straight line can always be reduced so as to contain but two arbitrary constants; hence, it is impossible to assign a contact of a higher order than the *first* to a straight line with a given curve. It may happen, however, that a straight line may have a contact of the second order, as, for example, at a point of inflexion. The most general form of the equation of a conic section can be reduced so as to contain but five arbitrary constants; hence, we may assign to a conic section a contact of the *fourth* order, but we cannot assign to it a contact of a higher order. The condition ($b^2 = 4ac$) that makes the conic section a parabola reduces the number of arbitrary constants in its general equation to four; hence we cannot assign to the parabola a contact of a higher order than the *third*. We have already seen (article OSCULATORY CIRCLE) that no order of contact higher than the second can be assigned to a circle.

It is a property of osculatrices that no osculatrix whose contact is of an odd order can cut the curve to which it is osculatory at the point of osculation, and that every osculatrix whose contact is of an even order must cut the curve to which it is osculatory at the point of osculation.

W. G. PECK.

Os'good, post-v. of Ripley co., Ind., on the Ohio and Mississippi R. R., 51 miles W. of Cincinnati; contains 3 churches, 1 newspaper, 2 limestone quarries, 1 flouring-mill, and stores. Pop. about 800.

R. N. PAPET, ED. "RIPLEY COUNTY JOURNAL."

Osgood (DAVID), D. D., b. at Andover, Mass., Oct. 14, 1747; graduated at Harvard 1771; was ordained to the Congregational ministry in 1774, and was after 1777 the minister of Medford, Mass.; distinguished as an able preacher and a zealous Federalist. D. at Medford Dec. 12, 1822. Author of *Sermons* (1824) and political addresses.

Osgood (FRANCES SARGENT), b. in Boston, Mass., June 18, 1811; married S. S. Osgood, an artist, in 1835. Her father was Joseph Lock, a merchant. She resided in England 1836–40, and while there published *The Casket of Fate* and *A Wreath of Wild Flowers from New England* (1838), the last a very successful volume of poems. Mrs. Osgood subsequently published other volumes of poetry and some books for children. Her collected poems appeared in 1849. D. at Hingham, Mass., May 12, 1850.

Osgood (HELEN LOUISE **Gilson**), b. at Boston, Mass., about 1835; was left an orphan in childhood; received a liberal education through the care of her guardian; became noted for musical ability and conversational powers; was one of the earliest organizers of soldiers' aid societies on the outbreak of the civil war; went to the army of the Potomac as a nurse early in 1862, remaining through the war; organized and directed a hospital for 1000 colored soldiers; married a gentleman connected with the Sanitary Commission; lost her health through her patriotic labors, and d. at Newton Centre, Mass., Apr. 28, 1868.

Osgood (SAMUEL), b. at Andover, Mass., Feb. 14, 1748; graduated at Harvard 1770; studied divinity, but became a merchant; was much in public life; an officer in the Revolutionary army, in which he attained the rank of colonel and assistant commissary; served in the Massachusetts legislature; was in Congress 1780–84; was first commissioner of the U. S. Treasury 1785–89; postmaster-general 1789–91; became Speaker of the New York house of assembly; supervisor in New York 1801–03; naval officer of the port of New York 1803–13; author of various works, chiefly on religious questions.

Osgood (SAMUEL), D. D., b. at Fryeburg, Me., Feb. 3, 1784; graduated at Dartmouth 1805; was pastor of the first Congregational church, Springfield, Mass., 1809–62. An able preacher, distinguished for active labors in every good work, he lived to be widely known and venerated. D. Dec. 8, 1862.

Osgood (SAMUEL), D. D., clergyman and man of letters, b. in Charlestown, Mass., Aug. 30, 1812; graduated at Harvard College 1832, and at Cambridge Theological School 1835; settled in Nashua, N. H., 1837, in Providence 1841, and in New York 1849; in 1870 left Unitarianism for the Episcopal Church, but assumed no pastoral charge. His writings are numerous: *Studies in Christian Biography* (1851); *The Hearth-Stone* (1854); *God with Men* (1854); *Mile-Stones in our Life-Journey* (1855); *Student Life* (1860); he translated from the German De Wette's *Human Life* (1842) and Olshausen's *History of the Passion* (1839); edited the *Western Messenger* two years and the *Christian Inquirer* four; has written articles in the *North American Review, The Christian Examiner, The Bibliotheca Sacra, Harper's Monthly Magazine,* besides sermons, orations, and discourses; was for many years home corresponding secretary of the New York Historical Society. Resides in New York.

O. B. FROTHINGHAM.

Osgood (THADDEUS), b. at Methuen, Mass., Oct. 24, 1775; graduated at Dartmouth College 1803; studied divinity with Drs. Lothrop and Emmons; was ordained about 1806; preached at Southbury, Conn.; was a missionary in New York and Canada; organized the first church at Buffalo, N. Y., established Sunday and day-schools and Bible societies at many places in Canada, and collected large sums for benevolent purposes. D. at Glasgow, Scotland, Jan. 19, 1852.

O'Shaugh'nessy (Sir WILLIAM BROOKE), M. D., F. R. S., b. at Limerick, Ireland, in 1809; educated at the University of Edinburgh; entered the Bengal army as a surgeon; devoted himself for many years to scientific inquiries, especially the application of medical science to engineering purposes; published numerous scientific memoirs; studied and wrote upon the subject of telegraphy as early as 1840; became in 1852 superintendent of the Indian telegraph system, which he extended throughout that vast country; was knighted 1856; was instrumental in promoting the construction of the overland and submarine lines of telegraph connecting England with India. D. in England in 1875.

Osh'awa, post-v. and warehousing port of Whitby tp., Ontario co., Ont., Canada, on the Grand Trunk railway, 33 miles N. E. of Toronto and near Lake Ontario. It has extensive manufactures of superior flour, of furniture, farm implements, machinery, steam-engines, printing-presses,

etc., and 1 monthly and 1 weekly newspaper. Pop. of sub-district 3185.

Oshawa, post-v. and tp., Nicollet co., Minn., on the Chicago and North-western R. R. Pop. 2640.

Osh'kosh, city and tp., cap. of Winnebago co., Wis., situated on the western shore of Lake Winnebago, at the mouth of Fox River, possesses an excellent system of public schools, and has the finest high-school building in the State. The city is supplied with water and gas; is the seat of the State Normal School and the Northern Wisconsin Insane Asylum. There are 40 shingle and saw-mills, 12 sash, door, and blind factories, a threshing-machine factory, and other manufacturing industries. Oshkosh has 1 daily and 3 weekly newspapers, an efficient fire department, with 3 steam fire-engines, a public and a law library. The U. S. circuit and district courts meet here annually. The city ranks second in wealth and commercial importance in Wisconsin. Pop. of city 12,663; of tp. 729. JOHN HICKS, ED. "DAILY NORTH-WESTERN."

Osh'temo, post-v. and tp., Kalamazoo co., Mich., on the Michigan Central R. R. Pop. 1594.

Osian'der (ANDREAS), whose true name was **Hosemann,** b. Dec. 19, 1498, at Gunzenhausen, near Nuremberg; studied theology at Ingolstadt and Wittenberg; became preacher at Nuremberg, and being an ardent adherent of Luther he labored with great energy for the reformation. In 1548, however, he was deprived of his office, as he would not agree to the Augsburg Interim, but he was shortly after (1549) made preacher and professor in theology at Königsberg. Here he entered into a hot controversy concerning justification, which greatly disturbed and embittered his last days. Justification and sanctification he represented as forming only one act. He d. suddenly Oct. 17, 1552. His principal works were *Harmonia Evangelica* (1537), *De Lege et Evangelio* (1549), and *De Justificatione* (1550).

O'sier [Fr.], a name properly belonging to those species of willow (such as *Salix vitellina, viminalis, rigida, rubra, angustata, triandra,* and others) which are suitable for basket-making. In England and on the European continent large areas of land are devoted to the cultivation of osiers; and at several times the attempt has been made to start the business in the U. S., but there has been hitherto comparatively small demand for the product. Care should be taken to select species which are not brittle when cured and dried. The plants are put out in rows; and if the best quality is to be produced, the ground is cultivated twice a year between the rows. Large rods are grown in Europe in copses, for hoop-poles, vine-props, charcoal, etc. No little skill is required for the profitable management of the *salicetum*, different climates, soils, and species requiring special treatment.

Osi'lo, town of Sardinia, province of Sassari, situated on a mountain more than 2000 feet above the sea, commanding a fine view, but exposed to violent winds. Pop. 5210.

Osi'mo (*Auximum*), town of Italy, province of Ancona, 11 miles S. of the city of Ancona and 9 miles from the sea. It is surrounded by an old Roman wall, and contains an episcopal, municipal, and many fine private palaces. In the municipal palace are preserved many interesting Latin inscriptions, and the library contains valuable documents of the thirteenth century. The Collegio Campana, founded in 1715, is the largest building in Osimo, and has a high literary reputation. In the various churches may be seen objects of archæological and artistic interest. The town is well supplied with charitable institutions and better provided with common schools than most Italian country towns. The inhabitants are industrious and chiefly occupied in the cultivation of grain, olives, and silk. There are ten silk-reeling establishments, in seven of which steam is employed, and raw-silk fabrics are produced on a large scale. *Auximum* was enclosed with walls by the Romans 174 B. C. Pompey used it as an important military centre, and the town continued flourishing during the early Christian period. Its mediæval history is a succession of civil wars, sieges, and change of masters. In the struggles for Italian independence since 1831, Osimo took a very active part. It has been a bishop's see since early in the fifth century. Pop. 17,086.

Osi'ris, the most celebrated of all Egyptian deities, eldest son of Seb or Saturn, and Nut or Rhea. His name was expressed by the hieroglyphs of an eye and seat or throne, and its etymology is unknown. His worship appears at the time of the fourth dynasty, but was not universally prevalent till the sixth. He belonged to the gods of the first order, and was supposed to have reigned over Egypt for 450 years. Although the details of the legend of Osiris appear at a later period, they are confirmed in a great degree by monumental evidence. He is stated to have civilized the Egyptians by teaching them the art of agriculture, and to have travelled over the rest of the world. At the age of 28, on the 17th day of the month Athor, when the sun was in Scorpio, he fell a victim to the conspiracy of his brother Set or Typhon, Aso, an Ethiopian queen, and seventy-two other accomplices. A mummy-chest which exactly fitted the size of the body of Osiris was brought into a banqueting-room and offered as a present to him whom it fitted. After all the conspirators had unsuccessfully tried it, Osiris did so, and the conspirators nailed down the cover and poured lead over it, or sealed it with a leaden seal. The body and chest were conveyed down the Tanaitic branch of the Nile to the sea. The Pans and satyrs, or rather the local gods of Chemmis, informed Isis, his sister and wife, then at the city of Koptos, and she cut off a lock of her hair and went into mourning. She then, it appears, departed to discover the child of her sister, Nephthys, who had been married to Typhon, but had given birth to a child, the issue of Osiris, and found Anubis. Hearing that the chest had been carried by the waves to Byblos in Phœnicia and lodged in a tamarisk, which, grown into a large tree, enclosed the chest, so that it could not be seen, and that the king of Byblos had made a pillar to his house out of the trunk of the tree, Isis went thither, where she so ingratiated herself with the queen as to be appointed nurse to the royal child. She suckled the boy with her finger and laid him on burning coals, while, transformed into a swallow, she hovered around the pillar at night. Discovered in these actions, she revealed herself, and obtaining, by request, the pillar, took out the chest and body of Osiris, restoring the rest to the king. She then sailed back to Egypt with them, but deposited them in a remote place while about to visit Horus at Butus. The chest was discovered by Typhon in the moonlight, who tore the body into fourteen pieces, which he scattered about the country. These Isis again sought out in a papyrus boat, and discovered all except some portions devoured by the dogs of Anubis and the fish. After this, the goddess contended with Set or Typhon for the supremacy, and Horus defeated Typhon in a battle which lasted three days and nights. (See ISIS.) When, however, Typhon was set at liberty by Isis, and Horus had torn off her diadem, for which Thoth substituted the head of the cow of Athor, Typhon accused Horus of illegitimacy, but that god was justified before the other gods by Thoth, and Typhon, after two battles, was again defeated by Horus. According also to the later legends, Harpocrates was a kind of posthumous son of Osiris by the goddess Isis. It appears from the hieroglyphs that four inferior deities, called Amset, Hapi, Tuaumutt, and Kabhsenut, were also the children of Osiris and Isis, and that Anubis was also the son of Isis, not Nephthys, as stated in the Greek legends.

In the Egyptian mythology Osiris appears to be the Pluto of the Hades or Karneter. Seated on his throne in the hall of the Two Truths, or place of the great judgment, he awards, as judge of the dead, the rewards or punishments of the future state. In this he is assisted by his sisters, Isis and Nephthys, and Thoth, the Hermes or scribe of the Hades, and his children, Horus, Anubis, and the four genii of the head, accompanied by the forty-two demons or gods who avenged the sins committed during life. Although this is his principal function, he was also allied occasionally with other deities, as Sekar or Socharis, a kind of solar Pluto, and then represented with the head of a hawk; often also depicted as the *Tat* or emblem of stability, probably alluding to the region of *Tattu*, Busiris, or the present Abusir, of which he was the lord; and is still more rarely seen wearing the lunar disk and identified with the moon. In the ritual of the dead he is said to have been justified by Thoth fourteen times before the gods of as many regions, a number corresponding with the pieces into which his body was torn and the cities to which they were distributed. His discovery and embalmment, the lamentations of his sisters at his death, and the mystical representation connected with his legend occur on monuments and papyri, especially those of a later age, which describe the reconstruction of his form by the god Chnoumis out of the mud and water of the Nile, and his embalmment by Anubis, the outer bandages with which he was swathed often having over them a net to depict that in which his body was found in the Nile, or, according to some traditions, brought by Horus transformed into a crocodile. In the ritual there is a table of one hundred and twelve different titles of this god, but his chief ones were resident, or dwelling in the west or abode of departed souls and spirits, lord of Tattu or Busiris, of Abut or Abydos, of Rusat or Rosetta, the pathway to the west, and of various other regions of the Hades. He was also called the Unnefer or Onnophris, the revealer of good things, lord of the age, eternal ruler, living lord, and similar

titles. On his head he wore the *att* crown, at the sides of which are the ostrich feathers of his truth, referring to his truth and jurisdiction over the judgment-hall of those goddesses in Hades, his hands emerging from his mummied form, holding the crook and whip, emblems of government and punishment. Dedications to Osiris appear at the time of the sixth dynasty, not earlier, at Sakkarah, but at the age of the twelfth dynasty his worship was universal; and at Abydos, where he was supposed to be buried, he was the local lord, and that cemetery the one whither the dead were transported. About the beginning of the nineteenth dynasty his name was prefixed to the name and titles of deceased persons who were thought to be like him, this title of Osiris or Osirian being prior to that time bestowed only on monarchs—a practice which continued till the latest days of paganism. At the time of the Ptolemies his worship was transferred to Philæ, where he was thought to be buried, and three hundred and sixty cups of milk were filled at the time of the appointed lamentations daily, and the most solemn oath was to swear by him who was buried at Philæ. Mysteries and festivals were celebrated to him, the most remarkable of which was the feast of lamps, held at Sais and elsewhere, and that called Paamylia, in honor of his birth, connected with the Phallophoria. Phallic figures of this god, made of barley and waxed cloth, are also found connected with the same festival and referring to his being the god who produced grain. No deity has been more difficult to explain in all Egyptian mythology, for he was thought to represent the sun, the moon, the constellation Orion, the earth, the inundation of the Nile, the principle of humidity, the reproductive power of nature, the divine beneficence, and even by some to anticipate the doctrine of the resurrection of the body, as his form and type, destruction and embalmment, make him more mortal than ordinary deities of the Pantheon. His particular office of judge of the dead after his own death was explained by his great purity causing him to be removed from earth, and the dead after the future judgment were said to be declared true or justified, as Osiris had been in the great judgment he himself had undergone. In the paintings his flesh is colored black or blue to show that he belonged to the deities of the lower world, or Hades, and he wears either the *att* crown, emblem of his jurisdiction over the dead, and the *hut* or white crown, in his character of lord of the upper world or hemisphere, or else the lunar disk, but this only at a later period. The sepulchral tablets or tombstones of the Egyptians are dedicated to him as the god who gave all the blessings of the future state to the dead, and in the eighteenth and subsequent dynasties his form is constantly seen upon them, and also upon the coffins of the mummies, especially in the judgment scene in Hades. The coffins, too, were modelled on the type of that of the god, as the mummy was supposed to be embalmed in the same manner and to represent Osiris himself. Figures of the god are found in wood, cloth, and barley, and sometimes in porcelain, but they are most common in bronze, although generally of a later age, and all collections of Egyptian antiquities abound in them. At the Greek and Roman period, especially amongst the Alexandrian Greeks, his form was replaced by that of Serapis or Pluto. So diffused was his worship in earlier times that he appears on the Phœnician coins of the group of islands round Malta, but his worship was not so universal in the days of the Roman empire as that of Isis, though it prevailed in Egypt to the last. The Greek writers of a later age regarded Osiris as the prototype of Dionysus or Bacchus, and confused the Osiris-Apis, or deceased Apis, with their Serapis, with whom, indeed, Osiris had no direct connection, as the Apis was in reality a type or avatar of Ptah. SAMUEL BIRCH.

Oskaloo'sa, post-v. and tp., Clay co., Ill. Pop. 1171.

Oskaloosa, city and tp., cap. of Mahaska co., Ia., on the Keokuk and Des Moines and the Central R. R. of Iowa; has 2 colleges, 3 public school-houses, 12 churches, 2 woollen and 2 flouring mills, 3 banks, 3 iron and brass foundries, 4 printing-offices, 3 lumber yards, gas-works, steam fire-engines, 4 weekly newspapers, an artesian well 900 feet deep, 2 planing mills, and stores. Oskaloosa is located in the best coal-region of the West. Large deposits of fire-clay and iron ore exist. Pop. of city 3204; of tp. 3387.
LEIGHTON & NEEDHAM, EDS. "HERALD."

Oskaloosa, post-v. and tp., cap. of Jefferson co., Kan., midway between Leavenworth and Topeka; has 1 academy, 2 school-buildings, 4 churches, 2 banks, 2 newspapers, and stores. Principal employment, stock-raising and manufacturing. Pop. of v. 640; of tp. 1613.
J. W. ROBERTS, ED. "INDEPENDENT."

Osman. See OTHMAN.

Os'mazôme, a name given by Thénard to that portion of meat extract which is soluble in alcohol and contains those constituents of the flesh which determine its taste and smell. C. F. CHANDLER.

Os'mium [Gr. ὀσμή, "odor"], an element of matter, one of the "platinum metals;" that is, found in association in nature with platinum. Its only ore is a native compound with another metal of the same natural group, IRIDIUM (which see), forming the mineral metallic alloy called iridosmine or osmiridium, which is excessively hard, and therefore used for tipping gold pens. This native alloy contains also RUTHENIUM (which see). The methods of procuring metallic osmium and its compounds from the ore are complex and difficult. Several allotropic modifications of the metal seem to have been produced, of which the density of one, determined by Deville and Debray, = 21.4, placing this osmium among the heaviest known substances, being equalled in that respect only by two or three of the platinum and iridium allotropes. Moreover, as Deville and Debray's osmium, modified by exposure to the highest obtainable heat, was not wholly fused, it probably was still somewhat porous; and we are justified in concluding that osmium may yet turn out to be the heaviest, as it is the most infusible, of known substances. At the most intense heats it volatilizes, without fusion. In fine division it is very combustible, burning to osmic acid. Osmium is believed to be, in some of its combinations, the most poisonous also of known substances. Its compounds, when heated before the blowpipe, emit, during the combustion to osmic acid, a singular and unpleasant odor, whence the name of the element. HENRY WURTZ.

Os'mose [Gr. ὠσμός, a "push" or "propulsion"], a more general term for ENDOSMOSE (which see) and exosmose. Diasmose is another term which has been used to include the whole subject.

Osmunda. See FERNS.

Os'nabrück, town of Prussia, in Hanover, on the Hase, contains a large cathedral, a town-hall, in which the treaty of Westphalia was signed in 1648, and numerous manufactures of tobacco, chicory, soap, paper-hangings, leather, linen fabrics, and woollen cloths. Its trade is said to have declined since the enactment of the German tariff-union. Pop. 23,308.

Os'naburg, post-v. and tp., Stark co., O. Pop. 2046.

Oso'lo, tp. of Elkhart co., Ind. Pop. 922.

Osphromen'inæ, or **Osphromen'idæ** [from *Osphromenus*—ὀσφρόμενος, "tracking by smell"—the chief genus], a sub-family of Anabantidæ, or a family closely related thereto, containing the celebrated gourami. The body is oblong, compressed, and covered with scales of moderate size; the lateral line uninterrupted; the head compressed, covered with scales similar to those of the body; eyes submedian; opercula unarmed; mouth with cleft lateral and oblique; upper jaw protractile; teeth only on the jaws; branchial apertures rather narrow, the gill-membranes of both sides being connected below the isthmus, and scaly; branchiostegal rays six; dorsal fin with variable spinous and soft portions; anal longer than the dorsal; caudal separate; pectorals generally developed; ventrals thoracic. The skeleton has numerous vertebræ (in the gourami 12 + 18–19); second superior pharyngeal bones are developed; superior branchials also present, and the fourth greatly laminated and modified for the reception and retention of water; the stomach has two pyloric appendages. The group distinguished thus, especially by the pharyngeal apparatus, has been differentiated by Prof. Cope as the type of a distinct family; the genera that belong to it have not been specified, but *Osphromenus* at least is the typical one and that best known, other genera agreeing in most respects being *Trichogaster* and *Betta*, but whether they belong to the same family is uncertain. The gourami, its chief representative, is famous for the fine quality of its flesh, and has been introduced into a number of countries. All the species are natives of Southern and Eastern Asia. THEODORE GILL.

Osprey. See FISH-HAWK.

Os'seine [Lat. *os*, "bone"], the modification of GELATINE (which see) that occurs in bones, forming substantially the whole of the organic part of the bone, apart from the tricalcic phosphate, which makes up the mass of the earthy part. Osseine may be isolated in its natural state by dissolving out the earthy part of the bone with muriatic acid and long and repeated washing with cold water. It then forms, before drying, a soft elastic mass, which is insoluble in cold water, but quickly dissolves in boiling water to a solution of ordinary gelatine, undergoing, no doubt, during the boiling some chemical transformation, of molecular volume, at least, not yet investigated. Osseine forms from 40 to 45 per cent. of the weight of the bones of a human child, which proportion in an adult falls to from 35 to 40 per cent., the variations being

in bones from different parts of the skeleton, the os temporum and humerus in the adult containing least and the costal or rib bones the most. In aged persons the osseine sometimes falls so low that the bones become weak and easily fractured. HENRY WURTZ.

Os'seo, post-v. of Hillsdale co., Mich., on the Lake Shore and Michigan Southern R. R.

Osseo, post-v. of Hennepin co., Minn.

Osseo, post-v. of Trempealeau co., Wis.

Os'sian, post-v. of Wells co., Ind., on the Fort Wayne Muncie and Cincinnati R. R.

Ossian, post-v. of Winneshiek co., Ia., on the Chicago Milwaukee and St. Paul R. R. Pop. about 500.

Ossian, post-v. and tp., Livingston co., N. Y. P. 1168.

Ossian. See MACPHERSON, JAMES.

Ossification. See HISTOLOGY, OSTEOLOGY, and SKELETON.

Os'sifrage (the "bone-breaker"), a name formerly given to various rapacious birds, especially to some of the eagles and to the LAMMERGEIER (which see). The latter is believed to be the ossifrage of the Old Testament Scriptures.

Ossineke, post-v. and tp., Alpena co., Mich. P. 144.

Os'sining, tp. of Westchester co., N. Y., on the Hudson River, includes village of Sing-Sing (originally "Ossinsing"), noted for its prison, and four hamlets; has extensive marble quarries, and was included in the manor of Philipsburgh before the Revolution. Pop. 7798.

Os'sipee, post-v. and tp., cap. of Carroll co., N. H., on the Conway division of the Eastern R. R., in a picturesque region S. E. of the White Mountains. Pop. 1822.

Os'soli (SARAH MARGARET **Fuller**), MARCHIONESS, b. in Cambridgeport, Mass., May 23, 1810; daughter of Hon. Timothy Fuller, a representative in Congress 1817–25; was in early childhood a proficient in the classical languages and modern literature, but noted for eccentricities and the violence of her passions; retired from school at the age of fifteen to devote herself to solitary study; became well acquainted with the modern German classics; taught languages in Boston to private classes and in Mr. Alcott's school after the death of her father in 1835; became principal of a school at Providence, R. I., in 1837; took extreme interest in the philosophical views of R. W. Emerson and his literary associates; gave a series of *conversazioni* for ladies at Boston 1839; was in 1840 editor of the *Dial*, a quarterly magazine devoted chiefly to the propagation of the new ideas; became widely known for brilliant powers of conversation; published in 1839 a translation of Eckermann's *Conversations with Goethe*, and in 1841 the *Letters of Günderode and Bettina;* made in 1843 a journey to Lake Superior, and wrote *A Summer on the Lakes;* removed to New York in Dec., 1844; became an inmate of the family of Horace Greeley and a writer for the *Tribune*, to which she contributed most of the *Papers on Art and Literature* issued in a volume in 1846; expanded an early essay in the *Dial* into a volume entitled *Woman in the Nineteenth Century* (1845); went to Europe early in 1846; visited Rome in May, 1847, whence she wrote letters to the *Tribune;* married in December a Roman nobleman, Giovanni Angelo Ossoli; was a witness of the Roman revolution of 1848 and of the siege of Rome by the French in 1849, at which time she was appointed by Mazzini directress of one of the hospitals; embarked at Leghorn for the U. S. in the ship Elizabeth May 17, 1850, accompanied by her husband and infant son, and with them perished by shipwreck at Fire Island, near New York, July 16, 1850. An unpublished history of the Roman revolution was lost with her. A monument to her memory has been erected in Mount Auburn cemetery. Two volumes of appreciative *Memoirs* by R. W. Emerson, W. H. Channing, and James Freeman Clarke appeared in 1851. A new edition of her work on *Woman in the Nineteenth Century*, to which were added many other scattered papers on the same subject, was issued in 1855 by her brother, Rev. Arthur B. Fuller, and the same gentleman published in 1856 her collected newspaper correspondence under the title *At Home and Abroad.* A new edition of her complete works appeared at Boston in 1874.

Os'sory (THOMAS **Butler**), EARL OF, son of the first duke of Ormond, b. in the castle of Kilkenny, Ireland, July 9, 1634; fought with conspicuous valor in the great rebellion; was imprisoned for several months in the Tower by Cromwell; took refuge in Flanders; returned with Charles II., and was made lieutenant-general of the forces in Ireland 1660; aided the duke of Albemarle in gaining the celebrated naval battle of the Downs over the Dutch fleet June, 1666; was rewarded by the title of Baron Butler of Moore Park Sept. 14, 1666; was made rear-admiral and second in command to Prince Rupert 1673; led the English troops in the service of the prince of Orange 1677; contributed to the defeat of Marshal Luxembourg at Mons 1678, and perished by shipwreck July 30, 1680.

Ostade, van (ADRIAN), (1610–1685), a Dutch painter of genre, b. at Lubeck; studied at Haarlem; made his residence at Amsterdam. His pictures are common in European galleries and favorably seen in England. His works, of which nearly 400 are catalogued, represent scenes of innocent happiness in humble life, and are remarkable for sincerity of feeling, harmony of color, and correctness of drawing. His works are much esteemed by connoisseurs. O. B. FROTHINGHAM.

Ostade, van (ISAAC), younger brother and pupil of Adrian, b. also at Lubeck about 1617; his latest work bears date of 1654. His pictures represent cheerful outdoor scenes in inn-yards and village squares. They are not numerous, and are highly valued.
O. B. FROTHINGHAM.

Ostash'kov, town of European Russia, government of Twer, on Lake Salig, has extensive tanneries and manufactures of booths, axes, sickles, and scythes; also, it has important fisheries. Pop. 10,827.

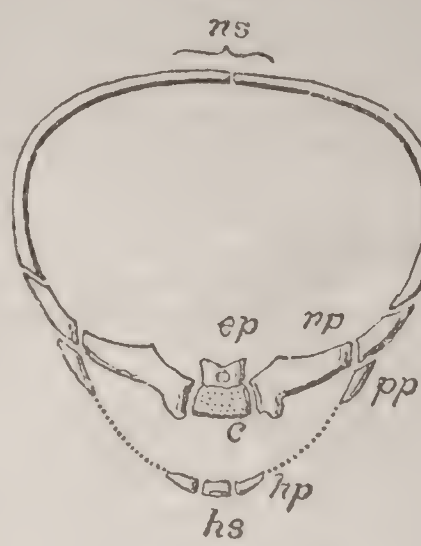
Ostend', town of Belgium, province of West Flanders, on the German Ocean, has a good harbor, is fortified and neatly built, and communicates daily by steamers with London and Dover. Besides manufactures of linen, sail-cloth, and ropes, it carries on important fisheries of oysters, cod, and herrings, and is much frequented as a bathing-place. Pop. 17,159.

Osteogloss'idæ [from *Osteoglossum*—ὀστέον, "bone," and γλῶσσα, "tongue"—the best-known genus], a family of fresh-water fishes of the order Teleocephali, and suborder Physostomi, characterized by the peculiar form and bony head. The body is more or less elongated, compressed, and covered with large hard scales composed of mosaic-like pieces; the lateral line high, little incurved from the back, and with widened mucous ducts; the head oblong, with the integument very thin, and cheeks protected, with large suborbital and postorbital plates; opercula large; nostrils double; mouth with a lateral cleft; its upper margin formed by the intermaxillaries at the middle and the supramaxillaries at the sides; teeth acute, on the jaws as well as palate; gill apertures large; branchiostegal rays numerous (8–16); dorsal and anal posterior elongated, the anal originating farther forward than the dorsal; caudal separately developed; pectorals inserted low down on each side of the throat; ventrals perfect, not very far from the head. The skeleton has numerous vertebræ (60–80). The stomach is not cœcal, but has two pyloric appendages. The family is noted for the peculiar distribution of its species. It is divisible into two subfamilies: (1) *Osteoglossinæ*, in which the abdomen is trenchant, having two genera, *Osteoglossum*, represented in S. America, and *Scleroparges*, with one species in several of the Philippine Islands, and another in Queensland, Australia; and (2) *Heterotinæ*, also with two genera: *Heterotis*, peculiar to West Africa and the Nile, and *Arapaima*, confined to S. America. A species (*Arapaima gigas*) of the last genus reaches a gigantic size, sometimes exceeding 15 feet in length and weighing upwards of 400 pounds. It is taken sometimes with a hook baited with small fishes, and sometimes with a harpoon. It is quite esteemed in Brazil, and sells for a high price. THEODORE GILL.

Osteol'ogy [Gr. ὀστέον, "bone," and λόγος, "discourse"], the science of the skeleton of vertebrated animals. This skeleton is composed of bone, or its cartilaginous or membranous basis, the intimate structures of which have been already pointed out in the article COMPARATIVE ANATOMY (which see). The skeleton consists either of a cartilaginous or membranous continuum, or of cartilaginous or osseous segments arranged in continuous succession, so as to form two tubes, one superior and one inferior, attached by a solid axis between them, the whole furnished with various appendages. Each axial segment is in turn composed of sub-segments, each of which arises from a separate (sometimes more than one) centre of ossification in the primal cartilage or membrane. Each primary segment of the skeleton is called a vertebra, and each vertebra is composed of the same elementary segments, some of which may be omitted, subdivided, etc., and also greatly modified in their form for the accommodation of the viscera they enclose. The superior arches or tubes protect the nervous axis of the animal, while the inferior surround the nutritive organs, or the digestive, circulatory, respiratory, and reproductive systems. The elementary segments and their modifications are exhibited in the following sections from the cranial, thoracic, and caudal regions respectively, in order to display the excessive devel-

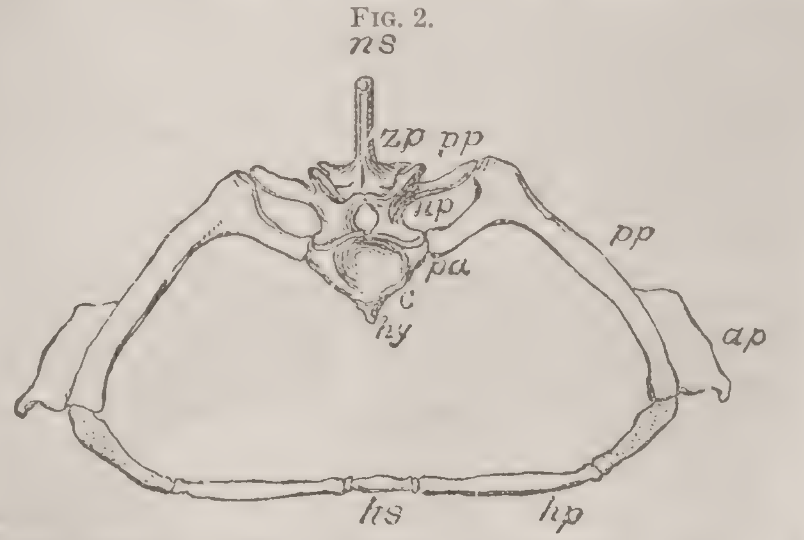
opments of the *neural* or upper arch (Fig. 1), the *hæmal* or lower arch (Fig. 2), and of the centrum (Fig. 3), by reduction of the arches. The elements are named as follows: *n s*, neural spine; *zp*, zygapophysis; *dp*, diapophysis; *pp*, pleurapophysis; *hp*, hæmapophysis; *hs*, hæmal spine. In addition to these, there are other processes less universally present—namely, on the middle line of the centrum above, *ep*, epapophysis (Fig. 1), on the middle line below, *hy*, hypapophysis (Fig. 2), and on the side of the centrum below the diapophysis, *pa*, parapophysis (Fig. 2, represented by capitular articulation for rib). In the thoracic vertebra

FIG. 1.



Cranial segment: *c*, centrum; *np*, neurapophysis; *ns*, neural spine; *ep*, epapophysis; *pp*, pleurapophysis; *hp*, hypapophysis; *hs*, hæmal spine.

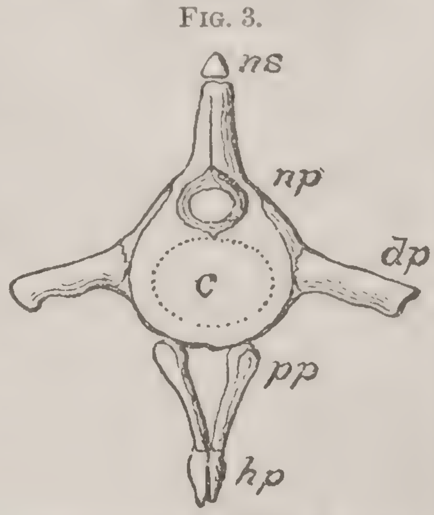
FIG. 2.



Thoracic segment from a crocodile. Letters as in Fig. 1: *zp*, zygapophysis; *dp*, diapophysis; *pa*, parapophysis; *hy*, hypapophysis; *ap*, appendage.

the segments correspond to the following special names of the bones: neural spine, *spinous process;* zygapophysis, *articular process;* diapophysis, *transverse process;* neurapophysis, *superior arch;* pleurapophysis, *rib;* hæmapophysis, *thoracic rib* or *cartilage;* hæmal spine, *sternal segment;* centrum, *body*.

FIG. 3.

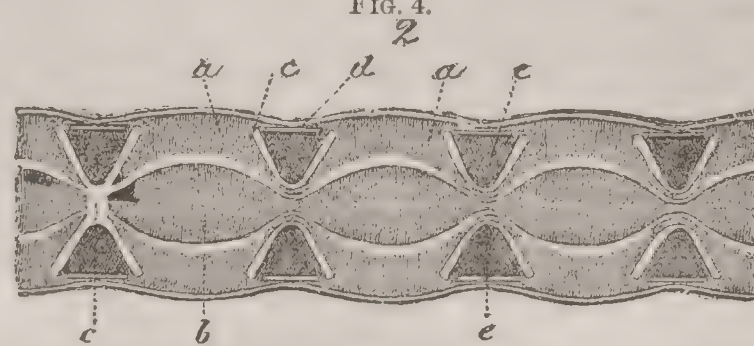


Caudal segment from dugong.

There are many peculiarities in the segments which compose the skull of Vertebrata, on which account the name of vertebræ has been denied them. Since they also present great likenesses to the vertebræ of the body in their growth-history as well as composition, they may be regarded as representing a special class of vertebræ. The limbs of Vertebrata also have received a variety of interpretations. These, when fully represented by a front pair and a hinder pair, are attached to corresponding arches, which depend from the vertebral axis, and are therefore hæmal. The pelvic arch, which bears the hinder limbs, is attached to the vertebræ, hence represents pleurapophysis (*ilium*) and two hæmapophyses (viz. *ischium* and *pubis*). That which supports the fore limbs, or the scapular arch, is not attached to a vertebral body in any class excepting that of the fishes, and then it is to the occipital or posterior segment of the skull and by dermal bones only. It has been supposed to represent a hæmal arch, embracing pleurapophysis (*scapula*) and hæmapophysis (*coracoid*). It is thus represented as shifted from its original position in all animals above the fishes. The limbs have been looked upon as lateral appendages of these arches, like the uncinate processes of the ribs (Fig. 2, *ap*), opercula of the suspensor of the lower jaw in fishes, etc. In order, however, to reach positive conclusions as to the homologies or mutual correspondences of these segments, it is necessary to examine the

Development of the Skeleton.—The spinal column will first claim attention. The germinal layer of the yolk of the egg, or blastoderm, is early marked by a linear impression, the "primitive groove." The blastoderm is divided into three layers, of which the lower or mucous stratum ultimately forms the interior lining of the alimentary canal, and the upper or serous stratum forms the cerebrospinal nervous axis and the epidermis of the body. From the middle layer, or mesoblast, are developed the remainder of the internal organs, etc. It is the upward longitudinal folding of the upper and middle layers (epiblast and mesoblast) on each side into the "dorsal laminæ" that forms the "primitive groove." The laminæ grow towards each other and unite along the median line, forming the neural canal. The two layers are at the same time folded downwards, forming the outside of the lamina, and with the lower or hypoblast continue downwards as parallel folds, or ventral laminæ. The middle layer divides, the inner lamina, with the hypoblast, forming the alimentary canal, while the outer, with the mesoblast, form the outer walls of the abdominal cavity, or the somatopleure. In the mean time, there appears in the layers below the primitive groove a cylindrical body of large cells filled with transparent protoplasm or jelly, around which are differentiated from two to four layers, forming a sheath. This

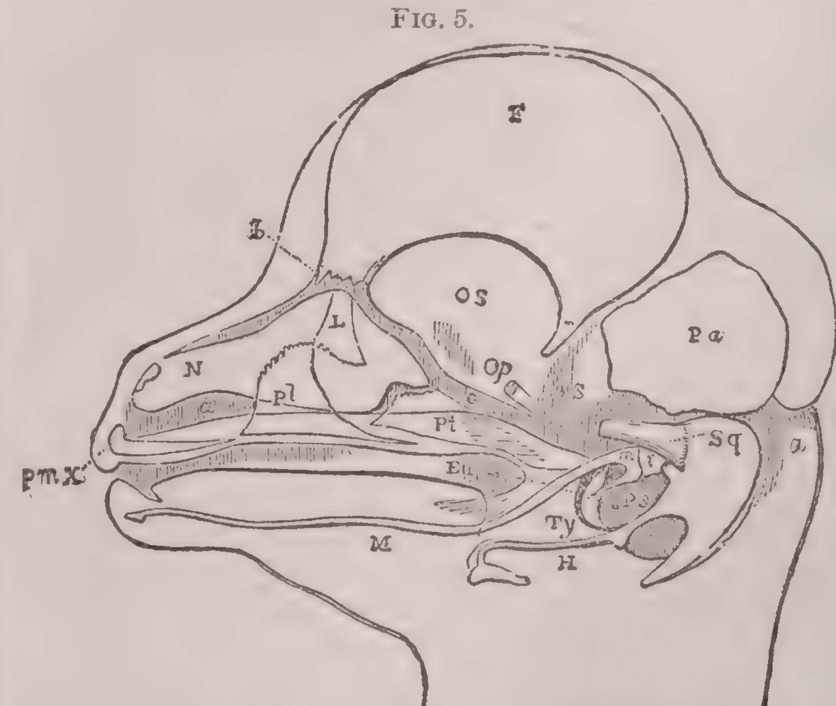
FIG. 4.



Longitudinal section of the posterior part of the vertebral column of *Heptanchus* (from Kölliker): *a*, fibro-cartilaginous part of sheath of chorda dorsalis; *b*, gelatinous chorda; *c*, osseous double cone perforated for the contracted chorda; *c'*, section of a vertebra to one side of the perforation; *d*, the external lateral osseous plates of the vertebræ; *e*, the cartilage filling the interspace of a double cone.

cylinder is the *chorda dorsalis*, which extends forwards to within a short distance of the end of the primitive groove. The portion of the groove above it is enlarged, and then bent downward in front of the chorda. There is a constriction in the horizontal portion of the now enclosed groove, or neural canal, so that three vesicles are formed, which are the concavities of the three axial segments of the future brain. The walls of this neural canal are continuous from the one end of the animal to the other. In the bodily portion of the axis, that part of the blastoderm which surrounds the chorda dorsalis early presents the appearance of sub-quadrate cartilaginous segments or bodies, which, extending, gradually enclose the chorda as rings. At the same time, corresponding segments appear in the dorsal laminæ. These are the bases of the future vertebræ, representing centrum and neurapophysis. The diapophyses and ribs appear in the form of cartilage in the

FIG. 5.



Head of a fœtal lamb, dissected so as to show Meckel's cartilage, M (from Huxley): *M*, the malleus; *i*, the incus; *Ty*, the tympanic; *H*, the hyoid; *Sq*, the squamosal; *Pt*, the pterygoid; *pl*, the palatine; *L*, the lachrymal; *pmx*, premaxillary; *N*, nasal sac; *Eu*, Eustachian tube.

somatopleure. The elements are completed by the deposit of phosphate of lime round the nutritive vessels, or the process of ossification; and they may remain distinct from each other or become co-ossified, according to the type of vertebrate. The manner of ossification of the body of the vertebra varies as follows:

I. Spinal column represented by the membranous sheath of the chorda dorsalis: class *Leptocardii* (lancelet).

II. Spinal column represented by the membranous sheath of the chorda, and cartilaginous neurapophyses and pleurapophyses: class *Dermopteri* (lamprey) and the *Chondrostei* (sturgeon, etc.).

III. Column represented by imperfect ossifications of the sheath of the chorda alone, with similar neurapophyses and pleurapophyses: certain sharks; *e. g. Hexanchus.*

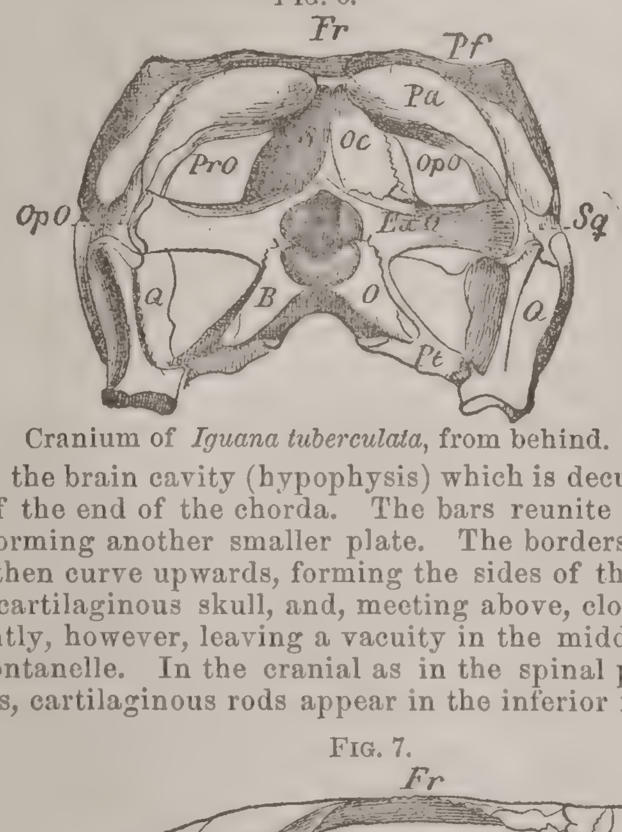
IV. Bodies of column ossifications of the proper sheath of the chorda, together with the investing sheath of blastoderm; *a*, ossification less complete: class *Selachii*, most sharks and rays; *aa*, ossification more complete: *Teleostei*, bony fishes.

V. Centra of vertebræ composed of ossifications of the external or blastodermic investment of the chorda: classes *Batrachia, Reptilia, Aves*, and *Mammalia.*

The ossification of the bodies, commencing in the circumference of the sheath, first completes a ring, which then grows inwards, constricting the chorda. The latter may be nearly or quite divided by the osseous body, and portions of it and the sheath remain between the biconcave centra as doubly-conical or globular bodies, as in the osseous fishes and many salamanders.

When cartilage appears round the chorda dorsalis, in what becomes the base of the skull, it is not segmented. It is plate-like, and sends a bar on each side round that

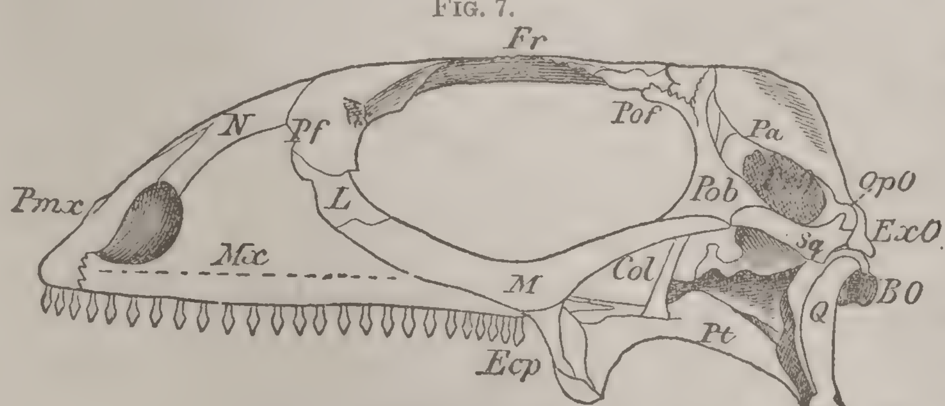
Fig. 6.



Cranium of *Iguana tuberculata*, from behind.

part of the brain cavity (hypophysis) which is decurved in front of the end of the chorda. The bars reunite in front of it, forming another smaller plate. The borders of the plates then curve upwards, forming the sides of the primordial cartilaginous skull, and, meeting above, close it in, frequently, however, leaving a vacuity in the middle line, or a fontanelle. In the cranial as in the spinal parts of the axis, cartilaginous rods appear in the inferior folds of

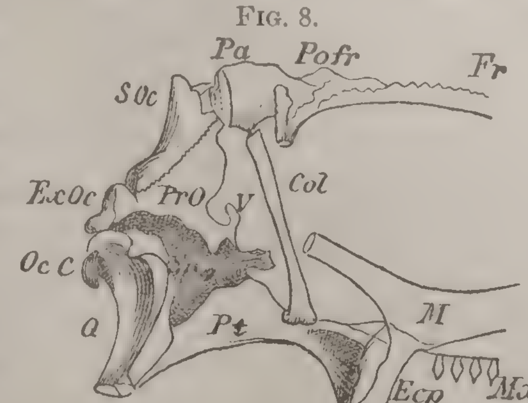
Fig. 7.



Cranium of *Iguana tuberculata*, profile.

the blastoderm or somatopleure, forming the visceral arches, the upper pieces of which become the ribs. Two of these appear beneath the posterior part of the skull, which become the *hyoid arch*, and the mandibular arch or lower jaw; a third appears as nearly horizontal, extending from the base of the second to near the end of the cartilaginous skull in front. When ossification sets in, the segmentation of the skull appears. This, however, takes place under two forms: the ossific deposit may be made in the cartilage or in the membrane investing that cartilage, forming the cartilage and membrane bones of anatomists. It ap-

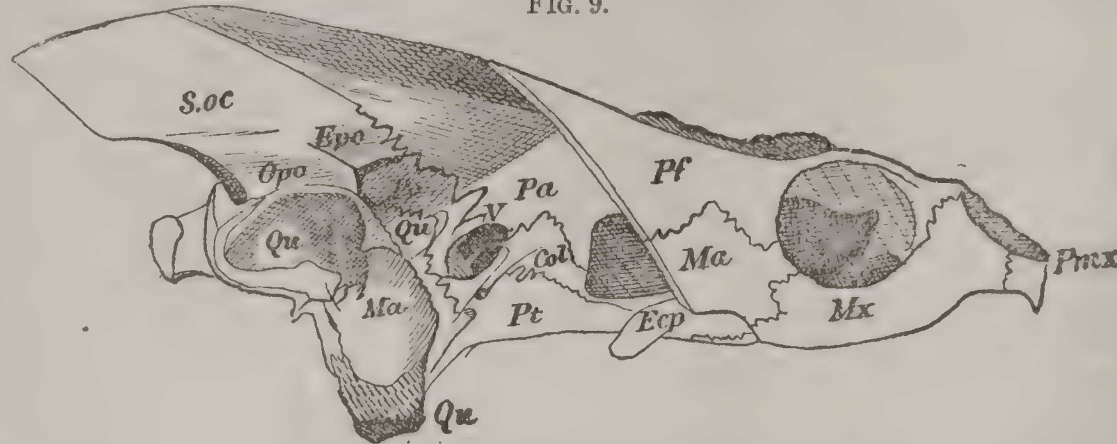
Fig. 8.



Posterior part of cranium of iguana, the arches removed.

pears that the membrane bone represents the primary condition, and one that prevailed among the earliest Vertebrata, while the penetration of ossification to the cartilage was the mode of origin of the first cartilage bones. Hence, though corresponding ones of the cranial bones may have different origins to-day, their correspondence is not thereby

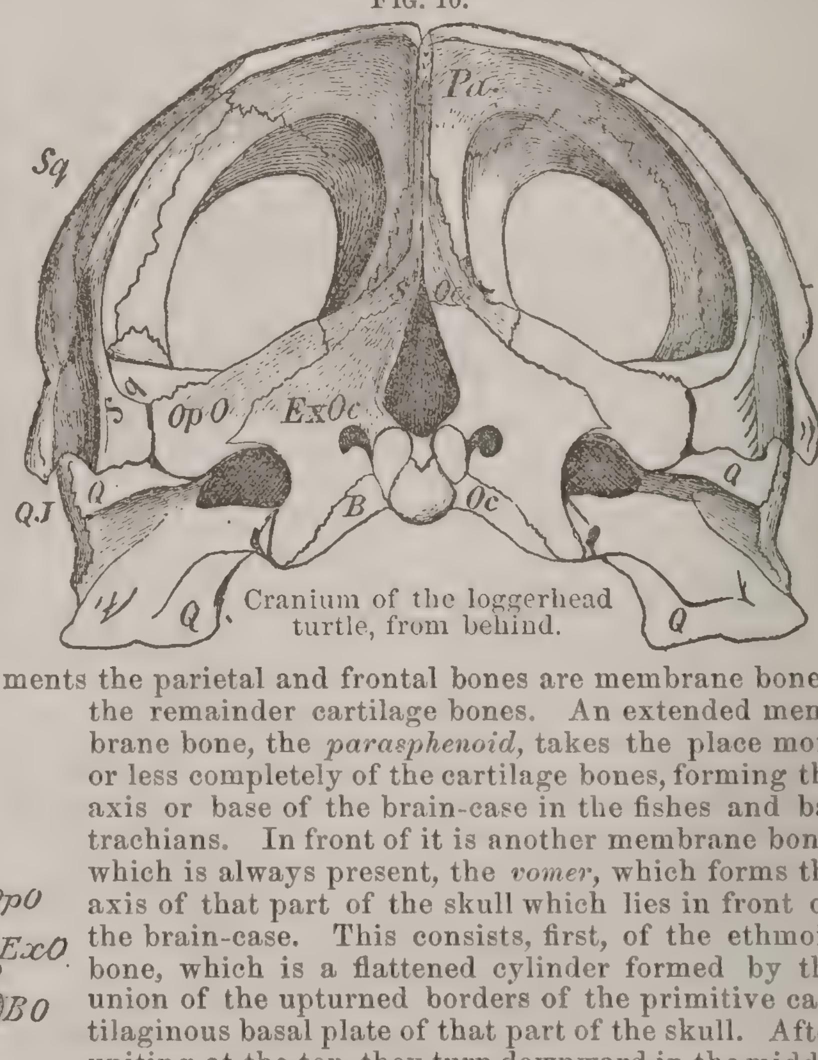
Fig. 9.



Cranium of the snapping-turtle.

destroyed. The base of the brain-case ossifies into three bones, the posterior the *basioccipital*, the next the *basisphenoid*, the anterior the *presphenoid.* The sides of the case ossify three plate-like bones, which correspond to and rest on these; namely, the *exoccipital*, the *alisphenoid*, and the *orbitosphenoid.* Closing the cranial cavity above are the three corresponding bones, the *supraoccipital, parietal*, and *frontal.* Thus, three distinct cranial segments are presented, the occipital, the parietal, and the frontal. A section of the parietal arch is seen at Fig. 1 (*n s*, parietal; *n p*, alisphenoid; *c*, basisphenoid). Of their ele-

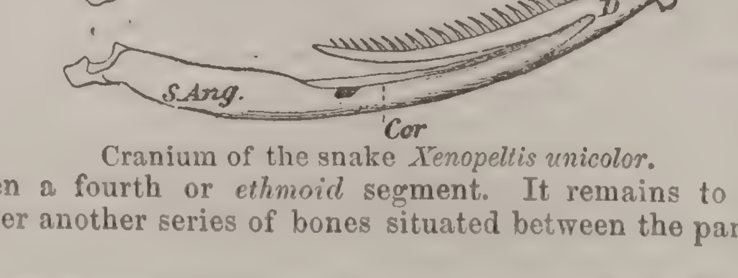
Fig. 10.



Cranium of the loggerhead turtle, from behind.

ments the parietal and frontal bones are membrane bones, the remainder cartilage bones. An extended membrane bone, the *parasphenoid*, takes the place more or less completely of the cartilage bones, forming the axis or base of the brain-case in the fishes and batrachians. In front of it is another membrane bone, which is always present, the *vomer*, which forms the axis of that part of the skull which lies in front of the brain-case. This consists, first, of the ethmoid bone, which is a flattened cylinder formed by the union of the upturned borders of the primitive cartilaginous basal plate of that part of the skull. After uniting at the top, they turn downward in the middle line, forming a vertical septum. Laminæ project into the cavities so formed, from the outer wall, on which the branches of the olfactory nerve are spread; these are the *turbinal* bones. On top of the ethmoid two membrane bones are developed, the *nasals*; at their sides behind and in front of the orbit, two other membrane bones may be present—viz. the *prefrontal* (the upper) and the *lachrymal* (the lower). We have

Fig. 11.



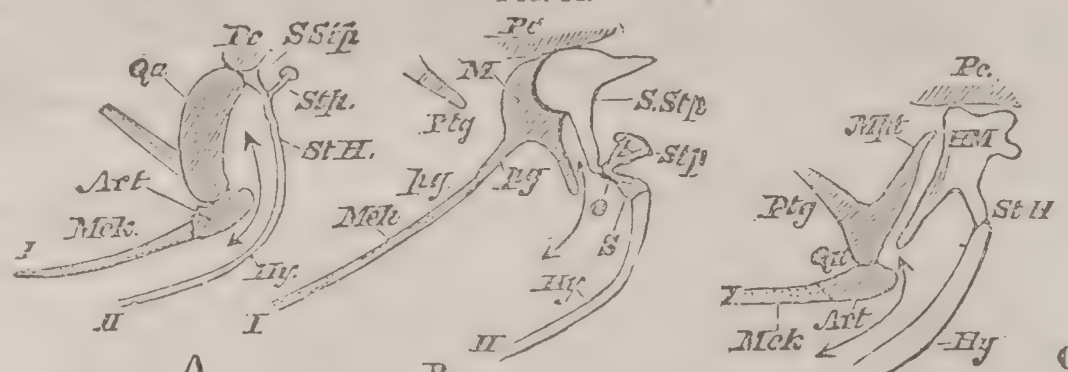
Cranium of the snake *Xenopeltis unicolor.*

then a fourth or *ethmoid* segment. It remains to consider another series of bones situated between the parietal

and occipital segments. These do not extend to the middle line of the superior or neural arch, but are developed in the cartilage in which the semicircular canals of the labyrinth of the auditory organs are embedded. The upper lateral bone, which is usually only present in fishes, is the *pterotic;* it is pierced by the external canal. Below this is the *proötic* bone, which receives the anterior canal. The posterior canal passes through a bone which is situated between the pterotic, the exoccipital, and the supraoccipital; namely, the *epiotic*. The two adjacent bones last named also support portions of its arc. A fourth and membrane bone, the *intercalare,* lies behind the proötic and in front of the exoccipital, but takes no part in the organs of hearing. Its presence is very irregular.

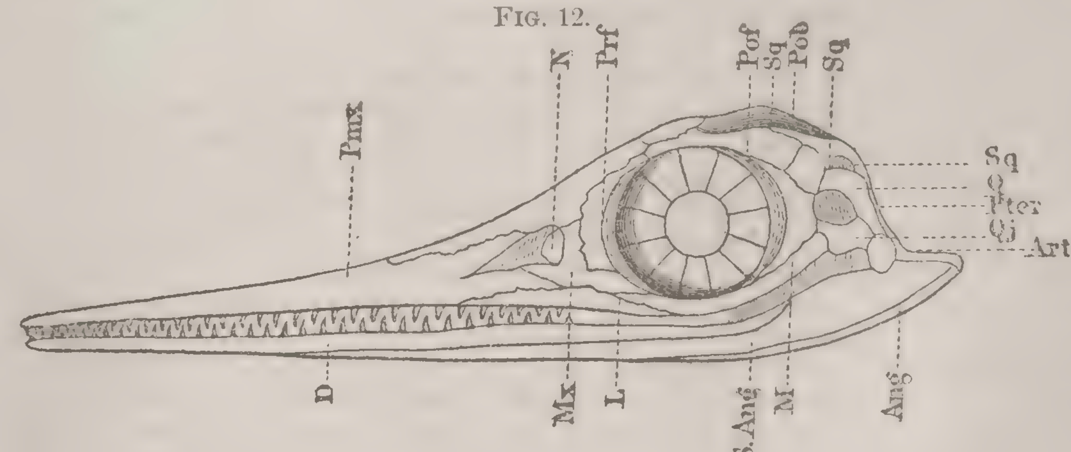
If we turn to the inferior or hæmal arches, we find three constantly (with a few exceptions) and several others occasionally present. The former are, beginning at the front of the skull, the maxillary, the mandibular, and the hyoid arches; the latter are the branchial arches, present only in fishes and some batrachians. The maxillary rods of opposite sides do not meet on the middle line, but the apex of the ethmoid arch is produced and its membrane ossifies on each side, forming the premaxillary bones, which in all vertebrates occupy the space between the maxillaries. The latter result from the ossification of the membrane covering the cartilage of the first visceral rods. Their inner margins grow together, forming the roof of the mouth and removing the posterior opening or the nostrils to the back part of it. At the same time an inner portion of the maxillary cartilage ossifies into the palatine (anterior) and pterygoid (posterior) bones, which extend to the inner side of the mandibular arch. The latter arch in its cartilaginous state is known as *Meckel's cartilage.* The part next the skull becomes separated from the rest, and is the support of the palatopterygoid cartilage. The remaining portion may be wanting, as in the lampreys (*Dermopteri*), or may remain as a movable articulated lower jaw. If these portions remain cartilaginous, we have the permanent condition seen in the sharks and rays. In bony fishes three ossifications appear in it, namely (commencing next the skull) the *metapterygoid,* the *inferior quadrate,* and the *articular.* In the membrane surrounding the latter the *angular* and *coronoid* bones appear in some; round the remainder of Meckel's cartilage the *dentary* is developed in all Vertebrata above Dermopteri. In reptiles and birds the metapterygoid and the inferior quadrate are represented by a single bone, the *quadrate,* which is the true support of the under jaw. In mammals the articular disappears, while the quadrate is drawn into the ear-chamber as the *malleus* or hammer, leaving the dentary to articulate directly with the skull. The hyoid arch also develops several osseous segments. In fishes these are called (beginning at the cranium) the *hyomandibular,* the *stapedial,* the *stylohyal, ceratohyal,* and as the middle piece below, the *basihyal.* The first-named is a large bone, and supports in part the articulation of the lower jaw through the intervention of the inferior quadrate. In reptiles it is represented by a flat plate, usually cartilaginous, attached to the stapes. In mammals it is drawn into the tympanic chamber of the ear, behind the malleus, and is known as the *incus* or anvil. The next segment is short in fishes, and in reptiles forms a rod, which abuts with an expansion like a lid against the fenestra of the labyrinth of the ear. In mammals it is entirely enclosed in the tympanic chamber, as the *stapes,* and is behind the incus. The *stylohyal* segment is united by suture with the ceratohyal in fishes; in reptiles and mammals it is cartilaginous or ligamentous, the portion next the skull in the latter being called the *styloid process.* In the lampreys, the lowest vertebrates, the palatopterygoid arch comes off from the posterior border of the ethmoid superior arch, the mandibular from the hinder part of the frontal region, and the hyoid from what corresponds with the parietal or occipital arch when ossified. The relations to the upper arches are not so definite in the higher Vertebrata.

FIG. 14.



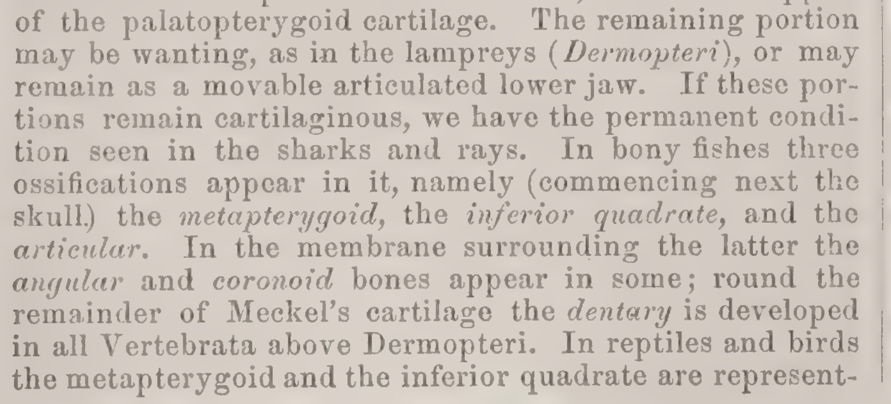
Diagrams of the skeleton of the first and second visceral arches in lizard (A), mammal (B), and osseous fish (C). First visceral arch (I) shaded, second (II) nearly unshaded. *Mck,* Meckel's cartilage; *Art,* articulare; *Qu,* quadratum; *Mpt,* metapterygoid; M, malleus; *pg,* processus gracilis; HM, hyomandibular; arrow, first visceral cleft; *Pc,* periotic capsule; *Ptg,* pterygoid.

FIG. 12.



Cranium of *Ichthyosaurus,* profile.

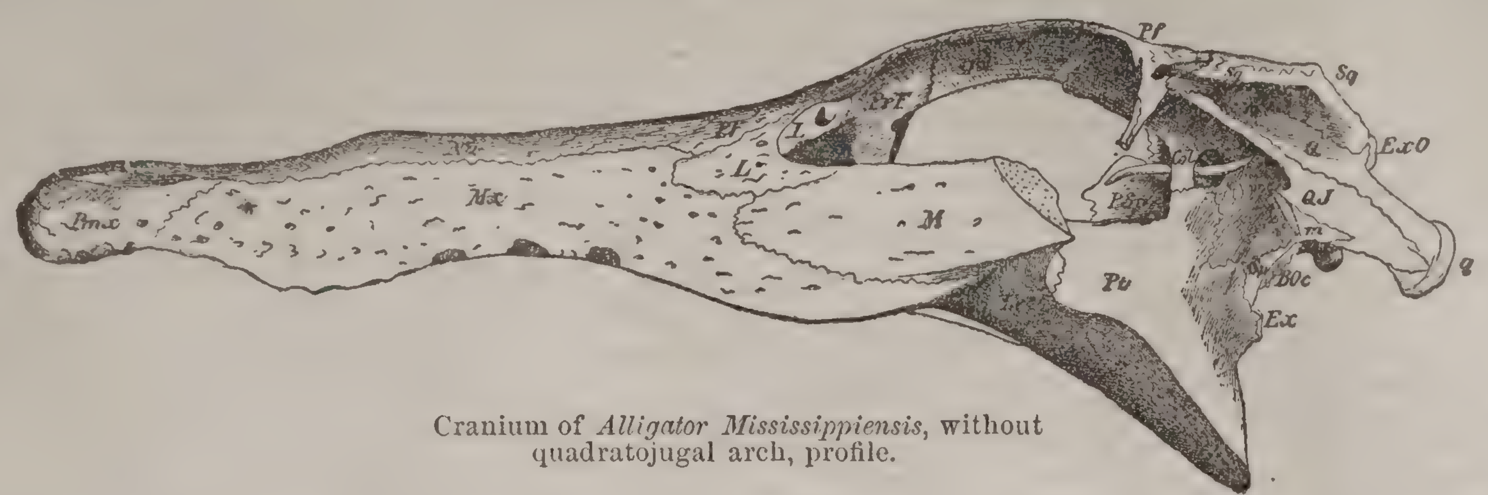
FIG. 13.



Pmx, premaxillary; *Mx,* maxillary; *Pl,* palatine; *Prf,* prefrontal; *SOr,* supraorbital; *HM,* hyomandibular; *Mt,* metapterygoid; *Op,* operculum; *SOp,* suboperculum; *IOp,* interoperculum; *PrOp,* preoperculum; *Brg,* branchiostegal rays; *Sy,* symplectic; *Qu,* quadrate; *An,* angular; *Ar,* articular; *D,* dentary.

It remains to notice some membrane bones which protect the sides of the cranium, and the muscles attached to them. The maxillary carries on its posterior end a more or less flat rod, the *malar* bone, which protects the orbit below in mammals and many reptiles. On its posterior end it is joined to another piece, the *squamosal.* In mammals this piece lies like a plate on the side of the temple, and unites with the proötic and epiotic bones to form the *temporal.* In reptiles, where the ear-bones project and carry the articulation of the lower jaw away from the skull, the squamosal accompanies them and stands above the end of the quadrate, supported on the projecting rod formed of the proötic, exoccipital, etc., which is now known as the *suspensorium.* In Batrachia it lies over the length of the quadrate, and in fishes occupies a similar position on the outer face of the inferior quadrate and hyomandibular, and is known as the *preoperculum.* Other membrane bones are added; namely, the operculum and suboperculum behind it, and the interoperculum below it. The malar rod may be connected with the end of the quadrate in reptiles and Batrachia by an intervening bone, the quadrato-jugal, and with the postfrontal, completing the orbit behind in many Mammalia and Reptilia. In the latter it is usually done by the intervention of a separate bone, the postorbital, and with the squamosal through a zygomatic bone. In some Batrachia (*Stegocephali*) the space so enclosed with the median bones of the skull is roofed over by a special plate, the supratemporal. Still another bone is formed in reptiles, mammals, etc., which develops in the cartilage near the position occupied by the intercalare in some fishes; namely, the opisthotic. In mammals it unites with the epiotic and proötic to form the *mastoid* and *petrous* portions of the temporal bone. In tortoises and pythonomorphs it forms part of the suspensorium, and is very much elongated in serpents. In lizards it sends a process upward with the squamosal, which forms, with a descending projection of the posterior angle of the parietal, the parieto-quadrate arch. The zygomatic arch is the only one found among the mammals. The ethmoid arch surrounds the olfactory lobes of the brain; the frontal is in front of the optic foramen; the parietal passes before the foramen of exit of the trigeminus (5th) nerve. The otic bones extend to the vagal (10th) foramen, and the occipital to the foramen magnum.

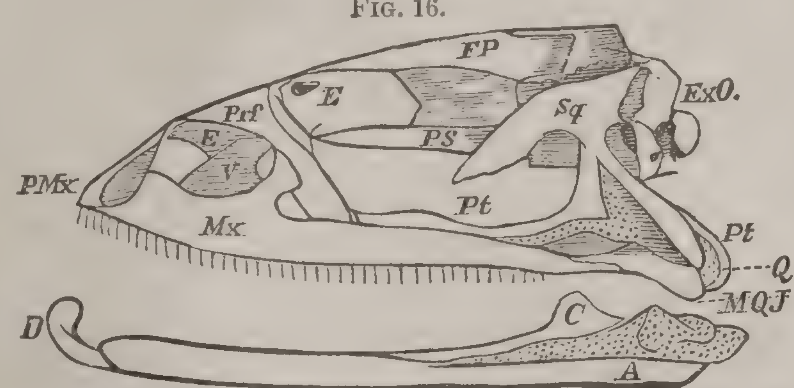
FIG. 15.



Cranium of *Alligator Mississippiensis*, without quadratojugal arch, profile.

Special Osteology.—Attention has already been called (art. COMPARATIVE ANATOMY) to the prominent peculiarities of the mandibular and hyoid arches, which distinguish the classes of Vertebrata. There are, however, very numerous peculiarities characteristic of natural divisions of these classes, to which only brief allusion can be made here. The vertebræ may be concave at both ends (*amphicœlous*), as in selachians, fishes, and Ichthyosauri, and many tailed batrachians; with ball-and-socket joint, the concavity being in the front of the body (*procœlous*), as in most tailless Batrachia and a majority of reptiles; with the cup behind (*opisthocœlous*), in the bony gar-fishes, some salamanders and frogs, a few Reptilia (?), and in the neck of many ungulate mammals. Finally, the centra are plane at both ends in Mammalia in general, and numerous reptiles, especially the extinct types Rhynchocephalia, Sauropterygia, Dinosauria, and some Crocodilia, where the ends are sometimes somewhat excavated. In Mammalia, and to a lesser degree in other Vertebrata, the vertebræ are distinguished into cervical, dorsal, lumbar, sacral, and caudal. The first are generally seven in number, and are readily distin-

FIG. 16.



Cranium of bullfrog, profile.

guished by the perforation of their transverse processes (= diapophysis + parapophysis) for the conduct of the vertebral artery. The dorsals are distinguished as furnishing the points of attachment for the ribs. These vary in structure as follows: I. A single rib-basis; *a*, exclusively on the vertebral centrum: fishes, batrachians, and some reptiles, viz. tortoises, lizards, Pythonomorpha, and serpents; *aa*, partially standing on the neural arch: Sauropterygia. II. Two separate points of rib attachment; *a*, on the centrum only, Reptilia, Ichthyopterygia; *aa*, the lower (capitular) articulation on the centrum, the upper (tubercular) on the diapophysis, which springs from the neural arch: reptiles (Crocodilia, Dinosauria, "Anomodontia," Pterosauria), birds, and mammals. The lumbar vertebræ succeed the dorsals, and are distinguished by the absence of rib articulations; but the ribs extend to the sacrum in some Crocodilia (Belodon), Dinosauria, Anomodontia, and birds. The sacral vertebræ are usually co-ossified into a single mass, the sacrum, with very massive diapophyses for sutural attachment to the iliac bones or pelvis. They are numerous in the birds, less so in the Dinosauria (Agathaumas has eight), four to six among mammals with well-developed hind limbs. There are three or two in reptiles with hind limbs, while in any of the orders where these members are small or rudimental a single vertebra serves the same purpose. The caudal vertebræ are distinguished among Vertebrata below the mammals by the presence of the chevron-bones (see Fig. 3, *p p*, *h h*) on the inferior surface. They are present in Cetacea (whales), Edentata, some rodents, etc. among Mammalia.

The ribs present a general similarity except in their proximal attachments, as already pointed out. They articulate in the thorax with the median bones of the breast or sternum in all above the fishes, and usually remain separate for the remainder of their length. An exception, however, occurs in the tortoises, where they are so widened as to unite by their borders into a more or less complete shield, which protects the entire visceral cavity, and into which, in many species, the head, tail, and limbs may be withdrawn. In birds, crocodiles, and Rhynchocephalia there are recurved processes on the ribs pointing backwards, the "uncinate processes." The thoracic ribs are united by segments on the middle line below, which, taken together, constitute the sternum. The hæmal element of the ribs is wanting in fishes, serpents, Ichthyopterygia, Sauropterygia, tortoises, and (?) Pythonomorpha; the sternum is absent in the same groups, so far as known. The first appearance of the sternum is in the Batrachia, where a cartilaginous plate behind the shoulder-girdle represents it in the tailed and many of the tailless forms. In some of the latter it becomes an osseous rod, and in some extinct Stegocephali is a bony, shield-like body. In Lacertilia, Pterosauria, and probably Dinosauria, it is a broad plate behind the coracoid bones. In birds it is of similar form in the most reptile-like forms, as the apteryx, ostriches, etc., but is peculiar in the possession of a produced process on each side in front (costal process). This is frequently ossified from a separate centre (protosteon), while the main shield originates from a centre on each side, the pleurosteon, and sometimes from two others behind these, the metostea. In all existing birds besides the ostriches there is a middle centre of ossification, the lophosteon, which when ossified is a prominent keel extending along the length of the sternum. The metostea are frequently produced as separate lateral rods, and in nearly all birds the hinder margin of the sternum is variously incised. In Crocodilia the sternum exists as a small shield in front, and a prolongation from it backwards on the median line. This brings us to the form seen in the Mammalia, where it defends the middle line of the thorax as a series of segments which may number from two (Echidna) to thirteen (two-toed sloth). In the whales it is represented by an oval or cruciform bone, and its posterior segment in other mammals is a spatulate cartilage or bone known as the xiphisternum.

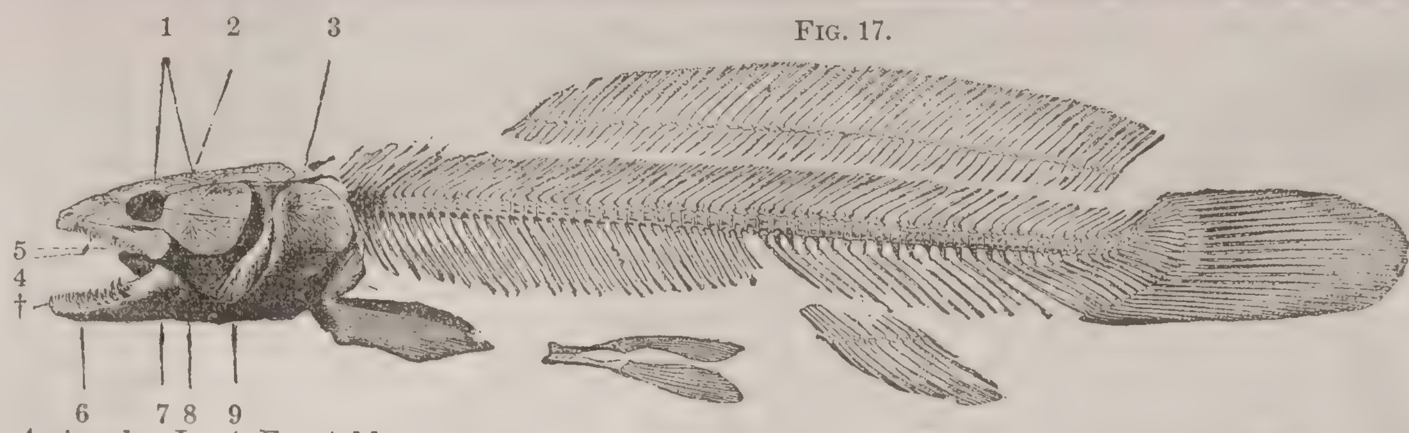
There are various *dermal* ossifications found behind the sternum and hæmapophyses in different Vertebrata. These consist, in many Stegocephali, of osseous rods arranged *en chevron*, with the angle anteriorly directed. Similar pieces, with the addition of lateral ones, exist in ichthyopterygian, sauropterygian, crocodilian, and rhynchocephalian reptiles. In tortoises these extend below the shoulder-girdle in front and the pelvic arch behind, and unite together into the solid inferior plate or plastron. This is connected with the ribs by a series of membrane bones, the marginals, which also extend all round the free margin of the upper shell or carapace. The dermal pieces of the plastron are the two clavicles, the interclavicle between them, the two hyosternals, the two hyposternals, and the two postabdominals.

The scapular arch in vertebrates is composed of both cartilage and membrane bones. Like the pelvic arch, it appears as a cartilaginous rod in the somatopleure of the fœtus, often extending in its fold to near the point of contact above the vertebræ on the median line. If development proceeds, the upper part of this cartilage becomes segmented off, forming the scapula, while the lower portion becomes bifurcated into the coracoid and procoracoid bones. From the junction of the three, the cartilaginous basis of the fore limb appears. Above the scapula another segment is usually present, the suprascapula. The dermal bones relate to the cartilaginous as follows, appearing on their anterior and outer faces, viz.:

Epiclavicle	Suprascapula.
Mesoclavicle and clavicle	Scapula.
Clavicle	Præcoracoid, Coracoid.
Interclavicle	Epicoracoid.

The fishes differ from other vertebrates in having another membrane bone, the post-temporal, connecting the epiclavicle with the cranium at the epiotic bone. This is wanting in sharks, where the arch is cartilaginous and

Fig. 17.



Amia calva, L.: 1, Frontal bone; 2, postfrontal; 3, posttemporal; 4, maxillary; 5, hyoid; 6, dentary; 7, angular; 8, interoperculum; 9, branchiostegal rays.

without laminiform membrane bones. In many fishes there are membrane bones which extend in a bar backwards and downwards from the clavicle; namely, the first, second, and third postclavicles. There may also be a cartilage bone behind the coracoid, the postcoracoid. The following scheme will express the leading characters of the classes and orders in the structure of the scapular arch:

A. Arch suspended to cranium by post-temporal.

1. Scapula, coracoid, and sometimes procoracoid osseous; epiclavicle and clavicle osseous; suprascapula cartilaginous; interclavicle generally double when present: *Pisces.*

A A. Arch not suspended to the cranium; no laminiform dermal bones.

1. Arch cartilaginous: *Selachii.*

2. Coracoid and scapula osseous; suprascapula and procoracoid cartilaginous: *Batrachia Urodela.*

3. Coracoid and scapula, suprascapula and procoracoid osseous: *Batrachia Anura.*

A A A. Arch not suspended; laminiform dermal bones present (except Chamæleo).

1. Scapula and coracoid only ossified: *Lacertilia Rhiptoglossa.*

2. Interclavicle only ossified membrane bone: *Crocodilia.*

3. Clavicle and single interclavicle of membrane, and scapula, procoracoid and coracoid of cartilage, all osseous.

a. Clavicle and interclavicle united with plastron; epicoracoid cartilaginous: *Testudinata.*

a a. Clavicle and interclavicle free; epicoracoid cartilaginous: *Ichthyopterygia, Lacertilia.*

a a a. Clavicle and interclavicle united with a short procoracoid, forming furcula; epicoracoid not osseous; suprascapula co-ossified with scapula: *Aves.*

a a a a. Clavicle and interclavicle distinct; epicoracoid osseous; procoracoid wanting: *Mammalia Monotremata.*

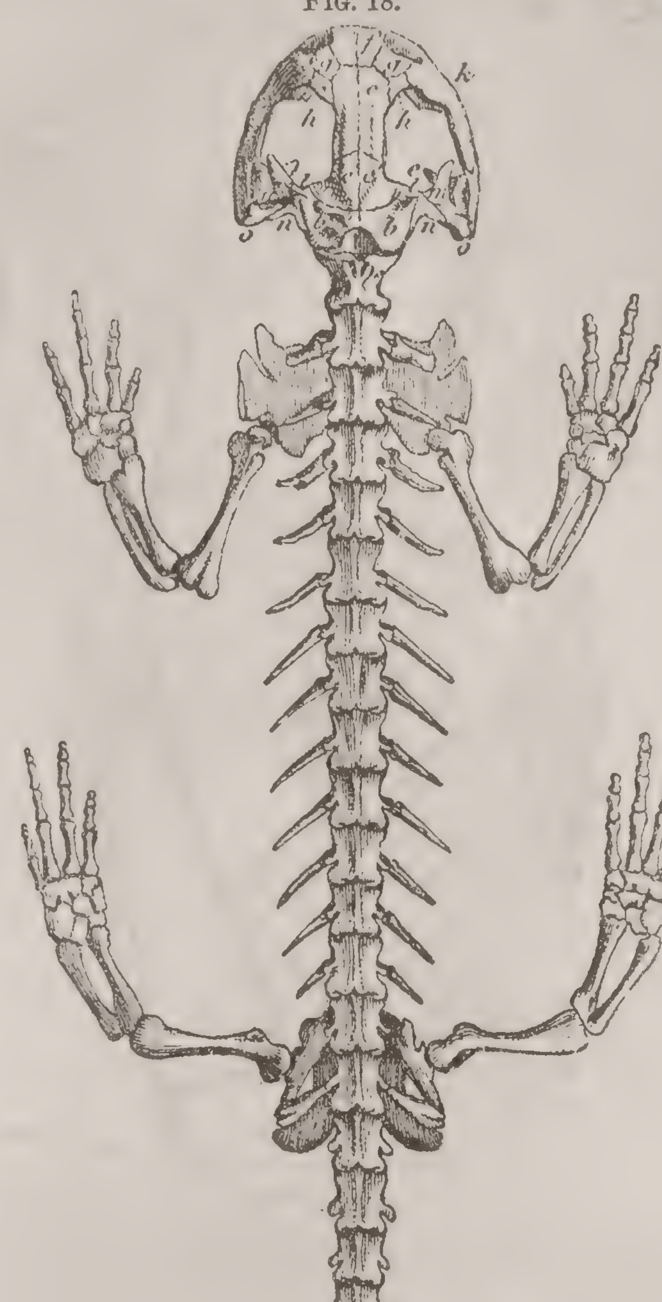
A A A A. Arch not suspended; both membrane and cartilage bones; coracoid rudimental or wanting.

a. Clavicle united with mesoscapula and procoracoid into one bar; epicoracoid and suprascapula rudimental or wanting: *Mammalia.*

The cartilage forming the limb-bones appears early in a fold of the outer skin, and in the Vertebrata above the fishes is soon divided by transverse interruptions into three segments. In Dipnoi or the Lepidosirenidæ this cartilage is broken up into many successive joints. In Ceratodus a branch segment is given off at the end of each of these primary joints, but in sharks and fishes, most of the segments diverge from one side only. The basal and the first and second of the one side are especially enlarged in the sharks, forming the *propterygium, mesopterygium,* and *metapterygium,* from which numerous cartilaginous radii arise, forming a triangular fin. The extremital parts of the fins are dermal, and embrace the ends of the cartilaginous rods. In true fishes the propterygium is wanting, and the radii of the first cross-row, either cartilaginous or osseous, enter between them and reach the scapular arch. The upper radial unites with the mesopterygium to form the first ray of the fin, often a strong spine; the remainder usually number four, of which the lower, like the others in shape, nevertheless is the metapterygium. They are subquadrate in the higher fishes, but much elongate in the Pediculati, where the number is reduced to three and two.

In Vertebrata, from the Batrachia up, the limbs, both fore and hind, are early divided into three principal segments. In the anterior, the first presents a single bone, the humerus; the second, two parallel bones, the ulna and radius, and thirdly the foot. This consists of two transverse rows of small bones, the carpals, and from three to five rows of longer bones, the phalanges, arranged in typically five ray-like lines or digits, the basal segments of which are called the metacarpals. Typically, there are three bones in the first transverse row of carpals and five in the second, with a median bone enclosed between the rows, a condition seen in various batrachians and reptiles. In higher classes these bones are variously combined or omitted. The bone next the radius is the scaphoid, the next the lunar, the next the cuneiform; in the second row the first is the trapezium, the second trapezoides, third magnum, while in mammals the fourth and fifth are combined and called the unciform; the centrale is probably united with some of the other carpals. In Ichthyopterygia the bones of the fore and hind limb beyond the humerus and femur are of similar shape, but though undistinguishable as to form are proximally of the usual position and number. In birds there are never more than three digits of

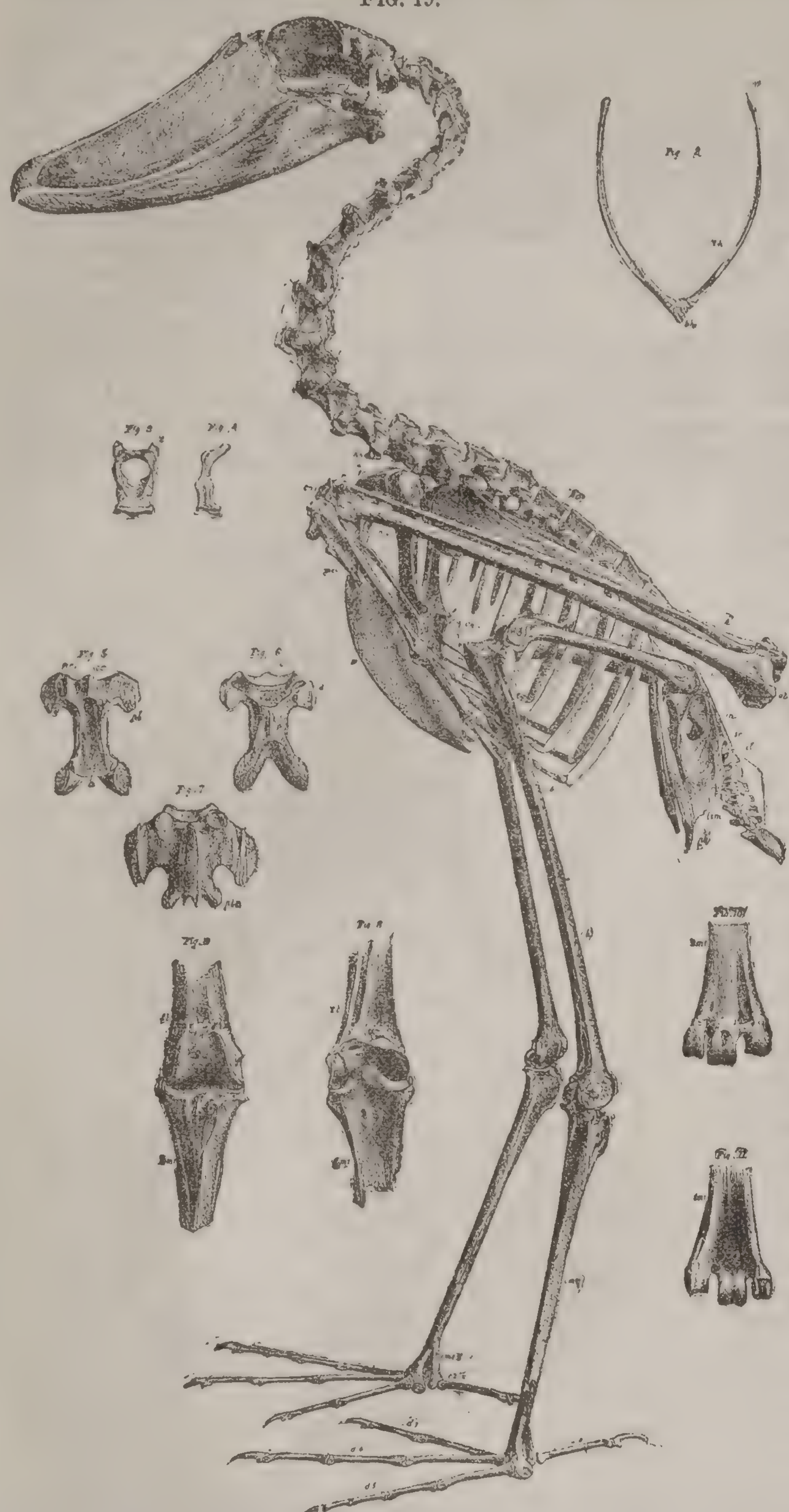
Fig. 18.



Salamandra maculosa, L.: *b*, exoccipital: *c′* parietal; *c*, frontal; *e*, pterygoid; *f*, premaxillary; *g*, nasal; *h*, prefrontal; *k*, maxillary; *l*, proötic; *m*, squamosal; *n*, opisthotic; *o*, quadrate.

the fore foot, in the Apteryx and Casuarius only one. These answer to the first, second, and third of the ordinary foot. The metacarpals are co-ossified in all birds excepting the

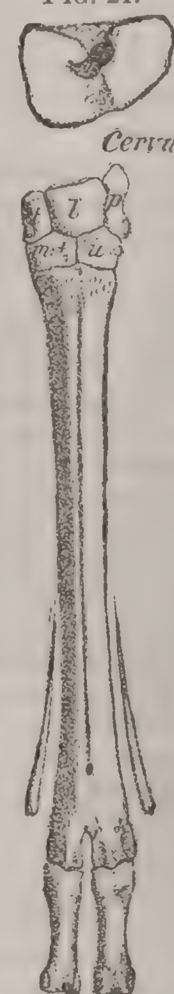
Fig. 19.



Balæniceps rex, Gould: Fig. 2, hyoid arch; Fig. 3, atlas from behind; Fig. 4, atlas, profile; Fig. 5, ninth cervical vertebra from below; Fig. 6, same from above; Fig. 7, middle dorsal vertebra from above; Fig. 8, posterior view of tibio-tarsal joint; Fig. 9, anterior view of do.; Fig. 10, distal end of tarso-metatarsus, front view; Fig. 11, same from behind.

extinct Archæopteryx. In Mammalia of the order Cetacea the ulna and radius are immovably fixed in a single plane with the carpus and manus, and not flexibly articulated with the humerus, thus resembling the aquatic reptiles (Sauropterygia). In higher orders the radius possesses greater or less power of rotation on the ulna, which is especially developed in apes and man. In proboscidians the proximal end of the radius is moved outwards above the ulna, so as to cross it obliquely. In Perissodactyla (odd-toed) and Artiodactyla, the ulnar attachment to the carpus is more and more reduced, until the radius, appropriating the larger part, extends almost entirely in front of the ulna. The latter becomes in the horse and ruminants, very slender and co-ossified with the radius. In the carpus a bone develops below the tendon of one of the flexors of the foot, which articulates with the cuneiform, called the *pisiform*. In five-toed orders the carpals are usually distinct, excepting in the Carnivora, where the scaphoid and lunar are generally co-ossified. In the Artiodactyla the number of toes is regularly reduced from four to two, and the number of carpals is reduced correspondingly in the second row, those of the first being narrowed. In the most specialized Ruminantia the trapezium is wanting, and the trapezoides and magnum are confluent. The outer digits become smaller and disappear, while the two middle metacarpals, representing the third and fourth, co-ossify into the single "cannon-bone." In the living types the third metacarpal supports the whole width of the trapezoides and magnum, while in the extinct family of the Anoplotheriidæ it articulated with the magnum only. The last phalange in Carnivora, Insectivora, bats, rodents, etc. is compressed, and with its complete horny sheath forms a claw; in ungulates it is broad, with two posterior faces, the terminal of which support the weight of the animal; the horny covering does not enclose it behind, and forms a hoof. In apes and men the last phalange is flat, and supports a flat horny nail.

Fig. 21.

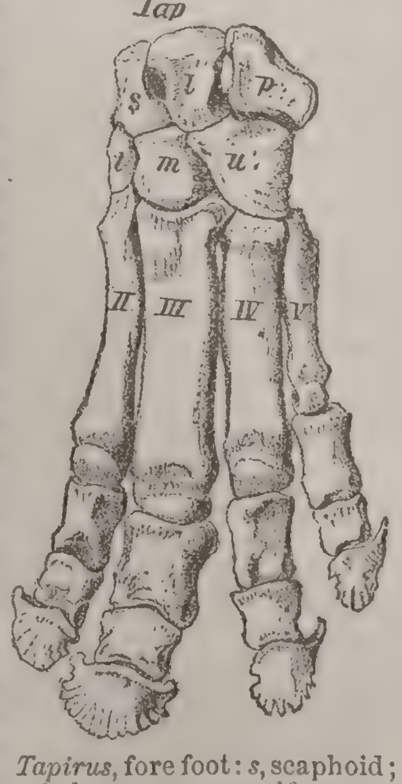


Cervus, fore foot: lettering as in Fig. 20.

The *pelvic* arch is composed of the single superior element, the *ilium*, and the two inferior ones arranged as limbs of a fork, the anterior, the *pubis*, the posterior, the *ischium*. The ilium corresponds with the scapula, the pubis with the procoracoid, the ischium with the coracoid, and the osseous bar, that usually connects the latter two, with the epicoracoid. The ilium generally presents a crest forward, from which a strong ligament descends to the end of the pubis, which represents the clavicle. It is the Poupart's ligament of human anatomy. Fishes, however, do not possess a pelvis, with two exceptions, those of the Lepidosirenidæ and of the Holocephali. In the former there is a single median diamond-shaped cartilage, to which the limbs are attached, whose homology is unknown. In the latter there is a flat curved cartilage extending forward from the basis of each fin on each side, which occupies the position of the pubis. Another and serrate cartilage is attached to its anterior margin in the male, which projects into an open pouch, from which it can be protruded. A cartilaginous rod succeeds the pubic bone as the basal element of the posterior limb. In the Dipnoi this is followed by others, forming the segmented ray representing the ventral fin. In Ceratodus each segment is furnished with a short divergent sub-segment on each side; but in the sharks and rays the sub-segments or radii are all on one side. In these animals the axis is much shortened, so that the radii are packed closely together on the basal piece; the first radius also is enlarged, forming an opposite border of the fin. In the rays the latter is much enlarged, and supports radii indistinguishable from the others. In Polypterus the basal element, or femur, is deprived of rays, except at its extremity, and they, as in the sharks, support the dermal fin-rays proper. In sturgeons the radial bones are present in the ventral fins only, but in Lepidosteus and Amia one or two very small rudiments remain, and the dermal fin-rays are attached immediately to the femur, as is the case with all the true fishes. In sharks the axis is developed into some peculiar and complex organs, the claspers, which bear some resemblance to the hinder limbs of terrestrial Vertebrata.

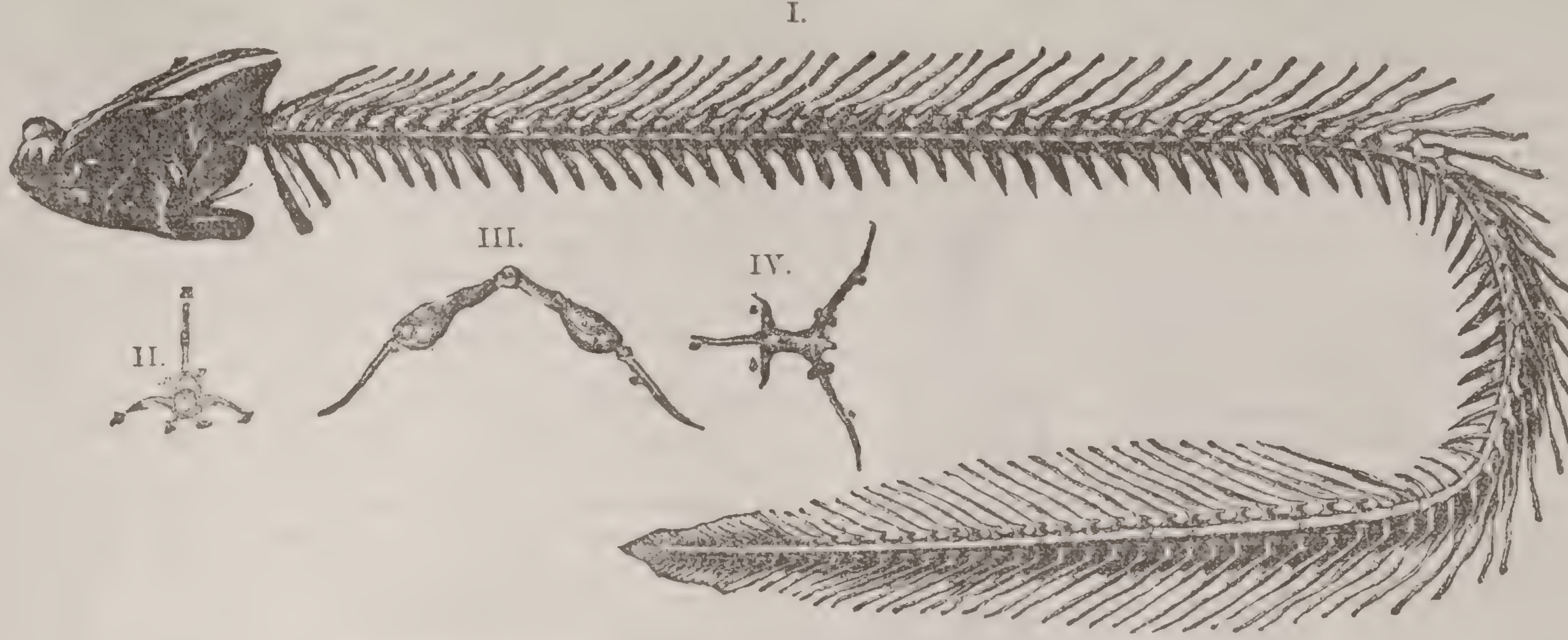
The three pelvic elements are remarkably constant in all the land vertebrates, the most marked variations being seen in the Batrachia Anura and the Dinosauria and Aves. In the former the ilia are much elongate and extended backwards to the acetabula, round which the ischia and pubes are compacted in a solid mass. In Dinosauria Goniopoda, the ischia are slender and unite into a dense osseous rod, which served as a support when in a sitting position (*e. g.* Megadactylus). In those of the order where the pubes are known, they are turned backwards beneath the ischia, are slender, and not united distally. They are similar in position in the birds, except in the ostriches, where they are united distally. The ischia in birds are slender and not distally united, but often co-ossified with the ilia.

Fig. 20.



Tapirus, fore foot: *s*, scaphoid; *l*, lunar; *p*, cuneiform; *t*, trapezoides; *m*, magnum; *u*, unciform.

Fig. 22.

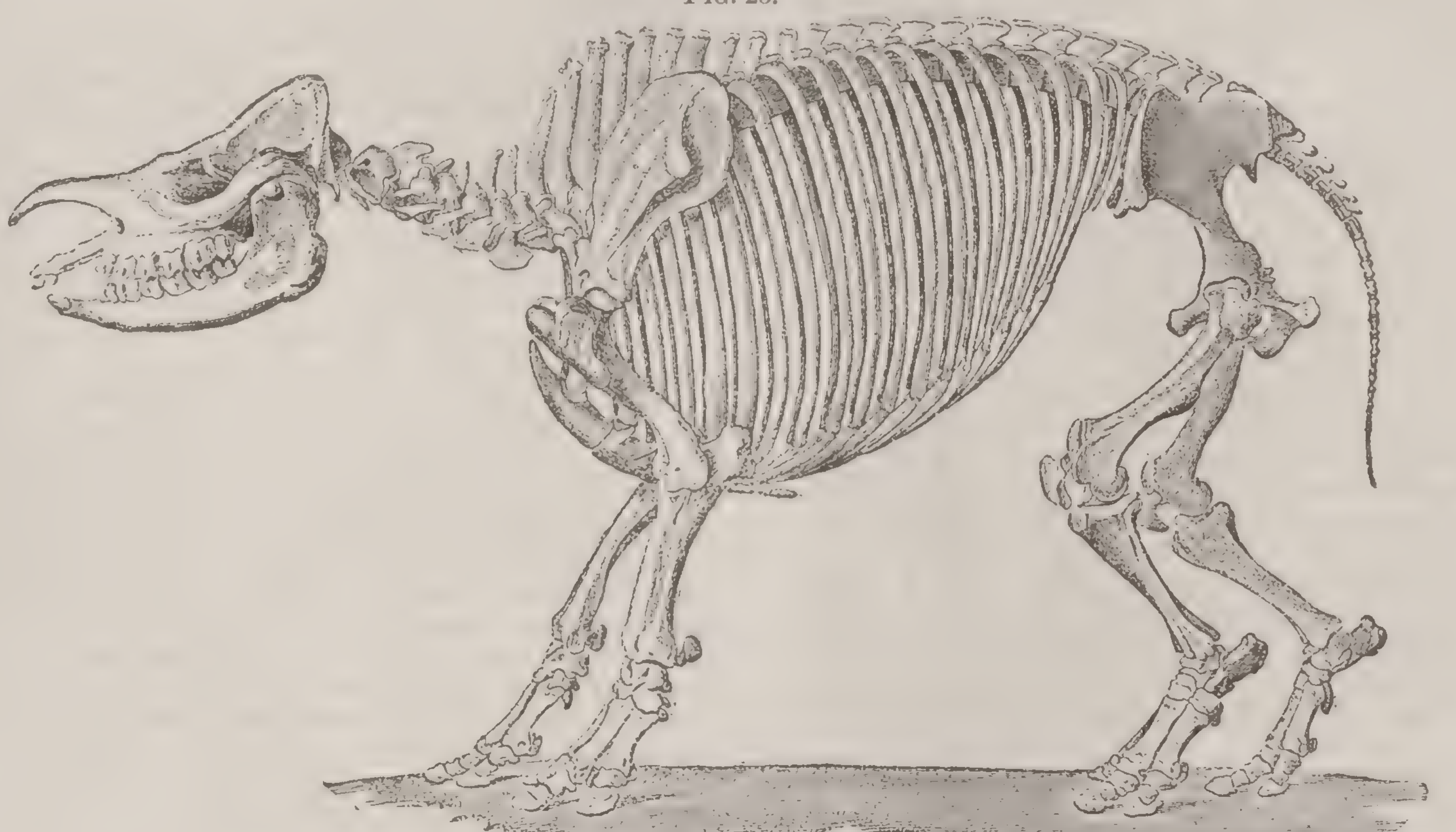


Lepidosiren paradoxa (I.); II. a vertebra; III. pelvis; IV. pectoral arch.

The latter are very much extended fore and aft, embracing many vertebræ as sacrum which belong to the lumbar and caudal series. They frequently meet over the neural spines, completing the pelvic arch above. In Dinosauria the ilium is usually elongate, as much so as in some birds in Agathaumas, but is shorter in others. The acetabulum is perforated and not completed at the fundus in this order and the birds. In Crocodilia the pubes are not united on the middle line below, but are directed forwards. In the marsupial mammals the pubes support a pair of bones directed outwards and forwards, the marsupial bones, which are ossifications of the tendons of the external oblique muscles. In Mammalia the pubes and ischia are in contact on the middle line below, and are sometimes extended posteriorly on the peduncles of the ilia.

The *hinder limbs* are wanting in Leptocardii, Dermopteri, and several orders of true osseous fishes collectively called Apodes or eels. In most other fishes they occupy the

Fig. 23.



Rhinoceros? Javanicus (from Cuvier).

usual position on the abdomen, but in the Physoclysti they are placed beneath the pectoral limbs, or nearly so, the femoral bones being more or less united and suspended from the symphysis of the coracoids. In Plectognathi they form a simple rod, which is generally deprived of fins. In Batrachia the hind limbs are constituted like the fore limbs, and therefore embrace one bone in the first segment, *femur;* two in the second, *tibia* and *fibula;* three in the third, *tibiale, mediale,* and *fibulare;* five in the fourth, from which are continued the five metatarsals and series of phalanges. These correspond with the elements of the fore leg as follows: femur to humerus; tibia to radius in front, and fibula to ulna behind. These relations are maintained so long as the limbs extend horizontally without twist, either in paddles, as in Ichthyopterygia, or terrestrial animals, as salamanders. In most vertebrates the first bones are twisted in opposite directions, that is, towards each other, the knee pointing forward, the elbow backward, which causes an apparent reversal of the homologies of the two bones of the second segment. In the hind foot of the higher Vertebrata, especially

Fig. 24.

Posterior foot of *Rhinoceros*: *a*, calcaneum; *b*, astragalus; c, cuboid; *d*, navicular; *e*, mesocuneiform; *f*, ectocuneiform: *g*, fourth; *h*, third; *i*, second toe.

the mammals, the tibiale and intermedium form the single astragalus, while the fibulare is produced backward, forming the heel-bone or calcaneum. The centrale becomes the navicular, while the fourth and fifth of the second row unite to form the cuboid. In the reptiles these bones are less distinctly constituted, and various modes of combination present themselves. In the Dinosauria the astragalus and calcaneum are often co-ossified, and may be united, by suture or co-ossification, with the tibia. In the birds the latter case always prevails, and the fibula, being much reduced, does not extend to the articulation. In reptiles and birds, then, the ankle joint is between the two rows of tarsals, while in Mammalia it is between the tibia and astragalus. The number of toes is usually four and five in the Batrachia and reptiles; among birds it is usually four, the inner being turned backwards and reduced in size, and sometimes wanting. The metatarsals of the three remaining toes are co-ossified with each other and with the second row of tarsal bones. In Mammalia the normal number of digits is five, but is often reduced to four. Among ungulates the hippopotamus displays four; the lateral ones are reduced in the hog and the Tragulus, till in the Poëbrotherium they are reduced to rudiments, two only remaining. These are united into a solid "cannon-bone" in the Ruminantia, which supports two distinct toes. In the rhinoceros there are but three toes, of which the central is the largest; the laterals are successively reduced in the horse series, composed of such genera as Anchitherium and Protohippus. In ruminants the navicular and cuboid bones are united, and

often the second and third of the second row or cuneiforms with each other and the naviculo-cuboid.

It remains to notice the peripheral ossifications of fishes and a few appendages of other Vertebrata. In the archetypal fin each neural spine and each hæmal behind the abdominal cavity, supports an additional bone called an interneural, and the latter another bone, the basal radial. This is the case in a large portion of the unpaired or peripheral fins of the Dipnoi. These radial bones support the fin-rays, which are developed in the dermal fold that represents the fins in the early stages. The vertebræ in the Dipnoi and a number of other fishes gradually diminish in size to the end of the tail, forming a type called the protocercal. In other fishes the hæmal spines of the last vertebræ are largely developed, forming the principal part of the basis of the caudal fin. In these the vertebral axis turns upward to the end, forming the type called heterocercal, which is seen in sharks, sturgeons, and some bony fishes. In the majority of osseous fishes the terminal vertebræ are wanting, and the greatly expanded hæmal spines extend round its end, forming a fan. This is the homocercal tail. In the bony fishes the radial bones are usually wanting, but in some cases rudimentary; they are long in the anal fin of Amia. In Polypterus they are very elongate, and each supports a number of cartilaginous rays, the posterior from the end, but the more anterior from the posterior side, forming the vertical pinnules of that genus. In higher fishes the interneurals, which support the dorsal, and the interhæmals, that support the anal fin, are more numerous than the vertebræ they are opposite to. In many fishes there are interneurals between the cranium and dorsal fin which support no fin.

Fig. 25.

Diplopus, hind foot (from Kowalevsky): *Cal*, calcaneum; *As*, astragalus; *nav C*, navicular; *Cb*, cuboid; C^3, ectocuneiform.

Horn cores are developed on the crania of various species of Mammalia, especially the Eobasiliidæ among Proboscidia, *Titanotherium* among Perissodactyla, and the Ruminantia among Artiodactyla. They are permanent except in the Cervidæ among ruminants, where they grow and are shed annually, leaving a basal portion, the burr, attached to the frontal bones. They are often of large size and grow with incredible rapidity.

List of authorities in general departments: Cope, *On Osteology of Fishes, Batrachia, and Reptilia, especially Lacertilia;* Cuvier, *Ossemens Fossiles;* Flower, *Osteology of Mammalia;* Gegenbaur, *On Limbs and the Shoulder and Pelvic Girdles;* Huxley, *Elements of Comparative Anatomy,* and *Anatomy of Vertebrated Animals;* Kölliker, *The Development of the Vertebral Column;* Owen, *Anatomy of Vertebrate Animals; Homologies of the Vertebrate Skeleton;* Parker, *Anatomy of the Shoulder Girdle; Development of the Skull in the Ostrich Tribe, the Pig, Frog, Eel, and Salmon;* Vrolik, *On the Ossification and Bones of the Skull of the Teleostei.*

E. D. Cope.

Os′terhaus (Peter J.), b. in Prussia; formerly an officer in the Prussian service, he emigrated to America and settled in St. Louis, Mo. On the outbreak of the civil war he accepted a major's commission in the 2d Missouri Vols., of which regiment he became colonel, participating in the battle of Wilson's Creek and Pea Ridge; promoted to be brigadier-general of volunteers June, 1862, he commanded a brigade in the 13th Corps at capture of Arkansas Post, siege and capture of Vicksburg, and in the 15th Corps at Chattanooga, Missionary Ridge, and operations resulting in capture of Atlanta, having been promoted to be major-general in July. In Sherman's "march to the sea" he commanded the 15th Corps from Atlanta to Savannah; subsequently, as chief of staff to Gen. Canby, he received the surrender of Kirby Smith May 26, 1865; mustered out Feb., 1866.

Os′terode, town of Prussia, in Hanover, on the Sose, at the foot of the Hartz Mountains, has breweries, distilleries, and manufactures of white-lead, linen and cotton-goods, and metallic wares. Pop. 5090.

Os′tia, an old Roman town, situated on the left side of the mouth of the Tiber, about 18 miles from the city of Rome. Ancient writers agree in stating that it was founded by Ancus Martius as a maritime station for his capital, but it was not until the wars with Carthage that it became important as a port for the introduction of foreign grain. From that time it grew rapidly, and was soon the principal commercial and naval station of the Romans. The harbor, however, was never a really good one, and in the reign of Claudius it was already so shoaled up by deposits from the Tiber as to necessitate the construction of an artificial basin about two miles to the N. This was called *Portus Augusti*, afterwards *Portus Trajani;* but the new town which grew up around it (*Portus* or *Portus Urbis*) never equalled the old one in size and opulence. Ostia began to decline with the declining empire, and early in the ninth century was a heap of ruins. Gregory IV. then tried to rebuild it, but without success; and later popes have made similar fruitless attempts. Fine statues and other works of art are often disinterred here, and recent excavations have disclosed extensive warehouses and other commercial and public structures, whose foundations and lower stories remain to witness to the former greatness of this ancient city. These ruins and the crumbling old mediæval walls and fortress offer a picturesque aspect to the visitor, and a few scores of men and women engaged in the manufacture of salt, like the first colonists of Ancus Martius, still linger about this desolate and pestilential spot. Ostia was an episcopal see at the beginning of the fifth century, and the title bishop of Ostia and Velletri is now given only to the dean of the Sacred College, resident in Rome.

Osti′glia [anc. *Hostilia*], town of Italy, province of Mantua, on the left bank of the Po. It is a place of much industry, and great quantities of silk are produced here, but the terrible inundations from the Po to which it is subject greatly interfere with its prosperity. Ostiglia appears in history before the Christian era, and is supposed by some to be the birthplace of Cornelius Nepos. Pop. 6829.

Ostraciont′idæ [from ὄστρακον, a "shell"], a family of teleost fishes of the order Plectognathi and sub-order Ostracodermi, distinguished by the trunk-like case in which the body is enclosed. This case is more or less angulated along the back and sides, and is formed by the coalescence of hexagonal osseous plates; the head is continuous with the body and encased in the same armature, being only separated externally by the small branchial apertures; the opercula are thus concealed from view; the mouth is small, the upper jaw formed by the intermaxillary and supramaxillary bones, which are coalescent with each other; the teeth slender and in a single row on each jaw; branchial apertures narrow slits in front of the pectoral fins; branchiostegal rays concealed within the case; the dorsal and anal fins are small and posterior, the latter farther behind than the former; caudal fin well developed; pectorals normal; ventrals entirely wanting. The family includes a number of species, which are popularly known under the name of trunk and box fishes, and which are all closely related to each other, although by some authors they have been differentiated into several genera. They are mostly confined to the tropics, although sometimes they wander beyond. One species, *Ostracion* (*Lactophrys*) *trigonus*, occasionally visits our own coasts. Theo. Gill.

Os′tracism [Gr. ὀστρακισμός, from ὄστρακον, a "shell, potsherd, or tile"], a form of temporary banishment which once prevailed in ancient Athens and some other Greek cities (Argos, Megara, Miletus). The Athenian senate and ecclesia having decided that ostracism was necessary in the case of any citizen, the ten tribes voted upon the question in the agora. Each voter in favor of the ostracism presented a tablet or shard of burnt clay, on which was written the name of the person to be banished. If there were 6000 votes for it, the person ostracised was obliged to leave the state within ten days and not return for ten years unless recalled. Ostracism was not a penalty for crime, but was employed against persons supposed to possess dangerous power. The exile retained his property and social position. In Syracuse the olive leaf was used instead of the clay tablet, and the act of exile was called *petalism.*

Ostræ′idæ [from *Ostræa*, the ancient name of the oyster], a family of the class Conchifera and order Monomyaria, typified by the common oyster. The animal has a mantle, with its opposite lobes separate; the margins finely fringed; no ocelli; the gills double, nearly of a size, posteriorly united together with each other and with the mantle lobes, thus forming a complete gill-chamber; the palpi triangular and connected round the mouth by a plain membrane; the foot is obsolete, the sexes distinct. The shell is quite irregular, variable in form, and more or

less inequivalve as well as equilateral, with the beaks greatly varying, being in some straight and very small and in others in one valve greatly produced, and even subspiral; the hinge is toothless; the ligament internal; the muscular impression central or subcentral (*i. e.* somewhat behind the centre); the pallial line simple and indistinct. The family thus distinguished include the famed oysters of Europe and America and many related species in other seas. Representatives early appeared on the surface of the globe, species being preserved in rocks as early as the Carboniferous period. Three genera are generally recognized as members of the family: (1) *Ostræa,* which has survived from the Carboniferous to the present time; (2) *Gryphæa,* which existed during the Triassic and Cretaceous epochs; and (3) *Exogyra,* which is characteristic of the later Oolitic and Cretaceous epochs. (See, also, OYSTER.) The so-called pearl-oysters have no near relationship with the true oysters, but belong to the family PTERIIDÆ (which see). THEODORE GILL.

Os′trich, the *Struthio camelus,* the largest of living birds, belonging to the order Ratitæ, and a native of South-western Asia and of Africa. It is represented in South America and Australia by several similar but smaller birds. (See CASSOWARY, EMU, NANDU.) The male ostrich is sometimes 8 feet high and may weigh 300 pounds. It is an extremely swift runner, but has no power of flight. It strikes severe blows with the foot. It is gregarious and polygamous, the wives of one male laying their eggs together in one nest; by day they are exposed to the sun's heat, but at night incubation is kept up until the greater part of the eggs are hatched. Ostriches are now domesticated and bred in considerable numbers in the Cape Colony for the feathers, oil, and eggs, and to some extent for the flesh, which is palatable if the bird is young, and have lately been introduced into California for the same purpose, but more especially for their plumes. These are assorted with great care, and bring various prices, according to shape, size, and quality. The coarse plumes used for feather-dusters are largely those of the nandu, or American ostrich. The ostrich has a remarkable habit of swallowing stones, iron, bits of leather, and the like—a habit shared by many other birds. These hard substances assist in the trituration of food in the gizzard. The ordinary food of the ostrich is grass, leaves, grain, and seeds, but it does not altogether reject animal food. According to general acceptation, it is a stupid animal, and the Arabs even have a proverb, "Stupid as an ostrich." As evidence of its stupidity, it is related that when hunted it thrusts its head into a bush, and imagines that the hunter cannot see it because it cannot see the hunter; and Dr. Shaw in his *Travels* relates as an instance of want of sagacity in the bird that he "saw one swallow several leaden bullets scorching hot from the mould." Other travellers, however, give quite another account of the character of the bird. In the Old Testament the ostrich is spoken of as being cruel, because it leaves its eggs to "the earth" and forgets "that the foot may crush them." The ostrich of Syria, Palestine, Egypt, and other regions not belonging to the tropical zone does not leave its eggs to be hatched by the sun, and is generally remarkable for the care it takes of them and the fondness it shows for its young ones. The Old Testament probably refers to the peculiar habit of the bird of laying a few eggs outside of the nest, that they may serve as food for the young ones.

Os′tritz, a small town of the kingdom of Saxony, on the Neisse, has some cotton-spinning and linen-weaving factories, and about 2000 inhabitants. In its vicinity is the Cistercian monastery for nuns, Marienthal, founded in 1374, and containing a richly-ornamented church.

Ostrog′, town of European Russia, government of Volhynia. Here the first Slavonic Bible was printed. Pop. 9353.

Ostrogoths. See GOTHS.

Ostrok′, a convent of Montenegro, near the border of Herzegovina, is remarkable on account of its situation in a spacious cavern on the side of a steep cliff, which rises 400 feet above it. It has sometimes been transformed into a stronghold by the Montenegrins and used as a powder-magazine.

Ostrolen′ka [Polish, *Ostroleka*], town of Russian Poland, government of Lomza, on the Narew, has 3466 inhabitants (1867). An encounter took place here Feb. 16, 1807, between the French under Savary and the Russians under Essen, in which the former were victorious. The place became still more famous by the battle which was fought here May 26, 1831, between the Poles under Skrzynecki and the Russians under Diebitsch. The struggle was bloody, protracted, and by itself undecided. The Poles retreated to Warsaw, but the Russians were unable to follow them on account of their own losses.

Ostrow′ski, the name of a celebrated family of Polish nobility, originally descending from the palatinate of Lublin. Among its most remarkable members was TOMASZ ADAM RAWICZ, COUNT OSTROWSKI, b. at Ostrow Dec. 21, 1739. He took a very active part in the establishment of the constitution of May 3, 1791, and was appointed minister of finance, but resigned when the king shortly after joined the confederacy of Targowicza, and lived after the third division of Poland (1795) in retirement on his estates in the Ukraine, occupied with making improvements in agriculture and public education. On the establishment of the duchy of Warsaw, he was made grand marshal of the diet Mar. 9, 1809, and president of the senate Dec. 6, 1811. The emperor Alexander I. also showed great confidence in him, and the Poles received their new constitution of 1815 from his hands. D. Feb. 5, 1817.—His son, ANTONI JOANNES, COUNT OSTROWSKI, b. at Warsaw May 27, 1782, studied at the University of Leipsic; entered in 1806 the French body-guard; was made a member of the provisional government of the duchy of Warsaw; followed Napoleon to Dresden in 1812, and fought in the battle of Leipsic; entered the Polish senate after the death of his father, and offered a firm and steady opposition to the arbitrary measures of the grand duke Constantine. Unable to continue his struggle against the Russian despotism, he went abroad, and travelled much in Germany, France, and England, but hastened back to Warsaw in 1830 on the first report of the insurrection. In the revolution he took a very active and very noble part, fighting at last in the ranks on the walls of Warsaw, and wrote the manifesto which the last remnant of the Polish army issued (Oct. 4, 1831) to the kings and nations of Europe after crossing the Prussian frontier and laying down their arms. He afterward lived in France, and published *Le Panslavisme moscovite* (1842).

Ostrowsky Mountains, The, form part of the central Carpathian range, and extend between the rivers Gran, Eipel, and Sajo. They show remarkable volcanic features. Their highest peak, Sitna, rises 3498 feet.

Ostu′ni (*Ostunium*), a town of S. Italy, in the province of Lecce, situated in a district rich in vines, olives, almonds, and grain. It lies about 20 miles N. W. of Brindisi, on the railway to Bari. The churches and convents are very numerous, but of no special interest. Pop. 16,295.

Osu′na is an old, substantially but irregularly built town of Spain, in the province of Sevilla, standing in a very fertile plain rich in wine, almonds, figs, and olives. The palace of the duke of Osuna is a large and magnificent building. Pop. 15,130.

Osuna (PEDRO TELLEZ **Giron**), DUKE OF, b. at Valladolid, Spain, in 1579; spent his childhood at Naples, where his grandfather was viceroy; was educated at Salamanca; assumed the title of duke of Osuna on his marriage with a daughter of the duke of Alcala; aided in the escape of Antonio Perez from Saragossa; was at first unpopular at the courts both of Philip II. and Philip III.; was twice exiled and once tried by the Inquisition on a charge of infidelity; gained military distinction in Flanders, where the twelve years' truce of 1609 was advised by him; became viceroy of Sicily 1611; was transferred to Naples 1616; incurred the hostility of the clergy by resisting the establishment of the Inquisition at Naples; was an active enemy of the maritime supremacy of Venice; was subsequently suspected of conspiring with foreign princes to make himself independent in Southern Italy; was recalled 1620; subjected to a long and secret trial for high treason, and though not convicted was retained a prisoner in the castle of Almeidas, where he d. in 1624, either by suicide or poisoned by his wife.

Os′wald (SAINT), king of Northumbria, b. in 604; son of Ethelfrid, who was killed in 617 by Redwald, king of East Anglia; resided some years thereafter an exile in Scotland (or Ireland), where he was converted to Christianity; came to the throne 634; made war upon Cadwalla, king of Wales, whom he killed in battle; introduced Christianity into Wales; married Cyneburg, daughter of the West Saxon king Cynegil, on condition of her embracing Christianity, and was killed at Maserfield Aug. 5, 642, by the heathen king Penda of Mercia. The events of his life as given by Bede and Alcuin are overgrown with miraculous legends, which were long popular, especially in Germany. Canonized by the Roman Church.

Oswald (Col. ELEAZER), b. in England about 1755, a relative of Richard Oswald of Auchencruive; came to New York shortly before the Revolution; served under Arnold at Ticonderoga and Quebec, where he commanded the forlorn hope after Arnold was wounded, and displayed great bravery; became secretary to Arnold; was lieutenant-colonel of Lamb's artillery regiment 1777; rendered good ser-

vice at the battle of Monmouth; became public printer at Philadelphia; was a strenuous opponent of Hamilton upon constitutional questions; took service in the French army 1792, commanding a regiment of artillery at the battle of Jemappes. D. at New York of yellow fever Oct. 1, 1795.

Oswald (RICHARD), b. at Auchencruive, Scotland, in 1705; was a merchant of London; married, late in life, Mary Ramsay, famous in the poems of Robert Burns, and was a plenipotentiary on the part of England in framing the treaty of peace with the U. S. D. Nov. 6, 1784.

Osway'o, post-v. and tp., Potter co., Pa. Pop. 629.

Oswegatch'ie, tp. of St. Lawrence co., N. Y., on the St. Lawrence at the mouth of the Oswegatchie River; enjoys a favorable position for manufactures and commerce. Pop. 3018.

Oswe'go, county of New York, bounded N. W. by Lake Ontario. Area, 1038 square miles. It is uneven and mostly fertile, being especially adapted to grazing and the dairy. Cattle, grain, wool, dairy products, hay, tobacco, etc. are the leading agricultural staples. The manufactures are important, and include lumber, cooperage, carriages, cheese, flour, clothing, leather, harnesses, furniture, metallic wares, shipping, wooden wares, starch, etc. The county is traversed by numerous railroads, and has important commercial interests, centring chiefly at Oswego. Building stone, clay, peat, marl, glass, sand, and some iron ore are found. Caps. Oswego and Pulaski. Pop. 77,941.

Oswego, post-v. and tp., Kendall co., Ill., on Fox River and Chicago Burlington and Quincy R. R.; has 1 weekly newspaper. Pop. 1756.

Oswego, post-v. of Plain tp., Kosciusko co., Ind. P. 116.

Oswego, post-v. and tp., cap. of Labette co., Kan., on the Neosho River and the Missouri Kansas and Texas R. R., 13 miles from Parsons: has 2 weekly newspapers and excellent water-power, utilized for saw-mills and factories. Pop. 1196; of tp. 1836.

Oswego, city and port of entry, cap. of Oswego co., N. Y., situated near the eastern end of Lake Ontario, 328 miles N. E. of New York City; is the principal port upon the American side of Lake Ontario, and possesses considerable commercial importance, being seventh in the list of the entry ports in the U. S. for duties collected, the importations consisting mainly of Canada grain and lumber. It has also a coastwise trade. Oswego has a daily line of steamers, during the navigable season, to Chicago and the other important places on the lake. It is the Lake Ontario terminus of the Delaware Lackawanna and Western R. R., of the New York and Oswego Midland R. R., also that of the Oswego branch of the Rome Watertown and Ogdensburg R. R. and of the Lake Ontario Shore R. R. Among its manufactories may be mentioned Kingsford's starch-works, probably the largest in the world, producing 35 tons of starch daily, with an annual consumption of 1,000,000 bushels of corn, 15 flouring-mills, with an aggregate of 76 runs of stone, capable of manufacturing 6080 barrels of flour daily, the Vulcan, Ames, and Kingsford iron-works, Conde's knitting-works, the Oswego shade cloth factory, 1 sash and door factory, and the car-works and repair-shops of the Delaware Lackawanna and Western, the Midland, and the Rome Watertown and Ogdensburg R. Rs., and Herick's car-works. Oswego has 10 grain-elevating establishments with a storing capacity of over 2,000,000 bushels, 2 extensive malt-houses, several barrel-factories, and numerous other industries. The city is supplied with fine water-power by the Oswego River, which drains an area of many square miles, including a cluster of 11 beautiful lakes, for which Central New York is so noted. The streets of the city are 100 feet wide, crossing each other at right angles. There are 2 parks, beautifully shaded, a public library, containing 20,000 volumes, a State normal and training school and an excellent public school system, 15 churches, an opera-house, 2 daily and 2 weekly newspapers, a fire-department, 6 national and 2 saving banks, and water-works of ample capacity. Its public buildings include the county court-house and jail, a city hall, State armory, a government building, containing the post-office, the custom-house, and a U. S. court-house. Fort Ontario, one of the three original fortifications that defended the city, has been rebuilt by the U. S. government, and is now a casemated structure overlooking the lake and harbor, and is garrisoned by a company of the U. S. army. The harbor, situated at the mouth of the Oswego River, is protected from the action of the lake water by extensive piers. The U. S. government is now constructing a new harbor outside the present one, which, when completed, will have a depth of 20 feet and be one of the safest and most commodious harbors upon the chain of great lakes. Pop. of city 20,910; of tp. 3043. JOHN A. PLACE, ED. "OSWEGO TIMES."

Oswego Falls, post-v. of Granby tp., Oswego co., N. Y., on the Oswego River opposite Fulton, and on the Oswego and Syracuse R. R. Pop. 1119.

Oswich'ee, post-v. and tp., Russell co., Ala. P. 1920.

Osyka, post-v. of Pike co., Miss., on the New Orleans Jackson and Great Northern R. R.; has 1 newspaper and is a trade centre of some importance.

Ota'go, province of New Zealand, consists of the southern part of Middle Island. The first settlement was made here in 1847, and in 1851 the number of settlers had increased to 1740; but in 1861 gold was discovered in several districts, and in two years the population swelled to 48,907, of whom only 500 were natives. Although the gold-production has declined, the province has made great progress; it is now extensively cultivated, and its natural riches are rapidly developing. Cap. Dunedin.

Otari'idæ [from *Otaria*—ὠταρός, "distinctly eared"—the principal genus], a family of mammals of the order Pinnipedia, containing the sea-lions and fur-seals. The form is more like that of ordinary quadrupeds than in any other members of the order; the fore-limbs are flippers, the hind limbs flexible forwards; the head is bear-like; small linear ears are developed; the 34 or 36 teeth are present (M. $\frac{5-6}{5-5}$, C. $\frac{1}{1}$, I. $\frac{3}{2} \times 2$), and the incisors of the upper jaw are notched; the skull is strong and has salient mastoid processes, which stand aloof from the auditory bullæ; well-developed post-orbital processes and alisphenoid canals are developed; the anterior limbs are about as large as the posterior; their digits decrease in a curved line and are destitute of claws; the posterior feet have all their digits nearly coterminal, and are furnished with long linguiform flaps extending beyond the tips; the three middle toes are alone provided with claws. The family has been variously subdivided, but by American naturalists is regarded as being represented by five genera, viz.: (1) *Zalophus*, (2) *Eumetopias*, (3) *Otaria*, (4) *Arctocephalus*, and (5) *Callorhinus*. The first is represented on the coast of California as well as Japan and Australia; the second is restricted to the North Pacific, *E. stelleri* descending, however, as far as California; the third and fourth belong to the southern seas; and the fifth to the North Pacific. The first three are "hair-seals" and the last two "fur-seals." *Arctocephalus* is hunted for its fur at widely distant places; *Callorhinus*, however, is only sought for, to any extent, on the Prybilov Islands, Alaska, and Commander Islands, Kamtchatka. THEODORE GILL.

Ote'go, tp. of Fayette co., Ill. Pop. 903.

Otego, post-v. and tp., Otsego co., N. Y., on the Albany and Susquehanna R. R.; has 2 newspapers and a large trade in grain, hops, and other agricultural products. P. 2052.

O'tey (Rt. Rev. JAMES HERVEY), D. D., b. at Liberty, Va., Jan. 27, 1800; graduated in 1820 at the University of North Carolina; took orders in 1825, and was the first Protestant Episcopal clergyman in Tennessee; was consecrated bishop of Tennessee in 1834, and engaged in laborious missionary labors in the S. W. D. at Memphis, Tenn., Apr. 23, 1863. Author of *Unity of the Church* (1852), and many *Charges* and *Sermons*.

Ot'fried, a Frank by birth, studied at Fulda till 848, and was afterward monk in a Benedictine monastery at Weissenburg, Alsace; wrote a paraphrase in German verses of the Gospels, which he sent in 868 to King Louis the German. The aim of this poem was to wean the newly-converted Germans from their heathenish ballads and draw them to Christianity. How well it accomplished its purpose is not known. Its poetical merits are very small, but for the study of German language it is invaluable. It has been edited by Graff (Königsberg, 1831) and by Kelle (Regensburg, 1856); the latter has also translated it into modern High-German in 1870. (For the character, esthetical and generally historical, of this poem and the poetry of the whole period, see Rechenberg, *Otfried's Evangelienbuch und die übrige althochdeutsche Poesie karolingischer Zeit*, 1862.)

Oth'man, or **Osman** (AL GHAZI), the founder of the empire of Turkey (called from this the Ottoman empire), b. at Sergut, Bithynia, in 1259; was the son of Orthogrul, a Turkish soldier, whom in 1280 he succeeded as commander in Armenia under the sultan of Iconium. In 1299 he was made ruler of Bithynia, and the remainder of his life was occupied with almost ceaseless wars with the Byzantines, against whom he gradually made headway. D. Aug. 10, 1326. The title of sultan was assumed by Orkhân, his son and successor.—OTHMAN II., sultan of Turkey, b. Nov. 4, 1604; succeeded Mustapha I. in 1618, and was killed by his janizaries May 19, 1622.—OTHMAN III., b. 1696, succeeded Mahmood I., his brother, 1754, and d. Oct. 28, 1757.

Othman Ibn Affan, the third caliph of the Moslems, b. about 574, a relative of Mohammed; one of the earliest

converts to Islam; subsequently son-in-law and secretary to the prophet; succeeded Omar in 644, and ruled to 655. He proved unequal to the position. Insurrections took place in Egypt, Persia, etc., and were quelled only by making concessions. His internal government was characterized by weakness and despotism, by cowardice and arrogance; and when he ordered Mohammed, the son of Abubekr, to be put to death, the latter marched to Medina, entered the city without opposition, and stabbed the caliph. Under Othman, the first authentic copy of the Koran was composed and the first naval expedition by the Arabs undertaken, a pillaging campaign against Cyprus and Rhodes, in 649.

O'tho, post-v. and tp., Webster co., Ia. Pop. 596.

O'tho (Otto) I., THE GREAT, emperor of Germany, b. Nov. 22, 912; succeeded his father, Henry the Fowler, in 936, as king of Germany, but was not crowned emperor of the Romans until 962. His thirty-six years' reign was a series of bloody wars with Czechs, Italians, Hungarians, Northern Slavi, Danes, Greeks, and malcontent nobles at home; but the emperor was everywhere triumphant, and greatly enlarged the German territories on the E. and S. E., besides subduing a large part of Italy. D. in 973 at Memleben, Thuringia.—OTHO II., son and successor of Otho I., b. 955, was crowned king of Lorraine 961; of Italy 962; emperor 967; succeeded his father 973; repressed the civil wars of Germany and Italy; drove out Lothaire, king of France, who had invaded Germany, designing to make good his claim upon Lorraine; ravaged Champagne and compelled Lothaire to give up his claim 977–980; carried on a war in Calabria with the Greeks and Arabians, by whom he was utterly defeated at Basantello July 13, 982. D. at Rome Dec. 7, 983. He was a warlike and able but rash prince.—OTHO III., son and successor of Otho II., b. in 980, was chosen and crowned king of Germany in 983, but not crowned emperor until 996. His reign was a turbulent one. D. at Paterno in Campania, Jan. 23, 1002, very probably poisoned by his enemies.—OTHO IV. (Otho of Brunswick), son of Henry the Lion, b. 1175; took refuge in England after his father's death, and was made count of Poitou by Richard Lion-heart, his uncle, 1195; in 1198 he claimed the empire, and was elected by the Guelphic faction; proclaimed emperor by the papal legate 1201, and crowned by Innocent III. 1209, his rival, the Ghibelline co-emperor Philip of Suabia, having died in 1208. Having violated his pledge to support the papal claims in regard to benefices, he was excommunicated and was compelled to resign the government 1212, but several times attempted to resume power. In 1214 his forces were badly beaten by Philip Augustus at Bovines; in 1215 he was formally deposed by the fourth Lateran Council; in 1217 his last military insurrection was repelled by Frederick II. D. at Harzberg May 15, 1218.

Otho, king of Greece. See OTTO.

Otid'idæ [from *Otis*, the generic name of the European bustard], a family containing carinate birds, which are mostly of large size and distantly resembling the ostriches, to which formerly they have been approximated by some naturalists; the body is longer, however; the neck moderately elongated; the head small and oblong; the bill more or less elongated, compressed, with the culmen straight above the nasal groove, and thence vaulted to the strongly emarginated tip; the nostrils at the base of the bill lateral, in a large membranous groove, and with large and oval apertures; the wings well developed and somewhat pointed; the tail moderately broad and rounded; feet stout; the tarsi long and covered with small scales; the toes short and covered above with small narrow scales; claws short, broad, and blunt. This family is peculiar to the Old World; and by G. R. Gray the species are arranged under two genera: (1) *Otis*, with two species, and (2) *Eupodotis*, with twenty-four species, arranged under nine groups. The species of *Otis*, or true bustards, are limited to Europe and Northern Africa; those of *Eupodotis* are found mostly in Africa, but several species occur in India and one in Australia. They are mostly large shy birds, inhabiting the plains and open countries of the old continents, and are generally solitary or combine in small parties of three or four. They feed mostly upon grains and seeds, but also, to some extent, on insects, worms, and even small animals. The females lay from one to five eggs, according to the species, on the bare ground; the young, when hatched, are able to follow their parents at once. THEODORE GILL.

O'tis, post-v. and tp., Hancock co., Me. Pop. 246.

Otis, post-v. and tp., Berkshire co., Mass., on Farmington River. Pop. 960.

Otis (FESSENDEN NOTT), A. M., M. D., b. at Ballston Spa, N. Y., May 6, 1825; graduated at the New York Medical College 1852; resident assistant physician at Blackwell's Island Hospital 1852–53; surgeon to the U. S. M. Steamship Co. 1853–60; surgeon of the New York police department 1861; lecturer on genito-urinary diseases at the New York College of Physicians and Surgeons 1862–71; superintending surgeon to Pacific Mail Steamship Co. 1869–73; president of New York board of police surgeons 1870–72; surgeon to the Strangers' Hospital and president of its medical board 1871–73; clinical professor at the College of Physicians and Surgeons 1871; advisory physician to the Artists' Fund Society and member of the medical board of the New York Charity Hospital 1873. Author of *Landscape Perspective and Animal Drawing* (1849), *History of the Panama R. R. and the Pacific Mail S. S. Co.* (1861), and numerous monographs on urethral and syphilitic diseases.

Otis (GEORGE ALEXANDER), M. D., b. at Boston, Mass., Nov. 12, 1830; graduated at Princeton 1849, and at the medical department of the University of Pennsylvania 1851; studied surgery two years in London and Paris; established the *Virginia Medical Journal* 1853; entered the army 1861 as surgeon; was assigned to duty July, 1864, in the office of the surgeon-general at Washington; published monographs on *Amputation of the Hip Joint* (1867) and *Excisions of the Head of the Femur for Injury* (1869); prepared in 1871 a *Report of Surgical Cases treated in the Army of the U. S. from 1867 to 1871*, forming a quarto volume, and in 1872 edited the surgical volume of the first part of the *Medical and Surgical History of the War.* He is now (1876) curator of the Army Medical Museum at Washington, engaged in preparing the remaining portion of the surgical history of the war.

Otis (HARRISON GRAY), son of Samuel A. and nephew of James Otis, was b. in Boston, Mass., Oct. 8, 1765; graduated at Harvard in 1783; was admitted to the bar in 1786; a Federalist leader in Congress 1797–1801; U. S. district attorney, Boston, 1801; Speaker in the Massachusetts legislature 1803–05; president of the Massachusetts senate 1805–11; judge of common pleas 1814–18; was in the U. S. senate 1817–22; was mayor of Boston, Mass., 1829–32. D. in Boston Oct. 28, 1848. He published speeches, etc.

Otis (JAMES), b. at Barnstable, Mass., June 14, 1702; was the son of Judge John Otis (1657–1727), and became one of the leaders in the patriotic opposition to the tyranny of the home government and the crown officers of Massachusetts. He was a provincial colonel, a judge in the provincial court, and held other important positions. D. Nov. 9, 1778. Was the father of James Otis and S. A. Otis.

Otis (JAMES), b. in West Barnstable, Mass., Feb. 5, 1725; graduated at Harvard College 1743; studied law with Mr. Gridley, and began practice at Plymouth 1746; removed to Boston 1750; published in 1760 *Rudiments of Latin Prosody*; in 1761, when advocate-general of the admiralty, refused to argue in favor of the writs of assistance, and resigned his office to plead the people's cause; in 1762 was elected to the State legislature, and in 1765, on his motion, the Stamp Act congress met in New York, to which he was a delegate; his speeches and pamphlets placed him at the head of the patriotic party in Massachusetts; in 1769 denounced in print the commissioners of customs, and on Sept. 9, meeting one of the commissioners in a coffee-house, he was attacked, and received a cut on his head which led to derangement; retired to Andover, where he was killed by lightning May 23, 1783; published *Vindication of the Conduct of the House of Representatives* (1762), *Rights of the British Colonies asserted* (1765), *Consideration on Behalf of the Colonists* (1765).

Otis (Col. JOHN), b. at Hingham, Mass., in 1657; settled at Barnstable on Cape Cod; represented that town twenty years in the general court; commanded the county militia; was chief-justice of common pleas, first judge of probate of Barnstable co., and councillor from 1706 to his death Sept. 23, 1727. He was father of Judge James Otis.

Otis (SAMUEL ALLEYNE), b. at Barnstable, Mass., Nov. 24, 1740; graduated at Harvard 1759; became a merchant in Boston; held many important public positions; was in Congress 1787–88; secretary of the U. S. Senate 1789–1814. D. at Washington, D. C., Apr. 22, 1814.

Otis'co, post-v. and tp., Waseca co., Minn. Pop. 531.

Otisco, post-v. and tp., Ionia co., Mich. Pop. 1578.

Otisco, post-v. and tp., Onondaga co., N. Y. P. 1602.

Otisco Lake, a shallow body of water in Onondaga co., N. Y., 4 miles long, half a mile wide, and 772½ feet above sea-level. It is bordered by high hills. Its waters flow through Nine Mile Creek into Onondaga Lake.

O'tisfield, post-v. and tp., Cumberland co., Me. Pop. 1099.

Otisville, post-v. of Mount Hope tp., Orange co., N. Y., on the Erie R. R.

Ot'ley, post-v. of Summit tp., Marion co., Ia., on the Keokuk and Des Moines R. R. Pop. 176.

O'toe, county of S. E. Nebraska, bounded E. by the Missouri River. Area, 570 square miles. It is one of the most fertile counties in the State, its soil being a deep silicious loess. Coal and peat are found to some extent; grain-culture is a leading industry. The county is traversed by the Midland Pacific R. R. Cap. Nebraska City. Pop. 12,345.

Otoe, tp. of Otoe co., Neb. Pop. 1044.

Otoe Agency, post-v. of Gage co., Neb. Pop. 13.

Otoe Indians, a tribe of Dakota stock, formerly inhabiting both sides of the Missouri. Their remnant is now united with the Missourias, a kindred tribe. (See Missouria Indians.)

Otomis, or **Othomis,** a tribe of Indians inhabiting the mountain-regions of the states of Querétaro, Hidalgo, and Guanajuato, with scattered bands in several other states of Mexico. They have been established in their present seats from time immemorial, and occupied the valley of Mexico before the Toltecs and Aztecs. At present they maintain no tribal organization, are Mexican citizens, and usually speak Spanish in addition to their own language, which is one of the harshest and most guttural of all Indian dialects. It consists in a great measure of words of one or two syllables only, whence it has erroneously been supposed to belong to a different linguistic family from the neighboring tribes, and unsuccessful efforts have been made to connect it with the Chinese. Several catechisms and devotional works have been printed in Otomi, the best-known grammar being that of Neve y Molina (Mexico, 1767).

Otran'to, post-v. and tp., Mitchell co., Ia. Pop. 596.

Otranto, duke of. See Fouché.

Otranto, Terra di, a province of Italy consisting of the south-eastern peninsula, the heel of the boot, and comprising an area of 3293 square miles, with 493,594 inhabitants. The coasts are generally marshy and unhealthy, but the high, mountainous inland, covered with branches of the Apennines, is beautiful, healthful, and exceedingly fertile. Wine, figs, almonds, oranges and melons, wheat, and olive oil are produced, and the best tobacco in Italy is grown. Cap. Lecce.

Ot'sego, county of Michigan. Area, 540 square miles. It is densely timbered and almost uninhabited. It is traversed by the Jackson Lansing and Saginaw R. R.

Otsego, county of Central New York. Area, 1038 square miles. It is hilly, with broad, fertile valleys, and is well adapted to grazing. Cattle, wool, grain, fruit, hops, and dairy products are the chief agricultural staples. The manufactures include flour, furniture, cheese, lumber, carriages, harnesses, metallic wares, castings, clothing, cooperage, brick, etc. Limestone is extensively quarried. Water-power is abundant, but not well developed. The county has at present good railroad facilities, and is increasing in wealth and prosperity. Cap. Cooperstown. Pop. 48,967.

Otsego, tp. of Steuben co., Ind. Pop. 1318.

Otsego, post-v. and tp., Allegan co., Mich., on the Kalamazoo division of Lake Shore and Michigan Southern R. R. Pop. of v. 994; of tp. 2396.

Otsego, post-v. and tp., Wright co., Minn. Pop. 595.

Otsego, tp. of Otsego co., N. Y., on the W. bank of Otsego Lake; is traversed by the Cooperstown and Susquehanna Valley R. R. Pop. 4590.

Otsego, post-v. of Monroe tp., Muskingum co., O. Pop. 111.

Otsego, post-v. and tp., Columbia co., Wis., on the Chicago Milwaukee and St. Paul R. R. Pop. 1715.

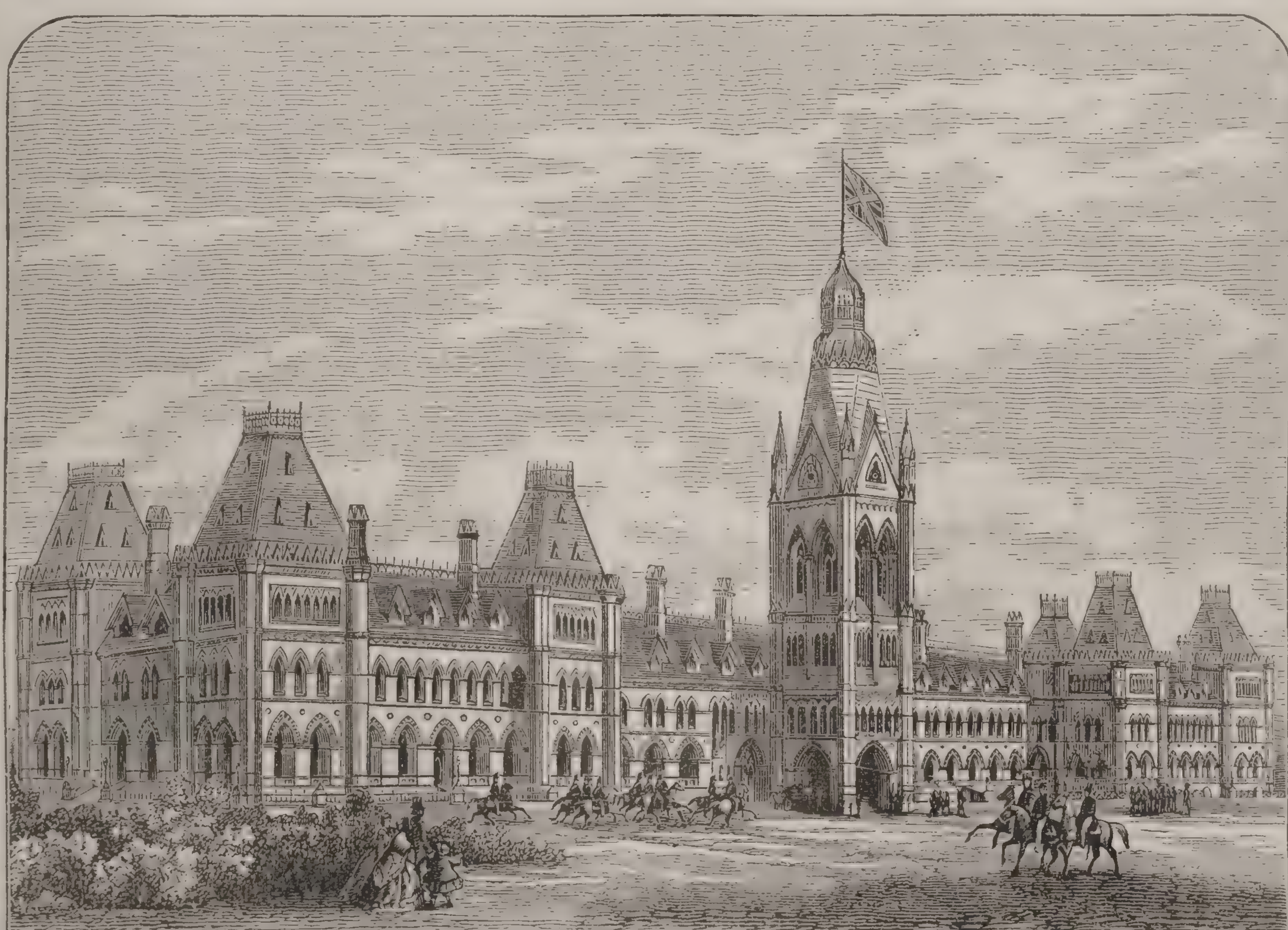
Otsego Lake, a fine lake of Otsego co., N. Y., 7½ miles long, 1½ broad, 1193 feet above tide. Its clear waters abound in fish, and its high and picturesque shores were the scene of many memorable incidents in Cooper's *Leather-stocking.* Cooperstown stands at its outlet. The lake is the source of the main fork of the Susquehanna River.

Otse'lic, post-v. and tp., Chenango co., N. Y., on Otselic Creek and the Auburn branch of the Midland R. R. Pop. of tp. 1733.

Ottaia'no (*Octavianum*), town of Southern Italy, province of Naples, lying at the foot and on the N. E. slope of Vesuvius. The neighboring country is extremely fertile, but the town itself is in perpetual danger from the eruptions of Vesuvius. Pop. of the commune 17,776.

Ot'tawa, a large county of Quebec, Canada, lying N. of the Ottawa River. It is heavily timbered and rocky, but the valley is very fertile and well watered. It has been rapidly settled of late. Cap. Aylmer. Pop. 38,635.

Ottawa, city, capital of the Dominion of Canada, on the S. bank of the river of the same name, occupies a central position, being almost equidistant from Toronto and Montreal, the chief commercial cities and by far the largest in Canada. From Prescott, opposite Ogdensburg, N. Y., it is 54 miles distant due N.; from Montreal it is 126 miles W.; from Kingston, the old capital of Upper Canada, at the foot or eastern end of Lake Ontario, it is 95 miles E. by N. Its position has peculiar importance independently of its political significance because of the great Canadian lumber trade, of which it is the central mart, and this trade is mainly in the hands of the native Americans. Indeed, it was to the Americans that the Canadians owed the development of their vast, if not unlimited, forest wealth lying to the N. W. of Ottawa City, and it is to this trade that the city of Ottawa owes nearly all that it has of com-



Capitol of Canada.

mercial importance. Ottawa was founded in 1827 at the instance of the British government under the administration of Col. By, of the Royal Engineers, who was sent out from England for the express purpose of forming an interior line of defence against possible American attacks. The Rideau Canal, connecting the Ottawa River with Lake Ontario at Kingston, was the grand conception as an inland line of communication between Montreal and the then province of Upper Canada. That line, formed by the Ottawa River from the Island of Montreal to the city of Ottawa, and thence by the canal to Kingston, has now no political or strategical significance, and never had, nor will have, much commercial importance. But it may be taken for granted that the records of the imperial colonial office, which led to the building of the canal half a century ago, also led to the selection of Ottawa as the capital of Canada some thirty years later. As such it is admirably situated. On the confines of the two most important provinces of Canada, by the side of one of the largest rivers in America, on the borders of one of the greatest lumbering regions in the world, surrounded by rich agricultural and mineral lands, the seat of government for half the North American continent, its future is full of promise. In compliment to its founder it was originally called Bytown, which name it retained until 1854, when it was incorporated as a city under its present designation. In 1856 it was selected by Her Majesty the queen as the capital of Canada, and ten years later was occupied by the government after the building of very costly and admittedly elegant departmental and parliamentary edifices. Improvements and additions are still going on, one of the latest being the completion of the library attached to the main building occupied by Parliament, and the other an extension of the western departmental block to make room for the Canadian Pacific Railway and other offices.

The progress of Ottawa has been very constant, though not at any time particularly rapid. The development of the lumber interest, chiefly due, as we have stated, to the enterprise of a number of American gentlemen, one of whom, Mr. J. M. Currier, at present represents the city in the House of Commons, has led to the establishment of a flourishing import trade for provisions and general merchandise, while the establishment here of the seat of government, with its 1200 or 1300 employés of all grades, has given a regularity to its retail cash business not enjoyed by any other city in Canada. The principal industries of the city are connected with the lumber business; but the mineral wealth of the neighboring country, chiefly in iron and plumbago, promises to add to their variety. In the development of these American capital is also largely embarked. The progress of Ottawa may fairly be judged by the increase of its population. In 1851 it was under 10,000; in 1861 it had risen to about 15,000; in 1871 it was over 21,000. These numbers are from the census returns, and are, as far as can be ascertained, reliable. An estimate from the city assessment for the present year (1875) gives the population as 24,262, though the cursory enumeration would doubtless be put at 25,000 or 30,000. Another means of estimating the progress of the city, less reliable than that of the population, is the assessment of the value of city property. In 1869 this was placed at $5,081,679, in 1875 at $11,254,635, or an increase of more than double inside of six years. Readers will, however, place their own value upon local assessments; but it cannot be denied that Ottawa has made very steady and substantial progress. The population of the city is, as nearly as may be, divided equally between Roman Catholic and Protestant, the former having a slight preponderance. The greater portion of the Roman Catholics are French Canadians, the remainder mainly Irish or of Irish descent. The Protestants are English, Scotch, Irish, and Americans; the last have the control of the leading business establishments, both financial and manufacturing, throughout the city. The church edifices are numerous and, as a rule, of superior architectural design. There are two bishops in Ottawa, the Episcopal or Church of England, who is called "bishop of Ontario," and the Roman Catholic, who takes his title from the city. The former is Dr. J. T. Lewis, the latter Dr. Duhamel, and both are gentlemen of cultivation, enjoying the esteem of all classes. Dr. Duhamel is a native of Ottawa and Dr. Lewis an Irish gentleman of good family. Prominent among the religious establishments is the new Reformed Episcopal church, built about a year ago, and having a select congregation, numbering among it some of the leading business men of the city. Ottawa is especially distinguished for its educational establishments. Chief among them are the Ottawa College, a Roman Catholic institution with a university charter; the Protestant Ladies' College, and the two convents under the charge of nuns, which command a very large support. In addition to these, the government has established in the city a normal school for Central Canada, and also a collegiate institute. These institutions are only opening for the first time this year, but they give a character to the neighborhood and have done much towards inspiring literary aspirations among the people.

The city occupies a most advantageous position, especially favorable for drainage. Parliament Hill (or Barrack Hill), on which the public buildings are situated, is a commanding bluff on the banks of the Ottawa, unsurpassed for beauty of natural scenery. Major's Hill, on the E. side of the Rideau Canal, has been laid out as a public park, for which it is delightfully situated. The Lower Town stretches about a mile eastward, and is a level plain with very wide streets, having no architectural adornment save the Roman Catholic cathedral. Sandy Hill, to the S. of Lower Town and E. of the canal, is mainly occupied with private residences, many of which are of an elegant design. In this neighborhood the ministers of the crown and many of the most prominent members of the civil service reside. Westward, and crossing the canal, is the busy hum of active commercial life, the large hotels, the banks, the law-offices, the city hall, the principal churches, etc. Farther on is the suburb of Rochesterville, and to the N. of it the great lumber manufacturing section of the Chaudiere, at which the traveller crosses the river to the neighboring city of Hull in the province of Quebec, where, as at the Chaudiere (or the "flats"), lumbering is extensively carried on, and which may fairly be considered a suburb of the Canadian capital, though it is a recently incorporated city of some 8000 or 10,000 inhabitants. At the E. end of the city is the village of New Edinburgh, where the residence of the governor-general—"Rideau Hall"—is situated. Rideau Hall, though commodious, is not imposing in appearance. It is merely an enlargement of the private residence of a local magnate, and was bought by the government at a very handsome price. The grounds surrounding the hall are spacious, and the conservatory, under the admirable taste of Earl Dufferin, the present governor-general of Canada, may be said to have become a source of national pride to the Canadians.

Ottawa is reached by two railways, one connecting at Prescott and the other at Brockville with the Grand Trunk railway running E. and W. In summer a line of steamers runs between the city and Montreal, and another between Britannia, hard by, and the Upper Ottawa. The Quebec Montreal Ottawa and Occidental railway, running from Quebec on the N. side to connect with the future Canadian Pacific railway, now under construction, will open a new means of communication with the outside world. Since the establishment of the supreme court of the Dominion in October last, the judges of that court, six in number, reside in Ottawa, and the sittings of the court will always be held here. Hon. W. B. Richards, an eminent jurist, has been appointed the first chief-justice of the Dominion. Hon. Alexander Mackenzie is the present prime minister of Canada, and, with his twelve colleagues, resides in Ottawa. Ottawa possesses 3 daily newspapers and many excellent hotels, of which the Russell House is the best.

ALEXANDER ROBERTSON.

Ottawa, county of Central Kansas. Area, 720 square miles. It is traversed by Solomon and Saline rivers, is undulating, fertile, and well adapted to stock and grain raising. The county has good and constant water-power. Good lignite is found. Cap. Minneapolis. Pop. 2127.

Ottawa, county of Michigan, bounded W. by Lake Michigan. Area, 540 square miles. It is traversed by Grand River and by various railroads. It is well timbered, level, and generally fertile. It is in the great fruit belt of Michigan. Live-stock, wool, grain, fruit, and lumber are leading products. Cap. Grand Haven. Pop. 26,651.

Ottawa, county of N. W. Ohio. Area, 250 square miles. It is bounded N. E. by Lake Erie, and includes some of the Wine Islands, in that lake. It is undulating and fertile. Live-stock, grain, fruit, wool, and lumber are leading products. The county is traversed by the Lake Shore R. R. Cap. Port Clinton. Pop. 13,364.

Ottawa, city and tp., cap. of La Salle co., Ill., at the junction of the Chicago Rock Island and Pacific and the Chicago Burlington and Quincy R. Rs., contains extensive manufactures of starch and glass, and its shipping facilities are fine. The great mineral springs located upon the S. bank of the Illinois River are surrounded by a handsome park. The city has 4 newspapers, several fine hotels, and stores. Pop. of city 7736; of tp. 463.

R. J. BLISS, ED. "FREE TRADER."

Ottawa, city and tp., cap. of Franklin co., Kan., 53 miles S. W. of Kansas City, Mo., has 1 university, 1 large union school, 8 churches, 3 banks, 3 newspapers, 2 large flouring-mills, a foundry, 1 soap manufactory, railroad

repair and machine shops, a castor and linseed oil establishment, and stores. Pop. of city 2941; of tp. 877.
JOHN T. HEWITT, ED. "JOURNAL."

Ottawa, tp. of Ottawa co., Kan. Pop. 359.

Ottawa, post-v. and tp., Le Sueur co., Minn., on the St. Paul and Sioux City R. R. Pop. 613.

Ottawa, tp. of Allen co., O., on the Ottawa River, at the intersection of the Dayton and Michigan with the Pittsburg Fort Wayne and Chicago R. R.; includes village of Lima, cap. of the county. Pop. 4662.

Ottawa, post-v. and tp., cap. of Putnam co., O., on the Dayton and Michigan R. R., 50 miles S. W. of Toledo, has a union school, 2 banks, 1 newspaper, 4 churches, several mills and factories, and stores. Principal employment, farming. Pop. of v. 1129; of tp. 2837.

Ottawa, post-v. and tp., Waukesha co., Wis., on the Milwaukee and Mississippi R. R. Pop. of tp. 922.

Ottawa Indians, a tribe of Algonkins formerly found on both sides of Lake Erie. In 1728, and again in 1764, they could muster 200 warriors. They were in 1831 removed to Kansas, and in 1867 obtained a reservation of 24,960 acres in Franklin co. In 1870 they removed to the Indian Territory. They maintain a tribal organization, but are U. S. citizens, and are generally prosperous. There is also a considerable number of Ottawas with the Chippewas of Michigan. They are self-supporting and well advanced in civilization. There are others in Canada. Pontiac was the most famous warrior of this tribe.

Ottawa River, in Canada, is the boundary between the provinces of Ontario and Quebec (except in the very lowest parts of its course). It rises on the divide between the basin of the St. Lawrence and Hudson's Bay, and flows S. E. and E., communicating with the St. Lawrence at the W. end of Montreal Island. It sends off the Rivière des Prairies, between Montreal Island and the Isle Jésus, N. of which the Ottawa flows, finally joining the St. Lawrence below the Island of Montreal. It has numerous rapids, some of which are flooded out by dams and others surmounted by canals. It is a noble stream, and has a heavy trade in lumber. Its cataracts afford very great and well-utilized water-power. It is navigated by steamboats and canal-boats. It is connected with Lake Ontario by the Rideau Canal. Its valley contains much fertile land and is rapidly filling with settlers. Length 600 miles.

Ot'tendorfer (OSWALD), b. at Zwittau, Moravia, Feb. 26, 1826; studied law at Prague and Vienna; settled at New York 1850; became an editor of the *New Yorker Staats-Zeitung*, and subsequently its manager and proprietor, having in 1859 married the widow of the former proprietor (Mr. Uhl). Under his auspices it became one of the leading German-American papers and a prominent advocate of the interests of the Democratic party. As president of the German Reform Association Mr. Ottendorfer took a leading part in the exposure of dishonesty in the city government 1871, at which time his paper assumed an independent attitude in politics; was alderman 1872–74, and was an independent candidate for mayor 1874.

Ot'ter, tp. of Warren co., Ia., on South River. P. 929.

Otter, tp. of Bedford co., Va., on Otter River and at the base of the celebrated "Peaks of Otter," a portion of the Blue Ridge, near the Virginia and Tennessee R. R. Pop. 4004.

Otter [Lat. *lutra;* Fr. *loutre;* Ger. *Otter*], a name applied to several species of carnivorous fur-bearing animals of the family Mustelidæ, and sub-families (1) Lutrinæ and (2) Enhydrinæ, and which have been differentiated in the genera (1) *Lutra, Aonyx, Pteronura,* and (2) *Enhydris,* and by some still further. The typical species is the European otter (*Lutra vulgaris*), which, from the fishy character of its flesh, is, with the scoter duck, permitted to be eaten during Lent. The permission is, however, very rarely taken advantage of, and its fur is far more valuable than its flesh. It feeds upon fish, and is very hard to shoot. It is hunted by a peculiar race of dogs called otter-hounds. The N. American otter (*Lutra Canadensis*) is much larger than the foregoing, attaining the total length of 4½ feet. The true otters have a singular fondness for sliding down hill upon mud and snow. Brazil, India, China, S. Africa, and other countries have peculiar species of otter, some of which are without nails or with only rudimentary ones (*Aonyx, Barangia*). India furnishes to commerce the skins of a small, short-haired otter. One of the aberrant genera of otters is the *Enhydris* or sea-otter. The *Enhydris marina* of the N. Pacific coasts furnishes the sea-otter fur of commerce, which is highly prized in Russia and China. It is the largest of the living otters, and is found often in the open sea far from land. Its body attains a length of nearly four feet. The tail is a foot long. It is stupid, timid, and harmless. Its fur is thick, soft, woolly, and quite handsome.
THEODORE GILL.

Ot'terbein (PHILIP WILLIAM), founder and bishop of the United Brethren in Christ, b. at Dillenburg, Germany, June 4, 1726; entered the Reformed ministry in 1749; came in 1752 to America as a missionary; labored especially in Pennsylvania and Maryland; founded his new church at Lancaster, Pa., in 1775; with Martin Boehm was chosen bishop; toiled for many years with great earnestness and success. D. at Baltimore Nov. 17, 1813. He was a man of learning and piety. (See UNITED BRETHREN IN CHRIST.)

Otterbein University, located at Westerville, O., on the Cleveland Columbus and Mt. Vernon R. R., about 11 miles from the city of Columbus; is under the control of the United Brethren in Christ; was organized in 1847, chartered with university privileges, has a commodious building, 170 feet in length and 109 feet in depth, with an endowment of $70,000. There is a regular classical course covering four years of study, after two years of preparatory instruction; scientific, with four years of study and one of preparatory; ladies', similar to scientific, but with less of science, and English course, omitting ancient and modern languages, and covering three years of study. In 1872 Rev. Henry A. Thompson, A. M., became president.

Otter Creek, tp. of La Salle co., Ill., near Vermilion River, covers rich coal-fields. Pop. 1009.

Otter Creek, tp. of Ripley co., Ind., on the Ohio and Mississippi River R. R. Pop. 1637.

Otter Creek, tp. of Vigo co., Ind., on the Wabash River; intersected by three railroads. Pop. 1269.

Otter Creek, post-v. and tp., Jackson co., Ia. Pop. 902.

Otter Creek, tp. of Linn co., Ia., on E. bank of Cedar River. Pop. 1600.

Otter Creek, tp. of Lucas co., Ia., near Burlington and Missouri R. R. Pop. 711.

Otter Creek, tp. of Tama co., Ia., on Iowa River and Central Iowa R. R. Pop. 2046.

Otter Creek, post-v. and tp., Mercer co., Pa. Pop. 560.

Otter Creek rises near the S. border of Rutland co., Vt.; flows through Rutland and Addison cos., and reaches Lake Champlain at the town of Ferrisburg. It is 90 miles long, affords good water-power, and is navigable 8 miles to Vergennes.

Otter Creek, post-v. and tp., Eau Claire co., Wis., on the West Wisconsin R. R. Pop. 920.

Otter River, post-v. of Worcester co., Mass., near the Vermont and Massachusetts R. R.

Otter's Creek, tp. of Edgecombe co., N. C. Pop. 651.

Otter Tail, county of W. Minnesota. Area, 2016 square miles. It is somewhat uneven, abounds in lakes, is well timbered, and adapted to grain-culture. The county is traversed by the Northern Pacific R. R. Cap. Fergus Falls. Pop. 1968.

Otter Tail City, post-v. and tp., Otter Tail co., Minn., on Otter Tail Lake. Pop. 52.

Ot'terville, post-v. of Cooper co., Mo., on the Atlantic and Pacific R. R.

Ott'ley (WILLIAM YOUNG), F. R. S., b. in England in 1771; studied art in Italy; published *The Italian School of Design* (3 vols. 1808–23), a magnificent collection of facsimiles of drawings by the best Italian masters; *An Inquiry into the Origin and Early History of Engraving upon Copper and in Wood* (2 vols. 1816); *Notices of Engravers and their Works* (1831), and several other elegant and costly art publications. He became keeper of the prints in the British Museum 1833, and d. at London May 26, 1836.

Ot'to, tp. of Kankakee co., Ill., on the Iroquois River and Chicago branch of Illinois Central R. R. Pop. 1356.

Otto, tp. of Oceana co., Mich. Pop. 135.

Otto, tp. of McKean co., Pa., near the Alleghany River. Pop. 298.

Otto, post-v. and tp., Cattaraugus co., N. Y., on the Cattaraugus Creek and Erie R. R. Pop. 1028.

Otto I., king of Greece from Oct. 5, 1832, to Oct. 27, 1862; b. at Salzburg June 1, 1815, the second son of King Louis of Bavaria; was established on the throne of Greece by the election of the Greek people and the guaranty of Russia, England, and France. His government was a failure, and the fault was to some extent his own. On his accession he confided the whole power to German officials, and German was used as the official language. This manner of proceeding, naturally very offensive to the Greek people, was stopped by the revolution of Feb. 14, 1837, but still the despotic and unnational measures of the king con-

tinued to alienate him more and more from the people. By a new revolution of 1843 he was compelled to convoke a national assembly and accept a liberal constitution Mar. 30, 1844, but under this form the intrigues of the Russian, English, and French diplomats made his government almost impossible. One ministry followed the other, keeping the popular parties in perpetual excitement and dragging the country along, now in the track of Russia, now in that of England. When the Crimean war broke out, the king and the people united for a short time in the same sympathy; both felt that Greece was the natural adversary of the Turks. But a French-English fleet was stationed at Piræus and neutrality was imposed on the country in a humiliating manner. Immediately after the peace of Paris the embroilments between the people and the king recommenced, and after several local insurrections, which were put down, the whole country rose in rebellion in Oct., 1862. A provisional government was established at Athens, declaring the Greek throne vacant, and King Otto left the country. He afterwards lived at Munich, and d. there July 26, 1867.

Otto (Friedrich Julius), b. at Grossenhain, Saxony, Jan. 8, 1809; studied natural science and chemistry at Jena, and afterwards at Giessen under Liebig, and was appointed professor in practical chemistry in 1836 at the Carolinum of Brunswick, where he d. Jan. 13, 1870. His *Lehrbuch der landwirthschaftlichen Gewerbe*, often reprinted, and his books on the manufacture of vinegar, beer, liqueurs, etc., are of great practical value.

Otto (Louis William), count of Mosloy, b. in Baden in 1754; educated at the University of Strasbourg; entered the diplomatic service; accompanied the chevalier Luzerne in his mission to the U. S. 1779, acting as secretary and afterwards as *chargé d'affaires* until 1792; married an American lady of the Livingston family; was employed in the public service in Paris by the Committee of Public Safety 1793; was thrown into the Luxembourg prison on the fall of the Girondists, remaining there until the revolution of the 9th Thermidor; was employed in diplomatic posts at Berlin, London, and Vienna; negotiated the marriage of Napoleon with Maria Louisa; was a minister of state 1813, and during the Hundred Days. D. at Paris Nov. 9, 1817.

Ot'tocar II., king of Bohemia from 1253 to 1278, b. about 1230, a son of Wenceslas I.; revolted against his father, but was defeated, and even imprisoned for some time; acquired Austria and Styria by marriage; made a crusade, after succeeding to the throne of Bohemia on the death of his father, against the heathen Prussians; conquered their country and founded Königsberg; defeated the Hungarians on the Marchfield in 1260, and took possession of parts of Hungary; inherited Carniola and Carinthia in 1269, and ruled with vigor and intelligence his vast empire, stretching from the Baltic to the Adriatic and from the Inn, Bavaria, to the Raab, Hungary. But in 1273 he opposed the election of Rudolph of Hapsburg as emperor of Germany, and refused to acknowledge him; the consequence was a war, in which Ottocar was defeated and compelled to cede Austria, Styria, Carniola, and Carinthia. Once more he tried his fortune against Rudolph, but was again defeated, and fell in the battle of Jedenspeng, Aug. 26, 1278. In his internal government he strove to break the power of the feudal lords and supported agriculture, industry, and commerce.

Ottoman Empire. See Turkey.

Otto of Roses. See Attar of Roses.

Ot'tumwa, city of Keokuk tp., cap. of Wapello co., Ia., on the Des Moines River, 75 miles N. W. of Burlington. It is the most important railroad centre in the State. The city contains 2 seminaries, 2 fine public-school buildings, 9 churches, 2 foundries, 2 pork-packing establishments, a furniture-factory, a sewing-machine attachment factory, 3 banks, 2 extensive wagon and carriage factories, a steam plough manufactory, 1 daily and 4 weekly newspapers, and a number of stores and mechanical shops. The Burlington and Missouri River R. R. has its feeding-yards here, where large numbers of cattle and hogs are rested and fed. Pop. 5214.

Hamilton & Warden, Eds. "Ottumwa Courier."

Ottumwa, post-v. and tp., Coffey co., Kan., on the Neosho River, near the Missouri Kansas and Texas R. R. Pop. of v. 263; of tp. 833.

Ot'way (Thomas), b. at Trotton, Sussex, England, Mar. 3, 1651; was educated at Winchester and Christ Church, Oxford; became an unsuccessful actor; served for a time as cornet in the Low Countries; memorable as the author of many dramatic pieces, some of which, in power, eloquence, and the portrayal of the passions, are of very high rank, though nearly all are needlessly coarse and indecent. His most successful pieces were *Don Carlos*, 1676; *The Orphans*, 1680; *Caius Marius*, 1680; *The Soldier's Fortune*, 1681; *The Atheists*, 1684; and especially *Venice Preserved*, 1681, which last is still occasionally played. Most of his works are tragedies of a high order. Otway's last years were spent in poverty; and according to the traditional account he starved to death in London Apr. 14, 1685.

Ouachita', county of S. W. Arkansas. Area, 730 square miles. It is traversed by the navigable Washita River, has a diversified and very fertile soil, with abundance of timber and good lignite. Live-stock, cotton, and corn are leading products. Cap. Camden. Pop. 12,975.

Ouachita, parish of N. Louisiana, traversed by the navigable Washita River and the Texas and Northern Louisiana R. R. Area, 575 square miles. It is somewhat hilly, well timbered, and fertile. Cotton and corn are leading products. Cap. Monroe. Pop. 11,582.

Ouachita, tp. of Bradley co., Ark. Pop. 718.

Ouachita, tp. of Hot Springs co., Ark. Pop. 542.

Ouachita, tp. of Polk co., Ark. Pop. 237.

Oude, a province of British India, bounded S. by the Ganges and N. by Nepaul, consists of a large plain watered by the Goggra, Goomty, Sye, and other tributaries of the Ganges. Area, 23,973 square miles; pop. 11,220,747, mostly Hindoos; a few are Mohammedans. The soil is extremely fertile and well cultivated; all the choicest products of India grow in abundance. The inhabitants are very warlike; they serve in all Indian armies, and formed the famous Sepoy regiments in 1857. Cap. Lucknow.

Oudenarde. See Audenarde.

Ou'dendorp, van (Franz), b. in Leyden July 31, 1696; educated in the University of Leyden as a pupil of J. Gronovius and P. Burmann; was made rector of the school at Nymwegen in 1724; rector at Haarlem in 1726, and called as professor of eloquence and history, along with Hemsterhuys, to Leyden 1740; published valuable editions of classic authors—*Julius Obsequens* (Leyden, 1720), *Lucan* (1728), *Frontinus* (1731), *Cæsar* (1737), *Suetonius* (1751), and began an edition of *Appuleius* (continued by Ruhnken and Bosscha), which appeared at Leyden (1786–1823, 3 vols. 4to). D. at Leyden in 1761. (See *Saxii Onom. Lit.*, vol. vi. pp. 336, 337.) Henry Drisler.

Oudinot' (Charles Nicolas), duke of Reggio, marshal of France, b. Apr. 26, 1767, at Bar-le-Duc, in the department of Meuse, France; was commander of a battalion in 1792, brigadier-general in 1794, general of division in 1799, and distinguished himself especially in the battles of Friedland and Wagram, when he was made a marshal and created duke. His greatest feat was his manœuvre in order to protect the crossing of the Beresina in 1812. In the battle of Leipsic he was wounded, but recovered soon, and remained faithful to Napoleon to the very last. During the Hundred Days he stayed on his estates. After the restoration he was made a peer of France and commander of the national guard. In 1823 he led the first corps during the invasion of Spain. He d. at Paris Sept. 13, 1847. —His son, Nicolas Charles Victor, b. Nov. 3, 1791, general in 1835, commanded in 1849 the expedition against the Roman republic, and compelled the city of Rome to unconditional surrender July 2. Protesting in the chamber of peers against the *coup d'état*, he was imprisoned, but shortly after restored to liberty. D. July 7, 1863.

Ougrée', town of Belgium, province of Liege, on the Meuse, has iron-works and cannon-foundries. Pop. 5759.

Oulachan, Eulachon, or **Candle-fish,** the *Thaleichthys pacificus*, a fish of the smelt family (Microstomidæ) and resembling the smelt and the capelin. In the spring it enters in great shoals the harbors and fiords of British Columbia and Washington Territory to spawn. The Indians take the fish in immense quantities for food and oil. The fish consist almost entirely of fat. A fish with a strip of bark drawn through it serves as a candle. Many oulachans are preserved for food by drying and smoking.

Ounce [Lat. *uncia*, the twelfth part of a pound], in troy weight, one-twelfth of a pound, or 480 grains; in avoirdupois weight, one-sixteenth of a pound, or 437½ grains troy. In the U. S. the apothecaries' ounce is the troy ounce; in Great Britain it is now the avoirdupois. In the U. S. the fluid ounce is one-twelfth of a wine-pint, in Great Britain the twelfth of an Imperial pint.

Ounce, the *Felis uncia*, a large cat of India resembling the leopard and panther, but lower, rougher, paler, and with a longer and more hairy tail and a thicker fur. The spots are also more irregular than those of the leopard. In parts of S. America the jaguar is called the ounce.

Ourebi [Dutch *bleek-boc*, or "pale buck"], *Scopophorus ourebi*, an antelope of S. Africa, is nearly three feet high, and found in great numbers in open plains. It is of a pale brown-yellow tint, white beneath. It has sharp straight

horns. It gallops rapidly, and its progress is effected by numerous graceful leaps. Its flesh is dry, but very good, and the animal is much hunted; for it does not attempt to flee from the neighborhood of towns and farms.

Ou'ro Pre'to, town of Brazil, cap. of the province of Minas Geraes, was originally founded as a settlement of miners, and reached a high degree of prosperity, but has now declined since its gold-mines became exhausted, or nearly so. It carries on an active trade with Rio Janeiro by means of mules. Pop. 8500.

Ouse, a river of England, flows into the Trent and forms the estuary of the Humber. Its entire length is 60 miles; it is navigable from York, 45 miles from its junction with the Trent.

Ou'sel [Fr. *oisel, oiseau,* a "bird"], a name applied in England to several birds. Thus the "ousel-cock" of Shakspeare was the European blackbird (*Turdus merula*); the ring ousel of the present day is a very similar bird, the *Turdus torquatus.* More frequently the name is applied to those remarkable birds, the water-ousels. (See WATER-OUSEL.) Still other birds receive this name; but nearly all are thrushes, or their allies.

Ouse'ley (Sir FREDERICK ARTHUR GORE), Bart., only son of Sir Gore Ouseley, ambassador to Persia, b. in London, England, Aug. 12, 1825; graduated at Christ Church, Oxford, 1846; was curate of a London church 1849–51; became precentor of Hereford Cathedral 1855, and incumbent of St. Michael's, Tenbury, Worcestershire, 1856; distinguished for his attainments in music as a science; took an active part in establishing St. Michael's College, Tenbury, of which institution he is warden; became professor of music in Oxford University 1855; author of several esteemed anthems, a *Treatise on Harmony* (1869), and a *Treatise on Counterpoint and Fugue* (1869), and editor of several collections of ancient and modern cathedral music.

Ouseley (Sir WILLIAM), LL.D., b. in Monmouthshire, Wales, in 1771; became cornet of dragoons 1788; left the army 1794; engaged in the study of Oriental languages at Leyden; published *Persian Miscellanies* (1795), *Oriental Collections* (3 vols., 1797), numerous other works on similar subjects, and translations from Oriental writers; was secretary to his brother, Sir Gore Ouseley, in his embassy to Persia 1810–12; published *Travels in Persia* (3 vols., 1819–23); brought to England valuable collections of Oriental literature. D. in England in 1842.—His brother, Sir GORE OUSELEY (b. about 1768; d. 1844), long a prominent member of the diplomatic corps, was a distinguished Oriental scholar and collector of manuscripts; author of a posthumous work, *Biographical Notices of Persian Poets* (1846).

Ouseley (Sir WILLIAM GORE), K. C. B., D. C. L., eldest son of Sir William, b. in London, England, July 26, 1797; entered the diplomatic service at an early age; was connected with the British legation at Washington in 1825, when he married a daughter of Gov. Cornelius P. Van Ness of Vermont; filled difficult and responsible diplomatic posts in Rio Janeiro, Buenos Ayres, Montevideo, and Asuncion during the wars originated by the dictator Rosas 1832–51; was employed on special missions in Central America and in the U. S. 1857–58; was author of *Remarks on the Statistics and Political Institutions of the U. S.* (1832); *Notes on the Slave Trade* (1850); *Views in South America, from Original Drawings* (1852), and many miscellaneous, political, and geographical writings. D. in London Mar. 6, 1866.

Oust'er denotes, in law, the dispossession or ejection of one who is entitled to the possession of real property by another who enters into occupation of the premises. Ouster may be either of the freehold or of chattels real, the former being the dispossession of an owner in fee or a tenant for life, the latter of a tenant for years. (See FEE, ESTATE, CHATTEL.) At common law there were five different methods by which ouster of the freehold might be effected: abatement, intrusion, disseisin, discontinuance, and deforcement. Abatement was the wrongful entry of a stranger upon land after the death of the owner, being an estate of inheritance, to the exclusion of the heir or devisee. Intrusion was a similar wrongful entry after the death of a tenant for life, to the exclusion of the remainderman or reversioner. Disseisin denoted the unlawful ejection of the owner, who was actually or constructively in occupation of the premises, by depriving him of the possession. Discontinuance and deforcement were peculiar modes of ouster, where the entry of the tenant was at first lawful, but the wrong consisted in retaining possession after his rightful interest had terminated. Thus, it was a deforcement for a lessee for years to hold over after the expiration of his term, refusing to deliver possession to the owner of the reversion. But at the present day the terms "ouster," "disseisin," and "adverse possession" are commonly used interchangeably to denote the dispossession of an owner of a freehold, without reference to the particular circumstances under which it is effected, and these ancient names, designating particular methods of ouster, have fallen into disuse. The remedy usually employed to recover the possession of lands of which the owner has been wrongfully divested is the action of ejectment. (See EJECTMENT.) There were formerly, however, various other forms of action which might be resorted to for this purpose, but these have been generally superseded in modern times by ejectment. If the wrongful possession be continued for a sufficient length of time, usually twenty years, under an adverse claim of title, and be open, notorious, and uninterrupted, it is generally provided by statutes of limitation in England and in this country that the rightful owner shall be divested of his title, and the adverse claimant thus becomes the owner of the property. (See the rules on this subject stated in the article LIMITATION, STATUTES OF.)

GEORGE CHASE. REVISED BY T. W. DWIGHT.

Outagamie', county of N. E. Wisconsin. Area, 648 square miles. It is somewhat level, is fertile, well timbered, and produces live-stock, grain, wool, and much lumber. The county is traversed by the Wolf, Fox, and other rivers, and has good railroad facilities. Cap. Appleton. Pop. 18,430.

Outagamies. See FOX INDIANS.

Out'law, Outlawry [Ang.-Sax. *ûtlaga, ûtlagian*]. An outlaw, in English law, is one who has been placed *out* of the protection of the *law* on account of wilfully avoiding the execution of legal process. In ancient times the process of outlawry took place both in civil and in criminal proceedings. In civil cases a person might be outlawed who was liable to arrest in an action which had been instituted against him, but who avoided the service of process and could not be found. The only forms of action in which a person was originally subject to outlawry were actions of trespass *vi et armis* (see TRESPASS), since in these alone was a defendant then liable to arrest; but subsequently outlawry and the process of arrest were extended by statute to other civil actions. The mode of proceeding to outlaw a person was as follows: If the sheriff were unable to find the defendant and apprehend him upon the regular writs of arrest, a special writ was issued, which required him to cause proclamation to be made in five county courts successively that the defendant should render himself up. If the defendant then failed to appear, he was declared an outlaw. If afterwards he appeared publicly, he might be arrested and committed until the outlawry were reversed. A reversal might readily be obtained upon any plausible cause, however slight, since the only object of the outlawry was to compel an appearance. The process of outlawry in civil actions was abolished in 1852 by statute, except in cases where the defendant was liable to arrest in the execution of a judgment rendered against him; and it was provided that if personal service of the writ could not be effected by reasonable diligence, the plaintiff might make affidavit that the writ had come to the defendant's knowledge or that he had wilfully evaded service, and might obtain an order authorizing him to proceed as if personal service had been made. In criminal proceedings outlawry existed at an earlier period than in civil actions, since no one was subject to be outlawed except for felony until some time after the Norman Conquest. It was extended from cases of felony to misdemeanors, and has continued, until the present, applicable in criminal proceedings of every kind. The mode of procedure in outlawing a defendant who absconds or evades arrest is substantially the same as in civil cases. Outlawry in prosecution for crime has not been abolished. A sentence of outlawry may be reversed by application to the court or by proceedings in error.

The effect of outlawry is to place a person beyond the protection of the law. The maxim applicable to outlaws is, "Let them be answerable to all, and none to them." They cannot, therefore, maintain actions for redress of injuries, nor are they deemed to have any legal rights which can be enforced by suit at law, while they are nevertheless liable upon all causes of action existing against them. Before outlawry in civil cases was abolished it was attended by a forfeiture of goods and chattels to the crown. The same penalty is incurred in cases of misdemeanor, but an outlawry in treason or felony is deemed equivalent to a conviction and attainder for the offence charged, and is attended by the same consequences, viz., in treason, a forfeiture of all his property, both real and personal, and in felony a forfeiture of chattels and the profits of his freehold estates in land during life. (See FORFEITURE.) Anciently, an outlawed felon was said to have a "wolf's head" (*caput lupinum*), so that any one might kill him as he would a wolf. But at an early period a different rule was

established, and the life of an outlaw was held to be under the protection of the law. Process of outlawry has fallen almost entirely into disuse in England, even where permissible. In some of the U. S. it has been retained as applicable in certain criminal cases, as in prosecutions for treason; but occasion for a resort to this practice seldom occurs, so that it may be said to be wholly disused.

GEORGE CHASE. REVISED BY T. W. DWIGHT.

Ou′tram (Sir JAMES), G. C. B., b. in Derbyshire, England, Jan. 29, 1803; educated at Marischal College, Aberdeen; entered the military service of the East India Company 1819; distinguished himself in campaigns in Candeish and against the wild Bheel tribes, from whom, after the peace, he formed an irregular military corps; pursued a similar policy respecting some rebel chiefs in Guzerat; was aide-de-camp of Sir John Keane in the Afghan war; took part in the capture of the Beloochee stronghold of Kelat, and, disguised as a native devotee, rode through the Belan Pass, then held by the enemy, and conveyed the news to Kurrachee; appointed political agent in Lower Scinde, with the brevet rank of major, and subsequently commissioner at Hyderabad; opposed Sir Charles Napier's aggressive policy, but had to defend the Residency from attack by the populace; became resident at Sattara 1845, at Baroda 1847, and at Lucknow 1854; was commander-in-chief of the British forces in the Persian war of 1856–57; arrived in India in the midst of the Sepoy rebellion; relieved Havelock at Cawnpoor Sept. 15, then waived the command in favor of Havelock, whom he accompanied to the relief of Lucknow Sept. 25 in his capacity of chief commissioner of Oude; defended the Residency and held the Alumbagh (Lucknow) during the subsequent siege by the rebels; aided Sir Colin Campbell in the final recapture of Lucknow Mar., 1858; was knighted and made lieutenant-general 1858; received the thanks of Parliament 1860; became a member of the supreme council of India; retired in broken health 1861. D. at Paris Mar. 11, 1863.

Ova′da, town of Italy, province of Alessandria, containing fine public and private buildings and having considerable trade and manufactures. During the mediæval wars, Ovada was fiercely contended for and suffered severely. Its old wall and castle are in ruins. Pop. 7053.

O′val [Lat. *ovum*], an egg-shaped curve; a curve resembling an ellipse. A semi-oval formed by arcs of circles of different radii and tangent to each other is sometimes used by engineers in the construction of arches. Such curves are often called basket-handled curves or basket-handled arches.

Cartesian Oval.—This name is given to a class of curves characterized by the property that the simultaneous increments of two lines drawn from the generating point to two fixed points have a constant ratio. If this ratio is -1 (that is, if one of these lines increases as fast as the other diminishes), we have the ellipse as a particular case of the Cartesian oval. If the ratio is $+1$ (that is, if the simultaneous increments are equal), we have the hyperbola as another particular case of the Cartesian oval. Let the fixed points lie on a horizontal line, and let one on the left be taken as a pole, the line joining them being the initial line; then will the equation of the oval be,

$$(m^2-1)r^2+4(a-m^2c\ cos\phi)r+4(m^2c^2-a^2)=o,$$

in which c is half the distance between the fixed points, m the ratio of the simultaneous increments of the lines drawn from these points to the generating point, and a an arbitrary constant. This equation is of the *fourth* degree, except for the particular cases in which $m=\pm 1$. In these cases the equation of the oval reduces to the form,

$$r=\frac{a^2-c^2}{a-c\ cos\phi}=\frac{a(1-e^2)}{1-e\ cos\phi}$$

the well-known polar equation of the ellipse and hyperbola, when the pole is taken at one focus. The scientific interest attached to the Cartesian oval arises from the fact that the surface generated by revolving it about the line that joins the two fixed points is a surface of *accurate convergence* (that is, a surface which must divide two media of different refracting power, in order that rays of light coming from one point may be so deviated as to pass accurately through another point). W. G. PECK.

Ovam′pos, a tribe or nation of Africans resembling both the true negro and the S. African tribes. They inhabit the Atlantic coast region S. of Cuanene River, and near Walfisch Bay. Except near the coast the soil is fertile, but water is not abundant. The surface is elevated and healthful. The people are warlike and strong, but remarkably ugly and filthy. They are, however, industrious, ingenious, and unusually honest, and have made some progress towards civilization. They keep large herds of cattle and swine and raise much grain and poultry. Their country abounds in elephants and other large game.

Ovar′, town of Portugal, province of Beira, on a river of the same name, has valuable fisheries and considerable trade. Pop. 10,000.

O′varies [Lat. *ovum*, "egg;" Fr. *ovaire*], the two organs in oviparous animals in which the *ova*—the generative product of the female—are formed. They are termed by Galen *testes muliebres*, since they are in woman the analogues of the testes of the male, which originate the male generative element—spermatozoids. The ovaries in adult women are situated on either side of the uterus, in the iliac fossæ; they are included in the two pelvic duplicatures of the peritoneum, which are called the broad ligaments.

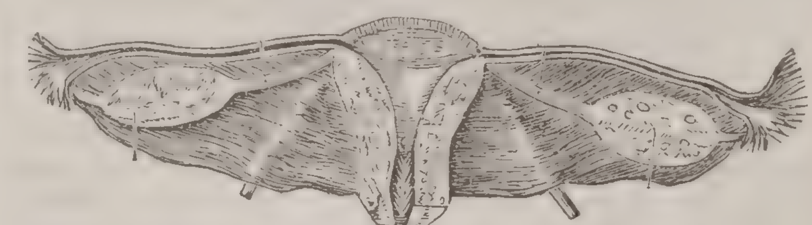
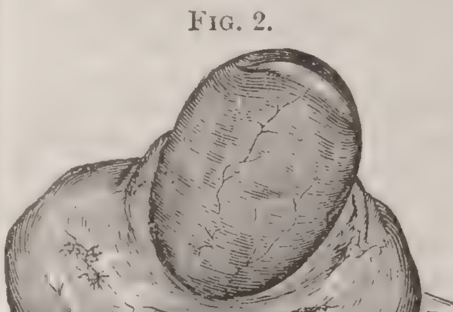


FIG. 1. Relation of uterus, Fallopian tubes, and ovaries.

Each ovary is also attached by a round fibrous cord, the ovarian ligament, to the side of the uterus, and by a lesser fibrous cord to the fringed edge of the Fallopian oviduct. These three ligaments support and retain the ovary in its proper position. The ovary is an oblong, ovoid, flattened body, of whitish color and uneven surface. It is one-third to half an inch thick, three-quarters of an inch wide, 1 to $1\frac{1}{2}$ inches long; it weighs from 1 to 2 drachms. (For elaborate description of the minute structure of the ovaries and of the development of the ova see HISTOLOGY.) The physiological function of the ovary is the formation of ova, their maturation, and their final discharge at periodic menstrual epochs. The distended follicle at the time of rupture may equal in size one-third of the ovary, and many scars exist where former ruptures have taken place. As a rule, the fringed end of the Fallopian tube clasps this distended follicle and receives the escaping ovum, which by the oviduct is carried to the interior of the uterus. It may here be impregnated and detained, or pass from the body with the menstrual flow; the blood of menstruation escapes from the mucous lining of the uterus. The activity of the ovary develops at puberty—usually the fifteenth or sixteenth year—and ceases with the climacteric—forty-fifth to fifty-second year. The remarkable functional activity of the ovary, including periodic congestions, ruptures, and cicatrization, renders it peculiarly liable to disease. Neuralgia, congestion, and inflammation of the ovary are frequent diseases in women—often temporary and slight, at times chronic, depressing strength and health, and causing hysteria and dementia. Solid tumors, fibrous and cancerous, affect the ovary less often than the uterus. Ovarian dropsy originates in the dropsical distension of one or more Graafian follicles by albuminoid serum. This may arise when the follicles are too deeply situated to rupture and discharge the contained ovum, or prevented by thickening of the surface from previous inflammation; it may also begin by accumulation in the cavity of the corpus luteum. A cyst may be *unilocular*, having but one cavity and arising originally from one follicle; or *multilocular*, having several compartments corresponding to several follicles. The ovarian cyst may contain many quarts of transparent, albuminoid serum.

FIG. 2.



Graafian vesicle about to rupture: scars of former ruptures.

Ovariotomy, the surgical operation of evacuating ovarian dropsy and eradicating the cyst, was first performed in America by Dr. Ephraim McDowell of Kentucky; this first case resulted in recovery. Dr. McDowell operated thirteen times—eight successfully. Originating in America, it is now accepted and extensively performed in all countries. Spencer Wells of England has operated in over 500 cases; second to him in number of cases stand Atlee, Peaslee, Kimball, Sims, and Thomas of this country. It is a formidable operation, but the ratio of recovery and cure steadily increases as the result of improved methods and instruments. Simple unilocular cysts quite generally recover; multiple cysts and those adherent to adjacent organs result less favorably. E. DARWIN HUDSON, JR.

Ov′en Bird, or **Golden-crowned Thrush,** the *Seiurus aurocapillus*, a N. American bird of the family Sylvicolidæ, remarkable for its nest, which it builds upon

the ground and roofs over with a dome-shaped covering. It is a shy, retiring bird, of an olive-brown color, six inches long, and is often seen running along the ground. The name oven bird is also given to certain S. American birds of the genera *Furnarius* and *Cinclodes*, belonging to the family Certhiadæ. They are remarkably bold little birds, and build a fine dome-shaped nest which is divided by a partition into two rooms, the innermost of which contains the eggs.

O'verbeck (Frederick), b. at Lubeck July 3, 1789; studied painting in Vienna from 1806 to 1809; settled in 1810 at Rome; embraced Roman Catholicism in 1814; was an apostle of the sentimental religious school in art; held beauty subordinate to piety; attempted to revive the devotional art of a former ascetic period, and founded a school which was numerously attended and celebrated in its day. His works expressed deep religious feeling, but are thin and artificial. Discarding as heresy the ideas of the moderns, he earned the title "Nazarene," which was bestowed on the men of his school. He chose sacred subjects: *The Entrance of Christ into Jerusalem* (Lubeck), *Christ on the Mount of Olives* (Hamburg), *The Entombment* (Lubeck), *The Triumph of Religion* (Frankfort). These are his best pieces. The great frescoes on the Monte Pincio and in the Villa Massimi were executed by Overbeck in conjunction with other artists of the same persuasion. D. in Rome Nov. 12, 1869. O. B. Frothingham.

O'verbrook, post-v. of Montgomery co., Pa., on the Pennsylvania Central R. R.

O'verbury (Sir Thomas), b. at Ilmington, Warwickshire, England, in 1581; graduated at Queen's College, Oxford, 1598; travelled on the Continent; became a resident of Edinburgh 1601, where he was an intimate friend of Robert Carr, afterwards Viscount Rochester and earl of Somerset; was knighted 1608; travelled on the Continent 1609; wrote *Observations upon the State of the Seventeen United Provinces;* incurred the enmity of his former friend, Lord Rochester, and of the countess of Essex, by his opposition to their criminal intrigues; refused a foreign mission offered him as a means of removing him from the country, and was thereupon thrown into the Tower, where he was cruelly treated, and d. Sept. 15, 1613. Three years later Lord Rochester, then earl of Somerset, and his countess were convicted of having poisoned Overbury.

Overdar'wen, town of England, in Lancashire, has large paper manufactures, iron-works, and coal-mines. Pop. 14,327.

O'verfield, tp. of Wyoming co., Pa. Pop. 433.

O'verisel, post-v. and tp., Allegan co., Mich. P. 1060.

Overland Route, The, from Great Britain to India, is most rapidly traversed by way of Dover, Calais, Lyons, Mt. Cenis, Turin, Bologna, and Ancona or Brindisi, thence by steamer to Alexandria, and by rail to Suez; or by the French Messageries steamers to Port Said direct, thence to Suez by canal, and thence by the Red Sea to Aden and Bombay. The trip may be made in twenty-three days, and will cost from about £170 (second class) to £300 (first-class fare).

O'verstone (Samuel Jones **Loyd**), Baron, only son of Lewis Loyd of Overstone Park, Northamptonshire, b. Sept. 25, 1796; was educated at Eton and at Trinity College, Cambridge; was high sheriff of Warwickshire 1838; member of Parliament for Hythe in the Liberal interest 1819–26; member of a powerful banking-firm in Lothbury, London; became a recognized authority upon financial and fiscal questions, on which he published a number of treatises; was a munificent patron of art; took an active interest in promoting the introduction of decimal coinage into England, and was raised to the peerage Mar. 5, 1850.

Overt Act. See Treason.

O'verton, county of Tennessee, bounded N. by Kentucky. Area, 450 square miles. It is uneven and in parts mountainous, occupying a place on the N. W. slope of the Cumberland Mountains. It contains detached coal-beds, has a good soil, and produces corn, tobacco, wool, and live-stock. Its area has been much diminished since the last census. Cap. Livingston. Pop. 11,297.

Overton, tp. of Lincoln co., Nev. Pop. 149.

Overton, post-v. and tp., Bradford co., Pa. Pop. 550.

O'verture [Fr. *ouverture*], the name given to the introductory movement, symphony, or elaborate prelude occurring in oratorios, operas, cantatas, and similar compositions. The overture, though complete in itself, is generally so framed as to bring the mind of the hearer into a correspondence of tone and sympathy with the leading traits of the work to which it is prefixed. To effect this it is sometimes sufficient to exhibit in the overture the prevailing sentiment or coloring of the earlier movements (at least) of the work it announces. In other cases the composer ingeniously weaves into the overture some of the leading ideas of the work itself by brief anticipations of its melodies, or anything striking in its modulations, harmonies, or rhythmical forms, thereby predisposing the mind of the hearer to enjoy the recurrence of those points in the after-part of the performance. The introduction of the overture as a distinct and highly-wrought species of composition is ascribed to Scarlatti, a Neapolitan of the latter part of the seventeenth century, before whose time its place was occupied by meagre preludes or prefatory symphonies, of little account beyond that of an ordinary opening strain. William Staunton.

O'verweg (Adolf), b. at Hamburg July 24, 1822; studied natural science, especially geology, at Bonn and Berlin; joined Barth and Richardson on their explorations of Central Africa in 1850, and d. near Lake Tchad Sept. 27, 1852. His observations, among which was the discovery that the desert of Sahara is an elevated plateau, and not, as had hitherto been supposed, a depressed plain, were communicated in *Monatsberichte der Gesellschaft für Erdkunde,* Berlin, vols. viii. and ix., and Petermann's *Zeitschrift für allgemeine Erdkunde,* Gotha, vol. i.

O'veryssel, a province of the Netherlands, lies between the Zuyder Zee in W., and Hanover and Westphalia in E. Area, 1312 square miles; pop. 260,543. The surface is level, the soil mostly light, in many places sandy and covered with heath, in others affording good pasture-grounds. Rye, barley, oats, hemp, potatoes, and buckwheat are raised. Cattle-rearing, digging of turf, and linen manufactures are extensively carried on.

O'vibos [Lat.], a genus of the *Bovidæ* or ox family, but more probably belonging to the *Ovidæ* or sheep family. The only known living species, *Ovibos moschatus,* the musk-ox, so called from the strong musky flavor of the meat of the bulls and lean cows, is an animal about the size of the smallest breed of oxen, or of a two-year old heifer, its carcass, without the entrails, weighing upwards of three hundredweight. This animal is at present confined to the extreme northern parts of the N. American continent, where it ranges over the barren grounds to the N. of lat. 60°, roaming in summer to the islands within the Arctic circle, though never reaching Greenland. During the glacial period its range must have been far more extensive, as its bones have been found in drift-gravel in the valley of the Avon at Bath, and elsewhere in England; whilst the remains of species allied, termed *Bootherium* by Leidy, have been found in the U. S. Edward C. H. Day.

Ov'id, tp. of Branch co., Mich., near the Michigan Southern R. R. Pop. 1230.

Ovid, post-v. and tp., Clinton co., Mich., about 20 miles N. of Lansing, on the Detroit and Milwaukee R. R., has 1 union school, 3 churches, 1 bank, a newspaper, 2 "shook" factories, 2 good hotels, 1 flour and 2 saw mills, an iron foundry, 1 organ-factory, 1 planing-mill, and stores. Pop. 2420. Reeves & Carrier, Eds. "Register."

Ovid, post-v. and tp., cap of Seneca co., N. Y., 20 miles from Ithaca; has a union graded school, 4 churches, a court-house and jail, a steam flouring and saw mill, 1 bank, 1 newspaper and job-printing office, the county clerk's office, and a number of stores. Pop. of v. 724; of tp. 2403. Oliver C. Cooper, Ed. "Independent."

Ovid (Publius Ovidius Naso), b. Mar. 20, 43 b. c., at Sulmo in the country of the Peligni, about 90 miles from Rome, of a rich equestrian family; received an elegant education in the schools of the rhetoricians; studied afterwards at Athens; travelled in Asia Minor and Sicily, and lived then for many years in Rome, idle, frivolous, but brilliant; intimately connected with Macer and Propertius; acquainted with Horace, moving with freedom and ease in the court circles; admired by all for his wit and his verses, and enjoying, as it seems, to the very dregs, all that could be enjoyed at Rome, until, in the latter part of the year 8 a. d., Augustus suddenly banished him to Tomi. The reason is not known with certainty. The edict mentions the obscenity and frivolity of the *Ars Amandi,* but the book had been in free circulation for ten years before this time, and cannot have been more than a pretext. It is more probable that the cause was the intrigue in which the poet, during the period between his second and third marriages, indulged with Julia, the daughter of Augustus. At Tomi, a small Getic town on the frontier of the empire, at the delta of the Danube, the fastidious libertine of the metropolis found life intolerable, and month after month sent the most humble supplications to Augustus, but the emperor was immovable, and the poet d. in exile 18 a. d. His works comprise *Heroides,* twenty-one letters from heroines to their lovers; *Amores,* love-elegies; *Ars Amandi; Remedia Amoris; Metamorphoses; Fasti,* a poetical

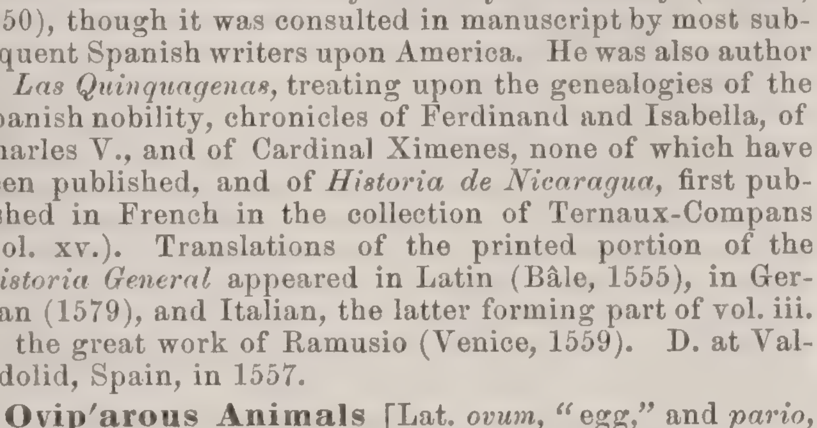
commentary on the Roman calendar; *Tristia; Epistolæ ex Ponto:* the tragedy *Medea* is lost. The most remarkable editions of his collected works are the *editio princeps*, Rome, 1471, that by Heinsius, Leyden, 1629, and that by Burmann, Amsterdam, 1727; separate editions, especially of *Metamorphoses* and *Ars Amandi*, are very numerous. Among the translations, likewise very numerous in all modern languages, is one of the *Metamorphoses* by Dryden, Addison, Congreve, and others, edited by Garth. Of all Latin poets Ovid stands nearest to modern civilization, partly on account of his fresh and vivid sense of the beauties of nature—a point in which the Latin literature is generally deficient—partly because his subject is love. His representations of this feeling are often sensuous, but they are graceful and strikingly true. He also excels other Latin poets in the perfect elegance of his form, especially in the character and rhythm of his verses. CLEMENS PETERSEN.

Ovie'do, town of Spain, capital of the province of the same name, is finely laid out, with a large and elegant public square in the centre, from which the four main streets lead in opposite directions. It has a beautiful cathedral from the eighth century, a splendid aqueduct, which provides eleven fountains with abundance of good water, a well-attended university with a large public library, and manufactures of arms, hats, linen, and leather. In the vicinity are hot springs, which are much used for bathing. Pop. 14,156.

Oviedo y Valdés, de (GONZALO FERNANDEZ), b. at Madrid, Spain, in 1478; was made inspector of mines in the West Indies 1514; held offices at Hispaniola; visited Darien and Nicaragua; made several voyages to Spain; was appointed historiographer of the Indies; published a *Sumario* or brief history in 1526, and *Historia General y Natural de las Indias Occidentales*, in 50 books, of which twenty-one were printed at Seville in 1535, and reprinted at Salamanca in 1547; but no complete edition was published until that edited by the Royal Academy (4 vols., 1850), though it was consulted in manuscript by most subsequent Spanish writers upon America. He was also author of *Las Quinquagenas*, treating upon the genealogies of the Spanish nobility, chronicles of Ferdinand and Isabella, of Charles V., and of Cardinal Ximenes, none of which have been published, and of *Historia de Nicaragua*, first published in French in the collection of Ternaux-Compans (vol. xv.). Translations of the printed portion of the *Historia General* appeared in Latin (Bâle, 1555), in German (1579), and Italian, the latter forming part of vol. iii. of the great work of Ramusio (Venice, 1559). D. at Valladolid, Spain, in 1557.

Ovip'arous Animals [Lat. *ovum*, "egg," and *pario*, to "produce"] are those which do not bring forth their offspring in a well-developed or even a fœtal state, but in the condition of an *egg*. *Ovoviviparous* are those which develop the ovum into a perfect egg, which, however, hatches before birth, so that living young are brought forth. All mammals are *viviparous*, that is, bring forth living young which has never been contained within a complete egg, though all have been through the *ovum* stage. But the non-placental mammals (marsupials and monotremes) have been called *semi-oviparous* because their reproduction is highly analogous to that by means of the complete egg; and, indeed, some observers have declared that the monotremes (duck-bill echidna) do indeed produce real eggs, which are hatched; but this is more than doubtful.

O'vule [Lat. *ovum*, "egg"], a rudimentary seed awaiting the action of the pollen, which, fertilizing a special



cell or its contents, incites the formation of the germ or embryo. Ovules are borne on the placenta, either singly or in numbers, and are often raised on a *funiculus*, or seed-stalk. The point of attachment is called the *hilum*, and in the seed forms a scar. The ovule consists of a *nucleus* and usually one or two coats, through which there is an orifice at the top known as the *foramen* or *micropyle*. The part where the coats, nucleus, etc. are united together is called *chalaza*. Ovules have four principal forms—the *orthotropous*, or straight; the *campylotropous*, or curved; the *amphitropous*, or half-inverted; and the *anatropous*, or inverted. The latter is the most common form: here the ovule coheres down one side with its funiculus, and its apex points to the placenta. The coherent support thus forms a ridge called the *rhaphe*. When the pollen reaches the stigma—which it does either by falling directly upon it, or through the agency of wind or insects—it absorbs moisture from the glutinous or naked tissue, and protrudes a tube. This insinuates itself between the loose cells and penetrates the style until it reaches the embryo sac. It contains the fluid contents of the original pollen-grain. What the action is which results upon contact is not definitely known, but it seems probable that the fluid of the pollen-tube is absorbed into the embryo sac by *endosmosis*. The actual body awaiting fertilization is a globule of protoplasm, and is called the *germinal vesicle*. It grows by cell-multiplication; the manner in which it is developed is treated under VEGETABLE PHYSIOLOGY.
W. W. BAILEY.

Ovum. See HISTOLOGY, by COL. J. J. WOODWARD, M. D.

Owas'co, post-v. and tp., Cayuga co., N. Y., on Owasco Creek and Lake. Pop. 1261.

Owasco Lake, a picturesque lake of Cayuga co., N. Y., 11 miles long, 1½ miles wide, and 758 feet above the sea. It is in a fertile region, and is a favorite summer resort. Its waters flow into Seneca River.

Owas'so, city and tp., Shiawassee co., Mich., 25 miles N. E. of Lansing, on the Detroit and Milwaukee and the Jackson Lansing and Saginaw R. Rs., contains a fine high school and 4 branch schools, 7 churches, 2 banks, fine water-power, 1 tannery, 2 flouring, 1 woollen, 1 plaster, and 2 planing mills, a brewery, 1 boot and shoe factory, 2 newspapers, a marble-mill, a fire-clay mine, 7 hotels, and stores. Pop. of city 2065; of tp. 3123.
J. H. CHAMPION, ED. "WEEKLY PRESS."

Owaton'na, post-v. and tp., cap. of Steele co., Minn., on Straight River, at the intersection of the Milwaukee and St. Paul with the Winona and St. Peter R. R., 90 miles W. of Winona, has 1 newspaper, important manufactures, and a brisk shipping trade. Pop. 2070; of tp. 2572.

Owe'go, tp. of Livingston co., Ill. Pop. 800.

Owego, post-v. and tp., cap. of Tioga co., N. Y., situated on the Susquehanna River, 236 miles from New York City, has a public library, an academy, 4 schools, 3 banks, 6 churches, 3 weekly newspapers, several good hotels, 2 flouring and 3 planing mills, 2 foundries and machine-shops, and other minor manufacturing interests. The village is situated in the heart of a fine agricultural section, and its streets are regularly laid out with rows of maple trees on either side. Owego is quite a resort for tourists during the summer months. Pop. of v. 4756; of tp. 9442. BEEBE & KINGMAN, EDS. "OWEGO GAZETTE."

O'wen, county in Central Indiana. Area, 400 square miles. It is somewhat uneven, fertile, well wooded, and abounds in valuable block coal. Cattle, wool, and grain are leading products. The manufactures include lumber, carriages, etc. The county is traversed by White River and by the Louisville New Albany and Chicago and the Indianapolis and Vincennes R. Rs. Cap. Spencer. Pop. 16,137.

Owen, county of Northern Kentucky, bounded W. by Kentucky River. Area, 300 square miles. It is rolling, fertile, and produces live-stock, corn, tobacco, and wool. Limestone abounds. Cap. Owenton. Pop. 14,309.

Owen, tp. of Pulaski co., Ark. Pop. 505.

Owen, tp. of Saline co., Ark. Pop. 283.

Owen, tp., Winnebago co., Ill., on Rock River. P. 929.

Owen, tp. of Clarke co., Ind. Pop. 679.

Owen, tp. of Clinton co., Ind. Pop. 1118.

Owen, tp. of Jackson co., Ind. Pop. 1589.

Owen, tp. of Warrick co., Ind. Pop. 1440.

Owen, tp. of Cerro Gordo co., Ia., on Shell Rock River, near the Central Iowa R. R. Pop. 211.

Owen (DAVID DALE), son of Robert Owen, the socialist, b. at New Lanark, Scotland, June 24, 1807; d. in New Harmony, Ind., Nov. 13, 1860; was educated at Hofwyl, Switzerland, and came to the U. S. with his father in 1823 to assist him in his social experiment at New Harmony; subsequently studied geology and other natural sciences. In 1835 received the degree of M. D. from the Medical College of Ohio, and in 1837, by appointment of the legislature, he made a geological reconnoissance of the State of

Indiana. Under instructions from the U. S. Land Office, he subsequently made an examination of the mineral lands of Iowa, and in 1848 was employed by the government to take charge of a geological survey of Wisconsin, Iowa, and Minnesota. The results of this survey, extending over a period of three years, were published in a quarto volume by Congress in 1852. From 1852 to 1857 he was employed in a geological survey of Kentucky, the results of which were published in four volumes. In 1857 he was appointed State geologist of Arkansas, and the report of his survey was subsequently published in one volume.
OLIVER JOHNSON.

Owen (ELIAS K.), U. S. N., b. in Illinois Nov. 21, 1834; entered the navy in 1848, and rose to be a commander in 1866; commanded the Louisville in most of the various hard-fought battles on the Western waters in 1863 and 1864. FOXHALL A. PARKER.

Owen (JOHN), D. D., "the great dissenter" and the "prince of divines," was b. at Stadham, Oxfordshire, in 1616; was educated at Queen's College, Oxford, 1628–37; was an early advocate of the parliamentary cause, and an adversary of Laud's measures; received the living of Fordham, Essex, which he exchanged for a Presbyterian pastorate at Coggeshall, where he introduced independent church government. In 1649 he became private chaplain to Oliver Cromwell; in 1651 dean of Christ Church, Oxford; was vice-chancellor of the university 1652–57, when he was deprived by the Presbyterian party; in 1673 he removed to London. D. at Ealing, Middlesex, Aug. 24, 1683. He was a man of great piety, learning, and magnanimity, the author of more than eighty theological works, doctrinal, practical, and polemical. His *Exposition of the Epistle to the Hebrews* (1668–84) is his greatest work. Though a zealous opponent of Arminianism, Presbyterianism, Episcopacy, and papacy, all parties held him in high esteem. His works, in Goold's edition (1850), occupy 24 vols. 8vo.

Owen (JOHN), b. in Bladen co., N. C., in Aug., 1787; was educated at the State University; was governor of North Carolina 1828–30; president of the Harrison convention at Harrisburg, Pa., in 1840, and held other public positions. D. at Pittsborough, N. C., Oct., 1841.

Owen (JOHN JASON), D. D., LL.D., b. at Colebrook, Conn., Aug. 13, 1803; graduated at Middlebury College, Vt., in 1829, and at the theological seminary, Andover, Mass., in 1831; entered the Presbyterian ministry in 1832; became in 1836 president of Cornelius Institute, New York; professor of Latin and Greek in the New York Free Academy 1848, and its vice-principal in 1853; vice-president of the College of the City of New York 1866; prepared editions, with notes, of Xenophon's *Anabasis*, 1843; Homer's *Odyssey*, 1844; of the *Cyropædia*, 1846; of *Thucydides*, 1848; of the *Iliad*, 1851; the text of the Acts of the Apostles, with notes, 1850; a Greek reader, 1852; a *Commentary on the Gospels*, 3 vols., 1857, *seq.* D. in New York City Apr. 18, 1869.

Owen (LEWIS), D. D., LL.D., b. at Maltraeth, Anglesea co., Wales, in 1533; educated at Winchester School and New College, Oxford, where he obtained a fellowship; was professor of canon law during the reign of Mary, and having remained attached to Catholicism retired in the reign of Elizabeth to Flanders; became professor at Douay, which he founded in union with Cardinal Allen, as also an English college at Rome, where he obtained high ecclesiastical dignities. D. Oct. 14, 1594.

Owen (RICHARD), C. B., F. R. S., LL.D., D. C. L., b. at Lancaster, England, in 1804; served for a time in the British navy; studied medicine at Edinburgh and St. Bartholomew's, London; succeeded Sir Charles Bell as Hunterian professor in the Royal College of Surgeons in 1836; became superintendent of the natural history department of the British Museum in 1855; has attained world-wide renown as a comparative anatomist, palæontologist, and of later years as a student of sanitary science; is a member of many learned societies and the recipient of many honors. Owen's most important works are *Lectures on the Comparative Anatomy and Physiology of Invertebrate Animals* (1843); *Lectures on the Comparative Anatomy and Physiology of Vertebrate Animals* (1846); *Odontography* (1840–45); *On the Archetypes and Homologies of the Vertebrate System* (1848); *On the Nature of Limbs* (1849), besides numerous other works of scarcely less importance, including a number of valuable catalogues of the museum, compiled with very great labor. In 1873 he was made a Companion of the Bath.

Owen (RICHARD), M. D., son of Robert Owen, b. at New Lanark, Scotland, Jan., 1810; was educated at Hofwyl and Glasgow; came in 1827 to the U. S.; served as an officer in the Mexican war, and afterwards assisted his brother, D. D. Owen, in geological labors; held professorships of natural science in the Military Institute and University of Nashville, Tenn., 1849–58; removed in 1858 to New Harmony, Ind. Author of *A Key to the Geology of the Globe* (1850–57), in which the doctrine of evolution is enunciated; and numerous scientific and other papers.

Owen (ROBERT), social reformer, b. in Newtown, Montgomeryshire, North Wales, Mar. 14, 1771, where he d. Nov. 19, 1858; entered upon a commercial life at an early age, and subsequently engaged in the cotton manufacture at New Lanark, Scotland, where he introduced important reforms having for their object the improvement of the condition of the laborers in his employ; then directed his attention to social questions on a broader scale, publishing in 1812 *New Views of Society, or Essays upon the Formation of the Human Character*, and subsequently *Book of the New Moral World*, in which he advocated doctrines of human equality and the abolition of class distinctions. Having won a large fortune in his business, he was able to give these works and various tracts embodying his views a wide circulation. The duke of Kent became his patron, and his followers were numerous. His religious views exposed him to much obloquy and a bitter opposition, and after the death of his patron he came to the U. S. in 1823, and founded at his own expense a communist society at New Harmony, Ind. The scheme proving a failure, he returned to England, where he tried several similar experiments with the same result. He also failed in an attempt to establish a "labor exchange" in London. In 1828, by invitation of the government of Mexico, he went to that country in the hope of carrying out his socialistic schemes, but was disappointed. In spite of his failures he was universally esteemed for his integrity and benevolence. His later years were spent in efforts to promote a religion of reason and to improve the condition of the working-classes. His followers bore the name of "Owenites," and from them sprang the English Chartist movement.
OLIVER JOHNSON.

Owen (ROBERT DALE), eldest son of Robert Owen, the social reformer, b. in Glasgow, Scotland, Nov. 7, 1801; was educated at Fellenberg's college, near Berne, Switzerland; came to the U. S. with his father in 1823, and assisted him in his efforts to found the colony of New Harmony, Ind. On the failure of that experiment he visited France and England, but returned to the U. S. in 1827 and became a citizen. In 1828, in partnership with Miss Frances Wright, he founded *The Free Enquirer*, a weekly journal devoted to socialistic ideas and to opposition to the supernatural origin and claims of Christianity. The paper was discontinued after an existence of three years. In 1832 he married Mary Jane Robinson of New York, who died in 1871. He settled in New Harmony, Ind., where for three successive years (1835–38) he was elected a member of the legislature. It was through his influence that one-half of the surplus revenue of the U. S. appropriated to the State of Indiana was devoted to the support of public schools. From 1843 to 1847 he represented the first district of Indiana in Congress, acting with the Democratic party; took an active part in the settlement of the north-western boundary question, serving as a member of the committee of conference on that subject; introduced the bill organizing the Smithsonian Institution, and served for a time as one of the regents; in 1850 was a member of the Indiana Constitutional Convention, in which he took a prominent part. It was through his efforts that Indiana conferred independent property rights upon women. In 1853 he went to Naples as U. S. chargé d'affaires, and in 1855 was appointed minister, and held the place until 1858. In 1860 he discussed the subject of divorce with Horace Greeley in the *Tribune*. The discussion, in pamphlet form, obtained a wide circulation. After the breaking out of the rebellion, Mr. Owen was a warm champion of the policy of emancipation, and the letters which he addressed to members of the cabinet and the President on that subject were widely disseminated. When the proposition was made by certain influential politicians to reconstruct the Union with New England "left out in the cold," Mr. Owen addressed a letter to the people of Indiana, exposing the dangerous character of the scheme, which the "Union Leagues" of New York and Philadelphia published and circulated extensively. In 1862 he served as a member of the commission on ordnance stores, and in 1863 was chairman of the American freedmen's commission, which rendered valuable service to the country. Mr. Owen has published *Outlines of the System of Education at New Lanark* (Glasgow, 1824), *Moral Physiology* (New York, 1831), *Discussion with Origen Bachelor on the Personality of God and the Authenticity of the Bible* (New York, 1832), *Pocahontas*, a historical drama (New York, 1837), *Hints on Public Architecture*, illustrated (New York, 1849), *Footfalls on the Boundary of Another World* (Philadelphia, 1860), *The Wrong of Slavery and the Right of Freedom* (Philadelphia, 1864), *Beyond the Breakers*,

a novel (Philadelphia, 1870), *The Debatable Land between this World and the Next* (New York, 1872), *Threading my Way*, an autobiography (New York, 1874). Mr. Owen received the degree of LL.D. from the University of Indiana in 1872. OLIVER JOHNSON.

O'wens, tp. of Dallas co., Ark. Pop. 690.

Owens (JOHN E.), b. at Liverpool, England, in 1823; was brought to the U. S. in infancy; made his début on the Philadelphia stage 1846, and has since appeared in comedy in the principal cities of the U. S. and England, his most successful part being *Solon Shingle*.

Owens (Rev. THOMAS), b. in South Carolina Jan. 8, 1787; entered the itinerant ministry in Mississippi in 1813; his ministry was unique, attractive, and successful; was a member of the Mississippi conference of the M. E. Church, South, at the time of his death, July 1, 1868.
T. O. SUMMERS.

O'wensboro', city, cap. of Daviess co., Ky., on the S. bank of the Ohio River, 160 miles from Louisville; contains an excellent system of public schools, churches representing all creeds, 18 tobacco stemmeries, with a capital sufficient to handle the entire tobacco crop of the Green River country, 3 weekly newspapers, and several manufactories. Rich deposits of coal exist throughout the county, and large quantities of corn, hay, wheat, and rye are raised annually. Pop. of city, 3437. J. G. FORD, ED. "SHIELD."

Owen Sound, port of entry, cap. of Grey co., Ontario, Canada, at the head of Owen Sound (a part of Lake Huron), 45 miles W. N. W. of Collingwood. It has a good water-power, several lumber-mills, foundries, and other manufactories, and 2 weekly newspapers. There is a good trade in lumber and grain. Pop. of sub-district, 3369.

Owens River rises in Mono co., Cal., E. of the Sierra Nevada, and flows S. into Owens Lake in Inyo co. The lake is saline and alkaline, and has no outlet. There is a narrow area of arable bottom-lands near the river.

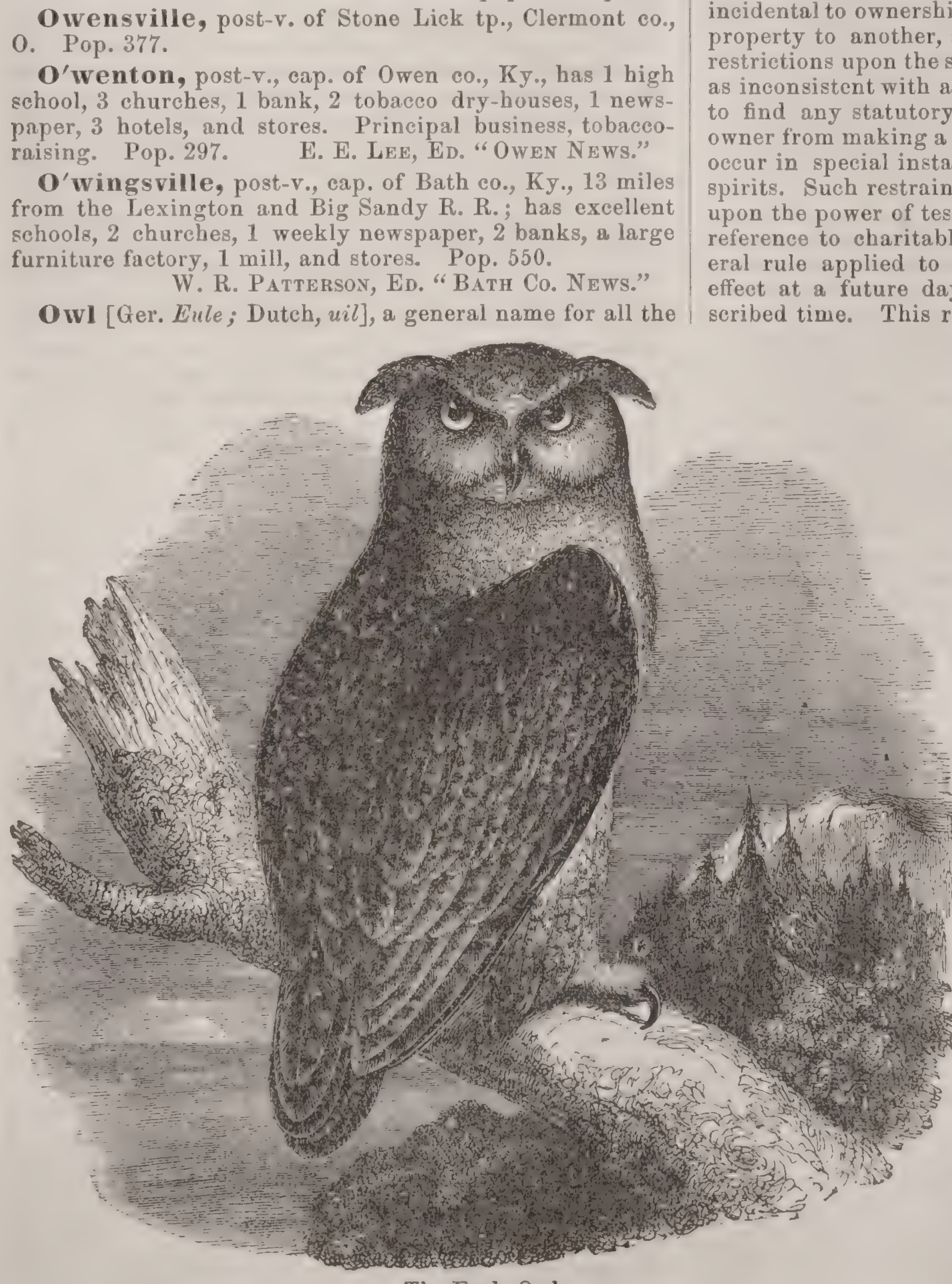
O'wensville, post-v. of Montgomery tp., Gibson co., Ind., near the Wabash River; has 1 newspaper. Pop. 522.

Owensville, post-v. of Stone Lick tp., Clermont co., O. Pop. 377.

O'wenton, post-v., cap. of Owen co., Ky., has 1 high school, 3 churches, 1 bank, 2 tobacco dry-houses, 1 newspaper, 3 hotels, and stores. Principal business, tobacco-raising. Pop. 297. E. E. LEE, ED. "OWEN NEWS."

O'wingsville, post-v., cap. of Bath co., Ky., 13 miles from the Lexington and Big Sandy R. R.; has excellent schools, 2 churches, 1 weekly newspaper, 2 banks, a large furniture factory, 1 mill, and stores. Pop. 550.
W. R. PATTERSON, ED. "BATH CO. NEWS."

Owl [Ger. *Eule;* Dutch, *uil*], a general name for all the nocturnal birds of prey. They are all short and heavy, with large head and eyes, the latter of which are in almost every instance fitted for night-vision and surrounded by radiating feathers. Nearly all have a singularly noiseless flight and a quick sense of hearing. By G. R. Gray 206 species are recognized as inhabitants of all regions. In N. America, N. of Mexico, 80 species are found, according to Baird, Brewer, and Ridgway. *Glaucidium gnoma*, the pygmy owl of the Pacific States, is the smallest North American owl, and is but seven inches long. *Nyctea nivea*, the snowy owl, and *Surnia ulula*, the hawk-owl, are diurnal in their habits. Owls have in all ages and countries been regarded as of ill omen by the superstitious. Their strange appearance, their harsh cries, their noiseless flight, and their nocturnal habits have all tended to confirm this popular opinion. The Greeks made the owl sacred to Athena, the goddess of wisdom.
THEODORE GILL.



The Eagle Owl.

Owl Creek, post-v. and tp., Woodson co., Kan., near the Neosho River and Missouri Kansas and Texas R. R. Pop. 1096.

Owl-Parrot, the *Strigops habroptilus*, a bird of the South Pacific Islands, and especially of New Zealand. It is a large bird with the aspect and nocturnal habits of the owl. It digs in the earth with its hooked beak after roots on which it feeds. It seldom flies, and generally rests in hollow stumps and logs. It is reputed to hibernate in caves in large groups. It is the type and only known representative of a peculiar group of the family Psittacidæ.
THEODORE GILL.

Own'ership, in law. This consists in dominion or control over property, real or personal. Considered as to its nature, it is of two sorts, absolute and qualified; regarded as to the number of owners, it is individual or joint. By absolute ownership is meant such a full control over property that one may do with it as he pleases. He may dispose of it freely, or even destroy it without action, unless he may in some way injure the rights of others. The unrestricted right to sell must be regarded as in general incidental to ownership. Accordingly, if one should convey property to another, and at the same time impose general restrictions upon the sale of it, the restrictions would be void as inconsistent with absolute ownership. It is not common to find any statutory restrictions preventing an absolute owner from making a sale of his property, though this may occur in special instances, as in the case of sale of ardent spirits. Such restraints are to a considerable extent placed upon the power of testamentary disposition, particularly in reference to charitable institutions. There is also a general rule applied to all dispositions of property, to take effect at a future day, that they must vest within a prescribed time. This rule is one of public policy to prevent the undue postponement of absolute ownership, and is known as the doctrine of "perpetuities" or "remoteness." (See PERPETUITIES and REMOTENESS.) When ownership has once been acquired, it cannot in general be lost, except by the consent of the owner. This consent is implied in some cases, as where property is taken under the exercise by the state of the right of eminent domain (see EMINENT DOMAIN), or by way of taxation, or on grounds of public necessity, as, *e. g.*, to check a conflagration or to prevent the incursions of an enemy in time of war. Under the general notion of the inviolability of property, it is well settled that a thief can transfer no title to the goods stolen, even if they be sold to a purchaser acting in good faith, though there is a single exception to this rule, based on public policy, in the case of commercial paper and current money. (See NEGOTIABLE PAPER.) Ownership is qualified in the case of wild animals and of bailment. (See BAILMENT.) The qualification in the case of wild animals is, that the animal may recur to its state of original wildness, and ownership thus be wholly lost. In the case of bailment, the qualification consists in the fact that the ultimate owner has parted with it for a special purpose, as, for example, to have it repaired, or to

raise money on it by way of pledge. The bailee may in such a case be regarded as a temporary or "special owner," while the bailor may be deemed the "general owner." The interests of the two, when combined, constitute complete ownership. Ownership is said to be several when it exists in one person, joint when it is vested in more than one. The subdivisions of JOINT OWNERSHIP are PARTNERSHIP, JOINT TENANCY, TENANCY IN COMMON, and the case of PART OWNERS OF SHIPS. (See these titles respectively.) Ownership may be lost or materially qualified by abandonment. This topic is peculiarly applicable to personal property. One may purposely cast away a chattel. If it be sunk in the sea, he may wholly abandon all effort to recover it. In this last case the property is called derelict. Any one may then interfere and save it, and have a claim upon the property saved for services, termed salvage. (See SALVAGE; see, also, PERSONAL PROPERTY.)

T. W. DWIGHT.

Owosso. See OWASSO.

Ows'ley, county of E. Kentucky, traversed by the South Fork of Kentucky River. Area, 460 square miles. It is mountainous, with fertile valleys, and contains beds of coal and iron of great prospective value. Live-stock, corn, and wheat are leading products. Cap. Booneville. Pop. 3889.

Owsley (WILLIAM), b. in Virginia in 1782; removed in 1783 to Lincoln co., Ky., with his father; became a teacher and lawyer of Garrard co., whence he removed to Boyle co. in 1843; was a judge of the Kentucky supreme court 1812–28, and governor of Kentucky 1844–48. D. at Danville, Ky., Dec., 1862.

Owy'hee, county of S. W. Idaho. It is mountainous, with fertile valleys adapted to farming and stock-raising. Rich lodes of silver ore abound. Mining is the principal industry. Cap. Silver City. Pop. 1713.

Ox. See CATTLE.

Ox'alates, compounds of OXALIC ACID (which see) with bases. The salt of sorrel has already been referred to as potassic dioxalate, and the first known source of oxalic acid. Oxalate of ammonia is largely in use in chemical laboratories as a reagent for lime. Oxalate of lime, as already stated, occurs largely in the vegetable kingdom, being found in different tissues and cells in the form of square prismatic crystals, which have the composition

$$CaO.C_2O_3.3H_2O.$$

Braconnot found that certain lichens growing on limestone rocks were half calcic oxalate. Liebig identified an incrustation found on the marble of the Parthenon at Athens as calcic oxalate, without making, however, a complete analysis. He called it thierschite, but Dana deems it identical with the mineral whewellite, already referred to. Oxalate of ferrous oxide, as humboldtine, has already been mentioned. There appear to be no other oxalates of general interest.

HENRY WURTZ.

Oxal'ic Acid [Gr. ὀξαλίς, a name for a kind of sorrel, whence the botanical name of the genus *Oxalis*, which contains this acid; Fr. *acide oxalique;* Ger. *Kleesäure, Oxalsäure*]. Salt of sorrel, which is an acid oxalate, dioxalate, or binoxalate of potash, has for a period unknown been procured in Germany from certain species of oxalis and rumex. Savary first obtained oxalic acid from it in 1773 by sublimation. Scheele afterwards obtained it from the same source by precipitation as oxalate of lead and subsequent decomposition of this. This latter chemist also first proved that the acid previously known as prepared by the action of nitric acid on sugar is oxalic acid. Besides the plants above mentioned, there are sea-shore plants, *Salsola* and *Salicornia*, which contain it as oxalate of soda. It is found as insoluble oxalate of lime in a great number and variety of plants, and in certain morbid conditions this latter salt is formed largely in the animal body, passing off by the urine, and forming what is called the "mulberry calculus" in the bladder. In the mineral kingdom calcic oxalate forms the species whewellite, which is but little known; but another mineral oxalate, humboldtine, which is the trihydrate of diferrous oxalate, is much more common, being found in brown coal in some European localities, and at one American locality discovered by Sterry Hunt, at Kettle Point, near Bosanquet, in Canada, as a sulphur-yellow incrustation in black shales.

All the oxalic acid of commerce is prepared by artificial processes, of which two are in common use: 1. By the action of nitric acid on sugar, starch, or molasses. A violent action occurs, with production of copious red fumes, which may be partly condensed and converted back again into nitric acid. It is advisable to use an excess of nitric acid, as otherwise intermediate products are formed, which embarrass the crystallization of the oxalic acid from the product. Also, the nitric acid should be of a special density, being at least 1.2, but no higher than 1.27, or the oxalic acid is itself partly oxidized and destroyed by it. 2. By fusing a hydrate of an alkali with starch or cellulose. Sawdust is generally used. Potassic hydrate gives more than sodic, and two of potassic to one of sodic hydrate gives still more. In the latter case, when the product is treated with a strong solution of carbonate of soda, carbonate of potash dissolves and oxalate of soda, by virtue of its low solubility, remains behind. From this oxalic acid is readily prepared. When required *pure* for chemical purposes it is sublimed. Great care must be taken in this case not to inhale the vapor, which is highly dangerous. Oxalic anhydride (or anhydrate, as we prefer to call it), C_2O_3, is unknown. The commercial crystallized acid, in correct chemical nomenclature, is dihydrate of monohydric oxalate, $H_2O.C_2O_3.2H_2O$. When subjected to a dehydrating agent, instead of obtaining C_2O_3, we find that it breaks up into carbonic acid and carbonic oxide, $C_2O_3 = CO_2 + CO$. Permanganate of potash, chromic acid, moist chlorine, and other powerful oxidating agents convert it readily into carbonic acid, but nitric acid acts upon it with difficulty. It dissolves in about nine parts of cold and one part of boiling water. When to its solution or that of an oxalate a lime-solution is added, there is thrown down oxalate of lime, an exceedingly insoluble substance, and for lime in solution it is the most delicate test. Except in very weak solutions, it is an exceedingly dangerous, fatal, and rapid poison, and its universal sale in shops and common use in households is greatly to be reprehended. It has been known to produce death in ten minutes, preceded by horrible agonies. It is used in the arts for cleaning leather, for discharging colors in calico-printing, and in scouring metals. For the latter purpose, cleaning brass and copper, it is now much used in households, as well as for removing ink-stains from fabrics. The greatest care should be exercised that it be not mistaken for Epsom salt (which it almost exactly resembles in appearance), a fatal and not infrequent accident.

HENRY WURTZ.

Ox'alis [Gr. ὀξαλίς], wood-sorrel, the principal genus of the sub-order of Geraniaceæ, from which it has been separated by some authors, but apparently without sufficient reason. The plants composing the family are popularly known as wood-sorrels. They possess five sepals, sometimes slightly coherent at the base, with five hypogynous petals convolute in the bud, and with no glands alternating with them. Stamens ten, often monadelphous, those opposite the petals longer than the others. Fruit a 5-celled pod or berry. The leaves are alternate, compound, and closing at night or sometimes to the touch, like those of Mimosa. *Oxalis sensitiva*, a native of India, has pinnate foliage exhibiting this irritability in a marked degree. All the Oxalideæ possess a sour juice, due to the presence of potassic binoxalate. *Oxalis acetosella* has been said to yield, from 500 pounds of the fresh plant, 4 pounds of this salt, which, under the name of "salts of sorrel" and "salts of lemon," is used to remove the stains of iron-rust from linen and other articles. The commercial article is obtained from other sources, and should never be marked "salts of lemon," as it is a dangerous poison. In the plants it exists only in sufficient degree to render them pleasantly acid, and in France they are sometimes used for culinary purposes. The berry of Averrhoa is intensely acid, and used in the East Indies as a pickle. The *Oxalis crenata* of Peru and Chili is used as an article of food, the tuberous roots forming a substitute for potatoes. They abound in starch, and are insipid to the taste. The plant increases with wonderful rapidity. Some of the species of the sub-order are astringent and have been used in cases of blood-spitting and in the prevention of malignant fevers. There are a considerable number of species in most countries, but they are most abundant in S. America and at the Cape of Good Hope. The flowers are often handsome, as in the well-known *Oxalis acetosella*, where they are white veined with red. This plant is common in the woods of both continents, blossoming in June. It is particularly abundant in Lapland. It is supposed by some to be the true shamrock, the national flower of Ireland, instead of the clover, which is generally so considered. The handsome species cultivated in conservatories mostly come from the Cape of Good Hope. *Oxalis versicolor* has white petals edged with rose-red. The outside of the petals is bright pink. *Oxalis stricta* is a common weed with small yellow flowers. According to Gray, "several species of *Oxalis* produce small peculiar flowers, which are precociously fertilized in the bud and are particularly fruitful, and the ordinary flowers are often dimorphous, or even trimorphous, in the relative length of the stamens and styles." There are upwards of 300 known species of this sub-order.

W. W. BAILEY.

Oxalu'ria [Lat., "oxalic urine"], a morbid condition of the general system which favors the constant excretion of oxalic acid by the kidneys. It is also known as the *oxalic acid diathesis.* At the present time the members of the medical profession are divided in regard to their opinions on this subject, some believing in such a condition constituting in itself a disease, others regarding it merely as a result of malassimilation; that is, "a derangement in the act by which living bodies appropriate and transform into their own substance matters with which they may be placed in contact." (*Dunglison.*) The latter view is perhaps the correct one, for we generally find those persons who have a constant and large deposit of oxalate of lime in the urine suffering more or less from dyspepsia. They are restless and uncomfortable during the digestion and assimilation of their meals, are troubled with flatulence and eructations, and, as a rule, they are more or less hypochondriacal. The advocates of the belief that the oxalic acid diathesis constitutes in itself a disease give the following symptoms as accompanying the excretion of oxalate of lime: Emaciation, nervousness, painful susceptibility to external impressions, and hypochondriasis. The patients are incapable of exerting themselves in the least without suffering from fatigue; they are irritable and easily excitable; and there is more or less impotence. A prominent symptom is a severe and constant pain or sense of weight across the loins. The above train of symptoms undoubtedly very frequently co-exist with the presence in the urine of oxalate of lime; the majority of them are the symptoms of dyspepsia, and may be present without the occurrence of oxalate of lime, and, conversely, oxalate of lime may be produced in immense quantities without any of these symptoms being present. Thus, we may have calculi of the salt repeatedly formed both in the pelvis of the kidney and in the bladder. We also repeatedly find oxaluria occurring in phthisis, heart disease, bronchitis, rheumatism, anæmia, cirrhosis, cancerous diseases, and even in a state of perfect health. Especially is this the case if we do not examine the urine for twenty-four hours after it has been passed, as during that time the mucus in the urine putrefies and communicates its alterations to the rest of the fluid, and lactic and oxalic acids are produced from some of the undetermined animal matters contained in the excretion. As fast as the oxalic acid is formed it unites with the lime which is in solution in the urine, and thus oxalate of lime is produced. This oxalate of lime is entirely insoluble in water and in the urine, even when heated to the boiling-point, so that it is difficult to understand how it could have been held in solution previously, and it surely could not have been excreted by the kidneys in any other condition. Oxalate of lime occurs in the urine in the form of minute octohedral or dumb-bell-shaped crystals, varying in size from a ten-thousandth to a thousandth of an inch in diameter. The formation of oxalic acid in the blood is occasioned by the malassimilation of certain articles of diet, especially those containing sugar, but in exactly what manner has not yet been determined by physiologists. Hence, sugar and all saccharine matters should be avoided as much as possible. Attention should be paid to the general health, and particularly to the digestive organs. As medicines, the mineral acids, given either alone or combined with tonics, seem to be the favorite remedies.

EDWARD J. BERMINGHAM.

Ox'enbridge (JOHN), b. at Daventry, England, Jan. 30, 1609; studied at Oxford and Cambridge; took his degree at the latter university 1631; took orders in the Church of England; made several voyages to the West Indies; was chosen fellow of Eton College; became incumbent of a parish at Beverley, England, 1644; was settled at Berwick-on-Tweed, where he was silenced for nonconformity 1662; went to Surinam, Guiana, as a missionary; was at Barbadoes 1667; came to Boston, Mass., 1669, and was ordained Apr. 10, 1670, colleague with Rev. Mr. Allen over the First church; was a popular and effective preacher, and published a number of sermons. D. at Boston Dec. 28, 1674.

Ox'enden (ASHTON), D. D., b. at Broome Parke, near Canterbury, England, in 1808; educated at University College, London; many years rector of Pluckly-with-Pevington, Kent; became honorary canon of Canterbury Cathedral 1864, and bishop of Montreal, primate, and metropolitan of Canada 1869.

Ox'enford (JOHN), b. at Camberwell, near London, England, in 1812; was called to the bar 1833; was many years theatrical critic for the London press; wrote several dramas and songs, and translated a number of German poems and prose works.

Ox'enstjerna (AXEL), COUNT, b. at Fånö, Upland, Sweden, June 16, 1583; studied theology and jurisprudence at Rostock, Jena, and Wittenberg, and was employed, after his return to Sweden in 1603, by Charles IX. in several important diplomatic negotiations, which he carried through with great sagacity and dignity. On the accession of Gustavus Adolphus in 1611 he was made chancellor of Sweden, and as such he negotiated the Peace of Kmered with Denmark in 1613 and of Stolbowa with Russia in 1617, and the armistice with Poland in 1629, and accompanied Gustavus Adolphus during his campaigns in Germany, taking charge of all diplomatic affairs. After the fall of Gustavus Adolphus at Lützen in 1632 he was empowered by the Swedish representatives to continue the war, and at the congress of Heilbron the Protestant princes chose him head of the league against the emperor. He concluded an alliance with Holland and France, and returned in 1636 to Sweden as chief of the government during the minority of Gustavus Adolphus's daughter Christina. When she became of age in 1644 his influence decreased, and when she abdicated he retired altogether into private life, and d. at Stockholm Aug. 28, 1654. The second part of *Historia Belli Sueco-Germanici,* of which Chemnitz wrote the first part, is generally ascribed to Oxenstjerna, who was an accomplished scholar.

Ox'ford, an old and famous city of England, the capital of Oxfordshire, is situated 55 miles N. W. of London, on the Isis, near its junction with the Cherwell, among rich and beautiful surroundings, and contains a great number of splendid edifices. Its trade and manufactures are comparatively insignificant; it is as a seat of learning it has acquired its fame, its university being the oldest and most celebrated institution of the kind in the United Kingdom. It is attended by about 6000 students, and has an annual revenue of between £400,000 and £500,000. It consists of 19 colleges and 5 halls, of which University College is the oldest and Christ Church College the largest. University College is said to have been founded by Alfred in 872, but it did not receive anything like its present form until 1249. Christ Church College was founded by Cardinal Wolsey in 1525, and comprises the most extensive grounds and the most magnificent buildings. Besides the edifices and institutions belonging to each college, there are some belonging to the university; as, for instance, the Bodleian Library, containing 220,000 volumes and 20,000 manuscripts, the theatre, the observatory, the botanical garden, etc. Besides the Bodleian there are 23 other libraries, of which that belonging to All Souls' College consists of 50,000 volumes, a fine picture gallery, and many collections for science and art. Pop. 31,554.

Oxford, a fertile county of Canada, in Ontario, has 2 ridings. Area, 710 square miles. It is intersected by the Great Western Railway. Cap. Woodstock. Pop. 48,237.

Oxford, county of W. Maine. Area, 1600 square miles. It is bounded W. by New Hampshire and N. in part by Canada. It is hilly and well timbered, containing much fertile soil. It is traversed by Androscoggin River and by the Grand Trunk and the Portland and Oxford Central R. Rs. Cattle, wool, potatoes, oats, and corn are leading products. The manufactures include lumber, leather, starch, carriages, wooden wares, furniture, flour, woollen goods, etc. Cap. Paris. Pop. 33,488.

Oxford, post-v. and tp., Calhoun co., Ala., on Selma Rome and Dalton R. R., 15 miles S. W. of Jacksonville. It contains Oxford College, 3 churches, 2 steam flouring-mills, iron-works, 1 newspaper, several hotels, a saw-mill, and a number of stores. Large quantities of cotton are shipped from this place. Pop. 1147.

W. J. BORDEN, ED. "INTELLIGENCER."

Oxford, post-v. and tp., New Haven co., Conn., on the Naugatuck River and R. R. Pop. 1338.

Oxford, post-v. of Newton co., Ga., on the Georgia R. R., is the seat of EMORY COLLEGE (which see). Pop. 665.

Oxford, post-v. and tp., Henry co., Ill., on the Rockford Rock Island and St. Louis and the Chicago Burlington and Quincy R. Rs. Pop. 1327.

Oxford, post-v. of Oak Grove tp., cap. of Benton co., Ind., 90 miles N. W. of Indianapolis. It has an academy, 1 bank, an elevator, 1 newspaper, a flouring-mill, a carriage and wagon manufactory, 3 hotels, and stores. Pop. 519. A. COWGILL, ED. "OXFORD WEEKLY TRIBUNE."

Oxford, post-v. and tp., Johnson co., Ia., on Iowa River and Chicago Rock Island and Pacific R. R. Pop. 1043.

Oxford, tp. of Jones co., Ia., on the Wapsipinicon River and Davenport and St. Paul R. R. Pop. 1121.

Oxford, tp. of Johnson co., Kan. Pop. 1926.

Oxford, post-v. and tp., Oxford co., Me., on the Grand Trunk R. R. Pop. 1631.

Oxford, post-v. of Trappe tp., Talbot co., Md., on Eastern Shore of Chesapeake Bay, S. W. terminus of Maryland and Delaware R. R. (unfinished). Pop. 227.

Oxford, post-v. and tp., Worcester co., Mass., on the Norwich and Worcester division of the Boston Hartford and Erie R. R., traversed by French River (so called from a Huguenot colony which settled the town 1684), has 6 churches, a national bank, 12 schools, a new town-hall, free public library, 4 cotton, 4 woollen, and 5 saw-mills, and 5 shoe factories. Pop. 2669.

Oxford, post-v. and tp., Oakland co., Mich., on the Detroit and Bay City R. R. Pop. 1367.

Oxford, post-v. and tp., cap. of Isanti co., Minn., near the Lake Superior and Mississippi R. R.

Oxford, post-v., cap. of Lafayette co., Miss., on the Mississippi Central R. R., contains the University of Mississippi, the Union Female College, Oxford Institute, the Oxford Male Academy, and a primary school, the county court-house, jail, and city hall, 5 churches, 1 bank, 2 furniture establishments, 2 newspapers, and stores. Pop. about 1422. S. M. Thompson, Ed. "Falcon."

Oxford, post-v. and tp., Warren co., N. J., on Delaware River and the Delaware Lackawanna and Western R. R., includes Belvidere, the county-seat. Pop. 2952.

Oxford, post-v. and tp., cap. of Chenango co., N. Y., on the New York and Oswego Midland and the Utica and Binghamton branch of the Delaware Lackawanna and Western R. Rs., 8 miles S. of Norwich, has an academy, 6 churches, 1 bank, 1 newspaper and printing-office, 3 hotels, and stores. Pop. of v. 1278; of tp. 3278.

J. B. Galpin, Ed. "Oxford Times."

Oxford, post-v. and tp., cap. of Granville co., N. C., 46 miles N. of Raleigh, the centre of a tobacco-growing section, and contains 6 churches, 2 tobacco warehouses, 7 tobacco manufactories, and 3 newspapers. Pop. of v. 916; of tp. 2724. Robert Blow, Ed. "Leader."

Oxford, post-v. and tp., Butler co., O., on the Cincinnati Hamilton and Indianapolis R. R., 39 miles N. W. of Cincinnati, contains the Oxford Female Seminary, Miami University, several churches, 1 newspaper, and stores. Pop. of v. 1738; of tp. 3959. F. D. Davis, Ed. "Citizen."

Oxford, tp. of Coshocton co., O., on the Pittsburg Cincinnati and St. Louis R. R. Pop. 1140.

Oxford, tp. of Delaware co., O., on the Cleveland Columbus Cincinnati and Indianapolis R. R. Pop. 1250.

Oxford, tp. of Erie co., O., on the Sandusky Mansfield and Newark R. R. Pop. 1238.

Oxford, tp. of Guernsey co., O. Pop. 1709.

Oxford, a v. of Killbuck tp., Holmes co., O. Pop. 116.

Oxford, tp. of Tuscarawas co., O., on the Tuscarawas River, Ohio Canal, and Pittsburg Cincinnati and St. Louis R. R. Pop. 1667.

Oxford, a v. and tp., Adams co., Pa., on the Susquehanna and Gettysburg R. R. Pop. 1322.

Oxford, post-b. and tp., Chester co., Pa., on the Philadelphia and Baltimore Central R. R., 55 miles from Baltimore, has excellent public and private schools, several churches, a library, 3 banks, extensive car-works, manufactories of carriages, furniture, and other commodities, 2 newspapers, and stores. The borough is supplied with water. Lincoln University, established for the instruction of colored persons, is located about 4 miles from this town. Pop. 1151. Geo. D. Hayes, Ed. "Oxford Press."

Oxford, post-v. of Cache co., Ut. Pop. 149.

Oxford, post-v. and tp., Marquette co., Wis. Pop. 608.

Oxford (Robert **Harley**), Earl of, b. in London, England, Dec. 5, 1661; raised a cavalry regiment for the service of the prince of Orange 1688; entered Parliament 1690 as an extreme Whig, but gradually changed his political views until they reached the opposite extreme of Toryism; was chosen speaker Feb., 1701; re-elected in the two succeeding Parliaments; was made chief secretary of state 1704, chiefly through the influence of Miss Abigail Hill (afterwards Lady Masham) with Queen Anne; acquired great power at court, and incurred the enmity of Marlborough and Godolphin; was dismissed from office 1708 through the prevalence of a popular belief that he was in correspondence with the French court; was made chancellor of the exchequer Aug., 1710; was stabbed at the council-board by the marquis of Guiscard, a Frenchman, Mar. 12, 1711, to which event he owed a new lease of public and royal favor; was created earl of Oxford and Mortimer May 24, and lord high treasurer May 29 of the same year; enjoyed from this time very great power, having completely supplanted Marlborough in the queen's favor, and consolidated his own popularity by the Peace of Utrecht, April, 1713, but was in turn supplanted by Bolingbroke and dismissed July 27, 1714. Regarded with distrust by George I., he was impeached of high treason by Parliament Aug., 1715; committed to the Tower; acquitted June, 1717; lived thenceforth in retirement; accumulated immense collections of books and manuscripts, of which the latter, numbering 8000, are now in the British Museum, and was author of some pamphlets of little merit. D. at London May 21, 1724.

Oxford Clay. The Oxford clay, so called from its extensive development in Oxfordshire, England, is a deposit widely extended over Europe, and constituting the argillaceous member of the middle Oolite series of rocks. It consists of a stiff, grayish-blue to dark-blue clay, containing more or less lime, and varying in different localities from 200 feet to 600 feet in thickness. It abounds in fossils, chiefly ammonites and belemnites. (See Jurassic.)

Edward C. H. Day.

Ox'fordshire, an inland county of England, bordering S. on the Thames, comprises an area of 735 square miles, with a population of 177,956. The surface is mostly level, but undulating in the southern part, where the Chiltern Hills rise to the height of 820 feet. The soil is a mixture of gravel and loam, and very fertile. Agriculture and dairy-farming are in an advanced state. Wheat, barley, turnips, butter, and cheese are produced in large quantities and of excellent qualities. Principal town, Oxford.

Oxford University. Although modern inquiry has long since disposed of the legend which carried back the foundership of Oxford University to Saxon Alfred, yet even the most skeptical of inquirers have left to the university an antiquity of which it may be justly proud. The first fairly authenticated notice of Oxford as a seat of learning dates from the time of Edward the Confessor. In the reign of Stephen we find Vacarius, a Lombard, giving lectures on Roman law at Oxford. The first charter was granted to the university by John; in 1201, according to Anthony Wood, the university numbered within its walls 3000 students. Later on, in the time of Henry III., Wood states that there were 30,000 students at Oxford; "but among these a company of varlets, who pretended to be scholars, shuffled themselves in, and did act much villainy by thieving, whoring, quarrelling, etc." Even after making allowance for the "varlets," the statement is of course a gross exaggeration; but it is plain that the university was beginning to attract great numbers. From Henry III.'s time date the foundations of three colleges, University (1253), erected on the site of a much earlier foundation, Baliol (1263), Merton (1264). In a little more than half a century from this date two other colleges were established, Exeter (1315) and Oriel (1326); Queen's followed in 1340, and New College in 1373. In the time of Richard II. many members of the university warmly espoused the doctrines of Wyckliff, and in the persecutions that followed on this avowal many of the colleges were thinned, some, indeed, being quite deserted. But the desertion was only for a short time; for in the reign of Henry VI. we find three new colleges established, Lincoln College (1427), All Souls' (1437), Magdalen (1456). The university found a generous patron in Richard III., who, among other bounties, granted the privilege to the university of importing or exporting books at will. In Henry VIII.'s time three new colleges were founded, Brasenose (1509), Corpus Christi (1516), Christchurch (1525); the last mentioned of these was founded by Wolsey, on a scale of great magnificence. Wolsey also endowed seven professorships for theology, civil law, physic, philosophy, mathematics, Greek, and rhetoric; especially the study of Greek was largely encouraged by the learned prelate. During the reign of Edward VI. royal commissioners were appointed, with full powers to examine the affairs of the university. In consequence, a new set of statutes was drawn up and the form of government in the university completely altered; but in the next reign the old order of things was re-established. The religious controversies about this time did much to hinder the advancement of learning; in Mary's reign the university appears to have been in a state of great stagnation. Endowments, however, were not wanting; for in 1554 Trinity College was founded, and St. John's followed three years later. Queen Elizabeth's reign is remarkable in the history of Oxford University for the foundation by Sir Thomas Bodley of the Bodleian Library, and for the passing of the act which confirmed the university as a corporate body; also, Jesus College was established in this reign. Shortly after the succession of James I. the two universities had the privilege granted of sending each two members to Parliament. In 1612 Wadham College was founded, and twelve years later Pembroke. During the troublous times of Charles I. the university sided throughout with the king, and suffered severely in consequence. In 1650, Cromwell was elected chancellor of the university, when several of the more obnoxious among the royalists were removed, to be reinstated at the Restoration. Under the tyranny of James II. the university came violently into collision with the crown;

on the refusal of Magdalen College to receive a president forced upon them by the king all the members of that college, with the exception of two, were expelled. However, at the approach of William of Orange they were reinstated by the tyrant. From this period the university has proceeded on an even and unruffled course. In 1714, Worcester College was founded; Hertford College followed in 1740, but for lack of endowments did not flourish, and in 1818 was turned into Magdalen Hall, from which, in 1874, it was metamorphosed again into Hertford College, receiving at the time fresh endowments. Three years before, in 1871, a new college, Keble, had been founded. In addition to these colleges, there are a few halls attached to certain of the colleges; as, St. Alban's Hall, attached to Merton College, St. Edmund's Hall to Queen's College, etc.

The highest officer in the university is the chancellor; the election is determined by the members in convocation, and the office is held for life. For the last two hundred years it has been the custom to elect some distinguished nobleman who has been educated at Oxford; the marquis of Salisbury is the present chancellor. There is no stipend attached to this office. The chancellor's deputy, the vice-chancellor, is nominated by the chancellor from among the heads of colleges: the office is held for four years, and is endowed with a salary of £600 a year. To assist the chancellor and vice-chancellor two other officers are appointed, the high steward and deputy steward; the appointments are at the disposal of the chancellor, subject to the approval of convocation. The business of the university is transacted in two separate assemblies, the house of congregation and the house of convocation. In the former the business is confined to granting ordinary degrees and confirming the nomination of examiners made by the vice-chancellor and the proctors. All other business is conducted in the house of convocation. To facilitate the ordinary legislation of the university there meets every week during term time the hebdomadal council, composed of the heads of colleges and others. Not the least important among the university officers are the proctors. The business of these gentlemen is to guard against any breach of discipline on the part of members of the university; the proctors are two in number, and are assisted by four pro-proctors. Both proctors and pro-proctors must have attained the standing of master of arts, the former for at least four years previous to election.

Before entering the university a preliminary examination, the matriculation, must be undergone, varying in difficulty according to the status of the college. Shortly after entering, the student is confronted by responsions, the first public examination: for this a slight knowledge of classics and mathematics is required. In order to get a degree the student must have resided at least twelve continuous terms at the university, and must have passed the necessary examinations. The study of ancient literature, history, and philosophy—*literæ humaniores*—is the study most largely encouraged at Oxford; the degree is usually acquired in the classical schools. There are also schools in modern history, civil law, and theology, in which the examinations are usually attended by men who have passed through the classical schools. For those who go to study mathematics, natural science, etc., there are also schools in those subjects. Attached to each college are fellowships and scholarships, awarded in most cases by open competition. Until lately fellowships were nearly all clerical, but now, to a great extent, restrictions have been removed, and the fellowships are thrown open as they become vacant to the whole university. In most colleges the fellowships are held for life, so long as the holder remains unmarried; but a sensible change is now largely adopted by making the fellowships tenable for ten years, whether the holders choose to marry or not. Scholarships are awarded after competition to undergraduates who have not exceeded a certain number of terms from matriculation, and to young men entering the university; there is in most colleges a limit of age. The value of the scholarships is about £80 or £100 a year, tenable for five years. Instruction is conducted mainly by the college tutors; lectures are also delivered by the university professors. Expenses vary at the different colleges; at the most economical college, Keble, the course for the year may be gone through on something less than £100. Ordinarily, for a person of inexpensive tastes, about £150 a year—from that to £200—is sufficient. For those who reside in the halls and for unattached students the expenses are considerably less. The university year is divided into four terms—Michaelmas, Hilary, Easter, and Trinity. The intervals between terms are short, with the exception of the long vacation, which lasts from the first or second week in June to the 10th of October. A. H. BULLEN.

Ox-gall (*fel bovinum*), the bile of the domestic ox, is used in the arts in scouring wool, since into its complicated composition there enters abundance of soda, which gives it a soapy quality. When properly refined from its coagulable and coloring matters it is used by artists in mixing colors, which it often improves in tint, while it fixes them and makes them flow better. It is also used in some kinds of artists' varnish and in cleansing ivory tablets for artists' use. In medicine it is sometimes given when a deficiency of bile is suspected to exist; in enemata it is believed to dissolve scybalous masses, and as an external application some practitioners consider it powerfully discutient.

Oxidation. See OXYGEN.

Ox'ides, compounds of OXYGEN (which see) with metallic and other basic substances. Oxides make up almost the whole mass of known matter. Water is an oxide of hydrogen, 88.88 per cent. of its weight being oxygen, and all the massive solid rocks, without exception, are made up substantially of different oxides. All the elements except fluorine combine with oxygen to form oxides, some combining in several different proportions to form as many different oxides. Oxides divide themselves into several natural groups. Basic oxides, or simply bases, are those which combine with acid oxides to form salts or neutral oxides, and, conversely, *acid* oxides, or *acids* simply, are those which combine with bases to form salts. This is, however, a very general definition, subject to several conditions and modifications in certain cases. Generally speaking, again, it may be stated that acid oxides contain larger proportions of oxygen than basic; and when an element combines to form different oxides with oxygen, those which contain most oxygen will be acid, and those containing least basic. The degree of acidity or basicity of an oxide depends also, however, upon the acidic or basic relations of the element which is combined with the oxygen. (On this subject reference may be made to the articles ACID and BASE, and under the head of OXYGEN further information will be given about oxides.) H. WURTZ.

Oxlip. See PRIMROSE.

Oxpecker. See BEEF-EATER.

Oxuderc'idæ [from *Oxuderces*—ὀξύς, "sharp," and δέρκω, to "look"—the only known genus], a family of fishes of the order Teleocephali and sub-order Acanthopteri, related to the gobies, from which it is especially distinguished by the numerous spines of the anal fin and want of ventral fins. The body is elongated, sub-cylindrical, and covered with small scales; the lateral line absent (?); the head elongated, also covered with small scales; opercula unarmed (?); nostrils single (?); mouth with a lateral cleft; teeth in both jaws, but none on the palate; branchial apertures capacious, the gill-membranes being united below the throat and not adherent below the isthmus; branchiostegal rays six (?); dorsal fins two, the first with six spines, the second elongated; the anal fin as long as second dorsal and armed with many (6) spines; caudal not free; ventral fins none. The anatomy is unknown. The family has been proposed by Dr. Günther for a single species (*Oxudercus dentatus*), originally described by Valenciennes from specimens obtained from Macao (Günther, *Catalogue Fishes Brit. Museum*, v. iii., p. 165). THEODORE GILL.

Oxus. See AMOO.

Oxychlo'rides, sometimes called **Basic Chlorides.** This class of compounds may in some cases be regarded as compounds of oxides and chlorides, but in many other cases we find difficulty in admitting the presence of two molecules of the basic element. The oxychlorides are sometimes formed by the direct action of an oxide of a metal upon the chloride of the same metal, as in the cases of lime, magnesia, zinc, etc. In the latter two cases important cements are founded upon the formation of such oxychlorides. Other classes of oxychlorides are formed by the partial decomposing action of water upon the chlorides of some metals, acting by removing a portion of the acid, as in the cases of antimony and bismuth. There are some native mineral oxychlorides, as atacamite and tallingite, oxychlorides of copper, and matlockite and mendipite, oxychlorides of lead. Other elements besides the metals form oxychlorides, such as silicon, carbon, sulphur, selenium, nitrogen, phosphorus. Oxychloride of phosphorus, $POCl_3$, is a compound of considerable interest. Some of the oxychlorides have been imagined to contain hypothetical compound elementoids or radicals, called by such names as carbonyle, CO, thionyle, SO, selenyle, SO, nitrosyle, NO_2, etc. Some oxychlorides are powerful acids, as chlorochromic acid, CrO_2Cl_2, chlorosulphuric acid, $S_2O_5Cl_2$, and others. H. WURTZ.

Ox'ygen and **Air-Ozone.** *Names.*—The word oxygen is from the Greek ὀξύς, "acid," and γένειν, to "engender," or "generate," and was applied by Lavoisier to represent the generalization which he had arrived at, and which in his day was almost universally accepted, that

oxygen was the sole "acidifying principle." To accommodate this hypothesis, muriatic acid, for example, was regarded as an oxide of some unknown element, and, furthermore, by a second subsidiary hypothesis, proposed by Berthollet in 1785, chlorine, which had then been discovered eleven years previously by Scheele, was regarded as an oxide of muriatic acid, as itself an acid substance, and the term "oxygenated muriatic acid" applied to it. In 1809, however, Gay-Lussac and Thénard demonstrated that chlorine contains no oxygen and is elementary; and H. Davy in 1810 entirely demolished the view of Berthollet, proposing the name *chlorine*, which still stands. Since then it has become more and more apparent that the class of substances called "acids" does not owe its characteristics to the presence of oxygen, and that hydrogen is far better entitled to the designation of the "acidifying principle," if there be any such thing. Indeed, there is now an attempt making throughout the range of chemical literature to confine the term acid to hydrogenated compounds, and to abolish it as applied to simple oxides of other elements. Thus, the term oxygen, now so firmly established in the minds of men that it probably never will be changed, must now be recognized as one of the most remarkable and unfortunate cases we have of a name founded upon a fragmentary and entirely incorrect generalization—a misnomer—which is destined to inculcate and perpetuate error, and to stand in the way of true scientific progress, whose object should pre-eminently be to bring our words and our ideas, which must go hand in hand, always into closer approximation to the creative ideas that underlie the scheme of Nature. In the German language, likewise, oxygen is *Sauerstoff*, "acid stuff" or material, again perpetuating Lavoisier's view. The first discoverer of oxygen, Priestley, called it "dephlogisticated air." Condorcet called it "vital air." Scheele called it "Feuerluft," fiery or fire-supporting air.

History.—Air was held by the chemists of old to be one of the elements of matter, all gaseous substances being classed together under this name. Rutherford in 1772 discovered that it contained an ingredient (NITROGEN, which see) incapable of sustaining respiration. Priestley, Aug. 1, 1774, first discovered and prepared in a pure state the life and fire-sustaining gaseous principle of the air, which he called "dephlogisticated air," as he was, even up to the time of his death, an adherent of the phlogistic theory of Stahl. Priestley prepared pure oxygen by heating red oxide of mercury, which is dissociated by heat into metallic mercury and oxygen gas. Priestley, who, from his many important discoveries and inventions relative to different gases and the manipulation of gaseous bodies, is known as the "father of pneumatic chemistry," knew well how to collect, preserve, and experiment upon the new gas. He thus easily proved its identity with the active element of the air. To commemorate this great event in scientific history, the chemists of America assembled Aug. 1, 1874, one hundred years later, at the grave of Priestley, on the banks of the Susquehanna at Northumberland, Pa., to celebrate the "centennial of chemistry." One year later than Priestley, in 1775, the great Swedish chemist Scheele made independently the same discovery. Lavoisier may be justly regarded as the discoverer or propounder of the true theory of fire, oxidation, and combustion, as consisting in combination with oxygen of the air. Grotthuss, and especially H. Davy, investigated flame, and advanced some steps in a theory thereof. Doebereiner made also important investigations upon flame and luminosity, which, though now forgotten, should be revived.

Occurrence in Nature.—It is in an enormous degree the most abundant, as it is in many respects the most important, of the elements of matter, upon our earth at least. The only other element that can compare with it in abundance is silicon, the special element of mineral silicates. Even in these oxygen preponderates largely. The following figures have here been calculated to furnish examples of the proportions of oxygen and silicon in some of the commonest of the minerals that make up nearly the whole mass of the known earth:

	Oxygen per 100.	Silicon per 100.
Quartz	54.	46.
Feldspar (orthoclase)	46.75	29.6
Mica (muscovite)	48.27	21.
Pyroxene	44.6	25.3
Amphibole	46.8	27.6
Limestone	48.	—Carbon... 12.0

From a glance over these figures it is plain that oxygen constitutes nearly if not quite half the total weight of known matter, and silicon not far from one-third. Of water, the liquid part of the earth, oxygen forms a still larger proportion, or *eight-ninths*. Of living matter, vegetable and animal, oxygen also forms by far the largest element, by reason of the fact that water is so predominant a constituent of these. Apart, however, from the water existing as such in living beings, much oxygen is contained in their solid or "plastic" constituents when perfectly dry. Thus cellulose and starch both contain 49.38 per cent. of oxygen, albumen 23.5, and gelatine 27.5 per cent. Of normal atmospheric air oxygen constitutes from 20.8 to 20.9 per cent. by volume, and by weight about 23 per cent., the oxygen being a little heavier than the nitrogen.

Preparation.—Of accomplishing this there are many methods besides that of Priestley, above referred to. Peroxides of manganese and barium both evolve oxygen when strongly heated. Peroxide of barium will take the oxygen up again at a lower temperature from a current of moist air, and the alternation of these two operations upon this peroxide, or, which is the same thing, upon anhydrous baryta, constitutes Boussingault's method of making oxygen. The method of Tessie du Motay, by which oxygen has of late years been manufactured for illuminating purposes, consists in the alternate exposure to a current of air and of steam of a salt of manganic acid. Sulphuric acid will evolve oxygen from a number of substances when heated therewith, such as bichromate of potash, permanganate of potash, peroxide of manganese, peroxide of lead, etc. It may also be obtained by electrolysis of water. Deville and Debray proposed two new methods, both of which furnish it at first in admixture with sulphurous oxide gas, one being to pass sulphuric acid in vapor over heated platinum, the other to heat white vitriol, or sulphate of zinc, to a high temperature. The method still in most general use, both in chemical laboratories and in the manufacture of oxygen for commerce, is to heat chlorate of potash to fusion. The evolution of the oxygen is greatly facilitated and hastened by pulverization of this substance and mixture with small proportions of certain metallic oxides, peroxide of manganese being generally used.

Chemical Properties.—A colorless and inodorous gas which has given no indications of reduction to a liquid under the heaviest pressures, assisted by the intensest cold attainable. It is magnetic—more so than any other gaseous substance. Its density, air being unity, is 1.10561. Bunsen found that ice-cold water can hold in solution 4.111 per cent. of its volume of oxygen, and water at 20° C. (= 68° F.) only 2.838 per cent. When pure, it manifests the most energetic affinities, and when inhaled soon destroys instead of sustaining life, by reason of an abnormally rapid oxidation of the blood. (See NITROGEN.) A combustible body, as a charred splinter of wood, a candle with a snuff upon it, or the like, if having but a spark of fire adherent, instantly kindles into flame when immersed in oxygen. In this way it may be distinguished from all other gases except laughing gas, which has the same power. Oxygen will itself burn with flame in an atmosphere of a combustible gas like hydrogen—a phenomenon now commonly exhibited as a lecture-room experiment. Even gaseous ammonia may be substituted for the hydrogen in this experiment. Oxygen is equivalent to two equivalents of hydrogen, chlorine, or other monadic element, and is therefore a dyad. When it burns with hydrogen, two volumes of the latter combine with one volume of oxygen, and the three volumes condense to two volumes of steam; but whether this condensation is on the part of the hydrogen or of the oxygen, or of both, is as yet matter of speculation.

Uses of Oxygen.—Outside of the applications of oxygen as a purely scientific and analytical agent in the chemical laboratory, its practical uses have not yet been developed to any great extent, in consequence of the large expense of obtaining it free from nitrogen. Dr. Hare's applications of it for producing intense heat for fusing metals, and intense light by the invention properly called Hare's lime-light, remain yet the most important uses. In France some hundreds of pounds of platiniridium have recently been melted at once by Hare's method. Deville and Debray have made an important improvement by enclosing the burning jets of mixed oxygen and hydrogen with the material to be melted in crucibles and small furnaces, built of blocks of quicklime, which is not only highly refractory, but a most powerful non-conductor of heat. A modification of Hare's light, in which the light of rich hydrocarbon gases is greatly enhanced and improved by a current of oxygen, has of late years been persistently tried in Paris, Vienna, New York, and Buffalo by Tessie du Motay and his associates; and if the estimates maintained as to the cost on a large scale of manufacturing pure oxygen by the new and beautiful methods of this ingenious chemist shall be justified in practice, we shall doubtless have very magnificent modes of illumination in connection with petroleum and petroleum-gas arising out of these inventions. Such result is greatly to be hoped for

otherwise, as cheap oxygen will be a most valuable agent in many arts of civilization.

Genesis of Oxygen.—Science seeks to assign causes for all known phenomena. Few known phenomena are more extraordinary than that of the highly oxygenated atmosphere of the earth. The crust of the earth is amply charged with combustible matter sufficient to combine with and appropriate *all* the oxygen of the atmosphere. It appears on a little calculation that a content of pyrites in the solid rocks of the earth's crust, amounting, on an average, to one-thirtieth of one per cent., in a layer of such rock only five miles in depth, would, on complete combustion to ferric sulphate, absorb all the oxygen of the atmosphere. And there is every reason to believe that such metallic sulphides in the rocks do actually and potentially represent a large part of the oxygen of the atmosphere—all that is not in the same way represented by the carbonaceous matter in the rocks—and that the oxygen now free was once partly contained in the waters of a primeval or prozoic ocean as metallic sulphates, and partly in the prozoic atmosphere in the form of carbonic acid gas, and that this prozoic atmosphere contained *no free oxygen*. These views were taken by the present writer in a communication to the American Association in 1869, and it was at the same time pointed out that we know no mode of genesis of oxygen except the respiratory action of the leaves of plants under the power of the solar ray, and therefore that the potential energy, the life, animal heat, and combustion now dwelling and proceeding upon the earth, have had, through this channel of oxygen-genesis, for the first time pointed out, their sole origin in the sun.

Ozone.—This is a modification of oxygen, known sometimes as "active oxygen," which, up to this time, stands almost if not altogether alone in some respects. Allotropic modifications of solid and liquid substances are exceedingly common, and will soon be recognized as almost indefinite in number, but those of gaseous bodies are little known, ozone being the only one that has been at all studied. As in the case of all allotropic changes, when oxygen passes to the form of ozone there is found to be a change of volume, and, as has already been stated under ISOMERISM (which see, minor head *Allotropism*), a *thermal* disturbance also. Ozone is formed when oxygen is submitted to various agents and operations. The electric spark and the slow oxidation of phosphorus are two of the most familiar. The oxygen formed by electrolysis contains it, also that evolved from a mixture of sulphuric acid and permanganate of potash. The American chemist Oscar Loew found it as a general product of flame in air. It is always readily detectable, when masking odors are absent, by its very singular and characteristic odor, which, once perceived, is always recognizable again. Other tests and other properties of ozone of extreme interest will be found described in the chemical text-books, to which we are forced to refer for them. HENRY WURTZ.

Oxygenated Water. See HYDROGEN PEROXIDE.

Oxygen, Medicinal Uses of. Oxygen is locally irritating to raw surfaces, exciting inflammation if too long applied. Inhaled in health with proper precautions to remove carbonic acid and other products of expiration from the inspired gas, it is perfectly respirable, and does not produce much substantial change in the rate of performance of the functions. This circumstance is accounted for by the fact, proved by experiment, that in health the blood can take up as much oxygen from ordinary atmospheric air as when supplied with the pure gas—in other words, as much as it is capable of absorbing—the only difference in the two cases being that where oxygen alone is breathed the highest point of saturation is reached more speedily than where air is employed. But when from any cause there is defective respiration, and the system suffers in consequence from imperfect oxygenation of the blood, the inhaling of pure or slightly diluted oxygen, by enabling something like the normal quantity of the gas to be presented to the blood at each inspiration, affords prompt and decided relief, and is, of course, *pro tanto*, of great benefit. Hence, in such affections as asthma, pulmonary emphysema, croup, diphtheria, dyspnœa from heart disease, etc. inhalations of oxygen are often exceedingly useful. In other diseases, generally those of mal-nutrition, such as consumption of the lungs, anæmia, severe dyspepsia, indolent ulcers, etc., experience has shown that in some cases much benefit has followed inhalations of oxygen. But where ulceration or active inflammation is present the use of the gas requires care, lest its irritant effects do harm. Oxygen for medicinal use must be perfectly pure, and is best prepared by decomposition of potassium chlorate. It is inhaled from a bag connected with the mouth by a tube provided with a proper mouthpiece to keep the expired air from mixing with the gas; and the nostrils being left free, enough air is at the same time inspired to somewhat dilute the oxygen. Inhalations morning and evening of from one to four gallons generally suffice in chronic affections, but in acute disease the amount must be determined by the necessities of the case. For medicinal use, cylinders holding from 100 to 200 gallons of gas compressed into a moderate compass are exceedingly convenient as portable reservoirs from which to supply the inhaling apparatus. EDWARD CURTIS.

Oxyhy′drogen Blow′pipe, a piece of apparatus invented in 1801 by Dr. Robert Hare of Philadelphia for the purpose of producing a very high temperature by burning hydrogen and oxygen together. It is now extensively used for melting platinum and for producing the Drummond light, by rendering a piece of lime intensely hot. The best form is a jet consisting of a tube for the delivery of oxygen, with a larger tube around it, the hydrogen being delivered through the annular space. (See *Am. Chemist*, v. 77 and 372.)

Oxynot′idæ [from *Oxynotus*—Gr. ὀξύς, "sharp," and νῶτος, the "back"—the generic name], a family of selachians of the order of sharks or squali, distinguished by the armature of the dorsal fins. The body is contracted rather abruptly; behind the dorsal and ventral fins and about the middle is trihedral in section, the sides being compressed towards the back, which is ridge-like (and hence the name); the scales are spiny; the head rather small, oblong, with a snout moderately protuberant; nostrils inferior, but far from the mouth; mouth with the cleft rather small and mostly transverse; teeth in numerous rows; branchial apertures five, all in front of the pectorals; spiracles large, behind the eyes; dorsal fins two, large, armed with robust spines, the first behind the pectorals, with a spine arising in the posterior part of the fin; the second above the ventrals, with the spine anterior; anal absent; tail elongated, with the caudal fin not notched; pectorals with a narrow base; ventrals far behind. The family has been proposed for a single known species (*Oxynotus centrina* or *Centrina Salviani*), found in the Mediterranean Sea. The species attains, generally, a length of little more than, if as much as, three feet. THEO. GILL.

Ox′ysalts, salts or neutral compounds (neither acid nor basic) formed by the saturation of an oxygen acid by an oxygen base. The term is necessary to distinguish this class of compounds from the other large class of salts called by Berzelius haloid salts, which contain no oxygen, being formed by the combination of a metal with one of his halogen group of elements, chlorine, bromine, iodine, and fluorine. To this latter class common salt, $NaCl$, belongs, and is therefore not an oxysalt. To the oxysalts belong, for example,

Sodic sulphate, $Na_2O.SO_3$,
Potassic chlorate, $K_2O.Cl_2O_5$. H. WURTZ.

Oxysul′phides, compounds formed by the joint combination of sulphur and oxygen with a metal or other element. They are not very numerous or important.

O′yer [L. Fr. *oyer*, from Lat. *audire*, to "hear"]. By the common law rules of pleading, a party to an action who alleged in his pleading any deed upon which he based his claim or his justification in defence was required to make profert of such deed (that is, to allege its production in court), and thereupon the other party was entitled to demand oyer of the deed, or to hear it read. Anciently, the pleadings were entirely oral, and profert then consisted in actually bringing the deed into court, and upon a demand of oyer it was read aloud by the party introducing it. But at an early period it became the practice to conduct the pleading by written instruments, which were delivered by the parties to each other, and profert was made by a formal allegation that the deed was brought into court, though in fact the party pleading it retained it in his own custody. The usual formula in making profert was this: "one part of which said indenture" (or other deed), "sealed with the seal of the said defendant" (or "plaintiff"), "the said plaintiff" (or "defendant") "now brings here into court," etc. Under this system of practice a demand of oyer was made in writing upon the party alleging the deed, who was then bound to deliver it into the other's hands for inspection, and, if required, to leave with him a copy. This was deemed equivalent to an actual reading of the deed in court. The rule permitting oyer was established in order that a party whose interests were affected by the alleged deed might have an opportunity to learn its entire contents or to ascertain its genuineness, and thus be enabled to prepare his answer or defence. The party alleging a deed was not required by the rules of pleading to set forth the entire instrument in every case, but only so much of it as was material for the purpose of establishing his claim or defence. This privilege of demanding oyer was, therefore, of much importance, since it enabled the other party to acquaint himself with facts involved in

the question at issue, of which knowledge could not otherwise be obtained, and which might be essential to the protection of his rights and interests. Oyer could be demanded only in cases where profert was necessarily made. If profert were made in cases where the law did not require it, or if it were omitted when it ought to have been made, there would be no right to demand oyer. If, however, oyer were demanded in a proper case, and the party obtaining it had occasion to found his answer upon any matter contained in the deed, but not set forth by his adversary, he would be obliged to set forth the entire deed in his own pleading. The effect of this would be the same as if the contents of the deed had been stated originally by the party making profert, and it might be demurred to as if it were a part of his pleading. (See DEMURRER.) Oyer was demandable only of deeds or instruments under seal, and of letters testamentary or of administration, and not of private writings having no seal. The practice of demanding oyer has generally been superseded in modern times by more convenient methods, which have been established for accomplishing the same object. In England it was abolished by the Common Law Procedure Act adopted in 1852. The English rule at present in force is that "any party may, without filing an affidavit, apply to a judge for an order directing any other party to the action to make discovery on oath of the documents which are or have been in his possession or power relating to any matter in question in the action." Moreover, every party in an action may obtain an inspection of documents referred to in another party's pleadings by sending a notice in writing to produce such documents for examination. Any party not complying with such a notice is debarred from introducing the documents in evidence in his own behalf, unless he refuse for good and sufficient cause. (*Supreme Court of Judicature Act*, as amended, 38 and 39 Vict., ch. 77, order 31 (1875).) In New York it is provided that the court before which an action is pending, or a judge thereof, may, upon due notice, order either party to give to the other an inspection and copy, or permission to take a copy of any books, papers, and documents in his possession containing evidence relating to the merits of the action or the defence therein. In case of refusal, the paper may be excluded from being given in evidence or the party may be punished (N. Y. Code, § 388). Similar provisions exist in other States. GEORGE CHASE. REVISED BY T. W. DWIGHT.

O'yer and Ter'miner [Fr., to "hear and determine"]. In English practice, courts of oyer and terminer are tribunals having criminal jurisdiction which are held before the queen's commissioners, among whom are usually included two judges of the superior courts at Westminster, in every county of the kingdom. In most of the counties sessions are held twice in each year. The name of these courts is derived from the language of the commission by which the judges are empowered to act. They are directed "to hear, inquire, and determine" all treasons, felonies, and misdemeanors. They can only proceed upon indictments found at the same assizes in which the trial is had. (See ASSIZE.) Upon occasions of special emergency, as when there is a sudden insurrection or riot, or flagrant public outrage which demands speedy redress, a special commission of oyer and terminer is ordinarily issued to expedite the administration of justice and to assist the regular courts in disposing of the increase of business. The course of proceeding is substantially the same as in the courts organized under the general and ordinary commissions. In the U. S. the phrase oyer and terminer is not infrequently employed as a designation of criminal courts, but the extent of the particular jurisdiction which they exercise and the mode of their organization are generally determined by express statutes. In New York this is the highest court of original jurisdiction in criminal cases.
GEORGE CHASE. REVISED BY T. W. DWIGHT.

Oys'ter, the English name common to the species of the family Ostreidæ and genus *Ostrea*. All the species of the genus are much alike, and agree in the following characters: The animal has the mantle margin double and finely fringed; the gills are nearly equal; the lips plain; the palpi triangular and attached; the shell is irregular and rough; the left valve adherent and convex; the right free and flat or concave; the umbones moderately prominent, and not or scarcely incurved; the hinge toothless; the ligamentary cavity elongated. The genus is almost cosmopolitan in range, but not represented in the polar seas. About 70 recent species have been recognized by various authors, but the true species are probably considerably less. The most notable are the oysters of Europe (*Ostrea edulis*) and the Eastern U. S. (*Ostrea virginiana*). The former is a comparatively small species, found generally in the European seas, and has a coppery flavor; the latter is the common large American species, and its great headquarters are the waters of Chesapeake Bay: it has none of the coppery taste characteristic of the European species. Both species (and indeed almost all of the genus) are subject to considerable variation in form, and the American has by some authors been differentiated into two—a northern roundish form (*Ostrea borealis*), and a southern longish one (*Ostrea virginica*)—but these intergrade into each, and are apparently simply varieties of a single polymorphic species. As is well known, the species are the objects of an extensive industry, and to a large extent artificially propagated and raised. THEODORE GILL.

Oys'ter Bay, post-v. and tp., Queens co., N. Y. The tp. extends across Long Island from the sound to the Atlantic, and includes 12 villages. Pop. 10,595.

Oyster-catcher, a name given to various wading birds of the Turnstone family and of the genus *Hæmatopus*. The U. S. have 3 species, *H. palliatus*, called the flood-gull, and *H. niger* and *ater*, the last two from the Pacific coast. *H. ostralegus* of Europe is by some regarded as identical with the first-mentioned species. It is called the sea-pie in England, is a very handsome bird, and the species feed on mollusks and insects.

Oyster-plant. See SALSIFY.

Oys'terville, post-v. and tp., cap. of Pacific co., Wash. Ter., on Shoalwater Bay. Pop. 104.

Ozæ'na [Gr. ὄζαινα, from ὄζειν, to "have an offensive smell"], a disease of the nose, characterized by a discharge of fetid muco-purulent matter from the nostril. It may depend upon caries, and may be a symptom of cancer, syphilis, glanders, or scurvy. It often follows scarlatina, or even a severe cold. General tonic treatment, good food, and weak local disinfectants are indicated in simple ozæna; but if there be caries, or any specific disease of which it is a symptom, such disease will require attention.

Ozaka. See JAPAN.

O'zan, post-v. and tp. of Hempstead co., Ark., on the Little Missouri River. Pop. 4405.

Ozanam' (ANTOINE FRÉDÉRIC), b. at Milan Apr. 23, 1813; studied law at Lyons and Paris; was appointed professor of foreign literature at the Sorbonne in 1844, and d. at Marseilles Sept. 8, 1853. He was a very fervent but liberal Roman Catholic. He wrote *Dante et la Philosophie catholique au Treizième Siècle* (1839), *Études germaniques* (2 vols., 1847–49), which twice received the great Gobert prize, *La Civilisation au Cinquième Siècle* (trans. by Ashley C. Glyn, 2 vols., 1868), *Les Poètes franciscains en Italie au Treizième Siècle* (Paris, 1850). His collected works appeared, with a preface by Ampère, at Paris, 1862–75, in 11 vols., 8vo.

Ozark', county of Missouri, bounded S. by Arkansas. Area, 648 square miles. It is rough and well timbered, with fertile valleys. Tobacco, corn, and wheat are staple products. Cap. Gainesville. Pop. 3363.

Ozark, post-v. and tp., Dale co., Ala., has 1 newspaper. Pop. 1720.

Ozark, post-v. of White Oak tp., cap. of Franklin co., Ark., on the Little Rock and Fort Smith R. R., has 3 schools, 1 newspaper, and stores. Principal employment, farming. Pop. 210. G. L. BROWN, ED. "BANNER."

Ozark, post-v. and tp., Anderson co., Kan. Pop. 617.

Ozark, post-v., cap. of Christian co., Mo., has 2 newspapers and valuable lead mines. Pop. 400.

Ozark, tp. of Lawrence co., Mo. Pop. 1752.

Ozark, tp. of Texas co., Mo. Pop. 638.

Ozark, tp. of Webster co., Mo. Pop. 3488.

Ozark Mountains, a series of steep and heavily timbered ridges of Southern Missouri, extending into Arkansas and the Indian Territory. They are nowhere of great elevation. They are believed to possess great mineral wealth.

Ozau'kee, county of Wisconsin, bounded E. by Lake Michigan. Area, 230 square miles. It is level and fertile, and produces good crops of grain. It has varied and important manufacturing interests. The county is traversed by the Milwaukee and Northern railway. Cap. Ozaukee. Pop. 15,564.

Ozaukee, post-v. and tp., cap. of Ozaukee co., Wis., on Lake Michigan, has 2 newspapers.

Ozaw'kie, post-v. and tp., Jefferson co., Kan., on the Sautrelle River and Atchison Topeka and Santa Fé R. R. Pop. of tp. 1600.

Ozie'ri, town of Sardinia, province of Sassari, about 1000 feet above the sea. In the neighborhood are found many of the round towers called *nuraghe*, for a description of which see La Marmora, *Viaggio in Sardegna*. Pop. 7965.

Ozone. See OXYGEN.

P.

P, a consonant of the class of labial mutes. It is very readily exchangeable with the vocalized labial *b* and the aspirated mute *f*, and even with other mutes and labials, but not especially so in English. P. is an abbreviation for *Pater*, "father;" PP., for "fathers;" p., for "page;" pp., for "pages." P, in chemistry, designates phosphorus. In Latin, P. stands for the proper name Publius. In music, *p.* means *piano*, "soft;" *pp.*, *pianissimo*, "very soft."

Pa'ca, the *Cœlogenys paca*, one of the largest of rodent mammals, a native of S. and Middle America. It is 2 feet long and generally dark brown with streaks and patches of white. The zygomatic arch is prodigiously developed, so that the cheek pouches are protected by a bony case. Its tail is very small. It is destructive to sugar-cane and other growing crops, burrows in the earth, and is remarkably cleanly in its habits. It is clumsy in build, but very active. When wild it bites fiercely if hard pressed. In captivity it is harmless and somewhat stupid. It is valued as food, but is usually very fat and oily. Its fur is worthless, but its thick skin makes a good leather.

The Brown Paca.

Paca (William), b. at Wye Hall, Harford co., Md., Oct. 31, 1740; graduated at Philadelphia College 1758; studied law in the Middle Temple, London, and became a lawyer at Annapolis, Md.; was a leading patriot in 1774; was in Congress 1774–79, and again 1786; signed the Declaration of Independence; was in the State senate 1777–79; chief-justice of Maryland 1778–80; chief-justice of the State court of appeals for admiralty and prize cases 1780–82; governor of Maryland 1782, 1786; was in the convention of 1788 which ratified the U. S. Constitution; was a U. S. district judge 1789–99. He was a gentleman of wealth and liberality and of elegant habits, and was a very popular public officer. D. in 1799.

Pacchion'ian Bodies [*glandulæ Pacchioni*, named in honor of Antonio Pacchioni, 1665–1726, their discoverer], a group of numerous small whitish bodies found, in man, on the inner and outer surfaces of the dura mater, and also within the superior longitudinal sinus and on portions of the pia mater, whence, indeed, they are originally developed, making their way outward into the dura mater and producing, by pressure and absorption, little depressions in the inner surface of the skull. They are very rarely found in subjects under three years of age, and are sometimes absent in adults. They are not glands, but fibrocellular nodules. Their use is not known.

Pachacamac', a village of Peru, seven leagues from Lima, is noted for the ruins of the splendid old Indian city of Pachacamac, which cover the surroundings.

Pache'co, post-v. of Contra Costa co., Cal., at the head of navigation, on Pacheco Slough, is the shipping-port for the Diablo and San Ramon valleys.

Pachi'no, town of Sicily, province of Syracuse, pleasantly situated on the sea-coast near Cape Passero or Pachino, from which it takes its name. The little harbor, known by the Romans as *Pachyni Portus*, serves as a shelter, in case of sudden tempests, for the numerous tunny-fishermen of this vicinity. The town is unhealthy from the almost constant prevalence of the sirocco during the winter months. Pop. in 1874, 6452.

Pachomius. See Monachism.

Pachyderm'ata [Gr. παχύς, "thick," and δέρμα, "the skin"], a name applied by Cuvier as an ordinal term to all the non-ruminant ungulates; *i. e.* (1) Ungulata Perissodactyli, (2) Ungulata Artiodactyli Omnivora, (3) Hyracoidea, and (4) Proboscidea. To the same group have also been referred by some (*e. g.* Agassiz, Kneeland, etc.) the Sirenian mammals, and even (*e. g.* by Wyman and Girard) the walrus. Some extinct forms, regarded by some authors as peculiar orders (Toxodontia, Dinocerata, and Tillodontia), would also be referable to the group as defined by Cuvier. The group is now discarded as a heterogeneous compound, and information regarding its members will be found under the heads enumerated. T. Gill.

Pachyu'ra [from παχύς, "thick," and οὐρά, "tail"], a sub-order of Raiæ characterized by the more or less stout and fleshy caudal region of the body, and the development thereon of rayed fins, thus contrasting with the masticura, or rays with a whip-like tail. There is, however, a regular gradation from the shark-like form of the saw-fishes to the comparatively slender tail of the rays. The sub-order includes the families Raiidæ, Rhinobatidæ, Rhamphobatidæ, Pristidæ, and Torpedinidæ. T. Gill.

Pacif'ic, county of Washington Territory, bounded W. by the Pacific Ocean and S. by the Columbia River. Area, about 1500 square miles. It contains the large inlet called Shoalwater Bay. It is principally covered with forests and has ores of silver. Its surface is mostly broken and elevated. Cap. Oysterville. Pop. 738.

Pacific, tp. of Humboldt co., Cal., on the Pacific seaboard. Pop. 818.

Pacific, post-v. of Franklin co., Mo., at the junction of the Atlantic and Pacific and the Missouri Pacific R. Rs., $37\frac{1}{2}$ miles W. of St. Louis, has a public school, 2 churches, 1 flouring-mill, 1 newspaper, and stores. Rich deposits of iron, lead, copper, and glass-sand exist in the neighborhood. Pop. 1208. James H. Combes, Ed. "Democrat."

Pacific, post-v. and tp., Columbia co., Wis. The township contains Portage, cap. of county. Pop. 247.

Pacific Ocean. See Ocean.

Pacific, University of the, located in Santa Clara Valley, 50 miles S. of San Francisco, chartered in Aug., 1851, under the auspices of the Methodist Episcopal Church; the preparatory department opened in May, 1852; in 1854 the college proper was formed. Sept. 22, 1858, the college of medicine was inaugurated in San Francisco, being the first medical college in the State. In 1871 a fine building was erected between Santa Clara and San José, one and a half miles from each city, and both sexes admitted to the same classes. The library is small, and the apparatus and cabinet are sufficient for illustration. The presidency has been occupied in succession by Rev. E. Bannister, D. D., Rev. Thomas Sinex, D. D., and Rev. A. S. Gibbons, A. M., M. D. It has a faculty of seven professors. A. S. Gibbons.

Pacin'ian Cor'puscle. The corpuscles of Pacini or Vater are peculiar structures found as peripheral nerve terminations. They are met with in the subcutaneous layer on the palms of the hands and soles of the feet, numbering in these situations, with those of the palmar surfaces of the phalanges, from 600 to 1400. On the sympathetic nerve plexuses and in the region of the aorta, behind the peritoneum near the pancreas, and sometimes in the mesentery, these bodies are to be seen. Their shape in man is oval or like an egg, having a diameter from one-twentieth to one-sixth of an inch. The structure seems to consist of several concentric layers of connective tissue surrounding the terminal extremity of a nerve-fibre. The connective tissue capsules are made up of either homogeneous or fibrillar substance, or both, through which elongated cells and nuclei are scattered. A mosaic marking has been demonstrated over the inner surface of the concentric membranes, due to a layer of epithelium; while a few blood-vessels ramify over the laminæ. Passing into the interior of the several layers just described may be

seen the nerve, which carries the oval enlargement as the stalk carries the berry. Up to the point where the nerve-fibre enters, it consists of its various sheaths surrounding the *axis cylinder;* as the fibre penetrates the several layers both tubular membrane and medullated sheath disappear, and the naked axis cylinder extends to the innermost layer of connective tissue, generally showing a forked or bifid termination. The corpuscle seems to be one of the modes of termination of the nerves of general sensibility. (See HISTOLOGY.) J. W. S. ARNOLD.

Pack'ard (ALPHEUS SPRING), D. D., a clergyman of the Congregational denomination, b. at Chelmsford, Mass., Dec. 20, 1799; graduated at Bowdoin College in 1816; was a college tutor 1819–24; professor of Latin and Greek languages and literature in Bowdoin College 1824–65, and in 1864 was made Collins professor of natural and revealed religion. He has published the *Writings* of Jesse Appleton, with a memoir (1837), Xenophon's *Memorabilia* with notes (1839, 3d ed. 1843), *History of the Bunker's Hill Monument Association* (1853), contributions to Sprague's *Annals*, etc.

Packard (ALPHEUS SPRING, JR.), M. D., b. at Brunswick, Me., Feb. 19, 1839; graduated at Bowdoin College 1861; studied natural history three years under Agassiz in the museum of comparative zoology at Cambridge, devoting himself particularly to entomology; graduated in medicine at the Maine Medical College 1864; made several scientific expeditions; has been for several years lecturer on entomology at Bowdoin College, a curator of the Peabody Academy of Sciences at Salem, Mass., and one of the editors of the *American Naturalist*, published by that institution, and established the *Annual Record of Entomology* 1868. Author of *Observations on the Glacial Phenomena of Labrador and Maine, with a View of the Recent Invertebrate Fauna of Labrador* (4to, 1867), *A Guide to the Study of Insects* (1869), *Our Common Insects* (1873), and *Half Hours with Insects* (1875).

Packard (FREDERICK ADOLPHUS), LL.D., b. at Marlborough, Mass., Sept. 26, 1794; graduated at Harvard 1814; studied law at Northampton, Mass., and was 1817–29 a lawyer at Springfield, Mass., and editor of the *Federalist* newspaper of that town; was 1829–67 editor of the publications of the American Sunday School Union, Philadelphia; edited also for many years the periodicals of that society and the *Journal of Prison Discipline;* author of the *Union Bible Dictionary* (1837), *The Teacher Taught* (1839), *Life of Robert Owen* (1866), and many other works. Declined in 1849 the presidency of Girard College. D. Nov. 11, 1867.

Packard (LEWIS RICHARD), PH. D., b. at Philadelphia, Pa., Aug. 22, 1836; graduated at Yale College 1856; travelled in Europe; pursued an extended course of study at the University of Berlin; became assistant professor of the Greek language and literature in Yale College 1863, and professor in 1866, and has occasionally written articles upon literary or classical topics for various periodicals.

Pack'er, tp. of Carbon co., Pa., on Lehigh River. Pop. 441.

Packer (WILLIAM FISHER), b. in Howard tp., Centre co., Pa., Apr. 2, 1807, of Quaker ancestry; learned the printer's trade in Sunbury and Bellefonte; became a clerk in the register's office of Lycoming co. 1825; worked as a journeyman printer 1825–27; studied law, and in 1827 became a journalist of Williamsport, Pa.; was 1832–35 superintendent of the West Branch canal construction; became in 1836 a Democratic journalist of Harrisburg; was (1839–42) one of the canal commissioners; in 1842–45 auditor-general of Pennsylvania; was (1847–49) Speaker of the house; State senator 1849–51; became president of the Susquehanna R. R. 1852; was governor of Pennsylvania 1858–61.

Pack'fong, the commercial name of the Chinese *petung*, or white copper, an alloy resembling German silver in appearance, but composed of arsenic and copper fused at a low temperature, 2 parts of arsenic to 5 of copper. It was once extensively exported to Europe and employed in making philosophical instruments and a great variety of other goods. It cannot be fused, for the copper alone will remain after melting. Of late the great variety of cheaper white alloys have driven this substance out of the European market. It is probable that the Chinese often manufactured packfong directly from arsenical copper ores.

Packwau'kee, post-v. and tp., Marquette co., Wis., on Wisconsin River. Pop. 612.

Pack'wood, tp. of Tulare co., Cal. Pop. 214.

Pac'olett, tp. of Spartanburg co., S. C., on the Spartanburg and Union R. R. Pop. 1312.

Pacto'lus [Πακτωλός, now *Sarabat*], a small stream of Lydia in Asia Minor, flows from Mount Tmolus into the Hermus. It is barely 10 feet wide and a foot deep. It was formerly famous for the gold contained in its mud. This was the source of the wealth of Crœsus. But for many centuries no gold has been obtained here.

Pactolus, post-v. and tp., Pitt co., N. C., on the Tar River. Pop. 2060.

Pacu'vius (MARCUS), b. at Brundisium about 219 B. C.; lived in Rome; became celebrated as a painter and tragedian; retired when an old man to Tarentum. D. there about 130 B. C. It is probable that he also wrote *Saturæ* and comedies, and his tragedies, which were not mere translations from Greek writers, but often original treatments of subjects from the Roman history, were still appreciated at the time of Julius Cæsar. The fragments of his tragedies which have come down to us are found in Bothe's *Poetarum Latii Scenicorum Fragmenta*, Leipsic, 1834, and in Ribbeck's *Tragicorum Latinorum Fragmenta*, Leipsic, 1852, 2d ed. 1871.

Padang' is a territory of the Dutch dominions on the W. coast of Sumatra, in the West Indies, consisting of the districts of Upper and Lower Padang, and containing the city of Padang, the capital of the territory, situated at the mouth of a river of the same name, in lat. 1° S. The territory comprises some of the loveliest regions found anywhere in the tropical zone. Only the low and marshy coastland is oppressively hot and unhealthy; the slopes of the high, volcanic mountains have a delicious climate and an exceedingly fertile soil, producing coffee, pepper, indigo, and caoutchouc, and yielding gold, iron, copper, quicksilver, and diamonds. Coffee is most extensively cultivated in Upper Padang; the district is said to contain 32,000,000 trees. The city, which is the residence of the governor, contains a Malay population living in bamboo huts on the left bank of the river, and a population of Europeans and Chinese living in houses of stone on the more elevated right bank. The place is unhealthy, but it carries on a most extensive trade. Pop. 12,000.

Pad'dle-fish, the *Polyodon folium*, a fish of the Mississippi, Ohio, etc., remarkable for having the nose prolonged into a thin bony appendage, sometimes about as long as the body. It has no scales, is five feet long, has a tough but eatable flesh, and uses its snout for the purpose of digging in the mud in search of food. It has a bluish back and a white belly. It is also called spoonbill and shovel-fish, but the latter name belongs to *Scaphirhynchops cataphractes*, a fresh-water sturgeon.

Pad'dock (BENJAMIN HENRY), D. D., b. at Norwich, Conn.; graduated at Trinity College 1848, at the Episcopal General Theological Seminary, New York, 1852; was an assistant at Epiphany church, New York, 1852–53; rector of Trinity, Norwich, Conn., 1853–60; of Christ church, Detroit, Mich., 1860–69; of Grace church, Brooklyn, 1869–73, and was consecrated bishop of Massachusetts Sept. 17, 1873.

Pa'derborn, an old, queer, and gloomy town of Prussia, province of Westphalia. It has a beautiful cathedral in Byzantine style, under which the sources of the Pader burst forth, many good educational institutions, breweries, distilleries, and manufactures of tobacco, oilcloth, hats, and paper. Pop. 11,176.

Pad'iham, town of England, in Lancashire, on the Calder, has some cotton manufactures. Pop. 5676.

Padron', a v. of Spain, province of Corunna, is the place where the body of St. James landed itself in 829, for which reason it is much resorted to by pilgrims. Pop. 5076.

Pad'ua [It. *Padova;* Lat. *Patavium*], a town of Italy, situated in lat. 45° 24′ N., lon. 11° 52′ E. The city is a triangular enclosure, surrounded by a wall 8½ miles in extent, the base of the triangle being towards the W. The vast plain of Venetia extends to the limits of the horizon on all sides except to the S. and W., where it is broken by the Euganean Hills. Padua is in full railway communication with Venice and Lombardy, as well as with Southern Italy. The walls of the town are remarkable for the great size and strength of their bastions, and three of the seven gates are very fine. The Bacchiglione, a tributary of the Brenta, after entering the town, divides into two branches, and from these a complete network of small canals, some open, others subterranean, intersects the city. These canals are crossed by 25 bridges, 4 of which are of the time of Augustus. After issuing from the town the Bacchiglione falls into the Brenta at Strà, thus forming a navigable communication with Venice, 23 miles to the N. E. The streets of Padua are not generally attractive, being narrow and the houses high and built on arcades, but some of the squares, gardens, and public buildings are very fine. The Prato della Valle or Piazza delle Statue, now called Piazza Vittorio Emanuele, is an irregular triangle surrounded by

water and adorned with about 80 statues, besides much other tasteful decoration. The botanical garden is the oldest in Europe, and is very interesting. The municipal palace is a vast rhomboidal structure, built on arches and surrounded by *loggie*, and containing an immense and highly ornamented hall, the Sala di Ragione, which has given its name to the whole building, and is said to be the largest vaulted room in Europe: length 267½ feet; breadth 89 feet; height from floor to spring of arches 41 feet; to summit of arches 49 feet. The Caffé Pedrocchi is also unrivalled in its way, and is most richly adorned with ancient marbles excavated when the foundations of the edifice were preparing. The justly celebrated University of Padua originated in the early part of the thirteenth century, but the building it now occupies dates only from the close of the fifteenth. It is very large, and contains halls devoted to the illustration of almost every branch of human knowledge. The university library, 128,000 volumes, is in the Palazzo Capitanio. The usual number of students is about 2000. The church of Sant' Antonio (begun in 1232, finished in the fourteenth century) is a grand building of mixed architecture, surmounted by seven cupolas, the centre one of which is over the famous chapel containing the relics of St. Anthony, the wonder-working patron of the city. The magnificence of the interior can hardly be exaggerated. Without, near the façade, should be noticed the admirable equestrian statue of Gattamelata in bronze by Donatello. There are many other sumptuous churches—the Cathedral, Santa Giustina, Sant' Andrea, etc.—but the oratory of the Annunziata nell' Arena, commonly called the Chapel of Giotto, is of the highest interest to the art-student as containing the best preserved frescoes of that great master. The great antiquity of Padua is undisputed, but its certain history begins only with the Roman period. At the commencement of the Christian era it was the largest town of Northern Italy, was famed for its extensive and excellent woollen manufactures, and is said to have furnished from within its own walls a body of 20,000 men for the public service. It was, however, plundered both by Alaric and Attila, and only partially recovered under Charlemagne. In 1087 it became a republic, and in 1110, having formed an alliance with Ravenna and some other towns, it rashly attacked Venice, but was forced to sue for peace. After this Padua was governed for the most part by powerful nobles, now of the Guelph, now of the Ghibelline faction, until it fell in 1405 under the dominion of the most serene republic, in whose possession it remained almost uninterruptedly until France gave both Venice and Padua to Austria. In 1848 a provisory government was proclaimed here, but the Austrians soon recovered their power, and it was only in 1866 that Padua became a part of the united kingdom of Italy. There is as yet very little commercial or industrial activity in this town. Pop. in 1874, 66,107. CAROLINE C. MARSH.

Padua, post-v. and tp., McLean co., Ill., on the Toledo Wabash and Western R. R. Pop. 1249.

Padu'cah, city, cap. of McCracken co., Ky., on the Ohio River, near the mouth of the Tennessee River, and on the Paducah and Memphis and the Louisville Paducah and South-western R. Rs., was incorporated in 1856, has a county court-house, a city court-house, 15 churches, a female seminary, public and private schools, a number of mills, factories, and tobacco-houses, 2 daily, 4 weekly, and 2 monthly newspapers, and is the shipping port for a region whose productions are tobacco, grain, and pork. Pop. 6866.

Padu'la, town of Southern Italy, province of Salerno, situated on a hill above the river Tanagro. It was governed by a baronial house during the Middle Ages. Pop. in 1874, 8662.

Padus. See Po.

Pæ'an [Gr. παιάν, Παιών, properly a name of Apollo, or of the god of healing], among the ancient Greeks, a hymn of thanksgiving and joy, such as was sung especially before and after battles. The pæan was addressed to Apollo and afterwards to other gods, and even to men.

Pæonia. See MACEDONIA.

Pæonine (*coralline*), a red coloring-matter obtained by treating phenol with sulphuric and oxalic acids. (See PHENOL and ROSOLIC ACID.) C. F. CHANDLER.

Pæ'ony [Gr. παιωνία, probably from Pæon, the god of medicine, on account of its medicinal qualities], a name given to herbs and shrubs of the genus *Pæonia*, order Ranunculaceæ. The U. S. has but one native species, *P. Brownii*, of the Pacific States and British America. It has small purple flowers. The various Old World species are cultivated as ornamental plants. The flowers are generally showy. Of the many artificial varieties some are fragrant. All have a poisonous principle, and some species were once employed in medicine, but none are much used at present. The seeds and roots of some species are used as food by wild tribes in Asia and America. The finest varieties in garden-culture belong to *P. officinalis, albifolia, tenuiflora, paradoxa*, etc. The tree-pæony of Japan (*P. Moutan*) affords some very fine varieties.

Paër' (FERDINANDO), b. at Parma June 1, 1771; composed when only sixteen years old his first opera, *La Locanda de' Vagabondi*, which was well received; was director of the opera at Venice 1791–97; at Vienna 1797–1801; at Dresden 1801–06; at Paris 1807–27; then chapel-master to Louis Philippe, and d. at Paris May 3, 1839. He composed a great number of operas rich in light and brilliant melodies, enthusiastically received at their first appearance, but now mostly forgotten; the intrigues, however, by which he tried to keep down Rossini are not forgotten.

Pæsa'na (*Padusana*), town of Northern Italy, province of Cuneo, about 13 miles W. of Saluzzo. This town belonged to the marquisate of Saluzzo, but was sold in the fourteenth century to the house of Savoy. A very valuable iron-mine in this neighborhood was abandoned in 1780 for lack of fuel to carry on the works. Pop. in 1874, 7176.

Pæs'tum (*Posidonia;* It. *Pesto*), an ancient town of Southern Italy, on the Gulf of Salerno, about 40 miles S. E. of Naples. It is spoken of by Strabo as a Greek colony from Sybaris; it was afterwards taken by the Lucanians, who named it *Pæstum*, then by the Romans, and it was finally destroyed by the Saracens in the tenth century. In the eleventh century Robert de Guiscard stripped the abandoned city of some of its finest marbles, after which it seems to have been forgotten. The magnificent ruins which are now so celebrated were first made known to modern Europe in 1755 and described by Antonini in 1795. They consist, in the main, of crumbling walls and towers and of several more or less well-preserved temples. These are all built of travertine blocks from 6 feet to 8 feet in length and from 3 feet to 4 feet in width, the surfaces in contact being so smoothed and well fitted as to require no mortar; the external surface, in case of the temples, was covered with stucco. The walls form a pentagon 3 miles in circumference, the N. and E. sides being best preserved; one of the eastern gates still exists, and an old street of tombs is traceable beyond the ruins of another. Colossal porphyry and granite vases have been found here, and medals with figures of anchors, rudders, etc., both of the Greek and later periods. The chief interest of Pæstum, however, is in two very ancient Doric temples, sacred, one to Neptune, the other probably to Ceres, and a third, of unusual construction, called without reason the Basilica. The first, or that of Neptune, is 196 feet in length and 79 feet in width, with a peristyle of 36 fluted columns (28 feet in height, 7½ feet in diameter), supporting an architrave without moulding, and frieze with the usual triglyphs; the pediments at the two ends are surrounded by a cornice and are of similar architecture. The cella is of the same form as the exterior, has two rows of eight columns each, and these are surmounted by smaller ones to support the roofs of the aisles, the cella itself having been hypæthral or uncovered. The temple of Ceres (some say of Vesta), though less imposing, is still worthy the palmy days of Greek art. Between these two temples are the ruins of, probably, a Roman theatre and amphitheatre. The so-called Basilica, S. of the temple of Neptune, is held by some to be the most ancient of the three temples, as it is certainly the most ruinous; but most antiquaries regard it as of later date. It is remarkable for having nine columns in each façade, with a row of eighteen running down the centre. The malaria of this coast has left it almost without inhabitants, but neither this nor the danger from brigands prevents Pæstum from being frequently visited.

Paez' (Gen. JOSÉ ANTONIO), b. near Acarigua, Venezuela, June 13, 1790; entered the patriot army in 1810, and for victories over the Spanish rose to general of division 1819; took a leading part at the battle of Carabobo, which secured the independence of Colombia 1821; became military commandant of Caracas; opposed the new Colombian constitution 1826; was at the head of the revolution which culminated in the independence of Venezuela Sept., 1829; was the first president of the new republic; again elected 1839; was minister to the U. S. 1860–61; was made dictator 1861–62; again came to the U. S.; published his *Autobiography* (New York, 1867); visited the Argentine Republic and Peru, and returned to New York 1872. D. there May 6, 1873.—His son, RAMON PAEZ, resident for many years in New York, is author of *Public Life of José Antonio Paez* (1854), *Wild Scenes in South America* (1862), and *Ambas Americas Contrastes* (1872.)

Paga'ni, town of Southern Italy, province of Salerno, about 22 miles S. E. of Naples. This is a very old town,

and in the seventeenth century contained 3 universities, but is now a place of little interest. Pop. in 1874, 12,492.

Pagani'ni (Nicolo), b. at Genoa Feb. 18, 1784; gave, when nine years old, his first public concert as a violin-virtuoso in his native city, and produced an extraordinary enthusiasm by his performance of *La Carmagnole* and the variations he had put to this air. From 1805 to 1808 he was engaged as first violinist to the princess Eliza of Lucca, a sister of Napoleon, whose whole circle at Parma he put in the wildest excitement, especially by his sonata *Napoleon*, composed for one string. Afterwards he led for many years a most adventurous life, emerging suddenly from obscurity and oblivion, thrilling the inhabitants of some Italian town, or rather putting them into a fit of frenzy, by his violin, and then disappearing as suddenly, sometimes playing for bread in a market-place and sometimes refusing to play though a fortune was offered him. From 1828 to 1833 he made a concert tour from Vienna, through Germany, to Paris and London, and the sensation he produced by his extraordinary virtuosoship, by the novelty and peculiarity of his effects, and by the mystical glimmer which surrounded his life, has never been equalled before or since by any virtuoso. Wealthy, but with broken health, he returned in 1834 to Parma, where he bought the Villa Gajona, and d. at Nice May 27, 1840. His compositions, of which the *Carnival of Venice* is one of the most famous, have no very great musical worth, but for the violinist they are of course of immense interest.

Pa'ganism, as a name for heathenism, originated among the Christians when Christianity gained superiority in the cities and the worship of the old Greek and Roman gods was confined to remote villages (*pagi*) and the scattered settlers in the country (*pagani*). It is now used as a general term including all polytheistic religions in opposition to Christianity, Judaism, and Mohammedanism; in the Middle Ages it also included Mohammedanism. In Germany it is also applied to tendencies within Christianity itself which are deemed polytheistic in their nature, such as the worship of the Virgin and the saints in the Roman Catholic Church.

Paga'no (Mario), b. at Brienza, near Salerno, in 1748, and studied at Naples, where he formed a friendship with Filangieri. Being employed to prepare a sketch of a reformed code of criminal law, he wrote his *Considerazioni sul Processo Criminale*. After this appeared *I Saggi Politici* and several dramas of a national tendency. In the reaction following the French Revolution, Pagano defended with great warmth the liberals who were arrested at Naples. Being himself thrown into prison, he there produced his essays *Sul Gusto*, *Sulla Poesia*, and *Sul Bello*. On the proclamation of the Parthenopean republic he was appointed to prepare the new constitution. The republic being overthrown, he was accused of treason, and declined to make any defence. D. by the hand of the executioner on the 29th of October, 1799.

Page [akin to the Gr. παῖς, a "boy"], in feudal times, a boy employed to attend upon a knight or lady as an attendant and companion, rather than as a menial servant. Pages were a kind of apprentices to the future ranks of esquire and knight. They were often of noble blood. The practice survives in a modified form in European courts. The pages of the British court may receive promotion to commissions in the foot-guards. The houses of Congress in the U. S. employ a number of "pages" as attendants upon the members while on duty.

Page, county of S. W. Iowa, bounded S. by Missouri. Area, 576 square miles. It is well watered and very fertile, and produces live-stock, wool, and grain. The county is traversed by several beautiful river valleys and by a branch of the Burlington and Missouri River R. R. Cap. Clarinda. Pop. 9975.

Page, county of Virginia, bounded E. by the Blue Ridge, W. by the Massanutten Mountains, and traversed by the S. fork of the Shenandoah River. It is highly fertile, and abounds in limestone, iron, and copper. Grain and tobacco are leading products. Distilled liquors are the principal article of manufacture. Area, about 250 square miles. Cap. Luray. Pop. 8462.

Page (Charles Grafton), M. D., b. at Salem, Mass., Jan. 28, 1812; graduated at Harvard 1832; practised medicine in Virginia 1838–40, and in 1839–40 was professor of chemistry in Columbian College, Washington, D. C.; examiner in U. S. Patent Office 1840–68. When ten years old he made an electrical machine, and acquired distinction by his experiments and machines designed to develop the economic use of dynamic electricity as a motive-power. Author of *Psychomancy* (1853), of a treatise on electricity, and of many scientific papers. D. at Washington, D. C., May 5, 1868.

Page (David P.), b. at Epping, N. H., in 1816; was for some years principal of the New York State Normal School at Albany; author of a valuable work, *The Theory and Practice of Teaching, or the Motives of Good School-Keeping*, and of an *Elementary Chart of Vocal Sounds* (1847), which was one of the first attempts of the kind in the English language. D. in 1848.

Page (John), b. at Rosewell, Gloucester co., Va., Apr. 17, 1743; graduated at William and Mary College 1763; was an ardent patriot and leading statesman of Virginia during the Revolution, and held the lieutenant-governorship and other public offices; was in Congress 1789–97; a Presidential elector 1800; governor of Virginia 1802–05. D. at Richmond, Va., Oct. 11, 1808.

Page (John), b. at Haverhill, N. H., May 21, 1787; was a State legislator 1818–20 and in 1835; register of deeds for Grafton co., N. H., 1828–34; U. S. Senator 1836–37; a State councillor in 1838; governor of New Hampshire 1839–42. D. at Haverhill, N. H., Sept. 8, 1865. He was a leading Methodist and a prominent Freemason.

Page (Thomas Jefferson), b. in Virginia about 1815; entered the U. S. navy 1827; became lieutenant 1833; was engaged for many years upon the coast survey and subsequently in the China squadron; commanded the U. S. Exploring Expedition on the La Plata, Paraná, and Paraguay rivers 1853–56; became commander Sept., 1855; published *La Plata, the Argentine Confederation, and Paraguay* 1859; resumed and completed his explorations 1859–60, and served in the Confederate navy, attaining the rank of commodore.

Page (William), b. in Albany, N. Y., Jan. 23, 1811; came to New York City when eight years old. A precocious talent for art took him from the study of law, and afterward from divinity. He studied with Mr. Herring, the portrait painter, and with S. F. B. Morse; painted portraits in Albany and New York with eminent success, being even then distinguished by his skill in drawing and in color; executed a few compositions, a *Holy Family*, *The Infancy of Henri IV.*, and others; resided in Rome and Florence several years; returned to New York in 1860, and has since resided there. Page is known as an experimenter in color, and has painted many extraordinary pictures to illustrate his ideas—a *Flight into Egypt*, *Moses and Aaron on Horeb*. His *Venus* became famous; copies of Titian by him have been mistaken for originals of the master. Page has been president of the National Academy and has written and lectured on art. His last work of absorbing interest has been a reproduction of the head of Shakspeare from the Kesselstadt mask. He is a man of enthusiastic temperament and daring genius, poetic, eloquent, and engaging. O. B. Frothingham.

Pagès. See Garnier-Pagès.

Pa'get (Sir James), Bart., F. R. S., D. C. L., b. at Great Yarmouth, England, in 1814; educated in surgery at St. Bartholomew's Hospital; reached the highest honors of his profession, and was made a baronet 1871. Author of *Lectures on Surgical Pathology* (1853), and many contributions to the *Transactions* of learned societies.

Page'ville, a v. (Downington P. O.) of Scipio tp., Meigs co., O. Pop. 80.

Paging-Machine, an apparatus used for paging blank books, numbering checks, railway tickets, packages, etc. There are many machines of the kind, some of which are so arranged that it is impossible to print duplicate numbers with them without going twice through the whole series for which the machine is set.

Pa'go, an island in the Adriatic, belongs to Austria, and is separated from Croatia by the Strait of Morlacca. Area, 106 square miles. Pop. 4500. It is mountainous and not very fertile, but is rich in salt and excellently cultivated. Sheep, fish, wine, and salt are exported.

Pago'da [Pers. *but-gada*, the "house of idols"], a name applied to a great variety of East Indian temples and religious monuments, both Hindoo and Boodhistic. They are often of most elaborate and costly architecture, and not unfrequently are very beautiful. They are usually of stone, are mostly terraced pyramids, and in some instances are purely monumental, having no interior apartments; such buildings are more frequently Booddhistic. They have often slighter surrounding structures, which are used as sanctuaries or as the dwellings of priests. Such is the great pagoda of Rangoon. The principal Hindoo pagodas are dedicated to the worship of Siva and his wife Parvati.

Pahaquar'ry, post-v. and tp., Warren co., N.J. Pop. 405.

Pahlampoor' is a small state of Hindostan, tributary to Great Britain, and situated between lat. 23° 57′ and

24° 41′ N., and between lon. 71° 51′ and 72° 45′ E. Pop. 322,000, of whom one-seventh are Moslem. The capital, of the same name, is surrounded with walls, has an extensive trade, several manufactures, and 30,000 inhabitants.

Pahranagat Valley, tp. of Lincoln co., Nev. P. 39.

Pah U'te, county of N. W. Arizona. Area, 4360 square miles. It is bounded N. by Utah and separated from Nevada on the W. by Colorado River, which traverses the county in deep cañons. It is a dry and unfruitful region. Cap. St. Thomas.

Pah-Ute Indians, a tribe of degraded Indians of the Shoshone stock. They number some 6000, and are placed upon two reservations of 320,000 acres each, one on Walker River and one on Pyramid Lake in Nevada. They are quiet, harmless, and subsist upon fish, game, roots, and the like. They show some disposition to be industrious. Besides these, there are some 2500 wandering "Pi-Utes" in S. E. Nevada, a destitute and degraded class of savages.

Paige (Alonzo Christopher), b. at Schaghticoke, N. Y., July 31, 1797; graduated at Williams College 1812; was admitted to the bar in 1819; as reporter of the New York court of chancery 1828–46 he published 11 volumes of *Reports;* was in the New York assembly 1826–30; a State senator 1838–42; a justice of the State supreme court 1847–51, 1855–57, and was a member of the New York constitutional convention of 1867. D. at Schenectady, N. Y., Mar. 31, 1868.

Paige (Elbridge Gerry), b. at Hardwich, Mass., about 1816; was for some time editor and proprietor of the New York *Sunday Mercury,* for which he wrote, under the pseudonym of "Dow, Jr.," a series of *Short Patent Sermons* (3 vols., N. Y., 1854), which were widely copied; was unsuccessful in business, and went to California. D. Dec. 4, 1859.

Paige (Lucius Robinson), A. M., D. D., b. at Hardwick, Mass., Mar. 8, 1802; educated in common schools; became a Universalist clergyman, and preached in Springfield and Sandy Bay, now Rockport, Mass. In 1839 he relinquished pastoral duty, and has published *Selections from Eminent Commentators* (1833), *Commentary on the New Testament* (6 vols., 1844–69), etc.

Paine (Charles), b. at Williamstown, Vt., Apr. 15, 1799; graduated at Harvard 1820; became a successful manufacturer; was governor of Vermont 1841–43; was a liberal benefactor of the State University and other institutions of learning, and one of the fathers of the railroad system of Vermont. He was active in the Southern Pacific R. R. movement, and d. at Waco, Tex., July 6, 1853.

Paine (Elijah), LL.D., b. at Brooklyn, Conn., Jan. 21, 1757; graduated at Harvard 1781, and in 1784 became a lawyer in Vermont; was a member of the State constitutional convention of 1786; of the legislature 1787–91; a judge of the State supreme court 1791–95; U. S. Senator from Vermont 1795–1801; a U. S. district judge 1801–42; was also a successful manufacturer of cloth at Northfield, Vt., a member of many learned and benevolent societies, a liberal benefactor of institutions of learning, and held numerous positions of honor and trust. D. at Williamstown, Vt., Apr. 28, 1842.

Paine (Elijah), b. at Williamstown, Vt., Apr. 10, 1796, a son of Judge Elijah Paine; graduated at Harvard in 1814; studied law at Litchfield, Conn.; became a law-partner of Henry Wheaton, and assisted in preparing Wheaton's *Reports;* was a judge of the New York superior court 1850–53; author of *Paine's Reports* (1827, 2d vol. 1856), and one of the authors of Paine and Duer's *Practice in Civil Actions* (2 vols., 1830). D. New York Oct. 6, 1853.

Paine (Gen. Halbert E.), b. at Chardon, O., Feb. 4, 1826; graduated at Western Reserve College 1845; was admitted to the bar at Cleveland 1848; removed to Milwaukee, Wis., 1857; was colonel of the Fourth Wisconsin regiment of volunteers 1861–63; brigadier-general Mar., 1863; participated in the defence of Washington against Early's raid; commanded a division in the Vicksburg campaign, and lost a leg in the last assault on Port Hudson June, 1863; was brevetted major-general Mar., 1865; was a delegate to the Philadelphia "Loyalist Convention" 1866, and was a Republican member of Congress 1865–71.

Paine (Levi Leonard), A. M., b. at E. Randolph, Mass., Oct. 10, 1832; graduated at Yale 1856; tutor there 1859–61; studied divinity at New Haven; Congregational minister at Farmington, Conn., 1861–70; became in 1870 professor of ecclesiastical history in the theological seminary at Bangor, Me.

Paine (Martyn), M. D., LL.D., son of Judge Elijah Paine (1757–1842), b. at Williamstown, Vt., July 8, 1794; graduated at Harvard in 1813; studied medicine under Dr. John Warren of Boston, Mass., and took his medical degree there 1816; practised his profession at Montreal 1816–22; removed to New York City, where he became one of the leaders of the medical profession; was one of the founders of the University Medical College 1841, in which he subsequently held important professorships. Author of a work *On the Cholera Asphyxia* (1832); *Medical and Physiological Commentaries* (3 vols., 1840–44); treatises on *Materia Medica* (1842, 1848); a very valuable standard treatise on the *Institutes of Medicine* (1847); *The Soul and Instinct* (1849), and other works.

Paine (Robert), D. D., b. Person co., N. C., Nov. 12, 1799. His father, James Paine, was a highly respectable farmer. Robert removed to Tennessee early in this century; in 1818 joined the Tennessee conference of the M. E. Church, and did pastoral work till 1830; became president of La Grange College, Ala., till 1846, when he became bishop; was a member of every General Conference from 1824 to 1846; chairman of the committee of nine which reported the plan of separation on the basis of which the M. E. Church was divided; was a prominent member of the Louisville convention in 1845 which organized the M. E. Church, South, and also of the General Conference of 1846, by which he was elected bishop. He has great pulpit ability, good learning, and great executive ability. His *Life and Times of Bishop McKendree* (2 vols.) is highly esteemed. T. O. Summers.

Paine (Robert Treat), b. in Boston, Mar. 11, 1731; graduated at Harvard College 1749; studied theology and acted as chaplain in the Northern army; subsequently studied law and admitted to the bar 1759, settling at Taunton; in 1770 was prosecuting officer (in the attorney-general's absence) of Preston and his men for the massacre at Boston; elected to the legislature 1773; delegate to Continental Congress 1774–78, meanwhile filling various important positions in Massachusetts; was one of the signers of the Declaration of Independence, attorney-general of Massachusetts 1780–90, and judge of the supreme court of Massachusetts 1790–1804, when he resigned. With others he founded the American Academy of Massachusetts (1780). D. at Boston May 11, 1814.

Paine (Robert Treat, Jr.), son of the signer of the Declaration of Independence of the same name, b. at Taunton, Mass., Dec. 9, 1773; graduated at Harvard College 1792; became a frequent contributor to the *Massachusetts Magazine;* established the *Federal Orrery* Oct., 1794; sold his newspaper the following year; wrote in 1798 the celebrated song *Adams and Liberty;* removed to Newburyport and commenced the study of law under Theophilus Parsons 1799; delivered a *Eulogy* on Washington Jan., 1800; practised law at Boston in partnership with Parsons 1802, and abandoned it 1803 to devote himself to theatrical literature. D. at Boston Nov. 13, 1811. His works were edited, with a prefatory *Memoir,* by Charles Prentiss, 1812. His original name was Thomas Paine, but to avoid confusion with a more celebrated writer he took that of his father by permission of the Massachusetts legislature in 1801.

Paine (Thomas), b. at Thetford, England, Jan. 29, 1737, son of a Quaker; received an indifferent education at the Thetford grammar school, but acquired a considerable range of knowledge by private study while working at his trade as a stay-maker at London, Dover, and Sandwich; served a short time on board a privateer 1755; preached occasionally as a dissenting minister; married in 1760 the daughter of an exciseman; obtained a post in the revenue service; became a grocer and tobacconist at Thetford and at Lewes in Sussex; cultivated literature; acquired so clear and forcible a style as to be chosen by the excisemen as their representative in advocating their interests, in which capacity he published a pamphlet, *The Case of the Officers of the Excise* (1772), which probably led to his introduction to Dr. Franklin; was dismissed from his office on a charge of smuggling 1774, when, cherishing a violent resentment against the British government and influenced by the advice of Franklin, he proceeded to America; arrived at Philadelphia Dec., 1774; obtained immediate employment as editor of the *Pennsylvania Magazine;* published in Bradford's *Pennsylvania Journal* in Oct., 1775, an article entitled *Serious Thoughts upon Slavery,* which attracted great attention; wrote, at the suggestion of Dr. Rush, his celebrated and widely-circulated pamphlet *Common Sense,* which struck the keynote of the situation by advocating independence and a republican government; received from the Pennsylvania legislature a grant of £500 in recognition of its value; established in Dec., 1776, a periodical entitled *The Crisis,* which appeared at irregular intervals and had

great influence in maintaining the spirit of the army and the people; was chosen in 1777 secretary to the committee of foreign affairs, from which post he was dismissed and censured by Congress in 1779 for revealing diplomatic secrets in a controversy with Silas Deane; was soon afterward elected clerk to the general assembly of Pennsylvania; rendered good service in 1780 in promoting a subscription for relieving the distress of the army; went to France with Col. Laurens, whom he aided in negotiating a loan 1781; received from Congress a grant of $3000 (1785) and from the State of New York an estate at New Rochelle as rewards for his services; went again to France 1787; invented an iron bridge, which was set up the following year at Rotherham, Yorkshire; published in 1791–92 his *Rights of Man*, a vindication of the French Revolution, in reply to Burke, which gave him immense popularity in France and led to a bestowal of citizenship and his election to the French National Convention as deputy for Calais; took his seat in that body; usually acted with the Girondists; opposed the execution of the king, advocating his banishment to America; was imprisoned by the faction of Robespierre, Jan. to Nov., 1794, narrowly escaping the guillotine; wrote in prison a portion of his *Age of Reason* (1795), a deistical work; again took his seat in the Convention; resided nearly two years in the family of James Monroe, then minister in France; wrote several political letters and pamphlets of minor importance; visited the U. S. in 1802, making the voyage in an American sloop-of-war; was cordially received at Washington, Philadelphia, and New York, and by Jefferson at Monticello, but insulted by the Federalists at Trenton and elsewhere, and resided the remaining years of his life in comparative obscurity at New York, and on his estate at New Rochelle. D. at New York June 8, 1809. He was buried on his estate at New Rochelle, where a monument was erected by his admirers in 1839, though his supposed remains were carried to England in 1819 by William Cobbett. Biographies of Paine have been written by Chalmers, Cobbett, Cheatham, Rickman, Sherwin, and G. Vale (New York, 1841), and a complete edition of his works was published by J. P. Mendum (Boston, 1856). PORTER C. BLISS.

Paines'ville, tp. of Stearns co., Minn. Pop. 318.

Painesville, post-v. and tp., cap. of Lake co., O., on the Lake Shore and Michigan Southern and the Painesville and Youngstown R. Rs., has a fine harbor, 1 park, a female seminary, 5 graded schools, 6 churches, 3 banks, 3 weekly newspapers, 2 machine-shops, a flouring-mill, foundries, tanneries, and factories. Pop. of v. 3728; of tp. 4995. MERRILL & SCOFIELD, PROPS. "TELEGRAPH."

Paint [Lat. *pingere*, to "paint"] is a name which is generally limited to mixtures of insoluble colors or pigments with certain materials which prepare them for application to surfaces of wood, iron, stone, plaster, canvas, etc. by the aid of a brush. When the colors are soluble, the preparation is more properly a stain or a dye. Paints are used not only for purposes of decoration, but to protect surfaces from moisture and decay, which they accomplish by closing the pores and excluding the agents of destruction. (See FERMENTATION and PRESERVATION OF TIMBER.) All paints consist essentially of two parts: (1) the pigment; (2) the vehicle. *The pigments* are very varied in character; the whites are generally white lead, more or less adulterated with barytes, oxide of zinc, prepared chalk, etc.; the yellows are ochres, chromate of lead, etc.; the reds are red oxide of lead, ochres, oxides of iron, red oxide of copper, vermilion, dichromate of lead, carmine, carmine-, madder-, and other lakes, etc.; the blues are Prussian blue, ultramarine, smalt, Thénard's blue, verditer, etc.; the greens are verdigris, Paris green, verditer, borate of copper, chromate of copper, oxide of chromium, cobalt green, and green lakes, the most common being, however, a mixture of chrome yellow and Prussian blue; the browns are umber, bole, terra di Sienna, bistre, sepia, etc.; the blacks are lampblack, bone-black, anthracite, graphite, etc. (See also the article on LAKES.) *The vehicles* determine the character of the paint: we have oil-paints and water-colors.

Oil Paints.—The most common vehicle is linseed oil, which is especially valuable on account of the property it possesses of oxidizing to a resinous body, which holds the paint in a firm waterproof varnish. By boiling this oil with litharge and sulphate of zinc it acquires the property of drying very rapidly, though the color is darkened by the operation. For some purposes other oils, as nut and poppy oils, are substituted for linseed oil; the latter, being colorless, is preferred for very delicate colors, but it dries very slowly. In the preparation of oil-paints the pigment is mixed with a small quantity of raw linseed oil and ground in a mill to make the mixture homogeneous. About 8 per cent. of oil is added to white lead, 12 or 13 per cent. to zinc white. The pigment, ground in oil, is put up in convenient packages for the painter, who mixes it for use with a further quantity of raw and boiled linseed oil, and colors it to any desired shade with colored pigments, which are also furnished ground in oil. Pigment and oil alone would be so thick as to make the labor of applying the paint to any large surface almost impossible, so a third class of agents is employed in preparing paints, the *thinners*. Thinners are either spirits (oil) of turpentine or benzine, the portion of petroleum having a gravity of about 62° B. (See PETROLEUM.) As they are solvents for oils, they mix freely with the oil-paint and thin it to any desired degree. As it is desirable that the paint, after it has been applied to a surface, should dry speedily before it is contaminated by dust or rubbed off by accident, it is necessary to do something more than boil the linseed oil; a fourth class of substances is used, the *driers* or *siccatives*. Driers are sugar (acetate) of lead, sulphate of zinc, verdigris, binoxide of manganese, red lead, japanner's gold size, etc. By far the most powerful siccative is the borate of manganese, one one-thousandth being sufficient to greatly hasten the drying of linseed oil. This agent is supplied to the painter ground in oil in a convenient form for mixing with the paint. It is always necessary to mix the above-mentioned materials, pigment, oil, thinner, and dryer, just before the paint is to be used, as, if the mixture is allowed to stand for any length of time, the pigment settles to the bottom, the thinner evaporates, and the oil absorbs oxygen, becomes thick and ropy, and a hard skin forms over it, which cannot be dissolved again. No amount of labor will restore to such a pot of paint the qualities which it possessed when first prepared. To meet this difficulty a new system of mixing paint, the invention of D. R. Averill, has been introduced, by which paints of any color can be made and mixed on a large scale at the factory, and put up in convenient packages from one pound cans to barrels, which are always ready for use. Any portion which may be left over after painting any work can be returned to the package for future use. The painter is thus saved all the trouble of mixing the paints, and great economy is also introduced, as nothing is wasted. The principle involved in the preparation of these ready-mixed paints is the formation of an emulsion which holds the pigment in suspension and prevents its settling. In the Averill patent the preferred process involves the use of (1) a solution of acetate and sulphate of zinc, made by mixing solutions of acetate of lead and sulphate of zinc; (2) a solution of silicate of soda; (3) lime water; (4) linseed oil. These are mixed in the order in which they have been mentioned, and the resulting product is a thick, gelatinous, oily emulsion, like a salad-dressing. To this is added the pigment and an additional quantity of linseed oil. The whole is finally thinned with turpentine or benzine, and then passed through a paint-mill to make it homogeneous. The pigment is generally white lead or oxide of zinc, and any desired color is obtained by adding colored pigments. For the emulsionizing agents above mentioned many others may be substituted; it is necessary, however, in order to secure a paint that will not drop the pigment, to combine water with the oil by the aid of some alkaline or gelatinous material which will produce an emulsion.

Water-Colors.—For many purposes paints are prepared with the aid of water as a vehicle, glue or gum being added to make the pigments adhere after the evaporation of the water. Such paints can only be used for interior work, walls and ceilings, for coloring pictures, maps, etc. They must be mixed as they are used, as a solution of glue or gum would mould or putrefy and dry up if kept for any time. The most common paint of this kind is called "kalsomine," and is a mixture of prepared chalk with a solution of glue, to which ultramarine is added to neutralize a faint yellow tint for white, and ochres, etc. for other colors. The solid cakes of water-color are made by mixing the pigments with gum and water to a thick paste, pressing in moulds, and drying in warm air. By rubbing them in water or applying a wet brush to them the color is liquified for use. Silicate of soda, soluble glass, has been suggested as a vehicle for pigments and as specially adapted for application to walls and ceilings, as it produces a very hard and durable surface. Sometimes the silicate of soda paint is applied to the ceiling, and a thin solution of the clear silicate is afterwards sprayed over the entire surface. Naphthas and tars, both coal and wood, are used as vehicles for cheap paints or for paints for special purposes, as for protecting iron, ships' bottoms, etc. Poisonous pigments are also used to prevent the adhesion of barnacles and other marine animals and sea-weeds to ships' bottoms, specially copper compounds, the red oxide, etc. Artists' colors are composed of very carefully prepared pigments ground in a small quantity of very fine oil, and put up in

metallic tubes. It is estimated that the value of the raw materials used in making paints which are annually made in the U. S. or imported exceeds $125,000,000, and that when properly mixed and sold to consumers the value is double this amount.

Literature.—The Painter and Varnisher's Guide, P. F. Tingry (London, 1816); *The Interior Decorator*, D. R. Hay (Philadelphia, 1867); *A Treatise on Colors and Pigments*, George Field (London, 1869); *The Painter, Gilder, and Varnisher's Companion* (Philadelphia, 1870); *Magazin für die Druck- Färbe- und Bleichkunst*, Joh. G. Dingler (Augsburg, 3 vols.); *Farben-Chemie insbesondere der Oel- und Wasserfarben*, S. Tschelnitz (Wien, 1857); *Lehrbuch der Farbenfabrikation*, J. G. Gentele (Braunschweig, 1860).

C. F. CHANDLER.

Paint, tp. of Fayette co., O. Pop. 1742.

Paint, post-v. and tp., Highland co., O., on Paint Creek. Pop. 2429.

Paint, tp. of Holmes co., O. Pop. 1212.

Paint, tp. of Madison co., O. Pop. 955.

Paint, tp. of Ross co., O., on Paint Creek. Pop. 1001.

Paint, tp. of Wayne co., O. Pop. 1418.

Paint, tp. of Clarion co., Pa. Pop. 346.

Paint, tp. of Somerset co., Pa. Pop. 923.

Paint Creek, tp. of Allamakee co., Ia. Pop. 1141.

Painted Post, post-v. and tp., Steuben co., N. Y., situated on the Erie R. R., 18 miles W. of Elmira, has 3 churches, 1 bank, 1 newspaper, 2 large saw-mills, iron-works, 2 hotels, and stores. Principal business, manufacturing and farming. Pop. (1850) 4334.

S. H. FERENBAUGH, ED. "TIMES."

Paint'er (GAMALIEL), b. at New Haven, Conn., May 22, 1743; erected the first house at Middlebury, Vt., 1773; served as captain and quartermaster in the war of the Revolution; was a delegate to the convention which in 1777 declared the independence of Vermont; was representative in the Vermont legislature; member of the constitutional convention 1793, and judge of the county court; councillor 1813–14. D. at Middlebury May 21, 1819. He was the principal founder of Middlebury College, to which he left $10,000 by his will.

Painter's Colic. See COLIC.

Painter's Cream, a mixture of mastic, lead, acetate, nut-oil, and water, applied by artists to unfinished oil-paintings to prevent them from drying during the interruptions of the work. It is applied with a brush and washed off with water.

Paint'ing [Lat. *pingere*, to "paint"], as a fine art, consists of drawing, invention, relief, perspective, and color (in the modern artistic sense), and history shows that its development has taken place in the above-mentioned order. *Drawing* consists not only in outline, but in the correct form of any surface expressed by the pencil or brush. It is form, as distinct from color. Latterly the word modelling has been borrowed from the sister art and applied, with the same meaning, to the representation of the inequalities of surface in the human form, not including the outline. *Invention* is the method with which the artist disposes his figures in order to explain his meaning, to tell his story—the variety of gesture, pose, expression, drapery, and accessory. It includes composition, and is the highest quality of the art. *Relief* is that management of light and shade which gives the pictured figure the appearance of standing out from its surroundings and background. *Perspective* is the application of geometry to the art in representing streets, buildings, galleries, and interiors by mathematical rules. Aërial perspective consists in representing the effects of distance and atmosphere upon objects, landscape, or figures. *Color* is intimately connected with light and shade (chiaroscuro); for until the gradations and alterations of tone made by it are recognized, color may be ornamental, but never artistic. It consists of harmony, opposition, sentiment, and truth, and is never seen except when art has arrived at its highest state. Color is the luxury of art, and usually precedes its decadence. The first art-impulse is plastic; the earliest known monuments of art are in rude sculpture; the most primitive form a heap of stones to mark an event, a boundary, a grave. These rough piles suggested the idea of representing the figure of the person to whose memory they were raised. The sphinxes of Egypt (those with human heads) are probably likenesses of the Pharaohs, the others being symbols. All primitive art is commemorative; and the same feeling which formed the statue built the tomb, and afterward the temple. From the effigy of the king it is a natural step to represent scenes in his life, when need was felt for more than a single figure, and thus the bas-relief and intaglio were invented. Colored reliefs led to color without relief, or pictures, the oldest examples of which have been found on the walls in the tombs of Thebes, on mummy-cases, and on pottery. They comprise a multitude of domestic, historic, and mythologic subjects, are spirited in action, aiming at accuracy of representation, and showing much invention in grotesque forms of animals, ornaments, and symbols. They consist of a simple outline filled in with flat tints, making a solid figure or monochrome, without lights, shades, or any attempt at background other than the color of the substance painted upon, reminding us in style of many of the Chinese figures of to-day. The pigments used are black, white, yellow, red, brown, blue, green, and also gilding. The colors, mixed with gum and water, were sometimes laid immediately on the stone wall, sometimes on a coating of plaster, as in modern fresco, and at times on wood, on baked and on wet clay, as is seen in their vases. "The series of Egyptian art," says Pulszky (in Gliddon's *Indigenous Races*), "continues in an unbroken chain from the thirty-fifth century B. C. down until long after the Christian era. It culminated under Sesortasen, twenty-second century B. C., when it was excellent in portraiture, delicate, and refined, but emotion was never portrayed by them, and the feeling of ideal beauty remained unknown." This criticism applies only to their statues, which attained a much greater artistic excellence than their paintings. The latter date from 1500 B. C., showing that in Greece, and later in Italy, the sculptor's art preceded the painter's, that form is portrayed before feeling, that pictures are a result of the reflecting period of a nation's life, and that Egyptian paintings were only illustrations of events, not expressions of ideas. A more intellectual people was needed before painting could rise to a higher plane, but Egypt taught the first lesson. The Assyrians took Egyptian forms and made them greater in size, the Hebrews took them and made them richer in material, both missing the true art-idea. Assyria introduced landscape and a more pictorial arrangement of figures into bas-reliefs; and there are some remains of Persian reliefs that show an excellent appreciation of the different types of men, with a refined execution; but it was in Etruria that Egyptian forms were gradually improved upon. This improvement can be traced on their terra cotta vases dating from 700 to 200 B. C., rising from the rudest shapes and designs to the most elegant and artistic. They vary with the changing civilizations around them, but show an inherent adaptability which marks the artist. The first have simple objects, wreaths, flowers, animals, painted in a uniform color on a ground of a different tint, chiefly brown on ash color. In 600 B. C. figures are introduced, brown on cream color; a little later black, white, and crimson figures appear with incised outlines. At the date of 450 B. C. we have black figures with a red ground, the flesh of women white, also black glazed vases with figures of red, white, and blue, the colors harmonious and ornamental, though never seeking to imitate nature, except in the few attempts of representing flesh as white, and with no light and shade; but in form, design, and composition the Etruscans are unrivalled, which excellence many seek to explain by saying that they had Greek workmen.

It is of this classic country we have now to speak. Pliny (*Hist. Nat.*, lib. xxxv.) says the Egyptians boast of having invented painting six thousand years before it passed into Greece, but adds: "Their vanity and lying are well known." However averse Pliny was to acknowledge this fact, we now know it to be true; but the profit gained from it was not sufficient to prevent the earliest art of the Greeks from being very rude, the author assuring us that they were obliged to write at the bottom of their pictures the name of the object represented. He refers at the same time to the perfection of Etruscan art and the brilliancy of the colors yet remaining on the walls of ruined temples, older, he says, than Rome itself. Tradition, which always contains some truth, designates Eumaras the Athenian (vide Pliny) as the first who distinguished the sexes; Cimon of Cleone, who attempted foreshortening, painted the veins, muscles, and articulations of the joints, and gave to draperies their natural folds; Panænus, who painted portraits in his battle-pieces; Polygnotus of Thasus, who observed expression and grace, making the lips smile and the draperies fly, ornamenting and arranging the hair; Apollodorus of Athens, celebrated for color, light, and shade (of which this is the first mention), representing things "alive." He was one of the great pioneers of the art, and lived about 376 B. C., more than a century after the perfection of sculpture in the Parthenon. The way being opened, Zeuxis appeared, celebrated for natural color, or close imitation of color; Parrhasius, the first who succeeded in giving his figures relief, observing manners, customs, and passions with the mind of a philosopher, and delineating the same in his pictures, for which

he first made designs on parchment with pen and ink; Pamphilus applied perspective to painting and founded an academy; Apelles, the Rafael of his age, seized that undefinable quality called grace; Calades preferred subjects from ordinary life rather than from history or fable, and painted small pictures (our modern genre), and Marcus Ludius was a celebrated landscape-painter. It was no wonder that painting, as the Greeks knew it, was said to be invented by them. With the Etruscans it was an ornament, with the Egyptians it was a record, with the Greeks it was an art. They first discovered its capabilities and used it as a medium of thought. None of their pictures remain, but the descriptions of their writers and the perfection of their sculpture lead us to suppose that they attained as high a state of excellence as was afterwards attained in Italy, except, perhaps, in color. They mostly used panels to paint on, sometimes walls, and in a few instances canvas. Apelles who was a colorist, was said to paint with four colors, white, yellow, red, and black; but later, Pliny mentions twenty pigments, with the manner of preparing, mixing, and using them, indicating those that altered their tone when applied to plaster. As at present, they consisted of various earths, minerals, and extracts, the last being tempered with chalk to give them consistency. The colors were mixed with gum, the yolk and white of egg, and water—a method which is called distemper. Melted wax was sometimes used as a varnish. Colored wax was also used as a pigment, and afterwards melted into harmony. (See ENCAUSTIC.) The Romans conquered pictures rather than made them. Less ideal than the Greeks, they excelled in portraiture, and in their compositions expressed more movement. Their art being but a reflex of that of Greece, it could scarcely be called national. The Byzantine period came next, through which art languished, shackled by traditions to which it was unable to give life. But finally, the old civilizations being ended and a new one established, its demand for expression formed a third great era in painting, called the Renaissance.

The building of the cathedral of Pisa in 1063, and of St. Mark's at Venice, brought many Byzantine artists into Italy, where they had their pupils and imitators. Nature appears distorted rather than represented by them, but from this beginning, with a growth as slow as that described in the rise of Greek art, came the school of Italy. Cimabue (1240–1300) was the first to make any noticeable change in the old manner, throwing off the yoke of arbitrary forms and going to nature for his inspiration. The three centuries from this date are reckoned the period of the greatest artistic activity the world has known. Vasari, who died 1574, mentions about 176 artists who flourished during this time—painters, sculptors, architects, mosaic-workers, goldsmiths, and followers of trades like leather-painters, armor-makers, and others. Cities emulated each other in the building of churches, palaces, theatres, arches, gateways, and streets. The art of engraving on wood and copper belongs to this epoch, about the year 1441. Oil was made available for the painter's use in 1410 by John Van Eyck, who thus initiated our modern school of painting. Perspective was again practised about 1464, anatomy was thoroughly investigated and applied to art by Da Vinci and Michael Angelo, and painting on glass reached great perfection. Every Italian city had its school of painting which boasted of some characteristic invention, and prided itself on its line of artists, culminating in one great master, the result of their teaching. School in this sense does not mean an academy, but a manner of painting, each school having a peculiarity by which it is known and of which it is the exponent. That of Florence was celebrated for drawing and learning; it attained its highest perfection in Da Vinci (1445–1520) and Michael Angelo (1474–1564). The Roman school found its glory in Rafael (1483–1520), noted for expression and invention. Bologna had Guido (1574–1642), whose works are distinguished for devotional grace. Parma is known by Correggio (1494–1534), whose specialty was the poetry of light and shade. Naples, Genoa, Mantua, Cremona, and Milan all had their schools and their masters. Venice, latest in date, and consequently most perfect in the mechanical parts of the art, uniting sentiment with color in Titian (1480–1576), and Greek appreciation of pure nature, the dignity of humanity, and the beauty of color in Paul Veronese (1530–88). Until 1410 the Italians used the distemper of the ancients to paint with, and after the discovery of oil it was still used in fresco painting, as it is to this day. Most artists of that time painted in both, their easel-pictures in oil and their frescoes in distemper. Thus they mixed the methods, used their oil as water, made their colors too thin, blended them or washed them on, and produced a hard, dry style from not understanding the capabilities of their materials. The Venetians, on the contrary, used their colors in a stiff paste, laid it on, not in washes, but with separate strokes of the brush; and even their wall-paintings were on canvas. They are the beginning of our modern school of art. The German school, with Albert Dürer (1471–1528), is noted for its close adherence to nature, but it lacks nobility in its first teachers, and has gone to the other extreme of being too academical in the later ones. The Flemish school, with Rubens (1577–1640), shows great wealth of color with poverty of ideas. The Dutch school, with Rembrandt (1606–74), also shows grace and poetry of color, but lacks refinement of subject. Spain was but a reflex of Italian art, following most nearly Venice. It is refined, dignified, good in color and drawing, lending to a borrowed manner an originality of treatment, which gives it the right to be called a national school. Ribera (d. 1655), Zurbaran (1598–1662), Velasquez (1594–1660), and Murillo (1613–85) are its shining lights.

The art of painting, as taught in the Middle Ages, has never been lost, and our modern schools follow their teaching, uniting in a greater or less degree their characteristics. The school of Munich of the present day takes the Roman for its model, Düsseldorf imitates the Florentine, Antwerp the Venetian; France is eclectic, and has followers of every school. But though the manner may be traced, the modern artist expresses himself, his age, and his country in the subject of his work. It is thus that true art is always original, that centuries never reproduce themselves, and that invention always finds a sphere. The Greeks painted heroes and gods; the Italians painted saints and angels; we paint ourselves or others like ourselves. The art has become democratic, as has the world. Architecture for the first time in history uses its best energies to build homes, not palaces; and modern art finds its highest expression in domestic decoration. The individual, not the prince or state, is its patron; consequently, the subject of the picture concerns itself with the broad interests of the people, their joys and sorrows, thoughts and affections, manners and customs. In the arts which preceded it this has been sometimes attempted, notably in the Dutch school, but it never before attained its present importance or perfection.

The modern teaching is academic. Most of the great cities have academies devoted to this purpose, the method pursued being much the same in all. The student is taught drawing from the antique (Grecian statues, busts, and reliefs, or casts taken from them). Charcoal pencils are used in making the first sketch, as it is easy to efface and correct. The drawing is then made permanent with crayons (colored chalks, black, white, and red), mistakes which occur in this stage being rubbed out with bread-crumbs or India-rubber. The rudiments of using the brush and colors are acquired from copying a few of the best paintings. The outlines are here again put in with charcoal; when correct, this is blown off, leaving a slight trace, which is followed with a camel's-hair brush containing a mixture of drying oil and one color—any that is preferred by the student. The shadows of the picture are usually marked out with this mixture also, which is then allowed to dry. The palette is set—white in the centre, with the browns, blues, and blacks to the left, the yellows and reds to the right. The colors are mixed by the colorman of the right consistency (that of a stiff paste) and enclosed in leaden tubes. They are laid on the canvas with bristle brushes, round and flat, in touches, the color thick in the lights and thin in the shadows. This may be afterwards retouched when dry, and is sometimes glazed, for which linseed oil is mixed with a color and washed over the parts desired. Next, the student copies the living model, both nude and clothed, striving always to follow nature in form and color. During this time the master points out the various effects of expression, composition, light, and shade. The student attends lectures on anatomy from a prepared subject, that he may know the position of the superficial muscles under varying circumstances, and have correct ideas of the skeleton, the basis of the human form. When sufficient accuracy has been attained, the invention of a picture is attempted, in which the living model is also used. After the subject has been decided upon, a sketch is made of the general disposition of the figures, their costumes, of which the color as well as the form must be considered, and their attitudes. The person acting as model is then made to assume these attitudes, and the artist proceeds as in copying a picture. Sometimes the model is copied exactly, as by Courbet; sometimes ideally, as with Delacroix. It is only in the decadence of art that a careful study of nature is neglected. For amateurs who wish to understand painting, the only way is to study the pictures themselves and seek for the various qualities that have been mentioned as forming the art. Any picture, to be good, must possess them in a greater or less degree, though it seldom happens that all are present on the same

canvas. Reading of pictures without seeing them gives but little instruction except in the history of art.

ELISA J. HALDEMAN.

Paint Rock, post-v. and tp., Jackson co., Ala., on Paint Rock River and the Memphis and Charleston R. R. Pop. 1502.

Paint Rock, tp. of Marshall co., Ala. Pop. 471.

Paints'ville, post-v. and tp., cap. of Johnson co., Ky. Pop. 247.

Paisiel'lo (GIOVANNI), b. at Taranto May 9, 1741; received his musical education in the conservatory of San Onofrio at Naples, and composed in 1763, for the stage of Bologna, his first opera, *La Pupilla*, which made a great success, and was followed, in the course of the next ten years, by about fifty operas. From 1776 to 1784 he was director of the opera at St. Petersburg; returned then by way of Dresden and Vienna to Naples, where he took charge of the opera; went in 1802 to Paris as director of the private orchestra of the First Consul, but returned again in 1806 to Naples, where he d. June 5, 1816. Besides a great number of masses, cantatas, and symphonies, he composed about 100 operas, of which *Nina*, *La Molinara*, *I Pitagorici*, etc. at one time reigned on all stages of Europe. At present they are forgotten.

Pais'ley, town of Scotland, in the county of Renfrew, on the White Cart, 3 miles from its junction with the Clyde. It consists of an old town situated on the western bank of the river, and presenting a mean appearance, and a new town on the opposite bank, paved and well built. The abbey is a historically interesting building, but it is the only remarkable edifice the city contains; Paisley is merely a manufacturing place. Of its manufactures cotton thread occupies the first place; the value of the annual production of this branch of industry amounts to £570,000, and it employs between 3000 and 4000 people. Next in importance rank the shawl manufactures, which were started in the beginning of this century and have developed to a high degree of perfection. Its manufactures of silk gauze were flourishing already in the middle of the last century, and employed 5000 looms in 1784. Besides these three chief branches of industry, many others are pursued with success in Paisley, such as cotton printings, handkerchiefs, carpets, soap, and starch. Pop. 48,257.

Paisley, post-v. of Bruce co., Ont., Canada, 16 miles N. of Walkerton, has 1 weekly newspaper. Pop. about 1000.

Paixhan Guns. (See APPENDIX.)

Paix'hans (HENRI JOSEPH), b. at Metz Jan. 22, 1783; was educated in the Polytechnic School; entered the army; served in Napoleon's campaigns, but left active service after the Restoration; was employed in the war ministry and on the committee on the artillery. In 1824 experiments were made at Brest, at Col. Paixhans' suggestion, upon cannon for horizontal shell-firing. The idea was taken up by the English admiralty, and the PAIXHAN GUNS (which see) were the result. He published *Considérations sur l'Artillerie* (1815), *Nouvelle Force maritime* (1822), and *Force et Faiblesse de la France* (1830). D. near Metz Aug. 19, 1854.

Pa'jaro, post-v. and tp., Monterey co., Cal. Pop. 761.

Pajaro, tp. of Santa Cruz co., Cal. Pop. 3114.

Pa'kenham (Sir EDWARD MICHAEL), G. C. B., a brother of the earl of Longford, was b. in Ireland in 1779; entered the light dragoons in early life, and served with brilliant reputation under Wellington (whose quartermaster-general he became), and also in the West Indies. In 1812 became major-general; in 1814 commanded the expedition against New Orleans; was killed in the battle of New Orleans Jan. 8, 1815, an action in which he displayed great gallantry.

Paks, town of Hungary on the Danube, has breweries and distilleries and trades in wine and agricultural produce. Pop. 9070.

Palac'ky (FRANTISEK), b. at Hodslawitz, Moravia, June 14, 1798; studied at Presburg and Vienna; made very comprehensive researches of documents relating to the history of Bohemia in the archives and libraries of Prague, Presburg, Vienna, Munich, and Rome, and wrote the *History of Bohemia* (5 vols., 1836–67), publishing at the same time the *Archiv Cesky* (5 vols., 1840–66). Being a member of the Bohemian diet and afterwards of the Austrian upper house, he played a conspicuous part in politics as leader of the Czech party and adherent of the Pan-slavonic movement. His publications of documents relating to the oldest history of the Bohemian language, and to the life and doctrine of Huss, are of great interest. D. May, 1876.

Pala'cios, a v. of Matagorda co., Tex. Pop. 35.

Palæog'raphy [formed from the Greek παλαιός, "ancient," and γραφή, "writing"] is the science of reading old manuscripts and determining their age from circumstantial evidence in the absence of any formal authentication, the data being the materials, bark, leaves, skin, paper, etc. which have been used for writing, the character of the letters, and the whole style of writing, the form of signatures, superscriptions, etc., all of which have varied with time and place. The founder of this science was Jean Mabillon, whose *De Re Diplomatica* was published in 1681. The principal work on the subject is *Paléographie universelle* (5 vols. fol., Paris, 1839–45).

Palæol'ogus, the last Byzantine dynasty, ascended the throne in 1261 (Michael VIII.) and lost it in 1453 (Constantine XIII.). (See BYZANTINE EMPIRE.) One branch of the family held possession from 1305 to 1533 of Montferrat, an independent principality of Northern Italy, between the territories of Piedmont, Genoa, and Milan. Another branch ruled over Morea from 1380 to 1460.

Palæontol'ogy [Gr. παλαιός, "ancient," ὄντα, "beings," and λόγος, "a discourse"], the science that treats of fossil remains of animals and plants. Though of very modern date, this science has acquired such dimensions that nothing but the briefest review of its history and conclusions can be brought within the enforced limits of this article. More than 2000 years ago the remains of marine animals imbedded in the rocks had attracted attention, and their true character had been recognized by both the Egyptian and Greek philosophers. In after times the minds of men were so darkened by ignorance and superstition that at the beginning of the sixteenth century, when fossil shells were observed in Northern Italy, they were attributed to the influence of the stars, to the fermentation of a certain *materia pinguis*, or the action of an imaginary "plastic force," and were called "the sports of nature." For two centuries and a half afterward this question of the character of fossils was discussed with great interest and no little acrimony, and the tide of public sentiment, mainly due to monkish influence, was so strongly opposed to the acceptation of the view that they were the remains of animals and plants that had once existed on the globe that the advocates of this theory were made to suffer not only obloquy, but persecution. Among those who deserve special mention for the clearness of their perception and the boldness of their defence of the truth are Leonardo da Vinci (1500), Palissy the potter (1580), Steno the Dane (1659), and Scilla, a Sicilian painter (1670).

About the beginning of the eighteenth century the old superstition had been so far vanquished that fossils were generally accepted as relics of living organisms; but it is doubtful whether the opposition would not have been much longer maintained had it not been suggested that all marine fossils were the products of the Noachian deluge, and thus a confirmation of Scripture. This view was quite generally entertained even as late as the early part of the nineteenth century. During the eighteenth century the facts of geology were subjects of investigation by some of the foremost intellects of the age, and the true nature of fossils having been generally recognized, they were studied with much care, both in comparison with living forms and in connection with the strata that contained them. After the first great step had been made, others followed, though still slowly, and it gradually came to be known that most of the remains found buried in the earth represented animals or plants different from those now living, and that certain groups of fossils were associated with certain strata. Still later it was discovered that the sedimentary rocks formed a sequence which was invariable wherever observed, the different members of this sequence being identified by their relative positions and by their characteristic fossils. When a large amount of material had been collected, it was noticed that the animal and vegetable forms buried in the lowest and oldest rocks were most unlike those living on the surface of the globe; also, that the fossils contained in strata more recent than these approached nearer and still nearer to those now living. Thus it was learned that the earth in the different geological ages had not only exhibited great diversity of physical geography, but that the aspects of nature had varied greatly, from the prevalence in each of animals and plants peculiar to itself. All this sequence of events required immense intervals of time, and the logical consequence of the acceptance of the truth in regard to fossils was the abandonment of the conventional notion universally entertained in former times, that the earth was only 6000 years old, and it was seen that millions of years were necessary for the accomplishment of the changes recorded on its surface. These millions are now generally conceded by all intelligent men, and the dogma of 6000 years, formerly insisted on with such pertinacity, is seen to be a matter of man's invention, and without authority from the Scriptures, where the chronology of creation is left untold.

In tracing the history of palæontology it may be said that the foundations of the science as it now exists were really laid in Paris in the first quarter of the present century, when Cuvier, Lamarck, and Brongniart took up the study respectively of fossil mammals, mollusks, and plants, and began the careful comparison of their structures—with each other and with living organisms—which has since yielded such important results. From the fragmental or otherwise imperfect condition of many fossils, the more obvious characters, such as were commonly used in the comparison and classification of living animals and plants, could not be appealed to, and attention was turned to their external forms and to the microscopic structure of the fragments submitted to observation. Thus, a single tooth or bone was found by Cuvier to be so characteristic of the structure to which it belonged that, as it was somewhat extravagantly said, he proved it to be possible "from a tooth or toe to reconstruct a whole lion." In this research the science of comparative anatomy had its origin. Lamarck in a less degree accomplished for the Mollusca what Cuvier had done for the vertebrates, and Brongniart, by studying the nervation of leaves and the cell-structure of wood, showed that the minute anatomy of plants is hardly less diagnostic of their relations than their external and more apparent characters. In order to make such comparisons intelligently, however, it became necessary to subject living forms and structures to a far more close and careful study than had before been bestowed on them. The result was not simply the discovery of characters by which extinct forms could be compared with living ones, but a flood of light was poured on the whole subject of the organization and relation of living animals and plants, greatly to the advance of zoology and botany.

Life of the Geological Ages.

Eras.	Ages.		Periods.
PSYCHOZOIC..	Age of Man.		Human.
CENOZOIC......	Age of Mammals and Angiosperms.		Quaternary. Tertiary.
MESOZOIC......	Age of Reptiles and Cycads.		Cretaceous. Jurassic. Triassic.
PALÆOZOIC...	Carboniferous, or Age of Amphibians and Acrogens.		Permian. Carboniferous. Sub-Carboniferous.
	Devonian, or Age of Fishes.		Catskill. Chemung. Hamilton. Corniferous. Oriskany.
	Silurian, or Age of Mollusks and Algæ.	Upper Silurian.	Helderberg. Salina. Niagara.
		Lower Silurian.	Hudson. Trenton. Calciferous. Primordial.
EOZOIC...........	Eozoic.		Eozoic.

The above table exhibits the principal subdivisions of the geological column. The details of each of the great systems will be found in the article GEOLOGY.

Palæontology has also broadened and deepened our knowledge of the living flora and fauna by illuminating the whole subject of classification. The number of fossil species known in some departments of natural history far exceeds that of those now living, and the material for comparison is not only thus proportionately increased, but the extinct forms so frequently supply the missing links in the classification of recent species that their aid is now regarded as indispensable. Our living forms are often so disconnected that their relationships are exceedingly obscure, and their classification constitutes a kind of Chinese puzzle in which many of the pieces are missing. Some of these are supplied by palæontology, so that what seemed before a broken, chaotic, and confused series is brought into beautiful relationship and symmetry. We are compelled to look to palæontology for the origin and history of our living groups of animals and plants; and although by far the greater part of the organisms which have existed on the surface of the globe have probably perished, and the great treasury of the earth holds far more material than has been taken from it, we may still say that palæontology has given us all we know of the history of life on the globe. Every day adds to the value and interest of its teaching, and we may reasonably hope that through the study of extinct forms of life we shall ultimately gain what we now lack—a clear comprehension of the system of nature.

The value of palæontology is also manifested in another and eminently practical way. Since it has been demonstrated that certain fossils are peculiar to certain strata, that fact has been made the basis of the classification of the entire series of sedimentary rocks, and all the great groups into which the geological series has been divided are named according to the character of the remains of life they contain. This will be seen by a reference to the table given above, in which the different geological systems are placed in their relative positions, with their current names.

The following is a brief *résumé* of the characteristic features of the life of each of the geological ages, beginning with the oldest:

The Geological Record.—The materials which compose the earth's crust form three distinct classes of rocks—the igneous, the sedimentary, and the metamorphic. Of these, the first class includes those that are the direct products of fusion, such as igneous granite, syenite, porphyry, trachyte, basalt, lava in all its different forms, pumice, obsidian, etc. These were undoubtedly the first-formed rocks in the consolidation of the globe, and they constituted the primeval continents. As soon, however, as these rocks were exposed to the action of the elements, they began to be worn down and washed away, and the materials derived from them were deposited as sediments in the first existing water-basins. That process went on through subsequent ages, so that most of the rocks which we now encounter belong to the class of sedimentary deposits. These are conglomerates, sandstones, shales, limestones, etc., the consolidated forms of gravel, sand, clay, and calcareous mud. The solidification of these rocks is mainly due to the cementing of their particles by solutions of silica or lime. When baked by heat or penetrated by highly-heated water or steam they have been rendered much more compact and crystalline, and have been converted into what are called metamorphic or changed rocks. The process of destruction and re-creation of rocks is now going on with perhaps as great activity as ever, and can be easily observed. The rain that falls on the land, assisted by sun and frost, is constantly disintegrating the materials with which it comes in contact. Part of this material is dissolved and part mechanically divided, until it can be washed down through the channels of rivers to the sea. The magnitude of the valleys excavated by the currents of rivers attest the potency of this agent. Shore-waves are still more effective agents of destruction; whether they break on cliff or beach, they are constantly employed in grinding up, and by their undertow carrying away, the barriers against which they beat. Nothing can resist their force and industry. In time the most iron-bound coasts and broadest continents would be swept away in their slow but sure advance, and the comminuted materials would be spread far and wide in the rear of their line of progress.

Another influence has greatly facilitated the action of shore-waves, for the crust of the earth is constantly warping up and down, and over wide areas the subsidence of the land has permitted the sea to come in and cover much of what was before a continental surface, and spread over it its series of sediments. This we know from finding far inland rocks full of marine organisms; and we learn from these, further, that over much of the land now inhabited by man the sea has rolled not once, but many times. Just what effect was produced by such invasions can be best learned by examining the present action of the sea. On any shore beaten by the waves we find along the sea-margin a belt of sand or gravel upon which the grinding force of the waves has been exerted. This we call the sea-beach, and it is a place from which material is always being removed. Outside of this the sea-bottom is covered with a constantly accumulating sediment worn from the beach or brought down by rivers, and which consists of finer mechanical materials, sand or clay. Still farther out, and beyond the reach of the wash of the land, a calcareous mud accumulates, derived from the hard parts of marine animals, which have the power to draw from sea-water the lime that forms their shells or bones. This we may therefore call an organic sediment. Hence, the materials thrown down by the sea naturally arrange themselves in three belts, more or less blended along their margins—viz. (1) that of the coarse mechanical materials, gravel and coarse sand, along the beach; (2) sand and clay, forming off-shore deposits; and (3) outside of this and in the depths of the ocean a calcareous mud or organic sediment. In any sub-

mergence of the land these different belts would move inland in regular order. First, the sea-beach, with its coarser and finer mechanical sediments, gravel, sand, and clay, forming an unbroken sheet, would be spread over all the area submerged; and in the rear of this, and wherever deep and clear water prevailed, a layer of ooze or calcareous mud would be laid down on top of the mechanical sediments. Should the sea for a long time occupy the submerged area, this organic sediment might accumulate to a great thickness, and when consolidated would form a limestone full of the shells of mollusks and other traces of marine life. When the land was again slowly elevated, the sea would shallow and retire, leaving a mixed sediment, formed by the mechanical material drained from the land and the calcareous deposit of the sea, as the last product of this invasion. In few words, the result of each submergence would be the formation of a circle or trinity of deposits—viz. a sheet of mechanical sediment at the bottom, a greater or less mass of organic sediment in the middle, and a stratum of mixed clay and lime at top. If in the advance or retiring of the sea the natural progress of events were checked or reversed, there would be an alternation of strata in any particular locality, according as shore, off-shore, and open-sea conditions prevailed there. It should also be said that where a shore submerged and acted upon by advancing shore-waves was composed of limestone only, the mechanical materials resulting from the action of the waves would be conglomerates of limestone pebbles and limestone—for there would be no material from which quartz conglomerate and sandstone could be produced.

In due time after the retreat of the sea the land would be clothed with vegetation, cut by the draining streams into hills and valleys, and more or less covered with gravel and sand brought from portions of the continent not covered by the previous submergence. If excavations were made on this land, beneath the soil would be found impure limestones; below these, purer limestones; and still lower, strata of shale, sandstone, or conglomerate, resting upon the eroded pre-existing continent. If, after the lapse of thousands or millions of years, another submergence should take place, it would result in a similar circle of sediments, but these would differ from the previous ones in this, that during the great lapse of time the fauna of the sea would probably have greatly changed, and the new sediments would contain a different group of fossils from the old. Afterward, no matter how much broken up and contorted these strata might be, and how much alike they were in lithological characters, they could be easily distinguished by their fossils.

This imaginary history is, so far as we can learn, an accurate description of what has taken place in the formation of each of our great geological systems. The oldest rocks of which we have any knowledge are those of the Eozoic system, the Laurentian and Huronian. These are now exposed along the belt extending from Labrador to the Lake of the Woods, and thence northward to the Arctic Sea, and in the adjacent areas of the Adirondacks, a portion of the Alleghany belt, and a district S. of Lake Superior. This Eozoic area is bordered by a plain composed of Silurian, Devonian, and Carboniferous rocks, mostly marine sediments deposited in the sea, which at different times advanced and retreated along the slopes of the old continent. The mechanical materials which form the Palæozoic strata have been derived from this continent as it has been worn down by shore-waves and atmospheric erosion, and these alternate with limestones which were deposited by the sea from organic materials when it stood at its deepest. The mechanical sediments are naturally thickest along the old shore-lines, and thin out and give place to limestones in the direction of the sea-basins. Each of the great formations referred to consists, at base, of a mass of mechanical material—sandstone, shale, and conglomerate—often ripple-marked and sun-cracked, showing that they were shore and shallow-water deposits; while the limestones which form the central mass of each circle, often pure and of great thickness, could only have accumulated in deep and comparatively clear sea-water. The upper members of each series consist, as a general rule, of earthy limestone or alternations of limestone and shale, proved by many circumstances to be the deposit of shallowing and retiring seas.

In the Lower Silurian circle of deposits the basal member is the Potsdam sandstone. This lies at the bottom of the series of sedimentary rocks throughout all the great basin which extends from the Alleghanies, the Adirondacks, and the Canadian highlands to the Black Hills and Rocky Mountains. Wherever it has been examined, the Potsdam sandstone rests on the upturned and eroded edges of the Laurentian and Huronian rocks, has generally conglomerate at the base, often shows ripple-marks and sun-cracks, and its layers are sometimes covered with impressions of fucoids. Its characteristic animal fossils are beach-inhabiting linguloid shells (*Lingulepis*, *Lingulella*, etc.), and everything proves it to be a shore-deposit.

The Potsdam sandstone is succeeded above by a great limestone formation, divisible into several members where deposited near the old shores and affected by local changes, but in the interior of the continental basin an indivisible calcareous mass. This is the deposit from the sea which formed the Potsdam sandstone in its encroachment on the land. In its long occupation of the conquered territory this sea precipitated on its sandy bottom a layer of calcareous mud sufficient to form, on an average, 1000 feet of limestone. This limestone is not only filled with, but in many places is totally made up of, the remains of the invertebrate animals (there were then no vertebrates in existence) which inhabited its waters. The Trenton limestone group, as we may call by a general name the sediments deposited by the abiding Lower Silurian sea, has been deeply cut in many directions by the erosion of our lakes and rivers, and its fossils have been so carefully collected and studied that they have given us what may be considered a satisfactory view of the marine life of the time and place in which they lived. Above the Trenton limestone, in most parts of the interior basin of our continent, are calcareous shales or earthy limestones, called the Hudson River group, which contain some forms of life not found in the lower and purer limestone series, and which, by a combination of proofs, are shown to be the products of a shallowing and retiring sea. This epoch forms the closing chapter of the Lower Silurian age. A similar group of strata found in other parts of the world, holding the same relative position and marking the same relative period in the sequence of events, gives us wider views of this age in the world's history, and proves a general uniformity in the aspects of life on the globe.

Above the Lower Silurian series of rocks over great areas we find another group of deposits, to which the name Upper Silurian system has been given, and this exhibits a remarkable similarity of structure to the lower series. The base of the group is a well-marked sheet of mechanical sediment, the Medina sandstone, locally a conglomerate. This also is ripple-marked, and its layers are often covered with impressions of *Lingulæ* and fucoids, but of quite different species from those which lived on the Potsdam beaches of the first Silurian sea. The Medina sandstone is, however, much less widely spread than the Potsdam, as it rapidly thins to an edge in passing from the old shore toward the sea-basin.

Above the Medina lies another great calcareous group, locally divided into the Clinton and Niagara, but becoming more homogeneous to the S. and W., and evidently the deposit of a great body of water which had again submerged much of the area left bare by the retirement of the Trenton sea. Of the animal forms imbedded in the sediments of this second sea, numerous as they are, not more than half a dozen can be asserted to be identical with those that inhabited the first. This indicates that during the interval between the formation of the two sets of deposits, down in the oceanic basins that have always been ocean, the marine life of the globe had been almost completely revolutionized. By what causes these changes were effected we can as yet only conjecture, as the record of this interval, which must have been immense, is almost unknown to us.

After the Niagara sea had stood long enough upon the land it occupied to throw down upon the Medina sandstone perhaps 500 feet of organic sediment (the Niagara and Clinton limestone groups), the land was elevated so that the Niagara sea was greatly shallowed and partly withdrawn. A landlocked basin, lying between the Adirondack and the Cincinnati arch, covering parts of the adjacent areas of New York, Canada, and Ohio, was, however, left. In this basin the salt water was evaporated, as in the Dead Sea or Salt Lake, till it precipitated its solid constituents in great sheets of salt and gypsum, intermingled with earthy matter washed into it, the whole forming saliferous marls, the Salina group, which in Central New York has a thickness of nearly 1000 feet. Subsequently, the ocean-water again flowed in, and remained long enough to deposit the Helderberg series of impure limestones. Of these the most important member is the Water-lime, so named from its earthy limestones, which have hydraulic properties. When this formation had been laid down, the continent was again elevated, but most rapidly toward the W., making the Helderberg rocks thickest toward the E.; and the sea was then withdrawn, completing its second circle of sediments and closing the history of the Upper Silurian age.

A third circle of deposits was in after times laid down on the Upper Silurian, and forms what is known as the De-

vonian system. Of this the Oriskany sandstone and Schoharie grit form the mechanical shore-deposit which lies at the base of the series; the Corniferous limestone, the calcareous centre, the product of the sojourn of the ocean in this third submergence; and the Hamilton shales and limestones, the mixed sediments produced by the shallowing, retiring Devonian sea. The life of this sea differed even more from that of the Niagara age than that did from the Trenton; for among the thousands of marine invertebrates which lived in and retired with the Niagara sea, not more than a mere handful, perhaps a half dozen species, survived to join the hordes which peopled the inflowing Devonian sea. The fauna of the Devonian age shows this marked difference from those that preceded it, that while in the Silurian seas all the great groups of invertebrate life were fully represented, in this country no traces of vertebrates have been found in any deposit older than the Devonian. In the Corniferous sea, however, fishes abounded, and attained such dimensions, and were so well armed for attack and defence, that they would if now living prove formidable antagonists to even the most powerful of existing fishes. In regard to the origin of this great fish-fauna we as yet have no satisfactory information, for it comes into our view from the depths of the primeval ocean full grown and complete. If it had a birth and infancy, the records of that interesting period in its history are as yet inaccessible to us. In the Old World, fishes made their appearance in the last portion of the Upper Silurian age; and as their remains are found in the upper portion of the group equivalent in age to our Niagara, we thus have evidence that they inhabited the Upper Silurian sea in the later period of its existence. These first fishes are there few and small, and no clue has yet been obtained to their origin.

Another great advance in the life of this continent has left its record in the Devonian rocks. In the strata formed in the preceding ages no traces of land-plants have been found, but in those of the Devonian age the remains of a varied and beautiful terrestrial flora are met with in many localities. The plants of this age were cryptogamous, but they included many species of the highest of this group—ferns, lycopods, and equiseta far exceeding in size any of their living representatives. In the Old World, land-plants, like fishes, left their traces in the Upper Silurian rocks, but there, as here, all indications of their origin are as yet wanting.

By continuing the analysis of the geological formations through those of a later date, it could be shown that they exhibit the same general structure with those already examined, and that they resolve themselves into circles of deposition which are the records of a similar sequence of events to those already noted. For the present purpose it is unnecessary to carry the study farther, as the examples cited will illustrate the character and mode of formation of the record to which we must go for our information in regard to the life history of the globe. Each great formation exhibits a degree of unity in its fauna and flora which has induced its erection into a distinct system, or group, and is composed of a circle of deposits which mark a more or less extensive submergence of the country where they are found. The great subdivisions of the geological column are the products of great and widespread changes of this nature, and such as have occurred in different countries, if not at the same absolute, at least at the same relative, time, so that they reveal with more or less fulness the aspects of nature in the periods or ages of their formation. The views which geology thus affords us of the life of the globe cannot in any one country form a continuous panorama, but rather a series of detached tableaus, in some instances separated by long and as yet blank intervals. Since the marine life of the geological ages is by far most fully represented in this record, and since the seas, occupying a far greater area than the land, have been more continuous and uniform in their existence, it might be inferred that the record of marine life would be so nearly complete as to enable us to read from it the history of all the changes through which it has passed; but from what has been said of the nature and relation of deposits left by the sea now exposed to our inspection, it will be seen that for any one country the geological record of even marine life forms a series of chapters separated by blank intervals of such length that the thread of the story is often nearly lost. By comparing chapter with chapter or picture with picture we are struck with the great differences they exhibit, and easily trace through all a progress from the lower to the higher, as we say, or, to speak more accurately, from the simpler to the more complex, from the generalized to the specialized. We may also note great and progressive changes in the fauna of the sea during the long period of its occupation of any submerged territory. The study of the fauna of one great limestone group may give us some insight into the nature of the influences by which species are evolved or created; but demonstration of the derivation of the great geological groups, one from another, if they have been so derived, may perhaps never be reached until the secrets of the great deep are fully revealed to us. By comparing the deposits that are alternated in different countries, we shall perhaps find that one supplies in part what the other lacks; but detailed study has extended over so small a portion of the earth's surface that comparatively little light has been thrown by such comparisons on the great questions of biology.

In addition to the series of marine sediments, which constitute by far the greater portion of the geological column, there are two other classes of deposit which sometimes contain the remains of animals and plants, and therefore form a portion of the record from which we may read the history of life of the past ages. These are lacustrine and terrestrial deposits. The first category includes all strata deposited in lakes of salt or fresh water. The sediments that have accumulated in such basins are, in quantity, as far surpassed by marine deposits as the bodies of inland water are exceeded in area by oceans; and yet from the fact that all landlocked basins which have existed have been surrounded by areas occupied by land animals and plants, they have been the repositories of most of the terrestrial forms that have been preserved.

Any lake-basin into which rivers flow receives much sediment, and with this leaves, fruits, and floated tree-trunks, which in turn sink to the bottom and are buried in silt, that settles down over them as gently as falling snow. Here they may be preserved through countless ages, until some of the changes constantly taking place on the land-surface bring them resurrection. In the same manner the remains of land and water animals are buried in lake-sediments. These include not only fishes and mollusks which are aquatic in habit, but all the reptiles, mammals, and even birds that frequent the water, are sure to find in it their graves. Sooner or later, too, most terrestrial animals which inhabit the shores of lakes or the valleys of streams are by floods and other accidents drowned and floated to the common receptacle of all the freight a river-current bears. In process of time lake-basins are shallowed by accumulations of sediment in them, and by slow but incessant wearing away of their outlets. Thus, the area once covered by water becomes in time dry land; and in many instances the streams which once flowed through lakes, after the water-basins have been drained, have cut deeply into the ancient lake-sediments, bringing all their hidden treasures to light. From deposits of this kind have been obtained nearly all the strange and varied forms of mammalian life which inhabited the globe immediately anterior to the advent of man. The gypsum-beds of Paris, which contain *Palæotherium* and other extinct animals, studied with such important results by Cuvier; those of the Sewalik Hills in India, where Falconer and Cautley found *Sivatherium*, the Ganessa elephant, etc.; and those from which Leidy, Marsh, and Cope have obtained the material that has enabled them to rehabilitate the Tertiary fauna of America,—all belong to the same category.

Among lake-deposits should be also included the cannel coals and bituminous shales, which were formed at the bottoms of lagoons in the old coal-marshes. Here we sometimes find within the space of a few acres and the thickness of half a foot the remains of many genera and species of fishes and amphibians that inhabited the waters of landlocked basins. The terrestrial deposits include peat-bogs and their ancient representatives, coal-beds, in which we find nearly all the forms of vegetation which flourished within the area they occupied; travertine, cave deposits, amber, etc.

In the foregoing list all the purely *fossiliferous* deposits have been enumerated, but the life of past ages has left us as part of its record still another class of inscriptions—viz. the "footprints on the sands of time" made by bird or beast on the shores of ancient lakes, bays, or seas. Of these, the most striking examples are furnished by the so-called *bird tracks*—probably for the most part reptilian—of the Connecticut Valley. As indicative of the absolute richness and yet relative poverty of the geological record, these inscriptions are of peculiar interest.

From the foregoing description of the manner in which the geological record has been formed a general idea of its scope and trustworthiness may be gained. In considering it as a whole, it will be noticed that it is as yet an incomplete and broken narrative, but that such portions of it as have been recovered and deciphered give a series of pictures of the aspects of nature in past ages which are in the highest degree interesting and instructive. The incompleteness of any exposition that can now be given of the life-history of the globe is dependent on two

causes: (1) the imperfections of the record itself; (2) our incomplete recovery and translation of that which remains. The imperfections of the geological record are also of two kinds. So far as we now know, all the earlier chapters are rendered illegible by the metamorphism of the stone tablets on which they were inscribed. The beginnings of life were probably recorded in the Laurentian and Huronian rocks, but, though traces of ancient inscriptions are everywhere visible, they are here almost obliterated. With the exception of *Eozöon Canadense*, no individual organisms have been found in the Eozoic rocks, though organic sediments, and even organic matter, are abundant. Our knowledge of the progress and development of life is therefore drawn from a study of the remains of the animals and plants found in the upper half of the geological column. This portion of the narrative also has its imperfections. In the first place, it has been but partially read. The study given to the faunæ and floræ of the different geological systems, though sufficient to determine their essential characters and fully to warrant the broader generalizations of the palæontologists, is still in progress. New facts are being gathered day by day, and this new material explains, and sometimes qualifies, conclusions based upon previous experience.

From the very nature of the case, also, the record must always remain in some respects incomplete. We have seen that by far the greater part of the sedimentary strata are marine, and hence the remains of marine life have been in all ages much more fully preserved than those of the land. Over all the area occupied by the sea in any age we might expect to find traces of the organisms inhabiting that sea that possessed tissues or parts which would resist decay; yet on the continents of the same age comparatively few of the terrestrial animals—birds, beasts, or insects—would leave any trace behind them. We may therefore conclude that aquatic animals and plants are much more fully represented in the geological record than those which occupied the land. In addition to this, all animals without shells, skeletons, or other hard parts must have perished and passed out of knowledge, and these have constituted an important part of the ancient fauna, now utterly lost to us.

From the manner in which marine deposits have been formed—by successive invasions of the sea, and these invasions frequently separated by long intervals of time—until we gain access to the missing links in the geological sequence we lack the connection between the successive faunæ, and therefore want the most important elements in the estimation of the causes of the revolutions of which we have evidence. It will be seen, therefore, that our most promising field for the study of the causes which have produced changes in the fauna and flora of the globe is to be found within the limits of each geological system. In many instances intervals of time practically incomprehensible to us elapsed, during which the physical conditions of large portions of the earth remained essentially the same. The different limestone strata must each have required many thousands of years for their accumulation; and by a careful study of the changes of fauna which took place within a circumscribed area during such intervals we may hope to acquire some knowledge of the nature and mode of action of the influences which have controlled the stability and mutation of species.

During the entire *Tertiary* age the continent of North America was in all its general topographical features what it is now, but we know its central and western portions were once occupied by broad expanses of inland waters, and that in process of time these were drained away and ceased to exist; and since our continent acquired nearly its present form and geological structure it has been swept by alternations of climate which must have powerfully influenced the development and distribution of life. Within the limits specified, therefore, we must look for the most important testimony afforded by the geological record on the great questions of biology.

It may also be said that the knowledge already derived from the sources enumerated has considerably modified the conclusions that were formerly universally accepted. In some instances the derivation of genera and species from what had seemed to be other genera and species has seemed to be clearly proved; while, on the other hand, the great number of what Prof. Huxley calls *persistent types*—that is, types that have continued to exist through incalculable intervals of time, and have spread through the diversified topography and climate of the world without sensible change—apparently indicates an inherent conservative influence in the life-principle which is incompatible with the theory that external circumstances alone have determined the forms assumed by plastic organic matter.

In the succeeding paragraphs the characteristics of the organic world in the different geological ages will be briefly sketched:

Eozoic Age.—The life of the incalculable lapse of time represented by the immense mass of sedimentary strata which form the Laurentian and Huronian systems has been almost entirely obliterated by the metamorphism of the rocks on which its history was once inscribed. Only one fossil has been found in the Laurentian, and the organic nature of this has been strenuously denied, though now established, as far as this can be, by weight of authority. This fossil is the *Eozoön Canadense*, supposed to be a protozoan, and nearly allied to the Foraminifera. Though the individual fossils have disappeared from the Eozoic rocks, abundant evidence remains that life in great abundance prevailed during the time of their deposition. This evidence consists of (1) immense beds of limestone, which are generally conceded to be of organic origin; (2) beds of graphite which rival in their extent the carbonaceous deposits of the Carboniferous and more recent ages (this graphite is undoubtedly the residuary product of the distillation of vegetable tissue which accumulated as our coal-beds and bituminous shales have since done); (3) apatite, the phosphate of lime, an abundant constituent of the Eozoic rocks, the phosphorus of which is supposed to be derived from organic tissue; (4) numerous and extensive deposits of iron ore, in the deposition of which organic matter doubtless played an important part, as it has done in the precipitation of the later beds of this material. The Eozoic rocks form a series of sedimentary strata estimated to have a maximum thickness of nearly 50,000 feet, or nearly half of the geological column, and the view is entertained by good geologists that they represent a large fraction, perhaps half, of the time covered by the geological record.

Cambrian Age.—The limits of the Cambrian system are as yet undefined, and it remains for geologists to decide by convention how large a portion of the fossiliferous rocks shall be included in it, and where the line shall be drawn between this and the overlying Silurian. For convenience, however, it is assumed here that the Cambrian system reaches up to the Potsdam sandstone and the "Lingula flags," and includes the greater part of the "Primordial" fauna of Barrande. The type rocks of this system are the Longmynd series of Wales, the Harlech and Menevian beds of England, Barrande's *Étages* "B" and "C" of Bohemia, Angelin's divisions A and B of Sweden, the St. John's or Acadian group of Newfoundland and New Brunswick, etc. The life of this age is represented by the remains of sea-weeds in large numbers, and animal forms belonging to all the invertebrate subkingdoms, the protozoans by sponges, the radiates by crinoids and polyzoa, the mollusks by pteropods and brachiopods, the articulates by worms and trilobites—the latter in very large numbers, including the genera *Paradoxides, Conocoryphe, Microdiscus, Olenus, Agnostus,* etc. More than 200 species of trilobites have been found in the primordial beds, and some of them two feet in length. These constitute the most striking feature of the fauna of the age and its highest development of life; and this may be considered the culminating period in the life of this group of crustaceans. No corals have yet been found in these oldest fossiliferous rocks, nor any traces of the highest orders of mollusks.

Lower Silurian Age.—In the classification here adopted the Lower Silurian system includes the Potsdam sandstone, the Calciferous sandrock, the Quebec group, the Chazy, Bird's-eye, Black River, and Trenton limestones, and the Utica and Hudson shales. In the British islands the Lower Silurian system contains the Lingula flags, the Tremadoc and Skiddaw slates, the Llandeilo rocks, Bala limestone, Caradoc sandstones, and the Llandovery group. The rocks of this age are highly fossiliferous, and over 10,000 species of fossils have been described from them. They include numerous representatives of all the invertebrate groups, but the remains of mollusks far outnumber all others. From this fact this is sometimes called the Age of Mollusks. The remains of protozoans are also in some localities exceedingly numerous. They consist of sponges (*Brachiospongia, Archæocyathus,* etc.) and Foraminifera (*Receptaculites, Ischadites,* etc.). The *Receptaculites* were Foraminifera of gigantic size, forming disks sometimes a foot in diameter, and so numerous in the Galena limestone on the upper Mississippi and the Trenton in Nevada that they constitute an important portion of the mass of the rock. The radiates are represented by crinoids, corals in considerable numbers, but generally of small size, and graptolites which are so numerous and varied as to constitute one of the most peculiar and characteristic features in the life of the age. The mollusks include an immense number of brachiopods, some pteropods (*Hyolithus, Conularia,* etc.), numerous gasteropods, and

conchifers, and a great variety of cephalopods, some of which attained gigantic dimensions. A species of *Orthoceras*, for example, attained a diameter of fifteen to eighteen inches, and a length of from twenty to thirty feet. The articulates of the Lower Silurian embrace annelids, phyllopods, eurypterids, and ostracods. The trilobites were mostly of different genera from those of the primordial fauna. They were scarcely less numerous or varied, but they were relatively less important elements in this than in the preceding fauna. The annelids are represented by tracks and burrows and by the genera *Concholites*, *Serpulites*, *Ortonia*, etc. The phyllopods are represented by *Ceratiocaris*, *Peltocaris*, etc.; the ostracods, which were very abundant, by *Leperditia*, *Byrichia*, etc. The plants of the Lower Silurian were probably all marine; certain casts of stems found at Cincinnati and in Sweden have been described as those of terrestrial plants, but none of their tissues have been preserved, and their external forms do not prove this.

Upper Silurian Age.—After the deposition of the marine sediments of the Lower Silurian the sea retired, and land conditions supervened over much of the area it occupied. After an indefinite period of absence the sea returned and again covered parts of its old bed, depositing on these parts a new series of sediments that contained a new fauna, in which, however, a few of the old species remained. What relationship existed between the faunas of the Lower and Upper Silurian we have as yet no means of accurately determining. Either the Lower Silurian fauna in the long period of its residence in the deeper sea-basins was transmuted by evolution, or it was replaced by new forms migrating from other regions. Doubtless, more light will be thrown on this question by future discoveries, but as yet it is one of the problems remaining to be solved.

The Upper Silurian fauna is essentially that of the Niagara sea, which in its advent produced the Medina sandstone, with its beach-inhabiting *Lingula cuneata*, the seaweed *Arthrophycus Hallii*, etc., and in its sojourn spread the great calcareous sheet of Niagara and Clinton limestones over most of its bed. In the subsequent shallowing and withdrawal of this sea the Salina group was formed in an isolated evaporating basin, and by a temporary return of deeper water the earthy limestones of the Helderberg group were deposited. In the diverse conditions recorded by these different sediments the life-record of the age was also much varied, but, on the whole, the fauna of the age shows a good degree of uniformity. In America no traces of vertebrate life have yet been found in the rocks of this age, but in the Old World fishes inhabited the Upper Silurian sea during the later epochs of its existence. As a whole, the Upper Silurian fauna may be regarded, zoologically, as a continuation of that of the Lower Silurian, as it is composed of the same great groups. The protozoans are represented in it by sponges and rhizopods, but these are smaller and less numerous than before. Among them are the genera *Asterospongia*, *Astylospongia*, and *Receptaculites*. Corals are far more numerous than in the sediments of the Lower Silurian ocean. In some localities the limestone is largely made up of them, though they are not known to have anywhere formed coral-reefs. Crinoids are abundant and form a large number of genera, of which the most characteristic are *Ichthyocrinus* and *Caryocrinus*. Star-fishes (*Palæaster, etc.*), as in the Lower Silurian, were not uncommon. Among the mollusks all the different orders, except the Tunicata, are well represented. We cannot infer from the absence of ascidians that they had no existence at that age, for they may have been numerous, but, like those now living, soft-bodied, and therefore could leave no trace of their existence. The Bryozoa are represented by numerous species of *Fenestella*. Brachiopods are abundant in the Upper Silurian rocks, the genus *Pentamerus*, forming several species, being the most characteristic. Conchifers were still comparatively rare, though they included much larger forms than any of those of the Lower Silurian, such as *Megalomus Canadensis*. Gasteropods are much more numerous and larger than in the older rocks, some species of *Murchisonia* attaining a length of five inches, and a discoid, *Pleurotomaria* (*P. Solaroides*), being four inches across. The pteropods exhibit several species of *Conularia*, and the cephalopods include a large number of straight and coiled shells (*Orthoceras*, *Cyrtoceras*, *Gomphoceras*, etc.), none of which, however, attained the dimensions of those inhabiting the Lower Silurian sea. Among the articulates, trilobites were numerous, and included some of the most interesting and highly-organized species known, belonging to the genera *Lichas*, *Homalonotus*, *Calymene*, *Dalmanites*, and *Illænus*. The ostracod or bivalve crustaceans were exceedingly numerous in the landlocked basins of the Salina and Helderberg epochs. Among these the genus *Leperditia* had several species, one of which (*L. alta*) covers the surfaces of the layers and composes much of the mass of the Water-lime. The phyllopods had numerous and striking representatives in species of *Ceratiocaris*, but the most remarkable crustaceans of the Upper Silurian were the Eurypterida (*Eurypterus*, *Pterygotus*, *Slimonia*, *Stylonurus*, etc.), and they formed the summit of the life-series of this age in America. The most conspicuous additions made to the life of the globe in this age were land-plants (lycopods) and fishes (small bucklered placoderms), which came on to the stage in Europe during the last epoch. No clue has yet been obtained to the origin of either of these groups.

Devonian Age.—The Devonian rocks exhibit the same general arrangement—*i. e.* a circle of deposition—as the formations below; in America the Oriskany sandstone and Schoharie grit forming the mechanical base, the Corniferous and Hamilton limestones the organic centre, and the Hamilton, Genesee, and Portage shales, generally carbonaceous, its mixed summit. We thus have conclusive proof that the series was formed by the third submergence of portions of the land, similar in kind and effects to those which had preceded it. The life of the incoming sea of this age was in some respects very different from that of the preceding ages, inasmuch as this sea was populated with great numbers of fishes. (See FOSSIL FISHES.) Of the origin of this fish-fauna we as yet know absolutely nothing, as no connecting links have been found between the vertebrates and the invertebrates. The bucklered fishes of the Devonian are not unlike in general aspect to some of the crustaceans which formed the preceding dynasty, but in structure they are as widely separated from them as are the fishes and crustaceans of the present day. The other forms of marine life of the Devonian were exceedingly numerous, but allusion can only be made here to some of the most conspicuous of them. The protozoans were abundantly represented by sponges, but the Foraminifera seem to have been all small, and they have left no such striking record of their existence in this age as in those that preceded and followed it. The radiates, on the contrary, seem to have had great development in the Devonian seas. Corals abounded, and in some instances formed reefs which rival those of the present day in extent and the variety of forms they included. Crinoids were extremely abundant, and large masses of rock are chiefly composed of their débris. Mollusks were represented by all the living orders, except the Tunicata. Among the brachiopods, Spiriferæ are more numerous and larger than before, and *Orthis*, *Strophodonta*, and *Streptorhynchus* exhibit a profusion of species which attained sizes not reached below. The pteropods were chiefly of the genera *Tentaculites* and *Conularia*, the former of which were very numerous. Conchifers show an increase in numbers and size over those of the preceding ages; the more important genera were *Avicula*, *Grammysia*, *Conocardium*, *Paracyclas*, etc. The gasteropods of the Devonian exhibit a corresponding advance, both in size and numbers. The cephalopods, however, show the most striking evidence of progress, for many of the discoid forms (*Nautilus*, *Gyroceras*, etc.) rival in magnitude those of later ages. The genera *Clymenia* and *Goniatites* are here introduced, and the former becomes characteristic. The Crustacea of the Devonian include many trilobites, but this group is already on the decline, for they are fewer and smaller than in the Silurian ages. The Eurypterida are quite numerous, and some of them (*Pterygotus*) attain dimensions never reached by crustaceans before or since. The phyllopods are represented by many species of *Ceratiocaris*, *Dythyrocaris*, etc., and this was probably the culminating period in the life of this group. The fishes of the Devonian include scaled and plated ganoids and elasmobranchs, the latter, however, far inferior in size and numbers to the former, which ruled the seas and formed the highest development of animal life.

The continents of the Devonian age, for the first time in the history of the world, were covered with land-plants. These were mostly acrogens (ferns, lycopods, and equiseta), among which were tree-ferns which equalled, if they did not exceed, in size any of those now living. Conifers seem to have occupied the higher portions of the land, and to have formed several genera which belong to the family of the Araucarians. Sea-weeds grew along the shores of the Devonian oceans, and in the period of the shallowing and retiring of the water they flourished in unprecedented variety and luxuriance, as their decomposing tissues seem to have supplied the carbonaceous matter with which the shales of the Upper Devonian are impregnated.

Carboniferous Age.—The Devonian sea deposited the Hamilton and Huron shales in the last period of its existence, when it was already narrow and shallow. Subsequently it was withdrawn from its ancient bed, and then ensued a period of oscillation of its level which caused it to spread over the previously-deposited sediments a broad sheet of mechanical materials, now known by the

name of the Portage sandstones and the Chemung, Catskill, and Waverley groups. These consist of shales and sandstones, with some layers of impure limestone, evidently the product of shore and shallow-water accumulation. All this mass of mechanical sediment was finally overflowed by the ocean in a submergence that was (on this continent) more extensive than either of those which have been described. In this invading sea the Carboniferous limestone was deposited. This is made up of the remains of a new fauna, so entirely distinct from that which preceded it that only a single species (*Strophomena rhomboidalis*) is known to have been an inhabitant both of the Devonian and Carboniferous oceans. The Carboniferous age, as is well known, takes its name from the beds of coal contained in the strata then formed. The life of this age included far more terrestrial forms of animals and plants than that of the preceding periods. It is marked by many important additions and changes: the chief additions are, in the beginning of the age, amphibians, and in its last epoch true reptiles. The sea of the Carboniferous age abounded in fishes, both ganoids and elasmobranchs, the latter having now become far more powerful in size and numbers than they were in the Devonian sea, while the ganoids seem to have been for the most part driven from the open ocean and confined to shores, rivers, and lakes. The invertebrate life of the Carboniferous sea was as varied as before, but in many respects different. The protozoans have left comparatively few distinct forms, but one genus (*Fusilina*) was so abundant that thick and widespread strata of limestone are composed almost entirely of its shells. Crinoids were exceedingly numerous, and this was the golden age of the group. True echinoids made their first appearance in the genus *Archæocidaris*. Corals are comparatively few and small in the Carboniferous rocks. Polyzoa were, however, very numerous, and constituted many genera, of which *Retepora Archimedes* is the most characteristic. The brachiopods were already declining, but two families introduced in the Devonian become conspicuous elements in the molluscous fauna—*Productus* and *Chonetes*. The pteropods were chiefly represented by *Conularia*, of which there were many species and the largest of the group known. The gasteropods of the Carboniferous form a great number of genera, among which may be mentioned *Bellerophon, Pleurotomaria, Euomphalus* and *Macrocheilus* as the most characteristic. Of the cephalopods, *Nautilus* and *Goniatites* are the most abundant, this being the culminating period in the life of both these genera. *Orthoceras* is feebly represented both in the number and size of the species. The conchifers show a considerable advance in numbers over the groups of the lower systems. For the most part, they belong to the genera *Allorisma, Aviculopecten, Sanguinolites*, and *Myalina*. Perhaps the most striking additions to the molluscous fauna are the land-shells *Pupa* and *Conulus*. The crustaceans were comparatively few and small, but include higher forms than the older fauna. Among them we find *Bellinurus* and *Prestwichia*, related to *Limulus*, and *Anthracopalæmon* and *Gampsonyx*, the forerunners of our shrimps and lobsters. In the Coal-measures myriapods and insects of several orders have been found. The fishes were ganoids, sharks, and rays, all in large numbers. Amphibians have left their remains mostly in the sediments of the lagoons of the coal-marshes. Traces of something like thirty genera and sixty species have been found in rocks of this age. True reptiles seem also to have been in existence during the coal-measure epoch; the vertebræ of an Enaliosaur having been found by Prof. Marsh in the coal-strata of Nova Scotia. The plants of the Carboniferous age included algæ, lycopods, ferns, equiseta, and conifers. No mosses, lichens, liverworts, grasses, palms, or angiosperms have left any traces of their existence. Cycads grew in the Coal-measures, but were apparently small. These, with a few monocotyledonous flowering plants, were prophetic of the flora of the succeeding age. The life of the Permian was simply a continuation of that of the Carboniferous.

Triassic Age.—The Triassic is the first of the Mesozoic ages; it ushers in a new era in the world's history, and one separated from the preceding by a more distinctly-marked hiatus than appears elsewhere in the series. The American representatives of the Trias are chiefly terrestrial, shore, and shallow-water deposits containing little limestone, and therefore affording an imperfect record of the marine life. In some parts of the Old World we find evidence of a distinct submergence, as the Trias constitutes a typical circle of deposition of which the base is the Bunter-sandstein, the calcareous marine centre, the Muschelkalk, and the mixed Keuper above. The fauna and flora of the Trias include many new and striking forms, which must have given a peculiar aspect to nature in that age. The vegetation was chiefly gymnospermous, the cycads predominating; conifers also being numerous. Endogenous plants likewise began to make their appearance in considerable numbers, and in the beautiful forms of *Yucca* and *Pandanus*. We find in the Trias traces of the first-known mammals, the little marsupials *Microlestes* and *Dromatherium*. By far the most conspicuous feature in the fauna was, however, formed by the great development of the Amphibia, of which this seems to have been the golden age. Amphibians were then the ruling dynasty, and they included in their number many which in size and prowess would compare with the most formidable reptiles now living. The most highly-organized members of the class, the *Anoura*, seem not to have then existed. True reptiles were also numerous in the Triassic age, and we have here the introduction to the "Reign of Reptiles," which was the characteristic feature of the life of Mesozoic times. Although numerous skeletons of reptiles and amphibians have been found in rocks of this age, by far the most impressive traces they have left are the tracks which the shore-inhabiting species made on the beaches washed by the waves of the Triassic sea. These impressions are found in great numbers in the Connecticut Valley, New Jersey, and Kansas. They were formerly called bird-tracks, but are now believed to be rather the tracks of amphibians and reptiles, and by their variety and abundance are significant of the richness of the fauna of which they constitute almost the sole record. Most of these tracks were probably made by terrestrial labyrinthodonts, but there were also marine lizards, allied to *Plesiosaurus*, in the age (*Nothosaurus, Simosaurus*, etc.). Another peculiar group of Triassic reptiles were the *Anomodontia*, chiefly found in South Africa, some of which had heads like turtles, but most were provided with huge canine teeth. The invertebrate life of the Trias is very imperfectly represented. In the Muschelkalk, however, and the Rhætic beds—which latter form the summit of the formation—a large number of radiates and mollusks have been discovered. These show a peculiar mingling of Palæozoic and more recent types. For example, in mollusks the genera *Orthoceras* and *Goniatites*, so abundant below, disappear altogether, and are succeeded, first by the more complex *Ceratites*, and in the Upper Trias by the genus *Ammonites*, so much expanded in the Jura and Chalk. Also, *Murchisonia*, which began in the Silurian, is associated with *Nerinea*, and *Megalodon* with *Trigonia*. Among the most characteristic Triassic mollusks are *Monotis* and *Myophoria*. Fishes have left numerous remains in the Triassic rocks, and these show that only ganoids and elasmobranchs were living in that age. Most of the fishes are of small size, and were the inhabitants of bays, lakes, and rivers. They include *Palæoniscus* and the peculiarly Triassic forms *Catopterus, Ischypterus*, etc. All of these have heterocercal tails, but this feature is less strongly marked than in the older fishes.

Jurassic Age.—The Jurassic rocks rest upon the Trias in Europe, in many localities without break, and the chain of life that pervades them is continuous. For the most part they seem to be the effects of a gentle subsidence with many oscillations, all without much disturbance. This resulted in covering the coarser sediments of the Trias with alternations of calcareous shale and limestone which form the Liassic and Oolitic groups. The most conspicuous feature in the life of the Jurassic is formed by the development of reptilian life, and this is the culminating period of the great reptilian age. The vegetation consisted mainly of cycads, conifers, and ferns. The cycads here attain their greatest development, and must have given a peculiar aspect to the scenery of the age. The Protozoa are represented by sponges and foraminifers, both of which groups have left a large number of representatives in the fossil state. Corals were numerous, but no portion of the Jurassic sea-bed yet exposed to our view exhibits any traces of coral-reefs, and most of the forms preserved are small. The echinoderms were exceedingly abundant, and *Pentacrinus* must have covered portions of the sea-bottom with a thicket-like growth of stems and branching arms. The echinoids proper were in this age far more numerous than before, and many beautiful species have been collected belonging to the genera *Hemicidaris, Diaster, Diadema*, etc. Star-fishes and ophiurans were also abundant, and all this group of radiate forms is far better represented here than in the rocks of the preceding ages. Among the mollusks, bryozoans are rare, and the same may be said of pteropods. Brachiopods were not uncommon, but were far less numerous and varied than in the earlier seas. The Palæozoic genera *Leptæna* and *Spirifera* disappeared in the Jurassic age, and the most abundant brachiopods were *Rhynchonella* and *Terebratula*. The conchifers exhibit great expansion in the long list of genera and species which inhabited the Jurassic ocean. Among them the oysters, with their associates, *Gryphæa* and *Exogyra*, are notable additions to the older molluscous fauna. The same may be said of *Trigonia, Lima, Phola-*

domya, and *Diceras;* the latter a genus of this order, in which the valves were coiled spirally like rams' horns. The Gasteropoda of the Jurassic are more numerous and varied than in the older faunas, and they have much more the aspect of those of the present day. A large number of genera which are now living make their first appearance in the Jurassic rocks, such as *Nerita, Turritella, Pteroceras, Buccinum, Fusus, Murex*, etc. The Cephalopoda have left an immense number of species in the sediments of the Jurassic seas. These include both the dibranchiate and tetrabranchiate groups. The latter are represented by several species of the genus *Nautilus*, which has run almost unchanged through the geological ages to the present day; and, far more numerous than the *Nautili*, the *Ammonites*, which form a group which must have given a peculiar character to the molluscous fauna of the age. The dibranchiate cephalopods were represented by the Belemnitidæ, a family which began in the latter part of the Triassic age, and ended in the Cretaceous, but which had its maximum development in numerous and varied species of *Belemnites* that form one of the most characteristic features in the Jurassic fauna. In the Jurassic system we first find unmistakable fresh-water deposits—the Purbeck beds. These contain numerous mollusks, such as *Cyrena, Limnea*, and *Viviparus*, which have continued to inhabit fresh-water lakes and streams, with little change of form, to the present day. The persistence of these types of fresh-water mollusks through so many and so great changes constitutes one of the most surprising facts of palæontology, for the inhabitants of fresh-water streams and basins are not only exposed to modifying circumstances that are extremely local and varied, but they would seem to be exposed to much greater probability of extermination than the inhabitants of the ever-continuous sea. The *Unios, Melanias, Paludinas*, etc. of the Purbeck and Wealden beds have, however, been much more persistent than their marine contemporaries, and they are so much like the species now living that when both are stripped of the epidermis they can hardly be distinguished. Whether birds existed in the Triassic age is still an open question, but that they lived in the age of the Jura is proved beyond a question, not only by single feathers, but by the discovery of *Archæopteryx* in the Solenhofen slates. This bird, however, and perhaps all others of the age, differed considerably from the birds of the present day in this, that the vertebral column was prolonged into a tail of considerable length. In this and some other features the *Archæopteryx* seems to be a kind of connecting link between birds and reptiles. The mammals of the Jurassic age, though evidently somewhat numerous, were small, and held a completely subordinate place in the fauna. It is probable, also, that they all belonged to the lowest group of mammals, the marsupials. Reptilian life in the Jurassic age seems to have expanded in every direction, for there were then swimming, walking, and flying reptiles, and their huge dimensions and formidable armaments serve as central and hideous figures in the pictures which the imagination paints of the age. Of the Jurassic marine lizards, the *Ichthyosaurus* and *Plesiosaurus* are best known, though the remains of many others have been found. Another great group, that of the *Dinosauria*, inhabited the land, and surpassed in dimensions our largest pachyderms. Some of these were carnivorous (*Megalosaurus*), while others were vegetable feeders (*Hylæosaurus*, etc.). The *Pterosauria* (winged lizards) form several genera (*Pterodactylus, Rhamphorhyncus*, etc.), and some of them exceeded our largest birds in size. Turtles and crocodiles existed in the Jurassic age, and one of the latter, *Teleosaurus*, resembled in form and equalled in size the gavial of the Ganges. The fishes of the Jurassic were all ganoids and elasmobranchs, the latter chiefly represented by hybodont sharks, of which the defensive fin-spines and pointed teeth are not uncommonly met with. Most of the ganoids had rhomboidal scales, and were but slightly heterocercal. These formed a great number of genera, varying in size from *Pholidophorus*, but little larger than a minnow, to *Lepidotus*, fully six feet in length, and covered with bony and enamelled scales half an inch in thickness.

Cretaceous Age.—In most respects the life of the Cretaceous age is but a continuation of that of the Jurassic; some very important additions were, however, made to pre-existing forms. In many countries where they are found, the Cretaceous rocks, by their composition and structure, as well as by their fossils, are shown to be deposits of deeper and clearer water than that of the seas where the Jurassic strata accumulated. They therefore indicate a period of greater submergence, and the fauna of this period includes a greater number of purely marine forms. As a whole, this age must be regarded as a final chapter of the Mesozoic history, in which all the prominent characters retain their places on the stage and play leading parts in the drama. Reptilian life seems to have been scarcely less abundant in the Cretaceous than in the Jurassic age. The cephalopod mollusks that were so abundant in the Jurassic seas become still further multiplied and varied, until they become a more striking feature of molluscous life than in the preceding age. We have to record the advent in the Cretaceous age of the highest order of plants, the angiosperms, and of fishes, the teleosts—which rapidly superseded, one the cycadaceous flora, and the other the ganoid fauna of the preceding age. The base of the Cretaceous in England is formed by the fresh-water beds of the Wealden, which, besides the mollusks already alluded to, contain the remains of several huge dinosaurs, among the most conspicuous of which was the *Iguanodon*. The Chalk itself is mainly composed of the remains of Foraminifera, which seem to have been specially abundant in this age. Though mostly microscopic in size, their shells form almost the entire mass of strata several hundred feet in thickness. Sponges are also numerous in the Cretaceous; scarcely any but the calcareous and silicious species have been preserved, but these were much more abundant than in the present seas. Molluscous life in the Cretaceous age approached still more closely to that of the present day than did that of the Jurassic, and a large part of the genera which left their remains in the Chalk are represented, though by different species, in the present seas. Radiates were abundant, and among the Cretaceous species we find nearly all the groups now living, with some that have passed away. Reef-building corals seem not to have existed in any of the Cretaceous seas the sediments of which have been examined, though the smaller forms are quite numerous. The echinoderms were represented by few crinoids as compared with preceding ages, but more than are now living. Of the higher members of the group, the echinoids and asteroids, the number was large, and in character they closely resembled those of the Jurassic. We know little of the articulates of the Cretaceous, except the marine crustaceans. They are more highly organized than those of the preceding ages, and they include representatives of both our lobsters and crabs. The teleost fishes, which began in the Cretaceous, seem to show no evidence of derivation from previously-existing forms, and they included at least one genus, *Beryx*, which is now living in the Atlantic. *Osmeroides* is another well-known Cretaceous genus, supposed to be allied to the salmons, and to represent the highest group of the teleosts. The change in the vegetation of the earth which took place in the Cretaceous age gave some signs of its approach in the first-formed strata of the system, where a few angiospermous leaves are found mingled with a vastly preponderating number of acrogenous and monocotyledonous plants. By the middle of the Cretaceous age the angiosperms had spread over the European and American continents, and vegetation had assumed the general aspects which it has at the present day.

Tertiary Age.—The rocks of this age are in some places several thousand feet in thickness. They were divided by Lyell into three groups, of which the lowest he called the Eocene, the middle Miocene, and the uppermost the Pliocene. In many parts of the world the Tertiary strata are of fresh-water origin, and hold the remains of a much larger number of land animals and plants than are to be found in the older formations. The diagnostic character of the fauna and flora of the Tertiary was considered by Lyell to be this, that they contain more or less living species, but it is doubtful whether any of the Eocene species have come down to modern times. The general character of the life of the Tertiary is expressed by designating this as "the Reign of Angiosperms and Mammals." Even in the Eocene rocks the remains of mammals abound, and these indicate such size and variety as to prove that the group of huge reptiles which dominated the world in Mesozoic times had, even thus early, given place to a mammalian dynasty which had become the rulers of the animal kingdom. The first knowledge of the mammalian fauna of the Eocene was gained through the discoveries of Cuvier, made in the gypsum-quarries of Montmartre, near Paris, where the skeletons of *Palæotherium, Anoplotherium*, and some other tapiroid animals were found. Since then great additions have been made to the known fauna of the Eocene by explorations in Western America, where, in the sediments of ancient lakes, there have been found and described by Leidy, Marsh, and Cope the remains of perhaps 200 distinct species. These include many large animals allied to the rhinoceros, but attaining nearly the size of the elephant, and provided with several pairs of horns and two huge canine tusks in the upper jaw. These constitute a new order of animals, the Dinocerata of Marsh, and form the most striking feature in the life of the first epoch of the age of mammals. One remarkable thing in the structure of these monsters, as shown by Marsh, is the very small

size of the brain, which is formed by a very slight bulbous expansion of the spinal cord. The associates of the Dinocerata included small four-toed horses and many genera of animals allied to *Palæotherium*. In the later deposits of the Eocene are carnivores related to cats, wolves, and foxes, also quite a number of lemurine monkeys, as well as many forms now quite extinct. The marine life of the Eocene was, like the terrestrial, very different from that of the Cretaceous, which indicates the lapse of vast periods of time between the deposits of the two systems. Among the marine vertebrates, the most striking are *Zeuglodon*, a peculiar cetacean which attained a length of seventy feet and inhabited the Atlantic and Gulf waters; *Carcharodon*, a shark of nearly equal size; and a manatee (*Squalodon*). The smaller fishes of the Eocene are chiefly teleosts, which had now almost completely supplanted the ganoids. The remains of rays, sword-fishes, and saw-fishes are not uncommon in the Tertiary marls of New Jersey and South Carolina. The reptiles of the Eocene include snakes (which here make their first appearance), turtles, and crocodiles, the latter being abundant. Birds seem to have been fairly represented in the Eocene fauna, and, like those found in the Cretaceous by Prof. Marsh, some of them were provided with teeth. Among the invertebrates, the most conspicuous features are as follows: the Protozoa are chiefly represented by Foraminifera, of which some existed in great numbers and attained relatively large size. Among these may be mentioned *Nummulites* and *Orbitoides*, which had discoid cells, sometimes an inch in diameter, and made up almost mountain-masses of limestone. Corals are not numerous in the Eocene rocks, and those found are closely allied to living forms. In the mollusks we find a great change from the fauna of the Cretaceous. All the great family of the Ammonitidæ, which filled the Cretaceous sea, had disappeared from the world before the deposit of the Eocene strata. The dibranchiate *Belemnites* also left no representative whatever in Tertiary rocks. *Nautilus* held on the even tenor of its way, as throughout the preceding ages. The gasteropods and conchifers are more numerous and varied than in any former age, and many of the former are siphonated. A large part of the genera now living were well represented in the first Tertiary sea. The fresh-water mollusks of the Tertiary, like those of the Wealden and Purbeck, have a most remarkable resemblance to those now living. The vegetation of the Eocene of Europe is sub-tropical in character, including forms that now flourish in the East Indies and Australia. At this time the great chains of the Pyrenees, Alps, Carpathians, etc. were not raised, and the southern coast of Europe was probably washed by a tropical sea. In America the Eocene flora was much more like that of the present day, but the abundance and variety of palms give it a sub-tropical character.

The life of the Miocene and Pliocene epochs shows an increase in the number and elevation of the rank of mammals and the culmination of the mammalian age. The elephant, mastodon, and camel, with a large number of extinct herbivores, and carnivores allied to our lions, hyænas, wolves, bears, and ferrets, go to make up a fauna far richer than any now existing upon the globe. In addition to the orders obtained from the Eocene, we here meet with edentates, proboscidians, and true monkeys. The Tertiary horses, which are numerous, had four toes in the Eocene, three useful toes in the Miocene, and one useful and two dwarfed toes in the Pliocene, showing a gradual transition to the present horse, in which the lateral toes are obsolete. (See HORSE, by PROF. O. C. MARSH.) The vegetation of the Miocene was in many respects similar to that of the present day, and included a number of species now living. The climate of the northern hemisphere was in the Miocene mild, and a luxuriant vegetation covered all North America to the Arctic Sea. At this time there must have been a land-connection between this continent and Europe on the E. and Asia on the W., as the American Tertiary flora is found in the Miocene deposits of Europe, and is now living in China and Japan. From Europe the flora was apparently exterminated by the Ice period: while having space for a southward retreat, it survived in America and Eastern Asia.

Glacial Period.—Immediately following the Tertiary, with its immensely-developed mammalian life and a rich vegetation which reached almost to the poles, came a period of great cold, when the present climate of Greenland descended on the American continent as low as New York, and all the northern half of the continent was covered with ice and snow. By this great revolution of climate a large part of pre-existent animals and plants were destroyed. The life-history of this period of the world is exceedingly meagre. In the alluvial deposits and caves of Europe, and in some of the inter-glacial peat-beds of both America and Europe, mere glimpses of it are obtained. We there find the evidence of the existence of elephants and rhinoceroses, provided with thick wool and hair to protect them from the severity of the climate, and of the presence in low latitudes of the musk-ox and reindeer, now the inhabitants of the Arctic regions. The giant beaver (*Castroides*), the mastodon, elephant, and several species of rhinoceros, which were then associates with the musk-ox and reindeer, have now entirely disappeared. With the amelioration of the climate and the retiring of the glaciers northward the larger mammals referred to extended their migrations to the Arctic seas, where their remains are now found in great quantities. By what influences they were exterminated we are as yet unable to say. Contemporary with the animals last mentioned was man, who made his advent in Europe probably immediately after the culmination of the Ice period. Whence he came and what was his origin are not yet taught by palæontology. J. S. NEWBERRY.

Palæosau′rus [Gr. παλαιός, "ancient," and σαῦρος, "lizard"], a genus of fossil thecodont lizards having affinities with the crocodiles and the dinosaurs. Their bones are found in the Permian strata of Europe, and relics referred to this genus occur in the Triassic of the Carolinas.

Palæotheri′idæ [from *Palæotherium*—παλαιός, "ancient," and θηρίον, an "animal"—the typical genus], a family of mammals of the order Ungulata and sub-order Perissodactyla, related to the horses and rhinoceroses. The form resembled somewhat that of the llama, the neck and legs being elongated; the teeth formed series interrupted by wide gaps for the reception of the canines of the respective jaws, and were in full number (M. $\frac{3}{3}$, P. M. $\frac{4}{4}$, C. $\frac{1}{1}$, I. $\frac{3}{3}$); the upper true molars had each a deep valley extending obliquely inwards from the median portion of the narrow wall, and a shallow one extending from the angle or posterior wall; the lower molars two (anterior and posterior) crescent-shaped ridges; the canines were well developed; the skull somewhat resembled that of a hornless rhinoceros; the basi-occipital was comparatively narrow forwards; the nasal bones produced forwards and ending in a free narrowed surface; the supramaxillary bones, expanded upwards, were widely separated above and in front, and connected with the nasal bones; their feet had three toes each. This family was formed for the reception of one of the animals famous for restoration by Cuvier, who had, however, quite an erroneous idea respecting the form, and likened it to that of the tapir, influenced thereto by the relations of the nasal bones. The animal was, however, of very different form, being slender and agile, and undoubtedly the snout was blunt and not provided with any proboscis such as was formerly attributed to it. The species had no relationship with the tapirs, to which they were approximated by Cuvier, but were much more nearly allied to the horses (Equidæ); and, indeed, between the two families there is quite a regular gradation of form through the intervention of Anchitheriidæ. The following genera have been referred to the family: *Palæotherium*, *Monacrum*, *Propalæotherium*, and *Paloplotherium*, or *Plagiolophus*. These forms flourished chiefly in the Eocene and Miocene epochs. They ranged in size from about the dimensions of a sheep to those of a horse. THEODORE GILL.

Palæozoic Ages. See GEOLOGY.

Palæph′atus [Παλαίφατος], a grammarian of Athens or of Egypt, was the author of a variety of works treating mostly of the current myths; *e. g.* Αἰγυπτιακὴ Θεολογία, Μυθικῶν Βιβλίον, and, most celebrated, Τρωϊκά, which are all lost. There is extant a treatise, Περὶ Ἀπίστων Ἱστοριῶν (*Concerning Incredible Tales*), usually ascribed to this Palæphatus, though both it and the Τρωϊκά are sometimes assigned to another of the name. The work is not complete, and may be a compilation from a larger treatise; it consists of 51 sections, and contains 50 of the Grecian legends, with an attempt to separate the true from the mythical in each. The best editions are those of Fischer (Leipsic, 1789), and of Westermann in his *Mythographi Græci* (Brunswick, 1843). (See Grote's *Hist. of Greece*, vol. i., pp. 341 *seq.*) HENRY DRISLER.

Palafox′ y Mel′zi (Gen. JOSÉ), b. in Aragon, Spain, in 1780; became an officer of the royal body-guard; was proclaimed by the populace of Saragossa captain-general of Aragon when that city was threatened by the French invading army 1808; conducted the heroic defence of that city during the two sieges; was sent as a prisoner to Vincennes, France, in violation of the capitulation of Feb., 1809; released in 1814; became again captain-general of Aragon 1814–20; favored the constitutional movement of 1820; protested against the restoration of absolute government 1823; was a partisan of the young queen Isabella 1833, but lost favor and was for some time imprisoned;

was made duke of Saragossa by the queen-regent, Maria Cristina, 1836; called the Aragonese to the support of Isabella during the Carlist war, and became director of the Invalides at Madrid, where he d. Feb. 16, 1847.

Palagia'no, town of Southern Italy, province of Lecce, about 15 miles from Taranto, in a district abounding in grain, vines, and olives. Pop. in 1874, 5204.

Palai'a, town of Italy, province of Pisa, situated on a high hill at the foot of which flows the Chiecinella. This town is about 19 miles from Pisa, and was once strongly fortified. It was ceded to Florence by the Pisans in 1250. Pop. in 1874, 10,119.

Palamede'idæ [from *Palamedea—παλάμη*, the "palm of the hand"—the first described genus], a family of birds most closely related to the ducks (Anatidæ), but resembling also the rails (Rallidæ), and remarkable for their large feet. In general aspect they resemble the rails more than the ducks. The neck is comparatively short; the head small; bill short, compressed, and with the culmen decurved to the tip; the nostrils large, lateral, and exposed in a membranous groove; the wings large and armed at the shoulder with two strong spurs; the tail rather small; legs enlarged, covered with numerous oblong and somewhat hexagonal scales, which extend on the tibiæ as well as tarsi, and with larger oblong scales in transverse rows on the upper surface of the toes; the tarsi widened towards the toes; the toes long, three before and one behind, the anterior connected by slight scaly webs; claws rather long and slightly curved. In the osteology the species essentially resemble the ducks, and have been combined with them by Huxley under the name Chenomorphæ as typical desmognathous birds. The family is composed of but two genera: (1) *Palamedea*, Linn., with one species, *P. cornuta*, and (2) *Chauna*, Illig., with two species. All are inhabitants of S. America, and frequent marshy grounds and borders of lakes and rivers. They generally associate together in pairs, but sometimes in troops of many individuals. Their gait when undisturbed is slow, their flight easy and rapid; they rest in high trees, and in these they make their nests, wherein the female generally lays two eggs.

THEODORE GILL.

Palanquin' [Port.; Javanese *pâlangki*; Hind. *palkî*], a portable litter for conveying travellers. Palanquins are employed extensively in India, China, and other Asiatic countries, for the Japanese *norimon* and *kango* are but forms of the palanquin. The Indian palanquin has a waterproof cover, with Venetian shutters at the sides. The traveller is carried in a recumbent posture. The palanquin is borne by four men, who are relieved at regular intervals by others. Quite a train of attendants accompany the palanquin on foot, and the bearers while on duty keep up a monotonous chant. The journey is often continued for long distances by day and night.

Pal'atal Bones, a pair of irregular bones which in man concur in forming the roof of the mouth, the outer walls and floor of the nose, and the lower side of the orbit of the eye. Each bone has a horizontal and a vertical plate, and the latter sends out two processes, an orbital and a sphenoidal. Each bone is developed from a single centre of ossification.

Pal'ate [Lat. *palatum*; Fr. *palais*]. The arch or roof of the mouth is made up of two parts, called the hard palate and soft palate, or *velum pendulum palati*. The hard palate, which is situated anteriorly, is bounded in front and at the sides by the gums and alveolar arches, being continuous behind with the soft palate. It consists of a bony structure, formed by the union in the median line of the two palate bones. These bones are wedged in between the superior maxillary and pterygoid process of the sphenoid. In form each palate-bone resembles the letter L, and is divided into a superior or vertical plate and an inferior or horizontal plate. The inferior surface of the horizontal plate forms the back part of the hard palate. The anterior border of each palate-bone articulates with the palate process of the superior maxillary bone. The bony structure of the hard palate is covered by periosteum, to which is firmly attached the mucous membrane. A linear ridge or raphe extends along the middle line, terminating anteriorly in a small papilla. The mucous membrane in front of and upon either side of the raphe is pale, thick, and corrugated; behind, it is smooth and deeper in color. A number of small glands are situated in the mucous membrane, the surface of which is covered with squamous epithelium. The *soft palate* is composed of muscular fibres covered by mucous membrane with gland structures embedded in its substance. From the middle of its lower border hangs a conical-shaped process, the *uvula*, and upon either side of the uvula, arching downwards and outwards from its base, are the pillars of the soft palate. The mucous membrane is thin, covered by squamous epithelium on both surfaces, except near the orifice of the Eustachian tube, where it is columnar and ciliated. The muscles of the soft palate are five in number on either side, viz. the levator palati, tensor palati, palato-glossus, palato-pharyngeus, and azygos uvulæ. Upon either side of the fauces, between the anterior and posterior pillars of the soft palate, are two glandular organs, the tonsils. During the first part of deglutition the food is carried back by the tongue, pressing against the hard palate; at the same time the base of the tongue is retracted and the larynx raised with the pharynx, and carried forwards under it. Then the epiglottis closes the entrance to the larynx, and over this the food glides, the palato-glossi muscles contracting at the same time that the levator and tensor palate with the palato-pharyngei prevent the passage of the food into the upper part of the pharynx or posterior nares. Thus the palate serves an important part in the act of swallowing or deglutition. J. W. S. ARNOLD.

Palat'inate, The [Ger. *Pfalz*], formerly a political division and independent state of Germany, consisted of two separate territories, respectively called the Upper Palatinate, now forming the northern part of the kingdom of Bavaria, and the Lower Palatinate, situated on both sides of the Rhine, and now forming the southern part of Rhenish Prussia, the northern part of the grand duchy of Baden, and the province of Bavaria, called Rhenish Bavaria. From the eleventh century these two territories belonged together and formed an hereditary monarchy, their ruler being one of the electors of the German empire. But in 1648, by the treaty of Westphalia, they were separated, the Upper Palatinate falling to Bavaria, while the Lower Palatinate continued a possession of the original dynasty. At the Peace of Lunéville, in 1801, the Lower Palatinate ceased to exist as an independent state, its territory being divided between Hesse-Darmstadt, Baden, and France, and the only alteration which the Congress of Vienna made in this arrangement consisted in transferring to Bavaria that part of the Palatinate which France had occupied. Its people emigrated largely to Pennsylvania. (See PALATINE.)

Pal'atine [from the Lat. *palatium*, a "palace"]. In mediæval France and Germany there were counts palatine attached to the court and palace of the sovereign for the purpose of assisting the latter in his judicial duties. Later, in these and in other countries, counts palatine were detached from the court and placed in charge of remote or turbulent provinces, where they maintained a court and palace in the sovereign's name. This was the origin of the counties palatine. Lancaster and Chester, in England, as formerly Durham, Hexham, and Pembroke, are counties palatine. King John divided Ireland into twelve counties palatine. Scotland had anciently a county palatine of Strathearn.

Palatine, post-v. and tp., Cook co., Ill., on the Wisconsin division of the Chicago and North-western R. R., 26 miles N. W. of Chicago, has 3 churches, 2 large grain-elevators, 1 newspaper, and stores. It is a place of summer resort for Chicago people. Pop. of v. 950; of tp. 1855. FRANK E. HOLTON, PUB. "HERALD."

Palatine, post-v. and tp., Montgomery co., N. Y., on the N. bank of the Mohawk River and N. Y. Central R. R., settled by Germans from the Palatinates 1713; was afterwards called "Stone Arabia," and the battle of that name, Oct. 18, 1780, between the Tories, under Sir John Johnson, and the Continental forces of Col. John Brown, was fought here. Pop. 2814.

Palatine, post-v. of Union tp., Marion co., West Va. Pop. 558.

Palatine Bridge, post-v. of Palatine tp., Montgomery co., N. Y., on the N. Y. Central and Hudson River R. R. and Mohawk River. Pop. 493.

Palatine Hill (*Mons Palatinus*), one of the most important of the seven hills of ancient Rome, was the site of *Roma Quadrata*, the original city. It is S. of the Capitoline Hill and S. W. of the Forum. It was the official abode of the emperors, and in mediæval times of the highest dignitaries, but has since then fallen into decay. Extensive excavations are now making, bringing to light many rich and extremely valuable remains of the imperial period.

Palat'ka, post-v., cap. of Putnam co., Fla., on the St. John's River, 75 miles from Jacksonville, is well situated, has several churches and schools, 3 hotels, and 1 weekly newspaper. Pop. 720.

Palaz'zo Acrei'de, town of Sicily, province of Syracuse, situated in a fertile region about 16 miles from Noto. This town stands on the ruins of the ancient Acræ, many interesting remains of which still exist. In the neighborhood are found a great variety of objects from the so-called

Stone Age down to the later periods of Syracusan culture. Pop. in 1874, 10,132.

Palaz'zo Adria'no, town of Sicily, province of Palermo. This town was an Albanian colony, and the inhabitants mostly adhere to the Greek Church. Pop. in 1874, 5438.

Palaz'zo San Gerva'sio, town of Southern Italy, province of Potenza, 20 miles S. E. of Melfi. This town is situated in a hilly, fertile country, but the extent of its external relations may be inferred from the fact that it has no post-office. Pop. in 1874, 6896.

Palefits, Lacustrine Villages, or **Lake Dwellings.** In many parts of the world, as in the East Indian Archipelago, we find races of men living partially in dwellings built upon piles over water, and Herodotus describes this custom as prevailing amongst certain ancient tribes. A new interest has of late years been given to this mode of constructing habitations from the discovery in Switzerland of the remains of villages that had been thus built by a people or peoples belonging to a period anterior to authentic history. Continued examination has revealed the remains of quite a large number (upwards of 200) of such settlements, or Pfahlbauten, situated at various points beneath the waters of the shallow borders of the Swiss lakes. It is also shown distinctly that these settlements were not confined to one epoch in the history of European man, since some of them belong to the later Stone Age, or Neolithic Period, others to the Bronze Age, whilst the latest bring us down to the introduction of the Iron Age and to the time of the Romans, anterior, however, to our era. The extent to which researches have been carried (from the settlement of Concise alone we are told that 25,000 relics have been obtained) has revealed to us an unexpected accumulation of facts regarding these ancient peoples, and has shown us that their numbers were considerable and that their favorite sites must have been occupied during very extended periods of time. In the Stone Age we are impressed with the labor and ingenuity displayed in the building of these pile-villages by men whose most effective tools were chipped flints and other stones (though they had also implements of bone) with which to cut and point the numberless piles upon which their rude huts were supported. In the one settlement of Wangen it is calculated that at least 50,000 piles must all together have been used, and so far no trace of metal has been discovered in the settlements of this period proper. As the Stone Age gradually gave place to the Bronze, and metal was introduced, we have, from the very composition of the metal, evidence of a growth of commerce. The rude pottery of the Stone Period is succeeded by improved kinds, and the metallic implements are often of great beauty. The inhabitants of both periods fed upon the flesh of the urus (*Bos primigenius*), of the aurochs (*Bison Europæus*), the elk (*Cervus alces*), and of other animals long extinct in Switzerland, and with these are found the remains of the beaver, the ibex, and the bear, almost exterminated, as well as those of the fox, the sheep, and numerous other still abundant forms; but the mammoth, the rhinoceros, the reindeer, etc., which were the associates of Palæolithic man, are quite unrepresented. Domesticated forms appear both in the "Stone" and the "Bronze" villages, but they are relatively more abundant in those of the later date; thus, the horse, rare in the former, becomes evidently more common in the latter. In both periods cereal plants were cultivated, thus indicating some amount of agricultural knowledge, and marking a strong point of difference between the lake-dwellers of Switzerland and the authors of the kitchen-middens of Denmark. By the computations of Prof. Morlot and others it would seem that the date of the Bronze Age carries us back from 3000 to 4000 years, and that of the Stone Age to from 6000 to 7000 years, though these must be considered as minimum figures.

EDWARD C. H. DAY.

Pale, Irish, a name formerly given to that part of Ireland which was completely under English sway, in distinction from the parts where the old Irish laws and customs were prevalent. The counties of Dublin, Carlow, Louth, Kilkenny, and Meath are generally given as belonging to the Pale; but its limits were at times much greater and sometimes smaller than the present limits of those counties.

Palembang', a Dutch possession on the E. coast of Sumatra, lies between lat. 5° and 0° 30′ S., and comprises an area of 61,911 square miles, with 573,697 inhabitants, of whom a number are Europeans and Chinese. The coast-land is low, marshy, overgrown with jungles, and extremely hot, but it is not unhealthy except in the immediate neighborhood of the swamps. The inland is higher, and covered with rice-fields and plantations of sugar, cotton, pepper, and tobacco, and with immense forests of gum and cocoanut trees. Coal and oil-springs are found, also gold dust, iron ore, sulphur, and arsenic. The tiger, leopard, panther, elephant, and rhinoceros haunt the country. The capital is Palembang, where the Dutch governor resides. It is built on both sides of the Moosee, a broad and deep river, which admits the largest vessels and forms a fine harbor. The city has upwards of 40,000 inhabitants, and carries on a very active trade both with the inland and with Java, China, and Siam. The value of exports amounted in 1870 to 2,123,180 gulden.

Palen'cia, province of Spain, consists of parts of Old Castile, and comprises an area of 4580 square miles, with 184,668 inhabitants. With exception of the northern part, which is mountainous, the surface presents an extensive table-land, cold and treeless, but fertile, well cultivated, and rich in salt, copper, saltpetre, chalk, and coal. Wheat, wine, vegetables, and fruit are produced.

Palencia, an old but well-built town of Spain, the capital of the province of the same name, on the Carrion, has large manufactures of woollen blankets and an active trade in corn and wool. Pop. 12,811.

Palen'que, a ruined Mexican town of the Pueblo type, near the modern hamlet of St. Domingo de Palenque, in the state of Chiapas and on the river Chacamas, in lat. 17° 30′ N.; lon. 92° 25′ W. The ruins were discovered in 1750; and as the town is not mentioned in connection with the conquest of Cortez, it is believed to have been destroyed long before that time, and forgotten by reason of its burial in the dense tropical forest. The area occupied by the ruins is quite large. A brief notice of the architecture of the most important of its ruins and of the probable social status of its inhabitants is given in this work in the article ARCHITECTURE OF THE AMERICAN ABORIGINES, by Lewis H. Morgan, LL.D. Further details may be gathered from the works of Stephens, Catherwood, and Morelet.

Paleocapa (PIETRO), b. at Bergamo in 1789. After receiving a military education in the artillery and engineer school at Modena, was at once appointed to superintend the works on the fortifications of Osopo and Mandella. After the fall of the first Napoleon, filled successively several important posts as director of hydraulics and other public constructions. In 1848 was elected member of the provisory government of Venice; became minister of public works, and afterwards minister of the interior. On the overthrow of that government retired to Piedmont, where he was most honorably employed, and in 1849 Gioberti offered him the portfolio of public works, a position which he retained until 1859, although totally blind during the latter part of this period. The advice of Paleocapa was most important in the construction of the Mont Cenis tunnel, and in that of the Suez Canal. D. at Turin 1867.

Paler'mo (anc. *Panormus*), city of Sicily, situated on the N. coast, in lat. 38° 6′ 44″ N.; lon. 13° 20′ E. It lies on a beautiful bay formed by a deep and spacious inland sweep of the sea between Cape Zafferano on the E. and Monte Pelegrino on the W. This enchanting bay, unrivalled, perhaps, in the world, unless by that of Naples, has received the name of the Conca d'Oro, the Golden Shell, a name also applied to the city and to the plain which extends from the sea to the mountains in the rear—a region upon which nature has lavished her best gifts in the way of climate, soil, and landscape beauty. The city walls, 4½ miles in circumference, form a square, the four angles corresponding very nearly to the four cardinal points of the compass, and the town is entered by sixteen gates. The harbor lies to the N. of the town, and is sheltered by a huge mole. The Oreto, which, with its many small tributaries, waters the adjoining plain, flows into the sea near the E. angle. Two fine streets, the Macqueda or Strada Nuova, and the Vittorio Emanuele, formerly Toledo, intersect each other at right angles near the centre of the city, thus dividing it into four sections. Most of the other streets are narrow, crooked, and in bad condition. Among the public squares are the Villena or Vigliena, very picturesque and decorated with fountains and statues in the Renaissance style; the public garden on the left of the Porta Felice, abounding in almost tropic vegetation; the Bologni, the Senatoria, San Spirito, Liberta, etc. The favorite promenade, however, is the beautiful Marina, running along the shore on the line of the old fortifications. The churches of Palermo (about 300) are, many of them, very sumptuous. The cathedral, built in the twelfth century, though disfigured by later changes and additions, is highly interesting, and contains very curious mediæval monuments. San Domenico is the largest church in the city, and will hold 12,000 persons; the Olivella is the most gorgeous church of Palermo; the Della Catena has a remarkably fine portico; San Giovanni was built by King Roger; the Compagnio del Rosario contains admirable pictures; and besides these, there are many other very

noteworthy churches. The royal palace is in part the work of the Arabs, for whom it served as a fortified castle, but it was transformed by the Normans. It is an immense building, and its architecture and decorations are of the greatest interest. The chapel and the Sala di Ruggiero are richly encrusted with curious old mosaics, and among the many inscriptions on this building is one recording the construction of a clock by order of the first Roger. The Palazzo de' Tribunali is very old, having been rebuilt in 1307; the Palazzo della Città was begun in 1300 by a king of the Aragonese line. Some of the private edifices are remarkable for their antiquity, others for their architecture. Palermo contains a university with about 600 students, several public libraries, and various literary and scientific associations, also hospitals and other charitable organizations. The environs of Palermo abound in objects of interest—the great cathedral of Monreale (see MONREALE); the Castello della Zisa; the Castello della Cuba; Monte Pellegrino, in which is the grotto of Santa Rosalia, the patroness of the city; and besides these, numerous other noticeable castles and villas. The *festa* of Santa Rosalia is celebrated in July with great pomp by a procession bearing from the city to the cavern a huge silver image of the saint on a gigantic car in the form of a Roman galley.

Palermo is probably of Phœnician origin, and is first known in history as a Carthaginian dependency. During the Punic wars it fell into the hands of the Romans and became a great naval station. In the fifth century A. D. it was taken by the Vandals, and was ceded by them to the Goths, who were driven out by Belisarius. The wretched rule of Byzantium was terminated by the Saracens (830), who made Palermo the capital of their Sicilian dominions, and under whom it became a splendid Arab town, in which Oriental luxury was combined with taste and elegance. In 1071 the Normans, under Count Roger, took Palermo, and it continued the capital of the Sicilian kingdom through the Norman and Swabian dynasties. Charles of Anjou removed his court to Naples (1269), since which time Palermo has never been a permanent royal residence. (For further historical details see SICILY and SICILIAN VESPERS.) From 1820 the revolutionary failures of Naples were repeated in Palermo until the landing of Garibaldi at Marsala (1860) caused an uprising here, which, headed by the hero himself, put to flight 30,000 Bourbon troops, backed by a strong fleet; and by an enthusiastic *plébiscite* the city became a part of the new kingdom of Italy. The condition of Palermo was at this time most lamentable—a disgrace alike to government and people. The dilapidated streets were without drains and filthy beyond description, not the least regard being paid to hygiene, or even to decency. Here and there an oil-lamp was lighted at night, but gas was unknown. There was not a fire-engine in the town, the police was worthless, and the misery and degradation of the lower classes were indescribable. Considerable material improvement has already taken place, though much remains to be done. Efforts are also making to advance general education. In 1860 there were in Palermo 9 primary schools with a total attendance of 783 children; in 1865 the number of schools was 206, total attendance 11,500. Trade and industry are increasing, though not rapidly. The number of vessels annually entering and clearing the port is about 7000, with a tonnage of 1,000,000; annual exports—fruits, wines, silks, gloves, etc.—about $10,000,000; the imports a little less. Pop. in 1874, 219,398. CAROLINE C. MARSH.

Palermo, post-v. and tp., Grundy co., Ia. Pop. 684.

Palermo, p.-v., Marion tp., Doniphan co., Kan. P.138.

Palermo, post-v. and tp., Waldo co., Me. Pop. 1223.

Palermo, post-v. and tp., Oswego co., N. Y. Pop. 2052.

Pa'les, in Roman mythology, a divinity of flocks and shepherds, corresponding in some respects to the Greek Pan, was probably of old origin, but is seldom mentioned, and played in historical times only a subordinate part in the religion of the Romans. It is uncertain whether this divinity was imagined as male or female. The festival of Pales, called Palilia, was celebrated on the 21st of April, considered the birthday of Rome.

Pal'estine [Heb. פְּלֶשֶׁת, *Pelesheth*, "land of sojourners;" from which came Παλαιστίνη, originating apparently in Egypt, and occurring for the first time in Herodotus, i. 105], a name designating originally only the country of the Philistines, but in the later Greek and Roman period applied, as we now apply it, to the whole country of the Israelites on both sides of the Jordan. Josephus (d. 97 + A. D.) uses the name in both of these senses. The oldest name was the Land of Canaan, or sometimes simply Canaan, "lowland," by which was meant, however, only the country W. of the Jordan, which is all that was promised to Abraham. Other Scripture names are Judæa, the Land of Israel, the Land of Promise, the Holy Land, which last name has now for several centuries been more current than any other.—The boundaries of Palestine cannot be determined exactly. Approximately, they were as follows: On the W. the Mediterranean; on the N. a line beginning near the *Promontorium Album*, S. of Tyre, in lat. 33° 10′, trending northward till, near the southern base of Hermon, it strikes lat. 33° 16′, and then runs straight on to the desert; on the E. the Arabian desert; and on the S. the parallel of lat. 31°, a little S. of Beersheba (31° 16′), curving to take in Kadesh. Within these boundaries, as recently determined, there are, on the W. side of the Jordan, about 6600 English square miles, and on the E. side, including ancient Moab, S. of the Arnon, more than 5000, perhaps nearly 6000, square miles. The length of this territory is about 150 miles; its average breadth W. of the Jordan more than 40, and E. of the Jordan about 40 miles.—The country is made up of four long parallel strips of territory, lowland and highland alternating. Along the Mediterranean coast is a strip of lowland, in the northern or Phœnician section of it about 20 miles long and from 4 to 6 broad; in the middle, Sharon section of it, S. of Carmel, more than 30 miles long and about 10 miles broad; and in its southern, Philistine section, 40 miles long and from 10 to 20 broad. This strip of lowland is interrupted by the ridge of Carmel, which branches off from the mountains of Samaria, runs north-westward for 18 miles, rises at one point to the height of 1750 feet, and thrusts out into the sea a promontory about 600 feet high. On all this coast there is not one good harbor. Next comes the highland strip, some 25 or 30 miles broad, which springs from the roots of Lebanon, swells into the hills of Galilee, is interrupted by the plain of Esdraelon, as the lowland strip is interrupted by the ridge of Carmel, swells again into the hills of Samaria, reaches its greatest average height in Judæa, and then sinks away into the desert S. of Beersheba. This broad, high central strip of West Jordanic territory has been compared to a ship's longboat turned downside up. Among its highest points in Galilee are Safed (perhaps the "city set on a hill" of Matt. v. 14), 2775 feet above the sea, and Jebel Jermûk, near by, about 4000 feet above the sea. In Samaria the highest points are Ebal, 2750, and Gerizim, 2650 feet above the sea. In Judæa the highest point of Jerusalem is 2581, Olivet 2643, Hebron 3029, and Beersheba 1100 feet above the sea. The Jordan valley, at some points quite narrow and at others from 5 to 10 or 12 miles broad, is one of the wonders of the world. The Jordan itself, in going from its Hasbeiya source to the Dead Sea (115 or 120 miles), plunges down a descent of more than 3000 feet, from 1700 feet above to more than 1300 feet below the level of the Mediterranean. The fourth parallel strip, E. of the Jordan, is, most of it, high table-land, some of it 3000 feet above the sea, sinking away eastward into the Arabian desert. As seen from the W. side of the Jordan it looks like a purple wall.—Of the four lakes of Palestine, the northernmost is Phiala, 5 miles E. of Banias, nearly round, about a mile in diameter, and of unknown depth, occupying apparently the crater of an extinct volcano. It is some 3300 feet above the sea, is not, as was anciently supposed, one of the sources of the Jordan, has neither inlet nor outlet, and abounds in frogs and leeches. Merom (now *Huleh*), 10 miles S. of Banias, in the midst of an extensive papyrus marsh, from 100 to 150 feet above the sea, is a triangular lake, with its apex pointing southward, about 5 miles long, nearly 4 miles across its base, and 15 feet deep. Ten miles farther down is Gennesaret, 12¼ miles in length, 6¾ in its greatest breadth (at Magdala), 165 feet deep, and 653 feet below the level of the Mediterranean. The Dead Sea, some 65 miles farther S., is 40 miles long, nearly 10 miles broad, more than 1300 feet below the level of the Mediterranean, and more than 1300 feet deep. No fish live in it.—Of rivers, the only one of much importance is the Jordan, which has no considerable tributaries emptying into it from the W., and only two, the Hieromax (now *Yarmuk*) and the Jabbok (now *Nahr ez-Zerka*), from the E. Most of the so-called rivers of Palestine are merely winter torrents, which run dry in summer. Of the few permanent rivers emptying into the Mediterranean, the most important are the Belus (now *Nahr Na'man*, near Acre), celebrated for the accidental discovery of the art of making glass; the Kishon, "that ancient river" (now *Nahr el-Mukatta*, "river of slaughter"), which drains the plain of Esdraelon; the Zerka, just N. of Cæsarea, said to be still haunted by crocodiles; and the Aujeh (not mentioned in Scripture), a few miles N. of Jaffa, which drains the mountains of Samaria, and is, next to the Jordan, the longest permanent river in Palestine. Three permanent streams empty into the Dead Sea from the E. These are the Zerka Ma'in (not mentioned in Scripture), near which are the four hot springs of Callirrhoë; the Arnon (now

Mojib), the northern boundary of the Moabites and the southern boundary of the Israelites, about halfway down the sea; and the Zered (now *el-Ahsy*), at the S. E. corner of the sea.—The fountains of Palestine constitute one of its most characteristic features. First in importance are the three sources of the Jordan. Of these, the fountain at Hasbeiya (not mentioned in the Bible) contributes one-seventh, that at Cæsarea Philippi (now *Banias*) two-sevenths, and that at Dan (now *Tell el-Kady*) four-sevenths, of the whole volume of the river. This last fountain especially reminds the American traveller of Daniel Webster's famous description of eloquence, bursting forth "with spontaneous, original, native force." As an indication of the very great multitude of fountains in Palestine, Robinson enumerates 30 in a circuit of 8 or 10 miles around Jerusalem.—The geology of the country has been studied by Seetzen (in 1805), by Poole (in 1836), by Russegger (in 1836–38), by Anderson (in 1848), by Lartet (in 1864), and others, but not exhaustively. Much still remains to be done. The backbone of the country, on both sides of the Jordan, is hard Jura limestone, full of grottoes and caverns, with sandstone, basalt, and other volcanic rocks, also on both sides of the river, but these last more especially on the E. side. There are many signs of violent volcanic action in the past, and earthquakes are still frequent and severe.—The climate, on the whole, is mild, inclining, however, towards the extreme of heat rather than towards the extreme of cold. There are only two seasons, summer and winter, the former, from April to November, rainless or nearly so; the latter, from November to April, rainy. But between the middle of December and the middle of February there is generally a kind of intermission, separating "the former and the latter rain." The average annual rainfall at Jerusalem is about 60 inches, while on our Atlantic seaboard it is 45, and in California, whose climate is much like that of Palestine, it is only 20. Along the Mediterranean lowlands, and still more in the Jordan valley, the heat of summer is always great, and sometimes exceedingly oppressive, but not so on the higher levels, except when the sirocco blows. At Jerusalem, from June, 1851, to Jan., 1855, according to Dr. Barclay's register, the mean temperature was 66.5°, the highest temperature 92°, and the lowest, on one occasion just before sunrise, 28°. In some years the mean is 62° and the highest 86°. Hermon, nearly 10,000 feet high, and looking down upon the whole of Palestine, is never entirely clear of snow, though late in autumn only slender threads of it are left, as the Arabs say, "like the straggling silver locks on an old man's head." During the winter ice seldom makes, and the ground is seldom if ever frozen in any part of the country. With abundant rains, which may generally be counted upon, Palestine was once very fertile, and might be so again. But in order to this, trees must be planted, cisterns built and kept in repair, and the hills terraced, as of old. The products of the soil still range from peas, beans, wheat, and barley to grapes, figs, olives, apricots, lemons, oranges, and dates. Dr. Thomson praises the apples of Askelon, which he thinks to be the same as the "apples" of Solomon's Song. Dr. Tristram thinks that the apple tree of Solomon was the apricot.—The botany of Palestine, unlike that of Egypt, is richly varied. Not less than a thousand species of plants have been reported, and probably another thousand might be added. No traveller ever forgets the impression made upon him by the flowers of Palestine. For mile on mile, in the proper season, the ground is fairly covered with all the colors of the rainbow. Everywhere one sees the scarlet anemone, which is thought by some to be our Lord's "lily of the field." The ranunculus and the pheasant's eye (*Adonis palestina*) are also very brilliant. The narcissus, the crocus, and the mallow are all candidates for the honor of being considered "the rose of Sharon." Of shrubs, the most abundant and most beautiful is the oleander. The whole country was once well timbered, and still there are groves, and even forests, of pine and oak beyond the Jordan. But on the W. side of the river, from Beersheba all the way up to Lebanon, there are very few trees except on Tabor and Carmel. Since the time of the Crusades the pine forest then standing between Jerusalem and Bethlehem has wholly disappeared. Repeated wars and conquests and dreary centuries of bad government have gradually reduced the country to its present naked, burnt, and desolate appearance. The tree now most common is the oak, of which there are three species. Most abundant of all is the prickly evergreen oak (*Quercus pseudo-coccifera*). The other two species are deciduous. The "oaks of Mamre" were not oaks, but terebinths, the most famous specimen of which is the so-called "Abraham's Oak," near Hebron, 23 feet in circumference.—The wild animals of the country are much the same as in ancient times, except that the lion has disappeared. There are bears, leopards, wolves, jackals, hyænas, wild-boars, antelopes, gazelles, foxes, porcupines, and rabbits. Of domesticated animals, the horse is less used than the ass, the mule, and the camel. The buffalo, introduced probably by the Persians, has in some sections taken the place of the ox, and the neat cattle of the country in general are neither so numerous nor so well cared for as in ancient times. Sheep and goats are abundant, but swine are scarcely ever seen. The dogs are nearly all of one breed (the shepherd), and are outcasts and scavengers, making night hideous, as the jackals do, by their howling. Of birds may be mentioned eagles, vultures, hawks, owls, storks, pelicans, ravens, doves, pigeons, partridges, quails, sparrows, and nightingales. Fish still abound, as of old, in the Lake of Galilee, but the natives employ rude methods in taking them, and very little has yet been done towards ascertaining the number of species. The "great fish" of Jonah i. 17, which swallowed the truant prophet, was not a "whale," as the κῆτος of Matt. xii. 40 is unwarrantably rendered in our version, but may have been a specimen of the great white shark (*Canis carcharias*), still found in the Mediterranean, and sometimes 25 or 30 feet long. There are many species of reptiles, not a fourth part of which have yet been described. The crocodile may still be found in the marshes of the Zerka. Lizards and serpents are very numerous. Frogs are abundant, but all of one species, and only one species of the toad has yet been found.

The earliest inhabitants of Palestine were descended from Canaan, the fourth son of Ham. In the original grant to Abraham (Gen. xv. 19–21) ten tribes are named, two of which (the Kenites and the Kenizzites) were probably S. of Palestine, towards Egypt, one of them (the Kadmonites) on the E. side of the Jordan, and the remaining seven (the Hittites, Girgashites, Amorites, Canaanites, Perizzites, Hivites, and Jebusites) on the W. side. In the time of Moses and Joshua the Ammon-Moab people were on the E. side of the river, but had been crowded down by the Amorites, who held the whole territory from Mount Hermon to the Arnon. Reuben, Gad, and Half-Manasseh took this territory E. of the Jordan. The remaining nine and a half tribes crossed over and occupied the other side. The Hebrew commonwealth reached the summit of its prosperity and power under David and Solomon. Visible decay began (about 975 B. C.) with the secession of the ten tribes. Assyria crushed the northern kingdom of Israel about 720 B. C., and Babylon crushed the southern kingdom of Judah about 587 B. C. Since then the country has been under foreign domination, with hardly more than the shadow of independence at any time. Persians, Greeks, and Romans succeeded one another in the mastery. In the time of Christ, under the Romans, there were four provinces—Galilee, Samaria, and Judæa, on the W. side of the river, and Peræa on the E. side. Since 637, when Palestine was conquered by the Saracens, it has, with little interruption, been under Mohammedan power. The Seljukian Turks seized the country in 1073, and by their barbarous treatment of Christian pilgrims provoked the Crusades. The Latin kingdom, with its nine successive sovereigns, established in 1099, held Jerusalem till 1187, and stayed in Acre till 1291. In 1517 the Ottomans came in, and made the country a part of the Turkish empire. It was snatched from the sultan by Mohammed Ali in 1832, but Europe intervened, and in 1841 it was given back again. It now belongs to the pashalic of Damascus, which includes the three sub-pashalics of Beyrout, Akka, and Jerusalem. As no census is ever taken, the population of Palestine cannot be exactly determined, but is supposed to be well on towards 400,000, which is less than a tenth of what it probably was in the time of Solomon. Of this number only about 18,000 are Jews, residing, 10,000 of them, in Jerusalem, 3000 in Safed, 1500 in Tiberias, and 500 in Hebron (the four holy cities), besides a few scattered here and there in eight other places. The little remnant of the Samaritans at Nablus numbers only about 150. The bulk of the inhabitants are a mixed race, descendants of the ancient Syrians and their Arab conquerors.

Pilgrimages to the Holy Land began with Helena, the mother of Constantine, in 326, and have continued ever since. What was then known of the country may be found in the *Onomasticon* of Eusebius and Jerome. During the Middle Ages the principal topographers of Palestine were ignorant, superstitious, and careless monks, whose identifications of sacred places were largely of the legendary and childish sort. It is only within a comparatively recent period that the true critical method has been pursued. Seetzen was there from 1805 to 1807; Burckhardt in 1810; Irby and Mangles in 1817–18. But no one man has ever done so much for the geography of the Holy Land as Dr. Edward Robinson. Not only was he thoroughly prepared for his task by fifteen years of special study, but he had a

passion and a genius for exact and certain knowledge. During two brief journeys, in 1838 and in 1852, aided by Dr. Eli Smith, one of the best Arabic scholars then living, he fairly swept the whole field clean of ecclesiastical traditions. He was the first to adopt and adhere persistently to the rule of looking for ancient Hebrew names under the disguise of modern Arabic names. Next in rank with respect to the amount and quality of service rendered is Dr. William M. Thomson of Beyrout, for more than forty years an American missionary in Syria and the Holy Land, whose book appeared in 1858. In 1848 the lower Jordan and the Dead Sea were for the first time thoroughly explored and surveyed by Lieut. Lynch of the U. S. navy. In 1859, Johann Gottfried Wetzstein, Prussian consul at Damascus, explored the northern section of the country E. of the Jordan. In 1866 the marsh and lake of Huleh and the upper Jordan were explored by John Macgreggor of Scotland, and in the same year the Lake of Galilee was accurately surveyed by Capt. Wilson of the English Royal Engineers. This last piece of work was done under the direction of the "Palestine Exploration Fund," a society organized in 1865 for the purpose of making an exhaustive exploration and an exact survey of the Holy Land. From 1867 to 1870, Capt. Warren, under the direction of the same society, was making excavations in and around Jerusalem. In Oct., 1870, the American Palestine Exploration Society was organized; and in order that there might be no friction, but only the most generous rivalry, it was agreed that in conducting the joint survey the English society should confine itself to the western side of the Jordan and the American society to the eastern. The triangulation of Western Palestine was begun in the autumn of 1871, by Capt. Stewart, whose health soon broke down, and has since been carried on by Lieut. Conder, who expects to finish his work in the field in 1876. Many places have been identified with more or less certainty, some of them places of no little historic interest, such as the altar of Ed (Arab. *Ayd*), the rock Oreb (Arab. *Ash el-Ghorab*), and the springs of Ænon (Arab. *Aynun*). This last place was found just where Robinson looked for it, E. of Nablus. Besides issuing, since 1869, a *Quarterly Statement*, the English society has published *The Recovery of Jerusalem* (1871) and *Our Work in Palestine* (1873). The map, of which only a small specimen section (Mount Carmel) has been published (Jan., 1875), will be on the large scale of an inch to the mile, and of course more than 12 feet long. In 1873 the American society sent out its first expedition, under command of Lieut. Edgar Z. Steever of the U. S. army, detailed for that service by the secretary of war. A base-line was measured in the desert E. of the Jordan, over against Jericho; the work was carried on through the hottest months of the summer, and more than 500 square miles were triangulated. Prof. John A. Paine, archæologist and botanist of the expedition, in 1874 was sent again into the same region, where he discovered many new species of plants, identified Mount Pisgah, and determined its relation to Nebo. In 1875 a second expedition was sent out under command of Col. James C. Lane, with Rev. Dr. Selah Merrill as archæologist. A rapid reconnoissance survey of the whole Trans-Jordanic territory was made, about 100 photographs of inscriptions, ruins, and scenery were taken, and a skeleton map was prepared as the basis of final work. The society has published three *Statements*, issued in 1871, 1873, and 1875. The finding of the Moabite Stone in 1868 has kindled great expectations in regard to archæological treasures which may yet be found in that part of the common field.

The literature of the subject is of immense extent. Tobler, in his *Bibliotheca Geographica Palestinæ* (1867), enumerates more than 1000 writers in this department of study. To mention only a few of the most important: The *Onomasticon* of Eusebius (c. 330), translated into Latin, with additions, by Jerome (388), edited by Larsow and Parthey (Berlin, 1862); *Descriptiones Terræ Sanctæ*, by writers of the eighth, ninth, twelfth, and fifteenth centuries, edited by Tobler (Leipsic, 1874); *Early Travels in Palestine*, edited by Wright (London, 1848); the *Historica Theologica, et Moralis Terræ Sanctæ Elucidatio* of Quaresmius (Antwerp, 1639), valuable for the traditions; Maundrell's *Journey from Aleppo to Jerusalem at Easter, 1697* (Oxford, 1703); Reland's *Palestina Illustrata* (Utrecht, 1714), a classic; Hasselquist's *Voyages and Travels in the Levant in the years 1749, '50, '51, '52*, edited by Linnæus (London, 1766), valuable for the natural history; Burckhardt's *Travels in Syria and the Holy Land* (London, 1822); *Travels in Egypt and Nubia, Syria and Asia Minor, during the years 1817 and 1818*, by Irby and Mangles, printed but not published (London, 1822); Robinson's *Biblical Researches* (3 vols., Boston, London, and Berlin, 1841); *Later Researches* (1856) and *Physical Geography of the Holy Land* (published posthumously, 1865); Williams's *Holy City* (1845; 2d ed. 1849), defending the traditional sites; Lynch's *Expedition to the Dead Sea and the Jordan* (1849); Stanley's *Sinai and Palestine* (1857), highly graphic; Barclay's *City of the Great King* (1858), valuable for the meteorology; Thomson's *The Land and the Book* (1859); Tobler's *Bethlehem* (1849), *Jerusalem* (1854), and *Nazareth* (1868); Macgreggor's *Rob Roy on the Jordan* (1870); Tristram's *Land of Israel* (1865), *Natural History of the Bible* (1867), and *Land of Moab* (1873); Nutt's *Samaritan Targum and History* (1874); Ritter's *Geography of Palestine*, translated by Gage (4 vols., 1866); Porter's *Damascus* (1855), *Giant Cities of Bashan* (1865), and *Handbook of Syria and Palestine* (revised ed., 1875). Of maps, the best as yet is Van de Velde's (1858; 2d ed. 1865), soon to be superseded by that of the English and American engineers. (For further information see special articles, such as ESDRAELON, HAMATH, JERUSALEM, JORDAN.) R. D. HITCHCOCK.

Palestine, tp. in Bradley co., Ark. Pop. 656.

Palestine, post-v. and tp., Crawford co., Ill., on the Wabash River. Pop. 1988.

Palestine, tp. of Woodford co., Ill., on the Peoria and Warsaw R. R. Pop. 1325.

Palestine, tp. of Story co., Ia. Pop. 732.

Palestine, tp. of Cooper co., Mo., on the Boonville branch of the Missouri Pacific R. R. Pop. 2430.

Palestine, a v. (EAST PALESTINE P. O.) of Unity tp., Columbiana co., O., on the Pittsburg Fort Wayne and Chicago R. R.

Palestine, a v. of German tp., Darke co., O. Pop. 264.

Palestine, post-v. of Darby tp., Pickaway co., O. P. 81.

Palestine, v. (TAWAWA P. O.) of Green tp., Shelby co., O. Pop. 86.

Palestine, post-v. and cap. of Anderson co., Tex., on the International and Great Northern R. R., contains a high school, 5 churches, 1 bank, 1 newspaper, a cotton-factory, and stores. Business, farming, hide, and lumbering. P. about 2200. H. J. HUNTER, ED. "ADVOCATE."

Palestri'na (anc. *Præneste*), town of Italy, province of Rome, on the site of an ancient and powerful city of Latium. This town, 18 miles N. E. of Albano, 22 miles E. S. E. of Rome, is situated on a spur of the Apennines, about 1600 feet above the sea. It covers only a portion of old Præneste, whose strong citadel crowned the height now occupied by the mediæval castle San Pietro. The view from this point (2400 feet above the sea), embracing the Alban Hills, the Campagna, Rome itself, and the adjacent waters of the Mediterranean, is surpassingly beautiful. The church of San Rosalia is richly adorned with marbles and alabaster. The Palazzo Barberini, occupying a part of the site of the vast old Temple of Fortune, was erected in the fifteenth century, and with the garden contains many statues, bas-reliefs, mosaics, and inscriptions, etc. from the ancient city. Among the mosaics is one of great interest representing an Egyptian landscape. Some of the best sculptures found here have been taken to Rome, and a large lion of remarkably fine workmanship now stands on a landing of the great staircase of the Barberini palace in that city. The old walls of Palestrina are an admirable study for the antiquary, as portions of the earliest cyclopean, the later polygonal, the Roman square tufa block, and the brick constructions are all still existing. Traces of the Saracens, too, are not wanting. Palestrina was subject to Alba Longa, and after the ruin of that power by Rome held out a long time against the victors. When it finally became a part of the Roman territory, it was treated with special favor. Sulla, however, inflicted upon it the most cruel punishment for harboring Marius, by putting to death (82 B. C.) more than 12,000 of its citizens. But the town recovered itself, and under the emperors it was a favorite resort of the Roman aristocracy. Augustus had a villa here, also Marcus Aurelius, Hadrian, Pliny, etc. On the fall of the Western empire it became a part of the papal dominions; but the Colonna family afterwards claimed it as their fief, and held it for more than two centuries in spite of papal excommunication. In 1297, Boniface VIII. treacherously obtained possession of the town, and, with the exception of the cathedral, destroyed it utterly. From this time the Colonna never ceased to struggle with the popes, and often with success, for the lordship of the ruined town, until 1630, when it passed by sale to the Barberini. The modern town is in itself of no interest except as the seat of one of the six suburban bishoprics. Pop. in 1874, 6015. CAROLINE C. MARSH.

Palestrina (GIOVANNI PIERLUIGIDA), b. at Palestrina in 1524; studied music in Rome under Claude Gondimel, and published in 1554 a collection of masses which gained the favor of Pope Julius III. in so high a degree that he

was appointed a singer in the papal chapel. This position, however, he lost under Pope Paul IV. because he was married, and he was afterwards appointed chapel-master at various churches in Rome, at last to the congregation of the oratory. But these appointments were small with respect to the salary they gave, and the great composer d. poor at Rome Feb. 2, 1592. His works, comprising masses, motets, hymns, etc., were very numerous, but not half of them were published; the rest are scattered in the libraries of Europe. They produced a revolution in the history of church music. In 1563 the Council of Trent determined to expel profane melodies from the churches, and to have the masses composed not only in a grave and dignified style, but also so simple that the words could be heard and understood. The problem was proposed to Palestrina, and he solved it with a success which was decisive; his *Missa Papæ Marcelli* is still heard with great admiration.

Pa'ley (Frederick Apthorp), grandson of William, b. at Easingwold, near York, England, in 1816; graduated at Cambridge 1838; resided there until 1846, when he became a Roman Catholic; edited Æschylus, Euripides, Hesiod, Homer, and several other classic authors; translated into English the plays of Æschylus (1864) and the odes of Pindar (1875). Author of a *Manual of Gothic Mouldings* (1845) and a *Manual of Gothic Architecture* (1846), and became classical examiner in the University of London.

Paley (William), D. D., b. at Peterborough, England, in July, 1743; graduated at Christ's College, Cambridge, where he became a tutor and lecturer upon moral philosophy and divinity; took orders in the Church of England; rector of Musgrove 1775; archdeacon of Carlisle 1782; published *Principles of Moral and Political Economy* (1785), *Horæ Paulinæ* (1790), *View of the Evidences of Christianity* (1794), and *Natural Theology* (1802). D. May 25, 1805.

Pal'frey (John C.), b. at Boston, Mass., Jan., 1834; graduated from the U. S. Military Academy and appointed brevet second lieutenant of engineers July, 1857; in the civil war served with distinction in his engineering capacity; in constructing fort on Ship Island; in repair of Forts St. Philip and Jackson, La.; at siege of Port Hudson; in Red River Expedition, and in siege and capture of Fort Morgan, Ala., where he was in charge. In Mar., 1865, he was appointed chief engineer 13th Army Corps, with rank of lieutenant-colonel, participating in the siege of Mobile. In 1866 he resigned his commission as captain of engineers to accept the agency of a large manufacturing company in Lowell, Mass.

Palfrey (John Gorham), D. D., LL.D., b. in Boston, Mass., May 2, 1796; was educated at Phillips Academy, Exeter, and Harvard College 1815; studied theology; succeeded Edward Everett as minister of Brattle Square church in Boston 1818; succeeded Andrews Norton as professor of sacred literature in the Cambridge Divinity School 1831; retired in 1839. From 1844–47 was secretary of state in Massachusetts. In 1847 represented the anti-slavery Whigs in Congress; was a leading Republican, one of the creators of the Republican party, a prominent writer and speaker on the anti-slavery side, an able ally of Sumner and Adams; lost his seat in Congress after a fiercely-contested struggle against the "compromise" Whigs; ran for governor of Massachusetts, but was defeated, in 1851; retired from public life and devoted himself to literature. Mr. Palfrey has been a diligent author. His books are: *Evidences of Christianity* (Boston, 2 vols., 1843), *Jewish Scriptures and Antiquities* (4 vols., 1838–52), *History of New England* (3 vols., 1858–64, still in progress), *The Slave Power* (1 vol., 1847). Besides, there are sermons bound and in pamphlet, lectures, a Fourth of July oration, articles in the *North American Review*, of which he was editor from 1835 to 1842, and the *Christian Examiner*. Dr. Palfrey has frequently visited Europe for purposes of historical study in connection with his New England history. While postmaster of Boston he lived in that city, but Cambridge is his permanent residence. His historical works hold the first rank for fulness of research, carefulness of statement, candor of judgment, and scholarly finish of style. O. B. Frothingham.

Palfrey (Warwick), b. at Salem, Mass., in 1787; published the *Evangelical Psalmodist* (1802), shortly after becoming apprentice in the office of the *Essex Register;* was a member of the city council and of the State legislature and senate many years, and ably conducted the *Register* for thirty-three years, from 1805 until his death at Salem Aug. 23, 1838.—His son, of the same name, still (1875) edits that paper.

Pal'grave (Sir Francis **Cohen**), b. in London, England, in July, 1788, originally named Cohen; belonged to a Jewish family; studied law; was employed in 1822 by the record commissioners; edited numerous early historical documents, and wrote a valuable *History of Normandy and England* (4 vols., 1851–64), besides several learned works upon particular periods of English history. D. at Hampstead July 6, 1861.

Palgrave (Francis Turner), son of Sir Francis, b. at London Sept. 28, 1824; educated at the Charterhouse School and at Baliol College, Oxford, where he obtained a scholarship; was elected a fellow of Exeter College; was five years vice-principal of the training college for school-masters at Kneller Hall, and has since been private secretary to Earl Granville and filled an important post in the educational bureau of the privy council. Author of *Idyls and Songs* (1854), *Hymns* (1867), *Lyrical Poems* (1871), and of several publications on art, and editor of *The Golden Treasury of English Lyrical Poetry* (1861), a collection made with great care and excellent judgment.

Palgrave (William Gifford), son of Sir Francis, b. at Westminster Jan. 24, 1826; educated at the Charterhouse and at Trinity College, Oxford, where he graduated with first-class honors 1846; served as an officer of the Bombay Native Infantry from 1847 till 1853, when he resigned his commission, joined the Roman Catholic Church, entered the Society of Jesus, studied theology at the Jesuit seminary at Laval, France, took orders as a priest, was sent as a missionary to Syria, resided several years in and near Damascus, obtained an intimate knowledge of Arabic and of Mohammedan theology, and undertook, in 1862, with the approval of his superiors and at the expense of Napoleon III., a daring journey through the Wahabite kingdoms of Central Arabia in the disguise of a physician; returned to Europe 1863; left the order of Jesuits 1864; published his *Personal Narrative of a Year's Journey through Central and Eastern Arabia* (2 vols., 1865); went to Egypt on a special mission for the release of the prisoners held by King Theodore of Abyssinia, July, 1865; was appointed British consul at Soukhoum-Kalé 1866, at Trebizond 1867, and at St. Thomas, West Indies, 1873; published *Essays on Eastern Questions* (1872), *Hermann Agha, an Eastern Narrative* (1872), *Alkamah's Cave, a Story of Nejd* (1875), and began in Dec., 1875, the publication in the *Contemporary Review* of his recent travels in Dutch Guiana.

Pāli is the language in which the sacred books and standard literature of the Southern Booddhists are written. It bears about the same relation to Magadhī, the language spoken in Megadha at the time when Booddha was alive, as ecclesiastical does to classical Latin, and about the same relation to Sanskrit as Italian does to Latin. Immediately after Booddha's cremation (which certainly took place between 400 and 543 B. C., and probably about the former date) a council of 500 of his disciples was held, at which the principal doctrines of the great teacher were repeated and collected into the books of the so-called *Three Caskets*. These were handed down orally from each generation of priests to the next, but in course of time opinions, not so much about Booddha's own attributes as about his ethical teachings, began to differ, or, as Booddhist theologians say, heresies arose. To cleanse the priesthood from these heresies and to settle all points then in dispute, a council was held about 250 B. C. at Pātali-putra (the modern Patna), under the celebrated emperor of India, Asoka the Great, and by that council the Booddhist canon was finally settled. Eleven years afterwards, Asoka's son, Mahendra, introduced Booddhism into Ceylon, and with it the Pāli sacred books, which were handed down orally in that island until about 80 B. C., when they were for the first time committed to writing at Alu-Cue, about 2 miles N. of the present Kachchēri at Mātalē. There is no doubt that the books now current in Ceylon are substantially the same as those then written; but during the intervals of nearly a century and a half since their first promulgation in Ceylon, and of the further period, at least as long, which elapsed between Booddha's death and the council of Pātali-putra, it is possible that changes and additions may have found their way into the original text; on the other hand, however, the example of the Vedas, which, under similar circumstances, were undoubtedly handed down unaltered for many centuries, is sufficient to prevent a too hasty conclusion that none of the original texts can possibly have come down to us. The proper course is to judge each book by such internal or external evidence as we possess: of those, for instance, yet published, the *Dhammapada* and *Sutta Nipāta* are evidently compilations from older books, and almost certainly, therefore, later than the first council of Rājagriha; but no reason has yet been shown why the *Upasampadā-kammavācā* may not have been then compiled.

According to Turnour and Spence Hardy the whole *Three Caskets* occupy in the native manuscript rather less than 5000 palm leaves, which, taking the *Dhammapada* as a fair sample of the rest, would give a total of about 2,000,000 words; allowing, therefore, for the greater length of Pāli words, the *Three Caskets* would occupy, if printed in ro-

man type of the size used in this article, about 1800 pages of this CYCLOPÆDIA, which is much less than has been usually stated. The commentary is nearly the same length as the text itself. Of the text about one-seventh consists of metaphysics, one-fifth of rules and directions for the Booddhist priesthood, and the remainder, about two-thirds of the whole, of hymns, parables, and sermons. Of the *Abhidhamma*, or metaphysics, nothing has as yet been edited in Europe, and of the original text of the *Winaya*, or monastic rules, only one, a small portion, viz. the little work above referred to, an excellent edition of which has been published by Mr. Dickson in the *Journal of the Royal Asiatic Society* for 1874, under the title of *The Upasampadā-kammavācā, being the Buddhist Manual of the Form and Manner of ordering of Priests and Deacons.* Without expressing any opinion on Spence Hardy's theory that Christian monasticism was derived from the Booddhists, it may safely be said that this little work, the English translation of which occupies only six and a half pages of the journal referred to, is probably the oldest form of ritual extant by which men devoted themselves to a life of poverty and chastity. From the vow of obedience and its consequences Booddhism has always been free. The *Pātimokkha*, which is a later collection of 227 of the more important of the monastic rules of this second division of the *Three Caskets*, was published in St. Petersburg in 1867 by Mr. Minayeff, in Sanskrit characters, with a Russian translation and notes. The *Dhammapada* is a similar collection of 432 choice passages from the third or ethical division; but as it has been included among the number of the sacred books, it must have been composed before the council of Pātali-putra. It was edited in 1855 by Mr. Fausböll of Copenhagen, with a Latin translation, extracts from the commentary, and notes, of which edition Prof. Max Müller says (*Buddhaghosha's Parables*, p. 10), "The greatest credit is due to Mr. Fausböll, whose *'editio princeps'* of the *Dhammapada* will mark for ever an important epoch in Pāli scholarship." Prof. Weber of Berlin published a German translation of this work in the fourteenth volume of the *Zeitschrift der deutschen morgenländischen Gesellschaft*, and Prof. Max Müller of Oxford an English translation in the introduction to *Buddhaghosha's Parables*, a translation from the Burmese published by Capt. Rogers, R. E., in 1870. Mr. Childers, professor of Pāli in University College, London, published in the *Journal of the Royal Asiatic Society* for 1869 the *Khuddaka Pātha*, the fifth book of the fifth division of the *Three Caskets*, with an English translation, and has undertaken, in conjunction with Mr. Fausböll, a complete edition of the *Jatakas*, or 550 Booddhist fables and tales, of which the first part has just been published in Copenhagen. Mr. Fausböll has already worked in this field, having published in 1858 in the *Bericht der königlichen preussischen Akademie der Wissenschaften* in Berlin a Booddhist fable called the *Makasa Jātaka* with a German translation; nine more jataka stories, under the title *Five Jātakas*, in 1861; two more, under the title *Two Jātakas*, in the *Journal of the Royal Asiatic Society* for 1870; three more, under the title *Dasaratha Jātaka*, in 1871, and twelve more, under the title *Ten Jātakas*, in 1872. English translations are added to nineteen out of these twenty-seven texts, the study of which, not to speak of their intrinsic interest, affords the best introduction to a knowledge of the Pāli language. Among these old Booddhist stories are many of the fables formerly ascribed to Æsop, and many of those comical and fairy tales which have long been the delight of European childhood.

It will be seen from the foregoing account how small a portion of the Pāli sacred books and commentaries has been published in the West, most of our knowledge of Booddhism being derived from translations and other works in the modern languages of Booddhist countries; to describe them does not come within the scope of this article, and on the subject of Booddhism generally we would refer the reader to our article under that head; but the later Pāli works demand some notice here. Though later, many of them are of great antiquity and interest, and among them the old Sinhalese royal and temple chronicles derive especial importance from the fact that they are the only ancient works existing in India which really deserve the name of histories. The oldest, the *Dīpavansa*, or *History of the Island* (of Ceylon), was written shortly after 300 A. D. in Anurādhapura, and contains in its first eight cantos a sketch of Booddhism in India before its introduction into Ceylon; the best known, the *Mahāvansa*, is the work the publication of the first volume of which in 1837 by the Hon. George Turnour, then of the Ceylon civil service, formed so marked an epoch in Oriental research. The original was written in Ceylon by Mahanāma, a priest, who died about 500 A. D., and commences, like the *Dīpavansa*, with a history of Booddhistic India; a new and complete edition of it is now very much required, as, though Turnour's work was of the greatest historical importance, and the foundation of all Pāli scholarship, yet the text, printed from a single manuscript, is in many places corrupt, and the edition has now become very rare. I have published two more chapters of the *Mahāvansa;* and a further account of the unpublished Ceylon histories will be found in my article on Ceylon inscriptions in the *Journal of the Royal Asiatic Society* for 1874. The only others as yet published are the *Dāthāvansa*, or history of the celebrated tooth-relic still preserved in Kandy, which was written about 1200 A. D., based on an earlier work in Sinhalese, and of which an excellent edition has just been published in London by Sir Coomāra Swāmy; and the *Attanagaluvansa*, a temple chronicle, written about 1300 A. D., and published in Colombo in 1866 by Mr. James d'Alvis. The latter author had published in 1863 a portion of the oldest Pāli grammar in Pāli, that of Kaccāyana, a complete and very excellent edition of which we owe to M. Senart in the *Journal Asiatique* for 1871. Finally, Pāli studies will receive a fresh impulse from the publication of Dr. Kuhn's *Pali Grammatik*, already in the press, and the completion of the *Pāli Dictionary* by Mr. R. C. Childers, to whose industry and scholarship all Pāli scholars are so deeply indebted. T. W. RHYS DAVIDS.

Palia'no, town of Italy, province of Rome, 30 miles N. E. of the city of Rome. This town, 1500 feet above the sea and strong from its natural position, was walled and provided with towers and bastions during the Middle Ages. Like so many other places in the papal territory, its possession was for centuries a subject of bitter contention between the popes and great Roman feudal lords, especially the Colonna. It is reached by a single road, has still its draw-bridge, and the walls are entered by only two gates. The principal buildings are the church, the baronial Colonna palace, and a few others. Pop. in 1874, 5500.

Pali'ci, Lake of (or **Nassia**), a small lake not far from Catania in Sicily, interesting to the geologist for the great quantity of carbonic gas which issues from it, and which throws up the water in jets to the height of six feet. In ancient times this lake was used as an ordeal for accused persons, who, being placed over the mephitic crater, called on the presiding divinity to attest their innocence. If they were able to resist the deadly effect of the vapor during the ceremony, they were released.

Palikao, de (Gen. COUSIN-MONTAUBAN), COUNT, b. in Paris June 24, 1796; served in Spain, and for twenty years in Africa; rose to be general 1851. In the expedition to China (1860) he commanded the French troops, gaining the victory of Palikao, carried the forts of Taku, and marching to Pekin enforced the conditions of peace submitted by the allied powers. He received for these services the cross of the Legion of Honor; was raised to the rank of senator with the title of count. In Aug., 1870, he succeeded M. Ollivier as premier of the French ministry; and acted as minister of war. He published in 1871 an account of the events of his ministry.

Pal'impsest, a word derived from two Greek words, πάλιν, "again," and ψηστός, "rubbed" or "scraped," is used either absolutely, or as an adjective with the word manuscript, to indicate an ancient writing of which the original ink has been washed away or erased to enable a scribe to use the material again. Another and less universal signification attached to this word is that of a tablet of wax, clay, or other soft substance, of which the writing could be erased at will of the writer. It was thought that the monks of the early Middle Ages had been the first to practise the somewhat discreditable art of erasing valuable classical manuscripts when the supply of material on which to inscribe their theological and philosophical effusions ran short, but Henri Etienne deduces from passages in the works of Plutarch that the Greeks themselves were not unacquainted with the process, and called the result a *palimpsest*. This very word occurs in the phrases ὥσπερ παλίμψηστα, and ὥσπερ βιβλίον παλίμψηστον, in Plutarch; and other passages may be compared in Cicero's letters to Trebatius, and Catullus's epigram *Contra Suffenum.* In the earliest times there is little doubt that extreme dearness and scarcity of parchment, produced by the want of skilled and organized workmen, caused scribes and authors to take refuge in this means of perpetuating their productions to the detriment of others who had preceded them, but it is probable that only writings of an ephemeral and trivial nature were allowed to pass under the scraping-knife of the vellum-seller. In later days, when the dissemination of letters had become general, there is equally little doubt that good, even in some cases unique, classical texts were ruthlessly destroyed for the sake of inserting matters of little or no value. The extensive conquests of the caliph Omar in these days nearly annihilated the manufacture of papyrus, hitherto furnished in great quantity

by Egypt, but destroyed along with the other national industries which fell together with the native rule, and no other means of writing was in existence to supply the deficiency. Parchment, or vellum, always dear and by no means universally plentiful, soon became enhanced in value, and the large styles of uncial and capital writings then in vogue assisted this dearness by reason of the large amount of writing surface required. Hence naturally sprung the adoption of the palimpsest; and from the fortunately imperfect manner of erasing the writing, the good and caustic qualities of the inks, and the manner of almost pressing in the letters into the substance of the vellum, the old writings were frequently left but partially scraped away and visible more or less distinctly under the new sentences. By these means many valuable recoveries of old texts have been achieved, such, for example, as the *Republica* of Cicero by the fortunate labor of M. Mai. Nevertheless, the erasure of manuscripts has been so extensively carried on that the world has without doubt lost on this account a large number of classical works. The works of Anacreon, the *Comedies* of Menander, the *Epics* of Ennius, the lost decades of Livy, the miscellaneous productions of Varro, and hundreds of other authors, which are known to have been extant as late as the seventh century, owe their loss entirely to the scalpel of the vellum merchant and the scribe of this era, which was *par excellence* the worst of all for making palimpsests, because it intervenes between the dispersion of the papyrus manufacture and the rise and general adoption of the productions of the paper-makers. To this era, too, must be attributed the great loss we sustain to-day in classical literature. The widely-felt need of a vehicle for recording writings went beyond attacking vellum only; for, according to M. Natalis de Wailly, a French palæographer of eminence, a palimpsest manuscript on papyrus has been found by him during his researches. Had it not been for the Eastern invention of thick cotton or vegetable paper (*carta bombycina*) in the ninth century, the rage for multiplying theological dissertations would probably have brought about the total destruction of all other older manuscripts. From that period, however, to the thirteenth century, when rag-paper was first employed, the *carta bombycina* gradually extended its use throughout the literary world. In process of time, however, the manuscripts which had been subjected to the process of scraping and obliteration fell under the notice of those who endeavored to restore their original texts. At first the imperfect knowledge of a means of restoring the faded inks and the want of any definite palæographic skill rendered the results unsatisfactory. But in the eighteenth century, Knittel, a German theologian, carefully went through the palimpsests at Wolfenbüttel, and was so fortunate as to identify fragments of the Bible of Ulphilas, translated from Hebrew into Gothic. P. J. Bruns discovered several of them at Rome in the library ceded by Christina of Sweden to the Vatican; his efforts were carried out by means of a chemical formula given by Blagden in the *Philosophical Transactions* for the year 1787, part ii. One of his best discoveries was that of portions of Livy, and Cicero *pro Roscio*, over which had been written a Latin version of the Scriptures. Niebuhr discovered in the same manuscript another work of Cicero, that *pro M. Fonteio*, and published it in 1820. Angelo Mai rendered himself celebrated in deciphering erased texts of palimpsests in the Ambrosian Library at Milan, many of which had originally been deposited in the monastery of Bobbio, some of his most interesting discoveries being diverse pieces of Cicero and the *Letters* of Fronto, over which were written the acts of the Council of Chalcedon. Many curious morsels of antiquity have thus been patiently rescued from oblivion; as, for example, the *Fables* of Hyginus, fragments of Aulus Gellius, Pliny, Sallust, and Tacitus; the *Institutions* of Gaius, which Niebuhr was able to recover almost entire from a palimpsest at Verona; fragments of the *Code* of Theodosius; the *Decretals* of Gratian, found by A. Peyron; portions of the *Phaethon* of Euripides, found by C. Tischendorf beneath the Pauline Epistles, and a considerable portion of the works of the historian Granius Licinianus, read by G. H. Pertz under a Syriac manuscript in the British Museum. Dr. W. Wright, professor of Arabic in the University of Cambridge, gives in his *Catalogue of Syriac Manuscripts in the British Museum* an account of a large number of palimpsests, including Arabic prayers, Coptic Old Testament and Pentateuch, Greek *Iliad*, Euclid, Gospels of St. Luke, and *Catena Patrum*. Some of these are in part doubly palimpsest. Dr. Fridegarius Mone of Carlsruhe published in 1855 a work entitled *De Libris Palimpsestis tam Latinis quam Græcis*. In this work the author indicates at length the state of some of the principal libraries of Europe from the fifth to the tenth centuries, the causes which led to the practice of making palimpsests, the means of restoring faded writings, and he concludes by a list of the Latin and Greek palimpsests which have been identified up to that time, and the progress that has been made towards their restoration and publication. From among these may be cited the works of Cicero, Fronto, Gargilius Martialis, Aulus Gellius, Hyginus, Juvenal, Livy, Lucan, Persius, Plautus, Pliny, Ovid, Sallust, Seneca, Terence, and Virgil, in the Latin list; in the Greek, Euripides, Galen, Aristotle, Hermogenes, Diodorus Siculus, Menander, Iamblichus, Ephræm Syrus, and many others of very great interest and importance in the classical and early Christian ages. W. D. Birch.

Pal'indrome [Gr. παλίνδρομος, "running back again"], a line, usually metrical, which reads the same backward and forward; as, "Able was I ere I saw Elba."

Palinu'rus (now *Capo Palinuro*), a promontory on the coast of Lucania, in the Tyrrhenian Sea, between Velia and Buxentum, received its name from Palinurus, the pilot of Æneas, who, according to tradition, was buried here. Some remains of old buildings still bear the name of the tomb of Palinurus. The place was twice the scene of great disasters, two large Roman fleets being wrecked on the rocky shores, one in 253 B. C., the other in 36 B. C.

Palisade', post-v. of Lander co., Nev., on the Central Pacific R. R., so named from the majestic mountain-range, is the point of departure for the White Pine mining district. Pop. 39.

Palisades, post-v. of Rockland co., N. Y., situated on the W. bank of the Hudson River, upon an elevated plateau 200 feet above tide-water, contains some very interesting relics of Revolutionary times, among others the dwelling known as the "big house," in which Gens. Washington and La Fayette often dined. It is now chiefly the summer residence of a number of gentlemen doing business in New York City. Pop. about 400. W. S. Gilman, Jr.

Pal'issy (Bernard), b. at Capelle Biron, in the department of Lot-et-Garonne, France, about 1510, in humble circumstances; was apprenticed to a potter, and afterwards, on account of his knowledge of geometry, engaged for some time as a land-surveyor, but pursued, in spite of poverty, religious persecutions, and manifold impediments, the art of pottery, enamelling, glass-painting, etc., not only with a natural talent and untiring energy, which made him one of the first artists of the French Renaissance, but also with a truly scientific method in his researches, which led him to new and valuable chemical observations. He was a Protestant; and although exempted from the massacre of St. Bartholomew by special order from the queen, in whose service he stood, he was twice imprisoned as a heretic—in 1557, when he was liberated by the intercession of the constable of Montmorency, and in 1588, when he was thrown into the Bastile and kept there to his death in 1590. The most remarkable of his glass-paintings is a representation of the myth of Psyche, after Rafaello. Of his pottery, vases, ewers, jugs, salvers, etc., generally small in size, but highly finished, collections are formed in several of the Paris museums; and these articles are much valued for their fineness of material, elegance of form, and beauty of decoration. His writings, containing many new and true observations on the formation of springs, on the fertilizing power of marl, on the best means of purifying water, etc., were published in 1777 by Faujas de St. Fond and Gobet, and in 1844 by A. Cap. His *Life* was written by H. Morley (2 vols., London, 1852) and by J. Salles (Nîmes, 1855).

Palla'dio (Andrea), b. at Vicenza Nov. 30, 1518; studied first sculpture, but was led by his passion for mathematics to the study of architecture, in which art he became one of the greatest masters. He lived and built principally in Venice and Vicenza, where he d. Aug. 19, 1580. His principal buildings are the churches of San Giorgio Maggiore and Il Santissimo Redemptore, and the atrium and cloister of the convent Della Carità in Venice, the Teatro Olympico, and a great number of palaces in Vicenza. He also wrote a work on architecture, first published at Venice in 1570, and subsequently often reprinted; and from this work, as well as from the imitation of his actual construction, originated the so-called Palladian style.

Palla'dium. The celebrated Palladium of Troy—τὸ μεμυθευμένον Παλλάδιον, as Dionysius calls it—was to the Greek poets and historians what the Holy Grail was to the Arthurian romances. We translate the account of its origin, as given by Apollodorus (Lib. iii. c. 12, 3): "They say that Athene after her birth was brought up by Triton, who had a daughter Pallas. On a day Pallas and Athene, as they were practising warlike games together, came into contention with one another; then, just as Pallas was about to strike a blow, Zeus in fear stretched his ægis before her; but she, being ware, looked up, and fell wounded by Athene. Then Athene made great moan over her and raised a statue to her, and girded round the breasts thereof the ægis which

Pallas had feared, and placing this statue next that of Zeus did honor to it. But afterwards, when Electra, after her ravishment, fled thither, then did Athene cast down the Palladium on to the land of Ilium. But Ilus prepared a temple for it and did honor to it; and such is the tale told of the Palladium." According to an old poet quoted by Dionysius (i. 69), the Palladium was given by Zeus to Dardanus; on the taking of Troy a copy of the statue was exposed by the Trojans, while the real Palladium was hidden away, to be brought afterwards by Æneas to Italy. Dionysius further tells us that the Trojan Palladium was supposed to be preserved in the Roman temple of Vesta. According to the usual account, the Greeks having learnt that Troy could not be taken so long as the Palladium remained in the city, Ulysses and Diomedes stole it away. In a later legend it is related that Diomedes, driven by stress of weather to Italy on his return from Troy, in obedience to the promptings of the gods gave back the Palladium to Æneas. Many cities, both Greek and Italian, pretended to possess the true Palladium—in Greece, Athens and Argos; in Italy, Lavinium, Luceria, and Siris. Pausanias (i. 28 *seq.*) gives a legend that the Athenians took it from Diomedes when that hero on his return, being brought to Attica in ignorance of the country he was in, attempted to plunder the inhabitants. A. H. BULLEN.

Palladium (symbol Pd), a white or steel-gray metal of the platinum group, and usually associated with platinum, discovered by Dr. Wollaston in 1803. It is ductile and malleable, and infusible in an ordinary furnace, but melts at a lower temperature than platinum, and burns with scintillation in the oxyhydrogen flame. It does not oxidize readily, but dissolves in hot nitric acid or aqua regia. It alloys readily with gold, and renders it white if present to the extent of 20 per cent. With silver it forms a ductile compound. The specific gravity ranges from 11.3 to 11.8, and is increased to over 12 if hammered. This metal has been used for the graduated scales of astronomical instruments, for which its color, hardness, and unalterability in the air render it especially suitable. An ingot of pure palladium valued at $9600, and extracted from native platinum and gold of the value of $5,000,000, was exhibited at the Vienna Exhibition in 1873.
W. P. BLAKE.

Palla'dius. 1. RUTILIUS TAURUS ÆMILIANUS, a Roman author, probably from the fourth century of our era, wrote a work on agriculture, *De Re Rustica*, in fourteen books, which was much used during the Middle Ages. Edited by J. G. Schneider in his *Scriptores Rei Rusticæ Veteres Latini*, Leipsic, 1795; translated into English by Thomas Owen, London, 1803.—2. A Christian Father, b. in Galatia in 367 A. D.; bishop of Helenopolis in Bithynia in 400, and of Aspona in Galatia in 420. D. in 430. Wrote the *Historia Lausiaca*, a collection of biographies of hermits, dedicated to Lausus, governor of Cappadocia, published by Meursius (Leyden, 1616), and by Fronto Ducæus in his *Auctarium* (Paris, 1624).—3. A Greek author on medicine, lived probably in Alexandria in the seventh century of our era, and wrote commentaries on the works of Hippocrates, and a book on fevers, edited by Bernard (Leyden, 1745).

Pal'lah [Dutch *roode bok*, or "red buck"], a fine dark-red antelope of S. Africa, the *Æpyceros melampus.* It has a white belly, a black mark upon the croup, and black tufts on the back part of each foot. It has long handsome horns, somewhat lyrate and ringed. Its flesh is good, though dry. It is very swift, but when surprised has the singular habit of trying to steal away undiscovered. It is found in considerable herds in bushy places.

Pallan'za, town of Italy, province of Novara, situated on an elevated promontory of Lago Maggiore. This town, from the extraordinary beauty of its position and its delicious climate, is now much frequented by travellers. Pop. in 1874, 4000.

Pal'las (PETER SIMON), b. at Berlin Sept. 22, 1741; studied medicine and natural science; visited England and Holland; published in 1766 his *Elenchus Zoophytorum* and *Miscellanea Zoologica*, still of value; was invited by Catharine II. in 1768 to Russia as professor of natural science at the Academy of St. Petersburg; made from 1768 to 1774 a journey of exploration through Southern Siberia to the frontier of China; resided for many years in the Crimea, where the empress gave him extensive estates, and partook with great activity in all scientific undertakings in Russia, but returned at last to Berlin, where he d. Sept. 8, 1811. Those of his numerous works best known and still of interest are *Travels through the Southern Provinces of the Russian Empire* (Leipsic, 1799–1801); translated into English 1812; *Flora Rossica* (2 v. fol., 1784–88), not completed, and *Sammlungen historischer Nachrichten über die mongolischen Völkerschaften* (2 v., St. Petersburg, 1776–1802).

Pallavici'no (PIETRO SFORZA), b. at Rome Nov. 20, 1607, of wealthy parents; received a careful education; took holy orders; entered the Society of Jesuits in 1637; was made a cardinal in 1657, and d. at Rome June 5, 1667. He was an accomplished scholar and a copious writer. The best known of his works is *Istoria del Concilio di Trento* (2 vols., fol., Rome, 1656–57), often reprinted afterwards, which was written, to some extent at least, in opposition to the liberal work on the same subject by Paoli Sarpi.

Pal'lee, town of Hindostan, in the dominion of Joodpoor, on the Luny, has an extensive transit-trade in opium and European manufactures. The annual revenue of its custom-house amounts to £7500. It is well provided with water. Pop. 50,000.

Pal'liser (JOHN). b. at Comragh, Ireland, in 1817; went to Canada in early life; spent several years among the Indians of the North-west; published *The Solitary Hunter, or Sporting Adventures in the Prairies* (1853); was British commissioner for the determination of the boundary between the U. S. and the Hudson's Bay territories W. of Lake Superior 1857–60, and prepared important reports upon the topography and resources of the regions traversed, which were published by order of Parliament 1861.

Palliser (Sir WILLIAM), C. B., b. in Dublin, Ireland, June 18, 1830; was educated at Rugby, Trinity College, Dublin, Trinity Hall, Cambridge, and the Sandhurst College; became ensign in the British rifle brigade 1855, and joined the 18th Hussars in 1858; became captain 1859, major, unattached, 1864, and retired from the service by sale of his commission in 1871. He is the inventor of the Palliser projectiles, designed for piercing armor-plated ships; has also invented an improved method of rifling iron wrought cannon for use both in ships and on fortifications, and of converting smooth-bore cast-iron ordnance into rifled guns. He was knighted by the queen Jan. 21, 1873.

Pal'lium [Lat., a "robe"], in the Roman Catholic Church, a band of white lamb's wool, embroidered with black crosses, worn upon the neck by the pope and all ecclesiastics of archiepiscopal rank, including metropolitans and patriarchs. It was once made of linen, embroidered with purple, and was worn by all bishops. At present, the pallium has two pendants, one hanging down the back and one down the breast of the wearer. It is the chief badge of the archbishop's authority; is granted by the pope in person, and is worn only upon very solemn occasions. The pope, however, wears it continually. It is always buried with the wearer, and can never be transferred to another person.

Palm. See PALM OIL, PALM TREE, and PALM WINE.

Palm [Lat. *palma*, "hand"]. Most ancient measures were derived from parts of the human body, originally, no doubt, indicating the actual measuring by the foot, the palm of the hand, etc., but in process of time acquiring a fixed and theoretical value. The Roman *palmus* was of two lengths—respectively of nine and three inches. The *palmus major* is found in the later writers, the common palm being that of four digits (3 inches). The modern Italian measure of *palmo* is derived from this larger palm, but it varies somewhat in the different parts of the country. WILLIAM E. A. AXON.

Pal'ma, one of the CANARY ISLANDS (which see). Area, 330 square miles, with 33,089 inhabitants. It contains the interesting, now extinct, volcano Caldera de Taburiente, produces good timber, and has two fine towns, St. Cruz and Los Llanos.

Palma, town of Spain, the capital of the province of Baleares, on the south-western coast of the island of Majorca. It is surrounded with walls and fortified with thirteen bastions, and has a fine harbor with a mole 500 yards long, and lined on both sides with dockyards, in which very active shipbuilding is carried on. The city is well built, and contains many elegant buildings, both private and public, among which the most remarkable are the cathedral, the exchange, and the governor's palace. It has many good educational institutions and manufactures of silk, soap, brandy, and glass. Pop. 40,418.

Palma (JACOPO), (called IL VECCHIO, "The Elder," to distinguish him from his nephew, IL GIORINE), an Italian artist, b. at Lerinatta, near Bergamo, about 1490; d. about 1560 (dates are confused), occupies a place between Bellini and Titian. He was a gentle, thoughtful painter, excelling in grace and color. His works were numerous; the best are *The Three Graces* at Dresden, the altar-piece of the S. Maria Formosa at Venice, the *Adoration of the Magi* at Milan, a *Holy Family* in S. Stefano at Vicenza. All the European galleries have specimens of his art. England is

rich in them. The famous *Bella di Tiziano* in the Sciarra Gallery at Rome is ascribed to Palma Vecchio.

O. B. Frothingham.

Palma (Jacopo), (Il Giorini), nephew of the above, b. at Venice about 1544; d. 1628; studied in Venice and Rome; an ambitious but hasty artist, coming somewhere between Tintoretto and Veronese; great among small painters, small among great ones. His best pieces are in Venice. O. B. Frothingham.

Pal′ma del Ri′o, town of Spain, in the province of Cordova, stands on the Xenil at its influx into the Guadalquivir, and has 5391 inhabitants.

Pal′ma di Montechia′ro, town of Sicily, in the province of Girgenti, is celebrated for its excellent oranges, figs, almonds, and grapes. Pop. 11,188.

Palmas, Cape. See Cape Palmas.

Palmas, Ciudad Real de las. See Las Palmas.

Palm′er, in mediæval times, a pilgrim returned or returning from the Holy Sepulchre, so called from the fact that he bore branches of palm gathered near Jericho, which were placed upon the church altar after the palmer's return. The palmer also employed the consecrated scrip (a leathern wallet) and staff; and it was further customary for him to visit the holy places of other lands during his return. Thus, after his visit to the shrine of St. James the Less at Compostella, he wore the scallop-shell (*Pecten Jacobæus*), the cognizance of the great apostle.

Palmer, post-v. and tp., Hampden co., Mass., situated at the junction of the Boston and Albany and New London Northern R. Rs., 15 miles E. of Springfield, contains 6 churches, 1 bank, a weekly newspaper, a carpet manufactory, an iron foundry and machine-shops, and 3 hotels. Pop. 3631. G. M. Fisk, Ed. "Palmer Journal."

Palmer, post-v. of Marquette co., Mich., on the Marquette Houghton and Ontonagon R. R., near the Roanoke River.

Palmer, tp. of Putnam co., O. Pop. 434.

Palmer, tp. of Washington co., O. Pop. 671.

Palmer, tp. of Northampton co., Pa., at the confluence of the Lehigh with the Delaware River, includes borough of Easton. Pop. 1444.

Palmer, post-v. of Ellis co., Tex., on the Houston and Texas Central R. R., near Trinity River.

Palmer (Anthony), a gentleman of wealth, who in 1708 removed to Pennsylvania from the W. Indies; was president of the Pennsylvania council and acting governor of Pennsylvania 1747–48. His twenty-one children by his first wife all died of consumption, and his descendants by a second wife long resided in Philadelphia. D. in 1749.

Palmer (Edward Henry), b. at Cambridge, England, Aug. 7, 1840; graduated at the university of that city 1867; was a member of the Sinai Surveying Expedition of 1868–69, and the survey of Moab in behalf of the Palestine Exploration Society 1869–70; acquired a good practical knowledge of Oriental languages, and became professor of Arabic at Cambridge 1871. Author of *The Negeb, or South Country of Scripture* (1871); *The Desert of the Exodus* (1871); of several translations from and into the Persian language, and of a *Persian-English and English-Persian Dictionary* (1875).

Palmer (Elihu), b. at Canterbury, Conn., in 1764; graduated at Dartmouth College 1787; studied theology; became a deist 1791; resided for some time in Augusta, Ga., where he collected materials for Dr. Jedidiah Morse's *Geography;* afterwards became conspicuous at New York and Philadelphia; became blind in consequence of an attack of yellow fever 1793; published a Fourth-of-July oration 1797; *Principles of Nature* (1802), and *Prospect or View of the Moral World* (2 vols., 1804). D. at Philadelphia, Pa., Apr. 7, 1806.

Palmer (Erastus Dow), b. at Pompey, N. Y., Apr. 2, 1817; was for some years a carpenter at Utica; began in 1846 to cut cameos; achieved great success; removed to Albany; began a new career as a sculptor 1852; has produced above 100 works in marble, including several portrait-busts of eminent men; has executed meritorious groups of allegorical and mythological characters, and a group of fifteen figures representing the landing of the Pilgrims, intended for the Capitol at Washington.

Palmer (Frank W.), b. at Manchester, Ind., Oct. 11, 1827; learned the printing trade; practised as a journeyman in New York City; was for ten years editor and publisher of the Jamestown *Journal*, 1848–58; member of the New York Assembly 1853–54; removed to Dubuque, Ia., 1858, where he edited the *Times;* State printer at Des Moines 1860–68; Republican member of Congress 1869–73, after which he established and edited at Chicago the *Inter-Ocean* newspaper.

Palmer (George W.), b. in Hoosick, N. Y., Jan. 13, 1818; became a lawyer; was surrogate of Clinton co., N. Y., 1843–47; was in Congress 1859–63, and in 1866 became a judge of the mixed court at Freetown, Sierra Leone, for the suppression of the slave trade.

Palmer (Innis N.), b. at Buffalo, N. Y., Mar. 30, 1824; graduated from the U. S. Military Academy; served in the Mexican war; subsequently on frontier duty; at the battle of Bull Run, July 21, commanded the cavalry regulars; appointed brigadier-general of volunteers Sept., 1861; transferred to North Carolina Dec., 1862, and participated with Gen. Sherman's army during its operations in North Carolina, receiving the various brevets from lieutenant-colonel to that of major-general for his services. In June, 1868, he attained the colonelcy of his regiment (2d Cavalry), with which he has served on our frontier since the war.

Palmer (Admiral James S.), b. in New Jersey in 1810; entered the U. S. navy as midshipman 1825; was engaged in naval battles in Sumatra 1838; commanded a blockading vessel on the Mexican coast 1846–47, and on the Atlantic coast of the Confederate States 1861–62; became captain July, 1862; led the advance at the passage of the Vicksburg batteries 1862; was Admiral Farragut's flag-captain at the battles of New Orleans and Mobile; commanded North Atlantic squadron 1865; became rear-admiral 1866. D. of yellow fever at St. Thomas Dec. 7, 1867.

Palmer (Gen. John McCauley), b. at Eagle Creek, Ky., Sept. 13, 1817; removed to Illinois 1832; settled at Carlinville 1839; was admitted to the bar 1840; took an active part in politics; State senator 1852–55; was prominent in the organization of the Republican party 1856; delegate to the Peace Convention at Washington, D. C., Feb., 1861; appointed colonel 14th Illinois volunteers in April; accompanied Gen. Fremont in his expedition to Springfield, Mo.; appointed brigadier-general of volunteers Dec., 1861, and made major-general of volunteers Nov. 29, 1862; was in command of 14th corps in Sherman's Atlanta campaign May–Sept., 1864, when he was relieved; subsequently in command of department of Kentucky; resigned Sept., 1866; governor of Illinois 1869–73.

Palmer (John Williamson), M. D., b. at Baltimore Apr. 4, 1825; was well educated, and studied medicine in Philadelphia; was city physician of San Francisco, Cal., in 1849; went in 1852 to China; served 1852–53 as surgeon of the East India Company's war-steamer Phlegethon in the Burmese campaign; has been a large contributor to American periodicals; was active in the Confederate cause 1861–65; became afterwards an editor in Baltimore. Author of *The Golden Dagon* (1853), *The Queen's Heart,* a successful comedy (1858), *The New and the Old* (1859); has translated Michelet's *L'Amour* and other works from the French; compiled *Folk-songs* (1860) and several other volumes of selected poetry; is widely known for his admirable papers on East Indian life.—His wife, Henrietta Lee Palmer, b. in Baltimore in 1834 and married in 1855, is the author of *The Heroines of Shakspeare* (1858) and of translations from the French, etc.

Palmer (Gen. Joseph), b. in Massachusetts in 1718; was a member of the provincial congress of Massachusetts 1774–75; was a member of the committee of safety appointed by that body; was colonel of militia during the operations of 1775–76, and brigadier-general in the Rhode Island campaign of 1777. D. at Roxbury Dec. 25, 1788.

Palmer (Joseph), M. D., b. at Needham, Mass., Oct. 3, 1796; graduated at Harvard College 1820; studied medicine; taught school at Roxbury, and was one of the masters of the Latin school at Boston for some years; resided in Cuba 1829–30, after which he became connected with the Boston press; was a painstaking investigator of the early annals of Massachusetts, historiographer of the Massachusetts Historical Society and the New England Genealogical Society 1856–61, and author of the annual necrology of Harvard College which appeared in the Boston *Daily Advertiser* 1851–68. A volume of his *Necrologies* (1851–63) was reprinted in 1864. D. at Boston Mar. 3, 1871.

Palmer (Ray), D. D., b. at Little Compton, R. I., Nov. 12, 1808; graduated at Yale College 1830; studied theology at New Haven; became pastor of Congregational churches at Bath, Me., 1835, and at Albany, N. Y., 1850, and secretary of the American Congregational Union at New York 1866. Author of many literary contributions to reviews, some doctrinal works, and several volumes of religious poems, among which is the favorite hymn, "My faith looks up to Thee." A collection of his poetical works was issued in 1875.

Palmer (Roundell), D. C. L., Baron **Selborne,** b. at Mixbury, Oxfordshire, Nov. 27, 1812, was educated at Rugby and Winchester schools; graduated at Trinity College, Oxford, 1834, with high honors, obtaining a fellowship at

Magdalen College and the Eldon law scholarship; was called to the bar 1837; entered Parliament 1847; became queen's counsel 1849; knighted and appointed solicitor-general 1861; was attorney-general 1863–66; was counsel of the British government before the Geneva court of arbitration on the "Alabama claims" 1871; became lord chancellor with the title of Baron Selborne of Selborne, Hampshire, Oct., 1872, retiring from that office Feb., 1874. Author of *The Book of Praise, from the best English Hymn-writers* (1862), and well known from his advocacy of the establishment of a law university at London.

Palmer (William Adams), b. in Vermont about 1780; was a member of the Vermont legislature six years; clerk of the courts eight years; elected judge of the supreme court 1816; State senator two years; was U. S. Senator 1818–25; judge of probate and of the county court; member of the constitutional conventions of 1828 and 1836, and governor of Vermont 1831–35. D. at an advanced age at Danville, Vt., in Dec., 1860.

Palmer (William Pitt), b. at Stockbridge, Mass., Feb. 22, 1805; studied medicine; became a teacher in New York City; was employed in the public service; was for some years a journalist, and author of numerous essays and poems.

Palmer's Springs, p.-v. and tp., Mecklenburg co., Va. Pop. 1618.

Palm'erston (Henry John **Temple**), Viscount, and Baron Temple, b. at Broadlands, Hampshire, England, Oct. 20, 1784, a son of an Irish peer of the family of Sir William Temple; succeeded in 1802 to his title; was educated at Harrow and St. John's College, Cambridge, where he passed M. A. in 1806; declined the election to the House of Lords as a representative peer for Ireland; entered Parliament for Bletchingley 1806; represented Newport in Parliament 1807–11, and Cambridge University 1811–31, and after that represented Bletchingley, South Hants, and Tiverton; became a junior lord of the admiralty 1807; was secretary at war 1809–28, under five administrations, having abandoned high tory principles for moderate liberalism; was secretary of state for foreign affairs 1830–34, 1835–41, and 1846–52, attaining great distinction as a diplomatist; secretary of state for home affairs 1852–55; premier and first lord of the treasury 1855–58 and 1859–65; was appointed lord warden of the Cinque Ports 1861; rector of Glasgow University 1863. D. at Brockett Hall, Herts, Oct. 18, 1865, and was buried in Westminster Abbey. (See his *Life* by Lord Dalling, 1870, incomplete.)

Palmet'to, a name properly belonging to *Chamærops humilis*, a small palm tree of Southern Europe, but also given to other small palms. Of these the U. S. has the following: (1.) *Sabal palmetto*, the cabbage palmetto, found as far N. as the Cape Fear River, in sandy soil near the coast. Its timber is useful in constructing piers, since it is durable and not subject to the attack of the teredo. The original Fort Moultrie was built of palmetto logs. The tree sometimes reaches the height of 50 feet. The leaves are largely used in making hats, and the "cabbage," or crown of young leaves, is excellent eating when boiled. The root has been proposed as a tanning material. It is highly astringent. (2.) *Sabal serrulata*, the saw-palmetto, has a creeping stem from 5 to 8 or more feet 6 inches in diameter, with thick clusters of fan-shaped leaves, the abode of many rattlesnakes. (3.) *Sabal Adansonii*, the dwarf palmetto, is stemless and has leaves two or three feet high. It covers dense patches of ground in low coast-regions. (4.) *Chamærops hystrix*, the blue palmetto, is a low palm with long-stemmed fan-like leaves, in the axils of which are sharp needle-like thorns. The roots of the palmettos are in some soils so numerous and strong as to make the ploughing of land very difficult and expensive. Much of the palmetto-leaf of commerce is derived from the Palmyra palm.

Palmetto, post-v. and tp., Pickens co., Ala. P. 581.

Palmetto, post-v. and tp., Campbell co., Ga., on the Atlanta and West Point R. R. Pop. 294.

Pal'mi, town of Southern Italy, province of Reggio, stands on the bay of Gioja and carries on an active trade. Pop. 9140. It was almost entirely destroyed by an earthquake in 1783, but was rapidly rebuilt.

Palmitic Acid. See Oleic Acid.

Palm Oil, the thick oil obtained from the fleshy pericarps of the fruit of *Elais Guineensis* and *melanococca*, a palm tree of Africa, and to some extent from other palms. It is extensively imported and made into soap, candles, and glycerine, and used for lubricating purposes. It is bleached and then pressed, and thus the palmitine is extracted for candle-making, while the elaine is used for lubricating, etc. The fresh oil is of a deep orange-red and a pleasant smell as of violets. It may be used like butter. The oil palm is now naturalized in S. America.

Palm Sunday, the Sunday before Easter, celebrated in the Greek and Roman Catholic and Lutheran churches in commemoration of the triumphal entry of the Lord into Jerusalem (John xii.), on which occasion the multitude cast branches of trees before him. These branches are represented by sprays of palm, or, in countries where the palm does not grow, by those of other trees, as of the yew, willow, box, and fir. These branches are blessed by a priest and distributed to the congregation, who wear them for the rest of the day. The custom prevails, at least locally, of gathering and preserving the "palms," which are afterwards burned, the ashes serving for use upon Ash Wednesday, the ashes of consecrated wood and of the old altar linen being also employed. It was another ancient custom that palmers returning from the Holy Land should bring with them leaves of the palm for service on Palm Sunday.

Palm Tree, a general term applicable to any individual member of the natural order Palmeæ which assumes the arborescent form. This order is, perhaps with the exception of the grasses, the most important in the vegetable kingdom for its varied uses. Its members are mostly trees with upright cylindrical trunks prolonged by a terminal bud and crowned by a few large clustered, fan-shaped, or pinnate leaves. These, as in the case of ferns, are called fronds. They are sometimes 50 feet long and 8 or 10 feet wide, and are in all cases stalked. The flowers are small, either perfect or polygamous, and with a double perianth of six divisions. The stamens are inserted in the base of the perianth, and usually as many as the petals and sepals together. Fruit a berry or drupe, with fibrous flesh and varying very much in size. Seeds with cartilaginous albumen, often hollow, the embryo lodged in a small cavity by itself. Some of the palms are shrubby and branched, while others, like the rattan, trail often as much as 1000 feet over bushes, climbing by means of hooks. Whatever may be the form, the stem is always woody and the root fibrous. The stem is hardest on the outside, where it is apt to be silicious; often it is extremely hard. Within, the stem is full of fibres, easily separable. The trunk is rough with the dilated sheathing burs of the leaves, which as they fall leave evident scars. In many it is beset with long and formidable spines. It is frequently of great height, as much as 190 feet having been measured. In the imperial gardens at Rio Janeiro there is a celebrated avenue lined on either side by gigantic leaf-crowned palms, the most graceful and picturesque of trees. A palm tree standing alone is equally majestic. The fecundity of the order is astonishing. Humboldt computed the number of flowers on a single palm at about 600,000, and the matured fruit was in equally large proportion. The flowers are borne on a spadix included in a boat-shaped spathe, which in certain species bursts with a loud explosion. The odor of the blossoms is often powerful and attracts vast numbers of insects. Von Martius, who wrote the most extended account of the palms, says of them, "Inhabitants of either world, they hardly range beyond 35° in the southern or 40° in the northern hemisphere. Particular species scarcely extend beyond their own peculiar and contracted limits, on which account there are few countries favorable to their production in which some local and peculiar species are not found. The cocoanut (*Cocos nucifera*) is one of the most widely spread. In America the *Chamærops palmetto* extends from Florida to North Carolina. It is likely that the number of species scattered over the world may be 1000, but not more than 600 are definitely known. Some love the banks of streams, others the shores of the ocean, and some ascend into high mountains; some collect in forests, and others stand singly on deserts or plains."

There are certain plants so useful to mankind, so closely connected with the uses of particular nations, that it would seem that without them these nations would cease to exist. The palm trees furnish a striking instance of this relation. The stems are used for constructing dwellings, the leaves for thatching and for making fans, while various weapons are constructed from different parts of the trees. Cordage, fishing-lines, mats, oars, walking-sticks, masts, sails, etc. are made from them. The young bud is often eaten as a sort of cabbage, while the fruits, as the cocoanut (*Cocos nucifera*) and the date (*Phœnix dactylifera*), are most delicious articles of food. Refreshing drinks and liquors, as arrack, are manufactured of the juices, and sugar is separated under the name of jaggery. Oil is also obtained, while sago, vegetable ivory (*Phytelephas*), and the betel-nut are other well-known products. Medicines and wax are derived from certain species; and indeed there is scarcely a conceivable use to which this splendid order cannot be applied.

W. W. Bailey.

Palm Wine, or **Toddy,** an alcoholic beverage prepared from the saccharine sap of various species of palm. It yields by distillation a stronger drink called arrack. Palm wine is extensively used in India and other parts of Asia; it is made in Chili, and is almost the only fermented liquor made in Africa. (See Johnston's *Chemistry of Common Life.*) C. F. CHANDLER.

Palmy'ra, one of the noblest of the palm trees, the *Borassus flabelliformis* of India and Ceylon. Its fruit is a valuable food, its timber is excellent, and it furnishes thatch, cordage, material for hats, fans, umbrellas; its leaves are used for writing tablets; sugar and arrack it produces abundantly. The young shoots are boiled and eaten, the seeds are edible, and the fruit yields a useful oil. This most useful tree is from 20 to 60 feet high and very beautiful, and its leaves are very large. Palmyra-wood is the commercial name of this and of various other palms.

Palmyra, an ancient city of Upper Syria, situated in an oasis, 120 miles N. E. of Damascus, was founded or enlarged by Solomon (1 Kings ix. 18; 2 Chron. viii. 4), and formed at that time a bulwark against the Bedouin hordes of the desert. Under the wars between the Romans and the Parthians it acquired great importance, developed a vast commercial activity, and became a splendid city. In the third century of our era, Odonathus, a native of Palmyra, established an independent Palmyrene kingdom, which was further extended, comprising the whole of Syria and parts of Mesopotamia, and brought to great prosperity by his widow, Queen Zenobia. But when the queen refused to acknowledge the authority of the Roman emperor, Aurelian defeated her army, dissolved her empire, and captured her capital in 273. A revolt, during which the Roman garrison was slain, occasioned its destruction shortly after, and it never recovered, though in 527, Justinian rebuilt its fortifications and endeavored to restore it. In 633 it was devastated by the Saracens, and again in 744. In 1400, Tamerlane completely destroyed it, and at present it is only a vast field of ruins. A small village, *Thadmor,* inhabited by a few Syrian shepherds, is situated close by. The ruins, among which some tombs with inscriptions in the old Palmyrene language and characters, and a temple of Baal, are very remarkable, were first visited by English merchants in 1691, and explored by Wood and Dawkins in 1751. (See St. Mart, *Histoire de Palmyre* (Paris, 1823), and Vogüé, *Syrie Centrale* (Paris, 1869).)

Palmyra, tp. of Lee co., Ill., on Rock River and Illinois Central R. R. Pop. 1109.

Palmyra, post-v. and tp. of Macoupin co., Ill. Pop. 2400.

Palmyra, tp. of Knox co., Ind., 5 miles E. of Vincennes. Pop. 1269.

Palmyra, post-v. and tp., Warren co., Ia. Pop. of v. 226; of tp. 1347.

Palmyra, tp. of Douglas co., Kan. Pop. 2431.

Palmyra, tp. of Somerset co., Me., on the Maine Central R. R. Pop. 1322.

Palmyra, post-v. and tp., Lenawee co., Mich., on Lake Shore and Michigan Southern Railroad. Pop. 1757.

Palmyra, post-v. of Liberty tp., cap. of Marion co., Mo., 6 miles W. of the Mississippi River, and on the Hannibal and St. Joseph R. R., at the junction of the Quincy branch, is in an agricultural region, has considerable trade and manufactures, and 2 weekly newspapers. Pop. 2615.

Palmyra, post-v. and tp. of Otoe co., Neb., on the Midland Pacific R. R. Pop. 886.

Palmyra, post-v. and tp., Wayne co., N. Y., on the Erie Canal, and near the New York Central and Hudson River R. R., is a trade and manufacturing centre, and has 2 weekly newspapers. Pop. of v. 2152; of tp. 4188.

Palmyra, post-v. and tp., Halifax co., N. C., on the Roanoke River. Pop. 2345.

Palmyra, post-v. and tp., Portage co., O. Pop. 848.

Palmyra, post-v. of Londonderry tp., Lebanon co., Pa., on the Lebanon Valley branch of the Philadelphia and Reading R. R.

Palmyra, tp. of Pike co., Pa., on the Delaware Lackawanna and Western R. R. Pop. 570.

Palmyra, tp. of Wayne co., Pa., on Honesdale branch of the Erie R. R. Pop. 2481.

Palmyra, post-v. and tp., cap. of Fluvanna co., Va., on the Ravenna River. Pop. 1979.

Palmyra, post-v. and tp., Jefferson co., Wis., on the Milwaukee and St. Paul R. R., 42 miles W. of Milwaukee, has a graded school, 4 churches, a water-cure, 1 newspaper, 1 wagon and carriage manufactory, several mills, and a number of stores and shops. Principal business, farming and dairying. Pop. of v. 703; of tp. 1621.
O. P. DOW, ED. "PALMYRA ENTERPRISE."

Pa'lo Al'to, county in the N. W. of Iowa. Area, 576 square miles. It is pleasantly diversified with lakes and undulations of land. It is fertile and highly productive of wheat and corn. Cap. Emmettsburg. Pop. 1336.

Palo Alto, tp., Jasper co., Ia., on Indian Creek. P. 1064.

Palo Alto, b. of North Manheim tp., Schuylkill co., Pa., 2 miles E. of Pottsville. Pop. 1740.

Palo Alto, in the southern extremity of Texas, between Matamoras and Point Isabel. Gen. Taylor, having taken up his position on the left bank of the Rio Grande, was in camp opposite Matamoras when informed of the design of the Mexican general Arista to attack his dépôts at Point Isabel. Leaving Major Brown, 7th Infantry, in command, he moved out May 1, 1846, and reached Point Isabel the next day. On the 7th he started on his return, with 2300 men, for the relief of Major Brown, who had been attacked at Fort Texas (afterwards called Brown in honor of its defender), when, on the 8th, he found the army of Gen. Arista, some 6000 strong, interposing to prevent his return. A battle of five hours' duration ensued, resulting in the hasty retreat of the Mexicans with a loss of 100. The American loss was less than 50.

Pa'lo Pin'to, county in the N. of Texas. Area, 974 square miles. It is traversed by the Brazos River, is somewhat hilly, and deficient in timber. Coal is found. It is principally a cattle and sheep range. Cap. Palo Pinto.

Palo Pinto, post-v. and tp., cap. of Palo Pinto co., Tex., on Texas Pacific R. R., near Brazos River.

Pa'los, post-v. and tp., Cook co., Ill., on the Des Plaines River and Chicago and Alton R. R. Pop. 853.

Palpitation. See HEART, by PRES. ALONZO CLARK, M. D.

Pame'lia, tp. of Jefferson co., N. Y., on the Rome Watertown and Ogdensburg R. R. Pop. 1292.

Pamiers', town of France, department of Ariége, was formerly the capital of Foix, is now the seat of a bishop, and has some manufactures of paper, iron, goods, etc. Pop. 8690.

Pam'lico, county of North Carolina, bounded E. by Pamlico Sound. It is quite level, in some parts marshy, and in others sandy. It abounds in pine forests. It has been formed since the census of 1870. Cap. Vandemere.

Pamlico, tp. of Beaufort co., N. C., on Pamlico River. Pop. 568.

Pamlico River, the estuary of Tar River, N. C., extends 40 miles W. from Pamlico Sound, almost cutting Beaufort co. into two nearly equal parts. It is deep enough for the craft which navigate the sound.

Pamlico (or **Pamplico**) **Sound,** by far the largest of the sounds of North Carolina, is fenced by long low islands from the open sea, with which it communicates by Ocracoke, Hatteras, Loggerhead, New, and other inlets. It is about 20 feet in average depth, with great areas of very shoal water. It communicates with Albemarle Sound on the N. Its shores are low and often marshy. The fisheries are important. The Neuse and Pamlico are its largest tributary rivers. The tides are very small.

Pam'pas is the name generally given to the vast plains of S. America extending along the rivers of La Plata and Paraguay from the eastern slope of the Andes to the Atlantic, and comprising an area of about 1,500,000 square miles. The soil is light and unproductive, containing much salt and saltpetre, and the violent transition from the wet season, with its moist, mild climate and frequent rain-storms, to the dry season, with its scorching heat, makes it impossible for trees to grow; the vegetation consists only of grass, luxuriant during the wet season, but withered during the dry. Large herds of wild horses and cattle roam in these plains, and their hides, tallow, and flesh form the principal articles of support to the inhabitants, a half-white tribe called Guachos.

Pampas Grass (*Gynerium agenteum*), a reed-like grass from the temperate regions of South America, now much cultivated for ornament. The recurved slender leaves are clustered thickly at the ground. From the middle of the tuft the flowering stems rise six to twelve feet high, and bear an ample silvery panicle. The staminate and pistillate flowers are borne by different plants; the flower-clusters of the female plant are distinguished by their larger size and greater spread; it is therefore the most ornamental. A. GRAY.

Pam'philus, b. at Berytus in Phœnicia about 240 A. D.; embraced Christianity; became a friend and associate of Eusebius; founded a library at Cæsarea in Palestine,

which he bequeathed to the Christian church there, and suffered martyrdom in 309. He wrote an apology for Origen, of which only the Latin translation by Rufinus of the first book has come down to us. Eusebius wrote his *Life*, but the book is lost.

Pamphyl′ia, an ancient district of Asia Minor, extending along the Mediterranean from Cilicia on the E. to Lycia on the W. It was mountainous, being covered with ramifications of the Taurus Mountains, which formed its northern boundary. The inhabitants were a mixed race, composed of Greek colonists and aboriginal tribes, and their language and institutions exhibited a similar mixed character, half Greek and half barbarian. The country belonged to the Persian empire, and after its fall to the Macedonians. When Alexander died it fell to Syria, and became subsequently a Roman province.

Pamplin's Dépôt, post-v. of Appomattox co., Va., on the Southside R. R.

Pamplo′na, the ancient *Pompeiopolis*, a town of Spain, the capital of the province of Navarre, situated on the Agra, is fortified and defended with a very strong citadel; is well built, and has a magnificent aqueduct on 97 arches, and manufactures of silk and leather. Pop. 22,702.

Pamun′key River, formed in Virginia by the confluence of the N. and S. Anna rivers, flows S. E. and at West Point joins the Mattapony to form the York River. It is now navigable some 12 miles to White House. Navigation by vessels of considerable draught once extended to Hanover Court-house, more than 60 miles, but the river is now shallow and full of sand-bars.

Pan [Gr. Πάν, probably kindred to πατ-έομαι, to "feed"], the Greek god of flocks and pasturage, a son of Hermes by some nymph. His general aspect was that of the satyrs and fauns, half human and half bestial. He was the inventor of pastoral music and of the syrinx. He was of a lecherous turn and had a loud voice, by which he used to frighten the wayfarer and even put armies to a sudden flight, whence such flight is called *panic*. His name is not improbably identical with that of Faunus.

Pana, post-v. and tp., Christian co., Ill., at the junction of the Illinois Central, the Indianapolis and St. Louis, and the Springfield Illinois and South-eastern R. Rs., has a large trade and 2 weekly newspapers. Pop. of v. 2207; of tp. 3096.

Panama, town of the United States of Colombia, S. America, in the state of Panama, stands on the bay of the same name, an inlet of the Pacific, and has a good though somewhat shallow harbor; large vessels cannot enter, but are compelled to anchor farther out in the bay, where anchorage, though protected by large reefs, is not perfectly safe. It forms the terminus on the Pacific of the Panama railway, terminating at Aspinwall on the Atlantic and connected by lines of steamers with San Francisco and New York; it was opened in 1855, and its traffic, especially its transit trade, is considerable. Pop. 10,000, mostly negroes or mulattoes.

Panama, post-v. of Harmony tp., Chautauqua co., N. Y., 5 miles N. of Panama station, on the Atlantic and Great Western R. R. Pop. 650.

Panama′, Isthmus of, formerly called the Isthmus of Darien, extends from lat. 7° 20′ to 9° 40′ N., with a breadth of from 30 to 70 miles, connecting N. with S. America and separating the Pacific from the Atlantic Ocean. The country is mountainous, its highest peak, the Picacho, rising 7200 feet above the level of the sea, while in other places the mountains sink into ranges of low hills. The coast is rocky and lofty along the Caribbean Sea, but mostly low and swampy along the Pacific. The soil is everywhere fertile, and all the products of the tropical zone can be easily raised; cotton of superior quality is indigenous and perennial here. Forests abounding in excellent timber are numerous, and salt, gold, copper, and iron are found. But the climate is very unhealthy, except on the heights. The isthmus forms a state, one of the United States of Colombia, comprising an area of 29,756 square miles, with 175,000 inhabitants.

Panan′ti (Filippo), a Tuscan poet, b. in 1766; d. at Florence 1837. He studied at Pisa, travelled in France, Spain, and Holland, and spent twelve years in England as opera-poet. Returning by sea to Italy, he was captured by pirates and carried as a slave to Algiers. The English consul obtained his freedom, and he profited by this opportunity to visit the African coast, which he has described in his book, *Avventure ed Osservazioni sopra le Coste di Barberia*. His principal poem is a romance entitled *Il Poeta di Teatro*. His *Works* were published in Florence in 1831 in ten volumes.

Panchatantra [Sans. the "five books," or sections], an ancient collection of East Indian fables and tales purporting to have been written by one Vishnusarman for the instruction of the sons of King Amarasakti of Mihilâropya. The fables are in prose, the morals are in verse. It was probably written after 400 A. D. The *Panchatantra* is the foundation of the later Hitopadesa (which see). The *Panchatantra* was translated in the sixth century A. D. into Pehlevi, and thence, 200 years later, into Arabic. From the Arabic it long ago passed into Western literature as the *Fables of Pilpay*. Translations exist in Turkish, Persian, Malay, Pushtu, Tartar, and all the European languages. The Arabic was translated into Greek (eleventh century); then Hebrew into Latin, in which many versions exist. The first German version was from the Latin by Eberhardt, count of Würtemburg (d. 1325); another appeared in 1802; in 1859 appeared Benfey's noble German translation from the Sanskrit with a critical treatise. The first English version from the Latin appeared in 1570. Few books have ever had so wide and remarkable a popularity.

Pancoast (Joseph), M. D., b. in Burlington co., N. J., in 1805; took his medical degree at the University of Pennsylvania in 1828; became in 1831 an instructor in anatomy and surgery; in 1834 physician in chief to the Children's Hospital, Philadelphia, and surgeon to the Philadelphia Hospital; professor of surgery 1838, and of anatomy 1861, in the Jefferson Medical College, Philadelphia; was visiting surgeon of the Philadelphia Hospital 1838–45; has published *Operative Surgery* (1852), *Essays and Lectures;* edited various reprints and translations of European works, and is author of many professional papers and member of various learned societies.

Pan′creas [Gr. πάνκρεας, "all-flesh"], or **Sweetbread,** a gland which in the human being is found behind the stomach, extending across the abdominal cavity. It weighs from two to six ounces, though it seldom exceeds four or five. A small posterior part (lesser pancreas) is sometimes detached. The right extremity is called the head, the left the tail, and the rest the body. In the octopus, a mollusk, the pancreas is a long, convoluted, single cæcum. In other mollusks it is either absent or rudimentary. Some insects have analogous organs. (*Siebold.*) The pancreas of the cod is a cluster of cæcal follicles; in the higher cartilaginous fishes a number of such clusters are bound together into a glandular mass, with several distinct excretory ducts. In the higher vertebrates there is sometimes but one duct (the canal of Wirsung), but there are very often, perhaps usually, two even in man. In the human subject the larger canal usually unites with the common choledic duct. The minute structure and general aspect of the pancreas recall those of the salivary glands. The secretion of the gland (called the "pancreatic juice") is normally alkaline, viscid, and coagulable by heat. It is secreted in abundance only during digestion. Its specific gravity, according to Bernard (who derived his specimens generally from the dog by artificial fistulæ), is 1.040. It contains the principle pancreatine, with other organic matters, and from 6 to 10 parts in 1000 of ash. It converts starch very rapidly into sugar (glucose), turns cane and milk-sugars into glucose, thus fitting them for absorption into the blood, emulsifies liquid fats, so that they may be taken up by the lacteals, and actively assists in the conversion of fibrin and albumin into peptones. It is probable that it does not normally acidify the fats of the food, although it does so in the test-tube. It is thus seen that the pancreas is one of the most important of the organs of digestion. For our knowledge of its uses we are chiefly indebted to Claude Bernard of Paris.

Pan′csova, a town of Austria in the Military Frontier, at the mouth of the Temes, emptying into the Danube, is fortified and contains several military establishments and some manufactures of woollens and leather. Pop. 13,408.

Pa′nda. See Ailurus Fulgens.

Pandana′ceæ, or **Screw-Pines,** a remarkable natural order of endogenous trees and shrubs, nearly all tropical, and in some cases closely approaching the character of palms. Thus the *Carludovica palmata*, and especially the *Phytelephas macrocarpa* (the first producing the material for Panama hats, the last affording vegetable ivory), are often called palms, but are perhaps nearer this order. The screw-pines proper (*Pandanus*, *Freycinetia*, etc.) send down aërial roots, as if to prop themselves up, while others are decumbent or climbing. Some of the species afford useful fruits and seeds; others powerfully fragrant blossoms. A few have active and even poisonous properties. The leaves of *Pandanus vacoa*, the vaquois of the Isle of France, afford a fibre which is very extensively made into burlaps and exported largely. The roots of the same tree are used for making coarse brushes. The *Nipa fruticans*, a palm-like tree of Tenasserim, affords large quantities of sugar (jaggery), and its leaves are exported for roofing material.

Pan'dects, The [*Pandectæ*, from Gr. πᾶν, "all," and δέχομαι, to "receive," the "all-containing"], also called the **Digest** [from Lat. *digesta*, "that which is systematically arranged"], the compilation of the Roman civil law made by the order of the emperor Justinian from the writings of eminent jurists, and constituting the most important part of the *Corpus Juris Civilis*. The previous condition of the Roman law, its development through the edict of the prætors and through the commentaries of professional jurisconsults, the changes in its character which had taken place during an interval of more than a thousand years, and the measures inaugurated by Justinian to reduce the whole into a codified form, will be found described under the title LAW, CIVIL. After the *Codex* or code had been completed, and near the end of the year 530 (Dec. 15, 530), the emperor addressed a special constitution or mandate to Tribonian, his *quæstor palatii*, which sketched the plan of the new work and ordered it to be undertaken. This statute commanded Tribonian, with the aid of sixteen commissioners chosen by himself, to select from the writings of ancient jurisconsults those portions which had not become obsolete, and to arrange them in a single volume, which should bear the name *Pandects* or *Digest*, and which should be divided into 50 books, and these again into separate titles, following the order of the code or that of the edict, as should be judged preferable. In respect to the mode of executing this process of redaction, a wide discretion and a large authority were conferred upon the commissioners. They were not to judge an opinion the better simply because it had been adopted by the greatest number of authors; they were not, however, to reject the notes of Ulpian, of Paulus, and of Marcian upon Papinian. The selections thus made were to have the same force and effect of law as though they had emanated directly from the emperor himself. They were to reject whatever was misplaced, superfluous, or mistaken, to leave no antinomy or contradiction between two laws, and no repetitions, to avoid inserting anew the matter already placed in the code, and to omit all that had become obsolete and useless. Finally, an emphatic warning was added, which prohibited all persons from making the text, when completed, the basis of any commentaries, and from obscuring its simplicity by prolix observations, as had been done to the ancient law. This commission, named and presided over by Tribonian, was composed of 16 members: Constantine, *comes sacrorum largitionum*, Theophilus and Cratinus, professors in the law school at Constantinople, Dorotheus and Anatolius, professors in that at Berytus, and 11 prominent advocates. They drew the entire material which composed the digest from the works of 39 jurists. In the actual performance of their labors it seems that certain books were assigned to each member separately, that he extracted therefrom such passages as he thought proper, making the changes which he considered necessary, and arranging the quotations under their appropriate titles. These individual results were then submitted to the whole commission, by whom they were, after further alterations and additions if needed, reduced into an harmonious system. In three years the digest was finished, and was promulgated by an imperial constitution dated Dec. 16, 533, which took effect on the 30th of that month. The text of the Pandects bears no resemblance to a modern code or revision of statutes. It is rather a mosaic-work of fragments taken from the writings of the foremost jurists; but from this very form it preserves more faithfully than could have been done in any other manner the spirit, the genius, and the underlying principles of the Roman law. Of the 39 authors who contributed to its contents, the greatest part lived during the period when the law had attained its highest degree of philosophic development, the fourth and third centuries before Justinian; the earliest, however, Q. Mucius Scævola, from whom a few paragraphs were borrowed, was a contemporary of Cicero. About one-third was taken from the writings of Ulpian; Paulus stands next, one-half of the text being extracted from the various treatises of these two prolific writers. The third in the amount but first in the excellence of his contributions was Papinian. Three millions of lines were thus reduced to 150,000, and 2000 original books to 50. Each of these 50 books is again subdivided into "titles," the total number of which is not the same in all editions, varying from 429 to 440. Under each title are placed the extracts, preceded in every instance by the name of the author and of the works from which it was quoted, technically termed the *inscriptio;* their number is about 9000. Some of them are single sentences, or even parts of a sentence, while others extend through many pages. The original language was Latin, except a few passages from Papinian and a considerable number from Modestin, which were in the Greek. The 50 books which compose the Pandects were separated by Justinian into 7 parts: the first, *Prota,* contained a statement of general doctrines; the second, *De Judiciis*, treated of real actions; the third, *De Rebus*, of contracts, except stipulations; the fourth, *Libri Singulares*, comprised the subjects of marriage and tutorship and other matters; the fifth, also entitled *Libri Singulares*, was appropriated to testaments and legacies; while the sixth and the seventh, without any special designation, embraced the other portions of the law. The extreme rapidity with which the task of compilation was accomplished necessarily detracted somewhat from the scientific character of the Pandects as a perfected work of legislation, and produced a certain confusion in the arrangement and many instances of repetitions, and even of express contradictions between different passages. The gravest fault, however, in the estimation of some moderns, consists in the alterations which the commissioners were permitted to make in the very text of the extracts selected by them, by means of which a doubt is thrown over the whole, so that the reader can never feel assured whether Ulpian, for example, actually said what he is represented as saying, or whether he did not say it, if at all, with such or such restrictions. Tribonian has, therefore, received no little condemnation, and even vituperation, from a school of juridical writers, who forget, however, in their zeal for pure historical truth, that without these very labors of Tribonian it is probable the Roman law would have been entirely obliterated and for ever lost to mankind. In fact, it may be said that, excepting the Holy Scriptures, no books have been so valuable to civilization, to the social development of the human race, as those which contain the *Corpus Juris Civilis*, of which the Pandects are by far the most important.

A tradition was long currently accepted as true that, the Pandects having been entirely lost for several centuries, at the taking of Amalphi, A. D. 1136, a copy, now known as the Florentine manuscript, was accidentally discovered and made public by the emperor Lothair II. Savigny, however, in his great work, *History of the Roman Law during the Middle Ages*, has shown that the *Corpus Juris Civilis* was continuously known and used in Italy from the time of its introduction there during the reign of Justinian. About the year 1100, and as a part of the general intellectual awakening, the study of the Roman law was revived. Commencing at the University of Bologna, and maintained there by a school of expounders to whom the name *glossators* has generally been given, and who were the earliest commentators upon the Pandects and largely aided in settling its text by a diligent examination and comparison of manuscripts, this study soon extended over Italy, Spain, France, Germany, and even for a while into England. Nearly all the existing manuscripts of the Pandects date from the twelfth to the fifteenth centuries, and are due to the *glossators*. There is one, however, much more ancient. During the time of the *glossators* it was preserved at Pisa; when Pisa was captured by the Florentines in 1406, it was removed to Florence, where it may yet be seen. The question has been raised whether this manuscript was the single source from which all the others now in existence were copied, the differences between them being entirely due to conjectural emendations made by the *glossators*, or whether, on the other hand, the manuscripts produced by the *glossators* and still preserved were taken, in whole or in part, from other more ancient originals, which are now lost. The latter opinion was maintained by Cujas; its correctness was demonstrated by Savigny, and is adopted by Puchta. It may be considered, therefore, as settled that the text of the Pandects transmitted to us by the *glossators*, which they called the vulgate text, *litera communis*, was settled by means of the Florentine manuscript and of certain other original manuscripts that have since been lost. The Pandects have of course been frequently printed. The editions which are regarded as the most accurate, the most authoritative, and the most celebrated are the following: the *editio princeps*, with the glosses, of which one part, called the *Infortiatum*, was published at Rome (1475), the second part, the *Digestum vetus*, at Pérouse (1476), the third, the *Digestum novum*, at Rome (1476); the text is throughout the vulgate; an edition published at Nuremberg in 1529 by Haloander, the text of which is composite, chosen from different manuscripts; the edition published at Florence in 1553 by Taurellius, the text of which is exactly reproduced from the Florentine manuscript. To these may be added that of Fradin at Lyons (1510, 1511); that of Heroagius, Bâle (1541), which gives the Greek passages entire; that of Miræus, Paris (1548), and that of Contius, Lyons (1571). To this list should also be added the numerous standard editions of the whole *Corpus Juris Civilis*. (For more detailed information, especially in relation to the contents of the Pandects, the reader is referred to the following works: Hugo, *Histoire du Droit romain;* Ortolan, *Histoire de la Législation romaine;* Falck, *Encyclopédie juridique;* De-

mangeat, *Droit romain;* Savigny, *Histoire du Droit romain au Moyen Age.*) JOHN NORTON POMEROY.

Panderpoor′, town of British India, in the presidency of Bombay, stands in lat. 17° 40′ N., on the Bima, and has a celebrated temple of Vishnu. Pop. 20,000.

Pando′ra [Gr. Πανδώρα, the "all-endowed"], in the old Greek legend, was the first woman on earth, sent by Zeus to mankind in vengeance for Prometheus's theft of the heavenly fire. Aphrodite gave her beauty, Hermes cunning, and each of the gods bestowed on her some fatal gift for the punishment of mankind. Again, it is said that the gods gave her a box full of blessings for mankind, but, prompted by curiosity, she opened the box, and all the blessings flew away, except hope.

Pan′dour [from *Pandur,* a town of Hungary], a foot-soldier of a former corps of the Austrian service. They were a set of irregular light infantry of Slavonic nationality, as much dreaded for their habits of brigandage as for their valor in action. They were useful only as guerilla soldiers, but they were in 1750 put under military discipline, and gradually brought to the footing of the other frontier troops.

Panel. See JURY, TRIAL BY.

Pan′ge Lin′gua ("Proclaim, O Tongue!"), a famous hymn by Thomas Aquinas, sung on the Corpus Christi festival and other eucharistic services. It is in rhymed Latin.

Pangen′esis, the name of a theory of generation propounded by Charles Darwin in his *Variation of Animals and Plants under Domestication* (1868), according to which it is not the reproductive elements nor the buds which generate new organisms, but the cells themselves throughout the body, the physiological units transmitted by the sexual elements only as vehicles. Similar hypotheses have been set forth by Buffon, Bonnet (the so-called *emboîtement*), Owen (*parthenogenesis*), and Herbert Spencer, the difference being in the definition of the physiological unit.

Pan′golin [a name of Malay origin], called also **Badjerkeit** and **Caballaya,** the *Manis pentadactyla,* an edentate mammal of India and the East generally. It is remarkable for its scaly armor. It is five feet long, including the scaly and prehensile tail. It is an ant-eater and can climb trees. When tamed it is affectionate and gentle. There are numerous other species of *Manis,* one of the most remarkable being the phatagin (*M. tetradactyla*) of Africa. Other species are found in China, Java, Africa, etc. They are all slow of motion, and defend themselves by assuming the form of a ball. They are now referred to the order Bruta or Edentata, sub-order Squamata, and family Manididæ.

Pan′ic. The word "panic" is derived from the name of the god Pan, who, from his supposed diversion of issuing from his mountain-fastnesses and frightening passing travellers with the grotesqueness of his appearance, was afterwards credited with causing all sudden alarms. The first thought of the old servant in the *Medea* (1171) on beholding the sufferings of Glauce was that the wrath of Pan had been visited upon her mistress; and in the *Hippolytus* (141) the Chorus tell the love-smitten Phædra that she is possessed by Pan or Cybele. Among the ancients panics were of frequent occurrence: a passing omen on the road would bring upon a whole army instantaneously either despondency or enthusiasm. Plutarch relates how the Greeks under Timoleon, when advancing to give battle to the Carthaginians in Sicily, were met on the way by mules laden with parsley. The hearts of the soldiers sank at the sight; for parsley was the customary adornment for tombs. But crowns of parsley were also the rewards of victors at the Isthmian games; and Timoleon, with great presence of mind, seized some parsley and crowned his head: "See here our Corinthian symbol of victory." The courage of the soldiers was restored by the omen, the march was continued with greater enthusiasm, and though opposed to a far larger force the Greeks gained a complete victory. This is but one of many instances.—In our time the term is used more especially to denote a monetary crisis in which mutual confidence suddenly gives place to general distrust in the sphere of trade. A. H. BULLEN.

Pa′nini, the oldest grammarian in the Sanskrit literature whose works have come down to us, flourished in the fourth century B. C. Of his life very little is known; the biography given of him in *Kathâsaritsâyana* dates from the twelfth century, and is considered by most scholars a work of mere fancy. But his grammar of the Sanskrit language formed for many centuries the foundation of the grammatical study of that literature, and, although in its method and general character it is very different from the works of classic or modern grammarians, it is still admired as something unsurpassed in its kind. (See the preface to Colebrooke's *Grammar of the Sanskrit Language,* Calcutta, 1805; Max Müller, *History of Ancient Sanskrit Literature,* London, 1859; Goldstücker, *Panini,* London, 1860; Benfey, *Geschichte der Sprachwissenschaft,* Munich, 1869.)

Paniput′, town of British India, presidency of Agra, province of Delhi. It is a large city, surrounded by walls and consisting of brick houses, half of which, however, are uninhabited. It had formerly a great trade, being situated on the highway into Hindostan, and has several times been the scene of bloody battles, being the key of the country. Pop. 22,612.

Paniz′zi (ANTONIO), b. at Brescello Sept. 16, 1797; took his university degree at Parma in 1818; was suspected in the uprisings of 1821 and obliged to flee; after spending some years on the Continent and in England was offered the professorship of Italian in University College, London; in 1831 became an assistant in the British Museum, and in 1837 was appointed librarian; thanks, in a great measure, to his activity, the number of printed volumes in the British Museum was increased, between 1837 and 1866, from 225,000 to 527,134; the *Catalogue* and the superb reading-room are also due to him; published (London, 1830) a critical edition of the *Orlando Innamorato* of Boiardo, and of the *Orlando Furioso* of Ariosto. In 1835 his volume, *Sonetti e Canzoni del Boiardo,* appeared.

Panno′nia, province of the Roman empire, was bounded N. and E. by the Danube, which separated it from Germania and Dacia, S. by the Save, which separated it from Illyria, and W. by the mountains of Noricum. It was inhabited by fierce and warlike tribes of Illyrian descent, but was conquered and made a Roman province by Augustus. Frequent rebellions, however, compelled the Romans to build a large number of fortresses in the country, of which Vindobona, the present Vienna, was the most remarkable, and to keep large garrisons in the cities. During the decline of the Roman empire, Pannonia fell into the hands of the Huns, and from them it passed successively to the Ostrogoths, Longobards, and Slaves, till, in the ninth century, the Magyars settled down on it and kept it.

Pano′la, county of N. W. Mississippi. Area, 729 square miles. It is nearly level, very fertile, and is traversed by the navigable Tallahatchie River and by the Mississippi and Tennessee R. R. Live-stock, cotton, and corn are leading products. Cap. Sardis. Pop. 20,754.

Panola, county of Texas, bounded E. by Louisiana and traversed by Sabine River. Area, 788 square miles. It is well timbered and has a fertile, sandy soil, producing cotton, corn, fruit, live-stock, and the other crops of the latitude. Cap. Carthage. Pop. 10,119.

Panola, tp., Woodford co., Ill., on Illinois Central R. R. Pop. 1260.

Panola, a v. of Panola co., Miss., on Tallahatchie River and Mississippi and Tennessee R. R. Pop. 192.

Panora, post-v. of Cass tp., cap. of Guthrie co., Ia., near Middle Coon River in the midst of an agricultural region, has 1 weekly newspaper. Pop. 504.

Panora′ma [Gr. πᾶν, "all," and ὅραμα, "view"] properly designates a painting disposed as if it were the concave side of a whole or half cylinder, with a view to presenting the full effect of a landscape. Good panorama-painting is difficult and requires peculiar modifications of perspective; but if well done, the effect is admirable. Robert Barker (1739–1806) invented the panorama, and first exhibited it at Edinburgh in 1788. Popularly, but incorrectly, any exhibition of large landscape-painting is called a panorama. The best panoramic artist thus far has been Robert Burford, who d. in 1861.

Panormus. See PALERMO.

Pansy. See VIOLET.

Pante′go, post-v. and tp., Beaufort co., N. C. P. 1792.

Pantelleri′a, Pantalaria, or **Pantaleria,** a small island lying between Africa and Sicily, about 47 miles from Cape Bon and 80 miles from Trapani. The soil is volcanic and well suited to the vine, the caper-plant, and to cotton, all of which are cultivated. The donkeys of this island are much prized. The mineral springs have some reputation. The principal town lies on a little bay where a harbor is formed by natural rocks and by a fortified castle, which now serves as a prison. Pantelleria, anciently called *Cosyra,* was used by the Roman emperors as a place of banishment for offenders. Pop. in 1874, 7000.

Pan′theism [Gr., "All-god-ism"], a word first used by Toland at the beginning of the eighteenth century to designate the monistic doctrine, which identifies the totality (*pan*) of being (*natura naturata*) with God (*theos*), *natura naturans.* Not that each thing is God, but that the whole essence or substance proper is God, and the entire phenomena are the necessary phenomena of God's nature. I. It is or is not virtually identical with atheism, as the

old nomenclature made it, just as the term God is defined. "Pantheism," says Schopenhauer, "is a misnomer, for the word God means a personal Creator: it is simply courtly atheism." But under the name pantheism we have a genus, ranging from the low level which, if it were the only one, would justify Schopenhauer's estimate, up to the highest forms, in which it almost seems to present us the personal free God of THEISM (which see), and is anti-theism, rather than atheism. It may be made in its various types the basis of irreligion, or may blend with the most transcendent forms of religionism. (See MYSTICISM and the articles on the Oriental religions—HINDU PHILOSOPHY, HINDU RELIGION, VEDA.) It was originally a religious, not a philosophical, construction, and underlies polytheism and all the systems which are the apotheosis of nature. The view which considers the substance of the world as unconscious till it reaches consciousness in man, and the view which maintains a supreme evolution of consciousness in the universe, in which man is participant as a subordinate member of the whole, certainly do not preclude the religious element to the same degree.

II. The *divisions* of pantheism help to define it, and also to mark its general history, though some of them are vague, and involve what is not properly pantheistic. Some of them, indeed, should be distinguished from it. (1) Psychological pantheism considers God as the soul or vital principle. Matter is the eternal body which God vivifies. (*Hylozoism, Timæus of Locres.*) (2) Cosmologic, ontologic pantheism, in its ancient form in the Eleatic school (the universe and God are identical). (See PARMENIDES, XENOPHANES.) In its modern and subtler form in Spinozism (one only substance, eternal, manifested in extension as matter, in thought as mind). (3) Mystical pantheism, the Hindoo pantheism (all things constitute an essence, of which the real and ideal, the objective and subjective, are but the opposite poles). (4) Idealistic pantheism of the Middle Ages: Erigena (emanation); Amaury de Chartres (nature is the totality of the phenomena and modes of God, without substantial and distinct existence); Bruno (sixteenth century, more than Spinoza the prototype of the most recent pantheism). (5) The materialistic pantheism (a misnomer): Heraclitus (the first Hegel); the Stoics (all-impenetrating fire); David de Dinant. If we can talk of materialistic pantheism, we can subdivide it and speak of atomistic pantheism. Büchner (matter is the original, self-existent, immutable, eternal; the atom is God). (*Natur u. Geist*, 3d ed., 1875.)

A twofold division has been proposed: I. The Oriental type, which loses the world in God—acosmism. There is no coming into being. One only being is, whose modifications are the individual phenomena: the Eleati, Spinoza. II. The Occidental type, which loses God in the world; totally denies the substantiality of God; evolution, not being; process, the absolute in the way to being: (Heraclitus the Stoic), Fichte (deduction of the world from the Ego, God the moral order of the world), Schelling (absolute identity, the absolute is God implicit, the world is God explicit, the absolute is primordial involution, the world is progressive evolution), Hegel (Fichte's method and Schelling's results), for whose school, in one of its developments, may be claimed the most perfect philosophical shape ever given to pantheism.

III. "Pantheism," says Heine, "is the secret religion of Germany." It attracts the subtler, less practical intellects. Materialism is the temptation of physicists and physicians. Pantheism has a charm for metaphysicians. Its dialectic simplicity, which is the power of all monism, but pre-eminently of pantheism, and its seeming consonance with the rise of all the phenomenal world from what we call substance, and its subsidence into it, tempts men to doubt whether that substance, so called, be not a mere mediate thing, a seeming substance to its own phenomena, the real phenomenon to the true substance, and no more than a link to the finality into which it will subside, which is the only true substance, because it depends on nothing, and all depends on it; while the seeming substances (*modi*) of the common illusion are but phenomena, one remove less from the original. The metaphysical dialectics of the case as against pantheism shuts itself up very much to the question whether phenomena can have phenomena. If they can, the total notion of substance is destroyed, and the pantheistic notion with it. If they cannot, the common notion of substance stands, but the pantheistic vanishes. It is reduced to annihilation or to logomachy. But the real "crucible of every philosophical system is found in its ethical principle." The lower forms of pantheism, in their view of moral agency, freedom, and responsibility, are of necessity so deterministic as to make religion and morality impossible; and wherever pantheism accepts an unmistakable principle of morals, it abandons to that extent its logical consistency. (See PHILOSOPHY.)

For literature see Bretschneider, *System. Entwickelung* (4th ed. 1841, pp. 45–52); Pierer, *Univ. Lexik.* (1861, xii. 605); Saisset, *Dictionnaire de Scienc. philosoph.* (Franck., 1875, 1249). CHARLES P. KRAUTH.

Panthe′on [Gr. Πάνθειον, a temple for all the gods], a celebrated Roman temple built in 27 B. C. by Marcus Agrippa, near the centre of the Campus Martius. It is of brick and is in excellent preservation, having been several times restored both in ancient and modern times. In 610, Pope Boniface IV. consecrated it as the church of Sancta Maria ad Martyres. It is known as La Rotonda, or Santa Maria Rotonda. It has a noble dome, the finest in the world, and its portico is equally celebrated. Here are buried Raphael and many other famous men.

Pan′ther [Gr. πάνθηρ], originally applied to an Old-World leopard (*Felis pardus*, L.), but in the U. S. perverted to the puma.

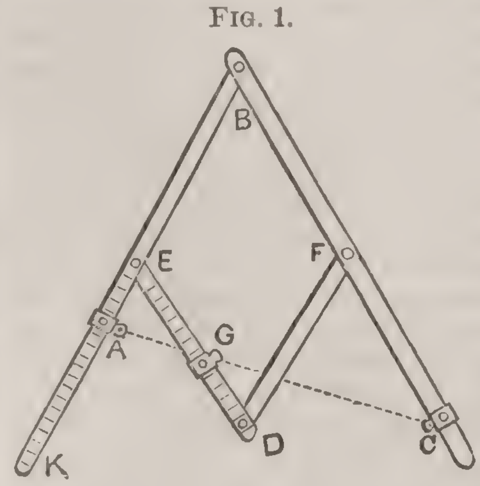
Panther Branch, tp. of Wake co., N. C. Pop. 921.

Panticapæum. See KERTCH.

Pan′tograph [Gr. πᾶν, "all," and γράφειν, to "trace"], an instrument used in copying maps and other drawings, either on the same or on some other scale.

The principle of the pantograph may be illustrated by the engraving, which shows the essential parts of the instrument in common use. It consists essentially of four brass bars with hinge-joints at B, F, D, and E, forming a rhombus B F D E in every position. The sides B F and B E are extended so that F C and E K shall each be equal to one side of the rhombus. The parts E K and E D are graduated and numbered so that a line A G through two corresponding divisions shall always pass through C. This requires the graduation to be such that E A : E G : : B A : B C. The whole apparatus is supported by delicately-formed castors. Three boxes, each fitted to hold either a pencil or a metallic tracing-point, are fitted to the beams, the one at C being fixed, and those at A and G capable of sliding along the beams, so that they may be set at corresponding points of the bars E K and E D. From the description already given, it is obvious that the three points A, G, and C will always remain in the same straight line, and that we shall always have A G : A C : G C : : A E : A B : E B; hence, if either of these points is taken as a centre of motion, the other two will trace out similar figures, whose homologous lines bear to each other a fixed ratio.

FIG. 1.

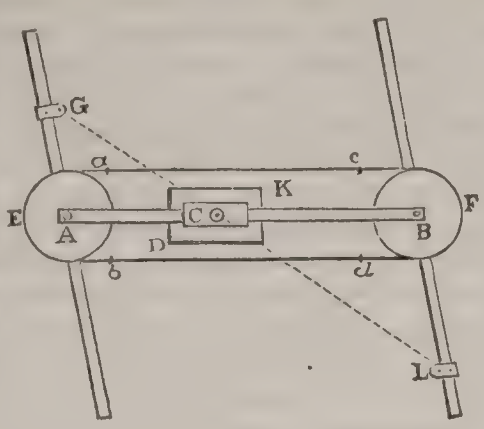


To use the instrument, the boxes A and G are clamped to the bars, so that A G and G C shall have the proper ratio, both being at corresponding points of the graduated scales. A metallic tracing-point is then clamped in the box C, which is taken as the centre of motion; a second tracing-point is clamped in the box corresponding to the drawing to be copied; and a pencil is clamped in the remaining box; the tracing-points and the pencil are all arranged so as to press with proper firmness against the plane of the paper. When thus adjusted, the movable tracing-point is carried along the lines to be copied, and the pencil traces out a similar figure. If the movable tracing-point is at G, the copy is larger than the original; if at A, the copy is smaller than the original. If G is taken as the centre of motion, the movable tracing-point and the pencil being at A and C, the copy will be reversed. In this manner the engraver is enabled to transfer the outlines of a drawing to the surface of the block or plate to be engraved, and which may be either enlarged or diminished in any given ratio. If the box A is at K, and the box G at D, the copy will be of the same size as the original, but reversed. By copying the reversed drawing with the same relation of parts, a result will be obtained equal in all respects to the original.

The pantograph just explained was invented in 1603 by Christopher Scheiner, and was described by him in a pamphlet published in 1623. A more perfect instrument for accomplishing the same object was invented by Prof. Wallace of Edinburgh: this instrument is called the *eidograph*. Its essential parts are shown in the diagram. A B is a brass beam sliding in a rectangular socket C, to which it may be clamped by a clamp-screw; from the lower side of the socket a steel axis projects, which enters a corresponding hole in the heavy mass D K, and around which, as a centre, the beam A B may be made to revolve; the

mass D K serves as a base for the whole instrument. At A and B are two pulleys, equal in diameter, and turning around axes which pass through eyes near the extremities of the beam A B; the pulleys are partially enveloped by bands of fine watch-spring *a e b* and *c f d*, and the ends of these bands are connected by steel wires *a c* and *b d;* the bands are made fast to the pulleys at E and F. The pulleys lie below the beam A B, and on the under face of each is a rectangular socket similar to C, and in these sockets are two parallel sliding beams A G and B L; by this arrangement of parts the beams A G and B L remain parallel to each other when A B is turned around its axis of motion C. Sliding boxes, like those already described, are adapted to the bars A G and B L, and by the aid of suitable graduation these may be set so that G, C, and L shall be in a straight line. The beam A B is also graduated so that it may be set in the socket C in such manner as to give to the ratio of A C and C B any required value. A tracing-point is clamped in the box L and a pencil in the box G. The instrument being thus adjusted, it is evident that if the point L is moved along the outlines of a drawing, the corresponding point G will trace out a copy similar to the original, and having its homologous lines in any given ratio to those of the original. W. G. PECK.

FIG. 2.



Pan′tomime [Gr. παντόμιμος, "all-imitating"], the art of representing thought, sentiment, will, and action by mimicry only, by attitude, gesture, and movement, is a Roman invention, though the name is Greek and originated in the time of Augustus. The Romans, who had more practical acuteness than imagination, had also more sense for virtuosity than for art. The Greek actor, declaiming the sublimest ideas in cadenced numbers, accompanied by harmonized melodies on the cithar and flute, and following the strain of music with rhythmical movements, was too complex a phenomenon to them. They seized on each single element of the representation and enjoyed it separately, the declamation through an elocutionist, the mimical expression through a pantomimist, the dance as a ballet, and the music as a concert. Besides, there were in the Roman life, such as it had developed spontaneously from olden times, certain features with which the pantomime easily combined, and which made it an acknowledged and much cherished institution. Of the old Roman *atellanæ*, a sort of improvised comedy performed at the festivals of the nobles by their own sons and for the sake of amusement only, the mimical imitation of what was awkward and ridiculous and the display of bodily adroitness and skill formed the principal part. In the last times of the republic these *atellanæ* received an artistic form through the *mimes* of Decimus Laberius and Publius Syrus. The *mime* was an imitation of every-day life, in the same manner as the modern comedy; but although the speech was written down and often elaborated with the greatest care, the acting or the mimical representation was still considered a most essential element. Decimus Laberius, who was a knight and who could not enter the stage without losing his social position, was celebrated as a reader in private of his own mimes, and at last Cæsar compelled him, with his compliments, to act publicly, and received him after the performance by returning to him the knightly ring and conducting him to the part of the theatre where the knights sat. In general, mimical expression and imitation were highly appreciated by the Romans. Cicero and Roscius vied with each other as to which could express a certain state of mind best, the one with his eloquence, the other with his mimicry; and under Augustus the pantomime became the reigning fashion. Pylades and Hylas were celebrated pantomimists in the tragical line, Bathyllus in the comical, and of the rivalry between the first two who danced *Agamemnon* and *Œdipus*, Macrobius tells some very amusing stories. Not only in public life, however, in the theatre, but also in private life, at the dinner-party, the pantomime played a very conspicuous part during the time of the first Roman emperors. When Cicero gave a dinner he had an elocutionist, who read to his guests a dialogue of Plato or a tragedy of Euripides. When Caligula gave a dinner he let loose on his guests a menagerie of wild beasts of prey, lions and tigers, whose claws and teeth had been previously extracted. On ordinary occasions a little pantomime with music and dance was enacted before each course—before the roast boar, a hunting scene; before the mutton, Ajax delirious, etc. The social position of the pantomimist was nevertheless very low. Hylas was flogged publicly, at the prætor's request, on account of some blunder he had made on the stage. Augustus forbade such interference of the prætor with the actors, but under Tiberius it became a law that a senator who visited the dwelling of a pantomimist or was seen in his company in the streets should lose his senatorship. The reason for thus throwing contempt on a class of artists who happened to be very fashionable was not the old Roman prejudice against actors and acting, but the character of the art itself. The obscenity and indecency which these pantomimes displayed exceeded all description; that the female pantomimist often danced entirely naked on the stage was not the worst feature. Such representations ceased, of course, when Christianity became a power in society. The companies were dissolved or banished. During the Dark Ages they strolled from town to town, exhibiting themselves in the market-place as acrobats. Later they were now and then employed at the performance of the mysteries, and by associating themselves with the *commedia dell' arte* their representations assumed the form under which we now know them. They borrowed the masks Harlequin, Perrot, Columbine, and Pantalone from the *commedia dell' arte*, formed a loose plot, mostly of comical elements, and filled out the scheme in a manner half acrobatic, half ballet. CLEMENS PETERSEN.

Pan′ton, post-v. and tp., Addison co., Vt., on Lake Champlain and Otter Creek. Pop. 390.

Pany′asis [Πανύασις], placed by the canon of the Alexandrian grammarians in the rank of distinguished epic poets, was, according to Suidas, son of Polyarchus and a native of Halicarnassus; other authorities make him a Samian or a Thurian; flourished about B. C. 480. Panyasis sought to revive epic poetry, which had had its blooming period, and had given way to the lyric and tragic. He composed two poems—the *Heraclea*, an account of the exploits of Hercules, in 14 books, in heroic verse; and the *Ionica*, in 7000 verses, in pentameter verse, and treating of Codrus, Neleus, and the Ionian settlements. Suidas states that he was ranked by some next to Homer, by others after Hesiod and Antimachus. Was put to death by the tyrant Lygdamis about B. C. 457 (Clinton, *Fast. Hell.*). The few fragments remaining are found in Gaisford's *Poet. Græc. Min.*, vol. iii., in Düntzer's *Epic. Græc. Frag.*, and in Tzschirner's *Panyasis* (Breslau, 1842). HENRY DRISLER.

Pa′ola, town of Southern Italy, province of Cosenza, pleasantly situated near the Tyrrhene Sea. It has a considerable coasting trade, about 800 small vessels entering its ports annually. The town is commanded by a castle and small fort of the time of the lower empire. Pop. in 1874, 8458.

Paola, city and tp., cap. of Miami co., Kan., near the Marais des Cygnes River, and at the junction of the Osage division of the Missouri Kansas and Texas with the Missouri River Fort Scott and Gulf R. R., has 3 weekly newspapers, and is a trade-centre for a rich agricultural region. Pop. of city, 1811; of tp., exclusive of city, 624.

Pao′li, post-v. and tp., cap. of Orange co., Ind., 10 miles S. of Orleans, has 1 weekly newspaper. Pop. of v. 628; of tp. 2350.

Paoli, post-v. of Willistown tp., Chester co., Pa., on the Pennsylvania Central R. R., noted for the action of Sept. 20, 1777, usually called the "Paoli massacre," which is commemorated by a monument.

Paoli (PASQUALE), b. near Morosaglia, Corsica, in 1726; was educated at Naples, whither his father took refuge, having been exiled in 1739 from the island for participation in the revolt against Genoa; returned to Corsica in 1755 as leader of the party which strove to expel the Genoese; defeated their army and even their fleet in several engagements, and deprived them of nearly all their strongholds in the island, at the same time bringing the agriculture, commerce, and industry of the country to a flourishing state by his wise and energetic administration. His success was almost complete, and excited great sympathy in Europe; but in 1767 the Genoese sold their claims on Corsica to France, and in 1769 Paoli was driven from the island by a French army of 22,000 men. In 1792, when Corsica was formed into an independent department, the French government appointed Paoli chief both of the civil and military administrations. But the anarchical state of the government soon occasioned collisions. He again placed himself at the head of a revolution; drove the French garrison and party, to which belonged the family of Bonaparte, from the island in 1796, and proclaimed George III. king of Corsica. The English now took possession of the island, but disagreements soon arose between

them and Paoli. He once more left his native country, retired to England. D. near London Feb. 5, 1807. (See Boswell, *Account of Corsica* (Glasgow, 1768), and *Biographies* by Arrighi (Paris, 1843), Klose (Brunswick, 1853), and Bartoli (Ajaccio, 1867).)

Paolo, Fra. See SARPI (PIETRO).

Paolo Veronese. See CAGLIARI (PAOLI).

Pa'pa, town of Western Hungary, has many educational and benevolent institutions and some manufactures of stone-ware and pottery. Pop. 14,223.

Papacy. See PAPAL STATES and POPE.

Pápagos, a tribe of Indians in Sonora, called by themselves **Papapootam,** classed by H. H. Bancroft in the Pueblo family, nearly related to the Pimas, and hereditary enemies of the Apaches. They were partially civilized at an early period by Jesuit missionaries; were afterwards under the care of the Franciscans, and still remain Catholics. They were usually at peace with the Spaniards, became citizens of the Mexican republic, and were in 1874 assigned a reservation on the river Santa Cruz, between Tucson and Tubac. They are agriculturists, live in small villages of dome-shaped houses, possess a few cattle and horses, and number about 5000.

Papal Infallibility. See INFALLIBILITY.

Papal States, The, occupied the central part of the Italian peninsula, and extended, though with a very irregular shape, from the Adriatic to the Mediterranean, bounded S. by Naples, and N. by Tuscany, Modena, and the Austrian possessions. They comprised an area of 15,289 square miles, with 3,124,668 inhabitants, had Rome for their capital, and yielded (in 1859) a revenue of 14,453,325 scudi. The temporal power of the pope was in its origin a natural consequence of his spiritual supremacy, and the formation of the papal states is to be traced as following hand in hand with the development of the idea of the spiritual authority of the pope. Constantine the Great had endowed the episcopal see of Rome with large landed possessions; and when the Roman bishop assumed the title of *papa* and rose as the primate of the whole Christian Church, he was able to act with that munificence and surround himself with that splendor which form a most powerful support for any claim of superiority. In the centuries after the fall of the Roman empire, when the barbarians pushed forwards to Rome and the Byzantine emperors showed themselves unable to defend their possessions in Italy, the so-called exarchate, it was quite natural that the people of Rome should look on the pope not only as their head, but as their leader; and the first step towards the establishment of the temporal sovereignty of the pope may be said to have been taken by Gregory III. in 726, when, after a quarrel with the emperor Leo the Isaurian, he declared Rome independent of the Byzantine crown and called on Charles Martel for help against the Lombards. Charles was willing to help, but both he and Gregory III. died in the same year. His son, however, Pepin le Bref, fulfilled his promise. He defeated Aistolf, the king of the Lombards, and compelled him to yield up to the pope, Stephen II., the exarchate of Ravenna, comprising, besides the so-called Pentapolis or the five cities of Rimini, Pesaro, Fano, Sinigaglia, and Ancona, seventeen other cities, mostly situated on the coast of the Adriatic, and thus the foundation of the papal states was laid. Pepin's son, Charlemagne, confirmed and enlarged the donation. In 1053 the pope obtained the duchy of Benevento by aid of the Normans, and in 1102 the countess Matilda of Tuscany left all her fiefs, consisting of Parma, Modena, Mantua, and Tuscany, to the pope, who secured the possession of them, though only after a long strife with the German emperors. The chief difficulty attending the establishment of the temporal sovereignty of the pope lay in the vague and undefined relation in which he stood to the German emperor. Pope Leo III. had crowned Charlemagne emperor of the Romans, and the emperor had given Leo III. the exarchate of Ravenna, Rome, and other Italian possessions. But what did this really mean? The title of Roman emperor was inherited by the German successors of Charlemagne, and they evidently meant to transform the title into a real authority. Hence the severe struggles between Gregory VII. and Henry IV., and between Innocent III., Henry VI., and Otho IV., and it was not until 1278 that Pope Nicholas III. succeeded in compelling the German emperor, Rudolf I. of Hapsburg, to acknowledge him as a free sovereign, thereby establishing the papal states as an independent empire. The territory of this empire was increased under Julius II. by Pesaro, Rimini, Faenza, and Reggio; in 1598 by Ferrara, Comacchio, and the Romagna; in 1623 by Urbino, and in 1650 by Romiglione and the duchy of Castro. It underwent some changes during the wars of Napoleon, being at one time entirely incorporated with France, but in 1814 it was restored to the pope with nearly its former boundaries. The miserable administration, however, of the papal government, especially during the reign of Gregory XVI., caused a great fermentation in the population. Revolutions broke out in 1831 at Bologna and other places, and Gregory XVI. depended entirely on Austrian troops for the maintenance of his sovereignty. Pius IX. made some attempts at reform, but failed. In 1848 the revolution broke out in Rome, and the pope fled in disguise to Gaëta. He was restored by French soldiers, who held the city of Rome from 1849 to 1870. Meanwhile, one part of the papal dominions after the other emancipated itself from the papal sceptre, and united, through unanimous popular votes, with the kingdom of Italy; and when the French soldiers left Rome, Aug. 21, 1870, King Victor Emmanuel simply took possession of the city, declaring it the capital of Italy, and thereby abolishing the temporal power of the pope.

CLEMENS PETERSEN.

Papavera'ceæ [from *Papaver*, "poppy," one of its genera], a natural order of polypetalous exogenous plants, herbaceous (with a single Californian exception), distinguished by having a milky, yellow, or red, and acrid or narcotic juice; the parts of the flower in twos or some multiple of two, rarely in threes, but never in fives; the petals always at least twice as many as the sepals, and in two sets, the latter falling when the flower opens, and the former usually at the close of the day; the stamens indefinitely numerous, and the compound pistil with two or more many-seeded parietal placentæ. The qualities and useful products of the order are best represented by the poppy and its inspissated milky juice, OPIUM (which see), but acrid poisonous properties prevail in the prickly poppy (*Argemone*), the "fico del inferno" of the Spaniards, and in the celandine; as also, along with other useful medicinal qualities, in the *Sanguinaria* or blood-root of the U. S. The seeds of all are said to be innocent, abounding in a bland fixed oil. That of the common poppy is an article of commerce, and is even used as an adulteration or substitute for olive oil. Several poppies and other plants of the order are widely cultivated for ornament; among others, *Eschscholtzia* of California (remarkable for wanting the milky juice, and for the calyx falling off whole in the form of a candle-extinguisher), which has become one of the commonest ornamental annuals of the garden. ASA GRAY.

Papaw' [Malay, *pâpaya*]. (1) The fruit of the *Carica papaya*, a small South American tree of the order Papayaceæ. This fruit is eaten, but is not very palatable. It has an acrid quality, and when boiled with meats renders them tender. The juice, at least before the fruit is ripe, contains a remarkable albuminous substance resembling or identical with fibrine, is anthelmintic, and has detergent powers. The root has an offensive odor. (2) In the U. S. the name papaw, or pawpaw, is given to *Asimina triloba*, *parviflora*, *grandiflora*, and *pygmæa*, handsome shrubs, or the former a small tree, of the order Anonaceæ. The pulpy fruit of the first mentioned is edible and not unpleasant, but if eaten in any considerable quantity is liable to cause nausea and other unpleasant symptoms.

Pa'pe (JOHANN GEORG WILHELM), a distinguished Greek lexicographer, b. at Culm in Prussia, Jan. 3, 1807; appointed assistant in 1828, promoted 1831, made professor 1837, in the Gray Cloister Gymnasium in Berlin; published *Etymologisches Wörterbuch d. griechischen Sprache* (Berlin, 1836), a preparation for his greater work, *Handwörterb. d. griechischen Sprache*, in 3 vols. (Brunswick, 1842; 2d ed. 1849–50), the 3d vol. devoted to proper names; added a *Deutsch-griechisches Wörterbuch* in 1845. An enlarged edition (the 3d) of the "Proper Names" was published under the care of Benseler (1863–70). D. Feb. 23, 1854. (See *Gelehrtes Berlin im J. 1845*.) HENRY DRISLER.

Pa'penburg, town of Prussia, in Hanover, was founded in the beginning of the last century, and is connected with the Ems by a canal. It has manufactures of sailcloth and ropes, a school of navigation, and an active trade in corn and wood. Pop. 6198.

Pa'per [Lat. *papyrus*, from Gr. πάπυρος and Egyptian *papu*, "a reed"]. The earliest known attempt at the production of an article similar to the paper of later or modern times was made in Egypt many centuries before the Christian era—some writers affirm 2500 years B. C.; the oldest manuscript in existence is on papyrus, and is supposed to bear date 1552 B. C. We have accounts of manufactories of paper for exportation at Memphis 700 B. C. The lower part of the stem of the papyrus-plant is, under its rough pellicle or skin, composed of thin layers of much cohesive power. These, being carefully separated, were laid side by side with edges overlapping, and on being subjected to pressure became a sheet of considerable tenacity. The number of these layers regulated the thickness of the sheet; they were made more solid and firm by beating, and were

susceptible of a degree of polish. This rude kind of paper was not improved for very many centuries, and seems to have met the wants of its consumers until about 450 B. C., when parchment was first used for books and valuable documents. At the beginning of the Christian era the use of parchment in Rome and Greece became very extensive, but not to the exclusion of papyrus, which was still exported largely from Egypt for many centuries. Toward the end of the first century the Chinese had, it is believed, begun to manufacture paper from silk and other fibres, but by what process is unknown. Two or three centuries later they were using cotton fibres for this purpose, and the art was either independently discovered or learned from the Chinese by various nations. The Persians and Arabs are known to have made paper from these fibres from the sixth to the seventh century; in 700 A. D. paper was made from cotton at Mecca. The art was introduced into Spain by the Moors, to whom modern civilization is so deeply indebted; and here it was first discovered that linen and cotton rags were more suitable for the manufacture of paper than the raw materials, owing to the hardness of the fibre being partly overcome by wear and use, making the reduction to pulp less difficult. From the twelfth century, Spain appears to have been the principal paper-producing country, Italy ranking second. During the fourteenth century the art was in use in France and Germany to a moderate extent, and in the next century these two countries had become the largest paper-producers; but during the fifteenth century Holland made rapid progress, and soon exported large quantities, England receiving her supplies mainly from Holland, France, and Italy. Toward the end of the fifteenth century—about 1490—the first paper-mill in England was built at Hertford, but the second mill was not established until fully fifty years later, being soon followed by three or four others. From this time forward the trade did not increase much for a period covering more than one hundred years, the country depending on the European continent for supplies. In France the art had flourished, paper being made there of superior quality, and it was exported to all European markets. About the end of the seventeenth century the manufacture in England received an impetus from the immigration of French refugees (driven from their native country by the Revocation of the Edict of Nantes by Louis XIV. in 1685), who introduced the improvements of the French manufacturers. The materials for some centuries were reduced to pulp by macerating them in water in a vessel resembling a mortar. A great step forward had been the introduction in the twelfth century of stamping-mills. The method of grinding by knives placed around a cylinder was invented in Holland, but not until the early part of the eighteenth century. This gave an impetus to the art.

FIG. 1.

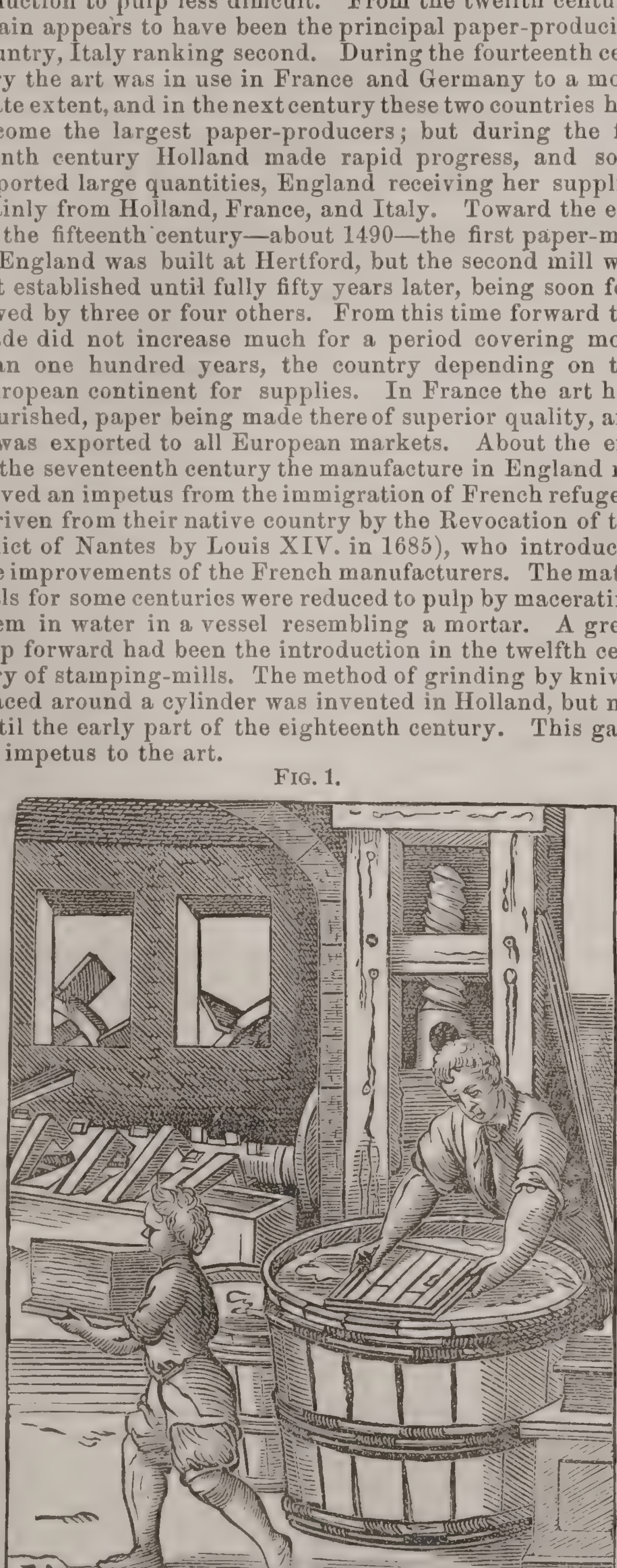


Illustration of a paper-mill of the sixteenth century, from Jost Amman's *Panoplia omnium liberalium mechanicarum et sedentariarum Artium Genera continens*, etc. (Frankfort, 1564).

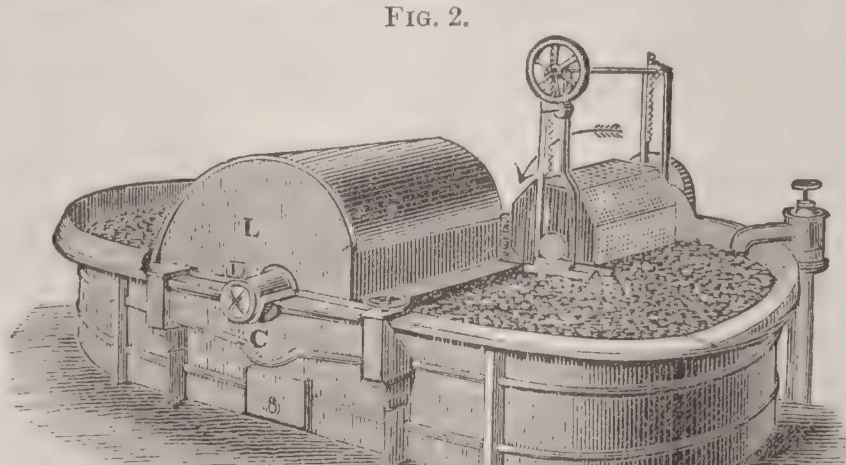
The great increase in the manufacture and consumption of paper did not begin until after the invention of the paper-machine. The original inventor, Louis Robert of Essonne, France, received in 1799 a patent for fifteen years and a premium of 8000 francs from the French government. It was introduced in 1802 by Leger Didot into England, where it was nearly perfected and brought into practical use by the Fourdriniers, whose name it bears, they having purchased the patent and rights of the original inventors. They expended large sums of money in their improvements—so large, in fact, that it ruined them financially, their only recompense being the honor of introducing one of the most wonderful pieces of mechanism ever devised, without which the demand for paper for the last fifty years could not have been met. The main principles of this machine, as it was put into operation by the Fourdriniers seventy years ago, have not been varied. Many improvements have been made in the working and form of the various parts, but the essential principle remains the same; and the same may be said as to the other principal piece of machinery requisite for paper-making—the engine for washing and beating—invented in Holland, and long called the Hollander. With this pulp-engine of the last century and the Fourdrinier machine of seventy years ago paper was made not much inferior to the product of the modern mills.

Cotton and linen rags were first used in Europe for making paper about the end of the eleventh century, and for a period of 700 years no other material was employed. The want of new material seems to have been felt with increased consumption, and active minds were constantly occupied in devising means of converting various substances into white paper, but with no practical result until within about thirty or forty years. Among the earliest of inventors on record was Bladen, who in 1682 took out a patent for making paper from cotton, linen, hemp, flax, cordage, silk, woollen, and all sorts of materials. It would seem his invention was not directed especially toward any new material, but about 100 years later we learn that white or partially white paper was made from wood in Germany. About the same time attempts were made to use straw for the same purpose, but with no practical result. The first invention that has been of any real advantage and worked in a practical manner was that patented by Mellier (about 1854) for the treatment of straw and other vegetable fibres by boiling at a pressure of 80° or over in caustic alkali of 4 per cent. This was rapidly followed by other inventions and improvements, and the result is now seen in a very large production of printing paper made almost solely from straw, and in some cases from straw alone, but the result is better with a moderate admixture of rags; and from this material can be produced white paper at a lower cost than from any other known substance. Almost simultaneously with this invention came a like method of treating wood chemically, and by nearly the same means, reducing it to a condition so that it could be bleached and used for white paper. The patents to Watt & Burgess were issued in 1854, and improvements were patented by Ladd, Keene, Dixon, and others. The result, after years of experiment and expenditure, was the erection in 1865 of extensive works at Manayunk, Pa., where the business has been continued on a large scale with more or less profit, but recently has been put in operation elsewhere. The fibre from wood, though softer and more pliable than that from straw, being wanting in strength as compared with that of esparto-grass or of the softest rags, is valuable when mixed with rags, and proves a great addition to the supply of paper-stock. Other patents have been issued for improved processes for the treatment of wood and straw chemically, but as yet none have been put in operation in a large way. The use of wood for white paper has not increased in proportion to the consumption of straw for the same purpose, the cost being greater. About the same time came Voelter's invention for reducing wood to fibre by machinery, without the use of chemicals. The wood is ground on stones rotating at high speed, the fibres being literally torn apart or separated; but they have very little power of cohesion, and consequently scarcely any strength. Mixed with rags, they increase the bulk of the paper. When 25 to 40 per cent. of ground wood is mixed with rags, they produce a cheap white paper. The wood retaining its natural color, the paper in which it is used is of inferior color, but, owing to its cheapness, the demand is large and increasing. In the U. S. 200 stones are now grinding it; their product, 15,000 to 20,000 tons yearly, being used mainly for newspapers, though in Germany it is used in the lower grades of writing papers. About two years later the conversion of esparto-grass into white paper was attempted. This material is found in large quantities in Spain, on the coasts of the Mediterranean, Algeria and Tunis exporting it largely—from Algeria a fair quality and in considerable quantities; the best qualities and largest supplies have been obtained from Spain. The principal consumption of it has been in England. It is only within a few years it has been used by French paper-makers. The first

patent for its use was issued to Routledge in 1856, and to him belongs the credit of its introduction. Unsuccessful for a long time, he finally worked out the problem, and the result now is a consumption of 120,000 tons yearly in England for white and fine papers, much of it being used for writing papers; as it yields from 45 to 50 per cent. of fibre, it furnishes stock for 50,000 tons of paper per annum. The value of this material is shown by the fact that twenty years ago it was worth barely the cost of gathering and transportation; the better grades now sell in England at £9 to £10 per ton, occasionally above £10. Straw without bleaching is largely used for ordinary grades of wrapping paper and straw boards. Jute, old ropes, bagging, waste from cotton factories, all kinds of old papers, paper clippings, all kinds of old waste material of vegetable fibre, are used by the paper-makers. Old newspapers and printed books are boiled in alkali to discharge the printer's ink, and used for making white paper. A printed newspaper will produce two-thirds its weight in clean white paper.

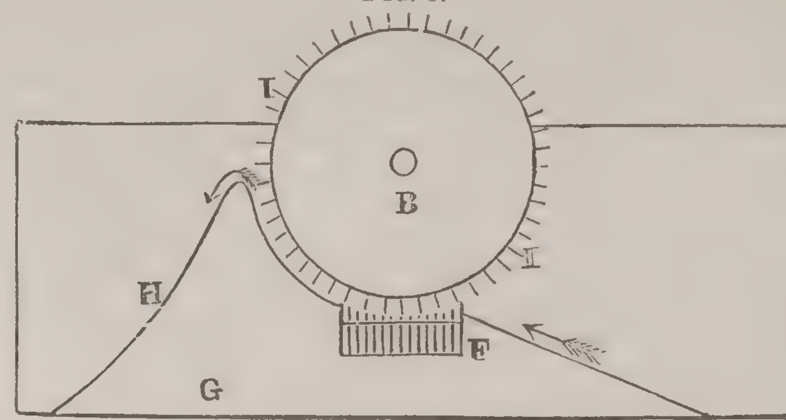
The first stage in modern paper-making is the careful sorting of the rags. This is done by hand (women being employed) on tables with bottoms of coarse wire-cloth, which allow a portion of the dust to fall through. On this part of the work, to a great extent, depends the cleanliness of the paper. It is necessary to take from the rags all pieces, however small, of metal, bone, or leather, above all of rubber, woollens, colored papers, and to dislodge all the dirt that is easily removed. The rags are also sorted into various qualities for the different grades of paper; then cut into small pieces. For very fine papers this is done by hand by the sorters, on a scythe or long knife fastened in a horizontal position on their tables; for the finest grades the seams are either cut off or cut open to exclude concealed dirt. Rag-cutters are used except where the finest qualities are made. The machine for cutting the rags usually has two rapidly-revolving blades coming in contact with a third or bed-knife, which is stationary, much like the hay-cutters, but of great strength. By these the rags are cut quite small, and are then carried on moving bands or belts to the duster, a large wire-cloth covered cylinder having a shaft inside with arms, the outlet end being lowest. This is revolved rapidly, giving the rags a thorough tossing and tumbling, whereby the dust is dislodged and falls through the wire cloth; after which they are ready for the boiling process. Where very fine hand-cut rags are used, they are sometimes boiled in chests or vats with little or no pressure, but in most mills the boiling is done in large, strong rotary boilers containing from 3000 to 4000 pounds of rags, and boiled from twelve to eighteen hours under a steam pressure of 20 to 60 pounds per square inch, varying with the quality of stock under treatment. Usually, they are boiled in a solution of lime, but for many grades soda-ash is added. This boiling softens or dissolves all grease, loosens the dirt, and prepares the rags for the thorough washing process which ensues. The washing and beating engines are much alike in form and construction—in fact, only requiring a change of knives to be used for either purpose. The engines are of various sizes; those built recently are much larger than formerly; with this exception there has been but little change for more than 100 years. Many engines are of cast iron, but they are better made of wood, as the iron is liable to rust, thereby staining the paper at times. The engine (Figs. 2 and 3), an oblong vat with the ends

FIG. 2.



rounded, is from 12 to 24 feet long, from 5 to 8 feet wide, $2\frac{1}{2}$ to 3 feet deep. The size mostly in use, and herein referred to, is 15 feet $\times$ $6\frac{1}{2}$ feet, capacity 300 to 400 pounds. A partition, called the "midfeather" (A), runs lengthwise of the middle of the engine, but not the entire length, being distant from each end half the width of the engine. This partition forms an endless passage-way for the pulp, half the width and the whole length of the engine; and through this passage-way the pulp is continually moved by the action of the engine-roll B. The roll is the same in length as the distance from the midfeather to the side of the engine, or nearly equal to half the width of the engine. This roll is

FIG. 3.



on a heavy iron shaft extending across the width of the engine and beyond for a bearing and driving pulley or gear; the end of the shaft on which the roll-block is secured also extends beyond the side of the engine, and the bearing D is on a long lever C, which, being raised or lowered by a screw, raises the roll from contact with the bed-plate F, or lowers it in closer contact with it. This bed-plate F is placed in a solid block G, which fills up the width between the midfeather A and the side of the engine. The front part of this block slants down to the bottom of the engine, thus allowing an easy approach of the pulp to the roll and knives of the bed-plate. From the back of the bed-plate, this block G is made to conform in shape to the curve of the circumference of the roll—near it, but not in contact. This part of the block is called the "backfall," H. From the top its shape is a curved descent to the bottom of the engine. The roll B is a solid wooden or iron cylinder securely fastened on a heavy iron shaft; lengthways on its surface, and parallel with the shaft, are equidistant grooves, 3 or 4 inches deep, and usually 2 to $2\frac{1}{2}$ inches apart. The roll-bars I are steel plates, the same in length as the face of the roll, 6 to 8 inches broad, about half an inch thick, hammered quite thin on one edge, having a notch or slot on each end. They are placed in the grooves, and are wedged tightly in their places; a heavy iron ring is driven tightly and firmly into each end of the roll; this ring fits into the notches in the end of the roll-bars; then the whole is tightly wedged, the bars extending $2\frac{1}{2}$ to 3 inches above the periphery of the roll. The bed-plate F, composed of a number of bars of steel with strips of wood between, firmly bolted together, is of the same length as the roll-bars; the form that has been the longest in use is called the elbow-plate (Fig. 4). Another form of bed-plate now much used is made of a large number of thin steel blades zigzag in form (Fig. 5); after each a thin layer of wood, all bolted together. The face of the bed-plate is curved to fit the sweep of the roll. The straight bars of the roll, running at high speed, come in contact with these diagonal knives or bars of the bed-plate, and grind, tear, and macerate most effectually the fibres of the material.

FIG. 4.

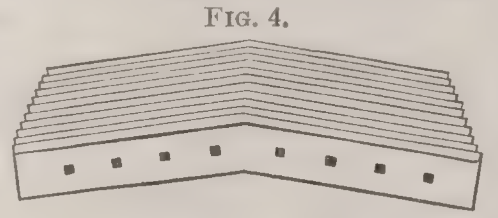
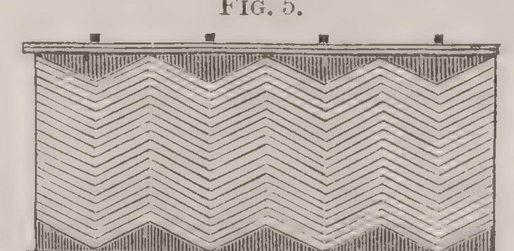


FIG. 5.



In the washing-engine are one or two cylinder-washers, K, which are lowered into, and partly submerged in, the mass of stock, and raised when their work is completed. They are round or octagonal cylinders of framework, with solid ends, but covered with fine wire-cloth on their periphery. When immersed in the stock, which is floated in a full supply of water, they revolve, and the dirty water passes through the wire cloth, is taken up by a series of scoops on their inside, and discharged through an opening in their shafts or journal. From the boiler the rags are placed in this first or washing-engine with a plentiful supply of water. The roll, revolving rapidly (130 revolutions a minute), draws toward and under it the floating rags; they are violently thrown over the top of the backfall H, and with them a volume of water. This action continuing, the rags are forced along, and soon the whole mass of rags and water is steadily moving in endless journeys around the engine and under the roll. The cylinder washer K is lowered and partly submerged in and revolves with the mass, continually discharging the dirty water, while a full supply of fresh, clean water is added during the whole operation. This washing continues from three to five hours, by which time the rags are thoroughly washed and rinsed by the passage through them of so much clean water. Over the roll is placed the curb, a box covering it, without which

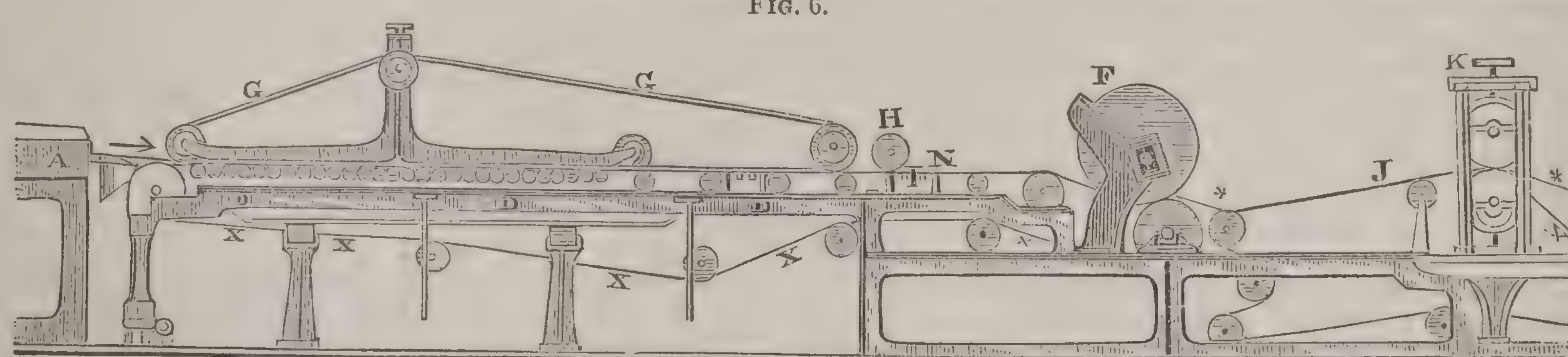
the roll by its rapid revolutions would throw out of the engine the rags and water. Clean, pure water is much desired for washing and all paper-making processes, since on its purity depend greatly the color and clearness of the paper. During this washing the rags have been partially ground and disintegrated, and are known as "half stuff."

The rags are now ready for bleaching, which is done by adding to the mass of half stuff in the engine a solution of chloride of lime, and later a small portion of sulphuric acid, which quickens the action of the chlorine. By raising a valve in the bottom of the engine the half stuff is emptied into a steep-chest in a room below; these steep-chests will contain many engines of half stuff. The half stuff remains in the steep-chests until the chlorine has fully acted on it—one to three days. The water is then drained off, and it is next taken to the beating-engine. In Europe an intermediate engine is used, in which, after washing, the rags are placed for bleaching; but in the U. S. the chlorine solution is added to the half stuff in the washing-engine. The beating-engine is substantially the same as the first or washing-engine, and is provided with a cylinder-washer, but with roll-bars and bed-plate less blunt, and usually with more rapid revolution of roll. The cylinder-washer is used for a short time, only to wash out the chlorine liquor, which is done by rinsing and changes of water, as in the washing-engine. If not fully washed out, the chlorine is neutralized by the use of an anti-chlorine solution. The lever C, sustaining the end of the roll-shaft, is now lowered, bringing the roll-bars in close contact with the bed-plate; the roll, revolving at high speed, produces a thorough grinding and beating of the pulp, which passes under the roll in endless motion for many hours until the fibres are thoroughly separated. This beating usually continues from three to ten hours, according to the quality to be produced. For bank-note paper twenty-four to seventy-two hours are often required, in which case the roll is not lowered in close contact with the bed-plate.

The half stuff is now ready for the paper-machine, and is emptied into stuff-chests, and more water added until it is of a semi-liquid consistency. It is here kept in constant agitation, that it may be thoroughly mixed with the water. Until the invention of the Fourdrinier machine, about the year 1800, this pulp was made into sheets of paper by hand—a process now but little used. A quantity is placed in the vat, a wooden tub; the quantity of water added regulates the thickness of the sheets of paper to be made. The mould is a light, flat wooden frame covered with wire cloth; if laid or water-mark paper is required, coarse wires on this would cause corresponding marks in the paper. A thin frame, called the deckle, is placed on the mould; the inner area of this deckle forms the size of the sheet to be made. The vatman, holding the mould with both hands, dips it into the pulp in the vat, and slowly raises it level and flat; the deckle or frame around the edges of the mould is somewhat higher, and retains a sufficient quantity of pulp on the mould to form the sheet of paper. The vatman carefully, with a peculiar slow shaking motion in both directions, raises the mould; the water runs through the wire cloth; the shaking motion of the half-liquid pulp causes the loose floating fibres to knit and adhere together. Soon the water has drained through this sieve-like mould, leaving a wet sheet of paper perfectly formed, but too wet and pulpy to be handled. The vatman slips off the deckle on to another mould, passing the first mould, with the sheet of paper on it, to another workman, the coucher (*accoucher*), who, after letting it stand in an inclined position a short time to drain, reverses the mould, laying it on a woollen blanket or felt, to which the pulpy sheet of paper adheres, leaving the mould (which goes again to the vatman). On this sheet is laid another felt, which in turn receives its sheet of paper, until 120 to 150 each of alternate sheets of paper and pieces of felt are piled up. This pile, called a "post," is now placed in a press and pressure applied to squeeze out as much water as possible. The sheets, although wet, can be handled, and after another pressing and stripping are hung up in the loft to dry. When dry the operation of sizing follows. If for writing papers, this is performed by dipping the dry sheets in animal sizing, a weak solution of glue. Again the sheets are hung up to dry, after which they are pressed, calendered, or hot pressed, and otherwise manipulated as their quality may require.

Under a microscope the vegetable fibre is seen to be a cylinder, but the early mortar and the later stamp-mill process having pounded and flattened it, the edges become rough and ragged; and the shaking motion given by the vatman with the mould brings these ragged

Fig. 6.

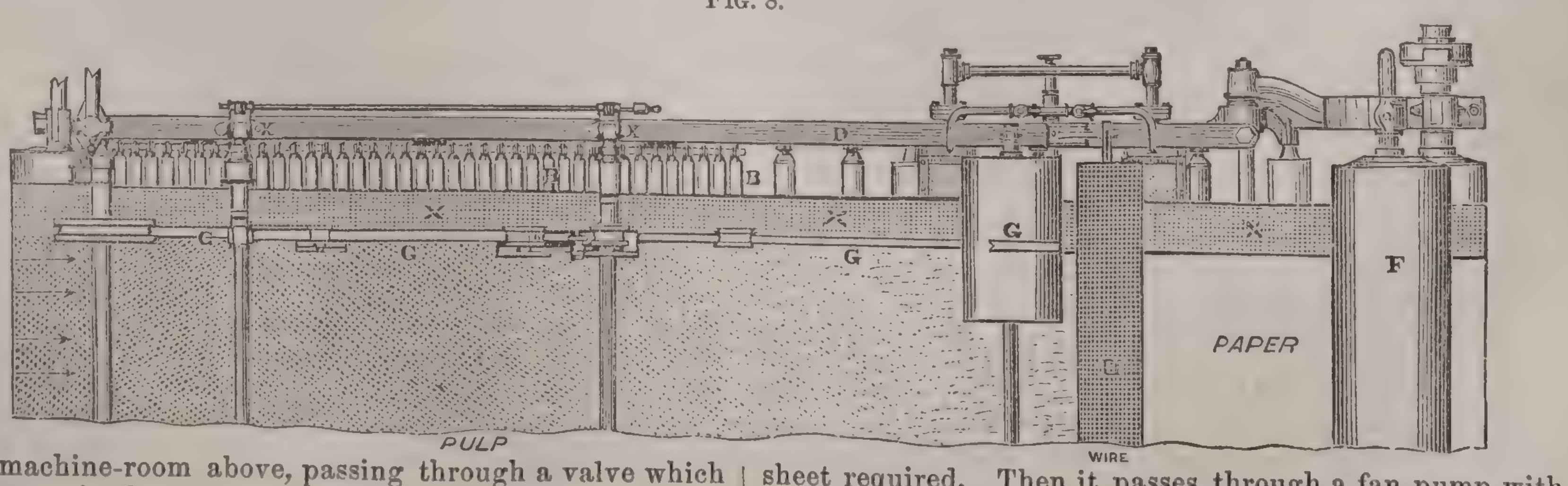


fibres into contact, when they become entangled and the sheet of paper is formed. It is by the imitation of this motion, given to the mould by the vatman, that the sheet of paper is so successfully formed by the Fourdrinier ma-

Fig. 7.

chine (Figs. 6, 7). In the stuff-chest, agitators in constant motion mix the pulp thoroughly with water, uniform consistency being necessary to form sheets of uniform thickness. The pulp is afterward pumped to the Fourdri-

Fig. 8.

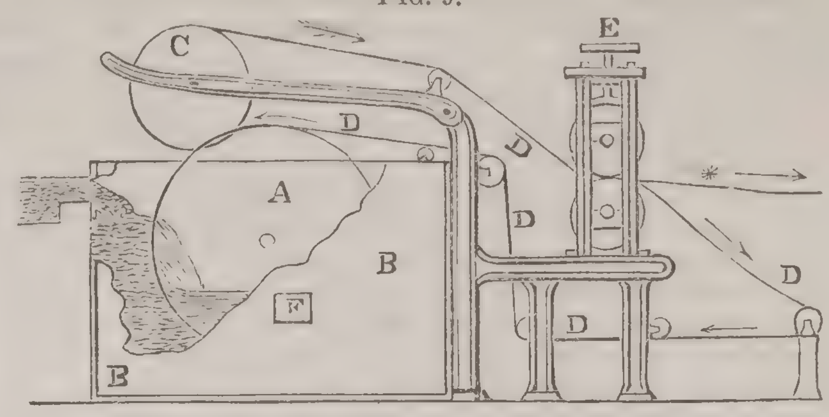


nier machine-room above, passing through a valve which regulates the flow in accordance with the thickness of the sheet required. Then it passes through a fan-pump with a large addition of water, the action of this pump mixing

it thoroughly. From the pump it passes in a broad stream on the screen, a wooden frame of the same width as the machine, covered with smooth brass plates, in which are long and very narrow slits. This screen has a rapid vertical jolting motion or shake given to it, which causes the pulp to pass through to the vat beneath. The knots, lumps, and much of the dirt remain on the screen, and are removed at intervals. From the lips of the vat A the pulp passes, much diluted, on an apron, in a very broad thin stream, on to the Fourdrinier wire or mould. This is an endless wire cloth (X) about 33 feet long and of the width of the machine (some are now made $8\frac{1}{2}$ feet wide, usually about 6 feet), running horizontally, and although a very thin wire cloth is used, it must run flat and level (Fig. 8). For this purpose it is supported by, and runs on, a number of copper or brass tube-rolls B, small in diameter and as near together as can be without contact. Below the tubes is a long, wide, shallow trough, the "save-all" C, to catch the water passing through the wire and the small portions of pulp carried through by it. The side-frame D supporting the ends of the tube-rolls is given a violent lateral shaking motion; the semi-liquid pulp while floating along on the wire cloth is by this motion shaken together, and the fibres become closely interlaced, the water passing through the wire cloth; and this process continues nearly the distance run by the wire cloth to the couch-rolls F. The pulp is prevented from spreading out over the sides of the wire cloth by the deckle-straps G, endless rubber straps, $1\frac{1}{4}$ inch thick or high, which run one on each side and on top of the wire cloth, and thus determine or form the width of paper. They continue about two-thirds the distance on the mould, by which time the paper is formed, although still in a wet and pulpy condition. About this point is placed the dandy-roll H, a cylindrical frame covered with wire cloth, which, running on the pulpy paper, presses the fibres closer together. If a laid mark or any design is required, it is made on the surface of this dandy-roll with coarse wire, and by running it on the wet paper the design is transferred to it. The wire cloth now carries the still wet paper over one or more suction-boxes, I, with perforated brass plates on the upper side next the wire, to which a suction-pump is attached, forming a vacuum in the boxes and drawing more of the moisture from the paper. The wire cloth now passes with the paper between the couch-rolls F, which are heavy metal rolls covered with thick woollen jackets. Their pressure expels much of the remaining water, and the paper, now somewhat free from moisture, is conveyed from the wire to the felt J of the "first-press" rolls K, two iron rolls with an endless woollen felt (J) between. The upper roll being weighted, more moisture is pressed out, and the paper passes to the "second-press" rolls * (L, Fig. 7), also on a felt, where still more moisture is pressed out; and it is now ready for the drying-cylinders M, copper or iron cylinders filled with hot steam; they are $2\frac{1}{2}$ to $3\frac{1}{2}$ feet in diameter, and from five to ten are used, occasionally a larger number. Moving with them, and covering three-fourths of their circumference, is a cotton or woollen felt P. The wet paper is introduced between the surface of the dryer and felt, the latter holding it firmly to the surface of the dryers until it has passed along with it and over all the dryers. Leaving them a continuous sheet of dry paper, it is then passed between a series of polished iron rolls S in stacks of two or more, to give the paper a surface. In modern mills in the U. S. chilled iron rolls, eight to twelve in a stack, with pressure applied by screws or levers and weights, are now used, and quite a high surface is the result. From these rolls the paper is usually wound on reels, T, to be afterward super-calendered if very high surface is wanted; then passed through the cutter, a machine with a revolving knife coming in contact at each revolution with a stationary knife; between them the paper passes and is cut into sheets, the speed of the revolving knife being regulated according to the length of sheet wanted.

The wire cloth on the Fourdrinier machine is rather costly, and wears only a few weeks. And the flow of water through the wire is so great, carrying with it some of the very finely-ground fibre, that although by the use of the "save-all" most of the water is caught and used again to mix with the pulp, a considerable waste of fibre is inevitable. The cylinder machine (Fig. 9) costs much less, and can be operated more economically. The cylinder A is a frame of metal $2\frac{1}{2}$ to $3\frac{1}{2}$ feet in diameter; its length is equal to the width of the paper-machine; its surface is formed of rods of brass quite close together. Over this is placed a jacket of coarse wire cloth, and over this a jacket of fine wire cloth, both tight and smooth, without wrinkles. The outer or fine wire cloth corresponds with that of the Fourdrinier. This cylinder is placed in the vat B, its ends fitting closely to

FIG. 9.



the sides. The vat is a square tank nearly filled with diluted pulp of the required consistency, with which it is kept supplied by a regular flow. The open ends of the cylinder are in close contact with the sides of the vat, and with a packing to prevent a leakage of water between the ends of the cylinder and the sides of the vat. The vat has an opening in each side below the centre of the cylinder, near its periphery; through these openings flows the water that passes through the wire-cloth covering of the cylinder. Above the cylinder, in contact and revolving with it, is the "couch-roll" C, of $1\frac{1}{2}$ to 2 feet diameter, and of the same length as the cylinder. Between the couch-roll and the cylinder runs an endless woollen felt D, which, after contact with the cylinder, passes around the couch-roll down to and between the first-press rolls, E. The practical operation is as follows: The machine starts—the vat filled with diluted pulp and with a constant supply flowing in—the water inside of the cylinder running out through an opening in the side of the vat; the water in the vat outside of the cylinder passes through the wire-cloth; and this continuous flow of water draws with it the pulp, which, however, is arrested at the surface of the cylinder by the wire-cloth covering, and the pulp forms a film on the submerged surface of the cylinder. This film is the paper in a pulpy condition. The cylinder revolving, this film of pulp adhering, it is lifted out of the liquid of the vat; the movement, continuing, brings it in contact with the soft woollen felt between the cylinder and the couch-roll, and it adheres to the felt. The couch-roll bearing with some weight on the cylinder, much water is pressed out. The movement continuing, the felt carries the paper between the first-press rolls, where more water is pressed out; then through the second-press rolls and over the dryer between calender rolls, the same as in the Fourdrinier machine. Beyond the first-press rolls the Fourdrinier and cylinder machines are alike. As the volume of water mixed with the pulp is very much less than on the Fourdrinier, and nearly all being carried back and again mixed with the pulp, there is less waste on the cylinder machine; but as there is no shake or lateral motion given to the pulp as it goes to the wire cloth of the cylinder, the fibres run mostly in one direction, and the paper is not as strong in both directions as that made on the Fourdrinier machine, where the fibres fall in all directions; and for the same reason the cylinder paper is not as bulky for the weight. Cylinder machines are extensively used in the U. S. for making wrapping papers, straw and binders' boards, hanging papers, and occasionally for the inferior kinds of news-print, while a few are employed for making writing papers. There are (1876) 700 cylinder machines in the U. S., and 350 Fourdriniers.

Sizing.—Paper in its natural state is porous and absorbent, and cannot be written on until it is sized. Paper made by hand is, after drying, dipped, a few sheets at a time, and passed through animal sizing, a weak solution of glue; it is then hung up to dry, afterward pressed, calendered, etc., the glue sizing also tends to harden and stiffen the paper. On the Fourdrinier and cylinder machines the paper after leaving the dryers passes through a shallow vat containing this glue or animal sizing, then between the "size-rolls," which press out the superfluous liquid sizing; it then passes to a machine which cuts it in sheets and lays them in a pile; it is then hung in the drying loft, and when dry stripped, pressed, and calendered. In England there are used in most mills, for drying paper after animal sizing, a series of cylinders covered with wire, over which the paper passes. Inside of each cylinder is a circular fan revolving rapidly, forming currents of cold air which dry the paper; often 50 or 60 cylinders with fans are used. Various other machines are used for the purpose of drying the animal sizing slowly, but the air-dried papers are always the best and most perfectly sized. Engine sizing is used where strong sizing is not necessary and for printing papers. In many parts of Europe the papers for writing purposes are sized in this way: The engine sizing is made of rosin and alkali; the solution is

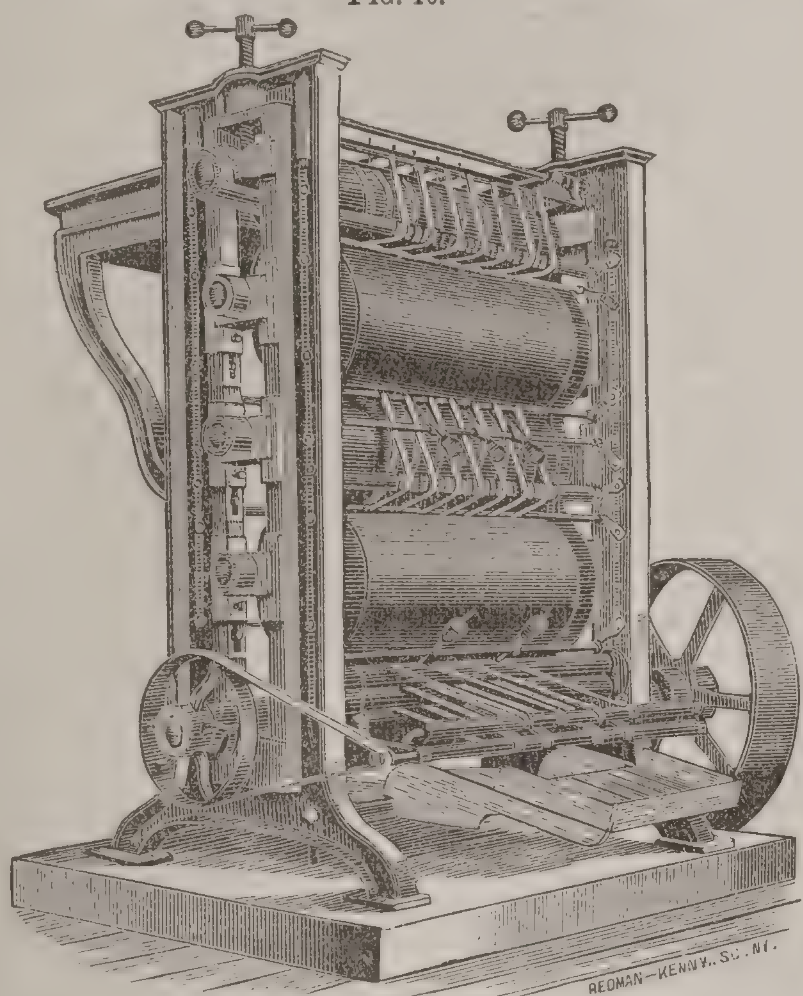
*Fig. 7 is a continuation of the paper-machine, all on the same level, but represented in two parts, on account of the width of the page.

put in the beating-engine and mixed with the pulp. For colored papers the dyes are mixed with the pulp in the beating-engine; also clay and terra alba for adulteration. Starch is often added to stiffen the paper and improve the surface. To overcome the yellowish shade of white paper a small portion of ultramarine is added.

Plating-Machines.—Paper hung up to dry comes down very rough. The early paper-makers pressed this between metal plates, and a moderately smooth surface was obtained. A later improvement was pressing between heated plates. Paper so treated was called "hot pressed." The plating-machine was the next improvement, still used almost exclusively in Europe, except in England, where calenders are also used. This machine is simply a pair of heavy and strong iron rollers in a stout iron frame. Great pressure is applied by weights and levers or by screws. The paper is placed between thin sheets of copper or steel, and passed between the rolls until the required surface is obtained.

Calenders.—The calenders (Fig. 10) now in use are five

Fig. 10.



to eight rolls in a stack, in strong iron frames, screws at the top pressing the rolls together, the alternate rolls being of highly polished iron and rolls covered with paper. The paper rolls are made by passing a heavy iron shaft through a hole in a great number of sheets of linen or manila paper. The paper, subjected to hydraulic pressure, becomes nearly a solid mass; it is then secured in its place by iron collars, turned round, and highly polished. The sheets are fed between the two upper rolls, and kept in position and carried through the set by tapes, carrying the paper after leaving one pair of rolls to the point of contact of the next pair. This process is repeated until the desired surface is obtained. In web-calendering, for calendering paper from reels before it is cut into sheets, one end is passed between the two upper rolls, and it is carried through the whole stack by the tapes and delivered at the bottom, where it is again reeled into a roll, this operation also being repeated until the surface is as required.

Clean white cotton or linen rags yield 65 to 80 per cent. of their weight; clean, sound colored rags make 55 to 60; while low-grade colored or very dirty white rags, containing more pieces of woollens and rubbish, will yield but about half their weight of paper. Paper shavings and clean waste papers yield 75 to 80 per cent.; old printed white papers are used in making white paper, the ink yielding to boiling in soda-ash, and producing 60 to 70 per cent. of paper; straw produces 30 to 40 per cent. of its weight of white paper, while, made into wrapping paper, without bleaching, its yield is twice as much. Dry poplar-wood chemically treated, yields 30 to 33 per cent. One cord of wood ground mechanically yields fibre for nearly 1000 pounds of paper.

Statistics.—Lockwood's tables for 1872 for the U. S. give the number of paper-mills at 812; value, $35,500,000. Fourdrinier's machines, 299; cylinder machines, 690; engines, 3296, employing 13,427 men, 7700 women, and 922 children. Total wages, $9,500,000; yearly product, 317,637 tons of paper; value, $66,500,000, of which there were 22,970 tons of writing, value $12,000,000; 91,446 tons of book, rag, print, value $25,000,000; 14,000 tons of straw print, value $3,000,000; 39,177 tons of manila, value $8,500,000; 39,597 tons of straw-wrapping, value $3,000,000; 19,700 tons of wood-pulp, value $2,000,000; remainder, straw and other boards, hanging, roofing, and sheathing papers, including 3800 tons for paper collars. Since 1872 about 80 mills have been put in operation, adding 25,000 tons to the yearly product, but the value is no higher, prices being much lower. The production of ground wood-pulp has been largely increased; about 200 wood-grinding machines are in operation, making about 20,000 tons of pulp yearly.

Rudel's tables for 1873 for the world, excluding the U. S., give mills, 1497; machines, 2042; tons, 880,000. Adding the U. S., the total is 2309 mills, 3031 machines, and 1,198,000 tons. The largest consumption is that of the U. S., the *per capita* being about fifteen pounds; Great Britain ranks next. C. E. O'Hara.

Pa'per-Hangings, or **Wall-Papers,** are reported to have been made in Spain and Holland before 1555, but their manufacture has only in recent time become a leading industry. The choicest wall-papers are made of good material, but for the low grade large quantities of woollen, hempen, and jute waste are employed. The paper is made of any desired length. It was formerly all printed by hand, either by the process of block-printing or stencil. Of late, cylinder-printing is used, identical in principle with the processes employed in Calico-printing (which see). But some choice styles are still hand-printed, and some striped papers are colored by a simple process which cannot be called printing, the colors being imparted through apertures, underneath which the paper is rapidly drawn. Flock-printing is done by printing the pattern in with varnish and then sprinkling on colored *flocks*, in powder, the flocks being the shearings of woollen cloth. Satin papers are finished with powdered steatite, and polished.

Paper, Mulberry. See Mulberry Paper.

Paper Nautilus. See Argonaut.

Paphlago'nia was a district of Asia Minor extending along the southern shore of the Euxine Sea from Pontus to Bithynia, and bounded S. by Galatia. It was inhabited by wild and warlike tribes belonging to the Semitic race, and it was celebrated for the excellent horses it produced. Originally, it formed an independent state, but it was conquered by Crœsus, and subsequently incorporated in the Persian empire. After the death of Alexander, it became independent once more, but was conquered by Mithridates, and after his fall it was made a part of the Roman province of Galatia.

Pa'phos was the name of two ancient cities of the island of Cyprus. One of them, the present *Kukla*, was often called *Palaipaphos* (Old Paphos), and was famous for its temple of Aphrodite, who was said to have been born here from the foam of the waves. The other, the present *Baffa*, was called *Neopaphos* (New Paphos), and was the place where St. Paul preached to the proconsul Sergius.

Pa'pias, a Christian Father of the second century, bishop of Hierapolis in Phrygia; suffered martyrdom at Pergamus during the persecutions of Marcus Aurelius about 163. Of his Λογίων Κυριακῶν Ἐξήγησις only eleven fragments have come down to us. (See *Reliquiæ Sacræ* of Routh (Oxford, 1814; 2d ed. 1846).) He was a very strong millenarian.

Papier-Mâché [Fr., signifying "mashed" or "pulped paper"], the name of an industry which, although comparatively modern in the Western World, seems to have been previously in use in China and the East. In its original sense, of paper moulded into required forms, *papier-mâché* is found to have been used in the construction of the ceilings of some of the Elizabethan mansions. The *carton-pierre* now used is a combination of stucco and papier-mâché. Early in the last century snuff-boxes are found made of papier-mâché, and there seems some reason to consider that, notwithstanding its French name, it is of English origin. In 1772, Henry Clay of Birmingham took out a patent for a process in which papier-mâché was made by pasting together sheets of spongy paper over metal moulds. He was a man of foresight, and claimed that his invention was applicable for panels, mantelpieces, trays, card-tables, and every other species of elegant furniture. Clay reaped a princely fortune, became a county magistrate and high sheriff of Warwickshire. A sedan chair presented to Queen Charlotte gained him royal patronage. The principal seat of the papier-mâché industry is still at Birmingham, and both the pulp and Clay's process of making the blanks are in use. The former is the cheaper, and much of the work now turned out is made from material so prepared. The superiority of the articles made from sheets of paper pasted together is due to the evenness of the material.

The decoration to which papier-mâché has been subjected has varied considerably in character. It may be doubted whether the simple lines of bronze, gold, black of the earlier specimens have been exceeded in point of good taste and effect. Copies of paintings have sometimes been introduced, and for a time subjects in gold-size and colored bronzes were common. Some of Morland's rustic pictures were copied in this manner. Some imitations of Chinese and Japanese ornament have been produced. Pearl-shell inlaying was patented in 1825. The ornament was painted on the pearl with varnish, and the unprotected part eaten off with acid. The thin laminæ of shell are simply fastened to the partially-prepared papier-mâché by copal varnish. Electro deposition and photography have also been used in the decoration of this article. Aluminium has been applied to it. There is also a process by which colored designs on tracing-paper are transferred. This was patented in England in 1856, and it depends nearly upon the principles of the well-known diaphanie process. The vice of the manufacture at present is a tendency to excessive ornamentation, and that not simple or chaste in character. The best articles are made from sheets of soft gray unsized paper, fastened together by glue or paste, and stretched on a metal surface adapted to give the desired form; then exposed to heat of 100° F., and rasped. Succeeding sheets are added until the required thickness is attained; they are immersed in oil and spirits of tar, and placed in another drying-stove with a heat of more than 200°. After smoothing and planing, they are placed in the varnisher's hands, who adds tar, varnish, and lampblack, and they are again stoved. The decorator now begins operations, and the articles are finished by a coating of transparent copal varnish. Some articles of papier-mâché are also made from sheets of thick mill-board made from pulp, subjected to great pressure. This block-paper is used alike for the panelling for railway cars and for the production of imitation jet ornaments. (See Timmins, *Birmingham and Midland Hardware District* (1866); *Abridgments of the Specifications of Inventions relating to Paper, etc.*)

Wm. E. A. Axon.

Papier-Mâché Process. See Printing.

Papilionaceæ. See Leguminosæ.

Papil'lion, post-v. and tp., Sarpy co., Neb., on the Union Pacific R. R. Pop. 333.

Pap'in (Denis), b. at Blois, France, Aug. 22, 1647; studied medicine at Paris and practised for some time as a physician, but devoted himself subsequently to the study of physics and mathematics under Huyghens; visited England, and received in 1687 a professorship in mathematics at Marburg in the present Prussian province of Hesse, where he d. about 1712. His writings are numerous, but are scattered in *Acta Eruditorum*, *Recueil de diverses Pièces*, *Philosophical Transactions*, etc.; they contain many valuable discoveries, most of which, however, were not fully recognized during his lifetime. He was the inventor of the so-called Papin's digester. (See Digester, Papin's.) It also appears that in 1707 he tried on the river Fulda a vessel propelled by paddles operated by a steam-engine.

Papineau', post-v. and tp., Iroquois co., Ill., near the Chicago Danville and Vincennes R. R. Pop. 1064.

Papineau' (Louis Joseph), b. at Montreal Oct., 1789; studied at the Seminary of Quebec and became an advocate; in 1809 entered the Canadian parliament, and in 1815, and again in 1827, was Speaker of the lower house; but Lord Dalhousie, who had tried in vain to conciliate him with the conservative party, in the latter year adjourned the parliament to prevent Papineau from acting as Speaker. He was after that the acknowledged leader of the Lower Canadian radicals, or French party, and after the breaking out of the rebellion of 1837 (which he did not approve) was accused of high treason and escaped to the U. S., and thence in 1839 went to France. In 1847 he returned to Canada; and though sent to Parliament and highly popular with the French element, he never again assumed the leadership. D. Sept. 23, 1871.

Pa'pinsville, post-v. of Bates co., Mo.

Papinia'nus (Æmilius Paulus), b. about 170 a. d.; held high and influential positions under the reign of Septimius Severus, but was put to death in 212 by Caracalla. His works—37 books of *Quæstiones*, 19 of *Responsa*, 2 of *Definitiones*, etc.—were considered the highest authority in Roman jurisprudence, and several of the most eminent Roman jurists, as, for instance, Ulpian and Caius, were his disciples. The *Digests* contain 595 extracts from his works, but generally they are very short.

Pap'pus [Πάππος] of Alexandria, a distinguished mathematician who flourished in the second half of the fourth century (a. d. 379–395). His most important work was the Μαθηματικαὶ Συναγωγαί ("Mathematical Collections"), explanations of earlier mathematicians, with extracts and his own criticisms on them, in 8 books, of which 6 have been preserved; of value in the history of mathematics. He wrote also a description of the world, rivers of Africa, on the explanation of dreams. Only slight portions of Pappus have been printed in Greek.

Henry Drisler.

Pap'ua, or **New Guinea,** a large island extending from lat. 0° 30′ to 10° 4′ S. and from lon. 131° to 151° 30′ E., and comprising an area of about 250,000 square miles, lies immediately N. of Australia and connects the Malay Archipelago with the Polynesian groups. The interior of this vast island is almost entirely unknown to us; we know only that it is mountainous, containing peaks which rise above the snow-line, and that its mountains are covered with immense forests yielding excellent timber and many peculiar vegetable products, as, for instance, the fragrant massay bark, which is largely exported to China and Japan and highly esteemed on account of its medicinal qualities. But even the coast-land has been explored only in a few points. Best known are the northern coast, along the Geelvink Bay and the delta of the Amberno, and the southern coast, along the Torres Strait, which separates Papua from Australia and at its eastern extremity forms a large inlet called the Gulf of Papua. The western shore of this inlet consists of one vast delta, whose mud-banks, extending from 10 to 20 miles out into the gulf and everywhere intersected by broader or narrower, deeper or shallower fresh-water canals, are overgrown with dense forests of camphor trees, iron-wood, sago-palms, cocoanuts, bananas, and oranges, interspersed with wild nutmeg and other spice trees. The eastern coast is lined for a distance of about 150 miles with coral-reefs, which, however, present many openings and afford excellent harbors. The coast itself is steep and bold, its highest summit, Mount Astrolabe, rising 3800 feet and pushing out close to the shore. At some distance behind these mountains a much loftier range is seen, covering the whole south-eastern peninsula and lifting its peaks to a height of over 13,000 feet. Both on the northern and southern coasts the mountains consist of a white limestone, but in the interior a brownish sandstone and a reddish clay mixed with blocks of quartz are of frequent occurrence; coal is found. The climate of Papua shows a remarkable difference from that of Australia. It is rather moist, water is everywhere abundant, while its scarcity in Australia makes many parts of that island a naked desert. This difference can be accounted for only by the circumstance that Papua is reached by the monsoons and the southern equatorial current, but the consequence is that the ground is covered with a most luxuriant vegetation. The indigenous animals, on the contrary, show only a few species. The wild-boar and the kangaroo are frequent; also the bird of paradise, the crown-pigeon, and the parrot. The inhabitants, the Papuans or Papua negroes, seem on a closer acquaintance not to be so homely and savage as formerly reported. They are of smaller stature than the African negroes, and characterized by a lateral compression of the head, an almost disappearing chin, and excessively thick lips and broad nostrils. They have only a very vague idea of a supreme being, by whose will they live and die, and have no forms of worship. They go almost naked and paint themselves hideously, but they build neat houses and good vessels with double lateen sails of matting. They marry early, and their marriages are monogamous and indissoluble. A fried banana is divided between bride and bridegroom; they eat it with joined hands, and the marriage ceremony is over. The tribes of the interior, however, are reported wilder, more warlike, and more savage; cannibalism is said to exist among them. Papua was discovered in 1511 by the Portuguese, and visited in 1615 by the Dutch. In 1828 the latter built a fort on Triton Bay and claimed the island as a possession of the Netherlands; and although the fort was finally abandoned on account of the insalubrity of the climate, they have in later years made several exploring and surveying expeditions to the island, and a trade has sprung up, the natives giving massay bark, tortoise-shells, pearls, and birds of paradise in exchange for European and Chinese tools and fabrics.

Clemens Petersen.

Papy'rus, a kind of reed or cyperus, supposed to be the *Cyperus antiquorum* formerly cultivated in Egypt for various purposes. Its Egyptian name was *papu*, from which *papyrus* is derived, or *tsut*, and when manufactured it was called *tama*, the Coptic *gômi*, by which it was known to the Hebrews. It was cultivated at the remote period of the fourth dynasty in the delta or Lower Egypt, and continued till some centuries b. c., but no longer exists there, although still existing in Lake Merom in Palestine, the Niger, and the Euphrates. The reason of its extinction

is unknown. The flowers were used for crowns, the pith or pulp for wood, the roots for fuel, the whole stem for ropes, matting, sails, boats, boxes, and sandals; but its principal employment was for the fabrication of papyrus, or rather paper, which was manufactured from slices of its stem. For this purpose the ends were cut off, and about twenty pellicles or philyræ under the rind of the prismatic stalk peeled from the whole length by a fine knife or needle. These varied in quality, the finest being inside. A number of these were laid close to one another vertically on a board, and over them another set close to one another horizontally. They were then moistened with water of the Nile, to which gum may have been added, hammered, pared, smoothed, and bleached in the sun. The papyri were made in long rolls, sometimes reaching 120 feet, but the breadth varied from about eight to fifteen inches at different times, according to its employment. Even before use it was rolled up into a cylindrical form like paper for walls, silks, and other fabrics. On this paper all the Egyptian books were written by a reed frayed and black ink made of animal carbon and oil and rubrics of red paint. The larger compositions are divided into short pages about eight or nine inches long, and from ten to fourteen lines to a page; and when the material was scarce these were written on both sides of the roll. Small documents, such as letters, had seals of clay attached to them. The subjects of the papyri comprise the circle of Egyptian literature, such as the *Book of the Dead*, or *Ritual*, when complete, in 165 chapters in the hieroglyphic and hieratic character; hymns to Ammon, Ptah, and the Nile; the *Lamentations of Isis;* the *sâi-en-sin-sin*. Solar litanies, representing the passages of the deceased in the sun's boat through the hours of the night, are also found. Besides these historical compositions, of which the expulsion of the Hyksôs and the dotation of Rameses III. to the temples of Egypt, the campaign of Rameses II. against the Khita, letters, romances, Greek letters, plaints, accounts, the *Iliad* and orations of Hypereides, Phœnician or Aramaic compositions, Coptic religious works, and Arabic passports have also been discovered in the tombs, placed in jars or on the mummies. Egyptian papyrus was in use in Greece, although expensive, and not common till the age of Alexander the Great, at which time it came into general use at Rome; and the plant is said to have been raised in S. Italy. But it was probably imported from Egypt, although subsequently prepared by sizing and other processes for the Roman market. Many kinds were known, distinguished by their size and fineness, as the Augusta, Livia, Fanniana, Claudia, named after persons or emperors; the Saitica, Memphitica, Thebaica, and Carica, after the places where produced; the regia, from its quality: it varied from nine to fourteen inches in breadth, and was sold in quires; scaphi, of ten or twenty pages. The writers used Egyptian or Carian reeds like the Egyptian, but with an ink made of vegetable carbon, and a red earth for the rubrics. Blind lines, or lines ruled with lead, were employed to guide the scribe, and each roll, called *volumen*, was rolled on a cylindrical stick, *umbilicus*, with a projecting knob, *cornu*, the edges colored black, and the title written on a parchment strip, *lorum*. A great trade flourished at Alexandria; and papyrus was used in Europe till the twelfth century A. D. The papyri of Pompeii were blanched by the volcanic eruption, but those of Herculaneum only charred like burnt paper, the writing slightly darker and more glossy. By a careful unrolling of these charred fragments, under a process discovered in 1758, several of these papyri have been copied and several published, but they are unfortunately chiefly works of philosophers of the Epicurean sect, and of no great interest. Papyri occupied much more space than modern books; it required above forty for the works of Homer alone, and the large public libraries of Alexandria and Rome scarcely amounted in their contents to 10,000 modern books. There are probably in Europe alone 4000 Egyptian papyri and fragments which have been unrolled, and there ought to be at least as many more in the sepulchres of Egypt. In Herculaneum, 1067 papyri and fragments were discovered. The Egyptian are generally damped to be unrolled, then laid down on drawing-paper and glazed. SAMUEL BIRCH.

Para′, in Turkish countries, a small coin generally of copper, worth one-fortieth of a piastre, or from about one-thirty-second to one-thirty-sixth of a cent.

Para, the largest province of Brazil, extends along the Amazon, bounded N. by Guiana and S. by Matto Grosso, and comprising an area of 532,000 square miles of the richest and most productive soil on earth. It consists of a low plain of alluvial soil, covered with primitive forests or presenting rich pasture-ground. But its inhabitants number hardly 350,000; that is, one man to one and a half square miles. During the revolutionary wars between 1830 and 1840, this province suffered very much; the best part of the population, the most industrious and intelligent, the Portuguese, were driven away, and the Indians, negroes, and mestizoes remained. In the last ten years, however, the province has begun again to advance. Coffee, rice, and cotton are cultivated. Coal, iron, gold, and diamonds are found, but mines are not worked.

Para, or **Belem,** town of Brazil, the capital of the province of the same name and a place of considerable commercial importance, with an excellent harbor on the right bank of the Para. It is well built and has several elegant buildings and beautiful promenades, and its climate is healthy even for Europeans. In 1819 it had 24,500 inhabitants; in 1840, after the revolutionary war, it had only 9052. It has risen rapidly, however, since the war, and its present population is variouly estimated at from 25,000 to 35,000. The value of its exports rose from £399,333 in 1858 to £665,196 in 1860, and that of its imports from £414,967 in 1858 to £529,863 in 1860.

Para, the southern and most frequented branch of the Amazon, South America, 40 miles broad at its entrance into the Atlantic, 200 miles long, and navigable throughout its whole length for the largest vessels, though not without a pilot. It is in this arm of the Amazon that the famous *bore* is formed.

Par′able [Gr. παραβολή, a "comparison"], a short fictitious narrative intended to illustrate some point in moral or religious teaching. Parables abound alike in the teaching of Christ and in the Jewish Talmudical writings; but the parables of Christ (not used by him in the beginning of his ministry, but only after he had encountered opposition) immensely surpass all others.

Parab′ola [Lat. *parabola ;* Gr. παραβολή], a plane curve having one or more infinite branches, but no asymptote. The general equation,

$$y^n = a^n x^m, \text{ or } y = a x^{\frac{m}{n}}, \qquad (1)$$

represents a family of curves passing through the origin of co-ordinates; the curves of this family are parabolas when m and n are whole numbers having the same sign, and they are hyperbolas when m and n are whole numbers having contrary signs. If $m = 1$ and $n = 2$, equation (1) represents the common parabola when referred to a diameter and the tangent at its vertex; its equation is then of the form

$$y^2 = 2px. \qquad (2)$$

If the diameter of reference is the principal axis, the tangent at the vertex is perpendicular to it; in all other cases the co-ordinate axes are oblique.

It is a property of the common parabola that every part of the curve is equally distant from a fixed point and from a given straight line. The fixed point is called the *focus*, the given line is the *directrix*, and a straight line through the focus perpendicular to the directrix is the *principal axis*. Any line parallel to the principal axis is called a *diameter*, and from the equation above given it may easily be shown that every diameter bisects all the chords of the curve that are parallel to the tangent at its vertex. The principal axis is therefore a line of *right* symmetry, and every other diameter is a line of *oblique* symmetry. The breadth of the curve through the focus is called the *parameter* of the curve; it is also called the parameter of the principal axis. The parameter of any diameter, including the parameter of the principal axis, is equal to four times the distance from the focus to the vertex of that diameter. The subtangent on any diameter is bisected at the vertex of that diameter, and the subnormal is equal to one-half the parameter of that diameter. These properties give rise to many useful constructions, for which the reader is referred to any of the numerous treatises on the conic sections.

The common parabola may be cut from any conic surface having a circular base by a plane parallel to one of the elements of the surface. The cutting plane intersects all the elements of the cone, except the one to which it is parallel, and all the points of intersection lie on one nappe of the cone; hence, the curve has but one branch, and that branch extends to an infinite distance; the two parts of the branch approach parallelism as they recede from the vertex, and at a comparatively short distance from the vertex they become sensibly parallel to each other and to the principal axis. If the cutting plane is revolved about the tangent at the principal vertex of the parabola which it determines, and through an infinitesimal angle in one direction, it will cut out an ellipse; and if revolved through an equal angle in the opposite direction, it will cut out an hyperbola. These three curves are sensibly coincident at, and in the vicinity of, their principal vertices, and for

this reason the parabola is said to be the common limit of the ellipse and hyperbola. This principle enables the astronomer to regard an elliptical orbit of very great eccentricity, or an hyberbolical orbit of very small eccentricity, as a parabolic orbit—an assumption that greatly facilitates the operation of determining the preliminary orbit of a comet or of a stream of meteors. If the plane which cuts a parabola from a cone with a circular base is moved parallel to itself and towards the vertex, the corresponding parabola will become more and more acute until it passes through the vertex of the cone, when it will reduce to a straight line. If the parallel motion is still further continued, the parabola will pass to the second nappe of the cone, and will then open out, becoming continually more and more obtuse.

A discussion of the general equation of the second degree between two variables shows that the parabola has five particular or limiting cones, two parallel straight lines, one straight line, and two imaginary parallels. The geometrical view of the question leads to the same result; for if we suppose the vertex of the cone to be at an infinite distance from the base, the cone will become a cylinder with a circular base, and the sections of that cylinder by planes parallel to an element will be two parallel lines, one line, or two imaginary parallels, according to their distances from the axis of the cylinder.

If $m = 3$ and $n = 2$ in equation (1), that equation represents a *semicubic* parabola referred to its principal vertex. This curve is the evolute of the common parabola, and is noted as being the first plane curve that was ever rectified. The semicubic parabola is composed of two symmetrical branches having their convexities turned towards the axis; these branches are tangent to each other at the principal vertex, forming a cusp at that point. If $m = 3$ and $n = 1$ in equation (1), that equation represents a *cubic* parabola, which consists of two infinite branches, one above the axis and the other below it—one on the right and the other on the left of the principal vertex; the two branches are tangent to each other at the origin, forming a point of inflection. W. G. Peck.

Parab'oloid [Gr. παραβολή and εἶδος], a volume bounded by a surface of the second order whose plane sections in certain directions are parabolas. The surface itself is also spoken of as a paraboloid. There are three principal varieties of paraboloids—viz. *elliptical, hyperbolic,* and *parabolic*—each of which has two particular cases. None of the paraboloids have centres except in certain particular cases, in which they have an infinite number of centres. Elliptical paraboloids are those in which all sections parallel to a straight line called the axis are parabolas, and in which all other sections are ellipses. If the sections perpendicular to the axis are circles, the surface is a paraboloid of revolution; if the vertex is at an infinite distance, the parabolic sections are parallel lines and the surface is an elliptical cylinder; hence, the paraboloid of revolution and the elliptical cylinder are particular cases of the elliptical paraboloid. Hyperbolic paraboloids are warped surfaces of double generation, such that all sections parallel to any two elements of the first and second generation are hyperbolas, and all other sections parabolas. The particular cases of this class of surfaces are two intersecting planes and the hyperbolic cylinder. In the parabolic paraboloids all plane sections are parabolas; the particular cases of this class are two parallel planes and the parabolic cylinder. W. G. Peck.

Paracel'sus, the assumed name of Philippus Aureolus Theophrastus Bombastus von Hohenheim, b. at Einsiedeln, Switzerland, in 1493; was the son of a physician; read the works of the alchemists and magicians, and travelled on foot far and wide collecting information regarding the healing art from barbers, blacksmiths, and wise women; spent much time in the mines of the Tyrol; took the degree of doctor in medicine; served for a time as a military surgeon in Denmark, the Low Countries, and Italy, and then resumed his wanderings. Œcolampadius procured him a professorship of medicine and surgery at Bâle (1526), but he was soon compelled to leave the place (1527) by the Galenic physicians, for he openly burned Galen's books and denounced the Arabian masters, then so generally studied. Erasmus was one of his patients. If we may believe his adversaries, Paracelsus was almost always drunk and was guilty of gross irregularities; certain it is that he had to resume his wandering life, and that after many strange vicissitudes he was thrown from a window and killed by the servants of a physician at Salzburg, Sept. 23, 1541. He left six professional treatises, besides a large number of works which bear his name, some of which were written by his enemies to injure his reputation, and others by fanatical admirers. His lectures also were delivered with great rapidity and published by his hearers in a very imperfect state. Paracelsus, though he displayed many traits of the charlatan, lived a most useful life. The profession of medicine at his time needed reformation quite as much as the Church did. He destroyed the humoral pathology, broke the tyranny of Galen and his Arabian followers, and introduced many new and valuable remedies. His empiricism was based upon precisely those principles of careful observation now so universally recognized. He paid great attention to diet, condemned the use of strong evacuants and the abuse of mercury, avoided the excessive mixing of drugs, and strove to reduce the overdosing then so prevalent. He is called an alchemist, although he condemned the search for the transmutation of gold, and an astrologist, although he opposed the study of astrology. A curious work regarding spirits is ascribed to him, and the strange jargon regarding sylphs, pygmies, undines, gnomes, salamanders, and other "elemental spirits" is commonly thought to have been invented by him; so that believers in the existence of such beings are called Paracelsists; but it is probable that he never wrote the work (*Liber de Nymphis*, etc., Bâle, 1590), for he elsewhere ridicules all such ideas. He taught a singular theosophy and was a person of erratic character; but in spite of the quackeries he was guilty of, he must be placed among the great and useful men of his age, when great men were not few.

Par'achute [Fr.], a machine first successfully employed by Blanchard at Strasbourg in 1787, and designed to enable aëronauts to descend safely to the ground from a balloon. It is shaped like an umbrella, and is taken up in a collapsed or closed form. The car is first attached beneath the parachute, and the balloon above the whole; a rope passing through the hollow stem of the parachute attaches the balloon to the car; this rope is cut at the proper time, the car falls rapidly, and the parachute is expanded by the action of the air. The car's downward motion is thus checked, and it descends slowly towards the earth. In practice, the parachute is not to be depended upon. It is liable to very dangerous oscillations, which have frequently proved fatal to the aëronaut.

Paraclif'ta, post-v. and tp., Sevier co., Ark., on the Cassalot River. Pop. of v. 45; of tp. 579.

Par'adise [Gr. παράδεισος; Sans. *paradesa*] signifies a garden or pleasure-ground, and is used by the Septuagint to express the Hebrew Eden (which see). Metaphorically, it is often used synonymously with *heaven,* denoting the future bliss which awaits the righteous.

Paradise, post-v. and tp., Coles co., Ill., on the Illinois Central R. R. Pop. 1220.

Paradise, post-v. and tp., Grand Traverse co., Mich., between Grand Traverse and Manistee rivers, at the junction of the Traverse City with the Grand Rapids and Indiana R. R. Pop. 266.

Paradise, post-v. and tp., Lancaster co., Pa., on the Pennsylvania R. R. Pop. 2193.

Paradise, tp. of Monroe co., Pa., on the Delaware Lackawanna and Western R. R. Pop. 622.

Paradise, tp. of York co., Pa. Pop. 1300.

Paradisi'idæ [from *Paradisia,* relating to Paradise], a family of birds distinguished by their curious plumage, and closely related to the Corvidæ. The bill is moderately elongated, strong, slightly decurved, compressed, and with the tip emarginated; the base of the bill, as well as nostrils, is covered to a greater or less extent by short feathers; the wings are long and rounded; the tail diversiform; in addition to the ordinary plumage are developed feathers of various forms and styles, divergent from the shoulders, sides, and caudal region; the feet are robust; the tarsi stout; the toes three before and one behind, all with long curved claws. The species are numerous in the island of New Guiana, and their number has been greatly increased by the researches of recent naturalists. D. G. Elliot (in *A Monograph of the Paradisiidæ, or Birds of Paradise*) enumerates 38 species, distributed among 19 genera. (See also Birds of Paradise.) Theodore Gill.

Paradox'ure (*Paradoxurus*), a genus of carnivorous mammals of the family Viverridæ. (See Viverridæ.)

Par'affine [*parum affinis,* "little affinity"], a beautiful white waxy solid which occurs native in the mineral wax ozocerite, found in Moldavia, Wallachia, and elsewhere, and in petroleum, and also found in coal and shale oil, and the products of the destructive distillation of many other organic bodies, as oil, fats, wax, wood, peat, albertite, grahamite, etc. It was discovered by Reichenbach in 1830 in wood-tar.

Preparation.—(1) Paraffine is obtained from ozocerite by distillation, cooling and pressing the product, and purifying it by treatment with sulphuric acid and caustic soda, washing and pressing. It is also purified by repeatedly melting it with petroleum naphtha and subjecting it

to pressure. (2) By similar means it is prepared from the heavier portions of coal oil and petroleum, which solidify on cooling, owing to the crystallization of the paraffine.

Composition.—Paraffine is generally a mixture of two or more members of the paraffine series of hydrocarbons, $C_{27}H_{56}$, $C_{28}H_{58}$, $C_{29}H_{60}$, $C_{30}H_{62}$, etc. $C_{27}H_{56}$ contains carbon 85.26 and hydrogen 14.74; $C_{30}H_{62}$ contains carbon 85.31 and hydrogen 14.69.

Properties.—A colorless, translucent solid, odorless and tasteless, resembling spermaceti. Its specific gravity is about 0.870; it melts at from 113° to 149° F., and forms a colorless oil which solidifies into a crystalline mass. It boils at about 600° F., and may be distilled with but little decomposition, especially if the distillation is aided by a current of superheated steam. That obtained from ozocerite has the highest melting-point, and is consequently preferred for the manufacture of candles. It is insoluble in water, but dissolves in 2.85 parts of boiling alcohol, separating almost completely on cooling, in crystals. It is more soluble in ether, oils, and naphthas. Acids, alkalies, and chlorine have little effect upon it; whence its name. By the long-continued action of nitro-sulphuric acid it is converted into paraffinic acid. Heated with sulphur, it yields impure sulphuretted hydrogen.

Uses.—Paraffine has numerous important applications in the arts. Beautiful candles are made from it, but when the more fusible varieties are employed the candles are liable to droop and lose their form. The crystalline structure also interferes with the manufacture of candles, but this is met by the use of small percentages of wax, etc., and by chilling the moulds, after the melted paraffine is poured into them, by placing them in cold water. It is extensively used for waterproofing fabrics, cloth and leather for shoes, even dress silks, which are thus protected from the stains which result from spilling liquids upon them. The goods are immersed in a warm solution of paraffine in refined petroleum naphtha. It is used for waterproofing or protecting from rust or decay, and putrefaction, meat, fruit, timber, metals, cartridges, pills, etc.; for making tight the stoppers of acid bottles; as a substitute for sulphur in the manufacture of matches; for oil-baths of constant temperature; for refining alcohol and spirits, by passing the vapor during distillation through melted paraffine, which abstracts the fusel oil; considerable quantities are used for chewing-gum, which supplies material for a disgusting habit too common among children; 70,000 pounds were purchased by one manufacturer of this article in a single year. (See PARAFFINES and PETROLEUM.) C. F. CHANDLER.

Paraffines, the first and simplest series of hydrocarbons, having the general formula C_nH_{2n+2}. (See HYDROCARBONS.) (For a table of the paraffines see article PETROLEUM.) The first number of the series is MARSH-GAS (which see), or methane, CH_4. The next two members are gases at ordinary temperatures; then follow about twenty liquids, and the series finally terminates with solid waxy paraffines. The paraffines occur in nature in the fire-damp of coal-mines, the gas from stagnant pools, petroleum, and ozocerite or solid native paraffine. They are also found among the products of destructive distillation, in coal-gas, tar, coal and shale oil, etc. They may be produced (1) from the salts of the fatty acids by heating them with alkaline hydrates. Thus, marsh-gas is produced from acetates:

$$\underset{\text{Sodic acetate.}}{NaC_2H_3O_2} + \underset{\text{Sodic hydrate.}}{NaOH} = \underset{\text{Marsh-gas.}}{CH_4} + \underset{\text{Sodic carbonate.}}{Na_2CO_3}.$$

There are other methods for preparing them: (2) By the action of zinc and water on the alcoholic iodides; from ethyl iodide ethane C_2H_6 is formed, $2C_2H_5I + Zn_2 + H_2O = Zn(OH)_2 + ZnI_2 + 2C_2H_6$. (3) By the action of zinc alone on alcoholic iodides; from ethyl iodide quartane (C_4H_{10}) is produced, $2C_2H_5I + Zn = ZnI_2 + C_4H_{10}$. Generally, in this reaction the paraffine is split up into a paraffine with half the number of carbon atoms and the corresponding olefine,

$$\underset{\text{Quartane.}}{C_4H_{10}} = \underset{\text{Ethene.}}{C_2H_4} + \underset{\text{Ethane.}}{C_2H_6}.$$

(4) By the electrolysis of the fatty acids, $2C_2H_4O_2 = 2CO_2 + C_2H_6 + H_2$. (5) From the olefines by the action of bromine, and subsequent treatment with potassic iodide, water, and metallic copper. (6) By the dry distillation of acetates, butyrates, etc. (7) By the destructive distillation of coal, etc. (8) By distilling alcohols, as amylic, with zinc chloride. (9) Marsh-gas may be produced synthetically by passing a mixture of carbon disulphide and hydrogen sulphide over red-hot copper, $CS_2 + H_2S + Cu_4 = 4CuS + CH_4$.

Properties.—Methane, ethane, propane, and quartane are gases at ordinary temperatures; most of the others are volatile liquids, regularly increasing in specific gravity, viscidity, boiling-points, and vapor-density as they become more and more complex. Those containing 20 carbon atoms or more are white crystalline waxy solids. The paraffines are saturated hydrocarbons, and are distinguished by their chemical indifference, and are incapable of uniting with other bodies, such as chlorine, bromine, sulphuric acid, etc.; whence the name "paraffine," from *parum affinis*, "little affinity." They form substitution-products, however; thus, $CH_4 + Cl_2 = CH_3Cl + HCl$. In the same manner CH_2Cl_2, $CHCl_3$, and CCl_4 may be formed. CH_3Cl is the chloride of the radical methyl (CH_3), which exists in METHYL ALCOHOL (which see), and the paraffines are often called hydrides of the alcohol radicals, marsh-gas being the hydride of methyl (CH_3H). The paraffines are scarcely attacked by oxidizing agents at ordinary temperatures; when heated they are either wholly burned to water (H_2O) and carbon dioxide (CO_2), or they may yield in addition small quantities of other oxidation-products, as acetic acid, etc. They are also oxidized by the long-continued action of air or oxygen gas. (See article on the oxidation of petroleum, by W. P. Jenney, in the *Am. Chemist*, Apr., 1875.) By exposing the heavier paraffine oils to temperatures near their boiling-points they are split up into simpler lighter paraffines and olefines. (See PETROLEUM.) C. F. CHANDLER.

Paraguay'. The republic of Paraguay is situate between the rivers Paraguay and Parana, above their confluence at 27° 32′ S. lat., and extending northward to the Rio Apa, its extreme northern limit being 22° 20′. Previous to the late war the territory claimed and occupied by it extended as far N. as 21° 20′. On the E. and N. it is bounded by Brazil, and on the S. and W. by the Argentine Republic and Bolivia. Its population at the commencement of the late war, though claimed by the government to be over 1,350,000, did not exceed 800,000, of whom not more than 80,000 were alive at its conclusion. Since then the return of prisoners and fugitives, together with the influx of foreigners, has added 80,000 more to the resident population. It has been claimed that the number of inhabitants is now 200,000, but nothing like an accurate census of the people has ever been taken.

The southern part of Paraguay consists almost entirely of swamps and jungles, so that the land is practically of no value. Farther to the N. it is more elevated and very fertile, finely diversified into hills and valleys, the former of which are covered with timber. The country is well watered, and has several small rivers—the Tibicuari, Ypane, Aquidaban, Apa, and others—that take their rise in the Cordilleras of the eastern part of the state and flow into the Paraguay. These Cordilleras, so called, are but ranges of hills, none of which exceed 3000 feet in height. There are no high mountains in that part of South America, and the only extraordinary feature of the country is the falls of Salto de Guayra, at a point on the Parana nearly E. of Asuncion, where the river makes a perpendicular descent, and then flows through a wild and picturesque country of broken hills and gorges.

No minerals of any importance have ever been found in Paraguay. During the war some iron ore of low grade was worked at a place near Ibicui, about 70 miles S. E. from the capital.

The climate of Paraguay is warm, but generally healthy. During the summer-time the mercury ranges from 80° to 98° F., seldom going above the one or below the other. During the winter the average is about 20° lower. Snow is unknown there, and frost is almost equally so.

The soil and climate are well adapted to the growth of maize, tobacco, cotton, sugar-cane, the mandioca or *Yucca* root, and all the tropical fruits. It also produces the *yerba mate* or Paraguayan tea (*Ilex Paraguayensis*); this plant or shrub grows in great abundance in the central and north-eastern sections of the country, and is a very important article of commerce. To the people of this and the adjoining countries it affords a beverage preferred above all others. It has all the essential qualities of the tea of China, and has a power of sustaining the strength of the body not possessed by the Eastern herb.

There are no wild beasts peculiar to this country, the animal kingdom being similar to that of the same latitude of Brazil.

The religion of the country is nominally Roman Catholic, though under the first and second Lopez little or no respect or allegiance was shown to the Holy See. The bishops and priests were mere spies of the president, the confessional being used principally as a means of espionage and all its secrets imparted to the government. They enjoyed no immunities by reason of their sacerdotal character, and under the younger Lopez the bishop and nearly all the more intelligent priests were arrested, tortured, and put to death.

The language spoken by the Paraguayans among themselves is that of the Guarani Indians, which the early fathers encouraged the first immigrants to learn instead of teaching Spanish to the natives. The elder Lopez tried to supersede the Guarani by the Spanish, by having it taught to all the children, but, though they learned to read it by

rote, they did not learn to speak or understand it; and as yet but a small proportion of the inhabitants speak anything but a *patois* of mixed Guarani and Spanish.

History.—It is to Sebastian Cabot that the credit is due of being the first discoverer of Paraguay, in the latter part of the year 1526. The great navigator, who, in seeking a more direct route to Peru than was then known, had entered the broad estuary that forms the mouth of the Rio de la Plata, and following the channel of the river, ascended to the confluence of the Paraguay and the Parana. Thence ascending the former till his little fleet reached a place called Angostura, he was attacked by a large force of Payagua Indians, who were repulsed and destroyed in vast numbers. This was the first battle, and consequently the country came to be first known to the Spaniards as the land of the Payaguas, from which, with but little variation, the name Paraguay is derived. In 1535 an expedition was sent out by Pedro de Mendoza—who had come to the mouth of the Plata with a large colony—to ascend the Paraguay and penetrate through to Peru. But he was never heard of afterward, and an expedition that was sent to search for him a year later established a fort and trading-post on the site of what is the town of Asuncion. The colony thus commenced was never broken up, and hence Asuncion takes precedence by 73 years, as a continuous European colony, of Jamestown, the first settlement in the U. S. The government soon fell into the hands of Domingo Martinez de Irala, a man of great energy and courage. He dealt justly by the Indians, and made himself feared and respected. He encouraged his men to take the native women as wives, and to respect both their marital and parental ties. The result was, that the colony increased beyond any subsequent example, and a semi-civilized nation of a mixed breed grew up within the next sixty years in the very heart of South America. As early as 1610 the Society of Jesus fixed upon Paraguay as a field for their labors, and established "reductions" or mission-stations in several places, and by their peculiar policy gained control of most of the Guarani Indians. They succeeded in impressing on the natives the duty and necessity of implicit obedience to authority, and to their teachings may be ascribed that blind submission which subsequently made it possible for a Francia or a Lopez to destroy them at pleasure, as beings incapable of resistance. The Jesuit fathers learned the Guarani language, and permitted no one to enter their precincts who could hear the stories or witness the treatment of the natives, while they published to the world that the novitiates were the happiest of mortals. They were, however, expelled from Paraguay and all the Spanish colonies in 1767, and compelled to leave their splendid churches and palatial residences. The independence of Paraguay was achieved in 1811. While the revolted colonies of Buenos Ayres and Montevideo were engaged in their war for independence from Spain, the Paraguayans quietly assumed that they were independent, and declared themselves a free and distinct nation. The power of the new government soon fell into the hands of that strange character, Dr. José Gaspar Rodriguez Francia. This man, then (1811) at the age of fifty-two, soon became the absolute dictator of Paraguay, and for twenty-nine years ruled the entire country with merciless rigor. The country being accessible only by way of the river, he stopped all ingress and egress, allowing during all this time only some half a dozen foreigners to leave the country, and none to enter it. The shipping then in the river stayed there, rotted, and fell to pieces. He died in the year 1840, and as for nearly thirty years no freedom of expression or thought had been permitted, and the better class of people had generally been destroyed, the nation at the time of his death was left not only without a government, but without its forms. The will of Francia had so long been the supreme law that when he died there was no authority left, no one to give an order, and no one to execute it if given. The soldiers, who had obeyed Francia implicitly, recognized no other ruler, and were glad to disappear from sight. It was not long after the death of the dictator before the people began to realize the necessity of some kind of public authority. After several futile attempts to establish a junta with governmental powers, two consuls—Carlos Antonio Lopez and Mariano Roque Alonso—were chosen by a sort of congress as an executive head of the nation. Lopez, however, soon got the power into his own hands, and at the end of three years managed to have himself declared president, which position he continued to hold till his death, which occurred in Sept., 1862. He was followed by Francisco Solano Lopez, who was killed in 1870. An account of their government will be found in their biographies. Since 1870 the government, though nominally republican, has been completely under the control of Brazil. The treaty of the triple alliance has only been so far respected by the latter power as not to have formally annexed it to the empire. It has ever since maintained so large a military and naval force at Asuncion as to completely dominate the country. The president and his cabinet are only such as are approved by the emperor, and but for the opposition of the Argentine Republic the country would undoubtedly be declared a Brazilian province. Of the Paraguayans living at the beginning of the war, not more than one-tenth were left alive at the time of Lopez's death. During the long struggle the country became almost a desert waste. Since then some attempts at colonization have been projected, and efforts made to start some industrial enterprises by means of a national loan. But the immigrants were glad to get out of the country, and of the money borrowed very little ever found its way to Paraguay. Previous to the close of the war there had never been any public debt, and yet her indebtedness to Great Britain alone is now not less than \$15,000,000. Besides this, the allies have charged her with the expenses of the war to the amount of \$177,000,000—a sum exceeding by many times the entire value of all the property, personal and real, within the territory. Hence the country is hopelessly and irretrievably insolvent.

CHARLES A. WASHBURN.

Paraguay′, a powerful and important river of South America, rises in lat. 13° 30′ S., lon. 55° 50′ W., at an elevation of 9535 feet above the level of the sea; flows southward through the Brazilian province of Matto Grosso, then on the boundary between Brazil and Bolivia, and then through the territories of the Argentine Republic, where it joins the Parana in lat. 27° 17′ S., after a course of about 1800 miles. It is navigable 100 miles above the city of Corumba, and its course is almost entirely free from obstructions. Steamers ply regularly on its waters from Buenos Ayres, on the Rio de la Plata, to the influx of the Cuyaba, one of its affluents.

Paraguay Tea. See MATE.

Parahi′ba, province of Brazil, named after the river Parahiba, which traverses it. It borders on the Atlantic, is bounded N. by the province of Rio Grande do Norte and S. by Pernambuco, and comprises an area of 21,700 square miles, with about 300,000 inhabitants. The ground is elevated, the surface hilly, and the soil eminently well adapted for the cultivation of sugar and cotton. European cattle are very numerous in the province, and much sugar, rum, and cotton are exported.

Parahiba, town of Brazil, the capital of the province of the same name, on the Parahiba, is well built, surrounded with rich coffee plantations, and carrying on an important trade. Pop. 15,000.

Paraje, post-v. of Socorro co., N. M., on the Rio Grande. Pop. 527.

Paralepid′idæ [from *paralepis*, παρά, "near to," and λεπίς, a "scale"], a remarkable family of fishes whose affinities were formerly quite misunderstood. The form is elongate and pike-like; the body covered with deciduous scales; the lateral line straight; head pointed; opercular apparatus with the suboperculum much reduced; mouth with the cleft lateral; the upper jaw with its margin formed by the intermaxillaries, behind which, and closely adherent to it, are the supramaxillaries; teeth on the jaws as well as palate; branchial apertures much enlarged; branchiostegal rays seven; dorsal fin short, far behind, and still farther behind an adipose fin; anal elongated; caudal emarginate; pectorals well developed; ventrals small, inserted below or in front of the dorsal fin. The species were thought by Cuvier to be nearly related to the Sphyrænas, but are now known to be most closely allied to the Scopelidæ and Salmonidæ. There are two genera: (1) *Paralepis* and (2) *Sudis*, the first with species in the Mediterranean, Madeira, and Greenland; the second with a Mediterranean form. THEODORE GILL.

Par′allax, the difference of direction in the angular measurement of a given fixed object as seen from different points. The effect of parallax is very perceptible to the observer who is himself in motion; the objects on either side of him have a parallactic motion in the contrary direction, which is greater as the objects are nearer. The effect is very striking in the rapid motion of a railroad train. The use of the word "parallax" is, however, confined almost exclusively to astronomy, in which science the term expresses the difference of direction of a given celestial object as observed, or supposed to be observed, from the two extremities of a radius of the earth. One of these supposed points of observation is always the earth's centre, and the other some position on the earth's surface. When the object is in the horizon, the radius is at right angles to the straight line drawn to it from the point of observation on the earth's surface; and the parallax is then greatest. It is called the horizontal parallax. When the object is above the horizon, the straight lines

drawn to it from the extremities of the radius are both necessarily oblique to such radius, and the parallax is less. Such a parallax is called *parallax in altitude*, and is always proportioned to the horizontal parallax as the sine of the zenith distance is to the radius.

As for purposes of astronomical computations the directions of bodies are always referred to the earth's centre, it is necessary to correct the apparent altitude of a body by adding the parallax in order to attain the real altitude. For computations of very distant bodies the horizontal parallax is always employed, and is the angle subtended at the body in a right-angled triangle, of which the earth's radius is the perpendicular. The equatorial radius and the equatorial horizontal parallax are commonly used in such computations. The moon's horizontal parallax is larger than that of any other celestial body, and amounts to 57′ 6″ at its mean value. The equatorial horizontal parallax of the sun is about 8.88″; that of Uranus is not as large as half a second. The earth as seen from the fixed stars possesses no sensible magnitude, but the earth's orbit, having the enormous dimensions of more than 180,000,000 miles in diameter, has an angular magnitude large enough to be appreciable as seen from one of these; and this, though excessively minute, amounting in general only to a small fraction of a second, has in a few instances been satisfactorily determined. (See STARS, FIXED.) This parallax, as being connected with the earth's periodical revolution, is called the *annual* parallax; the other, being dependent on the daily rotation, is called the *diurnal* parallax. The fixed stars and all other celestial objects rising in the E. and setting in the W. have an *apparent* parallactic motion enormously great, but this is due not to the change of place of the observer, but to the change of the position of his plane of reference, which is his horizon. Telescopes constructed to move upon an axis parallel to that of the earth are made to follow the stars with great facility, since no change of the position of the tube in declination is necessary; and on this account such telescopes are frequently spoken of as parallactic instruments, but they are more usually called equatorials, because the circle they describe is parallel to the equator.

F. A. P. BARNARD.

Par′allel [Gr. παράλληλος]. In music, parallel or direct motion (*motus rectus*) is that in which two or more parts move in the same direction, viz. upward or downward.

Parallel′ogram [Gr. παράλληλος and γραμμή], a quadrilateral whose opposite sides, taken two and two, are parallel. If one angle of a parallelogram is a right angle, all the other angles are right angles, and the figure is a rectangle. If two adjacent sides are equal, the other sides are also equal, and the figure is a rhombus. The diagonals of a parallelogram mutually bisect each other; conversely, if the diagonals of a quadrilateral bisect each other, the figure is a parallelogram. If the diagonals of a parallelogram are equal, the figure is a rectangle; if they are perpendicular to each other, the figure is a rhombus; if they are equal and perpendicular, the figure is a square. The area of a parallelogram is equal to the product of its base and altitude. W. G. PECK.

Parallelopip′edon [Gr. παραλληλεπίπεδον], a polyhedron bounded by six parallelograms. If the faces are rectangles, the volume is a rectangular parallelopipedon; if the faces are squares, the volume is a cube. In any parallelopipedon opposite faces are equal to each other, as are also diagonally opposite polyhedral angles. A plane through two diagonally opposite edges divides the volume into equivalent triangular prisms. The volume of any parallelopipedon is equal to the product of its base and altitude. W. G. PECK.

Parallels of Latitude, on the terrestrial sphere, are circles drawn around the earth parallel to the equator. Through the centre of each circle passes the earth's axis. The equator itself is the only one of these parallels which is a great circle. The others are smaller circles, whose limits are the great circle (the equator) on the one hand, and zero (at the poles) on the other. The tropics and polar circles are important parallels.

Paral′ysis [Gr. παραλύειν, to "relax"], impairment or loss of voluntary or normal reflex motion through defective nervous excitation. This definition excludes cases in which the voluntary power of motion is lost by reason of injuries or diseases of muscles, bones, joints, etc. Sometimes paralyzed parts are the seat of involuntary (reflex) movements, which may be very extensive and powerful. It is not proper to apply the term "paralysis" to the condition of loss of sensibility. Any part of the body containing muscular fibres, striated or unstriated, may be paralyzed. Thus, we have paralysis of the heart, of the arteries, of the bowels, of the limbs, or of the muscles of the face, the eyeball, etc. Paralyses are classified in two ways, according to their distribution, and according to the morbid conditions causing them. Under the first head there are hemiplegia (palsy of one-half of the body longitudinally), paraplegia (palsy of the legs and lower half of body), general paralysis (palsy of the whole body), glossoplegia (palsy of the tongue), etc. Under the second head are cerebral paralysis (caused by disease of the encephalon), spinal paralysis (produced by disease of the spinal cord), peripheral paralysis (caused by disease of the nerves), functional or reflex paralysis (not caused by material disease of nervous organs), and toxæmic paralysis (induced by the presence of a poison in the blood). E. C. SEGUIN.

Paramar′ibo, capital of Dutch Guiana, S. America, on the Surinam. It is a neat town, the streets broad and lined with rows of tamarind and orange trees. It is the residence of the governor, has barracks, many places of worship, a fine hospital, and a considerable trade; but it is very unhealthy. Pop. 20,000, most of whom are black.

Paramat′ta, town of New South Wales, Australia, on a river of the same name, near its entrance into Port Jackson. It is regularly built and growing rapidly. P. 10,000.

Param′eter [Gr. παρά, "beside," and μέτρον, "measure"], in general, any one of the *elements* or necessarily given numbers or lines by which one curve is distinguished from another of the same species. The radius (or diameter) of a circle is its sole parameter. The major and minor axes of an ellipse are the determining parameters of the particular curve, but other systems of lines can be used. The coefficients of the algebraic (or other) equation which expresses any curve form a system of parameters. The double ordinate at the focus of a parabola is more particularly called the "parameter," since it alone determines the particular parabola to which it belongs; and *this* element is also known as the *latus rectum*. J. G. BARNARD.

Parana′, province of Brazil, bounded W. by the river Parana and E. by the Atlantic. It is traversed from N. to S. by a range of low mountains running parallel with the coast, from which the ground slopes down towards the Parana in large plains. The soil is fertile and the climate healthful. Area, 115,000 square miles. Pop. 120,000. Capital Paranaqua, from which large quantities of Paraguay tea are exported.

Parana, a large river of Brazil, which forms the boundary between the provinces of Parana, São Paulo, and Minas Geraes on the one side, and Matto Grosso and Goyaz on the other. After joining the Paraguay and the Uruguay, it forms the Rio de la Plata.

Paranaphthalene. See ANTHRACENE.

Par′apet [Ital. *parapetto*, "breast-guard"], in fortification, a breastwork, wall, or bulwark of earth, brick, wood, iron, stone, or other material. The battlement around a flat roof or the railing of a bridge is also called a parapet.

Apapherna′lia [Gr. from παρά, "over and above," and φερνή, "dower or dotal portion"] means the clothing and ornaments of a married woman suitable to her condition in life. These may have been obtained by her before marriage, or may have been acquired from her husband or from other persons. When not obtained from her husband, they are deemed to be held to her sole and separate use, and he has no legal interest in them. When derived from the husband he is, to a certain extent, owner, so that he may sell them or they may be seized by his creditors. He is, however, not allowed to dispose of them by will so as to deprive his wife of them if she survive. According to these rules, if a wife's paraphernalia acquired from her husband should be delivered to a carrier for transportation, and he should fail to deliver them, the action for their recovery must be brought by the husband, though under the special laws of some of the States vesting property in married women it has been decided that the wife may, under such circumstances, bring an action in her own name. Statutes in some of our States, in case the wife survives, give the paraphernalia to her in preference to the husband's creditors. An illustration is found in the law of New York, which declares that the clothes of a widow and the ornaments proper to her station shall not be deemed assets of her husband's estate, but shall be included and stated in the inventory of the estate without being appraised. (See also MARRIED WOMEN.) T. W. DWIGHT.

Paraple′gia [Gr. παραπλήσσειν, to "strike beside"], paralysis of the lower limbs, and (usually) of the lower part of the trunk, including the bowels and bladder. There may be anæsthesia (loss of sensibility) or dysæsthesiæ (morbid sensations) in the same parts. Although the limbs are not under the control of the will, they are often the seat of strong movements of an involuntary or reflex character. The cause of paraplegia nearly always is a disease in or

about the spinal cord, in any part below the medulla oblongata; usually, the lesion is in the dorsal or lumbar part of the organ. (See MYELITIS.) The same symptoms may appear, without gross disease of the spinal cord, in consequence of irritation in some external part, of the action of cold upon the body, disease of the bowels, etc. Besides paraplegia in the above strict sense, there are paraplegiform affections and pseudo-paraplegia. The former is typically exemplified by progressive locomotor ataxia, a disease in which, through disease of the nervous organs, there is loss of function in the lower limbs, but without abolition or diminution of voluntary power; or through hysterical loss of sensibility in the feet and legs, or by spasm in the muscles of the lower limbs, a paraplegiform affection is produced. Pseudo-paraplegia may be the result of muscular or articular disease in the lower limbs, of severe pain in the same parts, or in the lower part of the body, or of a delusive conception on the part of the patient. E. C. SEGUIN.

Par′asang [Gr. παρασάγγης; Pers. *paraseng*] is derived by Rödiger (Ersch and Gruber's *Encyclopädie*) from the Persian *seng*, "a stone," and the Sanskrit *pâra*, "end." Thus, he connects the name with the stones which on the highroads in Persia were placed at the end of certain distances. Herodotus (ii. 6, etc.), Xenophon (*Anab.* ii. 2, § 6), Suidas, and Hesychius are all agreed in estimating the parasang at thirty stadia, or about three miles and a half. Afterwards the measure seems to have varied; for in a Byzantine writer, Agathias (circa 530 A. D.), we find the parasang reckoned at twenty-one stadia. Strabo (xi. p. 518) states that it was variously reckoned at thirty, forty, and even sixty, stadia. According to Pliny, the Persians themselves were divided as to its length: "Inconstantiam mensuræ diversitas auctorum facit, cum Persæ quoque schœnos et parasangas alii alia mensura determinent" (*Nat. Hist.* vi. 30). The parasang is still in use among the Persians to-day. Modern travellers concur with Herodotus and Xenophon in fixing its length variously from three and a half to four miles (Kinneird, *Geog. of Persia*, p. 57). A. H. BULLEN.

Par′asites [Gr. παράσιτος], **Animal.** In both the animal and vegetable kingdoms there are countless forms which live at the expense of others, and are dependent upon them for their support. This dependence, however, varies greatly, some being only parasitic to the extent of deriving their food from the bodies of others—as, for example, the leeches, gnats, etc.—while others during their whole life are attached to particular animals, and are indebted to them for their food as well as domiciles.

Types containing Parasitic Animals.—Parasitic animals belong to numerous different types, and it is quite important that the complete dissimilarity of parasitic types *inter se*, and their relation to others, should be appreciated. The classes of mammals, birds, reptiles, and amphibians do not furnish any exclusively parasitic types, although in each there are some parasitic to a slight extent. Thus, the vampire bats live upon the blood of other mammals; the bald eagle depends to a considerable extent upon the fish-hawk for his supply of food, as do the jagers (*Stercorarius*) for their supply on various species of gulls.

Among fishes there are several that are partly parasitic; *e. g.*, the species of the family of Fierasferidæ are generally inhabitants of the intestinal canal of holothurians and other echinoderms; a species of catfish (*Stegophilus*) lives in the mouth of another kind of catfish (*Platystoma*) of the rivers of South America, and depends for its food upon the ingesta of its host; *Apterichthys ocellatus*, an eel, lives in the branchial cavity of the angler (*Lophius piscatorius*) of the Mediterranean Sea, and therein catches a portion of the food taken within the tremendous maw of the host-fish. The species of remoras or Echeneididæ, by their peculiar disks, attach themselves to other fishes, especially to species of sharks, and are thus transported from place to place, and thereby enabled to avail themselves of the pasture-grounds obtained by their active carriers. Other species, such as members of the genera *Ostracion*, *Labrax*, *Caranx*, and *Poronotus*, attach themselves to other animals, more especially in the early part of their lives, and become "free messmates" with them. On the New England coast, *e. g.*, several species of acalephs or jelly-fishes, notably *Dactylometra quinquecirra*, are generally found during the summer harboring under their umbrella-like disks small fishes belonging to the genus *Poronotus*. Finally, the species of lampreys (Petromyzontidæ) and hags (Myxinidæ and Bdellostomidæ) are parasitic for a time on fishes, and burrow sometimes quite extensively into their tissues.

Many of the classes of invertebrates furnish parasites; only a few of the most notable examples of each may be cited here. Among the gasteropod mollusks are the *Entoconcha*, whose exact relationships are undetermined, but which live in the intestinal canal of echinoderms; and *Stylifer* and *Eulima*, which are also parasitic upon echinoderms; and *Cochiolepis parasiticus*, found under the scales of a worm.

Among insects the most interesting examples of forms are furnished by the *Strepsiptera*, which are closely related to, and by some regarded as members of, the order Coleoptera. The true coleopterous types, Meloidæ, Pselaphidæ, and Staphylinidæ, are also to a greater or less extent parasitic.

Of the arachnoids the most noteworthy forms are the Linguatulidæ or Pentastomidæ and Acaridæ; the former in an embryonic condition resemble mites, but become degraded in old age into long vermiform animals inhabiting the frontal sinuses and lungs of certain vertebrates; the latter are well-known ticks and mites, and to this group belong the itch-insect (*Sarcoptes scabiei*); a species which is found in the sebaceous follicles of man, especially about the nose (*Demodex folliculorum*); and numerous species of typical mites and ticks.

Among the crustaceans some even belonging to the highest groups are parasitic to the extent at least of commensalism, such as *Pinnotheres*, *Conchodytes*, etc.; while others are not only parasites, but are modified to an extraordinary degree in conformity with their parasitic mode of life. These are chiefly to be found in the order Ichthyophthira, which includes the lernæans, certain cirripeds, and species of isopods—*e. g. Cymothoa*, etc.

Of the true worms, the most notable are the leeches, already alluded to and familiar to all.

Of rotifers a few species are parasitic—*e. g. Bellatro calvus*, which is found in the interior of certain worms.

The scolices (simple worms with a little-complicated nervous system and with a well-developed water-system) are those which furnish the greatest numbers of parasitic forms. These represent several decidedly distinct types of structure of ordinal value, and which are represented almost exclusively by forms which inhabit the interiors of other animals. Such are the cestods, which comprise the numerous species of tapeworm found in man and other animals; the trematods, to which belong the flukes (*Fasciola*, *Distoma*, etc.) and kindred types; the Acanthocephala, which include numerous species found more especially in birds and fishes, but of which no representatives have been found in man; the Gordiacea, which include species, such as the hairworms, of which some are found in the interiors of animals at some periods of their life, and at other times live freely in streams and damp places; and finally the nematods, some of which are free, and others parasitic: among the latter are especially the species of *Ascaris*, *Trichina*, *Trichocephalus*, and *Strongylus*.

The polyps furnish a number of instances of more or less complete parasitism; of these the most interesting are the *Epizoanthus americanus*, which attaches itself to the hermit crab (*Eupagurus pubescens*) of the New England coast, and *Palythoa*, which infests a peculiar form of sponge (*Hyalonema*), represented in the Chinese and Japanese seas, as well as off the coast of Portugal.

The protozoans also contribute parasitic species, chief of which are worm-like forms known as Gregarinæ, which live in the intestinal canals of many vertebrate as well as invertebrate animals, and are especially abundant in the intestines of insects—*e. g.* beetles, cockroaches, etc.

The number of species of parasitic animals is very large, as may be inferred from the statement that almost all forms act as the hosts of a number of different species, nearly fifty having been found in man alone.

It will be thus seen, even from the few examples cited, that parasitic animals belong to numerous diverse types of the animal kingdom, and that they have, therefore, nothing in common except the physiological character of dependence to a greater or less extent for subsistence upon other animals. It thus becomes evident, too, that their origin is from a number of different sources, and that if the theory of evolution is assumed they have become developed from as many different free-living types as there are independent types of structure.

Degrees and Manner of Parasitism.—There are all degrees of parasitism, from simple attachment for the time being for some purpose or other, to permanent habitation in the interior of another animal. The animals exhibiting these differences have been separated by Van Beneden under the terms "messmates," "mutualists," and "parasites proper."

The messmate "is he who is received at the table of his neighbor to partake with him of the produce of his day's fishing." To this category belong, then, those forms which partake of the nutriment imbibed or provided by the host, but which do not attack directly their host, and which are generally comparatively little modified. Some are free, such as the *Pinnotheres* of mollusks, etc., the *Fierasfer*

and *Enchelyophis* of the echinoderms, and the sucking-fishes or Remoræ. Others are fixed, such as the cirripeds and certain mollusks and polyps.

The mutualists, according to Van Beneden, are those "animals which live on each other, without being either parasites or messmates; many of them are towed along by others; some render each other mutual services; others, again, take advantage of some assistance which their companions can give them; some afford each other an asylum; and some are found which have sympathetic bonds that always draw them together." Such are the Ricinidæ or bird-lice, *Caligi, Arguli,* and other crustaceans.

The parasite, according to the same author, "is he whose profession it is to live at the expense of his neighbor, and whose only employment consists in taking advantage of him, but prudently, so as not to endanger his life. He is a pauper who needs help, lest he should die on the public highway, but who practises the precept not to kill the fowl in order to get the eggs." Of this kind are the typical Entozoa as well as Ectozoa.

Scarcely any portion of the body is free from the intrusion of parasites. The different regions of the exterior are often infested by kinds peculiar to each, while almost every organ and system in the interior has its special parasites. These have been discriminated by Davaine into the following groups: (1) Those forms which are found in a free state in the cavities or passages which mutually communicate with the exterior—*i. e. a,* the respiratory passages, *b,* the digestive passages, *c,* the biliary passages, and *d,* the urinary passages; (2) those which are contained in closed cavities, natural or accidental, such as *a,* the blood-vessels, and *b,* the serous cavities; (3) those which belong especially to some organic system—*e. g. a,* the nervous system, *b,* the muscles of animal life, *c,* the lymphatic ganglia or glandules, and *d,* the interorganic cellular tissue; and (4) those which affect complex organs, such as *a,* the eye, *b,* the genital organs.

Development and Acquisition of Parasitic Habits.—How parasitic animals became developed in the interior of others was for a long time a mystery, and it appears to have been very generally supposed that they were of spontaneous origin or the result of pathological phenomena. It is now, however, well known that their lineage is a legitimate one, and that they are passed from one animal to another. The eggs laid are very numerous, and a portion of these, finding their way into a proper abode, become developed. Many parasites pass through two or more stages, and in different kinds of animals, before attaining their full development. There are, for example, two species of tapeworms which are tolerably common in man—*i. e. Tænia solium* and *Tænia medio-canellata.* These are found in the intestinal cavity in a fully-developed condition and with numerous segments, in which are developed eggs, and which become from time to time detached. In the common hog and cattle are found imbedded in the muscles bladder-like sacs connected with a head. The head in the entozoon of the hog resembles that of the *Tænia solium,* while that in the one of the cattle is similar to the head of the *Tænia medio-canellata.* It is found, further, by experiment and by feeding, that these cysts from the hog are developed into the *Tænia solium,* and those from the cow into the *Tænia medio-canellata.* It is therefore evident that the tapeworms of man are at least mainly derived from these respective animals, and that they are the result of eating the flesh of the hog or beef, *mutatis mutandis,* in a raw or imperfectly cooked state. On the other hand, the hog and the cattle have evidently derived these cysts from having eaten the eggs evacuated from man or some other animal with their food, and these eggs have been taken up by the circulation, and developed in the parts affected in the form of cysts or embryos of tapeworms; in this condition they remain until transferred to a congenial host; and of course a very large proportion fail to be developed.

The doctrine of spontaneous generation, as regards tapeworms at least, received blows successively from Götze, Siebold, and Küchenmeister. Ephraim Götze first noticed the similarity between the head of the tapeworm of the cat (*Tænia crassicollis*) and of the cysticercus of the liver of the rat and mouse (*Cysticercus fasciolaris*). C. T. von Siebold in 1848 suggested that all the Cystica, or sack-bearing Entozoa, were simply the larval forms of tapeworm. Finally, F. Küchenmeister in 1851 verified these statements by experiments. Thus, he gave to a dog the hydatids found in the mesentery of a hare (*Cysticercus pisiformis*), and on dissecting the dog after several weeks found therein the *Tænia serrata* in a transition state between the *Cysticercus* form and the adult *Tænia* form. Later, the *Cysticercus cellulosæ* of the hog was given to a criminal who had been placed at the disposal of Küchenmeister, and it was found on his execution that the *Tænia solium* had been developed. Numerous later experiments have amply confirmed the conclusions thus attained.

Literature.—P. J. van Beneden (*Animal Parasites and Messmates,* 1876), and those of C. M. Diesing (*Systema Helminthum,* 1850–51), C. Davaine (*Traité des Entozoaires et des Maladies vermineuses de l'Homme et des Animaux domestiques,* 1860), T. S. Cobbold (*Entozoa, an Introduction to the Study of Helminthology, with reference, more particularly, to the Internal Parasites of Man,* London, 1864), and Rudolf Leuckart (*Die menschlichen Parasiten, und die von ihnen herrührenden Krankheiten,* Leipsic and Heidelberg, 1864, etc.). See also ASCARIS, CESTOID WORMS, ENTOZOA, HÆMATOZOA, HYDATID, TAPEWORM, etc. THEODORE GILL.

Parasites, Human. The number of parasites which have been discovered in or on the human body, and which are liable to trouble man, is considerable. Probably few, however, are entirely exempt from intrusion. The following are the species which have been recognized by various authors as entozoic or ectozoic:

I. *Entozoa, or Parasites living in the Interior of the Body.*

CLASS ARACHNOIDEA.

ORDER LINGUATULIDA.

Family Pentastomidæ.

Pentastomum tænioides, Rudolphi = *Pentastomum denticulatum,* Rudolphi.

—— *constrictum,* Siebold.

CLASS PLATYHELMINTHES.

ORDER CESTODES.

Family Tæniadæ.

Tænia (*Tænia*) *solium,* Linnæus (adult).

—— (Larva) = *Cysticercus cellulosæ,* Rudolphi. Occurs rarely in the brain and other parts of the body.

—— (*Tænia*) *hydatigera Pallas* = *Tænia marginata,* Batsch = *Cysticercus tenuicollis,* Rudolphi. Larva, only in man.

—— (*Acanthotrias*) *acanthotrias,* Weinland. Larva only.

—— (*Tæniarhynchus*) *medio-canellata,* Küchenmeister. Derived from cysticercus of beef.

—— (*Echinococcifer*) *echinoccus,* Siebold = *Echinoccus hominis,* Rudolphi.

—— (*Diplacanthus*) *nana,* Siebold = *Tænia ægyptiaca,* Bilharz.

—— (*Hymenolepis*) *flavopunctata,* Weinland = *Tænia flavomaculata,* Molin.

—— (——— ?) *lophosoma,* Cobbold.

Family Bothriocephalidæ.

Bothriocephalus latus, Bremser.

Bothriocephalus cordatus, Leuckart.

ORDER TREMATODES.

Family Distomidæ.

Distomum hepaticum (Linn.) = *Fasciola hepatica,* Linn.

Distomum crassum, Busk = *Dicrocœlium Buskii,* Weinland.

Distomum lanceolatum, Mehlis.

Distoma hæmatobium, Bilharz = *Gynæcophorus hæmatobius,* Diesing = *Bilharzia hæmatobia,* Cobbold.

Distoma heterophyes, Siebold and Bilharz = *Dicrocœlium heterophyes,* Weinland = *Heterophyes ægyptiaca,* Cobbold.

Tetrastoma renale, Delle Chiaje. Doubtful; supposed to be the young of a *Polystoma.*

Polystoma pinguicola, Zeder = *Hexathyridium pinguicola,* Treutler. Doubtful; according to Gervais and Van Beneden, a form of *Pentastomum denticulatum.*

Polystoma venarum, Zeder = *Hexathyridium venarum,* Treutler. Doubtful; according to Davaine, the young of *Distomum lanceolatum.*

Distoma ophthalmobium, Diesing = *Distoma oculi humani,* Gescheidt. Doubtful; according to Leuckart, the young of *Distoma lanceolatum.*

CLASS NEMATELMINTHES.

ORDER NEMATODES.

Family Ascaridæ.

Ascaris lumbricoides, Linnæus = *Lumbricus teres hominis,* Tyson.

Ascaris mystax, Rudolphi = *Ascaris alata,* Bellingham.

Oxyuris vermicularis, Bremser = *Ascaris vermicularis,* Linnæus.

Family Strongylidæ.

Strongylus gigas, Rudolphi = *Eustrongylus gigas,* Diesing = *Lumbricus in renibus,* Blasius.

Strongylus quadridentatus, Siebold = *Sclerostoma duodenale,* Cobbold = *Anchylostoma duodenale,* Dubini.

Strongylus bronchialis, Cobbold = *Strongylus longevaginatus,* Diesing.

Family Trichocephalidæ.

Trichocephalus dispar, Rudolphi = *Ascaris trichiura,* Linnæus = *Trichocephalus hominis,* Göze.

Trichina spiralis, Owen = *Pseudalius trichina,* Davaine.

Family Filariidæ.

Filaria medinensis, Gmelin = *Filaria dracunculus*, Bremser = *Dracunculus medinensis*, Cobbold.

Filaria oculi, Gervais and Van Beneden = *Dracunculus oculi*, Diesing = *Dracunculus loa*, Cobbold. Larva.

Filaria oculi humani, Nordmann = *Filaria lentis*, Diesing. Larva.

Nematoideum tracheale, Rainey and Bristowe = *Filaria trachealis*, Cobbold. Larva.

CLASS INFUSORIA.

Paramecium coli, Malmsten.

Cercomonas urinarius, Hassal, Leuckart.

Cercomonas saltans, Ehrenberg, Wedl, Leuckart.

Cercomonas hominis, Davaine = *Cercomonas intestinalis*, Lambl. = *Balantidium coli*, Lachmann = *Paramecium coli*, Malmsten.

Trichomonas vaginalis, Donné, Davaine, Leuckart, Kölliker.

II. *Ectozoa, or Parasites on the Exterior of the Body.*

CLASS INSECTA.

ORDER HEMIPTERA.

Family Pediculidæ.

Pediculus capitis, Degler. The head louse.

Pediculus vestimenti, Burm. The body louse.

Phthirius pubis (Linn.). The crab louse.

ORDER DIPTERA.

Family Pulicidæ.

Pulex irritans. The common flea.

Sarcopsylla penetrans. The chigger of tropical America.

CLASS ARACHNOIDEA.

ORDER ACARINA.

Family Demodicidæ.

Demodex folliculorum, Owen. The pimple mite.

Family Acaridæ.

Sarcoptes scabiei, Degler. The itch mite.

Numerous other animals are more or less parasitic on man—*e. g.* the common bedbug, mosquitoes, gnats—but the present enumeration is only intended to include those that make a prolonged abode on his person. Even of these, several of the Entozoa are doubtful, but all those admitted by Cobbold are given. THEODORE GILL.

Parasol. See UMBRELLA AND PARASOL.

Parcæ. See FATES.

Parch'im, town of Germany, in Mecklenburg-Schwerin, on the Elbe, has some manufactures of leather and soap and large breweries and distilleries. Pop. 7142.

Parch'ment [Fr. *parchemin*] is not really leather: it is merely the well-cleansed and carefully dried skins of hares, rabbits, calves, asses, or sheep. Common parchment is prepared from sheep-skins, but vellum, a far finer variety, is made from the skins of young calves, goats, or still-born lambs. Sheep-skins are often split and made to yield two sheets of parchment. The skins are soaked in water and then subjected to the action of milk of lime. The wool or hair is then removed, the skins are washed, planed with a sharp knife to remove superfluous parts, and then stretched on frames singly and dried in the air. For bookbinders' use the dried parchment is planed to impart a rough surface, capable of being dyed or written upon. The dried parchment is finally dusted over with chalk and rubbed with pumice-stone. Drum-heads are made from calves' skins, heads of kettle-drums from asses' skins, sieves for gunpowder-mills from hogs' skins. Parchment was known long before the invention of paper. The name is derived from the city of Pergamus in Asia Minor. It is now made at Bentheim and Schuttorf in Hanover, at Augsburg, Nuremberg, Breslau, and Dantzic, and in Holland, England, and France. C. F. CHANDLER.

Par'deeville, post-v. and tp., Columbia co., Wis., on St. Paul and Milwaukee R. R. Pop. 205.

Pardessus' (JEAN MARIE), b. at Blois, France, Aug. 11, 1772; studied jurisprudence; became mayor of Blois in 1805; member of the legislative assembly in 1807; professor of mercantile law at Paris in 1810; member of the chamber of deputies 1815–16 and 1824–27, but retired from public life after the revolution of 1830, and d. on his estates near Blois May 26, 1853. By his numerous works, of which the most prominent are *Traité des Servitudes* (1806), *Traité du Contrat et des Lettres de Change* (1809), *Éléments de Jurisprudence commerciale* (1811), *Cours de Droit commercial* (1814–19), *Collection des Lois maritimes antérieures au 18e siècle* (6 vols., 1828–45), *Us et Coutumes de la Mer* (1847), etc., he exercised a great influence on French jurisprudence.

Par'doe (JULIA), b. 1806 in Beverley, Yorkshire, England; produced a volume of poems when thirteen years old, and afterwards novels, volumes of travel, and historical works—*Louis XIV. and the Court of France*, etc. In 1859 she received a civil-list pension. D. Nov. 26, 1862.

Par'don, in law. This as generally understood is an act proceeding from the executive department of a government, which relieves an individual from the penal consequences of a crime which he has committed. A distinction is taken between a reprieve and a pardon. The former is the suspension of a sentence for a time, while the latter entirely removes its effect. A pardon may be considered under two general divisions: I. Its nature and effect; II. The mode of granting and making use of it.

I. The nature of a pardon is to blot out the offence to which it is applied and to treat the wrongful act as though it had never existed. If granted before conviction, it prevents any of the penalties and disabilities consequent upon conviction from attaching; if granted after conviction, it removes the penalties and disabilities and restores the offender to all civil rights. It makes him, as it were, a new man, and gives him new capacity. It does not, however, restore offices forfeited or interests vested in others in consequence of conviction and judgment. (Consult the case of *Ex parte Garland*, 4 Wallace U. S. Supreme Court Reports.) A pardon is, in one sense, an act of grace and mercy, and yet it may be exercised on high grounds of public policy. It may also be resorted to as a mode of alleviating the effects of an imperfect administration of criminal justice. While there is danger that it may be used too freely and arbitrarily, and thus bring about an inefficient administration of criminal law, it is difficult to place any restriction upon the power, since it is impossible to foresee what circumstances may require its exercise. Accordingly, the power to pardon is granted in the U. S. Constitution in the most general and comprehensive terms to the President. "He shall have power to grant reprieves and pardons for offences against the U. S., except in cases of impeachment." (Art. ii., sec. 2.) This power cannot be controlled or limited in any manner by Congress. He alone has the power to pardon offences committed in a territory in violation of acts of Congress. It not only extends to personal punishment, but also to the remission of fines, penalties, forfeitures, and costs in criminal cases. However, if the money had actually been paid into the U. S. treasury before the pardon, it could not be drawn out without an appropriation from Congress. It has even been thought that the President may remit a fine imposed upon a citizen for a contempt in neglecting to perform a legal duty, such as serving on a jury, or for contempt of the process of the U. S. The reasoning upon this point is that the pardoning power, except in the instance of impeachment, is coextensive with the punishing power. This view could not be extended so far as to allow a remission of such pecuniary penalties as do not accrue to the U. S., but to others, as, for example, custom-house officers or informers. It should be added that in the U. S. Constitution the pardoning power is limited to offences, and accordingly cannot be extended to any case of forfeiture, loss, or condemnation not imposed by law as a punishment for an offence.

In some of the States the power of pardon is granted to the governors by the State constitution in the same general way as in the U. S. Constitution. In others there are different provisions, perhaps vesting the pardoning power in a board of pardons, or, if granted to the governor, it is subject to certain restrictions—*e. g.*, obtaining the consent of the senate; the State constitutions should be consulted. In England, while this power is usually exercised by the king, it may be by act of Parliament. In this country, if a constitution delegates it in general terms to a governor or president, it is entirely withdrawn from the legislature. Still, if the legislature make as an attendant upon the conviction for the crime a disability to be sworn in court as a witness, the pardon will not remove the disability, since the legislature has power to establish a rule of evidence. The effect of pardons has been much considered in connection with questions growing out of the late civil war. It has been decided that a full pardon and amnesty by the President for all offences committed by the owner of property seized under the act of Aug. 6, 1861, to confiscate property used for insurrectionary purposes (making property used in aid of the rebellion with the owner's consent subject to confiscation, etc.), relieves the owner from the forfeiture so far as any rights accrue to the U. S. (*Armstrong's Foundry*, 6 Wallace's Reports, 766.) In the same way, whether granted by general proclamation or special letters, it relieved claimants under the "captured and abandoned property act" from the consequences of participation in the rebellion, and from the necessity of establishing their loyalty in order to prosecute their claims. (*Carlisle* v. *U. S.*, 16 Wallace, 147.) The power to pardon may be exercised before trial, after trial, or even after expiration of the sentence. It is granted, in this last case, to remove personal disabilities, such as incapacity to vote or to hold office.

A pardon may either be absolute or conditional. The

claimant under a conditional pardon must make clear affirmative proof that the condition has been complied with. If, for example, the condition were to take a specified oath, the pardon would not be available if a different oath were taken. So, if a pardon had gone into effect, but was to cease on failure to keep a condition, such as to leave the country and not to return, it would become nugatory by a breach of the conditional clause. So the pardoning power may mitigate a punishment established by a sentence of a court, but cannot substitute another and a different one. A pardon does not become effective without acceptance. It may be rejected by a person to whom it is tendered, and a court has no power to force it upon him. If one be in prison when a conditional pardon is offered him, and he accepts it, it cannot be claimed that he is in such a state of duress as to make his acceptance of no effect. It has been held that there may be a constructive pardon without express words, as where an officer of the marine corps under an unexecuted sentence is appointed to a new commission.

II. A pardon may be made either by general proclamation or in a particular instance. The usual form is a deed signed by the executive, with the great seal attached. Publication in newspapers is not necessary to make it operative. It is a deed to which delivery is essential. It is accordingly revocable until it has been actually delivered to the prisoner or issued to the keeper of the prison in which he is confined with intent that it should become available to him. It may accordingly be revoked while it remains in the hands of the U. S. marshal, who is to be regarded as the messenger of the President, and not as the agent of the person pardoned. When a person pardoned desires to avail himself of his pardon, he must bring the fact before the court by some appropriate method, such as a plea or motion. Otherwise, the court will not take notice of it. T. W. DWIGHT.

Paré′ (AMBROISE), b. at Bourg-Hersent, near Laval, France, 1517; was the son of very poor parents; became a barber; studied surgery in Paris; joined the society of St. Côme, and in 1536 entered the army in Italy as a surgeon. His introduction of the ligature for bleeding arteries after amputation was the foundation of modern surgery, and he wrote a work on gunshot wounds which is still of value. His great invention dates from 1536. When the supply of oil failed the army in Piedmont (for up to that time hot oil was used to stanch bleeding), he was obliged to tie arteries with a thread, which he did, expecting that his patients would die; but he soon found that cases where the ligature was employed did much better than the others. From 1552 to 1590 he was surgeon to four French kings. He was a devout Huguenot (although Malgaigne denies it), but his reputation for surgical skill saved him at the massacre of St. Bartholomew and at other critical junctures. His professional works are rather numerous and very much in advance of his times, in spite of the fact that he was only a barber-surgeon, and as such unrecognized by the surgical faculty. One of the most singular of his works is that *On Monsters*, which is replete with the strange superstitions of his time. D. at Paris Dec. 22, 1590.

Paregor′ic Elix′ir (*tinctura opii camphorata*), a well-known anodyne compound, made by macerating together 60 grains each of powdered opium and benzoic acid, 40 grains of camphor, a fluidrachm of oil of anise, 2 troy ounces of honey, and 2 pints of alcohol. After standing seven days it is filtered for use. Liquorice is sometimes added. It is a mild anodyne and antispasmodic.

Pareira Brava [Port.], the dried woody root of some South American climbing plants of the order Menispermaceæ. It is a tonic and diuretic drug, used especially in chronic inflammations of the bladder and the urinary passages. The name is Portuguese for "wild vine." The plant in question has been for more than 100 years supposed to be the *Cissampelos Pareira*, but the late Mr. Hanbury has clearly ascertained that it is *Chondodendron tomentosum* of Ruiz and Pavon, *Cocculus chondodendron*, D.C.

Par′ent and Child, in law. There are many important legal questions growing out of the relation of parent and child. These are inquiries concerning the duties of parents, their authority and control over the actions of their children, and the duties of the children in their turn, particularly towards parents who are infirm and incapable of self-support. A convenient arrangement of the subject is to consider children under two general classes, the legitimate and the illegitimate.

I. *Legitimate Children.*—Under this division may be noticed the duties of parents towards their children, their authority over them, and the obligation of children towards parents. Parents may be said to owe their children maintenance or support, protection from injury by others, and a suitable education corresponding with their means. Only the first of these is strictly the subject of legal enforcement. The duty to protect or to educate is one of imperfect obligation. Much question has been made upon the point whether the obligation to maintain exists at common law or is derived from statute. This is a point of much magnitude and importance. If the obligation exists at common law as a legal duty, and the father without cause refuses to discharge it, it is reasonable that from his duty may be raised an implied contract to repay such persons as supply to the child the necessaries of life. On the other hand, if the duty is created by statute law, there is no other mode of enforcing it than that which the statute points out. The tendency of later English opinion is to hold that the duty is statutory, and that the only theory on which the parent can be made liable to third persons on a contract for necessaries supplied to the child is that of agency voluntarily created by the parent, though such an agency may be inferred from slight circumstances. A statute was passed at an early day in England (43 Eliz. c. 2, § 7) whereby the father, grandfather, mother, and grandmother and children (being of sufficient ability) of every poor, old, blind, lame, and impotent person, or other poor person not able to work, shall at their own charge relieve and maintain every such poor person in that measure and according to that rate as shall be assessed by the justices of the peace at their general quarter sessions. Obedience to the justices' order is enforced by a monthly forfeiture of twenty shillings. Proceedings under this statute are of a criminal nature, and the plain object of it is to cast the burden of maintenance upon the relatives rather than to devolve it upon the public. Similar statutes are found in the States of this country. The prevailing opinion among jurists in this country appears to be that, notwithstanding there may be such a statute, the duty of the parent to supply to his child the necessaries of life is not dependent upon it, and would survive its repeal as being a principle of the common law. Accordingly, if the parent was derelict in his duty, a tradesman might supply necessaries and sue the father upon an implied contract. It would, however, be agreed that this could not be done if the father actually supplied necessaries, even though the tradesman was not aware of the fact, so that he acts at his peril. A husband is under no obligation to support the children of his wife by a former marriage. If he takes them into his family in the usual way, the presumption is that he will make no charge for what is supplied them. He may, however, cause them to leave at any time, when any liability he might be under through an agency which he had voluntarily created in their favor would cease. The same general rule will apply to any children taken into a family by adoption, unless there is some statute regulating the subject. Courts of equity are frequently called upon in special cases to make an allowance to a father from a child's estate for his maintenance. Such an application might be made when the child had sufficient means of its own and there were other claims upon the father's estate, such as the support of other children, perhaps by another marriage, which would make it fit that the allowance should be made. It is common only to make such allowances prospectively. Still, there is nothing to prevent the court, when the circumstances of the case require it, from reimbursing the father for past expenditure in the way of maintenance. The jurisdiction of the equity court is based upon the theory that it represents the king or the protecting power of the state over all that class of persons who, by reason of immaturity or imbecility, are unable to take care of themselves.

The obligation now under discussion does not prevent a father from depriving his child by his will of all share in his estate. The liberty of testamentary disposition is, by the rules of the common law, so complete that the father's property may lawfully be bequeathed or devised to strangers, though this power is sometimes restrained by statute, particularly in the case of the disposition of property to charitable associations. (See, among other instances, *Laws of New York of 1860.*) The wrongful acts of a child, committed without a father's knowledge or consent, impose no liability upon the latter. Remedy in such a case must be sought against the child alone. Thus, a father would not be liable if his minor child should wilfully set a dog upon a person to his injury, unless the parent has some connection with the wrongful act. The remaining obligations of the father to his children may be treated briefly. While it is the moral duty of the father to protect his child, there is no mode provided by law for compelling him to discharge this obligation. The whole matter is left to the promptings of paternal affection. The law looks indulgently upon the acts or passion of the father when caused or aroused by abuse inflicted by strangers upon the child; and if he should take immediate revenge, he would properly be subjected to a less degree of punishment than is usually accorded to similar acts where no such relation exists. He is excused alto-

gether from acts of injury necessarily inflicted by way of defence of his child, even though they might result in taking the life of the aggressor. The same general remark may be made of education. There is no rule of the common law imposing upon the parent the duty to educate his child. In the formation of our system of jurisprudence the idea was prevalent that the whole subject should be remitted to parental affection and foresight. In some instances statute law establishes rules making education compulsory. The laws upon this subject are yet so meagre and transitional that it is scarcely worth while to refer to them. There has been much doubt among jurists whether the mother is under the same obligation as the father to provide the child with maintenance. The law cannot be regarded as settled. There is considerable tendency in modern law to place the widowed mother upon the same footing as the father in respect to duties and corresponding rights. (See the subject discussed with much fulness and the authorities collated in the cases of *Furman* v. *Vansize*, 56 New York Reports, 435, and *Grey* v. *Durland*, 50 Barb. 211.)

The next point to be considered is the power of a parent over the child, or, in other words, the rights of control and management. These rights may be resolved into three: (1) custody, (2) service, (3) discipline.

(1) *The Right of Custody.*—It is a general rule of law that the father has the right of custody as against all persons except the mother. As between the parents, the right will depend, to some extent, upon the circumstances of the case and the mode in which it is presented to the court. There are two modes in which the case may be presented—one, by the writ of *habeas corpus*, and the other, by petition in equity. When the question comes up on *habeas corpus*, the leading inquiry is whether the child is in the right custody. If it is above fourteen, its wishes will be consulted; if under that age, the court inquires as to the person who has the legal right to the control of the child, since it is assumed to be *under a restraint* which the writ is calculated to relieve when it is not under the control of its legal custodian. The English courts have gone very far under these rules in awarding the child to the father. The leading cases are the *King* v. *De Manneville* (5 East's Reports, 220), and the *King* v. *Greenhill* (4 Adolphus and Ellis's Reports, 626). In the last case the father lived in adultery with a mistress, but did not bring her into contact with the children. There being no evidence of cruelty nor of corrupting influences on his part, the custody of the children was awarded to him. Statute law in this country in some cases gives the courts greater discretion when awarding a writ of *habeas corpus* in such instances than exists at common law. An instance of this is found in the law of New York in the case of a voluntary separation of husband and wife. It would, however, be generally true that if a wife abandoned a husband without cause, the custody of the children would be awarded to him, unless there were special reasons to the contrary involving their welfare. When the question concerning custody of children is presented, not upon *habeas corpus*, but by appropriate proceedings in a court of equity, the power of the court is much more broad and comprehensive. This tribunal is considered in England to represent the king in his character of *parens patriæ;* that is, his guardianship of all those persons (including young children) who are unable to take care of themselves. The relation of the parent to the child is here deemed to be a trust, and it is expected that the latter will be brought up with a due education in literature, morals, and religion, and be treated with kindness and affection. When this trust is grossly violated, the court will interfere and appoint a person to act as guardian to take care of the child and to superintend its education. This power exists independently of the possession of the property. The whole subject was thoroughly considered in the case of *Wellesley* v. *Duke of Beaufort* (2 Russell's Reports 20; also 1 Dow and Clark, 162). This case is prominent in English law on account of the questions involved and the high rank of the parties. There are cases in which the court will hold that a father has lost his right to custody by his own act, as where he allows the child to be educated by a relative who has brought him up in a particular manner, and with just expectations as to receiving his estate, when the return of the child to the father would destroy the expectations thus raised by the father's consent. Still, no person can deprive a father of his guardianship by the mere fact of giving him an estate conditioned upon its renunciation. Should the father decline to renounce his right of custody, the provision in the child's behalf must fail.

(2) *The Right to Service.*—This is dependent upon the father's duty to maintain. While that continues he has the right to the child's services and to his wages whenever he is in the service of others. This right is in some States regulated by statute law, providing that the father must notify the employer within a specified time that he lays claim to the earnings. As an incident to the right to service may be mentioned some subordinate rights, such as that of suing for a recompense for injuries causing a loss of service, and for the seduction of a daughter. When a child is injured by the wrongful act of another, the father may maintain a suit on his own behalf for any loss of service which he may have sustained. This action is independent of that which the child may have on his own behalf. The action of the latter would be based on his own injury, including his pain and physical discomfort; that of the father would rest solely upon the ground of the loss of service, and if there were no such loss, no recovery could be had. The right to recover damages from the seducer of a daughter rests upon similar principles. There is a peculiarity in this case, growing out of the fact that, though the daughter may have no action by reason of her own consent, the father may still sue for his own loss. There has been much diversity of opinion upon the point whether an action will lie, notwithstanding the fact that the daughter, though still in her minority, is actually in the service of another. In England the view is that the father in this case has no remedy, unless the daughter has the intention to return to her father (*animus revertendi*). On the other hand, in this country there is strong authority for maintaining that the test of the right of action is the father's power to demand the daughter's services. Accordingly, if he can recall her from her present master, he may sue. But if she were lawfully bound out as an apprentice, he has no action (since his right to demand her services is lost) unless the apprenticeship were entered into by the master with a view to her seduction, in which case he would still have his action. Though the action is grounded on the loss of service, that is not the measure of damages. The right to sue having once been established, the jury may take into account the father's wounded feelings and the injury to the family honor, and give a verdict accordingly. Whether the mother can maintain the action will depend upon the view which may be taken in any State as to her right to demand the daughter's wages or insist upon her services. If this be conceded, the right to sue will follow. Thus far it has been assumed that the daughter was in her minority when the seduction took place. If she had at that time reached her majority, a father or other person claiming to be master could not sue without proving the actual existence of the relation of master and servant. In such a case, either the father or mother or other person standing in the position of master would have a right of action.

(3) *The Right of Discipline.*—The law accords to the father the right to train the child, and to give him a fit education in learning, morals, and religion. To this end he may inflict moderate corporal punishment, and may delegate to schoolmasters and tutors a like power. If the bounds of moderation are exceeded, the father or schoolmaster, as the case may be, is liable in a civil action, and in some instances criminally. There has been much consideration in England of the duty of guardians, after a father's death, to educate the children in the religion which he professed, and in which he would probably have educated them if he had lived. The general rule there prevailing is that the religious education must, in such a case, follow the views of the father rather than those of the mother, and the court of chancery will make an order accordingly, particularly where the child is of tender years and has not yet formed an opinion on points of religious controversy. (Reference may be had to *Re Newberry*, 1 Law Reports, Equity 431, and to *Hawkesworth* agts. *id.*, same series, 6 Chancery Appeals R. 539.) The father has, as such, no right to the estate of the child, except as guardian in socage. (See GUARDIAN.) When appointed guardian, he is required to give bonds for the due and faithful administration of the child's estate, and his duties and responsibilities must be sought under the rules of law applicable to guardians. It only remains to notice the legal relations and duties of the child towards the parent. The domicile of a minor child is that of the father, and it cannot be changed without the latter's consent. No action will lie by common law at the suit of the child if the father be injured or killed by the wrongful act of another. By statutes in many of our States, when a parent is killed by the negligence or wrongful act of another (see NEGLIGENCE), an action may be brought by the legal representatives for the benefit of the children if it can be shown that pecuniary damage has been sustained. It has been asserted by high authority that a child is under no common-law obligation to maintain an indigent parent, and that whenever such a duty exists it must be derived from statute. However, if a child offer in advance to pay one who will maintain his parent, and the maintenance is supplied on the faith of

the proposition, the child is liable on general principles of law appertaining to the subject of the consideration of a contract. (See CONSIDERATION and CONTRACT.)

II. *Illegitimate Children.*—The rules of law governing this class of persons have been sufficiently stated under the title BASTARD, in vol. i. (For further information on the general subject of this article, consult Reeve's *Domestic Relations;* Schouler's do.; *Kent's Commentaries,* Lecture 29; Forsyth's *Custody of Infants;* Hurd's *Habeas Corpus,* and the works of Story, Adams, and Willard (Potter's ed.) *On Equity Jurisprudence.*) T. W. DWIGHT.

Parepa-Rosa. See ROSA.

Par'ga, town of European Turkey, eyalet of Yanina, on a steep cliff surrounded on three sides by the sea, and defended on the fourth by an almost impregnable citadel. It was founded in the last days of the Roman empire, belonged to Venice from 1401 to 1797, and was during the first part of this period a place of considerable commercial importance. After the overthrow of the Venetian republic by Napoleon in 1797, the city came to Turkey by a treaty between Russia and Turkey in 1800, and was placed under the command of Ali Pasha, governor of Yanina. But the inhabitants, at that time numbering about 5000 Christian Albanians, determined not to submit, and all the pasha's attempts at reducing the place were in vain. It became a place of refuge for the victims of Ali's barbarous tyranny, and its prosperity increased. After the Peace of Tilsit (1807) Napoleon refused to recognize the cession of Parga to the Turks, and the city now lived on under a kind of French protectorate, perpetually fighting against Ali Pasha. After the fall of Napoleon (1815) the Pargiotes solicited the protection of England, and obtained it. The English put a garrison in the city, and then, in 1819, they quietly delivered it over to Ali Pasha, after which the Pargiotes dug up the bones of their ancestors and burnt them, left the city, and went into exile. (See Mustoxidis, *Précis des Évènements qui ont précédé et suivi la Cession de Parga* (Paris, 1820).)

Parhelia. See HALO.

Pa'riah [Hind., "mountaineer"], one of the lowest classes in India, so called because generally of the stock of the hill-tribes. The pariahs have woolly hair and thick lips, and are found especially in the S. of India. They are very degraded, are not allowed to approach within many feet of any Hindoo, and have to some extent adopted a system of caste among themselves. Chandalas and outcasts sink to the rank of pariahs. Of late successful efforts are making by missionaries and others to elevate the character and intellect of these wretched beings. They are very numerous.

Parian Chronicle. See ARUNDEL MARBLES.

Pa'rian Ware, a name given to vessels, statuettes, and bric-à-brac made of the same materials as fine English china. The material is reduced to a liquid state and then cast in moulds made of plaster of Paris. Great care must be taken in the firing. It was invented in 1845 in Staffordshire, England, the principal seat of the manufacture.

Pari'etal Bones [Lat. *paries,* a "wall"], the two bones which in men constitute the lateral parts and the roof of the skull. They represent the expanded neural spine of the third vertebra. Each is developed from one centre.

Pari'ma, or **Parime, Sierra,** also called the **Highlands of Guiana,** a mountain-system of South America, occupies the north-eastern part of the country, and separates the plains of the lower Orinoco from those of the Rio Negro and the Amazon. The general character of this mountain-system is that of an elevated plateau, rising 2000 feet above the level of the sea, and traversed by numerous ridges, whose highest peaks, Maravaca and Duida, reach an altitude of about 8000 feet. The western part, extending between lon. 60° and 68° W., and between lat. 2° and 8° N., is much more irregular than the eastern; the surface here has often a completely alpine character. The plateau is generally covered with forests or pasturages; the ridges are bleak, barren, and naked. The mountains nowhere reach the sea, but leave along the shore a broad belt of lowland. The Orinoco, the Essequibo, and the Rio Branco (or Parime), an affluent of the Rio Negro, have their sources in this system.

Parini (GIUSEPPE), b. at Bosisio, a village near Milan, May 22, 1729; was educated for the Church; lived for some time as tutor in a private family, devoting himself with great zeal to poetry; was subsequently appointed professor of belles-lettres at the University of Milan. D. there Aug. 15, 1799. Of his works (6 vols., Milan, 1801–04), the most remarkable is *Il Mattino, il Mezzogiorno, il Vespro, e la Notte,* a satire on the life of the so-called elegant society, which attracted much attention when it was first published, and has been republished often since.

Par'is, the capital and principal fortress of France, with 1,851,792 inhabitants (Jan. 1, 1873), on both sides of the Seine, forming nearly a circle, and surrounded with hills whose tops are crowned with strong forts. As the seat of the central government, the centre of commerce and industry, the vital point in the spiritual life of the nation, the great depositary for historical, scientific, and artistic monuments, it bears absolute sway over the country. The *cité,* situated on the *Île de la Cité* in the Seine, forms the oldest part, the kernel of the city, and around this centre the rest of the city forms three belts. The first belt, the *ville* proper, is bounded by the inner *boulevards,* the most important thoroughfares, the most magnificent streets, constructed by Louis XIV. in 1670 on the site of the old fortifications. The second belt consists of the *faubourgs,* and is surrounded by the outer boulevards, running along the former demarkation wall. Up to 1860 the *barrières* of this wall formed the gates of Paris, but in that year the wall was broken down. The third belt extends to the bastioned wall, beyond which the whole vicinity is covered with villas, gardens, and parks. The Seine traverses the city in a curve, and divides it in a larger part to the N. and a minor to the S. The longest diameter of the city, from Porte Point du Jour in the S. W. to the outermost point of La Villette in the N. E., is about 7½ English miles, whilst its shortest diameter, a line leading through the intersecting point of the Seine in the S. E., by the Tuileries to Les Batignolles, is 5½ English miles long. The whole area comprises about 135 sq. m., and is covered with about 45,000 buildings. The whole city is very finely built, with broad streets lined with large and stately houses, which are generally occupied by several families. The greatest changes and improvements were undertaken by Napoleon III., and are due to the talent of the prefect Hausmann. It is divided into 20 *arrondissements,* but the old names of the old divisions are still in common use, especially in cases in which the quarter has received a certain character from its inhabitants; such as Faubourg St. Germain from the legitimist aristocracy; Faubourg St. Honoré from the diplomacy and the financiers; Quartier Latin from the students; and Faubourg St. Antoine from the workingmen. The most important and the most beautiful streets are the boulevards, of which those situated on the right bank of the Seine surpass the streets of any other city in splendor of architecture and in the luxurious outfit of the stores and cafés. A series of such streets, 4800 mètres long and 30 mètres broad, runs from the Place de la Bastile to the Madeleine church—namely, the Boulevard Beaumarchais, des Filles du Calvaire, du Temple, St. Martin, St. Denis, Bonne-Nouvelle, Poissonnière, Montmartre, des Italiens, des Capucins, and de la Madeleine. But besides these there are numerous other beautiful though less famous boulevards, such as the Boulevard de Sebastopol, de Strasbourg, St. Michel, St. Germain, Hausmann, Magenta, etc. They consist of a macadamized roadway in the centre, and sidewalks paved with asphaltum on both sides; rows of trees are planted between the roadway and the sidewalks. Other elegant streets are Rue Rivoli, Rue Montmartre, Rue de la Paix, Avenue de Vincennes, Avenue des Champs Élysées, Rue St. Honoré, Rue Richelieu, Rue de la Victoire, Rue St. Denis, etc. The most celebrated public squares are—the Place de la Concorde, the largest and finest in the city, 357 mètres long, 217 broad, bounded S. by the quays of the Seine, N. by the Rue Rivoli, E. by the garden of the Tuileries, W. by the Champs Élysées. In 1763 this square was named Place Louis XV., after a statue of this king erected here, but on Aug. 11, 1792, the statue was taken away and melted down into two-sou pieces, a statue of the Goddess of Liberty was placed on the pedestal, and the square was called Place de la Révolution. On Jan. 21, 1793, the guillotine was erected here; among its victims were Louis XVI. and Marie Antoinette, the duke of Orleans, Danton, and Robespierre. In 1799 the name was changed to Place de la Concorde; in 1814, to Place Louis XV.; in 1826, to Place Louis XVI.; and in 1830, again to Place de la Concorde. The Obélisque de Luxor, a present from Mehemet Ali to Louis Philippe, was raised here in 1836. It consists of a rose-colored syenite monolith 23.50 mètres high, weighs 500,000 pounds, and stands on a pedestal 9 mètres high. It is covered with hieroglyphics in praise of the great king Sesostris (1500 B. C.). Two beautiful fountains are constructed beside the obelisk; they are ornamented with statues, and their basins measure 16.50 mètres in diameter. Eight statues, representing the eight largest cities of France—Lille, Strasbourg, Bordeaux, Nantes, Rouen, Brest, Marseilles, and Lyons—adorn the square, which is surrounded with a balustrade with columns and chandeliers. The Jardin des Tuileries, to the E. of the square, and belonging to the celebrated palace of the same

name, contains old and handsome trees, and is adorned with statues of marble and bronze; it is a favorite rendezvous for children and nurses. On the Place du Carrousel, enclosed by the Tuileries and the Louvre, stands the Arc de Triomphe, 14.60 mètres high, 19.50 broad, 6.65 thick, erected in 1806 by Napoleon I. in commemoration of his victories over Austria and Russia. On the Place Vendôme, an octagonal square at the foot of the Rue de la Paix, stands the Colonne Vendôme, modelled after the column of Trajan in Rome, and erected by Napoleon I. in 1806–10, 273 mètres high, and covered with spiral reliefs representing scenes from the campaign of 1805; 1200 cannon, captured in the campaign, afforded the materials for the covering of the column. On the top stood Napoleon in Roman costume. In 1814 the statue was thrown down by the royalists, and a white flag was substituted, but Louis Philippe again placed a statue of Napoleon, though in historical costume, on the top of the column. In 1871 the Commune threw down the whole column, but in 1875 it was again raised. On the Place des Victoires, 78 mètres in diameter, the gilded statue of Louis XIV. was erected in 1686, and the square received the name of Place Louis XIV., but in 1792 the name was changed and an obelisk took the place of the statue. In 1806 the statue of Gen. Desaix was substituted for the obelisk, but in 1814 this statue was removed, and in 1822 the colossal equestrian statue of Louis XIV. by Bosio was erected. The Place de la Bastile was formerly occupied by the fortress of the same name, which was used as a state prison, but on July 14, 1789, the people stormed the fortress, and it was afterward razed to the ground. After the July revolution a bronze column, 50 mètres high and surmounted with the genius of Liberty, was erected in the square. In the interior a spiral staircase of 238 steps leads to the top. The Place des Vosges is a square surrounded by an iron railing, and contains in the centre an equestrian statue in marble of Louis XIII. by Dupaty and Cortot, erected in 1829 in place of a statue of the same king which was destroyed in 1792. The Place du Châtelet contains the Fontaine de la Victoire, adorned with four allegorical figures, and the Colonne de Palmier, on which the names of the victories of Napoleon are inscribed, and on whose top stands a Victory by Bosio. The Place de l'Étoile, from which twelve boulevards and avenues radiate, contains the Arc de Triomphe de l'Étoile, the largest triumphal arch ever erected, 49 mètres high, 45 broad, and 22 thick. It was commenced in 1806 by Napoleon I., and finished after the design of Chalgrin in 1836, adorned with statues commemorative of the exploits of the French army by Rude, Lemaire, Cortot, Seurre, Marochetti, and others. The Champ de Mars is a military parade-ground, situated on the left bank of the Seine, 1000 mètres long, 500 broad, and capable of accommodating 30,000 men drilling and manœuvring. Here the Fête de la Fédération was celebrated July 14, 1790, and here the Exposition Universelle of 1867 took place. The Champs Elysées, laid out in 1616 under Maria de' Medici and formerly called Cours la Reine, is a small English park, about 400 mètres broad and 650 long, and extends from the Place de la Concorde to the Arc de Triomphe. A beautiful avenue, two kilomètres long, and one of the most frequented promenades of Paris, traverses the ground, lined on both sides with establishments for popular amusement. At the entrance stand the two Dompteurs de Chevaux by Courbon, which were brought hither in 1795 from the Château de Marly. The Champs Élysées connect with the garden of the Palais de l'Élysée or Élysée-Bourbon, which was built in 1718, and inhabited successively by the marquise de Pompadour, Napoleon I. during the Hundred Days, the duchess of Berry, and Napoleon III. as president of the republic. A large part of the Champs Élysées is occupied by the Palais de l'Industrie, a building covering 27,000 square mètres, 250 mètres long, 108 broad, and 35 high, and used for a perpetual exposition. The Avenue de l'Impératrice leads from the Arc de Triomphe to the Bois de Boulogne, a beautiful park, comprising an area of 900 hectares, and extending from the line of fortifications to the Seine. The beautiful forest suffered very much during the war of 1870–71, but the park offers still a most charming promenade with its fine trees, lakes, cascades, etc. The northern part of it, comprising an area of about 20 hectares, is occupied by the Jardin d'Acclimatation, a very interesting establishment. Other fine promenades are the Parc de Monceaux, to the N. E. of the Arc de Triomphe, and the gardens of the Palais Royal and de Luxembourg. The river is lined with 27 quays and spanned by 23 bridges, most of which are celebrated and beautiful constructions. Pont Neuf, 328 mètres long, connects on both sides the *cité* with the rest of the city, spanning both arms of the river, and bearing on the centre the equestrian statue of Henry IV.

The city has 65 churches, besides a number of chapels. Of these the most celebrated is the cathedral of Notre Dame, situated in the eastern part of the *cité*. It is a Gothic structure, erected from the twelfth to the fourteenth century, 126.25 mètres long, 48 broad, 33.75 high, with towers rising 68 mètres. Especially grand and beautiful is the front façade, rising in three divisions, of which the middle one is adorned with one large and two minor roses. The chief vault rests on 131 columns. Ste. Chapelle, also situated in the *cité*, is perhaps the most beautiful mediæval structure in existence. It belongs to the Palais de Justice, and was finished by Pierre de Montereau in the reign of St. Louis. The Madeleine, situated near the Place de la Concorde, planned after the model of a Greek temple, 109 mètres long, 46 broad, and surrounded with Corinthian columns, was founded in 1764, but not finished until the reign of Napoleon I. The pediment is by Lemaire, the bronze doors by Triquetti. On the left bank of the Seine the most important ecclesiastical structure is the Panthéon, built by Soufflot, and finished in 1790, in the form of a Greek cross, 112 mètres long, 84 broad, and 83 high, to the apex of the dome. The pediment, by David d'Angers, represents celebrated men of the country, to whom "France" distributes wreaths. The crypt contains the tombs of celebrated men; the most celebrated, however, Voltaire, Rousseau, Mirabeau, etc., have been carried away; the sarcophagi of the two philosophers are empty. St. Germain des Prés is the oldest church in Paris, built 1001–1163, 64 mètres long, 21 broad, 20 high—the lower part Romanesque, the upper Gothic. During the Revolution it was used as a manufactory of saltpetre; 1824–36 it was thoroughly repaired, and 1852–61, Hippolyte Flandrin adorned the interior with frescoes. St. Germain l'Auxerrois, situated in the Rue Rivoli, opposite to the colonnade of the Louvre, is the old parish church of the French kings. It is elegant, but neither grand nor in pure style; the decoration of the interior is modern, containing frescoes by Mottez and Guichard. St. Eustache, also in the neighborhood of the Louvre, built in a mixed style, Renaissance and Gothic, 106 mètres long, 44 broad, and 33 high, is much frequented, and contains many fine frescoes and statues, and an excellent organ. La Trinité, finished in 1866 by Balla in the style of the later Renaissance, 90 mètres long, 30 broad, with a tower rising 60 mètres, is one of the most elegant churches of Paris, and contains pictures by Lévy, Delaunay, Jobé-Duval, and Barrias. Notre Dame de Lorette, in the form of a Roman basilica, 68 mètres long, 32 broad, looks rather severe externally, but is nevertheless exceedingly gorgeous in the interior, radiant with gold and brilliant colors. St. Vincent de Paul, built 1824–44 by Lepère and Hittorf, has also the form of a basilica, 81 mètres by 36. The vault rests on 82 Ionic columns of polished stone. The church has beautiful frescoes by Picot and Hippolyte Flandrin. The Chapelle Expiatoire, erected in commemoration of Louis XVI. and Marie Antoinette, is in artistic respects of small interest. The beautiful St. Jean Baptiste, situated in the Rue de Belleville, the most elevated part of the city, was finished in 1858 by Lassus in Gothic style. St. Sulpice is a rich and important church, of large dimensions, 140 mètres long, 56 broad, 32 high, in the form of a cross, with two unequal towers. It was commenced in 1646, but not finished until about 100 years after. The chapels contain excellent frescoes by Eugène Delacroix, Heim, Vinchon, Lason, Hesse, Guillemot, and others. The pulpit and the organ are noteworthy. Ste. Clotilde, built by Gau and Balla in the style of the fourteenth century between 1846 and 1859, is a fine structure. The chapels contain remarkable frescoes by Picot, Lehmann, and Henri Delaborde, and good sculptures by Pradier, Duret, Guillaume, and others.

The city is still richer in palaces, of which the most celebrated are situated in the centre of the city—the Tuileries, Louvre, and Palais Royal. The Tuileries is now, since the days of the Commune in 1871, mostly in ruins. It formed the western front of a colossal structure, whose eastern part was formed by the palace of the Louvre, while the connecting links originated successively as wings and galleries. It was built in 1564, by order of Catharine de' Medici, by Philibert Delorme, on the site of a tile-factory, and was afterward much enlarged. At the time of its destruction it measured 317 by 33 mètres. The right wing was called Pavillon de Marsan; the left, which was the only part of the palace which escaped destruction, Pavillon de Flore. The central wing, Pavillon de l'Horloge, contained the large Salle de Maréchaux, Salle du Trône, Galerie de Diane, Salon du Premier Consul. The palace was richer in historical remembrances than in monuments of art. It had been the residence of the rulers of France since Feb. 1, 1800; Napoleon III. occupied the wing between the Pavillon de l'Horloge and the Pavillon de Flore. May 20, 1871, the Commune, pressed by the troops of the

government, determined to burn down the palace, together with several other great buildings, and May 22 and 23 they arranged a systematic conflagration. The Louvre is both in architectural respects and as a museum of art the grandest and most interesting building in Paris. Together with the Tuileries, it covered an area of 107,200 square mètres, and the buildings, although erected in the course of centuries and in different styles, formed nevertheless an harmonious whole. On the site of the present old Louvre stood originally a fortress, built by Philippe Auguste (1180–1223), but changed into a palace by Charles V. (1361–80). Francis I. had the whole structure pulled down in 1541, and a new palace erected by Pierre Lescot. Henry IV. finished the gallery commenced by Catharine de' Medici and Charles IX., which, 443 mètres long, runs along the Seine and connects with the Tuileries. Richelieu continued the enlargement of the palace. The eastern façade, with the celebrated colonnade, was begun in 1665 after the design of Perrault. Under Napoleon I. the connection between the Louvre and the Tuileries along the Rue Rivoli was undertaken, and Napoleon III. finished the gallery and lengthened the northern and southern façades to the Place du Carrousel, at an expense of 75,000,000 francs. The old Louvre is used as a museum, the new Louvre mostly for government offices. The southern wing, which is partly used as a museum, suffered somewhat by the conflagration of 1871, but has been restored. The Pavillon de la Bibliothèque, situated on the northern side and facing the Place du Palais Royal, suffered more, though the library, containing 90,000 costly works and many rare manuscripts, was nearly all saved. The museum consists of a combination of fifteen museums, some of which are unsurpassed in historical completeness and æsthetical worth. The Palais Royal, opposite the new Louvre, was built by Richelieu (1629–36), and called the Palais Cardinal. After his death it was inhabited by Anne of Austria, and received its present name. Louis XVI. presented it to his brother, and his son, the Regent, held here his orgies. The grandson of the Regent, Philippe Égalité, surrounded the garden with buildings which he rented out for shops and cafés, and the latter became during the time of the Revolution the established rendezvous of the radicals. The artistic monuments which the palace contains are of small interest. The Palais de Justice, situated in the *cité*, but mostly destroyed by the Commune in 1871, was the residence of the king to the close of the fourteenth century, at which time it was assigned to the Parliament. The great fires of 1618 and 1776 left of the old sombre palace only the four towers—de l'Horloge, du Grand-César, de Montgomery, and d'Argent, but from 1839 to 1869 the palace was fully restored. The Cour de Cassation, Cour d'Appel, Cour d'Assises, Tribunal de Première Instance, and Tribunal de Simple Police sat here, and it contained the celebrated Salle des pas Perdus and Cuisine de St. Louis. The Palais de Luxembourg is also historically interesting, containing an excellent collection of modern sculptures and pictures. It was built for Maria de' Medici in 1615 by J. Debrosse, in imitation of the Palazzo Pitti in Florence, and continued a royal residence up to the Revolution, when it was used first as a prison, and after 1795 as the Palais du Directoire and Palais du Consulat. After the Restoration and under Louis Philippe it was the Chambre des Pairs, and afterward the Palais du Sénat. At present it is occupied by the offices of the Seine prefecture till the restoration of the Hôtel de Ville is finished. The Palais du Corps Législatif, opposite the Place de la Concorde, on the left bank of the Seine, was commenced by Girardini and finished by Mansart for the dowager-duchess of Bourbon, and was called the Palais Bourbon. It has the form of a Greek temple with a Corinthian peristyle, and contains the beautiful Salle de la Paix, decorated by Horace Vernet, and Salle du Trône, decorated by Delacroix.

Other noteworthy public buildings are the Hôtel des Invalides, an imposing pile, crowned by a gilded dome and covering an area of 126,985 square mètres, with a front façade 200 mètres long, built 1671–75 by Libéral Bruant. The dome is 105 mètres high, and immediately under it stands the sarcophagus of Napoleon I. The building contains many trophies of French victories and an interesting museum of artillery; it is inhabited by 300 invalid soldiers. In the Palais de l'Institut, built in a semicircle, crowned with a dome, and situated on the left bank of the Seine, opposite the Louvre, the French Academy holds its meetings. Close by is the Palais des Beaux-Arts, a stately building, erected by Debret and Duban 1820–28. The Mint, with a façade on the Quai Conti, 120 mètres long; the Bourse, in antique style, a parallelogram 71 by 49 mètres, surrounded by a colonnade; the Bazar; the Central Hall, with 3200 stands for vegetables, fish, and poultry, etc. The Hôtel de Ville, the most interesting structure in Paris both in architectural and historical respects, was entirely destroyed by the Commune in 1871.

Of the numerous theatres of Paris, the most prominent are the New Opera, situated on the Boulevard des Capucins, built by Garnier, decorated by Baudry, opened in 1875, and containing seats for 2350 persons; Théâtre Français, in the Rue Richelieu, founded in 1600, at one time managed by Molière, representing only original plays; Théâtre Ventadour or Théâtre Italien, on the Boulevard des Italiens, for Italian opera; L'Opéra Comique, on the Place Boieldieu, for light opera; l'Odéon, near the Luxembourg, the second classical theatre, much frequented by the students; Le Gymnase, Le Vaudeville, Les Variétés, Les Bouffes-Parisiennes, Le Palais Royal, l'Ambigu Comique, Les Folies Dramatiques, Beaumarchais, etc. Good acting is the rule in these theatres; great talents are not uncommon; perfect training is indispensable, and love of art is generally diffused. On the whole, much is done for public amusement. There are a Cirque d'Été, formerly Cirque de l'Impératrice, in the Champs Élysées, containing 6000 seats; and a Cirque d'Hiver, formerly Cirque Napoléon, on the Boulevard des Filles du Calvaire. The concerts of the Conservatoire de Musique have a European reputation, and popular concerts are given in the Cirque d'Hiver and in the concert-halls of Herz, Erard, and Pleyel, not to speak of the numerous cafés chantants.

The institutions of learning and education are grand. At the head stands the Institut de France, the highest authority of science in the country. The Sorbonne, comprising faculties of theology, letters, and sciences, was founded by Robert de Sorbonne, the confessor of St. Louis, in 1250. The Collége de France, founded in 1530 by Francis I., contains 29 chairs, and teaches in public lectures history, law, languages, etc. There are 9 other colleges. The most celebrated are the École de Médecine, École Militaire, École Centrale des Arts et Manufactures, Conservatoire des Arts et Métiers, École Polytechnique, École des Mines, École des Ponts et Chaussées, etc. All these institutions are supported by the state, and make Paris the centre of human knowledge, not only for France, but for the world. The materials for study which the city contains are grand. The Bibliothèque Nationale, probably the largest and richest library in the world, contains 3,000,000 vols., 150,000 MSS., 300,000 maps and plans, besides other scientific treasures, among which is a celebrated cabinet of medals and antiques. Other important libraries are Ste. Geneviève, Mazarine, de l'Arsenal, de l'Université, etc. Of great importance for the study of natural science is the Jardin des Plantes, comprising an area of 30 hectares, and containing an anatomical and anthropological gallery, a botanical garden, etc.

With respect to commerce and industry, Paris occupies a position of the first rank. Characteristic and often unique in their kinds are the articles of luxury, fashion, play, knickknacks, bronzes, leather goods, musical instruments, artificial flowers, shawls, carpets, tapestry, etc., which in taste of execution generally surpass similar products of other countries. The reason is, that in France art and industry walk hand-in-hand. The mechanics study art in Paris, and the government encourages this tendency in every way. The manufacturers, for instance, of tapestry, printed goods, furniture, etc. procure their patterns from the artists, and are not afraid of the increased cost. With this flourishing state of industry the commerce of the city corresponds.

Among its charitable institutions the most remarkable are the Hôtel Dieu, Charité, Pitié, La Riboisière, Val de Grace, Institution des Jeunes Aveugles, Bicêtre, Salpêtrière, etc. A peculiar institution is the Morgue, in which the bodies found in the Seine are exposed for three days. The most interesting among the cemeteries are du Père Lachaise, de Montmartre, and du Montparnasse; the first especially is very famous.

Paris forms the centre of the railway system of France; eight lines, connected by a circular line, issue in different directions. The annual budget of the city amounts to 230,000,000 francs. Provisions to the value of 1 milliard are annually consumed, among which are 3,700,000 hecto. of wine, 1,200,000 of milk, 334,000,000 kilog. of meat, 300,000,000 kilog. of bread, 15,000,000 kilog. of vegetables, etc. Of special importance are the fortifications, begun under Louis Philippe. Besides the *enceinte* with its 94 bastions, they consist of 20 forts built for the purpose of securing the city against the attacks of hostile artillery. During the siege of 1871 it became evident, however, that these forts were not far enough advanced, and immediately after the conclusion of peace the construction of a new line of detached forts was commenced.

Paris is first mentioned in history under the name of *Lutetia Parisiorum*. Cæsar rebuilt it when it had been destroyed by the war, and it became the *urbs vectigalis* of

the province of Gallia. The name of *Civitas Parisiorum* or *Parisia* does not occur until after 358 A. D. In 486 it was conquered by the Franks and called *Paris*. Clovis made it his residence in 508. It continued to be the residence of the Merovingians and Carlovingians, and it increased steadily. In the thirteenth century it was one of the most important cities of Europe, had 150,000 inhabitants, and carried on a considerable trade. Francis I. did much for it, invited many foreign artists, and erected many buildings. Catharine de' Medici and Henry IV. also favored it. But it made its greatest progress under Louis XIV. His concentration of the whole government in the person of the monarch naturally increased the importance of his capital, and his passion for splendor and magnificence gave the city 80 new streets and many monuments, public squares, palaces, and new institutions of science and art. Under Louis XV. all who were rich gathered to his gay court, and numbers of new palaces were built in Paris. Under his successor, Louis XVI., the Revolution broke out—the result, certainly, of a general development which had taken place throughout the whole of France, but which as certainly received its power of explosion from the capital. From this period, and up to the year 1814, Paris was the capital of the European continent. Another brilliant period it had under Napoleon III., who rebuilt it, and whose very successful commercial policy brought great wealth to it. But during the contest between the government at Versailles and the Commune, from March to May, 1871, it suffered much. (For the history of the city see *Les Antiquitez, Chroniques et Singularitez de Paris*, by Corrozet (1586); *Le Théâtre des Antiquitez de Paris*, by Dubreul (1612); *Histoire de la Ville de Paris*, by Félibien (5 vols., 1725); *Histoire de la Ville et de tout le Diocèse de Paris*, by Lebeuf (15 vols., 1754–58); *Histoire physique, civile et morale de Paris*, by Dulaure (7 vols., 1820–22); *Histoire de Paris*, by Lavallée (2 vols., 1857); *Le Nouveau Paris*, by Labédollière (1860).) AUGUST NIEMANN.

Paris, a port of entry of Brant co., Ont., Canada, at the junction of the Great Western and the Buffalo and Goderich branch of the Grand Trunk railways. It has valuable beds of gypsum, great water-power, many mills, foundries, knitting-works, and other industries, and 2 weekly newspapers. Pop. of sub-district 2640.

Paris, post-v. and tp., cap. of Edgar co., Ill., at the junction of the Illinois Midland with the Indianapolis and St. Louis and the Paris and Danville R. Rs., has 2 weekly newspapers, a large trade, and important manufactures. Pop. of v. 3057; of tp. 4522.

Paris, post-v. of Oneida co., Id.

Paris, tp. of Howard co., Ia. Pop. 434.

Paris, tp. of Linn co., Kan. Pop. 1396.

Paris, post-v., cap. of Bourbon co., Ky., on a tributary of the Licking River, at the junction of the Kentucky Central with the Maysville and Paris R. R., has 2 weekly newspapers, is an important cattle-market, and the chief seat of the manufacture of Bourbon whisky. Pop. 2655.

Paris, post-v. and tp., cap. of Oxford co., Me., on the Grank Trunk R. R., 45 miles from Portland, has fine water-power, 2 academies, 5 churches, 1 foundry, a cheese-factory, 2 weekly newspapers, 1 bank, a baby-carriage factory, 4 hotels, and stores. Pop. 2765.

GEO. H. WATKINS, ED. "DEMOCRAT."

Paris, tp. of Huron co., Mich. Pop. 891.

Paris, tp. of Kent co., Mich., on the Grand River Valley division of the Michigan Central R. R. Pop. 1543.

Paris, post-v. and tp. of Mecosta co., Mich., on Muskegon River and the Grand Rapids and Indiana R. R.

Paris, post-v. of Jackson tp., cap. of Monroe co., Mo., on the Missouri Kansas and Texas R. R., 125 miles from St. Louis, has a public-school building, 1 bank, 2 newspapers, 6 churches, the county court-house, 3 hotels, and stores. Coal, timber, and water are plenty in the immediate vicinity. Pop. of v. 895.

MASON & BURNETT, EDS. "MERCURY."

Paris, post-v. and tp., Oneida co., N. Y., on Sauquoit Creek and the Utica Chenango and Susquehanna R. R. Pop. 3575.

Paris, tp. of Portage co., O. Pop. 691.

Paris, post-v. and tp., Stark co., O. Pop. 2625.

Paris, tp., Union co., O., on Springfield branch of Cleveland Columbus Cincinnati and Indianapolis R. R. P. 2838.

Paris, post-v., cap. of Henry co., Tenn., on the West Sandy River and the Louisville and Memphis line of the Louisville Nashville and Great Southern R. R., has 1 weekly newspaper. Pop. 1727.

Paris, post-v., cap. of Lamar co., Tex., near Red River, on the Texarkana and Sherman branch of the Texas Pacific R. R., has 3 newspapers, and is a centre of trade for a rich cotton-producing region.

Paris, tp. of Grant co., Wis. Pop. 907.

Paris, post-v. and tp., Kenosha co., Wis. Pop. 1015.

Par'is, a son of Priam, the king of Troy, and Hecuba, carried off Helen, the wife of Menelaus, king of Sparta, thereby bringing on the war between the Greeks and Trojans. By Homer he is described as shrewd but cowardly; in art he is represented as a youthful and handsome man, though somewhat effeminate in appearance. Being wounded during the siege by a poisoned arrow, he d. before the capture of the city.

Paris (JOHN AYRTON), M. D., b. at Cambridge, England, Aug. 7, 1785; graduated in medicine at Caius College 1808; resided some time in London, and several years at Penzance, Cornwall, where he founded the Royal Geological Society of Cornwall; returned to London 1817; lectured on materia medica and the philosophy of medicine; invented the "tamping-bar," an implement coated with copper for the protection of miners from the perils caused by the sparks emitted from iron bars; published, among other works, a *Memoir* of Sir H. Davy (1810), *Pharmacologia, or the History of Medical Substances* (1819), *A Treatise on Diet* (1826), *Philosophy in Sport made Science in Earnest* (3 vols., 1827), *Elements of Medical Chemistry* (1833), and *Medical Jurisprudence* (3 vols., 1823), in which he was aided by J. S. M. Fonblanque; became president of the London College of Physicians 1844, and retained that position until his death, at London, Dec. 24, 1856.

Paris, de (LOUIS PHILIPPE ALBERT D'ORLEANS), COMTE, son of the late duc d'Orleans and grandson of the late king, Louis Philippe, b. at Paris Aug. 24, 1838; was but four years of age when, deprived of a father by the sad accident of July 13, 1842, he became, after the king, the representative of the House of Orleans. Scarcely ten years of age, the revolution of 1848 occurred, when, with his mother and brother (the duc de Chartres), he witnessed the stormy scenes in the French Chamber of Deputies, where, by advice of M. Dupin and Admiral Bardin, the duchess had presented herself. They escaped with difficulty from thence, from Paris, and from France. In 1849 the duchess, who had first repaired to Belgium, rejoined the royal family at Claremont, England, where, under her care and in Germany, his education was conducted. Her death occurred (May 18, 1858) a year before he attained his majority. Travels in Greece, Egypt, and the East occupied the subsequent year or two, and in Aug., 1861, the prince, with his brother, the duc de Chartres, accompanied their uncle, the prince de Joinville, to the U. S. Though anticipating but a few months' sojourn, they did not fail to avail themselves of the opportunity of acquiring experience of war, and, at the same time, of exhibiting sympathy for the great republic in her hour of trial. Their proffer of services (they declining the receipt of pay) was warmly welcomed by the President and secretary of state. They were attached to the personal staff of Gen. McClellan with rank of captain, but free at any moment to relinquish the service and return to Europe. Of the long years of exile from France the count yet speaks of his ten months' service in the army commanded by Gen. McClellan, for whom he formed a strong attachment, and whose abilities as a general he highly esteemed, as the happiest portion. During their short career in the field no opportunity was lost by either of the young officers to serve on detached expeditions, in which, on more than one occasion, they freely exposed themselves. But it was at the bloody and fiercely-contested battle of Gaines's Mill that they most truly received their *baptême de feu*. Attached for the occasion to the staff of Gen. Porter, the captains "Paris" and "Chartres" were to be seen, now conveying orders and now freely exposing their lives in endeavoring to rally and re-form our lines. During the remaining days of the gravely eventful "seven" the services of the young princes were, if less exposed, equally active and efficient. An imperious necessity compelled them, to the regret of all, to return to Europe, leaving as soon as the army reached James River (July 2, 1862). In 1864 the count wedded his cousin, the princess Isabella, eldest daughter of the duc de Montpensier. On his return to England he devoted himself to the study of the condition of the operatives in the great centre of cotton manufacture, then in distress through the "cotton famine." The results of his protracted labors were made known in papers written for periodicals, which were subsequently embodied in a work on the *Workingmen's Associations in England* (*Associations Ouvrières en Angleterre*). Two other publications, *L'Allemagne nouvelle* (1867) and *L'Esprit de Conquête* (1870), show the count in the broader light of a statesman and profound student of the political "signs of the times." Absorbing as such studies must have been to

one standing in the relation of the count to the politics of Europe, they have not excluded devotion to what would seem a yet more laborious work—a great *history*. He has devoted the half score and more of years since he bore the commission of a captain in the service of the U. S. to writing the *History of the Civil War in America* (*Histoire de la Guerre Amérique*). Americans have cause to congratulate themselves that this work has been undertaken by one who, with personal knowledge, is yet a foreigner and at the same time a soldier, a statesman, and a scholar. Vast as were the operations of our civil war, admirable as were the displays of energy and skill in the organization and equipment, the supplying, feeding, and moving of the great armies arrayed, unquestionable as was the development of new and applicable methods of warfare appropriate to the physical characteristics of the country and to the modern improved weapons, our civil war as a theatre of vast military operations has been sadly depreciated in Europe. An appreciative *History* from the pen of the count of Paris finds readers in every court and in every camp in Europe. Since the removal of the ban of exile the count has resided, with his young family (three children have been born to him), in or near Paris.

J. G. Barnard.

Paris (Matthew), b. in England about 1195; became in 1217 a Benedictine monk at the convent of St. Alban's; wrote a continuation of the *Flores Historiarum* of Roger of Wendover, comprising the period from 1235 to 1259, the whole work, known as the *Historia Major*, having formerly been incorrectly ascribed to him; and superintended the preparation of an abridgment of that work, which under the same title of *Flores Historiarum* was ascribed to a supposed author, "Matthew of Westminster," who probably never existed. The difficult questions of authorship and authenticity were solved by Sir Frederick Madden, who published in 1866 the original manuscript of the abridgment, partly in the handwriting of Matthew Paris. The larger work has been translated by Rev. J. A. Giles (5 vols., 1849–54), the smaller by C. D. Yonge in Bohn's "Antiquarian Library" (2 vols., 1853). Nothing is known of the personal history of Matthew Paris beyond a few unimportant references to his own writings, except the fact that he was sent to Norway in 1248 by Pope Innocent IV. as visitor of the Benedictine order. His stay there was brief. D. at St. Alban's soon after May, 1259.

Paris Green, the popular name, in America, of what is correctly designated as "Scheele's green," having been discovered by the great Swedish chemist of that name. It may also be, and in Germany is, called "Swedish green." It is a compound of oxide of copper and arsenious acid, *arsenite of copper*. White arsenic (arsenious acid), by Scheele's original method of preparation, is dissolved by boiling in caustic potash-ley 11 parts of arsenious acid to 32 of solid potash, and added while hot to a hot solution of 32 parts of blue vitriol, sulphate of copper. The precipitate that falls has a very rich, bright, and peculiar tint of green, which is difficult to obtain by other means. It is hence, as well as by reason of the cheapness of this pigment, that it has passed into use all over the world to an extent which may be called enormous, notwithstanding the fact that it is one of the most deadly of poisons. It is used for coloring wall-paper and other ornamental paper, and paper for binding books, and for innumerable other uses. Children are often poisoned to death by chewing such paper, and arsenical disease is still oftener produced by inhaling the dust from arsenical wall-paper. Paris green is now, from the ease with which it is procured, used with increasing frequency for suicidal and homicidal purposes. It is far more than time that its use for common ornamental purposes, at least in articles of household use, should be banished, and its sale (except under the same restrictions that apply, for example, to *strychnine*) should be prohibited, in paint-shops and the like, by the most stringent legislation throughout the civilized world.

H. Wurtz.

Par′ish [Lat. *parochia*], in England, a certain circuit of ground of which one parson or vicar takes spiritual charge, and in which he has a legal right to levy tithes. In the U. S., where tithes never existed as a legal obligation, the word meant, consequently, only the territorial circumscription of the spiritual charge of a minister; and as the diversity of religious opinions developed and congregations were founded only from similarity of religious sentiment, without reference to residence, the word lost also its territorial signification. In the State of Louisiana it is used instead of the word "county."

Parish, post-v. and tp., Oswego co., N. Y., on the Syracuse Northern R. R., has 1 weekly newspaper. Pop. 1929.

Parish (Elijah), D. D., b. at Lebanon, Conn., Nov. 7, 1762; graduated at Dartmouth 1785, and was 1787–1825 pastor of the congregational parish of Byfield, Essex co., Mass., where he d. Oct. 15, 1825. He was a man of decided views, a follower of Hopkins in theology; assisted in the preparation of Morse's *Gazetteer* (1802); wrote a *History of New England* (1809); a *System of Modern Geography* (1810); *Memoir of E. Wheelock* (1811); *Sacred Geography* (1813); *Sermons*, with a *Memoir* (1826).

Parish Grove, tp. of Benton co., Ind. Pop. 193.

Parishville, post-v. and tp., St. Lawrence co., N. Y., on St. Regis River. Pop. of v. 312; of tp. 2241.

Paris Mountain, tp. of Greenville co., S. C. P. 690.

Paris, Plaster of. See Gypsum.

Park, originally a large and enclosed tract of ground, partly covered with forest, generally situated close to the mansion, and kept for the preservation of game. As this purpose required certain conditions of the ground, such as a running stream, diversity of dense woods, and open glades with greensward for pasturing, etc., and as the presence of deer on the ground and their browsing on the young trees imparted a certain character to the woods, the words "park" and "park-like" came to denote a peculiar æsthetical character of the landscape, in the same manner as "alpine," etc. At present the word is used in the U. S. to signify any kind of public ground laid out and cultivated for the sole purpose of pleasure and recreation, without any regard to the size and situation of the ground or the style of the arrangement. Parks, in this sense of the word, have been formed, or are now forming, in all large cities in Europe and America, and are mentioned in the respective articles on those cities; a special article is given on Central Park, New York (which see).

Park, county of Central Colorado, embracing the larger part of the South Park, with its surrounding territory. It is bounded N. and W. by the main range of the Rocky Mountains. It abounds in timber, good lignite, salt, and silver ore. The scenery is grand and the soil of the park fertile. Cap. Fairplay. Pop. 447.

Park, tp. of Scott co., Ark. Pop. 495.

Park, tp. of St. Joseph co., Mich., on Kalamazoo division of Grand Rapids and Indiana R. R. Pop. 1274.

Park (Calvin), D. D., b. at Northbridge, Mass., Sept. 11, 1774; graduated at Brown University 1797; was tutor and professor there 1804–25; Congregational pastor at Stoughton, Mass., 1826–40, where he d. Jan. 5, 1847. Was the father of Prof. E. A. Park.

Park (Edwards Amasa), D. D., b. at Providence, R. I., Dec. 29, 1808; graduated at Brown University 1826, and at Andover Seminary 1831; became in 1831 Congregational pastor at Braintree, Mass.; was 1835–36 professor of moral and intellectual philosophy in Amherst College; held the Bartlet professorship of sacred rhetoric in Andover Theological Seminary 1836–47, and in the latter year became Abbot professor of sacred theology in the same institution; in 1869–70 travelled extensively in Europe and the East; has long been one of the principal editors of the *Bibliotheca Sacra;* author of *Lives* of Hopkins (1852), Emmons (1861), B. B. Edwards (1853), W. B. Homer (1849), (prefixed respectively to editions of their writings); a *Life* of S. H. Taylor; *Discourses and Treatises on the Atonement* (1859), besides numerous published discourses, sermons, essays, reviews, and theological papers; is also an able preacher and distinguished for valuable labors as a hymnologist.

Park (John), b. at Windham, N. H., Jan. 7, 1775; graduated at Dartmouth 1791; became an instructor; studied medicine, and was 1797–1801 a U. S. navy surgeon; edited a Federalist journal at Boston, Mass., 1803–11, and was afterwards for twenty years the successful conductor of a school for young ladies. Published the *Boston Spectator* 1814. D. at Worcester, Mass., Mar. 2, 1852.

Park (Mungo), b. at Fowlshiels, Selkirkshire, Scotland, Sept. 10, 1771; studied surgery at Edinburgh, and was 1792–93 assistant surgeon on the Worcester Indiaman, under the patronage of Sir Joseph Banks; journeyed up the Gambia and visited the Niger 1795–97, suffering extreme hardships; settled as a surgeon in Scotland; took command in Jan., 1805, of a small military exploring party despatched by the African Association and the British government to trace the course of the Niger. Most of his party died of fever, and before the Niger was reached only five white men were left out of 44. The party set sail down the river from Bammako at first in two canoes, but soon built for themselves a little schooner, with which they descended the Niger some 1500 miles, when they were treacherously attacked by a large party of natives, and Park and all his company perished in the at-

tempt to escape by swimming. A narrative of Park's first African journey and fragmentary accounts of the second have been published.

Park (Roswell), D. D., b. at Lebanon, Conn., Oct. 1, 1807; graduated at Union College and at West Point July, 1831, and until Sept., 1836, served as a lieutenant of engineers; was professor of natural philosophy and chemistry in the University of Pennsylvania 1836–42; took orders in the Protestant Episcopal Church 1843; was an instructor in Connecticut 1846–52; president of Racine College 1852–59; chancellor of the same 1859–63; founded in 1863 a school at Chicago. D. at Chicago, Ill., July 16, 1869. Author of *Pantology* (1841), *Sketch of West Point* (1840), a *Handbook* for European travel (1853), and a volume of original, translated, and selected poems.

Park (Trenor William) was b. in Woodford, Bennington co., Vt., Dec. 8, 1823; received a liberal education, studied law, and was admitted to the bar in Dec., 1846; practised law in Vermont till 1852, when he removed to San Francisco, where he remained till 1863. Returning to Vermont in 1864, he served four years in the legislature of that State. He is president of the Panama Railroad Company, president of the First National Bank at North Bennington, Vt., and a director in several banks and railroad companies in New York. J. B. Bishop.

Parke, county in the W. of Indiana, bounded W. by Wabash River. Area, 440 square miles. It is generally very fertile and abounds in good coal. Live-stock, grain, and wool are leading products. The county is traversed by the Logansport Crawfordsville and South-western R. R. Cap. Rockville. Pop. 18,166.

Parke (John), b. in Delaware about 1750; studied at the University of Pennsylvania; was assistant quartermaster-general in the Revolutionary army, and published at Philadelphia in 1786 a curious work, *The Lyric Works of Horace, translated into English Verse, to which are added a number of Original Poems by a Native of America.*

Parke (John G.), b. near Coatesville, Pa., Sept. 22, 1827; graduated from the U. S. Military Academy July 1, 1849, when he was appointed brevet second lieutenant topographical engineers, serving on duty with his corps until the outbreak of the war in 1861, for many years as chief astronomer and surveyor in locating the N. W. boundary. Appointed brigadier-general of volunteers Nov., 1861, he accompanied Burnside to North Carolina, participating in the various engagements of that expedition, including the capture of Fort Macon, where he was in command; promoted to be major-general Aug., 1862, he served as chief of staff of the 9th corps in the battles of South Mountain and Antietam, and on Gen. Burnside's succeeding to the command of the Army of the Potomac was retained by the latter as his chief of staff, participating in the battle of Fredericksburg; was in command of the 9th corps during its march to Vicksburg, and for a time of left wing of Gen. Sherman's army; in command of a division of the 9th corps on Gen. Burnside's reassuming command, and engaged in Tennessee in siege of Knoxville, etc.; and in Richmond campaign of 1864, again attaining command of the 9th corps before Petersburg (Aug., 1864), which he retained through subsequent operations, terminating in the surrender of Lee's army at Appomattox Court-house. In 1864 he became a major of the corps of engineers, and for several years has had charge of a division in the office of the chief of engineers.

Parke Bar, tp. of Yuba co., Cal. Pop. 250.

Park'er, county of N. Texas, traversed by the Brazos River. Area, 900 square miles. It is fertile and adapted to wheat, cotton, fruit, and corn culture. Timber is quite abundant. Coal is found at several points. Cap. Weatherford. Pop. 4186.

Parker, tp. of Clark co., Ill. Pop. 863.

Parker, post-v. and tp., Montgomery co., Kan., on the Leavenworth Lawrence and Galveston R. R. Pop. 474.

Parker, tp. of Morris co., Kan., on the Neosho River and Missouri Kansas and Texas R. R. Newly organized.

Parker, post-v. and tp., Butler co., Pa., on the Allegheny Valley R. R. Pop. 1309.

Parker (Amasa J.), LL.D., b. at Sharon, Conn., June 2, 1807; removed in 1816 to Greenville, N. Y.; was principal of Hudson Academy 1823; graduated in 1825 at Union College; came to the bar in 1828, and became a law-partner of his uncle, Amasa Parker, of Delhi, N. Y.; entered the legislature in 1833; was chosen a regent of the university 1835; was in Congress 1837–39; became in 1844 vice-chancellor of New York, a circuit judge, and afterwards a judge of the State supreme court; in 1859 was appointed U. S. district attorney; published 6 vols. of law reports (1855–69), and assisted in the preparation of the *Revised Statutes* of 1859 (3 vols.); was one of the editors of the third edition of Judge Tapping Reeve's *Law of Baron and Feme*, etc.

Parker (Edward Griffin), b. at Boston, Mass., Nov. 16, 1825; graduated at Yale in 1847; became in 1849 a lawyer in Boston, and in 1857 political editor of the *Boston Traveller;* served as captain and aide-de-camp to Gen. Butler 1861; in 1862 became assistant adjutant-general, and was afterwards chief of staff to Gen. Martindale; took charge of a literary bureau of reference in New York after the war. D. at New York Mar. 30, 1868. Author of *Golden Age of American Oratory* (1857), *Reminiscences of Rufus Choate* (1860), etc.

Parker (Gen. Ely S.), b. at Tonawanda, N. Y., about 1825, on the reservation of the Seneca Indians, of whom he was one; received a good education at Rochester and other cities; became a civil engineer; rendered aid to Lewis H. Morgan in his work on the *League of the Iroquois;* resided for a time at Galena, Ill., where he made the acquaintance of U. S. Grant; took part in the civil war as a member of Gen. Grant's staff, reaching the rank of brevet brigadier-general; was one of the secretaries of Grant as general of the army; became commissioner of Indian affairs (1869), and retired from that office 1872 to devote himself to his profession.

Parker (Commodore Foxhall A.), son of Capt. F. A. Parker, U. S. N., b. in New York City Aug. 5, 1821; was appointed a midshipman in the U. S. navy Mar. 11, 1837; graduated from the Naval School at Philadelphia June 3, 1843; served against the Florida Indians, on the Coast Survey, and in the Mediterranean squadron; was commissioned lieutenant Sept. 21, 1850; served at the Washington navy-yard as executive officer 1861–62; co-operated with the Army of the Potomac on several occasions in command of seamen (with howitzers); on garrison-duty at Fort Ellsworth (commanding marines) and in building Fort Dahlgren; drilled some 2000 seamen in the exercise of artillery and small-arms, thereby promoting in no small degree the success of Admiral Foote's operations with the Mississippi flotilla; was promoted to commander July 16, 1862; commanded the steam-gunboat Mahaska (1862–63) in active service off Wilmington and Yorktown; commanded the Wabash off Charleston June to Sept., 1863, most of which time was spent on Morris Island in charge of a naval battery co-operating in the reduction of Fort Sumter; commanded the Potomac flotilla, consisting at one time of 42 vessels, from Dec., 1863, until the close of the war, being frequently engaged with the enemy; has since commanded vessels on several stations; was promoted to captain, "for good service during the rebellion," July, 1866; was chief of staff to the North Atlantic fleet 1872; ordered to special duty at Washington Aug. 7, 1872, to draw up a code of signals for steam tactics, and appointed chief signal-officer of the navy July 1, 1873, which position he still (1876) holds. In 1863 he prepared, by order of the navy department, systems of *Fleet Tactics under Steam* and *Squadron Tactics under Steam;* in 1865, *The Naval Howitzer Afloat;* and in 1866, *The Naval Howitzer Ashore;* all of which works are textbooks at the Naval Academy; was for many years a contributor to the *Knickerbocker Magazine;* published in 1866 a volume, translated from the Spanish, *Elia, or Spain Fifty Years Ago;* and was one of the founders of the U. S. Naval Institute, organized Oct. 9, 1873, at Annapolis, "for the advancement of professional and scientific knowledge in the navy." In Dec., 1874, Com. Parker was appointed chief of staff of the united fleets under command of Admiral Case which were assembled for instruction in tactics in the Florida waters.

Parker (James), b. at Bethlehem, N. J., Mar. 3, 1776; graduated at Columbia College 1793; inherited immense landed estates; was a member of the New Jersey legislature for many years; was a member of Congress 1833–37; member of the State constitutional convention 1844; president of the State Historical Society; gave to Rutgers College the land upon which its buildings were erected. D. at Perth Amboy Apr. 1, 1868.

Parker (Joel), LL.D., b. at Jaffrey, N. H., Jan. 25, 1795; graduated at Dartmouth 1811; became in 1815 a lawyer at Keene, N. H.; a judge of the New Hampshire supreme court 1833; chief-justice 1838; in 1840 chairman of a committee to revise the laws of the State; was in 1847 a law-professor in Harvard University. D. at Cambridge Aug. 17, 1875. Author of treatises and pamphlets on *The Three Powers of Government* (1867–69), *Non-extension of Slavery* (1856), *Personal Liberty Laws* (1861), *The Right of Secession* (1861), *Constitutional Law* (1862), *War-powers of Congress and the President* (1863), *Revolution and Reconstruction* (1866), *Conflict of Decisions* (1871), besides law reports, essays, addresses, lectures, etc.

Parker (Joel), D. D., b. at Bethel, Vt., Aug. 27, 1799; graduated at Hamilton College 1824; was ordained 1826; held pastorates in Rochester, N. Y., New Orleans, Philadelphia, and Newark, but principally in New York City; was president of the Union Theological Seminary and professor of sacred literature 1840–42, and for a time associate editor of the *Presbyterian Quarterly Review*. D. at New York May 2, 1873. Author of popular religious volumes.

Parker (Joel), LL.D., b. at Monmouth, N. J., Nov. 24, 1816; graduated at Princeton College in 1839; studied law, and was admitted to the bar in 1842; was elected to the State legislature in 1847; subsequently was county attorney. Upon the breaking out of the civil war he was made major-general of volunteers, and in 1862 was elected governor of New Jersey for three years, and again elected in 1871. In the national Democratic convention of 1876 he was among those prominently named as a possible nominee for the Presidency of the U. S., but on the actual ballot but few votes were cast for him.

Parker (Matthew), D. D., b. at Norwich, England, Aug. 6, 1504; educated at Corpus Christi College, Cambridge; took priests' orders 1527, and the same year M. A. and fellow of his college; chaplain to Anne Boleyn 1533; dean of Stoke Clare College, Suffolk, 1535; chaplain to Henry VIII. 1537; prebendary of Ely 1541; master of Corpus Christi College 1544; dean of Lincoln 1552; was deprived by Queen Mary 1553 for having married; appointed archbishop of Canterbury in 1559 through the influence of Nicholas Bacon and Cecil, for Queen Elizabeth was at that time violently opposed to the marriage of the clergy. The Bishops' Bible was printed at his expense. Later he became an enemy of conventicles and of the nonconforming spirit. He published Anglo-Saxon and other early English chronicles, and collected a valuable library, which he bequeathed to Corpus Christi College, Cambridge. D. May 17, 1575. The "Parker Society," named in his honor, published from 1841 to 1855 a series of 55 volumes of English ecclesiastical writings of the Elizabethan age.

Parker (Peter), M. D., b. at Framingham, Mass., June 18, 1804; graduated at Yale College 1831; studied theology and medicine at New Haven; went to Canton, China, as a missionary 1834; established a hospital, in which more than 2000 patients were treated the first year; had great success both in surgery and medicine, and trained many Chinese students; visited the Loo-Choo Islands and Japan 1837; returned to the U. S. 1840–42; became interpreter and secretary of legation to the American mission in China 1845, retaining charge of the hospital; acted as chargé d'affaires during the absence of the minister; again visited the U. S. 1855, but went to China the same year as commissioner with power to revise the treaty; finally returned to America 1857, since which time he has resided at Washington, D. C.; has been a regent of the Smithsonian Institution, and has filled other honorable scientific posts.

Parker (Richard Green), son of Bishop Samuel Parker, b. at Boston, Mass., 1798; graduated at Harvard 1817. Author of a popular series of school-books, part of which were prepared by him and J. M. Watson.

Parker (Samuel), D. D., b. at Portsmouth, N. H., Aug. 28, 1744; graduated at Harvard 1764; was an instructor for nine years; ordained to the Anglican ministry 1774 by the bishop of London; until 1779 assistant minister, and then rector, of Trinity church, Boston; in 1804 consecrated bishop of the Protestant Episcopal Church for the diocese of Massachusetts. D. Dec. 6, 1804.

Parker (Theodore), b. at Lexington, Mass., Aug. 24, 1810; was a grandson of Capt. John Parker, who commanded the company of minutemen fired on by British troops at Lexington Apr. 19, 1775; was distinguished in childhood for a precocious memory, learning by heart and retaining many pages of poetry, and knowing at ten years of age the names of all the trees and plants familiar to Massachusetts; studied Latin, Greek, and mental philosophy while working on the farm or in the tool-shop; taught school at the age of seventeen; studied at Lexington Academy; entered Harvard College 1830, but did not pursue the regular course, being obliged to carry on his studies at home and teach private classes at Boston and Watertown; became a proficient in many languages, including Syriac, Arabic, Danish, Swedish, Anglo-Saxon, and modern Greek; entered the Cambridge Divinity School 1834, graduating 1836; was settled at West Roxbury as pastor of the Second (Unitarian) church June, 1837; soon arrived at religious views widely differing from those of conservative Unitarians, and became the leader of a school of theology which rejected as unhistorical many portions of the canonical Scriptures, renounced all belief in the supernatural, and exercised great freedom in the definition of the Christianity which it continued to profess; laid down the principles of his new transcendental system in a series of five lectures delivered at Boston in the autumn of 1841, published under the title *A Discourse of Matters Pertaining to Religion* (1842); followed in the autumn of 1842 by a series of six *Sermons for the Times*; wrote articles in the *Dial*; published a volume of *Critical and Miscellaneous Writings* (1843), and a translation of De Wette's *Introduction to the Old Testament* (2 vols., 1843); spent nearly two years (1843–44) travelling in Europe, during which time his theology acquired a more exact form, chiefly the result of a careful study of German authorities in biblical criticism; returned to Boston in the autumn of 1844, when a controversy grew warm within the Unitarian denomination, arising from the act of several pastors of churches at Boston, who admitted him to their pulpits. As the result, Mr. Parker established an organization at Boston known as the "Twenty-eighth Congregational Society" (1846), which worshipped at the Melodeon, and subsequently for many years at the Music Hall, where his audiences were large and his teachings embraced a wide scope of subjects; founded and edited for three years the *Massachusetts Quarterly*; was earnestly opposed to the Mexican war, to slavery, and intemperance; was indicted in the U. S. court (June, 1854) for resistance to the Fugitive Slave Law in the case of Anthony Burns, the offence being an address at Faneuil Hall, but was never brought to trial; published several volumes of speeches, addresses, and sermons, and many single sermons, most of which enjoyed a wide circulation; suffered ill-health for several years, but continued preaching until Jan., 1859, when he was prostrated by an attack of bleeding at the lungs; visited the West Indies Feb., 1859, where he wrote a small work entitled *Theodore Parker's Experience as a Minister;* proceeded thence to Europe; resided successively in Switzerland and at Rome 1860, obtaining no relief. D. at Florence, Italy, May 10, 1860, and was buried in the Protestant cemetery outside the walls. He bequeathed a fine library of 13,000 volumes to the Boston Public Library. His complete works were edited by Frances Power Cobbe (12 vols., London, 1863–65) and by H. B. Fuller (10 vols., Boston, 1870); his *Life and Correspondence* was published by Rev. John Weiss (2 vols., New York, 1864), and his *Life* by Rev. O. B. Frothingham (New York, 1874). A French compendium, entitled *Théodore Parker, sa Vie et ses Œuvres* (1865), was prepared by Rev. Albert Réville. (See also *Sermons on Theodore Parker* (1860) and *Theodore Parker—In Memoriam*, Dec., 1860.) Several volumes of extracts from Parker's writings have been published, and a considerable quantity of miscellaneous addresses and other productions remain unpublished. Revised by O. B. Frothingham.

Parker (Thomas), b. in England June 8, 1595; studied at Oxford, in Ireland under Archbishop Usher, and at Leyden; became pastor of a church at Newbury, England; came to Massachusetts in May, 1634; preached a year at Ipswich, then began the settlement of Newbury, Mass., 1635; published several theological treatises, two of which were in Latin, and edited the *Works* of the Puritan divine Dr. Ames. A bitter controversy on church government was carried on for several years within his church, but he remained its pastor until his death, Apr. 24, 1677.

Parker (Willard), M. D., LL.D., b. at Lyndeborough, Hillsborough co., N. H., Sept. 2, 1800; graduated at Harvard 1826; studied medicine and surgery under Prof. John C. Warren; became professor of anatomy in the Vermont Medical College, and also in that of Berkshire 1830; professor of surgery in the latter institution 1833, and at Cincinnati 1836; spent some time in the hospitals of Paris and London; was for thirty years (1839–69) professor of surgery in the New York College of Physicians and Surgeons, after which he exchanged into the chair of clinical surgery, which he still (1876) retains. In 1854 he first described and reported cases of what is now known as "malignant pustule." Dr. Parker became president of the New York State Inebriate Asylum at Binghamton in 1865; was the first to call attention to the phenomena of concussion of the nerves as distinguished from that of the nerve-centres, formerly erroneously considered identical with a state of inflammation, and has made several important discoveries in practical surgery, including the operation of cystotomy for the relief of chronic cystitis, and that for the cure of abscess of the "appendix vermiformis."

Park'ers, tp. of Escambia co., Ala. Pop. 967.

Park'ersburg, p.-v. of Butler co., Ia., 18 miles W. of Cedar Falls, has 1 bank, 1 newspaper, 2 hotels. Pop. about 600. Dodge & Savage, Eds. "Eclipse."

Parkersburg, city, cap. of Wood co., West Va., on the Ohio River, at the mouth of the Little Kanawha, is the W. terminus of the Parkersburg branch of the Baltimore and Ohio R. R., has a fine railway bridge over the Ohio, possesses great facilities for manufactures and coal-refining, is the second city in the State, both in population and in

trade, is regularly laid out, has a court-house, market-house, several academies, 10 churches, 3 national banks, 3 foundries, a building for a post-office and U. S. court-house in course of erection, has several lines of steamers on the Ohio and the Little Kanawha, many mills and factories, and 2 daily and 3 weekly newspapers. Pop. 5546.

Parker's Landing, post-v. of Armstrong co., Pa., on the Allegheny River and R. R.

Parkersville, post-v. of Parker tp., Morris co., Kan.

Parkesburg, post-b. of Chester co., Pa., on the Pennsylvania R. R., 48 miles W. of Philadelphia, has a graded school, an academy, 1 bank, 3 warehouses, a steam flouring-mill, 1 newspaper, and a monthly magazine, several hotels, and stores. Pop. about 500.

A. H. Potts, Ed. "American Stock Journal."

Parkes'ine [named from Mr. Parkes, an Englishman, its inventor], a substitute for vulcanized India-rubber and for gutta percha, was originally a compound of castor oil and gun-cotton, but it is understood that by a secret process as good or better results can be obtained from much cheaper materials. It is claimed that it is cheaper and better than vulcanite or gutta-percha for all the purposes for which they are used, and is useful for many purposes where they cannot be employed.

Park Hill, post-v. of Middlesex co., Ontario, Canada, on the Grand Trunk Railway, 40 miles from Sarnia, has a great trade in grain, provisions, and lumber, and has 2 weekly newspapers. Pop. about 1000.

Park'inson (John), known by the fantastic name of **Paradisus in Sole** (Park-in-sun), b. in London in 1567; was apothecary to James I. and *botanicus regius primarius* to Charles I. Author of *Paradisus Terrestris* (1629–56) and *Theatrum Botanicum* (1640). He is one of the best of the old herbalists, and is commemorated by Plumier's genus *Parkinsonia*, order Leguminosæ. The year of his death is not known.

Park'man, p.-v. and tp., Piscataquis co., Me. P. 1105.

Parkman, post-v. and tp., Geauga co., O. Pop. 953.

Park'man (Francis), D. D., b. at Boston, Mass., June 4, 1788; graduated at Harvard 1807; studied divinity with W. E. Channing and in Edinburgh; was 1813–49 pastor of the New North church, Boston (Unitarian). D. at Boston Nov. 12, 1852. Author of *The Offering of Sympathy* (1829); founder of the Parkman professorship of pulpit eloquence in the Cambridge Divinity School, and an active laborer in public and private charities.

Parkman (Francis, Jr.), b. in Boston, Mass., Sept. 16, 1823; graduated at Harvard 1844; travelled in the far West and in Europe, and in spite of a severe chronic disease, accompanied by partial blindness, has attained a high rank as an historian and writer. His principal work is *France and England in North America*, of which the following parts have appeared: *History of the Conspiracy of Pontiac* (1851), *Pioneers of France* (1865), *The Discovery of the Great West* (1869), *The Jesuits in North America* (1867)—a work of great candor and fairness, written in graphic and unambitious style, and displaying faithful research. He has also written *The California and Oregon Trail* (1849) and *Vassal Morton*, a novel (1856).

Park's Fork, tp. of Trego co., Kan. Pop. 34.

Parksville, post-v. of Boyle co., Ky., on the Knoxville branch of the Louisville and Nashville R. R. P. 173.

Parksville, tp. of Perquimans co., N. C. Pop. 1293.

Park Valley, tp. of Box Elder co., Ut. Pop. 70.

Parkville, post-v. of Platte co., Mo., on the E. bank of Missouri River and the Kansas City St. Joseph and Council Bluffs R. R., 5 miles from Kansas City.

Park-way, a recently-formed word, corresponding to the French *boulevard*, and denoting a street of extraordinary width planted with rows or groups of trees and shrubbery, and affording at once a thoroughfare and a promenade.

Parlato're (Filippo), b. at Palermo in 1816; is director of the Museum of Physical and Natural Sciences in Florence, where he also teaches botany. Having practised extensively during the cholera at Palermo in 1837, he published a pamphlet on that disease. In 1840 he left Sicily for Paris, where he published his *Plantæ Novæ*, etc. His botanical publications are numerous; among them *Lezioni di Botanica Comparata; Ricerche sull' Anatomia delle Piante Aquatiche; Viaggio al Gran San Bernardo* (Florence, 1849); *Viaggio al Nord dell' Europa* (Florence, 1859); *Flora Palermitana; Flora Italiana*, etc.

Parl'iament, Brit'ish. The origin of parliamentary government in England, like that of many other British institutions, is involved in much obscurity. There can, however, be no doubt that alike in Saxon and Norman times the English people had always some share in making the laws whereby they were governed. The Witenagemote (or assembly of the wise) of the Saxon period, and the Parliament (or free-speaking council), which is traceable both in etymology and function to Norman influence, were at once the outgrowth and the guardians of popular rights and liberties. It is true that the earlier councils and assemblies have left no record of their proceedings, and probably they met at irregular intervals, being in some measure dependent on the caprice or necessities of the monarch. The taxes and crown levies could only be raised through the sanction of the people themselves; and it is one of the oldest as well as one of the most imperishable traditions of British government that there ought to be no taxation without representation. Successive sovereigns after the Conquest (1066) had encroached upon popular prerogative, until, in the reign of King John, the evil culminated in practical absolutism on the part of the Crown. The result was a violent recoil and a resolute demand for the restoration of baronial and popular rights, which led to the signing of Magna Charta on the field of Runnymede (1215). The Great Charter of King John is the oldest constitutional document extant in England. Among other provisions for securing general liberty, the king pledged himself to summon the superior clergy, nobles, and commons to meet at a certain place, with forty days' notice, "to assess aids and scutages when necessary." The Great Charter contained no new idea touching rights and liberties, every one of its clauses embodying an English tradition. In truth, it was only a revival of the British constitution; and the provision for calling a parliament whenever money was wanted was one of the first principles of ancient English politics. Little is known of the manner in which the pledges of the sovereign were kept for half a century after the signing of Magna Charta, but writs are still extant which were issued in the reign of Henry III. (1265), summoning the knights, citizens, and burgesses to meet in parliament. The government was even more democratic during the Middle Ages than it subsequently became, for the nobles and commons met in the same chamber, debating and voting promiscuously. Historians have failed to discover the date at which the legislature was separated into two chambers, but the present arrangement was in force during the fifteenth century. Numerous changes, sometimes violent and at other times mild and gradual, have been made in the machinery of English parliamentary government during 600 years, but certain great principles have survived all these transmutations. It will be more convenient and tend to perspicuity if we interweave historical references with our analysis of Parliament as it exists at the present time, and if we also classify under separate heads the subjects which must come under consideration. These are, (I.) its constituents, (II.) its powers, and (III.) its forms.

I. *Of what does Parliament consist?*—The imperial Parliament consists of the queen, the lords, and the commons. The three estates of the realm are the lords spiritual, the lords temporal, and the commons. The sovereign is the executive authority, and is charged with the duty of enforcing the will of Parliament; but in the matter of legislation the sovereign is no more than a constituent part of Parliament, acting in conjunction with the three estates of the realm. In ordinary times there can be no meeting of Parliament unless the monarch is present at the opening of it, either in person or by commissioners. We say "in ordinary times," for there have been exceptions to this rule. The Convention Parliament which restored Charles II. could not, in the nature of things, satisfy the above condition, but proceeded to do a supreme parliamentary act without any summons or sanction from the sovereign. Though Charles held himself to be king *de jure* before Parliament restored him, still he was sagacious enough not to insist upon his sovereign rights, which at the time a majority of the English people would have questioned. The self-constituted Parliament sat several months after the Restoration, and enacted laws which are still recognized as binding by English tribunals. Lest, however, the authority of this assembly should be questioned by the judges, an act was passed after the return of Charles, and to which the king placed his signature, confirming all that it had done. Such a precaution was generally held by lawyers to be superfluous, as the convention acted *ex necessitate rei*. Another departure from the rule laid down above occurred in 1688, when the two houses of Parliament met on the summons of the prince of Orange and proceeded to dispose of the crown itself. But the events of that period constitute, by universal consent, a revolution. At the same time, it is worthy of observation that even in disposing of the crown and kingdom by revolutionary force the English people have always kept as close to constitutional tradition

as circumstances would permit. The present sovereign has opened Parliament in person only once since the death of the prince consort in 1861.

The House of Lords is constituted as follows:

Lords Spiritual.	
Archbishops (Canterbury and York)	2
English bishops	24
Lords Temporal.	
Peers of the blood royal	5
Dukes	21
Marquises	18
Earls	111
Viscounts	24
Barons	242
Scotch representative peers	16
Irish representative peers	28
Total	491

Four Irish prelates sat in the House of Lords until 1869, when they became disqualified to sit, under the provisions of the act for disestablishing the Irish Church. The last consecrated of the 25 diocesan English prelates, provided he holds one of the inferior sees, has no seat in the House of Lords, and the same disability applies to suffragan and coadjutor bishops. A bishop is not a peer, but is only a lord of Parliament in virtue of holding an imaginary barony under the queen. In latter days there has been a steady diminution in the number of marquises, earls, and viscounts, but more than a corresponding increase in the number of barons. The creation of peerages is vested unreservedly in the Crown, and it is well known that the House of Lords consented to the passing of the Reform Bill in 1832 because the king had given his consent to the creation of as many new peers as would have served to outvote the opponents of the bill. All peerages are hereditary, the House of Lords having decided that a life-peer cannot, as one of their number, discharge any legislative functions. The question was raised in 1858, when the queen conferred on Sir James Parke a peerage "for and during the term of his natural life," under the title of Baron Wensleydale. Acting on the report of a committee, the House of Lords decided that it was not competent for him to take his seat in Parliament with such a patent of nobility. The Scotch representative peers are elected for one Parliament, the electors being those Scotch peers whose titles are older than the union with Scotland. The Irish representative peers sit for life, and are elected by the whole body of Irish peers, no matter from what period their titles date. The queen at present can only create one Irish peerage for every three which become extinct. As there is a feeling that an Irish peer who is not a lord of Parliament is a political anomaly, the House of Lords has recently requested Her Majesty to forego her right to issue patents of nobility of this class, and the queen has signified her willingness to hold in abeyance that part of her prerogative. Of the 491 peers enumerated above twelve are minors, who cannot sit till they attain their majority.

The House of Commons is constituted as follows:

England and Wales.		
53 counties return	187	members.
198 cities and boroughs	297	"
3 universities	5	"
Scotland.		
33 counties	32	"
7 cities and towns	11	"
15 districts of burghs	15	"
4 universities	2	"
Ireland.		
32 counties	64	"
31 cities and boroughs	37	"
1 university	2	"
Total	652	"

The full complement of members is 658, but two boroughs in England, returning four members, and two in Ireland, returning two members, have been recently disfranchised for bribery. The seats thus vacated wait a redistribution of political power. The constituencies of the United Kingdom have a wide range of choice in selecting their representatives, but nevertheless they are under a variety of restrictions. Certain persons are disqualified to sit in Parliament. Minors, lunatics, outlaws, and aliens are excluded; so also are the common-law judges, the clergy of the Established churches of England and Scotland, and Roman Catholic priests; likewise pensioners under the Crown during pleasure or for a term of years, contractors with government, members of the India council, and peers of Parliament. By the act of 1858 property qualification has been abolished. Prior to that date an estate of £600 a year was requisite in England and Ireland to qualify for a county, and £300 a year for a borough, except in the case of the eldest sons of peers and bishops. In Scotland and for the universities no property qualification was ever necessary. A member of the House of Commons cannot resign his seat; but if he accept any office of profit under the Crown, his seat is vacated *ipso facto*. When a member wishes to be relieved from parliamentary duties, he accepts the stewardship of the Chiltern Hundreds, an office of great antiquity, which is now a complete sinecure, and which has a merely nominal salary attached to it. Being, however, a place of *profit*, it furnishes a convenient back-door for wearied senators to make their escape into the retirement of private life. Members of the House of Commons are now elected by secret ballot in all the constituencies of the United Kingdom, with the exception of the universities. No religious test whatsoever is imposed upon members, the only oath taken by them being the oath of allegiance. Previous to 1858, Jews were incapacitated to sit on account of the oath including the words "on the true faith of a Christian." To illustrate the freedom from religious tests enjoyed by British legislators, it may be mentioned that the present House of Commons contains 475 Protestant Episcopalians, 53 Orthodox Presbyterians, 47 Roman Catholics, 16 Unitarians, 15 Congregationalists, 11 Wesleyan Methodists, 6 Jews, 4 Quakers, 4 Baptists, 1 Greek, and 20 unknown or doubtful, one or two of the last class being commonly called Secularists.

II. *The Powers of Parliament.*—The House of Lords has two functions, the legislative and the judicial. In legislation it acts in concert with the queen and the Commons, the assent of all three being necessary to give validity to a bill, which then becomes an act of Parliament. Practically, the law-lords alone sit in a judicial capacity, though every peer has a legal right to take part in trying appeals. The criminal cases which come before the House of Lords are those in which a person is impeached by the Commons, or those in which a true bill has been found by a grand jury against a peer of the realm. Peers can no longer vote by proxy in any case. Every peer, when dissatisfied with a decision of the house, has a right, with leave, to enter a protest on the journals. When sitting in his judicial capacity, he gives judgment on his honor, and not on his oath; but when summoned as a witness in any cause, he must be sworn. All bills affecting the rights and privileges of peers must originate with the House of Lords, and they may not be amended, but may be rejected by the Commons. The House of Commons is vested with the right of imposing taxes and voting money for the public service. Until 1867 the Commons decided for themselves all questions touching the election of members, but since that date election-petitions are tried by the common-law judges. Both branches of the legislature have certain privileges and powers for the protection of their own dignity, independence, and honor. At the commencement of every Parliament the Speaker of the House of Commons claims for the members, in presence of the queen or her commissioners, freedom of speech and that the best construction shall be placed on all their words. To publish the debates of the House is a breach of privilege, but this rule has long been disregarded, though peccant publishers may still be summoned to the bar of the house to answer for their contumacy. Strangers are admitted to the house, but are not "seen" by the Speaker. Until lately, whenever a member called the Speaker's attention to the presence of strangers he immediately ordered the sergeant-at-arms to clear the House. During the last session of Parliament strangers were thus "espied" in the gallery, the prince of Wales being one of the number. The Speaker's attention being called to the fact, he had no alternative but to eject all, including the heir to the throne. The incident led to a modification in the rules of procedure, and the law now is, when strangers are "seen," a vote is taken at once, without debate, whether they shall be ordered to withdraw or not. Ladies are not admitted within the house, but a clumsy evasion of this rule is effected by permitting them to sit in a gallery behind a grating, whence they can see and hear without being seen themselves. These regulations, however, are of small account when compared with the vast prerogatives which Parliament claims as a legislature and as the grand inquest of the nation. It makes and unmakes laws, and is, in fact, superior to all human law; for in the constitution of the United Kingdom despotic power lies in Parliament, there being no remedy for that which Parliament does wrong except in the same or another Parliament, summoned by the Crown and elected by the people. Any grievance which defies the ordinary remedies of law can be redressed by Parliament. It can determine the succession to the throne, and has done it. It can alter the established religion of the country, and can abolish an established Church altogether, as it has done recently in the case of Ireland. It can amend its own constitution, and can say how long a Parliament shall last. At present members are elected for seven years, but there was a time when each Parliament lasted only three years. It was a saying of Cecil

that "England could only be ruined by a Parliament." That ruin could be brought about if it violated the fundamental maxims of its own constitution. One of these is that the people, whom it professes to represent, can only be taxed with their own consent. By attempting to defy this maxim in the case of the American colonies in the reign of George III. a rupture of the empire was brought about, and a colony of England became an independent commonwealth.

III. *The Forms of Parliament.*—Parliament assembles on the summons of the sovereign; and although the law provides that not more than an interval of three years shall elapse from the dissolution of one Parliament to the assembling of the next, the practice of voting money for the public service annually has rendered this statute superfluous, as the government could not be carried on without an annual meeting of the House of Commons. Should the sovereign die between the dissolution of a Parliament and the issuing of writs for a new election, the old Parliament revives, and may continue to sit for a period not exceeding six months. At the beginning of each session the queen states her reasons for convening the Lords and Commons, and gives an outline of the legislation contemplated by her ministers. This statement is known as "the speech from the throne," and is either delivered personally or by commissioners. Adjournment is decided by each house for itself, but prorogation and dissolution are the sole acts of the sovereign. Prior to the reign of William and Mary the sovereign determined the duration of a Parliament. By the triennial act (William and Mary) the duration was limited to three years, and by the septennial act (George I.), still in force, a Parliament expires at the end of seven years. The sovereign, however, usually puts an end to it by dissolution, and does not allow it to expire by efflux of time. When the estimates are laid before the House of Commons, a member may move and carry the reduction of a vote, but no additional grant of public money can be made without a recommendation from the queen. A member of either house cannot be questioned outside of Parliament for anything he has said in his place; but if he afterwards publish his speech, he is liable to an action for libellous imputations, and is not protected by the privilege of his position as a member of Parliament. The persons of members are free from arrest in civil causes, but they may be adjudged bankrupts, and their goods are liable to distress on legal process, like those of private citizens. Every bill, before it becomes an act, must be read three times in each house, and also be reviewed clause by clause in a committee of the whole house or by a select committee. When a bill has passed both houses, the sovereign's assent is given, usually by commission, the Commons being summoned to the bar of the House of Lords, with the Speaker at their head, to hear the announcement of the queen's will. In the case of a public bill, the clerk of the Parliament reads its title and pronounces these words: *"La reigne le vaut."* When it is a private bill, the words are, *"Soit fait comme il est desiré."* There are numerous forms and details touching the election of Speaker, mode of addressing the house, putting the question in the two houses respectively, divisions, presenting of petitions, right of putting questions to cabinet ministers, conferences of the two houses, powers of committees, and various other matters of procedure, of which the reader will find ample information in the works enumerated below. The power of the House of Commons has steadily increased during the present century, and in any serious conflict between the two houses of Parliament the Lords invariably deem it prudent to give way. The House of Lords frequently rejects bills which have passed the Commons, such as the burials bill and the marriage with a deceased wife's sister bill, but in no case does the upper chamber reject a measure which has obtained the approval of the nation at a general election. The will of the people is paramount, in the long run, in all the departments of British legislation, and the friends of freedom desire that it should remain so for the future.

Literature.—The following works are recommended to the reader as books of reference: *Rules, Orders, and Forms of Proceeding of the House of Commons relating to Public Business* (1874); *History of the House of Commons*, by W. C. Townsend, Esq., M. A. (2 vols., 8vo); *How We are Governed*, by A. Fonblanque; *Constitutional History of England*, by Henry Hallam; *A Treatise upon the Law, Privileges, Proceedings, and Usage of Parliament*, by Sir Thomas Erskine May; *Burke's Peerage* (1875); *Essay on the Practice of the British Government*, by G. F. Leckie; *Essay on British Government*, by Francis Jeffrey; *History of the Anglo-Saxons*, by Sharon Turner; *The English Constitution*, by H. Hallam and J. L. de Lolme. RICHARD SMYTH.

Parlin Pond Plantation, tp. of Somerset co., Me. Pop. 11.

Par′ma, DUCHY OF, one of the political divisions of Italy previous to the formation of the Italian kingdom in 1860, embracing the actual provinces of Parma and Piacenza. Pope Paul III. first erected this territory, together with some of the adjacent districts, into a duchy for his son Pier-Luigi Farnese (1545). The government of the Farnese dukes was generally popular with the middle and lower classes, but was not acceptable to the nobility, who conspired frequently, and sometimes fatally, against them. In 1701, the direct Farnese line being extinct, the duchy passed to the royal family of Spain. In 1802 the French took possession of it, and in 1814 it was conferred (Spain protesting) as a sovereign duchy on the ex-empress Maria Louisa. In 1817 this arrangement was confirmed, with the stipulation, however, that the succession should fall on the duke of Lucca, the rightful heir in the Spanish line. The duke, tyrannical in his general government, made some most unpopular exchanges of territory, and in 1848 he was compelled to fly from his dominions. In 1849 he was succeeded by his more brutal son Charles III., who was assassinated in 1854; and his widow, after an ineffectual attempt to bring about some satisfactory reforms, left the country in 1859, together with her son, and the territory was soon after annexed to the new kingdom of Italy.

Parma, city of Northern Italy, situated in the great plain of Lombardy, about 12 miles S. of the Po and 75 miles S. E. of Milan, in lat. 42° 52′ N.; lon. 10° 20′ E. It is in direct railway communication with all the large towns of Piedmont, Lombardy, and Venetia. The town is circular in form, is surrounded by bastions, and is divided into two unequal parts by the river Parma, which runs through it from S. to N. The Via Emilia crosses it from E. to W. The streets are broad and in good condition, the squares large, and the public promenade, near the castle, on the S. side of the town, is pleasantly shaded with the horse-chestnut and other trees. Among the public buildings should be noticed the cathedral (Roman Byzantine, begun in 1060 and consecrated by Paschal II. 1106), which contains, among other superior works of art, many frescoes by Correggio of marvellous beauty, though now unhappily in a damaged condition; the baptistery (begun in 1196), a peculiar but fine specimen of Lombard architecture; the church of S. Giovanni Evangelista, very rich in statues and pictures, though the exquisite frescoes of Correggio, once its boast, are in even a more ruinous condition than those in the cathedral; the Madonna della Steccata, a church of the Renaissance, containing sepulchral monuments of the Farnese and Bourbon rulers of Parma and a celebrated picture by Parmigianino. The municipal museum, the academy of fine arts, the school of design, and the Farnese theatre are all in the great building known as the Pilotta, which was intended to form a part of a colossal ducal palace never completed. The national theatre is the work of Maria Louisa; the communal palace is a fine but unfinished structure. There is also a university here, and a very valuable library of about 150,000 volumes. Parma, however, owes its chief attraction to the masterpieces of Correggio in the academy of fine arts, and to his well-preserved frescoes in the little building now called the Camera di San Paolo. These latter consist of a *Diana* and a number of sportive boys, all of exceeding grace and beauty. Of the former the most celebrated is the large oil painting known as the *San Girolamo*, or *The Day*, a picture whose gorgeous and at the same time tender and harmonious coloring is probably unrivalled in the world. Parma, though lying in the old Etruscan territory, does not appear in history until the time of the Roman republic, when it was a town of much importance. Being nearly destroyed by Mark Antony, it was partially rebuilt by the first Cæsars, who gave it successively the names of *Julia* and *Augusta*. After suffering cruelly from the barbarians, it was again restored and rewalled by Theodoric. Narses took it and gave it the name of *Chrysopolis*, or the Golden City. Under the Lombards it fell into great misery. Charlemagne made a bishop (it has been an episcopal see from very early Christian times) its temporal lord, with the title of count. In the eleventh and twelfth centuries Parma was continually involved in wars arising out of papal and imperial quarrels. After the death of Frederick Barbarossa (1190), Parma declared itself a republic. In 1247, Frederick II. besieged it vigorously, but was forced to abandon the siege. In 1303, Parma ceased to exist as a republic and became the prey of feudal lords, sometimes foreign, sometimes domestic. At last it fell into the hands of the popes, who retained possession of it (except during a short occupation of the French) until 1545, when Paul III. included it in the duchy which he conferred on his son Pier-Luigi Farnese. (See PARMA, DUCHY OF.) There is now little business activity in this town beyond trade in the produce of the province, which consists chiefly of silk, grain, cheese, and cattle. Pop. in 1874, 45,500.

Parma, post-v. and tp., Jackson co., Mich., on the Kalamazoo River and the Michigan Central R. R. Pop. 1514.

Parma, post-v. and tp., Monroe co., N. Y. Pop. 2864.

Parma, post-v. and tp., Cuyahoga co., O. Pop. 1432.

Parma, Duke of. See FARNESE (ALEXANDER).

Parmelee (THEODORE N.), b. in Connecticut in 1804; was editor of the Middlesex (Conn.) *Gazette;* Washington correspondent of the New York *Herald* during the Van Buren and Tyler administrations; was intimately acquainted with the leading politicians of the time, including Pres. Tyler; was afterwards confidential secretary of Dean Richmond; editor for several years of the Buffalo *Commercial;* author of some of the biographies in the illustrated volume entitled *Men of Progress;* of the interesting series of political reminiscences published in *Harper's Magazine,* "Recollections of an Old Stager;" and of numerous fugitive literary productions. D. at Branford, Conn., July 3, 1874.

Parmen'ides [Παρμενίδης], son of Pyrrhes, and the most notable of the philosophers of the Eleatic School, was b. at Elea, a Phocæan colony situated in Lucania, about the year 519 B. C. (cf. Grote, *Hist. of Greece,* chap. lxvii.). He is said to have been the pupil of Xenophanes, founder of the Eleatic School (Aristotle, *Metaph.* i. 5), and to have to a considerable extent adopted the mode of living of the Pythagoreans, with two of whom, Ameinias and Diochætes, he was very intimate. He took an active part in the government of his native city and drew up a code of laws, to which the Eleans annually swore to conform. He disseminated his philosophy both by teaching and writing. He appears to have attained a ripe old age, and, if we may believe Plato (*Parmenides,* 127 B.), to have become personally acquainted with Socrates.

Writings.—The only work of Parmenides known to the ancients was that bearing the general and oft-imitated title *On Nature* (Περὶ Φύσεως), written, according to the custom of the time, in dactylic hexameters. It was divided into three parts: 1, An introduction, describing in highly figurative language the manner in which the philosopher reached the citadel of truth; 2, a treatise *On Truth* (τὰ πρὸς Ἀληθείην); and 3, a treatise *On Opinion* (τὰ πρὸς Δόξαν). The doctrines put in the mouth of Parmenides in the Platonic dialogue bearing his name are mostly the property of Plato, or of whoever was its author. The known extant fragments of Parmenides are comprised in something less than 160 hexameters. They are collected mainly from the writings of Plato, Aristotle, Clemens Alexandrinus, Sextus Empiricus, Plotinus, and Simplicius. There are editions of them by Brandis (1813), Karsten (1835), Mullach (1845; reprinted in the Didot *Fragmenta Philosophorum Græcorum,* Paris, 1860), and by Stein in *Symbola Philologorum Bonnensium* (1864–67), pp. 763–806. The best are those of Karsten and Stein. There is a translation into English hexameters of all the extant fragments, in the *Journal of Speculative Philosophy,* vol. iv. (For bibliography, see Ueberweg, *History of Philosophy* (Eng. trans.) vol. i., p. 50.)

Philosophy.—Parmenides, the Spinoza of ancient philosophy, was, with the exception perhaps of Herakleitos, the greatest of the pre-Socratic thinkers. The kernel of his thought is the notion of pure Being, which he identifies with pure Thinking, and labors to define by every means afforded by the undeveloped philosophic diction of his day. Pure Being, the common basis of finite existence and finite thought, alone *is.* Non-Being and all the array of finite thoughts and things which its assumption entails are delusions, unavoidable, perhaps, for the uncultured mind, but transparent enough to the true thinker. Being is

> ". . . Birthless and deathless,
> Whole and only-begotten, and moveless and ever-enduring:
> Never it was or shall be; but the *all* simultaneously now is,
> One continuous one."

The pure Being (ὂν εἶναι) of Parmenides, being an abstraction from sensuous objects, bears strong traces of its origin, being by no means our pure Being, but material existing in space in the form of a perfect bounded sphere. Such is the pith of the treatise on Truth. In opposition to pure Being stands not only non-Being, but the whole sensuous world, with its innumerable finite objects. Though the latter is mere delusion, Parmenides has nevertheless given us a theory of it in the third part of his work, which is a sort of cosmogony, as, indeed, Plutarch styles it. This part is exceedingly fragmentary, but we may still gather an outline of its contents. The ground of all delusion and finitude is the assumption of the reality of the negative or of non-Being, which gives the antitheses we find in nature—light, dark, or, in Parmenides' language, more concretely, fire, earth. Out of these are woven the sensuous world, which consists of a number of concentric spheres, the inmost (the earth) and the outmost (the firmament) being solid, while the intermediate ones are commingled light and darkness:

> "For out of formless fire are woven the narrower circlets,
> Those over these out of night; but a portion of flame shooteth through them;
> And in the centre of all is the goddess that governeth all things;
> She unto all is the author of loathsome birth and coition,
> Causing the female to mix with the male, and by mutual impulse
> Likewise the male with the female."

The predominance of the one element or the other determines the nature of each particular object. Parmenides appears to have been aware of the identity of the morning and evening star, and of the fact that the moon borrows her light. The philosophy of Parmenides largely affected all subsequent thought, and even as powerful a thinker as Aristotle could not shake off his cosmological ideas. Nowhere else have the rational and the sensuous been more clearly opposed. This is so true that some writers, notably Gladisch (*Die Eleaten und die Inder*), have endeavored to connect it with the Hindoo philosophy. (Cf. Aristotle, *Metaph.* A. 5; Plotinus, *Enneads,* v. 1, 8; Hegel, *Gesch. der Philos.,* vol. i.; Zeller, *Philos. der Griechen,* vol. i.; and the *Handbooks* of Ueberweg and Schwegler.)

THOMAS DAVIDSON.

Parmigia'no, or **Parmigianino,** whose true name was **Francesco Mazzuola,** or **Mazzola,** b. at Parma in 1503; studied the art of painting in his native city and at Rome; lived for some time at Bologna, but returned in 1531 to Parma, and d. at Casal Maggiore Aug. 24, 1540. His most celebrated pictures are *Santa Margherita* in Bologna, and *Moses breaking the Tables of the Law,* at Parma.

Parnahi'ba, a river of Brazil, rises in lat. 11° S., in the province of Goyaz, flows northward, forming the boundary between the province of Piauhi and Maranhão, and enters the Atlantic after a course of about 750 miles. Its course is free from obstructions, but its depth varies very much according to the season, many of its feeders being perfectly dry during the hot season.

Parnas'sus, a mountain of Greece in the district of Phocis, rises 8068 feet above the level of the sea. Its three peaks are covered with snow for the greatest part of the year; its sides are covered with beautiful forests and abound in crags and caverns. In ancient times it was consecrated to Apollo and the Muses. Delphi, with its famous oracle, was situated on its southern slope. The fountain of Castalia sprang between two of its peaks. The Corycian cavern, the abode of Pan and the Muses, was on its western slope, and on its highest top were celebrated the wild orgies of Dionysus.

Parnell. See CONGLETON, LORD.

Par'nell (THOMAS), b. at Dublin, Ireland, in 1679; educated at Trinity College, Dublin; took orders in the Church of England 1700; became archdeacon of Clogher 1705, prebendary in the cathedral of Dublin 1713, and vicar of Finglass 1716; resided chiefly in England; was intimate with Swift, Gay, and Pope; assisted the latter in his translation of Homer, and wrote the *Life* of Homer prefixed to the *Iliad.* D. at Chester July, 1717. Pope published in 1722 a volume of posthumous poems attributed to Parnell, the best of which was the *Hermit,* and another volume appeared many years later (1758), but its authenticity was considered doubtful. Goldsmith wrote a *Life* of Parnell (1770).

Parny', de (ÉVARISTE DÉSIRÉ DESFORGES), VICOMTE, b. at St. Paul, in the island of Bourbon, Feb. 6, 1753; was educated first at the theological seminary of Rennes, then at the military school of Paris; returned home in 1773, but having failed in marrying the lady with whom he fell in love, repaired to Paris in 1776 and became a poet. In 1785 he went to Pondicherry as aide-de-camp to the governor; during the revolution he held some subordinate positions in the department of public instruction and at the Théâtre des Arts; Napoleon gave him in 1813 a small pension. He d. in the vicinity of Paris Dec. 5, 1814. His *Poésies érotiques* (1780–81, afterwards often reprinted) are distinguished by freshness and vigor, but his *La Guerre des Dieux* (1799) is licentious and frivolous, and some of his other works, such as *Le Paradis perdu* and *Les Galantéries de la Bible,* are silly. There are complete editions of his works by Tissot (1827) and Béranger (1831), and selections by Boissonade (1827) and Sainte Beuve (1862).

Par'ody [Gr. παρά, "beside," and ᾠδή, a "song"], a burlesque upon some poem, or more rarely upon prose-writing. When the burlesque is of a loose and low kind, it becomes a travesty. Parodies always flourish best in a decadent stage of literature; but nevertheless they have been sometimes made the vehicle of much witty and useful, though often too pungent, criticism.

Parol′ (law), a technical term of legal nomenclature, borrowed from the French *parole*, a "word," and when used as an adjective in its literal sense signifying what is oral or verbal, and thus applied in several different connections to qualify the meaning of general names and phrases. Since the early English law, however, regarded contracts in writing not under seal as having no higher character than those which were simply verbal, the word when employed to designate a class of contracts acquired a special and technical signification, denoting what is unsealed. A parol contract, therefore, is one not sealed, whether oral simply or in writing. In other connections, and especially in more modern phrases, the term is strictly confined to its original and literal sense. For example, parol evidence is that delivered by the witnesses orally, as contradistinguished from writings and other similar proofs. A parol demise or lease is a mere verbal agreement to let land, which by an English statute is valid as a lease according to its provisions if the term of the letting does not exceed three years. Similar statutes have been generally enacted in the several States, although in many of them the period is reduced to one year. A parol promise is one that is purely verbal. In the very ancient common-law procedure the term was also used to describe the pleadings in an action, since these allegations of the parties were originally oral, made in open court, and reduced to writing by the clerk. Thus, a "parol demurrer" was a proceeding by which, under certain circumstances, the entire pleadings were stayed for a specified time. This sense of the word is wholly obsolete. The term is also used—generally with the French spelling—in the international law. When prisoners of war, as a condition of being released, undertake not to engage in active hostilities against their captors during a stipulated period of time, such agreement is denominated a *parole*; and an individual prisoner of war, instead of being confined, is sometimes permitted to go at large upon his *parole* or parole of honor—that is, his promise not to escape from the custody of his captors.

John Norton Pomeroy.

Parole′ [Fr., a "word"]. In military affairs, a word which differs from the countersign as follows: the countersign is communicated to all men on guard, while only the officers, and often only the higher officers of the guard, receive the parole. The countersign is usually the name of a place, as a battlefield.

Paropam′isus, or the **Paropamisan Mountains,** in ancient geography, a name of somewhat uncertain signification, sometimes limited to the range which forms the northern boundary of Cabool, sometimes extended to the whole group connecting the Caucasus with the Himalaya, but generally corresponding to the modern Hindoo-Koosh.

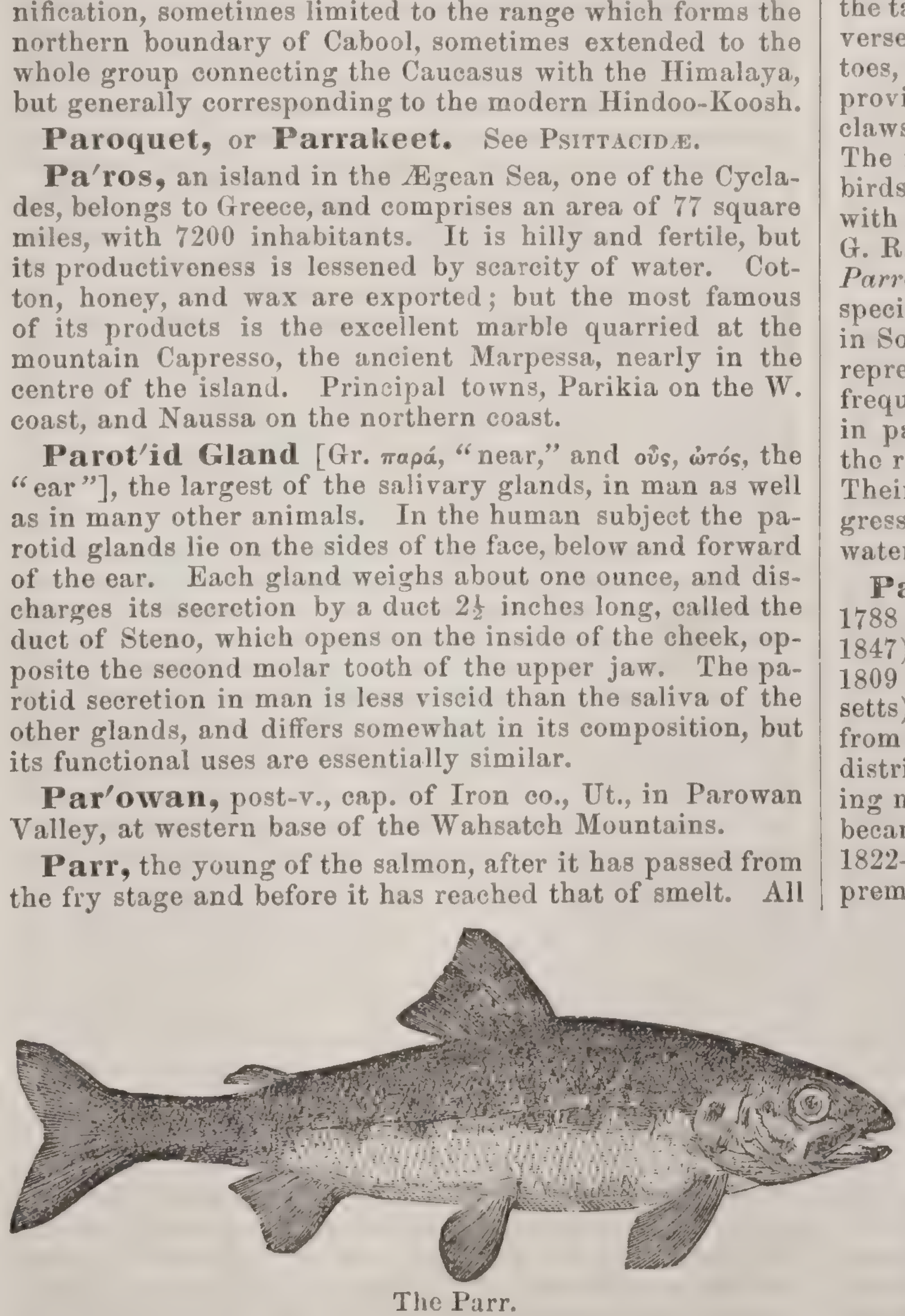
Paroquet, or **Parrakeet.** See Psittacidæ.

Pa′ros, an island in the Ægean Sea, one of the Cyclades, belongs to Greece, and comprises an area of 77 square miles, with 7200 inhabitants. It is hilly and fertile, but its productiveness is lessened by scarcity of water. Cotton, honey, and wax are exported; but the most famous of its products is the excellent marble quarried at the mountain Capresso, the ancient Marpessa, nearly in the centre of the island. Principal towns, Parikia on the W. coast, and Naussa on the northern coast.

Parot′id Gland [Gr. παρά, "near," and οὖς, ὠτός, the "ear"], the largest of the salivary glands, in man as well as in many other animals. In the human subject the parotid glands lie on the sides of the face, below and forward of the ear. Each gland weighs about one ounce, and discharges its secretion by a duct $2\frac{1}{2}$ inches long, called the duct of Steno, which opens on the inside of the cheek, opposite the second molar tooth of the upper jaw. The parotid secretion in man is less viscid than the saliva of the other glands, and differs somewhat in its composition, but its functional uses are essentially similar.

Par′owan, post-v., cap. of Iron co., Ut., in Parowan Valley, at western base of the Wahsatch Mountains.

Parr, the young of the salmon, after it has passed from the fry stage and before it has reached that of smelt. All these stages appear to be of indefinite duration, varying according to the food-supply and other conditions. It was once thought that the parr (called also samlet, pisit, or brandling) was of a distinct species, but no expert is now of that opinion.



The Parr.

Parr (Catharine). See Catharine Parr.

Parr (Samuel), D. D., b. at Harrow-on-the-Hill, England, Jan. 15, 1747; studied two years at the University of Cambridge 1765–67; was assistant master of Harrow School 1767–72; taught a private school at Stanmore 1772–76; became master of Colchester School 1776, of Norwich School 1778; took orders in the Church of England; became curate of Hythe 1778, rector of Asterby 1780, and perpetual curate of Hatton, Warwickshire, 1786, rector of Wadenhoe 1790, and of Graffnam 1802, and head chaplain to Queen Caroline 1820. He resided from 1786 through life at Hatton, engaged in literary pursuits and the classical training of pupils; was a brilliant but overbearing and quarrelsome talker, an ardent Whig partisan, possessed an extensive knowledge of Latin literature, was regarded by many of his contemporaries as an intellectual prodigy, and came near receiving the bishopric of Gloucester from the Whig ministry of 1807. D. at Hatton Mar. 6, 1825. The *Works* of Dr. Parr, with *Memoir* of his life and a selection from his correspondence, by John Johnstone, M. D., were published in 8 vols. (London, 1828).

Parr (Thomas), commonly known as **Old Parr,** b. at Winnington, Shropshire, late in the fifteenth century; was taken to London by the earl of Arundel Sept., 1635, and introduced at court as being 152 years old. A metrical narrative of his career was published at the same time by John Taylor, "the water poet," under the title *The Olde, Olde, Very Olde Man*, in which Parr was represented as having been born during the reign of Edward IV. and as having lived through the reigns of ten sovereigns. D. at London Nov. 15, 1635. An autopsy was made by Dr. Harvey, and he was buried in Westminster Abbey, where a monument commemorates his supposed longevity. (See Thoms' *Human Longevity*, 1873.)

Parr′idæ [from *Parra*, a Linnæan genus], a family of birds distinguished by long legs and enormous toes. In form the species greatly resemble rails and coots; the bill is elongated, rather slender, straight at the basal half, but thence with the culmen vaulted to the tip, which is entire; the nostrils longitudinally oval, near the middle of the bill, and in long grooves; the wings large and pointed; the tail diversiform; the legs long and provided with transverse scales, which extend on the tibiæ as well as tarsi; toes, three anterior and one posterior, all elongated and provided (but especially the hinder ones) with long, slender claws, nearly straight or even somewhat curved upward. The family is represented by a small number of tropical birds of doubtful affinities, some authors classifying them with the Palamedeidæ, and others with the Rallidæ. By G. R. Gray they are distributed among two genera—(1) *Parra* and (2) *Hydrophasianus*—the former containing ten species, and the latter one. The species of *Parra* are found in South America, Africa, Asia, and Australia; the single representative of *Hydrophasianus* in India. The species frequent marshes as well as rivers and ponds, generally in pairs or small flocks; they make a rude nest among the reeds, in which the female usually deposits four eggs. Their elongated toes seem to be a provision for ready progression on the plants which float on the surface of the water.

Theodore Gill.

Par′ris (Albion Keith), b. at Hebron, Me., Jan. 19, 1788; was a son of Judge Samuel Parris of Maine (1755–1847); graduated at Dartmouth 1806; came to the bar 1809; became a lawyer of Paris, Me. (then Massachusetts); entered early into public life; was in Congress from Massachusetts 1815–19; was appointed in 1818 U. S. district judge; removed to Portland; was one of the leading members of the Maine constitutional convention 1819; became judge of probate 1820; was governor of Maine 1822–27; U. S. Senator 1826–28; judge of the State supreme court 1828–36; second comptroller of the U. S. treasury 1836–50; mayor of Portland, Me., 1852; D. at Portland Feb. 11, 1857.

Parris (Samuel), b. in London, England, 1653; came to Massachusetts in youth; studied at Harvard, but did not graduate; was for a time a merchant at Boston; became first minister of Danvers 1689; obtained an unhappy notoriety through the great delusion called "Salem witchcraft," which originated in his family, where his daughter and niece accused an Indian slave from the West Indies of bewitching them. After the delusion was over, Parris was dismissed from the pastorship of Danvers church, acknowledged his error, removed to Concord,

preached occasionally in several towns, and d. at Sudbury Feb. 27, 1720.

Par'rish (Edward), son of Dr. Joseph Parrish, b. in 1822 in Philadelphia; became principal of the Philadelphia School of Practical Pharmacy, and in 1864 professor of materia medica there; was a man of practical benevolence and one of the leading promoters of the practical training of pharmacists in schools. Appointed a commissioner to the Indians on the Plains, he d. at Fort Sill in 1872. Author of *Practical Pharmacy* (1856), *The Phantom Bouquet* (1863), *Education in the Society of Friends* (1866), and many professional papers.

Parrish (Joseph), M. D., b. at Philadelphia Sept. 2, 1779; took his degree 1816 at the University of Pennsylvania; was a member of the Society of Friends; became resident physician to the yellow fever hospital, Philadelphia; physician to the Philadelphia Dispensary 1806–12; surgeon to the Pennsylvania Hospital 1816–20; consulting physician to the Philadelphia Dispensary 1835–40; author of professional *Memoirs*, etc., and was distinguished for benevolence. Was an active abolitionist and distinguished as a medical instructor. D. Mar. 18, 1840.

Par'rot [from Fr. *perroquet*], a name in its widest sense applied to all the Psittacidæ, and in a more restricted sense employed for the moderate-sized species, like the green and gray parrots, as contradistinguished from the paroquets, macaws, lories, cockatoos, etc. (See Psittacidæ.)

Parrot (Johann Jakob Friedrich Wilhelm), b. at Carlsruhe, Germany, Oct. 14, 1792; studied medicine, and was appointed professor in physiology and pathology at the University of Dorpat, Russia, where he d. Jan. 15, 1841. In 1811 he made a journey of exploration to Caucasus, in 1829 to Ararat, which he described in *Reise in die Krim und den Kaukasus* (2 vols., Berlin, 1815–18), and *Reise zum Ararat* (2 vols., Berlin, 1834).

Parrot-Fish, a name applied to many fishes of the family Scaridæ (which see).

Par'rott (Enoch G.), U. S. N., b. Nov. 27, 1815, in New Hampshire; entered the navy as a midshipman 1831; became a lieutenant 1841; a commander in 1861; a captain 1866; a commodore 1870; a rear-admiral 1873; retired in 1874; commanded the Augusta at the battle of Port Royal and the iron-clad Monadnock in both the Fort Fisher fights; highly commended by Flag-officer Dupont and Rear-admiral Porter. Foxhall A. Parker.

Parrott (Robert Parker), b. at Lee, N. H., Oct. 5, 1804; graduated at the U. S. Military Academy 1824; entered the army as second lieutenant of artillery, remaining, however, at the academy as assistant professor until 1829; was transferred to the ordnance corps in 1836, in which year he resigned and accepted the superintendency of the West Point iron and cannon foundry, Cold Spring, N. Y.; was judge of court of common pleas Putnam co., 1844–47; is the inventor of the system of rifled guns bearing his name, and of their projectiles. (See Artillery and Ordnance.)

Parrs'borough, port of entry of Cumberland co., N. S., on the N. side of the Minas Channel. It exports large quantities of lumber. Pop. about 800.

Par'ry (Sir William Edward), b. at Bath, England, Dec. 19, 1790; entered the navy 1803; was engaged in the naval service on the American coast during the war of 1812; was a member of Sir John Ross's Arctic expedition 1818; commanded another expedition 1819–20, with which he penetrated farther W. within the Arctic circle than any previous explorer, thereby gaining a reward of £5000 offered by Parliament; made other expeditions 1821–23 and 1826, in the last of which he penetrated farther N. than any earlier navigator; was knighted 1829; became rear-admiral 1852, lieutenant-governor of Greenwich Hospital 1853, and d. at Ems, Germany, July 8, 1855. He published narratives of all his voyages.

Parry Sound, a provisional district of Ontario, Canada. It takes its name from Parry Sound, a port on the E. side of Georgian Bay, Lake Huron. The district lies N. of Muskoka, which it much resembles. It is settling upon the free-grant system. Pop. 1519.

Par'ryville, post-v. of Franklin tp., Carbon co., Pa., on Lehigh and Susquehanna and Lehigh Valley R. Rs.

Par'sees [Per. *pârsi*] is the name generally given to the modern followers of Zoroaster. When, in 651 A. D., the last of the Sassanides, Yezdezird, was defeated by the caliph Omar in the battle of Nahavand, and Persia was conquered and subjugated by the Arabs, the whole population was converted to Islam. Only a small number of the Persians continued to cling to the national faith, and these were subjected to severe persecutions. The Mohammedans called them *Guebres*, "infidels," and allowed them to settle only in the poorest districts of the country, around Yezd and Kirmân. Most of them, however, emigrated to the western coast of India and settled at Bombay, Surat, Nawsari, Ahmedabad, etc. Those remaining in Persia were hard pressed; they decreased in numbers and sank into poverty. At present they number only about 7000, but they are much respected by the Europeans on account of their honesty and reliability. Those, on the contrary, who went to India, prospered much, though at one time they too were exposed to persecutions by the Mohammedans. They are said to number at present from 150,000 to 200,000, and many of the wealthiest merchants of Bombay belong to their denomination. In India, however, their religion became mixed up with Hindoo ideas and practices, which at present has occasioned a schism and the establishment of a reform association. Their morals underwent less change; they are still highly respected and feel well disposed towards European civilization. (For their doctrines and tenets see the articles Zend-Avesta and Zoroaster.)

Parseeism. See Parsees.

Pars'ley [Fr. *persil*; Ger. *Petersilie*; Gr. πετροσέλινον], the *Petroselinum sativum*, a biennial umbelliferous herb cultivated in gardens. There are many varieties. The leaves of most are used in garnishing meats. Others are sometimes cultivated for the rich white root, which resembles the parsnip. The root of common parsley has valuable medicinal qualities.

Pars'nip, formerly often written **Pastnip** (*Pastinaca sativa*), an umbelliferous plant, usually biennial, is found wild in Southern and Central Europe, in England, and in the southern parts of Russian Asia. There is a considerable difference between the wild and the cultivated parsnip, the root of the latter being larger, without branches, softer, and more fleshy. It succeeds best in light rich soil. The Guernsey parsnip has a root four feet long; the Dutch, only from twenty to thirty inches. To many this root is a great relish; the Romans cultivated it carefully and appreciated it much. To others, however, it is distasteful on account of its great sweetness. For fodder it has hitherto not been much used, though cows like it, and it produces excellent flesh and butter. The wild parsnip has an acrid taste, and sometimes malignant consequences when eaten; the cultivated assumes the same acrid taste as soon as it begins to grow in spring.

Par'son (law). So far as this term describes a peculiar legal status or condition, its use is confined to the English law, and its technical meaning results entirely from the union of Church and State. A parson is a parish priest of the Established Church in England, who, in addition to his spiritual functions, has the full legal ownership and possession of all the temporal rights belonging to the parochial church. According to Lord Coke, the name is derived from *persona*, because by his person the Church is represented, and he is in himself a corporation sole in order to protect the rights of the Church, which he personates by a perpetual succession. Another more ancient writer declares that he is so called since he is bound to perform divine service in his own person—*in propria personâ servire Deum.* The special feature which distinguishes the legal condition of the parson from that of other parish priests is the fact that the freehold ownership of the church, the parsonage, the glebe, the tithes, and all other parochial dues is vested in him alone. It sometimes happens that these temporalities are perpetually annexed to and held by some spiritual corporation, in which case they are said to be "appropriated;" and the tithes may even be thus held by a lay appropriator. Under these circumstances the incumbent is termed the vicar, since he is in some respects an agent or deputy (*vicarius*) of the one who holds the benefice and actually receives the revenues, and who pays therefrom the stipend of the officiating priest. In order that a person may become a parson, or even a vicar, four requisites are necessary: He must be in holy orders—that is, a consecrated priest according to the rites of the Established Church; he must be presented to the living by the patron thereof; he must be instituted into the spiritual cure by the bishop; and finally, he must be publicly inducted into the possession of the church and other temporalities of the parish. The spiritual functions of the parson include the performance of divine service, the administration of the sacraments, preaching, solemnization of marriage, and burial of the dead. He is for the time being the owner and holder of the parochial temporalities, subject, however, to the obligation of using them for their appropriate ecclesiastical purposes. This legal condition, with all its rights, may be terminated in several different modes—namely, by death, by "cession" in taking another benefice, by being consecrated a bishop, by resignation, and by deprivation or judicial removal from the

office and its emoluments as the penalty for various offences, civil or ecclesiastical. JOHN NORTON POMEROY.

Par'sons, city of Labette co., Kan., at the junction of three branches of the Missouri Kansas and Texas R. R., contains extensive car-works and machine-shops, 2 school-houses, 4 churches, 3 newspapers, 1 furniture manufactory, 2 banks, a public library, several good hotels, and stores. Pop. about 3000. G. C. WEST, ED. "SUN."

Parsons, tp. of Wicomico co., Md. Pop. 1106.

Parsons (ANSON V.), b. at Granville, Mass., in 1799; was admitted to the bar at Litchfield, Conn., 1826; was judge of the court of common pleas at Harrisburg, Pa., 1840–42, and again 1843–51, having in the interval been secretary of the Commonwealth; and published in 1851 a volume of *Reports of Select Cases in Equity,* containing decisions by himself and by President Judge King. A second volume was printed the same year, but the edition was destroyed by fire before distribution.

Parsons (JONATHAN), b. at West Springfield, Mass., Nov. 30, 1705; graduated at Yale College 1729; was pastor of the church at Lyme, Conn., 1731–45, and at Newburyport from 1746 until his death, July 19, 1776; and was distinguished as an orator, for his scholastic attainments, and skill as a polemic theologian. Author of *Sixty Sermons on Various Subjects* (2 vols., 1780) and other religious publications.

Parsons (LEWIS E.), a native of the State of New York; became in 1841 a Whig politician and successful lawyer of Talladega co., Ala.; became a Douglas Democrat in 1860, and was a Union man throughout the civil war; was in 1865 provisional governor of Alabama under President Johnson, and was unanimously sent to the U. S. Senate by the legislature, but was not allowed to take his seat.

Parsons (Gen. MONROE M.), b. in Virginia in 1819; removed in youth to Missouri; studied and practised law; engaged in the Mexican war; was attorney-general of the State 1853–57, subsequently a member of the State senate; acted in concert with Gov. C. F. Jackson at the outbreak of the rebellion in endeavoring to throw Missouri into the ranks of the Confederacy; was active in organizing the State militia; raised a mounted brigade, which he commanded at Carthage, Springfield, and Pea Ridge; served under Gen. Price in command of a division throughout most of the war, after which he, with some followers, took service under Juarez, and was killed in an engagement with the forces of Maximilian near Camargo Aug. 17, 1865.

Parsons (MOSES), b. at Gloucester, Mass., in 1716; graduated at Harvard 1736; taught schools for several years, and was pastor of the church at Byfield, Mass., from 1744 until his death in 1783. Author of a number of published sermons; and father of Chief-Justice Theophilus Parsons.

Parsons (RICHARD C.), b. at New London, Conn., Oct. 10, 1826; received a liberal education; went to Ohio 1847; studied law at Cleveland, where he was admitted to the bar 1851; became an active Republican politician; was a member of the State legislature 1857–61, and its Speaker 1859–61; was offered by Pres. Lincoln the mission to Chili, but declined; served a year (1861–62) as consul at Rio Janeiro, Brazil; was collector of internal revenue at Cleveland 1862–66; marshal of the Supreme Court of the U. S. 1866–72, and member of Congress 1873–75.

Parsons (Gen. SAMUEL HOLDEN), b. at Lyme, Conn., May 14, 1737; graduated at Harvard 1756; studied law at Lyme in the office of his uncle, Gov. Matthew Griswold; was admitted to the bar 1759; was representative in the legislature many years in succession from 1762; became king's attorney 1774, when he removed to New London; was a member of the Connecticut committee of correspondence 1775, in which year he took command of the 6th Connecticut regiment at the siege of Boston; took part in the battle of Long Island; was chosen by Congress brigadier-general Aug. 9, 1776; succeeded Putnam in command of the Connecticut line 1779; became major-general Oct. 23, 1780; practised law at Middletown after the peace; was commissioner to treat with the Miami Indians 1785; member of the Connecticut convention for the ratification of the Constitution of the U. S. Jan., 1788; was appointed by Washington first judge of the N. W. Territory; was commissioner of Connecticut to purchase from the Wyandot Indians the tract in N. E. Ohio known as the Connecticut or Western Reserve 1789; settled near the Ohio River; published a paper on the antiquities of the Western States in the *Transactions* of the American Academy (vol. ii.), and was drowned in the rapids of the Big Beaver River, O., Nov. 17, 1789.

Parsons (THEOPHILUS), LL.D., son of Rev. Moses, b. at Byfield, Mass., Feb. 24, 1750; graduated at Harvard 1769; taught school at Falmouth (now Portland); was admitted to the bar there 1774; returned to Byfield in consequence of the destruction of Falmouth by a British squadron in Oct., 1775; began legal practice at Newburyport 1777; was a member of the patriotic association called the "Essex Junto," and author of the famous pamphlet known as the *Essex Result* (1778), which contributed largely to the defeat of the State constitution then proposed by the legislature, and the establishment of the prevailing New England school of constitutional doctrine; was a member of the convention held at Ipswich in 1779 which framed a new constitution, and of the convention of 1788 for the ratification of the Federal Constitution; was several times elected to the State legislature; removed to Boston 1800, attained the highest position at the Massachusetts bar, and became in 1806 chief-justice of the supreme judicial court, which post he held until his death, at Boston Oct. 30, 1813. His *Decisions,* which fill vols. ii. to x. of the Massachusetts *Reports,* have given him a vast legal reputation. (See his *Life,* by his son, Theophilus Parsons, Jr. (Boston, 1859).)

Parsons (THEOPHILUS), LL.D., son of the eminent jurist of the same name; b. at Newburyport, Mass., May 17, 1797; graduated at Harvard 1815; studied law in the office of Judge William Prescott; visited Europe; practised some years at the bar at Taunton, and afterwards at Boston; was a frequent contributor to the *North American Review* and other magazines and periodicals; founded the *U. S. Literary Gazette;* published three volumes of *Essays* in support of the doctrines of the Swedenborgian or "New Jerusalem" Church; became in 1847 Dane professor of law at Harvard Law School; was author of some fifteen volumes of legal treatises on the laws of contracts, mercantile business, shipping and admiralty, notes and bills of exchange, marine insurance, etc., of a *Memoir of Chief-Justice Theophilus Parsons* (1859), of theological works, *Deus Homo* (1867), *The Infinite and the Finite* (1872), and several minor religious treatises, and of a valuable manual, *The Political, Personal, and Property Rights of a Citizen of the U. S.* (1875).

Parsons (THOMAS WILLIAM), M. D., b. at Boston, Mass., Aug. 18, 1819; studied at the Boston Latin School and in Europe; became a dentist of Boston, and in 1853 took his medical degree at Harvard College. Author of a good version of Dante's *Inferno* and *Purgatorio* (1843–67), a volume of poems (1854), *The Magnolia* (poems, 1867), and contributions to periodicals.

Parsons (USHER), M. D., b. at Alfred, Me., Aug. 18, 1788; studied medicine under Dr. John Warren; entered the navy as surgeon's mate 1812; was surgeon of Com. Perry's flagship at the battle of Lake Erie Sept. 10, 1813; practised medicine at Providence, R. I.; was professor in the medical school of Brown University, president of the Rhode Island Medical Association, author of several medical and miscellaneous works, and of a *Life of Sir William Pepperell* (1856). D. at Providence Dec. 19, 1868.

Parson's Creek, tp. of Dorchester co., Md., on Chesapeake Bay. Pop. 1748.

Parson's Creek, tp. of Linn co., Mo., on the Hannibal and St. Joseph R. R. Pop. 1118.

Par'sonsfield, post-v. and tp., York co., Me., on the Great Ossipee River. Pop. 1894.

Part [Lat. *vox;* Ger. *Stimme*], in music, the melody or series of notes appointed for any voice or instrument. A *solo* (unaccompanied) is a single part or mere melody, and is complete in itself. The *duet* consists of two parts simultaneously performed, the *trio* of three, the *quartet* of four, etc. These parts may be considered as so many parallel melodies, yet written under such rules and with such mutual relations as to form by their union an agreeable and connected chain of harmonious combinations. The several parts or voices, therefore, though seemingly independent, are really the development of the fundamental harmonies indicated by the bass and its figuring, each part in every step of its progress being formed of one or the other of the intervals of a succession of chords. In music for voices accompanied by the organ or pianoforte the accompaniment is called the organ or pianoforte *part,* though it really comprises all the parts sung by a choir, and frequently ornamental harmonies in addition.

WILLIAM STAUNTON.

Partan'na, town of Sicily, province of Trapani, situated on a mountain-slope 1250 feet above sea-level, and commanding a fine view of the Mediterranean and of the beautiful plain between Cape Lilibeo and the promontory of Sciacca. This town was originally a Greek colony, and terra-cotta vases of Greek workmanship and of great beauty are frequently disinterred in the vicinity. The Saracens erected three castles here, the ruins of which stil

exist. In the glorious revolution of 1860, Partanna furnished most prompt and important assistance to Garibaldi. There are few objects of interest in the town itself except the Chiesa Madre, a fine church containing some noticeable works of art. Pop. in 1874, 12,467.

Parthenay′, town of France, department of Deux Sèvres, has manufactures of cloth, serges, and leather, and a large trade in corn and cattle. Pop. 5057.

Parthenogen′esis [Gr. παρθένος, "virgin," and γένεσις, "production"], in animal biology, the production of young by a female without fecundation by a male. This definition excludes all cases of ALTERNATE GENERATION (which see) and all instances of fœtation by inclusion, rare instances of which are recorded, in which cases a small fœtus is included within some part of a larger, the larger being, in fact, a twin of the smaller, while the containing organism is as likely to be a male as a female. But true parthenogenesis is the development of the embryo from the ovum, by the normal course of gestation, without sexual congress. For example, it is certain that the eggs from which male or drone bees are hatched are laid by unimpregnated bees (queens, or even workers). The *Aphides*, or plant-lice, copulate in the autumn and deposit eggs which are hatched in spring. For an indefinite number of generations afterwards the females bring forth young, but not eggs. No males are produced, and no eggs are laid until cold weather comes on or till food fails. But in this instance the parthenogenesis resembles alternate generation in the fact that the young originate, not from an ovum, but from its analogue, a substitute called pseudovum, differing considerably in its history from the ovum. Various Acarina and some Hemiptera, and even the larvæ of some flies, are capable of this form of parthenogenesis. True parthenogenesis has been observed in several hymenopterous and lepidopterous insects. In some of these cases, if an ovum be impregnated, a female is produced; if not, a male is finally hatched from the egg. But in the lower form of parthenogenesis (common among radiates, crustaceans, and some annelids) the development has been called an internal gemmation, from its likeness to the budding process (gemmiparous reproduction) of the lowest forms of animals and of many plants. Parthenogenesis, alternate generation, gemmation, etc. have been grouped together as agamic or individual reproduction. Not one instance of either in any of the vertebrate animals has been observed by any scientist. Among plants, according to Fresenius, the *Datisca cannabina* produces seed when the pistillate plant is entirely unfertilized (and there are a few other less equivocal cases). This is a true parthenogenesis, while the production of reproductive bulbs in the place of seed by the onion illustrates spurious parthenogenesis, or internal gemmation, the phenomenon seen in the case of the *Aphis*. CHARLES W. GREENE.

Par′thenon [Παρθενών, from παρθένος, the "virgin," a title of Athena], a noble temple of Athena Parthenos at Athens. It was built by Pericles about 438 B. C. The architects were Ictinus and Callicrates, and a part of the sculptured decorations were from the hand of Phidias. It stands upon the Acropolis. It is of the Doric order, built of the best Pentelic marble, is 228 feet long and 101 feet wide. It is generally believed that it was painted within and without. There were 46 columns in its peristyle. Its end porticoes have 8 columns each, and the sides 17 each, reckoning the corner columns twice. Its walls are 66 feet high. It stood almost entire until 1687, when, during a siege by the Venetians, a large part of the central portion was destroyed by the explosion of some gunpowder, which had been stored in it by the Turks. It is regarded as the finest production of Greek architecture. The metopes were carried off by Lord Elgin (by permission of the Turkish government), and are among the chief treasures of the British Museum.

Par′thia, an ancient territory of Western Asia, was situated S. E. of the Caspian Sea, and corresponded nearly to the modern Persian province of Khorassan. It was wholly mountainous, and inhabited by a rough, wild, and warlike people of Scythian descent, famous for their horsemanship and skill with the bow. Agriculture and trade they despised; war was their only occupation. They belonged successively to the Assyrian, Persian, Macedonian, and Syrian empires, but in 250 B. C. they established an independent kingdom under Arsaces, whose dynasty, the Arsacidæ, ruled till 226 A. D. and formed a vast empire, extending from the Euphrates to the Indus. The Romans attacked them several times, but without success. But Artabanus IV. was killed in 226 A. D. in a rebellion, and the dynasty of the Arsacidæ was followed by that of the Sassanidæ, a Persian family. The Persian influence now became the ruling one in Asia till the Mohammedan conquest, 651 A. D.

Par′ticiple [Lat. *participium*, a "partaking"], a verbal form which partakes of the nature of an adjective. Participles are of two kinds, termed the perfect or past, and the active or present, although they have no definite relation to time. The form in *-en* or *-n* in *driv-en*, *bor-n*, *bor-ne*, belongs to Grimm's strong conjugation, and is the Anglo-Saxon and German *-en*, *-n*. The form *-ed* is akin to Latin *-ât-us*, as in *plic-at-us*, "*plie-d*," whence also *plea-t*. (See Haldeman's *English Affixes*, pp. 122, 132, 138, 167.) Participial forms due to Latin, such as *reluct-ant*, *luc-ent*, have become adjectives in English. The present participle in *-ing* arose from a blunder in confusing the proper form in *-end* or *-and* with the noun suffix present in *cloth-ing*, *bless-ings*, *wild-ing*; Icelandic, *reikn-ing*; Ger. *rechn-ung*; Eng. a *reckon-ing*; Anglo-Sax. *feorm-ung* and *feorm-ing*, a *form-ing*—the true participial form being present in Gothic *hab-ands*; Angl. *hæbb-ende*; Icel. *haf-andi*; Ger. *hab-end*; Lat. *hab-ens* ("having"), ablative case *hab-ent-e* (in "having"), the suffix of which was corrupted into *-ing* in the English *hav-ing*. The uncorrupted form is preserved in Scotch and in vulgar speech, but with the *d* absorbed by the *n*, giving forms like *hav-en*, *giv-en*, etc., commonly printed *hav-in'*, as if *-ing* had been the suffix mutilated, but *-ing* is not *-in* with a *gay*-sound added.

In the *Grammar* of Joseph R. Chandler (Philadelphia, 1847) there is a vindication of expressions like "the boy was being whipped," in contradistinction to the obscure form, "the boy was whipping." Mr. Grant White (*Words and their Uses*, 1871) prefers the less definite form, and is controverted by Dr. Fitzedward Hall (*Modern English*, 1873), who quotes Skillern (*Grammar*, 1802) for "I am being conquered," and Southey (1795) for "is being torn out," and two years later, "is now being educated." Sentences like "the witch was drowning," and "the witch was being drowned," are not equivalents, and in grammar and rhetoric ambiguous forms are to be avoided.

S. S. HALDEMAN.

Par′ticle [Lat. *particula*, "a small part"], a name of rather indefinite application, given primarily to the uninflected words in Greek and Latin, such as conjunctions, adverbs, and prepositions. The word is now used for the less important words in a sentence, which may be often omitted without injury to the sense. We have examples in "*Now*, it happened thus," "And now *also*" (Matt. iii. 10), "*But* when this occurred," "*Why*, yes," "*Well*, no." Some particles do not admit of translation, as the Latin interrogative *nunquid* in "Nunquid potest cæcus cæcum ducere?" ("Can the-blind the-blind lead?") In some Latin and English grammars the term is not used.

S. S. HALDEMAN.

Parti′nico, or **Partenico,** town of Sicily, province of Palermo, about 17 miles W. of the city of Palermo. It is situated in a wide pleasant valley, and is surrounded by calcareous mountains rising in the form of isolated pyramids. The vine and the olive thrive luxuriantly in this region, and the inhabitants are chiefly occupied with the manufacture and sale of wine and oil. Pop. in 1874, 20,154.

Parti′tion [Lat. *partitio*], in the technical legal phraseology the division of land held in a united ownership and in undivided shares by joint tenants, tenants in common or coparceners, so that each individual proprietor becomes severally owner and possessed of his particular allotment distinct from the portions assigned to the others. By far the most frequent instance which occurs in this country is that of a division among tenants in common, to whom as heirs the lands of a deceased ancestor have descended. There are two kinds of partition—voluntary and compulsory. In the former the whole proceeding is the result of agreement, and is consummated by the mutual execution and interchange of the proper deeds of conveyance, by which the designated allotment is released to each. The latter form is effected by means of a judicial proceeding instituted by one or more of the common owners against the others, in which the court determines the amount of the respective shares, and through its ministerial officers makes the actual division. The ancient common law provided a particular form of action for this purpose, but it has long been disused. Courts of equity possess a general jurisdiction over the subject-matter, and may decree a partition as the result of a regular suit in chancery. In the several States of this country the whole matter has very generally been regulated by statute, simple and expeditious special proceedings have been established, and a power to entertain them has frequently been conferred upon inferior courts, as, for example, upon the courts of probate. Whatever be the form of judicial proceeding adopted, all the co-owners are parties plaintiff or defendant, the extent of their interests is ascertained by a preliminary adjudication, commissioners are then appointed, who admeasure the shares and effect the allotment, and their acts are re-

viewed, and if found to be proper are confirmed by the court. If the land is incapable of an equitable division it may, by virtue of a statutory authority, be sold at public sale under the direction and control of the court, and the proceeds arising therefrom distributed among the owners. In such a case the rights of lien-holders, either on the whole tract or on the undivided shares, such as mortgagees and judgment creditors, are of course affected, and must therefore be ascertained and protected by the decree, the liens being transferred from the land to the fund resulting from its sale. In addition to the technical and strictly appropriate sense above described, the term "partition" is sometimes used to denote a similar process of dividing personal property, goods, and chattels among joint owners or owners in common. JOHN NORTON POMEROY.

Part′nership, in law. This consists in the association of two or more persons, who combine their labor or capital with a view to a common benefit or profit. It will be considered under the following principal divisions: I. The contract itself—its nature, its formation, and its relation to real estate; II. Its effect as to third persons; III. Its effect as between the partners themselves; IV. Dissolution and its consequences.

I. Partnership in goods is not to be confounded with joint tenancy or tenancy in common. In the former (see JOINT TENANCY) the survivor takes the whole interest, while in partnership the share of a deceased member passes to his personal representatives. One partner is for certain purposes the agent of the other, so that he can sell the entire stock in trade to a third person, while in the case of joint tenancy or ownership in common each owner has no implied authority to sell more than his own share. The ordinary rules of the law of agency become applicable to a partner, so that as to third persons his power to bind his associates will be derived from that department of law. As between himself and his associates, he is in a fiduciary position. The law of agency as to third persons, and that of trust as between themselves, are component parts of the legal rules affecting partners. The general principles of law governing contracts are to be extended to this relation. Thus, the incapacity to enter into this contract, depending upon infancy, mental weakness, duress, etc., is not different from that which is recognized in other cases of contract. A partnership may be constituted either by the respective partners contributing capital or skill, or one or more furnishing capital and others skill. Thus, lawyers in partnership may furnish no capital; members of a mercantile firm may all contribute capital, while some may supply capital and others skill. The general presumption is, that they will share profits equally, though there may be a special arrangement to the contrary. The capital of a mercantile partnership usually consists in the main of personal property, though there may be real estate when land is used for partnership purposes. An important inquiry arises as to the point whether it is to be governed by the technical rules applying to land or by those which prevail in the law of personal property. The courts do not wholly agree upon this point. Some maintain that the land required for or devoted to partnership purposes must be deemed, with a view to effectuate the intention of the parties, as stock in trade or personal property. Others insist that the characteristics of land shall not be taken away except to a modified extent, or so far as is necessary to work out the ends of the partnership. Thus, they would hold that the land is held in trust, and that the widow of a deceased partner could have no dower nor his heirs inherit until the partnership debts are paid and the joint affairs were fully settled. After this they would assert that any real estate remaining would be governed by the laws controlling land—that the trust imposed for the purposes of the partnership would cease, and, accordingly, that the widow would have her dower and the heirs would inherit. The latter view finds the greater support in the courts of this country. A word should be added as to the "good-will" of a partnership. By this expression is meant "the hope or expectation that customers will continue to resort to the place where the business is transacted." This expectation is treated by courts of equity as property of a peculiar kind. It cannot be sold by a sheriff on an execution, as it is in its nature intangible. It can only be made valuable through the peculiar remedies of courts of equity, such as an injunction. When one of several partners dies, the executor of the deceased can only realize anything from this source by means of a sale of the stock and premises, in which case the "good-will" accompanies the sale. In other cases the surviving partners are entitled to the good-will for their own benefit. This subject does not apply to professional partnerships, since the disposition of those who employ professional men to resort to them for advice is personal rather than dependent upon locality. This topic is frequently connected with the subject of the right to use firm-names and trade-marks. (See TRADE-MARKS.)

Partners at common law have been classified into secret, dormant, nominal, and ostensible. A dormant partner is one who simply supplies capital and takes no active part in management. A secret partner is one who is not known, though he may be active. A "nominal" partner is one who has no real connection with the firm, but holds himself out as a partner. Persons who give credit to the firm on the faith of his name may hold him liable on the ground of estoppel. (See ESTOPPEL.) There is by statute in some of the States a partnership known as limited. The theory of this is that there shall be one or more partners liable in the usual manner for the entire debts of the firm or *in solido*, and others who are only responsible for the amount of capital contributed. This result can only be accomplished by statute, and certain preliminary steps are required to be taken, such as publication in newspapers and filing notices in public offices. This will be more fully noticed at the close of this article. (For details the statutes must be consulted.) In France this system is known by the term "*en commandité*." Partnerships as to their subject-matter at common law may be either general or special; that is, they may be extended to nearly all kinds of trade or business in which persons engage, or they may be confined to a single item of property, such as the use of a race-horse for profit. They cannot be resorted to in the case of a mere position of trust, such as that of an executor or trustee, the duty to perform the trust being personal.

II. The great point of interest in partnership law is the capacity of one member of a firm to bind his associates in respect to third persons. There has been much diversity of opinion among jurists as to the true ground of partnership liability. Some have maintained that it rested upon participation in profits. The argument is that whenever a person takes by agreement a share of the profits as such, he withdraws a portion of the fund to which the creditors had a right to look for reimbursement, and accordingly should be held liable. This is the doctrine of a celebrated early English case (*Waugh* v. *Carver*, 2 Henry Blackstone's Reports, 235) which has been quite generally followed in the courts of this country. Much difficulty has arisen in the practical application of this rule in determining when a person takes the profits, *as such*, so as to make him a partner. Would a salesman, for instance, who received a percentage of the profits for his services, be a partner? The answer is that he would not, as the percentage is a mere mode of paying a subordinate for his services. He does not receive the profits in the character of a partner. It has accordingly been laid down that under this rule the test of partnership is the community of profit—a specific interest in the profits as profits, in contradistinction to a stipulated portion of the profits as compensation for services. Perplexing questions growing out of this view have led the English courts recently to a reconsideration of the correctness of the rule laid down in *Waugh* v. *Carver*, and it has been distinctly repudiated in the leading case of *Cox* v. *Hickman* (8 House of Lords' Cases, 268) by the highest appellate court. It is, however, quite probable that the American courts will adhere to the old doctrine with all its perplexities. The New York court of appeals has very recently reaffirmed (in *Leggett* v. *Hyde*, 58 New York Reports, 272) the correctness of the early English theory, and makes the participation in profits the basis of partnership. The other theory is, that agency is the test of partnership. The ground from which liability springs is, that one of the partners is the agent of the other, and thus has the capacity to bind him. The reception of profits may be evidence to show that the agency exists, but the final inquiry in all cases will be whether there has been such an agency created as to constitute a partnership. Were the question entirely new and the courts unfettered by precedents, this doctrine would seem to be the most philosophical and attended by the fewest difficulties. It is well settled, as already suggested, that a person may be a partner as to third persons who is not such in fact as between himself and his supposed associates. This proposition rests on the familiar doctrines of estoppel. It is on this ground that one who merely lends his name to a firm (nominal partner) is liable to those who have acted upon the supposition that he was in fact a partner. A similar principle is applied to one who lends money at usurious rates of interest to a firm on an agreement that he shall be paid legal interest and a share in the profits. The lender cannot allege the invalidity of the usurious contract, even though the borrowers can, and will be held liable, on the principle of *Waugh* v. *Carver*, already referred to, as a participant in the profits. One cannot be charged as a partner by a dealer with a firm unless he held that relation when the contract upon

which he is sought to be charged was made. Thus, if A purchases a quantity of paper of B, and afterward enters into a partnership with C in reference to publishing a newspaper, and they make use in the firm of the paper purchased of A, B has a claim only against A. He is not a creditor of the firm. The general principle may be laid down that if one partner borrows money or buys goods as an individual, and subsequently lends or sells to his firm, the lender or seller has no action against the firm, but only against the individual partners. On the other hand, if the loan or sale was in reality made to the firm, even though that fact was not disclosed, the partnership would be liable, on principles recognized in the law of agency as applicable to undisclosed principals. The difficulties attending this class of questions can be solved by inquiring whether there are two transactions or only one. If the borrowing or purchasing partner makes the contract for himself, and then by a new and independent act or contract deals with the partnership, it is only liable to him. But if he were at the time of the original transaction with the lender or seller not, in fact, dealing for himself, but for the partnership, it is liable on that contract. The kind of contracts which one partner under the general laws of agency can make so as to bind his associates depends upon the nature of the business. There is necessarily a much wider range in mercantile than in professional partnerships. Usually, a partner in a mercantile firm can buy and sell goods on credit, borrow such money as is required in the firm business, and give the firm note, draw checks, pay debts with the firm's property, and do like acts usual and necessary in the business in which they are engaged. It is enough to bind the firm that the member acting in the contract had the appearance of authority, even though in fact it had been withdrawn from him or was wholly unauthorized. An illustration may be found in the following case: A partner without the consent of his associates has no right to give a promissory note signed with the firm-name without consideration and as an act of accommodation to a friend to enable him to borrow money. Still, if he does issue such a note, and it is taken before maturity in the regular course of business by a purchaser in good faith, he can collect it from the firm, notwithstanding the partner's violation of duty. The ground of this rule is, that the partner has the apparent authority to issue the note. It cannot be distinguished in its appearance from one given in the regular business of the firm; and if one of two innocent persons must suffer, that one must sustain the loss who reposed the confidence. Still, if the person dealing with the firm knew, or had reason to know, that the partner was violating his duty, the firm would not be liable. Accordingly, a creditor of an individual partner could not enforce a firm-note given without the consent of the partnership, as he could not reasonably expect that his private debt would be paid by the firm. Owing to the intimate relation between the partners, the act of one is for many purposes the act of all. Thus, notice to one of any fact affecting their business is notice to all. An admission made by one is supposed to be made by all. An admission by one cannot be used to prove the existence of the partnership when that is in dispute, but after the partnership has been shown to exist the admission affecting their interest is receivable in evidence. It has been much questioned whether after the dissolution of a partnership an admission of a debt by one of the former partners will take it out of the statute of limitations as against the others. The better opinion would seem to be that it will not, as a mere admission, but a new promise is necessary in that case. On similar grounds, a partnership is liable for the torts or wrongful acts of one of its members connected with their business. Thus, if one of them is guilty of a fraud in making a contract the whole number is answerable. This rule cannot be applied when the wrongful act is wholly unconnected with his employment. The extraordinary powers given to a partner are conferred upon him for mercantile convenience, and this is the measure of them. He will not be allowed, without the consent of his associates, to submit the decision of a question to arbitrators which might form the subject of litigation, as each of the partners has a right to the judgment of the courts in respect to his legal interests.

III. The relation of partners, though growing out of a contract, is one of trust and confidence, and courts will hesitate to compel a person to go into partnership with another, though he may have agreed to do so. The injured party will commonly be left to an action for damages for breach of the agreement.

It is quite usual when a partnership is formed to enter into a formal agreement prescribing the duties of the respective partners, restricting their powers, defining their rights to participate in the profits, and sometimes providing for a continuance of the firm in case of the death or withdrawal of a member. Such an agreement is principally useful in defining the rights of the partners as between themselves. It will not bind third persons dealing with the firm unless its terms are communicated to them. They have a right to suppose, until they learn to the contrary, that the usual condition of things exists, and may accordingly deal with any member of the firm in the ordinary manner. The rule of *delectus personarum* should be adverted to in this connection. The meaning of this is, that partnership is so much a matter of trust and confidence that no new member can be introduced without the consent of all, or that the withdrawal of one destroys the partnership. It thus happens that on the withdrawal or death of one of the members the owners of the respective interests become mere tenants in common, unless they agree to the contrary. The agency to make new contracts is withdrawn, and the only power that remains to a member is to settle and adjust transactions already entered into. This rule has no application to joint-stock companies. (See Joint-Stock Companies.) A member of such a company may sell his stock, and the company will continue in existence. The accounts between partners can only be adjusted in a court of equity. Still, if they make a settlement and find an amount due from one to the other, there will spring up an implied contract on the part of the person found to be indebted to pay the amount due; and this contract is enforceable in a court of law. The view that their relation is one of trust and confidence prevents one of the firm from doing any act without his partners' consent in reference to the firm business which shall enure to his own individual advantage. Thus, if he buys up a claim against the firm for less than its face, he can only charge what he paid. So, if during the existence of the partnership he take, without the consent of his associates, from a landlord, in his own name, a renewal of a valuable lease belonging to the firm, he will be obliged to account as a trustee for the profits which may accrue. A cognate question concerns the right of a partner to carry on an independent business. It would be contrary to equity that he should engage in other business which would deprive his associates of any benefit which they had a right to expect from him; and, on the other hand, no good reason can be given why he should abstain from an entirely distinct occupation which in no possible way can be injurious to the partnership. A partner has no right to any additional compensation above his stipulated portion of the profits for extraordinary services unless such pay has been agreed upon. "The law," it has been said, "never undertakes to settle between them their various and unequal services in the transaction of their private affairs." However, any agreement fairly entered into for extra compensation will be binding. The remedies of the partners as between themselves are in the main to be sought in a court of equity. That tribunal has adequate means by its officers to take and state an account between them, and to enjoin one of the partners from doing an act injurious to the firm, and, if necessary, to appoint a receiver of its effects. This branch of the subject will be more appropriately considered under the topic of dissolution. (See the next subdivision.)

IV. A partnership may be dissolved in a number of modes. Whatever breaks up the relation of trust and confidence between the parties destroys the partnership. The leading modes are—(*a*) the express consent of the parties; (*b*) the sale by one of his interest; (*c*) death of one or more members; (*d*) bankruptcy; (*e*) marriage of a female partner; (*f*) insanity legally established; (*g*) the fact that one becomes by the law of nations an enemy to his associates; (*h*) the action of a court of equity decreeing a dissolution on such grounds as that the ends sought to be accomplished are impracticable, or that one of the firm is so conducting himself as to bring disaster upon the common interests, or is in such a state of mind that he cannot contribute to the common advantage; on the other hand, there are cases in which the court may interfere and prevent a dissolution by one of the partners when the interests of the firm require that no dissolution take place; (*i*) the voluntary withdrawal of a member. Such a person as is last named is commonly called a "retiring" partner. Notwithstanding his withdrawal, if the other members continue to prosecute the business, he will be liable for new engagements of the firm to those who had no notice of his withdrawal. For the purpose of giving such notice it is common to send circulars to customers announcing the change in membership. To persons who have not had dealings with the firm a publication in newspapers properly made will suffice. The effect of a dissolution is to prevent any new contracts from being made. The agency of each partner for that purpose is terminated. It only remains to pay debts and to close existing transactions. One of the most important cases of dissolution is that caused by the death of a member. The

survivors have no right, as far as the estate of the deceased partner is concerned, to carry on the business. Their duty is to wind it up. The title to the effects, in the view of a court of law, vests in them, so that they should bring suits and do other acts without making the representatives of the deceased parties to the proceeding. Still, in equity the survivors act as trustees, and may be compelled by the representatives of the deceased to account for any proceeds realized from the estate. So if any claims are due from the firm, they should, according to the prevalent American view, be collected from the survivors, unless it can be shown that they are insolvent, in which case the creditor may resort directly to the representatives. The theory in England (which is adopted in some of our States) is different. The partners are deemed in equity to be jointly and severally liable. (See JOINT AND SEVERAL.) The consequence is, that the creditor may proceed directly against the representatives of the deceased partner. Should the survivors, in violation of these rules, carry on the business and sustain a loss, they would be answerable personally; on the other hand, should they make gains, they might be held accountable for them on the general principles of law applicable to trustees. (See TRUSTS.) The contingency of dissolution by death is sometimes provided for in the partnership articles, and the partnership is to continue notwithstanding it may occur. In this case the estate of the deceased will be liable. So if the executors interfere in the management, they may become personally liable for debts. It should be added that the court has a superintending power over the acts of survivors, and may in appropriate cases grant injunctions to prevent any waste of assets, and if necessary appoint a receiver in the interest of creditors and others concerned, who may close up the business. The same general practice is resorted to when a dissolution of the relation is ordered by the court for any reason. The receiver is an officer of the court, and must follow its directions. (See RECEIVER.)

A question frequently arises on a dissolution as to the correct principle to be adopted in appropriating the funds of the partnership to the payment of individual and firm debts when the assets are insufficient to discharge both. It is plain that each partner may have debts of his own growing out of the transaction of his private business. Creditors of this class have a right to be paid from his share of the firm property so long as there are no conflicting claims of partners or partnership creditors. Where there is a contest for priority between the two sets of creditors, justice requires that the partnership creditors should first be paid out of the partnership estate. Were it not so, and could any individual creditor exhaust the share of his debtor, it might happen that after the firm assets had been used the residue of the partnership indebtedness would have to be satisfied from the private estate of the other members of the firm. An inequality of burdens would thus be caused. This would be contrary to the spirit of the administration of equity jurisprudence and to a favorite maxim, that "Equity delighteth in equality." The operation of this rule cannot be prevented by diligent action on the part of the private creditor in the way of collecting his claim. Thus, if he should proceed to judgment, and should sell on an execution the partner's share, the purchaser, while he would acquire the legal title to the portion sold, would in a court of equity be liable as a trustee to the creditors of the firm and the other partners until the partnership accounts were adjusted. If upon this adjustment the entire property was used to pay debts, the creditor of the individual partner must yield his claims. The general rule that in case of insolvency the partnership creditors must be first paid out of the partnership assets has been recognized in the legislation of Congress upon bankruptcy. (See *Revised Statutes of the U. S.*) It has been contended by many jurists that the rule is not complete and just in its action unless a similar preference is given to the individual creditor over the private estate of his debtor. If this proposition be sound, the result is that in case of bankruptcy the partnership creditors should be first paid out of the partnership property, and the private creditors out of the individual estate, and that after the preferential claims had been paid each set of creditors has a secondary claim upon any surplus remaining. This whole rule prevails in the legislation of Congress. However, when there are no partnership assets it is said that the rule will not be applied, and the individual creditors, as well as those of the partnership, will be placed upon an equality as to their claims against the estate of the debtor partner. This last proposition is strongly objected to by some writers as inequitable and unfair. No such rule prevails in favor of private creditors where there are no private assets, and it is urged that justice dictates that the partnership creditors should regularly give way to private creditors in respect to individual assets.

Some reference should be made in this connection to part-owners of ships. These in general are not partners. They are rather to be regarded as tenants in common. On general principles of law one cannot even make repairs against the assent of his associates and charge them for their share of the expenses, though by an early rule this may be done in the case of houses and mills owned by such tenants. Nor can a part-owner sell any more than his own interest. Nor can he insure other part-owners' interest without special authority. The prevailing opinion, notwithstanding some dissent, is that one part-owner has no lien on the share of his associates for any general balance due him for expenditures upon the ship, nor for the carrying on of a specific adventure, unless there has been a consent of the others to the expenditure, so as to form a species of partnership. Ships may, however, like other chattels, be owned and managed by partners, and the general principles of the law of partnership be applicable to them. So part-owners may enter into a partnership for a particular adventure, when they will, for the time being, subject themselves to the rules appertaining to partners.

It is proper to add some further considerations in respect to limited partnerships, briefly alluded to in subdivision I. It was found at an early day in this country that the general rules of partnership law were in many instances harsh and severe. Though one may contribute but to a small amount to the most extensive business, in case of its failure he may have his entire estate taken to pay debts. In legal phrase he is liable *in solido*. To avoid this result corporations are frequently resorted to in order that only the amount contributed to the capital stock may be at risk. On the same general principle the practice was introduced by statute of forming limited or special partnerships on a plan in vogue in France. The statutes on this subject, as adopted in a number of the States, vary in their details. A leading feature of them is that there is a combination of two kinds of partnership —general and limited. In other words, there is at least one active partner, liable on the principle of the common law *in solido;* there are other partners, who take no active part in the business, but contribute to the capital stock, who are liable only for the amount contributed. Publicity is another important element in the case. In an ordinary partnership there is in general no ready means of knowing who the partners may be, nor how much capital they may have contributed. On the other hand, in a special or limited partnership much care is taken to secure full disclosure upon these points. A certificate is to be signed by the partners and properly published in some newspaper, and recorded in some specified public office in the vicinity of the parties' residence or place of business. The office of the certificate is to set forth the nature of the business to be transacted, the names of the partners, distinguishing between those who are general and those who are special, the amount of capital contributed in cash by the special partners, the name of the partnership, and the date of its commencement and of its termination. Much care must be taken to comply with these regulations. As the exemption from liability is provided by statute, if its terms are not substantially complied with the supposed special partners will really be general partners, and be liable *in solido*. Thus, it has been decided in one of the State courts that if the certificate, as published, by an error of a compositor state a different amount from that published in the newspapers as required by law (the amount contributed as stated in the filed certificate being $3000, and that as mistakenly published $5000), there is no special partnership formed, and the contributor is liable as a general partner. Still, merely formal variations from the statute will not be fatal to the existence of the special partnership. For instance, a statement that the special partner has "actually paid in" his share of the capital is sufficient, although the statute requires the payment to be "in cash," the two expressions being substantially equivalent. After the partnership has been formed special rules continue to govern it. The special partner must not withdraw his capital; his name must not be used in a contract with his consent, nor must he be an active manager of the affairs of the firm. Should these rules be violated he becomes a general partner. This partnership may expire by the lapse of a prescribed time, or it may be dissolved by the action of a court of equity. So it may be renewed by the observance of prescribed statutory forms analogous to those whereby it was created.

(For further information on the general topic of partnership, which is of much commercial importance, consult the treatises of Collyer, Lindley, Bissett, Story, and Parsons, and those of the writers on the more general subject of contracts. See also JOINT-STOCK COMPANIES, CONTRACT, and TENANCY IN COMMON.) T. W. DWIGHT.

Par'ton (James), b. at Canterbury, England, Feb. 9, 1822; was brought to New York in early childhood; educated in an academy at White Plains, where he became a teacher at the age of nineteen; subsequently taught school in Philadelphia and New York; was for some years assistant editor of the *Home Journal;* has been a prolific and successful author, chiefly in the field of biography, and a popular lecturer upon literary, social, and political topics; in 1856 married the well-known authoress "Fanny Fern;" resided in New York until Mar., 1875, when he became a resident of Newburyport, Mass. Among his works are *Biographies* of Horace Greeley (1855; new ed. 1868), Aaron Burr (1857; new ed., 2 vols., 1864), Andrew Jackson (3 vols., 1860), Benjamin Franklin (2 vols., 1864), and Thomas Jefferson (1874), *Humorous Poetry of the English Language* (1857), *People's Book of Biography* (1868), *Smoking and Drinking* (1868), *Famous Americans of Recent Times* (1870), *Topics of the Time* (1871), *Triumphs of Enterprise* (1871), *Words of Washington* (1872), and *Caricatures in all Times and Lands*, in *Harper's Monthly* for 1875. He has for many years been engaged upon a memoir of Voltaire.

Parton (Sarah Payson **Willis**), wife of James Parton and sister of Nathaniel P. Willis, b. at Portland, Me., July 7, 1811; married Mr. Charles H. Eldredge of Boston, a bank-cashier, on whose death she resorted to literature as a means of subsistence; obtained great success by her short humorous essays entitled *Fern Leaves from Fanny's Portfolio* (2 vols., 1853–54), *Little Ferns for Fanny's Little Friends* (1853); wrote regularly for many years for the *New York Ledger;* issued several volumes of collected articles, and was author of two novels, *Ruth Hall* and *Rose Clark*. D. in New York Oct. 10, 1872. (See *Fanny Fern: a Memorial Volume, containing her Select Writings and a Memoir*, by James Parton, 1873.)

Part-Owners (law), in the most general sense, the owners of personal property—goods and chattels—in undivided shares, not being at the same time partners. They cannot transfer nor encumber the entire article, but only their own shares therein. They are not, by virtue of their being part-owners, agents for each other; such agency, if it exist at all, must arise from some other fact than the mere part-ownership. In these respects the interests, rights, and powers of part-owners differ materially from those of partners. The term, although thus defined in a general manner, is almost exclusively confined to the ownership of shipping. A ship or other vessel navigating the ocean is often regarded as divided into a number of equal shares, which are held by different persons, not partners, who together constitute the part-owners. In such a case the majority have the right to employ her in a particular voyage or adventure against the will of the minority, but may be compelled by a court of admiralty to secure such minority, in the amount of their respective shares, against her loss or failure to return. If, on the other hand, the majority are unwilling to use the vessel for any purpose, the minority possess a like authority to control her movements upon giving similar security to their fellow-owners. In the ordinary management of the ship the part-owners are usually represented by certain agents, of whom the most important are the master and the ship's husband, who are clothed with large powers to bind the owners by various species of maritime contracts and liabilities. When such agents have acted within the scope of their authority, and have bound the part-owners by their engagements, the latter are liable therefor *in solido;* that is, all are liable jointly, and each is liable individually, for the whole demand. John Norton Pomeroy.

Par'tridge, tp. of Woodford co., Ill., on Lake Peoria. Pop. 395.

Partridge [Fr. *perdrix;* Gr. πέρδιξ], the English name for *Perdix cinerea*, a representative of the family Tetraonidæ, and typical of a peculiar family; it is applied in some sections to the *Ortyx Virginiana*, or bob-white, etc. (Ortyginæ), and in others to the *Bonasa umbellus*, or ruffled grouse (Tetraoninæ). See Perdicinæ.

Partridge (Alden), b. in Norwich, Vt., about 1785; graduated at the U. S. Military Academy 1806, when he was appointed first lieutenant of engineers; captain 1810; was retained at the academy as assistant professor of mathematics until Apr., 1813, when he was appointed professor, and in Sept., 1813, professor of engineering; commanded at West Point Jan., 1815, Nov., 1816, and Jan. to July, 1817; resigned Apr., 1818, and in 1819 was appointed principal of the surveying party to determine the N. W. boundary of the U. S. In 1820 he founded a military school at Norwich, Conn., which was subsequently incorporated in the Norwich University, of which he was appointed president. He also established military schools in New Hampshire, Delaware, Pennsylvania, and Virginia, and delivered lectures on military matters throughout the U. S. Was appointed surveyor-general of Vermont 1822, and was a member of the Vermont legislature 1833–34 and 1839. D. at Norwich, Vt., Jan. 17, 1854.

Partridge (George), b. at Duxbury, Mass., Feb. 8, 1740; graduated at Harvard 1762; taught school at Kingston for some years; was an active member of the provincial congress 1774–75; delegate to the Continental Congress 1779–85; member of Congress 1789–91, and sheriff of Plymouth co. several years. D. at Duxbury July, 1828, bequeathing much of his property to religious and educational uses.

Par'tridgeber'ry, or **Checkerberry,** the common name of the *Mitchella repens*, a genus of edible berries found in the U. S., Canada, Mexico, and some parts of South America, belonging to the madder family. (See Rubiaceæ.) It is a trailing evergreen, bearing a fruit about the size of whortleberries, which remains on the stem through the winter. The wintergreen (*Gaultheria procumbens*) is sometimes incorrectly referred to this family.

Partridge-wood, a name applied in commerce and the arts to several handsome tropical woods used for veneering and for making small ornamental wares. It is more generally given to the wood of *Andira inermis*, a leguminous tree of the West Indies and South America. This wood is hard, and in Brazil is used in shipbuilding.

Party Wall (law), a wall which stands at or on the line between two adjoining lots belonging to different owners, and in which both proprietors have common rights and a common use. The special circumstance which ordinarily gives it a distinctive legal character is the existence in each proprietor of a double right—an ownership in fee of the portion resting upon his own soil, and an easement in the portion resting upon the soil of his neighbor. If, as is generally the case, the wall is erected upon the line which separates the estates, each owner has an easement extending over the half belonging to the other, and is in turn subjected to the corresponding right held by the other. This easement consists in the right that the wall itself shall remain unimpaired, and shall be used for the support of the two buildings which it separates. From these principles are derived a number of special rules in respect to its use and maintenance, its repair, additions to its height and to its foundations, and its rebuilding when necessary. In several of the States the rights and duties of the proprietors are carefully defined and regulated by statute. John Norton Pomeroy.

Párvatí' [Sansk., "mountain-born"], a female divinity of the ancient Hindoo pantheon, the consort of Siva, and usually identified with Devi, Durga, Kali, and Bhaváni. Her worship, which is widely diffused at the present time, is attended by the most repugnant and terrible ceremonies. (See Hindu Religion, by Prof. John Dowson.)

Pasakenta, post-v. and tp., Tehama co., Cal. P. 356.

Pascagou'la, city and tp., cap. of Jackson co., Miss., situated on an inlet of the Gulf of Mexico, and upon the New Orleans and Mobile R. R., 40 miles from the former place, is a port of entry, and contains 2 academies, several churches, 1 newspaper, 1 foundry, several shipyards, a Masonic lodge, 15 lumber, 3 planing, and a number of shingle and lath mills, and stores. There is a lighthouse at the entrance of the inlet, and good anchorage. Pop. 480. M. Smith, Ed. "Star of Pascagoula."

Pascagoula River, formed in Greene co., Miss., by the union of Chickasawha and Leaf rivers. It flows S. into Pascagoula Bay, a beautiful arm of the Mississippi Sound. The river sometimes floods its valley at high water. It is navigated by small steamboats. Much timber is cut in its pine forests for the New Orleans market.

Pascal (Blaise), b. at Clermont-Ferrand, Auvergne, June 19, 1623, an only son; very early showed himself possessed of the most extraordinary mental gifts. His father resigned his office in the provinces and repaired to Paris in order to give him the best education possible. His mother died when he was only three years old, but with his two sisters he always lived in the greatest intimacy and love. The father was a good mathematician himself, but as he wished that the son should acquire the languages and belles-lettres first, he kept all mathematical books away from him. Some slight circumstance, however, started his genius, and one day the father found the boy pondering over geometrical problems which had risen spontaneously in his mind. The study of Euclid began; and such was the progress of young Pascal that in his sixteenth year he wrote a treatise on *Conic Sections*, which attracted the attention of Descartes, and in his nineteenth year, his father having accepted an office in Rouen as intendant of finance for the province of Normandy, he

invented a calculating-machine to aid him in figuring out his accounts. Meanwhile, Torricelli's theory of fluids drew him from the study of geometry to that of physics, and the results were two admirable dissertations, on the *Equilibrium of Fluids* and on the *Weight of the Atmosphere*, which were not published until after his death, but which mark the beginning of modern physical science. He also undertook the first barometrical measurements, and the report of his experiences involved him in polemics with Father Noël, a scientist of the Aristotelian school, in which controversy the dialectics and definitions of the old school made their last efforts against the experiments and analyses of the new school. After his death a third treatise was found among his papers, in which he demonstrates the principles of the calculus of probabilities; and in 1659 he published under a *nom de plume* his celebrated essay on the cycloid, *Traité générale de la Roulette*, the idea of which came to him under his severe sufferings like a sudden inspiration, and made him forget both sickness and weakness for the eight days during which he put the demonstration down on paper.

While in Rouen, Pascal became acquainted with the Jansenists. Jansen's ideas were gaining ground at this time, especially in France, where they were represented at the Sorbonne by several great scholars and at the Port-Royal by a number of zealous disciples. Jansen's *Oratio de Interioris Hominis Reformatione* impressed Pascal very deeply, and, so to speak, wrought his conversion. Jansen said that science is simply the result of a curiosity which belongs to our lower nature, and contains nothing which is of any essential use for us to know, and this struck Pascal as truth; he confesses that from the moment he began to meditate on human nature and moral questions the abstract sciences, such as mathematics and physics, seemed to him sterile and valueless. He consequently abandoned science and determined to devote himself wholly to the study of religion and morals. Once more, however, he relapsed. His father died in 1651, and the fortune which he inherited, as well as other circumstances, carried him back into the world. He formed plans for different kinds of employment, and thought of marrying, when he again was led to abandon all such ideas, partly by the influence of his sister, partly by an incident which made an overwhelming impression on his mind. He was riding one day across the bridge at Neuilly. The horses became frightened: the leaders plunged into the Seine; and if the harness had not broken, the other pair and the carriage would have followed. From that day Pascal always felt as if there were an abyss beside him, and during the last years of his life he was frequently subject to hallucinations. Delicate and nervous by nature, overwork had early broken his health and strained his whole nervous system. To these circumstances he added in his later years a most rigorous asceticism. He denied himself the help of a servant; he abstained from any but the simplest and coarsest food; he wore an iron girdle around his loins, and whenever an unholy thought entered his mind he would drive the pointed edges into his flesh. He wished to live in prayer, charity, and sufferings, which he considered as the three forms of a true Christian life; and his wish was fulfilled. The last two years of his life were one long agony, broken only by prayers and charitable deeds. D. in Paris in the house of his eldest sister, Aug. 19, 1662. But the more strongly the life of Pascal impresses us on account of its asceticism and extreme enthusiasm, the more admirable seem his two great religious works, the *Provincial Letters* and the *Pensées*. Here are no exaggerations, no extremes; they are the beautiful expressions of a beautiful soul, and they have been read through all following ages and by all Christian denominations with the greatest enjoyment. The *Pensées* is not a finished book, but aphorisms or preparations for a work on religion. They were collected and published after Pascal's death in 1670, but in a mutilated form, everything being omitted that the editor did not understand; and in that condition they remained until 1842, when Victor Cousin drew attention to the fact. The *Provincial Letters* were published in 1656–57. The first three letters are simply a vindication of Antoine Arnauld, the celebrated Jansenist professor at the Sorbonne, whom the Jesuits had succeeded in driving from the school. But the following fourteen letters form a direct attack on the Jesuits themselves. They criticise the morals and policy of the order with a calm, almost humorous, irony, but beneath this calm, almost pleasant, surface lies a deep, implacable hatred. They roused even the most indifferent to attention; and the universal indignation which a century after Pascal caused the expulsion of the order from France is generally ascribed to the *Provincial Letters*. No less striking are the positive moral views which this book contains. It is Pascal who has done away with the moral philosophy of the Middle Ages, which was not much more than a system of definitions of names. In every case he established a connection between the rules of the moral system and the passions of human nature, and by this method established the principle of modern philosophy. It must also be noticed that, according to all French critics, the prose of the French language became finally formed and refined by the writings of Pascal. CLEMENS PETERSEN.

Pascalis (FELIX A. OUVRIÈRE), M. D., b. in France about 1750; became a physician in San Domingo; settled in Philadelphia after the negro insurrection of 1793, and subsequently resided nearly thirty years in New York, where he d. July 27, 1833. Author of several treatises upon medical subjects, and noted for his maintenance of the non-contagious character of yellow fever.

Pas′chal I., ANTIPOPE, a Roman archdeacon, appointed pope by the exarch of Ravenna in 687 A. D. Theodorus II., antipope, was chosen by a faction, but Sergius I. was declared the true successor of Conon, the deceased pope. Paschal was imprisoned as a simonial and pronounced a magician. D. in 694.—PASCHAL III., ANTIPOPE (*Guido di Crema*), b. in Lombardy, became in 1155 a cardinal-deacon, and in 1164 was declared pope by Frederick Barbarossa, whose partisan he was. D. at Rome Sept. 20, 1168.

Paschal I., POPE, b. at Rome, became abbot of St. Stephanus; succeeded Stephen IV. in 817; crowned Lothaire as emperor 823. D. Feb. 10, 824.—PASCHAL II. (*Raniero*), b. at Bleda, Italy, about 1050; was a Cluniac monk; became a cardinal-priest, and in 1099 succeeded Urban II.; was involved in life-long contests with the Henrys (IV. and V.) of Germany concerning investitures. Henry V. kept the pope in prison for some time. Similar troubles with Henry I. of England were settled by a compromise, by which Henry kept the substance of his former rights, but made unimportant concessions to the pope, and similar concessions were made by the king of France. D. Feb. 21, 1118.

Pas′chal Chron′icle [Lat. *Chronicon Paschale;* Gr. Πασχάλιον], an epitome of events, by an unknown author, arranged chronologically from Adam to the twentieth year of Heraclius (A. D. 629), so called from its being compiled in part from the paschal canons (relating to the festival of Easter) of various towns and provinces; it was also called *Alexandrinum*, from having been at one time supposed to be the production of Peter of Alexandria, or otherwise of George of Alexandria. It sometimes, also, is known by the name of *Fasti Siculi*, from having been found in an old library in Sicily, whence it was brought to Rome. Though full of faults in style and matter, it yet affords much valuable chronological material. The Chronicle ended originally, according to Holstein, in the reign of Constantius, with the death of his rival Magnentius (A. D. 354), and was continued thence, with interpolations in the former part, to 629 by a different compiler. Clinton, however, gives reasons for believing both parts to be by one and the same compiler. (*Fast. Rom.*, vol. ii., p. 209.) A list of emperors from Augustus to Constantine Monomachus (1042) is appended, having been removed from the text, as evidently the work of a later hand. The most recent and convenient edition is that of L. Dindorf (Bonn, 1832, 2 vols. 8vo). (See *Vossius de Hist. Græc.*, p. 332; Harles, *Hist. Ling. Græc.*, vol. ii., pt. i., p. 481.)
HENRY DRISLER.

Pascua′ro, or **Patzquaro,** town of the Mexican confederation, state of Michoacan, is picturesquely situated on the south-eastern shore of Lake Pascuaro, 7000 feet above the level of the sea; is well built, and has some sugar-refineries and copper-works. Pop. about 6000.

Pas-de-Calais′, department of France, borders N. and W. on the Strait of Dover and the English Channel, and comprises an area of 2550 square miles, with 761,158 inhabitants. A range of low hills, rich in coal, iron ore, marble, and slate, traverses the department, ending in Cape Gris-nez, and forming for a distance of several miles along the coast a row of cliffs similar to those on the opposite English coast. On both sides of this range of hills the ground is low, with a very fertile soil, except along the coast, which generally is marshy or sandy. Both agriculture and manufactures are in a very advanced state in this department. Wheat, hemp, and fruits are extensively cultivated; iron-foundries, glassworks, tanneries, mills, and factories are in operation, and important fisheries along the coast are carried on. Of 81,619 children of school age, 13,388 were without school education in 1857.

Pa′sewalk, town of Prussia, province of Pomerania, on the Ucker, manufactures spirits, tobacco, leather, and cloth. Pop. 7414.

Pasha′, or **Bashaw′** [from the Pers. *padishah*, "powerful ruler"], in Turkish countries, a high civil, military, or naval functionary. Pashas are of three classes, distinguished as pashas of one, two, or three tails; for the badge of a pasha's rank is the tail of a horse or yak borne as a

standard, those of highest rank having three and those of lowest but one tail.

Pas'kevitch (Ivan Fedorovitch), Russian field-marshal, count of Erivan, prince of Warsaw, b. at Poltava May 19, 1782; was educated as a page at the court of Paul I. at St. Petersburg; entered the army in 1800; distinguished himself in the campaigns against Napoleon, and was made a general in 1814; conducted in 1826 the expedition against Persia and took Erivan; commanded in 1829 a Russian army in Asia against the Turks and captured Erzroom; suppressed in 1831 the revolution in Poland, compelled Warsaw to capitulate, and was appointed viceroy. As such he governed with severity, but with justice; the principles he held were detested by the Poles, but not the man. In 1849 he led the Russian armies into Hungary and quelled the revolution, and in 1854 he commanded the Russian army on the Danube against the Turks. This time, however, he met with nothing but defeat and repulses. He resigned the command and retired to Warsaw. D. Feb. 1, 1856.

Pas'koag, post-v., Burrillville tp., Providence co., R. I.

Pasque Flower [so called, probably, because its petals were used to stain Easter or *pasque* eggs], a name given to *Anemone pulsatilla*, a ranunculaceous herb of Europe and Asia, and also to some other species of Pulsatilla section of the genus. They are spring-blooming plants, with poisonous and medicinal qualities. (See Anemone and Pulsatilla.)

Pasquier' (Etienne), b. at Paris Apr. 7, 1529; studied jurisprudence, and pleaded his first case in 1549; started on a literary career with some poetry in French and Latin, and became celebrated as an author by his *Recherches de la France* (1560), and as an advocate by his defence of the University of Paris in its lawsuit with the Jesuits in 1564. D. at Paris Aug. 31, 1615. There is a collected edition of his works (2 vols., fol., Amsterdam, 1723) and an edition of his *Œuvres Choisies* (2 vols., Paris, 1849).

Pasquinade' [Fr.], an anonymous attack, often in verse, and of bitter, caustic, and witty character. The name is derived from Antonio Pasquino, a cobbler, who lived at Rome towards the close of the fifteenth century, and who was famous for his sharp personal sarcasms. After his death it became customary to post up pasquinades upon a broken statue dug up near where he had lived. The torso was, and is to this day, called by his name. A most popular topic for pasquinades has been the Roman clergy and the public officers.

Pas'quotank, county of N. E. North Carolina. Area, 240 square miles. It is bounded E. by the navigable Pasquotank River, S. by Albemarle Sound, W. by Little River, and extends N. into the Great Dismal Swamp. It is highly fertile, and produces fine crops of corn, wheat, and cotton. Cap. Elizabeth City. Pop. 8131.

Pasquotank River, a navigable stream, rises in the Dismal Swamp, Va., and flows S. and S. E. into North Carolina, entering Albemarle Sound by a broad estuary. Steamboats pass from Norfolk, Va., by way of the Dismal Swamp Canal and the Pasquotank River.

Passadum'keag, post-v. and tp., Penobscot co., Me., on the European and North American R. R. Pop. 243.

Passa'ic, county of N. New Jersey, bounded N. by New York. Area, 193 square miles. It is uneven and partly mountainous, with fertile valleys. Manufacturing is the chief employment of the people. Silk goods, thread, cottons, linens, iron castings, iron, machinery, locomotive engines, and a great variety of other goods are manufactured. Grain, garden, and dairy products are the agricultural staples. Iron ore is mined to some extent. The county is traversed by various railroads, chiefly operated as branches of the Erie R. R. Cap. Paterson. Pop. 46,416.

Passaic, tp. of Morris co., N. J., on the Passaic River. Pop. 1624.

Passaic River rises in Morris co., N. J., and after a tortuous course of 100 miles flows into Newark Bay, 3 miles from Newark. It is navigable some 13 miles. At Paterson it has a remarkable fall of some 72 feet, affording a very valuable water-power.

Passamaquod'dy Bay lies E. of Washington co., Me., and S. W. of Charlotte co., New Brunswick. It abounds in good and deep harbors and in fine views. Picturesque islands are numerous and the fisheries are important. Its tides average 25 feet in rise. It receives the noble estuary of the St. Croix.

Passa'rowitz, town of European Turkey, province of Servia, has about 7000 inhabitants, and is historically noteworthy on account of the treaty of peace signed here in 1718 by Austria and Turkey.

Pas'sau, town of Bavaria, at the confluence of the Ilz, Inn, and Danube, consists of three different parts, built on the wooded hills between the rivers and defended by two fortresses and eight detached forts. It has several fine buildings, breweries, distilleries, and manufactures of tobacco. By the treaty signed here in 1552 by Charles V. and the allied Protestant princes religious liberty was conferred on the Protestants of Germany. The cathedral and a great part of the town were destroyed by fire in 1662. Pop. 13,883.

Passavant' (Johann David), b. at Frankfort in 1787; studied the art of painting in Paris and Rome, but devoted himself subsequently to the theoretical and critical treatment of the art, and became inspector of the Städel Museum in his native city, where he d. Aug. 12, 1861. He wrote *Rafael von Urbino und sein Vater Giovanni Santo* (3 vols., 1839–58), *Die christliche Kunst in Spanien* (1853), *Le Peintre-Graveur* (6 vols., 1860–64).

Pass Christian', post-v. of Harrison co., Miss., on the Mississippi Sound and New Orleans Mobile and Chattanooga R. R. Pop. 1951.

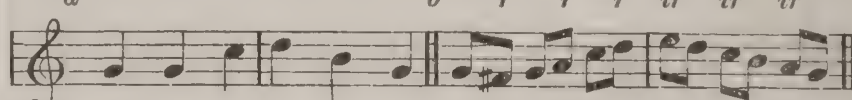
Pas'senger Pig'eon, the most common wild pigeon of the Eastern and Central U. S., *Ectopistes migratorius*. It is a fine, graceful bird, 16 inches long, one-half the length being composed by the tail-feathers. It is gregarious, and performs its very rapid migrations solely for the sake of finding good feeding-grounds. It is hunted so much that the enormous flocks so often seen in former years are now rare. The young birds are highly prized as food. Beech-nuts, rice, acorns, and buckwheat are eagerly sought by the wild pigeon, and, in fact, all kinds of grain and seeds. They are often caught in nets. Each bird has been estimated to consume half a pint of grain in season daily.

Pas'seres [*Passer*, "swallow"], a group of birds variously ranked as an order, sub-order, or minor combination of families, and accepted by different authors with different limits. As now generally adopted, it is applied to those families represented by the common song-birds, and distinguished by the structure of the skull and especially maxillo-palatine bones, as Ægithognathinæ, and contrasted by Huxley as Coracomorphæ with the Cypselomorphæ—*i. e.* the swallows, goatsuckers, and humming-birds. It is probably of the rank of a "super-family," and is generally differentiated into a large number of groups called families, but which are probably mostly of less value. No less than 22 of these so-called families are recognized for North American birds—viz. Hirundinidæ, Motacillidæ, Sylvicolidæ, Cærebidæ, Tanagridæ, Fringillidæ, Icteridæ, Sturnidæ, Corvidæ, Paridæ, Certhiidæ, Chamæadæ, Troglodytidæ, Laniidæ, Vireonidæ, Ampelidæ, Sylviidæ, Cinclidæ, Saxicolidæ, Turdidæ, Alandidæ, and Tyrannidæ.

Theodore Gill.

Pass'ing Notes, in music, certain notes in a melody, or in any of the parts in a harmonized piece, which are not radical and essential, but introduced to promote fluency, elegance, smoothness, expression, and ease of execution. By some writers these notes are called *transitions*, or *transient notes*. In the following example, see a series of plain notes at *a*, and the same with passing notes at *b*:

a *b* *r* *r* *r* *ir* *ir* *ir*



Transitions are of two kinds, *regular* and *irregular*: the former are those which occur on the unaccented and the latter those on the accented parts of the measure. In the example they are marked *r* and *ir*. Wm. Staunton.

Pas'sion-flower, a name in its widest sense applicable to nearly all the species of Passiflora, the principal genus and type of the order Passifloraceæ, mostly climbing plants of tropical America, but especially to *P. cœrulea*, and a few other ornamental species in common cultivation. The name is derived from the fancied resemblance of the various parts of the flower to the means of our Lord's passion and death; the nails, the crown of thorns, the five wounds, and even the hammer and the cross itself, having been identified in the blossom. There are nearly 150 species of true passion-flower. Some of these bear edible fruits (called *granadilla*); many have active medicinal powers, and many others are cultivated in greenhouses for their beautiful flowers. Of these the best known is the *Passiflora cœrulea*, a native of Brazil. The U. S. have six or seven native species, of which only *P. incarnata* is handsome. Its fruit, called May-pip, is eaten in the Southern States.

Pas'sionists, Congregation of the, an order of the Roman Catholic Church, founded at Ovado, Piedmont, in 1720 by Paul of the Cross (1694–1775). It was con-

firmed by Benedict XIV. in 1741 and 1746, and by Pius VI. in 1775. A house of women was admitted to the order before the founder's death. The Passionists are numerous in the U. S. and Europe. They practise many austerities, and devote themselves to local missions and the work of preaching. The mother-house is on the Celian Hill in Rome.

Passion Plays. See MIRACLES and OBERAMMERGAU.

Passion-Tide, the last two weeks of Lent, the first week of which is Passion Week and the last HOLY WEEK (which see). But popularly, Holy Week is called Passion Week also.

Passive State (or **Passivity**) **of Metals.** These terms are applied by chemists to certain phenomena having a very wide range, and as yet very inadequately investigated, which do not all seem likely to be referred ultimately to the same cause. It is found that a number of the metals which are acted on and dissolved with energy by certain acids and other chemical solvents may under special circumstances become what is called "passive," the action of the acid or other agent being totally suspended, and the metal remaining immersed therein often with a clean, brilliant metallic surface, and having lost entirely the power to decompose the liquid. Strong nitric acid is the solvent that has been best investigated in this relation, though many other agents behave similarly. Keir first observed the phenomenon in the case of iron immersed in strong nitric acid and solution of nitrate of silver, and Schönbein, Faraday, and Herschel have been among its most distinguished investigators. Iron is made passive towards nitric acid of density = 1.2 to 1.35 by a number of different methods. A wire heated at one end till enfilmed with black ferroso-ferric oxide becomes passive, not only where heated, but for a certain distance beyond, showing that it is not the film which merely protects mechanically. If first dipped in fuming nitric acid or in a mixture of weaker acid with oil of vitriol, it becomes passive towards the weaker acid itself. Contact of an iron wire which is being powerfully acted on with another wire in the passive state, or with a platinum or gold wire, will often instantly transform the first wire to the passive condition. An iron wire which is made the positive pole of a voltaic circuit, the negative pole being platinum, becomes passive, and remains so when the current ceases. Phenomena of a similar kind are observed with other metals in too great number and variety to be here detailed, the reader being referred for complete information to Gmelin's *Handbook of Chemistry*, or to Watts's *Dictionary of Chemistry* (under the head of "Electricity" in each work). All the phenomena of passivity are usually referred to *voltaic* action, but it is as yet doubtful whether they are all of this nature; and it must be stated that little or no progress has yet been made towards a clear understanding of their causes. H. WURTZ.

Passom'eter [Lat. *passus*, "step;" Gr. *μέτρον*, "measure"], a little instrument in the form of a watch which, carried about the person of a pedestrian, registers the number of his steps in walking. It has a dial and two index-hands, which latter are driven by a ratchet movement actuated by the inertia of a small pendulous weight made to vibrate by the motion of the walker. F. A. P. BARNARD.

Pass'over [Heb. *pesach;* Gr. *πάσχα*], the first and the greatest of the three annual festivals of the Jews, was instituted by Moses in commemoration of the deliverance of the Israelites from Egyptian bondage, and celebrated from the 15th to the 21st day of Nisan, both inclusive, thus falling between our March and April, at the time of the first full moon in the spring. The first and the last day of the festival were kept holy and observed by abstaining from all work, by prayers, hymns, thanksgivings, and other ceremonies, and during the whole period the bread was eaten without leaven, whence the name of the Feast of Unleavened Bread. On the evening of the 14th the Passover lamb was killed by the head of the family. The animal should be one year old, male, without blemish, and it should be roasted entire, with unbroken bones, and consumed entirely in one meal. The blood was sprinkled on the doorsill in commemoration of the night preceding the exodus from Egypt, when the angel went through the country and slew all the first-born, but passed by the houses of the Israelites. The fat pieces were burnt on the altar as a sacrifice, and the family gathered to partake of the roasted lamb, with prayers and hymns and clad in travelling garb. On account of some uncertainty with respect to the fixing of the new moon by the Sanhedrim at Jerusalem, the Jews who lived in foreign countries in "exile" were ordered to celebrate all their festivals on two successive days—a law which is still in force among the orthodox. At present, however, the Passover feast has generally simply the character of a hallowed family feast among the Jews. But as the death and resurrection of Christ coincided with the celebration of the Passover, many of the symbols, commemorations, and ceremonies of this Jewish festival passed into the Christian Easter feast, receiving a broader and more ideal signification. (For an interesting account of the Samaritan Passover, still observed in Mount Gerizim, see John Mills' *Three Months' Residence at Nablus* (1864).)

Pas'sow (FRANZ LUDWIG KARL FRIEDRICH), b. at Ludwigslust, Germany, Sept. 20, 1786; was educated at Gotha and Leipsic; became in 1807 Greek professor at Weimar; was 1810–14 director of the Conradinum at Jenkau; became in 1815 professor of ancient literature in the University of Breslau. D. there Mar. 11, 1833. Published texts and translations of *Persius* (1809), *Musæus* (1810), *Longus* (1811); author of *Turnziel* (1818), an admirable Greek-German lexicon (1819–24; 4th ed. 1831), *Grundzüge der griechischen und römischen Literatur und Kuntsgeschichte* (1829), and *Opuscula Academica* (edited by Bach, 1835).

Passpatangy, tp. of King George co., Va., on the Potomac. Pop. 1131.

Pass'port [Fr. *passeport*], a permission to pass through a port (as the Italian *passaporto*, not *passaporta*, shows) into a territory, and hence, generally, to enter into a foreign country whether by sea or land. It is a measure of self-defence to demand from a foreigner a certificate issued by his own government and certifying to his nationality or standing. In war a passport or safe-conduct issued to aliens allows them to enter its borders from a hostile country, and being, as its very nature implies, given for special purposes and to particular persons, must be strictly interpreted. A passport issued in peace, and often given in conformity to a treaty, is simply a statement of what the officer issuing it believes a person to be, but the comity between governments does not always require that the person thus provided shall be allowed admission into the foreign state; for the passport may have been obtained by fraud or the person be peculiarly objectionable. Even a passport honestly obtained is only a *primâ facie* evidence of character and of nationality. Hence, if he should be, as sometimes happens, a citizen of the country where he produces his passport, and should be arrested there on accusation of crime before committed, or for falsely assuming a foreign nationality, his passport could be no protection. T. D. WOOLSEY.

Passump'sic, post-v., Caledonia co., Vt., on the Passumpsic and Connecticut rivers and Passumpsic R. R.

Pas'ta (GIUDITTA), b. at Saronno, near Milan, in 1798, of Jewish parentage; received her musical education in the Conservatory of Milan; made her début as a singer in 1815 on the minor stages of Leghorn and Parma; sung in 1816 in Paris and London without producing any great impression; returned to Italy and appeared with better success in Venice and Milan in 1819. Her great career began at Verona during the congress of 1822. In the following years she sung with great success in Paris and London, and subsequently in Naples, where Pacini wrote his *Niobe* for her, and in Milan, where Bellini composed his *Norma* and *La Sonnambula* for her. In 1833 she sang for the last time at Paris, but her voice had lost somewhat in strength and passion, its most characteristic qualities. Her last engagement was at St. Petersburg in 1840. She then retired to her villa at Lake Como. D. Apr. 1, 1865.

Pas'tel [Fr.], a colored crayon made of pipeclay or other opaque material mixed with gum-water and some pigment. Pastel pictures are executed on roughened paper and parchment, and the color is generally worked on with the finger. This kind of picture is not generally durable, and has to be protected by glass.

Pasteur' (LOUIS), b. at Dôle, department of Jura, France, Dec. 27, 1822; studied physical sciences, especially chemistry, and was appointed professor in 1848 at Dijon, in 1849 at Strasbourg, in 1854 at Lille, in 1857 at Paris, where he first was director of the normal school, afterwards professor of chemistry at the Sorbonne. Besides a number of essays in *Annales de Chimie*, he wrote *Nouvel Exemple de Fermentation* (1863), *Études sur le Vin* (1866), *Études sur le Vinaigre* (1868), *Études sur la Maladie des Vers de Soie* (1870). Several of his chemical works have received prizes, and in 1874 the French government gave him a pension.

Pas'to, town of the United States of Colombia, stands in lat. 1° 13′ N., on a fertile plain among the Andes, at an elevation of 8500 feet, and has 8000 inhabitants, mostly Indians and mestizoes, engaged in agriculture and cattle-rearing and carrying on a transit-trade with Quito.

Pas'tor, an interesting genus of starlings, having representatives in Europe and the Old-World tropical regions. They are extremely useful as destroyers of insects, but sometimes are destructive to small fruits. *P. roseus*, the

The Rose-colored Pastor.

rose-colored pastor of Europe, is a handsome bird, a good singer, and a favorite cage-bird.

Pas'toral [Lat. *pastoralis*] **Po'etry** received its name from the circumstance that it chose its subjects from pastoral life. The form is indifferent. Dramas, epics, novels, ballads may all be pastoral. It is the fundamental sentiment of the composition which in this case constitutes the class. But it is a peculiar fact that this feeling of innocence and naïveté, which is so different from the pathos of the tragedy and the humor of the comedy, and which finds its fit materials only in the quiet, secluded life of the shepherd, acquired an artistic expression for the first time in one of the most corrupt and lascivious ages; and the class of poetry which it constituted has ever since flourished most rankly at times and in places where actual life had degenerated into frivolity, licentiousness, and affectation. It was at the court of King Hiero II. of Syracuse (270–216 B. C.), and under the influence of the revival of Greek civilization which took place in Alexandria, that pastoral poetry first appeared as an independent branch of literary or poetical composition. Theocritus was its father. It reached its highest development at the imperial court of Rome, in Virgil's *Bucolica* or *Eclogæ*. By Longus we have a pastoral in prose of the fourth or fifth century, *Poimenica*. In the fifteenth and sixteenth centuries pastoral poetry was revived at the small Italian courts, whence it was introduced to Spain, France, and England. Tasso's *Aminta* (1572) and Guarini's *Pastor Fido* (1590), both in dramatic form, made it the literary fashion, and of what consequence it was in England at that time may be seen from Spenser's *Shepherd's Calendar*, Sidney's *Arcadia*, Fletcher's *Faithful Shepherdess*, Shakspeare's *As You Like It*, etc. Again, in the eighteenth century, it attracted some attention: *The Gentle Shepherd* (1725), by Allan Ramsay, in England, and Gesner's *Idyllen* (1756), in Germany. In France, at the same time, pastoral subjects were employed more frequently by the artists, especially the painters, than the poets; and the manner of the treatment is exceedingly instructive with respect to the true significance and intrinsic worth of this kind of poetry. CLEMENS PETERSEN.

Pastoral Staff, a shepherd's crook of wood or metal, borne by bishops and abbots of the Roman Catholic Church. The archbishop's staff is cruciform and called a CROSIER (which see). The Greek bishops have a staff with the head shaped like a T or a Y. The staff is sometimes very richly ornamented.

Pas'tures, tp. of Augusta co., Va., on the Chesapeake and Ohio R. R. Pop. 3292.

Patæc'idæ [from *Patæcus*], a family of fishes of the order Teleocephali, related to the Blennidæ, and distinguished by the prominent profile. The body is oblong, elevated forward, and much compressed; the skin naked; the lateral line running near the back; the head deflected backward, and with the forehead very prominent and projecting forward; the eyes well advanced; opercula complete and striated; mouth with a small lateral cleft; teeth on the jaws; branchial apertures wide; branchiostegal rays six; dorsal fin very long, commencing above the forehead, and with most of its rays spinous; anal fin moderately elongated; caudal narrow; pectorals inserted very low down; ventrals wanting. This strange form is represented by two species, both of which are found in the Australian seas. THEODORE GILL.

Patago'nia, the southern portion of South America, extending from lat. 39° to 53° S., and bounded N. by the Rio Negro, which separates it from the Argentine Republic, E. by the Atlantic, S. by the Strait of Magellan, which separates it from Terra del Fuego, and W. by the Pacific. The western part of Patagonia is covered by the Andes, which, entering it from Chili, continue their course, parallel with the shore of the Pacific, down to the Strait of Magellan, but decreasing in height from 8500 to 3000 feet. The western slope of these mountains is steep, rugged, and abrupt, and leaves only a small strip of coast-land between its basis and the ocean. A string of innumerable islands, high, rocky, barren towards the ocean, wooded towards the mainland, garnish the whole range of the coast. The principal of these islands are—Wellington, 165 miles long, about 40 miles broad, between lat. 47° 30′ and 50° 5′ S., and separated from the mainland by Mersier Channel; Queen Adelaide, Hanover, the Chonos Archipelago, etc. The climate of this whole region may be described as one continuous rainstorm. The ever-blowing western gales, saturated with the vapors of the Pacific Ocean, are cooled on the tops of the Andes, and discharge their moisture in storms of pouring rain, sleet, and snow, which occur daily and make the country uninhabitable, though in many places they cover the ground with luxuriant vegetation. The trees and plants are generally the same as those of Chili. Ferns, mosses, and lichens predominate, and huge sea-weeds cover the surface of the waters between the main coast and the island. The quinoa, both the sweet and the bitter, which grows in Chili at an elevation of 13,000 feet above the level of the sea, in places where neither rye nor barley would ripen, is also found here, and its seed, which in its chemical composition resembles oats very much, forms in the northern part of the country the chief nourishment of the inhabitants. The eastern part of Patagonia consists of broad terraces, through which the Andes gradually slope down into the low plain which extends along the Atlantic. Numerous rivers descend from the Andes, cross the plains in an eastern direction, and enter the Atlantic, such as the Rio Negro, 500 miles long and navigable throughout; the Chupat; the St. George, also navigable, and forming the outlet of the large lake of Viedma, in lat. 49° 30′ S., and about 100 miles in circumference. The climate here is dry. Rain is rare. The winter is long and cold, and ushered in by hurricanes, which suddenly supplant the scorching heat of the summer. The soil is unproductive, in many places sandy, everywhere strewn with pebbles and boulders, and saturated with salt and saltpetre. Trees are few, but the pastures are in many places good. This country, comprising about 350,000 square miles, is probably not inhabited by more than 120,000 persons, all aboriginal Indians. The Patagonians are tall, bulky, and muscular, with black eyes and black, coarse hair, thick lips, and a skin of a reddish-brown color, hideously painted and greased over, and clad only in a mantle or cloak of skin. They live as nomads, and in some places cattle are reared; their chief occupation, however, is hunting, and they are unsurpassed in horsemanship and the handling of the arrow, ball, and bow. They worship a god of the good and a god of the evil, and all that happens, the hurricane and good-fortune in hunting, is considered as directly sent by one of these two gods, and directly referring to their own past actions, either as rewards or as punishments. They are utterly averse to Christianity, uncontrollable in a state of passion, and passionately fond of strong drink. Travellers describe nine tribes of Patagonians living S. of the Rio Negro—the Poyuches, Puelches, Cuilliheches, Chenches, Cañecaneches, Chaoches, Huilliches, Dilmaches, and Yakanaches—all speaking the same language, but with slight modifications. Their favorite food is horseflesh and the blood of animals; they have cooking utensils, but they generally prefer to eat their meat raw. The country was discovered by Magalhaens in 1520; he called it *Patagonia* ("large-footed") from some huge footprints observed on the coast and ascribed to the natives. It was visited by Drake in 1578, by Byron in 1764, by Cook in 1774, and recently explored by Darwin in 1834 and Musters in 1869. CLEMENS PETERSEN.

Pa'tanjala. See HINDU PHILOSOPHY.

Pataps'co River rises in Carroll co., Md., flows 80 miles S. and S. E., and enters Chesapeake Bay by a fine estuary, on which stands Baltimore. In its upper course it is very rapid, affording much water-power. Its estuary admits first-class ships.

Pataska'la, post-v. of Lima tp., Licking co., O., on the Pittsburg Cincinnati and St. Louis R. R., and Central Ohio division of Baltimore and Ohio R. R. Pop. 462.

Patch Grove, post-v. and tp., Grant co., Wis. Pop. of v. 177; of tp. 829.

Patchogue′, post-v. of Suffolk co., N. Y., 54 miles E. of Brooklyn (L. I.), has 3 churches, 1 paper and 2 cotton twine mills, stores, and a fish and oyster trade, there being a natural bed of "Bluepoints" here. Pop. about 3100.

Patchou′li, the *Pogostemon patchouli*, a labiate plant of Southern Asia. It is extensively used in perfumery and against the ravages of clothes-moths. The Orientals use it for stuffing mattresses and to ward off contagion and vermin. They also mix it with tobacco for smoking.

Patel′la [Lat.], or **Knee-Pan,** a probably sesamoid bone found in the tendon of the quadriceps extensor muscle of the thigh, just anterior to the knee-joint. It is considered by some anatomists to be the homotype of the olecranon process of the elbow; if so, it is not truly a sesamoid bone, but a part of the true neuro-skeleton. It develops from one or two centres. It does not begin to form until the child is from three to six years of age.

Patent Laws, History of. The practice of inciting inventors to improvements in arts and industries by giving them exclusive control for a limited time is of remote origin, but of this origin the data is so scant that neither time nor country can be given. So far as concerns modern jurisprudence, however, it was first adopted by the English, and the common law gave to the king the power of granting such privileges. But this power was abused, and patents were granted not only to projectors who deserved them, but to favorites and venal speculators, who thus obtained monopolies of the traffic in many of the necessaries of life and not a few of its conveniences, the right to which had existed in the public from time immemorial. The term *patent* was thus early applied indiscriminately to the rightful privileges by which inventors were rewarded for creating new and valuable improvements which had never belonged to the people, because they had never before existed, and to the wrongful monopolies, like those for the sale of salt, currants, vinegar, potash, pilchards, and many other articles, the right to traffic in which had always and undeniably belonged to the public. Confusion was thus created in the popular mind between a patent for an invention, which is right and proper in itself, and a monopoly in previously-known articles of trade, which is manifestly a violation of the common law and of natural justice. It was the latter class of patents, the wrongful monopolies, that constituted the inciting cause of the Great Revolution. And the same enactment, the famous Statute of Monopolies, that swept away the arbitrary and unconstitutional power of the British kings excepted from its operation the patents granted to inventors. It is upon this recognition of the rights of inventors that the patent laws of all lands ruled by the Anglo-Saxon race are based to-day. And as this statute did not establish, but confirmed, the practice of thus encouraging improvements in the useful arts, such practice may be traced unbroken from the complex systems of statute jurisprudence and equity practice of fifty-eight nationalities, states, and colonies to-day back to the time when Edward III. issued the first recorded patent to "two friars and two aldermen" for an alleged discovery of the philosopher's stone. But the separation of patents for new inventions, rightfully granted to those who added to the wealth of their country by increasing its industrial resources, from the wrongful monopolies that crushed the people, was a matter of slow growth. It may be said to have first taken positive and decided form in a hot debate in Parliament on Nov. 20, 1601, in the reign of Elizabeth, and it ended only with the dethronement of the Stuarts. But the Statute of Monopolies in 1623 (21 James I.), although it did not end the struggle, defined and made clear the principles of the common law. For by this last "the Crown, as the patron of science and art, and guardian of the common weal, had power to grant many privileges," even "although, *primâ facie*, as it was said, they appear to be against the common right; the *consideration* was the invention of a new manufacture or the introduction of a new trade; the grant could only be by charter or letters patent, and the term of privilege was to be reasonable." (See *Coryton on Patents*, p. 27.) The earliest form of these privileges was that of "conducting exclusively *new* trades, or dealing in objects of commerce *hitherto unknown*, as a *reward* and *encouragement* to parties introducing them." The common-law granting of patents has, it may be remarked, an apt illustration in the Scottish practice, for in Scotland, up to 1852, patents were issued to inventors in the total absence of a statute on the subject.

The common-law origin of patents for inventions is, moreover, a matter of much interest in its connection with the like origin of copyrights (which are simply patents under another name and applied to another class of objects) for literary productions, etc. Some of the earliest recorded of English patents were in reality nothing more nor less than copyrights protecting literary property, and some of these were far less defensible on grounds of public policy or of abstract justice than any patent ever granted for a *bonâ fide* new and useful invention. In 1539 a patent to Lord Cromwell gave him for five years an exclusive right to print the English Bible. In 1551, Laurentius Torrenti was given a seven years' patent for printing the *Pandects* and *Digests* of Justinian, and two years later Richard Tuthille secured a like grant of printing "all manner of books of the temporal law called the common law." Other patents of a similar kind were granted about the same time, and in 1556 the Stationers' Company of London received a charter far more in the nature of an unjust monopoly, using this term in its most odious sense, than was ever claimed for a new and useful improvement in the arts. This company found some difficulty in enforcing its claim against certain reserved rights of the Crown, but nearly half a century later obtained "the exclusive right of printing primers, psalters, psalms, almanacs, and prognostications." On Mar. 3, 1615, the nominees of Edward, Lord Morley, received the privilege of "the sole printing of a small book entitled *God and the Kinge*," and in 1617, seventeen years before the first patent granted in England for a mechanical improvement in the art of printing (that of Arnold Rotsipen for a printing engine), the attorney-general issued an injunction to restrain infringements upon a patent granted to the same Edward, Lord Morley, for the sole printing of a book *On the Oath of Allegiance*. Other like patents bear date Apr. 26, 1630, Aug. 18, 1635, May 12, 1641 (this last to confirm to the heirs of Sir Edward Coke the sole privilege of printing his works on jurisprudence), June 4, 1642, etc. etc. In Nov., 1644, both houses of Parliament "made an ordinance which prohibited printing unless the book was first licensed and entered on the register of the Stationers' Company," *or printing any book without consent of the owner, or importing if published abroad* —a provision that was substantially confirmed by the Long Parliament in 1649, and which made copyrights as much a creation of statute as the act of 21 James I. had made patents for inventions a creation of the statute—no more, no less, both having a common-law origin, both subsequently recognized, defined, and controlled by legislation. I have spoken of the patent of Arnold Rotsipen, the first granted in England, and I presume in the world, on improvements in printing machinery. This was dated June 24, 1634, and on Nov. 1 of the same year protection was afforded to "John Day Grant, citizen, fishmonger, and broom-broker of the city of London;" and as this last-named patent illustrates the identity which at that time existed between patents for inventions and copyrights for literary productions, I quote *verbatim* the language of the official abridgment of his patent, which was, "for the sole printing of the weekly bills of the prices of all foreign commodities for the term of fourteen years." We may pass from this to the even clearer case of copyright embraced in the patent granted Aug. 18, 1635, for a term of twenty-one years to "William Braithwaite, reader and schoolmaster, for the sole printing and sale of his books containing an easy method" of teaching devised by him. In 1709 an act (8 Anne, c. 19) of Parliament provided that after Apr. 10, 1710, "the authors of books already printed who have not transferred their rights, and the booksellers, etc. who have purchased copies, to have the sole right of printing them for twenty-one years. The authors of books not printed to have the sole right for fourteen years. . . . Copies of books to be entered before publication in the register-book of the Company of Stationers. . . . After the fourteen years the right of printing, etc. to return to the author, if living, for other fourteen years." This was virtually the then existing patent act applied to books, except that the places of registry were different, and the term of a patent for an invention and for a copyright on a book were, by virtue of reversion, twice as long in the latter case as in the former. Indeed, the only material difference in the previous status of patents for inventions and for copyrights had been in the fact that in the one there was no specified limit, in the other the term had been set by the act of 21 James I. at fourteen years. And at the present time the substantial identity in principle and practice between a patent commonly so termed and a "copyright" is illustrated by this, that an industrial design that in England and Canada is secured by copyright, in the U. S. is protected by a "patent." That patents and copyrights were, in this country, from the outset considered as identical in character is shown by that paragraph of the Constitution upon which all Federal legislation concerning either is necessarily based, and which reads as follows: "Congress shall have power . . . to promote the progress of science and the useful arts by securing for limited times to *authors and inventors* the exclusive right to their respective *writings and discoveries*."

I have considered this subject of the common origin of patents and copyrights not without reason. At the present time international copyright is attracting wide attention and the approval of all judicious thinkers; at this time also the patent laws, both in this country and abroad, are subject to the onslaughts of a class that, however sincere, are misled and mistaken as to the nature, tendencies, and results of the grand system of jurisprudence that they assail. It would seem that authors, themselves protected by the legal application of the great ethical principles that underlie the granting of patents for inventions, should be the foremost to defend the latter against attack. But by every one who has discussed the subject, from Thomas Noon Talfourd to Charles Reade, a fictitious antagonism has been created between the two systems. Patents for inventions and copyrights for books had a common origin, they rest upon the same basis, they must stand or fall together, and together they should receive the mutual support of the men whose genius for industrial improvement has made the material progress of the age, and of the writers whose genius has added to that progress the wealth of artistic, scientific, and literary advancement.

With patents for inventions, as with patents (copyrights) for books, the early procedure was crude and imperfect, but developed and expanded to meet the requirements of successive periods. The earlier patents were based upon the condition that the invention be *worked* within the realm, this *working* being the consideration paid by the patentee for the protection afforded. In some cases a tax or a portion of the profits were paid to the Crown—the former still a feature of the British patent laws, from which it has passed to those of France and Belgium. But the secret of the invention was not required to be revealed until after the expiration of the patent. From this it resulted that the inventor frequently succeeded in keeping his invention from the public even after the expiration of the term, and hence the *making known* of the invention became, subsequently, an essential part of the consideration for which the patent was issued. To this end it was at a very early date required as a preliminary to the issue of a patent that the inventor should place on record a description of his invention so "full, clear, and exact" that any one skilled in the art could proceed to put it in practice, and so definite in its statements as to clearly distinguish between what is new and what is old. For this purpose drawings are commonly essential, and the necessity of accuracy in the preparation of the descriptions, termed "specifications," has established a special class of practitioners termed patent agents or solicitors, who devote themselves to this special pursuit. The development of the patent law has been coincident with that development of the industries which has been due for the most part to the law itself. The earliest triumphs of modern invention, Watt's steam-engine, Arkwright's spinning-machinery, Cort's puddling process, Dudley iron manufacture, furnished in the litigation of the patents thereon the established precedents upon which the decisions of courts in patent cases all over the world are based. Previous to 1852 the British patent law related only to England. Scotland, as previously remarked, granted patents under the common law; Ireland had a separate patent law so costly and imperfect that many British inventors lost their inventions in the latter island before they could patent them there. In 1852 this was remedied by the law still in force, which embraces in one patent "England, Scotland, Ireland, the principality of Wales, the Isle of Man, and Berwick-upon-Tweed." The British patent law has from the beginning placed the introducer of a new improvement on the same footing as an original inventor. It requires no preliminary examination to determine the question of novelty, and declares a patent invalid if the invention has been previously publicly known in the realm. The cost of obtaining a British patent, including charges of competent and responsible agents, is about £60 sterling, or $300, gold. A tax of £50 is exacted at the end of three years, and another of £100 at the end of seven years. The full term is fourteen years. The cost is high, but, on the other hand, no models are required, and very frequently a single British patent may be made to embrace inventions that would require half a dozen U. S. patents to protect them. This last remark applies, moreover, to European patents generally.

The patent system of Great Britain was the parent stem from which all others have sprung, our own the earliest. In 1641 the general court of Massachusetts granted a ten years' patent to Samuel Winslow for a process of making salt. In 1652 the superior court decreed to John Clark a royalty of ten shillings from every family who should use his method of "saving wood and warming houses at little cost" during a period of three years—a privilege afterward confirmed to him during life. A twenty years' patent in the same colony was granted to John Winthrop, son of Governor Winthrop, in 1656, for a process of making salt. In 1672 the printed statutes of Connecticut provided that "there shall be no monopolies granted amongst us but of such new inventions as shall be judged profitable and for the benefit of the country, and for such time as the general court shall judge meet." In 1728, Connecticut granted a ten years' patent to Samuel Higley and Joseph Dewey "for the sole practice of the art of steel-making." A patent had previously been granted for a mill for slitting iron on "Stony Brook." In 1774 a *forty years'* patent was granted to John Shipman for a grist-mill within the town of Saybrook and 10 miles westward of Connecticut River. Most of these contained clauses that excluded rival establishments within their territories. As early as 1753 a Connecticut patent was granted to Jabez Hamlin and Elihu Chauncy for the *introduction* of a "new water-machine for dressing flax," brought from abroad; the term was fifteen years. Massachusetts and Connecticut were therefore the pioneers in the transplanting to this country the British system, although similar examples are found in the other colonies (or States) up to the time when the first U. S. patent law, the act of 1790, came into force.

The statute of 1790 provided for the granting of letters patent on "any useful art, manufacture, engine, machine, or device, or any improvement therein, not before known or used." The petition for the grant was to the secretary of state, the secretary of war, and the attorney-general. The patent was issued on the approval of these officials or any two of them. The description of the invention was certified by the attorney-general, and the President caused the great seal of the U. S. to be affixed on the issue of the patent. The term of the patent was for "any term not exceeding fourteen years" in the discretion of the aforenamed members of the cabinet. Although discretionary power was vested in these last, no preliminary examination to determine actual patentability was, in practice, instituted by the act. Provision was duly made for punishing infringers, the English idea of patentable novelty substantially adopted, and a schedule of government fees, that, exclusive of 10 cents per 100 words for copying specification on filing same, amounted to $3.70. A patent could be issued "to any person," no distinction between citizens and foreigners being made. In 1793 a new statute was passed, repealing that of 1790, although retaining much of its substance. This act of 1793 restricted the grant of patents to citizens of the U. S.; provided that the petition should be to the secretary of state; that owners of patents from any State should be incapable of holding a patent from the U. S. except on condition of relinquishing the State patent; that interfering applications should be decided by arbitrators; that patents obtained "surreptitiously or upon false suggestion" could be declared void on motion made and proof produced before the U. S. district court of the district wherein the patentee resided, if made within three years from the date of the patent, but not afterward; and provided further that the government fee paid by applicant for a patent be thirty dollars. This act of 1793 also provided that infringers should pay at least triple damages to the patentee. In 1794 a supplement permitted parties to suits set aside, suspended, or abated by the act of 1793 to revive them. Another statute, adopted in 1800, provided that the applicant should make oath that to the best of his knowledge or belief the invention had not been previously known or used "either in this or any foreign country;" and such knowledge or use either at home or abroad was made to render a patent utterly void. This act extended the privilege of obtaining patents to aliens who had resided within the U. S. for a period of two years previous to the date of their petition. In 1819 another amendment to the law provided "that the circuit courts of the U. S. shall have original cognizance, as well in equity as at law, of all actions, suits, controversies, and cases arising under any law of the U. S. granting or confirming to *authors* or *inventors* the exclusive right to their respective *writings, inventions,* or *discoveries.*" In 1832 another act provided for the publication of lists of expired patents annually in two newspapers in the city of Washington. The same statute made certain regulations concerning applications for extension of patents by Congress, and also established the practice of reissuing defective patents in order to better protect actual inventors against the results of accident, inadvertence, or mistake in the original application. Another act of the same year permitted all aliens who at the time of petitioning for a patent were residents of the U. S., and had declared their intention of becoming citizens, to secure patents, but rendered their patents void if the invention was not worked within one year of the date of the patent, or if the working thereafter ceased during a period of six months, or if the alien failed to become a citizen in due course. These several acts were repealed by the act of 1836, which, while

retaining many features of the old law, introduced many changes. It attached to the department of state "an office to be denominated the patent office, the chief officer of which shall be called the commissioner of patents." There was also provided a chief clerk of the patent office, who acted for the commissioner in his absence. This law was the first to institute the system of preliminary examinations to determine the patentability of inventions before issue of patents thereon, and from the single examiner appointed under it has come the immense staff of examiners and the complicated system of examinations, appeals, etc. that now obtains, and which, while undoubtedly productive of much good, has just as undoubtedly been the means of robbing many a poor inventor of the rights that belonged to him in justice, equity, and law. This statute provided a board of appeal, to which appeal could be had from adverse decisions of the examiner and commissioner. Aliens resident in the U. S. for one year, and who had made declaration of intention to become citizens, were allowed to take out patents for the same fees as citizens; but if a subject of the king of Great Britain, the fee was $500, and to all other foreigners $300. This law provided also for the filing of caveats on partially-perfected inventions, confirmed the right of reissue, fixed the standard of damages in infringement cases at the actual damages, except where exemplary damages were held by the court to be warranted, and in such cases limited the award to three times the actual damage; and placed the power of extending patents for an additional term of seven years after the expiration of the original fourteen in the hands of a board composed of the commissioner of patents, the secretary of state, and solicitor of the treasury. In 1836 the patent office was burned and many of the records lost. The act of 1837 provided for the restoration of the records by refusing recognition in any judicial proceeding to a previously-existing patent unless a true copy of the same was filed in the patent office. This act also provided for the filing of disclaimers where patent claims were found to be too broad. It also permitted a foreigner to withdraw two-thirds of the fee paid in case his application for a patent was rejected. The act of 1839 was chiefly notable for its proviso that "no patent shall be held to be invalid by reason of purchase, use, or sale prior to the application for a patent, except on proof of abandonment of such invention to the public, or that such purchase, use, sale, or prior use has been for more than two years prior to such application for a patent." This act also provided for appeals from the commissioner to the chief-justice of the U. S. court for the District of Columbia. The act of 1842 provided for the issue of patents for terms of seven years on designs, and on "busts, statues, or bas-reliefs or compositions in alto or basso relievo," and "any new or useful pattern, print, or picture." Recent legislation, it may be remarked, has placed industrial designs within the protection of the patent office—other items than those above indicated under protection of copyright. But the language of this act shows what has been the case from the first—that in all essentials patents and copyrights are the same in principle, rest on the same basis, and no distinguishing line can be drawn between them. The act of 1848 placed the power of extending patents wholly in the hands of the commissioner of patents. In 1849 the patent office was transferred from the department of state to that of the interior. An act passed in 1852 permitted appeals to be made from the commissioner to the assistant judges of the U. S. district court of the District of Columbia in the same manner as previously to the chief-justice. The act of 1861 (12 *Statutes at Large*, 130) provided that writs of error lie to the Supreme Court of the U. S. in all cases arising "under any law of the U. S. granting or confirming to authors the exclusive right to their restrictive writings, or to inventors the exclusive right to their inventions or discoveries," without regard to the sum or value in controversy. Another act of the same year (12 *Stat. at Large*, 246) repealed previous laws, while retaining in itself much of their substance. The important changes made by this statute were the extension of the term of patents from fourteen to seventeen years; the abrogation of extensions by the commissioner; the compulsory attendance of witnesses in patent cases; the establishment of a board of examiners-in-chief, intermediate between the examiners and the commissioner, to hear appeals from the decisions of the former; the repeal of the provision permitting withdrawal of two-thirds of the fee in case of rejection, and the sweeping away of all distinctions between citizens and foreigners in the granting of patents. This last-named change was subject to the proviso that it should not apply to citizens of countries discriminating against American citizens in the grant of patents; Canadians therefore were compelled to pay a fee of $500 until the passage of the Canadian patent law of 1872 removed the objection. The act of 1861 made an important change in the payment of fees, fifteen dollars being payable on the application, and twenty dollars on the issue of the patent. In 1870 a new statute replaced the old. It made but few changes, and these mostly for the worse. In one respect, however, it caused a decided advance in the utility of the patent office by providing for the printing of all patents as fast as issued. Brief abstracts, together with decisions of the courts in patent cases, decisions of the commissioner, etc., are published weekly in the official gazette. The reports of the commissioner of patents, formerly published annually, contained, from 1842 to 1849, inclusive, but the most imperfect notices of a few of the patents granted; from 1850 to 1852, inclusive, the claims only; in 1853 rude wood-cuts, white lines on black ground; from 1854 to 1869, inclusive, good line engravings with the claims, except that no engravings appear for the latter half of the last-named year; in 1870 and 1871, the claims, with short descriptive "briefs."

I had intended to include in this a sketch of the gradual adoption of patent laws in the various countries of Europe from the year 1791, when France, the earliest among continental nations to adopt the system, enacted her first statute on the subject. But the length this article has already reached prevents. Wherever patent laws have been fairly tried they have produced but one result—the quickening of industries, the creation of wealth, the cheapening of all the necessaries of life, the bringing of luxuries within the reach of the poor, the diffusion of knowledge, the rapid but normal growth of every element of national prosperity or individual good. It would be difficult to find an important invention made during the past two centuries and a half that has not owed its existence to the patent laws, for there is scarcely an inventor in all the records of the industries who has not looked upon the rewards offered by the grant of letters patent as the inciting cause of his efforts, the tangible form in which the fruits of his labor should come. These laws, based upon the first principles of justice, and proved expedient by the experience of 250 years, have turned the energies of the masses to the search for improvements in every handicraft under the sun; they have trained multitudes of men to the special work of invention, as the copyright laws have trained other multitudes to research and original thought in other departments of intellectual work. In unnumbered instances they have lured the sons of genius through the darkness of adversity, the bitterness of hunger and cold, with the fair promise of success, and have offered to wealth the most brilliant inducements in the fostering of industries and arts. But grand as is the system, and colossal as its results undeniably are, the laws of almost every country need more or less of reform to better adapt them to the complex conditions of the greater advancement which those laws have produced. There are fifty-eight nationalities and self-governing colonies that have adopted patent laws, and with all its defects that of our own country is beyond question the best. But the practice that seemed good a quarter of a century since is now proved by experience to be in some respects fallacious, and there is no more worthy field for the effort of the jurist than exists in the remedy of defects without injury to the organic structure of the present law. Few who are familiar with the working of the existing system can doubt that its utility, both as concerns the inventor and the public, would be vastly increased if the onerous tax of a model in each application were done away with; the absurd definitions of "patentable novelty" that encrust the practice of the patent office should be superseded by the correct idea that every invention, really new and really useful, is the proper subject of letters patent; the right of direct appeal in interference cases from the commissioner to the district court of the District of Columbia be restored; the rejected applications closed against access of the public; the reissue of patents permitted upon the specification as well as upon the drawing, and the full publication (after the manner of the British patent office) of all patents that have been granted from the organization of the system, carried into effect. The necessity for these changes is growing more imperative every year, and their adoption would leave but little to be desired in a beneficent system that, founded on the principles of ideal justice, has done more than any one other branch of jurisprudence to promote and enrich the practical arts of life. JAMES A. WHITNEY.

Patents [Lat. *patens*], **Laws relating to.** A patent for an invention is a declaration by the government defining what an inventor may be protected in the use of, and for what length of time. It consists of appropriate language of the grant and a description of the invention patented. Patent laws are laws which prescribe under what formalities and conditions patents may be granted, and provide for enforcing the protection which the patent grants.

A patent to a first inventor is not, as is often erroneously supposed, a grant of right to the *invention.* It is merely a grant of right to *protection* in the exclusive use of the invention. An inventor has a right to use his invention without a patent. He needs a patent and the aid of patent laws only to vest him with power to exclude others from the use of the invention. The grant of protection to an inventor in the exclusive use of his invention for a limited time is so well founded in justice and public policy that, although not of remote origin, it has been adopted by all civilized nations. There are now at least nineteen governments where there is a regular system of patent laws to secure such protection, and in nearly all of them the protection is granted to the first inventor. In England it is granted to the first introducer of the invention, whether he be the inventor or an importer of the invention. In most countries this protection is granted on condition of a forfeiture of the right unless the invention be put into use by the patentee within a specified time. The length of time for which the protection is granted in different countries varies from three to twenty-one years, but is generally limited to the shortest term during which protection, if any, has been previously granted for the same invention in any other country. The effect of patent laws being to reward the inventor according to his merits by securing to him, for a limited time, the benefit of his own productions, they are well calculated to stimulate inventive genius and render it a source of national wealth and power, and especially so when, as in this country, they have the aid of general education among the masses of the people. This is well illustrated by the work of American inventors. Previously to Oct. 1, 1874, 168,947 original patents were granted in the U. S., of which about 6500 were for improvements in machinery for weaving and in textile fabrics, 6000 for improvements in carriages and wagons, 4000 for improvements in firearms and blasting, 3500 for improvements concerning railways, 2500 for improvements in the art of printing, and 2000 for inventions in sewing-machines. On an average over 215 original patents now issue weekly from the U. S. Patent Office. The authority for the patent laws in this country is the clause in the Constitution of the U. S. which declares that Congress shall have power "to promote the progress of science and useful arts by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries." In consequence of this delegation of power by the several States, all legislation on the subject of patents for new inventions belongs to Congress, and by such legislation the exclusive jurisdiction for the administration of the patent laws belongs to the Federal courts. Neither State legislatures nor State courts have anything to do with either making or executing them. In the exercise of the power thus delegated, Congress passed its first general patent act in 1790, and its last one in 1870.

For what Subjects-Matter Patents may be granted.—The act now in force provides "that any person who has invented or discovered any new and useful art, machine, manufacture, or composition of matter, or any new and useful improvement thereof not known or used by others in this country, and not patented or described in any printed publication in this or any foreign country before his invention or discovery thereof, and not in public use or on sale for more than two years prior to his application, unless the same is proved to have been abandoned, may, upon payment of the duty required by law and other due proceedings had, obtain a patent therefor." It will be noticed that, by the language of the Constitution, Congress was given power to secure to inventors the exclusive right to their "discoveries," while the statute purports to secure what has been "invented or discovered." As the statute puts "invented or discovered" in the alternative, thereby indicating that Congress understood those terms to refer to different things or to things of different origin, it appears as if Congress had exceeded its authority in providing protection for *inventions* as well as for *discoveries.* But notwithstanding this disjunctive use in the statute of the terms "invented" or "discovered," the courts have held that, with reference to patentable subjects-matter, *discovery* is synonymous with *invention,* and such, from previous adjudications which had taken place in England, was well understood to be the import of those terms at the time of the adoption of the American Constitution. The word "discovery," as used in the Constitution and patent laws, does not mean a discovery of an abstract law or fact, but such a discovery only as is inseparable from invention. There cannot be invention without discovery. The ascertainment of the relation between the thing to be done and the means of doing it must of necessity involve discovery. Some inventions are produced which are chiefly the result of accidental discovery, requiring very little study or experiment, while others are the result of long and laborious research. It will be noticed that only four classes of patentable subjects-matter are mentioned in our statute; but these are sufficient to comprehend patentable improvements of any kind. In the English law only one was mentioned, being "manufacture," but the courts of England by construction give that one term sufficient scope to embrace all kinds of patentable subjects-matter. As used in the statute, the term "machine" includes all kinds of mechanism, whether machines proper or apparatus which have a mode of operation in working out or producing a result. The term "manufacture," according to the patent laws of this country, includes all kinds of useful articles which are made, except machines and compositions of matter, such, for example, as fabrics, tools, implements, wearing apparel, household furniture, etc. The designation "composition of matter" includes all kinds of mixtures or compounds of substances, such as medicines, articles of food and drink, perfumeries, paints, dyes, etc. The term "art" comprehends all methods and processes which may consist of modes of procedure with or without new ingredients or materials. It is often difficult to determine to which of the four classes of subjects-matter mentioned in the statute an invention belongs. Some of them merge into or overlap each other so that the line of separation becomes obscure to such an extent that an invention may properly be ranged under either of two classes. It sometimes happens that a new article is such that it may be designated either as a new manufacture or a new composition of matter, and it is often such that it may be regarded either as a new apparatus or a new manufacture. But this difficulty produces no inconvenience in practice, because when it occurs the law will be satisfied by the invention being arranged under either class. As both new articles of manufacture and the means of producing them are patentable, it frequently happens that an inventor is entitled to separate patents for three kinds of subject-matter, all having reference to the same production. When the article is new, he can patent *that* as a new manufacture; when the method of producing it is new, he can also patent *that* as a new process; and when the mechanism used in the process of producing the article is new, he can also patent *that* as a new machine or apparatus, and thus have three patents, one for the article, one for the machine that produces it, and a third for the method or process of production.

To whom Patents may be granted.—In this country, with one exception, he only is entitled to a patent who is the first inventor. The statute says "original and first inventor," but obviously the word original is superfluous, because, if one is the first inventor, he must be an original inventor. The exception referred to is that an applicant for a patent need not be the first inventor as against a mere prior knowledge or use in a foreign country, provided he believe himself to be the first inventor at the time of making his application for a patent. Patents may be granted to first inventors, whether individual or joint, or to their assignees, executors, or administrators, and to foreigners and citizens on the same terms.

What constitutes Patentable Inventions.—The mere conception of an idea is not patentable. An invention, to be patentable, must be completed ready for use without the addition of further invention or the necessity of further experiment. It must be so matured that the means of producing the result can be accurately and fully set forth. Mere experiments equivocal in their results are not patentable. When the invention consists of a process or of a composition of matter, it is not necessary, in order to entitle its author to a patent, that he should understand the rationale of the chemical changes involved. He has brought such an invention to a patentable condition when he has ascertained what articles are to be used and how they are to be used to produce the desired result. Some inventions are new in kind, while others are only new as improvements on something which in kind had prior existence. The former are patentable much more broadly than the latter. When an invention consists of doing by a machine what had previously been done by hand only, or had never been done at all, it is new in kind. The first sewing-machine and the first recording telegraph are instances of inventions which were new in kind. To give an invention patentable novelty it is immaterial whether it was the result of much or little or any research or labor. The law does not rate inventions according to the quantity of attention and time bestowed upon their production, but according to their nature. The patentability or non-patentability of an invention is to be determined from its character. How it was arrived at is immaterial. An invention or discovery made by accident is none the less patentable. New combinations of either new or old elements are patentable, but a combination of old elements, to be patentable, must produce some new result due to the co-operative or reciprocal action of the combined parts.

The mere addition of one old device to another, each producing its own result in such manner that their combination produces those same two results and no other, is not patentable, and is not invention. Any part in a machine which does not participate in the mode of operation of the machine is regarded as a dead part. Nearly all patents on machinery are for combinations of parts some or all of which were old. When a single part or any combination of parts less than the combination of the whole is new, then such part or such sub-combination of parts is patentable, as well as the entire combination, and they can be patented by separate claims in one patent or by a plurality of patents. Although an invention, to be patentable, must, with the exception mentioned, be new and useful, it does not follow that all new and useful productions are patentable. There are many things which, though both new and useful, are not patentable. Any change which was so obvious as to exclude the possibility of the exercise of the inventive faculties being necessary to produce it is not the subject of a patent. Any improvement which is merely the result of mechanical skill or superior workmanship is not patentable. A new discovery of a law of nature or of an abstract principle is not patentable. A discovery consisting of the adoption of a known equivalent of what was already in use is not patentable; such, for illustration, as the removal from a machine of one of the elements which it has in combination with other elements, and the substitution in its place of another known element possessing only the same function and performing only the same office in the combination as did the part for which it was substituted. In a process or composition of matter the substitution of one known chemical agent for another having only the same function is not patentable. Combinations in mechanism consisting of a mere assemblage of old parts, each part possessing only the same function and performing only the same office in the combination as it did out of it, and none of the parts co-operating with the others to produce any new or improved result, are not patentable combinations, but in judgment of law are mere aggregations of old elements. A new use of an old thing, called a double use, is not patentable; that is to say, if a machine or an instrument be known and used for one purpose, a discovery that it can be used to advantage for another purpose, accompanied by an actual application of it unchanged to such new purpose, is not patentable, but in such cases a very slight adaptation of it for the new use will render it patentable. This exclusion of a new use of an old thing from patentability is for the reason that when an invention is made, its author, having created it, is entitled to all its attributes, whether discovered by him or by any one else subsequently to his invention; and when that right passes from him to the public, it becomes vested with the same right; that is, to all uses of the invention. Anything which is injurious to public health or morals is not patentable.

Utility.—Although the statute requires the invention to be useful, yet no particular degree of utility is necessary to render an invention patentable. It need not be more useful than what was previously known for the same purpose. The requirements of the law are answered so far as utility is concerned if the invention be not absolutely frivolous or injurious to the public. Any invention injurious to health or public morals, or designed to facilitate the commission of crime, is not patentable, and fails of being so by reason of what is denominated want of utility.

How an Inventor may lose his Right to a Patent.—An inventor who has acquired a right to a patent may lose it in two ways: 1. By neglecting to apply for a patent for more than two years after the invention has been put into public use or on sale. The "public use" mentioned in the statute is not limited to a continuous public use for more than two years, but comprehends also a single instance of such use more than two years before the application for a patent. Public use has been judicially defined to be a use in public. The loss of an inventor's right to a patent by neglecting to apply for it for more than two years after the invention has been either used in public or put on sale is in the nature of a forfeiture of his right, and does not depend upon his intention. 2. An inventor may so deal with his invention as to create an abandonment or dedication of it to the public at any time. This he may do either by express declaration or by his silence while with his knowledge its use is generally adopted by others. Such a surrender of an inventor's right is a matter of intention on his part, but intention may be inferred from existing facts. Delay alone to apply for a patent, no matter for how long, will not constitute abandonment, but unreasonable delay, associated with the fact of the same invention being originated by another and patented or put into general use by him, will constitute abandonment. Hence, if a person unreasonably neglect to apply for a patent after completing his invention, he does so at the peril of losing his right. The issue of a patent is no guaranty to its owner of the right which it purports to secure. A patent is only *primâ facie* evidence of such right. It gives to its owner a right of action against infringers of the patent, and authorizes him to contest his right to the thing patented. Proof against a patent at any time during its term, in a suit brought for an infringement, that the patentee was not the first inventor of the thing patented, or that its subject-matter was not patentable, or that the inventor lost his right by forfeiture or abandonment, or any other fact against the validity of the patent, will invalidate the patent.

How Patents are obtained.—Patents are obtained by applications in the form of petitions to the commissioner of patents, accompanied by a description, including drawings and a model when the invention is of a kind admitting of drawings and model. When the invention is of a composition of matter, specimens must be furnished if required by the commissioner. The commissioner of patents is the head of the Patent Office, and has a corps of assistants called examiners, among whom the different patentable subjects-matter are divided, and whose duty it is to examine applications to ascertain whether the papers are in proper form and whether the invention described therein is, so far as they can ascertain, new and useful. On the commissioner receiving an application for a patent, he refers it to the proper primary examiner for his examination into the state of the art to which the invention appertains, and for his report of the result of his examination to the commissioner. If no reason is found against granting the patent, it is allowed and issued. If any cause is found by the examiner against the grant, it in such case is reported to the applicant; and if he can by explanation or argument remove the objection, the patent will still be issued, otherwise it will be refused by the primary examiner. From the decision of the primary examiner an appeal lies to a board of three examiners, designated examiners-in-chief. From a decision of the board of examiners-in-chief an appeal lies to the commissioner of patents, and from his decision an appeal lies to the supreme court of the District of Columbia. When an application is made for a patent which in the opinion of the commissioner would interfere with any pending application or with any existing patent, notice is given to the parties interested, and an opportunity granted to them to show by evidence which was prior in date of invention; and the patent will be issued to the one proved to be the first. The business in the Patent Office has become so extensive that there has grown up a class of persons known as patent agents or solicitors of patents, who conduct Patent Office business in behalf of inventors, and, being located in different parts of the U. S., are always accessible to inventors. The term for which patents for inventions issue in this country is seventeen years; but when an invention is patented in this country after being patented in a foreign country, the patent here will expire at the same time with the foreign patent, or, if there be more than one foreign patent, then at the same time with the foreign patent having the shortest term; but in no case can the American patent be in force for more than seventeen years. If an inventor, after conceiving the outlines of his invention, desire further time to mature the same, and in the mean time to guard against any other patent being granted for the invention, he may do so by filing in the Patent Office a caveat, setting forth the design and distinguishing characteristics of his invention and praying protection of his right until he shall have matured his invention. Such caveat will be preserved in secrecy by the commissioner of patents, and the effect of it will be to entitle the caveator for one year to notice from the commissioner of any application which may be made for a patent which would in any way interfere with his right. After receiving such notice, if any be given, the caveator will be allowed three months in which to file a complete application.

Designs.—New designs are also patentable, such as a design for a manufacture, bust, statue, alto-relievo, or bas-relief, also designs for printed fabrics, also ornaments, patterns, prints, or pictures to be placed on or worked into any article of manufacture, also new shapes.

Amendment of Patents.—A patent may be amended by being surrendered to the commissioner and the grant of an amended one, called a reissue, in its stead, or by filing with the commissioner a disclaimer of so much of the thing patented as the patentee was not the first inventor of. To amend by a reissue, the original patent and an amended specification must be delivered to the commissioner, asking an acceptance of the surrender and a grant of a reissue in conformity with the amended specification. A patent may by a reissue be amended in either its descriptive parts or its claims so as to conform to what the patentee was the

first inventor of; but no new matter can be introduced into the reissue, nor, in case of a machine patent, can the model deposited on the original application or the drawings attached to the patent be amended except each by the other; but when there is neither model nor drawing, amendments may be made upon proof satisfactory to the commissioner that such new matter or amendment was a part of the original invention and was omitted from the original specification by inadvertence, accident, or mistake.

Repeal of Patents.—There is no statutory provision for the repeal of patents; but where patents interfere by each claiming the same invention, any one interested in either patent may institute a suit in equity against the owners of the other patent, in which case the court has power to declare either patent invalid in whole or in part. It is also understood that the attorney-general of the U. S. has a right of action to invalidate a patent where there was fraud in the issuing of it.

Sale and Transfer of Patents.—A patentee may sell his entire patent or any undivided part of it for the whole or any specified part of the U. S. The conveyance of such an interest, to be valid, must be in writing, and is called an assignment. Such an assignment will be void as against any subsequent purchaser or mortgagee for a valuable consideration without notice that such assignment had been made, unless it be recorded in the Patent Office within three months from its date. Parties having an undivided interest in a patent are not thereby constituted partners, but are tenants in common; and any of such parties may grant licenses to others to use the invention in making, using, and vending the patented article, and receive and retain the consideration for the same without liability to their co-owners. Licenses under patents need not be in writing. They may be oral or implied. A license to a party to use the invention is not divisible or assignable unless expressly made so by its terms. A license, although in writing, need not be recorded. An invention not patented is assignable, but an invention is not salable or assignable before it is made, because a thing not *in esse* is not the subject of sale. An agreement, however, to assign an invention when made will be operative upon it as soon as it shall be made.

Remedies for the Protection of Patent Rights.—The law protects patentees against false representations of others. It provides that any person who, without authority from the patentee, shall in any manner mark upon anything made, used, or sold by him, for which he has not obtained a patent, the name, or any imitation of the name, of any person who has obtained a patent therefor, or who shall in any manner work upon or affix to any such patented article the word "patent" or "patented" or the words "letters patent," or any word of like import, with the intent to imitate or counterfeit the mark or device of the patentee, or who shall in any manner mark upon or affix to any unpatented article the word "patent" or any word importing that the same is patented, for the purpose of deceiving the public, shall be liable for every such offence to a penalty of $100. In case of an infringement of a patent, the law gives its owner right to remuneration for past infringement and to have further infringement prevented. He has a right to an action at law for a trial by jury, in which his recovery will be the actual damages he has sustained from the infringement. He also has a right to sue in equity, in which he can recover not only damages, but, in addition thereto, according to the statute, the profits realized by the defendant from the infringement, and obtain an injunction restraining further infringement; and where no serious doubt is raised respecting the validity of the patent or on the question of infringement, he may, on short notice, have a preliminary injunction restraining the infringement during the pendency of the suit. In suits for infringement all of the owners of undivided interests in the patent for the territory in which the infringement has been committed must be joined as co-plaintiffs or co-complainants. Where there has been a joint infringement, the infringers are jointly and severally liable for the infringement. Ignorance on the part of an infringer of the existence of a patent at the time of infringement is immaterial, so far as his liability for the infringement is concerned. To entitle a patentee to recover for an infringement of his patent, he is not required to show that the infringer knew of the existence of the patent. Still, neither the patentee nor his assigns are allowed to recover damages for infringement, unless it appear that they marked the patented articles made or sold by them with the word "patented," together with the date of the patent, or that the defendant was personally notified of the infringement and continued to infringe after such notice.

Relation of a Patentee to the Government.—The relation between the public and the inventor is that of contracting parties. The inventor being in possession of the invention, it is his; he has created it; he is not bound to divulge it; but if, without law to protect it, he make it known, others may use it. The public is in possession of power sufficient to protect him against the use of the invention by others. The public by its law offers to give him the protection for a limited time in case he, in consideration thereof, explain his secret. Promised protection is what the public gives. A description of the invention is the consideration given in return by the inventor. When the inventor has published the required description in the Patent Office, he has paid the full consideration for his protection, and the part of the contract remaining to be performed by the public is to furnish the patentee with the use of its officers and courts during the term for which the patent was granted, to prevent the use of the invention by others. It will be noticed that in forming this relation the public neither promises nor imparts anything to the inventor except legal protection to his property, while it receives a valuable addition to its productive resources. Instead, therefore, of anything being given to the inventor by the grant of a patent in the nature of property or of a right to the invention, as is generally supposed, the inventor imparts such right to the public, and the public, not the inventor, is the recipient of the right. From this relation of the inventor to the public, it will be realized how strong is his claim to a full and efficient protection to his right, because—(1) He has purchased the protection to his property in the invention for a special and valuable consideration; (2) He receives no greater protection than is furnished to others for other property without a special purchase; and (3) The protection is only for a limited time, while for tangible property the protection is without limitation of time. But notwithstanding this manifestly superior claim of patentees to full protection for their property in patented inventions, their title to such property is treated with comparative indifference, and trespass upon it by others is not held in the same disrepute as is trespass upon other kinds of property. Patents have been, and to a considerable extent still are, regarded as monopolies, creating undue restriction upon the rights of the public and appropriating to individuals what belongs equally to all. One cause of this false impression is a mistake as to what a patent grants, and an assumption that by it the government grants to a patentee an exclusive right to something which the public was previously in possession of. Another cause is the fact that patents for new inventions had their rise, and for a considerable time their progress, in England in the society of other grants, which did confer upon individuals privileges which the public was in previous possession of, and which were therefore monopolies, and odious monopolies, and which in the course of time became so obnoxious to the people as to be entirely abolished. From the fact that patents for new inventions were introduced in the form of and contemporaneously with oppressive monopolies which took rights from the public and gave them to individuals, they caught and have retained much of the odium, and even the name, of monopolies. This state of things was introduced into England with the feudal system, and continued down to the twenty-first year of the reign of James I., when the grant of letters patent for new inventions was taken out of the association with the monopolies by the celebrated statute of monopolies, which, after declaring "that all monopolies and all commissions, grants, licenses, charters, and letters patent heretofore made or granted, or hereafter to be made or granted, to any person or persons, bodies politic or corporate whatsoever, of or for the sole buying, selling, making, working, or using of anything within this realm, . . . are altogether contrary to the laws of this realm, and so are and shall be utterly void and of none effect, and in no wise to be put in use or execution," contains the following proviso: "That any declaration before mentioned shall not extend to any letters patent and grants of privilege for the term of 14 years or under hereafter to be made of the sole working or making of any manner of *new manufactures* within this realm to the *true and first inventor and inventors* of such manufactures." From the causes above stated the courts of England, for many years after the introduction of patents, treated them with disfavor, and whenever they became the subject of litigation struggled to invalidate them. Nearly all authors who early wrote on the patent laws treated these grants as monopolies, and thus, from the origin of patents down to within a few years, the impression was general, and still prevails to a large extent, that a patent is a grant of a special favor, and that, if justifiable at all, it is so only as a necessary evil. Such an understanding is entirely destitute of any foundation in fact or justice. Patents for new inventions are not monopolies, have none of their properties, and were never recognized as such by the common law or sanctioned as such by the statute of monopolies. The common-law definition of a monopoly is given by Lord Coke in the following words:

"A monopoly is an institution or an allowance by the king, by his grant, commission, or otherwise, to any person or persons, bodies politic or corporate, of or for the sole buying, selling, making, working, or using of anything *whereby any person or persons are sought to be restrained of any freedom or liberty which they had before or hindered in their lawful trade.*" Justice and consistency require that the property of an inventor, the creation of his own mind, should be exonerated from any idea of his being the grantee of a monopoly, that it should be freed from all such slanderous imputations, from such odious cognomens, and consequently from the bad odor which their habitual use diffuses through the public mind. All books and publications on the subject of patents should be entirely purged of their use as without foundation, authority, or meaning, so that the products of genius rendered fruitful by labor when subjected to proper limitations by patents and law, may be regarded as sacred to the use and benefit of their authors as any other property can be.

GEORGE GIFFORD.

Pater'culus (CAIUS VELLEIUS), b. about 19 B. C.; entered early the Roman army, and served from 2 to 14 A. D. under Tiberius in Germania, Pannonia, and Dalmatia. The year of his death is unknown, but his *C. Velleii Paterculi Historiæ Romanæ ad M. Vinicium Cos. Libri II.* reached to 30 A. D. The first manuscript of this book, and the only one that has come down to us, was discovered by Beatus Rhenanus at Murbach in Alsace, and printed at Bâle in 1520. The best editions are that by Orelli (Leipsic, 1835), and that by Kritz (2d ed., Leipsic, 1848). The beginning of the work is wanting, and there is also a portion lost after the eighth chapter of the first book.

Paternò, town of Sicily, province of Catania, is situated at the foot of the western slope of Etna, about 8½ miles from the city of Catania, on one of the routes to the summit of the great volcano. Remains of ancient aqueducts and the ruins of an old bridge over the Simeto may be seen here, and not far from the town other noteworthy traces of the Roman period. The old Norman castle, occupying a very elevated position, is one of the most curious existing monuments of its kind. Near the thermal springs in the neighborhood there is a cave called the Grotta del Fracasso, in which is heard a loud roaring noise caused by subterranean torrents from the melting snows of Etna. At a lower point the waters rise to the surface and form a stagnant pool, which poisons the air with miasma. Paternò has been supposed to occupy the site of the ancient *Hybla Major*. The present town contains some respectable buildings, but is of little general interest. The vicinity is very fertile in grapes, olives, hemp, etc. Pop. in 1874, 15,778.

Pa'ter Nos'ter [Lat. for "Our Father," the first words of the Lord's Prayer], the name given by Roman Catholics to the Lord's Prayer. In the ancient Church it was regarded as so sacred that its formula was kept a secret from the uninitiated. (See ARCANI DISCIPLINA.) In later times this prayer was repeated by the vulgar as a charm. The closing words, "For thine is the kingdom," etc., are not present in all the versions, and some Christians do not use them.

Pat'erson, city and cap. of Passaic co., N. J., situated both sides of the Passaic River, 5 miles above tide-water navigation and 15¾ miles N. W. of New York City. The Morris Canal and the New York and Erie, Delaware Lackawanna and Western, and New Jersey Midland R. Rs. pass through the city, giving it frequent connection with the great metropolis and other important places. The city is built upon a broad plain, whose W. extremity rises to a height of over 300 feet, known as "Garrett Mountain." Good drainage and valuable water-power are afforded by the Passaic River. The Passaic Falls, 100 feet high, are located within the city limits. Paterson is supplied with water and gas, and contains an excellent system of public instruction, besides several private institutions, 35 churches, 2 orphan asylums, 4 banks, 1 loan company, 6 horse railways, an electric fire-alarm telegraph, a volunteer fire department, 2 daily and 3 weekly newspapers, a court-house and jail, and a number of fine stores. It ranks second among the cities of the State in point of manufactures, which include silk, locomotives, iron bridges, heavy castings, brass and plumbers' goods, cotton machinery, steam fire-engines, flax, hemp, jute, carpets, cotton yarns, netting, calico prints, shirts, and paper. The iron industry for 1873 amounted to $8,517,000, and gave employment to 3758 persons. There are 25 firms engaged in the manufacture of all kinds of silk goods and fabrics, with a capital of $4,000,000, and it is owing to this industry that Paterson is called the "Lyons of America." The other important industries are the Passaic rolling-mills, the Paterson iron-works, paper, cotton, and planing mills, and machine-works. Paterson is the third city in the State in point of population, having 33,579 inhabitants in 1870. JAS. D. DONNELL, ED. "PATERSON PRESS."

Pat'erson (WILLIAM), b. at Skipmyre, Dumfriesshire, Scotland, in 1665; was persecuted as a Covenanter by Charles II.; settled at London as a merchant; visited the West Indies, where he obtained much information about the localities of the "Spanish Main" from the buccaneers; issued proposals for the establishment of the Bank of England, of which, upon its establishment in 1694, he was one of the directors; made unsuccessful efforts in England in the same year to organize a scheme of colonization in Darien; obtained from the Scottish Parliament in 1695 an act of incorporation; obtained large subscriptions, and proceeded to Darien with a considerable number of emigrants; was unsuccessful on account of quarrels, fever, famine, and the opposition of the Dutch, Spanish, and English governments; returned to Scotland 1700; was an advocate of the union of Scotland with England; entered Parliament 1708; obtained some compensation for his losses about 1715; wrote several treatises on economical subjects. D. at Westminster Jan. 22, 1719. (See *Biographies* by Bannister and Pagan.)

Patholog'ical Anat'omy, the science which treats of the changes produced in the tissues and organs of the body by disease. It embraces the study of these diseased conditions during life and after death. To ascertain the character and nature of these changes, we are obliged to employ the naked eye, the simple and compound microscope, and chemical reagents. In many diseases the lesion of some one organ appears to constitute the disease; in others, general constitutional symptoms exist without the presence of any lesions which we are able to detect. There is no department of medicine in which so much progress has been made of late years; and for this progress we are principally indebted to the Germans. The greatest obstacle to a real knowledge of such diseased conditions is our inability to observe diseased organs while still alive. We see changes after they have taken place, but not the process of change itself. While, therefore, we have, to some extent, a certain basis of facts, it must be confessed that many theories are current which show the want of knowledge rather than the existence of it. F. DELAFIELD.

Pathol'ogy [Gr., from πάθος and λόγος], the doctrine of the diseases. Under this name is comprehended the science which treats of all the diseased conditions which affect the human body. It is also applied to the diseases of some of the lower animals. We use the terms general pathology, special pathology, surgical pathology, medical pathology, internal and external pathology, and comparative pathology. By general pathology we understand the knowledge of those general principles which govern all diseased conditions. The processes of growth and decay, of inflammation and degeneration, the laws which govern the development and spread of contagious and infectious diseases—all belong to the domain of general pathology. Special pathology applies these general principles in detail to the study of the laws and phenoména which belong to individual diseases. Surgical or external pathology treats of diseases affecting the exterior of the body—the skin, the bones, the joints, etc. Medical or internal pathology treats of the diseases of the viscera. English authors restrict the term "pathology" rather to the principles of medicine and surgery, while the French include under it also what with us is usually embraced in the practice of medicine and surgery. F. DELAFIELD.

Pat'kul (JOHANN REINHOLD), b. about 1660 of a wealthy and influential family of Livonian nobility; received a military education and served as a captain in the army, but became famous afterwards as a diplomatist, or rather as an intriguer. Livonia was at that time a possession of the Swedish Crown; and in the controversies between the Livonian nobility and the Swedish king, Patkul played a conspicuous part. Accused of rebellion, he was summoned to Stockholm, but on his arrival there he soon discovered that the judgment was sure to go against him. He escaped to Courland, but was sentenced to death, and his estates were confiscated. For some time he lived in Switzerland and France, occupied in scientific studies, but in 1698 he entered the service of Augustus II. of Saxony and Poland, and the formidable alliance which was formed shortly after against Charles XII. by Augustus II., Peter the Great, and Frederick IV. of Denmark was principally Patkul's work. It seems, however, as if he could serve no friend and no purpose with full faith. In 1705, Augustus II. arrested him and put him in the dungeons of Königstein; and when Charles XII. made Patkul's surrender one of the conditions of peace, Augustus II. consented. On leaving Saxony the Swedes carried him away with them, and

Oct. 10, 1707, he was broken on the wheel and beheaded in the convent of Kazimierz near Posen.

Pat'more (COVENTRY KEARSEY DIGHTON), b. at Woodford, Essex, England, July 23, 1823, son of Peter George Patmore, a man of letters. The son was assistant librarian in the British Museum 1846–68; author of *Poems* (1844), *Tamerton Church Tower* (1853), *The Angel in the House* (4 parts, 1854–62), and other works.

Pat'mos [*Patino*, called also during the Middle Ages *Palmosa*, "island of palms"], one of the ancient group of the Sporades, now belonging to Turkey, about 30 miles W. of the coast of Asia Minor, and 20 miles S. of the W. extremity of Samos. It is one mass of rock, rugged and barren, about 10 miles long, 5 miles broad, and 28 miles in circumference. It may be seen in the distance in going from Beyroot to Constantinople. A narrow isthmus divides it into two unequal parts. Its chief port, on the E. side of the isthmus, is one of the best harbors in all the Greek islands. The Romans used the island as a place of banishment. The apostle John was sent there under Domitian, and recalled after the tyrant's death (Sept. 18, 96 A. D.). The grotto where he is said to have written the Apocalypse, now covered by a chapel, is about halfway up the hill overlooking the town. The town itself is half an hour from the landing. High over all stands the celebrated monastery bearing the name of "John the Divine," built by the Byzantine emperors in the twelfth century, and now occupied by some 50 monks. The library contains about 1000 printed volumes and 240 manuscripts, of little value. The inhabitants, numbering rather more than 4000, are all Greeks, and have a bad reputation. They live by fishing, boating, and doing agricultural work, in the season of it, on the continent or on the more fertile islands.

R. D. HITCHCOCK.

Pat'na, city of British India, in the presidency of Bengal, stands on the right bank of the Ganges, 285 miles N. W. of Calcutta, and extends with its suburbs along the river for a distance of 7½ miles. It is indifferently built, handsome brick buildings alternating with mud huts covered with tiles or thatched. But it has some manufactures of shawls, tablecloths, lacquered ware, and, being situated on the East India Railway, it has become the centre of the opium-trade. It is the chief seat of Mohammedanism in India. Pop. about 300,000.

Pato'ka, post-v. and tp., Marion co., Ill., on E. fork of Kaskaskia River and Illinois Central R. R. Pop. 1294.

Patoka, tp. of Crawford co., Ind., on Patoka Creek. Pop. 1253.

Patoka, tp. of Dubois co., Ind. Pop. 3086.

Patoka, tp. of Gibson co., Ind., on Patoka Creek and junction of Evansville and Crawfordsville with Louisville New Albany and St. Louis R. R. Includes Princeton, the county-seat. Pop. 4397.

Patoka, post-v. of White River tp., Gibson co., Ind., on the Evansville and Crawfordsville R. R. Pop. 844.

Patoka, tp. of Pike co., Ind. Pop. 1760.

Pat'on (Sir JOSEPH NOEL), R. A., b. at Dunfermline, Scotland; studied painting at the Royal Academy, London; became favorably known to the public by his etchings in illustration of Shakspeare and Shelley; gained premiums by his fresco *The Spirit of Religion* (1845) and his colossal oil-painting *Christ Bearing the Cross* (1847); produced numerous successful pictures illustrating scenes from the poets; became a member of the Academy 1856, queen's limner for Scotland 1865, and was knighted 1867. Author of *Poems by a Painter* and *Spin-drift* (1867).

Patras', town of Greece in the Morea, on the Gulf of Patras, is fortified, and has a large though not perfectly safe harbor provided with a mole. It is a prosperous and well-built city and the seat of the foreign commerce of the country. Its chief export is currants, which are extensively cultivated in its vicinity. Pop. 19,641.

Pa'tria Potes'tas (Roman civil law), the power given by the Roman law to the *paterfamilias*, or legal head of the family, over his children and all others who were considered as standing in the position of children. The most remarkable feature of the early Roman law—the original *lex civilis* or law for the citizen—was the fact that, so far as it concerned private relations, it dealt with the heads of families (*patresfamilias*) only. Families were the social units, and their representatives were alone recognized by the law, so far as it dealt with the private rights and duties of person, of property, and of contract. Each family, in respect to its internal affairs and the relations of its members with each other, was an independent jurisdiction, presided over by the *paterfamilias*, who was its sole lawgiver, judge, and administrator. In order to maintain this character, the early Roman law clothed him with three species of authority, very similar in their nature and extent, and differing chiefly in the subjects to which they applied. They were his dominical power—that over his slaves; his marital power (*manus*)—that over his wife by a complete legal marriage; and his paternal power—that over his children. This paternal power extended (1) to the children born in lawful marriage, continuing over the daughters and the sons' daughters until their marriage, when they passed from their original family into that of their husbands, but continuing over the sons and their wives and male descendants as long as the *paterfamilias* lived, unless lost or abandoned in some special manner provided for by law; (2) to children originally illegitimate who had been made legitimate by any legal method; (3) to persons introduced into the family and made children by "adoption," which took place when a person already under the power of a *paterfamilias* was by him transferred into that of another family head, and thus became in all legal respects the child of the latter; (4) to those brought into the family and made children by "arrogation," which took place when a person not under the power of another voluntarily submitted himself to the authority of a *paterfamilias* with the same legal effects as in case of adoption. The paternal power of any *paterfamilias* ended (1) by his death, when each of the sons became head of his own family, with a like power over his own descendants, and each of his unmarried daughters became free from the paternal authority, although subjected to that of a tutor; (2) by emancipation, which was a legal mode of freeing a child and rendering him completely *sui juris;* (3) by transferring a child into another family and under the power of its head; and finally, the *paterfamilias* himself might be subjected to a loss of his legal character and position by certain acts or defaults, which produced the same effects upon his capacities and rights as would be produced by his actual death. During the earlier stages of the Roman law this power of the *paterfamilias* within the domain of private relations was absolute over all the persons to whom it extended. It included the right of putting them to death, of selling them, and of complete ownership and disposition over all their property and acquisitions. In fact, the private status of the children in these respects resembled that of slaves. The sons under power could acquire and hold no property of their own; all belonged to the *paterfamilias*, and all their contracts and acquisitions enured to his benefit alone. These incapacities, however, did not extend to public affairs, nor within the domain of the public law. The son under power could nevertheless perform all the public duties of a citizen: he could vote, be elected to any office, even the highest, or hold any command in the army, and while performing such official functions could exercise jurisdiction over his own father; but within the domain of the private law he had no personal rights. He could contract a legal marriage, but the consent of his family head was necessary. These terribly severe provisions of the law continued without substantial change throughout the republic. Their mitigation, however, commenced near its close by allowing the son to acquire property (called his *peculium*) from certain special sources, the most important of which was his service in the army. They were rapidly modified by the notions of equity which entered into and reformed the jurisprudence under the empire, and all their harshest features had disappeared long before the codification of Justinian. The paternal power was finally reduced to a conformity with the sentiments of natural right and justice, and so far as it affected the persons of children, it embraced merely the authority to administer correction, to appoint testamentary guardians, and to sanction their marriage.

JOHN NORTON POMEROY.

Pa'triarch [Gr. πατριάρχης, "father of a race" or "family"], often loosely used of any venerable person, but more especially (1) in Bible history the fathers of mankind and of the Hebrew people, from Adam to the time of Moses, are called patriarchs, and their age is called the patriarchal age. (2) The pontiff whose authority centred at Tiberias, and who ruled over all the Jews westward of the Euphrates, from the latter part of the second century till 415 A. D., was called patriarch of the Jews. (3) In church history, during the fourth century, patriarch was the title of any and every bishop, but by the Council of Chalcedon (451) was made the official title of the bishops of Rome, Alexandria, Antioch, Constantinople, and Jerusalem. This system extended only to the Roman empire. From time to time other episcopal dignitaries have been called patriarchs.

R. D. HITCHCOCK.

Patri'cian. The word *patricius* in Latin is derived from *pater*, and by the Roman historians the connection was supposed to be that originally the "patricii" were the sons of the senators or patres. So Livy: "Patres certe ab honore, patriciique progenies eorum appellati" (Liv. t. 8).

But doubtless the true explanation of the word is that offered by Mommsen; he says: "Whoever was begotten in an illegal marriage or out of marriage was excluded from the membership of the community. On this account the Roman burgesses assumed the names of the 'father's children' (*patricii*), inasmuch as they alone in the eye of the law had a father." (*Hist. of Rome*, ch. v., vol. i., p. 69, Eng. trans.) It is certain that the patricians were the original burgesses of Rome, the "populus Romanus;" in the earliest times there was no plebeian class inside the state. The patricians were divided into certain clans, *gentes* as they were called; the gentes were divided into families, and all these families were connected together by certain religious rites called *sacra gentilicia.* Attached to each household were the slaves and the clients, the latter including foreign refugees and emancipated slaves. Sometimes a patrician would marry a client's daughter, in which case the children resulting from the marriage would take rank neither with the patricians nor the clients; they would have no political rights, but would be independent. There were many ways in which a state of independency might be attained by the clients; as, for instance, when a patron died and left no heir. Thus there soon arose in Rome a third class, the plebeians. To the class so formed were added many citizens among the conquered tribes round about Rome; after the conquest of Alba many of their citizens were brought to Rome, only a few being received as burgesses, while the majority joined the plebeians. The civil history of Rome for more than four centuries after the foundation of the city presents a constant struggle between the two orders of patricians and plebeians. At the beginning of the struggle the whole political, judicial, and hierarchical power was in the hands of the patricians; at the end of it a perfect equalization had taken place. The first great advantage gained by the plebeians was the establishment of magistrates of their own, tribunes of the plebs (495 B. C.), for the sole object of the protection of plebeians. During the next half century from that date rapid advances were made: intermarriage between the two orders was sanctioned; the consulship was for a while discontinued and the office of military tribune established, to which plebeians were made eligible; and a way into the senate was prepared for the plebeians by throwing open the quæstorship. The patricians, however, at this date still retained some of the highest offices; they alone were eligible for the augurships and the pontificate. Further, two new offices were created—offices of the highest power —the censorship and the prætorship of the city. By the coming of the Gauls (390 B. C.) the work of equalization was thrown back somewhat, but only for a time. By the Licinian Rogations the consulship was restored, and it was definitely arranged that one of the two consuls should be a plebeian. In B. C. 356 a plebeian was raised to the dictatorship; in 351 the censorship was thrown open; the prætorship followed soon after; and at length, in 300 B. C., the plebeians were elected to the highest sacred offices, the pontificate and the augurships. From this time onward the title of patrician carried with it no advantages apart from the respect which was considered due to high birth and the memory of noble ancestry. A. H. BULLEN.

Pat'rick, county of Virginia, bounded S. by North Carolina and N. W. by the Blue Ridge. Area, 485 square miles. It is mountainous and contains much mineral wealth. The soil is productive. Corn, tobacco, and live-stock are leading products. Cap. Patrick Court-house. Pop. 10,161.

Patrick (SAINT), the apostle and patron saint of Ireland. His baptismal name was *Succath* ("brave in battle"). His birthplace is not certainly known, and his dates are all disputed. He says of himself, in his *Confession*, that he was born "in the village of Bonavem of Tabernia," which some think to have been Kirkpatrick, near Glasgow in Scotland, but others, more probably, Boulogne in Northern France. According to the chronology hitherto most generally accepted, he was b. about 387; was a captive in Ireland from 403 to 409; went thither as a missionary in 432, and d. 465. Todd thinks he was b. 410, went on his mission 440–42, and d. 493. Killen thinks he was b. about 373, went on his mission about 405, and d. 465. The sending of Palladius by Pope Celestine "to the Irish believing in Christ," in 431, was accordingly an act of usurpation which miscarried. He d. on the 17th of March, the day now sacred to his memory. Ireland was then occupied by a great number of petty tribes, most of which were evangelized by Patrick. And so well was the work accomplished that Ireland was known in subsequent centuries as the "island of the saints." The method employed was that of dealing cautiously and gently with the old paganism of the people. The chieftains were first won over, and then through them their clans. Of Patrick himself much that has been related is fabulous. But his autobiographical *Confession* and his *Epistle to Coroticus*, both of which are unquestionably genuine, reveal to us a devout, simple-minded, unlettered man, and a most discreet and energetic missionary. It is a very curious fact that in these writings of his we find no mention of the pope, and no trace of purgatory, auricular confession, transubstantiation, or worship of the Virgin; while salvation by faith and all the related doctrines are clearly taught. (See James Henthorn Todd's *St. Patrick* (1864), W. D. Killen's *Old Catholic Church* (1871), and W. D. Killen's *Ecclesiastical History of Ireland* (2 vols., 1875).) R. D. HITCHCOCK.

Patrick (MARSENA A.), b. in New York Mar., 1811; graduated from the U. S. Military Academy and became brevet second lieutenant of infantry July, 1835; served in the Florida war; in the war with Mexico as Gen. Wool's chief commissary; resigned in 1850 and devoted himself to farming, and was superintendent of the New York State Agricultural Society and president of the Agricultural College. As inspector-general of New York he rendered valuable service in organizing volunteers, and in Mar., 1862, was appointed brigadier-general U. S. volunteers, serving with McDowell in the Shenandoah Valley and in Northern Virginia, and with the army of the Potomac at South Mountain and Antietam. In Oct., 1862, he was made provost-marshal-general of that army, and subsequently of the combined armies operating against Richmond; and, after the surrender, of the department of Virginia. In June, 1865, he again resigned his commission, and in 1867 became president of the New York State Agricultural Society.

Patrick (SIMON), D. D., b. at Gainsborough, England, Sept. 8, 1626; educated at Cambridge; became bishop of Chichester 1689, and of Ely 1691. D. May 31, 1707. Author of a voluminous *Commentary and Paraphrase on the Old Testament* (10 vols., 4to, 1695–1710), and other works.

Patrick Court-house, post-v., cap. of Patrick co., Va., also called TAYLORSVILLE.

Pa'triot, post-v. of Posey tp., Switzerland co., Ind., on the Ohio River.

Patripas'sians [Lat. *pater*, "father," and *patior*, to "suffer"], or **Monarchians** [Gr. μόνος, "single," and ἀρχή, "principle"], Antitrinitarians of the ancient Christian Church, who either taught, or were charged with teaching, either expressly or by implication, that God the Father was incarnated and suffered in the person of Jesus Christ. They denied the doctrine of Three Persons in the Godhead, teaching only three manifestations of the One Person. For themselves, they claimed that they were emphasizing both the unity of God and the divinity of Christ. Of those who held to the heresy in its balder form, the most eminent were Praxeas of Asia Minor, who was in Rome between 190–200 A. D., Noëtus, who was excommunicated at Smyrna shortly after 200, and the two popes, Zephyrinus (202–218) and Callistus (218–223). A much finer type of the heresy was developed by Beryllus of Bostra, recovered to orthodoxy by Origen in 244, and by Sabellius of Ptolemais in Egypt, 250–260 A. D., whose system has frequently reappeared, especially in Occidental Christendom.

R. D. HITCHCOCK.

Pat'ronage means, in general, the right of making appointments to vacant benefices, but it is commonly limited to the right of presenting candidates to vacant ecclesiastical benefices. As long as the Christian Church was chiefly missionary there could, of course, be no question of patronage. In the district or diocese which was placed under his superintendence the bishop fixed his residence at the religious house, where he lived together with a number of priests, as many as were sufficient for the religious instruction of the population of the diocese, and the whole establishment was maintained at the expense of the episcopal treasury. In course of time the bishop at the cathedral church would establish and endow branch churches in his diocese and nominate a priest among the *episcopi clerus*, who enjoyed the revenues of the parish endowment. But soon, when Christianity became the generally accepted religion, the bishop became unable to provide his whole diocese with churches or the churches with revenues. Private persons of wealth and piety then took the duty upon themselves. The count, the baron, the lord of the castle built on his domain a church and endowed it with land or other property sufficient to maintain the building and the priest. He now became the patron of this church; and he enjoyed the right of nominating a person in holy orders to be the officiating minister. So far the development was natural and sound. The third Lateran Council of 1179, and also the fourth of 1215, decreed that presentation by the patron, or induction, as it was called, was by itself not sufficient to confer any eccle-

siastical benefice, as it referred only to the temporalities of the office; institution or investment with its spiritualities was furthermore necessary; and as this could only be given by the Church, the bishop, or the pope, the patron's right of appointment was thereby actually annulled. In the thirteenth century the pope claimed for himself the patronage of all benefices whose incumbents died at the court of Rome; and as the number of ecclesiastics of all ranks and from all countries who visited Rome was very great, this claim was of considerable importance. The pope also gave dispensations for non-residence and for holding several benefices at the same time, and even assumed the right of giving away bishoprics, abbacies, and other ecclesiastical benefices before they were vacant—a measure which roused general indignation, so much the more as it was well known that he sold them. In England, under Edward I., an act of Parliament made every one subject to heavy penalties who should venture to enforce the authority of such papal provisions in England. Also, France made vigorous and successful protest. (See GALLICANISM.) With the Reformation the patronage generally returned to the original possessor, the founder of the church. In England it is treated exactly like any other piece of property: it may be connected with the manor, and is then called *appendant advowson*, and it may have been separated from it and belong to a person, in which case it is called *advowson in gross*. In Scotland it was twice cancelled and twice re-established; it still exists there, but in a somewhat restricted form. In Denmark it was abolished by the constitution of 1848.

Patrons of Husbandry, a secret order having for its object the affiliation, and promotion of the interests, of cultivators of the soil. Its ritual and work, though modelled, to some extent, after those of the Masonic order and the order of Odd Fellows, is simpler than either, and is wholly subordinate to its main purpose, the advancement and benefit of the great agricultural class.

After the late civil war agricultural interests all over the country were greatly depressed. In the South the poverty of the farmers after the war, the difficulty of obtaining efficient labor, the imperfect and ruinous way in which the soil had been cultivated, and in some sections the lack of knowledge of the best methods of cultivation, were sufficient causes for this depression; in the Eastern and Middle States, notwithstanding the efforts to spread agricultural knowledge, the steady and alarming decrease in the yield of cereals and other crops, indicating the near approach of a sterility which would render successful farming impossible, and the serious agitation in several of these States of the question, "Does farming pay?" showed the apprehensions which were depressing agriculture there; while in the West the fierce competition for a market, the low price of grain and other agricultural products, the high and increasing cost of transportation, the enormous prices charged for agricultural machinery, the high rates of interest, and the habit of the farmers, isolated as they were from all co-operation with each other, of buying always in the dearest market and selling in the cheapest,—all these things had rendered farming an unprofitable, or at least a precarious, pursuit. In some of the North-western States four-fifths of the farms were mortgaged or incumbered, and very often the debt incurred in purchasing agricultural machinery led to the foreclosure and sale at half its value of a farm, and the farmer and his family were compelled to go still farther West and take up new lands, which in their turn would be forfeited. This state of the agricultural interest led thoughtful men, throughout the country, to consider whether there was not some way by which these depressing influences could be averted from the great farming interest. Doleful letters from all parts of the country poured into the agricultural department at Washington, and one of the officers of that department, Mr. William Saunders, then superintendent of its gardens and conservatories, a gentleman of Scottish birth, of fine education and culture, whose whole life had been devoted to agricultural and horticultural pursuits, and who had some reputation as an agricultural writer, gave his whole mind to the question, whether some measures of relief could not be adopted for these widespread troubles, which seemed likely at no distant day to sap the foundations of the nation, by causing a very general abandonment of agricultural pursuits. Though himself neither a Mason nor an Odd Fellow, he had been an attentive observer of the progress of these secret organizations, and became convinced that if the bond of union which proved so effective in ensuring the permanency of these orders could be rendered available for farmers and tillers of the soil, it would go far toward solving then existing difficulties. After mature consideration he communicated the conclusions to which he had come to his friends, Messrs. O. H. Kelley, J. R. Thompson, and William M. Ireland, all members of the Masonic order, Rev. A. B. Grosh, a high official among the Odd Fellows and author of one or more works on that subject, and Rev. John Trimble, Jr. All these gentlemen were, we believe, clerks or employés in some of the departments at Washington. None of them were rich, though some had small farms in the West. They were all interested in the ideas advanced by Mr. Saunders, and with great unanimity labored together to render them practical. After some months of labor and consultation they united on a plan for an order, as yet nameless, and by Aug. 5, 1867, had prepared their ritual and work for the first degree. On the 12th of that month, Mr. Saunders, having occasion to go to Western New York, Ohio, and the Western States, took this first degree with him, and interested some of his agricultural friends in the proposed new order. Five of these —viz. Messrs. A. S. Moss, F. M. McDowell, George D. Hinckley, Anson Bartlett, and William Muir—took a deep interest in the subject, and rendered Mr. Saunders efficient service, then and subsequently. Encouraged by their aid and that of other agriculturists, the little coterie at Washington went forward in the autumn of 1867, completed the second, third, and fourth degrees, and gave the name of "Patrons of Husbandry" to the order. On Dec. 4, 1867, nine persons, all of whom have been named above except Mr. Edward P. Faris from Illinois, met at the office of Mr. Saunders on Four-and-a-half street, near the old canal, Washington, and organized the National Grange. (See GRANGE.) The following were the officers elected: William Saunders, master; J. R. Thompson, lecturer; Anson Bartlett, overseer; William Muir, steward; A. S. Moss, assistant steward; Rev. A. B. Grosh, chaplain; William M. Ireland, treasurer; O. H. Kelley, secretary; Edward P. Faris, gatekeeper. Their constitution provided for the admission of women as members of the order, and also for the election of four ladies as officers, to be designated, respectively, Ceres, Pomona, Flora, and Lady Assistant Steward. At a subsequent meeting these were elected, and also an executive committee. Two or three weeks later a subordinate grange was organized in Washington with about 60 members, which was made the school of instruction for the order. On Jan. 1, 1868, Mr. Saunders, as master of the National Grange, sent out a circular to intelligent agriculturists all over the country, setting forth the considerations which led to the formation of the order and its purposes and aims. These, as laid down in this circular, are substantially the objects and aims of the order to-day. Availing itself of the secret formulas and ritual as a means of unity and permanence of organization, and of the membership of women and young people of both sexes to add to the interest of the meetings of the granges, and to elevate their character, its main objects were declared to be the promotion of unity and co-operation among the tillers of the soil and the diffusion of a higher measure of general intelligence and culture, as well as of special knowledge on agricultural subjects and political economy generally. The introduction of political topics and the discussion of any subject connected with partisan politics was prohibited, but all methods of intellectual culture, whether by readings, recitations, essays, orations, or music, were to be adopted, and social culture was also to be encouraged so far as was compatible with good order. In subsequent circulars Mr. Saunders urged the importance of the formation of grange libraries, composed of standard and valuable books of reference on all subjects. The full development of the plans of co-operative purchasing and selling came later, as we shall see presently.

The early progress of the order was exceedingly slow. Mr. Saunders's excellent circular (which with other expenses had involved the National Grange in an indebtedness of $150) seemed destined to produce no effect. They had the one subordinate grange in Washington, but January, February, and March passed and there was no answer announcing the formation of another grange. On Apr. 1, 1868, Mr. Kelley, having resigned his clerkship in the post-office department, set out on a mission to establish subordinate granges. He was to have $2000 salary, provided he could organize a sufficient number of granges to receive that sum in the way of fees. He organized four granges during that month, and after arriving in Minnesota, where he had a small farm, six more. He remained in Minnesota till Jan., 1871, diffusing intelligence concerning the order, and succeeded in inducing a number of prominent agriculturists to unite with it. Mr. Saunders and his associates in Washington meantime were not idle. Eminent citizens of several of the Southern States became members and powerful advocates of the order, and a number of agricultural periodicals undertook its advocacy. Its progress was, however, still slow; to the eleven existing granges of Jan. 1, 1869, 39 were added in that year and 38 in 1870. When Mr. Kelley returned to Washington in Jan., 1871, to become the secretary and executive officer

of the National Grange, there were at most not more than 88 subordinate and 3 State granges in existence. In 1871, 125 more were added. The Rubicon was now passed. In the West and South the importance and value of the order were beginning to be evident. In 1872, 1160 new granges were established; in 1873, 8600; in 1874, about 11,000; and in 1875 as many more. The whole number of active granges (of course some had become defunct) in Nov., 1875, was about 30,000, and the membership very nearly 2,500,000. There are now State and Territorial granges in nearly every State and Territory, Alaska, Arizona, and the Indian Territory being, we believe, the only exceptions, and there are a large number of granges in Canada and the maritime provinces. The benefits which these organizations have conferred on the agricultural community cannot be estimated in dollars and cents. In the States where they are most numerous they have completely revolutionized the condition of the farmers and their families. In 1870 and 1871 most of the farmers were in debt, usually for agricultural machinery, and in addition to paying exorbitant prices for mowers, reapers, cultivators, etc., they were paying from 15 to 25 per cent. interest on these purchases, and their notes were a lien on their farms. Their grain or other produce was shipped to Chicago, Milwaukee, or St. Louis, rated as No. 2 or No. 3, and paid for at the lowest price, mainly in goods at the highest prices; and whatever the amount of their crops, they could not meet their liabilities. Now, through the co-operative management of the State and subordinate granges, and in some instances of county councils organized for this purpose, most of them are out of debt; their agricultural machinery, sewing-machines, musical instruments, books, and provisions and clothing, are purchased for cash at from 25 to 50 per cent. discount from the prices they formerly paid; if there is any new and improved method of cultivating any crop, any change in the markets for what they produce, it is promulgated in their monthly meetings, and all know it at once; and by a system of agencies and exchanges the grain, flour, potatoes, fruit, wool, and packed meats of the North-west, the rice, cotton, and sugar of the South and South-west, are sold in the great markets of Boston, New York, Philadelphia, Baltimore, and New Orleans without the intervention of middlemen, and foreign groceries, dry goods, sewing-machines, musical instruments, books, and other articles returned to the sellers at the lowest wholesale prices; and where these are not needed, the money-value of their goods. These farmers and their wives and daughters, instead of being mere drudges, now find time for intellectual and social culture, for which the grange often furnishes abundant resources. In some sections the household wants are supplied by grange co-operative stores; in others they have an arrangement with the merchants by which, purchasing through the grange, they obtain a liberal discount from retail prices. In some of the grain States the State or county granges or councils own their elevators, and inspect, weigh, and ship the grain themselves, paying no tribute to the grain speculators. If it is objected that by these arrangements for dispensing with middlemen as far as possible, and selling in the highest and purchasing in the lowest market, they are subverting the laws of trade, the Patrons reply that they are not responsible for that; that if they, after submitting so long to the old rule of selling in the lowest and buying at the highest market, have at last come to the conclusion that their duty to themselves and their families requires them to reverse the process, and they choose to conduct their own business, and dealing with every man for ready money, with the strictest honesty, secure to themselves some of the profits which formerly went into the purses of those who cared only to make money out of them, they are not blameworthy, and those persons who complain can, by turning their own attention to the culture of the soil, themselves reap the same advantages.

We have said that the founders of the order had made it a part of its fundamental law that the order should not intermeddle with political questions. Tillers of the soil of all political parties and of none are equally welcome in the order, but they must bring into it no discussion of partisan politics or of party measures under the penalty of expulsion. The great principles of political economy and of national existence and well-being are not prohibited. It has been often intimated by politicians and political editors that this fundamental law was violated; that such or such a measure was supported by the granges; that the legislation hostile to railroads in some of the North-western States was the result of the interference of the order with the elections; and that certain candidates for judges, governors, U. S. Senators, or members of Congress have been designated and supported by the Patrons as a body. Such statements, in their broadest sense, are untrue. We hazard nothing in saying, that in no national, State, or subordinate grange in the U. S. has any action ever been taken for or against any political measure or any candidate of either party, nor has any question of party politics ever been discussed in the grange-room. But the members of the order are citizens as well as Patrons, and they have as citizens their preferences for candidates, which they have the same right as any other citizen to express at the polls. That as farmers they should desire that the railroads might be prohibited from charging excessive freight for their produce was natural, and in those States where a large proportion of the farmers are members of the order it was very natural that such measures and the men who were pledged for them should be supported by the farming class, and as a consequence by a large number of Patrons. But this was totally irrespective of their connection with the order. Indeed, in the States of Illinois and Wisconsin, where the most stringent restrictions were placed upon railroads, the order was not very numerous at the time this action was enforced, and the general sentiment of the leading members and officers of the order was opposed to it. In the *Declaration* of the National Grange which met at St. Louis in Feb., 1874, the following passages refer especially to this subject: "No grange, if true to its obligations, can discuss political or religious questions nor call political conventions, nor nominate candidates, nor even discuss their merits in its meetings. Yet the principles we teach underlie all true politics, all true statesmanship, and, if properly carried out, will tend to purify the whole political atmosphere of our country. For we seek the greatest good of the greatest number. . . . It should always be the principle of every Patron of Husbandry that the office should seek the man, and not the man the office. . . . We desire a proper equality, equity, and fairness, protection for the weak, restraint upon the strong; in short, justly-distributed burdens and justly-distributed power."

We have said very little in regard to the organization and ritual of the order, because we regard these as matters of minor importance, and intended merely to bind the members together more effectually for the grand objects of the organization. Still, a few words of description of the plan of organization may not be out of place. Though the National Grange was first in the order of time, the subordinate grange is really the unit of the organization. A subordinate grange must have at least 15 members, of whom not less than 4 should be women. A complete grange must have 13 officers—viz. a master, overseer, lecturer, steward, assistant steward, chaplain, treasurer, secretary, and gate-keeper—all men; Ceres, Pomona, Flora, and Lady Assistant Steward—all women. These have each their appropriate insignia of office and their well-defined duties. There is also an executive committee of three members. The officers of the grange are addressed as "Worthy." Every member of the grange must be inducted into the first four degrees of the order before taking part in its work or business. All business meetings are confined to the fourth degree. The meetings of the subordinate grange are held monthly or oftener, and may determine upon such measures as shall promote the interests of the grange and its members. The members of the grange are bound to render fraternal aid to each other, to warn each other of danger, to stand by each other without violation of the laws, and to aid each other in penury or distress. The grange when fully organized has its meetings for literary and scientific improvement, and those for social culture and enjoyment. (2) In those States where the co-operative feature of the order has been most fully developed there are county or district organizations called granges or councils, which conduct the secular business, buying, selling, shipping of produce, etc., for the subordinate granges which they represent. These granges are held in the fifth degree, and are composed of masters and past masters of subordinate granges and their wives who are matrons, and also of from 1 to 3 fourth-degree members of each subordinate grange elected thereto. Dispensations for these councils issue from the State grange. (3) The State grange is composed of masters of the subordinate granges and their wives who are matrons; past masters, and their wives who are matrons, are honorary members, but have no vote. It has the same number of officers as the national and subordinate granges, and an executive committee of five. It issues dispensations to district and subordinate granges, subject to the approval of the National Grange, and generally legislates at the annual meetings for the subordinate granges and for the good of the order. Its sessions are always held in the fifth degree. (4) The National Grange is composed of masters of State granges and their wives who have taken the fifth degree, or Pomona; past masters and their wives are honorary members, but not entitled to vote. Its officers are chosen for three years, and it has an executive committee of three members, who are charged with the general business in-

terests of the order, its discipline and management. It meets annually. Its meetings are conducted in the sixth degree, Flora or Charity. There is a seventh degree, to which all members of the National Grange who have served one year may be admitted on application. It is called Ceres, or Faith, and has charge of the secret work of the order, and forms, upon occasion, a court of impeachment for the trial of officers of the National Grange. Its members are honorary members of the National Grange, but are not entitled to vote. L. P. BROCKETT.

Pattagumpus, post-v., Penobscot co., Me. Pop. 94.

Pat'ten, post-v. and tp., Penobscot co., Me., has 3 churches, several schools, an academy, 1 hotel, and 1 weekly newspaper. P. 704.

Patten (DAVID), D. D., b. Oct. 15, 1810; graduated at Wesleyan University in 1834; principal of the academy at Wilbraham, Mass., 1834; held various Methodist Episcopal pastorates in New England; was presiding elder of the Providence district 1852–53; professor of theology in the Biblical Institute, Concord, N. H., 1854–66; became in 1867 professor of homiletics and pastoral theology in the theological school now connected with Boston University.

Patten (GEORGE W.), b. in Newport, R. I., about 1808; graduated at Brown University 1825, and at U. S. Military Academy 1830, when he was appointed second lieutenant of infantry, lieutenant-colonel 1862; served in the Florida war and war with Mexico, losing a hand at Cerro Gordo, Apr. 18, 1847. In 1864 he was retired from active service. Author of *Army Manual; Tactics and Drill.* A collection of his poems was published in 1867.

Pat'tensville, v., Bloomfield tp., Jackson co., O. P. 38.

Pat'terson, post-v. and tp. of Putnam co., N. Y., on Croton River and the Harlem R. R. Pop. 1418.

Patterson, post-v. and tp., Caldwell co., N. C. P. 789.

Patterson, tp. of Orange co., N. C. Pop. 1092.

Patterson, tp. of Darke co., O. Pop. 978.

Patterson, tp. of Beaver co., Pa. Pop. 74.

Patterson, post-b. of Milford tp., Juniata co., Pa., on the Juniata River and Pennsylvania Central R. R. P. 659.

Patterson (CARLILE POLLOCK), son of D. T., b. at Shieldsboro', Bay of St. Louis, Miss., Aug. 24, 1816; appointed midshipman Sept., 1830; joined the frigate Brandywine in October, and served in the Mediterranean squadron; in Feb., 1836, returned to the U. S. in the line-of-battle ship Delaware, carrying his father's flag as commodore; was passed midshipman June, 1836; entered and graduated from Georgetown College, Ky., with diploma as civil engineer early in 1838; joined the U. S. Coast Survey, and served until 1841; as second lieutenant of the U. S. brig Boxer cruised in the West Indies until Jan., 1844; again in Coast Survey in 1845, and conducted a hydrographic party in the Gulf of Mexico; took command of Pacific mail steamship Oregon in Jan., 1850; resigned as lieutenant in the navy Sept., 1853, and remained on the Pacific coast until Mar., 1861, in private business and in command of steamships running from Panama to Puget Sound. In May, 1861, hydrographic inspector U. S. Coast Survey, and so continued until Feb. 17, 1874, when he was appointed superintendent of that work.

Patterson (DANIEL TOD), b. on Long Island, N. Y., Mar. 6, 1786; appointed midshipman in the navy in 1800; attached to the frigate Philadelphia when that vessel ran on a reef near Tripoli in Oct., 1803, and, being defenceless, surrendered to a flotilla of Tripolitan gunboats. Patterson remained a prisoner until peace was concluded in 1805; promoted to the rank of lieutenant in 1807, and to that of master-commandant in 1813. In 1814 he commanded naval forces at New Orleans, and for able co-operation with Gen. Jackson in defending that city received the thanks of Congress. He commanded the flotilla which captured and destroyed the forts and other defences of Lafitte the pirate on the island of Barataria; was appointed captain in Feb., 1815; commanded the frigate Constitution 1826–28 in the Mediterranean; served as navy commissioner 1828–32; commanded the Mediterranean squadron 1832–36; and from 1836 was commandant at the navy-yard, Washington, where he d. in 1839.

Patterson (Rev. JAMES), b. in South Carolina 1773; d. in North Carolina July 1, 1858; entered the ministry in the South Carolina Conference in 1795; labored very efficiently in South Carolina, North Carolina, and Virginia, and did much to check the schism occasioned by the secession of the Rev. James O'Kelly. T. O. SUMMERS.

Patterson (JAMES W.), b. at Henniker, N. H., July 2, 1823; graduated at Dartmouth College 1848; professor of mathematics in that college 1854–59, since which time he has been professor of astronomy and meteorology; secretary of the board of education of New Hampshire 1858–61; in Congress 1862–66; U. S. Senator 1867–73.

Patterson (Gen. JOHN), b. at New Britain, Conn., 1744; graduated at Yale College 1762; became a lawyer; removed to Lenox, Mass., 1774; was a member of the first and second provincial congresses of Massachusetts 1774–75; raised a Berkshire regiment of minute-men and started for Cambridge within eighteen hours of receiving news of the battle of Lexington; took part in the disastrous expedition against Canada and in the battles of Trenton and Princeton; was appointed brigadier-general Feb. 21, 1777; rendered important services at the battle of Stillwater; was present at Burgoyne's surrender and at the battle of Monmouth; remained in service throughout the war; was engaged in the suppression of Shay's rebellion 1786; settled soon afterwards at Lisle, Broome co., N. Y.; became a county judge, member of the State legislature, of the constitutional convention of 1801, and of Congress 1803–05. D. at Lisle July 19, 1808.

Patterson (ROBERT), LL.D., b. in Ireland May 30, 1743; removed to Philadelphia 1768; became in 1774 an instructor in Wilmington, Del.; was an officer of the Revolutionary army; was for a time vice-provost of the University of Pennsylvania and its professor of mathematics 1779–1814; became director of the U. S. Mint 1805; president of the American Philosophical Society. D. at Philadelphia July 22, 1824. Author of *The Newtonian System* (1808); of an *Arithmetic* (1819), and of many scientific papers; also editor of several volumes of the scientific writings of Ferguson, John Webster, Alexander Ewing, etc.

Patterson (Col. ROBERT), b. in Pennsylvania in 1753; emigrated to Kentucky 1775; settled near Dayton, O., 1804; was the original proprietor of the site of Lexington, Ky., and of one-third of the site of Cincinnati, O.; participated in Col. Clarke's three expeditions against the Western Indians 1778–82, being colonel in the latter; participated in Bowman's expedition against Chillicothe 1779; was second in command to Daniel Boone at the battle of the Lower Blue Lick Aug. 19, 1782, and in Logan's campaign against the Shawnees 1786. D. near Dayton Aug. 5, 1827.

Patterson (ROBERT), b. in Tyrone co., Ireland, Jan. 12, 1792; at an early age came to the U. S., and subsequently became a very successful merchant of Philadelphia. On the outbreak of the war with Mexico he was appointed a major-general of volunteers in the service of the U. S., and commanded a division under Gen. Scott, taking part in the battle of Cerro Gordo. On the breaking out of civil war in 1861 he was mustered into the service of the U. S. as major-general of Pennsylvania troops assembled under the President's first call on the States (Apr. 15, 1861) for 75,000 men for three months. Commanding the force on the Potomac in the neighborhood of Harper's Ferry, opposed to the Confederate force under Gen. J. E. Johnston, he was charged with neutralizing that force and preventing its junction with Beauregard at Manassas Junction. But Johnston succeeded in effecting a junction, his advance reaching Manassas on the 20th, the battle of Bull Run ensuing the next day. (See BULL RUN.) On the expiration of his commission (July 27, 1861) Gen. Patterson was mustered out of service. He has since resided in the city of his adoption, Philadelphia, one of her most honored and influential citizens, and one of the largest mill-owners in the U. S. His advanced age does not debar him from the closest personal attention to his immense manufacturing interests, nor from still finding pleasure in the rites of a generous hospitality.

Patterson (ROBERT M.), M. D., b. in Philadelphia 1786, a son of Dr. Robert Patterson (1743–1824); graduated in 1804 at the University of Pennsylvania; took his medical degree in 1808; studied chemistry under Davy; became professor of chemistry, natural philosophy, and mathematics in his *alma mater;* occupied a chair in the University of Virginia 1828–35; was director of the Mint at Philadelphia 1835–53; author of addresses, scientific papers, etc. D. at Philadelphia Sept. 5, 1854.

Patterson (WILLIAM), LL.D., b. at sea of Irish parents in 1745; was reared in New Jersey; graduated at Princeton 1763; was admitted to the bar 1769; was attorney-general of New Jersey 1776–86; member of the national constitutional convention 1787; U. S. Senator 1789–91; governor of New Jersey 1794; revised the laws of New Jersey 1798–99, and was a justice of the U. S. supreme court from 1794 to his death at Albany, N. Y., Sept. 9, 1806.

Patterson's, tp. of Alamance co., N. C. Pop. 717.

Pat'tersonville, post-v. of St. Mary's parish, La., on the Bayou Teche, near the Atchafalaya River.

Patteson (JOHN COLERIDGE), D. D., b. in London, Eng., Apr. 1, 1827; educated at Merton College, Oxford; became a fellow of Merton 1850, curate of Alfington 1852; went in

1854, with Bishop Selwyn, to New Zealand, where he labored as a missionary until 1861, when he was made bishop of the Melanesian Islands; spent the remainder of his life visiting the islands under his episcopal charge, and endeavoring to suppress the kidnapping of the natives to be carried to Queensland, and was killed on the island of Santa Cruz by the Melanesians, Sept. 20, 1871. His *Life* has been written by Miss C. M. Yonge (2 vols., London, 1874) and by Francis Awdry, *The Story of a Fellow-Soldier* (1875).

Pat′ti, town of Sicily, province of Messina, situated on two hills on the west side of a small gulf, to which it gives its name. The *Timethus*, now called the *Naso*, enters the Tyrrhene Sea a mile and a half E. of the town. It seems probable that Patti was originally a suburb or outpost of the ancient *Tindaridus*, the name of which is still preserved in the little hamlet Tindari, standing in the midst of the stately ruins of the old town. The famous sanctuary of Maria Santissima towers above the poor village and brings its yearly throng of devotees. Patti itself was made an episcopal see by Roger in 1094. In the sixteenth century the town was burnt by the Turks. It is now a flourishing place, and its manufactures and commerce are considerable; 300 vessels enter the port annually, and the tunny fisheries also contribute to its prosperity. Pop. in 1874, 8191.

Patti (Adelina Maria Clorinda), b. at Madrid Apr. 9, 1843; was educated at New York, where, on Nov. 24, 1859, she made her début as a singer in Donizetti's *Lucia di Lammermoor*. On May 14, 1861, she made her first appearance in London in *La Sonnambula*, and next year, Nov. 16, 1862, she appeared at Paris in the same rôle. She afterwards sang alternately in Paris, London, and St. Petersburg with great success. July 29, 1868, she married in London the marquis de Caux.

Pat′tison (Granville Sharpe), M. D., b. 1791 near Glasgow, Scotland; became lecturer on anatomy in the Andersonian University; held successive professorships of Anatomy in Baltimore, Md., Medical College, in London University, in the Jefferson College, Philadelphia, and 1840–51 in the University of New York. Author of professional writings. D. in New York Nov. 12, 1851.

Pattison (Robert Everett), D. D., b. at Benson, Vt., Aug. 19, 1800; graduated at Amherst 1826; was tutor in Columbian College, D. C.; ordained to the Baptist ministry at Salem, Mass., 1829; became in 1830 pastor of the First church, Providence, R. I.; held a professorship in Waterville College, Maine, of which he was president 1836–40 and 1853–57; was professor of theology in the theological school at Covington, Ky., 1846–48; held a chair in the Newton (Massachusetts) Theological Institution 1848–53; was for a time president of the Oread Institute, Worcester, Mass., and in 1871 became a professor in the Chicago University. Author of a *Commentary on Ephesians* (1859) and of published addresses, reviews, etc. D. Nov. 21, 1874.

Patton, tp. of Ford co., Ill. Pop. 2726.

Patton, tp. of Allegheny co., Pa. Pop. 1193.

Patton, tp. of Centre co., Pa. Pop. 721.

Pat′ton (Rev. Samuel), D. D., b. in South Carolina Jan. 27, 1797; d. in Knoxville, Tenn., Aug., 1854; filled important stations in Tennessee and Holston conferences for thirty-five years; was editor of the *Holston Christian Advocate* at the time of his death. T. O. Summers.

Patux′ent, post-v. of Anne Arundel co., Md., on Patuxent River, at the junction of the Baltimore and Potomac with the Annapolis and Elk Ridge R. R.

Patuxent, tp. of St. Mary's co., Md. Pop. 1935.

Patuxent River rises 18 miles E. of Frederick, flows S. S. E. and S., and falls at last into Chesapeake Bay by a wide and deep estuary. Its valley is very narrow, and the river is for many miles a navigable tidal stream, abounding in oyster-beds of great value.

Patzum′, town of Central America, state of Guatemala, has 5000 inhabitants.

Pau, town of France, capital of the department of Basses-Pyrenées, is most picturesquely situated on the Gave du Pau, with beautiful promenades presenting most striking views of the Pyrenées. It has a remarkable old castle built by Gaston de Foix in 1363, in which Henry IV. was born, several good educational institutions, linen and paper manufactures, and an active trade in wine, hams, leather, fruits, and corn. Pop. 24,800.

Paul (Saint), the apostle, b. at Tarsus, the capital of Cilicia, of Jewish parents, but a Roman citizen, and educated partly in his native city, which contained celebrated schools of rhetoric and philosophy, partly in Jerusalem, where he became the pupil of Gamaliel. We first hear of him as present at the martyrdom of Stephen, and a passionate adversary of Christianity. With a commission from the Sanhedrim, he was on the way to Damascus to stir up persecutions there too, when a vision overtook him, and he became at once converted to Christianity. He retired to Arabia, where he remained for three years in solitude. He then returned to Damascus, and began to preach there, in Jerusalem, and in Tarsus. Subsequently, Barnabas brought him to Antioch, and from this city, having made a new visit to Jerusalem in 44, he started on his three great missionary journeys. The first, on which he was accompanied by Barnabas, included Asia Minor, Pamphylia, Pisidia, and Lycaonia, and ended about 51. The second, on which he was accompanied by Silas, extended to Europe: Philippi, Thessalonica, Athens, and Corinth were visited. The third, which commenced about 54, embraced nearly the same districts, and terminated at Ephesus, where the apostle remained two years. From Ephesus he went up to Jerusalem; but in order to save him from the fury of the Jewish population, the captain of the Roman guard sent him to Cæsarea, the residence of the Roman governor, and here he was detained in prison two years. Having appealed to the emperor, he was sent to Rome, where he arrived in 61, suffering shipwreck at Melita. In Rome he was treated kindly and allowed to dwell "for two whole years in his own hired house," but it is uncertain whether he ever obtained his freedom. It is generally believed, however, that he made journeys both to the East and West, and, returning to Rome, suffered martyrdom during the persecutions in the reign of Nero about 67. (On the life and Epistles of Paul see the works of Conybeare and Howson, Lewin, Baur, the histories of the apostolic Church by Neander, Schaff, Lange, and the numerous commentaries on the Pauline Epistles.)

Paul I., Pope, a Roman, who succeeded his brother, Stephen III., in 757, and d. at Rome June 28, 767. He was an able prelate, and strengthened the papal authority in spite of its numerous enemies.—Paul II. (*Pietro Barbo*), b. at Venice Feb. 26, 1418; became bishop of Cervia, and in 1440 a cardinal; was chosen in 1464 to succeed Pius II. He first gave the red gown and hat to the cardinals. He preached a crusade against George Podiebrad, king of Bohemia, who favored the Hussites. D. at Rome July 28, 1471.—Paul III. (*Alessandro Farnese*), b. at Canino Feb. 29, 1468; became a cardinal 1493, bishop of Montefiascone 1499, and succeeded Clement VII. as pope in 1534. He pursued with address and vigor his two chief aims in life, the aggrandizement of the Farnese family and the suppression of heresy. Among the prominent events of his important pontificate were the excommunication of Henry VIII. of England 1538, the approval of the order of Jesuits 1540, and the convocation of the Council of Trent 1545. D. at Rome Nov. 10, 1549.—Paul IV. (*Gian Pietro Caraffa*), b. at Capriglio June 28, 1476; became bishop of Chiete 1507; was nuncio to London, and later had a high public office at Madrid; became archbishop of Brindisi 1518; founded the Theatines 1524; became cardinal 1536; succeeded Marcellus II. as pope 1555; joined France in the war for the conquest of Naples from Spain 1555–57; strove for the elevation of his family, and his impolitic course regarding England and Germany strengthened the Protestant cause. He was bitterly hated by the common people of Rome on account of his austere rule. D. at Rome Aug. 18, 1559.—Paul V. (*Camillo Borghese*), b. at Rome Sept. 17, 1552; became legate to Spain and cardinal 1596; succeeded Leo XI. as pope 1605. This pontificate was marked by the interdict laid upon Venice, the close of the Molinist controversy, the establishment of the Congregation of the Oratory and the orders of the Ursulines and the Visitation, and by great activity in the work of missions in heathen regions. D. at Rome Jan. 28, 1621.

Paul, czar of Russia, b. at St. Petersburg Oct. 1, 1754; was the son of Peter III. and Catharine II. Hated by both his parents and abused by his mother, he bore everything patiently, and in 1796 succeeded to the throne on Catharine's death. He immediately set about to reverse her policy in every particular. His reign began well. Kosciusko and the other Polish prisoners were liberated and treated with generosity. In 1799–1800 his troops served in Italy and Switzerland against France; but in 1800 he changed sides, embraced the cause of Napoleon, and challenged to personal combat any prince who refused to join him in a league against Great Britain. Meanwhile, the puerilities and tyrannies of his home rule begot a strong popular discontent, and he was murdered in his bedchamber by his nobles Mar. 24, 1801. Paul had some generous qualities. His own family he treated with a kindness before almost unknown in the Russian imperial house. He intended, it is said, to give Poland her freedom and autonomy; but his feeble intellect, his scanty educa-

tion, and an absurd and almost insane self-conceit led him into many acts of tyranny.

Paul (Gabriel R.), b. in Missouri Apr., 1813; graduated from the U. S. Military Academy, and became brevet second lieutenant of infantry July, 1834; served with his company in the Florida war; in the war with Mexico was wounded at Cerro Gordo and made brevet major for Chapultepec. On the outbreak of the civil war in 1861 he was major of the 8th Infantry, stationed in New Mexico; in Dec., 1861, was appointed colonel of the 4th New Mexico Volunteers; appointed brigadier-general of volunteers Sept., 1862, he was assigned to the army of the Potomac, and participated in the battles of Fredericksburg, Chancellorsville, and Gettysburg, where he was so severely wounded by a rifle-ball as to completely destroy his sight. Appointed colonel of the 14th Infantry in 1864, he was in 1865 retired on that rank; but in 1866 Congress granted him the full pay and allowances of a brigadier-general.

Paul (Vincent de), b. at Pony, Gascony, in 1576, in humble circumstances; received his first instruction from the Franciscan friars at Acqs; studied afterwards at Toulouse; took holy orders in 1600, and was captured in 1605 by pirates on a voyage from Marseilles to Narbonne, and carried as a slave to Tunis. In 1607 he succeeded in making his escape; visited Rome and then Paris; was appointed chaplain to the ex-queen Margaret of Valois, and in 1622 chaplain to the galleys at Marseilles; repaired in 1627 to Paris, where he developed an extraordinary activity in the establishment and management of charitable institutions, hospitals, asylums, etc., and in the foundation of religious fraternities, the Lazarists, the Sisters of Charity (which see); was a member of the "council of conscience," by which all ecclesiastical preferments were distributed. D. at St. Lazare Sept. 27, 1660. He was beatified by Benedict XIII. in 1729, and canonized by Clement XII. in 1737.

Paul'ding, county in N. W. Georgia. Area, 400 square miles. It is broken by wooded mountain-ranges, contains iron, limestone, and other valuable minerals, and has fertile valleys, producing cotton, corn, etc. Cap. Dallas. Pop. 7639.

Paulding, county of Ohio, bounded W. by Indiana. Area, 414 square miles. It is level, fertile, and in part covered by wooded swamps. Corn, wheat, and lumber are the leading products. The county is traversed by the Toledo Wabash and Western R. R., the Auglaize and Maumee rivers, and the Wabash and Erie Canal. Cap. Paulding. Pop. 8544.

Paulding, post-v., cap. of Jasper co., Miss. Pop. 262.

Paulding, post-v. and tp., cap. of Paulding co., O., on Crooked Creek, in an agricultural region, has 1 weekly newspaper. Pop. 448.

Paulding (Admiral Hiram), son of John, b. in Westchester co., N. Y., Dec. 11, 1797; entered the U. S. navy as a midshipman Sept. 1, 1811; was engaged in McDonough's victory on Lake Champlain 1814; became lieutenant 1816; accompanied Com. Porter in his cruise against the West Indian pirates 1823; became captain 1844; suppressed an intended expedition against Nicaragua, headed by William Walker, 1857; became rear-admiral on the retired list 1861; was in command of Brooklyn navy-yard 1862–65; rendered valuable service in equipping vessels for active employment in the navy and in protecting public property during the riots of 1863, and became governor of the Philadelphia Naval Asylum 1866.

Paulding (James Kirke), b. in Pleasant Valley, Dutchess co., N. Y., Aug. 22, 1779, the son of an active but unfortunate Revolutionary patriot of Dutch descent. The son received a scanty training in school, and in early life removed to New York City, where his sister had married William, an elder brother of Washington Irving, with whom he became associated in the authorship of *Salmagundi* (1807), but the second series of *Salmagundi* (1819) was by Paulding alone; became in 1814 secretary of the Board of Navy Commissioners; was secretary of the U. S. navy 1838–41, and for twelve years was navy agent in New York; was a facile essayist and humorist, and author of numerous works, among which were novels, political pamphlets, poems, etc. The best of his writings are *The Dutchman's Fireside* (1831), a powerful and well-written novel, and a valuable *Life of Washington* (1835). D. at Hyde Park, N. Y., Apr. 6, 1860.

Paulding (John), b. in New York 1758; served through the Revolutionary war, being three times taken prisoner; was one of the captors of Major André, for which service he received from Congress a silver medal, inscribed on one side "Fidelity" and on the other "*Vincit Amor Patriæ*," and was granted an annuity of $200. D. at Stoatsburg, N. Y., Feb. 18, 1818. A monument to his memory was erected at Peekskill over his remains in 1827 by the corporation of the city of New York, and his name has been given to one of the N. W. counties of Ohio, his companions, Van Wart and Williams, having been similarly honored.

Pau'li (Georg Reinhold), b. at Berlin May 25, 1823; studied philology and history at Berlin and Bonn; lived in Great Britain from 1847 to 1855, and was appointed professor in history at Rostock in 1857, at Tübingen in 1859, at Marburg in 1867, and at Göttingen in 1870. Besides several minor essays on various subjects, and some larger works relating to the history of England, he wrote *König Alfred und seine Stellung in der Geschichte Englands* (Berlin, 1851), translated into English by Thomas Wright (London, 1852), and *Bilder aus Alt-England* (Gotha, 1860), translated into English by E. C. Otté (London, 1861). The sharp criticism to which he subjected the policy of the government of Würtemberg in a review in the *Preussische Jahrbüchern* (1866) occasioned his removal from Tübingen to Marburg.

Pauli'cians, a Christian sect of the Eastern Church, originated in Armenia probably in the middle of the seventh century, but the origin of their name and the sources of their peculiar views are enveloped in obscurity. They rejected the worship of the Virgin and the saints, explained the sacraments spiritually, maintained no priesthood, and acknowledged only the New Testament as authoritative. After spreading quietly in Armenia for about two centuries, though now and then persecuted by the Byzantine emperors, the empress Theodora (841–855) undertook to suppress the sect. More than 100,000 are said to have been put to the sword, and the rest were exiled. Some fled to the Saracens, others to the Bulgarians, and in Bulgaria remnants of the sect were found as late as the sixteenth century. By Roman Catholic writers the Paulicians are generally brought into connection with the Manichæans, though, as it would seem, without sufficient reason.

Pauline Congregation. See Piarists.

Paul'ist Fathers, or **The Congregation of St. Paul the Apostle,** a missionary society of priests in the Roman Catholic Church, founded in 1858 by Rev. Isaac Thomas Hecker, and approved by Pope Pius IX. They are chiefly men who have abandoned Protestantism. The mother-house is in New York.

Paullinia. See Guarana.

Pau'lus (Heinrich Eberhard Gottlob), b. at Leonberg near Stuttgart, Würtemberg, Sept. 1, 1761; studied Oriental languages and theology at Tübingen, Göttingen, London, and Paris, and was appointed professor in 1789 at Jena, in 1803 at Würzburg, director of the department of public worship and education in 1808 at Bamberg, in 1809 at Nuremberg, in 1811 at Ansbach, but moved in the same year as professor to Heidelberg, where he d. Aug. 10, 1851. He was one of the most prominent representatives of the rationalistic theology in its historico-critical phase; but although his flat and barren principle often led him to the adoption of hypotheses and explanations which even his contemporaries found ridiculous, his integrity and courage, his sharp and acute judgment, and his great learning did good service on many occasions and commanded general respect. The most remarkable among his numerous works are *Clavis über die Psalmen* (1791); *Clavis über den Jesaias* (1793); *Commentar über das Neue Testament* (4 vols., 1800–07); *Leben Jesu* (1828); *Exegetisches Handbuch über die drei ersten Evangelien* (3 vols., 1830–33); Schelling's *Lectures on Revelation, with Critical Notes,* which implicated him in a lawsuit (1843); *Skizzen aus meiner Bildungs- und Lebens-geschichte* (1839).

Paulus (Lucius Æmilius), surnamed **Macedonicus,** b. at Rome about 230 B. C., a son of the consul of the same name, who fell at Cannæ 216; was prætor in 191; commanded afterwards as pro-consul in the province of Further Spain, where he put down a formidable insurrection and defeated the Lusitanians; was consul the first time in 181, and a second time in 168; censor in 164. D. in 160. During his second consulship he finished the third Macedonian war by his brilliant victory over Perseus at Pydna. The Macedonian kingdom was broken up into four independent republics with aristocratic governments, standing under the protectorate of Rome and paying a part of the land-tax into the Roman treasury. Also, the affairs of the other Greek states in Europe were regulated at the same time by a Roman commission under the presidency of Paulus.

Pau'lus Ægineta, a famous Greek physician and author, b. in Ægina at an unknown date, but Abulfaragius places him in the seventh century A. D., which is probably correct. His *De Re Medica Libri Septem* had great influence among European and Arabian physicians in the Middle Ages, and several Latin and Arabic versions were

made. Of the Greek text the edition of 1528 (Venice) and 1538 (Bâle) are complete. The Sydenham Society published (London, 1847) an improved edition of Francis Adams's complete translation, with abundant notes, in 3 vols. 8vo. Several other works of Paulus are mentioned by old writers.

Paulus Diaconus, or **Levita,** b. at Cividale in Friuli about 730; educated at the Lombard court at Pavia; became tutor to the daughter of King Desiderius, for whom he compiled his *Historia Romana*, parts of which are given in Muratori's *Rerum Italicarum Scriptores*, vol. i. (Milan, 1728); was ordained deacon, not later than 763; entered the monastery of Monte Casino, whence he addressed a letter to Charlemagne in 781; lived afterwards for several years at the court of Charlemagne, where he collected his *Homiliarius*, which was often reprinted in the fifteenth and sixteenth centuries and translated into German and Spanish, and wrote his *Gesta Episcoporum Mettensium*, printed in Pertz's *Monumenta Germaniæ Historica*, vol. ii. (Hanover, 1827); made an abridgment of Festus's *De Significatione Verborum* (see FESTUS); returned to Monte Casino in 787. D. there about 797. His last and most important work was his *De Gestis Longobardorum Libri VI.*, which ends at 744, and is published in the above-mentioned collection by Muratori, and in *Hist. Gotth. Vandal. et Longobard.*, ab H. Grotio (Amsterdam, 1655).

Paul Veronese. See CAGLIARI.

Paul'ville, v. of Salt River tp., Adair co., Mo. P. 100.

Pau'pack, tp. of Wayne co., Pa. Pop. 642.

Pau'perism is said not to be a word derived from the Latin through the Norman-French, but to have arisen in England in the seventeenth or eighteenth century to express a condition of things which was modern and characteristically English. It describes, in one aspect, that degraded condition of poverty where the habit of self-support and the attending mental state of self-respect have been much impaired and lost—a condition in which the lowest vices are bred, and which gradually degenerates into mental and physical weakness and extinction. In a more general sense, pauperism merely describes the settled condition of large masses of people, who are more or less dependent on the alms of the community for their support. It is not poverty simply: it is that degree of penury which demands public aid, and which has acquired the habit of dependence.

Poor Laws in England.—Laws for compulsory charity, or the so-called "Poor Law" of England, date back from Henry VIII. Before and during his reign the breaking up of the feudal system, the dispersion of noblemen's retainers, and the destruction of the monasteries had turned adrift very many dependent persons, who were obliged to support themselves, and who often fell into great poverty. At the same time, the rise of prices consequent on the large introduction of the precious metals from America into Europe pressed heavily on the working-classes. Much pauperism was in consequence created. The statutes for relief usually contained a preamble, stating that these laws were passed "to the intent that valiant beggars, idle and loitering persons may be avoided, and the impotent, feeble, and lame provided for which are poor in very deed," thus early indicating the different treatment to be given to voluntary and involuntary poverty. These statutes of Henry VIII. rendered each locality responsible for the support of its own poor, and regulated the giving of alms. The impotent poor were to be sent to the place where they were born, but the able-bodied were to be set to work; and if they did not accept it, they were to be severely punished. In regard to alms-giving, money was to be collected in each parish by voluntary subscriptions; but if these were refused, there were modes of compulsory collection by ministers and churchwardens. Any one giving alms privately rendered himself liable to a fine equal to ten times the amount of what he had given away. No tax, however, was laid for compulsory charity till the reign of Elizabeth. The celebrated 43 Eliz. c. 2 is the foundation of the present system of poor-rates. This act for the first time gave every one a legal right to claim relief. In order to obtain funds for the affording of this relief, the local authorities were empowered to lay a tax on all real property, such as land and houses. Overseers were to be appointed, who should be responsible for the collection of rates and the administration of relief. Apart from these, the main features of the law were the legal recognition of the primary liability of children, parents, and grandparents to support one another, the obligation of able-bodied paupers to work as a condition of obtaining relief, the necessary relief of the aged, impotent, and poor "unable to work," and the apprenticeship of poor children. The great defect of the act, apart from its publishing to the poor their "right of relief," was that it threw on the parochial authorities the responsibility of finding work for the unemployed—a provision which, without the "workhouse test," did so much to demoralize the working-classes of England previous to the reforms of 1834. To carry out the act, the local authorities were obliged to establish workhouses and hospitals; and finally, in 1723 (9 Geo. I. c. 7), a union of parishes was empowered to build a workhouse, and the offer of residence, if not accepted, was a bar to relief. The "workhouse test" for a time diminished pauperism; but gradually the management of these workhouses degenerated: they became mere asylums for the idle and worthless, or else parish-manufactories managed in the interest of individuals. The poor relief became discredited, and out-door relief was encouraged both by public opinion and by legislation. At length, in 1815, the workhouse test was altogether abolished and no able-bodied laborer was compelled to enter the workhouse, and justices were empowered to distribute money-alms to the poor at their own homes. If wages in any parish were below what was considered a reasonable maintenance, the local authorities were empowered to grant "allowances" or to supplement wages. Very strict laws of "settlement" also were passed, forbidding the free migration of poor laborers from one parish or county to another. The poorest class of laborers were in consequence kept in their own localities, as they had no motive, or even the power, to go where their labor might be in demand. Parochial relief became a vast system of indiscriminate alms-giving: the independent workman's condition was often inferior to that of the pauper. An artificial stimulus was given to population by increasing the parish-allowance in proportion to the number of children, and immorality was encouraged by the parish granting more money for an illegitimate than a legitimate child. Pauperism became a paying profession, and was sometimes followed by several generations of the same family. With increased dependence of the poor increased immorality and disorder resulted; and finally, in 1832, riots and incendiary fires became of common occurrence in the districts where pauperism was most rife. The distributors of relief became also demoralized, and various forms of peculation were discovered among them. The cost of pauperism also increased, and in some districts the taxes absorbed all that remained from the produce of the soil after the expenses of cultivation were paid. Many of the clergy gave up their land, and much fertile land was thrown out of tillage. Many English authorities maintain that the old Poor Law nearly ruined the country, and there can be no doubt that under it the evil of pauperism had reached gigantic dimensions.

In 1832, however, a commission of inquiry was appointed by Parliament, whose labors resulted in the celebrated Poor Relief act of 1834, the basis of the present poor-law system of England, and in a report still a standard of authority and reference in all discussions on this subject. By the act of 1834 a central controlling body was established with extensive powers in regard to the relief and management of the poor. The workhouse test was renewed, the granting of "allowances" in aid of wages was abolished, the appointment of paid overseers was provided for and an official audit of accounts secured. Illegitimacy was sought to be checked by making the father responsible for the support of the child instead of paying the mother, as had been the rule. The laws of settlement were made much more easy, so that laborers could move with more freedom from one parish to another. The general drift of the legislation was in favor of in-door relief as opposed to out-door relief, especially as regards able-bodied paupers. Its influence was to lead the industrial classes to rely on their own labor rather than on the rates. There were some hardships at the first execution of the law, when families were refused out-door relief, but these gradually righted themselves. The laboring classes became freed from contact with the pauper class, and their relations with employers were put upon the universal customary footing. It has now become exceedingly rare outside of London for parish authorities to administer out-door relief to able-bodied paupers. Under the new act the cost of pauperism diminished remarkably, the annual expenditure falling from £6,750,000 in the five years preceding the passage of the act to £4,500,000, while the average cost per head of the whole population fell from 8*s.* to 6*s.* and 5*s.* An even more stringent act was passed in Ireland in 1838, which entirely superseded out-door relief by workhouse relief, which was adhered to till the famine of 1847, when its restrictions were for a time thrown down. At present out-door relief is granted much less in Ireland than in England. In Scotland an act was passed in 1845, which allowed out-door relief even more than it was permitted under the English Poor Laws. This is believed to have planted among the Scotch population many of the evils of pauperism; and numerous workhouses have been obliged to be built in order to obviate its evils and apply the workhouse

test. In England the act of 1834 and the regulations following it remain practically unextended, but, at the same time, unrestricted. Under it, despite the improvement on the former state of things, a gigantic pauperism remains, or a population of 998,484 paupers in 1873 in England and Wales, out of a total population of 22,704,000, making one person in 23 a pauper. It is true that this pauperism is diminishing, as will appear in the statistics on a following page. In three years before 1873 there was a decrease of 194,000, or 18½ per cent., in the number of paupers, being a decrease of 7 per cent. in out-door cases and of 20½ per cent. in in-door, these estimates not including lunatics and vagrants relieved by the poor-rates. In one year (1873) there was a decrease, as compared with the preceding, of 54,126, or 6 per cent.

Out-door and In-door Relief.—Many of the English authorities are inclined to attribute the enormous extent of pauperism in England to the out-door relief granted still under the Poor Law Amendment act, and hold that if out-door relief were entirely cut off there would be a marvellous diminution of pauperism. This is apparently a theoretical view, which facts do not sustain. It is true that in Ireland the in-door paupers are to the out-door in the proportion of nearly 5 to 1, while in England the out-door are to the in-door as 8 to 1, and in England 1 in 25 is a pauper, while in Ireland the proportion is, according to Prof. Fawcett, 1 in 74, or, more exactly, 1 in 90. But it would be necessary to inquire how much of the diminution of pauperism in Ireland is due to the immense emigration which has been relieving the country, and how much its extent in England to the Poor Law on the one side and the very unequal distribution of property on the other. The American system is to mingle out-door and in-door relief, which seems more judicious than the absolute exclusion of the former. It often happens that a little relief given judiciously by a relieving officer in a small community will keep a family suddenly stricken by misfortune from absolute dependence. The residence in an almshouse degrades and pauperizes, and on no account should children ever be kept long in a poorhouse, but should speedily be apprenticed or placed out. It is for the interest of every community that no member of it should acquire the habits of pauperism. No disease is so dangerous. For that reason it may often be better for a village or small town to spend considerable sums in out-door relief, rather than have a portion of the population accustomed to the degradation and dependence of the almshouse.

Out-door relief in large communities by public authorities is, however, extremely dangerous, both on account of the difficulty of ascertaining the deserving character of the claimants and because it is peculiarly liable to be misused as a means of bribery and corruption. The true principles would seem to be (1) that in no case should out-door relief be given to the able-bodied male poor, but they should be required to earn their support in workhouses; (2) that out-door relief should not be given by public authorities in cities, but should be left to organized voluntary associations; (3) that out-door relief should be given in villages and small towns only on such conditions and in such modes as would prevent future pauperism, and to cases of sudden misfortune, as to widows deprived by sudden death of their husbands, to families of young children struggling to maintain themselves during the sickness of parents, or to the aged and impotent poor. The error of the English administration does not seem to have been so much in the excessive giving of out-door relief as in the feeling implanted in the poor of a "right of relief," and in the early giving of alms to the masses instead of education. Had the immense sums spent in England on the poor-rates been but in part devoted to popular education, the past year would not have seen more than 850,000 paupers in that country, calling for an expense of more than $35,000,000, and had the feeling of a "right to education" been implanted in the English laboring-classes, rather than a "right to relief," the most gigantic evil in English society would have been greatly lessened. The words of a writer (Malthus) who has been only too little appreciated are still true of Poor Laws in all countries: "The kind of despotic power essential to voluntary charity gives the greatest facility to the selection of worthy objects of relief, without being accompanied by any ill consequences, and has further a most beneficial effect from the degree of uncertainty which must necessarily be attached to it. It is in the highest degree important to the general happiness of the poor that *no man should look to charity as a fund on which he may confidently depend.*" (*Essay on Population,* v. ii. p. 430.)

Pauperism in the U. S.—There is very little of native pauperism in this country. The great proportion of paupers in the U. S. are foreign-born or of foreign descent. Many villages and towns are known where not a single pauper exists. The statistics on the subject, both in the census and in the reports of the State boards of charity, are utterly untrustworthy, owing to the method of counting, which often includes the same person a number of times. If the average number by the day could be taken, a fairer estimate would be given of the true number of paupers. The comparatively equal distribution of property in the U. S., the cheapness of arable land, the dignity imparted by political privileges, the absence of strict Poor Laws, and, above all, the influence of popular education, have tended to prevent the growth of pauperism. The only places where there is danger of its appearance is in the large cities. Here the occasional business calamities and the indiscriminate charity of the fortunate classes, with the careless mode of distributing public alms, all tend to form a pauper class. A Poor Law may be said to exist almost everywhere in the U. S.; that is, the local communities are required to support their own poor by taxation. Similar features also are found to those in the English law, requiring near relatives to be responsible for one another in case of pauperism resulting from misfortune, providing for the apprenticeship of pauper children, and distinguishing between voluntary and involuntary poverty.

American Settlement Laws for Paupers.—The legal settlements of paupers, such as oblige parishes or towns and villages to relieve or support them, have always been a prolific source of dispute and litigation. The laws for settlement in this country are mainly derived from those of England, yet they vary in different States. In Massachusetts a married woman follows the settlement of her husband if he has any, otherwise that of her own at the time of her marriage. Legitimate children follow the settlement of the father, or, if he have none, that of the mother. Illegitimate children follow that of the mother. Similar provisions exist in other States. But in Indiana, Wisconsin, and Kansas a married woman whose husband has no settlement in the State may acquire one on the same conditions with other persons. In Iowa and some other States a woman abandoned by her husband may acquire a settlement. In Indiana, Iowa, Wisconsin, and Kansas minors whose parents have no settlements are allowed to acquire one on the same terms as adults. In New York and Michigan "emancipated" minors may acquire settlements as follows: (1) If a female, by marriage and living with her husband a year; (2) if a male, by marriage and residence separately from his father's family for a year; (3) by being bound as an apprentice and serving for a year; (4) by being hired and actually serving for a year on wages paid to himself.* In Indiana, Iowa, Kansas, and other States an apprentice acquires a settlement at once on becoming bound. In regard to settlements from property and residence, the Massachusetts law (1868) provides that living on a freehold property for three years shall constitute settlement, or the ownership of property valued by assessors at $200, or whose income is set down at $12 for five successive years, or residence in any place within the State for ten years and payment of all taxes for five years. Women may acquire settlement by a residence of ten years without payment of taxes. The only other States which make the ownership of property a means of acquiring settlements are Vermont, New Hampshire, Rhode Island, Connecticut, Pennsylvania, and Delaware. The latter three States alone require that the person shall live upon the estate, and most of them provide a briefer period of residence, with or without the payment of taxes. All the other States merely require a certain period of continuous residence, without consideration of property or the payment of taxes. The longest period is in Maine, five years; the shortest in Nebraska, thirty days. Settlements are also derived from the holding of public office in Massachusetts, Vermont, Pennsylvania, and Delaware. In Massachusetts alone a clergyman acquires a legal settlement where he is settled as a minister. In three of the New England States a person acquires a settlement who is admitted an inhabitant by any town at a legal meeting. Apprenticeship also gives settlement in many of the States, even to minors, though in Massachusetts the apprentice must be of age and continue in the same place at his trade for five years. In some of the States a soldier acquires a legal settlement wherever he enlists, so that a town becomes liable for the support of persons by whom its quota is filled.

The final extinction of pauperism can only come through individual improvement. Where education sharpens the mental faculties, where religion elevates the moral character, or political rights increase personal dignity, with a fair distribution of property or an easy acquisition of arable land possible to each, there the peculiar debasement, dependence, weakness, and misery which constitute pau-

* *Report of Massachusetts State Board of Charities for 1871*, p. 12.

perism will in all probability be avoided. Contrary to the reasonable though gloomy forebodings of Malthus, the production of the human race has thus far increased faster than population, and the condition of the masses improves yearly in all the leading countries of the world. Even in England, the centre of this evil, pauperism is checked by popular education and by improved production. The statistics of pauperism in all countries are exceedingly untrustworthy, owing to the repetition, in the numbering of the cases, of the same persons. The only perfectly fair method would be to take the average number of cases per diem. Thus in Ireland in 1869, out of a total population of 5,799,000, there were during the year 235,562 paupers, or 1 in 20; but the daily average was only 52,240, or 1 in about 111.

Statistics of Recent English Pauperism.

Year.	In-door.	Out-door.	Total paupers.
1870	158,381	889,281	1,047,662
1871	150,846	847,638	998,484
1872	143,541	764,274	907,815
1873	147,319	706,370	853,689
1874*	137,944	646,404	784,006

In 1871, with a population of 22,704,000, there was a proportion in England of 1 pauper in nearly 23; in London, 1 in 27. According to a trustworthy writer (Emminghaus), there were the following proportions of paupers in these countries:

Great Britain......	1855–65, 1 to 20.83, or 22.22, or 4⅔ per cent.	
Prussia	1849–61, 1 to 20.60 to 56.05,	or about 2¼ per cent.
Saxony................	1856–64, 1 to 54.94 to 56.18,	
Würtemberg.......	1856–64, 1 to 29.94 to 52.01,	
Bavaria...............	1855–67, 1 to 38.91 to 56.85,	
France................	1853–60, 1 to 35 to 35.14 (3 per cent.).	

Cost per capita.

Great Britain, per annum....................................	$36.25
Germany, " "	7
France, " "	2.50

During the years 1867, '68, and '69 the annual cost in Great Britain for paupers was some $36,885,000, or an average cost per head of about $37.60. The poor-rates of London amounted in 1868 to $6,582,795, or an average cost per annum for each of about $22; not including those in asylums or the vagrants sheltered by the police. In 1847, England and Wales, with a population of 19,000,000, contained 1,876,541 paupers, or 1 to 10. The cost that year of the poor administration in England was $30,000,000, or about $16 per head; in France, $3,400,000, and the cost per capita $2.64. In London, with 2,500,000 of population that year, there were 300,000 paupers, or 1 in 8; in Paris, with 1,000,000, 75,000, or 1 in 13. The following proportions in the two countries for that year are given by De Watteville:

Lancashire	1 in $14\frac{2}{7}$
Department of Rhone..............................	1 " $12\frac{1}{2}$
Department of the North.........................	1 " $4\frac{8}{23}$
Wilts county (Eng.)................................	1 " $6\frac{1}{4}$
Lille...	1 " $3\frac{1}{3}$
Marseilles..	1 " 7
Bordeaux...	1 " 7
England (out of London).........................	1 " $12\frac{1}{2}$
France (out of Paris)................................	1 " $12\frac{1}{2}$

In these estimates the poor are supposed to be more closely reckoned in England than in France. In both countries the agricultural counties are the poorest; in France some rural communes contain more paupers than the towns. (*Rapport sur la Situation du Pauperisme en France,* par M. le Baron de Watteville, Paris, 1854.) But it is probable that many are included who only receive temporary help, and many are numbered more than once.

We append a table of statistics of comparative pauperism in three of the most populous States and large cities of the American Union. It should be remarked, however, that all such figures have comparatively little statistical value in the U. S., as the classification varies in different States, and all do not distinguish between names and persons in their tables:

Pauperism (1870).

State and City.	Wholly supported.				Partially supported.				Total.			
	No. of in-door.	Proport'n to population.	Cost of whole support.	Cost per capita.	No. partially sup.	Proport'n to population.	Cost of partial support.	Av. cost per capita.	Tot. No. relieved & sup.	Proport'n to population.	Total cost.	Av. cost per capita.
State of New York....	59,136	1 in 74 1-10	$1,681,470.29	$28.43	101,796	1 in 43 1-20	$911,855.15	$8.95½	160,932	1 in 27 1-5	$2,613,324.44	$16.31
" Pennsylvania.	19,010	1 in 185 1-4	664,471.92	34.95½	38,821	1 in 92 1-8	231,296.05	5.96	57,821	1 in 60 3-4	895,667.97	15.49
" Massachusetts	†9,875	1 in 147 6-10	847,858.34	85.86	23,775	1 in 61 1-3	303,670.73	12.76	33,650	1 in 43 3-10	1,150,529.07	34.19
City of New York....	‡29,761	1 in 31 2-3	688,903.00	23.14	5,834	1 in 161 1-2	126,360.52	21.65	35,595	1 in 26 1-2	815,263.53	22.90½
" Philadelphia..	§9,931	1 in 67 4-5	324,040.56	32.63	4,388	1 in 153 1-2	113,608.59	23.63	14,319	1 in 47	437,649.15	30.56
" Boston........	988	1 in 253 2-3	97.686.14	98.77¾	5,536	1 in 45 1-4	46,616.33	8.42	6,524	1 in 38 5-6	144,302.47	22.14

C. L. BRACE.

Paulown'ia Imperialis, a fine park tree of the order Scrophulariaceæ, a native of Japan. It has something the habit of a catalpa, the leaves being large and heart-shaped, the branches being crooked and nearly horizontal, the flowers are in large clusters of a pale violet color, and precede the leaves. The tree rarely exceeds 40 feet in height, and its trunk is usually less than a foot in diameter. It is hardy as far N. as New York.

Pausa'nias, a son of Cleombrotus and regent of Sparta during the minority of his cousin, Plistarchus, the son of Leonidas; commanded the confederate Greeks at Platææ 479 B. C., and achieved several brilliant victories during the following years. But, elated by these successes and seduced by an exorbitant ambition and vanity, he entered into treasonous negotiations with the Persians. He desired to bring the whole of Greece under his sway, and he hoped to realize this plan by the aid of Xerxes, which he proposed to buy by placing his future kingdom under Persian authority. Meanwhile, he assumed Persian dress, surrounded himself with a body-guard of Persian and Egyptian troops, and introduced Persian ceremony and Oriental luxury in his household. The Athenians denounced him and the Spartans suspected him. Twice he was recalled from the army and arraigned before the ephors, but no proofs could be presented and he was acquitted. He continued the negotiations with Xerxes, and even began to form a conspiracy with the Helots. But at last a letter from him to Xerxes was delivered over to the ephors by the slave entrusted to carry it to the Persian camp, and when he learned that his treason was discovered and his plan frustrated, he took refuge in the temple of Athene Chalciœcus, where the people shut up the entrance by a pile of stones, to which his own mother carried the first, and he d. of hunger about 468 B. C. The date of his death is uncertain, and there is also some discrepancy between the reports given by Nepos, Ælian, and others of the manner in which his death took place.

* July 1, 1874. † Average No. 5814.
‡ Average No. 6141. § Average No. 2985.

Pausanias, probably a native of Lydia, Asia Minor, flourished in the middle of the second century after Christ. His Ἑλλάδος Περιήγησις, in ten books, is an itinerary, in which he describes, often minutely and with great precision, the temples and other monumental buildings, the statues and pictures, the cities, rivers, mountains, springs, etc., which he saw on his journey through Greece, and the local traditions pertaining to these objects. The work, which is invaluable, is a source for the history of the legends, objects of antiquity, and works of art of ancient Greece, and was first printed by Aldus (Venice, 1516). The best editions are by Siebelis (5 vols., Leipsic, 1822–28), by Schubart and Walz (3 vols., Leipsic, 1838–39), and by Dindorf (Paris, 1845). There is an English translation by Thomas Taylor (3 vols., London, 1793–94).

Pausu'la [anc. *Pausulæ*], or **Montolmo,** town of Italy, province of Macerata, situated on a hill near the right bank of the Chienti, about 6 miles S. E. of the town of Macerata. It is a strongly-walled place, and contains several large churches, convents, and other public buildings. Pausula was an episcopal see as early as the beginning of the fifth century, and the strength of its castle and walls during the Middle Ages often enabled it to hold out successfully against its assailants. Pop. in 1874, 8145.

Pauw, de (CORNELIS), b. at Amsterdam in 1739; educated at Göttingen; became canon of Xanten near Cleves; was afterwards reader to Frederick II. of Prussia; published *Recherches sur les Américains* (Berlin, 1769), designed to prove that men and animals have degenerated in the New World, a treatise which elicited many answers, *Recherches sur les Égyptiens et les Chinois* (2 vols., 1774), and *Recherches sur les Grecs* (2 vols., 1788), works which were translated into English and enjoyed a high repute. De Pauw was uncle to the celebrated "friend of mankind," Anacharsis Clootz, and, like him, was noted for eccentricity. When the French invaded Cleves, De Pauw became insane, and burned the manuscript of a work on the Germans. D. at Xanten July 7, 1799.

Pau'wels (Ferdinand), b. at Antwerp April 13, 1830; studied the art of painting under Wappers, afterwards in Rome from 1852 to 1857; was professor at the academy of art in Weimar 1861 to 1872; but returned in the latter year to his native city. The most celebrated of his pictures are *Coriolanus* (1851), *Banished by Alva* (1861), *Hans Pleinhorn* (1868), *The Youth of Luther*, for Wartburg.

Pavement. See Roads and Pavements, by Gen. Q. A. Gillmore.

Pavi'a [anc. *Ticinum;* med. *Papia*], town of Northern Italy, lat. 45° 10′ N., lon. 9° 9′ E., on an elevation of the left bank of the Ticino, near its junction with the Po. A navigable canal connects the town with Milan (20 miles N.); it has direct water-communication through the Po with the Adriatic, and through the Ticino with Lago Maggiore, and is easily accessible by rail from all the large Italian towns. The view of Pavia seen from the Voghera railway where it passes over the new bridge (2400 feet long) is very striking, and the antique aspect of the town is heightened by a quaint old covered bridge of the fourteenth century uniting it with Borgo Ticino. Though defended by the Po and the Ticino, Pavia is surrounded by a wall (now somewhat ruinous), and with bastions of great strength. Of its 500 towers of mediæval celebrity only four remain, the highest 250 feet. The finest streets are: Corso Vittorio Emmanuele (Strada Nuova), Corso Cavour (Porta Borgorata), Corso Garibaldi (S. Giovanni). The churches of Pavia are of great historic and architectural interest; San Michele Maggiore, of the sixth or seventh century, is perhaps the most striking specimen of Lombard architecture existing; San Pietro in Cielo d'Oro, now a ruin, from which the superb monument (fourteenth century) to St. Augustine and the remains of Boethius have been transferred to the cathedral; the Duomo or cathedral, of the fifteenth century, and many others very noticeable. Of the old Castello, on the site of the ancient Lombard royal palace, little of interest is left except the grand half-ruined gateway. The University of Pavia, the *alma mater* of so many illustrious men, is said to have been founded by Charlemagne, and Maria Theresa and Joseph II. lavished favors upon it. The Museo Malespina contains some good pictures, a fine collection of engravings, and a block-book of great interest to students of the history of printing. Near Pavia is the beautifully picturesque old church Beato Lanfranco; but the great attraction of the neighborhood is the magnificent Certosa of Pavia, 4½ miles from the town, founded by the famous Gian Galeazzo Visconti, and probably the finest monastic building in the world. Pavia is of very ancient, probably Ligurian, origin. It was of some importance under the Romans, had a Christian church in 326, and though often sacked by the barbarians always recovered itself. Theodoric the Great, having taken Pavia from Odoacer, made it his first capital before fixing upon Ravenna. In 573 it became the Lombard capital, and for 200 years was a rich and great city. The subsequent mediæval history of Pavia is full of vicissitudes, it being, with the exception of a brief period of self-government, alternately under the dominion of foreign sovereigns and domestic despots. In 1524, Francis I. of France suffered a terrible defeat under the walls of Pavia, and was taken prisoner by the troops of Charles V. Three years later the town was barbarously sacked by the French, but it soon afterwards fell into the hands of Austria. Bonaparte, having taken Pavia (1796), at the prayers of the citizens limited his soldiers to a sack of three hours, so that the town was not totally destroyed. By the Peace of 1814 it returned to Austria, but, always foremost in patriotic uprisings, it became a part of the kingdom of Italy in 1859. Pavia has considerable internal trade in rice, hemp, silk, wines, etc. Pop. in 1874, 29,618.
Caroline C. Marsh.

Pavie' (Theodore Marie), b. at Angers, in the department of Maine-et-Loire, France, Aug. 16, 1811; travelled much in North and Central America, in China and the East Indies; lectured on Sanskrit from 1853 to 1857 at the Collége de France at Paris, and wrote, besides a number of minor essays on subjects from Chinese and Sanskrit literature, *Voyage aux États Unis et au Canada* (2 vols., 1828–33), *Krichna et sa Doctrine* (1852), etc.

Pavil'ion, post-v. and tp. of Kalamazoo co., Mich., near the Peninsula R. R. Pop. 1208.

Pavilion, post-v. and tp., Genesee co., N. Y. P. 1614.

Paving. See Roads and Pavements, by Gen. Q. A. Gillmore.

Pavlograd', town of European Russia, government of Yekaterinoslav, on the Voltcha, an affluent of the Dnieper, has some manufactures and 6929 inhabitants.

Pavon'inæ [from *pavo*, the ancient name of the peacock], a sub-family of Phasianidæ, distinguished by the development and lateral extension of the tail and its coverts. It embraces the genera *Pavo, Polyplectron*, and *Argus*, and, according to recent authors (Elliot and Gray), embraces fourteen species, distributed through Southern Asia. (See Phasianidæ and Peacock.) Theodore Gill.

Pavullo nel Frignano, town of Italy, province of Modena, situated in a plain surrounded by mountains. It was formerly the summer residence of the dukes of Modena. Pop. in 1874, 9772.

Pawcatuck' River is formed in Washington co., R. I., by the union of the Charles and Wood rivers. It is navigable for small vessels for several miles, and forms the S. portion of the E. boundary of Connecticut.

Paw Creek, p.-v. and tp., Mecklenburg co., N.C. P.1591.

Pawhe'a, town of Guinea, on the route from the coast to Dahomey, is situated in a mountainous district, has rich iron-mines, and manufactures iron goods of different descriptions with considerable skill. Pop. about 16,000.

Paw'let, post-v. and tp. of Rutland co., Vt., on the Rensselaer and Saratoga R. R. Pop. 1505.

Paw'ling, post-v. and tp. of Dutchess co., N. Y., on the Harlem R. R., 65 miles N. of New York City, has an institute of learning, 7 churches, 2 banks, 1 newspaper, a large mill, and stores. Principal business, farming and dairying. Pop. 1760. P. H. Smith, Ed. "Pioneer."

Pawn. See Pawnbroking.

Pawn'broking, the business of lending money upon the security of goods and chattels pawned or pledged with the creditor. Institutions for the loan of money to the poor upon such security have existed in various parts of Europe for several hundred years, and were at first regarded more as charities than as purely business establishments. The earliest of which any account is preserved were founded during the latter half of the fifteenth century in Italy; in the succeeding century the pawnbroker had become common in the Flemish and Belgian cities; in 1777, by virtue of letters patent, similar institutions, under the fanciful name of *monts-de-piété*, were authorized in Paris and other cities of France. In order that the pawnbroker may lawfully demand more than the ordinary rate of interest and escape the penalties of usury, he must receive express permission from the legislature, and the business is everywhere, therefore, the object of special statutory regulation. In England it is conducted in pursuance of a statute passed during the reign of George III. (39, 40 Geo. III. c. 99), which prescribes the rate of interest, defines the modes of carrying on the business, even to the minutest detail, authorizes the articles pledged to be sold at public auction after the expiration of one year, and adds numerous penalties for the violation of these provisions. The pawnbroker is required to procure a license, and his operations are carried on under a close surveillance of the police. The system, so far as it exists in this country, is borrowed directly from that which prevails in England. Statutes similar to the one described have been enacted in several States, while in others, as, for example, in New York, there is no general law affecting the entire State, but the subject is left to be regulated in each city by the local government thereof under its authority to make by-laws. John Norton Pomeroy.

Pawnee', county of Central Kansas. Area, 900 square miles. It is traversed by the Arkansas River and by the Atchison Topeka and Santa Fé R. R., and is well adapted for grazing. Cap. Larned. Pop. 179.

Pawnee, county of S. E. Nebraska, bounded S. by Kansas. Area, 432 sq. m.; is a beautiful undulating region, well watered, adapted to wheat, live-stock, hay, and wool. Coal and building-stone, fire-clay, and peat are found. Cap. Pawnee City. Pop. 4171.

Pawnee, post-v. and tp., Sangamon co., Ill. P. 1293.

Pawnee, tp. of Bourbon co., Kan. Pop. 630.

Pawnee City, post-v., cap. of Pawnee co., Neb., has a high school, 4 churches, a State bank, 1 newspaper, and 2 hotels. Business, farming and stock-raising. P. about 1900. A. E. Hassler, Ed. "Republican."

Pawnees (*Pani* of French authors), a tribe of warlike aborigines, hereditary enemies of the Dakotas, formerly residing chiefly in Central Nebraska. Their language is thought by some to have Dakota elements. Physically, they are superior to most of the Indians of the Plains. They are divided into four bands, Tsawé, Tsitkakish, Skeres, and Tapahowerats. They have always been friendly to the U. S., and numbered at one time 2000 warriors, but have been much reduced by constant wars with the Sioux. In 1875 they removed to the Indian Territory.

Paw Paw, v. and tp., De Kalb co., Ill., on Chicago Burlington and Quincy R. R. P. 978.

Paw Paw, p.-v. and tp., cap. of Van Buren co., Mich., on branch of Michigan Central R. R., has an excellent school system, 6 churches, 1 bank, 2 weekly newspapers, several flouring, saw, and planing mills, 1 sash, door, and blind factory, a carriage and bracket shop, and 1 printing-office. There is good water-power, and trade is carried on in wheat and wool. P. of v. 1428; of tp. 2670.

MISS LYDIA L. CONWAY, ED. "TRUE NORTHERNER."

Paw Paw, tp. of Marion co., West Va. Pop. 1653.

Pawtuck'et, post-v. of North Smithfield tp., Providence co., R. I., on the Providence and Worcester and the Boston and Providence R. Rs., 4 miles N. of Providence, contains a fine library, a high-school building, 12 churches, 3 national and 3 savings banks, a handsome park, several hotels, 1 newspaper, and a horse-railway, connecting it with Providence. It has a paid fire department, with an electric fire-alarm telegraph, the Dunnell print-works, hair-cloth, cotton, woollen, and thread factories, 2 manufactories of steam-engines, several iron-foundries and machine-shops, and numerous other industries. It was here that Samuel Slater, the father of American cotton manufactures, commenced operations with water-power in 1790. Pop. 6619. A. D. NICKERSON, ED. "GAZETTE AND CHRONICLE."

Pax'o, one of the Ionian Islands, situated 10 miles S. of Corfu, is 5 miles long and 2 miles broad, and has a population of 5287. Its oil is very celebrated.

Pax'ton, post-v. of Patton tp., cap. of Ford co., Ill., on the Toledo Wabash and Western and the Chicago branch of the Illinois Central R. R., has 2 newspapers, some manufactures, a considerable trade, and is the seat of the Swedish institution called the Augustina College of N. America, to the library of which the king of Sweden presented 5000 volumes. Pop. 1456.

Paxton, post-v. and tp. of Worcester co., Mass. P. 646.

Paxton, tp. of Ross co., O., on Paint Creek. Pop. 1738.

Paxton (Gen. ELISHA FRANKLIN), b. in Rockbridge co., Va., Mar. 4, 1828; graduated at Yale College 1847; studied at the Virginia Military Academy at Lexington, Va.; became president of a bank at Lynchburg; was brigadier-general and adjutant-general to "Stonewall" Jackson; commanded the "Stonewall brigade" and subsequently an army corps; served at Antietam, Fredericksburg, and Chancellorsville, being killed in the latter battle on the same evening that Jackson was mortally wounded, May 2, 1863.

Paxton (Sir JOSEPH), b. at Milton-Bryant, Bedfordshire, England, Aug. 3, 1803, of humble parentage; educated in the free school at Woburn, and obtained employment at Cheswick as a gardener in the service of the duke of Devonshire, where he displayed such remarkable talent for landscape-gardening that the duke made him manager of his Derbyshire estates and commissioned him to remodel the grounds at Chatsworth. Under his care that mansion soon became the most renowned country-seat in England, the great conservatory especially being regarded as a wonderful triumph of art. This building became the germ of the idea which culminated in the plans for the "Crystal Palace," the vast edifice of iron and glass erected from his designs for the great Universal Exposition of 1851. For this service he was knighted and received honors from several European sovereigns. He removed the buildings to Sydenham, erected a magnificent mansion for Baron James Rothschild, entered Parliament 1854, and published several works on botany, horticulture, and floriculture. D. at Sydenham June 8, 1865.

Payatte, tp. of Pulaski co., Ark. Pop. 659.

Payenne, tp. of Manitou co., Mich., comprises South Manitou Island in Lake Michigan. Pop. 287.

Pay'ment (law), in its widest signification, the discharge of a legal obligation by a performance thereof according to its very terms—that is, by doing exactly what the person upon whom the duty rests is bound to do; in a narrower but more ordinary sense, it is the discharge of an obligation by the delivery of money or of some equivalent accepted instead thereof. In all obligations which create a liability either in the form of debt or of damages—that is, in all which do not expressly prescribe some other mode of discharge—the law requires payment to be made in money, unless the creditor waives his right and consents to receive something else in satisfaction of his demand; but when the defence of payment simply is pleaded in an action the defendant may show the delivery to and acceptance by the plaintiff of goods or securities, or any other articles in place of money. The Constitution of the U. S. confers upon Congress the supreme and final authority over the subject, and prohibits the State legislatures from making anything but gold and silver coin a legal tender in payment of debts. Congress, by virtue of its exclusive power to regulate the national coin and the value of foreign coin, may declare what coined money shall be a lawful tender, and has repeatedly exercised this function from the earliest periods of the government. In the year 1862 a statute was passed which enacted that the treasury notes of the U. S., issued in pursuance thereof, should be a legal tender in payment of all debts, public and private, with the exception of duties on imports and interest on the public debt. The validity of this legislation has been sustained by the Supreme Court of the U. S., although a bare majority only of the judges concurred in the decision, which overruled a contrary judgment previously announced by the same high tribunal. Payment may be made by the debtor or by a person acting on his behalf, and must be to the creditor or to his authorized agent.

JOHN NORTON POMEROY.

Payne (JOHN HOWARD), b. in New York June 9, 1792; began to edit a weekly paper, *The Thespian Mirror*, when thirteen years old, and two years later published twenty-five numbers of a periodical called *The Pastime;* made a successful début as an actor at the Park Theatre, New York, Feb. 26, 1809, in the character of *Norval;* appeared on the stage at Boston and other American cities, also in London 1812–13, where he produced many new dramas, chiefly imitated from the French, for one of which, called *Clari, or the Maid of Milan*, he wrote the song *Home, Sweet Home;* published a volume of juvenile poems, *Lisping of the Muse* (1815); successfully produced his tragedy *Brutus* at Drury Lane 1818; was a friend and correspondent of Coleridge and Charles Lamb; edited in London a dramatic paper called *The Opera-Glass* 1826–27; returned to the U. S. 1832; was U. S. consul at Tunis, Africa, 1841–45; again appointed 1851, and d. there Apr. 10, 1852. Among his best writings were the plays *Virginius* and *Charles the Second.*

Payne's Creek, tp. of Tehama co., Cal. Pop. 80.

Paynesville, post-v. and tp., Stearns co., Minn. P. 318.

Payneville, tp. of Sumter co., Ala. Pop. 1405.

Pay'son, post-v. and tp. of Adams co., Ill. Pop. 1881.

Payson (EDWARD), D. D., b. at Rindge, N. H., July 25, 1783; was a son of Rev. Dr. S. Payson (1758–1820); graduated in 1803 at Harvard; was three years teacher of an academy at Portland, Me., where he was in 1807 ordained to the Congregational ministry as colleague pastor with a Mr. Kellogg until 1811, when he became sole pastor. Here he remained till his death, Oct. 22, 1827. He was a man of great zeal and of saintly devotion. His sermons, etc. (3 vols., 1846) have been published, together with a *Life* by A. Cummings, D. D.—His uncle, PHILLIPS PAYSON, D. D. (1736–1801), for many years Congregational minister of Chelsea, Mass., was one of the most scholarly and influential divines of the Revolutionary period.

Pay'ta, town of Peru, in lat. 5° 5′ S., on a bay of the same name, has a good harbor and carries on some trade. Salt, cotton, hides, and straw-mattings are exported. The harbor is visited by many whalers, who come to take in provisions; they cannot get fresh water here, however, as the town is obliged to have its entire supply of drinking-water brought to it on mules. Pop. 9000.

Pea, the plant and seed of *Pisum arvense* (field-pea) and *P. sativum* (garden-pea), annual plants cultivated in nearly all countries, doubtless forms of one species. The pea is of the order Leguminosæ, and is valuable not alone for the seed (which is used as food for man and beast, and is of the greatest excellence), but also as a forage-plant, for which use some of the very numerous varieties are especially adapted. Peas are cooked and eaten green or dry, and are largely exported from the U. S. to England, where dry peas are much more extensively used than in this country. Many other kinds of pulse are called peas, such as chick-pea (*Cicer*) and the cow-pea (*Dolichos*), a valuable forage-plant in the U. S.

Pea'body, post-v. and tp., Marion co., Kan., on the Atchison Topeka and Santa Fé R. R.

Peabody (formerly SOUTH DANVERS), post-v. and tp., Essex co., Mass., on the Eastern R. R., 5 miles W. of Salem, has 2 national banks, 6 churches, and large manufactures. Birthplace of George Peabody, who founded here in 1852 the Peabody Institute, to which at different times he gave $200,000. Pop. 7343.

Peabody (ANDREW PRESTON), D. D., LL.D., b. at Beverly, Mass., Mar. 19, 1811; graduated at Harvard in 1826; was three years a teacher; studied divinity at Cambridge, Mass.; was tutor at Harvard College 1832–33; was (Unitarian) minister of the South parish, Portsmouth, N. H., 1833–60, and in 1860 became Plummer professor of Christian morals and preacher to Harvard University; edited the *North American Review* 1852–61, and has long been a

leading contributor to the religious periodical press. Author of *Lectures on Christian Doctrine* (1844), *Sermons of Consolation* (1847), *Conversation* (1856), *Christianity the Religion of Nature* (1864), *Sermons for Children* (1866), a book of European travel (1868), *Christianity and Science* (1874), besides many published sermons, reviews, biographical and other writings, etc.

Peabody (Elizabeth Palmer), b. at Billerica, Mass., in 1804; spent her childhood in Salem; became a teacher at Boston 1822; wrote articles, chiefly on educational topics, for the *Journal of Education*, the *Christian Examiner*, the *Dial*, and the *Democratic Review;* translated De Gerando's *Moral Self-Education;* edited *Æsthetic Papers* (1849), *Crimes of the House of Austria against Mankind* (1850); published *R. G. Hazard's Essay on Language and Other Papers* (1857), *Records of a School, First Steps to History* (1833), *Chronological History of the U. S.* (1856), and other works, and with her sister, Mrs. Mary (Peabody) Mann, published *Moral Culture of Infancy* and *The Kindergarten Guide* (1863). Miss Peabody has been prominent in the successful introduction of "object-teaching" into infant schools, and a leading authority upon the methods of the new system. Two of her sisters were married—one to Horace Mann, the other to Nathaniel Hawthorne.

Peabody (Ephraim), D. D., b. at Wilton, N. H., Mar. 22, 1807; graduated at Bowdoin College 1827; studied theology at Cambridge; preached at Meadville, Pa., at Cincinnati, and at Boston; was pastor of a Unitarian church at New Bedford, Mass., 1838–46, and for the remainder of his life pastor of King's chapel, Boston; was the originator of the Boston Provident Society, eminent as a pulpit orator and a philanthropist. D. at Boston Nov. 28, 1856. A selection of his sermons, with a memoir, was published in 1857, and a volume of his writings, *Christian Days and Thoughts* (1858).

Peabody (George), D. C. L., b. at South Danvers (now Peabody), Mass., Feb. 18, 1795, of poor parents; received a scanty education; was a mercantile clerk at Thetford, Vt., and Newburyport, Mass., and at Georgetown, D. C., where he became partner with Elisha Riggs in mercantile business 1814; removed to Baltimore 1815; soon afterwards opened branch houses at New York and Philadelphia; made several voyages to Europe on commercial business; became head of the firm 1829; removed to London, England, 1838; withdrew from the house of Peabody, Riggs & Co., and established a celebrated banking-house 1843; accumulated a large fortune; aided Mr. Grinnell in fitting out Dr. Kane's Arctic expedition 1852; founded in the same year the "Peabody Institute" in his native town, the endowment of which he subsequently increased to $200,000; visited the U. S. in 1857; gave $300,000 for the establishment at Baltimore of an institute of science, literature, and the fine arts; in 1862 gave $2,500,000 as a fund for building lodging-houses for the poor in London; gave in 1866, during another visit to the U. S., $150,000 to establish at Harvard College a museum and professorship of American archæology and ethnology, an equal sum for the endowment of a department of physical science at Yale College, and created a "Southern educational fund" of $2,100,000, besides devoting $200,000 to various objects of public utility. In recognition of his munificence, Queen Victoria offered him a baronetcy, which he declined, and presented him with her portrait; the corporation of London conferred upon him the freedom of the city, and the citizens ordered a statue by W. W. Story, which was unveiled in the Royal Exchange July 23, 1869, by the prince of Wales, during Mr. Peabody's absence on a final visit to the U. S. On this occasion he raised the endowment of the institute at Baltimore to $1,000,000; created the Peabody Museum at Salem, Mass., with a fund of $150,000; gave $60,000 to Washington College, Virginia, $50,000 for a "Peabody Institute" at North Danvers, $30,000 to Phillips Academy, Andover, $25,000 to Kenyon College, Ohio, and $20,000 to the Maryland Historical Society, besides conferring munificent reminders of his former residence upon several other localities. In the previous year he had endowed an art school at Rome. D. at London Nov. 4, 1869, less than a month after returning from the U. S. His remains, after funeral honors in Westminster Abbey (Nov. 12), were brought to the U. S. in a British vessel-of-war and buried in his native town, now called Peabody. Several other bequests to objects of public utility were made by his will, in which his remaining fortune, about $5,000,000, was left to his relatives.

Peabody (Gen. Nathaniel), b. at Topsfield, Mass., Mar. 1, 1741; settled at Plaistow, N. H., as a physician 1761; became lieutenant-colonel of militia; was one of the captors of Fort William and Mary at Newcastle Dec., 1774; was an active and influential member of the legislature, of several conventions, and of the committee of safety during the Revolutionary war; became adjutant-general of the State militia 1777; delegate to the Continental Congress 1779–80; filled nearly every State office during a long course of public service, including those of Speaker of the house 1793 and major-general 1793–98, and was one of the founders of the New Hampshire Medical Society 1790. D. at Exeter, N. H., June 27, 1823.

Peabody (Oliver William Bourn), b. at Exeter, N. H., July 9, 1799; studied at Phillips Exeter Academy; graduated at Harvard College 1816; studied law at Cambridge; practised law at Exeter 1819–30; served in the State legislature; edited the *Rockingham Gazette* and *Exeter News-Letter;* removed to Boston 1830; aided his brother-in-law, Alex. H. Everett, in editing the *North American Review;* was for several years an editor of the *Daily Advertiser;* was register of probate of Suffolk co. 1836–42; was professor of English literature at Jefferson College, La., 1842–43; wrote the *Lives* of Gens. Putnam and Sullivan in Sparks's *American Biography;* published an edition of Shakspeare, with a *Life* and notes (7 vols., 1844); was licensed as a Unitarian preacher 1845; became pastor of a church at Burlington, Vt., in August of the same year. D. at Burlington July 5, 1848. (See a *Memoir* by E. E. Hale in *Christian Examiner*, xlv.)

Peabody (William Bourn Oliver), D. D., twin-brother of O. W. B. Peabody, b. at Exeter, N. H., July 9, 1799; graduated at Harvard College 1816; was assistant instructor at Exeter Academy 1817; studied theology at the Cambridge Divinity School under Dr. Henry Ware; was licensed as a preacher 1819, and ordained in Oct., 1820, pastor of the Unitarian church at Springfield, Mass., where he remained through life. Dr. Peabody was a man of ripe, scholarly culture and tastes, of extensive knowledge, of gentle nature, and winning manners. He wrote much on various branches of natural history; was one of the commissioners of the Massachusetts zoological survey, for which he prepared a *Report on the Birds of the Commonwealth* (1839); wrote the *Lives* of Alexander Wilson, Cotton Mather, David Brainerd, and James Oglethorpe in Sparks's *American Biography;* was well versed in landscape-gardening, and was an able lecturer upon scientific topics, especially his favorite subjects of forest trees, insects, and birds. D. at Springfield May 28, 1847. His *Sermons*, with a prefatory memoir by his brother, were published in 1849, and his *Literary Remains* in 1850.—His son, Everett Peabody, b. 1831, graduated at Harvard College 1849; edited the posthumous works of his father; completing the biography of his uncle; became a railway engineer, and colonel of Missouri volunteers; was killed at the battle of Shiloh, Apr. 6, 1862.

Peace is not merely a suspension of war, but a return to a state of intercourse such as existed before war, and to *amnesty*, or the oblivion, the waiving, of all future claims on account of those particular acts of injury for which a war was initiated. For the existence of peace a treaty is necessary: such a treaty, if there be a number of belligerents, may be made by all the parties on one side with all on the other; or each on one side may make a treaty with every other. The great treaties, such as the Treaty of Westphalia and the final act of the Congress of Vienna, are complicated documents; the first combining in two separate treaties—one between France and the German powers, and the other between Sweden and the same powers—the results of negotiations in two separate places; while the other contains the results of a great number of special treaties with powers not properly parties to the congress, or of such powers with one another, as well as of treaties between the parties to the congress themselves. T. D. Woolsey.

Peace, post-v. of Rice co., Kan., on the Atchison Topeka and Santa Fé R. R., 150 miles W. of Topeka, the capital of the State, has 2 churches, 1 newspaper, 2 lumber-yards, a steam flouring-mill, and stores. Principal business of county, farming and stock-raising. Pop. about 300. W. F. Wallace, Ed. "Herald."

Peace, Breaches of (law), violations of the public order and quiet done with force, actual or constructive. As the object of all law, and especially of the criminal law, is to produce and maintain public order, tranquillity, and decorum, any wilful act which disturbs, or in its consequences directly tends to disturb, this normal condition of order and peace is an indictable offence; and this element of breaking in upon or interfering with the peace and good order of the community lies at the basis of a very large class of crimes. Among the most familiar examples are unlawful assemblies, routs, riots, affrays, assaults and batteries in public, forcible entries or detainers of land, and sometimes the forcible taking of personal property from the possession of another, trespasses done

in public and with such force as to create a disturbance and cause fear, and many other similar acts of wrongful violence to person or to property. It is not necessary that the public peace should be broken in fact, if the unlawful act, or the attempt when carried out, directly tends to produce that result. Upon this principle, challenges to fight duels, carrying dangerous weapons, furious driving in frequented streets, the publishing of libels, the spreading of false news, fall within the same class of offences. The common law even regarded eavesdropping and the being a common scold as criminal breaches of the peace. In most of these instances the crime is now defined, and the punishment, which consists of imprisonment or fine, is regulated by statute. JOHN NORTON POMEROY.

Peace Creek, post-v., cap. of Polk co., Fla., near the centre of the peninsula.

Peace Dale, post-v. of South Kingston tp., Washington co., R. I.

Peace River, a river of British America, rises in the Coast Range Mountains N. of British Columbia, and flows N. E. through the Rocky Mountains to Athabasca Lake, more than 600 miles. It is navigable through most of its extent, and passes through a fertile valley, now without civilized inhabitants.

Peach [Fr. *pêche*], a small tree and its fruit, the *Amygdalus persica*, of the order Rosaceæ, a native of Central Asia. Of the peaches proper there are two principal varieties, the freestones and the clingstones, and of each there are many sub-varieties. The peach is extensively cultivated in most of the warmer temperate regions; but it is not perfectly hardy in some of the colder parts of the U. S., nor in most parts of Great Britain. Peaches are extensively sold both fresh and when sliced and dried. Great quantities are preserved by hermetical sealing in tin and glass cans. The ripe fruit is extensively distilled, making peach brandy. In the valley of the La Plata and on the treeless plains of some of the Western States peach trees are grown as fuel. They grow rapidly and afford a good fire. The leaves, bark, and kernel are poisonous from the presence of hydrocyanic acid. The NECTARINE (which see) doubtless originated from the peach.

Peach'am, post-v. and tp., Caledonia co., Vt. P. 1141.

Peach Bottom, post-v. and tp., York co., Pa., on the Susquehanna River and the Tide Water Canal. Pop. 2366.

Peach Orchard, tp. of Ford co., Ill., on the Gilman Clinton and Springfield R. R. Pop. 374.

Pea'cock, the name given to species of the *Pavo* and family Phasianidæ. The several species are remarkable for the long and showy tail-coverts of the male. Three species are now recognized: 1. The common peacock (*Pavo cristatus*); 2. The black-shouldered peacock (*Pavo nigripinnis*); and, 3. The Jason peacock (*Pavo muticus*). The common peacock is a remarkably vain and ostentatious bird, and is a native of Southern and South-eastern Asia, but is now naturalized in many parts of the world. Its flesh was formerly employed for food; but, except when young, it is scarcely palatable. The white peacock is an albino of the ordinary species. The name peacock is also sometimes applied to the species of the allied genera, *Polyplectron* and *Crossoptilon*. (See PAVONINÆ.)

Peacock (THOMAS LOVE), b. at Weymouth, England, Oct. 18, 1785; entered the civil service of the East India Company 1818; was employed in the London office of that corporation until 1856; was a friend of Lamb and Shelley, and author of several volumes of poems and romances which met with favor at their first appearance, were forgotten for many years, and obtained a renewed popularity on their republication in 1875 by Lord Houghton, accompanied by a biographical sketch. His most successful works were *Headlong Hall* and *Gryll Grange*. D. at London, Jan. 23, 1866.

Peacock-stone, sometimes used by jewellers as a gem, is the dried and opalescent ligament of the pearl oyster's shell, or that of some other large conchiferous mollusk.

Peak Creek, tp. of Ashe co., N. C. Pop. 1005.

Peale (CHARLES WILLSON), b. at Chestertown, Md., Apr. 16, 1741; was successively a saddler, silversmith, watchmaker, and carver; studied painting under Hesselius about 1767; afterward under Copley at Boston and at the Royal Academy, London, under Benjamin West 1770–71; painted the first portrait of Washington as a Virginia colonel 1772; commanded a company at the battles of Trenton and Germantown; was a member of the Pennsylvania Convention of 1777; painted the portraits of the most prominent officers of the Revolution; was a leading promoter of the Pennsylvania Academy of Fine Arts; was the first American popular lecturer on natural history; opened the first American museum; was the first American manufacturer of enamel teeth; invented a great variety of machines, and published a number of scientific essays. D. at Philadelphia Feb. 22, 1827.

Peale (REMBRANDT), son of Charles W. Peale, b. in Bucks co., Pa., Feb. 22, 1778; received an artistic training from his father; painted a portrait of Washington Sept., 1795; opened a studio at Charleston, S. C., 1796; studied under West at London, 1801–04; spent several years at Paris, where he executed portraits of prominent characters for his father's museum; returned to Philadelphia 1809; achieved eminence as a portrait-painter; executed the well-known pictures *The Roman Daughter* and *The Court of Death*, of which the latter was profitably exhibited in the chief cities of the U. S. for a number of years; lectured on the portraits of Washington, and published a *Biography of Charles W. Peale*, *Notes on Italy* (1831), *Portfolio of an Artist* (1839), and other works on art. D. at Philadelphia Oct. 3, 1860.

Peanut. See GROUNDNUT.

Pear (*Pyrus communis*), one of the most common and most appreciated fruit trees of the temperate zones, belonging to the division Pomeæ of the family Rosaceæ. It is closely allied to the apple tree, from which it is distinguished by the pyramidal tendency of its growth; its inclination to become thorny; its ovate and serrated leaves, smooth on both surfaces and without glands; its flowers, smaller than those of the apple tree, of a pure white color with purple anthers; and its fruit, hemispherical at the one end, tapering at the other, and produced on a stem, which is generally not sunk into a cavity like that of the apple. It is a long-lived tree, with a hard, close-grained wood, which is much used by turners. It is found wild in Southern and Central Europe and in the temperate regions of Asia; and in this state it is generally either a small tree or a large shrub, while in a cultivated state it often becomes forty or fifty feet high. It was cultivated in antiquity, but seems not to have reached any high degree of development. Pliny says that pears must be well boiled or baked in order to become thoroughly enjoyable, and Horace's famous lines do not sound very appreciative. Now it is known in over 1000 varieties, and some of them, such as the Bartlett, duchesse d'Angoulême, beurré, bergamot, etc., are reckoned among the most delicious fruits. It requires good, strong soil and frequent manuring in order to produce good and plentiful fruit, but in other respects it is quite a hardy tree. It is cultivated both as a standard, budded or grafted on pear seedlings, and as a dwarf, grafted on the quince, the thorn, or the mountain-ash. When grafted on the apple tree it rapidly degenerates, while some varieties, such as the duchesse d'Angoulême, produce better fruit on the quince than on their own root. The fruit of most varieties is improved by being picked from the tree when mature and allowed to ripen in the house; and of some varieties the fruit becomes quite worthless when allowed to ripen on the tree. The best *perry* is not made from the finest kinds of pears, but from coarser varieties, whose fruit has a rather austere taste. (For further details see Downing, *Fruits and Fruit Trees of America* (1869); Field, *Pear-Culture;* and Quinn, *Pear-Culture for Profit*.)

Pearce (JAMES A.), b. at Alexandria, Va., Dec. 14, 1805; graduated with first honors at Princeton 1822; became a lawyer and agriculturist of Maryland; was in Congress 1835–39, 1841–43; U. S. senator 1843–62; also law professor in Washington College, Chestertown, Md., where he d. Dec. 30, 1862.

Pearce (ZACHARY), D. D., b. at London, England, Sept. 8, 1690; educated at Trinity College, Cambridge; took orders in the Church of England; was made dean of Winchester 1739, bishop of Bangor 1748, bishop of Rochester and dean of Westminster 1756; declined the bishopric of London; wrote *The Miracles of Jesus Vindicated* (4 vols., 1727–28), a *Commentary on the Four Evangelists and the Acts of the Apostles* (2 vols., 1777), and other theological works. D. at Little Ealing June 29, 1774.

Pea Ridge, a range of hills in Benton co., Ark., near the N. W. corner of the State, noted for the important battle fought there Mar. 6–8, 1862, between the Union forces under Gen. Curtis and the Confederates under Gen. Van Dorn, resulting in the defeat of the latter.

Pea Ridge, tp. of Brown co., Ill. Pop. 1011.

Pea'risburg, post-v., cap. of Giles co., Va., 21 miles from the Virginia and Tennessee R. R., has 3 schools, 4 churches, 1 weekly newspaper, 2 hotels. Deposits of iron ore and other minerals exist here. Grain and cattle are raised. P. 1653. T. J. PEARSON, ED. "GAZETTE."

Pearl. See PRECIOUS STONES.

Pearl, county of S. Mississippi, having Pearl River on its W. Area, 520 sq. m. It is covered with large tracts of pine forests. Cap. Riceville.

Pearl, tp. of Pike co., Ill., on the Chicago and Alton R. R. Pop. 628.

Pearl'ash. In common parlance, this term is often applied to the commercial bicarbonate of potash or SALÆRATUS (which see). Pearlash, however, is properly the same substance as commercial potash, which has merely been subjected to a somewhat more careful preparation. The "black salts," or crude black potash obtained by the boiling down of ley from wood-ashes, instead of being simply fused, is stirred for some time with an iron rod upon the hearth of a furnace in which a flame is made to play over the mass. The carbonaceous impurities are thus burned out, and the mass becomes of a more or less bluish-white color. (See POTASH.) H. WURTZ.

Pearl'ington, post-v. of Hancock co., Miss., on Pearl River. Pop. 479.

Pearl River is formed by several head-streams which unite in Leake co., Miss. It flows in a general S. course, and is for some distance the E. boundary of Louisiana. It is some 250 miles long. Its navigation is impeded by snags and sand-bars. Its valley is subject to floods in the S. portion. The river flows into Mississippi Sound.

Pearl White. See BISMUTH.

Pear'sall's, post-v. of Queens co., N. Y., on the Southern R. R. of Long Island, 16 miles from Brooklyn, has several churches, a carriage-factory, 1 newspaper. Principal business, oyster-planting.
GEO. A. MOTT, ED. "QUEENS CO. ADVANCE."

Pear'son (JOHN), D. D., b. at Snoring, England, Feb. 12, 1613; educated at King's College, Cambridge, where he became fellow 1635; was afterwards divinity professor and master of Trinity College (1662), and became in 1672 bishop of Chester. D. at Chester July 16, 1686. Author of *Exposition of the Creed* (1659), still held in esteem by theologians.

Pearson's Mills, tp. of Putnam co., Fla. Pop. 760.

Peasants' War is the name generally given to the revolutionary rising of the peasants which took place in 1525 throughout the whole of Southern and Central Germany. The Reformation was the immediate occasion of this movement, but not its real cause. Similar risings on a smaller scale were of frequent occurrence previously to the Reformation. In 1476 the peasants revolted under Hans Böheim at Würzburg; in 1493 they formed the league of the *Bundschuh*, using a shoe for their symbol of union, at Schlettstadt in Alsace; and although this league was speedily suppressed in its native place, it reappeared in 1502 at Bruchsal in Baden, in 1512 at Freiburg, and in 1513 in Würtemberg; in 1514 a formidable insurrection of the Hungarian peasantry was organized under George Dozsa, and cost the lives of 60,000 peasants. The real cause of all these risings was the miserable social position of the peasants. They were serfs; that is to say, they belonged to the soil on which they were born, and through that to the lord who owned the soil. They were not exactly his property, his slaves—he could not sell them or dispose of them at will—but they had no right to move, and under no circumstances was there any legal appeal from his authority. When he appropriated for his own use the common pasture-grounds of the village, when he forbade them to fish in the streams and hunt in the woods, when he increased the ground-rent, the tithe, the socage service, according to his own need, they had to submit or to revolt. But it was quite natural that any such revolt should assume a religious coloring, for the whole mental life of the peasantry of that time was confined within the narrow pale of a few religious ideas. The inundation of a river, the miscarriage of a cow, a fever epidemic—in short, anything—was explained by the immediate application of religious categories. The peasant knew only two reasons for all that he observed within and without himself—God and Satan; and whatever he undertook to do, he did it in the name of the one or the other. Thus it was utterly impossible for the Reformation, as far as the peasantry was concerned, to accomplish a reconstruction of the religious consciousness of the age without at the same time putting all other spheres of human life into violent commotion; and with respect to the Peasants' War many special circumstances contributed much to produce such a result. The landlord was in many cases an ecclesiastic; and one of the most conspicuous shortcomings of the clergy was that its members had become landlords. In spite of the warnings, and even denunciations, of Luther and Melanchthon, several of the Reformers, such as Karlstadt, and many of their adherents among the nobility, aimed at once at a social and religious reformation. In 1524 a general fermentation spread among the German peasantry; and when, Jan. 1, 1525, the convent of Kempton was captured and plundered by a swarm of revolting peasants, this event became the signal for a general rising of the peasantry from the Alps to the Harz and from the Rhine to the Bohemian frontier. But with the exception of a few cases—MÜNZER, THOMAS, BERLICHINGEN, GÖTZ VON, etc. (which see)—the peasants had no leaders and no organization. They gathered together in large, uproarious multitudes of from 8000 to 30,000, and roved around like huge gangs of robbers. Castles were burnt, monasteries destroyed, cities plundered; the most disgusting excesses and the most atrocious cruelties were committed. As soon, however, as they fell in with regular armies—in the S. under Truchsess von Waldburg, in the N. under Philip of Hesse—they were routed, dispersed, or massacred in spite of their fierce and often furious resistance; and the revenge which the ruling classes took upon them was as cruel and as barbarous as their own behavior. The whole war lasted only a few months, and the only result of it was an enormous loss of life and property. The social position of the peasantry remained the same, or became even worse. (See Oechsle, *Beiträge zur Geschichte des deutschen Bauernkriegs* (1829); Wachsmuth, *Der deutsche Bauernkriegs* (1834); Bensen, *Geschichte des Bauernkrieg in Ostfranken* (1840); Zimmermann, *Allgemeine Geschichte des grossen Bauernkriegs* (1841–43); Cornelius, *Studien zur Geschichte des Bauernkriegs* (1862); Schreiber, *Der deutsche Bauernkrieg* (1864).)
CLEMENS PETERSEN.

Pease, tp. of Belmont co., O., on the Ohio River, opposite Wheeling, W. Va. Pop. 5211.

Pease (CALVIN), D. D., b. at Canaan, Conn., Aug. 12, 1813; graduated at the University of Vermont 1838; was professor of Greek and Latin in that institution 1842–55; became its president 1855–61, and pastor of the First Presbyterian church at Rochester, N. Y., 1862. D. at Burlington, Vt., Sept. 17, 1863.

Peaslee (EDMUND RANDOLPH), M. D., LL.D., b. at Newton, N. H., Jan. 22, 1814; graduated at Dartmouth College in 1836; was tutor there 1837–39; graduated in medicine at Yale in 1840, and in 1841 commenced practice at Hanover, N. H. He was appointed lecturer at Dartmouth in anatomy and physiology in 1841, and was professor of the same 1842–70. At Bowdoin College he was appointed lecturer on anatomy and surgery in 1843, and was professor of the same 1845–57, when he gave up anatomy, and remained professor of surgery till 1860. In the New York Medical College he was appointed professor of physiology and general pathology in 1851, and was professor of obstetrics 1858–60. He is now (1876) professor of gynæcology at Dartmouth (since 1872) and at the Bellevue Hospital Medical College in New York (since 1874). In 1858 he took up his residence in New York. His specialty is indicated by the title of his present professorship. The degree of LL.D. was conferred upon him by his alma mater in 1859, and in 1870 he was made a trustee of the college. He has been president of the New Hampshire State Medical Society, and of several other medical associations, and is an honorary member of gynæcological or obstetrical societies in Boston, Berlin, Philadelphia, and Louisville. He has published *Human Histology* (1857), *Ovarian Tumors and Ovariotomy* (1872), besides numerous articles in the medical journals. R. D. HITCHCOCK.

Peat. See FUEL, by PROF. B. SILLIMAN.

Pea Vine, tp. of Washoe co., Nev. Pop. 10.

Pea Weevil, or **Pea Bug,** the *Bruchus pisi*, a small dark beetle well known for its ravages among dried peas. It may be destroyed by scalding the peas before planting. The insect lays her egg in the flower, and the grub passes into the pea while it is still growing.

Peb'ble [Ang.-Sax. *pabol*], a small water-worn stone of any variety. Scotch pebble is simply agate. Brazilian pebble is a very transparent rock-crystal sometimes used by spectacle-makers as a material for their lenses. It is, however, much inferior to good glass. Most of the so-called pebble-spectacles are of common glass.

Pebble, post-v. and tp., Dodge co., Neb., on Elkhorn River and the Sioux City and Pacific R. R. Pop. 521.

Pebble, tp. of Pike co., O. Pop. 1422.

Pecan' [Fr. *pecane*], a tree and its fruit, the *Carya olivæformis*, a species of hickory growing on river-banks from Indiana to Texas. It is well known for its fine, delicious nuts, which constitute a considerable article of commerce. The tree is tall, slender, and has a hard timber.

Pecan, tp. of Mississippi co., Ark., on the Mississippi River. Pop. 155.

Pecaton'ica, post-v. and tp. of Winnebago co., Ill., on the Galena division of the Chicago and North-western R. R., midway between Freeport and Rockford, has an excellent graded school, 5 churches, 1 bank, 1 weekly

newspaper, a pork-packing establishment, and several manufactories. Pop. 1780. Colby Bros., Eds. "News."

Pec'cary [S. American name], the vernacular name of swine-like, artiodactylate ungulates, composing the family Dicotylidæ. The peccaries are of two species, both American. The collared peccary (*Notophorus torquatus*) ranges from Arkansas south-westward through Mexico and over a great part of S. America. It is 3 feet long and sometimes weighs 60 pounds. It is of a dark gray color, and has a gland upon the loins which secretes a fetid substance. It is gregarious, and is a dangerous animal to attack, as the herd often assails the offending huntsman most vigorously and persistently with their strong tusks. The white-lipped peccary (*Dicotyles labiatus*) is a larger S. American species. Both kinds are very destructive to growing crops, both are swine-like in habits and appearance. Their flesh is somewhat like pork, but not so good.

Pec'chio (Giuseppe), b. at Milan 1785; took his degree at Pavia, and in 1810 returned to Milan, where he was appointed to an important post in the department of finance and of the interior. In 1820 he published his *Saggio Storico sull' Amministrazione Finanziaria dell' Ex-Regno d'Italia dal 1802 al 1814*. In 1821 he was banished, took refuge in Switzerland, then in Madrid, where he published a book entitled *Sei Mesi in Ispagna nel 1821*. From Madrid he accompanied Dr. Bowring to Lisbon, where he wrote his *Tre Mesi in Portogallo*. In 1826, Pecchio was called to a professorship of modern languages at Manchester. D. at Brighton 1835. Among his other works are *Relazione degli Avvenimenti della Grecia nella primevera del 1825; Storia dell' Economia Publica in Italia; Vita di Ugo Foscolo; Storia critica della Poesia Inglese* (incomplete), etc.

Pèc'cioli, town of Italy, province of Pisa, on a hill about 24 miles from the city of Pisa. During the Middle Ages it was sometimes subject to Pisa, sometimes to Florence, and remains of its old fortifications still exist. Pop. in 1874, 6409.

Pe-Chee-Lee, the northernmost province of China, comprises an area of 59,934 square miles, with 46,313,360 inhabitants. It is lowland, not very fertile, with a hot summer and a cold winter, but it is cultivated with the utmost care. The capital of the Chinese empire, Peking, is situated in this province.

Peck (George), D. D., b. in Middlefield, N. Y., Aug. 8, 1797; travelled and preached extensively; was principal of Oneida Conference Seminary 1835–39, then editor of the *Methodist Quarterly Review* (1840) and of the *Christian Advocate* (1848); wrote *Wyoming, its History*, etc. (1858), and works on Methodist doctrine, etc. D. May 1, 1876.

Peck (Jesse Truesdell), D. D., b. at Middlefield, N. Y., Aug. 4, 1811; joined the Methodist ministry in 1832; became principal of the Methodist seminary at Gouverneur, N. Y., in 1836, and of Troy Conference Academy at West Poultney, Vt., in 1840; in 1844 he was elected president of Dickinson College, Carlisle, Pa., but after four years' service returned to the pastorate. He occupied a pulpit in Washington, D. C., two years, when he was appointed secretary and editor of the Tract Society of his Church. He subsequently served several years in pulpits in New York City and California, Peekskill, Albany, and Syracuse, N. Y. In the latter he was active in founding the Syracuse University of his Church. In 1872 he was elected bishop. He is author of *The Central Idea of Christianity, The True Woman, What must I do to be Saved?* and *The History of the Great Republic.*

Peck (John James), b. at Manlius, N. Y., Jan. 4, 1821; graduated at the U. S. Military Academy, and was appointed brevet second lieutenant of artillery July, 1843; served throughout the war with Mexico, gaining the brevets of captain and major for gallantry at Contreras, Churubusco, and Molino del Rey. Resigned in Mar., 1853, and became cashier of a bank at Syracuse, N. Y. In Aug., 1861, he was appointed brigadier-general of volunteers, and in the Virginia peninsular campaign of 1862 commanded a brigade in the 4th Corps; appointed major-general July, 1862, and subsequently commanded at Suffolk, Va., where he was besieged by Longstreet; in North Carolina, and on the Canada border. Since the war he has been president of a life insurance company.

Peck (John Mason), D. D., b. at Litchfield, Conn., Oct. 31, 1789; became a licensed Baptist preacher in Greene co., N. Y., in 1811; was ordained in 1813; removed in 1817 to St. Louis; was for forty years a successful pioneer preacher of Illinois and Missouri; organized in 1826 the first church of his denomination in St. Louis; was one of the founders of Shurtleff College, Upper Alton, Ill., and of the theological school at Covington, Ky.; received in 1852 the degree of D. D. from Harvard College. Author of *Guides for Emigrants* (1831 and 1836), *Gazetteer of Illinois* (1834), *Life of Boone*, in Sparks's collection, *Father Clark, the Pioneer Preacher* (1855). D. at Rock Spring, Ill., Mar. 15, 1858.

Peck (William G.), LL.D., b. at Litchfield, Conn., Oct. 16, 1820; graduated at the U. S. Military Academy in 1844; was promoted to the U. S. corps of topographical engineers, and served on the survey of Portsmouth harbor, and in Western explorations under Fremont till the breaking out of the war with Mexico. He was then assigned to duty with the Army of the West under Gen. Kearny, and served in that capacity till the end of the war, when he was detailed for duty as assistant instructor in mathematics at the Military Academy. After eight years of service at West Point he resigned his commission, and was for two years professor of physics and civil engineering in the University of Michigan. In 1857 he was called to Columbia College, New York, in which institution he has since served as professor of mathematics, mechanics, and astronomy. He was engaged with Prof. Charles Davies in compiling a dictionary and encyclopædia of mathematics; he is the author of a treatise on mechanics, and the American editor of Ganot's popular *Physics*, besides which he has written and published a complete course of mathematical text-books.

Peck (William Henry), b. in Augusta, Ga., Dec. 30, 1830; graduated at Harvard College, Mass., 1853; in 1856 was elected professor of *belles-lettres*, history, and elocution in the University of Louisiana, which position he held for three years, and on resigning was elected in 1860 president of the Masonic Female College at Greenville, Ga.; in 1863 resigned the presidency of the college at Greenville to accept the chair of natural sciences and modern languages in the Le Vert Female College at Talbotton, Ga., which position he held until nearly the close of the war, and, resigning it then, he betook himself to literature as a profession. A tale entitled *Antoinette de Bordelairs* by him was published as early as 1857, and in 1859 appeared the *Brother's Vengeance*. Soon after the war Prof. Peck moved to New York and entered into an engagement as a regular contributor to the *New York Ledger*. He now (Sept., 1875) resides in Atlanta, Ga., but still continues his engagement with Mr. Bonner of the *Ledger*. A. H. Stephens.

Pe'cos, county of W. Texas, bounded S. by the Rio Grande and N. E. and E. by the Rio Pecos. Its area exceeds 10,000 square miles. It is very dry, is traversed by mountain-ranges, and is reported to contain valuable silver ores. Where water can be had, the country affords good cattle and sheep ranges. Population small.

Pecos River, of New Mexico and Texas, rises in San Miguel co., N. M., and flows in a general S. S. E. course, falling into the Rio Grande del Norte after a course of 800 miles. It flows through a broken country, and in summer is dry the greater part of its length.

Pecquet' (Jean), b. at Dieppe about 1620; studied medicine, and especially anatomy, at Montpellier; discovered and demonstrated the course of the lacteal vessels in the human body; wrote *Experimenta Nova Anatomica* (1651), *De Circulatione Sanguinis et Chyli Motu* and *De Thoracis Lacteis* (1651). D. 1674.

Pectase, a substance of the class of ferments found in association with Pectose (which see) in the tissues of fruits and vegetables. The special function of pectase is to transform the pectose of unripe fruits, in the process of ripening, to Pectine (which see). Pectase is producible from the fresh juice of a plant—the carrot, for example—by precipitating with alcohol. This converts it into an insoluble modification, without, however, depriving it of its peculiar fermentive action upon pectosic substances. It has not been obtained in a crystalline form, being doubtless a colloid substance, like diastase, synaptase, and ferments generally. Henry Wurtz.

Pec'tic Acid, an insoluble gelatinous substance produced by the action of alkaline solutions upon the Pectine (which see) of ripe fruits and vegetables. Frémy calculates its composition as $C_{16}H_{22}O_{15}$, but this is not regarded as settled. The pectates of the alkalies are soluble, but all other bases form jelly-like insoluble masses, almost impossible to wash pure. Pectic acid, pectosic acid, and pectine are the principal constituents which give the gelatinous character to preserved fruits, fruit and vegetable jellies, etc. Henry Wurtz.

Pec'tine, or **Plant-Jelly.** This substance exists naturally in ripe fruits and vegetable juices generally, being a product, during the ripening, of the peculiar ferment called Pectase (which see) on the Pectose (which see) of unripe vegetables and fruits. It was obtained by Braconnot, its discoverer, by precipitating ripe-apple juice with alcohol, after boiling to coagulate the albumen, and

filtering. Frémy improved upon this by first precipitating lime with oxalic acid. Pure pectine is white, amorphous, and soluble in water. Even when fruits are unripe, as they contain pectose and pectase, on boiling pectine pectosic and pectic acid are formed, and jellies are producible. The composition of pectine is somewhat uncertain. Frémy computes the formula $C_{16}H_{24}O_{16}$, but others have obtained figures differing a little from his. HENRY WURTZ.

Pectoril'oquy [Lat. *pectus*, the "breast," and *loqui*, to "speak"], in auscultation of the chest, a preternatural distinctness in the sound of the patient's speech, as propagated to the auscultator's ear through the air-passages and pulmonary tissues. Pectoriloquy is either cavernous or amphoric according to the quality or timbre of its sound. It does not always, however, indicate a cavity in the lung, as was once supposed. It may arise from the hardening of a portion of the lung.

Pectose. This is a highly important proximate principle of vegetable bodies, from which proceed all the *gelatinous* constituents of fruits and vegetables, and of preparations thereof. Pectose exists largely in unripe fruits and roots, being, like cellulose, one of the "plastic" constituents, and giving, for instance, the hardness to green fruits. It is, however, a substance not only wholly insoluble, like cellulose, but, unlike the latter, extremely perishable or easily alterable. Therefore we have found no way of isolating and purifying it, so as to determine its composition. It is surmised to be a *carbohydrate*, like cellulose—that is, containing its hydrogen and oxygen in the proportions that form water. It exists more or less in all parts of vegetable bodies, and is always accompanied by a peculiar ferment substance, called PECTASE (see this head), which has the power to transform it, during the ripening of the fruit or maturation of the plant, into the plant-jelly or PECTINE (which see). This substance and its derivatives are of great interest, and demand much further investigation—an investigation surrounded, however, with great difficulties, from the non-crystalline or colloid nature of these compounds. HENRY WURTZ.

Pectosic Acid. This is an intermediate product of the action of the ferment pectase upon PECTOSE (which see), and, like pectine, the principal product is highly gelatinous in its character, forming a frequent constituent of artificial fruit-jellies. Its composition is yet uncertain. H. WURTZ.

Ped'al [Lat. *pedalis*], the distinctive name of that part or division of an organ which is played by a set of keys for the feet. Hence the terms pedal-pipes, pedal-keys, pedal-stops, and the pedal-part in music for the organ. The levers operated by the feet in pianofortes are also known as the loud and soft pedals. Organs, even of the largest class, were originally played by finger-keys or "manuals" alone, and the introduction of the pedal-organ with its separate pipes and key-board is ascribed to Bernhard, a German residing in Vienna in the latter part of the fifteenth century.—The name PEDAL or PEDALE is also given to certain passages in musical compositions in which a long-continued bass or pedal note is accompanied by a train of varied harmonies in the upper parts. (See ORGAN-POINT.)

Ped'dlers, also called **Hawkers** and **Chapmen,** are persons who travel from place to place, either with vehicles or on foot, carrying goods and merchandise which they sell at retail. In England they have, from an early day, been subjected to strict statutory regulation, and must be licensed in order to engage in their traffic. The agents of manufacturers and of wholesale dealers, commonly called "commercial travellers," are, however, excepted from the operation of these statutes. Similar legislation generally prevails in the States of this country, and the U. S., as a part of its internal revenue system, requires a license fee from peddlers of tobacco. JOHN NORTON POMEROY.

Pedee', tp. of Montgomery co., N. C. P. 640.

Pedee, tp. of Georgetown co., S. C. P. 2400.

Pedee, tp. of Marion co., S. C. P. 1113.

Pedee River. See GREAT PEDEE RIVER.

Pedicula'ti [from *pediculatus*, "stalked," in allusion to the pediculate pectorals], an order of fishes whose representatives are distinguished by their grotesque forms. The skull is constructed in nearly the same manner as in the typical or teleocephalous fishes; the epiotics united behind the supraoccipital; the intermaxillary and supramaxillary bones well developed and distinct; the first vertebra is united to the cranium by suture; the scapular arch is, as in ordinary fishes, composed of a great external bone (proscapula) and two internal bones (hypercoracoid and hypocoracoid), but coalescent with the proscapula; with these are articulated the actinosts, which are remarkable for their length; between the proscapula and the skull intervenes a post-temporal, which is not bifurcate, but connects by a squamous suture with the skull; the branchial aperture is thrown backward in or near the axilla of the pectoral fin; the ventral fins are more or less jugular; the dorsal fin is divided into a spinous and a soft portion; the latter is normal; the former modified, and in some of the representatives of the order represented by a filament in or near the nasal region. The order thus distinguished is composed of several families—viz. Maltheidæ, or the bat-fishes; Sophiidæ, or the anglers; Ceratiidæ; and Antennariidæ. THEODORE GILL.

Ped'igree [contracted from the French *par degrés*], a statement of the descent of a family or individual, usually arranged in a tabular form. When such a record is expanded into a narrative, it becomes a family history. (See GENEALOGY.) The word pedigree is also sometimes applied, in a secondary sense, to the descent itself. B. R. BETTS.

Ped'iment [Lat. *pes*, "foot"], the gable of a building fashioned after any of the classic orders; the triangular space bounded by the horizontal cornice below, and by the raking cornices at the end of the roof above. It was often employed as a place for setting sculptures. Small pediments are occasionally seen over doors and windows. The face of the pediment is called the tympanum.

Ped'lar, tp. of Amherst co., Va. Pop. 4628.

Pedom'eter. See ODOMETER.

Pe'dro I. (DOM ANTONIO JOSÉ DE ALCÁNTARA), emperor of Brazil, b. at Queluz, Brazil, Oct. 12, 1798; married the archduchess Leopoldina of Austria 1817; was made regent of Brazil 1821; declared himself emperor 1822; was recognized as such by his father, Dom John VI. of Portugal, 1825; reigned as king of Portugal (Pedro IV.) Mar. 10–May 2, 1826, when he resigned in favor of his daughter, Maria da Gloria; married in 1829 Amélie, daughter of Eugène de Beauharnais; abdicated in 1831 and retired to England, but in 1832 succeeded in expelling Dom Miguel, his usurping brother, from Portugal, and restored his daughter, whose regent he became. D. at Lisbon Sept. 24, 1834.

Pedro II. de Alcántara (JOÃO CARLOS LEOPOLD SALVATOR BIBIANO FRANCISCO XAVIER DA PAULO LEUCADIO MIGUEL GABRIEL RAFAEL GONZAGA), emperor of Brazil, b. at Rio Janeiro Dec. 2, 1825; succeeded his father, Dom Pedro I., in 1831; was crowned 1841, and married in 1843 a daughter of the king of Naples. The prosperity of Brazil has been great under his rule, and the emperor has acquired the reputation of being a humane, patriotic, and enlightened ruler, and is a man of cultivated tastes. He has but one child, the crown-princess Isabella, wife of the count d'Eu, son of the duke de NEMOURS (which see).

Pee'blesshire, an inland county of Scotland, on both sides of the Tweed, consists mostly of low, well-wooded mountains. Area, 319 square miles. Pop. 12,330. Rearing of sheep and cattle is the chief occupation; coal is mined, and manufactures of woollens are carried on. The only town in the county is Peebles, on a peninsula at the confluence of the Eddleston with the Tweed, 22 miles from Edinburgh, and the seat of a county administration. It is the birthplace of William Chambers, who in 1859 made a gift to the town of a spacious suite of buildings for educational purposes, designated the Chambers Institution.

Peeks'kill, post-v. of Cortlandt tp., Westchester co., N. Y., situated upon the E. bank of the Hudson River, 43 miles N. of New York City, contains an academy, 4 boarding-schools, 13 churches, 2 banks, 2 newspapers, 6 stove-foundries, 1 agricultural implement factory, a machine-shop and locomotive factory, 1 blast-furnace, 2 distilleries, 2 tanneries, an iron railing factory, a fire-brick establishment, and stores. The village is supplied with water-works, and has frequent connection with New York and other points by the New York Central and Hudson River R. R., and by steamboat in summer. Pop. of v. 6560. FORSHAY BROS., EDS. "HIGHLAND DEMOCRAT."

Peel, county of Ontario, Canada, on the N. W. shore of Lake Ontario. It is traversed by two divisions of the Grand Trunk railway. The soil is fertile. Cap. Brampton. Pop. 16,369.

Peel (Rt. Hon. Sir FREDERICK), K. C. M. G., b. at London Oct. 26, 1823, second son of the second Sir Robert; was educated at Harrow and Trinity College, Cambridge, where he took a first class in the classical tripos; came to the bar in 1849 at the Inner Temple; under-secretary for the colonies 1851–52 and 1853–55; under-secretary for war 1855–57; financial secretary to the treasury 1859–65; became a railway commissioner 1873; attained distinction as a liberal in Parliament.

Peel (Rt. Hon. JONATHAN), D. C. L., son of the first Sir Robert, b. Oct. 12, 1799; studied at Rugby; entered the army, and in 1859 became lieutenant-general on the retired list; was surveyor-general of the ordnance 1841–

46; secretary of state for war 1858–59 and 1866–67, and long a prominent conservative member of Parliament; was sworn of the privy council 1858.

Peel (Rt. Hon. Sir LAURENCE), a cousin of the second Sir Robert, b. 1799; graduated at St. John's, Cambridge, 1821 (A. B.), and 1824 (A. M.), and in the latter year was called to the bar at the Middle Temple; became advocate-general at Calcutta, and in 1842–55 was chief-justice of Bengal; was knighted 1842, sworn of the privy council 1856, and appointed Indian assessor to the same council. Author of a *Life of Sir Robert Peel* (1860).

Peel (Sir ROBERT), BART., b. at Peel's Cross, Lancashire, England, Apr. 25, 1750; became partner with William Yates, his father-in-law, a cotton manufacturer of Bury, Lancashire. Peel's small fortune rapidly increased, and he became probably the largest manufacturer in the world. From 1790 to 1820 he sat in Parliament for Tamworth, and was a strong Tory; was made a baronet in 1800. D. at Drayton Park, Staffordshire, May 3, 1830.

Peel (Sir ROBERT), BART., son of the foregoing, b. near Bury, Lancashire, Feb. 5, 1788; was educated at Harrow and Christ Church, Oxford, where he passed B. A. as double first-class, the first who ever had the distinction. In 1809 he entered Parliament for Cashel; was made under-secretary for the colonies 1811, and was 1812–18 chief secretary for Ireland, where his Tory principles led to the most severe criticisms from the opposition. He established the Irish constabulary. Peel represented Oxford University in Parliament 1818–22; introduced and carried (1819) a bill to return to specie currency; was home secretary 1822–27, 1828–30; introduced and carried important reforms in the administration of criminal law; remodelled the London police; moved the bill for Catholic emancipation (1829), and thus broke with the Tory leaders. Previously, Peel's name, with no special justice, had been associated with the leadership in the opposition to this cause, doubtless because he had held an important post in Ireland as a Tory. The University of Oxford rejected him in the new election; he re-entered Parliament for Westbury, and again represented Tamworth 1832–50; was first lord of the treasury and chancellor of the exchequer 1834–35, and afterwards headed the conservative opposition, having resisted the parliamentary reform of 1831–32 with all his power; was again premier 1841–46, during which time his position drifted slowly from that of a protectionist and strict conservative to that of a free-trader, and he at last supported the repeal of the corn-laws. He afterwards acted generally with the Whigs. D. in London July 2, 1850, in consequence of a fall from his horse. Peel was a man of thorough patriotism and high moral principle. His hereditary conservatism, although strengthened by a dislike of too hasty changes, was ever held subject to feelings of justice and humanity. He refused the Garter and the peerage, and was universally respected for honesty, truthfulness, and ability.

Peel (Right Hon. Sir ROBERT), G. C. B., b. in London May 4, 1822; was educated at Harrow and Christ Church, Oxford; was 1844–46 an *attaché* at Madrid; was secretary of legation 1846, and chargé d'affaires at Berne 1846–50; a lord of the admiralty 1855–57; chief secretary for Ireland 1861–65; has been since 1850 a liberal member of Parliament for Tamworth; was sworn of the privy council 1861; was made G. C. B. 1868; married in 1856 the eighth daughter of the marquess of Tweeddale.

Peele (GEORGE), b. in Devonshire, England, about 1553; graduated at Broadgate's Hall (now Pembroke College), Oxford, 1579; settled at London as a theatrical writer; was an associate of Nash, Marlowe, and Greene, and author of many dramas, of which, however, only six are certainly known to be his. They were republished by Dyce, together with his poems and miscellaneous writings (3 vols., 1828–39). D. about 1598.

Pee Pee, tp. of Pike co., O. Pop. 2320.

Pee'ples, tp. of Beaufort co., S. C. Pop. 1400.

Peepul. See Bo TREE.

Peers [Fr. *pair*, from the Latin *par*, "equal"], in the old feudal law, all the vassals belonging to the same feudal lord; but when, subsequently, the feudal system was broken down and the king became the sole master of the realm, peers became the common title of all the former vassals. In this sense the word is still retained in the English language. In England the peerage comprises the whole nobility, and its members are designated as peers of the king, not of the realm; often, however, the name is restricted to those members of the nobility who have seats in the House of Lords. In France, Louis XVIII. created in 1814 a house of peers. But this peerage comprised only a very limited number of the whole class of the nobility, and its members were styled peers of the realm, not of the king. The attempt to make this peerage hereditary failed, and the whole institution became insignificant.

Pee'rysville, post-v., cap. of McDowell co., West Va., on Big Fork River.

Peet (DUDLEY), M. D., b. at Hartford, Conn., July 9, 1830; graduated at Yale 1852; studied medicine in New York, and practised there; resided 1857–59 at Burlington, Ia., and then became one of the instructors in the New York Institution for the Deaf and Dumb. D. in New York Apr. 18, 1862.

Peet (EDWARD), b. at Hartford, Conn., May 28, 1826; graduated at the University of New York in 1847; studied at the Union Theological Seminary; became in 1849 professor in the New York Institution for the Deaf and Dumb; author of text-books for deaf mutes. D. in New York Jan. 27, 1862.

Peet (HARVEY PRINDLE), LL.D., b. Nov. 19, 1794, at Bethlehem, Conn.; graduated at Yale in 1822; was the associate of Thomas Gallaudet as a teacher in the deaf-mute asylum at Hartford, Conn., 1822–31, and in 1831 became principal of the New York Institution for Deaf Mutes. Author of many published addresses, memoirs, and reports upon his specialty; published a *Course of Instruction for the Deaf and Dumb* (1844–46).

Pegas'idæ [from *Pegasus*, the winged horse of ancient mythology], a family of fishes of somewhat uncertain position and remarkable form. The body is much depressed and broad, covered with osseous angular plates; the snout is produced into a longer or shorter process; according to Günther, the gill-cover is formed by a large plate homologous to the operculum, preoperculum, and suboperculum; interoperculum a long fine bone hidden behind the gill-plate; mouth inferior; upper jaw with the margin formed by the intermaxillaries and their cutaneous prolongations, behind which are the supramaxillaries; teeth absent; branchial aperture narrow and in front of the pectoral fins; branchiostegal rays one, rudimentary; dorsal and anal short and opposite each other; pectorals enlarged and nearly horizontal; ventrals small, with two or three rays. The family has several representatives, one of which (*Pegasus volans*) is found in the seas of China, and is familiar to many by reason of its being preserved in boxes of insects, shells, and other natural curiosities exported by the Chinese. Formerly, the family was considered as being a member of the order Lophobranchiates, but recent systematic authors have removed it from that order, and consider it an ordinary acanthopterygian, related to the Agenidæ. This is, however, quite doubtful, although, having pectinated gills and otherwise disagreeing with the Lophobranchiates, it does not belong to that order as properly restricted. THEODORE GILL.

Peg'asus (Πήγασος), in the Greek legend, a winged horse, the offspring of Medusa by Poseidon. He dwelt among the immortals. His father lent him to Bellerophon when the latter slew the Chimæra; but when Bellerophon attempted to fly to heaven on his back, the rider fell off and was killed. Pegasus made the well Hippocrene by a stroke of his foot. Hence he is considered the horse of the Muses.

Pegli, town of Italy, province of Genoa, lying on the sea-shore 6 miles W. of the city of Genoa. Fine gardens and rich orange orchards surround the town, and the beauty of its position and the charm of the climate attract hither many strangers, who find ample accommodations in the large hotels and bathing establishments provided for them. Pop. in 1875, 5000.

Pe'go, town of Portugal, province of Alicante, is a neat and prosperous place, with 5847 inhabitants.

Pe'gram (JOHN), b. in Virginia in 1832; graduated at the U. S. Military Academy 1854, when he was appointed brevet second lieutenant of dragoons, and was engaged on frontier duty until May, 1861, when he resigned to follow the fortunes of his native State. Appointed colonel, he was defeated at Rich Mountain July 1, and captured with his command July 12, 1861. Subsequently appointed brigadier-general and major-general, he commanded with distinction throughout the war. In command of a division in the army of Virginia he was killed while resisting a Federal advance at Dabney's Mill Feb. 6, 1865.

Pegram (Gen. WILLIAM JOHNSON), b. at Petersburg, Va., in 1841; was a law-student at the University of Virginia at the outbreak of the civil war, when he volunteered as a private in a Confederate regiment of artillery; gained distinction and promotion in that arm of the service at Cedar Run, Chancellorsville, and Gettysburg; was made brigadier-general early in 1865, and was killed in the battle of Petersburg, Apr. 2, 1865.

Pe'gu, province of British Burmah, Farther India, lies on both sides of the lower course of the Irrawadi, be-

tween lat. 15° 14′ and 19° 27′ N., and comprises an area of 36,454 square miles, with 1,533,505 inhabitants. The territory, which is very rich in teak-timber and exceedingly well adapted to rice-culture, was a province of Burmah until in 1853 it was conquered by the English and annexed to their Indian dominions.

Pegu, or **Bagoo,** town of the British dominion in Farther India, formerly the capital of the famous empire of Pegu, stands on the delta of a river of the same name, in lat. 17° 40′ N., lon. 96° 20′ E. It had at one time 150,000 inhabitants, but is now mostly in ruins, while a new city, Zangnomang, rises on the opposite shore of the river. Among its remains is the temple of Shoe-madoo, a pagoda 360 feet high, richly ornamented with spires and bells, and tapering from a basis 1390 feet square.

Pehlavi Language. See PERSIAN LANGUAGE.

Pei-ho′, a river of China, rises near the Great Wall, flows in a south-eastern direction through the province of Pe-chee-lee, and falls into the Bay of Pe-chee-lee, an inlet of the Yellow Sea. Tien-tsin is situated on its shores, 70 miles from its mouth. Tung-hui, one of its affluents, traverses Peking. It is navigable for more than three-fourths of its course, but at its mouth is a bar of stiff, tenacious clay which makes the entrance very difficult.

Peine Forte et Dure ("hard and severe pain"), called also **Pressing to Death,** was formerly, in England, the punishment of those who refused to plead or stood mute upon their arraignment for felony. The custom was to load the breast of such a person with weights until he was smothered or yielded. The offender lay upon his back. This punishment came into use about 1400, and was last employed in 1741. It was virtually, but not formally, abolished in 1772. A supposed witch was pressed to death at Salem, Mass., during the famous delusion on that subject.

Pe′ipus, a large lake in North-western Russia, 87 miles long, 30 miles broad, communicates with the Gulf of Finland through the Narova. It is deep, easy to navigate, and rich in fish, which are sent to the market of St. Petersburg. Its shores are low, marshy, or sandy, and in many places covered with forests.

Peirce (BENJAMIN), LL.D., F. R. S., b. at Salem, Mass., Apr. 4, 1809, a son of Benjamin Peirce (1778–1831), librarian of Harvard University. The son was a pupil of Nathaniel Bowditch, and graduated at Harvard in 1829; taught 1829–31 at Round Hill, Northampton, Mass.; became mathematical tutor in Harvard College 1831; professor of mathematics, etc. 1833–42; professor of astronomy, etc. 1842–67, and aided the construction and equipment of the observatory; superintendent of the U. S. Coast Survey 1867–74; has been since 1849 consulting astronomer to the *Ephemeris and Nautical Almanac;* a member of the leading American and foreign scientific societies; author of a series of mathematical textbooks 1835–70, and of many scientific papers. His work in pure and in applied mathematics is noteworthy for its novel, original, and remarkably direct and satisfactory methods.

Peirce (BRADFORD KINNEY), b. at Royalton, Vt., Feb. 3, 1819; graduated at Wesleyan University 1841; became a Methodist preacher 1843; was editor of the *Sunday-school Messenger* and the *Sunday-school Teacher;* was a State senator for Norfolk co. 1855–56; obtained the establishment of the State Industrial School for Girls at Lancaster, of which he became superintendent; was chaplain of the House of Refuge, Randall's Island, N. Y., 1867–72, after which he returned to Boston, and became editor of *Zion's Herald.* Author of a series of Sunday-school question-books, a *Bible Scholar's Manual, The Eminent Dead, Notes on the Acts, The Word of God Opened* (1868), *A Half Century with Juvenile Delinquents* (1869), and *Trials of an Inventor,* being an account of the career of Charles Goodyear, inventor of many of the uses of india-rubber.

Peirce (CHARLES SANDERS), son of Benjamin, b. at Cambridge, Mass., Sept. 10, 1839; graduated at Harvard University 1859; author of *The Logic of Relatives* in the *Memoirs* of the American Academy of Arts and Sciences for 1870; of various papers on logic, published in the *Proceedings* of that academy and in the *Journal of Speculative Philosophy;* and of courses of lectures on logic and the scholastic philosophy, delivered before the Lowell Institute at Boston and at Harvard University about 1869; also of a *Memoir on Observations of the Light of the Fixed Stars,* presented to the American Academy in 1875. He is now (1876) in the service of the U. S. Coast Survey, engaged in pendulum experiments to determine the density of the earth.

Peirce (CYRUS), b. at Waltham, Mass., Aug. 15, 1790; graduated at Harvard College 1810; studied theology; was pastor of a Congregational church at North Reading 1819–27, but preferred the vocation of teacher, in which he was engaged long at Nantucket; was principal of the first normal school in America at Lexington, Mass., 1839–42, and in 1844 became the head of the female normal school at West Newton. D. at West Newton Apr. 5, 1860.

Peirce (CYRUS NEWLIN), D. D. S., b. at Philadelphia, Pa., Mar. 5, 1829; graduated at the Philadelphia Dental College 1854; commenced the independent practice of the dental profession 1858; was professor of operative dentistry and dental physiology in the Pennsylvania College of Dental Surgery 1858–65; was dean of that institution 1860–65; has been an earnest advocate for a liberal and thorough education for the dental student, and has made several contributions to the literature of his profession.

Peirce (Gen. EBENEZER WEAVER), b. at Freetown, Mass., Apr. 5, 1822; received an academical education; was brigadier-general of State militia 1855–61; became colonel of the 29th Massachusetts regiment 1861; lost an arm at the battle of White Oak Swamp, June 30, 1862; commanded a brigade 1863–64, serving in Kentucky, Tennessee, and Virginia; became collector of internal revenue for the first district of Massachusetts 1866, and published a *Genealogy of the Peirce Family* (1870).

Peirce (JAMES MILLS), son of Benjamin, b. at Cambridge, Mass., May 1, 1834; graduated at Harvard University 1853; was tutor of mathematics in that institution 1854–58, and became university professor of mathematics 1869. Author of *A Textbook of Analytical Geometry* (Cambridge, 1857), *Elements of Logarithms, Three and Four Place Tables.*

Peirce City, p.-v., Mount Pleasant tp., Lawrence co., Mo., on Atlantic and Pacific R. R., 291 miles E. of St. Louis, has 3 churches, 1 bank, 1 newspaper, 2 large mills, and 3 hotels. P. 432. A. G. HEDGES, ED. "DEMOCRAT."

Peiss′ner (Col. ELIAS), b. at Vilseck, Bavaria, in 1826; graduated at the University of Munich; came to the U. S. in 1849; became professor of modern languages at Union College; published works on the German and Romaic languages and upon political economy; became colonel of the 119th regiment New York Vols., and was killed at the battle of Chancellorsville, May 2, 1863.

Pe′kin, city and tp., cap. of Tazewell co., Ill., on the Illinois River, in the centre of a rich agricultural section, has several important manufactories, an extensive pork-packing establishment, 3 distilleries, 3 newspapers, and stores and mechanical workshops. The city has railroad connection with all the important points of the country. Coal of an excellent quality is mined here. Pop. of city, 5696; of tp., exclusive of city, 166.

D. W. LUSK, ED. "REPUBLICAN."

Pekin, post-v. of Cambria and Lewiston tps., Niagara co., N. Y.

Peking, or **Pekin,** the capital of the Chinese empire, situated in lat. 39° 56′ N., lon. 116° 27′ E., in the province of Pe-chee-lee, on the river Tunghui, a tributary of the Pei-ho, about 35 miles from the Great Wall, has no great commercial or industrial importance, but forms, nevertheless, as the residence of the emperor and the seat of the government, the centre of the whole Chinese world. It stands in a fertile and well-cultivated plain covered with summer residences, gardens, and groves, and rising at a short distance into well-wooded hills. To the N. and W. extensive coal-deposits are found, yielding good bituminous and some anthracite coal, which is brought to the city on the backs of camels and mules; but the mines are worked very superficially, no machinery being employed for the removal of water, and coals, like all other articles, are very dear in Peking. Water is procured from numerous wells, and distributed by carts and wheelbarrows; it is of good quality. The climate is healthy, though severe, the thermometer rising in summer to 105°, and falling in winter to 10°. From December to March the waters in the neighborhood are generally covered with ice two feet thick, and violent storms occur; in June and July the atmosphere is horribly polluted by the thick layer of filth and dirt which covers the unpaved and undrained streets. The city consists of two parts—the northern or Tartar city, forming a parallelogram extending 4¼ miles from E. to W. and 3¾ miles from S. to N.; and the southern or Chinese city, also in the form of a parallelogram, extending 5 miles from E. to W. and 2¼ miles from S. to N.—the whole covering an area with a circumference of about 25 miles and surrounded with walls, beyond which only a few scattered suburbs are found. These walls with their gates form one of the most conspicuous and most magnificent architectural features of the city, especially that surrounding the Tartar city. It is 36 feet high, with a parapet 6 feet high on both sides. Its breadth varies from 40 to 52 feet, being greatest on the northern side. It is built of earth and stones, faced on both sides

with large bricks, and provided on the inner side with ramps for the ascent of cavalry. It is pierced by nine gates, of which three lead into the Chinese city. Behind the gates are large squares enclosed by other walls, and above the gates rise tall, strong, and elegant square towers, with cannon. At sunset the gates are closed with great ceremony, to be opened again at sunrise; they form the principal police-stations, and tolls are taken here on all goods entering. The Tartar city consists of three divisions, one surrounding the other—namely, the inner or prohibited city, enclosed by a red wall and containing the winter palace of the emperor and his family, to which no foreigner can get access; the celestial city, enclosed by a yellow wall and containing a number of magnificent temples and altars to Chinese divinities, the palaces of the imperial princes and the highest officials, and the imperial gardens, with an artificial mountain crowned with a gorgeous pavilion, an artificial lake bordered with groves and plantations, etc.; and the Tartar city proper, where the imperial stables, the government offices, the literary and educational institutions are located. Here reside the foreign ambassadors and the different missions, and here are a Roman Catholic cathedral, a Greek church, a Protestant chapel, and numerous Mohammedan mosques and Booddhist temples. The Chinese city is a densely-crowded, exceedingly noisy, picturesque, and filthy beehive. Broad, straight streets run from gate to gate, and cross each other at right angles. These streets consist of an elevated carriage-road in the centre, where cabs without springs, carts of all descriptions, camels and mules with towering loads move to and fro; on both sides of the road are footways, unpaved, covered with dust or filled with mud, lined on the one side with brick houses of one or two stories, on the other with stalls, and occupied for more than one-half of its breadth by merchandise gorgeously displayed and still more gorgeously advertised. The lanes which run from the streets are generally very narrow and excessively filthy, and it has repeatedly been remarked by foreign visitors that the whole city, even the public buildings, the temples, and the imperial palaces, bears an aspect of decay. Riots are of frequent occurrence, generally occasioned by the awkward and defective manner in which the city is supplied with provisions. It has been the residence of the emperors since 1410, and is one of the oldest cities of China, but was very imperfectly known to the civilized world until, in Oct., 1860, the French-English army arrived before its walls, occupied two of its gates, and compelled the emperor to conclude the Treaty of Tientsin or have his capital destroyed. The population is estimated at 1,500,000. The first European embassy which visited Peking came from Portugal in 1517. The ambassadors were imprisoned immediately on their arrival, and in 1523 they were put to death. A Dutch embassy of 1667 succeeded in concluding a commercial treaty. With the Russians the intercourse began in 1619. CLEMENS PETERSEN.

Pela'gianism, a system of anthropological doctrine which takes its name from Pelagius, but owes its shape rather to bolder if not abler men. Pelagius is spoken of by several of his contemporaries as a Briton; which is likely enough, in spite of his familiarity with Greek authors. But that his British name was Morgan ("sea-born"), rendered into the Latin *Pelagius*, is without sufficient ancient warrant. He was also called a monk, but perhaps this indicates only ascetic habits. At any rate, he was only a layman. He had been residing for some years in Rome when, in 410, during Alaric's third siege of the city, he escaped with his convert and pupil, Cœlestius, to Northern Africa, and had gone from there to Palestine before the meeting of the Council of Carthage in 411 (some say 412), which condemned Cœlestius. In Palestine two councils (at Jerusalem and at Diospolis, the ancient Lydda, in 415) declared him orthodox. And he is not heard of after 418. In the controversy to which his peculiar views gave rise he may not have acted quite frankly, but otherwise he appears to have been a very good man, of more than common moral strictness and purity, if not a man of any great spiritual depth or intellectual grasp. The impulse to his alleged heresy was a practical one. He had been scandalized by hearing Christians plead human infirmity as an excuse for shortcomings in the religious life. He is said to have been greatly roused by hearing a bishop repeat the well-known prayer of Augustine, *Da quod jubes, et jube quod vis* ("Give what Thou commandest, and command what Thou wilt"). His convert, Cœlestius, who appears to have been more of a Pelagian than Pelagius himself, had been an advocate in Rome, and was, perhaps, an Irishman by birth. He was younger and more impulsive than Pelagius. It was his application for ordination as a presbyter at Carthage (in 411 or 412) which led to the council already referred to. His application was denied, on the ground of these seven heretical opinions: (1) Adam would have died if he had not sinned; (2) Adam's sin injured himself only, not the race; (3) children are born as pure as Adam was before he fell; (4) men neither die because Adam fell, nor rise again in consequence of Christ's resurrection; (5) unbaptized, as well as baptized, infants are saved; (6) the law, as well as the gospel, leads to heaven; (7) even before Christ's advent there were sinless men. The answer of Cœlestius, that these were matters merely of speculation, availed him nothing; he was excluded from the fellowship of the Church. He then went to Ephesus for ordination, and was a presbyter there from 412 to 417, when he returned to Rome, and for a time had the bishop Sozimus (417–418) on his side, but fled from Rome in 418, Sozimus having turned against him; was banished from Constantinople in 429; appears in Rome again in 430; and is not heard of after 431, when he was condemned by the œcumenical Council of Ephesus. Meanwhile, a still younger man, of still greater boldness, Julian, bishop of Eclanum in Italy, comes upon the stage. Deposed in 418, with eighteen other bishops, for sympathy with the opinions of Cœlestius, he literally carried the war into Africa, assailing the Carthaginian anthropology with all his might. Augustine had already entered the lists on the other side. Julian went to Constantinople in 418, spent some years with Theodore of Mopsuestia, was in Constantinople again in 428, sought restoration to the Church in 439, but was refused, and died a schoolmaster in Sicily at some time between 440 and 553. Pelagianism, which was understood to be a denial both of original sin and of supernatural grace, was everywhere condemned. Semi-Pelagianism, 100 years later, shared the same fate. (See Wiggers, *Versuch einer pragmatischen Darstellung des Augustiniasmus und Pelagianismus* (1831–33), translated by Prof. Emerson of Andover (1840); Jacobi, *Die Lehre des Pelagius* (1842); A. Dorner, *Augustinus* (1873); and Shedd, *History of Christian Doctrine* (1863).) R. D. HITCHCOCK.

Pela'gius I., POPE, of Roman birth, archdeacon and legate to Constantinople under Vigilius, his immediate predecessor, and, like him, a mere creature of the Byzantine emperor, Justinian. He was with Vigilius when he died at Syracuse on his way home from Constantinople (where he had been since 547), June 7, 555, and at once assumed the pontificate, as he had previously been authorized to do by Justinian. He was suspected of having hastened the death of Vigilius. He was afterwards consecrated at Rome by two bishops and a presbyter, and d. there Mar. 3, 560.—PELAGIUS II., also of Roman birth, the immediate predecessor of Gregory the Great in the papal chair, and the first independently elected pontiff after the Byzantine conquest of Rome in 536. He was consecrated Nov. 27, 578; d. about the middle of January, and was buried Feb. 6, 590. R. D. HITCHCOCK.

Pe'lago, town of Italy, province of Florence, on the brow of a hill washed by the torrent Vicano. It is about 15 miles E. of Florence, on the road to Vallombrosa, and its chief industries are manufactures of earthenware and of woollen cloths. Pelago was a fief of the bishops of Fiesole in the eleventh century. Pop. in 1874, 10,037.

Pelargon'ic Acid. This compound, which is $C_9H_{18}O_2$, is one of the monatomic fatty acid series, $C_nH_{2n}O_2$, a homologue of formic and acetic acids. On the homologic theory its structural formula is $O_2.9H_2C$. (See HOMOLOGY.) It exists naturally in the volatile oil of rose-geranium, *Pelargonium roseum*, whence its name, and is obtainable artificially by several methods, one being the oxidation of essential oil of *Ruta graveolens*, or rue, by the action of nitric acid, a method discovered by Gerhardt and Cahours. Pelargonic acid is a colorless liquid, oily, and freezing by cold to a fatty mass which melts at 10° C.; odor like that of butyric acid; boils at 260°; slightly soluble in water and very soluble in alcohol. By keeping it becomes yellow. Delffs claims its identity with *œnanthic acid*, discovered by Liebig and Pelouze in wine in the form of *œnanthic ether*, which constitutes a portion of the *bouquet* of all wines (the term *œnanthic* being derived from the Greek word for "vine-blossom," οἰνάνθη). As pelargonic acid is a substance of some practical importance in the preparation of artificial flavoring essences, its mode of preparation will be briefly stated. The method of Gerhardt and Cahours from oil of rue is employed in practice. This essential oil is heated with twice its weight of very dilute nitric acid until it begins to boil. Two layers form in the mixture. The lower layer is separated, freed from free nitric acid by heating in a bath of chloride of zinc, and then filtered. It is now crude pelargonic acid, fit for the preparation of pelargonic or œnanthic ether; but if required pure, it is necessary to combine with potash, decompose with sulphuric acid, rectify the oily acid which separates, combine again with baryta, crystallize, and decompose the crystals of baric pelargonate with sulphuric acid.

Pelargonic Anhydride.—The "anhydride" of pelargonic acid, $C_{18}H_{34}O_3$, was discovered by Cahours, who obtained it by the action of oxychloride of phosphorus on baric pelargonate. It is a colorless oil, lighter than water, freezing at 0° C. and melting at 5°. HENRY WURTZ.

Pelargonic Ether (syn. *Œnanthic Ether*). This substance constitutes largely the aromatic principle or *bouquet* of most wines. It is prepared, in a crude state, from crude PELARGONIC ACID (see this head) by a prolonged digestion of the latter, at a gentle heat, with alcohol. It is recommended to pass dry hydrochloric acid gas through an alcoholic solution of pelargonic acid, when it separates as an oily layer, which is subsequently purified. Pure, it is a colorless oil, of density .861, boiling about 217° C. It has a powerful odor resembling *quinces*—is insoluble in water, though soluble in alcohol even when rather dilute. An alcoholic solution constitutes the commercial artificial *quince-essence.* It is doubtless largely used in the manufacture of factitious wines, as a flavoring constituent, to impart the *fruity* aroma. HENRY WURTZ.

Pelargonium. See GERANIUM.

Pelas'gians, The, are uniformly spoken of by all ancient Greek authors as the oldest inhabitants of Greece, but in details the notices which have come down to us about them are vague and contradictory. Some authors, Homer and Herodotus, describe them as an extensive race, the parent-stock from which sprung the Hellenes, and occupying not only Greece proper, but Asia Minor to the E., Macedonia, Thracia, and Illyria to the N., and Italy to the W. Others, Thucydides and Strabo, consider them only one of the many kindred tribes which inhabited Greece, like the Leleges and Dolopes. As the materials for investigation are exceedingly scanty, modern researches have failed to arrive at any definite and settled view. Of the Pelasgian language nothing has been preserved. Certain names, such as Larissa and Argos, are considered as pertaining to it. A Greek tradition designated the Albanian dialect as directly descended from it. Herodotus speaks of it as barbarous, but whether that means foreign or corrupted is not evident. Of architectural monuments found in Greece, certain constructions of an enormous massiveness and strength are ascribed to them, such as the so-called tomb of Atreus in Mycene. They consist of huge blocks of stone placed one above the other, and held together by their own weight, without any mortar; on account of their size these structures are called cyclopean. Of the history of the Pelasgians not one fact has as yet been ascertained, even that of the transition from the Pelasgian to the Hellenic period. Some modern Egyptologists, however, have described them as a seafaring people in frequent communication with Egypt. Of the various stocks settled in Italy, the Japygians and Etruscans are generally considered as branches of the Pelasgian race, but the hypothesis is at once hazardous and barren.

Pelecan'idæ (*Pelecanus*), a family of birds whose species are familiarly known as pelicans; they are of large size; have a rather long flexible neck, moderate head, a long, nearly straight, and rather broad bill, whose culmen is rounded at the base, and at the end produced into a strong hook; the lower mandible is broader than the upper, and provided with a naked membrane, which extends backward on the throat and is capable of great extension; nostrils linear; wings long and pointed; tarsi short and robust; toes four, connected together by a membrane, the three anterior largest, the fourth interno-posterior and smallest. The family, according to G. R. Gray, includes ten species; of these some one or other species are found in all quarters of the globe, and extend to interior lakes and rivers as well as the sea-coast. They live upon fish, which they take in their pouch to a place of rest, where they ingest and leisurely digest their meal. This habit has been taken advantage of by Chinese fishermen, who place a ring round the throat and send the pelicans to fish for them; the pelican brings to its master the fish in its pouch, and is rewarded by being finally permitted to fish on its own account. Pelicans feed their young with regurgitated and half-digested food. The ancients believed that the mother-bird fed her offspring with drops of blood obtained by piercing her own breast. Hence the pelican is taken as an emblem of maternal piety. THEODORE GILL.

Pel'ecoid [Gr. πέλεκυς, "hatchet," εἶδος, "form"], a geometrical figure of a hatchet shape. It is bounded by a semicircle and two quadrants, all having their concavities turned in the same direction; the quadrants are tangent to each other and to the diameter of the semicircle. W. G. PECK.

Pelew' Islands, a group of twenty islands situated in the North Pacific Ocean, extending between lat. 7° and 8° 30′ N., and between lon. 134° and 136° E. They are high, mountainous, and surrounded by coral reefs, but the soil is fertile, and produces bread-fruits, bananas, sugar-cane, and oranges. Pop. about 10,000, of the Malay race.

Pel'ham, post-v. and tp., Hampshire co., Mass. P. 673.

Pelham, p.-v. and tp., Hillsborough co., N. H. P. 861.

Pelham, p.-v. and tp., Westchester co., N. Y., on Long Island Sound, near New York and New Haven R. R. P. 1790.

Pelham, post-v. and tp., Caswell co., N. C. Pop. 1560.

Pelican. See PELECANIDÆ.

Pe'lion, the ancient name of the modern *Zagora*, a mountain-range on the eastern coast of Thessaly. On the summit of its highest peak stood the temple of Jupiter Actæus, and near this was the cave of Chiron. It was, and is still, celebrated for its magnificent forests of oak, chestnut, elm, and pine, and the deep impression which the ancients received of its lofty peaks found a fit expression in the myth of the giant sons of Aloeus, who in their wars against the gods placed Ossa on the top of Olympus, and Pelion upon Ossa; or, as Virgil relates, piled Ossa on Pelion, and rolled Olympus upon Ossa.

Pélissier' (JEAN JACQUES AMABLE), duke of Malakoff, marshal of France, b. Nov. 6, 1794, at Maromme, near Rouen; was educated at Brussels, afterward at the military schools of La Flêche and St. Cyr; entered the artillery as sub-lieutenant in 1814; served in Spain in 1823, in the Morea in 1828, and in Algeria in 1830. Commanding in 1845 a corps as colonel, he entered the territory of the Ouled Riahs, defeated them, and shut them up in a cave. As they refused to surrender, and even fired at his messengers, he applied burning fagots to the mouth of the cave, and about 600 Arabs were suffocated. This atrocity excited general indignation, and he was saved only by the declaration of Marshal Bugeaud, commander-in-chief in Algeria, that he had simply obeyed a positive order. In 1855 he was made commander-in-chief of the army in the Crimea, and took the Malakoff. He was governor-general of Algeria from 1860 to his death, May 22, 1864.

Pel'la, the ancient capital of the Macedonian empire and the birthplace of Alexander the Great, was a large and magnificent city in the days of Philip and Alexander, but lost its importance under the Romans, and disappeared altogether during the Middle Ages. Some few remains of it are still traceable near the village of *Neokhori* or *Yenikiuy*, along a small brook called Pelle. It is said to have had over 80,000 inhabitants.

Pella, tp. of Ford co., Ill. Pop. 552.

Pella, post-v. of Lake Prairie tp., Marion co., Ia., on the Keokuk and Des Moines R. R., 45 miles from Des Moines, contains the Central University of Iowa, 11 churches, 3 banks, 2 large wagon manufactories, 3 flouring-mills, 1 foundry and machine-shop, 2 newspapers, 3 hotels, 2 grain-elevators, several vineyards, stone-quarries, limekilns, and stores. Principal business, farming and stock-raising. Pop. 1909. J. H. BETZER, ED. "BLADE."

Pella, post-v. and tp., Shawano co., Wis., on a tributary of Wolf River. Pop. 318.

Pella'gra, a supposed endemic skin disease formerly prevalent in the Milanese (Italy), in the Asturias (Spain), and in other regions. Epilepsy, muscular contractions, insanity, and suicidal mania often accompanied it. It was considered probable that a maize diet was the cause, but it is more likely that poverty, hunger, overwork, and filth combined were the causes alike of the scaly eruption and of the other attendant evils.

Pellazzano, town of Southern Italy, province of Salerno, in a good grain-bearing district. P. in 1874, 6123.

Pellegri'no Parmense, town of Italy, province of Parma, in a district rich in olives, chestnuts, grapes, grain, and hemp. An old castle of the twelfth century stands near the town. Pop. in 1874, 5216.

Pellestrina, town of Italy, province of Venice, on one of the lagoon islands or dunes, from which it takes its name. The inhabitants are chiefly engaged in cultivating vegetables, in fishing, and in navigation; the women take part in all these occupations, and are so skilful with the oar that they often contend for and share the prizes in the famous Venetian regattas. The first settlement of Pellestrina was as early as the fifth century. Pop. in 1874, 6253.

Pellew. See EXMOUTH.

Pel'lico (SILVIO), b. at Saluzzo June 24, 1789; studied at Turin, and afterwards spent four years at Lyons, devoting himself to French literature; appointed professor of French in a military college at Milan, but afterwards became private tutor in the family of Porro; in 1819 his tragedy, *Francesca da Rimini*, was represented with the greatest applause, and in the same year, with Manzoni, Berchet, Breme, and others, he established the periodical

Il Conciliatore, which was the champion of the new liberal school of romance; it was suppressed in 1820, and he was arrested; Feb. 21, 1822, he was condemned to death, but the sentence was commuted to close confinement for life, and he was conveyed to the Spielberg. Pellico has painted to the life his sufferings in this prison in his popular and most touching book, *Le mie Prigioni*—a book which excited the strongest public feeling against the despotism of Austria, and brought a powerful moral pressure to bear upon the political policy of that country. He was released from his cruel confinement in 1830, and returned immediately to Turin, where he lived in complete retirement as the private secretary of the marchioness Barolo. Besides his excellent little work, *Dei Doveri degli Uomini*, he continued to write dramas and other poems. D. Jan. 31, 1854.

Pel′litory [from Lat. *parietaria*]. (1) The *Parietaria officinalis* or wall pellitory of the Old World, an urticaceous herb, resembling in its looks the common nettle. It is used as a diuretic in domestic practice. *Parietaria Pennsylvanica* is its North American representative. (2) More commonly this name is given to *Anacyclus pyrethrum*, a composite plant whose root is brought from the Levant. It is much used by dentists to relieve toothache and benumb the nerves of the teeth, and is a valuable and powerful sialagogue and local stimulant in tic douloureux and facial paralysis; is often incorrectly called Spanish pellitory.

Pelomedus′idæ [*Pelomedusus*, from Gr. πηλός, "mud," and μέδειν, to "hold sway over"], a family of tortoises of the sub-order Pleurodela—*i. e.* those forms which retract their neck sideways—distinguished by Prof. Cope (*Proc. Acad. Nat. Sci.*, Philadelphia, for 1868, p. 119) because they possess only two series of phalanges instead of the usual number (three). In external appearance they resemble the Chelydidæ (*Sternothærus*, etc.); the lobes of the sternum are solid and immovable. According to Dr. Gray, there are three species of the group, inhabitants of Africa.
THEODORE GILL.

Pelop′idas, b. at Thebes, a man of great wealth and an intimate friend of Epaminondas; was expelled in 382 B. C. from his native city by an oligarchic party supported by Sparta, but returned in 379 B. C., slew the Spartan leader with his own hand, established a thoroughly democratic government, and broke the Spartan influence not only in Thebes, but in Greece. He distinguished himself in the battle of Leuctra, 371 B. C., and on a diplomatic mission to Susa he was eminently successful in baffling the Spartan and Athenian intrigues at the Persian court, and Thebes was acknowledged as the first city of Greece. Sent in 368 B. C. as ambassador to Alexander of Pheræ, he was seized and imprisoned by the tyrant, but rescued by Epaminondas. In the year 364 B. C. he defeated Alexander at Cynoscephalæ in Thessaly, but was killed while pursuing the enemy.

Pelo′pium [Gr. Πέλοψ, "Pelops," a proper name], a name applied by the great German chemist Heinrich Rose to a supposed new metal found by him, together with NIOBIUM (which see), in American *columbite* and Swedish *tantalite*. Niobium is now understood to be neither more nor less than the columbium of Hatchett, discovered long before, and Rose himself afterwards concluded that his supposed oxide of the peculiar metal pelopium was only an oxide of niobium (columbium); so that it happens that both these names must be dropped from the language of the science. H. WURTZ.

Peloponne′sus (the "island of Pelops"), the ancient name for the southern division of Greece, the peninsula, which now generally is called the Morea. It was connected with Hellas proper by the Isthmus of Corinth, which separated the Saronic Gulf from the Corinthian (Lepanto). It was divided into six districts or states—namely, Achaia, in the N., along the Corinthian Gulf; Argolis, in the E., between the Saronic Gulf and the Gulf of Argolis; Laconia, in the S. E., between the Gulfs of Argolis, Laconia, or Kolokythia, and Messenia or Koron; Messenia, in the S. W., on the Gulf of Messenia; Elis, in the W.; and Arcadia, in the middle. (For further information with respect to its geography and history see the articles on GREECE and its divisions.)

Pe′lops, in Grecian mythology, the son of Tantalus and the father of Atreus and Thyestes; married Hippodamia, a daughter of King Œnomaus of Elis; became king after the death of his father-in-law; renewed the Olympian games, and gave his name to the southern division of Greece by sending a colony thither. Many and very different myths are connected with his name.

Pelouze′ (THÉOPHILE JULES), b. at Valognes in the department of La Manche, France, Feb. 26, 1807; studied chemistry under Gay-Lussac; became professor at Lille in 1830, at the École Polytechnique in 1838, at the Collége de France from 1839 to 1851. D. June 1, 1867. Besides a number of minor essays, among which are very valuable ones on the manufacture of sugar, he wrote *Traité de Chimie* (7 vols., 1853–56) and *Abrégé de Chimie* (3 vols., 1858).

Pelu′sium, the Egyptian *Peromi*, the *Sin* of the Scriptures, the Greek name of an ancient town situated on the eastern branch of the Nile delta, and forming the key to Egypt from Asia. It is often mentioned in history, but never obtained any importance.

Pel′ville, post-v. of Hancock co., Ky. Pop. 84.

Pel′vis [Lat. *pelvis*, "a basin"], the name of the lowest of the three great divisions of the trunk, or, more properly, of the bony ring or framework which surrounds this cavity, connecting the column of the spine with the lower extremities, and transferring the weight of the former to the latter. It consists of four bones. The front and sides are formed by the two *ossa innominata*, large irregular bones which have received their name from their not resembling any other body in form; behind, the circle is completed by the *sacrum* and *coccyx*. The pelvis varies somewhat in the male and female skeleton, and also in the skeleton of the different races. (See OSTEOLOGY.)

Pem′berton, post-v. and tp. of Burlington co., N. J., on the N. branch of the Rancocus River, and at the junction of the Burlington County and New Jersey Southern R. R., contains a public library, waterworks, a large feed and flour mill, 3 churches, 1 newspaper, 2 hotels, and stores. Incorporated in 1826. Pop. of v. 797; of tp. 2743.
CHARLES J. PEARCE, ED. "COURIER."

Pemberton, post-v. and tp. of Shelby co., O., on the Indianapolis division of the Cleveland Columbus Cincinnati and Indianapolis R. R. Pop. 157.

Pemberton (JOHN C.), b. in Pennsylvania Aug., 1814; graduated at the U. S. Military Academy, and became second lieutenant of artillery July, 1837; served in Florida against the Seminoles; in the war with Mexico on the staff of Gen. Worth, gaining the brevets of captain and major for Monterey and Molino del Rey; on the northern frontier, etc. until Apr. 29, 1861, when he resigned, being at the time a captain of artillery. Joining the Southern cause, he was appointed a colonel of cavalry, and attached to the staff of Gen. Joseph Johnston; rose to the rank of lieutenant-general, and in 1863 commanded in Mississippi, where he was defeated, May 16, at Champion Hills and Big Black (May 17); falling back on Vicksburg, he defended that place against assault, but being besieged was compelled to surrender the city and garrison July 4, 1863. (See VICKSBURG, SIEGE OF.) He subsequently served as inspector of artillery; farmer in Virginia since the war.

Pem′bina, county of N. E. Dakota, bounded on the N. by Manitoba, and separated on the E. from Minnesota by the Red River of the North, which is navigable. The county contains much fertile soil, which is well adapted to wheat-culture. It is traversed by the Northern Pacific R. R. This county has long been inhabited by descendants of Lord Selkirk's colonists. (See MANITOBA.) Cap. Pembina. Pop. 1213.

Pembina, county of N. W. Minnesota. Area, 7000 square miles. It is bounded W. by Dakota (from which it is separated by the Red River of the North) and on the N. by Canada. A small detached portion lies N. W. of the Lake of the Woods. Pop. 64.

Pembina, post-v. and tp., cap of Pembina co., Dak., on the Red River of the North, 2 miles S. of the boundary of British America.

Pem′broke, town of England, in S. Wales, in the county of the same name, on an inlet of Milford Haven, has large ship-docks and other naval establishments. Pop. 13,741.

Pembroke, a thriving town, capital of Renfrew co., Ont., Canada, on Allumette Lake, a part of Ottawa River, 100 miles above Ottawa. It is a great centre of the lumber business. Water-power is furnished by the falls of Muskrat River. The county buildings are chaste structures built of sandstone. There is 1 weekly newspaper. Pop. 1508.

Pembroke, post-v. of Christian co., Ky., on the St. Louis and South-eastern R. R. Pop. 278.

Pembroke, post-v. and tp., Washington co., Me., on Lubeck Bay. Pop. 2551.

Pembroke, post-v. and tp., Plymouth co., Mass., 5 miles W. of Duxbury. Pop. 1447.

Pembroke, post-v. and tp., Merrimack co., N. H., on the Merrimack River, at the junction of the Concord and Suncook Valley R. Rs. Pop. 2518.

Pembroke, post-v. and tp., Genesee co., N. Y., on Tonawanda Creek, crossed by the New York Central and

the Erie R. Rs., has an academy and 5 churches. The N. part of the town is occupied by a part of the Tonawanda reservation of Seneca Indians, several hundred of whom reside here, having a church and schools. Pop. 2810.

Pembroke, post-v. and tp., Giles co., Va. Pop. 1327.

Pem'brokeshire, county of England, bounded N. and W. by the Irish Sea, and S. by the Bristol Channel, comprises an area of 627 square miles, with 96,278 inhabitants. It is mountainous throughout, and contains coal, slate, lead, and iron. In the southern part the soil is fertile, and barley, oats, and potatoes are raised, and cattle reared. Large quantities of butter and cheese are exported.

Peme, probably the same as *Pempte* (Πέμπτη), the modern *Bembe*, a town of Egypt, in the Heptanomis, 20 miles above Memphis, on the left bank of the Nile. Pliny mentions a place called Pemma, belonging to the nomads settled on the borders of Egypt and Æthiopia, but the text is uncertain.

Pem'iscot, county of S. E. Missouri, bounded E. by the Mississippi River, which separates it from Tennessee, and S. by Arkansas. Area, 470 square miles. It is low, level, and in great part covered by swamps, bayous, and sloughs. Its soil is fertile. Corn is the leading product. Cap. Gayoso. Pop. 2059.

Pemiscot, tp. of Pemiscot co., Mo. Pop. 226.

Pem'mican, a kind of concentrated food, originally made by the North American Indians by drying and powdering the lean meat of the buffalo or deer, mixing it with service-berries, stirring all into boiling fat, and making it into cakes. The name is also given to a very different form of meat-biscuit used by arctic voyagers. The word is Cree.

Pemphi'gus [Gr. πέμφιξ, πέμφιγος, a "breath," a "bubble"], or **Pom'pholyx** [Gr. πομφόλυξ, a "bubble"], a skin disease in which successive crops of watery blisters appear upon the patient, each blister followed by a scab and a dark scar, which lasts for some time. If the disease attacks children, as it commonly does, it may, and not improbably will, leave in a few weeks, but quinia, iron, and other tonics appear to hasten its cure. Some cases are of syphilitic origin, and require mercury, the iodides, etc. But a very large proportion of the chronic cases are of unknown origin, and cannot, so far as is now known, be cured. The itching is usually intense. In such case the treatment is palliative almost entirely, and the patient is finally exhausted by nervous irritation. Ammonia is reported by Bamberger to be present in an abnormally large amount in the fluids of patients suffering from the disease.

Pen [Lat. *penna*, "feather"], an implement for writing. The earliest pen was a sharp iron, steel, or bronze instrument, which cut out letters, characters, or hieroglyphics in the limestones, sandstones, or steatites of Oriental countries; the next was substantially the same implement, used in tracing characters on the plastic clays of Central Asia, which after receiving their inscriptions were dried in the sun or baked in the fire: such were the Assyrian tablets. Not long after in the far East, and perhaps also in Egypt, the use of the camel's-hair pencil was substituted for the steel bodkin, and the characters were painted on the bark of trees and the skins of animals, very much as the Chinese draw them on paper at the present day; in the West, in Persia, Greece, and Syria, wax and leaden tablets came into use, and a stylus of metal, bone, or ivory, with one end terminating in a point and the other flattened to erase what was incorrect, was the pen of the time. The use of parchment and the papyrus necessitated something more flexible, and reed pens took the place of the metallic or ivory stylus. These were of a peculiar species of reed, and underwent a process of preparation before being used. For writing on parchment it was finally discovered that quills made better pens than reeds; the quills of the swan, goose, and, for fine writing, of the crow, were those most used. A somewhat doubtful authority fixes their introduction at A. D. 553. When paper was introduced into Europe for writing some centuries later, the quill pen was still the favorite implement of the ready writer, and continued so down to our own time. Great improvement was made in the preparation of quills for use, and those from Russia and Holland, which had been dutched or clarified by plunging in heated sand, and subsequently dipped in boiling alum-water or diluted nitric acid, were most in demand, and if of large size brought a high price. Pen-making was an art to be acquired by instruction and practice, and every teacher and writer was expected to know how to make a good pen. In the early part of the present century the stationers began to sell in the cities boxes of ready-made pens, and not long afterward pen-nibs, which were fastened in a holder and used for writing. It is recorded that iron pens were used as early as 1685, but their use must have been limited and the pens themselves very poor. Early in the present century the demand for something more durable than quills for writing purposes led to a variety of experiments with horn, tortoise-shell, glass, and finally steel, silver, and gold. The glass pen was a stylus with grooves on all sides of its conical point to hold the ink; the tortoise-shell and horn soon softened under the action of the ink, and were but little better than quills, and even the "diamond" and "ruby" points fastened in them did not make them very effective substitutes for the gray goose-quill. Silver was tried with various degrees of alloy, and from its elasticity and ductility was thought to be a success, but from failure to temper it thoroughly, and its susceptibility to wear at the point, it was eventually abandoned. Steel was tried in Wise's barrel pens as early as 1803, but these were expensive, ill-constructed, and but little used. About 1820 the manufacture of steel pens in Birmingham began in good earnest. Four men whose names have become known in connection with this manufacture all over the world engaged in it nearly at the same time; they were Joseph Gillott, Josiah Mason (now Sir Josiah Mason), ——— Mitchell, and ——— Perry. Mr. Gillott had been a manufacturer of steel toys, and did not enter upon pen-making until 1822, but he introduced many improvements in his pens, and his competitors were not behind him in their zeal to perfect theirs. In 1820 the first gross of pens sold in Birmingham brought at wholesale $36. In 1830 the price was $2; in 1832, $1.50; in 1860, 12 cents, while an article as good as those sold in 1820 was sold for 4 cents a gross. Others followed in the business, but none reaped such colossal fortunes from it as these men. For many years the annual production of Birmingham has ranged from 8,000,000 to 15,000,000 gross of pens. Several efforts have been made in this country to compete with the Birmingham manufacturers. There were in 1870 three manufactories of steel pens in the U. S., one of which achieved a good reputation on the Washington Medallion pen, an excellent pen, modelled after one of Perry's; but the Birmingham pens were sold at such low prices that the business has proved unprofitable.

But if American skill and ingenuity failed to compete successfully with the English on steel pens, it has been quite otherwise in the production of gold pens. In this manufacture, which requires a much higher degree of tact and judgment, as well as mechanical skill, than the other, the American manufacturers have for some years been foremost, and their pens are now sold largely in England, France, and Germany. The first attempt at making gold pens was made in England not far from 1825. Gold, even when alloyed, being too soft to make a durable point, it was necessary to have the points of some harder metal. Bits of diamond or ruby were tried at first, but Mr. John Isaac Hawkins, an American gentleman residing in England, was led by an accident to use the native alloy of iridium and osmium, one of the hardest and most refractory of all metallic alloys. Mordan, the English pencil-maker, also attempted to make gold pens, but without success. Hawkins's rights were purchased by Rev. Mr. Cleveland, an American clergyman then in England, who in 1835 induced Mr. Levi Brown, a watchmaker in Detroit, to engage in the manufacture of gold pens. These were at first made by hand, and were very poor substitutes for the quill. In 1840, Mr. Brown removed to New York and enlarged his business. Among the men in his employ was Mr. John Rendell, whom, by common consent, the pen-manufacturers acknowledge to have done more for the advancement of this industry than any and all other men. He invented a number of machines for the different processes of making the pens and for tempering them, giving them the elasticity of the quill with the permanency of the metal; organized a complete division of labor among the workmen, giving to each one his peculiar branch of the manufacture; and in short revolutionized the entire business. His machines were purchased by other parties who were desirous of entering upon the business, and by their use the pens of Bagley, Barney, Hayden, and others attained a fair reputation. Mr. Rendell associated with himself first Mr. Spencer, and six years later Mr. Dixon, and the pens of Spencer & Rendell, and later Spencer, Rendell & Dixon, soon became known as the best in the market. Two other men, Alexander Morton and Leroy W. Fairchild—the latter at first employed by Mr. Rendell, and the former by Mr. Bagley—about 1850 or 1851 added two important particulars toward perfecting this interesting manufacture. Mr. Fairchild bedded the iridium points in the gold instead of soldering them, thereby avoiding the galvanic and corrosive action of the ink on the two metals, the solder and the gold, as well as giving the points a firmer hold on

the pen, and modified the form and roundness of the pen; and Mr. Morton, by a series of rolls and other processes, increased the elasticity and completely regulated the temper of the pen. Mr. Fairchild eventually became, and still is, the head of the successors to the house of Spencer, Rendell & Dixon, and Mr. Morton, after some years of successful enterprise, died, and left his high reputation to his successors. It is peculiarly true of this manufacture that the highest success can only be obtained by the careful inspection of each finished pen by some thoroughly competent person. Every pen of the first quality manufactured by these houses was thus tested by Mr. Fairchild and Mr. Morton in person, or by carefully-trained experts, before it was put up for sale, and long experience enabled them to detect the slightest defect in its action. The purchaser of a gross of steel pens can throw one or another aside if it displeases him, but the purchaser of a gold pen expects to use it for years, and desires one which will be at all times ready for service. Even with the utmost care in the manufacture not more than eight or nine out of every dozen pass this severe crucial test. The business of making gold pens has been greatly expanded of late years, and several houses export considerable quantities to Europe, but through the lack of skill and careful testing of their goods some of the manufacturers, even with the excellent machinery of Rendell and his associates, turn out very poor pens. In 1870 the census reported 21 manufactories of gold pens and pencils, employing 242 hands, using $268,250 of capital and $181,740 of raw material, paying $133,556 wages, and producing goods valued at $467,380. The number of manufactories is now more than 30; the number of employés more than 500; the amount of capital invested is not far from $1,200,000; the raw material used over $250,000; and the annual product not far from $2,000,000. Several of the gold pen-makers manufacture gold pencils and penholders also, and there are pencil-makers who do not make pens. Gold barrel pens are made to some extent, and there are two or three so-called fountain pens, which by one device or another retain ink enough to write a letter of ordinary length without dipping the pen a second time. In this connection we should notice also the ruling pen, used by the blank-book manufacturers, consisting of two concavo-convex pieces of steel, well pointed, with their points rounded and in apposition, the concave surfaces holding the ink. The pen in ruling is perpendicular to the paper. Of somewhat similar form and application is the pen of the calligraph, a machine invented by Charles Thurber, Esq., and intended for rapid writing, especially for those suffering from writer's cramp or paralysis, and those to whom an upright position at the desk is a necessity. The machine is perfect in its action, exceedingly ingenious, and deserves to be better known. L. P. Brockett.

Penæa′ceæ, a small natural order of monochlamydeous plants, found at the Cape of Good Hope. They are shrubs, have apetalous flowers, four-celled ovaries, and minute or rudimentary cotyledons. One species (*Penæa sarcocolla*) is said to produce the gum-resin called *sarcocol*.

Peñafiel′, town of Spain, province of Valladolid, on the Duranton, near its influx into the Douro, has manufactures of worsted and leather. Pop. about 4000.

Pen′alty [Lat. *pœna*, "punishment"], law. In a broad and popular sense this term is often used to describe all punishment inflicted for the commission of crime; but as a word of strictly technical import in the criminal law a penalty denotes the sum of money the payment of which is required by a statute as a forfeiture from the person who violates its prohibitions or commands. While a fine is imposed by the court after conviction in a criminal prosecution, a penalty is sued for in a civil action and recovered by an ordinary judgment obtained therein. In whose name this action should be brought depends upon the requirements of the statute itself or of some general enactment regulating the matter; it may be prosecuted by the people or the state, or by certain designated officials, or sometimes even by a private citizen. Penalty is also a technical term in the law of contract, and signifies, when thus employed, a certain sum of money fixed upon by the parties in one portion of an agreement to be paid in case of a failure to perform the substantial stipulations contained in another part of the same instrument. Thus, in the common money-bond the obligor binds himself in absolute terms to pay to the obligee a certain sum, which is the penalty; but in a subsequent clause, called the condition, it is provided that if he shall pay another and smaller sum with interest at a specified time, the entire obligation shall be void. A penalty thus inserted in a contract is, however, a mere matter of form. Its legal effect was long ago established by equity, and this equitable doctrine has been fully accepted by courts of law. The party who fails to perform the agreement does not thereby forfeit the whole sum mentioned as the penalty, but is liable only for the amount of damages actually sustained by the other, and upon payment of such damages, or the principal and interest of the debt if the instrument is a penal bond, he is discharged from all other further obligation. Under certain circumstances, however, such a clause is not regarded as constituting a penalty, but is treated as a stipulation to pay a definite sum in the nature of liquidated or ascertained damages for a breach of the contract, and is binding according to its terms, so that the exact amount named in the instrument can be recovered from the debtor. John Norton Pomeroy.

Pen′alva, village of Spain, in the province of Huesca, near Fraga, on the Catalonian highway, has about 1000 inhabitants. Here was fought, on Aug. 15, 1780, a bloody battle between the army of Archduke Charles, consisting of Germans and Catalonians, and the army of Philip V., consisting of French troops and Castilians; the latter were defeated.

Pen′ance [from Lat. *pœnitentia*] is one of the seven sacraments of the Roman Catholic Church, and means a penalty imposed by the ecclesiastical authority, but voluntarily accepted by the sinner, by which atonement is made for sins actually committed and the divine punishment averted. The idea of justification in the eyes of God by doing penance was not foreign to the Jews and the pagans, and it showed itself very early in the Christian Church. With the Jews, sacrifices, fasts, rending of the clothes, strewing of ashes on the head, and other penalties were often imposed as means of justification, of averting the wrath of God; but at the same time it was strongly inculcated that the only sacrifice which pleased God perfectly was that of a repentant heart, and the only penance which satisfied him fully was that of the conversion of the sinful soul to obedience under his will. In the New Testament repentance and conversion are the only way to justification, and God's grace its only means; and the penance which very early came into common use in the Christian Church seems to have been simply a disciplinary measure. It was necessary for the Church, if it would not expose itself to fatal misconceptions, to excommunicate all such members as made scandal by signal and notorious crimes, by murder, adultery, idolatry, etc., and not allow them to return into the congregation until they gave public and unmistakable signs of repentance and conversion. But further, this penitential discipline seems not to have gone. In the fourth century its laws became very minutely fixed. The penitent had to go through four different stages: (1) that of the weepers (Gr. *prosklaiontes*; Lat. *flentes*), who were not allowed to enter the church during the time of public worship, but, standing outside, solicited the prayers of the faithful; (2) that of the hearers (Gr. *akroomenoi*; Lat. *audientes*), who were permitted to enter, but who remained among the catechumens, and, like them, left the church when the more solemn part of the service began; (3) that of the prostrators (Gr. *hypopiptontes*; Lat. *prosternentes*), who participated with the congregation in the general prayers, but only kneeling or prostrate; (4) that of the standers (Gr. *systantes*; Lat. *consistentes*), who were only excluded from participation in the sacraments. During the whole time of penance the penitent wore a peculiar dress, and was obliged to renounce all indulgences and luxuries, and practise many ascetic and austere exercises. His final admission into the congregation he received from the bishop who had excluded him, and who had the power of extending or shortening the time of penance. Up to the eighth century this public penance was in common use, but after that time it began to give way for the private penance, and in the eleventh and twelfth centuries it entirely disappeared. Hand in hand with its transition from public to private went its transformation from discipline to sacrament. At present it consists in the Roman Catholic Church of repentance, confession, satisfaction, and absolution. In Protestant churches penance was in use in the first period of Puritanism in Scotland; in Denmark between 1730 and 1746; in several districts of Germany, and also in some parts of Norway, but always as a disciplinary measure only. Clemens Petersen.

Penang′, or **Pulo-Penang,** an island in the Strait of Malacca, belongs to the presidency of Bengal, British India, and comprises an area of 107 square miles, with 59,956 inhabitants. The ground is high and mountainous, but the soil is very fertile, and eminently well adapted to the cultivation of pepper, cloves, nutmegs, and other spices, which are annually exported to the value of $75,000. Sugar, coffee, indigo, and cotton are also raised, and tin is abundant; 1195 tons were exported in 1850. Capital, Georgetown, with a good harbor and considerable trade.

Pena'tes [Lat.], the household gods of the ancient Romans, including the private Lares, as well as Jupiter, Juno, Vesta, and other gods. Besides these there were reckoned public Penates, who protected the state and city. A perpetual fire burned upon the hearth to the Penates, and food and salt for them were served at every meal. Libations and prayers were daily offered to them. (See LARES.)

Pencader, hundred of New Castle co., Del., traversed by the Philadelphia Wilmington and Baltimore R. R., and by the Chesapeake and Delaware Canal. Pop. 2542.

Pen'cils [Lat. *penicillum*], instruments for painting, drawing, and writing. The oldest pictures were no doubt produced simply by lumps of colored earth or chalk cut in forms convenient for holding in the hand. But in the fourth century B. C. Greek artists began to use wet colors, which were laid on with fine hair brushes. For such brushes or pencils the hairs of camels, badgers, sables, minks, kolinskis, fitches, goats, and the bristles of hogs are used. They are tied up in bundles terminating in a perfectly smooth cone, well pointed, and either drawn through goose-quills or fastened in metallic holders provided with wooden handles. The manufacture of such a pencil, especially of the finest kinds used by artists, requires great skill and care. The lead pencil was at one time actually manufactured from lead, but subsequently graphite was used almost exclusively. The graphite from the Cumberland mines was especially celebrated, but afterwards large deposits of the finest kind of this mineral were discovered in Siberia and other places. The natural graphite, however, was never found so pure and uniform that a perfectly reliable pencil could be made from it. It was therefore subjected to an artificial process of purification. It was pulverized and all impurities were removed. The pulverized mass was then made solid once more by the aid of hydraulic pressure. At last this was sawed in thin plates, the plates cut in fine sticks, and these encased in wood to protect them from breaking and from soiling the hands.

Pen'cis, tp. of Dallas co., Ala. Pop. 942.

Pen'der (WILLIAM D.), b. in North Carolina in 1834; graduated at the U. S. Military Academy July, 1854, when he was appointed second lieutenant of artillery; transferred to the dragoons in 1855, he was almost constantly engaged in active service on our frontier until Mar., 1861, when he resigned to enter the Confederate service. At once appointed colonel, he was soon raised to brigadier and major-general, and served under A. P. Hill. At Gettysburg, in command of a division, he was killed on the last day of the fight, July 3, 1863.

Pen'dleton, town of England, in Lancashire, 2½ miles N. W. from Manchester, is the seat of a very extensive and steadily increasing manufacturing business, especially in linen and cotton goods. Rich collieries are worked in the vicinity. Pop. 20,900.

Pendleton, county of N. Kentucky, extending on the N. E. to the Ohio River. Area, 300 square miles. It is uneven, well wooded, and has a fertile limestone soil. It is traversed by the Licking River and the Kentucky Central R. R. Live-stock, wool, grain, and tobacco are leading products. Cap. Falmouth. Pop. 14,030.

Pendleton, county of West Virginia, bounded E. and S. W. by Virginia. Area, 500 square miles. It lies E. of the main Alleghany and W. of the Shenandoah range, and is traversed by parallel ridges, with wide, fertile, and well-cultivated valleys, which are watered by the forks of the S. branch of the river Potomac. Live-stock, wool, and grain are leading products. Cap. Franklin. Pop. 6455.

Pendleton, post-v. of Fall Creek tp., Madison co., Ind., on Indiana division of Cleveland Columbus Cincinnati and Indianapolis R. R., has 1 newspaper. Pop. 675.

Pendleton, tp. of St. François co., Mo. Pop. 851.

Pendleton, post-v. of Warren co., Mo., on the St. Louis Kansas City and Northern R. R.

Pendleton, post-v. and tp., Niagara co., N. Y., on Tonawanda Creek and the New York Central R. R. Pop. of v. 214; of tp. 1772.

Pendleton, post-v. of Reilly tp., Putnam co., O. P. 145.

Pendleton, post-v. and tp., cap. of Umatilla co., Or., on the Umatilla River.

Pendleton, post-v. and tp., Anderson co., S. C., on the Blue Ridge R. R. Pop. of v. 985; of tp. 2115.

Pendleton (EDMUND), b. in Caroline co., Va., Sept. 9, 1721; became a lawyer when twenty-one years old; was one of the leaders of the Virginia legislature, and often its Speaker; as a conservative he was the political antagonist of Patrick Henry; was in the first Continental Congress, 1774–75; drew up the resolutions by which Virginia instructed her delegates to propose the Declaration of Independence; though maimed for life by an accident in 1777, he continued to take an important part in public affairs, and afterwards presided over the courts of chancery and of appeals, and over the convention of 1788 by which Virginia endorsed the U. S. Constitution. He was distinguished as a debater. D. Richmond, Va., Oct. 23, 1803.

Pendleton (EDMUND MONROE), M. D., b. at Eatonton, Ga.; graduated in the Medical College of South Carolina 1838; practised medicine in Warrenton and Sparta, Ga., thirty-five years; several of his contributions to science have been copied into the British medical journals. At the organization of the Oglethorpe Medical College in Savannah he was elected professor of surgery, which, however, he declined because of feeble health, as also the chair of chemistry in another institution. He afterward turned his attention to agriculture, and became active in giving an impetus to fertilizers, first developing the fact that phosphoric acid and nitrogen are the two plant-constituents first exhausted from soils by cereals and cotton-culture. In 1872, Dr. Pendleton was called to the chair of scientific agriculture in the University of Georgia at Athens. His textbook on this subject has been adopted by the Agricultural College of Amherst, Mass., and other similar institutions. PAUL F. EVE.

Pendleton (GEORGE H.), b. at Cincinnati, O., July 25, 1825, a son of N. G. Pendleton, an able lawyer, and a grandson of Judge Nathaniel Pendleton of New York; became a lawyer; was in Congress 1857–65; was in 1864 Democratic candidate for Vice-President of the U. S.

Pends d'Oreilles. See KALISPELS.

Pend'ulum [Lat. *pendulus*, "hanging"]. A suspended body oscillating under the action of gravity is called a pendulum. In order to investigate the laws of its motions we abstract from its material qualities, and consider a heavy point suspended by a right line without weight from a fixed point, about which it is free to move. This is called a *simple pendulum*; by an *oscillation* is meant its motion from one extreme of the arc to the other extreme on the opposite side of the vertical. When the arc of vibration is small, the following relation is found to obtain between the length l of the pendulum and the time t of one vibration—viz. $t^2 = \frac{\pi^2}{g} l$, g denoting the force of gravity, or *the squares of the times are proportional to the lengths.* Hence, a pendulum making one oscillation in two seconds must have four times the length of one that oscillates once in one second of time. By g is meant the velocity acquired in one second by a heavy particle falling from rest by the action of the earth's gravity, the space fallen through being $= \frac{1}{2}g$. Hence, we see also, by putting $t = 1$ in the above equation, that $g = \pi^2 l$, or that the velocity acquired in one second is $\pi^2 \times$ the length of a simple seconds pendulum. That length having been found to be, at New York, 39.10 inches, it follows that $g = 32.16$ feet at that place.

It further appears that the time of vibration is independent of the length of the arc, so long as the arc is very small—an important property in the application of the pendulum to the regulation of timekeepers which was first made use of for that purpose by Huyghens. (See CLOCKS.) When a simple pendulum, being at the extremity of its arc of vibration, receives an impulse at right angles to the plane of its vibration, the heavy point will describe a curved path about the vertical, and it is then called a *conical pendulum.* Its path will be circular, with a certain impulse; a greater or less impulse will cause it to describe elliptic arcs. This property is made use of in regulators for steam-engines and other machinery.

When instead of a simple pendulum we have a material or *compound pendulum*—consisting, for instance, of a rod with a disk or ball attached to its lower extremity—the same laws can be applied by conceiving the whole mass of the pendulum united in one point, called the *centre of oscillation,* whose distance from the line of suspension is equal to the length of a simple pendulum vibrating in the same time as the given compound pendulum. That distance is found by dividing the sum of the *moments of inertia* of all material particles of the pendulum by the sum of their *statical moments.* When the line of suspension has a considerable length, and bears a very small proportion to the suspended mass, the centre of oscillation is very near the centre of gravity of the latter. Thus, when a disk of several pounds weight is suspended by means of a slender steel rod, the distance from the line of suspension to the centre of the disk will differ but little from 39.1 inches for a seconds pendulum.

For accurate experimental purposes it is necessary to take into account circumstances that modify in some degree the simple relation between the length and time of oscillation above stated. First, when the arc a employed

is not very small, and it becomes necessary to make a proper allowance for it, in order to reduce the time to what it would have been for infinitesimal vibrations. Secondly, in consequence of changes in temperature the length of the pendulum will not remain invariable, and the observed number of vibrations must be reduced to some standard temperature. Thirdly, if the vibrations are made in air, as is usually the case, it becomes desirable to calculate the number which would have been made in vacuum, all other circumstances being the same. The effect of the air, like that of any other fluid upon a body immersed in it, is to diminish the weight of the pendulum by a quantity equal to the weight of the air displaced, or to diminish the apparent force of gravity. Since the density of the air is variable, it becomes necessary to observe the barometer. J. E. HILGARD.

Pendulum Observations. By this term are designated observations to determine the force of gravity at various points on the earth's surface by means of a pendulum. Since the squares of the times of vibration of a pendulum of constant length are inversely proportional to the accelerating force, it is only necessary to ascertain by observation the time of one small vibration of the same pendulum, corrected for the temperature and density of the medium in which it oscillates, in order to obtain the relative values of the force of gravity at the several places of observation. Between that force and the figure of the earth there exists the following relation, known as *Clairaut's theorem*—namely, that $\frac{g}{G} = 1 + (\frac{5}{2}m - e)\sin^2 L$, when G is the force of gravity at the equator, g that at any latitude L, m the ratio of centrifugal force at the equator to gravity, and e the ellipticity, on the supposition that the earth is a spheroid of equilibrium. It is readily seen, then, that if observations be made at places in widely different latitudes, the earth's eccentricity may be deduced from the same. The following table gives an extract of experiments made by Sabine at various places; the column headed "computed oscillations" showing what should have been the number if the law derived from the aggregate of all the observations were strictly fulfilled at each station:

Pendulum Observations.

Stations.	Latitude.	Oscillations. Computed.	Oscillations. Observed.	Differences.
	° ′ ″	s.	s.	s.
Equator	0 0 00	86263.60		
St. Thomas	0 24 41 N.	86263.60	86269.32	+5.72
Maranham	2 31 34 S.	86264.30	86259.77	—4.53
Ascension	7 55 30 S.	86267.86	86273.04	+5.18
Sierra Leone	8 29 28 N.	86268.48	86268.33	—0.15
Trinidad	10 38 55 N.	86271.24	86267.27	—3.97
Bahia	12 59 21 S.	86274.90	86273.16	—1.74
Jamaica	17 56 07 N.	86284.80	86285.12	+0.32
New York	40 42 43 N.	86358.66	86357.73	—0.93
Paris	48 50 14 N.	86390.20	86388.48	—1.72
Shanklin	50 37 24 N.	86397.06	86396.54	—0.52
Greenwich	51 28 40 N.	86400.34	86400.59	+0.25
London	51 31 08 N.	86400.48	86400.00	—0.48
Arbury	52 12 55 N.	86403.12	86403.31	+0.19
Clifton	53 27 43 N.	86407.80	86407.23	—0.57
Altona	53 32 45 N.	86408.10	86408.94	+0.84
Leith	55 58 41 N.	86417.02	86417.89	+0.87
Portsoy	57 40 59 N.	86423.10	86424.60	+1.50
Unst	60 45 28 N.	86433.64	86435.56	+1.92
Drontheim	63 25 54 N.	86442.24	86438.77	—3.47
Hammerfest	70 40 05 N.	86462.42	86461.05	—1.37
Greenland	74 32 19 N.	86471.00	86470.50	—0.50
Spitzbergen	79 49 54 N.	86479.90	86483.01	+3.11

The ellipticity of the earth derived from these and many other experiments of a similar kind is $\frac{1}{289}$, while that derived from geodetic measurements is $\frac{1}{295}$. (See GEODESY.)

A correction for reducing the observation to the level of the sea has been applied in every instance, but from the difficulty of ascertaining the density of the intervening strata such correction cannot be very exact.

The differences in the table indicate very sensible irregularities in the observed times, which doubtless result mainly from the different densities of the matter in the proximate vicinity of the several places of observation. They correspond to similar differences found in the observed amplitudes of measured arcs of the meridian.

This subject has of late received much attention. A marked deflection of the plumb-line having been observed in the vicinity of Moscow, pendulum experiments disclosed a corresponding deficiency of attraction over a well-defined area. Experiments made by Airy in the Harton mine, Durham, England, have shown a diminution of the force of gravity by its $\frac{1}{19200}$th part at the bottom of a shaft 1256 feet in depth. A comparison of the force of gravity between Geneva and Righi-Kulm, by Plantamour has shown that the attraction of the mountain is $\frac{1}{12300}$th part of that of the whole earth, the station on the mountain being 4526 feet higher than that on the lake.

When we desire to ascertain the absolute length of a seconds pendulum, it becomes necessary to measure the distance between its point of suspension and its centre of oscillation. Accurate experiments to this end were first made in 1790 at Paris by Borda, who employed a spherical platinum ball suspended by fine wire 12 feet in length, and found, after applying all due corrections, 3 feet 8.5593 lines (old French measure). The method devised by Huyghens and first employed by Kater is, however, that which affords the simplest means of ascertaining the length of an equivalent simple pendulum. It consists in using a *reversible* pendulum; that is, a rod with opposite knife-edges near either end, and so weighted with two *unequal* weights that the time of vibration is the same whichever of the two knife-edges the pendulum is suspended from. In such case each knife-edge is in the centre of oscillation of the other, and the time of vibration is therefore the same as that of a simple pendulum whose length is equal to the distance between the two. When the times of vibration are not exactly, but very nearly, equal, the requisite reduction can be deduced from the relative distances of the two knife-edges from the centre of gravity. By having the two weights of equal size, one of them being hollow, and placed at equal distances from the nearest knife-edge, the resistances and other variable circumstances affect the vibrations alike in both positions of the pendulum. Such is the form of the reversible pendulum used by Plantamour in Switzerland, which has also been adopted by the European Geodesic Association. The times of oscillation are observed by means of a telescope, and are compared by the electro-chronographic method with a standard clock regulated by astronomical observations. The knife-edges rest on agate planes supported by a firm frame, and about 3000 consecutive oscillations are observed in each of the four positions in which the pendulum can be suspended. The length of a seconds pendulum at Geneva is found to be 0.993333 of a mètre.

The length of a simple pendulum making *in vacuo* one oscillation in one second of mean solar time, at a fixed place, has frequently been proposed as a permanent unit of reference for standards of length, from which they might be reproduced in case of loss, but the wide distribution of a large number of accurate standards renders it unlikely that it will ever be necessary to have recourse to such means. J. E. HILGARD.

Pene'do, town of Brazil, province of Alagoas, on the San Francisco, near its mouth, is well built, and carries on a considerable trade in cotton, coffee, and hides. P. 9000.

Penelope, a gallinaceous bird. See PENELOPIDÆ.

Penel'ope [Gr. Πηνελόπη], in the Greek legend, was the daughter of Icarius, the wife of Odysseus (Ulysses), and the mother of Telemachus. While her husband was absent at Troy she was beset by numerous and eager suitors, whom she put off by declaring that she must first finish weaving the shroud of Laërtes. Accordingly, she wove by day and unwove by night, and thus prolonged the work. Detected in her noble deceit, she was hard pressed by the villains, but was relieved by her husband's timely return.

Penelop'idæ [*Penelope* or *Crassidæ*], a family of gallinaceous birds, including the curassows and guans of South America. The bill is moderate, varying in form according to the genus, with the culmen more or less arched towards the tip; nostrils varying in position according to the subfamily; the wings moderate and round; tail elongated and broad; tarsi robust, with the toes three before, connected together by a basal web, and a long hinder one on the same plane as the front ones. The sternum has its lateral elements (*Metostea*) united by a broad margin with the central part (*Lophosteon*), the single notch being half as long as the sternum itself. The family, by the most recent systematic authors (Sclater and Salvin), has been divided into three sub-families—(1) Cracinæ, with four genera; (2) Penelopinæ, with seven genera; and (3) Oreophasianæ, with one genus. The species are "strictly confined to the forests of the New World, and extend from the Rio Grande of Texas on the N. to the wooded region of Paraguay on the S. They do not occur in the Antilles, with the exception of Trinidad and Tobago, and on the western side of the Andes do not pass southward of the Gulf of Guayaquil." The species found within the limits of the U. S. is *Ortalida vetula*. The *Oreophasis Derbianus* is said to be absolutely restricted to the forests surrounding a single volcano in Guatemala (Volcan de Fuego), at the height of 10,000 feet above the level of the sea. (See also CURASSOW and GUAN.) THEODORE GILL.

Penetan'guishene, a port of entry of Simcoe co., Ont., Canada, on a bay of Lake Huron, 34 miles N. of Barrie. It has a trade in fur, fish, cattle, and produce, and is the seat of the Ontario reformatory prison. It was once a military and naval station. Pop. about 1000.

Pen′field, post-v. of Greene co., Ga. Pop. 447.

Penfield, post-v. and tp., Monroe co., N. Y. P. 2928.

Penfield, post-v. and tp., Lorain co., O. Pop. 749.

Pen′guin, the name of a bird with imperfect wings, derived from "pengwin," a corruption of "penwing" or "pinwing," "meaning a bird that had apparently undergone the operation of pinioning or 'pinwinging,' as it is in at least one part of England still commonly called." The formal name, "pen-wing," it is said, still survives as a reminiscence, in the island of Newfoundland, of the auk or *Alca impennis*, not long ago inhabiting its rocks. The etymologies given by many authors from the Latin *pinguedo* ("fatness") or the Welsh *pengwyn* ("white head") are undoubtedly erroneous. (See A. Newton in *Ann. and Mag. Nat. Hist.* (4), iv. 133, 1869.) In recent times the name has been transferred almost entirely to birds representing a peculiar family (Spheniscidæ), exclusively inhabiting the ocean and coasts of the southern hemisphere. (See SPHENISCIDÆ.) THEODORE GILL.

Penhallow (SAMUEL), b. in Cornwall, England, July 2, 1665, was a pupil of Charles Morton at Newington Green Academy; accompanied his teacher to Massachusetts 1686; settled at Portsmouth, N. H., where he became treasurer of the province, judge of the superior court, and was chief-justice from 1717 to his death, Dec. 2, 1726. Author of a *History of the Indian Wars of New England from 1703 to 1726*, published 1726, included in the *N. H. Hist. Colls.*, and recently reprinted at Boston.

Penikese Island. See ELIZABETH ISLANDS.

Penin′sula, tp. of Grand Traverse co., Mich. P. 667.

Pen′iston (ANTHONY A.), M. D., b. at Baton Rouge, La., May 24, 1824; graduated at Harvard University in both the literary and law departments, and in the medical department of the University of Louisiana 1853; resided in Paris 1853–55; on his return became one of the founders of a new school of medicine in New Orleans, La., 1856. D. Apr. 2, 1863. PAUL F. EVE.

Peniten′tiaries [Lat. *pœnitens*, "repenting"] were first instituted by the Friends of Pennsylvania in 1786, and are now established on a double plan, that of Pennsylvania and that of New York. According to the first system, the prisoners are kept in separate cells, where they work during stated hours, receive visits from their moral instructors, but are absolutely excluded from any communication with their fellow-prisoners. According to the second system, the prisoners work and eat together, but sleep in separate cells, and are absolutely forbidden to speak to each other. Under the first system punishment is administered by deprivation of food, light, and work for a certain time; under the second, by whipping.

Penn, tp. of Shelby co., Ill. Pop. 428.

Penn, tp. of Stark co., Ill. Pop. 1121.

Penn, tp. of Jay co., Ind. Pop. 1441.

Penn, tp. of Parke co., Ind. Pop. 1335.

Penn, tp. of St. Joseph co., Ind. Pop. 4982.

Penn, tp. of Guthrie co., Ia. Pop. 676.

Penn, tp. of Jefferson co., Ia. Pop. 1616.

Penn, tp. of Johnson co., Ia. Pop. 676.

Penn, tp. of Madison co., Ia. Pop. 651.

Penn, post-v. and tp., Cass co., Mich., on the Michigan Central and Chicago and Lake Huron R. Rs. Pop. 1421.

Penn, tp. of McLeod co., Minn. Pop. 420.

Penn, tp. of Sullivan co., Mo. Pop. 1744.

Penn, tp. of Highland co., O. Pop. 1471.

Penn, tp. of Morgan co., O. Pop. 1242.

Penn, tp. of Allegheny co., Pa. Pop. 2685.

Penn, tp. of Berks co., Pa. Pop. 1515.

Penn, tp. of Butler co., Pa. Pop. 837.

Penn, tp. of Centre co., Pa. Pop. 1158.

Penn, tp. of Chester co., Pa. Pop. 692.

Penn, tp. of Clearfield co., Pa. Pop. 639.

Penn, tp. of Cumberland co., Pa. Pop. 1888.

Penn, tp. of Huntingdon co., Pa. Pop. 1143.

Penn, post-v. and tp., Lancaster co., Pa., on the Reading and Columbia R. R. Pop. 1972.

Penn, tp. of Lycoming co., Pa. Pop. 701.

Penn, tp. of Perry co., Pa. Pop. 1529.

Penn, tp. of Snyder co., Pa. Pop. 1415.

Penn, post-v. and tp., Westmoreland co., Pa., on Pittsburg division of Pennsylvania R. R., includes the scene of Boquette's battle with the French and Indians. P. 820; of tp. 2423.

Penn, tp. of Williamsburg co., S. C. Pop. 676.

Penn (GRANVILLE), son of Thomas and grandson of William Penn, b. at Philadelphia, Pa., Dec. 9, 1761; was for many years assistant chief clerk of the British war-office, and succeeded to the family estates on the death of his brother, John Penn, in 1834. D. at Stoke Park, Buckinghamshire, Sept. 28, 1844. Author of numerous works, chiefly archæological or theological, among which the most important were *Memorials of Sir William Penn* (1833, 2 vols.) and a translation of the New Testament under the title *The Book of the New Covenant* (1836–38), which displayed considerable learning.

Penn (JOHN), a grandson of William Penn, b. in England 1728; proprietary governor of Pennsylvania 1763–71, and again 1773–75; a man of austere and ungenial disposition; neutral during the Revolution, although leaning towards royalism. D. in Bucks co., Va., Feb., 1795.

Penn (JOHN), b. in Caroline co., Va., May 17, 1741; read law with his relative, Edmund Pendleton; became an eloquent and successful barrister; removed in 1774 to Greenville co., N. C.; was in Congress 1775–76, 1778–80; signed the Declaration of Independence; served with ability in various important public positions. D. Sept., 1788.

Penn (JOHN), LL.D., brother of Granville and grandson of William Penn, b. in England in 1759; educated at Clare Hall, Cambridge, and succeeded his father, Thomas Penn, as hereditary governor of Pennsylvania 1775. D. in 1834. Author of several poetical, dramatic, and critical productions, which, however, never attained popularity.

Penn (RICHARD), brother of Gov. John Penn, was b. in England in 1734; was proprietary governor of Pennsylvania 1771–73; was liberal, scholarly, and highly popular; carried in 1775 a petition from Congress to the king, and it is said that he entered the House of Commons; when examined by the House of Lords regarding the colonies, his liberal views drew forth a strong rebuke from the ministry. D. in England May 27, 1811.

Penn (THOMAS), son of William, b. in England Mar. 8, 1702; resided many years in Pennsylvania; returned to England 1741; became proprietor and governor of Pennsylvania on the death of his brother John, 1746; was the principal founder of Pennsylvania College, and a liberal benefactor of many public institutions at Philadelphia. D. in London, Eng., Mar. 21, 1775.

Penn (WILLIAM), a celebrated member of the Society of Friends and the founder and first legislator of the State of Pennsylvania, was b. at London Oct. 14, 1644. He was a son of Admiral Sir W. Penn, and received a very careful education. He studied at Christ Church, Oxford, but having met here with Thomas Loe, he was converted to Quakerism, and shortly after expelled from the university. The father sent him on travels in Holland and France, and on his return in 1666 he was set to manage the estates of the family in the county of Cork, Ireland. He fulfilled this task with great success, but in Cork he met for the second time with Thomas Loe. He was imprisoned for attending a Quaker meting, and although he was very soon liberated he had to leave Ireland. On his return to London he began to preach and work in different ways for the society to which he belonged, and after the publication of *The Sandy Foundation Shaken* (in 1668) he was thrown into the Tower. Here he wrote *No Cross, no Crown*, and *Innocency with her Open Face*, but by the interference of the duke of York he soon obtained his freedom again. The good relations between father and son were several times disturbed on account of the religious views of the latter, but after every rupture a reconcilement soon followed; and when the old admiral died (in 1670) he left his estates and all his property to his son. Penn continued, however, to preach and work for what he considered to be the highest truth, and in 1671 he was once more thrown into prison. As he would not take an oath at his trial, he was sent to Newgate for six months, and while here he wrote the celebrated defence for toleration, *The Great Cause of Liberty of Conscience*. Having been liberated, he made a tour to Holland and Germany, and on his return in 1672 he married Gulielma Maria Springett. From his father he had inherited a claim on the government for £16,000. In settlement of this claim the government granted him large territories in North America, the present State of Pennsylvania, with right to found a colony or society with such laws and institutions as expressed his views and principles. In 1682 he went over to America. A great number of settlers, not only Quakers, but members of all denominations, Englishmen, Swedes, and Germans, gathered together; a charter of liberties was issued, and a democratic government instituted; the city of Philadelphia was planned, and the colony soon came into a most flourishing condition. Towards the close of the reign of Charles II., Penn returned to England, in-

tent on bettering the social position of the Quakers in that country, in which plan he also partly succeeded. During the reign of James II. his connection with the court became very intimate—so much so that he was suspected of being implicated in certain disgraceful measures of the king. After the overthrow of James he was twice accused of entertaining treasonous communications with the exiled king, and an order of council (Mar. 14, 1692) deprived him of his title to the Pennsylvania government. After a most searching trial he was fully acquitted in 1693, and another order of council restored his title to him in 1694. After the death in 1693 of his first wife, he married (in 1695) Hannah Callowhill, and went in 1699, for the second time, to America, where he stayed till 1701. His return to England was chiefly caused by the deranged state of his affairs there. The mismanagement and villainy of his agent had brought him to the verge of bankruptcy. He was even thrown into the Fleet for some time in 1708. These vexations affected his health; in 1712 he was struck by apoplexy, and although he recovered, his mental faculties were greatly impaired after that time. D. July 30, 1718, at Ruscombe in Berkshire. His contemporaries, even such as were not his friends, testify to the correctness and justice of his character, and recent attempts at reviving old suspicions have been successfully refuted. C. PETERSEN.

Pennacooks. See MASSACHUSETTS INDIANS.

Pen'nant (THOMAS), LL.D., b. at Downing, Flintshire, England, June 14, 1726; educated at Queen's and Oriel colleges, Oxford; devoted himself to zoology and archæology, and produced a large number of folio and quarto volumes containing his travels in various parts of the British Islands, which possess few graces of style and little scientific accuracy, but have preserved from oblivion some valuable facts. D. at Downing Dec. 16, 1798. Among the more important of his works are *British Zoology* (4 vols., 1761–77), *History of Quadrupeds* (2 vols., 1771), *Three Tours in Scotland* (3 vols., 1771–76), *Arctic Zoology* (3 vols., 1784–87), *Antiquarian and Historical Account of London* (1790), and his amusing autobiography, entitled *The Literary Life of the Late Thomas Pennant, Esq., written by himself*, published during his lifetime in 1793.

Penne, town of Italy, province of Teramo, in the Abruzzi. It is situated on two hills below which flow the torrents Tavo and Sino from Monte Corno. Penne is of very ancient origin, and the medicinal springs for which it is now well known are praised by Vitruvius. Pop. in 1874, 9848.

Penn'field, tp. of Calhoun co., Mich. Pop. 1132.

Penn Forest, tp. of Carbon co., Pa. Pop. 504.

Penn Haven, post-v. of Lausanne tp., Pa., on the Lehigh River.

Pen'nington, tp. of Bradley co., Ark. Pop. 1806.

Pennington, post-v. of Hopewell tp., Mercer co., N. J. Pop. 1200.

Pennington, tp. of Trinity co., Tex. Pop. 193.

Pennington (WILLIAM), son of Gov. W. S. Pennington, was b. at Newark, N. J., May 4, 1796; graduated at Princeton 1813; was clerk of his father's district court 1815–26; became chancellor of New Jersey; governor 1837–43; declined the governorship of Minnesota Territory and other Federal offices; was a member of Congress 1859–61, and was chosen Speaker of the House after a long contest. D. at Newark, N. J., Feb. 16, 1862.

Pennington (WILLIAM S.), b. in 1757; was major of the 2d New Jersey artillery in the Revolutionary army; became a lawyer in 1802; associate justice of the State supreme court in 1804; was for a time chancellor of the State; governor 1813–15; U. S. district judge 1815–26. D. at Newark, N. J., Sept. 17, 1826. Author of a volume of law-reports 1825.

Penningtonville, post-v. of Sadsbury tp., Chester co., Pa.

Penns'bury, tp. of Chester co., Pa. Pop. 767.

Penn's Grove, post-v. of Upper Penn's Neck tp., Salem co., N. J., on Delaware River, about 12 miles N. of Salem.

Penn's Station, post-v. of Westmoreland co., Pa.

Penns'ville, tp. of Morgan co., O. Pop. 189.

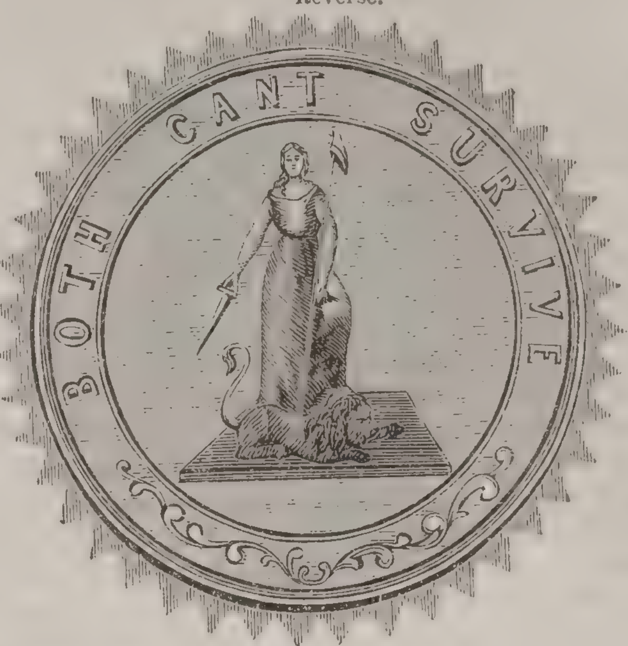
Pennsylva'nia, one of the Middle States of the Atlantic slope, and one of the original thirteen of the first Confederacy, lying between the parallels of 39° 43′ and 42° 15′ N. lat. (the parallel of 42° being its northern limit to the western boundary of New York, where it takes in a small tract of the Lake Erie coast), and between the meridians of 74° 43′ 36″ and 80° 31′ 36″ W. lon. from Greenwich. It is bounded on the N. by Lake Erie and the State of New York, on the E. by Chautauqua co., N. Y., and by Delaware River, which separates it from Delaware co., N. Y., and from the State of New Jersey; on the S. by Delaware, Maryland, and West Virginia; on the W. by West Virginia, Ohio, and Lake Erie. Its greatest length from E. to W. is 302.34 miles, and its greatest breadth from N. to S. 175.6 miles. Its mean length is 280.39 miles; its mean breadth, 158.05 miles. Its area, including the water-surface of the portions of Lake Erie and Delaware Bay which pertain to it, is 46,000 sq. m.; its land-area is 45,086 sq. m., or 28,808,443 acres.

Face of the Country, Mountains, Rivers, Lakes, etc.—The surface of Pennsylvania is greatly diversified, but falls naturally into three divisions of unequal size—viz. (1) The S. E. section or district extending from Delaware River to the Blue or Kittatinny Mountains; near the river a narrow plain of level land, not over 75 or 100 feet above the sea, but a few miles inland a rolling or undulating tract with gently-rounded hills, for the most part with broad and beautiful valleys and ridges of hills of no great elevation, that portion of what is known as the Great Valley of the eastern chain of the Appalachian system being here (in Cumberland Valley) without a barrier toward the sea. There are occasionally here as in New Jersey, in this continuation of the red sandstone, isolated elevations of trap-rock, such as the Haycock in Berks co. and the Round Top in York. This region, while containing much mineral wealth, is admirably adapted for the growth of cereals. (2) The mountain-district adjoining this, which crosses the State in a belt varying in width from 75 to 160 miles, and trending from N. E. to S. W. All the mountain-chains which go to make up the Appalachian system are here in their full breadth, though not attaining a great altitude. The greater part of these chains do not rise above 2000 feet, though some of the summits of the Alleghanies proper attain a height of 2500 feet, and one or two of them nearly 3000. The mountains of the Appalachian system in the State, aside from their general division into two great ranges, the Blue or Kittatinny and the Alleghany range, are subdivided into a host of minor chains, ridges, or isolated mountains, and intersected by numerous valleys, often of considerable length, and broad and fertile, occasionally canoe-shaped, and of wonderful beauty, and sometimes narrow and deep, with the frowning and precipitous eastern face of the Alleghany range overhanging them. The most noted of these local mountain ranges and spurs are Sharp and Broad Mountain, enclosing the Pottsville and Mine Hill basin of the anthracite region; the Lime Mountain and Mahanoy and Little mountains, enclosing the Shamokin and Mahanoy basin; the Beaver Meadow Mountain basin, which extends to Bucks Mountain on the N., and has numerous short spurs or ranges intersecting it; and the chains which surround the exquisitely beautiful Wyoming Valley — Wyoming and Moosic mountains on the S. E. and Knob Mountain, Shawney Range, Capon's Range, and Lackawanna Range on the N. W. These mountain-groups, basins, and valleys all lie E. of the Susquehanna Valley proper, and the E. branch of the Susquehanna traverses nearly the whole length of Wyoming Valley. Between the Wyoming mountains and the Kittatinnies extends the "Poco" or "Pocono Wilderness"—a wild and desolate region, occupying a considerable portion of Pike and Monroe cos., and including swampy thickets of laurel and other shrubs, the lair of the panther, bear, and other wild animals, known to sportsmen as "The Shades of Death"—and extensive plateaus of beech-woods about 2000 feet above the sea. W. of the Susquehanna Valley are the Blue Mountains proper, then the Tuscarora mountains, the Shade and Black Log mountains, Sideling Hill Mountain, Broad Top, Jack's Mountain, Stone Mountain, and the Seven Mountains, Tussey's Mountain, and the isolated summits of Huntingdon, Warrior's Ridge, and Terrace Mountain. Some of the valleys, particularly Stone Valley, Juniata Valley, Great Aughwich Valley (a continuation of the preceding), and Kishacoquillas Valley, present landscapes of rare and extraordinary beauty; between Tussey's Mountain and the precipitous eastern front of the Alleghany range proper, are Bald Eagle Ridge and the magnificent Bald Eagle Valley, which opens at its lower portion into Bedford Valley on the E. For a part of the distance (110 miles) Nittany Valley runs parallel with it on the eastern side. The Bald Eagle Valley is 160 miles in length, but for a part of its length it is narrow. (3) The western table-land, which occupies about one-half the area of the State, is a broad rolling plateau, with occasional ranges of hills, but sloping northward and westward toward New York, Lake Erie, and Ohio River. It extends from the summits of the Alleghanies westward to the N. W. and W. boundaries of the State. The N. W. portion has several isolated summits, such as Mehoopany Mountain, Towanda Mountain, Blossburg Mountain, and Crooked Creek Mountain. It is the

region of pine and hemlock lands, and furnishes vast amounts of lumber to Eastern markets. The S. W. part is intersected by Negro Mountain, Chestnut Ridge, and Laurel Ridge. Ligonier Valley, lying between the last two ridges and intersected at one point by Youghiogheny River, which forces its way through both ranges, has some admirable landscapes. *Rivers.*—Regarded simply with reference to the drainage of the State, there are six distinct water-basins, which, with their tributaries, drain the entire State—viz. the Delaware and its affluents, which drain about $\frac{1}{7}$th of the State; the Susquehanna and its tributaries, about $\frac{4}{9}$ths; the Genesee, about $\frac{1}{320}$th; the Potomac, nearly $\frac{1}{28}$th; Lake Erie, about $\frac{1}{120}$th; and the Ohio, with its large and numerous affluents, about $\frac{1}{3}$d. The Ohio is formed by the union of two large rivers, the Alleghany and Monongahela, at Pittsburg. Both have numerous tributaries; the principal affluents of the Alleghany are Conewango, Oil, and French creeks, Tionesta Creek, Clarion River, Red Bank, Mahoning, and Crooked creeks, and Conemaugh River. The Monongahela receives the Youghiogheny and several smaller streams, while Chartier's Creek and Shenango River discharge directly into the Ohio. The Susquehanna is formed by the union of the E. and W. branches at Sunbury, and from thence flows S. and S. E. to Chesapeake Bay. The E. branch receives in Pennsylvania, Meshoppen, Tunkhannock, and Lackawanna creeks; the W. branch, Sinnemahoning, Pine, Lycoming, Loyalsock, and Muncy creeks, and on the S. bank Clearfield, Moshannon, Bald Eagle, White Deer, and Buffalo creeks. The Susquehanna itself receives Juniata River and Penn's, Sherman's, Conedogwinit, Breeches, Conewago, and Codorus creeks, and on the E. bank Shamokin, Mahanoy, Wiconisco, Powell's, Clark, Stony, Swatara, and Conestoga creeks. The principal tributaries of Delaware River in this State are Lackawaxen Creek, Lehigh River, Schuylkill River, and Brandywine River. Aside from Lake Erie, there are no lakes of importance. There are several islands in the Delaware, and two or three in Lake Erie, belonging to Pennsylvania.

Obverse.

Reverse.



Seal of Pennsylvania.

Geology.—Our space does not allow us to go into minute details in regard to the very interesting geological formations of Pennsylvania, and as an elaborate geological survey of the State is in progress, there is the less necessity for this; but the general features of its geology must be understood in order to comprehend the economic value of its varied and abundant mineral deposits. Bucks co., and a portion of Lehigh and Montgomery, forming the Alluvial plain N. of Philadelphia and 10 or 15 miles W. of the Delaware, is an Alluvial or Quaternary deposit of considerable thickness. The S. E. corner of the State, including Philadelphia, Delaware, Chester, Lancaster, and most of York cos., is Azoic. N. and W. of this the Alluvial belt, of no great width, extends to and across the Maryland line, with occasional isolated masses of trap-rock, already referred to. W. and N. W. of this a somewhat broader belt of Silurian rocks, forming the Kittatinny Mountains, and extending from the Hudson River region in New York, passes S. W. to Maryland and Virginia. This tract is rich in iron ores. The Devonian overlaps this along the W. slope of the Kittatinnies, and in the Devonian are found the three distinct anthracite coal-fields, the most important and valuable deposit of anthracite, though not the only one, on this continent. The area of these coal-fields is about 472 sq. m. The northern part of the State, nearly one-fourth of its area, extending to Lake Erie, is wholly Devonian, except occasional scattering outcrops of bituminous coal. W. of the Susquehanna and S. of its W. branch the Devonian and Silurian systems alternate to the summit of the Alleghanies proper, where the Conglomerate, which underlies the coal-measures, appears with a westerly dip; and thence to and beyond the W. boundary of the State, and from about 41° 30′ N. lat. S. into West Virginia, the whole region belongs to the coal-measures. The coal varies in quality and character, being all of it bituminous, but some cannel, and other deposits block or smelting coals. The N. W. portion of the State—the oil-region—is partly Devonian and partly Carboniferous.

Minerals and Mineralogy.—Gold, silver, copper, tin, and sulphur in a native state have been discovered in Pennsylvania, but none of them in such quantities as to make their working profitable. Prof. Genth estimates that the clay which underlies Philadelphia co. contains over $1,000,000,000 worth of gold, but adds that no one could realize more than from 30 to 60 cents per day in extracting it, as a cubic foot does not contain more than 3 cents' worth. Silver in some localities would pay better, but not well enough to make it profitable to work the mines. Iron does not exist in a native state, but the iron ores of the State embrace every known ore, and many not found elsewhere. The iron furnaces of Pennsylvania have hitherto made about one-half of the pig iron manufactured in the U. S., though having only two-fifths of the whole number of stacks. The iron interest has for the past two or three years been suffering from great depression all over the U. S., and Pennsylvania has suffered more than her share from the fact that some of the other iron-regions could produce iron at somewhat less cost than her furnaces. The most valuable of the minerals of Pennsylvania economically is her coal. Of anthracite coal nearly 25,000,000 tons are annually sent to market or used in the vicinity of the mines. The amount of bituminous coal is constantly increasing. Pennsylvania furnishes nearly one-third of the entire amount used, or about 6,000,000 tons. Petroleum is another mineral product of Pennsylvania of great value and importance. The product for the year 1874 was 11,589,115 barrels of 40 gallons each, of which 1,652,601 barrels were exported. The other mineral products of economic value are building-stone, including granite, brownstone (sandstone), trap or porphyry, and marble, slate, the production of which is rapidly increasing, zinc, nickel, and copper. Attempts have been made to produce salt, but the brines are more valuable for the chlorine, bromine, and iodine, and the compounds of these elements, which they contain, than for the salt. There are numerous mineral springs, some of them of great medicinal value. Several of them have been reputed to contain considerable quantities of chloride of lithium, but Prof. Genth finds but a slight, almost inappreciable trace in any of them. Of the minerals possessing only scientific value the number is very great, embracing almost every mineral of note in our largest catalogues.

Soil, Vegetation, and Botany.—The State has yet a large amount of forests; about 6,257,000 acres, or almost one-fourth of the area of the State, was included among the woodlands in farms, aside from the wild forests of the Pocono Wilderness, which have never been reclaimed. The demands on this for lumber, for hemlock bark for tanning, and for the use of the railroads, are, however, materially and rapidly diminishing this large reserve. The forest trees of the State include several species of pine, hemlock, spruce, fir, cedar, and cypress, as well as some other coniferous trees; 6 or 7 species of oak and 4 of hickory; the black walnut and butternut; 3 or 4 species of maple; the chestnut, chinquapin, beech, buckeye, linden, tulip tree, dogwood, hornbeam, birch, ash, willow, elm, aspen, sycamore, American poplar, mulberry, persimmon, gum, sassa-

fras, locust, wild cherry, papaw, catalpa, magnolia, crab-apple, etc. The flora is varied. The soil of the valleys and plains is generally fertile, and some of it very rich, yielding large crops for a succession of years.

Zoology.—From the extent of the forests in the central portion of the State the number of wild animals is very large—bears, panthers, wild-cats, lynxes, wolves, otters, the red and the gray fox, the raccoon, marten, mink, weasel, skunk, opossum, muskrat, porcupine, woodchuck or ground hog, and occasionally the beaver; the flying, red, striped, and gray squirrel; the hare or rabbit; and among the larger game the Virginian deer, and rarely the elk. Birds are numerous—of prey, the bald and the golden eagle, the turkey-buzzard, fish and other varieties of hawk, owls, the whippoorwill, the nighthawk, the swallow, etc.; these and the reptiles are the same as those found in New York and New Jersey.

Climate.—Extending over so large an area and of such varied surface and elevation, there are considerable differences in the climate of different portions of the State. The mean annual temperature, which is 52° in the S. E. counties, decreases to 48° in the central counties and 44° in the northern and north-western. The amount of rainfall is usually greatest in the S. E., and decreases N. and W. The following table gives the temperature and rainfall in ten representative points in the State:

Meteorological Data.	Erie, lat. 42° 07′, lon. 80° 10′; elevation, 671.5 ft.	Pittsburg, lat. 40° 32′, lon. 80° 02; elevation, 791 ft.	Newcastle, lat. 41° 1′ 40″, lon. 80° 21′.	Cannonsburg, lat. 40° 17′, lon. 80° 12.	Franklin, lat. 41° 23′, lon. 79° 50′.	Tioga, lat. 41° 48′ 30″, lon. 78° 10′.	Mount Joy, lat. 40° 11′, lon. 77° 22′.	Lewisburg, lat. 40° 57′ 30″, lon. 77° 58′.	Harrisburg, lat. 40° 15′, lon. 77° 56.	Philadelphia, lat. 39° 57′, lon. 75° 10′; elevation, 71.12 ft.
Temperature:	°	°	°	°	°	°	°	°	°	°
Annual mean temp...	49.2	52.6	49.3	50.1	47.1	41.4	52.3	48.4	53.3	52.5
Highest temp. of year	96	99.5	89	93	92	106	103	98	96	97
Lowest " " ...	8	10	4	6	0	—20	1	2	13	10.5
Range annual temp...	88	89	85	87	92	126	102	96	83	86.5
Mean temp. spring...	42.7	40.3	46.7	47.7	43.6	41.7	50.6	46.7	49.1	47.5
Highest " " ...	81	......	81	84	86	80	86	85	87	87.5
Lowest " " ...	11	......	2	6	7	—20	5	6	13	19
Range " " ...	70	......	79	78	79	100	81	79	76	68.5
Mean temp. summer.	71.2	73	70.9	70.2	67.5	64.4	72.9	69.7	74.7	72.9
Highest " " ...	96	99.5	89	93	92	106	103	98	96	97
Lowest " " ...	50	50	39	44	39	30	42	40	45	51
Range " " ...	46	49.5	50	49	53	76	61	58	51	46
Mean temp. autumn.	51.5	53.6	47	47.6	46.4	46.5	51.5	47.5	53.1	53.7
Highest " " ...	87	97	81	88	86	84	87	85	85	90
Lowest " " ...	20	18	15	16	10	10	1	21	30	20.5
Range " " ...	67	79	66	72	76	74	86	64	55	69.5
Mean temp. winter...	31.6	35.7	32.7	34.8	30.9	25.1	34.0	29.8	35.1	36.1
Highest " " ...	70	69	60	68	64	54	64	48	59	75
Lowest " " ...	8	10	4	6	0	—12	10	2	18	10.5
Range " " ...	62	59	56	62	64	66	54	46	41	64.5
Rainfall:	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
Mean annual rainfall	45.65	44.26	43.91	37.96	50.86	40.54	30.33	38.63	44.51	49.32
Rainfall of spring....	4.55	12.51	10.17	10.43	11.10	11.41	5.65	10.14	10.48	14.67
" summer..	12.78	11.50	10.67	8.48	11.34	7.38	7.48	10.83	10.93	9.92
" autumn..	13.88	10.49	8.29	10.04	16.68	14.85	11.80	10.69	8.40	16.31
" winter ...	14.44	9.76	14.78	9.01	11.74	6.90	5.40	6.97	14.70	8.42

Agricultural Productions.—In 1870 there were reported 17,994,200 acres of land in farms, about 63.44 per cent. of the entire land-area of the State; of these, 11,515,965 acres were improved and 6,478,235 acres unimproved, including woodlands. The value of the farms was $1,043,481,582, and of farming implements and machinery, $35,658,196. The value of all farm productions for the year was $183,946,027, and of animals slaughtered or sold for slaughter, $28,412,903. The value of home manufactures was $1,503,754; of forest products, $2,670,370; of market-garden products, $1,810,016 (evidently an under-statement); of orchard products, $4,208,094. The wheat-crop of the year 1869–70 was 19,672,967 bushels (nearly all of it winter wheat); the rye-crop, 3,577,641 bushels, a larger amount than is grown in any other State; Indian corn, 34,702,006; oats, 36,478,585; barley, 529,562; buckwheat, 2,532,173; flax, 815,906 pounds; hemp, 571 tons; wool, 6,561,722 pounds; hay, 2,848,219 tons; hops, 90,688 pounds; tobacco, 3,467,539 pounds; maple-sugar, 1,545,917 pounds; sorghum-sugar, 9 hogsheads; sorghum-molasses, 213,373 gallons; maple-molasses, 39,385 gallons; Irish potatoes, 12,889,367 bushels; sweet potatoes, 131,572; peas and beans, 39,574; beeswax, 27,033 pounds; honey, 796,989 pounds; domestic wine, 97,165 gallons; cloverseed, 200,679 bushels; flaxseed, 15,624; grass-seed, 50,642; butter, 60,834,644 pounds; cheese, 1,145,209 pounds; milk sold, 14,411,729 gallons. Value of all live-stock, $115,647,075; number of horses, 611,488; of mules and asses, 18,009; of neat cattle, 1,505,897, of which 706,437 were milch cows; of sheep, 1,794,301; of swine, 867,548. The report of the agricultural department gives the value of all live-stock in the State in Jan., 1875, as $121,803,698. There were estimated to be 573,700 horses, 25,600 mules, 828,800 milch cows, 722,600 oxen and other cattle, 1,674,000 sheep, and 930,900 swine. The principal crops of 1874, according to the same authority, were—wheat, 16,636,000 bushels; rye, 3,250,000; Indian corn, 35,821,000; oats, 25,607,000; barley, 437,000; buckwheat, 2,062,000; Irish potatoes, 9,223,000; tobacco, 10,500,000 pounds; hay, 2,421,900 tons. The value of these crops was stated at $117,730,915.

Manufacturing Industry.—Pennsylvania ranks second only to New York in the annual product of her manufactures, while, if we could place any dependence upon the estimates of capital employed in manufacturing given in the census, it would seem that the State was first in the amount of its capital invested; but these estimates are acknowledged to be grossly erroneous. The general statistics of manufactures are—37,200 establishments, employing 319,487 hands (256,543 men, 43,712 women, and 19,232 children); the capital invested was stated at $406,821,845 (it was quite probable that it was at least four times that sum); the amount of wages paid was $127,976,594; the amount of raw material used, $421,197,673; and the amount of annual product, $711,894,344. The Pennsylvania statisticians give the annual product in 1875 as $1,067,841,351, but go into no details, except the apportionment of the increased amount to the several counties. Of the various industries which employ its people, iron and manufactures of iron occupy the first place—907 establishments, producing annually $129,174,007; flouring-mill products, 1251 mills, were $31,124,017; leather tanned, curried, dressed, and in morocco, 1495 establishments, amounted to $28,899,466; machinery of all kinds, 477 machine-shops, produced $29,258,153. Of woollen goods, there were produced in 403 mills $27,361,897; cotton goods, 143 establishments, goods to the value of $17,565,028; boots and shoes and findings, 359 shops, produced goods to the amount of $11,322,406; glass and glassware, 52 establishments, $8,301,325 (the glass-factories of Pittsburg alone produce about $11,600,000, and the 25 or 30 others more than $6,000,000 more); molasses and sugar, refined in 15 establishments, produced $26,731,016; printing cotton and woollen goods, $6,113,584, in 7 establishments; printing and publishing, 307 offices, $13,482,449; bleaching and dyeing, 79 establishments, $7,285,114; brick, 458 kilns, $6,071,209; clothing, ready made, 1538 establishments, $23,363,156; coal oil rectified, 89 establishments, $15,251,223; drugs and chemicals, 82 establishments, $8,451,991; furniture, 948 cabinet-shops, $8,082,530; carpets, 396 establishments, $10,218,621; cars, freight and passenger, 49 car-shops, $9,288,041; carriages and wagons, 1449 establishments, $6,682,302; bread and other bakery products, 809 bakeries, $5,597,291; agricultural implements, 286 establishments, $3,652,295; bookbinding, 91 binderies, $3,588,623; cooperage, 474 shops, $3,209,470; hosiery, 76 factories, $5,306,738; steel and steel springs, 26 establishments, $7,754,801; tobacco and cigars, 1000 establishments, $6,130,873; tin, copper, and sheet-iron ware, 974 establishments, $5,311,810; worsted goods, 31 establishments, $7,883,038; liquors, malt and distilled, 354 distilleries and breweries, $11,674,628; lumber, planed and sawed, and sash, doors, and blinds, 1953 saw and planing mills, $18,080,705; marble and stone work, monuments, etc., 308 establishments, $4,843,302; packed meats, 22 packing-houses, $6,662,902; paints and oil floor-cloth, 40 establishments, $5,187,774; paper, 83 establishments,

$6,511,446; patent medicines and compounds, 61 establishments, $6,344,796; soaps, candles, perfumery, and fancy soaps, 115 establishments, $3,917,826; silk goods and silk and twist, 10 establishments, $1,662,900 (in 1874–75 the production of the 23 establishments was $1,876,744); oils, vegetable and animal, 27 establishments, $2,108,623; shipbuilding, repairing, and materials, 106 shipyards, $3,083,244; umbrellas, canes, and umbrella furniture, 31 factories, $2,479,643; lime, 403 kilns, $2,058,675; brass founding and finishing, 63 establishments, $2,030,055; confectionery, 268 establishments, $2,491,332; hats and caps, 81 factories, $2,813,766; saddlery and harness, 903 establishments, $3,051,771. Sixteen other branches of manufacturing industry produced in 1108 establishments goods to the value of between $1,000,000 and $2,000,000 each.

Mining.—The mining interests of Pennsylvania are large; in 1870 they lacked but $182,214 of equalling the entire product of the other States and Territories. The returns of the census of 1870 show 3086 mining and quarrying companies, of which 598 were engaged in coal-mining; they were reported to have a cash capital invested of $84,660,276, to give employment to 81,215 hands, to pay $38,815,276 in wages, and to produce $76,208,745 of coal, ores, petroleum, and quarry products. A little more than two-thirds of this amount ($52,357,814) was coal, and three-fourths of the remainder was petroleum, while iron, copper, nickel, zinc, marble, slate, and other stone made up the amount. At the close of 1875 the entire mining product of the State exceeded $100,000,000 per annum.

Railroads and Canals.—The auditor-general's report on railroads, canals, and telegraphs for 1875 gives the returns to the beginning of 1875. From this report we learn that there were in the State at that time 146 railways operated by steam, the main lines of which had a length in miles of 7886.56, of which 6829.87 were in operation, and of this 4392.91 miles were in Pennsylvania, in addition to 1547.64 miles of branch roads and 2733.14 of sidings. There were 1806.28 miles of double-track road. In 1873–74 there were 5228.61 miles completed and operated in Pennsylvania, including branches. The amount of capital stock of these roads paid in was $482,931,393.50; amount of funded debt, Jan. 1, 1875, $437,157,118.44; amount of floating debt, $34,923,155.75; total funded and floating debt, $471,633,998.02; cost of roads and equipment, $744,701,826.99. Number of passengers carried on cars during the year, 42,297,158; gross amount of tonnage for year, 78,992,785; number of miles run by all trains for the year, 99,443,714. The gross expenses of these roads for the year were $82,940,105.49, of which $44,241,700.18 was for operating the roads. The gross receipts were $137,446,245.16. There were in the State 40 passenger railways operated by horse-power. The total length of these roads was 311.51 miles, and the cars were drawn by 6430 horses. Total cost of roads and equipment, $9,695,843.57; the amount of capital stock subscribed was $14,965,672.50, of which only $7,028,901.80 had been paid in; and there was $2,676,121.48 of funded and floating debt. The number of passengers carried on these cars was 91,036,500. The total expenses were $4,149,553.68; the total receipts, $5,828,690.27. *Canals.*—There are 9 canals in the State, having a total length of 875 miles; the cost of the canals and fixtures was $36,816,728.14; the amount of capital actually paid in is $46,107,629, and of funded and floating debt, $46,239,173.12. The amount of tonnage carried on them in the year 1874 was 7,925,883 tons. The annual expenses are $1,179,890.75, and the receipts, $2,289,824.55.

Finances.—The public debt on Dec. 1, 1875, amounted to $23,233,137.74, and there was in the sinking fund $9,466,572.85 toward reducing it, leaving net indebtedness of $13,766,564.89. The debt is being rapidly reduced, and probably by 1890 will be extinguished. Receipts into the treasury for the year ending Dec. 1, 1875, including balance, $7,534,650.67, and disbursements $6,541,443.40, leaving a balance in the treasury of $993,207.27.

Commerce.—As Pennsylvania nowhere touches the ocean, and only at one point one of the great lakes, its foreign commerce is not, of course, so large as that of States having numerous harbors and seaports. Still, a large foreign business is conducted through the port of Philadelphia, which is well situated for that purpose (according to the government reports, Philadelphia ranks as the fourth port in the amount of her imports and sixth in the amount of her exports, while her merchants also import largely through New York in bond), and a smaller but considerable trade through the port of Erie. Pittsburg is also a port of entry, but its imports and exports are indirect, and, though the latter are large, the city is mostly noted for its domestic trade, carried on upon Ohio River and the numerous railways which centre there. The following table gives the commercial statistics of the three ports for the years ending Dec. 31, 1874, and June 30, 1875:

Customs Districts.	Imports for the year ending Dec. 31, 1874.	Domestic exports for year ending Dec. 31, 1874.	Foreign exports for year ending Dec. 31, 1874.	Imports for year ending June 30, 1875.	Domestic exports for year ending June 30, 1875.	Foreign exports for year ending June 30, 1875.	Entrances for year ending June 30, 1875, including coastwise trade. Vessels.	Tonnage.	Crews.	Clearances for year ending June 30, 1875, including coastwise trade, etc. Vessels.	Tonnage.	Crews.	Registered, enrolled, and licensed tonnage in 1875. Vessels.	Tonnage.	Indirect trade for year ending Dec. 31, 1874, imports.
	$	$	$	$	$	$									$
Erie	229,675	47,723	......	361,593	58,690	......	829	459,473	10,211	820	456,911	9,881	74	20,516	
Philadelphia	25,306,525	29,878,911	22,432	24,236,387	28,588,019	23,635	2,355	1,155,479	31,216	2,566	1,347,296	36,543	3,039	403,874	874,045
Pittsburg	....	....	......	....	....	......	.....	....	......	.....	....	......	457	98,720	
Totals	25,536,200	29,926,634	22,432	24,597,980	28,646,709	23,635	3,184	1,615,052	41,427	3,386	1,804,207	46,424	3,570	527,110	874,045

The internal commerce of the State vastly exceeds its foreign. Over its railways, canals, and navigable rivers the products of its numerous manufactories, mines, and farmlands, as well as great quantities of foreign goods and the products of other States, are constantly passing, and the aggregate amount is counted by probably thousands of millions. The coal, iron, and oil shipped annually make up over $150,000,000, while grain, flour, and meal, brick, machinery, locomotives, cars and car-wheels, woollen and cotton goods, imported and American silks, provisions, produce, butter and cheese, groceries generally, etc., make a total which considerably exceeds $2,000,000,000.

Population.

Census year.	Total population.	Males.	Females.	White.	Colored.*	Native.	Foreign.	Density of population.	Ratio of increase of population.	Illiteracy.	Persons of school age, 5–20.	Persons of military age, 18–45, males.	Persons of voting age, 21 and upward, males.	Citizens.	No. of dwellings in the State.	No. of persons to a dwelling.	No. of families.	No. of persons to a family.
1790	434,373	222,810	211,563	424,099	10,274	....	....	9.45	.....	......	158,329	85,789	103,260					
1800	602,365	309,507	292,857	586,095	16,270	....	....	13.09	38.67	......	219,540	118,968	143,362					
1810	810,091	413,575	396,518	786,804	23,287	....	....	17.60	34.49	......	295,278	159,993	192,801					
1820	1,049,458	532,432	517,047	1,017,094	30,413	....	....	22.81	29.55	......	382,527	207,268	249,771					
1830	1,348,233	684,378	664,455	1,309,900	38,333	....	....	29.31	28.47	......	491,431	266,276	320,879					
1840	1,724,033	867,556	856,477	1,676,115	47,918	....	....	37.49	27.87	......	628,410	340,496	410,319					
1850	2,311,786	1,168,103	1,143,683	2,258,160	53,626	2,006,207	305,579	50.26	34.09	76,272	842,766	456,593	550,181	459,781	386,216	5.99	408,497	5.66
1860	2,906,215	1,454,419	1,451,796	2,849,259	56,949†	2,475,710	430,505	63.18	25.71	81,515	1,033,527	559,689	691,296	590,443	515,319	5.64	524,558	5.54
1870	3,521,951	1,758,499	1,763,452	3,456,609	65,294‡	2,976,642	545,309	76.56	21.19	222,356	1,222,697	679,506	886,883	776,345	635,680	5.54	675,408	5.21

Banks.—There were in the State 205 national banks in 1875, having a capital paid in of $53,910,240, bonds on deposit to the amount of $47,645,850, and an outstanding circulation of $42,092,711. There were at the same time 121 State banks and savings institutions (61 savings banks and 60 State banks and trust companies), whose capital stock actually paid in was $11,022,906.22, their deposits $22,801,449.41, reporting an aggregate surplus of $1,388,199.84, and earnings for the year of $752,489.67. Their entire liabilities, summed up, including surplus and earnings, were $40,391,877.99, and their resources to the same amount.

Fire and Life Insurance Companies.—There were 63 joint-stock fire and fire marine insurance companies in the State on Jan. 1, 1875, having $28,590,355.25 of admitted assets, a paid-up capital of $10,312,384.74, a net surplus of $4,778,681.78, and all other liabilities, including re-insurance fund, amounting to $13,632,771.52, making the total liabilities, including capital and surplus,

* Of the colored population enumerated in this column, 3737 were slaves in 1790, 1706 in 1800, 795 in 1810, 211 in 1820, 403 in 1830, and 64 in 1840.

† Including 7 Indians.

‡ Including 14 Chinese and 34 Indians.

$28,723,838.04. The total cash income of the year had been $13,446,849.32, and the total cash expenditures, $10,659,388.03. There were also 111 mutual fire insurance companies; their showing indicated assets available to the amount of about $5,146,000, and immediate liabilities of about $1,789,000, and a total surplus since their organization of about $3,797,600. The income from the year's business was stated at $2,293,827.19, and the disbursements at $1,879,648.24, giving about $414,000 net profit for the year. There were 9 life insurance companies in the State, 7 of them in Philadelphia, having total assets of $15,085,387.09, and liabilities (including a re-insurance reserve, and excepting capital) of $11,800,719.78, showing a surplus, as regarded policy-holders, of $3,600,351.65; the amount of capital stock was $1,879,262.03. (Two of the companies were mutual.) The income of the year was $3,694,910.08, and the expenditures, $2,679,756.57. The number of policies issued during the year was 5503, and the amount insured by them, $13,859,750; the number of policies in force Jan. 1, 1875, was 34,032, insuring $87,027,532.

Education.—I. *Public Schools.* There were 2089 school districts and 17,092 public schools in the State on June 1, 1875; of these 5625 were graded schools; the number of teachers was 19,880; the number of pupils, 890,073; the average attendance, 551,848; average length of school term, in months, 6.85; average salaries of male teachers, per month, $41.07; of female teachers, $34.09. The cost of tuition for the year was $4,746,875.52; cost of buildings, fuel, contingencies, debt and interest, $4,507,780.61; making the total expenditure for school purposes $9,363,927.07, of which $1,000,000 was appropriated by the State and the remainder raised by counties and districts. The estimated value of school property was $24,260,789. Of this school property, $5,352,161 belongs to Philadelphia, and $1,815,811.36 was expended in that city for school purposes in 1875, besides $30,000.50 for evening schools. Teachers' institutes were held in each county—88 in all—continuing an average of 5 days in each; they were attended by 13,863 teachers, and nearly 29,000 other persons interested in education were present; 474 instructors and lecturers gave instruction, and $13,145.53 was expended for them.

II. *Secondary Instruction.*—There are about 350 academies and seminaries in the State, many of them of high grade, and a considerable number of excellent preparatory schools. The Moravian schools at Nazareth, Litiz, and Bethlehem, as well as many others, have a good reputation. There are also several female colleges or collegiate schools, which impart a high grade of secondary instruction.

Superior (Collegiate), Scientific, and Professional Education.—The following table gives the principal statistics of the colleges, scientific and professional schools of the State, so far as they are obtainable. Most of the statistics are for 1875; in a few instances those of 1874.

Colleges, Universities, Scientific and Professional Schools.	Location.	Date of organization.	Under whose control.	Professors and instructors.	Students. Male.	Students. Female.	Students. In preparatory course.	Students. In collegiate or advanced course.	Value of buildings, grounds, apparatus, etc.	Amount of productive endowment.	Income from endowment or State funds.	Total income from all sources.	Volumes in library.
I. *Colleges and Universities.*									$	$	$	$	
Allegheny College	Meadville	1815	Meth. Episcopal	7	160	...	59	101	145,700	150,000	10,000	18,500	12,000
Dickinson College	Carlisle	1783	Meth. Episcopal	6	88	...	...	88	150,400	200,000	11,500	13,269	27,503
Franklin and Marshall College	Lancaster	1853	Reformed (Ger.)	7	128	...	57	71	90,000	117,500	5,000	7,120	12,000
Haverford College	Haverford, Delaware co.	1832	Orth. Friends	6	49	...	...	49	152,800	91,200	7,508	18,814	10,500
Lafayette College	Easton	1826	Presbyterian	27	323	...	...	323	666,702	400,000	24,000	31,462	19,400
La Salle College	Philadelphia	1863	Roman Catholic	9	176	...	110	66	155,000	....	......	......	1,500
Lebanon Valley College	Annville, Lebanon co.	1867	United Brethren	7	90	34	52	72	62,000	7,000	......	4,000	1,100
Lehigh University	South Bethlehem	1866	Prot. Episcopal.	7	103	...	...	103	500,000	400,000	24,000	24,000	2,000
Lincoln University	Lincoln Univ., Lower Oxford, Chester co.	1853	Presb. (colored).	9	185	...	81	104	125,000	105,000	6,885	......	3,500
Mercersburg College	Mercersburg	1865	Reformed (Ger.)	10	101	...	59	42	60,000	14,000	700	4,900	4,000
Monongahela College	Jefferson, Greene co.	1867	....	6	93	...	81	12	....	20,000	1,200	2,580	140
Muhlenberg College	Allentown	1867	Evang. Luth.	7	111	...	69	42	125,000	45,500	3,380	8,700	3,600
Palatinate College	Myerstown	1868	Reformed (Ger.)	9	208	...	192	16	30,000	....	......	5,000	900
Pennsylvania College	Gettysburg	1832	Lutheran	11	158	...	74	84	103,400	156,000	6,150	12,150	19,550
Pennsylvania State College	State Col., Bellefonte, Centre co.	1859	State	12	141	...	85	56	....	....	......	30,000	
Pennsylvania Military Academy	Chester	1862	Non-sectarian	12	121	...	17	104	100,000	....	......	......	1,200
St. Francis's College	Loretto	1849	Roman Catholic	10	85	...	85	...	120,000	6,000	400	14,400	3,000
St. Vincent's College	Near Latrobe	1846	Roman Catholic	24	469	...	315	154	....	....	......	......	13,000
Swarthmore College	Swarthmore, Delaware co.	1869	Friends, Hicks.	19	160	101	161	100	470,000	35,000	80,000	82,000	2,500
Thiel College	Greenville	1870	Evang. Luth.	8	63	...	32	31	30,000	22,200	2,152	4,015	2,600
University of Lewisburg	Lewisburg	1847	Baptist	6	99	...	34	65	222,000	130,000	8,500	14,500	5,400
University of Pennsylvania	Philadelphia	1753	Non-sectarian	22	215	...	63	152	1,500,000	1,450,000	30,810	50,819	10,000
Ursinus College	Freeland	1870	Reformed (Ger.)	11	111	...	75	36	30,000	....	......	3,500	6,500
Villanova College	Villanova P. O.	1842	Roman Catholic	18	160	...	60	100	250,000	50,000	3,000	33,000	8,000
Washington and Jefferson College	Washington	1802	Presbyterian	8	177	...	37	140	140,000	210,000	11,500	14,000	7,000
Waynesburg College	Waynesburg	1850	Cumb. Presb.	10	151	146	215	82	20,000	30,000	2,000	4,000	1,800
Western University of Pennsylvania	Pittsburg	1819	Non-sectarian	16	296	...	213	83	202,000	345,833	17,520	33,578	5,280
Westminster College	New Wilmington	1852	United Presb.	7	165	...	48	117	25,100	79,000	6,000	......	3,000
II. *Schools of Science.*													
Franklin Institute	Philadelphia	1824	Trustees	Inst	ruc	tion	by	lec	tures and	evening cl	asses.	......	15,000
Polytechnic College	Philadelphia	....	Trustees										
Pardee Scientific dept. of Lafayette Col.	Easton	1866	Lafayette Col.	Rep	orte	d w	ith	the	college.				
Pennsylvania State College	Bellefonte, Centre co.	1859	State	10	142	...	86	56	397,589	500,000	......	30,000	1,500
Scientific department of Villanova Col.	Bryn Mawr P. O.	1842	Villanova Col.	9	76	...	20	56	7,000	....	......	......	2,500
Scientific dept. of Univ. of Pennsylvania	Philadelphia	1871	Univ. of Penn.	16	113	...	...	113	500,000	500,000			
Wagner Free Institute of Science	Philadelphia	1855	Trustees	6	...	...	...	...	300,000	....	......	......	16,000
III. *Schools of Theology.*													
Crozer Theological Seminary	Upland, Chester co.	1868	Baptist	5	46	...	...	46	150,000	227,000	......	......	7,000
Moravian Theological Seminary	Bethlehem	1807	Moravian	3	17	...	...	17	7,387	58,000	2,271	......	5,026
Meadville Theological School	Meadville	1847	Unitarian	7	12	...	...	12	27,000	110,000	7,000	......	12,000
Missionary Institute	Selinsgrove	1855	Lutheran	2	12	...	...	12	20,000	16,000	1,000	......	2,000
Theological Sem. St. Charles Borromeo.	Lower Merion	1832	Roman Catholic	8	139	...	...	139	....	....	......	......	10,000
Philadelphia Divinity School	Philadelphia	1862	Prot. Episcopal.	5	37	...	...	37	....	....	......	......	6,000
Theological dept. of Ursinus College	Freeland	1869	Reformed (Ger.)	3	10	...	...	10					
Theological Seminary	Gettysburg	1826	Evang. Luth.	6	40	...	...	40	50,000	90,000	5,500	......	11,000
Theological Seminary of Reformed Ch.	Lancaster	1825	Reformed (Ger.)	3	34	...	...	34	....	60,000	3,600	......	7,000
Theological Seminary of Evang. Church	Philadelphia	1864	Evang. Luth.	5	54	...	...	54	52,000	116,356	7,581	......	2,500
St. Michael's Theological Seminary	Pittsburg	1845	Roman Catholic	15	30	...	...	30	60,000	....	......	......	5,000
Theological Seminary of U. P. Church	Allegheny City	1825	U. P. Church	4	43	...	...	43	50,000	43,790	3,180	......	4,000
Theological department of Villanova Col.	Villanova P. O.	1842	Roman Catholic	3	19	...	...	19	....	....	......	......	3,000
Theological department of Lincoln Univ.	Lower Oxford	1871	Presbyterian										
Western Theological Sem. of Presb. Ch.	Allegheny City	1827	Presbyterian	6	2	...	...	2					
IV. *Schools of Law.*													
Law department of Lincoln University.	West Chester	1870	Lincoln Univ.	6	...	...	...	...	....	....	......	......	190
Law department Univ. of Pennsylvania.	Philadelphia	1850	Univ. of Penn.	5	54	...	...	54	....	....	......	......	250
V. *Schools of Medicine.*													
Jefferson Medical College	Philadelphia	1824	Trustees	7	320	...	...	320	100,000	....	......	45,000	
Medical department of Lincoln Univ.	Oxford	1870	Lincoln Univ.	8	6	...	...	6					
Medical dept. Univ. of Pennsylvania	Philadelphia	1765	Univ. of Penn.	22	486	...	...	486	....	....	......	60,000	3,000
Woman's Medical College	Philadelphia	1850	Trustees	14	...	62	...	62	50,000	69,750	4,750	7,900	
Hahnemann Medical College	Philadelphia	1869	Trustees	23	126	...	...	126	60,000	....	......	10,123	2,000
Pennsylvania College of Dental Surgery	Philadelphia	1856	....	3	59	...	...	59	....	....	......	6,755	
Philadelphia Dental College	Philadelphia	1863	Trustees	14	101	...	...	101					
College of Pharmacy	Philadelphia	1821	Trustees	71	269	...	...	269	76,000	16,000	1,550	11,850	2,350

III. *State Normal Schools.*—Twelve of these have been ordered by the State, and ten of them are now in operation, though the State superintendent gives statistics of only nine, which we reproduce on next page.

Special Education.—There are in the State 2 institutions for deaf mutes—viz. the Institution for the Deaf and Dumb at Philadelphia, founded in 1821, a corporate institution, but receiving State beneficiaries and State support for them. It had in Jan., 1875, 14 instructors and 271 pupils (146 males and 125 females), of whom 192 were State beneficiaries. Its buildings, grounds, and apparatus are valued at $325,000; the State appropriation is about $50,000, and the income from other sources about $13,600 more. The expenditure for the year 1874 was $63,628. The number of volumes in its library was about 5000. The Pittsburg Day School for the Deaf and Dumb, with which is connected a home for deaf mutes, was founded in 1869; it has 2 instructors and 43 pupils (19 males and 24 females);

there are 10 acres of land connected with it, and the buildings, grounds, and apparatus are valued at $45,000. It has a State appropriation of $2000 a year; its expenditures are $4500 a year. The Pennsylvania Institution for the Instruction of the Blind, founded in 1832, is perhaps the best institution of its class in the U. S. It had in Jan., 1875, 200 pupils, 121 males and 79 females (the capacity of the institution is but 204); 130 were State beneficiaries. The value of buildings, grounds, and apparatus is stated at $201,000; the amount of endowments yielding income is $106,640. The State and municipal appropriation is about $54,660; the sale of merchandise amounted to $20,811.85;

Title.	Location.	Date of organization.	No. of teachers.	Students in normal school. Males.	Students in normal school. Females.	No. graduated in elementary course.	No. graduated in scientific course.	No. graduated in classical course.	No. of graduates 1874–75.	Pupils in model school. Boys.	Pupils in model school. Girls.	Value of buildings, grounds, apparatus, etc.	Debts.	Tuition per year in normal school.	Tuition per year in model school.	Income from State.	Total income.	Annual expenditures.	Volumes in library.
												$	$	$	$	$	$	$	
2d Dist. Nor. School..	Millersville, Lancaster co.........	1859	26	458	281	37	1	..	38	46	18	204,449.09	77,093.75	55	55	19,510	135,162.84	73,659.30	3,500
12th " "	Edinboro', Erie co..	1861	10	334	359	15	..	..	15	82	87	57,400.00	61,000.00	36	18	5,000	33,261.23	30,916.87	2,530
5th " "	Mansfield, Tioga co.	1862	7	125	80	31	..	..	31	9	9	88,250.00	102,097.43	36	15	5,000	18,726.00	34,333.08	906
3d " "	Kutztown, Berks co.	1866	12	388	22	19	..	..	19	83	23	76,760.45	65,700.60	41	18	7,644	38,913.02	36,459.01	1,700
6th " "	Bloomsburg, Columbia co............	1869	15	144	113	17	1	..	18	41	39	143,919.00	95,137.85	..	21	5,000	27,959.89	26,174.28	581
1st " "	West Chester, Chester co............	1871	14	121	135	18	..	..	18	27	10	126,500.00	96,735.26	65	21	.....	35,394.57	26,426.15	2,000
7th " "	Shippensburg, Cumberland co........	1873	12	221	108	25	..	..	25	29	23	166,500.00	170,175.00	63	21	5,000	39,209.21	47,258.24	800
10th " "	Sagamore, Washington co............	1874	8	119	136	2	..	..	...	41	48	77,302.00	52,631.00	40	20	5,000	14,127.27	17,122.31	350
9th " "	Indiana, Indiana co.	1875	10	79	66	...	..	..	...	43	37	191,800.00	157,000.00	58	12.60	.....	4,240.00	4,849.50	
Totals..............	....	....	114	1989	1300	164	2	..	166	401	294	1,102,880.54	907,570.89	..	....	52,154	346,293.53	297,198.66	12,367

receipts from other sources, $32,098.17, making entire receipts $93,576.80; and the expenditures of the year were $86,888.03. There is a home for the blind connected with this institution, which had 18 inmates—7 males, 11 females. There are also an industrial home for blind women and a Pennsylvania working home for blind men, both, we believe, in Philadelphia; the former receives $2000 from the State. The Training School for Feeble-minded Children at Media, founded in 1853, is a well-conducted institution. It had in Jan., 1875, 65 instructors and employés, and 231 children (128 males and 103 females). Its expenditures in 1874 were $63,593.99, of which a little over $7000 was for new buildings; its receipts were about $65,550; of these, $22,460.20 was from the State of Pennsylvania for State pupils, and a little more than $3500 from the city of Philadelphia; nearly $9000 from other States; $24,507.31 from private pupils; and the remainder from donations and special funds.

Reformatories and Industrial Schools.—There are two houses of refuge—one for white, the other for colored children—in Philadelphia; the Pennsylvania Reform School at Pittsburg; and the Sheltering Arms, a private reformatory for homeless and morally-endangered girls, at Wilkinsburg, near Pittsburg. These institutions were founded in 1826, 1850, 1854, and 1873. The income of the two houses of refuge from all sources in 1874–75 was $122,254.93, and the expenditures $109,063.36. The population of the white house of refuge was 738—595 boys and 143 girls; of the colored house, 200—138 boys, 62 girls. The buildings, real estate (11 acres), and furniture, etc. of the Philadelphia houses of refuge are valued at $926,000. The Reform School at Pittsburg has 10 acres of land, and its buildings and personal property are valued at $350,000. It had 431 inmates in 1874–75—286 white and 30 colored boys, 101 white and 14 colored girls. There are about 30 other industrial schools, farm schools, and homes for orphaned and morally-endangered children, all private, though some of them receiving county or municipal aid. They are mostly under the control of religious denominations.

Churches.

Denomination.	Number of church organizations, 1870.	Number of church edifices, 1870.	Sittings, 1870.	Church property, 1870.	Church organizations, 1875.	Church edifices, 1875.	Ministers, etc., 1875.	Church members or communicants, 1875.	Adherent population, 1875.	Church property, 1875.
All denominations......................	5984	5668	2,332,288	$52,758,384	7824	7583	2783	738,595	2,407,600	$64,311,365
Baptists, regular.........................	395	371	178,210	3,157,500	548	511	435	57,874	285,000	4,673,400
Baptists, Seventh-day, Mennonite, Church of God, Tunkers, etc.....	235	218	110,100	537,800	388	297	286	38,000	180,000	1,083,500
Christians, and Disciples..............	97	69	27,500	584,100	117	98	87	10,183	51,000	1,186,000
Congregationalists.......................	40	36	14,450	318,200	77	70	54	5,672	27,500	529,500
Protestant Episcopalians.............	238	234	94,182	6,703,067	264	259	316	31,850	159,000	7,216,500
Evangelical Association..............	256	233	80,545	712,800	289	273	208	32,180	160,000	989,400
Friends..	114	118	43,725	1,764,700	120	122	......	12,460	60,000	2,073,000
Jews...	15	14	7,750	681,000	17	16	18	2,500	12,000	758,000
Lutherans......................................	904	841	339,128	6,474,022	1007	916	520	123,406	560,000	7,231,000
Methodists....................................	1286	1271	446,463	7,510,675	1612	1573	1869	141,981	650,000	9,928,515
Minor sects *................................	7	7	2,500	63,200	7	7	6	560	2,500	65,000
Moravians.....................................	15	16	9,000	401,000	16	16	19	4,800	25,000	478,000
New Jerusalem (Swedenborgian)..	11	7	1,950	78,000	12	9	9	1,016	5,500	88,000
Presbyterians (regular)................	739	723	304,828	9,626,950	1183	1106	1078	152,602	660,000	10,986,750
Presbyterians (United, Reformed, Cumberland, etc.)......................	289	285	119,022	2,487,500	321	311	276	29,400	120,000	3,103,500
Reformed (late Dutch)..................	10	10	5,300	298,000	11	11	13	2,150	10,000	357,000
Reformed (late German)..............	712	657	270,835	3,746,320	926	801	427	74,080	290,000	4,617,500
Roman Catholics...........................	362	319	197,115	6,675,050	513	424	528	....	450,000	7,825,000
Second Adventists........................	3	3	725	11,500	3	3	3	240	1,000	13,000
Unitarians.....................................	4	4	2,050	68,800	5	5	5	1,000	5,000	83,500
United Brethren in Christ............	201	183	60,860	489,300	327	294	186	14,389	70,000	581,000
Universalists	21	18	6,725	288,500	28	26	22	2,247	10,600	348,500
Union churches............................	26	27	7,450	51,900	29	29	17	2,315	11,000	65,800
Local missions..............................	4	4	1,875	28,500	4	4	3	500	2,500	30,000

Charitable Institutions not Educational.—There are four State hospitals for the insane, having accommodations for 2050 patients—viz. Harrisburg, Dixmont near Pittsburg, Danville, and Warren, the last now nearly completed. Besides these there are the Philadelphia Hospital for the Insane; Philadelphia Almshouse Hospital, which has an average of 1100 patients; the Pennsylvania Hospital for the Insane, one of the best institutions of its class in this country, at Haverford, near Philadelphia, having accommodations for 500 patients; and the Friends' Asylum, at Frankford, which has accommodations for about 100. The whole number treated in these hospitals in a given year is about 3854, and there are usually about 80 or 90 more males than females. The expenditure for the erection and maintenance of these hospitals is very large—the support and treatment of the indigent insane being a very heavy tax on the resources of almost any State. The annual expenditure does not vary greatly from $650,000 per annum, and the outlay for buildings exceeds $3,500,000. There are also over 1300 indigent insane maintained in almshouses and jails. The cities of Philadelphia and Pittsburg are well provided with ordinary hospitals for the sick, and there are a considerable number in the smaller cities; 4 or 5, especially in the mining districts, have received State aid. There are many charitable institutions of the asylum class, homes for aged and

*Including Bible Christians, 1 church, 1 church edifice, 300 sittings, church property, $30,000; Schwenkfelders, churches 6, church edifices 6, sittings 2200, church property $33,200.

indigent persons, lying-in asylums, eye, ear, orthopedic, and pulmonary hospitals, inebriate asylums, etc., but these are privately endowed or supported.

Penal Institutions.—Pennsylvania has two State penitentiaries—one at Philadelphia, the other at Allegheny. The Eastern penitentiary, and, to a certain extent, the Western, have been conducted on the plan of solitary confinement or complete isolation, being the only prisons on this plan in the U. S. The prisons are not self-supporting. The Western penitentiary in 1874 had 633 convicts, maintained at a cost of $88,038.76, of which only about $16,500 was from their earnings; the Eastern penitentiary had 854 convicts, maintained at a cost of $111,305.27, of which $26,795.03—less $3175.77 overwork—was the product of convicts' labor. In the county jails there remained Sept. 30, 1874, 2083 persons—1974 males, 109 females—besides 1706 awaiting trial, detained on account of fines, costs, etc. The cost of maintenance of prisoners in these jails for the year was $838,687.47.

Newspapers and Periodicals.—In 1870 there were 540 newspapers and periodicals published, having a circulation of 3,419,765, and issuing annually 241,170,540 copies. Of these, 55 were dailies, having an aggregate circulation of 466,070; 3 tri-weeklies, 10,000 circulation; 2 semi-weeklies, 17,700; weeklies, 385, with 1,214,395 circulation; 11 semi-monthlies, 825,100 circulation; 73 monthlies, 846,750 circulation; 3 bi-monthlies, with 8550 circulation; 8 quarterlies, 31,200 circulation. In 1875 the number had increased to 707, of which 78 were dailies, 2 tri-weeklies, 2 semi-weeklies, 511 weeklies, 19 semi-monthlies, 88 monthlies, 2 bi-monthlies, and 5 quarterlies.

Constitution, Courts, Representatives in Congress, etc.—The provisions of the new constitution, adopted Dec., 1873, require that every male citizen of the age of 21 years who has been a citizen of the U. S. one month and has resided in the State one year and in his election district two months prior to the election, and, being 22 years of age or upward, has paid a State or county tax within two years, shall be entitled to the rights of an elector. The executive power of the State is vested in the governor, who, with the lieutenant-governor, is elected by the people for the term of four years. The secretary of the commonwealth and attorney-general are nominated by the governor and confirmed by the senate during pleasure. The superintendent of public instruction is appointed in the same way for four years. The secretary of internal affairs is elected for four years, the auditor-general for three years, and the State treasurer for two years. The legislative power is vested in a general assembly, consisting of a senate and house of representatives, the former consisting of 50 members, elected for four years, and the latter of an indefinite number, apportioned among the counties according to the population, for two years. The number in 1876 was 201. The judicial power is vested in a supreme court, composed of 7 judges elected for a term of twenty-one years; in courts of common pleas, which have one judge for every district of 40,000 inhabitants, these judges being elected for ten years; in courts of oyer and terminer, general jail delivery, quarter sessions, and orphans' courts, all of which are to be presided over by the judge of the court of common pleas in the same district. Under the apportionment of 1872, Pennsylvania is entitled to 27 Representatives in Congress.

Counties.—The whole number of counties is 66, as follows:

Counties.	Pop., 1870.	Males, 1870.	Females, 1870.	Pop., 1860.	Assessed valuation of property, 1874.	True valuation of property, 1874.
					$	$
Adams	30,315	14,879	15,436	28,006	11,368,043	22,736,086
Allegheny	262,204	132,811	129,393	178,831	282,711,269	282,711,269
Armstrong	43,382	22,157	21,225	35,797	10,102,875	40,411,500
Beaver	36,148	18,025	18,123	29,140	4,949,496	24,747,480
Bedford	29,635	14,925	14,710	26,736	4,444,221	22,221,105
Berks	106,701	53,448	53,253	93,818	21,394,010	106,970,050
Blair	38,051	18,878	19,173	27,829	7,924,435	23,773,305
Bradford	53,204	26,926	26,278	48,734	7,801,688	35,107,596
Bucks	64,336	32,235	32,101	63,578	21,398,656	74,895,296
Butler	36,510	18,351	18,159	35,594	7,988,537	27,959,879
Cambria	36,569	18,601	17,968	29,155	4,943,636	24,718,180
Cameron	4,273	2,408	1,865	......	1,006,169	3,018,507
Carbon	28,144	14,711	13,433	21,033	4,359,920	17,439,680
Centre	34,418	17,313	17,105	27,000	11,823,392	23,646,784
Chester	77,805	38,594	39,211	74,578	58,164,751	87,247,126
Clarion	26,537	13,559	12,978	24,988	3,645,033	14,580,132
Clearfield	25,741	13,492	12,291	18,759	8,420,051	12,630,076
Clinton	23,211	12,109	11,102	17,723	5,423,003	13,557,507
Columbia	28,766	14,325	14,441	25,065	5,709,501	17,128,503
Crawford	63,832	32,780	31,082	48,755	23,102,218	40,428,881
Cumberland	43,912	21,336	22,576	40,098	12,974,171	45,409,598
Dauphin	60,740	30,155	30,585	46,756	16,074,079	56,259,276
Delaware	39,403	19,507	19,896	30,597	37,702,458	50,269,944
Elk	8,488	4,793	3,695	5,915	2,372,239	7,116,717
Erie	65,973	33,435	32,538	49,432	40,784,579	61,176,868
Fayette	43,284	21,395	21,889	39,909	14,592,443	36,481,107
Forest	4,010	2,219	1,791	898	1,608,255	2,412,382
Franklin	45,365	22,313	23,052	42,126	14,184,556	35,461,390
Fulton	9,360	4,693	4,667	9,131	1,117,763	3,353,289
Greene	25,887	12,935	12,952	24,343	7,223,393	14,446,786
Huntingdon	31,251	15,499	15,752	28,100	5,305,582	26,727,910
Indiana	36,138	17,729	18,409	33,687	8,399,709	25,199,127
Jefferson	21,656	11,030	10,626	18,270	2,440,588	12,202,940
Juniata	17,390	8,697	8,693	16,986	2,490,696	9,962,784
Lancaster	121,340	59,172	62,168	116,314	103,028,120	128,785,150
Lawrence	27,298	13,440	13,858	22,999	8,721,494	17,442,988
Lebanon	34,096	16,806	17,290	31,831	12,107,691	36,323,073
Lehigh	56,796	29,047	27,749	43,753	39,744,909	49,681,136
Luzerne	160,915	84,785	76,130	90,244	26,894,111	147,917,610
Lycoming	47,626	24,227	23,399	37,399	6,791,885	40,751,310
McKean	8,825	4,598	4,227	8,859	1,411,225	5,644,900
Mercer	49,977	25,413	24,564	36,856	23,397,398	40,945,446
Mifflin	17,508	8,677	8,831	16,340	3,380,000	13,520,000
Monroe	18,362	9,401	8,961	16,758	1,499,522	8,997,132
Montgomery	81,612	40,583	41,029	70,500	38,134,631	66,735,604
Montour	15,344	7,760	7,584	13,053	2,663,706	13,318,530
Northampton	61,432	30,911	30,521	47,904	48,239,330	48,239,330
Northumberland	41,444	20,971	20,473	28,922	7,244,507	28,978,028
Perry	25,447	12,778	12,669	22,793	7,118,217	14,236,434
Philadelphia	674,022	320,379	353,643	565,529	586,163,332	1,025,785,831
Pike	8,436	4,299	4,137	7,155	898,190	5,389,140
Potter	11,265	5,734	5,531	11,470	1,335,652	6,678,260
Schuylkill	116,428	59,555	56,873	89,510	32,393,414	97,180,242
Snyder	15,606	7,773	7,833	15,035	3,642,714	10,928,142
Somerset	28,226	14,411	13,815	26,778	4,293,746	17,174,984
Sullivan	6,191	3,262	2,929	5,637	789,355	3,157,420
Susquehanna	37,523	19,172	18,351	36,267	3,471,258	20,827,548
Tioga	35,097	18,034	17,063	31,044	7,097,110	17,742,775
Union	15,565	7,651	7,914	14,145	4,439,095	13,317,285
Venango	47,925	25,625	22,300	25,043	16,359,262	32,718,524
Warren	23,897	12,813	11,084	19,190	10,421,662	10,421,662
Washington	48,483	23,766	24,717	46,805	15,395,655	46,186,965
Wayne	33,188	16,924	16,264	32,239	1,793,702	14,349,616
Westmoreland	58,719	29,254	29,465	53,736	29,325,010	51,318,767
Wyoming	14,585	7,419	7,166	12,540	4,178,550	10,446,375
York	76,134	37,626	38,508	68,200	44,557,799	77,976,148
Totals	3,521,951	1,758,499	1,763,452	2,906,215	1,760,765,415	3,425,325,415

Principal Cities and Towns.—Harrisburg, the capital, had 23,104 inhabitants in 1870; Philadelphia, the commercial metropolis, had 674,022 at the same time, and claimed about 900,000 in 1875; Pittsburg, 86,076 in 1870, and Allegheny, 53,180, were the only other cities of over 50,000 inhabitants; Scranton and Reading were each between 30,000 and 40,000; Lancaster and Erie, between 20,000 and 30,000; Williamsport, Allentown, Pottsville, York, Easton, Norristown, Altoona, and Wilkesbarre, between 10,000 and 20,000; Chester, Titusville, East Birmingham, Birmingham, and Danville, between 8000 and 10,000; while 20 other towns ranged from 5000 to 8000.

History.—Delaware Bay was discovered by Hendrick Hudson in 1609, and Delaware River ascended in 1616 by Cornelis Hendricksen. Settlements were made on the E. side of the Delaware as early as 1623, but none in Pennsylvania (except two or three trading-houses in 1626–27) before 1643, though a colony of Swedes under Peter Minuit was planted at Zwanendael in Delaware in 1638. The first settlement within the bounds of Pennsylvania was at Tinicum Island by Swedish colonists, under John Printz's administration; the same year (1643) a mill was built on Cobb's Creek, and in 1646 a church at Tinicum. Uplandt (now Chester) was founded in 1648. In 1655 the Dutch from New Amsterdam, led by Stuyvesant in person, marched upon these Swedish settlements, captured their forts, and took formal possession of the country, over which they appointed a vice-director. In 1660 a Dutch settlement was planted at the Minisinks, the settlers being colonists from New Amsterdam. When the English captured New Amsterdam in 1664 the colony on the Delaware followed its fortunes, and remained under the government of New York (except for a part of 1673–74, when the Dutch recaptured it) until Mar. 4, 1681, when Charles II. granted to William Penn the "tract of land in America lying N. of Maryland, on the E. bounded with Delaware River, on the W. limited as Maryland, and northward to extend as far as plantable," in consideration of the claims of his father, Admiral Penn. This tract King Charles named Pennsylvania. The original charter is still in existence at Harrisburg. The principal condition of this grant was the payment of two beaver-skins annually, and this was paid regularly for 99 years. William Markham, a cousin of Penn, was deputed to proceed to America and take command of the province. Finding that Lord Baltimore claimed the land along Delaware Bay and River to the mouth of the Schuylkill, Penn solicited and obtained from the duke of York a release of the territories or counties on both river and bay extending over 150 miles of shore-line. Penn landed at New Castle (now in Delaware) Oct. 27, 1682. Thence he went to Uplandt on the 29th, and in November visited the infant city of Philadelphia, and probably during that month made his famous treaty of amity with the Indians under the great elm in Shackamaxon. During 1683 he was employed in organizing his new government and providing places for the large number of immigrants (mostly Friends) who began to flock thither. A controversy having arisen between him and Lord Balti-

more concerning the boundaries between Pennsylvania and Maryland, he returned to England in 1684 for its settlement, leaving the executive government in the hands of a provincial council of which Thomas Lloyd was president. At this time the province and "territories" (the latter term designating what is now Delaware) consisted of six counties—Philadelphia, Chester, and Bucks W. of the Delaware, and New Castle, Kent, and Sussex farther S. The population was a little above 7000, of whom 2500 were in Philadelphia. In 1686 the government was vested in five commissioners, any three of whom might act, but their want of unanimity made a deputy governor necessary, and Capt. John Blackwell was commissioned in 1688. A printing-press was established in Philadelphia in 1685 by William Bradford, who printed his first book in that year, and the first Bible in 1687–88, and in 1689 defended the liberty of the press on his trial for libel. From 1692 to 1694, Penn was deprived of all authority over the province, but his rights were restored in Aug., 1694, and William Markham appointed lieutenant-governor. In 1698 the Shawanese Indians were permitted by the authorities to migrate from North Carolina and occupy the lands along the Susquehanna. In 1698, Penn again visited his province, remaining till 1701, and gave the colonists a new constitution and Philadelphia a charter. He also agreed to the eventual separation of the "territories" from the province; this separation took place in 1703. From this time to 1720 emigration to Pennsylvania, stimulated by the liberality of the proprietary government, constantly increased. The Palatinates, persecuted at home, came by thousands, and selected lands beyond the English settlements; many Huguenots also came, and the North of Ireland Protestants in large bodies took up lands still farther W., and proved themselves excellent and enterprising citizens. Penn died in 1718 at the age of seventy-four, and his heirs succeeded him as proprietors. An attempt was made in 1726 to impose a duty of 40 shillings per head on aliens in order to limit immigration, but it was defeated by a union of the Friends and Germans. Independence Hall, the old State-house, was built 1729–34. In 1735, Hannah and Springett Penn having died, John, Thomas, and Richard Penn became proprietaries. The declaration of war between France and Great Britain in Mar., 1744, led to apprehensions of trouble with the Indians, whom the French, in order to establish their line of forts from Canada to the Mississippi, were stimulating to hostility against the English colonists. Great efforts were made to retain the friendship of the Indians, but all in vain. The Shawanese were the first to break faith with the colonists. The French, having secured them as allies, constantly increased their aggressions, establishing forts at Presque Isle (Erie) and at two other points on and near Lake Erie in 1753, and in 1754 seizing the position at the forks of the Ohio (Pittsburg) and erecting Fort Du Quesne there. The repeated battles in that vicinity, in which Washington participated, the defeat of Braddock, and the ravages of the Indians which followed in 1755 and 1756, belong properly to the history of the U. S. A line of forts was erected along Susquehanna River and the Blue Mountains, and for three years the settlers acted mostly on the defensive. The French evacuated and burned Fort Du Quesne in 1758, and the same year a treaty with the Indians secured peace till 1763. Then came Pontiac's war, and throughout nearly the whole year there were terror and bloodshed along the frontier, but the Indians were severely punished in December. An insurrection occurred the same year against the provincial government. The proprietaries, John and Richard Penn, assumed the government in person from 1763 to 1776. The boundary between Pennsylvania and Maryland was run in 1767–68 by Charles Mason and Jeremiah Dixon. In 1768, by a treaty with the Six Nations, a large tract of land, called the New Purchase, embracing most of the counties of N. and N. W. Pennsylvania, was conveyed to the proprietaries, and at once induced an enlarged immigration. Pennsylvania took an active part in the movement for independence; her merchants signed the non-importation agreements and destroyed the taxed tea in 1774. The first Continental Congress was held in Philadelphia in Sept., 1774, and Pennsylvania was well represented. A provincial convention was held on Jan. 23, 1775, and after the battle of Lexington a committee of safety appointed. Within ten days after receiving intelligence of the battle of Bunker's Hill the first Pennsylvania rifle regiment was on its way to Boston. The Declaration of Independence was made public at Independence Hall, Philadelphia, July 4, 1776, and on the 8th it was read to the thousands assembled in front of that building. On July 15, 1776, a convention was called to prepare a constitution for the State of Pennsylvania, and on Sept. 28 it was ratified by the people. The battle of Brandywine occurred Sept. 11, 1777, the massacre at Paoli on the 20th, and the battle of Germantown Oct. 4, 1777. The British troops occupied Philadelphia from Sept. 26, 1777, to June 18, 1778; the State and national authorities returned soon after the latter date. The massacre of the Wyoming settlers by British soldiers, Tories, and Indians occurred in July, 1778, and was summarily avenged by the McIntosh and the Sullivan expeditions. In 1778 the charter was annulled, and the Penns were allowed £130,000 for their unsettled lands in the State. Pennsylvania furnished more than her full quota of troops for the Revolutionary war. Slavery was abolished in 1780. The State constitution was revised in 1790. The "whisky insurrection" in the western counties occurred in 1794; it occasioned great excitement, but was put down without bloodshed. Another but less considerable insurrection was attempted four years later, but was promptly suppressed. In 1799 the State capital was removed to Lancaster, and in 1812 to Harrisburg. A tram railroad was built in 1806 in Ridley township, Chester co. In the war of 1812, Pennsylvania quickly raised her quota of troops. The State claims a share in the glory of the naval battle of Lake Erie, Perry's fleet being built and fitted out at Erie. After this war the State was largely engaged in colossal enterprises of internal improvement—canals and railroads—which for some years embarrassed her finances. Her common-school system was established in 1834; a revised constitution was adopted in 1838. In 1859 the petroleum discoveries were made, creating an excitement only less intense than that following the announcement of the discovery of gold in California in 1848–49. After the lapse of fifteen years Pennsylvania still remains the centre of the coal-oil interest, the north-western corner of the State, on and near Oil Creek, furnishing more than three-fourths of all the petroleum of commerce. In the late civil war Pennsylvania was prompt, generous, and always ready; she sent 362,284 men into the field, besides over 25,000 militia in 1862, and fed hundreds of thousands from other States at her refreshment saloons in Philadelphia. The State was three times invaded by the Confederates—first on Oct. 10, 1862, when Chambersburg was captured and military stores burned; second, by Gen. Lee, when the battle of Gettysburg was fought on her territory, and several towns put under contribution by the enemy; third, in July, 1864, when Chambersburg was burned. In 1873 her constitution was revised for the third time, and the revision ratified by over 100,000 majority.

Governors.

I. Colonial.

1. *Under the Swedes.*

Peter Minuit....................1633
Peter Hollander................1641
John Printz......................1643
John Pappegoya...............1653
Johan C. Rysingh.............1654

2. *Under the Dutch.*

Deryck Schmidt, *pro tem*...1655
John Paul Jacquet............1655
Colony divided into city and company...........1657–62
Jacob Alricks (city)...........1657
Alex. D'Hinoyossa (city)...1659
Goeran Van Dyke (com'y)..1657
Wm. Beekman (company)..1658
Colony united...................1662
Wm. Beekman...................1662
Alex. D'Hinoyossa............1663
Captured by the English...1664

3. *Under the English.*

Col. Richard Nichols (gov.) 1664
Robert Carr (deputy gov.)..1664
Col. Francis Lovelace.........1667
Anthony Colve (gov.) Dutch 1673
Peter Alricks (deputy gov.).1673

4. *Under the English.*

Sir Edmund Andross.........1674

5. *The Proprietary Government.*

Wm. Markham (dep. gov.) 1681
William Penn (proprietor) 1682
The Council (Thos. Lloyd, president).......................1684
Commiss'ners ap. by Penn..1688
John Blackwell (dep. gov.) 1688
The Council (Thos. Lloyd, president).......................1690
Thos. Lloyd (d. g. of prov.)..1691
William Markham (deputy governor lower counties) 1691
Benj. Fletcher, governor of New York (governor).....1693
Wm. Markham (lieut.-gov.) 1693
Wm. Markham (dep. gov.) 1695
William Penn (proprietor) 1699
Andrew Hamilton (d. g.)...1701
Council (E. Shippen, pres.).1703
John Evans (deputy gov.)..1704
Charles Gookin (dep. gov.) 1709
Sir Wm. Keith (dep. gov.)..1717
Patrick Gordon (dep. gov.) 1726
Council (J. Logan, pres.)....1736
George Thomas (dep. gov.) 1738
Council (A. Palmer, pres.)...1747
James Hamilton (dep. gov.) 1748
Rob. Hunter Morris (d. g.).1754
William Denny (dep. gov.) 1756
Jas. Hamilton (dep. gov.)...1759
John Penn (lieut.-gov.)......1763
Council (J. Hamilton, pres.) 1771
Richard Penn (lieut.-gov.) 1771
John Penn (lieut.-gov.)......1776

6. *In the Revolution.*

Com. of Safety (B. Franklin ch'n), Sept., 1776–Mar., 1777

7. *Pres'ts of Supreme Ex. Council.*

Thos. Wharton, Jr...Mar. 5, 1777
Joseph Reed.........Dec. 22, 1778
William Moore......Nov. 15, 1781
John Dickinson....Nov. 7, 1782
Benj. Franklin......Oct. 17, 1785
Thomas Mifflin.....Nov. 5, 1788

II. State.

1. *Under the Constitution of 1790.*

Thomas Mifflin..................1790
Thomas McKean................1799
Simon Snyder....................1808
William Findlay.................1817
Joseph Heister...................1820
John Andrew Shulze.........1823
George Wolf......................1829
Joseph Ritner....................1835

2. *Under the Constitution of 1838.*

David R. Porter.................1839
Francis R. Shunk...............1845
Wm. F. Johnston (acting)..1848
William Bigler...................1852
James Pollock....................1855
William F. Packer.............1858
Andrew G. Curtin.............1861
John W. Geary...................1867
John F. Hartranft.............1873

3. *Under the Constitution of 1873.*

John F. Hartranft.............1876

Electoral and Popular Vote for President and Vice-President.

Elect. year.	Candidates for whom the electoral vote of the State was cast.	Elect. vote.
1788	George Washington P......	10
	John Adams V.-P..........	8
	John Hancock V.-P.........	2
1792	George Washington P......	15
	John Adams V.-P..........	14
	George Clinton V.-P........	1
1796	John Adams P..............	1
	Thomas Jefferson P.........	14
	Thomas Pinckney V.-P.....	2
	Aaron Burr V.-P....	13
1800	Thomas Jefferson P.........	8
	Aaron Burr P...............	8
	John Adams V.-P...........	7
	C. C. Pinckney V.-P........	7
1804	Thomas Jefferson P...... George Clinton V.-P.....	20
1808	James Madison P.......... George Clinton V.-P.....	20
1812	James Madison P.......... Elbridge Gerry V.-P......	25
1816	James Monroe P........... D. D. Tompkins V.-P.....	25
1820	James Monroe P........... D. D. Tompkins V.-P.....	24

Elect. year.	Candidates for whom the electoral and a majority of the popular vote of the State were cast.	Elect. vote.	Pop. vote.	Opposition or minority candidates.	Pop. vote.	Other candidates.	Pop. vote.
1824	Andrew Jackson P....... John C. Calhoun V.-P...	28	36,100	John Quincy Adams P... Nathan Sanford V.-P....	5,440	William H. Crawford P. Martin Van Buren V.-P.	4,206
						Henry Clay P.......... Nathan Sanford V.-P...	1,609
1828	Andrew Jackson P....... John C. Calhoun V.-P...	28	101,652	John Quincy Adams P... Richard Rush V.-P......	50,848		
1832	Andrew Jackson P....... William Wilkins V.-P....	30	90,983	Henry Clay P............ John Sergeant V.-P......	56,716		
1836	Martin Van Buren P.... Richard M. Johnson V.-P.	30	91,475	William H. Harrison P.. Francis Granger V.-P...	87,111		
1840	Wm. H. Harrison P...... John Tyler V.-P.........	30	144,021	Martin Van Buren P..... Richard M. Johnson V.-P.	143,676	James G. Birney P...... Thomas Earle V.-P	343
1844	James K. Polk P......... George M. Dallas V.-P...	26	167,535	Henry Clay P............ T. Frelinghuysen V.-P...	161,203	James G. Birney P...... Thomas Morris V.-P.......	3,138
1848	Zachary Taylor P....... Millard Fillmore V.-P...	26	185,360	Lewis Cass P............ William O. Butler V.-P..	171,176	Martin Van Buren P..... C. Francis Adams V.-P..	11,263
1852	Franklin Pierce P........ William R. King V.-P...	27	198,568	Winfield Scott P......... William A Graham V.-P.	179,174	John P. Hale P.......... George W. Julian V.-P..	8,525
1856	James Buchanan P....... J. C. Breckenridge V.-P..	27	230,710	John C. Fremont P...... William L. Dayton V.-P.	147,510	Millard Fillmore P....... A. J. Donelson V.-P.....	82,175
1860	Abraham Lincoln P..... Hannibal Hamlin V.-P..	27	268,030	Stephen A. Douglas P.. H. V. Johnson V.-P....	16,765	John Bell P.............. Edward Everett V.-P....	12,776
				J. C. Breckenridge P... Joseph Lane V.-P......	178,871		
1864	Abraham Lincoln P...... Andrew Johnson V.-P...	26	296,391	George B. McClellan P... George H. Pendleton V.-P.	276,316		
1868	Ulysses S. Grant P...... Schuyler Colfax V.-P....	26	342,280	Horatio Seymour P...... Francis P. Blair, Jr., V.-P.	313,382		
1872	Ulysses S. Grant P...... Henry Wilson V.-P......	29	349,589	Horace Greeley P........ B. Gratz Brown V.-P....	212,041	Charles O'Conor P.......	No report.

(For a valuable collection of documents relative to the present condition of Pennsylvania, its geology, etc., as well as for the brief but comprehensive abstract of its history given above, the writer is indebted to William H. Egle, M. D., author of the latest and best *History of Pennsylvania*, and of the sketch of Harrisburg in this CYCLOPÆDIA.) L. P. BROCKETT.

Pennsylva'nia, tp. of Mason co., Ill. Pop. 932.

Pennsylvania College, Gettysburg, Pa., was founded in 1832, and is under the auspices of the Lutheran Church. In 1834 the State of Pennsylvania appropriated $18,000 to the institution, and, for a number of years, annually $1000. By an act of the legislature in 1850 one-third of the value of the funds of Franklin College of Lancaster, Pa., was transferred to Pennsylvania College, to establish in it a professorship known as the "Franklin professorship." A preparatory department has been from the first connected with the institution, designed to afford a suitable training for admission into college. The control is in the hands of a board of thirty-six trustees, which perpetuates itself by elections on the occurrence of vacancies. The instruction is given in the college proper entirely by the professors in the different departments, who constitute the faculty and administer the government and discipline under the board of trustees. The first president was Rev. C. Philip Krauth, D. D., from 1834 to 1850, followed by Rev. H. L. Baugher, D. D., at whose death, in 1868, Rev. M. Valentine, D. D., succeeded. Within the last few years additional advantages have been provided by the founding of professorships of the German language and literature, of the English language and literature, and of the natural sciences. The institution possesses chemical and philosophical apparatus, a laboratory for practical chemistry, and a cabinet of mineralogy. The libraries of the college and literary societies contain over 18,000 volumes. The chair of the English language, etc., has been endowed by the gift of $20,000 by John E. Graeff, Esq., of Philadelphia; and the professorship of the natural sciences by the same amount by the brothers A. F. and G. P. Ockershausen of New York. M. VALENTINE.

Pennsylvania Dutch (more correctly *German*) is not a corrupt dialect of German formed in America, nor is it akin to such broken English as Leland attributes to European Germans in his *Breitmann Ballads*, but it is a legitimate South-German dialect, due to the fusion of forms existing on the upper Rhine in Rhenish Bavaria, Baden, Darmstadt, Würtemberg, German Swisserland, and Alsace, and taking up an English element, as English itself took up native words like *hickory*, or French forms like *prairie, bayou*, and *ville*. The characteristics of the dialect may be learned from the excellent poems in it by the late H. Harbaugh, D. D. (1870), and in Haldemann's *Pennsylvania Dutch* (1872), both published by the Reformed Church Publication Board, Philadelphia. Careless speakers of English unconsciously corrupt their language with Germanic idioms, as in the use of "dumb" for *dull* or *stupid*, and "red beet" for *beet*, translating *die rothe rübe*, because in German a "white" beet (*weisse rübe*) is a turnip. S. S. HALDEMAN.

Pennsylvania, University of, originated as a charity school 1745; founded as an academy 1749; incorporated as a college 1755; and erected into a university 1779. The medical department was founded in 1765, and the law department 1789. In 1872 the institution was located at the junction of Thirty-sixth street, Darby road, and Locust street, in two squares of about sixteen acres, in West Philadelphia, Pa., and having separate and commodious buildings for the medical hall, for the university hospital, and for the departments of arts, science, and law. The department of arts, with 13 teachers, embraces the collegiate branches, and the department of science, with 18 teachers, those of architecture, chemistry, drawing, engineering, geology, metallurgy and assaying, mineralogy, and mining, each department having a course of four years. Connected with the department of science are a mineralogical cabinet and a collection of American fossils, containing 10,000 specimens. The law department has a course of two years and 5 professors. The medical department, with a faculty of 24 professors, has a two years' course, and is provided with a valuable museum and cabinets. Adjoining the medical hall is a well-arranged hospital, having accommodations for nearly 200 patients, affording an invaluable means of clinical instruction. The various libraries connected with the university number 18,000 volumes. In 1875 the whole number of professors was 41, other teachers 15, and students 800.

Penn'ville, post-v. of Penn tp., Jay co., Ind.

Pen'ny [Ger. *Pfennig*], an English coin, first mentioned in the laws of Ina, king of Wessex, about 695 A. D. It was at first of silver, and at one time weighed 22½ grains troy, being the twelfth part of a shilling, and designated by the letter *d*, the initial of the Lat. *denarius*, but its value and weight slowly declined. The first copper pence were introduced in 1797. At present the English penny is of bronze.

Penny (VIRGINIA), b. at Louisville, Ky., in 1826; was educated at the female seminary at Steubenville, O.; devoted herself to the industrial side of the woman's question, in behalf of which she has written in periodicals, and has published *The Employments of Women, a Cyclopædia of Woman's Work* (1862), *Five Hundred Employments adapted to Women* (1868), *Think and Act, a Series of Articles pertaining to Men and Women, Work and Wages* (1869).

Penn Yan [so called because originally settled by *Penn*sylvanians and *Yan*kees], p.-v., Milo tp., cap. of Yates co., N. Y., on Northern Central R. R., at the foot of Keuka Lake, near Seneca Lake, which is navigated by two steamers; has 5 churches, 2 banks, 3 newspapers, an academy, a fine water-power, extensive trade, and manufactures. P. 3488.

Penny'backer (ISAAC S.), b. in Shenandoah co., Va., in 1806; studied law, and entered upon the practice of his profession; was a representative in Congress 1837–39; afterward a judge of the district court of Western Virginia; and was in 1845 elected as a Senator in Congress for Virginia for the ensuing term of six years, but died before the completion of the term. D. in Washington Jan. 12, 1847.

Pen'nypacker (GALUSHA), b. in Pennsylvania. Entering the service as private on the outbreak of the civil war, he was in August appointed captain in the 97th Pennsylvania volunteers, and in October major, attaining the coloneley of that regiment in Aug., 1864; served in the department of the South to Apr., 1864; engaged in operations in Florida and against Charleston. With the 10th corps, Army of the James, he participated in the attack

on Drury's Bluff, May, 1864 (thrice wounded), and engaged in operations on the N. side of James River and in front of Petersburg to Sept., 1864; commanded a brigade in the assault and capture of Port Harrison (wounded) and action of Darbytown Road. In the final and successful attack upon Fort Fisher he led his brigade with great bravery, receiving severe wounds which confined him to the hospital till Apr., 1866, when he resigned, being meanwhile (Feb., 1865) appointed brigadier-general. In July, 1866, he was appointed colonel of the 34th Infantry, U. S. A.; transferred to the 16th regiment in 1869; brevet brigadier-general for Fort Fisher, and major-general for gallant services during the war.

Pennyroy'al, a popular name for *Mentha pulegium*, a fragrant labiate herb of the Old World, growing wild or cultivated in gardens, and used in Europe in domestic medicine as a stimulant and carminative. In the U. S. the name is given to *Hedeoma pulegioides* (low pennyroyal) and *Mentha Canadensis* (high pennyroyal), both having very nearly the odor of the English pennyroyal. They are valuable in domestic practice as deobstruents, carminatives, and diaphoretics.

Pennyweight. See WEIGHTS AND MEASURES.

Pe'no, tp. of Pike co., Mo. Pop. 2160.

Penob'scot, county of Central Maine. Area, 3350 square miles. Its N. portion is covered with dense forests, and is hilly and in parts mountainous. The S. part is well settled, and contains much good soil. Live-stock, grain, potatoes, and wool are leading products. The manufactures are important, and include lumber, carriages, cooperage, harnesses, leather, brick, shipping, boots, shoes, metallic wares, clothing, etc. The noble Penobscot River traverses the county, and affords great water-power as well as important navigation and fisheries. The county is intersected by the Maine Central, the Bangor and Piscataquis, and the European and North American R. Rs. Cap. Bangor. Pop. 75,150.

Penobscot, p.-v. and tp., Hancock co., Me. P. 1418.

Penobscot Bay penetrates the coast of Maine for 30 miles, having Waldo and Knox cos. on the W. and Hancock co. on the E. Its deep waters abound in islands and good harbors; principal tributary, Penobscot River.

Penobscot River, the longest and largest river of Maine, and the most important navigable stream in the New England States, rises in Somerset co., near the Canada line, flows E. into Chesuncook Lake, thence S. E. to its union with the Mattawamkeag, having 12 miles above united in the town of Medway with the Seboois or E. branch of the Penobscot. Afterwards its course is S. by W. to Penobscot Bay. It is navigable for large ships to Bangor, 60 miles, where the tide rises 17 feet. Above this point small steamers run for many miles. Its upper waters afford valuable motive-power, and great numbers of logs are floated from the forests of Northern Maine to Bangor, and then sawed for lumber. Its length is 300 miles. The valley of the Penobscot has an area of 8200 square miles. The mean outflow of water is given as 146,250 cubic feet per minute. Its enormous motive-power is only in small part utilized. It is the most important salmon-stream in the U. S., its product excelling in value and quality of fish, though not in quantity, that of the Columbia River.

Penobscots, a tribe of Indians in Maine, residing upon an island of the river of the same name, at Oldtown, 8 miles N. of Bangor. They belong to the Abenaquis branch of the Algonkin family, being nearly related to the Passamaquoddies (of whom about 500 remain on Passamaquoddy Bay), and to the Micmacs and Malaseets (or Malecites) of New Brunswick. By early French writers they were called Etechemins. They were allies of the colonists during the war of the Revolution, and were rewarded by the grant of a large tract of land on both sides of Penobscot River, most of which they have sold piecemeal. They are Roman Catholics, have a church, several schools, and some devotional works in their language which were prepared by Rev. Eugene Vetromile, S. J., and possess a fund of more than $50,000, administered by the State authorities. They have established an elective government, and number about 500.

Penobs'quis, p.-v. of Kings co., N. B., on European and North American Railway, 51 miles from St. John, has extensive saltworks and some paper-mills. P. about 400.

Pen'rith, town of England, county of Cumberland, is beautifully situated and well built, and has some manufactures of cotton, linen, and woollen goods. Pop. 7189.

Pensaco'la, city, cap. of Escambia co., Fla., on Pensacola Bay, 10 miles from the Gulf of Mexico and 64 miles E. of Mobile, southern terminus of Pensacola and Louisville R. R., has an excellent harbor, with 21 feet of water on the bar, and was a place of considerable importance during the Spanish and English government of Florida. It has a navy-yard and forts, and was the scene of important military and naval operations during the war of the rebellion. The ruins of the old Spanish fortresses San Miguel and San Bernardo are a short distance to the rear of the city. Pensacola has 5 churches, 2 newspapers, several schools, a custom-house, and a considerable trade in lumber. The climate is usually healthy, but subject to occasional visitations of yellow fever. P. 3347.

Pensacola, tp. of Yancey co., N. C. Pop. 319.

Pensacola Bay, an inlet of the Gulf of Mexico, at the W. extremity of Florida, extending inland N. E. about 35 miles, affording a deep, capacious, and commodious harbor. It is divided into Escambia Bay on the W. and the Bay of Santa Maria de Galvez on the E., and receives Escambia, Black Water, and Yellow Water rivers. The entrance is 1 mile wide between Santa Rosa Island, on the E. defended by Fort Pickens, and the entrance point of the mainland on the W., on which stands Fort McRae. Less than 2 miles N. of the latter stands the old Spanish fort of San Carlos de Barrancas, and in its immediate vicinity a naval hospital, extensive barracks, and a lighthouse, while a short distance N. E. is the navy-yard, which was surrendered to the Florida militia Jan. 12, 1861, but recovered by the Federal forces, after sharp engagements, early in 1862.

Pensau'kee, post-v. and tp., Oconto co., Wis. P. 777.

Pen'sions [Lat. *pensio*, "payment"], allowances of money, generally in fixed amounts and annual payments, made by the government to certain individuals or to their families and representatives, in consideration of some public services performed or supposed to have been performed by them. In Great Britain pensions are conferred upon the judges of the higher courts and upon many other civil officers who have performed their duties for a specified number of years and then resigned their active functions. They are also frequently granted to distinguished and meritorious authors, artists, scientific men, inventors, and the like, or to their widows or families, for the purpose of rewarding personal merit and of encouraging literature, art, and science. The policy of the U. S. government has confined the bestowment of pensions to the officers and privates who have served in the army or navy during the wars in which the country has been engaged, or who have been wounded or otherwise disabled while in active service, and to their widows, children, and other dependent relatives. In distributing its bounty among these military classes, Congress has exercised a liberality unsurpassed, and indeed unequalled, by any other modern nation. The provisions of the existing laws which determine the various classes of the national beneficiaries and the amounts of their respective pensions, and which are too numerous and complicated to be quoted, are contained in the *U. S. Rev. Stat.* (§§ 4692–4791). JOHN NORTON POMEROY.

Pentac'rinus [Gr. πέντε, "five," and κρίνον, "lily"], an interesting genus of ENCRINITES (which see) remarkable as containing, besides many fossil species, the *P. caput medusæ*, long considered to be the only species of living encrinite, but several others are now known.

Pen'tateuch [from πέντε, "five," and τεῦχος, "book"], the collective name of the first five books of the Old Testament—Genesis, Exodus, Leviticus, Numbers, and Deuteronomy. It originated from the Greek translators and Fathers; the Jews themselves called this division of their sacred book *Torah*, "the Law." (See BIBLE.)

Pentathion'ic Acid, one of the sulphur-acids, formed, like common sulphuric acid, by combination of sulphur, oxygen, and water. It is $H_2O.S_5O_5$. It was discovered by Wackenroder, and prepared by the interaction of sulphohydric acid and sulphurous monohydrate, $5(H_2O.SO_2) + 5H_2S = H_2O.S_5O_5 + 9H_2O + S_5$. In liquid form it is inodorous; with care may be concentrated, but when more highly heated decomposes into S,SO_2,H_2S and $H_2O.SO_3$. Its salts are almost all soluble, that of baryta even in alcohol, and crystallizing therefrom in square prisms.

H. WURTZ.

Pen'tecost [Gr. πεντηκοστή, "fiftieth"], one of the three principal festivals of the Jews, celebrated on the fiftieth day after the Passover. It was originally called the "Feast of Weeks," took place at the beginning of harvest-time, was characterized by the offering, as "first fruits," of two loaves of leavened bread made from new grain, and was a period of liberality to the poor. In modern times the Jewish festival of the Pentecost lasts two days, and the anniversary of the giving of the Law on Sinai has been combined with the earlier festival. In the Christian churches the word Pentecost has a different meaning, derived from the occurrences related in Acts ii.—viz. the de-

scent of the Holy Spirit upon the infant Church ten days after the Ascension, the gift of tongues, and the conversion of 3000 persons. In the English Church, Pentecost is known as Whitsunday or Whitsuntide, from the white garments formerly worn by candidates for baptism.

Penthièvre′, de (PIERRE PHILIPPE JEAN MARIE D'ORLÉANS), DUKE, son of the Prince de Joinville, b. Nov. 4, 1845. He went through, with the aid of a tutor, the course of study of the College of Edinburgh before reaching the age of fifteen. His predilections pointed strongly to the naval service, and in Sept., 1861, the prince, with permission of the American government, placed him in the U. S. Naval School, then at Newport, where he had the rank of naval cadet. Exceedingly zealous in the discharge of his duties and popular with his fellow-cadets, he received the commission of midshipman in 1863, ensign the same year, and lieutenant in 1864, during which time he made a cruise in the Gulf of Mexico, and took there a fever from which his life was barely preserved. Political reasons constrained his reluctant resignation from the service of the U. S. He then entered the Portuguese service, in which he remained two years. His subsequent extensive travels by sea and land include a voyage around the world and a revisiting of the U. S. (at New Orleans). Since the return of his family to France he has found his chosen sphere of duty as a naval officer in the service of his native country.

Pent′land Frith, a channel connecting the Atlantic with the German Ocean, and separating the Orkney Islands from Scotland, is 17 miles long, from 6 to 8 miles broad, and annually passed through by about 4000 vessels, though it is very difficult to navigate.

Pent′water, p.-v. and tp., Oceana co., Mich., at the terminus of the Chicago and Michigan Lake Shore R. R., on Lake Michigan, has 2 churches, 1 bank, 1 newspaper, saw and shingle mills, 1 foundry, and 4 hotels. Its deep harbor affords excellent dockage. Pop. of v. 1294; of tp. 1414. AMOS DRESSER, JR., ED. "NEWS."

Penum′bra. See ECLIPSE.

Pen′za, government of European Russia, lies around the rivers Moksha and Soora, and comprises an area of 14,768 square miles, with 1,197,393 inhabitants. The ground is mostly level and somewhat elevated, and the soil very fertile. Corn, flax, hemp, tobacco, hops, and beetroots are raised; splendid forests of oak trees cover nearly one-third of the country. Besides agriculture, the principal branch of industry, manufactures of linen stuffs, spirits, glass, and beetroot-sugar are carried on.

Penza, town of European Russia, capital of the government of the same name, is finely built on the banks of the Soora, and contains a large park and many beautiful promenades and gardens. It has many educational and benevolent institutions, some manufactures, and an active trade in corn and timber. P. about 28,000.

Penzance′, town of England, county of Cornwall, on Mount's Bay, is well built and beautifully situated. It has some manufactures of woollens and cloth, and an active trade in flax, hemp, timber, corn, iron, and coal. The mild climate and the beauty of the surroundings attract a great number of visitors. Pop. 10,406.

Pe′onage [Sp. *peon*, a "foot-soldier," the *pawn* in chess], a kind of slavery in Mexico whose first subjects were the conquered Aztecs, who were compelled to a kind of serfdom in the mines. This was long since formally abolished except for criminals and debtors. Even the form of peonage has been from time to time forbidden by law, but it has still been kept up in some districts.

Peo′ria, county of Central Illinois. Area, 580 square miles. It is bounded on the S. E. by Illinois River and Lake Peoria. It is undulating, fertile, and contains valuable deposits of coal. Live-stock and grain are leading products. The county is traversed by various railroads. Cap. Peoria. Pop. 47,570.

Peoria, city, cap. of Peoria co., Ill., on W. bank of Illinois River (here called, from its width, Lake Peoria), at the head of navigation, is connected with St. Louis by lines of river-steamers, and with Chicago and Lake Michigan by the Michigan Canal; is the point of junction of nine railroads, has large manufacturing interests, and is the centre of an extensive distributing-trade. First made the site of a trading-post by La Salle in 1680, Peoria was an important point of the route between the French settlements in Canada and those in Louisiana, but its permanent settlement dates only from 1819. It is handsomely situated on high ground, surrounded by bluffs, is regularly laid out and well built, has 5 daily and 5 weekly newspapers, 6 banks, and 28 churches. Iron-works constitute a leading industry. Pop. 22,849.

Peoria, a v. of Butler tp., Miami co., Ind. Pop. 119.

Peoria, post-v. and tp., Franklin co., Kan. P. 1160.

Peoria, post-v. of Hill co., Tex. Pop. 234.

Peoria Indians, a tribe of aborigines once inhabiting Illinois. In revenge for the murder of Pontiac in 1769 the northern tribes fell upon and almost exterminated them and the neighboring Illinois tribes. In 1832 their remnant was removed to Kansas, and in 1867 to the Indian Territory, where they are prosperous, though very few in number. They are confederated with the Weas, Kaskaskias, and others.

Peoria Lake, an expansion of the Illinois River, has Peoria co., Ill., on the W. and Woodford and Tazewell cos. on the E. It is 22 miles long, 3 miles in maximum breadth, and is very deep. It abounds in fish, and in winter yields a large amount of ice for market.

Peotone, post-v. and tp., Will co., Ill. Pop. 1213.

Peperi′no, a geological term applied to a certain kind of volcanic rock formed by the cementing together of sand, ashes, cinders, etc., is derived from the Italian *pepe* ("pepper"), and refers to the peculiar color of the substance. It is distinguished from ordinary tufa less by color, however, than by texture and composition, the grain being much coarser and more irregular, and composed of fragmentary and varied materials, so as to be almost a breccia; it is also generally considerably harder than tufa, the grain of which is finer and almost homogeneous in composition.

Pep′in, county of W. Wisconsin, bounded S. W. by the Mississippi River (Lake Pepin), and E. partly by Chippewa River. Area, 250 square miles. It is somewhat uneven, and has a fertile soil well adapted to grain-culture. Cap. Durand. Pop. 4659.

Pepin, v. of Glasgow tp., Wabashaw co., Minn. P. 336.

Pepin, post-v. and tp., Pepin co., Wis., on Chippewa River and Lake Pepin. Pop. 956.

Pepin, Lake, an expansion of the Mississippi River, 27 miles long and from 2 to 3 miles wide, having Pierce and Pepin cos., Wis., on the N. E., and Goodhue and Wabashaw cos., Minn., on the S. W. It is surrounded with rocky ramparts of picturesque and inspiring appearance. The lake is not very deep, and affords a good supply of fish.

Pepin le Bref, b. in 714, son of Charles Martel and father of Charlemagne; became in 741 major-domus of Neustria and Burgundy under Childeric III., a *fainéant*, and in 747 succeeded his brother Carloman as major-domus of Austrasia and the Rhine country, including Thuringia and Suabia. In 749 he defeated the Bavarians, and in 752 was crowned king of the Franks by St. Boniface by authority of Pope Zachary; conquered Septimania from the Saracens 752–760; was again crowned by Pope Stephen III. 754; broke the power of the Lombards in Italy 754–756, and gave the exarchate of Ravenna and the Pentapolis to the Holy See, the origin of the temporal power of the popes; overcame the Saxons 757; took Narbonne from the Saracens 759; waged a stubborn war with Guaifar, duke of Aquitania, 760–768, and in the latter year procured the assassination of his valorous enemy. D. Sept., 768. His title, *Le Bref* (the "short"), was given on account of his small stature.

Pepin of Héristal, founder of the Carlovingian line of Frankish kings, a grandson of Pepin von Landen, mayor of the palace in Austrasia; became duke of the Austrasian Franks 680, and in 687, by the battle of Testry, conquered Burgundy and Neustria, and afterwards subdued the Frisians and ravaged Suabia. D. Dec. 16, 714 A. D. He never assumed the royal title, but exercised sovereign power in the name of four successive Merovingian *fainéant* kings. Charles Martel was his natural son.

Pe′poli (CARLO), COUNT, b. in 1801 at Bologna, where he was educated, and where he still lives. He was a member of the provisory government of 1831, and on its fall emigrated first to Switzerland, then to France, and finally to England, where he lectured on the fine arts in Italy, and wrote the libretto for *I Puritani*. In 1839 he was appointed professor of Italian literature in the London University, a post which he held till his return to Italy in 1848, when he entered into the service of the pontifical army. He was vice-president of the Roman republic, and on its overthrow by the French again retired to England, where he devoted himself to literature till 1859, when he once more returned to his native country, and was soon after appointed senator of the kingdom of Italy.

Pep′per [Lat. *piper*] is a climbing shrub, with a smooth, woody stem from twelve to twenty feet long, with leathery, ovate leaves, and, opposite to each leaf, a solitary spike with hermaphrodite flowers, and fruits of the size of a pea and bright red when ripe. The common or black pepper is a native of the East Indies, but now extensively cultivated in most tropical countries. It was known to the Romans, and highly appreciated during the Middle Ages, when a

pound of pepper was considered a royal present. It is now one of the most common spices.

Pep'per (WILLIAM), M. D., b. at Philadelphia, Pa., Aug. 21, 1843; graduated at the University of Pennsylvania 1861; became professor of clinical medicine in the University of Pennsylvania; physician to the Pennsylvania Hospital and to the Children's Hospital, fellow of the College of Physicians, president of the Pathological Society, and director of the biological department of the American Academy of Natural Sciences.

Pep'perell, post-v. and tp., Middlesex co., Mass., on the Nashua River and the Worcester and Nashua R. R., has 4 paper, 5 grist, and 3 saw mills, 4 churches, and a fine town-hall. Pop. 1842.

Pepperell (Sir WILLIAM), BART., b. at Kittery Point, Me., June 27, 1696, of Welsh descent, was the son of a fisherman; became a merchant and a distinguished Indian fighter; was a member of the Massachusetts council 1727–59; became chief-justice of the common pleas court 1730; captured Louisburg 1745; was made a baronet 1746; a colonel of the British army 1749; major-general 1755; lieutenant-general 1759; was acting governor of Massachusetts 1756–58. D. at Kittery, Me., July 6, 1759.—W. P. SPARHAWK, his grandson, took his name, title, and his great estates in 1774, but lost everything in consequence of his Tory principles in 1778. D. in London Dec. 17, 1816.

Pepperidge. See BLACK GUM.

Pep'permint, the *Mentha piperita*, a well-known labiate herb, a native of the Old World, but completely naturalized in the New. This plant and its essential oil are extensively used in confectionery, and in medicine as a carminative and to conceal the flavor of nauseous drugs. Peppermint is extensively cultivated in St. Joseph co., Mich., and in Wayne co., N. Y. Lyons, N. Y., is the great seat of the distillation of oil of peppermint in the U. S. Great quantities are produced here, and the business is in good seasons a very lucrative one.

Pep'perville, tp. of Butler co., Neb. Pop. 197.

Pep'sine [Gr. πέψις, "digestion"], an active principle of the gastric juice, precipitated by alcohol or lead-acetate. It has never yet been perfectly isolated, but is known to be one of the albuminoids or nitrogenous organic substances. Substances called pepsine, and usually containing more or less of the active principle, are often prescribed in dyspepsia for the relief of the irritated stomach; and no doubt in well-selected cases the prescription is a useful one.

Pe'pusch (JOHANN CHRISTOPH), b. at Berlin in 1667; was a musician at the court of Brandenburg when in 1698 he went to London. Here he founded in 1710 the Academy of Ancient Music, arranged the music to the *Beggar's Opera*, wrote a *Treatise on Harmony* in 1731, and d. July 20, 1752.

Pepys (SAMUEL), F. R. S., b. Feb. 23, 1633, the son of a London tailor; was educated at Magdalen College, Cambridge; became a Roundhead, but turned royalist under Monk, and was made secretary to the generals of the fleet; was appointed clerk of the acts of the navy 1660, and had other important offices in connection with the admiralty, for he had good talents for business. He was (1673–79) secretary for the affairs of the navy; was imprisoned 1679–80 for alleged complicity in the popish plot; was afterwards the secretary to the admiralty until 1689; president of the Royal Society 1684–86, and was in 1690 imprisoned for a time as a Jacobite. D. at London May 26, 1703. Pepys's *Diary*, kept in shorthand (1660–69), has been often imperfectly reprinted since 1825, when Lord Braybrooke's very imperfect edition appeared. Bohn's ed. (4 vols.) is very generally accessible, but that of Mynors Bright (1875) is the fullest and most satisfactory. This work is instructive and entertaining, giving us a valuable insight into the everyday life of the times of the later Stuarts. His *Memoirs of the Royal Navy* (1690), *Portugal History* (1677), and other writings are of some value. He was an industrious collector of ballads, a dabbler in the various sciences and the fine arts, and founder of the Pepysian Library at Cambridge.

Pequan'nock, tp. of Morris co., N. J. Pop. 1534.

Pequea', post-v. and tp., Lancaster co., Pa., on the Conestoga River. Pop. 1276.

Pe'quods, or **Pequots,** a tribe of Algonkin Indians of Eastern Connecticut, nearly related to the Mohegans, whom the early colonists nearly exterminated in the "Pequot war" of 1637. (See MASON, JOHN.) The remnants were scattered among the neighboring tribes, but a few were afterwards gathered into bands in the towns of Ledyard and North Stonington, where about 50 still remain. The others went to Oneida co., N. Y., with the Brotherton Indians, and are now at Green Bay, Wis.

Pe'ra [Gr. πέραν, "beyond"], a suburb of Constantinople, beyond (N. of) the Golden Horn, over against the old Stamboul, and connected with it by a floating bridge. It crowns a bold promontory, and is the diplomatic and Frankish quarter of the Turkish metropolis. The name appears in the *Chronographia* (lib. xvi.) of Malalas, a Byzantine historian of the sixth century.

R. D. HITCHCOCK.

Peræ'a [Gr. Περαία, from πέραν, "beyond"], the name of several districts lying beyond a river, strait, or sea, but used especially of that part of Trans-Jordanic Palestine which extended from Pella on the N. to Machærus on the S., and from Philadelphia on the E. to the Jordan on the W. These were its boundaries as given by Josephus in his *De Bello Judaico*, iii. 3, 3. It is there described as generally wild and rugged, though well watered by streams and fountains, and in some parts of it very fertile. The name has also been applied to the whole of Palestine beyond the Jordan. (See Reland, *Palæstina Illustrata*, p. 197.) R. D. HITCHCOCK.

Peramel'idæ [*Perameles*, from Gr. πήρα, "pouch;" Lat. *meles*, "badger"], a family of marsupials of the order Syndactyla and section Entomophaga, distinguished by the elongated snout and slender legs. Teeth of three kinds and in large number are developed—viz. M. $\frac{4}{4}$, P. M. $\frac{3}{3}$, C. $\frac{1}{1}$, I. $\frac{4-5}{3-4} \times 2$; the true molars have transverse crowns; the third premolars only have deciduous predecessors; premolars compressed; canines and incisors small; the stomach is simple; a moderately long intestinal cæcum is developed; the legs are slender and the toes in incomplete number (*i. e.* less than five), and provided with well-developed claws; as to the rest, they differ much in the development of their feet. (1) In the typical species (Peramelinæ) the anterior feet have the three middle toes well developed, while the external are rudimentary; (2) in an aberrant type (Chæropodinæ) the digits are reduced to a minimum, and the anterior feet have only two well-developed toes, and these offer in combination some resemblance to those of a hog (a circumstance which has obtained the name for the genus—viz. *Chæropus*—*i. e.* χοῖρος, "hog," and πούς, "foot"); they are sustained by very long metatarsals, and correspond with the largest digits of the feet of Paramelinæ, but their claws are shorter than those of that group; a small-clawed tubercle developed at the external base of the metacarpal represents the third digit. All the species are of inconsiderable size, and are confined to Australia, Tasmania, and New Guiana. They appear in those countries to replace in the economy of nature the insectivorous mammals of other regions. (For illustration see BANDICOOT.) THEODORE GILL.

Per Cap'ita [Lat.], in law, a technical term originally of the Roman law, transferred to the English and American, and used in the statement of those rules which regulate the succession to the property of a deceased owner. Whenever the heirs and next of kin of the deceased, in whatever degree of relationship they may be, inherit his lands or succeed to his personalty as individuals in equal shares, they are said to take *per capita*—that is, by the heads. Thus, if the intestate had originally three sons, two of whom are living, and the other has died leaving four children, and the whole estate is divided into six equal parts, one for each child and grandchild, the succession thereto would be *per capita*. Also, if all the three sons have died, the first leaving two children, the second three, and the third four, and the property is distributed share and share alike among these nine grandchildren, the same phrase would designate the mode of division. A like rule applies in the case of collateral kindred. If the relatives of the intestate entitled to his estate are certain surviving brothers and sisters and the children of other deceased brothers and sisters, and they all participate equally in the property, real or personal, they would take *per capita*. In what instances the descent of lands to heirs and the distribution of personalty among the next of kin follows the mode thus described is determined by statute, and there is a great variety in the statutory rules established by the several States. Succession *per capita* is opposed to that *per stirpes*. (See PER STIRPES.)

JOHN NORTON POMEROY.

Percé [so called from the Pierced Rocks in the sea near by], post-v., cap. of Gaspé co., Quebec, Canada, on the Gulf of St. Lawrence, 500 miles below Quebec. It has a court-house, a jail, and a thriving cod fishery. P. about 300.

Percep'tion [Lat. *per*, "through," and *capio*, "to take"], the act of obtaining knowledge of external objects through or by means of the organs of sense, or of internal states and conditions by means of consciousness or intuition. It also signifies the result of such act. Application has been made of this term to signify cognition or thinking in general, including all the theoretical powers

—sensation, representation, inference, and intuition. In this sense perception and volition would include all the powers of the mind. It is limited by many writers to external perception by means of the senses, and the higher activities of reason and reflection are regarded as modified sensation. The presence of inference or judgment in each act of sense-perception has been pointed out by Reid, Kant, Fichte, and Hegel. Erasmus Darwin made volition an essential element of higher perception—the association of ideas. In so far as attention underlies perception, the modifying influence of the will is obvious.

The doctrine of the intervention of images arising from effluxes from sense-objects has played a great rôle in the history of philosophy. Empedocles (500 B. C.) first advanced this theory, explaining sense-perception through effluxes and pores, interpenetration and mixture of elements arising through the same; effluxes of fire and water to and from the eyes constituting sight; of air into the ears, producing sound; smell and taste being similarly caused. Cognition of the elements of things was held to be by means of corresponding elements in ourselves. Anaxagoras (500 B. C.) took notice of the principle of contrast in perception, and held that like is not known by like, but by unlike, thus repudiating the principle of identity as set up by Empedocles, and explaining perception through difference. The atomists, Leucippus and Democritus (460 B. C.), taught the doctrine of effluxes modified to suit their doctrine of atoms. Atoms impinge on our senses and produce images. These thinkers also distinguished between obscure perception (σκοτίη)—*i. e.* through the organs of sense—and clear perception (γνησίη), through investigation. The doctrine of effluxes appears again with Epicurus (341–270 B. C.). Sense-perceptions are mental images coming from the surfaces of things by efflux. Plato (427–347) pointed out the existence of inference in all sense-perception, and showed it to be necessary to reconcile the contradictory predicates which inhere in sense-objects by reason of their relativity. He found a higher form of perception in the cognition of ideas, which constitute the true in and for itself; sense-perception deals with the changing and variable. Aristotle (384–322 B. C.) held that sense-perception (αἴσθησις) is the result of qualities which exist potentially in the objects perceived, and actually in the perceiving subject. The seeing of colors, for example, depends on the activity of the medium of vision (air or water). In the active reason (νοῦς ποιητικός), which is the highest potence of the soul, will and perception are one; it is creative and cognitive in one. The Peripatetic Strato (288 B. C.) made this higher perception to be only a modification of the lower, and in this direction the Stoics tended, their prevalent doctrine being that sense-perception is the origin and criterion of all perception. St. Augustine, Thomas Aquinas, and Meister Eckhart held the doctrine of effluxes and images which were taken up into the soul through the senses. But, with Aristotle, they distinguished from this the higher perception through the active reason, which gives us knowledge of divine truth. Descartes (1596–1650) laid great stress on the distinction between clear and obscure perceptions, making the former cognizant of eternal truths existing only in the mind, and the latter cognizant of external things and their affections. He separated soul from body so sharply that he was forced to explain their connection (in volition and sense-perception) by divine interference. Geulincx tried to explain the same by the doctrine of occasionalism, holding that through God's power our psychical activity is transmuted into corporeal, and the latter into the former. Malebranche unfolded this into the mystical doctrine that we perceive all things by participation in God's perception. Spinoza, however, abandoned the Cartesian dualism altogether for the doctrine of the unity of substance, which makes perception explicable. Leibnitz denied the theory of effluxes as a mere mechanical explanation, and set forth the more spiritual one of monads as perceiving-substances which reflect or represent within themselves, each, the entire universe. Obscure or insensible perceptions are those which are unaccompanied with consciousness or memory. The myriad of perceptions to which we do not direct our attention are of this order. The whole universe is latent, as it were, in each monad, existing in this form of insensible perception, which needs only to be aroused to consciousness to become actual knowledge. Thus, even the lowest state of the monad—that simply of heavy matter—contains in its weight an obscure representation of the universe of matter, for the weight of each body depends upon the mass of all other bodies in space. Thus, the entire history of each being and of all beings is contained in a dormant state in each being; and it is the activity of the soul which brings them to consciousness in the various grades of perception. The aggregate of these obscure or insensible perceptions makes up the instinct of animals and the disposition, impulses, and emotions of man. Herbart (1776–1841) and Beneke (1798–1854) have pursued this thought of Leibnitz, and have made many valuable discoveries in psychology. The mutual arrest of opposing ideas in consciousness, and the power which one idea has of intensifying or obscuring and rendering latent another, as well as of combining, when latent, with other latent ideas and reappearing in consciousness in a new guise,—the investigation of these phases of perception forms one of the most interesting chapters in modern psychology. Kant (1732–1804) made time and space the *a priori* forms of sense-perception, and denied the objective validity of higher perception, limiting it to subjective forms. Reid (1710–96) taught that mind is active in sense-perception, every act being an act of judgment or inference. Common sense or higher perception cognizes necessary truths of inherence, causation, and design—truths which Kant had pronounced merely subjective. Sir William Hamilton agrees on the one hand with Reid in repudiating the intervention of images and material effluxes, but holds with Kant that we do not cognize things in themselves, thus rejecting Reid's common-sense theory. (See PSYCHOLOGY.)

WILLIAM T. HARRIS.

Perceso'ces [Gr. πέρκη, "perch," and Lat. *esox*, "pike"], a sub-order of teleocephalous fishes, peculiar for the combination of features respectively characteristic of acanthopterygian and malacopterygian fishes. Generally, there are two dorsal fins, the first of which is sustained by spinous rays, but sometimes (Ophiocephalidæ) a long single dorsal, and the ventrals are abdominal, although provided, typically at least, with an external spiny ray; the lateral line is either obsolete or nearly concurrent with the back; the branchial arches are well developed, all the bones, except the fourth superior pharyngeal, being developed, and the third is much enlarged; the inferior pharyngeals are separate; the air-bladder is closed, and has no connection with the œsophagus. The sub-order was first recognized by Prof. Cope, who included therein the Atherinidæ, Mugelidæ, and Ophiocephalidæ. On the one hand the sub-order is related to the *Haplomi* (Esocids, Cyprinodonts, etc.), and on the other to the typical acanthopterygian fishes (perches, etc.). THEODORE GILL.

Per'ceval (SPENCER), b. in London, England, Nov. 1, 1762, was the second son of John, earl of Egmont; educated at Harrow and Cambridge; studied law at Lincoln's Inn; was called to the bar 1786; entered Parliament for Northampton 1796; became intimate with Pitt, through whose influence he was made solicitor-general in the Addington ministry 1801; was promoted to attorney-general 1802; conducted the prosecution in the celebrated Peltier case; was an active partisan of war with France and an opponent of Catholic emancipation; resigned office on the death of Pitt; became chancellor of the exchequer in the Portland cabinet Apr., 1807; succeeded the duke of Portland as premier Oct., 1809, and was assassinated by John Bellingham in the lobby of the House of Commons May 11, 1812.

Perch [Lat. *perca*], a name primitively applied to the species of *Perca* or yellow perches (*Perca fluviatilis* of Europe and related American forms), but also extended to many other, often quite distantly related, types; *e. g. Stizostedium Americanum*, etc. (pike-perch), *Morone Americana* (white perch of the Atlantic border), *Haploidonotus grunniens* (white perch and buffalo-perch of Ohio, etc.), *Sebastes norvegicus* (red perch of Eastport), etc. (See PERCIDÆ.)

Perche, tp. of Boone co., Mo. Pop. 3119.

Perchlo'rates, compounds of perchloric anhydride (see PERCHLORIC ACID) with bases. Perchloric acid reacts powerfully with bases, forming well-defined and perfectly neutral salts. Most of these are very deliquescent, as those of *soda*, *baryta*, *strontia*, *lime*, and *magnesia*. Serullas succeeded, however, in crystallizing these from alcoholic solutions. *Potassic perchlorate* is the most important one as the source of perchloric acid. It is preparable by two methods: (*a*) Chlorate of potash is fused and allowed to evolve oxygen until it becomes pasty, and until a drop removed on a platinum wire does not color muriatic acid deep yellow, indicating absence of chlorate. The residual mass by solution and crystallization will yield crystals of perchlorate and a solution of chloride. (*b*) Potassic chlorate in powder is gradually added to hot nitric acid. Cl and O gases are evolved, and a mixture formed of nitrate and perchlorate, easily separable by crystallization. Perchlorate of potash is anhydrous, and decomposes like the chlorate, though only at a temperature over 400°, into chloride and free oxygen. It does not appear to be deliquescent, unlike nearly all the other perchlorates. Although it contains about 7 per cent. more oxygen by weight than the chlorate (46.21 per cent. as against 39.18

per cent.), it does not, according to Stadion, react so violently with carbonaceous bodies as the chlorate. It may never have been tried as a constituent for explosive mixtures like gunpowder, but it should be so tried, as it appears likely to possess valuable capabilities in this regard. HENRY WURTZ.

Perchlo'ric Acid. Perchloric monohydrate is a liquid acid of great energy, comparable well in some respects with oil of vitriol, being a colorless liquid, of density 1.782 according to Roscoe, which does not freeze at — 35° C. Its composition is $H_2O.Cl_2O_7$. With two equivalents of water it combines to a solid crystalline compound, with great evolution of heat in the combination. This latter Roscoe found to have a density of 1.811 when melted at 50° C. The density in solid form he apparently did not determine. Perchloric monohydrate cannot be kept in the liquid form, as it sooner or later explodes spontaneously. By contact with some organic substances it also instantly explodes with terrible energy, so that it is a dangerous material to handle. It is prepared from the potassic perchlorate (see PERCHLORATES) by simple distillation with sulphuric acid. No use has yet been discovered for it. HENRY WURTZ.

Per'cidæ [Lat. *perca*, "perch"], a family of fishes typified by the common yellow perches of Europe and the U.S. The body is elongated; covered with ctenoid scales, and with a continuous lateral line concurrent with the back; the head conic and more or less compressed; the opercula more or less armed, the preoperculum being serrated and the true operculum armed with spines; the mouth variable in size, but with a more or less vertical cleft; teeth villiform, on the jaws as well as palate; branchial apertures ample; branchiostegal rays seven; dorsals two, the anterior with many spinous rays, the posterior with soft ones; anal small, far behind; ventrals thoracic, each with one spine and five rays. The skeleton has numerous vertebræ (in the perch 21 + 20 — 21); the stomach is cæcal, and pyloric cæca are developed. The family, as thus defined, has received its limits from recent writers (*e. g.* Gill and Günther); formerly it was extended to include the Serranidæ and related types, but as now limited embraces only fresh-water fishes distinguished by the increased number of vertebræ and other associated characters. To it are to be referred, besides the large and familiar species of the group, numerous small fishes distributed among the fresh waters of the U. S., which have been grouped by Prof. Agassiz under the common names Ethiostomata and Ethiostomidæ. The family with these forms is confined to the temperate and colder waters of the northern hemisphere. The best-known genera are *Perca*, including the common yellow perches; *Stizostedium* or *Lucioperca*, including the pike-perches; *Acerina*, represented by the ruffles of Europe; *Aspro*, also confined to the Old World; and *Percina*, confined to the New World. The other genera are mostly represented by small species, rarely met with by any except the professed ichthyologist. THEODORE GILL.

Per'cival (JAMES GATES), M. D., b. in Kensington parish, Berlin, Conn., Sept. 15, 1795; graduated at Yale in 1815, and took his medical degree in 1820; resided for a short time in Charleston, S. C., and published several small volumes, chiefly of poetry; was appointed assistant surgeon in the army in 1824, and detailed as professor of chemistry, mineralogy, and geology in the West Point Academy, but at his own request was soon transferred to Boston, where he engaged in literary and editorial work; removed in 1827 to New Haven, Conn., and for a time assisted Dr. Webster in preparing his *Dictionary;* engaged in 1835 in the geological survey of that State; became distinguished as a linguist, and wrote much poetry which was at one time highly popular; but, though not without conspicuous merits, his poetry is nearly all crude and half-written, and it has been consequently for the most part forgotten. Percival was a man of melancholy disposition, and throughout life was hard pressed by poverty. In 1854 he became State geologist of Wisconsin. D. at Hazel Green, Wis., May 2, 1857.

Percola'tion [Lat. *per*, "through," and *colo*, to "strain"], in pharmacy and chemistry, sometimes denotes simply filtration (see WATER), but more frequently it designates the preparation of tinctures and fluid extracts by means of a process essentially that of lixiviation or leaching. The drugs to be acted on are coarsely powdered and packed in a funnel-shaped percolator, through which the menstruum slowly drips, or sometimes it is forced through by the air-pump. There are many forms of the percolator, some of them combining the principle of dialysis.

Percops'idæ [Gr. πέρκη, "perch," and ὄψις, "appearance"], a family of fishes represented by a single genus (*Percopsis*), confined to North America. The form is trout-like, and the fish is sometimes mistaken for the young of trout and salmon. The body is covered by moderate scales with comb-like margins; lateral line well defined and nearly straight, but somewhat concurrent with the back; head conical, compressed; opercular apparatus with all the bones present and unarmed; mouth small, but with a lateral cleft; upper jaw with its margin formed by the intermaxillary bones alone; teeth villiform on the jaws, but none on the palate; branchial apertures ample; branchiostegal rays six; one true dorsal fin, with branched rays; an adipose fin also developed as in the Salmonids; the anal small; ventrals thoracic. The family was considered by Prof. Agassiz, who first described its type, as one of the most remarkable of living fishes, and was referred by him either to the vicinity of the Percidæ, or considered as perhaps the type of a peculiar order; it is now, however, generally admitted to be most closely related to certain South American forms (Haplochtonidæ, etc.), and more distantly to the Salmonidæ. There appear to be several species, but the typical one is *Percopsis pellucidus*, originally obtained from Lake Superior. THEODORE GILL.

Percus'sion [Lat. *percussio*], a medical term denoting a peculiar branch of auscultation, by which the presence or absence of air and fluid in certain internal organs is ascertained by the aid of artificial sounds. These sounds are produced either directly by tapping with the fingers or a small hammer tipped with india-rubber on the surface of the body just above the place to be investigated, or mediately by the aid of a pleximeter, and struck either with the fingers or with a hammer. (See AUSCULTATION.)

Percussion-Caps. See FULMINATES.

Per'cy, an historical family of England, descended from William de Percy, a companion of William the Conqueror, who derived his name from the village of Percy in Normandy. The barony of Alnwick was acquired by Henry de Percy in the reign of Edward I. His grandson having married into the royal Lancastrian family, Henry Percy, father of the celebrated Hotspur, was created by Richard II. earl of Northumberland in 1377. The first four earls of this family took prominent parts in the "wars of the Roses," and all perished in battle or by assassination. The title became extinct in 1537, but was revived in 1557 in favor of Thomas Percy, who was beheaded at York 1572 for conspiring against Elizabeth. His brother Henry, eighth earl, was charged with conspiring in favor of Mary, queen of Scots, and was murdered in the Tower of London June 21, 1585; Henry, the ninth earl, was imprisoned many years in the Tower for alleged participation in the Gunpowder Plot of 1605. The title having again become extinct in 1670, it was revived in 1749 in favor of Seymour, duke of Somerset, a grandson of the last earl. His son-in-law, Sir Hugh Smithson, took the name of Percy, succeeded by permission of Parliament to the earldom in 1750, and was made first duke of Northumberland 1766. His son Hugh (known as Earl Percy) was engaged in the battle of Lexington, succeeded to the dukedom June 6, 1786, and d. July 10, 1817. The career of his son, Algernon Percy, fourth duke, has been given under the title NORTHUMBERLAND, DUKE OF.—The present representative of the family is ALGERNON GEORGE PERCY, LL.D., sixth duke, b. May 2, 1810, who succeeded to the title Aug. 22, 1867, and became lord of the admiralty 1858. Northumberland House, Charing Cross, the London residence of the Percies for many generations, was sold to the board of public works in 1873 for £500,000, to be pulled down for the opening of a new street, and the duke employed a considerable part of that sum in the improvement of Trafalgar Square.

Percy (HENRY), surnamed HOTSPUR, son of the first earl of Northumberland, b. in England May 20, 1364; became famous in the wars of France and of the Scottish border; defeated and killed Douglas at Otterburn (Chevy Chase) 1388; joined Henry of Lancaster 1399, aiding him to obtain the English throne; was rewarded with the wardenship of the East Marches and the gift of the Isle of Man; was distinguished at the battle of Homildon Hill 1402; took up arms with his father to place Mortimer, earl of March, on the throne, and was killed at the battle of Shrewsbury, July 21, 1403. He is immortalized in Shakspeare's *Henry IV.*

Percy (THOMAS), D. D., b. at Bridgenorth, Salop, England, Apr. 13, 1728; was educated at Christ Church, Oxford, where he took his master's degree 1753; became vicar of Easton Maudit and rector of Wilby 1756; domestic chaplain to the duke of Northumberland 1766; chaplain in ordinary to the king 1769; dean of Carlisle 1778; bishop of Dromore 1782. D. at Dromore, Ireland, Sept. 30, 1811. His best-known work, *The Reliques of Ancient English Poetry* (1765), had a wide influence in developing a taste for ballad literature and antiquities. He translated Mallet's *Northern Antiquities* (1770), and collected a mass

of ancient tales and poetry which were not printed until 1868. Among his other works is a *Key to the New Testament.*

Perdic'cas, a celebrated Macedonian general to whom Alexander the Great on his deathbed gave his ring, the symbol of the royal power; held the empire together for a short time by his superior energy and talents, but when it became evident that he himself aspired to the crown, a coalition was formed against him by Antipater, Crateros, and Ptolemy, and on his expedition against Ptolemy he was assassinated in 321 B. C., near Memphis, by his own soldiers.

Perdic'inæ [Lat. *perdix*, "partridge"], a sub-family of Tetraonidæ, containing the partridges and quails of the Old World. These are distinguished by a comparatively

The Common Partridge of Europe.

slender and depressed bill, and the lower mandible has an unarmed margin. There are numerous species, 85 having been recognized by G. R. Gray; these are found chiefly in the tropical regions of Africa and Asia, but species also extend to Northern Europe and Asia, as well as Australia, Tasmania, and New Zealand. They have been variously combined in genera, but by Gray they are all included in five genera—viz. (1) *Ptilopachus;* (2) *Ithaginus*, with three sub-genera; (3) *Francolinus*, with nine sub-genera; (4) *Perdix*, with seven sub-genera; and (5) *Coturnix*, also with seven sub-genera. The common European partridge belongs to the genus *Perdix*, the common quail to *Coturnix*. The American species known under the same names have no relation to these, but belong to a peculiar sub-family, contradistinguished from the Perdicinæ by the stout bill and armed lower jaw. (See ORTYGINÆ.)

THEODORE GILL.

Per'egrine Fal'con (*Falco peregrinus*), a hawk formerly much used in falconry. It is bold, graceful, swift, docile, strong, and destructive, and was the favorite among the noble falcons, though less powerful than the lanner and the jerfalcon. The female peregrine is the bird which is, *par excellence*, called falcon; the male is the tercel, and is smaller than his mate.

Perei'ra (JONATHAN), M. D., F. R. S., b. in Shoreditch, London, May 22, 1804; studied at Finsbury for four years; received a medical education; was licensed by the Apothecaries 1823; became fellow of the Royal College of Surgeons 1825; apothecary and chemical lecturer to the Aldersgate Street Dispensary 1823; professor of materia medica in the same school 1832; took the doctor's degree at Erlangen 1840; became a fellow of the Royal College of Physicians 1845; physician to the London Hospital 1851; was one of the examiners of London University. D. (in consequence of a fall) at London Jan. 20, 1853. His great work was the *Elements of Materia Medica and Therapeutics* (1839–40), still a standard authority; also published a *Treatise on Diet* (1843), *Lectures on Polarized Light* (1843), and other works.

Perekop', town of European Russia, government of Taurida, on the isthmus of the same name, which connects the Crimea with the mainland. The town, which was formerly strongly fortified, is still of great strategical and commercial importance, as it is situated at a point where all the roads leading from Southern Russia into the Crimea connect. Its trade in salt produced from the salt lakes in the vicinity is very extensive. Pop. 5000.

Père Marquette', tp. of Mason co., Mich. Pop. 954.

Pereslavl', or **Perejaslavl,** an old town of European Russia, government of Poltava, at the confluence of the Alta and the Troobezh. It has 11 churches, among which are several cathedrals, and many educational institutions. Pop. 7218.

Pereslavl'-Zalies'ki, a manufacturing town of European Russia, government of Vladimeer; its cotton fabrics are exported even to China. Pop. 6335.

Pe'rez (ANTONIO), b. at Monreal de Ariza, Aragon, Spain, in 1541, was a natural son of Gonzalo Perez, who was many years a secretary of Charles V. and Philip II.; was educated at the University of Louvain, studying also at Venice and at Madrid; became secretary of state to Philip II. on the death of his father in 1567; was the chief agent of that treacherous monarch in many of his secret crimes, especially in the assassination of Juan de Escovedo 1578; was tried for that crime, imprisoned, and exiled from the court; was again arrested for the same crime in 1590, when, being put to the torture, he confessed the act, but accused the king of complicity; escaped to Aragon in April, where he placed himself under the protection of the *fueros* or privileges of that kingdom; was twice seized by royal command and handed over to the Inquisition, but on both occasions released by the people, thus giving rise to a rebellion which ended in the suppression of the *fueros* of Aragon. Perez escaped to France Nov., 1591; resided in England as secret agent of Henry IV. 1593–95; published in London his *Relaciones*, giving his own account of his romantic adventures (1594), and was the author of *Cartas Familiares* and several other works, elegantly written. D. at Paris Nov. 3, 1611. (See Mignet's *Antoine Perez et Philippe II.* (1845).)

Perez (JOSÉ JOAQUIN), b. at Santiago, Chili, in 1801; was secretary of legation in France 1829–31; minister to Buenos Ayres 1832; subsequently deputy in Congress, councillor of state, minister of finance, of the interior, and of foreign affairs; president of the chamber of deputies and of the senate, and was president of the republic during two terms (1861–71). During his administration that republic enjoyed internal peace and prosperity, and great material improvements were carried out. During a nominal war with Spain, Valparaiso was burned by a Spanish squadron, and one or two Spanish men-of-war were captured by the Chilians, but no attempt at invasion of the country took place.

Perform'ance (law), the doing by a party to a contract the very acts which by its terms he is bound to do, whereby he is wholly discharged from the obligation. When the contract creates a pecuniary obligation only, either in the form of debt or damages, such discharge thereof is ordinarily denominated "payment," which is merely a particular instance or species of performance; so that the latter term is practically confined, in the technical nomenclature of the law, to the doing of any and all acts, other than the payment of money, stipulated to be done, by means of which the legal duty arising from the agreement is fully satisfied.

JOHN NORTON POMEROY.

Per'fumes [Lat. *per*, "through," and *fumus*, "smoke"], **Chemistry of.** Of all the senses, those mysterious media through which matter acts upon mind, there is certainly none more mysterious or more interesting than the sense of smell. Our present concern is not, however, so much with the sense itself as with the nature of the bodies that excite it. It may be said that as a general thing *volatile* bodies are odorous, but there are numbers of exceptions to this, one of the most eminent exceptions being that most abundant of all volatile bodies, *water*, which when pure is, to the best of our belief, absolutely devoid of odor, at least to the human sense. When it is said that animals can "smell water" at a distance, it is probable that they smell some odorous effluvium proceeding from organic decay that accompanies the vapor from the water. Nevertheless, it can by no means be asserted that pure water itself may not have a positive odor to these animals. Other exceptions are certain gases, which are held to be but the vapors of liquids that are volatile at temperatures below the normal range. It must be admitted, nevertheless, that the inodorous gases are among those which have never been positively proved to be convertible into liquid form, such as *oxygen*, *hydrogen*, and *nitrogen*. Two other *incondensable* gases, however—carbonic oxide and marsh-gas—are asserted by some to possess distinct though feeble odors;

and no general principle can here be deduced. The division of odors into two classes, those to be called *perfumes*, and those which are not such, presents also much difficulty in a scientific sense. Odors which are most repulsive to some are attractive, and often even highly enjoyable, to others. This is even true with the same individual, in the case of many odors, with reference to the degree of *intensity* of the odor, many volatile bodies existing which almost all consider fragrant when diffused in very minute proportion throughout the air, but are most offensive and even nauseating when concentrated. The probability seems to be that many vapors have their odors fully developed only when diffused thinly throughout a large mass of air, as if this development were really due to some agency—for example, *ozone*—in the air itself; in other words, that the odorous power, so to speak, over the sense of smell, were only developed by chemical action. There are many surprising facts known that bear upon this hypothesis; among them the almost infinitesimal amount of some substances —such as *musk*, for instance, which will give out odor for an almost indefinite period. Some scientists, among them our eminent American chemist, Robert Hare, have thus been led to consider the possibility that odors may be transmitted to the sensorium, as the perception of colors is transmitted to the retina, through the *ethereal medium*, and not by actual contact of material particles. This, however, is a subject yet belonging almost wholly to the realm of speculation, no adequate experimental foundation of facts for scientific induction having been laid.

The whole mass of what are technically called *perfumes*, or sometimes *aromatic* substances, belongs chemically to the compounds having a basis of carbon and hydrogen. It is of interest in this connection that among chemists of late there has grown up a mode of classifying all carbohydrogen compounds in two great series—the "fatty series" and the "aromatic series," the latter comprising the homologues of benzene and their derivatives, with a great mass of coal-tar products and natural essential oils (including the large *terpene* group), all believed by many chemists to constitute a natural family, distinguished from the fatty series by peculiarities of constitutional or molecular structure, which are represented (on the blackboard) by certain groupings of symbols in fanciful and symmetrical forms, such as their laws of "atomicity" allow to be contrived and varied with ease. Admitting the reality of such a distinction into two natural families, and that this may hereafter be established by the discovery and demonstration of some cause of such distinction, the term "aromatic" is certainly unfortunate, in appearing to imply that the distinction is thereby defined, and that the bodies possessing agreeable aroma are to be placed in the series thus designated. Whereas, among the alcohols, and particularly among the compound ethers, of the fatty series, are found bodies of the most exquisite aromas and perfumes of the most delicious fragrance. Indeed, almost all the artificial fruit-essences, which are now quite important articles of trade as used for flavoring foods, drinks, and confectionery, as well as in perfumery, pertain to the fatty series. A few examples may be given of the composition of some of the more important of these commercial fruit-essences, as a matter of general interest.

Essence of—

Pineapple	contains	chloroform 1, aldehyde 1, ethyle-butyrate 5, amyle-butyrate 10, glycerine 3.
Strawberry	"	ethyle-nitrate 1, ethyle-acetate 5, ethyle-formate 1, ethyle-butyrate 5, glycerine 3.
Pear	"	ethyle-acetate 5, amyle-acetate 10, glycerine 10.
Apple	"	aldehyde 2, amyle-valerate 10, chloroform, ethyle-nitrate, and ethyle-acetate 1 each, glycerine 4.
Grape	"	œnanthic ether 10, chloroform, aldehyde, and acetic ether 2 each, methylic salicylate 1, glycerine 10.

The glycerine in these mixtures is merely to unite and retain the different ethers, some of which are quite volatile. Great numbers of such preparations are now made and largely employed. Unfortunately, their aroma is evanescent, and often liable to change rapidly by the volatilization of some of the ingredients, so that the confectionery, etc. flavored with them rapidly deteriorates.

Among the class of products called *essential oils* is found the great bulk of the ingredients of *natural* perfumes. To give any account that would have detail enough to be useful of the great variety of these substances would be impossible to us, and we cannot do better than refer the reader for such details to the *U. S. Dispensatory* of Drs. Wood and Bache (pp. 584 to 626, inclusive, and 1299 to 1314, inclusive), a work which is to be found in almost every drug-store. HENRY WURTZ.

Per'gamus, an ancient city of Mysia, Asia Minor, was founded by Greek colonists on the northern bank of the river Caïcus, 120 stadia from the sea. In the general confusion which reigned after the death of Alexander the Great, the city became important as the stronghold of Lysimachus. His governor, Philetærus, made himself independent, and Attalus I. (241–197 B. C.) succeeded in establishing a kingdom of which Pergamus became the capital. The Romans favored this new state as a useful ally against Macedonia and Syria, and at different times Phrygia, Lydia, Pisidia, Lycaonia, and Pamphylia were added to it. Meanwhile, the capital became one of the greatest and most magnificent cities of Asia Minor, celebrated for its architectural monuments, its splendid library, its grammar school, its invention of parchment, etc. On his death (133 B. C.) King Attalus III. bequeathed his possessions to the Romans, and they made Pergamus the focus of all the great military and commercial routes of Asia Minor. Under the Byzantine rule it rapidly declined, but the splendid and extensive ruins around the modern BERGAMA (which see) testify to its former importance.

Per'gola, town of Italy, provinces of Pesaro and Urbino. Pop. (1874) within its municipal limits, 8953.

Pergole'si (GIOVANNI BATTISTA), b. at Jesi, near Ancona, Jan. 3, 1710; entered the conservatory of music at Naples in 1717; produced his first oratorio and his first opera in 1731; was appointed chapel-master at the church of Loretto in 1734. D. at Torre del Greco, near Naples, Mar. 16, 1736. Of his operas, only one, *La Serva Padrona*, achieved a great success, but his church music, cantatas, masses, oratorios, and several trios for string instruments occupy a high rank in the history of music.

Per'ham (SIDNEY), b. at Woodstock, Me., Mar. 27, 1819; was for some years a teacher, afterwards a farmer; served in the legislature and on the State board of agriculture; was county clerk of Oxford 1858–61; member of Congress 1863–69; and governor of Maine 1870–71.

Perham Plantation, tp. of Aroostook co., Me. P. 79.

Pe'ri [a Persian word, identical with *fairy*], in the folk-lore of Oriental lands, the male or female spirits or *jins*, who are the offspring of fallen spirits, but are themselves guiltless, beautiful, happy, and beneficent immortals. They are hostile to the *devs*, or wicked ones, but friendly to man. In consequence of their birth they can never enter Paradise.

Pericarditis. See HEART DISEASES.

Pericar'dium [Gr. περί, "about," and καρδία, the "heart"], the fibro-serous sac which surrounds the heart. Its outer fibrous part is very dense and strong; its inner or serous lining membrane is continuous with that which covers the heart. It secretes a thin lubricating serous fluid which facilitates the motions of the heart.

Per'icarp, in botany, every part of a ripe fruit situated on the outside of the placenta, which is the name of that copious development of cellular tissue out of which the ovules arise.

Per'icles, b. at Athens about 495 B. C., descended on the father's side from the Pisistratidæ, on the mother's from the Alcmæonidæ; received the instruction of Zeno and Anaxagoras; served with distinction in the army, and entered, about 469 B. C., on his political career as a member of the democratic party. He proposed or aided in carrying laws according to which the funds of the public treasury were employed for the benefit of the poorer classes. It became the law that citizens should be paid when serving in the army, on a jury, or when performing any other public duty, even when attending the religious festivals; and thereby it became possible for the poorer classes to take part more actively in public life. By these laws Pericles gained the attention and favor of his party, and soon he attained the absolute leadership of it by his eminent talents, his impressive or rather irresistible eloquence, his shrewdness and adroitness in party manœuvring, his grand and wise plans, etc. A great victory was achieved over the aristocratic party in 461 B. C.; its position was undermined and its leader was crushed. The Areopagus, which was the principal political organ of the Athenian oligarchy, lost almost entirely its influence as a party organ by the introduction of a new jury-system; and after his unsuccessful campaign against Mount Ithome, Cimon was impeached, and shortly after banished by ostracism. Pericles was now in reality the ruler of the state. Cimon was recalled in 454 B. C., but on the proposition of Pericles, and it was said that there existed an agreement between them, according to which Cimon should command the army on its foreign expeditions and Pericles govern at home. After the death of Cimon, in 449 B. C., the aristocratic party was reorganized by one Thucydides, and once more arrayed against Pericles. In 444 B. C., Pericles was accused of squandering the public money or employing it for inappropriate purposes, but the attempt to overthrow

him failed. Thucydides was banished by ostracism, and henceforth there existed in Athens no really effective opposition to Pericles. He was arraigned once more for embezzling some of the gold destined for the statue of Athene in the Parthenon; his friends were repeatedly attacked; Phidias died in prison, Anaxagoras was banished, and Aspasia was saved only by great exertions. But these and other similar events were nothing more than the outbursts of a desperate envy and maliciousness. There are no instances in which any important measure of Pericles was frustrated by an internal opposition. It was the great aim of his policy to make Athens the brilliant and magnificent political centre of a united Greece. He opposed his countrymen's extravagant plans of conquest in Egypt, Carthage, or Sicily, and concentrated his whole energy on the affairs of Greece herself. Athens stood at the head of a confederacy of several Greek states for defence against a possible Persian invasion. This confederacy held its meetings and kept its treasury at Delos. By Pericles' dexterous negotiations both the meetings and the treasury were transferred to Athens, and, furthermore, the contributions of the allies were commuted from actual service to a sum of money, for which Athens alone undertook to furnish the whole military armament. Thus, the supremacy of Athens was established, and it was further developed by the successful settlement of new colonies, by supporting the democratic parties in the Greek states, etc. Of great influence too in this respect were the magnificence of the city and the splendor of the life led in it. It was the time of Phidias, Socrates, Sophocles. The Parthenon and the Odeon were built, and that most stupendous of all architectural constructions of Greece, the Propylæum. Commerce flourished, and many branches of industry were carried to perfection. Hospitality and elegance in social intercourse, magnanimity and magnificence in all public affairs, distinguished life in Athens at this period, and the foreigner who visited the city was as delighted as he was astonished. But Athens—or, more properly, Pericles, for he was the soul of all her great undertakings—had an unrelenting rival in the Spartan aristocracy. The Peloponnesian war drew nearer and nearer, and, although Pericles warded it off for several years by bribery, at last it became inevitable. In the same year that it broke out the city was fearfully devastated by the plague. Next year, Pericles died (429 B. C.), and with his death began the decline of Athens, first in political power, then in literature and art, and soon also in commerce and industry.

CLEMENS PETERSEN.

Perier′ (CASIMIR), b. at Grenoble, department of Isère, France, Oct. 21, 1777; was educated at Lyons; served for a short time in the army; engaged then in the large and prosperous banking business established at Paris by his father and elder brother; was elected a member of the Chamber of Deputies in 1817, and became one of the leaders of the opposition under Charles X. After the revolution of July, 1830, he was prime minister to Louis Philippe from Mar. 13, 1831, to his death by cholera, May 16, 1832, and as such he occupied a distinctly defined standpoint, the so-called *juste-milieu*, which he vindicated with great vigor, and also with partial success. Attempts at insurrection were speedily put down, and his resistance to the differently colored tendencies of anarchy, ultramontane and radical, which showed themselves in France after 1830, was very effective. Guizot, who in several respects was his political disciple and heir, has given a very vivid and impressive picture of him in his *Mémoires*.

Per′igee [Gr. περί, "about," and γῆ, "earth"], in astronomy, that point of the moon's orbit which is nearest to the earth. Anciently, when the sun and planets were supposed to circulate around the earth, the term was also applied to them.

Périgueux′, the ancient *Vesunna*, town of France, department of Dordogne, on the right bank of the Isle. The old part of the city, containing the magnificent cathedral and many interesting Roman remains, consists of narrow and gloomy streets, but it is encircled by new and elegant boulevards occupying the site of the old walls and ramparts. A large trade in liqueurs, truffles, partridges, and wine, and some manufactures of paper and woollens, are carried on. Pop. 21,864.

Perihe′lion [Gr. περί, "about," and ἥλιος, "sun"], in astronomy, that point in the orbit of a planet or comet which is nearest to the sun. Its position or longitude is one of the elements by which the orbit is determined.

Per′im, a small island belonging to Great Britain, in the Strait of Bab-el-Mandeb, at the entrance of the Red Sea, 13 miles from the African coast and 1½ miles from the coast of Yemen. Area, 7 square miles. Pop. 211. It rises about 230 feet from the sea, is rocky, nearly destitute of vegetation, and without water, but it has a good harbor on its southern coast, and its fortifications command the strait on both sides. The passage generally used by vessels going to or from the Red Sea is the narrow one between the island and the Arabian coast. Perim was first occupied by the English in 1799, while Napoleon was in Egypt. It was given up in 1801, but again occupied and fortified in 1857, on account of the building of the Suez Canal. It is under the command of the governor of Aden.

Pe′riod [Gr. περίοδος, "going round"], a term used in chronology, history, and rhetoric. In chronology it is sometimes synonymous with CYCLE (which see); sometimes it forms a subdivision of a cycle, and sometimes it denotes a cycle of cycles. In history it is nearly synonymous with *epoch*, though generally "epoch" is used for such divisions of history as are characterized, not to say governed, by the predominant spirit of one single individual—as, for instance, the epoch of Pericles; while "period" is applied to such divisions as are principally characterized by events which seem to obey some objective law—as, for instance, the period of the Crusades. In rhetoric it means a compound sentence from one full stop to another, although the simple sentence, from one full stop to another, is sometimes called a period.

Period, in music, a division consisting of two or more phrases or sections. (See RHYTHM.)

Period′icals, a vague title usually applied to a class of publications differing from newspapers in being devoted, not to the occurrences of the day, but to literature or to special departments of knowledge. They are consequently of very various forms, sizes, and periods of publication, but the most general types are the monthly and quarterly magazines. There is still a large class of weekly journals which combine the characteristics of the newspaper with those of the literary periodical, but with the rapid progress of journalism the weekly newspaper, once the chief medium for the communication of passing events, has been supplanted in great part by the daily journal, and the time cannot be far distant when the latter will enjoy a monopoly of the communication of news, and the weeklies will pass entirely into the domain of periodicals. The establishment of periodicals devoted to special branches of knowledge (other than theology) is comparatively of recent date, the earlier periodicals having usually embraced the whole field of literature. Of these, the first in the order of time was the *Journal des Savants*, a critical review, which, however, could scarcely be called a "periodical," inasmuch as it made its appearance at irregular intervals. With brief interruptions it has ever since continued, becoming in 1816 the organ of the French Academy. The only widely-known French periodical of the present day is the *Revue des Deux Mondes*, a fortnightly magazine established in 1829, to which the most eminent French authors contribute. The weekly *Illustration*, however, though chiefly devoted to the recording of passing events, has many of the characteristics of a literary periodical. In England the periodicals, strictly so called, of the eighteenth century were dreary affairs. In 1802 the *Edinburgh Review* (quarterly) was started by Jeffrey, Brougham, and Sydney Smith, and was the precursor of the *Quarterly* (1809), the *Westminster* (1824), and the *British Quarterly* (1845), all of which have achieved important positions in the literary world. The English and American monthly magazines, which now form so important an element in literary history, are of still more recent origin, the oldest of the existing monthlies of recognized merit being *Blackwood's*, established 1817. *Fraser's* (1830), *Macmillan's* (1859), *Cornhill* (1859), the *Contemporary*, and the *Fortnightly* are now (1876) the leading English monthlies. In the U. S. many monthly magazines have been started, but few have long survived. Among the existing American monthlies of high rank *Harper's* (1850) is the oldest, others being the *Atlantic* (1857), *Scribner's*, the *Galaxy*, *Lippincott's*, the *Eclectic*, and the *Overland*. Among those no longer published, *Sartain's*, the *Knickerbocker*, *Putnam's*, and *Old and New* deserve honorable mention. The *North American Review* (quarterly), established at Boston in 1815, is the acknowledged leader of its class of publications, its chief competitor being the *International Review* (six times a year), started at New York in 1874. The theological, medical, legal, and other professional magazines of the U. S. are mainly of recent date, but have become very numerous.

Periodic′ity, a physiological and pathological term denoting the regular or nearly regular recurrence of certain phenomena in animal life. In the healthy state the menstruation, and in the state of disease the paroxysms of intermittent fever, are obvious instances of periodicity; and all phenomena of animal life seem to have a tendency to periodicity, such as sleep, hunger, the relieving of the bowels, etc. At all events, any function of animal life is greatly impaired by a high degree of irregularity in its

exercise, and the first indication of a diseased state is generally a disturbance of the natural or acquired periodicity of the various functions of life.

Periœ′ci [Gr. περίοικοι, "dwellers round about"], in Laconia and other ancient Dorian lands, the descendants of the ancient inhabitants of the country. The Periœci were freemen, and not strictly vassals, much less serfs like the Helots, but they were inferior in social rank and political rights to the Spartiatæ. They occupied the inferior kind of lands, were artisans, merchants, and sailors, and had, at times, a share in the government. They might, at least at some periods, intermarry with the Dorians, and they served in war even as hoplites, though not in the same corps with Dorians. They were in many cases people of wealth and refinement.

Perios′teum [Gr. περιόστεον, "around the bones"], the strong fibrous membrane which surrounds the bones, excepting only the parts covered with cartilage. It is found also around the roots of the teeth, and lines the sockets in which the teeth are fixed. That which covers the outside of the skull is the *pericranium*, and that within the skull is the *dura mater;* but the *dura mater* of the spinal cord is distinct from the periosteum. The periosteal membrane is called *endosteum* when it lines the medullary cavity of a bone. The periosteum is continuous with the tendons and ligaments. It is very vascular, and plays an important part in the growth and nutrition of bone. Thus, in operations for the removal of diseased bone the periosteum should be carefully peeled off and left *in situ*, and in many cases new and healthy bone will be developed from it, especially if the patient be young.

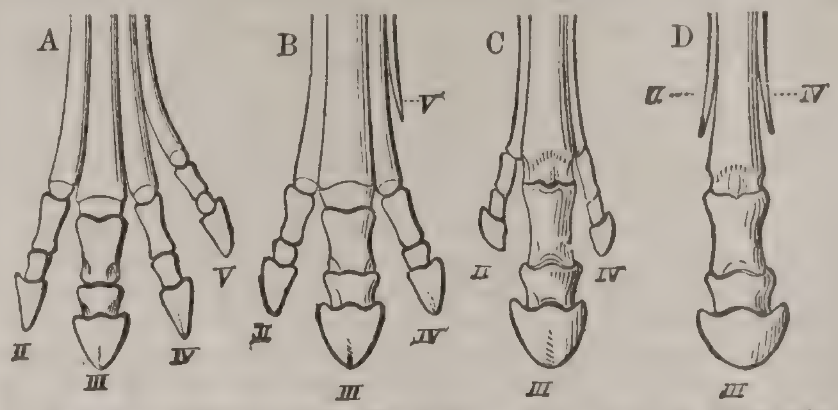
Periosti′tis [Lat.], the inflammation of the periosteum, is sometimes caused by a syphilitic, scrofulous, or perhaps rheumatic dyscrasia, but is very commonly induced in boys and young men by a sudden exposure to severe cold, as by bathing in very cold water after violent exercise, by standing long in cold water, and the like. It is a very painful disease, and is best treated by local poultices, by opiates, and by free incisions. Cases due to any specific cause will require special constitutional treatment.

Peripatetic Philosophy. See ARISTOTLE.

Per′iplus [Gr. περίπλους, "a sailing round"], a Greek compound word meaning circumnavigation, but applying particularly to the circumnavigation of Africa by Hanno, the Carthaginian. By some writers the account of Hanno's famous voyage is regarded as fabulous, but the weight of both evidence and opinion is against their hasty conclusions. The description given by Herodotus, of the trees in India "bearing wool which surpassed that of sheep in beauty," was long regarded as an absurd fabrication, while later the tales of Marco Polo, of "the wondrous land of Cathay," were utterly discredited. Certainly, nothing would seem to be more probable than that an enterprising, commercial people like the Carthaginians should make some effort to become acquainted with the form, extent, resources, and character of the country which they inhabited. As to the terminus of Hanno's cruise, authorities differ; some asserting that he turned back, owing to a scarcity of provisions, from Gorilla (now St. Thomas) Island; others, that he kept on to the Arabian Gulf, whence he sent messengers home by land. On one point all are agreed—namely, that Hanno was absent from Carthage five years, and that when he returned to it he delighted the people of that city with marvellous accounts of the dangers he had experienced by land and by sea, and of the curious birds, beasts, and fishes fallen in with during his wanderings. His logbook was deposited in the temple of Saturn. It was entitled *An Account of the Voyage of Hanno, Commander of the Carthaginians, round the parts of Libya, beyond the Pillars of Hercules.*

FOXHALL A. PARKER.

Perissodac′tyla [Gr. περισσός, "unequal," and δάκτυλος, "a toe"], a sub-order—or, according to some authors, an order—of the hoofed animals (Ungulata), so named because the digits are of unequal size. These are unpaired or uneven, the third being the largest and most exserted, the fourth nearly coequal in size and position with the second, and the fifth on the hind foot at least atrophied; the articulating phalanges, as well as carpal and tarsal bones, are correspondingly modified; the astragalus has the anterior or inferior articulate surface divided into two very unequal facets; the femur is provided with a third trochanter, and its shaft is perforated at the back part by the medullary artery; the dorso-lumbar vertebræ are in increased number—*i. e.* not less than twenty-two (d. 18 — 19 + 1, l. 3 — 6). The skull has the intermaxillary bones tectiform or shelving in a roof-like manner above, and united at the symphyses, and the incisors, when present, are implanted nearly vertically, and are parallel to their roots; the stomach is cæcal; the cæcum very much enlarged and sacculated. The sub-order thus distinguished includes three families, represented by liv-



A, *Orohippus* (Eocene); B, *Mesohippus* (Miocene); C, *Hipparion* (Pliocene); D, *Equus* (Quaternary and Recent).

ing forms; the tapirs (Tapiridæ), rhinoceroses (Rhinoceratidæ), and horses (Equidæ). In previous geological ages numerous others, more or less related to them, flourished. The affinities of these forms were, to some extent, recognized by Cuvier, and still more by De Blainville, but the sub-order was first distinctly introduced with formal characters by Prof. Owen. The accompanying figures will exemplify the various modifications of the feet in recent as well as extinct types of the order. THEODORE GILL.

Peristal′tic [Gr. περισταλτικός, "compressing"] **Motion,** the name given to certain movements which take place in the alimentary canal, the term being generally restricted to the worm-like action by means of which the food is carried to and fro over the mucous membrane of stomach and intestines. The walls of both stomach and intestines are made up of two layers of involuntary muscular tissue, which are arranged as an external longitudinal and an internal circular; the outermost layer of the intestine is serous, and is simply a reflexion of the peritoneum. The internal coat consists of a mucous tissue, varying in structure in different parts. Between the external and internal muscular layers is situated the *plexus myentericus* of *Auerbach*, to which reference will be made farther on. From the anatomy of the parts it is easy to perceive how, by the simple action of its muscular walls, the food after its entrance into the stomach is first moved about in this organ, and then, having passed into the small intestine, is carried onward by the gradual contraction and relaxation, which, starting from above, is continued downward. The contraction of the circular fibres diminishes the calibre of the gut, and at the same time the shortening of the longitudinal layer tends to the onward movement of the alimentary substances. During the processes of digestion this movement is readily observed by opening the abdomen of a living animal, and it will be seen that the movement continues for a short time, then ceases, to be renewed. Not only does the muscular wall carry the food toward the outlet of the canal, but often after the mass has been pushed, or rather squeezed, for a certain distance downward, it is carried back again in the opposite direction (antiperistaltic movement). There is probably little if any peristaltic action while the intestine is empty, it being the stimulus of food which causes it. The alimentary mass, coming in contact with the periphery of the nerves situated in the mucous membrane, imparts a certain amount of irritation, which is followed by muscular movement—*i. e.* contraction and relaxation—probably through the agency of the *ganglionic plexus myentericus* of *Auerbach;* and this slow, gradual passage of the food backward and forward is required for the processes of digestion. The varied theories attributing the peristaltic motion to the action of bile, blood in the veins or arteries, etc. are not worthy of comment. J. W. S. ARNOLD.

Peristeria. See HOLY SPIRIT PLANT.

Peritoneum. See PERITONITIS.

Peritoni′tis [Gr. περιτείνειν, to "stretch over"], inflammation of the peritoneum, a serous membrane investing the viscera of the abdomen; popularly designated "inflammation of the bowels." The peritoneum has two layers, and constitutes a closed sac; the external layer lines the abdominal walls; the internal is reflected over the stomach and intestines, liver, spleen, ovaries, uterus, and bladder. These opposed surfaces are smooth and lubricated by secreted serum, permitting the free movements of the viscera, their ascent and descent in respiration, and the peristaltic movements of the bowels. Traumatic peritonitis is the result of bruises, wounds, and surgical operations. Idiopathic peritonitis is a primary inflammation; it may result from perverted conditions of the blood or from checked perspiration and chilling of the abdomen or lower extremities. Local peritonitis is a frequent occurrence, the inflammatory process being limited to the perito-

neal investment of a single viscus, as the liver, uterus, or ovary. Puerperal peritonitis, or metro-peritonitis, is inflammation of the uterus and peritoneum occurring in women following confinement. (See PUERPERAL FEVER.) Tubercular peritonitis is chronic and slowly progressive, consisting in the deposition of successive strata of inflammatory lymph, alternating with miliary tubercles, with interspersed masses of caseous matter, or yellow tubercle; tubercle usually coexists in the lungs and other organs. Acute peritonitis, as a rule, is of sudden onset. Abdominal pain is its prominent symptom, at first localized, but quickly diffused over the entire abdomen. The pain is increased by pressure, by the movements of respiration, and by tension of the abdominal muscles. The breathing is therefore chiefly thoracic, the diaphragm fixed to prevent abdominal movement, and the respiration is correspondingly shallow, restrained, and rapid. The limbs are retracted upon the body to relax tension of the abdominal surface. There is temporary paralysis of the muscular coat of the bowel; constipation results, also extreme flatulent distension of the intestines, and general tumefaction of the abdomen, which, when percussed, is resonant—a condition termed tympanitis. The inflamed surface is so extensive, invests so many important organs, producing extensive peripheral nerve-irritation as well as impressions on the plexuses of the sympathetic nerve, that the constitutional depression is very marked. The face is pale, haggard, and anxious, wearing an expression of great suffering. The teeth are set, the lips tightly drawn, the eye set and sunken, the cheeks collapsed—in extreme cases constituting the *Hippocratic facies*, or *facies griffé* of the French. Peritonitis is always a dangerous disease, but its termination will depend upon early diagnosis and a correct treatment, conducted with vigor and persistence. When incipient, it may be aborted or limited by local use of ice or cold water, local dry cupping, cardiac sedatives, as veratrum and digitalis, and a single prompt saline purge. If fully developed, opium is the supreme remedy, to allay pain and secure absolute rest of the intestines from their physiological peristaltic action. In peritonitis the tolerance of opium is very great. The cold water or ice pack, if judiciously used, will be of value during the acute period of the disease, but later warm and anodyne applications are preferable. The diet during the disease should be liquid, and cathartics should be avoided.

E. DARWIN HUDSON, JR. REVISED BY WILLARD PARKER.

Per'iwinkle, a popular name of various half-shrubby and herbaceous erect or trailing plants of the genus *Vinca* and order Apocynaceæ. The *V. major*, *minor*, and *herbacea* of the gardens are hardy European plants. *V. rosea*, a fine greenhouse evergreen shrub, grows wild in most tropical regions, and also in Florida, where it was not improbably introduced. But it is probably a native of the West Indies, etc., rather than of the Old World.

Periwinkle, a name applied to the numerous species of *Littorina* and similar genera. The *Littorina littorea* is in Great Britain extensively used as food, and is agreeable to the taste, but in the U. S. is hardly ever employed as food.

Per'jury (law). The crime of perjury at the common law—that is, independent of all statutory modification—is defined by Lord Coke as follows: Where a lawful oath is administered by any one who hath authority to a person in any judicial proceeding, who swears wilfully, absolutely, and falsely in a matter material to the issue or cause in question, either by his own act or by the subornation of others. Certain requisites were therefore necessary in order to constitute the offence—viz. (1) an *oath* must be administered, (2) by a person having lawful authority and jurisdiction, (3) in some pending judicial proceeding, (4) the matter testified must be false, (5) and wilfully so, not the result of mistake or surprise or inadvertence, (6) and must be absolute, not the mere expression of an opinion, (7) and must be material to the questions awaiting decision in the controversy. It is plain that the common law left many instances of false swearing outside of this definition. Statutes of the U. S. and of the individual States have supplied the defect, and have greatly enlarged the scope of the crime. In the first place, the effect of an *affirmation* has been made the same as that of an oath. The second important modification consists in embracing all cases of wilfully false statements, when material, made in proceedings not judicial, wherever the law requires or even authorizes an oath or affirmation to be administered to a person in order to protect a public or a private right or to enforce a public or a private duty. A reference to one or two of these statutes will be sufficient as illustrations of the whole. A general act of Congress, originally passed in 1825, and contained with all its substantial features in the *U. S. Revised Statutes*, provides that "if any person in any matter or proceeding where an oath or affirmation shall be required to be taken under any law of the U. S." shall wilfully swear or affirm falsely, he shall be guilty of perjury. In New York the crime embraces all cases of oaths or affirmations legally administered (1) in judicial proceedings; (2) when required by law as necessary for the prosecution or defence of any private right or for the ends of public justice; (3) when lawfully required by any judicial, executive, or administrative officer. In many of the States the statutory language describes the oaths as "required" by law, while in many others it speaks of them as "required or authorized" by law. It is a well-established doctrine that a person cannot be convicted of perjury upon the unsupported testimony of a single witness, since there is then only an oath opposed to an oath. It is sufficient, however, if the direct testimony of one witness for the prosecution, fully substantiating the charge, is corroborated in some material point by other and independent evidence. The punishment is imprisonment in the State's prison, with sometimes a fine in addition. JOHN NORTON POMEROY.

Per'kins, tp. of Sagadahoc co., Me. Pop. 71.

Perkins, tp. of Erie co., O. Pop. 1291.

Perkins (CHARLES CALLAHAN), A. M., b. at Boston, Mass., Mar. 1, 1823; graduated at Harvard University 1843; has published in London *Tuscan Sculptors* and *Italian Sculptors*—works of great research and highly illustrated.

Perkins (ELISHA), b. at Norwich, Conn., Jan. 16, 1741, was the son of Dr. Joseph Perkins of Plainfield, Conn. The son established and supported an academy at Plainfield, where he practised medicine with great success. In 1796 he announced the invention of metallic tractors for the cure of rheumatism, gout, and the like diseases. His son went to Europe with the tractors, where, as well as in America, the new cure, called "Perkinism," attracted great attention, and was favorably received even by physicians. Lord Rivers presided over a Perkinian institution in which many marvellous cures were wrought solely by the power of imagination, for the tractors were simply pins of iron and brass which were drawn over the affected part. In Copenhagen the medical faculty published a voluminous report in favor of Perkinism; and when in 1803 the English physicians had begun to see through the imposture, T. G. Fessenden produced his *Terrible Tractoration* as a defence of Perkins and a satire upon the doctors. Perkins afterwards invented a remedy of great alleged value in the cure of fevers, and during a yellow-fever season in New York went there to test its value, but himself fell a victim to the disease, Sept. 8, 1799. He was a man of great native endowments, public spirit, and generosity, but it seems impossible to clear him of the charge of falsehood with regard to his tractors, which he pretended were made of a peculiar combination of metals, but which in reality were of common brass and iron.

Perkins (GEORGE H.), U. S. N., b. Oct. 20, 1836, in New Hampshire; graduated at the Naval Academy in 1856; became a lieutenant in 1861, a lieutenant-commander in 1862, a commander in 1871; served with distinguished gallantry as the executive officer of the Cayuga at the passage of Forts St. Philip and Jackson and capture of New Orleans in 1862, and commanded the iron-clad Chickasaw at the battle of Mobile Bay, Aug. 5, 1864, where his conduct attracted the attention of Rear-Admiral Farragut, who in his official report of the battle says: "I cannot give too much praise to Lieut.-Com. Perkins, who, though he had orders to return North, volunteered to take command of the Chickasaw, and did his duty nobly."

FOXHALL A. PARKER.

Perkins (GEORGE ROBERTS), LL.D., b. in Otsego co., N. Y., May 3, 1812; was principally self-educated; was teacher of mathematics at the Clinton Liberal Institute 1831–38; professor of mathematics in the State Normal School 1844–48; principal of that institution 1848–52; superintended the erection of the Dudley Observatory; became deputy State engineer 1858, and State surveyor. Author of a series of mathematical textbooks, and has contributed to scientific periodicals.

Perkins (JACOB), b. at Newburyport, Mass., July 9, 1766; was in childhood apprenticed to a goldsmith; invented a new method of plating shoe-buckles; was employed in 1797 to make dies for the State coinage; invented soon afterwards a machine for cutting and heading nails at a single operation, and was the originator of the use of steel, instead of copper plates, for engraving bank-notes. After residing some years in Boston and New York, he engaged in business in Philadelphia as a bank-note engraver in 1814; went to England in 1818; obtained a contract for supplying plates to the Bank of Ireland, and during a course of years originated many curious ex-

periments. He was the inventor of the steam-gun, of the bathometer for measuring the depth of water, of the pleometer for registering the speed of vessels, and largely aided in perfecting the manufacture of the steam-engine. D. at London July 30, 1849.

Perkins (JAMES HANDASYD), b. at Boston, Mass., July 31, 1810, nephew of Col. Thomas H. Perkins, in whose counting-room he was a clerk 1828–30; visited England and the West Indies 1831–32; settled at Cincinnati 1832, and studied law; devoted himself to literature; edited the *Evening Chronicle* and the *Cincinnati Mirror;* became a Unitarian minister 1839; pastor of a church 1841–47; was the first president of the Cincinnati Historical Society 1844; wrote valuable historical papers on the Western States in the *North American* and the *New York Reviews;* published *Annals of the West* (1847), and was identified with the causes of education and prison discipline. In a fit of depression he drowned himself in the Ohio River at Cincinnati Dec. 14, 1849.

Perkins (JONATHAN COGSWELL), b. at Ipswich, Mass., Nov. 21, 1809; graduated at Amherst College 1832; studied at the Cambridge Law School; was admitted to the bar 1835; practised law successfully thirteen years, editing and annotating several valuable legal textbooks; was elected State senator 1847; became judge of the court of common pleas 1838. Since his retirement from the latter position he has practised law at Salem.

Perkins (JUSTIN), D. D., b. at West Springfield, Mass., Mar. 12, 1805; graduated at Amherst College 1829, and Andover Theological Seminary 1832; was tutor at Amherst 1832–33; went to Persia as a missionary of the A. B. C. F. M. 1833; laid the foundation of the Nestorian mission at Oroomiah Nov., 1834; established schools; created a modern literature in the Nestorian dialect of Syriac, into which he translated the whole Bible and several religious and educational books; visited the U. S. with Mar Yohannan, a Nestorian bishop, 1842; made another visit 1848; finally returned to the U. S. Aug., 1869. D. at Chicopee, Mass., Dec. 31, 1869. Author of Syriac commentaries on Genesis and Daniel, of *Eight Years in Persia* (1843), and *Missionary Life in Persia* (1861).

Perkins (Col. THOMAS HANDASYD), b. at Boston, Mass., Dec. 15, 1764; went as a supercargo to Batavia and Canton 1789; formed a partnership with his elder brother, James, and was for many years largely engaged in trade to Canton, Calcutta, and the N. W. coast of America; acquired great wealth; was a strenuous opponent of Pres. Madison's administration during the war of 1812–15; represented Boston nearly twenty years in both branches of the State legislature; retired from active business about 1823; was the largest contributor to the Mercantile Library Association; took a prominent part in the erection of the Bunker Hill Monument, and subsequently in that of the Washington Monument; was the projector of the Quincy Railway (1827), the first built in the U. S.; gave his mansion on Pearl street, valued at $40,000, as an asylum for the blind; was a liberal benefactor of the Massachusetts General Hospital, and with others of his family contributed $60,000 to the Boston Athenæum. D. at Boston Jan. 11, 1854.

Perkins' Plantation, tp. of Franklin co., Me. P. 149.

Per'kinsville, post-v. of Weathersfield tp., Windsor co., Vt., on Black River.

Perkio'men, tp. of Montgomery co., Pa. Pop. 2056.

Per'leberg, town of Prussia, province of Brandenburg, on the Stepnitz, has manufactures of beetroot-sugar, wadding, and chicory. Pop. 6485.

Perm, the easternmost government of European Russia, comprises an area of 128,623 square miles, with 2,173,501 inhabitants. The larger, central part of the country is covered by the Ural Mountains, which attain a height of 4000 feet, rising through very gentle slopes from the surrounding meadow-lands, and entirely covered with forests. The climate is very severe. In the middle of September the snow comes, the rivers freeze, and all transportation is carried on by sledges; at lat. 60° N. all cultivation ceases. Nevertheless, the country produces sufficient grain and cattle for its home consumption. The chief branch of industry is mining. Gold, silver, platina, iron, salt, coal, alabaster, marble, and diamonds are found, and some of the mines are very rich. Perm iron is celebrated in Europe, and is produced annually to the value of $30,000,000. The platina-mines are said to be the richest in the world. A very important transit-trade between Asia and Europe is carried on.

Perm, town of European Russia, capital of the government of Perm, on the Kama. It is the see of an archbishop, and carries on, besides a large trade in the products of its own industry, a most extensive transit-trade in European and Asiatic products. Pop. 22,859.

Perman'ganates, compounds with bases of *permanganic anhydride*, Mn_2O_7. Permanganates have in crystalline form a dark-red or brownish color. With combustible bodies they deflagrate like the nitrates and chlorates. They are all soluble in water, and many are deliquescent. Permanganate of silver is the least soluble salt, and according to Mitscherlich may be caused to precipitate in great part in a crystalline form by mixing concentrated alkaline permanganates with concentrated solution of argentic nitrate. The solutions of these salts have an intense red color and enormous tinctorial power, a surprisingly small quantity tingeing red a very large volume of pure water. They are reduced and destroyed with rapidity by oxidable matters, especially of the organic kind; so that water slightly tinged with a permanganate constitutes a very delicate test for deoxidizing matters, the color being destroyed thereby. A weak solution of a permanganate is used in volumetric analysis, in the laboratory, for determination of oxidable substances. Certain contaminations of drinking waters, products of putrefaction, are readily detected by adding to the water a little weak solution of permanganate, which may tinge the water for a minute or two, but if these impurities are present the color will rapidly fade or turn brownish. By virtue of their high oxidating power permanganates are much used in disinfection.

Potassic permanganate is the salt which is employed for disinfecting and as a chemical reagent, and has therefore become an article of commerce. A brief statement of its preparation will hence be appropriate. The method most recommended is that of Béchamp of Montpellier, who mixes 10 parts of fine powder of black oxide of manganese intimately with 12 parts of potash in concentrated solution, dries thoroughly, puts into an earthenware retort, heats and passes over the mass oxygen, or air free from carbonic acid, as long as absorption continues. The mass is then dissolved, and the excess of potash neutralized—not with a mineral acid, as usual, but with a current of carbonic acid gas, passed until the liquid becomes purple. It is then decanted, evaporated at a moderate heat, and crystallized. Purity is obtained by recrystallization. Permanganate of potash crystallizes in beautiful and brilliant dark-purple prisms. It dissolves in five times its weight of water. It is anhydrous, and its formula is $K_2O.Mn_2O_7$. H. WURTZ.

Permangan'ic Acid. This acid is preparable from the permanganate of potash by distillation with somewhat diluted sulphuric acid at a very low temperature, not over 160° F. Violet-colored vapors pass over, and condense to a singular greenish-black liquid, which has a lustre of a *metallic* character. It is very deliquescent, and causes spontaneous combustion on contact with several organic bodies by virtue of its energetic oxidizing power. Its formula in this form is $H_2O.Mn_2O_7$. The anhydride, Mn_2O_7, has never been isolated. H. WURTZ.

Permian Group. See GEOLOGY.

Permuta'tions [Lat. *permutatio*], the results obtained by writing a certain number of letters, or factors, in every possible order, so that all the letters shall enter each result, and each letter but once. Thus, the letters a, b, and c may be written abc, acb, bac, bca, cab, and cba. Here there are three letters and $1 \times 2 \times 3$, or 6, permutations. To determine the number of permutations of n letters, n being any whole number, let us denote the number of permutations of $n-1$ letters by Q; if we now introduce a new letter, it is obvious that it may have n places in each of the Q permutations of $n-1$ letters; that is, it may be written before the first letter of each, between each two letters, and after the last letter of each; hence, the whole number of permutations of n letters is $Q \times n$. Now, the number of permutations of 3 letters is $1 \times 2 \times 3$; hence, the number of permutations of 4 letters is $1 \times 2 \times 3 \times 4$. Proceeding from this conclusion, we infer that the number of permutations of 5 letters is $1 \times 2 \times 3 \times 4 \times 5$, and so on indefinitely. Hence, the number of permutations of n letters is the continued product of the natural numbers from 1 to n, inclusive, n being any whole number. If the actual product indicated by each permutation is found, it will be equal to a fixed quantity in each case. The theory of permutations finds an important application in the deduction of formulas for combinations and arrangements, and these in turn are used in developing the theory of probabilities. (See Davies' *New Bourdon*, pp. 317–322.) W. G. PECK.

Pernambu'co, province of Brazil, S. of Parahiba, and bordering on the Atlantic, comprises an area of 61,068 square miles, with 1,250,000 inhabitants. It contains extensive meadows teeming with cattle, and large tracts of the most fertile soil covered with plantations of cotton, sugar-cane, and coffee, or with forests yielding the most valuable kinds of timber and wood.

Pernambuco, city of Brazil, with respect to size the third, with respect to commercial importance the second, of the country, is at the mouth of the Biberibe, in lat. 8° 4′ S., on a low but extremely fertile plain covered with sugar and cotton plantations, and producing all varieties of tropical fruits. Its excellent harbor is formed by a reef extending for several miles along the coast, and acting as a breakwater, on whose northern extremity is a lighthouse marking the entrance into the harbor. The city itself, which was founded by the Dutch, and which, not only in its single buildings, but also in the general character of its architecture, shows a Dutch influence, consists of three parts: Recife, on a narrow peninsula; Boa Vista, on the river-shore; and San Antonio, on an island in the river; which three parts are connected by elegant iron bridges. Recife forms the business part of the city, and has several broad and elegant streets; and, although the city has no very remarkable public buildings, its general appearance is neat, and in many parts even beautiful, on account of the promenades and gardens with their wonderful tropical vegetation. The two principal articles of export are sugar and cotton. In 1868 no less than 48,624 tons of sugar were exported, and 197,994 sacks of cotton (160 pounds each). Besides these two articles, large quantities of rum, hides, dyewood, and coffee are shipped from this port. The pop. of the city is estimated at from 90,000 to 100,000.

Per′nau, town of Russia, government of Livonia, at the entrance of the river Pernau into the Gulf of Riga, is regularly built and was formerly fortified. Pop. 9527.

Peronosporeæ, an order of Fungi in which the conidia are aërial, and produced either singly or in rows on the surface of the foster-plant, and whose oöspores are produced by the action of a pollinodium upon the contents of an oögonium which is buried in the substance of the foster-plant. This small order, comprising only two genera, includes species which, with a single exception, are all parasitic on living herbaceous plants. They appear to the naked eye either like a white frost or in white powdery spots on green leaves and stems, particularly on the lower surfaces of leaves. The order includes some of the most destructive of Fungi, as that which causes the potato-rot, the lettuce, onion, and American grapevine mould, and the white mould of cabbages, mustard, and other cruciferous plants. The mycelium of the species of this order pervades all parts of the plants on which they are parasitic, extending from the flowers, as seen in *Peronospora violacea* and *Cystopus candidus*, to the roots, of which we have a familiar example in the potato-rot. The hyphæ or threads of the mycelium are not often divided by cross-partitions, and are in most species furnished with *haustoria*, or suckers, by means of which they not only make their way between, but also force their way into, the cells of the foster-plant, and are thus more easily enabled to attach themselves and to absorb nourishment. In some species, as in *Cystopus candidus*, the haustoria are nothing more than little knobs, while in *Peronospora parasitica* they are so large as almost to fill up the cells into which they have made their way. The haustoria are more readily seen in the stem than the leaf. The mycelium of the species of this order is extremely sensitive to moisture. In dry weather it remains comparatively dormant, but in wet seasons grows rapidly through all parts of the plant, and finally pushes its way through the stomata into the air, as in the genus *Peronospora*, or, as in *Cystopus*, bursts through the epidermis in irregular spots. We shall first consider what takes place in *Peronospora*, where the mycelium pushes through the stomata and does not rupture the epidermis. From this fact we see why the presence of a *Peronospora* is first made known to the eye as a frostlike spot on the under surface of the leaves. The hyphæ, after passing through the stomata, branch in different ways according to the species; irregularly, as in *Peronospora infestans*, Mont.; dichotomously, as in *P. effusa*, Grev. (Fig. 1); trifarously, as in *P. viticola*, B. & C.; or stellate, as in *P. gangliformis*, Berk. At the tips of the branches are borne the conidia or asexual spores, which are formed by a swelling of the terminal part of the mycelium, which is separated from the rest of the mycelium by a cross-partition. The conidia are always more or less oval in shape, and fall very easily from their attachments. If the conidia fall on any wet or moist surface, they germinate in a very short time, sometimes as quickly as an hour. The method of germination varies in different species, and may be of three different kinds. First, as in *Peronospora effusa*, Grev., a germinal tube may be given off from the side of the spore, as shown in Fig. 2, *a*; secondly, the germinal tube may be given off from the end of the spore, as in *P. gangliformis*, Berk. (Fig. 2, *b*); thirdly, we may have a more complicated development, as in *P. infestans*, Mont., and *P. viticola*, B. & C., where the contents of the conidia divide into small bodies, from three to seventeen in number, which burst through the wall of the conidia, and then swim rapidly about for from fifteen to thirty minutes by means of two cilia attached at the side. At the expiration of this period they come to rest, the cilia fall off, and in a short time a germinal tube is produced which soon assumes all the characters of the original *Peronospora* mycelium. In Fig. 2, *c*, is represented one of the conidia of *Peronospora infestans*, in which the contents are dividing so as to form zoöspores; in *d* the zoöspores, with their two vibrating cilia, have forced their way out of the conidia; and *e* represents one which has come to rest and shot out a germinal tube.

Fig. 1.

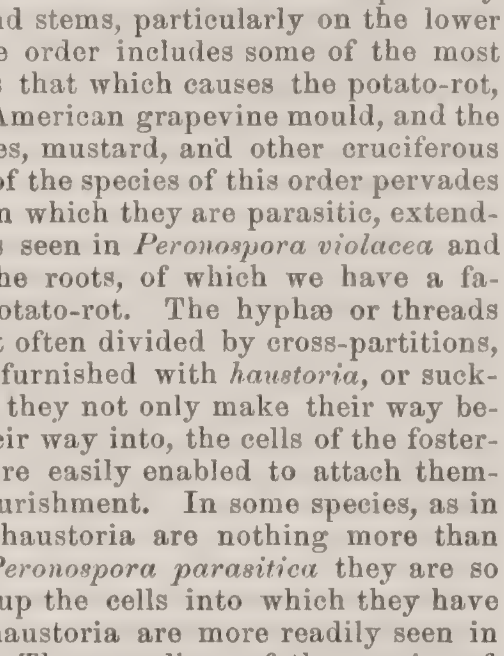
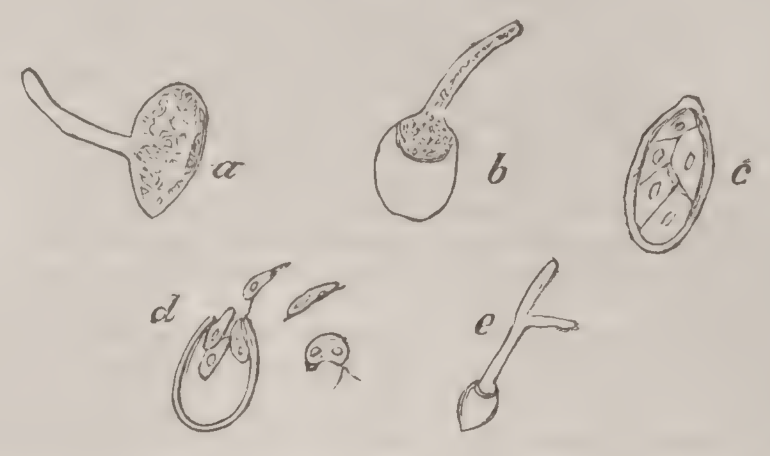


Fig. 2.



When the mycelium of any *Peronospora* has made its way through the stomata into the air and borne conidia, it has, of course, spread through the leaf, stem, or whatever part of the plant it may be to such an extent as to absorb all the nourishment of the plant-cells themselves, and, contemporaneously with the appearance of the conidia, we have a blackening of the leaves, stems, etc., which indicates the death of the foster-plant from the ravages of the *Peronospora*. In many cases, however, before this blackening occurs, a change has taken place in the threads of the mycelium imbedded in the tissue of the leaves and stems. Certain filaments are observed to enlarge until a spherical outline is attained. A cross-partition then forms, which separates the spherical part from the rest of the mycelium. In the mean while, another filament has grown until it comes in contact with the spherical portion of the first, and its terminal portion is also separated from the rest of the mycelium by a cross-partition. Fig. 3 represents the change just described; *b* and *a* respectively represent the ends of two mycelial threads, which are shut off from the rest by cross-partitions; *a* is the *antheridium*, *b*, the *oögonium*, in which the protoplasmic contents, *o*, are collected in a spherical mass at the centre. The fertilization of *o*, which is to form the oöspore, is effected by the growth from the antheridium of a small process, *p*, which, from its resemblance to a pollen-tube, has been called the *pollinodium* by De Bary. Whether the pollinodium makes its way into, or merely touches the surface of, the mass *o*, has never been satisfactorily proved. As the result of impregnation a coating of cellulose is formed around *o*, and it becomes the oöspore, as is shown in Fig. 4, where *b* represents the mother-cell, as in Fig. 3, and *a* the shrivelled remains of the antheridium. The outer cellulose wall of the oöspore is often developed into ridges or spines, and is

Fig. 3.

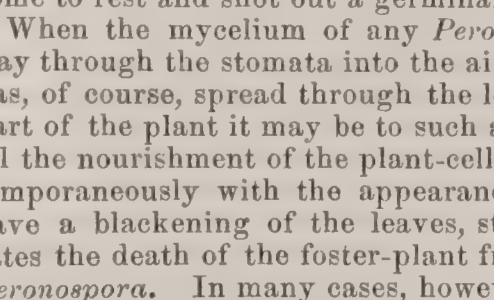
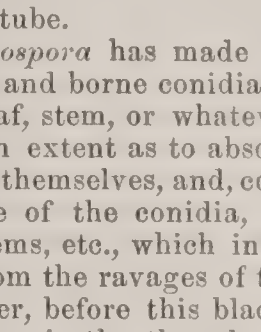


Fig. 4.



of tough, resisting nature, generally able to endure the cold of winter without injury, whereas the conidia are destroyed by freezing. The oöspores, which are never aërial, but buried in the leaves or stems, are set free by the rotting of the tissue in which they are enclosed. The germination of the oöspores has been observed only in *Peronospora Valerianellæ*, Fuckel. In that species the thick outer membrane bursts and a germinal tube grows out.

The species of *Peronospora* are rather numerous, and are distinguished from one another by the branching of the filaments which bear the conidia, by the shape, color, and mode of germination of the conidia, and by the size and markings of the oöspores. As a rule, species of *Peronospora* are limited in their habitat to a single species of phanerogams or to a few nearly-related species. *Peronospora infestans*, Mont., is limited to the potato and the tomato. When a *Peronospora* occurs on more than one species of phanerogam, it sometimes happens that the oöspores are not found on all of them. This is also the case with the species of *Cystopus*. *Cystopus candidus*, for example, which is very common on Cruciferæ, bears conidia abundantly when parasitic on *Capsella*, but no oöspores; whereas when parasitic on *Sinapis* oöspores abound.

Of the species of *Peronospora*, *P. infestans*, Mont., which is the cause of the potato-rot, deserves special notice. In 1842, and again in 1845, the potatoes cultivated in the U. S., as well as in a great part of Europe, were attacked by a violent disease which in the course of a few hours caused whole fields to become black and rotten. The general direction of the epidemic was from W. to E. The source of the trouble was at length found to be a parasitic fungus, which Montagne described as *Botrytis infestans*. The disease has occurred several times since 1845, and in fact it prevails to a certain extent almost every damp season, but never with such severity as in 1845. In that year the crop was entirely destroyed, and in countries like Ireland and Nova Scotia, where the potato constituted an important article of diet, there was great distress. Numerous prizes were offered for a remedy, but without success, although botanists examined the habits of the fungus very thoroughly. The most exhaustive account of the subject was given by De Bary in the *Annales des Sciences* (4th series, vol. xx. 1863). He studied the germination of the conidia which has been referred to above, and found that the germinal tubes could enter any part of the potato-plant. He even found the ground under infected plants filled with the moving zoöspores. The most important question was to ascertain how the disease was propagated from year to year, for the conidia, which are abundant in summer, cannot survive the cold of winter. No oöspores were found by which the disease could be propagated, and it began to be surmised that the oöspores, if they existed, must be in some wild species of *Solanum* growing in Peru or the neighboring countries, or else that they must be found in some plant not nearly allied to the potato. During the summer of 1875, Mr. Worthington G. Smith of England discovered the oöspores in the leaves of some cultivated American varieties of potato, and published an account of them in the *Gardener's Chronicle* of July 17, 1875, and in the *Quarterly Journal of Microscopic Science* of Oct., 1875, where two photographs of preparations are given. The only other useful plant which, so far as is known, is attacked by the potato-rot is the tomato. There is no direct cure for the disease. For its production to any very injurious extent a wet, rather warm, season is necessary. The leaves and stems of diseased plants should be destroyed to prevent the fungus spreading. Fig. 5 gives a view of the mycelium of the potato-rot fungus passing through a stoma and bearing conidia.

Fig. 5.

Cystopus, the remaining genus of the Peronosporeæ, resembles closely the genus *Peronospora*, except in the structure of the conidia. In *Peronospora*, as we have seen, they are borne singly at the tips of branching threads; in *Cystopus* they are in rows which are packed closely together. W. G. Farlow.

Pe'rote, post-v. and tp. of Bullock co., Ala. P. 1538.

Pérouse, La. See La Pérouse.

Perpendic'ular [Lat. *perpendicularis*], a style of Gothic architecture which flourished in England during the fifteenth century. While in France, Gothic architecture became debased by being overloaded and by running into the fantastic (see Flamboyant), it degenerated in England by becoming stiff, dry, and meagre, as if the aim had been to confine architecture to the use of straight lines only. One of the most prominent specimens of this style is the cathedral of Winchester; also most of the colleges at Oxford and Cambridge belong to it. But with the Perpendicular style followed the open timber roof, which is often elaborated with great beauty; an interesting example is the roof of Westminster Hall, built by Richard II.

Perpet'ual Mo'tion, a term employed to denote an assumedly possible form of mechanism, which having been set in motion by some natural force, should continue always to move, and should at the same time be capable of at once constantly restoring the force expended in moving it, and of performing useful work besides. The mechanical absurdity involved in this notion is to ordinary minds self-evident the moment the proposition is distinctly stated. In spite of this, however, there have been found a surprising number of individuals so completely and incorrigibly blind to the error as to have devoted their whole lives to attempts to solve the fascinating problem. Gravity is the natural force which, in nearly every instance, these schemers have endeavored to compel to undo its own work, and to do additional work besides. With this view there have generally been employed wheels provided with a variety of contrivances by which it was imagined that weights descending on one side might be made to carry up on the opposite side other equal weights to the same height, which latter by descending in turn might maintain the motion. Strictly speaking, if there were no friction or other sources of resistance in the case, a wheel set into rotation would continue to revolve for ever, and would need none of these contrivances of lifted and descending weights to maintain its uniformity of velocity. It would therefore be a perpetual motion, but not a perpetual motion in the sense intended by the schemers with whom the expression originated. It would do no work. The planets are examples of perpetual motion upon a grand scale, but this is owing only to the fact that they encounter no sensible resistance in their paths through space.

The history of the very numerous mechanical conceptions by which the different seekers after a *working* perpetual motion have hoped to accomplish their end would form a very entertaining chapter, but a chapter without practical utility. Those who would pursue the subject further will find a good account of it in Dircks's *Perpetuum Mobile*, London, 1861. Montucla's *Histoire des Mathématiques* contains also notices of the delusion, and the scientific journals of the last century in Europe have scattered through them descriptions of numerous such projects.

F. A. P. Barnard.

Perpetuities. See Annuity.

Perpignan', town of France, capital of the department of Pyrénées-Orientales, on the Tet, is a fortress of first rank, and commands the passage between France and Spain. It has distilleries, bell-foundries, and manufactures of leather, cork, and woollen fabrics, and an active trade in oil, wine, corn, and fruits. Pop. 27,378.

Perquim'ans, county of N. E. North Carolina. Area, 250 square miles. It is bounded S. by Albemarle Sound, and traversed by the navigable Perquimans River. It is in part marshy; its soil is light and productive. Corn is the leading product, but of late cotton is cultivated with great success. Flour is a leading article of manufacture. Cap. Hertford. Pop. 7945.

Perrault' (Claude), b. at Paris in 1613; studied medicine, but devoted himself afterwards to architecture; designed the façades of the Louvre and the Observatory of Paris; translated Vitruvius (1673–84); published several volumes of essays on physics and architecture. D. at Paris Oct. 9, 1688.—His brother, Charles Perrault, b. Jan. 12, 1628, d. May 16, 1703, was a very prolific poet and miscellaneous writer, but he is now known only through the sarcasms of Boileau, and through a small book which he published pseudonymously, *Les Contes des Fées*.

Perrenot, de (Antoine). See Granvelle.

Per'rinton, tp. of Monroe co., N. Y. Pop. 3261.

Perron, du (Anquetil). See Anquetil-Duperron.

Perrot' (Georges), b. at Villeneuve-Saint-Georges, department of Seine-et-Oise, France, Nov. 12, 1832; studied from 1855 to 1858 at the French school in Athens; made in 1861 a journey of exploration in Asia Minor; dwelt for some time at Ancyra investigating the famous inscription

on the temple which the Galatians built there in honor of Augustus; and wrote *Exploration archéologique de la Galatie et de la Bithynie* (1863), *Souvenirs d'un Voyage en Asie Mineure* (1864), *Essai sur le Droit publié et privé de la République Athénienne* (1867), etc.

Perrot (Nicholas), b. in France early in the seventeenth century; obtained a good education; came to Canada, and became an Indian trader, acquiring great influence among the Western tribes, whose languages he learned; rendered great services to several Canadian governments, and was the discoverer of the lead-mines on the river Des Moines, Ia. Author of journals largely employed by Charlevoix and other writers.

Per'ry [Lat. *pirum*, "pear"], a drink made extensively in England from the juice of the coarser kinds of pears, in much the same way as cider is made. Perry is sweeter than cider, and is largely used as a beverage. It is popularly regarded as an antidote for mushroom-poisoning.

Perry, county of W. Alabama. Area, 740 square miles. It is uneven, very fertile, and well wooded. Cotton and corn are leading products. It is traversed by several railroads, and by the Cahawba River, which it is proposed to render navigable. Cap. Marion. Pop. 24,975.

Perry, county of Central Arkansas. Area, 530 square miles. It is hilly, broken, well timbered, and contains beds of coal. The valleys are fertile, and adapted to cotton and grain culture. The Arkansas River washes the N. E. border. Cap. Perryville. Pop. 2685.

Perry, county of S. Illinois. Area, 485 square miles. It is very fertile, well wooded, and abounds in excellent coal. Cattle, grain, and wool are leading products. The county is traversed by the Illinois Central, the St. Louis Alton and Terre Haute, and the Iron Mountain Chester and Eastern R. Rs. Cap. Pinckneyville. Pop. 13,723.

Perry, county of S. Indiana, bounded S. and S. E. by the Ohio River. Area, 450 square miles. It is very hilly and remarkably fertile, producing much corn, wool, tobacco, and live-stock. Good coal and iron ore abound. The county has large and increasing manufacturing interests. Cap. and principal town, Cannelton. Pop. 14,801.

Perry, county of S. E. Kentucky. Area, 700 square miles. It is mountainous, with some fertile valleys. Corn is the leading product. Coal is found, which has here a prospective value only. Drained by the head-streams of the Kentucky River. Cap. Hazard. Pop. 4274.

Perry, county of S. E. Mississippi. Area, 1116 square miles. It is level, sandy, and mostly covered with dense pine forests. It is watered by affluents of the Pascagoula River. Cap. Augusta. Pop. 2694.

Perry, county of S. E. Missouri, bounded N. E. by the Mississippi River, which separates it from Illinois. Area, 430 square miles. It is uneven, heavily timbered, and fertile. Live-stock, grain, and wool are leading products. Lead and iron are found. Cap. Perryville. Pop. 9877.

Perry, county of Central Ohio. Area, 400 square miles. It is hilly, fertile, and contains beds of good coal. Cattle, wool, tobacco, and grain are staple products. Stone and earthen ware is a leading article of manufacture. The county is traversed by the Cincinnati and Zanesville R. R. Cap. New Lexington. Pop. 18,453.

Perry, county of Central Pennsylvania. Area, 475 square miles. It is bounded E. by the Susquehanna River, is traversed by the Juniata River and the Pennsylvania R. R., and by several parallel wooded mountain-ridges, with broad, beautiful, and fertile valleys. Live-stock, grain, hay, and wool are leading products. Leather, flour, metallic wares, etc. are manufactured. Iron ore is extensively mined. Cap. New Bloomfield. Pop. 25,447.

Perry, county of Middle Tennessee, bounded W. by the Tennessee River. Area, 375 square miles. It is somewhat uneven, very fertile, and produces corn and live-stock. Cap. Linden. Pop. 6925.

Perry, tp. of Johnson co., Ark. Pop. 495.

Perry, tp. of Perry co., Ark. Pop. 366.

Perry, p.-v., cap. of Taylor co., Fla.

Perry, post-v. of Upper Town tp., cap. of Houston co., Ga., on Central R. R. of Georgia, located in the centre of the great cotton-growing section, contains important industries, with 1 weekly newspaper. Pop. of v. 836.

Edwin Martin, Ed. "Journal."

Perry, p.-v. and tp., Pike co., Ill. P. of v. 798; of tp. 2161.

Perry, tp. of Allen co., Ind. Pop. 1280.

Perry, tp. of Boone co., Ind. Pop. 1109.

Perry, tp. of Clay co., Ind. Pop. 1340.

Perry, tp. of Clinton co., Ind. Pop. 1220.

Perry, tp. of Delaware co., Ind. Pop. 1163.

Perry, tp. of Lawrence co., Ind. Pop. 982.

Perry, tp. of Marion co., Ind. Pop. 2452.

Perry, tp. of Martin co., Ind. Pop. 1760.

Perry, tp. of Miami co., Ind. Pop. 1667.

Perry, tp. of Monroe co., Ind. Pop. 1513.

Perry, tp. of Noble co., Ind. Pop. 3135.

Perry, tp. of Tippecanoe co., Ind. Pop. 1481.

Perry, tp. of Vanderburg co., Ind. Pop. 1719.

Perry, tp. of Wayne co., Ind. Pop. 876.

Perry, tp. of Buchanan co., Ia. Pop. 1633.

Perry, post-v. of Spring Valley tp., Dallas co., Ia., on Coon River and the Des Moines Valley R. R.

Perry, tp. of Davis co., Ia. Pop. 722.

Perry, tp. of Jackson co., Ia. Pop. 1273.

Perry, tp. of Marion co., Ia. Pop. 465.

Perry, tp. of Plymouth co., Ia. Pop. 74.

Perry, tp. of Tama co., Ia. Pop. 713.

Perry, post-v. of Kentucky tp., Jefferson co., Kan., on the Kansas Pacific R. R., has 2 school buildings, 3 churches, 1 newspaper, 2 hotels, a telegraph-office, 2 steam-elevators and corn-shellers, and stores. Corn, pork, wheat, and railroad ties are shipped from here. Pop. of v. 403.

H. G. Evans, Ed. "Times."

Perry, post-v. and tp. of Washington co., Me., on Passamaquoddy Bay. Pop. 1149.

Perry, post-v. and tp. of Shiawassee co., Mich., on Looking-glass River. Pop. 1058.

Perry, tp. of St. François co., Mo. Pop. 1351.

Perry, p.-v. and tp., Wyoming co., N. Y., at the outlet of Silver Lake, is the southern terminus of Rochester and Pine Creek R. R., has an academy, a bank, a weekly newspaper, and manufactories. P. 167; of tp. 867.

Perry, tp. of Allen co., O. Pop. 1235.

Perry, tp. of Ashland co., O. Pop. 1452.

Perry, tp. of Brown co., O. Pop. 3016.

Perry, tp. of Carroll co., O. Pop. 932.

Perry, tp. of Columbiana co., O. Pop. 4388.

Perry, tp. of Coshocton co., O. Pop. 932.

Perry, tp. of Fayette co., O. Pop. 1194.

Perry, tp. of Franklin co., O. Pop. 1297.

Perry, tp. of Gallia co., O. Pop. 1514.

Perry, tp. of Hocking co., O. Pop. 1745.

Perry, post-v. and tp. of Lake co., O., on Lake Erie and the Lake Shore and Michigan Southern R. R. P. 1208.

Perry, tp. of Lawrence co., O. Pop. 2215.

Perry, tp. of Licking co., O. Pop. 897.

Perry, tp. of Logan co., O. Pop. 922.

Perry, tp. of Monroe co., O. Pop. 1116.

Perry, tp. of Montgomery co., O. Pop. 2029.

Perry, tp. of Morrow co., O. Pop. 1044.

Perry, tp. of Muskingum co., O. Pop. 991.

Perry, tp. of Pickaway co., O. Pop. 1415.

Perry, tp. of Pike co., O. Pop. 748.

Perry, tp. of Putnam co., O. Pop. 637.

Perry, tp. of Richland co., O. Pop. 686.

Perry, tp. of Shelby co., O. Pop. 1208.

Perry, tp. of Stark co., O. Pop. 1736.

Perry, tp. of Tuscarawas co., O. Pop. 1089.

Perry, tp. of Wood co., O. Pop. 1323.

Perry, tp. of Armstrong co., Pa. Pop. 3877.

Perry, tp. of Berks co., Pa. Pop. 1680.

Perry, tp. of Clarion co., Pa. Pop. 1568.

Perry, tp. of Fayette co., Pa. Pop. 1445.

Perry, tp. of Greene co., Pa. Pop. 1292.

Perry, tp. of Jefferson co., Pa. Pop. 1222.

Perry, tp. of Lawrence co., Pa. Pop. 806.

Perry, tp. of Mercer co., Pa. Pop. 914.

Perry, tp. of Snyder co., Pa. Pop. 1016.

Perry, post-v. and tp. of Dane co., Wis. Pop. 1051.

Perry (Amos), b. at Natick, Mass., Aug. 12, 1812; graduated at Harvard College 1837; was for many years teacher of high schools and seminaries at New London, Conn., and Providence, R. I.; was consul to Tunis 1862–67, and published in 1869 a volume containing the results of careful researches upon the sites of Carthaginian cities.

Perry (Arthur Latham), b. at Lyme, N. H., Feb. 27, 1830; graduated at Williams College 1852; became profes-

sor of history and political economy in that institution 1854, and in 1875 pastor of a church at Williamstown. He was at one time a writer upon the Springfield *Republican*, and is author of *The Elements of Political Economy* (1866), a work which is considered the scientific exponent of Free Trade doctrines.

Perry (Capt. Christopher Raymond), b. at South Kingston, R. I., in 1761; was a sailor from boyhood; served in privateers and in the American navy during the Revolutionary war; was taken captive and thrown into the famous prison-ship Jersey, where he was kept for some months; again entered the merchant service, and was appointed post-captain in the U. S. navy in 1798, when war with France appeared imminent. Retiring from the navy in 1801, he was appointed collector of Newport, where he d. June 8, 1818. His five sons were all officers in the navy during the war of 1812 (see Perry, Oliver H. and Matthew C.), and several grandchildren now follow the same profession.

Perry (Com. Matthew Calbraith), brother of Oliver Hazard, b. at South Kingston, R. I., in 1795; entered the navy as a midshipman Jan. 16, 1809; served under Commodores Rodgers and Decatur; was promoted to lieutenant July 24, 1813; cruised on the coast of Africa in the Cyane 1819, and fixed the locality of the first settlement in Liberia; commanded the schooner Shark in the West Indies 1821–24, where he captured several pirates; was made commander Mar. 21, 1826, and captain Feb. 9, 1837; served many years on foreign stations, especially in the Mediterranean; took an important part in the introduction of steam as a motive-power in vessels of the navy; commanded successively the navy-yard at Brooklyn, the W. African squadron, and the West Indies squadron during the war with Mexico, in which he occupied nearly all the Mexican seaports of the Gulf, captured the city of Tabasco, and co-operated in the siege and bombardment of Vera Cruz. In 1852, Com. Perry was sent to Japan at the head of a naval expedition, and succeeded by skilful negotiation in opening that country to foreign commerce (1854). An elaborate *Report of Com. Perry's Expedition to Japan*, edited by Rev. Dr. Francis L. Hawks and Mr. George Jones, was published by order of Congress in 3 quarto vols. (Washington, 1856). D. at New York Mar. 4, 1858. A magnificent bronze statue has been dedicated to his memory on the public square of Newport, R. I.

Perry (Com. Oliver Hazard), son of Christopher Raymond, b. at South Kingston, R. I., Aug. 23, 1785; entered the U. S. navy as midshipman Apr. 7, 1799; cruised with his father in the West Indies 1799–1800; was engaged in the war against Tripoli 1804–05; became lieutenant Jan. 15, 1807, and at the outbreak of the war of 1812 was in command of a flotilla of gunboats on the Atlantic coast, when in Feb., 1813, he was transferred at his own request to serve under Com. Isaac Chauncey on Lake Ontario. He took an active part in the attack upon Fort George; was appointed to fit out a squadron upon Lake Erie, which he successfully accomplished at Presque Isle (now Erie), Pa.; and having equipped nine small vessels, attacked and captured the British fleet near Put-in Bay, O., Sept. 10, 1813. This action, known as the "battle of Lake Erie," or more commonly as "Perry's victory," obtained him an immense popularity, partly attributable to the sententious manner in which it was announced by the famous despatch, "We have met the enemy, and they are ours." Congress rewarded him with a vote of thanks, a medal, and the rank of captain. Perry co-operated with Gen. Harrison in his operations at Detroit and at the battle of the Thames, Oct. 5, 1813, and in the following year was employed upon the Potomac and in the defence of Baltimore. He commanded the Java in Decatur's squadron in the Mediterranean 1815; was sent to the Spanish Main in command of a squadron June, 1819; ascended the Orinoco to Angostura in July; was seized with yellow fever, and d. at Port Spain, on the island of Trinidad, the day of his arrival there, Aug. 23, 1819. His remains were removed to Newport in a ship of war by order of Congress, and buried in the cemetery of that city Dec. 4, 1826, where an imposing obelisk was erected by the State of Rhode Island. In Sept., 1860, a marble statue of Com. Perry, by Walcutt, was erected at Cleveland, O. (See his *Life*, by Capt. Alexander S. Mackenzie, 2 vols., 1841.)

Perry (William Stevens), D. D., b. at Providence, R. I., in 1832; graduated at Harvard 1854; studied theology; became rector of an Episcopal church at Geneva, N. Y., 1858; secretary of the house of clerical and lay deputies of the General Convention of the Episcopal Church. Author of several publications relating to American history, among which are *Connection of the Church of England with Early American Discovery and Colonization* (1863), *Documentary Annals of the Colonial Church*, *Questions on the Life and Labors of the Great Apostle* (1868), *Churchman's Year Book* (1870); and edited papers relating to the *History of Virginia 1650–1776* (1870); elected bishop of the diocese of Iowa 1876.

Per′rymansville, post-v. of Hall's Cross Roads tp., Harford co., Md., on the Philadelphia and Baltimore R. R.

Perry's, tp. of Jackson co., Ala. Pop. 621.

Per′rysburg, post-v. and tp. of Cattaraugus co., N. Y., on Cattaraugus Creek and the Erie R. R., includes the village of Versailles and a portion of Cattaraugus reservation of Seneca Indians. Pop. 1313.

Perrysburg, p.-v. and tp., Wood co., O., on Maumee River, on Dayton and Michigan R. R., has 1 newspaper and an active trade. P. of v. 1835; of tp. 4100.

Perry's Mill, post-v. of Champlain tp., Clinton co., N. Y., on the Chazy River and the Ogdensburg and Lake Champlain R. R. Pop. 276.

Perrysville, post-v. of Highland tp., Vermilion co., Ind., on the Wabash River. Pop. 690.

Perrysville, a b. of Milford tp., Juniata co., Pa., on the Juniata River. Pop. 559.

Per′ryton, tp. of Mercer co., Ill. Pop. 1085.

Perryville, post-v. of Boyle co., Ky., noted for the severe battle of Perryville or Chaplin's Mills fought here Oct. 8, 1862. Pop. 479.

Perryville, p.-v., Cecil co., Md., on Chesapeake Bay and Philadelphia Wilmington and Baltimore R. R.

Perryville, p.-v., cap. of Perry co., Mo., has 1 newspaper. P. 501.

Perryville, post-v. of Perry tp., Ashland co., O.

Per′ryville Court-house, post-v. and tp., cap. of Perry co., Ark., on the Fourche la Fave River.

Persecu′tions, The Ten, of the Christian Church, certain periods in which new enactments were passed against Christianity or existing ones enforced with unusual rigor, and refer specially to the persecutions under Nero (64), Domitian (95), Trajan (107), Hadrian (125), Marcus Aurelius (165), Septimius Severus (202), Maximinus (235), Decius (249), Valerianus (257), and Diocletian (303).

Persep′olis, the Greek name of the ancient capital of Persia, whose Persian name is not known, stood in a fertile and beautiful plain (now called *Merdusht*), 35 miles N. E. of Shiraz, near the confluence of the Araxes (now Bendamir) and the Medus (now Pulwân). Of the age and history of the city very little is known. It was not the residence of Cyrus, who had his palace at Pasargada, unless this be the same city, as assumed by some antiquarians. But Xerxes and Darius Hystaspis resided here, and in their time the city was known to the Greeks as a wonder of splendor and magnificence. By Alexander the Great it was completely destroyed, and it is mentioned in history only once afterwards, when Antiochus Epiphanes visited it for the sake of plunder (2 Macc. ix. 1). Of the city itself no traces can now be found, though it is probable that it occupied the same site as afterwards the Mohammedan fortress Istakhr. But of the palaces some very interesting ruins are still extant, known by their local name, *Chel Minar* ("Forty Columns"), or, since the time of Fergusson, by the name of "Xerxes' Hall." They consist of a stupendous substructure of cyclopean masonry, forming a platform 1500 feet long, 936 feet wide, and divided into three terraces, to which magnificent flights of stairs give access. Of the buildings, a magnificently sculptured staircase, the entrance to a propylæum, and a number of columns 60 feet high, are still standing. (For further details see Fergusson, *Palaces of Nineveh and Persepolis Restored* (1851); Rawlinson, *The Five Great Ancient Monarchies* (1871); P. V. N. Meyers, *Remains of Lost Empires* (New York, 1875).)

Per′seus, in Greek mythology, the son of Zeus and Danaë, a grandson of Acrisius, king of Argos; was driven into exile together with his mother, and educated in Seriphos, one of the Cyclades; conquered Medusa by the aid of Hermes and Athene, and cut off her head; returned after many adventures to Argos, from which Acrisius fled to Thessaly, and settled afterward at Tiryns. In ancient art he is represented very similar to Hermes.

Perseus, a son of Philip V., succeeded to the Macedonian throne in 179 B. C., and continued his father's policy. After a preparation of seven years he commenced war against Rome with an excellent army, a full treasury, and important alliances. But his execution of the plan was as slovenly as his preparations had been energetic. The incompetent Roman generals were repeatedly defeated, but Perseus did not understand how to use his victories; and while the war dragged on for several years without any decisive result, the avarice of the Macedonian

king and the shrewdness of the Roman diplomates alienated all his allies from him. At last, L. Paulus Æmilius was sent as commander-in-chief to the theatre of war. He arrived in March, began active operations in June, and finished the war, after a campaign of thirteen days, by the battle of Pydna, June 22, 168 B. C. The Macedonian army, although fighting with great valor, was completely routed, and Perseus fled with his money-chest to Samothrace. He was afterwards delivered up to the Romans, and held in captivity at Alba, in Italy, where he died. He was the last king of Macedonia.

Persever′ance of the Saints, The Doctrine of, is one of the Five Points of Calvinism. It teaches that the true believer, the recipient of divine grace, will never fall away into perdition, but will be kept by divine power unto eternal life. The opponents of this doctrine believe in the possibility of a fatal lapse from a state of grace.

Per′sia [Per. *Iran*], country of Western Asia, extends between lat. 25° 30′ and 39° 50′ N., and lon. 44° and 62° E., bounded N. by Caucasus, the Caspian Sea, and Asiatic Russia; E. by Afghanistan and Beloochistan; S. by the Indian Ocean, the Strait of Ormuz, and the Persian Gulf; and W. by Asiatic Turkey; comprises an area of 635,000 sq. m., and is divided into the following 11 provinces: Ghilan, Mazanderan, and Astrabad to the N.; Khorassan and Kerman to the E.; Laristan, Farsistan, and Khuzistan to the S.; Looristan, Irak-Ajemi, and Azerbaijan to the W.; which provinces, again, are subdivided into 25 governments.

The *surface* forms a vast plateau elevated 4000 feet above the sea to the E., 3000 feet to the W., and 2000 feet in the centre, and surrounded on all sides, except to the E., where it continues uninterruptedly into Afghanistan and Beloochistan, by high, wild mountain-ranges, which send forth numerous branches and spurs. From Mount Ararat, skirting the valley of the Tigris, and sending down into its plains a number of torrents which generally dry up during the hot summers, runs a bleak but lofty range of mountains, which soon splits into several parallel ranges, and forms along the southern border of the plateau a wild alpine region, leaving between its foot and the Persian Gulf only a narrow belt of coast-land, low, sandy, hot, and arid. On the northern edge of the plateau, from 10 to 50 miles from the Caspian Sea and continued into Afghanistan, runs the Elbrooz range, whose highest peak, Mount Demavend, an extinct volcano, situated N. E. of Teheran, rises about 20,000 feet, and is noted for the hot sulphur springs at its southern foot and the frequent earthquakes which visit the surrounding country. The coast-land along the Caspian Sea is low, hot, but well watered and covered with a tropical vegetation. The plateau itself has no rivers and few streams, but is dotted all over with salt lakes—Urumeyah to the N. W., 90 miles long and from 20 to 30 miles broad; Bakhtegan to the S. E., 70 miles long and 8 miles broad. The eastern and central parts of it form a vast desert, covered in some places with fine sand, which rises in the slightest wind in huge clouds enveloping and often burying the traveller; in others with a saline efflorescence several inches deep, which glitters in the sunlight like frost-flowers. In other parts of the plateau the soil consists of loam, lime, and calcareous conglomerate, very fertile when sufficiently watered. Extensive coal-fields have been discovered at Kasbin; salt, sulphur, naphtha, and marble abound; iron, copper, and lead are found in the Elbrooz range; very remarkable are the turquoise-mines at Madena in the province of Khorassan.

The *climate* is very dry everywhere in the country except in the Caspian coast-lands. In the valleys it is hot, with mild winters. In the plateau the winter, from the middle of December to the middle of February, is generally severe and the snowfall heavy, while during the summer, from the middle of June to the middle of August, the thermometer sometimes rises to 110° in the shade. Spring and autumn are perfectly delightful, and, in spite of its great extremes, the climate is generally healthy. On account of the dryness both of the climate and the soil the country bears in many places a naked and barren aspect, but wherever sufficient water can be procured and irrigation is carried on the life of nature develops immediately into a fairy-tale. Persia is the home of the rose and the nightingale. Although trees are generally scarce, the slopes of the Elbrooz range along the Caspian Sea and all of the mountains in Laristan are clad with magnificent forests of oak, elm, beech, walnut, and fir, and on the plateau large tracts are covered with tamarisks, terebinths, acacias, shrubs, and thorny bushes. In the valleys the cypress and myrtle abound, the fig grows wild, the mulberry and olive are cultivated in large plantations, the vineyards yield strong and highly-flavored wines; apples, pears, apricots, peaches, cherries, oranges, and pomegranates of unsurpassed quality are raised in the orchards, and the gardens teem with roses and geraniums. The date-palm grows in the oases of the desert, and dates are a common article of food. The cereals are wheat of excellent quality, rice, maize, and barley. Vegetables and leguminous plants, especially beans and cabbages, abound, and the melon of Ispahan is as celebrated as the Messina orange and the Malaga grape. It is characteristic of Persia, for its climate and soil, not for its method or energy of cultivation, that many of the fruits which it produces are unequalled in nourishing power, in savoriness, in richness of flavor, and in beauty of appearance by any of the same kind produced elsewhere on the earth. Cotton sufficient for the demand of the country, tobacco of excellent quality, sugar, etc., are also easily cultivated. The northwestern part of Persia contains the same animals as Southern Europe, only the tiger is added. The southwestern contains those of Hindostan, among which is the lion. In the central parts, in the desert, and on its borders the antelope and wild-ass abound, deer of various kinds, the wild-hog, and the hyæna. The domestic animals are camels, horses of a large and strong breed, asses and mules for beasts of burden, sheep and lambs for wool and meat, cows almost exclusively for milking, goats for their hair and for milking. The wild-ass and the moufflon are much hunted. Birds are numerous—besides common poultry, the wild-pigeon, the snipe, the partridge, the wren, the swallow, and, above all, the nightingale; the duck on the Caspian Sea, the pelican on the Persian Gulf. Fish are scarce except on the shores of the Caspian Sea.

The *population* is estimated at from 5,000,000 to 8,000,000. About 1,000,000 are located in the cities, of which Teheran and Tabreez are the largest; Meshed, the holy city; Ispahan, the capital; Kermanshah, the manufacturing centre; Reshd and Balfurosh on the Caspian Sea, and Bushire on the Persian Gulf, the principal ports. About 3,000,000 dwell in villages, of which there are about 8000, with a population varying from 300 to 2000. The rest are nomadic tribes, generally known under the name of Ilijats or Iliyats. The prevailing religion is Mohammedanism of the Shiah form; Sufism and other forms are found and tolerated. The Parsees or Guebres, followers of Zoroaster, are few—only about 7000—and like the Jews, whose number is estimated at 16,000, they are often subjected to persecution. The number of Armenian and Nestorian Christians is larger, and they are respected. The American Presbyterians have a mission in the city of Urumeyah. The Ilijats consist of various races—Turks, who immigrated from Toorkistan many centuries ago, but still preserve their native language; Leks, descending from the old Persians; Koords, and Arabs—all of whom speak Persian or Persian dialects. The social position of these tribes is very vague. Some of them have settled and begun to till the soil, but most of them are still wandering with their flocks and tents from place to place, and very often they swerve from hunting and herding into robbery and pillage. The villagers are a bright and handsome race, pursuing agriculture in a somewhat rude and primitive manner, though successfully; good soldiers, often capable of reading and writing, generally happy and contented, though much exposed to the extortions and injustice of the officials. The city population is polished and courteous, but false; quick-witted and enterprising, but cunning; with refined and even literary tastes, and open to European civilization. They have carried several branches of industry to a high degree of perfection, such as the manufacture of arms and jewelry, of silks and woollens, especially carpets and shawls, of perfumes and elegant knick-knacks, etc. Their commerce with India and Western Europe over the Persian Gulf, with Turkey through Asia Minor, with Russia over the Caspian Sea, is considerable. Wheat, raw silk, silkworm-eggs, woollens, tobacco, etc. are largely exported. They are said to be very wealthy, but the rapacity of the government compels them to conceal their wealth. The exterior of their houses is generally indifferent, but the interior is often very comfortable and elegant, not to say luxurious and voluptuous, and beautiful gardens usually surround their dwellings. The government is a pure despotism. The shah's power over the lives and property of his subjects is not only unlimited by any law, but even unrestrained by any social power, such as a church, an aristocracy, a public opinion, etc. And as the shah's power is absolutely despotic, so is that of his officials with respect to those below them—a social state which, lasting for centuries, could not fail to stunt the development of the country and spoil the character of the nation. Of late, however, as more frequent and intimate relations have been established between Persia and Europe, social improvements have begun to be introduced.

The *history* of Persia begins with Cyrus. The Aryan tribes which in times immemorial emigrated from the regions of the Indus River formed two empires—one in Persia, the present Farsistan, and one in Media, the present

Irak-Ajemi. In Media originated the powerful religion of Zoroaster, and Media was also, in political respects, the principal empire in these regions until Cyrus (in 558 B.C.) rose at the head of a general Persian revolt, threw off the Median yoke, conquered Media itself, and established an empire of which Persia was the centre. To Persia and Media he added countries inhabited by Semitic races, Babylon and Assyria. His son, Cambyses (529–522), conquered Egypt and Northern Africa, and for two centuries Persia was the most powerful empire in the known world and the centre of civilization. Its enormous cities, Persepolis, Pasargada, Babylon, Susa, and Ecbatana, where thousands of human lives were annually exhausted in building the palaces, temples, and gardens, appeared like fairy-tales to the wondering eye, and its armies—huge multitudes in which the most different arms, tactics, habits, and tongues mingled together in bewildering confusion—fell irresistibly like avalanches or swarms of grasshoppers upon the neighboring countries. But a history in the proper sense of the word this empire has not. There are no great popular movements, resulting in new enterprises and new institutions, to record. Its history is that of its monarchs; it is dissolved in a series of biographies which will be found in this book under the proper names. Under the reigns of Darius Hystaspes (521–496) and Xerxes (496–465) a singular occurrence took place. The great central plateau of Asia Minor nowhere reaches the Mediterranean, except to the S. It stops suddenly at some distance from the sea, girded on a large curve by a range of lofty but bleak mountains, and leaving at its feet a belt of coast-land which sometimes expands into large plains, though it is generally cut up by rocky spurs into narrow valleys opening upon the sea. Here flourished the Greek colonies, city by city, and when Darius incidentally came in contact with them and undertook to subdue them, he met with an unexpected resistance; they were supported by their countrymen from the other side of the Ægean. Indignant, he sent an army into Greece, but it remained on the plains of Marathon. His son, Xerxes, pushed forward the whole avalanche. Myriads of archers, horsemen, runners, leapers, charioteers, etc. descended upon Greece; thousands of ships gathered from Caucasus, Syria, and the Nile; and the Greek waters and its valleys resounded with the yells of the barbarians. But at Salamis, Platææ, and Mycale the foreigners were silenced for ever. To Persia these events were of no immediate consequence; they were only a foreboding. But in the reign of Darius Codomannus (336–330) Alexander landed in Asia at the head of an army which in its power of acting simultaneously at many points without dissolving, and of concentrating itself on one point without breaking, looked as if it were one compact body, one single man, one intelligence; it was like the Greek statue, a true representative of the Greek civilization. The coast-land from the Pontus to the Nile was first conquered; here lived everywhere Greeks. Then Alexander threw himself into the interior of the vast empire, stabbed the colossus in the heart, and it fell. After the death of Alexander the history of civilization drew more and more to the West, and the Eastern countries sank more and more into insignificance. Persia belonged for some time to the kingdom of the Seleucidæ, but in 248 B.C. the Parthians, a tribe occupying the present Khorassan, revolted under Arsaces, conquered Persia, and established an independent kingdom of Parthia, which under the dynasty of the Arsacidæ successfully withstood the Romans. In 228 A.D. one Ardshir, who called himself a descendant of Cyrus, overthrew the Arsacidæ, made Persia proper the controlling power, and founded the dynasty of the Sassanidæ, of which Sapor II. (310–384) and Chosroes II. (590–628) have become celebrated, the former for his victories over Julian the Apostate, and the latter for his successes against the Byzantine empire and for the general magnificence of his reign. After the battles of Cadesia (636) and Nehavend (641) Persia was conquered by the caliphs, and Mohammedanism was introduced by the sword. Persian civilization, however, was not destroyed by the Arabs, as will be seen from the article on PERSIAN LANGUAGE AND LITERATURE, and, although subsequently the country was repeatedly overrun and devastated—in the twelfth century by the Seljook Turks, in the thirteenth century by the Mongols, in the fourteenth by Tamerlane—it rose again to prosperity in the sixteenth and seventeenth centuries under the Soofee dynasty. It is this toughness of the nation, in connection with the great resources of the country, which of late has again attracted much attention to Persia. The present dynasty, the Kajars, which ascended the throne in the latter part of the eighteenth century with Aga Mohammed, has not been successful in war; Feth Ali (1797–1834) lost in his two wars with Russia (1813 and 1824) Georgia, Mingrelia, Erivan, Nakhitchevan, and Talish; and Nasr-ed-Din, who ascended the throne in 1848, was deeply humiliated by the English in 1857. But the shah's journey in Europe in 1873 has opened Persia, at least to some extent, to European ideas and European enterprise, and great results are anticipated. CLEMENS PETERSEN.

Per'sia, post-v. and tp., Cattaraugus co., N. Y., on Cattaraugus Creek and the Erie R. R., includes part of the village of Gowanda. Pop. 1220.

Per'sian Berries, the berries of *Rhamnus infectorius*, and used by calico-printers and dyers as a source of a yellow coloring-matter.

Persian Gulf, an inlet of the Arabian Sea through the Gulf of Oman and the Strait of Ormuz, and between Arabia and Persia. It is 650 miles long, 250 miles broad, receives the water of the Shat-el-Arab, and contains many islands, most of which are barren and desolate. The pearl fisheries along the Arabian coast are celebrated.

Persian Insect Powder. See FEVERFEW.

Persian Language. Next to the Arabic, Persian is the most important of all the Mohammedan languages. The word *Persian*, whether as the name of the country or the language, is a misnomer. Pars or Fars is a province of the great empire of Iran, and it is only because the language of its capital, Sheeraz, became the fashionable mode of speech that the name *Parsee* was applied to the entire language.

The Persians present a marked contrast to their Arab neighbors; they stand, indeed, much in the same relation to them as the French do to the English. The Persian is volatile, quick, and witty; while the Arab is stolid and slow, but possesses nevertheless a certain sense of the humorous. Poetry and the fine arts have always been cultivated in Persia, but Persian literature, as we now have it, dates entirely from the establishment of the Mohammedan religion. At the time of Mohammed's birth Amishirwan the Just reigned over Persia. There were then two languages current in the empire—*Deri*, or the court language, a dialect of the Parsi, and *Pehlavi*, the learned language, which derived its name from Pehlav, a tract of country bordering upon Persian Irak. Pehlavi poetry no longer exists, the religious zeal of the Mohammedan conquerors having destroyed every trace of it; but although we have no Pehlavi poetry, constant allusions to its existence are to be found in Persian authors. When the Arabs conquered Persia, and the government fell into the hands of men of that race, it was only natural that the language of the conquerors should be forced upon the people. The principal literature of the early Arabs was in the form of poetry. As an old Arabic proverb says, "The registers of the Arabs are the verses of their bards;" and as the art of versification had been already reduced by them to a most elaborate system, its influence soon began to be felt by the Persians. This, and the efforts which Mohammedan fanatics made to suppress all traces of the pagan literature, soon resulted in the complete adoption of the Arabic form of verse. But the national character of Persia nevertheless broke through, and showed itself behind its foreign dress; and the poets of Persia, although they could not throw aside the Arabic measures altogether, began to modify them to suit their own taste, and readily invented metres of which the Arabic itself was not susceptible.

Until the time of the Seljookian princes Arabic continued to be the official language of the court, and to make use of any other in composition was considered illiterate and vulgar. The first who broke through this restraint and braved the sneers of his pedantic contemporaries was Amid el Mulk el Kendi, vizier of Togrul Beg.

The Persian language is essentially an Aryan speech. As at present used, however, it contains a vast number of Arabic words; indeed, it possesses an unlimited power of drawing upon that language whenever it becomes necessary to enlarge its own vocabulary, and this, of course, gives it a peculiar richness and copiousness of expression. The construction is simple and the accent soft and musical. The character used in writing it (called *talik*) is a graceful modification of the Arabic handwriting (*neskhi*), to which it bears the same relation as the italic does to the Roman character with us. A still further modification, a current hand called *shikasteh*, is employed in ordinary correspondence. The similarity between Persian and the European languages appears to have struck even the ancients. Seneca, for instance, tells us that after the Macedonian conquests a great intermixture took place of the Asiatic and European races. Traces of this and of an even closer relationship may still be seen in the great similarity of structure and language which exists between the Greek and the Persian. Many words in both languages are as nearly as possible identical; *e. g.* πατήρ, *peder;* μήτηρ, *mâder;* δυσμενής, *dushmen;* ἵστημι, *īstem;* and a thousand others which the comparative philologist would at once detect. In the time of the caliph Mamoon, at the beginning of the ninth century, the Pehlavi

language was still cultivated by learned Persians. In the preface to a book entitled *Javidan Khirad* (a collection of proverbs and maxims attributed to the ancient Persian king Hosheng) we are told that the Pehlavi original was discovered by a certain Zoban, minister of the prince of Cabool, and translated into Arabic by Hasan ibn Sahel, Mamun's prime minister, by one Khizir ibn Abdallah, "a man well skilled in Pehlavi, and one who could read it off-hand."

Abundant materials exist for the acquisition of Persian. The principal English works are the following: *Persian Grammar*, by Sir William Jones (ed. by Lee, London, 1828); Mirza Ibrahim's *Persian Grammar* (London, 1841); Richardson's *Persian and Arabic Dictionary* (London, 1852); Palmer's *Concise Dictionary, Persian-English and English-Persian* (London, 1875).

History.—For the history not only of Persia, but of the whole Eastern world, Persian literature possesses the amplest materials. Under the monarchs of the Sassanian dynasty (beginning 226 A. D.) materials had been collected for a history of Persia, and Yezdigird I. early in the fifth century ordered an abstract of them to be made. This was translated from the Pehlavi, and continued by later princes up to the account of the Mohammedan conquest. From these old records the poet Firdausí (b. 940 A. D.; d. 1021) composed the *Shah-nama*, or "Book of Kings," for the conqueror Mahmud of Ghazni. This is a magnificent epic of 60,000 couplets, embracing the whole of the legendary history of Persia from the remotest times until the death of Yezdigird. The book is remarkable for the pure Persian in which it is written, there being only a very small admixture of Arabic words. (Abridged translation of the *Shah Nameh* by J. Atkinson, Oriental Translation Fund, London, 1832; *Le Livre des Rois par Aboul Kasim Firdousi*, publié et traduit par Jules Mohl, Paris, 1838–68, 6 vols. folio, forming part of the Collection Orientale; *The Shah Nameh of Firdousee*, by Turner Macan, Text and Glossary, Calcutta, 1839, 4 vols.)

The oldest of the prose historians is Tabari (b. 838 A. D.; d. 922), who wrote a history of Persia down to the times of the khalifate. His work has been translated for the Oriental Translation Fund. (*Chronique d'Abou Djafar Muhammed Tabari*, par Zotenberg, Paris, 1836.) The book was originally written in Arabic, but only the Persian version of it exists in a complete state. In the fourteenth century Yahya bn Abd-ul-latif, Cazwini (d. 1351 A. D.), published a comprehensive general history entitled *Lubb-et-tawarikh*, or "Pith of History." Mohammed ibn Khavend-shah Mirkhond (b. 1432; d. 1493 A. D.), author of the *Rauzat us Safa*, or "Meadow of Purity," a history of Persia from the Creation to A. D. 1471. (*History of the Early Kings of Persia, etc., from the original Persian of Mirkhond*, by D. Shea, Oriental Translation Fund, London, 1832.) His son, Khondamir, who was attached to the court of Báber soon after the invasion of India (1528), wrote an abridgment of his father's work under the title *Khulasat el Akhbar*, "Abstract of Information." It is in ten books, and is an excellent epitome of Eastern history. The *Habib us Siyar*, or "Biographer's Friend," another esteemed historical work, by the same author, Khondamir. There is a very excellent history of Persia, written about 1300 A. D. by Wassaf of Shiraz; an account of it is given by Sir Gore Ouseley in his *Notices of Persian Poets* (Oriental Translation Fund, London, 1846), where, amongst other extracts from the work, he gives a story which is the exact counterpart of the well-known English legend of "Whittington and his Cat." Besides these general histories, there are a great many histories of particular reigns and periods too numerous to mention here.

I have confined myself to purely Persian works, but in addition to these there is a large number of works written in that language in India, and relating for the most part to the affairs of that country. Of these, the most important are the *Ayin i Akbari*, or "Institutes of Akbar the Great," emperor of Hindostan, vol. i. (translation by Blockman, vol. ii.; text by do., *Bibliotheca Indica*, Calcutta, 1867–74); *Tarikh i Ferishta*, a general history of India by Muhammed Kasim Hindu Shah, surnamed Ferishta (d. about 1612 A. D.), (ed. by Gen. Briggs, Bombay, 1831, 2 vols., folio; translated by A. Dow, London, 1770–72; do. translated by Gen. Briggs, London, 1829, 4 vols., 8vo); and the *Siyar ul Mutaakkherin*, or "Modern Biography," a history of India down to recent times; this last has been translated into English with the title *A Translation of the Seir Mutagharin*, by Gholam Hossein (Calcutta, 1789, 3 vols.); Briggs's *History of the Mohammedan Power in India* (London, 1829); the *Siyar ul Mutakherin*, translated by J. Briggs (London, 1832). The best histories of Persia in English are—*The History of Persia from the Earliest Period to the Present Time*, by Sir John Malcolm (2 vols., London, 1815); *A General Sketch of the History of Persia*, by Clements Markham (London, 1874); *Persia, Ancient and Modern*, by John Piggott (London, 1874). A most complete and interesting account of the native historians of Persia is given in *A Descriptive Catalogue of the Historical Manuscripts in the Arabic and Persian Languages preserved in the Library of the Royal Asiatic Society of Great Britain and Ireland*, by W. H. Morley (London, 1854).

Poetry.—Of the various forms of Persian poetry, the most important are—(1) the *Masnavi*, or "Rhyming Couplets," which answer to our own "heroics," epic, narrative, and didactic pieces being generally written in this metre. (2) The *Ghazal*, or "Ode." These are for the most part ostensibly anacreontic songs, love and wine being the constant theme, but they are really highly metaphorical religious writings, expounding the peculiar theosophic views of the most extraordinary sect the East has ever produced, the Sufi dervishes. (3) The *Casidah*, or "Idyl," which is generally employed in panegyric. The principal poets of Persia are the following: Rudaki, lived in the reign of Nasr, grandson of Ismael Samani, founder of the Samany dynasty (circa 940); he was born blind, but wrote magnificent lyrics, some few of which have come down to us. (See Malcolm's *History of Persia*.) Firdausi has already been mentioned in the account of the historians; in addition to his great work, the *Shah Nameh*, he wrote a bitter satire on his ungrateful master, Mahmud, which is usually prefixed to the epic itself; and a poem entitled *Yusuf u Zuleikha*, or "The Loves of Joseph and Potiphar's Wife," a favorite subject with the Persian bards. The latter has never been translated, but copies of the original are not rare in India. One of the most original and extraordinary poets of Persia was Omar Kheiyam (d. 1123). He was a great astronomer and mathematician, and to him we owe the work called *Aljebr u el Mukabileh*, on the science which still bears the name "algebra" which he gave it. His poems consist entirely of *rubaiyat*, or quatrains; they breathe a spirit of advanced free thought, which sometimes, indeed, verges on atheism; but they have at the same time a strange mixture of refined sentiment, philosophical cynicism, and manly feeling, which makes them unlike any other composition of the kind. They have been edited with a French prose translation by J. B. Nicolas (Paris, 1867), and a small selection in English verse has been published by Quaritch (London, 1869). Omar Kheiyam in his youth was an intimate friend of Hasan Sabah, the original "Old Man of the Mountain" and founder of the celebrated sect of Hashashin or Assassins. Anvari (d. 1190 A. D.) Anhad-ud-din Anvari was b. at Mahna in Khavaran, and attracted the notice of Sultan Sanjar, the sixth of the Seljukian dynasty. He was an astrologer as well as poet, but having predicted a terrific storm on the occasion of the conjunction of the seven planets in Libra (Sept. 16, 1186), and failed signally, he relinquished the former profession. His principal works are *Kasidahs*, or "Odes," which enjoy even now a great reputation in Persia. They are full of fine and even sublime conceptions, nervous and elegant language, and original conceits. The whole Divan or "collected works" of Anvari have been lithographed at Tebriz during the present reign. (*Two Kasidahs of the Persian Poet Anvari*, *Journal of Philosophy* (Cambridge, England, vol. iv. p. 1, 1872); *The Tears of Khorassan* (translation of one of the last-mentioned odes, *Asiatic Miscellany*, Calcutta, 1785, p. 287).) Saadi Muslih-ud-din Saadi of Shiraz (b. about 1176 A. D.; d. 1275 A. D.), next to Háfiz enjoys the greatest reputation of any Persian poet. He is a master of elegant style, and many of his works are marked by a very high tone of moral sentiment. That by which he is best known in Europe is the *Gulistan*, or "Rose-garden," a beautiful collection of moral stories in prose and verse. Saadi was a great traveller, and is said to have been the first person who composed verses in the *Zaban i Rekhta*, or Hindostani language. M. Garcin de Tassy quotes some maccaronic verses of the poet in support of this hypothesis in the *Journal Asiatique* for Jan., 1843. (*Select Fables from Gulistan*, by S. Sullivan (London, 1774); *The Gulistan*, with an English translation by Gladwin (Calcutta, 1806; reprinted London, 1808 and 1827); *The Gulistan in Persian*, by Eastwick (Hertford, 1850); do. by F. Johnson (London, 1863); *The Gulistan*, translated into prose and verse by Eastwick (Hertford, 1852); *The Gulistan*, translated into English by John Platts (London, 1873); *The Boostan of Sadi*, with commentary and dictionary of words by Maulavre Tummuzdey (4th ed., Cawnpore, 1832); *Le Boustan de Sadi*, texte Persan avec un commentaire Persan, par C. H. Graf (Vienne, 1858).) Ferid-ud-din Attar (d. at a very advanced age 1230 A. D.) was an eminent Sufi and poet. His principal work is a collection of tales and parables in verse entitled *Mantik ut Tair*, or "The Language of Birds." It has been edited with a French translation by M. Garcin

de Tassy (Paris, 1863). Abu Mohammed ibn Yusuf, generally called Sheikh Nizami of Ganjah Nizami (d. about 1200 A. D.), wrote a *Khamseh—i. e.* a collection of five didactic poems embodying Sufiistic doctrines. Of these the most celebrated are perhaps the *Laila wa Majnun*, an Arabian love-story, and the *Sikandar-Nameh*, or "History of Alexander the Great." Nizami's style is terse and rather difficult, but at the same time very forcible. Few poets contain more subtle thoughts and pregnant expressions; and while other Persian poets generally err on the side of verbiage and prolixity, Nizami frequently falls into the opposite extreme. Besides the five poems above mentioned, Nizami wrote a *Divan*, or "Collection of Odes, Elegies, etc." (The *Sikandar Nama* of Nizami (Calcutta, 1852); *Part of the Khirad Nama*, ed. by Dr. A. Sprenger (Calcutta, 1852); *Makhzan el Asrar*, ed. by Bland (London, 1844).) Maulavi Rumi, Jelal-ud-din Rumi, the founder of the sect of Mevlaviyeh dervishes (b. 1207; d. 1272), is the great exponent of the mystic doctrines of the Sufis. He was a contemporary of Saadi, the author of the *Gulistan.* His immortal work, the *Masnavi*, consists of six long books in rhyming couplets. It contains a complete exposition of the Sufi doctrines, and forms a perfect *repertoire* of all the tales, legends, fables, and apologues current in the East. This narrative portion of the work is written in a lively, unaffected style, but the long speculative digressions, to which the stories serve merely as introductions, though instructive and often beautiful, are somewhat tedious to a European reader. So highly is the book esteemed throughout the Mohammedan world that it has acquired the title of the "Koran of Persia." In addition to the *Masnavi*, Jelal-ud-din wrote a *divan* of beautiful lyrics, some of which have been translated into English verse by Prof. Falconer in the *Asiatic Journal* for 1842. The collection of Maulavi Rumi's minor poems is generally known in India by the name of *Kulliyat Shems Tabriz*, Shems Tabriz being his *takhallus* or *nom de plume.* Shems-ud-din Mohammed, Hafiz (d. 1389 A. D.). (See art. HAFIZ.) Jami (b. 1414 A. D.; d. 1493 A. D.) wrote a *Khamseh* in imitation of Nizami, including a *Sikandar Nameh*, a "History of Alexander the Great," and *Yusuf u Zuleikha*, a subject also treated by Firdausi; it is by the last-named poem that he is best known. Jami also published a *divan* of lyrical odes. His poetry is much more light and elegant in character, and more full of feeling, than Nizami's, but it lacks the stately grandeur and profound thought which distinguish the latter. (*Medjnoun et Laila*, poëme traduit du Persan de Djamy par A. L. Chezy (Paris, 1838); see *Zeitschrift der deutschen morgenländischen Gesellschaft*, vols. xxiv.–xxv.) Hatifi (d. about 1520 A. D.) was a nephew and pupil of Jami, and wrote many beautiful poems, amongst them one entitled *Laila u Mejnun*, which has been edited by Sir William Jones (Calcutta, 1787); his works gave promise of peculiar excellence, and he would no doubt have become one of Persia's greatest poets had he not been cut off prematurely by death. Khakani, Afzal-ud-din Ibrahim, called after his royal patron, Khakan Manuchehr Shirwan Shah, Khakani, d. about 1186 A. D. He is perhaps the most forcible writer in the Persian languages, and his poetry is distinguished by a peculiar loftiness of thought and sublimity of style. He is best known by his odes and satires, and by a charming poem containing an account of the countries through which he passed on his way to Mecca, and called *Tuh fat ul Irakain*, "A Present from Persian and Arabian Irak." (*Mémoire sur Khâcâne, poëte Persan du xii^e Siècle*, par N. de Khanikoff, *Journal Asiatique*, vol. iv., 1864, pp. 137–200; vol. v., 1865, pp. 296–367.) Emir Khosru of Dehli (b. 1253 A. D.; d. 1324 A. D.) was of Tartar origin, being sprung from the tribe of Hazara Lachin, near Balkh. He came to Hindostan, and settled at Puttiala near Dehli, where, thanks to the influence of his father-in-law, he obtained an important post at the court of Tughlak Shah in Dehli. He was a very voluminous writer, and his poetry is marked by great wit and exuberance of fancy. He is best known by five Sufiistic romances after the model of the *Khamsah* of Nizami. We must not omit to mention the wild and stirring improvisations of the robber-poet Kurroglou, who flourished about the middle of the seventeenth century, and who, although writing in a half-Turkish patois, may yet be considered as a representative of the rustic muse of Persia. (*Specimens of the Popular Poetry of Persia, as found in the Adventures and Improvisations of Kurroglou*, translated by A. Chodzko, Oriental Translation Fund, 1842.) There is an immense crowd of minor poets in the ranks of Persian versifiers, but those mentioned above are the standard and really important ones.

The aim of the Oriental poets is not, as with our own, to discover and produce new conceits and new trains of thought. Indeed, the introduction of an entirely novel and original simile is considered rather a breach of good taste than otherwise. But then, upon the other hand, the wealth of the language enables them to clothe a single idea in an almost infinite variety of forms of expression, and it is in this direction that their ingenuity and invention are exercised. In order, then, to become able to read any fresh poet with ease, it is necessary for the learner to adopt the native method, and make himself perfectly acquainted with all the minutiæ of the works of *one* of the standard classical writers, and this will give him a ready key to all the rest.

The present reign has produced a poet of no mean pretensions, Hakim Kaani, poet-laureate to the shah. His poems have been printed at the imperial press at Teheran, and form a large folio volume. Kaani has a most astonishing command of language and rhythm, and while following closely the ancient traditions of Persian poetry as to the form, he has not disdained, nevertheless, to infuse into his works a spice of modern learning, a slight *soupçon* of European civilization, which imparts a novel and pleasing character to his style. Dr. A. Sprenger's *Catalogue of the Arabic, Persian, and Hindustany MSS. in the Library of the King of Oudh* (vol. i., Calcutta, 1854) contains short biographical notices and accounts of the works of all the principal Persian poets.

Ethics, Science, Fiction, and Miscellaneous Works.—The number of these works which Persian literature contains is so numerous that it would require a large volume to give anything like an adequate account of them. The modern Persians, like other Oriental nations, have been stimulated into intellectual activity in recent times by their increased communications with the West, and the result has been that a number of useful works on educational and scientific subjects have been translated from the various European languages. The old standard authors, however, still hold their ground, and are studied with as much ardor as ever. The most esteemed and best-known miscellaneous works are—*Akhlak i Jelali*, a treatise on Persian moral philosophy, by Jelal-ud-din (lithographed at Lucknow at Munshi Nawal Kishore's press; a translation of the work appears amongst the publications of the Oriental Translation Fund, London); the *Akhlak i Muhsini*, by Hussem Vaiz Kashifi (translated by Keene, Hertford, 1852), another much esteemed work on the same subject; the *Gulistan* of Saadi, already mentioned in the notices of poetical works; the *Anwar i Suheile*, the Persian version of the fables of Bidpai, by Hussem Vaiz Kashifi (Persian text ed. by Col. J. W. Ouseley, Hertford, 1851; do. translated into prose and verse by E. B. Eastwick, Hertford, 18—); the *Dabistan i Mazahib*, by Mohsin Fani, a most interesting account of the rise, progress, and doctrines of various religious sects throughout the East. It contains, amongst others, a history of the ancient religion of Persia, of Hindooism, and of the different sects of Mohammedanism. (*The Dabistan*, translated with notes and illustrations by David Shea and Anthony Troyen, Paris, 1843, 3 vols.) The *Beharistan*, or "Spring Garden," of Jami, is a charming collection of tales, anecdotes, and aphorisms, and contains, besides, short biographies of twenty-eight of the principal poets of Persia. The text, with a German translation, was published in Vienna (1846) by Baron Schlechta Wessehrd. One of the most interesting works in Persian is the *Tezkerah i Ahuara*, or "Memoirs of the Poets," by Daulat Shah, who finished it about 1486 A. D. It is divided into a preface and nine chapters, each chapter containing biographies of about twenty poets, written in a most entertaining style, with extracts from and criticisms upon their works. It is also filled with historical details of great interest and importance, and displays great research and critical acumen in its compilation. De Sacy has a notice of this work in the *Notices et Extraits IV.*, pp. 220–272, but it has never been translated or published as a whole. It forms the groundwork of Von Hammer's *Geschichte der schönen Redekünste Persiens.*

E. H. PALMER.

Per'sifer, tp. of Knox co., Ill. Pop. 853.

Persigny', de (JEAN GILBERT VICTOR FIALIN), DUKE, b. at Saint-Germain-Lespinasse, department of Loire, France, Jan. 11, 1808; entered the army, but was discharged in 1830 on account of insubordination; became a contributor to the *Temps;* founded in 1834 *L'Occident français*, a Bonapartist organ; became very intimate with Louis Napoleon; took part in the affair of Strasbourg, from which he escaped, and about which he wrote *Relation de l'Entreprise du Prince Napoléon-Louis* (London, 1837); took part also in the descent on Boulogne, where he was captured and imprisoned; was restored to liberty by the revolution of 1848; chosen aide-de-camp to Napoleon and elected a member of the Legislative Assembly; played an important part in the *coup d'état*, and was minister of the interior from Jan., 1852, to Apr., 1854, and again from

Nov., 1860, to June, 1863; was created a duke in 1863. D. at Nice Jan. 13, 1872. The letters on public affairs which he now and then published are believed to have been inspired by Napoleon himself.

Persim'mon, a tree and its fruit, the *Diospyros Virginiana*, a tree of the U. S. and of the order Ebenaceæ. The common persimmon tree has a fruit which is excessively astringent until over-ripe, but after hard frosts have brought it to the verge of decay is a very sweet and agreeable fruit. The wood is used for lastmaking and other turnery. (See DATE-PLUM.)

Per'sius (AULUS PERSIUS FLACCUS), b. at Volaterræ, in Etruria, Dec. 4, 34 A. D., of a rich equestrian family; received a careful education in the schools of Rome; became a pupil of Cornutus the Stoic; moved in the most elegant circles of the capital; was acquainted with Lucanus and Seneca. D. very young, Nov. 24, 62. Six satires by him, comprising 650 hexameter lines, are still extant, edited by Jahn in 1843 and by Heinrich in 1844; and it is probable that he wrote no more, and even left these in an unfinished state, as he wrote seldom and slowly. In antiquity these satires were read and appreciated more perhaps than any other production of Latin literature; they were studied and quoted, not only by the pagan authors, but also by the Christian Fathers, such as Augustine, Lactantius, and Hieronymus. In the darkest periods of the Dark Ages they were still read, and their present standing is indicated by the circumstance that there are fourteen English and twenty French translations of them. They are, nevertheless, not easy to understand. But on a more intimate acquaintance, a pure, enthusiastic, and earnest soul reveals itself, which, feeling itself fettered by the corruption and depravity of the age, fights the foe as best it can. Later editions, with English commentary, by Macleane, by Conington (with an English translation), and by Gildersleeve (New York, 1875).

Per'son [from the Lat. *persona*, a "mask"], a term used in grammar to indicate the relations between him who speaks, him who is spoken to, and him who is spoken of; which relations exhaust the whole sphere to which they belong, and are respectively denominated first, second, and third person.

Person, county of North Carolina, bounded N. by Virginia. Area, 360 sq. m.; is undulating, fertile, and contains copper ores, graphite, and slate. Products, corn and tobacco. Cap. Roxborough. Pop. 11,170.

Personal Equation. See EQUATION, PERSONAL.

Personal Property, in law, denotes property or right of ownership in things personal as contradistinguished from things real. The inherent physical differences between immovables (lands) and movables (chattels) are so great that some distinction between the rules of law concerning them has existed among every civilized people. This was true of the Romans, and is alike true of all the modern nations which have based their legislation upon that of Rome. In no other jurisprudence, however, are the differences and contrasts between the rules pertaining to personal and those pertaining to real property so many, so wide, and so sharply defined as in the common law of England; and they have not been obliterated, nor even modified in any essential feature, by the statutes of the various States of the U. S. This double kind of property in the English law was entirely due to feudalism. The feudal system dealt wholly with lands. It developed from its primitive customs a series of arbitrary rules controlling the acquisition, ownership, inheritance, and transfer of lands, which, with some statutory modifications, became consolidated into the real-property law of England and of the U. S.; while property in chattels, which were few in number, and of little value or importance when compared with real estates, was left to be regulated by more simple and natural methods, partly borrowed from the Roman law and partly derived from certain doctrines of the common law. According to the classification made by the ordinary text-writers, things personal, which are the objects of personal property, are separated by a threefold division into (1) chattels, (2) chattels-real, and (3) things- (or *choses*) in-action; but to the first of these divisions alone the name "thing" is strictly applicable, for the other two are properly species of rights, and not the physical objects of rights. (1) Chattels include all tangible material objects which are in their nature movable, and are not permanently affixed to the soil so as to become in contemplation of law a part thereof. In England certain movables called "heirlooms" form an exception to this general definition, and are considered as belonging to the land, but they are unknown to the law of the U. S. (See HEIRLOOM.) Among the most familiar examples of chattels are horses, cattle, and other animals, household furniture, goods, wares, and merchandise, ships and other vessels, coin, annual crops even while growing; perennial plants, such as grass and the fruits of trees, are not chattels until severed from the land. Ores when mined, rocks when quarried, clay, sand, and gravel when dug and ready for use, are also chattels. So also are written instruments, contracts, bonds, notes, and the like when considered merely as tangible objects, without reference to the rights secured by them, although their value may depend upon and be measured by such rights. A chattel may be so affixed to the soil as to become a part thereof, and it is sometimes a difficult question to determine whether a particular article retains its original character as a chattel or has been converted into a fixture and a portion of the realty. (See FIXTURE.) (2) Chattels-real are simply the leasehold interests in land held by tenants for years—not the land itself, which is necessarily owned in fee by some one, but the temporary estate therein conferred upon a tenant by means of a letting. A chattel-real is therefore a peculiar species of *right*, at most an inferior grade of property in the soil, and its only feature of resemblance to personal property in general consists in the fact that upon the death of the lessee the unexpired portion of his term passes to his executors or administrators, and not to his heirs. By modern text-writers these leasehold interests are uniformly treated of in connection with real estates. (3) Things- (anciently called *choses*) in-action are claims or demands in favor of one person to recover something of value, which may always be estimated in money, due upon contract or other obligation from another person. Under this head are embraced all debts and all claims for damages resulting from the breach of contracts or from the commission of torts. Although, in a mercantile point of view, these credits of various kinds are justly considered as the representatives of value, and by their means the business of the world is transacted, and they are regarded as constituting property, yet in a legal point of view, and using the words in their true sense, it is a strange misnomer to describe things in action as forming a species of personal property. This classification shows the utter want of scientific conceptions among the ancient common-law writers. The very distinguishing element of the legal right conferred upon the holder of a thing-in-action consists in the fact that it is *not* a property right. As long as the thing-in-action exists, the holder thereof has no property whatever in the money or other article of value to which it relates; as soon as the holder becomes proprietor of the money or other article, and by the very fact of so becoming the owner, the thing-in-action is gone, its force as a claim is spent, it ceases to exist. The common law recognized this principle, and many of its rules concerning the use of different actions were expressly contrived to enforce the doctrine. A thing-in-action, therefore, instead of being a kind of property, is a right against some determinate person, which, if consummated by the holder, may result in his acquisition of property in money or some other thing.

The most important legal element which distinguishes personal property from real is its mode of devolution on the death of a proprietor. Lands are inherited directly by the heirs or are transferred immediately to the devisees. All personal property, including chattels-real and things-in-action, passes in the first instance to executors or administrators, and from them the creditors, next-of-kin, and legatees derive their possession and title. The whole process is the creature of statutes. At a very ancient day the English king succeeded to the personal property of a deceased intestate. Subsequently, this power of the king became transferred to the bishops, who took the goods, not as trustees, but as absolute owners. They were supposed to devote such acquisitions to pious uses, but in fact appropriated them to their own purposes. This unjust authority was gradually taken away by Parliament. A statute (13 Edw. I. ch. 19) compelled the bishops to pay the debts of the intestates out of the funds which they received. A second statute (31 Edw. III. ch. 11) deprived the bishops of their former power to administer, and directed them to appoint "the next and lawful friends of the deceased person intestate to administer his goods." This jurisdiction was retained by the bishops through their spiritual courts until its abolition in 1856. In the statute 21 Hen. VIII. ch. 8 it was determined from what classes of persons and in what order among the next-of-kin the administrator should be selected. Finally came the celebrated "statute of distributions" (22 and 23 Chas. II. ch. 10). Prior to this enactment the administrator appointed by the bishop, after paying the debts of the deceased, retained any surplus as his own absolutely. Pursuant to the rules introduced by the new legislation, the administrator is made a trustee in respect of such surplus, and is bound to distribute it, under the direction of the court, among the next-of-kin of the deceased in a certain fixed order and in certain determinate shares. The system thus finally adopted

by Parliament was substantially copied from the first three chapters of the 118th Novel of Justinian, in which that emperor had remodelled the law of successions. The "statute of distributions" has been re-enacted with more or less variations of detail, but without any change in its general features, by most of the American States. The duties of executors are the same as those of administrators, except that the surplus, after discharging the debts, is applied in payment of legacies, instead of being distributed among the next-of-kin.

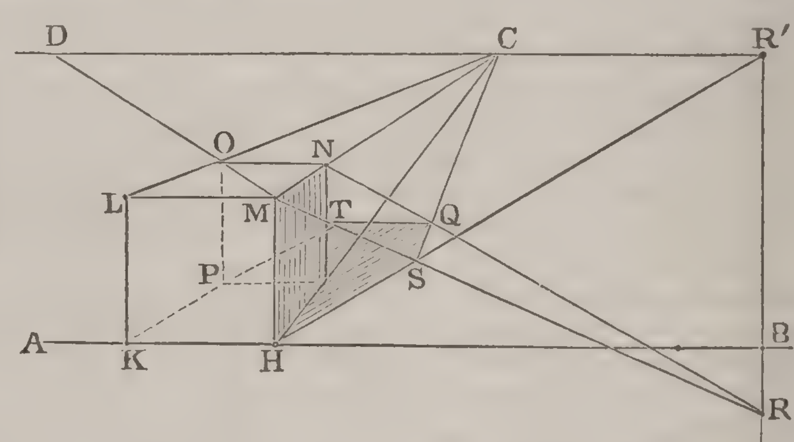
The modes by which personal property may be acquired are simpler and more natural and less connected with arbitrary forms than those by which real property is transferred. They may be classified as follows: I. Where a person acquires by his own act, without connection with or transfer from any other immediate owner; often called "original" acquisition. This class embraces (1) Occupancy, by which the captor of wild animals or the finder of abandoned articles becomes owner thereof from the mere act of appropriation. (2) Prescription, by which, through the statute of limitations, an adverse possessor may acquire property when his possession has lasted the statutory time. (3) Natural increase. (4) One's own labor, or, in the nomenclature of the Roman jurists, "accession." Whatever things a person constructs from his own materials are clearly his. If a person, acting in good faith and reasonably supposing that they were his, uses the materials of another to construct an article, the property in the product becomes his. But this result does not follow if the materials of another were originally taken by fraud or wilful trespass. The patent right of the inventor and copyright of the author fall within the present division, although they must be referred to a statutory origin. II. When the property is acquired on the occasion of the death of the former owner. This class includes succession by will and through intestacy. III. When the property is acquired from a former living owner. This general class is separated into two subdivisions: *First,* when the transfer is made by the act and with the consent of the former owner—namely, (1) by donation, or transfer by gift without consideration; (2) by contract, or transfer for a valuable consideration, the most important instance being that of sale; (3) by marriage. At the common law the husband became owner of the wife's chattels, and entitled to her things in action. (For the modern legislation in the U. S. abrogating this doctrine see the article MARRIAGE, AND MARRIED WOMEN.) *Second,* when the transfer is made without the former owner's consent. The methods included in this subdivision are all based upon the acts or defaults of the former owner, but lack the element of his own volition which characterizes those of the preceding subdivision. The law supplies this want by substituting an official consent. All these methods are in fact sales, the transfer being either made by an officer having authority, or to an officer by virtue of some positive enactment. The most important are sheriffs' sales on execution, assignments in bankruptcy or insolvency proceedings, and transfers to receivers under a judicial order or decree. Property in things personal may be absolute or qualified. Qualified or special property is limited in respect to its duration and the capacity to use and transfer which it confers.

JOHN NORTON POMEROY.

Personifica'tion, or **Prosopopœ'ia,** in rhetoric, is a figure in which inanimate objects or abstractions are made to possess the attributes of living things.

Persons, or **Parsons** (ROBERT), b. at Nether Stowey, Somersetshire, England, June 24, 1546; educated at St. Mary's Hall and at Baliol College, Oxford, where he graduated 1568, and became dean; left Oxford in 1574, in consequence of his conversion to Roman Catholicism; resided for a time in the Netherlands; studied medicine and law at the University of Padua; entered the Society of Jesuits at Rome July, 1575; studied divinity in the Jesuits' college at Rome; took orders as a priest; was sent by Pope Gregory XIII. to England, along with Edmund Campion and other Jesuits, July, 1580, to attempt the conversion of that kingdom to Roman Catholicism; travelled in disguise among his coreligionists; became the object of energetic measures on the part of the English government; escaped to the Continent 1581; opened a seminary for English youth at Eu in Normandy 1584; became rector of the English college at Rome and provincial of the English missions; communicated with James VI. of Scotland in behalf of his mother, Mary, queen of Scots, then awaiting execution, and visited in her behalf the courts of France, Spain, and Portugal; founded seminaries for English Roman Catholics at Valladolid, San Lucas, Seville, and Lisbon, and at St. Omer, France, 1593; became a second time rector of the English college at Rome 1594, and made an unsuccessful attempt to be appointed cardinal 1596. D. at Rome Apr. 18, 1610. Author of several treatises in favor of the doctrines of the Church of Rome, which appeared in London under assumed names, among which were *A Brief Discourse* (1584), *The Christian Directory* (1583–91), *A Conference about the next Succession to the Crown of England* (1594), and *A Treatise of the Three Conversions of England* (1603–04). For issuing the first and the third of these works the printers were hanged and quartered, and it was made high treason to own a copy of the latter book, which advocated the claims of the infanta of Spain to the English throne. Gibbon attributed his youthful conversion to Roman Catholicism to the writings of Persons.

Perspec'tive [Lat. *perspicio*], the art of representing an object on a surface so that it shall present to an eye situated at a particular point the same appearance that the object itself would present if the surface were removed. Such a representation of any object is called its perspective. To conceive what is meant by the perspective of an object, imagine a transparent plane to be placed between the eye and the object, and let straight lines be drawn from every point in the visible portion of the surface to the eye. Each of these lines pierces the transparent plane in a point, and if each point thus determined is properly tinted, the resulting picture will present the same appearance as the object itself. This picture is the perspective of the object as just defined. The art of perspective is divided into two parts: (1) the correct delineation of the principal lines of the object; and (2) the proper shading and coloring of the picture to produce the desired effect of distance and tint. The first part is called *linear perspective,* and the second part is called *aërial perspective.* The former is purely mathematical, and it alone will be considered in this article.



A perspective drawing may be made on any surface whatever, but in what follows we shall suppose it to be made on a plane, which, for convenience, will be taken in a vertical position and between the eye and the object; this plane is called the perspective plane, and any object lying on the same side of it as the eye is said to be in front, and any object lying on the other side is said to be behind the perspective plane. The lines that are drawn from the different points of an object to the point of sight are called *visual rays;* all the visual rays that are drawn from a right line of the object, or from a plane curve passing through the point of sight, make up a *visual plane;* and all the visual rays that are drawn from any other curve make up a visual cone. The art of linear perspective consists in passing visual planes and visual cones through the principal lines of the object, and finding their intersections with the perspective plane. The method of proceeding depends on a few simple principles of plane and of descriptive geometry, of which the following two are most frequently used: (1) If two lines are drawn through any point of an object, their perspectives will intersect, and this point of intersection is the perspective of the given point. (2) If visual planes are passed through any number of parallel lines of the object, they will intersect each other in a visual ray parallel to the given lines, and the point in which this ray pierces the perspective plane will be a point common to the perspectives of all the given lines.

The following definitions are necessary to a complete understanding of the method of applying the preceding principles: The *centre of the picture* is the orthogonal projection of the point of sight on the perspective plane. The *horizon of the picture* is the horizontal line of the perspective plane which passes through the centre of the picture. The *vanishing point* of any straight line is the point at which a parallel visual ray pierces the perspective plane: all parallel lines have a common vanishing point. A *perpendicular* is a line perpendicular to the perspective plane: all perpendiculars vanish at the centre of the picture. A *diagonal* is a horizontal line that makes an angle of 45° with the perspective plane: two diagonals can be drawn through any point, one inclining to the right and the other

to the left; there are, therefore, two vanishing points of diagonals, both in the horizon of the picture—one on the right and the other on the left of the centre, and at distances from that point equal to the distance of the eye from the perspective plane. If a visual ray parallel to a system of diagonals inclines to the right, those diagonals vanish at the right-hand point; if it inclines to the left, the corresponding diagonals vanish at the left-hand point. A *parallel* is a line parallel to the perspective plane: the vanishing point of a system of parallels is at an infinite distance, and consequently the perspectives of a system of parallels are parallel to each other and to the given parallels.

The object to be put in perspective is usually given by its projection on a horizontal plane, and by the distances of its several points above or below their horizontal projections. The perspective of any point is determined by the intersection of the perspectives of a diagonal and of a perpendicular through that point. The perspective of the shadow of any point upon any surface is determined by the intersection of the perspectives of a ray of light through the point, and of the projection of that ray on the given surface. Hence, the perspective of the shadow of a point upon a horizontal plane lies on the perspective of the ray through the point, and on the perspective of the horizontal projection of that ray. As an illustration of this method of perspective, called the method by diagonals and perpendiculars, let us find the perspective of a cube and the perspective of the shadow which it casts on the horizontal plane of its base, the rays of light being parallel. Take the perspective plane through the front face of the cube, and let A B represent the intersection of the plane of the lower base of the cube with the perspective plane. Let C be the centre of the picture, and let D C, parallel to A B, represent the horizon; also let D be the left-hand vanishing point of diagonals, R the vanishing point of rays of light, and R′ the vanishing point of horizontal projections of these rays; R′ is in a perpendicular through R to A B, and also in the line D C. Construct the square H L to represent the front face of the cube, and it will be its own perspective. The edges of the cube that pierce the perspective plane at H, K, L, and M are perpendiculars, and their indefinite perspectives may be found by drawing lines from these points to C. The diagonal through the upper left-hand vertex of the back face pierces the perspective plane at M and M D in its perspective; the point O in which M D cuts L C is therefore the perspective of this vertex. The edges of the cube parallel to L M and K H are parallel to the perspective plane, as are also the edges parallel to L K and M H, and consequently their perspectives are parallel to the lines themselves. Hence, if we draw O N and O P parallel to L M and L K, and then construct a square on these lines, it will be the perspective of the back face of the cube. The figure H O is then the required perspective of the given cube.

To find the perspective of its shadow on the horizontal plane A B, we draw M R, which will be the perspective of the ray of light through M, and H R′, which will be the perspective of the horizontal projection of that ray; the point S in which these lines intersect is the perspective of the shadow of the point M, and H S is the perspective of the shadow of H M. The shadow of the edge M N is a perpendicular; hence, we draw S C and N R, intersecting at Q; then is S Q the perspective of the shadow cast by M N. The shadow of N O is a parallel; hence, we draw Q T parallel to O N, and limited by a line from O to R; then is Q T the perspective of the shadow cast by N O. The line T P is the perspective of the shadow cast by the edge O P. The perspectives of the shade and shadow of the cube, so far as they are visible, are indicated by the shaded part of the drawing.

In the application of the rules for perspective it is often necessary to find the perspective of a circle; this is readily done by means of the following rule: Draw a tangent to the given circle parallel to the perspective plane, and find the perspective of the diameter that passes through the point of contact; draw the perspective of a diagonal through its middle point, and find the corresponding diagonal; through the point in which this diagonal intersects the diameter referred to draw a chord parallel to the perspective plane, and find the perspective of this chord; then on the two perspectives found, as conjugate diameters, construct an ellipse, and it will be the perspective of the given circle. The perspectives of other curves may be found by constructing the perspectives of a sufficient number of points, and then drawing a curve through them.

The true *panorama* is a perspective drawing, made on the inner surface of a vertical cylinder with a circular base, the point of sight being taken at some point of the axis of the cylinder.

Certain meteorological phenomena may be explained by means of the principles of *celestial* or spherical perspective. The dome of the heavens, which we call the celestial sphere, has its centre at the eye, and consequently every straight line not passing through the eye is projected upon it in the arc of a great circle. It often happens that clouds are thrown into parallel lines by currents in the atmosphere; they are then seen projected on the sky in great circles, intersecting each other at two points of the horizon diametrically opposite to each other. The line giving these points is parallel to aërial currents. In the warm and moist air of the tropics the parallel rays of the setting sun are often visible as they pass through our atmosphere; when projected against the sky they appear to be arcs of great circles, intersecting at the sun and at a point diametrically opposite to it. W. G. PECK.

Perspiratory Glands. See HISTOLOGY.

Per Stir′pes (law), a technical term, originally of the Roman law, transferred to the English and American, and, like the correlative phrase *per capita*, used in the statement of those rules which regulate the succession to the property of a deceased owner. Whenever the heirs and next of kin of the deceased, being in unequal degrees of relationship, or his remote descendants in the same degree, inherit his lands or succeed to his personalty, not in equal portions, but in such shares as their respective *stocks* or deceased ancestors would have received if living, they are said to take *per stirpes*—that is, by the stocks—or by representation, the living descendants standing in the place of, and representing, their immediate dead ancestor, who is regarded as a *stock* of descent. Thus, if the intestate had originally three sons, two of whom are living, and the third has died leaving four children, and the whole estate is divided into three equal parts, one for each of the surviving children, and one for the four grandchildren taken together, the succession is *per stirpes*, or by representation. The three original sons are the three stocks of descent, and determine the number of shares into which the estate is separated. The children of the deceased son represent their father, and take in a body the portion that he would have received had he survived. If all the sons have died, the first leaving two children, the second three, and the third four, and the property is still divided into three equal parts, one for each group of grandchildren, the succession would also be *per stirpes*, each family of grandchildren representing their father as a stock. The same rule extends to collateral kindred. If the nearest relatives are, for example, two brothers of the intestate and the children of another brother or sister deceased, and the estate is distributed one-third to each of the brothers and one-third to the family of nephews and nieces, they would take by representation, or *per stirpes*. Although the actual mode of inheriting lands and distributing the personalty is regulated by statute, and there is a considerable diversity among the rules applicable to particular instances in the several States, it is the generally-established doctrine that when the heirs and next of kin of the intestate, whether lineal or collateral, stand in unequal degrees of relationship with him, the succession to his property among them is *per stirpes*, or by representation. (See PER CAPITA.)

JOHN NORTON POMEROY.

Perth, town of Australia, colony of West Australia, on the Swan River, 12 miles above its mouth, had 5007 inhabitants in 1871.

Perth, town of Scotland, capital of Perthshire, is situated at the foot of the Grampian Mountains on the Tay, which is navigable here for vessels of considerable burden and crossed by several elegant bridges. It is a handsome city, with large manufactures of shirtings, ginghams, and shawls, breweries, distilleries, tanneries, dyeworks, and shipbuilding docks, and a very active trade. Pop. 25,585.

Perth, county of W. Ontario, Canada, has a fertile soil. Traversed by the Grand Trunk and other railways. Area, 698 square miles. Cap. Stratford. Pop. 46,522.

Perth, post-v., cap. of Lanark co., Ont., Canada, on the river Tay, is the terminus of a branch of the Brockville and Ottawa Railway. The town is well built of a handsome freestone. It is in a rich mineral and farming district. It has considerable manufactures, 3 weekly newspapers, and a fire department. Pop. of sub-district, 2375.

Perth, post-v. and tp., Fulton co., N. Y. Pop. 1013.

Perth Amboy′, post-v. of Middlesex co., N. J., at the mouth of Raritan River, on Staten Island Bay, and on the Rahway branch of the Pennsylvania and the New York and Long Branch R. Rs., has a spacious harbor, a female seminary and public school, 6 churches, 2 banks, 2 weekly newspapers, a cork manufactory, and stores. Pop. 2861.

H. FARMER, ED. "MIDDLESEX CO. DEMOCRAT."

Perth′shire, central county of Scotland, area 2834 sq. m., with 133,500 inhabitants. Part of the ground is occu-

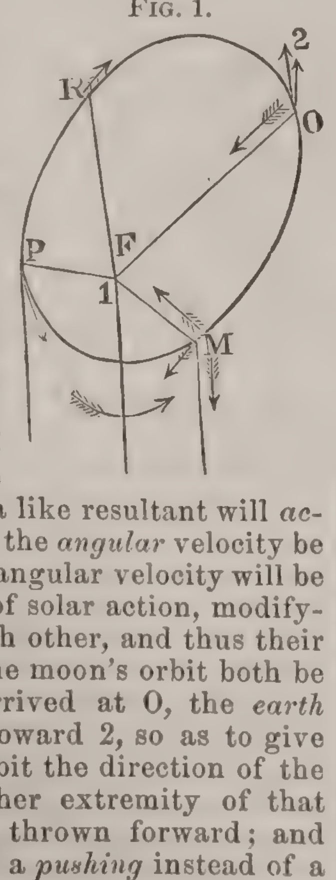
pied by the Grampian Mountains, whose highest peak, Ben Lawers, rises 4000 feet, and which are well wooded, affording good pastures and containing many beautiful lakes; part is low plains, with rich soil, producing wheat, barley, oats, potatoes, and fruits.

Pertica'ri (GIULIO), COUNT, b. at Savignano, in the Romagna, in 1779; d. at San Costanzo, near Pesaro, in 1822. After studying at Fano and Pesaro he removed to Rome in 1801, and there took his degree; in 1808 was appointed podestà of Savignano, and in 1812 married Costanza, the daughter of Vincenzo Monti, herself also a poet. Among the writings of Perticari the two following are the most important: *Degli Scrittori del Trecento e dei Loro Imitatori*, and *Dell' Amor Patrio di Dante e del suo Libro sul Volgare Eloquio.*

Perturba'tion [Lat. *perturbatio*, "disturbance"] is the name applied in physical astronomy to the disturbance of the simple elliptic motion of two heavenly bodies about their common centre of gravity; which disturbance may be occasioned by the attraction of a third body or by the eccentric action of the mass of one or other of the principal bodies concerned because of its deviation from a spherical form. The moon and the earth afford a notable example of this in both of the respects here indicated. Were these the only bodies in space, and both truly spherical, with the mass of each symmetrically disposed around its own centre, they would accurately describe similar ellipses around their common centre of gravity, their respective radii vectores (see PLANET) describing areas equivalent among themselves in equal times. The *unequal* and varying action of the sun incessantly *disturbs* all this. Were that action indeed in equal proportion to the masses of the earth and moon, and in the line of their own mutual action, the elliptical orbits around the common focus would both be preserved, though with changed dimensions, in accordance with the principle of the coexistence of forces and their resultant motions. But in no position of the moon can the continuous action of the sun be thus equable. Thus, at the time of new moon, for instance, the moon, being nearer to the sun than the earth, is therefore more powerfully attracted (in proportion to its mass) than the earth; and this *excess* of action is manifested in drawing the *moon away* from the earth. But at the time of full moon, the *earth* being the body attracted by the sun in more than the proportion due to its mass, the effect of this mutual action is manifested in drawing the *earth away* from the moon.

At another time, when the moon, as at M (Fig. 1), is yet in the region near to the position of new moon, so that the *moon* is drawn even there *away* from the earth, then —the direction of motion in the orbit being that indicated by the *bent* arrow—it will be perceived that the attraction of moon and earth acting inward toward F, and the *excess* of solar action (action of sun on moon and moon on sun) already alluded to being operative in the direction of the arrow pointing downward at M, the resultant of the two forces (as indicated in the figure) will in whole or in part pull back or *retard* the moon in her orbit; while in the situation such as that marked at P a like resultant will *accelerate* the orbital motion, and thus the *angular* velocity be *directly* influenced. But this same angular velocity will be *indirectly* influenced by the excess of solar action, modifying that of moon and earth on each other, and thus their distance asunder and the form of the moon's orbit both be changed. When the moon has arrived at O, the *earth* being drawn *away* from the moon toward 2, so as to give the radius vector of the moon's orbit the direction of the arrow line in the figure, the farther extremity of that radius vector will be, as it were, thrown forward; and thus, in effect, what has been styled a *pushing* instead of a *pulling* force be exerted on the moon, so that the motion in the orbit will be *accelerated* at O, instead of being *retarded* as at M. At R, the efficiency, being again that of a *pushing* force, will there *retard* the orbital motion.

FIG. 1.

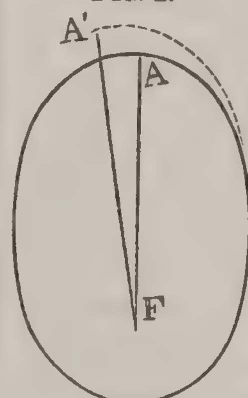


The perturbations change the *form* of the orbit, and will themselves introduce modifications in the perturbative action, both directly and indirectly, and thus the irregularities be excessively multiplied. Then, the earth being spheroidal in form, the *excess* above an inscribed sphere extending from pole to pole will not have the resultant of the moon's action upon *it* the same as though the action of that material were at the very centre of the earth itself, as is very nearly true of the sphere inscribed; but that same spheroidal excess will have that portion of it which at any time is nearer to the moon more forcibly attracted than other portions more remote; and the same will be true, but with less intensity of action, with respect to the perturbation of the same spheroidal excess by the mutual attraction of it and the sun. Hence, nearly the whole of the precession of the equinoctial points; of which more in the sequel.

Periodic perturbations have been characterized as those which depend upon the configurations of the system; and they go through their changes during the period of those configurations or changes of position, to begin their series of effects anew. Thus, as has already been seen, the excess of solar attraction, when most direct, has a tendency at new moon to draw the moon away from the earth, and at full moon to draw the earth away from the moon. Thus, the effect on the whole is to expand the moon's orbit. And as the earth's orbit around the sun is elliptical, with the sun in one focus, the expansion here spoken of will be the greatest when the earth is nearest to the sun (about the 1st of January), and the least at the opposite season of the year (about July 1st); the expansion and contraction of the lunar orbit will therefore recur alternately during successive half years, the whole *period* of change and restoration to very nearly the same state occupying a year.

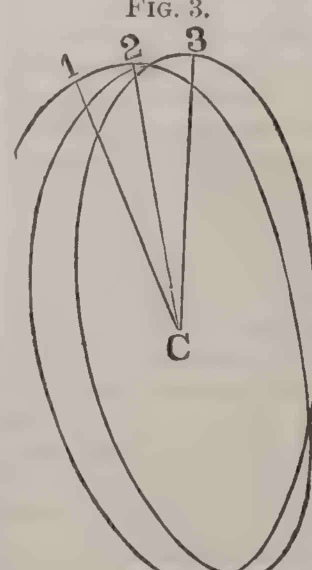
But restoration to exactly the same state after any one period will not recur, and there will thus be left small outstanding remainders, which in the course of ages accumulate *secular* perturbations extending in their course through enormous periods of time. Thus, the larger masses of the solar system being outside of the earth, the tendency of the planetary perturbations is *upon the whole* to draw the earth away from the sun, or expand the earth's orbit very much after the manner already indicated in the case of the moon. Hence, when the earth (Fig. 2) is about approaching what would be its aphelion (or position most distant from the sun), the planetary perturbations draw the earth away to describe something like the dotted line in the figure; insomuch that that orbit is not perpendicular to the direction of F A produced outward; and that is not effected until the earth has passed farther on to A′; so that the major axis of the orbit is found *in advance* of what would be its undisturbed direction. The revolution to return to the like position in the ellipse is therefore more than one complete revolution around the sun, or the *anomalistic* exceeds the *sidereal* year. But as the change of direction here described is only 11.8″ per annum, the whole period of this *secular* perturbation occupies many centuries.

FIG. 2.



This change of direction of the longer axis (or line of the apsides) of the earth's orbit admits of illustration by experiment. Thus, let a weight of some dense material (a leaden weight, if we please) "be suspended by a brass or iron wire to a hook in the under side of a firm beam, so as to allow of its free motion on all sides of the vertical, and so that when in a state of rest it shall just clear the floor of the room or a table placed ten or twelve feet beneath the hook. The point of support should be well secured from wagging to and fro by the oscillation of the weight, which should be sufficient to keep the wire as tightly stretched as it will bear with the certainty of not breaking." Now, let "a considerable" motion "be communicated to the weight, not by merely withdrawing it from the vertical and letting it fall, but by giving it an impulse sideways. Then the axis of the somewhat bent ellipse which the weight describes will be seen to have changed its position at every revolution of the weight, so as to be advanced in the same direction with the weight." (See Fig. 3.) The experiment is that indicated by Sir John Herschel in illustration of "the motion of the apsides of the lunar orbit," the change of direction of which is more rapid than the like change in the earth's orbit. (*Outlines of Astronomy*, 692.) The experiment will succeed very well when the somewhat heavy ball is suspended by a thin string. The reason for the change of direction of the apsides of the experimental curve is that the force drawing the ball to the perpendicular position varies in a *less* ratio than the distance from the *centre* of the curve. Were that ratio preserved, the ball, in accordance with the laws of central forces, would describe an ellipse around the *centre* of the curve, not around the focus. But the condition of an *insufficient* force at the extremities of the line of apsides secures a sufficient-

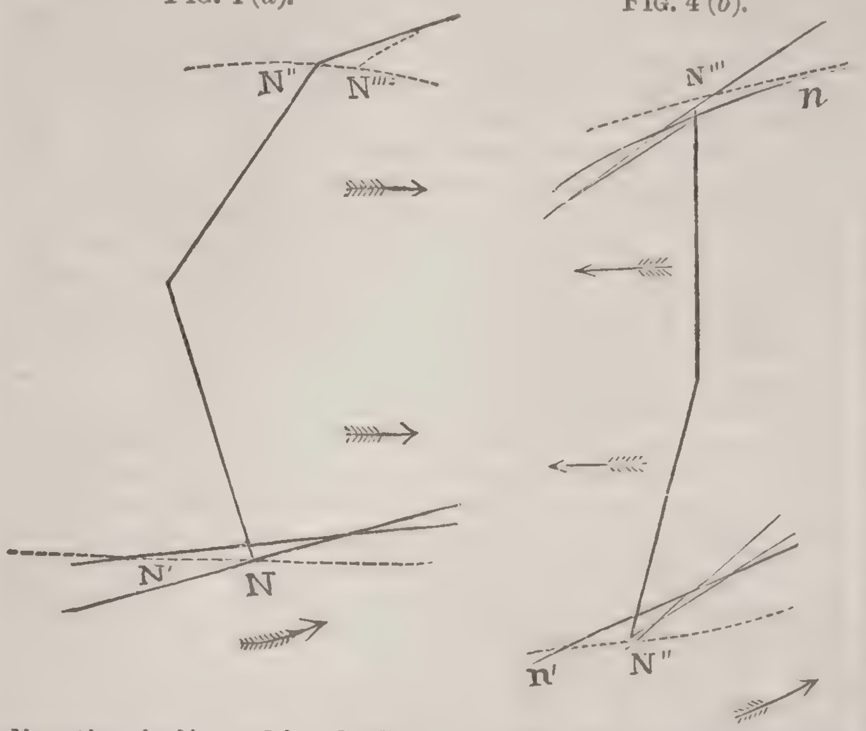
FIG. 3.



ly approximate imitation of the phenomenon to be illustrated.

Change in Direction of the Nodes of the Moon's Orbit.—When the action of the sun's attraction is as near as may be at right angles to the line N N of the nodes of the moon's orbit, as represented in Fig. 4, the moon (revolving in the

FIG. 4 (*a*). FIG. 4 (*b*).



direction indicated by the bent arrow), when she has passed N, and is on the side *toward* the sun, will be *drawn by him away* from the earth, as heretofore shown; and this more and more, indeed, as she advances toward Q, this action of the sun being withal in the plane of the ecliptic indicated by the dotted curve; and so the tendency will be to pull the moon over into the path which carried backward would intersect the plane of the ecliptic at N′ *behind* N; or the node will seemingly *have gone backward—i. e. retrograded*—while the interior angle at N′, which measures the *inclination* of the orbit so disturbed, will be *less* than the inclination at N. Then, before the moon can reach N‴, she, being drawn away from the earth by the solar force acting in the same plane as before, will move in a path intersecting the plane of the ecliptic at N″ behind N‴. Beyond and behind that, the *earth*, as heretofore described, will be *pulled away* from the moon; and so, as heretofore, we may describe the action on the moon as being in effect that of a *pushing* force instead of a pulling force; and this going on continuously, and on the whole more intensely, the moon, in effect, will describe a path coming from N behind N‴, but with a *less* inclination. At N′ we shall have a similar effect, but with a *greater* inclination, so that while the changes of inclination have been alternately *compensatory*, or nearly so, and thus have shown a *periodical* perturbation, the nodes have throughout retrograded.

When the direction of the sun's action is in the line of the nodes instead of at right angles to that line, the action of the sun will not disturb the position of the nodes, as the line of nodes will lie *in* the plane of his action. But when the solar action, as in Fig. 5, is oblique to the line of the nodes, then the *pulling force* will, while the moon is passing from *q* toward N, throw the position of the node toward which she is tending in the direction *forward* of N′, and the *pushing* force, in the region from *q*′ to N‴, will cause the moon to describe a path tending to *n* in *advance* of the node. But in other parts of the orbit the change of position will be retrograde, as in the case of the action at right angles, though not so rapid; so that, under these circumstances, the nodes will retrograde during the greater part of the moon's revolution with regard to them, but advance at other times.

FIG. 5.

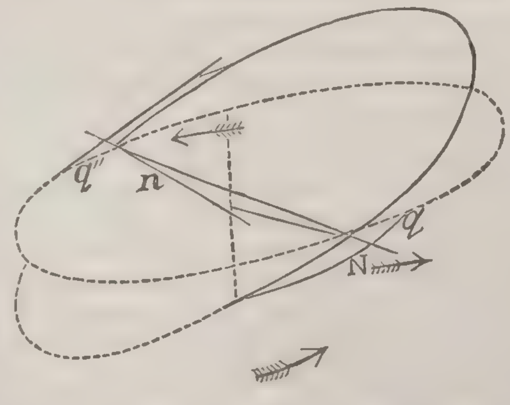
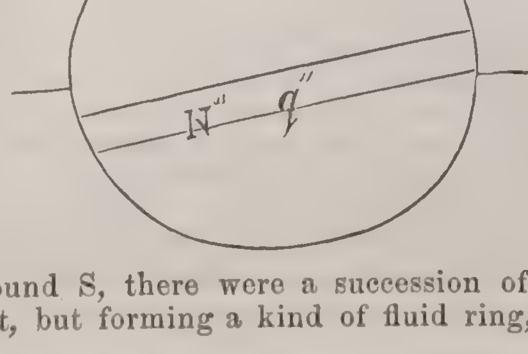


FIG. 6.



Of the Precession of the Equinoxes.—"Suppose in Fig. 6 that instead of one body P, revolving round S, there were a succession of particles not coherent, but forming a kind of fluid ring, free to change its form by any force applied;" then, if the ring revolved in its own plane, its nodes would retrograde by the action of the distant body (sun or moon) in the direction of S, the *majority* of the particles being acted upon in such a way as to induce that, when the action of S was oblique to the line of nodes, and thus overcoming the tendency of the other particles to push or draw the nodes the other way, so that the resultant tendency would superinduce a remaining retrogradation of the nodes of the whole ring. When the action of S was at right angles to the line of nodes, the tendency throughout would insist upon a retrogradation, and when S acted in the line of the nodes, the direction of that line would not be changed. All this is consistent with what has already been illustrated in the case of the moon. "The motion of such a ring, then, as we have been considering would imitate, as far as the recess of the nodes goes, the precession of the equinoxes, only that its nodes would retrograde far more rapidly than the observed precession, which is excessively slow. But now conceive this ring to be loaded with a spherical mass enormously heavier than itself, placed concentrically within it, and cohering firmly to it, but indifferent, or very nearly so, to any such cause of motion, and suppose, moreover, that instead of one such ring there are a vast multitude heaped together around the equator of such a globe, so as to form an elliptical protuberance enveloping it like a shell on all sides, but whose mass, taken together, should form but a very minute fraction of the whole spheroid. We have now before us a tolerable representation of the case of nature; and it is evident that the rings, having to drag round with them in their nodal revolution the great inert mass, will have their velocity of retrogradation proportionally diminished. Thus, then, it is easy to conceive how a motion similar to the precession of the equinoxes, and like it characterized by extreme slowness, will arise from the causes in action." (Sir J. Herschel, *Outlines of Astronomy*, 643 and 647.)

Sir John Herschel in a note notices the seeming objection that the *inscribed sphere*, as well as the elliptical protuberance, might be influenced in the way here described. But the action of sun or moon on this spherical portion, and its reaction on them, being as though its resultant were applied at the centre, there is no leverage with which to bend or otherwise influence the *spherical portion* in *its* rotation, so that the elliptical protuberance will be loaded with all the rest, as already indicated.

In article 668 of his *Outlines of Astronomy*, Sir J. Herschel thus succinctly states some of the grand conclusions of physical astronomy: "We are, therefore, conducted to this most remarkable and important conclusion: viz. that the major axis of the planetary (and lunar) orbits, and, consequently, also their mean motions and periodic times, are subject to none but periodical changes; that the length of the year, for example, in the lapse of infinite ages, has no preponderating tendency to increase or diminution—that the planets will neither recede indefinitely from the sun nor fall into it, but continue, so far as their mutual perturbations at least are concerned, to revolve for ever in orbits of very nearly the same dimensions as at present." (For a more extended and full discussion of the subject of this article reference may be made to the various works on physical astronomy.) S. ALEXANDER.

Peru′, republic of South America, extending along the Pacific Ocean from lat. 3° 20′ to 22° 20′ S., with a maximum length on the coast-line of about 1600 miles, a maximum breadth of 800 miles on the frontier, with Ecuador on the N., chiefly formed by the river Marañon, and a frontier, with Brazil and Bolivia on the E., extending irregularly about 1500 miles, chiefly formed by the Javary and Purus rivers and the summit of one of the ranges of the Andes. The country has nearly the shape of an inverted right-angled triangle, the Marañon being the base and the Pacific coast the hypothenuse. The area is approximately 500,000 sq. m., the pop. variously estimated at from 2,865,000 to 3,417,000. Politically, the republic is divided into 17 departments—Amazonas, Ancachs, Apurimac, Arequipa, Ayacucho, Cajamarca, Cuzco, Huancavelica, Huánuco, Ica, Junin, Libertad, Lima, Loreto, Moquegua, Piura, and Puno—and 2 littoral provinces, Callao and Tarapaca. Lima, the capital, had in 1868 a population of 121,362. The other chief cities are Arequipa, Ayacucho, Cuzco, Callao, Cajamarca, Iquique, Cerro de Pasco, Moyobamba, and Tacna.

Physical Geography.—Peru is traversed from N. to S. by two parallel ranges of the Andes, by which it is naturally divided into three regions, respectively known as the *Coast*, the *Sierra*, and the *Montaña*. The Coast region, lying between the western range of the Andes and the Pacific, varies in width from 60 to 20 miles, and is for the most part a sandy desert, only the valleys of the numerous

small rivers springing from the Cordillera being available for cultivation. Rain is unknown, the S. E. trade-winds having exhausted their moisture in traversing the vast regions E. of the mountains, which sometimes exceed 20,000 feet in height, but cool winds and heavy dews maintain an equable temperature, which rarely rises above 85° or sinks below 60° F. The Sierra, or region between the two ranges of the Andes, is a series of valleys broken by many small spurs of mountains, averages 100 miles in width, is estimated to cover 150,000 sq. m., or nearly a third of the republic, and embraces nine-tenths of the cultivated area and four-fifths of the population. The Sierra consists of—(1) the great plain of Titicaca, on the S. E., comprising the basin of the lake of the same name, lying partly in Bolivia, with an altitude of nearly 13,000 feet; (2) the *Nudo,* or "knot" of Vilcanota, formed by the union of the two ranges of the Andes, with several minor transverse ranges, constituting a region diversified by tropical valleys and vast elevated plateaus, in one of which, containing 15,000 sq. m., is the city of Cuzco, at an elevation of 11,000 feet above the sea-level; (3) the valley of the Apurimac, the most populous part of Peru, stretching N. W. 300 miles in length by 30 in average breadth; (4) the knot of Pasco, another region of table-lands similar to that of Vilcanota, formed by a second union of the parallel ranges of the Cordillera, and noted for its mineral wealth; and (5) the tropical valleys of the Marañon and its great tributary, the Huallaga. To the N. of Pasco is a third more eastern range of the Andes, parallel to the two former, which now rapidly decline in height until, having passed the limits of Peru, they again unite to form the knot of Loja in Ecuador. The Montaña embraces the vast region E. of the Andes, traversed by great navigable rivers, but almost unexplored, and occupied by barbarous tribes of Indians. With the exception of insignificant streams on the coast and the few tributaries of Lake Titicaca the rivers of Peru all form part of the Amazonas system. The Marañon itself, which is considered as the source of the Amazonas, rises in Lake Lauricocha, near the mines of Cerro de Pasco, flows N. W. 500 miles between the ranges of the Andes until at lat. 5° 30′ it bends abruptly eastward and forms the N. boundary of the republic for nearly 1000 miles, until it enters Brazilian territory at Tabatinga. The Huallaga, which rises near the Marañon and flows N., is navigable for steamers 600 miles of its lower course. The Ucayali, formed by the union of the Apurimac and Urubamba, is a river of the first magnitude, considered by many geographers as the true source of the Amazonas, and navigable through most of its course. The Purus, rising near Cuzco, is said to be navigable for 2000 miles, but most of its course is within Brazilian territory. The Lobos and Chincha islands, lying in the Pacific near the Peruvian coast, are remarkable for their vast deposits of guano, which furnish a large part of the revenue of the state. Earthquakes are frequent throughout the Sierra and Coast regions, particularly in the vicinity of Arequipa, where several volcanoes are also found.

Productions and Resources.—The soil of the Peruvian Sierra is extremely fertile, yielding all the ordinary tropical and sub-tropical plants, with many which are peculiar to this region. In the forests of the northern valleys are found scores of valuable cabinet woods, as also the chinchona tree (which yields the precious "Peruvian bark" or quinine), the coca, caoutchouc, the bread-fruit tree, and many varieties of spices. The potato is supposed to be a native of the Peruvian table-lands, where also the sweet potato and the valuable esculent root called *quinoa* abound. Cotton, cacao, the sugar-cane, grapes, and olives are leading objects of cultivation, and many exquisite varieties of fruit are indigenous to the country. Silkworms and cochineal-insects are successfully reared. Besides an abundance of the European domesticated animals, the llama, vicuña, alpaca, and guanaco are found in the upper regions of the Sierra. Fish and fowl abound in the Montaña, and gayly-plumaged birds of numberless species are found in every part. Sea-birds have for ages been so numerous as to have deposited millions of tons of guano at many places on the coast, giving rise to an important branch of commerce, still probably in its infancy, as the coast-region has been very imperfectly explored. The guano-beds, as well as the vast deposits of nitrate of soda recently discovered in the province of Tarapaca, constitute government monopolies of sufficient value to have paid for the construction, within a recent period, of more than 1000 miles of railways, which, traversing the Andes at several points, have connected Puno, Cuzco, Oroya, Huaraz, and other cities of the Sierra with the sea-coast.

Antiquities.—Ancient Peru included also the territories of the modern republics of Ecuador and Bolivia (formerly called Upper Peru), and it is the latter region, around the Lake of Titicaca, which is designated by tradition and by extant monuments as the original centre of aboriginal Peruvian civilization. The island of Coati in that lake was the scene of the appearance of the mythic ancestors of the Incas, Manco Capac and Mama Oello, and on it may still be seen the ruins of large structures of hewn stone in a tolerable state of preservation. At Tiahuanaco, 10 or 12 miles from the shore of the lake, are other ancient edifices, remarkable for the massive blocks of cut stone, 30 feet long by 18 wide, sometimes covered with sculptured figures enclosed in rows of small squares. At Huanuco are two well-preserved pyramidal structures of massive hewn stones with symmetrical triangular-shaped gateways, broad at the base, but rapidly narrowing upward until they are surmounted by lintels formed by single blocks 11 feet in length. The materials of the great "temple of the Sun" and of the fortress of Ollantaytambo at Cuzco were nearly all employed in the construction of the modern city, but the extant remains are of a similar character to those of Tiahuanaco. Fragments of immense stone aqueducts and bridges are found in several parts of Peru, the former having sometimes been more than 100 miles in length, and some of them are still in use. About 20 miles S. of Lima, on the sea-coast, are extensive remains of Pachacamac, a city of later origin than the foregoing, the structures being of adobe, but occasionally employing massive stones. At Cuelap, in N. Peru, a still-existing structure is described as consisting of a solid wall of hewn stone 3600 feet long, 570 feet wide, and 150 feet in perpendicular height, forming the platform for another similar structure 600 by 500 feet, and also 150 feet in height. It is to be regretted that more exact accounts of this remarkable ruin have not been given to the world. Vast remains of paved roads or causeways may still be traced through much of the distance (more than 1000 miles) from Cuzco to Quito. An interesting collection of Peruvian remains was exhibited at the Centennial Exposition at Philadelphia.

History.—Peru was occupied, when discovered by Spaniards early in the sixteenth century, by two comparatively civilized races of cognate origin, the Quichuas and Aymarás, governed by the so-called Inca dynasty, which was traditionally descended from the sun. (See QUICHUAS and INCAS.) The population of Peru at the Conquest has often been calculated as high as 30,000,000, but probably did not reach a third of that number, even including the territories now forming Bolivia and Ecuador, which were then subject to the incas. Peru was conquered and plundered in the fourth decade of the sixteenth century by a small band of Spanish adventurers headed by Francisco Pizarro and Diego Almagro, who put to death the inca Atahuallpa, and placed his half-brother, Manco Capac, upon the throne as nominal emperor. For many years the country was in constant anarchy from insurrections of the natives and civil wars between the conquerors themselves, which resulted in the death of most of the leaders, Pizarro himself having been assassinated at Lima, the city he had founded as a capital, June 26, 1541. A viceroyalty was ultimately established in Peru, which continued to govern that country until July 21, 1821, when independence was proclaimed as a consequence of a successful invasion by a liberating army under command of the Argentine general José de San Martin, already the liberator of Chili. San Martin was made protector, but soon resigned, and was replaced as dictator by the Colombian chieftain Simon Bolivar, who defeated the Spaniards at Gunin and Ayacucho (1824), and they were driven from their last stronghold at Callao in Jan., 1826. Bolivar retired to Colombia in 1825, and a republican government was formed. In 1836 the Peru-Bolivian confederation was formed under the presidency of the Bolivian Santa Cruz, but it was overthrown in 1839. Numerous civil wars and changes of constitution followed, the principal leaders, Castilla, Echenique, and Vivanco, alternating in the presidency. Slavery was abolished in 1855. A war with the Spaniards, who had seized upon the Chincha Islands, took place in 1866, Bolivia, Ecuador, and Chili being allies of Peru. Col. Prado was president 1865–68, and was succeeded by Col. Balta, who was murdered July, 1872. Don Manuel Pardo was thereupon elected president for a period of four years, expiring in 1876, when Col. Prado became chief magistrate a second time. The first three years of Pardo's administration were marked by financial reforms and great energy in railroad construction, but in 1875 the diminished supply of guano led to a failure to maintain the national credit in the European money-market, a cessation of public works, the bankruptcy of leading business institutions, and a general financial prostration, from which, it is feared, the republic cannot soon recover. (See Prescott's *Conquest of Peru* (1847); Rivero and Tchudi's *Peruvian Antiquities* (New York, 1847); Markham's *Travels in Peru and India* (1862); and E. G. Squier's *Travels in Peru* (1876).)

PORTER C. BLISS.

Peru, city and tp., La Salle co., Ill., at the head of navigation on Illinois River (here crossed by a handsome bridge), and at the S. W. terminus of Illinois and Michigan Canal, is beautifully situated on the Chicago Rock Island and Pacific R. R.; has extensive trade and manufactures, 7 churches, 1 newspaper, 1 hotel, 1 bank, 5 public-school buildings, and 4 grain-warehouses, is lighted with gas, and has a good fire department; 125,000 tons of ice are annually exported to Southern markets, and extensive coal-mines are found in the vicinity. Lines of steamers ply in the summer to St. Louis and Peoria. Pop. of city, 3650; of tp. 3945.

Peru, p.-v. and tp., cap. of Miami co., Ind., at the junction of Toledo Wabash and Western and Indianapolis Peru and Chicago R. Rs., 75 miles N. of Indianapolis, has 2 banks, Howe sewing-machine manufactory, a woollen-mill, basket-factory, carriage-factories, foundries, 1 daily and 3 weekly newspapers. P. of v. 3617; of tp. 1115.
J. A. Miller, Ed. "Miami Co. Sentinel."

Peru, tp., Dubuque co., Ia. Pop. 889.

Peru, post-v. of Belleville tp., Howard co., Kan., on the Middle Caney Creek.

Peru, post-v. and tp., Oxford co., Me., on the Androscoggin River. Pop. 931.

Peru, p.-v. (formerly Partridgefield) and tp., Berkshire co., Mass., on Boston and Albany R. R. P. 455.

Peru, post-v. and tp., Nemaha co., Neb., on the Missouri River. Pop. 1164.

Peru, post-v. and tp., Clinton co., N. Y., on Lake Champlain and the Plattsburg R. R. Pop. 2632.

Peru, post-v. and tp., Huron co., O., on the Sandusky Mansfield and Newark R. R. Pop. 1297.

Peru, tp. of Morrow co., O. Pop. 953.

Peru, post-v. and tp., Bennington co., Vt. Pop. 500.

Peru, tp. of Dunn co., Wis. Pop. 242.

Peru Bal'sam, a balsamic exudate obtained from *Myrospermum Peruvianum*, a handsome tree of the natural order Leguminosæ, growing in the state of San Salvador, Central America. Portions of the bark are bruised by beating with blunt instruments, and subsequently charred by flame. A week or so later the injured bark comes away, and the balsam, which now begins to exude from the exposed wood, is collected on cloths, from which it is afterwards separated by gentle boiling in water. Peru balsam is a dark-brown, viscid substance, like thick molasses, of a rather fragrant odor and a warm, bitterish taste. It is insoluble in water, but mixes perfectly with absolute alcohol and chloroform. It is combustible, giving forth white fumes and a fragrant balsamic odor. It contains a resin, a volatile oil, and cinnamic and benzoic acids. Balsam of Peru was probably introduced into Europe as a medicine about the year 1524, and was considered of great value in bronchial and other respiratory affections, and locally upon ulcers or wounds. But its medicinal virtues are feeble, and other balsams have almost completely superseded it in American practice. It is an ingredient of the compound tincture of benzoin of the *U. S. Pharmacopœia*. Edward Curtis.

Peru'gia [anc. *Perusia*], town of Central Italy, which gives name to the province. It is situated 75 miles S. E. of Florence and 8 miles from the historic Lake Thrasimene (now Lake of Perugia), on a hill near the right bank of the Tiber, 1600 feet above the sea-level. The air is healthful, and the view of the surrounding country, rich in vegetation and most picturesque from the old towns, churches, and castles everywhere scattered over it, is extremely beautiful. The town itself, as seen from below, is most striking. It is well walled, and entered by gates mostly mediæval or modern; but among them is one of the Etruscan period, bearing the inscription "Augusta Perusia" placed on it by Augustus. Some remains of the old Etruscan walls also still exist. The streets, though often steep, are broad, and the squares are flanked by imposing public and private edifices. In the very large Piazza del Duomo there is a superb fountain, the work of Niccolò and Giovanni da Pisa. The churches are numerous (at least 100) and very noteworthy. Some of the palaces contain choice works from the hands of renowned artists, especially the Palazzo del Collegio del Cambio, which is rich in frescoes by Perugino. The Palazzo Publico (1333) is a building of great interest. Many of the fifty convents of Perugia have been suppressed recently, and from these and other sources a most interesting and highly instructive collection of pictures from the best masters of the Umbrian school, such as Perugino, Raphael, etc., has been brought together in the Academy of Fine Arts near the university. Perugia has always been renowned for love of art and literature, and its university (established in 1320) is still flourishing and respectable. Without the gates there are some remarkable antiquities; among others, the Torre di S. Manno, on which is the celebrated cubital writing called by Maffei "the queen of Etruscan inscriptions." Many interesting tombs, Roman as well as Etruscan, have been found in the neighborhood. Perugia was one of the oldest of the twelve chief Etruscan cities, and one of the last to fall before the Romans. In the quarrel between Antony and Octavianus this town espoused the cause of the former, and was cruelly punished by the latter, who afterwards rebuilt it. Its mediæval history has much of the romantic interest common to that of other large Italian towns. It is said to have been an episcopal see from the earliest Christian times, and continues such to the present day. Though always restive under the papal yoke, this town was not united to the kingdom of Italy till 1860—a year after the suppression of political disturbances and a brutal massacre of many of its citizens by the pontifical troops. Perugia manufactures silks, velvets, woollens, liqueurs, etc. Pop. in 1874, within walls, 20,000; suburbs included, 49,500.

Perugia, Lake of [anc. *Lacus Trasimenus*], is a lake of Central Italy, in the province of Umbria, 30 miles in circumference, and surrounded by beautifully wooded hills. Here Hannibal defeated the Romans in 217 B. C.

Perugi'no, Pietro (Pietro Vannucci della Pieve), friend of Leonardo da Vinci, teacher of Raphael, head of the so-called Umbrian school, which Raphael perfected, b. in Città della Pieve, a small Umbrian town, 1446; d. 1524; began his studies in Perugia, completed them in Florence, returned to Perugia at the age of forty. His best pieces belong to this period. His works mark an era in painting. His best work suggests Raphael. His school is characterized by softness, gentleness, tender grace, and richness of color. The devoutness of expression verged on sentimentality, and, being a manner rather than a feeling, easily became monotonous, affected, and wearisome. Perugino was neither a devout nor an amiable character; his hand was skilful, but his genius was meagre; both in subject and treatment he repeated himself fatiguingly. His finest pictures were painted in Perugia. Excellent examples are in the Vatican, the Pitti Palace in Florence, and the National Gallery in London. O. B. Frothingham.

Peruvian Antiquities. See Peru, by Porter C. Bliss, A. M.

Peruvian Bark. See Cinchona.

Pe'ruwels, town of Belgium, province of Hainaut, has breweries, tanneries, and manufactures of yarn, caps, and beetroot-sugar. Pop. 7775.

Peruz'zi (Baldassare), b. at Ancajaro, near Siena, in 1481; studied first the art of painting, and is considered the inventor of perspective architecture painting, but devoted himself afterwards chiefly to architecture; built in Rome the Palazzo Farnesina and Palazzo Massimi; succeeded Raphael as architect of St. Peter's in 1520. D. in 1537, poisoned by a competitor.

Peruzzi (Ubaldino), descendant of an old and distinguished family of Florentine bankers, b. in Florence Apr. 2, 1822, and educated at the École des Mines in Paris. In 1848 he was appointed gonfaloniere of Florence, in which office he did not carry out the views of Guerrazzi, as was expected. After the overthrow of the grand duke in 1859 (to which Peruzzi himself contributed) he was elected member of the Tuscan Assembly, afterwards deputy from Florence to the Italian Parliament. In 1861, Cavour offered him the post of minister of public works, an office which he retained until the fall of the Ricasoli ministry. While Rattazzi was in power Peruzzi threw himself into the opposition, but under the presidency of Minghetti he took the portfolio of the interior, and thus became a member of the ministry which negotiated with Napoleon III. the convention of Sept. 15, 1864, for the transfer of the capital from Turin to Florence. Peruzzi succeeded Count Cambray Digny as syndic of Florence, and he has not only carried out the admirable plans of his able predecessor for the improvement and embellishment of the city, but he has shown great energy in suggesting and executing important projects of his own to the same end. On the occasion of the recent festival at Florence in honor of Michael Angelo the city complimented her syndic with a gold medal.

Pe'saro [anc. *Pisaurum*], town of Italy, province of Pesaro and Urbino, in lat. 43° 55′ N., lon. 12° 54′ E. It lies on the slightly elevated right bank of the Foglia, near its entrance into the Adriatic, and is immediately connected with the larger towns of Southern and Northern Italy by the great railway skirting that sea. Pesaro is strongly walled and commanded by a citadel, and from the agreeable promenade upon the ramparts the view, embracing the neighboring hills dotted with castles and villas, the distant peaks of the Apennines, and the near Adriatic, is very fine. The streets are broad and well paved, and

the town contains many churches and private palaces of considerable interest. The cathedral is remarkable as showing by its three superimposed pavements the great changes of level which have taken place on this coast. Pesaro is probably of Pelasgian origin, was enlarged and adorned by the Romans, and had a bishop as early as 251 A. D. It suffered cruelly from barbarian invasions, and its mediæval life was much agitated. It is the birthplace of many distinguished men, both ancient and modern; among the latter, of Rossini, who bequeathed his large fortune to his native town—after the death of his widow—to be devoted to a musical lyceum. The maritime trade of Pesaro is of some importance, and there is an active traffic in the very fine fruits, grain, beans, silk, hemp in which the adjoining district is so rich. P. in 1874, 19,900.

Pescade'ro, p.-v. and tp., San Mateo co., Cal. P. 659.

Pesca'ra, town of Italy, province of Chieti, the most important station on the railway between Ancona and Foggia. It stands on a river of the same name, here crossed by a fine bridge, and the mouth of which forms a small but secure harbor. The fortifications of Pescara, formerly very strong, but now mostly demolished, begun by Charles V., have since sustained many sieges. The neighboring country is highly fertile. P. in 1874, 5238.

Pesch'el (OSKAR FERDINAND), b. at Dresden Mar. 17, 1826; studied law at Leipsic and Heidelberg; was for several years employed on the Augsburg *Allgemeine Zeitung;* became professor of geography at the University of Leipsic in 1871, and wrote *Geschichte des Zeitalters der Entdeckungen* (1858), *Geschichte der Erdkunde bis auf A. von Humboldt und Karl Ritter* (1865), *Neue Probleme der vergleichenden Erdkunde* (1870).

Peschie'ra sul Lago di Garda, an Italian fortress situated at the point where the Mincio issues from the Lake of Garda, and on the railway from Brescia to Verona, about 14 miles W. of the latter city. The circumference of the fortress is about 8000 feet, and it is surrounded by high, strong walls and bastions, and by broad and deep trenches filled with water from the lake. Peschiera, chiefly important as forming a part of the military system known under the name of the "Quadrilateral," commands the approaches by the Mincio and the navigation of the lake. From the natural strength of its position it was occupied during the Middle Ages by a fort held now by one faction now by another. In 1549 the Venetian republic repaired and garrisoned the fortress; in 1796 it was taken by the Austrians, who afterwards enlarged and strengthened the works at immense expense, and who held it (except a brief occupation by the French in the early part of this century, and by the Italians in 1848) until it was ceded to the kingdom of Italy in 1866. P. of v. in 1874, 4218.

Pe'scia, town of Italy, province of Lucca, situated in a most fertile district, 12 miles E. of the city of Lucca. The churches and other public buildings, as well as the private palaces, are very respectable, but without special interest. The inhabitants are active and industrious, the silk, leather, and paper factories are extensive and prosperous, and the fruit-market of Pescia is very famous. This town was a dependency of Lucca during the Middle Ages. P. in 1874, 12,700.

Pesci'na, town of Italy, province of Aquila degli Abruzzi, on the left bank of the Giovenco, near Lake Fucino. The principal buildings are the cathedral and the episcopal palace. It has considerable trade in oil, wine, wax, honey, and hides. Remains of cyclopean walls are to be seen in the neighborhood. P. in 1874, 5156.

Peshaw'er, a territory formerly belonging to Afghanistan, but now annexed to the dominions of Punjaub, British India, comprises an area of 2300 sq. m., with 847,695 inhabitants, of whom 776,063 are Mohammedans and 71,632 Hindoos. The soil of the country is exceedingly fertile, and by artificial irrigation it produces annually two crops of the finest rice in the world. The capital, Peshawer, is situated on the frontier of Afghanistan, at the eastern terminus of the Khyber Pass, which forms the principal road of commerce between India and Persia. It was formerly a very flourishing city, with 100,000 inhabitants, but it was nearly destroyed in the beginning of this century by the Sikhs. Under English rule, strongly fortified and defended by a garrison of 10,000, it is rapidly rising again. P. 53,000.

Peshi'to [Syr. for "simple"], the standard Syriac translation of the Old and a part of the New Testament. It was probably made in the second and third centuries of the Christian era, and is now generally believed to be the work of Christian Jews. It is a generally faithful and scholarly piece of work. The Gospels and Apocalypse are wanting, and are believed not to have been translated into Syriac until much later times.

Peshti'go, p.-v. and tp., Oconto co., Wis., on Peshtigo River, near Green Bay. P. 1749.

Peso'tum, p.-v. and tp., Champaign co., Ill., on Toledo Wabash and Western and Illinois Central R.R. P. 919.

Pestaloz'zi (JOHANN HEINRICH), b. at Zurich, Switzerland, Jan. 12, 1746; studied first theology, then law, but moved by the perusal of Rousseau's *Émile,* and obeying his own inner calling, he burnt his books, settled as a farmer at Neuhof in the canton of Aargau, married, and commenced the development of his educational ideas, theoretically and practically. In 1780 he published (in Iselin's *Ephemeriden*) *The Evening Hours of a Hermit;* in 1781, *Leonard and Gertrude,* a sort of romance; in 1782, *Christoph und Else;* in 1782–83, *Das Schweizerblatt für das Volk;* in 1801, *How Gertrude teaches her Children;* in 1803, *Buch der Mütter;* in 1804, *Anschauungslehre der Zahlenverhältnisse,* etc. The ideas which these books set forth, and most of which seem to us to be mere truisms, because they form the very foundation of our views of education, were at that time new and startling; and the attention which they attracted was very great, and increased by the practical application which the author at the same time gave them. Schools, or rather educational institutions, for children of the lowest classes were established by him at Neuhof, at Stanz, and at Burgdorf in the canton of Berne. This latter, which was afterwards removed to Yverdun, in the canton of Vaud, was at one time very prosperous, and was visited by a number of teachers from other European countries, who came to learn the new method, and brought it back to their native countries. But Pestalozzi lacked financial and disciplinary skill. Harassed by pecuniary difficulties and by dissensions among his co-operators, he retired in 1825 to Neuhof, where he wrote his *Schwanengesang* and *Meine Lebensschicksale.* D. Feb. 17, 1827. There is a collected edition of his works by L. W. Seyffarth (16 vols., 1871–72). (See Biber, *Life and Trials of Henry Pestalozzi* (St. Gallen, 1827), English trans., Philadelphia, 1833; and *Pestalozzi and Pestalozzianism,* by H. Barnard (New York, 1859).)

Pesth, city of Hungary, situated in a sandy plain on the left bank of the Danube, opposite Buda, with which it is connected by a magnificent suspension bridge and several other bridges; originated as a Roman colony (*Transacincum*); was fearfully devastated by the Mongols in 1241; recovered, and rose rapidly into prosperity, especially on account of the elections of the Hungarian kings taking place on the neighboring plain, Rákos, where often armies of 100,000 men were encamped for months; sank again under the Turkish rule (1526–1686) almost into a heap of ruins and rubbish, but recovered once more; was made a free city of the empire, and greatly favored by Maria Theresa and Joseph II., who removed the Hungarian University hither, built a number of great buildings, and made it the seat of the government of the country; and is now the most splendid and populous city of Hungary, the centre of its political and literary life, of its industry and commerce. It consists of five divisions, the old city and four suburbs, of which the Leopoldstadt is the finest. The quays along the Danube and the new boulevards are very elegant, broad, and lined with palatial houses. Among its institutions the most remarkable are—the university, with 140 professors and 2296 students in 1873, a library of 105,000 volumes, a botanical garden, and an observatory; the national library, of 200,000 volumes; the museum, with a complete collection of Hungarian coins; the theatre, the academy of music, the casino, etc. Besides the Roman Catholic cathedral, there are 30 places of worship, among which is a magnificent synagogue; it also has a great number of excellent educational institutions. The principal branches of manufacturing industry are leather, tobacco, brandy, silk, cloth, hats, and shoes. The chief articles of commerce are grain, wine, wool, potash, and soda. P. 200,476, of which 136,890 are Roman Catholics, 22,344 Protestants, and 39,386 Jews.

Pestilence. See EPIDEMIC and PLAGUE.

Petaluma, p.-v. and tp., Sonoma co., Cal., at the head of navigation on Petaluma Creek, on San Francisco and Northern Pacific R. R., 42 miles N. of San Francisco, with which it is connected by a daily line of steamers. Stock-raising, agriculture, and wine-producing are the leading industries, and 4 newspapers are published. P. 4588.

Petard' [Fr. *pétard*], a stout iron or wooden case filled with powder, affixed to the gate or palisades of a beleaguered place, and exploded for the purpose of making a breach. Bags of powder have been found equally effective. The Huguenots first used petards at Cahors (1579).

Petch'ora, a river of European Russia, rises in the Ural Mountains, flows with winding course through wild,

uncultivated regions covered with forests of larch-wood, and enters the Arctic Ocean through a large estuary in lat. 68° N. and lon. 53° E.

Pe'ter, SAINT, the first in the list of the twelve apostles, was b. in Galilee, at Bethsaida, on the shore of the Lake of Gennesaret, whence he removed to the adjoining village of Capernaum. He was a fisherman, like his brother Andrew, and, like him, he was probably a disciple of John the Baptist, but he followed Christ immediately when called. His original name was Simon, which Christ changed, declaring, "Thou art Peter, and upon this rock I will build my Church" (Matt. xvi. 18). From his call to the office of apostle, and up to the time of the apostles' council in Jerusalem, the events of his life are told in the Gospels and the Acts, and are familiar to all. His personal character is so distinct and strongly marked that there probably are no readers of the Bible who have not a vivid conception of it, or any two whose conceptions differ very much. But of the facts of his history after the apostles' council in Jerusalem tradition is the only authority, and the circumstance that the papal see rests its whole claim of primacy on events related by this tradition has caused it to be richly elaborated and very much doubted. Jerome and Eusebius relate that Peter was bishop of Antioch for several years, preached in Pontus, Galatia, Bithynia, and Cappadocia, and spent the last twenty-five years of his life in Rome, where he suffered martyrdom. This can hardly be correct. It seems impossible that Peter should have been bishop in Rome for twenty-five years. Paul makes no reference to such a fact in his Epistle to the Romans. At the time of the Reformation it was even contended—for instance, by Spanheim—that Peter never was in Rome; but at present most critics, Protestant as well as Roman Catholic, agree in accepting the tradition in its principal traits—namely, the residence of Peter in Rome and his suffering martyrdom there—though it has not been possible to establish an agreement with respect to the dates of these events. The most probable date is 66 or 67. Of the two Epistles in the New Testament which bear St. Peter's name, the genuineness of the former has commonly not been doubted, while some consider the second, or at least a large part of it, to be spurious.

Peter I., the Great, czar of Russia, b. at Moscow June 12, 1672, son of the czar Alexis Michailowitz; in 1682 succeeded Feodor, his brother, but his brother, Ivan V., being lawful heir, was soon after announced as joint-sovereign under the regency of their sister Sophia; but the energetic Peter, after seven years of tutelage, thrust the princess-regent into a convent, where she died after twenty-two years of confinement, while the inactive Ivan in 1689 abdicated his share of the government. Peter at once reorganized the army; built a small naval force; went to sea in person on several Dutch and English ships, so as to learn the practical part of navigation; took Azof from the Turks 1696; lived abroad (1697–98), chiefly at Saardam in the Netherlands and at Deptford and London, and with his own hands worked as a ship-carpenter and blacksmith, and for some months studied the sciences, so that Oxford gave him the degree of D. C. L. In 1698 he took 500 English mechanics, engineers, etc. to Russia, and in the same year, the Strelitzes having revolted, he ordered them all to be put to death, and assisted the executioners with his own hands; but pardoned a few upon the scaffold, noteworthy among whom was the young Orloff, founder of the princely house of Orloff. Peter spared his life on account of his indifference as he approached the block. In the same year died Le Fort, Peter's wisest counsellor, a Swiss by birth. The czar now reformed the calendar, founded schools, introduced arithmetic (hitherto unknown in Russia), compelled rich merchants to engage in foreign commerce, and enacted rules for dress and deportment; entered upon a war of conquest against Sweden, supported by Denmark and Poland, 1700, and in the same year was badly defeated by Charles XII. at Narva; founded St. Petersburg 1703; invaded Courland 1705; overthrew the Swedes at Pultava 1709; seized the Baltic provinces 1710, and Finland 1713; married Catharine I., his mistress, 1707, and declared her czarina 1711; waged an unfortunate war against the Turks 1711; finally gave up most of Finland in the peace of 1721; made the tour of Europe 1716–17, and returned with many books and works of art; put to death his son Alexei 1718, on the ground of his treasonable conduct; conquered three Caspian provinces from Persia 1722, but in 1730 Persia recovered a great portion of them, after Peter's death, which occurred Feb. 8, 1725. He was succeeded by Catharine I., his wife. Peter was the first Russian to take the title of emperor 1721. The surname "the Great" was assumed by himself.

Peter II., Alexeivitch, b. at St. Petersburg Oct. 23, 1715, a grandson of Peter the Great, a son of Alexei; succeeded Catharine I. on the Russian throne May 17, 1727. D. suddenly Jan. 29, 1730. The most prominent features of his short reign were the desperate intrigues between the families of Mentchikof and Dolgoruki.

Peter III., Feodorovitch, b. at Kiel, in Holstein, Feb. 21, 1728, a son of Peter the Great's daughter Anna, who had married a duke of Holstein; was designated as heir to the Russian crown in 1742 by his aunt, the empress Elizabeth; married, in 1745, Princess Catharine of Anhalt-Zerbst, afterwards Catharine II.; ascended the throne Jan. 5, 1762, and was deposed, arrested, and strangled July 8, same year. He had two very prominent passions—admiration of Frederick II., with whom he immediately made peace, restoring to him the conquered provinces, and hatred to the royal dynasty of Denmark, against which he immediately began war, with the intention of sending it to Tranquebar. He found no time, however, to execute his plans. Just as he had placed himself at the head of an army destined to invade Denmark, a revolution broke out at St. Petersburg. Münich, whom he had recalled from Siberia, advised him to march immediately with the whole army to the capital, but he was taken so completely by surprise that he lost all power of action. At Ropscha he was strangled in his bed by the brothers Orloff. Some years later an impostor, Pugatchew, put himself forward as the murdered emperor, but without success.

Pe'terboro', post-v. of Smithfield tp., Madison co., N. Y. Residence of the late Gerrit Smith. Pop. 368.

Peterborough, town of England, in Northamptonshire, on the New, is celebrated for its beautiful cathedral, built in the twelfth century in Norman style. Its length is 476 feet; the height of the nave to the ceiling 78 feet, and of the lantern-shaped tower 135 feet; its breadth is 78 feet. The town has a large trade in corn. Pop. 17,429.

Peterborough, county of Central Ontario, Canada, is fertile in its southern part, and abounds in lakes and streams. It has 3 ridings. Cap. Peterborough. Pop. 30,473.

Peterborough, a thriving town, the capital of Peterborough co., Ontario, Canada, on the river Otonabee, on the Cobourg Peterborough and Marmora and a branch of the Canada Midland Railway, is handsomely built on a fertile plain, is lighted with gas, has good water-power, manufactures of lumber, leather, machinery, castings, farm-implements. It has a good trade in grain and flour. A handsome bridge connects it with the village of Ashburnham. It has 1 weekly newspaper. Pop. of sub-district, 4611.

Peterborough, p.-v. and tp., Hillsborough co., N. H., on Contoocook River, at the N. terminus of Monadnock R. R., has 1 weekly newspaper and several cotton-mills, foundries, and factories. P. 2236.

Peterborough (CHARLES **Mordaunt**), EARL OF, b. in England about 1658, was a son of Lord Mordaunt of Reygate, Viscount Avalon, to which titles he succeeded 1675; served in boyhood in the navy against the Barbary corsairs in the Mediterranean; was engaged under Admirals Torrington and Narborough in the expedition against Algiers 1678–79; exchanged into the army; took part in the defence of Tangier against the Moors 1680; was an attached friend of Algernon Sydney, whom he attended to the scaffold; was a bitter opponent of the governments of Charles II. and James II. in the House of Lords; indulged in a lavish prodigality, which involved him in debt and made it expedient for him to retire to Holland 1686; used every opportunity of inciting William, prince of Orange, to undertake the overthrow of James; accompanied that prince in his English campaign 1688; became first lord commissioner of the treasury, and was created earl of Monmouth (a title formerly borne by his maternal ancestors) Apr., 1689; soon found himself in conflict with his ministerial colleagues and with the king through his ardent Whiggism; retired from office Jan., 1690; served under William in Flanders 1691; remained several years in unwilling retirement on his estates; was imprisoned in the Tower by order of Parliament on an accusation of complicity in Sir John Fenwick's plot against the king's life 1697; succeeded in the same year to the earldom of Peterborough by the death of an uncle; was restored to favor at court on the accession of Anne; became privy councillor Mar., 1705; obtained through the influence of the duchess of Marlborough the command of the land-forces sent to the aid of the archduke Charles of Austria in asserting his claim to the Spanish crown; sailed with Sir Cloudesley Shovel at the head of 5000 Dutch and English soldiers May, 1705; took on board the archduke at Lisbon and the prince of Hesse-Darmstadt (commander-in-chief of the allied forces) at Gibraltar; occupied Valencia without resistance; proposed an immediate march upon Madrid, but was overruled, and the

siege of Barcelona undertaken against his judgment. Early in September that siege was about to be abandoned as impracticable, when Peterborough obtained leave to undertake a seemingly desperate night-assault upon the citadel of Monjuich, one of the strongest fortresses in the world, which was successfully undertaken (Sept. 6), and led to the capture of Barcelona. Peterborough then began a brilliant campaign, overran Catalonia, Aragon, and Valencia with the greatest rapidity, and successfully defended Barcelona against the formidable army of Philip V. (1706), but resigned in 1707, in consequence of dissensions with his associate commanders. Employed for some years in diplomatic posts, he became governor of Minorca 1713, sided with the Tories during the last years of Anne, lived in retirement during most of the reigns of George I. and George II., was an associate and friend of the chief literary celebrities of the time, and became general of the marine forces of Great Britain 1722. D. at Lisbon Oct. 25, 1735. Peterborough was a chivalrous and eccentric character, of vast military genius, and considerable literary taste, as shown by several occasional publications. He wrote his own *Memoirs*, but they were destroyed by his widow, the celebrated singer, Anastasia Robinson. (See Macaulay's *Essays*, Lord Mahon's *History of England*, and Eliot Warburton's *Memoir* (1853), which contains selections from Peterborough's correspondence.) PORTER C. BLISS.

Peter Creek, tp. of Van Buren co., Ark. Pop. 149.

Peter, Epistle of St., The First, one of the catholic or general Epistles, was written from "Babylon" (perhaps symbolical for Rome) about 64 A. D.—PETER, EPISTLE OF ST., THE SECOND, has suffered more from doubts as to its authenticity than any other book of the New Testament. It is directed against heretics and corrupt men, and the second chapter, in which they are described, bears a striking resemblance to the Epistle of St. Jude.

Pe′terhead, town of Scotland, Aberdeenshire, on a narrow peninsula, with two good harbors on the northern and southern sides of the peninsula, connected with each other by a canal. The herring fisheries along the coast are important; the shipbuilding industry and trade are considerable. P. 8535.

Peter the Hermit, b. at Amiens in the middle of the eleventh century; was educated at Paris and in Italy; served in the army in Flanders, but gave up the military career and married; became a monk after the death of his wife, and finally a hermit; made in 1093 a pilgrimage to Jerusalem, and, deeply impressed by the indignities and cruelties inflicted on the Christian pilgrims by the Mohammedan rulers of the city, he began immediately on his return to Europe, and with the authority of Pope Urban II., to preach a general war for the delivery of the Holy Sepulchre. His preaching in Italy and France stirred up the whole populace, and a crusade was actually determined upon by the Council of Clermont in 1095. Peter himself led the first army towards the Holy Land—an undisciplined and disorderly swarm, containing as many women and children as men. After unspeakable sufferings on their way through Hungary, Bulgaria, and Constantinople to Asia Minor, they were routed and massacred at Nice by Sultan Solyman. Next year a regular and brilliant army, comprising the flower of European chivalry, undertook the second crusade, under the command of Godfrey of Bouillon. Peter accompanied also this expedition, and after the conquest of Jerusalem in 1099 he preached to the crusaders on the Mount of Olives. Shortly after he retired to Huy in Belgium, where he founded a monastery, and d. July 7, 1115.

Pe′terhof, an imperial palace in the government of St. Petersburg, Russia, on the Bay of Kronstadt, was built by Peter the Great, contains a fine collection of pictures, and is surrounded with beautiful parks and gardens. A small town has grown up around it.

Pe′termann (AUGUST), b. at Bleicherode, in Prussian Saxony, Apr. 18, 1822; was educated in the gymnasium of neighboring Nordhausen, and entered in 1839 the geographical institution of Prof. Berghaus at Potsdam, where he stayed for six years, assisting him in the preparation of his *Physical Atlas*, and preparing himself the maps to A. von Humboldt's *Asie Centrale*. In 1845 he went to Edinburgh to superintend the English edition of the *Physical Atlas*, and in 1847 to London, where he became a member of the Royal Geographical Society, and contributed a number of geographical essays and articles to the *Athenæum*, *Encyclopædia Britannica*, etc. In 1854 he returned to Germany as director of Justus Perthes' geographical institution in Gotha, and next year began the publication of his celebrated *Mittheilungen*, a monthly which now has reached 21 vols., and may be considered as the central organ and the highest authority in present geographical literature. Practically, Petermann has interested himself very much in several African and Arctic expeditions, and contributed much to organize them.

Pe′ters, tp., Franklin co., Pa. P. 2603.

Peters, tp., Washington co., Pa. P. 943.

Peters (ABSALOM), D. D., b. at Wentworth, N. H., Sept. 19, 1793; graduated at Dartmouth College 1816, at Princeton Theological Seminary 1819; was pastor of a Congregational church at Bennington, Vt., from 1820 until 1825, when he accepted the secretaryship of the United Domestic Missionary Society; was the first secretary of the American Home Missionary Society, holding that position until 1837, and editing the *Home Missionary and Pastor's Journal;* became in 1838 editor of the *American Biblical Repository;* was professor of pastoral theology in Union Seminary, N. Y., 1842–44, pastor of a church at Williamstown, Mass., 1844–57, and originated the *American Eclectic Review* and the *American Journal of Education.* D. in New York City May 18, 1869. Author of several theological and polemical treatises, and of a volume of poems.

Peters (CHRISTIAN HENRY FREDERICK), PH. D., b. at Coldenbüttel, Sleswick, Germany, Sept. 19, 1813; graduated at the University of Berlin; travelled extensively for several years in Italy and the East; engaged in scientific researches, after which he settled in the U. S.; was employed upon the Coast Survey; became professor of mathematics and astronomy at Hamilton College 1858, where he took charge of the Litchfield Astronomical Observatory, which he brought to a high state of efficiency; made very extensive investigations concerning comets and asteroids, having discovered more than twenty of the latter bodies; catalogued 16,000 zodiacal stars and recorded over 20,000 solar spots. Under the auspices of the regents of the University of the State of New York, Dr. Peters determined the exact longitude of several points within that State, especially upon the western boundary. He took a prominent part in the observation of the total solar eclipse of Aug. 7, 1869, at Des Moines, Ia.; was chief of the party sent by the U. S. government to New Zealand to observe the transit of Venus of Dec. 9, 1874, and was the only observer on that island who had complete success, having obtained 237 photographs of the transit.—His brother, WILHELM KARL HARTWIG, b. at Coldenbüttel Apr. 22, 1815, took a prominent part in the Prussian survey of Mozambique (1842–47), and is a distinguished professor of zoology at Berlin.

Peters (HUGH), b. at Fowey, Cornwall, in 1599; was educated at Trinity College, Cambridge; became a clergyman in London; was imprisoned for nonconformity; was for some years a preacher at Rotterdam; came to New England in 1635, and succeeded Roger Williams as minister of Salem, Mass.; was influential in public affairs; returned in 1641 to England; became a preacher in Cromwell's army, serving in Ireland with the rank of colonel; filled important civil and ecclesiastical positions, but upon Charles II.'s restoration was shut up in the Tower, and beheaded Oct. 16, 1660, on the charge of having been concerned in the king's death. There have been widely different estimates of his character: the royalist writers of his time bring severe charges against his character, but with very questionable justice. He left some quaint literary remains, now almost forgotten.

Peters (JOHN CHARLES), M. D., b. in New York July 6, 1819; studied homœopathy in Europe, having gone thither in 1842; established himself in New York as a homœopathist, but pursued an independent and novel line of medical theory, and aimed to blend to some extent the scientific methods and results of modern medical practice with those of homœopathy. Edited the *North American Journal of Homœopathy* (1856–61); was chosen president of the American College of Medical Sciences in 1859, and professor of materia medica and therapeutics; author of a series of medical treatises; one of the translators of Rokitansky's *Pathological Anatomy*, etc.

Peters (RICHARD), b. at Blockley (now part of Philadelphia), Pa., Aug. 22, 1744; became a successful lawyer, distinguished for wit and brilliant social qualities; was a captain in the Revolution; secretary to the board of war 1776–81; was in Congress 1782–83; U. S. district judge 1789–1828; was one of the first American farmers to use gypsum, upon the valuable qualities of which he published a memoir 1797; author of 2 vols. of *Admiralty Decisions* (1780, 1807). D. at Blockley, Pa., Aug. 21, 1828.

Peters (SAMUEL ANDREW), D. D., LL.D., b. at Hebron, Conn., Dec. 12, 1735; graduated at Yale in 1757; became Church-of-England minister at Hartford; was compelled to flee to England as a Tory in 1774, and his property was confiscated; published *A General History of Connecticut* (1781), a laughable satire on his native State, probably

not intended to convey any historical information. It was severely denounced in the U. S. Peters was chosen bishop of Vermont in 1794, but the archbishop of Canterbury refused him consecration; returned to the U. S. in 1805, and in 1817 endeavored to get possession of a tract of land in what is now Minnesota. D. in great poverty in New York Apr. 19, 1826.

Peters (Thomas McClure), D. D., b. at Boston, Mass., June 6, 1821; graduated at Yale College 1841; studied theology; took orders in the Episcopal Church; became rector of St. Mary's, of All Angels', and of St. Michael's churches, N. Y.; president of the "Sheltering Arms," and prominently identified with several charitable institutions.

Pe'tersburg, p.-v. and tp., cap. of Menard co., Ill., on Chicago and Alton and Springfield and North-western R. Rs., 20 miles N. W. of Springfield. The town was laid out by Abraham Lincoln (afterward President of the U. S.) in 1835; has fine schools, 7 churches, 2 newspapers, several flouring-mills, good water-power, and extensive timber tracts. Deposits of coal exist here. Pop. of v. 1792; of tp. 2821. John F. Mounts, Ed. "Democrat."

Petersburg, v., Venedy tp., Washington co., Ill. P. 35.

Petersburg, p.-v., Washington tp., cap. of Pike co., Ind., situated 1½ miles S. of White River, has an excellent graded school, 4 churches, 1 bank, 1 carriage-factory, 2 flouring-mills, 2 woollen-mills, a brewery, court-house and jail, and stores. Coal is abundant. P. of v. 923. Harvey Wishard, Ed. "Press."

Petersburg, p.-v. and tp., Boone co., Ky., on Ohio River. P. 400.

Petersburg, p.-v., Summerfield tp., Monroe co., Mich., on Raisin River and Lake Shore and Michigan Southern R. R., has 1 newspaper.

Petersburg, p.-v. and tp., Jackson co., Minn., on Des Moines River. P. 168.

Petersburg, p.-v. and tp., Rensselaer co., N. Y., on Little Hoosick River and Harlem Extension R. R. P. 1732.

Petersburg, p.-v. and tp., Mahoning co., O., on Pittsburg Fort Wayne and Chicago R. R. P. 218.

Petersburg, p.-b., West tp., Huntingdon co., Pa., on Pennsylvania Central R. R. P. 381.

Petersburg, p.-b., Penn tp., Perry co., Pa., on Susquehanna River. P. 960.

Petersburg, city and port of entry of Dinwiddie co., Va., 23 miles S. of Richmond, on the S. bank of Appomattox River, 12 miles above its mouth, near the falls which constitute the head of tidewater and of navigation for large vessels, and supply abundant water-power for milling and manufacturing purposes. Above the falls the Appomattox is navigable more than 100 miles for flatboats. Petersburg is connected with Richmond, Norfolk, Lynchburg, Weldon, and City Point by means of Atlantic Mississippi and Ohio, Petersburg, and Richmond and Petersburg R. Rs., has 6 banks, 4 savings institutions, 1 weekly and 3 daily newspapers, 24 churches and chapels, 27 public and 21 private schools, 62 manufactories, including many of tobacco, and several of cotton goods, iron and wooden ware, 2 public libraries with an aggregate of 10,000 volumes, several creditable public edifices, including the court-house, the custom-house and post-office, 2 markets, and a theatre, some of which, however, suffered serious damage during the war; is picturesquely situated on the declivities of a hill sloping gradually to the river-bank, affording natural drainage; is well built, lighted with gas, and copiously supplied with pure water from a reservoir; has a beautiful public park called Poplar Lawn; is surrounded by the remains of numerous intrenchments which constituted its defences during the memorable siege of 1864–65, since which period it has rapidly risen in prosperity, doing a heavy shipping business in Southern agricultural staples. In 1874 the exportation of tobacco from the port of Petersburg was 46 per cent., and in 1875 nearly 36 per cent., of the entire freight export of that article from the U. S., the number of pounds exported in the latter year being 3,266,804, and the revenue paid in the city on the manufactured article being $812,345. In 1874, 26,240 barrels of flour were inspected, while 39,648 bales of cotton and 108,000 bushels of peanuts were shipped. It is a place of considerable historic interest, being located on the site of an Indian village burned by Nathaniel Bacon in Aug., 1676; was laid out in 1733, simultaneously with Richmond, by Col. William Byrd; was incorporated 1748, and re-incorporated 1781, and was twice occupied as head-quarters during the Revolutionary war by the British forces, whose commander, Gen. William Phillips (the predecessor of Cornwallis), died here of fever May 13, 1781, shortly after having repulsed an attack by Gen. Steuben. A gallant company of Petersburg volunteers in the war of 1812 earned for it the complimentary title of "Cockade City of the South," attributed to Pres. Madison; and its heroic defence during the closing scenes of the late civil war rendered it memorable as the "last citadel of the Confederacy." The Army of the Potomac, under Gen. Grant, being induced by the result of the second battle of Cold Harbor to abandon its advance upon Richmond by the line of the Chickahominy, crossed the James River below City Point June 12, 1864, and made formidable assaults upon Petersburg June 15 and 16, which were repulsed with a loss, as stated by Gen. Grant, of 10,268 men; after which he proceeded to invest the city. Gen. Lee promptly threw himself into Petersburg, and rapidly strengthened the fortifications. The actual siege began June 19, after which the Weldon railroad was torn up by the Union cavalry under Wilson, and an attempt was made to isolate the city from its supplies. Mines were constructed and exploded on an extensive scale, and the "bloody battle of the crater," July 30, was but one of a series of unsuccessful attempts to take the city by storm. The siege was prolonged, amid long-continued, indecisive operations, until Apr. 3, 1865, when a week of bombardment and active engagements, including Sheridan's success at Five Forks, determined Gen. Lee to evacuate the city, and his surrender at Appomattox six days later terminated the war. The population of Petersburg remained nearly stationary during the decade of the war, having been 18,266 in 1860 and 18,950 in 1870, but since the latter date it has rapidly increased. Roger A. Pryor.

Petersburg, p.-v., cap. of Grant co., West Va., situated on the S. branch of Potomac River, 150 miles S. E. of Wheeling, has good schools and hotels. It is a general dépôt for grain from the neighboring counties. P. about 300. S. D. Gordon, Ed. "Examiner."

Peters' Comet, so called because the elements of its orbit were first determined by Prof. C. H. F. Peters, director of the Litchfield Observatory at Clinton, N. Y. Of the fourteen ascertained periodic comets whose mean distance from the sun is less than that of Saturn, this has the greatest distance and the longest period, Pigott's comet being the next. Its motion is direct; mean distance from the sun, 6.3206; eccentricity of orbit, 0.8464; inclination of orbit, 13° 2′ 14″; period of revolution, 15.990 years.

Peter's Creek, p.-v. and tp., Stokes co., N. C. P. 1491.

Pe'tersen (Clemens), b. in the island of Seeland, Denmark, Oct. 2, 1834; studied theology and philosophy at the University of Copenhagen; had charge of the critical department of the principal Danish paper in that city 1853–69; lectured on literature and art; wrote *On the Performance of the Greek Tragedy* (1861) and *The Contest between the Old and the New in Danish Literature*, published by the Literary Society of Copenhagen (1867); came to New York in 1869, and has been an occasional contributor to the *Atlantic*, *Galaxy*, and other periodicals.

Petersen (Niels Matthias), b. at Sanderup, island of Fuhnen, Denmark, Oct. 24, 1791; studied philology and history, and became professor of ancient Scandinavian language and literature in 1845 at the University of Copenhagen, where he occupied a prominent place as one of the earliest and most gifted representatives of modern ideas in philology and history. His works relating to ancient Scandinavian mythology, literature, history, and language (*Det Danske, Norske og Svenske Sprogs Historie* (1829), *Den Nordiske Mythologie* (1849), *Danmarks Historie i Hedenold* (1834), *Haandbok i den oldnordiske Geographie* (1834), etc.) are distinguished both for elevated and comprehensive views and ingenious treatment of details, and his elaborate *History of the Danish Literature* (6 vols., 1853–64) exercised a deep and regenerating influence on Danish taste. As a literary character he was not altogether unlike Thomas Carlyle. He had no system, hardly any tendency. His soul was a deep sea of sentiment, wonderfully pure, but sometimes violently agitated; and now and then he burst out in self-contradictions which astonished the systematic intellect and offended party passion, but behind which were subsequently found the sublimest manifestations of his genius. D. at Copenhagen May 11, 1862. Clemens Petersen.

Pe'tersham, p.-v. and tp., Worcester co., Mass., noted as the scene of the battle in which the insurrection under Daniel Shays was suppressed by Gen. Benjamin Lincoln, Feb. 4, 1787. P. 1335.

Pe'terson, p.-v., Clay tp., cap. of Clay co., Ia., on Little Sioux River. P. 44.

Peterson, tp., Emmet co., Ia., on W. fork of Des Moines River. P. 153.

Peter's Pence, or **Romescot,** an ancient tax for the benefit of the pope, perhaps first levied as a voluntary tribute from the Anglo-Saxon princes of England to the successor of St. Peter, or more probably at first as a tax for the support of the English school at Rome. (See

Lappenberg's *History of England under the Normans.*) Peter's Pence was paid the pope, with some interruptions, until 1534, when, during the reign of Henry VIII., it was finally abolished. The levy of Peter's Pence was attempted in various other countries at different times. In 1848 the attempt was made to renew the contribution of Peter's Pence in every part of the Church, and since that time the pope has derived a good part of his revenue from this source.

Peter's, St., Church, at Rome, the largest cathedral in the world, consists of a Latin cross 613 feet long and 450 feet across the transept, surmounted by a dome which rises 434¾ feet above the pavement with a diameter of 195½ feet. The façade is 368 feet long and 145 feet high. The building was commenced under Pope Nicholas V., after a plan by Rosselini, in 1450, but the work was neglected for nearly half a century. Under Julius II., Bramante prepared a new plan, which was subsequently followed out in the main. Raphael had charge of the building for some time. Michael Angelo designed the dome and nearly completed its erection. The façade is by Carlo Maderno, the colonnade by Bernini. The church was consecrated by Urban VIII. Nov. 18, 1626, the 1300th anniversary of the day on which St. Sylvester consecrated the basilica which originally occupied the site, and which was built by Constantine the Great on the spot where, according to the tradition of the Roman Catholics, the apostle Peter, whose remains rest under the high altar, suffered martyrdom.

Pe'tersville, p.-v. and tp., Frederick co., Md., on Potomac River. P. 159; of tp. 2574.

Peterwar'dein, town of Austria, the cap. of the Slavono-Servian military frontier, on the Danube, is one of the strongest fortresses of the Austrian empire, with barracks to accommodate 10,000 men. The town itself is insignificant, and has hardly 4000 inhabitants.

Peth'erick (John), a British traveller in Africa; entered the service of the viceroy of Egypt, Mehemet Ali, as a mining engineer 1845; went to Kordofan 1847; became a merchant at Khartoom on the death of the viceroy; received the appointment of British consul at that place, and made extensive explorations of the Upper Nile, of which he gave an account in his work entitled *Egypt, the Soudan, and Central Africa, with Explorations from Khartoom on the White Nile to the Regions of the Equator* (1861).

Petic', or **Pitic,** town of the Mexican confederation, in the state of Sonora, on the river Sonora, near the place where it becomes lost in the sand. Since the exhaustion of the gold-mines it has begun to decline, but it is still an important place, as situated at the entrance into an exceedingly fertile and densely-peopled valley which stretches along the Sonora, and produces wheat, wine, and fruit in large quantities. P. about 14,000.

Pet'igru (James Louis), b. in Abbeville co., S. C., May 10, 1789; graduated at Columbia College, S. C., in 1809; admitted to the bar in 1812; went to Charleston, S. C., and became attorney-general of the State, though he was a very decided adherent to the principles of the Federal party under the elder Adams, in opposition to those taught by the disciples of the school of Mr. Jefferson, which then constituted the general creed of South Carolina. In the days of nullification he was the acknowledged leader of the Union party in the State. But he stood almost solitary and alone of all the men of wealth, position, and high reputation in the State, and with firmness, earnestness, and eloquence opposed the doctrines put forth at that time by Hayne, Hamilton, McDuffie, and Calhoun. In 1860 also he was strongly opposed to the doctrine of secession, but yielded a quiet obedience to the ordinances and laws of his State. The great work of his life was the codification of the laws of South Carolina. This high trust had been confided to him by the legislature notwithstanding his well-known political principles. During the first year of the war he devoted himself almost exclusively to the completion of this work, and he survived his labors on it only a short time. The codification was finished in the fall of 1862. D. in Charleston Mar. 9, 1863. A biographical sketch, by W. J. Grayson, was published in New York in 1866. A. H. Stephens.

Peti'lia [*Policastro*], town of Southern Italy, province of Catanzaro, situated on a hill surrounded by a most fertile country, about 11 miles from the Ionian Sea. Its only remarkable building is the palace of the archbishop of Salerno, who passes his summers here. P. in 1874, 5500.

Pétion' (Anne Alexandre **Sabès**), b. at Port-au-Prince, Hayti, Apr. 2, 1770, was a quadroon, the son of a free mulatto woman by M. Sabès, a wealthy planter; was educated in the military school at Paris; entered the French army; joined the Haytian rebellion, and strove to restrain excesses and to protect the whites of the island. In 1799 he abandoned the cause of Toussaint, whose extreme measures he deplored, and for a time served against him under Rigaud; re-entered the French service as colonel, serving in Hayti, but the cruelties of Leclerc led him in 1802 to head a new revolt against the French. He finally became the leader of the mulatto party against the blacks, who were headed by Christophe, and in 1807, Pétion was declared president of Hayti. Involved in frequent wars with Christophe, and impeded in the execution of his patriotic plans by the almost savage condition of his people, Pétion became insane, and starved himself to death. D. at Port-au-Prince Mar. 29, 1818. He was a man of amiable and philanthropic character and of engaging manners, but was deficient in that firmness and energy required by the circumstances in which he was placed.

Pétion' de Villeneuve' (Jérôme), b. at Chartres, department of Eure-et-Loir, in 1753; studied jurisprudence and practised law in his native city, when in 1789 he was elected a deputy of the States General. He showed himself a thorough republican and a fierce adversary of the court; belonged first to the party of the duke of Orleans, then to that of Robespierre; became a prominent member of the Jacobin Club, and was chosen mayor of the city of Paris Nov. 18, 1791. In this position he at first connived at, perhaps even instigated, the risings of the Parisian mob, but as the Revolution developed he became frightened, separated from the Terrorists, and sided with the Girondists. His popularity was immediately gone, and when he voted for the death of the king on condition of an appeal to the people, he became suspected as a royalist and accomplice of Dumouriez. On June 2, 1793, he was arrested, but escaped, and assembled with the other Girondists at Caen. After the defeat of their army he wandered for some time in the neighborhood of Bordeaux, where his corpse was found, together with that of Buzot, in July, 1793, in a cornfield, half eaten by wolves. His *Œuvres* were published at Paris in 4 vols. (1793), and consist of political speeches and pamphlets. His *Mémoires* were published by Dauban at Paris (1866).

Peti'tion [Lat. *petitio*], a representation of a grievance for which the ordinary judiciary courts can give no redress, accompanied with a supplication for the relief by legislation of said grievance, addressed to an authority capable of granting it. In all free countries the right of petition—that is, the right of the citizen to address petitions to the legislative power of the government—is considered a most valuable right. In the English constitution it is of old standing, and in all younger liberal constitutions it has been claimed most emphatically by the citizens and defined with the greatest precision by the government.

Petition of Right, a celebrated English statute passed early in the reign of Charles I. (3 Car. I. c. 1, A. D. 1627) for the purpose of restraining and limiting the acts and prerogatives of the Crown, and securing the personal and civil liberties of the subject. Although a legislative act, yet, as it does not profess to establish any new rule, but simply to reaffirm those already in existence, it is in the form of a petition, and is entitled, "The Petition exhibited to His Majesty by the Lords and Commons, etc. concerning divers rights and liberties of the subjects, with the King's Majesty's royal answer thereto in full Parliament." After reciting the most important provision of Magna Charta and certain old statutes passed in the reigns of Edward I. and Edward III., which prohibited unlawful taxes and assessments, and forced loans, and illegal arrests and imprisonments, and quartering of soldiers upon private citizens, and a resort to martial law in civil cases; and after reciting in detail the various acts done by or in the name of the king which violated all of these prohibitions—viz. his unwarrantable levies of taxes, his forced loans, his arbitrary arrests and imprisonments, his quartering of soldiers in private houses, and his commissions authorizing the use of martial law—the Parliament prays that all these acts and proceedings should be discontinued and not repeated, recapitulating the violations of law above mentioned in detail, and concluding in the following language: "That you would be pleased to declare your royal will and pleasure that in the things aforesaid all your officers and ministers shall serve you according to the laws and statutes of this realm, as they tender the honor of Your Majesty and the prosperity of this kingdom." The king's assent, given in full Parliament, is indicated by the formula, "*Soit droit fait come est desiré*" ("Let right be done as prayed"). This declaration of the legislature, together with Magna Charta, the Bill of Rights, the Habeas Corpus act, and the Act of Settlement, is justly considered as forming one of the fundamental and constitutional guaranties by which civil and political liberty is secured to the British people. Although it does not contain in express terms the statement of broad principles, but rather deals with particular instances of executive wrongdoing,

yet it is always regarded as actually including and establishing the principles of personal right and liberty in the most comprehensive manner.

The term is also applied to a common-law proceeding by which a subject sought to establish his title to, and recover possession of, real or personal property in the possession and under the control of the Crown. As the king is not liable to be sued in the ordinary manner, a petition setting forth the facts of the case and praying for the proper relief is presented to him; upon this he endorses the words, "*Soit droit fait al partie*" ("Let right be done to the party"), and delivers it to the law-officers of the Crown. The subsequent proceedings resemble those in an ordinary action; the issues are tried before a court, and judgment is rendered for or against the petitioner, as the case may be. JOHN NORTON POMEROY.

Petitcodiac, p.-v. of Westmoreland co., N. B., on European and North American Railway, has 1 weekly newspaper. P. about 400.

Petit Jean, tp., Perry co., Ark. P. 228.

Petitot′ (LOUIS MESSIDOR LEBON), b. at Paris June 23, 1794; studied sculpture under his father at the Academy of Paris and in Rome. D. in Paris June 1, 1862. His most prominent works are *Ulysses visiting Alcinous* (1821) and *The Pilgrim* (1847), which latter was placed in the garden of the Luxembourg in 1874.

Petit-Thouars. See DUPETIT-THOUARS.

Pe′to (Sir SAMUEL MORTON), BART., b. at Woking, Surrey, England, Aug. 4, 1809; became partner in a wealthy building firm, and afterwards engaged extensively in the work of railroad construction in Great Britain, on the Continent, in Africa, Canada, and other regions; was made a baronet in 1855 for patriotic services in the Crimea; was several years in Parliament, and was distinguished for his large charities; is one of the leading Baptists of London. In 1868 his firm failed with $35,000,000 liabilities. Author of a work on *Taxation* (1863) and another on the *Resources of America* (1866).

Pet′öfi (SÁNDOR), b. at Kun-Szent-Miklos, in Little Cumania, Hungary, in humble circumstances; was baptized at Kisköros Jan. 1, 1823, and received a very poor education, growing up as a private soldier and as a strolling actor. Nevertheless, as early as 1843 his numerous songs, published in newspapers and periodicals, had attracted so much attention that he was enabled to take a place in the young literature whose brightest ornament he soon became. In 1848 it was he and his song, "Now or Never," which gave the first impulse to the Hungarian rising. In the following year he fought in the army as aide-de-camp to Gen. Bem, and in the encounter at Szegesvár, July 31, 1849, he fell, or rather disappeared. Between 1843 and 1849 he published a drama, *Tiger and Hyæna*, a translation of Shakspeare's *Coriolanus*, a comic and a serious epic, which latter, *János*, became the national epic of the Hungarians, a large romance, and several short tales or novels—all of which bear the stamp of an original genius of high rank—and at the same time he continued to pour forth his stirring songs, which belong to the most excellent specimens of lyrical poetry. There are many translations of his works into German; several of his poems have been translated into English by Bowring (London, 1866).

Pe′tra [Gr. Πέτρα, "rock"], the Selah of 2 Kings xiv. 7, taken from the Edomites by Amaziah (839–810 B. C.), in the hands of the Moabites about 700 B. C., and the capital of the Nabathæans (descendants of Nebaioth, the eldest son of Ishmael) about 300 B. C., when the Greeks first knew it as Petra. During the reign of Trajan (in 105 A. D.) it was conquered by the Romans, is mentioned several times by Eusebius and Jerome as an ecclesiastical metropolis, but is not heard of after about 536 A. D. Whether destroyed by the Mohammedans in the seventh century, or previously by the hordes of the desert, is not known. Its identification, suggested by Ritter on the basis of facts gathered by Seetzen in 1807, was established by Burckhardt in 1812. A good description of the ruins may be found in Robinson's *Biblical Researches* (1841), as also in Porter's *Handbook for Syria and Palestine* (1875). The present name of the little valley is *Wady Musa*, about 28 hours N. E. of Akabah, the E. head of the Red Sea. The city, shut in by cliffs from 150 to 300 feet high, occupied an area of about half a mile square. A stream still flows through the valley. The ruins of tombs, a theatre, and perhaps a temple are exceedingly picturesque.
R. D. HITCHCOCK.

Petra′lia Sopra′na, town of Sicily, province of Palermo, 22 miles from Cefalù. It stands on a very high hill, and contains pictures and other works of art. P. in 1874, 6600.

Petra′lia Sotta′na [anc. *Petrapolis*], town of Sicily, province of Palermo, very near Petralia Soprana, though on a lower spur of the Madonie. It is still nearly 3000 feet above the sea-level. The churches are interesting—some of them very old, others containing good pictures. The town is well supplied with charitable institutions and is increasing in prosperity. About 3 miles N. of Petralia on one of the highest crests of the chain, 4000 feet above the sea, stands the Santuario della Madonna dell' Alto, erected in 1328. P. in 1874, 7374.

Pe′trarch [It. *Petrarca*], (FRANCESCO), b. at Arezzo July 20, 1304, of an exiled Florentine family; educated at Pisa 1312, Avignon 1313, and Carpentras 1315, and studied law at Montpellier 1319–23, and Bologna 1323–26, but returned after the death of his father to Avignon, and devoted himself exclusively to literary pursuits, to poetry, and the study of the Latin authors. From 1327 to 1353 his residence was principally at Avignon and in the neighboring valley of Vaucluse, though he made numerous journeys in Spain, France, Germany, and Italy, both for literary purposes and on diplomatic missions. In 1353 he returned to Italy, where he resided first at Venice to 1370, and then at Arqua, near Padua, where he d. July 18, 1374. But long before he left Avignon he had acquired great fame as the first poet and scholar of the age. Apr. 18, 1341, he was crowned as *poeta laureatus* at the Capitol in Rome; and that movement in European civilization which is characterized as the revival of letters received one of its noblest and most powerful impulses from Petrarch. He was a zealous collector of manuscripts, and the preservation of several interesting classical works, such as Cicero's letters and Quintilian's book, is due to him. He copied several manuscripts with his own hand, and he was evidently as passionate and enthusiastic in his studies as in his writings; he was found dead in his library with his head gently bent over the book. But it is a curious fact that of his poetical works those which made him famous in his own time are now hardly known at all, while those which have brought his name down to our time, and still charm the world, were treated with comparatively little respect by himself and his friends. He wrote both Latin and Italian poetry; all his prose writings are in Latin. But it was his *Africa*, a Latin epic on the Punic war, which procured for him the laurel crown, while it is his *Rime*, his sonnets to Laura, which in our time make him admired as one of the greatest lyric poets that ever lived. His Latin works appeared at Bâle in 1496, and again in 1581. His Italian poems were published at Venice in 1470, and have subsequently passed through a great number of editions. Biographies, reviews, and sketches concerning his writings and life, especially concerning his relation to Laura, are also very numerous. The most prominent are—Jacques de Sade, *Mémoires pour la Vie de Pétrarque* (Amsterdam, 3 vols., 1767); Ugo Foscolo, *Essay on Petrarch* (London, 1825); Thomas Campbell, *Life of Petrarch* (2 vols., 1841); Alfred Mézières, *Pétrarque, Étude après de Nouveaux Documents* (1857); Ludwig Geiger, *Petrarka* (Leipsic, 1874).

Pet′rel [from *Peter*, because they were believed to walk, like St. Peter, on the waves], a name applied to various species of the family Procellariidæ, and to some extent conflicting with the names fulmar and Mother Carey's Chickens. (See PROCELLARIIDÆ.)

Pe′trie (GEORGE), LL.D., b. at Dublin, Ireland, in 1790, son of a portrait-painter; became early noted for his skill as a draughtsman in water-colors; was employed to illustrate many works of travel or topography; obtained an intimate knowledge of the archæology of Ireland; became librarian of the Royal Hibernian Academy 1830; was associate editor of the *Dublin Penny Journal* (1832–33); founded the *Irish Penny Journal* (1842); originated the fine museum and library of the Royal Irish Academy, for which he collected more than 400 volumes of Irish MS. documents; took an active part in the ordnance survey of Ireland 1833–46 as director of its historical and antiquarian sections; was secretary, and afterwards president, of the Royal Irish Academy; procured the autograph originals of the *Annals of the Four Masters*; published in 1832 a prize essay on *The Round Towers of Ireland*, expanded in 1845 into *The Ecclesiastical Architecture of Ireland*; and was author of many other antiquarian publications. D. at Dublin Jan. 18, 1866.

Petrifactions. See PALÆONTOLOGY.

Petro′leum, Naphtha, Mineral Oil, Kerosene, Coal Oil, Shale Oil, Photogen, Solar Oil, etc. The word "petroleum" is from πέτρος, "rock," and *oleum*, "oil" (the latter from the Greek ἔλαιον, "oil"), dating only from the Middle Ages. "Naphtha" is from the Persian *nafata*, to "exude." Petroleum is an inflammable

liquid which exudes from the earth in various parts of the world.

History.—Although petroleum has been known from time immemorial, and has been collected in considerable quantities in various parts of the world for ages, it was not until American enterprise in 1859 successfully bored an artesian well for the express purpose of procuring oil from the rocky strata below, that this cheap and beautiful illuminating oil became an important article of commerce. The previous introduction of an oil very similar to petroleum in composition, but which was obtained by the destructive distillation of various bituminous substances, such as cannel coals, asphalts, and shales, had paved the way for petroleum, which came in at once as a cheaper and purer substitute for the artificial oils. In this country, at least, the manufacture of coal and shale oil is a thing of the past. It is impossible to go back to the time when petroleum was first discovered; its occurrence in abundance in the form of springs of oil in many localities makes it evident that it has always been known—certainly more than 4000 years. The earliest evidence of the use of petroleum is found in the ruins of Nineveh and Babylon. In building both of those cities an asphaltic mortar (" slime " of the Old Testament) was employed, the asphalt for which was a partially evaporated petroleum. That used at Babylon was obtained from the springs of Is, on the Euphrates, which at a later date attracted the attention of Alexander, of Trajan, and of Julian; they even to this day supply the neighboring villages with oil. Herodotus, 500 years before Christ, spoke of the oil-wells of Zante; and Pliny and Dioscorides described the oil of Agrigentum, which was used in lamps under the name of "Sicilian oil." In one of the Ionian Islands there is a spring which has yielded petroleum more than 2000 years. The wells of Amiano, on the banks of the Taro, formerly supplied oil for lighting the city of Genoa. In Persia, near the Caspian Sea at Baku, numerous springs of petroleum have been known from the earliest times. The springs of Rangoon, on the Irrawaddi, have been worked for ages; before the general introduction of petroleum among civilized nations the yield of the wells in this district is said to have been 400,000 hogsheads of oil per annum. The perpetual fires burned at pagan shrines are supposed to have been caused by springs of petroleum, ignited at the surface. The American Indians collected petroleum, which was sold for various purposes under the name of Seneca oil. But it seems probable now that, before the Indians, the race of people who worked the copper deposits of Lake Superior and lead ores of Lexington, Ky., and built the mounds in the Western States, also dug numerous wells in Pennsylvania, Ohio, and Canada to collect the oil which flowed into them. These wells are known, from the trees now growing upon the earth thrown out in making them or growing in the wells themselves, to be from 500 to 1000 years old. One of these, at Titusville, was found after it was cleared out to have been 27 feet deep and 5 or 6 feet in diameter, and to be cribbed up with logs to the top. In another a notched tree was found still standing in the position in which it had been used as a ladder. In 1819 oil was accidentally obtained in boring two salt-wells on Muskingum River, O. It was used to a limited extent in workshops in the neighborhood, but did not prove a satisfactory substitute for the animal and vegetable oils in use, as the lamps suitable for burning it had not yet been invented. The oil was considered a great evil on account of its interference with the manufacture of good salt. In 1829 a flowing well was accidentally obtained at Burkesville, Ky., and for two or three weeks the oil flowed over the surface of Cumberland River, and, becoming ignited, caused some apprehension of a general conflagration among the inhabitants of the towns and villages lower down on the river. As early as 1836 from 50 to 100 barrels of petroleum were collected annually in the valley of the Kanawha and sold as a medicine.

It was not, however, till oil from coal and shale had been successfully introduced, with lamps specially adapted for this class of oils, that attention was directed to the petroleum springs as likely to furnish a cheap supply of material. From the time of Eele, Hancock, and Portlock, who in 1694 made " pitch, tar, and oils " of a kind of stone, various persons have made investigations in coal and shale oil. Selligue in France was the first to manufacture an oil (shale oil) on a large scale and introduce it for lighting. He began his experiments as early as 1834, erecting three factories. He manufactured in the six years between 1838 and 1843 about 15,000 barrels (40 gallons each) of shale oil. Still, the industry did not extend. Abraham Gesner made oil from coal in Prince Edward's Island in 1846, and obtained patents which were sold to the New York Kerosene Co. In 1850, James Young of Glasgow, Scotland, introduced paraffine oils, made from the Torbane Hill mineral, commonly called *boghead coal.* This industry was very profitable and rapidly extended. It was introduced into Germany, the material being either the boghead coal from Scotland or the bituminous shales which abounded in the country.

In the U. S., as early as 1850, Luther Atwood experimented on this class of oils, and succeeded in perfecting his " coup oil," made from coal-tar. This was manufactured as a lubricating oil in considerable quantities by Samuel Downer of Boston. The first factory established in the U. S. was that of the Kerosene Oil Co., built at Newtown Creek in 1854. In 1855 or 1856 the Breckenridge coal of Kentucky was used as a material for making oil. Trinidad pitch, chapopoti from Cuba, candle-tar, menhaden oil, and various other materials were used for making this oil, but it was found to be more economical to import the boghead coal from Scotland than to use the cheaper but poorer materials found in this country. The only exception to this statement is the albertite of Nova Scotia, which yielded larger quantities of oil than any other material; this was, however, monopolized by a single company. The grahamite of West Virginia was also used to a limited extent. The industry rapidly expanded, and on Jan. 1, 1860, there were 40 coal-oil factories on the Atlantic border, all of which used the Scotch boghead coal, with the exception of two, where albertite was employed. The total yield of the works amounted to 500 barrels per day, or 200,000 barrels per annum. Besides these there were 25 factories in Ohio. This industry was doomed to be very short-lived in the U. S., although it still flourishes in Europe, for the wells of Pennsylvania in 1860 yielded 650,000 barrels of petroleum; in 1861, 2,000,000; and in 1862, 3,000,000 barrels. Not only were the coal-oil works at once changed to petroleum refineries, but new refineries were erected all over the country. In 1854 the Pennsylvania Rock Oil Co. had been formed for the purpose of collecting oil at Oil Creek, Pa., but collecting the oil from the surface of ditches with blankets and squeezing it into tubs was found too expensive a process to compete with the coal-oil manufacture. The elaborate report of Prof. B. Silliman, Jr., on the petroleum of Venango co., made to this company in Apr., 1855, is extremely interesting, especially now that the industry has grown to such magnitude and importance. It was reprinted in full in the *American Chemist* (vol. ii., p. 18, July, 1871).

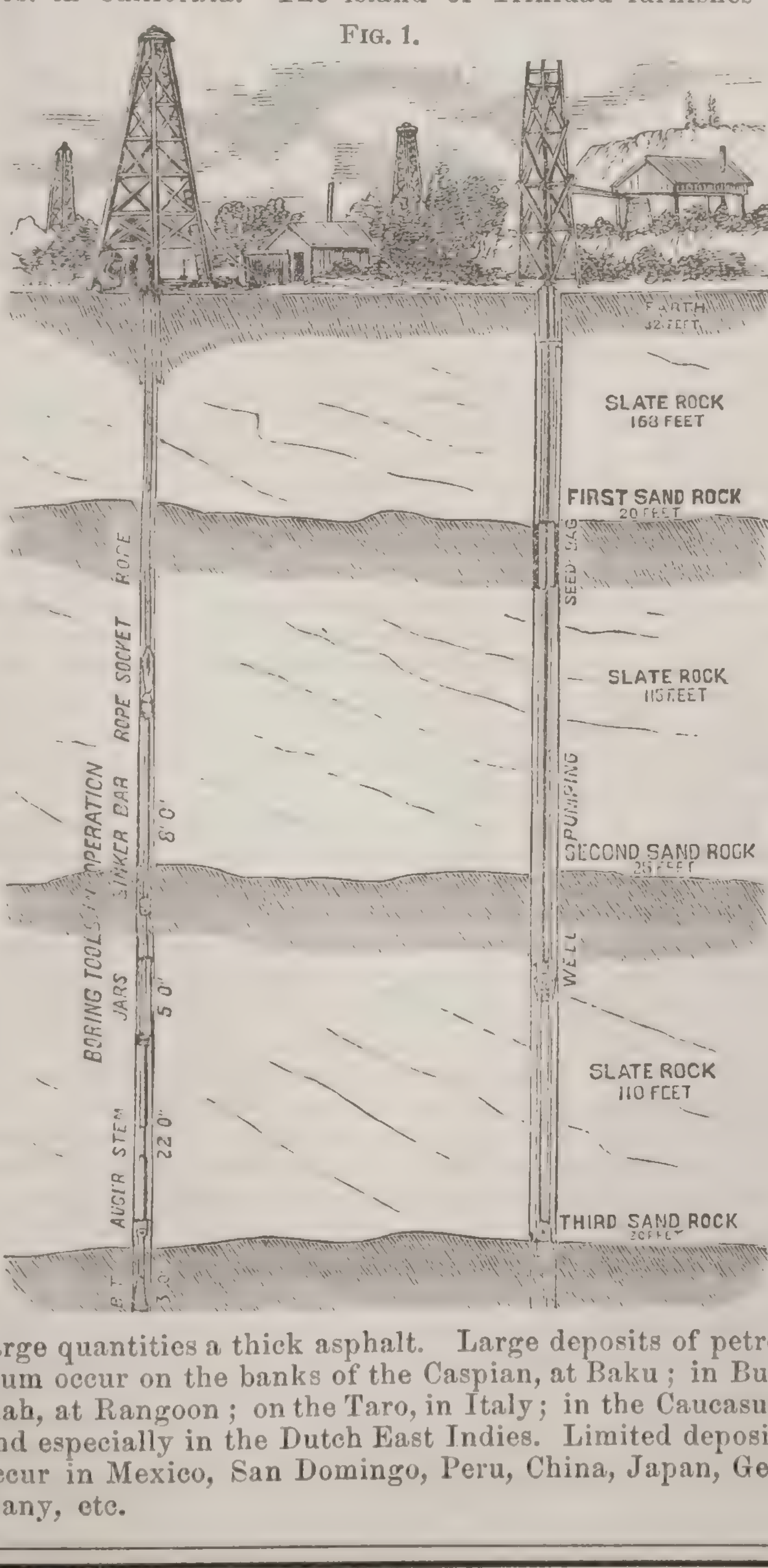
In 1858, however, Col. G. L. Drake, the superintendent of the company, began to bore, on Oil Creek, Venango co., Pa., an artesian well for oil, much to the amusement of his friends and neighbors, who considered the project most absurd. When, however, on Aug. 28, 1859, he " struck oil " at a depth of 71 feet, and obtained 400 gallons of oil a day, which sold for 55 cents per gallon, there was a great excitement. Every one who could leave his home rushed to the oil-region, a forest of derricks soon appeared in the valley, and numerous wells were bored. Wells were also bored in West Virginia, Ohio, etc. No mining enterprise had ever offered such sudden fortunes. A well costing a few thousand dollars might yield, if successful, from 100 to 2000 barrels of oil daily, with no expense for pumping. The Noble well yielded, in a little more than one year, 500,000 barrels of oil. The Sherman flowed 450,000 barrels in about two years. The poor farmers on Oil Creek, who could not previously have realized more than a few dollars per acre, suddenly found themselves wealthy. Single farms brought their owners from $500,000 to $1,000,000, with, in some cases, a royalty on the wells in addition. One man received $3000 per day royalty from the wells on his farm, and thus accumulated $600,000, all of which was soon squandered. After a time, however, the novelty of the oil-wells wore off somewhat, and a steady, permanent industry was established. As wells failed new ones were bored to take their place. In some cases old wells were made to renew their yield by the explosion in them of torpedoes charged with nitro-glycerine.

When the petroleum of Southern California first attracted attention, it was thought that the deposit would far exceed in quantity that of Pennsylvania. Before the wells were bored on Oil Creek there was very little oil to be seen; here and there a little scum on the pools of water was the only indication of oil. Prof. Silliman went to California for the purpose of exploring the oil-district. He was familiar from its very inception with the development of the oil industry of Pennsylvania. He was the first to investigate the nature and properties of the raw material as first found in the trenches and shallow pits of Oil Creek, as we have already shown, and he knew how trifling were the surface-indications which in Pennsylvania had led to such surprising discoveries by artesian borings. When, therefore, he saw the remarkable extent and accumulation of the heavy hydrocarbons in Santa Barbara co., Cal.—phenomena which have struck all observers with

wonder—and found that the thin oil which oozed from the broken and upturned edges of the rocks was soon converted into pools of tough maltha, in which cattle and even wild animals were mired to their destruction, it certainly required no effort of the imagination to infer that explorations by boring, if judiciously undertaken and pushed, would become fruitful in wells from which an ample supply of thin oil might be expected. A few artesian borings were made, but it appears that this research was not wisely conducted. Several tunnels run into the hills across the broken and upturned strata of Tertiary rocks were, however, fruitful of considerable quantities of oil of a quality which warranted its manufacture, and for a time excellent oil of California manufacture was produced and sold in San Francisco in successful competition with the Pennsylvania petroleum. But the price of the raw material fell at the Pennsylvania wells from $8, and even $12, per barrel (40 gallons) in 1863, to a merely nominal price in 1865; and this fact, taken in consideration with the high price of labor in California, the absence of casks and of means of transportation, rendered these explorations unprofitable, and has suspended indefinitely the time when the oil-producing regions of California can be successfully developed. Subsequent research demonstrated that the California oil does not belong to the same class as the Pennsylvania petroleum; that it is devoid of the lighter naphthas and yields no paraffine; that the burning oil made from it has a higher density than the Pennsylvania kerosene, but is an excellent illuminant. Prof. Silliman also demonstrated by later researches that even the densest malthas of the surface-pools of California are capable of being *cracked* into light naphthas, burning oil, and heavy oil, but without developing any paraffine.

Geographical Distribution.—By far the most extensive deposits of petroleum occur in the N. W. corner of Pennsylvania, on and near Oil Creek. This locality furnishes more than three-fourths of all the petroleum of commerce. Other districts are the Mecca, Grafton, Vermilion, and Mapen Valley in Ohio; Smith's Ferry, on the boundary between Ohio, West Virginia, and Pennsylvania; Parkersburg, West Va.; Glasgow and Burkesville, Ky.; Enniskillen and Gaspé, Canada; Santa Barbara and Humboldt cos. in California. The island of Trinidad furnishes in

FIG. 1.



large quantities a thick asphalt. Large deposits of petroleum occur on the banks of the Caspian, at Baku; in Burmah, at Rangoon; on the Taro, in Italy; in the Caucasus; and especially in the Dutch East Indies. Limited deposits occur in Mexico, San Domingo, Peru, China, Japan, Germany, etc.

Geological Position.—Petroleum occurs in rocks of nearly all geological ages, from the Lower Silurian to the present epoch. It is associated with shales and sandstones, and often permeates limestones. It often collects in cavities along gentle anticlinals, whence it issues in jets when an outlet is made by boring. (1) Lower Silurian petroleum is found at Manitoulin in Hudson and Utica shales, and at Burkesville, Ky., in Trenton limestone. (2) The Devonian rocks furnish the great supplies of petroleum at present, the Oil Creek wells being in the Portage and Chemung deposits. The oil of Vermilion, O., and of Enniskillen and Gaspé, Canada, are also Devonian. (3) Lower Carboniferous oil occurs at Mecca, Mapen Valley, and Grafton, O., and at Glasgow, Ky. (4) The coal-measures yield oil at Parkersburg in West Virginia and S. E. Ohio, and at Smith's Ferry in Pennsylvania and Ohio. (5) Oil is found in the Triassic formation of North Carolina. (6) Tertiary deposits yield oil in Los Angeles and Santa Barbara cos., and Humboldt Bay, Cal., in Italy, Trinidad, and on the Caspian. (See PETROLEUM, GEOLOGY OF, by PROF. J. S. NEWBERRY.)

Oil-wells are drilled to the proper depth with the aid of the derrick and the same drilling-tools which are used in boring for water. (See ARTESIAN WELLS.) Often a cavity is struck by the drill which may deliver gas, oil, or water first, according as it was penetrated at the upper, middle, or lower part. In some instances the well is a flowing one, but in most cases the oil must be pumped. It is received in large wrought-iron tanks, which are often sunk in the ground and covered with gravel to diminish the danger from fire. The oil is then transported to the refiner's in barrels, glued to make them tight, in tank-barges, tank-cars, or through lines of iron pipe laid underground, often for miles, by the pipe companies. In California the side-hill was tunneled to reach the oil.

The properties of petroleum vary at different localities. Pennsylvania petroleum is generally of a dark greenish-brown color; thin, of a somewhat offensive odor, varying in specific gravity from 0.820 to 0.782, or from 40° to 48° Baumé. Oils, differing from that which occurs so abundantly at Oil Creek, Pa., are obtained in more limited quantities at various localities, some of which are given in the following table:

Locality.	Gravity, Baumé.	Color.
Oil Creek, Pa.	43 to 47°	Greenish-brown.
Pit Hole Creek, Pa.	49 to 57°	"
Allegheny River, Pa.	34 to 39°	"
French Creek, Pa.	28 to 31°	"
Burning Spring, West Va.	42 to 43°	"
Enniskillen, Canada	42 to 43°	Blackish-brown.
Mecca, O.	26 to 28°	Yellow.
Amiano, Italy	25 to 50°	Red to straw.

The oil passes by insensible gradations into thick maltha, and then into semi-solid or solid asphalt, which is an oxidized compound.

Composition.—Petroleum is a mixture of a great number of hydrocarbons, compounds of carbon and hydrogen, the average proportion of the two elements in the mixture being—

Carbon	85
Hydrogen	15
	100

These hydrocarbons differ from each other in volatility. Some are so volatile as to evaporate rapidly at ordinary temperatures, making it dangerous to approach an open tank of petroleum with a flame; others are much less volatile, some requiring a temperature of 700° to 800° F. to vaporize them. The volatility of these component hydrocarbons is intimately related to their specific gravity or weight, the lightest ones being the most volatile, while the heavier oils possess the higher boiling-points. The inflammability of the oils is also intimately connected with their volatility and specific gravity. The light volatile oils ignite on the approach of a burning match, no matter how cold they may be, while the heavy, less volatile oils can only be ignited when they are heated above the ordinary temperature of the air. The lighter oils in petroleum belong mostly to the group of hydrocarbons known as the hydrides of the alcohol radicals, paraffines, or marsh-gas series; the heavier oils are believed to belong to the olefines, or ethylene series. Neither of the groups has been fully studied, and the exact constitution of the heavier portions of petroleum has yet to be determined. Table I. shows the composition, boiling-points, and gravities of some of the members of the first group, or marsh-gas series. Table II. shows the composition, boiling-points, and gravities of the members of the olefine or ethylene series. The first or lowest members of each series are gases at ordinary temperatures; the intermediate members, liquids; the highest members, solids.

I. *The Paraffines, or Marsh-gas Series of Hydrocarbons.*

Names.	Formulæ, C_nH_{2n+2}	Carbon.	Hydrogen.	Boiling-points.	Specific gravity.	Density, Baumé.
Methane, m'sh-gas.	CH_4	75.00	25.00	A gas.		
Ethane	C_2H_6	80.00	20.00	A gas.		
Propane	C_3H_8	81.81	18.19	A gas.		
Butane, quartane	C_4H_{10}	82.80	17.20	34° F.	0.600	106°
Quintane	C_5H_{12}	83.33	16.67	86°	0.628	98°
Hexane	C_6H_{14}	83.72	16.28	154°	0.669	86.5°
Heptane	C_7H_{16}	84.00	16.00	200°	0.699	72°
Octane	C_8H_{18}	84.21	15.79	242°	0.726	64.5°
Nonane	C_9H_{20}	84.38	15.62	278°	0.741	60.5°
Decane	$C_{10}H_{22}$	84.51	15.49	321°	0.757	56.5°
Endecane	$C_{11}H_{24}$	84.61	15.39	360°	0.765	54.5°
Dodecane	$C_{12}H_{26}$	84.70	15.30	388°	0.776	52.5°
Tridecane	$C_{13}H_{28}$	84.78	15.22	422°	0.792	48°
Tetradecane	$C_{14}H_{30}$	84.85	15.15	460°		
Pentadecane	$C_{15}H_{32}$	84.90	15.10	496°		
	* *					
	$C_{18}H_{38}$	85.04	14.96			
	* *					
	$C_{20}H_{42}$	85.11	14.89			
	* *					
	$C_{23}H_{48}$	85.18	14.82			
	* *					
	$C_{25}H_{52}$	85.23	14.77			
	* *					
Paraffine	$C_{27}H_{56}$	85.26	14.74	Solid.	......	31.5°
	* *					
Paraffine	$C_{30}H_{62}$	85.31	14.69	698°F.		

II. *The Olefines, or Ethylene Series of Hydrocarbons.* Composition: carbon, 85.71 per cent.; hydrogen, 14.29 per cent.

Names.	Formulæ.	Boiling-points.	Specific gravity.	Density, Baumé.
Ethylene	C_2H_4	Gas.		
Propylene	C_3H_6	0° F.		
Butylene	C_4H_8	37.4°		
Amylene	C_5H_{10}	95.°		
Hexylene	C_6H_{12}	156.°		
Heptylene	C_7H_{14}	203.°		
Octylene	C_8H_{16}	240.°		
Nonylene	C_9H_{18}	284°		
Dicatylene	$C_{10}H_{20}$	343°		
Endecatylene	$C_{11}H_{22}$	384°	.782	50.°
Dodecatylene	$C_{12}H_{24}$	321°		
Decatriylene	$C_{13}H_{26}$	455°	.791	48.°
	* *			
Cetene	$C_{16}H_{32}$	527°		
	* *			
	$C_{20}H_{40}$			
	* *			
Cerotene	$C_{27}H_{54}$	......	Solid.	Solid.
	* *			
Melene	$C_{30}H_{60}$	707°	Solid.	Solid.

Pelouze and Cahours think they find in petroleum members of the marsh-gas series as high as $C_{15}H_{32}$, and probably higher. Warren believes that this series terminates with C_9H_{20}, and that the oils of higher density and atomic numbers belong to the ethylene series. Warren found that there was a second isomeric marsh-gas series, which he called the beta-naphtha group. The boiling points of the members of this group are 8° C. higher than their isomeres.

The Beta-Naphtha Group.

Formulæ.	Boiling-point.	Gravity.
C_4H_{10}	8–9° C.	0.611
C_5H_{12}	37	0.645
C_6H_{14}	68.5	0.689
C_7H_{16}	98.1	0.730
C_8H_{18}	127.6	0.752

The benzol group of hydrocarbons is represented in some varieties of petroleum, the first three members in Rangoon tar, xylol in the petroleum of Schude in Hanover, and all the members in the petroleum of Boroslaw in Galicia. None of these have been found in Pennsylvania petroleum.

The Benzol or Aromatic Series of Hydrocarbons.

Name.	Formulæ.	Carbon.	Hydrogen.	Sp. gravity.	Boiling-point.
Benzol	C_6H_6	92.31	7.69	0.85	82° C.
Toluol	C_7H_8	91.30	8.70	0.88	111°
Xylol	C_8H_{10}	90.57	9.43	0.86	139°
Cumol	C_9H_{12}	90.00	10.00	0.87	148°
Cymol	$C_{10}H_{14}$	89.55	10.45	0.86	175°

Naphthalene, $C_{10}H_8$, has been observed in Rangoon tar.

Alteration of petroleum occurs in two ways: (1) by the evaporation of the lighter portions, by which the heavier, thicker constituents alone are left; (2) by oxidation, by which asphalts and bitumens are produced. Generally, both operations occur simultaneously, the various malthas, asphalts, albertite, grahamite, bitumen, etc., being the final results. (See article on the "Oxidation of Petroleum," by W. P. Jenney, *Amer. Chemist*, v. 359.) Besides these hydrocarbons there are always present small quantities of oxidized bodies, acids, bases, sulphur compounds, etc.

The origin of petroleum is generally attributed to the decomposition of vegetable and animal remains, diffused in a finely-divided condition in fine mud or clay. The theory which attributed petroleum to a process of distillation from coal, etc. is untenable, as there is no evidence of heat to be found in the oil-bearing strata. (See PETROLEUM, GEOLOGY OF, by PROF. J. S. NEWBERRY.)

Refining Petroleum.—The dark, offensive crude petroleum is subjected to a process of refining in order to separate from the portion designed for burning in lamps—(1) the lighter oils, naphthas, which are very inflammable, and, owing to their volatility, evolve vapors at ordinary temperatures, which, when mixed with the proper proportions of air, constitute explosive mixtures; (2) the heavier oils, which do not burn well in lamps, but are excellent lubricators. From these oils is obtained by chilling and pressing the solid paraffine, which is used for candles, for water-proofing cloth, etc. (see PARAFFINE); (3) the tarry matter, which would crust the wicks of the lamps; (4) the coloring-matters; (5) the compounds which cause the offensive odors of the crude oil.

Refining, as usually practised, involves three successive operations: (1) fractional distillation; (2) agitation with sulphuric acid; (3) agitation with hydrate of soda or ammonia. A few refiners improve the quality of their refined oil by redistilling it after the treatment with acid and alkali.

Fractional Distillation.—The apparatus employed consists of an iron still, connected with a coil or worm of wrought-iron pipe, which is submerged in a tank of water for the purpose of cooling it. When the still has been filled with crude oil the fire is lighted beneath it, and soon the oil begins to boil. The first products of distillation are gases; at ordinary temperatures they pass through the coil and escape without being condensed. Soon the vapors begin to condense in the worm, and a stream of oil trickles from the far end of the coil into the receiving-tank. The first oils obtained have a gravity of about 95° Baumé; as the distillation proceeds the product becomes heavier, 90° B., 85° B., 80° B., 75° B., 70° B., and so on. In most establishments it is customary to run the product into one tank till the gravity reaches 65° B. to 59° B.; the product, known as *crude naphtha*, being subsequently separated by redistillation into (1) *gasolene*, the lightest, condensed in worm by cold water, used in "air-gas machines" and gas "carbonizers;" (2) *naphtha*, for *oil-cloths*, cleaning, etc., so-called "safety oil," "Danforth's oil," "American safety gas," etc., for adulterating kerosene, cleaning oil-wells, etc.; (3) *benzine*, for paints and varnishes. By cooling the condensing-worm with ice and salt, the very volatile liquid "rhigolene" is obtained, which is used as an anæsthetic. By the use of a condensing-pump a still more volatile liquid, "cymogene," is obtained, which has been used in ice-machines. When the stream of oil runs from the coil with a gravity from 65° to 59° B., it is diverted into the *kerosene*-tank, and continues to run into this receiver till the gravity reaches about 38° B., or until the color deepens to a yellow. This second fraction is the burning oil or *kerosene*, and is subsequently purified by sulphuric acid and alkali. After taking off the burning oil the stream is directed to the *paraffine* oil tanks, and continues to run there till nothing remains in the still save coke. The last products have a gravity of about 25° B. This oil is chilled to crystallize the paraffine, and is then folded in cloths and exposed to pressure to squeeze out the oil. The solid paraffine is purified by repeatedly melting it in naphtha, chilling, and pressing; the oil separated from it is purified with sulphuric acid and alkali, and used for lubricating purposes. While this is a general outline of the process of distillation, it should be remarked that refiners differ in the details of the operation.

When very large stills are employed, of a capacity of from 1000 to 3500 barrels, the distillation is not continued till coke is formed, but is interrupted when there remains in the still a thick tarry residuum amounting to from 5 to 10 per cent. of the original oil. This residuum is afterward distilled to coke in smaller stills. By slow distillation in high stills the heavier oils are "cracked" into lighter oils, so that the refiner need not produce any heavy oil. In many of the largest establishments only three products are obtained from crude oil: (1) crude naphtha, (2) burning oil, (3) residuum. The *burning oil* is deodorized and bleached for market with sulphuric acid and alkali; the *crude naphtha* is sold for from 3 to 5 cents per gallon, and poured down the oil-wells, nominally *to clean them*, but practically to be sold to the refiner again in the crude oil, or it is sold to be redistilled for gasolene, refined naphtha, and benzine. The well-owners are many of them dishonest enough to pour the naphtha into the crude-oil tank. This adulteration averages 15 per cent. The residuum is sold to be distilled for paraffine and lubricating oil, or it is cracked in high stills, and the product put into the large stills with the crude oil. In this

case no lubricating oil or paraffine is manufactured. This is the practice at Cleveland and Pittsburg. Some redistill the last 10 per cent., the colored portions of the burning oil, with the crude oil. Some place the crude petroleum in large stills and blow steam through it, and thus take off the crude naphtha before the oil is run into the fire-still. Some manufacturers, who pride themselves upon the superior quality of their special brands of oil, separate certain portions of the distillate and send them to market as unusually safe oils. The "*astral oil*" is probably the oil which runs from about 54° to 44° B.; in other words, the "heart" of the burning oil. As it does not contain the lighter portions of the ordinary oil, its flashing-point is 125° F., or 25° above the standard of safety, although its average gravity is 49° B. The "mineral sperm" and "neutral lubricating oil," made by the Downer Kerosene Oil Co. under the patents of Joshua Merrill, are among the most remarkable products of petroleum. The "mineral sperm" is a heavy oil, which probably runs between 40° B. and 32° B., averaging 36° B., sp. gr. 0.847. This is so heavy (it boils at 425° F.), and requires so high a temperature to volatilize it, that it does not evolve an inflammable vapor below 262° F. nor take fire below 300° F. Practically, it is as safe as whale oil. "The neutral heavy lubricating oil" is made from the heavy paraffine oil which is distilled off last, after the burning oil. Owing to the cracking which takes place during the distillation the crude distillate contains a large percentage of light offensive oils, which are too thin for lubricators. These cannot be separated by ordinary distillation without producing a new quantity by cracking the heavier oils. Merrill found that by placing the crude distillate in a still, heating it to near boiling, and blowing superheated steam through it, he could remove all the light offensive oils without cracking, and leave in the still a neutral, odorless heavy oil from 26° to 29° Baumé, or sp. gr. 0.883, with a boiling-point of 575° F. Many hundred thousand gallons of this neutral heavy hydrocarbon oil, which has frequently perplexed the most expert judges and dealers in oils, have been made by Mr. Merrill. It is almost odorless and tasteless, and cannot be easily distinguished when mixed with one-fifth part of its volume of the best bleached animal, sperm, or other fat oil. No better estimate of its valuable qualities can be given than the statement that in the year 1871, 50,000 gallons of this oil were sent to England alone, where it was used for lubricating spindles, oiling wool, and other purposes.

Treatment with Acid.—After the oil has been fractioned it is subjected to the action of sulphuric acid to remove a little color, but more particularly to *sweeten* it—*i. e.* to remove the disagreeable odor which it still retains. About 2 per cent., by measure, of acid, is poured into the oil, the mixture is thoroughly agitated, and on standing a dark, tarry sediment separates; this is removed, and the clear oil is then agitated with water, then with alkali, either caustic soda or ammonia. This neutralizes the last traces of acid, and, after removal by water, leaves the oil "sweet." Some of the more careful refiners then subject it to a somewhat elevated temperature to expel a small percentage of naphtha or benzine which it still contains, while a few subject it to redistillation.

The following table will give a clear idea of the fractional distillation and its various products:

Products of the Distillation of Crude Petroleum.

	Limits of gravity, Baumé.	Average gravity, Baumé.	Sp. gr.	Boiling-point.
1. Gases, uncondensed....				
2. Cymogene..................	115° to 105°	110°	.600	32° F.
3. Rhigolene..................	105° to 95°	100°	.625	65°
4. Gasolene	95° to 80°	87°	.664	120°
5. Naphtha (refined).......	80° to 65°	73°	.700	175°
6. Benzine.....................	65° to 60°	63°	.750	250°
7. Kerosene, burning oil.	60° to 38°	46°	.807	340°
8. Lubricating oil (com'n)	38° to 25°	30°	.885	425°
9. Paraffine	....	....	......	
Special Products, Downer Kerosene Oil Co.				
10. C, naphtha..................	....	70°	.706	180°
11. B, naphtha..................	....	67°	.724	220°
12. A, naphtha..................	....	65°	.742	300°
13. Mineral sperm oil........	....	36°	.847	425°
14. Neutral lubricating oil	....	29°	.883	575°

Prof. Henry Morton has discovered a very interesting solid hydrocarbon, *thallene*, in the last distillate of petroleum, which is a product of destructive distillation. It is probably $C_{14}H_{10}$. It is one of the most beautifully fluorescing bodies known.

The Yield of Different Products.—The yield of the different products from crude petroleum varies greatly in different refineries. The following is a fair average for Pennsylvania oil of about 45° B.:

Gasolene	1½
Refined naphtha..	10
Benzine...	4
Refined petroleum or kerosene..........................	55
Lubricating oil..	17½
Paraffine..	2
Loss, gas, and coke	10
	100

By cracking, the same oil could be made to yield—

Crude naphtha	20
Burning oil..	66
Coke and loss...	14
	100

The following is the usual yield from the distillation of residuum in small stills for lubricating oil and paraffine; 30 barrels yield—

1. Light oil for gas,	35° B.,	2 bbls..........	6.50 per cent.
2. First run,	29° B.,	8 "	26.50 "
3. Second run,	35° B.,	12 "	40 "
4. Coke and gases..............		....	27 "
		22 bbls.	100 per cent.

The first and second runs are treated with oil of vitriol and soda, chilled and pressed to separate the paraffine. The heavy petroleum of West Virginia and Ohio, varying from 32° B. to 27° B., is stored in tanks to settle out the gritty impurities, and then used directly as a lubricator, or is mixed with animal or vegetable oils. Sometimes it is filtered over charcoal to remove color. The same is true of the Tidioute oil, though some of it is mixed with "residuum" and "still bottoms," and fractioned into lubricating oil, etc.

The kerosene or burning oil is the most important product of petroleum. It is a mixture of many hydrocarbons. It has the consistency of the essential oils, a burning taste, and aromatic odor. When properly refined it is nearly colorless by transmitted light, and slightly fluorescent by reflected light. Its density should be about 43° B., or 0.810. At ordinary temperatures it should extinguish a match as readily as water. When heated it should not evolve an inflammable vapor below 110°, or, better, 120° F., and should not take fire below 125° to 140° F. As the temperature in a burning lamp rarely exceeds 100° F., such an oil would be safe. It would produce no vapors to mix with the air in the lamp and make an explosive mixture; and if the lamp should be overturned or broken, the oil would not take fire.

Why most of the Kerosene in the Market is unsafe.—The crude naphtha sells at from 2 to 5 cents per gallon, while the refined petroleum or kerosene sells for 20 to 25 cents. As great competition exists among the refiners, there is a strong inducement to turn the heavier portions of the naphtha into the kerosene-tank, so as to get for it the price of kerosene. They change the direction of the stream from the coil of the still when it reaches 65° to 63° B., instead of waiting till it reaches 58°. Thus the inflammable volatile naphtha or benzine is allowed to run into the kerosene, rendering the whole highly dangerous. Dr. D. B. White, president of the board of health of New Orleans, found that, experimenting on an oil which flashed at 113° F., an addition of

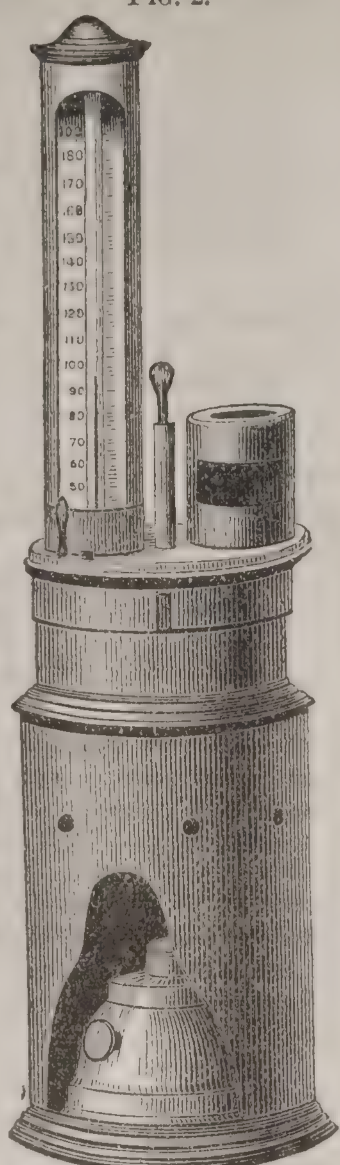
1	per cent. of	naphtha	caused it	to flash	at	103° F.
2	"	"	"	"	"	92°
5	"	"	"	"	"	83°
10	"	"	"	"	"	59°
20	"	"	"	"	"	40°

After the addition of 20 per cent. of naphtha the oil *burned* at 50° F. It is, therefore, the cupidity of the refiner that leads him to run as much benzine as possible into the kerosene, regardless of the frightful consequences which result from the frequent explosions. It must not be supposed that the specific gravity of the oil can be considered a safe index of its quality; on the contrary, the specific gravity gives very little idea of the quality, for while naphtha tends to render the oil lighter, the average gravity of good oil is maintained by the heavier oils present. A poor, dangerous oil may be heavier than a safe oil. The *astral oil* illustrates this fact; while it does not flash below 125° F., its gravity is 49° B. Ordinary kerosene flashes at 86° F., but has a gravity of 47° B.

Testing kerosene is a very simple operation. It is merely ascertaining the temperature at which the oil evolves an inflammable vapor, the "flashing-point," and the temperature at which the oil takes fire, the "burning-point." Although the operation is simple, results may yet in ignorant hands deviate 20° or 30° from the truth, while in skilful hands 4° or 5° will cover the most divergent results. (1) A suitable apparatus is required, consisting of a cup to hold the oil, surrounded by a vessel of water, which is heated by a small spirit-lamp: the bulb of a thermometer

is immersed in the oil. The tester legalized in the schedule of the English Petroleum act (Fig. 4) is a very good one. The open tester of Tagliabue (Fig. 3) is a very good instrument, but should be protected from currents of air, when in use, by a screen. The closed tester, or "pyrometer" (Fig. 2), I consider very unreliable, at least for determining the burning-point, as the mass of metal (brass) over the oil is very liable to become heated by the burning vapor after the flashing-point has been reached. (2) The oil should be heated very slowly; the temperature should not rise faster than 2° per minute. Whenever the test is to be used in a prosecution against the dealer, it should be duplicated with special care. The length of time occupied depends, of course, on the size of the flame beneath the tester. (3) The thermometer should not descend far below the surface of the oil; if the bulb is well covered it is sufficient. There is often a difference of a number of degrees in the temperature of the oil at different depths; it is well, therefore, to stir the oil before applying the flame. (4) Care should be taken, in making the test, to use a very small flame for trying the oil. I have used, with entire satisfaction, a minute gas-flame, burning from a glass tube drawn to a fine point; this is attached to a burner by a flexible rubber tube. This flame should not be thrust against the surface of the oil in making the flashing-test, as it might, by heating the oil, cause it to flash a number of degrees below the temperature recorded. It should merely be flitted quickly across the surface after noting the thermometer.

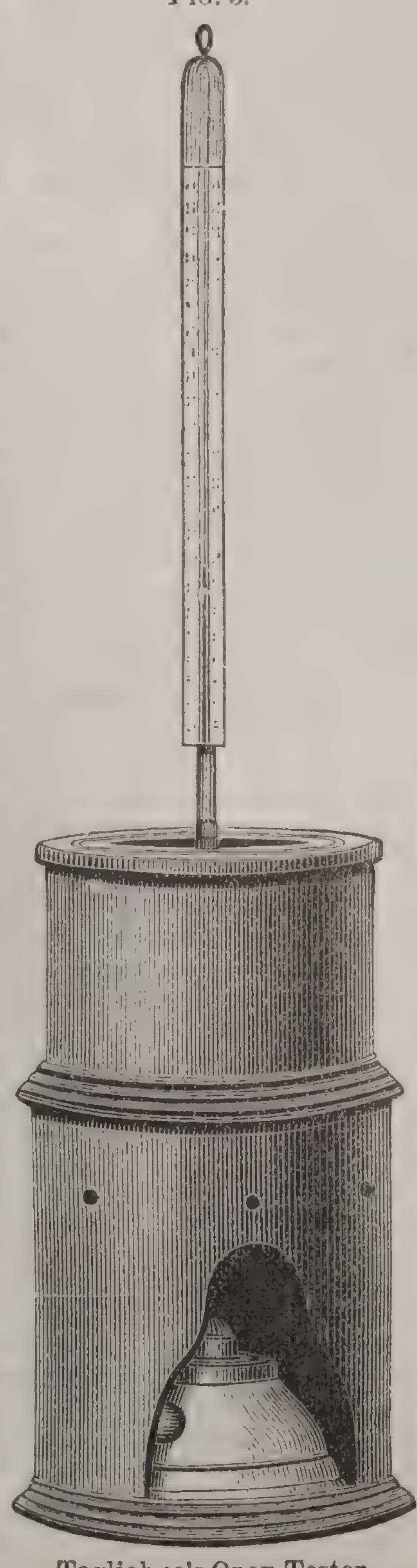
FIG. 2.



Tagliabue's Closed Tester, or "Pyrometer."

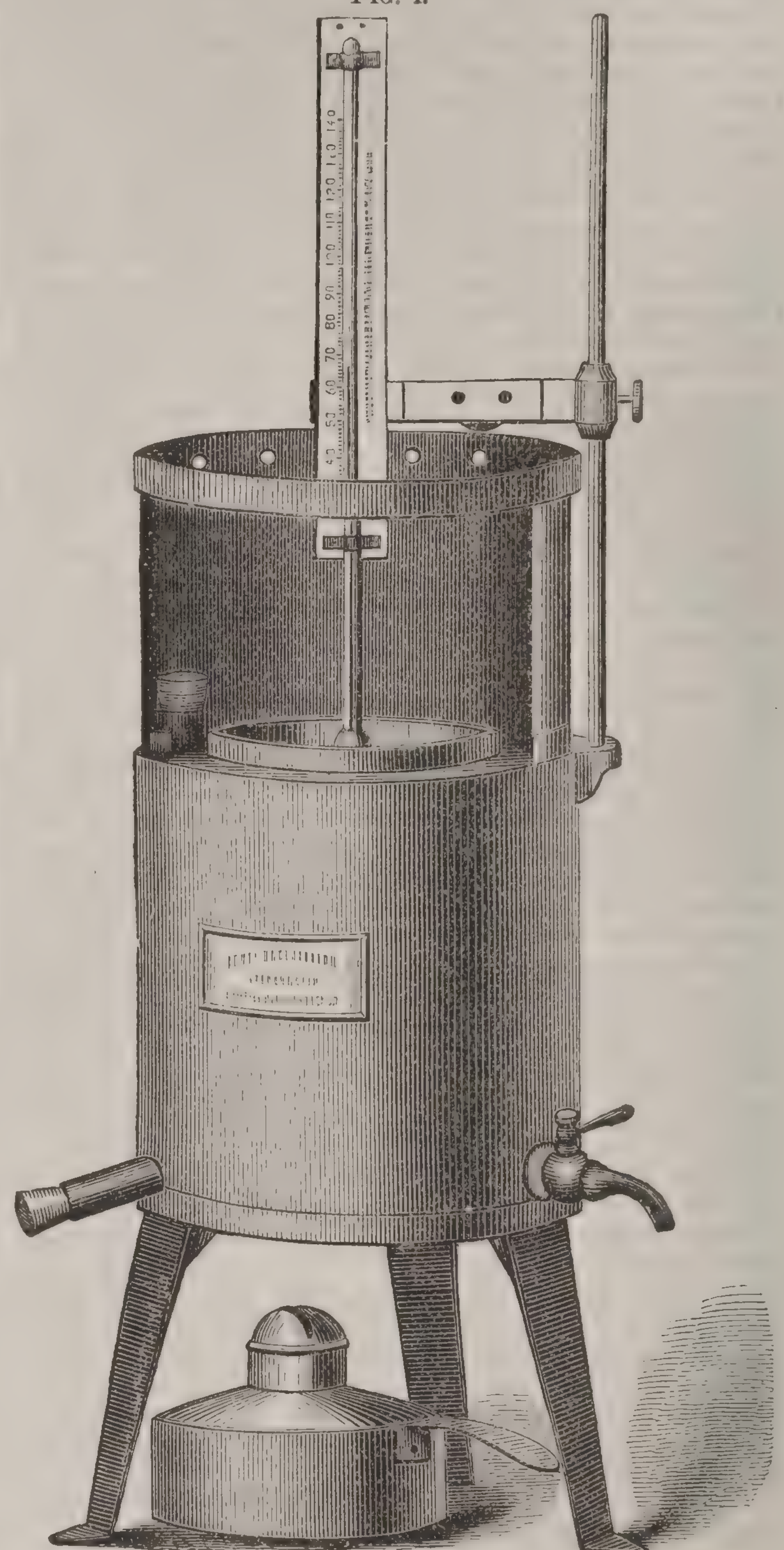
The Standard of Quality.—There are two distinct tests for oil—(1) *the flashing test*, (2) *the burning test*, which are often confounded, and when the law or ordinance specifies *the fire test*, there is a doubt as to which of the two tests is intended. *The flashing test* determines *the flashing-point* of the oil, or the lowest temperature at which it gives off an inflammable vapor. This is by far the most important test, as it is the inflammable vapor, evolved at atmospheric temperatures, that causes most of the accidents. Moreover, an oil which has a high flashing test is sure to have a high burning test, while the reverse is not true. *The burning test* fixes the burning-point of the oil, or the lowest temperature at which it takes fire. The burning-point of an oil is from 10° to 50° F. higher than the flashing-point. The two points are quite independent of each other; the flashing-point depends upon the amount of the most volatile constituents present—naphtha, etc.—while the burning-point depends upon the general character of the whole oil. One per cent. of naphtha will lower the flashing-point of an oil 10° without materially affecting the burning test. The burning test does not determine the real safety of the oil—that is, the absence of naphtha. The standard which has been generally adopted as a safe one fixes the flashing-point at 100° F. or higher, and the burning-point at 110° or higher. In the English act and some of the more recent laws of the States of the American Union the burning test has been very judiciously omitted, as two distinct tests are often confusing, and moreover, the burning test or point is not an index of the safety of the oil. More than half of all the samples of oil which have been tested by the writer did not take fire below 110° F., consequently they were safe according to the burning test, but only 28 of 736 samples were really safe, all the rest evolving inflammable vapors below 100° F. The *flashing test* should therefore be the only test mentioned in laws framed to prevent the sale of dangerous oils.

FIG. 3.



Tagliabue's Open Tester.

FIG. 4.



English Standard Tester.

What flashing-point should be selected as a standard of safety is a question on which there is some difference of opinion. The higher the flashing-point the safer the oil. Animal and vegetable oils do not flash below 500° to 600° F., hence it is impossible to have an explosion or any burning accident with a lamp or can filled with them. The flashing-point should be somewhat higher than the highest temperature the oil ever reaches in the lamps or cans. Our highest summer temperature does not far exceed 90° F., though a can of oil placed in the sun or near a fire might become much hotter. The point of 100° F. does not seem to be high enough to secure immunity from danger, though it may be said very few, if any, accidents occur with oil which does not flash below this temperature. In some of the laws 110° is fixed as the flashing-point, and in one of them 120° F. With a desire to throw some light on this question, an investigation was made of the temperature of the oil in burning lamps. (See *Am. Chemist*, Aug., 1872, p. 43, for results in detail.) By these results it ap-

pears that the temperature of the oil in lamps often rises much above 100° F., thus reaching a temperature at which oil *which does not emit a combustible vapor below 100° F.* would be dangerous. It is apparent that 100° F. is too low a standard for safety; 120° F. would not be too high a standard, and its adoption would add but a few cents per gallon to the cost of the oil.

Advantages of Petroleum.—The great advantages of petroleum, which led to so sudden a revolution in the system of artificial illumination all over the world, causing the old lamps designed for whale, sperm, and vegetable oils and for camphene to be thrown aside and to be replaced by the new lamps, are the cheapness of this oil, the brilliancy of the light, and the freedom of the flame from smoke. Although the first oil was struck in Col. Drake's well on Oil Creek as recently as Aug. 28, 1859, or only seventeen years ago, the average *daily* production in the U. S. has now reached the enormous amount of 25,000 barrels of 42 gallons each. The wells on Oil Creek now run more oil in a fortnight than was captured per annum by the entire fleet of 600 vessels which sailed from Nantucket, New Bedford, Stonington, New London, and Providence in the palmiest days of the whale fishery.

The Economy of Kerosene.—The following results show the wonderful cheapness of the light from kerosene oil. They were calculated when the oil was much higher in price than at present. The standard of comparison is a sperm candle which burns 2 grains per minute, or 120 grains per hour. (For details of the experiments see *Am. Chemist*, iii. 20.) It was found that in lamps of the sizes generally used the illuminating power of the kerosene flame is equal to from 8 to 9 sperm candles with the flat wick, to from 11 to 15 candles with the round wick, and to from 9 to 17 with the "dual" burner, and that a gallon of oil lasts from 59 to 109 hours in such lamps, and gives an amount of light equivalent to that which is afforded by from 14½ to 20 pounds of sperm candles. The heavy mineral sperm oil adds to the advantage of a degree of safety almost equal—in fact, practically equal—to whale oil, that of giving an amount of light equal to from 18 to 21½ pounds of sperm candles. The ordinary gas-burner, burning 5 feet of gas per hour, gives, if the gas is of good quality, a light equal to from 16 to 18 candles.

One thousand feet of 16-candle gas, costing $3, is equivalent to

3.25 gallons common kerosene, flashing at 86° F., costing, at 30 cts. per gallon	$0.97
3.15 gallons standard kerosene, flashing at 115° F., costing, at 40 cts. per gallon	1.26
3.27 gallons astral oil, flashing at 125° F., costing, at 50 cts. per gallon	1.64
2.87 gallons mineral sperm, flashing at 262° F., costing, at 75 cts. per gallon	2.15

The average cost per hour of light equal to eight sperm candles is—

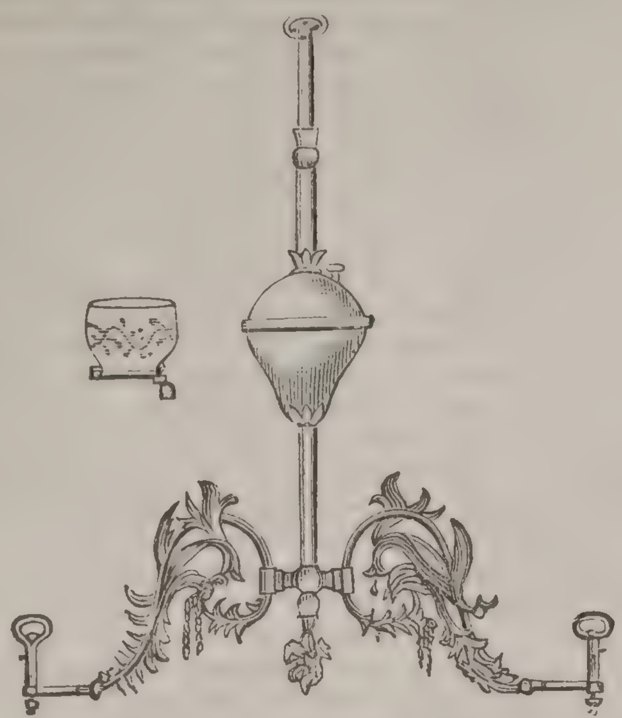
From sperm candles, at 42 cts. per pound	$5\frac{76}{100}$ cts.
Gas, at $3 per 1000 feet	$0\frac{75}{100}$ "
Mineral sperm oil, in German student lamp, at 75 cts. per gallon	$0\frac{57}{100}$ "
Mineral sperm oil, in Merrill's lamp, at 75 cts. per gallon	$0\frac{48}{100}$ "
Mineral sperm oil, in dual-wick lamp ⅝ in	$0\frac{56}{100}$ "
" " " " ⅞ in	$0\frac{54}{100}$ "
Astral oil, flat-wick lamp, at 50 cts. per gallon	$0\frac{46}{100}$ "
Astral oil, German student lamp, at 50 cts. per gallon	$0\frac{44}{100}$ "
Astral oil in Merrill's lamp, at 50 cts. per gallon	$0\frac{34}{100}$ "
Standard kerosene, in flat-wick lamp, at 40 cts. per gallon	$0\frac{33}{100}$ "
Standard kerosene, in German student lamp, at 40 cts. per gallon	$0\frac{31}{100}$ "
Standard kerosene, in dual-wick lamp, ⅝ in	$\frac{35}{100}$ "
" " " ⅞ in	$\frac{31}{100}$ "
Standard kerosene, in Merrill's lamp, at 40 cts. per gallon	$0\frac{28}{100}$ "
Common kerosene, unsafe, in flat-wick lamp, at 30 cts. per gallon	$0\frac{27}{100}$ "

In addition to the advantages of economy, brilliancy, cleanliness, and absence of smoke, it should be mentioned that kerosene never freezes and never becomes rancid. The only real objection—but, nevertheless, a most serious objection—raised against kerosene is the danger arising from its inflammability and the combustible vapors which are evolved at ordinary temperatures by most of the oils in common use. The oils used in the experiments above narrated do not belong to this class; they are perfectly safe, and every refiner has it in his power to manufacture a safe oil at an expense of not over 3 to 5 cents per gallon more than it costs him to make the dangerous oil now generally sold. It is moreover shown in the last table that the difference in the cost of the same amount of light when obtained from safe or unsafe oils, burned in flat-wick lamps, between "standard kerosene," which flashes at 115° F. and is safe, and common oil, which flashes at 86° F. (the average of the unsafe oils sold in New York), is only $\frac{6}{100}$ths of a cent per hour, or 1 cent for 16 hours. Certainly, an illuminating material which gives, in a cheap lamp, an amount of light equal to that of eight sperm candles at a cost of one-third of a cent an hour is an inestimable boon to the world. It adds several hours to the day, and enables the workingman to devote the long evenings to the improvement of his mind by reading; or where the labors of the day must be prolonged into the night, it saves the eyes from the inevitable ruin which would follow the use of insufficient light. The sanitary advantages of a clear, smokeless light are inestimable.

Naphtha and Benzine under False Names.—Processes have been patented and venders have sold rights throughout the country for patented and secret processes for rendering gasolene, naphtha, and benzine non-explosive. Thus treated, these explosive oils, just as explosive as before the treatment, are sold throughout the country under trade names, such as "liquid gas," "aurora oil," "safety gas," "petroline," "puroline," "black diamond," "septoline," "anchor oil," "sunlight non-explosive burning fluid," etc. These processes are not only totally ineffective, but they are ridiculous; roots, gums, barks, and salts are turned indiscriminately into the benzine, to leave it just as explosive as before. In the patent-office report for 1866 are fourteen such patents for "burning fluids," a few of which are quoted by way of illustration: No. 57,095. Gasolene, 40 gallons; gum olibanum, 1 pound; cascarilla bark, ½ pound; lichen, ½ pound. No. 57,390. White-oak bark, 2 pounds; alkanet root, 2 pounds; salt, 2 pounds; alcohol, 1 pint; cyanide of potassium, 1 ounce; to be added to 3 gallons naphtha to make it non-explosive. No. 57,749. Naphtha, 40 gallons; carbonate of soda, 3 pounds; alum, 2 pounds; hydrate of lime, 2 pounds; slippery elm, 2 pounds; gum camphor, ½ pound; oil of sassafras, 4 ounces; essence of tar, 1 ounce. No. 58,180. Naphtha, 40 gallons; potatoes, 50 pounds; lime, 4 pounds; sal soda, 4 pounds; curcuma, 3 pounds. No wonder we have kerosene accidents, with agents scattered through the country selling county rights and teaching retail dealers how to make these murderous "non-explosive" oils. The experiments these venders make to deceive their dupes are very convincing. None of the petroleum products are explosive *per se*, nor are their vapors explosive under all circumstances when mixed with air. A certain ratio of air to vapor is necessary to make an explosive mixture. That this is true is proved by the air-gas machines, which are simply contrivances designed to saturate air with gasolene or benzine vapor, when it burns like ordinary coal-gas. Equal volumes of vapor and air will not explode; 3 parts of air and 1 of vapor give a vigorous puff when ignited in a vessel; 5 volumes of air to 1 of vapor give a loud report. The maximum degree of violence results from the explosion of 8 or 9 parts of air mixed with 1 of vapor. It requires considerable skill to make *at will* an explosive mixture with air and naphtha, and it is consequently very easy for the vender *not to make one*. In most cases the proportion of vapor is too great, and on bringing a flame in contact with the mixture it burns quietly. The vender, to make his oil appear non-explosive, unscrews the wick-tube and applies a match, when the vapor in the lamp quietly takes fire and burns without explosion. Or he pours some of the "safety oil" into a saucer and lights it. There is no explosion, and ignorant persons, biassed by the saving of a few cents per gallon, purchase the most dangerous oils in the market. *It is not possible to make gasolene, naphtha, or benzine safe by any addition that can be made to it. Nor is any oil safe that can be set on fire at the ordinary temperature of the air.*

Special lamps, some of them of very elegant design, have been introduced for burning the liquid gas (naphtha). They are all provided with a reservoir for the dangerous fluid, and a burner by which it is vaporized and burns like gas. The cuts represent some of these dangerous contrivances. The apathy of the public in regard to this matter is beyond comprehension. These facts are well known in almost every community, and yet, although it is now twenty years since this class of oils came into general use, we have as yet no adequate legislation for the protection of life or property. Nothing but the most stringent laws, making it a State-prison offence to mix naphtha and illuminating oil, or to sell any product of petroleum as an illuminating oil or fluid to be used in lamps, or to be burned except in air-gas machines, that will evolve an inflammable vapor below 100° F., or better, 120° F., will be effectual in remedying the evil. In case of an accident from the sale of oil below the standard, the seller should be compelled to pay all damage to property, and if a life is

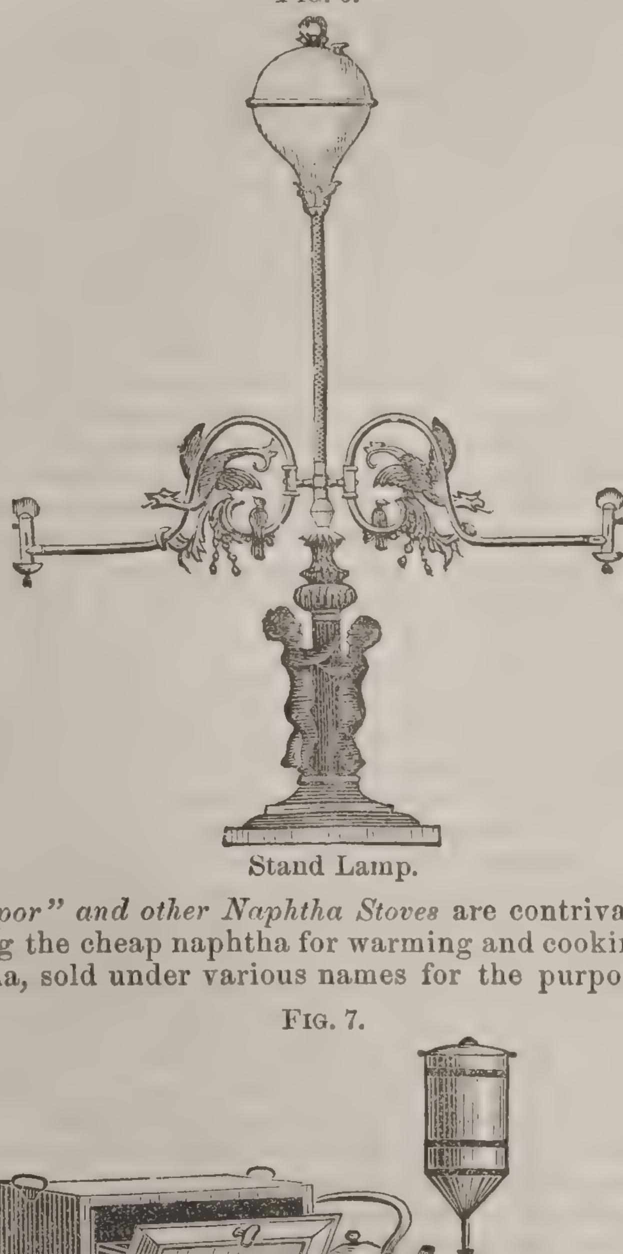
FIG. 5.



Hanging Lamp.

sacrificed should be punished for manslaughter. It should be made extremely hazardous to sell such oils.

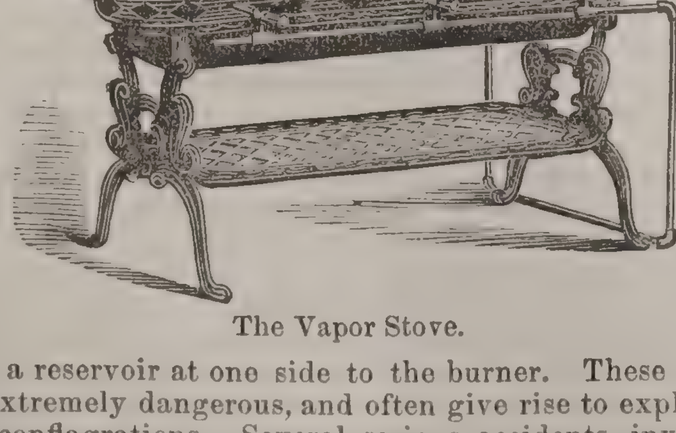
FIG. 6.



Stand Lamp.

"Vapor" and other Naphtha Stoves are contrivances for burning the cheap naphtha for warming and cooking. The naphtha, sold under various names for the purpose, flows

FIG. 7.

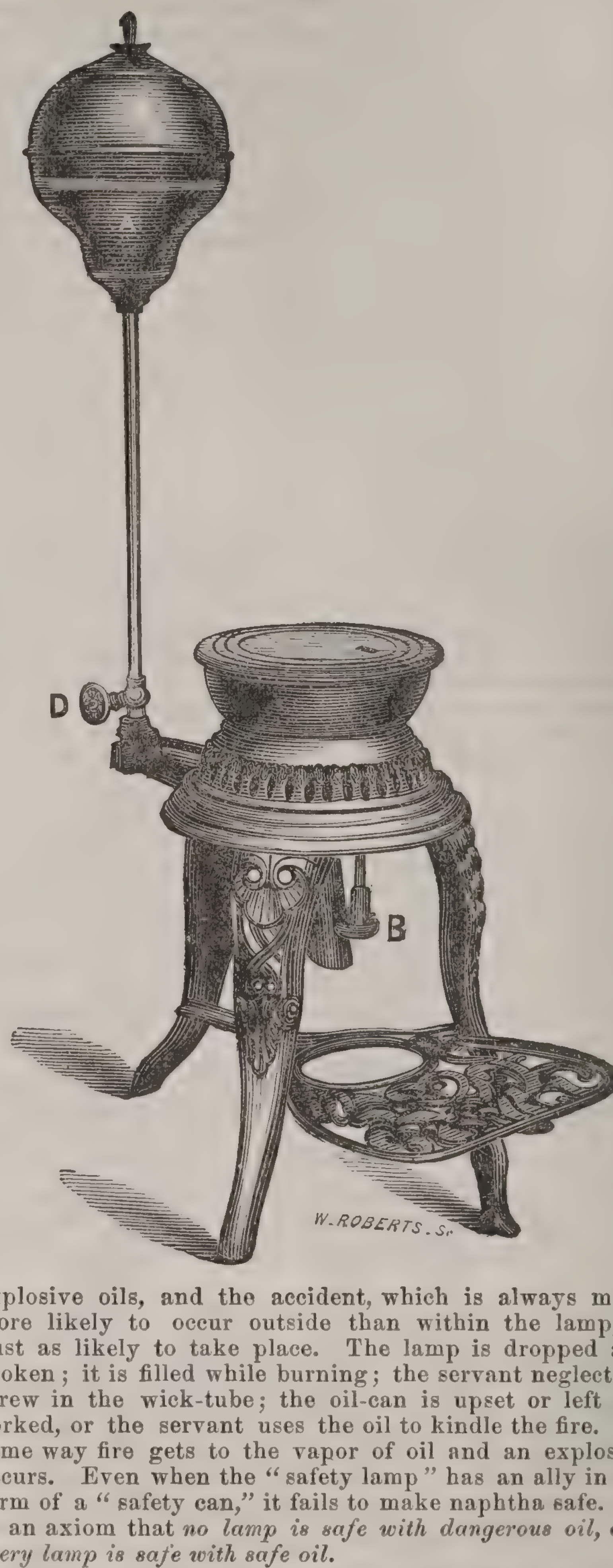


The Vapor Stove.

from a reservoir at one side to the burner. These stoves are extremely dangerous, and often give rise to explosions and conflagrations. Several serious accidents, involving loss of life and destruction of property, have already occurred with them in New York.

The So-called Safety Lamps.—An indefinite number of safety lamps have been patented with a view to make it possible to burn the explosive, inflammable naphthas without danger. No matter how well they realize the idea of protecting the oil they contain from explosion, they are treacherous friends. They allay one's fears of

FIG. 8.



explosive oils, and the accident, which is always much more likely to occur outside than within the lamp, is just as likely to take place. The lamp is dropped and broken; it is filled while burning; the servant neglects to screw in the wick-tube; the oil-can is upset or left uncorked, or the servant uses the oil to kindle the fire. In some way fire gets to the vapor of oil and an explosion occurs. Even when the "safety lamp" has an ally in the form of a "safety can," it fails to make naphtha safe. It is an axiom that *no lamp is safe with dangerous oil, and every lamp is safe with safe oil.*

Petroleum as Fuel.—Numerous efforts have been made to employ petroleum and the crude oils from coal, shale, etc. as fuel. The heating power of these oils is two or three times that of coal, and furnaces have been invented in which they can be readily and completely consumed under steam-boilers. But the practical difficulty is, after all, the cost of the petroleum. A gallon of petroleum weighs about 7 pounds, a barrel of 42 gallons 294 pounds, or $7\frac{1}{2}$ barrels make a ton of 2240 pounds. At the wells, at \$1.40 per barrel, the oil costs \$10.50 per ton, and if we add \$2.50 per barrel for transportation, we have \$18.75, which makes the total cost of a ton of petroleum \$29.25, at which it cannot compete with coal. (See *Petroleum versus Coal*, report by Prof. R. A. Fisher (New York, 1864); *Petroleum and Shale Oil, Report of Experiments at Woolwich* (House of Commons, Aug. 10, 1866); *Hydrocarbons as Fuel, Address of Francis H. Thomson, Phil. Soc. Glasgow* (Nov. 6, 1867); *On Liquid Fuel*, Benj. H. Paul, Ph. D., *J. Soc. Arts* (Apr. 17, 1868); *Papers by H. Sainte-Claire Deville, Comptes Rendus* (1871); *The Eames System of Furnace-working with Petroleum, Am. Chem.* (Sept., 1875, 94).)

Statistics.—The following figures have been selected from the report of the second geological survey of Pennsylvania and the circulars of Tetens & Beling and Beling, Niemeyer & Wessels of New York, and of G. R. Babbitt of Petrolia, Pa.:

Pennsylvania Petroleum.

Year.	Production in barrels.	Average price for year at wells.	Total value at wells.	Exported, crude or its equivalent, barrels.	Value of exported at wells.
1859	3,200	$13.00	$41,664		
1860	650,000	6.72	4,368,000		
1861	2,113,600	2.73	5,770,128	27,812	$75,926
1862	3,056,606	1.68	1,135,098	272,192	457,282
1863	2,611,359	3.99	10,419,322	706,268	2,818,009
1864	2,116,182	9.66	20,442,318	796,824	7,697,319
1865	3,497,712	6.57	22,979,967	745,138	4,895,556
1866	3,597,527	3.73	13,418,775	1,685,761	6,287,888
1867	3,347,306	3.18	10,644,443	1,676,300	5,330,634
1868	3,715,741	4.15	15,420,325	2,429,498	10,082,416
1869	4,215,010	5.85	24,657,750	2,568,713	15,026,971
1870	5,659,000	3.80	21,504,200	3,530,068	13,414,258
1871	5,795,000	4.35	25,208,250	3,890,326	16,922,918
1872	6,539,103	3.75	24,521,636	4,276,660	16,037,475
1873	9,879,455	1.84	18,178,197	4,981,441	9,165,851
1874	10,910,303	1.17	12,765,054	4,903,970	5,737,644
1875	8,619,639	1.21	10,429,763	5,200,000	6,292,000
Tot.	76,326,733	....	$245,904,880	37,690,971	$120,242,147

The Export for 1874 and 1875.

	1874.	1875.
Crude oil, barrels (42 gals.)	299,008	386,664
Refined oil " "	3,463,128	3,549,532
Lubricating oil "	....	2,584
Naphtha "	199,660	283,676
Residuum "	....	47,316
Refined oil, cases (10 gals.)	2,738,595	2,621,507
Naphtha " "	1,550	19,100
Equivalent of above in crude oil, barrels,	4,903,970	5,200,000

As nearly all the oil exported is refined in this country, we may add $2 per barrel for refining, and also $2.50 per barrel for transportation to the seaboard, when we shall have—

	For 1875.	Total to end of 1875.
Oil at wells	$6,292,000	$120,242,147
Cost of refining	10,400,000	75,381,942
Cost of transportation	12,500,000	94,227,427
Total	$29,192,000	$289,851,516

The wells drilled in Pennsylvania to end of 1868 were 5560, yielding 27,700,000 barrels of oil, the average being 4600 barrels per well; at the average price of $4.06 per barrel, yielding $18,700 per well. From 1869 to 1874, inclusive, 4939 wells were drilled, yielding 42,000,000 barrels of oil, or 8400 barrels per well, which at $2.90 per barrel, the average price, has been $24,500. Of the entire 10,499 wells drilled to the end of 1874 (in oil-producing territory only), 3250 were pumping at the beginning of 1875. The daily yield during Nov., 1875, was in—

Butler and Armstrong counties	15,017 barrels.
Clarion district	4,890 "
Upper oil-country	3,350 "
Bradford district	195 "
Total	23,452 barrels.

No data are at hand for West Virginia, Ohio, Canada, etc., but the amount is comparatively small.

Literature.—Naphtha in Asia (*Am. J. Sci.*, 1839, xxxvii. 353); *Report on the Nature and Products of Distillation of Peat*, by the director of the Museum of Irish Industry (London, 1851); *Asphaltes et Naphtes*, par Isidore Huguenet (2d ed., Paris, 1852); *Report on the Rock Oil or Petroleum from Venango Co., Pa.*, B. Silliman, Jr. (1855; reprinted in *Am. Chemist*, July, 1871, i. 18); *Petroleum*, Greville Williams (*Phil. Trans.*, 1857); *Handbuch der Photogen u. Paraffin Fabrikation*, Ullenbuth (Quedlinburg, 1858); *Die trockne Distillation, etc.*, Mueller (Leipzig, 1858); *The Rock Oils of Ohio*, J. S. Newberry (*Ohio Ag. Rep.*, 1859); *The Manufacture of Photogenic or Hydrocarbon Oils, etc.*, T. Antisell (New York, 1859); *Review of Dr. Antisell's Book*, F. H. Storer (*Am. J. Sci.*, 1860, xxx. 112, 254); *Notes on the History of Petroleum or Rock Oil*, T. S. Hunt (*Canadian Naturalist*, July, 1861); *Petroleum or Rock Oil*, T. S. Hunt (*Smithsonian Report*, 1861, 319); *Handbuch d. Ch. Tech.*, Bolley (Bd. i. G. 2, Braunschweig, 1862); *Handbuch d. Fab. Min. Oele*, Theo. Oppler (Berlin, 1862); *Petroleum and its Products*, A. Norman Tate (London, 1863); *Die Mineraloele*, Otto Buchner (Weimar, 1864); *Coal Oil and Petroleum*, H. Erni (Phil., 1865); *Geol. Survey of California*, "Geology" (vol. i., 1865); *Lehrbuch d. Chem. Tech.*, 3te Auf., Dr. F. Knapp (Braunschweig, 1865); *Le Pétrole*, E. Soulié et H. Handoüin (Paris, 1865); *A Practical Treatise on Coal, Petroleum, and other Oils*, 2d ed., Abraham Gesner (New York, 1865); *Researches on the Volatile Hydrocarbons*, C. M. Warren (*Mem. Am. Acad.*, new series, ix. 1865, 1866); *Petroleum*, report of S. S. Hayes (39th Congress, Ex. Doc. 51, 1866); *I Petrolii in Italia*, A. Stoppani (Milano, 1866); *Nouveau Manuel complet de la Fabrication et de l'Emploi des Huiles Min.*, D. Maguier, Manuels Roret (Paris, 1866); *Des Huiles Min.*, Ch. Cogniet (Paris, 1868); *Mineral Oils of the Netherlands' East Indian Possessions*, E. H. v. Baumhauer (*Archives Néerlandaises des Sciences, etc.*, xiv. 1869); *Notice sur l'Eclairage aux Huiles Min.*, Ed. Colin (Paris, 1870); *Petrolia, a Brief History of the Pennsylvania Petroleum Region*, A. Cone and W. R. Jones (New York, 1870); *Report on Petroleum as an Illuminator, etc.*, C. F. Chandler (Report Health Dept. New York, 1870; reprinted in part in *Am. Chemist*, ii. 409–446; iii. 20, 41); *The Oil-bearing Limestones of Chicago*, T. S. Hunt (*Am. Chemist*, ii. 27); *Report from the Select Committee of the House of Lords on the Petroleum Bill* (London, 1872); *Das Paraffin u. die Mineralöle*, M. Albrecht (Stohmann-Engler's Payen's *Tech. Chemie*, Stuttgart, 1874); *The Paraffine Industry*, F. Field (*Am. Chemist*, v. 169); *Second Geol. Survey of Pennsylvania*, appendix to Minerals of Pennsylvania, S. P. Sadtler, and *Special Report on the Petroleum of Pennsylvania*, H. E. Wrigley (Harrisburg, 1875); *Extinction of Petroleum by Chloroform*, Ommeganck (*Am. Chemist*, v. 292); *Wagner's Jahresb. d. Chem. Tech.* (i. to xx., 1855–74); Watt's *Dict.*, "Naphtha, Paraffine, Petroleum;" *Muspratt's Technische Chemie* (2te Auf. iii. 1381; v. 181). C. F. CHANDLER.

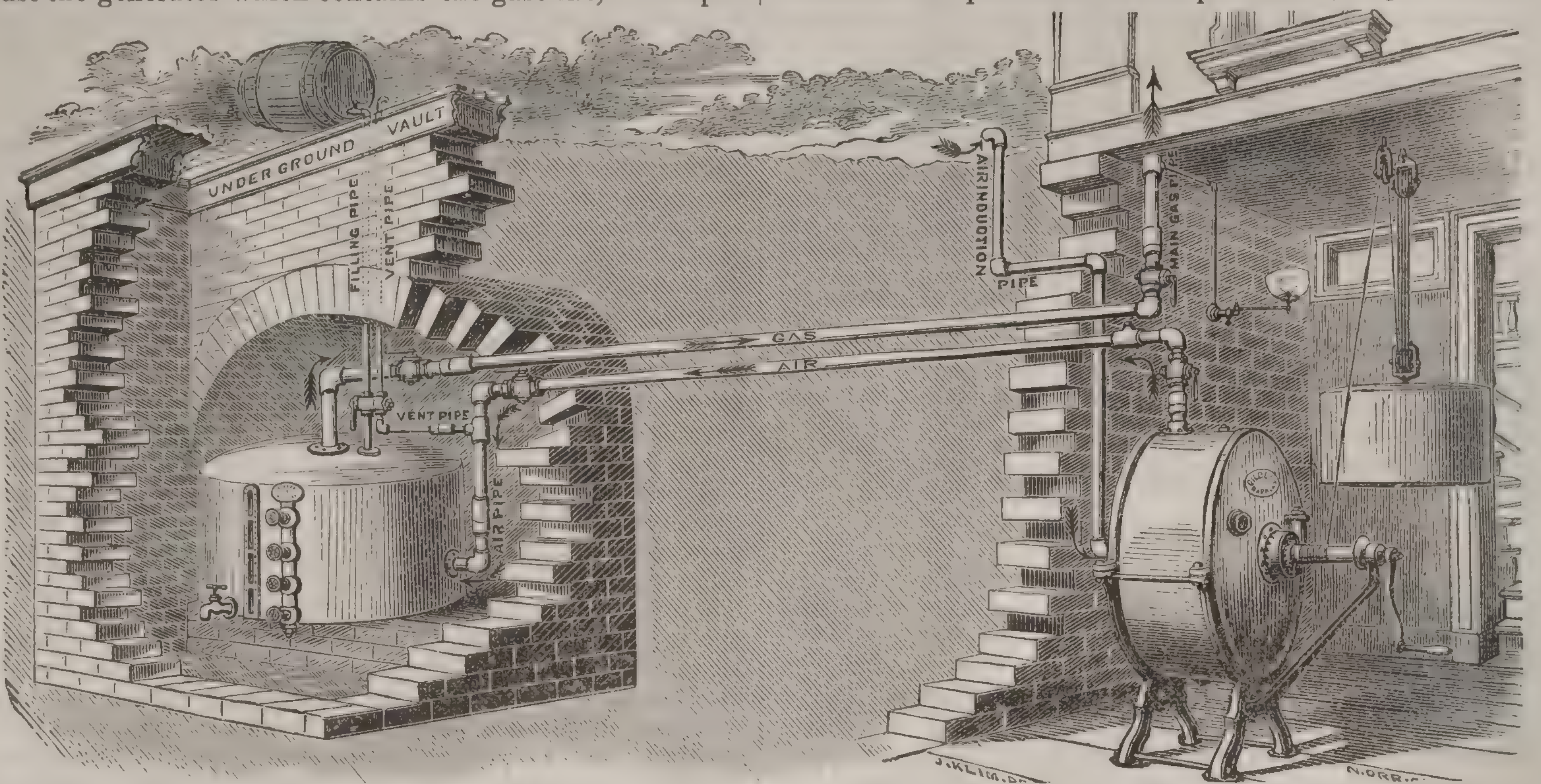
Petroleum and **Naphtha Gas.** Many processes have been patented, and put in practice to a greater or less extent, for the preparation of illuminating gas from petroleum and its products, as well as from coal and shale oils. These processes involve either (1) simply charging atmospheric air with the vapors of the lighter portions of petroleum, etc., gasolene, and using the mixture, *air-gas;* or (2) subjecting either of the above-mentioned materials to destructive distillation at or above a red heat, and thus converting them into permanent gases of high illuminating power, to be used either (*a*) alone, or (*b*) mixed with air or other gases. *Air-gas* is now extensively manufactured, generally on a small scale, for the lighting of dwellings, hotels, factories, etc. Air-gas was first made by passing air over benzol from coal-tar. Beel patented a machine for carburetting air with benzol in 1836; Paine in Worcester, Mass., experimented on an air-light about 1850; O. P. Drake of Boston brought out a machine in 1852; Jesse Carpenter patented a machine soon after this date. (For details with regard to early patents see *Wagner's Jahresb.;* Longbottom's, 1856, p. 422; Mongruel, 1863, p. 727; Well and Meyers, 1864, p. 700; S. Marcus, 1866, p. 701; Pond, Richardson, and Morse, 1866, p. 703; Friedleben, 1868, p. 763; and Müller and Methei, 1868, p. 765.) The cost of benzol was an obstacle which for a long time prevented the introduction of the air-light. It was obtained in limited quantities, and sold for $1 to $1.50 per gallon. The introduction of petroleum gave a new impetus to this system of illumination by supplying gasolene in large quantities at about 25 cents per gallon. Inventors at once turned their attention to the subject, and a great variety of "gas-machines" were soon patented. All consist, however, of at least (1) a contrivance for securing a current of air, "the blower," and (2) a vessel to hold the gasolene, "the generator," more or less complicated, so as to expose a very large quantity of liquid, either in shallow trays or on cotton wicking, shavings, etc. Some have in addition (3) arrangements for warming the generator to increase the evaporation. The evaporation of the gasolene lowers the temperature of the generator very rapidly if it is small, and the low temperature retards the evaporation. This difficulty is met by warming or by increasing the size and capacity of the generator. Dr. A. A. Hayes tested the gas from one of these machines, and found that the evaporation and subsequent condensation in the pipes of the gasolene was controlled by the temperature to a marked degree: at 60° F. five feet of the air-gas gave a light varying from 17 to 19 candle-power (sperm candles, burning 2 grains each per minute); at 38° F., 11 to 12 candles; at 27° F., 9½ candles; and at 14° F., 3 candles. At 60° F., 3½ pounds of gasolene, or $\frac{7}{10}$ths of a gallon, furnished 100 cubic feet of gas, equal to a consumption of 7 gallons per 1000 feet.

Air-gas requires burners with large openings specially constructed for it, and must be burned under a low pressure. If the current is too rapid, the flame is cooled too much and is readily extinguished. A few years since the writer tested the gas from a number of different machines at the American Institute Fair, and found it to vary from 10½ to 30 candles. Some of these machines are provided with a retort which is sufficiently heated to actually decompose at least a portion of the gasolene passing through it into permanent gases. These are afterward diluted with air. This is not properly "air-gas," in the sense to which the term is usually restricted. A. S. Kimball has analyzed the gas from such a machine, and found it to contain—air, 70 per cent.; fixed gas, 27; olefiant gas, 1; hydrogen (?), 2. (See *Am. Chemist*, vi. 11.)

Special precautions are necessary to make the use of these machines safe. Gasolene is such an inflammable liquid that it will take fire at any temperature, and is so

volatile that it evolves a combustible vapor at all temperatures, which, mingling with the air, forms an explosive mixture. Several serious accidents have already occurred. All danger can be obviated by placing the machine, or at least the generator which contains the gasoline, in a separate and carefully-locked building or vault at a considerable distance (100 feet) from the building to be lighted.

Gas from Petroleum, etc. by Destructive Distillation.—Permanent gas of high illuminating power can be readily obtained from petroleum and its products by exposing them



Gas-Generator in vault, distant from house 50 feet or more. Air-Pump, in cellar of house.

Springfield Gas-machine.

to a red heat. This was at first doubted by many, who believed that the only effect of heat would be the vaporization of the volatile hydrocarbon oils and the production of a mere vapor, which would condense in the cool pipes. The "cracking" or splitting of complex hydrocarbon oils into simpler, lighter, and more volatile oils has been discussed in the article PETROLEUM, and the conversion of such oils into permanent gases in the article GAS-LIGHTING. There is but one condition necessary to accomplish the latter result; that is, the actual exposure of the oily vapors to a full red heat for a sufficient length of time, a few seconds only. The product may contain some condensable vapors, but after the separation of these there will remain a large percentage of rich permanent gases, consisting of marsh-gas (CH_4), ethane (C_2H_6), butane (C_3H_8), etc., with olefines (C_2H_4,C_3H_6), acetylene (C_2H_2), etc. The higher the temperature and the longer the exposure the simpler the products and the lower the illuminating power. The real difficulty is in regulating the temperature so as to secure a constant product. A deposit of carbon will be found in the retort, but this should not be so abundant as to cause inconvenience. Much fear was expressed lest the gas should "stratify" in the holders. Stratification could result in only two ways: (1) either by the heavier, richer gases settling from the lighter ones, or (2) from an irregular production due to variations in the heat, by which heavy gas is produced at one time and light gas at another. The first way is impossible, as gases never separate after they have once mixed (The popular idea that carbonic acid accumulates near the floor in our rooms is entirely fallacious.) By the second method *temporary* stratification may occur, but a uniform mixture will be sure to result finally, as gases diffuse into each other, no matter how great the difference in their densities. (See article GAS.)

Crude petroleum is readily converted into gas by causing it to pass through a red-hot retort filled with fragments of coke, fire-brick, or similar porous body to increase surface, or fitted with tray-like iron plates. The material being free from sulphur, the gas requires little purification. Ten gallons of crude petroleum yield 1000 feet of gas, samples of which, analyzed by Bolley (Wagner's *Technology*), were found to contain—

	I.	II.
Heavy hydrocarbons	31.6	33.4
Light hydrocarbons	35.7	40.6
Hydrogen	32.7	26.0
	100.	100.

According to Wagner, the petroleum gas made in Hirzel's apparatus consists chiefly of acetylene (C_2H_2), and has a specific gravity of 0.69.

Petroleum residuum may be used in place of crude petroleum. F. A. Sabatton found that 6¼ gallons could be made to yield 1000 feet of rich gas. *Crude shale and coal oils* give results similar to those obtained with petroleum. (See Wagner's *Technology*.) *Creosote soda*, the refuse product obtained in purifying coal and shale oil with caustic soda, has been suggested by L. Ramdohr as a cheap material for the manufacture of a rich gas. *Naphtha*, the cheapest and most volatile available product from petroleum, is, however, the material which has found most favor as a substitute for coal. Numerous processes have been patented in the U. S., and some of them are now in use on a considerable scale. (1) The naphtha is passed alone, generally in vapor, through a red-hot retort, and converted into gas which is (*a*) used alone, (*b*) diluted with air, (*c*) added to pure coal-gas as an enricher, (*d*) diluted with both air and coal-gas (Rand & Gale process, used at N. Y. Mutual works and elsewhere), (*e*) diluted with water-gas, a mixture of hydrogen and carbonic oxide, produced by passing steam over red-hot charcoal, coke, or anthracite, or by passing a mixture of naphtha-gas and steam through a red-hot retort (Spencer process; see WATER-GAS); or (2) a portion of the coal-gas made in the ordinary way is passed through heated naphtha, and when loaded with its vapors is sent through a red-hot retort (Olney's process, Harlem gas-works, Citizens' G. L. Co.'s and People's Gas L. Co.'s works, Brooklyn). All of these methods may be made to yield permanent gases of high illuminating power. Some can, however, be carried out with much more regularity and certainty than others. Some result in the rapid destruction of the retorts; others do not. It is a mistake to suppose that the higher illuminating power of the naphtha-gas is a special reason why it should be substituted for coal-gas. Seventeen candle-gas, such as is furnished from coal by all our city companies, is as rich as is desirable. Gas much richer is liable to smoke, at least at times, and the products from partially-burned gas not only discolor fixtures, walls, and houses, but they are very oppressive to the lungs. The real questions are (1) whether naphtha is cheaper than caking coals for supplying the entire volume of gas, or (2) whether it is cheaper than cannel, albertite, grahamite, etc. as an enricher for coal-gas of low illuminating power. Naphtha with a specific gravity of 0.700 or 72° B. weighs 5.8 pounds to the gallon, equivalent to 386 gallons to the ton of 2240 pounds. This at 5 cents per gallon is \$19.30 per ton; at 6 cents, \$23.16; 7 cents, \$27.02; 10 cents, \$38.60. Further, naphtha yields neither coke nor tar, both of which are important items in the accounts of coal-gas works, especially as coke or other fuel must be provided to make the naphtha-gas. A further and most important element in the calculation is the fluctuation in the price of naphtha, even now when but little is used for gas. Should the large works create a new demand, the price would undoubtedly advance to double or treble the present rate. It is not probable that naphtha-gas can ever come into general use, even in this country, near the source of supply, except as an enricher of coal-gas.

C. F. CHANDLER.

Petroleum, Geology of. Petroleum is the common name for mineral oil, whatever its physical characters or chemical composition. These vary greatly, some kinds being dark, viscid, and tar-like, others almost transparent, very fluid, and volatile. More generally petroleum has an oily consistence, is brown, green, or yellowish by reflected,

often red by transmitted light, and has a strong, characteristic odor. It cannot be regarded as a mineral species, as it has no fixed formula of composition, but is a variable mixture of several substances, which differ much in their physical characters and in the ratios of their constituents. The different varieties of petroleum form a continuous series of hydrocarbons, which begins with asphaltum, a hard, black solid, and ends with naphtha, an ethereal fluid. These, with water, carbonic acid, marsh-gas, etc., are the evolved products of a natural or spontaneous decomposition of organic tissue, lignite, peat, coal, anthracite, and graphite being the residual products. The diversity observable in petroleums is probably due in part to differences in the vegetable and animal matters from which they have been produced, and in part to changes they have suffered through evaporation and oxidation. As originally formed, probably most petroleums were very light, but have been evaporated and sometimes oxidized by exposure. Petroleum distilled artificially becomes more and more dense by the loss of its lighter parts until it is reduced to a tar or pitch. In nature essentially the same changes take place, and the final residuum is asphalt. This is formed about oil-springs, often in large quantities, as in Canada, at the "tar-springs" of Colorado, in Southern California, the island of Trinidad, etc. Asphalt in its turn also suffers distillation, and the older asphalts, like grahamite and albertite, though derived from petroleum and filling fissures once reservoirs for oil have become so hard and dry as to be classed as "asphaltic coals."

The theory of the genesis of petroleum held by the writer of this article is briefly as follows: It is well known that in the growth of plants the mysterious principle called life produces the dissociation of the elements composing carbonic acid and water, breaking the strongest bonds of inorganic chemistry. Under this influence structures of hundreds of feet in height and many tons in weight are piled up in antagonism to the force of gravitation and the affinities of inorganic chemistry. When the life-spark leaves this structure, and its creative and conservative power is no longer exerted, the mass stands as an unstable compound, and the oxygen which has been divorced from its carbon by the intrusive life-force now hastens to reclaim its own. This reunion may take place slowly and quietly, and is then named "decay," but under favoring circumstances with heat and fury, which is called "combustion." The result in each case is the same: the organic tissue is oxidized; the affinities of inorganic chemistry reassert themselves; the stable compounds carbonic acid and water are formed and pass away; hydrocarbons are evolved and oxidized; and in place of the great mass of organic tissue a handful of ashes is left, which represents the mineral matter woven by life into its ephemeral fabric. This process of the decomposition of organic tissue may be hastened or retarded, but it can hardly be permanently arrested. By excluding oxygen and applying heat the constituents of the mass react upon themselves, forming new compounds—solids, liquids, and gases—several of which possess properties which make them useful to man during their existence, or in the development of usable force in the act of passing to their inevitable destiny, oxidation.

The chemical composition of wood-tissue varies somewhat in different kinds of wood, but a typical example chosen by Bischof gave carbon 49.1, hydrogen 6.3, oxygen 44.6. When this is placed in a retort and subjected to destructive distillation, there are evolved from it watery vapor (hygroscopic), acetic acid, condensable vapors of naphtha, and, as the heat is increased, uncondensable gases (carburetted hydrogen, etc.), water from the combination of hydrogen and oxygen, free nitrogen, ammonia, and carbonic acid, the latter from a combination of the oxygen and carbon of the wood. The ultimate residual product is charcoal, consisting of carbon and the ash of the plant, in all, perhaps, one-quarter of the original mass. A similar round of changes may take place in nature spontaneously and at a low temperature. When buried under water or wet earth, vegetable tissue is still slowly oxidized, since water absorbs some air; but apart from this, the original tissue is greatly modified by the reaction of its constituents upon themselves. The carbon, hydrogen, and oxygen combine in part to form carbonic acid, water, carburetted hydrogen, and naphtha (petroleum), which escape, in part remaining temporarily as a solid residuum, which becomes at first brown and ultimately black from its free carbon, and is known first as lignite, and subsequently, as it progressively changes, as coal, anthracite, etc. The escape of gases from vegetable matter decaying in shallow water has been seen by almost every one. The evolution of liquid hydrocarbons has also been observed, and would be more frequently noticed if carefully looked for. The process of subterranean or subaqueous distillation of vegetable tissue is called bituminization, because one of its temporary products is bitumen, which saturates or invests the residual carbon, giving it a pitchy appearance. This process goes on as long as there is any organic compound left in the mass; the final residuum being graphite, the intermediate stages represented by peat, lignite, bituminous coal, anthracite, etc. Some of its phenomena may be observed in the evolution of carburetted hydrogen and carbonic acid ("fire-damp" and "choke-damp") from beds of lignite and coal, and by a constant flow of inflammable gas and petroleum from strata of bituminous shale. The spontaneous distillation and oxidation of the organic constituents of beds of lignite, coal, and carbonaceous shale may be seen along their lines of outcrop, where even the carbon of the most exposed portions is altogether burnt off, leaving an ash or clay behind. As the strata are penetrated the percentage of carbon and hydrogen constantly increases, until, having passed beyond the reach of atmospheric influences, the mass is found presenting its normal physical and chemical characters. A similar series of facts may be observed in a comparison of the carbonaceous deposits of different geological ages, as, except where local causes like volcanic outbursts and elevation of mountain-chains have produced metamorphism of all rocks, and perhaps complete destructive distillation of organic matter, the oldest deposits exhibit the most complete result of this process, and the more recent beds of carbonaceous matter approach more and more nearly to the composition of cellulose.

It has been claimed by some chemists that in the decomposition of vegetable tissue it is resolved primarily into coal, carbonic acid, carburetted hydrogen, etc., and that the escape of gases from coal is simply their liberation from imprisonment in its interstices. This theory is disproved, however, not only by the facts that have been cited, but by observations made on the changes which take place in coal itself when long exposed—observations which show a progressive and spontaneous distillation of this substance. If any further evidence of the validity of this view is required, it is furnished by the fact that from peat, lignite, bituminous shale and coal, hydrocarbon gases and liquids can be and are produced on a grand scale by artificial distillation. All our cities are lighted with illuminating gas distilled from coal, and it is well known that previous to the discovery of abundant supplies of petroleum, oils were distilled from coal and carbonaceous shale to supply wants since more cheaply met by the natural oils. Even now in some countries the manufacture of artificial oil is a great and well-sustained industry. In all their essential characters the artificial agree with the natural oils, the most important difference being that the former contain benzole, naphthalene, anthracene, etc., and hence supplying the materials for the coal-tar colors, while they are found in but few "rock oils." This difference is probably due to the fact that in one case the distillation is effected at a high temperature, which results in the formation of certain organic compounds not often produced in the natural distillation.

If the theory given above be the true one, petroleum where it occurs in nature should be associated with carburetted hydrogen, and be traceable to some deposit of organic matter; and such may probably be always found to be the case. Petroleum shows itself at the surface flowing out, usually with water, from some subterranean source, and all *copious* springs of this description are found to be located at no great distance above some considerable mass of bituminous material. Where obtained in large quantities it is found in reservoirs of broken or porous strata, which overlie carbonaceous deposits. Much confusion has been produced in the minds of those who have not thoroughly investigated this subject by the fact that coarse sandstones and conglomerates form the reservoirs which hold the oil of Western Pennsylvania; but it needs no argument to prove that petroleum is not indigenous in a mass of comminuted quartz, and that it must have been derived from some other source and from organic material. It is inevitable also that when flowing out of the rock where it is produced, it should rise and occupy any reservoir open to receive it; and that where the channels through which it flows are continuous to the surface, the current production should pass off with the water and be evaporated, oxidized, and dispersed, or leave only an asphaltic residuum. When petroleum is stored it is placed in capacious tanks, where it is hermetically sealed up; and in nature we find it stored in the same way. Porous and jointed strata of conglomerate and sandstone often lie conveniently above some mass of carbonaceous material undergoing decomposition. These open strata form great reservoirs that are filled with water, gas, and oil, and above this is sometimes spread a sheet of impervious matter that serves as a cover. When by boring through this cover the reservoirs are tapped, either water,

oil, or gas is forced out, according as the bottom, middle, or top of the reservoir is pierced. What are called fountain or flowing wells must be connected with subterranean reservoirs in such a way that the elasticity of the gas in some upper chambers forces out the oil. This is the structure of our most productive oil-districts; and something similar must exist wherever great accumulations of petroleum appear and where flowing wells are attainable.

If the facts reported above are accurately stated, and the explanation of them is the true one, it follows that petroleum is being constantly produced, and that the oil in any oil-district will not be exhausted until all the hydrocarbonaceous matter from which it comes is distilled. But it has been learned by experience that the enormous productiveness of some oil-wells (1000 to 2000 barrels per day) is short-lived, and also that the supply from any one oil-district may be so nearly exhausted that the current production will not pay its cost. Hence we may expect that at no distant day all the now productive and the yet-to-be-discovered oil-districts—of which the number is unknown, but is probably small—will be practically, though not perfectly, worked out, and petroleum cease to be one of the great staple products of the country. Fortunately, it has been demonstrated that the work nature is doing so slowly can be taken out of her hands, and be done artificially far more rapidly than, and almost as cheaply as, she does it. The Huron shale and other oil-producing rocks can be distilled so as to furnish oil at a cost not greater than double that now paid, and the supply obtainable from this source is practically inexhaustible. We may therefore congratulate ourselves that the present over-stimulated production and wasteful use of this valuable portion of our national estate is not so ruinous an extravagance as it at first sight would seem; for after this stock of the manufactured article shall be squandered by the heirs there will still remain a vast amount of raw material from which industry, and not speculation, will supply the wants of the people, and for ever maintain a legitimate and flourishing business.

Distribution of Petroleum.—Petroleum occurs at all geological horizons above the Eozoic system. The metamorphic rocks of this series and the later ones of New England contain graphite and anthracite, but the hydrocarbons have been entirely expelled from the vegetable tissue of which these are residues. In the later and unchanged sedimentary rocks petroleum is usually to be found flowing in greater or less quantity from every considerable mass of carbonaceous material. It seems, however, to be produced in the greatest abundance from bituminous shale, and it is probable that all the great accumulations of rock-oil are derived from strata of this character. This is doubtless due in part to the great thickness and extent of deposits of this class, since they contain in the aggregate a far greater amount of bituminized organic tissue than beds of coal, lignite, or peat. It is also probable that the carbonaceous matter of bituminous shales is peculiarly prone to this kind of decomposition. It is derived very largely from marine vegetation, and has always been submerged in water; and perhaps for this reason is richer in hydrogen, and in spontaneous distillation furnishes a larger quantity of oil and gas, than any other form of mineralized organic tissue.

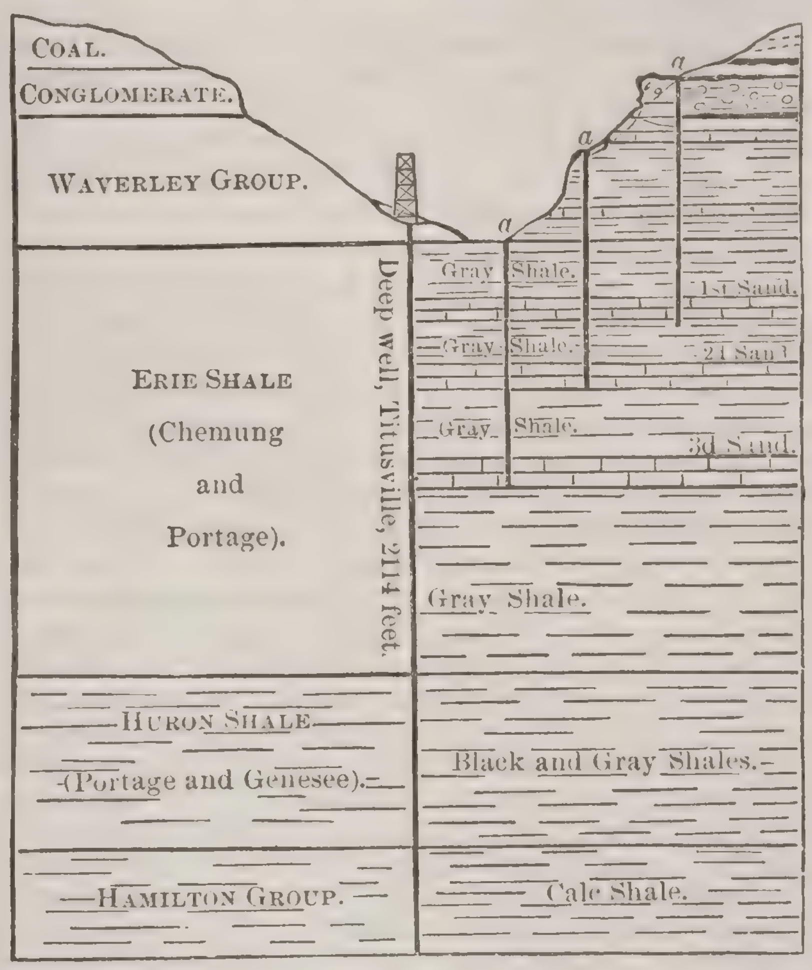
In ascending the geological scale, the first oil-horizon is found in the upper part of the Lower Silurian series. Here the Utica shale is highly bituminous, and is the source of oil and gas springs over a large area. In the State of New York oil and gas issue from the Utica shale in many places, and they are here probably derived from sea-weeds and graptolites. At Collingwood, Canada, this formation is saturated with petroleum, but it is here a bituminous, earthy limestone, filled with the remains of trilobites, and it doubtless owes much of its carbonaceous impregnation to the animal matter of these crustaceans. In the region about Burkesville, Ky., famous for its oil-springs and flowing wells, the oil apparently emanates from strata of the age of the Utica shale, and is confined by sheets of impervious limestone which represent the Hudson River group. These strata are exposed by the deep erosion of the valley of the Cumberland, and the accumulation of gas under the flaggy limestones is such as in some instances to cause violent explosions, in which many hundred tons of rock and water are thrown out. These *gas volcanoes*, as they are called in this region, afford positive proof of the *gradual* production of marsh-gas from bituminized organic tissue, since if the animal and vegetable matter buried in the mud at the bottom of the Silurian sea had in its primary decomposition produced all the gas it was capable of yielding, this would have all bubbled out ages ago. Though now "landlocked," and from its isolation neglected, the Cumberland oil-region is probably capable of producing a large amount of petroleum. In Western Canada, between Lake Erie and Lake Huron, is a district which from the quantity of oil it has produced is generally known as the Canada oil-region. The country is here low and level, and is underlaid by a thick sheet of clay. Beneath that, the surface-rocks are the Hamilton limestones and shales, smoothly planed off by glacial action. The oil obtained here has been mainly derived from the line of junction between the clay and rock, and so much had accumulated there that when the clay was pierced many thousand barrels of oil flowed from a single orifice. When these reservoirs were emptied the oil was found to issue in relatively small quantity from fissures in the rock below. The current supply in the shafts sunk was too small to be remunerative, and the wells bored, though yielding considerable oil, were on the whole not successful; and this oil-region has been practically abandoned. The Canadian geologists have considered the Corniferous limestone as the source of oil in Western Canada, and have gone so far as to represent this as the great source of petroleum in the country. There are serious difficulties, however, in the way of this theory. Though the Corniferous limestone is undoubtedly an organic deposit, it nowhere contains more than a small percentage of hydrocarbons; very little oil can be produced from it, and oil and gas springs are very rare where it underlies the surface. No considerable quantity of petroleum is derived from wells in the Corniferous or any other limestone, either because of the absence of petroleum or the closeness of the rock. Cells filled with oil are frequently met with in many limestones, but they are generally closed cavities. The oil of Canada is probably derived from two horizons—the Marcellus and Hamilton shales, and the underlying Collingwood shales, to which reference has already been made. This district lies in the line of the Cincinnati axis, and it is highly probable that the strata are slightly disturbed or broken in such a way as to favor the emission of oil, even from deep sources. The Canadian petroleum is nearly black in color, has a gravity of 26° to 42° Beaumé, and a peculiar acrid and nauseous smell, probably in virtue of a small amount of sulphur it contains.

The next higher oil-horizon is by far the most productive one in this country. It lies in the Upper Devonian rocks, and is that in which all the oil-wells of Pennsylvania are located. The geological structure of this district is as follows: The hills and table-lands are formed of carboniferous rocks, patches of coal-measures, the conglomerate, and 300 to 400 feet of Lower Carboniferous or Waverley shales. The draining streams generally cut through these strata and expose the Chemung. The wells bored in the valleys begin in the shales of the Chemung; those of the table-lands pass through the Waverley. The underlying Chemung and Upper Portage rocks are here composed of alternations of clay shale, with three or four bands of sandstone and conglomerate. The oil is found in the latter, saturating the porous material and filling an extensive system of fissures which traverses them. These are records of slight disturbances which have affected the region, and which have shattered and opened the harder strata, while the shales—as is the constant habit of such rocks—have settled back into compact masses. That the petroleum of Western Pennsylvania has not originated in the mechanical strata just mentioned is certain, as there neither is nor has been any constituent of this rock which could be transformed into it. And, as intimated in a preceding paragraph, we must look below the reservoirs that contain it for its place of origin. We there find a great thickness of bituminous shales, which furnish all the conditions necessary for the solution of the problem. The carbonaceous beds referred to consist of the Marcellus, Genesee, and Gardeau black shales, of which the upper ones combine toward the W. and form in Ohio the Huron shale. This has the thickness of over 300 feet, all colored black by carbon, and containing 10 to 20 per cent. of combustible matter. In Central Pennsylvania the representatives of the Huron shales form portions of what Rogers called the Cadent group, in which the bituminous layers at their outcrops in Huntingdon county have a thickness of 800 feet. This formation is very widely spread, and contains a larger aggregate amount of combustible matter than all our coal-measures. That these black shales can and do produce petroleum is demonstrated by the facts that they have been extensively and successfully used in the artificial manufacture of oil, and that a series of gas and oil springs mark their line of outcrop all the way from Central New York to Alabama. While the quantity of oil which they furnish is relatively small where the current production has free escape, in N. W. Pennsylvania, where nature has prepared great reservoirs for its reception, and closed these above with nearly impervious covers, it has accumulated for ages, and forms the most important deposits of petroleum known

in the world. It may also be said that all the most important gas springs and wells of the country are located in strata immediately overlying this great black shale formation, and from these in New York, Pennsylvania, and Ohio sufficient inflammable gas is daily escaping to light all our cities.

The view here presented of the genesis of petroleum is not accepted by the Pennsylvania geologists, but it is the result of careful study on the spot of the phenomena presented in all our oil-regions, and of many months devoted to practical well boring and pumping in Pennsylvania and Ohio. One feature which it presents, however, demands a passing notice. Within the limits of the large area over which oil is found, productive wells are limited to certain "oil-centres." The reason of this localization of the flow of oil has not been demonstrated, but it may be conjectured that those districts where the oil is found in greatest abundance have suffered more disturbance than the surrounding barren areas. None of this region is much disturbed, the horizontality of the rocks being unchanged, so far as can be judged by the eye; but it is certain that the waves of strata which form the Alleghanies and the series of coal-basins which border them on the N. W. reached far beyond the limits of the State of Pennsylvania, as even in Ohio they are distinctly perceptible. In confirmation of this view it may be said that all the other productive oil-regions of the country afford unmistakable evidence of disturbance; and it is difficult to conceive any reason why so much of the country W. of Oil Creek, which is underlaid by the same geological formations, should yield oil in almost every well, but nowhere in considerable quantities, unless it be because—what is known to be true—the sandstones and conglomerates wedge out and disappear—the reservoirs are wanting: the rocks are all compact and impervious, and the sources of the oil are hermetically sealed up.

In N. E. Ohio, the Waverley series contains a sheet of



Oil-bearing section of rocks on Oil Creek, Pa.: *a*, *a*, *a*, oil-wells.

bituminous shale (Cleveland shale) from 20 to 60 feet in thickness, from which a large amount of gas and oil is constantly escaping. These show themselves in gas and oil springs along its lines of outcrop, and in the complete saturation of the overlying Berea sandstone in several localities. Two of these—Mecca, Trumbull co., and Grafton, Lorain co.—are local oil-districts. At Mecca at least 1000 wells have been bored from 60 to 100 feet deep, many of which have at times yielded considerable oil; but as the reservoir-rock had no impervious cover over it, no great accumulation of oil had taken place in it, and the supply was soon exhausted. It has been discovered, however, that a slow but constant reproduction of petroleum is going on, and many of the wells have been successfully pumped for a few days each year for the last ten years. The oil of this horizon is thick and heavy, and is used for lubricating machinery—a character which it probably owes to the fact that it has been exposed to evaporation, by which the lighter portions have been lost.

The oil-district which is next in importance to that of Pennsylvania is that of West Virginia and S. E. Ohio, in the vicinity of Parkersburg and Marietta. There the surface-rocks are the coal-measures, but a marked line of disturbance passes through this region, and there is very little doubt that the petroleum comes from a deeper source. The oil of West Virginia is generally green in color and of excellent quality. It is heavier than that of N. W. Pennsylvania, and much of it is used for lubricating purposes. Though the production of this district has greatly diminished, it still yields a large quantity of oil. Among the interesting features of the West Virginia oil-field the famous grahamite deposit deserves mention, as it is undoubtedly one of the oil phenomena. This is a nearly vertical fissure broken through the shales and sandstone of the coal-measures in the disturbed area to which reference has been made. In the shales this fissure has closed again, as it would in clay or putty, but in the sandstone it has stood open, and has been filled with asphalt. This asphalt (grahamite), like the albertite, was long ago asserted by the writer to be the residual product of the evaporation and oxidation of petroleum; and this view has been fully confirmed by the artificial preparation of grahamite from petroleum by Mr. W. P. Jenney.

At Smith's Ferry, where the Ohio crosses the Pennsylvania line, large quantities of petroleum have been noticed rising to the surface of the water in the river ever since the occupation of this region by the whites. After the breaking out of the oil excitement on Oil Creek many wells were bored at Smith's Ferry and on Island Run, a few miles N. These have furnished a large quantity of oil, but most of them have now failed, and the present yield of this district is small. The valley of the Ohio at Smith's Ferry is cut down nearly to the base of the coal-measures, but the source of the oil is in the Lower Carboniferous or Upper Devonian rocks.

In the preceding notes the more important oil-regions of the valley of the Mississippi have been enumerated, but there are others in the far West which demand a passing notice. The Palæozoic rocks W. of the Mississippi contain little carbonaceous matter, and so far as known no petroleum flows from them. In the Cretaceous and Tertiary formations, however, are beds of lignite which rival in extent and thickness our carboniferous coal-seams, and we also find there numerous springs of petroleum. In Western Colorado, on White River, is a region where petroleum, mineral tar, and asphalt are said to occur in considerable quantities, but no detailed description of this region has ever been given. Some petroleum is also obtained on the upper Arkansas, S. of Denver, Col. In Southern California the Cretaceous and Tertiary rocks are very extensively saturated with oil, tar, and pitch, but no great quantity of oil has been obtained there, as the structure of the region has not been favorable to its accumulation. The asphalt derived from it exists in enormous quantities and has considerable economic value.

Although the oil-wells of America have had no rival in productiveness, they are not so entirely without parallel in the history of the world as has been stated, nor was the oil of this country discovered and used as recently as is generally supposed. It has been ascertained that the oil of Oil Creek was extensively collected, and wells were dug to obtain it, by the ancient inhabitants of our country, the "Mound-builders," those who also worked the copper-mines of Lake Superior, the lead-mines of Kentucky, and the mica-mines of North Carolina. In the Old World petroleum has been known and used for ages. The Chinese have obtained it from wells bored much like ours. On the banks of the Irrawaddi in India a large number of oil-wells have yielded petroleum for several hundred years, and it was sold in the markets of Europe under the name of "Rangoon petroleum" long before it was known that any such thing existed on this continent. At Baku on the shores of the Caspian innumerable gas and oil springs exist, and oil has been collected in large quantities from pits dug for the purpose during many centuries. The formation in which the oil occurs on the plain and promontory of Baku is Miocene-Tertiary, but this is underlaid by Jurassic rocks which contain beds of coal; and these are now regarded as the source of the oil. At various localities in Italy oil has been found in Tertiary strata, and the towns of Parma and Amiano were lighted with it long before it was used in America. Perhaps the most remarkable oil-spring known is the "Pitch Lake" on the island of Trinidad. This is really a petroleum lake, of which the shores are formed by the asphalt produced by its evaporation and oxidation. J. S. NEWBERRY.

Petroleum Centre, p.-v., Cornplanter tp., Venango co., Pa., on Oil Creek and on Oil Creek and Allegheny River R. R., is in the midst of the petroleum region.

Petro'lia, p.-v. of Lambton co., Ont., Canada, has numerous oil-wells and refineries, from which several thousands of barrels of crude and refined oil are shipped weekly

by the Great Western Railway, a branch of which extends to this place, which is 51 miles E. of Sarnia. It has 1 weekly newspaper. P. of sub-district, 2651.

Petromyzont'idæ [*Petromyzon*, from πέτρος, "a stone," and μύζειν, to "suck"], the only recognized family of the order Hyperoartii. The form is eel-like; the skin naked; in the adult the head is elongated, with branchial and antebranchial regions nearly equal; eyes well developed, not far in front of the first branchial aperture; mouth with a subcircular suctorial disk armed with teeth which are horny, severally sessile on soft papillæ, and simple or multicuspid; they are distinguished into maxillary, mandibulary, lingual, and suctorial, although with little reason; the branchial apertures are always seven in number and lateral; dorsal, anal, and caudal fins represented to a greater or less extent by a continuous or interrupted membrane; pectorals and ventrals not developed; the intestine has a spiral valve. Such are the characters of the adults, but all the species undergo a metamorphosis, and a very different form is possessed by the young or larvæ. This stage was formerly regarded as representing a peculiar mature form, and described under the name *Ammocœtes*; in this stage the antebranchial region of the head is little developed, the eyes are wanting, and the mouth is represented by a longitudinal slit, and is without teeth. Representatives of the family are found in the temperate regions of both the northern and southern hemispheres; these are represented by the generic forms *Petromyzon* and *Ammocœtes* (= *Lampetra*) in the northern hemisphere generally; *Entosphenus* in Western America; *Geotria* in Australia; *Velasia* in Chili, New Zealand, and Australia; and *Mordacia* in Chili and Tasmania. The species are, to some extent, parasitic, and fasten themselves by their suckers to fish, whose flesh they consume by abrasion.

THEODORE GILL.

Petro'nius Ar'biter, the author of a Latin romance, *Satyricon*, which in a half-comical manner gives a description of the vices and debauchery of Roman society under the first emperors, now in prose, now in verse, sometimes witty, generally obscene. Of the work, which seems to have been very large, only fragments are still extant. One of these, well known under the name of the *Supper of Trimalchio*, was first discovered in the middle of the seventeenth century, and published at Paris in 1664. Several attempts have been made to deceive the public by spurious manuscripts of the lacking portions of the book; thus, in 1693, Francis Nodot published a complete *Satyricon* from a manuscript which he pretended to have found in Belgrade. The best editions of the true fragments are that by Burmann (Amsterdam, 1743) and that by Bücheler (Berlin, 1862). A most minute and thorough collation of the MSS. was made by Charles Beck (Cambridge, 1863). Of the author of this book nothing is known. In former days he was thought to be the Petronius of whose character and life Tacitus gives an amusing sketch, the *maître de plaisir*, *elegantiæ arbiter*, at the court of Nero, the authority and model in matters of taste and fashion in dress, manners, and sensual enjoyment. But Beck ("The Age of Petronius Arbiter," *Proc. Amer. Academy*, 1856) puts the work, on historical and linguistic grounds, considerably earlier—between 6 and 34 A. D.

Petropaulov'ski, the official Russian name of the peninsula of KAMTCHATKA (which see), and the name of its capital, a village of only 479 inhabitants, exclusive of the garrison.

Petropaulovski, town of Siberia, province of Akmolinsk, on the river Ishim, is situated on the great Siberian post-road, has a garrison and a cannon-foundry, and is an important station for caravans from Khiva and Turkistan. P. 8220.

Petrovsk', town of Russia, government of Saratov, on the Medvieditza, an affluent of the Don, has 7 churches, 1 monastery, an ecclesiastical seminary, and several educational and benevolent institutions. Bees are extensively reared in the vicinity. P. 7631.

Petrozavodsk', town of European Russia, capital of the government of Olonets, on the Onega Lake, was founded in 1703 by Peter the Great, who discovered the rich iron ore which the vicinity contains. It is the see of an archbishop, and has many educational institutions, a good harbor, and a large cannon-foundry. P. 10,910.

Petrus Lombardus. See LOMBARD (PETER).

Petsh, or **Ipek,** town of European Turkey, eyalet of Room-Elee, on the Bistritza, with fine and substantial houses surrounded with orchards and mulberry plantations, has large manufactures of silk and arms. P. 8000.

Pets'worth, tp., Gloucester co., Va. P. 2692.

Pet'tenkofer, von (MAX), b. at Lichtenheim, Bavaria, Dec. 3, 1818; studied medicine, pharmacy, and chemistry at the University of Munich, and was appointed professor of medicine there in 1847. Besides a number of minor essays on practical chemistry in *Zeitschrift für Biologie*, of which he became editor in 1865, and in other scientific periodicals, he wrote a valuable work on ventilation, *Die atmosphärische Luft in Wohngebäuden* (1858), two on the manner in which cholera spreads (1855 and 1871), and *Ueber Oehlfarbe und Conservirung der Gemäldegalerien* (1870).

Pet'tigrew (CHARLES), D. D., b. probably in Pennsylvania about 1750; removed with his family to North Carolina; became a teacher at Edenton 1773; was ordained in the Protestant Episcopal Church at London 1775; was chosen first bishop of North Carolina 1794; took a leading part in establishing the University of North Carolina. D. at Bonarva, on Lake Scuppernong, in 1807.

Pettigrew (THOMAS J.), M. D., F. R. S., b. at London, England, Oct. 28, 1791; was admitted to the Medical Society of London 1808, becoming successively their secretary and registrar; was an early friend of Coleridge and other eminent thinkers; founded the Philosophical Society of London 1810; was secretary to the Royal Humane Society 1813–20; became surgeon-in-ordinary to the dukes of Kent and Sussex and librarian to the latter, for whom he drew up the splendid bibliographical work entitled *Bibliotheca Sussexiana* (1827–39); took part in founding Charing Cross Hospital 1820; was one of the founders of the British Archæological Association, of which he was long treasurer, vice-president, and editor of the *Journal*; was intimate with Young, Wilkinson, Belzoni, and other antiquaries; devoted much study to Egyptian archæology, on which subject he published several curious works, and was author of various professional books, especially *Superstitions connected with Medicine and Surgery* (1843) and *The Medical Portrait-Gallery* (4 vols., 1840). D. at South Kensington Nov. 23, 1865.

Pet'tis, county of Central Missouri. Area, 670 sq. m. It is somewhat uneven, fertile, well timbered, and contains beds of coal. It is traversed by Missouri Pacific and Missouri Kansas and Texas R. Rs. Live-stock, grain, and wool are leading products. Cap. Sedalia. P. 18,706.

Pettis, tp., Adair co., Mo. P. 1041.

Pettis, tp., Platte co., Mo. P. 3943.

Pet'trich (FERDINAND), b. at Dresden in 1798; studied sculpture at the academy of his native city and under Thorwaldsen in Rome; lived for some time in the U. S. as director of the Academy of Art in Pennsylvania, afterward in Brazil. D. at Rome Feb. 14, 1872. The most prominent of his works are his statues of Belisarius and Christ, and his bas-relief, *Day and Night*.

Pettusville, p.-v. and tp., Limestone co., Ala. P. 1659.

Pet'ty, tp., Lawrence co., Ill. P. 1591.

Petty (Sir WILLIAM), b. at Romsey, Hampshire, England, May 16, 1623, was the son of a clothier; educated in the school of his native town and at Caen in France; was for a time an officer in the English navy; afterward studied medicine at Paris; obtained from Parliament in 1647 a patent for his invention of a "pentagraph" or copying-machine; practised medicine at Oxford, where he became assistant to the professor of anatomy; obtained a fellowship at Brasenose College 1648; chosen professor of anatomy in the University of Oxford 1650, professor of medicine in Gresham College 1651; became physician to the army in Ireland and secretary to Henry Cromwell 1652; was made surveyor of forfeited lands in Ireland; entered Parliament 1658, and at the Restoration was knighted and made surveyor-general of Ireland. He was one of the founders of the Royal Society; made several curious inventions and discoveries in physics; lost much by the fire of London, but afterwards acquired a large fortune by successful speculations, and was author, among other works, of *The Political Anatomy of Ireland* (1691), *Taxes and Contributions* (1667), *Political Arithmetic* (1676), a treatise on money entitled *Quantulumcunque* (1660), which have procured him the reputation of being the principal founder in England of the science of political economy. He was ancestor of the noble house of Landsowne. D. at Westminster Dec. 16, 1687.

Petu'nia [from the Brazilian name of tobacco, *petun*], a genus of annual, biennial, or perennial plants of the order Solanaceæ, natives of the hot regions of America. The *Petunia nyctaginiflora* and *violacea* have been for fifty years cultivated in European and North American gardens, and have afforded numerous hybrid and other varieties, some of which are very beautiful.

Peu'tinger (KONRAD), b. at Augsburg Oct. 14, 1465; d. Dec. 24, 1547; wrote several works on antiquities, and

was the possessor of the so-called *Tabula Peutingeriana*, a map of the military roads of the West Roman empire from the fourth century. It was first discovered in a Benedictine monastery at Tegernsee, and remained there for nearly two centuries in the family of Peutinger, but was bought by Prince Eugene, who presented it to the imperial library of Vienna, where it is now preserved. A part of it was published by Marcus Welser (Venice, 1591); the whole by Scheyb (Vienna, 1753), by Mannert (Leipsic, 1824), who also gives an interesting account of the vicissitudes which this unique monument of ancient literature has gone through from the fourth to the nineteenth century; and in *Recueil d'Itinéraires anciens*, by Fortia d'Urban (Paris, 1845).

Peutingerian Table. See PEUTINGER.

Pevera'gno, town of Northern Italy, province of Cuneo. The ruins of only two of its four mediæval castles remain, and the feudal palace is now a private dwelling. P. in 1874, 6887.

Pew [Old Fr. *pui*], a seat in a church enclosed and separated from others. In England the exclusive and perpetual right to a particular pew in the parish church may be held by a parishioner as an appurtenant to his mansion-house, such ownership arising either from prescription—that is, long-continued use—or from a grant by the ordinary or bishop. All the other pews not so claimed are under the control of the churchwardens, acting on behalf of the ordinary. In the U. S. different customs prevail in different churches and States. Occasionally, the trustees or vestry, or other officers of the corporation, retain the entire custody of the church edifice, and the seats are free to all comers during divine service. Sometimes the pews are leased for a year only at a specified rent; on the other hand, they are often conveyed by an instrument in the form of a perpetual lease, reserving an annual rent. In the latter case the right of the pewholder is peculiar; it is property, and may be transferred, but is generally exempt from sale on execution; in some States it descends to the heirs as real estate, and in others it passes to the administrator as personal estate. It is, however, limited, and subject to the ultimate control of the trustees or vestry, who may, under restrictions not affecting the pewholder, convey the church edifice, rebuild it, repair it, or remodel it at their discretion. JOHN NORTON POMEROY.

Pewa'mo, p.-v., Lyons tp., Ionia co., Mich., on Detroit and Milwaukee R. R.

Pewau'kee, p.-v. and tp., Waukesha co., Wis., on Pewaukee Lake and Chicago Milwaukee and St. Paul R. R.

Pewee. See PHŒBE-BIRD.

Pewee Valley, p.-v., Oldham co., Ky., on Louisville Cincinnati and Lexington R. R.

Pew'ter [O. Fr. *peutre*], an alloy of lead and tin of extremely variable proportions. Bismuth, antimony, copper, and other metals are sometimes introduced for special purposes into the metal.

Peyer's Glands, small sacculi peculiar to the mucous membrane of the small intestine, termed *glandulæ solitariæ* when scattered singly, and *glandulæ agminatæ* when collected in groups, or *Peyer's patches*, so named from Peyer (1653–1712), who first described them. (See HISTOLOGY.)

Peyron' (AMEDEO), ABBÉ, b. at Turin in 1785; d. 1869. He was a pupil of Tommaso Valperga di Caluso, and succeeded him in the chair of Oriental languages. He was a member of the Turin Academy of Sciences, foreign member of the French Institute, and senator of the kingdom of Italy. He rendered important services to the study of Greek and of Coptic. Many of his memoirs are in the publications of the Academy of Turin; he translated Thucydides anew into Italian, published a profound work of historical criticism upon the Hellenic constitution, prefixed to the *Scene Elleniche* of Brofferio; discovered and published several Greek texts (Empedocles, Parmenides, Theodosianus), fragments of the *Orations* of Cicero for Scaurus and Tullius and against Clodius. He has, besides, the merit of having founded the study of Coptic by his *Lexicon Linguæ Copticæ* and his *Grammatica Linguæ Copticæ*.

Peyronnet', de (CHARLES IGNACE), COUNT, b. Oct. 9, 1778, at Bordeaux; studied law, and practised as an advocate in his native city; became very conspicuous during the first and second restorations as an ultra-royalist and staunch adherent of the Bourbons, and was minister of justice in the cabinet of Villèle from Dec. 14, 1821, to Apr. 17, 1827. In 1822 he carried a law by which all press cases were deprived of trial by jury and referred immediately to the royal courts, which were empowered to suspend and suppress any publication which seemed hostile to the public peace, the established Church, and the royal authority. In 1825 he carried another law by which profanation of any object consecrated to the public worship was punished by forced labor for life. In 1822 he was created a count; May 16, 1830, again entered the government as minister of the interior in the cabinet of Polignac, and as such he signed the notorious ordonnances of July 25, 1830, which occasioned the revolution of 1830 and the fall of the elder line of the house of Bourbon. Arraigned before the House of Peers for high treason, he was sentenced to imprisonment for life, and confined in the fortress of Ham, but Oct. 17, 1836, he was pardoned. D. Jan. 2, 1854, at his estates in the Gironde. He wrote a *Histoire des Francs* (2d ed. 1846) and *Satires* (2d ed. 1854).

Peyto'na, p.-v. and tp., Boone co., West Va., on Coal River. P. 1166.

Pézénas', town of France, department of Hérault, is beautifully situated at the confluence of the Peine and the Hérault, and has large manufactures of chemicals, brandy and liqueurs, and a brisk trade in wine, olives, and almonds, which are produced in its vicinity. P. 7375.

Pfäfers, a watering-place of Switzerland, canton of St. Gall, near Ragatz. Its waters have a temperature of 100° F., and enjoy a high reputation for their curative qualities; they are used both for drinking and bathing.

Pfeif'fer (IDA), b. at Vienna Oct. 15, 1797; d. there Oct. 27, 1858; became widely known by her journeys to the Holy Land, the Scandinavian countries, round the world twice over different routes, and to Madagascar, which she described in *Journey to Iceland, Sweden, and Norway* (Pesth, 1846; London, 1852), *A Woman's Journey Round the World* (Vienna, 1850; London, 1854), *Second Journey Round the World* (Vienna, 1856; London, 1857). (See *The Last Travels of Ida Pfeiffer, with a Biography*, Lond., 1861.)

Pforz'heim, town of Germany, grand duchy of Baden, at the confluence of the Nagold, Ens, and Würm, has large manufactures of jewelry, chemicals, and linens, ironworks, tanneries, and oil-mills; and an active trade in timber, which is cut in the neighboring Black Forest. P. 19,801.

Phacochœr'idæ [*Phacochœrus*, from φακός, "a wart," and χοῖρος, "a hog"], a family of hog-like ungulates very closely related to the Suidæ, or true hogs. They are distinguished by the following characters: the skull has the palato-maxillary axis extremely deflected, and forming an angle with the occipito-sphenoidal axis; the basi-sphenoid is reflected, with the crest uniting with the presphenoid, and forming two deep pocket-like cavities; the orbits are directed upward and backward, and the induced position of the eyes gives to the animal a peculiar physiognomy; the malar bones are very deep, and have short inferior processes; the teeth are very aberrant in the adult; the molar series is reduced to the true molars, or even the last true molar; this last is elongated, and composed of three longitudinal rows of columnar tubercles, presenting when worn simple oval, insular areas; the incisors in the adults are reduced to two, or even entirely lost in the upper jaw, and sometimes entirely wanting also in the lower one. Of this type only a single genus (*Phacochœrus*) is known; this is represented by two species—(1) *Phacochœrus Africanus*, which is common to several parts of Africa; and (2) *P. Æthiopicus*, confined to South-eastern Africa. These are popularly known under the name of "wart hogs." The snout, as in the true hogs, is disciform, and the nostrils open forward from it. THEODORE GILL.

Phæ'dra, in Greek legend, the wife of Theseus and the stepmother of Hippolytus, with whom she fell desperately in love. When he refused to comply with her wishes, she accused him to his father of an attempt upon her honor, but when she heard that he had perished in consequence of his father's wrath, she confessed her guilt and committed suicide. The tragedies on this subject by Sophocles and Euripides are lost, but there is a celebrated one by Racine.

Phæ'drus, b. in Thracia or Macedonia; was brought to Rome as a slave, but was made free by Augustus, and became famous by his five books of fables, containing 97 fables, most of which, however, are only versifications of the fables of Æsop. The style is easy and fluent, and the book often very pleasant to read. There are editions by Orelli (Zürich, 1831), L. Müller (Leipsic, 1868), and others.

Pha'ethon, in Greek mythology, the son of Helios, obtained one day permission of his father to drive the chariot of the sun across the heavens, but the horses ran off, and the chariot was just about setting the earth on fire when Zeus struck down the unfortunate driver with a thunderbolt. He fell into the river Eridanus (Po), and his sisters, the Heliades, who stood mourning by his corpse, were transformed into poplars and their tears into amber.

Phaëton'idæ [*Phaëton*, in allusion to the tropical habitat of the species], a family of large swimming birds, familiarly known as "tropic-birds." The form is somewhat ternlike; neck rather short; the bill about as long as the head, compressed, with the culmen slightly elevated and

curved; the gonys long and ascending; the nostrils near the base, linear and exposed; the wings long and pointed; the tail rather large, and with the two median feathers prolonged in a linear form; the legs originating rather more forward than usual, with the tarsi short, and the toes all connected together by a broad membrane, the hind one being deflected upward and forward; the claws are small, compressed, and acute; the skull belongs to the "desmognathous" type of Huxley; the sternum is very short and co-ordinate with the anterior position of the legs. The family is composed of but a single genus (*Phaëton*), in which four species are generally recognized; these are all found generally in the tropical seas, and often observed at great distances from land. They seek the shore for rest, however, and build their nests in hollow trees or in rocks, in which they lay generally two eggs. THEODORE GILL.

Phalan'ger, the anglicized form of the name Phalangista. (See PHALANGISTIDÆ.)

Phalangist'idæ, or **Phalangers** [*Phalangista*, a name having reference to the manner in which two of the toes are joined together as far as the last phalanges], a family of the order Marsupials and sub-order Syndactyles, adapted for herbivorous diet. They are of moderate or small size, with a moderate head, of which the facial portion is rather short; with the muffle naked, and with the upper lip cleft; the teeth are in moderate number—viz. I. $\frac{3}{1}$, C. $\frac{1}{1}$ or $\frac{1}{0}$, P. M. $\frac{1}{1}-\frac{3}{3}$, M. $\frac{4}{4}-\frac{3}{3} \times 2$; the limbs are equal, the fore feet provided with five well-developed toes, armed with compressed and curved claws, the hind ones with five toes, the first or internal of which is large, thumb-like, and opposable to the others; the second and third smaller than the rest, and, as in the Syndactyles generally, united by a common integument nearly to their extremities, and furnished with curved hollow nails; fourth and fifth with curved and compressed claws; tail generally long and more or less prehensile, sometimes rudimentary; a well-developed pouch is present, and opens downward; at the bottom are four (or two?) mammæ; the stomach is simple, and sometimes provided with a cardiac gland; a cæcum present, and in most species very large. The family was thus essentially divided by Waterhouse, but the genus *Tarsipes* at least included by him therein is entitled to separate family rank. The species of the family are distributed throughout almost every part of Australia and the Papuan Archipelago. They are nocturnal in their habits, and feed upon grass and other herbage. By Krefft eight genera are admitted, exclusive of *Tarsipes*—viz. (1) *Phascolarctos*, (2) *Cuscus*, (3) *Phalangista*, (4) *Petaurista*, (5) *Belideus*, (6) *Dactylopsila*, (7) *Acrobates*, and (8) *Dromicia;* these include fourteen species. By some these have been combined in several sub-families, the first being the type of the Phascolarctinæ, which is by some elevated to family rank, and the rest distributed among the sub-families Phalangistinæ and Petaurinæ. THEO. GILL.

Pha'lanx [Gr. φάλαγξ], in the military organization of ancient Greece, the tactical unit of the heavy-armed troops, a body of foot soldiers armed with spears and shields. The number of men was various. They were arranged from four to sixteen men deep. In later times the great phalanx under the Macedonians comprised 16,384 men, and was composed of four minor phalanges, each of which had two *merarchies*, or halves. Each merarchy was composed of two *chiliarchies*, each of these of four *syntagmata*, and each syntagma of sixteen men. The phalanx was, when compared with the Roman legion, a cumbrous arrangement of men.

Phal'aris, proverbially the most cruel tyrant known to antiquity, was the ruler of Agrigentum in Sicily for about sixteen years, in the middle of the sixth century B. C. Of his history hardly anything is known with certainty, most of it being enveloped in fables. A prominent feature in these fables is the brazen bull, invented by one Perillus, in which Phalaris roasted his enemies, inaugurating the ingenious instrument of torture by the roasting of its inventor. The famous *Epistles of Phalaris*, 148 in number, first printed at Venice in 1498, and afterwards often reprinted and translated, give quite another picture of the man's character, and were read through many centuries with great edification, until Bentley proved that they were spurious, a product of a much later time.

Phalarope, the anglicized form of *Phalaropus*. (See PHALAROPIDIDÆ.)

Phalaropid'idæ [*Phalaropus*, from φαλαρίς, "coot," and πούς, "foot"], a family of aquatic birds. They have some resemblance to the plover in form; the bill as long as, or longer than, the head, nearly straight, more or less slender, with the culmen decurved toward the tip, and with the sides of the upper mandible grooved for nearly the whole length; nostrils near the base, linear, and in the lateral groove of the mandible; wings long and pointed; tail short and rounded; legs rather posterior, with the tarsi moderate, the anterior toes united at the base and with lobate sides, and the hind toe elevated and with a narrow membrane; the skull is of the "schizognathous" type of Huxley. The family is one of several associated together by Huxley under the common name Charadriomorphæ. "The species," according to G. R. Gray, "are inhabitants of the northern regions, but migrating to the more temperate climes during severe winters. They are usually observed in pairs or in small parties, swimming about on the sea or on lakes, ponds, and streams of fresh water, generally near the margins, moving quickly in search of floating seeds, aquatic insects, and small crustaceous animals, on which they subsist. They swim with the greatest facility and swiftness, and their flight is rapid and elevated in the air. The female deposits four eggs among a tuft of herbage in the marshes." Only one genus, with three species, is recognized; these species are all inhabitants of the northern hemisphere; two of them belong more especially to Europe, and one to America. THEODORE GILL.

Phal'lic Wor'ship, originally seems to have been the adoration of the reproductive and regenerative powers of nature, represented after a time by the phallus, or male generative organ, or in some instances by a straight column or by the pistil of a flower, as in India at the present day. This worship, whatever of symbolism it may have had at first, rapidly became a most corrupt and intolerable practice. It prevailed in India (as at present), in Chaldæa, Egypt, Syria, Phrygia, Greece, and Rome, as in later days among some of the American savages, notably the Seminoles of Florida. The forms which this abomination assumed were innumerable. Dionysus, Hermes, Venus, Priapus, Pan, Isis, and other gods were worshipped at Rome by phallic symbolism.

Phanerog'amous [Gr. φανερός, "evident," and γάμος, "marriage"] and **Phænog'amous** [φαίνειν, to "show," and γάμος] are synonymous terms, applied to those plants which have stamens and pistils, or perfect and evident reproductive organs. All other plants are cryptogamous. Phanerogamous plants, then, are flowering plants. (See BOTANY.)

Pha'raoh, the term applied in the Bible to the kings of Egypt, of which many explanations have been proposed, as *pa-ra*, "the sun;" *pi-ouro*, "the king;" *per-aa*, "the great house," "court," a phrase explained by Horapollo as "emperor of the world;" *pa-ra-anh*, or "the living sun." None of these etymologies are altogether satisfactory, some not being found at an early period. It is still less possible to connect it with the name of any Egyptian monarch, and it must have been a common appellation like *khan*, *cæsar*, or *czar*. Many Pharaohs are mentioned in the Bible, but in the present state of Egyptian chronology it is not possible to certainly determine the monarchs of Egypt they represented. The first known is the Pharaoh reigning in the days of Abraham, but he cannot be identified with any Egyptian monarch or "shepherd king," and the account given of him applies rather to some conterminous ruler or vassal of Egypt, for the camels which he is said to have given to the patriarch were never used by the Egyptians or seen on any monument, although at the time of the nineteenth dynasty they are mentioned in papyri as existing in Palestine. The next Pharaoh is the one of the time of Joseph (Gen. i. 4–6), whose court appears to have been at Heliopolis, and in whose reign Joseph was elevated to the post of governor of Egypt. According to Eusebius, he was the monarch Apepi or Apophis, of the sixteenth or Shepherd dynasty, and it is probable that the conditions of the history of Joseph coincide with the events of such a period, although other inquirers would place the arrival of Joseph in the days of the twelfth dynasty, when it is known Egypt was afflicted with a famine. The next Pharaoh is the one under whom the Israelites were in bondage, and who compelled them to build the treasure-cities of Pithom and Rameses of bricks; and it was under him or his successor that Egypt was afflicted with the ten plagues, and that Moses and Aaron led the Israelites out of Egypt, and the Egyptian army in its pursuit of the retreating Israelites was drowned in the sea, although it is doubtful if the Pharaoh perished with them. The identical Egyptian monarch who was the Pharaoh of the Exodus has been a subject of dispute, but it is principally confined to the period of the eighteenth and nineteenth dynasties. According to the old classical chronologers, the Exodus happened at the beginning of the eighteenth dynasty, and coincided with the expulsion of the Hyk-shos, with whom the Hebrews were confounded. Some would therefore consider that Thothmes II. was the Pharaoh of the period. The Egyptologists, however, generally consider Meri-en-ptah (or

Menephtah) to have been the king in whose reign the event took place, and that the name Ramses or Rameses of the treasure-city was given after Rameses II., his father and predecessor, who reduced the Hebrews to bondage. The name of Raamses is, however, said to be that of the land given to Jacob and his family, which it could not have had at the time, but by which it might have been known in the time of Moses or the writer of the book of Genesis. This *migdol* or tower of Rameses is represented in the wars of Rameses III., and is supposed to be the Pa-ramessu or Tanis from which the Hebrews departed in the direction of Canaan—according to the theory of Brugsch by the road across the spit of land between the Sirbonian Bog, or Lake Serbonis, and the Mediterranean. The other Pharaohs mentioned in the Bible are the father of Hadad the Edomite, supposed to be a king of the twenty-second dynasty; the father-in-law of Solomon; one of the predecessors of Sheshanka or Shishak; that monarch himself, who overran the Holy Land and pillaged Jerusalem; Tirhakah the Ethiopian, who for a time wrested Egypt from the Assyrians; Nekau or Necho II., who invaded Palestine to reduce to subjection, then in alliance with the Assyrians, but was finally defeated at Carchemish by Nebuchadnezzar, then at a youthful age, B. C. 605; and Uah-pa-ra, Hophra, or Apries, of the twenty-sixth dynasty, who marched to relieve the siege of Jerusalem, causing the Babylonians to retire for a while, although it was finally taken by Nebuchadnezzar, B. C. 588. It is remarkable that the Ethiopian kings Zerah and So mentioned in the Bible are not styled Pharaohs, like the Egyptian rulers, as if for some reason they had not the same title or were recognized as lawful rulers of the country. A person named Pharaoh is said to be the father-in-law of Mered, and by the rabbis supposed to have been a king. SAMUEL BIRCH.

Phar'isees [generally derived from the Hebrew *perushim*, "the separated"] originated as a political and religious party among the Jews during the time of the Maccabees in opposition to the invasion of Greek ideas and Greek customs which took place especially during the reign of Antiochus Epiphanes. While the Sadducees and the ruling aristocracy had yielded to the idea of a distinction between religion and politics, between Church and State, the Pharisees still maintained the old and genuinely Jewish view of a theocracy; and while the Sadducees adhered rigorously to the literal conception of the words of the sacred books, the Pharisees adopted the tradition as a means by which to interpret Scripture. Thus, the Pharisees stood at the time of Christ at once as the national party in politics and as the progressive school in theology, and their influence with the mass of the people seems to have been very great. The sources of our knowledge of them are the New Testament, Josephus, and the Mishna. Modern scholars seem inclined, however, to look at them under a milder view than that in which they appear in the New Testament, though it is only natural when the importance which they ascribed to the observation of all minutiæ of the Law led to hypocrisy and falsity. (See JEWISH SECTS.)

Pharmacopœ'ia [Gr. φάρμακον, "a medicine," and ποιεῖν, to "make"], a dispensatory or book of directions for the composition of medicine, approved by medical practitioners or published by authority. Recently-discovered manuscript—the *Papyrus Ebers*—establishes the existence of books of formulæ among the iatro physicians, the medical priesthood of Egypt, as far back as the sixteenth century before the Christian era. Of the later Alexandrian school many articles and formulæ attributed to Isis and Osiris, and the *Simples* of Serapion, were transmitted and employed during the Greek and Roman periods. The remedials advised by Galen, and by those who expounded and practised his exclusive teachings, may be considered the only code of therapeutics until the origin of the Arabian school. The first systematic attempt at methodical collection and classification of recognized formulæ was made by Sabor ebn Sahel in the latter part of the ninth century. The Italian school of the twelfth to the fifteenth centuries produced the extensive work of Nicolaus de Salerno. Many of the early pharmacopœias of the sixteenth and seventeenth centuries contain preparations of the older Arabian and Italian works. The first pharmacopœia issued by authority was compiled by Valerius Cordus in 1542, under sanction of the senate of Nuremberg. Other German pharmacopœias are those of Brandenburg and Ratisbon, and the *Pharmacopœia Germanica*, authorized May, 1872, is to-day employed throughout Germany and in Russia. The pharmacopœias of Amsterdam and Brussels are celebrated. That of Paris is authority in France and Switzerland. The first edition of the *London Pharmacopœia* was issued in 1618; that of Edinburgh in 1699; that of Dublin appeared first in 1807. These three have passed through several editions, and had material differences. They were employed in the U. S. until the second quarter of this century. In 1864 the issues of London, Edinburgh, and Dublin were merged into one work, official for the United Kingdom and its colonies—the *British Pharmacopœia*. In the U. S. the first effort to secure an official pharmacopœia was made in 1818 by the New York County and New York State Medical societies. Other State societies united, and a convention of delegates from State medical societies and medical colleges met in Washington Jan. 1, 1820. The result was the issue in 1820 of the first *Pharmacopœia of the U. S. of America*, a volume of 272 pages. Its adoption was not general. The convention provided for further conventions every ten years to revise the work. Such conventions were held in 1830, 1840, 1850, and the revised editions issued in the following years. The convention of 1860 had delegates from colleges of pharmacy and pharmaceutical societies and from the medical corps of the army and navy. In 1831 appeared the first edition of the *U. S. Dispensatory*. It is a most extensive work—an encyclopædia of materia medica, therapeutics, and pharmacy, and contains full descriptions of many drugs which are not officinal. This work is chiefly employed by apothecaries, but the *Pharmacopœia*, which is brief and concise, is in use with physicians who prepare their own medicines, and with druggists, as a convenient handbook in preparing officinal formulæ. The pharmacopœias of Europe were published only in Latin. The American was published both in Latin and English until the edition of 1840, when and since the Latin has been omitted. The Latin names of medicines and preparations alone were retained, as essential to correspond with terms employed in prescription-writing by physicians, and to maintain a degree of uniformity with the nomenclatures of foreign countries. In the original and subsequent editions many processes are identical with, and derived from, the *British Pharmacopœia*, a correspondence between it and the American being desirable, as the former was long in use in this country, and also as a step towards the future issue of a universal pharmacopœia. The convention for the fifth decennial revision of the work met in Washington in 1870. It made two essential modifications of the previous general plan—first, to substitute for measures of capacity expressions of weight for the quantities in all formulæ; secondly, to extend the scope of the work by adding articles with reference to the local peculiarities of the population and climate. Twenty-seven new articles were added, five were dropped as obsolete. Eighty-seven new preparations were added, seven dismissed. Many entirely new medicines were designated for the first time in this edition, as the benzoate, bromide and iodide of ammonium, digitalinum, extract of American hemp, extract of Calabar bean, citrate of iron and strychnia, yellow oxide of mercury, arseniate of sodium, etc. The terminations of chemical medicines have been changed to correspond with the new nomenclature and terminology of chemistry. The *Pharmacopœia Germanica* of 1872 has been translated into English by C. L. Lochman. As much of the recent literature of therapeutics comes from abroad, and many of our physicians are foreign-born, educated in Europe, or apply the formulæ advised by foreign authors, the apothecary of our larger cities has to employ the British, French, and German pharmacopœias in addition to that of the U. S.

E. DARWIN HUDSON, JR. REVISED BY WILLARD PARKER.

Phar'macy [Gr. φάρμακον, "a medicine"], the art of preparing, compounding, and dispensing medicines with reference to their physical properties, their compatibilities, and chemical combinations. It includes a knowledge of the different parts of plants, the method and season of their collection, their desiccation and preservation; a knowledge of the chemical structure of mineral and artificial inorganic drugs, as well as of their crystalline and other obvious physical appearances. The pharmaceutist employs a scale of weights and measures especially adapted for his art. The "apothecaries' weight" of the U. S. corresponds with the troy weight in its pound, ounce, and grain, having additional definite terms of weight—the scruple and drachm. *Apothecaries' Weight.*—20 grains = 1 scruple (abbreviated ℈j.); 60 grains, or 3 scruples = 1 drachm (ʒj.); 480 grains, or 8 drachms = 1 ounce (℥j.); 12 ounces = 1 pound (℔j.). An earnest effort has been repeatedly made to secure a uniform scale of weights for pharmacy in all countries, the French decimal system being the one preferred. The unit of French weight, the gramme, is equal to 15.4340 grains. The great diversity in official weights will be seen by comparing the equivalent in grammes of the pound of several countries. The pound of England and the U. S. equals 373.246 grammes; Germany, 500 grammes; Austria, 720.009; Holland, Belgium, and Switzerland, 375; Russia and Norway, 357.854; Rome, 339.161; Spain, 345.072; Portugal, 344.190, etc. The measure of liquids employed in pharmacy is wine

measure. The unit of this system is a minim, or .95 of a grain of pure water at a temperature of 60° F.: 60 minims = 1 fluid-drachm (fʒj.); 8 fluid-drachms = 1 fluid-ounce (f℥j.); 16 fluid-ounces = 1 pint; 2 pints = 1 quart; 4 quarts = 1 gallon.

Crude drugs are reduced to a powdered state by various methods. Having been previously dried, they are ground in the drug-mill, triturated by hand with mortar and pestle, or, in the case of soluble saline substances, obtained by the process of granulation, constantly stirring the solution, while evaporated by heat, to prevent recrystallization. Various organic and inorganic drugs are dispensed in powders; there are also several officinal compound powders—the aromatic powder, powder of aloes and canella, Dover powder, compound jalap and compound rhubarb powders. Drugs in their powdered state, unchanged by chemical combinations, are incorporated in the form of pills, suppositories, ointments, and plasters. Only such drugs are dispensed in form of powders as are soluble in water or the gastric juice, or intended to act locally, either chemically or mechanically, upon the parts they affect. The preparation of pills consists in incorporating either crude powdered drugs or their inspissated extracts and active principles with some inert soluble substance to make the pill-mass. More recently, by machine-power, the active ingredients are compressed into very small bulk, being retained in pill form by gelatine or mucilage, with which the articles are saturated. Pills are dusted with aromatic powders to prevent exposure to the air and disguise taste; they are also coated with sugar, gelatine, and tin-foil. Cerates and ointments are made of variable consistency by employing separately or in combination simple cerate or purified fat and wax, in which the active ingredients are disseminated by fusion or trituration. Plasters may consist of the inspissated extracts spread for use, or of medicinal substances added to emplastrum plumbi (lead plaster), which is the base of many officinal plasters. Of liquid preparations or solutions there are, first, *liquores* and *aquæ*, containing medicines soluble in waters; secondly, *spirits* and *tinctures*, solutions in alcohol; thirdly, *vini*, solutions in wine; and, fourthly, ethereal solutions. The simplest solution is an infusion, by pouring on of cold or hot water; next, the decoction, the product of boiling. Tinctures, wines, and ethers may be produced at once when their medicinal contents are soluble in them, but more often are the result of admixture and maceration with the drug and separation by gradual percolation or by displacement.

In continental Europe and Great Britain the standard of scientific qualification to practise pharmacy is high and enforced by law. In the U. S., until recently, there were no restrictions, and in many parts of the country medicines are prepared and dispensed and prescriptions compounded by the ignorant and unskilled. Schools of pharmacy have, however, been established in New York, Philadelphia, and other large cities, and an earnest effort made by the medical profession and American Pharmaceutical Association to secure an enforced standard. In New York City, since June, 1872, all persons not graduated from recognized colleges of pharmacy in this country or abroad, before practising as pharmaceutists or dispensing chemists, are required to appear and pass a satisfactory examination before the board of pharmacy. This board is to be composed of five competent pharmacists, three of whom shall be graduates in medicine, and two graduates in pharmacy. During the brief period of its enforcement this law has developed accuracy and skill in place of error, and fatal accidents no longer occur.

E. Darwin Hudson, Jr. Revised by Willard Parker.

Pharos. See Lighthouse Construction.

Pharsa'lia, p.-v. and tp., Chenango co., N. Y., on Otselic River. P. 1141.

Pharsa'lus, an ancient city of Thessaly, on the Enipeus, became famous for the battle which was fought here Aug. 9, 48 B. C., between Cæsar and Pompey, and in which Pompey was utterly defeated.

Phar'ynx [Gr. φάρυγξ], a musculo-membranous sac situated at the base of the skull, immediately behind the mouth, nose, and larynx, and in front of the cervical vertebræ, extending as far down as the fifth, where it is continuous with the œsophagus. It has the following openings into it: two from the nose, the posterior nares; two Eustachian tubes, which communicate with the middle ear; the mouth, larynx, and œsophagus. It is lined by mucous membrane, which is continuous with that lining the various cavities opening into it. Beneath this mucous coat is a fibrous layer known as the pharyngeal aponeurosis; and beneath this, again, is a muscular layer, composed of the superior, middle, and inferior constrictor muscles; they diminish the capacity of the pharynx, and by their successive contraction from above downward the food is carried along into the œsophagus. The pharynx is freely supplied with glands, which are situated beneath the mucous membrane. The function of the pharynx is to give passage to the food in deglutition and to the air in respiration. The pharynx is subject to the following diseases: catarrhal, croupous, and diphtheritic inflammation of its mucous membrane, phlegmonous inflammation, syphilitic affections, retro-pharyngeal abscess, polypi.

Edward J. Bermingham. Revised by Willard Parker.

Pharyngobran'chii [from φάρυγξ, φάρυγος, the "throat," and βραγχία, "gills"], an order of fishes, represented by a single known genera (*Branchiostoma* or *Amphioxus*), which is at the same time the type of a peculiar sub-class, the Leptocardii (which see). Theodore Gill.

Pharyngogna'thi [Gr. φάρυγξ, φάρυγος, the "throat," γνάθος, the "jaw"], an artificial combination of fishes originally established by Johannes Müller for the reception of those teleosts in which the two lower pharyngeal bones are united together and form a single solid piece. The group thus distinguished was elevated to ordinal rank by Müller, and to it were referred some of Cuvier's acanthopterygians (Labridæ, Cichlidæ, Embiotocidæ), as well as some malacopterygians (Scomberesocidæ). These forms have, however, on the one side no close affinity with each other, and on the other side they are severally related to other types in which the lower pharyngeals are separated; again, there are fishes of other families (*e. g.* some Pleuronectidæ and the Sciænidæ hoploidonotinæ—*e. g. drum*) which have the lower pharyngeals as much united as in the typical Pharyngognathi of Müller; therefore, the order, though formerly generally adopted, is now discarded by the best ichthyologists. Theodore Gill.

Phascolomy'idæ [*Phascolomys*, φάσκωλος, a "pouch," and μῦς, a "mouse"], or **Wombats,** a family of marsupial mammals distinguished by their rodent-like dentition. The body is stout and large; the head large, with full cheeks, flattened above, with an obtuse muzzle and a more or less naked muffle; nostrils widely separated behind, but converging forward; upper lip cleft; teeth twenty-four in number—viz. I. $\frac{1}{1}$, P. M. $\frac{1}{1}$, M. $\frac{4}{4} \times 2$, all of which are rootless, more or less incurved, and grow upward, like the incisors of the placental rodents; the limbs are nearly equal, short and stout; anterior feet with five short, stout toes, severally flattened, with broad and little-curved nails; hind ones with five toes, the innermost of which is small, at nearly right angles with the rest, and destitute of a nail; the second, third, and fourth toes are connected, and they, as well as the fifth, have long curved nails; the tail is rudimentary; the stomach simple, with a special gland situated to the left of the cardiac orifice; the cæcum is short and wide, and has a vermiform appendage. The species, as indicated by their dentition, are addicted to gnawing; they feed chiefly upon grass, roots, twigs, and other vegetable products. They form extensive burrows, and in them remain for the most part of the day; in the night they leave to seek their food. The female generally has only one young at a birth. Four living species are found in various parts of Australia—viz. (1) *Phascolomys wombat* in Tasmania; (2) *P. platyrhinus* in Victoria, Australia; (3) *P. lasiorhinus* in South Australia; and (4) *P. niger* in the neighborhood of Port Lincoln in South Australia. In former geological times large species flourished in the same countries. Theodore Gill.

Phase. See Moon.

Phasian'idæ [*Phasianus*, the Latin name of the common pheasant], a family of birds including most of the gallinaceous fowls. They all have the bill moderate, with the sides compressed, and with the culmen arched towards the tip, which is decurved over the lower mandible; the wings are moderate and more or less rounded; the tail variable in development, in some (Phasianinæ) compressed, in others (Pavoninæ) depressed; the tarsi are robust, and covered with transverse scales in front, smaller ones behind, and still smaller ones on the sides, and in the cock are generally armed with one or more spurs; the toes are moderate, three in front united at base by a slight membrane, and a hinder one short and elevated. The sternum has its lateral elements (pleurostea) separated by a very deep notch from the median one (lophosteon). The family includes two sub-families—viz. (1) Phasianinæ, sometimes divided into Phasianinæ and Gallinæ; and (2) Pavoninæ (which see). The family has recently (1870–72) been made the subject of a monograph by Mr. D. G. Elliot, the plates of which are in imperial folio and prepared by Wolf. This work has been pronounced by an eminent authority (A. Newton) to be "the most gorgeous ornithological work yet published." Theodore Gill.

Phasian'inæ [from *Phasianus*], the principal sub-

family of the Phasianidæ, distinguished by the compression of the tail and the greater or less extension, at least in the males, of the median ones. To this group belong the numerous species of pheasants, the barn-door fowl, and related types. Recent authors, as Gray and Elliot, admit in the sub-family fifty-one species, distributed under the genera *Phasianus, Thaumalea* or *Chrysolophus, Pucrasia, Crossoptilon, Euplocomus, Gallus, Ceriornis*, and, according to some, *Lophophorus*. Several of these have been divided into sub-genera. THEODORE GILL.

Pha′sis, the ancient name of the *Rion* or Faz River, in the Russian province of Transcaucasia, considered by the classical geographers as the boundary between Europe and Asia. The Argonauts were fabled to have landed at its mouth. The name of the pheasant (Lat. *Avis Phasiana*) is derived from a supposed origin in the region of Colchis traversed by this river.

Pheas′ant [from the Lat. *Phasianus*, itself derived with reference to *Phasis*, a river of Colchis, now called *Rion*, from whose neighborhood it was carried to Greece], a name originally belonging to the *Phasianus Colchicus*, a gallinaceous bird of the family Phasianidæ. It is now naturalized throughout a great part of Europe. It is very beautifully marked with a great variety of changing colors. In England it exists in a half-domesticated state, and is fattened with grain, attaining sometimes a weight of five pounds. Pheasants are collected at the proper time in large numbers, and slaughtered by so-called sportsmen *en battue*. The flesh is very excellent food. This bird hybridizes readily with most other gallinaceous birds. The name pheasant is also popularly extended to other birds of the sub-family Phasianinæ, as well as to species of very different families—*e. g.* in some parts of the U. S. to the ruffed grouse (*Bonasa umbellus*), etc. (See PHASIANIDÆ and PHASIANINÆ.)

Pheasant-Shell, a collector's name for the shells of *Phasianella*.

Pheasant Springs, tp., Dane co., Wis. P. 1065.

Phelan (JOHN D.), jurist; entered public life as representative in the Alabama legislature in 1833, while editor of the Huntsville *Democrat;* attorney-general of Alabama 1836–39; Speaker of the house 1839; a judge of the State circuit court 1841–51, of the supreme court 1851–53 and 1863–65; clerk of that court 1853–63 and 1865–68; and then became law-professor in the University of the South, Suwanee, Tenn.

Phelps, county of S. E. Missouri. Area, 650 sq. m. It is uneven, well wooded, and very fertile. Corn and live-stock are leading products. The county is traversed by Atlantic and Pacific R. R. Ores of lead, copper, and iron abound. Cap. Rolla. P. 10,506.

Phelps, county in S. Nebraska, bounded N. by Platte River, formed since the census of 1870. Area, 550 sq. m.

Phelps, p.-v. and tp., Ontario co., N. Y., on the Auburn branch of New York Central R. R., has 5 churches, 1 bank, 1 newspaper, several malt-houses, 1 agricultural steam-engine manufactory, rich deposits of gypsum, and stores. Here is also the most extensive dépôt for peppermint and other essential oils in the world. P. of v. 1355; of tp. 5130. JOHN M. WATERBURY, ED. "CITIZEN."

Phelps (ALMIRA HART LINCOLN), b. at Berlin, Conn., in 1793, was the daughter of a Mr. Hart and sister of Mrs. Emma Willard. In 1817 she was married to Simeon Lincoln, a journalist who d. 1823, and in 1831 she was married to the Hon. John Phelps of Vermont. She was for many years engaged in the instruction of young ladies, and conducted with success several seminaries and schools, the best known of which was the Patapsco Institute, near Baltimore, over which she presided from 1841 to 1856, assisted by her husband until 1848, when he died. Author of a series of textbooks for schools, of which the most widely known is the *Lectures on Botany;* also published tales and didactic works, chiefly for the young.

Phelps (ANSON GREENE), b. at Simsbury, Conn., Mar., 1781; was bred a saddler, but became a merchant of Hartford. In 1815 he removed to New York, and became a successful dealer in metals; was distinguished for liberality and for his deep interest in the missionary work and other benevolent enterprises. In his will he bequeathed $371,000 to different charities and religious societies. D. at New York Nov. 30, 1853.

Phelps (AUSTIN), D. D., b. at West Brookfield, Mass., Jan. 7, 1820; graduated at the University of Pennsylvania 1837; studied divinity at Andover and New Haven; was pastor of the Pine street Congregational church, Boston, Mass., 1842–48; became Bartlett professor of sacred rhetoric in the Andover Theological Seminary in 1849; author of *The Still Hour* (1859), *Hymns and Choirs* (1860), *The New Birth* (1867); was one of the compilers of the *Sabbath Hymnbook*, and has prepared various tunebooks, etc. for use in churches and Sunday schools.

Phelps (ELIZABETH STUART), b. at Andover, Mass., Aug. 13, 1815, was daughter of Prof. Moses Stuart and wife of Prof. Austin Phelps; was married in 1842, and d. at Andover Nov. 30, 1852. Under the anagrammatical name of "H. Trusta" she wrote *The Sunny Side, Peep at Number Five*, and other highly popular tales, mostly for the young.

Phelps (ELIZABETH STUART), daughter of Prof. Austin Phelps and of the foregoing, b. at Andover, Mass., Aug. 31, 1844; author of *Ellen's Idol* (1864), *Up Hill* (1865), *Mercy Gliddon's Work* (1866), *The Gypsy Series* (4 vols., 1866–67), *The Gates Ajar* (1868), *Hedged In* (1869), *Men, Women, and Ghosts* (1869), *The Silent Partner* (1871), and of frequent contributions to periodicals.

Phelps (JOHN SMITH), b. at Simsbury, Conn., Dec. 22, 1814; educated at Trinity College, Hartford; studied law; removed to Springfield, Mo., 1837; was chosen to the legislature 1840; sat in Congress without interruption from 1845 to 1863; was for a short time colonel of volunteers 1861; appointed military governor of Arkansas 1862; was a delegate to the Loyalists' convention at Philadelphia 1866, and became a commissioner to settle the war-claims of Indiana 1867.

Phelps (JOHN W.), b. in Vermont Nov. 13, 1813; graduated at the U. S. Military Academy, and appointed brevet second lieutenant of artillery July, 1836; captain 1850; was engaged in the Florida war, and in garrison and on frontier duty until the war against Mexico 1846–48, throughout which he served, and was brevetted captain for gallantry at Contreras and Churubusco, but declined. Resigned Nov., 1859. In the civil war he was appointed colonel of the 1st Vermont Vols. May 2, 1861, and two weeks later brigadier-general U. S. volunteers. During this month he took possession of Newport News. In November he accompanied Butler's expedition to the Gulf of Mexico; took possession of Ship Island, Miss., and co-operated with the navy in the capture of the forts below New Orleans and of the city, after which he was stationed above New Orleans, where he was the first to organize and arm negro slaves as soldiers, for which act he was declared an outlaw by the Confederate government. His action not being approved, he resigned his commission Aug. 21, 1862, and returned to Brattleboro', Vt., where since 1865 he has been vice-president of the teachers' association, and wrote *Secret Societies, Ancient and Modern*.

Phelps (OLIVER), b. in 1749 at Windsor, Conn.; became a successful merchant of Granville, Mass., and was in the commissary service of Massachusetts during the Revolution. He was one of the partners in the "Phelps and Gorham purchase" of 1788, by which the State of Massachusetts sold for $1,000,000 a tract of 2,600,000 acres now in eight counties of Western New York. This was a portion of a region of about 6,000,000 acres which New York ceded to Massachusetts at the Hartford Convention of 1786. Phelps and Allen were to pay for the land in the "consolidated securities" of that time, but a rise in the price of these securities prevented the complete fulfilment of the agreement, and they gave up a part of the lands. Phelps opened at Canandaigua (1789) a land-office, and invented a system of townships and ranges which, with modifications, has been generally adopted in surveying U. S. government lands. In 1795, Phelps and others bought of Connecticut the "Western Reserve" in Ohio, about 3,300,000 acres. He became a judge in a State court, and was in Congress 1803–05. D. at Canandaigua, N. Y., Feb. 21, 1809.

Phelps (SAMUEL SHETHAR), A. M., b. at Litchfield, Conn., May 13, 1793; graduated at Yale 1811; was appointed a paymaster in the army 1814; became a highly able and successful lawyer of Middlebury, Vt.; a judge of the State supreme court 1831–38; U. S. Senator 1839–51 and 1853–54. D. at Middlebury, Vt., Mar. 25, 1855.

Phelps (SYLVANUS DRYDEN), D. D., b. at Suffield, Conn., May 15, 1816; graduated at Brown University in 1844; studied divinity at New Haven; was ordained pastor of the First Baptist church, New Haven, Conn., in 1846. Author of *Eloquence of Nature, and other Poems* (1842), *Sunlight and Heartlight* (1856), *Holy Land* (1863), *Poet's Song* (1867), *Bible Lands* (1869), etc., and proprietor and editor of the *Christian Secretary*, Hartford, Conn.

Phelps (THOMAS S.), U. S. N., b. Nov. 2, 1822, in Maine; entered the navy as a midshipman in 1840; became a lieutenant in 1855, a lieutenant-commander in 1862, a commander in 1865, a captain in 1871; was engaged in many skirmishes on the rivers of Virginia and North Carolina in 1861 and 1862, and commanded the Juniata in both the

Fort Fisher fights; recommended to the department by Rear-Admiral Parker. FOXHALL A. PARKER.

Phelps (WILLIAM FRANKLIN), M. A., an American educator and author, b. Feb. 15, 1822, at Auburn, N. Y.; graduated at the State Normal School, Albany, in 1845, and at Union College, Schenectady, in 1851. For several years he was an instructor at the normal school above named; in 1855 was elected principal of the State Normal School at Trenton, N. J., and in 1856 was also placed in charge of the Farnum Preparatory School at Beverly, a branch of the normal school, jointly endowed by the State and Paul Farnum, a private citizen. Prof. Phelps held these important trusts until 1864, when he was elected president of the First State Normal School, Winona, Minn.—an office he still holds (1876). His reports on normal schools in New Jersey and Minnesota form two large volumes, and have attracted much attention both in our own and foreign countries. In 1875 he published his *Teacher's Handbook*, a professional work that has been received with marked favor by the educators and the press of the U. S. He is now engaged in the preparation of a *Manual for Country School Teachers*, and another work, entitled *The Art of Illustration*, for the use of teachers. In 1875 he was elected president of the National Educational Association for the Centennial year. He is one of the contributors to this work.

Phelps (WILLIAM WALTER), b. at New York Aug. 24, 1839; graduated at Yale College with high honors 1860; studied in Europe; graduated with valedictory honors at Columbia College Law School; commenced the practice of law, residing at Eaglewood, N. J.; became a director of several banks, trust companies, and railroads; was chosen fellow of Yale College by the alumni of that institution July, 1872; was a prominent member of Congress 1873–75, and failed of re-election by a few votes.

Phelps City, p.-v., Atchison co., Mo., on Missouri River and Kansas City St. Joseph and Council Bluffs R. R. P. 252.

Phenic Acid. See PHENOL and CARBOLIC ACID.

Phenicine, or **Phenyl Brown,** a coloring-matter first prepared by Roth in 1865 by the action of nitro-sulphuric acid on phenol (carbolic acid). The acid is added in successive portions to the crystallized phenol, the mixture being cooled after each addition as long as red fumes are evolved. The whole is then poured into cold water, and the precipitate of phenicine washed and dried. Phenicine is a brown amorphous powder, slightly soluble in water, very soluble in alcohol, ether, and acetic acid. With alkalies it forms a fine violet-blue solution, which is changed to brown by the slightest excess of acid. It dissolves also in lime-water. It consists of two coloring-matters—one yellow dinitro-phenol ($C_6H_4(NO_2)_2O$), the other a black, humus-like body, both possessing the same tinctorial properties. Phenicine dyes silk and wool without the aid of mordants. On submitting the dyed silk or wool to the action of potassic chromate, or, better, cupric chromate acidulated with sulphuric acid, the color changes to a fine garnet-red. Cupric nitrate produces a similar change, but with less intensity. Cotton mordanted with sodic stannate or tannin readily absorbs phenicine, and acquires a deep purple on subsequent immersion in hot potassic chromate, but the color is changed to blue by alkalies, and easily destroyed by soap. Strong nitric acid changes phenicine into a resinous paste, which dissolves in ammonia, forming a brown solution which dyes silk and wool somewhat like archil. C. F. CHANDLER.

Phe'nix, p.-v., Kent co., R. I.

Phe'nol ($C_6H_6O = C_6H_5OH$), **Phenic Acid, Carbolic Acid, Phenyl Hydrate, Phenylic Alcohol,** or **Coal-tar Creosote,** discovered in coal-tar by Runge, produced by the dry distillation of salicylic acid, either alone or mixed with caustic lime or baryta; of gum-benzoin, of the resin of *Xanthorrhœa hastilis*, of quinic acid, or of chromate of pelosine. It is formed when anisol is heated with concentrated hydriodic or hydrochloric acid to 130°–140° C.; by boiling the sulphate, nitrate, or hydrobromide of diazobenzene with water; by fusing potassic phenyl-sulphite with excess of potash; by heating acetylene with fuming sulphuric acid, forming the acid $C_2H_2SO_3$, and fusing this with an excess of potash; and by heating monochlorobenzene (C_6H_5Cl) with sodic hydrate. It is found in small quantity in the products obtained by passing the vapor of alcohol or acetic acid through a red-hot tube, or by distilling glycerine with calcic chloride or zinc chloride. Castoreum owes its peculiar odor to phenol. The urine of the cow, horse, and man yield it in small quantities. Commercial creosote often consists entirely of phenol, but the true creosote from wood is a totally different substance.

Preparation.—Phenol is prepared from coal-tar. The tar is separated by fractional distillation into (1) light oil of coal-tar, crude coal-tar naphtha; (2) heavy oil of coal-tar, "dead oil;" (3) anthracene oil; (4) pitch which remains in the still. From the light oil the phenol is most easily prepared. The oil is rectified by distilling with a current of steam, and leaves behind a portion known as "naphtha tailings," which contain about 15 per cent. of phenol, with very little of its homologues cresol, C_7H_8O, and phlorol, $C_8H_{10}O$. These tailings are agitated with caustic soda, the sodic compound is decomposed by an acid, and the crude phenol thus obtained as a separate layer is rectified by distillation. To remove the last portions of water the phenol is either heated to near its boiling-point, and dried by passing a current of dry air through it, or it is rectified over anhydrous cupric sulphate. The crystallization is accelerated by dropping into the liquid phenol a few crystals or fragments of the solid phenol. The small quantity of phenyl sulphide, which often gives to phenol a very offensive odor, may be separated by distillation with a little litharge. From dead oil it is more difficult to obtain pure phenol, owing to the presence of much cresol. But the mixture of the two, which is better than pure phenol for disinfecting purposes, is readily obtained. The dead oil is agitated with caustic soda, and the heavy layer of the sodic compound is decomposed by an acid. The crude mixture of phenol and cresol thus obtained is subjected to fractional distillation, rejecting the first and last portions of the distillate. By careful fractioning the pure phenol can be separated from the cresol, or by selecting the portion which boils between 366° and 370° F., dehydrating it with cupric sulphate, and placing in it a few crystals of phenol. Dead oil contains from a trace to perhaps 12 per cent. of phenol, cresol, etc., the "tar acids," according to the part of the distillate it represents, the entire product of dead oil averaging about 5 per cent.

Properties.—Phenol occurs in long colorless needles or in white crystalline masses, sp. gr. 1.065, melts at 93°–95° F., and boils at 368°–370° F. The crystals deliquesce on exposure to the air by absorbing a trace of water. A lump of fused calcic chloride causes the liquid to solidify. Phenol does not redden litmus. It smells like wood-tar creosote, and attacks the skin like that substance. It dissolves in about 20 parts of water, and mixes in all proportions with alcohol, ether, and strong acetic acid. It unites with camphor, forming a liquid. Shaken with one-fourth its weight of water and exposed to 40° F., a hydrate ($2C_6H_6O.H_2O$) crystallizes in large six-sided crystals. The aqueous solution of phenol coagulates albumen and preserves animal substances from decomposition. It even removes the fetid odor from meat which is already in a state of decomposition. Fish and leeches die when immersed in the aqueous solution, and their bodies subsequently dry up on exposure to air without putrefying. These properties have led to the extensive use of phenol as an antiseptic and disinfectant. It is used in all grades of purities—dead oil for privy vaults, sewers, cattle-yards and cars, and purer forms for street gutters, cellars, water-closets, dwellings, clothing, etc. All grades except dead oil should be mixed with 20 to 50 parts of water before they are applied, or they may be mixed with dry slaked lime, sawdust, clay, etc. and applied in powder; the first-mentioned mixture is sold under the name of carbolate of lime. Many mixtures of carbolic acid are advertised as disinfectants which are practically worthless. A mere odor of phenol is not sufficient to prevent putrefaction. (See DISINFECTION and FERMENTATION; also "Phenol as a Disinfectant," G. Grimaud, *Comptes rend.*, lxxiii. No. 3, July, 1871, and P. C. Plugge, *Am. Chemist*, iii. 183; "What Substances are truly Disinfectants," *Am. Chem.*, ii. 400; "Experiments on Disinfectants," *Am. Chem.*, ii. 141; "The Right Use of Disinfectants," H. Letheby, *Am. Chem.*, iv. 381; "The Disinfection Question," Kletinsky, *Am. Chem.*, iv. 131; "Disinfection and Disinfectants," E. Waller, *Am. Chem.*, vi. 2.) Water containing $\frac{1}{4000}$th of phenol was found to preserve bodies at the Paris Morgue. Plugge found that 1 to $1\frac{1}{2}$ per cent. killed all the small organisms in putrefying liquids, 4 per cent. arrested and prevented alcoholic fermentation, $\frac{1}{250}$th checked and stopped lactic fermentation in milk, $\frac{1}{500}$th checked and $\frac{1}{250}$th prevented peptonification of albumen. He considers phenol superior to ferrous sulphate, chloride of lime, chlorine, permanganates, and mineral acids. Dead oil has been extensively used for preserving timber. (See report of T. J. Cram, *Am. Chem.*, ii. 332.)

Phenol is highly poisonous except in an extremely dilute solution. The best antidote is olive oil, administered in large quantities. Sulphuric acid converts phenol into phenyl-sulphuric acid. Strong nitric acid converts it into trinitrophenic acid, PICRIC ACID (which see), an important dye, $C_6H_3(NO_2)_3O$. Weaker acid forms mono- and dinitrophenic acid. By the action of nitro-sulphuric acid,

added in small quantities to an excess of phenol, PHENICINE (which see) is formed. Chlorine and bromine act upon phenol, forming substitution-products. Standardized bromine-water is used as a quantitative test for phenol. An alcoholic solution of phenol is turned brown by an alcoholic solution of ferric chloride; wood-tar creosote gives an emerald green color under like conditions. Passed in vapor over zinc-dust, phenol yields benzol, C_6H_6. Phenol solutions boiled with a solution of mercurous nitrate assume a deep red color; $\frac{1}{60000}$th gives a very distinct reaction. A solution of phenol mixed with one-fourth its volume of ammonia and a few drops of a $\frac{1}{20}$th solution of bleaching-powder, and gently warmed, becomes blue (green if very dilute); sulphuric and hydrochloric acids change to red; $\frac{1}{4000}$th of phenol gives a strong blue. When a solution of 6 per cent. of potassium nitrite in concentrated sulphuric acid is added to a mixture of equal volumes of phenol and concentrated sulphuric acid, the solution becomes first brown, then green, and finally deep blue. By the action of potassic cyanide on phenol a potassic isopurpurate is formed, which is the beautiful dye "grenate brown;" it is explosive by friction when dry. By treating phenol with sulphuric and oxalic acids an important scarlet dye is obtained, known as coralline, aurine, rosolic acid, PÆONINE (which see), etc. By heating pæonine with aniline a blue dye, azuline, is obtained. Phenol unites with alkalies and other bases, though it is an alcohol, not an acid. On heating the soda compound in carbonic acid, half the phenol distils off, leaving a sodic salicylate, which is now the source of the valuable salicylic acid.

(See *Watts's Dict.*, vol. iv., 1st and 2d Suppl., articles "Phenol," "Pæonine," "Aurine," "Coralline," and "Rosolic Acid;" *Wagner's Technology*, p. 580; paper by F. C. Calvert in *Chem. News*, xvi., 297; and paper by Dr. E. R. Squibb in *Proc. Am. Pharm. Ass.*, 1868.) C. F. CHANDLER.

Phenol Colors. See PHENOL.

Phenols, a class of bodies formerly called secondary alcohols. They are derived from the aromatic hydrocarbons by substituting hydroxyl for hydrogen. Benzol (C_6H_6) yields the primary phenol, C_6H_5OH. Toluol or methyl-benzol (C_7H_8 or $C_6H_5(CH_3)$) yields cresol (C_7H_8OH or $C_6H_4OH(CH_3)$), which is not identical with benzyl alcohol, C_7H_8OH or $C_6H_5(CH_2OH)$. C. F. CHANDLER.

Phenyl (C_6H_5), a monatomic radical, which exists in aniline, phenol, etc.

Phenylamine. See ANILINE.

Phenylic Acid. See PHENOL.

Phe'ræ, an ancient city of Thessaly, in a fertile plain near Mount Pelion, 10 miles W. of its port, on the Pagasæan Gulf, on the site of the modern *Velestino*. It was a splendid and prosperous town, and under the government of the tyrant Alexander, notorious for his cruelty, it became the controlling power of the whole of Thessaly and played a conspicuous part in Greek politics. But the treachery of Alexander induced the Thebans (see PELOPIDAS and EPAMINONDAS) to aid the oppressed Thessalians; and after the battle of Cynoscephalæ his dominion was again confined to the city and district of Pheræ. He was, nevertheless, still strong enough to land troops in Attica and plunder Piræus. In 359 B. C. Alexander was murdered, and in 352 B. C. Pheræ passed with the rest of Thessaly into the hands of Philip of Macedon.

Pherecydes OF LEROS, a Greek logographer, flourished in the fifth century B. C., and lived in Athens. Of his great work on Greek mythology, often quoted, though under various titles, by ancient writers, the existing fragments have been collected and edited by Müller, in *Historicorum Græcorum Fragmenta* (Paris, 1840).

Pherecydes OF SYROS, a Greek philosopher of the sixth century B. C., was a rival of Thales and the teacher of Pythagoras. Of his work, which bears the mystical title Ἑπτάμυχος, and seems to have been a product of poetical intuition rather than of philosophical reasoning, some fragments are still extant, and have been edited by Aug. Wolf in his *Literarische Analekten* (Berlin, 1817).

Phid'ias, the greatest sculptor of Greece, perhaps of all ages and lands, b. at Athens 500 B. C.; was taught by Hegias and Ageladas; his career as a sculptor (he gave but brief attention to painting) began under Cimon, but reached its glory under Pericles, with whose splendid epoch his name is indissolubly associated. He was a man of lofty soul, majestic intellect, consummate knowledge of the principles of his art, and wonderful skill in design. The buildings that crowned the Acropolis at Athens are believed to have been erected under his direction, and much of the work—how much cannot be known—may be ascribed to his hand. The great statue of Athene in the Parthenon, of gold, ivory, and precious stones, was, there is little room for doubt, executed by him. It was finished 437 B. C. Later, he completed the colossal statue in gold and ivory of Jupiter in the temple of Olympia at Elis. It sate enthroned in the temple for 800 years, and was finally destroyed by fire about 475 A. D. Of these works, which commanded the admiration of all Greece, and have given the master an immortal renown, nothing but the fame remains. An imitation of the Jupiter's head is preserved in the Vatican Museum. Much work has been attributed to Phidias which there is reason to think he neither executed nor designed. Tradition gave him no less than nine statues of Athene in different cities—one of bronze on the Acropolis of Athens, a group of bronze figures at Delphi, and other works, a description whereof must be sought in books on sculpture. His share in the Elgin marbles is disputed. The incidents in the life of Phidias are uncertain. That he met great changes of fortune from the fickleness of his countrymen, that he shared the popularity and the unpopularity of his patron, Pericles, was accused of crimes against the state, embezzlement, and even impiety, and imprisoned, may be believed. He is supposed to have had a long life, and to have died from poison about 432 B. C. (See K. O. Müller, Flaxman, Winckelmann, Lübke.) O. B. FROTHINGHAM.

Phigali'an Marbles, a sculptured frieze from the cella of the temple of Apollo at Bassæ, near Phigalia, in Arcadia. It represents the struggles of the Centaurs and Lapithæ. By an act of vandalism it was removed in 1814 to Great Britain, and is now in the British Museum. The temple itself is one of the best preserved in Greece.

Philadelphia. See ALA-SHEHR and AMMAN.

Philadel'phia, county of Pennsylvania, bounded E. by the Delaware River, is identical in area and population with the city of PHILADELPHIA (which see).

Philadelphia, p.-v., cap. of Neshoba co., Miss.

Philadelphia, p.-v. and tp., Jefferson co., N. Y., on Rome Ogdensburg and Watertown R. R. P. of v. 384; of tp. 1679.

Philadelphia, the principal city of Pennsylvania, in population second in the U. S., and largest in territorial area, is situated on the W. bank of the river Delaware, commencing on the S. at Bow Creek, about 2½ miles below the mouth of Schuylkill River, and extending along the Delaware to Poquessing Creek, about 5 miles below Bristol, in Bucks co. Distance N. E. of Washington, 136 miles; S. E. of New York, 87 miles. By the course of the Delaware, which inclines from the extreme point of the southern boundary toward the eastward, then nearly N. and N. E., the front of the city along the river is 23 miles. The shape is irregular, and presents upon the map a rough resemblance to the head of a knight with helmet, and visor up. The western and a portion of the southern boundaries are Montgomery and Delaware cos. On the N. the city is bounded by Montgomery co. and a portion of Bucks. In 1763–64 the celebrated English surveyors, Charles Mason and Jeremiah Dixon, who were sent over to fix the boundaries between Pennsylvania and Maryland, placed the initial point of their work at the most southerly portion of Philadelphia as then laid out, a distance of about 7 miles N. of the present southern boundary. They found the situation to be 39° 56′ 29.1″ N. lat.; the longitude of the City Hall, between the Delaware and the Schuylkill, is 75° 9′ 54″. The principal streams which flow through the city are Schuylkill River, Wissahickon and Mill creeks (which empty into the Schuylkill), Hollander's, Cohocksink, Gunner's or Aramingo, Frankford, Wissinoming, and Pennypack creeks, which empty into the Delaware. The southern part of the territory on the Delaware and on both sides of the Schuylkill is low. Between Point Breeze and Greenwich Point the land rises between the Delaware and Schuylkill, and a plateau commences, gradually rising and extending as high as the parallel of Fairmount, at which there is a moderate rise between the two rivers, which continues until in the upper part of the city, at Germantown and Chestnut Hill, the land lies at a considerable altitude above the level of tide-water. The ground on the W. side of Schuylkill River rises gradually from the southern portion, and becomes hilly opposite Fairmount. N. of that point the banks of the river are lofty up to the northern boundaries. The area is 129.382 sq. m., or 82,603 acres. From the size of the city the character of the population is urban, suburban, and rural. Portions of the town are thickly settled, governed by the interests of a great metropolis. In other sections town and country interests mingle, and in yet others the population is governed by agricultural customs and all the cares of the country. The city includes what was once the county, in which were several villages of considerable size. The principal of these were Frankford, Holmesburg, Germantown, Chestnut Hill, Manayunk, and Hamilton and Mantua, now included in West Philadelphia. The streets in the well-built parts of the city are paved with granite

blocks and cobble-stones, the footways with flagstone and brick. The houses are in great majority of red brick, the sombre appearance of which is gratefully relieved by doorways, window-heads and sills, and steps of white marble, of which latter material there is abundance a few miles distant from the city. Of late years the painful uniformity in the style of building has been broken up by the introduction of other materials—brownstone, sandstone, green serpentine, white and blue marble, iron, and light-colored brick. Almost every house of modern construction, however humble it may be, is provided with a bath-room supplied with hot and cold water from a kitchen range, and there are water-closets, small portable heaters in the cellar, and gas-fixtures in every room. The baths supplied by the city waterworks in 1875 were 51,214—a number far exceeding any other city in the world. At the same time 122,961 dwelling-houses were supplied with water from the city works. Every house has space adjoining for a yard or a garden, so that ventilation can be secured. By a law passed in 1855 no new house can be built on a street of less than 20 feet in width, and every dwelling-house must have adjoining it on the side or in the rear not less than 12 feet square of open space. In the number of dwelling-houses Philadelphia exceeds any city in America, and perhaps is only surpassed in that particular in Europe by the city of London. In 1870, according to the U. S. census, there were 112,366 dwelling-houses in Philadelphia, in which lived 674,022 persons, of whom 490,398 were native and 183,624 foreign-born. The whites were 651,854, the colored 22,147, Chinese 13, Indians 8—an average of 6.01 persons per dwelling-house. There were at that time 127,746 families—an average of 5.28 per family. Since the census of 1870, according to the returns made by the building inspectors, there were built in the year 1870, and up to the end of 1875, 28,249 new dwelling-houses and 4117 other buildings. In Mar., 1876, the city police, under orders of the mayor, counted the dwelling-houses, and returned the number at 143,936. By municipal census Apr. 1, 1876, the population was returned as 817,448 : males over 21, 226,070 —under, 171,998; females over 21, 246,634—under, 172,746. Total males, 398,068; total females, 419,380. The buildings of all kinds are at least 150,000. The tenement-house scarcely exists in the city; the greater portion of the population includes but a single family to each house; and these advantages, with incidental comforts, have gained for Philadelphia of late years the pleasant appellation of "the City of Homes." There are over 600 building associations in operation, having a very large aggregate capital, which is derived from the payments of the members, so that the borrowing of money for building purposes is easy. The system of selling land on ground-rent, by which the purchaser becomes possessed of a lot of ground upon no other obligation than to pay in the shape of rent the annual interest on the original value of the ground, has greatly facilitated building operations. The purchaser is free from the danger of foreclosure, as would be the case upon mortgage, and the seller cannot demand the principal, yet is compelled to take it and extinguish the rent whenever offered.

The streets were originally laid out so as to run nearly due westward from Delaware River, intersected by other streets running nearly N. and S. This plan has been generally carried out, although in some portions of the city the directions of the streets are different in accordance with the formation of the ground. The streets, however, cross at right angles almost everywhere. There are about 1200 miles of streets opened, and over 700 paved. The Schuylkill is crossed by 14 bridges, 3 of which are for special railroad use; 3 for railroad and general use; 8 are entirely for city travel. The finest bridge is at Girard avenue, in the Park. It is of iron, of light and handsome construction, is 1000 feet long and 100 feet in breadth, being wider than any other in Europe or America. The sidewalks are 16½ feet each, and the roadway 67 feet wide. The Spring Garden (or Callowhill) street bridge carries two streets, one upon the upper deck and one upon the lower. It is of iron and very handsome in appearance. It is 1290 feet long and 48 feet wide. The upper floor, which connects Spring Garden street, is 32 feet above the lower floor, which continues Callowhill street. The whole length of the bridge, abutments, and approaches is 2730 feet. At Chestnut street is a handsome iron and stone bridge 1528 feet long, of two spans of 398 feet each. South street bridge is built with a draw, which opens two water-passages of 77 feet each. Its length with its approaches is 2419 feet. The Market street bridge, which was the oldest in the city, being finished in 1804, was totally destroyed by fire Nov. 20, 1875. A practicable structure was built at the same place by the Pennsylvania Railroad Co. in 28 days. The new construction is larger and better than the old, and, although a temporary affair, seems strong enough to last for twenty years.

The streets in the built-up part of the city are lighted with gas; at the end of 1875 there were 10,729 public lamps. The gas-mains (city and Northern Liberties works) extended 672 miles; the street water-mains at the beginning of 1876 were 662 miles in extent; drainage is carried off by 136½ miles of sewers and culverts. Means of transportation between various parts of the city are particularly necessary in consequence of the wide extent of ground which it covers. There are 19 horse-railroad companies, the tracks of which are laid down upon 242 miles of streets. They had in use at the beginning of 1875, 903 cars, drawn by 5490 horses, and in the year 1874 carried 76,465,489 passengers. The receipts from passengers alone were $4,355,231.14. There is a good deal of local travel by the large railroads operated by steam. They convey numerous passengers daily to and from the stations on the lines of their roads within the city. Water is supplied by 6 pumping-works operated by steam and water-power. There are 7 great reservoirs, and a very large one, which is to have a capacity of 750,000,000 gallons, is partially completed in the East Park. Fairmount, Schuylkill, Belmont, and Roxborough and Chestnut Hill works are upon or near Schuylkill River. The Delaware works furnish water from Delaware River to the north-eastern portion of the city. Another pumping-station has been projected upon the Delaware above Frankford, and the construction authorized. In 1875 the city works supplied 15,097,160,906 gallons. The price of water is low; the assessments for water-rents in the year 1875 were $1,025,278.50; for 1876, $1,093,864. The gas manufacture is principally by the city works at Market street, Callowhill street, Point Breeze on the Schuylkill, and Manayunk, 21st Ward. New works will shortly be erected on the Delaware above Port Richmond. The Northern Liberties gasworks are upon Laurel street below Front. The city works manufactured in 1875, 1,873,192,000 cubic feet of gas, which was an increase over 1874 of 106,924,000; the Northern Liberties works manufactured 87,744,590 cubic feet; total, 1,960,936,590 feet. Gas is supplied since Mar. 1, 1876, at $2.15 per 1000 cubic feet. The receipts for sale of gas by the city works were $2,877,348 in 1875. The public lights consumed 313,373,748 cubic feet. The total number of lights supplied by the city works was 1,191,393. The average illuminating power of the city gas was equivalent to 16.61 candles.

The food-supply has always been abundant and varied. A rich agricultural and grazing country surrounds the city, and the means of access to the markets are easy. Meats, poultry, fish, oysters, butter, eggs, and vegetables of all kinds suitable to the seasons are plentiful, and the prices moderate. It is impossible to obtain statistics of the food-supply, the sources being so many. The trade is not only in the hands of butchers and dealers in provisions, but in those of countrymen, fishermen, hucksters, etc. coming directly to market. The meat consumption is estimated at a weekly average of 4500 beef cattle, 15,000 sheep, and 10,000 hogs. At the droveyards in 1875 there were sold 141,000 beeves, 11,720 cows, 491,500 sheep, and 243,300 hogs. There are 28 market-house buildings belonging to corporations specially erected for use as places for the sale of food and provisions. Some of these are very large, costly, and elegant, being attractive and stately in exterior appearance, and within secured from all unpleasant odor by lofty ceilings and the ventilation which is ensured. The corporation of the city owns seven street-markets, relics of the past, which occupy the middle of highways in which they are located. They are together about 2½ miles in extent.

The health of the population is much improved by the manner of building, the amount of ventilation in private houses, the freedom allotted to each family, the supply of water, and the system of drainage. In 1875 the total number of interments in the city was 17,805 persons. Of these, 9100 were males and 8705 females; 16,871 white, 934 colored. The adult deaths were 8716; children, 9089. According to the estimate of the board of health of the population July 1, 1874, the death-rate was 19.66 per 1000 persons. The English registrar-general in 1872 found the highest death-rate to be at Madras, 37.6; Vienna, 34.4; New York, 30.1; Paris, 24.4; London, 22.7. The number of registered births in 1875 was 17,933; number of registered marriages, 6144.

The city government is controlled by a mayor and councils. The city councils sit in Independence Hall, occupying the second story. The mayor's office is in City Hall, corner Fifth and Chestnut streets. Various other public offices are upon the square, but in consequence of want of space several are placed in other parts of the city. A new city hall was commenced at Broad and Market streets in Aug., 1871, and is partially built. It will be of granite and marble, 470 feet in length from E. to W., and 486½

feet from N. to S. It is to be surmounted by a tower crowned by a statue of William Penn at the altitude of 450 feet—the highest tower in the world. The design is in the Renaissance style, and very rich and elaborate. The area is larger than that occupied by the buildings of the U. S. Capitol at Washington.

The total of city expenditure for 1875 was $13,446,451.73. Total receipts, including balance from 1874, $15,774,375.33, with a cash balance Jan. 1, 1876, of $2,463,502.72. This return does not include a floating debt unpaid at the end of 1875. The amount of funded and floating debt Jan. 1, 1876, was $69,716,524.17; assessed value of taxable property Jan. 1, 1876—at full rate, $537,213,282—tax, $2.05 per $100; suburban, $38,031,673—rate, $1.36⅔; farm, $20,168,423—rate, $1.02½; aggregate tax, $11,739,364.81. In addition, there was a public-building tax of 10 cents per $100, equal on all property—making the full rate, city, $2.15, suburban, $1.46⅔, farm, $1.12½.

The police force is under the control of the mayor. It numbered at the end of 1875, 1 chief of police, 1 fire marshal, 4 captains, 27 lieutenants, 25 turnkeys, and 1200 patrolmen. The force is to be considerably increased in 1876. There are 24 police districts and 26 station-houses, the Delaware and Schuylkill harbor police having stations of their own. There are 24 magistrates' courts for police and civil causes. There are 4 courts of common pleas, with 3 judges each, who sit at the State-house and have 7 court-rooms for their use. These judges by turn sit in the quarter sessions and oyer and terminer for the trial of criminal cases, having two court-rooms. The orphans' court has 3 judges. The supreme court of Pennsylvania sits in the State-house in full bench during several months of the year. The U. S. circuit and district courts are held in the post-office building, entrance on Library street near Fifth. The fire department consists of 36 companies, accommodated at 35 fire-stations, and had in Jan., 1875, 34 steam fire-engines, 4 hand-engines, 13 hose-carriages, 5 hook-and-ladder trucks, fuel-wagons, etc. The department consists of 1 chief engineer and 5 assistants, with a total force of 389 men and 123 horses. A signal

New City Buildings.

fire-alarm is connected with a police telegraph. There were 202 fire-alarm telegraph-boxes in Jan., 1876, and 5636 fire-plugs. The total number of fires in 1875 was 669, with an estimated loss of $1,193,970.05, covered by an insurance of $6,545,789. A fire-patrol service is maintained in the central part of the city at the expense of insurance companies, and is supplied with wagons and horses, gum and linen covers; it is the duty of the men to attend fires, rescue property, and cover goods to prevent them from being wet.

The manufactures are extensive, and greater in the variety of articles made, the number of persons employed, and the value of materials used than in any other city in the Union. New York exceeded Philadelphia in 1870 only in the value of the articles manufactured. The plentifulness of water, proximity to coal-fields, together with the breadth of the space available for large manufacturing establishments, and the comfort which mechanics may enjoy with their families, have contributed to this result. In 1870 the census statistics, revised by the board of trade, showed that the number of establishments in the city and vicinity operated upon Philadelphia capital and account was 8579. They employed 152,550 hands, of whom 100,661 were males above the age of 15 years, 40,760 females above the same age, and 11,129 children and youth. The amount paid in wages during that year was $68,647,874; capital employed, $204,340,637; value of materials used, $193,861,297; value of manufactured productions, $362,484,698. There were in the census tables nearly 100 classes comprising articles made in the city. The increase since 1870 can only be estimated. In the latter year there were in use 2177 boilers and steam-engines of 57,304 horse-power, and 59 water-wheels of 2696 horse-power. The boiler inspector of the city reports that there were 3068 steam-boilers in use at the beginning of 1876, an increase of 891, or over 33 per cent., in five years. At this ratio the number of manufacturing establishments at present would be nearly 11,500. Concerning the capital employed, a safe estimate might place it in 1876 at from $225,000,000 to $250,000,000.

The commerce of the port has been increasing for several years. The foreign trade shows the following results:

Years.	Exports.	Imports.
1870	$16,640,478	$14,952,371
1871	20,688,551	19,564,558
1872	20,484,803	26,304,051
1873	29,633,186	29,186,925
1874	29,878,911	25,004,748
1875	31,936,727	23,457,334

The amount of duties received at the custom-house in 1875 was $8,164,518.71. The vessels employed in the foreign

trade which entered the port were 501 American, of 563,528 tons, and 604 foreign, of 388,751 tons. The American vessels brought in goods worth $14,850,751; foreign vessels, $8,606,583; total, $23,547,334. Entries coastwise with foreign goods, tonnage 536,092. The total of arrivals, coastwise, was 8238 vessels; foreign, 1126; total, 9364 vessels. The principal importations were from England, value, $12,318,666; Cuba, $6,111,401; Belgium, $1,266,933. Of the articles imported the most valuable were cotton manufactured goods to the value of $1,122,292; tin in plates, $1,805,229; wool, manufactured, $2,575,986. There came through the port of Philadelphia destined to interior parts goods worth $1,123,975. The principal exports in 1875 were—of breadstuffs, petroleum (crude, refined, naphtha, and benzine), provisions, leaf tobacco, cigars, snuff, and cotton in bales, $17,819,798. Of the exports, more than one-half in value went to England, Scotland, and Ireland, $5,325,216 to Belgium, and $2,742,783 to Germany. There was a large increase in the exportation of breadstuffs and provisions over former years. In 1871 the value of the breadstuffs shipped from the port was $4,148,595; in 1874 it was $8,159,371; in 1875, $9,222,971. The increase of the trade of the port has been very much assisted by the establishment of new lines of steamships to Europe. The American Steamship line, plying between Philadelphia and Liverpool, and the International and the Red Star lines, from Philadelphia to Antwerp, have direct communication with all ports of the U. S., the Pennsylvania R. R., carrying freight to the ships' sides, affording great facilities for loading and unloading. The shipment of grain is aided by the use of elevators, one of which is at the dépôt at the foot of Washington avenue, and the other at the International Navigation docks at Girard Point on the Schuylkill. The Washington avenue elevator has storage capacity of 500,000 bushels, and can load three vessels at once. The Girard Point elevator is 200 feet long, 100 feet wide, and 124 feet high to the peak of the roof. It has a capacity of 800,000 bushels, and 6 vessels can be loaded at one time. The Pennsylvania R. R. Co. has a grain-storage building on the W. side of the Schuylkill, at Market street, 550 by 125 feet, with a storage capacity of 300,000 bushels, and can unload 125 cars, containing 45,000 bushels, a day. This railroad reaches tide-water on the Delaware at Greenwich Point in the lower part of the city, has branch tracks to Gibson and Girard Points on the Schuylkill, and is carried up the Delaware to Dock street, where there is a large freight dépôt for the receipt and delivery of goods to vessels. The steamships of the American line are of the first class, built of iron at Philadelphia, and are the only steamships plying between America and Europe which fly the American flag. The departures are weekly, and 6 ships are employed. The International line to Antwerp has 2 steamships, and makes semi-monthly trips. These vessels carry the Belgian flag. There are ocean steamship lines to Boston, New York, Charleston, and Savannah, and steam lines to various places N., E., and S. by canals. The provision trade, from $341,382 in 1871, had increased in 1875 to $6,381,408. The petroleum trade is very important. In 1875 there was exported from Philadelphia to foreign countries petroleum (crude, refined, naphtha, and benzine) valued at $7,927,399. Germany, Belgium, and the Netherlands take the largest portion of this product. Coal shipments are very large from the wharves of the Reading R. R. and the Lehigh Navigation Co. The greater proportion of these shipments is for American use. In 1874 the Reading R. R. Co. brought to Philadelphia 3,140,563 tons, and shipped from Port Richmond 2,051,127. There were carried through the Lehigh Canal 792,783 tons. The Reading R. R. Co. maintains a line of 14 steam-colliers. At its extensive wharves at Port Richmond are 23 piers with docks between, so that nearly 300 vessels can be loaded with coal at the same time. From 30,000 to 40,000 tons can be loaded every day. The petroleum trade concentrates principally at Gibson's Point on the Schuylkill, and at Greenwich Point on the Delaware, where there are extensive storage accommodations and pumping machinery to carry the oil into the vessels. Navigation is kept open in winter by the service of three powerful iceboats owned by the city.

Iron shipbuilding is carried on at Cramp & Son's yard, in which the steamships of the American line were built. The Philadelphia and Reading Coal and Iron Co. occupies an immense yard for the purpose of building iron ships for its own use; it has great buildings, launching docks, dry docks, shipways, etc. There are several other establishments for building iron ships in and near the city. The Pennsylvania Warehousing Co. has a powerful steam cotton-press at the foot of Queen street on the Delaware, which is capable of pressing a bale of cotton per minute. Commercial and business interests are guarded by the Commercial Exchange and the Chamber of Commerce, which have a large building on Second above Walnut; by the Board of Trade, and by 6 special trade exchanges. The elegant Merchants' Exchange of marble at Dock and Walnut streets, originally built entirely for mercantile uses, has for some years been diverted to other purposes.

The principal railroads which have their dépôts in the city are the Pennsylvania, which operates and controls more than 2000 miles of railroad in the U. S. and runs 1000 locomotives, 25,000 freight and 5000 passenger cars. It has 2 freight and 3 passenger dépôts in the city. The business offices of the company are in Fourth below Walnut street in a very large and imposing marble building. The office of the Philadelphia and Reading R. R. Co. adjoins the former on Fourth street, and is of brownstone, presenting a stately appearance. This company owns 1400 miles of road, 400 locomotives, 16,000 coal, 3600 freight, and 225 passenger cars. The dépôts are at Port Richmond, Thirteenth and Callowhill streets, and Ninth and Green. Other railroads are the North Pennsylvania to Bethlehem and the Lehigh Valley; the Philadelphia Wilmington and Baltimore; West Chester, to the town of that name in Chester co.; West Jersey, from Camden, opposite the city, to Cape May, N. J.; and Camden and Atlantic, to Atlantic City, N. J. The Baltimore Philadelphia and New York R. R., a new line, will be opened in 1876. The Lehigh Valley R. R. is considered a Philadelphia corporation, and has its main office in the city. The North Pennsylvania and Schuylkill Navigation Cos. have large and convenient office-buildings. Coal is brought in by nearly all the railroads, and by canal and Delaware River to the Lehigh Navigation Co.'s wharves at Windmill Island, opposite the city, and by Schuylkill Canal. The Delaware and Chesapeake Canal gives access to Baltimore, and connects with the Tide-water Canal extending on the Susquehanna to Harrisburg. The Pennsylvania Canal is in good order from that point to Pittsburg. The Delaware and Raritan accommodates the trade with New York.

There are 31 national banks, with a combined capital of $17,335,000, and 10 banks acting under State charters, with a capital of $2,100,950. Of these, the Bank of North America is the oldest in the country, having been chartered by the Continental Congress Dec. 18, 1781. It occupies a fine brownstone building in the Florentine style of architecture in Chestnut street near Third. The finest bank-buildings are upon Chestnut street. The Philadelphia, formed in 1803, occupies a massive granite building. The Farmers' and Mechanics' bank-building, of white marble in the Palladian style, adjoins. A few feet farther W. the Girard building, lofty and handsome, is occupied by the People's (State) bank. The First National has a massive granite building between Third and Fourth. The Girard National bank occupies a classic structure, with Grecian front and pediment, built for the use of the first Bank of the U. S. in 1798. There are 4 principal savings fund societies, the oldest, the Philadelphia, established in 1816, occupying a fine granite building at the corner of Walnut and Seventh streets. This society accepts very small deposits, and holds in trust over $4,000,000. Three trust companies have life insurance powers, and combined capitals of $1,800,000; 5 safe deposit and trust companies occupy buildings of elegant appearance and strongly built for the security of valuables. The Fidelity, Philadelphia, and Guarantee are upon Chestnut street. The two former occupy elegant buildings of fine white marble. The Guarantee has a very solid and peculiar-looking edifice in the Venetian style, of brick, graystone, blackstone, and tiles. There are 43 fire insurance companies acting under State charters, of which the Philadelphia Contributionship, incorporated Mar. 25, 1752, is the oldest in America. There are 7 fire and marine and 12 life insurance companies. Many American and foreign companies have agencies and do a large business. The most conspicuous of these is the New York Mutual Life Insurance Co., which occupies a magnificent fire-proof building at Tenth and Chestnut, of granite and iron, four stories high, which cost $1,000,000.

The U. S. custom-house and sub-treasury occupy a building on the S. side of Chestnut street, between Fourth and Fifth, of white marble, which extends through to Library street, 119 feet wide and 225 feet deep. The porticoes are in Doric style, and the building has long been considered one of the finest specimens of Greek architecture in the world. It was originally constructed for the second Bank of the U. S. The U. S. appraisers' building, Second street above Walnut, running through to Dock, is five stories in height, built of brick and iron, and considered thoroughly fire-proof. Adjoining the custom-house is the post-office, with a front of marble in the French style, the upper stories being occupied by U. S. courts and offices. The post-office, by the hands of 227 carriers, delivered 42,590,669 mail and local letters, postal-cards, and newspapers in 1875, being an increase of over 6,500,000 missives

upon the business of the former year; 31,537,843 letters, etc. were collected from local mail-boxes, being an increase of 4,500,000. Sales of stamps, envelopes, etc. amounted to $988,630.96; the money-orders issued were 40,333, amounting to $776,057.35; orders paid, 176,674, amounting to $2,217,623.84; international money-orders issued in 1875, 3794, amounting to $65,971.67, and paid 2564, amounting to $47,220.89. Foreign letters received, 631,542; sent, 780,361, showing considerable increase over the preceding year. There are 21 sub-post-offices in the city, and 913 street letter-boxes. The present post-office is entirely too small, and a new post-office building has been begun at the corner of Ninth and Chestnut streets. The cost is limited by Congress to $4,000,000; style of architecture, French Renaissance; length of building, 428 feet; width, 152; height to top of dome, 184 feet.

The U. S. Mint, corner of Juniper and Chestnut streets, is of marble; style of building, Grecian Corinthian. During the fiscal year ending June 30, 1875, there were coined at the mint of gold, silver, copper, and nickel 37,080,440 pieces, valued at $11,514,835; fine gold bars for commercial purposes were made worth $30,383.20; silver bars, $163,787.21. The U. S. government has 2 arsenals—1 at Frankford, on Tacony Creek, grounds contain over 62 acres. It is principally used for the manufacture of cartridges and other articles; 10,500,000 cartridges were made at this arsenal during the fiscal year 1874–75. The Schuylkill Arsenal, on Gray's Ferry road, occupies about 8 acres. It is employed as a great workshop and storehouse of clothing for soldiers, including everything that they wear or use in garrison or camp life, except arms. The value of goods on storage is very great, and the disbursements for materials and wages have frequently been as high as from $14,000,000 to $20,000,000 a year. The U. S. Navy-yard is at League Island, near the mouth of the Schuylkill, distant from Independence Hall about 7 miles. It is about 2 miles in length from E. to W., and from a quarter to half a mile wide. Area, including the back channel, 923 acres; depth of water in front, 26 feet. The Delaware at that point is 2800 feet wide. The back channel is a commodious harbor for monitors and other vessels. There are large buildings and docks upon the island. The repairing basin occupies 39 acres, the fitting-out basin 40 acres, and the storage-dock basin 7 acres. This island is marked upon the oldest map known of the Delaware River, that of Peter Lindstrom (1654–55). It was bought by the city of Philadelphia in 1862 for $310,000, and presented to the U. S. government for a navy-yard. The U. S. Naval Asylum, Gray's Ferry road below Bainbridge street, is of marble, 3 stories high, and stands upon a lot of about 25 acres. There are

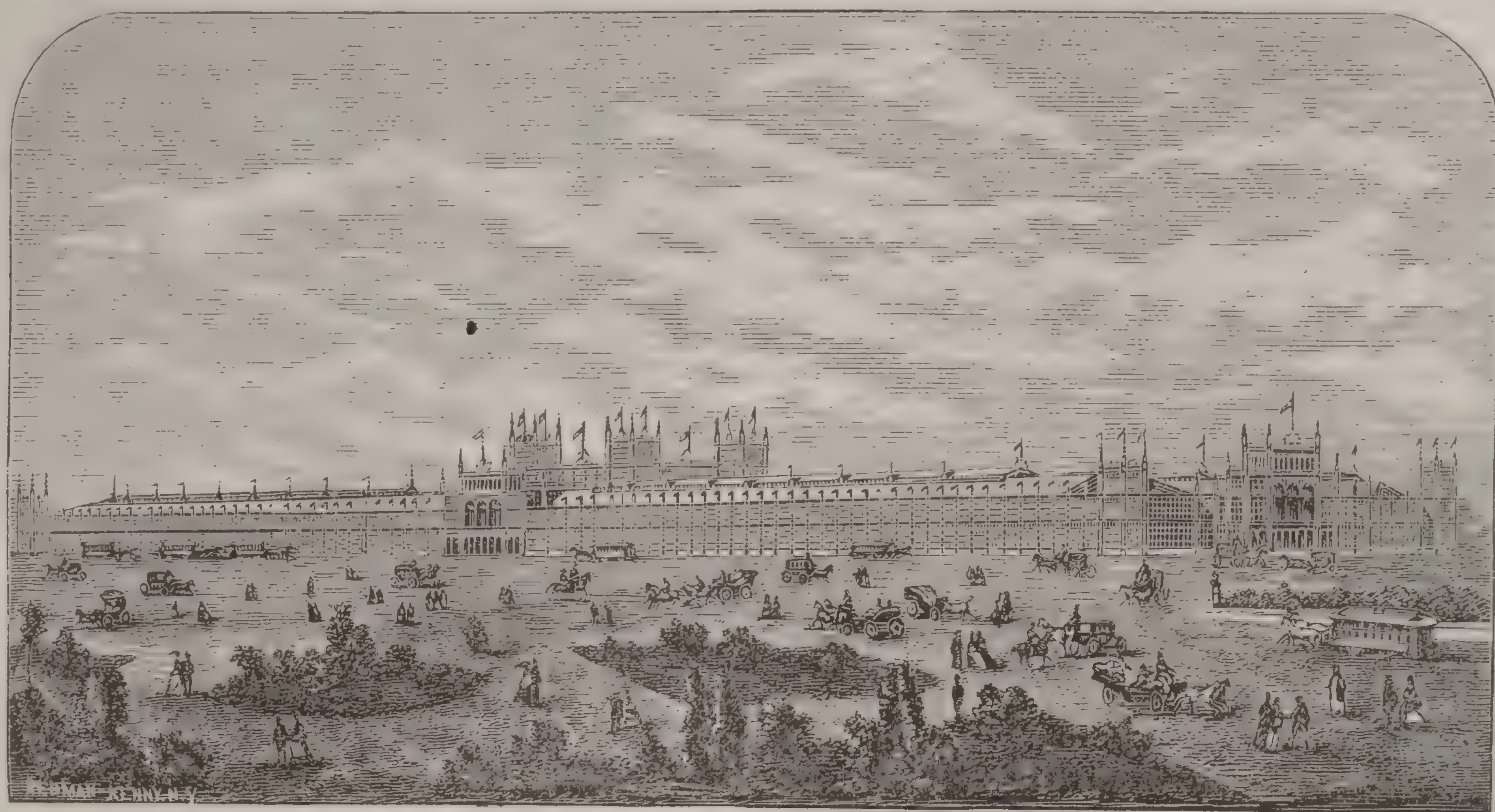
New Post-Office.

accommodations for 300 naval pensioners. The U. S. Hospital adjoining is of brick, was finished in 1868, and will accommodate 140 patients.

Among the prisons is the Eastern Penitentiary, on Fairmount avenue, of granite and stone in castellated style, 670 feet front; lot about 11 acres. The county (or Moyamensing) prison, Passyunk road near Tenth street, has a front of Quincy granite in the Tudor style of Gothic castle architecture; the female prison adjoining is of brownstone in the Egyptian style. There are cells for 400 males and 100 females. The House of Correction near Holmesburg, in the N. E. portion of the city, is massive and of great size, and built of stone. There are a central building and 8 extensive wings, with cells sufficient to hold 3000 persons. The House of Refuge for the reformation of boys and girls has 3 buildings of brick at Twenty-third and Parrish and Poplar streets. The Almshouse is on the W. side of the Schuylkill, S. of Darby road. The grounds occupy 30 acres. There are 5 main three-story buildings extending from the central buildings. One of these is occupied by the Philadelphia Hospital, the oldest in the country, founded in 1732. The insane department has constantly from 1000 to 1200 patients. The almshouse buildings hold at times a population of over 4000 persons. The cost of maintaining the institution and out-door poor in 1875 was $568,080.35; in 1874, 76,072 out-door poor were assisted.

The educational institutions are many. The University of Pennsylvania, which may date its foundation from the academy founded by Franklin and others in 1749, occupies a lot of ground in West Philadelphia of more than 6 acres. The buildings are the largest and most conveniently arranged college structures in the country. The departments of science and art occupy an edifice 254 feet long by 124 feet in depth, 4 stories high, built of green serpentine and graystone in collegiate Gothic style, which is very attractive. The towers, pinnacles, gables, etc. make a fine appearance in the distance. In the same enclosure the medical department occupies another building of greenstone, in harmony with the style of the main building. There are accommodations for 600 medical students. The University Hospital, also of greenstone, occupies a portion of the ground. Girard College, for white male orphans, built under the trusts of the will of Stephen Girard, stands upon a lot of 41 acres at Ridge avenue and Nineteenth street. The main building is of marble, 169 feet long, 111 feet wide, and is surrounded on all sides by a range of fluted columns, 38 in number, 55 feet in height, 9 feet 3 inches in diameter at the base, and surmounted by richly-carved capitals. There are several outbuildings of marble for the accommodation of the professors and pupils. There are 20 professors and teachers, and in 1875 there were over 500 pupils. The cost of the building and grounds was $1,933,821.78. There are numerous other academies, schools, seminaries, and colleges in the city, charitable and under the control of religious denominations. There are 4 colleges for medical instruction, three of which—the University, Jefferson, and the Woman's College—are allo-

pathic, and the Hahnemann, homœopathic. The College of Pharmacy is devoted to the instruction of students for the business of apothecaries and druggists. There are 2 dental colleges, and a Polytechnic college devoted to instruction in engineering, mining, etc. The public schools are managed by the board of education and the school directors elected in the various sections. There were at the beginning of 1876, 198 public-school buildings, the value of which, with the appurtenant ground, was $5,288,672; school furniture a little under $290,000. There are 1 central high school for boys, 1 normal school for girls, 63 grammar, 29 consolidated, 127 secondary, 224 primary, and 47 night schools; total, 492; teachers in day schools, 1886; in night schools, 286; number of day and night school pupils in at-



Main Exhibition Building.

tendance, 109,695. The expenditure for the support of schools in 1875 was $1,634,653.26. The school buildings are scattered all over the city, many being of brick, but those built during late years of stone. The boys' high school is of brick; the girls' normal school is a large and handsome edifice of greenstone. The principal scientific institutions are the College of Physicians, which possesses a valuable museum and library, and the Academy of Natural Sciences, building of greenstone, at the corner of Nineteenth and Race streets, the museum of which contains 600,000 specimens of birds, shells, fishes, reptiles, mammals, with minerals, plants, etc. The collection of humming-birds alone contains more than 30,000 specimens. The Zoological Society facilitates the study of natural science at the Zoological Gardens, Fairmount Park. The grounds contain 33 acres, laid out with walks, flower-beds, etc. In the enclosure are a carnivora-house, aviary, monkey-house, eagle-house, pachydermata-house, bear-pits, restaurant, and other buildings. The cost of the buildings has been more than $200,000, and the collection of animals is large and interesting. The American Philosophical Society occupies a building upon Independence Square, in Fifth street below Chestnut. It contains a library and museum. This society originated from the Junto established by Dr. Franklin and others in 1743. The Wagner Institute of Science (free) occupies a building at Seventeenth street and Montgomery avenue. The Franklin Institute for the promotion of mechanic arts, established in 1824, has a building of marble containing a library, museum, and lecture-room on Seventh street below Market. The Horticultural Society occupies a very fine hall, 75 feet front and 200 feet deep, with sandstone front, on Broad street N. of Spruce, adjoining the Academy of Music.

The Academy of Fine Arts, with a new and exceedingly

Machinery Hall.

striking building fronting 100 feet on Broad street and 260 feet in depth on Cherry street, is devoted to the promotion of drawing, painting, and sculpture, maintains a free art-school, and possesses a fine collection of statues and pictures. It was instituted in 1805. The School of Design for Women, at Filbert and Merrick streets, furnishes instruction in the decorative arts. Music has been cultivated by the Musical Fund Society for many years at its hall, Locust street above Eighth, and by the Handel and Haydn and other associations.

The oldest library is the Philadelphia, which occupies an old-fashioned brick building at the corner of Fifth and Library streets. It was founded July 1, 1731, by Benjamin Franklin and others. The company owns about 100,000 volumes. A fund amounting to about $1,500,000 was left by Dr. James Rush in 1869 for the

purpose of erecting a library building and for the support of the institution. The whole property is directed to be appropriated to the use of the Philadelphia Library Co. if the stockholders shall accept; if they decline, the institution is to become a free library under the name of the Ridgway Library, so called from the maiden name of the wife of Dr. Rush. The building, nearly finished (1876), is at Broad and Carpenter streets, and is of granite, with three porticoes on the front; 220 feet front, 105 feet deep. The Mercantile Library, Tenth above Chestnut, has a large number of members and 128,000 books. The Athenæum, Sixth below Walnut, occupies a building of brownstone in the Palladian style. It has a large library and a reading-room. The Apprentices' Library, corner of Fifth and Arch

Memorial Hall.

streets, loans its books free to boys and girls, young men and young women, and has 23,600 books. There is also a reading-room. The Pennsylvania Historical Society, Spruce street above Eighth, has a very valuable collection of historical books and MSS. and a museum of relics and curiosities. Numerous other libraries, corporate and denominational, possess a large number of books. There were in 1870 nearly 3700 libraries in Philadelphia, public and private, having 2,985,770 volumes.

The benevolent institutions are numerous. There are 24 hospitals for the relief of the sick and afflicted. The oldest of these, next to the Philadelphia Hospital at the almshouse, is the Pennsylvania, which was proposed in 1750 by Dr. Thomas Bond. It occupies the square bounded by Spruce, Pine, Eighth, and Ninth streets, and being built of brick in the old style of architecture, presents a venerable appearance. Connected with the institution are two insane hospitals for male and female patients, situate on the W. side of the Schuylkill upon a plot of ground of 111 acres. The buildings are of stone and very extensive, and each will accommodate about 250 patients. There is an insane asylum near Frankford under control of the Society of Friends. The hospital of the Protestant Episcopal Church, corner Lehigh avenue and Front street, covers a square of ground, and is an imposing brownstone building in the Norman style, 258 feet front, 256 feet deep in the centre, with wings of 200 feet; its capacity is 300 beds. St. Joseph's Hospital, Girard avenue and Seventeenth street, is of brick, four stories high, under control of the Sisters of Charity of the Roman Catholic Church; the number of beds is 250. The Presbyterian Hospital, Thirty-ninth and Filbert, has accommodations for 100 patients. University Hospital, Spruce street and Thirty-fourth, has at present accommodations for 146 patients. There are in addition the following: German, St. Mary's (R. C.), Jewish, Friends' Asylum for the insane, Municipal, Charity, Preston Retreat, Wills (for the eye), Orthopedic, Children's, Homœopathic, Women's, State, Gynæcological, and Mission. A new hospital building has been begun which is to be attached to the Jefferson Medical College. All the hos-

Horticultural Hall.

pitals under the management of religious sects are open to the afflicted without reference to their religious belief; besides the hospitals there are 15 dispensaries for the supply of medicines and medical attendance gratis to the poor.

There are 21 asylums for orphans and abandoned children, some of which occupy very large and elegant buildings. There are 19 homes for aged men and women. An asylum for the deaf and dumb, corner of Broad and Pine streets, occupies a block extending to Fifteenth street. The Pennsylvania Institution for the Blind, corner of Twentieth and Race streets, is devoted to the instruction of that class of unfortunates. There is a Working Home for blind men, and one for blind women, where they are given shelter and employment; for the reformation of fallen

women there are 5 asylums. There are two homes for inebriates; 11 industrial aid societies extend assistance to those who are willing to work and will embrace the opportunity. For assistance of various classes of persons there are 13 societies. There are 10 soup societies which supply the poor with food in winter. The national societies established for the relief of foreigners in distress are the German, St. George's and Albion (English), St. Andrew's (Scotch), Welsh, French, Hibernian, Swiss, and Italian. The German society has a hall on Seventh street above Chestnut. The St. George's society has lately finished a very elegant hall of white marble at Thirteenth and Arch streets. Among the principal halls of the charitable orders and associations is the Masonic Temple, corner of Broad and Filbert streets, built of granite, 150 feet by 245; the apex of the roof is 95 feet from the pavement and the highest tower 250 feet. The Norman porch is exceedingly elaborate. The interior is grandly finished in various styles of architecture. The hall is the finest Masonic structure in the world, and cost $1,300,000. There are 6 Masonic halls in other parts of the city. The principal Odd Fellows hall is on Sixth street below Race. There are 8 other Odd Fellows halls. The order of United American Mechanics has a large hall at the corner of Fourth and George streets, and the Independent Order of Red Men a stately brick building at Third and Brown streets. The leading social club is the Philadelphia, established in 1834, which occupies a large and plain-looking brick building at Thirteenth and Walnut streets. The Union League has a splendid club-house, of brick with brownstone trimmings, in the French style, at the corner of Sansom and Broad streets, which occupies the greater portion of a lot 100 by 200 feet. The Reform Club, also social and political, occupies a spacious building with marble front on Chestnut near Sixteenth street.

There were 534 religious congregations, including Israelites, in Jan., 1876, nearly all of which were provided with churches and buildings for worship. The Baptists had 71 churches; Congregational, 2; Evangelical Association, 6; Friends (Orthodox), 8 meeting-houses; Friends (Hicksite), 8 meeting-houses; Israelites, 9 synagogues; Lutherans (General Council), 22 churches; (General Synod), 6; (German Mission Synod), 1; (Independent), 1; Methodists, including African M. E., 104; Moravian, 4; New Church (Swedenborgian), 3; Presbyterian, 78; Presbyterian Reformed, 13; United Presbyterian, 11; Protestant Episcopal, 93; Reformed Episcopal, 5; Reformed, 20; Roman Catholic, 43; Unitarian, 2: Universalist, 4; other sects, 21. The churches of historic interest are Gloria Dei (Old Swedes'), on Swanson street near Washington, built in 1700; Christ church, Second above Market, commenced in 1727, finished in 1744; Trinity church, in Oxford township, 2 miles N. W. of Frankford, built 1709–14; St. James, Kingsessing (Swedish), built 1762–63; St. Peter's, corner of Third and Pine, dedicated Sept. 4, 1761. These churches are all Protestant Episcopal. The Third Presbyterian (Old Pine Street) church, corner of Fourth and Pine, was opened for worship in 1768; occupied by the British army during the Revolution as a hospital. St. George's, Methodist, Fourth below New, was used by the British in 1777–78 as a riding-school. The finest church buildings are the First, Fifth, Memorial, and Beth Eden, Baptist—the two former of brownstone, the two latter of greenstone and other material; Holy Communion (Lutheran), of greenstone, corner of Broad and Arch streets; Arch Street Methodist, at the corner of Broad street, of white marble; Second Presbyterian, Twenty-first and Walnut, of granite and other stone; West Arch, Presbyterian, Eighteenth and Arch, in the Corinthian style. St. Mark's, Protestant Episcopal, Locust street near Seventeenth, is considered by many the finest church in the city. The Roman Catholic cathedral of St. Peter and St. Paul is a magnificent building of brownstone, with a dome rising to the height of 210 feet. The Jewish synagogue Rodef Shalom, on Broad street, in Saracenic style, is large and of handsome appearance. Auxiliary to the religious denominations may be mentioned the Presbyterian and Baptist Boards of Publication, the Sunday School Union, and the Young Men's Christian Association, which occupy large and elegant buildings, and many other societies which are comfortably but not so grandly accommodated.

Agricultural Hall.

The cemeteries are about 20 in number, church burial-grounds not included. The principal one is Laurel Hill, on the E. bank of the Schuylkill, near the Falls, which was opened in Oct., 1836. It has been a favorite burial-place, and is crowded with cenotaphs, monuments, statues, tombstones, and other memorials, many of which are rich and extremely costly. West Laurel Hill is on the W. bank of the Schuylkill, at some distance above the old cemetery. Woodlands is on the Schuylkill below the University; the ground has handsome natural features and contains many fine tombs.

The principal place of amusement is the Academy of Music, corner Broad and Locust streets, a brick and brownstone building 140 by 238 feet. The exterior is plain; the interior is rich and elegant. There are fine lobbies, retiring-rooms, a splendid foyer, and a stage 72 feet 6 inches deep, 90 feet wide at the proscenium, 120 feet between the walls, and 70 feet high from the floor. There are four tiers, the auditorium being handsomely decorated with emblematic carvings, etc. The seating capacity is for 2900 persons. There are 3 principal dramatic theatres—the Arch, the Walnut, and the Chestnut, located respectively on those streets. The buildings of the two former are old, but have been refitted and modernized; the latter was opened in 1863. There are 2 principal buildings for Ethiopian minstrelsy, a museum building for the display of curiosities and for dramatic performances, and 5 variety theatres and a German theatre.

There are 2 parks and 13 public squares belonging to the city. The principal of these is Fairmount, which contains 2740 acres, and, next to Epping and Windsor Forest in London and the Prater of Vienna, is the largest park in the world. It is situated on both sides of the river Schuylkill, commencing at Fairmount and extending 5½ miles to the mouth of Wissahickon Creek, and along that stream 7½ miles to Chestnut Hill; total length of the Park, 13 miles. On the W. side, the Park extends from Spring Garden street to Chamouni and Roberts' Hollow, about 4½ miles. The natural features of the enclosure are extremely beautiful. The property was originally composed of country-seats, and the fine old forest trees have been preserved with great care. There are many shaded glens, ravines, and valleys in which are streams and springs of water. The ground is diversified, and as the beautiful river Schuylkill is in view from nearly all the roads in the eastern and western portions, the diversity is charming. There is an

art-gallery in the Park near the Green street entrance, in which is the *Battle of Gettysburg*, painted by Rothermel, and other pictures. A bronze statue of Pres. Lincoln, by Randolph Rogers, erected by the citizens of Philadelphia, is near by. There are groups and statues erected by the Park Art Association. A grand fountain, with a central figure of Moses striking the rock, and statues of Charles Carroll of Carrollton, Bishop Carroll, Commodore John Barry of the Revolution, and Father Mathew, apostle of temperance, erected by the Roman Catholic T. A. B. societies, was finished in 1876. Bronze statues of Frederick von Humboldt, Christopher Columbus, and John Witherspoon, a signer of the Declaration of Independence, were also erected in that year. The Wissahickon portion of the Park is traversed by a road which leads through a deep gorge wooded to the top, and with towering crags through which a romantic stream calmly pursues its way amidst the wild grandeur of the scenery. Hunting Park is in the upper part of the city, occupies 45 acres, and is not yet in use. The 13 public squares, 4 of which were laid out by Penn at the foundation of the city, are kept in good order and are attractive.

Among the buildings of historic note are—Independence Hall (the old State-house), in which the Declaration of Independence was adopted, and Congress Hall, on Independence Square, at the corner of Sixth street, in which Congress sat from 1790 to 1800, and in which Washington and Adams were inaugurated as President, and Adams and Jefferson as Vice-President. The U. S. Supreme Court sat in the City Hall, corner of Fifth and Chestnut. Carpenters' Hall, standing S. of Chestnut street, between Third and Fourth, was the place of assemblage of the first Continental Congress. The Declaration of Independence was written by Thomas Jefferson in the house standing at the S. W. corner of Seventh and Market streets. William Penn's mansion, built in 1682, the oldest house standing in Philadelphia, is on the W. side of Letitia street, below Market. The old London Coffee-house, S. W. corner of Market and Front streets, built in 1702, was, before the Revolution, the most fashionable resort in the city for strangers and citizens. The mansions of historic interest still standing are Cliveden; Chew's house, where was enacted one of the most memorable incidents in the battle of Germantown; Stenton, James Logan's house, near Germantown; Mount Pleasant, in the Park, built by Capt. John McPherson, bought by Benedict Arnold, the traitor, presented as a wedding-gift to his wife, and afterward occupied by Baron Steuben; Belmont, West Park, seat of the Revolutionary patriot Richard Peters, for a long time judge of the U. S. district court; the house of John Bartram, the botanist, W. side of Schuylkill, below Gray's Ferry; Solitude, built by John Penn, now standing in the Zoological Gardens; Woodlands, West Philadelphia, the seat of the Hamilton family; Fairhill, seat of the Norris family, and occupied for some years by the famous Revolutionary patriot John Dickinson.

The principal hotels are the Continental, S. E. corner Chestnut and Ninth, six and eight stories in height, covering 41,536 square feet of ground, with accommodations for 1200 guests; the Girard House, brownstone, immediately opposite, with lodgings for 1000; the La Pierre House;

U. S. Government Building.

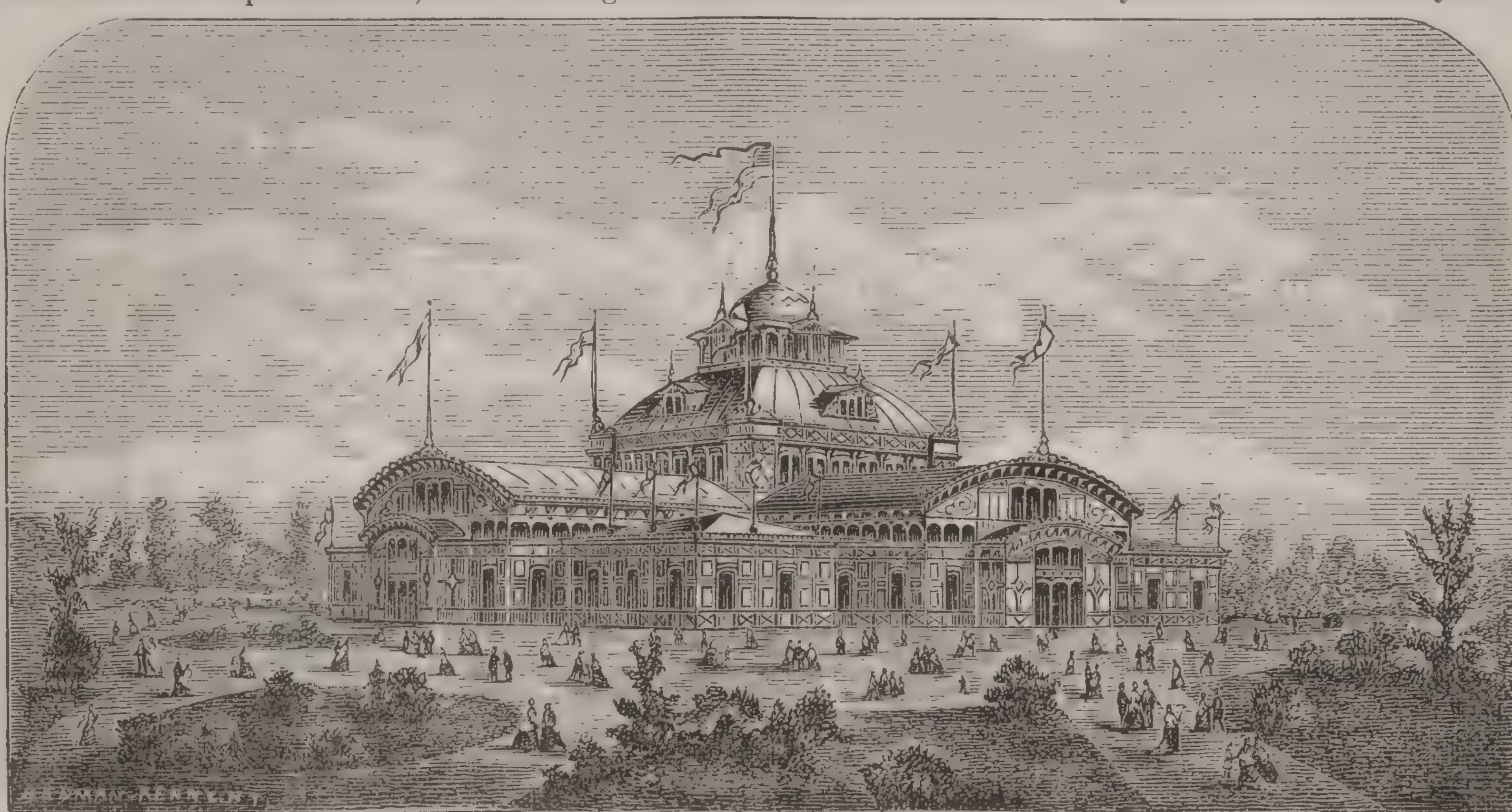
and the Colonnade. There are about 100 permanent hotels and inns of various sizes. For the accommodation of visitors to the Centennial Exhibition during 1876 several very large buildings have been specially erected, the majority of them being in the neighborhood of the Exhibition ground. Among these are the Globe, Transcontinental, United States, Ruloff, Aubry, Grand Exposition, Atlas, Diamond Street, and others, with accommodations for from 15,000 to 20,000 guests.

The active functions of the press are discharged by 14 daily papers, 4 of which are printed in the German language. The *Public Ledger* has the largest circulation, which is daily from 90,000 to 95,000 copies; its advertising patronage is very heavy. There are 7 Sunday papers and about 50 weekly journals, literary, religious, scientific, legal, medical, and of a business character; 14 papers are issued monthly; over 20 magazines and many other publications are printed.

The preparations which have been made for the celebration of the centennial anniversary of American independence at Philadelphia have attracted much attention to the city. The place of the exhibition is in Fairmount Park, on the W. side of the Schuylkill. The grounds extend from the foot of George's Hill at the S. W. extremity of the Park, nearly over to the Schuylkill in some places, and are in extent about 236 acres. The plateau is about 100 feet above the river, and the buildings can be seen from a great distance. There are 5 principal buildings constructed by the Centennial Board of Finance, and about 100 others. Industrial Hall, the main exhibition building, is in the form of a parallelogram extending E. and W., 1880 feet long and 464 feet wide. Towers and central projections are at each end of the building and on the sides in the centre, which break up the uniformity that would otherwise detract from the appearance of so large a structure. The building is of glass, stone, brick, and iron, and covers in ground floor, upper floor, and towers 936,008 square feet, or 21.47 acres. The interior has a central nave 120 feet wide, two avenues 125 feet wide, two aisles 48 feet wide, and two 24 feet, with a central transept 416 feet in length and 120 wide, and 2 smaller side transepts. Cost, $1,600,000. Machinery Hall lies W. of the main building, and in appearance, although different in plan and decoration, assimilates with the other. It is 1402 feet long, 360 feet wide, with an annex on the S. side 208 by 210 feet. It covers 558,440 square feet, and with the upper floors provides 14 acres of floor-space. The building is of wood, iron, brick, and glass. The contract price was $792,000. The most elegant building is Memorial Hall, built at the cost of the State of Pennsylvania and the city of Philadelphia, which has been appropriated to the uses of an art-gallery, and is intended to be permanent. It is of granite, glass, and iron, perfectly fireproof. It is 365 feet long, 210 feet wide, 59 feet in height, surmounted by a dome of glass and iron terminating with a colossal bell, upon which stands a figure of Columbia at the height of 150 feet from the ground. The architecture is in the Renaissance style. Figures of colossal size stand at each corner of the dome representing the four quarters of the globe. Numerous other statues appear upon the building, and it is rich in decorations. The entrance is 70 feet wide, through three doorways 40 feet in height and 15 in width. The galleries, with the rotunda, are lighted from above. The building gives 75,000 square feet of wall for paintings and 20,000 square feet of floor for statues. Cost, $1,500,000. Although the largest art-building in the world, it has proved insufficient for the demands

upon it, and a temporary annex immediately in the rear, one story in height, 300 feet long, 250 feet wide, has been further enlarged by building two additional pavilions. Horticultural Hall is a building of very striking appearance, in the Moresque style of architecture of the twelfth century. It is of stone, glass, and iron, very ornate in appearance, and to be permanent in the Park. Length, 383 feet; width, 193 feet; height to top of lantern, 72 feet. The central conservatory, 230 by 80 feet, 55 feet high, surmounted by a lantern 14 feet high, occupies the main floor. N. and S. are four forcing-houses for the propagation of young plants, and the building is surrounded by magnificent flower-gardens. Cost of the hall, paid by the city of Philadelphia, $251,937. Agricultural Hall is constructed of wood and glass, and consists of a long nave crossed by three transepts, the style being Gothic, with towers and other ornaments. The nave is 826 feet long by 100 wide, with a height of 75 feet from the floor to the point of the arch. The central transept has a breadth of 100 feet, and the two end transepts are 70 feet each. The ground-plan in parallelogram would occupy a space of 465 by 630 feet, covering about 10¼ acres. Besides the main buildings there are many others of considerable size and of attractive appearance. Among them are the U. S. Government Exhibition Building, covering a space of 1½ acres; Women's Pavilion, for the exhibition of women's work, over half an acre in extent; buildings for executive officers, the Centennial Commission, jury, 6 large restaurants; special buildings erected by trades and occupations for their own peculiar use; and buildings erected by foreign governments for the accommodation of their subjects. Among these are structures erected by Great Britain, Japan, Germany, Sweden, Turkey, and other nations. Special buildings have been erected by the States of Ohio, Indiana, Illinois, Connecticut, Massachusetts, New Jersey, Kansas, New York, Michigan, Wisconsin, New Hampshire, and Pennsylvania for the accommodation of their citizens. The entire space covered by buildings, it is estimated, is over 75 acres. The Vienna Exhibition buildings occupied for all purposes 56 acres; the Paris Exhibition of 1867, 31 acres; and the Crystal Palace of London, 1851, 23 acres. Upon a narrow-gauge railroad within the grounds passengers are conveyed from building to building; it is 4½ miles in length. The railroad communication with all parts of the Union by the Pennsylvania, Reading, and Baltimore R. Rs. is direct to the Exhibition-grounds, the arrangements for transporting thousands of persons a day being admirable. Five passenger railways, extending to the most distant portions of the city, bring passengers to the main entrance. The Exhibition is to open May 10, and to close Nov. 10, 1876.

The spot on which Philadelphia is built was first discovered by Capt. Hendrickson in the yacht Onrust, which sailed from Manhattan (New York) in the year 1623. The Dutch settled upon South or Delaware River shortly after. The Swedes came in 1638, and settled along the river and within the boundary of Philadelphia. The Dutch built Fort Casimir near New Castle in 1651, which was conquered by the Swedes in 1654, and reconquered by the Dutch under Peter Stuyvesant in the same year. Ten


Women's Pavilion.

years afterward the English captured Manhattan from the Dutch, and in due time appeared upon Delaware River and captured Trinity Fort. The Dutch reconquered the territory in 1673, but in 1674, by the treaty between England and Holland, which gave New York to the former, the settlements on the Delaware fell again under English authority. William Penn received his charter for Pennsylvania Mar. 4, 1681. Philadelphia was laid out in 1681–82. Penn arrived in the latter year, remained about 22 months, and went back to England. He returned in 1699, and found great changes. There were streets, houses, shops, warehouses, wharves, and shipping. The houses were 700; the population, 4500. Granting a charter to the city dated Oct., 1701, he went back to England, and never returned. Between the years 1739 and 1748 there were wars between England, Spain, and France, in which the colonies were in danger of invasion. Privateers were commissioned at Philadelphia, but there was no preparation for home defence. Great peril, menacing in 1747 from French privateers, created fears of attack upon the city. The Quakers, in majority in the assembly, refused to sanction measures of defence. As the last resort, voluntary associations of citizens who had no conscientious scruples against fighting were formed. They raised two regiments in the city, and built a battery below Swedes' church which mounted upward of 50 pieces of cannon. In 1755, in consequence of Braddock's defeat, the assembly was forced into the adoption of a militia law. Two regiments were raised in the city and county, Benjamin Franklin being colonel of the first and Jacob Duché of the second. The passage of the Stamp Act in 1765 led to proceedings in opposition, which compelled the stamp-master, John Hughes, to decline acting under his appointment. In 1768, in consequence of the passage of an act of Parliament laying duties on paper, tea, etc., an agreement was entered into by the people of the city to import no merchandise from England and to encourage American manufactures. In 1773 the tea-ship Polly, Capt. Ayres, from London, coming up the river, was stopped at Gloucester Point, N. J., and compelled to return without reaching the city. The first Continental Congress met Sept. 5, 1774, in Carpenters' Hall, and adjourned in October. The second Congress met on May 2, 1775, after the battle of Lexington. July 2, 1776, this body, which was sitting at the old State-house, adopted the resolution declaring the United Colonies free and independent of Great Britain. On the 4th of July the reasons for adopting the resolution of independence were embodied in the Declaration, which was adopted the same day. The Declaration was read to the people July 8 by John Nixon from an observatory erected in the State-house yard in 1770 to observe the transit of Venus. (See DECLARATION OF INDEPENDENCE.) On this occasion the State-house bell, cast in 1752, bearing upon its side the remarkable motto, "Proclaim liberty throughout the land, unto all the inhabitants thereof," was rung in honor of the great event. After the battle of Brandywine the British troops under Gen. Howe crossed the Schuylkill at Fatland and Gordon's Ford on Sept. 22, 1777, and entered the city on the 26th. The Americans held the Delaware below, particularly in the neighborhood of Mud Fort (Mifflin) and Red Bank. The battle of Germantown on Oct. 4 caused the withdrawal of all outlying detachments, and the British army encamped within the city, which was defended on the N. by a chain of redoubts and abattis stretching from the Delaware at Kensington to the Schuylkill at Fairmount. To free the navigation of the Dela-

ware, Count Donop crossed the river with Hessians and chasseurs Oct. 21, and attacked the fort at Red Bank. He was defeated, repulsed, and himself killed. During this time there was a fight between the Pennsylvania galleys and the British frigates. Two of the latter, the Augusta and Merlin, were lost, being set on fire and blown up. Mud Fort was bombarded by the fleet and shore-batteries for six days, until it was untenable, when the commander succeeded in withdrawing safely to shelter at Red Bank. A portion of the American fleet succeeded in passing the city, and obtained safety in the upper part of the Delaware. Some vessels were taken and others burned and destroyed. The British evacuated the city June 18, 1778. Gen. Benedict Arnold was made military governor. Congress came back shortly afterward, and remained until June, 1783, when the mutinous conduct of regiments of the Pennsylvania line frightened the members off to Princeton. A convention to frame a Constitution for the U. S. met at the State-house in May, 1787, and adjourned on Sept. 18. George Washington was president and William Jackson secretary. It adopted the Federal Constitution, the ratification of which by a majority of the States was celebrated by a magnificent procession on July 4, 1788. John Fitch first demonstrated practically on the Delaware River in 1787, 1788, 1789, and 1790 the utility of steam navigation. In the latter year his steam-

Judges' Pavilion.

boat ran regularly for the carriage of passengers and freight to Burlington, Bristol, Chester, and other places, announcing the trips by advertisements in newspapers, and traversing during that season more than 3000 miles. Congress came to Philadelphia in 1790, and the city was the seat of the Federal government until 1800. The yellow fever was exceedingly disastrous in 1793, 1797, and 1798; the deaths by this pestilence in six years were over 12,000. The first waterworks were established on Schuylkill River at Chestnut street, and water distributed Jan. 1, 1801. The Schuylkill Navigation, the first great internal improvement connecting with the city, was finished 1825. The first railroad to Germantown was opened 1832. Gas was first distributed through the public streets Feb. 18, 1836. During the Asiatic cholera of 1832 the cases were 2314 and the deaths 935. In 1834, 1835, and 1838 abolition riots took place, the blacks being assaulted and their houses injured and torn down; Pennsylvania Hall, built by abolitionists, was set on fire by a mob and totally destroyed May 17, 1838. The Native American riots against the Roman Catholics took place in May and July, 1844. During this time houses were broken into and set on fire, 2 Roman Catholic churches and a female seminary were burned, and numerous persons on both sides were killed. On the night of July 7 a battle took place between the military and the mob, which resulted in the killing of 9 persons and the wounding of many others. This was the last great riot in Philadelphia. In 1854 the boundaries of the old city of Philadelphia were enlarged so as to include the adjoining districts and townships, and embracing the whole county within the bounds of the city. During the late civil war Philadelphia strongly adhered to the cause of the Union. In 1864 the Philadelphia branch of the U. S. Sanitary Commission held a fair in Logan Square, the net proceeds of which, $1,080,000, were appropriated to the relief of wounded, sick, and dying soldiers. The contributions to the Sanitary Commission, including the fair-proceeds, were in Philadelphia $1,565,377.15.

THOMPSON WESTCOTT,
ED. "PHILADELPHIA SUNDAY DISPATCH."

Philadelphia, p.-v., Loudoun co., Tenn., on East Tennessee Virginia and Georgia R. R.

Phi'læ [Egyptian, *Pilak*], an island of the Nile, situated in Upper Egypt, in lat. 24° 1′ N., contains celebrated remains of a temple of Isis built by Ptolemy Philadelphus, and of some other buildings of a more recent date.

Phil'brick (JOHN DUDLEY), LL.D., b. in Deerfield, N. H., May 27, 1818; graduated at Dartmouth College in 1842; was engaged during the next ten years in teaching, first in the Roxbury Latin School, and then in Boston as instructor in the English High School, and as master of the Mayhew and Quincy schools; was principal of the Connecticut State Normal School 1853–55; State superintendent of schools in Connecticut 1855–57; superintendent of the public schools of Boston 1857–74; re-elected to the same post 1876; educational commissioner of Massachusetts to the Vienna Exposition 1873, where he was a member of the international jury; was also president of the State educational associations of Connecticut and Massachusetts, of the American Institute of Instruction, and of the National Teachers' Association; for ten years a member of the Massachusetts board of education, and from its origin a member of the government of the Massachusetts Institute of Technology; was editor of *Connecticut Common School Journal* and Massachusetts *Teacher;* and wrote numerous papers on education.

Phile'mon, a Greek play-writer, b. at Soli in Cilicia or at Syracuse in Sicily about 360 B. C.; lived mostly in Athens, where he often competed successfully with Menander; visited Alexandria. D. at Athens in 262 B. C. Some fragments of his comedies are still extant, and generally printed in the editions of Menander.

Philemon, Epistle of St. Paul to, was written at the same time as the Epistles to the Ephesians and Colossians. It is a private letter, begging forgiveness and acceptance as a brother beloved for a runaway servant, Onesimus, who had been converted through the apostle's teachings. It is stated by tradition that the letter was written from Rome. Others suppose Cæsarea was the place. One tradition makes St. Philemon a bishop of Colossæ, and in the Roman missal he is commemorated on Nov. 22.

Phil'idor (FRANÇOIS ANDRÉ DANICAN), b. at Dreux, department of Eure-et-Loire, France, Sept. 7, 1726; received his musical education in the royal chapel, afterward in Holland and Germany, where he resided from 1745 to 1754; composed between 1754 and 1774 a number of operas, comic and serious, which were well received; but became most famous as an unrivalled master of chess-playing. His book, *L'Analyse du Jeu des Echecs* (London, 1777), was for many years considered the code of the game. D. in London Aug. 29, 1795. (See Allen, *Life of Philidor*, Philadelphia, 1864.)

Phil'ip, the fourth called to the apostleship by Christ, b. at Bethsaida, is often mentioned in the Gospels, especially by John (vi.; xii. 20–22; xiv. 8), but must not be confounded with Philip the Evangelist, mentioned in Acts

vi.; preached, according to Theodoret and Eusebius, in Phrygia; was married and had three daughters, according to Clement of Alexandria. D. at Hierapolis. His festival is celebrated by the Latin Church on May 1, by the Greek on Nov. 14. The *Acta Philippi* are apocryphal.

Philip, the name of five Macedonian kings, of whom two became very celebrated. PHILIP II. (359–336), b. at Pella in 382, a son of Amyntas II., spent while a youth three years as a hostage at Thebes in the house of Epaminondas, where he became familiar not only with Greek tactics, but also with Greek politics. At the moment he ascended the throne Macedonia was attacked from two sides by external enemies, the Illyrians and the Athenians, and in the interior it was torn by four pretenders and their factions. But in less than two years the young king repelled the Illyrians, bought off the Athenians, defeated and killed the pretenders, and established himself firmly in the country. He immediately began to work at the realization of his much-cherished plan, the acquisition of the supremacy over all Greece, and by his energy and shrewdness, his talents and unscrupulousness, he succeeded at last. He conquered Pydna and Methone, two Athenian possessions on the coast of Macedonia, the peninsula of Chalcidice, with the prosperous cities of Olynthus, Potidæa, Amphipolis, etc., all Athenian colonies or allies; and a part of Thrace, with the rich gold-mines, which yielded about £300,000 a year, and the town of Crenides, which soon became a flourishing city under the name of Philippi. And in spite of Demosthenes' thundering against him he achieved these conquests without occasioning any serious breach with Athens, for he understood how to bribe and how to deceive. Meanwhile, he had also defeated the tyrant of Pheræ and reduced the whole of Thessaly, and during the two sacred wars in 346 and 339 he acquired a foothold in Greece proper, called in by the Greeks themselves — in the first case, by the Thebans against the Phocians; in the second, by the Amphictyonic Council against the Locrians. Alarmed at his successes, Athens made a coalition with Thebes and other Greek states against him, but he routed the allied army at Chæronea in 338, and after this victory he actually became the master of Greece. By his admission as a member of the Amphictyonic Council shortly after the First Sacred war he and the Macedonians were recognized as belonging to the Greek nation, and by the congress at Corinth (in 337) he was chosen commander-in-chief of all the Greeks under a projected invasion of Persia. But the realization of this vast plan he had to leave to his son, Alexander; during his preparations he was assassinated at Ægæ by Pausanias. —Under PHILIP V. (220–179), b. in 237, Macedonia relapsed into insignificance. He dreamt, like his subjects, only of the re-establishment of the empire of Alexander. His whole attention was taken up by the East, by Pergamus, Bithynia, Syria, etc., and meanwhile the danger arose from the West, from Rome, which already held possessions in Illyria. The offers of alliance which Hannibal made he treated slightingly, and the war with Rome, which began incidentally, the first Macedonian war (210–205), he carried on without energy, though generally successfully. But in 200 the war began again, the second Macedonian war, in consequence of Philip's aggressive policy towards Pergamus and the Achæan association, now allies of Rome; and the Macedonian army was completely routed by Titus Quintius Flamininus at Cynoscephalæ in 197, and the country reduced to a submissive ally of Rome, relinquishing all its conquests in Europe and Asia, surrendering its fleet, and paying a tribute. CLEMENS PETERSEN.

Philip, the name of six kings of France, of whom the most remarkable are—PHILIP II., AUGUSTUS (1180–1223). (See CRUSADE, FRANCE, HISTORY OF, and RICHARD CŒUR DE LION.)—PHILIP IV., THE FAIR (1285–1314), b. in 1268, a son of Philip III., was an avaricious, haughty, and even cruel man, but courageous and eminently successful in extending the boundaries of France and consolidating the power of the Crown. In order to procure money the king taxed the clergy. The pope, Boniface VIII., forbade the clergy to pay the tax, and the king answered by forbidding the exportation from France of money or other valuables, thereby cutting off one of the richest sources of the papal revenue. The pope sent a legate, who remonstrated in an insolent manner with the king, and the king threw the legate into prison. Philip now convoked the States General, and having ascertained that the French people would stand by him even if he were excommunicated, he pursued his own course and confiscated the property of those prelates who sided with the pope. Meanwhile, Boniface assembled a council at Rome and excommunicated the king, but a French army under William de Nogaret captured Rome and imprisoned the pope. In 1304, at the election of Clement V., the papal residence was transferred to Avignon, and for a long time the papal authority was merely a weapon in the hands of the French king. Clement V. also sold the Knights Templar to Philip IV., who treated them in a most cruel and unjust manner in order to get possession of their wealth. (See TEMPLARS.)—PHILIP VI. (1328–50), the founder of the house of Valois, b. in 1293, a son of Charles of Valois, brother to Philip the Fair; was first proclaimed regent of France on the death of Charles IV. in 1328, but when the queen-dowager, who was pregnant at the death of her husband, shortly after gave birth to a daughter, who, according to the Salic law, was excluded from the French throne, Philip assumed the royal dignity and was crowned at Rheims. Edward III. of England, a grandson of Philip the Fair, laid claim to the French throne, and when Philip undertook to support David Bruce of Scotland, the English king made an alliance with Flanders and declared war in 1337, thus opening that terrible contest between the French and English dynasties which lasted for 100 years, exhausted England, and devastated France. The two prominent events of the war during the reign of Philip VI. were the battle of Cressy (1346), in which the French army was totally routed, and the capture of Calais by the English (1347). In the following year the plague, the so-called *Black Death*, entered France and made fearful ravages; but in spite of all these calamities the king, who was bigoted and debauched, went on with his carousals, squandering the money which was extorted from the people by heavy taxes and ruinous government monopolies.

Philip, the name of five kings of Spain, of whom two deserve a special notice.—PHILIP II., b. at Valladolid May 21, 1527, d. at the Escurial Sept. 13, 1598; succeeded his father, Charles V., in the Netherlands Oct. 25, 1555, and in the other possessions of the Spanish crown Jan. 16, 1556. The emperor's attempts at procuring the imperial crown of Germany and the Austrian possessions for his son failed, and his plan of bringing England into co-operation with his policy by Philip's marriage with Queen Mary miscarried; but Philip II. was nevertheless, on his accession to the throne, the most powerful monarch of Europe. He ruled over Spain, its vast dominions in America, the East Indies and Africa, the Two Sicilies, and Milan, Burgundy, and the Netherlands, to which in 1581 he added Portugal; and these countries were at that time the principal centres of European civilization and wealth. From his father's reign he inherited a war with France, the pope, and the Turkish sultan, who had made an alliance for the purpose of depriving the Spanish crown of its Italian possessions; but the duke of Alba, viceroy of Naples, drove the French out of Italy and compelled the pope to sue for peace under the walls of Rome, while the brilliant victories of St. Quentin and Gravelines, won by Egmont, enabled Philip to conclude an advantageous peace with France at Château-Cambrésis, Apr. 2, 1559. Nevertheless, the forty years' reign which now followed bears throughout the character of a miserable failure. The countries under his sceptre became devastated and forlorn, and the nations sank into degradation or rose in rebellion. And these calamities were not the results of any special ill-luck in his fate or of any strikingly predominating vice in his character. Like Robespierre, he was a small man placed by destiny in an immense situation, and by this distorted into a monster; the worst of him was his virtues. On leaving the Netherlands he confirmed the political privileges of the provinces, but he refused to repeal his father's ordinances against heretics. On the contrary, he would enforce them, and immediately set to work to extirpate heresy in the Netherlands by means of the Inquisition. He met with energetic resistance, and the duke of Alba was sent as governor to the country with an army of Spanish veterans. Egmont, Horn, and other prominent men were executed and horrible cruelties perpetrated. But the result was just the opposite of that which had been expected. The resistance, instead of dying out, grew into a revolution, and under the organization and leadership of William of Nassau the union of the seven provinces was formed at Utrecht in 1579, and a protracted war was carried on against Spain by land and sea. When Philip died, Spain was exhausted, but the provinces were not reduced to obedience. In his wars against the Turks or the Mohammedans in general he gained a brilliant success by the battle of Lepanto, Oct. 7, 1571. After this victory, it would have been possible to incorporate the northern coast of Africa into the political system of the civilized world, and Don John of Austria entertained some such idea; but Philip felt a jealous distrust of his illustrious half-brother, and the situation of the Mediterranean pirates remained the same after the battle as it had been before. The disastrous expedition against England, the destruction of the Invincible Armada, were mortifications which he bore with dignity, but the unfortunate war against Henry IV. of France and the dis-

advantageous Peace of Vervins (May 2, 1598) he felt as a deep humiliation. He shut himself up in sullen despair in the pompous palace-tomb he had built, and died shortly after of a most loathsome disease, leaving Spain exhausted almost to prostration, with its industry, commerce, and other material resources greatly impaired and disturbed, and the proud, adventurous spirit of its people curbed by despotism and influenced by fanaticism. He was four times married—with Maria of Portugal, Mary of England, Elizabeth of France, and Anne of Austria. By his first wife he had a son, the unfortunate Don Carlos—by his fourth wife he had another, Philip, who succeeded him. (See Prescott, *History of Philip II.* (3 vols., 1856–59), and Motley, *Rise of the Dutch Republic* (3 vols., 1856).)—PHILIP V. (1701–46), the founder of the house of Bourbon in Spain, b. at Versailles Dec. 19, 1683, the second son of the dauphin Louis, son of Louis XIV. by the Spanish princess Maria Theresa; was declared heir to the Spanish throne by the will of Charles II., who died childless Nov. 1, 1700. There was, however, another claimant to the throne—Archduke Charles of Austria—and war began almost immediately. (See SUCCESSION WARS, Spanish.) By the Peace of Utrecht (1713) Philip retained the Spanish crown, but he was compelled to surrender his possessions in Italy and the Netherlands to Austria, and Gibraltar to England. He was indolent, weak-minded, and always controlled by his surroundings. Under his first marriage, with Louisa Maria of Savoy, the princess Orsini had the predominant influence; after his second marriage, in 1714, with Elizabeth Farnese of Parma, the queen, Cardinal Alberoni, the adventurer Ripperda, and others held the reins. The policy of the queen was concentrated on the acquisition of the former possessions of Spain in Italy for her sons, for which purpose Spain waged several wars. (See SUCCESSION WARS, Austrian.) Meanwhile, the king became weaker and weaker. Jan. 10, 1724, he abdicated in favor of his eldest son, but as the young king d. Sept. 6, 1724, Philip was persuaded to assume the government once more, though he had become almost idiotic. At last he would not leave his bed, and nothing would arouse him from his mental stupor but the songs of Farinelli. D. at Madrid July 9, 1746. CLEMENS PETERSEN.

Philip, or **Metacom,** usually called **King Philip,** youngest son of Massasoit, sachem of the Pokanoket Indians of Massachusetts, succeeded to the chieftainship on the death of his brother Alexander 1662, when he visited Plymouth and promised friendship to the colonists, but in 1675 headed the great war known by his name, in which thirteen towns were destroyed and 600 colonists lost their lives. Philip was killed at Mount Hope Aug. 12, 1676, by a party under Capt. Benjamin Church, after his tribe had been nearly annihilated.

Philip the Bold, b. Jan. 15, 1342, a son of John, king of France, distinguished himself in the battle of Poitiers (1356), where he saved his father's life and received the surname of *Le Hardi*. Sept. 6, 1363, King John gave him, as a fief of the French crown, the duchy of Burgundy, which had become vacant by the extinction of the elder ducal line in 1361. Philip married Margaret of Flanders, heiress of Flanders, Artois, Rethel, and Nevers, and founded the younger ducal line, under which Burgundy became one of the most prominent powers of Western Europe. During the minority and subsequent insanity of Charles VI., Philip the Bold assumed the regency of France, which involved him in many feuds with his brother, the duke of Anjou, and his nephew, the duke of Orleans, but which he held to his death, Apr. 27, 1404.

Philip the Good, b. at Dijon June 13, 1396, a grandson of Philip the Bold, succeeded his father, John the Fearless, as duke of Burgundy after his assassination on the bridge of Montereau in 1419, and married in 1424 Jacobæa of Holland, heiress of Holland, Brabant, Zealand, and the rest of the Low Countries. In order to avenge the murder of his father, which had been perpetrated at the instigation of the dauphin, afterward Charles VII., Philip allied himself closely with England, and acknowledged by the Treaty of Troyes (1420) the English king as the legitimate heir of the French crown after the death of Charles VI. The arrogance of the English, however, provoked him afterward to break the alliance, and in 1435 he concluded a separate peace with Charles VII. and aided him in expelling the English from France. He governed his extensive possessions with great wisdom, and, in spite of several risings in Ghent and Bruges, occasioned by the heavy taxation, he was much loved by his subjects. D. at Bruges June 15, 1467.

Philippeville′, town of Algeria, province of Constantine, on the Gulf of Stora, forms the port of Constantine, is well built, and has a fine harbor and large fishing, manufacturing, and trading interests. P. 13,022.

Philip′pi, an ancient town of Macedonia, was built, or at least enlarged, by Philip, from whom it received its name. It became very famous as the place where the battle was fought in 42 B. C. between Brutus and Cassius on the one side, and Antony and Octavianus on the other. Brutus and Cassius were totally routed.

Philippi, p.-v. and tp., cap. of Barbour co., West Va., 12 miles from Baltimore and Ohio R. R., has 1 graded school, 3 churches, 1 weekly newspaper, 1 furniture establishment, 2 tanneries, 1 flouring and 1 saw mill, a fine court-house, and stores. The first battle of the rebellion was fought here. P. 1605. D. W. GALL, ED. "PLAINDEALER."

Philip′pians, Epistle of St. Paul to the, was written to the church at Philippi in 63 A. D. from Rome. It is not theological or dogmatic, but a generally friendly and encouraging letter to a people to whom the apostle was affectionately attached. An Epistle of St. Polycarp to the Philippians is extant in the Greek. It is valued for its quotations from the early text of canonical New Testament books. English translations exist by Cave, Wake, Clementson, etc.

Philip′pics, a name properly belonging to three splendid and spirited orations of Demosthenes against King Philip. The first was delivered in 352 B. C., the second in 344, the third in 342. There is also a fourth philippic, probably spurious, assigned by some to the year 341. The fourteen orations of Cicero against Mark Antony are also called philippics. They were delivered in 44 and 43 B. C., mostly in the senate, but the second and severest was written and not delivered. The name is applied to any severe personal attack in speech or print.

Phil′ippine Islands, a group of about 1200 islands, situated between the Pacific Ocean to the E. and the Chinese Sea to the W., and between lat. 5° 32′ and 19° 38′ N., and forming the northern part of the Malay Archipelago. The largest are Luzon, 51,300 sq. m.; Mindanao, 25,000; Samar, 13,020; Mindoro, 12,600; Panay, 11,330; Leyte, 10,080; Negros, Masbate, and Zebu. The total area is estimated at 120,000 sq. m., of which about one-half is under Spanish rule; the rest is divided into small independent states governed by native chiefs. P. 4,319,269. The Philippine Islands are of volcanic origin. Active volcanoes are found throughout the whole group, such as Mayon in Luzon and Buhayan in Mindanao, and earthquakes are frequent and often violent; in 1863, Manila, the capital of Luzon, was nearly destroyed, and in 1864 the whole province of Zamboanga, in Mindanao, was fearfully devastated. But the soil is exceedingly fertile, and as water is abundant both in lakes and rivers, and the climate is hot and moist, vegetable life reaches here an almost gigantic development. The mountains, rising to a height of 7000 feet, are covered to their very tops with forests of immense trees, yielding excellent timber and many of the most valuable sorts of wood. Teak, ebony, cedar, and gum trees, iron and sapan wood, are interspersed with bread-fruit and cocoanut trees, oranges, citrons, mango, tamarinds, and other varieties of fruit trees, the whole bound together with floating garlands of huge climbing plants and brilliant parasites. On the extensive slopes and in the valleys are cultivated abaca or manila hemp, of which over 30,000 tons are annually exported; tobacco, which the Spanish government keeps as a monopoly (from which it has an annual gross receipt of £1,062,041, paying out 67 per cent. for the cultivation and manufacture of the article, and taking in 33 per cent. as clear profit); cotton, sugar, coffee, indigo, rice, wheat, maize, pepper, ginger, vanilla, cinnamon, cocoa, etc. The animal and mineral kingdoms are splendidly represented. Of wild beasts there are none, but oxen, buffaloes, horses, goats, sheep, and swine of peculiar but excellent breeds are extensively reared; deer, wild-boars, pheasants, ducks, and fine fish are abundant; the forests swarm with monkeys, squirrels, parrots, humming-birds, and bees—the jungles with lizards, snakes, mosquitoes, tarantulas, and other insects. Gold is found; iron, copper, coal, vermilion, saltpetre, quicksilver, sulphur in immense quantities, both pure and mixed with copper or iron; mother-of-pearl, coral, amber, and tortoise-shell.

The Philippine Islands were discovered in 1521 by Magellan, who died here in the same year, and a few years after the Spaniards under Villabos took possession of the whole group. The inhabitants consist partly of negroes, who resemble those of the interior of Papua, and seem to have formed the aboriginal population. They live in the interior, are repulsive in aspect, and savage, and roam in bands, mostly occupied in robbery. The Malays are Roman Catholics, settled in villages, and engaged in agriculture and fishing. They possess many fine branches of industry—as, for instance, their beautiful mats and their elegant linen fabrics—and they imitate European indus-

try, shipbuilding, leather-dressing, carriage-building, etc., with great success. The Chinese, and the mestizoes, generally descending from Chinese fathers and native mothers, are mostly engaged in commerce. Very few Spaniards reside in the islands.

Phil'ippins [from *Philip Pustoswiät*, one of their former leaders], or **Staroverski** ("old-faith men"), a sect of Russian origin settled since 1700 in East Prussia and Lithuania. They reject oaths and the priesthood, refuse to do military service, rebaptize all converts from other sects, and have a celibate eldership. They are peaceable and industrious citizens, but have at times fallen into wild fanatical excesses. They cling persistently to the ancient liturgy of the Russian Church, which has been officially discountenanced for more than 200 years. The Philippins are a branch of the RASKOLNIKS (which see.)

Philippop'olis, town of European Turkey, eyalet of Adrianople, on an island in the river Maritza, which here becomes navigable and is crossed by several bridges. It has manufactures of silk, cotton, and leather, and carries on an active trade and a very extensive banking business. It is rather indifferently built, but has large and well-stocked bazaars. The surrounding plain is very fertile, and produces excellent wine and rice. P. 50,000.

Philippoteaux' (FÉLIX EMMANUEL HENRI), b. at Sedan Apr. 3, 1815; studied painting under Léon Cogniet, and began to exhibit in 1833, his first picture being *Glen Rocks*, an episode of the American war of independence. Remarkable among his subsequent works, mostly battle-pieces, are *The Retreat from Moscow* (1835), *The Capture of Ypres* (1837), *The Last Banquet of the Girondists* (1850), *General Bonaparte in Italy* (1853), *Defeat of the Cimbres* (1855), and episodes of the Algerian, Crimean, and Franco-German wars.

Phil'ips (AMBROSE), b. in Leicestershire, England, about 1671; graduated at St. John's, Cambridge, 1696; settled in London as a writer; was an associate of Steele, Addison, and their circle; wrote six *Pastorals*, which appeared in Tonson's *Poetical Miscellany* (1709) along with others by Pope—a circumstance which led to a bitter rivalry between the two poets; produced on the stage three tragedies, *The Distressed Mother* (1712), *The Briton*, and *Humphrey, Duke of Gloucester* (1721); commenced in 1718 a serial paper, *The Free-Thinker*, which attained great popularity; became secretary to the primate and to the chancellor of Ireland 1726; was chosen a member of the Irish Parliament; became registrar to the prerogative court 1734; returned to London, where he published a collection of his poems 1748. D. there June 8, 1749.

Philips, or **Phillips** (JOHN), b. at Bampton, England, Dec. 30, 1676; educated at Winchester School and at Christ Church, Oxford; wrote *The Splendid Shilling* (1703), a popular mock-heroic poem; *Blenheim* (1705), a poem in honor of Marlborough's victory; and *Cyder* (1706), an imitation of Milton and of Virgil's *Georgics*. D. at Hereford Feb. 15, 1708.

Phil'ipsburg, v., Clay tp., Montgomery co., O. P. 187.

Philipsburg, p.-b., Rush tp., Centre co., Pa., on Moshannon River and on Tyrone and Clearfield R. R., 20 miles from Tyrone, has schools, 5 churches, 1 bank, 3 hotels, a public library, 1 newspaper, 2 planing-mills, 1 tannery, a flouring-mill, foundry and machine-shops. P. 1086.
E. H. ELLSWORTH, ED. "JOURNAL."

Philis'tines, a people who occupied the southern seacoast of Palestine during most of the period of biblical history, and were almost constantly at war with the Israelites. As they are not mentioned among the occupants of the land in the time of Joshua, it is inferred that they were later invaders who came from Crete (Caphtor) during the obscure early period of the Judges. Their race-affinities have been much disputed. The genealogical table in Gen. x. seems to derive them from Ham, through Mizraim, but many commentators nevertheless consider them a Semitic people closely related to the Phœnicians, and not distantly connected with the Israelites themselves. The land of the Philistines was the low plain called the *Shefelah*, and their superiority in the arts of war and in the possession of weapons several times enabled them to conquer the Israelites. The five chief cities of the Philistines, Gaza, Ashdod, Ashkelon, Gath, and Ekron, had each their princes, who were united in a confederacy. The chief divinities of the Philistines noticed in the Bible were Dagon, Ashtaroth, and Baal-Zebub. The Philistines shared the fate of the Israelites in successive subjection to Assyria, Babylon, and Egypt, and disappeared altogether from history previous to the Christian era.

Phil'limore (JOHN GEORGE), LL.D., b. in Oxfordshire, England, in 1809; educated at Westminster School and at Christ Church, Oxford; was called to the bar at Lincoln's Inn 1832; became an eminent jurist, queen's counsel 1851, and professor at the Middle Temple; was chosen to Parliament 1852; wrote several legal works, and commenced the publication of a *History of England during the Reign of George I.* (vol. i., 1863). D. at Shiplake House, Oxfordshire, Apr. 27, 1865.—His brother, SIR ROBERT JOSEPH PHILLIMORE, D. C. L., b. in London Nov. 5, 1810, graduated at Oxford 1831, is also a distinguished lawyer and writer; sat in Parliament 1853–57; was knighted 1862; has been advocate-general, privy councillor, judge of admiralty, judge-advocate-general (1871), and master of the faculties (1873); author of *Commentaries on International Law* (4 vols., 1854–61).

Phil'lip (JOHN), R. A., b. at Aberdeen, Scotland, in May, 1817; was apprenticed to a house-painter; displayed such genius that through the aid of Lord Panmure he was enabled to study at the Royal Academy, London, 1837; exhibited his first historical picture 1840; returned to Aberdeen; employed ten years in delineations of the peasant life and the religious observances of Scotland; made several visits to Spain, where he found materials for numerous successful pictures; became a member of the Royal Academy 1859. D. at London Feb. 27, 1867.

Phillipp's, tp., Etowah co., Ala. P. 477.

Phil'lips, county of Arkansas, bounded E. by Mississippi River, which separates it from Mississippi. Area, 750 sq. m. It is in part level and subject to floods, but is extremely fertile and well timbered. Cotton and corn are extensively produced. The county is traversed by Arkansas Central R. R. Cap. Helena. P. 15,372.

Phillips, county of Kansas, bounded N. by Nebraska. Area, 900 sq. m. It is undulating, well watered, and adapted to wheat and stock raising. Since the census of 1870 it has been rapidly settled. Cap. Phillipsburg.

Phillips, tp., Hot Springs co., Ark. P. 239.

Phillips, p.-v. and tp., Franklin co., Me., on Sandy River. P. 1373.

Phillips (ADELAIDE), b. at Stratford-on-Avon, England, in 1833; came to Boston, Mass., in childhood; appeared on the stage at the Boston Museum 1843, and at the Walnut Street Theatre, Philadelphia, 1846; was for several years a favorite member of the Museum company; possessed a fine contralto voice, which by cultivation in Italy (1852–54) enabled her to become a successful prima donna, having appeared in Italian opera at Milan and Paris, as well as in the American cities. She resides in Boston.

Phillips (GEORG), b. at Königsberg Jan. 6, 1804, of Protestant parents; studied law at Göttingen and Berlin; became a convert of the Roman Catholic Church; wrote *Deutsche Geschichte mit besonderer Rücksicht auf Religion, Recht und Staatsverfassung* (2 vols., 1832), in which he defends all the extravagances and encroachments of the papal see; founded in 1838, together with Görres, the *Historisch-politische Blätter*, a periodical whose tendency was the re-establishment of the supremacy of the Roman Catholic Church in social life and the reduction of the state to a mere police institution; was appointed professor at Munich in 1833, at Innspruck in 1849, and at Vienna in 1851. D. at Salzburg Sept. 6, 1872. The most remarkable of his numerous writings are *Das Kirchenrecht* (7 vols., 1845–69) and *Deutsche Reichs- und Rechtsgeschichte* (2 vols., 1845–50).

Phillips (JOHN), LL.D., b. at Andover, Mass., Dec. 6, 1719; graduated at Harvard 1735; was for a time a preacher, but became a successful merchant of Exeter, N. H., where in 1781 he founded Phillips Academy at a cost of $134,000; gave also $31,000 to Phillips Academy, Andover, besides liberal sums to Dartmouth College and Nassau Hall, N. J. D. at Exeter, N. H., Apr. 21, 1795.

Phillips (JOHN), b. at Boston, Mass., Nov. 26, 1770; graduated at Harvard 1788; became a lawyer, and in 1809 a judge of common pleas; a State senator 1803–23; president of the State senate 1813–23; first mayor of Boston 1822–23; father of Wendell Phillips. D. at Boston May 29, 1823.

Phillips (JOHN), b. at Marden, Wiltshire, England, Dec. 25, 1800, was a nephew of William Smith, called "the father of English geology," of whom he was a pupil; became professor of geology in King's College, London, in the University of Dublin, and finally in the University of Oxford, and made important researches in electricity, magnetism, astronomy, and meteorology. Author of *Illustrations of the Geology of Yorkshire* (1829–36), *A Treatise on Geology* (2 vols., 1837–38), *Palæozoic Fossils of Cornwall, Devon*, etc. (1841), and other writings on geology. D. at Oxford Apr. 24, 1874.

Phillips (PHILIP), b. in Chautauqua co., N. Y., Aug. 13, 1834; was bred on a farm, but gave much attention to

music, which he studied under Lowell Mason; has for some years been distinguished as a composer of religious songs; became musical editor for the Methodist Book Concern at New York in 1866; has published collections of music for Sunday schools and social worship.

Phillips (Samuel, Jr.), LL.D., b. at Andover (North parish), Mass., Feb. 7, 1751; graduated at Harvard 1771; was a prominent legislator of Massachusetts, in whose senate he sat for twenty years, being for fifteen years its president; was a judge of common pleas 1781–98, and afterward lieutenant-governor; was a prominent merchant and manufacturer, and the principal founder of Phillips Academy, Andover, Mass. D. Feb. 10, 1802.

Phillips (Stephen Clarendon), b. at Salem, Mass., Nov. 1, 1801; graduated in 1819 at Harvard; became a merchant and a prominent State legislator; was in Congress 1834–38; mayor of Salem 1838–42; Presidential elector in 1840, and twice a Free Soil candidate for governor, besides holding various public offices; was many years connected with the State board of education, and one of the most prominent and public-spirited citizens of his State. He was extensively engaged in the lumber business in Canada, and perished at the burning of the steamer Montreal on the St. Lawrence, June 26, 1857.

Phillips (Wendell), the Tyrtæus of the anti-slavery cause in America, b. in Boston, Mass., Nov. 29, 1811, is the son of John Phillips, the first mayor of Boston, and was sent to Harvard College, from which he graduated in 1831; entered the Cambridge Law School, and after completing his studies in that institution in 1833, was admitted to the Suffolk bar in 1834. The times in which he entered upon the stage were clouded with political anxieties of the most serious character; and it was not in the nature of things for a young man of strong moral convictions, and with the consciousness of power lodged in an alert and vigorous body—a man, in short, in full spiritual and physical health—to stand outside the struggle that was already begun between the forces of liberty and slavery. William Lloyd Garrison, by his clear-headed, courageous, and uncompromising declaration of anti-slavery principles, had not only made that struggle inevitable; he had actually brought it about, and taken so bold a stand that it was impossible it should ever end until one side or the other should conquer. Those who knew the principles that were at stake, and how deep they struck down into the foundations of society, and who knew also what the man was who had pledged his life, his fortunes, and his sacred honor not to forsake the cause of liberty, knew well enough that the war was begun, and that it would be fought out to the end. The incidents of the anti-slavery contest, so far as Mr. Garrison was directly connected with them, have been already fully detailed in our account of his life. In 1835 the "Broadcloth mob"—so called because it was set on foot, and even led, by men of wealth and social position—broke into a meeting of the Women's Anti-Slavery Society and obliged it to disperse. Mr. Garrison, who was assisting at the meeting, was seized by the mob, a rope was put about his body, and he was dragged through the streets, the authorities refusing to interfere officially, and his life was only saved by the subterfuge of putting him in jail as a disturber of the peace. It is pertinent to our subject to state here that the women of the society behaved on this occasion with the heroism that might have been hoped for from such as they were—women of the best blood and breeding of Boston. The president of the society was Mrs. Maria Weston Chapman, than whom America never knew a better-trained, more cultivated, or more earnest woman, with nobler manners, with a larger heart, or richer in saving common sense. Wendell Phillips, not at that time twenty-five years of age, witnessed the extraordinary spectacle of this mob of gentlemen—well-dressed, rich, and the inheritors not only of money, but of all that had been done for culture and enlightenment in Boston for 200 years, yet still so sunk in essential ignorance as to believe they could fight moral conviction with brick-bats and ropes! And he saw, too, the courage of a band of women delicately born and bred, who in this hour of trial could teach men what strength belief in principle can impart to the weak. He saw, what those who saw it say can never be forgotten, the face of Maria Weston Chapman as she walked out of the hall, where, in answer to her dignified pleading, the mayor of the city had told her he had no power to protect her or her society. No mob, not even one of gentlemen, could have found it in its heart to insult such a woman, and if even the representatives of Beacon street and Park street opened up a way for this woman to pass through unharmed, it is not difficult to understand that a nature so nobly strung as that of Phillips's must have been greatly moved by such a sight. Nor will it surprise us to learn that from those earliest days the cause of the rights of woman has held an almost equal place in his mind with that of the rights of the slave; nor that when the one cause was gained, and slavery felt to be under foot, the cause of woman should have found in him one of its sturdiest supporters. Mr. Phillips made his first distinguished mark as an orator in 1837. A meeting had been called in Boston to protest against the murder at Alton, Ill., of the Rev. Elijah P. Lovejoy, the editor of an anti-slavery newspaper, who had been killed by a mob in that place while attempting to save his printing-press and his office from their fury. Mr. Lovejoy was a native of New England, a man of character and worth, and his death was deeply felt by the friends of the anti-slavery cause everywhere. The Boston mob had sown the seeds of open violence over the whole North, and the Alton mob, though it was made of different stuff from that which had its origin in Beacon street, was animated by the same spirit. The meeting in Boston would have ended in the smoke of a few perfunctory resolutions—and under the crafty leadership of the chairman, Attorney-General Austin, a cowardly conservatism had nearly gained so much—when Wendell Phillips in a manly, logical, and yet fiery speech took the meeting out of the hands of the Sauls who held the clothes of the slayers of the martyrs and were consenting unto their death. From this time Mr. Phillips, having once set his hand to the plough, never looked back. He gave up his commission as a lawyer, since he could no longer hold himself bound to obey the Constitution of the U. S., which, as a lawyer, he knew protected the holder of slaves in those rights which Phillips had determined not only never to recognize, but to destroy. It must be remembered that in taking this step Wendell Phillips made a sacrifice of social position and of ambitious prospects such as few young men have ever made in any country. He had good grounds for every hope that can animate a youth. He was well born, he was well bred, he had a fortune assured without labor, and was thus free, loving labor, to strike his furrow where he would. He had all personal advantages, and such native gifts as an orator—graces and strengths that played against a background of solid learning and accomplishment—that it was inevitable all the prizes of the world he lived in would have been heaped into his hands had he only been willing to serve that world in its own way. On the other hand, when he turned and looked, he saw but a grim prospect. Certainly, he did not, as Mr. Garrison did, see ruin and starvation staring him in the face. All his material wants were secured from peril, but everything else that makes life dear to social man was on the hazard of the die he cast when he joined the anti-slavery cause and gave up his position at the bar. Perhaps never anywhere, out of France, did political and religious hatreds have such a swing as they had in the Boston of the first half of this century. No one who does not know these days by experience can imagine the social pressure that was brought to bear on those who took up the anti-slavery cause in earnest. The trouble was, that these converts were not poor fishermen and carpenters, but were socially every way the equals of the people who persecuted them. They were born as well, had fed as well, and when they were called on to endure the winter's cold, with doors shut in their faces that once were gladly opened, with averted glances in the street, and open cuts from old-time friends, they must have been callous indeed not to feel this cruelty. But all was borne with high-hearted cheerfulness and sweetness; and let one who as a boy was by good fortune an eyewitness of this noble company's behavior testify how inspiring it was to live even in the shadow of such serene and honest heroism. Phillips, then, had great compensations, and bought with what in simple faith and loyalty to right he meant for a sacrifice the confidence and intimate companionship of men and women with whom it was a high privilege to live and share their work. From this time, giving up all other employment, Mr. Phillips devoted himself with unfailing energy to the advocacy of the anti-slavery cause. He was the orator, above all others, by the charm of a powerful logic, a wit that played about his theme with the purity and the power of the sunbeam, and a command of the English language that showed him familiar with the works of every master. It may fairly be questioned whether there ever spoke in America such an orator as Wendell Phillips. He had, united, such weight of matter and such manliness of manner, with only so much grace as may be allowed in a man, that no audience, though it were packed with enemies when he began, but would be his friend when he had ended. He spoke, so far as it was physically possible, wherever he was called, and always without pay—sometimes, very often indeed, paying his own travelling expenses. He never used notes in speaking, nor, we believe, wrote out his speeches beforehand. His manner was grave and dignified, with but few gestures, and those struck out from the fire of the moment; and they had such truth and aptness as no premeditation can give.

His characteristics as a speaker were—a logical, lawyer-like setting out of his subject and great closeness in his argument, so that if he went off a little to meet an interruption, or to answer a question, or to parry the thrust of an insult or a threat interjected, he quickly returned and beat out the iron on his anvil. He had no pathos, nor ever tried to move that way; he had not Mr. Lincoln's Eastern gift for story-telling; but he knew well the charm of anecdote, of illustrations from history and biography, and his speeches were rich in the objective charm that comes from the apt introduction of these. No speaker was more welcome; and when the storm of the anti-slavery agitation was somewhat subsided, and people had learned that it was useless to try to stay the stream, no name was surer to draw out the population of the towns and villages to the lyceum than that of Wendell Phillips. In New York and Boston he was always sure of a crowded house, and he was always ready to speak for any cause he held dear, especially for temperance, of which he was always a distinguished advocate, and for woman's rights. He sometimes lectured on topics apart from his main errand, and one lecture, *On the Lost Arts*, has been delivered by him an immense number of times. For such deliveries as these we believe Mr. Phillips has always been paid, but with a generosity characteristic of the man the money earned in this way has been turned into some needy treasury or found its way into hands whose needs were not to be made known. The anti-slavery cause, so far as it could be the work of one man, was Mr. Garrison's creation without a doubt, but Mr. Phillips took the water out of Mr. Garrison's great cistern and with it refreshed the whole land. This new Paul planted, and this new Apollos watered; and, as they did all for the love of God, they would be the first to declare that he alone gave the increase in which we to-day rejoice. Since the abolition of slavery, Mr. Phillips has found his occupation gone, and he seldom appears in public in these later days. In his way of advocating his favorite doctrines of temperance and woman's rights a world that loves him, and freely pays the gratitude it owes him, forgives what it can but think his frequent wrong-headedness and lack of judgment. But it finds it more difficult to forgive his soiling his great name, never flecked before, by striking hands with that least-erected spirit, Benjamin F. Butler, in any enterprise, and, of all enterprises, in the advocacy of such a fallacy as that of paper money. CLARENCE COOK.

Phillips (WILLARD), LL.D., b. at Bridgewater, Mass., Dec. 19, 1784; graduated at Harvard 1810; was a college tutor 1810–15; became a lawyer of Boston, Mass.; was a judge of probate 1839–47; became in 1843 president of a life insurance company; author of treatises on *Insurance* (1823), *Patents* (1837), *Political Economy* (1828), and several legal and other works.

Phillips (WILLIAM), b. in Boston, Mass., Apr. 10, 1750; was a successful merchant, an ardent patriot, and a liberal benefactor of Phillips Academy, Andover, and the Andover Theological Seminary, to which his father, William, also gave freely; was lieutenant-governor of Massachusetts 1812–23. D. May 26, 1827.

Phillips (WILLIAM WIRT), D. D., b. in Montgomery co., N. Y., Sept. 23, 1796; graduated at Union College 1815; studied theology at the New Brunswick Seminary; became pastor of the Pearl street Presbyterian church, N. Y., 1818; was transferred to the Wall street church 1826, which subsequently removed to Fifth avenue; prominent in the public concerns of the Presbyterian Church; was trustee of the college and seminary at Princeton, member of the council of the New York University, president of the board of foreign missions, and moderator of the General Assembly 1835. D. in New York Mar. 20, 1865.

Phil'lipsburg, p.-v. and tp., cap. of Phillips co., Kan., on Deer Creek.

Phillipsburg, p.-v. and tp., Warren co., N. J., on Delaware River opposite Easton, Pa., on Morris and Essex, Central New Jersey, Lehigh and Susquehanna, and Belvidere Delaware R. Rs., has 1 newspaper and large manufactures, chiefly of iron. P. 5932.

Phillipsburg, b., Moon tp., Beaver co., Pa. P. 554.

Phillipston, p.-v. and tp., Worcester co., Mass. P. 693.

Phil'lipstown, tp., Putnam co., N. Y. P. 5117.

Philmont, p.-v., Claverack tp., Columbia co., N. Y., on Harlem R. R.

Philo, p.-v. and tp., Champaign co., Ill., on Toledo Wabash and Western R. R. P. of v. 291; of tp. 1184.

Phi'lo Judæ'us, b. at Alexandria about twenty years before Christ; spent his whole life there, with the exception of two journeys he made—one to Jerusalem, and one to Rome. Of his life very little is known, though he is often mentioned by Josephus, Eusebius, and Hieronymus. He was of a wealthy family, and occupied a conspicuous position in his native place. In the year 40 A. D. he was chosen a member of the embassy which the Jews sent to Rome to Caius Caligula. The embassy stayed in Rome over half a year without being admitted to the presence of the emperor; but during the reign of Claudius a learned defence of the Jews, written by Philo, was read in the Roman senate. The embassy he has described in his *Legatio ad Cajum*. In Alexandria he devoted all his time to studies, and although as a philosopher he is without original genius, and as an author without original style, the peculiarity of his situation as mediator between Greek and Oriental wisdom, between Platonism and Judaism, between polytheism and monotheism, gave his writings a great influence in his own time, and makes them interesting to ours. During the reign of the Ptolemies many Jews had gathered at Alexandria, allured by the marvellous progress of that city in wealth and commercial importance. At the time of Philo they occupied two of the five wards of the city, and they were found also in the three others. But having come into close contact here with Greek civilization and Greek philosophy, it became difficult for them to maintain their original character as Jews unalloyed. They naturally endeavored to reconcile that which in their sacred books they considered as divine revelation with that which in the Greek speculation they felt to be true. From this intermixture of Greek and Oriental views sprang Gnosticism, Neo-Platonism, and that school of Christian theology which is generally called the Alexandrian, represented by Clemens Alexandrinus, Origen, and others. But the first representative or manifestation of this peculiar spiritual atmosphere of Alexandria is Philo Judæus. He was a very pious and religious man, and believed himself to be an orthodox Jew. He was very severe on those of his countrymen who found it easy to accommodate the faith of their ancestors to the new circumstances; yet he is himself their representative, their type. His many writings are generally divided into three classes—those defending his countrymen, *Contra Flaccum, Legatio ad Cajum, De Nobilitate;* those interpreting and explaining the sacred books of the Jews and their ideas, *De Mundi Opificio, Legis Allegoriarum Libri III., De Monarchia, De Præmiis Sacerdotum, De Posteritate Caini, De Cherubim, De Pœnitentia;* and those treating metaphysical subjects, *De Mundi Incorruptibilitate, Quod Omnis Probus Liber, De Vita Contemplativa.* Of these three classes, the second and third are the most interesting with respect to his standpoint. His method of interpretation is the allegorical. The texts of the sacred books are not made subjects of positive criticism, but employed as opportunities for the development of theories. Thus, the garden of Eden represents God's wisdom, and the four streams issuing from the garden the four virtues emanating from wisdom. Adam, hiding away from God, represents vice, which bereaves us of the aspect of the good. In his total view of the universe he retains the genuine Jewish separation between God and the world, but he knows how to reconcile it with the Greek polytheism and pantheism. While in the Old Testament the world is in God's hand like a cloth, which he folds or unfolds just as he pleases, with Philo matter is an eternal principle. His idea of God is thoroughly monotheistic, but between God and matter he finds a convenient place for the ideas of Plato transformed into the angels of the Old Testament. These ideas or powers or angels form the medium through which God reveals himself to the world, and they are all gathered together in a divine world-spirit, a divine intellect, the *Logos.* CLEMENS PETERSEN.

Philology. See LANGUAGE.

Philopœ'men, b. at Megalopolis, Arcadia, in 252 B. C., of a noble family; received a careful education, and gave early evidences of his military and administrative talents; distinguished himself greatly in the battle of Sellasia (221 B. C.) as leader of the horse; lived subsequently for several years in Crete, and was chosen commander-in-chief (*strategos*) of the Achæan League in 208 B. C., a position which he held eight times. It was his policy to put down rigorously all internal dissensions and feuds in order to deprive the Romans of any opportunity of interfering in Greek affairs; and although his plan was finally baffled by the fickleness of his countrymen and the meddlesomeness of the Roman senate, in details he achieved many brilliant successes; thus, he compelled the Spartans to join the league, which was an important step toward the establishment of a united Greece. He was in Greek history the last character of a heroic cast. When the Messenians revolted against the league, he was seventy years old and sick in bed, but he rose immediately and put himself at the head of the army of the league. In the ensuing battle he fell into the hands of the enemy, and their commander sent to him a cup of poisoned wine, which he emptied (183 B. C.).

Philop′olis (P. O. name Sparks), Baltimore co., Md.

Philos′ophy [Gr. φιλοσοφία, from φίλος and σοφία, "love of wisdom"]. The introduction of this term is currently attributed to Pythagoras on the authority of Cicero (*Tusc.*, v. 3) and Diogenes Laertius (i. 12; viii. 8), but the oldest writer known to use it is Herodotus (i. 30). The Seven Wise Men were called σοφισταί, to denote their practical sagacity rather than their knowledge of science as such. Socrates, however, is said to have called himself a philosopher in order to reprove the Sophists of his time, he being only a seeker of wisdom—they, self-styled possessors of wisdom.

Its Definition.—Many noteworthy definitions of this science may be culled from its writers. While the Stoics made it include "a striving after virtue in the sciences, physics, ethics, and logic," Epicurus declared it to be the rational pursuit of happiness. Plato had already designated philosophy as the acquisition of true knowledge (ἐπιστήμη = scientific knowledge), and Aristotle had defined it as the science of being as being (τὸ ὂν ᾗ ὄν). The relation of cause and effect furnishes the basis of the definitions of the earlier among modern philosophers (Descartes, Bacon, Hobbes, Leibnitz). Wolf returns substantially to the Aristotelian basis by defining it to be the science of possible existence in so far as possible, thus referring to the logical conditions of existence. Fichte makes it the science of sciences (*Wissenschaftslehre*); and this conception is very generally adopted, with slight modifications, by later thinkers. Whenever man attempts to refer all of his cognitions to one, he begins to philosophize. Each nation's philosophy is an endeavor to solve the problems of the world, as they appear to it from the standpoint of its national life, by some one principle. This principle may be any cognition selected from the realm of nature or from that of mind. The systems of philosophy of a given nation or time may differ as to the one principle chosen as the explanatory one, but they are certain to agree in the elements of the problem to be solved. For the philosophy of a given epoch endeavors to state in ultimate terms the elements of the problems of its epoch. A philosophic solution of a problem consists in the reduction of the immediate and contradictory elements, as they are given in life, to the ultimate terms or expressions which indicate the universal and necessary conditions out of which those elements have arisen. Hence, every philosophy has two factors: (1) the temporal and finite one, which includes the empirical elements to be explained—that is, the then present world of man and nature, which involves problems to be solved; (2) an eternal and infinite element, or the permanent and unchangeable ultimate idea through which the solution is wrought out and by which the temporal and finite is explained: this element is the conception of the absolute as it finds expression in the solution. Thus, the different systems of philosophy start from different phases of life (because its phases, from one age to another, are perpetually changing), and yet they arrive at substantially the same result if they are complete systems. The difference, therefore, between the systems of philosophy of different peoples appertains rather to the empirical factor than to the character of the general terms in which the solution is expressed and contained. It has been pointed out (see Generalization) that in the most rudimentary form of knowing—*i. e.* in sense-perception—there is a synthesis of the two extremes of cognition: (1) the immediately conditioned content, which is the particular object as here and now perceived; (2) the accompanying perception of the self or Ego which perceives—that is, the activity of self-consciousness, the knowledge that it is I who am subject in this particular act of perception. Hence, in sense-perception two objects are necessarily combined: (*a*) the particular object here and now presented; (*b*) the universal subject of all activity of perceiving. This universal subject, which is thus its own object in all forms of knowing, appears in two characters if we reflect upon it: (1) it is absolutely particular—*i. e.* present in this special moment now and here, and in this special act of perception; and (2) it is absolutely universal, retaining its self-identity under the constant change or flux which essentially belongs to the process of the immediate now and here, or present moment. The present now is a point in time, and thus has no duration except through the synthetical addition of past and future time, which *are* not, but either *were* or else *will be*. Thus, such a thing as the perception of a permanent or a *relation of any sort* (for example, the one of identity or of difference, the most elementary and fundamental ones) cannot transpire without attention on the part of the subject who perceives to the perception of self or to the universal factor which is present in perception. This act of attention to self is reflection, self-perception entering all perceptions. The degree of the power of reflection or of attention to self-consciousness measures the ability to generalize or the ability to think; or, in other words, the strength of thought. For the minimum of this power of reflection admits barely the possibility of combining the perceptions of time-moments that are slightly separated, and hence its results are bare perceptions of identity or difference, without the quantity and quality thereof. Sense-perception increases in richness of knowledge in proportion as the power of synthesis or of combining the successive elements of perception increases. And this power of combining such separate elements is contingent on the power of reflection or of attention to the self-activity in perception. Such reflection has been called "second intention," and is the condition of all generalization. Self-consciousness is therefore the basis of all knowledge; for all predication—from the emptiest assertion, "This is now," up to the richest statement involving the ultimate relation of the world to God as the highest principle—is possible only through a withdrawal of the mind out of the limiting conditions of the particular here and now by means of attention to its own activity, which, as already pointed out, comprehends the two phases of absolute particularity and absolute universal potentiality in one. This is the psychological basis of the general principle laid down regarding the identity of systems of philosophy and their phases of difference. The naïve state of mind of the uncultured human being, alike with the acute philosophical intellect or the intuition of the religious mystic, involves in all its activities and at every moment thereof this phase of attention to the self-activity or to the subject which knows. The naïve or non-philosophical stage of consciousness differs from the philosophical stage in the fact that the latter sets up some one of its cognitions as the highest principle, through which it attempts to explain the totality of said cognitions, while the former makes no such attempt. The philosophical activity of the mind is therefore a *third intention*, or act of attention which has for its object the reference of individual cognitions, whether particular or general, to an assumed supreme principle. This philosophical act, it is evident therefore, is a species of reflection different from that reflection which is implicit in all cognition. It is an act of withdrawal of the mind from immediate cognition, which arises through the first and second intention (or perception and reflection), and a concentration of the attention upon the relation of that immediate cognition (as existing in its separate details) to all cognition as totality. It is therefore systematic knowing. Moreover, as already suggested, it may posit as its supreme principle any one of its cognitions, taking, for example, an empty one lying close to the sensuous pole of cognition, or a concrete one lying close to the pure Ego. Thus, it may make matter, or some form of matter, as water, air, fire, or ether, the philosophical principle which is to explain all things, being universal and particular at the same time; or it may take for this purpose Reason (νοῦς), the Will, the Idea, the Good, *Causa sui*, the self-representing monad, or some form nearly approaching the pure Ego, for its principle. But the psychological presupposition underlying all philosophy, whether materialistic or spiritualistic, is the fact of withdrawal or abstraction of the mind from its first stage of cognition, and the contemplation of the same under the form of relation to a single principle—*i. e.* to an absolute totality. This contains the remarkable result that in this species of knowing the mind views its first principle, or the primitive existences by which it explains things as self-activities; which means that mind sees under its knowledge its own form as the ultimate truth of all. Take the standpoint of materialistic philosophy, for example: Matter is the ultimate principle, the whence and whither of all. Matter is thus posited as a universal which is the sole origin of all particular existences, and also the final goal of the same. Hence, matter is active, giving rise to special existences, and also changing them into others with all the method and arrangement which we can see in natural laws. For matter must contain in it potentially all that comes from it. Hence, matter is creative, causing to arise in its own general substance those particular limitations which constitute the differences and individuality of things. It is negative or destroyer in that it annuls the individuality of particular things, causing to vanish those limitations which separate or distinguish this thing from that other. Such a principle as this "matter" is assumed to be, which causes existences to arise from itself by its own activity upon itself and within itself, entirely unconditioned by any other existence or energy, is self-determination, and therefore analogous to that factor in sensuous knowing which was called the Ego or self-consciousness—an activity which was universal and devoid of form, and yet incessantly productive of forms, and destructive of the same. All this is implied in the theory of materialism, and exists there as separate ideas, only needing to be united by inferences. But "mat-

ter" as such idea is a cognition which arises only through reflection; it is perceived by "second intention," for first intention only refers or relates to immediate particular objects, and not to general objects like "matter," which is only a term for the persistent activity which recurs in the perception of whatever objects it apprehends in time and space. As cognition of the mind, therefore, "matter" is a product of "second intention," but as philosophic principle it is more than this: it is this special cognition of matter posited as the absolute or as the totality and entirety of cognition, and hence not as limited through other particular cognitions, but as containing within itself all limitations necessary for the particularization of other cognitions. Hence, it is a pure Ego in so far as the possibility of all special ideas are concerned, and an active process so far as actual particular existence arises from it. Thus, the position even of materialistic philosophy implies the thought of a totality which is purely universal, and a pure activity originating particular existences at the same time. And here we meet the most important distinction which belongs to the definition of philosophy. The degrees of consciousness are various, and differ through the completeness with which they grasp the determinations of the self-activity of the Ego. On the stage of philosophy consciousness grasps determination as a totality, and hence as self-determination. But this may happen in all shapes, from the emptiest up to the fullest and concretest. Even in materialism the attempt to explain the world through an ultimate principle indicates the certitude of the mind of the objectivity of its principle of self-determination, and it therefore implicitly asserts and presupposes that the truth of things is self-determination. And yet it may under this form so far contradict itself as to represent its content, "matter," to be a mere spatial existence, thinking under the term a vague abstraction as the origin of all immediate particularity and as the final cause thereof, without distinctly defining to itself these attributes as belonging to matter as highest principle. There are, then, various forms of philosophy, differing in the degree of completeness in which they consciously define their highest principle as the concrete Universal which originates the particular by its self-activity, and thus realizes itself in its own externality.

The distinction of philosophy from religion (and religion would be thought at first to be a reduction of all specialty to an absolute principle (God), in the same manner as defined for the province of philosophy) lies in the fact that while philosophy attempts to comprehend the totality of things through its absolute principle, religion *represents* its absolute in the historical relation of Creator of the world, and thus while it does subordinate all knowledge to one of its own principles, the mind in religion is not active in its third intention, but only in its first and second intentions. Religion offers its teaching to the lower and lowest stages, as well as to the highest stages of theoretical consciousness; for its revelation, although of the highest essence, is not immediately addressed to the theoretical reason, but rather to the Will. Hence, it presents its absolute, not for assimilation, but for practical reconciliation with the individual. The relation of theosophy or mysticism to philosophy is here to be defined. Setting out from the standpoint of religion, and positing the absolute of religion as not only the principle of human action, but also of theoretical cognition, the religious mystic explains the world of nature and of history through it. This constitutes theosophy. It purports to arise through special illumination of the mind through the Absolute, and may be very profound and complete in its theory of things, but will of necessity use categories borrowed from religion, and consequently tinged with pictured representations, while philosophy uses its thoughts abstractly, and derives them from the activity of reflection.

The province of literature is to be distinguished from philosophy through the fact that its works seek an æsthetic unity of form, rather than a unity in the principle portrayed. It may happen, as in the poem of Lucretius, *De Rerum Natura*, that a philosophical treatise assumes an æsthetic form, but such form does harm to the requirements of scientific method. The essay and the literary criticism may offer profound reflections, but they are necessarily hampered through their form when it is literary rather than scientific.

The sciences, finally, are more difficult to distinguish from philosophy, especially the mental sciences. Indeed, philosophy is sometimes made synonymous with mental science, or with psychology. While religion agrees with philosophy in content (the relation of the Absolute to the world), it differs from it in form (employing the principle of faith or authority instead of logical necessity); the sciences, on the contrary, agree in form, but disagree in content. They treat of the systematic arrangement of materials within special provinces, rather than the reduction of the same to the first principle of all. The province of philosophy may include those of all special sciences, and even those of art and religion, jurisprudence and ethics, psychology and ethnology, in so far as those provinces are made elements of the problem of the universe to be solved by a first principle.

Its Method.—Philosophy alone can cognize methods, whether of other provinces of mental activity or of its own procedure. First and most obvious is the analytic method, which proceeds by resolution of a whole into its parts, and is a method of invention or discovery, inasmuch as it concentrates indefinitely the power of the mind upon a subject by attacking its details singly. This method is in philosophy what the microscope is in anatomy and kindred physical investigations. It proceeds from the vague to the distinct and clear. Then there is the synthetic method, which proceeds by combination or composition, and is a method of generalization or of principles—a method of explanation rather than of discovery. Besides these species of method, their union gives rise to higher species of method: (1) deductive method, proceeding from the necessity of the whole to the necessity of the parts; (2) inductive method, proceeding from particulars contingently given to their necessary unity; (3) dialectic method, which by the analysis of its object discovers its essential dependence upon other objects and its unity with them; again, considering the new object, which has arisen synthetically through the discovery of dependence in its first object upon other objects, it discovers by analysis a new form of dependence, which leads to a new synthesis, etc. It is a method of ascent toward a first principle by the discovery of presuppositions, and by their addition to the object considered. It is contrasted by Plato (*Repub.*, bk. vii. ch. xiii.) with the mathematical method (that of simple deduction), as the method which removes its hypothesis (*i. e.* its first object) and ascends toward a first principle (ἐπ' αὐτὴν τὴν ἀρχήν), while geometry and the kindred sciences use fixed hypotheses (*i. e. assumed* first principles), and are unable to show their necessity as the dialectic method does by the discovery of presuppositions. The method of Aristotle is dialectic in the same sense as that of Plato, differing only in this, that he makes it more exhaustive by laboriously collecting and discussing all the inadequate phases that fall under each subject, exhibiting at last the true archetype or adequate realization of the species, as though he had empirically discovered it by careful investigation. The dialectic method contains the process of analysis in union with that of synthesis. Its analysis proves to be a synthesis because it reveals dependence, and hence the relation of the part to a whole. It must be present under all forms of necessary thinking, even when the thinker is unconscious of his method; as, in fact, he may be even of all method, and still think philosophically. The inductive and deductive methods, so called, unite analysis and synthesis also, but in the former the side of analysis is partly suppressed, in the latter that of synthesis. Again, the dialectic method is skeptical when it lays chief stress on its negative side, on that of the destruction of its hypothesis through the discovery of dependence, and speculative when it subordinates the negative phase to the total result, which is constructive of a more comprehensive and deeper thought—hence, of a truer thought.

Its Classification.—(A.) From the foregoing definition of philosophy it is evident (*a*) that there is one province of thought which belongs partly in the domain of philosophy and partly in that of religion—to wit, theosophy or mysticism. In it the dogma is partially rationalized, and therefore belongs to the realm of cognition instead of faith. Theosophy is the first form of philosophy, therefore, inasmuch as it makes its appearance as an outgrowth from religion, the effort being made to realize the content of religion as truth. (*b*) Thought perfectly independent from religion, and intent on constructing a rational view of the world and on reducing its common notions to consistency, originates systems of materialism. It is not yet sufficiently disciplined to seize consciously its higher cognitions (those of the soul, for example) as first principles with which to explain the world; it therefore posits a cognition lying close to its ordinary experience and most familiar to it, as the explanation of all. (*c*) It gradually discovers what it has implied by endowing a principle with the power of originating all things, and comes to adopt, step by step, more spiritual principles until it reaches pure idealism and recognizes the world of sense-perception as phenomenal manifestation of absolute mind. (B.) Above this standpoint begins the series of systems founded on perception of method (the fourth intention of the mind, making for its object the operations of the mind in its third intention, or ordinary philosophizing). (*a*) The first

system founded on perception of method is skepticism, which breaks the link between subject and object, between the mind and the truth, by calling attention to the process or method of the mind in philosophizing, and exhibiting the modifying effect of mind upon truth. It shows that the activity of the mind enters and constitutes an element of truth, and therefore invalidates it. (*b*) The second system founded on the perception of method is the system of speculative psychology, which perceives the positive side of method, and its necessary universality as principle of existence or as logical condition of the world. This last system is sometimes called pure science, science of ideas in and for themselves, ontological logic, science of knowledge, absolute idealism, etc. Examples of each of these five systems may be found in the subdivision *History of Philosophy*.

Its Departments.—The old division of Wolf makes four departments in philosophy: (*a*) ontology, (*b*) rational psychology, (*c*) cosmology, (*d*) theology. This may be modified to meet the present development of philosophy thus: (*a*) pure science or logic or methodology—dialectical discussion of general ideas; (*b*) science of nature, corresponding to rational cosmology; (*c*) science of spirit, including numerous subordinate spheres, such as (1) psychology, (2) ethics, (3) politics and history, (4) æsthetics, (5) theology (natural). This corresponds nearly to the division of the ancients into (*a*) dialectics, (*b*) physics, (*c*) ethics. (Other distinctions which appertain to this subject will be found under the *History of Philosophy*, and in many instances under their several titles throughout this work.)

Its History:—The history of philosophy, according to the definition discussed in this article, will contain the record of all thinking which refers the manifold of experience to an ultimate principle; this explanatory principle being materialistic on the one hand in the elementary stages of thought, and idealistic in the more advanced stages, while it becomes a principle of method (or a principle at once ontological and psychological) in the highest thinking.

The Orient has generally been excluded from the domain of the history of philosophy, on the ground that its thinking is not emancipated from religious authority. Religion and philosophy are mingled in a species of theosophy in Asia, but are worthy of study as a phase of transition containing the embryonic shapes and metamorphoses that become fully developed and distinct in the literature, religion, and philosophy of the Western peoples. The Chinese systems of Lao Tzŭ (604 B. C.) and Confucius (550 B. C.) posit a first principle (called *Tao* by the former, and *Tai-ki* by the latter), an abstract indeterminate substance, whence arise masculine and feminine principles that beget all things.—The caste system gives rise to limitations so irksome and galling that the great problem in Indian thought is emancipation; it seeks relief from the rigid particularity of the distinctions (tedious ceremonial observances) which it encounters in life, by flight to the indefinite, vague, and empty ground of substance of all things, and finds solid satisfaction in contemplating Brahm —*i. e.* the pure identity wherein neither caste-differences, nor the bewildering luxuriance of tropical nature, nor even the prolific creations of its own active fancy and teeming intellect, any longer find subsistence to vex and weary it. Besides the Sankhya or rational system, there is the Nyaya, or logical system of Gautama, and its modification in the atomic system of Kanada, called the VAISHESHIKA (which see); the Vedic system, full of mysticism, including the elder school of commentary called *Purva Mimansa*, founded by Jaimini, and a later one called *Uttara Mimansa*, founded by Krishna Dwaipayana.—The philosophic stand-point of the Persian consciousness is considered to be an advance upon those just considered, in that it gives greater validity to the negative element—that of limitation or finitude, the principle of individuality or particularity. It posits a process, the conflict of light and darkness or of good and evil, the positive and negative, as the explanatory principle of the universe.—The worship of Hercules and of Adonis in Syria and of Osiris in Egypt indicate a progress over the standpoint of Zoroaster, in that the principle of particularity is still more highly prized. Purification through pain reconciles the finite and infinite, and it is not necessary to annihilate the former. Immortality of the individual becomes explicable, and the Egyptian mind is mostly occupied with this thought.—Western Asia (including Egypt) occupies itself with the problem of individuality and its essential inherence in the absolute. Its influence appears in the Ionic philosophy, particularly in the teachings of Anaximander and Heraclitus; in the Pythagorean philosophy; in neo-Platonism; in gnosticism; in the mysticism founded on the *Cabbala;* in the early Christological speculations of the Church; in Arabian mysticism.—The history of philosophy in the Occident, beginning with Greece, has to do with independent thinking, and is no longer obliged to seek its material in systems that are partly religious, partly ethical, and partly speculative. Greek philosophy begins with the Ionic school in Asia Minor, Thales, Anaximander, Anaximenes, and Heraclitus being its chief names. They set up material principles—(*a*) water, (*b*) the indefinite (matter), (*c*) air, and (*d*) fire—as the origin of things. Pythagoras, an Ionian by birth and taught in its school of philosophy, founds a society in Lower Italy, and proclaims numerical harmony as his principle. The Eleatic school (also of Lower Italy) sets up the principle of pure being; it included Xenophanes, Parmenides, and Zeno. Empedocles of Sicily taught that love and hate are the ultimate principles, while Anaxagoras at Athens announced the important doctrine that Reason (νοῦς) arranges and orders all things. Leucippus and Democritus of Thrace founded the atomic philosophy. The Sophists, of whom the most important were Protagoras, Gorgias, and Prodicus, discovered and applied the principles of ratiocination, or the dependence of conviction upon grounds or reasons. Socrates investigated universals, seeking ultimate grounds for conviction in order to establish moral principles on a firm basis. The νοῦς of Anaxagoras becomes with the Sophists individual reasoning—with Socrates, universal reason as conscience. Plato, continuing the investigation, finds the theoretical universals, the ideas or archetypes, antecedent to and dominant over the world of experience. Aristotle, finally, takes an empirical inventory of the world, and completes the demonstration that νοῦς is the principle of things in detail, being their final cause. He finds that all universals are phases of one universal Reason (νοῦς ποιητικός), which is the highest principle. His doctrine of first and second entelechies defines the relation of individuals to this absolute Reason and the grounds of the immortality of man. He maps out the paths of the several particular sciences, and makes important investigations in many of them. His pupils, Eudemus and Theophrastus, and his commentators, Alexander of Aphrodisias, Porphyry, Themistius, Simplicius, and, later, Avicenna and Averroës, deserve mention in any notice of Greek philosophy, however brief. The Stoic school of Zeno of Citium, whose system is ethical in its tendency, the school of Epicurus, whose system is an atomic materialism, belong to the decline of Greek philosophy. (This brief summary of the first phase of Greek philosophy may be supplemented by reference to articles in this CYCLOPÆDIA devoted to special titles here named, and particularly to the following: THALES, PARMENIDES, ZENO OF ELEA, HERACLITUS, PYTHAGORAS, SOPHISTS, SOCRATES, PLATO, ARISTOTLE, STOICS, ZENO OF CITIUM, TELEOLOGY, FORM, MATTER, SUBSTANCE, IDEA, SIMPLICIUS, SEXTUS EMPIRICUS, LUCRETIUS.) The revival of Greek philosophy at Alexandria after the Christian era was occasioned by the contact of Greek thought with Orientalism. Alexandria was the focus or centre for the East and the West. Neo-Platonism, accordingly, is the struggle to define the relation of Greek thought to spiritual religion. Its distinguished names are Ammonius Saccas, Plotinus, the two Origens, Porphyry, Iamblichus, and Proclus. Its principle is the transcendence of the Deity, and it labors to explain how the world emanates from a primal one which is in nowise related to it, and is devoid of all antithesis, and therefore unthinkable. Boëthius, through his *Consolatio* and his translation of a portion of the *Organon*, and by his commentary on the *Isagoge* of Porphyry, transmitted almost all that was known of Greek philosophy by the Christians in the West for several centuries. (See articles on PLOTINUS, PORPHYRY, IAMBLICHUS, PROCLUS, GNOSTICS, MYSTICISM, PHILO.) — Within Christianity, Gnosticism arose in the second century as an attempt to construct a philosophy on a Christian basis. Philo had already speculated on the Logos. Valentinus made the νοῦς the "only-begotten" and the source of the Logos. Origen and Clement endeavored to assimilate some of the gnostic doctrines. After the Council of Nice had given definition to the orthodox faith, more attention was given to the philosophic justification of its dogmas. Athanasius, Gregory of Nyssa, St. Augustine, Synesius, Æneas of Gaza, Philoponus, and the pseudo-Dionysius the Areopagite contributed to this work. In the ninth century it was the translation of the writings of the pseudo-Dionysius by Scotus Erigena that gave rise to scholasticism. The controversy of nominalism and realism, in which Roscellinus, Anselm, Abelard, and William of Champeaux were the chief disputants, occupied the first period of scholasticism. The mastery of Aristotle and the refutation of the pantheistic commentary of Averroës were the chief business of the second period, in which appeared the great theologians Alexander of Hales, Bonaventura, Albertus Magnus, Thomas Aquinas, and Duns Scotus. Aristotle became the "*precursor Christi in naturalibus*," as John the Baptist "*in gratuitis*." Besides Averroës should

be named Avicenna, Alfarabi, Akendi, and Algazel among the Arabians, and Avicebron, Ben David, and Moses Maimonides among the Jewish philosophers. Roger Bacon and William of Occam did not follow the prevailing tendencies, the former being an experimenting physicist born before his time, and the latter an invincible opponent of the logical realism current. Nominalism under Occam destroyed the tendency to rationalize the dogma, and scholasticism went down altogether. (See articles on SCHOOLMEN, NOMINALISTS, REALISM, IDEALISM, IMMORTALITY, NECESSITY, OCCAM, DUNS SCOTUS, AQUINAS.) The fall of the Eastern empire brought many learned Greeks into the West, and kindled at Florence and elsewhere the direct study of Plato and Aristotle in the original Greek, whereas hitherto the interpretation of commentators had been generally accepted. Distinguished translators and new commentators, such as Ficinus, Pomponatius, Scaliger, appeared. (See FICINUS.) The naturalistic opponents of the traditional philosophy of the schools at this period, Nicolaus Cusanus, Jerome Cardan, Telesius, Patritius, and Ramus, prepared the way for an epoch of emancipation from authority, in which the leading spirits were Giordano Bruno, Francis Bacon, and René Descartes. The first of these attacked the ecclesiastical authority in matters of science; the second founded the empirical method of philosophizing; the third completed the emancipation from scholasticism by bringing the principles of philosophy to the test of consciousness and by discarding the authority of tradition. Thomas Hobbes applied Bacon's principle to politics; Geulincx and Malebranche explained the relation of mind and matter in the Cartesian dualism; Spinoza avoided the Cartesian dualism altogether by adopting the principle of One Substance, with the two attributes, thought and extension. Locke attempted a critical survey of the powers of the mind to cognize truth, and found sense-perception and reflection to be the sources of all ideas. Berkeley drew from Locke's doctrine the inference that we know only ideas and not the external world. Cudworth, author of the *Intellectual System*, and Henry More the Platonist, Gassendi the atomist, Grotius and Puffendorf, writers on international law, Bayle the pantheist, are among the foremost thinkers of the time.—Meister Eckhart, probably a pupil of Albertus Magnus, founded in the fourteenth century along the Rhine the most noteworthy school of theosophy yet known, and with his followers, Tauler, Heinrich Suso, John Ruysbroeck, and the author of *Theologia Germanica*, and Thomas à Kempis, exercised a most potent influence on the growth of thought in Germany and the rise of the spirit that produced the Protestant Reformation. Jacob Böhme, contemporary of Descartes and Lord Bacon, developed another system of theosophy nearly as remarkable as that of Eckhart, and in substantial agreement with it. With Leibnitz, theosophy becomes philosophy. His doctrines were systematized by Wolf, and held sway down to the time of Kant. In his *Monadology* he sets up in opposition to the mechanical system of Descartes the doctrine of monads, which have no mechanical relation to each other, but only the ideal or psychological one of representing each other.—David Hume is the point of departure for the chief systems of philosophy which have appeared during the past hundred years. His criticism on the idea of causality, reducing it to the mere "habit of surveying things constantly conjoined with each other," sapped the foundations of all dogmatic philosophy current at his time. La Mettrie, Voltaire, Rousseau, Condillac, Diderot, D'Alembert, Robinet (who anticipated Darwinism and the Spencerian "evolution"), and Von Holbach are noted thinkers in the same movement in France. Lessing began the struggle for literary independence in Germany, and Kant completed the reaction in philosophy and freed his country from its subservience to French ideas. The *Critique of Pure Reason* established on the ground of their universality and necessity the *a priori* character of causality and other categories, and demonstrated the self-activity of the mind in sense-perception. The *Critique of Practical Reason* showed that God, free will, and immortality are necessarily postulated by all acts of the individual as "regulative ideas;" they are the logical conditions of human action. These two *Critiques* rescued religion and morality, and the institutions founded on them, from the attacks of skepticism, but they denied the possibility of theoretical cognition in the realm of objective existence. This inability the later schools of German philosophy labored to remove. Fichte's *Science of Knowledge* showed in a systematic form the origin of the categories in the self-activity of the mind, and proved that the will is therefore presupposed everywhere as a conditioning factor in cognition. The sensuous factor of knowledge is accordingly subordinated, and the moral world is almost the only world that exists for Fichte. Schelling, however, reacts to the opposite extreme, and lays great stress on the evolution of unconscious organism in nature and human history. The central object of his system is therefore æsthetic art, wherein the unconscious reason reaches its completest expression. Schelling's school includes the distinguished theosophist Baader and the naturalists Oken, Carus, Oersted, Esenbeck, Steffens; the theologians Schleiermacher, Eschenmayer, Blasche, Görres; Schubert the cosmologist, Stahl the jurist, Solger and Ast, æsthetic writers; besides Krause, Troxler, Jacob Wagner, and others. Hegel, in opposition to Schelling's tendency to emphasize unconscious evolution, endeavored to grasp the content of nature and mind with self-conscious method. His "unity of thought and being" means that universal and necessary ideas, being the logical conditions of the world of experience, are as objective as they are subjective, any denial of this principle being self-contradictory, inasmuch as it assumes to pronounce *a priori* upon the objective possibility of existence—the very thing it repudiates. Hegel's philosophy, like that of Aristotle, takes an encyclopædic inventory of the world of nature and man, reconciling and interpreting all phases. The most eminent of the direct expounders of Hegel are Marheineke, J. Schulze, Gans, Von Henning, Hothe, Förster, Michelet, Rosenkranz, Weisse, Göschel, Erdmann, and Kuno Fischer. There is a left wing, so-called, which expounds the Hegelian system as a logical pantheism ("pan-logism"); a right wing, which expounds it in harmony with orthodoxy; a centre, which agrees substantially with the right wing, but introduces many modifications in the technicalities of the system. A school has also arisen which approximates more or less in methods the English and Scotch schools of empirical psychology. Its most eminent names are J. H. Fichte, Wirth, Zeller, Ulrici, Bona Meyer, and Liebmann. A materialistic tendency appears in the writers of the "left wing," and becomes complete in Strauss and Feuerbach.—Herbart reproduces Leibnitz as modified by the psychology of Kant and Fichte. His school is prolific in distinguished writers, of whom the most prominent are Beneke, Drobisch, Exner, Hartenstein, Steinthal, Lazarus, Waitz, Bonitz, and Wittstein. Lotze's system is a more independent reproduction of Herbartianism. Trendelenburg's system is based chiefly on Aristotle. The sensualistic system of Czolbe and the "philosophy of the unconscious" by Von Hartmann should be named for their popularity. Schopenhauer's pessimism has exercised much influence on the recent literature of Germany.—The ablest Italian philosophers of the present century are Galluppi, Rosmini, Gioberti, Mamiani (who publishes at Rome a journal devoted to speculative philosophy), and the Hegelians Vera, Mariano, and Spaventa.—In France, Laromiguière, Royer Collard, Maine de Biran, Victor Cousin, Jouffroy, Paul Janet, Rémusat, Ravaisson represent the empirical psychological tendency; St. Simon, Fourier, Leroux the socialistic; Comte, Littré, Taine, the positivist direction.—The Scotch school of Reid, Stewart, Brown, and Sir William Hamilton begins with a reaction against Hume, and tends toward the adoption of a modified Kantianism. The school of Locke and Hume is represented in the present century by Stuart Mill, Lewes, Spencer, and others. German philosophy in Great Britain has been introduced and interpreted by Coleridge, Carlyle, Hutchison Stirling, Jowett, Flint, T. H. Green, Ferrier, and others.—American philosophy counts (*a*) in its theological school such names as Edwards, Dwight, Taylor, Tappan, and Finney; (*b*) in its transcendentalist school, Marsh, Emerson, Margaret Fuller, A. B. Alcott, Theodore Parker, J. F. Clarke, George Ripley, O. A. Brownson (who became a "Thomist"), and F. H. Hedge; (*c*) in its psychological school (after the Scotch or after the French eclectics), Porter, McCosh, Bowen, and Mahan; (*d*) in its school based on original study of Kant or his successors, J. B. Stallo, L. P. Hickok, C. C. Everett, and E. Mulford. (See articles on IDEALISM, IDENTITY, KNOWLEDGE, REASON, SENSATIONALISM, TRANSCENDENTAL, UNDERSTANDING, DESCARTES, SPINOZA, MALEBRANCHE, BACON (FRANCIS), LOCKE, LEIBNITZ, HOBBES, HUME, KANT, FICHTE, SCHELLING, HEGEL, SCHLEIERMACHER, SCHOPENHAUER, HERBART. Consult also, on the general problems recurring in the history of philosophy, GENERALIZATION, INFINITE, MIND, MORAL PHILOSOPHY, PSYCHOLOGY, SCEPTICISM, SOUL, THOUGHT, UNIVERSALS, WILL.) The chief historians of philosophy are Stanley, Bayle, Brucker, Tiedemann, Buhle, Tennemann, Reinhold, Ritter, Hegel, Schwegler, Erdmann, Scholten, Cousin, Lewes, Zeller, K. Fischer, L. Ferri; periodicals devoted to speculative philosophy are—*Zeitschrift für Phil. und philosophisch. Kritik* (at Halle); *Phil. Monatshefte* (at Berlin); *Die Neue Zeit* (at Prague); *La Filosofia della Scuole Italiane* (at Rome); *Mind, a Quarterly Review of Psychology and Philosophy* (at London); *Revue philosophique de la France et de l'Etranger* (at Paris); *Journal of Speculative Philosophy* (at St. Louis). WILLIAM T. HARRIS.

Philosophy, Moral. See MORAL PHILOSOPHY, by PRES. NOAH PORTER, S. T. D., LL.D.

Phil Sheridan, tp., Wallace co., Kan. P. 80.

Phil'tre [Gr. φίλτρον], a love-potion, an aphrodisiac preparation. Philtres were much used in ancient Greece and Rome, and the Thessalians had special eminence in their preparation. From the accounts which have come down to us, many of their ingredients were harmless, or at most disgusting, and used on account of some purely fanciful efficacy; while others, it would seem, were violent poisons. Thus, a doubtful tradition says that the poet Lucretius died in consequence of a strong philtre given by his wife; and some hold that Caligula's madness was caused and maintained by his wife's philtres. The use of these potions is prevalent in almost all barbarous and half-civilized lands. As of old, magic arts are employed to add force to the supposed natural powers of the drugs.

Phips (Sir WILLIAM), b. at Woolwich, Me., Feb. 2, 1651, was one of a family of twenty-six children by one mother; was a shepherd, but when eighteen was apprenticed to a shipbuilder and learned to read; went in 1684 to England, and obtained means to fit out a vessel to recover the silver of one of the Spanish plate-fleet wrecked off the Bahamas, but was not successful until 1687, when he obtained treasure worth some $1,500,000 (some accounts say $3,000,000), for which he got some $80,000, besides receiving knighthood and the office of high sheriff of New England; captured Port Royal, N. S., with his fleet, and went unsuccessfully against Quebec; was the first royal governor of Massachusetts 1692–94; built the fort of Pemaquid, Me., 1692; co-operated with Mather in the witchcraft trials, until at last his own wife was accused; was suddenly called to England 1694 to answer charges against him. D. in London Feb. 18, 1695. His enterprise and patriotism were remarkable, and his native abilities fair, but he was ignorant, ill-tempered, credulous, and the tool of abler men.

Phips'burg, tp., Sagadahoc co., Me. P. 1344.

Phlebi'tis [Gr. φλέψ, φλεβός, "vein," and *-itis*, affix denoting inflammation], inflammation of the coats of a vein or veins. Phlebitis may occur in any part of the body from direct injury and accidental or surgical wounds. Idiopathic or primary phlebitis occurs chiefly in the lower extremities, especially in the tortuous expansions and dilated pouches of varicose veins. When a vein is inflamed its contained blood coagulates, adheres to the walls of the vessel; a local fibrinous mass (thrombus) obstructs or wholly suspends the circulation. Exceptionally, this thrombus organizes, connecting with the nutritive capillaries of the venous coats. More often it partly or wholly breaks down, disseminating pus and contaminating the blood, or giving off particles which are carried by the blood to the different parts of the body, and may lodge in the small vessels of large organs, occluding them. Such plugs or emboli deprive a tract of tissue of its nutritive blood-supply, and lead to the condition of fatty degeneration or abscess. Phlebitis, if acute, may be announced by chills and febrile disturbance preceding the local inflammation. The affected vessels are hard, tortuous, prominent, visibly elevated if the surface be viewed in profile. There is a dusky redness over and in the immediate vicinity of the vein, with slight tumefaction and redness of an erysipelatous character, shading off into adjacent tissues. Nodular prominences exist at the site of the valves in the veins. The vein is sensitive to touch, and the entire part tender and painful if moved. Œdema or dropsical swelling, evidenced by pitting upon pressure, may result from the obstructed circulation; in the extremities this swelling may be considerable, with sense of great weight, due to accumulated venous blood and serous transudation. Following childbirth, phlebitis occasionally occurs, usually in the lower extremities, due to local thrombi following the perverted blood of the puerperal state, and probably resulting from absorption of septic matter by the open uterine sinuses. This painful condition is known as *phlegmasia alba dolens*, and popularly termed "milk leg." Indeed, at present the infection of the blood by septic matter and local thrombosis as the causes producing phlebitis is generally conceded. Phlebitis and venous thrombosis are chiefly interesting as endangering embolism in other parts of the body, metastatic abscesses. The "multiple abscesses" of the liver follow inflammation of the venæ portæ. Coexisting abscesses in the brain, lung, liver, spleen, and kidneys may develop from a general poison of the blood. When a vein is enlarged and rigid, as in the sinuses of the cranium, the veins of old hæmorrhoids, or stricture of the rectum, or the varicose veins of the leg, its inflammation is very liable to infect the system. The treatment of phlebitis will be by local antiphlogistics and internal administration of antiseptics and tonics.

E. DARWIN HUDSON, JR. REVISED BY WILLARD PARKER.

Phlegma'sia (synonyms, *Phlegmon, Phlegmonous Inflammation, Pseudo-erysipelas, Diffuse Abscess*), an acute inflammation of the subcutaneous cellular tissue, tending to suppuration, in which the pus formed has a tendency to become infiltrated through the tissues, instead of collecting into one place as in ordinary acute abscess. The causes of this variety of inflammation are sometimes very obscure. It has often been ascribed to infection or an ordinary cold, but these causes are in all probability only hypothetical. We do find it resulting from mortifying shreds of tissue in wounds, and complicating injuries, but in by far the greater number of cases it arises spontaneously in debilitated individuals—persons suffering from mal-assimilation, and who have consequently a thin and impoverished blood, which is incapable of producing a healthy inflammatory action. In such individuals we generally find it occurring in the extremities, especially in the fingers and hand. The symptoms of phlegmasia are those of ordinary inflammation somewhat aggravated—viz. pain, heat, redness, and swelling; there is always more or less œdema of the affected part, and, as a consequence of it and the swelling, we have a tense, shining skin; a throbbing, synchronous with the pulse-beats, is one of the chief symptoms of the disease, and generally immediately precedes the suppurative process. In a few days the skin becomes red at one or more points, and fluctuation appears. Sometimes the œdema and swelling exist to such a marked extent that the skin is deprived of blood, and consequently becomes gangrenous; and as a complication we often have immense sloughs of integument coming away, exposing the uncovered muscles and fasciæ beneath. Accompanying these local symptoms there is always a high fever. In the treatment the first indication should be to remedy as far as possible the condition of the system which has acted as a predisposing cause of the trouble; for this purpose aperients and such tonics as quinine and iron should be given. Locally, suppuration should be hastened by warm applications, and as soon as fluctuation appears at any point an exit should be made for the pus by the lancet; should two or more outlets be found to communicate subcutaneously, the sinus or sinuses should be laid open the entire length, and be allowed to heal from the bottom. Sometimes local depletion, if practised at the outset of the disease, will cut it short.

EDWARD J. BERMINGHAM. REVISED BY WILLARD PARKER.

Phlogis'ton [Gr. φλογιστός, "burnt," from φλογίζειν, "to burn"], a term introduced into chemistry by George Ernest Stahl in 1697 to designate a principle whose existence was first pointed out by Johann Joachim Becher in 1669. This principle corresponds, in a measure, with what is known to the science of the present day as *vis viva*, living force or *energy*, and the extreme crudity of the theoretical science of Becher's day is illustrated by the singular name he gave to his principle—"an inflammable earth." Becher supposed that metals and all bodies that can burn contain this "inflammable earth," and that the process of combustion—that is, *fire*—consists in the loss of this principle or thing or substance by the burning body. Becher died in the same year (1682) in which a work of his was published attempting to develop his theory. Fifteen years later, Stahl, giving credit to Becher for the original conception, first published his theory of *phlogiston*, which was an imponderable principle contained in metals and combustible bodies, combustion consisting in its evolution. Burnt bodies and metallic oxides were "dephlogisticated" bodies. Incombustibility on the part of any substance indicated that it had been burned and had lost its phlogiston, just as we should now say that it had lost its *potential energy*—or *energy of chemical condition*, as we might call it. In those days chemists knew nothing of the nature of air or of oxygen, or of the fact that in burning oxygen combines with the burning body, and that the product of combustion represents in substance or weight or quantity of matter the sum of the body burnt and of the oxygen. The phlogistic theory at once took a deep hold upon the chemical world, which it retained for nearly a century, all chemical phenomena being interpreted by it and all chemical teaching based upon it. The depth of this hold is shown by the fact that Priestley, the discoverer of oxygen in 1774, who in that discovery proved at the same time that a metallic oxide (mercuric oxide) was a compound of metal and oxygen, did not recognize the tremendous significance of this latter fact, and even called his new and wonderful gas "dephlogisticated air." (See OXYGEN.) It even stands as matter of history that long after Lavoisier and others had overthrown the phlogistic theory, and demonstrated the true nature and functions of oxygen, and

its relations to fire and combustion, and even up to the day of his death in 1804, Priestley remained an unconvinced adherent of the then almost obsolete phlogiston. This may have been due to Priestley's realization of the indisputable truth that *something*—and something of commanding power and importance—is set free and *does* escape during combustion—namely, what we now call *energy*, as before remarked. A curious phase of the progress of the theory of phlogiston was the distinct recognition, soon after the time of Stahl, by many of his most earnest disciples, of what could not escape any conscientious laboratory worker, the fact that burnt bodies are *heavier* than before the combustion. To reconcile this class of facts with phlogiston, the latter was by some, by an extraordinary subsidiary hypothesis, endowed with *specific levity*, thus imparting to its compounds, combustible bodies, a tendency to *fly from* the centre of the earth. At this day it is difficult for us to realize the different aspect that all nature and all natural phenomena must have presented in the light—or rather in the false glimmer and deceptive gloom—of this strange theory of Stahl. HENRY WURTZ.

Phlox [Gr. φλόξ, "flame"], a genus of a few annual and nearly thirty perennial herbs of the order Polemoniaceæ, all but one Siberian species North American. There are many fine artificial varieties in flower-gardens, chiefly belonging to *P. paniculata, maculata, Drummondii,* and *subulata,* all natives of the Atlantic U. S.

Phocæ'a, an ancient city of Asia Minor, an Ionian colony situated on the peninsula between the Cymæan and Hermæan gulfs, 25 miles N. W. of Smyrna, was famous in antiquity for the daring enterprise of its inhabitants, who were the founders of Massilia in Southern France, Alalia in Corsica, Rhegium on the Sicilian Strait, and other flourishing settlements. Unable to defend themselves against the Persians under Cyrus, they made a truce of one day with Harpagus, who besieged them, brought their women, children, and property on board their ships, and set sail for Corsica. Under Persian rule the city never acquired any importance. The ruins of it now extant are insignificant.

Phoc'idæ [from *Phoca*, the Latin name of the seal], the typical family of pinniped mammals exemplified in the form of the common seal. The body tapers backward, and the hind feet project posteriorly in the same line; the fore limbs are flippers; the hind ones not flexible forward; the head more or less dog-like; no external ears are developed; the teeth are variable—viz. M. $\frac{5}{5}$ or $\frac{6}{6}$, C. $\frac{1}{1}$, I. $\frac{6}{4}$ or $\frac{4}{4}$ or $\frac{4}{2}$; incisors of the lower jaw conical; the skull has the mastoid processes swollen, and they superficially appear to form a part of the auditory bullæ; the postorbital processes are null or obsolete; no alisphenoid canals exist; the anterior limbs are smaller than the posterior, and their feet have digits which become successively abbreviated, and all are armed with claws; the posterior flippers are emarginate, the third and fourth digits being shortest, and are generally provided with claws. The family is represented by three distinct sub-families: (1) Phocinæ, represented in the northern hemisphere by the genera *Phoca, Pagophilus* (= *Pagomys*), *Erignathus, Histriophoca, Pusa* (= *Halichœrus*), and *Monachus;* (2) Cystophorinæ, with *Cystophora*, or the hooded seal of the northern hemisphere, and *Macrorhinus*, or the elephant seals of the southern hemisphere and the Californian coast; and (3) Stenorhynchinæ, confined to the Antarctic or southern seas, with the genera *Lobodon, Ogmorhinus* (= *Stenorhynchus*), *Leptonychotes*, and *Ommatophoca.* The smallest of the seals is the ringed seal, or *Pagophilus fœtidus,* which attains to little more than four feet in length; the largest the elephant seal, or *Macrorhinus elephantinus,* which is sometimes known to reach the length of thirty feet. The following species are found on the eastern coast of North America, as well as in the European waters and the Arctic seas generally: *Phoca utulina*, the common seal; *Pagophilus grœnlandicus*, the harp seal; *Pagophilus fœtidus*, the ring seal; *Erignathus barbatus*, the great seal; *Pusa* (*Halichœrus*) *grypus*, the gray seal; and *Cystophora cristata*, the hooded seal. These all feed almost entirely on fishes, which they capture with great dexterity. They are awkward on land, and progress thereon by dragging their body forward chiefly by means of their fore feet, the hind limbs scarcely or not at all assisting; but in the water are very graceful. They generally bring forth but one young—rarely two—at a birth.
THEODORE GILL.

Pho'cion, an Athenian general, b. about 402 B. C., of humble descent, but excellently educated; commanded with great success against Philip II. of Macedon in Eubœa, Megara, Byzantium, and other places. In politics, however, he sided with the Macedonian party, and was an unrelenting adversary of Demosthenes. After the death of Antipater he became implicated in the intrigues between Cassander and Polysperchon, fled to Phocis, was delivered up to the Athenians, and by them condemned to take poison (317 B. C.), and his corpse was hurled unburied across the frontier. One year later the Athenians raised his statue and erected a fine monument in his honor.

Pho'cis, an ancient division of Greece in Hellas proper, was bounded S. by the Corinthian Gulf, E. by Bœotia, N. by Doris, and W. by Locris. It was very mountainous, being almost entirely covered with the famous mountain-range of Parnassus. Its north-eastern part was traversed by the river Cephissus, which formed a beautiful and fertile valley. Delphi, Elatea, and Cirrha were its principal towns. It derived its chief historical interest from the circumstance that the famous oracle of Delphi was situated in its territory. But this circumstance became at last the cause of its ruin. A verdict of the Amphictyonic Council ordered the Phocians to pay a fine for having used a tract of land which belonged to the oracle. When the Phocians refused to pay, a ten years' war (generally called the Sacred war), from 355 to 346 B. C., broke out, in which they fought bravely, maintaining themselves by the treasures of the temple; but at last they were conquered, chiefly by the strategy of Philip of Macedon, and then their cities, twenty-two in number, were destroyed, and they were scattered in villages, of which none was allowed to contain more than fifty houses.

Phœbe. See DIANA.

Phœ'be-Bird, or **Pewee,** a well-known fly-catcher of the U. S., the *Sayornis fuscus*, which often builds under old bridges, mills, and at other points near the water. It is easily recognized by its well-known note, whence its name is derived.

Phœbus. See APOLLO.

Phœni'cia [probably from the Gr. φοίνιξ, "a palm tree"], the name by which the Greeks, and after them the Romans, indicated the narrow coast-land between the mountains of Lebanon and the Mediterranean, which with a breadth of from 10 to 12 miles extends from Aradus, in lat. 34° 52′ N., to Mount Carmel, in lat. 32° 30′ S. The inhabitants themselves called their country *Canaan*, "lowland." It was hilly, much broken up by spurs of the Lebanon, rocky and barren in some places, level but sandy in others, and nowhere specially fitted for agriculture. But it had excellent harbors and a most favorable situation for commercial pursuits; and these natural advantages were developed by the teeming population with extraordinary energy and success. Wealthy cities, which extended their enterprises over the whole known world, dotted the coast from N. to S.—Tripolis (*Tarablus*), Byblus, called by the Hebrews Gebal (*Jebail*), Berytus (*Beyroot*), Sidon (*Saida*), Tyre (*Sûr*), Ptolemais (*Acre*), Dor, etc.; and several of these cities, such as Sidon and Tyre, formed at various periods powerful empires. Our knowledge, however, of the people and its history is aphoristic, and in many points utterly insufficient. The Phœnicians have left no literature and no artistic monuments. A few coins, a few inscriptions—among the most important of which are that on the sarcophagus of King Eshmunazar, discovered in 1854 near Sidon, that on a stone disinterred in 1845 near Marseilles, that on the monument at Dhiban in Moab, discovered in 1868, etc.—a number of names of localities, and a couple of scenes in Plautus's *Pœnulus*, are all that remain of their language and industry. Our views of them we must compose from notices gleaned from Hebrew, Greek, Roman, and other writers, but it must be added that these notices are sufficient both to prove that in ancient times the Phœnicians exercised a powerful and beneficial influence, and to give a general idea of their life and character. Their language belonged to the Semitic family, and was nearly related to the Hebrew, but whether they themselves immigrated into Phœnicia from the coasts of the Erythræan Sea, as stated by Herodotus, is uncertain. Their religion was a nature-worship centring in the idea of generation, and their gods were generally worshipped in a double form—one abstract and lofty, and the other local and concrete, such as Baal and Melkarth (Heracles), Astarte and Tanith (Aphrodite), etc. In their political constitution and social organization they resembled the later Greeks more than the contemporary Eastern peoples or the Egyptians. Each city with its adjoining territories formed an independent state, governed by an hereditary king and a powerful aristocracy, but it seems as if some single city—Sidon at one time, Tyre at another—always held a sort of supremacy, perhaps only as president of some kind of league. Within the state the population consisted of free men and slaves; and slaves, besides being among the most important articles of Phœnician commerce, were used to such an extent that at one time they conspired in Tyre, revolted, and succeeded in driving out of the city the free population. The oldest of the Phœnician cities was Sidon, but

Tyre became the most celebrated. King Hiram of Tyre entertained friendship with Solomon, and their fleets went together to Ophir. At this time the Phœnicians had colonies on the Persian Gulf and the Red Sea, from which they traded with India, Persia, Arabia, and Nubia. In Babylon, Nineveh, Thebes, and other great cities they inhabited a ward of their own. The Mediterranean Sea was girded all round by their commercial stations and colonies —along the northern coast of Africa (see CARTHAGE), the Ægæan Islands, the eastern coast of Greece, Sicily, Etruria, Gaul, and Spain. They knew the way to Britain, perhaps into the Baltic, whence they brought amber to Greece. They worked the silver-mines of Spain and the lead-mines of Britain, and they penetrated in Africa to Timbuctoo. It is probable, however, that they were principally a commercial and not an industrial people. They transferred goods without manufacturing them; they spread the arts without inventing them. They brought the alphabet, the compass, the application of astronomy to navigation, the use of coins, etc. to Greece and Etruria, but whether they had themselves invented these arts is doubtful. The same is the case with respect to their most famous articles of commerce—Tyrian purple, glass, etc. Nevertheless, Tyre must have been the seat of considerable industrial skill and activity, since King Hiram could supply Solomon with all kinds of workmen. The country was successively conquered by Assyria, Babylon, and Persia, but, characteristically enough, this circumstance seems to have had no influence on its prosperity. It was the rise of the Greek communities which drove the Phœnicians out of the eastern part of the Mediterranean, as it was later the enterprise of the Roman merchants which drove them out of the western. After the conquest by Alexander and the destruction of Tyre the country lost its importance and was incorporated with Syria. (See Heeren, *Historical Researches* (1833); Schröder, *Die Phönizische Sprache* (1869); Renan, *Mission de Phénicie* (1874); Lenormant and Chevallier, *Les Premières Civilisations* (1874).) CLEMENS PETERSEN.

Phœni'cia, p.-v., Shandaken tp., Ulster co., N. Y., on Esopus Creek.

Phœnicopter'idæ [*Phœnicopterus*, φοινίκεος, "purple," and πτερόν, a "wing"], a family of birds of peculiar organization whose species are known under the English name "flamingoes." The form is somewhat swan-like, the neck being elongated and slender; the head moderate; the bill large, and with the anterior half abruptly deflected; the upper mandible depressed, especially in its deflected portion; the lower mandible compressed; the lateral margins finely laminated, like those of the duck's bill; the nostrils linear, in the groove of the mandible, and covered by a membrane; wings moderate and pointed; tail short; legs very long, slender, and slightly compressed, covered in front with transverse scales, which extend on the tibia as well as on the tarsi; toes comparatively short, the anterior three united together by a membrane, the posterior free and short; the claws of all short. In their osseous structure, as in their external characters, they are almost intermediate between the duck-like birds (Anatidæ and Palamedeidæ) and the stork-like birds (Ciconiidæ); there has, therefore, been considerable doubt as to their systematic position, some authors having associated them with the wading birds and others with swimming birds; on the whole, however, they appear to be most closely related to the stork-like forms, although forming a peculiar type or "super-family" by themselves, named by Huxley Amphimorphæ. Species are found in the tropical and sub-tropical regions of both the eastern and western hemispheres. Eight species are recognized by G. R. Gray, of which four are found in the Old World and four in the New. They mostly frequent the sea-shore or salt marshes, and associate in flocks of many individuals, whose safety is generally guarded by one of their number who acts as a sentinel. "When flying they form two lines, springing from one bird, which gives the appearance of a triangle, but they alight in a straight line, and generally remain so even when seeking their food. They are capable of running quickly, but when walking assist themselves by placing their upper mandible on the ground." The female is said to build a subconical nest of mud, in which she deposits two or three eggs, and sits crouched over them. (For figure, see FLAMINGO.) THEODORE GILL.

Phœ'nix [Gr. φοίνιξ], a fabled bird of Arabia, mentioned in the myths of many Oriental nations as living 500 years or more, and at last burning himself alive upon a funeral-pyre of myrrh and spices. From the flames arises a new phœnix, who encases the ashes of the old in myrrh, flies with them to Heliopolis in Egypt, and there casts the ashes into the flames. Legends of the phœnix are found in the hieroglyphic writings and in Herodotus, and others are current now in India, Persia, and Arabia.

Phœnix, p.-v., cap. of Maricopa co., Ara., on Salt River.

Phœnix, tp. of Henry co., Ill. P. 793.

Phœnix, p.-v., Schroeppel tp., Oswego co., N. Y., 16 miles N. of Syracuse, on Oswego Canal and River, has fine water-power, excellent graded schools, 3 churches, 1 bank, 1 newspaper, several hotels, 1 saw and 2 flouring mills, a cabinet manufactory, 2 coal-yards, a lumber-yard. Three railroads run through the village. P. 1418.
J. M. WILLIAMS, ED. "REGISTER."

Phœ'nixville, p.-b., Schuylkill tp., Chester co., Pa., 27½ miles N. W. of Philadelphia, at the junction of French Creek with Schuylkill River, on the Philadelphia and Reading R. R., has a public park, water and gas works, 1 seminary, 3 large public-school buildings, 9 churches, 3 banks, 2 public halls, 2 weekly newspapers, several hotels, the blast furnaces and mills of the Phœnix Iron Co., 2 cotton-factories, a sash and planing mill, a fire department. P. 5292. V. N. SHAFFER, ED. "INDEPENDENT PHŒNIX."

Phonautograph. See ACOUSTICS, by O. N. ROOD.

Phonet'ics, the science of speech-sounds, and the art of representing their combinations by writing. Speech-sounds are such of the phenomena of the resonance of enclosed masses of air variously excited by the organs of speech as are used for communication of thought. The resonance-cavities are the larynx, pharynx, nasal passages, and mouth, with various smaller parts. Each cavity has a separate resonance, and each resonance acts more or less in combination with all the others. The action of the resonance for vowels was first fully explained by Helmholtz (*Sensations of Tone,* my translation, 1875, pp. 153–172, 179–181, 724–741). It is necessary to distinguish the mode of exciting resonance and the fixed or variable forms of the resonance-cavities.

I. *Mode of Exciting Resonance.*—(1) "Irrespirates," sounds independent of respiration, which may or may not be carried on at the same time through the nose. The air in the resonance-cavities is excited by smacks, clicks, smokers' mouth-puffs, blowpiper's cheek-puffs, or implosion (due to sudden condensation). All these are recognized elements of language. (2) "Inspirates," sounds arising from drawing in air—(*a*) through the mouth only, as in chirps, whistles, sobs, gasps; (*b*) through the nose only, as in snuffling, or (*c*) through both nose and mouth, as in snoring. Common elements of expression, even in English. (3) "Expirates," sounds arising from expelling air from the lungs. (*a*) "Physems," or bellows-actions of the lungs, with constant pressure (force, loudness, modern accent), with discontinuous pressure (jerks, the main element of aspiration), or with condensation suddenly relieved (explosions, one element of post-aspiration). (*b*) "Glottids," or actions of the elastic glottis, which, when the vocal chords forming it are wide apart, give either inaudible breath (physem weak) or "flatus"—that is, audible breath (physem strong). When the glottis is narrowed, but not closed, they give "whisper." When the glottis is closed elastically, they give "voice." When the glottis is closed inelastically, they give the Arabic *hamza*, or "check." These actions also, chiefly by various tensions of the vocal chords, produce variety of pitch (Sanskrit, Greek, and Latin musical accent, singing), and by different arrangements regulate the size and distinctness of the periodical puffs of air on which voice depends (original quality of tone, expression); with other effects not so marked. (*c*) "Arytĕnads," or actions of the gristly glottis, giving by various actions the Arabic *hha* or wheeze, and *ain* or bleat, and the Danish *r*. (*d*) "Hisses," arising from flatus driven through narrow passages, as for *s*, *sh*. (*e*) "Sonants," arising from driving the voice into closed cavities, where the air rapidly becomes too condensed to sound. (*f*) "Buzzes," arising from driving the voice laboriously through passages suitable for hisses, and hence producing the effect of a mixture of voice and flatus, as for *z*, *zh*. (*g*) "Vocals," arising from driving the voice easily through a partially-obstructed cavity, or one periodically obstructed and relieved by a vibrating membrane, as for *l*, *r*. (*h*) "Vowels," arising from letting the voice resound clearly in comparatively unobstructed cavities of the mouth separately, or mouth and nose combined, which modify the original quality of tone.

II. *Fixed Forms of Resonance-Cavities.*—(*a*) "Oral Vowel Positions," the uvula, being pressed against the back wall of the pharynx, shuts off the nasal cavities; the tongue, in part or in whole, is raised to different heights within the mouth, but not sufficiently to touch the palate; the throat (pharynx), in whole or in part, is lengthened, shortened, widened, or narrowed; the lips are more or less closed or opened; or all these alterations of tongue, throat, and lips are variously combined. The number of possible oral vowels is infinite; at least 60 genera are known, and 15 to 20 of them are common in European languages. (*b*)

"Orinasal Vowel Positions," the nasal passages are open to the larynx by the advance of the uvula, and the various membranes of the nose are variously brought into action, at the same time that the various oral vowel positions are assumed. Each oral vowel generates various kinds of orinasal vowels. The four French orinasals in the words *an, on, un, vin* are best known. (*c*) "Oral Consonant Positions" have the nasal passages cut off, as for oral vowel positions, and either entirely obstruct the passage of air, flatus or voice (as for "mutes," *p, t, k*, positions without sound and rendered effective only by "glides," III. 10); for "implodents," with a sound due to implosion, as in modern Saxon *p, b* or *t, d*, I. 1; and for "sonants" (as *b, d, g*, I. 3, *e*); or is only adapted for hisses" (such as *f, s, sh, th*, I. 3, *d*); buzzes (such as *v, z, zh, dh*, I. 3, *f*); or "vocals" (such as *l, r*, I. 3, *g*); by the formation of narrow or choked passages, or the introduction of a vibrating valve. Such positions are very numerous. (*d*) "Nasal Consonant Positions" have the nasal passage open, but the mouth (generally) closed as for mutes, and also generally voiced (as *m, n, ng*), but many other forms occur.

III. *Changing Forms of Resonance-Cavities.*—(1) If while a violin-string is bowed the stopping finger is slid on the finger-board from the nut toward the bridge, the result is a series of musical sounds, changing by insensible degrees. The first and last sounds may or may not be of sensible duration. In each case the changing sounds are called "glides." (2) If the extreme sounds have sensible duration and the glide is short, the glide becomes a "slur," to which case the word will be here specially limited, although musically it has a wider signification. (3) When no glide or slur occurs, there is a "break" or silence during change of position. (4) In speech, glides and slurs are the cement by which elements are bound into syllables. Speech-glides were first recognized, I believe, by myself in my *English Phonetics* (1854), and slurs in my *Early English Pronunciation* (Part IV., 1875, p. 1130). They generally arise from continuing sound during change of resonance-cavity, but there are also (5) "force-glides," arising from continuously variable bellows action of the lungs; (6) "pitch glides," from continuous alterations, chiefly in the tension of the vocal chords; and (7) "glottal glides," from continuous alterations in the degree of separation of the vocal chords, changing from flatus through whisper to voice, and conversely; and (8) "arytĕnad glides," arising from continuous changing position of the gristly glottis. (9) "Vowel glides" arise from passing from one vowel position to another, and may be "lip," "tongue," or "throat glides," separately or combined two or three together, the results being "diphthongs" and "fractures" of the most diverse character and of great philological importance. (10) "Mixed glides" arise from passing from a consonant to a vowel position, and conversely, and are most remarkable in the case of mutes, as in *peep, took*, because it is solely by the glide that the mute becomes effective. When final, the mute often glides on to a click or some flatus (in English), and often (in English and German) flatus is interposed between the mute and the vowel, producing a passing glottal glide, the habits of different nations and individuals being extremely different. In such words as *see, cease, seize* there are glottal as well as mixed glides. (11) "Consonant glides" occur when we pass from one consonant position to another, of which one at least is capable of flated or voiced resonance, as in *tree*, where there is a consonant glide from *t* to *r*, and a mixed glide from *r* to *ee*. (12) All these glides give rise to slurs, which are more convenient to the speaker than breaks, because breathing is uninterrupted, and hence they constantly occur between syllables. (13) "Breaks" occur where the passage of breath is interrupted by some suspension of expiration, some check of the glottis, or some mute consonant. (14) The study of glides is one of the most important parts of phonetics for clear enunciation, intelligible singing, and comparative philology.

The above analysis of speech-sounds, here merely indicated, results from the most recent physiological and linguistic investigations, and its great complication would apparently involve immense difficulty in the attempt to find a method of representing speech-sounds to the eye. But writing is a very ancient invention, and the inventors had not even a remote notion of the mode in which speech-sounds are produced, which was not at all understood till the end of the last century (Kratzenstein, 1780, and Kempelen, 1791). The process originally pursued seems to have been from the picture to its name, and thence to the beginning of its name. At first, only pictures of things were probably used, and these were grouped so as to indicate events. The old Mexican writing seems to have been in this stage. Such pictures, worn down by rapidity of formation, give the Chinese ideographs, to which different sounds are assigned in each Chinese province. A certain number of such signs, indicating words which contained all the groups of sounds made use of in speech, forms the Chinese phonetic symbols, each of which is a monosyllabic word. These, transported to another system of languages, give the Japanese "syllabary," or a collection of signs each of which forms a syllable, being only a part of a word. In Egypt the syllabary was constructed by using a sign to express the first part of a word, probably up to the termination of the first vowel in its earliest form, but the picture of the class of words (determinative) was generally annexed. In the Semitic languages the same sort of syllabary was originally constructed, but at a later period, as in the modern Cherokee syllabary (the invention of which serves to show how natural is this process to the mind), the signs indicated syllables without any connection with an original picture or its name. In the East Indian languages the fact that syllables frequently ended with consonants, so that there was a glide after as well as before the vowel, led to various contrivances for indicating the suppression of the inherent vowel of a syllabarian sign, and also a means of replacing that vowel by another without the necessity of inventing a new syllabarian symbol. But to this day the Sanskrit and Dravidian systems of writing betray their original syllabarian character. When the Greeks borrowed the Phœnician syllabary, they gave it a real alphabetic character by dismissing the inherent vowel, and replacing it universally by a movable vowel, which generally had a preceding, and less frequently a following, glide. It was in this form that the Romans adapted the same Phœnician characters to their needs, and from these two original sources all modern European alphabets are derived. At an early period the Roman alphabetic system became general for most Aryan languages, and was subsequently used for languages of different families, as Basque and Hungarian. The diverse nature of the selection of speech-sounds and systems of glides and accents in use among the different nations of Europe has caused the Roman letters individually and in groups to have different significations in the several countries using them, and to be practically increased in number by the addition of various diacritical marks. These systems of writing were in many cases introduced by "clerks" (ecclesiastics), who were satisfied with a rough indication of the sounds of words at remote periods when the sounds of the languages thus reduced to writing were different from those now in use. But there was always an indisposition to make any changes in orthography, and this indisposition has increased since printing became widely used. Hence, the groups of letters have in many instances ceased altogether to recall the sounds of the words, and consequently alphabetical writing has in numerous instances almost reverted to ideographical symbolization. This is especially the case in English, where sign and sound are so practically independent, to the great detriment of education, that no one who sees an English word for the first time knows how to speak it, and no one who hears an English word for the first time knows how to spell it. The consequence is, that children cannot become good readers at sight, and good spellers without many years of instruction, which wastes time that should be devoted to acquiring knowledge, over the acquisition of an imperfect power of handling the mere tools of knowledge, reading and writing. The pretence for retaining an orthography so injurious to every speaker and learner of English is that by a change of spelling we should sacrifice the etymology of words, which is unknown in many cases; which the present spelling does not preserve in others; which no spelling could indicate with certainty, even to those acquainted with the old spoken (not merely written) forms of the English language and its Aryan relatives; which could be taught, as far it is now known, much better to those who spell phonetically than to those who do not; which is practically seldom present to the mind of any speaker; and which is a part of antiquarian and philosophic education, that those who insist on it rarely know anything about, and that millions of those who speak English have little concern with or power to appreciate. But a change is not impossible, for the old Athenians altered their spelling officially in B. C. 403, and within the last 100 years the Netherlands and Spain have altered theirs, the former having vainly tried to fuse etymology with phonetics, but the latter having wisely clung to phonetics only. Wallachian orthography shows the absurdity of an etymological basis. But Polish and Bohemian among Slavonic languages, and Hungarian among non-European, also show that the phonetic principle is not dormant.

Missionary enterprise and scientific linguistics have raised the question of a universal alphabet capable of writing all languages. We are still very far from being able to determine what should be the value, number, or form of the separate elementary symbols in such an alphabet, and how their combination should be indicated. Prof.

Lepsius of Berlin invented the "Linguistic Alphabet" (German ed. 1855), adopted under the name of the "Standard Alphabet" by the English Church Missionary Society in 1858 (2d English ed. 1863), and approved by many other missionary societies. It consists of a mixture of Latin and Greek letters, supplemented by a vast complication of diacritical marks, which render its use so laborious that in special adaptations most of these marks are omitted. It requires new founts of types (two of which have been cut in Germany, but the German types will not "work" with the English); and notwithstanding the number of its symbols (more than 250), it is defective for well-known languages, both in characters for elementary sounds and in the means of representing glides. Prof. Bruecke's *Neue Methode der phonetischen Transkription* (1863) introduces entirely new letters, based first upon the positions of the speech-organs, and secondly on the accompanying effects of flatus, voice, and glottal action. It is very philosophical for the consonants, but sadly deficient for the vowels, and altogether failing in glides. Mr. Melville Bell's *Visible Speech* has a similar basis, but its characters are formed on the totally different principle of picturing the positions of the speech-organs. It embraces a philosophic consideration of vowels as well as of consonants, and although deficient in glottids, glides, and some other symbols, it is by far the best and most practical attempt yet made. For the purposes of my *Early English Pronunciation* (1869–75, in progress) I introduced a system called "Palæotype," because it can be readily printed with ordinary or "old types." In this no attempt at systematic forms of letters has been made, because our phonetic knowledge does not appear to be advanced enough for that purpose, but unambiguous representatives are furnished for a far greater number of speech-sounds than have been considered by any other writer, including the 388 elements of Prince L. L. Bonaparte's alphabet (whose symbols, formed on a Latin and Greek basis with diacritical marks, are as yet unpublished; see my *Early English Pronunciation*, pp. 1298 and 1352), and all the classes mentioned in the preceding analysis have been more or less considered. The avowedly temporary signs of palæotype allow of a discussion of the analysis, synthesis, and classification of speech-sounds, and of practical applications for phonological and philological purposes (of which my *Early English Pronunciation* contains numerous examples), whence, perhaps, in time may result some basis of agreement as to the proper form of symbols for universal phonetics.*

In the mean time, the question of particular phonetics, or of writing the sounds of a particular language with sufficient accuracy for native use, is comparatively easy. It will be necessary in what follows to confine attention to the English language, for which, as we have seen, some orthographical amendment is urgently required. We have to remember that no two speakers pronounce precisely alike; that words are so diversely pronounced by even educated speakers in different parts of England and America that keywords alone do not sufficiently convey sounds; and that, especially in vowels, we must recognize the fact that only classes, and not individuals, can be represented. Also, the question of what forms an element is so difficult and delicate that we must trench upon the old solution of the syllabary by using combinations or groups as our real elements. Thus, we may write *ee* and *oo* as well-known separable sounds, and perhaps *s*, but certainly not *t*, which has no sound at all. We must acknowledge that *see*, *too* are syllabarian groups, ending with *ee*, *oo*, which are, however, preceded by much more than the mere hiss *s* or mute *t*—namely, by the "glides" from *s*, *t* to those vowels. In the case of *too* there is solely a mixed glide. In the case of *see* there is a hiss, a glottal glide, and a mixed glide. In *t* we have a philosophical element; not so in *d*, *s*, or *z*. With this view, in 1846, in conjunction with Mr. Isaac Pitman of Bath, I framed an alphabet of 40 letters for English, of which 23 were old and 17 new, the latter requiring new types, which were cut for several founts. This I have now abandoned, and since 1870 I have advocated an alphabet called "Glossic," adapted to every fount of Roman or fancy types. The immediate object I had in view was to create a system of writing the pronunciation of all the English dialects by one alphabet, based on prevailing literary usages, for which purpose Glossic has been adopted by the English Dialect Society. The secondary object was to provide a new orthography for English, to remove the present inconveniences, but of such a nature that it might be used concurrently with the present spelling for teaching to read in schools, and that by its legibility to all present readers it might obviate the fatal necessity of learning to spell in the old way. The following unexplained key-words will suffice to indicate the nature of the solution attempted for "literary" English only. After each approximate element is placed a word in "Glossic," followed by the same in "nomic" or usual spelling. In these words the accent-mark, a turned period (•), is used to indicate both length and strength, but in the subsequent example this is omitted, as being unnecessary to natives, except in unusual words and cases of ambiguity, though indispensable to foreigners. Of course due additions have been made to indicate foreign and dialectal sounds, but these are here omitted, as unnecessary for the mere purpose of illustration:

Key to English Glossic.—(1) Strong long vowels: *ee*, *bee·t*, beet, beat; *ai*, *bai·t*, bait, bate; *aa*, *baa·*, *baa·m*, baa, balm; *au*, *kau·l*, caul, call; *oa*, *koa·l*, coal; *oo*, *koo·l*, cool. (2) Strong short stopped vowels: *i*, *nit*, nit·, knit; *e*, *net·*, net; *a*, *nat·*, gnat; *o*, *not·*, not, knot; *u*, *nut·*, nut; *uo*, *fuot·*, foot. (3) Weak short open vowels (distinguished by having no accent-mark or consonant to glide to): *ee*, *troa·kee*, trochee; *i*, *wit·i*, witty; *ai*, *rai·lwai*, railway; *au*, *augus·t*, august, adj. (*au·gust*, subst.); *oa*, *win·doa*, window; *oo*, *in·flooens*, influence. (4) Diphthongs (each representing a large genus): *aay*, aye; *ei*, *heit*, height, hight; *oi*, *foil*, foil; *ou*, *foul*, foul, fowl; *eu*, *feu·d*, feud. (5) Glottid: *h*, *hai·*, hay. (6) Consonants: *y*, *yai·*, yea; *yh*, *yheu*, hew, hue; *w*, *wai·*, way, weigh; *wh*, *whai·*, whey; *p*, *pee·*, pea; *b*, *bee·*, bee; *t*, *toa·*, toe, tow; *d*, *doa·*, doe, dough; *ch*, *ches·t*, chest; *j*, *jes·t*, jest; *k*, *kee·p*, keep; *g*, *gai·p*, gape; *f*, *fei!* fie!; *v*, *vei*, vie; *th*, *thin·*, thin; *dh*, *dhen·*, then; *s*, *see·l*, seal; *z*, *zee·l*, zeal; *sh*, *mesh·*, mesh; *zh*, *mezh·er*, measure. (7) Consonantal L and nasals; *l*, *lai·*, lay; *m*, *mai·*, may; *n*, *nai·*, nay, neigh; *ng*, *sing·er*, singer; *ngg*, *ling·ger*, linger. (8) Vocal L and nasals: *l*, *lit·l*, little; *m*, *rith·m*, rhythm; *n*, *oa·pn*, open. (9) Trilled R (distinguished by being always before or between vowels only; frequently untrilled, but not vocal, in the U. S.; never untrilled in England, except when speakers have an organic effect; written *r'* with a following apostrophe, in first reading-books): *rai·*, ray; *mer·i*, merry; *mar·i*, marry; *hur·i*, hurry; *okur·ence*, occurrence. (9) Vocal R (distinguished by being never used before or between vowels; a mere vowel in England, which, however, may be followed, not replaced, by a trilled R, and must be so followed if final before a word beginning with a vowel; always replaced by a trilled R, preceded by a vowel in Scotland): Strong: *er* or *ur*, *her·b*, *hur·b*, herb; *mer·*, *mur·*, myrrh; *ker·*, *kur·*, cur; *oker·*, *okur·*, occur; weak: *er* or *ur*, *dol·er*, *dol·ur*, dollar, dolour, dolor; *prop·er*, *prop·ur*, proper; *eelik·ser*, *eelik·sur*, elixir; *tai·ler*, *tai·lur*, tailor; *on·er*, *on·ur*, honour, honor; *mer·mer*, *mur·mur*, murmur; *plezh·er*, *plezh·ur*, pleasure; strong: *eer*, *pee·r*, pier; *air*, *pai·r*, pair, pare, pear; *aar* (the vocal *r*, generally omitted in London), *paa·r*, par; *aur* (the vocal *r*, generally omitted in London), *nau·rth*, north; *oa·r* (frequently *au·* in London), *poa·r*, pore, pour; *oo·r*, *poo·r*, poor; *eir*, ire; *our*, our; *eur*, *yoor*, ure, your. (10) Vocal R, followed by trilled R (distinguishing by the occurrence of *rr* between vowels), *err*, *oker·ring*, occurring; *eerr*, *pee·rring*, peering; *airr*, *pai·rring*, pairing, paring; *aarr*, *maa·rring* (usually *maa·ring* in London); *oarr*, *poa·rring* (often *pau·ring* in London), pouring, poring; *oorr*, *poo·rrer*, poorer; *eirr*, *fei·rri*, fiery (distinct from *fei·uri*, also used); *ourr*, *flou·rri*, floury, flowery (distinct from *flou·uri*, also used for flowery); *eurr*, *keu·rring*, curing (the vocal R in *eerr*, *airr*, *oar*, *oorr*, *err*, *ourr*, *eurr* is often omitted in the U. S. and in Scotland, where *pee·ring*, *pai·ring*, *poa·ring*, *poo·rer*, *fei·ri*, *flou·ri*, *keu·ring* may be heard, but this is never the case in England). (11) Weak indistinct A, E, or U: *a*, *eidee·a*, idea (or *u*, *eidee·u*); *el*, *ei·del*, idol (or *ul*, *ei·dul*, distinct from *ei·dl*, idle); *em*, *buoz·em*, bosom (or *um*, *buoz·um*); *en*, *ten·ent*, tenant (or *u*, *ten·unt*; *ten·ant* with distinct weak *a* is unusual).

Exaamplz ov Unaksented Inggliah Glossik-Objekts.—Too fasilitait lerning too reed. Too maik lerning too spel unneseseri. Too asimilait reeding and reiting too heerring and speeking. Too maik dhi riseevd proanunsiaishen ov litururi Ingglish aksesibl too aul reederz, proavinshel and foren. *Meenz.*—Leev dhi oald speling untucht. Introdeus along seid ov dhi oald speling a neu aurthografi, kunsisting enteirli ov dhi oald letters, and mainli ov dhi oald kombinaishenz, euzd invairriabli in aulredi familyer sensez. Emploi dhi neu speling in skoolz too teech kleer aartikeulaishen and distingkt reeding in boath aurthografiz. Alou eni reiter too reit in dhi neu speling oanli on aul okaizhenz widhout loozing kaast, proaveided hee euzez a riseevd proanunsiaishen. Dhat is, *aknolej dhi neu speling konkurentli widh dhi oald.* *Advaantejez.*—Redi akwizishen ov pour too reed and reit in dhi neu speling, widh graitly improovd proanunsiaishen. Dhi pour too reed in dhi prezent speling widhout speshel instrukshen, and widh dhi saim eez dhat reederz ov dhat speling kan purooz oalder

*For an account of certain phonetic peculiarities of the North American Indians see Haldeman's *Analytic Orthography* (Philada., 1860).—Eds.

aurthografiz, soa dhat aul prezent lituruteur wuod bikum eevn moar aksesibl dhan ever, and hens dhair wuod bee noa need faur prezent reederz too akweir a maasturi oaver dhi neu speling in aurder too maik dhemselvz inteligibl too dhoaz hoo euz it aloan. Noa ferdher okaizhen too lern dhi prezent speling faur reiting perpusez dhan prezent reiterz have too lern dhi speling ov Chauser and Wiklif. Dhi ridukshen ov dhi eksajeraited estimet in which dhi pour too reed and reit iz nou held too its troo level, kunsiderd az meerli dhi abiliti too handl toolz. Dhi saiving ov waist ov mentel pour in dhi prezent sloa and freekwentli imperfekt akwizishen ov dhis pour, and konsikwentli dhi gain ov teim faur dhi advaansment ov intelekteuel edeukaishen proper. *Difikeltiz.*—Dhi jenurel ignurens ov dhi naiteur ov speech-soundz. Dhi diffurens in dhi habits and fansiz ov speekerz. Dhi wont ov eni rashenel popeuler kunsepshen ov etimoloaji. Dhi egzistens ov a kunfeuzd, unfoanetik, paartli historikel, mainli teipoagrafikel, enteirli unfiloasofikel aurthografi in which vaast stoarz ov nolej hav been embaamd, and which iz soa difikelt too akweir dhat dhi meer pour too euz it iz esteemd in itself a maark ov edeukaishen.

ALEXANDER J. ELLIS.

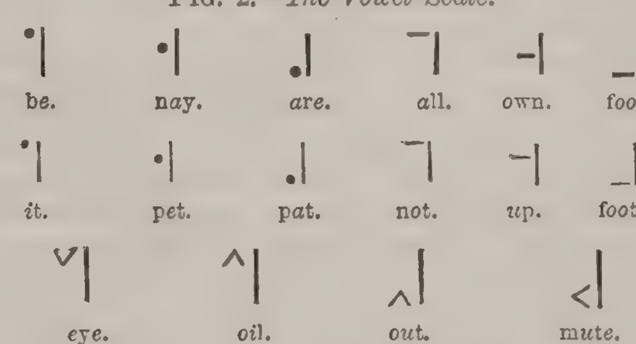
Phonog'raphy [Gr. φωνή, "sound," and γράφειν, to "write"], or **Phonetic Shorthand**, any system of brief writing which expresses more or less fully and accurately the vocal elements of speech. The name "phonography" was first applied to a system of shorthand writing by Isaac Pitman in the second edition of his system, published in London in 1840, but had been applied as early as 1701 to a little work on phonetic spelling by J. Jones, M. D., London. The appearance of Pitman's system (first ed., London, 1837) marked an era in the history of shorthand writing. By the introduction of new stenographic material, a more accurate analysis of the vocal elements of the English tongue, and a more systematic presentation of the shorthand art, Pitman did very much to bring the possibility of verbatim reporting within the reach of persons of ordinary adaptability for the practice of the art. In the rapidly-succeeding editions of his work he introduced many ingenious improvements, so that his system soon stood in marked contrast to the awkwardness and arbitrariness of the systems of his predecessors. But if the succession of new editions was attended by the introduction of new and valuable stenographic material and further systematization, it also had the disadvantage, by reason of the uncertainty arising from frequent changes, of disheartening beginners and of delaying still further the introduction of phonographic correspondence. Pitman's has been the basis of every subsequent system which has received any considerable degree of public support; but it has not been taught to any extent in this country since the introduction of Graham's and Munson's systems. Graham's system, which is now written by a large proportion of the shorthand writers in the U. S., embraces many improvements upon Pitman's system. Its chief characteristics are simplicity, ingenuity, and analogic harmony throughout, and a comprehensive and elastic nomenclature—an entirely new feature. Its literature embraces about thirty volumes, including a phonographic dictionary, the first work of the kind ever attempted. We shall use, in illustrating this article, Pitman's system as modified by Graham.

The Phonographic Alphabet.—The material of the phonographic alphabet consists of the simplest geometrical characters variously modified and combined. Shorthand authors early found it necessary to analyze the vocal elements of the language and provide a more extended alphabet. Without going into distinctions too nice to be of any practical value for the purpose in hand, distinct signs are provided for forty elements in the "working alphabet." The consonants, with their appropriate signs and names, are illustrated in Fig. 1. The vowels are represented by means of dots and dashes, and the diphthongs by a combination of two dashes. They are written by the side of a consonant stroke, and the vowel-scale is made extensive by giving a different vowel-significance to the dot or dash according as it is written opposite the beginning, middle, or end of the stroke. The vowels are read before or after an adjacent consonant, according as they are written before or after perpendicular or inclined, or above or below horizontal strokes. (See Fig. 2.) They are named by their sound. In rapid writing they are not inserted except to indicate words of unusual occurrence or to vocalize proper names. Indeed, the consonant outlines of words are found to be so legible and suggestive that the vowels are usually left out even in phonographic correspondence.

FIG. 1.—*The Consonant Signs.*

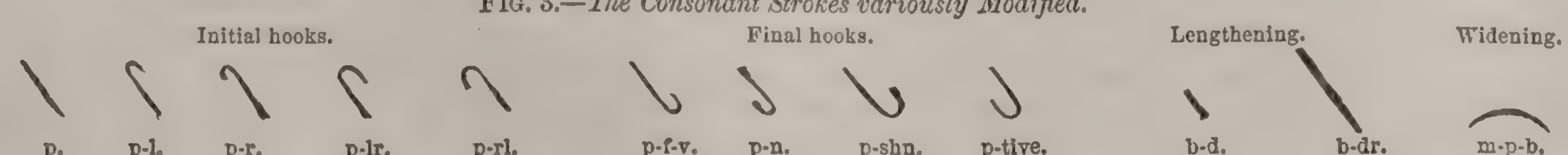
Sign.	Sound.	Name.	Sign.	Sound.	Name.	Sign.	Sound.	Name.
	p	pee.		f	ef.		l	el.
	b	bee.		v	vee.		r	ar.
	t	tee.		th	ith.		m	em.
	d	dee.		Th	thee.		n	en.
	ch	chay.		s	es.		ing	ing.
	j	jay.		z	zee.		y	yay.
	k	kay.		sh	shay.		w	way.
	g	gay.		zh	zhay.		h	hay.
Additional Consonant Signs.								
	r	ray.		w w	wĕh. wuh.		y y	yĕh. yuh.
	h	*hĕh* dot.		s ss	*iss* circle. *ses* circle.		st str	*steh* loop. *ster* loop.

FIG. 2.—*The Vowel Scale.*

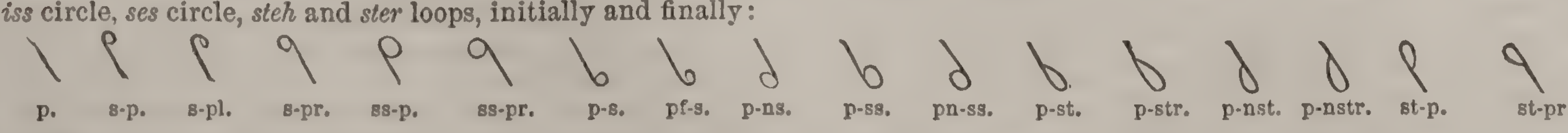


Modifications of the Consonant Strokes.—The primary consonant strokes are variously modified to indicate the addition of other consonants; thus, a small initial hook indicates the addition of *l* or *r*, according to the side on which it is written. A large initial hook indicates the addition *lr* (as in *ler, lor, lar*) or *rl* (as in *rel, ral,* etc.), according to the side on which it is written. A small final hook indicates the addition of the sound of *f, v,* or *n*; and a large final hook the addition of *shn* (*tion, sion, cion, cian,* etc.) or *tive*, according to the side on which it is written. The *iss* circle when written at the beginning of a stroke (hooked or not) implies that the stroke is preceded by *s*; when written at the end of a stroke (hooked or not), that the stroke is followed by *s*. The *ses* circle occurring initially or finally implies the precedence or succedence of *cis, ces, sis, ses, sus, sas,* etc. The *steh* loop initially or finally indicates *st*. The *ster* loop indicates *str* (as in *ster, stor,* etc.), but is not written initially. These circles and loops when written finally, on the side of the *n* hook (by making the hook into a circle or loop), signify the addition to the stroke, of *n-s, n-ses, cis,* etc., *n-st* or *n-str*. The sound of *s* may be added to a stroke modified by an *f* hook by writing the *iss* circle within the hook. *S* may be made to precede a stroke modified by an *l* or *r* hook by writing the *iss* circle within the *l* hook, or by making the *r* hook into a circle. By *halving* a stroke (writing it half length) *t* or *d* is added, according as the stroke is

FIG. 3.—*The Consonant Strokes variously Modified.*



The *iss* circle, *ses* circle, *steh* and *ster* loops, initially and finally:



light or heavy; by *lengthening* (writing it double length) *tr, dr, thr*, or *Thr* is added, according as the stroke is light or heavy; by *widening, p* or *b* is added. (See Fig. 3.)

Expedients for increasing Speed.—Various other expedients are made use of, as an initial dot or tick or small circle to imply a prefix, as *con, com, cog, circum, contra, self-con*, or *self-com;* a final dot or tick (light or heavy), or circle, to indicate the imperfect participle of verbs, an adverbial or other affix, as *ing, ings, ing -the, a, an*, or *ly; self, selves, bleness, fulness*, etc. Other affixes are indicated by an abbreviated termination, as *sv* for "soever" in *whosoever, whensoever*, etc. By "nearness" (writing two words near together) the omission of the connecting preposition "of," or of the prepositional phrases "of the," "of a," is implied. An outline written just touching the under side of the line of writing implies the precedence of "to," or "two." (See Fig. 4.)

Two other expedients for increasing speed remain to be noticed—phrase-writing and word-signs. By phrase-writing is meant the junction of several words without

Fig. 4.

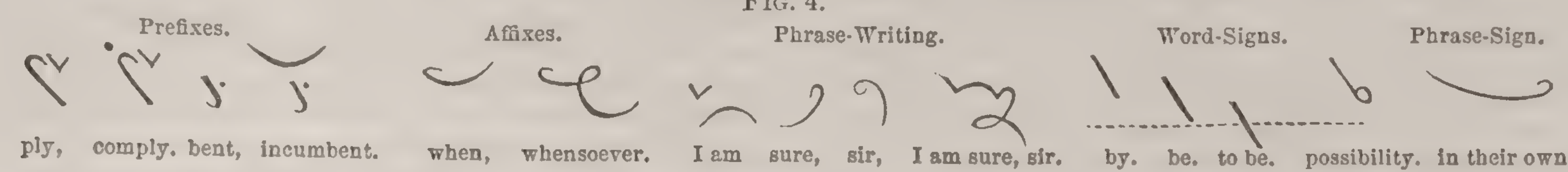
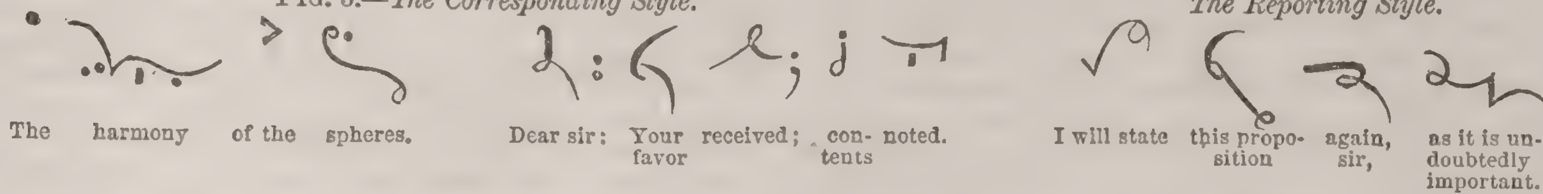


Fig. 5.—*The Corresponding Style.* *The Reporting Style.*



lifting the pen. The junction of words does not diminish, but rather increases, the legibility of the writing where the words are grammatically closely related, as in the phrase "I am certain." By the term word-sign is meant a primary character, simple or modified, which is memorized as an arbitrary and abbreviated expression of a certain word or words. The principle of word-signs is carried to a great extent, and like phrase-writing is one of the reporter's most important auxiliaries for increasing the speed of his writing; but word-signs being in a large degree arbitrary, give the phonographer more difficulty in reading his notes when they are "cold" and his mind is relaxed than the full or partial expression of words which are easily deciphered by reference to principle. (See Fig. 3.)

The average rate of public speaking is about 120 words per minute. To acquire this speed the phonographic student needs to devote to the art about one year of practice of two or three hours daily. The impassioned utterances of public orators sometimes reach as high as 250 words per minute; here none but the most expert can follow. Indeed, the requirements of the art in the present stage of its development are such that none but those peculiarly adapted for the work can ever hope to attain, even after years of practice, the high rate of speed just mentioned.

Phonography as presented in the best systems is scientific in its arrangement, and but the average intelligence, together with persistence, is required for its mastery in theory and practice. Though the possibility of verbatim reporting is still beyond the popular reach, it cannot be doubted (especially seeing the great advancement which has been made during the past twenty years) that writers of fair adaptability for the work will yet be able, after due training, to follow and record in permanently legible characters the most rapid utterances of public speakers. Fig. 5 illustrates the corresponding and reporting styles of phonography. (See also Stenography.)

John Francis Meyer.

Phor′idæ [Gr. φορός, "carrying"], a family of gasteropod mollusks of the order Pectinibranchiata, distinguished by the attachment to the shells of foreign substances, such as stones, shells, etc., whence the name. The visceral sac is contained in a comparatively depressed spiral shell; the mantle margin is simple in front; the head has a rostrum elongated and tapering forward; tentacles subulate, sessile on the outer sides of the base of the tentacles; the lingual ribbon is provided with seven longitudinal rows of teeth; the central or rachidian has a narrow base, is dilated upward, and its margin has a large median and several lateral rounded teeth; the inner lateral is transversely sub-rhomboid, the outer lateral more or less elongated and claw-shaped; the foot is small, subcylindrical, and adapted for jumping rather than walking, and differentiated into an anterior expanded and a posterior tapering portion; the shell is trochiform, not pearly, and generally loaded with foreign substances attached at or near the angulated margin; the operculum is large, subannular, with the nucleus lateral and horny in texture. The family is composed of singular shells, remarkable on account of the peculiar habit expressed by the name. They progress by scrambling along, and, according to Adams, "often extending and fixing the front dilated portion of the foot, draw the hind lobe up to it, and then make another step, throwing forward the shell at every movement; they cannot glide like most other mollusks, but the form of their foot is admirably adapted to the nature of the floor on which they live, which is usually composed of the débris of dead shells." The family is generally divided into two genera: (1) *Phorus* or *Xenophora*, and (2) *Onustus;* the species are chiefly inhabitants of the Chinese and East Indian seas, but one species is found in the West Indies. Theodore Gill.

Phor′mion, a celebrated Athenian general, b. of a distinguished family belonging to the deme Pæania; was sent in 440 B. C. with reinforcements to the Athenian troops blockading Samos, and in 432 he commanded the troops which were sent to reinforce Callias, besieging Potidæa. Here, after completing the circumvallation of the city, he led the rest of his troops against the Chalcidians, in which undertaking he was joined by Perdiccas, king of Macedonia. His first independent command he received in 430, when he led the Acarnanians against the Ambraciots, and in the same year he was sent with twenty ships to Naupactus, to prevent the Corinthian vessels from sailing out of the gulf, and to stop all vessels bound for Corinth. A Peloponnesian fleet was sent out to help the Corinthians, but, although much inferior in number, Phormion utterly defeated the enemy in two engagements, of which Thucydides gives a detailed description. Once more he commanded the Acarnanians with success, and in after-times they held his name in such respect that on a later occasion they asked to get his son, Asopius, as their general. His tomb, with a splendid monument, was on the road leading to the Academy, near those of Pericles and Chabrias.

Phos′gene Gas [Gr. φῶς, "light," and γεννάειν, to "engender"], (syn. *Chloroxycarbonic Acid, Chloride of Carbonyle;* Ger. *Chlor-Kohlenoxyd*). Formula, $CO.Cl_2$. Equal volumes of chlorine and carbonic oxide gases, mixed and exposed to sunshine, unite without explosion, the greenish color of the chlorine disapppearing, and the volume of the product (if the atmospheric pressure has access to it) becoming exactly one-half that of the mixture. Another mode of preparation, more convenient than the former, is to pass carbonic oxide gas through liquid pentachloride of antimony. Phosgene is a colorless gas, of an odor more suffocating and unpleasant than chlorine gas itself, drawing tears from the eyes. It does not fume in the air, though contact with water decomposes it. It has acid characters and reddens litmus. Water converts it into a mixture of muriatic and carbonic acid gases. It has as yet received no practical application. H. Wurtz.

Phos′phates, compounds, with basic bodies, of the Phosphoric Anhydride, P_2O_5 (which see). Of all classes of the oxygen-salts as yet studied by chemists, this class presents the greatest difficulties and complexities. This is due to the circumstance, explained under the head of Phosphoric Acids (which see), of the existence of a number of hydrates of phosphoric pentoxide, which contain the latter in such molecular forms as to possess different basicities, corresponding to the water in each hydrate. Moreover, even among the ordinary or orthophosphates—which comprise nearly all of any practical importance, and all for reference to which we can spare space—complexity, or at least great multiplicity, is occasioned by the fact that the three molecules of base are *interchangeable;* that is, in normal or neutral orthophosphates there may be three of one base, or two of one and one of another, or one each of three different bases. Besides this, there are two classes of *acid* orthophosphates, due to the replacement of one or two of the three basic molecules by one or two of water. Still further, there are compounds which are rated as *superbasic* orthophosphates, of which some natural minerals furnish examples. Of the orthophosphates, the following possess importance:

Ordinary Phosphate of Soda ($H_2O.2Na_2O.P_2O_5$).$24H_2O$;

Twenty-four Hydrate of Monohydric disodic orthophosphate.—This is the common commercial salt. It is an ingredient of blood and found in urine. It is prepared commercially by adding a slight excess of carbonate of soda to the crude phosphoric acid obtained from bones (see PHOSPHORIC ACIDS), and crystallizing. It forms fine large transparent prisms, oblique rhombic in form. The density-determinations indicate several allotropic modifications, Zimmermann giving 1.514, Schiff, Stolba, and Playfair and Joule all about 1.525, while Buignet gives 1.55, and Kopp as high as 1.586. On exposure to the air it undergoes rapid efflorescence, losing probably 10 of its $24H_2O$. Its taste is saline like common salt; alkaline to test-paper; soluble in 4 parts of cold and half as much boiling water. Much used in medicine and in the laboratory.

Microcosmic Salt, also called *Phosphorus Salt* [$H_2O.Na_2O.(NH_4)_2O.P_2O_5$].$8H_2O$, *Octohydrate of monohydric monosodic monammonic orthophosphate.*—Found abundantly in putrid urine, and as *stercorite* in guano. By reason of its forming, when fused, with loss of all its water and ammonia, a transparent glass of pure *sodic metaphosphate*, it is much used as a flux in the laboratory, particularly in blowpipe-analysis. Schiff gives for it the density 1.554, but for stercorite Dana's *Mineralogy* gives 1.6151.

Struvite is another mineral phosphate from guano, which seems to be *monammonic dimagnesic orthophosphate*, identical with the precipitate formed by a solution of microcosmic salt in a magnesic solution, the form in which magnesia is determined in chemical analysis.

Tricalcic Phosphate—Bone-earth, $3CaO.P_2O_5$.—This compound is the most important of the phosphorus compounds, and the source of all the rest. Information about it has already been given under the heads of BONE, CHEMICAL COMPOSITION OF, and OSSEINE.

Superphosphate of Lime, which is so important an artificial fertilizing material, is prepared by treating ground bones with a somewhat diluted sulphuric acid. It contains, mixed with sulphate of lime, an acid calcic orthophosphate, probably $CaO.2H_2O.P_2O_5$. The density of pure tricalcic phosphate appears as yet to be unascertained. Mineral phosphate of lime, *apatite*, is not pure tricalcic phosphate, but a compound of three molecules thereof with one molecule of *chloride of calcium*.

Phosphate of Alumina occurs in nature as the mineral *wavellite*, which is the *dodecahydrate* of *trialuminic diorthophosphate; turquoise*, another mineral, is *pentahydrate* of *dialuminic orthophosphate*, stained to the peculiar green color with cupric phosphate.

Phosphates of Iron occur native. The mineral *vivianite* is *trihydrate of triferrous orthophosphate*. Magnificent crystals are found in the greensand formation of New Jersey. *Cacoxenite* is a hydrated *diferric orthophosphate*, and there are several others. The orthophosphates of iron and alumina, with phosphate of lime, are almost universally diffused, in more or less minute proportion, throughout all rocks and soils.

Phosphate of Lead occurs native, in combination with *chloride of lead*, in the beautiful mineral species *pyromorphite*, three molecules of *triplumbic orthophosphate* to one molecule of *plumbic dichloride*.

The phosphates of *silver, uranium*, and some others have much scientific interest, but for information about these and others the reader must be referred to the textbooks of chemistry.

In view of the fact that the animal framework or skeleton is built mainly of *tricalcic phosphate*, phosphates become almost of paramount importance as mineral constituents of the food of man, and within the last two decades great, and doubtless praiseworthy, efforts have been made, chiefly under the inspiration and through the energy of our distinguished American chemist, Horsford—to whom the original idea is due—to introduce phosphates as ingredients of human food. The forms selected and the modes of incorporation with the food are such as to favor the assimilation of the phosphates. HENRY WURTZ.

Phosphat'ic Diath'esis, a name given by some physicians to a condition of the general system in which the salts of phosphoric acid are found in abnormal abundance in the urine. These salts occur normally in the proportion of 12½ parts in 1000, in the form of the phosphates of soda, potassa, magnesia, and lime; but, unless they are present in superabundance, the urine is capable of holding them in solution when acid. However, when the proportion is abnormal, although held in solution in acid urine at the temperature of the body, they are precipitated when the temperature is raised to the boiling-point, and show themselves throughout the liquid either as granular or crystallized phosphate of lime or crystals of phosphate of ammonia and magnesia. We may even find them in perfectly healthy urine after decomposition has set in. As soon as the excretion becomes alkaline from this cause, the granular phosphate of lime, being only soluble in acid fluids, is precipitated. The next change produced by decomposition is by the action of the carbonate of ammonia on the phosphates of soda and magnesia, giving rise to the phosphates of magnesia and ammonia and of soda and ammonia. Under certain circumstances the urea of the urine is altered in the kidneys or bladder; carbonate of ammonia is formed, which unites with the phosphate of magnesia and gives rise to the triple phosphate. The tendency to the formation of this salt is very often accompanied by some disease in the urinary passages, most commonly inflammation of the bladder. Independently of this, we generally find the deposit in the urine of persons suffering from general debility; also in those who have overworked themselves or have been depressed by over-anxiety, insufficient nourishment, or sexual excesses. In them the complexion is sallow and the circulation poor. They generally suffer from cold hands and feet. The treatment for this condition should be strict attention to the mode of life of the patient, which will generally need correction. A generous diet, plenty of exercise in the open air, cold bathing, and tonics will do a great deal in a short time. If indicated, opium may be given to relieve the anxiety.
EDWARD J. BERMINGHAM. REVISED BY WILLARD PARKER.

Phosphines, bases corresponding to amines, bearing the same relation to PH_3 that amines do to NH_3. Triethyl phosphine is $P(C_2H_5)_3$. (See AMINES.)

Phosphores'cence, a term applied to a very wide range of chemical or physico-chemical phenomena, including all those in which *light*, resulting from some process within the body that emits it, is unaccompanied by heat, or at least by an amount of heat perceptible to the sense of touch. The word is derived from *phosphorus*, but the phosphorescence of phosphorus itself is truly slow chemical combustion, proceeding only in the presence of oxygen, accompanied by the absorption of the latter and the formation of definite and well-known oxides, the heat produced also being readily detected by delicate thermoscopes; whereas in the great majority of cases classed under this name no oxygen—or at least no aërial oxygen—is involved, many occurring *in vacuo*, and often no heat can be detected. Moreover, it has been shown that in many cases the light evolved is of a different nature from the light evolved from ordinary combustion, being screened or arrested, for example, by media which are transparent to normal light. No more interesting, and at the same time more obscure, kinds of phenomena are known than those that are vaguely classed under this name *phosphorescence*. These phenomena are exhibited by bodies belonging to all the three kingdoms of nature—mineral, vegetable, and animal—and by the two latter in both life and death, and during both growth and decay. In the mineral kingdom so-called phosphorescences appear under a great variety of circumstances. The discussion of the subject would go far beyond our limits, and for the vast mass of facts belonging under this head the reader may be referred to Gmelin's *Handbook of Chemistry*, chapter on "Light," in vol. i.
HENRY WURTZ.

Phosphor'ic Ac'ids. Phosphoric pentoxide or anhydride combines with water in a number of different proportions; and there is this peculiarity about several of these hydrates, that when the water in them is displaced by a metallic oxide to form a salt, the nature of the salt varies with the hydrate, its basicity being in proportion to the number of equivalents of water in the latter. No other acidogenic oxide has this character so far as known. The pentoxide of *nitrogen*, which stands next to phosphorus as a member of the triadic series of elements, forms a series of hydrates, but these all form, with bases, ordinary *monobasic* nitrates, under ordinary circumstances; and as for arsenic pentoxide, which also stands next—on the other side of phosphorus—in the triadic series to phosphoric pentoxide, though this forms definite solid hydrates corresponding with those of the phosphoric compound, they all dissolve in water as trihydric arsenate, and all form *tribasic* salts with bases. There are three of these peculiar phosphoric hydrates that have been well investigated, though others are believed to exist. The three referred to are—

1. Metaphosphoric acid, or monohydric phosphate, $H_2O.P_2O_5$.
2. Pyrophosphoric acid, or dihydric phosphate, $2H_2O.P_2O_5$.
3. Orthophosphoric acid, or trihydric phosphate, $3H_2O.P_2O_5$.

It is evident, from the behavior of these three compounds with bases, that they contain the elementary phosphorus molecules in different allotropic forms, possessing, therefore, different molecular *volumes;* but so little have they been looked at from this point of view by their investigators that the *density* of one only of the three, the common or trihydrate, has been determined, the densities of the

other two, and therefore their molecular volumes, being as yet unknown. (See VOLUMES, MOLECULAR.)

1. *Metaphosphoric Acid,* $H_2O.P_2O_5$.—This compound was discovered by Graham. It is produced by heating either of the other two hydrates to redness, or by combining the anhydrous pentoxide with water in the cold. It is a transparent glass, which dissolves slowly but largely in cold water. It coagulates solutions of *albumen,* and forms with *silver* and *barium* insoluble precipitates. *Molybdate of ammonia* does not react with it as with the ordinary trihydrate. (See MOLYBDENUM.) Even at ordinary temperatures slowly, but on boiling quickly, it passes into the form of the ordinary or orthohydrate. Its density is unascertained.

2. *Pyrophosphoric Acid,* $2H_2O.P_2O_5$.—Discovered by Dr. Clark of Aberdeen. It is formed from the trihydrate at 215°, but not quite pure. Pyrophosphate of lead, decomposed in admixture with water by a current of sulphuretted hydrogen, and the filtrate boiled down till the temperature rises to 215° C., yields pure pyrophosphoric acid as a soft, glassy mass. Ignited, it becomes metaphosphoric acid; and boiled with water, it passes to the trihydrate. In acid solutions, unlike metaphosphoric, but like orthophosphoric acid, it does not precipitate *albumen, baryta,* or *silver,* but in neutral solutions it does throw down the two latter. Its density also is unknown.

3. *Orthophosphoric* (or *Ordinary Phosphoric*) *Acid,* $3H_2O.P_2O_5$.—This hydrate doubtless contains the phosphoric pentoxide in its *natural* molecular form or volume; that is, as it exists in natural phosphates, including bones, vegetable tissues, and mineral phosphates. It must not be supposed that this is the same volume as that of the uncombined pentoxide (see PHOSPHORIC ANHYDRIDE), as this is very improbable. Common phosphoric acid is preparable by two chief methods. The first from elementary phosphorus, by the action of nitric acid, which gives a chemically pure product, suitable for laboratory use: 1 part of phosphorus requires 15 parts of nitric acid of density 1.2. Much effervescence occurs. The second, from bone-ash, furnishes it only in approximate purity. The tricalcic phosphate is first decomposed with sulphuric acid, and by a tedious process of repeated evaporations, dilutions, and filtrations all but a trace of the lime is removed. The magnesia and part of the soda will also separate as a crystalline double phosphate on heating the concentrated solution for some time to 315° C. Orthophosphoric acid may be obtained in hard, transparent crystals, prismatic in form, by evaporation over oil of vitriol. Density of these, according to Schiff, 1.88. Its solutions do not coagulate *albumen* nor precipitate *argentic, baric,* or *ferric* solutions, though *neutral* solutions of *orthophosphates* do precipitate the three latter. The fused or "glacial phosphoric acid" of commerce is generally an indefinite mixture of the dihydrate and trihydrate, but on boiling a solution of it in water for some time, pure trihydrate results.

(For compounds of the acids of phosphorus see PHOSPHATES.) HENRY WURTZ.

Phosphor'ic Anhy'dride (*Phosphoric Pentoxide*), P_2O_5. This substance is the product of the burning of phosphorus with flame in the air. It appears as a white smoke. To procure it in quantities a large glass flask having three tubulures is provided, with a straight glass tube descending to about its centre through one of the tubulures, open at both ends, and having a small cup suspended to its lower end to hold the burning phosphorus, which may be dropped down through this tube into the cup in small fragments as it burns away, the upper end of the tube being kept closed with a cork. Through the other two tubulures a current of dry air—dried by passage through chloride of calcium—is led in and out constantly, passing into a bottle or series of bottles, by which the phosphoric anhydride that does not settle in the large flask will be caught. The phosphoric pentoxide thus obtained is a snow-white amorphous powder, which sublimes at a moderate heat below redness. Its density, according to Brisson, is 2.387. It is highly deliquescent, and when added to water combines with it with great heat and explosive violence. If the water is boiling, or allowed to become so from the heat developed, there is generated by this combination ordinary tribasic phosphoric acid or trihydric phosphate; if the water is kept cold, the hydrate generated is the metaphosphoric acid or monohydric phosphate. (See PHOSPHORIC ACIDS.) HENRY WURTZ.

Phosphor'oscope, a device invented by E. Becquerel for showing the phenomenon of phosphorescence in bodies which shine but for a very minute portion of time after their insulation. By suitable perforations in a disk revolving over a box in which is the substance to be examined, sunlight is allowed to fall upon it and to be cut off before the observer can see it through another aperture. By giving to the disk a sufficiently rapid rotation observations may be made after an interval of less than $\frac{1}{400}$th of a second after light has ceased to shine upon the substance. In this way it has been discovered that many substances are phosphorescent (*i. e.* capable of emitting light) which have never before been known to be so. But there are still a large number of bodies which have no appreciable phosphorescence.

Phos'phorous Anhy'dride and Phos'phites. Phosphorus trioxide, P_2O_3, is formed when phosphorus undergoes *slow* combustion, without flame, at the ordinary temperature in perfectly dry air. It forms volatile white flakes having an alliaceous odor and highly deliquescent. It combines with water, with a hissing noise, to form—

Phosphorous Acid, $3H_2O.P_2O_3$.—This compound is obtainable also by several other methods, as by the action of phosphorus on cupric sulphate, according to Schiff, and by the action of trichloride of phosphorus on oxalic acid, according to Hurtzig and Geuther. It may be made to form very deliquescent crystals. When heated it is decomposed into phosphoric acid and phosphuretted hydrogen gas. Phosphorous acid is a powerful reducing agent in metallic solutions, precipitating gold, silver, and mercury in metallic forms. It is a *dibasic* acid, and forms two series of salts, neutral and acid. The neutral phosphites are remarkable in being sparingly soluble, except those of the alkalies. *Phosphite of lead* is almost insoluble in water, and even but slightly soluble in excess of the acid. The phosphites have been somewhat well investigated, but present as yet no special *practical* interest. HENRY WURTZ.

Phos'phorus [Gr. φῶς, "light," and φορός, "bringing," fr. φέρειν, to "bring"], one of the most important and interesting of the elements of matter, and one of those most essential to animal life. It was discovered more than 200 years ago, in 1669, by Brandt of Hamburg, who obtained it in experimenting on the distillation of extract of urine with charcoal. In 1740, Marggraf identified phosphoric acid as a peculiar acid, Stahl having previously examined it, and supposed that he had proved it to be *phlogisticated muriatic acid!* Gahn in 1769 proved that bones contain this acid, and Scheele discovered how to prepare it from them. Phosphorus is now manufactured by first making from bones a soluble acid phosphate of lime through the agency of sulphuric acid, and mixing and distilling this with charcoal in earthen retorts at a red heat. Bone-ash contains nearly 20 per cent. of phosphorus, this being the precise proportion in pure *tricalcic phosphate;* but the amount of phosphorus obtained in practice is only from 8 to 11 per cent. The process is also expensively consumptive of fuel and destructive of apparatus, as well as of the health of the operatives, these facts much enhancing the cost of phosphorus. The importance of this product to man is, however, so great—chiefly as a material for making matches—that the production is carried on on a very large scale and with great skill in all civilized countries, and phosphorus is a comparatively cheap and quite abundant article of commerce. Common commercial phosphorus is a slightly yellowish body of wax-like consistence, and translucent. It is generally cast into the form of sticks, which, on account of their dangerous inflammability, must be preserved under water. It melts at 44° C. or 111° F. to a liquid of oily consistence, which may be cooled if undisturbed much below the melting-point again without solidifying, but then at once solidifies on agitation. Although flexible and highly sectile at ordinary temperatures, it becomes brittle and breaks with a crystalline fracture at the freezing-point of water. It may be crystallized from bisulphide of carbon, in which it is soluble, the crystals belonging to the regular system. It boils between 250° and 290° C. (482° and 554° F.), forming a transparent vapor nearly four and a half times as heavy as air. Phosphorus is slightly soluble in ether and in fixed oils, considerably so in benzole, and in many essential oils, including oil of turpentine, largely so in bisulphide of carbon. The solution in the latter, if applied to paper, causes it to take fire spontaneously as soon as the solvent has evaporated—a circumstance that has led to the proposition to use such a solution in offensive warfare for incendiary shells. Phosphorus may be finely granulated by agitation while melted with a solution of *urea,* as observed by Böttger. Blondlot states that solutions of salt and sugar will effect the same object.

Special chemical interest attaches to phosphorus, by reason of the curious and interesting character of its allotropic modifications. Of the existence of *five* such modifications, at least, distinct and well characterized, there can be little or no doubt. These are *common, white, red, black,* and *metalloidal* phosphorus. Much study of the molecular nature of these has enabled the present writer to discover the following figures for the true densities of these and other modifications at melting ice, from which their varying molecular volumes are computable in the usual way:

	True densities, H. Wurtz.	Other authorities.
Opaque white phosphorus	1.516	1.515, Watts's *Dictionary*.
Common phosphorus, including three modifications, based on figures of Berzelius, Playfair and Joule, and Pisati and De Franchis	1.764	1.77, Berzelius.
	1.832	1.837, P. & De F.
	2.105	2.09, P. & J.
Red phosphorus of Schrötter	1.984	1.964, Schrötter.
Crystals of Brodie	2.242	2.23, Brodie.
"Metallic" phosphorus of Hittorf	2.336	2.34, Hittorf.
Black phosphorus	Undetermined.	

The white opaque modification forms from common phosphorus under water spontaneously. Red, generally called *amorphous* phosphorus, is prepared by heating to near its boiling-point for some time. (See ISOMERISM.)

HENRY WURTZ.

Phosphorus Bases. See PHOSPHINES.

Phosphorus Bronze. This term is used to designate a bronze or alloy of tin and copper with which a small amount of phosphorus—less than 2 per cent.—has been combined. The discovery was made about the beginning of 1871 by MM. Montefiori, Levi, and Keuzel. It was stated that a phosphorus bronze containing the proper proportion of phosphorus was more lasting, had fewer cavities in it, had a more homogeneous fracture, with a steely grain, had its elasticity increased 80 per cent., and its absolute tensile strength 170 per cent. While the fusing-point is not changed, the fused metal is more liquid and makes sharper casts. It resists oxidation where iron and steel quickly rust. The Prussian government has since experimented with cannon of phosphorus bronze, but the results were not as satisfactory as had been hoped. The guns cracked after sixty or seventy rounds. The claims made for the material must be regarded as still subjects for experiment. HENRY WURTZ.

Phosphorus, Medicinal Uses of. Pure phosphorus is locally an intense irritant and caustic to animal tissues, and taken internally is a virulent poison, whether in large single dose or in repeated administration of small quantities. Even in a single fatal dose, however, the symptoms may not begin till several hours after swallowing the poison, and death does not generally occur till after several days. There are the usual signs of irritant poisoning—viz., nausea, vomiting, and sometimes purging, with abdominal pain, but the latter symptom is not so severe as with other corrosive poisons. Then a peculiar feature of phosphorus poisoning sets in—namely, jaundice, from fatty degeneration of the liver. A garlicky breath; luminosity of the eructations and sometimes of the secretions; profound disturbances of the nervous system, such as delirium, convulsions, coma, with extreme general prostration, follow, and the individual may die suddenly from collapse and syncope, or more slowly after sinking into coma. After death there is found profound structural disintegration of the tissues, with special tendency to fatty degeneration of many of the organs, and extravasations of blood into their tissue. In chronic poisoning the symptoms are essentially similar, only more gradually induced. Sometimes, however, no symptoms occur except a profound general debility, in which condition the subject may sink away and die. Before the introduction of allotropic phosphorus in the making of matches, workers at that trade were apt to suffer from a peculiar form of poisoning through inhalation of phosphorus fumes, of which caries of the teeth and necrosis of the jaw were prominent symptoms. The antidotes in phosphorus poisoning that seem to be of most use are some soluble salt of copper, and *impure, acid* oil of turpentine. The pure rectified oil is of no use. Given medicinally in doses of a minute fraction of a grain, phosphorus is sometimes of benefit in conditions of nervous debility, and especially in neuralgias. Under its use the patient's general state may improve and the special morbid symptoms abate. A hypothetical explanation of these therapeutic effects is based on the existence of a phosphorized fat as a normal ingredient of nerve-substance. In nervous exhaustion this is supposed to be deficient, and the giving of phosphorus is assumed to supply the want. Phosphorus is most commonly given in pill form, the minute dose being dissolved by warmth in some form of fat which concretes on cooling. It may also be given in solution in appropriate fluid mixture, but most of these solutions have an excessively offensive taste. As slow poisoning by phosphorus is very insidious, the drug should only be taken under the observation of a physician.

EDWARD CURTIS. REVISED BY WILLARD PARKER.

Pho'tius, the date and place of whose birth are unknown, as are also the circumstances of his early life, held a high position in the civil service of the Byzantine government, and was distinguished for his learning and literary taste, when in 858, on the deposition of Ignatius, he was hurried through all the grades of the ecclesiastical order in six days, and on the seventh installed by the emperor, Michael III., as patriarch of Constantinople. A council of 318 bishops, held at Constantinople in 861, confirmed the election, but a quarrel having arisen between the Roman and the Constantinopolitan sees concerning the jurisdiction over the newly-converted Bulgarians, Pope Nicholas I. objected to the irregularities of Photius's election, and convoked a council at Rome in 862, which deposed and excommunicated him. For the sake of self-defence, Photius now gave the conflict a doctrinal turn, and the Council of Constantinople (867) condemned and excommunicated Pope Nicholas I. because he held heretical views, thereby laying the foundation of the schism between the Eastern and Western churches. In 867, when Basilius the Macedonian succeeded Michael III., Photius was bereft of his office and sent into exile, and Ignatius was reinstated; but after the death of Ignatius he returned to Constantinople and was once more placed on the patriarchal throne. In 886, Leo the Philosopher again exiled him, and he d. a few years after in an Armenian monastery. Of his works, the *Myriobiblon* or *Bibliotheca*, a collection of extracts and reviews of 279 Greek authors (edited by I. Bekker, 1824), the *Lexicon* (edited by Porson, 1822), the *Nomocanon*, a collection of acts and decrees of councils up to the seventh œcumenical council, and his letters are of great interest. A collected edition is found in Migne's *Patrologiæ Cursus Completus*.

Pho'togen [Gr. φῶς, "light," and γεννάειν, to "produce"], the German term for the portion of shale, coal, or petroleum oil suitable for burning in lamps. (See PETROLEUM.)

Photographic Engraving. See PHOTOGRAPHY.

Photog'raphy [Gr. φῶς, "light," and γράφειν, to "write"]. This art dates back to the beginning of the present century, although the fact that light affects various substances had long been familiar through the fading of dyed stuffs, the blackening of organic matter, like paper, hair, etc., when moistened with silver solutions, and the darkening of chloride of silver on exposure to light. In 1802, Thomas Wedgwood, an Englishman, first produced photographic pictures by exposing paper impregnated with nitrate of silver to sunlight under a silhouette or similar dark object. The result was a dark copy of the silhouette on a light ground, and this was very imperfectly fixed by washing away the unaltered silver salt. Davy succeeded in obtaining copies of objects by combining the solar microscope with a camera obscura, but the paper used by Wedgwood was not sensitive enough for the ordinary camera. In 1814, Nicéphore Niepce of Châlons began to experiment, and finally succeeded in taking pictures in a camera by exposing for hours a silvered plate of copper coated with asphaltum dissolved in oil of lavender. The parts acted on by the light remained insoluble when the rest of the coat was dissolved off with volatile oils. In 1826 he exhibited some of his heliographs, and is said to have taken impressions from them by printing. In 1833 he died, and Daguerre, his associate for some years, perfected his well-known process, exhibiting its results publicly in 1838, and making known his secret in Aug., 1839, in return for a pension of 6000 francs. Niepce's son also received one of 4000 francs from the French government. Daguerre exposed a polished silver plate, coated with iodide by means of iodine vapors, to the light in a camera; no image was visible until the plate was exposed to vapors of mercury, when that metal was precipitated upon the parts most affected by the light. The superfluous silver iodide was removed with hyposulphite of soda. Daguerre's idea, which is the basis of all successful processes, was *development* of the latent image. It is said to have been the result of accident, the silver plate having been left in a closet with some mercury. Dr. J. W. Draper of New York first took portraits from life in America.

In 1841, Talbot succeeded in obtaining a paper negative in the camera by using paper prepared with iodide of silver, solution of nitrate of silver, and gallic acid, and developing with a mixture of the two latter agents. These paper *Calotype* or *Talbotype* negatives were too rough in outline, and in 1847, Niepce de St. Victor substituted glass coated with albumen containing iodide of potassium. This gave a very sharp picture, but the film of albumen was too destructible. In 1850, Legray attempted, and in 1851 Archer and Fry of England made a more successful effort, to replace the albumen with collodion, a solution of pyroxyline in alcohol and ether. Pyroxyline is prepared from cotton by the action of sulphuric and nitric acids, is chemically the same as gun-cotton, and is frequently called by

the same name, but true gun-cotton, used for firearms, is not soluble in alcohol and ether. (See COLLODION.)

The paper used for positives was improved by being coated with albumen; the time of exposure, which Daguerre had reduced to minutes, was reduced to seconds by Petzval's double objective lens; mixtures of bromide with iodide of silver were found to be more sensitive than iodide alone; Fizeau introduced toning with gold solutions to improve the color and durability of positives; Herschel some time before had proposed hyposulphite of soda as a *fixing* agent; Russell discovered the tannin *dry process;* and thus photography became well established as an art. Fizeau in 1844 deposited a film of copper by galvanism on the daguerreotype plate, obtaining a plate from which he got rough impressions, and Barreswil, Lemercier, Niepce de St. Victor, and others introduced processes for using lithographic stone and steel plates coated with asphaltum, exposed under negatives, treated with solvents to remove the unaltered asphaltum, and then with acids to etch the plates so that they could be used with ink for printing impressions. Mungo Penton observed that gelatine containing bichromate of potash was altered by the action of the light, and Talbot, Pretsch, and Poitevin, following up his discovery, laid the foundation for some of the most important photographic processes. Lubeck in 1810 showed that chloride of silver assumes different colors in different parts of the spectrum, and Becquerel in 1847 found that a plate of silver, immersed in metallic chlorides and exposed under colored glasses, receives an impression which it retains while kept in the dark. *Heliochromy*, or the production of colors by sunlight, is therefore possible, but no way of fixing these colors is known.

In some cases the action of the light may be physical. If a polished glass or metal surface is exposed to the sunlight for some time under a perforated shield, not in contact with it, and the surface is then breathed upon, the vapor will condense most abundantly on the spot exposed to the light. This is analogous to the condensation of the mercury vapors on the daguerreotype plate, and is only one of many physical effects of light. If a ray of sunlight or any ordinary artificial light is passed through a triangular prism, it will be decomposed into several rays of different-colored light, arranged as in the rainbow. This constitutes the well-known *spectrum*, and it has been found that chloride of silver is most rapidly darkened by the violet and certain rays beyond the violet called ultra-violet rays, while the chemical action of the rays rapidly diminishes toward the other end of the spectrum, until it is almost imperceptible in the yellow rays. It is on this account that pure colors photograph differently; yellow and red, which have little effect on the prepared plate in the camera, coming out dark in the positive picture, for reasons which are explained by the action of the chemicals used in obtaining the negative picture, while blue and violet would give a white spot in the positive; but if the colors are the result of mixing other colors, the effect produced by them will depend on the proportions and nature of the original colors, and also on the nature of the colored surface. Silk stuffs reflect more pure light than woollen, and would therefore give darker positives even if of the same color. Bromide of silver is more sensitive to green, yellow, and red rays than iodide, and hence is useful as an addition to iodized collodion for general use. Vogel has found that the sensitiveness of the silver bromide, etc., is increased for different-colored rays by adding to it bodies which absorb those rays; as coralline for yellow light, aniline green for red light. It is a mistake to suppose that the interposition of blue glass increases the chemical effect of light, for it not only absorbs the rays of slight energy, but is not even perfectly transparent to the most active. Acids retard the chemical effect of light on bromide, iodide, and chloride of silver; solution of nitrate of silver aids it, especially in the case of iodide and bromide. This is due to the absorption of bromine and iodine by nitrate of silver solution; and the same explanation can be given for the accelerating effect of other substances, as tannin, pyrogallic and gallic acids, etc. Organic substances, like paper, also exert a *sensitizing* effect, especially on chloride of silver. Thus, the paper used in the positive process is impregnated with chloride and nitrate of silver; the chloride is decomposed, metallic silver deposited on the paper, and the nitrate of silver decomposed by the chlorine thus set free, so that fresh chloride is formed, and the paper made much darker than by chloride of silver alone.

When a plate prepared with iodide, bromide, or chloride of silver is exposed a short time to the light, no result is apparent until the plate is covered with a silver solution containing a reducing agent, when the silver is reduced and forms a dark pulverulent precipitate wherever the light had acted. This process is called "developing," and the developers used are sulphate of iron, gallic acid, pyrogallic acid, etc., with solution of nitrate of silver.

The first step in the ordinary photographic process is to obtain a negative. The cameras used consist of a dark box, capable of being drawn out, so that a prepared plate at the rear can be brought into the focus of a lens in the front. This lens for portraits must, first of all, be able to concentrate a strong light on the plate; it must, however, also give as perfectly flat and sharp a picture as possible. For landscapes the light is less important, and it is therefore possible to secure greater depth of focus, so that near and distant objects may alike be thrown sharply on the plate. For copying flat objects perfect flatness is desired in the image produced on the plate. The glass plate being thoroughly cleansed with acid, and then with ammonia or otherwise, is coated with collodion, sometimes receiving a previous coating of albumen. This collodion is made by immersing cotton or paper in sulphuric and nitric acids and then washing it thoroughly. Then it is dissolved in alcohol and ether, and *sensitized* by addition of salts of iodine and bromine. The salts generally used are iodides of ammonium, potassium, sodium, and cadmium, and the corresponding bromides. Upon the length of time the cotton was immersed in the acids, the strength of the acids, the proportions of alcohol and ether, and the nature of the sensitizing agents, will depend the fluidity, clearness, sensitiveness, and durability of the collodion, and the qualities of the negative produced with it. These points require very large experience. The collodion plate is then immersed in a bath of solution of nitrate of silver, previously saturated with iodide of silver, to prevent the solution of the iodide of silver formed during the immersion on the collodion plate. This bath is generally acidified with a few drops of nitric acid, and contains for ordinary purposes 1 part by weight of nitrate of silver to 10 of distilled water. The sensitizing must be done in a room lighted by very faint candle or gas light, or by light admitted through yellow glass. The wet plate is now enclosed in a dark case and placed in the camera, where it is exposed as long as necessary to the light. The length of time for exposure must be determined by experience, and will depend on the intensity of the light and the nature of the object; the longer the time, the more intense will be the negative, within certain limits; but overexposure renders the details indistinct by destroying the contrast of light and shade. The plate is removed to the dark room and a developer poured over it, and left until the details of the picture are all visible, when it is washed off. The developer is usually a solution of sulphate of iron, containing acetic acid, and a little alcohol if the silver bath is old. Generally, a negative is not intense enough, and then it is intensified by pouring over it some more of the sulphate of iron solution with a little acetic acid and very dilute solution of nitrate of silver. It is then washed, and *fixed* in a solution of cyanide of potassium, which dissolves the unchanged iodide and bromide of silver. Hyposulphite of soda is less frequently employed to fix negatives. Vogel recommends for intensifying the negative, after washing it, a mixture of pyrogallic acid dissolved in alcohol, with water, nitrate of silver, and citric acid. The fixed negative is dried and varnished, and is then ready for furnishing the *positive*. To obtain the positive picture the negative is placed upon albumenized paper, previously impregnated with solution of chloride of sodium, then floated in solution of nitrate of silver, and dried. The two are exposed to the light, and the silver salts on the paper are darkened by the light which passes through the transparent parts of the negative. The result is a picture in which the lights and shades are in their proper places, and it is now necessary to fix this picture by dissolving the superfluous silver salt with hyposulphite of soda. By this operation the purplish-brown color of the positive is changed to a disagreeable yellowish-brown, which is remedied by *toning* in a gold bath before fixing. The picture thereby acquires a better color, and is more durable on account of the gold surface obtained. Chloride of gold, generally combined with chloride of potassium or sodium, is used for toning, and the color produced will vary according to the acidity or alkalinity of the bath. After being fixed, the positive is well washed, mounted, and calendered. Slight modifications of this process are adopted by different photographers. The negative is generally retouched before using it for obtaining a positive, as thereby spots and defects can be concealed; the positive paper is sometimes exposed to ammonia vapors before it is used; the fixed picture may require to be retouched, and frequently it is polished by putting some solution of wax in ether upon it and rubbing it with a woollen cloth. By using developers with nitrate of potash, nitrate of silver, and nitric acid, with a suitable collodion and short exposure, positives can be taken at

once in the camera, either on glass, afterward coated on the back with black varnish, or on plates of dark glass or of iron faced with black varnish. These are called ambrotypes and melainotypes. Transparent positives on glass can be made by substituting for the paper a plate of glass properly prepared with sensitized collodion. They can also be made by the Woodbury process. If the transparent positive is to be of a different size from the negative, recourse is had to the camera obscura. Positives on glass can also be transferred to ivory, porcelain, etc., by causing the collodion to adhere to the new surface by means of suitable adhesive preparations. Life-size pictures are obtained by concentrating the light with a large lens on a small negative, and then forming an enlarged image of this negative by passing the rays from it through a second lens and receiving them on prepared paper. Stereoscopic pictures are taken with cameras having two lenses, about two and a half inches apart, or by moving the single-lens camera a little to one side after taking the first picture. Negatives of very minute objects in enlarged size are taken with the microscope by inserting the eyepiece of the instrument into the camera and throwing the image of the strongly-illuminated object on the prepared plate without the intervention of the usual camera objective. Photographs of astronomical objects are taken by substituting for the eyepiece of the telescope a prepared plate, which receives at once the image thrown on it by the object-glass, or this image enlarged by the intervention of a lens of short focus. Microscopic photographs are obtained by again photographing a negative with a lens of very short focal distance. Photography has also been made to record meteorological observations and to aid in physiological researches.

Among the tricks of photography are the spectre photographs, where a faint image of an object was made to appear dimly on a plate by a very short exposure, while the main object was exposed for the usual time. Moonlight effects are really produced by sunlight by a very short exposure; the ostensible moon in the picture being really the sun. Magic photographs are paper photographs dipped in chloride of mercury solution, which bleaches them by forming white chloride of silver and subchloride of mercury. These, covered with paper impregnated with hyposulphite of soda, are turned black by the formation of sulphide of mercury. The subchloride of mercury can also be blackened by the ammonia of tobacco-smoke, as in the magic cigar-holders. Instantaneous photographs are simply the result of using powerful lenses, a strong light, good collodion, and a strong developer and intensifier. The artificial lights used are the electric, calcium, and magnesium lights. Sometimes sunlight is introduced into dark places with mirrors. The dry collodion process is very convenient for use on expeditions. As the nitrate of silver solution present on the plate in the camera in the wet collodion process must be washed off before drying the plate, it becomes necessary to use some agent that will increase the sensitiveness of the plate. Substances which absorb iodine do this, and, according to Vogel, this explains the action of the tannin and other agents used in this process. Russell's process consists essentially in using albumenized or gelatinized plates to receive the collodion, and in immersing these when sensitized and dried in a solution of tannin in water. The plate is developed by washing it, pouring on a solution of pyrogallic acid, and subsequently adding nitrate of silver to this solution. Bartholomew's excellent process consists in coating the sensitized plate with solution of acetate of morphine.

By re-photographing a negative in the camera, so as to obtain a positive on glass, and intensifying this with pyrogallic acid and silver solution, the effect of which was augmented by using chloride of mercury and iodide of potassium, Scamoni succeeded in obtaining so high a relief that it could be successfully used to obtain, by the galvanic battery, a copper plate suitable for producing impressions —a valuable process for copying maps and drawings. Some of the most important accessory processes of photography depend upon the following facts: If gelatine impregnated with bichromate of potash or ammonium is exposed to the light, it loses its properties of swelling in cold water and of dissolving in warm water. Talbot discovered this, and employed it to produce steel engravings, by coating the steel with chromatized gelatine, exposing it under a negative, dissolving out the unchanged gelatine, and etching the plate where it was thus exposed. Pretsch by copying under a positive obtained a film in relief, which he reproduced with copper by the galvanic battery, and used for printing. The process is very useful for reproducing maps, etc., but shows the half-tones very imperfectly. Pigment prints are made by coating paper with chromatized gelatine, colored with any desired pigment, and exposing it under a negative. The gelatine film is then dampened, placed on a smooth zinc plate, and when dry immersed in warm water. This removes the paper, and the gelatine film is then transferred to glue-paper. If it is not desired thus to reverse it, it is at once transferred to albumenized paper, which is pressed upon it, and the whole plunged into hot water. As the gelatine is affected to a greater or less depth according to the intensity of the light, the half-tones are preserved. Monochromatic pictures are thus reproduced in their original colors, sketches of the old masters being especially so copied. By exposing a simple chromatized gelatine film, resting on collodion, under a negative, dissolving out the unchanged gelatine with hot water, allowing the relief thus obtained to become very hard by drying, and then placing it on a lead plate under a strong press, Woodbury obtains a printing plate. On this is poured warm colored gelatine solution, upon which is placed calendered paper, and the gelatine adhering to this in layers of different thickness produces a perfect representation of the half-tones. This process, called "relief printing," is very valuable where many copies are required, and it can be used to print on glass also. After exposure to light, a chromatized gelatine film will receive a coating of lithographic ink, but will not become moist when rubbed with a wet sponge. By exposing such a film under a negative, brushing it with a wet sponge, and then passing over it an inked roller, an inked plate is prepared from which an impression can be taken. This constitutes the basis of the Albertype process, which has been perfected by Obernetter, and yields results surpassing those of the Woodbury process in sharpness, but not in delicacy of shading. These two processes are nearly equal to the silver positives in their results. Asser and Osborne obtain photo-lithographs by exposing under a negative chromatized gelatine paper, which then only absorbs lithographic ink where the light has worked; the paper is then washed and applied to a lithographic stone, which absorbs the ink and can be used for printing. The same thing can be done with zinc, giving photo-zincographs, but the copies obtained are decidedly wanting in sharpness in both cases, although valuable where cheapness is desired.

Pictures burnt in on porcelain and glass surfaces were obtained by Grüne, who transferred the collodion film to these surfaces, after replacing the silver on it with other metals, by means of solutions of their salts. Joubert has perfected a pyro-photographic method, proposed by Poitevin, which consists in exposing, under a positive, a glass coated with gum-arabic and sugar or honey and chromate of potash. This plate when dried loses its stickiness after exposure to the light, and if it is powdered with any fine powder, this will stick to it only where the film was protected from the light. By using appropriate colors and transferring it, if necessary, to curved surfaces, the pictures can be burned in on glass or enamel. H. B. Cornwall.

Photolithography. See Photography.

Photom'eter [Gr. φῶς, "light," and μέτρον, "measure"], an instrument for comparing the intensity of any light with that of another assumed as a standard. In 1833, Arago constructed a photometer based upon principles involved in the laws of the polarization of light. The principle, however, upon which most photometers are constructed depends upon the law that "the intensity of light emanating from a point varies inversely as the square of the distance of the light from the object illuminated." Among those deserving consideration are the following:

Masson's Electro-photometer, especially adapted for comparing lights of different colors. It consists of a circular disk divided into black and white sectors which is revolved by clockwork at the rate of 250 to 300 turns per second. When illuminated by a constant light, it appears gray, but when illuminated by the electric spark, the sectors are plainly visible as if it were at rest. If the intensity of the light from the spark is diminished, or the illumination from the constant source of light is increased, a point is finally reached at which the light from the spark ceases to make the sectors of the disk visible. By a comparison of the distances at which two lights prevent the appearance of the sectors when the electric spark is passed, the relative intensities of the two lights may be calculated. Recent experiments have shown that certain modifications of selenium show an increase in their capacity for conducting electricity in accordance with the extent to which they are illuminated, and it has been proposed to make this property the starting-point for photometrical tests. (*Pogg. Annalen*, No. 10, 1875.) The other photometers which have been proposed and more or less used may be distinguished as (1) those in which the lights compared are on the same side of the screen upon which their intensities are compared; of this class Rumford's photometer may be taken as the type. (2) Those in which the lights compared are

on opposite sides of the screen upon which their intensities are compared; the type of this class is the ordinary Bunsen photometer.

Rumford's Photometer consists of a wooden cylinder with a small white screen behind it, upon which its shadow is thrown. With two lights there are of course two shadows, each shadow being illuminated only by one of the lights. The lights are so arranged that the shadows are brought close together without overlapping, and the lights are moved independently nearer to or farther from the screen until the shadows are equally illumined. The intensities of the lights are then inversely as the squares of their distances from the screen. *Ritchie's Photometer* is a modification of this, where the lights are cast upon a screen of oiled paper in a box enclosed in a dark chamber, the shadows of the sides of the box being brought together, and the relative intensities of the lights determined in the same manner. Various other modifications of this mode of testing have been made by different experimenters as regards the material forming the screen and the mode of inspecting it. *Foucault's modification* of Rumford's photometer, arranged by Dumas and Regnault with starched glass plates, has been extensively used in France. Other experimenters have used ground-glass plates and other translucent materials. These "shadow tests," so called, require much practice in the experimenter, and even with expert manipulators it is claimed that the error is from 5 to 10 per cent.

Bunsen's Photometer consists of a bar 80 to 100 inches long, supporting a small disk of paper in a frame, the paper being oiled all over with the exception of a spot in the centre, or in some cases the centre being oiled while the remainder of the paper is left in its natural state. At one end of this bar is placed the standard light, at the other the light to be tested. The disk is moved along the bar until it is seen to be equally illuminated on both sides. The bar is usually graduated so that the readings may be made directly, without elaborate measurements and calculation. *Letheby's modification* of Bunsen's photometer has the disk enclosed in a box, with mirrors at each side so placed that the observer can see both sides of the disk at a glance. Dr. Letheby has also substituted for the oiled disk a disk of thick white paper from which a star has been cut, with bits of thin paper on each side of it. This form of photometer is the one most generally used. The maximum error is stated to be about 5 per cent.

Lowe's Jet Photometer is another form of photometer which is much used, and depends upon an entirely different principle. It is used exclusively for testing illuminating gas. Mr. George Lowe, an English gas-engineer, discovered that "the height of a flame of gas burning under a well-regulated and constant pressure from an aperture of unalterable dimensions depends upon the illuminating power of that gas. The apparatus therefore consists essentially of a jet with a single opening, made at first of porcelain, but at present usually constructed of steatite (the so-called lava), connected with suitable apparatus for regulating the flow and pressure of the gas to a nicety. The jet of gas is made to burn in a box, the front of which is of glass on which is engraved a scale, while on the opposite side of the box is another scale corresponding, so that the point to which the top of the flame attains may be observed accurately. This instrument affords good comparative indications for gas made from the same materials at different times, but as the rate of efflux of gas from an aperture depends upon its specific gravity, it cannot be relied upon for the comparison of gases where the specific gravities differ materially.

Naturally enough, photometers are used chiefly in the determination of the illuminating power of substances used as artificial illuminants, principally coal-gas. The standard measure of luminous intensity is therefore a subject of great importance, and great difficulty has been experienced in fixing it. In acts of Parliament the light from sperm candles six to the pound, and consuming 120 grains per hour, has been assumed as the standard. An elaborate series of experiments was made on the standard candle in England in 1869, the results of which went to show that the average rate of consumption of sperm candles six to the pound was 135 grains per hour. (*Brit. Jour. of Gas-Lighting*, 1869, p. 390.) However, up to this time no change has been made in the requirements of the act. Differences in the manufacture of the candles make considerable differences in the rate of burning and the amount consumed per hour. The sperm in itself is too friable, and requires the addition of small amounts of wax to give it the requisite toughness. The mode of plaiting the wick and the materials of which it is composed also have considerable influence. (See Suggs's *Manual of Gas Manipulation.*) Candles entirely of wax have been found to give a very variable light compared with sperm. The use of paraffine has been proposed. Dr. Faulkland prefers a composition candle; Dr. Fyfe prefers wax. Some have used a mixture of 9 parts of hydrogen with 1 part of olefiant gas to give the standard light, but its use is attended with considerable inconvenience in many ways. Crookes (*Chem. News*, No. 450, p. 25) proposes a lamp with wick of platinum wires in which is burned a mixture of 5 volumes of alcohol of sp. gr. 0.805 and 1 volume of pure benzol boiling at 81° C., the wires to be 0.01 inch in diameter, and the liquid in the lamp to be kept at a constant level by a suitably-arranged apparatus. Hartley examined numerous standards proposed, and gave the preference to that of Keats, which is a moderator lamp of peculiar construction consuming 750 grains of sperm oil per hour. The light from this lamp is equal to that of ten standard candles. (*Journal of Gas-Lighting*, Mar. 16, 1869.) The standard used in France has been the light of a colza-oil lamp (Carcel) consuming 42 grammes = 648 grains per hour.

In testing the gas the style of burner and the rate at which the gas is burned are also important elements in the test. The French use an argand burner, called by them the *bec Bengel*, having thirty holes for the escape of the gas and provided with a chimney. All the dimensions of the burner are fixed by special statute. The English standard from 1852 to 1863 was an argand of metal with sixteen holes, the chimney seven inches in height, and the gas to be tested was to be consumed at the rate of 5 cubic feet per hour. From 1863 to 1869 another burner was used, which differed from the old one in that the gas was caused to burn at a lower pressure, and the burner, instead of metal, was of steatite. In 1869 another argand burner of improved form, invented by Sugg, with also a steatite burner, was adopted as the standard. In all cases the amount of gas and the pressure at which it should be passed through the meter was the same (5 feet per hour). A comparison of these three standards by Dr. Letheby resulted as follows: Calling the intensity of light from the old test-burner 100, that from the second standard burner, under the same conditions, was equivalent to 111.1, and that from the present standard to 128. A higher illuminating power is now required, however, than was formerly demanded, so that in effect the illuminating power of the gas is maintained at essentially the same point as at first. (*Engineering*, Nov. 12, 1869, p. 328.)

In photometrical experiments the operations are usually conducted in a room the walls of which are blackened to prevent as far as possible any reflections which would tend to affect the observations. Some few photometers are constructed with a view to dispensing with the so-called "dark room," but the results are considered more reliable when the observations have been made in an apartment prepared for the purpose by having the walls colored a dead black.

An apparatus for gas photometry usually consists of a bar carrying the Bunsen or Letheby disk, with the gas-fixture at one end and the place for the candles at the other, a balance and weights for weighing the candles before and after the operation, a meter recording thousandths of a foot, a seconds clock to time the experiment, and a pressure-gauge. Suggs's latest improvement is a combination "clock-meter," in which a hand moved by clock-work moves around the face of the meter, and if the gas is burning at the right rate, the clock-hand and meter-hand travel around the face of the meter together Two candles instead of one are now frequently used, in the expectation that the irregularities of the one in burning will counteract those of the other. Readings are taken sometimes once and sometimes twice a minute for ten to fifteen minutes, and the results are averaged. If the candles or gas, one or both, have not been burning at exactly the prescribed rates, corrections are made by means of a simple proportion. If the gas-rate or candle-rate, however, varies very widely from the prescribed rates, but little reliance can be placed on the results. The temperature of the gas in the pipes has a marked effect on its illuminating power. (*Jour. Gas-Lighting*, Dec. 7, 1869, p. 930.) It is ordinarily tested, however, at ordinary temperatures, and no correction made for variations of the thermometer.

Illuminating Quality of Gas, etc.—The following table shows the illuminating quality of the gas consumed in various towns in Great Britain, as determined by Prof. Frankland in accordance with the government test:

London	12 candles.	Birmingham	15 candles.
Carlisle	16 "	Manchester	22 "
Liverpool	22 "	Inverness	25 "
Edinburgh	28 "	Glasgow	28 "
Greenock	28.5 "	Harwick	30 "
Paisley	30.3 "	Aberdeen	35 "

In Paris it is 12.3; Berlin, 15.5; and in Vienna only 9. In addition to the standard, as above, for London, which is for the common gas, there is one manufactured from cannel coal, the standard of which is never below 20

candles. This gas is used in the public buildings, the dwellings of the wealthy, etc. So far as ascertained, the illuminating power of gas in this country varies from twelve to eighteen candles, taking the English standard as a measure. E. WALLER.

Photo-Relief Printing. See PHOTOGRAPHY.

Phran'za, or **Phran'zes,** the last, and one of the most important, of the Byzantine historians, b. in 1401; was educated at the court of Constantinople; appointed chamberlain to Manuel II. Palæologus in 1418, and employed with success in many diplomatic missions. After the death of Manuel II., he attached himself to Constantine, the brother of the reigning emperor, John VII., and distinguished himself as a soldier. At the siege of Patras he saved the life of Constantine, but was taken prisoner himself and subjected to cruel sufferings in a Turkish dungeon. On the accession of Constantine Palæologus to the throne in 1448, he was promoted to the highest positions, but after the capture of Constantinople in 1453 he and his wife and two children were made slaves. He escaped with his wife to Sparta, but his daughter died and his son was murdered in the sultan's harem. From Sparta he fled to Corfu, was still active for some time in diplomatic negotiations, but retired finally to the monastery of Tarchaniotes, where he wrote his *Chronicon*, and d. after 1477. His *Chronicon* gives the history of the Byzantine empire from 1259 to 1477, and is interesting and reliable; it was not printed until 1796, when it was edited by Alter in Vienna.

Phrase, in music, a short series of sounds, not complete in itself, but ending with a pause or an imperfect cadence. (See RHYTHM.)

Phrenol'ogy [Gr. φρήν, "mind," and λόγος, "discourse"]. This term, properly signifying the science of faculty, in distinction from psychology, the science of the soul, was first applied by Gall and Spurzheim to a group of psychological theories arising partly from the discovery that the animal brain is a very complex congeries of organs, and partly from empirical observations as to the existence of a certain correspondence, or series of correspondences, between the configuration of the cranium and the special aptitudes exhibited by its possessor. During the progress of the group of doctrines designated as phrenological the main propositions of Lavater's system of physiognomy and the discoveries of Sir Charles Bell, developed in his work on the *Anatomy of Expression*, have been incorporated as elementary principles; so that phrenology may be regarded as a development, partly scientific and partly purely empirical, of the general idea that a minute correspondence exists between the physical structure and the psychical and mental traits of every individual man or animal. The special bias that gave direction to Dr. Gall's investigations was due, in the first instance, to empirical data, such as that the crania of artists are distinguished by swelling in the region of the temples, those of philosophical thinkers by great development in the upper frontal region, and those of accurate observers of facts by projection in the region of the eyebrows. He had prosecuted his observations in this field for several years before he hit upon the idea of hardening the brain in spirits of wine or by boiling it in oil in such a manner as to unfold its filamentous structure, and to give scientific value to his system by harmonizing it with cerebral anatomy. Previous to the celebrated dissections of Gall and Spurzheim, the principal idea of which was the expanding filamentous structure of the brain from below upward, that organ had been regarded by anatomists as a semi-structureless mass, exhibiting certain constant ganglia, such as the striated bodies, the optic thalami, the quadrigeminal bodies, and the pineal gland, but, on the whole, as a single organ rather than as a group of organs; and the method of dissection practiced in medical institutions was to examine it in successive slices from the vertex downward. Indeed, so extraordinary was the discovery of Gall in its bearings on the current theory of cerebral structure that it required several years and many verifications to convince professors of anatomy that the filamentous view was well founded; and the great developments in anatomical science, particularly as respects the nervous system, which have taken place during the last fifty years, must now be considered as due to the investigations of two men who have become widely celebrated as the founders of phrenology, but who have really high claims to be remembered as anatomical discoverers.

Gall's view of the physiology of the brain may be described as follows: The convolutions are distinct nervous centres, each having its special activity. As concerns the lobes, the frontal are occupied by the perceptive group of centres; the superior by the moral and æsthetic groups; the inferior by a group mainly concerned in the nutrition and adaptation of the animal to external conditions; the posterior by the social instincts; and the cerebellum is supposed to have the function of presiding over the procreative activity, of endowing it with passion and psychic significance, and thus lifting it within the sphere of sentiment and feeling. As concerns all these propositions, with the exception of the last, recent experiments in vivisection have verified their general accuracy; the most decisive evidences thus far recorded having been contributed by Dr. Ferrier of King's College, London, in 1872–73. Their general result may be stated as furnishing an experimental demonstration in detail that the convolutions are separate and distinct nervous centres in all animals in which they occur, and that these centres are arranged into groups and lobes substantially as Gall and Spurzheim taught; while in brains that have no convolutions corresponding sections of the cortex are still the seats of special activities, although the eye fails to distinguish their boundaries. Dr. Ferrier's experiments were conducted in the same general manner as the less conclusive ones of Fritsch and Hitzig of Germany—namely, by exposing the cortex of the brain and exciting it in sections with the induced electric current. The difficulty that physiologists have experienced in verifying experiments of this special class appears to be due to the fact that a very trifling loss of blood in preparing for the operation may impair the excitability of the cortex to such a degree that the current elicits no responsive movements.

On the other hand, as respects the function of the cerebellum, Gall's theory not only lacks confirmation, but the general tenor of experiment leads to the adverse view that that organ specially co-ordinates the muscular movements concerned in locomotion. A very thorough review of the evidences *pro et contra* will be found in Dr. Austin Flint's work on the *Nervous System*, which should be perused, however, with the reservation that the author's bias in favor of regarding the cerebellum as one of the great centres of motion is so decided as to impair, in a measure, the scientific value of his conclusions. Again, the evidences of comparative nervous anatomy appear, in so far as they bear upon the question, to be adverse to the phrenological view. But, taking all the facts into consideration, it cannot as yet be asserted that either theory is conclusively established. The truth seems to lie midway between the two extremes, and may probably be formulated as follows: The cerebellum co-ordinates the movements concerned in locomotion in a primary and instinctive manner, as vivisection experiments and comparative anatomy indicate; but as these movements are partly identical with those concerned in coition, it is also materially concerned in the sexual instinct, which, if the evidences of comparative anatomy are permitted to have their proper weight, must be regarded as having its special centre in the abdominal section of the spinal column, since the relative complexity under which the sexual instinct manifests itself in the different orders of animals is always in direct ratio to the relative development of gray matter in the inferior section of the spinal marrow. Another important point, developed by the patient anatomical studies of Wagner and Huschke, presents itself here in opposition to the doctrines of Gall, which assume that the building or constructive instinct in animals is contingent on a development of the brain giving great apparent breadth just in front of the ears. Their view is that the constructive instinct, as exhibited in the bee, is primarily due to the higher complexity of the sexual process that results from the more complex nervous development of the abdomen in that insect, as compared, for illustration, with the spider. In other terms, the wonderful constructive capacity displayed by certain animals is a response in faculty to the instinctive prompting to build a home for the protection of their young. This is the comparative-anatomy view of the question as interpreted by two of the ablest representatives of that science, and one that Dr. Jacoby of Berlin adopts as the basis of his volume on the *Evolution of Society*.

While, then, so far as respects the physiology of the brain, many of the leading positions of Gall and Spurzheim have been verified by later specialists, and have been absorbed into scientific psychology, the empirical parts of their work have remained without the pale of science. It is by the adoption and exposition of the latter that modern phrenologists are properly distinguished from cerebral psychologists as represented by Bain, Carpenter, Ferrier, Wagner, Huschke, and others. That is to say, phrenology superimposes upon certain established views of brain-physiology certain empirical doctrines, and groups them together under the general head of craniology, which, as a part of the system, rests upon the assumption that the relative development of the centres of the brain can be accurately determined by an external examination of the skull —by protuberances here as contrasted with depression in another quarter, and by other indications in their nature

unverifiable in any special instance without *post-mortem* examination, but having a certain degree of foundation in the general truths of physiology. It was this pretension of Gall and Spurzheim that led to the contemptuous rejection of their system in Germany, while its valuable results as respects brain-physiology were taken up by Wagner and Huschke and elaborated into the new science of psycho-physics. The same pretension debarred Spurzheim from popularity in England, led to his tour in America, and rendered this country the scene of the first real organization of phrenology into an intellectual movement. So that, while the science of psycho-physics in Germany and cerebral psychology in England are simply continuations of the inductive movement initiated by Gall and Spurzheim, it has been only in America that phrenology as such has obtained general currency or occasioned much discussion, and only here that it broadly assumes to delineate a man, mentally, morally, and psychically, with unerring precision, by examining his head, making a few measurements, and observing his special temperament. In the present state of science no serious discussion of this aspect of the subject can be attempted, since it rests purely upon empirical data, and in the hands of those who know it best and have practised it for years lays no claims to scientific exactness or to well-reasoned theory. That practised phrenologists are often quite correct in their descriptions of the inner life and the special aptitudes and biases of a person under examination, is generally conceded. That they are frequently in error, they themselves concede. The data being uncertain and general, such must be the conclusions. The cranium may be small, and yet, owing to the depth of the furrows, the cortex of the brain may be very large and ample. *Vice versâ*, a large skull, owing to the superficial nature of the furrows, may coexist with a very limited development of the thinking membrane (the cortex). In no aspect of anatomy, as every practical expert is well aware, is there a greater variation than exists between the dimensions of the skull and the development of the cerebral cortex. The thickness of the skull is also subject to considerable variation in different portions of its surface. These facts appear at first sight to militate very strongly against the assumption that the relative development of the cortex or the thickness of the skull can be determined, even proximately, by external examination; although, on the other hand, these variations themselves, upon which the uncertainty of practical phrenology depends, are subject to laws as yet but partly ascertained, that enable expert anatomists to predict with considerable certainty, in any given case, that the convolutions will be found deep or shallow, and the skull thick in certain quarters or the reverse, by superficial inspection of a subject submitted for dissection; and hence, though not yet formulated as science, a fundamental law of morphological development underlies the empirical observations of the craniologist. F. G. Fairfield.

Phryg'ia [Gr. Φρυγία], an ancient, highly civilized, and flourishing kingdom, whose boundaries cannot be exactly determined, occupying the western central part of Asia Minor. The people (of Indo-European descent) were closely related both in race and history to the Bryges ("freemen") of Macedonia. But whether the original migration was from Asia to Europe, or from Europe to Asia, writers are not agreed. The alphabet of the inscriptions found in the valley of the Sangarius is much like the oldest specimens of the Greek. The national religion, at one time widely diffused, was a grossly naturalistic pantheism. The self-mutilated priests of Cybele, with their wild dances, were famous. The whole national character was highly enthusiastic and sensuous. The country was noted for its wool, its cheeses, and the excellence of its agriculture generally. Its great wealth is indicated by the fable of Midas turning everything that he touched into gold. The principal rivers were the Mæander and Sangarius; the principal cities were Apamea, Colossæ, Laodicæa, and Hierapolis. Phrygia was conquered by Crœsus of Lydia (558–544 B. C.), afterward by the Persians and Greeks, and, with the rest of Pergamum, fell into the hands of the Romans 133 B. C. The Roman province, however, was not identical with the ancient kingdom. Christianity was introduced by the apostle Paul. Papias the millenarian and Montanus the enthusiast were Phrygians.
R. D. Hitchcock.

Phryg'ian, in music, the name of one of the ancient ecclesiastical modes or scales. The Phrygian scale commences on E, and differs from the modern E minor in having for its second degree F♮, instead of F♯. The *cadence* commonly called Phrygian has already been described among other cadences in the article Music.

Phry'ne, a Greek courtesan of surpassing beauty, was employed by Praxiteles as a model for his Cnidian Venus, and by Apelles for his Venus Anadyomene. She was b. at Thespiæ in Bœotia in humble circumstances, but when Alexander the Great destroyed the walls of Thebes she offered to rebuild them. When accused of profaning the Eleusinian mysteries, and summoned before the tribunal of the Heliasts, her defender threw off her veil, whereupon the judges immediately acquitted her, and the people carried her in triumph to the temple of Aphrodite.

Phryn'ichus, an Athenian poet who by ancient writers is ranked between Thespis and Æschylus as one of the founders of the Greek tragedy; gained his first tragic victory in 511 B. C., twenty-four years after Thespis and twelve years before Æschylus, and his last in 476 B. C., on which occasion Themistocles was his *choragus*, and recorded the event by an inscription. Of his personal life nothing more is known, though it is probable that he went to Sicily and died at the court of Hiero. The improvements for which the Greek tragedy was indebted to him were very considerable. The tragedies of Thespis were of a light and imitative character; those of Phrynichus were serious and imaginative. He took his materials from the poems of Homer, which had recently been collected by the care of Pisistratus; and when he chose to treat an event of contemporary history, it was always a sublime and impressive one. The character of his tragedies is strikingly indicated by the incident which Herodotus relates. He brought a tragedy on the stage representing the capture of Miletus, and the representation was so powerful that the whole audience burst into tears. But such a stirring up of their passions the Athenians would not allow to art, and they fined the poet 1000 drachmæ. It is self-evident that this transition from the ludicrous to the pathetic in the contents of the tragedy made corresponding modifications of the form necessary; and we find with the ancient writers many notices which indicate that with Phrynichus the light, mimetic choir of Thespis grew into the solemn, magnificent chorus which characterized the Greek tragedy when at its point of culmination. Of his works nothing has come down to us.

Phrynis'cidæ [*Phryniscus*, dim. of φρύνη, a "toad"], a family of anourous amphibians containing "toad-like frogs," for the most part confined to South America. As defined by Cope, it is distinguished by the absence of teeth on the jaws, the presence of epicoracoids, the distinction of sacrum from the coccygeal style, and the triangular diapophyses of the sacrum. By Cope seven genera have been referred to the family, one of which (*Calophrynus*) is represented in Borneo and China, and all the others are peculiar to South America. Theodore Gill.

Phthalic Acid ($H_2C_8H_4O_4 = C_6H_4(COOH)_2$), **Alizaric Acid, Naphthalic Acid, Monocarbobenzoic Acid,** or **Dicarbobenzolic Acid,** a bibasic acid derived from benzene (C_6H_6) by the substitution of two carboxyl (COOH) for H_2. It is susceptible of three modifications, according to the relative position of two carboxyl-groups—(1) ortho-phthalic acid, or simply phthalic acid; (2) meta- or iso-phthalic acid is formed by the oxidation of meta-xylene or iso-xylene; (3) para- or terephthalic acid is produced by the oxidation of turpentine oil, cuminic acid or aldehyde, xylene, and other aromatic hydrocarbons. Phthalic acid (ortho-) is prepared by the action of nitric acid on alizarine, purpurine, munjistine, naphthalene, naphthalene dichloride, or naphthaquinone; by the action of manganese dioxide and sulphuric acid on naphthalene or benzene; of potassic dichromate and sulphuric acid on naphthalene; of chlorous acid on naphthalene; of potassic chlorate and hydrochloric acid on naphthalene dichloride; of potassic permanganate on an alkaline solution of orthotoluic acid. It crystallizes in white nacreous laminæ arranged in rounded groups; is slightly soluble in cold water, readily soluble in alcohol and ether. By distillation with an excess of lime it yields benzene and calcic carbonate; with a smaller proportion of lime, calcic carbonate and benzoate. This reaction is now employed on a large scale by P. and E. Depouilly (*Bull. Soc. Chim.*, 1864, i. 163) for the preparation of benzoic acid. It forms acid and neutral salts, and yields substitution products with bromine, chlorine, nitric acid, etc. By distillation it yields its anhydride, $C_8H_4O_3$, called also phthalide, and pyrophthalic acid. When phthalic anhydride is heated to 195° C. with resorcine, obtained by action of caustic alkalies on assafœtida, certain other gum-resins, or benzinodisulphuric acid from benzene, it produces fluoresceine, which crystallizes from alcohol in brown crusts. Fluoresceine heated with zinc-dust yields colorless fluoresceine. When fluoresceine is heated with strong sulphuric acid, it produces a red body, which gives with alkalies a blue solution. The red solution dyes wool blue; the color is not so fine nor so fast as indigo. Fluoresceine forms a red crystalline powder; crystallizes in yellow needles from methylic alcohol; and its ammonia solution exhibits a most beau-

tiful and intensely green fluorescence. It is $C_{20}H_{12}O_5 = C_6H_4(CO.C_6H_3.OH)_2O$. Nitric acid converts it into tetranitro-fluoresceine, an explosive body, which dyes wool an intense reddish-yellow. Fluoresceine has become of great industrial importance as a basis for the preparation of the new and beautiful dye called *eosine*, which rivals safflower and saffronine for dyeing rose-red. Eosine is the potassic salt of tetra-brom fluoresceine. (See papers on fluoresceine by A. Baeyer (*Ber. Chem. Ges.*, Berlin, iv. 658); E. Fischer (*Ber. Chem. Ges.*, vii. 1211, 2116); on eosine, Guehm (*Ber. Chem. Ges.*, vii. 1743); A. W. Hofmann (*Ber. Chem. Ges.*, viii. 62); A. Baeyer (*Ber. Chem. Ges.*, viii. 146); Bindschedler and Busch (*Chem. News*, xxxii. 198); Reimann's *Färber Zeit* (1875).) C. F. CHANDLER.

Phthisis. See CONSUMPTION.

Phycol'ogy [from φῦκος, a "seaweed," and λόγος, a "discourse"] is the name applied to that department of botany which treats of the Phycæ, or Algæ, as they are more frequently called. Algæ may be defined as thallogens, or flowerless plants having no proper distinction of stem and leaf; which always grow in water or very wet places; which have green coloring-matter; and which are never truly parasitic. This definition, it will be observed, is a little vague, and it is probable that before long the term "Algæ" will fall into disuse; at present it is still retained by the majority of writers, inasmuch as it is convenient, although not well defined scientifically. The Algæ constitute a large group of plants, although not by any means so rich in species as the Fungi. They are most abundant in the ocean, of which, with very few exceptions, they form the entire vegetation, and are generally known under the name of seaweed, sea-moss, etc. They are also very abundant in fresh water, where, however, they by no means present so striking or varied forms as in the ocean, but are generally composed of green thread-like structures of a more or less slimy consistency. In size, shape, and color Algæ vary exceedingly. Some are no larger than dust, and consist of a single cell. (Some of the more interesting of these simple forms are described in the article on DIATOMACEÆ.) From small species consisting of a single cell there is a regular series of forms until we reach the gigantic species found in the Antarctic and Pacific oceans, which excel all land-plants in length, if not in size. *Macrocystis pyrifera* attains a length of 1000, and some writers even say of 1500, feet; and the very slender stems of *Nereocystis Lütkeana* are not unfrequently 200 feet long, and are used by the Indians of the North-west coast for fish-lines. Some species of *Lessonia* and *Durvillæa* also attain enormous dimensions, but the majority of Algæ are but a few inches long, and are either thread-like or form small membranous expansions.

The substance of the Algæ varies from that of a jelly to that of stone. Many of the fresh-water Algæ are mere masses of jelly, and some, as the *Nostocs*, swell up into more or less shapeless masses after a rain, and afterward dry up into almost imperceptible crusts. Some of the devil's aprons, particularly *Laminaria dermatodea*, are coriaceous, and many species, found more especially in the tropics, are covered or infiltrated with a calcareous deposit. The coating of the diatomes is silicious.

The Algæ vary in color from almost black to a beautiful rose-color. The color depends to a great extent on the position in which any species grows, but it is so constant in different species that it has been used as a means of classification by some writers. Nearly all fresh-water Algæ are green, the *Nostochineæ* being slightly tinged with blue. The red or purple Algæ are almost all marine, and grow at or below low-water mark. The brown-colored Algæ are marine, and are found principally in what is known as the littoral region, or the tract between high and low tide marks. All Algæ, whether green, brown, or red, contain a certain amount of chlorophyl, although in the red and brown seaweeds the chlorophyl is obscured by the presence of one or more red and yellow coloring-matters, to which various names have been given by chemists, and of which the two most common forms are phycoxanthine and phycoerythrine. Some species of seaweeds are beautifully fluorescent. A familiar example is the common Irish moss, *Chondrus crispus*. Fluorescence is very marked in some Mediterranean species, as *Chylocladia Mediterranea*, and some species of *Cystoseira*.

As has been said, the Algæ are never parasitic, although frequently epiphytic. They fasten themselves by suckers or fibrils to stones, woodwork, or other Algæ, or form floating patches of variable extent. Some are furnished with bladders, which help them to float. Although they absorb their nourishment directly from the water about them, they are prone to decay when torn from their attachments. They all contain large quantities of water, and when dried they shrink very much, and are afterward easily affected by changes of moisture. Many of the seaweeds contain iodine in considerable quantities, and some species, as *Laminaria saccharina*, contain mannite, which covers the surface of the Algæ as it dries.

The species of Algæ are widely distributed, many fresh-water species, as well as some marine, being found all over the world. Species which inhabit brackish water seem to be particularly widely distributed. The marine species, if we except the diatomes, seem to be all limited to a rather narrow belt extending along the shore, while the ocean-bed is, as far as seaweeds are concerned, a desert. The Sargasso Sea, as it is called, consists simply of an immense floating mass of the Gulf-weed (*Sargassum bacciferum*), which covers an area of many miles—according to Humboldt six or seven times as large as the area of Germany—lying W. of the Azores. The greatest depth at which Algæ grow cannot be ascertained with exactness, but we have good reason to believe that few seaweeds occur below 70 or 80 fathoms, and even the enormously long species do not grow very deep, but expand over the surface. Strange to say, the deepest-growing species are generally of the brightest rose or purple color. The greatest number of species is found in the tropics, but the luxuriance of the marine vegetation is probably greater in those temperate regions where there is a great rise and fall of the tide. The forms of Europe and the E. coast of North America closely resemble one another. The species of Australia are very numerous and beautiful, and, as in the case of the flowering plants, offer many types not found elsewhere. The seaweeds have usually a definite season of growth and fruiting, and grow quite as well in winter as in summer. Some species, as *Ceramium rubrum*, seem to flourish at all seasons, but most are limited either to summer or winter, or at least fruit at a definite period of the year.

Of the Algæ growing in fresh water there is no species directly useful to man. Of the seaweeds there are several edible species, although, as far as taste is concerned, they all resemble one another. The Irish moss of commerce is the common *Chondrus crispus* of Europe and Eastern North America. In the East Indies, *Gracilaria lichenoides* is much eaten, and the Chinese are particularly fond of laver, *Porphyra vulgaris*. *Schizymenia edulis*, *Rodymenia palmata*, the common dulse, and *Alaria esculenta*, are also eaten. The larger seaweeds, rock-weeds, devil's aprons, etc., are used extensively for manure and also for the manufacture of iodine.

The classification of Algæ is of too complicated a nature to admit a full explanation in these pages. The father of modern phycology was C. A. Agardh, bishop of Carlstad, Sweden, whose *Species Algarum* appeared in 1821. Previous to his time it was the custom to call all the larger Algæ, Fuci, and all the smaller, thread-like species, Confervæ. The science was further extended by his son, J. G. Agardh, professor at Lund, who published his *Algæ Maris Mediterranei et Adriatici* in 1842, and more recently his *Species Algarum* in two parts—the most extensive systematic work on sea-weeds yet published. It, however, does not include fresh-water species or the green marine species. Since the publication of J. G. Agardh's *Species Algarum* our knowledge of the nature and development of Algæ has been much increased by the observations of Naegeli, Pringsheim, Derbes, Solier, but more especially by the researches of Thuret and Bornet. The results of their studies will be found scattered through various publications, but there is no good summary of the modern state of phycology. Among the older systematic writers on Algæ may be mentioned Lyngbye, whose classic *Tentamen Hydrophytologiæ Danicæ* appeared in 1819, and compared favorably with Agardh's work; and Dawson Turner, whose work in 4 vols., entitled *Historia Fucorum*, was superbly illustrated by Sir W. J. Hooper. More recently numerous illustrated works have been published by Greville, Kützing, Harvey, Zanardini, Rabenhorst, and others. (For an account of the marine species of the U. S. the reader is referred to the *Nereis Am. Bor.*, by Prof. W. H. Harvey, published in three parts by the Smithsonian Institution. An account of the fresh-water species will be found in a monograph by Prof. H. C. Wood, also published by the Smithsonian Institution. For illustrations of many of our common marine species the reader is referred to the *Phycologia Britannica* of Prof. W. H. Harvey.) Harvey divided all Algæ into three groups: (1) Melanospermæ, including all that were of an olive-brown color, as Gulf-weeds, rock-weeds, devil's aprons, etc.; (2) Rhodospermæ, including all red and purple Algæ; (3) Chlorospermæ, including all those of a green color, which comprise nearly all fresh-water species. (For a detailed explanation of Harvey's system the reader is referred to the introduction of the *Nereis Am. Bor.*, above referred to.) A partial summary of Thuret's system is given in the *Liste des Algues marines*

de Cherbourg, by A. le Jolis. More detailed accounts of the orders are given in the *Annales des Sciences naturelles*, 3me Série, tome iv.; 4me Série, tome iii.; 5me Série, tome iv. W. G. FARLOW.

Phylac'teries [Gr. φυλακτήριον, a "guard," a "charm"], properly, amulets worn to protect the person from evil influences. In the New Testament the name is given to the leathern cases containing on fine parchment certain passages of Scripture. They are fastened by leathern straps to the forehead and the arm, and also to doorposts and the like. This custom has been maintained from very ancient times to the present day by the Jews.

Phylæ [Gr. φυλή, a "tribe"] designated the tribes into which ancient Attica was divided. Their number was originally four, but after the expulsion of the Pisistratidæ it was raised to ten by Cleisthenes; two more were afterward added in honor of Antigonus and his son Demetrius. At the head of each tribe was a phylarch, who superintended the registering of the members of the *phyle*, organized the choirs for the festivals, presided over the communal assemblies, and commanded the contingent of cavalry. Afterward, however, the office was divided, the phylarch retaining only the military duties, while the civil duties were transferred to a new office, that of the epimeletes. To the Athenian senate each phyle sent 50 members. (See Kutorga, *Essai sur l'Organisation de la Tribu dans l'Antiquité* (1839), and Haase, *Die athenische Stammverfassung* (1857).)

Phylar'chus, a Greek historical writer, b. at Naucratis in Egypt, lived chiefly in Athens, and was a contemporary of Aratus. He wrote several historical works, of which the principal one was a history, not only of Greece, but also of Macedonia, Egypt, Cyrene, etc., from the expedition of Pyrrhus to Peloponnesus, in 272 B. C., to the death of Cleomenes in 220 B. C. Of this, as well as of his other works, there exist only a few fragments, but he has been severely blamed by Polybius for being partial to Cleomenes. (See Lucht, *Phylarchi Historiarum Fragmenta* (Leipsic, 1836).)

Phyllostom'idæ [*Phyllostoma*, φύλλον, "leaf," and στόμα, "mouth"], a family of bats, so named from the leaf-like appendages with which the nasal region is furnished. The ears are moderately large, and each has a distinct tragus; "nostrils in the front part of the cutaneous nasal appendages, or opening by simple apertures at the extremity of the muzzle;" the tail perforates the interfemoral membrane, and appears on the upper surface, or is produced considerably beyond the membrane when the latter is truncated; the intermaxillary bones are entire and contiguous; the true molars developed; upper incisors four; the middle digit of the wing has three phalanges; the stomach is sacciform, and its extremities curved toward each other. The family is limited to America, and as here limited has still numerous representatives, which are distributed by recent authors (Peters and Dobson) among three sub-families, which may be called Phyllostominæ, Glossophaginæ, and Stenoderminæ. These are distinguished from each other by the condition of the outer side of the molars, the tongue, the lower lip, and the muzzle. One species (*Macrotus Californicus*) extends into the south-western portions of the U. S. THEODORE GILL.

Phyllotaxy. See BOTANY, by PROF. A. GRAY, LL.D.

Phyllox'era [from φύλλον, a "leaf," and ξηρός, "parched"]. This name was first proposed in the year 1834 by a French entomologist, Fonscolombe, for a genus of plant-lice, the type being *Phylloxera quercus*, a species found in Europe on the under side of oak-leaves, to which its punctures give a parched or withered appearance. Though first characterized in Europe, North America seems to be the home of the genus; for while there are but two well-defined species so far known as indigenous to Europe, sixteen distinct species have already been described from the U. S. These are—

1. *P. vastatrix* Planchon. Forming galls on the leaves and swellings on the roots of *Vitis*. Introduced into Europe, and well known as the grape phylloxera.
2. *P. Rileyi* Lichtn. Living on the under side of the leaves and hibernating on the stems of *Quercus alba*, *obtusiloba*, and *bicolor*.
3. *P. Caryæ-foliæ* Fitch. Forming conical galls, which open at the summit, on the upper side of the leaves of *Carya alba*.
4. *P. Caryæ-caulis* (Fitch). Forming elongate, rather irregular, but generally ellipsoid, smooth, green swellings of large size on the petiole of the leaf of *Carya glabra* and *amara*; the gall subsequently cracking open and becoming black and contracted.
5. *P. Caryæ-venæ* (Fitch). Forming plaits in the veins of the leaves of *Carya alba*, which plaits project up from the surface in an abruptly elevated keel upon the upper surface of the leaf, and with a mouth opening on the under side, the lips of which are woolly.
6. *P. Caryæ-semen* (Walsh). Forming fuscous, minute, subglobular, seed-like galls on leaves of *Carya glabra*, the galls opening in a small nipple on the under side.
7. *P. Caryæ-globuli* Walsh. Forming hemispherical galls about 0.25 inch diameter on the upper surface of the leaves of *Carya glabra* and *alba*, the galls rather flat below, where they open in a slit.
8. *P. spinosa* (Shimer). Forming large, irregular galls, covered with spines, on the petiole of the leaf of *Carya amara*, the galls opening beneath in an irregular, sinuate slit.
9. *P. Caryæ-septa* (Shimer). Forming flattened galls with a septum, on the leaves of *Carya alba*, the galls opening both above and below.
10. *P. forcata* (Shimer). Forming galls much like those of No. 6, but larger.
11. *P. depressa* (Shimer). Forming depressed galls on leaves of *Caryæ alba*, the gall opening below with a constricted mouth fringed with filaments.
12. *P. conica* (Shimer). Forming galls similar to No. 11, but without the fringe. Probably the same.
13. *P. castaneæ* (Haldeman).
14. *P. Caryæ-gummosa* Riley. Forming pedunculated, ovoid, or globular galls on the under side of the leaves of *Carya alba;* the gall white, pubescent, and gummy or sticky, and opening below in a fibrous point.
15. *P. Caryæ-ren* Riley. Forming numerous, more or less confluent, mostly reniform galls on the petiole of leaf and stems of *Carya glabra;* the galls varying from 0.2 to 0.7 inch in diameter, pale green and densely pubescent, and opening in a slit the whole of their length, transversely with the axis of the petiole.
16. *P. Caryæ-fallax* Riley. Forming conical galls thickly crowded on the upper surface of the leaves of *Carya alba*. Strongly resembling No. 3 (*Caryæ-foliæ*), but the height one-third greater than the basal diameter, and opening below, instead of above, in a circular fuzzy mouth.

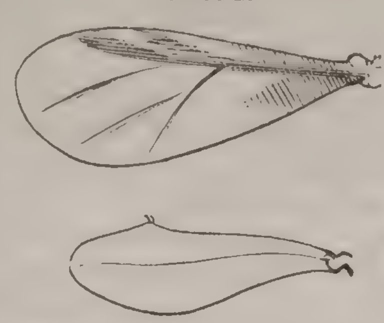
From the foregoing synopsis it is manifest that the habit of the genus is essentially gall-inhabiting. It is structurally distinguished from the other genera of the Aphididæ, principally by the three-jointed antennæ (the third joint much the longest), by the simple venation of the wings, and by these being carried flat on the back, and not roof-fashion, as in the more typical Aphides. The genus is interesting to the entomologist as occupying an osculant position between the plant-lice and the more degraded bark-lice (Coccidæ), though agreeing with the former in all the more important characters.

For a long time the term *Phylloxera* was known and of interest only to the naturalist; but during the past six or seven years the grape Phylloxera, or *Phylloxera vastatrix* Planchon, a species which injuriously affects the grapevine, has attracted so much attention, particularly in North America and parts of Europe, that it has come to be known as *the* Phylloxera. This insect, while it occasionally acquires the gall-making habit so characteristic of the genus, normally dwells underground upon the roots of its food-plant. Indigenous to that portion of North America lying E. of the Rocky Mountains, it is found from Canada to the Gulf wherever the grapevine grows, and has doubtless existed on our wild vines from time immemorial. Early in the history of grape-culture in the U. S. the gall-making type was observed on the leaves of certain varieties, and more especially on the Clinton; and in 1856 this type was briefly described by Dr. Asa Fitch, State entomologist of New York, by the name of *Pemphigus vitifoliæ*. The more normal root-inhabiting type was not suspected, however, till discovered by the writer in 1871. Meanwhile, about the year 1865 a peculiar grape-root disease began to attract attention in France, where the grape interest is of such vast importance that anything which affects it is sure to receive particular attention. Time passed, and the disease, which was at first confined to a few restricted localities, extended in augmenting ratio, and attracted more and more attention until the grape interest was so threatened that the minister of agriculture offered a premium of 60,000 francs for a remedy; and this sum two years ago was increased to 300,000 francs. The study and investigation which this premium and the importance of the subject induced soon brought to light the facts that the insect producing the disease is identical with that which is indigenous on American vines, and that it was imported into France from America, probably during our civil war, and on our vines sent to French nurserymen. First noticed in the lower valley of the Rhone upon the plateau of Pujault, in the department of Gard, it had in 1866 already spread to several localities in the department of Bouches-du-Rhône. In 1868 it extended along the whole of the left bank of that river, and in 1869 it invaded the departments of Var and Hérault. Since then it has continued to spread, and has now obtained a foothold in restricted localities in Spain, Portugal, Switzerland, Austria, and Prussia, widening its area not only by natural means, but by commerce in vines and cuttings, on which it is carried from infested to non-infested districts.

Natural History of the Insect.—The species, as already intimated, presents itself in two types—the one (*gallicola*) gall-inhabiting, the other (*radicicola*) root-inhabiting. The former is easily distinguished from the latter (see ac-

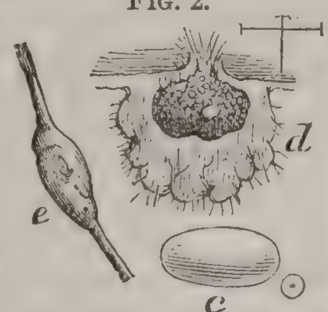
companying figures) by lacking the tubercles or warts on the back. On carefully opening one of the galls we find the mother-louse diligently at work surrounding herself with pale-yellow eggs, scarcely (.01) the one-hundredth part of an inch long, and not quite half as thick. She is about .04 inch long, of a dull orange color, and looks not unlike an immature seed of the common purslane. The eggs begin to hatch when six or eight days old into active little beings, which differ from their mother in their brighter yellow color and more perfect legs. Issuing from the mouth of the gall, these young lice scatter over the vine, most of them finding their way to the tender terminal leaves. Here they commence pumping up and appropriating the sap, forming galls and depositing eggs, as their immediate parent had done before. This process continues during the summer until the fifth or sixth generation. Every egg brings forth a fertile female, which soon becomes wonderfully prolific. By the end of September the galls are mostly deserted, and those which are left are usually infected with mildew, and eventually turn brown and decay. The young lice attach themselves to the roots, and thus hibernate. It is an important fact that the gall-inhabiting insect occurs only as an agamic and apterous female form. It is but a transient summer state, not at all essential to the perpetuation of the species, and does, compared to the other or root-inhabiting type, but trifling damage. It flourishes only on the *Riparia*, and more especially on the Clinton and Taylor. A few of its galls have been noticed on some other varieties, and abortive attempts are often made to found them on others. In some seasons it is even difficult to find a few galls on the very vines on which they were very abundant the year before.

FIG. 1.



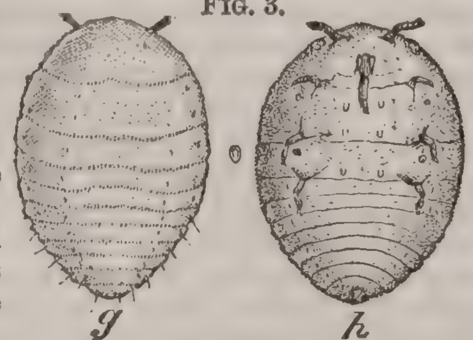
Upper and under wings of Phylloxera.

FIG. 2.



c, egg; *d*, section of gall, showing mother-louse and eggs; *e*, swelling of tendril; dot and lines showing natural size.

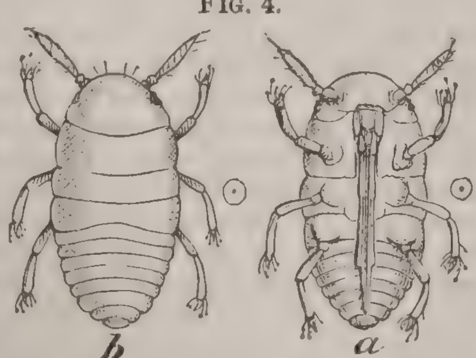
FIG. 3.



Mother gall-louse: *g*, dorsal; *h*, ventral view; natural size indicated between them.

The more normal or root-inhabiting type presents many more forms and many interesting biological traits. The newly-hatched lice are precisely like those which hatch in the galls, but, as they develop, rows of tubercles appear on the back where only minute short hairs were observed before (Fig. 5). During winter these young are found, somewhat dulled in color, adhering closely to the roots. As vegetation starts in spring they become active, rapidly enlarge, and soon commence laying unimpregnated eggs, for there are at that time no males. These bring forth females, which in their turn develop and lay unimpregnated eggs; and this virginal reproduction continues for five or six generations, the development increasing in rapidity with the heat, but the prolificacy or the number of eggs laid decreasing. In July some of the individuals show little wing-pads at the sides, and begin to issue from the ground and to acquire wings. These winged individuals become very numerous in August, and continue to appear in diminishing numbers thereafter till the leaves have all fallen. They are all females, and carry in the abdomen from three to eight eggs of two sizes, the larger ones about $\frac{2}{100}$ths of an inch long, and half as wide; the smaller, three-fourths as long. These eggs are also unimpregnated, and are laid by preference on the under side of the more tender leaves, attached by one end amid the natural down. They increase somewhat in size, and give birth in about ten days to the true sexual individuals, the larger producing females, the smaller males. Anomalous as it may seem, these individuals are born perfect, though without mouth and with no other than the reproductive function. A most remarkable fact, discovered by Balbiani, is, that some of the females that never acquire wings, but always remain on the roots, also produce the few different-sized eggs from which these true, mouthless males and females hatch. The sexes pair soon after hatching, and the female is delivered

FIG. 4.

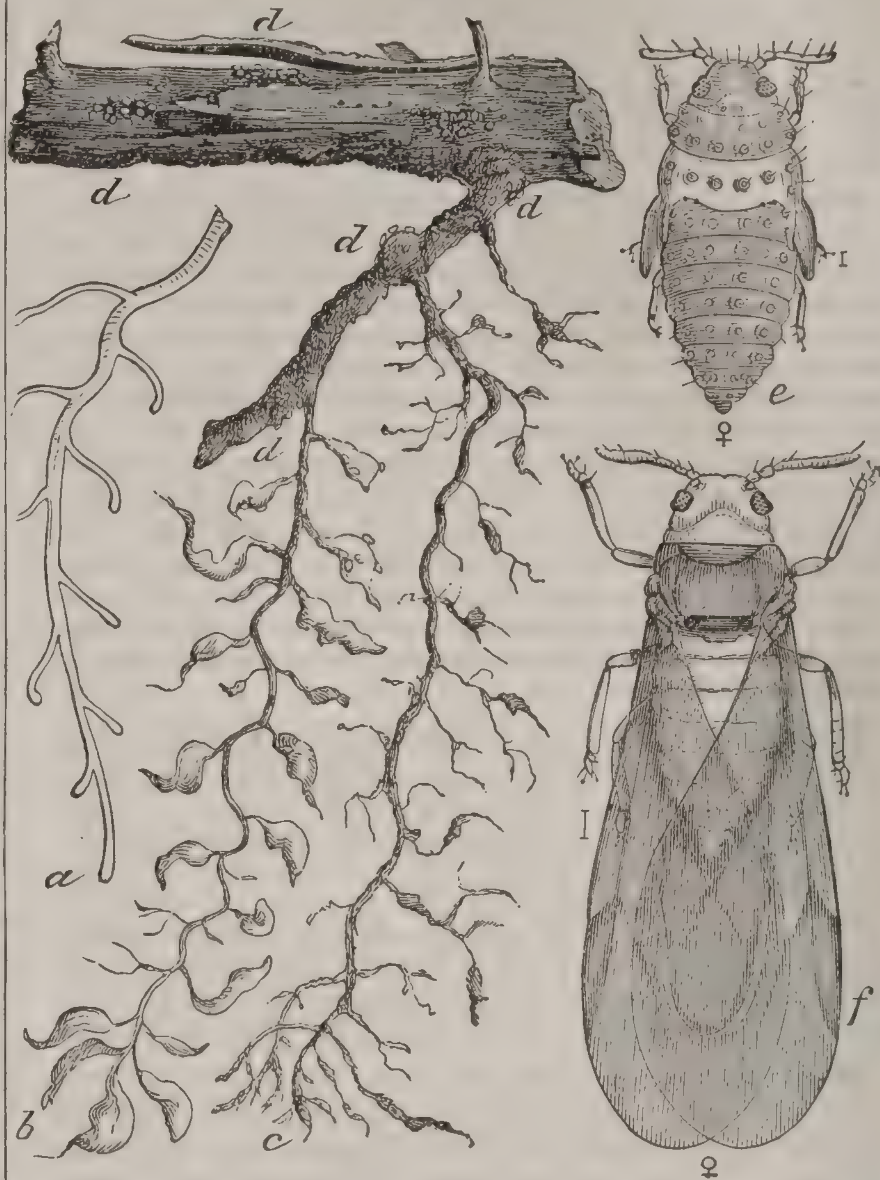


Newly-hatched larva: *a*, ventral; *b*, dorsal view; natural sizes in circles at sides.

FIG. 5.

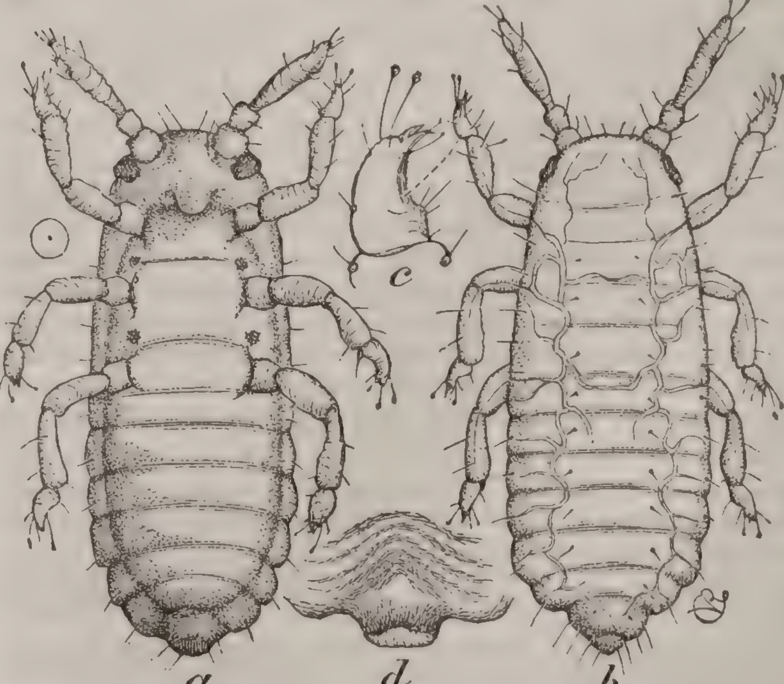
Wingless mother root-lice: *f*, dorsal; *g*, lateral view; natural size indicated at side.

FIG. 6.



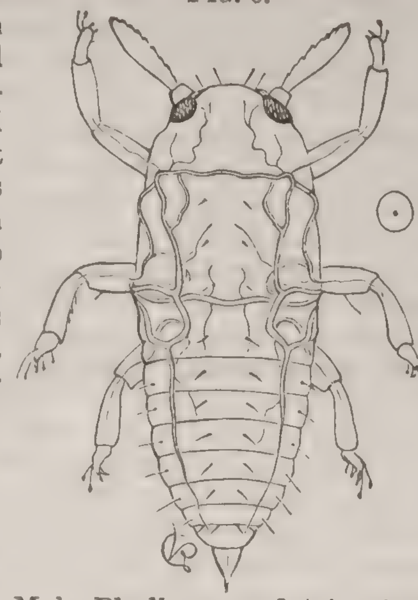
a, healthy root; *b*, root on which the lice are working, showing the knots and swellings caused by their punctures; *c*, root deserted by them, on which the rootlets have begun to decay; *d d d*, lice on the larger roots, natural size; *e*, female pupa, dorsal view; *f*, winged female, dorsal view, greatly enlarged.

FIG. 7.



True female Phylloxera: *a*, ventral view, showing obsolete mouth and solitary egg occupying nearly the entire body; *b*, dorsal view; *c*, tarsus; *d*, contracted anal joints after the egg is laid; dot in circle showing natural size.

FIG. 8.



Male Phylloxera: dot in circle showing natural size.

on the third or fourth day of a solitary egg, and then perishes. This impregnated egg is somewhat more ellipsoidal than the others, and soon becomes olivaceous. It is within a few millimètres as long as the egg was when first laid from which the true mouthless female originally came. This egg is never laid on the leaf, but always on the wood, either under the bark or in sheltered situations above ground, or on the roots underground. The young hatching from it is the normal agamous mother, which, with increased vigor and fertility, lays a large number of eggs, and recommences the virginal reproduction and the cycle of the species' curious life. The impregnated eggs laid early in the season doubtless hatch the same year, though some of the later-deposited ones may pass the winter before hatching.

To recapitulate, the insect presents itself in the following distinct forms, exclusive of slight variation to which some of these forms are subject:

1. The gall-inhabiting type (*gallicola*), forming galls on the leaves, and presenting—
   - *a*, The ordinary egg (Fig. 2, *c*), with which the gall is crowded;
     - *b*, The ordinary larva (Fig. 4);
       - *c*, The swollen parthenogenetic mother, without tubercles (Fig. 3).
2. The root-inhabiting type (*radicicola*), forming knots on the roots, and presenting—
   - *aa*, The ordinary egg, differing in nothing from *a*, except in its slightly larger average size;
     - *bb*, The ordinary larva, also differing in no respect from *b*;
       - *d*, The parthenogenetic, wingless mother, the analogue of *c*, but covered with tubercles (Fig. 5);
       - *e*, The more oval form, destined to become winged;
       - *f*, The pupa (Fig. 6, *e*);
       - *g*, The winged, parthenogenetic female (Fig. 6, *g*).
   - *h*, The sexual egg deposited by *g*, being of two sizes, and giving birth to the true males and females;
     - *i*, The male (Fig. 7);
     - *j*, The true female (Fig. 8);
   - *k*, The solitary impregnated egg deposited by *j*;
     - *bbb*, The larva hatched from *k*, which, so far as known, does not differ from the ordinary larva, except in its greater prolificacy;
     - *l*, The hibernating larva, which differs only from *b* in being rougher and darker.

Appearance of the Phylloxera Disease.—A vine attacked by Phylloxera has the more fibrous roots covered with little nodosities or swellings; and a careful examination of the swellings during the growing season will disclose numerous yellowish lice of different ages, and groups of brighter yellow eggs barely visible to the naked eye. The swellings in course of time rot, and the lice settle on to the larger roots. Vines that are more susceptible to the disease generally show external signs the second year of attack in a sickly, yellowish appearance of the foliage and in stunted growth; while the third year they frequently perish, when on examination the lice are no longer to be found—they have left or died—and all the finer roots have decayed and wasted away.

Spread of the Disease.—The wingless Phylloxera travels over the surface of the ground from vine to vine, or beneath the ground where roots interlock; while in the winged form it may fly or be carried as many as 15 or 20 miles, and, under exceptional conditions, even more. Through man's agency, by commerce in plants and cuttings, it may be carried to indefinite distances. Hence the importance of precautionary measures in grape-producing countries still free from the scourge, and the wisdom of laws—such as have been enacted by Australia, Algiers, Italy, Germany, and other countries—prohibiting the importation of vines from infested regions. The writer drew attention in 1872 to the danger which threatened the grape interest of California from the possible introduction of the pest. Active preventive measures then adopted by the State might have avoided a calamity which now threatens the grape-growers of the Pacific slope; for the insect has been introduced, and is now making headway and causing much alarm.

The Disease more virulent in Foreign Countries than where it is indigenous.—A certain harmony or mutual adaptation exists between the autochthonous fauna and flora of a country, the result of a long-past "struggle for existence," as Darwin has so forcibly put it. Plants and animals suffer most from diseases which they have not been accustomed to. American vines, though showing a varying power of resistance to the attacks of Phylloxera, are less susceptible than the European vine, which has been so long under cultivation and which is more highly developed and more tender. The disease spreads more rapidly also in countries where the grapevine is grown to the exclusion of almost every other plant; for the winged females can scarcely fail to settle where their offspring may live and thrive. In countries, on the contrary, where vineyards are few and far between, hosts of these winged mothers get wafted away and settle on to vegetation where their offspring must needs come to naught, as the species is incapable of living on anything but the grapevine.

Practical Considerations.—Of the many remedies that have been proposed, none are universally practicable or satisfactory. Such an underground enemy is measurably beyond man's reach. Submersion, where feasible, is a sufficient protection. Coal-tar and sulpho-carbonate of potassium have given some satisfaction, but the limits of this article will not permit a proper consideration of the multifarious remedies that have been proposed. The literature of the subject is very extensive, and the American reader desiring further information may consult the *Missouri Entomological Reports* from 1870, on. Having discovered that our cultivated American vines possessed a varying degree of resistance to the disease, the writer recommended the least susceptible to be used in the French vineyards as stocks on which to graft their own vines. In consequence, there has been an increasing demand for cuttings of such American vines, until the present year the demand has exceeded the supply. The varieties most employed are Clinton, Taylor, Concord, and those more particularly belonging to the species *æstivalis*, as Cunningham, Norton's Virginia, Herbemont, Cynthiana, etc. All other remedies are being abandoned in France, and by means of the American vines there is hope of restoring the blighted vineyards. America unwittingly gave the disease to that country: she also gives the remedy. The French have already learned to appreciate our vines, that had before been ignored or despised by them; and the experience, science, and system of Europe which will be brought to bear on the improvement of these American vines and the manufacture of their wine are already redounding to the good of American grape-culture, and must inevitably enure to its great advantage and stimulate its development. C. V. RILEY.

Physalis [Gr. φυσαλίς, a "bladder"], a genus of annual or perennial herb of the family Solanaceæ or nightshades, embracing above fifty species, several of which are found in the U. S. The *P. Peruviana*, otherwise known as strawberry tomato, ground cherry, winter cherry, yellow alkekengi or Cape gooseberry, is cultivated in gardens in England, France, and the U. S., and bears an edible fruit enclosed in a balloon-shaped netted angular calyx. The *P. alkekengi*, probably a native of Spain or N. Africa, bears a brilliant scarlet berry, and is an ornamental garden-plant. An American species, *P. Philadelphica*, or purple alkekengi, has a dark-purple berry an inch in diameter, which is sometimes preserved.

Physeter'idæ [Gr. φυσητήρ, a "blowpipe or bellows"], a family of toothed whales (*Cete, Denticete*), including the gigantic sperm whales and small porpoise-like forms agreeing in anatomical characters. They vary in form as well as in size, the head being in the sperm whales disproportionately large and blunt in front, and with a subterminal blowhole, and in the small species small and conical, and with a more posterior blowhole; the snout, however, always projects forward, and the mouth is consequently inferior; the cervical vertebræ are all ankylosed together in the sperm whales, and differentiated into an atlas and posterior coalesced six vertebræ in the smaller species; the hinder ribs lose their tubercles, and are only connected by their heads with the transverse processes of the vertebræ; the costal cartilages which connect the ribs with the sternum retain more or less of their original cartilaginous condition; the skull has the bones upraised toward the periphery, so as to form a more or less retrorsely convex margin; the nares, the supraoccipital, and parietals together extend forward on the sides, and present a convex border projecting forward high above the temporal fossæ and forward beyond the vertex; the frontal bones have an extended surface deflected downward and produced upward, exposing to view a triangular or retrorsely falciform wedge between the maxillaries and supraoccipital; the nasal bones are very disproportionately developed relatively to each other, the left being very much reduced, and the right greatly enlarged and twisted to the left side; the jugal is well developed and projects downward or backward; the orbit is small or of moderate size; the pterygoid bones are thick, produced forward, and enter largely into the bony roof of the mouth over and behind the palatine bones, not contig-

uous at the middle; they have low ridges on the oral surface, which diverge more or less outward and backward, and the sides are involuted so as to form the outer wall of the postpalatine air-sinus; the lower jaw has its rami connected by a more or less elongated symphysis; teeth are functionally developed only or chiefly in the lower jaw. By these characters the forms of the family, which differ so much in external appearance, are combined together and distinguishable from all others. The family naturally falls into two sub-families: (1) Physeterinæ, including the gigantic species; and (2) Koginæ, including the pigmy forms. The former are at once recognizable by their enormous truncated head, while the latter have a superficial resemblance to the porpoises, and are distinguishable by the projecting snout. Of the sperm whales only one species is certainly known, the *Physeter macrocephalus*, which extends into almost all seas; of the Koginæ, five species have been based upon forms found in the Australian seas, on the coast of the Madras presidency, and that of California. (See also SPERM WHALE.) THEODORE GILL.

Physical Education. See FENCING and GYMNASTICS.

Physical Geography, or **the Geography of Nature.** See GEOGRAPHY, by PROF. A. GUYOT, LL.D.

Physi'cian [Fr. *physicien*], one whose vocation is the alleviation and cure of disease by therapeutic agencies. In its broad acceptation it includes the surgeon who conducts any surgical operation or treatment essential to life or comfort—the healing of wounds, correction of deformities, removal of tumors and unnatural growths, the amputation of injured or diseased members. Although surgery has as its chief requirements accurate anatomical knowledge and precision and nerve in operations, surgical diseases and conditions are often secondary or associated with constitutional disease, and the surgeon must also possess knowledge and judgment in the broad field of medicine. The medical knowledge of the physician has had many transitions—beginning with ignorance, traditions, superstitions, religious rites; later acquiring a value by the accumulation of facts established by experience; and in modern times replacing mere empiricism by rational and scientific practice, founded upon correct anatomy, physiology, and pathology, and the careful study of causes and symptoms of disease, and their early diagnosis. The physicians of remote antiquity were deemed superhuman. In Egypt the first physicians were deities—Isis and Horus her son, Taaut (the Hermes of the Greeks), and Serapis, to whom temples were dedicated by Egyptians and Greeks. Later, the Alexandrian school of priest-physicians had many learned and skilful men, especially Herophilus the anatomist. In Greece, Æsculapius was deified, and in temples dedicated to him the healing art was long exercised by an exclusive order of physicians, the Asclepiadæ, who were sworn by Apollo, Æsculapius, Hygieia, Panacea, and all the gods not to profane the mysteries of medicine, and to divulge them only to the children of their masters or those bound to them by oath. This order was replaced by the Pythagorean physicians, who were philosophers, and freely divulged and explained their views of health and disease. Hippocrates (460–370 B. C.) studied and described disease, and treated it with great success. Rome first had only Greek physicians—at first the keepers of baths and sanitariums, later a few philosophers but little in favor. The Roman legions were attended by surgeons. Asclepiades, Celsus, and Galen were eminent—the first for dietetic treatment, the second as scholar and surgeon, the third as physician and writer on medicine. The knowledge of the ancients was preserved chiefly by the Arabian and Saracen physicians of Spain; they were careful observers and original discoverers of many valuable curative methods and means. The Italian school of physicians of the twelfth and fifteenth centuries inaugurated the study of minute and internal anatomy and physiology. But medicine was pursued chiefly by the priesthood. So in France and Germany, physicians were chiefly of religious orders. Surgery was practised by barbers. The great Ambrose Paré was a barber-surgeon, but the order was steadily elevated, and incorporated with the faculty of medicine in 1795. In England the barber-surgeons were abolished, but a distinction exists to this day between general practising physicians, who assume the title of M. D., and surgeons, who are designated by the affix F. R. C. S. (Fellow of the Royal College of Surgeons). On the continent of Europe and in this country medicine and surgery are requisites in medical study, and but one title (doctor in medicine) is conferred. The study of medicine abroad occupies five years. In this country the prescribed course is at present three years, but efforts are making to extend it. The departments of study required are anatomy, physiology, chemistry, materia medica, practice of medicine, surgery, and midwifery. But in the larger medical schools many special branches have been added—hygiene, microscopy, pathology, medical jurisprudence, and the specialties of diseases of the eye, ear, larynx, and skin.

E. DARWIN HUDSON, JR. REVISED BY WILLARD PARKER.

Phys'ick (PHILIP SYNG), M. D., b. at Philadelphia July 7, 1768; graduated at the University of Pennsylvania 1785; studied medicine in Philadelphia, London, and Edinburgh, where he took his medical degree in 1792, having been previously the pupil and intimate friend of John Hunter; became one of the ablest surgeons and physicians of Philadelphia, in whose hospitals and public charities he was for many years a prominent official; became in 1805 professor of surgery in the University of Pennsylvania, and was (1819–31) professor of anatomy there; was an exceedingly popular instructor; was chosen in 1825 a member of the French Institute, and in 1836 honorary member of the Royal Medical and Chirurgical Society of London. D. at Philadelphia Dec. 15, 1837.

Physics. See DYNAMICS and MECHANICS, by PROF. W. P. TROWBRIDGE, A. M., M. N. A. S.

Physics of the Earth [Fr. *physique du globe*], or **Terrestrial Physics,** a term often employed to designate the study of the globe as a unit, irrespective of its surface, comprising its general form as given by geodesy, its density, its magnetism, its specific temperature, etc., forming a special portion of physical geography. (See GEOGRAPHY, by PROF. A. GUYOT, LL.D.)

Physiog'nomy [Gr. φύσις, "nature," and γιγνώσκειν, to "know" or "discern"], the art of interpreting the character of man—the temperament, quality, and strength of intellect, and the relative development of the several mental faculties—by facial conformation and expression. It was first presented as a systematic study by Lavater in 1775. It was included in the systematic phrenology of Gall and Spurzheim. While much has been, and is still, claimed for physiognomy inconsistent with the facts of natural history of man and the laws of physiology, the face may be regarded as an index, by facial expressions developed both voluntarily and involuntarily, of the prominent characteristics of intellect, emotion, and will. The physiognomy of infants, while the intellect is latent, expresses only happiness and pain or sorrow. With the training of the tongue and lips in phonation, and the development of the language of expression by the control of the muscles of the eye, the nostrils, and mouth, combinations of facial lines and individuality of features become established. Such facial signs are most marked in the races of sanguineous temperament and in persons of spare habit. The inert brain of the idiot is indicated by a facial blankness. But the man of finest intellect may by facial paralysis wear a mask which conceals all trace of his character. Reversely, by electrical excitation of muscles and groups of muscles of the face, the various expressions of mirth, sorrow, impotency, power, etc. may be produced irrespective of the mental condition—expressions which the subject's character had never developed. The size and prominence of the eye, state of the pupil, the action of the nostrils, the contraction and attenuation of the lips in moments of mental concentration, are the results of involuntary and unconscious control by mental and emotional states, and develop permanent facial exponents of the æsthetic and moral nature. Marked lineaments and activity of facial expression are indicative of force of will and intellect, rather than of quality, and often by persistent exercise are a false guide to cover an inconsistent and false character. The various involuntary facial conditions —the dilating pupil, the expression of the eye, its suffusion and lachrymation, the blush and pallor—are controlled by the sympathetic nervous system. Facial expressions, dependent upon habitual use or the education of certain muscles, are derived chiefly from the motor oculi and facial nerves and the independent or combined action of the analogous muscles of the two sides of the face. The patheticus nerve supplies a marked expression of the eye—sympathy and grief.

E. DARWIN HUDSON, JR. REVISED BY WILLARD PARKER.

Physiog'raphy [Gr. φύσις, "nature," and γράφειν, to "write"], a newly-adopted term for a description of the natural features of a country, and more especially of the climate and groups of plants and animals which characterize it, or its organic geography. (See GEOGRAPHY, by PROF. A. GUYOT, LL.D.)

Physiol'ogy [Gr. φύσις, "nature," and λόγος, "discourse"], that department of natural science which treats of the laws, processes, and phenomena of organized life. The prominent features of the physiology of human physical being are vital force and nutrition. Vitality is the first condition of animal existence—the condition determining growth and maintenance; nutrition supplies the mate-

rial of the germinal and incipient stages of organism, the mature growth of the body, and constant renewal and regeneration which counterbalance the waste of cell and tissue metamorphosis.

The blood is the circulating nutritive fluid of the body—one-eighth of the entire weight, or about eighteen pounds. It is alkaline, and has a sp. gr. of 1.052. It consists of the plasma, or water with albumen, fibrine, and salts in solution, and the solid elements, the red and white blood-cells. The blood-cells constitute about one-half of its volume. They are formed, according to some authorities, by genesis from the nutritive elements of the fluid blood. Others claim the origin of white corpuscles in the spleen or from the lymph, and their transition to the red. The white are the larger, but relatively few—one to several hundred of the red. The white have active amœboid movements, and probably migrate from the vessels under certain circumstances to form new cells and tissues or for processes of repair. Red corpuscles have but one known function—the carrying of oxygen from the lungs to the tissues, and possibly the return of carbonic acid gas. Spectroscopic analysis of red globules reveals oxygen, salts of potash, and iron. The heart is the centre of the circulation, propelling the blood into the arteries with a force of 51½ pounds—a force steadily decreasing as the arteries subdivide and approach the capillaries. Capillary circulation is effected partially by a remaining element of cardiac force, chiefly by vital relations of the blood to their capillary channels and the chemico-vital processes they subserve. The veins return the blood to the heart. The veins are more numerous than the arteries—have double their capacity; hence, the venous blood circulates with but half the rapidity of the arterial. Venous return is aided by the compression of the integuments, exercise, and the presence of valves in the veins. In 1553, Servetus discovered the circulation of the blood through the lungs. In 1603, Fabricius demonstrated the valves of the veins; he was Harvey's preceptor at Padua. In 1616, Harvey demonstrated the general circulation of the blood, publishing his researches in 1628. In 1661, Malpighi discovered cells in the blood; in 1673, Leeuwenhoeck determined these anatomical elements more definitely; in 1770–75, William Hewson discovered the white blood-cells. Respiration is a double act of inspiration and expiration, expansion and contraction of the lung. Freshly-inhaled air parts with oxygen in the vesicles of the lung, which is taken up by the red corpuscles of their vascular walls, and expired air is loaded with carbonic acid gas, received from venous blood. Respiration is an involuntary act; formerly regarded as reflex from the presence of impure air in the lung, now established as emanating from the cognizance which the medulla oblongata takes of the nutritive demand of all parts of the body for a constant supply of oxygenated red blood. Certain lower animals have no lungs, but receive the oxygen by direct surface absorption. The materials of the blood are supplied by food after preparation by the processes of digestion. Appetite and hunger are also sensations of centric origin, indicative of the nutritive demands of the tissues. Food must be varied in character, and include both nitrogenous substances and hydrocarbons, as well as water and a proportion of salts. The preliminary steps of digestion are mastication, insalivation, and deglutition. Albuminoid substances are digested by the gastric juice; starchy, saccharine, and fatty substances by the secretions of the small intestine, pancreas, and liver. Emulsioned food is absorbed from the stomach and bowels by the lacteals, and emptied by the thoracic duct directly into the blood. The lacteals are a part of the general lymphatic or absorbent vessels distributed throughout the body, discovered by Eustachius and Asellius in the sixteenth century. Secretion is the action of special glands in the body, which elaborate elements of the blood for special purposes, as the serum bathing the pleura and peritoneum, the synovial fluid lubricating joints, mucus to moisten the air-tubes and intestines, saliva, gastric and intestinal juices to digest food. Excretion is glandular separation from the blood of effete products—the urine, fæces, perspiration, and bile. Fæcal matter is partially débris of digested food. Bile is to be regarded secretory so far as it aids digestion. Certain ductless glands—the spleen, suprarenal capsules, thymus, thyroid, pituitary, and pineal glands—have no known function. Nutritive waste and supply and glandular activity evolve heat, and determine the normal temperature of the body—in the healthy adult, 98.5° F., with little variation.

The nervous system was divided by Bichat into the cerebro-spinal and the sympathetic. The first comprises the brain, spinal cord, motor and sensory nerves, and nerves of special sense. The second controls the functions of the large internal organs, the capillaries, and the equilibrium of the circulation. The brain and cord have gray and white substances; the gray is ganglionic, composed of cells which originate force or receive impressions; the white is tubular, nerve-tracts which transmit motor stimulus from the brain to the muscles or sensory impressions from the body to the brain. The rapidity of nerve-action is 111 feet per second. Motor nerve-fibres terminate in neural plates upon the surface of the muscular fibre. Sensation is received by the Pacinian tactile bodies of the hands and feet, the sensitive papillæ of the skin, taste-buds of the tongue, etc. The brain comprises the cerebrum—the seat of the mind—the cerebellum, pons varolii, and medulla—controlling vital functions. The spinal cord is a column of nerves connecting the brain with their distributions throughout the body. It possesses certain ganglionic cells, and is the seat of independent reflex action; it also has a partial control of co-ordinated action of groups of muscles in the extremities. The "cranial nerves" proceed from the brain to their destination without entering the cord. They are partly nerves of special sense—sight, hearing, smell, and taste; the "facial" nerve gives expression to the face; the pneumogastric nerve controls the rhythmic action of the heart and lungs and influences the digestive process.

Speech is produced by movements of the larynx, tongue, teeth, and lips, methodically trained to create sounds, which, by custom, are representative of ideas; it is an artificial method, the invention of man, and slowly developed and perfected. Sight is the impression received by the brain of light and the images of objects, transmitted through the optical media of the eye to the sensitive retina and optic nerve. Hearing is a transmission of sound-waves to the tympanum, and, by the system of ossicles and resonating canals and cavities, to the filaments of the auditory nerve. Generation, or reproduction of definite species and of individual characteristics, is the result of predetermined law. Conception begins with the fecundation of germinal elements, which develop vitality, motion, and nutritive growth; by successive steps—cellular multiplication, nutritive membrane, nerve-canals, primitive blood-vessels, heart, lungs, glands, lateral walls of the body, enclosing cavities, budding of the extremities, and facial conformation—the embryo progresses to the perfect human being.

E. Darwin Hudson, Jr. Revised by Willard Parker.

Physiology, Vegetable. See Vegetable Physiology.

Physoclis′ti, a name formed by Müller, and used for various groups of teleostean fishes, all of which agree in the absence of a duct between the air-bladder and intestinal canal, and consequently the closing of the air-bladder, whence the name. (1) As applied by Müller it embraced nearly the same forms as were united by Cuvier in his order of Acanthopterygians and Jugular Malacopterygians, but excluding the Pharyngognathi; (2) by Lütken (in 1871) it was also used as an ordinal name for the fishes included therein by Müller, and also the Pharyngognathi, the Lophobranchiates, and Plectognaths; (3) by Cope (also in 1871) it was employed as the name of a "tribe" of his "sub-class Actinopteri," with the same limits as by Lütken for his order. It is scarcely a natural combination, although the forms to some extent make a natural series and include the most specialized of fishes.

Theodore Gill.

Physos′tomi [φῦσα, "wind"—*i. e.* "air-bladder"—and στόμα, "mouth"], a term, also devised by Müller, for those teleostean fishes which are provided with a duct connecting the air-bladder with the intestine as by a mouth, in allusion to which the name has been given. (1) Müller used the name as an ordinal one for the abdominal and apodal Malacopterygians of Cuvier, exclusive of the Ganoids and the Scomberesocidæ; (2) Lütken also used it as an ordinal name, but included in the group so designated by him not only the forms recognized by Müller, but also all the Ganoids and Dipnoans (*Lepidosiren*, etc.); (3) Cope has employed the name for a "tribe" of his "sub-class Actinopteri" and included therein the Ganoids with completely bony skeletons in addition to the Physostomi of Müller. The character upon which these groups are based is, however, simply indicative of generalized organization, and the forms combined therein are very dissimilar in other respects. The most correct combination is apparently that of Müller. Theodore Gill.

Phytelephas. See Vegetable Ivory.

Phyth′ian (Robert L.), U. S. N., b. Feb. 6, 1837, in Pennsylvania; graduated at the Naval Academy in 1856; became a lieutenant in 1861, a lieutenant-commander in 1862, a commander in 1870; served in the Lehigh in several actions with Forts Sumter and Moultrie, and in the Ironsides at the capture of Fort Fisher. Commended for "ability and gallantry." Foxhall A. Parker.

Phyto-Chem′istry [Gr. φυτόν, "plant"], the chemistry of plants. It treats of the proximate principles of plants, the nutrition of plants, and the formation and metamorphoses of their constituents. (See AGRICULTURAL CHEMISTRY.)

Phytography, or **Descriptive Botany.** See BOTANY, by A. GRAY, LL.D.

Phytozo′on, pl. **Phytozo′a** [Gr. φυτόν, "plant," and ζῷον, "animal"], a term sometimes applied to zoöphytes, also to certain parasitic animals inhabiting plants. But at present it designates the antherozoids, small and often ciliated cells, which are set free by the bursting of the antheridia of some cryptogamous plants. After moving about spontaneously for a time, some of them appear to blend with the archegonia (or pistillidia), the contained spores of which they are believed to fertilize. These cells sometimes curiously resemble the spermatozoa of animals.

Piacen′za [anc. *Placentia*], chief town of the Italian province of the same name, situated (lat. 45° 3′ N., lon. 9° 40′ E.) on the right bank of the Po, a little below the mouth of the Trebbia. The position is of the greatest military importance. Piacenza is surrounded by ramparts, trenches, and other works common to modern fortifications, and forms a part of the line of defence extending from Ancona to Alessandria. The streets are broad, the Stradone Farnese being the finest, and the principal square, the Piazza de' Cavalli, in which are two famous equestrian statues in bronze, has a busy aspect. The city in general, however, has a decayed and sombre look, owing partly to the mediæval character of so many of the public and private buildings. The cathedral, begun in 1122 on the foundations of a much earlier church, is Lombardo-Gothic in style, and is especially remarkable in its interior. The numerous frescoes are mostly by Guercino and L. Caracci, and are of very great merit. Among other noticeable churches are—Sant' Antonio, once the cathedral, built in 324 (on the spot, it is said, where St. Barnabas first preached to the people), but much altered by restorations. The Palazzo Farnese, called La Cittadella, was a splendid structure, but is now a barrack. The Palazzo del Comune (1221) is a fine but now ruined monument of the prosperous republican days of Piacenza. The private palaces contain some rare pictures. This town, of Gallic origin, served the Romans as a strong point of defence against Hannibal, and the construction of the great military road of M. Æmilius Lepidus and various large canals raised it to great prosperity. Under the Goths it was allowed to govern itself; under the Lombards and Franks it had a feudal lord, and was occupied by the French in 1796. On the fall of the First Napoleon, Piacenza was given to Maria Louisa, after whose death Austria held it (1848 excepted) till 1859, when it was united to Piedmont, and consequently now forms a part of the kingdom of Italy. The little trade of Piacenza is chiefly in the products of the rich neighboring country—grain, wine, cheese, etc.; the manufactures are silks, linens, etc. P. in 1874, 35,000.

Piacenza, DUKE OF. See LEBRUN (C. F.).

Pi′a Ma′ter [Lat., "tender mother"], the innermost of the meninges or membranes covering the brain and spinal cord. It is so named because it serves in nourishing the nerve-centres. It is a fine plexus of blood-vessels covering the brain, dipping down into its convolutions, forming the velum interpositum in the third and the choroid plexus in the fourth ventricle. A small part, over the crura and pons, is not very vascular, but tough and fibrous. It is abundantly supplied with nerves and lymphatics. The pia mater of the spinal cord is less vascular than that of the brain, with which it is continuous. It is partly composed of longitudinal fibrous bundles. It is intimately connected with the cord, of which it is the neurilemma. The tunica vasculosa of the testes is also called pia mater.

Pianel′la [*Castrum Planellæ*], town of Southern Italy, province of Teramo. It contains an old church with some interesting monuments, and was a fortress under the Lower empire. P. in 1874, 6353.

Piankatank, tp., Matthews co., Va. P. 2024.

Pia′no de′i Gre′ci, town of Sicily, province of Palermo, on the skirts of Monte Pizzuto, about 12 miles from Palermo. The church dedicated to the Greek rite contains some very fine frescoes. The Latin church has some good statues. This town was colonized by Greco-Albanians, driven from their country by the Mohammedans, and the inhabitants still preserve their primitive language and customs. P. in 1874, 7714.

Pia′no di Sorren′to, town of Southern Italy, province of Naples, 8 miles S. W. of Castellamare di Stabia. It has a small harbor, and coasting-trade. P. in 1874, 8265.

Pia′nofor′te [It. *piano*, "soft," and *forte*, "loud"], a musical instrument played by a double row of keys upon a finger-board, each key being a species of hammer connected with an elastic steel string. The principle of the key-board was applied to a musical instrument, the clavichord, as early as the fourth century, and other instruments of the same class, as the cithara, the harpsichord, and the spinet, were popular down to the eighteenth century. The invention of the pianoforte has been claimed for Germany, Italy, France, and England. The best evidence seems to assign it to Bartolommeo Cristofali, a harpsichord-maker at Padua, Italy, about the year 1710. Marius claimed a similar invention in Paris in 1716, and Christoph Gottlieb Schroter in Germany in 1717. It was not until 1760 that the instrument was manufactured in England by German mechanics. The firm of Broadwood & Stodart soon took a leading position as English manufacturers, and improvements were rapidly made, the instrument attaining a speedy popularity. The grand piano seems to have been first made in 1781, the upright in 1795. Few pianos had been brought to the U. S. when, in 1822, Jonas Chickering began their manufacture at Boston, being thus the pioneer of an important industry in which American genius has achieved signal triumphs.

Piano′ra, town of Southern Italy, province of Bologna, on the Savena, about 12 miles S. of the city of Bologna. This town is of uncertain but very ancient origin. P. in 1874, 5534.

Pi′arists [Lat. *pius*, "pious"], called also the **Pauline Congregation,** and popularly known as **Scolopins,** a congregation of regular clerks of the Roman Catholic Church, founded in 1599 by St. Joseph Calasanctius (1556–1648) for the purpose of spreading education. They were confirmed by Paul V. (1617) and by Gregory XV. (1621), when they received the official title of "Regular Clerks of the Pious Schools." The congregation was suppressed by Innocent X., and again confirmed by Clement IX. Their work is supplementary to that of the Jesuits. They are chiefly found in Europe.

Pias′sava Fibre, a coarse substance used for making brushes and brooms for street-sweeping. It is brought from Brazil, and is produced chiefly from the palm trees called *Leopoldinia Piassaba* and *Attalea funifera.*

Pias′tre [akin to the words "plaster," "flat," and "plate," applicable as well to any coin], the Spanish and Spanish American dollar, *peso*, or "piece of eight," once so called because it contained eight reals. In the Levant there are piastres whose value is about five cents.

Pi′att, county of Central Illinois. Area, 475 sq. m. Level, fertile, and contains coal; is traversed by the N. fork of Sangamon River and by several railroads. Live-stock, grain, and wool are leading products. Cap. Monticello. P. 10,953.

Piatt, tp., Lycoming co., Pa. P. 493.

Piatt (DONN), b. in Cincinnati, O., in 1829; graduated at St. Xavier College; studied law, and was made judge of the court of common pleas for Hamilton co., O.; was appointed secretary of legation at Paris by Pres. Pierce, and for nine months, during the illness of Minister Mason, acted as chargé d'affaires. When the civil war broke out he enlisted as a private; was elected captain; served through the war as assistant adjutant-general on the staff of Gen. Robert Schenck, and came out with the title of colonel. After the war he served one term in the Ohio legislature; acted as Washington correspondent of the Cincinnati *Commercial;* was engaged in starting the New York *Sun*, and subsequently founded the Washington *Capital*, which he now controls. J. B. BISHOP.

Piatt (JOHN JAMES), b. at Milton, Ind., Mar. 1, 1835; was educated at the Columbus (O.) High School and Kenyon College; joint author, with W. D. Howells, of *Poems by Two Friends* (1860); with his wife, wrote *Nests at Washington* (1863); sole author of *Poems in Sunshine and Firelight* (1866), *Western Windows* (1868), *Landmarks*, etc. (1871), and many fugitive pieces of marked originality and much poetic merit.—His wife, SARAH MORGAN BRYAN PIATT, b. at Lexington, Ky., 1835, is also distinguished as a writer of verse.

Piauhi′, province of Brazil, bordering N. on the Atlantic, and bounded W. by the Parnahiba, comprises an area of 94,500 sq. m., with a population estimated at 232,000. The surface is an elevated plain or series of plateaus sloping down toward the Atlantic and the Parnahiba, and affording good pastures. Useful minerals are found, but mines are not worked. There is very little agriculture, though in many places the soil is well adapted to cotton-cultivation. Rearing of cattle is the only occupation of the inhabitants.

Piaz′za Armeri′na, town of Sicily, province of Caltanissetta, situated on a high hill surrounded by an undu-

lating country of the greatest fertility. Its churches are numerous, containing some valuable pictures, and the episcopal palace is worthy of notice. There are also several not insignificant libraries, and considerable efforts are now making in the way of schools and of education generally. Piazza Armerina is a very ancient town, settled, tradition says, by a colony of Greeks from Platææ. Under the Normans it rose to importance, but suffered greatly under the Angiovine dynasty. Its prosperity depends entirely on the abundance of grain, wine, oil, chestnuts, walnuts, produced in the vicinity. P. in 1874, 20,310.

Piaz′zi (GIUSEPPE), b. at Ponte, on the Valtelline, in 1746. His master was the mathematician Father Giambattista Beccaria, and he himself joined the order of the Theatines. After being professor of philosophy in several of the large Italian universities, he was appointed in 1780 professor of mathematics at Palermo, where he promoted the establishment of an observatory, and finally went to France and England to obtain instruments for it. This observatory was opened in 1791, and there Piazzi compiled his famous *Catalogue of the Stars.* On Jan. 1, 1801, he discovered the planet or asteroid Ceres, which opened the way for the discovery of so many others. Piazzi revised the plan of the new observatory at Naples, of which he was afterward for some time the director. On occasion of the erection of a monument to Piazzi at Ponte, B. E. Maineri published his biography. D. in 1826.

Piaz′zola sul Bren′ta, town of Italy, province of Padua, situated on the Brenta, about 12 miles N. of Padua. It contains some fine buildings, among which may be specially noticed the parochial palace, the Palazzo Contarini, now Camerini. P. in 1874, 5102.

Pi′broch [from the Gaelic for "pipe-music"], the war-notes of the Highland bagpipe. There are numerous compositions of this kind, scarcely distinguishable from each other by the untrained ear. The use of this pipe in Scottish warfare has been traced back no farther than 1594.

Pic′amar [Lat. *pix*, "pitch," and *amarus*, "bitter"], an oily body found in wood-tar.

Picard′ (JEAN), a French astronomer, b. at La Flèche, department of Sarthe, France, July 21, 1620; accomplished the first exact measurement of a degree of the meridian, between Amiens and Malvoisin; made a number of valuable improvements in the instruments of observation and methods of calculation; was the real founder and constructor of the Observatory of Paris; is noted for the noble disinterestedness with which he aided other astronomers, such as Ole Römer the Dane, Cassini the Italian, etc., and wrote among other works *La Mesure de la Terre* (1671) and *Voyage d'Uranibourg, ou Observations astronomiques faites en Danemark* (1680). D. at Paris Oct. 12, 1682.

Picard (LOUIS BENOIT), b. at Paris July 29, 1769; studied law and medicine; in 1789 wrote for the stage *Le Badinage dangereux;* became an actor in 1797; was director of the grand opera from 1807 to 1816, afterward of various other Parisian theatres, and published at the same time a number of romances. D. at Paris Dec. 31, 1828. His novels made no great impression, but his light comedies, *Médiocre et Rampant* (1797), *Les Marionettes* (1806), etc., and comic operas, *Les Visitandines* (1792), etc., reigned for a long period in France, Germany, and Scandinavia, and are distinguished by freshness, vivacity, and a certain gracefulness.

Pic′ardy, an old province of France, bordering on the English Channel, is now divided into the departments of Somme and Pas de Calais; parts of it belong to the departments of Aisne, Oise, and Yonne.

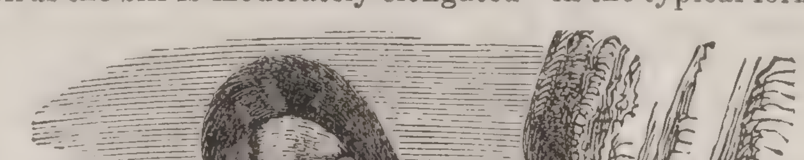
Picci′ni, or **Piccin′ni** (NICOLÒ), b. at Bari, Italy, in 1728; received his musical education in the conservatory of Naples; made in 1754 his début as a composer with the opera *Le Donne dispettose;* achieved in 1760 an almost unprecedented success by his opera, *Cecchina, ossia la buona figliuola;* went in 1776 to Paris, and engaged in that musical contest with Gluck which, continued through several years, forms one of the most interesting chapters in the history of music. He composed during this period *Roland, Phaon, Atys, Iphigénie en Tauride,* etc., in all fifteen operas; but, although most of them were received with great enthusiasm, Gluck was victorious, and other troubles being added to the defeat, Piccini left Paris for Naples in 1791. In Italy he composed several successful operas, *Griselda, Il Servo Padrone,* etc., but the government suspected him of sympathizing with the French Revolution, and in the musical arena rivals and coteries harassed him. In 1798 he returned to Paris, where Bonaparte gave him a position as inspector of music at the National Conservatory. D. at Passy May 7, 1800. Although by no means a genius of high order, he was a respectable and even talented representative of the Italian music of that period, and his productivity was truly enormous; from 1754 to 1775 he composed 133 operas, besides many pieces of church music, etc.

Piccolom′ini, a celebrated family of Italian nobles, still flourishing, from which sprang the popes Pius II. (1458–64) and Pius III. (1503), and the Austrian general OCTAVIO PICCOLOMINI, b. 1599; d. at Vienna 1656; became very famous for the counterplot by which he frustrated Wallenstein's plot against the emperor and overthrew him. Schiller's *Wallenstein* contains a somewhat softened and modernized, but essentially true and very vivid, portrait of him; he was childless, however, and Schiller's Max is a fiction.

Piche′gru (CHARLES), b. at Arbois, department of Jura, France, Feb. 16, 1761; was a teacher of mathematics at the military school of Brienne while Bonaparte was a pupil there; entered the artillery service of the Revolutionary army in 1790 and rose rapidly; was commander-in-chief of the army of the Rhine in 1793, of the army of the North in 1794; conquered Holland and organized the Batavian republic in 1795; resumed the command of the army of the Rhine, but entered into negotiations with the Bourbons; became suspected and was deprived of his command in 1796. In 1797 was elected a member of the Council of Five Hundred, and chosen its president, but his plottings with the *emigrés* and the royalist party being discovered, he was arrested, Sept. 4, 1797, and transported to Cayenne. In 1798 he escaped to England, where he formed a conspiracy with Cadoudal, the Polignacs, and others against Napoleon's life. He repaired secretly to Paris, but the conspiracy had in the mean time become known to the police; he was captured, imprisoned, and found strangled in his cell Apr. 5, 1804.

Pich′urim Beans, or **Sassafras Nuts,** the seed-lobes of *Nectandra Puchuri,* a South American lauraceous tree. They are used by chocolate-makers and others for flavoring. They have a strong taste, resembling nutmeg as well as sassafras.

Pic′idæ [from *Picus*, a "woodpecker"], a family of birds including the woodpeckers, wrynecks, etc. In these birds the bill is moderately elongated—in the typical forms



The Great Spotted Woodpecker.

more or less nearly straight and compressed toward the tip, which is produced into a truncated vertical or chisel-like edge, but in aberrant species somewhat decurved and with a pointed tip; the nostrils are near the base, lateral, and generally concealed by overarching plumes or bristles; the wings are moderate and pointed, with ten primaries, the first of which is very short; the tail has twelve feathers, the external very small, which generally are more or less rigid and cuneate, but sometimes (in Picumninæ and Yunginæ) are soft; tarsi covered in front with large plates, behind with small ones; toes opposed in two groups, the second and third being directed forward, the first and

fourth backward (the first rarely wanting). The skeleton exhibits a number of peculiarities, and the relations of the palatovomerine and maxillaries have some resemblance to those of the Saurians, for which reason the family has been taken as the type of a primary group of carinate birds, for which the name *Saurognathi* has been proposed by Parker. Species are distributed throughout all parts of the world, but most abundantly in tropical wooded regions; they live upon the worms and insects which are found in holes in trees, and which they obtain by pecking at and enlarging the holes by means of their chisel-like bills; the structure of the feet enables them to run with great dexterity along the trunks of trees, even on surfaces inclined downward. They also make their nests in trees, in which they deposit generally from four to six white eggs. The species are very numerous, G. R. Gray admitting 341, differentiated among six sub-families: (1) Picumninæ, with 2 genera and 34 species; (2) Picinæ, with 7 genera and 135 species; (3) Gecininæ, with 6 genera and 87 species; (4) Melanespinæ, with 4 genera and 70 species; (5) Colaptinæ, with 2 genera and 20 species; and (6) Yunginæ, with 1 genus and 5 species. The family has been the subject of an elaborate monograph by Malherbe (*Monographie des Picidées, ou Histoire naturelle des Picidées, Picumninés, Yunginés ou Torcols*, etc., etc., par Alf. Malherbe, 4 vols. folio). THEO. GILL.

Pick'ard (HUMPHREY), D. D., b. at Frederickton, N. B., June 10, 1813; graduated at Wesleyan University, Middletown, Conn., in 1839; entered upon the Wesleyan ministry in New Brunswick; was president of the conference of Eastern British America 1862 *seq.*, and again 1870; president of the college at Sackville, N. B., 1866–69, when he became editor of the *Provincial Wesleyan* and book steward for the conference at Halifax, N. S.

Pick'away, county of Central Ohio. Area, 525 sq. m. It is undulating and very fertile, producing great amounts of wool, grain, broom-corn, live-stock, etc. The county is traversed by Scioto River and Cincinnati and Muskingum Valley R. R. Cap. Circleville. P. 24,875.

Pickaway, tp., Shelby co., Ill. P. 728.

Pickaway, tp., Pickaway co., O. P. 1632.

Pick'ens, county of Alabama, bounded W. by Mississippi. Area, 900 sq. m. It is uneven and very fertile. Cotton and corn are staple products. The county is traversed by Tombigbee River. Cap. Carrollton. P. 17,690.

Pickens, county of N. Georgia. Area, 300 sq. m. It is high and mountainous, with picturesque and fertile valleys, producing corn, cotton, and tobacco. The mineral wealth is unexplored. Cap. Jasper. P. 5317.

Pickens, county of N. W. South Carolina, bounded N. by North Carolina. Area, 420 sq. m. The Blue Ridge extends along the N. border. It is uneven and fertile, with great mineral wealth, and produces corn, wheat, and cotton. Cap. Pickens Court-house. P. 10,269.

Pickens, tp., Edgefield co., S. C. P. 1559.

Pickens (Gen. ANDREW), b. at Paxton, Bucks co., Pa., Sept. 13, 1739, of Huguenot descent; went with his parents to the Waxhaw Settlement, S. C., in 1752; was a volunteer in Grant's expedition against the Cherokees 1761; was a captain of militia at the beginning of the Revolution; soon rose to the rank of brigadier-general, and shared with Marion and Sumter the honor of the heroic resistance made in South Carolina to the overwhelming numbers of the British and Tory forces. After the war he was for many years a member of the legislature; served in Congress 1793–95; was frequently commissioned to make treaties with the Indians; settled at Hopewell in the Pendleton district, which he had purchased from the Indians by the Hopewell treaty. D. there Aug. 17, 1817. —His son, ANDREW PICKENS, JR., was governor of South Carolina 1816–18. D. at Pontotock, Miss., July 1, 1838.

Pickens (EZEKIEL), an eccentric jurist of Dallas co., Ala., was a judge of the State circuit court 1835–47, and again for some years after 1850, but removed to Mississippi. Many curious anecdotes regarding his eccentricities are current in the South-west. D. in Mississippi.

Pickens (FRANCIS W.), son of Andrew, b. at Togadoo, S. C., Apr. 7, 1807; was educated at South Carolina College, and in 1829 became a lawyer of Edgefield district; was prominent in 1832 as a nullifier in the State legislature; was in Congress 1835–45; opposed the Bluffton secession movement of 1844; U. S. minister to Russia 1857–60; governor of South Carolina 1860–62, and as such had important connection with the early secession movements of his State. D. at Edgefield, S. C., Jan. 25, 1869.

Pickens (ISRAEL), b. in Cabarrus co., N. C.; was in Congress 1811–17; register of land-office, Mississippi Territory, 1817; governor of Alabama 1821–25; U. S. Senator 1826. D. near Matanzas, Cuba, Apr. 23, 1827.

Pickens Court-house, p.-v., cap. of Pickens co., S. C., on Keowee River, has 1 weekly newspaper, fine water-power, and is situated in a mineral region.

Pickens, Fort. See FORT PICKENS.

Pick'ensville, p.-v., Pickens co., Ala., on Tombigbee River. P. 1111.

Pickensville, p.-v. and tp., Pickens co., S. C. P. of v. 1223; of tp. 3164.

Pick'erel [dim. of *pike*], a name given in England to the young of the pike of that country (*Esox lucius*), but in the U. S. variously applied. In many parts of the country it is given to the small Esocidæ, and in some places (*e. g.* the interior lakes of the North-western States) to the *Esox lucius* (= *E. estor*, Les.). The species so called of most of the great Northern lakes, and especially in the markets, are, however, Percids or Luciopercæ—*i. e. Stezistedium americanum*, etc.

Pickerel Lake, tp., Freeborn co., Minn. P. 337.

Pick'ering (CHARLES), M. D., b. in Susquehanna co., Pa., Nov. 10, 1805; took his medical degree from Harvard University 1826; practised medicine in Philadelphia eleven years; was naturalist to the Wilkes expedition 1838–42; travelled in India and Africa. Author of *Races of Man* (1848), *Geographical Distribution of Animals and Man* (1854), *Geographical Distribution of Plants* (1861), and scientific papers. Grandson of Timothy Pickering.

Pickering (EDWARD CHARLES), b. at Boston, Mass., July 19, 1846; graduated at the Lawrence Scientific School 1865; taught mathematics at Cambridge 1865–67; was shortly afterward elected Thayer professor of physics at the Massachusetts Institute of Technology; was a member of the *Nautical Almanac* party which observed the total eclipse of Aug. 7, 1869, in Iowa, and of the Coast Survey party sent to Spain with a similar object in 1870; has conducted extended observations in optics, and especially in regard to the polarization of glass and of the sky, on which subjects he has contributed papers to several scientific journals; and has successfully carried out the laboratory method of teaching physics upon a system exhibited in his work entitled *Physical Manipulation* (1874). His system has been largely adopted in other institutions. Prof. Pickering is a great-grandson of Col. Timothy Pickering of Revolutionary fame, and is married to a daughter of the late Jared Sparks. In 1873 he was elected a fellow of the National Academy of Sciences.

Pickering (HENRY), son of Timothy, b. at the Hasbrouck House, Newburg, N. Y., the recent head-quarters of Washington, Oct. 8, 1781; received a careful education at Philadelphia, where his father was a member of Washington's cabinet; went to Salem, the former home of the family, with his parents 1801; engaged in mercantile pursuits, and acquired a moderate fortune, which he employed in a liberal manner; met with serious losses in 1825; removed to New York, but being unsuccessful in business, settled at Rondout, on the Hudson, and devoted his remaining years to study and writing. D. in New York May 8, 1838. Author of graceful poems, chiefly on natural objects, of which a volume appeared at Boston in 1831.

Pickering (JOHN), LL.D., son of Col. Timothy, b. at Salem, Mass., Feb. 17, 1777; accompanied his father in his visits to the Six Nations of Central New York, deriving from that circumstance his fondness for American philology; graduated at Harvard 1796; studied law in Philadelphia; was attached to the U. S. legations in Lisbon and London 1797–1801; a lawyer of Salem, Mass., 1801–27; city solicitor of Boston 1829–46; was much in the State legislature, and assisted in revising the statutes; declined the Greek and Hebrew professorships at Harvard; was a laborious philological student and familiar with many languages; president of the American Academy of Arts and Sciences; founder and first president of the American Oriental Society; maintained a correspondence for many years on philological topics with P. S. Duponceau and Wilhelm von Humboldt, the originals of which are carefully preserved by his family; author of valuable legal, archæological, and philological papers, including an *Essay on a Uniform Orthography for the Indian Languages of North America* (1820), in which he proposed the alphabet adopted by American missionaries in reducing to writing not only Indian but Polynesian languages; *Remarks on the Indian Languages of North America* (Philadelphia, 1836); of a useful *Vocabulary of Americanisms* (1816), and of a *Greek and English Lexicon* (1826; 3d ed. revised and enlarged, 1846). D. at Boston, Mass., May 5, 1846. He is deservedly considered the chief founder of American comparative philology. PORTER C. BLISS.

Pickering (OCTAVIUS), LL.D., b. in Wyoming Valley, Pa., Sept. 2, 1792; graduated at Harvard 1810; became a lawyer of Boston, Mass., 1816; was State reporter 1822–

40; lived in Europe 1841–48. D. in Boston, Mass., Oct. 29, 1868. Author of an unfinished *Life of Timothy Pickering*, his father (1867), of 24 vols. of law-reports, and of some other legal writings.

Pickering (TIMOTHY), LL.D., b. at Salem, Mass., July 17, 1745; graduated at Harvard 1763; became a lawyer of Salem 1768; was prominent in resistance to British aggressions; in 1775 became judge of the maritime and common pleas courts, and published *An Easy Plan of Discipline for a Militia*, which was made the official textbook in Massachusetts; commanded the Essex regiment raised in 1776; served through the Revolution as colonel with valor, energy, and disinterestedness; became in 1777 Washington's adjutant-general, serving as such at Brandywine and Germantown, and member of the board of war in the same year; quartermaster-general 1780; became a commission merchant at Philadelphia at the close of the war; was sent in 1786 by the Federal government to quiet the difficulties arising from a conflict of jurisdiction in the Valley of Wyoming, Pa.; acquired a large tract of land in that region and settled at Wilkesbarre, and strove with much wisdom to harmonize the conflicting elements, but was seized and imprisoned for twenty days; was a delegate from Luzerne co. to the Pennsylvania constitutional conventions of 1787 and 1790; negotiated treaties with the Six Nations of New York in 1790, 1791, and 1794, and with the Ohio Indians in 1793; postmaster-general 1791–94; secretary of war 1794–95; U. S. secretary of state 1795–1800; returned to the forests of Wyoming and built a log house for his family, when by sale of a portion of his lands to friends in Massachusetts, he was induced to return to Salem; was made a judge of common pleas 1802; was U. S. Senator 1803–11; one of the war-board of Massachusetts 1812–15; in Congress 1815–17; was author of able political pamphlets; devoted much attention to agriculture, being president of the Essex Agricultural Society; was an ardent Federalist, and in religion an Unitarian. He published several occasional addresses and pamphlets. D. at Salem, Mass., Jan. 29, 1829. (See his *Life*, commenced by his son Octavius, and completed by Rev. Charles W. Upham, 4 vols., 1867–73.) PORTER C. BLISS.

Pick'ering's Isle, tp., Hancock co., Me. P. 3.

Pick'erington, p.-v., Violet tp., Fairfield co., O. P. 195.

Pick'ersgill (HENRY WILLIAM), b. in London, England, Dec. 3, 1782; was distinguished as a portrait-painter; became a member of the Royal Academy 1826, and its librarian 1856. D. in London Apr. 25, 1875.—His nephew, FREDERICK RICHARD, b. in London in 1820, has become celebrated for historical paintings, especially *The Death of King Lear* and *The Burial of Harold*, both of which received handsome prizes; and was chosen a member of the Academy in 1857.

Pick'ett (ALBERT JAMES), b. in Anson co., N. C., Aug. 13, 1810; removed in 1818 to Autaga co., Ala.; acquired wealth; studied law; was A. A. G. in the Creek war, and aide to Gen. Clay in 1836, and published in 1851 a valuable *History of Alabama*. D. at Montgomery, Ala., Oct. 28, 1858.

Pick'ett (GEORGE E.), b. in Richmond, Va., Jan. 25, 1825; graduated at the U. S. Military Academy, and entered the army as brevet second lieutenant of infantry July, 1846; engaged in the war with Mexico from Vera Cruz to the capture of the City of Mexico; brevet first lieutenant and captain for gallantry at Contreras, Churubusco, and Chapultepec; on frontier duty 1848–61, when (June 25) he resigned, and in September was appointed colonel, and brigadier and major general in 1862. In the Virginia Peninsular campaign of 1862 he led a brigade, and was severely wounded at Gaines's Mill. Continuing thereafter with the Army of Northern Virginia, he participated in the battles of that army, and was conspicuous for his bravery and intelligence. At Gettysburg his division led the assaulting column which suffered so severely July 3, 1863; also commanded in North Carolina, at the capture of Plymouth. In the campaign of 1864–65 he made the final stand at Five Forks, where his division was surrounded and broken up after a desperate resistance. D. at Norfolk, Va., July 30, 1875.

Pickett (JOHN R.), b. in Fairfield district, S. C., Apr. 2, 1814; joined the South Carolina conference (M. E.) Feb., 1835. He was great both in body and mind. By dint of close application he became a fine linguist and a profound metaphysician. He was remarkable for independence, geniality, generosity, and a dash of eccentricity. D. in Chester, S. C., Mar. 15, 1870. T. O. SUMMERS.

Pick'ettsville, v., Stephens co., Tex. P. 115.

Pi'co, one of the AZORES ISLANDS (which see), belonging to the central group, comprises an area of 254 sq. m., and consists of one single mountain, whose highest peak, Pico, rises 7613 feet, and still emits smoke and lava. It is fertile and well wooded, and produces an excellent wine, of which 25,000 pipes are annually exported. P. 36,000.

Pic'oline [Lat. *pix*, "pitch"], or **Odorine** (C_6H_7N), an oily base found in the tar obtained by exposing bones and other animal substances, bituminous coal, shale, peat, beans, cinchonine, etc. It is produced by the decomposition of the acroleine-ammonia formed during these distillations. (See Watts's *Dict.* and *Supplements.*) C. F. CHANDLER.

Picou' (HENRI PIERRE), b. at Nantes, France, Feb. 27, 1824; studied painting under Delaroche, and began to exhibit in 1847. The most celebrated of his pictures are—*Cleopatra and Antony* (1848), *Cleopatra and Octavius* (1853), *Sappho* (1863), *Inundation of the Loire* (1865), *Molière at Versailles* (1868), *The Night Watch* (1873).

Picric Acid. See CARBAZOTIC ACID and TRINITROCARBOLIC ACID.

Picrotox'ine [Gr. πικρός, "bitter," and τοξικόν (sc. φάρμακον), "arrow-poison"], a poisonous bitter principle found in the *cocculus indicus* of commerce, the berries of the *Anamirta cocculus*. Its chemical constituents are carbon, hydrogen, and oxygen.

Pic'ton, a port of entry, cap. of Prince Edward co., Ont., Canada, on the Bay of Quinté, 40 miles S. S. E. from Kingston. It is the seat of Ontario College, and has 3 weekly newspapers. P. of sub-district, 2361.

Picton (JOHN W.), M. D., b. in New Jersey in 1804; first graduated at West Point; served seven years in the army; graduated in medicine in Philadelphia; located in New Orleans, where he practised thirty-two years, and acquired distinction as a surgeon; was one of the founders of the New Orleans School of Medicine. D. in Louisiana 1858. PAUL F. EVE.

Pictor (FABIUS). See FABIUS PICTOR.

Pictou', county of N. Nova Scotia, has a very level and fertile surface. It has mines of iron and coal, the latter extensively wrought, besides valuable beds of sandstone and fictile clay. It is traversed by Nova Scotia Railway. Cap. Pictou. P. 32,114.

Pictou, port of entry, cap. of Pictou co., N. S., on a safe and commodious harbor. Its lighthouse stands in lat. 45° 41.5′ N., lon. 62° 40′ W. It is the terminal point of Nova Scotia Railway, which extends to Halifax, 113 miles distant. Steamers ply to Charlottetown, Quebec, and the ports of the Gulf of St. Lawrence. Bituminous coal is mined near by, and is quite extensively exported. A beautiful sandstone is also quarried here. There are considerable manufactures, an academy, court-house, and 1 weekly newspaper. P. of sub-district, 3462.

Picts, a Celtic tribe, the Caledonians of the Roman writers, inhabiting the lowlands and the eastern part of Scotland, are first mentioned under the name of the *Picti* in a speech addressed by the rhetorician Eumenius to the emperor Constantius Chlorus on his return in 296 A. D. after the victory over Allectus. They were divided into the southern and northern Picts by the Grampian Mountains. The southern Picts were converted to Christianity in the fifth century by St. Ninian—the northern in the sixth by St. Columba. In the ninth century they were subdued by the Scots, a kindred tribe which invaded the country from Ireland. Kenneth II. conquered the whole of Scotland, made it one kingdom, and took up his residence in the old Pictish capital, Forteviot, in Stratherne. Subsequently attacked on both sides—from the N. by the Scandinavian invaders, and from the S. by the Teutonic inhabitants of England—the Pictish language and nationality gradually disappeared. In details, however, almost every point of their history, from the origin of their name and their place in the family of nations down to their final amalgamation with the surrounding Teutonic race, has been the subject of much controversy. (See Innes, *Civil and Ecclesiastical History of Scotland*, and Pinkerton, *Inquiry into the History of Scotland.*)

Picts' Houses, a name applied in Scotland to various structures of the pre-historic period. Remains of this character are quite common in many parts of that country, and are of various construction. Tradition assigns them, with no great improbability, to the Picts.

Piedimon'te d'Alife, town of Southern Italy, province of Caserta, situated at the foot of Monte Cila, N. E. of Alife. It is one of the most industrious of Southern Italy, and has extensive cotton, woollen, and linen manufactures of excellent reputation. P. in 1874, 7000.

Piedimon'te Etne'o, town of Sicily, province of Catania, situated in the midst of wild volcanic scenery. Near this town is the famous chestnut tree known as the "castagno dei cento cavalli." P. in 1874, 5140.

Pied'mont, territory of Northern Italy, comprising an area of 11,777 sq. m., with 2,764,263 inhabitants, and bounded S. by the Maritime Alps, W. by the Graian and Cottian, N. by the Pennine Alps, and E. by the river Ticino. In the twelfth century it became a possession of the house of Savoy, and now it forms, with slightly altered boundaries, a large division of the kingdom of Italy, being subdivided into the four provinces of Turin, Cuneo, Alessandria, and Novara. The greater part of this country is mountainous, covered with spurs of the Alps, between which the numerous affluents of the Po, the Tanaro, Bormida, Clusone, Dora, Sesia, etc. form beautiful and fertile valleys. But towards the E. the country gradually opens into the plain of the Po, which belongs to the most fertile and best cultivated land of Italy. Rice, wheat, maize, wine, olive oil, and many varieties of the most delicious fruits are produced, and a very extensive dairy-farming and manufacturing industry is carried on. The method of the Piedmontese silk-culture is celebrated and very successful.

Piedmont, tp., Rappahannock co., Va. P. 1634.

Piedmont, p.-v. and tp., Mineral co., West Va., on N. branch of Potomac with Baltimore and Ohio and Cumberland and Pennsylvania R. Rs., 173 miles E. of Wheeling, has good schools, 3 churches, 1 bank, 1 newspaper, railroad shops, a public hall, and is situated in the great coal-region of Virginia. P. of v. 1366; of tp. 1785.

JOHN E. WOOD, ED. "INDEPENDENT."

Piegans, a sub-tribe of the Blackfeet nation of Indians in Montana, deriving their present name (*i. e.* "pheasant") from that borne by their chief at the time of their separation from the Blackfeet during the present century. They originally consisted of two bands, who lived on the Marias, Teton, and Missouri rivers, were the best known and most civilized as well as the bravest of their nation, were skilful bowmen, noted for their love of ornament, and were constantly at war with the Shoshones, Flat Heads, and Gros-Ventres, though generally friendly to the whites. An unprovoked massacre of 173 Piegans, chiefly women and children, at Red Horn's camp on the Marias River, perpetrated Jan. 23, 1870, by Lieut.-Col. Baker, was severely condemned throughout the country. Lands were ceded by them to the U. S. by treaties in 1868, and their reservation was diminished by act of Apr. 15, 1874, at which time they numbered 2450. A Catholic mission among them was commenced in 1846, but they are officially recognized as under the religious supervision of the Methodists since the beginning of Gen. Grant's administration. Their members have rapidly declined of late from epidemic diseases.

Pierce, county of S. E. Georgia. Area, 500 sq. m. It is level, in part covered by swamps, and has extensive forests. Rice and corn are leading products. The county is traversed by Brunswick and Albany and Atlantic and Gulf R. Rs., and by Satilla River. Cap. Blackshear. P. 2778.

Pierce, county of N. E. Nebraska. Area, 540 sq. m. It is undulating and well adapted to stock-raising. Cap. Pierce. P. 152.

Pierce, county, Washington Territory, bounded N. by Green River, E. by Cascade Mountains, S. W. by Nisqually River, and N. W. by Puget Sound. Except in the W. it is very rough and densely timbered. Grain, wool, fruit, and lumber are leading products. It is traversed by Northern Pacific R. R. Cap. Steilacoom City. P. 1409.

Pierce, county of Wisconsin, bounded S. W. by Mississippi River, which separates it from Minnesota. Area, 550 sq. m. It has St. Croix River and Lake on the W. It is undulating, well wooded, and fertile, and is one of the leading counties of the State in its product of wheat and oats. Cap. Ellsworth. P. 9958.

Pierce, tp., De Kalb co., Ill. P. 1003.

Pierce, tp., Washington co., Ind. P. 1179.

Pierce, tp., Page co., Ia. P. 430.

Pierce, tp., Morrison co., Minn. P. 151.

Pierce, p.-v., Mount Pleasant tp., Lawrence co., Mo., on Atlantic and Pacific R. R., at the S. terminus of Memphis Carthage and South-western R. R. P. 432.

Pierce, tp., Stone co., Mo. P. 781.

Pierce, tp., Texas co., Mo. P. 366.

Pierce, p.-v., cap. of Pierce co., Neb., on the N. branch of Elkhorn River. P. 152.

Pierce, tp., Clermont co., O. P. 1773.

Pierce, tp., Kewaunee co., Wis. P. 1130.

Pierce (BENJAMIN), b. at Chelmsford, Mass., Dec. 25, 1757; served throughout the Revolution with valor; settled in New Hampshire, where he held various important positions, and was governor in 1827–29; father of Pres. Franklin Pierce. D. at Hillsborough, N. H., Apr. 1, 1839.

Pierce (BRADFORD KINNEY), D. D., b. Feb. 3, 1819, at Royalton, Vt.; graduated at the Wesleyan University 1841; entered the Methodist ministry 1843; has been editor of various Sunday-school journals and of *Zion's Herald*, Boston, Mass., 1872 *seq.*, and held various public, civil, and other positions; chaplain of the Massachusetts Industrial School for Girls 1856–62, and of the House of Refuge, Randall's Island, N. Y., 1863–72; author of *Notes on Acts*, *Bible Scholar's Manual*, *The Eminent Dead*, *Trials of an Inventor*, *Stories from Life*, *Half Century with Juvenile Delinquents*, and other works.

Pierce (FRANKLIN), b. at Hillsborough, N. H., Nov. 23, 1804, was a son of Gov. Benj. Pierce; graduated in 1824 at Bowdoin College, where he was the intimate associate of Nathaniel Hawthorne, his lifelong friend; was the law-pupil of Levi Woodbury; came to the bar in 1827, and practised law with great success in Hillsborough and Concord, N. H.; was in Congress 1833–37; in the U. S. Senate 1837–42; was heartily in favor of the union of Texas with the U. S.; twice declined positions in the cabinet of Mr. Polk; became colonel 16th U. S. infantry 1846; brigadier-general 1847; served in the Mexican war; was president of the New Hampshire constitutional convention 1850–51; was chosen President of the U. S. in 1852 by 254 electoral votes to 42 for Gen. Scott, the Whig candidate. Mr. Pierce's administration was a period of great political excitement. Prominent among its events were the Gadsden Purchase, the repeal of the Missouri Compromise, the beginning of the troubles in Kansas (during which the President opposed by every means in his power the organization of a Free State government), and the publication of the Ostend Manifesto. Mr. Pierce was an ardent advocate of what is known as the State Rights doctrine, and during the war of 1861–65 sympathized with the Southern States. D. at Concord, N. H., Oct. 8, 1869.

Pierce (GEORGE EDMOND), D. D., b. at Southbury, Conn., Sept. 9, 1794; graduated at Yale 1816, and at Andover Seminary 1821; was ordained pastor of a Congregational church at Harwinton, Conn., 1822; president of Western Reserve College 1834–55. D. at Hudson, O., May 27, 1871.

Pierce (GEORGE FOSTER), D.D., son of Lovick, b. in Greene co., Ga., Feb. 3, 1811; studied law with his uncle, Hon. Geo. Foster; in 1831 joined the Georgia conference of the M. E. Church; performed important pastoral work in prominent places in Georgia and South Carolina, and presided over literary institutions (Emory College for six years) till 1854, when he was made bishop; was a prominent member of the General Conference of 1844 in New York, when measures were adopted for the division of the Church; was also a member of the General Conferences of 1846, 1850, and 1854; is an excellent executive officer, a laborious and successful preacher, and a brilliant orator of national reputation; has published *Incidents of Western Travel* and several sermons, addresses, etc., one being *Devotedness to Christ*, a sermon on the death of Bishop Andrew, his attached friend. Resides near Sparta, Ga. T. O. SUMMERS.

Pierce (JOHN), D. D., b. at Dorchester, Mass., July 14, 1773; graduated at Harvard 1793; was tutor there 1796; was ordained pastor of the First Congregational church at Brookline 1797; remained sole pastor for above half a century; was a member of the Academy of Arts and Sciences and of the Massachusetts Historical Society; president of the Massachusetts Bible Society, and had a prodigious knowledge of genealogy and antiquities, on which subjects he filled 18 large volumes of MS. with his memoranda. D. at Brookline Aug. 24, 1849. Author of a *Half-Century Discourse* (1847) and of a *Sketch of Brookline*, in the *Mass. Hist. Coll.* (2d series, vol. ii.).

Pierce (LOVICK), D. D., father of Bishop Pierce, b. in Halifax co., N. C., Mar. 24, 1785. Early in life his parents moved to Barnwell co., S. C., where, with only six months' previous schooling, he entered the Methodist ministry in 1804; in 1809 moved to Greene co., Ga.; during the war of 1812 was a chaplain in the army; studied medicine, and graduated at Philadelphia; went to Greensboro', where he practised medicine and preached for several years, but has more recently devoted himself to the ministry alone. A. H. STEPHENS.

Pierce (Rev. REDDICK), b. in North Carolina Sept. 26, 1782. With his brother Lovick, the great Georgia preacher, he joined the South Carolina conference (M. E.) in 1805; was a man of gigantic intellect, weighty and slow in speech; preached powerfully, even after he became so deaf that he could scarcely hear his own voice. D. in South Carolina July 24, 1860. T. O. SUMMERS.

Pierce City, p.-v., cap. of Shoshone co., Id., on Oro Fino River.

Pierce'ton, p.-v., Washington tp., Kosciusko co., Ind., on Pittsburg Chicago and Fort Wayne R. R. P. 1063.

Pier'mont, v., White Pine co., Nev. P. 18.

Piermont, p.-v. and tp., Grafton co., N. H., on Connecticut River. P. 792.

Piermont, p.-v., Orangetown tp., Rockland co., N. Y., on Hudson River, the E. terminus of a branch of Erie R. R. Derives its name from a pier 100 feet long, built by the Erie R. R. Co. P. 1703.

Pier'pont, p.-v. and tp., Ashtabula co., O. P. 990.

***Pierpont** (John), A. M., b. at Litchfield, Conn., Apr. 6, 1785; graduated at Yale 1804; was an instructor in Connecticut and South Carolina; studied law at Litchfield, and in 1812 became a lawyer of Newburyport, Mass.; was afterward partner in an unsuccessful mercantile business with John Neal, the novelist, in Boston and in Baltimore; was pastor of the Hollis street Unitarian church, Boston, 1819–45; held pastorates in Troy, N. Y., 1845–49, and in Medford, Mass., 1849–56; was for a time chaplain in the 22d Massachusetts regiment 1861, and was later employed in the treasury department, Washington, D. C., 1861–64. D. at Medford, Mass., Aug. 27, 1866. Author of *Airs of Palestine* (1816 and 1840) and *Poems* (1854), containing pieces of much poetic merit. He also published a series of reading-books for schools (the *Little Learner*, 1839), and prepared a valuable *Digest* of decisions and rules regarding the collection of customs. Mr. Pierpont was a leading anti-slavery and temperance orator and writer, and late in life became a Spiritualist. ✓

Pierre'pont, p.-v. and tp., St. Lawrence co., N. Y., on Racket River. P. 2391.

Pierrepont (Edwards), b. in North Haven, Conn., Mar. 4, 1817; graduated at Yale College in 1837, and a year later was admitted to the bar; practised law at Columbus, O., till 1846, when he removed to New York City; in 1857 was elected a judge of the superior court of New York, resigning that position three years later; was engaged by the national government in 1867 to conduct its case against John H. Surratt, indicted for complicity in the murder of Pres. Lincoln; in 1869 was appointed by Pres. Grant U. S. district attorney for the southern district of New York, but resigned that office in May, 1870. In 1875 was appointed attorney-general of the U. S. He has received the degree of LL.D. from Columbian College, Washington, and from Yale College. J. B. Bishop.

Pier'son, tp., Vigo co., Ind. P. 1489.

Pierson, p.-v. and tp., Montcalm co., Mich., on Grand Rapids and Indiana R. R. P. 755.

Pierson (Abraham), b. at Lynn, Mass., 1641; graduated at Harvard 1668; was ordained in 1672 at Newark, N. J., as colleague to his father, Rev. Abraham Pierson (1608–78); was Congregational pastor at Killingworth, Conn., 1694–1707, and was the first president of Yale College 1701–07. D. Mar. 5, 1707.

Pi'etists, in Germany, Christians who never formed a sect nor professed distinctive doctrines, but were noted for their preference of practical religion. The first writers of importance who assumed this ground were Johann Arndt (*Vom wahren Christenthum*, 1605) and Johann V. Andreæ (*Invitatio Fraternitatis Christi*, 1617). The term was first applied in derision to a number of teachers at Leipsic in 1689, chief among whom was A. H. Francke, and was soon afterward employed chiefly as a designation of the followers of Philipp Jakob Spener. The combined influence of Spener and Francke led to the foundation of the University of Halle, which became a centre of the pietistic movement. The rationalism of the close of the eighteenth and beginning of the nineteenth century operated adversely to pietism, but since the overthrow of rationalism by the Straussian school, pietism has largely revived in Germany, its centres being Berlin, Silesia, and Würtemberg.

Pie'tra Du'ra [It. for "hard stone"], a name applied to the better kinds of cameo and Mosaic-work (which see).

Pietragal'la, town of Southern Italy, province of Potenza, in a mountainous but very fertile district. Oil of the best quality is produced in abundance, and the sulphur-mines are very rich. The neighborhood is also famous for its honey. P. in 1874, 5850.

Pietraper'zia, town of Sicily, province of Caltanisetta, in a mountainous district abounding in grain, almonds, pistachios, sulphur, plaster of Paris, lapis-lazuli, etc. N. of the town stands a grandiose old castle, interesting for its various styles of mediæval architecture and for its internal decorations, with inscriptions in the Sicilian dialect. P. in 1874, 10,150.

Pietrasan'ta, town of Central Italy, province of Lucca, situated on a hill about 2 miles from the Mediterranean and 20 N. W. of the city of Lucca. It is surrounded by a castellated wall with a strong citadel, and is entered by three gates, one of which opens almost directly upon the principal square, and here the noteworthy buildings are the Pretorio and the Palazzo Comunale. The streets are broad, straight, and well paved, and most of the churches and houses appear to have been built in the fourteenth and fifteenth centuries. The neighboring country, partly hill and partly plain, is in the highest degree fertile, producing the vine and olive in great luxuriance. Pietrasanta is the chief point from which the Serravezza marble is transported to market. P. in 1874, 13,227.

Piëzom'eter [Gr. πιέζειν, to "press," and μέτρον, a "measure"], an instrument for the measuring of the compression of water and of other fluids under pressure. The first successful piëzometer was that of Oersted, in which the pressure was gauged by the manometer, and the amount of compression of the water was indicated by the use of mercury in a glass tube. Regnault's piëzometer is in principle the same, but it also takes into account the expansion of the tubes under pressure, and consequently gives more accurate results.

Pig'eon [Fr.], a name applied primarily to the *Columbia livia* in its wild as well as domesticated races, and secondarily extended to all the species of the family Columbidæ. The *Columbia livia,* in its wild state, is an inhabitant of almost the entire extent of Europe. It belongs to a section of the genus in which the tarsi are as long as the middle toe. The wings are black at their outer margin, and have a black spot at the extremity of the secondaries, and a second on the great coverts; the rump is ashy; the tail is of a bluish ash at its basal two-thirds, black at its posterior third, with the lateral feathers at their basal half white externally. The length from tip of bill to end of tail is about fifteen inches, and the spread of wings nearly twenty-seven; the weight is about fourteen or fifteen ounces; the beak is about three-quarters of an inch long; the feet at middle toe about two and three-quarter inches long. Such are the characters of the wild pigeon, which is the stock from which have originated the numerous varieties of domesticated breeds. These have diverged in various degrees from the parent race, as many as 250 or even more, radiating in different directions and to diverse extents, being now existent. The principal features of the wild stock having been given, the consideration of the diverging races may be considered in the order of their specialization, but under the categories admitted by Darwin. Eleven distinct races (including many sub-races and minor varieties) have been recognized by that naturalist, distinguished by the following peculiarities—viz. (1) Essentially resembling in structure the wild form. (2) Tuft of feathers at the base of the bill curling forward; feet much feathered; voice very peculiar: trumpeter. (3) Feathers of the neck forming a hood; wings and tail long; bill moderately short: jacobin. (4) Feathers reversed and bill very short: Indian frill-back. (5) Bill generally short (sometimes excessively short and conical). The birds during flight tumble backward: tumbler. (6) Feathers divergent along the front of the neck and breast, and bill very short: turbit and owl. (7) Tail (generally with many feathers) expanded and carried upward: fantails. (8) Bill short, broad, and deep; naked skin round the eyes broad and corunculated, and skin over nostrils slightly swollen: barbs. (9) Bill long and massive, and body of great size: runts. (10) Bill elongated, narrow, and pointed; much naked skin round the eyes, and generally corunculated; neck and body elongated: carriers. (11) Œsophagus much enlarged and very distensible, and body and legs elongated: pouters. Mr. Darwin has further combined these as follows: the 1st and 2d in one group; the 3d to 7th in a second; the 8th to 10th in a third; and the 11th in a fourth. (See also Columbidæ.) Theodore Gill.

Pigeon, tp., Vanderburg co., Ind. P., exclusive of city of Evansville, 875.

Pigeon, tp., Warrick co., Ind. P. 1646.

Pigeon Berry, a name applied to the poke or Garget-root (which see).

Pigeon Cove, p.-v., Rockport tp., Essex co., Mass., on the Atlantic coast, is a picturesque spot recently become popular as a watering-place, and furnished the granite for the new post-office at Boston.

Pigeon English [from the Chinese mode of pronouncing the word *business*], an extraordinary and grotesque artificial dialect employed in the commercial cities of China as the medium of communication between foreign merchants and the Chinese. Its base is English, with a mixture of Portuguese and Hindostanee. It consists of but few words, chiefly nouns and verbs, without grammar or inflections other than a termination in *ee*, which is common to most verbs. It is never employed in print, or even in writing, but is taught in some Chinese schools; and though intrinsically a ridiculous and silly expedient, which

should be replaced by a correct use either of English or of Chinese, is still employed in all the business transactions of foreign merchants with the natives of China.

Pigeon (Gyro), an instrument patented in the U. S. in 1872, consisting of an apparatus for imitating the movements of pigeons when released from a trap, and recommended on humanitarian grounds as a substitute for pigeons in shooting-matches.

Pigeon Hill, p.-v. and tp., Union co., Ark. P. 236.

Pigeon Pea, a name applied to the pea-like pulse grown upon the leguminous shrubs *Cajanus flavus* and *bicolor*, which are extensively cultivated in many tropical countries, where they are highly valued. The better sorts are very palatable substitutes for the pea.

Pigeon River, p.-v. and tp., Lake co., Minn. P. 16.

Pigg River, tp., Pittsylvania co., Va. P. 2686.

Pig'ments, the coloring-matters which when mixed with oil, water, or gum form paint. They are either mineral or extracted from organic matter. (See PAINT, by PROF. C. F. CHANDLER, PH. D., LL.D.)

Pignerol. See PINEROLO.

Pignot'ti (LORENZO), b. in 1739 at Figline, Italy; for awhile taught rhetoric at Arezzo, studied medicine at Pisa, and commenced practice in Florence. The University of Pisa then appointed him professor, and the grand duke afterwards made him his own historiographer. . Pignotti published in 1813, in 9 vols., his *Storia della Toscana sino al Principato*, a well-written work, but wanting in critical ability. His *Favole*, in verse, do him much more honor. They have been often reprinted, and he has sometimes been called the "Tuscan La Fontaine." D. 1812.

Pignut. See HICKORY.

Pigweed. See CHENOPODIUM.

Pika, a name sometimes applied to the tailless hares, or LAGOMYIDÆ (which see).

Pike, a name applied in the English-speaking countries to different species of fishes. (1) The English pike

The Pike.

(*Esox lucius*) has been supposed to have been "so called either from the likeness of its nose to a pike or spear, or because it moves itself in the water like a spear thrown" (*Richardson*); or with greater probability because of the pointed or pike-like teeth. In the U. S. it is applied to the same or closely-related species (*Esox estor*), and in some places to the smaller species of the same genus—*e. g. Esox reticulatus, Esox niger* or *gasciatus*, etc. These are, however, generally called pickerel. The *Esox nobilior* is in most sections distinguished under the name muskellunge. All the species agree in the form familiar to most persons from personal acquaintance with some one or other of the species, or from the illustrations in angling books, and differ chiefly in the comparative length of the snout, the extension of scales on the cheeks and operculæ, the number of rays in the dorsal and anal fins, and color. The name "pike," either alone or in combination, is also perverted to species very different from those just considered. In some parts of the U. S., *e. g.*, the species of *Stizostedion* or *Lucioperca* (a genus closely related to *Perca* or the perches) are called walled-eyed pike, or simply pike. The species of *Centropomus*, a genus of fishes peculiar to the tropical American seas, are called sea-pike. (See ESOCIDÆ in APPENDIX.) THEODORE GILL.

Pike, county of S. E. Alabama. Area, 750 sq. m. It is a part of the great pine forest of the State, and has a sandy but very productive soil. Live-stock, cotton, and corn are leading products. Cap. Troy. P. 17,423.

Pike, county of S. W. Arkansas. Area, 650 sq. m. It is hilly and broken in the N., and generally level in the S. The county has great water-power, abundant and varied mineral wealth, is well timbered, and has a fertile soil. Live-stock, corn, and cotton are leading products. Cap. Murfreesborough. P. 3788.

Pike, county of Central Georgia. Area, 375 sq. m. It is uneven, generally fertile, and has beds of iron ore. Cotton and corn are leading products. Flint River bounds the county on the W. It is traversed by Macon and Western R. R. Cap. Zebulon. P. 10,905.

Pike, county of Illinois, bounded S. W. by Mississippi River and E. by Illinois River. Area, 750 sq. m. It is highly fertile, and contains beds of coal. Live-stock, grain, and wool are leading products. The county has manufactures of carriages, cooperage, flour, etc. It is traversed by several railroads. Cap. Pittsfield. P. 30,768.

Pike, county of S. W. Indiana, bounded N. by White River. Area, 300 sq. m. It is nearly level or slightly rolling, very fertile, and contains good coal. Tobacco, live-stock, grain, and wool are leading products. Cap. Petersburg. P. 13,779.

Pike, county of Kentucky, bounded S. E. by Virginia. Area, 300 sq. m. It is mountainous, with fertile valleys. Bituminous coal and iron ore abound. Live-stock and corn are leading products. The county is traversed by tributaries of Big Sandy. Cap. Piketon. P. 9562.

Pike, county of S. Mississippi, bounded S. by Louisiana. Area, 750 sq. m., level and highly fertile. Cotton and corn are leading products. It is traversed by affluents of Pearl River and by New Orleans Jackson and Great Northern R. R. Cap. Magnolia. P. 11,303.

Pike, county of N. E. Missouri. Area, 600 sq. m. Separated from Illinois by Mississippi River; somewhat uneven, well timbered, and with fertile limestone soil. Live-stock, wool, tobacco, and grain are staple products. Coal is found. Carriages and wagons are leading articles of manufacture. It is traversed by Chicago and Alton R. R. Cap. Bowling Green. P. 23,076.

Pike, county of S. Ohio. Area, 400 sq. m., hilly and fertile. Live-stock, grain, tobacco, wool, and lumber are leading products. It is traversed by Scioto River and Ohio and Erie Canal. Cap. Waverly. P. 15,447.

Pike, county of E. Pennsylvania, bounded E. by Delaware River, which separates it from New York and New Jersey. Area, 620 sq. m., uneven, and in parts hilly and elevated. Much of its surface is a wilderness covered with forests of beech, oak, hemlock, etc. A large part of this undeveloped tract is, after clearing, finely adapted to raising oats and hay and to sheep-pasturage. Lumber and leather are the leading products. It is traversed by Erie R. R. Cap. Milford. P. 8436.

Pike, tp., Livingston co., Ill. P. 847.

Pike, v., Atlas tp., Pike co., Ill., on Mississippi River, opposite Louisiana, Mo., at the junction of Chicago and Alton with Quincy Alton and St. Louis R. R.

Pike, tp., Jay co., Ind. P. 1585.

Pike, tp., Marion co., Ind. P. 2206.

Pike, tp., Ohio co., Ind. P. 921.

Pike, tp., Warren co., Ind. P. 941.

Pike, tp., Muscatine co., Ia. P. 740.

Pike, tp., Lyon co., Kan. Pop. 693.

Pike, tp., Stoddard co., Mo. P. 1421.

Pike, p.-v. and tp., Wyoming co., N. Y., contains a seminary, a bank, 3 churches, 3 factories, and 2 mills. P. of v. 551; of tp. 1730.

Pike, tp., Brown co., O. P. 1314.

Pike, tp., Clark co., O. P. 1582.

Pike, tp., Coshocton co., O. P. 773.

Pike, tp., Fulton co., O. P. 878.

Pike, tp., Knox co., O. P. 1301.

Pike, tp., Madison co., O. P. 394.

Pike, tp., Perry co., O. P. 2319.

Pike, p.-v., Pike co., O.

Pike, tp., Stark co., O. P. 1333.

Pike, tp., Berks co., Pa. P. 925.

Pike, tp., Bradford co., Pa. P. 1814.

Pike, tp., Clearfield co., Pa. P. 1138.

Pike, tp., Potter co., Pa. P. 184.

Pike (ALBERT), M. A., b. at Boston, Mass., Dec. 29, 1809, was the son of a poor shoemaker, who removed during Albert's early childhood to Newburyport; the son became a teacher, and studied at Harvard University, where he afterwards received the degree of M. A.; went in 1831 to Santa Fé, N. M., by way of St. Louis, going much of the way on foot; reached Fort Smith, Ark., in 1832 in a destitute state; was a journalist at Little Rock 1834–36, after which he became a successful lawyer and a prominent States Rights politician; served as a captain of Arkansas cavalry in Mexico; was brigadier-general in the Confederate service during the civil war; editor of *Memphis Appeal* 1867–68; author of *Prose Sketches and*

Poems (1834), 5 vols. of *Law Reports* (1840–45), *The Arkansas Form-Book* (1845), *Nugæ* (poems, 1854), a romance (1835), a volume of Masonic statutes and regulations (1859), *Morals and Dogma of Freemasonry* (1870), besides fugitive pieces in prose and verse; has thoroughly studied the origin and rituals of Freemasonry, and its connection with ancient mysteries and religion; and has been for years the head of the Ancient Accepted rite in the South.

Pike (Mrs. Mary H. **Greene**), b. at Eastport, Me., in 1827; married Mr. F. A. Pike, member of Congress from Maine 1861–69; published in 1854, under the *nom de plume* of "Mary Langdon," an anti-slavery novel, *Ida May, a Story of Things Actual and Possible*, of which 60,000 copies were sold within four years. The authoress obtained her knowledge of slavery during a residence for health at Aiken, S. C. She has since published other novels—*Caste, a Story of Republican Equality* (1856), *Agnes* (1858), *Bond and Free* (1858), *Entanglements* (1863), *Cumworth House* (1864), *The Cypresses* (1865), and *My Son's Wife* (Philadelphia, 1868)—and has contributed to the *Atlantic*, *Harper's*, and other magazines. Most of her recent works were published in London, where they were favorably noticed by the critical journals.

Pike (Zebulon Montgomery), b. at Lamberton, N. J., Jan. 5, 1779, son of a captain in the U. S. army; became a cadet in his father's regiment; was soon promoted to lieutenant; was appointed, on account of his skill in languages and mathematics, to conduct surveys of various parts of the newly-acquired territory of Louisiana; penetrated to the head-waters of the Mississippi in the autumn of 1805, and in the following year was charged with an exploration of the interior of Louisiana, in the course of which he discovered Pike's Peak in the Rocky Mountains and reached the Rio Grande; was detained by Spanish authorities, taken to Santa Fé for examination, and his papers seized. Being ultimately released, he arrived at Natchitoches July 1, 1807, received the thanks of the government for his services, was rapidly promoted, published in 1810 an account of his two expeditions, became brigadier-general 1813, and commanded the expedition sent against York (now Toronto), Canada, in the assault of which place he was killed, Apr. 27, 1813. (See his *Life*, by H. Whiting, in Sparks's *American Biography*, 2d series, vol. v.)

Pike Creek, tp., Shannon co., Mo. P. 155.

Pike's Peak, a summit of the Rocky Mountains, in El Paso co., Col., is 14,336 feet in height above the sea. It is 10 miles S. W. of Manitou, and from its summit there is a most noble prospect. The ascent is quite difficult. It is nearly in lat. 39° N., lon. 105 W., and received its name in honor of Gen. Z. M. Pike, who discovered it in 1806.

Pikes'ville, p.-v., Baltimore co., Md.

Pike'ton, p.-v., cap. of Pike co., Ky., on the W. fork of Big Sandy River.

Piketon, p.-v., Seal tp., Pike co., O., on Scioto River. P. 638.

Pike'ville, p.-v., cap. of Marion co., Ala., on Battahatchie River.

Pikeville, p.-v., Lockhart tp., Pike co., Ind.

Pikeville, v., Pike co., Ky. P. 140.

Pikeville, p.-v., Wayne co., N. C. P. 1720.

Pikeville, p.-v., Greenville tp., Darke co., O. P. 356.

Pikeville, p.-v., cap. of Bledsoe co., Tenn. P. 188.

Pilas'ter [Lat. *pila*, a "pillar"], a square pillar, usually attached to the wall, from which it often stands out but little. It sometimes has the taper of a column, and is sometimes of equal breadth from top to bottom. Its base and capital conform to those of the pillars or columns. The name pilaster is also given to the column of rough brick or stone standing on the inside of a wall, and designed to sustain the end of a sleeper for the floor above.

Pi'late (Pontius), the sixth Roman procurator of Judæa and Samaria (ἡγεμών in the Gospels; ἐπίτροπος with Philo Judæus; *procurator* with Tacitus; *governor* in King James's translation); entered his office in 25 or 26 A. D., residing partly in Cæsarea, partly in Jerusalem, where he inhabited the magnificent palace built by Herod the Great. In 36 he was arraigned by the Samaritans before the Syrian proconsul, Vitellius, on account of his unjust and cruel government, and Vitellius sent him to Rome to answer the accusations before the emperor. The issue is not known with certainty. According to Eusebius, he was banished to Vienne in Gaul, and committed suicide in 38. According to a widely-spread tradition, he was beheaded under Nero. A great number of legends, more or less fanciful, clustered naturally around his name. His singular behavior during the trial of Christ, as we read it in the Bible, excited from the earliest time a most vivid interest, and occasioned very different explanations. Tertullian calls him *jam pro sua conscientia Christianum*, and the Æthiopian Church declared him a martyr and a saint. Modern scholars, however, agree generally in considering him one of those frivolous characters which were the natural offspring of the Roman civilization in the Augustan period—by no means incapable of receiving a strong impression of the sublime, but utterly unable to act on such an impression. And the cruel massacre of the Samaritans at Gerizim, the nearest cause of his downfall, is not inconsistent with that kind of weakness of character which rises from moral indifference. The so-called *Acta Pilati* are spurious, but it is not improbable that he addressed a report of the trial of Christ to the emperor.

Pilat'ka, p.-v., cap. of Putnam co., Fla., on St. John's River, 30 miles S. W. of St. Augustine, has 1 weekly newspaper, and is situated in a fine sugar and cotton region. P. 720.

Pilchard. See Clupeidæ.

Pilcomay'o, a river of South America, is formed in lat. 21° 35′ S. by the junction of two streams, which both rise in the Bolivian Andes, the one near Potosi, the other near Chuquisaca. It flows S. E. through the territories of the Argentine Republic, and joins the Paraguay a few miles below Asuncion, after a course of about 1200 miles. It has yet not been thoroughly explored.

Pile (William A.), b. near Indianapolis, Ind., Feb. 11, 1829; became a Methodist preacher of Missouri; chaplain of a volunteer regiment 1861; captain of artillery 1862; colonel of infantry volunteers 1862; brigadier-general of volunteers 1863, serving with distinction to the end of the war; was chosen to Congress in 1866 from Missouri, and afterward became U. S. minister to Venezuela.

Piles, in engineering. See Bridge and Foundation.

Piles, or **Hæmorrhoids** [Gr. αἷμα, "blood," and ῥέειν, to "flow"], vascular and fibro-vascular tumors of the lower bowel or rectum—termed *external* piles when below the sphincter muscle and upon the verge of the anus; *internal* piles when above the sphincter. In structure they are due to congestion of the hæmorrhoidal veins, which are a part of the portal venous circulation, returning blood from the intestines through the portal vein and liver to the vena cava and the heart. Piles when chronic are varicose veins of the anus and rectum, with fibrous thickening of the tissues and mucous membrane investing them. Piles seldom afflict persons who are robust, abstemious, frugal, and engaged in active exercise. They result from excessive eating and drinking, congestion of the liver, alcoholic excesses, and constipation and costiveness. Sedentary occupation favors their development. Cavalry officers and railway travellers suffer from piles—in part from constipation, in part from the influence of incessant jarring and hypostatic congestion of the lower bowel. The abuse of harsh and powerful cathartics, drinking water impregnated with mineral substances, and too fine, non-laxative diet may develop piles. Pregnant women have piles from pressure of the gravid uterus upon the veins. Piles are often the result of overheated blood and plethora, and hence are a frequent disease in tropical countries and very hot seasons. Internal piles may increase in size, and in efforts of evacuation be protruded from the bowel. By this stretching the hæmorrhoidal tumors in time become pedunculated, and are forced out with every act of defecation. They require to be constantly returned: failure to do this may result in their strangulation, ulceration, bleeding, and even removal by gangrene. External piles when inflamed may also ulcerate and bleed. Hæmorrhoids when inflamed render evacuations of the bowels very painful, and cause suffering in sitting and walking. Patients with hæmorrhoids usually discharge mucus from the anus, and sometimes shreds and patches of organized lymph. They are to be prevented, and also treated in their milder forms and stages, by regulated, laxative diet, active exercise, and mild saline cathartics. When pedunculated they may be removed by the knife, ligature, or galvano-cautery. When piles are strangulated they must be reduced in size by ice or cold water, oiled, and returned. Ulcerated and inflamed piles are treated by cold applications, astringent and anodyne ointments, and free evacuation of watery stools by use of saline cathartics.

E. Darwin Hudson, Jr. Revised by Willard Parker.

Piles'grove, tp., Salem co., N. J. Pop. 3385.

Pill [Lat. *pilula*], a spherical solid pharmaceutical preparation, smaller than the bolus and larger than the granule. Pills are convenient and easy of administration, especially when coated with sugar or isinglass in such a way as to conceal the taste of the drugs employed. Most pills contain, besides the active medicinal elements, one called the vehicle or excipient, which is commonly but not always inert.

Pillar. See COLUMN.

Pillar Saints, in the Eastern Church, chiefly in Syria, a class of ascetics who dwelt each on the top of a lofty pillar, after the example of ST. SIMEON STYLITES (which see). The practice began to prevail in the fourth century, and in the twelfth was not yet extinct.

Pillars of Hercules. See GIBRALTAR.

Pil'lau, the port of KÖNIGSBERG (which see), on the Baltic, at the entrance of the Frische Haff, fortified, and has 2909 inhabitants.

Pil'lory [Fr. *pilori*, from *pilier*, a "pillar"], an instrument of punishment, consisting of a wooden frame in which the offender's head and arms were inserted, he being then left exposed to public ridicule. Something of the kind existed in England previous to the Norman Conquest, and was known as the *halsfang*, or catch-neck. From the reign of Henry III., and especially during the sixteenth, seventeenth, and eighteenth centuries, the pillory was a statute punishment for perjurers, forgers, users of false weights, etc., and was not altogether abolished until 1837. In France a similar implement, called the *carcan*, was in use until 1832. The pillory existed on the statute-books of the U. S. until 1839, but it seems to have been rarely if ever employed.

Pil'low (GIDEON JOHNSON), b. in Williamson co., Tenn., June 8, 1806; graduated at the University of Nashville 1827; studied law; practised successfully at Columbia; was a delegate to the national Democratic convention of 1844, where he was influential in securing the nomination of James K. Polk for the Presidency; was appointed brigadier-general of Tennessee volunteers July 13, 1846; was at first with Gen. Taylor on the Mexican frontier, afterward joined Gen. Scott at Vera Cruz; took a prominent part in the siege of that city; was one of the commissioners to receive its surrender; commanded the right wing at the battle of Cerro Gordo, where he was wounded; was made major-general Apr. 13, 1847; took part in the battles of Churubusco, Molino del Rey, and Chapultepec, being severely wounded in the latter; came into collision with Gen. Scott in regard to the convention of Tacubaya, which he disapproved, and at his own request was tried by a military court upon charges of insubordination preferred by Gen. Scott, but was honorably acquitted; resumed the practice of law in Tennessee; was a member of the Nashville convention of 1850, where he opposed extreme measures; raised a large force of Tennessee volunteers for the Confederate service in 1861; was appointed major-general; commanded at the battle of Belmont, Nov. 7, 1861; was second in command at Fort Donelson in February; refused to take the chief command; escaped before the surrender, and afterward served under Gen. Beauregard in the S. W.

Pi'lot [Fr. *pilote*]. Pilots in the early days of navigation were assistants selected by the master, on account of their knowledge of seamanship and navigation, to advise with him on the management and keep the reckoning of the vessel. In the first voyage of Columbus the first day out a reckoning was ordered to be kept; on Sept. 10, four days out, Columbus's journal says "two reckonings kept;" Oct. 1, the admiral (Columbus) compares reckoning with his pilot, by which it appears the pilot was 580 leagues from Hierro. The admiral acknowledged 584, but his private reckoning was 707. In modern times pilots are trained to special duties, those of guiding vessels entering and departing from ports where the navigation is difficult and dangerous. Hence, all maritime countries have endeavored to maintain their efficiency by affording to them means of instruction and by punishing them for misconduct or incapacity. For these purposes, and for securing reciprocal benefits to shipowners, most systems of maritime law have made their employment compulsory. The duty of a pilot, as soon as he boards a vessel at sea, is to report himself to the master, and make inquiries as to the anchors and cables, to see that he has a leadsman at hand with his lead (in a large vessel, two), and that the signal-lights are ready for use. He should inform the master when he is ready to direct the piloting of the vessel, which, if the master wishes, may be as soon as he gets on board; but the New York pilot commissioners prefer that the master keep control until within 15 miles of Sandy Hook lighthouse, as the Sandy Hook pilots often board vessels 350 miles from that light, and the masters are supposed to be better navigators and know the qualities of their vessels better than the pilots do. If the master does not give up the control of the vessel at once, the pilot should place himself near the man at the wheel to see how the vessel minds her helm, steams or sails, and be ready to co-operate with the master in any advice or assistance which may be asked of him until he takes the direction of the vessel. But the master is in no case relieved of his command until the voyage is completed. His responsibility continues even after the pilot has taken the direction of the vessel. The duty of a pilot, strictly, is to keep her in the channel-way and conduct her safely to her anchorage or dock. It is not only proper, but necessary, that a pilot should be a good seaman, but the management of the vessel, whether moved by steam or sails, belongs to the master. He takes the orders from the pilot whether to go fast or slow, if under steam—if under canvas, to make or take in sail—and sees that they are executed. It is considered "a valid offer of service" on the part of a pilot that he hail the vessel when the pilot-boat is so near that the hail was heard on board of the vessel, or might have been if there had been a proper lookout kept. The pilot should always be informed by the master whether he is required to stay on board of the vessel after being anchored, to prevent dispute. The liability of pilots for their acts in a pecuniary point of view has not been settled in this country. The English law limits their responsibility to the amount of their bond. The New York pilot commissioners punish them by taking away their licenses and mulcting the pilotage. The Law of Oléron allowed the seaman or master to strike off the head of the pilot if he lost or even perilled the ship, providing he could not pay for her. The Danish law allowed him to be keelhauled thrice. The English law on the subject of responsibility is, that "no master or owner of any ship is to be answerable to any person whatever for any damage done by the fault or incapacity of any qualified pilot in charge of his ship within any district where the employment of such pilot is compulsory." The U. S. Supreme Court, in the case of the steamship China, has decided that the owner of the vessel in fault is liable for damages, although there was a licensed pilot on board at the time of the collision; also, that the taking of a pilot is compulsory. A master refusing to take a licensed pilot vitiates the insurance on the vessel, and makes himself and owners responsible for any loss to the owners of goods on board of the vessel which may be caused by this refusal. In the U. S. the States regulate the laws of pilotage by the acts of Congress of 1789, of 1837, and of 1866; in Great Britain by acts of Parliament.

A comparison of the pilots between the two greatest ports in the world is appended:

1873.	Liverpool.	New York.	New Jersey.
Number of pilots	270	176	43
Vessels piloted	17,186	10,307	2388
Accidents	106	29	
" investigated	40	5	
Pilots punished	7	4	2

GEORGE W. BLUNT.

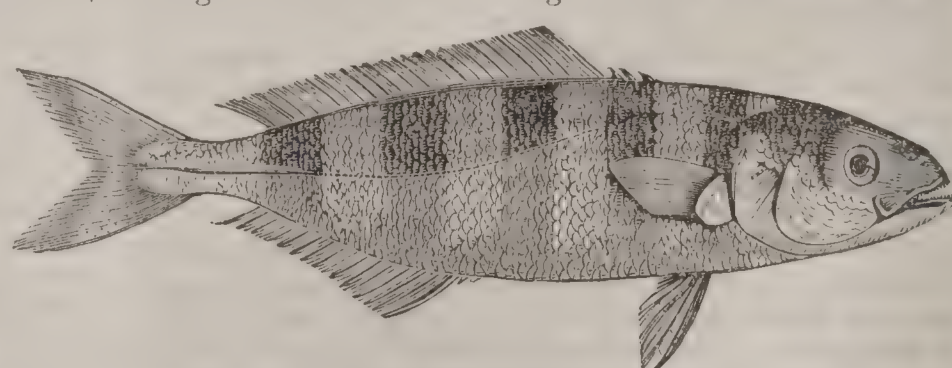
Pilot, tp., Kankakee co., Ill. P. 1140.

Pilot, p.-v. and tp., Vermilion co., Ill. P. 1332.

Pilot, tp., Iowa co., Ia. P. 623.

Pilot, tp., Surry co., N. C. P. 1311.

Pilot Fish, or **Pilot,** a name given because the fish in question was formerly supposed to act as a pilot to the mariner, and is still supposed to act as such to sharks; it is applied to certain carangoid fishes of the genus *Naucrates*. These are found in almost all tropical and temperate seas, and often follow in the wake of vessels, associating with sharks and taking the refuse thrown from the ships. They are elongated, symmetrical, fusiform fishes of graceful form and with seven cross-bands of black, which, however, in part disappear in after life. They are remarkable for the changes which they undergo, and which have given rise to numerous nominal species. Thus, (1) in the very young a well-developed spinous dorsal fin of three to six spines exists, and the preoperculum is armed with large radiating spines; and to this stage the name *Nauclerus* has been given. (2) At a later period, but while the spinous dorsal fin still persists, the preoperculum loses in spines, and the form has been then confounded with the genus *Seriola* under the names *S. Dussumieri* and *S. succincta*. (3) Finally, the dorsal spines cease to grow, and the mem-



The Pilot Fish.

brane is almost lost, while the preoperculum has a perfectly entire margin, and thus the fish assumes the form of *Naucrates.* The common, and possibly the only distinguishable, species of *Naucrates* is *N. ductor.* It is rarely seen much more than a foot long. THEODORE GILL.

Pilot Grove, tp., Hancock co., Ill. P. 1217.

Pilot Grove, p.-v. and tp., Faribault co., Minn. P. 390.

Pilot Grove, p.-v. and tp., Cooper co., Mo. P. 1086.

Pilot Grove, tp., Moniteau co., Mo. Pop. 1024.

Pilot Knob, p.-v., Iron co., Mo., on Arkansas branch of St. Louis and Iron Mountain R. R., situated at the base of the celebrated Pilot Knob Mountain, much of which consists of iron ore.

Pilot Mound, p.-v. and tp., Boone co., Ia., on Des Moines River. P. 747.

Pilot Mound, p.-v. and tp., Fillmore co., Minn., on Root River. P. 945.

Pilot Mountain. See ARARAT.

Pilot Point, p.-v., Denton co., Tex.

Pilot Rock, tp., Johnson co., Ark. P. 164.

Pilot Rock, p.-v. and tp., Cherokee co., Ia., on Little Sioux River and Dubuque and Sioux City R. R. P. 280.

Pilpay. See PANCHATANTRA.

Pil'sen, town of Bohemia, at the confluence of the Mies and the Beraun, is surrounded with walls, and has good educational institutions, large breweries, manufactures of leather and pottery, and four annual fairs, which are much attended. P. 23,681.

Pim (BEDFORD CLAPPERTON TREVYLIAN), b. at Bideford, Devonshire, England, June 12, 1826; was educated at the Royal Naval School; went to India in the merchant service; was appointed on his return a volunteer of the first class in the navy; was employed for some years in coast survey duty; made a voyage round the world in H. M. S. Herald 1845–51; was engaged in the search for Sir John Franklin, both in Behring's Strait and in Baffin's Bay; saved the crew of the Investigator; was the first officer who passed from a ship on the eastern to a ship on the western side of the N. W. passage; saw active service in the Crimea and in China, where he received six wounds; became a commander in the British navy Apr. 19, 1858; visited the Isthmus of Suez and studied the question of an interoceanic canal 1859; was sent to the West Indies, and afterward to Western Africa, in command of the Gorgon; retired on half-pay 1861; visited Nicaragua 1862, in company with Dr. Berthold Seemann; devoted himself for several years to the project of an interoceanic communication across Nicaragua, and to the promotion of gold-mining in the same republic; wrote *The Gate of the Pacific* (1863) and (in connection with the late Dr. Seemann) *Dottings on the Roadside in Panama, Nicaragua, and Mosquito* (1869); was imprisoned and put in irons in Paris on a charge of fraud in connection with a loan to one of the Central American states, but soon obtained his discharge; was made captain Apr. 16, 1868; placed on the retired list Apr., 1870; was admitted to the bar at the Inner Temple Jan. 27, 1873, and was chosen to Parliament as a Conservative for the borough of Gravesend at the general election of Feb., 1874. Author of numerous geographical pamphlets, of an *Essay on Feudal Tenures,* and a history of the late Franco-German War, *The War Chronicle* (1837). Capt. Pim is a magistrate for the county of Middlesex, a member of several scientific societies, and proprietor of a newspaper called *The Navy,* devoted exclusively to the maritime interests of Great Britain.

Pi'ma, county of S. E. Arizona. Area, 28,000 sq. m. It is traversed by numerous mountain-ranges and has a very dry climate. The soil when irrigated is usually very fertile. Mining and cattle and wool raising are the leading pursuits. The county is bounded N. by Gila River, E. by New Mexico, and S. by Mexico. Cap. Tucson. P. 5716.

Pimas, or **Névomes,** a nation of agricultural and non-nomadic Indians of Arizona, called by themselves *Ohotama,* classed by H. H. Bancroft along with the Maricopas and Pápagos in the Pueblo family of the New Mexican group. Dr. J. G. Shea connects them, on the evidence of language, with the Opatas, Eudeves, and Joves of the Mexican states of Sonora and Sinaloa. The whole region, from the Gila River southward to the Yaqui River (Sonora), was known to the Spaniards as the Pimeria, and divided into Alta and Baja ("upper" and "lower"), the latter being that now occupied by the Opatas and their allied tribes. The Pimas were subdivided into a multitude of bands, to which specific names were given by the Mexican missionaries, but they seem to have rested upon no ethnological evidence. Missions were begun among the Pimas proper in the seventeenth century, and at the close of the eighteenth century they had 22 towns with 8 missions. They now occupy, along with the Maricopas, a reservation of 64,000 acres on both sides of the Gila River, from Maricopa Wells to Sacaton, in Pima and Maricopa counties, set apart for them in accordance with the act of Feb. 28, 1859. They are tall, bony, and well formed, are fond of athletic games, wear cotton blankets of their own manufacture, live in villages of dome-shaped huts, and wage a perpetual warfare against the Apaches. They cultivate the soil by means of irrigation, are skilful in weaving, in basket and boat making, and have a rude kind of pottery. They are much addicted to intemperance, and have many curious superstitions, one of them being a purification of sixteen days after having killed an enemy. They now number about 4000, and are under the religious influence of the Reformed (German) Church. A grammar of the Pima or Névome language (which is totally different from the Maricopa), by Buckingham Smith, was published in New York in 1862. (See *The Native Races of the Pacific States,* by H. H. Bancroft, vol. i., 1874.) PORTER C. BLISS.

Pimelepter'idæ [Gr. πιμελή, "fat" or "thick," and πτερόν, "a fin"], a family of fishes of the order Teleocephali and sub-order Acanthopteri. The body is compressed, and more or less oval and symmetrical, the outlines being correspondingly developed above and below the median axis; the scales are rather small; the lateral line entire; the head rounded forward; the opercula generally armed—*i. e.* preoperculum serrated and operculum with spines; mouth with an oblique lateral cleft; upper jaw moderately protractile; teeth compressed, and forming a more or less cutting edge; branchial apertures continuous below; branchiostegal rays seven; dorsal and anal fins with their soft parts opposite each other, and thick with scales; dorsal spines rather numerous, 10–12 (?); caudal separate from dorsal; pectorals with branched rays; ventrals thoracic, each with one spine and five soft rays; the skeleton has the normal or nearly normal number of vertebræ (9–10 + 14–16); the pyloric cæca are developed in great number. The species of the family are generally readily recognizable by their symmetrical outline, scaly fins, and trenchant teeth, and may be distributed among at least three subfamilies—Pimelepterinæ, Girellinæ, and Scorpidinæ; these are mostly inhabitants of the tropical or warm seas; one species (*Pimelepterus Boscii*) ascends northward to the Atlantic coast of the U. S. THEODORE GILL.

Piment'a, or **Pimento** [Sp. *pimiento*], the unripe berries of *Eugenia pimenta,* a handsome evergreen tree of the natural order Myrtaceæ, growing throughout the West Indies and in Mexico and South America. The name is a corruption of *pimiento,* the Spanish for "pepper." The fruit is a small globular berry, rather less than a third of an inch in diameter; it is two-celled, each cell containing a single black kidney-shaped seed. The active principles are a volatile oil, contained in the proportion of from 3 to 4 per cent., and a green fixed oil. Both of these occur in largest proportion in the cortical portion of the fruit. Pimenta has a warm, pungent, aromatic taste, and may be used in medicine for the general purposes of the aromatic spices—namely, as stomachics, to improve digestive power, to allay nausea, and correct the nauseating and griping effects of other medicines. But its most common use is as a spice in cookery, for which it is largely consumed under the name of "allspice" or "Jamaica pepper." It is obtained in commerce from the island of Jamaica. EDWARD CURTIS.

Pim'pernel, or **Poor Man's Weather-glass,** the *Anagallis arvensis,* a common herb of Europe, naturalized in North America, having rather handsome flowers, most commonly scarlet, but often white or blue. It is remarkable that it always closes upon the approach of bad weather. The water-pimpernel is *Samolus valerandi,* found in the U. S. and most other countries. *S. floribundus* and *ebracteatus* are found in the Gulf States. The above plants all belong to the Primulaceæ. The first-mentioned one was thought to have active medicinal powers, and the second was once looked upon as having magical qualities.

Pinal, county of S. Arizona, formed since the census of 1870.

Pi'na Mus'lin, a very valuable and costly fabric made in Manila from the fibre of pineapple leaves. It is extremely beautiful, delicate, and durable, and is chiefly employed in making ladies' handkerchiefs and dresses. It has a pale yellow tint, is transparent, and is exported only in small quantity.

Pinas'ter, the *Pinus pinaster* or *maritima,* or cluster-pine of Europe and Asia, and planted extensively in the Landes of France, where, with the *Laricio,* it covers what were once great wastes of sand. Its timber is poor, but it yields immense amounts of tar, pitch, turpentine, and lamp-black. It is a noble tree.

Pinch'beck [the name of the inventor], a kind of brass formerly much used for making cheap watch-cases, and now used as a substitute for the more costly bronze. It contains over 80 per cent. of copper, and the rest is zinc, and has when new a look quite like that of gold.

Pinck'ney, p.-v., Putnam tp., Livingston co., Mich., on Portage Lake. P. 446.

Pinckney, p.-v. and tp., Lewis co., N. Y. P. 1149.

Pinckney (Charles), LL.D., b. at Charleston, S. C., 1758; was bred a lawyer, and during a part of the Revolution was held a prisoner by the British; was in Congress 1784–87, and in the convention of 1787 which framed the U. S. Constitution; president of the convention of 1788 in which South Carolina ratified the U. S. Constitution, and of the State convention of 1790; governor of the State 1789–92, 1796–98, 1806–08; U. S. Senator 1798–1801; minister to Spain 1802–05; and was again in Congress 1819–21; an ardent and eloquent anti-Federalist. D. at Charleston Oct. 29, 1824.

Pinckney (Charles Cotesworth), LL.D., b. at Charleston, S. C., Feb. 25, 1746, son of Judge Charles Pinckney; was educated at Westminster, at Christ Church, Oxford, and the Middle Temple, London; studied military science at Caen, France; became a barrister at Charleston 1769; served as captain, and afterwards as colonel of South Carolina troops in the Revolution; was aide to Washington in 1777; displayed great valor and skill in the Southern campaigns 1778–80; suffered much as a prisoner of war 1780–82; became a brigadier-general 1783, and later a major-general of the State, and still later of U. S. troops (1797); declined many important offices; assisted in framing the U. S. Constitution; was one of the special ministers to France 1796–97, when he was ordered to leave that country; was the author of the famous sentiment, "Millions for defence, but not one cent for tribute;" Federalist candidate for Vice-President 1800, and one of the ablest lawyers of his time. D. at Charleston, S. C., Aug. 16, 1825.

Pinckney (Henry Laurens), b. at Charleston, S. C., Sept. 24, 1794, son of Gov. Charles Pinckney and brother-in-law of Robert Y. Hayne; graduated at South Carolina College 1812; became a prominent lawyer, legislator, and State Rights leader; mayor of Charleston 1832, 1839–40; in Congress 1833–37; edited for a time the Charleston *Mercury;* was collector of the port; author of memoirs of J. Maxcy, of Jackson, and of R. Y. Hayne. D. at Charleston Feb. 3, 1863.

Pinckney (Thomas), brother of C. C. Pinckney, b. at Charleston Oct. 23, 1750; graduated at Oxford, and was called to the bar at the Temple, London, 1770; entered the Revolutionary army, in which he served with much distinction, receiving a bad wound at Camden; governor of South Carolina 1787–89; U. S. minister to London 1792–94, and to Madrid 1794–96, when he negotiated the important treaty of San Ildefonso; was in Congress 1799–1801; appointed major-general 1812, and served against the Creeks and Seminoles with success. D. at Charleston Nov. 2, 1828.

Pinck'neyville, p.-v., cap. of Perry co., Ill., on Beaucoup Creek, at the junction of St. Louis Alton and Terre Haute with Iron Mountain Chester and Eastern and St. Louis and Cairo Short Line R. Rs., has 2 weekly newspapers and manufactories. P. 773.

Pin'dar, the greatest lyric poet of Greece, b. at Cynoscephalæ, a village near Thebes, Bœotia, in either 518 or 522 B. C., and studied his art at Athens under the tuition of Lasus, Agathocles, and Apollodorus. The lyrical art in those times comprised not only the rhythmical arrangement of the words, but also the composition of corresponding vocal and instrumental music and of accompanying choral dances; and Pindar is said to have been equally great in all these branches of his art, though, from what has been left to us, we can only form an opinion of his talents with respect to the first point. On his return to his native city he entered into the lyrical contest with the celebrated poetess, Corinna, and was beaten five times. Nevertheless, his merits were soon recognized. His fame grew great, and, invited by kings and free cities, highly honored and richly paid, he wandered from place to place where the Greek nation lived and the Greek tongue was spoken, celebrating the great games and religious festivals with his songs. He resided for a period of four years at the court of Hiero, tyrant of Syracuse, but left it on account of his disagreement with Simonides; lived for several years at Athens; entertained friendships with Alexander, son of Amyntas, king of Macedon, and Theron, tyrant of Agrigentum. D. at Argos about 442 B. C., sitting in the theatre. His poems, consisting of pæans and dithyrambs (hymns to the gods), prosodia and partheneia (songs for processions), hyporchemata (songs for choral dances), scolia (drinking-songs), threnoi (dirges), etc., were gathered by the old grammarians into 17 books, but only four of these have come down to us—the so-called *Epinicia*, containing his triumphal songs in celebration of the Olympian, Pythian, Nemean, and Isthmian games. The metrical rhythms of these poems are almost entirely inapprehensible to us, as the musical composition has been lost; perhaps the abruptness of their style and the obscurity of their form are due to this very same circumstance, at least to some extent. But in spite of these disadvantages, Pindar's odes show a powerful and elevated imagination and a deep and earnest religious feeling. The best aids in studying his poems are the edition of Böckh, with notes and introductions (Leipsic, 1811–22), and *Essais sur le Génie de Pindare et sur la Poésie lyrique*, by Villemain (Paris, 1859). The translations, English by Cary and Abraham Moore, German by Thiersch and Ludwig, are as hard to understand as the original text.

Pind-Dadun'-Khan, town of the dominion of Punjaub, British India, on the Jhylum, is poorly built, consisting of mud huts; has a population estimated at from 6000 to 13,000, and important saltworks.

Pindemon'te (Ippolito), b. at Verona Nov. 13, 1753; studied at Modena, and afterward travelled very extensively throughout Europe; was the personal friend of almost all the scholars of his time, many of whom consulted him as a man of perfect taste. Ugo Foscolo dedicated to him his *Sepolcri*, to which Pindemonte replied with his own *Sepolcri*. Vittorio Alfieri, who always sent his verses to Pindemonte for revision, used to say jocosely that he acted as his *blanchisseuse*. He wrote prose and verse with equal elegance. Gentle by nature, his satire was very delicate and without passion. He translated the *Odyssey* into Italian verse. Count Benassù Montanari of Verona published at Venice in 1834 a full monograph on the life and works of Pindemonte. D. Nov. 18, 1828.—His brother, Giovanni Pindemonte, b. in Verona 1751, author of the tragedy entitled *I Baccanali di Roma*, surpassed him in poetical genius and in liveliness of fancy, although he was less correct in form. D. Jan. 23, 1812.

Pine [Lat. *pinus*], the collective name of a tribe of plants of the greatest importance to man and of the greatest interest to science. We take here the word *pine* in the Linnæan sense, comprising a number of allied forms, which have been popularly as well as scientifically distinguished, but have always been kept united, if not in the genus *Pinus*, at least in the pine-tribe, Abietineæ. They belong to the family of Coniferæ, ligneous plants with sterile and fertile flowers separate, of the most simple and primitive structure, without any envelopes, such as calyx or corolla, and in the fertile ones the germs or ovules borne on open scales; not enclosed in carpels, as in all other flowering plants, nor the seeds in regular fruits. They thus belong to the class Gymnosperms, or plants with naked seeds, which mark the dawn of the higher vegetable development, and form a transition from the flowerless to the flowering plants, from the ferns and club-mosses to the palms, the oaks, etc. But, remarkable enough, though not quite unexpected in organic development, we find, together with their imperfect flowers, a high organization of the trunk, which is regularly exogenous, growing by external accretion of annual rings, though its microscopic anatomy shows essential differences from that of the other trees of our forests.

As in organic development, so in geological history, these Gymnosperms assume their place on our globe with the first land-plants, and immediately after, if not contemporaneous with, the higher Cryptogams mentioned, in the Carboniferous and even in the Devonian period, long before we find traces of any other higher organized flowering plants. The conifers of those oldest periods are closely allied to the South American representative of pines, *Araucaria;* but real pines also made their appearance long before ordinary trees, in what geologists term the Mesozoic age.

The pines, in the wider sense, are distinguished from other conifers by bearing two inverted ovules on each carpellary scale, many of which are crowded together in a cluster (inflorescence), and eventually form the well-known pine-cone, in which each well-developed scale covers two winged seeds. All the pines have linear, almost always stiff and evergreen leaves, often called needles. They are confined to the northern hemisphere, and are the only forest trees of high latitudes and altitudes. Toward the Arctic zone, in the more elevated parts of all mountain-chains, in the higher Alleghany Mountains, in the whole Rocky Mountains, and the Californian Sierras, these sombre evergreens constitute the entire forests; in the warmer temperate regions they often occupy and adorn sterile tracts unsuited to any other forest vegetation; towards the tropics they are confined to higher mountainous districts. In North

America, and especially westward, the pines are more diversified and more extensively and variously developed than in the Old World.

The wood of the pines is the most important of all trees on account of its abundance, size, lightness, and durability, and equally indispensable to us are the resinous products of these trees—tar, pitch, rosin, and turpentine—which no other plants can furnish. An essential article of food to many birds and beasts, to man the oily seeds are only remarkable as the sustenance of some Western Indian tribes, though the larger ones in the S. of Europe and Western U. S. are also much relished by civilized people.

The most numerous and most important of these Abietineæ are the trees which are more strictly called pines—*Pinus* of most modern botanists. Their angular, two or three-edged leaves (almost always serrulate or rough on the edges), in bunches of two to five, are enclosed in a sheath of membranaceous scales; only one (W. American) species has a single rounded leaf in this sheath. Their sterile flowers develop abundantly at the base of the shoots of the same spring; the fertile clusters appear singly, or a few together higher up or near the top of such shoots. The young fruit remains almost stationary for a whole year, and only in the second summer the cone enlarges, maturing in the autumn. The true pines spread over the whole geographical region assigned to the Abietineæ, from the Arctic countries to the shores of the Atlantic in our South-eastern States, and to the mountains of Mexico, Central America, and the West Indian islands, as well as to the Atlas and Himalaya, and even to the Philippine Islands.

We distinguish two sections of true pines. The white pines have five mostly slender leaves in a bunch; scales of the cones rather thin; wood whiter, lighter, softer, and less resinous, and therefore highly prized for carpenterwork. Of these our Eastern and Northern white pine (*P. strobus*) is the fairest representative, a tree of magnificent proportions and universal application, and highly prized as an ornamental tree. The immense pine woods of Maine, Michigan, and Wisconsin stand first among the great national resources of this country, which we might take better care of than we do. Similar, still more ornamental, but also more tender, is the Himalaya or Bootan white pine. In our West this group of pines is represented by the colossal sugar pine (*P. Lambertiana*), with its immense cones and large edible seeds, and by the mountain white pine (*P. monticola*) of the Pacific mountains; another species, with large squarrose cones (*P. ayacahuite*), is spread over the Mexican mountains. Similar to these, but distinguished by more rigid leaves, shorter, thicker cones, with thicker scales and large, edible, almost wingless seeds, is the small group of the Cembra pines, the principal species of which grows on the European and Siberian Alps, the similar *P. albicaulis* on the Pacific alps, and *P. flexilis* on the Rocky Mountains. *P. cembra* furnishes the red wood with the white sap from which those pretty particolored Swiss carvings are made.

The second and by far the largest section of true pines comprises those with knobby scales, leaves from one to five in a bundle. The small group of the four Mexican and W. American nut-pines closely approaches to the last; they are small and scraggy trees, that make excellent firewood, with globose cones, the scales thick with very prominent knobs, bearing large, edible, wingless seeds, like those of Cembra, and with leaves varying in the different species from a single one (*P. monophyllos*) to five in number.

Next to these range the large-fruited nut pines, with thick or hook-knobbed scales, and large short-winged seeds, of which *P. pinea* is the Mediterranean, and *P. Sabiniana, Coulteri*, and *Torreyana* the W. American representatives. Of the large number of pines remaining, some bear their cones just below the terminal bud of the same year's shoot; their scales are usually thinner, with less prominent prickles, and their wood whiter and less resinous. The Scotch and the Austrian pine of Europe, and our red pine of the North, all of them with leaves in pairs, belong here, as also the long and five-leaved, large-coned, and variable Mexican pines of the alliance of *P. Montezumæ*. Those pines that bear lateral cones have usually very knobby and prickly scales, and heavy, resinous, yellowish wood—the real *yellow* or *pitch pines*. Here range the seaside pine (*P. pinaster* of the Mediterranean regions), the Eastern pitch pine, the Jersey pine, prickly pine, loblolly pine, the yellow pine, Elliott's pine, and, above all, that most important and magnificent of all our pitch pines, the long-leaved pine of the South (*P. australis*), which furnishes a most highly prized naval timber and nearly all the resinous products of our country. To the yellow pines belong also a number of Western pines, the most important and widest spread of which is the heavy pine (*P. ponderosa*) and *P. contorta*, and the most interesting but very local Monterey pine (*P. insignis*), and a few others.

All the other trees allied to the true pines are distinguished by single, not sheathed leaves, by bearing their flowers on branchlets of the previous year, and by maturing their seeds in one season (except the cedar). Here belong the firs (*Abies*), stately trees with usually flat, two-ranked leaves, bearing on their uppermost branches large erect cones, which at maturity fall to pieces. The silver fir of Europe, the silver or balsam fir of the North, which furnishes the Canada balsam, the grand fir, the great timber tree of Oregon, the pale fir of the Rocky and California mountains, are fine examples of these magnificent conifers; but the largest of all seems to be the justly so-called *Abies magnifica* of the higher Sierras, one of the two spruce-leaved firs peculiar to the Western mountains. The timber of the firs is not as highly esteemed as that of the pines or spruces, as being more brittle and less durable.

The hemlock-spruces (*Thuja*) have the flat leaves of the firs and the pendulous cones with persistent scales of the spruces; their spray is light and graceful, and their cones of the smallest, the wood rather inferior, but the bark greatly valued for tanning purposes. One species belongs to Eastern, another to Western America; two others to Japan and the Himalaya. Allied to the hemlock-spruces are two Western trees, the Douglas spruce, with flat leaves and larger cones fringed with long protruding bracts, common in the Rocky and California mountains, and far into Mexico; and the rare Patton spruce, from the highest points of the mountains from British Columbia to California, with smooth, slender cones and somewhat triangular leaves.

Of greater importance to us are the spruces (*Picea*), elegant, regularly-shaped trees, with square leaves, and persistent scales to their pendulous cones. Here belongs the most important timber tree of Europe, the Norway spruce; in this country we have the black and the white spruce of the North and East, and Menzies' and Engelmann's spruce of the West, the first and last of which are the most useful spruces of our country, with fine, white, and even timber.

The last of the pine tribe are the larches and the cedars. Both have two different kind of branchlets: vigorous elongated shoots with distinct single leaves, and short, knobby, lateral branchlets with crowded (fasciculated) leaves; such stunted branchlets also bear the flowers and fruit. The larches (*Larix*), peculiar to the mountains of Europe, Asia, and N. W. America, and the tamarack, to the swampy regions of North-eastern America, are the only trees belonging here that bear deciduous leaves. They are of some economical importance in the countries where they abound. The cedars (*Cedrus*) are distinguished from the larches by their persistent foliage, autumnal flowers, and their large compact cones, which mature one year after flowering, and after some time drop to pieces. They are, like our *Sequoias* of the West, of limited geographical range, being peculiar to some mountain-ranges of the Old World—the Atlas in Africa (Atlas cedar), the Lebanon and Taurus in Western (true cedar of Lebanon), and the Himalaya in Eastern Asia (the deodar). The cedars of Lebanon have been well known since ancient times, highly prized as the most precious timber-trees, and are greatly esteemed now as the stateliest ornamental trees in climates suited to them, such as Southern Europe, including the S. of England. Our climate seems to be less favorable to their development; in Missouri they get winter-killed every few years. GEORGE ENGELMANN.

Pine, county of Minnesota, bounded E. and S. E. by Wisconsin, from which it is in part separated by St. Croix River. Area, 1450 sq. m. It is level, with a soil often rather wet and heavy. Noble pine forests cover a large part of the county, which is traversed by Snake River and numerous other streams, and by Lake Superior and Mississippi R. R. Cap. Pine City. P. 648.

Pine, tp., White co., Ark. P. 149.

Pine, tp., Benton co., Ind. P. 523.

Pine, tp., Porter co., Ind. P. 474.

Pine, tp., Warren co., Ind. P. 1032.

Pine, tp., Montcalm co., Mich. P. 283.

Pine, tp., Allegheny co., Pa. P. 718.

Pine, tp., Armstrong co., Pa. P. 1642.

Pine, tp., Columbia co., Pa. P. 751.

Pine, tp., Crawford co., Pa. P. 343.

Pine, tp., Indiana co., Pa. P. 921.

Pine, tp., Lycoming co., Pa. P. 527.

Pine, tp., Mercer co., Pa. P. 1235.

Pine'al [Lat. *pinea*, "cone of pine"] **Gland,** or **Conarium,** a vascular mass of reddish-gray nervous matter found within the brain behind the third ventricle, and resting upon the corpora quadrigemina. It often contains

a fluid and some calcareous matter. Its use is not known. It was considered by the ancients to be the seat of the soul. It is by no means a gland.

Pine'apple, the compound conical fruit of *Ananassa sativa*, a plant of the order Bromeliaceæ, a native of tropical America, now naturalized in many hot countries, and cultivated also in hot-houses. When properly cultivated it is one of the best of fruits, but too often it is tough, coarse, and indigestible. The Bahamas and South Florida are finely adapted to pineapple culture. The leaves of this and allies afford the fibre whence the beautiful PINA MUSLIN (which see) is made.

Pineapple, p.-v., Wilcox co., Ala., on Selma and Gulf R. R. P. 1960.

Pine Bluff, p.-v., Vaughn tp., cap. of Jefferson co., Ark., located in the cotton-producing section of Arkansas, has excellent public schools, 5 churches, 1 Jewish synagogue, 2 banks, 2 newspapers, several hotels, 3 machine-shops, flouring, saw, and planing mills, and stores. P. 2081. FRANK SILVERMAN, ED. "REPUBLICAN."

Pine-chaf'er, a name given to *Pissodes strobi, Tomicus pini, T. xylographus*, and several species of *Hylurgus*, coleopterous insects, whose larvæ commit great ravages in pine forests, eating away the new material between the bark and the wood.

Pine City, p.-v. and tp., cap. of Pine co., Minn., on Lake Superior and Mississippi R. R., 63 miles N. of St. Paul, has 2 fine school-houses, 1 newspaper, 3 extensive mills, and stores. P. 220.
J. S. HUGHES AND H. P. ROBIE, EDS. "NEWS."

Pine Creek, tp., Ogle co., Ill. P. 1215.

Pine Creek, tp., Madison co., N. C. P. 887.

Pine Creek, tp., Clinton co., Pa. P. 970.

Pine Creek, tp., Jefferson co., Pa. P. 941.

Pine Creek, tp., Carroll co., Va. P. 1969.

Pine Finch, or **Goldfinch,** a bird of the family Fringillidæ, the *Chrysomitris pinus* of recent authors. It is congeneric with the common yellow-bird of the U. S. (*Chrysomitris tristis*), and occurs more or less abundantly throughout North America. It attains a length of about 4¾ inches, is brownish-olive above, and beneath whitish, streaked with dusky. It feeds chiefly on the seeds of hemlock and other trees, as well as those of grasses, etc.
THEODORE GILL.

Pine Flat, tp., Dallas co., Ala. P. 1558.

Pine Grosbeak, a bird of the family Fringillidæ and genus *Pinicola*, the *Pinicola enucleator* (Linn.), Cab. It is found throughout the northern regions of the Old as well as New World. Its average length is about 8½ inches; the bill and legs are black; the male is rosy-colored above, tinged, except on the head, with brownish, ashy below; the female brownish above, ashy, tinged with greenish-yellow below. As indicated by the name, the species affects pine and other evergreen forests; it feeds on spruce-seeds, etc. It is rare in the U. S., except near the northern border, although occasionally abundant even as far S. as Philadelphia. THEODORE GILL.

Pine Grove, tp., Van Buren co., Mich. P. 1700.

Pine Grove, p.-v., Esmeralda co., Nev. P. 305.

Pine Grove, p.-b. and tp., Schuylkill co., Pa., on Schuylkill and Susquehanna, Pine Grove and Lebanon, and Philadelphia and Reading R. Rs. P. of b. 845; of tp. 2274.

Pine Grove, tp., Venango co., Pa. P. 875.

Pine Grove, tp., Warren co., Pa. P. 1206.

Pine Grove, tp., Orangeburg co., S. C. P. 827.

Pine Grove, tp., Portage co., Wis. P. 318.

Pine Island, p.-v. and tp., Goodhue co., Minn. P. 1140.

Pinel' (PHILIPPE), b. at St. André, department of Tarn, France, Apr. 20, 1745; studied medicine at Toulouse and Montpellier; removed in 1778 to Paris; obtained a prize in 1791 for his *Traité médico-philosophique sur l'Aliénation mentale*, and was appointed first physician of the Bicêtre in 1793, and in 1795 of the Salpêtrière. D. at Paris Oct. 25, 1826. By his scientific writings on the subject, and by his very successful management of the two asylums, he accomplished a thorough reform of the treatment of mental diseases. He also wrote *La Nosographie philosophique* (1798) and *La Médicine clinique* (1802).

Pine Level, p.-v., cap., Manatee co., Fla.

Pine Meadow, p.-v., New Hartford tp., Litchfield co., Conn., on Farmington River and Connecticut Western R. R.

Pine Plains, tp., Allegan co., Mich. P. 180.

Pine Plains, p.-v. and tp., Dutchess co., N. Y., on Dutchess and Columbia R. R., has a bank, a weekly newspaper, an academy, 4 churches, 3 hotels, and manufactories. At Shekomeko, within this township, a Moravian mission to the Indians was established in 1740. P. of v. 401; of tp. 1503.

Pine River, tp., Gratiot co., Mich. P. 981.

Pine Rock, tp., Ogle co., Ill. P. 1048.

Pinero'lo [*Pignerol*], town (once a strong fortress) of Northern Italy, province of Turin, 20 miles S. W. of the city of Turin. It stands on a hill 1200 feet above the sea, on the left bank of the torrent Chisone, with a fine view on all sides, especially on the W., where the Alps rise, crest above crest, in all their magnificence. The public buildings generally are of little interest. The cathedral stands near an ancient tower, once a prison, but at present serving as a campanile or belfry. The old Piazza d'Armi is now beautifully shaded with American elms. From the early part of the eleventh century this fortress was held for the most part by the house of Savoy, though France frequently, and often successfully, disputed its possession. In 1696 the formidable fortifications of Pinerolo were, in accordance with a treaty, mostly destroyed. Since 1748 it has been an episcopal see. Pinerolo is now a place of considerable industry; its manufactures are silks, woollens, cottons, liqueurs, etc. P. in 1874, 16,800.

Pines, Isle of. (1) An island in the Caribbean Sea, belonging to Spain, and situated 33 miles off the south-western extremity of Cuba, comprises an area of 1200 sq. m., with about 2000 inhabitants. The principal settlements of the colony are Nueva Gerona, Santa Fé, and Jorobado. The island is noted for its mild and salubrious climate.—(2) An island in the southern Pacific Ocean, belonging to France, and situated in lat. 22° 38′ S., lon. 167° 25′ E., off the south-eastern extremity of New Caledonia, was discovered in 1774 by Capt. Cook, and was selected in 1872 by the French Assembly for a penal station. The number of the inhabitants, exclusive of the convicts, is estimated at 800, belonging to the same race as the population of New Caledonia.

Pine Snake (*Pituophis melanoleucus*), a large serpent, six feet long, two inches thick, of a shining white color with dark-brown spots, and emitting a strong, disagreeable odor; received its name from having its home in the pineries of Eastern America, from New Jersey southward, though it is also sometimes called the "bull snake," from the loud bellowing sound it produces. It feeds on eggs and small birds and mammals, but is perfectly harmless to man.

Pine Spring, tp., Sanford co., Ala. P. 447.

Pine Swamp, tp., Ashe co., N. C. P. 409.

Pine Top, tp., Middlesex co., Va. P. 1968.

Pine Valley, tp., Elko co., Nev. P. 35.

Pine Valley, p.-v., Veteran tp., Chemung co., N. Y., on Northern Central R. R. P. 260.

Pine Valley, tp., Clark co., Wis. P. 953.

Pine'ville, tp., Marengo co., Ala. P. 400.

Pineville, tp., Monroe co., Ala. P. 853.

Pineville, p.-v., cap. of Josh Bell co., Ky., at the upper ford of Cumberland River. P. 974.

Pineville, tp., Rapides parish, La. P. 414.

Pineville, p.-v. and tp., cap. of McDonald co., Mo., on Elk River, situated in a rich mineral region, has good water-power and 1 weekly newspaper. P. 1057.

Pi'ney, tp., Johnson co., Ark. P. 176.

Piney, tp., Madison co., Ark. P. 270.

Piney, tp., Van Buren co., Ark. P. 160.

Piney, tp., Oregon co., Mo. P. 437.

Piney, tp., Texas co., Mo. P. 866.

Piney, tp., Ashe co., N. C. P. 839.

Piney, tp., Clarion co., Pa. P. 1160.

Piney Creek, p.-v. and tp., Alleghany co., N. C. P. 689.

Piney Fork, tp., Sharpe co., Ark. P. 1454.

Piney Grove, tp., Sampson co., N. C. P. 1776.

Pingré (ALEXANDRE GUI), b. at Paris Sept. 4, 1711; studied theology, but adopted Jansenistic views, and devoted himself subsequently to astronomy; published 1754–57 the first nautical almanac under the title of *État du Ciel;* greatly extended Lacaille's table of eclipses in the second edition of *L'Art de vérifier les Dates;* wrote in 1783 his *Cométographie, ou Traité historique des Comètes* (2 vols.), which is his principal work, and translated the poem by Manilius, *Astronomica* (1786). D. at Paris May 1, 1796.

Pinguicola. See BUTTERWORT.

Pin Hook, tp., Lawrence co., Ala. P. 407.

Pink, the name of various plants of the genus *Dianthus,* all natives of Asia and Europe, for the wild pinks of the U. S. are of the genus *Silene,* and are properly called campions or catchflies; but *D. Armeria* and *prolifer* are sparingly naturalized here. The most common pinks are beautiful garden and window flowers, often delightfully fragrant. There are thousands of fine varieties—carnations, flakes, bizarres, picotées, pheasants' eyes, monthlies, Chinese pinks, maidens, Carthusian pinks, etc. They are somewhat doubtfully referred to some four or five original species (*D. plumarius, caryophyllus, Chinensis, Carthusianorum, superbus, deltoides,* etc.). All need much care to produce perfect flowers.

Pink′erton (John), F. S. A., b. at Edinburgh, Scotland, Feb. 13, 1758; passed an apprenticeship of five years to the law in his native city; settled in London 1780; devoted himself to literature under the patronage of Horace Walpole, and produced an immense number of works, chiefly historical, none of which, however, were marked by any great talent. The best known is his *General Collection of Voyages and Travels* (17 vols. 4to, 1808–14), with maps and engravings, which is still useful for reference. He wrote some poems not destitute of merit, but his *Ancient Scottish Poems* (2 vols., 1786), purporting to be from the MS. collections of Sir Richard Maitland, has been pronounced a literary forgery, probably executed by himself. In 1804 he settled in Paris, where he d. Mar. 10, 1826. (See his *Literary Correspondence,* edited by Dawson Turner, 1830.)

Pink Hill, p.-v. and tp., Lenoir co., N. C. P. 572.

Pink′ney, tp., Warren co., Mo. P. 1018.

Pinkney, tp., Union co., S. C. P. 2413.

Pinkney (Edward Coate), son of William, b. in London, England, in Oct., 1802; educated at St. Mary's College, Baltimore; was in the naval service 1816–24; practised law at Baltimore with little success; published *Rodolph and other Poems* (1825), and edited for a short time a political journal, *The Marylander* (1827). D. at Baltimore Apr. 11, 1828.

Pinkney (William), LL.D., b. at Annapolis, Md., Mar. 17, 1764, was the son of an English loyalist; studied medicine and law; was admitted to the bar 1786, and rapidly rose to eminence; a member of the constitutional convention of 1788; was chosen to Congress 1790, but did not take his seat; was a U. S. commissioner in England 1796–1804; attorney-general of his native State 1805; minister extraordinary, with Monroe, to Great Britain 1806; minister resident there 1806–11; U. S. attorney-general 1811–14; served as a volunteer officer at Bladensburg, and was wounded; in Congress 1815–16; minister resident at Naples 1816; minister to Russia 1816–18; U. S. Senator 1820–22. D. Feb. 23, 1822. (See *Life,* by H. Wheaton (1826); by W. Pinkney, D. D. (1853).)

Pink′root, the root of *Spigelia Marilandica,* a showy herb of the U. S., not often found N. of the Potomac. The infusion of this root is much used as an anthelmintic; it has also some narcotic qualities. The pinkroot should be combined with a cathartic, such as senna. *S. anthelmia* is a similar plant of South America. They belong to the Loganiaceæ. *S. loganioides* and *gentianoides* grow in Florida.

Pin-money (law), an annual sum of money, sometimes provided for in a marriage settlement, to be paid by the husband to the wife for the purpose of defraying her own personal expenses for dress and the like. When the wife dies, her representatives cannot claim any arrears that may be unpaid at the time, nor can the husband ever be compelled to pay more than the arrears of a single year; for the allowance is intended to be fully expended in each current year, and is designed to keep up the family dignity and appearance, and not to furnish the wife a means of accumulation. It is supposed by some that the peculiar term was derived from an ancient tax by which the queen was supplied with pins. Both the name and the provision for the wife which it designates are practically unknown in this country, being confined to the English law and social customs. John Norton Pomeroy.

Pin′nace [It. *pinnaccia*] is a rowboat carried on ships. It is larger than a cutter and smaller than a launch. The name was formerly given to small sailing vessels.

Pin′nacle [Lat. *pinnaculum,* a "little feather"], in Gothic architecture, a turret, often standing on parapets, angles, and buttresses, and usually adorned with rich and varied devices. It has a finial at the top, and below this is somewhat pyramidal.

Pinn′idæ [*pinna,* a "fin" or "wing"], a family of conchiferous mollusks. The animal with its mantle is elongated and obliquely triangular or wedge-shaped; the mantle margins fringed; the palpi long; the foot elongated, cylindrical, and grooved by a bissal cleft; the adductor muscles not very unequal; the shell is very oblique and triangular, equivalve, and gaping posteriorly, with an unarmed hinge and with a brittle texture; it is composed chiefly of prismatic cell-layers, while the pearly interior is thin and extends only part-way from the beak. Species are found in almost all warm seas, and forms of the family have existed from the Devonian epoch to the present. Over 60 living species are known. Theodore Gill.

Pin′nipeds [*pinna,* "a fin," and *pes, pedis,* "a foot"], mammals which, according to some authors, form a peculiar order, and by others are considered as a sub-order of the order Feræ, comprising the seals, sea-bears, sea-lions, and walruses. The body is more or less prone—*i. e.* little or not at all uplifted from the surface of the ground—and the legs are confined in the common integument beyond the elbows and knees; the feet are rotated backward, and the toes connected together by an extensively developed web, and especially adapted for swimming; the anterior and posterior feet have the first phalanges and digits enlarged and produced beyond the others; the skull is much compressed between the orbits; the lachrymal bone early united with the maxillary, imperforate, and entirely contained within the orbit; the malar is applied to the inner side of the transverse zygomatic process of the maxillary, and not continued to the front of the orbit; this, therefore, is bounded by the maxillary; the palatines do not extend forward sideways, and consequently extensive vacuities intervene between the frontal and maxillary bones; the tympanic bones are separated from the exoccipitals by a vacuity, as well as by the re-entering periotic bones; the teeth of the first series are extremely small and undeveloped, those of the second series well developed. In all these respects the forms of the group are peculiar, but they agree with the Feræ or carnivorous animals in the coalescence of the scaphoid, lunar, and central bones into one, and in the possession of a zonary deciduate placenta. The group is differentiated into three well-defined families: (1) Otariidæ, or sea-lions and sea-bears; (2) Phocidæ, or typical seals, and (3) Rosmaridæ, or walruses, each of which is noticed under its proper name.

Theodore Gill.

Pi′no, p.-v. and tp., Placer co., Cal., on Sacramento division of Central Pacific R. R. P. 191.

Pi′nos Al′tos, p.-v. and tp., cap. of Grant co., N. M.

Pins, pieces of wire pointed at one end and provided with a head at the other, mentioned as having been in use for the purpose of fastening from the oldest time history knows of; but the pins which have been found in Egyptian, Etruscan, and old Scandinavian tombs, or in other ways have come down to us from antiquity, are mostly very elaborate and expensive instruments, made of iron, bronze, brass, silver, or gold, sometimes twelve inches long, with artistically executed heads of wood, bone, ivory, amber, metal, or precious stones; and it is evident that in many cases in which we now use pins the ancients used clasps, laces, and other contrivances. In England pins came into common use in the fifteenth century, but were at first introduced from the Continent. Soon, however, the manufacture was introduced into England, and in the latter part of the seventeenth century Birmingham became the centre of this branch of industry. In the U. S. it was attempted in 1820, and again in 1824, but not firmly established until the invention of the Howe machine in 1832. The original process of the manufacture by hand, from the straightening of the wire to the spinning and hammering of the head, was long and tedious, and required no less than fourteen distinctly different operations. At present, all these processes, from the cutting of the wire to the sticking of the pins into papers, are performed by machinery, which needs only to be fed by the proper materials at each stage of its operation.

Pinsk, town of Russia, government of Minsk, situated in a marshy plain on the Pina. It carries on an important transit-trade on the Oghinsky Canal, which connects the Dnieper with the Niemen. P. 12,963.

Pint, a measure of capacity, the eighth part of a gallon. (See Weights and Measures.)

Pintard (John), LL.D., b. in New York City in 1759; graduated at Princeton 1776; studied law, but never practised; was a volunteer in the Revolution; acted for three years as clerk to his uncle, Lewis Pintard, commissary for American prisoners in New York City; edited for a short time the *Daily Advertiser;* engaged subsequently in commerce; was for many years city inspector and secretary to the Mutual Insurance Co.; was the founder of the New York Historical Society, vice-president of the American Bible Society, and an efficient member of other useful societies, and distinguished through a long period

as a philanthropist and the most accomplished local antiquary in New York. D. at New York June 21, 1844. Author of many fugitive articles in periodicals, chiefly on antiquarian topics, a selection from which, with a biography, was announced some years since, but has not appeared. (See interesting notices in Dr. Francis's *Old New York.*)

Pinto. See MENDEZ-PINTO.

Pin'to, tp., White Pine co., Nev. P. 51.

Pintos [Sp., "spotted"], a name popularly given in Mexico to the residents of the valley of the Mescala River in the state of Guerrero, on account of a disease to which they are subject consisting of leprous-like spots, believed to be caused by some peculiar quality of the water of the Mescala. The inhabitants are chiefly of Indian descent, whence the Pintos have often been erroneously supposed to be a specific tribe of Indians.

Pinturic'chio (BERNARDINO), or, more properly, BERNARDINO BETTI, b. at Perugia in 1454; d. at Siena in 1513; was a friend of Perugino and Raphael, and a prominent member of the so-called Roman school of painting. His principal works consist of frescoes in the Vatican (1493–96), and in the cathedral of Siena (1502–09).

Pin-worms (*Oxyoris vermicularis*), a parasitic worm, white, filamentous, from one-eighth to one-half of an inch long, accumulating in infants or children in considerable number in the rectum, and causing, especially during rest, a burning and itching sensation in the mucous membrane of the anus. The disease is generally temporary, and disappears spontaneously. With proper treatment the vexation may be much alleviated.

Pinzon', the name of a family of enterprising navigators at Palos, Spain, of which three brothers were associates of Columbus in the discovery of America, and one was afterward the discoverer of Brazil. The head of the family, MARTIN ALFONSO, rendered great service to Columbus in fitting out his little fleet and in obtaining sailors. He commanded the Pinta; was separated from Columbus in the West Indies, and subsequently by a storm on the return voyage, but reached Bayonne in safety before Columbus had arrived in Spain, and wrote to the court asking permission to give an account of the voyage. The opportune arrival of Columbus defeated what was believed to be a scheme for appropriating the honors of the discovery. Pinzon was forbidden to present himself at court, and soon afterward died.—His brother, VICENTE YAÑEZ, commanded the Niña in the first voyage of Columbus; was at the head of an expedition of four vessels which sailed from Palos Nov. 13, 1499; discovered Brazil at Cape St. Augustine Jan. 28, 1500; explored the northern coast as far as the Orinoco, entering the mouth of the Amazonas; reached Hispaniola June, 1500; lost two of his caravels, and returned to Palos in September, having lost his fortune by the voyage. In 1506 and 1508 he was associated with Juan Diaz de Solis in the respective voyages in which they discovered Yucatan and the river La Plata. His subsequent history is unknown.—FRANCISCO MARTIN, the third brother, was pilot to the Pinta in the first voyage of Columbus. The family was raised to the rank of hidalgoes by Charles V., and has continued to be of note in Spain, its present representative being Admiral Pinzon, who commanded the Spanish fleet which took possession of the Chincha Islands in Peru in 1863.

Pio'che, p.-v., cap. of Lincoln co., Nev., situated in a cañon of the Cordilleras, about 7000 feet above the sea-level, possesses several rich silver-mines, 3 schools, 2 churches, several literary and social institutions, 2 banks, 1 newspaper, 1 public library, 2 foundries, boiler and machine shops, 1 narrow-gauge railroad, and stores.

J. F. O'HALLORAN, ED. "DAILY RECORD."

Piombi'no, town of Italy, province of Pisa, lying on the sea-coast opposite the island of Elba. It is surrounded by old walls, with a fort without and a citadel within overlooking the sea. Here, near a very safe roadstead called Porto Vecchio, is a large metallurgic establishment for the manufacture of Bessemer steel, the ore being brought from Elba. Military projectiles of great hardness and perfection are also manufactured here by Signor Bosina. Piombino was the capital of the little principality of the same name, which was originally a fief of the German emperors, but which passed successively from one power and one family to another until 1860, when it became a part of the new kingdom of Italy. P. in 1874, 4000.

Pioneer', tp., Cedar co., Ia. P. 1622.

Pioneer, p.-v., Deer Lodge co., Mont., on Hell Gate River.

Pioneer, p.-v., Madison tp., Williams co., O., on St. Joseph River. P. 338.

Pioneer, p.-v., Cherry Tree tp., Venango co., Pa., on Oil Creek and Allegheny River R. R.

Pioneers' [allied to Sp. *peon*, a "foot-soldier"], in military operations, a body of men detailed from the various regiments to clear roads, fell trees, repair bridges, etc. Their work is less scientific than that of the engineers.

Piorry (PIERRE ADOLPHE), M. D., b. at Poitiers Dec. 31, 1794; studied medicine; took his degree in 1816; became professor at Paris in 1840, and retired into private life in 1866. He invented the pleximeter, which he described in his *Traité sur la Percussion médiate*, and for which he received the Montyon prize in 1828. He also wrote *De l'Hérédité dans les Maladies* (1840), *Traité de Médicine pratique et de Pathologie iatrique ou médicale* (9 vols., 1841–51), *Traité de Plessimètrisme et d'Organographisme* (1866).

Piotrkow, town of European Russia, government of Warsaw, on the Stradra, was formerly an important and prosperous city, but has fallen into decay during the wars. P. 13,633.

Pio've di Sac'co [*Plebs Sacci*], town of Italy, province of Padua, warmly contended for by Padua and Venice during the Middle Ages. Some of its churches are very ancient, others possess fine pictures. Linen and cotton were once largely manufactured here, but the making of willow-work and of straw matting is now the chief industry of the inhabitants. P. in 1874, 8221.

Pioz'zi (Mrs. HESTER LYNCH **Salusbury**), b. at Bodvel, Carnarvonshire, Wales, Jan. 16, 1740; married, in 1763, Henry Thrale, a wealthy brewer, subsequently a member of Parliament; made in 1764 the acquaintance of Dr. Samuel Johnson, who became in 1766 an inmate of her family at Southwark, and remained such until Mr. Thrale's death in 1781; contributed several poems to Mrs. Anna Williams's volume of *Miscellanies* (1766), among which was the celebrated *Three Warnings*, often supposed to be the composition of Dr. Johnson; married, in 1784, Signor Gabriel Piozzi, a native of Florence, then a music-teacher at Bath; resided a year or two at Florence, where she edited a volume entitled *The Florence Miscellany* (1785) under the signature of "Anna Matilda," thereby attracting the relentless criticism of Gifford against the "Della Crusca School;" published *Anecdotes of Dr. Johnson* (1786), *Letters to and from Dr. Johnson* (1788), a book of travels on the Continent (1789), *British Synonymy* (1794), and *Retrospection* (1801). D. at Clifton, near Bristol, May 2, 1821. (See her *Autobiography, Letters, and Literary Remains* (1861), edited by A. Hayward.)

Pipe, in music, a tube in which air is made to vibrate so as to produce a musical sound: in commerce, a wine measure, varying in size according to the kind of wine it contains, a pipe of port containing 138 gallons, of sherry 130, of madeira 110, of vidonia 120: in hydraulics and pneumatics, an artificial channel through which watery or aëriform fluids are conveyed with or without pressure: in every-day life, an instrument for smoking tobacco, consisting of a bowl of wood, stone, clay, or meerschaum for the tobacco, and a stem, long or short, stiff or flexible, connected with a mouthpieçe of amber or horn, through which the smoke is inhaled.

Pipe'clay, a fine white and pure clay, very infusible and tenacious. It is used for making pottery, tobacco-pipes, for whitening the accoutrements of soldiers, and for whitening boot-tops and harnesses.

Pipe Creek, tp., Madison co., Ind. P. 2300.

Pipe Creek, tp., Miami co., Ind. P. 1227.

Pipe Fish, a name given to species of fishes with a tubular or pipe-like snout, chiefly belonging to the order Lophobranchiata and family SYNGNATHIDÆ (which see).

Pipe-mouth, a name occasionally connected with the fishes of the genus Fistularia.

Pipera'ceæ [from *Piper*, the principal genus], a natural order of exogenous and often climbing herbs and shrubs, altogether tropical, but rare in Africa. There are some 600 species, nearly all acrid, some of them astringent, and some narcotic. Pepper, cubebs, matico, and betel are the chief commercial products. The principle *piperine* abounds in many of these plants.

Pi'per City, p.-v., Brenton tp., Ford co., Ill., on Toledo Peoria and Warsaw R. R. P. 302.

Piper'no, town of Italy, province of Rome, S. E. of the city of Rome. It stands on an elevation in the midst of an amphitheatre of lofty hills near the site of the ancient Volscian town of *Privernum*, from which it takes its name. It is almost entirely surrounded by castellated walls with towers, and stones and inscriptions, taken from the ruined temples and palaces of the ancient city just below it, serve to adorn the more modern town. The principal square is embellished by orange trees of rare size, and in the midst

of it stands a statue of Priapus, one of the numerous antiquities exhumed in the vicinity. Many striking ruins of convents exist in and near this town. In a still remaining abbey, the entrance of which is rich in mosaics, died, in 1272, the celebrated Thomas Aquinas. Piperno is very unhealthy, owing to its nearness to the Pontine Marshes. P. in 1874, 5704.

Piper's Gap, p.-v. and tp., Carroll co., Va. P. 1605.

Pipe'stone, county of Minnesota, bounded W. by Dakota. Area, 460 sq. m. It is celebrated for its quarry of red pipestone, a layer of which occurs in the Sioux quartzite. From this quarry, regarded as sacred by the Indians, material was obtained for Indian tobacco-pipes.

Pipestone, p.-v. and tp., Berrien co., Mich. P. 1379.

Pipette' [Fr.], a chemical laboratory instrument of glass which is used for sucking up quantities of liquids by the application of mouth-suction. The pipette has therefore a long stem with a contracted orifice for introduction into deep or narrow-mouthed vessels, with a bulbous or elongated expanded portion above to contain the liquid. Sometimes pipettes are *graduated*, so that known quantities of liquids may be taken up. H. WURTZ.

Pip'idæ [*Pipa*, a proper name], a family of toad-like anurans peculiar for its habits. The fronto-parietal is completely ossified, the prefrontals separate; no teeth are developed; the ribs are wanting, simple; coccyx attached to a single condyle; sacral diapophyses dilated; coracoid and epicoracoid divergent, their connecting arches not overlapping; manubrium absent; the terminal phalanges are simple and acute; the external metatarsus separated by a web. The family is represented by the genus *Pipa*, peculiar to South America. In the breeding season the back of the female is developed into a number of small pits, and into these the eggs which she lays are deposited by her mate, and there hatched. THEODORE GILL.

Pippi. See GIULIO ROMANO.

Pi'qua, city, Miami co., O., on Miami River and Miami and Erie Canal, at the crossing of Pittsburg Cincinnati and St. Louis and Cincinnati Dayton and Michigan R. Rs., has 2 newspapers, an active trade, and some manufactures. P. 5967.

Piqua, v., Montgomery tp., Franklin co., O., suburb of Columbus, the State capital. P. 2364.

Piquet' [Fr.], a game of cards in which the three court-cards, the ace, the ten, nine, eight, and seven of each suit are employed. After shuffling and dealing, two by two, to each of the two players, until each holds twelve cards, the rest are laid on the table, and constitute a talon of eight cards. Next, the oldest hand (the one who did not deal) discards from one to five of his poorest cards, and draws as many more from the talon. The opponent next discards. The first player now reckons points, as follows: for *carte blanche* (twelve plain cards), 10 points; for *point* (the hand fullest of any one suit, or, if both hands are alike, the best hand of the two high suits, calling aces eleven, face-cards each ten, and counting pips on the plain cards) the highest hand scores the number of cards in his fullest suit; for *sequence* (the greatest number of cards in any suit, or, if both hands are alike in this respect, the one whose highest sequence begins with the higher card; but no two cards make a sequence) the better hand scores as follows: if the best sequence is three cards, count 3; for four cards, 4; for five, 15; for six, 16; for seven, 17, etc. Sometimes all sequences are scored. For the *quatorze*, of four equal honor-cards, the highest scores 14, or if there are no sets of four, the highest set of three equal honor-cards counts 3, etc. The first player now plays a card. The opponent now scores his *carte-blanche* if he has any, adds what other points he has, and then follows suit. Each player counts 1 for each lead; and if the second player takes a trick, he counts 1 for that. The one who takes the larger number of tricks counts 10 for *cards;* if he takes all, he counts 40 more for *capot.* If the first hand makes 29 by preliminary scores, and 1 by first lead, he counts 30 more by *pique;* but if his first score comes up to 30 before his lead, he scores 60 more by *repique:* 100 or 101 points make the game, but there are several ways of scoring besides the above.

Piræ'us [Gr. Πειραιεύς], a rocky peninsula, supposed to have been once an island, on the coast of Attica, nearly 5 miles S. W. of Athens, forming three natural harbors, all commanded by the hill Munychia, 267 feet high. This peninsula, with its three harbors (Munychia, now *Phanari*, Zea, now *Stratistiki*, and Piræus proper, now *Drako*), was made by Themistocles (491 B. C.) the port of Athens, instead of Phalerum, its original port. Connecting the city and these three harbors were two parallel walls, about 60 feet high and 1550 feet apart, built between 457–431 B. C., and swept away by Sulla (87–86 B. C.), though their foundations may still be traced. The principal harbor is safe and deep. The modern town of *Piræus* has sprung up since 1834. A railway, opened in 1869, connects it with Athens. P. 11,047. (See Curtius, *De Portubus Athenarum*, 1842.) R. D. HITCHCOCK.

Pirane'si (GIOVANNI BATTISTA), b. Oct. 4, 1720, at Rome; studied drawing, architecture, and engraving at Venice and Rome, and published a work (29 vols. fol., containing 2000 plates) on the antiquities and public buildings of Rome. D. Nov. 9, 1778.—His children, FRANCESCO, PIETRO, and LAURA, were also celebrated as engravers.

Pira'no, town of Austria, province of Istria, on the Gulf of Largone, has a good harbor, some shipbuilding, large fisheries, and a trade in wine, oil, fish, and salt. In the immediate neighborhood of Pirano are the extensive saltworks of Porto Rose, which were celebrated as early as the thirteenth century.

Pi'rate and **Pi'racy** [from a Greek word denoting "one who makes," or the "act of making *attempts*"—*i. e.* attacks—on ships upon the sea], a word used for the earlier term, meaning *robber*—*i. e.* sea-robber. (For the more full definition compare the article INTERNATIONAL LAW.) T. D. WOOLSEY.

Pir'masens, town of Rhenish Bavaria, Vosges, is well built, and has manufactures of straw hats, shoes, musical instruments, and glassware. P. 8563.

Pir'na, town of Saxony, on the Elbe, at the influx of the Gottleube, has manufactures of stockings, woollens, earthenware, and beetroot-sugar. The citadel, Sonnenstein, is now used as a lunatic asylum. P. 8905.

Piron' (ALEXIS), b. at Dijon, France, July 9, 1689; studied law, but did not practise; left his native town chiefly on account of an utterly improper ode he wrote; lived in Paris for a long time in obscurity; began to write for the minor theatres, and obtained admission to literary and elegant society by his brilliant sarcasm and ready wit; entered into a rather ludicrous rivalry with Voltaire as a tragedian, but wrote an excellent comedy, *La Métromanie* (1738). When proposed as a member of the Academy he was rejected on account of his ode, not by the Academy, but by Louis XV. D. at Paris Jan. 21, 1773. Collected edition of his works by Rigoley de Juvigny (7 vols., Paris, 1776).

Pi'sa, city of Italy, capital of the province of the same name, situated (lat. 43° 43′ N., lon. 10° 24′ E.) on the Arno, which flows through it in a semicircular sweep from E. to W. Its distance from the sea, now about 7 miles, has been slowly increasing for centuries, owing to the deposits at the mouth of the river. The plain in which Pisa lies is extremely fertile, and the salubrity of the climate draws hither invalids from all parts of the world. It is still a walled town, and is entered by six gates. The bridges over the Arno are very fine, especially the Ponte del Mezzo, which spans the centre of the semicircle. An aqueduct 4 miles in length supplies the town with water. The public buildings are of great interest, and the Duomo, the Baptistery, the Leaning Tower, and the Campo Santo of Pisa will always be among the first objects in Italy to call forth the enthusiasm of the traveller. The Duomo (or cathedral), founded, probably, in 1063, on the site of a palace of Hadrian, is of great architectural interest without, and contains many artistic treasures. The Baptistery (1154) and the Leaning Tower (1174) are both circular structures, the former 180 feet in height and 160 in diameter; the latter, 179 feet in height and 50 in diameter, with an inclination of nearly 13 feet from the perpendicular. The Campo Santo, besides its architectural merit, is adorned with frescoes which once excited the admiration and kindled the genius of the greatest Italian masters, but which, unhappily, are now sadly defaced by time. Another choice architectural gem is the Sta. Maria della Spina, a small Gothic church or chapel of exquisite beauty on the left bank of the Arno. This chapel has been recently taken down, stone by stone, each stone being numbered, and re-erected. Many of the other numerous churches deserve attention, as do also several palaces remarkable for their historic associations and for their artistic wealth. The University of Pisa (twelfth century) is very celebrated, and it counts the immortal Galileo among its former pupils and professors. An academy of fine arts and a botanical garden are among the many other provisions for public instruction. Pisa is of very remote but uncertain origin. As an Etruscan town its relations with Rome were friendly from the beginning. Under the first emperors it rose to great prosperity, and many monuments of this period still exist; among these, inscriptions of much interest which have been illustrated by Pagni, Noris, Tantini, Lupi, etc. This prosperity lasted till the middle of the fifth century, after which time it shared in the common calamities of barbarian invasion. In the early part of the ninth century Pisa was once more powerful enough to drive the Saracens from her coast, and

to pursue them into the heart of their own dominions. In 1003 the pope invited Pisa, now an independent republic, to assist in expelling the Saracens from the Roman territory, and in this enterprise she won the highest distinction. Having wrested Sardinia, Corsica, Elba, and other places of importance from the infidels, Pisa gave herself to commerce and the arts of peace, but her rapidly increasing power and wealth excited the jealousy of Genoa and of the other neighboring republics. Several Guelphic cities, instigated by Ugolino Gherardesca, a traitor noble of Pisa, united in a league against this Ghibelline commonwealth, and disastrous wars followed. The Pisans finally suffered a great naval defeat at Meloria in 1220, and never again fully recovered their former strength. Henceforth, rival families and rival parties disputed the government of the city, but the commonwealth sustained itself most heroically, both against France and its own sister republics, until 1509, when it was forced to submit to Florence. From this time the history of Pisa is one with that of Tuscany. The commerce and manufactures of this town are at present inconsiderable. P. in 1874, 50,500. ANGELO DE GUBERNATIS.

Pisa, Council of, considered œcumenical by Gallican theologians, but not so regarded by the Roman Catholic Church. Bellarmine calls it a *consilium generale nec approbatum nec reprobatum.* Its object was to heal the papal schism which had scandalized Christendom since 1378. It was summoned neither by pope nor emperor, but by fourteen cardinals (seven in each obedience) of the two rival popes. It met in the cathedral of Pisa Mar. 25, 1409, and held its twenty-third and last session Aug. 7, 1409. It was composed of 24 cardinals; 4 patriarchs; 80 bishops in person and 102 by proxy; 87 abbots in person and 200 by proxy; the ambassadors of several governments; the representatives of 13 universities; and more than 300 professors and doctors of canon law. On June 5, 1409, the council deposed Gregory XII. of the Roman line and Benedict XIII. of the Avignon line, declaring them both to be schismatics, heretics, perjurers, and vow-breakers. On June 26, the 24 (some say only 22) cardinals made Peter Philargi pope, an old man of seventy years, cardinal-archbishop of Milan, who took the name of Alexander V. The reforms talked of were then adjourned for the consideration of a general council to meet in Apr., 1412, and, as for rival popes, the Church now had three instead of two. Schwab has shown (1858) that Gerson was not in attendance, although the council was mainly Gallican.—Another Council of Pisa, held May 30, 1135 (not 1134), and attended by St. Bernard, excommunicated the antipope Anacletus II.—Still another, called by five rebellious cardinals of Pope Julius II., met in Pisa Nov. 1, 1511, adjourned to Milan Nov. 11, 1511, left Milan for Asti Apr. 21, 1512, and Asti for Lyons, having ridiculously failed in its attempt to depose the pope. R. D. HITCHCOCK.

Pisa'no (NICCOLO), b. at Pisa in 1200; d. there in 1278; was a remarkable architect, and built several fine churches in Pisa, Florence, Venice, etc., but became more celebrated as a sculptor, which art he actually revived. His principal works are the pulpits of the baptistery of Pisa (1260) and of the cathedral of Siena (1266).—His son, GIOVANNI PISANO, b. at Pisa about 1240; d. there in 1320; studied painting and architecture under the guidance of his father, and became celebrated as an architect. He designed the Campo Santo at Pisa, and constructed the Castel Nuovo at Naples, which was used as a model for the Bastile of Paris.

Piscat'aqua River, for some miles the boundary between Maine and New Hampshire, is formed by the junction of Salmon Falls and Cocheco rivers, both of which furnish extensive and well-utilized water-power. Its lower course is tidal, and constitutes the harbor of Portsmouth, N. H. Drainage area, 550 sq. m.

Piscat'aquis, county of Central Maine. Area, 3780 sq. m. Its northern part is an uninhabited forest, abounding in lakes and streams, and is in some parts hilly and mountainous. It is traversed by Penobscot River, and is in part bounded W. by Moosehead Lake. The S. portion is well settled and contains much fertile soil. Cattle, corn, wool, and potatoes are leading products. Lumber and other goods are extensively manufactured. Traversed by Bangor and Piscataquis R. R. Cap. Dover. P. 14,403.

Piscataquis River rises in Somerset co., Me., flows E., and reaches the Penobscot at Howland. Length, 71 miles. Drainage area, 1276 sq. m.

Piscat'away, p.-v. and tp., Prince George's co., Md., on Potomac River, at the mouth of Piscataway Creek, opposite Mount Vernon. P. 1999.

Piscataway, tp., Middlesex co., N. J. P. 2757.

Pisciculture. See FISH-CULTURE.

Pise (CHARLES CONSTANTINE), D. D., b. at Annapolis, Md., in 1802; was the son of an Italian by an American mother; educated at Georgetown, D. C., and at Rome, where he received knighthood and the doctor's degree; became an instructor in the college at Emmittsburg, Md.; was ordained to the Roman Catholic priesthood 1825; performed pastoral labors, chiefly in Maryland, in the District of Columbia, and in New York City and vicinity. D. in Brooklyn, N. Y., May 26, 1866. Author of *Church History* (5 vols., 1830), volumes of poetry, tales, controversial, devotional and other religious writings, and was one of the ablest of American pulpit-orators of his Church.

Pi'sek, town of Bohemia, on the Watawa, which here is crossed by a large and remarkable bridge, has several breweries and distilleries and manufactures of leather and woollens. P. 8180.

Pis'gah, a mountain of Palestine, mentioned several times in the Pentateuch, especially that part of it which bears the name of Mount Nebo; has lately been identified by Prof. Paine with the south-western point of the present Jebel Siahgah, which overlooks the Dead Sea, the valley of Jordan, Bethlehem, Jerusalem, the hills around Nazareth, and Peræa.

Pisid'ia, an ancient territory of Asia Minor, situated between Phrygia, Cilicia, Pamphylia, Lycia, and Caria. It was inhabited by wild and predatory tribes ruled by petty chiefs, and was never wholly conquered by the Romans, though they held possession of the chief towns of the country, Sagalassus and Selge.

Pisid'ium [from *pisum*, a "pea"], a family of conchiferous mollusks including the small species of the fresh waters, and well represented in American streams. The form is obliquely oval; the mantle open in front, closed behind; the siphons partly united; the palpi small and pointed; the gills united behind, the outer smallest; the foot large, compressed, and extensible far forward; the shell has rather thin valves, with the umbones placed backward, the hinge with the cardinal teeth minute and the lateral elongated and compressed. The species are ovoviviparous, the eggs being hatched in the external branchiæ; the young are comparatively large in size, and consequently few in number. Species are found in the fresh waters of most of the countries of the Old as well as New World, and have survived from the Wealden to the present time. The distinctive character of the shell is the posterior position of the umbones. THEODORE GILL.

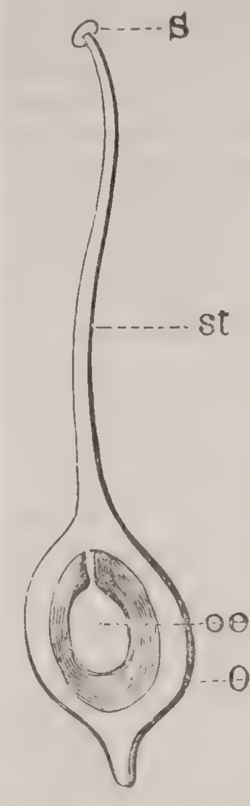
Pisis'tratus, b. at Athens about 612 B. C. (d. there 527 B. C.), belonged to the family of the Philaïdæ, of Pylian origin, descending from Neleus, the father of Nestor; his mother was a cousin-german to the mother of Solon. As a youth he was conspicuous for his personal beauty and mental endowments. With Solon he lived in great intimacy, and on several occasions he offered his celebrated kinsman valuable assistance, both with his forensic eloquence and with his military valor. Solon, however, penetrated his character, and, although Pisistratus was a master in the art of dissimulation, Solon discerned the daring ambition which grew up in his soul, and warned him. Soon after the establishment of the Solonian constitution the old parties of the republic formed again and renewed their feuds—the Pedieis, or the party of the plain, consisting of landed proprietors and headed by Lycurgus; the Parali, or the party of the seaboard, consisting of merchants and headed by Megacles; and the Diacrii, or the party of the highlands, consisting mostly of workingmen and mechanics. As demagogism is the shortest way to despotism, Pisistratus enlisted in the party of the Diacrii, and endeavored to make himself the patron of the poor. He threw open to the public his magnificent gardens, and when he appeared in the streets two boys accompanied him carrying purses, in order that he might always be able to supply immediately the wants of any needy citizen he met. Thus, he won the love and enthusiasm of the lower classes, and his noble character and brilliant talents made him a favorite with many wealthy and influential citizens, even though they suspected his plans. Solon, who had been absent from Athens for some time, returned before the crisis, and offered the most vigorous opposition, but in vain. One day Pisistratus entered the Agora covered with bleeding wounds, which he had inflicted on his own body, and said that his enemies had attempted to assassinate him. His story raised a general indignation, and one of his partisans, Ariston, proposed that a body-guard of fifty citizens should be given him. Solon opposed the proposition, and called Pisistratus a hypocrite; but the people declared that Solon was mad, and the body-guard was granted. Pisistratus now raised not fifty, but five hundred men, and one day (560 B. C.) he seized the citadel; the mask was dropped, the tyrant was ready. Megacles and Lycurgus took to flight; Solon placed his arms in the street before his house; submission was instantaneous. But before Pisistratus

could thoroughly consolidate his power the parties of Lycurgus and Megacles combined and drove him out of the city. His property was confiscated and sold by auction, though there was only one who dared to bid. Six years he lived in banishment. Meanwhile, Megacles, who was unable to maintain himself against Lycurgus, made overtures to Pisistratus, and offered to reinstate him in the tyranny if he would marry his daughter. The offer was accepted, and the restoration was accomplished by help of a new stratagem. A beautiful girl, Phya, a flower-seller, was dressed in the robe and helmet of Pallas Athene, and, with Pisistratus standing behind her in a magnificent chariot, she drove towards the gates of Athens, while heralds galloped in advance and announced that the tutelary goddess of the city was coming in person, bringing Pisistratus back with her. The stratagem succeeded; Phya was worshipped and Pisistratus accepted. Pisistratus now married Megacles's daughter, but treated her so badly that her father and her whole family, the Alcmæonidæ, exasperated at the insult, once more combined with the party of Lycurgus, and this combination once more drove him into exile. He retired to Eretria in Eubœa, where he lived for ten years, busy with preparations for his return, which was effected this time not by stratagem, but by force. Money and men he procured from other Greek cities, and with a well-equipped army he crossed over to Attica and landed at Marathon. His adversaries drew out to attack him, and the two armies met at Pallene. Pisistratus was victorious, and thus for the third time he came into possession of absolute power in Athens, which he henceforth held to his death. In order to be safe against the intrigues and attacks of his enemies, he always kept a troop of mercenaries, but in other respects his rule was so mild and wise that he was able to leave his power to his sons, Hipparchus and Hippias. He retained the form of the Solonian constitution, but he took care that the highest offices were always held by members of his own family. He exacted obedience to the laws, and many of his social measures were sound and beneficial. The poorest class of the inhabitants, which generally lay idle, he compelled to leave the city and engage in agriculture, and he provided them with seed and cattle. The artisans he kept busy with great building undertakings, such as the temples of the Pythian Apollo and the Olympian Zeus, the Lyceum, and the Fountain of Nine Springs. Many of the most beautiful and most characteristic institutions of Athenian life are ascribed to Pisistratus; as, for instance, the establishment of the festival of the Greater Panathenæa, the introduction of tragedy and of dramatic contests at the Attic Dionysia, the collection of the first library in Greece, and the collection, revision, and written preservation of the Homeric poems. CLEMENS PETERSEN.

Pista'chio-Nut, or **Green Almond,** the fruit of the pistachio tree, *Pistacia vera* (order Anacardiaceæ), which is common in the S. of Europe and in Asia and Africa. The nut is delicious for dessert. The kernel is somewhat like that of the almond, but is green. The nut yields a good table oil. To the same genus belong the mastich, the terebinth, and other valuable trees. Lamb fattened upon pistachio-nuts is a famous delicacy.

Pistic'ci [mediæval *Pisticcium*], town of Southern Italy, province of Potenza, 23 miles S. of Matera. It was a large and flourishing town from the ninth to the seventeenth century, but in 1688 was almost totally destroyed by an earthquake. P. in 1874, 7737.

Pis'til [Lat. *pistillum*], the female or central seed-bearing organ of fructification in phænogamous plants. A flower may possess one or more pistils; these, taken collectively, receive the name of *gynæcium*. The pistil may consist of one carpel or of several combined, as indicated by the number of cells or the angles of the ovary. A perfect pistil has three parts, to which appropriate names have been given. These are the *stigma*, the *style*, and the *ovary*. The stigma and the ovary are the only essential portions, and the style is often omitted. The ovary is the young pod, containing the ovules to be fertilized and become seeds. Several carpels which unite to form one ovary may be again divided as to the styles or stigmas. The style is usually cylindrical or columnar, often long and thread-form, sometimes flat, and it is crowned by the stigma, which may be a knob or a double or single line extending down the inner face of the style. It assumes very many different forms, but whatever may be its appearance, it always serves the same end. It consists of naked cellular tissue, or is rough with papillæ, or hairy or viscous. On its surface falls the pollen from the anthers, which then imbibes moisture, swells, and protrudes tubes, which penetrate the style, and finally reach the ovary and fertilize its contained ovules. These now develop the embryo or germ, increase in size, and become seeds. In theory, each carpel may be considered as a small leaf folded upon itself. It may be sessile or borne upon a stalk, representative of the petiole of the leaf. In some cases this is very much extended. The ovules are generally attached to the margin of this transformed leaf, and the portion where they are attached is called the *placenta*. The pistils may be in flowers by themselves on the same or different plants. In hermaphrodite flowers both stamens and pistils are present, although they may be so situated with reference to each other as not to be self-fertilizing. In such cases the desired cross-fertilization is usually accomplished through the agency of insects. The partitions which divide an ovary into cells are called *dissepiments*. The ovules may be arranged on a central placenta, or borne on the sides of the ovary, when the placentation is called *parietal*. There is every gradation between these two arrangements. In a few exceptional cases the seeds are not produced and matured within an ovary, as in the case of the Coniferæ and Cycadaceæ. These plants are hence called *gymnospermous* or naked-seeded. In them the pollen, which is abundant and scattered by the winds, falls directly upon the exposed ovules.



W. W. BAILEY.

Pisto'ja [Lat. *Pistoria* or *Pistorium*], town of Italy, province of Florence, 21 miles N. W. of the city of Florence. It lies in a most fertile valley between two spurs of the Apennines, one of which separates the valley of the lower Arno from that of the Ombrone, a torrent flowing a little to the E. of this town. A fine view of Pistoja is obtained from the remarkable railway which crosses the Apennines between Bologna and Florence. A wall, rhomboidal in outline, surrounds the town, which is entered by four gates besides the railroad barrier. The streets are sufficiently wide and well paved, the squares large, and the public buildings very respectable. The cathedral, in form an ancient basilica, was built in the sixth century, rebuilt in the twelfth after a destructive fire, and again remodelled by Niccolò Pisano between the thirteenth and fourteenth. It contains some interesting works of art, among them a famous silver altar and the cenotaph of Cino da Pistoja. The baptistery, opposite the cathedral, is octagonal in form, though popularly called the Rotondo. The font is worthy attention. San Bartolomeo, Sant' Andrea, and San Giovanni are all churches of very ancient date, and the latter contains a pulpit of white marble (fourteenth century) exquisitely wrought in alto-rilievo; also an admirable marble group by N. Pisano. The bishop's palace is an imposing edifice. The façade of the hospital is decorated with remarkable terra-cottas by the Della Robbia family, representing the seven works of mercy. The elder Pliny first mentions Pistoja as a Roman military colony; Gregory the Great sent thither its first bishop in 594. From the time of the countess Matilda (1046) Pistoja began to govern itself as an independent commonwealth; but, after a long period of prosperity with occasional reverses, it fell in 1351, desperately resisting, under the dominion of Florence, and it has little separate subsequent history. The manufactures of Pistoja consist chiefly of hides, woollens, silk, ironwork generally, and especially firearms. Pistols are said to have been first made here, a fact which is thought by many to explain their name. A very fine rock-crystal is also wrought here. P. in 1874, 13,000.

Pistol. See SMALL-ARMS, by GEN. P. V. HAGNER, U. S. Army.

Pis'tole [from the It. *piastruola*, a "little piastre"]. The Spanish pistole is a gold coin, lately worth about $4, but formerly much more valuable. The new Italian gold pistole of twenty lire is worth $3.823, but the old ones are variable. There are also German and Swiss pistoles.

Pitaval', de (FRANÇOIS GAYOT), b. at Lyons in 1673; served for some time in the army; studied law; practised as an advocate in Paris, and acquired a name by his publication of *Causes célèbres et intéressants* (20 vols., Paris, 1734–43). D. at Paris in 1743. The work, a collection of law-cases and their decisions, excited considerable interest, was several times abridged, translated into other languages, and continued after the death of Pitaval by François Richer (22 vols., Amsterdam, 1772–88). In 1842, Hitzig and Häring commenced a similar collection at Leipsic, under the title of *Der neue Pitaval*, which was afterward continued by Vollert, and reached nearly 50 vols.

Pit'cairn, p.-v. and tp., St. Lawrence co., N. Y., on Oswegatchie River. P. 667.

Pitcairn (Major John), b. in Fifeshire, Scotland, about 1740; became captain of marines Jan. 10, 1765, major Apr., 1771; was stationed several years at Boston, Mass.; led the advance in the expedition to Lexington and Concord, Apr. 19, 1775; commenced the first battle of the Revolution, and was killed at Bunker Hill June 17, 1775.

Pitcairn Island, a small island in the Pacific Ocean, in lat. 25° 3′ S. and lon. 130° 6′ W., and comprises an area of 1¼ sq. m. It is of some consequence, because it is the only place on the route from South America to Otaheite in which fresh water can be procured. It was discovered in 1767, and colonized in 1790. It belongs to Great Britain.

Pitch, in music, the degree of acuteness or gravity of a sound, as distinguished from its other qualities, as loud or soft, harsh or smooth, dull or piercing, etc. A musical sound is not necessarily identified with any particular degree of the diatonic, chromatic, or even an enharmonic scale. A string tuned, for instance, to C may be shortened by the finger or a bridge in a hundred or more places successively, and at each shortening it will give forth under the bow a musical sound more or less acute, according to the length of the sounding portion. In like manner, an organ-pipe while sounding may be made to give a great number of slightly varying musical tones by drawing its stopper up or down with a sliding motion. The musical scale, however, is not thus uncertain, but consists of eight definite sounds, derived for the most part from the tones given by the mathematical divisions of a string, and then gathered and arranged in a regular series. (See Music, Scale, and Temperament.) But such a series, unless fixed by some determinate standard limiting and defining its measure of acuteness, may be supposed to take its rise from any point even of a *sliding scale*, as in the case just mentioned of a *single* sound produced by a pipe or string. The fixing, therefore, of some invariable standard of pitch, whereby any given note of the scale shall represent a sound of one and the same degree of acuteness in all written music, has been an object of interest and importance from the first rise of musical science. It is quite improbable that in early times, when music was in its rudest state, there was any standard corresponding to what we now call *concert-pitch;* for though the ancient Greeks had a certain familiarity with the relations and order of intervals, yet the very imperfect nature of their instruments seems to forbid the conclusion that the adjustment of such instruments to a strictly accurate pitch was an object of much practical importance. The human voice also, on account of its variety of range in different individuals, could be used only approximately as a standard of pitch. Stringed instruments are equally useless in determining pitch, as they merely exhibit a pitch that has been otherwise ascertained, and into agreement with which they are tuned. There is much room, therefore, for conjecture in regard to the mode in which the pitch of the scale came, in the course of time, to be settled by common consent as it stood, for instance, in the fifteenth or sixteenth century. It is probable that the organ-builders of that period contributed as much to the settlement of the question of pitch as those who found its solution in the doctrine of vibrations. The organ-builder knew that an open pipe about two feet long and of moderate diameter would give the sound which we now call "middle C;" and the theorist knew that the column of air in such a pipe would make 512 vibrations in a second of time. But in all such cases the practical issue would prove of more immediate consequence than the theoretical; and the fixing of any *one* sound by a pipe of a certain length would be, in fact, the fixing of the whole scale above and below, whether that sound were taken as tonic, dominant, or any other term in the octave. When by this or any other means a standard of pitch was once established, conformity to it would almost necessarily follow in vocal exercises and in the construction and tuning of instruments generally. This conformity, however, has never been strictly exact, either in time or place, as it is found that concert-pitch varies somewhat in different countries, and has apparently undergone some changes in one and the same country within the last two centuries. It is asserted by musicians of eminence that an alteration of pitch to the extent of a semitone upward has taken place even since the time of Haydn (d. 1809); and the opinion has been expressed that in the age of Tallis (sixteenth century) the ordinary pitch was two whole tones lower than it is at present. That concert-pitch has been gradually rising may be proved by comparing old and new tuning-forks, the older being flatter than those now in use; but some singular facts on the other side may also be alleged, such as the existence of several old organs in Germany which are a whole tone *sharper* than the current pitch. To account for these variations, it has been maintained with some plausibility that there have existed simultaneously *several* standards of concert-pitch—viz. the secular or orchestral and the ecclesiastical—and that in the latter the pitch of the organ differed sometimes a full semitone from that adopted by the voices, rendering it necessary for the organist to transpose his part in order to bring it into agreement with the choir. Efforts have been made within the last few years, and scientific measures set on foot, for the establishment of a uniform standard of pitch; but the adoption of such a standard, even if agreed upon, suggests difficulties which seem almost insuperable—such, for instance, as the mechanical operation of bringing all organs and other instruments of fixed tone to an exact conformity with the prescribed pitch, and a general agreement among instrument-makers and vocalists to yield their preferences (if any), and accept a pitch possibly less brilliant than that in ordinary use. Wm. Staunton.

Pitch. See Bitumen, by Gen. Q. A. Gillmore, U. S. Army; and Tar.

Pitch'er, tp., Cherokee co., Ia. P. 144.

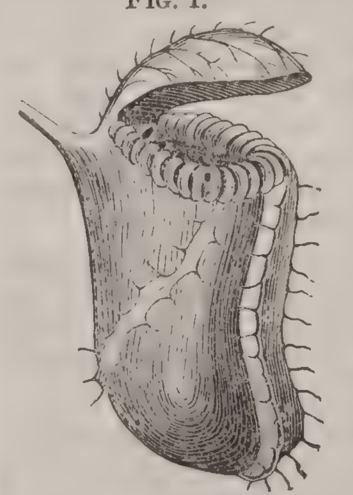
Pitcher, p.-v. and tp., Chenango co., N. Y., 16 miles S. E. of Syracuse, has 6 churches, 1 newspaper, 2 flouring-mills, 1 woollen-factory, 1 fork and edge-tool factory, 2 mineral springs, and stores. P. of v. 148; of tp. 1124.

E. Fenton, Ed. "Otselic Valley Register."

Pitcher (Thomas G.), b. in Indiana about 1824; graduated at the U. S. Military Academy, and entered the army as brevet second lieutenant of infantry July, 1845. The impending war with Mexico called him at once to active duty in Texas, and with his company he served throughout that war; subsequently on frontier till 1861, having attained a captaincy 1858; commanded his company and was severely wounded at the battle of Cedar Mountain, Aug. 9, 1862; appointed brigadier-general of volunteers Nov., 1862, and on recovery from his wound served as assistant provost-marshal-general; in 1866 was appointed colonel 44th Infantry; transferred to 1st Infantry 1870; superintendent U. S. Military Academy 1866–73.

Pit'cher-Plants. These have their leaves, or some considerable portion of the leaf, in the form of a pitcher, urn, trumpet-shaped tube, or other hollow vessel (technically called an *ascidium*) capable of holding water. They always had a curious interest, which has of late been much increased by some knowledge of a probable use which they subserve. The principal kinds belong to five different genera of plants, in three orders, which have no near relationship or resemblance except in the pitchers. One, of a single species, peculiar to South-western Australia, is thought to belong to the Saxifrage family, where it stands alone. It is named *Cephalotus follicularis.* The leaves are all in a cluster next the ground; some are flat and of ordinary conformation; others are oval pitchers, hanging from a short stalk near the top on one side, where the handle of a pitcher should be, and fitted with a lid, which neatly covers the mouth, resting at first upon a thickened and crested ring which surrounds and strengthens the orifice, but opening on its hinge as soon as the pitcher is full grown. (Fig. 1.) It has long been observed that this pitcher secretes a watery fluid and entraps many insects. Little more is yet known as to its action, although the plant has long been in conservatories; but it is difficult of cultivation.

Fig. 1.



Cephalotus.

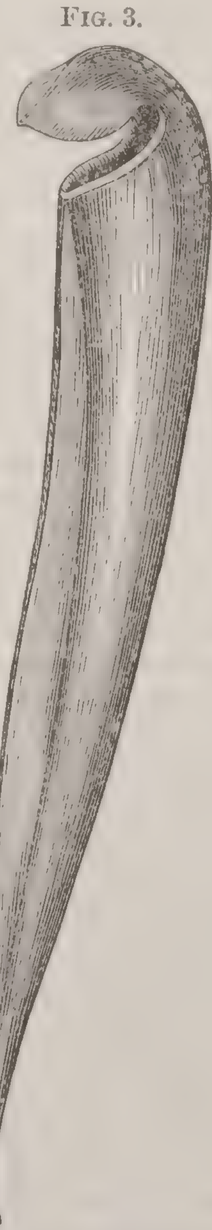
The other pitcher-plants belong to two natural orders, which are peculiar, and so far as known contain only pitcher-bearing plants. One of them, Nepenthaceæ, consists of numerous species of one genus, chiefly inhabiting the Indian Archipelago; the other, Sarraceniaceæ, is wholly American, mainly North American, and consists of three genera—one, of a single species in the mountains of California; another, of one species, in the mountains of British Guiana; the third, of several species, is confined to Atlantic North America. This is *Sarracenia.* The pitchers are all at the root, and appear to rise from the ground in a cluster. Instead of a proper lid, they have a sort of hood at the top, and a projecting wing runs down the inner or upper side from top to bottom. *Sarracenia purpurea*, native of bogs from Newfoundland to Florida, was the earliest known and is the most familiar species, as well as the only one N. of Virginia. Its oblique, urn-shaped pitcher (Fig. 2) is sometimes called "huntsman's cup." Instead of a proper

hood or cover, it has a large projecting lip, nearly erect, which half surrounds the open orifice. Most of the water with which the cup is usually half full may therefore come from rain, but at first some is doubtless secreted. This water in summer is charged with the decomposing matter of insects and the like, of various kinds, which are in some way attracted to it and drowned in it. In low grounds of Southern U. S., from Virginia to the Gulf of Mexico, near the coast, is found a second species (*S. flava*), with very long and narrow pitchers, which, on account of their shape, are popularly called "trumpets," while the yellow flowers, from their depressed rounded shape, when young, are called "watches." The hood of this species closes the orifice in the growing state, overarches it for some time afterward, but at maturity stands erect or nearly so. The interior secretes a watery fluid, ordinarily in small quantity, and this may perhaps be sparingly replenished by rain: but there is reason for the opinion that most of the liquid found at the narrow bottom of the tube is a secretion. Many insects are entrapped in these pitchers, and few if any of those that enter ever escape, owing partly to the narrowness of the tube, which prevents flight except directly upward, of which they are mostly incapable, partly to the extreme smoothness of the gorge and upper portion, and still more to the lining of the portion below with a fine *chevaux-de-frise* of close and sharp downwardly-directed bristles. The captured insects therefore perish, decompose, or are macerated in the liquid when this is abundant, or their remains are fed upon by the larvæ of other insects hatched in the decomposing mass from eggs which are deposited therein. There are two red-flowered species in the Southern States (*S. rubra* and *S. Drummondi*), with tubular or trumpet-shaped pitchers, generally similar to those of *S. flava*, the common yellow-flowered species. But the most curious of all is a yellow-flowered species named *S. variolaris*, which is common in the low country from South Carolina to East Florida. Its tubular pitchers, which are purplish-variegated and white-blotched over the back at top, are carried into dwellings to serve as fly-catchers, for which they are more efficient than any other. One of them is shown in Fig. 3, much reduced. They vary from eight or ten to twenty inches in length. The orifice is permanently protected by a strongly overarching hood, which must naturally exclude the rain. The liquid which they contain, often in some abundance, collected at the bottom of the tube, is doubtless a secretion. Flies, ants, and most other insects which have entered far or fallen into the deep cavity are unable to escape. It remains to be ascertained whether the secretion is increased after insects are captured.

FIG. 2.

Sarracenia purpurea.

FIG. 3.

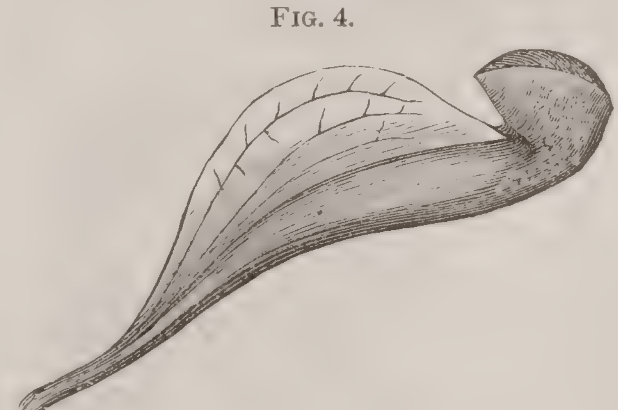


Sarracenia variolaris.

In all these tubular pitchers, when freshly grown and vigorous, and in the warm temperature of early summer, a different secretion, sweet and somewhat viscid or honey-like, is exuded within the orifice and base of the hood, which is the attraction to insects, and allures them to the brink or within the gorge of the pit, into which they eventually fall. It has been thought to intoxicate or stupefy the insects that sip it, thus causing their fall. This was affirmed by Mr. Grady of North Carolina to be true of *S. flava:* but Dr. Mellichamp of South Carolina does not find this to be true of *S. variolaris*, the most efficient of all as a fly-trap. His account was published in the New York *Tribune* in July, 1874, and in the *Proceedings* of the American Association for the Advancement of Science for that year. Dr. Mellichamp's experiments, however, go to show that the watery liquid within, into which the insects are precipitated, is narcotic or asphyxiating to them, as they perish in it much sooner than they do in ordinary water. The existence of this sweet secretion and its attraction of insects in the Southern species appear to have been more or less known at an early period, but nearly to have passed out of knowledge until recently. There are some allusions to it in William Bartram's *Travels in Georgia and Florida*, published in 1791, but they are vague, and do not discriminate between the sweet secretion at the orifice and the watery liquid below. The first good observations we know of were made by Dr. James Macbride of South Carolina in 1810 and the following years, and published in the *Transactions* of the Linnæan Society in 1815. A less specific announcement of the existence of this "honeyed fluid" and its action, but without mention of the species in which it occurred, had meanwhile been published in 1812, in Tilloch's *Philosophical Magazine*, by the distinguished Prof. Benjamin Smith Barton, whose paper is dated Sept. 3, 1811. But as Dr. Barton states that these facts had only just then come to his knowledge, and mentions them only in a general way, while Dr. Macbride's observations, which are particular and specific, were mainly made in the spring of the year 1810, as between the two the latter should be credited with the discovery, which indeed he probably made known at Philadelphia. The species which he investigated are *S. variolaris* and *S. flava;* and all the facts already referred to are clearly brought out, except the stupefying property of the watery liquid, which rests on the authority of Dr. Mellichamp. The latter discovered a most interesting particular in *S. variolaris*—namely, that, at the period of the greatest activity of its pitchers in secretion and in insect-capture, a narrow line or trail of the sweet exudation appears upon the edge of the wing, and extends from the orifice down to near the base, a distance of from eight to eighteen or twenty inches, according to the size of the leaf. This trail of treacle, continuous from the copious similar deposit within the orifice down to near the ground, seems especially adapted for the allurement of ants and other wingless insects fond of sweets. And it had already been observed by those unacquainted with this arrangement, and has since been confirmed, that the pitchers of *S. variolaris* usually contain far more ants than they do of all other insects together.

A remaining species, *S. psittacina*, or the parrot-headed

FIG. 4.



Sarracenia psittacina.

Sarracenia (Fig. 4), of the Southern U. S., bears small pitchers, of less width than the leafy wing; it is mainly remarkable for the inflated hood completely inflated over the orifice, which is thus reached only from underneath. Its arrangements for enticing insects are not yet made out. It is chiefly interesting as showing a transition toward the pitchers of the Californian representative of the family of a peculiar genus—viz. *Darlingtonia Californica.* This is found only in the northern portion of the Sierra Nevada, extending to Shasta Peak. The flower is less like that of *Sarracenia* than are the leaves or pitchers, which only are now under consideration. These may be compared with those of the last-mentioned *Sarracenia;* only they are far larger, varying from a span to two feet in length, stand erect or nearly so, have a twist of at least half a turn, the summit is equally hooded and inflated, so that the orifice looks downward, and the extremity of the hood bears a curious, two-forked, pendulous appendage, in the form of a fish's tail. These are the leaves of the adult plant. Those of seedlings are open-mouthed, with a small and merely overarching hood, and no such appendage; in all these respects well agreeing with the tubular Sarracenias. The ensuing account is from observations on the living plant in its native habitat by Mrs. Austin of Taylorsville, Plumas co., Cal., supplemented by Mr. Wm. M. Canby (in a paper read before the American Association for the Advancement of Science in 1874, published in its

Proceedings, and in recent letters). The pitchers capture insects in abundance, both of ambulatory and flying kinds, such as wasps, grasshoppers, beetles, ants, flies and gnats, butterflies and moths, also spiders, worms, and snails. The decaying mass at the bottom generally contains the thin white larvæ of some dipterous insect. Some watery secretion is found in young pitchers which have not yet opened; it increases somewhat afterward, especially after insects have been caught, and in proportion to their number. Bits of meat thrown in also increase the secretion. This at times fills six or seven inches of the lower part of the tube, and sometimes almost the whole of it. From the situation of the orifice it is evident that no rain is likely to enter. The liquid when first secreted is slightly bitter and astringent. Later, it is shown to be slightly acid by litmus-paper. Insects immersed in it ordinarily die in a few minutes. After warm weather comes on, a sweet secretion begins to appear in the form of minute drops, like honey-dew, on the inside of the hood and of the fish-tail appendage. As summer advances this is increased, extends all over the appendage or its lobes, outside as well as inside, occasionally gathering into a drop at the tip of each lobe. It has some odor and the taste of honey. Insects, flies especially, are fond of it. In large leaves at midsummer a line of this sweet secretion extends from the orifice downward along the edge of the wing almost to the ground; in most leaves, whether large or small, it occurs, in the form of minute globules resembling honey-dew, along the angle on either side formed by the junction of the wing with the tube.

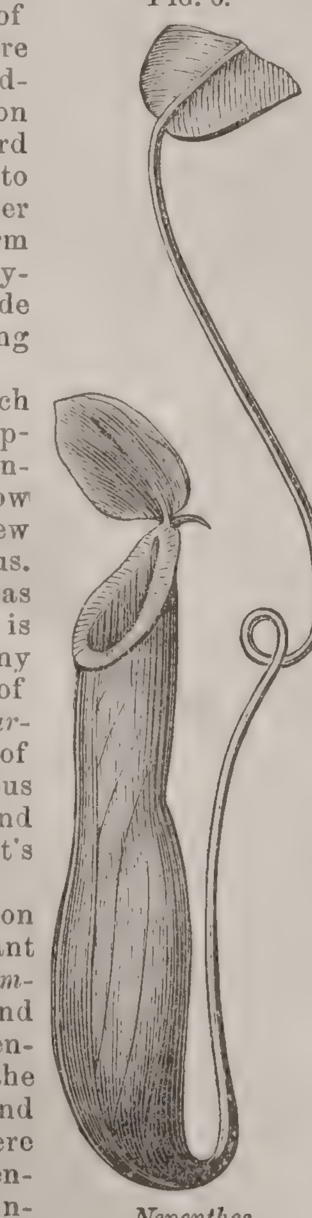
Fig. 5.

Darlingtonia Californica.

It is difficult to believe that such adaptations, and the consequent captures, are purposeless or of no benefit to the plant, the more so now that several plants of the sundew family are found to be carnivorous. (See Sundew and Dionæa.) It has not been shown, however, and it is not very probable, that there is any proper digestion or absorption of unaltered animal matter in the *Sarracenia* family. But the products of decomposition, in a liquid or gaseous form, are probably absorbed and made subservient to the plant's nourishment.

Nothing is known as to the action of the only remaining pitcher-plant of the *Sarracenia* family, *Heliamphora* of Guiana. Its short and broad pitchers are erect and open-mouthed, as much so as those of the northern *Sarracenia purpurea*, and the hood or lid is obsolete or a mere rudiment. The pitchers, being opened, are liable to be filled with rainwater, and can therefore serve only for maceration.

Fig. 6.



Nepenthes.

However it be in some *Sarracenias* and in *Darlingtonia*, there is reason to believe that something like a true digestion takes place in the remaining order of pitcher-plants, represented only by the rather large genus *Nepenthes*. (See art. Nepenthes and Fig. 6.) These plants, as is elsewhere stated, belong to the southern hemisphere and to the great islands, from Madagascar to Borneo. It is now known (mainly by the observations and experiments of Dr. Hooker, president of the Royal Society) that a sweet secretion which allures insects forms on the rim of the pitcher, and sometimes on its lid; that the watery liquid which is secreted by and contained in the interior of the pitcher increases in quantity when insects are caught or drowned in it, and equally so when bits of meat or little cubes of cartilage or boiled white-of-egg are thrown in; also, that the secretion then becomes acid, and acquires the power of dissolving such solid matters, in a manner apparently analogous to that of the gastric juice of animals.

Asa Gray.

Pitch'stone, a name given to a variety of feldspar of somewhat resinous appearance; it is also a popular name for many sorts of opal which have a decidedly resinous lustre, and other glassy minerals.

Pith, in the stalk and branches of exogenous plants, the central core of soft cellular tissue. It communicates with every leaf-bud directly, and with the bark by the "silver-grain" or medullary rays. In most trees and shrubs the older wood encroaches upon it, and to some extent obliterates it. In the young shoot it is a reservoir of nutritious juices for the use of the growing parts. Its cavity is lined by the medullary sheath.

Pit Hole City, p.-b., Allegheny tp., Venango co., Pa., on Pit Hole branch of Oil Creek and Allegheny River R. R., a noted centre of the petroleum-supply. P. 237.

Pit'kin (Timothy), LL.D., b. at Farmington, Conn., Jan. 21, 1766; graduated at Yale 1785; became a lawyer, and was five times Speaker in the State legislature; a Federalist Congressman 1806–20; author of *Statistical View of the Commerce of the U. S.* (1816; rev. ed. 1835), *Political and Civil History of the U. S.* (2 vols., 1828, with a continuation, not yet published). D. Dec. 18, 1847.

Pit'man (Isaac), b. at Trowbridge, Wiltshire, England, Jan. 4, 1813; was educated in the normal college of the British and Foreign School Society at London; was appointed master of the British School at Barton-on-Humber 1832; established a similar school at Wotton-under-Edge 1836; published *Stenographic Short-Hand* (1837) and *Phonography, or Writing of Sound* (1840), giving the principles of his invention of a superior method of short-hand called phonography, since so widely diffused as almost to have extinguished the earlier systems; removed to Bath 1839; devoted himself to the perfection and propagation of phonography and its complement phonetics; founded in 1843 the Phonetic Society, and established the Phonetic Institute, a printing-office from which he has brought out for many years *The Phonetic Journal* (weekly, with a lithographed *Supplement*); has issued several revised manuals of phonography and a considerable number of standard works in phonetic printing. His most complete professional work is the *Phonographic Reporter's Companion* (1853). His system was introduced into the U. S. by S. P. Andrews and A. F. Boyle in their *Complete Phonographic Class-book* (1847), soon followed by many similar works.—A brother of the inventor, Benn Pitman, removed to the U. S., settling at Cincinnati, where he devoted himself to the propagation of phonography; published a *Manual of Phonography* (New York, 1860), and reported the treason trials at Indianapolis (1865) and the trial of the assassins of Pres. Lincoln (New York, 1865). His present system differs slightly from that of his brother.

Pitman (Robert Carter), LL.D., b. at Newport, R. I., Mar. 16, 1825; graduated at Wesleyan University 1845; was admitted to the bar in 1848, and became a lawyer of New Bedford, Mass.; was often in the State senate, of which he was president in 1869; became a police judge in 1858, and in 1869 was appointed one of the judges of the Massachusetts superior court.

Pitra' (Jean Baptiste), b. at Champforgeuil, department of Saône-et-Loire, France, Aug. 31, 1812; studied theology at Autun; took holy orders; became a member of the Benedictine congregation of Solesmes; published *Spicilegium Solesmense* (5 vols., Paris, 1852–60); was commissioned in 1858 by Pius IX. to write a history of Oriental rites and canon law, of which the first volume appeared in 1864, second in 1868, under the title of *Juris Ecclesiastici Græcorum Historia et Monumenta.* Cardinal Mar. 16, 1863.

Pit'ri [cf. Lat. *pater*, "a father"], in Hindoo mythology, originally meant a deceased ancestor, but was ultimately transformed to signify one of an order of divine beings into which the spirits of mortals may be received on condition of the due performance of the *Sraddha* or funeral rites. The legends and accounts of the Pitris in the Vedas, the laws of Menu, the Puranas, and the later mythical works are very conflicting, but the most constant tradition is that which considers them as ancestors not only of men, but of gods and demons. The worship of the Pitris forms a large part of the Puranic ritual.

Pitt, county of E. North Carolina. Area, 700 sq. m. Traversed by Tar River; has extensive pine forests, and a light, productive soil. Live-stock, corn, cotton, and forest products are staples. Cap. Greenville. P. 17,276.

Pitt, tp., Wyandot co., O. P. 991.

Pitt (William). See Chatham, Earl of.

Pitt (William), generally called the **Younger Pitt,** the second son of the earl of Chatham, and b. May 28, 1759. He was a boy of delicate constitution, but of great precocity of mind, and when, in 1773, he was sent to the University of Cambridge, he astonished all with his knowledge and power of judgment. In 1780 he entered into public life, and took his seat in the House of Commons as member for Appleby. The opposition against the party in power, the cabinet of Lord North, consisted of two factions—one led by Rockingham and Fox, and the other by Lord Shelburne. Pitt joined the latter, which mostly consisted of old friends of his father, and his speeches made such an impression that Lord Shelburne, when he became first lord of the treasury in July, 1782, offered him a place in the cabinet as chancellor of the exchequer. Lord North, although at one time driven from power by Rockingham and Fox, now formed a coalition with them against the cabinet of Lord Shelburne, and in 1783, Lord Shelburne had to give in his resignation, and Pitt with him. But in the very next session, when Fox brought in his bill for transferring the government of India from the East India Company to Parliament—that is to say, to the ministry—the coalition was defeated and the cabinet compelled to retire. Pitt was called upon to form the new cabinet, and after dissolving Parliament and gaining a majority at the general election of 1784, he established himself firmly in the most powerful position which a subject can occupy in England, and he maintained himself in this position without interruption for fourteen years. This extraordinary success was not due to an equally extraordinary talent. Pitt was no doubt a very talented man, but his greatest fortune was his name. The nation loved him first because he was a son of the great Pitt, and secondly because he was disinterested, honest, upright, and fearless; which latter virtues were so rare among English statesmen of the eighteenth century that they alone were almost sufficient to make a man great. And Parliament respected him first because he was a man of eloquence and business capacity—two qualities which are valuable everywhere, and which in England are as indispensable as coal; and secondly, because he was a son of the great Pitt. Macaulay in his *Biographies* falls into strange raptures of admiration because he can assert that Pitt never stole, never touched "unlawful gain." Indeed, the only pecuniary advantage he took of his political position was that very harmless one of leaving behind him a debt of £40,000, which he could never have made if his creditors had not known that after his death Parliament would pay his debts, as it had paid those of his father. No less unqualified is Macaulay's admiration of Pitt's eloquence, its "ample periods," its "merciless sarcasm." But what about its objects? All his great measures, the constitution of the East India Company, the establishment of the sinking fund, the subjugation of Ireland, the war against Napoleon, were accompanied by the loud praise and eager sympathy of his contemporaries; but that is not enough to make them great, especially since not one of them has escaped the heavy censure of posterity. No English historian has as yet been able to give a sufficient reason for the war which England began against France in 1793 and continued to 1815. It seems to have been a whim, a chimera of the minister; he would imitate his great father in this point too. But his war administration was weak and confused, and when losses and disasters followed, the chimera grew into a mania. In 1801 he retired from office. Different reasons are given. Some say that after establishing the union between Ireland and England he intended an emancipation of the Roman Catholics of Ireland, and resigned when the king refused to give his assent. Others say he retreated before a public opinion which not only in England, but in all Europe, demanded peace. In February he resigned, and in May the Peace of Amiens was concluded. Pitt's stubbornness, however, had made it one of Napoleon's principal objects to crush England, and that line of policy which in England had originated in a mere chimera became in the course of time a dire necessity. In 1804, Pitt was recalled and the war was renewed. But the surrender of the Austrian army at Ulm, the battle of Austerlitz, the Peace of Presburg filled the haughty but impotent minister with such chagrin that he actually died from disappointment and rage, Jan. 23, 1806; and although, at last, England came out triumphant and victorious, it is more than questionable whether she, or Europe, or civilization in general, derived any good from this war between Napoleon and her minister. Clemens Petersen.

Pit'tacus, one of the Seven Wise Men of Greece, b. at Mytilene in Lesbos 652 b. c.; as a leader of the democratic party participated very actively in all the feuds and embroilments of his native city, and was chosen *æsymnetes* in 589 b. c.—that is, ruler with absolute power—which office he filled to 579 b. c. D. 569 b. c. Of his laws and other acts as a ruler nothing is known; of his elegiac poems Diogenes Laertius has preserved a few lines.

Pit'tidæ [Gr. πίττα, "pitch," in allusion to the color of some species], a family of passerine birds popularly known under the name ant-thrushes. They are larger than the thrush; the bill moderate and nearly straight, with the sides compressed toward the tip, and with the tip decurved; the nostrils lateral, in a membranous groove, and near the base; the wings short, with the third and fourth quills longest; tail very short and even; feet robust; tarsi long, slender, and with transverse scutellæ; toes three in front, of which the outer is longer than the inner, hind toe quite long; all with long curved claws. The species are quite showy, and the most salient character is the shortness of the tail. They are inhabitants of India and the contiguous regions, as well as Western Africa, Australia, and Madagascar, where alone the species *Philopitta* are found. The family embraces only two genera—*i. e. Pitta* and *Philopitta;* the former has thirty-nine species, the latter two.

Theodore Gill.

Pitts'borough, p.-v., Middle tp., Hendricks co., Ind., on Indiana division of Indianapolis Bloomington and Western R. R. P. 201.

Pittsborough, p.-v., cap. of Calhoun co., Miss. P. 186.

Pittsborough, p.-v., cap. of Chatham co., N. C.

Pitts'burg, tp., Johnson co., Ark. P. 959.

Pittsburg, p.-v., Tippecanoe tp., Carroll co., Ind., on Wabash River. P. 320.

Pittsburg, or **Cross-Roads,** tp., Wicomico co., Md. P. 2132.

Pittsburg, p.-tp., Coos co., N. H. P. 400.

Pittsburg, city, cap. of Allegheny co., Pa., at the junction of Allegheny and Monongahela rivers, the two rivers here uniting to form the Ohio, which empties into the Mississippi 1000 miles below. The city is 354 miles, by rail, W. of Philadelphia, and about 40 miles E. of the Ohio State line; lat. 40° 26′ 34″ N., lon. 80° 2′ 38″ W. It is the western terminus of Pennsylvania R. R. from Philadelphia, and Connellsville R. R. from Baltimore; the southern terminus of Allegheny Valley R. R. from Buffalo, Erie and Pittsburg from Erie, and Cleveland and Pittsburg from Cleveland; the eastern terminus of Pittsburg Fort Wayne and Chicago R. R. from Chicago, and of Pittsburg Cincinnati and St. Louis R. R.; and the northern terminus of Pittsburg Virginia and Charleston R. R., not yet completed. It also has railroad connection with Butler, Blairsville, and Indiana by West Pennsylvania R. R., and with Washington, Pa., by Chartiers R. R. Allegheny River is navigable as far up as Warren, but only when in flood. Monongahela River is slack-watered up to the Virginia line, and steamboats ply on it during the whole year, except in seasons of extreme cold. Ohio River is navigable from six to eight months in the year, according to the rainfall. Lumber and oil are transported to a considerable extent, nearly all the lumber from the western counties of the State finding its way to market in rafts by this stream. Coal and coke are produced in large quantities on the Monongahela, and are floated in barges to Cincinnati, Louisville, and New Orleans when the rivers are in flood. The annual product is about 60,000,000 bushels, or 2,000,000 tons.

The city was originally confined in its limits to the peninsula of level ground between the two rivers, but has since spread out up the banks of both rivers and over the adjoining hills, until it now extends to 7 miles up both rivers and across, and a population of over 30,000 has also been added from the S. side of the Monongahela and Ohio. Allegheny City, on the opposite side of the Allegheny River, still maintains a separate municipal existence, but is always regarded as being a part of what is known under the general name of Pittsburg. The site of the city was regarded in early days as being of great strategic importance. Washington as a young surveyor became acquainted with its value as early as 1753. In Feb., 1754, the English took possession of it and built a stockade at the junction of the rivers, but the French drove them out in the following April, and built Fort Duquesne for its protection. The disastrous expedition of Gen. Braddock in 1755 was undertaken for the purpose of dislodging the French, but he was met and defeated (July 9, 1755) by the French and Indians at a point 12 miles above Pittsburg, on the Monongahela, where now stands the flourishing village of Braddock. Maj. Grant, with 800 men, made a second attempt Oct. 15, 1758, and penetrated to the high ground on which a part of the city now stands, but his command was cut to pieces. The hill on which he en-

camped prior to his defeat is still known as Grant's Hill, although the hill has nearly all been graded away. The court-house now occupies the ground of his encampment. A third attempt, made by Gen. Forbes with 8000 men (Nov. 25, 1758), was more successful, and the French withdrew permanently. A new fort was built in 1759, the French having burned the old one, and the place immediately became a great point for trade. The fort was called Fort Pitt, in honor of William Pitt, then at the head of the British ministry, and when the place had grown to a town it was called Pittsburg. The post was given up by the English in 1772, but as early as 1764 efforts were made to build up a town, and it gradually increased its population. In 1804 it was incorporated into a borough. Virginia at one time claimed that all that part of Western Pennsylvania along the Monongahela and Ohio belonged to her, and a commission of Virginians took possession of Fort Pitt in 1775; but when the boundary-line was settled between Pennsylvania and Virginia in 1779 it was placed considerably S. of Pittsburg, and the possession of the fort was surrendered. The site of the original town was a part of one of the manors reserved by the Penn family when they surrendered to the State their proprietary rights to the soil, and the town was surveyed and laid out by them in streets and town-lots at a very early day after the English left. The lower part of the city still retains the streets and general conformation given to it by this survey. The Whisky Insurrection and the agitation attending it, which extended from 1791 to 1796, led to many scenes of violence and excitement in Pittsburg, many of its then citizens taking an active part in that trouble. The borough was incorporated into a city in 1816, its limits being unchanged. In the same year a town called Bayardstown was laid out immediately adjoining it on the N. E., which was many years afterward added to the city. The U. S. arsenal was built in 1814 at a point on the Allegheny River 2 miles above the city. It is now entirely surrounded by the city, which has extended miles beyond it. After Bayardstown was admitted into the city as the fifth ward (the old city consisting of four) the city-line was extended over the large hills immediately E. of the old city, increasing the number of wards to twelve; in 1867 the whole territory between the two rivers, from a point 7 miles above the junction, was added, increasing the number of wards to twenty-three. Subsequently, in 1872, the several towns S. of the Monongahela were added, increasing the number of wards to thirty-seven. The population in 1793 was 1139; in 1820 it was 7497; in 1850, 46,601; in 1860, 49,217; in 1870, 86,076; and in 1874, with the additions made on the S. in 1872, it is about 140,000. Adding Allegheny City, which is practically a part of Pittsburg, the population is 210,000. The business of manufacturing, which is the distinguishing characteristic of the city, began at a very early period. As early as 1777 boat-building was extensively carried on, and in 1794 a line of keelboats was established between Pittsburg and Cincinnati. The first paper-mill was built in 1798, the first cotton-mill in 1805, the first glasshouse in 1807, and the first nail-machine was put up in 1814. The establishment of rolling-mills and foundries began shortly after the close of the second war with Great Britain, and has been going on steadily. The first bank was started in 1814, and the rivers were both bridged in 1816.

The present condition of the city may best be inferred from the following statistics: There are 10 daily papers published, 2 of which are in German, and 20 weeklies. The number of iron-mills is 43, using 570 puddling furnaces and 520 nail-machines. There are 12 blast furnaces for the production of pig metal, yielding, in 1873, 163,853 tons, and the pig metal imported into the city by rail and river in the same year was 320,342 tons, making a total consumption of 474,195 tons for mills and foundries. The amount of ore imported for use in furnaces and mills was 346,380 tons. The number of foundries and machine-shops is 75. The coal and coke mined and sent to market was 130,000,000 bushels, of which 60,000,000 bushels were shipped down the river to ports below, and 70,000,000 consumed in the city. Number of glasshouses, 70, employing 5000 men. Number of home insurance companies, 19; banks of discount and deposit, 36; savings banks, 23; capital of insurance companies, $3,250,000; of banks, $13,000,000; of savings banks, $3,250,000. The receipts of crude oil in 1874 were 2,000,000 barrels and the exports of refined were 800,000 barrels. The grocery and produce trade, wholesale, amounts annually to $25,000,000, and the dry goods trade to $10,000,000. The capital invested in manufactures is estimated at $60,000,000, and the annual export of manufactured goods at $150,000,000. The receipts of flour were 400,000 barrels, and 5,000,000 bushels grain. The great "Union" gun, the largest in the world, was cast here in 1861, weighing 49,050 pounds. The various manufactories of the city embrace sheet, bar, and boiler iron of all kinds, nails, spikes, rivets, bolts, nuts, screws, blister, plough, and cast steel, axles, vises, crow-bars, gas-pipe, stoves, water-pipes, iron and wooden bridges, tacks, glassware of all kinds, copper, sheet and pig, white lead, ploughs, wagons, carriages, shovels, axes, safes, cutlery, wire, boilers and engines, files, guns, etc. There are 3 copper-mills, 10 white-lead factories, 2 silver-smelting furnaces for extracting lead and silver from Rocky Mountain ores, and quite a number of smaller factories of various sorts. The number of men employed is from 30,000 to 40,000, and the total business of the city reaches an aggregate of $200,000,000 annually. There are now 6 bridges over the Allegheny, connecting the two cities of Pittsburg and Allegheny, 1 of which is a beautiful suspension bridge; and 4 over the Monongahela connecting the old city with the S. side. There are 8 street railways, leading to all parts of the city, and 2 inclined planes up the bluff hill on the S. side formerly known as Coal Hill. The city has an excellent system of ward schools, with a high school for advanced pupils, and many of the ward school-houses are fine specimens of architecture. Besides a large number of fine buildings, public and private, there are 1 university, an insane hospital, 4 hospitals for the sick and injured, 2 orphans' asylums, an observatory, a marine hospital, 3 public libraries, and about 200 churches, belonging to all denominations. Both Pittsburg and Allegheny are well supplied with water from Allegheny River, the S. side being supplied from the Monongahela. There are 4 large basins on high ground, holding the supply for daily use—1 S. of the river, 2 between the rivers, and 1 N. of the Allegheny; and the city of Pittsburg is now engaged in building new reservoirs, to be filled with water drawn from the Allegheny above the city-line, and of sufficient capacity to supply a city with 1,000,000 inhabitants. There are 5 gasworks, with mains extending to all quarters, and gas is cheaper in this city than in any other city in the Union, being supplied to the city at 75 cents per 1000 cubic feet, and to citizens at $1 in the densely-settled parts of the city. Nine railroads enter the city from various points, and the people have direct access to all parts of the country by rail. The Pittsburg Virginia and Charleston road is the only one unfinished. It is now built only to Monongahela City, in the adjoining county of Washington, but is to be extended into West Virginia and southward until it connects with the Southern chain of roads. The steady growth of the city may be inferred from the fact that from 1500 to 2000 new houses are annually built, more than half of them being brick. The city was visited by destructive floods in 1832 and 1852, and by a terrible fire in 1845, which swept away one-third of the business part of the city. It has also been thrice visited by the cholera, but only to a very limited extent each time. The general health of the city is remarkably good, the death-rate being 80 to 100 weekly in a population of 210,000. RUSSELL ERRETT, ED. "COMMERCIAL."

Pittsburg, p.-v., cap. of Camp co., Tex.

Pittsburg Landing. See SHILOH.

Pitts'field, p.-v. and tp., cap. of Pike co., Ill., at the southern terminus of Pittsfield branch of Toledo Wabash and Western R. R., has 2 newspapers, several flouring-mills and tobacco manufactories, and a considerable trade. P. 1621; of tp. 2799.

Pittsfield, p.-v. and tp., Somerset co., Me., on Maine Central R. R. P. 1813.

Pittsfield, p.-v. and tp., cap. of Berkshire co., Mass., in lat. 42° 36′ N., lon. 73° 15′ W., is located upon a beautiful plain 1200 feet above the sea, and surrounded by fine sheets of water, adding much to its picturesqueness and scenery. There are 6 lakes and lakelets, the outlets of which form Housatonic River, one branch girting the village on the W. and the other on the E., both finally meeting S. of the village. It is supplied with water and gas, and contains a park, a free library of 7000 vols., works of art, etc., 1 high and 30 public schools, 2 seminaries, a fine court-house, 10 churches, 2 weekly newspapers, 3 banks, a life and fire insurance company, several fine hotels, a jail, and fine stores. The lakes in the vicinity afford excellent water-power, which is utilized in the manufacture of cotton and woollen fabrics, silk, and tacks. Pittsfield is an important railroad centre; Boston and Albany, Housatonic, and Pittsfield and North Adams R. Rs. pass through it, affording good facilities for transportation in all directions. A benevolent institution for the disabled by accident or disease ranks among its charities. The site of Pittsfield was granted to Boston in 1735, and was known as Boston Plantation until its incorporation in 1761, when it received its present name. P. 11,112. JOHN TATLOCK.

Pittsfield, tp., Washtenaw co., Mich. P. 1121.

Pittsfield, p.-tp., Merrimack co., N. H., on Suncook Valley R. R., 15 miles E. of Concord, has an academy, 5 churches, 2 banks, 2 newspapers, 1 cotton-factory, and 1 shoe-factory. P. 1600. J. C. Cashman, Ed. "Star."

Pittsfield, p.-v. and tp., Otsego co., N. Y., on Unadilla River. P. 1469.

Pittsfield, p.-v. and tp., Lorain co., O. P. 980.

Pittsfield, p.-v. and tp., Warren co., Pa., on Broken Straw Creek and Philadelphia and Erie division of Pennsylvania R. R. P. 1260.

Pittsfield, p.-v. and tp., Rutland co., Vt. P. 482.

Pittsfield, tp., Brown co., Wis. P. 585.

Pitts′ford, tp., Butler co., Ia. P. 512.

Pittsford, p.-v. and tp., Hillsdale co., Mich., on Lake Shore and Michigan Southern R. R. P. 1675.

Pittsford, p.-v. and tp., Monroe co., N. Y., on Irondequoit Creek, Erie Canal, and New York Central R. R. P. of v. 505; of tp. 1974.

Pittsford, p.-v. and tp., Rutland co., Vt., on Rutland R. R. P. 2127.

Pitts′grove, p.-v. and tp., Salem co., N. J., on West Jersey R. R. P. 1667.

Pitt's Point, p.-v., Bullitt co., Ky. P. 98.

Pitts′ton, p.-v. and tp., Kennebec co., Me., on Kennebec River. P. 2353.

Pittston, p.-b. and tp., Luzerne co., Pa., in the centre of the Wyoming coal-region, 9 miles from Wilkesbarre, ships annually over 1,000,000 tons of coal, and has 3 railroads, excellent public schools, churches of all denominations, 2 newspapers, 4 banks, water and gas works, 1 foundry, and machine-shops, 1 knitting and 2 planing mills, a stove manufactory, terra-cotta works, lumber-yards. P. of b. 6760; of tp. 4447.
G. M. Richart, Ed. "Gazette."

Pitts′town, p.-v. and tp., Rensselaer co., N. Y., on Troy and Boston R. R. P. 4093.

Pittsylva′nia, county of Virginia, bounded S. by North Carolina. Area, 900 sq. m. It is hilly, picturesque, and very fertile. Iron ore and limestone abound. Live-stock, grain, and tobacco are largely produced. Traversed by Richmond and Danville R. R. Cap. Competition (Pittsylvania Court-house P. O.). Danville is the largest town. P. 31,343.

Pittsylvania Court-house (P. O. name of Competition), cap. of Pittsylvania co., Va.

Pitu′itary Body [Lat. *pituita*, "mucus"], a small, soft, reddish, oval, vascular body within the skull, is situated on the *sella turcica*. It has two lobes, and appears to be a ductless gland, of the same class with the thyroid, the thymus, etc., and like them is proportionally much larger in the fœtus than in the adult.

Piu′ra, town of Peru, in a dry and sandy plain on the river Piura, in lat. 5° 11′ S., 63 miles from its port, Payta, on the Pacific, was founded by Pizarro in 1531, and is the oldest settlement of the Spaniards in Peru. The province of which Piura is the capital, and which bears the same name, is rich in sulphur, iron, lead, magnesia, lime, and petroleum, and produces maize, tobacco, cacao, cotton, and sugar; it is also noted for its fine breed of mules. The city is well and substantially built, and carries on a considerable trade. A railway connecting it with Payta is under construction. P. about 15,000.

Pi′us, the name of nine popes, of whom three have acquired a conspicuous name in history.—Pius VI. (*Giovanni Angelo*), Count Braschi, b. at Cesena, province of Forli, Italy, Dec. 27, 1717; was elected pope Feb. 15, 1775, under very difficult circumstances. In most Roman Catholic countries, Austria, France, Portugal, Naples, and Tuscany, there showed itself a marked tendency to emancipate the national Church from the authority of the pope and place it under the direct control of the state; against which tendency Pius VI. found no other weapon to apply than a repetition of the old papal pretensions. But these declamations sounded so much the more singular in his mouth as he was not a character of any great weight. Although a handsome, graceful, affable man, of prepossessing manners, he was somewhat vain, a little ostentatious, weak and irresolute of will, and soon entangled in glaring self-contradictions. He drained parts of the Pontine Marshes, but the immense sums which this undertaking cost he raised by establishing in his states one of the most objectionable forms of lottery, which here, as everywhere, speedily reduced poor people to complete misery. He built the harbor of Ancona, but he gave his nephew, Luigi Braschi, a monopoly of the trade in oil and corn. With Joseph II. he succeeded in negotiating without incurring any open breach, but with the revolutionary government of France this proved impossible. The policy of the National Convention and the Directory was as violent and cynical as that of the pope was imprudent and undignified. In 1797 he bought the Peace of Tolentino by immense sacrifices of land and money. But new complications soon arose, and on Feb. 18, 1798, the French proclaimed the Republic in Rome and imprisoned the pope. The old man, now eighty-one years of age, was carried from Rome to Florence, thence to Grenoble, and at last to Valence, borne across Mount Genèvre in a litter and sheltered against the cold by the furs of the hussars who formed his guard. At Valence he d. shortly after, Aug. 29, 1799.—Pius VII. (*Gregor Barnabas*), Count Chiaramonti, b. at Cesena Aug. 14, 1742, a cousin of Pius VI.; was elected pope Mar. 14, 1800; entered Rome July 3 by the aid of Austrian, English, and Turkish troops, and took possession of all the papal dominions with the exception of Avignon and Venaissin Nov. 22, 1801, having concluded the concordat with France on July 15 of the same year. His aim, like that of his predecessor, was the re-establishment of the papal authority in all its mediæval glory, but he was a man of strong convictions and firm will, and all his actions bear a mark of gentleness and simplicity which commands respect and sympathy. Nov. 28, 1804, he arrived at Paris, on the invitation of Napoleon, in order to crown him, but this visit, which lasted till Apr. 4, 1805, was fatal to the good relations between the emperor and the pope. The incompleteness of the concordat gave rise to many questions at once delicate and important. The demands of Napoleon became by degrees almost outrageous. While the Directory simply declared the papal authority null and void, the emperor seemed inclined to use it as a puppet. The resistance of Pius VII. was energetic and dignified, but unsuccessful. Feb. 2, 1808, Rome was garrisoned with French troops, and Apr. 2 of the same year the provinces of Urbino, Ancona, Macerata, and Camerino were incorporated with the kingdom of Italy. May 17, 1809, the incorporation was extended to the whole of the papal dominions, and when the pope excommunicated Napoleon by a bull of June 11, Gen. Radet broke into the Vatican during the night of July 6 and carried the pope away a prisoner, first to Grenoble, then to Savona, at last (in 1812) to Fontainebleau. Here Napoleon compelled him to sign a new concordat (Jan. 25, 1813), but Mar. 24 the pope revoked his consent, and declared that he would enter into no negotiations with the emperor until he had been restored to Rome. Jan. 22, 1814, he was allowed to return to his capital, and by the Congress of Vienna all his possessions, with the exception of Avignon and Venaissin, were restored to him. His subsequent government was energetic and just, but thoroughly reactionary in both ecclesiastical and political respects. D. Aug. 20, 1823.—Pius IX. (*Giovanni Maria Mastai-Ferretti*), b. at Sinigaglia May 13, 1792. Delicate health compelled him to give up his original plan of embracing the military profession. He entered an ecclesiastical seminary, studied theology at the College of Volterra, and took holy orders in 1818; in 1823–25 visited Chili; in 1827 was created archbishop of Spoleto, whence he was transferred in 1832 to the see of Imola; in 1840 was made cardinal, and was several times employed in diplomatic missions. In all the different offices he filled he distinguished himself by the mildness, benevolence, and vivid sympathy of his nature. Asylums, hospitals, schools—in short, all kinds of educational and charitable institutions—received his attention and support, and when, on the death of Gregory XVI., the conclave chose him pope (June 16, 1846), he was greeted with general acclamation. His first steps as a sovereign increased his popularity still more. He granted a general amnesty to all political offenders, and suppressed with great energy all abuses in the administration. He lowered the taxes, granted concessions for railroads, favored commerce and manufactures, opened the civil offices to laymen, and called together (Nov., 1847) a council of state composed of delegates from the provinces. These proceedings created quite an enthusiasm for him, not only in Rome and Italy, but in the whole civilized world, and excited the most sanguine expectations. The more surprising was it that the next year (Nov. 24, 1848) he had to flee from Rome in disguise and take refuge in the Neapolitan fortress of Gaëta. But this sudden change in his position is to be explained partly from the fact that all his reforms resulted from the kindness of his personal character, rather than from any liberality in his political ideas; partly from the circumstance that by his general amnesty Rome had become the gathering-place of a great number of political intriguers, exasperated exiles, and fanatical enthusiasts, whose exaggerated demands no liberality of views could satisfy, and who never ceased to stir up and inflame the general excitement of the people. The

pope appealed to France, Austria, Spain, and Naples for help, and in Apr., 1849, an Austrian army moved toward Rome from the N., and a French from Civita Vecchia. On Aug. 22, Rome surrendered to the French, and the papal authority was re-established; the pope himself returned in Apr., 1850. As long as the Austrian army occupied the northern part of the state, and the French army Rome and the southern part, the government of Pius IX. remained undisturbed; but it was evident enough that it was antagonistic to the feelings and ideas of his subjects. As soon as the Austrian army retired (in 1859), the northern provinces annexed themselves to the kingdom of Italy, and the same took place in Rome and the southern province on the withdrawal of the French army in 1870. Without any further revolutions or disturbances, the temporal power of the pope glided out of existence. How far the views of Pius IX. are from harmonizing with the spirit of the nineteenth century is best seen in his management of ecclesiastical affairs. He has enriched the dogmatics of the Roman Catholic Church with two new doctrines—namely, the immaculate conception of the Virgin, established by a decree of Dec. 8, 1854, and the infallibility of the pope in all matters of faith and morals, established by the so-called œcumenical council of Rome in 1870. But both these doctrines seem to belong to the Middle Ages, rather than to the nineteenth century; and still more apparent is the discrepancy in the encyclical letter of Dec. 8, 1864, especially in its famous Syllabus. Here Pius IX. condemns as heretical the ideas of liberty of conscience, of the liberty of the press, of the independence of the secular government from the ecclesiastical, of the equality of laymen and clergymen before the law, of the right of a people to make their own laws and elect their own magistrates, etc.; that is to say, he condemns in the eighty-four theses all the principal ideas of modern civilization as heretical. In France the publication of the syllabus was forbidden; the Italian government protested against its contents in very strong expressions; and the Austrian government took a cautious reservation. The general effect was that the antagonism between the spirit of the nineteenth century and the present head of the Roman Catholic Church became very vividly felt. CLEMENS PETERSEN.

Pi Ute′, county of S. E. Utah, extending W. from the Territory of Colorado. Estimated area, 5500 sq. m. It embraces a great variety of soils and surface. Mining is the chief industry. Cap. Bullion. P. 82.

Pi-Utes. See PAH-UTES.

Pix′ley, tp., Clay co., Ill. P. 1517.

Pizar′ro (FRANCISCO), the "great marquis," b. at Truxillo, Spain, about 1471, was the natural son of a Spanish colonel of foot by a peasant-girl of Estramadura; was bred a swineherd, and even, according to a popular account, was suckled by the swine in infancy, on account of his mother's neglect. He grew up a bold, ignorant, and brutal man, and from 1510 to 1525 was engaged in perilous adventures in Spanish America; was one of Balboa's party which discovered the Pacific Ocean. Having heard of the existence of Peru, with its great wealth, he led a party which after incredible hardships reached and partly explored that country in 1526, a previous expedition having failed (1524). In 1528 he obtained leave of Charles V. to attempt the conquest of Peru, but without public aid; and in 1531, after great sufferings, he invaded the Peruvian empire with 110 foot-soldiers, 67 mounted men, and two small cannon; treacherously seized the confiding inca, Atahuallpa, and in less than two years had overthrown the ancient government of the realm, partly by good generalship, unceasing activity, and unfailing valor, but quite as much by perfidy and brutal violence. Pizarro was made a marquis, founded Lima and other towns, and for some years ruled Peru as captain-general with almost absolute power; but a desperate and nearly successful revolt of the Indians was followed in 1538 by a contest with Almagro, his associate, who was defeated and slain; soon after which Almagro's followers attacked Pizarro in his palace (June 26, 1541), and he was killed after a desperate struggle. Pizarro was simply a successful robber. Avarice, perfidy, jealousy, cruelty, and habits of brutal outrage marked his career. When in power he said *no* to every request. Courage and constancy to his purpose must be conceded to him. He was a Roman Catholic, and died embracing the crucifix. He never learned to read and write. He married the inca's daughter, and founded a line of grandees, marquises de la Conquista, who still bear his name. His half-brothers, Gonzalo, Hernando, and Juan, were partners of his crimes in Peru.

Piz′zo, seaport town of Southern Italy, province of Catanzaro, on a rocky hill rising above the Gulf of Sta. Eufemia. This town is in general well built, and the old baronial castle still exists. It is a place of very considerable trade, and the fisheries are important, the tunny being most abundant. P. in 1874, 8300.

Placenta. See EMBRYOLOGY, by PROF. JOHN C. DALTON, M. D., M. N. A. S.

Placen′ta [Gr. πλακοῦς, "a flat cake"], a structure peculiar to mammals of the highest class—Monodelphia or Placentalia—and destined for the nutrition of the fœtus during a prolonged intra-uterine life. It is developed in various degrees of complication, and these have led to the differentiation of the placentiferous mammals into various groups, distinguished by the degree of development.

In (1) the Primates (man and monkeys), (2) Chiropters (bats), (3) Insectivores, (4) Rodents, (5) Carnivores, (6) Proboscidians, and (7) Hyracoids, the placenta is formed by outgrowths from both the ovum and the lining membrane of the uterus, the former furnishing the amnion and chorion, and the latter the decidua: in the first stage the chorion develops villi, which fit into depressions of the decidua, but finally the chorion and decidua grow together and form a single structure; the decidua itself is resolvable into three parts—(1) a *decidua vera*, lining the general cavity of the uterus; (2) a *decidua reflexa*, which is an outgrowth of the decidua vera, and invests the ovum; and (3) a *decidua serotina*, which is a special development of the decidua vera, and is, says Huxley, "a layer of especial thickness, developed in contiguity with those chorionic villi which persist and become converted into the fœtal placenta." The placenta of this type characterizes the (Monodelphia) Deciduata of Huxley; in some of these (the Primates, Chiropters, Insectivores, and Rodents) the placenta encloses the fœtus in a discoid sac; in others (Carnivores, Proboscidians, and Hyracoids) it forms a zone-like girdle around the fœtus.

In the Ungulates and Cetaceans no decidua is developed from the lining of the uterus. The types thus distinguished are combined by Huxley under the common name (Monodelphia) Non-deciduata.

Among the Edentates are exemplifications, it is said, of all these types; and inasmuch as the concordance in other respects of these mammals indicates their consociation to be natural, the classificatory value of the placental characters are strongly impugned.

The chief zoologists who have made use of the modifications of the placenta for the characterization and arrangement of the orders of mammals are Von Baer, H. Milne Edwards, and Huxley. H. Milne Edwards has especially used the modifications of the placenta in great detail for the classification of the several forms (*Récherches pour servir à l'Histoire naturelle des Mammifères*, introduction, 1868). THEODORE GILL.

Placenta′lia [from *placenta*], a name given by Owen to those mammals which are provided with a placenta. It is equivalent to the sub-class Monodelphia of De Blainville and recent authors. (See MAMMALS.) THEODORE GILL.

Placentia. See PIACENZA.

Placen′tia, seaport, cap. of Placentia district, Newfoundland, on a low beach (sometimes overflowed) on the E. side of Placentia Bay. Its harbor is spacious, but not very deep. Placentia, settled by the French in 1626, was long held by them as a menace to the English, who once attacked it without success. Placentia is the seat of a Roman Catholic bishop. P. about 400.

Placer′, county of California, extending W. and S. W. from the Nevada State line to Sacramento River. Much of it is rugged and densely timbered. The W. part is level. Wool, wheat, fruit, and lumber are extensively produced. Quartz, hydraulic, and other gold-mining are important industries. Traversed by Central Pacific R. R. and by N. fork of American River. Area, 1386 sq. m. Cap. Auburn. P. 11,357.

Placerville, p.-v. and tp., cap. of El Dorado co., Cal., situated about 40 miles E. of Sacramento, has excellent public schools, 1 private academy, 4 churches, 1 synagogue, 2 weekly newspapers, 1 iron-foundry, 2 fire-engine companies, 4 distilleries, 2 breweries, 1 evaporator for fruit-drying, 1 grist and 9 saw mills, and stores. Quartz lodes bearing gold are numerous, and water is obtained for mining and irrigation from lakes situated near the summit of the Sierra Nevada, through an aqueduct over 40 miles in length. Fruit-growing is extensively carried on, and the breeding of Angora goats has proved successful. The Odd Fellows, Masons, Knights Templar, Red Men, and Druids have each lodges here. Numerous quartz-mills are located in the vicinity. P. of v. 1562; of tp. 2624.
W. A. SELKIRK, ED. "MOUNTAIN DEMOCRAT."

Placerville, p.-v., Boisé co., Id. P. 318.

Placerville, v., Elko co., Nev. P. 160.

Placogan′oids [from πλάξ, a "flat plate," γάνος, "brightness," in allusion to the lustre of the plates or

scales, and εἶδος, "form"], the name of a group of extinct fishes, embracing types peculiar to the Silurian and Devonian epochs, and which were distinguished by their plate-like armor. (See FISH.) THEODORE GILL.

Placun'idæ [*Placuna*, πλακοῦς, a "flat plate," given in allusion to the flat, plate-like form of the shell], a family of conchiferous mollusks allied to the oysters, etc. The body is much compressed and sub-orbicular; the mouth has its margins free, double, and fringed with cirrhi; gills two on each side, unsymmetrical, united behind; mouth with plain lips confluent with the gills; foot small and cylindrical, with a small retractor muscle; the sexes are distinct; "the generative system attached to the right mantle-lobe, and the ventricle exposed" (*Woodward*); the shell has moderately unequal subcircular valves, which are semi-transparent, and consists entirely of sub-nacreous plicated laminæ penetrated to some extent by minute tubuli; the hinge has a cartilage bounded by two diverging ridges in the right valve, corresponding with grooves in the left; there are scars left of a large submedian adductor muscle, and a small one in front of it. The family is chiefly represented by species in the Indian and Pacific oceans. The Anomiidæ of North America are the nearest allies. THEODORE GILL.

Plagal. See MODES, ECCLESIASTICAL.

Pla'gal Ca'dence, in music, a cadence formed by the harmony of the subdominant, followed by that of the tonic or keynote. It is of frequent use in church music, and hence is sometimes called the "ecclesiastical" cadence. (See MUSIC.)

Plagios'tomi [πλάγιος, "oblique," and στόμα, "the mouth"], an order, or rather super-order, of Selachians, including the sharks (order Squali) and rays (order Raiæ). They are distinguished, in contrast with the Holocephali, by the freedom of the mandibular bone and its simple articulation with the cranium, the absence of opercular bones, the development of five (rarely six or seven) external branchial apertures. (See further RAIÆ and SQUALI.) THEODORE GILL.

Plague [Gr. πληγή; Lat. *plaga*, a "blow"], a malignant and fatal contagious fever, now little known, but formerly epidemic in Egypt and the Levant, and spreading in devastating epidemics throughout Europe. By its mortality it was an obstacle to the growth of countries and the advance of civilization. It was termed "the pest," the "black death," and the "great mortality." Its first appearance in Europe was at Constantinople in A. D. 544. Since that time epidemics have occurred at variable intervals; there were forty-five in the seventeenth century. The "Great Plague" of London was in 1665, and was supposed to have been brought from Holland. It is estimated that in Europe 25,000,000 have died of plague. The disease has prevailed in brief and local epidemics during the eighteenth and first half of the nineteenth centuries—at Copenhagen in 1712, Marseilles 1720, Moscow 1771, Malta 1813, Silesia 1819, Bulgaria (in the Russian army) in 1828–29. It has not appeared even locally in Europe since 1841. Its last appearance in Egypt was in 1844. In 1857–58 it occurred among the Arabs of North Africa, in 1857 in Mesopotamia, and in 1871 in Persian Koordistan. The plague is now regarded as a zymotic disease, derived from insalubrious and poisonous atmospheric or telluric conditions, a *materies morbi* gaining access to the blood, and rapidly multiplying in it and destroying its nutritive elements. In malignity and nature it resembles typhus fever, but is regarded as distinct from it. Its propagation was formerly supposed to be by contagion, but it is now regarded as due to importation by ships or on the person, and communicable by atmospheric infection. In Egypt the overflow of the Nile was considered its pestilential source. Overcrowding, bad ventilation, uncleanliness, deficient food, and residence in damp, marshy soils have been considered the predisposing causes of local epidemics. After exposure there is a period of latency or incubation of from two to seven days. The disease has four stages, yet all may occur in rapid succession and brief time: (1) invasion, (2) fever, (3) local phlegmons, and (4) collapse or convalescence. It is preceded by lassitude and enfeeblement of mind and body; its definite onset is announced by shivering, headache, vertigo, vomiting, high fever-heat, great prostration, stupor or unconsciousness, blood in the urine or from the bowels, the appearance of bubos or inflammatory enlargement of lymphatic glands, or of carbuncles, or again, in fatal cases, of petechiæ or purple spots and mottling of the skin. Its duration is two or three days, and, when survived, a slow subsequent convalescence. It is to be prevented by hygienic measures and public quarantine, but its treatment, beyond general measures of stimulation and nutritive support, avails little. (See Hecker's *Epidemics of the Middle Ages*, London, 1846.)

E. DARWIN HUDSON, JR. REVISED BY WILLARD PARKER.

Plaice. See PLEURONECTIDÆ.

Plain, tp., Monroe co., Ark. P. 220.

Plain, tp., Kosciusko co., Ind. P. 1490.

Plain, tp., Franklin co., O. P. 1293.

Plain, tp., Stark co., O., on Pittsburg Fort Wayne and Chicago R. R. P. 2226.

Plain, tp., Wayne co., O. P. 1837.

Plain, tp., Wood co., O. P. 1719.

Plain City, p.-v., Darby tp., Madison co., O., on Pittsburg Cincinnati and St. Louis R. R., 17 miles W. of Columbus, has 3 churches, 1 weekly newspaper, 2 banks, 1 steam flouring-mill, 2 hotels, and 1 planing-mill. P. 467.

A. SMITH, ED. "PRESS."

Plainfield, p.-v. and tp., Windham co., Conn., at the junction of Norwich and Worcester with Providence Hartford and Fishkill R. R., on Quinebaug and Moosup rivers. P. 4521.

Plainfield, p.-v. and tp., Will co., Ill., on Du Page Creek. P. 723; of tp. 1750.

Plainfield, p.-v., Guilford tp., Hendricks co., Ind., on St. L. Vandalia Terre H. and Indianapolis R. R. P. 795.

Plainfield, p.-v. and tp., Hampshire co., Mass. P. 521.

Plainfield, tp., Iosco co., Mich. P. 122.

Plainfield, tp., Kent co., Mich., on Grand River and Grand Rapids and Indiana R. R. P. 1499.

Plainfield, p.-v. and tp., Sullivan co., N. H., on Connecticut River. P. 1589.

Plainfield, city, New Providence tp., Union co., N. J., on Central R. R. of New Jersey, was incorporated as a city in 1869; has 1 institute, 1 seminary and free graded school, 15 churches, 4 banks, 3 weekly newspapers, and an extensive clothing manufactory. P. 5095.

J. C. RUNYON, ED. "CENTRAL N. J. TIMES."

Plainfield, tp., Otsego co., N. Y., on Unadilla River. P. 1248.

Plainfield, tp., Northampton co., Pa., on S. slope of the Blue Mountains. P. 1988.

Plainfield, p.-v. and tp., Washington co., Vt., on Winooski River. P. 726.

Plainfield, p.-v. and tp., Waushara co., Wis. P. 997.

Plain Grove, p.-v. and tp., Lawrence co., Pa. P. 775.

Plainland, tp., Monroe co., Ark. P. 220.

Plains, p.-v. and tp., Luzerne co., Pa., on Susquehanna River. P. 4018.

Plains, tp., Rockingham co., Va., on Washington City Virginia Midland and Great Southern R. R. P. 3035.

Plain Song, or **Plain Chant** [Lat. *cantus firmus*; It. *canto fermo*], in music, the simple, grave, and unadorned chant in which the services of the Catholic Church have been rendered from a very early age. It consists largely of monotone, and its inflections seldom exceed the range of an octave. The ecclesiastical chant is supposed to be chiefly of Greek origin, with some modifications brought in from Hebrew sources by the converts from Judaism in the first centuries. Prior to the time of St. Ambrose (fourth century) the music of the Church was in a rude and unsettled condition, but by his skill and energy it assumed the more regular form known as the Ambrosian chant. At a later period Gregory the Great introduced many improvements, corrected certain abuses, and gave to the ritual chant that more systematic form which has since borne his name. Plain song is usually written in black note on a stave of four lines, with either a C or an F clef. (See GREGORIAN MUSIC.) WILLIAM STAUNTON.

Plaint'iff (law). At the common law this term was confined to the class of legal actions called personal as distinguished from real, and described the moving party therein, the one who is named on the record as bringing the action; in the modern nomenclature, which prevails in most of the States, it designates the same person in all classes of civil suits, whether legal or equitable. It is a French word, first used when the records of judicial proceedings were kept in that language, and finally passing into the English with a slight change of orthography. In the earliest books it appears as *pleyntyfe*, from *pleyndre*, now *plaindre*, to "complain." Thus, Britton says: "No judgment—that is, judicial proceeding—can take place without three persons—*un juge, un pleyntyfe, et un defendaunt*." In the *Year Books*, which are the earliest reports of decided cases in England, and are written in the law French, the spelling is *pleintife*, while in Littleton, and other subsequent reports still in the French, it is changed

to *plaintife*, but in the oldest editions of Coke's *Commentaries* it is treated as an English word, retaining, however, the form last mentioned, which was ultimately altered to the present mode of spelling. By the early English law, and before any statutory modifications, special names were employed to designate the moving party, the party who institutes the proceedings, in the various classes of suits and in the different courts. In "real actions"—that is, the ancient forms of legal actions by which title to land was established and its possession recovered—he was denominated "the demandant;" in suits in equity he was called "the complainant;" and in the admiralty and ecclesiastical courts, or wherever the proceedings were based upon the Roman civil law, he was known as "the libellant." The term "plaintiff" was thus restricted to a class, but most important and common class, of legal actions, embracing all those which were not "real." Under certain circumstances a distinction existed, growing out of the extreme technicality of the common law, between the legal or nominal plaintiff and the equitable or real plaintiff. The former was the one who appeared as such on the record, and in whom the bare legal title to the subject-matter of the controversy was vested; the latter was the person who, not holding this bare legal title, and not appearing on the record, was still the actual owner of the demand, entitled to the proceeds, and for whose benefit the action was prosecuted. These common-law rules formerly prevailed in most of the States of this country. The reformed procedure, originally adopted in New York in 1848, and extending at the present day over more than twenty other commonwealths, has, however, greatly modified and simplified the judicial practice in reference to parties. In pursuance of that system all forms of civil action, legal and equitable, are reduced to one, in which the complaining party is denominated the plaintiff; and as he must be the real party in interest, the distinction between nominal and real plaintiffs has disappeared. A "plaintiff in error" is the party who obtains a "writ of error," and thereby removes a judgment into a higher court for the purpose of review. JOHN NORTON POMEROY.

Plainview, tp., Saline co., Ill., on N. fork of Saline River. P. 450.

Plain View, p.-v. and tp., Wabash co., Minn. P. 637; of tp. 1365.

Plainville, p.-v. and tp., Hartford co., Conn., at the crossing of New Haven and Northampton and Providence Hartford and Fishkill R. Rs., 13 miles S. W. of Hartford, has a graded school, fine water-power, 3 churches, 1 weekly newspaper, and 14 manufactories. P. 1433.

S. TOMLINSON, ED. "NEWS."

Plainville, p.-v. and tp., Onondaga co., N. Y., at the confluence of Seneca with Oswego River. P. 161.

Plainwell, p.-v., Gunplain tp., Allegan co., Mich., on Lake Shore and Michigan Southern and Grand Rapids and Indiana R. Rs., has 4 churches, 1 foundry, union schools, waterworks, 1 newspaper, paper-mills, several flouring and saw mills, and 4 hotels. P. 1035.

JEROME WINCHELL, ED. "REPUBLICAN."

Plaistow, p.-v. and tp., Rockingham co., N. H., on Boston and Maine R. R. P. 879.

Pla'na, de (GIOVANNI ANTONIO AMADEO), BARON, b. at Voghera, Piedmont, Nov. 8, 1781; studied at the Polytechnic School of Paris; became professor of mathematics at the school of artillery in Alessandria in 1803, and professor of astronomy at the University of Turin in 1811. D. there Jan. 20, 1864. His principal works are *Sulla teoria dell' Attrazione degli Sferoidi ellittici* (1810), and *Théorie du Mouvement de la Lune* (3 vols., 1832).

Planché' (JAMES ROBINSON), b. in London Feb. 27, 1796; became early distinguished as a writer of plays and librettos; gave great attention to archæology and costumes, on which subjects he wrote; author of some 200 dramatic pieces; designed Shakspearian costumes for Mr. Charles Kemble and his assistants; published in 1852 *The Pursuivant of Arms*, a treatise on heraldic subjects, which procured him the appointment of Rouge Croix Pursuivant in 1854. In 1866 he was promoted to be Somerset Herald. Has also written books of travel, songs, etc.

Planche (JEAN BAPTISTE GUSTAVE), b. at Paris Feb. 16, 1808; studied literature and art; lived from 1838 to 1845 in Italy, and had for some time, both before and after his Italian journey, entire control of the critical department of *Revue des Deux Mondes*. His contributions, collected under the titles *Portraits littéraires* (4 vols., 1836–49), *Portraits d'Artistes* (2 vols.), *Études sur l'École française de 1831 et 1832* (2 vols., 1855), are very valuable. D. at Paris Sept. 18, 1857.

Planck (GOTTLIEB JAKOB), b. at Nürtingen, on the Neckar, in Würtemberg, Nov. 15, 1751; studied theology at Tübingen, and became professor at the Karlsacademie in Stuttgart in 1780, whence he removed in 1784 to the University of Göttingen, where he d. Aug. 31, 1833. His principal works are—*Geschichte der Entstehung, der Veränderungen und der Bildung unsers protestantische Lehrbegriffs* (6 vols., 1781–1800), *Geschichte der protestantischen Theologie von der Concordienformel an bis in die Mitte des 18. Jahrhundert* (1831), *Geschichte der Entstehung und Ausbildung der christlich-kirklichen Gesellschaftverfassung* (5 vols., 1803–09), *Geschichte des Christenthums in der Periode seiner ersten Einführung in die Welt durch Jesus und die Apostel* (2 vols., 1818), etc.

Plan'cus (LUCIUS MUNATIUS), one of Cæsar's legates in Gaul in the winter of 54 B. C.; commanded his troops at Ilerda in Spain in the beginning of 49; accompanied him in his African campaigns in 46, and was nominated to the government of Transalpine Gaul for the year 44. After the death of Cæsar, he hastened to take possession of his province, but hesitated long before he decided what part to take in the ensuing contest. He finally joined D. Brutus, but, when this proved wrong, immediately went over to Antony. When the triumvirate was formed in 43, he consented to the proscription of his own brother in order to enjoy his consulship in 42 undisturbed. When the war between Octavius and Antony broke out, he tried to keep aloof, but finally fled with Antony to the East, and was first made governor of Asia, then of Syria, where he committed unheard-of cruelties and extortions. When he foresaw the fall of Antony, he hastened to Octavius, and it was on his proposition that the senate conferred the title of Augustus on the latter. He afterward lived very pleasantly in Rome at the new court. The date of his death is unknown. Horace addressed the seventh ode of his first book to him.

Plancy', de (JACQUES ALBIN SIMON COLLIN), generally called **Collin de Plancy,** b. at Plancy, department of Aube, France, Jan. 28, 1793; came to Paris in 1812; built up a business as a printer, publisher, editor, and author, and wrote *Dictionnaire infernal*, *Dictionnaire féodal*, *Mémoires d'un Vilain au 14e Siècle*, *Taxe des Parties casuelles de la Boutique du Pape*, *Biographie pittoresque des Jésuites*, *Le Diable peint par lui-même*, etc.—all in a decidedly anti-clerical, not to say anti-religious, revolutionary, and frivolous manner. In 1830 he fled from Paris on account of pecuniary difficulties, and settled at Brussels, where he wrote *Fastes militaires de la Belgique*, *Histoire des premières Années du Règne de Léopold*, and other things—all very flattering to the national vanity of the Belgians. In 1837 he was able to return to Paris, and he came back thoroughly converted. He now wrote *Légendes de la Sainte Vierge*, *Légendes des Origines*, *Légendes du Juif-Errant*, *Chronique de Godefroy de Bouillon*, *Légendes des Sept Péchés capitaux*, *Légendes des Esprits et des Démons qui circulent autour de nous*, *Le Chansonnier du Chrétien*, etc.: which books were zealously canvassed by Roman Catholic associations for the introduction of good books among the lower classes. The method which he generally applied in making a new book consisted in cutting up two old ones and rearranging their contents. The new book was then generally provided with a new pseudonym. Among the many names he employed as an author are "Paul Béranger," "Croquelardon," "Hormisdas-Peath," "Baron Nilense," "Saint Albin," "Johannes Videlbius," etc.

Plane [Lat. *planus*], a surface such that if any two points of it are joined by a straight line, that line will lie wholly in the surface. The surface extends to infinity in all directions.

Plane [Lat. *planus*], an instrument much used by carpenters and joiners for smoothing wood. It is of many forms, each adapted to special uses, but for planing upon a large scale it has been superseded by machines driven by steam or water. There are also special forms of the planing-machine for smoothing metallic surfaces.

Plan'er Tree, the *Planera aquatica*, a rather small ulmaceous tree of swampy lands in the Southern States. It has the general appearance of the elms, but is quite distinct from them in flower and fruit. It was named in honor of J. J. Planer, a German botanist. Its timber is hard, and suitable for many economic uses. The wood of *Planera abelicea*, of the Levant, is aromatic. It is the Cretan false sandal-wood of old writers. Another planer is *P. Richardi* of Persia and the Caucasus, partly naturalized in Europe, and sometimes called *zelkoua*. It is a tall and handsome tree, producing excellent timber.

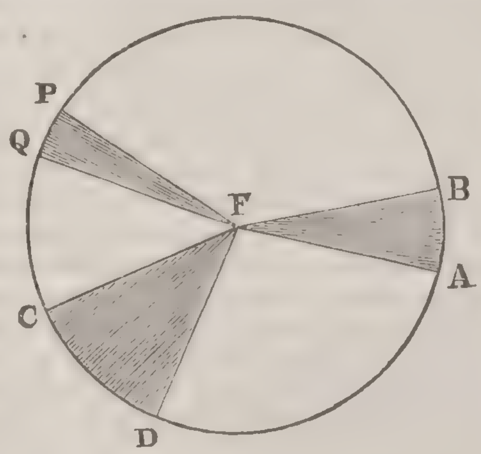
Plan'et [Gr. ἀστήρ πλανήτης, "wandering star"]. This term was applied by the ancient Greeks to five conspicuous stars (Mercury, Venus, Mars, Jupiter, and Saturn), which, changing their places, seemed to *wander* among the constellations. Modern science has added to these no less than 160 other bodies, all having special characteristics,

and all subject to the same common conditions, the earth itself being, for these reasons, undoubtedly to be classified among those bodies, and also Uranus and Neptune, as well as the minor planets between Mars and Jupiter, which by Sir William Herschel were designated as *asteroids;* of which, up to the present time (Jan. 6, 1876), 157 have been recognized. But this systematic nomenclature and designation does not include satellites (see MOON) nor comets, nor yet meteorites of various dimensions, whose physical constitution or governing centres of force, or both, are different.

The conditions to which all the planets are subject are distinctly indicated in *Kepler's Laws.* These are:

Law 1st. That the planets describe ellipses, all having a common focus at the centre of the sun.

Law 2d. That every planet so moves around the sun that an inflexible line drawn from the planet's centre to that of the sun would describe areas proportional to the times. [Thus, in *equal* times, F A B, F P Q (Fig. 1) would be found to be *equivalent.* With the one time the *double* of the other, the corresponding area F C D would be the double of F A B or of F P Q; etc.]



Law 3d. That the squares of the *periodic times* (times of entire revolution around the sun) are as the cubes of the mean distances from the sun. [Thus, to present a supposititious case in order that the ratios may be exhibited in whole numbers, if the mean distance of a planet were exactly four times that of the earth taken as 1, then the *cubes* would be—

$$4 \times 4 \times 4 = 64,$$
$$\text{and} \quad 1 \times 1 \times 1 = 1;$$

and the ratio of the cubes would be that of 64 : 1. But the periodic time fulfilling the law would, in such a case, be 8 years, the earth's periodic time being 1 year; and their respective squares would be—

$$8 \times 8 = 64,$$
$$\text{and} \quad 1 \times 1 = 1;$$

and the ratio of *these also* be 64 : 1.]

The third law affords the means of determining the relative mean distances of the several planets, and even those of the periodic comets, when the periodic times have been first ascertained; and these in the instances of the principal planets have been very accurately determined by long-continued observations. The third law is itself slightly modified by the consideration due to the *masses* of the revolving bodies. Thus, if M represent the mass of the sun, and m, m' the respective masses of any two planets, while a, a' represent their mean distances from the sun, and T, T′ represent their periodic times, we have

$$\frac{T'^2}{T^2} = \frac{a'^3}{a^3} \times \frac{M + m}{M + m'},$$
$$\frac{T'^2}{T^2} \times \frac{M + m'}{M + m} = \frac{a'^3}{a^3}.$$

A more accurate determination of the masses than any previously obtained must, then, slightly modify the ratio of the cubes of the distances as here exhibited in equation, and therefore also the ratio of the distances themselves. The results of a careful re-discussion of the expressed values of the mean distances, in view of the more correct determination of the masses, is exhibited by the author of this article on p. 3 of No. 280 of the *Smithsonian Contributions to Knowledge.*

The relative mean distances, that of the earth being 1, are as follows:

Mercury ....0.3870987 —	Jupiter...........5.2028004 —
Venus ....0.7233322 —	Saturn............9.5338544 —
Earth............1.0000000	Uranus ....19.1833617 +
Mars..............1.5236913	Neptune........30.0567298 —

Of the so-called Bode's Law.—Bode's Law is the name given to a singular progression in the series of distances, or rather special differences of distances, of the planets from the sun. The most simple expression of this is that given by Sir John Herschel (*Outlines of Astronomy,* 11th ed., 505), viz.: "The interval between the orbits of the earth and Mercury is nearly twice that between those of Venus and Mercury; that between the orbits of Mars and Mercury nearly twice that between the earth and Mercury; and so on." The same is more commonly expressed as follows: the values of the successive terms being stated to the nearest whole number in every case, the earth's distance being represented by 10. And in the arrangement as exhibited below the actual value on the same scale is in every case compared with the empirical value:

Empirical distances.		Actual distances.
Mercury	4..................................	4 —
Venus............................	4 + 1 × 3 = 7	7 +
Earth	4 + 2 × 3 = 10	10
Mars	4 + 4 × 3 = 16	15 +
(Asteroids)	4 + 8 × 3 = 28	
Jupiter............................	4 + 16 × 3 = 52	52
Saturn............................	4 + 32 × 3 = 100	95 +
Uranus............................	4 + 64 × 3 = 196	192 —
Neptune	4 + 128 × 3 = 388	300

The failure of the "law" is notorious in the cases of both Saturn and Neptune. Yet deficient as it was, it, years before the discovery of Neptune, was suggestive of the probability of the existence of one planet at least between Mars and Jupiter; and the conjecture that such might be the case was verified by the discovery of the minor planet Ceres Jan. 1, 1801—a discovery since followed by that of 166 other minor planets in the same region. ("Bode's Law" is ascribed by M. Voiron to Prof. Titius of Wittenberg, instead of M. Bode of Berlin.—*Supplement to Bailly's History of Astronomy,* p. 69.)

A comparison of the results now stated will at once make it manifest that whatever might be said of generality, "Bode's Law" is deficient in that *precision* which belongs to a law of nature. It notwithstanding furnished some approximation toward what must be the estimated distance of the planet the effect of whose perturbations was accurately made out and discussed by Messrs. Adams and Leverrier previously to the discovery of Neptune by M. Galle.

Laws of Planetary and Satellite Distances.—Let (V) represent a limit between the mean distance of Uranus and that of Saturn, and (⊕♀) in like manner another limit between the earth and Venus. Then if of the distance of Neptune we take $\frac{5}{9}$, and of that fractional product, again, $\frac{5}{9}$, etc. etc., the several results in this *geometrical progression* will exhibit a *very close* approximation to the various planetary distances and intermediate limits, as exhibited in the annexed comparison of Law with Fact: a *missing* term in the region of Fact, which, as will be hereafter shown, would have had a position analogous to that of Venus, being itself represented by $\hat{\odot}\,i$, and the term due to the asteroid region, by (A):

First Approximate Arrangement.

Names.	Law.	Fact.	Difference, L.—F.
Neptune..........................	30.05733	30.05733	0.000
Uranus	....	19.183 +	
Limit (U)	16.698 +	....	
$\hat{\odot}\,i$	....	(missing)	
Saturn..........................	9.277 —	9.539 —	— 0.262
Jupiter..........................	5.154 —	5.203 —	— 0.049
Limit (A)..........................	2.863 +	(to be supplied)	
Mars..........................	1.591 —	1.524	+ 0.067
Earth	....	1.000	
Limit (⊕♀)	0.884 —	....	
Venus	....	0.723 +	
Mercury in aphelion.....	0.491 —	0.467 —	+ 0.024

(The arrangement, even thus far, presents a marked contrast to the rough approximations obtained by "Bode's Law.") The ratio of every term except the first to its immediately preceding term being that of 5 to 9, the ratio of every superior to its immediately inferior term will be that of 9 to 5, which $= \frac{9}{5} = \frac{18}{10} = \frac{1.8}{1} = 1.8$.

An inspection of what is here exhibited will moreover reveal the fact that the Earth and Venus seem to have characteristics of *half-planets;* the *one* term, 0.884 (in the series), pertaining to them, being indicative of a distance between those of the two planets at which their masses should be united; which *limiting* distance is designated as *limit* (⊕♀). This being so, it seems also desirable to ascertain whether they have not also themselves each a determinate position such as may be exhibited in a definite ratio to a term or terms in the whole planet series. In the ascertainment of this let it be noted that the distance of *Mars* is, in fact, a little greater than $1\frac{1}{2}$ times that of the *Earth,* while the like is also true of the distance of *Neptune* compared with that of *Uranus.* This being so, if we call the terms due to Uranus and the Earth respectively *exterior* half-planet terms (while that due to Venus is styled an *interior* half-planet term), and extend, moreover, the *exterior* half-planet designation of term to the *perihelion* distance of Mercury, we shall have precisely for the ratios of the mean distances from the sun introduced by the *exterior* half-planet terms, as follows:

$$\left.\begin{aligned} \frac{\text{Neptune}}{\text{Uranus}} &= 1.56681 \\ \frac{\text{Mars}}{\text{Earth}} &= 1.52369 \\ \frac{\text{Mercury in aphelion}}{\text{Mercury in perihelion}} &= 1.51768 \end{aligned}\right\} \text{Mean} = 1.53606.$$

But 1.8 being, as already shown, the approximate ratio which obtains for other than half-planet distances, we have withal, as respects this ratio,

$$(1.8)^{\frac{3}{4}} = 1.55401,$$

agreeing very nearly with the preceding; so that r being the ratio for other than half-planets, the ratio for the *exterior* half-planets is $r^{\frac{3}{4}}$.

Also, as again respects mean distances from the sun,

$$\frac{\text{Earth}}{\text{Venus}} = 1.38249\,;$$

while as, once more, respects the ratio r of 1.8, the *square root of* r, or

$$r^{\frac{1}{2}} = 1.34161.$$

All this sufficiently indicates the existence among the planetary distances in the solar system of *three* ratios; the leading ratio due to the *whole*-planet terms being very nearly 1.8; that due to the *exterior* half-planet terms, $(1.8)^{\frac{3}{4}}$; and that due to the *interior* half-planet term, $r^{\frac{1}{2}}$.

Completed Arrangement of the Planetary System, exhibiting the Correspondence of Law with Fact.

Names and symbols.	Law.	Fact.	Law – Fact.	
			Earth's dist. = 1.	Planet's, etc. dist. = 1.
Neptune.....	30.057264	30.057332	—0.000+	—0.000+
URANUS......	19.55718	19.18336	+0.374+	+0.019+
Limit (U).........	16.91431			
Int. to ♅, ♅*i*......	(14.64275)	missing.		
Saturn	9.44511	9.53885	—0.094—	—0.010—
Jupiter	5.23391	5.20280	+0.031+	+0.006
Limit (A).........	2.87831	(2.82293)	+0.055+	+0.020—
Mars..........	1.57096	1.52369	+0.047+	+0.031
Earth.........	0.99335	1.00000	+0.007—	—0.007—
Limit (⊕ ♀)......	0.85101			
Venus...............	0.72975	0.72333	+0.006+	+0.009+
Aph. of Mercury	0.45758	0.46670	—0.009+	—0.020—
MERCURY	0.39166	0.38710	+0.005—	+0.012—
Per. of Mercury	0.28573	0.30750	—0.022—	—0.071—

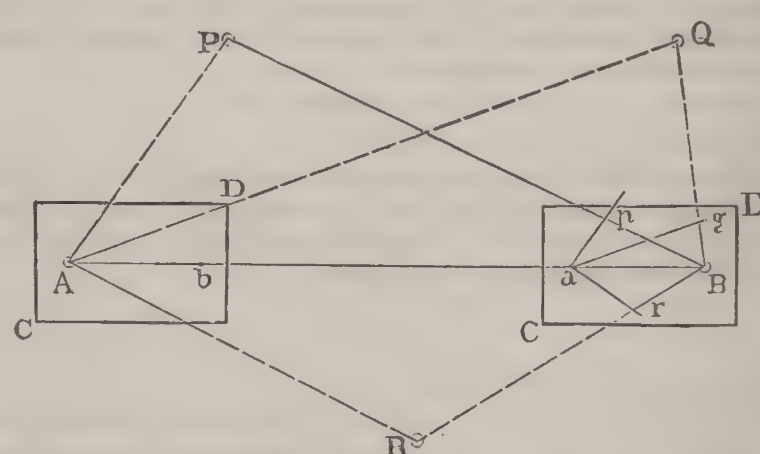
After more extended induction and an enormous number of tentative processes, it was found that a mean value of ratio $r = 1.8253$, instead of 1.8, would be more perfectly consistent with the existing state of the system; and yet more so if the ratio from that of the greatest terms inward were subjected to a *small* but regular *increase*, the extreme values differing from the mean by a little less than $\frac{1}{38}$th of the latter. Then, moreover, as the limit due to the *missing term* interior to Uranus—*i. e.* to ♅*i* in the first approximation—is that of an *interior* half-planet, the ratio of the distance of Uranus to that is $r^{\frac{1}{2}}$; the value of r being that due to that region of the system—viz. very nearly 1.8 itself. The *interior* half-planet *limit* ♅*i* will thus be found to be $= 14.64275$. The value of the asteroid limit (A) may be independently determined in the region from *Saturn* to *Mars* inclusive. It is thus found to $= 2.82293$; which value is inserted in the preceding table in the column of Fact, but in a parenthesis for comparison with the value of the same term resulting from the general series from *Neptune* downward. In the table the respective powers of r are indicated outside of the braces which in every case connect the quantities compared. In this table the *half*-planet terms are marked in italics, and the position of Mercury is indicated in small capitals. It here is (incidentally) derived from the position of the *half*-planet Venus. But Mercury has other relations, which, however, are exhibited only by the aid of an hypothesis, which designedly is not here introduced; the results being as directly dependent *on existing relations in the solar system itself* as are the *Laws of Kepler.* (It is, however, at least not a little curious that the limit (⊕♀) is very nearly at the distance of the *centre of (simultaneous) gyration* of the Earth and Venus at which the *vis viva,* or the *turning power,* of these masses concentrated would be the *same* as that of the separate masses (simultaneously revolving at their now existing distances), as though they *had* once turned around the sun together; which is, in part, what the *nebular hypothesis* of Laplace supposes. But such being very nearly the *fact* with respect to the two half-planets Earth and Venus, we may, by the application of the formula for the centre of gyration, ascertain what ought to be due to the missing mass ♅*i*, as an interior half-planet to Uranus; and it will be, mass of ♅*i* = nearly $1\frac{4}{10}$ times that of Uranus.)

In the *system of Saturn,* also, as *facts existing independently of any hypothesis,* three ratios of the distances from Saturn's centre are apparent, and the rings, both bright and dusky (as it were), *claim their places as satellites,* the ring-systems in every case being referred to *their respective centres of gyration.* In the limited systems of Jupiter and Uranus two ratios are apparent. The satellite systems are thus in their arrangement analogous to those of the primary system. (For other arrangements and the application of theory and for numerous coincidences with the same, see the exposition by the author of this article, in No. 280 of the *Smithsonian Contributions to Knowledge,* already referred to.)

Eccentricities of the Orbits of the Planets.—The orbits of the asteroids, of Mercury, and of Mars are the most eccentric, while those of Venus and Neptune are least so.

S. ALEXANDER.

Plane Table, an instrument used in surveying for mapping in the field. It is particularly employed in filling in outline sketches of trigonometrical surveys. It is not used where great accuracy is required, but where approximate sketches only are needed it is particularly valuable on account of the rapidity with which they can be executed. The plane table consists essentially of a drawing-board mounted on a tripod in such manner that its upper surface may be made horizontal, and so that the entire table may be turned in azimuth through any angle whatever. The combination of parts by which these motions are effected is entirely similar to that employed in levelling and orienting the horizontal limb of a theodolite. The instrument as described is accompanied by a ruler, usually of brass, and provided with a telescope so mounted that its line of collimation and the bevelled edge of the ruler shall always be in the same plane. The telescope is arranged with a vertical arc, by means of which we may measure



small angles of elevation and of depression. The paper on which the map is to be made is stretched and held firmly in contact with the table by suitable clamps. The method of using the plane table is indicated in the diagram. Let it be required to determine the relative position of the points P, Q, and R. Two stations, A and B, are selected as the extremities of a base line A B, and each is marked by a flag; the distance between them is measured; a line, Ab, is drawn on the paper C D to any suitable scale to represent the line A B. The plane table is then set up at A and levelled, so that the point A of the table shall be exactly over the corresponding point A in the field; the bevelled edge of the ruler is then made to coincide with the line Ab, a small pin being placed at A to serve as a guide, and then the latter is turned in azimuth till the flag at B coincides with the intersection of the cross-hairs of the telescope, and in this position it is clamped. The telescope is then turned in succession upon the objects P, Q, and R, the bevelled edge of the ruler always touching the pin at A; and in each of these positions a pencil line is drawn along the edge of the ruler. The instrument is then taken to B, and bevelled so that the point B of the table shall be exactly over the point B in the field; a guiding-pin is placed at B; the edge of the ruler is made to coincide with Ba, and then the telescope is directed to the flag at A; and in this position the table is clamped. The telescope is then turned in succession to the points P, Q, and R, and in each position a line is drawn along the bevelled edge of the ruler intersecting the lines drawn to the same points at the other station; the points p, q, and r, in which the latter lines intersect the former, have the same relative positions on the plot that the given points have in the field. In like manner any number of points may be plotted. If the limits of the paper do not permit the whole area to be represented on it, a second sheet may be used, taking care to determine two common points on each sheet. The two sheets are united so that the plotted positions of these two points shall coincide.

W. G. PECK.

Plane Tree. The preferable name for trees of the genus *Platanus* and order Platanaceæ, commonly known as buttonwood, sycamore, cottonwood tree, etc. The Oriental

plane (*Platanus orientalis*) of the Old World grows rapidly, lives long, and in favorable situations attains a great size. It is a valued timber tree. The Occidental plane, the buttonwood of the U. S. (*P. occidentalis*), is one of the largest of our native trees, and is often cultivated for shade. Its large leaves, its huge trunk marbled with patches of white, and its pendulous globose heads of fruit are well known. Its wood is a good fuel, but its timber is hard and brittle, warps easily, and is considered perishable. The buttonwood of the Pacific coast (*P. racemosa*) has a deeply-lobed leaf and pendulous clusters of balls. It furnishes valuable timber.

Plan'isphere [Lat. *planus* and *sphæra*], a projection of the various circles of a sphere on a plane. It is used in astronomy as a substitute for a celestial globe.

Pla'no, p.-v., Kendall co., Ill., on Chicago Burlington and Quincy R. R., 55 miles W. of Chicago, has an academy, 3 churches (including a Mormon, presided over by Joseph Smith, son of the prophet), 2 newspapers, 1 tannery, several cheese-factories, and the manufacturing shops of Marsh's harvesters. P. about 1800.

D. M. Corbin, Ed. "Mirror."

Plano, p.-v. and tp., Collin co., Tex., on Houston and Texas Central R. R. P. 155.

Plant. (See Botany, Phyto-Chemistry, and Vegetable Physiology.)

Plant, tp., Pulaski co., Ark. Pop. 461.

Plantag'enet, the surname of the Angevine dynasty of English monarchs, derived from the marriage of Matilda, daughter of Henry I., to Geoffrey Plantagenet, count of Anjou. The Plantagenet monarchs reigned from 1154 to 1485, when the victory of Bosworth transferred the crown to the house of Tudor. They were usually ambitious and warlike princes, who distinguished themselves in the field, both in France and in the long civil contests known as the "wars of the Roses." The surname is still borne by the family of the dukes of Buckingham and Chandos.

Plantagina'ceæ, a natural order of exogenous herbs, found in nearly every part of the world, but mostly in temperate regions. It is almost restricted to the genus *Plantago,* to which the common herbs called *plantain* belong. A few have bitter and mucilaginous properties and a limited use in medicine, but no important commercial product comes from this order. There are about 120 species, mostly humble and stemless herbs.

Plant'ain [Lat. *plantago*], the *Plantago major,* an herb which is common in nearly every part of the world. It belongs to the order Plantaginaceæ, and although nearly inert, is employed in domestic medicine. Its seeds are fed to cage-birds, and its young leaves, boiled as potherbs, are palatable. There are a great many species in this genus, which is well represented in the U. S. Of these, the ribwort (*P. lanceolata*) is sown in Europe as a forage-plant on light soils, and fleawort (*P. Psyllium* and *arenaria*) is raised in France for the seeds, which yield a valuable size for cotton goods and paper.

Plantain, a name given to the fruit of the coarser cultivated varieties of *Musa paradisaica,* the finer and more delicate sorts being called bananas. The plantain is a native of the East Indies, but is now common in nearly all hot countries. It is of the order Musaceæ. *M. Cavendishii* or *Chinensis* is a dwarf variety. The plantain furnishes a very large part of the food of the human race in some hot countries. The leaves yield a fibre which may become a very important commercial product, since it closely resembles Manila Hemp (which see).

Plantain-Eater. See Musophagidæ.

Planter, tp., Chicot co., Ark. P. 332.

Planter's, tp., Phillips co., Ark. P. 1102.

Plantersville, p.-v., Dallas co., Ala., on Selma Rome and Dalton R. R. P. 854.

Plantigrades. See Mammalogy, by Prof. Theodore Gill, M. D., Ph. D., M. N. A. S.

Plant-Louse. See Aphides.

Plants'ville, p.-v., Southington tp., Hartford co., Conn., on Quinnipiac River and New Haven and Northampton R. R.

Plaquemines', parish of Louisiana, bounded E. and S. by the Gulf of Mexico. Area, 900 sq. m. Its surface is low and in parts swampy, and much cut up by bayous. The soil is very fertile. Leading products, sugar, molasses, and rice. Cap. Point à la Hache. P. 10,552.

Plaquemines, p.-v., cap. of Iberville parish, La., on W. bank of Mississippi River, at mouth of Plaquemine Bayou, 20 miles S. of Baton Rouge, has 3 newspapers and a large river-commerce. P. 1460.

Plasen'cia, town of Spain, province of Caceres, is picturesquely situated on the Jerte, at the entrance of the valley which that river traverses, and which is celebrated for its fertility and romantic beauty. The town is old, surrounded with walls surmounted by Gothic towers, and has an aqueduct of eighty arches, three bridges across the Jerte, and many monasteries and churches. P. 6844.

Plas'ma [Gr., an "image"], a leek-green variety of chalcedony, much esteemed by the ancients, who often cut and wrought it as a gem. It often occurs in collections of antiques, but is now esteemed inferior to bloodstone.

Plassey, Battle of. See Clive.

Plas'ter (*emplastrum*), in pharmacy, an adhesive mixture of lead-oxide and a fatty acid, or a resinous and fatty compound, often medicated, and designed to be spread upon leather, linen, or even paper, and then applied to some portion of the human body. Plasters have a considerable use in medicine, and especially in surgery, where strips of adhesive plaster are employed for many purposes.

Plaster of Paris. See Gypsum.

Platæ'æ, ancient city of Greece, in Bœotia, on the northern slope of Mount Cithæron, was famous as the place where in 479 B. C. the Greeks under Pausanias totally routed the Persians under Mardonius. The city was twice destroyed by the Thebans, in 427 and in 374 B. C., but was both times rebuilt, and existed in the sixth century A. D. Remains of it are still visible near the village of *Kokhla.*

Plata, La. See Argentine Republic.

Platale'idæ [*Platalea,* the old Latin name of the spoonbill], a family of wading birds popularly known as spoonbills. The general form is heron-like; the bill elongate, nearly straight, and with its apical half much depressed and broadly dilated into a spatula-like extremity, furrowed above by two lateral grooves, which commence on the forehead, and for their distal half are concentric with the margins; nostrils not far from the base, on the upper surface of the bill, and in the grooves originating from the forehead; wings long, and with the second quill produced; tail short; tarsi elongated and covered, with reticulated scales which extend a short distance on the tibiæ, as well as on the toes; toes long, the anterior three united by a basal membrane, the posterior somewhat elevated; claws short. The birds of this family are distinguished by their spoon-like bill, and are quite generally distributed throughout the warm regions of the earth. Seven species are generally recognized. Theodore Gill.

Platanist'idæ, a family of toothed Cetaceans, allied to the dolphins and represented by the singular susus of the Indian rivers. The form is dolphin-like except as to the head, which is distinguished by its upraised forehead and its small eyes; the external respiratory aperture is longitudinal; the beak is elongated; the cervical vertebræ are all separate; the hinder, the tubercular, and capitular articulations of the ribs blend together posteriorly; the costal cartilages remain unossified; the skull has the vertex produced forward, the supraoccipital not projecting forward laterally above the temporal fossæ; the frontals visible above only as elongated falciform borders produced around the maxillary; the nasal bones moderately unequal; the maxillary bones are remarkable for their large bony, incurved crests; the teeth are simple and destitute of cingulum or tubercle. The family is represented by but a single known genus, with two species—(1) *Platanista Gangetica,* inhabiting the Ganges and Brahmapootra and their tributaries; and (2) *P. Indi,* found in the river Indus. They rarely exceed the length of seven feet. Although the body appears to be adapted for swiftness, the species are said to be rather sluggish animals; they prey upon fish, like their salt-water relations. Theodore Gill.

Pla'ta, Rio de la, the name of the estuary formed by the entrance of the two great South American rivers, Parana and Uraguay, into the Atlantic, 180 miles long, and 130 miles broad at its mouth, but its depth soon decreases from 10 fathoms to 16 feet; its navigation is difficult on account of irregular currents and sudden tempests.

Plated Ware. See Electro-plating.

Pla'ten-Hallermün'de, von (August), Count, b. at Ansbach, Bavaria, Oct. 24, 1796; served for some time in the Bavarian army; studied language and philosophy at Würtzburg; devoted himself to literary pursuits, and lived mostly in Italy. D. at Syracuse Dec. 5, 1835. His historical work, *Geschichten des Königreichs Neapel, 1414–43,* is dry and tedious; his drama, *Die Liga von Cambrai,* and epic, *Die Abbassiden,* are flat and uninteresting, but his dramatic satires, *Die verhängnissvolle Gabel* (1826), against Müllner, and *Der romantische Œdipus* (1829), against Immermann, are not without power, and all his

lyrical poems, from the *Polenlieder* to the *Ghaselen*, evince a mastership and purity of form which are truly admirable.

Plate-powder, a polishing powder, a mixture of fine chalk with powdered talc, peroxide of tin, or other detergent materials. Some plate-powders contain mercurial salts, but such compounds are very destructive to silver.

Pla'ter (George), b. about 1736; graduated at William and Mary College 1753; became a judge of the Maryland court of appeals; was in Congress 1778–81: president of the State convention of 1778 to ratify the Federal Constitution; governor of Maryland 1792. D. at Annapolis, Md., Feb. 10, 1792.

Plather's Creek, tp., Alleghany co., N. C. P. 637.

Plating. See Electro-plating, Nickel, and Silver.

Platino-Iridium. See Iridium.

Plat'inum, or **Platina** [Sp. *plata*, "silver"], a whitish, steel-gray metal, malleable, very ductile, and as unalterable by ordinary agencies as gold. Like gold, it occurs in the native state, and in this form its specific gravity ranges from 16 to 19, and its hardness upon the mineralogical scale from 4 to 4.5, being harder than either gold or silver, and a little softer than iron. When fused and refined it is, however, as soft as copper, and the gravity is increased to 21.15. This metal was first discovered in Choco, South America, and was taken thence to Spain in 1735 by the traveller Ulloa. It was obtained in Jamaica from Carthagena in 1741, and in 1822 was discovered in Russia, whence the chief supply has since been obtained. The chemical and physical properties of platinum were studied by European chemists as early as 1750. The native metal from Siberia was analyzed by Berzelius in 1828, who found it to contain iron, rhodium, iridium, palladium, copper, and osmium, the amount of platinum ranging from 73 to 86.5 per cent. It is found, like gold, chiefly in alluvial deposits, in rounded grains, *pépites* or nuggets, or in flattened scales worn smooth by attrition in the gravel of river-beds. It is there associated with gold and the other heavy metals, as iridium and iridosmine. Having nearly the same specific gravity as gold, it cannot be separated from it by washing in the ordinary way, and quicksilver, which will amalgamate with the gold and leave the platinum untouched, is used to effect the separation. Upon the northern coast of California, for example, a mixture of gold and of the platinum metals in extremely small scales is washed from the beach-sand, and from this mixture the gold is removed by amalgamation. Observations of the rocks and minerals found with platinum in deposits sustain the belief that the metal is chiefly derived from the disintegration of serpentine rock. Chromic iron is a common associate. It is also found in syenite. It has not been found, however, in regular veins in quartz, and its precise mode of occurrence is still obscure.

Nearly all the native platinum is more or less magnetic. Some masses have true polarity and hold iron filings like magnetic iron ore. There were several specimens of this kind in the collection sent to the Paris Exposition in 1867 by Prince Demidoff, upon whose estates, in the government of Perm, there are twenty or more localities from which some of the largest masses known have been obtained. One specimen at Paris was six inches in its greatest diameter, and weighed thirteen pounds troy. A mass weighing twenty-one pounds is preserved in the Demidoff cabinet. A specimen weighing 4728 grammes, and very perfect in form, was shown at Vienna in 1873. It is estimated that the production of the metal in the Urals, from the discovery to the year 1851, was 2061 Russian poods; in 1830 it was 106 poods, and in 1860, 61 poods. From 1860 to 1863 it averaged 84 poods annually, which is the equivalent of 1344 kilogrammes. In 1871 there were six mines in operation, producing from 10,440,650 poods of sand and gravel 125 poods of platina, against 118 in 1870. This is more than is obtained from Brazil, Colombia, California, Borneo, and other regions combined, which is believed not to exceed 1000 pounds annually. The raw metal finds its chief market in London and Paris, where it commands about $70 per pound of the pure metal, and is refined before being made into ingots, plate, wire, and various objects. The comparative infusibility of platinum, it yielding only to the oxyhydrogen blowpipe or to powerful electrical currents, and its resistance to oxidation, render it peculiarly valuable for many purposes in the arts and to the chemist in analytical work and in manufacturing. One of its most important uses is for large evaporating stills for the concentration of sulphuric acid. A still of this kind, valued at 95,000 francs, exhibited at Vienna in 1873, was capable of concentrating 20,000 pounds of sulphuric acid daily. The joints of such stills are autogenously soldered, thus giving entire uniformity of material, and making the whole vessel in one piece. It would not be possible to produce such large homogeneous vessels without the aid of the oxyhydrogen blowpipe. As early as the year 1837, Dr. Hare of Philadelphia proposed to melt platinum by this means, and succeeded in melting twenty-eight ounces into one malleable, homogeneous mass. MM. Deville and Debray of Paris have greatly extended and perfected this method, so that ingots can be made weighing 200 pounds or more. An ingot of this weight, worth $17,000, was made by Johnson & Matthey of London for the Exhibition of 1862. An ingot of one-third of this size is sufficient for the body of a five-ton still. The experiment of using platinum for money was tried in Russia for several years, but was finally abandoned. It was formed into coins of eleven and twenty-two roubles each, and the value of this coinage from 1826 to 1844 was about $2,500,000. The value of platinum, compared with silver, is about as 5 to 1.

The chief solvent of the metal is aqua regia, and the chloride is the most important salt. It forms alloys with gold and silver and with many of the more fusible metals. These alloys are much more fusible than the pure platinum. When combined with iridium it forms an alloy of great hardness, especially well adapted for gun-vents and for standard weights and measures. The alloy known as platino-iridium is used for the manufacture of standard mètres, and is melted in lime crucibles upon Deville's method. (For details of the process for the purification of platinum and its fusion in large quantities reference should be made to the memoirs of Deville and Debray upon platinum and the associated metals.) William P. Blake.

Platinum Black, a finely-divided form of platinum, resembling soot. It has the property of condensing gases upon its surface in a remarkable degree. It absorbs many times its bulk of oxygen gas, and gives it off in contact with alcohol or ether, forming new compounds. Platinum sponge is another form of the metal, porous and slightly coherent, obtained by heating to redness the double chloride of platinum and ammonia. It also condenses gases upon its surface, and to such a degree in a current of cool hydrogen that the metal glows with the heat evolved and inflames the gas. W. P. Blake.

Pla'to, tp., Kane co., Ill. P. 1004.

Pla'to [Πλάτων], a Greek philosopher, b. 429 B. C., and d. at the advanced age of eighty-one years. Solon and Codrus were both reckoned among his ancestors. Many incidents of his life are related by the gossiping writers of antiquity. There is the fable of the bees settling on his lips in infancy. We are told of his early attempts at poetry, and his giving it up when he found his verses inferior to those of Homer. His extensive reading of the Greek poets needs no other voucher than his own writings. With the opinions of all previous philosophers he seems to have been familiar. There are stories of his travels in Egypt and the East, but they rest on little or no foundation in his own writings. Aristotle shows an intimate acquaintance with his doctrines, but tells us hardly anything about him personally. The accounts given first by writers who lived many centuries after him, such as Proclus and Iamblichus, are of no value. And yet there is no philosopher of antiquity with whom we have the means of so close an acquaintance. There was one teacher whom he has made most familiar to us, and from whom, in turn, we become most familiar with the pupil: Plato and Socrates are inseparable names. They are one power in the world's movement. This view can be held without diminishing the value or the position of either. Plato is not the mere reporter, neither is Socrates the merely ideal sketch. There is, in all the *Dialogues*, a most real Socrates, but equally unmistakable is the presence of another soul, like a related harmony, in closest unison with the life depicted as creative of its own.

The Platonic *Dialogues* have remarkable dramatic merit. We feel that we are in the midst of the real; we are living at Athens; we know Socrates; we know his pupils, aside from their being, for the most part, historical characters. We walk with them from the Piræus; we stroll with him and the youthful Phædrus one warm June morning up the shady Ilissus, and listen to Socrates discoursing all that long summer day on the celestial love whilst bathing his unsandalled feet in the cooling water. And then there is Socrates, the street-preacher, ever talking to the boys when he could gather a number round him, "*corrupting*" the youth, as the Athenian lawyers said, or wasting his time and talents, as the hard politician Callicles charges him, in "prattling" to these youngsters about the καλόν and the ἀγαθόν, the dreamy "*fair* and *good*," when he might be a "*practical* man," a man among men, and "conspicuous in the public assemblies of the state." Imagine him in his encounters with the really corrupting Sophists or the unprincipled politicians. Observe him in the scenes of the Symposion, that most exquisite picture which Plato has given us of an Athenian literary soirée. How odd his

appearance, and still more odd his ways, moving the jest, yet at the same time eliciting their deepest reverence, and melting to tears the dissolute Alcibiades when he remembers what he might have been had he followed the counsels of his early teacher! But it is in the prison dialogues, the *Crito* and the *Phædo*, that the solemn and familiar meet in most impressive unison. The early assembling of those devoted friends on the morning of that last memorable day. "Plato, I think, was sick," says the modest narrator; but Plato was there, beyond all question. No one else could have so reported that immortal argument on the immortality of the soul; no one else could have so painted the tender passages between Socrates and those two attached young men; no one else could have so described that death-scene, of whose every incident the reader is as certain as though he had himself been one of that tearful band which surrounded the couch of the dying martyr.

The identity of the two minds appears especially in the *doctrine of ideas*. It is this, more than anything else, that gives character to the Platonic philosophy. It is, too, the doctrine which shows how far from the truth is the prevailing notion of this philosophy, as mystical, transcendental, imaginative, far removed from what is called "common sense" or "positive knowledge." "Nothing so clear," says the young man Simmias in the *Phædo*, "as this doctrine of reminiscence, and the ideas of the fair and the good thus awakened in the soul." The word is used in two different yet closely-related aspects. An idea is, in the first place, what the mind adds to a sensation so as to make it rational. Without it, the sense is ἄλογος, as Plato supposed the animal to be (a view, in fact, held by Aristotle as well as Plato), mere sense, and of itself incapable of becoming anything more. His illustrations are drawn mainly from the mathematical ideas. In attempting to follow him here the utmost brevity must be consulted. Let us image to ourselves a confused mass of spots or points, such as the spatterings of a paint-brush thrown at hazard upon a canvas. There is visible, at first, no order, no idea—nothing for the mind, all for the sense. As far as the soul is concerned, there seems *nothing* there—or rather *no thing*, since it is *form* of some kind that makes a *thing*; that is, a thing thinkable, a *res* or *reality* for the mind. The animal and the man see at first the same, neither more nor less. As far as sense is concerned, the former may even have the keener vision. The human subject at last beholds the dawning of something supersensual, though the light has come from himself. Even in a single point he sees something more than the point. It is the idea of unity. The spatterings begin to assume form, or the soul is waking up to give its own forms to the formless. He is rising above sense. He begins to see *continuity*, or the rudiments of line-extension. He looks more steadily; there is something more than mere lineality; rectilineality, or *straightness*, is coming into view. It may be a mere approach to it; for the cognition of defect, or deviation, or *non-straightness*, is just as positive an evidence of some supersensual measuring-rule or idea as the most perfect agreement. In all this he not only *cognizes*, but *re-cognizes*. Aha! says he, I see something which draws my eye, or which my eye seems rather to draw out of its chaos. This supersensual thing has an interest for me beyond anything of sense. There is beauty in it. I seem to *know* it, although it never may have crossed my sense before. Have I imagined it? What, then, called out that supersensual power? A closer gaze sees not only a series of points forming one straight line (or evenness, τὸ ἴσον), but another seeming to hold to it a peculiar relation. There is the equality, or the approach to equality, of angular spaces. Here is a new beauty, a new interest, which could not have come from lines, perfect or imperfect, inclining to each other in any manner however irregular. There is no name as yet, but the soul sees perpendicularity, and delights in it as satisfying its idea. In the same way it sees parallelism. It is another aspect of the τὸ ἴσον. It sees relation; it sees ratio, multiple, proportion. It sees radii, or seeming equalities, tending, more or less perfectly, to a point of union. It is an idea again, something which the mind seems to know. In other words, it sees *circularity*, whilst the gazing animal, gaze he ever so long, sees only roundness (στρογγυλότης), or *difference* of sensation merely, whether quantitative or otherwise. In this way one might go through the infinite range of the mathematical ideas. Their teaching is really ἀνάμνησις, recollection, but not merely the recollection of one object of sense by another, as of Simmias by Cebes, but the true calling up of something *in the soul* at the sight of some outward object serving as its perfect or imperfect diagram. It is that which gives intelligibility to the object, making it a real thing for the mind—its own creation in fact, instead of the *tohu* and *bohu*, the utter formlessness of sense.

In an analogous way are seen the ideas of the *fair* and the *good*. The emotional mingles, more or less, with them all. In the sight of a straight line even there is beauty, interest, emotion, something of the soul's own; and this is because, like all beauty, it is in some way soul seeing soul, and rejoicing at the sight. It is like the feeling of the philosopher Aristippus when, after his shipwreck, he discovered a circle marked upon the sandy beach. "Let us be of good cheer," said he; "I see mind." If such an appearance were made by nature, it only shows that ideas are older still, fashioning the laws and *powers* of nature in harmony with their forms and their equalities. Or it is like the emotion of the boys in the *Meno* and the *Theætetus*, as Socrates, in his obstetric way, delivers them of their mental births: it is something which they felt they had ever *known*, but did not *know* that they *knew* it. Even experience, here, teaches an *a priori* truth, strange as that may seem. A man need only carefully examine the difference in his own feelings between the learning of an inductive truth wholly from without, and the soul's recognition of an idea in geometry, in morals, or in æsthetics.

Now, this is not mystical or transcendental or a mere play upon words, as the followers of Mill would call it. It is clear as the light itself. It is, as has been said, the true doctrine of "common sense," of the κοινῶν ἐννοιῶν, and Plato is the most lucid of all writers in bringing it out. When a young man sees it, his mode of thinking, his philosophical and, in some respects, his theological, temperament is changed for ever. Even admitting that this inner transforming knowledge may be a knowledge *acquired* does not change the wonder or the interest in the fact that our sense-world is, to so great an extent, the creature of the spiritual. Whether innate or by a divine mirroring of the supersensual, it is its imbuing the sensitive perception with its own thought that forms the mysterious difference between man and the animal, or between certain men and others. Surely there is nothing in the painter's retina or on the last matter of his brain that is not optically in that of other men.

Another Platonic doctrine, somewhat different from this, though often confounded with it, is that of *universals* as real existences. Nothing is more certain than that names for them are in language before the names of individuals; and that is one reason why Plato insists so much on dialectics as a mode of discovering universal truths. It is not generalization alone, but that within us, which makes us generalize, instead of being content with individual sense-objects. Without it we should be like the animal, who has no language, not from defect of vocal organs (for some are here superior to man), but because he has no inner or ideal world for which language is needed. We cannot seek, says Plutarch, without some idea of that for which we are seeking. We must have some notion of universals before we can even think of classifying. *Humanity* is as real as the individual man, who becomes *man*—that is, who becomes *real*—by partaking of this divine creation. It was for this doctrine of universals that Plato was ever a favorite with the best of the Christian Fathers, the Schoolmen, and the Reformers. In the old Nominalism of Epicurus, especially as revived by Abelard, they saw the dissolution of all faith, even as the best thinkers now regard it as threatening the interest of all true science. If individuals are the only realities, it cannot stop short of individual atoms. All forms are but accidental phenomena; there are no species; all are reduced to arbitrary classifications, having no standard but the ever-varying assimilations of sense. But where do universals exist? what is the locus of the ἓν ἐν πολλοῖς? They exist ἐν νῷ ("in mind"), says Plato, ἐν νοητῷ τόπῳ; and this is as real a mode of being as position ἐν τόπῳ, or pure space existence. Their locus is the eternal mind, whence they are mirrored in the finite intellect.

Connected with *ideas* is Plato's doctrine of pre-existence. Did he mean an individual pre-existence? He sometimes seems to accommodate his language to such a conception. In the highly imaginative *Phædrus*, Socrates has something to say of unborn souls "riding on the supercelestial sphere." But, on the other hand, it is easy to see that to maintain such a pre-existence of *individual* souls in a former sense-world, like the present, would destroy the argument in the *Phædo*. The true ideal reminiscence is gone. It would only be a sense-notice in this life, recalling a preceding sense-notice in another. The whole of that immortal argument is based upon the fact of a sense-experience here, calling up an idea belonging to the very constitution of the soul regarded as lying back of all sense. It is the pre-existence, then, of something belonging to all rational souls, and by partaking of which they become rational as they are born into this life. "In the image of God made He man." It was a divine reality, not a mere generalization or outward classing of individual resemblances. So He who is "the

express image," the "image of the substance," "lighteth every man as he cometh into the world." This is the pre-existence that satisfies the argument in the *Phædo*, whilst the other view of a sense-pre-existence is wholly at war with it.

Plato held to the eternity of matter, it is said. In one sense it may be true; in another and clearer sense it is certainly most false. Matter, as body, as occupying space, as having even the lowest degree of resistance so as to become sensible to any *possible* sentiency—matter as fluid, aërial, æthereal, or nebular—matter as having any sense-conception whatever,—such matter, according to Plato, is one of the things of time, of the γιγνόμενα, of the things that are born and perish. It is a direct product of the Γεννήσας Πατήρ who made it, as he made the *Anima Mundi* or nature—the one for the body, the other for the soul or life of the world. Nothing can be clearer than the expression of this in the *Timæus*. So, too, in the argument against the atheist in the tenth book of *The Laws*. Soul—that is, God—ideas, truth, as older than matter—such is the principle on which, in that discussion, all depends. But there is another idea of Plato's which has doubtless given rise to the charge. He speaks of the *hyle* (ὕλη), "the mother of matter," "without form or qualities," and wholly supersensual, belonging, in fact, to the νοητά rather than to the αἰσθητά, or νούμενον rather than φαινόμενον (Heb. xi. 3)—a thing for the mind rather than the sense. This has, indeed, a being before time, though nowhere represented as coeternal with God. It is something supposed to be between matter and spirit, matter and God. The truth is, Plato lost himself here, as some of our scientific men, and even theologians, are now losing themselves in the attempt to conceive of *force* as something existing before *body*, or of which matter itself is but a manifestation, or in the still darker and more pantheistic effort of resolving it into spirit itself or the divine will. But this does not affect the purity of his theism, any more than similar attempts to get beyond the limits of the human conception warrant the charge of pantheism oftentimes so ignorantly and absurdly made. It is enough that, according to Plato, the world, its *body* and its *soul*, its *matter* and its *nature*, all belong to time; all had a beginning; all are declared to be the product of the "Generating Father" (*Timæus*, 37 c.), who stands "rejoicing over his work," even as in Genesis God is represented as admiring his creation and pronouncing it "good, very good."

Plato connects evil with matter, but it is with this gross matter whose resistance is in proportion to its grossness and consequent unmanageableness. God has brought into time this hard-to-be-governed thing, and there is in it what the philosopher calls ἀνάγκη, or hard necessity; but it is not, on that account, an original and eternal evil. So, too, he elsewhere speaks of an "evil soul," but this could not be the *Anima Mundi*, for that is described in the close of the *Timæus* as the "intelligible Kosmos" itself, "the image of the intelligible God, most fair, most perfect, the one, the only-begotten." Much less could it be, as in the Persian doctrine, any eternal partner of the Γεννήσας Πατήρ. But, in truth, Plato fell into inconsistency, and even absurdity here, from his attempt to explain that dark problem of evil which all human thinking has found insolvable, and of which revelation (see Isa. xlv. 7) only cuts the knot, saying, without explaining, and in defiance, as it were, both of the Persian and the Greek philosopher, "Forming the light and creating darkness, forming peace and creating evil, it is I, Jehovah, that do all these things."

This doctrine of Plato, that evil dwells in matter, whether as an eternal or an acquired principle, might be regarded as a mere speculation, and in that sense comparatively harmless. It may be called, however, the great defect of the Platonic philosophy; not by making two eternals, but from the great practical mischief it works in its ethical teaching. It may be said to have given it ascetic features not derived from Pythagoras. It introduces a purgatorial idea into its otherwise most impressive system of future retribution. But worse than all is the view it gives of *sin* as mainly, if not wholly, belonging to the *flesh*. It is the φρόνημα σαρκός, taking the latter word literally for the very body itself, instead of using it, as Paul does, for all that is wrong in our perverted human nature. In consequence of this laying all evil upon the poor body, it ignores the sins of the spirit, or "lusts of the mind," as Paul calls them—the dire soul-sins, such as ambition, malice, revenge—that have little if anything to do with any corporeal constitution—or envy, that pure spiritual devilism, hatred of another's excellence, and which a disembodied demon may be conceived as possessing in even a higher degree than the most fleshly man. These *soul-sins* are hardly mentioned by Plato at all. He stands in striking contrast with the Greek poets here, as his doctrine is equally opposed to a sound ethical psychology. The body would soon be all right, a σῶμα πνευματικόν, in fact, if the soul, the original corrupter, were perfectly pure; and yet to get away from this body, as the seat of evil, is represented, even in the *Phædon*, as the most morally deserving of human efforts.

To compensate for this great defect there is the noble argument, presented in so many places, that *virtue*, the good, the ἀγαθόν, inseparable from the καλόν, the fair, is the end of the rational life, instead of happiness, the ἡδύ, the pleasant, the agreeable, evermore resolving itself, in its more refined as well as its grosser forms, into pleasurable sensations as its ultimate analysis. If *happiness* be the *end*, whether of the individual or of the universe, then *virtue* is a *means*, a subordinate thing; and that is a position which Plato could not bear. It was not a compromise between Hedonism and Cyreneacism, as some have lately said—that is, an identifying virtue with happiness, and making the latter, in the end, the unfailing accompaniment of the former, or, as it is commonly expressed, virtue its own reward. Any such thought of compensation would have destroyed the Platonic idea: "Men must serve God, or serve the good, for naught." See the picture of "the superlatively righteous man" (ὁ δικαιότατος ἀνήρ, in the second book of the *Republic*, 360, 361). He has the ring of Gyges that gives invisibility; he can do all evil with impunity and without reproach; yet is he righteous still. He may be the very opposite of this, having the reputation of unrighteousness, and no means of ever reversing the unjust decision; yet is he righteous still. The picture, even thus far, tries our Christian faith, but it does not stop here. He may be made to endure the severest pains, with no prospect of deliverance either now or at any other time; yet is he righteous still. The hope of compensation must have no place on the canvas. Finally, says this strange painter, what may a man, thus conditioned, expect from his fellow-men? Wonderful is the answer: Ὁ δίκαιος, οὕτω διακείμενος, μαστιγώσεται, στρεβλώσεται, δεδήσεται, καὶ, τελευτῶν, πάντα κακὰ παθὼν, ἀνασχινδυλευθήσεται ("The righteous man in this state will be scourged; he will suffer dislocating tortures; he shall be bound with cords, and, finally, after suffering all evils, he shall be impaled or crucified"). What δαίμων or spirit spoke in Socrates when he said these things? What wondrous far-reaching view possessed Plato when he ascribed such words to his master? It is not at all strange that some of the Christian Fathers were almost inclined to regard it as a prophecy of Him, "the Prince and Perfecter of Faith," who, "instead of (ἀντὶ χαρᾶς) the joy set before him, endured the cross, despising the shame," that we might be "partakers of his righteousness." "Virtue the end, but not without happiness;" this has been given as a solution, but if it means that happiness—and pain too, just as well—furnish the necessary theatre on which virtue finds its exhibition, the idea may be in harmony with the Platonic. Still, virtue is the *end*, and becomes dethroned by any mixture, as end, with the hedonic element. In another place (*Gorg.*, 494, 495) the same exhausting process is pursued in respect to *pleasure*. The ἡδύ, or happiness, if it is the end of being, becomes simply a question of *quantity*. It is the amount that is to be considered, whether it be the glut of some exquisite moment, or a thinner pleasure hoarded for its rarity and spread over a longer period. The cultivated Cyrenean has no right to talk of his refined happiness, and to condemn that of others as gross and low. If the ἡδύ is the ἀγαθόν, then it constitutes the ἀγαθὸς ἀνήρ, and the man who gets the most of it is "the better man." Then, too, if the world were one huge ζῷον, so made as to be quivering for ever with the maximum of ecstatic sensational delight, that would be the best of all possible worlds. Discard the ἀγαθόν as the end of life, and the maxim *De gustibus non est disputandum* becomes the highest ethical rule. Happiness in that case is only to be judged by its degree or its intensity. If there are real differences in pleasures, so that some may be called *good* and others *bad*, then there must be some more ultimate principle, not resolving itself into happiness or into "self-rewarding virtues," according to which their respective ranks and moral values are to be determined. The argument is unanswerable, and this gives rise to a like extreme statement in the opposite direction. Some of the lowest pleasures, as they are called, excel all others in the fulness of their pleasing sensations. Let the man who chooses this have it for his portion to all eternity—no palling, no abatement; one everlasting succession of never-paining, never-cloying, pleasurable, and even ecstatic, emotion. The Almighty might have made it so. He has, indeed, most mercifully put Nature in the way, making her his executioner, instead of the lawgiver, as a certain kind of modern ethics are inclined to regard it. But Plato presents it as an ethical and æsthetical supposition. What should we think of one who had chosen, and to whom there was permitted, for ever, such an uncloyed

existence? The answer is most dramatically brought out of the moral feeling, even of the sensualist. Socrates but gives back to him his own rising thoughts: "Such an existence, would it not be δεινὸς καὶ αἰσχρός—awful and shameful"? "Would he not be ἄθλιος, a very *wretch* indeed, not in the sense of pain, but as denoting the extreme of degradation and perdition, abhorrent to the rational mind"?

What is called Plato's hedonic view is carried even into the State. As he says, in the beginning of the fourth book and in other parts of the *Republic*, the object of government is not so much to make men happier or richer, as to secure a healthy civic organism—ὅπως ὅτι μάλιστα ὅλη ἡ πόλις—"for in such a commonwealth may we best hope to find righteousness." There is the same idea in the *Gorgias*, that the true statesman is he who aims not to *please*, but to leave the people morally better, "healthier in their souls," than he found them.

There is one feature in the Platonic *Dialogues* which has not received the attention it deserves. Allusion is made to what are called the Platonic myths. For the more extensive and gorgeous of them the reader is referred to the close of the *Republic*, the *Phædon*, and the *Gorgias*; the first two setting forth the retributions of the unseen world, and the third the appalling scenes of the spiritual judgment "*for sins done in the body.*" Nowhere out of the writings of Paul does this expression assume a more terrific significance. The "sins done in the body," all appearing as marks in the soul, not one, the least, having failed in stamping itself upon the tablet of the eternal spiritual memory. There is the myth of *Prometheus* in the *Protagoras*, the fanciful myth of the *Phædrus*; the wholly original and splendid myth of the *Politicus*, setting forth the alternating cosmical periods, the one of the divine order, the other of Nature left to herself, when (in direct opposition to the latest scientific holdings) she inevitably begins to degenerate, as having in herself no principle of progression, or even of permanence, though even in her abandonment she may preserve some portions of the spermatic reasons that were sown during her diviner circuit.

It is a question of interest whence Plato—or, in this case, more properly, Socrates—derived these myths. Some aspects of them seem to show that there was in them a popular lore that arrested his attention, as being more ancient and, at the same time, more truly significant, than the common mythology as represented on the stage. There are resemblances, indeed, but at the same time some striking differences. They are more serious than either the epic or dramatic. They seem to be regarded by Plato as an ancient body of truth, a sort of primitive revelation, as it were, in respect to the retributions of the other world, and the ante-historical and superhuman destinies of the earth on which we live. Some regard them as mere pleasant tales forming a part of the Socratic humor, leading him to tell a story where he finds himself failing in the argument. No careful reader, however, can retain this, or avoid feeling that Socrates is never so serious and, we venture to say, so Christlike (see the account of the Cavern of Sense, the prison of the worldly soul, in the beginning of the *Republic*, vii.) as in these myths and allegories. It seems also to have been an idea ever present in the mind of Plato that there was some superior wisdom in the minds of the earliest men, or, as Cicero expresses it, probably deriving it from him, "et primum omnis antiquitas, quæ quo propius aberat ab ortu et divina progenie, hoc melius ea quæ erant vera cernebat." (*Tusc. Disp.*, i. 26; *Aristot. Metaph.*, Lib. xi. (xii.), Lips., vol. ii. p. 254; παραδέδοται ὑπὸ τῶν ἀρχαίων καὶ παλαιῶν, ἐν ΜΎΘΟΥ ΣΧΉΜΑΤΙ καταλελειμμένα τοῖς ὕστερον, ὅτι περιέχει ΤῸ ΘΕΙ͂ΟΝ τὴν ὅλην φύσιν): "For by the primitive and very ancient men it has been handed down in the form of myths, and thus left to later generations, that the Divine it is which holds together all nature."

As has been already said, hardly any writings are more clear from the mystical or the false profundity that seeks the shade of unmeaningness. The German editors and commentators, though great as critics, have confused themselves and their readers by an affectation of too much insight. The *Timæus* itself is easier reading than Schleiermacher. The unpretending Stallbaum gives us the best, because the plainest, clue to the historical connections and the plans of the several parts. With others their unceasing cant about "multiplicity in unity," and "working out from a central ground," only bewilders the reader when he finds how different from this labyrinthine refinement is the clear though involved and apparently aimless discourse, winding along like a river at its will, and surprising us all the more by the pleasant places to which it is ever leading us. On this character of the *Dialogues* and the Socratic method generally more might be said, were it not that it will come better under the title SOCRATES itself. It is sufficient to say here that whilst, of all writings, they show the least of logical design—concealing it, in fact, instead of bringing it under notice—there are none more remarkable for the extreme tenacity with which they ever hold fast to certain peculiar ideas. To use Socrates' own figure, the game is never lost sight of until it is unearthed, however many may have been the apparent doublings of the hounds. Some dialogues, even quite long ones, seem to come to no result. These have been called *tentative*, sometimes skeptical. Socrates himself is made to style them the *kathartic*, sometimes the *kunegetic*. Their object is to evacuate the soul of error before the attempt to fill it with truth—to chase away the idols of the cavern in order to admit the sunlight with its realities; or, to use another figure, to test whether the idea so long sought proves to be, on its birth, a true offspring of the soul, or nothing more than an ᾠὸν ἀνεμιαῖον, an abortion, or *wind-egg*, to be cast away. There are none more valuable than these, though none have been less understood.

There have been various translations of Plato, such as those of Taylor, Sydenham, Victor Cousin, and others. The one, however, which for the English reader must supersede all others is that of Jowett. He has done the best, perhaps, that could be done in transferring this most spiritual and colloquial Greek into the most vivacious and, at the same time, idiomatic English. Yet still it is felt to be a translation. It is no disparagement of it to say that to one who reads Plato with ease in his grand old tongue the grace is often gone; threadbareness frequently takes the place of the shining gloss, whilst what suffers most of all is the Socratic wit ever enhancing instead of lowering the Platonic dignity. TAYLER LEWIS.

Pla'tof (MATVEI IVANOVITCH), b. Aug. 6, 1757, on the banks of the Don; distinguished himself in the Turkish wars; was made hetman of the Cossacks of the Don in 1801, and evinced considerable administrative talent; sprang suddenly into European fame by the military operations he performed as leader of the irregular cavalry in the rear of the French during their retreat from Moscow. With his twenty regiments of Cossacks he hung on their skirts like a cloud of birds of prey. Their Moscow booty he recaptured; their baggage and provision trains he seized and burnt; fragment after fragment of the grand army he cut off, defeated, and massacred. And this tale of horrors lasted from Moscow to Paris, and grew wilder with every step; his cruelties after entering France herself knew no bounds. At the end of the campaign the emperor Alexander made him a count, the citizens of London presented him with a silver sword, and loaded with honors he retired to his native place, where he d. Jan. 15, 1818.

Platon'ic Love, an affection for a person of opposite sex, based entirely upon moral and intellectual sympathies, without any admixture of the lower passions. According to Plato, this is the ideal love, of which the ordinary sexual love, however devoted, is but a feeble image.

Platoon' [Fr. *peloton*, a "knot," a "pellet"], in military tactics, half a company of troops. The platoon is useful in marching on narrow roads in column, and is sometimes employed in the skirmish-drill in rallying the line. The troops also at times fire by platoons.

Platt (JAMES H., JR.), b. in St. John's, Canada, July 13, 1837, of parents who were American citizens; graduated from the medical department of the University of Vermont 1859; served during the civil war as captain 4th Vermont Vols., and on the staff of Gen. Sedgwick as acting chief quartermaster 6th corps; prisoner of war May 30 to Dec., 1864; appointed lieutenant-colonel and chief quartermaster, which he declined. Settled in Virginia at the close of the war; was member of Petersburg city council, of State constitutional convention; in 1869 elected to the 41st Congress, and re-elected to the 42d, 43d, and 44th.

Platte, county of Missouri, bounded S. W. by Missouri River, which separates it from Kansas. Area, 400 sq. m. It is diversified, well wooded, and very fertile. Products, live-stock, grain, and wool; manufactures, lumber and flour. Traversed by various railroads. Cap. Platte City. P. 17,352.

Platte, county of Central Nebraska. Area, 630 sq. m. It is undulating and mostly well watered, fairly wooded, and productive. The S. E. part is traversed by Platte River and Union Pacific R. R. Cap. Columbus. P. 1899.

Platte, tp., Taylor co., Ia. P. 163.

Platte, tp., Union co., Ia. P. 565.

Platte, p.-v. and tp., Benzie co., Mich. P. 181.

Platte, tp., Andrew co., Mo., on Little Platte River. P. 3416.

Platte, tp., Buchanan co., Mo., on Platte River. P. 1159.

Platte, tp., Clay co., Mo. P. 3085.

Platte, tp., Clinton co., Mo., on a branch of Platte River. P. 1631.

Platte City, p.-v., Carroll tp., cap. of Platte co., Mo., on Chicago Rock Island and Pacific R. R., has 2 academies, 2 newspapers, 2 banks, 2 hotels, fine water-power, extensive paper-mills, and stores. P. 599.

WM. M. PAXTON, ED. "PLATTE COUNTY ADVOCATE."

Plattekill, p.-v. and tp., Ulster co., N. Y. P. 2031.

Platte River is formed in Lincoln co., Neb., by the union of the N. and S. forks. The former rises in the North Park, Col., receiving the Sweetwater, the Laramie, and other streams. The South Platte flows from the South Park of Colorado, and in its upper course is extensively utilized in irrigation and as a source of water-power. The united stream flows E., and reaches the Missouri at Plattsmouth. It is the widest, but neither the largest in volume nor the longest, affluent of the Missouri. Its mouth is over 1000 yards wide, but it is so very shallow that it can nowhere be navigated with much success. Its valley is generally very fertile. The drainage-area is estimated at 7500 sq. m. The Loup Fork and Elkhorn are the chief tributary streams. Length of the main stream, 900 miles.

Platte River, tp., Polk co., Neb. P. 44.

Platte Valley, tp., Douglas co., Neb. P. 631.

Platte'ville, tp., Mills co., Ia., on Missouri River opposite its mouth. P. 762.

Platteville, p.-v. and tp., Grant co., Wis., on Galena and Southern Wisconsin Narrow-gauge R. R., has a State normal school, 13 churches, 1 bank, 1 newspaper, 2 foundries, a planing-mill, 6 flouring-mills, 2 carriage-factories, several hotels, and a powder-mill. P. of v. 2537; of tp. 3683. M. P. RINDLAUB, ED. "WITNESS."

Platt'ford, p.-v. and tp., Sarpy co., Neb., on Platte River. P. 556.

Plat'tin, p.-v. and tp., Jefferson co., Mo. P. 1217.

Platts'burg, p.-v., cap. of Clinton co., Mo., at crossing of Chicago and South-western and Lexington and St. Joseph division of St. Louis Kansas City and Northern R. R., has 1 newspaper. P. 1067.

Plattsburg, p.-v. and tp., cap. of Clinton co., N. Y., on both banks of Saranac River at its entrance into Lake Champlain, southern terminus of Montreal and Plattsburg division of Vermont Central and northern terminus of Whitehall and Plattsburg R. Rs., has a fine harbor, a good water-power, extensive woollen, flouring, and saw-mills, foundries, machine-shops, and manufactories, a large lumber-trade, fine court and custom houses, 3 hotels, an academy, 3 banks, extensive U. S. barracks, 6 churches, and 3 newspapers. Noted as the scene of the capture of a British fleet on Lake Champlain by Com. McDonough, Sept. 11, 1814. P. 5139.

Plattsburg, p.-v., Harmony tp., Clark co., O., on London branch of Cincinnati Sandusky and Cleveland R. R. P. 87.

Platts'mouth, p.-v. and tp., cap. of Cass co., Neb., located at the junction of Platte and Missouri rivers, on Burlington and Missouri River R. R., formerly the outfitting point for emigrants seeking California, has a fine high school, 2 machine-shops (1 connected with the railroad), a foundry, 2 grist-mills, 2 newspapers, and the surveyor-general's office for Iowa and Nebraska. P. of v. 1944; of tp. 2448.

JNO. A. MACMURPHY, ED. "NEBRASKA HERALD."

Platt Springs, tp., Lexington co., S. C. P. 679.

Plattsville, p.-v., Green tp., Shelby co., O. P. 94.

Platycephal'idæ [πλατύς, "broad," and κεφαλή, a "head"], a family of fishes of the order Teleocephali, represented in the Pacific and Indian oceans. The body is elongated and depressed anteriorly, covered with ctenoid scales or plates; the lateral line entire; head much depressed and triangular above; the bones more or less armed with spines; mouth with a lateral cleft; teeth present in villiform bones on the jaws as well as palate; branchial apertures continuous below; branchiostegal rays seven; dorsals two, the anterior with six to nine spines; the posterior dorsal and anal similar and opposite each other; the pectorals with the lower rays at least simple; ventrals thoracic or subjular, each with a spine and five rays; the skeleton has the vertebræ in increased number (about 12 + 15); the pyloric appendages are developed in moderate number; there is no air-bladder. The family includes three well-marked genera—*Platycephalus*, *Hoplichthys*, and *Bembras*. In some respects the family is more nearly related to the Triglidæ (*Prionotus*, etc.) than to any other familiar to American naturalists. THEODORE GILL.

Platypter'idæ [*Platyptera*, πλατύς, "broad," and πτερόν, "fin"], a family of teleocephalous fishes related to the gobies, dragonets, etc. The body is elongated, covered with ciliated scales; lateral line inferior; the head broad and depressed; opercula unarmed; mouth with a narrow cleft; upper jaw protractile; teeth small, only on the jaws; branchial apertures moderate, separated below; branchiostegal rays six; dorsal fins two, the anterior with (seven) flexible spines; the posterior dorsal and anal similar, small, and obliquely opposite each other; caudal separated; pectorals with branched rays, large and expanding laterally and forward; ventrals wide apart, each with a spine and five rays; the vertebræ are rather numerous (11 + 16); no air-bladder exists. The group is represented by a single fresh-water species (*Platyptera aspre*), found in the fresh waters of the East Indian islands Bantam and Celebes.

THEODORE GILL.

Platypus, a name applied to the DUCK-BILL (which see).

Plau'en, town of Saxony, on the Elster, has many good educational institutions, and large manufactures of paper, leather, muslin, cambric, jaconet, and other woollen and linen goods. P. 23,355.

Plau'tus (TITUS MACCIUS), b. about 254 B. C. at Sarsina, in Umbria; came early to Rome, where he found employment with the actors; saved some money and started a business of his own, but failed; worked afterward in a hand-mill at Rome, and wrote, about 224 B. C., three comedies, which he succeeded in selling to the managers of the public festivals. They were well received, and from this time he lived as a play-writer to his death, 184 B. C. The plots, and generally also the characters, of his plays he took from the Greek comedians, Menander, Diphilus, and Philemon, but both underwent a very free treatment and a thorough Latinization, which may be inferred from the general character of his dialogue; it is not only fluent and witty, but racy and taken fresh from the lips of the people. His success was considerable. While Terence, who was much more elegant, but also a much closer imitator of the Greeks, complains that the audience ran away from his plays to look at some rope-dancer, Plautus remained a favorite with the Romans down to the time of Diocletian, and was appreciated not only by the mass, but also by the most fastidious people—*e. g.* Cicero. His fertility seems also to have been great. According to Varro, there existed 130 plays which bore his name, but the number of those unquestionably genuine the critics limit to 21—namely, *Amphitruo*, *Asinaria*, *Aulularia*, *Bacchides*, *Captivi*, *Casina*, *Cistellaria*, *Curculio*, *Epidicus*, *Menæchmi*, *Mercator*, *Miles*, *Mostellaria*, *Pœnulus*, *Persa*, *Pseudolus*, *Rudens*, *Stichus*, *Trinummus*, *Truculentus*, and *Vidularia*. The last of these has been lost, but the other twenty are still extant, though in a text much corrupted and interpolated. Best edition by F. W. Ritschl (3 vols., Bonn, 1848–54, still incomplete). There is an English translation by Thornton and Warner (5 vols., 1767–74), another by Riley (2 vols., 1852).

Play'fair (JOHN), b. at Benvie, Forfarshire, Scotland, Mar. 10, 1748; educated at the University of St. Andrew's, where he was distinguished for his attainments in natural history; became a minister of the Scotch Church 1772; held the living of Benvie 1773–82, when he resigned, removed to Edinburgh, and became a private tutor; was appointed assistant professor of mathematics in the University of Edinburgh 1785, professor of natural philosophy 1805, and became in the same year general secretary of the Edinburgh Royal Society. He was a frequent contributor to the *Transactions* of that body, as well as to the *Edinburgh Review;* published a valuable edition of Euclid's *Elements of Geometry* (1795), still in use both in Great Britain and the U. S., *Illustrations of the Huttonian Theory of the Earth* (1802), and *Outlines of Natural Philosophy* (2 vols., 1812–16), containing the substance of his university lectures. Prof. Playfair was one of the precursors of the geological discoveries of the present century; travelled in search of geological data in France, Switzerland, and Italy, and left incomplete at his death an interesting *Dissertation on the Progress of Mathematical and Physical Science*, prepared for the supplement to the *Encyclopædia Britannica.* D. at Edinburgh July 19, 1819. A collected edition of his works was issued at Edinburgh (4 vols., 1822).

Playfair (LYON), C. B., F. R. S., LL.D., b. in Bengal in 1819; educated at St. Andrew's, Scotland, and the Andersonian University, Glasgow; studied chemistry under Graham and Liebig; engaged in industrial chemistry; became in 1843 professor of chemistry in the Royal Institution, and in 1858 took the chemical chair in the University of Edinburgh; became in 1868 a Liberal member of Parliament for the Universities of Edinburgh and Aberdeen; postmaster-general 1873–74; has held many other public positions of importance, and been the recipient of many honors, British and foreign.

Playing Cards. A pack of playing cards, as used in modern times and for the most common games, numbers

52 cards, and consists of four suits, two red (hearts and diamonds), and two black (spades and clubs), each suit comprising 13 cards—three picture-cards, the king, queen, and knave; and ten plain cards numbered from one, the ace, to ten. Chinese packs have only 30 cards—three suits of nine cards each, and three single cards, which rank higher than the others. Like chess, cards were introduced into Europe from Asia; but while the game of chess evidently originated from the warlike disposition and occupations of ancient nations, cards seem originally to have been used only for fortune-telling and similar purposes. The first games practised in Europe were those of mere chance, and there are no vestiges of any real application to them of the historical and symbolical associations connected with the cards; the four suits representing the four classes—hearts, the clergy; spades, the knights; diamonds, the burghers; and clubs, the serfs; the four kings representing David, Alexander, Cæsar, and Charlemagne; etc. The Saracens first brought cards to Spain and Italy, whence they soon spread to France and Germany. At the close of the thirteenth century the manufacture of playing cards was a considerable branch of industry in Nuremberg and other German cities. In the time of Richard III. and Henry VII. card-playing became a favorite amusement among the higher classes in England. But the golden age of this kind of entertainment was the middle and latter part of the eighteenth century. One of the most beneficial influences of Louis XIV. and his gay court was the greater sociability which they introduced into European life—the general taste for social gatherings for the mere purpose of entertainment, without any grand occasion, such as the celebration of a wedding, a funeral, etc. But in other countries that vivid interest for literature and art was wanting which in France made social gatherings a noble intellectual enjoyment; and in France, too, this interest slackened considerably during the latter part of the reign of Louis XIV. and during the next generation. The materials for a good conversation given up, soon even the faculty became lost, and people began to feel as if they did not know what to do with themselves. In this emergency cards were eagerly resorted to as the panacea against *ennui*. Card-tables were arranged in long rows through the saloons; ladies and gentlemen were seated around them according to their rank, and for several hours, between the heavy dinner of sixteen courses and hot wines and the light supper of eight courses and mild wines, nothing was heard in the crowded rooms but the rustling of the cards, the ringing of money, and now and then a burst of anger or exultation. Goethe played, at one time of his life, his game of *L'ombre* every day after dinner. Then came the French Revolution with its passionate debates, and swept away, like a whirlwind, the cards, the card-tables, and the card-players.

Plea (law), the name given in the common-law system of pleading to the first defence or statement of fact interposed by the defendant in an action at law. Pleas are divided into two general classes—those in abatement, and those in bar. The former allege facts showing that the plaintiff ought not to recover in the particular action, but do not attack the cause of action itself; the latter controvert the very cause of action, and show that the plaintiff ought not to recover at all. Pleas in bar are subdivided into those by way of traverse and those by way of confession and avoidance. Traverses are general or special—general when they deny all the allegations made by the plaintiff; special when they deny some particular allegation. Pleas in confession and avoidance admit the truth of the plaintiff's averments, but at the same time set up other facts which destroy their legal effect, and show that notwithstanding them the plaintiff is not entitled to recover. The term, with the general system to which it belongs, has been abandoned in England and in a majority of the States of this country, but is still used in those States where the ancient methods of procedure are preserved. (See PLEADING and PROCEDURE.) JOHN NORTON POMEROY.

Plead′ing (law), the written allegations of the parties to an action, by which they state their respective claims and defences, and finally arrive at an issue of fact or of law, the decision of which will determine the judicial controversy between them. Prior to the comprehensive reforms recently effected by statute there had long existed in England and in this country three different types or species of pleading in civil suits—namely, the common law, the equity, and that by allegation. The common-law method prevailed exclusively in the courts of law. At a very early period the parties to a suit appeared in open court and made oral statements of their claims and defences in the actual presence of the judges, which were at once written down by an officer of the court; and this official transcript constituted the record of the proceedings. It is plain from the writings of Bracton that this oral mode was universal in the time of Henry III., and it seems to have continued until about the middle of the reign of Edward III. The common-law system, as it was subsequently perfected, arose from the substitution of written allegations in the place of these oral ones; and such writings, instead of being presented to the judges themselves sitting in court, were filed by the attorneys in the offices of the proper clerks. The first pleading by the plaintiff was the "declaration," which contained a statement of the cause of action made in a highly artificial, formal, and technical manner, and in language which differed widely from the English of ordinary narrative, and also indicated the particular form of action which the plaintiff had adopted. If the defendant admitted the truth of the facts set forth by the plaintiff, but denied that in law they constituted the cause of action against him, his pleading was termed a "demurrer," and formed merely an issue of law to be decided by the court. If, however, he desired to present an issue of fact, his pleading was styled the "plea." The "pleas" by the defendant, and all subsequent pleadings in the suit by either of the parties, were separated into two classes—those by way of traverse, which directly denied all or the essential statements of fact contained in the preceding pleading of the adverse party; and those by way of confession and avoidance, which admitted such statements to be true, but alleged other and new facts obviating and destroying their legal effect. If the defendant's plea was a traverse, an issue of fact was formed at once; if it was in confession and avoidance, the plaintiff must interpose a "replication" or a demurrer. In this manner the alternate allegations were conducted until either an issue of law was presented by a demurrer, or an issue of fact by a direct affirmation on the one side and a denial thereof on the other; in actual practice, however, the series seldom was extended beyond the "replication." The rules which governed the common-law system and regulated the manner of making the averments were exceedingly refined, precise, and formal; and the result was, that litigations were often decided upon the most technical questions, having no connection whatever with the merits of the controversy, and the amount of wrong and injustice thus done to suitors was simply incalculable. The method of pleading in courts of equity was very different from that prevailing in courts of law. The complainant's case was stated in a "bill of complaint" and the defendant's in an "answer," and these ordinarily constituted the only pleadings, although a few particular defences were set out in a form known as the "plea." The parties were not subjected to the technical rules of the common law, but used a more natural mode of statement. The pleader averred not only the principal facts constituting the ground for relief or the defence, but also the evidence by which these facts were substantiated, and thus spread out in his bill or answer a full and detailed narrative of the entire transaction which formed the subject-matter of the controversy, so that the cause could often be decided upon these averments alone, without the aid of evidence. The mode of pleading in the court of admiralty and the ecclesiastical courts was substantially identical, in respect to the matters required to be stated, with the equity method, and differed from that simply in the external form of the averments. Each important fact, together with the detail of evidence concerning it, was contained in a separate paragraph, technically termed an "allegation," so that the "libel" of the complaining party, which corresponded to the "declaration" and the "bill" of other courts, was separated into a number of distinct paragraphs or allegations, each relating to a single fact or occurrence. In 1848 the legislature of New York effected for that State a radical change in these modes of pleading by adopting the code of civil procedure; the reform thus inaugurated has extended into more than twenty other States and Territories of this country, and has even been adopted as to all of its essential features in England, where it went into operation during the year 1875. By this system the distinction between legal and equitable suits is abolished, and the rules which governed the common-law pleading are abrogated. The parties in all actions are required to state the facts constituting the ground of relief or the defence as they actually existed, in ordinary language, without any technical formality, and without any averments of evidence or of legal conclusions. In some of the States the first pleading by the plaintiff is denominated the "complaint," in others the "petition," while in England it is called the "statement of claim." The only pleading of fact by the defendant is styled the "answer" in all of the several States, but the "statement of defence" in the English practice. Under certain circumstances the plaintiff must put in a "reply," but the pleadings of fact can never extend beyond this point. The defendant may demur to the plaintiff's complaint, petition, or statement of

claim, and to his reply; and the plaintiff may demur to the defendant's answer or statement of defence. The underlying principle of this reformed system is natural, correct, and at the same time truly scientific; if its full beneficial results have not been attained in all of the States, the fault does not inhere in the system itself, but in the loose manner of its enforcement by the courts and the bar. (See PROCEDURE.) JOHN NORTON POMEROY.

Pleas'ant, tp., Fulton co., Ill. P. 1685.

Pleasant, tp., Allen co., Ind., on St. Mary's River and Fort Wayne Muncie and Cincinnati R. R. P. 1280.

Pleasant, tp., Grant co., Ind., on Mississinewa River. P. 1575.

Pleasant, tp., Johnson co., Ind., on Jeffersonville Madison and Indianapolis R. R. P. 2170.

Pleasant, tp., La Porte co., Ind., on Indianapolis Peru and Chicago R. R. P. 814.

Pleasant, tp., Porter co., Ind. P. 615.

Pleasant, tp., Steuben co., Ind., includes Angola, the county-seat. P. 2071.

Pleasant, p.-v. and tp., Switzerland co., Ind. P. 2145.

Pleasant, tp., Wabash co., Ind., on Eel River. P. 2553.

Pleasant, tp., Appanoose co., Ia. P. 1101.

Pleasant, tp., Hardin co., Ia. P. 842.

Pleasant, tp., Lucas co., Ia. P. 632.

Pleasant, tp., Monroe co., Ia., on Des Moines River, and on Central Iowa and Burlington and Missouri River R. Rs. P. 1299.

Pleasant, tp., Poweshiek co., Ia. P. 646.

Pleasant, tp., Union co., Ia. P. 563.

Pleasant, tp., Wapello co., Ia., on Burlington and Missouri River R. R. P. 1166.

Pleasant, tp., Winnebago co., Ia. P. 301.

Pleasant, tp., Winneshiek co., Ia., on Upper Iowa River. P. 994.

Pleasant, tp., Wright co., Ia., on Iowa River. P. 332.

Pleasant, tp., Brown co., O., on Ohio River, includes Georgetown, the county-seat. P. 2605.

Pleasant, tp., Clark co., O. P. 1553.

Pleasant, tp., Fairfield co., O. P. 2327.

Pleasant, tp., Franklin co., O., on Darby Creek. P. 1833.

Pleasant, tp., Hancock co., O. P. 1366.

Pleasant, tp., Hardin co., O., on Scioto River and Cincinnati Sandusky and Cleveland R. R., includes Kenton, the county-seat. P. 4002.

Pleasant, tp., Henry co., O. P. 860.

Pleasant, tp., Knox co., O., includes Gambier Village, site of Kenyon College. P. 851.

Pleasant, tp., Logan co., O., on Miami River. P. 994.

Pleasant, tp., Madison co., O. P. 1330.

Pleasant, tp., Marion co., O. P. 1078.

Pleasant, tp., Perry co., O. P. 655.

Pleasant, tp., Putnam co., O., on Dayton and Michigan R. R. P. 1953.

Pleasant, tp., Seneca co., O., on Sandusky River and Cincinnati Sandusky and Cleveland R. R. P. 1352.

Pleasant, tp., Van Wert co., O., includes Van Wert, the county-seat. P. 3683.

Pleasant, tp., Warren co., Pa., on Allegheny River. P. 385.

Pleasant, tp., Barbour co., West Va. P. 1395.

Pleasant, tp., Clay co., West Va. P. 488.

Pleasant, tp., Preston co., West Va. P. 1570.

Pleasant Branch, v., Middleton tp., Dane co., Wis. P. 173.

Pleasant Gap, p.-v. and tp., Bates co., Mo. P. 1634.

Pleasant Grove, tp., Jackson co., Ala. P. 730.

Pleasant Grove, tp., Limestone co., Ala. P. 649.

Pleasant Grove, tp., Coles co., Ill., on Embarras River. P. 1573.

Pleasant Grove, p.-v. and tp., Des Moines co., Ia. P. 1023.

Pleasant Grove, tp., Floyd co., Ia. P. 442.

Pleasant Grove, tp., Mahaska co., Ia. P. 875.

Pleasant Grove, tp., Marion co., Ia. P. 1445.

Pleasant Grove, tp., Greenwood co., Kan. P. 462.

Pleasant Grove, p.-v. and tp., Olmstead co., Minn. P. 1071.

Pleasant Grove, tp., Alamance co., N. C. P. 1246.

Pleasant Grove, tp., Johnston co., N. C. P. 1535.

Pleasant Grove, tp., Randolph co., N. C. P. 1218.

Pleasant Grove, p.-v., Utah co., Ut. Ter. P. 930.

Pleasant Grove, p.-v. and tp., Lunenburg co., Va. P. 1778.

Pleasant Grove, tp., Norfolk co., Va. P. 2429.

Pleasant Hill, tp., Clarke co., Ala. P. 520.

Pleasant Hill, p.-v. and tp., Dallas co., Ala. P. 2003.

Pleasant Hill, tp., Pike co., Ala. P. 640.

Pleasant Hill, tp., Newton co., Ark. P. 352.

Pleasant Hill, p.-v. and tp., Pike co., Ill., on Louisiana branch of Chicago and Alton R. R. P. 230; of tp. 1411.

Pleasant Hill, p.-v., Mercer co., Ky. P. 362.

Pleasant Hill, tp., Winona co., Minn. P. 643.

Pleasant Hill, p.-v. and tp., Cass co., Mo., on Missouri Pacific R. R., 248 miles W. of St. Louis, has a public library, 12 churches, 1 bank, 2 flouring and 3 grist mills, 3 newspapers, and 3 hotels. P. of v. 2554; of tp. 3502. GEO. H. PRESTON, ED. "REVIEW."

Pleasant Hill, tp., Sullivan co., Mo. P. 634.

Pleasant Hill, p.-v., cap. of Saline co., Neb., has excellent schools, 3 churches, 1 newspaper, a court-house, lime and cement works, and 2 hotels. Large quantities of grain and vegetables are raised here. P. about 300. W. O. ELLIS, ED. "NEWS."

Pleasant Hill, p.-v. and tp., Miami co., O. P. 324.

Pleasant Hill, p.-v. and tp., Lancaster co., S. C. P. 1624.

Pleasant Mills, p.-v., St. Mary's tp., Adams co., Ind., on St. Mary's River. P. 80.

Pleasant Mounds, p.-v. and tp., Blue Earth co., Minn. P. 448.

Pleasanton, p.-v., cap. of Linn co., Kan., on Missouri River Fort Scott and Gulf R. R., 75 miles S. of Kansas City, has good schools, 2 churches, 1 bank, 1 newspaper, 2 mills, 2 hotels; rich deposits of lead and coal exist here. P. about 1100. E. H. BROWN, ED. "OBSERVER."

Pleasanton, p.-v. and tp., Manistee co., Mich. P. 283.

Pleasanton, v., Wesley tp., Washington co., O. P. 109.

Pleasanton, p.-v., cap. of Atascosa co., Tex., on Atascosa River. P. 206.

Pleasant Prairie, p.-v. and tp., Martin co., Minn. P. 408.

Pleasant Prairie, p.-v. and tp., Kenosha co., Wis. P. 1377.

Pleasant Ridge, p.-v., Greene co., Ala. P. 1547.

Pleasant Ridge, tp., Fulton co., Ark. P. 330.

Pleasant Ridge, tp., Livingston co., Ill. P. 809.

Pleasant Ridge, tp., Lee co., Ia., on Skunk River. P. 972.

Pleasant Ridge Plantation, tp., Somerset co., Me. P. 135.

Pleasant Run, tp., Lawrence co., Ind. P. 699.

Pleas'ants, county of West Virginia, separated from Ohio on the N. W. by Ohio River. Area, 280 sq. m. It is hilly, and for the most part fertile. Chief product, grain. Cap. St. Mary's. P. 3012.

Pleasants (JAMES), b. in 1769 in Virginia; in Congress 1811–19; in the U. S. Senate 1819–22; governor of Virginia 1822–25, and declined other important positions. D. in Goochland co., Va., Nov. 9, 1836.

Pleasant Site, p.-v., Franklin co., Ala. P. 1053.

Pleasant Vale, tp., Pike co., Ill., on Mississippi River. P. 1188.

Pleasant Valley, p.-v. and tp., Jo Daviess co., Ill. P. 943.

Pleasant Valley, tp., Fayette co., Ia. P. 1119.

Pleasant Valley, tp., Grundy co., Ia. P. 402.

Pleasant Valley, tp., Johnson co., Ia., on Iowa River. P. 1189.

Pleasant Valley, p.-v. and tp., Scott co., Ia., on Mississippi River. P. 751.

Pleasant Valley, tp., Wilson co., Kan. P. 470.

Pleasant Valley, tp., Washington co., Md. P. 1183.

Pleasant Valley, tp., Mower co., Minn. P. 319.

Pleasant Valley, p.-v. and tp., Dutchess co., N. Y. P. 1963.

Pleasant Valley, v., Whitestown tp., Oneida co., N. Y. P. 87.

Pleasant Valley, tp., Madison co., O. P. 467.

Pleasant Valley, tp., Potter co., Pa. P. 140.

Pleasant Valley, tp., Eau Claire co., Wis. P. 348.

Pleasant Valley, p.-v. and tp., St. Croix co., Wis. P. 592.

Pleasant View, tp., Macon co., Ill. P. 899.

Pleasant View, p.-v. and tp., Cherokee co., Kan. P. 971.

Pleasantville (formerly CLARK'S CORNERS), p.-v., Mt. Pleasant tp., Westchester co., N. Y., on New York and Harlem R. R.

Pleasantville, p.-b. and tp., Venango co., Pa. P. 1598.

Pleas'onton (ALFRED), b. in the District of Columbia Dec., 1823; graduated at the U. S. Military Academy July, 1844, when he was appointed brevet second lieutenant 1st Dragoons; major 2d Cavalry Feb., 1862. He took part in the war against Mexico, gaining the brevet of first lieutenant for gallantry at Palo Alto and Resaca de la Palma; subsequently, prior to 1861, served on frontier duty with his company and as acting assistant adjutant-general. In the civil war he commanded his regiment on its march from Utah to Washington, with which he continued to serve throughout the Virginia Peninsular campaign of 1862; appointed brigadier-general of volunteers July 16, 1862, he commanded in September the division of cavalry (Army of the Potomac) following Lee's army invading Maryland; engaged at Boonsboro', South Mountain, Antietam, and subsequent pursuit, and constantly engaged the enemy's cavalry at Fredericksburg; at Chancellorsville, by his brilliant action, he stayed the further advance of Stonewall Jackson's corps, which threatened to carry all before it. Promoted for this valuable service to be major-general in June, he was engaged in the numerous actions preceding Gettysburg, where he also commanded in chief the cavalry; transferred to Missouri in 1864, he drove the invading forces of Gen. Price from the State. Mustered out of the volunteer service Jan., 1866, he resigned in 1868 his commission in the regular army, and for several years was U. S. collector of internal revenue.

Plébiscite' [Lat. *plebiscitum*]. In the Roman republic, a *plebiscitum* was a law passed at the *comitia tributa* by the *plebs* or commons on the rogation of a tribune, and was different from a *lex*, which was passed at the *comitia centuriata* by the *populus* or patricians on the rogation of a consul or other senatorian magistrate. In modern France, *plébiscite* denotes a decree of the whole nation obtained by universal suffrage, a proceeding which both Napoleon I. and Napoleon III. used in order to legitimize their *coups d'état*. After the dissolution of the Directory, Nov. 9, 1799, Napoleon I. appealed to the nation in this way, and Napoleon III. did the same after the dissolution of the National Assembly, Dec. 2, 1851. But, although in both cases the appeal was made by means of universal suffrage, the tendency of the proceeding was both times to despotism, and the measure itself nothing but a preparation for the establishment of the Empire, which then was confirmed by new *plébiscites*—the first, in May, 1804, giving a majority of 3,572,399 votes; and the second, in Nov., 1852, giving a majority of 8,157,752 votes.

Plebs and **Plebeians.** See PATRICIANS.

Plectog'nathi [Gr. πλεκτός, "intertwined"—*i. e.* "connected"—γνάθος, "jaw"], an order of teleost fishes comprising the file-fishes, trunk-fishes, swell-fishes, etc. They are distinguished by the greater or less co-ossification of the premaxillary and supramaxillary bones, and especially by the coalescence of the elements of the lower jaw; the cranium is posteriorly normal, and essentially resembles that of the teleocephalous fishes; the interoperculum is a slender bone; the scapular arch is destitute at least of the mesocoracoid bone; the post-temporal is undivided and co-ossifies with the epiotic; the vertebræ are generally in small number; the gills normal and pectinated; the pharyngeal bones also normal; the scales are more or less aberrant in type, and tend to development as angular scutes or spines; the ventral fins are absent. The order is really a natural one, although its various species are remarkably unlike in external appearance. This dissimilarity has led to skepticism lately as to its homogeneous character, and necessitates a differentiation into three suborders—viz. (1) Gymnodontes, including the swell-fishes (Tetrodontidæ and Tridontidæ) and short sunfishes (Orthagoriscidæ); (2) Ostracodermi, with the trunk-fishes (Ostraciontidæ); and (3) Sclerodermi, with the file-fishes (Balistidæ and Triacanthidæ). THEODORE GILL.

Pledge, or **Pawn** (law), a species of bailment by which personal property is delivered by a debtor to his creditor, to be held as a security for the payment of the debt or the discharge of the obligation. Anything which is tangible and movable may be the subject of a pledge, and this includes all species of chattels and all things in action in the form of written instruments, such as bonds, mortgages, notes, certificates of stock, bills of lading, warehousemen's receipts, and other written promises or engagements. There must be either an actual delivery of the article pledged into the possession of the creditor, or the delivery of its muniments of title or the written means and authority by which the actual possession may be obtained. Thus, goods on shipboard may be pledged by a delivery of the bill of lading, and those in a warehouse by a delivery of the warehouseman's receipt. The pledgor—that is, the debtor who makes the pledge—retains the general property in the article, subject to the possession and other rights of the creditor, and on payment or performance his property becomes again perfect and absolute. His interest may be transferred, will pass to his executors or administrators at his death, and may generally be sold on execution if the article itself is subject to such sale. The creditor, or pledgee, acquires the right of possession as long as the debt remains unpaid or obligation unperformed, and such a qualified property in the thing as enables him to maintain actions against third persons to recover its possession from them or damages for injuries done to it or for its wrongful conversion. Upon the debtor's failure to pay or to perform at the stipulated time, the property of the creditor or pledgee does not become absolute; he has then merely the right to maintain an action and to procure a judicial sale of the article, or to sell it himself without suit, and apply the proceeds in payment of his claim. If he resorts to the latter proceeding, he must, in the absence of express stipulations between himself and the debtor authorizing another course, first make a demand of payment from the pledgor, and secondly give him a reasonable notice of the time and place of the sale; and the sale itself must be public and in the usual course and custom of business. It is held, however, in New York and in some other States that certain things in action—as, for example, negotiable paper—when pledged, cannot be sold by the creditor in satisfaction, but must be collected in the ordinary manner and the proceeds applied upon his claim. While the possession of the pledgor continues he is bound to use ordinary care and diligence in respect to the articles, and is responsible for any losses or injuries caused by ordinary negligence. JOHN NORTON POMEROY.

Ple'iades, or **Plei'ades** [Gr. Πλειάδες or Πληϊάδες], in astronomy, a group of stars in the shoulder of Taurus, called "the seven stars," though to most eyes only six are visible. But there are hundreds of telescopic stars in the group; and Herschel has shown that they are, physically, closely related to each other. According to the ancients, the seven stars were seven daughters of Atlas and Pleïone, one of whom (Sterope or Electra) became invisible from shame, because she had been embraced by a mortal. Their myth is variously given, but their transfer to the heavens was generally believed to have followed their death from grief.

Pleistocene, a term used to denote the newest tertiary deposits. (See GEOLOGY.)

Plesiop'idæ [*Plesiops*, πλησίος, "near," and ὤψ, "an eye"], a family of fishes of the order Teleocephali. In external appearance they have some resemblance to the American sunfishes, the body being oblong, compressed, and covered with moderate scales; the lateral line is interrupted; the head rounded anteriorly; the opercula unarmed; the mouth has a lateral cleft, and the upper jaw is moderately protractile; teeth small, on the jaws as well as palate; branchial apertures continuous below; branchiostegal rays six; dorsal elongated, with the spinous portion longer than the soft (11–14 + 7–16); anal with its soft part opposite that of the dorsal, and armed with three spines; pectorals with branched rays; ventrals each with a spine and four soft rays. The family is especially recognizable by the development of only four soft rays in the ventral fins. They inhabit the salt water, and extend from the Red Sea to the Pacific Ocean. The scientific name alludes to the approximation of the eyes, resulting from the narrow frontal bones. THEODORE GILL.

Plesiosaurus. See GEOLOGY, by PROF. JOHN W. DAWSON, LL.D., F. R. S.

Pleskov. See PSKOV.

Plessis' (JOSEPH OCTAVE), b. at Montreal, Canada, Mar. 3, 1762; became a Roman Catholic priest 1786; bishop of Canatha *in partibus* 1800; translated to the see of Quebec 1806; received the archbishop's title 1819; was the first titular archbishop of Quebec, though the see did not become truly archepiscopal until 1844. D. at Quebec Dec. 4, 1825.

Plethodont'idæ [Gr. πλῆθος, "crowded," ὀδούς, ὀδόντος, "tooth"], a family of urodele amphibians or salamanders

characteristic of the North American fauna. The cranium has no anterior axial bone; the palatines are not prolonged over the parasphenoid, and have teeth on the posterior portion; the prefrontals are generally present; the pterygoids wanting; the frontal is slightly embraced by the parietals, but not by the prefrontals; the orbito-sphenoids separated by membrane from the proötic; the occipital condyles are sessile; the premaxillaries always embrace a fontanelle; on the parasphenoid are dentigerous plates; the vertebræ are biconcave, the carpus and tarsus cartilaginous. Such are the characters attributed to the family by Prof. Cope, who combines in it the North American genera *Batrachoseps*, with three species; *Hemidactylium*, with one; *Plethedon*, with six; *Stereochilus*, with one; *Manculus*, with two; *Spelerpes*, with six; *Gyrinophilus*, with one; and *Anaides*, with two. Outside of America occurs the genus *Geotriton*, with species in Europe and Northern Siam. The larval condition is long retained. The species are mostly found in brooks and damp places in forests. THEODORE GILL.

Pleth'ora [Gr. πληθώρη], a condition in which the supply of blood is excessive. It usually occurs in overfed persons of inactive habits; but medical writers speak of a *sthenic* plethora occurring in robust and active young persons, who by it are rendered peculiarly liable to acute inflammatory attacks. Such persons should follow an outdoor occupation and avoid excesses of all kinds, for they may determine such inflammatory disease. Far more common is the *asthenic* plethora of overfed and inactive persons, whose muscles, and especially those of the heart, are weakened and atonic, often in consequence of excessive use of alcoholic drinks. Apoplexy and organic diseases of the viscera frequently occur in such subjects. A sparing diet and the judicious use of saline mineral waters, with correct hygienic conditions, may greatly relieve the evil tendencies.

Pleura. See PLEURISY.

Pleu'risy [Gr. πλευρά, "the side"], an inflammation of the pleura, the closed serous sac which invests the lung, separates it from the bony wall of the chest, and enables it to move freely with the alternating expansions and contractions of respiration. The causes of pleurisy are exposure to damp and cold, congestion in the course of acute febrile diseases, and extension of inflammation from the lung when the seat of pneumonia or superficial tuberculosis. Local pleurisy over a mass of tubercle in the lung-surface is a conservative process, since by pleuritic thickening and adhesions perforation of the pleura and collapse of the lung are prevented. The pleura is, in health, bathed by a slight secretion of clear serum, which lubricates the opposed surfaces and favors ease and freedom of lung-movement. Evanescent and slight attacks of pleurisy, consisting in a temporary suppression of this normal secretion and a dry congested state of the opposed pleural walls, is of frequent occurrence: it will be indicated by a slight stitch and soreness in one side of the chest, a slight, dry cough, and slight febrile disturbance, quickly dissipated by rest, warm clothing, hot drinks, and evacuation of the bowels—agencies which establish the equilibrium of the circulation. Acute pleurisy is announced by an initial chill, by marked elevation of temperature, frequent pulse, rapid, shallow, and checked breathing, each inspiratory act producing a lancinating or stabbing pain in the side of the chest, the result of attrition of the dry, swollen, and sensitive inflamed surfaces. There is a dry, irritative, hacking cough, without expectoration, the effort of coughing producing the local pain or "stitch" in the side in its greatest intensity. Soon the distended blood-vessels of the pleura are relieved by the escape of the serous or watery element of the blood, transuding their coats into the cavity of the pleural sac. This "effusion" may be abundant and consist of pure serum, filling the entire cavity and compressing the lung. In other cases it is sero-plastic, leaving an element of plastic matter or products of rapid cell-formation on the inflamed surfaces. Still other cases have only plastic exudation, agglutinating the two pleural surfaces, and liable to organize and form permanent adhesions, which bind down and cripple the lung and render it liable to certain forms of phthisis. When effusion or exudation takes place, the pleuritic stitch ceases. But the presence of fluid in the pleura causes shortness of breath, disturbed circulation, and impaired health. In vigorous constitutions the fluid is soon removed by absorption, but in the feeble and sickly it remains and becomes purulent. Acute pleurisy is treated by antiphlogistic measures, anodynes to relieve pain, counter-irritants, and rich diet, tonics, iodide of potassium, during convalescence to ensure the absorption of the effusion. When the fluid is purulent it has to be evacuated by puncture with the trochar and canula, or more safely by the aspirator, a force-pump withdrawing fluids through tubes of small calibre. When pleurisy has left adhesions, counter-irritation by iodine, comp. iodine ointment, etc., must be resorted to, and the lungs systematically and persistently inflated to prevent compression by the organizing deposit on their surface. When such deposits and adhesions are established, they are liable to increase by fresh congestive or inflammatory attacks from time to time—a condition of chronic pleurisy. Chronic pleurisy causes persistent cough, congestion of adjacent lung-substance, spitting of blood, and various steps of fibrous or interstitial phthisis, or the development of specific tubercle when the person has the inherited specific taint. Pleurisy in a majority of cases is harmless and recovered from; in the feeble, scrofulous, and consumptive, and in cases of unusual severity, it is fatal by exhaustion or the subsequent development of consumption.

E. DARWIN HUDSON, JR. REVISED BY WILLARD PARKER.

Pleurisy-root. See ASCLEPIAS.

Pleurobranch'idæ [Gr. πλευρόν, "side," and βράγχια, "gill"], a family of nudibranchiate mollusks. The body is somewhat slug-like, but shorter and convex; the mantle large and covering the body above; the head not produced, but in great part hidden under the mantle, with the frontal veil extending more or less between the base of the tentacles and the mouth; the tentacles rather narrow and slit on the outer side; the eyes on the outer side of the base of the tentacles; lingual ribbon with teeth uniform and in numerous longitudinal series; the foot large and expanded; the gill is lateral (whence the name) between the mantle and foot; the shell is either absent or limpet-like, and enclosed in the mantle; the organs of generation are close together in one tubercle. The family has a number of species distributed in the seas of various regions and representing some half dozen genera. The animals feed chiefly on algæ, and have very complicated stomachs. THEODORE GILL.

Pleurodel'idæ [*Pleurodeles*, πλευρόν, "the side," and δηλέομαι, "to wound"], a family of salamanders chiefly developed in the Old World. The skull is destitute of an anterior axial bone; the palatines have posterior separate processes extending over the parasphenoid, and bear teeth on the inner margins; the prefrontals as well as pterygoids are present; the frontals are broad, and not embraced by the parietals; the occipital condyles are sessile; the parasphenoid has no dentigerous plates; the vertebræ are only concave behind; the carpus and tarsus are ossified. The family embraces the genera *Hemisalamandra*, *Neurergus*, *Lissotriton*, *Lophinus*, *Euproctus*, *Cynops*, *Notophthalmus*, *Pleurodeles*, *Glossolega*, and *Siranota*, peculiar to the Old World, and *Notophthalmus*, with three species, in North America. THEODORE GILL.

Pleurod'ira [Gr. πλευρόν, "the side," and δειρή, "neck"], according to some authors a sub-order of the order Testudinata, or tortoises, distinguished by the neck bending sideways and the incapability of retraction of the head completely under the carapace, and thus contrasting with the tortoises of the northern hemisphere, in which the neck bends in a vertical plane. The pelvis is fixed to the carapace and plastron. The group embraces families peculiar to the southern hemisphere and related forms found in the early epochs of the northern. The generally recognized families are Podocnemididæ, Chelydidæ, Hydraspididæ, Pelomedusidæ, and Sternothæridæ. THEODORE GILL.

Pleuronect'idæ [*Pleuronectes*, πλευρόν, "the side," νήκτης, "a swimmer"], a family of fishes including the ordinary flat-fishes, such as flounders, turbots, halibuts, etc. It belongs to the order Teleocephali and sub-order Heterosomata. The body is always strongly compressed, more or less oval or rhomboid, and with one of its sides (which is upward when the animal is reclining on its side) colored, and the other (which is downward) generally colorless; the scales are variously developed (sometimes ctenoid, sometimes cycloid, and sometimes wanting); the lateral line is continuous behind; the head compressed, more or less rhomboid, and with the snout pointed; both eyes are on the same side, one being on or near the forehead, the other comparatively low down; opercula normal, unarmed; mouth terminal, and with an oblique lateral cleft and of various extent; branchial apertures continuous below; branchiostegal rays five to eight; dorsal elongated, extending generally from about the rostral region to near the caudal fin; anal fin also elongated, and extending about as far back as the dorsal; both are composed almost solely of articulated rays; caudal fin distinct from the dorsal and anal; pectorals on both sides; ventrals jugular. The skeleton has numerous vertebræ; piloric cæca are generally developed, but in small number. The species of the family thus defined are distinguishable into three subfamilies—(1) Pleuronectinæ, in which the mouth is small, and the supramaxillary ends before or under the front of the eye; (2) Hippoglossinæ, in which the mouth is large,

and the supramaxillaries extend more or less under the eye, and the ventrals are lateral; and (3) Rhombinæ, in which the mouth is large, and the ventral fin on the dark side inserted on the ridge of the abdomen. The species are numerous, and found distributed in every sea, and some of them ascend rivers. They live chiefly on sandy bottoms, and rest with their white side below and the dark one upturned. Although almost all have the eyeless side white or colorless, a few have dull spots on that side, and in one species (*Reinhardtius hippoglossoides*) it is colored like the eyed side. Over 100 species are known, of which 15 inhabit the waters of the Atlantic, and 16 those of the Pacific U. S. The most common species in the markets of the Eastern States are the small-mouthed flounder (*Pseudopleuronectes Americanus*), a large-mouthed flounder (*Chænopsetta ocellaris*), and the halibut (*Hippoglossus Americanus*). Within a few years past the *Reinhardtius hippoglossoides*, already noticed, has been brought to the New York markets from the Banks of Newfoundland, and is sold under the name of turbot, although it is most closly related to the halibut. Neither the turbot nor sole is found in the American waters, although a worthless species allied to the turbot (*Lophopsetta maculata*), and a still more worthless one related to the sole (*Achirus lineatus*), are their respective representatives. THEO. GILL.

Pleu'ro-Pneumo'nia (see PLEURISY and PNEUMONIA). In seasons of unusual severity, of great cold and high winds, when influenza prevails in epidemics and fevers tend to the malignant and asthenic forms, acute pneumonia with co-existing pleurisy, attacking one or both lungs, seems to arise from general atmospheric causes, which depress the individual vitality, and to share in the low type and unusual fatality of other prevailing diseases. The aged, feeble, and consumptive are most in danger. The symptoms and physical signs of pleurisy and pneumonia may be clearly present, but often are vague, and marked by the extreme prostration and other features resembling typhoid or typhus. Pleuro-pneumonia of widespread prevalence and fatality occasionally occurs among domestic animals. E. DARWIN HUDSON, JR. REVISED BY WILLARD PARKER.

Pleurotom'idæ [*Pleurotoma*, πλευρόν, "side," τομή, "a slit"], a family of gasteropod mollusks of the order Pectinibranchiata and sub-order Toxoglossa. The form is normal; the mantle moderate, and with a slit in the hinder part of the outer side; the head small and produced; tentacles well developed; the eyes inserted on the outer sides of the tentacles; the lingual ribbon is armed with two longitudinal rows of elongated subulate teeth with enlarged bases; the shell is spiral and more or less fusiform, and with the anterior canal straight; the aperture oblong; the outer lip with a notch at or not far from the suture; the operculum is in some present (and then horny and annular), and in others wanting. The family is composed of over 500 species, representing a number of genera (*e. g. Pleurotoma, Clavatula, Drillia, Bela, Defrancia*, etc.). The species are mostly of small size, especially those living in the colder waters, but some tropical species of *Pleurotoma* attain considerable dimensions. Species of the family lived at least as early as the Cretaceous epoch, and flourished during the Miocene. THEODORE GILL.

Pli'ca Polon'ica, a disease of the hair and scalp, chiefly seen in Poland and Lithuania. A foul secretion mats the hair, which becomes the seat of a *Trichophyton*, a microscopic fungus-parasite. It is believed that cutting off the hair and the free use of soap will cure the disease, but it is regarded as a sign of good luck, and a cure is therefore not often desired.

Plin'y (CAIUS PLINIUS SECUNDUS), generally called **Pliny the Elder,** b. at Verona or at *Novum Comum*, 23 A. D., of a noble and wealthy family; served in the army under L. Pomponius Secundus in Germany, where he composed a work, *De Jaculatione Equestri*, and commenced another on the history of the Germanic war; returned to Rome in 52; studied jurisprudence and commenced to practise, but without success; retired to Verona, where he composed his *Studiosus*, in three books, and *Dubius Sermo*, in 8 books; was appointed *procurator provinciæ* of Spain in 71; returned in 73 to Rome, where he lived in great intimacy with the emperor Vespasian, and was suffocated by the eruption of Vesuvius in 79. There is a detailed and very interesting account of his death by his nephew, Pliny the Younger, in a letter to Tacitus (*Epist.*, vi. 16). He was a very prolific writer, but of his works only the *Historia Naturalis*, in 37 books, is still extant, edited in 20 vols. by Panckoucke, with commentaries and notes (Paris, 1829–33), and by Sillig (8 vols., Gotha, 1851–58; translated into English by Philemon Holland, London, 1601, and in Bohn's *Classical Library*, 6 vols., 1855).—His nephew, CAIUS PLINIUS CÆCILIUS SECUNDUS, generally called PLINY THE YOUNGER, was adopted and educated by his uncle; served in the army in Syria; held several high offices, but devoted most of his time to literary studies. He was an intimate friend of Tacitus and Trajan. Nothing is known of him after 107. His *Panegyricus* and his *Epistolæ*, 10 books, were edited by G. H. Schäfer (Leipsic, 1805); the *Epistolæ* were translated into English by Melmoth (1746), Lord Orrery (1759), and a summary is given in *Ancient Classics* (1872).

Pliocene. See GEOLOGY, by PROF. JOHN W. DAWSON, LL.D., F. R. S.

Pliohippus. See HORSE, FOSSIL.

Ploce'idæ [*Ploceus*, πλοκή, a "web"], a family of birds framed by recent ornithologists for certain species inhabiting the tropical regions of the Old World. The form is essentially similar to that of the finches, to which they are closely related; the bill is strong and conic, with the culmen advancing backward on the forehead and arched to the tip, which is entire; the wings are somewhat rounded, with the first quill remarkably short; the tarsi with long scutellæ in front; the toes three, with large scales, the posterior nearly as large as the median anterior one. The family, according to Gray, contains 260 species, which he has distributed in three sub-families—viz. (1) Ploceinæ, with seven genera; (2) Viduanæ, with two; and (3) Spermestinæ, with four. Most of these genera are further subdivided into numerous sub-genera. The family, however, is not well established, and must be considered as a provisional one. The species are by far the most numerous in Africa. THEODORE GILL.

Plock, government of Poland, bounded N. by Prussia and W. by the government of Warsaw, comprises an area of 6600 sq. m., with 490,291 inhabitants. The surface is level, covered to a great extent with forests, lakes, and marshes. Agriculture and rearing of cattle and sheep are the principal branches of industry.

Plock, town of European Russia, capital of the government of Plock, Poland, on the right bank of the Vistula, is the seat of the governor, the see of a bishop, has many educational institutions, and carries on a large transit-trade. P. 21,843.

Ploëmeur', town of France, department of Morbihan, has 9219 inhabitants, mostly engaged in the catching and preparation of sardines.

Ploërmel', town of France, department of Morbihan, carries on an active trade in cattle, flax, hemp, honey, and woollen and linen fabrics. P. 5478.

Ploeuc', village of France, department of Côtes-du-Nord, noticeable for its manufactures of wool-cards and nails, and trades much in cattle, corn, and hemp. P. 5052.

Plojesh'ti, town of Wallachia, the seat of the civil authorities of the district, has several educational institutions and carries on an extensive trade in wool. P. 24,400.

Plombières', small town of France, department of Vosges, is beautifully situated in the valley of the Angronne, a tributary of the Saone, and noted for its thermal springs, much recommended for diseases of the liver, the digestive organs, and the skin. The springs have been used for medicinal purposes for centuries, but the present very elegant bathing establishments were founded by Napoleon III. P. about 1500.

Plot'idæ [*Plotus*, πλώτης, a "swimmer"], a family of swimming birds whose species are known under the name of darters. They have the body somewhat like that of the pelicans; the neck very long and slender; the head continuous with the neck; the bill rather long, compressed, straight, and graduated toward the tip, which is much pointed; the nostrils near the base and inconspicuous; the wings long and pointed, with the second and third quills largest; the tail long; tarsi short and robust, covered with reticulated scales all around; toes three in front, one behind, united together by a broad web; the claws short and curved; the skull is of the desmognathous type of Huxley. The family is represented by but a single genus (*Plotus*) and four species. The American species, which is found in the Southern States and ascends far up in the Mississippi Valley and Southern Illinois, is the *Plotus anhinga;* it is sometimes known under the name of snake-bird, on account of its long, flexible neck. THEODORE GILL.

Ploti'nus, b. at Lycopolis, Egypt, about 203 A. D.; went to Alexandria in 232, and spent there ten years under the tutelage and instruction of Ammonius Saccas. In 242 he accompanied the emperor Gordianus on his expedition against the Persians, in order to make himself acquainted with the philosophy of Persia and India; but the emperor was murdered in Mesopotamia in 243, and Plotinus now repaired by Antiochia to Rome. Here he applied himself to the teaching of philosophy, attracted immense audiences, gained numerous disciples, and enjoyed great respect and

confidence. In 269 he retired into solitude. D. at Puteoli, in Campania, the following year. The most famous of his disciples, Porphyrius, collected his works and wrote a biography of him. The collection comprises a great number of treatises on different subjects—on beauty, the immortality of the soul, the supreme good, the genesis of ideas, against the Gnostics, etc.—arranged in six divisions, each consisting of nine books, for which reason they are called *Enneads*. Parts have been translated into German and English, the whole into French. The easiest to understand and the most interesting to general readers are the treatises on beauty and against the Gnostics.

The philosophy of Plotinus is a vision rather than a system. The centre of all that exists is the One, the All-intelligence, God. From God emanates the soul of the world; from the soul of the world emanates the soul of man; and in this way the divine descends from sphere to sphere, forming itself into time and space, and building up its own body, until at last it meets with matter. The divine can form matter, but not penetrate it so as to prevent it from collapsing and returning into chaos. Matter is the seat of imperfection, the source of evil; and the aim of life is to return from the polluting contact with it into the All-intelligence. Thus, the connection between the soul and God is much deeper and much more intimate than that between the soul and the body. Although the soul, with its power of vegetative, sensitive, intellectual, and rational life, actuates the body even in the most minute details of life, still it does not form one composition with it; the soul only rests on the body as the light on the air. Otherwise with respect to God. "We move round him like a choral dance; even when we look from him we revolve about him; we do not always look at him, but when we do we have satisfaction and rest, and the harmony which belongs to that divine movement. In this movement the mind beholds the fountain of life, the fountain of mind, the origin of being, the cause of good, the root of the soul. There will be a time when this vision shall be continual, the mind being no more interrupted, nor suffering any perturbation from the body." For it is the body which disturbs that contemplation of God in which our soul unites with the universal soul, a union which cannot be effected by the reason, as the reason is incapable of grappling immediately with things divine, but which must be effected by an immediate intuition, by an ecstasy, in which "the soul sinks into a deep silence, and all around her the tumult of the senses and the agitations of the body grow still."

The most mystical part of the philosophy of Plotinus is his treatment of dæmons, magic, astrology, etc. Concerning the dæmons his writings contain contradictory utterances. At one time he describes them as parts and powers of our soul; at others he calls them the instruments of the universal soul, and ascribes to them an independent existence. In the later development of the philosophy of the Neo-Platonic school the dæmons became individual beings, but with Plotinus they oscillate between symbols and visions. CLEMENS PETERSEN.

Plotos'idæ [*Plotosus*, πλωτός, "swimming"], a family of salt-water teleost fishes of the order Nematognathi and related to the Siluridæ (catfishes, etc.). The body is elongated and almost eel-like; the skin naked; lateral line simple; head oblong and depressed; operculum present; mouth with its cleft transverse; teeth on the jaws as well as palate; branchial apertures nearly or quite confluent, the branchial membrane not being confluent with the isthmus, or only united with it by a narrow area; branchiostegal rays in considerable number (9–12); dorsal fin divided into two portions, a short anterior one above the pectoral region, and a long posterior one; the latter and anal are confluent with the caudal; pectorals simple; ventrals with many rays; the skeleton has numerous vertebræ (12–15 + 35–65); the anterior ones are coalesced into a compound piece. The family is composed of species inhabiting the coasts of the Indian Archipelago as well as Western Polynesia and Australia. By Günther three genera are recognized—*Plotosus*, *Copidoglanis*, and *Cnidoglanis*, each with three species. The aspect of the fish somewhat reminds one of the fresh-water cusk (*Lota*). The head is provided with barbels, as in ordinary catfishes. THEODORE GILL.

Plott's, tp., Cabarrus co., N. C. P. 913.

Plouaret', town of France, department of Côtes-du-Nord, trades in corn, wine, hemp, and butter. P. 5498.

Plougastel', village of France, department of Finistère, is noticeable for its linen manufactures and trade in wine, corn, and flour. P. 6840.

Plough, an implement for breaking up the soil, was used, though in a primitive form, as far back in ancient time as history reaches. The Old Testament speaks of ploughs with shares shod with socks of iron or bronze. The Greeks knew the wheel-plough. The modern plough, with its mould-board to turn over the broken-up soil, was invented in the Netherlands in the seventeenth century, but has since been much improved. The first steam-plough was worked in England in 1832.

Plouguerneau', village of France, department of Finistère, is noticeable for its linen manufactures. P. 5868.

Plouha', town of France, department of Côtes-du-Nord, is noted for its plantations and nurseries. P. 5112.

Plouigneau', village of France, department of Finistère, trades in wine and iron, and has 5017 inhabitants.

Plover. See CHARADRIADÆ.

Plov'er, p.-v. and tp., Portage co., Wis., on Wisconsin River and Green Bay and Lake Pepin R. R., has 1 weekly newspaper and a considerable lumber-trade. P. 881.

Plow'den's Mill, v., Clarendon co., S. C. P. 853.

Plum, a name given to the tree and fruit of those species of *Prunus* (order Rosaceæ) which differ from the cherries in having a richer fruit, ripening later in the season; for though the Old-World plums have leaves convolute in the bud, while cherries have folded leaves, and while most plums have oblong, flattened, and pointed stones, those of cherries being almost globular, and while, again, most plums have a bloom upon the fruit, which cherries do not have, Prof. Gray has shown that none of these marks is constant, so that the difference between cherries and plums, while it is readily perceived, is hard to define. Plums of the better sorts, when fully ripe, are among our most delicious fruits. They are extensively cultivated in Europe, but less so in the U. S. than in former times, chiefly on account of the ravages of the curculio and of the disease called black wart. The principal varieties are referred to *Prunus domestica*, a small tree of Old-World origin. The Chickasaw plum (*P. Chicasa*) and the common wild plum (*P. Americana*) are receiving considerable attention as cultivated fruit trees. PRUNES (which see) are made by drying certain kinds of plums. Plum-wood is very hard and handsome, and in Europe is much sought for by turners and carvers.

Plum, tp., Allegheny co., Pa. P. 1300.

Plum, p.-v. and tp., Venango co., Pa. P. 1140.

Plu'mas, county of California, bounded N. E. by the main Sierra Nevada. Area, 2700 sq. m. It is very mountainous and elevated, with fertile valleys. Wool is an important product. Quartz and placer gold-mining are the principal industries. Traversed by Feather River and its tributaries. Cap. Quincy. P. 4489.

Plumas, tp., Plumas co., Cal. P. 640.

Plumb (JOSEPH), b. probably in New York in 1791; was an early settler of Western New York, where he acquired a large landed estate; resided for many years at Lodi (now Gowanda), Erie co., on the border of the Cattaraugus reservation of Seneca Indians, in whose welfare he took a deep interest; was prominent in all benevolent and educational movements; was one of the organizers of the Liberty party of 1840, accepting its candidacy for lieutenant-governor 1844; was the owner of the land upon which the village of Cattaraugus was built on the completion of the Erie Railway, and sold all the lots with a clause of forfeiture in case any intoxicating liquors should ever be sold thereon. D. at Cattaraugus May 25, 1870.—His son, EDWARD LEE PLUMB, b. about 1826, has been secretary of legation and chargé d'affaires in Mexico, consul-general at Havana, and agent in procuring the charter of the International Railway of Mexico.

Plumbagina'ceæ, or **Leadworts,** a natural order of herbs and small shrubs, mainly salt-marsh plants, found in all parts of the world. Many have acrid properties; marsh-rosemary (*Statice limonium*) is a valuable astringent, and the typical genus, *Plumbago*, with one or two allied genera, affords some good garden-flowers; but the order is otherwise one of small economic importance.

Plumbago. See GRAPHITE.

Plum Bayou, p.-v. and tp., Jefferson co., Ark. P. 1597.

Plumb'ing [Lat. *plumbum*, "lead"]. Lead has been used from the earliest ages, and is frequently mentioned in the oldest books of the Bible. (See the article on LEAD for a description of this metal.) The terraces of Nebuchadnezzar's hanging gardens were covered with sheets of lead soldered together to retain moisture in the soil. Lead pipes have been more or less common in all the celebrated nations of old—in the cities of Asia, Egypt, Greece, Syria, etc. They were employed to convey water wherever the pressure was too great to be sustained by those of earthenware or pottery. Other pipes were sometimes made of stone, wood, or leather, but most generally of lead and copper. Vitru-

vius says Roman plumbers usually made their pipes from sheets of lead about ten feet long, and soldered together with a composition of lead and tin, some of which were of very large size, having a corresponding weight to suit their respective diameters. Leaden pipes were extensively used in the old city of Rome, the water being conveyed to it by aqueducts (see AQUEDUCT) built of strong masonry, and collected for household purposes in large tanks, and frequently in an ancient sarcophagus of stone or marble, but the water was rarely carried to the upper stories. The waterworks of Rome were constructed on a substantial and extensive scale. Besides the strongly-built aqueducts, there were used earthenware or clay pipes, further extended by lead pipes. Brass faucets, very strong, were used for the same purpose as they are at present. Plumbing with the Romans had arrived at considerable perfection as a science. Samples of their handiwork have been found extended to other countries. Lead pipes were found in Spain in the ninth century which had been worked by the Romans. Several Roman mining-tools and pigs of lead were found in Yorkshire, England, in 1741. From the ruins of Herculaneum many lead pipes have been extracted, and in Pompeii large quantities of lead have been found which had been manipulated by the Romans or Syrians.

Pumps have been extensively improved since their introduction, and their designs have been various. (See PUMPS.) From the atmospheric pump there is the HYDRAULIC RAM (which see). It has a self-acting or reactionary movement, impelled by the water from a pond or reservoir gradually rising at the distance of eight or nine yards to a height of ten feet from the level of the ram, giving power enough to drive water 100 feet high into the tank in a house. A ram can only be used in locations suitable to drain away the surplus water flowing from the operating valve, as only about one-third of the water used to drive it passes up to the house, two-thirds being wasted, and must be drained away. A 2-inch supply-pipe will supply a $\frac{3}{4}$-inch stream at a velocity of 5 gallons per minute, having to flow 100 feet high, ensuring the amount of 7200 gallons every twenty-four hours—a sufficient supply for a pretty large house. The overflow water, after filling the tank in the house, may be economized by running it to the stables, coach-house, barn, etc., placing a tank in the most convenient place in the centre and on the rafters of the building, taking care to box it all round and at top and bottom, and fill in with sawdust or charcoal to prevent freezing, and distribute the water through lead pipes, leaving the ends open, that no water may remain in the pipes. In the tank place a valve on top of the pipe, and connect the necessary cranks and wire to lead to each place required to be drawn from, keeping the pipes entirely free from frost. The same system is applicable to all buildings having no heat radiating through them.

Siphons are very useful applications when water cannot be got readily, principally where hills intervene. Quarries can be emptied and houses supplied by them, but in all cases the end of the pipe out of the water must be several feet lower than that in the water. To fill a siphon with water to start it for use, place on both ends a stop-faucet, close them, and at the highest point connect a pipe and funnel and fill with water. When full, shut the top faucet and simultaneously open both faucets at the ends, and the siphon will work. The moment any air enters the siphon it stops, and must be filled again.

Hydraulic presses are powerful machines for compressing goods. Where no steam is applied the force-and-lift-pump is used, forcing the water through a very small pipe. The smaller the pipe the more powerful is the force-pump. (See HYDROSTATIC PRESS.) In the same manner is the HYDRAULIC ELEVATOR (which see) constructed. It is formed like a telescope, and the water is admitted and emptied by the bottom. The pressure of water from a high tank will operate it as well as a force-pump. Hydraulic pressure in connection with steam operates the machine which makes lead pipes. The machine consists of a large cast-iron cylinder, containing melted lead heated by a furnace. On the top is fitted a cover or piston, and through this piston is a hole over which is fastened an iron pipe, the outside size of pipe to be made. Inside is a rod the size of the bore. The pressure having been put on, the hot lead is driven through and up the space between the rod and pipe gently, and, passing through a vessel of liquid to cool, it is passed over a wooden drum and coiled for transportation. The first improvement in leaden pipes was made in England in 1539. The first machine for making lead pipes by hydraulic pressure was patented in England by Mr. T. Burr in 1820. Several improved machines are now in use in this country.

The city of New York is supplied with water by aqueduct from Croton River, about 40 miles distant, collected into reservoirs, and distributed, and conveyed through cast-iron pipes from one to four feet in diameter. The lower part of the city is very scantily supplied, the water being consumed as fast as it comes into the pipes. The water rarely reaches above the first floor, thus necessitating the use of pumps to drive it to the top of the houses and collecting it in cisterns. The upper part of the city, having been connected to the higher reservoir, has now the benefit of about 50 pounds pressure, the lower part not having more than 10 pounds. Hanson's hydraulic pump was formerly much used to drive the water to the top of the houses, but having been found to waste too much water, it was prohibited. It worked by the pressure of the Croton, and wasted much more water than it pumped up.

Chicago is supplied with water from Lake Michigan driven into a large cylindrical pipe or water-tower by steam-pumps the height of the tower, giving about 50 pounds pressure throughout the city, which lies only a few feet above the level of the lake, in consequence of which it has always been a difficult problem to get perfect drainage for Chicago; and the houses were raised about 10 feet, and the streets filled in to accommodate the sewerage of the city.

The Palace Hotel in San Francisco, the largest in the U. S., is supplied from an artesian well bored in the centre of the building. The water is distributed from reservoirs or tanks on the upper stories, furnished with steam-pumps; they supply hot and cold water to 1000 wash-hand basins, 400 water-closets, 400 bath-rooms, the wash-rooms, culinary department, and steam apparatus. The same well supplies the Grand Hotel in the neighborhood.

New Orleans is very poorly supplied from the Mississippi River. The water is always muddy, and has but a few pounds' pressure, being used only on the ground floors. The other parts of the houses are supplied from large lead tanks, usually built on the tops of the houses, collecting all the rain-water from the roofs for general use. For drinking purposes stone filters are frequently used. The water from the Mississippi, drawn from faucets or hydrants, is used by drawing off into a large vessel the quantity expected to be required next day, and letting the mud settle by dropping in a small piece of alum.

Paris, France, is supplied from the river Seine. One pipe is usually taken into the houses direct from the river and used for washing purposes; another is filtered for drinking purposes before entering the houses, requiring two pipes. All the water used up stairs is carried there by pumps. Plumbing-work, in consequence, is not so prominent a feature of convenience as in the U. S.

Boston has an extra pressure of water from the Cochituate River, requiring all the plumbing-work to be executed with heavier pipes and heavier brass faucets than in any other city in the U. S. There is from 50 to 100 pounds' pressure. Having little or no use for pumps, every house is fitted up with all the improvements and in a very substantial manner. Brooklyn has an excellent supply of water from Ridgewood Lake, with a pressure as great as in Boston, allowing plumbing in all its forms. Long Island City, Hunter's Point, is supplied by steam-pumps, which force the pressure of water direct into the pipes, and are so automatically arranged that, if an extra pressure is required, caused by a fire or other emergency, there are other rotary pumps connected to assist, whereby a hose attached to any fire-hydrant can convey water over any house or any ordinary steeple. The hose must be able to stand 400 pounds pressure.

Philadelphia is supplied from the Schuylkill River by pumps driven by water-wheels. The water has great natural excellence. The Philadelphia waterworks at Fairmount have 8 water-wheels from 16 to 18 feet in diameter, forcing water 96 feet high through a distance of 290 feet. Plumbing-work in that city has improved rapidly in twenty years. Buffalo is supplied with water by steam-pump power. (For velocity and pressure of water under various conditions see HYDRO-DYNAMICS.)

Plumbing-work throughout the U. S. is executed in the same manner as in New York City. The largest number of workmen have learned their business in New York City, or have been under the tuition of New York plumbers.

Water-closets are of Asiatic origin. Those constructed in the palace of the Cæsars were adorned with marble, arabesques, and mosaics. The pipe and basin of one were discovered near the theatre in Pompeii, where they still remain. In the city of Fez "round about the mosques are 150 common houses of ease, each furnished with a cock and a marble cistern which scoureth and keepeth all clean and neat, as if these places were intended for some sweeter employment." Sir John Harrington is said to have introduced water-closets into England in the reign of Elizabeth. M. Roubo, a French author, says they were used in France much ear-

lier than they were known in England. Within the last thirty years water-closets have been multiplied into such a vast number of designs, and improved upon to such an extent, that there is hardly any room left for improvement; nevertheless, the same style that has been in use for a century is as good as any modern "improved" one. All water-closets should have a good supply of water, and the best way to get it is to use tanks large enough to hold from 50 to 100 gallons. The common copper pan water-closet is the most serviceable: by making the seat movable by hinges, and covering the basin with lead, it becomes a water-closet, urinal, and slop-closet. Under the seat there should be an attachment to a flue by a 4-inch galvanized iron pipe, to draw any smell emitted, also a ventilator at the ceiling for the same purpose. The tanks to supply these water-closets require to be 7 or 8 feet from the floor. The English Bramah closet is a very pretty one. It is supplied in the same way as the pan closet, and has instead of a pan a valve made of brass and ground water-tight. The Jennings patent has a diaphragm valve attachment, and must have a column of water of from 15 to 30 feet to operate it properly, and requires a good supply, as it runs nearly 16 gallons a minute. Water-closets, generally speaking, are a source of great trouble and annoyance in a house when not fitted up on correct sanitary principles. They should have good strong lead traps underneath, running into large cast-iron pipes, and in all cases the iron pipes should be extended to the roof of the building. (See also SEWER.)

Bath-rooms may consist of a bath-tub, a wash-basin, a bidet, and foot-tub, all fitted up with hot and cold water, having a trap to each, with a 2-inch waste-pipe, to be carried down separately to the sewer in the cellar. All wash-basins should be connected to the sewer in the cellar by a good-sized pipe, and each separately trapped. Where hot water is used, it should never be connected with water-closet waste-pipes. Bath-rooms may be fitted up in any degree of elegance. All bath-rooms should be placed in the centre of the house and above the parlor, and have a leaden safe under all the pipes in case of accident; in fact, the whole floor of a room should be covered. All hot-water pipes leading up stairs should, wherever placed, and more especially where there are any branches leading from them, have room for expansion, and not be carried up by the side of cold-water pipes. The sudden cooling of a hot-water pipe by coming in contact with a cold pipe breaks it. Not suspecting the cause, people generally attribute it to defective pipes. All pipes can be put into a house to be safe from freezing if the owners or architects will consult with an experienced plumber, who is best able to judge the most suitable location for all the conveniences of a family in a hygienic and sanitary point of view. A very serious complaint in most houses consists in not getting water up stairs at any and all times. The great evil lies in not putting in large enough pipes. To estimate the quantity of water to be drawn, ascertain the number of outlets to draw from. One ⅝-inch pipe will run, at 50 pounds pressure, 16 gallons per minute. Find the number of outlets, and how much water they will run at once and together; then put in a pipe large enough to give that quantity, place it from cellar to top floor, and branch off from every floor. The whole house will thus be supplied alike and at the same time.

For wash-tubs place a small cistern by the end tub nearest to the range, supply it with a float and cock on the same level with the tub, and connect the two together by a 1-inch pipe from the bottom, lead the hot and cold water pipes from the range through a water-back to the tub, putting the hot-water pipe highest, and the water will boil in the tub as if it were on the fire. The hot-water pipes from the copper boiler in the kitchen should be carried up to the highest point of drawing water, and returned by a smaller pipe, so as to keep up a circulation, thereby allowing hot water at every place required without waiting for or wasting the water.

According to the census of 1870, there were in the U. S. 705 plumbing establishments, having a capital of $3,731,667, employing 4783 persons, and a production valued at $10,394,471. DAVID PATERSON.

Plumb-line [Lat. *plumbum*], a line or string having a conical piece of lead attached to one extremity; it is used for determining when one point is exactly over another.

Plum Creek, p.-v., cap. of Dawson co., Neb., on Union Pacific R. R., 230 miles W. of Omaha, has a good school system, a court-house, and newspaper. A bridge spans Platte River at this point. P. about 450.

F. J. PEARSON, ED. "PIONEER."

Plum Creek, tp., Armstrong co., Pa. P. 1738.

Plum'er (WILLIAM), b. at Newbury, Mass., June 25, 1759; removed to Epping, N. H., in 1768; became a successful lawyer 1787; was much in the State legislature, and took a prominent part in framing the constitution of 1792; was U. S. Senator 1802–07; governor of New Hampshire 1812–13, 1816–19, and afterwards engaged in literary occupations. D. at Epping Dec. 22, 1850.—His son WILLIAM (1789–1854) was in Congress 1819–25; published 2 vols. of poems (1841–43), and was author of a *Life* of his father (1856), edited by A. P. Peabody, D. D.

Plumer (WILLIAM SWAN), D. D., LL.D., b. at Griersburg (now Darlington), Pa., July 25, 1802; graduated at Washington College, Va., 1825; studied at Princeton Theological Seminary; was ordained 1827; organized in that year a Presbyterian church at Danville, Va.; afterward preached at several places in North Carolina and Virginia; became pastor of churches at Richmond (1834) and Baltimore (1847); conducted for eight years (1837–45) at the former city the *Watchman of the South;* was a professor in the Western Theological Seminary at Allegheny City, Pa., from 1854 to 1862, when he removed to Philadelphia; was pastor of a church at Pottsville, Pa., 1865–66, since which time he has been professor in the Theological Seminary of Columbia, S. C. Author of several works of theology or biblical criticism, of which the most important are *Studies in the Book of Psalms* (1866) and commentaries on the Epistles to the Romans (1870) and Hebrews (1872).

Plum'mer (Gen. JOSEPH B.), b. at Barre, Mass., in 1820; graduated at West Point 1841; served with distinction in the Florida and Mexican wars; rendered important aid to Gen. Lyon in the capture of Camp Jackson and in the battle of Wilson's Creek, 1861; became colonel of the 11th Missouri Vols. Sept. 25; defeated the Confederates at Fredericktown, Mo., Oct. 21; was appointed brigadier-general of volunteers Oct. 22, 1861, and participated in Gen. Pope's campaign in Tennessee and Mississippi. D. at Corinth, Miss., Aug. 9, 1862.

Plump'tre (EDWARD HAYES), D. D., b. in England Aug. 6, 1821; educated at University College, Oxford; became fellow of Brasenose College 1844; chaplain at King's College, London, 1847; professor of pastoral theology in that institution 1853; prebendary of St. Paul's 1863; professor of exegesis of the New Testament 1864; rector of Pluckley 1869, and vicar of Bickley 1873. He has been preacher at Lincoln's Inn and Boyle lecturer (1866–67), and is now one of the Old Testament company of revisers of the authorized text of the Bible. Author of several volumes of sermons, addresses, and classical translations, of many articles in Dr. Smith's *Dictionary of the Bible,* of *Biblical Studies* (1870), and editor of the *New Bible Expositor* (1875).

Plum'stead, tp., Ocean co., N. J. P. 1566.

Plumstead, tp., Bucks co., Pa., on Delaware River. P. 2617.

Plunk'et (WILLIAM **Conyngham**), BARON, b. at Enniskillen, Ireland, in July, 1764; graduated at Trinity College, Dublin; studied law at Lincoln's Inn; was called to the Irish bar 1787; became king's counsel 1798; was elected to the Irish Parliament in the same year; was suspected of sympathy with the Irish rebellion, but was in 1803, as solicitor-general, prosecuting attorney in the trial of Emmet; was attorney-general for Ireland 1805–07; sat in Parliament 1807–22, where he favored Catholic emancipation; became again attorney-general for Ireland 1822; chief-justice and baron 1827, and lord chancellor of Ireland 1830–41. D. in Wicklow co. Jan. 4, 1854.

Plunkett's Creek, tp., Lycoming co., Pa. P. 415.

Plu'ralism, a term used in canon law, denotes the possession of more than one ecclesiastical benefice by the same person and at the same time. In the earlier times of the Christian Church pluralism was considered unlawful, and it was forbidden by many councils, as, for instance, by those of Chalcedon (451) and Nicæa (787). Later, however, it became one of the most common and most vicious practices in the Roman Catholic Church, and in order to screen its unlawfulness very subtle distinctions were made by the canonists. Benefices were divided into compatible and incompatible—that is, such as could be held together, and such as could not. Incompatibility might arise, for instance, from the duty of residence; thus, it would be impossible for the same man to be bishop of Palermo and Trondhjem at the same time, because it was a bishop's duty to reside in his diocese. But then the pope could grant a dispensation from the duty of residence, and thereby the two benefices became at once compatible. In this, as in so many other cases, the sharp and circumstantial definitions of the law were nothing but dust by which to blind the eyes of truth; and the popes did not neglect to avail themselves of this circumstance. At one time it was very common to find Italian clergymen living at the court of Rome and enjoying the revenues of different bene-

fices in Spain, France, Germany, and Scandinavia. In our time this evil has disappeared almost entirely in the Roman Catholic Church.

Plush [Fr. *peluche;* Ger. *Plüsch*], a fabric which differs from velvet in not being shorn, and in having a long pile or shag. It is sometimes all worsted, sometimes worsted with a mohair pile, and most frequently of cotton with a silk pile. This last kind is used for hatmaking. The loops of the pile are cut with a long needle-like knife.

Plu'tarch, b. at Chæronea, in Bœotia, Greece; studied philosophy under Ammonius at Delphi when Nero visited Greece in 66 A. D.; travelled much in Italy and lived for some time in Rome, where he lectured on philosophy in the reign of Domitian, but returned subsequently to his native city, where he held an office as a magistrate, and d. at an advanced age in the reign of Hadrian. He was a very prolific writer: 60 works bearing his name and treating various subjects, mostly of a practical character, are still extant, and were collected under the common title of *Moralia*, edited by Wyttenbach (8 vols., Oxford, 1795–1821), and translated into English by Morgan and others (London, 1603); which translation was revised and corrected by W. W. Goodwin (5 vols., Boston, 1870). But the work which made his name so widely known in antiquity, and afterward in all ages up to our day, is his *Parallel Lives*, edited by C. Sintenis (4 vols., Leipsic, 1639–53), and translated into all European languages—into English several times, by North, by Dryden (that is, under his name), by John and William Langhorne; the Dryden translation was revised and corrected by A. H. Clough (5 vols., Boston, 1859). This work consists of forty-six biographies, divided into pairs—one from the Greek and one from the Roman history—and each pair accompanied by a psychological and moral comparison between the persons described. The biographies are—Theseus and Romulus, Lycurgus and Numa, Solon and Valerius Publicola, Themistocles and Camillus, Pericles and Q. Fabius Maximus, Alcibiades and Coriolanus, Timoleon and Æmilius Paulus, Pelopidas and Marcellus, Aristides and Cato Major, Philopœmen and Flamininus, Pyrrhus and Marius, Lysander and Sulla, Cimon and Lucullus, Nicias and Crassus, Eumenes and Sertorius, Agesilaus and Pompey, Alexander and Cæsar, Phocion and Cato the Younger, Agis and Cleomenes, Tiberius and Caius Gracchus, Demosthenes and Cicero, Demetrius Poliorcetes and Mark Antony, Dion and M. Junius Brutus. Besides these forty-six parallel lives, the editions contain biographies of Artaxerxes Mnemon, Aratus, Galba, and Otho. The charm which this book has exercised through centuries, and still exercises on all, young and old, educated and uneducated, rises partly from the subjects it treats of, partly from the character of the treatment. It speaks of great men who while living wrought out the destinies of their time, and who after death stood for centuries, and still stand, as models after which the aspiring soul tries to shape itself; and it describes these men not by subtle analyses of their genius and their influence, which would have required a considerable mental development in order to be fully appreciated, but, giving a rapid outline of the political and historical importance of the man, it portrays his character by a series of personal traits whose moral and psychological bearing may be instinctively felt by the least developed mind, at the same time that they strike the intelligent student with their powerful signification. Plutarch is no historian, but he is as little a gossip. A man of ready talent and superior education, of comprehensive knowledge and vivid sympathy with all that is great and good, he is always instructive and always entertaining. CLEMENS PETERSEN.

Plu'to, in ancient mythology, a son of Saturn and Rhea, a brother of Jupiter and Neptune, and married to Persephone or Proserpina, received the lower world when the universe was divided between Saturn's three sons, and was fierce and inexorable in character.

Pluton'ic (or **Igneous**) **Rocks,** those which have been formed by the cooling of molten materials, either cast up by volcanoes or in dykes, whether on the surface of the earth or at a considerable depth.

Plu'tus, in ancient mythology, the personification of riches, much used by the poets and often represented by art, but never worshipped.

Plym'outh, a seaport-town and parliamentary borough of Devon co., Eng., on the sound of the same name, between the estuaries of the Plym and Tamar. The South Devon Railway terminates here. Taken in its largest sense, it comprehends what are called the "three towns" —Devonport on the W., Stonehouse in the centre, and Plymouth (proper) on the E. The citadel, a large bastioned work, situated on a bold headland, forms one of the most noticeable features of Plymouth proper; it is, however, by no means the most interesting or important of the present (recent) system of fortification. Plymouth has important manufactures of soap, sailcloth, cement, etc.; also shipbuilding yards, foundries, etc. Its fisheries are productive, its trade, both coasting and foreign, important. But the chief importance of Plymouth is as a naval station, the naval arsenal of Devonport (on the Hamoaze, an expansion of the Tamar, near its entrance to Plymouth Sound) occupying about 360 acres, and comprising two of the finest dockyards in the world. These dockyards comprehend an area of 150 acres. Devonport and its arsenal are enclosed within a bastioned enceinte of old date, but the demands of modern warfare have transferred the defence of this great seaport to a line of forts, recently built, encircling the place at a distance of 3 miles. As a great naval station, Plymouth owes its prominence in great measure to the spaciousness and accessibility of Plymouth Sound. To protect the interior of this wide estuary the Plymouth Breakwater was constructed. The harbor is defended by the Breakwater Fort and the recent iron-armored batteries at Staddon Point, Picklecombe, Drake's Island, and Mount Edgecumbe. The first is an elliptical work with periphery entirely of iron, built in deep water close behind the breakwater. (See IRON PLATING, etc.) A few miles above Plymouth the Cornwall Railway crosses the Tamar by the Royal Albert Bridge, one of the most remarkable specimens of modern railway bridges. (See BRIDGE.) P. of the three towns (without reference to "boroughs") was over 80,000 in 1855; is supposed to exceed that now. J. G. BARNARD.

Plymouth, county in N. W. Iowa, bounded W. by Dakota, from which the Big Sioux River separates it. Area, 360 sq. m. It is a fertile rolling prairie-region, finely adapted to grain-culture. Traversed by Iowa Falls and Sioux City and St. Paul and Sioux City R. Rs. Cap. Lemars. P. 2199.

Plymouth, county in S. E. Massachusetts, bounded E. by Cape Cod Bay and S. by Buzzard's Bay. Area, 720 sq. m. Portions of its surface are sandy, rocky, or swampy, but under skilful cultivation the soil is for the most part productive. There are large tracts of cedar and hard pine forest, which furnish large amounts of lumber. Bog-iron ore was formerly mined extensively, and the iron manufacture is still important. Boots, shoes, boxes, nails, hardware, harnesses, cotton, woollen, straw, and metallic goods are among the other principal articles of manufacture. The county is traversed by Old Colony and Cape Cod R. Rs. and their branches. Cap. Plymouth. P. 65,365.

Plymouth, p.-v. and tp., Litchfield co., Conn., on Naugatuck River and R. R., has large manufactures. P. 4149.

Plymouth, p.-v., St. Mary's tp., Hancock co., Ill., on Galesburg and Quincy division of Chicago Burlington and Quincy R. R.

Plymouth, p.-v., Centre tp., cap. of Marshall co., Ind., on Yellow River, at junction of Chicago Cincinnati and Louisville with Pittsburg Fort Wayne and Chicago R. R., situated in a good timber-region, has 2 newspapers and some manufactures. P. 2482.

Plymouth, p.-v., Fall tp., Cerro Gordo co., Ia., at junction of Iowa and Dakota division of Milwaukee and St. Paul R. R. with the Burlington Cedar Rapids and Minnesota R. R.

Plymouth, tp., Plymouth co., Ia., includes Plymouth, the county-seat. P. 357.

Plymouth, p.-v. and tp., Penobscot co., Me. P. 941.

Plymouth, port of entry, p.-v. and tp., cap. of Plymouth co., Mass., situated on Massachusetts Bay and Old Colony R. R., 37 miles S. E. of Boston, is celebrated as the landing-place of the Pilgrim Fathers in 1620, who here founded the first settlement in New England. The climate is very healthy, the heat of summer seldom being oppressive or the cold of winter intense, while there is a remarkable freedom from heavy tempests and thunderstorms in their season. The town covers an area of nearly 18 miles in extent along the coast, varying from 5 to 9 miles in width. Plymouth is supplied with 5 waterworks, gas, an efficient fire department, Masonic and Good Templars lodges, a post of the Grand Army of the Republic, several clubs, with charitable and benevolent organizations. There are 12 churches and 7 chapels, a public library, excellent schools, 4 banks, and 2 newspapers, manufactories of cordage, cotton sail-duck, tacks, rivets, stoves, and hollow-ware, iron and zinc nails, cotton cloth and batting, steel shanks, hammers, and other articles. There is some commercial business, and a fleet of vessels engaged in the Newfoundland fisheries. The town contains many points of interest associated with the landing and subsequent lives of the Pilgrim Fathers. P. 6238.

C. C. DOTEN, ED. "OLD COLONY MEMORIAL."

Plymouth, p.-v. and tp., Wayne co., Mich., at junction of Detroit Lansing and Lake Michigan with Flint and Père Marquette and Holly Wayne and Monroe R. Rs. P. 969; of tp. 3016.

Plymouth, tp., Hennepin co., Minn. P. 872.

Plymouth, p.-v. and tp., cap. of Grafton co., N. H., on Boston Concord and Montreal R. R. Point of departure by stage for White Mountains. P. 1409.

Plymouth, p.-v. and tp., Chenango co., N. Y., on New York and Oswego Midland R. R. P. 179; of tp. 1523.

Plymouth, p.-v., cap. of Washington co., N. C., on an outlet of Albemarle Sound, has 2 newspapers and a brisk commerce. P. 1389.

Plymouth, tp., Ashtabula co., O. P. 657.

Plymouth, p.-v. and tp., Richland co., O., on L. and E. division of Baltimore and Ohio R. R., has a graded school, 4 churches, 1 bank, 1 newspaper, several large mills, a frame establishment, and 3 hotels. P. of v. 703; of tp. 1609.

Plymouth, v. (BARTLETT P. O.), Palmer tp., Washington co., O. P. 84.

Plymouth, p.-b. and tp., Luzerne co., Pa., on E. branch of Susquehanna River and on Lackawanna and Bloomsburg R. R., 4 miles from Wilkesbarre, has 2 newspapers and an active business in coal-mining. P. 2648.

Plymouth, tp., Montgomery co., Pa., on Schuylkill River. P. 2025.

Plymouth, p.-v. and tp., Windsor co., Vt. P. 1285.

Plymouth, tp., Mercer co., W. Va. P. 1687.

Plymouth, tp., Juneau co., Wis. P. 795.

Plymouth, tp., Rock co., Wis. P. 1396.

Plymouth, p.-v. and tp., Sheboygan co., Wis., 52 miles N. of Milwaukee, on Wisconsin Central and Sheboygan and Fond du Lac R. Rs., has a bank, 1 newspaper, 3 extensive flouring-mills, several cheese-factories, and a plaster and saw mill. Large quantities of grain are shipped from this point. P. 2280. C. D. WELLS, ED. "REPORTER."

Plymouth Brethren. In the end of 1827 four persons, led by the apprehension of the unity of the Church as the body of Christ, and the ruin of the professing body around them, to which may be added the expectation of the coming of the Lord, and the deep conviction that ministry flowed from gift from Christ on high, and not from ordination by man, met in Dublin in Ireland, breaking bread every Lord's day, and at first in a private house, feeling authorized and privileged so to meet by Matt. xviii. 20, as a resource in the midst of the confusion; demanding only soundness in the faith and godliness of life, and then only seeking for themselves what met the demand of their consciences, according to what they saw in the Word of God; preaching and teaching belonging to those who had the gift of one or the other. This spread from like wants in others, or the conversion of sinners. In 1831 one of those who thus began in Dublin began to work at Plymouth in England also with others who were now associated. About the same time, or very soon after, it began in London by another who had been there. Since then it has gradually spread. There are 500 or 600 gatherings, so called, in the British isles, a large number in France, particularly in the southern parts and the Cevennes, but also E. and W. There are a large number in Germany, and proportionately still more in Switzerland; a considerable number in Holland also. They have also a large number of meetings in Canada, where the work has spread rapidly; among the negroes also in the West Indies, and generally in all the British colonies and settlements. The work is more recent in the U. S., but there also it has spread E. and W., but the numbers are not as yet large. As regards their doctrines, they hold the great fundamental doctrines of Christianity. What may perhaps be said to distinguish them is a definite faith in the personal presence of the Holy Ghost as come down on the day of Pentecost, giving, on the one hand, the consciousness of being children or sons of God to all those who are sealed by his being given to them, and that they are in Christ; and, on the other, so uniting them to Christ that they are members of his body, hence, that the true Church began only on the day of Pentecost (though the ground of salvation be the same for all), and will continue till the Lord comes and takes it up to be with himself, and all things in heaven and earth will be gathered under Christ as head, the Jews being restored, and the earth blessed and in peace, Satan being bound. Afterwards will be the final separation on earth, Satan being let loose, and then the wicked dead judged before the great white throne. These are not presented as the terms of communion, but, and especially the presence of the Holy Ghost, characterize their teaching as distinguished from many. This presence of the Holy Ghost gives another character to the Church—namely, that it is the habitation of God through the Spirit on the earth. This is distinct from the body, and all manner of worthless materials have been built in. On this judgment will fall, the whole system being cut off as Judaism was, the saints constituting the body being caught up to heaven. They hold that all in whom the Spirit of Christ dwells constitute the Church or assembly of God in its truth; at least, are members of it, for they see them now scattered; hence, they do not call themselves the Church, but profess to meet on the principle of its unity. They use 2 Tim. ii. and iii. as guiding their conduct in the present state of things. They hold the full divine inspiration of Scriptures, and rest everything on the authority of the written word, while they believe in the necessity of the grace of the Holy Spirit to understand and profit by it. They profess to exercise a strict discipline as to faith and morals in their assemblies, and hold a practical unity of them all, so that one excluded from one is excluded from all. Their writers are numerous, and they circulate gospel and other tracts widely, and publish various periodicals in English, French, and German. Their most voluminous writers are Mr. McIntosh, Mr. Kelly, Mr. Darby, Mr. Bellett. But there are others as well esteemed amongst them. There is a large collection of papers called *The Present Testimony;* another called *Bible Treasury;* of a more popular character, *Things New and Old.* As a popular tract-writer, Mr. Stanley is well known under the initials "C. S." The original periodical was the *Christian Witness*, but that is now very difficult to procure. I. N. DARBY.

Plymouth Sound, an inlet of the English Channel on the southern coast of England, between the counties of Devon and Cornwall, is 3 miles long, 4 miles broad, and forms, with the estuaries of the Plym and the Tamar, the harbors of Plymouth and Devonport, well known as one of the principal naval stations of Great Britain. In order to protect the shipping in the harbor against the heavy surge which sets into the sound from the Atlantic, an immense breakwater, 1700 yards long and built of massive stones, has been constructed.

Plymp'ton, p.-v. and tp., Plymouth co., Mass., on Plymouth branch of Old Colony R. R. P. 804.

Plympton (GEORGE W.), b. at Waltham, Mass., Nov. 18, 1827; graduated at the Rensselaer Polytechnic Institute at Troy, N. Y., 1847; was professor of engineering and architecture at Cleveland University 1852–53; of mathematics in the State Normal School, Albany, N. Y., 1853–55, and again 1858–60, and at the State Normal School, Trenton, N. J., 1860–63; became professor of physical science at the Brooklyn Polytechnic Institute 1863, and of physics at Cooper Institute, N. Y., 1869, which posts he still (1876) occupies. Author of a work on blowpipe analysis (1858) and of fugitive articles on engineering field-work, and editor of Van Nostrand's *Eclectic Engineering Magazine* since 1870.

Pneumatic Despatch and **Railway.** See PNEUMATIC TRANSMISSION, by WILLIAM E. A. AXON.

Pneumat'ics [Gr. πνεῦμα, "air"] deals with the mechanical properties of elastic fluids, of which air is taken as the representative. A perfectly elastic fluid, or what is called a perfect gas, is characterized by this property: A fixed quantity of it by weight—as, for instance, a pound—may occupy any space, however great or small. Enclosed in a vessel of 1000 cubic feet capacity, it fills every part of it, while it may be compressed so as to occupy a volume of but 1 cubic foot or less. In either case, if it is kept at the same temperature, its volume multiplied by its pressure per square inch or per square foot is the same. In other words, its pressure is inversely proportional to its volume. A pound of air, for instance, at a temperature of 32°, enclosed in a vessel containing 12.387 cubic feet, exerts a pressure of 14.7 pounds per square inch, or 2116.8 pounds per square foot, upon the sides of the vessel. The product of 2116.8 multiplied by 12.387 is 26,221. If we force the same quantity of air into a vessel of 1 cubic foot capacity, its pressure at 32°, were it a perfect gas, would be 182.09 pounds per square inch, which is 26,221 pounds per square foot; and as its volume is represented by 1, the product of its pressure by its volume is 26,221. Again, if it be allowed to expand into a vessel of 1000 cubic feet capacity, it would exert at 32°, were it a perfect gas, a pressure of but 26.221 pounds per square foot, which multiplied by 1000 is 26,221. The idea of a perfect gas is not absolutely realized in nature, but air is sensibly so except at very high pressures.

The *density* of a gas is its weight per cubic foot. A cubic foot of air at the temperature of 32°, and under the average atmospheric pressure, weighs 0.08073 pounds, which is at the rate of 12.387 cubic feet to the pound, being

$\frac{1}{772}$d the weight of water. For common purposes we may reckon $12\frac{1}{2}$ cubic feet of air to the pound. The densities of several other gases at the same pressure and temperature are as follows:

Oxygen..........	0.0893	lbs. per cub. ft., or	11.204	cub. ft. to the lb.
Hydrogen......	0.00559	" "	179.	" "
Carbonic acid.	0.1234	" "	8.101	" "
Nitrogen........	0.0784	" "	12.753	" "

Steam at a temperature of 212° and the pressure of the atmosphere weighs 0.0380 pounds per cubic foot, which is at the rate of 26.36 cubic feet to the pound. As ordinarily used, steam does not follow the law of perfect gases. Expanded in a cylinder to twice its original volume, it does not exert half its original pressure. Highly superheated steam is sensibly a perfect gas.

Temperature.—When air is maintained at a uniform pressure, its volume is increased 0.365 times, or $36\frac{1}{2}$ per cent., in passing from the temperature of melting ice to that of boiling water; and when air is maintained at a uniform volume—being, for instance, enclosed in a tight vessel—its pressure is increased by the same fraction in undergoing the same change of temperature. Otherwise stated: each degree of change of temperature in air at constant pressure changes its volume by one $\frac{1}{500}$th of its volume at 32°; and each degree of change of temperature in air at constant volume changes its pressure by $\frac{1}{500}$th of its pressure at 32°.

Pressure of the Atmosphere.—As in the case of liquids, the pressure of the atmosphere per square inch, at any point, is equal to the weight of a vertical column of air 1 inch square reaching from that point to the upper limit of the atmosphere. The difference of pressure between two points at different heights is the weight of a vertical column of air reaching from the level of the lower point to that of the higher. There is this difference between the pressure of water and that of air: the pressure of a column of water is known directly when its height is known, being the weight of so many cubic feet or so many cubic inches of the liquid. To find the pressure of a column of air requires an intricate calculation, as its density is not the same at any two points of its height. The average pressure of the atmosphere at the level of the sea is 14.7 pounds per square inch, being the pressure exerted by a column of mercury 29.92 inches high. This height is so near 30 inches that it is customary to speak of the pressure of the atmosphere as being equivalent to that of a column of mercury 30 inches high. It is also substantially equal to that of a column of water 34 feet high (exactly, 33.9). This would be the pressure at all times if the air were in a state of rest, but the continual heating and cooling of the air makes it impossible for it to remain long at rest. The pressure is therefore continually changing, being sometimes more and sometimes considerably less than 30 inches of mercury. Pressures are expressed in pounds per square inch, by the equivalent height of mercury in inches, or by the equivalent height of water in feet. Thus, we say, a pressure of 10 pounds per square inch, 20.36 inches of mercury, or 23.08 feet of water.

Instruments for measuring the pressure of the atmosphere are described in the article BAROMETER. Instruments for measuring higher gaseous pressures are constructed upon the same principles, and are called pressure-gauges, manometers, piëzometers, etc. The well-known suction-pump is a striking illustration of the atmospheric pressure. This machine, represented at Fig. 1, consists of a tube dipping into water, and rising above the same to any height not exceeding that of the least pressure of the atmosphere. The upper part is provided with an apparatus for exhausting the air consisting of two valves, one contained in a movable piston, the other in a fixed diaphragm. Each valve permits the passage of fluid in an upward direction, but not downward. (See VALVES, etc.) For the sake of definiteness, suppose the upper valve in its highest position to be 30 feet above the surface of the water in the well, and suppose the pressure of the atmosphere to be equal to 34 feet of water. Suppose, also, the piston to move 6 inches at a stroke. The water stands at the same level inside the tube or pump-barrel as outside. The weight of the atmosphere acts directly upon the surface of the water outside the pump-barrel, but not inside, being intercepted by the valves. The air inside the pump-barrel is in the condition of a spring which has been bent by a heavy weight, and being fastened in that position the weight is removed. It presses against its fastenings with a force precisely equal to the weight. The air has entered the pump-barrel in the state of compression due to the weight of the atmosphere, and though the latter no longer acts upon it, its tendency to expand, or what is called its elastic force, acts upon the sides of the barrel and the surface of the water with a pressure precisely equal to that of the atmosphere. A stroke of the pump is now made, removing $\frac{1}{60}$th of the air contained in the barrel. The pressure within the barrel is no longer equal to the external pressure. The preponderance of the latter forces the water to rise in the barrel to such a height that its pressure at the surface of the well, added to the pressure of the air in the barrel, will equal that of the atmosphere. This will be the condition after the first stroke: the air in the pump-barrel will exert a pressure equivalent to 33.749 feet of water. The water will have risen 0.251 feet in the barrel, making, together, 34 feet. The rise of the water will be a little greater for each successive stroke until the last, which will raise it 6 inches.

Determination of Heights by the Barometer.—The pressure of the air, as indicated by the barometer, furnishes the means of finding the heights of points upon the earth's surface. The accurate performance of this operation requires attention to several facts—viz. (1) The pressure of the mercurial column depends, in some degree, upon its temperature as well as its height. This temperature is usually somewhat different from that of the surrounding air. (2) It requires a knowledge of the temperature as well as the pressure of the air to give a correct indication of the height. (3) The scale, usually of brass, which serves to measure the height of the mercurial column, changes its length with the temperature, though not in the same degree as the mercury itself. (4) The force of gravity acts with greater intensity at the lower station than at the higher. This variation affects the column of mercury differently from the column of air. (5) The force of gravity changes somewhat with the latitude of the place, also affecting the mercury differently from the air. (6) The height indicated by a given pressure and temperature of the air depends, in some degree, upon the quantity of aqueous vapor contained in the air. Methods and tables taking account of all these minute sources of error are too complicated and voluminous to be introduced here. An observer who aims at minute accuracy must use the works of Guyot or Plantamour, or the *Practical Tables in Meteorology and Hypsometry*, by R. S. Williamson of the U. S. engineer department. The following very simple mode of computation, given in the *U. S. Ordnance Manual*, is sufficiently correct for ordinary purposes: The height of the barometer in inches and the temperature of the air in degrees of Fahrenheit's thermometer being taken at each of the two stations whose difference of altitude is desired, divide the difference of the heights by the sum of the heights, and multiply the result by 55,000. Multiply $\frac{1}{440}$th of this product by the difference between the mean temperature and 55°. Call this result the correction. If the mean temperature is more than 55°, add the correction; if less, subtract it. The result is the height of the higher point above the lower, in feet. As an example, suppose we find at the

Lower station, barom. 29.63 in., temp. 66°
Upper " " 29.12 " " 58°
Sum of heights, 58.75 in.; difference, 0.51 in.; mean temp., 62°. 62 — 55 = 7°. Dividing 0.51 by 58.75, and multiplying the quotient by 55,000, we obtain.......... 477.45 feet.
477.4 divided by 440 is 1.08, and 1.08 times 7 is correction.......... 7.56 "
The mean temperature being more than 55, we add the correction, giving.......... 485 feet,
which is the height required. Had the mean temperature been 46°, the result would have been 477.4, less 9 times 1.08 = 467.7 feet.

Another method of finding altitudes consists in ascertaining the temperature at which pure water boils. The boiling of water consists in the formation of bubbles of steam below the surface and their escape at the surface. In an open vessel this occurs when the pressure of the steam is exactly equal to that of the atmosphere. If we know the temperature at which boiling occurs, we can ascertain the atmospheric pressure, and an apparatus for determining this temperature is a kind of barometer. The approximate rule in this case is: Multiply the difference between the temperatures of the boiling-point, in degrees of Fahrenheit's thermometer, by 540. The product is the difference of altitude in feet. This method requires thermometers of very great delicacy.

Pneumatic Machines.—Figs. 1 to 10 indicate different types of machines for altering the pressure of air. Though the distinction is verbal rather than real, they may for convenience be divided into two classes—(1) machines for rarefying the air; (2) machines for compressing the air. The suction-pump (Fig. 1) has already been referred to, and its action is too well known to need further comment. It is hardly necessary to observe that Fig. 1 is drawn to illustrate the action of the pump, not to show its ordinary construction. The barrel is usually much smaller below the lower valve than above.

Fig. 2 represents the mercury air-pump, the invention of Herman Sprengel. It consists of a vertical tube termi-

nating above in a funnel-shaped vessel, the bottom open and immersed in mercury; c is a cock; x is a branch com-

FIG. 1.

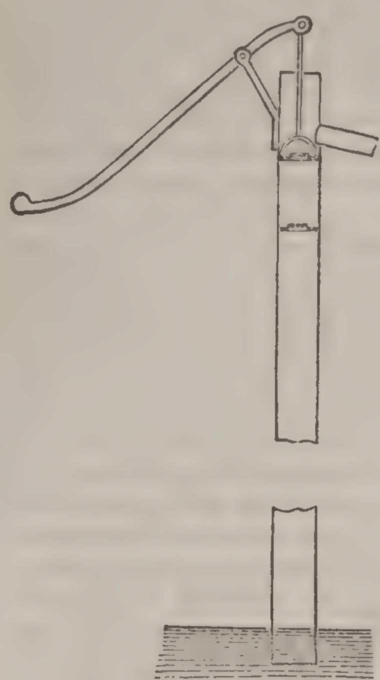
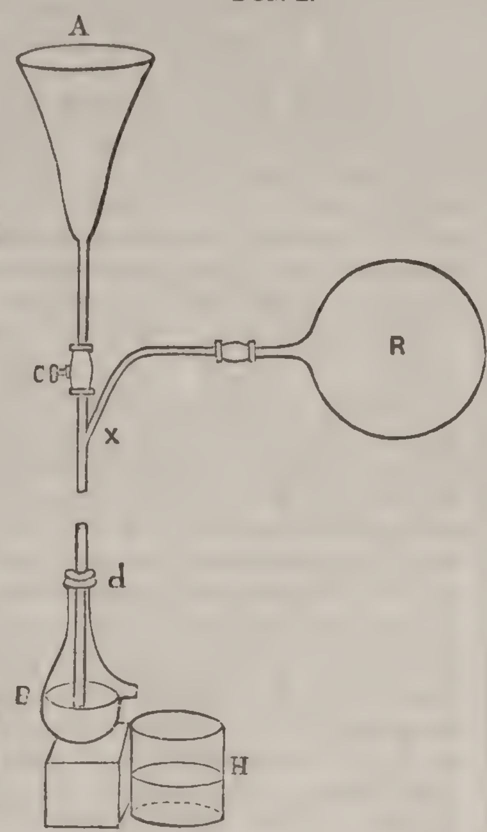


FIG. 2.



municating with the receiver R, in which the vacuum is to be created. Mercury is poured into the funnel A, and flows into the vessel B, and thence into the movable vessel H, from which it is again poured into A. The point x being more than 30 inches above the surface of the mercury in the vessel B, the mercury at x is under no pressure. The air from the receiver enters the vertical tube and is carried downward, escaping at the surface of the mercury in the reservoir B in the form of bubbles. When no air-bubbles are brought down by the mercury the vacuum is perfect. The most perfect vacuum can be produced by this instrument, but its use is somewhat laborious.

Fig. 3 is a section of the air-pump invented and manufactured by E. S. Ritchie of Boston. In air-pumps of ordinary construction, the valves being operated by the pressure of the air, they do not close till after the piston has commenced its stroke, which prevents the formation of a perfect vacuum. Mr. Ritchie's arrangement of the valves is designed to avoid this difficulty. The air is drawn from the receiver into the cylinder of the air-pump through the tube c and valve b. The piston contains a valve so formed that it is closed by a pull on the piston-rod. The valve b is operated by a rod a passing through a stuffing-box in the piston. The piston being at the bottom of the cylinder, the first upward movement of the piston-rod closes the valve e e. The first movement of the piston opens the valve b by the friction of the stuffing-box on the rod a. While the piston is ascending, the air from the receiver flows through the valve b, and the air above the piston is forced out through the valve f. When the piston reaches

FIG. 3.

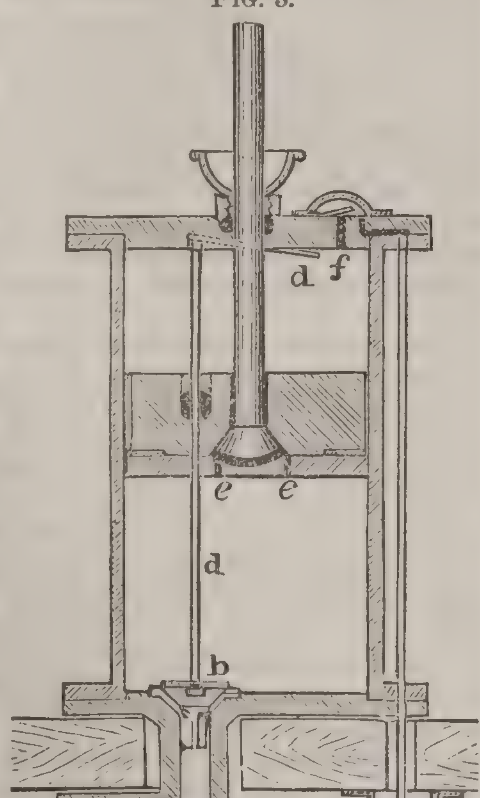


FIG. 4.

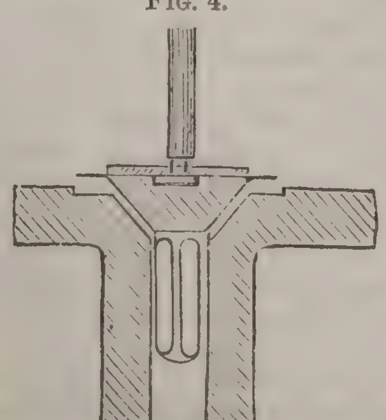
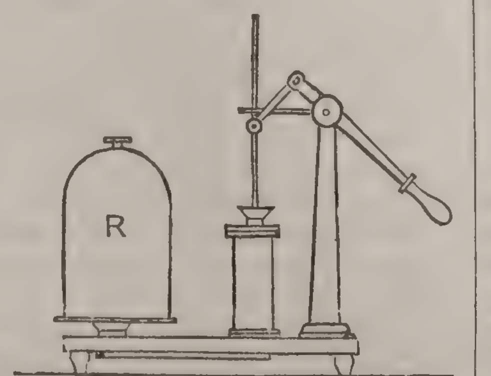


FIG. 5.



the top of its stroke it strikes the lever d and closes the valve b. The first downward movement of the piston-rod opens the valve e e. Fig. 4 shows the valve b on an enlarged scale. It is conical, and has a projecting disk of oiled silk. Fig. 5 shows the pump as mounted, the manner of working it, and the receiver R.

Fig. 6 shows a kind of air-pump much used where water under considerable pressure can be had, and where a perfect vacuum is not desired. The tube c communicates with the receiver, b with the water-reservoir. The stream of water escaping from b draws the air from c. A vacuum equivalent to 27 or 28 inches of mercury can be created with such an instrument.

FIG. 6.

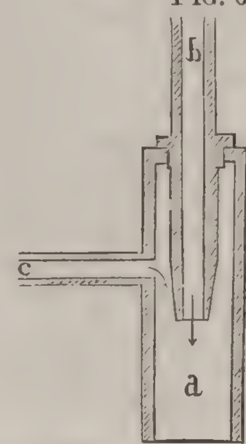


FIG. 7.

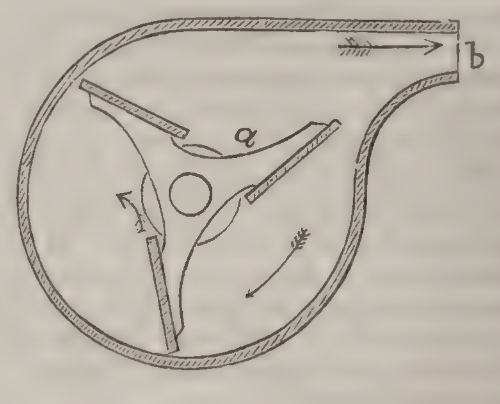
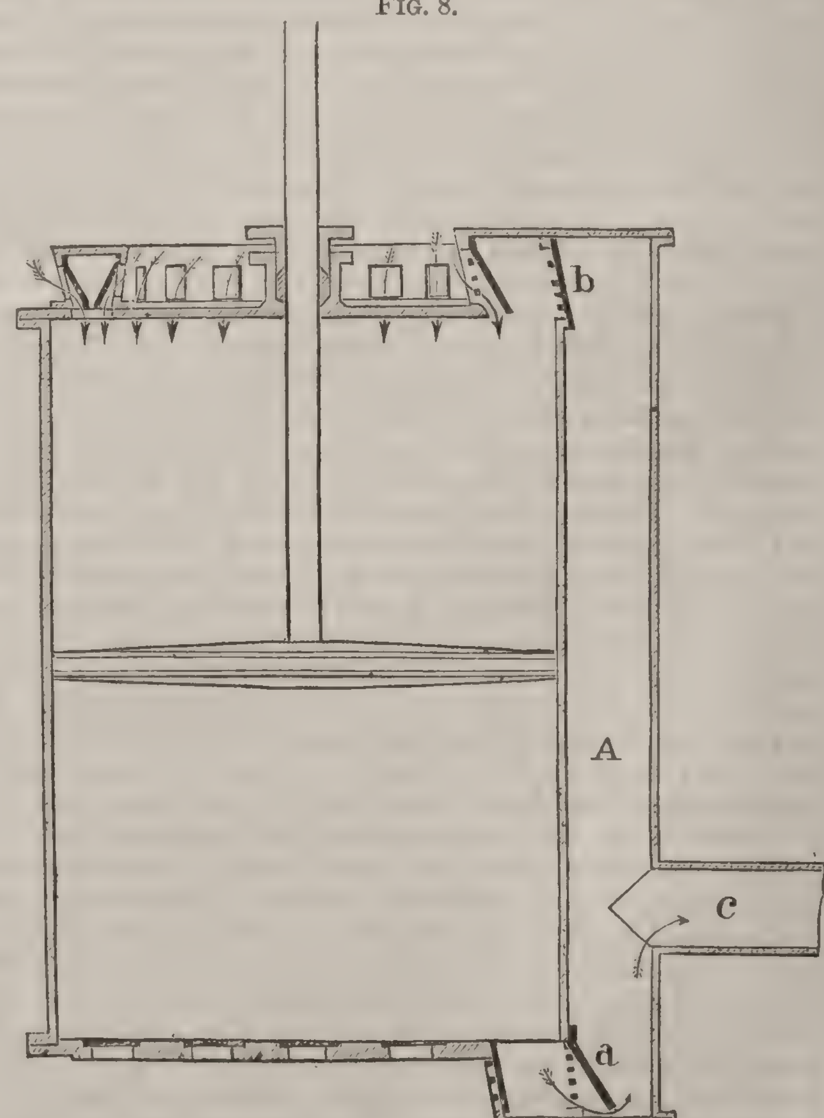


Fig. 7 is a fan much used in factories for creating a powerful current of air, which it does sometimes by rarefying, sometimes by condensing the air. It consists of a cylindrical drum in which radial floats revolve with great velocity. The air enters at the centres of the ends and passes out at an opening, one side of which is tangent to the drum. The centrifugal force developed in the whirling mass of air makes the pressure at the circumference considerably greater than at the centre, and causes the air to escape through the passage b with great velocity. Fans are often made with curved floats. They are used in cotton-mills for separating cotton from its impurities and for drying sized yarn. They are sometimes used for blast furnaces, though not so often as the blower (Fig. 8). Powerful fans are used in planing-mills to create a current of air for conveying the shavings to the boilers, where they are used for fuel. The air is taken in at the cutting-tool, and carries the shavings with it. Steam saw-mills are sometimes provided with similar arrangements for carrying off the sawdust.

Fig. 8 is a blower commonly employed for the large blast

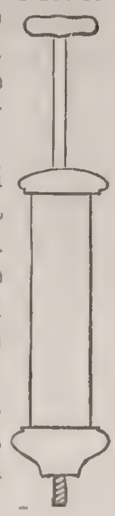
FIG. 8.



furnaces of ironworks. It consists of a cylinder with a reciprocating piston, and large passages for the ingress and egress of air. During the downward stroke of the piston a series of valves in the top of the cylinder open by the preponderance of the external over the internal pressure. The valve a opens, admitting the air into the chamber A,

whence it passes to its destination through the pipe *c*. On the upward stroke the upper valves close by the excess of the internal over the external pressure; the valves in the bottom of the cylinder open; *a* closes, *b* opens, and the flow through *c* continues. The large valves are of the kind known as gridiron valves, resting, when closed, upon a sort of grating. The valves are usually of leather. This machine is operated by steam or water-power, as is the fan.

Fig. 9.



Figs. 9 and 10 show an air-compressor operated by hand. It consists of a piston closely fitting a cylinder which has valves for the ingress and egress of air. During the upward stroke of the piston the valve *b b*, consisting of an annular disk of oiled silk, rises and admits the air through the passages *a a*. At the same time a similar valve of oiled silk closes the passages *d d* from below. During the descent of the piston the valve *b b* falls, closing the passages *a a*. The air passes through the passages *d d*, and to its destination through *c*.

Fig. 10.

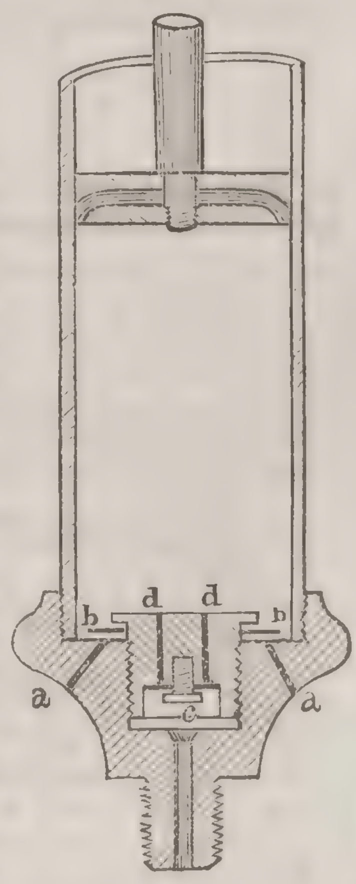
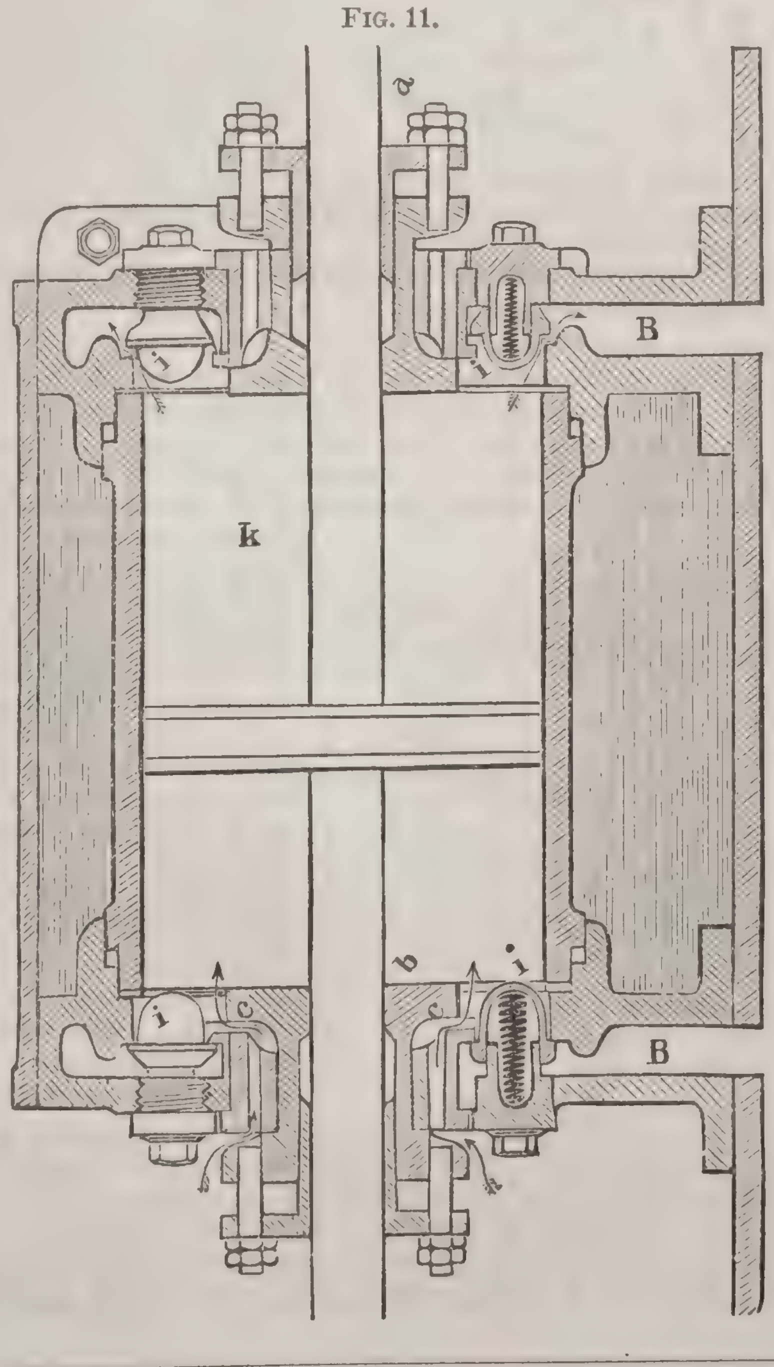


Fig. 11 is a section of the working cylinder of Sturgeon's air-compressor, a powerful machine driven by steam or water-power for furnishing highly compressed air. The air is admitted from the atmosphere through stuffing-box valves. The stuffing-boxes are so formed as to admit of a slight movement at each stroke of the piston. At the commencement of the upward stroke, for instance, the first movement of the piston-rod carries the stuffing-boxes with it a very short distance, opening the passages *c c* below the piston and closing similar passages above. When the piston has moved sufficiently to bring the air above it to the necessary state of compression, the spring-valves *i i* are lifted by the pressure, and the air passes through the passages B B to the tank *k*. The cylinder is surrounded by water to absorb the great heat developed in compressing the air. The piston of this machine moves with a velocity of 490 feet per minute.

Fig. 11.



Pneumatic Transmission.—The facility with which a piston is moved in a cylinder by the pressure of air has led to many devices for employing cylinders of great length for the transportation of passengers and merchandise. (See PNEUMATIC TRANSMISSION.)

Pneumatic caisson, a shallow inverted vessel used in constructing the foundations of the piers of bridges and in other operations requiring excavations in deep water. (See FOUNDATION.)

Compressed Air as a Means of Transmitting Power.—Power for driving machines cannot always be generated at the point where it is required for use. It is often required at points where, from the nature of the case, neither water-wheels nor steam-engines can be located. Compressed air conveyed in pipes is often employed in such cases. It is used in cylinders with pistons in precisely the same manner as steam. The use of highly-compressed air is necessarily attended with a great waste of power. Air, like all compressible bodies, develops heat when its volume is diminished, and absorbs heat when its volume is increased. To understand the reason of the loss of power, we must consider what takes place during the compression and expansion of the air. In the machine represented at Fig. 10, when the piston is fully raised the air below it is at the ordinary pressure of the atmosphere. Suppose its temperature to be 60° F. Let the piston be forcibly depressed to the extent of one-half its stroke. If we suppose the air to be kept at the same temperature of 60° during compression—that is, if the heat generated during compression is all taken away—its pressure will be twice that of the atmosphere, or 29.4 pounds per square inch. Now, if we allow the air to expand again, raising the piston, it will not exert the same pressure during expansion as during compression, for the reason that it has parted with a portion of its latent heat, and heat is power. If, on the contrary, no heat is allowed to escape from the air, then when its volume is reduced to one-half, its temperature will have risen to 230° F., and its pressure to 39 pounds per square inch. If, now, the air be cooled to 60°, and then allowed to expand, it will exert the same pressure during expansion as in the former case. Here is a twofold loss of power. The power required to compress the air is greater than in the former case, because the pressure is increased by the heat, while the power exerted in expansion is the same as before. If the air could be expanded before cooling, it would exert the same pressure that was required to compress it, but this can never occur in practice. The air is always cooled in the course of transmission. A third cause operates to diminish the power derived from compressed air. During compression the air enters the compressing cylinder at the atmospheric pressure and leaves it at the required pressure. It opposes an increasing resistance to the compressing piston at every stage of its compression. But it rarely happens that the air can be expanded down to the pressure of the atmosphere in the cylinder of the air-engine. These causes—viz. (1) heat abstracted from the air, naturally or artificially, (2) resistance to compression consequent on development of heat, and (3) imperfect expansion—reduce the work derivable from compressed air to but a fraction, sometimes a small fraction, of that expended in compressing it.

According to experiments made by Mr. William Daniel of Leeds, communicated by him to the British Institution of Mechanical Engineers (*Lond. Engineering*, Aug. 14, 1874), compressed air at a pressure of 40 pounds per sq. in. gives $25\frac{1}{2}$ per cent. of the power expended in compressing it.

At 34 pounds per square inch the percentage is 27.
" 28 " " " " " " 28.
" 24 " " " " " " 35.
" 19 " " " " " " $45\frac{1}{2}$.

Pressure above a vacuum, in pounds per square inch	Temperature in degrees of Fahrenheit's thermometer.	Volume.		Pressure above a vacuum, in pounds per square inch.	Temperature in degrees of Fahrenheit's thermometer.	Volume.	
		Without change of temperature.	Without transmission of heat.			Without change of temperature.	Without transmission of heat.
5	—80	294.00	215.04	65	341	22.62	34.80
10	5	147.00	131.46	70	358	21.00	33.02
15	63	98.00	98.58	75	375	19.60	31.44
20	109	73.50	80.36	80	391	18.38	30.03
25	147	58.80	68.59	85	406	17.29	28.77
30	180	49.00	60.27	90	420	16.33	27.62
35	209	42.00	54.01	95	434	15.47	26.58
40	236	36.75	49.13	100	448	14.70	25.63
45	260	32.67	45.18	105	461	14.02	24.76
50	282	29.40	41.93	110	473	13.36	23.96
55	303	26.73	39.19	115	485	12.79	23.21
60	322	24.50	36.84	120	497	12.25	22.52

The preceding table, giving the pressure, temperature, and volume of a quantity of air whose volume at the atmospheric pressure and at a temperature of 60° is represented by 100, is abridged from a larger table computed by Prof. Thurston of the Stevens Institute of Technology. According to this table, a quantity of air which at the atmospheric pressure and a temperature of 60° occupies a volume of 100 cubic feet, would, when compressed without change of temperature, so as to exert a pressure of 40 pounds per square inch, occupy a volume of 36.75 cubic feet. Compressed to the same tension without loss of heat, it would occupy a volume of 49.13 cubic feet, and its temperature would be 236°.

The following table was published by Prof. Frazier in the *Engineering and Mining Journal*, July, 1873. It gives, from theoretical considerations, the portion of the work lost in compressing air:

Pressure above vacuum in atmospheres.	Percentage of work lost with full expansion.		Percentage of work lost with no expansion.	
	Air completely cooled in compressor.	Air not cooled in compressor.	Air completely cooled in compressor.	Air not cooled in compressor.
2	0.09	0.18	0.28	0.35
3	0.14	0.27	0.39	0.48
4	0.18	0.33	0.46	0.56
5	0.20	0.37	0.50	0.61
6	0.22	0.40	0.53	0.65
7	0.24	0.43	0.56	0.67
8	0.25	0.45	0.58	0.69
9	0.26	0.47	0.60	0.71
10	0.27	0.49	0.61	0.73

This table shows the great advantage of cooling the air completely during compression. It also exhibits in a striking manner the great losses of power to which the method is liable. Thus, for the case of air at a pressure of ten atmospheres, or 147 pounds per square inch, used without expansion and not cooled in the compressor, the loss is 73 per cent. That is to say, the power derivable from the air is but little more than one-fourth of that expended in compressing it.

It will be noticed that both tables give results calculated upon two suppositions—viz. (1) for air completely cooled or kept at a constant temperature during compression; (2) for air that parts with no heat during compression. Neither of these suppositions is exactly realized in practice. Heat generated during compression cannot all be confined to the compressing cylinder, since all materials conduct heat with greater or less rapidity. Neither can it be absorbed with such rapidity as to prevent the temperature of the air from rising. All the cases that can occur in practice, however, lie between these limits. The calculations also proceed upon the assumption that the air is dry, which is not strictly correct, the atmosphere always containing a certain quantity of aqueous vapor, amounting, in the extreme case, to 20 grains in a cubic foot.

In addition to the losses of power in compressing air consequent upon the waste of heat, there is a further loss in the course of transmission in pipes, amounting, according to the best authorities, to about 10 per cent. per mile. That is, the power derivable from compressed air is diminished 10 per cent. by transmission one mile, and that remaining at the end of one mile is diminished 10 per cent. by transmission another mile, etc. J. P. FRIZELL.

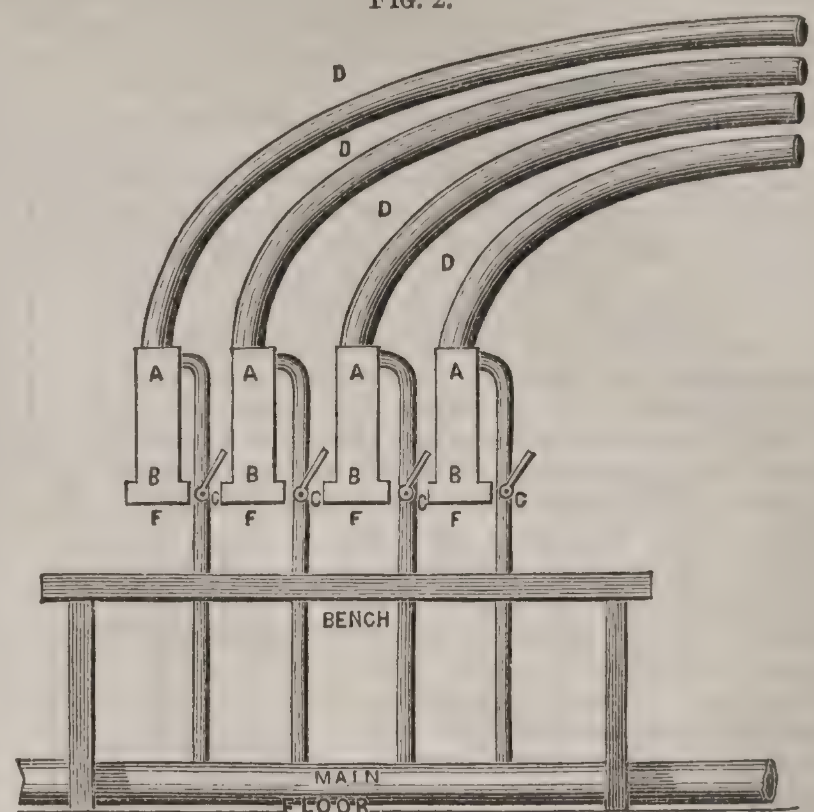
Pneumat′ic Transmis′sion. Our modern pneumatic despatch arrangement is the culmination of the efforts made from time to time to introduce what are popularly known as atmospheric railways. As early as 1684, Denys Papin seems to have suggested the first crude idea in a paper presented to the Royal Society; no trace can, however, be found that his arrangement was ever practically tried. No allusion to pneumatic transport is contained in the records for more than a century after, until M. van Estin amazed his friends, according to the *Dictionnaire Encyclopédique des Amusements des Sciences* (Paris), by sending them to the other end of the park, three-fourths of a mile distant, for the reply to a question just put to him, which they found concealed in a small ball in the drawer of a desk in a little summer-house. It was not until 1810 that Medhurst, a Danish engineer, took up the application of pneumatic transmission, issuing a pamphlet entitled *A New Method for transmitting Packets and Letters by Air*, and in 1812 his *Calculations and Remarks to prove the Possibility of a New Method of transmitting Packets and Letters by Air*. In 1824, Valoric proposed to establish a passenger service between London and Brighton with a wooden tube 6′ 6″ wide. This was impracticable. In 1824, Medhurst suggested what was the original idea of the first atmospheric railway—

FIG. 1.

Section of carrier.

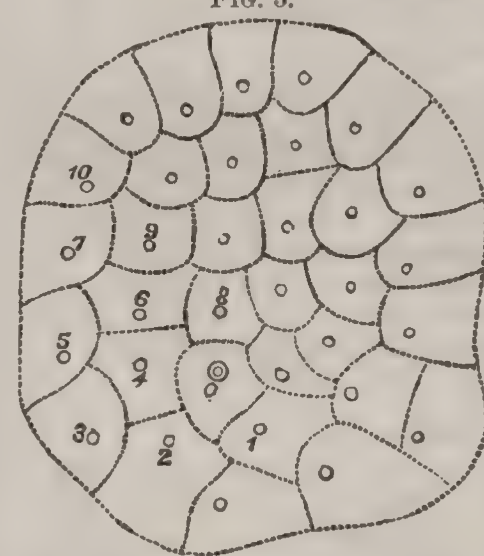
viz. a tube with a longitudinal slit on top for the passage of a connecting-rod between a piston in the tube and a carriage above it, the slit to be closed by a kind

FIG. 2.



of continuous valve. This sort of construction has been the subject of numerous patents, beginning, according to the patent-office records, in 1834 with the American Pinkus, and almost without exception directed against the opening and closing of the continuous slit. Great ingenuity is displayed in some of the arrangements. Most of them were impracticable, and those few that have been practically carried out are now abandoned, we believe, in favor of the locomotive. (See *Engineering*, 1874, ii.) Joseph Ressel, an Austrian inventor, however, proposed, even before Pinkus—in 1832—to transmit postal communications in a hollow piston fitting in an iron pipe, from which the air being exhausted on one end, the pressure of the atmosphere acted on the other side of the piston, and propelled it.

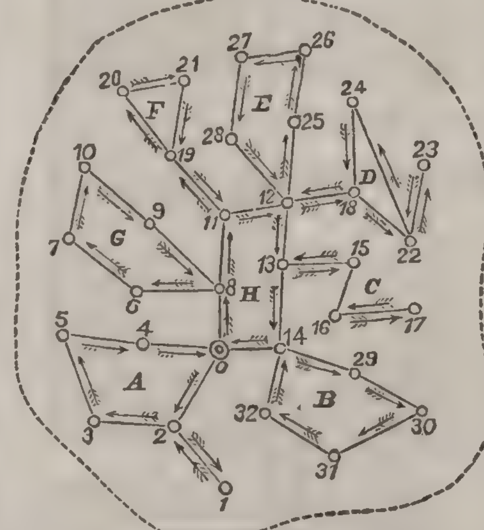
FIG. 3.



This system is now in successful operation in our largest telegraph-offices, having passed through numerous phases of development.

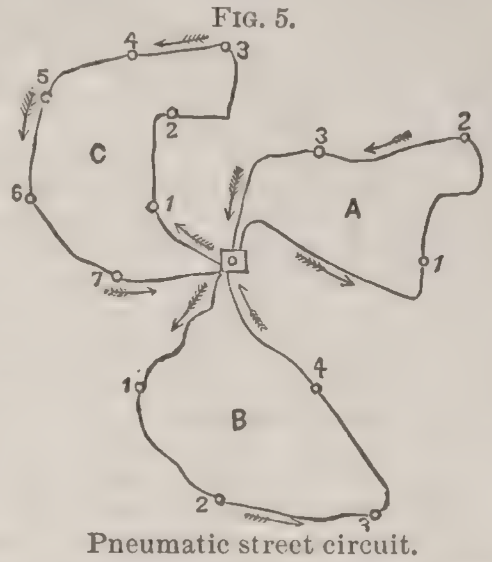
The modern pneumatic transmission exclusively used as a despatch arrangement—*i. e.* for sending communications on paper—may be generally described as follows: Two stations, the distance between which may be a mile and a half, though usually from one-fourth to three-fourths of a mile, are connected by an ordinary wrought-iron gas-tube, seldom exceeding $2\frac{1}{4}''$ internal diameter. The pipes are laid under the street pavement and terminate in the station building. Here an arrangement exists by which the air can either be sucked from the tube or the tube be filled with compressed air. Now, if some small object, fitting tolerably but not too tightly, be put into the tube, and compressed air be let in behind it, after the opening through which the insertion took place has been closed, that object will be propelled along the tube so long as the pressure continues to press it forward, and with a speed proportionate to such pressure, until it arrives at its destination. If the piston—or carrier, as it is called—is to be sent back, the attendant, after having placed the carrier in the tube, gives a signal, usually by means of an electric

FIG. 4.



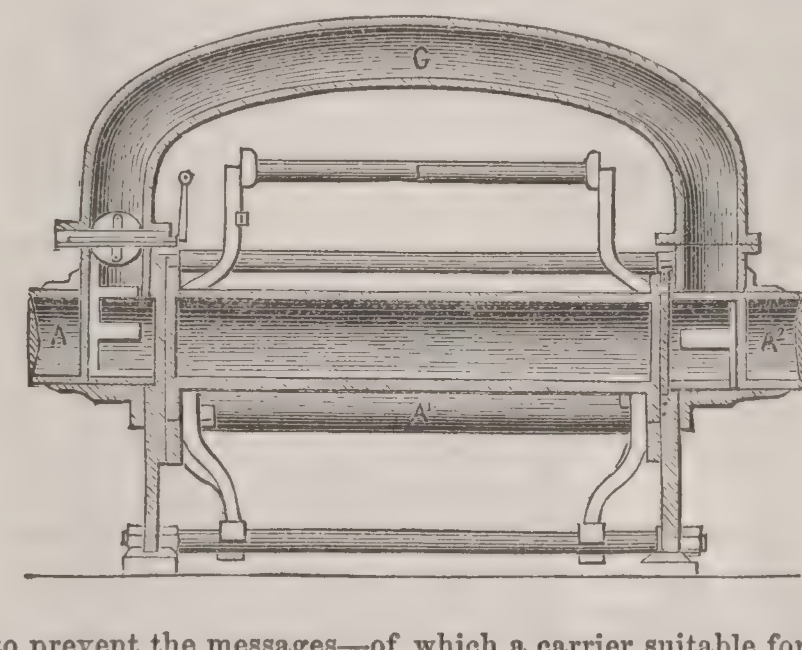
bell; the attendant at the other station (where the motive-power is) turns the vacuum-cock, thus exhausting the air from the tube, and the pressure of the atmosphere propels the carrier back to the station from which it originally came, and signals its arrival by a sharp click against the end-cover or flap of the tube. The carrier is hollow, and contains the objects transmitted. This simple carrier alone has caused much anxious thought and speculation. Iron, steel, tin, copper, brass, india-rubber, leather, felt, wood, and other materials have been tried, and mostly abandoned. The best we have seen, now used in the English offices (Fig. 1), is a very simple tube of india-rubber, open at one end, enclosed in a very stout wrapper of hair felt. At the closed end of the tube several felt washers, a little larger than the tube, are placed together, so as to well fill the tube in which they have to travel, the other part being about 4″ long, and fitting very loose into the pneumatic tube. A small elastic band across the open end of the india-rubber tube is the only safeguard

Fig. 5.



Pneumatic street circuit.

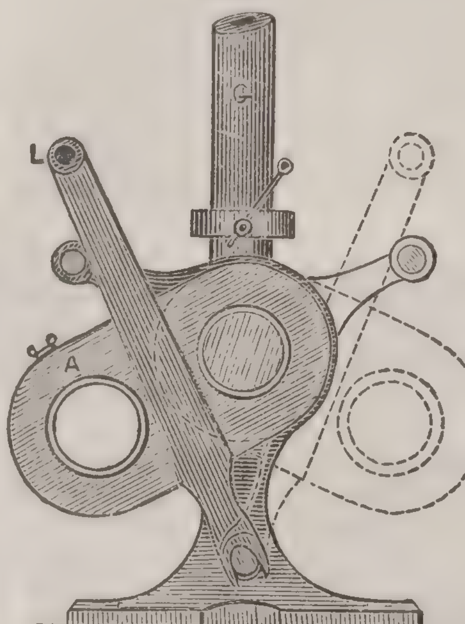
Fig. 6.



to prevent the messages—of which a carrier suitable for a $1\frac{1}{2}''$ tube will hold about ten—from falling out of the tube during transit—an accident now seldom occurring, but in the infancy of the system a fruitful source of annoyance. In Paris a tin case with a leather cover is used, the leather also forming a sort of collar similar to the felt collar on the one illustrated. A combination of tin and wood is also in use there.

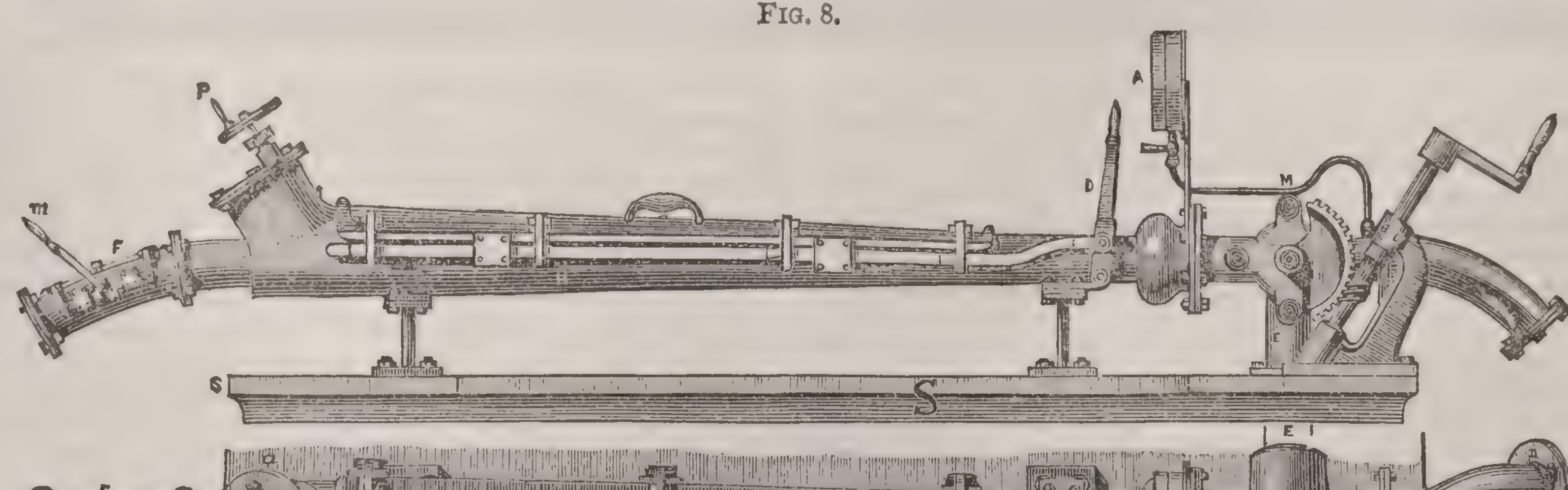
Although the practical success of the pneumatic despatch is of comparatively recent date, telegraph-office authorities would be sorely puzzled were they suddenly deprived of its use. It serves as a messenger or telegraph; it combines the certainty of the former with the speed of the latter if applied to short distances, such as the arrangement is now used for, although the necessary machinery and working expenses of the telegraph are much less than those of the pneumatic system. But the advantage of the latter lies in its greater capacity, and consequent saving of time and labor, as well as the almost absolute certainty. It is usually supposed that telegraphic messages handed in at any of the branch offices are telegraphed from that station direct to their destination; this is quite erroneous. They are first transmitted, either by telegraph, pneumatic tube, or other arrangement, to the central telegraph-station, from which all messages are telegraphed and at which all are received, and either distributed direct by messenger or sent by wire or pneumatic tube to the branch office in the district where they are to be delivered. The pneumatic carrier only requires something like a minute for its journey—according to distance and pressure employed. In Paris, where a train of ten is sent at a time, and the distances are pretty regular, varying from 1 to $1\frac{1}{4}$ kilomètres, $2\frac{1}{4}$ to $2\frac{1}{2}$ minutes are allowed for a journey—viz. $1\frac{1}{4}$ or $1\frac{1}{2}$ minutes for the transit of the train itself, and 1 minute for discharging and re-charging. There, messages handed in at any of the offices are delivered to local correspondents in the original, a great advantage. We have no doubt whatever that before long a local postal service by means of pneumatic tubes will be introduced in all great business-centres, by means of which letters may be handed in at any of the central offices, and delivered at their destination a few minutes later: indeed, the emptying of the pillar-boxes by pneumatic means has already been suggested.

Fig. 7.



There are various kinds of receiving and despatch apparatus. The simplest is perhaps the one in use in English offices, designed by Mr. Willmott, which we illustrate in Fig. 2. It is the one most suitable for systems in which each station is in direct connection with the central office. It consists of a brass box A connected with the pneumatic pipe D. B is a slide which may be drawn forward and backward, and closes the opening in the bottom of the box when in one position, at the same time turning

Fig. 8.



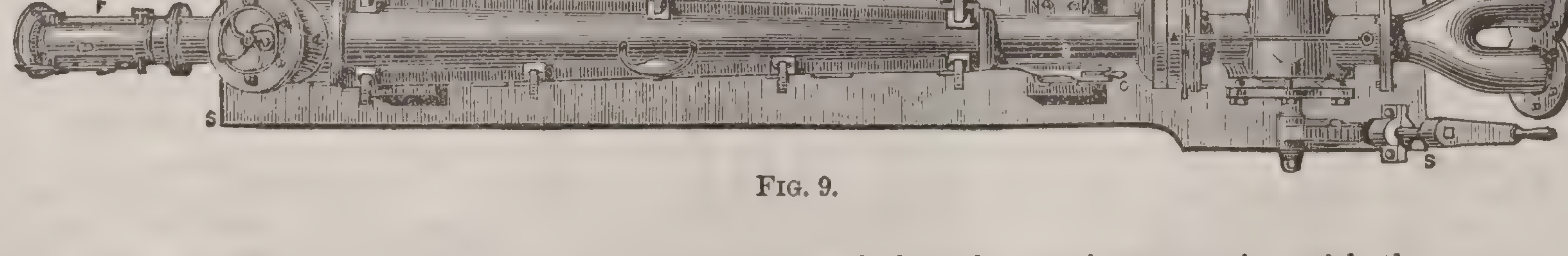


Fig. 9.

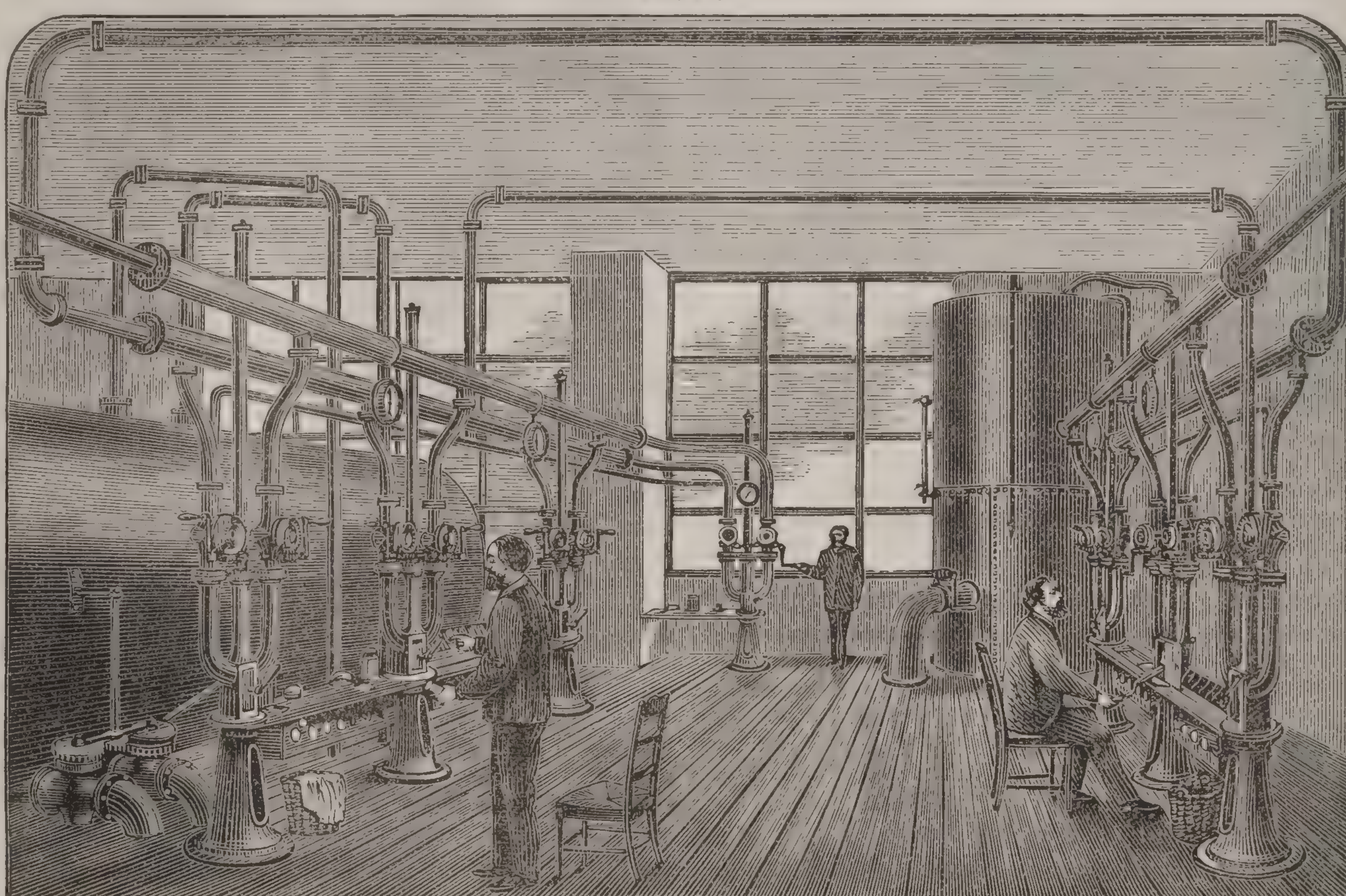
on the compressed air, the pipe for which is not seen in the sketch. This is the position for sending away; if a signal is given from the other station that they wish to send a carrier, the slide is moved, and thereby the compressed air turned off and the bottom of the box opened; the leather flap F is put over the opening, the tap C turned, and the tube put in connection with the vacuum main. The flap F is held against the opening by the pressure of the atmosphere until the carrier, arriving at great speed, strikes against it and keeps it open; the tap C is then closed and the carrier taken out. It will be seen that in this manner the carrier is sent forward and backward in

the same pipe; if, however, the traffic between two stations is very heavy, the circuit system is usually adopted—*i. e.* two tubes are used, one for the out, the other for the return journey. Recourse is also had to this mode of working if there are intermediate stations, or one behind the other, so that despatches coming from the farthest would have to pass others on the way. In such cases the tubes are connected from station to station, the lines forming a polygon which is called a "circuit;" and then the transmitting pistons are only sent in one direction, continually going round, each station taking out what is intended for it and putting in what it desires to send to the central or any other station. On this plan the very extensive system in Paris is worked which we illustrate in Figs. 3 and 4, also that of London, represented in Fig. 5. Fig. 3 shows how the ground is divided into districts, each having its station, O being the central one. Fig. 4 shows the tabular network, arranged into polygons or circuits A B C D E F G H, and their connections, and the direction in which the communications move. Fig. 5 shows the plan adopted in London, the letters denoting the circuits, and the figures the stations.

For the circuit system a different receiving and despatching apparatus from the one described in Fig. 2 is employed, as it is desirable to permit carriers to pass through stations without interruption or interference. In Figs. 6 and 7 we illustrate Siemens' arrangement in section and end view. With the aid of this a carrier may move through the station without interference, the valves being adjusted upon receiving a certain signal; or it may be that a number of carriers are moving in the circuit at the same time whose progress it is desirable not to arrest while removing from the pipes one intended for the station. In the latter case, the carrier drops in the box A^1—A and A^2 being the pneumatic tubes—while the circulation of the compressed air and vacuum continues uninterruptedly through the bypass G, the movement being effected by moving the slides with the handle L on the rocking frame to which A^1 is attached. Varley's apparatus, formerly employed, has now given way to those described.

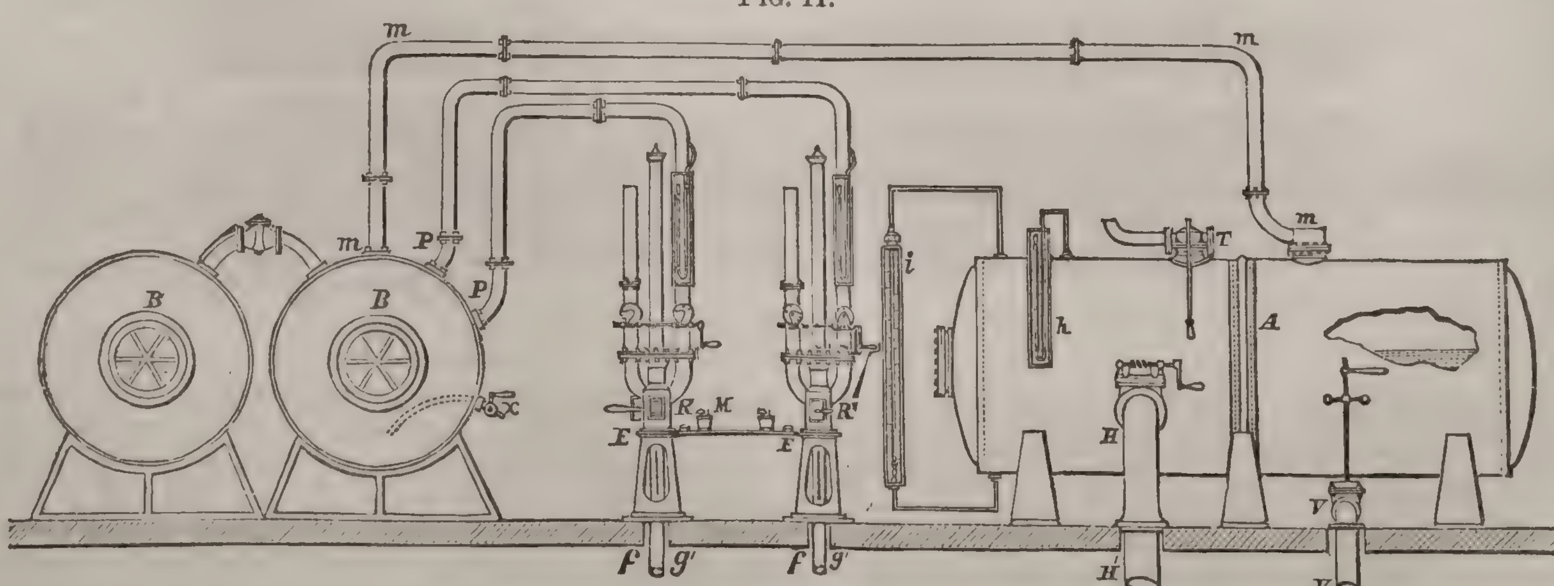
In Paris two kinds of receiving and despatching apparatus, totally different from the above, are in use—the vertical and the horizontal. The latter (Figs. 8 and 9) is only used at stations where there is sufficient room; it offers some advantages not possessed by the vertical arrangement; viz. the train can be stopped, the lid opened, and only such carriers be removed as are intended for the station; when this is done, the cover is put on again, the air-taps turned, and the train moves on. The horizontal receiver consists of a conical box H mounted on a cast-iron plate S. The train arrives in the box H; the lever D is moved and releases the cover, which is lifted off, and the train is open to view, and may be removed, or the box is closed again, the tap M moved, and the train sent on. For despatch, the carriers are introduced through the opening F, which is uncovered by moving the lever *m*. The apparatus is provided with a pressure-gauge (A). The valve P is to facilitate examination in case of stoppage. Fig. 10 shows the interior of a station at Paris fitted with *vertical* receiving apparatus; the huge cylinders seen in the cut are the air or vacuum reservoirs.

Fig. 10.



We come now to the motive-power. Various ways are employed to obtain both a vacuum and a plenum. In the new post-office, St. Martin's le Grand, London, three fine 50-horse compound beam-engines produce the required power for the thirty-four lines existing. Each has a high-pressure cylinder, 17″ in diameter, 4′ 1½″ stroke, the low-pressure cylinder being 25½″ in diameter, with a stroke 5′ 6″ long. Steam is supplied by four multitubular Lancashire boilers, 6′ 6″ in diameter, 20′ 2″ long, with two internal flues 2′ 6″ in diameter, 14′ 6″ long, terminating in seventy-four tubes 3″ in diameter, 5′ 9″ long. These en-

Fig. 11.



gines have each a compressing and vacuum pump of suitable size, connected with storage reservoirs from which the supply is drawn when wanted. No doubt this provision is also intended to supply future wants. In Paris water is the chief source of motive-power. There it is employed in many ways, the simplest being that of displacement—viz. having a vessel of sufficient capacity with air-tight valves connected with the water-mains. If, now, all air-outlets be closed, and the water in the lower part of the reservoir be turned on, the water will continue to flow in, and leave less and less room for the original quantity of air, which thus becomes confined, and consequently compressed, until of the same pressure as the water, when the one will balance the other and the flow of the latter cease. The water may now be turned off, or may be left on to urge still further the outflow after the proper valves have been opened. If the air is all expended, the water must be drawn off before a fresh supply of air can be compressed.* If this compressing apparatus is sufficiently elevated above the level where the water is to be finally discharged, that head of water may again be utilized for producing a partial vacuum; and this is done in Paris. These are the more simple arrangements in use there, and it will be seen that there are no moving parts about the whole arrangement; but turbines are also used to supply motive-power to exhaust and compression pumps. Even the injector or induced-current principle is turned to account, and several stations receive their power by means of these contrivances, worked by water. Steam is there used in only a very few instances, water costing something under 3*d.* per 1000 gallons.† The working pressure is about eight or nine pounds per square inch; that in England is much higher, attaining a vacuum of about eight pounds and a pressure of 30 to 40 pounds.

According to *Engineering*, the cost of the Paris establishment is about £965 per mile of line, and per station £600. This gives a capital of

39 lines	= £37,700
33 stations	19,800
	£57,500

The total working expenses per annum are—

Water	£16,850
Sinking fund	5,750
Station expenses	4,620
Maintenance, inspection	1,584
Employés	21,912
	£50,716
	7,150
Extraordinary	£57,866

There are sent 15,000 communications per day, averaging 267 per train; these at 4*d.* each would make £91,250 per annum, or a surplus of £33,348 per annum. In England the expenses are much less than the above.

Besides Paris and London, pneumatic despatch arrangements are in full operation in Berlin, Manchester, Liverpool, Birmingham, Glasgow, Dublin, and other large cities. WILLIAM E. A. AXON.

Pneumatic Trough or **Cistern,** an apparatus for collecting and preserving samples of different gases in the laboratory and chemical lecture-room. It was the invention of Dr. Joseph Priestley, the discoverer of oxygen gas, whose advances were so great in the department of science which relates to gases that he has been called the "father of pneumatic chemistry." The pneumatic trough consists of a vessel of water, with a shelf situated an inch or two beneath the surface of the water. This shelf often slides in grooves. It is sometimes perforated with holes. To collect a sample of a gas, a jar or bell is inverted under the water in the cistern, thus becoming filled with water. It is then turned mouth downward while beneath the water. If then raised vertically with proper care and placed on the shelf, it of course remains full of water, kept there by the atmospheric pressure. The tube conducting the gas is then brought up through one of the holes under the jar, or the jar may stand projecting a little over the edge of the shelf and the tube brought under it, so that the gas may bubble up and displace the water. The pneumatic trough was the first step toward the invention of our present gas-holders for illuminating gas. H. WURTZ.

Pneumogas'tric Nerve [Gr. πνεύμων, a "lung," and γαστήρ, "stomach"], so-called from its distribution to the lungs and stomach. It is the tenth cerebral nerve, though, physiologically speaking, it is a true spinal nerve. Its nucleus of origin is a mass of ganglion-cells lying deep in the posterior part of the medulla oblongata, in the floor of the fourth ventricle, and its fibres escape from the side of the medulla. It issues from the skull by the jugular foramens, at which point there is a ganglionic enlargement of the nerve. It then descends with the carotid artery to the chest, and after entering the thorax lies upon the œsophagus. Upon the lower part of the œsophagus the two nerves conjoin, pass through the diaphragm, and are distributed to the stomach and solar plexus. At the level of the jugular foramen the pneumogastric is joined by branches from motor nerves—the facial, hypoglossal, spinal accessory, etc. The branches of the pneumogastric are sent to the pharynx, to the larynx (superior laryngeal nerve, which is sensory, inferior laryngeal, which is motor), to the heart, lungs, œsophagus, and stomach. From its origin to its ganglion (analogous to posterior root of spinal nerves) the pneumogastric nerve is purely sensory, and its most important function—viz. the regulation of breathing by the transmission of sensations through its pulmonary branches to the medulla (centre of respiration)—is performed by that property. Below the ganglion it is a mixed nerve. The motor properties of the inferior laryngeal (actions of breathing and voice) are derived chiefly from the branch of the spinal accessory nerve, and the pharyngeal branch derives its motor power from the nerves which join the pneumogastric below the ganglion. The action of the pneumogastric on the heart (through cardiac branches and cardiac plexus) is checking or inhibitory, paralysis of the pneumogastric producing excessive rapidity of the heart's action (and slow respiration), while irritation of the nerve stops the cardiac movements. The movements of the œsophagus and stomach are under the control of the motor fibres of the pneumogastric.

E. C. SEGUIN.

Pneumo'nia [Gr. πνεύμων; pl. πνεύμονες, "the lungs"], inflammation of the lung, of the lining of the air-sacs, and of the interstitial framework of the lung. Pneumonia more recently has been classified into (1) catarrhal pneumonia, when only the air-sacs are involved, filled with products of catarrhal inflammation, extending from the bronchial tubes; (2) croupous pneumonia, where the air-sacs are filled with solid lymph exuded from their inflamed walls; (3) interstitial pneumonia, a slow and chronic inflammatory infiltration and consolidation of the fibrous structures which surround the air-sacs and minute bronchial tubes. But pneumonia, as commonly termed in England and this country, consists of the croupous form only, an inflammation of the air-sacs, which are the functional elements of the lung for the oxygenation of the blood and the liberation of carbonic acid gas. Pneumonia is usually confined to one lung, rarely is double. It is further designated as "vesicular pneumonia," as the air-sacs or vesicles are involved, and as "lobar pneumonia," one lobe only frequently inflamed, or the disease attacking the lobes successively. Primary pneumonia in healthy persons occurs more often in the right lung, beginning, as a rule, at the base of the lung and progressing upward toward the apex. In old and feeble persons it may begin at the apex, but pneumonia when local or commencing at the apex is usually secondary to tubercle in the lung, deposits by broncho-pneumonia or former plastic pleurisy. Pneumonia is a disease chiefly of adults, and more often of males. It results from catching cold, fatigue, impoverished condition of the blood, the congestions and perverted blood-states of acute and malignant febrile diseases. It is announced by a heavy chill, high fever, rapid respiration, frequent pulse, flushed cheek—on the side of the affected lung; in severe cases by delirium and symptoms of a typhoid nature. There is acute pain in the side, due to congestion of the pleura, and a duller, heavier pain or soreness of the side, with sense of weight, due to excess of blood and the solid products of inflammation in the lung. There is cough, with expectoration of mucus tinged with blood or rust-colored; and in grave cases brownish or dark sputa, resembling tobacco-juice or prune-juice, and indicative of a decomposed state of the blood, and the exuded elements filling the vesicles. The contents of the vesicles are gradually softened and expectorated, and the lung restored to its normal state. Acute pneumonia of adults, although grave in its symptoms, is usually recovered from, and, contrary to popular apprehension, seldom leads to subsequent consumption. Pneumonia, so called, in children is usually acute catarrhal inflammation of the minute bronchial tubes and air-sacs, occurring in one or many lobules of both lungs. It is liable to leave portions of lung-substance inactive, collapsed, or consolidated, and develop the catarrhal form of phthisis. Pneumonia is variously treated. Locally, cold water and ice-bags may abort or limit the inflammation

* In Fig. 11 is represented such an arrangement. A is the water-reservoir or compressor; H the valve for the admission of the water through the pipe H′; B B are air-storage reservoirs; *m* the supply-pipes from the compressor; P P the connecting pipes with the vertical receiving apparatus E E, through the opening R R of which the carrier is removed after having arrived by the lines *f g′*; *h* and *i* are pressure water-gauges; *v* and R the let-off valves and pipe.

† The cost for water per mile amounts to 4.3*d.*, and the cost per each complete tour of a train 197.8*d.*, or per day of fourteen hours and four trains per hour = 56 × 197.8*d.* = £46 3*s.*

at its commencement. When established, warm applications, as poultices, warm anodyne fomentations, cotton-batting, and oil silk afford the greatest comfort and favor resolution and removal of the exudation from the air-sacs. Carbonate and muriate of ammonia as diffusive stimulants and to liquefy the exuded lymph, calisaya bark or quinine, mild alcoholic stimulation, and rich liquid diet to sustain strength, veratrum viride to control the heart and lessen pulmonary congestion, are the most approved and successful agents.

E. Darwin Hudson, Jr. Revised by Willard Parker.

Po [Lat. *Padus*, or, poetically, *Eridanus;* Gr. Ἠριδανός], the largest and most important river of Italy. A rivulet rising on the E. flank of Monte Viso, in lat. 44° 30′, at the height of 6560 feet above the sea, though neither the longest nor the most copious of the streams which unite to form the upper course of the river, is popularly regarded as the true Po, and takes that name at its very source. It flows N. E., receiving many affluents in its course, till its junction with the Dora Baltea near Chivasso. From this point its general direction, though with many sinuosities, is a little S. of E. to the Adriatic, into which it discharges by several mouths in about lat. 44° 30′. The total length of the Po, in a right line, is 260 miles, or, measured by its own channel, 360 miles. In the first 20 miles of its course it descends 5300 feet to a point near Revello, at the height of 1260 feet above the sea; and here, though it has now grown to a large stream, its bed is sometimes left dry for a considerable distance, the entire superficial current being evaporated, absorbed by the sands, or diverted for irrigation. It bursts out again with an increased temperature, which it does not wholly lose afterward, for it rarely if ever freezes, while the Arno at Florence, a degree and a quarter farther S., and more than 1000 feet lower, is often covered with ice. At Valenza, about one-third of the whole distance from its source to its outlet, it reaches the level of some 600 feet above the sea, and from this point it flows chiefly through its own alluvion to the Adriatic. The width of the Po is about 525 feet at Turin; 870 at the great bridge of Mazzana Corti, not far from Pavia; and 750 at Ponte Lagoscuro, near Ferrara, where it is crossed by its last bridge. At other points its width, the level of its surface, and of course its depth, are extremely variable, partly because, from its erosion of its banks on the one hand and the deposit of sediment brought down by torrents into its channel on the other, its bed is constantly widening or narrowing, as well as shifting, and partly because, except in extreme droughts or excessive cold, more or fewer of its many affluents are almost always at flood. These tributaries differ greatly in volume as well as in the solid matter they transport, and their partial inundations so variously affect the main trunk that the river-guards on the lower course of the Po profess to be able to distinguish, by the color and consistence of the balls of foam, the appearance of discolored threads of water in the current, and the character of the rubbish floated down, to what particular affluent any sudden rise of the river is to be ascribed. From Valenza to its mouth the Po is navigable for vessels of 130 tons, but steamers are not used on its waters; and as most of the transport which would otherwise be carried on by means of its channel is now effected by railway, the river has lost much of its relative importance as a route for personal travel and commercial communication.

The Po is diked continuously from near Cremona to the marshes at its outlet. The levees do not follow the smaller windings of the river, but, for the sake of saving distance and for other reasons of convenience, often diverge from it so widely as to leave a space of even miles between them. An embankment running along the margin of the channel is called *argine a froldo*, or simply *froldo*. When it recedes sensibly from the river it is called *argine a golena*. The *golene*, or spaces between the levee and the channel, are frequently protected by low dikes and cultivated, but in every considerable rise of the river the *piarde*, or natural banks, are overflowed, and a greater or less extent of the *golene* submerged. The levees are not often burst by erosion or by simple pressure, because the vigilance of the people and the official guardians of the river usually applies proper defences at threatened points in time. Crevasses are more frequently occasioned by the holes of burrowing animals, by the digging of wells near the dikes, and other purely accidental circumstances, and terribly destructive inundations are often caused by them. The prevention of the lateral spread of the water in floods by levees occasions the deposit of sediment in the channel, and consequently an elevation of the bed, which requires the embankments to be raised proportionally; but this effect in the case of the Po is by no means so considerable as has been often represented. Lombardini has shown that in the *middle* lower course of the Po the bed of the proper low-water channel of the river is subject to so little permanent change of level that it may be regarded as having now become substantially constant. But this conclusion, though, as we believe, sound, is not universally accepted by engineers; and besides, admitting that there is no elevation of this narrow bed by deposit, yet the surface of the *golene* is constantly rising from the sediment let fall whenever they are flooded. Hence, the effective capacity of the whole channel is diminishing, and in inundations the water conveyed by it must rise higher in proportion. It must further be observed that from the continued prolongation of the delta of the river by deposits at its mouth the inclination of its last reaches is gradually diminishing, and hence the velocity of the current is checked for a considerable distance up stream, and of course the level of its surface raised in proportion.

There is still another circumstance which has an important bearing on this point. Although there is probably little *permanent* elevation of the bed for a considerable part of the lower course of the Po, yet in floods the first waters it receives are from tributaries of a torrential character, very heavily charged with sediment. This is almost immediately let fall in large proportion near and below the confluence of these torrents with the main stream, and they must inevitably *temporarily* raise the bed of the river, and of course the level of its surface. These deposits, however, are very soon swept out and the bed restored to its normal level by the vast influx of *clear* water delivered into the channel of the Po by the emissaries of the Alpine lakes, which arrive at a later stage of the flood, and after the torrential affluents have mainly done their work. We must allude to another element in the physical geography of the lower Po hitherto little noticed. It has long been known that the coast of the Adriatic at and near the outlets of the Po is slowly sinking. If the depression is confined to the coast-line and its vicinity, it must increase the inclination of the bed of the lower Po, and of course tend to counteract many of the influences we have noticed. But we are ignorant whether it may not extend a greater or less distance into the interior, and thus compensate effects it would otherwise produce.

The Po drains the S. slope of the great chain of the Alps lying W. of the valley of the Adige, the E. slope of the Italo-French Alps, and the N. scarp of the Apennines W. of the valley of the Reno. The boundary of its basin crosses the summits of Monte Rosa, Monte Cervino or the Matterhorn, and Mont Blanc on the N.; of Monte Viso on the W.; and its S. limit, the watershed of the Apennines, at some points near the Gulf of Genoa, approaches within 5 miles of the Mediterranean. The basin of the Po lies wholly within the kingdom of Italy, with the exception of a portion of its N. and N. E. territory, belonging to Switzerland and to Austria, and comprising the valleys of the Maggia, the upper Ticino, Maira, and Chiese, the Sarca, and some other less important streams. Its drainage-area, down to the mouth of the lowest tributary, which empties into its channel near Ferrara, is computed at about 27,000 sq. m., of which Italian geographers class 16,000 as mountain, 11,000 as plain lands.

A striking and important feature of the hydrography of this basin is the existence of a chain of lakes lying at the foot of the Alps, between lat. 44° 30′ and 45° 30′, extending E. and W. about 150 miles, and with a total area of more than 300 sq. m. These lakes serve as basins of reception for the water and the sediment brought down by many torrents, greatly retarding the flow of the water into the Po, and retaining the whole of the vast quantity of sedimentary matter with which these torrents are charged. The Po receives not less than four-tenths of its volume from the lakes, and of course that proportion of its waters is thus detained and purified. The Lago di Garda, the longest of this chain, which drains only a narrow valley, is indeed subject to little change of level, but Lago Maggiore and the Lake of Como sometimes rise more than 25 feet in twenty-four hours. In the inundation of Sept., 1829, the single Lake of Como received, during a period of five days, an influx of 2600 cubic yards to the second, which is about equal to the mean discharge of the Po; and as the efflux was but about 1000 cubic yards to the second, it accumulated in those five days a surplus of 670,000,000 cubic yards of water, which was gradually drawn off by its natural channel. Still more signal services were rendered by these lakes in the great floods of 1839, 1868, and 1872. Had such stupendous volumes of water, sand, and gravel been precipitated into the channel of the Po, as but for the lakes they must have been, the entire plain of Lombardy would have been deluged and laid waste several times in the course of a single century.

The delivery of the Po is vaguely calculated to be equal to from two-thirds to three-fourths of the total precipitation upon the basin; but as, from the want of sufficient pluviometrical observations in the mountain-lands, we

know next to nothing of the actual rainfall in those regions, this estimate is entitled to very little confidence. The mean discharge into the Adriatic, as deduced from daily measurements for fourteen years, is 1720 cubic mètres, or 60,745 cubic feet, to the second, which appears to differ little from the delivery of the Rhone and of the Rhine, and equals six-tenths of the mean volume of the Nile, and about one-eleventh of that of the Mississippi. The smallest measured discharge of the Po is 7558 cubic feet, the largest, 181,580; but in the inundation of Oct., 1872, the amount must have been greater by at least 40,000 cubic feet to the second. Its waters are usually at their lowest stage twice in the year, about the summer and winter solstices, at their highest in May and October, but there are occasional exceptions. There has been a constant increase in the height of the floods of the Po for the last three centuries. This is partly explained by the permanent elevation of some portions of the channel of the river, and the temporary rise of other portions from sedimentary deposit, and by the general strengthening of the levees in modern times, whence crevasses allowing the escape of great volumes of water are less frequent, but chiefly by the more rapid drainage of the uplands in consequence of the felling of the woods and other "improvements." From original formation, and from a general rise of the bed of the Po at a remote period, the *piarde*, or natural banks, are relatively low. Hence, the adjacent plains, not being gradually raised by flood deposits like the borders of undiked streams, are not much higher than the river-bed. Consequently, the *golene*—and, in case of a breach in the levee, the adjacent plains also—are overflowed upon every considerable rise of the river, and its waters thus acquire space for a great lateral expansion, which serves as a basin of reception, and they do not rise so high as they would in a more confined channel. The difference of level between *ordinary* low water and the highest known, that of the inundation of Oct., 1872, did not exceed 28 feet at Artiglia, the *ventre* of the floods, or point where they are highest, though it is believed that the water would have risen another foot but for a great crevasse on the right bank of the river, which served as a safety-valve and drew it off. On the whole, the scale of variation of level from the lowest to the highest known stage may be taken at not far from 35 feet.

Besides its vast discharge proportionally to the extent of its basin, the enormous amount of mineral matter ground down to fine silt deposited by its waters at and near its outlet—a consequence of the fact that most of its tributaries are mountain-torrents—is a very extraordinary feature in the physical character of the Po. In floods this is calculated to equal $\frac{1}{300}$th part of the total delivery in *volume*, or almost ten times the mean proportion of solid matter borne down by the Mississippi. It is computed to amount to 55,000,000 cubic yards per annum on the average, and in the single flood of 1839–40, which lasted three months, the Po is asserted to have let fall at its mouth nearly three times that quantity. The deposit extends the delta of the Po into the Adriatic at a rate of advance not greatly inferior to that of the Mississippi, or more than 200 feet per year, though the lateral spread of the sediment is less than at the mouth of the great American river. The total alluvion of the Po and its tributaries, from the earliest to the present age, appears to be little inferior to that of the Nile below the N. boundary of Nubia.

It is perhaps superfluous to add that very many of our numerical data respecting the Po, though derived from the best-known sources, are subject to uncertainty, and that our quantitative estimates in general require verification.

The hydrography of the lower course of the Po, as well as of many of its more important affluents, has been studied with extreme care for many centuries, and the highest theoretical science and practical engineering skill has been brought to bear upon it; but, for reasons which cannot here be stated, the existing knowledge respecting this river is far from complete, and it has not yet been collected and co-ordinated. Of the Po, therefore, as a whole, there exists no monograph at all approaching the remarkable studies of Gens. Humphreys and Abbot on the Mississippi. In that volume the reader will find much additional information upon the Po, and we refer further to the articles ITALY, by PROF. BOCCARDO, and LEVEE, by G. W. R. BAILEY, in this CYCLOPÆDIA; to the article "Po" in the great chorographical dictionary *Italia*, and especially to the numerous essays of the eminent Milanese engineer Lombardini on fluviatile hydrography, among which we particularize his *Guida allo Studio dell' Idrologia* (1 vol. 8vo). A board of engineers has just submitted to the government of Italy a plan for improving, regulating, and partially reconstructing the entire chain of dikes on both banks of the Po, as a national work. GEORGE P. MARSH.

Poaching and Poachers. See GAME LAWS, by PROF. GEORGE CHASE, LL.B.

Pocahon'tas, county in Central Iowa. Area, 576 sq. m. It is a very fertile, rolling prairie-region, finely adapted to wheat and corn culture. It is traversed by Iowa Falls and Sioux City R. R. Cap. Rolfe. P. 1446.

Pocahontas, county of West Virginia. Area, 830 sq. m. It is mountainous, with fertile plateaus and valleys. Wool is an important product. Coal, saltpetre, and superior iron ore are found. Mineral springs are numerous. Cap. Huntersville. P. 4069.

Pocahontas, p.-v., cap. of Randolph co., Ark., at the head of navigation on Black River, 100 miles W. of Memphis, has 2 weekly newspapers and is a shipping-centre for cotton, grain, and live-stock.

Pocahontas, p.-v. and tp., Bond co., Ill., on St. Louis Vandalia and Terre Haute R. R. P. 1535.

Pocahontas, p.-v., Hardeman co., Tenn. P. 225.

Pocahontas, daughter of Powhatan, a powerful Indian chief of Virginia, was b. about 1595. According to the *True Relation* of Capt. John Smith, she in 1607 rescued the latter from death by throwing herself beneath the uplifted war-club and successfully entreating her father to spare the prisoner's life. The truth of this narrative is doubted. The rescue, according to Smith's narrative, took place at Werowocomoco (now Shelly), Gloucester co., Va., near the junction of Carter's Creek and York River. In 1609 she visited Smith with news of an intended Indian attack, and she several times supplied the hungry colonists with corn. In 1612 the chief Japazaws sold her to Argall for a copper pot, and her father offered a ransom of 500 bushels of corn; but in 1613 she married Thomas Rolfe, afterward secretary and recorder-general of Virginia. She was baptized as Rebecca, went to London, and was presented at court. King James, it is said, blamed Rolfe severely for marrying an emperor's daughter without his consent. D. at Gravesend, England, Mar., 1617, leaving a son, Thomas Rolfe, from whom the Randolphs, Eldredges, Murrays, Bollings, Guys, Hemmings, and other leading families of Virginia trace their descent.

Pocatal'ico, p.-v. and tp., Kanawha co., West Va., on Pocatalico River. P. 1597.

Pock'et, tp., Moore co., N. C. P. 1362.

Po'cock (EDWARD), D. D., the foremost of English Orientalists, b. Nov. 8, 1604, at Oxford, where he graduated in 1622; was fellow in 1628; Laud professor of Arabic from 1636; regius professor of Hebrew and canon of Christ Church from 1648; received the degree of D. D. in 1660. D. Sept. 10, 1691. His life was one of many vicissitudes. From 1630 to 1636 he was chaplain to the English factory at Aleppo, Syria, where it was said of him, "This young man speaks and understands Arabic as well as the mufti of Aleppo." He returned to Oxford in 1636 to take the professorship of Arabic, then just founded by Archbishop Laud. After giving one course of lectures he went back to the Orient, and was in Constantinople from 1637 to 1640, collecting manuscripts and coins and ardently pursuing his favorite studies. When he returned to England in 1640 his patron was a prisoner of state in the Tower, and was afterward executed, Jan. 10, 1645. In 1643 his college gave him the living of Childrey in Berkshire, about 12 miles from Oxford. A staunch though not intemperate loyalist, he would have lost his professorships in the time of Cromwell but for the remonstrances of John Owen and John Selden. The restoration of Charles II. in 1660 multiplied and secured his honors. He published, besides other works, *Version from the Syriac and Notes on the Epistles of 2 Peter, 2 and 3 John, and Jude*, omitted in the Peshito (1630), *Specimen Historiæ Arabum* (1648), *Porta Mosis* (1655), *Annals of Eutychius* (1658), *Arabic Version of Grotius de Veritate* (1660), *Abulfaragius Historia Dynastiarum* (1663), and English *Commentaries* on Micah (1677), Malachi (1677), Hosea (1685), and Joel (1691). He also rendered important assistance in the editing of *Walton's Polyglott* (1657). (See his *Works* and *Life*, in 2 vols., by Leonard Twells, London, 1740.)—Of his nine children, two sons, EDWARD and THOMAS, were authors in the same line. R. D. HITCHCOCK.

Po'cocke (RICHARD), LL.D., the Oriental traveller, distantly related to the preceding, was b. at Southampton, Eng., in 1704; graduated at Oxford in 1731; took the degree of LL.D. in 1733; travelled in the East 1737–42; published his *Description of the East and some other Countries* (2 vols. fol., with 178 plates) in 1743–45; was made archdeacon of Dublin in 1745, bishop of Ossory in 1756, and in 1765 bishop of Meath, where he d. suddenly of apoplexy in September of that year. He was the author of some papers in the *Philosophical Transactions* and in the *Archæologia*, but his fame rests upon his work on Palestine, which Robinson pronounces "one of the most important,"

although he knew but little Arabic and his scholarship was more classical than biblical. R. D. HITCHCOCK.

Po'comoke River rises in the Cypress Swamp of Sussex co., Del., flows 60 miles S. and S. W., mostly in Maryland, to Chesapeake Bay. The tide ascends 22 miles, and it is navigable 20 miles, to Snow Hill, Md.

Pocono, p.-v. and tp., Monroe co., Pa. P. 1119.

Pocopson, tp., Chester co., Pa., on Brandywine Creek. P. 573.

Poc'oson, tp., York co., Va. P. 1710.

Pocotal'go, tp., Beaufort co., S. C. P. 605.

Podes'tà [Lat. *potestas*, "power"], an inferior police justice in Italian cities. The name was formerly applied to the chief magistrate of Italian towns, appointed in troubled times with full dictatorial powers. He was usually a stranger to all the local factions, appointed for a term of years, but he sometimes became a permanent despotic ruler. The name was probably first given to the German magistrates whom Frederick Barbarossa appointed over the Lombard cities.

Podgorit'za, town of European Turkey, eyalet of Room-Elee, near Montenegro, is fortified. P. 6000.

Podicip'idæ [from *Podiceps*, *podex*, the "rump," and *pes*, "a foot"], a family of swimming birds including the grebes. The body is somewhat duck-like; the neck moderate; the bill rather short, straight, compressed, and with the culmen decurved toward the tip, which is acute and entire; the nostrils oblong and in a groove near the base of the bill; the wings short, but pointed; the tail very small and inconspicuous; the legs appearing far behind (hence the name); the tarsi stout, rather short, and compressed, covered with small scales; the anterior toes with broad lobate margins, the posterior short and high up; claws short and depressed. The family is closely related to the loons (Colymbidæ), with which it has been confounded by some authors. It includes two well-marked genera—(1) *Podiceps* and (2) *Podilymbus*, the former with about thirty species, the latter with three. These are found distributed over almost the entire globe: *Podilymbus*, however, is peculiar to America. The species usually congregate in small flocks near the sea-coast, as well as on the border of inland waters, but are rarely found on land, their form being ill adapted for walking. They are great divers, and feed chiefly on fishes. THEODORE GILL.

Podie'brad (GEORGE), b. Apr. 23, 1420, of a noble and wealthy Bohemian family belonging to the moderate section of the Hussite party; joined the Utraquists after the election of Albert of Austria to the Bohemian throne in 1438, and distinguished himself greatly by compelling Albert to raise the siege of Tabor. As leader of the whole Hussite party, he became governor of Bohemia in 1444, during the minority of Albert's son, Ladislaus the Posthumous, and on the death of Ladislaus he was elected king himself, and crowned at Prague Mar. 2, 1458. It was his great aim to reconcile the Hussites and the Roman Catholics among his subjects, and he acted with wisdom, and not without success. But the pope excommunicated him as a heretic, preached a crusade against him in Germany, incited his son-in-law, Mathias Corvinus, king of Hungary, to attack him, and even instigated his own Roman Catholic subjects to revolt against him. But Podiebrad suppressed the insurrection, routed the German crusaders, defeated the Hungarians several times, and, in order to strengthen the anti-papal and anti-Hungarian party in Bohemia, he induced his countrymen to elect Ladislaus, heir of the Polish crown, as his successor, while his two sons retired into the ranks of the nobility. D. Mar. 22, 1471.

Podo'lia, government of European Russia, bounded W. by Galicia and S. by the Dniester, comprises an area of 16,558 sq. m., with 1,946,761 inhabitants. The surface is mostly level, the soil fertile, and the climate mild. Corn, hemp, flax, hops, and tobacco are grown, and the vine and the mulberry are extensively cultivated. On the excellent pastures large herds of cattle and sheep are reared.

Podophthal'ma [Gr. πούς, ποδός, "foot," ὀφθαλμός, "eye"], a sub-order of the order Rhipidoglossa (class Gasteropoda), characterized by the gills being developed solely on the left side of the branchial cavity, the eyes situated on peduncles, and the body and shell being spiral; it thus contrasts with the Dicranobranchia, and includes the aquatic Trochidæ, Neritidæ, and Haliotidæ, as well as the terrestrial Helicinidæ and related types. THEODORE GILL.

Podophthalmata, an order of crustaceans with the eyes borne generally at the end of more or less elongated movable peduncles, and with a dorsal carapace which extends over the head as well as covers the body, or at least the greatest number of thoracic segments; the feet are, in the typical forms, developed to the number of five pairs, the previous segmental appendages being converted to a greater or less extent into foot-jaws. The order embraces a very large number of species, including all the true crabs, lobsters, crawfishes, shrimps, etc. By recent systematic authors they have been grouped into three orders: Decapoda (including all the forms above mentioned), Schizopoda, and the Stomapoda. THEODORE GILL.

Podophyllum and **Podophylline.** See MAY-APPLE.

Podu'ra [Gr. πούς, ποδός, "foot," and οὐρά, "tail"], a genus of degraded wingless neuropterous insects, found on the surface of stagnant water, on dung-heaps, in hot-beds, and often seen on the snow in winter. They are called "spring-tails" and "snow-fleas," for they can leap a prodigious distance, considering their small size. The short anal bristles are bent under the body, and assist the creature in its leaps. The *Poduræ* are interesting from the fact that their scales are excellent test-objects under the microscope. They belong to a family called Poduridæ.

Poe, tp., Hancock co., West Va. P. 872.

Poe (EDGAR ALLAN), b. at Boston, Mass., Feb. 19, 1809, son of David Poe and Elizabeth Arnold, an English actress, said to have been a natural daughter of Benedict Arnold. His parents, who pursued the vocation of actors, having died in his early childhood, Edgar was adopted by a wealthy citizen of Richmond, Va., Mr. John Allan, by whom he was sent to school at Stoke Newington, near London, England, where he remained until 1822; was prepared for college by private tutors at Richmond; entered the University of Virginia at Charlottesville in 1826; was there distinguished for scholarship, but was expelled within a year, probably on account of addiction to the gaming-table; resided with his benefactor at Richmond two years; went to Baltimore, where he published a pamphlet of 71 pages, *Al Aaraaf, Tamerlane, and Minor Poems* (1829), which contained nothing remarkable and attracted no attention; was admitted a cadet at West Point 1830 through the influence of Chief-Justice Marshall and Gen. Scott, procured by Mr. Allan, but was expelled by sentence of a court-martial for irregular conduct Mar. 6, 1831; published by subscription (his patrons being chiefly cadets) a new edition of his poems, with some additional pieces; again resided some months with Mr. Allan at Richmond, with whom he ultimately quarrelled, when he enlisted as a private soldier in the U. S. army, but did not long remain in that position. In 1833, Poe competed for two prizes of $100 each offered by the publisher of a literary journal at Baltimore, won them both, and in consequence obtained, through Mr. John P. Kennedy, one of the committee of award, the post of editor of the *Southern Literary Messenger* at Richmond, Va. While occupying that position Poe married his cousin, Virginia Clemm, and led for two or three years a life of considerable regularity, devoting himself to study and writing many tales, reviews, essays, and brief poems. Having at length quarrelled with his publisher, Poe removed to New York Jan., 1837; earned a precarious living for a year by writing occasional articles in several papers; published in 1838 his first prose volume, *The Narrative of Arthur Gordon Pym*; went to Philadelphia; was editor of Burton's *Gentleman's Magazine* from May, 1839, to June, 1840, and of *Graham's Magazine* from Nov., 1840, to about Apr., 1842; published *Tales of the Grotesque and Arabesque* (2 vols., Philadelphia, 1840); gained a prize of $100 offered by the *Dollar Newspaper* in 1843, with his tale, *The Gold Bug*; removed to New York in the autumn of 1844, where the appearance of his best-known production, *The Raven*, in Colton's *Whig Review* for Feb., 1845, gained him a wide reputation, and procured him the post of sub-editor on Willis and Morris's *Home Journal*, where, according to the testimony of Mr. Willis, he conducted himself with strict propriety; was associated with Mr. C. F. Briggs in the management of the *Broadway Journal* 1845–46; contributed to Godey's *Lady's Book*, May to July, 1846, the biographical and critical sketches entitled *The Literati of New York City*; resided about this time in a cottage at Fordham, Westchester co., and fell into such poverty that an appeal to public charity in his behalf was made by N. P. Willis in the *Home Journal*; lost his wife, who had clung to him with fond devotion, in Jan., 1848; delivered at the Society Library, Feb., 1848, a lecture, published soon after under the title *Eureka, a Prose Poem*, which comprised a novel and ingenious system of cosmogony; was engaged about this time to an accomplished New England lady, but the engagement was soon terminated; went to Richmond, Va., in the summer of 1849; was there engaged to a lady of fortune, one of his early friends, and having appointed the day for the wedding, started for New York Oct. 2, to make preparations for that event; became in-

toxicated; was attacked with delirium in the streets of Baltimore; was conveyed to the Baltimore Hospital, and there d. Oct. 7, 1849. A monument to his memory was erected in the Westminster churchyard, Baltimore, Oct., 1875, by a subscription raised by the school-teachers of that city. The works of Poe have been repeatedly republished since his death, both in the U. S. and in England, where they are perhaps better known than in America, and have attained an immense popularity in a French translation. They were first edited in New York (4 vols., 1850) by Poe's "literary executor," Rufus Wilmot Griswold, who prefixed a defamatory *Memoir*, many of the allegations of which have been successfully refuted by later biographers, such as Mrs. Sarah Helen Whitman in her *Edgar A. Poe and his Critics* (1860), John H. Ingram in a *Memoir* prefixed to Poe's *Works* (Edinburgh, 1874), and Richard Henry Stoddard in a memoir accompanying a new edition of the *Poems* (New York and London, 1875). A more elaborate biography will probably soon appear, and is fully warranted by the untiring popular interest in the mysterious character and career of one of the most remarkable of American authors. PORTER C. BLISS.

Poe (ORLANDO M.), b. in Ohio Mar., 1832; graduated at the U. S. Military Academy, and entered the topographical engineers July, 1856; major 1867; engaged upon lake survey duty until the outbreak of civil war in 1861, when, after serving as chief engineer department of the Ohio and on the staff of Gen. McClellan, he was (Sept., 1861) appointed colonel of the 2d Michigan Vols., and served with the Army of the Potomac until Dec., 1862, having been appointed brigadier-general Nov. 29, 1862; subsequently served in his engineering capacity as chief engineer 23d corps, Army of the Ohio; as chief engineer of Gen. Sherman's army in the invasion of Georgia, the march to the sea, and through the Carolinas, terminating in the surrender of Johnston's army at Durham Station, gaining the successive brevets from major to brigadier-general for "gallant" and "meritorious" services. Returning to duty with the corps of engineers at the close of the war, he was (1865–70) engineer secretary of the U. S. lighthouse board; in 1870–73 constructed the lighthouse on Spectacle Reef, Lake Huron. (See LIGHTHOUSE CONSTRUCTION.) In 1873 appointed aide-de-camp on the staff of the general of the army, and 1874 a member of the lighthouse board.

Poe'rio (ALESSANDRO), b. at Naples in 1802; was banished when scarcely thirteen years old, and on his return the sentence was renewed in 1821. He passed the time of his exile in Germany, France, and England, and in 1835 returned to his own country and commenced the practice of law; in 1843 published at Paris some anonymous verses full of patriotic fire; in 1848 hastened to the defence of Venice, was mortally wounded at Mestre, and d. invoking blessings on his country. A second and enlarged edition of his poems was published in Florence in 1852, with a *Life* of the author written by Mariano d'Ayala.

Poerio (CARLO), b. at Naples in Apr., 1803; took a most active part in the Neapolitan movements in 1848; was director of the police, and afterward minister of public instruction. On the re-establishment of the Bourbon tyranny, having refused to fly, he was arrested and imprisoned with many liberals, and finally condemned to hard labor. The sufferings of Poerio and his companions in the prisons of Naples were proclaimed to all Europe by Gladstone in his famous letter to Lord Aberdeen. Being liberated in 1858, Poerio retired to Turin, where he contributed by his influence to bring about the annexation of Naples to Piedmont. He was afterward elected deputy to the Italian Parliament, and became one of its vice-presidents in 1861. D. in Florence Apr. 28, 1867.

Poes'tenkill, p.-v. and tp., Rensselaer co., N. Y. P. 1769.

Po'et-Lau'reate, a title once bestowed at universities and by sovereigns at various courts, and so named, it would appear, from the tradition that Horace and Virgil were crowned with laurel in the Roman Capitol. In 1341, Petrarch was crowned poet-laureate, and this has been called the first instance of the title. Tasso died the day before his proposed coronation. Bernardino Perfetti in 1775, and a lady, Signora Morelli (Corilla), in 1776, both improvisators, received the title. Court-poets had long been employed in England, but it is believed that John Kay or Caius, appointed by Edward IV., was the first to receive the title. Skelton, who had been made poet-laureate by both universities, was probably court-poet also. In 1512, Robert Whittington was made poet-laureate by Oxford. This is the last instance of the degree at an English university. The name of Andrew Bernard seems to be the second on the list of court poets-laureate, for there is no proof that Bracton or Scogan, much less that Chaucer, ever bore the title. Spenser, Daniel, and Drayton are sometimes called poets-laureate, but they probably never were officially so called. The regular succession of English court poets-laureate is as follows: Ben Jonson (1630–37), Davenant (1638–68), Dryden (1670–89), Shadwell (1689–92), N. Tate (1693–1714), N. Rowe (1714–18), Eusden (1719–30), Cibber (1730–57), W. Whitehead (1758–85), T. Warton (1785–90), H. J. Pye (1790–1813), Southey (1813–43), Wordsworth (1843–50), and Tennyson (since 1850). The yearly fee of the poet-laureate was formerly £100 and a tierce of canary wine, but since 1813 the wine has been commuted for money.

Po'etry [from the Gr. ποιεῖν, to "make," to "create"] is used in a double sense—the one, especially English, nearly synonymous with "verse," and forming the opposite to "prose;" the other, descending from the Greek literature, denoting all creations of the imagination irrespective of their form, verse or prose, literature or art, and forming a correlative to "science." The former sense has fallen almost entirely out of use in the literature of continental Europe; the latter was not introduced into English literature until very recently, but is gaining ground rapidly. (For more detailed information see DRAMA, EPIC POETRY, LYRIC POETRY, FINE ARTS, etc.)

Poey (FELIPE), b. in Havana, Cuba, in 1802, is of French descent; studied in Madrid, devoting himself especially to natural history; fled to Paris in consequence of having been involved in a political conspiracy; took part in the foundation of the French Entomological Society; published *La Centurie des Lepidoptères* (1828); went to Havana 1830; organized the Museum of Natural History in that city 1837; became professor of natural history in the University of Havana; published a school geography of Cuba (1840), *Geografia Universal* (1842), *Memorias sobre la Historia natural de la Isla de Cuba* (Havana, 2 vols. 4to, 1864), the text being in Spanish, French, and Latin; and commenced in 1865 the publication of a scientific monthly periodical entitled *Repertorio fisico-natural de la Isla de Cuba*, in which he has described 230 new species of fishes. He is a member of the Smithsonian Institution and of the French Academy of Sciences, and author of poems which have been highly commended.—His son, ANDRÉS POEY, b. at Havana in 1837, has taken high rank as a meteorologist, was for several years director of the physico-meteorological observatory at Havana; author of many French publications on meteorology; published a new classification of clouds in the *Report* of the Smithsonian Institution for 1870; is, like his father, a member of the French Academy of Sciences, and commenced in 1875 the publication of *La Bibliothèque positiviste*, as an exponent of the positive philosophy of Auguste Comte.

Pog'gendorff (JOHANN CHRISTIAN), b. at Hamburg, Germany, Dec. 29, 1796; was educated at the University of Berlin, where he became professor of physics in 1834; attained great distinction as an observer of magnetic and electrical phenomena; published a *Treatise on Voltaic Electricity* (1821), and in 1824 became editor of the renowned *Annalen der Physik und Chemie*, and with Liebig edited the *Wörterbuch der Chemie;* has written important works on biography and on the literature of the physical and mathematical sciences.

Poggibon'si, town of Italy, province of Siena, about 25 miles S. of Florence, to whose territory it generally belonged during the Middle Ages. It is now a place of little industry or energy. P. 7760.

Pog'gio Renati'co, town of Italy, province of Ferrara, formerly belonging to Bologna, and fortified as a frontier town. P. in 1874, 5500.

Pogodin (MIKHAIL PETROVITCH), b. at Moscow Nov. 22, 1800; was professor in history at the university of his native city from 1828 to 1844; undertook for archæological purposes extensive travels in Russia; published his *Lectures on the History of Russia* (7 vols., St. Petersburg, 1846–54), besides several other works, and developed great activity as editor and translator. His *Political Letters*, in which he advocated panslavism, made a great sensation and were translated into German in 1860.

Poin'dexter (GEORGE), b. in 1779 in Louisa co., Va.; became a lawyer; removed in 1802 to Mississippi; was chosen attorney-general of Mississippi 1803; delegate in Congress 1807–13; a U. S. judge 1813–17; in Congress 1817–19, where his brilliant and effectual defence of Jackson attracted much attention, but Jackson and he afterward became bitter enemies. Poindexter's duel with Abijah Hunt, who was killed, led to sharp controversies. He was governor of Mississippi 1819–21; U. S. Senator 1831–35, after which he practised law at Louisville; prepared the *Revised Code* of Mississippi laws 1824. D. at Jackson, Miss., Sept. 5, 1853.

Poin'sett, county in the N. E. of Arkansas. Area, 425 sq. m. It is rolling, fertile, well timbered, and adapted to cotton and grain culture. Cap. Harrisburg. P. 1720.

Poinsett (Joel Roberts), LL.D., b. at Charleston, S. C., Mar. 2, 1779, of a Huguenot family; spent his early childhood in England; educated at Greenfield, Conn., under Pres. Dwight 1793–94; went again to England 1796; studied medicine at Edinburgh, and entered the military academy at Woolwich; returned to Charleston and studied law 1800; went again to Europe 1801; travelled in Asia Minor and in Russia; returned home in 1809; was sent to Chili by Pres. Madison to report on the revolution in that country, and there achieved great popularity; was in Congress from South Carolina 1821–25; U. S. minister to Mexico 1822 and 1825–29, filling a position then very difficult and important; U. S. secretary of war 1837–41; founded the Academy of Fine Arts, Charleston, S. C., and liberally endowed the National Institution; author of *Notes on Mexico* (1824) and of various published essays and discourses, and was a strong opponent of the extreme States Rights view. While in the U. S. Poinsett's name is nearly forgotten, he fills a large space in the histories of Chili and of Mexico. D. at Statesburg, S. C., Dec. 12, 1851.

Point, tp., Woodruff co., Ark. P. 788.

Point, tp., Calhoun co., Ill. P. 1551.

Point, tp., Posey co., Ind. P. 980.

Point, tp., Northumberland co., Pa. P. 938.

Point à la Hache, p.-v., cap. of Plaquemines parish, La., on E. bank of Mississippi River, 40 miles S. of New Orleans, has 1 weekly newspaper and an export-trade in sugar and rice.

Point Comfort, Old. See Old Point Comfort.

Point Coupée, parish of Central Louisiana. Area, 500 sq. m. It has Mississippi River on the E. and Atchafalaya on the W. Cotton, corn, sugar, and molasses are among the leading products. Cap. Point Coupée. P. 12,981.

Point Coupée, p.-v., cap. of Point Coupée parish, La.

Point du Chêne, p.-v. of Westmoreland co., N. B., on the island of Shediac, and on Gulf of St. Lawrence, is the N. terminus of European and North American Railway, and has lines of steamers plying to Quebec and Charlottetown. P. about 150.

Pointe-à-Pitre, town of the French island of Guadeloupe, in the West Indies, is well built, has a good harbor on the Petit Cul-du-Sac, and carries on a lively trade. P. about 19,000.

Pointe Claire, p.-v., cap. of Jacques Cartier co., Quebec, Canada, on St. Lawrence and on Grand Trunk Railway, 15 miles W. of Montreal, and 67 miles from Lachine, has extensive stone-quarries. P. 461.

Point Edward. See Sarnia.

Pointer (*Canis avicularis*), a species of dog of the hound type, employed for hunting game. The best-known breed is the Spanish pointer, probably of Eastern origin. The faculty of pointing at game, though much developed by training, seems to be chiefly due to inheritance, so that dogs of the purest stock acquire the habit almost without instruction.

Point Isabel, p.-v. and tp., Clermont co., O. P. 160.

Point Levi. See Levis.

Point Pleasant, tp., Warren co., Ill., has 1 weekly newspaper. P. 1004.

Point Pleasant, p.-v., Monroe tp., Clermont co., O., on Ohio River. Native place of Gen. U. S. Grant. P. 137.

Point Pleasant, v., Valley tp., Guernsey co., O. P. 138.

Point Pleasant, p.-v., cap. of Mason co., West Va., near the junction of the Kanawha with Ohio River, and opposite Gallipolis, O., has 2 weekly newspapers, an extensive trade in coal and salt, and was the scene of one of the most important battles fought with the Indians during the colonial history of America, Oct. 10, 1774. (See Lewis, Gen. Andrew.) P. 773.

Point Reyes, tp., Marin co., Cal. P. 271.

Poiri'no, town of Italy, province of Turin, 15 miles S. E. of the city of Turin. The inhabitants are industrious, and there are 700 private looms in operation. P. 6770.

Poison. See Toxicology. See also Jurisprudence, Medical, by Prof. John Ordronaux, M. D., LL.D.; and Lead-Poisoning.

Poison Ivy. See Rhus.

Poison of Serpents. The venom of serpents is formed in a gland which lies back of and below the eye on each side, and the gland of either side discharges its poison through a duct which leads to the base of the hollow fang. The poison is in all serpents a thin yellow fluid, which is made up chiefly of albuminoid matters in solution, and resembles white of egg. One of these albumen compounds is the poison, the others are inert. The poison is active—half a drop of rattlesnake venom will kill a pigeon—and when dried it preserves its virulence for years; neither is it altered by contact with weak acids, strong alkalies, alcohol, iodine, bromine, or any disinfectant like chlorine or carbolic acid. The recent researches of Indian surgeons corroborate the prediction made years ago by Dr. Weir Mitchell in America, that the action of all the various snake-venoms would be found in time to be alike. In fact, they differ only in that some produce more local effects, and some destroy sooner than others the coagulability of the blood.

The effects are divisible into local and general, immediate and remote. The venom having been injected under the skin by the fang, the first effect is a general feebleness, in which the heart shares, and which is or is not accompanied by nausea and vomiting. If the dose be large, the animal or man dies within a time which varies from twenty minutes to hours; but if, in man, he survives several days, the tendency is to recovery. The first effects are upon the nerve-centres of breathing, and of the heart and muscles in general. If the early depression passes over, recovery is often sudden, or else the creature poisoned enters the second stage of the poisoning. This is characterized by blood-changes, and by a general degradation in the nutrition of every tissue, so that all suffer more or less. The series of changes begins with lessened or lost power of the blood to clot; at the same time the texture of the smaller vessels is so altered as to allow of the escape of the incoagulable blood, which, if the animal survive long, finds its way into the tissue of nearly every organ, causing thus symptoms which vary as the organ most affected is the brain, spinal cord, liver, lungs, or kidneys. These changes result, therefore, in bleeding from the mucous surfaces of the breathing or digestive organs, and in oppressed respiration, bloody stools or bloody urine, and finally in coma or convulsions, which close the scene. These facts account for the variety of descriptions given by authors of the causes of death in snake-bite. The local symptoms vary with the snake, but vary in degree only. First, there is thrown out about the fang-track a vast amount of blood, which, as it cannot clot, soaks through the tissues, and even stains the bones. The muscles near by soften, and at last inflammation comes on, with great swelling and pain, and with, at last, more or less local death of the part.

Snake-venom does not affect plants. Seeds will germinate in it, and it does not check the growth of the yeast-plant or inhibit the development of bacteria or vibriones; but to all life above these it is fatal when inoculated in sufficient amount, while it does not seem to have any power to injure when swallowed; so that the author has even fed pigeons on it, giving 20 or 30 drops a day for a week without harming them. Mixture with gastric juice alone does not destroy its power, but it is altered below the stomach, and seems unable to enter the blood in a virulent form by this channel. Birds die easily from venom—cold-blooded creatures slowly, unless kept very warm.

There is no antidote yet known. The proper treatment is to tie a ligature around the part bitten, and at once to lay open the wound in the line of the fang-mark. It is useless to apply any local dressing, save to put the part in hot water to provoke copious bleeding. If within reach of full help, an elastic bandage should be put around the whole limb, after Esmarch's plan for bloodless operations, until time is given to deal with the part bitten. This would be better than a mere ligature alone, which causes swelling beyond it. After ligation every effort should be made to squeeze out the venom from the wound. Next, alcohol should be given until the heart is excited, when the ligatures may be loosened a little, so as to admit to the general circulation some of the poison, which soon or late must reach it. When the heart begins to fail the ligature should be tightened again and more stimulus given, and so the poison which remains may be fought in detail. The alcohol is not an antidote. Men bitten when dead drunk die; it is a stimulus to carry the suddenly-enfeebled system over this time of weakness. For the second stage there is little to do but to ease pain and wait.

Rattlesnake-bite is rarely fatal; cobra-bite is more so, not on account of being a much stronger poison, but because of the generally larger size of the snakes and of the speed with which in a hot climate they accumulate venom, the severity of symptoms being directly as the dose of poison. The authorities on serpent-venom are Fontana, *Poisons;* Weir Mitchell, *Venom of Rattlesnake;* and Fayrer, *The Poisonous Serpents of India.* Weir Mitchell.

Poisson' (Siméon Denis), b. at Pithiviers, department of Loiret, France, June 21, 1781; was educated at the École Polytechnique, and became professor in that school

in 1802; member of the bureau of longitudes in 1808; counsellor of the university in 1820; peer of France in 1837. D. Apr. 25, 1840. His principal works are *Traité de Mécanique* (2 vols., 1811), *Mathematical Theory of Heat* (2 vols., 1835), besides about 300 memoirs in scientific journals, mostly on mathematical physics.

Poitiers′, town of France, capital of the department of Vienne, on the Clain, is an old, ill-built, and gloomy place, but it has a celebrated lyceum, a theological seminary, a good public library, and other educational institutions. Large breweries, distilleries, spinning-mills, glass-works, and tanneries are in operation, and an active trade is carried on in corn, wine, hemp, wool, wax, honey, and leather. Here Edward the Black Prince defeated and captured King John of France and brought him as a prisoner to England in 1356. P. 30,036.

Poitiers, Diana of. See Diane de Poitiers.

Poitou′, an old province of Western France, now divided into the departments of Deux Sèvres, Vendée, and Vienne. It became an English possession in 1151, on the marriage of Eleanor, the countess of Poitou, and Henry of Anjou, afterwards Henry I. of England. In 1204, Philip Augustus conquered it from England, and although it once more reverted to that country in 1360 by the Peace of Bretigny, it was soon after reconquered, and finally incorporated with the French crown.

Pokag′on, p.-v. and tp., Cass co., Mich., on Michigan Central R. R. P. 228; of tp. 1386.

Pokanokets. See Massachusetts Indians.

Poke, a name given in parts of the U. S. to *Phytolacca decandra* (see Garget-root), and in other parts to *Veratrum viride* (see Veratrum). These plants are both poisonous, and both useful in medicine, but differ widely in properties and appearance. The young shoots of the former are eaten like asparagus.

Poker, a game of cards for two or more players, originating in the S. W. of the U. S. about 1835, formerly played with 20 cards, excluding all below the tens, but now, under the name "draw-poker," employing a full pack. The original "twenty-deck poker" was a variety of "brag," a game much in use in America early in the present century, but now become obsolete by the superior interest of modern games. The most authoritative statement of the rules of draw-poker may be found in a pamphlet by Hon. R. C. Schenck (London, 1874).

Pokhurn, town of Hindostan, dominion of Jodhpoor, which is tributary to Great Britain, is a desolate-looking place, surrounded with heavy walls, and containing a very conspicuous temple. It carries on an important transit-trade. P. 15,000.

Po′la, town of Austria, in Istria, on an inlet of the Adriatic, 54 miles S. of Trieste, occupies the site of the ancient *Pietas Julia*, of which it contains several interesting ruins —an amphitheatre, a beautiful triumphal arch, etc.; was made a naval station in 1850, and has an excellent and fortified harbor, an arsenal, a dry dock, etc. P. 16,324.

Po′lacre [It. *polacca*], a three-masted vessel of the Mediterranean, sometimes rigged in a peculiar style called the polacca-rig, and oftener square rigged; but the main and fore masts are of only one piece, and have neither cross-trees, caps, tops, nor horses for the upper yards.

Po′land [from *polska*, "a plain"] comprised at the time of its first division an area of 282,000 sq. m., with about 12,200,000 inhabitants, and extended from the Baltic Sea to the Carpathian Mountains; bounded E. by the Russian provinces of Smolensk, Tchernigov, Poltava, and Kherson, and W. by the Prussian provinces of Silesia, Brandenburg, and Pomerania. The surface of this territory presents one vast plain, swelling just enough in the centre to form the watershed between the rivers flowing to the Baltic and those flowing to the Black Sea. Large tracts of the land consist of sand, heath, and swamp, others are covered with forests of pine, beech, and oak, but generally the soil is a light loam, well suited for agriculture and affording excellent pastures. From ancient times large herds of cattle, horses, and swine were reared here, and much rye, barley, wheat, and fruit was raised; honey, wax, and salt were also largely produced.

The inhabitants of this country form one of the principal branches of the Slavic family. They appeared first in history in the fifth century under the name of the Polani, occupying the plain between the Oder and the Vistula, and living among other Slavic tribes, as, for instance, the Masovii, Kujavii, Obotrites, Wends, etc., which they partly absorbed, partly subdued. For several centuries, however, their history is fabulous, and it did not assume a clear and distinct shape until the time of Mieczyslaw I. (962–992). By his marriage with the Bohemian princess Dombrowka he was induced to embrace Christianity and to allow it to be preached among his subjects, and thereby the country came in close contact with Western and Southern Europe. His son, Boleslas I. Chrobry the Great (992–1025), extended the frontiers to the Saale in the W., the Dnieper in the E., and the Danube in the S., and contributed at the same time very much to the consolidation of the empire; he established the archbishopric of Gnesen and received the royal crown from the pope. Both these kings belonged to the Piast dynasty, which ruled over Poland to 1370, when it became extinct with Casimir III. It was followed by the dynasty of the Jagellons, who were grand dukes of Lithuania, and united that country to Poland. When the Jagellonian family became extinct in 1572 with Sigismund II., Poland became an elective monarchy; and this circumstance is apparently the principal cause of all the great misfortunes which befell the Polish nation. Parties were formed, which fought not for victory, but for life, and means were employed in the party contests which made defeat not ruin, but crime. It was natural that the party which opposed the election of a king should often assume the aspect of traitors in the eyes of the king elected, and thus it became less unnatural when parties often employed treason in order to avoid defeat. Such is the principle of the elective monarchy, and this principle had in Poland the freest scope for its evil consequences, because it corresponded to a defect in the national character. There is, or was, in the Polish character a wild pride, an undisciplined feeling of independence (independence without obedience), a wrong idea of freedom (freedom without duty); and their history is the Nemesis of this fault. They saw in the elective monarchy a guaranty of their liberty as a people, and they overlooked the fact that it might be the annihilation of their existence as a nation—a mistake which reappears in many other points of their political organization, most strikingly in their *liberum veto*. In the Polish diet, the foundation of which was laid by Casimir II. (1177–94), any one member had it in his power to bring the action of the whole diet to a dead standstill by his veto. As it was impossible for a Pole to submit to anything which was not of his own choosing, every decision of the diet had to be unanimous in order to be valid; and when, after months of debate and fight, of intriguing and bribery, of violence and manslaughter, the assembly approached to unanimity, one disagreeing member, concealed in the chimney and in the last moment crying out into the hall his veto, was enough to prostrate the most enormous exertions and renew the most intolerable agonies; and just as if there had been an evil purpose in the play, the social organization of the Polish people showed a defect similar to that of their political constitution. There was no third estate. Commerce and industry were almost exclusively in the hands of the Jews. They were degraded into mere means of gain, and they never ranked, or pretended to rank, as an important branch of the business of the people. Literature and art were occupations of the nobility, and nothing but occupations. Splendid gifts were wasted in finding out new ornamentations for other people's ideas and other people's artistic types. The nation consisted of two classes only—the nobles, who owned the soil and strove after an illusory freedom; and the serfs, who cultivated the soil and were tied to it in miserable thraldom. The connecting link, the vital channel between these two classes, was lacking, and in several cases the Polish peasants sided with the oppressors of the Polish nation, and fell with fire and sword on their own countrymen who had risen in rebellion to fight for the freedom of their fatherland. The consequences of this situation soon became evident. In 1572 the dynasty of the Jagellons became extinct with Sigismund II. In 1573 more than 25,000 Polish noblemen in brilliant attire, armed *cap-à-pie*, and with their horses gorgeously caparisoned, assembled on the field of Wola to choose their new king. Several candidates presented themselves, and the most worthless of them was chosen—Henry of Valois. Shortly after, however, he ran away to become king of France, and then followed the voivode of Transylvania, Stephen Bathori (1575–86); three princes of the Swedish Vasa dynasty, Sigismund III., Ladislaus VI., and John Casimir (1586–1672); a native Pole, John Sobieski (1674–96); and at last the two electors of Saxony, Augustus II. to 1733, and Augustus III. to 1763. Every new prince brought a new set of vices, which the Poles imitated with too much success, and produced wars with new enemies, in which the Poles won the battles with their blood and paid the expenses with their best provinces. Internal jealousy, rivalry, and dissensions split the nation into as many parties as there were noble families, and bribery, violence, intrigue, and treachery blossomed like thistles in August. Poland was ripe, and with the death of Augustus III. in 1763 the end began. There was one party, called monarchists or

reformers, and headed by the family of Czartoryski, which saw where the root of the evil lay, and tried to hit it. The abolition of *liberum veto* and the establishment of an hereditary constitutional monarchy were their ideas; and in order to realize them they sought and found the support of Catharine II. of Russia. At the death of Augustus they succeeded, by the aid of Russian bayonets, in placing Stanislas Poniatowski, a member of the Czartoryski family and a great favorite of the empress, on the Polish throne, and the work of reform began immediately. Catharine saw very soon, however, that Poland, reformed in this direction, would very rapidly fall out of her grasp, and accordingly she changed position. There was another party, headed by the family of Potocki, and called republicans because they defended the old oligarchical institutions. They had adopted the old Polish maxim of religious toleration, while the Czartoryskis were fanatical Roman Catholics and tried to exclude all dissenters from office. The empress chose to defend religious toleration and "republican" institutions, and having entirely forgotten her former favorite, the present king, she had a number of his adherents kidnapped in the night and sent to Siberia. This occasioned the Confederation of Bar, headed by the family of Pulaski, and formed in 1768 against foreign aggression (which meant Russia), regal usurpation (which meant the king and the Czartoryski party), and the influence of the dissenters (which meant the republican or Potocki party). The confusion could not be greater. The confederates entered into an alliance with the Turks, and the war began. Catharine had a large army in the country, and in 1772 a Prussian and an Austrian army also entered Poland. A diet was convoked in 1773, but only to sanction the dismemberment of the country—its first division. Russia took the palatinates of Polotzk, Vitebsk, and Mstislavl, comprising an area of 42,000 sq. m., with 1,800,000 inhabitants; Prussia took the province of Posen, area 13,000 sq. m., population 416,000; and Austria took Galicia and Lodomeria, area 27,000 sq. m., population 2,700,000. The second and third divisions followed in rapid succession. The people had now become thoroughly roused to the appreciation of the dangers which their old constitution involved, and reform became the work of the day. *Liberum veto* was abolished, the crown was made hereditary, the cities received political rights, etc. But, unfortunately, there were found a few persons who, at the instigation of Catharine II., formed the Confederation of Torgovitza in 1792, in defence of the old "republican" institutions, and under the pretext of aiding them and their cause the Russian army invaded Poland once more. Frederick William II. of Prussia, who had encouraged the reformers, found it more profitable now to side with the czarina, and when, at last, the poor king himself went over to the confederates, Joseph Poniatowski and Kosciusko's victories were in vain; the second division took place. Russia seized a territory of 96,000 sq. m., with 3,000,000 inhabitants, and Prussia one of 22,000 sq. m., with 1,100,000 inhabitants. A general and violent rising in all the Polish provinces was the consequence, and the Russians and Prussians had to retreat; but in the right moment Austria entered the stage and turned the balance. Kosciusko was taken prisoner at Macieowice, Praga was stormed by Suwaroff, Warsaw capitulated, the king resigned his crown, and the third division (in 1795) annihilated the existence of Poland. Russia took all the provinces E. of the Niemen and Bug (area 43,000 sq. m., population 1,200,000); Austria, those between the Bug and the Vistula (area 18,000 sq. m., population 1,000,000); and Prussia the remainder, together with the capital (area 21,000 sq. m., population 1,000,000). Thus the end had come. In 1814 a rearrangement of the Polish territories took place. Napoleon had in 1807 established the duchy of Warsaw, consisting of the Polish provinces which Prussia ceded by the Treaty of Tilsit. But after his disastrous campaign in Russia any hope of the re-establishment of the old kingdom of Poland vanished, and at the Congress of Vienna the largest part of the former Polish territory was given to or taken by Russia. Alexander erected a kingdom of Poland, gave it a free constitution, and, at least in the beginning, the country seemed to have not only a tolerable, but even a hopeful future. But no one ever knew what Alexander meant. The good and sensible which he attempted remained floating in the air like a dream; that on which he succeeded in bestowing form and shape was atrocious and disgusting. At the end of his reign that line of policy began to show itself which since has been followed by his successors—denationalizing and Russianizing Poland. The consequence of this policy has been a number of bloody rebellions—in 1830, 1846, 1849, and 1863—which have been put down and stamped out by the Russians with unexampled and revolting severity, while the behavior of the Poles has excited at once the highest admiration for their valor and perseverance and the deepest pity for their lack of unity and discipline.

Language and Literature.—See Polish Language and Literature, by Joseph Kzargé. Clemens Petersen.

Poland, p.-v., Cass tp., Clay co., Ind. P. 126.

Poland, tp., Buena Vista co., Ia. P. 60.

Poland, p.-v. and tp., Androscoggin co., Me. P. 2436.

Poland, tp., Chautauqua co., N. Y. Pop. 1418.

Poland, p.-v. and tp., Mahoning co., O., on Ashtabula Youngstown and Pittsburg R. R. P. 453; of tp. 2481.

Poland (Luke P.), LL.D., b. at Westford, Vt., Nov. 1, 1815; received an academic education; was admitted to the bar 1836; was register of probate 1839–40, prosecuting attorney 1843–44; judge of the supreme court, annually re-elected, 1848–65, becoming chief-justice 1860; served as U. S. Senator, filling the vacancy caused by the death of Jacob Collamer, 1865–67, and was a member of Congress 1867–75; was a regent of the Smithsonian Institution, and took an active part in legislation.

Polar, in geometry. See Pole.

Polar Bear. See Bear.

Polar Circles. See Antarctic and Arctic.

Polar Clock. See Optics (conclusion), by Pres. F. A. P. Barnard.

Po'lar Co-or'dinates, a system of co-ordinates by means of which points are referred to a fixed line, called the *initial line*, and to a fixed point of that line, called the *pole*. There may be two cases: (1) all the points considered may lie in the same plane; and (2) the points considered may be situated in any manner in space. In the former case, only two co-ordinates are required; in the latter case, three are necessary. (1) Let A X be a fixed line, and let P be any point lying in a plane through A X; then will the point P be known, or given, when we know the angle X A P and the distance A P. The angle X A P, denoted by v, is called the *direction angle* of P, and the distance A P, denoted by r, is called the *radius vector* of P. By giving proper values to v and r, the point P may be made to coincide with any point of the plane X A P. If P is any point of a plane curve lying in the plane X A P, the equation which expresses the relation between r and v is called the *polar equation* of the curve; r and v are the *polar co-ordinates* of the point P. (2) Let A X be a fixed line, let X A P′ be a plane through A X, and let P be any point in space. Draw P P′ perpendicular to the plane X A P′, and let P′ be the point in which this perpendicular meets the plane; then will the position of P be known with respect to A X when we know the angle X A P′, denoted by u, the angle P′ A P, denoted by v, and the distance A P, denoted by r. The quantities u, v, and r are the *polar co-ordinates* of P; by giving suitable values to these co-ordinates, the point P may be made to coincide with any point in space. If P is any point of a curve in space, the two equations which express the relations between r, v, and u are called the *polar equations* of the curve. If P is any point of a curved surface, the single equation which expresses the relation between r, v, and u is called the *polar equation* of the surface. The method of polar co-ordinates is used in analytical investigations, and on account of its simplicity it is peculiarly adapted to the subjects of astronomy and analytical mechanics. W. G. Peck.

Fig. 1.

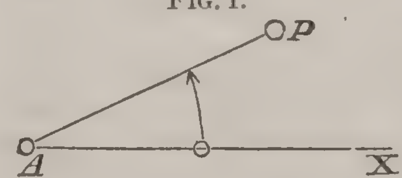
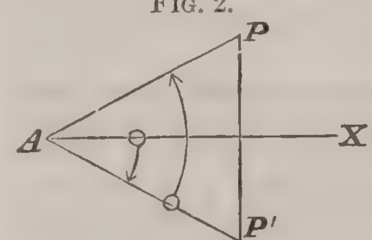


Fig. 2.



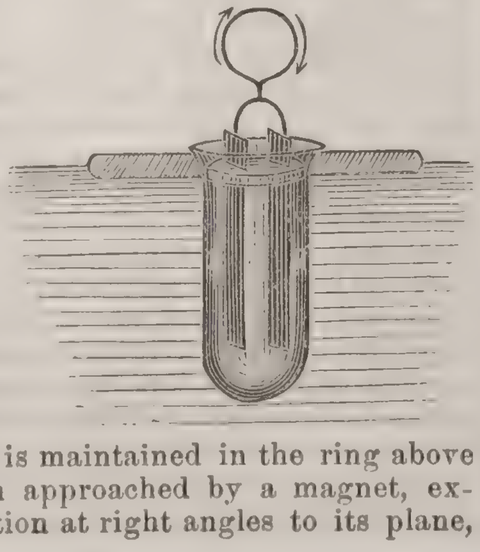
Po'lar Equa'tions, of a curve or surface, are those in which, instead of rectangular co-ordinates, the *distance* of the point from the origin, and the angle or angles which its direction makes with the axes of reference, are used. They are much used in astronomy for the expression of the orbits and varying positions of the heavenly bodies; indeed, the terms *latitude, longitude, right ascension, declination*, etc. refer to angular co-ordinates, which alone can be directly derived from observation.

Polar'iscope [Gr. πολεῖν, to "turn," and σκοπεῖν, to "view"], properly, an instrument for testing the condition of radiant light as to polarization. The term is, however, very commonly employed to denote any of the various forms of apparatus designed for the examination of transparent media with a view to ascertain how far they may possess the polarizing power. Among the simpler forms of polariscope may be mentioned that of Savart, in which two plates of quartz four or five millimètres thick, cut

from the crystal parallel to a face of one of the terminal pyramids, are crossed upon each other and secured in a setting along with a tourmaline plate having its axis 45° from the principal planes of the quartz. The tourmaline acts as an analyzer (see POLARIZATION), and when the light coming to the eye through this eye-piece is polarized, the field of view is striped with colored bands or fringes. In Babinet's polariscope a thick plate of unannealed glass occupies one end of a short tube, and a Nicol's prism the other. This in polarized light gives colored figures in the field, which in common light are not seen. Arago's polariscope consists of a plate of quartz cut across the axis placed in one end of a tube which carries in the other end a doubly-refracting prism. Two images are seen, both colorless in common light, but exhibiting complementary colors in light which is polarized. Soleil's polariscope, employed in his ingenious saccharimeter, is a disk of quartz formed of two semicircular plates severally cut from right-handed and left-handed crystals across the axis, and joined along their common diameter. Light transmitted through this disk and received through an analyzer is colorless if unpolarized; but if originally polarized, will exhibit complementary colors in the two semicircles, except in a single position of the analyzer, in which the tint is the same on both sides. This tint, called the "tint of passage," changes with a very slight movement in rotation of the analyzer or of the plane of original polarization, and the tints become again contrasted. Senarmont's polariscope is a compound plate, or flat rectangular prism made up of four triangular prisms, two of them cut from right-handed, and the other two from left-handed quartz crystals. In polarized light it presents colored stripes parallel to the edges of the plate, the middle stripe being well defined and dark. These stripes, in a certain position of the analyzer and of the plane of polarization, are continuous from end to end; but on the slightest rotatory displacement of either they become dislocated, the halves being displaced laterally in opposite directions. Any instrument capable of being used as a polarizer, or as an analyzer of polarized light, may serve to a certain extent as a polariscope, since, when common light is observed through such an instrument, the intensity is independent of the azimuth; while polarized light exhibits a variable intensity when the azimuth of the instrument is varied by rotation. F. A. P. BARNARD.

Polar'ity [Gr. πολεῖν, "to turn"], in language, is the name of a phenomenon, which some words present, of having opposite meanings, as *dike*, which is applied to a ditch and an embankment, as the clay taken from one forms the other.

Polarity, a physical character possessed in certain conditions by some bodies or their molecules, in virtue of which they manifest, in a determinate direction, properties which are analogous and at the same time contrasted on opposite sides. The original idea attached to this term was much simpler, embracing merely a geometrical relation. A pole of any circle of the sphere is a point in the spherical surface around which as a centre an arc of a great circle revolving in the same surface will describe with its remoter extremity the circumference of the circle of which it is the pole. As there are always two points on the sphere which fulfil this condition, and as these are diametrically opposite, the term *pole* was, in consequence of the obvious analogy, early transferred to the opposite points in a magnet which are the apparent centres of its dissimilar attractive and repulsive forces. The notion seems, indeed, to have long prevailed that these forces are actually inherent in these points; but as every fragment of a magnet, however small, has still its two poles, it is evident that such polar points are merely the points of common intersection of the resultants in different directions of all the forces exerted by the individual molecules. Magnetic polarity is happily illustrated and rationally explained by the theory of Ampère, which attributes the phenomena of magnetic attraction and repulsion to the reaction upon each other of closed electric circuits surrounding the molecules. The condition of a molecule, as supposed in this theory, is illustrated on a palpable scale in the little apparatus represented in the cut known as "De la Rive's ring." A current generated by a miniature battery floated on a cork is maintained in the ring above the float; and this, when approached by a magnet, exhibits polarity in a direction at right angles to its plane, the axis being reduced to a minimum, and the two poles sensibly coincident.



The term "polarity" is not, however, limited in physics to cases in which manifestations of active energy are observed to take place. It is applied to any case in which similar but contrasted properties are oppositely and symmetrically disposed. The most important examples of this are the polarity possessed under certain circumstances by the rays of light and heat, for which see POLARIZATION OF LIGHT. F. A. P. BARNARD.

Polariza'tion of Light, a physical condition produced in rays of light by reflection or refraction, in which they exhibit unequal intensities when subsequently reflected in different planes at a constant incidence. This is the characteristic most easily detected, though polarized light possesses other properties, to be presently mentioned. Polarization of light by reflection was first, as stated in the article OPTICS, observed by Malus in 1808. It is also produced by refraction—partially by ordinary refraction, and completely by double refraction. Polarization by reflection is also partial, except for a limited number of reflecting substances, and for them at particular determinate incidences. Water and glass are such substances, and the polarizing incidences for these are—for the first, 52° 45′, and for the second, 54° 35′. The variations of relative intensity of the two images of a luminous point produced by a doubly-refracting crystal, when observed through a second similar crystal which is rotated in azimuth, are described in the article on REFRACTION, DOUBLE (which see). Malus discovered that the two images of a radiant observed through a single crystal undergo similar variations when the crystal is rotated, provided the radiant is seen by reflection at the incidences just specified from water or glass; and thus he reached the conclusion that light so reflected possesses all the properties which belong to the two pencils into which a ray of common light is divided by a doubly-refracting crystal. Accordingly, if such a crystal be placed in the path of a ray reflected at the polarizing angle, with the principal plane of the crystal or a conjugate plane in the plane of reflection, the ray will not be doubly refracted. (For definition of these terms see REFRACTION, DOUBLE.) But if the crystal be turned in azimuth, two rays will make their appearance, unequal at first in intensity, but becoming equal at the azimuth of 45°. Beyond this azimuth the ray which was previously most intense fades gradually away, while the other gains in strength, until at 90° the former disappears entirely, and the latter remains alone. These phenomena are repeated in every quadrant.

If the ray which has been reflected as above described be incident upon a second surface of glass at the same angle (54° 35′) as at first, the plane of second reflection corresponding with that of the first, it is in part reflected and in part transmitted, as is the case with common light; but if the second plane of reflection be at an azimuth of 90° with that of the first, no reflection at all will occur, but the whole ray will be transmitted.

An interesting experiment of Brewster illustrating the identity of the phenomena of polarization by reflection, and polarization by double refraction, is the following: Let the light of a candle or other luminous object be polarized by reflection, and afterward received, at the polarizing angle, upon a plate of plane glass which has its plane of reflection in azimuth 90° from the plane of polarization. It will be wholly transmitted, so that, to an eye placed anywhere in the direction in which reflection would ordinarily occur, the radiant will be invisible. The eye remaining in this position, let another person breathe upon the glass plate, and instantly the luminous object will appear, and will continue to be seen until the film of moisture left by the breath has evaporated. This is because the polarizing angle for water is not the same as that for glass. The experiment may be varied and made still more striking by placing a second plate by the side of the first, and adjusting this one to the polarizing angle for water. The radiant will then be visible in the second plate, but not in the first. In this state of things, if both plates be breathed on simultaneously, the light in the second plate will be extinguished, and that in the first revived by the same breath.

It is only at the angles which have been mentioned that polarization by reflection is complete. But partial polarization takes place in reflection at any angle, being zero at the incidences 0° and 90°, and increasing from those incidences up to the polarizing angle. Light is polarized by reflection from all polished surfaces, but it is only in the case of bodies whose indexes of refraction are in the neighborhood of 1.4 that the modification which it undergoes has the simplicity which belongs to the examples we are considering. The index of water is 1.336, and that of crown-glass 1.48 to 1.53.

Malus believed the angle of polarization of a given

body to be independent both of its refractive and of its dispersive power. Dr. Brewster, however, demonstrated that this angle depends on the refractive power, and is connected with it by the law that "the index of refraction of any body is the tangent of the angle of polarization." From this last law we derive one or two interesting consequences—first, at the angle of polarization the reflected ray is perpendicular to the refracted ray; for, putting i for the angle of incidence, r for the angle of refraction, and n for the index, the law of Snellius gives us $n \sin r = \sin i$; and the law of Brewster, just mentioned, gives $n = \tan i$. Hence,

$$\tan i \sin r = \frac{\sin i}{\cos i} \sin r = \sin i; \text{ or, } \sin r = \cos$$
$$\text{and } i + r = 90^\circ.$$

Secondly, when light falls upon a transparent plate having parallel surfaces, if the angle of incidence at the first surface is the polarizing angle, the angle of incidence at the second surface will also be the polarizing angle for that surface. In this case r is the angle of incidence and i the angle of refraction for the second surface, the index of refraction being $\frac{1}{n}$, and we have

$$\tan r \sin i - \frac{\sin r}{\cos r} \sin i = \sin r; \text{ or, } \sin i = \cos r,$$
$$\text{and } i + r = 90^\circ.$$

We have seen that when the two polarized rays into which a single ray of common light is divided by double refraction in passing through a rhomb of Iceland spar fall upon a second similar rhomb, they are both of them subdivided in most of the positions of the second rhomb, but that the intensities of the rays of each pair are unequal, except when the principal planes of the rhombs differ in azimuth 45°, and that one member of each pair disappears entirely when the principal planes are coincident or normal to each other. The inequality of intensity is variable, and is dependent on the angle between the principal planes. If one ray of either pair be observed through all its variations, it will be found to begin from zero of intensity to increase regularly in brightness for 90°, and then to diminish through the second 90° to zero again. The other member of the same pair passes through a similar series of changes, but its maxima correspond in azimuth to the minima of the first, and its minima to the maxima of the first.

A ray which has been polarized by reflection possesses the same character as those which have been produced by double refraction in Iceland spar; and, accordingly, if such a ray be transmitted through a doubly-refracting rhomb which is turned in azimuth in the manner just described, it will be divided into two rays, which will alternately increase and diminish in intensity, and of which one will become zero in the azimuth 0° or 90° between its plane of polarization and the principal section of the rhomb. Assuming the united intensities of the two rays into which a single one is thus divided by double refraction to be equal to the total intensity of the original ray, Malus inferred that their several intensities should vary as the squares of the sines and the cosines of the azimuth. Thus, if I be put for the total original intensity, and a for the azimuth, reckoned from the position of coincidence of the plane of polarization with the principal section of the rhomb, then the ordinary ray would have the intensity $\mathrm{I} \cos^2 a$, and the extraordinary $\mathrm{I} \sin^2 a$. These values fulfil the condition of constancy of sum, since

$$\mathrm{I} \cos^2 a + \mathrm{I} \sin^2 = \mathrm{I}.$$

If a ray which has been polarized by reflection fall, at the polarizing angle, upon a second mirror of transparent glass with parallel faces, it will be divided into two rays, one of which will be reflected and the other transmitted. When the second mirror is turned in azimuth around the incident ray, these two derivative rays will undergo changes of intensity somewhat resembling those which have just been described as produced by double refraction. When the two planes of reflection are coincident, the intensity of the reflected ray will be maximum, and that of the transmitted ray minimum. This minimum will not, however, be zero. When the two planes differ in azimuth 90°, the intensity of the transmitted ray will be maximum, and that of the reflected ray minimum. This minimum *will* be zero, and the simultaneous maximum of the transmitted ray will be equal to the total intensity of the incident light. The alternations in this case resemble, therefore, to a certain extent, those previously described as produced by double refraction; but they are not represented by the law of Malus. By *plane of polarization*—a term used above without definition—is always to be understood the plane in which a polarized ray is most susceptible of reflection at the polarizing angle.

In the arrangement of two mirrors, as above described, when the second mirror is rotated in azimuth, its plane of incidence and reflection is constantly changing its inclination to the plane of polarization of the ray incident upon it. Suppose the incidence upon the second mirror *not* to be at the polarizing angle. It is found that after reflection in an oblique azimuth the plane of polarization is nearer to the plane of reflection than it was at incidence. If the azimuth at incidence be represented by a, and that after reflection by a', there will be found to be a constant ratio between $\tan a$ and $\tan a'$, $\tan a'$ being always less than $\tan a$. By many reflections, with the same azimuth between the mirrors, the plane of polarization may be brought indefinitely near to the plane of reflection, but it can never be made in this way absolutely coincident with it.

When common light is reflected from any surface at an angle greater or less than the polarizing angle, it is found to be partially polarized; that is to say, it is made up of a mixture of polarized light with common light. By repeated reflections at the same incidence the polarization may be made sensibly complete. The number of reflections necessary for this purpose will be greater as the angle of incidence is farther from the polarizing angle. It must not be overlooked that, though at the angle which we have called the polarizing angle all the light that is reflected is polarized, yet that this is, after all, but a small portion of the incident light. From a single surface of glass it amounts to less than 8 per cent. When, for purposes of experiment, it is desired to obtain a large and intense beam of polarized light, it has accordingly been found useful to employ many reflecting plates placed one upon another, forming a *bundle* or *pile*. It is obvious that the thinner these plates are made (so that they are not so thin as to produce color) the more convenient they will be in use, and, from the diminution of absorption, the more economical of light. Not fewer than sixteen are usually employed.

The amount of light reflected at different angles of incidence goes on increasing from 0° to 90°. The amount which is polarized in the reflected beam also goes on increasing, but not throughout the quadrant. For glass having the index 1.5 the incidence of maximum polarization is 79°. At this incidence the total intensity of the reflected light is expressed by the decimal 0.355, the intensity of the incident light being 1. The amount which is polarized in the reflected beam is, however, only 0.1518, which is still about double that which is reflected at the polarizing angle. But, comparing this value with the foregoing 0.355, we shall see that it is less than half the total light reflected (44 per cent.), and accordingly it is not suited to exact experiments in polarization.

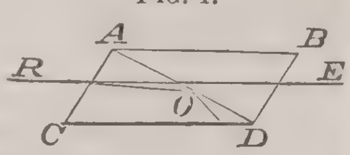
When a transparent reflector is employed as a polarizer, the transmitted beam will be found to contain light which is polarized in a plane perpendicular to the plane of refraction. The amount of light so polarized is exactly equal to the amount polarized at the same time by reflection, and in the plane of reflection; and as the maximum amount polarized by reflection from one surface of glass having the index 1.5 is 0.1518, this also is the maximum amount which can be polarized at one surface by refraction. But since, at this angle of maximum polarization, the total reflection is only 0.355, the total transmission will be 0.645, and of this amount the polarized portion will be but 23½ per cent. But if this light, already partially polarized, be transmitted through other refracting surfaces, though it will continually lose in total intensity by reflection, it will gain in the *proportion* of the polarized light which it contains; and if the incidence is that of the polarizing angle for reflected light, the quantity transmitted *which is polarized* will continue to increase *in absolute amount*, notwithstanding the decrease of *total intensity*, until polarized light only is transmitted. Moreover, if the number of refracting plates employed should happen to be greater than is necessary to produce complete polarization, the supernumerary plates will not reduce the amount of polarized light transmitted, since, at the incidence supposed, they are incapable of reflecting light polarized transversely to the plane of reflection. This statement presumes, of course, that the refracting surfaces are perfect, and that no light is lost by absorption in the media.

It is a curious fact, resulting from the polarizing power of a pile of glass plates, that the pile is more transparent when held at an obliquity greater than the angle of polarization than it is at that angle, and that the transparency increases with the obliquity. This is owing to the fact that the light which has been polarized by the first few laminæ undergoes very little loss by reflection on increasing the obliquity; but the amount *polarized* in these first refractions increases as the obliquity increases, more rapidly than the loss by reflection of the natural light falling on the same surface is increased. The intensity of the transmitted beam, therefore, becomes actually greater as

the obliquity is greater—a fact which is the reverse of what happens with a single plate.

In observations upon polarized light there are some inconveniences attending the use of a mirror, which when turned in azimuth obliges the observer to change his own position, or of a doubly-refracting prism or crystal, which presents two images often not sufficiently separated. Both these disadvantages are obviated by means of a prism invented by Mr. Nicol, which is now in almost universal use. This contrivance is represented in Fig. 1. It is an elongated rhomb formed of Iceland spar, its length being about three times its breadth. Having been brought into this shape from the natural crystal, it is carefully sawn asunder in the plane which divides it symmetrically through its shortest diagonal A D, and then reunited by means of Canada balsam. This substance is perfectly transparent, and has a refracting power whose index is 1.532, intermediate between those of the ordinary and extraordinary rays—viz. 1.654 and 1.488. The relative index between the crystal and the balsam for the ordinary ray is 1.0796, and the limiting angle of emergence from the former to the latter is 68°. The ordinary ray from R meets the surface A D at a greater angle than this, and is totally reflected at O. The extraordinary ray passes through. The sides of the prism are blackened to prevent a second reflection. This ingenious contrivance is invaluable to the observer in this interesting branch of optical investigation. Its advantages are, however, in some respects limited. The necessary length of the prism, as compared with its lateral dimensions, renders it difficult to employ light of any considerable convergency or divergency. The cost of the construction of such prisms increases also very rapidly with their magnitude, and few have been made which measure more than an inch on the side. Those commonly found with opticians are much smaller than this.

Fig. 1.



Another convenient eye-piece, which may also serve, like Nicol's prism, as a polarizer for small beams, is formed of a lamina of tourmaline cut parallel to the axis. This mineral possesses the very remarkable property, when not in exceedingly thin laminæ, of suppressing one of the rays into which incident common light is divided by it, and transmitting the other. The ray transmitted, as in Nicol's prism, is the extraordinary ray. Cut perpendicularly to the axis, a plate of tourmaline is opaque. Two equal plates, cut parallel to the axis, are opaque when crossed upon each other. The disadvantages of the tourmaline eye-piece are—first, the color of the crystal, which mars the beauty of the tints exhibited by polarized light, and to some extent neutralizes them. It is rather unfortunate that the crystals which are least colored are usually bad polarizers. In this respect different crystals very much differ. Some, which are light green, transmit a notable amount of the ordinary ray even when quite thick. Those which polarize best are usually brown or yellowish-brown. Occasionally one of this kind will be found which polarizes well without being very disagreeably dark. But an equal if not greater disadvantage of the tourmaline is the great brittleness of the crystal, and the rarity of specimens in which fissures do not naturally exist. It is difficult, therefore, to obtain clear plates of any considerable size. Finally, the supply seems, of late years, not to have kept pace with the demand, and opticians intimate that it is almost impossible to obtain large specimens fit for optical purposes at all.

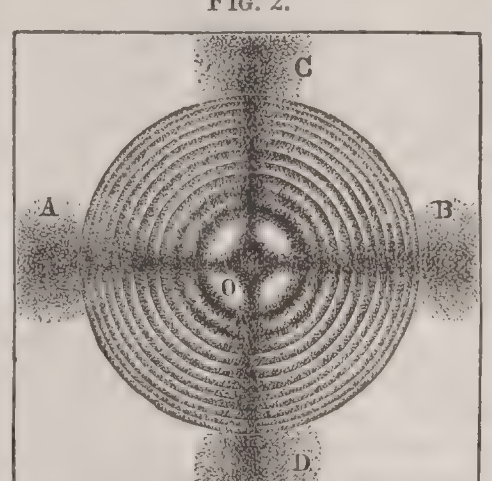
A few years since Dr. Herapath of London announced the discovery of a property like that of tourmaline in artificially prepared crystals of the iododisulphate of quinine. These crystals are but slightly colored, and could they easily be prepared and made permanent would probably come into general use. Dr. Herapath succeeded in obtaining specimens half an inch across. The peculiar property of the tourmaline was also early observed by Sir David Brewster in agate, but that substance is not sufficiently transparent for the purposes of optical experiment. For large polarizers, mirrors may be employed made of black glass or bundles of thin plates, as above described. Instruments in compact form for observations on polarization are called polariscopes. (See POLARISCOPE.)

Upon examining thin plates of certain transparent crystals, such as mica, selenite, or quartz, by means of transmitted polarized light, M. Arago found that when the light was received upon the eye through a prism formed of Iceland spar, the richest conceivable colors made their appearance, which were complementary to each other in the two images, and which varied in intensity with the azimuth of the lamina or of the prism. When the principal plane of the prism coincides with the plane of polarization of the light, and the azimuth of the lamina is varied, the maximum brilliancy of coloring is found in the azimuth of 45° between the principal section of the lamina and the plane of polarization. When the azimuth is 0° or 90° the color entirely vanishes, and the light appears entirely unchanged. At intermediate azimuths the color has an intermediate intensity, regularly increasing and diminishing between the positions of minimum and maximum. These variations, as well as the thickness of the laminæ themselves in which the phenomena appear, satisfied M. Arago that the colors could not be owing to the same causes which produce the colors of Newton's rings. Still, they had evidently some relation to the thickness, for it was not difficult to remove them entirely, either by considerably increasing the thickness or by excessively diminishing it. In the rotation of the lamina as just described, the colors which appear between the successive positions of minimum are always the same in the same image. But when the lamina itself remains fixed while the prism at the eye is rotated in azimuth, the two images interchange their colors in passing each successive position of minimum.

If instead of a doubly-refracting prism as an eye-piece, a mirror, presented to the ray at the polarizing angle, be employed, only one of the images is reflected, but the other, if the mirror be transparent, will be seen in the light transmitted. In consequence of this separation of effects, M. Arago was led to distinguish the mirror when used in this way as the *analyzer*.

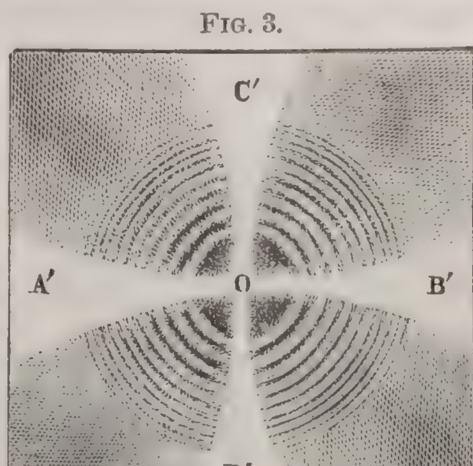
If in a plate of selenite we hollow out a spherical cavity of very large radius, we shall find it to exhibit several orders of rings resembling those of Newton, and following the same laws, though the thicknesses at which the colors of the same order occur are very much greater. According to the determination of Biot, the comparative thicknesses at which the same colors appear in air, in Iceland spar, in quartz, in selenite, and in Siberian mica are as the numbers 1, 13, 230, 230, and 440, the thickness for selenite and quartz being sensibly the same. The limits of absolute thickness below which crystalline plates fail to give colors in polarized light are, for selenite, 0.017 inch; for mica, 0.0323 inch; and for Iceland spar, 0.001 inch. The maximum thickness for this last crystal is but $\frac{6}{1000}$ths or $\frac{7}{1000}$ths of an inch. Mica and selenite are therefore prepared with facility for this class of chromatic experiments, but this is not equally true of Iceland spar. If a lamina of selenite—a mineral which is very easily wrought—be secured by transparent cement of any kind to a plate of glass, very fanciful effects may be produced by grinding it away unequally in different parts according to any definite pattern. Figures of various kinds, images of insects, flowers, Gothic windows, etc. may thus be prepared, which will come out in polarized light in very brilliant colors.

Fig. 2.



Somewhat later, Dr. Wollaston discovered a class of chromatic effects of a novel and highly interesting character observable in crystals cut across the axis. The arrangements for observation are the same as in the experiments already described. If a mirror be employed as an analyzer, and be turned to azimuth 90° before the introduction of the crystalline plate, no light will, of course, be reflected to the eye; but the moment the crystal is introduced a system of concentric rings will make its appearance, colored with the richest conceivable tints, and marked by a black cross, whose arms are in the plane of reflection, and at right angles to it, passing through the centre. The ends of these arms are enlarged, and have the appearance of brushes. If the analyzer is transparent, another set of rings may be seen by the transmitted light, in which the colors will be complementary to the former, and the cross will be white. As the analyzing mirror is revolved in azimuth the colors fade, and a new set of rings gradually appears, with colors complementary to the first, and distinguished by a white cross. In short, in this case the colors before trans-

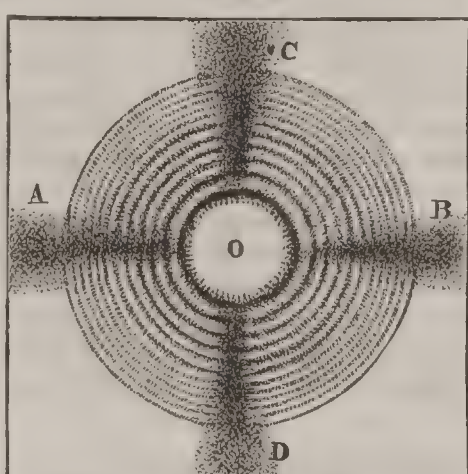
Fig. 3.



mitted are reflected, and those before reflected are transmitted. Figs. 2 and 3 exhibit the two aspects of the rings which have been just described. These rings make their appearance at thicknesses much greater than those which produce color in laminæ parallel to the axis.

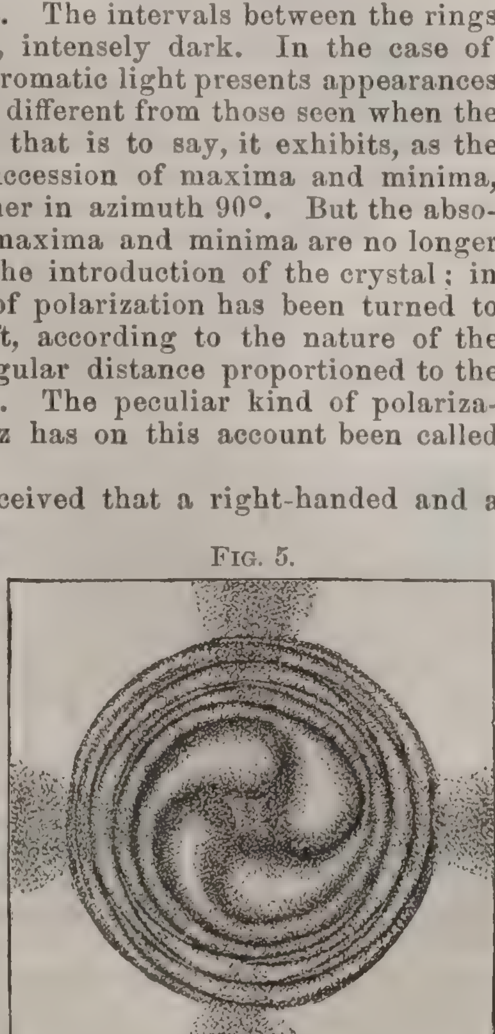
Crystals of quartz cut across the axis and examined in polarized light present a curious and exceptional peculiarity. The centre of the field is always illuminated with light of uniform tint, whatever be the position of the analyzer; but the tint varies as the analyzer is turned, ascending regularly through the scale from red to violet. To this fact, first noticed by M. Arago, M. Biot contributed the additional discovery that the ascent of the tints is produced in some crystals by a right-handed rotation (in the direction of the hands of a watch), and in others by a left-handed rotation. Hence, the distinction since made between right-handed and left-handed crystals, called also, more appropriately, *dextrogyre* and *lævogyre*. It was subsequently noticed by Sir John Herschel that the gyratory power of crystals is so apparently dependent on the causes which produce modifications of the crystalline form, that its direction may be inferred without optical examination, by means of the external characteristics. The crystal is usually a hexagonal prism, with terminal hexagonal pyramids; but the tetrahedral angles where the lateral and terminal faces meet, and the lateral edges also, are sometimes replaced by planes, called *plagihedral*, which encroach on the neighboring faces more on one side than on the other. If, in the crystal as held by the observer with the pyramidal vertex toward him, the plagihedral encroachment is largest on the faces toward the right, the crystal is optically dextrogyre, and *vice versâ*. Sir David Brewster's observations on these crystals led to the discovery that when the crystal is not very thick the uniformly-tinted field is confined to the centre, and is surrounded by a system of rings resembling those seen in Iceland spar, but in which the cross is imperfect. (Fig. 4 exhibits the appearance.) He also found in that remarkable species of colored quartz called amethyst, veins of right-handed and left-handed crystallization alternating with each other in many parallel layers, and producing at their surfaces of contact lines of neutral character. In some specimens the layers were found to be so extremely thin as to neutralize the rotatory power of the whole crystal, and in these instances the ordinary system of rings with a perfect cross makes its appearance. In all these observations upon crystals in the direction of their optic axes, the number of rings is greatly increased by the use of monochromatic light. The intervals between the rings are also, in such light, intensely dark. In the case of quartz crystals, monochromatic light presents appearances in the centre very little different from those seen when the crystal is not present; that is to say, it exhibits, as the analyzer is turned, a succession of maxima and minima, separated from each other in azimuth 90°. But the absolute azimuths of these maxima and minima are no longer what they were before the introduction of the crystal: in other words, the plane of polarization has been turned to the right or to the left, according to the nature of the crystal, through an angular distance proportioned to the thickness of the crystal. The peculiar kind of polarization produced by quartz has on this account been called *rotatory* polarization.

Fig. 4.



It will be easily conceived that a right-handed and a left-handed crystal of equal thickness, superposed upon each other, will produce a resultant rotation equal to zero. But two such plates so superposed, examined in polarized light, exhibit a remarkable spiral cross, such as is seen in Fig. 5. These spirals were first observed by Mr. Airy, and are commonly known as Airy's spirals. Two contrary plates of *unequal* thickness, superposed as above, produce an amount of rotation proportional to their difference of thickness.

Fig. 5.



The power of rotation of the same crystal is different for the different colors, being, in the undulatory theory of light, an inverse function of the length of the undulations. By employing the successive colors of the spectrum for each separately, M. Biot determined the absolute rotatory power of a crystalline plate of quartz $\frac{1}{25}$th of an inch in thickness, as follows:

Extreme red	17.4964	Limit, green and blue	30.0460
Limit, red and orange	20.4978	Limit, blue and indigo	34.5717
Limit, orange and yellow	22.3138	Limit, indigo and violet	37.6829
Limit, yellow and green	25.6752	Extreme violet	44.0827

This property of rotatory polarization does not exist in plates of quartz cut parallel to the axis. In such plates ordinary double refraction exists, but it is the extraordinary instead of the ordinary ray whose velocity is least, or the crystal is a positive one.

The double refraction of quartz along its axis was experimentally analyzed by Fresnel by means of a very ingenious arrangement. The difference of velocity of the two rays being so slight as to render their separation by ordinary expedients difficult, he devised and constructed a compound prism by which to double their divergency. In Fig. 6, A B F and C D F represent similar triangular prisms of right-handed quartz with the faces A B, C D cut perpendicularly to the axis. The obtuse-angled prism B F D, having the angle B F D equal to the supplement of 2A F B, has its base B D parallel to the axis of a crystal of left-handed quartz. The incident ray I I′, falling perpendicularly upon A B, is separated into two, whose velocities differ, but which pursue the same path, which is the axis. At the surface B F their paths become different, the velocity of one of them passing from — to +, and that of the other from + to —. At the surface F D this divergency is increased, the velocities again interchanging their relations. At final emergency from the face C D the divergency will be further slightly increased in consequence of the inclination of the emergent rays to the surface. By this arrangement a sufficient separation of the two rays is obtained to make it possible to examine them singly; and it is obvious that a duplication of the system of prisms here shown, or an increase in the number of elements employed, would, if necessary, make the separation still wider. If quartz were like other uniaxial crystals in the law governing refraction along its axis—that is, if the velocities of the two rays were in that direction equal in this crystal, as they are in others—the system of prisms just described would produce no separation of the rays. The fact of the separation proves quartz to be in this respect an exceptional case. When the separated rays are examined, however, the extent to which quartz is exceptional is discovered to be much greater than is implied in the difference just indicated. The peculiarities are the following, and are true of either of the separated rays. Examined with a doubly-refracting prism, two perfectly equal images appear in all azimuths of the prism. Received upon a mirror at the polarizing angle, equal reflection takes place in all azimuths of the mirror. In these respects the rays resemble ordinary unpolarized light. But in the following particulars they differ. Transmitted through thin crystalline plates, they display, on being analyzed, tints like those produced by polarized light, only they are such tints as ordinary polarized light produces in thicknesses of crystal greater or less, by a determinate amount, than those used in the experiment. Transmitted through a rhomb of glass, like that represented in Fig. 7, of which the acute dihedral angles are $54\frac{1}{2}$, they emerge, after two internal total reflections, at P and Q, polarized in planes—one in azimuth 45° on the right, and the other in azimuth 45° on the left of the plane of reflection. If both are transmitted through the rhomb simultaneously, so as to emerge together, they will form a single ray polarized in the plane of reflection. Rays in this condition are said to be *circularly* polarized. And as it appears that a circularly polarized ray becomes *plane* polarized by two internal reflections in glass at an angle of incidence of 54° 30′, the resultant plane of polarization being in azimuth 45° from the plane of reflection, it follows that a plane polarized ray may be circularly polarized by causing it to make two similar reflections, the plane of its original polarization being 45° in

Fig. 6.

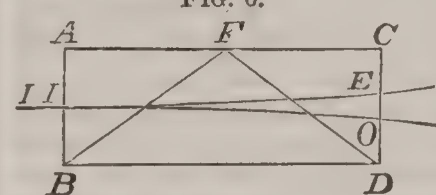
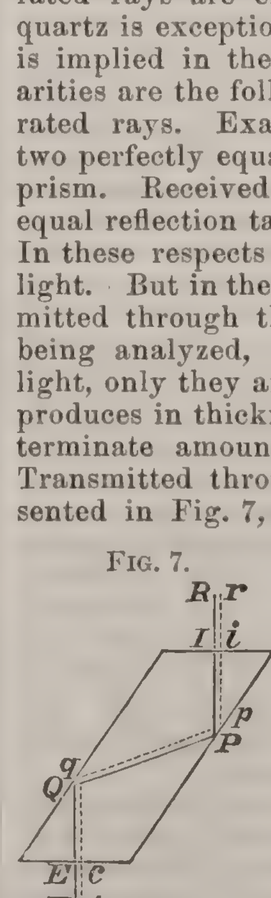


Fig. 7.



azimuth from that of the first reflection. This is effected by the use of a rhomb such as has just been described, and which, from its originator, has been called Fresnel's rhomb. It is obvious that if a plane polarized ray be thus passed through *two* of Fresnel's rhombs successively, it will emerge plane polarized.

M. Fresnel was led to the discovery of the remarkable property of the rhomb which bears his name by theoretic considerations. When light is passing from a denser to a rarer medium, the angle of refraction is greater than the angle of incidence, and the law of Snellius,

$$\frac{\sin i}{\sin r} = n,$$

gives a value for n, the index of refraction, less than unity. Now, as 1 is the greatest possible sine, if we put $\sin r = 1$, we shall have $\sin i = n$, and therefore i itself less than 90°. For an incidence greater than this value of i there can be no emergent ray; and hence this is called the *limiting angle.* For all such incidences the whole of the light is reflected; and this is what is meant by *total reflection* at second surfaces. M. Fresnel found that the mathematical formulæ which he had deduced from his theory of light, to express the intensity of reflection at different incidences, became *imaginary* in the case of total reflection; and in reasoning on the probable causes of their failure he was led to predict that a rhomb of glass having the angles above stated would produce precisely the effect which has just been described. Experiment proved the truth of this anticipation.

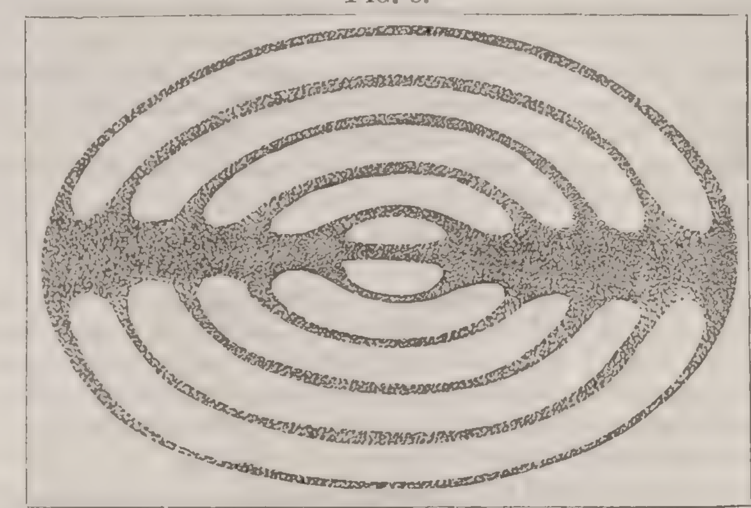
Reflection from metals presents characters which resemble those of reflection from the second surface of transparent media. There is this difference, that common light totally reflected exhibits no traces of polarization, but common light reflected from metallic surfaces *is* partially polarized. When the incident light at second surfaces is polarized in an azimuth between 0° and 90°, the modifications which it undergoes resemble those produced by metals. This subject was first systematically investigated by Sir David Brewster. He first discovered that polarized light, after having undergone one total reflection in an azimuth between 0° and 90°, produced colors, when examined with an analyzer, analogous to those produced by thin crystalline laminæ. He afterward ascertained that a polarized ray which has undergone successive reflections from plane metallic mirrors placed parallel to each other, when the original azimuth of reflection is 45° from the plane of polarization, will exhibit similar tints. The angle of incidence at which the effect is best produced varies with different metals, but is in all or nearly all cases above 70° and below 80°. The brightness of the tints increases with the number of reflections. Sir David Brewster also found this analogy between the effects of such a pair of parallel metallic mirrors and a pair of Fresnel's rhombs—that at a certain angle of incidence, different for different metals, the effect of the reflection on the first mirror would be exactly compensated by that on the second, and the ray would emerge plane polarized. But he found also this difference between the cases—that while (the azimuth of incidence being $+45°$) the ultimate plane of polarization with the rhombs was $-45°$, that with the metallic mirrors was always less than this, being for silver, in which it was greatest, $-39°\ 48'$, and for galena, in which it was least, no more than $-2°$. There is also this additional and very remarkable difference: in the case of the rhombs, after the light had undergone reflection in the first, it will be restored to its original condition by the second, no matter what be the azimuth between the planes of reflection in the two rhombs; but in the case of the two mirrors, if the second be turned in azimuth, it will no longer restore the ray unless the *angle of incidence* be changed also. If it be turned quite round, the angle of incidence required to effect restoration will pass through a series of regular variations between determinate limits, which variations may be represented by the varying radii of an ellipse. It was on this account that the term *elliptical* polarization was originally applied to light in this physical condition. Common light reflected from metallic surfaces is more or less elliptically polarized. In fact, the recent investigations of M. Jamin and others have proved that there are very few substances which furnish by reflection from their surfaces absolutely pure plane polarized light. None are capable of doing so whose indexes of refraction exceed or fall short of 1.414. Water and glass do so sensibly, but in this respect they are nearly exceptional.

The rings seen in crystals cut across the axis, when examined in circularly polarized light, exhibit some singular peculiarities. They are divided into quadrants by a cross which is neither very dark nor very bright, and which does not change in intensity with the revolution of the analyzer, but turns with it. The rings in the alternate quadrants are *unconformable,* those in one opposite pair being nearer to the centre, and those in the other more distant from the centre by a quarter of an interval than the corresponding rings in plane polarized light.

Mr. Airy found that light may be circularly polarized by *refraction* in passing through laminæ of crystals which doubly refract, provided the thickness of the laminæ used is such as, on the undulatory theory of light, is just sufficient to effect a retardation of one of the rays produced by the double refraction one quarter of an undulation behind the other, or to advance it one quarter of an undulation before the other. The mineral employed by him for this purpose, and which is more conveniently prepared of suitable thickness than most others, is mica, of which the laminæ are easily separable and cleave in large sheets without breaking. A lamina reduced to a thickness proper to produce circular polarization is commonly called a "quarter-wave lamina."

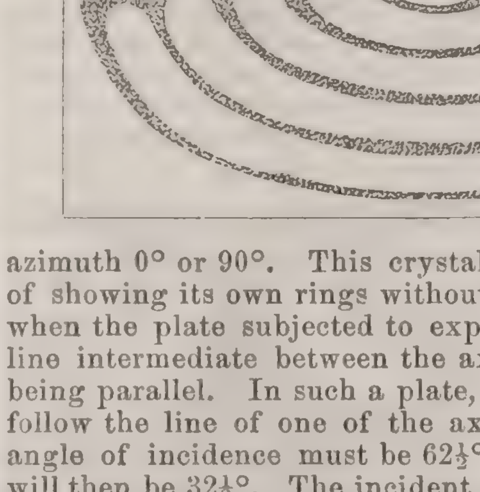
For some time after the discoveries had been made of which a brief account has here been given, it was supposed that all doubly-refracting crystals have but a single optic axis. In the year 1817, however, Sir David Brewster announced the remarkable fact that most crystals have two optic axes instead of one. The rings seen in crystals of two axes are elliptical when the axes are so far apart that only one can be observed at a time; and they form *lemniscate* curves, or curves resembling the figure 8, when they are near together. In topaz the axes form an angle with each other of 65°, and the rings present the appearance shown in Fig. 8 when the analyzer is crossed upon the polarizer, the plane of the axes of the crystal being in

FIG. 8.



azimuth 0° or 90°. This crystal possesses the peculiarity of showing its own rings without the help of an analyzer when the plate subjected to experiment is cut across the line intermediate between the axes, the opposite surfaces being parallel. In such a plate, in order that the ray may follow the line of one of the axes within the crystal, its angle of incidence must be 62½°; the angle of refraction will then be 32½°. The incident angle at either the first or the second surface will, therefore, be very nearly equal to the polarizing angle for the substance, since the reflected and refracted rays make an angle of 85° with each other; whereas, according to the law of Brewster, at the polarizing angle they should be at right angles. If, therefore, instead of observing the light transmitted through the plate, we receive upon the eye the rays reflected from the second surface and emergent from the first, the reflecting surface itself forms an analyzer sufficiently perfect to exhibit the rings. But as the angle of reflection is not truly the polarizing angle, when the crystal is in azimuth 90° the dark band will not be as large as is the case in the rings seen with a better analyzer by transmitted light.

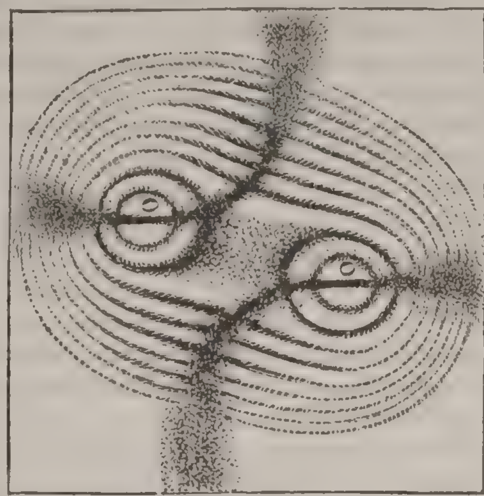
FIG. 9.



In Figs. 9 and 10 are seen the appearances presented when the subject of examination is saltpetre (nitrate of potash), in which the axes are inclined to each other 6°. The plane of the axes of the crystal being brought into coincidence with the plane of polarization of the incident light, and the analyzer being crossed upon the polarizer, a system of lemniscate curves is seen, like that shown in Fig. 9 intersected by a dark cross, of which the bar coinciding in direction with the plane of the axis is longest. If the analyzer be turned 90°, the colors become complementary and the cross becomes white; but if, the analyzer and

polarizer remaining fixed, the crystal itself is turned in azimuth, the cross will break at the centre, forming two curves, which, when the rotation becomes 45°, assume the form of two opposite hyperbolas. This appearance is exhibited in Fig. 10.

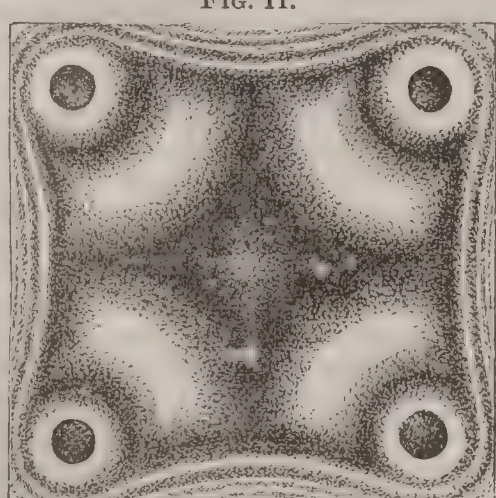
Fig. 10.



A very curious property of crystals of two optic axes, first announced on theoretical grounds as probably existent, and afterward experimentally demonstrated by Dr. Lloyd, consists in this—that, supposing, in a crystal properly prepared for the purpose, the straight line representing either axis to be produced externally in both directions, this line will be also the axis of a hollow cone at either extremity, the vertices being at the intersections with the surface of the crystal and the bases outward, such that any incident ray coinciding with an element of either conical surface will coincide within the crystal with the optic axis itself, and will coincide on emergence with the other conical surface. Thus, an incident hollow cone of rays becomes an emergent hollow cone; but what is more remarkable, an incident solid cone or pencil gives an emergent hollow cone, since the interior rays of the incident pencil are scattered by refraction within the crystal. Moreover, an incident ray coinciding externally with the true direction of the optic axis is spread out by refraction into a hollow cone within the crystal, and becomes on emergence a hollow cylinder. These singular phenomena are usually referred to by the terms *conical refraction* and *polarization.*

When cylinders, tubes, rhombs, or other geometrical forms of well-annealed glass are subjected to a sudden increase of temperature acting upon all their surface, as by immersing them in hot water or hot oil, there will be seen within them, by polarized light, systems of symmetrical figures circular and concentric in cylinders, and dependent on the form of the solid for their shape in other cases, bearing a striking resemblance to the rings seen in crystals. An illustration of these appearances is presented in Fig. 11. Like those rings, these figures are marked by a cross, which changes from black to white with the rotation of the analyzer. But these figures will alter their forms if the glass be broken, which is not true of the rings formed in crystals. When the heat has fully penetrated the glass, and the interior temperature is uniform, the figures cease to be seen. At this time, if the heated glass be removed from the bath and allowed to cool rapidly, a new system of figures will spring up within it. This is related to the former one, as the rings of a positive crystal are to those of a negative one; and therefore, if two similar solids, in one of which the former set of figures is seen, and in the other the latter, be superposed when the intensities are equal, they will neutralize each other's effects, and the colors will disappear. This structure may be made permanent in the glass solids we have been considering, by heating them nearly to the point of fusion and then suddenly cooling them. Many common articles of glass are so imperfectly annealed as to display the doubly-refracting structure in a striking manner. The stoppers of bottles, if cut across the axis and polished, will invariably show it; so will the stems of wine-glasses, the stirring-rods of the chemist's laboratory, and many if not all glass tubes.

Fig. 11.



The effects of heat are also remarkable in altering the doubly-refracting character of crystals. M. Mitscherlich discovered that heat expands crystals unequally in different directions. Iceland spar is expanded in the direction of its axis, and slightly contracted at right angles to the axis. Its doubly-refracting power is thus diminished. In sulphate of lime, which is a crystal of two axes inclined to each other 60°, he found that the inclination diminishes with elevation of temperature until the two axes unite in one; after which, with further increase of heat, they open out in a plane at right angles to the first. Dr. Brewster discovered an example even more remarkable in *glauberite.* At the freezing-point this crystal has two optic axes for every color of the spectrum, the inclination of the axes of the red being greatest, and that of the violet being least. At ordinary temperatures it has two axes for red and one for violet. When heat is applied, the other axes approach, as in the case just described, and, after successively uniting, successively open out in the transverse plane.

In comparing the crystals which possess the power of double refraction (being by far the greater number of the whole), there is found to be a certain relation between the optical character of the crystal and the crystallographic structure. All crystals whose primitive form is the cube, the regular octahedron, or the rhomboidal dodecahedron—figures whose geometrical axes are all equal—are destitute of the property. All crystals which have one axis greater or less than the others are crystals of one optic axis. All crystals whose geometric axes are all three unequal have two axes of double refraction.

The power of rotatory polarization belongs to many liquids. Their relative rotatory forces are estimated by a comparison of the amount of angular change in azimuth produced upon a polarized ray in passing through a column of given length; but as yet there has been no universal agreement upon a standard length. The statements of experimenters, therefore, usually embrace both the angular rotation and the length of the column by which it has been produced, rendering a reduction to a common length necessary before a correct comparison can be instituted. It would perhaps be most convenient to adopt as a standard length the length of the tube introduced by M. Soleil into his *saccharimeter*, or instrument for measuring the rotation in solutions of sugar, which is twenty centimètres. With this length the dextro-gyration of the oil of bitter orange is, for red light, 157°.89, which is the maximum observed in this class of liquids. The lævo-gyration of narcotine in alcohol and ether is 151°.4; that of sulphate of quinine in water acidulated with sulphuric acid is 192°.95 in the same direction. Solution of crystallizable cane-sugar is dextrogyre; that of uncrystallizable cane-sugar, or molasses, is lævogyre. Solution of sugar of grapes is also dextrogyre when prepared from the juice and before solidification, but if evaporated to dryness and redissolved it is lævogyre. Crystallizable cane-sugar is made uncrystallizable by heat, and its rotatory power is accordingly reversed by the same cause. In many solutions the introduction of an acid modifies the rotatory power. Narcotine, from being $-151°.4$, becomes, after the addition of hydrochloric acid, $+83°$. Cane-sugar has its rotatory power inverted in the same way. On this principle is constructed the saccharimeter of Soleil, just mentioned. A solution of the sugar to be examined is made of a definite density, and its rotatory power is observed in a tube twenty centimètres in length. One-tenth of its volume of strong hydrochloric acid is then added, and the mixture is kept for ten minutes at a temperature of 150° F., after which it is cooled and observed in a tube one-tenth longer than before. Its rotation is now wholly negative. The two observations are proportional to the difference and the sum of the crystallizable and uncrystallizable sugar present. (See SACCHARIMETER.)

M. Pasteur has made a very elaborate examination of the salts of tartaric and paratartaric acid in their relations to polarized light. All the tartrates are dextrogyre; the paratartrates have no rotatory power at all. M. Pasteur made the interesting discovery that paratartaric acid, which is the same as racemic, and which differs from tartaric acid only in having an additional atom of water, is composed of two acids, one of which has a positive and the other a negative rotatory power. The dextro-racemic acid is simply tartaric acid, and the dextro-racemates are tartrates. Paratartaric acid and its salts owe their neutral character to the balance of opposite forces belonging to their components. In considering the crystalline forms of these different salts, M. Pasteur detected a relation between them and their polarizing properties, such as has already been described to exist in quartz; that is to say, the salts which possess rotatory power have plagihedral faces leaning in the direction of rotation. The crystals are all of the kind called by M. Weiss *hemihedral;* that is to say, not in all respects symmetrical. M. Pasteur observed that there are two kinds of hemihedral crystals, which he has distinguished as the *superposable* and the *non-superposable.* When a crystal or any solid or surface is such that another may be conceived or constructed like it in every particular as to form and dimensions, yet incapable of being made to occupy the same matrix or mould, such a crystal or solid or surface belongs to the class of the *non-superposable.* The image of the face in a mirror as compared with the face itself, the left hand or the left foot as compared with the right, and many analogous objects, natural and artificial, may serve to illustrate this conception. M. Pasteur

found that all the crystals whose salts possess the rotatory power are hemihedral and *non-superposable*, and, conversely, that all salts whose crystals are non-superposably hemihedral have the power of circular polarization, with two exceptions only thus far known, which are formiate of strontian and sulphate of magnesia. In the latter case the crystal is so very nearly superposable that it is hardly surprising that it should not sensibly conform to the law. In the instance of the formiate of strontian, M. Pasteur thinks that the hemihedrism does not depend on the arrangement of atoms in the chemical molecule, but on that of the physical molecules in the entire crystal; so that, on solution, the structure on which the rotatory power depends disappears in the same manner as it is known to do in quartz on fusion.

The polarization of the light of day by atmospheric reflection has been sufficiently noticed under OPTICS. The object of the present article has been to give an account of the most important phenomena belonging to this interesting branch of science, without discussing the causes to which they are owing. These are considered under the title UNDULATORY THEORY (which see).

F. A. P. BARNARD.

Po'lar Research', a term indicating explorations and researches in the Arctic and Antarctic circles. The Arctic or its vicinity was visited as early as the ninth century. Iceland, which touches the Arctic circle at the N., and corresponds with the accounts of the ancient Thule, was discovered by Naddodr, a Norwegian viking, A. D. 860, and settled in 874 by a colony of Norsemen, the ancestors of the present Icelanders. In 890, Octher, a Norwegian, sailed into the Arctic, along the north-eastern coast of Norway, passing the Loffoden Islands, North Cape, and probably as far as Varanger Fiord, or the mouth of the river Kola, finding the country along the coast occupied by Finns, who lived by fishing in the summer and by hunting in the winter; which is the first voyage around the North Cape and across any part of the Arctic circle that is on record. In 982 or 983, Erik the Red, a Northman, discovered the E. coast of Greenland. He sailed around Cape Farewell, passed three years in exploring the W. coast of Greenland, and in about 986 returned with a colony of Icelanders and established a settlement on the S. E. coast of Greenland, in about lat. 60°, which existed for some time, but ultimately perished, all connection with the parent country having been cut off. In 1869, Dr. I. I. Hayes found the stone ruins of this settlement, including the church edifice, which was still in good preservation, excepting the roof. Two Italians, the brothers Zeni, made a voyage in 1380 in this direction, far to the N.; but as the truth of the published account, particularly as to the extent of the voyage and the details of it, is in dispute, the facts are not deemed sufficiently certain to be accepted and enumerated. In 1477, Columbus, from his own account, "sailed 100 leagues beyond the island of Thule," from which it is inferred that he visited Iceland, and probably Greenland. This is all, up to this period, that can be reliably stated respecting the Arctic, except that it was at this time, and probably before, resorted to for its fisheries, being then, as it is still, a favorable region for the capture of whales and the fur-bearing animals.

Toward the close of the fifteenth and throughout the sixteenth century the northern nations of Europe, and particularly the English and the Dutch, became deeply interested in promoting explorations and discovery in this quarter of the globe. The account given by Marco Polo of the wonderful countries he had visited in the East drew the attention of the maritime nations of Europe to the importance of a more intimate connection with China and India. A comparison of Marco Polo's account with that of others led Prince Henry of Portugal, surnamed "the Navigator," to devote the residue of his life to the study of navigation, the fitting out of vessels, and the promotion of that brilliant era of maritime discovery which began in the latter part of the fifteenth century, the inauguration and successful prosecution of which in the beginning were wholly due to his efforts. The discovery of the continent of America by Columbus in 1492, and of a way to the Indies by the Cape of Good Hope by Vasco de Gama in 1498, diverted maritime commerce from its ancient seat in the Mediterranean, and gave to the Portuguese and the Spaniards, as the discoverers of the newly-acquired territories in Africa and America, a control over the commerce of the world. These nations not only claimed the new countries by the right of discovery, but also a right to the exclusive navigation of the ocean between them, and each claimed over the other the exclusive right. As the enforcement of such a claim by either would have involved both in an interminable war, they mutually agreed to refer the settlement of their respective claims to the pope as arbitrator, and he drew a line through the centre of the South Atlantic, and decided that the Portuguese had the right to the eastern part and the Spaniards to the western; which has been erroneously supposed by some writers to have been a gift of this part of the world by the pope, whereas it was simply a settlement, in the interests of peace, of a matter in controversy between two great nations, in which he merely acted as umpire. Neither the English, the Dutch, nor the French, however, recognized this claim on the part of the Portuguese and the Spaniards, nor did the pope, in fact, assume any right to dispose of the newly-discovered countries or the ocean between them as against the rights or the claims of other nations. But as the Portuguese and the Spaniards after this settlement united in the exclusion of all other nations, and as any attempt on the part of any other to encroach upon their mutually-assumed rights involved a war with each of them, the attention of the northern maritime nations of Europe was awakened to the importance of the discovery at the N. of a passage around the continent of Europe or of America to the Indies, which, if found, would not only be shorter than the route by the Cape of Good Hope, but would give to these nations, from their nearer proximity, the commercial superiority.

To the statesmen and geographers of that day it appeared highly probable, as a passage by water had been found around the continent of Africa, that one would be found also around the continent of Europe or through some portion of the northern part of America—a probability which was greatly strengthened afterward by the discovery of a passage to the Pacific through the Straits of Magellan in 1519. It was with this object that the voyages of the Cabots were made in 1495, 1497, and 1502; of Cortoreale in 1500 and 1501; the disputed voyage of Verazzano in 1524; the voyage of Gomez in 1525, of Rut in 1527; the voyages of Cartier in 1534, and of Frobisher in 1576, 1577, and 1578, by which voyages Newfoundland and the North American continent up to the Arctic circle were discovered. The design of Sebastian Cabot was the discovery of a north-*west* passage to India, but having sailed as far as 67° N. lat. without finding it, the English, after the lapse of some years, directed their attention to the discovery of a north-*east* passage, and an expedition under Sir Hugh Willoughby and Richard Chancellor, consisting of three ships, sailed in 1553, and entering the Arctic, reached as far as the southern part of Nova Zembla, in about 72° N. lat., but were compelled to return. Sir Hugh Willoughby, with the officers and crews of two of the vessels, was frozen to death in the mouth of the Dwina; but Chancellor in the other vessel succeeded in entering the White Sea, then only known to the Russians, and reached Archangel in safety. The search for a N. E. passage was renewed by the English in 1556, and Stephen Burroughs was sent out by the Muscovy Company. In a small pinnace he sailed along the coast of Norway, and passing the eastern promontory of the Gulf of Archangel, and beyond the mouth of the Petchora, discovered the straits that bear his name and the entrance to the Sea of Kara. Another expedition was sent out under Pet and Jackson in 1580, but got no farther than the Bay of Petchora. The efforts and failure of the English to discover a passage to the N. E. stimulated the Dutch, and in 1594 the merchants of Amsterdam, uniting with those of Middleburg and the syndic of West Friesland, fitted out three vessels, which proceeded to the Arctic, and, separating into two divisions, two of the vessels sailed through the Tugorsky Schar (Pet's Strait) and along the coast of Nova Zembla until their further progress in that direction was obstructed by ice, when they sailed through the Sea of Kara to about the vicinity of the Gulf of Obi, and then returned; whilst Barentz, in the other vessel, sailed along the western coast to the northern extremity of Nova Zembla, in lat. 77°, but was compelled to return. A Dutch mercantile expedition in 1595, and another for discovery in 1597, made further attempts in this direction. The last of these expeditions, which was commanded by Barentz and John Cornelius Ryp, discovered Bear Island and Spitzbergen, both vessels reaching as far N. as 80° N. lat. when they entered the Straits of Hinlopen from the E., and, passing around New Friesland and West Spitzbergen, returned to Bear Island, from whence Barentz, in one of the vessels, sailed around the N. E. point of Nova Zembla, until his further progress was impeded and he was hemmed in by ice. His vessel being crushed and disabled by the ice, he and his companions passed the winter, under terrible sufferings, in a hut erected by them in a little bay on the N. E. shore of Nova Zembla, from whence they emerged in the spring, and after a journey of great peril and hardship, in the course of which Barentz died, they reached Kola in Lapland in safety. All further attempts to pass around Nova Zembla to the N. E. were unsuccessful until 1871, when Capt. Karlsen rounded it in a small Swedish

sloop, and found the hut of Barentz with everything in it as Barentz had left it 276 years before.

The ill-success of these attempts to find a N. E. passage drew the attention of the English to the possibility of crossing in the direction of the Pole, as the vessels engaged in the fisheries penetrated farther into the Arctic in that direction than in any other. Henry Hudson was accordingly sent out in 1607 by the Muscovy Company to find his way, if possible, across the Pole. He made a vigorous attempt to do so, and got as far as about 81° N. lat., E. of Spitzbergen, when he was obliged to put back to Nova Zembla. The same company in 1610 sent out Poole with the like object, but he reached only to 77° 25′ N. lat., W. of Spitzbergen, although about the same time Thomas Marmaduke is said to have penetrated N. of Spitzbergen to 82° N. lat. In 1614 and 1615, Fotherby made a similar attempt, but reached no farther than the northern part of Spitzbergen; after which all attempts to reach the Pole, except an abortive one by Capt. Wood in 1676, were abandoned by the English for more than a century and a half.

The failure to discover a passage either to the N. E. or in the direction of the Pole revived the interest for the discovery of a N. W. passage. From an early period a belief existed that the continent of North America terminated in a cape, and was separated from Asia by the imaginary Straits of Anian, which were supposed to open into the Pacific and afford a short passage to China and India. It was with this view that the voyages of the Cabots, Cortoreale, Gomez, and Frobisher, before referred to, were undertaken respectively by the English, the Portuguese, and the Spaniards. This investigation, as has been said, was renewed in 1585, when some merchants of London sent out John Davis, who, following up the W. coast of Greenland, discovered Davis Straits and a part of Cumberland Island, and in two subsequent expeditions in the same direction he reached as far as 72° N. lat. Expeditions were again sent out by the Muscovy Company, under Weymouth in 1602, and under Knight in 1606, but they did not get as far north-westward as Davis. In 1608, Hudson, in the employment of the Dutch, explored, in the search for a western passage, the coast of North America, and discovered the Hudson River and the Bay of New York. In 1610 he was sent out again by the English, and discovered Hudson Strait and Hudson Bay, where his crew mutinied and set him adrift with his carpenter, who agreed to share his fate, in an open boat in the middle of the great bay that bears his name. The English, continuing their efforts, despatched Sir Thomas Button in 1612, Gibbons in 1614, and Bylot and Baffin in 1615—expeditions which resulted in very important discoveries, such as Baffin's Bay, the strait between Cumberland Island and the continent, and Horn, Lancaster, and Smith sounds; and having penetrated thus far N. in the western part of the Arctic without finding the expected western passage, the English desisted for some years from any further efforts in that direction. They were renewed, however, by Denmark in the expedition of Jens Munk in 1619; and in 1631 the English sent out Fox, James, and Middleton; in 1641, Moor and Smith; and in 1646, Capt. Wood; by which expeditions the island of Southampton, Fox Channel, James Bay, Wager River, and Repulse Bay became known.

The whole of the northern coast of Asia, with the Liakhov Islands or New Siberia and Wrangel's Land, was discovered by the Russians. The Arctic was traversed in the middle of the sixteenth century by Russian navigators in small vessels from the White Sea and the Petchora to the entrances of the rivers Obi and Yenisei. The subsequent Russian expeditions were so numerous and involve so many details that within the limits of our space they can be referred to only by name: Expeditions to the Yenisei in 1610; to the Lena in 1630; to the Kolyma in 1644; to the Gulf of Anadyr in 1648; Bhering and Tchirikow to East Cape in 1728; Krupischew, completing the discovery of both sides of Bhering's Straits, in 1730; Bhering and Tchirikow to the peninsula of Alaska and the Aleutian Islands in 1740; Liakhov's discovery of, and expeditions by him to, the archipelago of New Siberia in 1770, 1773, and 1775, and by Anjous in 1823; the various expeditions and attempts to double Capes Taimur and Tchscheljuskin in 1735, 1736, 1738, 1739, 1740, 1741, and 1843; Kotzebue's voyage to the N. E. coast of Alaska, and the discovery of Kotzebue Sound in 1815 and 1817; Wrangel's exploration and survey from the mouth of the Kolyma eastward to Cape Schelagskoi in 1820 and 1824; Middendorf to Cape Taimur and discovery of the Open Sea in 1843; Lutke's exploration of the Siberian coast and discovery of Wrangel's Land.

The search for a N. W. passage was resumed by the English in 1818 under Sir John Ross, and continued until the discovery of the passage by Sir Robert McClure in 1850. The explorations and expeditions despatched for this purpose, and those sent out for the relief of Sir John Franklin or other absent explorers, resulted in the discovery of that great region lying within the Arctic circle between 60° and 130° W. lon., up to Cape Parry, 71° 23′ W. lon. and 77° 6′ N. lat., or from Davis Strait to Cape Bathurst, embracing Banks, Prince Albert, and Prince Patrick's Lands, Melville Island and Sound, McClintock's Channel, Bathurst Island, Victoria, Prince of Wales, and King William Lands, Boothia and Gulf of Boothia, North Somerset, North Devon, Melville Peninsula, Cockburn Island, Grinnell, Ellesmere, and Washington Lands, Lancaster, Eclipse, and Jones sounds, Wellington Channel, Kellett, Barrow, Franklin, Peel, Sir James Ross, and the Fury and Hecla straits, Regent's Inlet, and the discovery in 1833 by Sir James Ross of the N. magnetic pole. These expeditions were so numerous, and the discoveries, explorations, and researches made by them so extensive, that we can only state the expeditions in the order of their occurrence: Sir John Ross, 1818, 1829, and 1833; Sir Edward Parry, 1819, 1824, 1832, 1833, 1847, and 1850; Admiral Beechey, 1826–29; Capt. Back, 1836; Dease and Simpson, 1837, 1838, and 1839; Dr. Rae, 1846, 1850, 1853, and 1854; Sir John Franklin, 1836, 1845, and 1849; Sir John Richardson, 1848; Capt. Kellett, 1847; Sir James Ross, 1848; Capt. Penny, 1849–50; Sir Robert McClure, 1850–54; Admiral Ommancy, 1850; Lieut. De Haven (Grinnell expedition), 1850; Capt. Austin, 1850 and 1855; Capt. Kennedy, 1850–53; Sir L. McClintock, 1850, 1857, and 1859; Sir Edward Belcher, 1852 and 1853; Lieut. Bellot, 1852; Admiral Inglefield, 1852 and 1854; Dr. Kane, 1853; Dr. Hayes, 1853 and 1860; Capt. Hall, 1860.

Parry, after attempting in three voyages to find a N. W. passage, determined in 1827 to renew the attempt to reach the Pole. His vessel being impeded by ice at the N. end of Spitzbergen, he made the attempt to reach the Pole in boats, getting as far as 82° 50′, the highest position attained by any previous explorer, and would probably have reached much farther but that the ice on which he was travelling drifted southward, rendering any further advance by him impossible.

The N. W. passage found by McClure is between Banks and Prince Albert Lands, through Prince of Wales Strait, Melville Sound, Barrow Strait, and Lancaster Sound, to Baffin's Bay, and may be entered from other points. It is, from the obstruction of ice, of no practical utility for the purpose of commerce and navigation, and since its discovery polar research has been limited to attempts to reach the Pole or to explore the seas that lie between Vaigat's Island and Bhering Straits, and the countries within the Arctic circle that are in the northern part of Siberia and the north-eastern portion of Europe.

The explorations of Dr. Kane and Dr. Hayes in 1853 and 1860 through Smith Sound and Kennedy Channel revived the belief in the existence of an open polar sea—a belief which has existed for more than two centuries, and which sea was even represented upon maps as early as 1608. The probability of the existence of such a sea was advocated by the Russian explorers, Wrangel and Middendorf; and Dr. Kane, after the discoveries of Admiral Inglefield in Smith Sound, and of Sir Edward Belcher in Wellington Channel, became convinced that there was such a sea somewhere between 80° N. lat. and the Pole, with a milder climate than in the region S. of it. His expedition to Smith Sound in 1853 was for the purpose of discovering it, during which Morton and a companion discovered Kennedy Channel, and reached as far as Cape Constitution in 82° 27′ N. lat.; and Morton saw at the N. E. what he supposed to be the open sea, but which was found, upon Capt. Hall's expedition in 1871–73, to be what is now known as Robeson's Channel. Dr. Hayes followed up this exploration in Smith Sound by an expedition in a single vessel in 1860, and by a sledge-journey, after great hardships, reached as far as 81° 35′, returning with the conviction that the most practicable route to the Pole was through Smith Sound—an opinion which subsequent events have strongly tended to confirm.

Attention, however, was directed from this route by Dr. Petermann, the German geographer, who maintained that the experience of the past warranted the belief that the best course was either between Greenland and Spitzbergen, or through Barentz Sea between Spitzbergen and Nova Zembla; and his opinion being generally adopted, the attempts to reach the Pole were in this direction for the following ten years in expeditions despatched by the Swedes, Germans, and Austrians. Expeditions were sent out by the Swedes in 1857, 1861, 1864, and 1868; by the Germans in 1868, 1869, and 1871; by the Austrians in 1871, 1872; to which should be added explorations by Norwegian vessels in 1869 and 1871, and several voyages made by Mr. Lamont in his yacht. All attempts, however, to reach the Pole in this direction proved abortive, and the knowledge

acquired impressed the navigators that any further attempt between Spitzbergen and Greenland was hopeless. The second Austrian expedition, however, under Lieuts. Weyprecht and Payer, penetrated the sea between Spitzbergen and Nova Zembla, discovering a large region (Franz Joseph Land) extending from below the 80th to beyond the 82d parallel of N. lat.; and from the farthest point reached, 81° 57′ N. lat., they saw land extending beyond the 83d parallel, the farthest northern point upon the globe yet seen by man. Lieut. Payer's opinion was, that ships could not penetrate N. of Franz Joseph Land, and he has no belief in an open polar sea. It has been said that this voyage confirms Capt. Bent's theory that the Pole can best be reached by following the course of the Gulf Stream northward between Nova Zembla and Spitzbergen; which is, however, in direct conflict with Lieut. Payer's statement that the drift northward was in no ways owing to the Gulf Stream. The Norwegians were also very successful. They penetrated through Pet's Strait and the Karian Sea to the Gulf of Obi, and Capt. Karlsen sailed around Nova Zembla in 1871—a feat achieved for the first time. In 1872, Capt. Hall sailed through Smith Sound and Kennedy Channel, and through what he named Robeson Channel, unobstructed, to 82° 16′ N. lat., being farther than any sailing vessel had reached before. Although none of these expeditions succeeded in reaching the Pole, the amount of scientific information they gathered has given to polar explorations a new and important interest, in the fact, now generally recognized, that scientific observations in the region of the Arctic and Antarctic are of the highest value; that they materially assist in the solution of some of the most important scientific questions of the day; and that the large contributions made by these expeditions to human knowledge have not only fully repaid the fitting of them out, but have shown the importance of still more extended explorations in this interesting field for scientific research. It is mainly in this view that an expedition, consisting of two vessels under the command of Capt. Nares, the late commander of the Challenger and an experienced Arctic explorer, was despatched by the British government in 1875, which, when last heard from, was upon its way through Smith Sound in an attempt to reach the Pole. The feasibility of the route through Smith Sound and Kennedy Channel, which is called the American route, has been uniformly advocated by Kane, Hayes, and the American Geographical Society, and was followed successfully by Hall to the high latitude previously stated. It has, heretofore, had in England the support of the Arctic explorers Osborne, Collinson, McClintock, Back, and Hamilton, but with these exceptions English geographers and explorers, until very recently, have generally been in favor of the route E. or W. of Spitzbergen. The result of the abortive efforts in that direction, however, as contrasted with the easy passage of Hall's vessel to 82° 16′, has entirely changed opinion, and the Nares expedition has gone by that route with the common approbation and hearty approval alike of Dr. Petermann and of all who are entitled to be regarded as authority.

In 1875 the Swedish explorer Nordenskiöld sailed through and *dredged* successfully in the Sea of Kara, to the mouth of the Yenisei, which he ascended, and made his way by Tobolsk to St. Petersburg.

Explorations within the limits S. of 66° 30′ S. lat. of the Antarctic circle have been few as compared with those of the Arctic. After the discovery of the passages around the continents of Africa and America by the Cape of Good Hope, the Straits of Magellan, and Cape Horn, there was no practical object to stimulate further explorations, as in the Arctic; in addition to which, explorations toward the Pole in the Antarctic are impeded by greater difficulties and attended with greater perils than in the Arctic. When the ancients, from astronomical observations and mathematical deductions, came to the conclusion that the form of the earth was globular, and Parmenides had divided it into five zones or climates, separated by an equatorial belt or zone, which was originally thought to be uninhabitable from excessive heat, an impression arose that there was beyond this supposed highly-heated region of the equator a large continent extending to the Pole, which they called *Terra Australis incognita,* in a portion of which, between the equator and the Pole, it was assumed there was a temperate climate. When it was afterward known that the region upon the equator was inhabitable, this unknown continent was shifted farther S. The belief in its existence survived to the Middle Ages, and after the continents of Africa and South America were circumnavigated this Terra Australis incognita continued to be represented upon the maps as a huge continental mass encircling the Antarctic Pole, and presenting to the ocean a continuous circuit of shore extending around the globe. After Van Dieman's explorations of the coast of Australia, and Tasman's

exploration of the western coast of New Zealand, the supposed continent was again shifted farther S.; and when Cook, in his voyage of 1722–55, made a circuit of the southern seas in high latitudes, and entered the Antarctic circle in three separate quarters, the illusions respecting this huge continent were dispelled, and it disappeared from the maps. To use his own words, he put an end to the searching for a southern continent, which had engrossed the attention of maritime nations for two centuries, and had been a favorite theory with the geographers of all ages. The most southerly point attained by Cook within the Antarctic circle was 71° 10′ S. lat., on the 107th meridian, and he settled the form of New Zealand, New Caledonia, and other Australian lands and islands. Bellinghausen in 1821 sailed several degrees within the circle, and discovered Petra and Alexander islands. In 1821, Palmer, an American, discovered the land bearing his name. Weddell, in 1823, advanced three degrees farther than Cook—that is, to 74° 15′ S. lat. Biscoe, in 1831–33, discovered Graham and Enderly Lands and Kemp Island—Ballenny, in 1833, Sabrina Land. Expeditions for discovery were sent in 1840 by the French government under D'Urville, and by the American government under Wilkes. D'Urville discovered Adelie and Clarie Lands, and Wilkes, in about the same parallel, coasted along an impenetrable barrier of ice, and as he saw land at different points, he inferred that this icy barrier marked the coast-line of a continuous continent; which does not necessarily follow, and geographers, from subsequent explorations, think, on the contrary, that it is probable that there is a chain of islands in this quarter of the Antarctic just without the circle, extending from the 95th to the 150th meridian. The most important exploration, however, in the Antarctic was made by Sir James Ross in the Erebus and Terror, from 1839 to 1843, who penetrated to 78° 11′ S. lat., the highest southern latitude ever attained, and made extensive discoveries within the Antarctic circle, amongst which was Victoria Land, which he supposed to be a continent, and the coast of which, with its icy barrier 150 feet high, he followed from 70° to 79° S. lat. In the northern extremity of this land, 77° 32′ S. lat., 168° 12′ E. lon., he discovered Mount Erebus, a volcanic mountain 12,360 feet high, and Mount Terror, 10,880 feet, and Mounts Ross, Crozier, Sabine, and Murchison, the whole coast being steep, rocky, and, like nearly all the land seen in the Antarctic, entirely bare. He ascertained the position of the S. magnetic pole to be 75° 5′ S. lat., 154° 8′ E. lon. The object of this voyage was scientific research. It was one of extraordinary perils and wonderful escapes, and the cool courage, perseverance, and ability displayed by both officers and men have never been surpassed in any voyage of exploration. The scientific information obtained in relation to the Antarctic, the course of currents, the distribution of heat, the temperature of the ocean depths, the tides, the mean temperature and pressure of the atmosphere, the extent of the distribution of plants, the fauna, and the geology, were of the highest value. In 1845, Capt. Moore, in the Pagoda, was despatched by the British admiralty for the observation of magnetic phenomena in a quarter of the Antarctic not visited by Ross. In E. lon. 39° 30′, S. lat. 68°, the vessel's course was stopped by an impenetrable ice-pack, when her direction was changed, and she afterward got beyond the 73d parallel.

The researches made show that the two polar regions differ greatly. The seas of the Arctic teem with animal life. Land animals, such as the bear, wolf, reindeer, musk-ox, and Arctic fox, are scattered over the frozen surface of the land, where they find the means of subsistence. The air is peopled with innumerable flocks of birds; a hardy vegetation extends close up to the Arctic circle, and beyond it, in mosses, lichens, scurvy-grass, sorrel, small stunted shrubs, dwarfed trees, and in summer beautiful flowers. In the Antarctic, on the contrary, vegetation ceases at a certain limit, trees terminating at about 56° S. lat. Animal life abounds in the seas, but no quadrupeds are found upon the land, though birds exist in great numbers and in varieties unknown in the Arctic. The severer climate of the Antarctic has been attributed to the great preponderance of water, the direction of its currents, and to the small extent of the land, the continents of America and Africa narrowing to a point, in marked contrast with the great breadth of land that encircles and covers the Arctic. The researches show that in both regions a luxuriant tropical or semi-tropical vegetation formerly existed. The fossil remains of trees three feet in circumference have been found in the Antarctic underlying basalt, and beds of coal in Kerguelen Island and throughout the Arctic, particularly in the eastern portion of the N. W. passage; and at Disco, New Siberia, and in Smith Sound fossil remains have been found of trees of enormous size, of plants, and of numerous animals that exist now only in tropical or semi-tropical regions. Many theories have been advanced

to account for this remarkable phenomenon, the last of which, and the most probable, is that of Mr. Croll, the meteorologist, that a tropical climate in the Arctic and Antarctic is brought about in long lapses of time through the change in the eccentricity of the earth's orbit, in combination with the precession of the equinoxes, by which the distribution of heat, through the action of ocean-currents, is increased N. and S. of the equator as the eccentricity approaches its maximum, causing a slow secular change of climate, of warmer and colder cycles, alternately in the northern and southern hemispheres.

CHARLES P. DALY.

Polar Seas. See ANTARCTIC OCEAN and ARCTIC OCEAN.

Pol'der [Dutch, probably allied to English "pool;" Ger. *pfuhl*, a "pool" or "marsh"], the technical term in Holland for a once-submerged area of land surrounded by dikes and reclaimed by artificial drainage, usually in the smaller polders by wheels driven by windmills—in the great polders powerful pumping-engines moved by steam. The polders vary in area from 100 acres and less to 12,000 or 15,000 acres; their surface is usually depressed from 1 to 15 or 20 feet below the surrounding country, and these lowest, as those of Schieland near Rotterdam, the Haarlemermeer polder, etc., are below the sea-level. South Holland alone contains more than 1000 polders. The most important are those which have been created by artificial drainage of what were permanently-submerged areas, such as that of the Haarlemermeer. (See HAARLEM LAKE.) In connection with the formation of the NORTH SEA CANAL (which see), all the areas once covered by the waters of the Y and Wijkermeer are converted into polders.

J. G. BARNARD.

Pole and **Polar,** in geometry. If from any external point a pair of tangents be drawn to a circle, the line drawn through the two points of contact is called the *polar*, and the external point the *pole*. The polar of any point P is constructed geometrically by joining it to the centre C of the circle, and taking on the joining line a point M such that $C\,M.\,C\,P = R^2$. A line drawn at right angles with the joining line through this point is the polar. If the point P be *within* the circle, the above construction will give a line wholly external: no tangents can be drawn through such a point. Nevertheless, the analytical process of determining equations of tangents and of the chord of contact remains the same. The points of contact become *imaginary*, but the imaginary expressions for their co-ordinates will satisfy the equation of the line as constructed by the above rule, and the point and line are still regarded as pole and polar to each other with reference to the circle. Modern geometry rests in no small degree upon the relations of poles and polars. If any curve S and an *auxiliary* circle* be given, another curve *s* may be generated, the consecutive points of which shall be the *poles* of consecutive tangents to S. The curve *s* is called the *polar reciprocal* of S, since the latter can be generated from the former in the same manner that *s* was generated from S. Very important geometrical deductions are derived from these relations. Every theorem of *position* (*i. e.* not involving *magnitudes* of lines or angles) is twofold; from each another can be derived by suitably interchanging the words "point" and "line," "inscribed" and "circumscribed," "locus" and "envelope," etc. Thus, the reciprocal theorems:

If two $\left\{\begin{matrix}\text{vertices}\\ \text{sides}\end{matrix}\right\}$ of a triangle $\left\{\begin{matrix}\text{move along fixed right lines}\\ \text{pass through fixed points}\end{matrix}\right\}$, the $\left\{\begin{matrix}\text{locus}\\ \text{envelope}\end{matrix}\right\}$ of the third $\left\{\begin{matrix}\text{vertex}\\ \text{side}\end{matrix}\right\}$ is a conic section.

In these reciprocal relations consists the "PRINCIPLE OF DUALITY." The method of reciprocal polars (as of projection) is due to Poncelet, but the principle is established on a broader basis (by Möbius, 1827) by that important modification of geometrical interpretation of analytical equations by which a system of co-ordinates (tangentical or line) is introduced, in which the position of a right line is indicated by co-ordinates, and that of a point by an equation.

J. G. BARNARD.

Pole (REGINALD), b. at Stourton Castle, Staffordshire, England, in Mar., 1500, son of Sir Richard Pole, Lord Montacute, and of Margaret Plantagenet, countess of Salisbury, daughter of the duke of Clarence, the brother of Edward IV.; studied at the Carthusian monastery of Shene, near Richmond; graduated at Magdalen College, Oxford, 1515; was made prebendary of Salisbury 1517 and dean of Wimborne and Exeter 1519; completed his education at the University of Padua, Italy, 1520–23; returned to England 1525; was favorably received by his cousin, Henry VIII., by whom he was sent in 1529 to negotiate for the approval by the University of Paris of the projected divorce of Queen Catharine of Aragon, but soon came himself to an opinion adverse to that measure, and was consequently dismissed from the royal presence 1530; refused also to approve Henry's project of renouncing the allegiance of the English Church to the pope; resided successively at Avignon, Padua, and Venice; sent to Henry his book, *Pro Ecclesiasticæ Unitatis Defensione* (1536), for writing which he was summoned to return to England, and, refusing to obey, was deprived of his ecclesiastical preferments and attainted by Parliament, but in compensation was in the same year invited to Rome by Pope Paul III. and created cardinal Dec. 3; was commissioned as papal legate to France and Flanders 1537, but refused entrance into their territories both by Francis I. and Charles V., but was received by the latter as ambassador in Spain Jan., 1539; was legate at Viterbo 1539–42; presided as papal legate at the opening of the Council of Trent, Dec. 13, 1545; was excepted by name from the amnesty decreed by Edward VI. on his accession to the throne, 1547; was a prominent candidate for the papacy in the election of 1549; was appointed legate to England on the accession of Queen Mary, and received by her with great pomp Nov. 24, 1554; successfully invited Parliament to a reconciliation with the papacy, and freed the realm from spiritual censures; was appointed by the pope archbishop of Canterbury Dec. 11, 1555; was consecrated Mar. 22, 1556; elected chancellor of the universities of Oxford and Cambridge 1556; made a visitation of the universities Feb., 1557, and exercised a great influence upon the government of Mary, though not responsible for the cruelties of the persecution of Protestants, as has frequently been alleged. D. at Lambeth Palace Nov. 18, 1558, the day following the death of Mary. Author of *Liber de Concilio* (1562), the first work printed at Rome by Paulus Manutius; *De Summo Pontifice Christi in Terræ Vicario* (1569), and *A Treatise of Justification* (1569), besides his principal work, previously mentioned. PORTER C. BLISS.

Pole-Axe. See BATTLE-AXE.

Polecat. See WEASEL.

Polem'ics [Gr. πόλεμος, "war"], **Theological,** a branch of the science of theology which has now generally lost its position in the theological system as an independent discipline, and has been incorporated with other branches of the science, but which at certain periods of the history of the Christian Church, and in certain situations, has vindicated itself as of the greatest importance. Thus, in the earliest times of the Christian Church, when Christianity had to defend itself against the attacks of the Jews and the pagan philosophers, theological polemics often occupied the time and the genius of the first minds, such as Irenæus, Tertullian, Athanasius, and Augustine, and a science was developed of the method and principles on which Christianity was to be defended. Again, at the time of the Reformation a similar situation was formed. The Protestant and Roman Catholic theologians not only attacked each other, but the science of such theological polemics was reconstructed. By Schleiermacher, however, this discipline was reduced to an introduction to practical theology.

Polemonia'ceæ [from *Polemium*, one of the genera], a natural order of exogenous gamopetalous plants, mostly herbs, distinguished from allied families by having regular and symmetrical flowers with the parts five each, except the superior pistil, which is of three carpels, forming a three-celled capsule. The seed-coat when wet usually develops mucilage and spiral threads, especially in the genus *Collomia* (which takes its name therefrom), and in the large genus *Gilia*. *Polemonium* (the Greek valerian or Jacob's ladder) is the only European genus, but the single European species is also North American, as are the few others and nearly all the rest of the order, except a few peculiar to South America, and one or two extending into North-eastern Asia. The order is rich in plants for ornamental cultivation, but is otherwise of no economical importance, the plants and their watery juice being bland and inert. PHLOX (which see) furnishes the gardens with numerous handsome perennials and one or two annuals, running into many varieties; *Gilia* supplies many annuals, chiefly Californian, and one or two showy biennials, such as the "standing cypress." *Cobæa*, a common cultivated climber, with compound leaves and tendrils, is an anomalous member of the family from Mexico and South America.

ASA GRAY.

Polianthus. See TUBEROSE.

Police' [Gr. πόλις]. This term is applied in common discourse to two very different although related subjects: it denotes the particular department of a national juris-

* Any conic section may be employed, but the circle, as the simplest, is used. The relation of pole and polar, of point and line joining pairs of tangents, is, however, developed by *all* curves of whatever degree.

prudence which is specially concerned with the quiet and good order of society, and it is also used to designate the organization of officials by which the rules composing that department of the law are enforced. In the former and primary sense, and in its most comprehensive meaning, police may be defined as the action of society in suppressing and removing the obstacles which are opposed to the attainment by the state or by individuals of the objects or ends for which they exist. In more definite language, it is the means instituted by the government to maintain public order, liberty, property, and individual security. In the accomplishment of this function it is sometimes the auxiliary of the administrative department, sometimes the auxiliary of the judicial department. In the former case, the measures which it employs are chiefly preventive, and are necessarily, to a certain extent, discretionary. This very discretionary power, which renders the police action more prompt and effective, also renders it more dangerous to civil liberty. The sphere within which it may act should therefore be carefully limited, and the general purpose of its measures should be accurately defined by the law. In respect to the nature of its functions and the subject-matter of its acts and rules, police is separated into two principal divisions—the administrative and the judicial. The former is confined to the work of supervision, and to the habitual maintenance of public order in every place and in each part of the general administration. The latter has for its object the discovery and investigation of offences which the administrative police has not been able to prevent, the collection of the proofs, and the bringing the offenders before the courts for trial and punishment. These divisions are essential, and are found in every country; the differences exist in the modes of organization.

Administrative Police.—According to the definition already given, this most important class should consist solely in the use by the public authorities of such measures of prevention in every place, and for each branch of the administration, as are deemed proper to suppress the infractions of existing laws. In some European countries, however, the police authorities exercise in addition a certain power of making regulations, delegated to them in different degrees, by virtue of which they themselves promulgate the rules necessary to maintain the permanent good order in society. Such methods are unknown in England and in the U. S., and are opposed to the principles of constitutional government and to the spirit of civil liberty, which require an absolute separation of the legislative and the administrative functions. In respect to the extent of the powers which may be exercised in maintaining public order, there are two systems which stand in marked opposition. One entirely subordinates the citizen to the administration, assumes charge of all his acts, authorizes or forbids the exercise of private rights, and only allows to the individual the liberty of choosing certain pursuits, of opening certain establishments, of devoting himself to certain professions, when he has obtained permission of the proper authority. The other, on the contrary, trusting the citizens, traces out in advance their duties, and subjects them equally to conditions which are expressed in general terms, and not for each special case and each individual; whoever infringes them incurs the penalties prescribed beforehand by the law. The former of these systems prevails to a greater or less degree in several continental states of Europe—among others, in France, Germany, Austria, and Russia; it is opposed to the genius of American and British institutions, and to all the tendencies of legislation based upon free constitutions. A special branch of administrative police forms a part of many European national systems, to which the name "political police" has been appropriately given. It has for its object the maintenance of the public peace considered as identified with the stability of the government. Its proceedings are therefore directed solely to the detection and prevention of offences against the state, and both its measures and its officials are generally secret. In respect to the modes of organizing the officials who are charged with the administrative police duty, and the distribution of functions among them, the division is commonly made between the general or rural police, which operates throughout the country districts, and the metropolitan police, which is constituted for large cities. While both of these classes have the same general objects and are clothed with the same general powers, the duties of the latter are, from the nature of the case, much more minute, extensive, detailed, affecting a greater variety of subjects, and enforcing a greater number of rules. The most important objects which the administrative police, whether rural or municipal, has in view are the safety of the state, the security of persons, the public health, and the orderly pursuit of the various industries in which society is engaged. In many of the continental states of Europe the functions of the police organizations, properly so called, embrace all of these subjects. In the U. S. and in Great Britain their functions are limited to the security of persons and property, and to the measures which fall within the division of judicial police; other departments of the government, State or municipal, are charged with the duty of maintaining the safety of the state, preserving the public health, and regulating the operations of trade and commerce so far as they are subjected to governmental control.

John Norton Pomeroy.

Polignac′, the name of a French family which has played a conspicuous and fatal part in the later history of the Bourbons.—Jules, Count de Polignac, and his wife, Yolande Martine Gabrielle de Polastron, were the most intimate friends of Marie Antoinette and the most prominent members of that faction of the court which, under the leadership of the count of Artois, gathered around her and intrigued, more or less openly, against the reforms of Louis XVI. and his ministers. The count was made a duke in 1780, and the family received immense dotations of land and money. As the prodigality of the queen and the political mistakes she made were generally ascribed to the influence of the duchess of Polignac, she and her husband were the special objects of the French people's hatred and contempt. But they were very prudent people; they left the country, together with the count of Artois, July 16, 1789, as the first *emigrés*. The duchess d. at Vienna Dec. 3, 1793. The duke went afterward to Russia, where he was well received by Catharine II.; she gave him an estate in Ukraine, where he d. Sept. 21, 1817. His three sons tried first to form an intrigue for the re-establishment of the Bourbons by the First Consul, through his wife, Josephine; afterward they participated in the conspiracy of Cadoudal, and were imprisoned at Paris when the allied army approached the city. They were very active for the return of the Bourbons, and soon made a brilliant career. The second of them, Jules Augustus Armand Marie, b. May 14, 1780, was made a Roman prince by the pope in 1820, and became president of the cabinet Aug. 8, 1829. As such he signed the famous ordonnances of July 25, 1830, which caused the immediate downfall of the Bourbon dynasty. He fled, but was caught at Granville Aug. 15, 1830, brought first to St. Lô, then to Vincennes, and sentenced by the Chamber of Peers to imprisonment for life and forfeiture of his titles and rights as a citizen. Restored to liberty by the amnesty of Nov. 29, 1836, he went to England. D. Mar. 2, 1847, at Paris.

Poligna′no a Ma′re, town of Italy, province of Bari, on the summit of a broad, steep rock which rises, island-like, almost perpendicularly from the Adriatic, with a partially secure anchorage for shipping. The trade is mostly in lemons and oranges. A little N. W. of the town stands the monastery of Sanvito, remarkable for its size, its architecture, and the fine finish of the interior. P. in 1874, 8564.

Poligny′, town of France, department of Jura, has large dye-houses, tanneries, ironworks, and a trade in wine and grain. Good marble-quarries are found in the vicinity. P. 5401.

Pol′ishing Slate, a very light scaly material brought from France and Germany, and used for finishing glassware, marble, etc. It is composed of the fossil frustules of diatoms, and is essentially the same as tripoli.

Po′lish Language and Literature. The great Slavic family, with its numerous idiomatic variations, offers four distinct literary languages—the Polish, the Bohemian (Czech), the Serbo-Illyrian, and the Russian. The Polish, developing under the parliamentary debates of a comparatively free government, and refined through the genius of eminent writers, is superior to all her sisters, and the nation which speaks it occupies the first place in the civilization of the Slavic peoples. The Poles, who were masters of all the countries between the Elbe and the Dnieper, have spoken it ever since their settlement in these regions. It became a written language simultaneously with the introduction of Christianity into Poland. Its oldest relic is the war-song *Bogarodzica* ("St. Mary's Hymn"), ascribed to Bishop Adalbert (d. 997), a Bohemian, Poland's first apostle and martyr. But the Latin language, introduced and fostered by the Church, gained a powerful ascendency even among the people; Polish writers used it exclusively for several centuries. Extant among these are the chronicles of Martin Gallus (d. 1150), Vincent Kadlubek (d. 1223), and the more extensive works of Jan Dlugosz (d. 1480). The golden era of Poland's classical literature embraces the interval between 1506 and 1622. The popular idiom had at that time asserted its right as a written language, without, however, entirely superseding the Latin, as the poems of the renowned lyrists Sarbiewski (d. 1640) and Szymanowicz (d. 1629) attest. Upon this newly-acquired domain

Polish classical poetry throve both in style and form with wonderful vigor, demonstrating how thoroughly ancient and modern models had been studied, and how well they were appreciated. Nicolas Réj (d. 1569), heralding the classical period of Polish literature, stands hardly above mediocrity as a poet, but as a prose-writer he has earned the name of the Polish Montaigne in his didactico-historical memoirs entitled *The Books of the Life of an Honest Man.* A younger contemporary of Réj, Jan Kochanowski (d. 1584), the most brilliant representative of this literary period, is deservedly considered as the coryphæus of the Polish language. The Frenchman Ronsard was his teacher; Virgil and Ovid his models. Highly valued both by Roman Catholics and Protestants was his translation of the Psalms, which in sublimity of style equals the original. A charming production, replete with noble sentiment, is his lyrical poem, *Treny* (tear-drops shed over the grave of his little daughter). His rivals and imitators were numerous, but all the writers of this period were distinguished not only for simplicity and elegance of style, but for entire absence of levity; what they wrote was for a serious and manly purpose, in keeping with the nation's character; and it is indeed to the credit of Poland that her intellect never has been prostituted to the service of vice. The sacred literature of this period is represented by Andrew Trzyciecki (d. 1584), chaplain at the court of Albrecht of Brandenburg, the first sovereign duke of Prussia. Trzyciecki contributed extensively to the Protestant Polish hymnal compiled by Jan Seklucyan (d. 1578), whose Protestant Polish Bible, now very rare, was printed at Königsberg in 1551. Seklucyan also took prominent part in the translation of the Calvinistic Bible, printed at Brzesc-Litewski in 1563. Jacob Wujek (d. 1597), a renowned Latin, Greek, and Hebrew scholar, called the Hieronymus of Poland, translated the Bible into Polish for Roman Catholics. The third decade of the seventeenth century found Poland's literature in complete lethargy, which continued for over a century and a half. The precious germs so successfully nurtured during the golden era became mildewed and blighted under the baneful influence of the order of Jesuits, whose importation into Poland was effected by Cardinal Hosius in 1562. They managed to secure the exclusive guardianship of national education and the printing-press. Henceforth, the Polish language was looked on as heathenish, and therefore to be reprobated, and in its place the dead language of Rome was instituted. They fomented internal discord and destroyed the welfare of the realm for ever, paralyzing the intellectual life of the nation. All valuable relics of Poland's ancient literature, as well as a large number of Protestant works, were doomed to the flames, and books of mediæval scholasticism put in their place. The nation had become degenerate and frivolous. Religious tolerance, the boast of an earlier Poland, was abrogated and the horrors of persecution initiated. Toward the close of the eighteenth century began among the priestly order of the Piarists a national reaction against the Jesuits. A member of the former order, Konarski (d. 1773), undertook by means of educational, religious, and rhetorical works, as well as through the republication of ancient Polish authors, to revive the national literature, wherein he was supported by O. Kopczynski, the foremost Polish grammarian, Piramowicz, and Naruszewicz. Literature revived, indeed, but only in the form of imitation, and the French classicism of the period of Louis XIV. became its absolute model. The leaders of this movement were the archbishop Krasicki (d. 1801), whose fables and satirical epics, *Myszeis* ("War of Mice") and *Monomachia* ("War of Monks"), are famous; the declamatory satirist Trembecki (d. 1812), the erotic Kniaznin, and the satirist Wegierski (d. 1787).

Poland's deplorable downfall caused also the death of this artificial literature, as it had developed under the effeminate Stanislas Augustus, preparing, however, for the regeneration of Polish poetry. The Poles began to appreciate the sacred word *ojczyzna* ("fatherland"). The national chord was touched by Karpinski (d. 1825), and the epic poem of Woronicz (d. 1829), *Sibylla*, delineates the principal epochs of Poland's history. Still more decisively is this the case in the works of Kosciusko's war-companion, Julian Niemcewicz (d. 1841). Although not entirely emancipated from the formal traditions of "classicism," his *Songs of the Poles*, his drama, *Kasimir the Great*, his novel, *Jan of Tenczyn*, and his history of the reign of Sigismund III. are nevertheless replete with national pathos. Upon these three-mentioned harbingers follows the reformer of Polish literature, Adam Mickiewicz (d. 1855), undoubtedly the greatest poet that not only Poland but the entire Slavic race has as yet produced. He belongs to the romantic school of poets. Besides the traditional poetry of the various Slavic peoples, Shakspeare, Schiller, and Byron have influenced him. Not without reason, and apparently referring to himself, Mickiewicz once said that Byron was the mystic ligature which united the great literature of the Slaves with that of the Western nations; the types created by Byron are multiplied and refined in even more sublime forms by the Slavic genius. *Ojczyzna*, however, is the chord which incessantly vibrates in Mickiewicz's poems; it affords him neither rest, nor time to plunge, like Byron, who cared little for England, into a sea of doubts. The dominant thought which resistlessly agitates the Polish bard is the moral and political restitution of his country. A fierce strife ensued subsequently to 1815 between the classical and romantic leaders in Poland, which resulted in the general acknowledgment of Mickiewicz as leader of the modern literature, seconded by the excellent popular lyric poet and influential critic, Brodzinski (d. 1835). A. C. Odyniec and I. Korsak have both been meritorious in furthering the new movement by the translations of congenial foreign authors. The most perfect expression of Mickiewicz's genius is given in his ballads and romances, including the bold and fantastic rhapsody *Faris* and the delightful sonnets *From the Krim* (Crimea), all translated into German by K. von Blankensee. Among his great creations in dramatic form is *Dziady* ("Obsequies"), wherein the author portrays not only his personal grief, but also the woes of his people and humanity at large; it is a shriek of rage and revenge in behalf of a downtrodden people, a cry of despair in behalf of an enslaved and tortured humanity. More artistic in form than *Dziady* is *Konrad Wallenrod* (German translation by Kannegiesser), which the Poles consider their national epic. It treats of the period when the order of the German knighthood preached to the Lithuanians "the religion of love" by means of fire and sword. The pearl of Slavic literature, and at the same time one of the best modern European epic poems, is Mickiewicz's *Pan Tadeusz* ("Thaddeus"), German translation by Spazier. In it the author treats the social and political events of his country of a more recent date. His subsequent productions are historical studies of the Slavic race, delivered in the form of lectures at Paris in the Collége de France (1840–44), published in 4 vols. in French, and translated into German by Siegfried. A contrast to Mickiewicz was J. Slowacki (d. 1849). Both were patriots; the former romantic, with a tendency toward religious mysticism—the latter modern and liberal. As a dramatist (in *Maria Stuart, Balladina, Mazeppa*, etc.) and as a writer of epics (in *Zmija, Jan Bielecki, Mnich, Lambro, Waclaw, Beniowski*, etc.) he has evinced high power; and as a lyrist, in his last poem, *Krol Duch* ("king-genius"), he delineates in beautiful and lofty stanzas the Slavic genius, approaching in design and execution Shelley's *Revolt of Islam*.

With the Lithuanian school of poets—called so in honor of Mickiewicz's home—was associated that of the Ukraine. Inspired likewise by the same national aspiration, it principally bases its creations on the nature and history of the poetical home of the Cossacks. Among the first of the Ukraine's poets is Bogdan Zalewski, whose *Dumy* ("Musings") have become the common property of the people. His next great poem, *Duch od Stepu* ("The Genius of the Steppe"), is a thrilling reflection of the historical destiny of the Slaves. Still more energetic than Zalewski are Malczewski (d. 1826) and Goszczynski, in their poetical portraiture of Ukraini's life. The former in his poetical narrative *Maria* (German translation by Vogel) has transplanted a Volhynian legend upon the soil of the Ukraine, describing with masterly skill the tumult of battle which so frequently swept over these steppes. His poetry became the most popular on account of its heroine being the true ideal of a Polish woman. Goszczynski's renown rests chiefly on his famous *Zamek Kaniowski* ("Castle of Kaniov"), in which he portrays with great fidelity the last war between the Cossacks and the Poles. An original and fiery prose-writer of this school, Michal Czajkowski, gives graphic pictures of the life and habits of the Cossacks and Don Slaves in his *Cossack Legends, Wernyhora, the Prophet of the Ukraine, Kirdzali, the Hetman of the Cossacks, Czarniecki.* Active participator in the great rising of the Poles in 1830, he became a voluntary exile, and, buffeting with an adverse fate in foreign lands, he finally embraced Islamism, as a reward for which the Turkish government created him pasha and commandant of Turkish Cossacks. Pardoned 1873 by the Russian government, he now lives within her domain as her pensioner, devoting as loyal subject his talent to the reconciliation of his countrymen with Russia. Most of the followers of the Ukraine school were, like Mickiewicz, exiles, who produced in foreign lands an extensive literature. As lyrists and novelists active at home Bielawski, Siemienski, Skarbek, Massalski, and Kraszewski—the latter a highly-gifted author, and unquestionably the greatest, most fertile, and national among Polish novelists—deserve mention. In the historical novel Rzewuski is

noticeable. In his poetical narratives, *Stepy, Kirgiz* (German translation by Bahn), Zielinski is the successful rival of Mickiewicz and Malczewski. Prominent among the most recent writers are the ardent and pathetic poet of *Lirenka*, T. Lenartowicz; the national songster, *par excellence*, Vincent Pol (d. 1873); the valiant, but early deceased, Romanowski (d. 1863); Roman Zmorski, Ch. Brzozowski, the affectionate lyrist, F. Morawski; Maria Ilnicka; Gabriela Zmichowska; the highly-gifted improvisatrice, Deotima (Hedwig Luszczewska); and the epic as well as dramatic poet, Wladimir Wolski. In religious legends and popular traditions Archbishop Holowinski excels (d. 1855). Adam Asnyk published in 1869, under the pseudonym "El . . . y," his excellent poems, remarkable for artistic finish, copiousness, and nobility of thought. Wladyslaw Belza may also be counted among the most gifted modern poets. Before concluding the list of remarkable Polish poets, particular mention must be made of two of the highest rank. Stephen Garczynski since his participation in the revolutionary war against Russia (1830) has uttered many a wrath-flaming war-song in exile. His philosophical epic, *Waclaw's Deeds*, is his principal work. Sigismond Krasinski (d. 1859) is the author of *Nieboska Komedia* ("Undivine Comedy"), (German trans. by Batornicki), a fantastic drama, inasmuch as not only the scene and persons, but also the time which it portrays, had never existed, but, ardently hoped for by millions of sorrowing hearts, were created by the poet. The future therein is anticipated with such solemn and prophetic grandeur that one reading it cannot help exclaiming, "Thus will it be." Krasinski's second work, *Iridion* (German translation by Germano-Polonus), likewise in prose and dramatic form, is, æsthetically viewed, a still loftier composition than the former. It also delineates the exasperated strife between an ancient and modern society—the strife from an enlarged Christian view of the world with that of an arrogant Roman state-idea. The scene is laid in the most depraved period of Rome's decay. The main thought of this glowing poem is the principle of revenge, which exhibits itself in the history of the world as the world's doom. *Iridion* contains the embodiment of a principle which ever again reappears in stirring centuries.

In the department of metaphysics noteworthy is J. Goluchowski (d. 1858), *Philosophy in its Relation to the Life of Nations and Single Individuals*. August Cieszkowski accepts in his *Prolegomena Historiosophiæ*, as a philosophical basis, a personal self-conscious God and the immortality of the soul. The original, but in his theories frequently misty supernaturalist, F. B. Trentowski (d. 1869), wrote, besides numerous works in Polish, in German *Vorstudien zur Wissenschaft der Natur; Grundlage der universellen Philosophie*, and a posthumous work, *Die Freimaurerei*. Honorable mention should be made of J. Supinski, who has written a valuable work on general physiology, and belongs to the greatest of national economists. Carl Libelt, rewarded with the title of doctor by the University of Berlin for an essay, *De Pantheismo in Philosophia*, wrote a new system of philosophy, holding that the discovery of truth is only feasible through intuition, "which either as a vague, uncertain presentiment or as a sudden flash reveals in its totality a clear recognition of truth." An edition of all his works is about to be issued by J. K. Zupanski in Posen.

Among Poland's modern historians, Joachim Lelewel pre-eminently occupies the first place. Bestowing with unsurpassed industry his activity not only on the history of his own country, to which even in exile he clung devotedly, he embraced in his investigations all nations, as his numerous works on the philosophy of history, geography, numismatics, history of jurisprudence, and bibliography attest. Lelewel wrote in Polish as well as in French, and himself engraved the explanatory charts for his works. This highly meritorious man, minister of public instruction in Poland during the revolution of 1830, lived during the last twenty-nine years of his life at Brussels in indigent circumstances, yet known and honored by high and low. Abstemious as Diogenes, he rejected with indignation every offer of open or secret aid. D. at Brussels in 1861. C. Szajnocha, J. Szujski, L. Lozynski, A. Moraczewski, T. Morawski, J. Lepkowski, and J. Lukaszewicz are all accurate historians. In the department of linguistic research are noted Kopczynski, Linde, Mrozinski; in lexicography, Bandtke, Trojanski, Mrongovius, Leslaw, Lukaszewicz, A. Czajkowski, and Rykaszewski. JOSEPH KZARGÉ.

Poliste'na, town of Southern Italy, province of Reggio di Calabria, on the Gerapotamo, at the western foot of the Apennines. The modern town is of little interest except as commanding a wonderfully fine sea-view. The old town, of ancient but uncertain origin, was nearly destroyed by an earthquake in 1783. P. in 1874, 8530.

Poli'tical Econ'omy. The Greek word οἰκονομία means "the law of the house," with special reference to a thrifty provision for the physical well-being of the members of the household. As individuals make up families, so families make up cities or states; and *political* economy is to the community or body politic what domestic economy is to the household. The principles of sound economy as respects both the acquisition and the expenditure of means for physical comfort, are essentially the same in the two relations. Hence, there is fitness in the term thus extended, and, despite the manifold objections that have been urged, its fitness and convenience are likely to perpetuate its use, as the term, on the whole, best suited for its purpose.

Definitions.—Political economy is that department of social science which treats of the development and application of material wealth for the physical well-being of men in society. The science is based on four fundamental laws: (1) God has made man a creature of *desires*, and constituted the material world in which he lives with qualities and powers available for the *gratification* of those desires. There is no assignable limit to the development of either men's desires or nature's resources. (2) For those desires which rise above the very simplest wants of the animal, man must by *labor* force Nature to yield her hidden resources. All the conveniences and comforts of civilized life come only through labor. (3) The exertion of labor establishes a *right of property* in the fruits of labor, and the idea of exclusive appropriation and possession is a necessary consequence. (4) With this right of property comes also the possibility and right of *exchange*, or the mutual transfer of possessions between man and man and between different communities and countries. The material of this department of science thus lies fixed in the nature of man and of the physical world which he controls, and in the structure of human society. It is drawn out by the study of men's wants, the investigation of nature's resources, the study of the statistics of human invention and industry, and the defining of principles for common and reciprocal agencies in social relations. This science combines elements of both physical and metaphysical philosophy. It differs from the purely physical sciences in that the phenomena of *human volition* are continually involved in the system. It differs from the branches of intellectual and moral science in that it contemplates those phenomena with reference mainly to certain physical results.

Political economy regards *self-interest* as a universal motive of human action. Assuming this without considering directly the moral aspects, its ever-recurring problem is to find a common interest which, as the resultant of the antagonism of individual self-interest, may properly combine and regulate the separate forces. Three desires inherent in every man contend for the mastery: (1) desire of ease; (2) desire of present gratification; (3) desire of means to ensure future gratifications. The resultant of these conflicting desires measures for any man his interest in the accumulation of wealth. The degree in which the others are subordinate to the third determines the productive activity of a community.

The main subject of political economy is *wealth*. This term may be concisely defined to embrace *the sum-total of useful things which can be appropriated and exchanged.* The original source of all wealth is the bounty of God in nature. The secondary source of wealth is man's labor exerted to bring forth the bounty of nature in form and time and place adapted to meet the wants of men. (See WEALTH.) Another important term of this science is *value*. In its strict signification value is simply *purchasing power;* that is, that quality of anything which gives it power to command other things in exchange. Both services and commodities have value. (See VALUE.) The ultimate end contemplated in political economy is the production of wealth in the largest measure and of the highest value, and its application to the fullest and most general satisfaction of men's desires.

Divisions.—First to be studied are the laws and processes which relate to the *production* of wealth. But the object for which wealth is produced is to provide the means of gratifying men's desires, and such gratification involves always the destruction or consumption of values. Next to be studied, therefore, are the laws and processes which relate to the *consumption* of wealth. Production and consumption thus constitute the two leading divisions of this science. But, again, in civilized society many persons are concerned in producing the things of value which are counted as wealth, and the principles which pertain to the equitable *distribution* of the value embodied in these joint products must be distinctly studied. Furthermore, every man wants many things which he cannot directly produce for himself—many things which his own country cannot yield. Hence the necessity for the mutual transfer of values

in *exchange* under defined processes and just laws. So we recognize distribution and exchange as two subordinate divisions of political economy. The processes and laws of production and consumption are simple and easily apprehended. The most difficult problems of the science are concerned with adjusting matters of distribution and exchange. Those which are logically the subordinate divisions do therefore demand the largest place in the actual treatment of the subject. (The limits of this article permit a notice only in meagre outline of the main points of these four divisions.)

Production.—Wealth is produced by the application of human labor to things existing in nature. But the laborer must have fit instruments, and must be supported by provisions already laid up. These are the fruits of previous labor embraced under the comprehensive term capital. Under production must be considered, therefore, (*a*) labor, (*b*) *capital*, (*c*) the co-operative union of labor and capital. Under labor are included both physical and mental labor. In the last analysis, physical labor only gives motion to matter and directs it. Mental labor, as directly concerned in production, is employed in the processes of discovery and invention. Indirectly, it contributes to the main end by improving the condition of the laborer and perfecting the organization of society. (See LABOR.) The effectiveness of labor is increased by the employment of nature's forces and by a systematic division of labor. (See DIVISION OF LABOR and MACHINERY.) To secure these helps capital is all-essential. Capital is the result of saving—that is, simply laying up a surplus of wealth produced above wealth consumed. It represents former labor, and in the process of production it is embodied in three forms—viz. the materials to which labor is applied, the instruments of labor, and the means for the support of the laborers. (See CAPITAL.) The union of labor and capital is natural and necessary. In it, past labor, the fruit of saving, simply joins hands with present labor, vital and active. They meet to best advantage in the same person—that is, when the laborer is owner of capital enough to employ his labor. Sound political economy favors the making of every laborer to some extent a capitalist, and every capitalist in some way a laborer. But the capacities, tastes, and habits of men so differ that this adjustment cannot be made universal. Yet, as the principles of political economy are better understood and more fairly applied, society will approximate this ideal state, and the greatest good of the greatest number will be realized. Government best fulfils its function when it secures the utmost freedom to both parties and guards most faithfully the rights of each.

Consumption may be regarded as either *private* or *public*. Private consumption embraces the following legitimate gratifications: (*a*) those which pertain directly to the preservation of life and health; (*b*) those which delight the senses and tastes, refining without corrupting the life; (*c*) intellectual gratifications, which come through the expansion of the mind's powers and the acquisition of knowledge; (*d*) social gratifications, found in the exercise of genial hospitality and all acts of friendliness; (*e*) moral gratifications, which proceed from the culture of a good conscience toward God and toward man. It will be seen that the noblest and richest of these gratifications are the least costly. Public consumption includes that destruction of values which is directed by public authority for the general good, specified as follows: (*a*) expenditures for the support and administration of government; (*b*) expenditures for the defence of the state; (*c*) expenditures to favor commercial intercourse at home and abroad; (*d*) expenditures to secure the general education of the people; (*e*) expenditures for advancing science and diffusing intelligence; (*f*) expenditures for the relief of poverty and special calamities. The style and scale of public expenditure should be such as to command the respect and honorable pride of the people, without useless display. Its method should be such as to hold all the agents of the government to a direct responsibility and to the utmost fidelity in the discharge of all trusts. Wisdom dictates that the government should undertake no work which private enterprise can as well or better achieve. There are two simple rules of economy for both private and public consumption: (1) let the destruction of value in any case be as small as possible to secure a given result; (2) from a given expenditure get the largest and most satisfactory result possible.

Distribution.—In any branch of industry, and in the general productive industry of a nation, three parties are to be recognized—viz. the government, which gives security to property, the owners of the capital employed, and the laborers. The gross annual production must accordingly be distributed for four distinct purposes: (1) for the support of government through taxes paid (see TAXATION); (2) for replacing the capital actually destroyed, in materials used up, in provisions consumed, and in machinery worn and decayed; (3) to give capital its due reward in the form of rent, interest, or dividends (see INTEREST and RENT); (4) to give labor its due reward in wages, salaries, commissions, or fees (see WAGES). These four items are to be reckoned in the aggregate of expenses of production. But the result of productive industry should show a surplus beyond these in the form of profits. (See PROFITS.) The most difficult question of distribution respects the disposal of these. Strict justice would divide the profits in some fair proportion between the capitalists and the laborers, including the managers, with due regard to the difference of capacity, responsibility, and risk pertaining to the respective parties. The interposition of government is needed only to guard the rights of all. Where liberty and intelligence prevail, these matters will be best adjusted by free competition under the general law of supply and demand. The wide range and intricate complication of this part of the subject may be apprehended if one will take a single article—a shirt, for instance—and consider how many processes and how many persons have come in between the unploughed cotton-field and the finished garment on the wearer's back, to have some part in its production.

Exchange.—The diversity of nature's gifts, the wide reach of men's desires, and the principle of division of labor necessitate exchange. This part of the machinery of society gives rise to the most difficult problems of our common life; hence it fills the largest place in the discussions of political economy. Some have therefore proposed to resolve the whole science into a science of catallactics or exchanges. The simplest form of exchange is barter—that is, the giving of service for service, commodity for commodity, or service for commodity, and commodity for service. Value is the central term in this branch of the subject. The inconveniences of barter necessitate the introduction of some instrument which shall serve as a universal measure of values and as a medium of exchange. This instrument, whatever form it takes, is money. (See CURRENCY and MONEY.) Credit also, in the machinery of exchange, renders a service no less important than that of money. Credit in political economy is simply *trust in the promise of an equivalent to be rendered at a future day for values immediately transferred.* The true basis of all credit is real wealth, existing or prospective, which is, or is expected to be, at the command of the party trusted. Its essence is confidence in his ability and truthfulness. When either of these is weakened, credit wavers. Credit fulfils two important functions: (1) It brings capital and labor together for production. It cannot of itself create wealth, but it can turn existing wealth into capital by transferring it from those who cannot to those who can employ it, and is thus the indispensable means for bringing the whole capital of a country into the fullest productive activity. (2) Credit facilitates exchanges. As an intermediate agency it actually effects far the greater part of the exchanges of the world with great saving of money, time, labor, and risk, virtually resolving trade to a great extent into barter. The leading forms in which credit is thus employed are, book-accounts, loans, mercantile paper, bank-deposits, stocks, bonds, and bills of credit issued by banks or governments to be used as currency. (See BANK, BOND, BOOK-KEEPING, BILL OF EXCHANGE, and STOCKS. Credit unduly extended leads inevitably to financial panic. Under the head COMMERCE the intricate relations of exchange to both production and consumption, and to the growth of nations and the progress of civilization, are treated with sufficient fulness. For a discussion of the question of government interference with the freedom of exchange in order to foster home production, see the articles on FREE TRADE and PROTECTION.)

History.—This article cannot be fitly closed without a few words on the history and development of political economy as a science. Under the ancient civilizations of Egypt, India, Greece, and Rome we find evidence of careful observation of the facts of economic science and the occasional defining of sound principles. But no systematic arrangement of either facts or principles was attempted. Aristotle in one of his works first employs the term "political economy," though in a vague way, and propounds some good doctrines which have stood the test of time. But with Greeks and Romans alike agriculture was the only form of labor held in any honor. All mechanical and commercial occupations were esteemed servile and degrading, and consequently any development of public economy in its wide range was impossible. The convulsions of the Dark Ages checked industry and suspended commerce. Feudalism gave birth to the protective system and to manifold grievous monopolies. In the sixteenth century the industrial and commercial activity of

the Italian cities prompted a broader and more philosophical investigation of the sources of public prosperity, and with the Italian writers of that and the following centuries systematic political economy had its origin. Its development was aided by Spanish and French writers and by the financial reforms instituted by Sully and Colbert, the ministers of Henry IV. and Louis XIV. The restricted policy of the so-called mercantile system, which forbade all exportation of gold and silver, and of the false idea of the balance of trade, both involving the principle of monopoly, prevailed in the first stages of the science. In England the operations of the East India Company first raised a question as to the soundness of the current notions, and along in the middle of the seventeenth century various tracts appeared affirming, as McCulloch says, "that the prosperity of states can never be promoted by restrictive regulations or by the depression of their neighbors; that the genuine spirit of commerce is inconsistent with the selfish and narrow policy of monopoly; and that the self-interest of mankind, not less than their duty, requires them to live in peace and to cultivate a fair and friendly intercourse with each other." In 1776, Adam Smith published his *Wealth of Nations*, which may be said to be the beginning and source of modern political economy. Since his day, amid much conflict of opinions, fundamental principles have been settled, and the tendency has been to recognize more and more the golden rule of Christ as applicable alike to states, communities, and individuals, in their economic relations as well as in all other social relations.

A. L. Chapin.

Polity, Ecclesiastical. See Church Government.

Polizia'no, Angelo (Angelus Politianus), b. at Monte Pulciano in Tuscany July 14, 1454; was tutor to the two sons of Lorenzo de' Medici, and afterward professor of Latin and Greek at the Lyceum of Florence; exercised a great literary influence by his elegant translations and critical treatment of the classical authors, and acquired wide celebrity both as a Latin and an Italian poet. D. Sept. 24, 1494, at Florence. He was the author of the first regular drama written in Italian, *Orfeo*, composed in 1472, first published in a critical text in 1770, and again, together with his *Rime*, in 1864 by Carducci. An edition of his collected works appeared in Bâle in 1653.

Poliz'zi Genero'so, town of Sicily, province of Palermo, situated in a very fertile but little cultivated district. There is a great lack of industry as of education among the inhabitants. P. in 1874, 6724.

Polk, county of Arkansas, bounded W. by the Indian Territory. Area, 1100 sq. m. It is rough and hilly, and abounds in coal, iron, lead, novaculite, limestone, and timber. The soil is adapted to corn and cotton culture. Cap. Dallas. P. 3376.

Polk, county of Central Florida. Area, 1580 sq. m. It is chiefly occupied by dense pine forests. It has a light, productive soil, fit for cotton, corn, and sugar culture. Cattle-raising is the principal pursuit. Cap. Peace Creek. P. 3169.

Polk, county of N. W. Georgia. Area, 360 sq. m. It is level in the N., broken in the S. The soil is generally good. Corn and cotton are leading products. The county is traversed by Cherokee R. R. Cap. Cedartown. P. 7822.

Polk, county of Central Iowa. Area, 567 sq. m. It is level, fertile, and produces large quantities of corn and wheat. Good coal is found abundantly, and the county is well timbered and watered. It is traversed by various railroads, centring at Des Moines, the capital of the county and State. Des Moines is also the seat of important and increasing manufactures. P. 27,857.

Polk, county of N. W. Minnesota. Area, 4800 sq. m. It is but slightly developed, and is in part occupied by Indian reservations. The soil is in general adapted to wheat-culture. The county is traversed by Wild Rice and Red Lake rivers, and bounded W. by Red River of the North, which separates it from Dakota. Cap. Crookston.

Polk, county of S. W. Missouri. Area, 576 sq. m. It is uneven, well wooded, and generally fertile. Live-stock, grain, and wool are leading products. It is traversed by Pomme de Terre River. Cap. Bolivar. P. 12,445.

Polk, county of Central Nebraska. Area, 490 sq. m. It is bounded N. W. by Platte River, and is rolling, fertile, and finely adapted to stock and grain raising. Cap. Osceola. P. 136.

Polk, county of North Carolina, bounded S. by South Carolina and W. by the Blue Ridge. Area, 250 sq. m. It is broken and rough, with fertile valleys. Corn is the principal product. Gold and other metals are found. Cap. Columbus. P. 4319.

Polk, county of N. Oregon. Area, 920 sq. m. It is bounded E. by navigable Willamette River and W. by the Coast Range of mountains. The E. is level, extremely fertile, and well settled; the W. is mountainous and heavily timbered. Wheat, oats, wool, and cattle are largely produced. Cap. Dallas. P. 4701.

Polk, county of Tennessee, bounded E. by North Carolina and S. by Georgia. Area, 400 sq. m. It is mountainous, and has valuable ores of copper. Corn is a leading product. It is traversed by Hiawassee and Ocooee rivers. Cap. Benton. P. 7369.

Polk, county of S. E. Texas, bounded W. by Trinity River, which is navigable during high water. Area, 1188 sq. m. It is all fertile land, well wooded, producing corn, cotton, live-stock, some sugar and tobacco. Cap. Livingston. P. 8707.

Polk, county of N. W. Wisconsin, bounded W. by Minnesota, from which it is separated by St. Croix River. Area, 950 sq. m. It is well timbered, and adapted to wheat and small grains. Cap. Osceola Mills. P. 3422.

Polk, tp., Arkansas co., Ark. P. 613.

Polk, tp., Calhoun co., Ark. P. 286.

Polk, tp., Montgomery co., Ark. P. 304.

Polk, tp., Newton co., Ark. P. 369.

Polk, tp., Huntington co., Ind. P. 960.

Polk, tp., Marshall co., Ind. P. 1812.

Polk, tp., Monroe co., Ind. P. 843.

Polk, tp., Washington co., Ind. P. 920.

Polk, tp., Benton co., Ia. P. 1196.

Polk, tp., Bremer co., Ia. P. 1267.

Polk, tp., Jefferson co., Ia. P. 1211.

Polk, tp., Marion co., Ia. P. 879.

Polk, tp., Taylor co., Ia. P. 724.

Polk, tp., Wapello co., Ia. P. 1113.

Polk, tp., Adair co., Mo. P. 769.

Polk, tp., Atchison co., Mo. P. 562.

Polk, tp., Cass co., Mo. P. 1307.

Polk, tp., Christian co., Mo. P. 1243.

Polk, tp., Dade co., Mo. P. 1453.

Polk, tp., De Kalb co., Mo. P. 957.

Polk, tp., Madison co., Mo. P. 320.

Polk, tp., Nodaway co., Mo. P. 3427.

Polk, tp., Ray co., Mo. P. 1368.

Polk, tp., St. Clair co., Mo. P. 316.

Polk, tp., Sullivan co., Mo. P. 1415.

Polk, p.-v., Jackson tp., Ashland co., O., on Atlantic and Great Western R. R.

Polk, tp., Crawford co., O. P. 4369.

Polk, tp., Jefferson co., Pa. P. 256.

Polk, tp., Monroe co., Pa. P. 1076.

Polk, tp., Washington co., Wis. P. 2220.

Polk (James Knox), eleventh President of the U. S., b. in Mecklenburg co., N. C., Nov. 2, 1795, of Scotch-Irish stock originally named Pollock, was a grand-nephew of Col. Thomas Polk, celebrated in connection with the Mecklenburg Declaration of Independence; removed to Tennessee with his father, Samuel Polk, 1806; graduated at the University of Nashville 1818; studied law with Felix Grundy; was admitted to the bar at Columbia 1820; was a member of the State legislature 1823–25; acquired prominence as a lawyer; was elected to Congress 1824, and continuously re-elected until 1839; was an able speaker and debater; conspicuous as an opponent of the administration of Adams, of all Federal appropriations for internal improvements, of protective tariffs, and of the national bank; was an early and influential supporter of Jackson, whose conduct in the removal of the deposits he vindicated in the session of 1833–34, being then chairman of the committee of ways and means; was defeated as Democratic candidate for Speaker 1834, but elected 1835, and re-elected 1837, presiding over the House with dignity and ability; was governor of Tennessee 1839–40; was proposed by the legislatures of Tennessee and of other States 1840 as a suitable candidate for Vice-President of the U. S.; was defeated in 1841 as a candidate for re-election as governor; was nominated by the Democratic national convention at Baltimore (May 27, 1844) for the Presidency in opposition to Henry Clay, and elected by 170 electoral votes against 105, the chief issue being the annexation of Texas, which was accomplished by the expiring administration of Tyler the day before Polk's inauguration, Mar. 4, 1845. Pres. Polk formed an able cabinet, consisting of James Buchanan, Robert J. Walker, William L. Marcy, George Bancroft, Cave Johnson, and John Y. Mason; settled the Oregon boundary question; created the department of the interior;

succeeded in carrying the low tariff of 1846; reorganized the financial system of the government, and conducted the Mexican war, which resulted in the acquisition of California and New Mexico and had far-reaching consequences upon the later fortunes of the republic. Declining to seek a renomination, Polk retired from the Presidency Mar. 4, 1849, when he was succeeded by Gen. Zachary Taylor; retired to Nashville, and d. there June 19, 1849. Without being possessed of extraordinary talents, he was a capable administrator of public affairs and irreproachable in private life. PORTER C. BLISS.

Polk (LEONIDAS), b. at Raleigh, N. C., in 1806; graduated at the U. S. Military Academy, and entered the artillery July, 1827; resigned Dec. 1, 1827; in 1831 was ordained in the P. E. Church; was missionary bishop of Arkansas and the Indian Territory S. of 36° 30′, with provisional charge of the diocese of Alabama, Mississippi, and Louisiana, and missions in the republic of Texas, 1838–41; bishop of Louisiana 1841–61. In 1861 he accepted the appointment of major-general in the Confederate army, and commanded at Columbus; subsequently commanded a division in the West; at Murfreesboro′, Chattanooga, Chickamauga, and in the Georgia campaign of 1864 commanded a corps, ranking then as lieutenant-general. Was killed at Pine Mountain, Ga., June 14, 1864.

Polk (THOMAS), b. probably in Mecklenburg co., N. C., about 1732; became the proprietor of a large estate near Charlotte, and colonel of the county militia; issued in May, 1775, the summons for the election of the delegates who framed May $\frac{20}{31}$ the MECKLENBURG DECLARATION OF INDEPENDENCE (which see); took part in the Revolutionary conflict; led an expedition of 700 men against the Tories of South Carolina, and was commissary-general of provisions for the State of North Carolina, but incurred the suspicion of Gen. Gates by accepting protection from Cornwallis 1780. The date of his death is unknown.

Polk (TRUSTEN), b. in Sussex co., Del., May 29, 1811; graduated at Yale 1831; studied in the law school at New Haven, Conn., and in 1835 became a lawyer of St. Louis; was chosen to the constitutional convention of 1845; Presidential elector 1848; governor of Missouri 1857; U. S. Senator 1857–62, when he was expelled on account of his hostility to the U. S. government.

Polk (WILLIAM), son of Col. Thomas, b. near Charlotte, N. C., in 1759; was present at the Mecklenburg Declaration of Independence, May, 1775; joined the Revolutionary army 1777; was engaged in the battles of Brandywine and Germantown; accompanied Gates and Greene in their Southern campaigns; was wounded at Eutaw Springs; represented Mecklenburg county in the North Carolina legislature 1787; subsequently removed to Raleigh; took an active part in State politics; declined a nomination as brigadier-general 1812, being opposed to the war with England; was a prominent witness in behalf of the Mecklenburg Declaration of Independence, and collected testimony to establish its genuineness. D. at Raleigh Jan. 14, 1835, being then the last surviving field-officer of the North Carolina line.

Polk (WILLIAM H.), brother of President Polk, b. in Maury co., Tenn, May 24, 1815; educated at Chapel Hill, N. C., and at the University of Tennessee; was admitted to the bar 1839; elected to the legislature 1841 and 1843; appointed by Pres. Tyler chargé d'affaires to Naples 1845; served as a major of dragoons in the Mexican war; was a delegate to the Nashville convention 1850; member of Congress 1851–53, and a firm opponent of secession. D. at Nashville Dec. 16, 1862.

Pol′ka [Czechic, *pulka*, "half," from its characteristic half-step], a dance in $\frac{2}{4}$ time, with an accent on the third quaver of the measure. It is reputed to have been invented about 1831 by a peasant-girl of Elbeteinitz in Bohemia. It was introduced into Paris in 1840.

Polk′ton, tp., Ottawa co., Mich. P. 2416.

Polkton, p.-v., Anson co., N. C., on Carolina R. R., 144 miles W. of Wilmington, has a school, 2 churches, 1 newspaper, 2 steam saw-mills, 1 cotton-gin, and carriage factories. P. about 400. C. D. GALE, ED. "ANSONIAN."

Polk′ville, v., Calhoun co., Ala. P. 434.

Pol′la, town of Southern Italy, province of Salerno, on the Negro, in a district very fertile in the cereals and abounding in rich pasturage. P. in 1874, 5706.

Pollanarrua, once the capital of Ceylon, now only a heap of ruins, situated about 60 miles N. E. of Candy, and consists of an immense tank and a number of remains of curious constructions. It was first visited by Europeans in 1820, and the place is now generally called *Toparé*.

Pol′lard [from *poll*, to "clip the hair"], a tree whose branches are cut off completely from time to time for the purpose of obtaining fuel, stakes, vine-props, bark, etc. The trees most frequently pollarded are the willow, poplar, elm, and oak. The custom prevails extensively in Europe, and, judiciously managed, yields a larger amount of wood than almost any other plan.

Pollard, p.-v., cap. of Escambia co., Ala. P. 1087.

Pollard (EDWARD A.), b. in Nelson co., Va., in 1838, a son of Maj. Richard Pollard, U. S. A.; was educated at the University of Virginia and at William and Mary College; visited California, Mexico, and Nicaragua; was a government clerk at Washington under Mr. Buchanan's administration; edited the Richmond *Examiner* during the war of 1861–65; edited *Southern Opinion* 1867–69; author of *Black Diamonds* (1859), *Eight Months in Prison* (1865), *Southern History of the War* (1866), *The Lost Cause* (1866), *Lee and his Lieutenants* (1867), *Life of Jefferson* (1868), *Life of Jefferson Davis* (1869), *The Lost Cause Regained* (1868), and a series of political works.

Pol′len [Lat., "fine flour"], the fine dust-like substance produced within the anthers of phanerogamous plants, and discharged by the bursting of the anther. It serves to fertilize the ovules contained within the female organs of the plant. The forms of pollen-grains when seen under the microscope are exceedingly various, but are constant for the same species, and sometimes for genera or orders. Each pollen-grain possesses two envelopes, the inner one exceedingly delicate. Functionally, the pollen-grain represents the phytozoön (antherizoid) of the cryptogamous plant, but in structure it more nearly resembles the spore. A. GRAY.

Pollen′za [*Montemilone*], town of Italy, province of Macerata, in the Marches, about $5\frac{1}{2}$ miles from the town of Macerata. Pollenza stands on a hill in the midst of a district rich in pasturage and producing the best olive oil; it is still surrounded by old walls. Near Pollenza, Stilico gained his great victory over the Goths in 403 A. D.

Pollen′zo, small town of Northern Italy, province of Cuneo, noticeable as the site of the ancient *Pollentia*, of which interesting ruins remain.

Pol′lio (CAIUS ASINIUS), b. at Rome in 76 B. C.; began his career as an orator; sided in the war between Cæsar and Pompey with the former, whom he accompanied from the Rubicon to Rome, and again on the march to Pharsalia; commanded in Spain against Sextus Pompeius; was consul in 40 B. C., during the first triumvirate; made a successful campaign in Illyria in 39; retired from public life, and devoted himself to literary pursuits; was a friend of Virgil, Horace, and Catullus; founded the first public library in Rome, and wrote a history of the civil war, which is lost. D. 4 A. D. A few letters from him to Cicero have been preserved.

Pöll′nitz, von (KARL LUDWIG), BARON, b. Feb. 25, 1692; d. June 23, 1775; was maintained through all his life by some royal person in some court quality—latest by Frederick the Great—and wrote in French *Mémoires* (3 vols., 1734) and *Nouveaux Mémoires* (2 vols., 1737), which may be read with interest.

Pol′lock, a name of the *Pollachius* (or *Merlangus*) *carbonarius*. (See COAL-FISH.)

Pollock, p.-v., Perry tp., Clarion co., Pa., on Allegheny River.

Pollock (FREDERICK), BART., b. in London, England, Sept. 23, 1783; graduated at Cambridge 1806; became fellow of Trinity College 1807; studied law at the Middle Temple; was called to the bar Nov., 1807; had great success in his profession; became king's counsel 1827; sat in Parliament for Huntingdon 1831–44; was knighted Dec., 1834; was attorney-general during the first and second administrations of Sir Robert Peel; succeeded Lord Abinger as chief baron of the court of exchequer and privy councillor Apr., 1844, which post he held until July, 1866, when he retired with a baronetcy. D. at Hatton, near London, Aug. 23, 1870.—Sir DAVID POLLOCK, an elder brother, was also distinguished at the bar and as a magistrate, rising to the post of chief-justice of Bombay, India.—Sir CHARLES EDWARD POLLOCK, son of Sir Frederick, b. Oct. 21, 1823, has been queen's counsel and baron of the exchequer, is author of several legal textbooks, and was knighted in 1873.

Pollock (Sir GEORGE), b. in London in 1786; educated at the Woolwich academy, but in 1802 entered the military service of the East India Company; became captain of the Bengal artillery in 1805, colonel 1829; participated in the sieges of Dieg and Bhurtpore 1802–05; commanded the artillery in the Burmese war 1821, and the armies W. of the Indus in the Afghanistan war 1842, having attained the rank of major-general in 1841. For his services in Burmah he was made C. B., and his services in Afghanistan were recognized by many marks of distinction. The East

India Company granted him a pension of £1000. He was one of the earliest to receive the order of grand commander of the Star of India, was brevetted field-marshal in 1870, and succeeded the late Sir John Burgoyne as constable of the Tower in 1871. In Mar., 1872, he was created a baronet. D. at Walmer Oct. 6, 1872.

Pollock (JAMES), LL.D., b. in Milton, Northumberland co., Pa., Sept. 11, 1810, of Scotch-Irish ancestry; graduated with first honors at Princeton in 1831; was admitted to the bar in 1833; was district attorney 1835–38; a Whig member of Congress 1843–49; became in 1850 president judge of a State district court; was governor of Pennsylvania 1855–58; was director of the U. S. mint, Philadelphia, 1861–66, and again received the same office in 1869.

Pollockshaws′, town of Scotland, county of Renfrew, on the White Cart, has manufactures of silk and cotton goods, cotton-spinning, and calico-printing. P. 7648.

Pol′lok (ROBERT), b. at Muirhouse, Renfrewshire, Scotland, in 1799; graduated at the University of Glasgow; studied theology, and was licensed as a preacher of the United Secession Church 1827. D. at Southampton Sept. 15, 1827. Author of *Tales of the Covenanters* (1833) and of *The Course of Time* (1827), a poem in blank verse which gave great promise of future excellence. It became extremely popular both in Great Britain and in the U. S., where for many years it was used in schools as a parsing-book.

Pol′loksville, tp., Jones co., N. C. P. 1263.

Pollux. See CASTOR AND POLLUX.

Pol′lux (JULIUS), b. at Naucratis, Egypt, about 130 A. D.; lived in Athens as teacher of rhetoric and philosophy. His *Onomasticon*, edited by Dindorf (Leipsic, 1824) and Bekker (Berlin, 1846), is a kind of dictionary in which the principal words relating to certain subjects are collected into groups, defined, and illustrated by quotations. The work is of manifold interest to the student of the Greek language, literature, and art.

Po′lo, p.-v., Buffalo tp., Ogle co., Ill., on Illinois Central R. R., has a public library, good schools, 2 banks, 2 grain-harvester manufactories, 7 churches, 1 weekly and 2 monthly papers, 3 hotels, and stores. P. 1805.

J. W. CLINTON, ED. "OGLE CO. PRESS."

Po′lo, Mar′co. The name is the most remarkable in the history of travel, though the individual in his dim personality can hardly rank as one of the greatest men among travellers. The Polos were a noble family of Venetian merchants represented about 1260 by three brothers, Marco, Nicolo, and Maffeo. In the year named Nicolo, who had left a family at Venice, and Maffeo went on a mercantile venture to the Tartar court at Sarai on the Volga. Thence circumstances carried them to Bokhara, and a party of Mongol envoys, passing that way, invited their company to the court of the Great Khan in the far East. Kublai, the ablest descendant and successor of Chinghiz, was then reigning. His nominal supremacy embraced all Asia except the great southern peninsulas, though his kinsmen in Turkestan, in Persia, and on the Volga were now practically independent. Never before having seen European gentlemen, he took the Polos into great favor, and after a time sent them back, in the character of envoys to the papal court, to ask, among other things, for a great body of priests to instruct his people. Kublai seems to have had no religious motive, but he felt the want of religious aid to civilize his Tartars, and saw, no doubt, that men of this Frank stamp were likely to render higher aid than lamas or degenerate Nestorians. The two brothers reached Acre in Apr., 1269, and, hearing that the papal see was vacant, went home. Nicolo found that his wife was dead, but that his son Marco, the subject of this article, was now a fine lad of fifteen. After waiting two years vainly for a new pope, the brothers started again for the East, taking young Marco. They were yet on the Gulf of Scanderoon when they heard at last of a pope's election in the person of Tedaldo Visconti, a church dignitary of Acre, who had shown great interest in their mission, and who afterward reigned creditably as Gregory X. He recalled them to Acre to receive his letters, but in lieu of the hundred teachers asked by Kublai he could give but two, and the hearts of these failed at the outset. The long journey to Cathay occupied three years and a half. It lay through Southern Armenia, Persia, the valley of the Oxus, and Badakhshan, thence over the high plateau of Pamir, a route since followed by no European until the spirited exploration of Lieut. Wood in 1838 to the sources of the Oxus—an exploration only now (Mar., 1874) followed up. From Pamir the Venetians descended upon Kashgar, and thence by Khotan and across the Gobi desert to *Tangut*, as the country at the western end of the Great Wall was then called. Here they were met as the Great Khan's guests, and conducted to his summer-seat at Shangtu on the plateau of Mongolia, 200 miles nearly due N. of Peking (*Cambaluc—i. e. Khan-bâligh*, "imperial city"). Kublai received the party cordially, and showed especial favor to Marco. The young man applied himself to acquire some languages current at the Mongol court (though Chinese was certainly not one of his acquisitions), and soon got employment in the khan's service. Under 1277, M. Pauthier has found a Chinese record of his nomination. His first important commission carried him through Western China and the wild Tibetan frontier to Yun-nan, called by the Mongols Karajang (*Carajan*), and thence to the borders of Burma (*Mien*). Marco had observed the khan's interest in strange countries, remarkable objects, and peculiar manners, and had heard his frank disgust expressed at the stupidity of travelled officials who could only give a dry report of business. He therefore stored his memory with curious facts, and related them with vivacity at court. Favor followed him, and he was often employed on foreign or domestic business. Our information on this is only incidental. But a mission to India was one of his charges, and the government of the great city of Yangchew, with its district, was another. The khan grew old, and the Polos began to fear what might follow his death; they desired to depart, but he heard them with displeasure, and but for a happy accident we should have lost our mediæval Herodotus. Kublai's kinsman, Arghûn, khan of Persia in 1286, lost his favorite wife, Bulugân. Dying, she begged him to fill her place with a Mongol lady of her own family in Cathay. Envoys were sent to Cambaluc, and Kukâchin, a beautiful maiden, was selected to return with them. The envoys desired to return by sea, and sought the company of the experienced Venetians. Kublai was reluctant, but consented, and fitted the party out nobly for the voyage, charging the Polos with friendly messages for the kings of France, England, and Spain. Their fleet of fourteen vessels sailed from Fokien in the beginning of 1292; the voyage was long and disastrous, but the Polos after two years landed in Persia. Arghûn had long been dead, and his brother reigned, but Ghazan, his son, afterward a famous king, succeeded to the bride's hand. She quitted her noble Frank guardians with tears, and we learn from a Persian writer that she did not long survive. After a time the Polos proceeded to Europe, and reached Venice late in 1295. Venetian tradition preserved the story of their cold reception, and of the quaint means which they took to have their identity acknowledged; for which we have no space here. Venice and Genoa were then in hot and often sanguinary rivalry. In 1298 the Genoese sent forth a powerful armament under Lamba Doria to strike the foe in her own waters. Venice hastily augmented her Adriatic fleet under Andrea Dandolo, and under him went Marco Polo as gentleman-commander (*sopra comito*) of a galley. On Sunday, Sept. 7, 1298, the fleets came to action off Curzola, with disaster to the Venetians: 7000 prisoners were carried to Genoa, Polo among them. At Genoa he fell in with a certain Rusticiano or Rustichello of Pisa, an inmate also of the prison there, and known otherwise as a *littérateur* of humble claim. To him we owe the preservation of Polo's travels and memory, for he probably suggested the record of his experiences, and certainly he wrote them down from Polo's dictation. In the summer of 1299 peace was made and the prisoners were liberated. Marco Polo survived to Jan., 1324, the date of his will still extant, but died soon after—certainly before June, 1325. He had married, and left three daughters; two of them married before his death. One of these, Fantina Bragadino, survived in 1379. Nicolo, the father, was dead before Aug., 1300; Maffeo, the uncle, was alive and made a will in 1309.

The *Book of Marco Polo* consists of two unequal sections. The first, called *Prologue*, is a personal narrative of great interest, but too great brevity. The second consists of a long series (232 in the oldest form) of chapters, extremely various in length and interest, descriptive of the regions of Asia visited by the Polos in their different journeys, but especially of the emperor Kublai, his court and dominions. It is a curious fact, only ascertained within the last half century, but now quite proved, that the original work, dictated by Marco, a Venetian, to Rustichello, a Pisan, was written in *French*, and very bad French too. The greatest number of MSS. is, however, in Latin, a version by Friar Pipino, executed in Polo's lifetime, having been much diffused. Italian versions are also numerous, the French less so, but far more valuable. The whole number of MSS. known is under 80. Polo's recognition as prince of mediæval travellers is due to his romantic story and to the vast compass of his travels, anticipating so many supposed discoveries of the sixteenth century, rather than to transcendent character or capacity. It is a mistake to place him beside Columbus, as declaimers and enthusiastic

biographers have done. We trace in him nothing of the genius and lofty enthusiasm or ardent previsions of the great admiral. But he has his own real, indisputable, and unique claims to glory. He was the first traveller to trace a route across the whole longitude of Asia, naming and describing kingdom after kingdom from the shores of Cilicia to the Yellow Sea—the first traveller to reveal China in all its wealth and vastness, with its mighty rivers, its huge cities, its swarming population, and rich manufactures; to tell us of the nations on its borders, with their eccentricities of manners and worship; of Tibet, of Burma, of Laos, of Siam, of Cochin-China, of Japan; the first to speak of that museum of beauty and wonder, the Indian Archipelago; of Java, the pearl of islands; of Sumatra (*Java Minor*); of Ceylon with its Mountain of Adam; of India, not as a mythical region, but as a country seen and partially explored; of the secluded Christian kingdom of Abyssinia; of Zanzibar, Madagascar, and Socotra; and in remotely opposite quarters of the high plateaus of Pamir, with their wild sheep; of Siberia and the Arctic Ocean; of white bears, sledge-dogs, and reindeer-riding Tunguses. That all these should be the revelations of one man and one book surely accounts for and amply justifies the author's high place on the roll of fame, without our seeking to invest him with imaginary attributes. His book has presented many difficulties, but progress in exploration and in the translation of Oriental literature has made most of them now clear. Marsden's (London, 1818) was the first edition of value; Pauthier's (Paris, 1865) brought a vast amount of curious and interesting Chinese learning to bear upon the subject. The present writer in 1871 published an edition on which great labor had been bestowed, and this is about to issue afresh with many additional elucidations and illustrations. H. YULE.

Polotsk', town of Russia, government of Vitebsk, on the Dwina, is one of the oldest towns of Russia, the see of an archbishop, and has many educational institutions, but no manufactures and only a small trade. P. 11,418.

Polta'va, government of European Russia, bordering S. and W. on the Dnieper, comprises an area of 19,265 sq. m., with 2,102,614 inhabitants. The surface is level, the soil fertile, and the climate mild and agreeable. Agriculture and rearing of cattle are almost the only branches of industry pursued. Corn, hemp, tobacco, and fruits are raised; bees and silkworms are extensively reared. Manufactures are few, and the inhabitants often emigrate to the adjacent governments to find employment.

Poltava, town of European Russia, capital of the government of Poltava, on the Vorskla, is a neat and handsome place, though most of its houses are built of wood. It has some manufactures and four annual fairs, at which large commercial transactions take place. On June 27, 1709, Peter the Great won here a decisive victory over Charles XII., in commemoration of which a large monument has been raised in the principal square. P. 31,852.

Polyan'dry [Gr. πολύς, "many," and ἀνήρ, ἀνδρός, "man," "husband"], the custom which prevails extensively in many wild tribes in various parts of the earth of marrying a woman to several husbands at once. The Todas of India, the people of Thibet, and other tribes of Asia follow this practice. Very commonly the husbands are all brothers, and in some tribes they together take but one wife.

Polyan'thus ("many-flowered"), a popular name for a large class of primroses, probably belonging to *Primula grandiflora*, and quite closely allied to the auriculas, cowslips, oxlips, etc. The polyanthus is a hardy perennial, and the flowers are often beautiful and profuse.

Polyatomic Alcohols. See ALCOHOL.

Polybasic Acids. See ACIDS.

Polyb'ius, b. about 204 B. C. at Megalopolis in Arcadia of a wealthy and influential family; entered early into the military and political service of the Achæan league, and was one of the 1000 Achæans who were summoned to Rome after the battle at Pydna (167 B. C.) to answer before the senate why the league had not sent auxiliaries to the Roman army in Macedonia. The trial never came off, but the hostages were detained for sixteen years in Italy, having been distributed among the towns of Etruria. Polybius, however, was allowed to live in Rome, and stayed in the house of Æmilius Paulus. Here he formed an intimate friendship with Scipio Æmilianus, whom he accompanied on his African campaign, where he witnessed the destruction of Carthage. On the outbreak of the war between Rome and the Achæan league he hastened home, and arrived in Greece just after the fall of Corinth, in 146. He now exerted himself successfully to mitigate the fate of his countrymen, and statues were afterward raised in honor of him by several Greek cities. Of the latter part of his life very little is known; he is said to have died in the eighty-second year of his age from a fall with his horse. His principal work, and the only one of which anything has come down to us, is his history of Rome, in 40 books, from 220 to 146 B. C., with an introduction giving a sketch of the rise of the city from its conquest by the Gauls to the outbreak of the Second Punic war. Only the first five books and fragments of the rest are still extant, edited by Schweighäuser (Leipsic, 1789–95, 8 vols.), I. Bekker (Berlin, 1844), and L. Dindorf (Leipsic, 1866); translated into French by Thuillier, with military notes by Folard (6 vols., Paris, 1727–39), and into English by Hampton (2 vols., 1772). In artistic respects the history of Polybius can hardly be said to occupy any high rank, though perhaps it would be unjust to form any definite judgment from the existing fragments. But the author was possessed of accurate and extensive geographical and military knowledge, and his representation is impartial and conscientious.

Pol'ycarp, one of the apostolic Fathers, apparently of Christian parentage, a disciple of St. John and bishop of Smyrna, where he suffered martyrdom. It has generally been supposed that his martyrdom occurred in the year 166 or 167 A. D. But recent investigations (of Waddington and others) have changed the whole chronology, making it probable that he was b. in 69 or 70 and d. 155 or 156 A. D. Most of what is known of him comes from his pupil Irenæus, who was bishop of Lyons 177–202 A. D. In his letter to Florinus (preserved by Eusebius, *Hist.*, v. 20) Irenæus gives a graphic account of Polycarp as remembered by him. Another extract (*Adv. Hær.*, iii. 3, 4) emphasizes Polycarp's hostility to heretics. And there is still another extract from a letter of Irenæus to Victor, bishop of Rome (preserved by Eusebius, *Hist.*, v. 24), in relation to the Passover dispute, describing a visit of Polycarp to Anicetus, bishop of Rome from 154 A. D. What purports to be an epistle from the Church in Smyrna to a neighboring Church in Philomelium, describing the martyrdom of Polycarp, if genuine, must have been largely interpolated. But some features of the narrative are quite above suspicion and in keeping with the best traditions of the age. When entreated to save his life by reviling Christ the answer of the martyr was, "Eighty and six years have I served him, and he has done me no ill, and how can I blaspheme my King who has saved me?" The spot now pointed out as the site of this martyrdom is marked by a tall cypress on the face of Mount Pagus, overlooking the city of Smyrna. Polycarp's Epistle to the Philippians appears to have been written shortly after the martyrdom of Ignatius, 115 A. D. Its genuineness, though disputed by writers of the Tübingen school, is now generally conceded. Its tone is hortatory; its most important characteristic, great profuseness of quotation from the apostolic writings. The best editions are those by Hefele (1839; 4th ed. 1855), Dressel (1857; 3d ed. 1876), and Jacobson (1838; 4th ed. 1866). (See an essay by Prof. Lightfoot in the *Contemporary Review*, May, 1875.) R. D. HITCHCOCK.

Polycen'tridæ [from *Polycentrus*, Gr. πολύς, "many," and κέντρον, "spine"], a family of teleocephalous fishes peculiar to the fresh waters of tropical South America. The body is much compressed; the scales ctenoid; the lateral line undeveloped; the head compressed; the opercular bones more or less armed; mouth with a lateral cleft; upper jaw very protractile; teeth small; branchial apertures extensive; branchiostegal rays six; dorsal and anal fins long, each armed with numerous spines, and with the soft portions comparatively short and opposite each other; pectorals with branched rays; ventrals thoracic, each with a spine and five rays. The family is composed of two genera—(1) *Polycentrus*, without a barbel, and (2) *Monocirrus*, with a barbel. Two species of the former and one of the latter are known. THEODORE GILL.

Pol'ychrome, synonymous with ÆSCULIN (which see).

Polychrome Printing. See PRINTING.

Polycle'tus, b. at Sicyon, Achæa, subsequently made a citizen of Argos; received instruction, together with Phidias and Myron, from Ageladas, and made the celebrated chryselephantine statue of Hera in the Heræum of Argos, and the still more celebrated statue of the *Spearbearer*, which was afterward studied by other artists as containing the *canon* with respect to the proportions of the human body. He was also famous as an architect, and built the theatre of Epidaurus.

Polyc'rates, tyrant of Samos, one of the most daring and most successful of the many sea-kings who in ancient times swarmed over the Ægean Sea; was warned by his friend, King Amasis of Egypt, that he should sacrifice something which he valued very highly in order to ward off the envy of the gods. He consequently threw his ring, a jewel of immense value, into the sea, but the next day the ring was found in the stomach of a fish served up on his table. His life, which was one long series of brilliant

victories, ended, nevertheless, in a pitiful manner. One Orœtes, satrap of Sardis, lured him into Magnesia, and seized and crucified him for some unknown reason about 522 B. C.

Polydip'sia [Gr. πολύς, "much," and δίψα, "thirst"], a name given to the disease sometimes called *diabetes insipidus*, in which the patient drinks large quantities of water. The name has also been given to the morbid appetite for alcoholic drink, a far more formidable disease.

Polygala'ceæ, or **Milkworts**, a natural order of polypetalous exogenous herbs and shrubs, of which the large genus *Polygala* is the typical one. The order is remarkable for the seemingly papilionaceous character of its flowers, although the structure is really quite different; the parts which have been called wings belong to the calyx, and the pistil is compound, with two cells to the ovary; the stamens are eight or fewer, and the anthers open by a terminal pore. The order is extremely well marked, but its relationship obscure. It is widely distributed over the world, and several species of *Polygala* (called milkwort, but not milky) are prized for their ornamental flowers. The Atlantic U. S. have numerous species, all low herbs; among them, the principal officinal plant of the order *P. Senega*, the Seneca snake-root, the acrid root of which is used as a stimulating expectorant and diuretic. It has an old reputation as an antidote to the bite of the rattlesnake; and in various parts of South America, also in South Africa, the same property is ascribed to certain species of *Polygala*. The roots of several European and one U. S. species have been used as bitter tonics.
ASA GRAY.

Polyg'amy [from the Gr. πολύς, "many," and γαμεῖν, to "marry"], the state of a man having two or more wives at the same time. The state of a woman having two or more husbands at the same time is generally called POLYANDRY, and is treated under that head. In ancient times polygamy was practised by all the Eastern nations, and was sanctioned, or at least tolerated, by their religions. In the Homeric age it seems to have existed to some extent among the Greeks, but during the later development of Greek civilization it entirely disappeared. To the Romans and the Gotho-Germanic races it was unknown. With the Jews it was common among the patriarchs and tolerated by the law of Moses, but toward the beginning of our era the custom appears to have died out. The Koran sanctions it, but among the Arabs it does not prevail as a general rule. Among Christians, although the New Testament contains no positive injunction against it, it was never tolerated until, in 1843, Joseph Smith introduced it among the Mormons in accordance with a special "revelation" he had received. (See MORMONS and BIGAMY.) In our times polygamy is common only among the savage African and Malayo-Polynesian races, and among the degraded Asiatic nations.

Pol'yglot [from the Gr. πολύς, "many," and γλῶττα, "tongue"], a book with versions of its text in several languages, but generally used only of such editions of the Bible. Of Origen's *Biblia Hexapla* only a few fragments are extant. The first great polyglot printed was the Complutensian (Alcalá de Henares, Spain, 1522); it was followed by the Antwerp (1569–72), the Parisian (1628–48), and the London (1654–57).

Polygno'tus, b. in the beginning of the fifth century B. C. in the island of Thasos; was an intimate friend of Cimon, and lived mostly in Athens, where he decorated the temple of Theseus, the Anaceum, and the Pœcile; afterward also the inner halls of the Propylæa. His pictures were very celebrated in antiquity, and the whole art of painting appears to have been elevated to a high standard by his genius.

Pol'ygon [Gr. πολύς, "many," and γωνία, "angle"], a limited plane figure bounded on all sides by straight lines. The bounding lines are called *sides* of the polygon, and the points at which they meet are called *vertices* of the polygon; the entire bounding line is called the *perimeter*. Polygons are divided into classes according to the number of their sides or angles. Polygons of three sides are called *triangles;* those of four sides are called *quadrilaterals;* those of five sides, *pentagons;* those of six sides, *hexagons;* those of seven sides, *heptagons;* those of eight sides, *octagons;* those of ten sides, *decagons;* and so on. If the sides of a polygon are equal, the polygon is said to be *equilateral;* if its angles are equal, it is called *equiangular*. A *regular* polygon is both equilateral and equiangular. If the circumference of a circle is divided into any number of equal arcs, the chords of these arcs form a regular polygon having a corresponding number of sides; if the number of sides of such a polygon is greater than any assignable number, or *infinite*, the value of each side is less than any assignable line, or *infinitesimal*, and the polygon is then said to become a circle. The circle is therefore the limit of an inscribed regular polygon having a varying number of sides. A closed broken line, all of whose sides are not in a single plane, is often called a *twisted polygon*.
W. G. PECK.

Polygona'ceæ, a natural order of apetalous exogenous herbs, shrubs, or rarely trees, found in most parts of the world and containing about 700 species. The essential marks of the order are the nodose stems or swollen joints, usually entire leaves, and ochreate stipules—*i. e.* the stipules form sheaths around the stem; the stamens seldom accord in number with the divisions of the usually colored calyx; and the ovary contains a solitary orthotropous ovule, rising from the base of the cell. The properties of the order are somewhat diverse, and the economical uses of some species important. Several have purgative roots, of which the officinal rhubarb is the noted representative. Many, such as docks, bistort, etc., have very astringent roots. A volatile acridity characterizes the herbage and gives name to water-pepper and smart-weed, common species of *Polygonum;* and some of these species yield a yellow dye for domestic use, while the wood of *coccoloba* dyes red. The fruit or succulent calyx of the latter is eaten under the name of seaside grape. Sorrel and some species of rhubarb, etc. are noted and useful for their pleasantly acid herbage, and the farinaceous grain of buckwheat takes the place and well fulfils the office of a cereal grain. ASA GRAY.

Polyg'onal Numbers, series of numbers each term of which is formed from the preceding by adding to it the corresponding term of an arithmetical progression. They are called polygonal numbers because the number of points in each series can be arranged in the form of a polygon, which gives the name to the series. Thus, the numbers 1, 3, 6, 10, 15, etc. are triangular numbers, because they indicate the proper number of points necessary to form triangles. The numbers 1, 4, 9, 16, 25, etc. are square numbers, since the corresponding number of points may be arranged in squares. The numbers 1, 5, 12, 22, etc. are pentagonal numbers.

Polyhe'dral Angle, an angular space bounded by three or more planes passing through a common point. The intersections of the bounding planes are called *edges* of the polyhedral angle, and their common point is called the *vertex* of the angle. If a sphere is described about the vertex as a centre with a radius equal to 1, the part of its surface included within the bounding planes is taken as the measure of the angle.

Polyhe'dron [Gr. πολύς, "many," and ἕδρα, "side"], a volume bounded on all sides by polygons. The polygons are called *faces*, and the lines in which they meet are called *edges* of the polyhedron. The points in which two or more edges meet are called *vertices* of the polyhedron. The simplest polyhedron is bounded by four triangles, and is known as pyramid or tetrahedron.

Polyhym'nia, one of the nine Muses, the inventor of the lyre and the genius of lyric poetry, is generally represented by ancient artists in a pensive attitude.

Polymer'ic Isomorph'ism. (For ISOMORPHISM see that head.) Polymeric isomorphism is a term applied to a class of facts first observed by Scheerer, to the effect that in minerals containing both magnesia and combined water the crystalline form is not altered by the substitution of three equivalents of water for one equivalent of magnesia. MgO was therefore claimed by Scheerer to be isomorphous, or crystallogenically equivalent to $3H_2O$. Scheerer's observations, published in 1846, were followed up in 1853 by Prof. Sterry Hunt, who maintained that in mineral species water plays the same part that H_2C does in organic compounds, and that series of *homologues* (see the article HOMOLOGY) are formed by successive additions of single molecules thereof, which homologues must of course be also *isomorphs* to satisfy this view. Laurent had before pointed out cases among organic salts where additional water does not change the crystalline form. Prof. Hunt appears also to have extended his idea so as to include other metallic oxides besides magnesia. The subject is still involved in much obscurity. H. WURTZ.

Polymerism. See ISOMERISM.

Polymyxi'idæ [from *Polymixia*, Gr. πολυμιξία, "a mingling of many characteristics"], a family of teleocephalous fishes distinguished by the peculiar union of characters. The body is rather elongated and compressed; the scales are not serrated; the lateral line is continuous with the back; head compressed and with a decurved profile; preoperculum serrated; mouth with a lateral and nearly horizontal cleft; teeth villiform, on the jaws as well as palate; branchiostegal apertures large; branchiostegal rays four; dorsal moderately elongated, with several spines increasing backward; anal opposite the posterior portion of the dorsal,

armed with three or four spines; pectorals with branched rays; ventral fins thoracic, each with a spine and six or seven rays. The skeleton has the vertebræ in increased number (29). The family is distinguished by the combination of chin barbels, increased number of rays, and small number of branchiostegals. Its affinities are doubtful, but on the whole seem to be rather with the Mullidæ. But two species are known—(1) *Polymixia nobilis*, from the seas of Madeira and St. Helena, and (2) *Polymixia Lowii*, of the Caribbean Sea. THEODORE GILL.

Polynem'idæ [from *Polynemus*, Gr. πολύς, "many," and νῆμα, "thread"], a family of teleocephalous fishes peculiar for the free filiform rays below the pectoral fins. The body is rather elongated and moderately compressed; the scales ctenoid; the lateral line continuous; the head projecting at the snout; the opercula more or less armed; mouth inferior, with the cleft lateral; upper jaw scarcely protractile; teeth villiform, and on the jaws as well as palate; branchiostegal apertures enlarged; branchiostegal rays seven; dorsal fins two, and far apart; the anterior dorsal short, with seven or eight spines; posterior dorsal and anal short, nearly equal, obliquely opposite to each other, and covered with scales; caudal fin separate and more or less emarginated; pectorals divided into two parts, the upper normal fin and a lower row of thread-like simple filamentary rays entirely disconnected; ventrals sub-abdominal, each with a spine and five rays; the skeleton has the vertebræ in normal or nearly normal number (9–10 + 14–15); the skull is traversed by muciferous canals; the air-bladder is either present or wanting, and variously developed. The family is represented by about twenty-five species, distributed in almost all tropical regions, and one (*Trichidon octofilis*) occasionally wanders northward as far as New York. THEODORE GILL.

Polyne'sia [from the Gr. πολύς, "many," and νῆσος, "island"], formerly employed, especially by French geographers, as the common name for all the islands and groups of islands situated between the eastern shore of Asia and the western shore of America; other names, however, such as Oceanica and Australasia, were also used. Subsequently, the islands of the Indian Ocean were separated, forming a group by themselves under the name of Malaysia. Australia and the islands situated nearest to it were gathered into another group, named Australasia; and thus the name Polynesia was restricted to those islands or groups of islands lying between lon. 100° W. and the Philippines—Papua, New Britain, New Hebrides, New Zealand, etc., including the Hawaiian, Marquesas, Society, Friendly, Feejee, Caroline, Ladrone Islands, etc.

Polynices. See ETEOCLES.

Polyodont'idæ [from *Polyodon*, Gr. πολύς, "many," ὀδούς, "tooth"], a family of ganoid fishes remarkable for the extension of the snout into a long, thin, and depressed shovel-like process. The body resembles somewhat that of the sturgeon, to which the form is nearly related; the skin is almost naked or merely studded with minute stellate ossifications; the head is chiefly distinguished by the projection of the snout into the shovel-like process above indicated; neither a preoperculum or suboperculum developed; operculum more or less produced backward; the mouth has a lateral cleft and is quite wide; the upper jaw formed by the premaxillaries; teeth minute, on the jaws; branchial apertures continuous below; a broad branchiostegal ray is developed on each side; dorsal and anal fins far behind; caudal heterocercal and provided with fulcra above; pectorals with numerous rays; ventrals abdominal; the skeleton has numerous peculiarities (see SELACHOSTOMI); the stomach is cæcal; pyloric appendages are developed in the form of a broad, divided, and subdivided, leaf-like organ; the air-bladder is cellular, and not bifid. This remarkable type is represented by but two or three species in the present epoch—(1) *Polyodon folium*, of the Mississippi River and its tributaries, and (2) *Psephuri*, of China and Japan. THEODORE GILL.

Polyphe'mus, the famous Cyclops, a son of Poseidon, a gigantic monster with one eye in the centre of the forehead; lived in the island of Thrinacia, where he captured Odysseus on his return from Troy; but Odysseus escaped by making him drunk and burning out his eye.

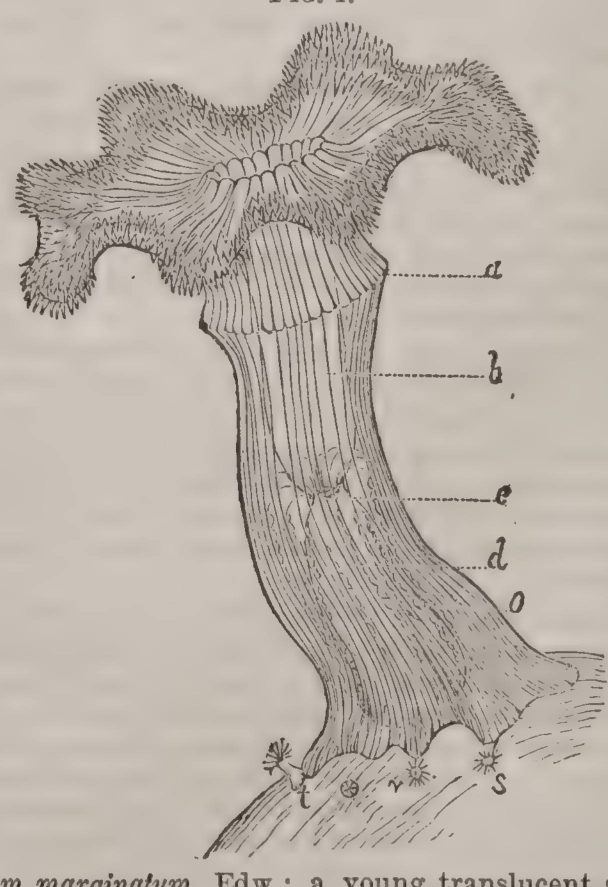
Polyphon'ic [Gr. πολύφωνος, "many-voiced"], in music, a term referring to such compositions as consist of numerous parts or voices, and are thus distinguished from duets, trios, etc., in which the parts are few.

Polyplacoph'ora [Gr. πολύς, "many," πλάξ, πλακός, "plate," and φορός, "bearing"], a sub-class or order of gasteropod mollusks pre-eminently distinguished by the multi-articulated shell. The body is symmetrical, more or less oblong, with a large coraceous mantle, and with a broad foot, as in the limpets; the heart is median and elongated; the branchiæ are developed in a series of laminæ between the foot and the mantle around the posterior region of the body; the head is extensible into a proboscis; cartilaginous jaws are developed, and an elongated radula or lingual ribbon; no eyes or tentacles exist; the sexes are united in the same individual; the organs of generation are symmetrically arranged and repeated on the respective sides, and have two orifices; the intestine is straight and median, and the anal aperture posterior. The shell is composed of eight transverse plates, which are lodged in the mantle, and inserted therein by apophyses from their anterior margins; the first and last are convex toward their respective extremities; the six median divided by lines of sculpture into a dorsal and two lateral areas; these, as well as the first, have each the apex posterior, while the last has its apex near the anterior margin. Such are the principal characters of the very peculiar mollusks which form the families Chitonidæ and Chitonellidæ. The peculiarities of structure are numerous, and indicate for the group the value of at least an order, and probably a sub-class, of gasteropods, whose relations are nearest with the Dothoglossa (limpets, etc.). The order has been represented by species from the Silurian to the present epoch. Although occurring in all regions, in the salt waters and wherever rocks abound, they are most numerous in the tropics. THEODORE GILL.

Pol'ypod, or **Pol'ypody** [Gr. πολυπόδιον, "many-footed," alluding to the branching root-stock], popular names given to many ferns, but the name properly belongs to those of the genus *Polypodium*, of which the U. S. have several species, growing on rocks, tree-trunks, etc.

Pol'yps, or **Pol'ypi** [Lat. *polypus*, from Gr. πολύς, "many," and πούς, "foot"], a name applied by many zoologists to one of the classes of Radiata, and equivalent to Anthozoa of other authors. Formerly, before their anatomy was known, the Hydroida, Polyzoa, and compound ascidians were also called polyps. The true polyps, or Anthozoa, constitute an important and diversified group, including most of the true coral-producing animals, as well as many that secrete no coral. Those kinds that abound in tropical seas and have a firm skeleton of coral, from which coral-reefs and islands are formed, are the most important. Most species of polyps form compound colonies or clusters composed of numerous more or less closely-united individual zoöids, each of which usually has at least a mouth and stomach of its own. The zoöids of such a colony all originate from one primary polyp, either as successive generations of buds that do not separate completely, or by repeated incomplete spontaneous divisions of the first one and its successors. Most kinds of sea-anemones (Fig. 1) and many corals (*Fungia*, etc.) always remain simple, or if they produce buds they soon separate completely. Some of these simple kinds grow to a large size, often becoming several inches, or even more than a foot, in diameter; while among the compound species the individual zoöids are generally small, and often quite minute, though never really microscopic; but the entire colony produced by the many thousands thus united together may be several feet in height or breadth, as in certain species of *Porites*, *Madrepora*, *Astræa*, *Gorgonia*, etc.

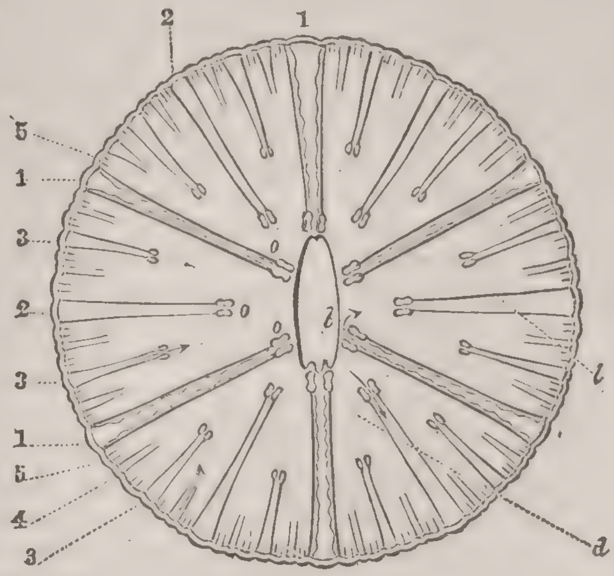
FIG. 1.



Metridium marginatum, Edw.: a young translucent specimen, reduced one-half.

Nearly all polyps, when first hatched from the egg, have the form of oblong or oval ciliated larvæ or *planulæ*, and swim free in the ocean; but most of the species very soon attach themselves to some solid substance and remain fixed for life, whether they are to remain simple or become compound by budding. But the simple sea-anemones (*Actiniæ*, etc.) adhere by a muscular locomotive basal disk, with

FIG. 2.



Transverse section of an Actinia: *b*, stomach; *d*, body-cavity; *l*, a radial chamber; *o*, ovaries; 1, 1, 2, 2, 3, 3, 4, 5, 5, radial partitions of the five successive series.

which they can creep slowly; and certain compound species (Pennatulaceæ, Fig. 3) have a hollow muscular locomotive stem common to the whole colony, by means of which they can unitedly move about.

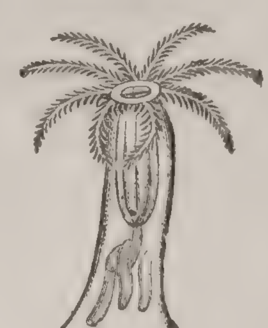
Polyps have a tubular body, which may be long and cylindrical, or short and broad, or even almost disk-like; the base or lower end sometimes tapers to a point, but is oftener broad for adhesion, and is perforated in only a few species; the upper end of the body terminates in a circular or elliptical disk, in the centre of which there is an oblong or elliptical mouth, with the lips usually bordered by more or less prominent lobes (Fig. 1); the disk is surrounded by one or several circles of hollow tentacles, varying greatly in form, size, number, and position in different species. In some cases the tentacles are scattered over the disk as well as around the margin, and there may be thousands of them, while in other species (Fig. 4) there are never more than eight, which form a single marginal circle. The tentacles are usually very contractile, and are covered with great numbers of minute nettling-cells, with which they capture their prey. In the interior the stomach (Figs. 1 and 2, *b*) occupies the centre, in the upper portion of the body. It is a capacious flattened sac, with a corrugated internal surface, communicating directly with the mouth at its upper end, and having an orifice (Fig. 1, *c*) at the lower end, opening directly into the general cavity of the body (*d*). The body-cavity is longitudinally divided by a number of symmetrically arranged fleshy radial partitions (Fig. 2), which extend inward from the outer wall of the body, the principal ones reaching the stomach, to which they are attached by their inner edges along most of its length, but, being narrower below, they leave a large open central chamber beneath the stomach. (Figs. 1 and 2, *d*.) In those species that have more than eight radial partitions they are arranged in pairs, and there are between the pairs of broad primaries pairs of narrower ones, which are formed successively later, and do not usually become attached to the stomach. (Fig. 2, *2, 2, 3, 3, 4, 4*.) The radiating chambers formed by these partitions communicate freely with the central cavity below the stomach; and by means of a circular opening through each partition, near its upper margin, all the chambers are also in direct communication at their upper ends; the cavity within each of the hollow tentacles is also a direct prolongation of the radiating chamber beneath it. The radiating partitions are filled with muscular fibres, which, by contracting at the same time with the outer wall, serve to withdraw the disk and tentacles and contract the upper end of the body

FIG. 3.

Rophobelemnum clavatum, Verrill.

into a small compass when disturbed. In polyps the sexes are generally separate, though exceptions have been observed, but the ovaries and spermaries (Figs. 1 and 2, *o*) are alike attached to the inner margins of the radial partitions in the body-cavity, below the stomach. The eggs are discharged into the body-cavity, where they often remain until developed into ciliated planulæ, and even into well-formed young polyps; they are usually discharged by passing into the stomach and thence out of the mouth. Certain species of Actinaria (*Sagartia*) have openings through the outer wall of the body, from which long, white, thread-like defensive organs (*acontia*) covered with nettling-cells can be protruded when they are alarmed. Other species (*Bunodes*) have adhesive suckers in vertical rows along the sides; and in certain genera there are variously branched, gill-like organs below the tentacles or on the disk, and sometimes these are large and arborescently divided. In several genera (*Actinia*, etc.) there is a row of rounded, bright-colored organs below the bases of the tentacles; these are regarded as visual organs, and clusters of nerve-cells connected with them have been described, but no connected nervous system has been discovered in any of the polyps. The nutritive fluid contained within the general cavity of the body and in the hollow tentacles is kept in constant circulation by the vibrating cilia that cover the internal membranes, and no special blood-vessels have been detected. After feeding, the undigested parts of the food are discharged from the mouth, and the nutritive parts pass directly into the general body-cavity, mingling with the fluid contained therein, which is also mixed with a large proportion of sea-water when the polyp expands.

FIG. 4.



A zoöid of Fig. 3, enlarged.

FIG. 5.

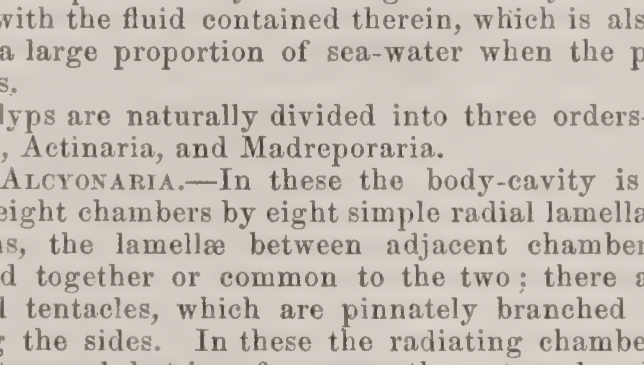
Astrogorgia Sinensis, V.: *a*, natural size; *b*, a retracted zoöid, enlarged.

Polyps are naturally divided into three orders—Alcyonaria, Actinaria, and Madreporaria.

I. ALCYONARIA.—In these the body-cavity is divided into eight chambers by eight simple radial lamellæ or partitions, the lamellæ between adjacent chambers being united together or common to the two; there are eight broad tentacles, which are pinnately branched or lobed along the sides. In these the radiating chambers never secrete coral, but in a few cases the external wall of the body becomes calcified and rigid in its lower part, thus forming tubular corals (*Tubipora, Heliopora*), and all the species secrete, more or less abundantly, small nodules, grains, or plates of carbonate of lime in the outer wall, and usually also in the tentacles and various other parts. (Fig. 5, *b*.) These are known as spicula, and vary widely in size and form both in the different species and in different organs of the same species; but their characters are peculiar and distinctive in each genus and species. These spicula are variously and often very brightly colored, and give to these polyps their brilliant hues. They are most commonly fusiform, and covered with rough, wart-like grains, but wheel-shaped, club-shaped, and scale-like forms are common, and also various forms of crosses, some of them very elegant.

The Alcyonaria are divided into three sub-orders: (1) *Pennatulacea*.—In these the zoöids are united together into a free locomotive colony, sometimes club-shaped

FIG. 6.



Anthelia lineata, Stimp., natural size.

(Fig. 3), with the zoöids scattered over the upper portion, while the lower is a smooth, hollow, muscular bulb for locomotion, but usually containing a solid axis; sometimes the stalk is very long and slender (in some cases six feet or more), with vast numbers of zoöids on wing-like projections along the sides (*Virgularia, Stylatula*, etc.): others

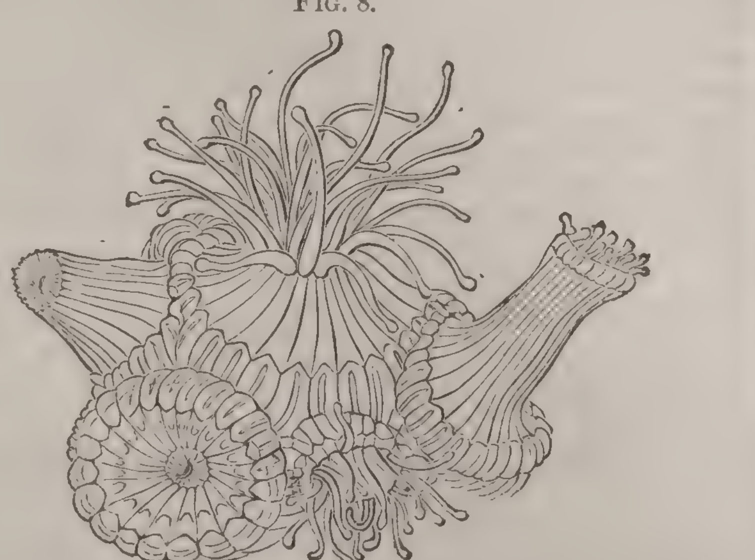
have short and thick colonies, with broad pinnæ bearing the zoöids on their edges, and a stout bulbous base (*Pennatula*); and the genus *Renilla*, common on our Southern coasts, has the zoöids on the upper surface of a broad reniform, leaf-like disk, with a hollow, muscular, and very contractile peduncle on the lower side, with which the colony creeps about. Most Pennatulacea have a second and less complete form of zoöids, differing widely from the normal ones by lacking tentacles and other organs; they may be scattered among the ordinary ones, as in *Renilla*, but more commonly occupy special areas. (2) *Gorgonacea* (Fig. 5).—In these the zoöids have short bodies, and are united together laterally by a porous, crust-like, common tissue, or *cœnenchyma*, filled with spicula, and surrounding a solid axis, which is attached by its base and generally much branched, commonly forming large shrub-like and fan-shaped corals, often several feet high. The axis is a secretion from the cœnenchyma, and may be horn-like and flexible, as in *Gorgoniæ* (Fig. 5); or solid and calcareous, as in the precious red coral (see CORAL); or it may consist of alternate solid and flexible segments, as in *Isis;* or it may be fibrous and composed of spicula. The axis is surrounded externally by a series of longitudinal tubes, by which the numerous zoöids are united together, and these tubes cause the longitudinal grooves, which are always to be seen along the surface of the axis of these corals. (3) *Alcyonacea* (Fig. 6).—In this group the zoöids are elongated, and more or less united at their basal portions, forming fleshy lobed or branched colonies (*Alcyonium*), or broad encrusting groups, with the zoöids rising from the creeping base (Fig. 6), or small shrub-like tufts. These colonies are attached at base to some solid substance, but have no solid axis. The genus *Tubipora* forms a coral consisting of many parallel red tubes united at intervals by transverse plates.

FIG. 7.

Epizoanthus Americanus, V., encrusting a shell occupied by a hermit crab.

II. ACTINARIA.—In this order the zoöids have the outer walls of the body flexible and muscular to the base, with a large central body-cavity extending, like the radial chambers, quite to the base, no coral being secreted either in the walls or radial chambers. The radial chambers have each a lateral radial lamella of its own on each side, so that adjacent chambers are separated by two radial partitions. These chambers and the corresponding tentacles vary in number from ten to many hundreds in the different species, but are commonly in multiples of six. As the polyps grow new chambers and tentacles are introduced, in successive sets, in the spaces between the older ones. (Fig. 2.) There are three sub-orders: (1) *Actinacea* (Fig. 1).—This includes the sea-anemones, or *Actiniæ*, etc. The body has a muscular basal locomotive disk or bulb, by which they adhere and also glide slowly along. They are all simple, but some species produce, from the base, buds which soon separate. (Fig. 1, *r, s, t.*) Many of the species are brilliantly colored, and the forms are usually elegant in expansion. Some tropical species grow to the diameter of fifteen inches, and the *Cerianthus borealis*, from deep

FIG. 8.



Astrangia Danæ, Ag.: a group of the coral-polyps in different states of expansion, enlarged.

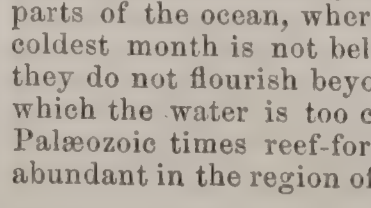
water off the coast of Maine, becomes twenty inches long, with tentacles spreading six inches. (2) *Zoanthacea* (Fig. 7).—These are mostly compound, with the zoöids united at base into encrusting colonies permanently attached to rocks, shells, etc. The tentacles are numerous, smooth, and tapering. (3) *Antipathacea.*—In this group the zoöids are short, with six to twenty-four conical tentacles, and they are united by a membranous cœnenchyma, which secretes a horn-like axis, generally arborescently branched, usually black, and resembling that of *Gorgoniæ*, except that it is generally spinulose and not sulcated.

III. MADREPORARIA.—This order includes nearly all true reef-building corals, as well as many smaller and more delicate kinds, found in all seas, and even at great depths in the ocean. Most of the species form large compound colonies, firmly attached to the bottom or to one another, but many remain always simple (Fig. 9), and many of the simple species and some of the compound ones are attached only when young. Among the compound species the forms are very diverse, according to the mode of increase. Some form large tree-like or shrubby clusters of branches (*Madrepora*, etc.); others grow in low encrusting forms (Figs. 8, 10) or in flat fronds, and many of the reef corals form large, solid, hemispherical or irregular masses, sometimes several feet in diameter. Some of these increase in size by the budding of new zoöids, others by the repeated subdivisions of the old ones. (Fig. 10.) In this order the tentacles are simple and usually elongated, varying in number from twelve to several hundred. The disk and upper parts of the wall are flexible and retractile, but the lower part of the wall secretes coral and becomes rigid; coral is also secreted in the lower part of the radiating chambers, and often in the central cavity among the ovaries, and by the cœnenchyma. The radial and central chambers are therefore smaller and less developed than in the previous groups. There are several sub-orders: (1) *Madreporacea* (Fig. 10).—These have long cylindrical zoöids, much exsert in expansion, with twelve or more slender marginal tentacles. Their corals have porous walls, and mostly increase by budding, forming either much-branched species (*Madrepora*), or rounded masses (*Porites*). Many of them are very important reef-corals. The extinct genus *Favosites* and other related tabulate corals, found in Palæozoic rocks, belong to this group, and were ancient reef-building corals. (2) *Oculinacea* (Figs. 8, 9).—These also have the zoöids much exsert in expansion, with the tentacles slender and marginal, but the corals have compact walls. They increase by budding, and sometimes by fissiparity. They form both massive and slender-branched corals, and also encrusting kinds. (Fig. 8.) *Pocillopora* and allied tabulate corals belong here. (3) *Astræacea.*—In these the zoöids are broader and but little prominent in expansion, and the tentacles are shorter and more numerous. The corals are firm, with compact walls and radiating plates, and the spaces between the plates are usually much divided by transverse septa. The zoöids mostly multiply by incomplete spontaneous fission, and usually form rounded or hemispherical masses or low clumps. Many of the largest reef-builders belong to this group—*e. g. Meandrina, Diploria* (the "brain coral"), *Astræa*, etc. (4) *Fungacea.*—The zoöids in this group are low, with a broadly-expanded disk. The tentacles are numerous, short, and scattered on the disk. The coral has the external walls little developed, while the radial plates are broad and conspicuous, and connected together laterally by transverse bars. Many of the species are simple and free, forming broad circular disks (*Fungia*, etc.), or large elliptical ones (*Ctenactis*), sometimes sixteen inches across; but others are compound; the zoöids, multiplying by marginal budding, usually form rather thin frondose and lichen-shaped corals, though sometimes massive (*Siderastræa*). (5) *Stauracea, or cyathophylloid Corals.*—The corals of this group are abundant in the Palæozoic rocks, and they were important reef-corals in those early geological ages, but, unless a few doubtful kinds be excepted, they have long been extinct. The outer walls of these corals were formed mostly of epitheca, and while some had numerous radial plates, these were lacking in others. Many have successive transverse septa across the central cavity, but in others this structure is wanting or irregular. Many of the species were simple and cornucopia-shaped, others were compound and massive.

FIG. 9.

Desmophyllum simplex, Verrill.

FIG. 10.



Heteropsammia geminata, Verrill.

Modern reef-forming corals are restricted to the warmer parts of the ocean, where the average temperature of the coldest month is not below 68° F. For the same reason they do not flourish beyond about 100 feet in depth, below which the water is too cold, even in the tropics. But in Palæozoic times reef-forming corals of many kinds were abundant in the region of the Northern U. S.; at the island

of Anticosti, near Southern Labrador; and even on the shores of the Arctic Ocean. A. E. Verrill.

Polypter'idæ [Gr. πολύς, "many," and πτερόν, "wing" or "fin"], a family of African ganoid fishes remarkable for the combination of characters, and connecting the dipnoan fishes with the typical Ganoids. The body is more or less elongated and sub-cylindrical; the scales lozenge-like, and in numerous oblique rows; lateral line decurrent; head depressed, with the bones externally visible; operculum and suboperculum well developed, the other elements wanting; mouth cleft laterally; lower teeth rasp-like, and in broad rows on the jaws as well as palate; branchiostegal apertures continuous below; branchiostegal rays replaced by a single bony plate; the dorsal fin is represented by a variable number of separate spines, to each of which an articulated finlet is attached; anal far back; anal small and near the caudal; caudal recurrent forward above; pectoral supported by an oval scaly peduncle; the ventrals are far behind or wanting. The skeleton is composed of numerous vertebræ, of which the abdominal are much more numerous; the stomach (in *Polypterus*) is without a blind sac, and but one pyloric appendage is developed; the air-bladder is developed, and connects (as in the dipnoans) by a duct with the ventral wall of the pharynx, and not with the dorsal, as in other fishes. The family is most interesting as containing the only surviving representatives of a group of fishes which were predominant in the early epochs of our earth's history. It is now represented by two genera—(1) *Polypterus*, with a moderately elongated body, and with ventral fins, and represented in the tropical parts of Africa; and (2) *Calamoichthys*, with a very elongated body and without ventral fins, whose single known species is a native of Old Calabar. Theodore Gill.

Polytech'nic Schools [from the Gr. πολύς, "many," and τέχνη, "art"], a kind of higher educational institution in which the sciences of mathematics, physics, and chemistry are taught, either exclusively or principally, and with a more or less strongly marked practical bearing. The first and most celebrated of these institutions, the École Polytechnique in Paris, was founded in 1794 by decree of the National Convention. It has since been somewhat modified in its plan, and under Napoleon I. its discipline received a certain military cast; but it has fostered all the greatest scientists which France has produced in this century. After finishing the general course in the École Polytechnique the pupils enter the special schools—École des Mines, de Génie, de la Marine, des Ponts et Chaussées, etc.—and thence they generally enter the service of the government. For private industry, however, this school is not of great importance, but it is supplemented for this purpose by the École Centrale des Arts et Manufactures. Similar schools on more or less modified plans have been established in all European countries.

Polytheism. See God, by Prof. A. A. Hodge, S. T. D.

Polyu'ria, a disease characterized by excessive excretion of urine, consisting chiefly of water, but not dangerous and seldom met with. (See also Diabetes.)

Polyzoa. See Polyzoans.

Polyzo'ans [Gr. πολύς, "many," and ζῶα, "animals"], a class of invertebrates most closely related to the brachiopods. Its exact relation to other classes is still involved in some obscurity. By Cuvier and the older naturalists generally the constituents of the class were associated together with the hydroids in the class of acalephs; by H. Milne-Edwards the class was referred to the branch of mollusks, and in that it has been by many retained; some, however, combine the polyzoans and brachiopods with the tunicates in a peculiar branch (Molluscoidea); others segregate the polyzoans and brachiopods in a still more limited group; and still others combine them with the worms. They are all small animals, and generally live in communities, which are either ramose, like branching plants, or incrusting, like lichens or mosses. The single individuals (see illustration of the *Plumatella*, Fig. 24, in Comparative Anatomy) are erect, bag-like forms, with a long intestine doubled on itself, the mouth being at one side, in a disk called the lophophore, at the free end, and the anus at the other, but near the mouth; between the intestinal canal and parietes of the body is an extensive perivisceral cavity; the lophophore has its margins provided with many ciliated tentacles; above or overhanging the mouth, in some forms, is a peculiar appendage called the "epistoma," and homologized by certain naturalists (*e. g.* E. Ray Lankester) with the foot of the true mollusks; the only nervous ganglion developed exists between the mouth and anus. The separate individuals are retractile each into a crust-like chitinous case or "cell." These separate individuals are designated as "polypides," and the colony which they form in combination is a "polyzoarium." The differences in other respects as to detail have furnished the criteria for subdivision of the class into several orders and numerous families. The orders are Entoprocta, Gymnolæmata, Phylactolæmata, and Rhabdopleuræ: about fifty families are known. Species are abundant in all marine waters, and a few fresh-water representatives are known. Theo. Gill.

Pomacen'tridæ [from *Pomacentrus*, Gr. πῶμα, "lid," and κέντρον, "spine"], a family of teleocephalous fishes characteristic of tropical seas. The body is more or less compressed and oval; the scales ctenoid; the lateral line either interrupted or discontinued under the dorsal fin; the head compressed and more or less rounded in front; the opercula variable as to armature; the mouth with a lateral oblique cleft; the upper jaw protractile; teeth on the jaws, none on the palate; branchial apertures continuous below; branchiostegal rays five to seven; dorsal fin long, with the spinous portion longer than the soft; the soft portion of the dorsal and anal fins corresponding opposite to each other; the anal with two (rarely three) spines; pectorals with branched rays; ventrals thoracic, with a spine and five soft rays; the vertebræ are in moderate number (11–12 + 14–15); the intestinal canal of moderate length; the pyloric appendages in small numbers; three and a half gills developed. The family is composed of numerous rather showy small fishes found in the tropical seas of all parts of the globe. Between 150 and 200 species have been described. (See Günther, *Cat. Fishes in Brit. Mus.*, vol. iv. pp. 2–64.) Theodore Gill.

Pomàri'ca, town of Italy, province of Potenza, situated on a hill about 18 miles S. E. of Matera, and enjoying a most healthful climate. P. in 1874, 5100.

Pombal' (Sebastião José de **Carvalho e Mello**), Marquis of, b. at Lisbon, Portugal, May 13, 1699; studied law at the University of Coimbra; spent some years in the army; afterward entered the civil service and obtained the favor of the court; was sent in 1739 as minister to London, and in 1745 to Vienna, where he married the wealthy countess of Daun, and succeeded as mediator in averting the threatened rupture between the court of Austria and Pope Benedict XIV.; became minister of foreign affairs of Portugal 1750; acquired a great influence over his sovereign, King Joseph; displayed great vigor and judgment as a political reformer; exercised a kind of beneficent dictatorship during the days of panic following the great earthquake of Nov., 1755; superintended the rebuilding of the city with greater magnificence; became first minister 1756, and caused the banishment from Portugal of all the members of the Society of Jesus by royal decree of Sept. 3, 1759, they having been suspected of connection with the attempted assassination of the king in the previous year; created count of Oeiras in 1759, he was made marquis of Pombal in 1770, and retained nearly supreme power until the death of Joseph in 1777. On the accession of Pedro III. he was superseded in favor at court, and retired to his estates. D. at Pombal May 5, 1782. He is still known in Portugal as the "great marquis."

Pomegran'ate [Lat. *pomum granatum*, "fruit abounding in seeds"], the *Punica granatum*, a shrub of the Old World, and of the order Granataceæ, now naturalized in most warm countries. It grows finely in the Gulf States. Its fruit is of fine appearance. Some of the varieties are sub-acid and others sweet. Most of the sorts abound in small seeds, but some are seedless. The fruit is very grateful in hot climates. The plant is sometimes used for hedges. The flowers are very fine, and sometimes are double. The bark is used in tanning. The rind of pomegranates is a good astringent for medicinal use. The bark of the root is a good anthelmintic. The *Punica nana*, a small West Indian shrub, is cultivated for its fine flowers.

Pomeran'ce, town of Italy, province of Pisa, about 15 miles S. E. of Volterra. It is situated on a hill at the foot of which flows the Cecina, and the castellated walls of the fifteenth century are still standing. The chief industry of this place is the manufacture of borax, which is carried on largely. P. in 1874, 7373.

Pomera'nia, province of Prussia, bordering N. on the Baltic, and bounded W. by Mecklenburg and S. and E. by the provinces of Brandenburg and West Prussia, comprises an area of 12,304 sq. m., with 1,431,633 inhabitants. The ground is low and the surface perfectly level. Along the Oder and the Baltic the soil is marshy and produces good pasture; in other places it is sandy and little productive. Rye, wheat, potatoes, and hemp are cultivated; cattle and poultry are reared; the fisheries are important; smoked geese and pickled eels form two quite considerable items of exportation. The inhabitants of Pomerania are of Wendish origin, and formed an independent Wendish dukedom during the Middle Ages. On the death of Boleslaus XIV., in 1637, the ruling dynasty became extinct, and the country was divided between Prussia and Sweden, which during the Thirty Years' war had made

large conquests in Germany. After the downfall of Charles XII., Sweden was compelled in 1720 to cede its part of Pomerania to Prussia, of which state it since that time has formed a part. It is divided into the three districts of Stettin, Stralsund, and Cöslin.

Pomeranus. See BUGENHAGEN.

Pom'eroy, city, Orange tp., cap. of Meigs co., O., situated equidistant from Pittsburg, Pa., and Cincinnati. It is the fifth of the river-towns in point of trade and commerce above Cincinnati. It contains good schools, churches of all denominations, rolling and nail mills, steam-engine and machine shops, flouring, woollen, saw, and planing mills, 1 newspaper, insurance-offices, several banks, temperance and Odd Fellows' societies, and stores. Rich veins of bituminous and cannel coal underlie this section, and deposits of salt are extensive and profitably mined. P. 5824. SAM. WYLLYS POMEROY.

Pomeroy (JOHN NORTON), LL.D., b. at Rochester, N. Y., Apr. 12, 1828; graduated at Hamilton College in 1847; studied law, and was admitted to the bar 1851; professor of law and dean of the law faculty in the University of New York City 1864–69, during a portion of which period he also occupied the chair of political science; returned to Rochester and resumed the practice of his profession; in 1865 published *An Introduction to Municipal Law,* and in the following year received the degree of LL.D. from Hamilton College; in 1868 published *An Introduction to the Constitutional Law of the U. S.* (3d ed. 1875), adopted as a textbook in the U. S. Military Academy at West Point and in many of the leading colleges; in 1874 prepared a second edition of Mr. Sedgwick's *Statutory and Constitutional Law,* with notes; in 1876 published a treatise on *Remedies and Remedial Rights, according to the Reformed American Procedure,* adapted to use in all the States and Territories where that system prevails, and also in England; has been a regular writer for the *Nation,* and contributed numerous articles to the *American Law Review* and the *North American Review* upon topics connected with constitutional and international law, general jurisprudence, and the science of politics.

Pomeroy (SAMUEL C.), b. at Southampton, Mass., Jan. 3, 1816; educated at Amherst College; was elected from his native town to the Massachusetts legislature 1852; took part in organizing the New England Emigrant Aid Society 1864, of which he became financial agent; went to Kansas the same year; was actively engaged in the anti-slavery struggle in that territory as a member of the defence committee; was a delegate to the Pittsburg and Philadelphia conventions 1856, and to that of Chicago 1860; was chairman of the relief committee during the famine in Kansas, and U. S. Senator from that State 1861–73.

Pomeroy (SETH), b. at Northampton, Mass., about 1715; was major in the Massachusetts forces at the capture of Louisburg 1745; lieutenant-colonel of the regiment commanded by Col. Ephraim Williams, at whose death, in the battle of Lake George, Sept. 8, 1755, he took command and gained a complete victory over Baron Dieskau. By occupation a mechanic, he was skilled in the manufacture of arms. He was a delegate to the Massachusetts provincial congress 1774–75, by which he was elected a general officer Oct., 1774, and a brigadier-general Feb., 1775; fought at Bunker Hill as a private soldier, and was soon afterward appointed senior brigadier by the Continental Congress, but declined the honor in consequence of disputes which arose about military rank, and retired to his farm. In the autumn of 1776 he raised a considerable military force for the relief of the army under Washington, and marched to the Hudson River. D. at Peekskill, N. Y., in Feb., 1777.

Pomeroy (THEODORE M.), b. at Cayuga, N. Y., Dec. 31, 1824; graduated at Hamilton College 1845; studied law; was district attorney for Cayuga co. 1850–56; member of the State legislature 1857; a Republican member of Congress 1861–69; took a prominent part in legislation, and was chosen Speaker Mar. 3, 1869 (the last day but one of the term), to fill the post vacated by Schuyler Colfax, the Vice-President elect.

Pom'fret, p.-v. and tp., Windham co., Conn., on Quinebaug River and Boston Hartford and Erie R. R. Residence of Gen. Israel Putnam previous to the Revolution, and scene of his famous adventure with the wolf. P. 1488.

Pomfret, Chautauqua co., N. Y., on Lake Erie and Canadaway Creek, traversed by Lake Shore and Michigan Southern and Dunkirk Allegheny Valley and Pittsburg R. Rs. Includes the village of Fredonia. P. 4306.

Pomfret, p.-v. and tp., Windsor co., Vt., on White River. P. 1251.

Pomiglia'no d'Ar'co, town of Italy, province of Naples, about 7½ miles N. of Vesuvius, of which it commands a superb view. Very considerable ancient ruins exist here, and among them what is supposed to have been a palace of the family of Pompey, alluded to by Cicero. In the excavations made there are found no less than four successive layers of lava. P. in 1874, 10,045.

Pomme de Terre, tp., Wilkin co., Minn. P. 178.

Pomol'ogy [Lat. *pomum,* "fruit"], the study and culture of fruit. (See FRUIT-CULTURE, by F. R. ELLIOTT.)

Pomo'na, the Roman goddess of fruits, beloved of all the rural deities, and especially of Vertumnus. The *flamen Pomonalis,* her chief priest, was one of the minor flamens, chosen from the plebs.

Pomona, or **Mainland,** the largest of the Orkney Islands, comprises 150 sq. m., with 17,193 inhabitants. It is high, sloping toward the E., with good pasture-grounds, on which numerous sheep and swine are reared, and some fertile tracts in the valleys, in which oats and beans are cultivated. Principal towns, Kirkwall and Stromness.

Pompadour', de (JEANNE ANTOINETTE POISSON), MARCHIONESS, b. at Paris Dec. 29, 1721, the natural daughter of a butcher; was married in 1741 to Le Normand d'Étoiles, a farmer of the taxes; became the mistress of Louis XV. in 1744; was presented at court as marchioness of Pompadour, and splendidly established in the royal residences at Paris, Versailles, and Fontainebleau; received several magnificent estates and an annual income of 1,500,000 francs, and exercised a most decided influence on the government of France for nearly twenty years, in all its branches—its finances, foreign alliances, military operations, etc.—bringing loss and disgrace over the country at every point. D. at Versailles Apr. 15, 1764, detested by the whole French people and lamented by none.

Pompanoo'suc, p.-v., Norwich tp., Windsor co., Vt., on Connecticut River and Passumpsic R. R.

Pompe'ii, an ancient city of Campania, situated at the foot of the S. S. E. slope of Vesuvius, near the Sarnus, about 14 miles S. E. of Naples. Pompeii first appears in history as a flourishing commercial town in the fourth century B. C. That it was originally founded by the Oscans, and afterward passed successively under Etruscan, Samnite, and Carthaginian rule, before becoming a permanent part of the Roman territory (91 B. C.), is confirmed by the architectural character of the ruins and by the inscriptions upon them, but its art and its culture were at all periods rather Greek than Italic. Under the emperors it continued to thrive until 63 A. D., when it suffered so severely from an earthquake that the inhabitants left their shattered houses and the Roman senate seriously debated the expediency of rebuilding it. The fertility of the soil of its territory, the charm of the climate, and the beauty of the site were, however, powerful arguments; the question was decided in the affirmative, and, aided by the government, the citizens began the work of reconstruction with great zeal. But before it was completed, in 79 A. D., in the midst of a public festival, a still more awful calamity befel the ill-fated city. Vesuvius (a name then embracing the whole mountain-elevation, including Somma and the site of the present cone of Vesuvius), which had been inactive during the whole historic period, and was only *suspected* to be of igneous origin, suddenly shot forth clouds of smoke, and soon buried, fathoms deep under volcanic ashes, sand, pebbles, and scoriæ, Pompeii, Herculaneum, and several smaller towns. The population of Pompeii at this time is very variously estimated at from 50,000 to 12,000, the best recent authorities inclining to the smaller number; but the fatal shower was not so suddenly overwhelming as to preclude flight, and nearly all except the sick, prisoners, sentinels, and a few who returned to secure some treasure seem to have saved their lives in that way. This catastrophe is often mentioned by contemporaneous and by subsequent writers, and the volcanic phenomena attending it are most vividly described in two celebrated letters of Pliny the Younger. Titus proposed to excavate and rebuild the buried city, but his plans were not carried out, and later the event seems to have been almost forgotten. Indeed, the physical changes caused by the first and by following eruptions were so great as to perplex the geographers of the Middle Ages in their search for the site of the lost city. In 1592 Fontana began to construct the aqueduct that now passes through these ruins, but no important discoveries were made, and it was not till 1748 that some objects found by a peasant attracted the notice of Charles III. of Naples, and led him to make experimental excavations. The results were such as to induce his successors to continue the work; but, though the museum of Naples was enriched by choice specimens of ancient art, by inscriptions, and by an immense number of objects illustrating ancient South-

Italian life with the most astonishing minuteness, yet, except during the reign of Murat, little was done in the true spirit of antiquarian research until the government of Victor Emmanuel appointed in 1861 the accomplished Fiorelli to superintend the excavations. Since that time the work has been conducted with system and with care; the ruins previously exposed are protected; the police is admirable, as are also the facilities afforded the visitor. Only about one-third of the space included within the irregular oval formed by the old walls has as yet been uncovered. This oval, about $1\frac{3}{8}$ miles in circumference, extends lengthwise from W. to E., the western or sea wall having been removed or destroyed before 79. Even on the other sides the wall, though once flanked by strong towers, was evidently in a ruinous state. The city was entered by eight gates, named from the towns toward which they led, the southern or Stabian gate being the oldest, and the north-western or Herculanean gate being remarkable for the Street of Tombs extending beyond it. The space within the walls was divided into nine *regiones*. The streets (the widest 30 feet, others much narrower, and some mere lanes) run nearly at right angles, are solidly paved with polygonal lava-blocks, and are provided with sidewalks and raised crossing-stones. The wheel-tracks are deeply worn, and the width between the parallel ruts is only $4\frac{1}{2}$ feet. The general system of naming the streets appears to have been by *numbers*, and the recently discovered inscription "VIA III.," on a house near the Stabian gate, strengthens this supposition. Of the public structures already uncovered (and it would seem from their character that few so considerable remain to be unearthed) the first found (1748) was the amphitheatre, not far from the Stabian gate, differently estimated to seat from 10,000 to 20,000 persons; then followed the theatres, the temple of Isis, the Forum Civile, the latter surrounded on three sides by a Doric portico enclosing an area 515 feet long and 108 feet broad, in which are the pedestals of many statues; the temples of Mercury and of Jupiter, the latter being very large and adorned with magnificent Corinthian columns; the Pantheon or temple of Augustus, rich in frescoes; the Forum Triangulare, with an area enclosed by 100 Doric columns, in the midst of which stands a fine old Greek temple; the Basilica or temple of Venus, dating from about 100 B. C.; the Chalcidicum, built by a priestess, and probably used as an exchange; the thermæ or baths; the so-called courts of justice, the prisons, etc. Near a large barrack-like building were found sixty-four skeletons, supposed to be of soldiers on guard. In most of the above-named edifices, as well as in the private houses, statues, statuettes, frescoes, mosaics, etc. of various ages and degrees of merit have been found in profusion. The choicest of these are in the museum at Naples, but the present policy is to preserve objects, as far as may be, on the spot where they are found. The private houses, usually small, are for the most part built of rubble, held together, not very firmly, by mortar, and bound here and there, especially at the corners, by bricks or blocks of *tufa*, the walls within and without being afterward covered with stucco. The plastic ornamentation of these walls proves that the art of moulding, if not of taking casts, in plaster, was known to the ancients. The upper stories of the houses, except in a single instance, no longer exist, but the stairs which led to them are often still standing. In a Pompeian house the wall facing the street was generally blank, or broken only by small grated openings, with the exception of the wide entrances to the shops that usually occupied the front of the lower story, and of the vestibule which led to the *atrium* or court, from which the family apartments received light and air—a style of building not unfrequent at this day in Southern France and Italy. This court is enclosed by a colonnade, the centre of the space being uncovered and occupied by the *impluvium*, where the rain was collected and conducted into a cistern. The street-doors, as did those of all public buildings, *always opened outward.* Among the private dwellings richest in art are the House of the Quæstor or of the Dioscuri, beautifully adorned with frescoes and overflowing with sculptures, vases, candelabra, etc.; the House of the Faun, so named from an exquisite dancing faun found here among endless artistic treasures, of which the most celebrated is a mosaic supposed to represent the battle of Issus, and pronounced by Overbeck the *chef d'œuvre* of ancient mosaics; the House of Sallust, one of the largest and finest; the House of M. Lucretius, very rich and curious; the House of the Tragic Poet, where, among other valuable mosaics, was found the dog with the motto "*Cave Canem*;" the House of Procolus, more recently excavated, and containing paintings of great freshness and beauty. The graceful statuettes known as the *Narcissus*, the *Ganymede* or *Paris*, *Aphrodite gathering up her hair*, and an invaluable painting representing *Laocoon*, are among late discoveries. Several of the statuettes show indisputable traces of having been *painted*. About 200 men and boys are now at work, and new buildings, new objects, and new inscriptions are almost daily brought to light. A few months since a large woollen-factory was laid open, and near it a private house with exquisite wall-paintings. The famous *wood tablets* found during the past summer appear to have belonged to a broker, who was a usurer as well. They contain receipts, contracts, statements of sales, etc. Indeed, precious as is the artistic wealth drawn from Pompeii, the great interest of the buried city lies in the revelation it has made to us of the daily life and habits of its citizens. We see them in their streets, in their temples, in their theatres, in their dwellings, their factories, their bakeries, their shops—in short, everywhere—and surrounded by the objects of their worship, their pleasure, their convenience, and their business. The political canvasser tells us, by a chalk-mark or a scratch on the wall, who was his candidate; the wit records his jest of the day, the misanthrope his bitter sarcasm, the soldier his oath. By other means even the scenes of that last awful night are brought before us with fearful reality, and the visitor may chance to see some unhappy victim of this disaster lifted from his stony couch, after the lapse of nigh 2000 years, and borne in solemn silence to the funeral hall in which these strange relics of humanity are now preserved. The whole number of skeletons hitherto found is variously stated at from 400 to 600. Popular descriptions of Pompeii will be found in the volumes *Pompeii* of the "Library of Entertaining Knowledge;" in Marc Monnier's *Pompei et les Pompejens* (1865); in Bulwer's novel, *Last Days of Pompeii*. For more elaborate accounts see Mazois and Gau, *Les Ruines de Pompei* (4 vols., 1812–38); Gell and Gandy, *Pompeiana* (1875); Fiorelli, *Scavi di Pompei dal 1861 al 1872*, and *Descrizione di Pompei* (1875); Helbig, *Die Campanische Wandmalerei* (1874). CAROLINE C. MARSH.

Pom'pey, p.-v. and tp., Onondaga co., N. Y., on Syracuse and Chenango R. R. (ORAN STATION). P. 3314.

Pompey the Great, a son of the ill-famed Cn. Pompeius Strabo, b. Sept. 30, 106 B. C. Cicero describes the father as "cruel, avaricious, and perfidious," but he had some military talent. The son was educated in his camp, and distinguished himself both in the battle at the Colline Gate and still more during the immediately following dangerous circumstances when Cinna attempted to have Strabo assassinated and the soldiers became mutinous. These complicated affairs came to a sudden and unexpected issue when in the same year (87 B. C.) Strabo was killed by lightning, leaving to his son immense wealth. The position of the young Pompey was dangerous, however, on account of the victory of the popular party. He did not venture to show himself in public until after the death of Marius (86 B. C.), and when his enemies made out a case against him he found it necessary, in order to defend himself, to marry the daughter of the prætor who presided at the trial. Meanwhile, Sulla had finished the Mithridatic war and was on his way to Italy. The popular party made the greatest preparations to oppose him, while the nobles hastened to join him at Brundusium, where he landed 83 B. C. Pompey, however, was too vain to come to Sulla simply as a man who needed his protection. Although he had no office, no commission from the senate, no authority at all, he raised an army on his own account, and his military talent and great personal valor procured for him a victory over the force of the democratic party. Sulla received him with great compliments, and in the following years he distinguished himself still more, fighting, as the legate of the dictator, with great success in Sicily against Carbo, and in Africa against Cn. Domitius Ahenobarbus, the two leaders of the now scattered democratic party. On his return to Rome (81 B. C.) he asked for a triumph, and although it was unheard that a man who was merely a simple *eques* had ever received the honors of a triumph, and although even Sulla opposed the demand, it was at last granted. After the death of Sulla (79 B. C.), and after a short but successful contest with Lepidus, Pompey became the acknowledged head of the aristocratic party and the most powerful man in the republic. In Spain, however, the popular party still held the ascendency; Sertorius, one of Marius's generals, could not be reduced. Pompey was sent against him (76 B. C.) with a brilliant army, but the war lasted four years, and was not brought to a conclusion until after the assassination of Sertorius by Perperna. In 71, Pompey entered Rome for the second time in triumph. A much more brilliant feat was his war against the pirates. The Mediterranean Sea literally swarmed with robbers, who made all commerce unsafe, disturbed the communication between Rome and her provinces, captured the corn-fleets, and caused famine in Rome, and sometimes even descended on the cities along the coasts and plundered and

devastated them. In 67 B. C., Pompey was invested with almost absolute power in order to stop their ravages, and in less than three months he swept the sea clear, chasing the pirates from the Straits of Gibraltar to the coast of Cilicia, where he finally broke their power in the battle of Coracæsium. The term of his power was extended, and he now formed a new army, with which he marched through Asia Minor against Mithridates and his allies. Mithridates was defeated in several battles, and driven back into the inaccessible parts of his dominions in Cimmerian Bosphorus. Armenia, Pontus, Syria, and Palestine were conquered, and (in 61) Pompey entered Rome for the third time in triumph. The procession lasted two days. It was opened with pictures and tablets which told how he had taken 1000 fortresses, 900 towns, and 800 ships; how he had founded 39 cities and raised the revenue of the republic from 50,000,000 to 85,000,000, etc.; then followed thousands of wagons loaded with the treasures of the East; then the 324 kings and princes whom he had taken prisoner; and at last Pompey himself on his triumphal chariot. This moment was the culminating and also the turning-point of his life. He was a soldier, and not a statesman. Although he was too sensible a man to meddle with what he did not understand, yet his vanity and his military habits made him believe that in a developed republican society he could vindicate for himself a position above all parties. The consequence was, first, that all parties mistrusted him; next, that the multitude laughed at him. And he had no redeeming personal qualities. He was cold, haughty, and fantastic. Even his honesty, frugality, justice, and loyalty isolated him. His dealings with CÆSAR are told in that article. After the battle of Pharsalia (Aug. 9, 48 B. C.) he fled to Egypt. Sept. 29 he reached that country, descended from the trireme, and was rowed toward the shore, where the Egyptian king stood waiting for him. But when he rose to salute him, he was stabbed from behind by one of his own centurions, then in the service of the king of Egypt; his body was thrown naked on the shore, and his head was sent to Cæsar, who burst into tears at the sight and had the murderers put to death.—His son, SEXTUS POMPEIUS, b. in 75 B. C., maintained himself for a long time in Spain, and occupied Sicily, Sardinia, and Corsica during the confusion after the assassination of Cæsar. By intercepting the corn-fleets destined for the supply of Rome he caused famine in the capital, and became very dangerous to the triumvirs. In the beginning all their endeavors to reduce him failed, but in 35 he was completely defeated at Messana by M. Vipsanius Agrippa. He fled to Asia Minor, but was killed in the same year at Miletus. CLEMENS PETERSEN.

Pompey's Pillar (so-called) was erected, according to an inscription on its base, by one Publius, prefect of Egypt, in honor of Diocletian. It stands on an eminence just S. of Alexandria. The shaft, 73 feet long, is of beautiful red granite, highly polished, and is thought to have served originally some other purpose. The total height of the column is 98 feet 9 inches. It was erected about 296 A. D.

Pomponius Mela. See MELA.

Pomp'ton, p.-v. and tp., Passaic co., N. J., on Pompton River and New Jersey Midland R. R. P. 1840.

Pona'ny, or **Paniani,** town of British India, in the presidency of Madras, on a small river of the same name, near its mouth, has valuable fisheries and an active trade in rice, pepper, iron, and building-timber. P. 8600.

Pon'ca, p.-v., cap. of Dixon co., Neb., near Missouri River. P. 843.

Ponca Indians, a tribe of Dakota stock. They have a reservation of 576,000 acres near the mouth of Niobrara River. They are considerably advanced in civilization, and are generally peaceable and quiet. P. 735.

Pon'ce de Leon' (JUAN), b. in Leon, Spain, about 1460, of an ancient family; became page to Don Fernan, afterward the renowned Ferdinand V.; served in the Moorish wars, and (according to some authorities) in 1493 sailed with Columbus to Hispaniola, where he was commandant of the eastern province; in 1509 he conquered Porto Rico, where he became *adelantado* and acquired great wealth; sailed in 1512 in search of the island Bimini with its miraculous fountain of youth; landed (Apr. 8) upon the coast of Florida, whose coasts he explored; went to Spain 1513, and was named governor of Florida, which he was directed to conquer and colonize; led in 1514 an expedition against the Caribs, and in 1521 invaded Florida; was repelled by the Indians, and received a wound of which he died in Cuba 1521.

Ponce de Leon (LUIS). See LEON, DE.

Ponchatou'la, p.-v., Tangipahoa parish, La., on New Orleans Jackson and Great Northern R. R. P. 320.

Pon'cho [Sp.], a Spanish-American garment consisting of a blanket with a slit in the middle, through which the head is thrust. It thus becomes a sort of cloak. Waterproof ponchos, made of painted cotton cloth or rubber-cloth, are used in the army, chiefly for mounted troops.

Pond, tp., Winston co., Ala. P. 411.

Pond (ENOCH), D. D., b. at Wrentham, Mass., July 29, 1791; graduated at Brown University 1813; studied theology under Dr. Emmons; was pastor of a Congregational church at Auburn, Mass., 1815–28, when he became editor of the *Spirit of the Pilgrims*, an orthodox monthly magazine established in Boston. In 1832 he became professor of systematic theology in the seminary at Bangor, Me.; was made president, professor of church history, and lecturer on pastoral duties in 1856; and since 1870 has been president and professor emeritus. Besides many minor works, he has published *Pastoral Theology* (1866), *Christian Theology* (1868), and *History of God's Church* (1871).

Pond (JOHN), F. R. S., b. in England about 1767; educated at Trinity College, Cambridge; studied astronomy under Wales, the companion of Capt. Cook; settled at Westbury near Bristol, where he made observations proving that the quadrant in use at Greenwich had changed its form; removed to London 1807; succeeded Dr. N. Maskelyne as astronomer-royal 1811; devoted himself to cataloguing and determining the exact places of the principal fixed stars; translated La Place's *System of the World* (2 vols., 1809); wrote the introduction to astronomy prefixed to Pinkerton's *Geography*, and published numerous papers in the *Transactions* of the learned societies. D. at Blackheath Sept. 7, 1836.

Pond City, tp., Wallace co., Kan. P. 40.

Pond Creek, tp., Greene co., Mo. P. 882.

Pondicher'ry, a French settlement in India, on the Coromandel coast, 83 miles S. W. of Madras, in lat. 11° 55′ N., comprises an area of 107 sq. m., with 171,217 inhabitants. It consists of a low, flat plain, with a sandy, not very productive soil, and is only partly watered by the river Gingee. The town of Pondicherry, which is the capital not only of this settlement, but of all the French possessions in India, is regularly laid out and well built, with fine promenades and plantations. Its manufactures of fine cotton cloth and cotton thread are important; but it has no harbor, vessels are compelled to anchor in an open roadstead, and landing is difficult on account of the surf. P. 30,000, of whom 4000 are Europeans.

Poniatow'ski, the name of a celebrated princely family of Poland directly descending from the Italian family of the Torelli, which settled in Poland in the middle of the seventeenth century, and closely allied to the Leszczynskis and Czartoryskis. The most prominent members of the family are (1) STANISLAS AUGUSTUS, the last king of Poland, b. in Lithuania Jan. 17, 1732; ascended the throne in 1764 by the influence of Catharine II.; resigned in 1795, and d. at St. Petersburg Feb. 12, 1798. He was weak, irresolute, and utterly incapable of grappling with the party fury of his subjects and the treachery of his allies. The principal events of his unhappy reign are told in the history of Poland.—(2) JOSEPH ANTONY, b. at Warsaw May 7, 1762, a nephew of the king; received a military education; served in the Austrian army in the Turkish war; entered the Polish army in 1789 as a major-general; commanded against the Russians in 1792, but retired from service when the king joined the confederation of Targovitza; fought again in 1794 against Russia under Kosciusko; repaired to Vienna in 1795, but returned to Warsaw in 1798, and lived on his estates, at that time under Prussian dominion. In 1807 he commanded the Polish army against Russia, and when the duchy of Warsaw was established by the Peace of Tilsit he was appointed minister of war. In 1812 he commanded the Polish contingent of the grand army during the Russian campaign, and distinguished himself both by his valor and by tactical talent. Shortly before the battle of Leipsic he was made a marshal of France, and after the battle he was charged with covering the retreat of the army, but was drowned (Oct. 19, 1813) in crossing the river Elster.—(3) JOSEPH, b. at Rome Feb. 20, 1816; d. at London July 3, 1873; became known as a composer of several operas and masses. *Don Desiderio* was performed at Paris in 1868 with considerable success.

Ponsard' (FRANCIS), b. June 1, 1814, at Vienne, department of Isère, France; was educated at Lyons; studied law in Paris; began to practise as an advocate in his native city, but removed afterward to Paris, and devoted himself exclusively to literature. In 1837 he translated Byron's *Manfred*; in 1843, his tragedy, *Lucrèce*, was performed with great success in the Odeon Theatre of Paris, and from that time he stood at the head of the classical

party in the French literature, attacking and attacked by the romantic school formed by Victor Hugo. His principal works are the tragedies, *Agnès de Méranie* (1846), *Charlotte Corday* (1850), *Ulysse* (1852); and the comedies, *L'Honneur et l'Argent* (1853), *La Bourse* (1856), and *Œuvres complètes* (2 vols., Paris, 1866). D. at Paris July 13, 1867.

Pons Varolii. See BRAIN.

Pon'ta Delga'da, town of the Azores Islands, situated on the southern coast of St. Michael. Its harbor is shallow and the roadstead outside the harbor unsafe, yet it has a large trade, especially in oranges to Great Britain, corn to Portugal, and earthenware to Brazil. P. 15,885.

Pont-à-Mous'son, town of the German empire, in the Lorraine, on the Moselle, has manufactures of oil, vinegar, candles, and cutlery. P. 8211.

Pontarlier', town of France, department of Doubs, on the Doubs, is noted for its manufactures of absinthe. P. 5007.

Pontassie've, town of Italy, province of Florence, prettily situated near the junction of the Sieve with the Arno, and lying 12½ miles E. of the city of Florence. It is a walled town, the streets are tolerably well kept, the principal church is large, and the main square handsomely decorated. The inhabitants, for the most part cultivators of the soil, are generally in comfortable circumstances, and the fairs of Pontassieve, which exhibit in profusion all the rich products of Tuscany, are extremely animated. This town formed a part of the old Florentine territory, and was a fief of the Filicaja family. P. in 1874, 11,000.

Pont-Audemer', town of France, department of Eure, stands on the Rille, which here becomes navigable, is well built and surrounded with walls and ditches. It carries on an active trade, and manufactures paper, leather, saddlery, and cotton fabrics. P. 6136.

Pontchartrain', Lake [named after Jérome Phélypeaux, comte de Pontchartrain, minister of marine under Louis XIV.], a lake of Louisiana, about 40 miles in its longest dimension E. and W. and 25 miles N. and S., the southern shore of which is but about 5 miles distant from, and nearly parallel to, the Mississippi River in its local easterly course in this region. It is separated by a peninsula of cypress swamp from Lake Maurepas (named after Count Maurépas, son and successor of Pontchartrain) on its W. (a much smaller lake), with which it communicates by the Pass Manchac. One of the numerous outlets or delta-arms of the Mississippi, the Iberville bayou, formerly discharged through Amite River into the latter lake. This was closed as a measure of defence by Gen. Jackson in 1815, and there is now no connection between the lakes and the river, though the numerous *crevasses* which have occurred near and below the Bonnet Carré Bend pour their waters through the marginal swamps into these lakes, and have sometimes inundated the more depressed rear portions of the city. New Orleans communicates with the lake by Pontchartrain R. R. (almost the earliest in the U. S.), and by two canals navigable by schooners and smaller craft, one of which, and the earliest made, enters the head of the bayou St. John, by which the navigation is continued to the lake; the other is wholly artificial. These canals have their heads in "basins" in the rear of the city; they do not communicate with the Mississippi. The lake communicates with Lake BORGNE and MISSISSIPPI SOUND (which see) by the passes of the Rigolets and Chef Menteur, through which there is a tidal flow of the salt (or sea) water. FORTS PIKE and MACOMB (which see) defend these passes. An important commerce in lumber, firewood, bricks, etc. is carried on through the lake and the Rigolets; and indeed, previous to the construction of the Mobile R. R. steamers from the lake terminus of the Pontchartrain Railway constituted the almost sole means of communication from New Orleans with Mobile, Pensacola, and the shores and watering-places of Mississippi Sound. The northern shore of the lakes, a continuation westerly of the "pine-woods" region, is elevated and healthful. The southern and western shores are the cypress swamps of the Mississippi margins; nevertheless, the *termini* of the Pontchartrain R. R. and the two canals, accessible by roads along the canal margins affording agreeable drives, furnish delightful places of resort to the New Orleans population during the hot season. It is a project partially carried out, but now suspended for want of means, to connect the shore of the lake and the city by a boulevard consisting of a heavy embankment and road along the shore, and lateral *levees* and roads through the swamps, connecting, above and below the city, with the river levees. The Great Northern or Jackson R. R. from New Orleans, skirting Lake Pontchartrain, threads, through the cypress swamps, the peninsula between the lake and Maurepas, and crosses Pass Manchac by a long trestle bridge. The Mobile R. R., taking the reverse (easterly) direction, by a very similar route crosses the Chef Menteur and Rigolets, and finally escapes from the swamps and *prairies tremblantes* to the pine woods of the Gulf shore. J. G. BARNARD.

Pont du Gard, the remains of one of the most magnificent Roman structures in France, is a bridge 156 feet high and consisting of three tiers of arches, on which the aqueduct which brought the water of the Aure to Nîmes crossed the river Gard 10 miles N. E. of that city. The lowest tier contains 6 arches, the middle 11, and the uppermost, on which the channel of the aqueduct rests, 35.

Pontecor'vo, town of Southern Italy, province of Caserta, about 28 miles S. of Sora. It is situated on a hill, the top of which is quite level and occupied by the portion of the city known as the Cività, while on the slope hangs the so-called Pastina, both commanding very fine views of the rich surrounding country. The old walls and towers, once very strong, are now in a ruinous condition. A bridge, originally of Pelasgian construction, and from the curved form of which the town takes its name, connects the city with its suburbs. This bridge was broken down to check the march of Hannibal, and afterward beautifully restored. In 1860 it was blown up by the Bourbon troops, but was rebuilt soon after. There are some fine churches in and near the town which contain admirable frescoes, and among the archives of the cathedral are Lombard, Gothic and mediæval Latin MSS. of considerable interest. The episcopal residence and several private palaces deserve notice. On a neighboring height, now crowned by a sanctuary, once stood the formidable *Arx tutica Fregellano*, mentioned by Livy. The ruins of the ancient *Fregellæ* are distinctly traceable, and among them are found mosaics of great beauty. Pontecorvo first appears in mediæval history in the ninth century, and afterward plays no inconsiderable part in the confused drama of Southern Italy. Bonaparte created Bernadotte prince of Pontecorvo in 1806. It was the first town of the Terra di Lavoro to declare itself (1860) in favor of the national movement. Macaroni and works in plaster constitute the chief industries of the place. P. in 1874, 10,760.

Ponte, da. See BASSANO.

Pontede'ra, town of Italy, province of Pisa, situated near the junction of the torrent Era with the Arno, 13 miles E. of the city of Pisa. It was a strongly fortified town during the wars between Pisa and Florence, and was fiercely contended for by these rival powers, which held it alternately. At present the town has a respectable appearance, and its manufactures are of importance. Bricks are made on an extensive scale, and cotton, woollen, and hempen stuffs are largely woven by women, not less than 1000 private looms being in operation. P. in 1874, 10,817.

Pontefract (pom'fret), town of England, county of York, on the Aire, trades chiefly in corn, cattle, malt, and garden produce. P. 5372.

Pon'te La'go Scu'ro, town of Italy, province of Ferrara, about 3 miles N. W. of the city of Ferrara, and 40 miles from the mouth of the Po, which is here crossed by the lowest bridge on its course. This bridge, built for the Venice-Bologna railway, is of iron, and is 745 feet long. Ponte Lago Scuro is an important place in the hydrography of the Po, which receives no affluents at any lower point. It is here that all the measurements of the discharge of the river have been made, and it is also from the mean low-water mark at Ponte Lago Scuro that the rise of the water in inundations is usually reckoned.

Ponteve'dra, town of Spain, province of Pontevedra, is beautifully situated on a peninsula formed by the confluence of the Lereg, Alta, and Tomaso, the latter of which is crossed by a noble bridge from the Roman times (*pons vetus*). The city is neatly and substantially built, and the surroundings belong to the most fertile and beautiful regions of Spain. P. 6623.

Pontevi'co, town of Italy, province of Brescia, on the left bank of the Oglio. This town dates from 700 A. D., and its strong walls and castle gave it importance in the wars of the Venetian republic. It is at present a place of no special interest. P. in 1874, 6600.

Pon'tiac, the north-westernmost county of Quebec, Canada, bounded on the S. by Ottawa River. It is rapidly settling up. It is a great lumber-region. It abounds in sterile, rocky hills, but the valleys are fertile. Cap. Havelock. P. 15,791.

Pontiac, p.-v. and tp., cap. of Livingstone co., Ill., at the junction of Chicago Alton and St. Louis and Chicago and Paducah R. Rs., 90 miles S. of Chicago, has 3 public schools, 6 churches, a State reform school, 3 banks, 2 flouring-mills, an iron-foundry, coal-mine, and 1 weekly newspaper. P. of v. 1657; of tp. 2438.

FRED. L. ALLES, ED. "SENTINEL."

Pontiac, p.-v. and tp., cap. of Oakland co., Mich., on Clinton River and Detroit and Milwaukee R. R., 20 miles N. W. of Detroit, has 3 weekly newspapers, some manufactures, and a large trade in wool and agricultural productions. P. of v. 4867; of tp. 5942.

Pontiac, p.-v., Evans tp., Erie co., N. Y. P. 100.

Pontiac, a chief of the Ottawa Indians, b. near the river Ottawa in 1720; became an ally of the French in Northern Michigan, and in 1746 defended Detroit against Indian attacks. In 1755 he was present, it is believed, at Braddock's defeat, and after the English in 1760 had displaced the French in the North-west, Pontiac organized a conspiracy among the various Indian tribes with the purpose of murdering the English garrisons at all points. In May, 1763, nine garrisons (ranging from Western Pennsylvania to Mackinaw) were destroyed or dispersed on the same day, and the whole frontier was ravaged. The attack on Detroit, led by Pontiac himself, was anticipated by the English, but the chieftain besieged the town May 12–Oct. 12, 1763, maintaining his force by the issue of birch-bark notes, all of which he subsequently redeemed. Deserted by his followers, he still endeavored to arouse his people to the dangers in store for them, but in 1766 he was obliged to submit to the British rule. He was murdered at Cahokia, Ill., in 1769, by an Illinois Indian while intoxicated. (See Parkman's *Conspiracy of Pontiac*, 1867.)

Pontianak', town of Borneo, situated on the W. coast of the island, at the confluence of the Landak and the Kapnas, which from here to its mouth is called the Pontianak, and lined on both sides with impenetrable forests peopled with immense swarms of parrots and monkeys. Pontianak is the capital of the Dutch dominions of Western Borneo, the residence of the governor, and is defended by Fort du Bus. Its population varies between 6000 and 19,000, most of whom are Chinese, very few Europeans, but its trade in diamonds, gold-dust, sugar, rice, cotton, and coffee is rapidly increasing.

Ponticel'li, town of Southern Italy, province of Naples, and very near the city of Naples. P. in 1874, 6593.

Pon'tifex [Lat., probably from *pons*, "a bridge," and *facio*, to "make," because (says Varro) the pontiffs built and sustained the Sublician bridge at Rome; but perhaps referring to the making of sacrifices upon that bridge], a member of the great college of priests in ancient Rome, of whom there were at first four, besides the pontifex maximus, their chief, but the number varied, and finally became fifteen. The name is usually rendered *pontiff* in English. The duties of the pontifical college were the supervision of religious rites and the execution of certain civil duties, which thereby attained a religious solemnity. The office of pontiff was one of great dignity, and such men as Cæsar and Crassus, besides several of the emperors, were honored by the office of pontifex maximus. Besides the above, there were *minor* pontiffs, secretaries to the regular college. The pope of Rome has long been called *pontifex maximus*, and a few of the German emperors assumed the title.

Pontifical States. See Papal States.

Pon'tine Marsh'es [Lat. *Pomtinæ Paludes*], a tract of marshy ground in the province of Rome in Italy, much resembling in its general features the Maremme of Tuscany (see Maremme), but less elevated above the level of the sea. The area and boundaries of these marshes are somewhat variously estimated, but they are generally described as extending from the vicinity of Cisterna, near which were probably the "Three Taverns" of St. Paul, S. W. to the sea at Terracina, a distance of about 28 miles, with a mean width of little more than 5 miles. Geological evidence is thought to show that this tract was once a bay of the Tyrrhenian, bounded N. E. by the Volscian Mountains, S. W. by a long spit consisting chiefly of sand thrown up by the sea. This bay, it is supposed, was gradually filled up by the sediment of the numerous torrents of those mountains, and raised to the present level of its surface, which near Cisterna is about 30 feet above the sea, while at Terracina it dips below the sea-level. It has been contended that this change has taken place within the historic period, but the probability is that it belongs to a remoter era. The slope of the marshes toward their general outlet at Terracina is too gentle for the discharge of their waters, and though about one-third of the surface has been drained and converted into very fertile arable land and luxuriant permanent pastures, it is nearly all subject to occasional overflow, and most of it is either a swampy waste, or at best capable only of serving as a range for half-wild horses, ordinary domestic quadrupeds, and buffaloes, which latter animals are very serviceable in clearing the ditches of aquatic plants that encumber them. Both the marshes and the boggy and tangled forest on the low sands which bound them on the S. W. are very unhealthy during the warm season, and the miasmata they exhale are borne by the S. winds even to the city of Rome. They can hardly be said to be inhabited, though there are a few agricultural, pastoral, and police stations upon them, and numbers of hardy mountaineers come down to them to labor at seed-time and harvest. The Romans made many partially successful attempts to drain and reclaim this territory. They built a great road through the centre of it, the Appian Way, commenced 312 B. C. and finally continued to Brundusium, and they constructed a navigable canal not far from the line of the road, quite down to Terracina. It was on this canal that "I and honest Heliodorus" performed a part of the journey to Brundusium humorously described by Horace in the *Iter Brundusinum*. Pliny states that this district was anciently thickly inhabited and contained twenty or thirty large towns, besides numerous villages and hamlets; but few ruins of old constructions are found on its soil, and it is now generally believed that its condition was never much better than at present so long as its history is known. The drainage-works got out of repair in the troublous times of the civil wars and the decaying Empire. They were more or less thoroughly restored during the Middle Ages, and especially under the enlightened administration of Theodoric the Goth, but nothing very effectual was accomplished until the last quarter of the eighteenth century, when, by an expenditure of about $2,000,000, Pope Pius VI. brought them nearly to their present state. They now yield to the government an annual revenue of about $18,000, derived from long leases to a few large farmers. (See Prony, *Description hydrographique et statistique des Marais Pontins* (1813, 4to); Giordani, *Gita alle Paludi Pontine* (1872, pamphlet).)

George P. Marsh.

Pontoise', town of France, department of Seine-et-Oise, manufactures hosiery, sailcloth, vinegar, chemicals, etc., and carries on a considerable trade. P. 6480.

Pontoon, or **Ponton.** See Bridge, by Gen. J. G. Barnard, A. M., LL.D., M. N. A. S.; and Docks, by Samuel H. Shreve.

Pontoo'sic, p.-v. and tp., Hancock co., Ill., on Carthage division of Chicago Burlington and Quincy R. R. (Dallas Station). P. 1946.

Pontop'pidan (Erik), b. at Aarhuus, Jutland, Denmark, Aug. 24, 1698; studied theology at the University of Copenhagen; became professor in 1738, bishop of Bergen, Norway, in 1747, chancellor of the University of Copenhagen in 1755; wrote *Menoza* (3 vols., 1742), a sort of theological romance, *Annales Ecclesiæ Daniæ* (4 vols., 1741–52), *Gesta et Vestigia Danorum extra Daniam* (3 vols., 1740), *Danske Atlas* (7 vols., 1763–81), *Glossarium Norvagicum* (1749), etc. D. at Copenhagen Dec. 20, 1764. As a theologian he was a disciple of Spener; as an historical writer he was careful and accurate and possessed of immense learning.

Pontotoc', county of N. E. Mississippi. Area, 474 sq. m. It is level and very fertile. Products, live-stock, corn, and cotton. It is drained by branches of the Tallahatchie River. Cap. Pontotoc. P. 12,525.

Pontotoc, p.-v., cap. of Pontotoc co., Miss., has 1 weekly newspaper, schools, and U. S. land-office. P. 384.

Pontrem'oli, town of Italy, province of Massa-Carrara, situated at the foot of a narrow gorge of the Apennines, at the point where the torrent Verde falls into the Magra. It stands 700 feet above the sea, and the castle Piagnaro, once its defence, still overlooks it from a hill above. A part of the town is very old, but the modern portion has an air of comfort. The streets are well paved, and the cathedral is large and crowned with a remarkably fine cupola. Pontremoli was a place of some consequence during the Middle Ages, and suffered the usual miseries resulting from the Guelph and Ghibelline party factions. In the winter of 1834 it was so severely shaken by an earthquake that the inhabitants fled from their houses, not one of which remained uninjured, but the only loss of life was from cold and hunger. In 1859, Pontremoli passed from the tyranny of the duke of Parma under the sceptre of Victor Emmanuel. The principal trade of the town consists in cattle, in homespun linen, and in woollen cloths, silk, etc. P. in 1874, 12,625.

Pont Saint-Esprit', town of France, department of Gard, on the Rhone, carries on a varied manufacturing industry, comprising candles, linen fabrics, silk, and articles of copper, tin, faïence, and crystal. P. 5123.

Pon'tus, the name of a territory of Asia Minor, extending along the southern coast of Pontus Euxinus or the Black Sea between Cappadocia and Paphlagonia. It belonged alternately to one or the other of these two countries, and formed, together with the latter, an independent

kingdom from the middle of the fourth century to 66 B. C., when it was conquered by Pompey, and dismembered. In A. D. 63 it was made a Roman province. The most celebrated of its rulers was Mithridates the Great, under whom it culminated and fell.

Pontus Euxinus. See BLACK SEA.

Po'ny [Fr. *poni*], a name applied to the small varieties of the horse. The most famous European ponies are the Shetland, Iceland, Welsh, Dartmoor, Corsican, and Greek. In North America there are the Canadian, Sable Island, Gay Head, Sea Island, and Mustang. These little animals are tough and spirited, but often vicious. Their small size and unusual development of the hair, mane, and tail are due to exposure and scanty food for many generations.

Poole, town of England, county of Dorset, on the estuary of the Trent, has some shipbuilding, manufactures of sailcloth and cordage, and exportations of pipeclay and potter's clay. P. 10,129.

Poole (JOHN), b. in England in 1785; d. in London Feb. 5, 1872; author of a large number of successful dramas and farces, of which the best known were *Paul Pry* (1825), *Deaf as a Post, Turning the Tables,* and an adaptation of Shirley's *Wife's Stratagem.* He also wrote novels, essays, and character sketches, among which *Little Pedlington and the Pedlingtonians* (2 vols., 1839) took high rank for originality and racy humor. In his last years Poole enjoyed a pension from the civil list, procured by the good offices of Charles Dickens.

Poole (MATTHEW), b. at York in 1624; educated at Emmanuel College, Cambridge; took orders in the Church of England, and became rector of St. Michael-le-Querne, London, but was ejected for non-conformity in 1662; wrote much against Roman Catholicism; is said to have narrowly escaped being murdered at the time of the "Popish plot," and removed to Amsterdam, where he d. Oct., 1679. Author, among other works, of a famous compendium of the critical views of 150 biblical commentators, entitled *Synopsis Criticorum* (5 vols., 1669–76), and of *Annotations upon the Holy Bible* (1683–85), left unfinished, but completed by eminent nonconformists.

Poole (WILLIAM FREDERICK), b. at Salem, Mass., in 1821; graduated at Yale College 1849; published while at college an *Index to Subjects in Reviews and Periodicals* (1848), subsequently expanded into the valuable *Index to Periodical Literature* (1853); was librarian of the Boston Mercantile Library 1852–56, of the Boston Athenæum 1856–69, of the Cincinnati Public Library 1869–73, and since the latter date of the Chicago Public Library, and is noted for his vast acquaintance with bibliography. Author of *The Battle of the Dictionaries* (1856), *Websterian Orthography* (1857), *The Orthographical Hobgoblin* (1859), *The Mather Papers* (1868), *Cotton Mather and Salem Witchcraft* (1869), and other miscellaneous publications, and has written frequently for the *North American Review.*

Poolville, p.-v., Hamilton tp., Madison co., N. Y., on Utica Chenango and Susquehanna Valley R. R. P. 163.

Poo'nah, town of British India, capital of a district of the same name, in the presidency of Bombay, on the Moota, near its influx in the Moola, on a dry and treeless plain, 2000 feet above the sea. Although the climate is hot and dry and water is scarce, the place is considered healthy, and has been made the station of the army of Bombay. The city is well built, and contains many fine barracks, a college (where the Indian and English languages and literature are taught), a prosperous female school (the first in India), and several other educational institutions. Its trade in the raw products of the interior and in manufactured goods from Bombay is considerable. P. 80,000.

Poon Tree, the *Calophyllum angustifolium* and *C. inophyllum,* a tree of Farther India, used in shipbuilding. Poon spars are famous in the East. The tree is of the order Clusiaceæ, and abounds in a resin called tacamahac.

Poor (DANIEL), D. D., b. at Danvers, Mass., June 27, 1789; graduated at Dartmouth College 1811, at Andover Theological Seminary 1814; went to Ceylon as a missionary of the A. B. C. F. M. 1815; resided first at Tillipally, then at Barricotta, where he founded an educational institute; published a number of religious and educational works in the Tamil language; removed to Madura 1836, to Jaffna 1841; spent two years lecturing on Indian missions in the U. S. 1848–50; wrote for American religious periodicals. D. at Jaffna, Ceylon, Feb. 3, 1855.—His son, DANIEL WARREN POOR, D. D., b. at Jaffna, Ceylon, Aug. 21, 1818; graduated at Amherst in 1837; spent two years at Andover; was pastor of the Central (Congregational) church at Fairhaven, Mass., 1843–49, of the High street (Presbyterian) church in Newark, N. J., 1849–69, and of the First Presbyterian church at Oakland, Cal., 1869–72, when he was appointed professor of ecclesiastical history in the San Francisco Theological Seminary. He received the degree of D. D. from the College of New Jersey in 1857. Besides occasional sermons and pamphlets, he has published *Select Discourses from the French and German* (1858, with Dr. Fish) and *First Corinthians,* in the American edition of Lange's *Commentary* (1868). R. D. HITCHCOCK.

Poor (ENOCH), b. at Andover, Mass., 1736; became a merchant of Exeter, N. H., a colonel of provincial troops 1776, brigadier-general in the Continental army 1777; served with great distinction against Burgoyne and at Monmouth; was in Sullivan's expedition of 1779 against the Six Nations, and in 1780 took command of one of La Fayette's light infantry brigades; was killed near Hackensack, N. J., in a duel with a French officer, Sept. 8, 1780.

Poor (JOHN ALFRED), b. at Andover, Me., Jan. 8, 1808; studied law, practised at Bangor; removed to Portland; edited the *State of Maine* newspaper; served in the legislature; was the first active promoter of the railroad system of Maine, having originated the European and North American line; published *A Vindication of the Claims of Sir Ferdinando Gorges as the Founder of English Colonization in America* (New York, 1862), and delivered the address at the commemoration of the founding of the Popham Colony at Fort St. George, mouth of the Kennebec, Aug. 15, 1863.

Poor Debt'ors (law). Three general types of statutory provisions are found in the legislation of the several States and Territories in reference to poor debtors, the first and second relating to all insolvents, the third referring exclusively to those who are in confinement under arrest either on mesne process—that is, a preliminary warrant of arrest or *capias*—or on final execution against the person. In many of the States there is no legislation on the subject of insolvents generally, and the common law is left in force, which permits assignments in trust for the benefit of creditors even when preferences are given by the failing debtor. The first class of statutes above referred to simply provide for general assignments to trustees for the benefit of creditors made by insolvents, and regulate the proceedings of the assignees therein and the mode of settling the estate. They generally require that the assignment must be for all the creditors without preference; they prescribe its form and contents, the mode of proving claims by the creditors, the steps to be taken by the trustee—there being of course much diversity in the detail among the statutes of the different States. The debtor himself is not discharged from his existing liabilities. Statutes of this character are found in the following States: Illinois, Iowa, Kansas, Kentucky, Maine, Missouri, New Hampshire, New Jersey, Ohio, Pennsylvania (but wages due to minors, mechanics, and laborers, if not exceeding $200 to any one person, must be first paid in full by the assignee), and Vermont. The second class of statutes authorize a similar assignment to trustees for the benefit of creditors, and thereupon the insolvent, in the absence of fraud, may be discharged from his liabilities. There is here also much diversity in the provisions of the legislation among the various States. In some the debtor is discharged by the mere act of making a proper assignment of all his non-exempt property; in others it is necessary that the assets should pay a certain percentage of the claims; in others the consent of a portion of the creditors is made requisite; while in others, still, certain classes of debts, especially those accompanied by a breach of the debtor's fiduciary duty, are not included in the discharge. In one or two States, particularly in Massachusetts, a complete system of bankruptcy has been enacted. In the following States the legislation belongs to the class thus described: California, Connecticut (but the assets must pay 70 per cent. of the debts, and an allowance is made to the debtor for the support of his family), Idaho, Massachusetts, Michigan, New York (but creditors representing two-thirds of the claims must unite with the debtor in asking the discharge), South Carolina (the debtor is discharged from the demands of all those creditors who accept a dividend under the assignment), and Wisconsin. The operation of all these statutes, so far as they conflict with the U. S. bankrupt law, is suspended thereby. Finally, there is a class of enactments found in very many States which relate to debtors imprisoned on civil process, and permit their discharge from confinement upon the performance by them of certain conditions, which generally consist in the taking an oath, termed "the poor debtor's oath," in furnishing an inventory of all their property, with an affidavit that it comprises their entire property not exempt from execution, and in executing an assignment thereof to a trustee, to the intent that it may be appropriated in payment of debts. Statutes of this character exist in all the States which permit the arrest and imprisonment of debtors either on mesne or on final process.

JOHN NORTON POMEROY.

Poore (Benjamin Perley), b. at Newbury, Mass., Nov. 2, 1820; learned the printing business; edited the *Southern Whig* at Atlanta, Ga., 1838–40; became an attaché of the U. S. legation in Belgium 1841; made a valuable collection of historical MSS. from the French archives for the State of Massachusetts 1844–48; travelled in Egypt, Palestine, and other Eastern countries as correspondent of the Boston *Atlas* 1843–48; published *The Rise and Fall of Louis Philippe* (1848), *The Life of Gen. Taylor* (1848), *The Early Life of Napoleon* (1851); became editor and proprietor of the *American Sentinel* (1851); wrote several novels in the columns of *Gleason's Pictorial;* has a residence at Newburyport, but has lived since 1854 chiefly at Washington, D. C., as correspondent of the Boston *Journal*, secretary of the U. S. Agricultural Society, and clerk of Senate committees. He edited the volumes of the *Conspiracy Trials* of 1865 and the *Congressional Directory* since 1867.

Poor Handmaids of Jesus Christ, a Roman Catholic sisterhood founded in 1849 at Dernbach, Germany, by Catharine Caspar, under the auspices of the bishop of Limburg; received papal approbation in 1860 and 1870. Their mother-house in the U. S. is at Fort Wayne, Ind.

Poor Laws. See Pauperism, by Rev. C. L. Brace.

Poor, Little Sisters of the. See Little Sisters of the Poor.

Popayan', town of the United States of Colombia, South America, capital of the state of Cauca, is beautifully situated on the Cauca, at the foot of the Andes, on a plain 6000 feet above the sea, whose wonderful climate ripens the strawberry and the coffee-fruit to equal perfection. It was founded by the Spaniards in 1537, and rose rapidly, but in 1834 it was almost entirely destroyed by an earthquake, and the wars of independence and the unsettled condition of the state have prevented it from fully recovering. Its trade in agricultural produce is increasing, however. P. 16,000.

Pope, county of N. W. Arkansas. Area, 900 sq. m. It is partly bounded S. by Arkansas River, which traverses the S. W. part. It is uneven, very fertile, and abounds in coal and timber. Cotton, live-stock, and corn are leading products. Cap. Dover. P. 8386.

Pope, county of S. E. Illinois. Area, 372 sq. m. It is bounded S. E. by Ohio River, which separates it from Kentucky. It is undulating, very fertile, and yields large amounts of tobacco, corn, cotton, wool, etc. Mineral springs and kaolin are found. Cap. Golconda. P. 11,437.

Pope, county of Central Minnesota. Area, 720 sq. m. It is rolling, fertile, and abounds in small lakes. It is well adapted to the production of wheat, oats, and hay. The S. W. corner is traversed by St. Paul and Pacific R. R. Cap. Glenwood. P. 2691.

Pope [Gr. πάπας; Lat. *papa*], a term applied in the Greek Church to all priests, and originally used in the same manner also in the Western Church, but in the latter part of the fifth century it began to be applied exclusively to the bishop of Rome, and since the time of Gregory VII. (1073–85) it has become his official title. He is also called "Sovereign Pontiff," "Vicar of Christ," and "Holy Father." He is addressed as "Your Holiness," and subscribes himself *Servus Servorum Dei* ("Servant of the Servants of God"). The pope was elected in olden times by the clergy and people of Rome, but since Nicholas II. (1058–59) he has been elected by the college of cardinals assembled in the conclave. A simple majority is not sufficient to elect a pope; two-thirds of the votes are necessary. During the election all communication between the conclave and the outside world is interrupted. When elected, the pope is crowned with the tiara and enthroned; instead of a sceptre he wields the *pedum rectum*, a staff, not bent like that of the bishops, but ending in a cross. The supremacy of the pope over the Roman Catholic Church is nothing but a simple historical development. Not the circumstance of St. Peter being bishop of Rome, which is at least very uncertain, but that of Rome being the capital of the world, gave prominence to its bishop. Nevertheless, no supremacy was either claimed or recognized during the first, second, and third centuries, and when, in 343, at the Council of Sardica, the supremacy of the Roman see over the Christian Church was spoken of for the first time in undisguised terms, the Oriental bishops protested and left the council. Thus from the very beginning the primacy of the Roman bishops was confined to the Occidental Church, and the Council of Chalcedon (451) determined that the see of Constantinople should occupy the same rank in the Eastern Church as that of Rome in the Western. But originally no power, either secular or spiritual, was connected with this supremacy of rank. Charlemagne treated the pope simply as the first metropolitan, and considered himself the head of the Church, its patron, and its legislator; and up to the middle of the eleventh century the pope remained subordinate to the emperor and the councils. But with Gregory VII. a change took place, and in the course of the two following centuries the hierarchical position of the pope became fully developed and firmly established, especially by the exertions of Alexander III. (1159–81), Innocent III. (1198–1216), Gregory IX. (1227–41), Innocent IV. (1243–54), and Boniface VIII. (1294–1303). He was now acknowledged as the vicegerent of Christ on earth and as the highest authority in all matters of faith and discipline in the Church. He alone could convoke an œcumenical council and make its decrees valid by confirming them. He alone could give a bishop the episcopal institution or deprive him of his dignity. The Vatican Council of 1870 declared the infallibility of the pope, which before had been a matter of dispute between the Gallicans and the Ultramontanes. (For further information see the biographies of the popes and the articles on the Roman Catholic Church, Gallicanism, etc.) We subjoin a list of the popes (compiled from Herzog's *Real-Encyklopädie für protestantische Theologie und Kirche*), giving the year of accession to the throne, and the names of the antipopes in italics:

St. Peter.	
Linus.	
Cletus.	
Clement I.	
Evaristus, about	100
Alexander I.	110
Sixtus I.	116 or 119
Telesphorus	128
Hyginus	138
Pius I.	142
Anicetus, about	151
Soter	168
Eleutherius	177
Victor I.	185
Zephyrinus	197
Calixtus I.	220
Urban I.	226
Pontianus	230
Anterus	235
Fabianus	236
Cornelius	251
Novatianus.	
Lucius I.	252
Stephen I.	253
Sixtus II.	257
Dionysius	259
Felix I.	269
Eutychianus	275
Caius	283
Marcellinus	296
Marcellus I.	308
Eusebius	310
Melchiades	311
Sylvester I.	314
Marcus	336
Julius I.	337
Liberius	352
Felix II.	
Damasus I.	366
Ursicinus.	
Siricius	384
Anastasius I.	398
Innocent I.	402
Zosimus	417
Boniface I.	418
Celestinus I.	422
Sixtus III.	432
Leo I., the Great	440
Hilarius	461
Simplicius	468
Felix III.	483
Gelasius I.	492
Anastasius II.	496
Symmachus	498
Hormisdas	514
John I.	523
Felix IV.	526
Boniface II.	530
John II.	532
Agapetus I.	535
Sylverius	536
Vigilius	540
Pelagius I.	555
John III.	560
Benedict I.	574
Pelagius II.	578
Gregory I.	590
Sabinianus	604
Boniface III.	606
Boniface IV.	608
Deusdedit (or Deodatus) I.	615
Boniface V.	619
Honorius I.	625
Severinus	638
John IV.	640
Theodorus I.	642
Martin I.	649
Eugenius I.	654
Vitalianus	657
Deusdedit II.	672
Domnus I.	676
Agatho	678
Leo II.	682
Benedict II.	684
John V.	685
Conon	686
Sergius I.	687
John VI.	701
John VII.	705
Sisinnius	708
Constantine	708
Gregory II.	715
Gregory III.	731
Zacharias	741
Stephen II.	752
Stephen III.	752
Paul I.	757
Stephen IV.	763
Adrian I.	772
Leo III.	795
Stephen V.	816
Paschal I.	817
Eugenius II.	824
Valentinus	827
Gregory IV.	827
Sergius II.	844
Leo IV.	847
Benedict III.	855
Nicholas I.	858
Adrian II.	867
John VIII.	872
Martin II.	882
Adrian III.	884
Stephen VI.	885
Formosus	891
Sergius and *Boniface VI.*	
Stephen VII.	896
Romanus	897
Theodorus II.	897
John IX.	898
Benedict IV.	900
Leo V.	903
Christopher.	
Sergius III.	904
Anastasius III.	911
Lando	913
John X.	914
Leo VI.	928
Stephen VIII.	929
John XI.	931
Leo VII.	936
Stephen IX.	939
Martin III. or Marinus II.	943
Agapetus II.	946
John XII.	955
Leo VIII.	*963*
Benedict V.	964
John XIII.	965
Benedict VI.	972
Domnus II.	974
Benedict VII.	974
John XIV.	983
Boniface VII.	
John XV.	985
John XVI.	996
Gregory V.	996
Sylvester II.	999
John XVII.	1003
John XVIII.	1003
Sergius IV.	1009
Benedict VIII.	1012
John XIX.	1024
Benedict IX.	1033
Sylvester.	
Gregory VI.	1044
Clement II.	1046
Damasus II.	1048
Leo IX.	1048
Victor II.	1055
Stephen X.	1057
Benedict X.	1058
Nicholas II.	1058

Alexander II	1061
Gregory VII	1073
Clement III.	
Victor III	1086
Urban II	1088
Paschal II	1099
Albert and *Theodoric.*	
Gelasius II	1118
Calixtus II	1119
Honorius II	1124
Innocent II	1130
Anacletus.	
Celestinus II	1143
Lucius II	1144
Eugenius III	1145
Anastasius IV	1153
Adrian IV	1154
Alexander III	1159
Victor, Paschal, and *Calixtus.*	
Lucius III	1181
Urban III	1185
Gregory VIII	1187
Clement III	1187
Celestinus III	1191
Innocent III	1198
Honorius III	1216
Gregory IX	1227
Celestinus IV	1241
Innocent IV	1243
Alexander IV	1254
Urban IV	1261
Clement IV	1265
Gregory X	1271
Innocent V	1276
Adrian V	1276
John XXI	1276
Nicholas III	1277
Martin IV	1281
Honorius IV	1285
Nicholas IV	1288
Celestinus V	1294
Boniface VIII	1294
Benedict XI	1303
Clement V	1305
John XXII	1316
Nicholas.	
Benedict XII	1334
Clement VI	1342
Innocent VI	1352
Urban V	1362
Gregory XI	1370
Urban VI	1378
Clement VII	*1378*
Benedict XIII	*1394*
Boniface IX	1390
Innocent VII	1404
Gregory XII	1406
Alexander V	1409
John XXIII	1410
Martin V	1417
Eugenius IV	1431
Felix.	
Nicholas V	1447
Callixtus III	1455
Pius II	1458
Paul II	1464
Sixtus IV	1471
Innocent VIII	1484
Alexander VI	1492
Pius III	1503
Julius II	1503
Leo X	1513
Adrian VI	1522
Clement VII	1523
Paul III	1534
Julius III	1550
Marcellus II	1555
Paul IV	1555
Pius IV	1560
Pius V	1566
Gregory XIII	1572
Sixtus V	1585
Urban VII	1590
Gregory XIV	1590
Innocent IX	1591
Clement VIII	1592
Leo XI	1605
Paul V	1605
Gregory XV	1621
Urban VIII	1623
Innocent X	1644
Alexander VII	1655
Clement IX	1667
Clement X	1670
Innocent XI	1676
Alexander VIII	1689
Innocent XII	1691
Clement XI	1700
Innocent XIII	1721
Benedict XIII	1724
Clement XII	1730
Benedict XIV	1740
Clement XIII	1758
Clement XIV	1769
Pius VI	1775
Pius VII	1800
Leo XII	1823
Pius VIII	1829
Gregory XVI	1831
Pius IX	1846

CLEMENS PETERSEN.

Pope (ALEXANDER), b. at London May 21, 1688. His father, who was a Roman Catholic, was a man of means, but not finding London a fit place for a papist to live in after the revolution of 1688, he retired from business and settled at Binfield in Windsor Forest. The son was educated partly at home, partly in Twyford, and partly in London, but the instruction he received was very loose and desultory, and his poor health made a systematic education almost impossible. He was very small, very feeble, and a little crooked. In one point, however, his education was unremitting and consummate. He had by nature a wonderful sense for form, not only theoretically, so as to feel any break or blunder, but also practically, so as to produce perfect expression. And by self-study and exercise he developed this sense to the highest degree of sharpness and refinement. He had no originality of thought; all his ideas are borrowed. His imagination was without spontaneity; he took his inspiration from books, not from nature. But in adopting other people's ideas and images he not only refined them, but by combining them he actually produced something new; and this new production was often very brilliant. He began writing epics and tragedies when he was twelve years old, but he had the good sense to burn what had no value, and to keep in his desk what needed to be rewritten in order to become valuable. Meanwhile, he was introduced to the literary world in London, and was for some time (about 1704) very busy correcting Wycherley's verses. He followed the famous dramatist "as a dog;" he later on followed Addison in the same manner, and Swift and Lady Montagu, and indeed during his whole life there was always some one to whom he clung passionately. But one day Wycherley became a little haughty, and in the same moment Pope became "malicious," and the friendship was at an end. In 1709 he published his *Pastorals*, written several years before, and almost immediately he was acknowledged as one of the first poets of his age. Then followed the *Essay on Criticism* in 1711; *Rape of the Lock* in 1712; *Windsor Forest* in 1713; *Temple of Fame* in 1715; and *Eloisa to Abelard* in 1717. In this year, after the death of his father, he moved with his mother to Twickenham, on the banks of the Thames, where he spent the rest of his days in an elegant retirement, visited by all the first men of literature and society. He had become not only the fashion, but the rage of his time, and he knew how to punish any dissentient, for his wit and satire were as ready and effective as his sentiments and descriptions were airy and charming. He was also rich. From 1715 to 1726 he translated the *Iliad* and *Odyssey*, for which he received nearly £8000, and in 1725 he published a new edition of Shakspeare, also with good profit, though to people who know Homer his translation is as singular a work as his edition is to those who know Shakspeare. The best of all his productions are perhaps the *Dunciad*, published in 1728, and the *Essay on Man*, published in 1734. D. at Twickenham, Middlesex, May 30, 1744. CLEMENS PETERSEN.

Pope (CHARLES A.), M. D., b. at Huntsville, Ala., Mar. 15, 1818; graduated at the University of Alabama; studied medicine at Huntsville, Cincinnati, and Philadelphia; spent two years studying surgery in France and Germany; settled at St. Louis, Mo., 1841, where he soon established an extensive practice; became professor of anatomy and afterward of surgery in the St. Louis University; aided in founding the St. Louis Medical College; was president of the American Medical Association in 1853; took an active part in promoting general education; retired from practice about the close of the civil war, and took up his residence at Paris, Mo. D. at Paris July 6, 1870.

Pope (JOHN), b. in Prince William co., Va., about 1770; lost an arm by accident in his youth, and was thereby led to study law; practised first in Shelby co., Ky.; afterward settled at Lexington; was many years a member of the State legislature; U. S. Senator 1807–13; president *pro tem.* of the Senate 1811; governor of Arkansas Territory 1829–35, and member of Congress 1837–43. D. in Washington co., Ky., July 12, 1845.

Pope (JOHN), b. in Louisville, Ky., Mar. 16, 1823; graduated at the U. S. Military Academy, and commissioned brevet second lieutenant topographical engineers July 1, 1842, captain 1856. Prior to 1846 he was engaged in Florida and in the survey of the N. E. boundary-line between the U. S. and Great Britain; in the war with Mexico he participated in the battles of Monterey and Buena Vista, gaining the brevets of first lieutenant and captain for gallantry; returning to duty with his corps on the termination of war, for six years (1853–59) he conducted the survey of a route for the Pacific R. R.; on lighthouse duty until the outbreak of civil war. Appointed brigadier-general of volunteers May 17, 1861, he held important commands in Missouri, and in Dec., 1861, surprised a Confederate camp at Milford, which he captured with large supplies, thus forcing the Confederate general Price to S. E. Missouri; following up his success, now in command of the Army of the Mississippi, in co-operation with Admiral Foote New Madrid was taken (Mar. 14, 1862). Promoted to be major-general Mar. 21, 1862, and a month later (Apr. 8) captured Island No. 10 in Mississippi River, with upward of 6500 prisoners and about 125 cannon and 7000 small-arms. Uniting with the combined armies under Gen. Halleck, he participated in the advance upon Corinth, and upon the evacuation of that place (May 30) pursued the Confederate army as far as Baldwin. Called to the East in June, he was made a brigadier-general in the regular army (July 14, 1862) and placed in command of the Army of Virginia, comprising the forces of Fremont, McDowell, and Banks, to which were added those of the Army of the Potomac arriving from the Peninsula of Virginia. The unsuccessful battle of Bull Run was fought Aug. 29–30, and the next day (Sept. 1) that of Chantilly; a few days later Pope resigned his command, and resumed command of the department of the North-west. Since the war he has commanded various military divisions and departments.

Poperinghe', town of Belgium, province of West Flanders, has manufactures of linens, lace, tobacco, and earthenware, and extensive cultivation of hops in the vicinity. P. 10,691.

Pope's Mills, p.-v., Macomb tp., St. Lawrence co., N. Y., on Black Lake. P. 76.

Pop'ham (GEORGE), b. in Somersetshire, England, about 1550, brother of Sir John Popham, lord chief-justice of the king's bench (b. 1531; d. June 10, 1607), who was one of the patentees, with Sir Ferdinando Gorges, of an extensive territory in the present State of Maine; sailed from Plymouth, England, May 31, 1607, with two ships and 100 men, Raleigh Gilbert, nephew of Sir Walter Raleigh, being in command of one of the vessels. They landed Aug. 15, 1607, at the mouth of Kennebec or Sagadahock River, where on the western peninsula they built a storehouse and a rude fortification which they named Fort St. George. This was the first English settlement in New England, but Popham having died Feb. 5, 1608, the colonists became discouraged at the inclemency of the region, and returned

to England in the spring.—Sir FRANCIS POPHAM, probably a son of Sir John, was a patentee of New England and a member of Parliament 1620. The anniversary of the foundation of the "Popham Colony" was celebrated in 1862, and several times since, under the auspices of the Maine Historical Society, and a *Memorial Volume* was prepared "in vindication of the claims of Sir Ferdinando Gorges as the founder of English colonization in America." (See POOR, JOHN A.)

Popish Plot. See OATES (TITUS).

Pop'kin (JOHN SNELLING), D. D., b. at Boston, Mass., June 19, 1771; graduated at Harvard College 1792; was tutor there 1795–98; pastor of the Federal street Congregational church, Boston, 1799–1802, of the First church at Newbury 1804–15, and professor of Greek at Harvard College 1815–33. D. at Cambridge Mar. 2, 1852. A volume of writings, chiefly lectures, sermons, and addresses, was edited, with a *Memoir*, by Prof. C. C. Felton (1852).

Pop'lar [Lat. *populus*], properly the name of the trees belonging to the genus *Populus* and order Salicaceæ, but popularly and very incorrectly extended to the TULIP TREE (which see) of the U. S. The poplars have a light, white wood, which is very perishable if exposed to the weather or if not carefully seasoned. The common balsam poplar, tacamahac, or balm of Gilead tree (*P. balsamifera*), produces a copious fragrant resin on its buds; it is a handsome tree of North America and Asia. Several of the poplars of the U. S. are called cottonwood. (See COTTONWOOD TREE.) The cottonwoods are useful for fuel and timber, but liable to warp unless prepared with care. The *P. tremuloides*, or white poplar, American aspen, is a handsome tree, as is the *P. grandidentata*. *P. angulata* and *heterophylla* are large cottonwoods with rather large leaves. The abele, or silver-leaf poplar of Europe (*P. alba*), is sometimes planted in the U. S. It spreads rapidly by the roots, but its timber is excellent, as is that of the *P. canescens* and *nigra*, the gray and black European poplars. The Lombardy poplar (*P. fastigiata*) is remarkable for the singular upward tendency of its branches. One of the most important of the more recent economic uses of the poplars is the manufacture of paper-pulp from their wood. Paper is not usually made from this pulp alone, but it may be profitably mixed with rag-pulp in the manufacture of ordinary qualities of printing paper. REVISED BY A. GRAY.

Poplar, tp., Orangeburg co., S. C. P. 730.

Poplar Bluff, p.-v. and tp., cap. of Butler co., Mo., on St. Louis and Iron Mountain and Cairo Arkansas and Texas R. Rs., has 1 newspaper, a stave-factory, and hotels. P. 840. KITCHENS & KELLY, PUBS. "HEADLIGHT."

Poplar Branch, p.-v., Currituck co., N. C., on Currituck Sound. P. 1140.

Poplar Grove, p.-v., Caledonia tp., Boone co., Ill., on Kenosha division of Chicago and North-western R. R.

Poplar Plains, p.-v., Fleming co., Ky. P. 1565.

Poplar Ridge, p.-v. and tp., Madison co., Ala. P. 611.

Poplar Springs, tp., Tallapoosa co., Ala. P. 638.

Poplar Tent, tp., Cabarrus co., N. C. P. 1280.

Popocatepetl' [Aztec, *popoca*, "smoking," and *tepetl*, "mountain"], a volcano, still smoking, though no eruption has taken place since 1540, 10 miles S. W. of the City of Mexico. It rises 17,720 feet above the level of the sea, is of conical form, and covered with forests to a height of about 13,000 feet, where vegetation ceases and perpetual snow begins.

Pop'oli, town of Italy, province of Aquila degli Abruzzi, situated most picturesquely at the confluence of the Pescara and the Sagittario. The attention of physicists has been drawn to certain curious periodical air-currents which are observed here. P. in 1874, 6708.

Pop'pi, town of Italy, province of Arezzo, situated on an isolated hill, at the foot of which flows the Arno, the torrent Sora falling into it at a point just opposite. Poppi was a strongly-fortified town, but few traces of its mediæval life remain except the castellated palace of the counts Guidi. P. in 1874, 6414.

Pop'py [Ang.-Sax. *papig*], the common name of the *Papaver* genus of plants of the natural order Papaveraceæ. The flower is large and showy, the corolla being generally four-petalled and the calyx two-leaved. The stigma is in the form of rays, ranging from four to twenty in number. It springs directly from the germen, and persists upon the capsule. The latter is one-celled, though with imperfect partitions, and contains numerous seeds which escape by pores under the flaring stigma. The poppy is an annual or perennial herbaceous plant, and abounds in a milky juice. There are about twenty species, natives of Europe and Asia, most of which are found only in the warm temperate regions. By far the most important species is *P. somniferum*, from which the drug opium is obtained. (See OPIUM.) There are several varieties of this species, of which the most prominent are called the *white* and *black* poppy, respectively, from the color of the seeds. The flower of the former is white—that of the latter generally red or violet, though also sometimes white. This species of poppy has been known from a remote period in the countries bordering on the eastern coast of the Mediterranean, and is now extensively grown in Asiatic Turkey, Persia, Egypt, Europe, India, and China. In the Oriental countries it is cultivated for opium, but in France and Germany principally for a bland fixed oil, *poppy oil*, found in the seeds. This oil exists in the seeds in about the proportion of 40 per cent., is entirely devoid of narcotic properties, and is used extensively for the same purposes as olive oil, which it much resembles. In England there occurs in abundance a species of poppy called the *red poppy* or *corn-rose* (*P. Rhœas*), characterized by a fiery-red flower. The scarlet petals of this are used in pharmacy to impart their brilliant color to mixtures. In America, *P. somniferum* has been naturalized, but is cultivated principally as a garden-flower. EDWARD CURTIS.

Popula'tion [Lat. *populatio*]. The matter of chief interest on this topic respects the ratio between the increase of population and the increase of food for its subsistence. The subject should be considered in the light of facts rather than of theories. It is evident, as the Scriptures affirm, that the whole earth, with its manifold forces and resources, is under the dominion of man, to be subjected and made subservient to his support. But the greater part of the earth's surface is as yet but thinly peopled, and in hardly any portion are its resources for the support of human life fully drawn out. Many of the richest lands lie almost desolate. The law of reproduction in mankind no doubt tends to increase population in a geometrical ratio. But there is also in the vegetables and animals on which man feeds a structural provision for increase in a higher geometrical ratio. Both are subject to natural checks, which tend to preserve the balance between them, yet so that always the earth shall yield all, or more than all, that mankind need.

Turning to the actual occupancy of the earth by man, it is evident that those most scantily provided with means of subsistence are the nations which, in a savage state, are scattered thinly over wide territories. In such circumstances population tends to decline rather than increase, because there is no disposition or ability to unfold the hidden resources of nature by labor, no stimulus to production from genial social life, and what Malthus calls the positive checks to increase of population—viz. war, disease, and famine—work with freest and most destructive effects. When civilized men come to occupy such countries the increase of population is rapid, but that increase of population becomes itself a means of increasing subsistence more rapidly. The industries of civilized society open new treasures of earth, control new forces of nature, and tend always to a production of means of satisfaction even beyond the ever-multiplying desires of an ever-growing people. If confined within narrow limits they may in time exhaust the capacity of their own soil for yielding food, but they are producing a surplus of wealth which, through the exchanges of commerce, will bring food from other lands, perhaps colonized by their own surplus people. It needs but freedom of intercourse between all parts of the world for both people and products, and the most crowded country will be able to command a full supply of food for the needs of all. The history of the world furnishes no instance of a country depopulated, or a nation turned backward on the line of civilization, by the mere fact that its population had outgrown the means of subsistence.

Under a highly-developed civilization where industry is active and wealth is increasing, it is found that the poorer classes increase most rapidly, and that there is a steady diminution in the rate of increase as the social condition improves; that is, the ratio of increase is greatest where the means of support are least. This fact is most manifest where social distinctions are most fixed and the poorer classes can have little hope of bettering their condition. It is accounted for by the recklessness of sheer desperation. With nothing better in the future to aspire to, men cast off all prudential restraint and live only for present indulgence. Misery, instead of being the effect, is itself the cause of this excess of population. Ignorance, degradation, and vice tend to perpetuate this condition of things. On the contrary, under the inspiration of hope, full force is given to all those considerations which affect men's future condition. Regard is had not merely to the bare necessities of life, but to the decencies which belong to social position, and to the luxuries which adorn and refine

life. With reference to these, marriage is postponed and self-restraint is imposed, and thus naturally are brought in those which Malthus calls the prudential checks on excess of population. Hence, the true relief for the apparent wretchedness of crowded populations is to be found in the removal of whatever in the structure of society or the form of government tends to divide society into castes and to perpetuate inequalities of wealth and condition, and in special efforts, by education and moral influence, to inspire the lower classes with hopefulness, prudence, thrift, and energy to lift themselves to a higher level both of self-development and of social position. Here there is place for the application of sound principles of political economy to secure a more equitable distribution of wealth produced to laborers engaged in its production, and a reduction of the wastful consumption of wealth in harmful luxuries and ruinous vices. An increase of population under these conditions must be always a source of strength and a sign of prosperity in any state. With free interchange of friendly and commercial intercourse between the nations we may regard the time to be far off in the indefinite future when the population of this earth shall be brought up to the full measure of the earth's resources to support human life. These views are confirmed by the following statistics: The number of inhabitants to the square mile is, in Belgium, the most densely-peopled state of Europe, 436; in England, which stands next in order of density, it is 389; for the whole of Europe the average is but 71. In China it is estimated at 420 to the square mile; the average is 46 for all Asia, and 16 for all of Africa. The State of Massachusetts has 201 inhabitants to the square mile; Ohio, 66; the average for the whole U. S. is 11, and for the American continent as a whole, 6 to the square mile. In Australia there are nearly 2 square miles for every inhabitant. A. L. CHAPIN.

Por′celain [the origin of the word, which is found in many languages, is unknown; the French word *porcelaine* means also "sea-snail"], a name applied to the finer varieties of earthenware, composed essentially of silicates of alumina. In the making of true porcelain, however, besides fine pure, white clay—mineralogically, *kaolinite*—a certain proportion of white *feldspar* is always incorporated with the mass before burning, which, by virtue of the alkali contained in its composition, gives rise to a sort of semi-vitrification, imparting to the mass, after burning, a certain translucency to which the peculiar beauty of porcelain is due. To the same cause is due a certain toughness, infrangibility, and a crypto-crystalline homogeneity, which imparts a sonorous character like that of glass. (See POTTERY, by S. BIRCH.) H. WURTZ.

Porcelain Clay. The finer varieties of white clay, after being purified by washing, are thus designated. (See CLAY and KAOLIN.) Technically, we may define porcelain clays as those fine white and plastic clays which are free, or almost so, from *iron* and *manganese*. The following are analyses of some French porcelain clays:

	St. Yrieux, by Berthier.	Aue, by Kühn.		St. Tropez.		Halle, by Bley.
Silica	47.09	47.64		55.8		39.62
Alumina	36.41	35.97		26.0		45.00
Potash	1.56	.....		8.2		......
Magnesia	2.94	......		0.5		3.32
Lime	......	1.57	Ox. iron	1.8	Ox. mang.	0.19
Water	12.00	13.18		7.2		10.00

HENRY WURTZ.

Porcelain, Réaumur's, a porcelain-like substance, first obtained by Réaumur by *devitrifying* ordinary glass. Excessively slow cooling will sometimes produce devitrification, particularly in very calcareous glasses, but it often occurs in actual glass-working as an effect of careless and repeated heating and cooling. The glass becomes opaque, tougher, and less susceptible to fracture from sudden heating and cooling, having really something of a porcelain-like character. It is attributed to the formation of crystalline compounds in the mass, which, when once formed, are difficult of refusion. H. WURTZ.

Porchet′ (FRANCIS PEYRE), M. D., b. in St. John's, Berkley, S. C., 1825; graduated A. B. at South Carolina College, Columbia, and in 1847 M. D. in the Medical College in Charleston. With Dr. Cain he issued 5 vols. there of the *Medical Journal and Review* before the war, and is now publishing the 3d vol. (new series); served in the military hospitals at Norfolk and Petersburg, Va.; author of *Resources of the Southern Fields and Forests*, and a prize essay, *Illustrations of Disease with the Microscope* (1861). PAUL F. EVE.

Porcu′na, town of Spain, province of Jaen, has manufactures of serges, woollen fabrics, and soap. P. 7645.

Por′cupine [It. *porco-spinoso*—*i. e. porco*, "a pig," and *spinoso*, "spiny"], a name given to certain rodents of the families Hystricidæ and Spalacopodidæ, distinguished by the development of spines among the hairs. The forms thus characterized are found in America, as well as Asia and Africa, but belong to two quite different groups, and their relations in other respects are with forms having hair little more harsh than ordinary mammals. The Old-World species have much stouter spines, and form the family Hystricidæ, the nearest relatives of which are South American animals without spines. The genera of Hystricidæ are (1) *Hystrix*, with four or five species, found in Asia and Africa, as well as Southern Europe; (2) *Acanthion*, with two species in Southern Asia; and (3) *Athenura*, with five species in Asia and Africa. It is the *Hystrix cristata* of Africa that furnishes chiefly the quills used as pen-handles. The South American porcupines belong to the family Spalacopodidæ and sub-family Cercolabinæ. The genera are (1) *Erethizon*, including the North American porcupine, (2) *Cercolabes*, and (3) *Chætomys*; the first of these has a short tail; the last two a prehensile one. The quills of *Erethizon* are used by the Indians in ornamental work. The quills of all the porcupines are nothing but modified and greatly developed spine-like hairs, and almost every grade of hair is exemplified either in the same animal or in representatives of related types. Belonging to the same family with the American porcupines are numerous genera, some of which have hairs little less robust than the porcupines. The name porcupine has been also extended to the Australian *Tachyglossus*, a representative of the order of Monotremes, but this animal has no relation whatever with the typical porcupines. (See also HYSTRICIDÆ and SPALACOPODIDÆ.) THEODORE GILL.

Porcupine Ant-eater, the popular name of the ECHIDNA (which see).

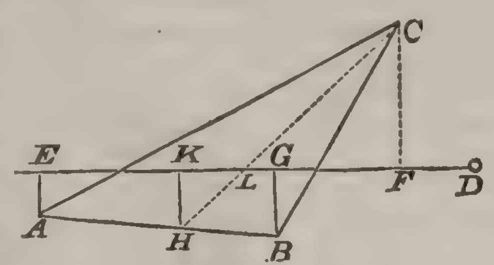
Pordeno′ne, town of Italy, province of Udine, beautifully situated on the right bank of the Noncello, about 30 miles from the city of Udine. Of its ancient walls and once-splendid castle only the ruins remain. In the cathedral (begun 1347) and in several smaller churches may be seen oil-paintings and frescoes of rare beauty by Pordenone and others of his school. The Palazzo Communale also contains most valuable frescoes by the same artists. Pordenone has utilized its abundant water-power, and the large cotton, silk, and earthen and iron ware manufactories employ more than 2000 persons. P. in 1874, 8269.

Pore [Gr. πόρος], a very narrow passage in any solid substance, but the name is more particularly applied to the efferent ducts of the glands in the skin of animals. The largest of these and the least abundant are the ducts of the sebaceous glands, which secrete an oily substance. They are numerous on the head and face and near the orifices of the body, but elsewhere fewer or even wanting. The ducts of the sweat-glands are most numerous on the palm of the hand, where 2800 have been counted in one square inch. Krause estimates the number on a single person at 2,381,248. In calibre they are extremely variable.

Por′gy [*Stenotomus argyrops*, or the *Pagrus argyrops* of Cuvier and old American authors], a species of the family Sparridæ peculiar to the coasts of the Atlantic States. This name is the one given at New York and its vicinity, but it is also known as the scup about Vineyard Sound, etc., scuppaug, bream in Rhode Island (formerly), and fairmaid on the E. coast of Virginia. It ranges from the southern side of Cape Cod southward to Cape Florida, at least; on the southern coast it occurs throughout the year, but is most abundant in June and July, and on the northern coasts is only found in considerable quantities in the summer, before and after which time it probably inhabits the deeper waters off the coast. It attains not unfrequently a length of eighteen inches and a weight of about four pounds or more; this size is reached probably in about five or six years; the female, however, even in the second year, has mature eggs. It is highly regarded as food, and is one of the most prominent fishes of the markets of New York, Philadelphia, and the Southern coast cities generally. It feeds quite indiscriminately; worms, crustaceans, mollusks, etc. contribute to its wants; it readily takes the hook, which is most frequently baited with clams. It is, however, chiefly taken for the market in nets, and especially in pound-nets, along the southern New England coast. It varies considerably in abundance, in some seasons or periods of seasons being excessively numerous, and in others comparatively scarce. A late period of such comparative scarcity has led to the investigation of the causes thereof, and it has been attributed to the indiscriminate use of pounds throughout the season and for every day; legislation has been attempted in regard to the matter. Although a very savory fish, its abundance compared with other fishes renders it a cheap article of food; formerly it was sold as low as ten to twenty-five cents a barrel, and was even used as a manure at or near the places of capture; it now, however, fetches about six to eight cents a pound, wholesale, at Newport, and at

New Bedford about ten cents. (For further information see *Report of the U. S. Commissioner of Fish and Fisheries*, part i. pp. 228–235.) THEODORE GILL.

Po′rism [Gr. πόρισμος], a name given by ancient geometers to a class of propositions having for their object to show what conditions will render certain problems indeterminate. In order that the solution of a problem may be determinate, there must be as many independent conditions as there are parts to be determined. If, therefore, any supposition can be made on the *data* of the problem that will cause one of the given conditions to depend upon one or more of the others, the solution will become indeterminate; that is, the problem will have an infinite number of solutions. The object of the porism is, then, to discover an hypothesis that will make one of the given conditions of a determinate problem dependent upon one or more of the others. The nature of a porism will be illustrated by an example: Let A B C be a given triangle, and D any point in its plane; it is required to draw a line through D such that the sum of the perpendiculars to it from the two vertices on one side shall be equal to the perpendicular to it from the vertex on the other side.



Suppose the problem solved, and let D E be a line such that the sum of A E and B G is equal to C F. Draw C H bisecting A B at H and cutting D E at L; also draw H K perpendicular to D E; then will H K $=\frac{1}{2}(A E + B G)$, or $C F = 2H K$. From the similar triangles L K H and L F C we have H K : H L : : C F : C L, or $C F = 2H L$. Hence, the line D E must cut H C at a point one-third of the distance from H to C, and this no matter what may be the position of D. In the general case—that is, when D and L do not coincide—the problem is determinate, and admits of but one solution. Now let it be required to determine the condition that will make the problem indeterminate. If we suppose D to coincide with L, the preceding proportion will be true whatever may be the direction of E K; hence, the condition required is that D shall coincide with L, and the operation of determining this condition constitutes the essential part of the porism. The porism just considered may be enunciated as follows: To find in the plane of a triangle a point such that if any line is drawn through it, and perpendiculars let fall upon it from the vertices, the sum of the perpendiculars on one side shall be equal to the perpendicular on the other side. Playfair's definition of a porism is as follows: "A porism is a proposition affirming the possibility of finding such conditions as will render a certain problem indeterminate, or capable of innumerable solutions." W. G. PECK.

Pork [Fr. *porc;* Lat. *porcus*, a "swine"], the flesh of the domesticated swine, extensively used as an article of food. It is cured either by salting or smoking, and in the latter case is called bacon. The principal source of the commercial supply of pork is the U. S. Most other countries produce less pork than is required for home consumption. The valley of the Mississippi produces most of the swine. They are mostly transported alive to large commercial centres like St. Louis, Chicago, Cincinnati, Boston, and Buffalo, and are there killed. The pork is shipped principally to Great Britain, France, Germany, and the West Indies. Ireland exports great quantities of pork. Much has been written to show the unhealthiness of pork as an article of human food, but, while it must be admitted that in many countries it is too extensively used, it is certain that there is no cheaper article of flesh-food, nor any more acceptable to hard-working men, like lumbermen, sailors, and farm-laborers, than sound, healthy pork. Its use should, of course, be accompanied by suitable food, such as green vegetables, bread, and stewed fruits. It should be also well cooked, whether used by itself or in the form of sausage, as it is much subject to the attacks of the *trichina.*

Poros′ity [from the Gr. πόρος, "a passage"], a property of matter in consequence of which its molecules are not in absolute contact, but separated by intervals or pores filled with air. The porosity, for instance, of stone or wood is proved by immersing the object in water under the receiver of an air-pump; when the air is exhausted from the surface, that enclosed in the pores of the object will rise to the surface in the form of bubbles. The porosity, for instance, of cast iron has been proved by forcing water through the pores of a plate four inches thick.

Porphyr′ius, b. at Batanea, Syria, about 233 A. D.; received the instruction of Origen at Cæsarea; studied afterward at Athens under Longinus, and finally in Rome under Plotinus, of whom he became a passionate disciple; travelled in Sicily and other countries, but returned subsequently to Rome, where he d. about 305. Of his numerous works, the greater part is no longer extant. The most important of his lost productions was his work against Christianity, which was publicly burnt by order of Theodosius II. in 435. Among the works which have come down to us are biographies of Plotinus and Pythagoras; a commentary on Aristotle's *Categoriæ*, generally printed as an introduction to the *Organon;* a treatise on *Abstinence from Animal Food*, etc. There is no collected edition of his works.

Por′phyry [Gr. πορφυρίτης, from πορφύρα, "purple"], a name applied to various rocks, but correctly to red antique porphyry, a metamorphic mass of uncleavable feldspar, containing crystals of orthoclase or oligoclase, which when polished causes the purplish-gray surface to be spotted with paler patches. Much of the so-called porphyry is porphyry conglomerate, containing pebbles. Diabase porphyry is hornblendic. The name porphyry is often extended to other volcanic and basaltic rocks containing feldspar crystals.

Por′poise [It. *porco*, "hog," and *pesce*, "fish"], a name given to the small and slender species of the family Delphinidæ and sub-family Delphininæ. The name probably owes its origin to the snuffing noise which the animals make, simulating the grunt of the hog, and which has obtained upon our own coasts the name of "snuffer" and "puffing pig" for the *Phocæna Americana.* They are represented by numerous species and several genera—*e. g. Delphinus, Leucorhamphus, Tursiops, Lagenorhynchus*, and *Phocæna.* The species of some one or other of these genera, especially *Delphinus*, are found in almost all seas. The most common American species are the *Phocæna Americana, Lagenorhynchus leucopleurus, Tursiops erebennus*, and *Delphinus delphis* of the Atlantic, and the *Phocæna vomerina, Lagenorhynchus thicolea, Tursiops Gillii, Delphinus Bairdii*, and *Leucorhamphus borealis* of the Pacific coast of the U. S. THEODORE GILL.

Por′pora (NICOLÒ), b. at Naples Aug. 19, 1686; d. there in Feb., 1767; was one of the most celebrated singing-masters and composers of his time. Among his pupils were Farinelli and Cassarelli. His compositions, 50 operas, a number of masses, etc., are now forgotten, but in the history of music he is still remembered as the successful competitor of Handel during his visit to London in 1730, and as the master of Haydn during his visit to Vienna in 1746.

Porret′ta, town of Italy, province of Bologna, on the railway between Florence and Bologna, about 38 miles from the latter city. Porretta has only 3500 inhabitants, but is fast growing in population and in importance on account of its much-frequented hot sulphur springs, which are rendered more efficacious by the freshness and purity of the air, the town being about 1130 feet above the sea. This place is further noticeable for the jets of inflammable gas which issue forth near the springs, and which are used for lighting a part of the village.

Porsen′na, a king of the Etruscan city of Clusium, with whom the Tarquins, when expelled from Rome, sought refuge and aid; is believed to have conquered Rome and occupied it for some time—a fact which some Roman historians, such as Tacitus, hint at, while others, such as Livy, conceal the fact under the brilliant legends of Horatius Cocles, Mucius Scævola, etc. Pliny in his *Historia Naturalis* gives a description of the sepulchral monument of Porsenna.

Por′son (RICHARD), b. at East Ruston, Norfolk, England, Dec. 25, 1759, son of the parish clerk; was educated at Eton and at Trinity College, Cambridge, where he won the Craven scholarship, the chancellor's medal, and a fellowship 1782; began the publication of a series of critical labors upon the texts of classical authors; published in 1790 his famous *Letters* on the spuriousness of the text of the three witnesses; resigned his fellowship 1791 from conscientious scruples about subscribing the Thirty-nine Articles; became regius professor of Greek at Cambridge at £40 per annum, his friends subscribing a fund for his salary; became librarian of the London Institution 1806; published critical editions of several plays of Euripides, and corrected the text of Æschylus, Homer, Virgil, and Herodotus. D. at London Sept. 25, 1808. He was as noted for his marvellous memory as for his vast erudition. His *Notes* on Aristophanes (edited by Dobree) were published 1820, and the *Lexicon* of Photius 1822. (See his *Life* by J. S. Watson, 1861.)

Por′ta (CARLO), b. at Milan 1776; was an intimate friend of Alessandro Manzoni and of Tommaso Grossi. Of his poems in the Milanese dialect, which have passed through many editions, the most celebrated is the one entitled *Disgrazi de Giovanin Bongee.* Porta was an amiable

satirist, most true to nature and full of power and vigor; thus far, he stands unrivalled among writers *in dialetto.* D. 1821.

Por'ta, del'la (GIAMBATTISTA), b. in Naples about 1540; studied natural science, especially optics; travelled much in Italy, Spain, and France; founded in his native city an academy, I Segreti, which held its meetings in his own house, and to which none was admitted unless he had made some discovery in natural philosophy; became very famous on account of certain predictions which turned true, and was eagerly sought by people who wished to know something of the future; was accused of magic, and compelled by the pope to dissolve his academy; wrote many volumes on natural magic, geometry, optics, the human physiognomy, etc.; invented the *camera obscura,* and was the first to demonstrate that visual perception is not effected by rays emanating from the eye, but by rays reflected from the objects. D. at Naples Feb. 4, 1615.

Portadown', town of Ireland, county of Armagh, on the Bann, has large distilleries and manufactures of linen and linen yarn, and an active trade in corn. It communicates by canal with the sea at Newry. P. 6658.

Portaels' (JEAN FRANÇOIS), b. at Vilvoorden, province of South Brabant, Belgium, in 1820; studied painting in the Academy of Brussels, at Paris under Paul Delaroche, and in Rome; travelled in Egypt and the Orient, and was appointed director of the Academy of Ghent in 1847. His most celebrated works are *A Drought in Egypt, The Story-teller of Cairo, A Funeral in the Desert of Suez,* and *A Caravan in Syria overtaken by a Simoom.*

Port'age, county of N. E. Ohio. Area, 500 sq. m. It is level, fertile, and is celebrated for its cattle, grain, wool, and dairy products. Cheese, lumber, carriages, leather, glass, machinery, saddlery, etc. are among the manufactured articles. Coal is found at some points. The county is traversed by Cleveland and Pittsburg, Cleveland and Mahoning, and Atlantic and Great Western R. Rs. Cap. Ravenna. P. 24,584.

Portage, county of Central Wisconsin. Area, 792 sq. m. It is undulating, and abounds in pine timber, which is extensively cut and sawn. The soil is good. Cattle, grain, and wool are staple products. The county is traversed by Wisconsin River and Wisconsin Central R. R. Cap. Stevens's Point. P. 10,634.

Portage, tp., Porter co., Ind., on Lake Michigan, Calumet River, and Michigan Central R. R. P. 728.

Portage, tp., St. Joseph co., Ind., on St. Joseph River, includes the village of South Bend, the county-seat. P. 777.

Portage, tp., Houghton co., Mich., on Sturgeon River. P. 1540.

Portage, p.-v. and tp., Kalamazoo co., Mich., on Kalamazoo division of Lake Shore and Michigan Southern R. R., and on Grand Rapids and Indiana R. R. P. 1050.

Portage, v., Portage des Sioux tp., St. Charles co., Mo., on Mississippi River at the point where the Sioux carried their canoes across the peninsula to Missouri River. P. 160.

Portage, tp., Livingston co., N. Y., on Genesee River, Genesee Valley Canal, and Buffalo division of Erie R. R., which here crosses Genesee River on a bridge 800 feet long. P. 1338.

Portage, tp., Hancock co., O., between Middle Portage and Auglaize rivers. P. 899.

Portage, tp., Ottawa co., O., on the peninsula between Sandusky Bay and Lake Erie. P. 1246.

Portage, tp., Summit co., O., between Cuyahoga and Tuscarawas rivers, includes the city of Akron, the county-seat. P. 1594.

Portage, p.-v. and tp., Wood co., O., on Middle Portage River. P. 1069.

Portage, tp., Cameron co., Pa., on Sinnemahoning River and Philadelphia and Erie division of Pennsylvania R. R., near Portage Creek, a tributary of the upper Allegheny River. P. 99.

Portage, city, Pacific tp., cap. of Columbia co., Wis., on the government canal between Fox and Wisconsin rivers, has a high school and an excellent system of common schools, 8 churches, 3 weekly newspapers, 2 banks, 1 foundry and machine-shop, a brewery, 1 flouring-mill, 1 tannery, and stores. It is the terminus of 2 railroads, and has a round-house and repair-shops. P. 3945.

E. W. STEVENS, M. D., ED. "WESTERN ADVANCE."

Portage des Sioux, p.-v. and tp., St. Charles co., Mo., on Mississippi River. P. 1861.

Portage Lake Plantation, tp., Aroostook co., Me. P. 124.

Portageville, p.-v., Genesee Falls tp., Wyoming co., N. Y., on Genesee River and Buffalo division of Erie R. R. P. 491.

Portale'gre, town of Portugal, province of Alemtejo, near the Spanish frontier, is surrounded with dilapidated fortifications, and has a fine cathedral and large cloth manufactures. P. 6000.

Port Allen, p.-v., Oakland tp., Louisa co., Ia., on Iowa River. P. 50.

Port-au-Prince, the capital of Hayti, situated on its western coast, on the Bay of Gonaives, is an ill-built, filthy, and unhealthy place. Mud islands, overgrown with mangrove shrubs, form in the harbor, and remain there; dung-hills obstruct the passage in the streets, and, according to an account taken in 1840, more than half of the children of the city grow up without any school education. The senate-house is the only public building worth mentioning. Coffee, cocoa, mahogany, and Campeche-wood are exported. P. 23,000.

Port Aus'tin, p.-v. and tp., Huron co., Mich., on Lake Huron, has 3 churches, 1 newspaper, 3 salt manufactories, 2 grindstone-quarries, 2 hotels, and stores. P. 778.

WILLIAM F. CLARK, ED. "HURON CO. NEWS."

Port Bruce, a port of entry of Malahide tp., Elgin co., Ont., Canada, pleasantly situated at the mouth of Catfish Creek on Lake Erie. P. about 200.

Port Bur'well, a port of entry of Bayham tp., Elgin co., Ont., on Lake Erie at the mouth of Otter Creek. It has a good harbor, and has been of late years steadily increasing. P. about 1300.

Port By'ron, p.-v. and tp., Rock Island co., Ill., on Mississippi River and Western Union R. R., at head of Upper Rapids. P. of v. 576; of tp. 832.

Port Byron, p.-v., Mentz tp., Cayuga co., N. Y., on New York Central R. R. and Erie Canal, 26 miles W. of Syracuse, has 4 churches, 1 bank, paper and grist mills, 1 newspaper, 2 hotels, and stores. P. 1089.

C. E. JOHNSON, ED. "CHRONICLE."

Port Car'bon, p.-b., East Norwegian tp., Schuylkill co., Pa., on Schuylkill River, Mahanoy and Broad Mountain R. R., and Schuylkill Valley branch of Philadelphia and Reading R. R., in the vicinity of rich coal-mines, 3 miles N. E. of Pottsville. P. 2251.

Port Ches'ter, p.-v., Rye tp., Westchester co., N. Y., on New York New Haven and Hartford R. R., 25 miles from New York City. It was incorporated in 1868; has 1 institute, a large public and a graded school, 5 churches, 2 banks, an iron-foundry, 2 shirt-factories, public halls, hotels, 1 weekly newspaper, a screw-bolt manufactory, 1 woollen-mill, and 1 carriage-coupling, etc. manufactory. P. 3797. B. F. ASHLEY, ED. "JOURNAL."

Port Clin'ton, p.-b., West Brunswick tp., Schuylkill co., Pa., on Schuylkill River and Canal and Philadelphia and Reading R. R. P. 578.

Port Clinton, p.-v., Portage tp., cap. of Ottawa co., O., on Lake Erie, at the mouth of Portage River and on Lake Shore and Michigan Southern R. R., 14 miles W. of Sandusky, has 1 weekly newspaper and some lake-trade. P. 543.

Port Col'borne, a thriving port of entry of Welland co., Ont., Canada, on Lake Erie where Welland Canal begins, and on Welland Railway and Buffalo branch of Grand Trunk, 20 miles from Buffalo. It has an elevator which can transfer 6000 bushels of grain per hour from vessels to the cars. It has 3 churches and a lighthouse. P. of sub-district, 988.

Port Dalhou'sie, port of entry, the terminus of Welland Canal and Railway, on Lake Ontario, is in Grantham tp., Lincoln co., 31 miles by water from Toronto. It has a lighthouse and some manufactures. P. of sub-district, 1081.

Port Depos'it, p.-v. and tp., Cecil co., Md., on E. bank of Susquehanna River, at head of navigation for heavily-laden boats, and on Port Deposit branch of Philadelphia Wilmington and Baltimore R. R., has 1 newspaper and large interests in the lumber-trade on the Susquehanna and in shipping granite to Baltimore. P. 1839.

Port Do'ver, port of entry of Norfolk co., Ont., Canada, at the mouth of Lynn River, on Lake Erie. It exports lumber and farm produce, has some manufactures and 1 weekly newspaper. P. about 1100.

Porte, Ottoman Porte, or **Sublime Porte** [the "lofty gate," or high gate of the imperial palace, among the Byzantines, as among other Orientals, was a favorite seat of justice; also the gates of cities are places for deliberative meetings], names which are applied to the central government of Turkey and the sultan's court at Constantinople.

Port El'gin (Normanton P. O.), a port on Lake Huron, in Bruce co., Ont., Canada, 55 miles N. by E. of Goderich, has some trade and manufactures and 1 weekly newspaper. P. about 750.

Port Eliz'abeth, in a commercial point of view the most important town of the eastern province of the English colony of the Cape of Good Hope. It was founded in 1820, and is situated on Algoa Bay in lat. 34° S., and its growth has been steady and rapid. In 1847 the value of its exports and imports amounted to £530,602; in 1867, to £4,000,000. The wool-trade of all the eastern districts of the colony is here concentrated, and splendid warehouses line the bay. P. 17,968, of whom most are of English descent.

Por'ter. See Beer, by Prof. C. F. Chandler, Ph. D., M. D., LL.D.

Porter, county of N. W. Indiana, bounded N. by Lake Michigan and S. by Kankakee River. Area, 450 sq. m. Its N. portion is sandy, the S. wet and marshy; the central part is productive and well timbered. Cattle, grain, and wool are leading products. The county is traversed by various railroads. It has important manufacturing interests. Cap. Valparaiso. P. 13,942.

Porter, tp., Porter co., Ind. P. 1006.

Porter, p.-v. and tp., Oxford co., Me., on Great Ossipee River. P. 1104.

Porter, tp., Cass co., Mich. P. 1933.

Porter, p.-v. and tp., Midland co., Mich., on Pine River. P. 82.

Porter, tp., Van Buren co., Mich. P. 1316.

Porter, tp., Christian co., Mo. P. 959.

Porter, tp., Richardson co., Neb. P. 219.

Porter, tp., Niagara co., N. Y., on Lake Ontario at mouth of Niagara River. Includes Fort Niagara and the village of Youngstown. P. 2042.

Porter, tp., Delaware co., O. P. 819.

Porter, tp., Scioto co., O., on Ohio and Little Scioto rivers and Marietta and Cincinnati R. R. P. 1965.

Porter, tp., Clarion co., Pa., on Red Bank Creek. P. 1546.

Porter, tp., Clinton co., Pa. P. 1101.

Porter, tp., Huntingdon co., Pa., on Juniata River and Pennsylvania R. R. P. 1253.

Porter, p.-v. and tp., Jefferson co., Pa. P. 525.

Porter, tp., Lycoming co., Pa. P. 650.

Porter, tp., Pike co., Pa. P. 102.

Porter, tp., Schuylkill co., Pa. P. 1167.

Porter, tp., Rock co., Wis. P. 1223.

Porter (Alexander J.), b. near Armagh, Ireland, in 1786; came to the U. S. 1801; engaged in mercantile pursuits at Nashville, Tenn.; studied law; was admitted to the bar 1807; settled at St. Martinsville, La., 1810; was a member of the convention which formed a State constitution 1811; gained prominence as a jurist and as a Whig politician; became a judge of the supreme court of Louisiana 1821; was U. S. Senator 1834–37; again elected in 1843, but declined to accept on account of ill-health. D. at Attakapas Jan. 13, 1844. The existing jurisprudence of Louisiana is largely due to the labors of Judge Porter.

Porter (Andrew), b. at Worcester, Pa., Sept. 24, 1743; taught a school at Philadelphia from 1767 till June, 1776, when he accepted from Congress a commission as captain of marines; was soon transferred to the artillery, in which he rendered good service, and was promoted to a colonelcy at the close of the war; was a commissioner to survey the boundary-lines of the State 1784–88; became brigadier-general of State militia 1800, soon afterward major-general; was appointed surveyor-general of Pennsylvania 1809; declined the post of secretary of war tendered him by Pres. Madison in 1812. D. at Harrisburg Nov. 16, 1813. Three of his sons filled high political posts.

Porter (Anna Maria), sister of Jane, b. at Durham, England, about 1780; educated at Edinburgh, where in her childhood she was a favorite of Sir Walter Scott; wrote many novels and tales, which once enjoyed considerable popularity, but are now forgotten. D. near Bristol, England, June 21, 1832.

Porter (Augustus S.), nephew of Peter B., b. at Canandaigua, N. Y., in 1798; graduated at Union College in 1818; studied law with the late Judge Howell at Canandaigua; settled first at Black Rock, N. Y., and afterward removed to Detroit, Mich., of which city he was for some years mayor; was afterward elected to the Senate of the U. S., in which he ranked as one of its most useful and upright members. D. at Niagara Falls in 1872.

Porter (Benjamin F.), b. at Charleston, S. C., in Sept., 1808; was self-educated; was admitted to the bar at an early age; afterward studied medicine, which he practised in Alabama until 1830, when he returned to the legal profession; was elected to the Alabama legislature 1832; became reporter of the State 1835; was elected to the bench 1840, but declined, doubting the constitutionality of his election; edited 14 vols. of the Alabama *Reports;* translated Heineccius's *Elements of the Institutes;* published a volume of *Poems* at Charleston, and was frequently an orator on public occasions and a contributor to periodicals.

Porter (David), b. at Boston, Mass., Feb. 1, 1780; served from boyhood on board a merchant vessel under his father, who was a sea-captain; entered the U. S. navy as midshipman Apr., 1798; was on board the Constellation during her engagement with a French frigate 1799; became a lieutenant Oct., 1799; was wounded in an action with pirates on the coast of Santo Domingo Jan., 1800; took part in the naval war upon Tripoli 1801–06; was captured in the Philadelphia Oct., 1803, and held for eighteen months a prisoner; was given command of the frigate Essex (32 guns) in 1812; captured H. B. M.'s ship Alert, the first man-of-war taken from the British; made several other prizes; sailed to the Pacific Jan., 1813; captured several whalers and trading vessels, but was himself captured in the harbor of Valparaiso Mar. 28, 1814, by two British vessels after a severe fight; published a *Journal of the Cruise of the Essex* (2 vols., 1815); was a navy commissioner 1815–23; commanded an expedition against West Indian pirates 1824; was court-martialed and suspended for six months in 1825 for disobedience to orders in a difficulty with the Spanish authorities of Puerto Rico; resigned his commission Aug. 18, 1826, and accepted the command of the Mexican navy; was sent as consul to Algiers 1829; was made chargé d'affaires to Turkey 1830; was afterward promoted to minister resident, and negotiated several treaties with the Porte. D. at Pera, near Constantinople, Mar. 28, 1843. His remains were brought to the U. S. and buried in the grounds of the U. S. Naval Asylum at Philadelphia. From his letters to a friend a work was compiled, *Constantinople and its Environs* (2 vols., 1835). A biographical sketch by Washington Irving appeared in vol. iv. of the *Analectic Magazine.* Porter C. Bliss.

Porter (David Dixon), b. June 8, 1814, in Pennsylvania. His father, the gallant Porter of Essex fame, having left our service and accepted the position of commander-in-chief of the naval forces of Mexico during her war with Spain, obtained an appointment for his son as a midshipman in the Mexican navy, and sent him to sea in the Guerrero, a 22-gun brig, having a complement of 180 officers and men, and commanded by his nephew, David H. Porter, an enterprising officer of but twenty-one years of age, who, like his uncle, had served in our navy. The Guerrero sailed from Vera Cruz on Apr. 17, 1827, and a few weeks thereafter fell in with the Spanish frigate La Lealtad, fully manned and carrying 64 guns. Finding it impossible to get away from the frigate, Capt. Porter resolutely gave battle, and absolutely maintained the unequal fight for nearly four hours, not striking his colors until the brig was filled with the dead and the dying and her spars and sails so torn to pieces as to make her utterly unmanageable. "As soon as the Spaniards saw the Mexican flag come down they put their helm up and ran down to the Guerrero, delivering two heavy broadsides when within 100 yards." During this cowardly firing Capt. Porter, "one of the bravest men that ever trod a ship's deck," was cut in two by a round shot, and his remains, instead of being interred with military honors, according to the usages of war, were barbarously thrown overboard by the victors in plain view of the land. Two years after this rough experience David D. Porter entered our navy as a midshipman, and as a lieutenant eighteen years later we find him actively engaged in all the operations of our navy on the E. coast of Mexico, and adding new lustre to a name already regarded in the U. S. as a synonym for valor. When the civil war broke out, Porter, then a commander, was despatched in the Powhatan to the relief of Fort Pickens, Fla., for whose beleaguered garrison the President felt great solicitude. This duty accomplished, he went vigorously to work fitting out a mortar flotilla for the reduction of the forts guarding the approaches to New Orleans by the lower Mississippi, which the government considered it of vital importance to get possession of. After the fall of New Orleans the mortar flotilla was actively engaged at Vicksburg, and in the fall of 1862, Porter was placed in command of all the naval forces on the Western rivers above New Orleans, with the rank of rear-admiral. His ability as a commander-in-chief was now conspicuously exhibited, not only in the battles which he fought, but also in the creation of a really formidable

fleet out of river-steamboats, which he covered with such plating as they could bear. Inspired by his example, his officers and men displayed a heroism which has never been surpassed, and wherever there was water enough to float a gunboat there the old flag was carried and respected. In 1864, Porter was transferred to the Atlantic coast to command the naval forces destined to operate against the defences of Wilmington, N. C., and on Jan. 15, 1865, the fall of Fort Fisher was hailed by the country as a glorious termination of his arduous war-service. In 1866 he was made vice-admiral, and appointed superintendent of the Naval Academy, which institution is still reaping the benefit of his able administration of two years; and on the death of Farragut (in 1870) he succeeded that illustrious man as the admiral of the navy. FOXHALL A. PARKER.

Porter (DAVID R.), son of Gen. Andrew, b. in Pennsylvania in 1788; became a lawyer; was frequently a member of both houses of the legislature; became an extensive iron manufacturer, and was governor of Pennsylvania for two successive terms (1839–45). D. at Harrisburg Aug. 6, 1867.

Porter (EBENEZER), D. D., son of Thomas, b. at Cornwall, Conn., Oct. 5, 1772; removed in 1779, with his father, to Tinmouth, Vt.; graduated at Dartmouth 1792; became in 1796 pastor of the Congregational church, Washington, Conn.; in 1812 professor of sacred rhetoric, and in 1827 president of Andover Theological Seminary. D. at Andover Apr. 8, 1834. Author of *Young Preacher's Manual* (1819) and a series of works on sacred rhetoric; and compiler of the *Rhetorical Reader* (1831), of which more than 300 editions were issued. Several volumes of his lectures and other discourses have been published in Great Britain and the U. S.

Porter (ELIPHALET), D. D., b. at North Bridgewater, Mass., June 11, 1758; graduated at Harvard College 1777; studied theology with his father, Rev. John Porter, who was minister at North Bridgewater from 1740 to 1802; was ordained pastor of the Congregational church at Roxbury Oct. 2, 1782, and filled that post until his death, Dec. 7, 1833. Author of a *Eulogy on Washington* (1800) and of a number of separately published sermons, and was one of the members of the American Academy of Arts and Sciences.

Porter (FITZ JOHN), b. at Portsmouth, N. H., in Sept., 1822; graduated at the U. S. Military Academy, and entered the army as brevet second lieutenant of artillery July, 1845; served throughout the war with Mexico from Vera Cruz to the capture of the City of Mexico, being wounded at the assault of the capital, Sept. 13, 1847; brevet captain and major for gallantry at Molino del Rey and Chapultepec. From 1849 to 1855 he was stationed at West Point as instructor of artillery and cavalry, and was for a year adjutant of the post. Transferred to the adjutant-general's department, with the rank of brevet captain, June, 1856, he served in this capacity at various points, being (1857–60) assistant adjutant-general of the Utah expedition. He was appointed colonel of the 15th Infantry May 14, 1861, and three days later brigadier-general of volunteers, and served as chief of staff with Gen. Patterson and Gen. Banks until Aug., 1861, when he was assigned to the command of a division in the defences of Washington (Army of the Potomac). In the Virginia Peninsular campaign he was director of the siege of Yorktown, and upon the evacuation of that place was placed in command of the 5th corps, which formed the right wing of the army, and fought the battles of Mechanicsville and Gaines's Mill; at Malvern Hill his command held the left, which mainly resisted the assaults of that day. In the second battle of Bull Run his corps suffered severely on Aug. 30, but was not engaged on the 29th, although ordered into action by Gen. Pope. Continuing in command of his corps, he was present at Antietam, but in November was arraigned before a court-martial on the charge of disobedience of orders at Manassas, and on Jan. 21, 1863, was cashiered. In 1875 he was appointed commissioner of public works of New York City, but failed of confirmation Jan., 1876.

Porter (GEORGE B.), son of Gen. Andrew, b. at Lancaster, Pa., in 1790; was liberally educated; became a lawyer and a man of extensive business capacity; was appointed governor of Michigan Territory 1831, and while holding that office d. at Detroit July 6, 1834.

Porter (HORACE), son of Gov. David R., b. in Pennsylvania May, 1837; graduated at the U. S. Military Academy, and became brevet second lieutenant of ordnance July, 1860, major 1867; in Oct., 1861, accompanied the Port Royal expedition as assistant ordnance officer; engaged in the siege and reduction of Fort Pulaski, Ga.; on James Island expedition; chief of ordnance Army of the Potomac July–Sept., 1862; of the department of the Ohio Sept., 1862–Jan., 1863; of Army of the Cumberland Jan.–Nov., 1863; as A. D. C. on the staff of Lieut.-Gen. Grant Apr., 1864, participating in the battles of the campaign in Virginia of 1864–65, and at the close of the war was retained on the staff of Gen. Grant until the elevation of the latter to the Presidency, when he was selected by the President as his military secretary; resigned 1873 to become manager of the Pullman Palace-Car Co.

Porter (JAMES DAVIS), b. at Paris, Tenn., Dec. 7, 1828; educated at the University of Nashville, Tenn.; graduated in 1846; member of the legislature of Tennessee in 1859–60; adjutant-general of Cheatham's Confederate division; delegate from Henry co. in the constitutional convention of 1870; elected judge of the twelfth judicial circuit of Tennessee in 1871 for a term of eight years; resigned in Feb., 1874; nominated as Democratic candidate for governor in Aug., 1874; elected in the following November; inaugurated in Jan., 1875. JAMES D. PARK.

Porter (JAMES MADISON), son of Gen. Andrew, b. at Selma, Pa., Jan. 6, 1793; was educated for the bar; served as a volunteer in the war of 1812; was a member of the Pennsylvania constitutional convention of 1838; took an important part in its labors; was appointed secretary of war by Pres. Tyler 1843, but was rejected by the Senate; was one of the founders of Lafayette College at Easton; president of its board of trustees twenty-five years, and served, at different times, as president judge of two judicial districts. D. at Easton Nov. 11, 1862.

Porter (JANE), b. at Durham, England, in 1776, daughter of a surgeon in the 6th Dragoons, who died during her childhood; was educated at Edinburgh; afterward lived with her mother successively at London, at Ditton-on-Thames, and at Esher; published in 1803 her popular novel, *Thaddeus of Warsaw;* in 1809 the equally successful *Scottish Chiefs;* wrote, at the request of George IV., *Duke Christian of Luneburgh, or Traditions from the Hartz* (3 vols., 1824), and besides several other novels issued in 1831 a fictitious but highly circumstantial *Narrative of the Shipwreck of Sir Edward Seaward,* which by some reviewers was deemed a genuine narrative of facts. Most of Miss Porter's works were republished in the U. S., where they obtained a wide circulation. D. at Bristol May 24, 1850.

Porter (JOHN ADDISON), M. A., M. D., b. at Catskill, N. Y., Mar. 15, 1822; graduated at Yale in 1842; became professor of rhetoric and modern languages in Delaware College; went in 1847 to Giessen and studied chemistry with Liebig; professor of chemistry applied to the arts in Brown University 1850–52; held chemical professorships in Yale College 1852–64. D. at New Haven, Conn., Aug. 25, 1866. Author of two chemical textbooks and of several scientific papers; edited the *Connecticut War Record;* translated parts of the *Kalevala* (pub. 1868).

Porter (JOSHUA), M. D., b. at Lebanon, Conn., in 1730; d. at Salisbury, Conn., 1825; graduated at Yale College; was a representative in the general assembly and a member of the committee on the pay table; also colonel in the State militia, and agent to look after the first *home-made* cannon and balls used in the war and manufactured at Salisbury from its celebrated iron. Owing to a scarcity of officers at the battle of Saratoga, he voluntarily led a regiment through the engagement. That ended, he attended in the hospital those who had been wounded in the fight. For more than fifty years the soldier-doctor held important public trusts. GEORGE W. HOLLEY.

Porter (MOSES), b. at Danvers, Mass., in 1755; entered the Revolutionary army as lieutenant of artillery; was at Bunker's Hill; served through the war; remained in the regular army after its close; participated in Wayne's campaign of 1794 and other Indian wars; became colonel of light artillery Mar. 12, 1812; distinguished himself at the capture of Fort George, May 27, 1813; appointed brevet brigadier-general U. S. A. Sept. 10, 1813; took command at Norfolk, Va., 1814; became colonel 1st Artillery May, 1821. D. at Cambridge, Mass., Apr. 14, 1822.

Porter (NOAH), D. D., LL.D., b. at Farmington, Conn., Dec. 14, 1811, son of Rev. Noah Porter, D. D., minister of Farmington for fifty-five years (b. 1781; d. Sept. 24, 1866); graduated at Yale College 1831; taught school at New Haven 1831–33; was tutor at Yale 1833–35, pursuing theological studies at the same time; became pastor of the Congregational church at New Milford, Conn., Apr., 1836; settled at Springfield, Mass., 1843; was chosen Clark professor of metaphysics and moral philosophy at Yale College 1846; spent a year (1853–54) in Europe, chiefly in Germany, where he made a close study of modern German philosophy, and was elected president of Yale College on the resignation of Dr. Woolsey in 1871. Author of an *His-*

torical Discourse, delivered at Farmington Nov. 4, 1840, in commemoration of the 200th anniversary of the settlement of that town; a prize essay on *The Educational Systems of the Puritans and the Jesuits compared* (New York, 1851), *The Human Intellect, with an Introduction upon Psychology and the Soul* (New York, 1868), *Books and Reading* (1870), *American Colleges and the American Public* (1870), *Elements of Intellectual Philosophy* (1871), being an abridgment of the larger work, and *The Science of Nature versus the Science of Man* (1871). Dr. Porter was the principal editor of the revised edition of *Webster's Dictionary* (1864), and has sparingly contributed to religious and literary reviews and periodicals. He is admitted to be one of the ripest and most scholarly of American metaphysicians. PORTER C. BLISS.

Porter (PETER AUGUSTUS), only son of P. B. Porter, b. at Black Rock, N. Y., 1827; graduated at Cambridge, and afterward studied at the universities of Heidelberg and Berlin, Germany, intending to devote himself to literature. During the civil war he raised a regiment which was consolidated with the 8th New York heavy artillery and placed under his command. He was killed at Cold Harbor June 3, 1864, after having succeeded to the command of the brigade, which he was leading against the enemy's works. He had been a member of the legislature, but after entering the military service declined political preferment, on the ground that his neighbors—fathers and sons—had enlisted in the same service with the understanding that they were to be under his personal charge, and he would share their lot to the end. GEORGE W. HOLLEY.

Porter (PETER BUEL), second son of Joshua, b. at Salisbury, Conn., Aug. 14, 1773; d. at Niagara Falls, N. Y., 1844; graduated at Yale College 1791; obtained his professional education at the famous Litchfield Law School, and settled at Canandaigua, N. Y., but soon removed to Black Rock; where and at Niagara Falls he, in connection with his brother, the late Judge Augustus Porter, had acquired large possessions. He was elected to Congress in 1808, re-elected in 1810, and the year following, as chairman of the committee on foreign relations, prepared and introduced the celebrated report recommending war with Great Britain. Hostilities having begun, he resigned his seat in Congress, refused a general's commission in the regular army, was made quartermaster-general of New York, and not long afterward received the command of the Pennsylvania and New York volunteers and a body of Indians of the Six Nations. In June, 1813, after Buffalo and Black Rock (where he lived) had fallen into the hands of the British, his own house was made their head-quarters. Inspiring his neighbors with his own enthusiasm, he rallied a force and drove them back to Canada, their commander, Col. Bishop, having been mortally wounded in the affray. As one holding command in Smythe's unfortunate "army of invasion" he was twice permitted to embark to lead the van of the army into Canada, and each time recalled before reaching its shore. Some indignant remarks on this vacillating course ended in a duel with Gen. Smythe. In the summer of 1814, with his brigade of 3500 volunteers and Indians, he joined the army under Gen. Brown, which was again to undertake an advance into Canada. He "exhibited great personal gallantry" at Chippewa, and at Lundy's Lane, leading his brigade through the forest, he fell upon the right flank of the British at the critical moment when Morgan had carried the destructive battery on their left, thus securing victory in the most obstinate and sanguinary battle of the war. Besieged with the army under Gen. Gaines at Fort Erie, Gen. Brown being in Buffalo, wounded, he planned and led the famous sortie of Sept. 17, characterized by Napier (*Hist. of the War of the Peninsula*) as "a brilliant achievement—the only instance in history where a besieging army was entirely broken up and routed by a single sortie." Passing with part of his staff from one column to another, he suddenly came upon a party of about seventy British soldiers. Ordering them to surrender, he advanced boldly and disarmed them. A company of his own men fortunately came up just in time to save him from a hostile demonstration that, seeing him without escort, they had just begun against him. Preparatory to another campaign his private papers show that he was to have been appointed commander-in-chief of the army of the frontier. The Treaty of Ghent, however, by which peace was restored, put an end to further military operations on the frontier. In acknowledgment of his services in this war the city of New York presented Gen. Porter with the freedom of the city in a gold box; the State of New York voted him a sword; and the thanks of the Congress of the U. S., with a gold medal struck to commemorate the successful campaign of 1814, were presented to the five generals who had most distinguished themselves—Brown, Scott, Ripley, Gaines, and Porter. He was appointed in 1816 by Pres. Madison a commissioner under the treaty to settle the boundary-line between Canada and the U. S. An early projector of the Erie Canal, he with Morris and Clinton constituted the first board of commissioners for selecting its route. He married late in life Letitia Grayson, daughter of John Breckenridge, attorney-general under Pres. Jefferson. In 1828 he was appointed secretary of war, holding the office to the end of Mr. Adams's administration. His subsequent days were passed on his estate and among his numerous relations at Black Rock and Niagara Falls. G. W. HOLLEY.

Porter (ROBERT KER), brother of Jane, b. at Durham, England, about 1775; became distinguished as an historical painter and traveller; went to Spain with Sir John Moore 1808; was knighted in 1811; was consul in Venezuela 1826–41; lived many years in Russia, where he married the daughter of a prince. D. at St. Petersburg May 4, 1842. Author of *Travels in Russia and Sweden* (1808), *Letters from Portugal and Spain* (1809), *An Account of the Russian Campaign* (1813), and *Travels in Georgia, Persia, and Armenia* (1821–22).

Porter (ROBERT MASSINGALE), M. D., b. Apr. 12, 1818, in Nashville, Tenn.; d. there July 1, 1856; received the literary degree in 1836 from the University of Nashville; in 1838 that of law from Cambridge, Mass.; in 1843 that at Princeton for his theological course there; and in 1845 took M. D. at the University of Pennsylvania. At the organization of the medical department of the University of Nashville in 1852 he was made its first professor of anatomy, and four years afterward fell a victim to professional zeal by imbibition of blood-poisoning while teaching a summer class. Dr. Porter was a man of much promise, attested by his articles in the Nashville *Medical and Surgical Journal*, his zeal and interest in the profession, and the profound regret felt at his early loss. PAUL F. EVE.

Porter (THOMAS), b. at Cornwall, Conn., in May, 1734; served in the French war at Lake George 1755; became a prominent politician and member of the Connecticut legislature; took an active part in the public concerns of the Revolution; removed to Tinmouth, Vt., 1779; was for ten years a judge of the supreme and county courts of Vermont, and served thirty-five years in the legislatures of Connecticut and Vermont. D. at Granville, N. Y., in Aug., 1833. Father of Rev. Ebenezer Porter, president of Andover Theological Seminary.

Porter (THOMAS KENNEDY), M. D., b. in Franklin co., Ky., Feb., 1801; d. at Paris, Tenn., Feb., 1848; received the degree of M. D. from Transylvania University, Lexington, Ky., 1822; became one of the pioneer physicians of Western Tennessee, where his practice became so extensive that his life was shortened by excessive labor. His success in Henry co. was greater than any other of his day, and his generosity so conspicuous that, like Mr. Jefferson, in dying he left clean hands but an empty purse. He was the father of the present popular governor of Tennessee. PAUL F. EVE.

Porter (WILLIAM D.), son of Com. David, b. at New Orleans, La., in 1810; entered the U. S. navy as midshipman Jan. 1, 1823; became lieutenant Dec. 31, 1833; was the originator of the lighthouse system in use in the U. S.; served in the Gulf of Mexico during the Mexican war; was retired 1855; re-entered the navy 1859; built and commanded the iron-clad Essex in the Mississippi flotilla 1861–62; participated in the attacks on Forts Henry and Donelson; sailed down Mississippi River to New Orleans, forcing a passage by several Confederate batteries; took part in engagements at Vicksburg, Baton Rouge (where he effected the destruction of the Confederate iron-clad Arkansas), Natchez, and Port Hudson, and was made commodore July 16, 1862. From feeble health he took little part in subsequent naval service. D. in New York City May 1, 1864.

Porter (WILLIAM T.), b. in Vermont in 1806; was successively a teacher and a journeyman printer, which vocation he followed for some years in New York; established the *Constellation*, a weekly journal, afterward merged into the *Spirit of the Times*, a sporting journal, and in 1856 founded, in connection with George Wilkes, a new paper with a similar title, *Porter's Spirit of the Times*, which he conducted until his death at New York, July 19, 1858. He edited several volumes of stories upon sporting or humorous topics, and often wrote for other journals besides his own.

Porter's, tp., Montgomery co., Ala. P. 1564.

Portersville, p.-v., Muddy Creek tp., Butler co., Pa. P. 198.

Por'teus (BEILBY), D. D., b. in York, England, May 8, 1731; educated at Christ's College, Cambridge, where he obtained a fellowship and gained the Seatonian prize for

poetry; became chaplain to Archbishop Secker 1762, and to George III. 1769; was appointed bishop of Chester 1776, and of London 1787. D. in London May 14, 1808. Author of a *Review of the Life and Character of Archbishop Secker* (1797), *A Summary of the Evidences of Christianity*, and other works, of which a collective edition, preceded by a memoir, was published in 6 vols., 1811.

Port Ewen, p.-v., Hudson River tp., Ulster co., N. Y., has a large trade in Pennsylvania coal. P. 1251.

Port Gib′son, p.-v., cap. of Claiborne co., Miss., on Bayou Pierre, 8 miles from Mississippi River, with which it is connected by rail, has 1 collegiate academy, 2 public schools, 6 churches, 1 newspaper, 1 carriage establishment, 2 grist-mills, 1 steam cotton-gin, several hotels, and stores. Large quantities of cotton are shipped from this place. P. 1088. FRANCIS MARSCHALK, ED. "STANDARD."

Port Glas′gow, town of Scotland, county of Renfrew, on the Clyde, has large quays, shipbuilding docks, extensive manufactures of sailcloth and ropes, and considerable importation of American timber. P. 10,805.

Port Glasgow, a small port of entry on Lake Erie, in Aldborough tp., Elgin co., Ont., Canada. P. about 100. (P. O. ALDBOROUGH.)

Port Has′tings, p.-v. of Inverness co., Cape Breton Island, has a good harbor called Plaister Cove, and is the landing place of cable telegraphs to Heart's Content, N. F., and to St. Pierre, Miquelon. It is a place of some trade. P. about 600.

Port Hawkes′bury, p.-v. of Inverness co., Cape Breton, has the best harbor on the Strait of Canso, and has a steam-ferry to Port Mulgrave, N. S. P. about 600.

Port Hood, the capital of Inverness co., Cape Breton (lat. 46° N., lon. 61° 34′ W.), has a good harbor, which is a great resort for fishing vessels in bad weather. Beds of coal are found near by. P. about 700.

Port Hen′ry, p.-v., Essex co., N. Y., on Lake Champlain and on Hudson and Delaware R. R., on the W. side of the lake, has good schools, 4 churches, 2 newspapers, 2 fire companies, 2 iron furnaces, and several superior iron-ore mines. P. about 5000.

A. N. MERCHANT, ED. "RECORD."

Port Hope, a flourishing port of entry picturesquely situated on the N. shore of Lake Ontario, in Hope tp., Durham co., Ont., Canada, on Grand Trunk Railway, 63 miles E. of Toronto, and is the southern terminus of Midland Railway. It has a good harbor and a large fleet of vessels. A daily steamer visits Charlotte, N. Y., the port of Rochester. Lumber, flour, and grain are largely exported. The town is lighted with gas, is the seat of Trinity College School, and has 1 daily and 2 weekly newspapers. The town has a valuable water-power, afforded by Smith's Creek, which flows through the place. There are 5 flour-mills, 2 manufactories of ground plaster, lumber, buttons, woollen goods, leather, furniture, beer, and spirits. Port Hope has many tasteful public and private buildings. P. of sub-district, 5114.

Port Hud′son, p.-v., E. Feliciana parish, La., on Mississippi River, is the southern terminus of Clinton and Port Hudson R. R., and noted for important military events during the civil war.

Port Hu′ron, city, tp., and port of entry, cap. of St. Clair co., Mich., situated at the foot of Lake Huron, on Chicago and Lake Huron and Michigan division of Grand Trunk R. Rs., has a public library, excellent schools, 1 daily and 4 weekly newspapers, 2 horse railways, 8 churches, 2 dry docks, 5 shipyards, 5 saw, 2 flouring, and 3 planing mills, 3 foundries and machine-shops. It is engaged in the lumber-trade. P. of city, 5973; of tp. 832. JOHN F. TALBOT, ED. "SUNDAY COMMERCIAL."

Por′tici, town of Southern Italy, province of Naples, beautifully situated on the Bay of Naples, at the western foot of Vesuvius, about 5 miles from the city of Naples. Since 79 A. D. the volcano has poured its burning lava seven times over the spot on which Portici now stands, and as many times has it been rebuilt. The excavations in search of the treasures of Herculaneum were begun here in 1714. The ancient city occupied a portion of the present site of Portici, but also extended beyond it. The modern town consists chiefly of one long street, one fine square, a mole for the convenience of the shipping, a little fort which commands the roadstead, some respectable churches, and a royal palace, from the gardens and terraces of which may be had magnificent views of Naples, the sea, the islands, and the ever-threatening mountain. The chief industry of Portici, apart from the coral and other fishing, and from the small coasting-trade, consists in the manufacture of macaroni and of a variety of ribbons. P. in 1874, 11,792.

Portier′ (MICHAEL), D. D., b. in France Sept. 7, 1795; was consecrated Roman Catholic bishop of Mobile in 1826, the first of that title. D. May 14, 1859.

Port Jack′son, p.-v., Florida tp., Montgomery co., N. Y., on Mohawk River and Erie Canal. P. 446.

Port Jef′ferson, p.-v., Suffolk co., N. Y., on the Long Island R. R., 63 miles E. of New York City, has a good school system, 3 churches, 2 steam saw-mills, 1 newspaper, and stores. Shipbuilding is the principal business. P. about 2500. S. A. TITUS, ED. "LONG ISLAND LEADER."

Port Jefferson, v., Clinton tp., Shelby co., O., on Great Miami River and Miami Canal (PRATT P. O.). P. 410.

Port Jer′vis, p.-v., Deer Park tp., Orange co., N. Y., on Erie R. R. and Delaware and Hudson Canal, at the confluence of the Neversink with the Delaware, and at the intersection of the boundary-lines of New York, New Jersey, and Pennsylvania, beautifully situated in the midst of picturesque scenery, has 6 churches, 1 daily, 1 tri-weekly, and 2 weekly newspapers, 3 banks, fine graded schools, several manufactories, and extensive repair-shops of Erie R. R. Port Jervis acquired considerable celebrity in the spring of 1875, when for several weeks it was threatened with destruction by an ice-gorge, but escaped with the loss of a railway bridge and a few buildings. P. 6377.

Port Ken′nedy, p.-v., Upper Merion tp., Montgomery co., Pa., on Schuylkill River and Philadelphia and Reading R. R. P. 516.

Port′land, a suburb of St. John, N. B., adjacent to that city, but having a separate government and police force. It extends from the harbor on the E. to St. John River on the W. It has many steam saw-mills, some shipyards, a street railway, a gas and water supply, and many handsome residences. A suspension bridge connects it with Lancaster. A rich graphite-mine is wrought here. P. of sub-district, 12,520.

Portland, p.-v., Dallas co., Ala. P. 1740.

Portland, p.-v. and tp., Ashley co., Ark. P. 984.

Portland, p.-v. and tp., Middlesex co., Conn., on the Connecticut River, nearly opposite Middletown, noted for the "Portland quarries" of brown sandstone. P. 4693.

Portland, p.-v. and tp., Whitesides co., Ill., on Rock River. P. 986.

Portland, p.-v., Wayne tp., cap. of Jay co., Ind., on Salamonie River and Cincinnati Richmond and Fort Wayne R. R., has 1 weekly newspaper and a considerable lumber-trade. P. 462.

Portland, p.-v. and tp., Cerro Gordo co., Ia., on Shell Rock River. P. 221.

Portland, cap. of Cumberland co., the largest city of Maine, and the fifth in size in New England, is situated in lat. 43° 39′ 52″ N., lon. 70° 13′ 34″ W., on a small peninsula jutting into Casco Bay. The peninsula occupied by the city proper comprises 1666 acres. The city is well drained, and is supplied with water and gas, a paid fire department with an alarm telegraph and 5 steam fire-engines, a board of trade, and possesses one of the best harbors on the Atlantic coast. The commercial interests of the city are extensive, and embrace in exportation quantities of lumber, sugar, and other commodities, while the importations include West Indian goods and articles of foreign manufacture. As the railroads began to affect the conditions of land-traffic, Portland became the gateway for the business of Maine, securing communication by rail with Boston in 1842, and with Montreal in 1853. A second road was opened to Boston, a direct line to New York *viâ* Worcester was completed in 1874, and a new road to the West through the Notch of the White Mountains and Northern Vermont will be opened in 1876. The gauge of the Grand Trunk R. R., from Portland to Montreal, and thence westward to Sarnia and Detroit, has been changed to correspond to the American gauge, thus permitting the shipment of grain from San Francisco to Portland without change. Portland is the winter port of the ocean-steamers connecting with Grand Trunk R. R. at Montreal in summer, and plying to Liverpool and Glasgow. There are 2 lines of steamers daily to New York, daily boats to Boston, and lines to Bangor, St. John, and Halifax. The value of imports at this port for 1872 was $22,523,232; of exports, $21,465,522. Portland has 2 public libraries, several scientific and literary societies, 6 musical clubs, numerous charitable associations, 25 churches, 3 lines of street-cars, 8 banks, besides private banking-houses, 3 daily and 9 weekly newspapers, a safe-deposit company, 2 iron-rolling mills, manufactories of locomotives and marine-engines, a dry dock deeper than any other in the U. S., and manufactories of carriages, furniture, varnishes, etc. P. 31,413.

H. W. RICHARDSON, ED. "ADVERTISER."

Portland, p.-v. and tp., Ionia co., Mich., on Detroit Lansing and Lake Michigan and Coldwater Marshall and Mackinaw R. Rs., 110 miles W. of Detroit, has fine water-power, a union school, 5 churches, 2 banks, 1 newspaper, 2 flouring-mills, 2 foundries and machine-shops, 2 saw-mills, 3 hotels, and stores. P. of v. 1060; of tp. 2353.
J. W. Bailey, Ed. "Observer."

Portland, p.-v. and tp., Callaway co., Mo., on Missouri River. P. 121.

Portland, p.-v. and tp., Chautauqua co., N. Y., on Lake Erie, Lake Shore and Michigan Southern, and Buffalo Corry and Pittsburg R. Rs., includes the village of Centreville and Brocton. P. 1887.

Portland, tp., Erie co., O., includes the city of Sandusky. P. 681.

Portland, the chief city of Oregon, cap. of Multnomah co., on the W. bank of Willamette River, 12 miles above its confluence with the Columbia, at the head of ship-navigation, is well laid out, built, paved, lighted, and shaded; is the N. terminus of Oregon Central R. R., and connected by ferries with E. Portland, the N. terminus of Oregon and California R. R. By steamers on Willamette and Columbia rivers Portland is in daily connection with the S. terminus of Pacific division of Northern Pacific R. R. at Kalama, Wash. Ter., and has frequent communication with British Columbia and with San Francisco. The exportation of wheat and flour to Great Britain, New York, Japan, and China has developed largely since 1868. There was in 1873–74 a tonnage of nearly 200,000, with a registry of 61 vessels, in the coasting trade. The U. S. courts for Oregon are held here. There are 14 newspapers, 16 churches, 4 banks, numerous foundries, saw-mills, and factories, good graded schools, an Episcopalian grammar and divinity school, 2 Roman Catholic academies, a library association, and good public buildings. Laid out in 1845, Portland was incorporated as a city 1851. A large part of the city was burned Aug. 2, 1873, but has been rebuilt in better style. P. 8293.

Portland, p.-v., Upper Mt. Bethel tp., Northampton co., Pa., on Delaware Lackawanna and Western R. R.

Portland, p.-v. and tp., Preston co., West Va., on Baltimore and Ohio R. R. (Cranberry Summit Station). P. 1997.

Portland, tp., Dodge co., Wis. P. 1286.

Portland, tp., Monroe co., Wis. P. 630.

Portland Beds, in the British Upper Oolite, is the name (1) of a stratum resting on the Shotover sandstone, and (2) of a dirt-bed in the Lower Purbeck, lying over the former and associated with fresh-water marls. Fishes, mollusks, marsupials, and Insectivores have left their remains in these strata. The Portland stone, so famous for building purposes, is from these and the overlying strata. The best is from the lowest beds. It is a limestone, and is quarried in very large amounts.

Portland, Isle of, also called, from its shape, the **Bill of Portland,** a peninsula projecting into the English Channel from the coast of Dorsetshire, England, rises 458 feet, is connected with the mainland by a ridge of loose shingle, the Chesil Bank, and is noted for its quarries of excellent building-stone, the Portland stone of which St. Paul's cathedral in London is built; its fine breed of sheep, Portland mutton; the old castle, erected by Henry VIII.; the magnificent breakwater, with which are connected a naval station and a harbor of refuge; its prisons, capable of accommodating 1500 convicts, etc. (See Breakwater.)

Portland (or **Barberini**) **Vase,** a cinerary urn of blue glass covered with an enamel of white glass, and cut in cameo, so as to show a finely artistic group of the wedding of Thetis and Peleus. It once held the ashes of a relative of the emperor Alexander Severus, perhaps his mother, Mammæa, or those of the emperor himself. It dates from the third century A. D. It was found in the sixteenth century in a rich sarcophagus on the Monte del Grano, and was placed in the Barberini Palace. In 1770 it was bought by Sir W. Hamilton, and in 1810 was placed in the British Museum by the duke of Portland. In 1845 it was wantonly broken by one Lloyd, but the numerous pieces have been carefully united. It is ten inches high, and is one of the most valued relics of antiquity.

Port'landville, p.-v., Milford tp., Otsego co., N. Y., on Cooperstown and Susquehanna Valley R. R.

Port Lava'ca, p.-v., Calhoun co., Tex., on Matagorda Bay.

Port Ley'den, p.-v., Leyden tp., Lewis co., N. Y., on Black River and Utica and Black River R. R., has 1 newspaper, a fine water-power, and a large trade in lumber. P. 977.

Port Lou'is, capital of the English colony of Mauritius, on the north-western coast of the island. It is well built and strongly fortified, has a good harbor, barracks, a public library, a theatre, and a botanic garden, and forms the centre of the commerce of the colony. P. 30,000.

Port Loui'sa, p.-v. and tp., Louisa co., Ia., on Mississippi River. P. of v. 75; of tp. 774.

Port Lud'low, p.-v., Jefferson co., Wash. Ter., on Puget Sound. P. 259.

Port Mad'ison, p.-v., cap. of Kitsap co., Wash. Ter., on Puget Sound, 32 miles S. of Port Townsend. P. 249.

Port Mahon', town of Spain, capital of Minorca, situated on the southern coast of the island, has a spacious, safe, and strongly-fortified harbor, capable of accommodating a whole fleet of men-of-war. P. 12,600.

Portneuf', county of Quebec, Canada, extending N. W. from the St. Lawrence. Cap. Portneuf. P. 22,569.

Portneuf, p.-v., cap. of Portneuf co., Quebec, Canada, on the N. bank of the St. Lawrence, has manufactures of paper and a trade in flour and lumber. P. about 600.

Por'to Ale'gre, town of Brazil, capital of the province of São Pedro do Sul, on the shore of Lake Patos, through which it communicates with the sea. It is well built and progressing. P. 20,000.

Porto Empedocle, seaport-town of Sicily, province of Girgenti, about $5\frac{1}{2}$ miles from the city of Girgenti. The mole was built by Charles III. of Naples, and, though the harbor is in many respects very deficient, yet it is the best on the S. coast of Sicily. The Italian government proposes extensive improvements in this port. P. in 1874, 7000.

Por'to Ferra'io, town in the island of Elba, embraced in the province of Leghorn. It stands on a considerable elevation, terminating in a double summit, commanded by two higher hills upon which strong castles were built by Cosimo I. It is sheltered by a promontory, and the port, opening to the N. N. E., is one of the safest and deepest found in the Italian islands. Nearly 1000 vessels annually take refuge here in bad weather, and the number entering for commercial purposes is about 1100. The town is surrounded by bastions, and the lower part extending to the mole is called the "Linguella." Seen from the water, the little city is almost imposing, but the streets are narrow and the buildings generally insignificant, except the palace and other constructions erected during the short stay of Napoleon I. on this island. Porto Ferraio is generally believed to be the *Ferraium* of the Romans, so named from the iron brought hither for transportation from the inexhaustible mines of the island. It sustained many sieges during the mediæval wars, and was the theatre of important military operations as late as 1799. The vine thrives in the neighborhood, but the town lives chiefly by fishing and by the manufacture of salt. P. in 1874, 5789.

Porto Maggio're, town of Italy, province of Ferrara, situated between two affluents of the lagoons of Comacchio, and so surrounded by water as to form an island accessible by six bridges. There is a tradition that it was once a seaport, though the Adriatic is now 22 miles distant. Porto Maggiore suffers greatly from malaria, but is the centre of an extensive trade in cattle and in agricultural produce. P. in 1874, 15,150.

Porto Mauri'zio [*Portus Mauritii*], seaport-town of Italy, province of the same name, about 14 miles from San Remo. It is strikingly situated on a hill overlooking the water, and was once well fortified and walled. The harbor is formed by two moles, and is entered from the S. S. W. Being quite unsheltered on the S., it is unsafe in heavy southern gales, but it is much frequented for the coast-trade. There are some fine churches here containing pictures worthy of notice. P. in 1874, 7000.

Por'to No'vo, town of British India, presidency of Madras, on the Coromandel coast, in lat. 11° 31′ N., has large iron-foundries. P. about 12,000.

Port Oram, p.-v., Morris co., N. J., on Morris and Essex and Chester R. Rs.

Por'to Ri'co, an island in the West Indies, one of the Greater Antilles, belongs to Spain, and comprises an area of 3530 sq. m., with 621,500 inhabitants, of whom one-half are white, one-third creoles, and the rest negroes. From W. to E. the island is traversed by a range of mountains whose average height is 1500 feet, but which in some peaks reach a height of above 3000 feet. In some places these mountains approach very near to the sea, but generally they leave a belt of low coast-land from 5 to 10 miles broad and consisting of rich alluvial soil. Numerous short rivers flow out from among the mountains and form lagoons along the coast, but most of them are navigable to the foot of the mountains, and the island is rich in good

harbors. The climate is hot, especially in the valleys and the coast-land, but not unhealthy. Water is abundant, and the vegetation is very rich. Forests of tropical density cover the mountains, and rice, maize, sugar, cotton, and coffee are extensively cultivated. The following table shows the exports for three consecutive years:

	1870.	1871.	1872.
Sugar, cwts	2,025,966	2,162,666	1,885,241
Molasses, gallons	7,293,011	7,590,915	6,087,550
Coffee, cwts	192,645	210,066	177,208
Tobacco, cwts	86,105	55,240	61,761
Cotton, cwts	7,066	7,800	5,139
Hides, cwts	....	6,838	5,644
Rum, gallons	2,458	19,896	2,513

Many cattle are reared, and of a good breed. Copper, iron, lead, coal and saltworks are in operation; gold is found. The island is remarkably free from beasts of prey and serpents, but it is infested with rats, thousand-legs, mosquitoes, and other tormenting insects. Cap. Porto Rico.

Por′to Tol′le, or **San Nicolò,** town of Italy, province of Rovigo, situated on the Po at the point where the Tolle separates itself from the main stream. In 1860 a hurricane prostrated many of the houses, and swept away the cabins of the neighboring peasants. P. 5350.

Port Penn, p.-v., St. George's hundred, Newcastle co., Del., on Delaware River. P. 320.

Port Per′ry, p.-v. of Reach tp., Ontario co., Ont., Canada, on Whitby and Port Perry Railway, 47 miles from Toronto, and on Scugog Lake, has an extensive trade in grain and lumber by rail and steamboat, and has 1 weekly newspaper. A floating bridge three-fourths of a mile long extends to Scugog Island. Lumber is extensively sawed. P. about 1500.

Por′trait-Painting (or, that we may include sculpture, as well as painting, **Por′traiture**) is in human nature, and therefore it is vain to seek its origin in time and place. Vanity may have given it birth, but love was no doubt a more moving cause. The fable takes this side which says it began with the maiden who traced, with a coal from the hearth, the shadow of her lover's head on the wall. Yet, so little of what the oldest races did in this field remains to us that until Mariette's discovery in Lower Egypt of portrait-statues belonging to the third dynasty (B. C. 4449) we had a right to believe the art of portraiture to be of recent origin. Coming down to historic times, perhaps the earliest portraits of which we have any mention are those Apelles made of Alexander and Antigonus. We have but little record of the subsequent history of portraiture in Greece, for nearly all traces of Greek painting have disappeared, and no well-authenticated portrait-bust of antique Greek workmanship exists. The Romans had a great liking for portraits, and though we have little of their painting left, yet it may be that if more of it had been spared we should have seen that their painters were no less occupied with portraiture than their sculptors, since, of all the marbles left us from Roman times, a goodly share are busts or statues—portraits of their emperors, empresses, patricians, and notables.

The revival of painting in Italy in the thirteenth century was exclusively in the interests of the Church, but even Giotto introduced portraits of his contemporaries into his religious pictures, and his example was followed not only by his pupils, but by almost every succeeding Italian artist. An important exception is Michelangelo, who left no portraits. Even the statues of Lorenzo and Giuliano in the Medici chapel he declared he did not intend for portraits. The innovation made by Giotto led naturally to portrait-painting for its own sake, but it was late before portraits were painted as separate pictures. Raphael and his contemporaries, with their immediate successors, brought the art to its full perfection.

In Spain, Velasquez is the greatest name, but less skill than his, which was supreme, would have sufficed to give pre-eminence in a country where portrait-painting was so little practised as it was in the Peninsula. N. of the Alps, Van Eyck, Cranach, Dürer, Holbein, Rubens, Franz Hals, and Rembrandt distinguished themselves in portraiture. Holbein belongs, however, as much to England as to Germany; most of his finest portraits are in England. Since his time Germany has not produced any great portrait-painter.

In France no native-born portrait-painter of any distinction appeared until the eighteenth century. Francis I. invited several Italian artists into France, chief among them Leonardo da Vinci, from whose hand the king hoped he might get other portraits equal to that of Mona Lisa del Giocondo, now in the Louvre, on which Leonardo worked for four years, and which Francis bought of him for 4000 golden crowns. But, as is well known, Leonardo did not paint a single picture while he was in France.

In England, Holbein may be said to have created portrait-painting: he had many imitators, some of them most skilful, yet, though the country did not produce many portait-painters of consideration before the eighteenth century, she welcomed good painters from other lands. In Mary's time, Antonio Moro came from Utrecht, and in Elizabeth's reign Federigo Zucchero, an Italian, was in vogue. A Dutch painter, Lucas de Heere, also found employment. Later were the two Olivers, of French extraction; they were miniature-painters, and contemporary with them was Nicholas Hilliard, one of the first Englishmen by birth who gained distinction in the art. The brief visit of Rubens gave, after Holbein, the second great impetus to the art of portrait-painting in England. He remained in the island only one year, but he painted many portraits. He was followed by his great pupil, Van Dyck, who became for England a standard of excellence in portraiture. Contemporary with him was George Jameson, who had studied with Rubens, and who enjoyed in his own day a reputation second only to that of Van Dyck. The next name of repute is that of Samuel Cooper, a miniature-painter, born in England. He is reckoned a master in his own art. Peter Lely, a Westphalian, came to England and established himself as a portrait-painter. Besides Cromwell and many of his chiefs, he painted all the beauties of Charles II.'s harem. Cornelis Janssen of Leyden, a good painter, came over in 1618. While Lely was flourishing, Gottfried Kneller, a native of Lubeck, arrived; he had already gained some distinction in Europe. He had great success in England, and painted Dryden, Addison, and Pope, with nearly every notable man and woman of his time in the island. With the appearance of Sir Joshua Reynolds (1723–92) began a new and more fruitful period, the third important influence affecting the growth of painting, and particularly of portrait-painting, in England; and from his time to the present the history of English portraiture has never wanted for splendid names. Reynolds essayed historical painting, but his failures in this field cannot be seen for the splendid light that streams from his portraits. He painted men, women, and children with equal sympathy and delightfulness, and no artist that ever lived has left a work behind him richer in all that wins the love and admiration of mankind. If his times were not England's noblest, he makes them seem so; and all that England had of noble and beautiful in man or woman is illustrated by his canvases. Thomas Gainsborough, his contemporary (1727–88), would have been a dangerous rival if he had devoted himself as exclusively to portraiture as Reynolds did, but he preferred landscape-painting, and though his portraits are charming, yet he is widest known as one of the founders of landscape-painting in England. Another notable painter of this time was Romney (1734–1802), whose reputation has increased with time. John Opie (1761–1807) also gained considerable distinction.

The modern French school began with David (1748–1825), who was before all a so-called historical painter, but who made some excellent portraits. France has, however, never had a great artist whose name is identified exclusively with portrait-painting, or even to any considerable extent so identified. With those even who have excelled in it, it has always been held of secondary importance. Yet Gérard (1770–1837) made many interesting portraits, and those of Ingres (1781–1867) must surely outlive all but two or three of the imaginative compositions on which he thought to build his fame. Within a few years portrait-painting in France, as in England, has been taken up by some of the foremost men, and in the Royal Academy exhibitions the portraits by Holman Hunt, Watts, and Millais are looked for with the same interest that attends their other works.

Sculpture in England has been more successful in portraiture than in ideal work. It owed its modern impulsion to a Frenchman, Roubiliac (1695?–1762), who came to England in 1720, and by the very excess of his dramatic conception and the superfluous energy of his execution gave an impetus to his art in England which in a dull, pedantic time bore down everything before it. He was followed by a number of distinguished sculptors—Flaxman, Banks, Nollekens—Flaxman the greatest of all, but less known as a sculptor of portraits than the others. The line of statuaries has been unbroken in England from their time to our own, and the talent of Englishmen in this field has been for the most part directed to portraiture. The better-known names in English sculpture are Westmacott, Gibson, Foley, Bell, Marshall-Wood, Boehm, and Woolner. The portrait-busts of the last two are productions of singular merit, and future ages, no less than ours, will rejoice that such sculptors as Boehm and Woolner should have been found to preserve for us the features of Carlyle and Tennyson.

In America the art of portraiture properly begins with Copley, born in Boston in 1737, but who went to England

in 1774, when he was thirty-seven, and remained there the rest of his life, dying in 1815. He was an artist of native growth, and if Heaven had vouchsafed an atmosphere more genial to the arts than either America or England at that time afforded, he would doubtless have developed larger qualities than were perhaps possible under the circumstances in which he was educated. His manner of painting was somewhat cold and hard, but he drew well, his color is agreeable, and he gave a good deal of life and animation to his heads. He was followed by John Trumbull, who, though he failed as an historical painter, deserves to be remembered for his miniatures. Another excellent miniature-painter was Malbone. The next most distinguished name to Copley is, however, that of Gilbert Stuart (1756–1828), an artist who when at his best was one of the excellent painters of his time, whether at home or abroad. Other notable names, and bringing us down to our own time, are those of Leslie, Sully, Inman, Harding, Healy, Elliot, Baker, Huntington, and Page, not forgetting that of Furness, who died young, but left behind him work that gave promise of a brilliant future.

It may be remarked, in closing, that the world is unfortunate in that she has no portraits of the few greatest ones who have shaped her spiritual and intellectual life. Of Moses, of David, of Mohammed, of Confucius, of Booddha, of Aristotle, of Plato, of Socrates, of Jesus, we have no hint of any portrait. The so-called busts of Socrates, if meant for him at all, were probably made in later times from the descriptions of his contemporaries. The busts of Plato are now considered to be ideal heads of the Indian Bacchus. The pictures of Jesus are either formed directly on the antique types of Zeus or Apollo, or else upon the fictitious letter of Lentulus to the Roman senate. The discovery in our own day of the lost portrait of Dante by Giotto—thanks to stupid restorers and feeble copyists, lost again as soon as found—the discovery of a supposed death-mask of Shakspeare, and the bringing to light a forgotten bust of Milton, have shown at once how strongly the world desires to see how her great children looked when among men, and how far that desire is from being accomplished. For the most part, the antique world of men and women exists for us only in fancy; but the after-world, if it should care to know how the famous people of this age looked, will find abundant record, not only in the work of our painters and sculptors, but in the mechanic copies of the century's illustrations made by the photograph, an invention which is to the art of our day what the invention of printing was to literature in the fifteenth century. CLARENCE COOK.

Port Repub'lic, p.-v., Galloway tp., Atlantic co., N. J.

Port Republic, p.-v., Rockingham co., Va., on Shenandoah River, noted for the battle of June 8, 1862, won by Gen. "Stonewall" Jackson.

Port Rich'mond, v., Centre tp., Wapello co., Ia., on Des Moines River. P. 85.

Port Richmond, p.-v., Northfield tp., Richmond co., N. Y., on N. side of Staten Island and on Kill von Kull River, 8 miles S. W. of New York, with which it has hourly connection by steamer; was incorporated as a village 1866; has 1 newspaper, 4 churches, convenient docks for shipping, and some manufactures. P. 3028.

Port Row'an, a port of entry of Walsingham tp., Norfolk co., Ont., Canada, on Lake Erie, has a good harbor, and ships immense quantities of lumber and logs and considerable grain. P. about 900.

Port Roy'al (or, more properly, **Port Royal des Champs**), founded in 1204 by Matthieu de Montmorency at Chevreuse, near Versailles, as a monastery for Bernardine or Cistercian nuns. In the course of time it became noted as an educational institution, to which the French nobility sent their young daughters, but at the same time it lost to some degree its religious character, until in the beginning of the seventeenth century the abbess, Mère Marie Angélique, thoroughly reformed the establishment and revived the old religious discipline, with its rigid seclusion, poverty, and asceticism. She was a sister of Antoine Arnauld, "the great Arnauld," professor in theology at the Sorbonne and an ardent disciple of Jansen, and thus the monastery became Jansenistic. It flourished, and the number of nuns increased rapidly. In 1625, Hôtel de Clugny, in Faubourg de St. Jacques, Paris, was bought, and a branch institution was founded here under the title of Port Royal de Paris, and in 1626 a new and extended abbey was erected at Port Royal des Champs. Meanwhile, a number of pious and learned men had established themselves at a farmhouse near Port Royal des Champs, called Les Granges, for the purpose of leading a secluded and ascetic life, devoted to studies and religious exercises; and when the nuns moved to the new abbey they were allowed to occupy the old place under the immediate jurisdiction of the archbishop of Paris. They were all Jansenists, and soon Port Royal became famous as the centre of the whole Jansenistic movement and the focus of the opposition to the Jesuits. Here the Jansenists founded a school and issued their celebrated handbooks in grammar, mathematics, logic, etc., and here were prepared those formidable attacks on the Society of Jesus which startled the whole world. But in 1664 the community was scattered by force; in 1669 the two monasteries, Port Royal des Champs and Port Royal de Paris, were separated, and the latter reorganized under the influence of the Jesuits; and when the nuns of Port Royal des Champs still refused to subscribe to the papal condemnation of Jansen, they were dispersed in 1709, and imprisoned in various other monasteries of France, and the buildings of their abbey levelled to the ground. (See Fontaine, *Mémoires pour servir à l'Histoire de Port Royal* (2 vols., 1736); Racine, *Histoire abrégée de Port Royal* (1742); Sainte-Beuve, *Port Royal* (5 vols., Paris, 1840–60), a most excellent work, sometimes overwhelming, and even exhausting, the receptive power of an ordinary reader, but giving a most valuable picture, at once sympathetic and impartial, of the scientific ideas, the moral character, and the social influence of the Jansenists.

Port Royal, P. O. name PERRYSVILLE (which see).

Port Royal, p.-v., Beaufort co., S. C., noted for one of the earliest settlements made by the Spaniards within the present limits of the U. S., for important events during the war of the rebellion, and as the present (1876) rendezvous of the North Atlantic squadron of the U. S. navy. The harbor is one of the finest in the world.

Port Royal, p.-v. and tp., Caroline co., Va., on Rappahannock River. P. 435; of tp. 3543.

Port Saeed', town of Egypt, at the junction of the Suez Canal with the Mediterranean, was in 1862 an insignificant village, but has now between 8000 and 9000 inhabitants, and its harbor, formed by two immense moles, is annually visited by over 1000 vessels.

Port San'ilac, p.-v., Sanilac tp., Sanilac co., Mich., on Lake Huron.

Port Sarnia. See SARNIA.

Ports'mouth, town of England, county of Hants, on the small island of Portsea, which is separated N. from the mainland by a narrow strait crossed by a bridge at the entrance of Portsmouth Harbor, an inlet of the English Channel, 4 miles long, 5 miles broad, but only 220 yards across its entrance, and affording convenient and perfectly secure anchorage. Portsmouth, like Plymouth, is a triple town, consisting of Portsmouth proper, Portsea, adjoining on the N., and GOSPORT (which see), the latter on the opposite side of the harbor, communicating by a flying bridge. The dockyard is the most important establishment of that description in the United Kingdom, not only as regards its capability for building, repairing, and refitting ships of war, and the vast amount of stores of every denomination accumulated there for the service of the fleet, but also from its central position on the S. coast of England. It comprises an area of 293 acres of land, containing wet and dry docks, warehouses, anchor-forges, iron and copper mills, rope-houses, and every kind of establishment necessary for the construction and outfit of a ship-of-war. The royal Clarence victualling yard, formerly one of the large naval establishments of Portsmouth, is now removed to Gosport. Plymouth and Portsea are encircled by a fortified *enceinte* of the last century. As at Plymouth, the modern exigencies of defence have, under action of the defence commission appointed in 1859, removed the perimeter of defence to a chain of works built on modern types from 3 to 5 miles distant, and including in its length the crest of the commanding Potsdam Hill. Closely associated with Portsmouth as a naval dépôt, and with its defence from maritime attack, is the important anchorage of Spithead. P. 113,569.

Portsmouth, p.-v. of Frontenac co., Ont., Canada, has an excellent harbor, 2 miles W. of Kingston. It is the seat of Kingston penitentiary and of the Rockwood lunatic asylum, a beautiful structure. There is a marine railway, a tannery, a brewery, and a handsome town-hall. P. of sub-district, 1702.

Portsmouth, p.-v. and tp., Bay co., Mich., on Saginaw River and Flint and Père Marquette R. R. P. 1243; of tp. 1660.

Portsmouth, city and port of entry, cap. of Rockingham co., N. H., situated on the right bank of Piscataqua River, 3½ miles from the sea, in lat. 43° 04′ 35″ N., lon. 70° 45′ 08″ W. The climate is superior to that of any seaport N. of Cape Cod, the average temperature ranging higher in winter and lower in summer, with less fall of rain and more clearness. The first settlement was made at Little Harbor (now Rye) by the English in 1623, the most compact part of the city being known as Strawberry

Bank, from the abundance of this fruit that grew there. In 1653 the whole township was formally named Portsmouth, and in 1849 the town was incorporated as a city. Portsmouth contains 2 libraries of about 14,000 volumes, a mineralogical cabinet, 14 public schools, 10 religious societies, 7 banks, 2 military companies, a fire department, a cotton-mill, 2 breweries, several weaving establishments, 2 daily and 2 weekly newspapers, a fine custom-house, and many flourishing stores and elegant private residences. The U. S. navy-yard, situated about half a mile distant, is built upon two islands lying on the Kittery side of the river, and comprises 170 acres. Though in fact in another town and State, it is intimately connected with this city, and is commonly known as the Portsmouth navy-yard. The Eastern R. R. connects here with Portsmouth Saco and Portland R. R., while Portsmouth and Concord, Dover and Portsmouth, and Conway and Great Falls R. Rs. all terminate here. Portsmouth is the only seaport and customs entry in New Hampshire. Its harbor is capacious and one of the best in the U. S., having a depth of 40 feet at the entrance at low tide, with a mean rise and fall of 8½ feet, and never freezing. Commerce and shipbuilding are the chief industries, and have been from the earliest times. Two shipyards are still in active operation building for the merchant marine. Many celebrated war-vessels have been constructed here. In 1690 the Falkland of 54 guns was built by order of the British government, and she was followed by the America of 50 guns in 1749 for the same government. The famous Ranger of 18 guns was turned out in 1777 by order of the Continental Congress, and was commanded on her first cruise by John Paul Jones, the Farragut of the American Revolution. The ship was the first one to carry the Stars and Stripes and to receive a salute. These vessels were followed by many others, and to-day she ranks among the foremost of the shipbuilding-yards of the U. S. P. 9211. C. W. TUTTLE.

Portsmouth, p.-v., Carteret co., N. C. P. 341.

Portsmouth, city, Clay tp., cap. of Scioto co., O., at the confluence of Scioto River with the Ohio, and at the S. terminus of Ohio and Erie Canal, on a branch of Marietta and Cincinnati R. R., is the shipping-point for the mineral regions of S. Ohio and N. E. Kentucky, and for the fertile valley of the Scioto, through which a railroad will shortly be built; has about 12 churches, 6 banks, 3 newspapers, 7 building associations, 2 rolling-mills, 3 foundries, several saw and planing-mills, numerous manufactories; has Holly waterworks, an opera-house, a Masonic temple, graded public schools, and a flourishing river-commerce. P. 10,592.

Portsmouth, p.-v. and tp., Newport co., R. I., embraces the northern half of Rhode Island; has many villas and picturesque places of resort for summer visitors. P. 2003.

Portsmouth, city and port of entry, cap. of Norfolk co., Va., at the E. terminus of Seaboard and Roanoke R. R., on the E. bank of Elizabeth River, opposite Norfolk, with which it is connected by ferry, has one of the best harbors in the U. S., is the seat of Gosport navy-yard, of a dry dock, and naval hospital, and has lines of steamers to the principal Atlantic seaports. The exports are cotton, lumber, oak staves, naval stores, pig iron, and early vegetables for the Northern cities. There are 13 churches, 2 banks, 3 hotels, 1 daily newspaper, 2 academies, 12 public and 41 private schools, and several manufactories. P. 10,492.

Port Stan'ley, flourishing and beautiful port of entry in Elgin co., Ont., Canada, the S. terminus of London and Port Stanley Railway, 24 miles long. A steamer plies between this port and Cleveland, O., 85 miles distant. P. about 900.

Port Tobac'co, p.-v., Duffield tp., cap. of Charles co., Md., at the head of Port Tobacco Bay on Potomac River, has 1 newspaper, and was formerly an important shipping-point. P. 215.

Port Towns'end, p.-v., cap. of Jefferson co., Wash. Ter., on Port Townsend Bay and the Strait of Juan de Fuca, has a large lumber-trade and 1 weekly newspaper. P. 593.

Por'tugal [from *Portus Cale*, the ancient name of the city of Oporto], an independent kingdom of Europe, occupying the western part of the Iberian peninsula, between lat. 36° 57′ and 42° 8′ N. and lon. 6° 12′ and 9° 32′ W., and bounded N. and E. by Spain, S. and W. by the Atlantic, comprises an area of 34,500 sq. m., with a population of 3,990,570, and is divided into the following six provinces:

Provinces.	Area.	Pop.	Capital.
Minho	2807	971,001	Oporto.
Tras os Montes	4289	365,833	Bragança.
Beira	9244	1,294,282	Coimbra.
Estremadura	6872	839,691	Lisbon.
Alemtejo	9416	331,341	Evora.
Algarve	1872	188,422	Faro.

The Azores and the islands of Madeira and Porto Santo are directly connected with the kingdom with respect to their administration. The colonial possessions in Africa and Asia comprise an area of 639,000 sq. m., with 3,200,000 inhabitants, and consist—in Africa, of Cape Verd Islands, São Thomé, and Principe Islands, several points in Senegambia, Angola, and Benguela (250,000 sq. m.; pop. 2,000,000), Mozambique, and Sofala (380,000 sq. m.; pop. 300,000); and in Asia, of Goa, Salsette, Damaun, Macao, and Timor (5527 sq. m.; pop. 250,000). The surface is in all its principal features simply a continuation of Spain, and will be described there. The most prominent groups of mountains are that which enters the country between the Douro and the Tagus, traverses the provinces of Beira and Estremadura in several parallel chains, Serra da Estrella in the north-eastern part, Torres Vedras, Mafra, and Cintra in the south-western, and ends in Cabo da Roca, about 2000 feet high, on the Atlantic coast; and that which under the name of Serra de Monchique forms the boundary between the provinces of Algarve and Alemtejo, and ends in Cape St. Vincent. The coast is low between Cape St. Vincent and the mouth of the Tagus, in some places sandy, in others marshy; between the mouths of the Mondego and the Douro it presents the same aspect, but between Cabo da Roca and the Mondego it is high, rocky, and rough. It affords only a few good harbors—Oporto at the mouth of the Douro, Lisbon on the estuary of the Tagus, Setubal, Aveiro, Figuera, and Viana. The immense surf which from the Atlantic sets in on the coast has generally formed bars at the entrance of the harbors, and makes access to them difficult with certain winds. The soil is generally fertile, and the mountain-scenery often surpassingly fine. Large deposits of anthracite coal are found at Valongo, near Oporto; lead is mined in considerable quantities at Braçal; salt is produced at different places to the amount of 60,000,000 bushels annually; gold, silver, copper, and tin are also found, but mining is not carried on with any high degree of energy. The climate is milder than that of Spain, the summer heat being tempered by breezes from the sea, and severe cold with snow being unknown except in the northern mountain-districts. Algarve and the southern part of Alemtejo are the hottest parts of the country, and suffer often severely from droughts. Extensive forests of oak, elm, ash, pine, and chestnut, occupying an area of more than 300,000 acres, are found principally in the northern part; in the southern, large plantations of cork trees and date-palms; in the central, of olive and mulberry trees, the olive plantations occupying an area of more than 100,000 acres, and yielding an annual production of 5,500,000 gallons of oil. The orange, lemon, citron, fig, peach, walnut, and almond are raised throughout the whole country, and are of excellent quality. The principal cereals are wheat (5,500,000 bushels), rye (6,000,000), maize (14,000,000), and rice (400,000), but agriculture is in a very backward state, and the produce is barely enough to satisfy home demands. The cultivation of the olive tree and the vine is carried on with more care, and yields a considerable quantity for exportation. The vineyards of Portugal, of which the most important are situated in the valley of the Douro, cover an area of 473,517 acres, and produce annually about 132,500,000 gallons of wine. The finest breed of cattle is reared in the northern provinces, of sheep in Beira, of horses in Alemtejo. Mules and asses are generally used as beasts of burden. Goats and pigs are very numerous, especially in the mountain-districts; bees and silkworms are also extensively reared. Fish abound; the tunny and anchovy fisheries of Algarve are important. Some few wild animals, such as the wolf, the wild-boar, are found; small game is abundant.

The commerce and manufacturing industry, although steadily progressing, are still only little developed. Some cotton, wool, silk, paper, glass, and soap factories are in operation, and manufactures of earthenware, chemicals, hats, lace, copper, tin, and wicker ware are carried on. The foreign trade is principally with Great Britain, though also to a considerable extent with Brazil and France. The value of exports amounted in 1871 to $23,386,000; that of imports to $29,876,000; the principal articles of exportation are wine, olive oil, salt, chemicals, copper pyrites, dried fruit, pork, silver, cork, etc.; of importation, textile fabrics, coal, iron goods, timber, hides, tobacco, coffee, tea, etc. In 1873 the merchant navy consisted of 17 steamers, with a tonnage of 14,536, and 415 sailing vessels, with a tonnage of 93,815. But the internal means of communication—roads, canals, railways, etc.—are still insufficient, though large sums have been expended in the last few years for this purpose; and a still worse impediment to the rapid development of the material interests of the country is the confused state of the finances. In 1871–72 the revenues amounted to $20,310,832, the expenditures to $24,015,605, and for the last thirty years no budget has

been without a deficit. The national debt, which originated in 1796 by a loan of $4,500,000, amounted in 1873 to $364,165,000, with an annual interest of $11,080,000, which is sometimes paid, and sometimes not. The government is an hereditary monarchy, with a free constitution. The state religion is the Roman Catholic, but all religions are tolerated. There were 632 monasteries and 118 nunneries, with over 18,000 monks and nuns, and an annual income of about $5,000,000, dissolved in 1834, and their property confiscated. Primary instruction is compulsory, but in this, as in many other cases, the laws of the country would be very good if they were duly carried out.

Portugal was originally inhabited by Celtic and Iberian tribes. In the second century before our era it was conquered by the Romans and made a province under the name of *Lusitania*, after one of the principal tribes settled on the soil; in the fifth century after Christ it was overrun by the Visigoths, and in the eighth it was subjugated by the Moors. But at the close of the eleventh century Alfonso V., king of Leon and Castile, conquered the region between the Minho and the Douro from the Moors, and gave it to his son-in-law, Henry, about 1095; and from this point begins the national history of the Portuguese. Henry called himself count of Portugal, transferring the name from his capital, Porto Cale, to his whole dominion, and his son Alfonso assumed the title of king on the battle-field of Ourique in 1139, having defeated the Moors and extended his possessions to the Tagus. In 1253 the kingdom comprised nearly the same area as to-day. The most brilliant period of its history was in the fifteenth and sixteenth centuries, when the Portuguese occupied a prominent place among the European nations on account of their scientific knowledge, their practical enterprise, and their wealth. Prince Henry the Navigator (1394–1460) awakened that enthusiasm for the study of geography, astronomy, navigation, etc. and started the series of maritime explorations, which finally led to the discovery of America. In 1420, Porto Santo, and in 1421 Madeira, were discovered by Tristam Vaz, and soon after colonized. In 1445, Dinis Diaz passed Cape Verd; in 1486, Bartolomeu Diaz doubled the Cape of Good Hope; in 1497, Vasco da Gama found the way S. of Africa to India; Goa, Ceylon, the Moluccas, etc. were conquered, and all the riches of India began to flow into the harbors of Portugal. In 1500, Cabral discovered Brazil and took possession of it, and for more than half a century Portugal occupied the position of a grand power in the political system of Europe; Lisbon was at this time the centre of the commerce of the world. But under John III. (1521–57) the Jesuits came into the country with the Inquisition, and they soon succeeded in burying the energy of the people under dull superstition, and in training its passions for the cruelties of religious fanaticism. Aug., 1578, King Sebastian and his whole army, consisting of the flower of the nation, perished in the battle of Kassr-el-Kebir against the Moors, and thereby the military and pecuniary strength of the empire was broken. In 1580 the dynasty became extinct with Cardinal Henry, and Portugal now passed into the hands of Philip II. of Spain, during whose wars with the Netherlands it lost its commerce and its colonies. Impoverished and degraded, it still had strength enough left to reconquer its independence in 1640, when a general revolt against the Spanish dominion broke out, and the dynasty of Braganza was placed on the Portuguese throne with John IV. (1640–56). The country was once more rapidly advancing toward prosperity under the energetic government of Pombal, but under the long reign of Maria I. (1777–1816) the Jesuits again succeeded in plunging it into misery. Its close alliance with England implicated it in the wars with Napoleon, and Nov. 24, 1807, the royal family fled to Brazil. The English succeeded in re-establishing the dynasty by the Treaty of Cintra, Aug. 30, 1808, but the country had to pay very dear; its finances were loaded down with debt, and its commerce and industry were much impeded by monopolies held by London merchants. John VI. (1816–26) returned in 1821 from Brazil, but before he landed in Portugal he was compelled to sign a liberal constitution, July 3. In 1822, Brazil was separated from Portugal and acknowledged as an independent state, under his son Dom Pedro. He was succeeded by Maria II. (1826–53; see MIGUEL, DOM), Pedro V. (1853–61), and Louis I., the present king.

Por'tuguese Language and Literature. The Portuguese language is a branch of the *lingua Romana rustica*, with a strong infusion of Arabic terms, derived from the time of Moorish domination, and a considerable admixture of Teutonic, brought by the early Suevian and Burgundian conquerors, and is closely connected with the Galician dialect of Spanish, with which it was, in fact, originally identical. It is less energetic, but more fluent, than the Castilian, and native grammarians claim for it the title of "eldest daughter of the Latin." It has no gutturals or harsh aspirates, but possesses five nasal vowels (pronounced nearly *ang, eng, ing, oung, oong*) and five double vowels or *prolaçoes*—namely, *ch, lh, nh, ph,* and *rr*—corresponding nearly to their French analogues. Many Latin words are preserved more exactly than in the sister languages (*e. g. ferro, filho*), while in others the phonetic decay has been strongly marked, chiefly by the omission of the consonants *l* and *n* between vowels (*e. g. dôr = dolor, pôr = ponere, povo = populus*).

The national literature of Portugal has suffered from the constant tendency of native writers on important subjects not merely to imitate, but to employ, the Spanish (and more recently the French) language; and had the subjection of Portugal to Spain by Philip II. (1580–1640) been permanent, Portuguese would doubtless have ceased to exist as a literary language, and become a mere dialect of Spanish, like the Gallego. The inveterate political enmity of the Portuguese to the Spaniard has, however, not only preserved the national language, but has been instrumental in endowing it with a poetical and historical literature of considerable interest. The Portuguese language assumed a distinct form in the eleventh century, but the earliest existing specimens, chiefly translations from Provençal songs, date from the beginning of the thirteenth century. The Portuguese kings of the Burgundian dynasty fostered the beginnings of the national poetry, several of them being themselves poets, especially Dionysius or Diniz (1279–1325), the founder of the University of Coimbra, by whom a *cancioneiro* or songbook was compiled, which, after being lost for several centuries, was discovered in the Vatican Library and published in 1847. The celebrated romance *Amadis de Gaul*, by Vasco de Lobeira, was among the first prose compositions. In the fifteenth century history in the form of chronicle began to flourish, the most eminent author being Fernão Lopes, called the "Portuguese Froissart," whose royal chronicles were continued by Gomes Eannes de Azurara. In the sixteenth century Damião de Goes wrote a learned *Chronicle of King Emanuel;* João de Barros produced his classic *Asia Portugueza;* Alfonso d'Albuquerque his *Commentarios;* Lopes de Castanheda wrote his valuable history of the discovery of the Indies; and the traveller Fernão Mendes-Pinto produced the celebrated *Peregrinaçao,* which gave him (justly or unjustly) so high a rank among imaginative writers. During the same century, which is the golden age of Portuguese literature, Bernardino Ribeiro wrote his famous romance, *Menina e Moça*, and founded the pastoral and romantic school of poetry, which was soon adorned by the writings of Christovão Falcão, Sa de Miranda, Pedro de Caminha, Diego Bernardes, Rodrigues Lobo, and Jeronimo Cortereal. About the middle of the century Antonio Ferreira, a successful imitator of Horace and Petrarch, was the leading ornament of the classical school of poetry, and in his *Ines de Castro* produced a tragedy before any theatre existed in Spain. He was quickly followed by Gil Vicente. The greatest name in Portuguese literature is Luiz de Camoens (1524–79), author of the immortal epic *Os Lusiadas*, which has for ever determined the literary form of the language. The close of the sixteenth and beginning of the seventeenth century was a period of literary as well as political eclipse, illustrated only by the names of Pereira de Castro, Sa y Menezes, Faria e Sousa, Barbosa Bacellar, and Jacinto Freire de Andrada, author of the admired *Vida de João de Castro*. Toward the close of the seventeenth century Father Antonio Vieyra produced his remarkable sermons, considered as models of pulpit eloquence, and literature exhibited some signs of prodigious activity, which soon filled the libraries of Portugal with imitations of the prevailing taste in France. The *Bibliotheca Lusitana* of Diego Barbosa Machado gave the literary history, bibliography, and biography down to 1750, and commemorated many hundreds of authors whose works rarely passed the limits of the little kingdom. The greatest names of the latter half of the eighteenth century were the lyric poets Francisco Manoel do Nascimento and Manoel Barbosa de Boccage, and the distinctively modern school of Portuguese literature dates from the epic and romantic poet Agostinho de Macedo. The leading recent writers of Portugal are the historian and novelist Alexandro Herculano and the viscount Almeida Garrett, a versatile poet and essayist, the dramatist Mendes Leal, and the novelist Rebello de Silva.

Portuguese literature in Brazil produced toward the close of the eighteenth century the epic poems *Uruguay*, by José Basilio da Gama, and *Caramurú*, by Fray Durão; and lyric poetry was creditably cultivated by some writers who constituted the so-called Minas school. In the present century the most noted Brazilian writers have been the moralist Fonseca, marquis of Maricá, the lexicographer Moraes e Silva, the dramatist and poet D. J. G. de Ma-

galhães, the historian F. A. de Varnhagen, and the novelists and poets Gonçalves Dias, Joaquim Manoel de Macedo, and Norberto de Souza e Silva. PORTER C. BLISS.

Portuguese Man-of-War, the popular name of the *Physalia arethusa.* See ACALEPHÆ.

Portulaca'ceæ [from *Portulaca*, one of the genera], a natural order of succulent exogenous herbs and shrubs, all harmless and many of them with gay flowers. The purslanes (*Portulaca*), the calandrinias, and the claytonias, include a few ornamental species.

Port Whit'by, Canada. See WHITBY.

Port Wine. See WINE.

Port'ville, p.-v. and tp., Cattaraugus co., N. Y., on Allegheny River, Genesee Valley Canal, and Buffalo New York and Philadelphia R. R. P. 450; of tp. 1814.

Port Wash'ington, p.-v., N. Hempstead tp., Queens co., N. Y., on Manhasset Bay, Long Island Sound. P. 804.

Port Washington, p.-v., Salem tp., Tuscarawas co., O., on Tuscarawas River, Ohio and Erie Canal, and Pittsburg Cincinnati and St. Louis R. R. P. 425.

Port Washington, v. and tp., Ozaukee co., Wis. (OZAUKEE P. O.), on Lake Michigan and Milwaukee Lake Shore and Western R. R. P. 2390.

Port Wil'liam, p.-v., Liberty tp., Clinton co., O., on Cæsar's Creek. P. 184.

Po'rus, a king of India, ruling E. of the Hydaspes; attacked Alexander when he tried to cross this river, but was defeated, wounded, and captured. He was treated with great kindness, however, by Alexander, and restored to his kingdom, which was much enlarged. As an ally of the Macedonians he afterward supported them on their further expedition into India, but after the departure of Alexander he was put to death by Eudemus, who was left in command of the Greek army of occupation.

Por'y (JOHN), b. in England about 1570; studied at Gonvil and Caius College; translated the *Geographical History of Africa* by Leo Africanus (folio, 1600; republished by Purchas); resided at Paris 1612; was secretary to the Virginia colony at Jamestown 1619–21; visited Plymouth, Mass., on his voyage to England, shortly after its settlement by the Leyden Pilgrims; returned to Virginia as a commissioner deputed by the privy council 1623, and d. probably in Virginia before 1635. He was one of the assistants of Hakluyt in his great geographical enterprise, a man of considerable learning, and a well-wisher both of the Virginia and the Plymouth colonies.

Poseidon. See NEPTUNE.

Po'sen, province of Prussia, bounded by Silesia, Brandenburg, Pomerania, East Prussia, and Poland, comprises an area of 11,260 sq. m., with 1,583,843 inhabitants, of whom more than two-thirds are Poles, using the Polish language and adhering to Roman Catholicism. The land is a low and level plain around the Warta, an affluent of the Vistula. It is dotted all over with small lakes and covered to a great extent with fine forests. The soil is fruitful and well cultivated. Many swamps and marshes have of late been drained and transformed into good meadows or arable land. Cattle of superior quality are reared, and large crops of wheat, rye, barley, and oats are raised. Manufactures, especially of linen and lace, are carried on. Posen formed a part of Poland until the first partition of that country, when Prussia took the largest part of the present province. The robbery was enlarged at the two following partitions, and solemnly sanctioned at the Congress of Vienna in 1815. But setting aside the manner in which the province was acquired, it has been well governed and is steadily progressing under Prussian rule.

Posen, town of Prussia, capital of the province of Posen, on the Warta, is an old but handsome city. The Russian government has made it one of its great fortified places, and surrounded it by a modern enceinte with citadel and outworks at a cost of 114,000,000 reals. It contains many elegant buildings, both public and private, many fine promenades and public squares, many good educational and benevolent institutions, and extensive manufactures of tobacco, sealing-wax, wax candles, leather, furs, liqueurs, gold and silver ware, woollen and linen fabrics, arms and carriages. P. 56,374.

Po'sey, county of S. W. Indiana, separated from Kentucky on the S. and Illinois on the W. by Ohio and Wabash rivers. It has a very fertile soil. The wide bottom-lands are flat and low, the uplands hilly. Corn, grain, tobacco, and wool are important products. Carriages, ploughs, etc. are among the manufactured articles. Cap. Mount Vernon. P. 19,185.

Posey, tp., Clay co., Ind., on St. Louis Vandalia Terre Haute and Indianapolis R. R. P. 2132.

Posey, tp., Fayette co., Ind., on a branch of Jeffersonville Madison and Indianapolis R. R. (BENTONVILLE STATION). P. 947.

Posey, tp., Franklin co., Ind. P. 974.

Posey, tp., Harrison co., Ind., on Ohio River. P. 1774.

Posey, tp., Rush co., Ind., on Cincinnati Hamilton and Dayton R. R. P. 1763.

Posey, tp., Switzerland co., Ind., on Ohio River. P. 2183.

Posey, tp., Washington co., Ind., on Great Blue River. P. 1349.

Posey (THOMAS), b. in Virginia July 9, 1750; received an ordinary common-school education; removed to Western Virginia in 1769; was quartermaster to Lewis's division of Lord Dunmore's expedition against the Ohio Indians, and took part in the memorable battle of Point Pleasant, Oct. 10, 1774; was in the following year a member of the Virginia committee of correspondence, and captain of a company which he raised for the 7th Virginia regiment; participated in the defeat of Lord Dunmore at Gwyn's Island, July 8, 1776; joined the Continental army at Middlebrook, N. J., early in 1777; was transferred to Morgan's famous rifle regiment; distinguished himself in an action at Piscataway, N. J., and in the battles of Bemis Heights and Stillwater under Gen. Gates; commanded the regiment with the rank of major in an expedition against the Indians Oct., 1778; commanded the 11th Virginia regiment 1779, distinguishing himself at the head of a battery at Stony Point; was present at Yorktown; served under Wayne in Georgia; defeated the Indians June 23, 1782; resided in Spotsylvania co., Va., many years after the war; was appointed brigadier-general Feb. 14, 1793; removed soon afterward to Kentucky, where he became lieutenant-governor and major-general, 1809; was U. S. Senator from Louisiana 1812–13; succeeded Harrison as governor of Indiana Territory 1813, and became agent for Indian affairs 1816. D. at Shawneetown, Ill., Mar. 19, 1818. His *Life* was published in Sparks's *American Biography.*

Poseyville, p.-v., Robb tp., Posey co., Ind. P. 213.

Posido'nius, b. at Apamea in Syria about 135 B. C.; studied at Athens under Panætius; settled in Rhodes; became the head of the Stoic school of philosophy, whose doctrines, however, he softened and toned down in harmony with those of the Peripatetics; went in 86 B. C. to Rome as ambassador; was the teacher of Cicero and Pompey. D. at Rome about 51 B. C. Some fragments of his works are still extant, collected and edited by Janus Bake (Leyden, 1810) under the title *Posidonii Rhodii Reliquiæ Doctrinæ.*

Posi'lipo [Gr. Παυσίλυπον, "an end to care"], the name of a villa of the notorious epicure Vedius Pollio, afterward extended to the entire eminence which bounds the city of Naples on the W. It is pierced by a tunnel called the Grotto of Posilipo, 2244 feet long, 21½ wide, 69 feet high at the eastern extremity, and 25 in the middle, through which runs the road to Puzzuoli. Above the eastern archway of the grotto is the so-called Tomb of Virgil, who had a villa near by. The whole eminence is now covered with charming villas.

Pos'itivism [Lat. *positivus*]. In the opinion of its adherents the system of thought known as positivism or the positive philosophy is a universal system, which is destined to be accepted by the whole human race, and in comparison with which all other systems must appear as insignificant and local, as, for example, the opinions of Socinus or Manichæus must appear when contrasted with all-embracing Christianity. To those, however, who not being disciples of Comte, do not share these views, the positive philosophy not only seems to be as much a temporary and local phenomenon as the philosophy of Anaxagoras or of Hegel; but it appears so deeply impregnated with the purely individual idiosyncrasies of its founder that without a biographical notice its real character cannot be fully understood.

Isidore Auguste Marie François Xavier Comte was born at Montpellier, in the S. of France, on Jan. 19, 1798. His parents were rigid Catholics and legitimists—a fact of some interest, since the later career of their son shows that, however pronounced may have been his dissent from the doctrines of theological and political orthodoxy, the character of his social and religious speculations was to a great extent determined by the mental symbols with which his earliest education must have furnished him. Throughout his life, indeed, though he attained to views of scientific method which in profundity few modern writers have surpassed, and though he succeeded in taking a survey of human history in many respects more comprehensive and suggestive than any which had been previously achieved, yet he never seems to have framed even the most rudi-

mentary conception of that purely free and critical temper of mind which is essential to the attainment of truth in scientific matters, or of that unhampered but legitimate freedom of action which human history shows to be at each moment the goal of all preceding social progress and the indispensable condition of further social progress in the future. Comte's ideal of society, from first to last, was one in which the beliefs and actions of the great mass of mankind, even in their minutest and most trivial details, should be inexorably prescribed by a small governing class; and the most extreme result of his religious and political radicalism was to alter the superficial appearance of this small governing class by substituting a "high priest of humanity" and a board of positive philosophers for the pope and the imperial council of the Middle Ages. Hence, with all his wide historic sympathies, he never succeeded in understanding the fundamental principle of Protestantism, the most important acquisition of modern times; nor, in spite of his profound insight into certain aspects of scientific thinking, did he ever comprehend or value that critical spirit which questions all things in order that it may hold fast to that which is verified—a spirit in the absence of which all the discoveries of Newton and Faraday would be of no more real use to us than the cosmological dogmas of the priests who burned Vanini and imprisoned Galileo. To ascribe these grave philosophical defects to Comte's early training would be to make far too extensive an inference; but the facts are none the less interesting in view of the thorough consistency of aim which, in spite of superficial changes, characterized his whole career.

Comte early exhibited remarkable mathematical ability, and at the age of seventeen was admitted to the École Polytechnique at Paris, from which he was, however, soon expelled for participating in a complaint against one of the masters on the part of the younger students. But after having tasted of the intellectual life of the great capital he naturally found it impossible to content himself with Montpellier; and so, after a few months of intense study at home, he returned to Paris, penniless and in defiance of the wishes of his parents; and having been befriended by two scientific men of the highest eminence—Poinsot the mathematician and Blainville the biologist—he set about earning a livelihood by private teaching in mathematics. From 1818 to 1824 he was associated as secretary and pupil with St. Simon, the celebrated founder of a sect of world-menders; and it appears to have been during this period that he began to conceive his great scheme for the reorganization of society by philosophy. By 1824, Comte's views had so far outgrown those of his master that their friendly co-operation was brought to an end. The plans then conceived by Comte show the vast sweep of his mind. Dreamers or crotchety speculators of the type of St. Simon and Fourier, deeply impressed with the defects of human society as actually existing, have sought to remodel the relations which men sustain to one another in such a way as to eliminate these defects. But as a rule such attempts have been based upon *a priori* theories as to the constitution of human nature in the abstract. It was Comte's peculiarity that he saw that any such attempt, to be legitimate, must be based upon a thorough study of the conditions of social existence and of the tendencies of human nature as concretely exemplified in history. Before artistic practice must come scientific theory; before the polity must come a sociology. It was in connection with these views that Comte maintained in 1824 that the phenomena of society conform to fixed and ascertainable laws, no less than the phenomena of chemical combination or planetary rotation. It would perhaps be wrong to give Comte the credit of having originated this view, which had been growing in the minds of advanced thinkers since the time of Adam Smith; but the clearness with which he conceived it and the emphasis with which he set it forth constitute one of his chief philosophic merits. To discover the laws or most general aspects of the succession of social events was therefore the great task which Comte set before himself. But from his commanding standpoint such a task as this required a systematic and elaborate preparation on the most immense scale. For the phenomena of human society are by far the most complicated and irregular phenomena with which investigation has to deal. In two ways the successful study of them involves a previous study of the most general aspects of all other phenomena. For, in the first place, the human units of society conform to physical, chemical, and biological laws, so that these must be known before we can give a complete account of the actions of social units. And, in the second place, each science has devices for getting at the truth about things which are to some extent peculiar to itself, so that we must look over the whole field in order to equip ourselves adequately for a research which will call into play all the devices we can bring to bear. One science, for example, succeeds pre-eminently by the use of experiment, while another, in which experiment is less likely to return finally satisfactory answers, gets along best by using the comparative method. Let us, therefore, study each method in that science which best illustrates the proper use of it, and then we shall be the better prepared to investigate the excessively complex questions presented by the phenomena of human society.

Thus, in the attempt to inaugurate a scientific theory of social phenomena Comte was led incidentally to work up the elements of a grander theory of scientific method than any which had yet been laid before the world. As his acquaintance with physical science was wholly at second-hand, he fell into many errors in the details of his scheme, as has been forcibly pointed out by Prof. Huxley and others, but he nevertheless accomplished so much as fairly to entitle him to a place beside Bacon or Descartes as a writer on method. Our present space allows us only to give brief hints at some of his most significant views. The first task to be accomplished was to classify the various sciences in the order of their logical dependence. Having made a division between abstract and concrete sciences, corresponding nearly to the old division between natural philosophy and natural history, Comte arranged his so-called abstract sciences in a linear series, determined by the decreasing generality and simplicity of the phenomena with which the respective sciences are concerned. He began with the most simple and general phenomena, to proceed step by step to those which are most complex and special. Upon this principle the inorganic sciences, as a group, were manifestly to come before those which deal with organic phenomena. For example, we can study thermal radiations and chemical reactions without taking vital forces into the account, but we cannot study living organisms without appealing to physics and chemistry at every step. In the region of inorganic science Comte placed astronomy first, as dealing (in his time) only with gravitative force as manifested in the relatively simple phenomena of the mutual attractions of the heavenly bodies; whereas physics, which he placed next, treats not only of gravitative force as manifested throughout relatively complex terrestrial phenomena, but also of such modes of forces as cohesion and capillarity, and of the varieties of wave-motion known as sound, heat, light, magnetism, and electricity. Chemistry, dealing with the still more complex phenomena in which the relative positions of molecules are altered heterogeneously, resulting in new compounds with new properties, was ranked third in order. Passing then to organic science, Comte grouped together, under the head of biology, the most general aspects of nutrition and reproduction, of muscular contractility and nervous sensibility; under the last-named head he included all the phenomena of mind, leaving no place for psychology as an independent science, and setting aside altogether the study of the subjective phenomena of consciousness by introspective observation. Last in the series, as obviously the most complex and specialized of all, was ranked the science of sociology. Mathematics, on the other hand, was placed before all these sciences, the phenomena of number, form, and magnitude being universal, and capable of generalization without reference to other phenomena. The "hierarchy of the positive sciences" thus came out in the following order: (1) mathematics; (2) astronomy; (3) physics; (4) chemistry; (5) biology; (6) sociology. According to Comte, this arrangement represented not only the logical order in which the sciences depend one upon another, but also the historical order in which they have been successively developed and in which they have aided each other's advance. Thus, astronomy, according to Comte, was truly a science in the days of Hipparchus, while physics became a science, in the true sense of the word, only when Galileo discovered the increment of velocity in falling bodies; chemistry was not scientific until the time of Lavoisier; biology was first organized into a coherent body of doctrine by Bichat; and sociology had to wait until all these lines of inquiry were gathered together in the hands of the founder of positivism. The sharp-sighted reader will not fail to note that in setting forth some of these results the philosopher is reasoning upon the words rather than upon the things. It was only the geometrical part of astronomy, for instance, which had been generalized in the time of Hipparchus, and it is needless to say that the geometrical data employed in these generalizations had all been originally obtained from the study of terrestrial phenomena. On the other hand, the dynamical part of astronomy, the part in which physical conceptions of force and motion are involved, did not get scientifically treated until sundry generalizations of terrestrial physics, made by Galileo and Huyghens, had furnished Newton with the necessary data. The order of dependence as between astronomy and physics was, there-

fore, wrongly stated by Comte; and this error is only one among many. Indeed, fascinating as the Comtist classification of the sciences has appeared to many minds, it is not at the present day accepted by scientific thinkers, being in many fundamental aspects not merely inadequate, but positively misleading. An article like the present is not the proper place for the discussion of this subject, for which the reader may be referred to Mr. Herbert Spencer's two essays on the *Classification of the Sciences*, and the *Genesis of Science*, and to Part I. ch. viii. of *Outlines of Cosmic Philosophy*, by the present writer. It is there shown, by arguments which no one has as yet succeeded in answering, that while the Comtean classification may freely be allowed to be more profound than any which had preceded it, it nevertheless does not represent either the historical or the logical order of dependence among the sciences, and is not in any sense a tenable classification.

Inadequate and untrustworthy, however, as this classification turns out to be if regarded as an attempt to describe the true relations between the different sciences, it was not a bad classification for the practical ends which Comte had in view. He cared much less about organizing a coherent body of doctrine concerning the various provinces of nature than about co-ordinating the methods of research which the sciences severally best illustrate. To this point, already briefly alluded to, a few words of explanation must be given. His most important step consisted in assigning to each class of phenomena its appropriate method of investigation, and in clearly marking out the limits within which each method is applicable. It is this which makes it still interesting and profitable to read his great work, even in those chapters on physics, chemistry, and biology which in nearly all other respects the recent revolutions in science have rendered thoroughly antiquated. According to Comte, the resources at our disposal for the inductive investigation of phenomena may be classified as Observation, Experiment, and Comparison. In simple observation we merely collate the phenomena as they are presented to us; in experiment, we artificially vary the circumstances; in comparison, we watch the circumstances as they are varied for us on a great scale by nature. The conditions of successful observation are best studied in astronomy, where experiment is out of the question, owing to the magnitude and inaccessibility of the phenomena, and where the comparative method is only beginning to be applied. Physics and chemistry, on the other hand, are, *par excellence*, the sciences of experiment, since we can vary the phenomena almost indefinitely. In biology, experiment is also indispensable, nearly all our knowledge of the more important organic functions having been gained through vivisection and other forms of experiment; but experiment is far more complicated and difficult to interpret in biology than in physics, partly owing to the subtlety of the causes in operation, partly because the experiment itself sets in motion a new series of phenomena which are liable to mask and obscure those which we wish to observe. Hence, the practical study of experimentation should not begin in biology, but in physics or chemistry, where the conditions are simpler. On the other hand, it is in biology that we can best learn the use of the comparative method, since here we have a vast hierarchy of organisms, in which various organs and their corresponding functions appear in all stages of development. It was in biology that the method of comparison was first employed upon a great scale, and since the time of Cuvier its extension over all departments of sociological inquiry, including linguistics, mythology, and jurisprudence, is perhaps the most striking event in the history of science.

Perhaps no better illustration of the use of the comparative method could be found than is furnished by Comte's first wide generalization from the facts of history. When, after the elaborate preparatory discussion of scientific methods here pointed out, Comte endeavored to sum up the most prominent aspects of social progress, both intellectual and material, his first achievement was his celebrated theory of the "three stages" through which men's conceptions must pass. In his opinion this evolution of human thought through three stages is not only the fundamental phenomenon in history, but also affords the norm for testing the validity of philosophic systems. And unquestionably the theory constitutes the most essential part of the structure of positivism. He who intelligently accepts the so-called "law of the three stages" may well be regarded as a Positivist; he who rejects the so-called "law," as an inadequate and misleading description of the phenomena which it seeks to generalize, must be ranked among the antagonists of the positive philosophy. With these preliminaries the theory may be thus stated: "There are three modes of philosophizing—the theological, the metaphysical, and the positive. The first two modes are characterized by the attempt to formulate the unknowable Cause or causes of phenomena; but positivism, recognizing the futility of all such attempts, ignores the unknowable Cause or causes of phenomena. Positivism limits itself to ascertaining uniformities of coexistence and sequence among phenomena. Metaphysics and theology superadd investigations concerning the nature of the hidden efficient cause of the phenomena; but metaphysics regards this cause as a mere abstract entity, while theology regards it as endowed with volition and intelligence. There are three successive stages of theology—fetishism, in which phenomena, not being generalized, are regarded as endowed each with a volition of its own; polytheism, in which generalized groups of phenomena are regarded each as under the control of a presiding deity endowed with volition; and monotheism, which arises when men have gained the conception of a universe, and have generalized the causes of phenomena until they have arrived at the notion of a single First Cause. According to Comte, philosophy began in fetishism; as science progressively arranged phenomena in groups of wider and wider generality, philosophy passed through polytheism into monotheism; and as with its increasing generality the primitive anthropomorphic conception of cause faded away, becoming replaced by the conception of an unknowable Cause manifested in phenomena, philosophy became metaphysical; finally, when the unknowable Cause is ignored, and no account is taken of anything beyond the immediate content of observed facts, philosophy becomes positive." This statement, cited from the chapter in the *Outlines of Cosmic Philosophy* in which it is sought to refute the positivist theory, may fitly be supplemented by a statement from Comte himself. At the beginning of his great work he tells us that "the mind employs successively in each of its researches three methods of philosophizing, of which the character is essentially different and even radically opposed—first, the theological method, then the metaphysical, lastly the positive. The theological system arrives at the highest perfection of which it is susceptible when it has substituted the providential action of a single Being for the capricious play of the innumerable independent deities which were primitively imagined. Likewise, the perfection of the metaphysical system consists in conceiving, instead of many particular entities, one grand entity, Nature, as the source of all phenomena. Finally, the perfection of the positive system would be to represent all observable phenomena as particular cases of a single general fact." In accordance with this general view, Comte maintains that in every department of inquiry whatever, human speculation has passed through, or is passing through, these three stages; and, by way of welding firmly together the different parts of his system, he affirms that the order in which the respective sciences have advanced toward the positive stage is truly represented by the order in which they are ranked in his linear classification. Obviously, we have here a very important theorem. For if this view of intellectual progress could be demonstrated, it would follow that the conceptions of mankind must eventually become "positive" with reference to all questions, and Comte's claim to be regarded as the philosophic lawgiver for the whole future of the human race might not seem extravagant.

It is primarily the business of a sketch like the present article to describe rather than to criticise or seek to overthrow the system of philosophy of which it treats. Yet it is through a few words of criticism, in which dissent must unavoidably be expressed, that we shall best succeed in characterizing this central theory of positivism. That there is a strong appearance of truth in the Comtist theory when superficially considered can hardly be denied. Nay more, we need not be chary in admitting that as an historical generalization it really contains a considerable amount of truth; and the way in which Comte has worked it out, more especially in that part of his work which deals with the philosophy of history, is such as to call forth and justify the warmest admiration for his great power of historical generalization. That science which consists in following out the mental processes of uncivilized races by means of their mythology, superstitions, and customs—that science of which Mr. Tylor is the great representative—leaves it quite beyond question that the most primitive speculations of men who know enough to speculate at all are such speculations as Comte would have called fetishistic. By men in such a stage of culture the wind which blows down a hut is a person endowed with conscious volition; it blows down the hut on purpose, perhaps because the owner has offended it; and to prevent a recurrence of the disaster there is no better way than to cajole the irritable Wind. Savages may continue indefinitely to think thus; but obviously among progressive races, as generalization goes on, so that causes at first thought of as multitudinous

and local come to be thought of as few and general, these causes get detached in thought from their phenomenal effects, and men do not imagine them in such concrete shape as formerly. Instead of an angry Wind we have a half-spiritual Wodan, who manifests his wrath through many other agents besides the howling tempest; and in place of a definitely imaginable volition in the agent itself, we have some occult property, such as momentum, through which the act is effected. After a while it comes to be further perceived that, for purposes of scientific research, even this occult property need not be postulated, such a term as momentum being merely a convenient symbol for denoting certain relations, actual or possible, between one body and another. In the recognition of this fact Comte would say that we reach the positive stage of thought with reference to the phenomenon in question. A further illustration will assist us in comprehending this point, upon which it is needful to be very explicit. In his inquiry into the movements of the planets Newton very carefully abstained from making any hypothesis as to the nature of gravitative force. For the purposes of his scientific calculation it was not only not necessary to appeal to any such thing as attraction, but the calculation could indeed get along much better without making such an appeal. All that the scientific process required was that, a given quantity of matter being present in a given position, a certain other portion of matter should proceed to occupy a series of sequent positions in a certain specified order. When it was found that in the presence of such a portion of matter as the earth, another portion of matter known as the moon keeps on occupying such successive positions as were indicated by the Newtonian hypothesis, then the hypothesis was duly verified. And it remains to this day an adequate description of the facts with which it professes to deal, no matter whether the occult cause of the facts be really attraction, as has generally been supposed, or a differential result of pressures, as some physicists now imagine. For the immediate purposes of the astronomical theorem the content of the observed facts is all that is required. Obviously, the principle involved in this simple case remains the same in the most complicated cases of causation with which science can deal; and so the "positive" stage of thought, of which Comte believed himself to be the herald, would be a stage in which this Newtonian way of considering things would become universally regarded as finally sufficient for the interpretation of nature. From the positivist point of view, therefore, the world in all its actual complexity, man and his loftiest attributes included, is but a variegated succession of groups of events between which there obtain divers relations of coexistence and sequence; and the detection and description of these relations is the sole legitimate business of philosophy, which has nothing whatever to do with Cause, and knows nothing of any ultimate Existence as the source of phenomenal events. This, it will be seen, is at bottom identical with the skeptical nihilism of Hume, the chief difference between the two philosophers being that Comte sought to construct an elaborate dogmatic system upon a basis which to Hume seemed only to afford a ground for skepticism. That the positive mode of philosophizing, as thus described by Comte, bears a strong resemblance to the mode of philosophizing habitually adopted by modern scientific thinkers, cannot be denied. And this is, I believe, because Comte's description of the scientific process is correct as far as it goes. It is true that in such scientific operations as the undulatory theory in physics, or the theory of definite proportions in chemistry, or the hypothesis of physiological units in biology, we do turn our attention away from metaphysical conceptions of force and cause and concentrate our attention upon the mere sequent grouping of phenomena. But the anti-positivist school, of which Mr. Herbert Spencer is the great representative, maintains that in this scientific restriction of inquiry to mere phenomenal sequence we have simply the most extensive application of an artifice to which science has hitherto owed most of its triumphs—namely, the artifice of abstracting from Things those aspects of them with which we can most securely deal. Thus, the lines and circles of geometry are fictions, in the sense that no such things are to be found in nature; and so the "attraction" of the physicist and the "atoms" of the chemist are as likely as not fictions in the same sense: whether they are or not is all one to the scientific inquirer, so long as they are of service in bringing his ideal constructions into agreement with observation. But in saying this we do not say that there is no basis in nature for lines and circles, nor do we imply that there is no such thing as an intimate constitution of matter, even though our attracting atoms may not be the sort of things of which matter is made up. In short, we recognize that in disregarding the ontological side of any problem, and confining our attention to the phenomenal side, we are only employing a scientific artifice due to the limitation of our faculties; we do not for a moment imply that the problem has no ontological side. On the contrary, we hold that beneath every physical problem there lies a metaphysical problem, which doubtless we can neither solve nor elude, yet in default of an answer to which our vaunted physical solution remains merely symbolic. And in similar wise, with reference to the interpretation of the world as a whole, we hold that Cause cannot be ignored save as a temporary artifice of thinking, and that phenomenal existence cannot be rationally conceived without positing an Absolute Existence of which the former is the manifestation.

In the light of this statement of dissent it seems that the real character of what Comte meant by positivism is more fully brought out than it could be in any other way. To know what anything is, we must know what it is not. And we now can see clearly that in the Comtist scheme the "positive" stage does not mean merely the scientific stage of thought on all manner of subjects, toward which every one must admit that society is progressing. It means more than this, for it means a stage of thought the very possibility of which may well be denied by truly scientific thinkers, and is in fact denied by some whose names rank second to none. It is Prof. Huxley who says of the word "positive" that "in its specially philosophical sense, as implying a system of thought which assumes nothing beyond the content of observed facts, it implies that which never did exist, and never will."

With regard to this fundamental doctrine of the "three stages," therefore, Mr. Spencer and his school hold a position diametrically opposed to that held by the Positivists. Between the three terminal conceptions—of God, of Nature, and of Law—as above described by Comte, we deny that there is any incongruity, or that the latter supersedes the former; and we maintain, on the contrary, that science, when properly understood, remains quite at one with metaphysics and theology in the assertion of Unconditional Existence as the source of Conditioned Existence. While in Comte's system, therefore, the assumed conflict between science and religion is emphasized and perpetuated, in Mr. Spencer's system it disappears entirely. The system of Mr. Spencer has by many persons been supposed to be akin to positivism, because, like the latter, it rejects as illegitimate sundry *a priori* methods of arriving at truth which have hitherto been more customarily associated with the processes of metaphysics and theology than with those of science. But this surface resemblance only shows that all modern philosophy, following out a tendency which has been apparent for two centuries, is becoming more and more thoroughly permeated by the scientific spirit of skeptical wariness in its method of reaching conclusions. Though Comtists and Spencerians alike claim to be scientific, yet they differ so fundamentally as to what science means that their systems may be more truly described as the two opposite extremes of scientific philosophizing. The difference between them is the difference between a system that is radically revolutionary and quasi-atheistical, and a system that is conservatively progressive and in the deepest sense theistic.

This difference is further eludidated by Comte's theory of sociology, and it serves in turn to elucidate that theory. To give even a sketch of Comte's brilliant contributions to the philosophic study of history would be out of the question in the limited space at our disposal. We can only hint at the character of his fundamental position. The so-called "law of the three stages," just criticised, is regarded by Comte as the law of the intellectual progress of society; and the fifth volume of his great work is a splendid survey of European history, in which this theory is applied and illustrated with admirable ingenuity. It should be read in connection with the *History of Civilization* by Guizot, which in many respects it strongly resembles, though the latter writer, while inferior to Comte in depth of thought, yet far surpasses him in philosophic appreciation of the democratic and Protestant aspects of modern society. Along with the progress from theological to positive habits of thought, Comte joins the progress from military to industrial modes of life, and maintains—incorrectly, as we should hold—that the latter change is determined by the former. This brings us to his fundamental point. He passes over the history of moral progress, and while admitting as a fact the growth of the sympathetic and social feelings at the expense of the selfish and unsocial, he yet fails to take this into the account as the pre-eminent factor in social changes, and always argues as if social amelioration were the product of a reformation of speculative beliefs. Instead of recognizing that the framework of society is based ultimately upon *character*, he regards it as based ultimately upon *opinion*. To this, as to nearly all the theorems of positivism, the Evolutionists of Mr. Spencer's school oppose a di-

rectly contrary theorem. Without forgetting that man is a complex phenomenon, wherein opinion and character are facts inextricably mixed together, we hold that the latter is a more fundamental fact than the former in determining social progress. We hold that men's opinions depend more on their characters than their characters upon their opinions, and that, in order to improve society, it is not enough to effect a change of beliefs, but it is further necessary that there should be a gradual change in men's dispositions and prevalent motives. Now, improvement in character is a slow result of countless influences summed up in what has been called social discipline, and accordingly we do not suppose it possible to effect a radical reformation of society—to bring in the millennium, for example—by any such movement, taken separately, as can be carried out by one man or a single generation of men; least of all, do we believe it possible to reform society by means of philosophy. The whole structure of positivism, the whole lifework of Comte, is founded on the precisely contrary belief, that society can be reorganized by means of philosophy—that in order to ensure a more harmonious co-operation of human interests it is sufficient to effect a unification of men's beliefs. The evil which Comte always regarded as the grand fundamental evil to be remedied, and which is always thus alluded to by his followers, is what they are fond of calling "the intellectual anarchy of the Western World." Note how profoundly in accordance with the general temper of Comte's mind is the belief that individuality, as involving variety in opinion and behavior, is equivalent to "anarchy," and that "order" means uniformity. It was to put an end to this "anarchy," and to inaugurate an era of uniformity in belief and conduct, that Comte entered upon his long series of philosophical labors; and from first to last he kept this end steadily in view. All his profound studies in the philosophy of method, and all his elaborate historical generalizations, were merely as incidents in the accomplishment of this great central task. And perhaps he is not alone among famous thinkers in that his incidental labors were mainly successes, while his central task turned out to be an utter and, as we shall presently see, a ludicrous and contemptible failure.

To appreciate the form which Comte's practical application of his sociological theories finally assumed, it is necessary to recur for a moment to the circumstances of his private life, and to observe what happened after his rupture with St. Simon in 1824. In the year following this event he was married to Caroline Massin, bookseller; and in 1826 he had sufficiently matured the scheme of his positive philosophy to begin the systematic exposition of it in a course of seventy-two lectures, under the auspices, as Mr. Lewes tells us, of such men as Poinsot, Blainville, Carnot, and A. von Humboldt. But the cerebral excitement attendant upon the preparation of these lectures had been extreme, and after some three or four had been delivered the course was brought to an end by an attack of acute mania, which made it necessary for a time to place the young philosopher under the care of Esquirol. Comte was soon, however, taken from the asylum, and, with his mother and wife for nurses, so far recovered as to be able in 1828 to proceed with his work. In 1830 the first volume was published, and in 1842, after twelve years of unremitting labor, the sixth and concluding volume appeared. In this same year he was separated from his wife, with whom his relations seem never to have been pleasant, and about this time he lost an office in the École Polytechnique which he had held since 1833, so that he was once more without means of supporting himself. "To mitigate the blow," says Mr. Lewes, "three Englishmen—Mr. Grote, Mr. Raikes Currie, and Sir W. Molesworth—through the intervention of Mr. Stuart Mill, offered to replace the official salary for one year, understanding that at the end of the year Comte would be either reinstated or would have resolved on some other career." The position was not regained, and the subsidy was not renewed, though Mr. Grote sent 600 francs additional; and Comte's indignation was great at the refusal of his wealthy English friends to keep up a contribution to his support, to which he considered himself as legitimately entitled in virtue of his services to philosophy. In this aberration of moral sentiment one can see that the unbalanced or quasi-insane period of his life was beginning. In 1845 he conceived an intense affection for Madame Clotilde de Vaux, a lady who had been "separated from her husband by a crime which had condemned him to the galleys for life." Comte's relations with this lady (who died the next year) seem to have been entirely of the kind that are in polite slang termed "platonic," but they gave a color to all his after life and speculation. However the fact is to be explained, certain arrogant pontifical moods of feeling, which had at times been apparent in the earlier part of his life, now took entire possession of him. His old project, of inaugurating a new philosophy which should renovate human society, now assumed the form of an attempt to institute a new religion, which Prof. Huxley has happily and tersely described as "Catholicism *minus* Christianity," and in which Comte, instead of the pope, was to be sovereign pontiff. In one of his works, published some seven years after this time, he alludes to it as the era in his life when to the career of Aristotle, which he had hitherto followed, he added the career of St. Paul! Yet the philosophic germs of this later career, as above hinted, are apparent enough in his earlier work. There was no such break between his earlier and his later speculations as one would infer from reading Mr. Mill's little book on *Auguste Comte and Positivism.* The early philosophic project for reorganizing society came to be transfigured into a quasi-religious project, but its general outlines underwent no further change than was necessarily implied in such a transfiguration of external aspect. The end in view still was to ensure a fixed and uniform standard of social action by establishing a fixed and uniform standard of belief; but the attainment of such a standard by means of scientific methods was no longer deemed sufficient: in addition to this there must be a uniform religious impulse and a uniform cultus. But as the assumed outgrowing of the theological stage of thought involved the ignoring of Deity, and as even Comte was not able to imagine a religion without some sort of a god, it became necessary to furnish some new kind of deity as the source of this new religious impulse and the object of this new cultus. This new kind of deity, according to Comte, is Humanity, and the religious impulse of the future is to be the impulse to serve Humanity and to deserve well of it. It must be admitted that the ethical side of this conception of religion is lofty enough, but the speculative side of it may well seem too grotesque to be seriously entertained by any one endowed with the slightest modicum of that sense of humor which, next to religious faith, is the most desirable possession of a human being. Comte spent the later years of his life in rearing upon this basis a system of practical philosophy astonishingly minute in detail, which in complicated absurdity has probably never been matched by the productions of any other human mind. To describe the details of such a scheme would be out of place in an article like the present one, our duty in this regard being sufficiently discharged by referring the reader to the books in which the scheme is elaborately expounded. It may suffice to note that the ideal of society, as described by Comte, is a state in which everything—even to the minutest details of life—is to be prescribed by unquestioned authority, in which the New Pope or "high priest of Humanity" is to decide upon the age at which each man shall be married, what profession he shall choose, upon what scientific researches he shall enter, and when he shall become *emeritus* as to the general work of life. No caliph, in his wildest dreams of absolutism, ever imagined such a state of things as Comte sought to work out for his ideal society. The main features of this scheme were shaped in curious accordance with the Roman Catholic ideal as conceived by the mediæval popes. There was to be a class of philosophers corresponding to the class of priests under the old régime, with unlimited control over opinions. The arch-philosopher, or "high priest of Humanity," was to supersede the pope; and Paris was to be the holy city of the Positivist as Rome had been the holy city of the Roman Catholic. A new calendar was to be instituted, beginning with the French Revolution of 1789, and like the old one was to be made up of saints' days, save that philosophers, poets, legislators, inventors, and pre-eminently deserving men of all sorts, and from all ages and countries, were to be substituted for the saints of the old calendar. And for the Virgin Mother an antitype was to be found in the ideal of Humanity, symbolized as "a woman of thirty with a child in her arms." And so on throughout a host of dreary and arbitrary details.

This, it will no doubt be thought, was a sorry outcome for an attempt which had begun with a profound classification of the doctrines and methods of science, and with an elaborate survey of human history. And such frivolity seems too puerile to have come from a man who, with all his shortcomings, must always hold a high place among the solid thinkers of the first half of the present century. It seems to me that the true explanation of these aberrations is to be found in the theory that during the later years of his life Comte was really insane. Many profound and sensible thoughts are to be found in the *Positive Polity* and in the *Catechism of Positive Religion;* and this fact has been urged in defence of the essential sanity of Comte's mind. But even madmen may often be wise and reasonable; and we need not suppose that the insanity of a powerful and learned thinker like Comte must necessarily resemble that of a weak and uncultured mind. The phe-

nomena of mental alienation may be as diversified as those of mental health; and there are so many degrees of insanity that it is not unfrequently difficult to define it sharply. Certainly, I would not be understood as attributing an ordinary form of insanity to the founder of positivism. His first great work shows no sign of mental unsoundness, though it had been preceded by a cerebral attack. But long before this work was concluded Comte had entered upon a course of life which was not only a symptom of mental eccentricity, but was quite well calculated to bring on a mental one-sidedness hard to distinguish from monomania. He kept entirely aloof from society, and even from the reading of contemporary literature, and buried himself in seclusion, with no company save his own meditations and a few mystic writers of the Middle Ages. This he called "cerebral hygiene," but, as elsewhere argued, such a course is always likely to beget eccentricity, and most of all in the case of so impatient and egotistical a thinker as Comte. And when such eccentricity has been carried to a certain length it becomes a mere question of words whether we are to call it insanity or not.

In the very last years of Comte's life this mental aberration became even more unmistakable. After finishing the *Positive Polity* he began a new work, called *Subjective Synthesis*, in which it is recommended that decimal numeration should be abandoned in favor of a septimal system, because seven is a sacred number, and, moreover, being a prime number, is better fitted to inspire the human intellect with a sense of its necessary limitations! Every volume, moreover, constituting a distinct treatise, should consist of "seven chapters, besides the introduction and the conclusion; and each of these should be composed of three parts. Each third part of a chapter should be divided into seven sections, each composed of seven groups of sentences, separated by the usual break of line," etc. etc. "These rules of composition make prose approach to the regularity of poetry, when combined with my previous reduction of the maximum length of a sentence to two manuscript or five printed lines—that is, 250 letters." The author did not live to complete these fearful and wonderful speculations, but died soon after the publication of his first volume, on Sept. 5, 1857.

At his death Comte left behind him one great disciple, M. Émile Littré, one of the wisest thinkers and most consummate scholars that France has produced—inferior, perhaps, to his master in scientific depth, but vastly superior to him in learning and in practical sagacity. But M. Littré is regarded as half a heretic by the thorough-going disciples of Comte, as he refused to follow his teacher through his later vagaries. M. Robinet, the eminent physiologist, is also a follower of Comte; and besides this, a small number of Positivists, under the leadership of M. Laffitte, continue at Paris to profess the "religion of humanity." In Germany, positivism has never gained any footing at all; in England, only a slender and precarious one. Among eminent English thinkers Comte exercised considerable influence over Mr. Mill, and made a partial conquest of Mr. Lewes. Among the declared followers of Comte in England are Mr. Congreve, Prof. E. S. Beesly, Mr. Harrison, and Dr. Bridges; and Mr. John Morley, editor of the *Fortnightly Review*, has been considerably influenced by him. Mr. Congreve is at the head of a so-called "positivist church" in London; and an attempt to get up a similar society has been made in New York. But while it has furnished many valuable suggestions, the influence of positivism as a whole upon the philosophic thought of the present generation has been slight; and that influence is visibly waning. The most eminent English thinkers, such as Prof. Huxley and Mr. Spencer, have shown toward it, from the outset, the most determined hostility. As a rule, the positivist school of the present day is characterized by a sympathy with Communists and belligerent workmen, a partiality for the short and sharp despotic method of settling social questions, a tendency to regard politics from the sentimentalist point of view, a dislike to individuality of thought, an obtuseness to the requirements of scientific method, and (in the speculative region) a more or less open hostility to the theory of evolution, the doctrine of the correlation of forces, and other theories which have assumed prominence since the time when their master Comte stigmatized such kinds of theorizing as "metaphysical" and "chimerical."

Bibliography.—The works of Auguste Comte are as follows: *Cours de Philosophie positive* (6 vols., Paris, 1830–42; since republished with preface by Littré, 1864); *Traité élémentaire de Géometrie analytique* (1843); *Traité philosophique d'Astronomie populaire* (1844); *Discours sur l'Esprit positif* (1844); *Discours sur l'Ensemble du Positivisme* (1848; afterwards included in the *Politique positive*); *Calendrier positiviste* (1849); *Culte systématique de l'Humanité* (1850); *Catéchisme positiviste* (16mo, 1852); *Système de Politique positive, ou Traité de Sociologie, instituant la Religion de l'Humanité* (4 vols., 1852–54); *Appel aux Conservateurs* (1855); *Synthèse subjective* (tom. i., 1856);—all at Paris, and, except the *Catechisme*, in 8vo. *English translations: The Positive Philosophy*, by Miss Harriet Martineau, very much abridged (2 vols. 8vo, Lond., 1853; New York, 1858); *Catéchism of Positive Religion*, by Richard Congreve (12mo, 1858); *A General View of Positivism* (*Discours sur l'Ensemble*, etc.), by J. H. Bridges (8vo, 1865);—all at London. A translation of the *Politique positive* is announced as about to appear in London. Part of the 1st vol. of the *Philosophie positive*, translated by W. M. Gillespie, was published (New York, 1858) under the title *Philosophy of Mathematics*. A review entitled *La Philosophie positive*, conducted by Littré and Wyrouboff, has been published six times a year in Paris, since July, 1867. As auxiliary expositions and discussions of the positive philosophy, the student should consult Littré, *Auguste Comte et la Philosophie positive* (Paris, 1864); *Paroles de Philosophie positive* (1863); *Auguste Comte et Stuart Mill* (1866); Pellarin, *Essai critique sur la Philosophie positive* (Paris, 1864); Robinet, *Notice sur l'Œuvre et sur la Vie d'Auguste Comte* (Paris, 1864); Blignières, *Exposition de la Religion et de la Philosophie positive* (Paris, 1857); Mill, *Auguste Comte and Positivism* (London and Boston, 1866); Bridges, *The Unity of Comte's Life and Doctrine* (London, 1866); C. G. David (*pseudon.*), *A Positivist Primer* (New York, 1871); Lewes, *Comte's Philosophy of the Sciences* (London, 1853); *History of Philosophy* (3d ed., 2 vols., London, 1867; the edition republished in this country by D. Appleton & Co., New York, is the 2d ed. of 1857, in which the subject is much less thoroughly treated). These are the principal works out of a considerable body of literature which has accumulated about the subject. For hostile criticisms see Huxley, *The Scientific Aspects of Positivism*, in his *Lay Sermons* (London, 1870; reprinted in New York); Spencer, *Recent Discussions in Science, Philosophy, and Morals* (New York, 1873); and *Outlines of Cosmic Philosophy* (2 vols., London, 1874, and Boston, 1875), by the present writer. JOHN FISKE.

Pos′se Comita′tus [Lat.], literally, "the power of the county." By the common law the sheriff while engaged in executing process, especially when it was criminal, or in pursuing and arresting felons, or in exercising his functions generally as the chief administrative officer charged with the duty of keeping the peace, was authorized to summon to his aid if necessary all the men above the age of fifteen years within the county, with a few exceptions, and they constituted, in the ancient technical nomenclature, "the power of the county." The same authority is given to the sheriff in this country, although its exercise is often regulated by statute. The ordinary cases in which such a resort is had to the active assistance of private citizens are the quelling of riots, the overcoming of forcible seizures or detainers of land, the subduing of forcible rescues made or attempted of persons arrested pursuant to the command of a proper writ, and the resistance to any forcible measures in opposition to the execution of public justice; in short, wherever a breach of the peace has attained, or threatens to attain, such magnitude that the officials themselves are unable to suppress it. Since the sheriff may call out the entire power of the county, he may, at his discretion, under the circumstances above described, summon one or more individuals, or any number less than the whole, when their help is necessary to enable him to accomplish his public duty. Certain classes, however, who are incompetent to render any valuable aid, are exempt—namely, the sick and infirm, those under the age of fifteen, and women. JOHN NORTON POMEROY.

Possibil′ity [Lat. *possibilitas*], in law. This term is used to denote both a future uncertain event, and a future contingent interest in land or personalty depending upon such an event. Possibilities are either "bare" or "coupled with an interest," and also "near" or "remote." A bare possibility is the mere chance or hope of succeeding to an estate, without any present right or interest; as, for example, the expectation of the heir during the life of his ancestor; it is in no sense property, and cannot be transferred nor released. A possibility is said to be coupled with an interest when an estate or right has been given to a person upon the happening of some future and uncertain event, as in the case of many contingent estates. A possibility is near when the contingency is single; as, for example, an estate given to A upon the death of B; it is remote, where two or more doubtful events must take place in succession, and an estate is given upon the happening of the last in order. JOHN NORTON POMEROY.

Post and **Post-Office.** See POST-OFFICE, by G. G. HUBBARD.

Post, tp., Allamakee co., Ia. (Postville P. O.), on Milwaukee and St. Paul R. R. P. 1223.

Post (Alfred Charles), M. D., LL.D., b. in New York City Jan. 3, 1806; graduated at Columbia College, N. Y., 1822; has been attending and consulting surgeon to various hospitals and institutions in New York City (among them St. Luke's Hospital), and professor of general surgery in the medical department of the University of New York from 1851 to the present time.

Post (Minturn), M. D., b. in New York June 28, 1808; graduated at Columbia College 1827; took his medical degree at the University of Pennsylvania 1832; studied in Paris under Louis and other eminent instructors; practised for many years with success in New York, giving special attention to diseases of the chest. D. in New York Apr. 26, 1869; translated Raciborski on *Auscultation and Percussion.*

Post (Truman Marcellus), D. D., b. at Middlebury, Vt., June 3, 1810; graduated at Middlebury College 1829; was principal of an academy at Castleton, Vt., 1829–30; tutor at Middlebury 1830–32, during which time he studied law; spent the winter of 1832–33 at Washington, D. C., hearing the debates in Congress and the Supreme Court; was a short time at St. Louis, Mo.; settled at Jacksonville, Ill., and was admitted to the bar, but in the same year (1833) accepted the professorship of languages in Illinois College at that place; subsequently became professor of history; was ordained to the ministry and installed pastor of the Congregational church at Jacksonville 1840; became in 1847 pastor of the Third Presbyterian church at St. Louis, Mo., and in 1851 of the First Congregational church, then formed in the same city, which position he still (1876) holds. During his pastorate in St. Louis, Dr. Post has also officiated as professor of history in Washington University in that city, professor of ecclesiastical history in the theological seminary at Chicago, Ill., and lecturer on Congregationalism in the seminary at Andover, Mass. He has contributed to the *Biblical Repository* and other periodicals, has printed a number of pamphlets, addresses, and sermons, and is author of *The Skeptical Era in Modern History* (New York, 1856).

Post (Wright), M. D., b. at North Hempstead, L. I., Feb. 19, 1766; studied medicine in New York and Europe; became a practitioner in New York 1786; received in 1792 the professorship of surgery, and later that of anatomy and physiology in Columbia College; became professor of anatomy in the College of Physicians and Surgeons 1813, its president 1821–26; author of various professional papers and lectures. D. at Throg's Neck, N. Y., June 14, 1828.

Postel (Karl). See Sealsfield (Charles).

Post′humous [Lat. *postumus*, sometimes *posthumus*, "the last"] **Child** (law), a child born after his father's death; and the term is also applied to the very exceptional case of a child taken from the dead body of its mother. It is a general doctrine of the law that for all purposes of succession, either from an intestate or by a will or marriage settlement, a legitimate posthumous child is regarded as though born at the death of its father, so that it is able to inherit the land or succeed to the personal estate, or take the property given by the testament or deed, provided that it would have done so if it were born before the father's decease. John Norton Pomeroy.

Post Liminium. See Postliminy.

Postlim′iny [Lat. *postliminium*], a Roman law-term, literally denoting "return behind one's own threshold" or "into one's own house;" then, especially, return from a state of capture and its consequences, or restoration to former political and other rights. Capture in war, as well of a Roman as of any one else, was held to make him a slave; and as a slave could make no will nor have any civil rights, the captured Roman's rights of property, citizenship, even of family, would be by this calamity not merely suspended, but brought to an end. The right of testament was saved from the effect of capture by the fiction of the Cornelian law, according to which the soldier was conceived of as having been killed in battle while yet a free Roman. The rights of citizenship, family, and property were saved by the *jus postliminii*, by which, if he had freed himself during war or had been restored by treaty, it was assumed that he had never been away. This right of postliminy has been applied in international law to recapture; but as capture in Christian nations does not involve slavery, it is unnecessary as far as persons are concerned; and as far as the rights of an original owner of recaptured property are concerned, there is no need of applying to them the principles of Roman postliminy, nor can it well be done.

T. D. Woolsey.

Post Oak, tp., Johnson co., Mo. P. 2631.

Post′-Office, The. Couriers for the conveyance of letters and despatches for kings and princes are as old as empires and kingdoms. The vast extent of territory and the great number of kings and satraps subject to the emperors of Persia and Assyria required them to maintain regular couriers to bear their commands and bring reports from their distant provinces. The first system of posts seems to have been established by the Romans, and from the Latin the word *post* is derived. It was the policy of the Romans to maintain constant communication with all the countries that became subject to them, and for this purpose they constructed "royal ways" from Rome through all the countries of Europe, and their route is to-day easily traced through Italy, France, England, and Germany. At intervals were greater and lesser posts; the first, at the termination of a day's journey, was a camp with a small band of soldiers and a large equipment of men, carriages, horses, and supplies, and whatever was necessary for expediting couriers or travellers on their way; at the other were the relays of horses, and over all was the Roman eagle. Along these ways the couriers bore public and private letters, while passengers and merchandise were carried by slower conveyances. On one occasion it is said that a courier travelled nearly across the continent of Europe at the rate of 160 miles a day. As the power of Rome declined the posts were gradually abandoned, the ways neglected and deserted, until the Dark Ages removed these vestiges of civilization. The Renaissance of the thirteenth and fourteenth centuries led to a renewal of intercourse between different parts of the same country and with foreign states, and by slow degrees the highways were renewed and posts were again seen travelling through the land—at first on horseback, afterward by carriage. On the Continent the postal service was established for the convenience of the sovereigns and nobles, but subsequently the carriage of passengers, freight, and the letters of private individuals was permitted. The service was generally performed by the sovereigns, who owned and maintained the equipment, that they might retain the power of inspecting all correspondence; sometimes the monopoly was given to private individuals. The posts of the counts of Thurn and Taxis were maintained for many generations, and their stamps are found in all large collections of stamps. The carriage of the mails in England was generally left to private parties, although even there it was repeatedly farmed out as a monopoly to favorites of the Crown. The introduction of stage-coaches at the close of the last century gave despatch and regularity to the postal service of Great Britain, and about 1800 the mails were carried with as great rapidity as the posts of the Romans.

The post-office abroad was established for the use of the rulers, and the cost was defrayed by regular taxes; but when the people were permitted to use it they were charged for the privilege a postage high enough to pay all expenses and yield a large revenue to the state. In America a different system has always prevailed; here it was established for the benefit of the people, and as public intelligence contained in newspapers was for the public benefit, they have been carried free or for a very small postage, and private intelligence or letters have been carried at a higher rate, the revenue derived from these two classes of mail-matter being high enough nearly to cover the expense of the service. The post-office existed in America from its earliest settlement. Originally, it was merely a receptacle in the coffee-house, where letters arriving from abroad were deposited, and taken by those to whom they were addressed or carried to them by their neighbors. The first legislation on the subject is found in the records of the general court of Massachusetts for 1639, and the next in the colonial law of Virginia in 1657; these illustrate the character of the service. That of Massachusetts provides "that notice be given that Richard Fairbanks his house in Boston is the place appointed for all letters which are brought beyond the seas or are to be sent thither, to be left with him; and he is to take care that they are to be delivered or sent according to the directions; and he is allowed for every letter a penny, and must answer all miscarriages through his own neglect in this kind." The colonial law of Virginia required "every planter to provide a messenger to convey the despatches, as they arrived, to the next plantation, and so on, on pain of forfeiting a hogshead of tobacco for default." Gradually, a postal service was established between the several colonies, and in 1672 there was "a post to goe monthly from New York to Boston." In 1710 the postal service of the British empire was consolidated into one establishment, the chief offices at Edinburgh, Dublin, and New York. One of the earliest acts of the Continental Congress was the establishment of a post-office and post-routes from Falmouth, Me., to Savannah, Ga., "for conveying intelligence and letters throughout this continent," and to spread knowledge of the acts of Congress and the progress of the

Revolution among the different colonies. Benjamin Franklin was the first postmaster-general, and under his practical management it was soon extended through all the colonies. Franklin's connection with the post-office began early in life—in 1737 as postmaster at Philadelphia—and continued for over forty years. Newspapers were generally published by the postmasters of the several cities, and their papers were not only sent free through the mails, but all others were excluded. Franklin was the first to give equal privilege to all publishers; subsequently, a small sum was charged as postage, which seems to have been a perquisite of the postmaster, but no regular postage on newspapers was established by law until 1792. For some years subsequently to 1776 the postage was paid in currency, and was increased as the value of the currency depreciated until it became impossible to keep up with the decreasing value, when the rate was reduced and made payable in specie. The rates of postage fixed in 1792 were continued, with a few unimportant changes, for more than fifty years. There were nine different rates: for 30 miles and under, 6 cents; over 30 and not exceeding 60 miles, 8; between 60 and 100 miles, 10; between 100 and 150 miles, 12; between 150 and 200 miles, 15; between 200 and 250 miles, 17; between 250 and 350 miles, 20; between 350 and 450 miles, 22; over 450 miles, 25. These high and various rates amounted almost to a prohibition of correspondence. Few letters were sent, and from 1800 to 1830 the increase scarcely kept pace with the growth of the population. Many letters were sent by private hand, and after the express companies were started a great many were sent by them at less than the postage, and though the post-office department endeavored to prevent it at different times, was unable to do so. But the post-office for the use of the people and as the agency of the government, in which they are more immediately interested than in any other department, is the product of the present generation. In 1845 the number of letters and transient matter mailed throughout the U. S. was about 29,000,000; in 1875 the number of letters and transient matter mailed in the city of Boston alone was about 39,000,000, or one-third more than was mailed in the whole country by the preceding generation. The entire expenditures of the department during fifty years ending in 1833 were \$34,700,000; revenue, \$36,400,000. During the year 1875 the expenditures were \$33,611,000, the revenue, \$27,441,000. The number of letters and transient matter mailed in fifty years was less than 100,000,000, while during the year 1875 nearly 900,000,000 letters and transient matter, besides newspapers, were transmitted—nine times as many letters in one year as in fifty, at about the same cost. Prior to 1851 the department was self-sustaining, although in some years the receipts were less than the expenditures; since then the expenses, with the exception of one year during the war, have invariably exceeded the income. In the year 1851 the postage on newspapers and magazines was greatly reduced, and bound books were first carried by mail at less than letter-postage; subsequently, seeds, clothing for soldiers, ores, minerals, and merchandise generally were made mailable matter. The weight of these parcels was at first limited to 12 ounces, but subsequently increased to 4 pounds. The weight of the mails and their cost have been greatly increased by the carriage of newspapers and parcels. It appears, from a statement prepared by the department in 1875, that letters pay an annual profit of \$4,000,000, and that all other mail-matter yields \$11,000,000 less than it costs, as will appear by reference to the table at the end of this article.

The rapid growth of the postal service has not been confined to America, but has extended to all civilized countries. It commenced in Great Britain in 1840, five years earlier than in this country, when penny postage was introduced after a contest of many years, and in three years the correspondence was quadrupled. In all the countries of the Continent a similar result has taken place. This increase is due to four causes: first, the reduction of letter-postage from an average of 12½ to 3 cents in this country, and from 15 to 2 cents in Great Britain; second, the introduction and extension of railroads, by which intercourse with different places is facilitated, more frequent mails are sent, and much greater despatch made than by the old methods of travel; third, by the extension of the mail-routes to the dwellings of the inhabitants of large cities through the letter-carrier system; and fourth, by increased efficiency in the management of the department, and by the greater activity and stimulus in the habits of men and in the business of the country.

In Great Britain a postage of 2 cents on letters and 1 cent on newspapers yields a net revenue of \$13,710,000. In America a postage of 3 cents on letters and 2 cents a pound on newspapers, equal to about 4 mills on a single newspaper and of 8 cents a pound on third-class matter,† costs \$6,000,000 over and above the receipts. This is due to the low postage on newspapers and third-class matter, and to the extent of our mail service. Long mail-routes are maintained at an enormous expense through territories where there are but few inhabitants, while two out of every three of the post-offices do not pay even their office-expenses. In six States the profits in 1875 exceeded the expenses by a sum sufficient to cover the loss in twenty-two other States, leaving nine States and Territories from which this large annual deficit arises.

General Postal Statistics.

Year.	Country.	Population.	Number of letters.	Journals and printed matter.	Letters, average number to each person.	Receipts.	Expenditures.
1874	Great Britain.	31,847,000	967,000,000	259,000,000	30	\$18,758,000	\$15,047,000
1874	Germany.......	41,070,000	697,000,000	350,000,000	17	23,077,000	21,053,000
1874	Austria.........	20,394,000	245,000,000	82,000,000	12	8,250,000	7,640,000
1874	Hungary.......	15,510,000	68,000,000	23,000,000	5		
1874	France..........	36,102,000	334,000,000	331,000,000	9	*22,083,000	*14,600,000
1874	Russia...........	65,704,000	63,000,000	24,000,000	1		
1873	Italy..............	26,871,000	104,000,000	94,000,000	4	4,562,000	4,440,000
1871	Spain............	16,835,000	78,000,000	....	4½		
1874	Sweden.........	4,341,000	15,000,000	....	3¾		
1874	Belgium.........	5,253,000	58,000,000	59,000,000	12		
1874	Switzerland...	2,669,000	63,000,000	39,000,000	24	2,893,000	2,586,000
1874	United States.	41,000,000	973,000,000	....	23½	27,441,000	33,611,000
1873	Canada..........	3,718,000	34,000,000	25,000,000	9	1,139,000	1,387,000

Our mails in 1875 were transported 75,000,000 miles by railroad over 70,000 miles of post-roads, and 58,000,000 miles by other modes of transportation over 208,000 miles of post-roads; total transportation, 133,000,000 miles over 278,000 miles of post-routes, at an annual cost of \$15,353,000; 755,000,000 letters and unsealed circulars, besides newspapers and magazines, were distributed by 51,177 officers and employés through 35,547 post-offices. About one-third of the whole business originated in seven cities—Baltimore, Boston, Chicago, Cincinnati, New York, Philadelphia, and St. Louis—and one-fifth in New York alone. The system of free delivery has been extended to 88 cities and towns, and is self-sustaining, the amount of local postage exceeding its entire expense. The ratio of increase of the whole service in 1875 was 9 per cent.; in the free-delivery cities, 13½ per cent. Many of the railroads of the U. S. have placed upon them postal cars, attended by several clerks, which receive and deliver mails at the stations, the mails received being assorted while the cars are in motion. This system has been further extended by the improved facility of receiving the mails from hanging-posts by a crane or scoop, by the necessary adaptation of the car, without stopping at the stations, the mails being also delivered by being thrown from the car at the stations. In 1875 two fast-mail trains were put in operation between New York and Chicago and between New York and St. Louis, by which the time of delivery of mails is much lessened between the eastern and western portions of the U. S.

A system of registration for letters has been adopted. The fee is uniform at 10 cents for all parts of the world. Its use is increasing slowly, but the registration of letters will not be made generally available until some further improvements have been made and a prompt delivery of the package guarantied by the department, as is now done in some countries of Europe. The money-order system was introduced a few years ago, and is coming into general use; over 5,000,000 orders are annually issued, amounting in the aggregate to about \$80,000,000. The rates were

* The rate on all third-class matter was fixed at 1 cent an ounce in Mar., 1875.

† 1873.

slightly increased by the act of Mar., 1875, and vary with the value of the order—from 10 cents for \$15 to 25 cents for orders over \$40 and under \$50. These orders are issued payable in Great Britain, Switzerland, Germany, Italy, Canada, and Newfoundland. They illustrate the tendency of capital toward the centres of trade, and from the West to the East. Smaller offices issue more orders than they pay—larger ones pay more than they issue. The West issues nearly twice as many as it pays, and America issues nearly six times as many on Great Britain as it pays.

Postal-cards, a recent extension of the service, were first adopted by Germany. Their use has increased much more rapidly here than abroad. The number of letters mailed in Great Britain is 50 per cent. greater than with us, but the number of postal-cards mailed is one quarter less. This difference can be accounted for only by the fact that the postage on letters is 50 per cent. higher here than in Great Britain. The increase of postal-cards in 1875 was 18 per cent.; of ordinary postage-stamps, 6 per cent. Great Britain has the largest correspondence in proportion to population, but the ratio of increase is much less rapid than that of the U. S.; the average number of letters to each person for the year 1874 was 33 in England, 14 in Ireland, 30 in the United Kingdom of Great Britain. In Switzerland the average number is 24 to each person; next is the U. S., 23½ to each person; next Germany, Austria, and the Netherlands; France and Canada have about half as many as the U. S., and twice as many as Spain and Norway; Greece one-fourth as many as Norway, and four times as many as Russia. Belgium has the greatest number of post-offices in proportion to population, Great Britain the next, Spain one-tenth as many as Great Britain, while Japan leads Greece and Norway.

Statistics relating to the Business of the Post-Office Department of the U. S.

For five years ending July 1.	Revenue.	Expenditures.	Profit and loss.	Cost of transportation.	Number of letters * and transient papers.	Average number to each person in five years.	Per cent. of increase.	Population.
1794	\$384,000	\$285,000	+ \$99,000	\$175,000	2,688,000			
1799	1,066,000	767,000	+ 299,000	463,000	7,462,000	$1\frac{4}{10}$	...	5,308,000
1804	1,964,000	1,415,000	+ 554,000	866,000	13,783,000	$2\frac{2}{10}$	80	6,311,000
1809	2,313,000	2,219,000	+ 94,000	1,439,000	17,191,000	$2\frac{4}{10}$	25	7,239,000
1814	3,476,000	2,786,000	+ 690,000	1,890,000	24,332,000	$2\frac{9}{10}$	40	8,435,000
1819	5,344,000	4,779,000	+ 565,000	2,980,000	35,538,000	$3\frac{7}{10}$	46	9,633,000
1824	5,652,000	5,852,000	— 200,000	3,896,000	37,364,000	$3\frac{7}{10}$	5	10,299,000
1829	7,420,000	7,295,000	+ 125,000	4,853,000	47,860,000	$3\frac{8}{10}$	28	12,866,000
1834	11,547,000	11,976,000	— 429,000	7,826,000	74,329,000	5	58	14,967,000
1839	19,215,000	18,178,000	+ 1,037,000	11,872,000	121,374,000	$7\frac{1}{10}$	64	17,069,000
1844	22,031,000	22,516,000	— 485,000	16,335,000	136,717,000	7	13	19,630,000
1849	21,358,000	21,208,000	+ 150,000	12,911,000	269,028,000	$11\frac{6}{10}$	95	23,191,000
1854	†31,731,000	35,139,000	— 3,408,000	20,707,000	457,024,000	$16\frac{6}{10}$	90	27,312,000
1859	39,171,000	59,568,000	—20,397,000	35,267,000	851,607,000	27	75	31,443,000
1864	50,902,000	63,565,000	—12,663,000	31,530,000	1,488,168,000	$42\frac{7}{10}$	50	34,748,000
1869	79,717,000	94,711,000	—14,994,000	43,878,000	2,194,659,000	$57\frac{5}{10}$	45	38,115,000
1874	111,393,000	136,258,000	—24,865,000	64,547,000	3,482,159,000	$82\frac{7}{10}$	56	41,000,000
Totals...	\$414,689,000	\$488,617,000	—\$73,928,000	\$261,535,000				
Year ending 1875	\$27,441,360	\$33,611,309	— \$6,054,000	\$15,353,369	973,275,000	23½	...	41,000,000

America has always had an interest in the interchange and development of its correspondence with Europe; the high postage formerly limited this correspondence. In 1865 the postage to England was 24 cents, to the Continent higher; only 6,000,000 letters were then exchanged with Europe. Our post-office was the first to propose a reduction of ocean-postage, and now 20,000,000 letters a year are exchanged.

At the invitation of Germany, in the year 1874 a postal congress of all the states of Europe, the U. S., and Egypt was held at Berne, and a postal convention was agreed upon, which was signed by the delegates from the countries of Europe and the U. S., and has been ratified by the several governments. A postal-union was organized, with a central office at Berne, under the supervision of the post-office department of Switzerland, for the purpose of considering and working out all questions in the interests of the union. It is expected that hereafter these conventions will be held every three years. Instead of the varying rates theretofore prevalent, a uniform postage was adopted of 5 cents on prepaid, and 10 cents on unpaid letters, weighing not over ½ an ounce, between all members of the union; newspapers, not over 4 ounces in weight, 2 cents; books and other printed matter and patterns of merchandise, not exceeding 8¾ ounces, 2 cents for each 2 ounces; postal-cards, 2 cents; prepayment invariably required except on letters.

England has taken the lead in almost every reform of the postal service. It was the first to adopt a penny postage; it has the best free-delivery system extending over both town and country, and issues postal money-orders payable in almost every part of the world. It receives and pays out deposits as a savings bank, allowing interest on deposits

Postal Statistics of Great Britain.

	Total number of letters.	Increase per cent. per annum.	Average number to each person.	Gross revenue.	Expenditure.	Net revenue.
Estimated number in......1839	76,000,000	......	3	\$11,950,000	\$3,730,000	\$8,165,000
" " " 1840	169,000,000	122½	7	6,795,000	4,290,000	2,500,000
Average of five years. 1841–45	227,000,000	10	8	8,290,000	5,005,000	3,280,000
1846–50	327,000,000	5	12	10,715,000	6,512,000	4,190,000
1851–55	410,000,000	5¾	15	12,845,000	7,205,000	5,640,000
1856–60	523,000,000	4½	18	15,675,000	8,925,000	6,745,000
1861–65	648,000,000	5½	22	19,455,000	10,370,000	9,085,000
1866–70	800,000,000	4	26	23,090,000	12,095,000	10,990,000
Year..............................1871	867,000,000	2⅓	27	24,500,000	12,795,000	11,700,000
" 1872	885,000,000	2	28	26,040,000	13,770,000	12,270,000
" 1873	907,000,000	2½	29	26,740,000	14,230,000	12,505,000
" 1874	967,000,000	$6\frac{7}{10}$	30	28,755,000	15,045,000	13,710,000

of small amounts, and has absorbed almost all the old savings banks; 1,670,000 individuals have on deposit \$115,000,000. It issues licenses for dogs, horses, carriages, servants, guns, and game, from which it derives an income of over \$2,600,000. It grants annuities and effects insurance on lives, and has in existence about 10,000 of these contracts. The post-office pays annually to the treasury nearly \$14,000,000, net profits; it operates the postal telegraph, and transmitted in 1874 over 19,000,000 messages, at a net profit of \$550,000, without including interest on the cost of the property. The letter-delivery in the city of London is unequalled. It begins early in the morning and continues till 7 or 8 o'clock in the evening, the last delivery being made after the arrival of the continental, Irish, and Scotch mails. It is their boast to find the residence of the addressee of every letter.

In all the countries of Europe the telegraph has been adopted as one of the postal agencies for the transmission of correspondence. The rates are generally low and uni-

* The number of letters prior to 1858 is ascertained by multiplying the yearly postage received on letters by the average postage; since then, by the number of stamps issued; these include stamps on transient newspapers, magazines, and other third-class matter, and parcels having more than one stamp, which amount to about 20 per cent.; newspapers and periodicals issued to regular subscribers are not included. There are no means of ascertaining how many of this class are mailed, as they are weighed, and the postage paid by the weight of the parcel.

† Including permanent appropriation of \$700,000 a year for franked matter.

form, the business large, and a source of profit in almost every country. Switzerland takes the lead in this correspondence, and transmits 81 telegrams a year for each 100 of its inhabitants; Great Britain, 54; Belgium, 52; Germany, 32; the U. S. one-half as many as Switzerland; and France one-half as many as the U. S.

In Great Britain the postage on letters not exceeding 1 ounce is 2 cents; on registered newspapers, 1 cent; on books and printed matter, 1 cent for each 2 ounces; prepayment invariable. The size is limited to 18 in. × 9 in. × 6 in., and the weight to 5 pounds. No other kinds of parcels are mailable, unless at letter-postage, excepting samples for foreign countries. In France the postage is 3 cents for drop-letters, 5 cents for others; double rates if not prepaid. Journals and periodicals treating of politics and social economy, 4 centimes, or 8 mills; other journals, 8 centimes = 16 mills; other printed matter, 4 mills a gramme,* increasing 2 mills for each added gramme; samples of merchandise, 3 cents for 50 grammes, adding 1 cent for each additional 50 grammes to 300, the extreme limit; other parcels are not mailable except at letter-rates. In almost all the other countries of Europe merchandise is mailable, but in these countries it is not received, transmitted, or delivered with letters, but through separate bureaus and by other conveyances; the rates vary with the weight, distance, and speed of transmission. In America all mail-matter is divided into three classes—letters, 3 cents ½ ounce; newspapers and journals issued to regular subscribers, at 2 and 3 cents a pound; and all other matter, not weighing over 4 pounds, that can be sent without injury to the employés or mail, 1 cent an ounce.

The United States Official Postal Guide, published by Messrs. H. O. Houghton & Co. of Boston, at the Riverside Press, "is revised and published by authority of the post-office department." It is a very useful manual, containing the regulations of the department and full instructions to the public, and information required by those who have any transactions with the department.

Tabular Statement of the Cost, Revenues, and Comparative Profit and Loss of carrying the different Classes of Mail-matter for the period of one year, in the United States.

Class of mail-matter.	Total number pieces of mail-matter of each class originating in U. S.	Per cent. of the number of each class to total of all classes.	Total weight of each class of mail-matter originating in U. S.	Per cent. of the weight of each class to total of all classes.	Number pieces each class of mail-matter to each pound.	Revenue from each class of mail-matter in the U. S.	Per cent. of revenue from each class to revenue from all classes.	Revenue from each piece of mail-matter.	Revenue from each pound of mail-matter.	Cost of transportation, handling, etc. each class of mail-matter.	Per cent. of cost each class to whole cost.	Cost of each piece.	Cost of each pound.	Total profit or loss on each class.	Profit or loss on each piece.	Profit or loss on each pound.
	Pieces.		Pounds.		Pieces.	$		Cts.	$	$		Cts.	$	Profit.	Cts.	Cts.
1st class..	629,185,386	61.5	13,502,762	12.1	46.6	19,597,204.90	77.6	3.11	1.45	15,384,614.20	47.7	2.445	1 13.937	$4,212,390.70	.665	31.063
														Loss.	Loss.	Loss.
2d class..	155,399,019	15.2	55,783,832	50	2.785	976,217.06	3.9	.628	.175	7,969,240.97	24.7	5.128	14.28	6,993,023.91	4.5	12.53
3d class..	237,081,046	22.3	42,351,308	37.9	5.59	4,658,643.88	18.5	1.96	.11	8,772,559.41	27.6	3.7	20.7	4,113,915.53	1.74	9.7
Total....	1,021,665,451	....	111,637,902	....	......	25,213,865.84	....	....	....	32,126,414.58						

NOTE.—It is not claimed that this table is exactly accurate in all its figures. It is, however, as nearly so as it is possible to make it, and the comparisons as to the different classes of mail-matter are doubtless very nearly absolutely correct. This is clearly shown by the following facts: The information upon which the table is based was gathered from 258 fairly representative post-offices, from which about 50 per cent. of the entire revenue of the post-office department is collected. The estimates from these actual examinations, compared with the actual facts so far as reported by the proper bureaus of the department, are found to be approximately correct. Thus, the total number of pieces of first and third class matter is shown by the table to have been 866,266,432, while by the official report the number of stamps, stamped envelopes, and postal-cards issued for the same period was 905,451,305, leaving 39,184,873 pieces for packages upon which more than one stamp was used; which is believed to be about in accordance with the actual fact. The figures as to the weight of the matter are based upon actual weighing, and are almost exactly correct. For the figures showing the comparative cost and revenue of the different kinds of matter long and searching examinations were made, and the deductions therefrom for the year, being compared with official reports so far as they exist, were found to be correct. The table, therefore, forms a proper and just basis for any deductions that may be made.

GARDINER G. HUBBARD.

Post Town, v., Madison tp., Montgomery co., O. P. 37.

Post'ulate, in geometry, differs from *axiom* by being simply a position on which mathematicians agree, but which it would not be impossible to deny; while an axiom denotes a self-evident position. Thus, the position, "A circle may be described from a given centre with a given radius," is a postulate, while the position, "Things equal to the same thing are equal to one another," is an axiom. In philosophy this distinction between postulate and axiom has been obliterated, and both words are used synonymously to denote such positions as cannot be denied without denying consciousness itself. Thus, in the Kantian philosophy the existence of God and the immortality of the soul are treated as postulates of the practical reason, forming the very basis of the moral consciousness, needing no theoretical evidence, and even incapable of any.

Post'ville, p.-v. and p.-tp., Allamakee co., Ia., at the junction of the main line with Milwaukee division of Milwaukee and St. Paul R. R., has 1 newspaper.

Potamogal'idæ [from *Potamogalæ;* Gr. ποταμός, "river," and γαλῆ, "a weasel"], a family of insectivorous mammals represented by a single species which inhabits certain African rivers. The form is somewhat otter-like; the head elongated, and with the snout produced; the tail very much compressed; the digits not connected by webs; the skull is cylindro-conic, with a suboptic foramen, but no lachrymal one; the teeth forty—viz. I. $\frac{3}{3}$, C. $\frac{1}{1}$, P. M. $\frac{3}{3}$, M. $\frac{3}{3} \times 2$; the upper molars present, each incompletely divided, triangular prisms, two principal internal cusps being developed; the lower molars have each a narrow triangular, transverse crown, behind which is a quite large posterior lobe or area; the scapula has no metacromion; the clavicles are atrophied; the tibia and fibula ankylosed together at their distal extremities. The family is distinguished by these characters from the Centetidæ, with which it is most nearly allied. The single species (*Potamogale velox*) is an inhabitant of some equatorial West African streams. THEODORE GILL.

Pot'ash [Fr. *potasse;* Ger. *Kali, Kaliumoxyd, Pflanzenlaugensalz*], **Vegetable Alkali,** or **Pearlash;** chemically, hydrate of the oxide of the metal *potassium,* $K_2O.H_2O$; by many chemists written KHO or KOH, on the hypothesis that it has a molecular structure similar to that of water, HHO or HOH, or is built upon the "water-type." Potash and pearlash of commerce are obtained by the lixiviation of wood-ashes mixed with lime, and boiling down the ley. Pearlash is merely a somewhat purer form, produced by calcination. During the burning of wood to form ashes, organic salts of potash, which exist in it, are converted into carbonate of potash; and in the lixiviation the lime converts the carbonate into hydrate of potash. Ashes vary greatly in their content of potash according to their source, ashes of *wheat-stems,* for example, containing 47 per cent., of *oak-leaves* 24 per cent., of *corn-stalks* (Indian corn) 17.5 per cent., of *grape-vines* 12.73 per cent., of *flax* 5 per cent., of *willow-wood* 2.85 per cent., and of *pine-wood* but half of 1 per cent. The U. S., being one of the countries in which wood is abundant, is one of the largest potash-producing countries, and the State of New York, particularly, is said to furnish 75 per cent. of the whole of the large American export of potash. Russia is another very productive potash country. As the forests disappear, however, mineral sources of potash must come into application, and the most available of these at present are the minerals *carnallite* and *sylvite,* containing chloride of potassium, found abundantly at the Stassfurt mines. The greatest natural treasuries of potash are the common mineral *feldspars,* in which, however, it is combined by such powerful affinities that no sufficiently cheap method has yet been discovered for its extraction. In America we have another mineral, even cheaper and more readily obtainable than feldspars, the *glauconite* of the Cretaceous or *greensand* formation, chiefly developed in New Jersey, which constitutes a large geological formation, often nearly pure glauconite, and containing the equivalent of 10 or 12 per cent. of commercial potash. This mineral—which constitutes a large and abundant article of commerce for fertilizing purposes—is far more easily decomposable than the feldspars, and will be in the future an immensely valuable source of potash in illimitable quantities.

The commercial varieties of potash are by no means pure. The French chemist Vauquelin made the following analyses of some of them:

*1000 grammes = 35 ounces.

In 100 parts.	Equivalent in pure hydrate of potash.	Sulphate of potash.	Chloride of potassium.	Insoluble residue.	Carbonic acid and water.
American	74.4	13.37	1.74	0.18	10.33
Russian	67.0	5.64	0.43	4.86	22.05
Pearlash	65.45	6.95	0.35	0.52	26.74
Dantzic	52.34	13.19	1.21	6.85	26.39

The strength of commercial potash, which it is an essential matter to know, is determined by processes of alkalimetry. (See ALKALIMETER; also VOLUMETRIC ANALYSIS.) But it is also important to know whether the potash may not be adulterated with the cheaper alkali, *soda*. There are several tests for this, one of the best probably being that of Frémy—a solution of the *metantimoniate* of potash—which is applied after converting the potash into neutral chloride, and will precipitate, with proper care, 1 per cent. of soda. *Pure hydrate of potash*, an important reagent in the laboratory, is prepared from the crystallized bicarbonate, the most available commercial potash compound that is obtainable in a state approaching purity. A moderate heat converts this into carbonate, which is then decomposed by boiling its rather dilute solution with hydrate of lime. The solution of hydrate of potash thus obtained, on being boiled to dryness and treated with alcohol, will yield a solution of potash pure enough for most uses. The alcohol is distilled off and used over again. Hydrate of potash, approximately pure, cast into the form of sticks or pencils, is abundant in commerce, being used sometimes in this form as a cauterizing agent. Hydrate of potash is very deliquescent, and must be kept from contact with the air. It dissolves in a little over its own weight of water, forming a solution which, according to Dalton, may have a density of 2.4, containing about 47.5 per cent. of hydrate. As the hydrate itself has a density of but 2.1, a great molecular condensation is indicated in this solution. HENRY WURTZ.

Potas'sium [Ger. *Kalium*], a metallic element which forms the basis of the bodies known as potash-compounds. Anhydrous *potash* (K_2O) is one oxide of this metal, and common *caustic potash* ($K_2H_2O_2$) is engendered by its contact with water in proper proportions.

History.—The earlier chemists held that the two "mineral alkalies," *potash* and *soda*—called also by them "fixed alkalies," to distinguish them from *ammonia*—were elementary in their nature. Lavoisier suspected them to be of the nature of metallic oxides, and there were several current statements of their having been found by different chemists to yield, on intense ignition with charcoal, metallic matters, which were, however, generally recognized as iron, derived from impurities in the materials. It was reserved for H. Davy in 1807, while experimenting with a voltaic battery of great power upon potash, to isolate and obtain the wonderful new metal potassium—a discovery which at that time created an interest and excitement throughout the chemical world such as has seldom been equalled. His experiment was repeated by all chemists who possessed the means, and other modes were discovered of decomposing potash. Gay-Lussac and Thénard, who discovered another mode, for some time maintained that potassium was a *compound* substance, composed of potash and hydrogen—a conclusion which arose legitimately and directly from the phlogistic views then still quite prevalent. (See PHLOGISTON.) Gay-Lussac and Thénard also at first claimed that Davy's new body was a *liquid metal*, like mercury. (See below.) Berzelius and other chemists quickly came to the rescue, and the hypothesis of Lavoisier, as demonstrated by Davy's astounding discovery, was soon established, and the mineral alkalies, together with the alkaline earths soon after, took their true places as metallic oxides in our chemical classification.

Occurrence and Functions in Nature.—Potassium is very widely, though not so very abundantly, diffused throughout the earth. In the older rocks of the continents almost its sole matrices are *orthoclase* or potash-feldspar, and the potash-micas *muscovite*, *biotite*, and *phlogopite*. Its minerals or ores are therefore not numerous, though often very abundant locally in amount. Like all the other soluble constituents of the rocks, potash is continually being leached out from these as well as from soils composed of their débris, and being carried down into the ocean, where, however, it has not accumulated to so great an extent as the other alkali-metal sodium, chiefly for two reasons, one of which is that rivers carry down a very far smaller proportion of potassium than of sodium; and another reason, still stronger, being the fact that certain mineral bodies containing potassium appear to separate or to be precipitated, in some manner not at all as yet understood, from the waters of the ocean. One such body is the mineral *glauconite* (greensand). Potash was called, in the early days of the science, the "vegetable alkali," from the fact that it peculiarly abounds in the plant kingdom, the ashes of which are indeed as yet the most abundant source of this alkali. In the mineral kingdom SODIUM (which see) is a much more prevalent element than potassium. A highly-productive source of potassium compounds of late years has been found in certain layers of the great saline deposits at Stassfurt, as the chlorides *carnallite* and *sylvite*, and the double sulphate with magnesia, *picromerite*.

Preparation of the Metal.—H. Davy's original method was to expose slightly-moistened caustic potash to the current of a voltaic battery of 200 couples. The potash was placed in a platinum dish, which was connected with the negative pole—that is, made the cathode—while the positive pole, or anode, was a platinum wire. The heat of the current caused fusion of the mass, and globules of the metallic potassium in a fused state appeared in the dish, which were quickly transferred to petroleum to prevent their taking fire and burning up in the air. The method next discovered, that of Gay-Lussac and Thénard, consisted in allowing fused caustic potash to flow into an iron tube filled with iron borings and heated to whiteness. Their first potassium, as before stated, was permanently liquid, which they themselves found afterward to be due to the fact that their potash contained soda, and their product was an alloy with sodium, which is a permanently liquid alloy at ordinary temperatures. A third method is that now in general use for making potassium, which was suggested by Curaudau, but carried successfully into practice by Brunner, and is hence known as "Brunner's method." It consists in distilling in an iron retort, at a very elevated temperature, an intimate mixture of dipotassium-carbonate and charcoal, the whole mass being (theoretically) convertible into potassium and gaseous dioxide of carbon: $O_3CK_2 + C_2 = (CO)_3 + K_2$. Under the head SODIUM will be found some details of Brunner's method, generally applicable also to potassium; but the latter metal is much more difficult to obtain by this method than sodium, and is hence always much more costly. This is, however, of the less importance since sodium is applicable generally to the same uses as potassium, is much more easily handled and managed, and, having a smaller equivalent (23, while that of potassium is 39), goes further, weight for weight. In the manufacture of potassium by the method of Brunner there is a great tendency to the formation of an *explosive body*, not well understood, but supposed to be a compound of potassium and carbonic oxide, which often gives rise to dangerous accidents. The potassium produced must always be redistilled once or twice to rid it of all admixture with secondary products, which either contain or in time engender the explosive body referred to. Matthiessen proposed to return, in a measure, to the original method of obtaining potassium of Davy, by electrolysis. He used, however, instead of caustic potash, the *chloride of potassium*; and, to render this more fusible, he combined it with chloride calcium in equivalent proportions to a double chloride. A Bunsen battery of six cells furnished him with voltaic power sufficient to procure considerable quantities of potassium in a perfectly pure state, and of course without any trouble from the explosive body above referred to. It can scarcely be doubted that the application of electrolytic currents obtained by mechanical means—from magneto-electric engines—would be found practically available in the preparation of potassium if Matthiessen's ideas should be employed.

Nature and Properties.—Potassium is a very soft metal, cutting like wax, having a rather dark lead-blue color, with brilliant lustre; becoming brittle and crystalline at zero Centigrade. Two density-determinations only are on record, which do not differ much:

Gay-Lussac and Thénard (at 15° C.) .865
Sementini (temperature not stated) .87

These two preparations, therefore, belonged, in all probability, to the same allotropic modification. Indeed, a definite and simple potassium-molecule, computed from the newly-discovered geometric law of molecular condensation of the present writer (explained under head of VOLUMES, MOLECULAR), requires the density *at zero* .871. Potassium is therefore lighter than water, and, next to LITHIUM (which see), it is the lightest solid body yet known when in its elemental form. When it combines with oxygen, however, to form K_2O (whose density at zero is 2.714), it condenses, as the writer has discovered, to a density of about 2.65, or about that of *wrought aluminium*. This same *heavy* molecule of potassium exists also in its sulphates, chromates, permanganate, sulphocyanide, and some other compounds. Potassium is so soft at the mean temperature of 60° F. that two pieces pressed and kneaded together will coalesce like pieces of soft wax. It is commonly said to be susceptible, therefore, of being *welded* at ordinary

temperatures, as iron is at a white heat. At about 145° F. it melts, and at a red heat boils, and may be distilled, yielding a vapor of a beautiful green color. It combines with the oxygen of the air with great avidity, so that a freshly-cut surface tarnishes instantly in the air; and in order to preserve it, it must remain immersed in a bottle under the surface of some hydrocarbon liquid free from oxygen. Rectified petroleum may be used for this purpose, but the rectified oils of coal-tar are preferable. C. E. Long obtained potassium, by pouring off the liquid part during its solidification, in bright octahedral crystals of the tetragonal (dimetric) system. SODIUM (which see) forms similar crystals upon similar treatment. Potassium burns when heated with a large flame of very intense temperature and a peculiar violet color, which resolves itself in the spectroscope into the characteristic spectrum of potassium. When thrown on water, the reaction which occurs between the metal (whose levity, as above stated, causes it to float) and the water is so violent, and so much heat is developed, that the potassium and the hydrogen produced by the decomposition of the water both take fire spontaneously, and burn together with a rich rose-red colored flame, constituting one of the most beautiful, interesting, and instructive experiments of the chemical classroom. The melted globule of potassium runs about over the surface of the water eccentrically, propelled by the torrent of hydrogen gas evolved around it, the motion becoming more and more rapid until there remains at last only a fused globule of caustic potash; which is also supported out of contact with the water by the atmosphere of steam around it, until finally, on cooling sufficiently, this globule suddenly unites with the water below with a slight sharp explosion. Potassium unites with mercury with great and explosive violence to form potassium-amalgam, whose properties are so similar to those of the much more important compound *Sodium Amalgam* (see SODIUM, COMPOUNDS OF) that a reference to this latter head will be appropriate. H. WURTZ.

Potas'sium Compounds, Medicinal Uses of. *Potassa*, from its strong chemical affinities, is powerfully caustic to living tissues. It unites with water and with albuminous substances, and from its deliquescence and high diffusive power rapidly penetrates the tissues, and thus carries its destructive effects very deeply. The slough is black, slimy, and pultaceous. Taken internally, potassa or a strong solution thereof is a violent corrosive poison. The antidote is some organic acid, such as acetic (vinegar), citric, or tartaric. In weaker solution potassa swells and softens epithelium, producing a slippery feel to the fingers. Potassa is used in surgery as a caustic, being fused and run into cylindrical moulds about the size of a goosequill, so as to form conveniently-shaped sticks. A solution of potassa of specific gravity 1.065 is officinal in the *U. S. Pharmacopœia*, and may be used for the general purposes of alkaline medication. But alkaline salts of the same base are preferable, and this solution is therefore employed more in pharmacy than in medicine. *Potassium carbonate* and *bicarbonate* are strongly alkaline, and have essentially the physiological properties of solution of potassa. They are used externally in weak solution as lotions in skin diseases to remove dried epithelial crusts and scabs and control the excessive secretion of such diseases as eczema. Like other alkaline lotions, they often allay the itching of skin disease. They are not much given internally, sodium salts and other alkalies being preferable for alkalizing the contents of the alimentary canal, and salts of potassium with organic acids for producing the effects of potassa on the system at large. They are sufficiently alkaline to be poisonous in large dose. *Potassium acetate* and *citrate*, though of neutral reaction, become converted into carbonates in the blood through decomposition of the organic acids. They thus tend to increase the alkalinity of the blood, to alkalize the urine, and especially to diminish the quantity of uric acid present in the system. They may also prove diuretic, increasing the quantity of the solid elements as well as the water of the urine, but this effect is very uncertain, and frequently does not occur at all in health. These salts are used medicinally in rheumatism, gout, and uric-acid gravel to diminish the excess of acidity characteristic of those diseases, and in dropsy and deficient secretion of urine to produce diuresis. Solution of the citrate, freshly made by saturating lemon-juice by potassium carbonate and drunk during effervescence, is a favorite mode of giving the salt for the above purposes, and is also a very refreshing fever-draught, for allaying nausea, and for reducing over-action of the heart in acute febrile states. *Potassium and sodium tartrate* (Rochelle or Seignette salt) is of low diffusion power, and in large dose is purgative simply, producing, like other cathartic salts, watery stools. In smaller quantities, as a drachm, given considerably diluted, it is absorbed, its acid decomposed, and then under the form of carbonate it produces the effects and may be used for the purposes just enumerated. It is also employed as a purgative, and is most commonly given in the form of the *Seidlitz powder* (*pulveres effervescentes aperientes* of the *U. S. Pharmacopœia*). A Seidlitz powder consists of a blue paper containing two drachms of the Rochelle salt and forty grains of sodium bicarbonate, and a smaller white paper containing thirty-five grains of tartaric acid. The contents of the two papers are to be separately dissolved in about two fluid-ounces of water, the solutions mixed and drunk during the effervescence that immediately takes place. *Acid potassium tartrate* (bitartrate = cream of tartar) is purgative like Rochelle salt, and is considerably used as a saline cathartic. In small dose, again like the Rochelle salt, it is absorbed and may prove diuretic, but apparently in the case of this salt the acid is not decomposed, or at least the salt does not act as an alkali in the blood. It cannot be used, therefore, for alkaline internal medication, like the acetate or citrate. *Neutral potassium tartrate* is also purgative, but from its disagreeable taste the acid tartrate is medicinally preferable. *Potassium sulphate* is again purgative, but is harsh and may be poisonous, and is therefore little used. *Potassium nitrate* (nitre = saltpetre) is irritant and in large dose poisonous, inflaming the stomach, causing vomiting and purging, and also having an effect, common to many of the stronger potassium compounds, of affecting the heart, enfeebling its power, and even causing death by syncope. Nitre is used in medicine as an ingredient of cooling saline draughts in fever, to reduce over-action of the heart, and was at one time largely employed in acute rheumatism. Nitre has nothing to do with the so-called *sweet spirit of nitre*, which is a peculiar ethereal compound containing nitrous ether and alcohol. *Potassium chlorate*, though of high diffusion power like nitre, is less freely soluble, and is hence not so strongly irritant and poisonous; yet an inordinate dose can inflame the stomach, and in one case proved fatal. This salt is peculiar in being largely excreted by the salivary glands and increasing their secretion. Medicinally, its use is almost confined to inflammatory and ulcerative diseases of the mouth and throat, over which it often has a remarkable power. A saturated solution may be gargled, and a little swallowed from time to time, or a few of the crystals may be held in the mouth and allowed slowly to dissolve.

The other potassium salts used in medicine derive peculiar powers from their several acidifying principles. *Potassium cyanide* is intensely poisonous, and has essentially the properties of HYDROCYANIC ACID (which see). *Potassium ferrocyanide* has but feeble physiological action, and is practically used only in pharmacy and the arts. The properties of *potassium iodide* will be found described under IODINE, MEDICINAL USES OF. *Potassium bromide* has peculiar powers over the nervous system, in addition to possessing the properties of potassium salts in general of enfeebling the heart and tending to cause diuresis. The nervous influence is first a mere blunting of reflex excitability, cerebral and spinal, passing to complete paralysis if the drug be administered too long in inordinate quantities. The production of an eruption on the face like acne, and moderate salivation with a fœtid breath, are minor effects following the continued use of the drug. This salt is largely used in medicine to allay morbid nervous irritability, and is of special curative power in epilepsy, for the treatment of which it is perhaps the best remedy yet found. *Potassium sulphide* is used in medicine for the sulphur it contains. (See SULPHUR, MEDICINAL USES OF.) *Potassium bichromate* is irritant and caustic, and internally a corrosive poison. It is officinal in the *Pharmacopœia* only for pharmaceutical use, being employed for the preparation of sodium valerianate. *Potassium permanganate* in concentrated solution is slowly caustic, but the medicinal use of the salt is as a disinfectant. It acts by oxidation through giving up of some of its own oxygen, and in weak solution is an excellent disinfectant application to wounds, foul sores, and ulcers. EDWARD CURTIS.

Potassium, Compounds of. Of *oxides* of the metal potassium *three* exist, all of which have been obtainable only since Davy's discovery of the metal POTASSIUM (which see), as they are derivable only from the metal. To obtain the lowest oxide, K_2O, the best method is to heat together two equivalents of potassium with one of potash: $K_2 + K_2H_2O_2 = 2K_2O + H_2$. Its true density at zero is 2.714; Karsten found (at normal temperature) 2.656. It melts at a red heat, but is not so volatile as potash. When mixed with water, it combines to form potash with such energy as to give rise to incandescence, as is also the case with quicklime and some other oxides; this notwithstanding the fact that an important *expansion* takes place in the combination; the mean density of equal equivalents of K_2O and water being about 2.44, while pot-

ash has the true density at zero 2.048 (Filhol found 2.044). In the case of quicklime the expansion is even greater in proportion. (See VOLUMES, MOLECULAR.) The other two oxides of potassium, K_2O_2 and K_2O_4, *dioxide* and *tetroxide*, are formed in the rapid combustion of potassium in dry air or oxygen. To obtain either of them in a pure state special precautions are necessary. The dioxide is white, but the tetroxide has a chrome-yellow color.

Chloride of Potassium (KCl).—This salt occurs native as the mineral *sylvine* (*sylvite* of Dana). The early chemists had for it the name *sal digestivum sylvii*, whence the name of the mineral. Its principal localities are Mount Vesuvius, where it condenses from fumaroles in cubical crystals, and Leopoldshall in Anhalt. It also occurs in solution in many mineral waters and in the ocean. Chloride of potassium is not abundant as the mineral sylvine, but there is another mineral, containing this chloride as a constituent, that is found so abundantly at the Stassfurth mines in Magdeburg as to be a large article of commerce of late years as a material for making fertilizers. This is *carnallite*, which is a double chloride of potassium and magnesium. It forms at Stassfurth the greater part of a stratum from 60 to 70 feet in thickness. Its composition is $KCl.MgCl_2.6H_2O$. Chloride of potassium is more soluble than common salt, dissolving in three times its weight of water at normal temperature.

Bromide of Potassium (KBr).—This salt, so largely used of late years in medicine, is found in solution in mineral springs, but is prepared for commerce by artificial methods, one of which is the decomposition by carbonate of potash of *bromide of iron*, previously prepared by the action of bromine on iron. It is very soluble in water.

Iodide of Potassium (KI).—Also an exceedingly valuable medicinal salt. It is prepared by various methods, one of which is similar to that referred to under the bromides, using *iodide of iron* instead of bromide. It dissolves in seven-tenths of its weight of water and in six times its weight of alcohol. Its solutions have the power to dissolve iodine itself largely, forming deep-brown liquids. In these the iodine does not appear to be combined, but merely dissolved, since disulphide of carbon will dissolve it out. Iodide of potassium produces cold when dissolving in water, the depression under favorable circumstances being as much as 43° F.

Sulphides of Potassium.—Five of these are known—K_2S, K_2S_2, K_2S_3, K_2S_4, and K_2S_5. The preparation called *liver of sulphur*, prepared by fusing together sulphur and carbonate of potash, contains several of these sulphides. The modes of separation and of preparation in a state of purity will be found described in the chemical textbooks. Many of the other potassium-compounds will be found described elsewhere under appropriate heads.

HENRY WURTZ.

Pota'to, the most widely-cultivated and valuable of esculent tubers, is the *Solanum tuberosum*, and being the typical species of a typical family, both of vast extent and widely-differing characteristics (see SOLANACEÆ), it is thus allied to several powerful narcotics, such as tobacco, henbane, and belladonna, as well as to other esculents, such as the tomato, egg-plant, and capsicum. The name, which is applied indifferently to the plant and to the tuber, is directly derived from the Spanish *batatas*, a word undoubtedly from the Carib or some other American Indian language, and first applied to the sweet potato, to which the name was exclusively given by English writers before the middle of the seventeenth century. The potato is a native of the elevated tropical valleys of Mexico, Peru, and Chili; and was probably carried to Spain from Peru early in the sixteenth century. It was probably introduced into Virginia from Florida by the Spanish explorers, and into Great Britain from Virginia by Sir John Hawkins in 1565, though the credit is usually assigned to Sir Walter Raleigh, who was never in Virginia. At the present day it is found in several varieties in a wild state in Peru, Chili, and the island of Chiloe, the wild plant bearing still a close resemblance to the cultivated, except in the abnormal development of the tuber in the latter. The common potato was described in 1597 under the name of *Batata Virginiana* by Gerard in his *Herball*, and in the following century it was cultivated on a small scale in the Netherlands, Burgundy, and Italy, and on account of its great yield was recommended by the British Royal Society in 1663 for introduction into Ireland as a safeguard against famines (!); but it was not until near the middle of the eighteenth century that it acquired any real importance in Europe outside of Ireland. It was little regarded in Virginia, and seems to have been unknown in New England until the eighteenth century, when it was carried thither from Ireland. The potato is not mentioned in *The Complete Gardiner*, a work published in 1719, and as late as 1771 only two varieties, a white and a red, were mentioned in the most important English work on gardening, and they were considered chiefly as food for swine and cattle. The potato is usually spoken of as a *root*, but this is an inaccuracy, the roots being quite distinct from the tuber, which is in reality an underground stem, naturally of considerable size, and abnormally developed by cultivation, through the accumulation of starch for the use of the plants growing from the *eyes* or buds. Under proper trimming and management the branches above ground may be made to assume several of the characteristics of the tubers.

The potato may be described as a perennial plant, with smooth herbaceous stems, from one to three feet in height, pinnate leaves, flowers varying in breadth from an inch to two inches, and in color from bluish-white to purple, and consisting of a wheel-shaped corolla, more or less veined, bearing a globular purplish fruit or seed-ball of the size of a gooseberry, and an herbage characterized by a narcotic smell, and practically useless, though it may be eaten like spinach, both by man and by cattle. One of the leading qualities of the potato is an extraordinary productiveness, far exceeding that of any esculent with which it can be placed in competition, an equal amount of ground yielding, according to Humboldt, thirty times greater weight of potatoes than of wheat. Potatoes consist almost wholly of starch, and are accordingly deficient in nitrogen, and ill-adapted for an exclusive article of diet. They are hardy, and grow well in poor land throughout a vast extent of the earth's surface. Though, as already mentioned, indigenous to tropical America, they do not grow there in the lowlands, but only in the high valleys several thousand feet above the level of the sea. In the U. S. they yield best in the extreme Northern States, especially New York and New England, and also in Canada; and in Europe are successfully cultivated up to 60° N. lat. in Sweden. Formerly planted exclusively by hand in hills three or four feet apart, they are now sown extensively in drills, and flourish without that minute care once given them. Where large quantities of potatoes are grown, various mechanical devices are in use for dividing the drills and throwing up the tubers, ready to be gathered by hand. They have natural affinities to moisture and antipathy to light, to which they should never be exposed. There is a bitter principle subsisting in the potato which may be considered as more or less poisonous, and which is aggravated by the action of light to such a degree as to turn green; this principle must be removed by cooking before the tuber is fit for food; hence the water in which potatoes have been boiled should never be employed in the preparation of other food. The particular variety of potato can be secured only by raising the tubers. The seed of a single ball will often produce many varieties of potatoes, and cannot be depended upon to propagate the parent stock. Dr. Hexamer of New Castle, N. Y., a high authority on potato-culture, keeps constantly on hand, as a standard of comparison, above 300 varieties of potatoes, and new varieties might be produced apparently without limit by the necessary effort. The varieties most esteemed in the first half of the nineteenth century seemed to receive a complete check by the potato-rot of 1845, and they have now (1876) practically fallen into disesteem, and are replaced by others. The best of the old favorites was probably the mercer of Neshannock (so called from having originated on Neshannock Creek, Mercer co., Pa.); its place in point of popularity seems to be filled by the early rose, Jackson, white garnet, Chili, peach-blow, and early Goodrich, most of which were originated by the late Rev. Chauncey E. Goodrich of Utica, N. Y., to whom the world is largely indebted for the preservation and improvement of this important article of diet. The annual crop of potatoes in the U. S. in 1870 was 143,337,473 bushels, of which New York produced 28,500,000, Pennsylvania nearly 13,000,000, and Ohio and Illinois each about 10,000,000. (For an account of the ravages of the most recent enemy to the potato, the Colorado potato-bug, see the ensuing article.)

REVISED BY ASA GRAY.

Pota'to-Bug. This term is applied indiscriminately by farmers to a great many different insects that attack the potato, the habits of which are in many cases as different as those of a horse and a hog. Of the principal insect enemies of the potato, the following may be enumerated: *Boring in the stalk*—the stalk-borer (*Gortyna nitela*); the potato-stalk weevil (*Baridius trinotatus*). *Feeding upon the leaves*—the potato-worm (*Sphinx 5-maculata*); the three-lined leaf-beetle (*Lema trilineata*); the cucumber flea-beetle (*Haltica cucumeris*); over half a dozen species of blister-beetles, belonging to the genera *Lytta* and *Epicauta;* and finally the Colorado potato-beetle (*Doryphora 10-lineata*), a hemispherical yellow beetle about one-third of an inch long, with ten black stripes on the elytra. This last, on account of its singular history and great destruc-

Fig. 1.

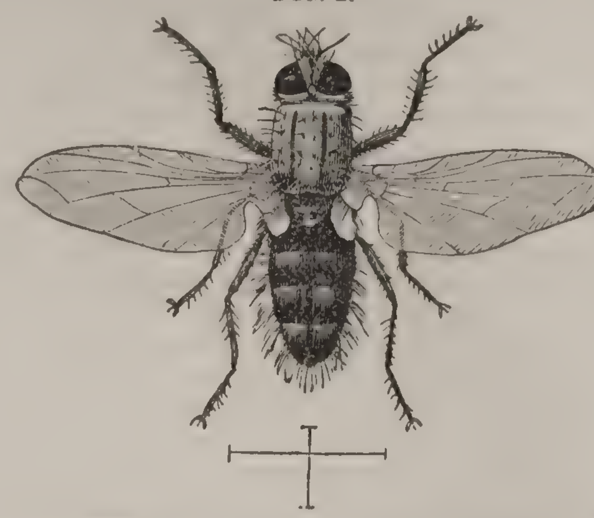
Colorado Potato-beetle: *a*, eggs; *b*, *b*, *b*, larvæ; *c*, pupa; *d*, *d*, beetle from side and back. Colors, *a*, orange; *b*, Venetian red; *c*, pale orange; *d*, black and yellow.

tive power, has come to be known as "the potato-bug," and it is to it that we shall confine our attention under that title.

Few insects have attracted greater attention than has this species since 1860. First described by Thomas Say, who found it tolerably common on the upper Missouri in 1824, it was afterward scarcely heard of till 1859. Feeding originally on the sand-burr (*Solanum rostratum*), a wild plant belonging to the same genus as the potato, the insect was at first doubtless confined to the more fertile country just E. of the Rocky Mountains, ranging from the Black Hills down into Mexico, but being most common and extending farthest E. to the N., or in the Black Hills region. Its wild food-plant is easily dispersed by adhering to animals and vehicles, and has for many years, like the beetle, been extending its range eastward. We are therefore warranted in concluding that by its dispersion, and perhaps by other aid given by man, directly or indirectly, the beetle was enabled to cross the stretches of plain and prairie that intervene between its native home and the more fertile country to the E. It would naturally be most assisted along the line of greatest travel, and we consequently find it first falling in large numbers on the cultivated potato, which it found to its liking, about 100 miles W. of Omaha, Neb., in 1859. With extensive fields of cultivated potatoes instead of scattering plants of *Solanum rostratum* to feed on, the insect began to multiply and to spread at a marvellous rate. In 1861 it invaded Iowa; in 1862, S. W. Wisconsin; in 1864 and 1865 it crossed the Mississippi to the western part of Illinois: along the Iowa line, and from N. E. Missouri in 1866, it occupied most of the country W. of a line drawn between Chicago and St. Louis; in 1867 it reached S. W. Michigan and W. Indiana; in 1868 many parts of Ohio, and from that time on kept spreading from year to year, until in 1874 it touched the Atlantic seaboard at numerous places, and in 1875 was common from Virginia to Maine, and even abounded in the streets of the larger cities, as Philadelphia and New York. It may thus be said to have travelled over 1500 miles in a direct line within sixteen years, and to have spread over an area of something like 500,000 sq. m., including most of the territory in Nebraska, Kansas, Missouri, Iowa, Minnesota, Wisconsin, Illinois, Indiana, Kentucky, Michigan, Ohio, Ontario (Canada), New York, Vermont, New Hampshire, Connecticut, Massachusetts, Rhode Island, New Jersey, Pennsylvania, Delaware, Maryland, and Virginia. Though the insect is generally said to have travelled E., in so far as the language implies that the species is migratory or itinerant it is incorrect. The insect simply spreads, and, though most injurious during the first few years of its advent, it never leaves one section for another, but always remains where it has once obtained a foothold, its destructive power varying according as the season is favorable to its development or otherwise, or according as its enemies multiply or decrease.

Natural History.—The insect hibernates in the perfect or beetle state under old rubbish in sheltered situations of whatever kind, but normally in the ground, generally but a few inches beneath the surface, but exceptionally at a depth of three feet. As vegetation starts in spring the insect issues from the ground, and long before potatoes are up, or even planted, it may be seen flying on genial days in search of food and company, the rose-red under-wings contrasting prettily with the yellow and black of the elytra. It will frequently work into a sprouting hill of potatoes as these are raising the soil, and feed upon the

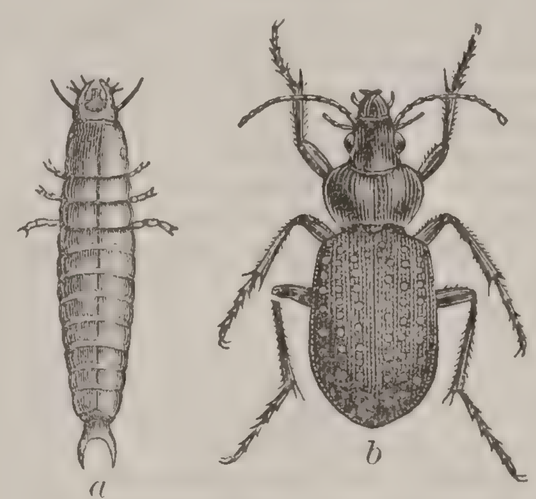
Fig. 2.



Lydella doryphoræ: Colors, black and silvery-gray.

tender sprouts and tubers; and as soon as the plant shows itself the female begins to lay her oval orange eggs in clusters of from 10 to 40, each attached by one end to the under side of a leaf or to a stem. With favorable weather

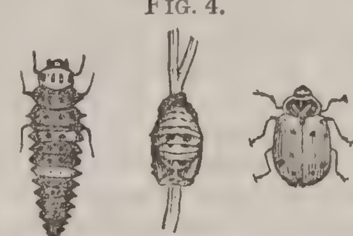
Fig. 3.



Fiery ground-beetle: *a*, larva; *b*, beetle. Colors, *a*, black; *b*, black and golden.

there hatches, in the course of a week, from each egg a small, dark Venetian red, hunchbacked larva, which becomes paler and acquires a double row of lateral black spots as it advances toward full growth. This period arrives in about three weeks from hatching, and the larva finally burrows into the ground, where, within a simple earthen cavity, it becomes a pupa, and finally a beetle in from seven to ten days, the whole cycle of its transformations from the egg to the beetle requiring rarely more than a month.

Fig. 4.



Convergent Ladybird: larva, pupa, and beetle. Colors, black and orange.

The illustrations in our figure will convey a correct idea of its different stages. In the latitude of St. Louis there are three broods annually, the last brood of beetles issuing from the ground early in the fall, and, as we have already seen, entering it again to pass the winter. The migratory habit is often very noticeable in this last brood of the beetles, and for weeks they may be seen flying in bevies or travelling on foot in immense armies wherever they are unusually numerous. The beetle feeds less than the larva, but is nevertheless very tenacious of life. The period of oviposition covers about a month for each female, and the number of eggs produced by each averages about 500. While the species feeds by preference on plants belonging to the genus *Solanum*, and it is doubtful whether it could thrive for any length of time on other plants than those of the family

Fig. 5.

15-spotted Ladybird: *a*, larva; *b*, pupa; *d*, beetle. Colors, *a*, black and yellow; *b*, black and orange; *d*, black, cream-yellow, and chocolate.

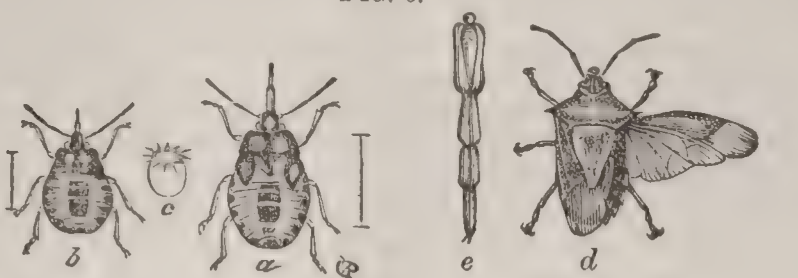
Solanaceæ, yet in its march across the country it has adapted itself, in an emergency, to other kinds, among which may be mentioned the cabbage, hedge mustard (*Sisymbrium officinale*), smart-weed (*Polygonum hydropiper*), pig-weed (*Amarantus retroflexus*), thistle (*Cirsium*), mullein (*Verbascum*), lamb's-quarter, and maple-leaved goosefoot (*Chenopodium album* and *C. hybridum*).

Means of averting its Injuries.—These may be consid-

ered under three heads: (1) natural enemies; (2) preventive measures; (3) direct remedies.

Natural Enemies.—To the naturalist it has been interesting to watch how, with the insect's advance toward the

FIG. 6.



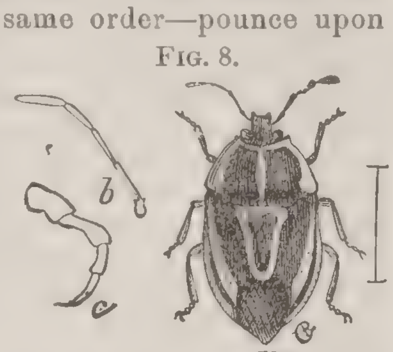
Spined Soldier-bug: c, egg; b, larva; a, pupa; d, mature bug, with wings on one side extended; e, its beak magnified. Colors, c, bronze; a, b, black, yellow, and red; d, yellowish-gray.

E., the number of its natural enemies has increased. The farmer should learn to distinguish these his allies, and to encourage them. Among birds, the rose-breasted grosbeck (*Guiraca Ludoviciana*) often effectually clears a potato-patch of the pest. The quail also devours it, and the domestic chicken has in some sections acquired a taste for it, and has been used to good advantage. The crow also attacks it. Among quadrupeds, there is good evidence that the skunk feeds upon it. Among reptiles, the toad finds the insect to its taste. Among spiders, some species of the long-legged harvestmen or "grandfather graybeards" (*Phalangium*) feed upon it. But the most efficient aids are found in its own class. Over two dozen of these have been described in the entomological reports made to the State of Missouri by the writer, but we can only illustrate in this connection a few of the more important ones. The only true parasite known to infest it is a tachina-fly (*Lydella doryphoræ*) belonging to the Diptera, and having the general appearance of a common house-fly. From minute, tough, ovoid, whitish eggs, laid on the back of the thoracic joints of the *Doryphora* larva, the larvæ (white, footless maggots) of this fly enter the body of their victim, and are carried into the ground when it descends to transform. Here they soon destroy their host and go through their transformations. Certain asilus-flies—a bloodthirsty family of the same order—pounce upon and suck out the juices of the beetle. In its own order a number of ground-beetles (Carabidæ), of which the fiery ground-beetle (*Calosoma calidum*) may be taken as an example, attack and devour it, and several species of ladybird (Coccinellidæ), and notably the convergent ladybird (*Hippodamia convergens*) and the 15-spotted ladybird (*Mysia 15-punctata*), feed greedily on its eggs. Among half-wing bugs (Heteroptera) several species are also very efficient in piercing the beetle, and more particularly the larva, with their strong beaks, and sucking out the vitals, the most common and efficient being the spined soldier-bug (*Arma spinosa*), the many-banded robber (*Harpactor cinctus*), and the ring-banded soldier-bug (*Perillus circumcinctus*).

FIG. 7.

Many-banded Robber: with beak enlarged at side, b. Colors, pale yellow and black.

FIG. 8.



Ring-banded Soldier-bug: a, mature bug; b, enlarged antenna; c, enlarged beak. Colors, polished brown and yellow.

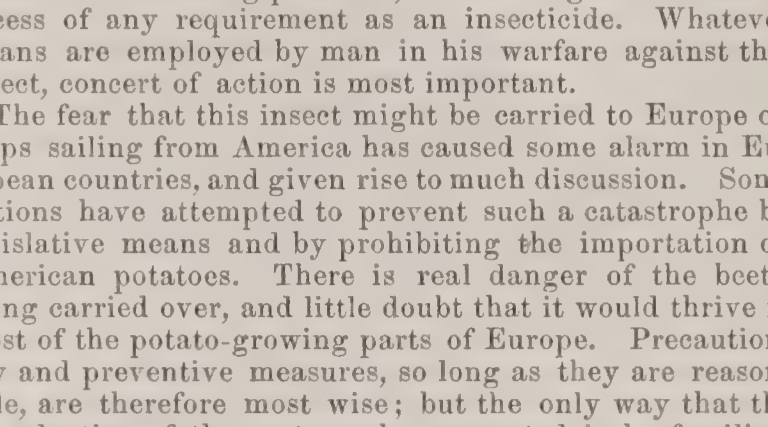
Preventive Measures.—The insect shows a preference for the more tender-leaved varieties, and such as the white Neshannock are destroyed much quicker than the early rose and peach-blow, for instance. By isolating a potato-patch in the midst of a corn-field or in timber, or by surrounding a field of the less-liked varieties with a few rows of the kinds preferred, much will be gained in the battle with the pest. Sliced potatoes dusted with Paris green, and laid upon the ground where other animals cannot reach them, will allure and kill many beetles early in the season, before planted potatoes sprout; and when the tubers are planted a dressing of ashes and hen-manure will have the effect to prevent the earth cracking, and to deter the beetle from entering the ground, and from attacking the young plants as they appear above the surface.

Direct Remedies.—Destruction by hand of the first beetles and eggs appearing on the young plants is to be strongly recommended, but great care must be had to discriminate between the eggs of the ladybirds, which resemble those of *Doryphora* in color and mode of attachment, but which are invariably somewhat smaller. A practised eye soon discriminates between them; and it is often on such minute discriminations that the farmer must distinguish between friend and foe. Numerous mechanical means—machines used by hand, and even by horse-power—have been devised to knock the insects off the vines and collect them; and during very hot and dry summer weather in the more Western States the insects perish when merely knocked on to the ground. Some care should be had in destroying large collected masses, as there is abundant evidence to show that the volatile principle of the oil contained in their bodies, when disengaged by scalding or burning, is poisonous when largely inhaled. The only cheap and effective way of protecting the plants when once the insect has been allowed to unduly multiply is by the use of Paris green. This poison is now very generally employed, either as a powder with about 25 parts of some diluent, such as ashes, lime, bran, or flour—the last the best; or in suspension at the rate of a tablespoonful of the pure green to three gallons of water, and with a certain portion of molasses or other cheap sticky substance to facilitate adhesion. This poison has been very extensively used without any evil results; and though, on theoretical grounds, grave objection has been made against its use, careful experiment by several capable parties, and particularly by Prof. R. C. Kedzie of the Michigan State Agricultural College, fully accords with an extensive practical experience covering many years, and establishes the following facts: (1) Paris green that has been four months in the soil no longer remains as such, but has passed into some less soluble state, and is unaffected by the ordinary solvents of the soil. (2) When applied in small quantities, such as alone are necessary in destroying injurious insects, it does not affect the health of the plant. (3) The power of the soil to hold arsenious acids and arsenites in insoluble form will prevent water from becoming poisoned, unless the green is used in excess of any requirement as an insecticide. Whatever means are employed by man in his warfare against this insect, concert of action is most important.

The fear that this insect might be carried to Europe on ships sailing from America has caused some alarm in European countries, and given rise to much discussion. Some nations have attempted to prevent such a catastrophe by legislative means and by prohibiting the importation of American potatoes. There is real danger of the beetle being carried over, and little doubt that it would thrive in most of the potato-growing parts of Europe. Precautionary and preventive measures, so long as they are reasonable, are therefore most wise; but the only way that the introduction of the pest can be prevented is by familiarizing the ships' officers with its appearance, and instructing them to use all possible vigilance in destroying such beetles as may be noticed on board when once out at sea. There is no more danger of its going over in or among potatoes than in other cargoes, and the prohibition of traffic with America in that commodity is puerile and a consequence of insufficient knowledge of the insect's habits.

This article would be incomplete without a brief reference to the bogus Colorado potato-beetle (*Doryphora juncta*), which so closely resembles the species under consideration that it was formerly often mistaken for it, even by good entomologists. The illustrations introduced will show the principal differences; and it only remains to add that in *juncta*, as compared with *10-lineata*, the eggs are paler; the larva is paler, with but one row of lateral black

FIG. 9.



Bogus Colorado Potato-beetle: a, a, eggs; b, b, larva; c, beetle; d, enlarged elytron; e, enlarged leg. Colors, a, whitish-yellow; b, cream-yellow, brown, and black; c, black, yellow, and brown.

dots, instead of two; the beetle has the second and third black stripes on the elytra (counting from the lower edge) joined at the ends, instead of the third and fourth; the punctures of said elytra more regularly in rows, and the legs with pale instead of dark tarsi, and with a black spot

on the thighs. It feeds on the nettle (*Solanum Carolinense*), has always existed in the southern half of Missouri eastward, and never touches the cultivated potato. C. V. RILEY.

Potato Disease and Rot. See PERONOSPOREÆ, by W. G. FARLOW.

Potato-Fly. See CANTHARIS.

Potato Neck, tp., Somerset co., Md., on Tangier Sound, Chesapeake Bay. P. 2266.

Potato, Sweet. See SWEET POTATO.

Potato-Worm, the larva of the HAWK MOTH (which see).

Potchin′ki, town of Russia, government of Nizhnee-Novgorod, is noted for its manufactures of potash. P. 6000.

Potem′kin (GRIGORI ALEXANDROVITCH), b. in 1736 of a family of Polish nobility on its estate in the government of Smolensk; entered the Russian army, and was ensign in the imperial body-guard when he attracted the attention of Catharine II., shortly after her accession to the throne, by his handsome person; received immediately an appointment in the household of the empress as gentleman of the bedchamber, and superseded Orloff as her lover. This intimacy seems to have lasted only for a couple of years, but by his entire freedom from jealousy, by his mastery of the art of making himself interesting and indispensable, by a shrewd application of flattery and fear, by a thousand petty tricks, he succeeded in retaining his influence over the empress to his death, and vindicating his position at the head of the Russian polity. Not only the empress herself, but foreign monarchs—Frederick the Great, Maria Theresa, and Joseph II.—loaded him with honors and riches and submitted to all his whims; and as an alliance with Russia at this time began to be of the utmost importance to the neighboring states—Sweden, Poland, Prussia, Austria, and Turkey—he, as the dispenser of this alliance, played an important part in the politics of Europe. He was, nevertheless, a mediocre though rather good-natured person, more vain than ambitious, full of fantastical plans and restless activity; and although much of what he did was good and beneficial to his country, such as the foundation of the cities of Kherson, Kertch, Nikolaiev, Sebastopol, etc., the creation of a Russian fleet in the Black Sea, the Turkish wars which resulted in the acquisition of the Crimea, Caucasus, etc., it does not confer much honor on his name, as it was evidently done without any noble purpose, only as a sort of theatrical show. D. on the road between Jassy and Nikolaiev Oct. 15, 1791. (See Cérenville, *Vie de Prince Potemkin* (1807), and De Ligne, *Mémoire de la Cour de Russie* (1859).)

Poten′tial, in physics. If a body attract, according to the law of universal gravitation, a point, whether external or of its own mass, the sum of the quotients of its elementary masses, each divided by its distance from the attracted point, is called the "potential." It has an analogous signification in relation to electricity and magnetism. (See LAPLACE'S COEFFICIENTS.) J. G. BARNARD.

Potentil′la [dim. of the Lat. *potens*, "powerful," from its supposed virtues], a genus of herbs and shrubs of the order Rosaceæ. There are many, mostly herbs, and quite a number are natives of the U. S. The plants known as cinquefoil, five-finger, and tormentil belong to this genus. They have a highly astringent property, which is useful in medicine, and in the Orkneys and Lapland their roots have been employed in domestic tanning and dyeing.

Poten′za, town of Southern Italy, province of the same name, situated on a hill near the river Basento (anc. *Casuentus*), about halfway between Naples and Taranto. This city, which takes its name from the ancient *Potentia*, the site of which is lower down the hill) was founded by the Lucanians, and is identified with the history of that people and their territory. It has always been subject to earthquakes, and in 1694 suffered severely, but the most recent as well as the most terrible shock occurred on Dec. 17, 1857, the line of agitation being apparently from Stromboli to the extinct volcano Monte Vulture. Not only Potenza, but some 30 or 40 neighboring towns and villages were almost totally destroyed. The immediate loss of life is said to have been not less than that from the great Calabrian earthquake of 1783, and the number who died afterward from injuries received may be inferred from the fact that 4000 amputations were performed in Potenza alone. Besides those who lost their lives from the direct effects of the catastrophe, thousands perished for want of food and shelter. The walls and fortifications of Potenza were not overthrown, nor was the cathedral seriously damaged. There is now little activity of any kind here, although the neighboring country is agriculturally rich, and produces, among other things, silk, honey, and cheese of great excellence. P. in 1874, 18,513.

Potenza Picena, town of Italy, province of Macerata, in the so-called Marches. It stands on a hill overlooking the Adriatic, and below it lies the rich old abbey of Potenza. The fort which defended the port of Monte Santa is still standing, but the harbor is now so sanded up as to admit only fishing-boats. P. in 1874, 6763.

Pothier′ (ROBERT JOSEPH), b. at Orléans Jan. 9, 1699; studied law; was professor of jurisprudence in his native city, and d. there Mar. 2, 1772. Besides *Pandectæ Justinianeæ* (3 vols., 1748–52), often reprinted, he wrote *Maritime Contracts*, translated by Caleb Cushing (Boston, 1821), *Contracts of Sale*, by L. S. Cushing (Boston, 1839), *The Law of Obligations or Contracts*, by W. D. Evans (Philadelphia, 1840), *Œuvres complètes* (25 vols., Paris, 1810), often reprinted.

Potidæ′a, a rich and flourishing colony of Corinth, on the narrow isthmus which connects the peninsula of Pallene with the mainland, surrendered to the Persians on their march into Greece, but withstood afterward several sieges and attacks by them with great fortitude. After the Persian wars it became a subject ally of Athens, but revolted in 432 B. C. After a siege of two years and unspeakable sufferings it capitulated, and was partly recolonized by the Athenians. It was finally destroyed by Philip of Macedon. He sold the inhabitants into slavery, and the site stood vacant till Cassander founded a new city here, which he called *Cassandreia*.

Poto′mac, a river of the U. S., forming through its whole course the boundary between Maryland and Virginia, and West Virginia, is formed by the junction of two branches, of which the northern rises in the Alleghanies of West Virginia, and the southern in the Shenandoah range, Va. In form it resembles a bow, abounds in delicious fish, is nearly 400 miles in length, receives as tributaries from Virginia the Shenandoah, Savage, and Monocacy rivers, is an estuary 6 to 8 miles wide for 100 miles of its lower course, and enters Chesapeake Bay 75 miles from the Atlantic. The city of Washington, D. C., the national capital, is situated upon its left bank, 125 miles above its mouth, to which point the tide ascends, and it is navigable for large vessels. Above Washington are several falls. The scenery of the upper Potomac is remarkably picturesque, especially the junction of the Shenandoah at Harper's Ferry. On its lower course are the birthplace and the residence of Washington, and in its whole extent it formed an important strategical line during the civil war, giving a name to the principal Northern army, and witnessing many important engagements.

Potosi′, city of Bolivia, South America, capital of a province of the same name, on the northern side of the Cerro de Potosi, at an elevation of 13,350 feet above the sea-level, in lat. 19° 35′ S. and lon. 65° 25′ W. In the seventeenth century it had 160,000 inhabitants; now it has about 26,000. Thus, although it contains many fine and substantial buildings, it looks rather like a city in ruins, large portions of it being uninhabited and decaying. The surroundings are naked and barren; provisions must be brought from distant places and on bad roads. The climate, though not unhealthful, is disagreeable on account of the sudden changes of temperature. The conical peak of the Cerro de Potosi, which rises to the height of 16,150 feet and is thickly interwoven with veins of pure silver, is now perfectly honeycombed by the shafts and gangways and galleries of the works, more than 5000 mines having been worked here. The amount of silver and gold which these mines yielded was at one time almost fabulous, but of late it has decreased very much—not because the veins are exhausted, but because the mines have reached a depth in which they cannot be worked without great capital, on account of the immense volume of water in them.

Poto′si, tp., Linn co., Kan., on La Cygne River, includes Pleasonton, the county-seat. P. 1779.

Potosi, p.-v., cap. of Washington co., Mo., at W. terminus of Potosi branch of St. Louis and Iron Mountain R. R., near extensive mines of iron and lead, has a large trade in lumber and dry goods, and 1 weekly newspaper. P. 897.

Potosi, p.-v. and tp., Grant co., Wis., on Mississippi River. P. 2686.

Potosi Island, an island of McIntosh co., Ga., in the Atlantic Ocean. P. 36.

Pots′dam, city of Prussia, province of Brandenburg, at the confluence of the Ruthe and the Havel, 17 miles S. W. of Berlin. It is well laid out, with many fine streets, public squares, and promenades, and is well built, with many fine houses, public edifices, gates, bridges, and monuments. It contains a military and several other educational and benevolent institutions, large manufactures of firearms, and a great number of royal palaces and

summer-houses, old and new, some of which are built on a grand scale and surrounded with extensive gardens and parks. It was founded by the elector Friedrich Wilhelm, who built a palace here in 1673, and owes its prosperity, and even its existence, to the presence of the court. P. 43,834.

Potsdam, p.-v. and tp., St. Lawrence co., N. Y., on Racket River and on De Kalb and Potsdam junction branch of Rome Watertown and Ogdensburg R. R., 22 miles E. of Ogdensburg, noted for its extensive quarries of sandstone of a geological formation which has taken its name from this town. Within the township limits are the post-villages of Potsdam Junction, W. Potsdam, S. Potsdam, and Crory's Mills, besides the principal village, which has fine water-power from Racket River, Holly waterworks, a fire department, the fair-grounds of two agricultural societies, a State normal school, a fine edifice, with 14 teachers and 500 pupils, 6 churches, 1 weekly newspaper, numerous foundries, machine-shops, saw-mills, and manufactories, especially of furniture and agricultural implements, and one of "silver-reed" organs. The densely-wooded region traversed by the upper Racket River affords an immense supply of lumber, which is floated in rafts down the stream. P. 2891; of tp. 7774.

Potsdam Junction, p.-v., Potsdam tp., St. Lawrence co., N. Y., on Racket River, at junction of Ogdensburg and Lake Champlain with De Kalb and Potsdam junction branch of Rome Watertown and Ogdensburg R. R. P. 966.

Pots'dam Sand'stone, the name given to the lowest member of the Lower Silurian series in the classification of the New York geologists. It was derived from the town of Potsdam, St. Lawrence co., N. Y. In this region the Potsdam sandstone is 300 feet in thickness, and is mainly a rĕd or yellow sandstone, sometimes changed to quartzite, and at the base is usually a conglomerate. From Potsdam the outcrop of this formation stretches westward to Lake Superior, where it forms the Falls of the Ste. Marie and the S. shore of the lake to Marquette, including the Pictured Rocks. The copper-bearing sandstones and conglomerates of Kewenaw Point are also generally regarded as representing the Potsdam. On the upper Mississippi the Potsdam sandstone is thicker than at the East, and is locally much more calcareous. It there contains great numbers of trilobites. Farther W., in the Black Hills and Rocky Mountains, the Potsdam sandstone has been fully identified in many places. There, as in New York, it is a red sandstone—sometimes metamorphosed, sometimes highly charged with its characteristic fossils—resting upon the crystalline Eozoic rocks. In Missouri and Texas the Potsdam sandstone is found lying at the base of the unchanged sedimentary series, resting upon the Huronian. In the Alleghany belt it extends southward to Georgia, and attains a thickness not yet observed elsewhere. About the Gulf of St. Lawrence there are strata of shale, sandstone, and limestone, reported by Murray to be of Potsdam age, 5000 feet thick, but they are certainly not the exact equivalents of the New York Potsdam, which was deposited in a mere fraction of the time they represent. In the deep wells of St. Louis and Columbus this rock is found holding its normal position beneath this Calciferous and the great mass of limestones of the Trenton series. The characteristic fossils of the Potsdam sandstone are *Scolithus linearis*—probably the cast of the burrow of annelids—the brachiopods *Lingulepis, Obolus,* and *Obolella;* the pteropods *Hyolites;* and several species of trilobites of the genera *Conocoryphe, Dikellocephalus, Agnostus,* etc.

The mode of formation of this widely-spread deposit can be easily learned by a study of its composition and structure. It is generally composed of coarse materials, often a conglomerate at the base, sandstones higher up. The sandstones are frequently ripple-marked, and in some places sun-cracked, showing that they were deposited along shore-lines where they were marked by the action of the waves, and were here and there exposed temporarily to the sun and wind. We are compelled, therefore, to conclude that the Potsdam sandstone is a beach-deposit, and that it was formed by an invasion of the sea which followed a subsidence of the old Eozoic continent. As the shore-waves moved inland, they spread behind them an unbroken sheet of sea-beach—gravel and sand. This reached as far as the sea extended. When the limit of submergence was reached, the sea remained in undisputed possession until it had spread over the Potsdam a mass of limestones—organic sediments made from the hard parts of marine animals—1000 to 2000 feet in thickness. When the Silurian sea shallowed and retreated, its organic deposits were mingled with the wash from the land carried down by drainage-streams, and the Hudson River group was formed. This completed the Lower Silurian series of sediments, and brought this geological age to a close, leaving a large part of the area occupied by the Trenton sea as dry land. No deposits were made on this till, after the lapse of ages, the sea again flowed over parts of it, forming in its advance, sojourn, and retreat the Upper Silurian circle of deposits, similar in character to those below, but containing a different group of fossils, since in its long retirement the inhabitants of the sea had so far changed that scarce a half dozen species of the old fauna came back with the new. (See GEOLOGY and PALÆONTOLOGY.) J. S. NEWBERRY.

Pot'stone, a variety of talc, sometimes wrought, like soapstone, into pots, stoves, and kettles. It abounds in Europe, and is coarser and more granular than the best soapstone.

Pott (AUGUST FRIEDRICH), b. at Nettelrede, in Hanover, Nov. 14, 1802; studied philology at Göttingen; was appointed professor in Halle in 1833, and is one of the most prominent representatives of the science of comparative philology. Of his *Etymologische Forschungen,* one of his principal works (2 vols., Lemgo, 1833–36), he gave a new and revised edition (4 vols., Detmold, 1867–73). Of his numerous works treating more particular subjects the most remarkable are *Die Zigeuner in Europa und Asien* (2 vols., Halle, 1845), *Die quinare und vigesimale Zählmethode* (1847), *Die Personennamen und ihre Entstehungsarten* (1853), *Anti-Kaulen* (1863), *Die Sprachverschiedenheiten in Europa an dem Zahlen nachgewiesen* (Halle, 1868).

Pottawat'tamie, county of W. Iowa, separated from Nebraska by Missouri River. Area, 970 sq. m. It is uneven, highly fertile, and adapted to corn and wheat culture. The county is traversed by various railroads, which centre at Council Bluffs, the capital. P. 16,893.

Pottawattamie, county of N. E. Kansas. Area, 851 sq. m. It is bounded S. by Kansas River, and its W. part is traversed by Big Blue River and Kansas Pacific R. R. It is undulating, fertile, and adapted to grain-culture. Cap. Louisville. Cap. 7848.

Pottawattamie, tp., Coffey co., Kan. P. 520.

Pottawattamie, tp., Franklin co., Kan. P. 695.

Pottawattamie, tp., Pottawattamie co., Kan., on Rock Creek. P. 1155.

Pottawattamies, a tribe of Indians of the Algonkin family who originally occupied a large portion of the peninsula of Michigan; were of a very low grade of civilization as compared with the surrounding tribes, being divided into bands recognizing no common allegiance or settled government; spoke an extremely rude dialect; were constantly at war with their neighbors, and were driven westward to Green Bay by the Iroquois toward the close of the seventeenth century. By an alliance with the French in several wars they recovered their position in Southern Michigan, and spread over Northern Indiana and Illinois. The Jesuits early established a mission on St. Joseph's River, Mich. They took part in the alliance formed by Pontiac 1763, fought against the Americans during the Revolution, were vanquished by Wayne in his Western campaign, participated in the treaty of Greenville Dec. 22, 1795, were allies of the British in the war of 1812–15, after which they soon disposed of most of their lands by successive treaties, and removed to the region now known as Kansas. In 1838 they numbered 4000. A few still reside in Michigan and in Wisconsin; the majority have been partially civilized by Catholic and Protestant missions, and are now citizens of Kansas.

Pot'ter, county of Pennsylvania, bounded N. by New York. Area, 1050 sq. m. It is elevated, and mostly covered with great forest trees. Its soil is generally good. Grain and wool are produced. Lumber and leather are the principal manufactures. The county contains detached beds of coal, but little developed. Cap. Coudersport. P. 11,265.

Potter, p.-v. and tp., Yates co., N. Y. P. 1970.

Potter, tp., Centre co., Pa. Pop. 2358.

Potter (ALONZO), D. D., LL.D., b. at La Grange, N. Y., July 10, 1800; graduated in 1818 at Union College, and afterward married the only daughter of Pres. Nott; became a college tutor 1819, and held a mathematical professorship in Union College 1821–26; took deacons' orders in the Protestant Episcopal Church 1821, presbyters' orders 1824; was rector of St. Paul's, Boston, 1826–31; professor of moral philosophy and vice-president of Union College 1831–45; became bishop of Pennsylvania in 1845; was one of the founders of the Episcopal Hospital and the Divinity School, Philadelphia. D. at San Francisco, Cal., July 4, 1865. Author of *Political Economy* (1841), *Handbook for Readers and Students* (1847), *Discourses, etc.* (1858), *Religious Philosophy* (1870), and other works.

Potter (Chandler Eastman), b. at Concord, N. H., Mar. 7, 1807; graduated at Dartmouth College 1831; taught school, practised law, served in the State legislature; edited the Manchester *Democrat* 1844–48, the *Farmer's Monthly Visitor* 1852–53, and the *Granite Farmer* 1854–55; wrote a history of Manchester; was an active member of the New Hampshire Historical Society, of which he was president 1855–57; wrote largely upon the Penobscot and other Eastern Indians, and drew up a *Military History of New Hampshire*, published in the adjutant-general's *Reports* for 1866 and 1868. D. at Flint, Mich., Aug. 4, 1868.

Potter (Clarkson Nott), son of Bishop Alonzo, b. at Schenectady, N. Y., in 1825; graduated at Union College 1842, and at the Rensselaer Institute, Troy, as a civil engineer 1843; became a surveyor in Wisconsin; studied law and was admitted to the bar in that State; commenced practice in New York City 1847; obtained an extensive business, and sat in Congress as a Democrat 1871–75.

Potter (Edward E.), U. S. N., b. May 9, 1833, in New York; entered the navy as a midshipman Feb. 5, 1850; became a lieutenant in 1858, a lieutenant-commander in 1862, a commander in 1869; served as executive officer of the Wissahickon at the passage of Forts Jackson and St. Philip and capture of New Orleans, and in all the hard-fought battles on the Mississippi in 1862, and commanded the Chippewa at the taking of Fort Fisher, Jan., 1865. Commended by Commander de Camp for "ability and courage," and recommended for promotion by Rear-Admiral Porter. Foxhall A. Parker.

Potter (Eliphalet Nott), D. D., son of Bishop Alonzo Potter and grandson of President Nott, b. at Schenectady, N. Y., Sept. 20, 1836; graduated at Union College 1861; studied theology; took orders in the Episcopal Church; was pastor of churches at Bethlehem, Pa., and Troy, N. Y.; built at the former place three churches, and at the latter two chapels; became professor of Christian evidences at Lehigh University 1866, and president of Union University (formerly Union College) 1871, adding the duties of chancellor of that institution 1872. Author of *Parochial Sermons*, and now (1876) preparing a work on *Christian Evidences at the Close of the Nineteenth Century*.

Potter (Hazard Arnold), M. D., b. in Potter, Ontario co., N. Y., Dec. 21, 1810; took his medical degree at Bowdoin College in 1835; became in 1853 a surgeon and physician at Geneva, N. Y., where he attained a national reputation as a skilled operative and clinical surgeon. As early as 1837 he detected arterial blood in the veins of a part paralyzed in consequence of injury to the spinal cord—a phenomenon which he was one of the first to announce. Served as a surgeon in the Federal army in the war of 1861–65. D. at Geneva, N. Y., Dec. 2, 1869.

Potter (Horatio), D. D., LL.D., D. C. L. Oxon., b. at La Grange, N. Y., Feb. 9, 1802, a brother of Bishop Alonzo Potter; graduated at Union College 1826; took deacons' orders in the Protestant Episcopal Church 1827, presbyters' orders 1828; was professor of mathematics in Washington (now Trinity) College, Hartford, Conn., 1828–33; became in 1833 rector of St. Peter's, Albany; in 1854 provisional bishop, and in 1861 bishop, of New York.

Potter (John), D. D., b. at Wakefield, Yorkshire, England, about 1674; educated at the Wakefield free school; graduated at University College, Oxford, 1692; published a volume of *Variantes Lectiones* on one of the works of Plutarch 1693; became fellow of Lincoln College 1694; edited Lycophron's *Alexandra* 1697; was ordained in the Anglican Church 1697; published his principal work, *Archæologia Græca* (2 vols., 1697–98); became chaplain to Archbishop Tenison 1706; regius professor of divinity at Oxford 1708; bishop of Oxford 1715, having just finished his edition of *Clemens Alexandrinus*, and became archbishop of Canterbury 1737. D. at Lambeth Oct. 10, 1747. His *Theological Works* appeared in 3 vols., 1753.

Potter (John F.), b. at Augusta, Me., May 11, 1817; educated at Phillips Academy, Exeter, N. H.; studied law and settled in Wisconsin; was a judge of Walworth co. 1842–46; member of the legislature 1856; Republican member of Congress 1857–63, acquiring celebrity during the excitement growing out of the Brooks assault upon Sumner by his proposal to fight a duel with a Southern member with bowie-knives as weapons; was a delegate to the "Peace convention" of 1861, and appointed in 1863 consul-general at Montreal, Canada.

Potter (Joseph H.), b. in New Hampshire in 1822; graduated at the U. S. Military Academy, and entered the army as brevet second lieutenant of infantry July, 1843; colonel 1873; in the war against Mexico was engaged in the defence of Fort Brown, May, 1846, and in the battle of Monterey, Sept., 1846, where severely wounded (brevet first lieutenant); subsequently served on the Western and Southern frontiers, and made prisoner in Texas July, 1861; exchanged Aug., 1862, appointed colonel of the 12th New Hampshire Vols. in September, and, joining the Army of the Potomac, commanded a brigade in the battle of Fredericksburg, Dec., 1862, at Chancellorsville May, 1863, where wounded and taken prisoner; exchanged Oct., 1863. Served as assistant provost-marshal-general of Ohio Feb.–Sept., 1864, when assigned to the command of a brigade in the 18th corps, and in December in the 24th corps, of which latter he was chief of staff from Jan., 1865, till the close of the war. Appointed brigadier-general U. S. volunteers May, 1865; mustered out Jan., 1866. In Dec., 1873, became colonel of the 24th Infantry. Brevet lieutenant-colonel, colonel, and brigadier-general U. S. A. for gallantry during the war.

Potter (Nathaniel), M. D., b. on the Eastern Shore of Maryland in 1770. The greater part of his life was spent in Baltimore, where, with others, he organized the medical department of the University of Maryland, and occupied in it for thirty years the chair of the theory and practice of medicine, even down to his death. As a practitioner he was prompt to every call and exercised sound judgment; and as a teacher was impressive. D. in Baltimore Jan. 2, 1843. Paul F. Eve.

Potter (Paul), b. at Enkhuysen, in the present province of North Holland, in 1625; received the first instruction in painting from his father, an obscure painter, but soon outgrew his guidance and became the most celebrated painter of animals of his time, admired for the truth of his observation, the naturalness and variety of his composition, and the brilliant effects of his coloring. D. at Amsterdam Jan. 15, 1654. Some of his pictures, such as the *Young Bull*, at the Hague, the *Bear Hunt*, in Amsterdam, etc., are life-size, but most of them are cabinet pieces distinguished by an extraordinary finish. His etchings and drawings are much appreciated. (See *Paul Potter, sa Vie et ses Œuvres*, by J. van Westeheene (the Hague, 1867).)

Potter (Robert), b. in England in 1721; graduated at Emanuel College, Cambridge, 1741; held several ecclesiastical benefices; wrote some poems and miscellaneous essays, and produced esteemed poetical translations of Æschylus (1777), Euripides (1781–82), and of Sophocles (1788); became prebendary of Norfolk and vicar of Lowestoft and Kessingland. D. Aug. 9, 1804.

Potter (Robert B.), son of Bishop Alonzo, b. in New York about 1830; studied law, which he practised with success in New York; entered the volunteer military service 1861 as major of the 51st New York Vols.; participated with distinction in the battles of Roanoke Island, New Berne, Cedar Mountain, Manassas, Chantilly, and Fredericksburg; carried the stone bridge at Antietam, where he was wounded; became brigadier-general Mar. 13, 1863; commanded a division at Vicksburg and a corps in the Tennessee campaign; again commanded a division under Grant in the final campaign in Virginia; was brevetted major-general June, 1864, "for gallantry in several actions since crossing the Rapidan," and was shot through the body in the assault on Petersburg Apr. 2, 1865, but recovered.

Potter's Clay. See Clay.

Potter's Hollow, p.-v., Rensselaerville tp., Albany co., N. Y. P. 138.

Pot'tery, a term applied to all objects made of baked clay, derived from the Greek word *poterion* and the French *poterie*. It was one of the oldest arts of mankind, and sun-dried bricks appear in Egypt almost coeval with the nation itself. Vases of small size made of red kiln-baked clay abound in the vicinity of the Pyramids, although the Egyptians never used baked bricks, and the so-called *porcelain* of this people, a kind of faïence of white sand, very slightly fused, and covered externally with a thin silicious glaze of a blue or green color, is of equal antiquity. At a later period yellow, red, and other colors formed by metallic oxides appear, and contemporaneously a kind of glazed ware made by covering steatite with a fused glaze. This porcelain continued in Egypt till the age of the Roman empire, or the second century A. D., and was chiefly used for objects of small size or inlaying. The bright blue is remarkably fine, but was superseded about the sixth century B. C. by a pale and dull green. The art of pottery was extensively used by the Babylonians and Assyrians, and terra-cotta or slightly-baked red clay employed in the shape of barrel-cylinders or prisms for historical records deposited in the foundations of edifices, or rectangular tablets, sometimes convex on the sides, for various records and compositions. On these the scribe impressed with a stylus the cuneiform or arrow-headed characters. Bricks of the same material were also used and inscribed in the same manner, and some of these are

as old as B. C. 2000. The vessels of these people resembled those of the Egyptians, except that the forms were more elegant and the sides thinner. They also at an early period had a faïence of glazed ware of various colors with a lead glaze, employed for bricks, architectural ornaments, and vessels. Blue was a favorite color, as in Egypt, and the bricks had sometimes pictures in outline on them. This was continued in the valley of the Euphrates after the fall of the Babylonian empire, and large coffins with oval covers of the Sassanian epoch, as late as the first century A. D., have been found extensively used in the cemeteries of Warka and Mugeyer. It may indeed be considered doubtful if the art of glazing vases was ever lost in the East. The Jews in the time of the Kings had potteries, some glazed; their unglazed ware was coarse, and strongly resembled the Egyptian. The objects of pottery brought from Moab are modern and spurious imitations of the antique. All these nations used the different processes of modelling, forming on the wheel, and stamping. The Phœnicians had also plain and glazed wares, one kind resembling the Egyptian blue faïence, the other like the early Greek, consisting of a thin silicious glaze laid over terra-cotta vases ornamented with black or maroon bands and geometric patterns. This pottery is apparently as old as the sixth century B. C., and continued till the pre-eminence of the Greek wares supplanted it about the fourth century B. C.

FIG. 1.

Egyptian bottle of unglazed ware, ornamented with grotesque head of the god Bes.

Amongst the Greeks, the invention of the potter's art was as old as Homer, by whom it is mentioned, and sun-dried clay was employed by some of the earliest potters. Kiln-dried bricks were used in the palace of Crœsus; and these, thin and tile-like, were of various sizes, named *Lydia*, or Lydian; *didora*, two palms; *tetradora*, or four palms; and *pentadora*, or five palms square. They were in extensive use and stamped with the names of makers. Other architectural members of buildings were also made of terra-cotta stamped by moulds, and statues of life-size were occasionally made of the same material about the fourth century B. C. Objects to affix to other *emblemata*, made separate from moulds, and a great number of small terra-cotta figurines, used as sepulchral deposits or votive offerings, hollow internally, with a hole to hang them up or obviate the contraction of the clay in the furnace, were made throughout Greece and Asia Minor from a very early period to the second century A. D. These were colored white with a coating of lime (*leukoma*) and gaudily painted. Some are of exquisite beauty, others caricatures or grotesques. Lamps, *lychni*, with subjects in relief on the upper surface and with the maker's name beneath; dolls with movable limbs (*neurospasta*); cones or weights; whorls or conical bracts, and some few smaller objects, were made of terra-cotta. But the principal product of the Greek potter was vases, made on the horizontal table or wheel, mostly for domestic purposes, especially the export of wine and oil; and those of Rhodes, Cnidus, and other Greek cities had impressed on their handles the device and name of the *eponymon* (magistrate for the year in which they were made). They are *amphoreis*, or amphoræ, and used as casks, and came extensively into use about the second century B. C. Some of these vases are of the oldest date of the pre-historic period of Greece, and some found on the site of Troy resemble those discovered in the mounds of Eastern Germany. Other vases of the same material, made for purposes purely sepulchral, were covered with a similar coating, painted and in part gilded. The most remarkable are the so-called *painted* (or rather glazed) vases found in the sepulchres of all Greek sites and in Etruria, and which were developments of the Phœnician, before mentioned. The glazed bands and geometric ornaments were at first accompanied by small figures of animals; human figures were subsequently introduced, but of diminished size, and became, as the art advanced, of larger size, occupying the area of the vase, while the ornamentation was reduced to smaller dimensions. These figures were traced on the moist clay by an incised or dotted line, and the colors laid on with a reed or brush; a second color was applied in the accessories over the black color of the figures, and incisions were made through the dark color of the face and limbs to indicate the details. The dark color of these early vases was manganese—the flat, superposed pipe-clay, oxides of iron and copper, and ochres. The clay of Corinth was straw-color, that of Athens fawn, but a warm red came into use as the art advanced. The whole vase, except the flat tints, was covered with a silicious glaze. These vases with black figures seem to have prevailed from the sixth to about the fourth century B. C., after which by degrees the figures were left the color of the clay, and instead of incisions lines drawn by the pencil filled up the details; the background was colored black; and the art, which had reached its apogee about the middle of the fourth, gradually changed in style from the chaste and pure to the florid and voluptuous about the third century B. C., becoming at last extinct as the states of Greece declined and metallic vases superseded those of clay. The last vases of the kind, of black color with white decorations and subjects, or entirely black with ornaments and designs stamped out from moulds, imitated those of metal. The subjects of these vases are derived from the cycle of Greek mythology; the figures are often accompanied with inscriptions, the names of the figures represented, their speeches; the names of potters, vase-painters, and of celebrated beauties are also introduced, and the names of ancient possessors are sometimes scratched on them. The subjects were copies or adaptations of the principal pictures of the time. Many vases were made for sepulchral purposes, and were covered with a *leukoma*, on which the artist drew in red outline and filled in with gaudy color subjects from the mythos of Orestes. These vases have been found at all the places which had commerce with Greece—in Etruria, the Crimea, the isles, and even Egypt—and the largest specimens are those discovered out of Greek territory.

FIG. 2.

Birth of Athene, on a Greek pelike, from Vulci.

The Etruscans worked in terra-cotta like the Greeks, their best products being statues; and although they imitated with small success the painted vases of Greece, they produced a peculiar ware of brown color with rude ornaments, and a soft black ware moulded with ornaments and figures in coarse style, imitations of works of metals, and on the different ware produced friezes or other ornaments by stamping or by a revolving cylinder. They extensively imported as objects of luxury the finest vases of Greece.

The Romans, following the Etruscans, whose statues they adopted, made great use of flat bricks (*lateres*) and tiles (*tegulæ*), like bricks, but with flanges for roofs, covered by a semi-cylindrical tile (*imbrex*) at the joint. These were employed for buildings, walls, and graves; they also had hollow square pipes (*tubi* or *tubuli*) for the flues of hypocausts, and cylindrical ones for drains. The tiles, as well

as other architectural members and ornaments, were made of a fine compact clay of red color, and those used at Rome had stamped upon them a circular stamp with a trade device, the name of the potteries where and of the consuls under whom made; provincial ones had instead the names of the legions by whom fabricated during the first and second centuries A. D. Statues, figurines, lamps with bas-reliefs of different subjects and names of makers, vases, or casks of huge size (*dolia*) and other vessels for domestic use, especially amphoræ and phials, were also produced by the potteries. But the best ware of the first two centuries A. D. was the so-called Samian, first made at Cuma, Capua, and Arretium in Italy, and afterward throughout Spain, Gaul, Britain, and Germany, of a red sealing-wax color and appearance throughout, with subjects stamped in relief, and the names of potters. It was principally used for small vases, and covered with a silicious glaze. An inferior black-and-brown ware was made in the provinces till about the third century A. D.

Outside the limits of the civilized world, the inhabitants of Europe made at the early or pre-historic period hand-made vases of a rude, friable, imperfectly-baked brown ware, with a few other articles of pottery, differing in type according to locality, and much improved subsequently after contact with the Roman. This rude ware was followed by the Anglo-Saxon and German with stamped ornaments, but the use of unglazed pottery and terra-cotta declined in the Dark and Middle Ages in Europe, and did not revive till the fourteenth century. Great jars, water-bottles, and some other vessels have been made from that period to the present day in the West and East, the earthenware being of a harder texture; and about the fourteenth century a glazed earthenware, consisting principally of jugs covered with a green glaze, came also into use. This succeeded the Roman glazed ware for some small objects of a brown or olive color produced by lead. According to some, the use of glazes was introduced into Spain as early as the eighth century A. D., and some tiles used for the early churches and Alhambra date from 1300. The conquest of Majorca (1155) is thought to have introduced metallic glazes, and a new departure took place about 1415, when Lucca della Robbia employed them for architectural ornaments. A century later the majolica-ware, as it is called, was used for plates, jars, and other objects of luxury, painted with gay colors, especially yellow, from designs by Raphael, Marc Antonio, and others. Pesaro, Gubbio, Faenza, Forli, and Rimini were the chief sites of this pottery, which flourished in Italy till the eighteenth century, and has been successfully imitated recently by the English potteries. Although introduced into France, where it flourished till the close of the seventeenth century, it was surpassed in that country by the potter Palissy about 1550, who produced dishes and objects with animals in relief of a hard gray paste covered with a fine enamel—a style also recently revived; and by the so-called Henry II. ware, made of pipeclay, with various colors finely glazed. Germany also made majolica and glazed wares at the same time, and Holland the delftware imitated from the Chinese, and stoneware bottles for wine and tankards glazed by salt and ornamented with reliefs produced by a mould. These vessels were much prized and extensively exported.

FIG. 3.

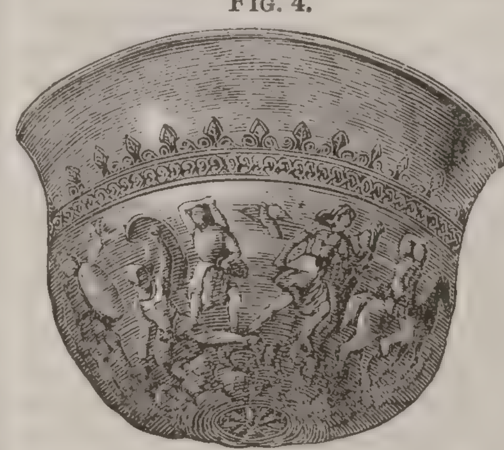
Etruscan wine-pitcher, of black ware: Perseus and the Gorgons.

In England, except the rudely-glazed pitchers, the principal produce of the potteries was the so-called Norman tiles, used for the floors and other parts of religious edifices. They were made of red clay, with white or yellow devices of a floral or architectural character, and glazed. The tiles are of small size, about four inches square, and are supposed to have been made by the monasteries. The first improvement in the English potteries was caused by the introduction of Dutch potters in the seventeenth century, who manufactured stone and delftware at Fulham and Lambeth. In the same century the potteries of Burslem in Staffordshire produced only coarse earthenwares till the arrival of German potters and the discovery of the use of flint and more suitable materials; but the great improver was Wedgwood, who invented several improved wares, as well as terra-cottas, and whose small objects in relief, with designs by the sculptor Flaxman, elevated the beauty of the production, especially by his works in biscuit, used for objects of virtu. Subsequently, in 1767, the art of applying designs from copper-plates to pottery, and that of gilding it, were discovered. Great improvements were made by Spode about 1800 in the production of soft porcelain by the introduction of feldspar, borax, and bone. Although Staffordshire was the chief site of the potteries, stoneware has continued to be made at Lambeth and Vauxhall, and other potteries were distributed over the country at Fulham, Bristol, Leeds, and Lowestoff, most of which are now extinct.

The introduction of Chinese porcelain gradually effected a revolution in the European potteries, which endeavored to rival, with more or less success, the products of the Celestial Empire. The invention of pottery or earthenware is attributed by the Chinese to Hwang-te, who lived about B. C. 2700, and it is extensively used to the present day for the ordinary requirements of life—jars and other objects. Tiles of this ware glazed yellow were employed for the celebrated Porcelain Tower or pagoda of Nanking. Porcelain was not made in China till the time of the Han dynasty, about B. C. 185, when it was invented at Sinping, and about A. D. 538 the celebrated potteries at Kingtechin, consisting of 3000 furnaces and 56 establishments, were established. Crackle, produced by suddenly cooling the ware, was invented about A. D. 1279, and eggshell in 1573. The date of the introduction of porcelain manufacture into Japan is not exactly known, although some historians place it B. C. 27, in the time of Sinra, who introduced it from the Corea. Chinhan (B. C. 203) is thought to have colonized the Corea in the time of the Chinese Tsin dynasty. But it was not till A. D. 662 that a Booddhist monk introduced translucent porcelain into Japan, and it came to Europe in the sixteenth century, principally from Hizen, which produced a red, blue, and gold ware called at the time "old Japanese." The best wares came from Idsumi Yama, or the mountain Idsumi. At Owari all kinds of porcelain, called *setamoni*, were made. The oldest potteries, however, were those of Kioto or Miaco, the capital, celebrated for its red and gold ware. Titsu produced a kind of pots; Satsuma, porcelain with delicate orange tints; Awadji, a cream-colored faïence; and Hiogo, a celadon ware. The Japanese porcelain is whiter, of finer quality, and more beautifully colored than the Chinese.

It is not known that porcelain existed at an early period in the Corea or Indo-China, but some examples find their way from those countries into the hands of collectors. Chinese porcelain seems to have been exported to Arabia in the eighth century A. D., and was known to Arab writers of the twelfth century. It found its way to Europe at the beginning of the sixteenth century, but it was not till the commencement of the eighteenth century that the secret of making it was discovered. In 1712 the Jesuits had sent from Jaouchow descriptions from Chinese books, as well as of the processes carried on for its fabric, but Réaumur, although he determined the true character of the ware, was unable to obtain the materials. In 1709, Böttcher, a chemist of Berlin who had fled to Saxony, produced a perfect white porcelain at Meissen, near Dresden, from the kaolin found at Aue in the Erzegebirge, and the shapes and painting were rapidly improved by his successors and assistants. Although every attempt was made to retain the secret, the art was soon known all over Germany, and at Vienna in A. D. 1720 an establishment was founded, and has been followed by others at Carlsbad and Prague. Others appeared in 1755 at Frankenthal, and a private (but subsequently royal) porcelain manufactory at Berlin in 1751. In France, although soft porcelain was attained in 1695, and the manufactory of Sèvres established in 1756, the requisite kaolin and pihtuntsze were not discovered till 1768, and soft porcelain continued till 1804. Other places in France also manufactured this ware, but that of Sèvres was always pre-eminent for elegance of shape, beauty of color, and the painting. Hard porcelain was also made in Italy and Spain, and a manufactory flourishes in Portugal. In England soft porcelain was first produced at Bow in the

FIG. 4.



Proto-Samian cup, with an Amazonomachia in relief, from Athens.

eighteenth century, and at Chelsea at the close of the seventeenth, but it was not till French and German artists had been procured that the Chelsea ware attained that beauty of form and painting for which it is distinguished. The vases were imitated from France and Dresden; the establishment was abandoned in 1795. Minor manufacturers at other places produced hard porcelain, but it gradually gave way in England to the cheaper soft porcelain, and, although again produced by Minton in 1850, has never been extensively used.

In the East, the potteries are chiefly of unglazed ware, although glazed ware, both of tin and lead, has been made in Turkey, Arabia, and Persia since the twelfth century A. D. In Africa the tribes of negroes make a black-and-red ware slightly baked and not glazed, and in Oceanica, Feejee alone produced a hard-baked red earthenware glazed, or varnished with a gum. In America the different products of the aboriginal races produced different kinds of earthenware, chiefly unglazed. That of North America, including Canada, resembles the Celtic and Teutonic of the so-called pre-historic period. In the mounds of Ohio pipes—some with the bowls in shape of animals—and gourd-shaped bottles have been found. The Mexicans attained considerable excellence in the fabrication of pottery, producing large vases of earthenware, with moulded figures of men and animals, painted with flat colors, and bowls painted inside with ornaments in red, black, and white. They also produced a polished ware. All are hand-made, and not produced by the wheel, and a kind of it continues to be made at the present day. Similar wares were made in Central America; and in the S., Peru, during the rule of the incas, had a fine pottery, chiefly flasks or drinking-vessels, often with two cylindrical necks and orifices, and the body moulded in the shape of the human head, animals, and gourds. Some of these are finely executed, and ornamented with figures drawn with great skill, and slightly glazed or polished. The modern pottery of Peru is far inferior, as is that of South America in general. Great black casks or jars were made to hold the desiccated bodies of some of the tribes of the continent. Brazil produces a large quantity of pottery, chiefly double-necked bottles, and jars (*talhas*) capable of holding fifteen gallons of liquid.

In the U. S. attempts were made early in the present century to establish works for the production of porcelain and pottery—one in New Jersey in 1816, others at Philadelphia, abandoned in 1836. Trenton, N. J., has extensive fire-brick and terra-cotta works; Jersey City manufactures glazed red and white granite ware and a good porcelain; Greenpoint, Long Island, N. Y., has large porcelain-works; and East Liverpool, O., produces fine stone ware.

Pottery and porcelain are divided into soft pottery, fine earthenware, stone or granite ware, and porcelain. The soft porcelain is distinguished by fusing at a lower temperature. At all times the pride of the potters has recorded their names upon their productions; the Greeks wrote them; the Romans stamped them in relief; the Chinese used square seals in red or blue, not impressed or in relief, having the dates of manufacture (commencing with Hung-Woo (A. D. 1368) and continuing till the present day), the names of establishments, persons, and sometimes devices; the Japanese employed the same, and in Europe initial letters, arms of town and patrons were glazed in colors, or else devices—such as a globe and cross for Berlin; a sun, crowned eagle, or comet for Sèvres. Initials, as B. by Palissy, N. for the potteries of Nevers, and the name in full by Wedgwood and others, either in relief or glazed, were used. Thousands of these names and devices occur, and require a special knowledge to refer the pieces to their exact place and period. Large prices are paid by amateurs and collectors for choice and rare specimens of porcelain and ancient Greek vases. S. BIRCH.

Pottery and Porcelain Manufacture [*Earthenware, Stoneware, Ceramics;* Ger. *Porzellan, Steingut, Töpferei;* Fr. *potterie*]. The peculiar properties of clay and its general distribution have made it the most available material for the manufacture of useful and ornamental vessels from the most remote antiquity. Its plastic quality when wet renders the work of giving it any desired form very simple, and its hardness and firmness after baking give it a great amount of durability, notwithstanding its brittleness. For this reason vessels of pottery and bricks are among the oldest and most numerous relics we have of ancient races all over the world. Clay is the product of the disintegration or weathering of silicious rocks. Feldspar, mica, hornblende, etc. are silicates of alumina, potash, soda, lime, magnesia, oxide of iron, etc., which occur in the crystalline rocks associated with grains of quartz. By the long-continued action of water, carbonic acid, etc., they are decomposed; the alumina retains a certain proportion of the silica, combines water, and becomes clay, while the other bases are removed more or less completely either as soluble silicates (potash and soda) or as soluble bicarbonates, etc. (lime, magnesia, etc.). The immediate effect of this decomposition is the conversion of the firm rock into a soft mass of clay (more or less firm) and of quartz-sand. By the action of water this mass is finally separated into sand, which, owing to its size, is deposited while the water is still in motion, and clay, which is held in suspension until the water becomes quiet, when it is deposited in beds. Owing to the difference in the mineral constituents of the original rocks, and in the extent to which the decomposition and separation has proceeded, there is the greatest variety in the composition, and consequently in the quality, of the resulting clays. The chief and characteristic constituent of all clays is the hydrous silicate of alumina, called *kaolinite* ($Al_2O_3.2SiO_2 + 2H_2O$), which contains 46.36 SiO_2, 39.72 Al_2O_3, 13.91 H_2O. Associated with this there is always a considerable quantity of fine quartz-sand (SiO_2), a little silicic hydrate (H_2SiO_3), or alkaline silicate, variable proportions of undecomposed feldspar, mica, hornblende, etc., oxide of iron, carbonate of lime, organic matter, etc. Riley (*Chem. Soc. J.*, xii. 13; xv. 311) has shown that nearly all clays contain titanic acid; he found from a trace to 1.05 per cent. The formation of kaolinite from feldspar is here shown:

Feldspar	$K_2O,Al_2O_3,6SiO_2 + Aq.$	
Kaolinite		$Al_2O_3,2SiO_2 + 2H_2O$
Potassium silicate	K_2O	$4SiO_2 + Aq.$

Clay occurs in soft masses, which can generally be readily crushed. It is plastic when wet, this most important quality varying with the purity; the more plastic is said to be *fat* or *long*—the less *lean, meagre*, or *short*. It concretes into a hard mass on drying, and after baking is often so hard as to strike fire with steel. If it contains little besides pure clay (kaolinite) and silica (sand), it is infusible at a white heat, but the presence of undecomposed silicates, feldspar, etc., or of alkalies, lime, magnesia, oxide of iron, etc., renders it more fusible. Oxide of iron, if present to any extent, causes it to become red on baking. The pure, highly-plastic clays are liable to crack in drying and to lose their shape. This is counteracted by adding sand. To prevent distortion in firing, hard-burned stoneware is ground to powder and incorporated with the clay. The degree of shrinkage which occurs in drying the clay depends on the purity of the clay and the percentage of water it contains—from 14 to 31 per cent. on the surface of articles, from 20 to 43 on the volume. A fusible and a refractory clay when baked together form a mass which is no longer porous (stoneware). The clays employed in ceramic manufacture are—(1) Refractory clays, as kaolin or porcelain clay, fire-clay, pipe-clay, etc. (2) Fusible clays, as potter's clay, loam, or brick-clay, etc. (3) Calcareous clays or marls. (4) Ferruginous clays, as ochre, reddle, etc.

Kaolin, or *Porcelain Earth*, is white, with often a yellowish tint. It is meagre to the touch, burns white, and is infusible in the porcelain furnace. It is found in connection with the crystalline rocks—granites, porphyries, etc. Its chief localities are (1) Bavaria: Aschaffenburg, Stolberg, Diendorf, Oberedsdorf; (2) Prussia: Morl and Trotha near Halle (material for Berlin porcelain manufacture); (3) Saxony: Schneeberg, Mionia; (4) Hungary: Brenditz, Carlsbad, Prinzdorf; (5) France: St. Yrieux, near Limoges; (6) England: St. Anstel, in Cornwall; (7) China; (8) Japan; (9) U. S.: Brandon, Vt.; New Castle and Wilmington, Del.; Jacksonville, Ala.; Edgefield, S. C.; Augusta, Ga., etc. The composition of kaolin is shown in the following analyses:

	Passau.	Zettlitz.
Silica	44.90	45.96
Alumina	34.29	37.97
Sesquioxide of iron	0.85	0.83
Lime	1.23	0.20
Magnesia	0.27	0.44
Potassa	0.59	1.00
Soda	0.39	0.65
Water	16.85	14.21
	99.37	101.26

As the kaolin is first raised, it has the appearance of mortar, containing grains of quartz and other minerals. It is exposed to a stream of water, and the milky liquid is carried through a series of settling-vats, where the coarser particles are deposited. The liquid is then run into shallow reservoirs, where the kaolin settles. It is afterward dried for market.

Fire-clay is one of the most refractory varieties. It is used for crucibles, gas-retorts, stove-linings, and fire-bricks. It is found in the Carboniferous strata, immediately under the coal-beds, whence it is called the *under clay*. The following analyses show the composition of this clay:

	Amblecote.	Stourbridge.	Dourdan, Seine-et-Oise.	Savanas, Ardèche.
Silica	61.33	60.27	60.60	58.76
Alumina	26.22	23.89	26.39	25.10
Protoxide of iron	1.06	1.74		
Sesquioxide of iron	......	......	2.50	2.50
Lime	0.41	0.72	0.84	trace
Magnesia	0.19	0.66	......	2.51
Alkalies	0.68	0.95		
Water	10.11	11.21	9.20	12.50
	100.	99.44	99.53	101.37

Pipe-clay, Potter's Clay, Plastic Clay, compact, smooth, even unctuous to the touch; may be polished by the finger when dry. It has a great affinity for water, adheres strongly to the tongue, forms a tenacious paste with water; infusible in the porcelain furnace, but acquires great solidity in firing, which distinguishes it from common clays used for coarse earthenware. Some varieties burn white, some red. It is used for fine stoneware. Such clay is abundant at Hackensack and Perth Amboy, N. J., East Liverpool, O., etc.

	Strasbourg.	Stourbridge.	Forges-les-Eaux.
Silica	66.70	63.70	52
Alumina	18.20	20.70	27
Magnesia	0.60		
Oxide of iron	1.60	4.50	2
Water	12.00	10.00	19
	99.10	98.90	100

Ordinary Potter's Clay is very plastic, but contains such quantities of oxide of iron, lime, etc. as to cause it to fuse at high temperatures, and generally to burn dark-red. Such clay abounds at Elizabethport, N. J., and many other localities. The following are common potter's clays:

	Provins, Seine-et-Marne.	Livernon, Lot.	Helsingborg.
Silica	57.	61.	60.
Alumina	37.	30.	24.
Oxide of iron	4.	7.6	7.5
Lime	1.7	2.4	0.5
	99.7	101.	92.

Dorsetshire Blue Clay is a fusible clay which burns white; it is abundant at Wareham. The Glasgow red or brown clay is a fusible clay much prized for common black ware, flower-pots, etc.:

	Wareham blue clay.	Glasgow red clay.
Silica	46.38	49.44
Alumina	38.04	34.26
Protoxide of iron	1.04	7.74
Lime	1.20	1.48
Magnesia	trace	1.94
Water	13.44	5.14
	100.	100.

Common Clay, or *Loam*, is an impure mixture of clay and sand, generally containing sufficient iron to burn red. It is found at the surface, occurs almost everywhere, and is used for bricks, drain-tile, and coarse pottery. Beds occur in some of the Western States which are so free from iron that they burn to a cream color; the Milwaukee bricks are notably of this character.

Marls are clays containing considerable quantities of carbonate of lime. In water they fall to powder, and form a non-adhesive, pasty mass. They fuse easily. The following analyses show their character:

	Chambray.	Savone.
Silica	49.50	37.00
Alumina	29.00	11.00
Oxide of iron	3.00	6.50
Carbonate of lime	18.00	45.00
Carbonate of magnesia	0.50	
	100.00	99.50

Varieties and Classification of Clay Wares.—The plasticity of wet clay makes it possible to fashion vessels from it which when dry may be baked or fired. The resulting ware will vary in color, texture, hardness, solidity, and transparency according to the nature of the clay and of the materials which are in some cases added to it. The application of the glaze to the outside of the ware introduces still further differences. Clay ware is subdivided into *dense* and *porous* ware. The first is semi-vitrified, and is not porous on the fracture; it includes true porcelain, tender porcelain, granite-ware, and stoneware. The second kind consists of a refractory mass which shows no signs of fusion, and is consequently porous. It may be glazed to render it impervious to water. It includes earthenware, faïence, bricks, tiles, etc. The two classes graduate into each other by insensible shades of difference. The following are the most important varieties of ceramic ware:

I. PORCELAIN.—Mass uniformly fluxed, dense, not scratched by knife, texture fine and uniform, translucent, very sonorous, white. (1) *Hard or Real Porcelain.*—Mass difficult of fusion, consists of infusible kaolin with quartz, and a flux of feldspar or lime. The glaze is composed of the same flux; contains no lead or tin. (2) *Tender Porcelain.*—Mass easily fusible. (*a*) French tender porcelain: a glass-like mass, a potash-alumina silicate, prepared without clay, and consequently not properly a clay ware; containing lead, and glazed with lead; (*b*) English tender porcelain, *ironstone china.* The mass pipe-clay, with flux of gypsum and bone-ash. Glaze, clay, chalk, borax, and oxide of lead.

II. STONEWARE.—Mass dense, hard, not scratched by knife, sonorous, fine-grained, homogeneous, showing incipient fusion, scarcely translucent on the edges, white or colored. (3) *Fine stoneware, granite ware, firestone ware.*—Mass white or colored, composed of plastic pipe-clay and kaolin, with flux of feldspar (Cornish stone). Glazed or not; glaze often contains lead. (4) *Common Stoneware.*—Mass reddish-gray or bluish, generally without glaze or with a salt glaze.

III. EARTHENWARE.—Mass earthy, porous, pretty hard, opaque, texture open, little sonorous. (5) *Fine Earthenware* (*Faïence*).—Mass white, hard, and sonorous. Glaze, of crystal containing lead, borax, feldspar, etc., or opaque with tin: majolica, delftware, etc. (6) *Common Earthenware.*—Mass finely granular, uniform, more or less colored (yellow). Glaze, a soft white or colored enamel. (7) *Ordinary Pottery.*—Mass earthy, porous, opaque, soft, homogeneous, texture very open, very porous, always colored. Glazed or unglazed; glaze may contain lead or not; is always easy of fusion, and transparent. (8) *Bricks, Tiles, Terra-cotta Ornaments, etc.*—Mass not uniform, always colored, very soft, porous, and open, little sonorous, opaque, fusible at a high temperature; sometimes glazed. (9) *Fire-brick, Crucibles, etc.*—Mass difficultly fusible, or infusible; not glazed.

Hard Porcelain was made by the Chinese and Japanese long before the Christian era. A revival of the manufacture, which had declined in consequence of an invasion, is spoken of as having occurred 485 B. C. Chinese porcelain was first imitated in France in a very imperfect manner in 1695. The manufacture of real china was invented in Germany by Bötticher in 1709. The duke of Saxony (August II. of Poland) built him a factory at Meissen near Dresden, and in 1710 he was installed as director. The process was guarded as a great secret, but it finally became known, and was established in 1720 in Vienna, 1751 in Berlin, 1755 at Nymphenburg near Munich, 1758 at St. Petersburg, and in 1765, after the discovery of kaolin at St. Yrieux, it was substituted for the tender porcelain at Sèvres. The hard porcelain is composed of kaolin, quartz to prevent excessive shrinkage on drying, and a flux (to fuse and bind the whole together) which consists of feldspar or gypsum. The proportions used at Berlin in 1863 were kaolin 28, quartz 66.6, protoxide of iron 0.70, magnesia 0.6, lime 0.3; at Nymphenburg, kaolin 65, sand therewith 4, quartz 21, gypsum 5, broken biscuit-ware 5; at Vienna, kaolin from Zedlitz 34, kaolin from Passau 25, kaolin from Unghvar 6, quartz 14, feldspar 6, broken ware 3; at Meissen, kaolin from Aue 18, kaolin from Sosa 18, kaolin from Seilitz 36, feldspar 26, broken ware 2. At Sèvres chalk from Bougival is a constant addition to the mass; it contains—

Carbonate of lime	95.50
Carbonate of magnesia	0.80
Silica	0.80
Oxide of iron, manganese, and alumina	1.70
Water	1.20
	100.

The feldspar is brought from various localities; that from Bohemia contains—

Silica	65.87
Alumina	25.66
Sesquioxide of iron	0.27
Lime	0.36
Magnesia	0.10
Potassa	4.71
Soda	3.09
Water	0.58
	100.64

The kaolin is washed and ground to free it from impurities and make it uniform. The quartz, feldspar, and broken ware are ground in mills with water, and the different constituents are then mixed, and the mixture is ground and strained until it is perfectly uniform. At Sèvres the mixture is so made as to secure the following composition for the dry mass:

Parts.		Silica.	Alumina.	Lime.	Potash.
48	kaolin	30.00	16.90	0.05	0.96
48	feldspar	28.30	17.04	0.53	2.01
4	lime	......	......	4.00	
100	Total	58.30	33.94	4.58	2.97

The liquid mass, known as *slip*, is now treated for the removal of water, either by evaporation, by passing it over beds of plaster of Paris, by which the water is absorbed,

or by the aid of filter-presses. The moist mass is then slapped, kneaded, and trodden to make it uniform, and is put away in moist cellars to undergo a species of decay to make it more plastic. During this process the mass becomes dark-colored by the reduction of the iron, and exposure to the air is necessary to reoxidize this.

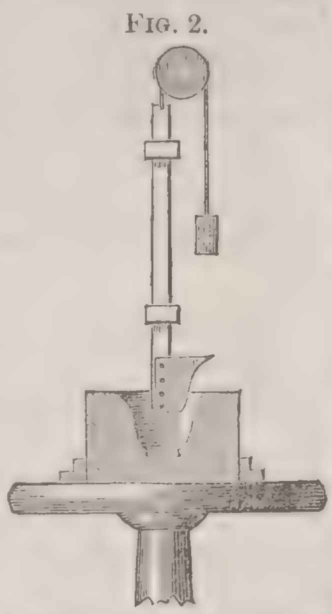
Forming.—When the mass is ready, it is formed either on the potter's wheel or in moulds. "The potter's wheel con-

FIG. 1.

The Potter's Wheel.

sists of a vertical iron axis, on which is a horizontal disk, which is made to revolve by the feet of the operator on a lower disk or by steam. A lump of the plastic mass is placed upon the wheel, the thumb being placed in the centre of the lump and pressed downward; a hollow is thus formed, which is widened or the walls continued vertically according to the shape of the vessel to be made. The constant revolution of the wheel easily allows of the moulder obtaining a perfectly cylindrical form. By thus humoring the clay, elongating the vessel, again depressing it, widening it, and by continued manipulation in this manner, the most exquisite shapes are produced. To form the ridges or sharp edges of the vessel a small piece of iron, a strip of horn or wood, termed a bridge, is used. The perfectly-formed vessel is cut away from the wheel by a piece of brass wire." (*Wagner.*)

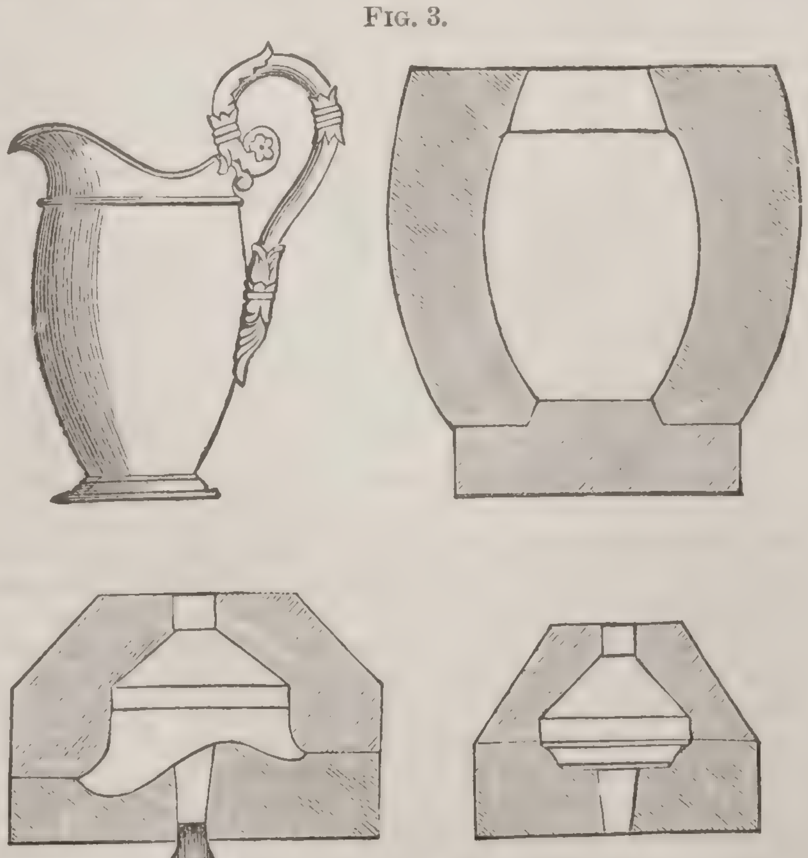
FIG. 2.



Forming a tea-cup on the potter's wheel.

Many articles are made on plaster of Paris forms. The mould is taken from the original article in parts, which are made to fit together accurately. The wet plastic mass is made to fill all the indentations accurately, and when it has stood long enough to enable the porous mould to absorb enough moisture from it to make it firm, the mould

FIG. 3.

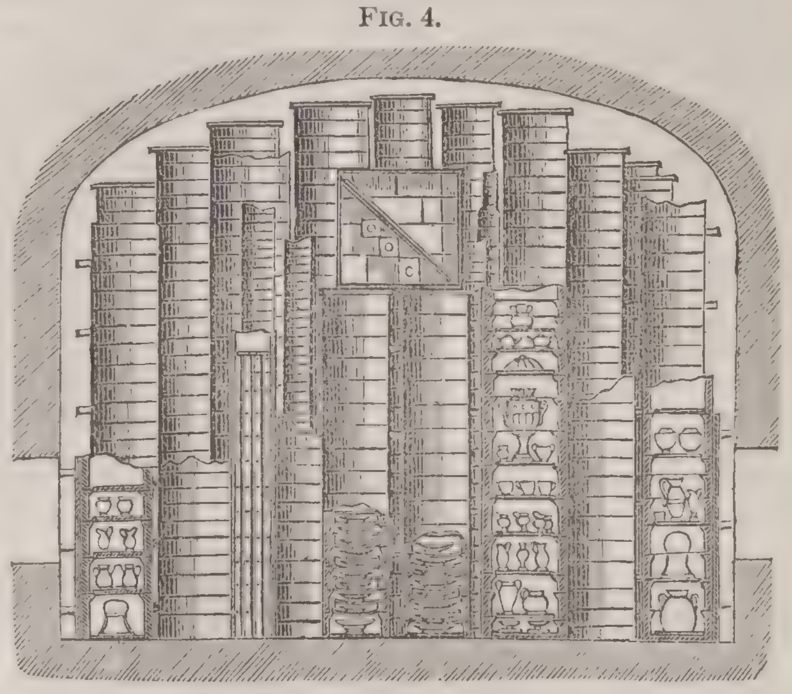


Gypsum moulds for a pitcher.

is opened and the article released. For cups, plates, saucers, etc. the plaster form is placed on the wheel. The mass is rolled out into a sheet, pressed upon the mould, the wheel set in motion, and a brass knife, cut to the exterior form of the plate or saucer, or the interior form of the cup, is held against the mass as it revolves, and the surface scraped to the desired form. The handles for the cups are made in separate moulds and attached by moistening the surfaces. Many articles, such as pitchers, busts, etc., are cast in plaster moulds. The mass is thinned with water to a thick cream. The mould is filled with this, and allowed to stand till by the absorption of water it is lined with a firm layer of the mass of sufficient thickness. The still fluid mass within is then poured out, the whole allowed to stand till the mass is firm, when the mould is opened. Flowers, medallions, etc., are moulded separately in plaster, and then attached in their proper places. The texture of drapery is imitated by means of a piece of tulle, which is laid on the mass and burned off in the baking. When all the parts have been combined, and the article has been carefully finished with tools, it is allowed to dry.

Firing.—The next step is the firing or baking of the ware. In order to protect it from ashes and smoke, it is

FIG. 4.

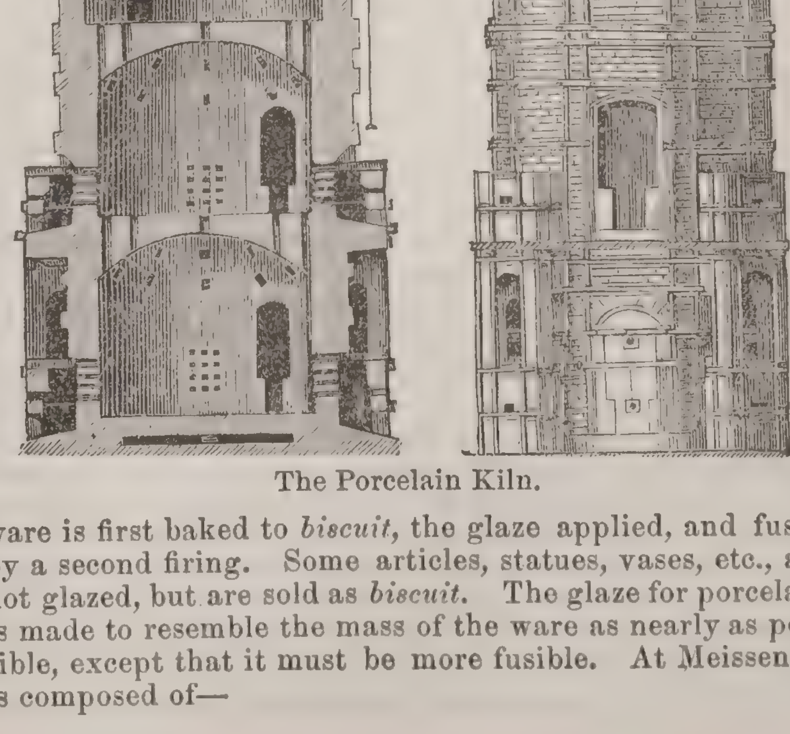


A chamber of the porcelain kiln, showing the seggars.

carefully enclosed in fire-clay vessels called *seggars*. These seggars are piled one upon another in columns in the kiln or oven, which is a large circular reverberatory furnace with three chambers, one above the other, and five fires around the outside. Heat is applied gradually at first, but is finally carried to a strong red. This high temperature is maintained for seventeen or eighteen hours, when the kiln is opened and allowed to cool gradually for three or four days. The seggars are then removed and the ware taken out.

Glazing.—In some establishments the green ware is coated with the glaze before the first firing; in others the green

FIG. 5.



The Porcelain Kiln.

ware is first baked to *biscuit*, the glaze applied, and fused by a second firing. Some articles, statues, vases, etc., are not glazed, but are sold as *biscuit*. The glaze for porcelain is made to resemble the mass of the ware as nearly as possible, except that it must be more fusible. At Meissen it is composed of—

Quartz	37.0
Kaolin from Seilitz	37.0
Lime from Pirna	17.5
Broken porcelain	8.5
	100.

At Berlin—

Quartz	43
Kaolin from Morle	31
Gypsum	14
Broken porcelain	12
	100

At Sèvres a mixture of pegmatite from St. Yrieux (feldspar) and quartz is used. The mixture contains 74.3 silica, 18.3 alumina, 6.5 potassa, 0.4 lime, 0.2 magnesia. The materials are ground and mixed in the same manner as the mass, and the final slip, of the consistence of cream, is applied by dipping the biscuit ware into the tub or vat. After the dipping process the part of the piece held by the workman is coated with glaze by the aid of a brush. When dry the ware is replaced in the seggars and again fired.

Decorating the porcelain is accomplished by applying metallic oxides mixed with a suitable flux, as a silicate or borate, or both together. The colors are therefore colored glasses, which are reduced to powder, mixed with oil of lavender, and applied with a brush. The following list of colors is given by Wagner: Oxide of iron, for red, brown, violet, yellow, and sepia; oxide of chromium, for green; oxide of cobalt and potassium-cobalt-nitre, for blue and black; oxide of uranium, for orange and black; oxide of manganese, for violet, brown, and black; oxide of iridium, for black; oxide of titanium, for yellow; oxide of antimony, for yellow; oxide of copper (and protoxide), for green and red; chromate of iron, for brown; chromate of lead, for yellow; chromate of barium, for yellow; chloride of silver, for red; chloride of platinum, for platinizing; purple of Cassius, for purple and rose-red. The burning-in of the colors is effected in a muffle furnace. For gilding, precipitated gold is applied, mixed with honey and a flux, as nitrate of bismuth. After it is burned in, it is brightened by burnishing. Bright gilding can be secured without burnishing by using a solution of sulphuret of gold or fulminating gold in balsam of sulphur. For silvering, the metal precipitated by copper or zinc, and for platinizing, platinum-black, are employed.

Fig. 6.

The muffle for fixing the colors on decorated porcelain.

Composition of Hard Porcelain.

	Berlin.	Superior china.
Silica	72.96	71.04
Alumina	24.78	22.46
Lime	1.04	3.82
Alkali and loss	1.22	2.68
	100.00	100.00
Sp. gr.	2.419	2.314

Artificial teeth are extensively manufactured from hard porcelain, the materials being feldspar, quartz, and a little kaolin. The yellow tint is produced by titanic acid, pink by gold, gray or blue for the tips by platinum-sponge or cobalt. The feldspar must not be so fine as to completely flux the quartz to a glass. The feldspar, clay, etc., are ground to an impalpable powder under water, dried, and made into a paste. That composing the body of the tooth is of different materials from that composing the base or enamel. The teeth are made in brass moulds, and this is quite a delicate process. The enamel is first put in place with a small steel spatula; the platinum rivets, by which the teeth are fastened to the plate, are placed in position, and then the body is pressed into the mould. They are then submitted to powerful pressure and dried. After being dried, they are submitted to a process called biscuiting, in which they can be cut like chalk. They are then sent to the trimmers, who scrape off all projections and fill up all depressions which may have been left in the operation of moulding, and then wash them with what is technically termed "enamel." This is composed of various substances more fusible than the tooth itself, and answers to the glaze in common porcelain-making. It is ground to a fine powder and suspended in water, and is laid on with a camel's-hair brush. They are now sent to the gummers, who apply the gum. This is colored with oxide of gold, and is applied in the same manner as the enamel. After being dried, they are burned. This operation is carried on in a muffle. The teeth are placed on a bed of crushed quartz, which is placed on a slab of refractory clay. After being exposed to an intense heat for some hours, they are taken out, cooled, and assorted.

French Tender Porcelain, or *Frit Porcelain.*—The manufacture of this peculiar ware began in France in 1695 at Sèvres, and was continued till 1751, when it was superseded by the hard porcelain, invented by Böttícher. It is not properly porcelain, nor even a clay ware, but an imperfectly-fused glass. The mass or body is composed of (1) frit, (2) chalk, (3) marl. The frit is made by heating together in a calcining furnace the following mixture:

Melted saltpetre	22.0
Sea-salt, gray	7.2
Alum, generally burned	3.6
Alicante soda	3.6
Gypsum (Montmartre)	3.6
Sand (Fontainebleau)	60.0
	100.

This mixture was not completely fused in the furnace, but merely reduced to a pasty mass, and well stirred to secure uniformity, yielding a white spongy frit. This was crushed and lixiviated to remove soluble salts, and then ground with millstones under water to a fine powder in order to form a paste. Chalk and white calcareous marl from Argenteuil were also separately ground up with water, and freed from impurities by settling, etc. The three materials, suspended in water, were then mixed in the following proportions, calculated for the dry powders:

Frit	75.....75
Chalk	8 to 17
Marl	17 to 18

This corresponds to an average composition for the mass of—

Silica	76
Alumina	2
Lime	16
Soda and potassa	5
Magnesia, etc	1
	100

The pulp was allowed to remain for a month to dry, and was then again pulverized. This mass was almost entirely wanting in plasticity, owing to the almost complete absence of clay. It possessed so little cohesion that it could not be worked at all till it received an addition of 12 per cent. of soap and glue or gum-tragacanth, and then only by pressing in plaster moulds, not on the potter's wheel. After moulding, the articles were dried, and finished on the lathe with iron tools. The firing lasted from 75 to 100 hours, and was a very delicate operation. Owing to the fusible nature of the mass, the articles had to be supported at all points in the seggars to prevent their losing their form. Plates, saucers, etc. were arranged upon earthen moulds, so placed as to permit shrinkage without loss of form. Other articles were supported on forms made of the same mass, which suffered during the baking the same contraction, and could consequently be used but once.

The glaze or enamel was a kind of crystal or flint glass; it was prepared by melting in crucibles—

Sand from Fontainebleau, burnt	27
Flints, calcined	11
Litharge	38
Carbonate of potash	15
Carbonate of soda	9
	100

The fused mass was ground fine, and diffused in water, mixed with a little vinegar, to the consistence of cream. As the biscuit ware was not porous enough to take the glaze by immersion, it was necessary to pour the slip over it. The articles were then baked again for 30 hours in separate seggars, but without supports, in the upper chamber of the kiln, which was not hot enough to soften the body of the ware. As the first glaze was not very equal, it was necessary to apply a second, and return the pieces to the kiln a third time. For the decoration of this ware the colors required careful and peculiar preparation and treatment. The peculiarities of this old French tender porcelain are—body fine, dense, vitreous, hard, very translucent, fusible; glaze vitreous, transparent, tolerably hard.

It was similar to cryolite glass, or *hot-cast porcelain.* It was very expensive to manufacture, owing both to the labor required and the high percentage of loss. It was also very fragile, and, like glass, incapable of bearing rapid changes of temperature, the heat of boiling water frequently cracking it. It possessed some advantages as to painting, and could be made very brilliant in its decorations.

English Tender Porcelain, or *Ironstone China,* is manufactured exclusively in England, where hard porcelain cannot be economically made for the want of clay sufficiently refractory for the seggars. The mass or body is composed of (1) plastic clay; (2) kaolin, "china clay" from Cornwall; (3) granite or "Cornish stone" (pegmatite), which consists of feldspar with some quartz; (4) chalk flints; (5) bone-ash, consisting of phosphate of lime, with some phosphate of magnesia, carbonate of lime, etc. The use of this material is due to Mr. Spade in 1802, and constitutes the peculiarity of English china. Recently, other forms of phosphate of lime, as apatite, phosphorite, staffelite, or sombrerite, have been substituted. (6) Steatite (soapstone) is sometimes used to diminish the contraction of the wares in the furnace. It contains 44 of silica, 44 of magnesia, 2 of alumina, 7.3 of sesquioxide of iron, 1.5 oxide of manganese, 1.2 oxide of chromium. These materials are all ground in water to an impalpable slip. A frit is then made of—

Cornish stone	40
Flint	28
Carbonate of soda, crystals	20
Borax	7
Oxide of tin	5
	100

This is ground to slip, and the mass is then made up of—

Plastic clay, blue	45.
Kaolin	33.
Cornish stone	7.5
Flint	3.
Bone-ash	52.
Frit	5.
	100.

Or the mass is not fritted in part, but mixed all at once, in the following or other proportions:

	I.	II.
Plastic clay	50	19
Kaolin	18	11
Flint	0	21
Bone-ash	29	49
Broken ware	3	
Mould refuse of unfired mass	100	100
	200	200

The mass is very plastic, in consequence of the large percentage of clay, and is readily formed either on the potter's wheel or in plaster moulds. The ware is burned in seggars. The firing lasts from 48 to 50 hours, and from 20 to 30 hours are allowed for cooling.

The glaze for table ware is composed of—

Cornish stone	34	Fritted, ground, and mixed with 10 per cent. of Cornish stone, and 20 per cent. of white lead.
Chalk	17	
Flint	15	
Borax	34	
	100	

A little oxide of cobalt is added to increase whiteness. The white lead is sometimes omitted, and the necessary fluidity secured by a larger addition of borax. The glaze is applied to the biscuit by immersion. The firing requires about 17 hours.

The colors are prepared from metallic oxides, ground up with fusible glasses or fluxes. The flux most generally used consists of red lead 6, borax 4, flint 2. The painted goods are fired in the enamel-kiln or muffle.

Peculiarities.—English porcelain, when carefully made, has almost all the advantages of the old Sèvres, being translucent and exhibiting the brilliancy which can only be obtained on soft glazes, while it presents none of the difficulties to the manufacturer which arose from the want of plasticity and the fusible nature of the mass of the old Sèvres, as it is extremely plastic, and can be fired at lower temperatures in seggars of inferior clays. The following analyses have been published:

	I.	II.
Silica	39.88	40.40
Alumina	21.48	24.15
Phosphate of lime	26.44	15.32
Lime	10.06	14.22
Magnesia	....	0.43
Alkalies and loss	2.14	5.28
	100.	99.80

A vase made in 1871 contained only 3.67 per cent. of phosphoric acid, which corresponds to 8 per cent. of bone-phosphate of lime.

Parian, Carrara, etc., Statue Porcelain, is a fine unglazed, hard porcelain, made with a more fusible feldspar than ordinary porcelain. The peculiar creamy-yellow tint is due to a little oxide of iron contained in the materials; the surface is wax-like. Its composition is variable: some contains bone-ash, some silicate of barium, some only kaolin and feldspar. Parian was first prepared by Copeland in England in 1848, though statues and medallions had been previously made in hard porcelain biscuit at Meissen. The statues, etc., are cast in different pieces in plaster moulds with liquid slip, and afterward united—some before, some after, firing. Owing to the large amount of water in the slip, the mass contracts one-fourth its bulk in the firing. The best Parian is made in England. The following mixtures for Parian are given by Muspratt:

No. 1. Frit.

Well-washed Lynn or Isle of Wight sand	80 pounds.
Feldspar	35 "
Cornish stone	15 "
Pearlash	12 "

The whole mixed together with water, and fired in flinted seggars at the earthenware heat.

Mass.

Frit	50
Feldspar	130
China clay	130
Fine-powdered glass	20

These ingredients being all well ground together.

No. 2. Frit made as before.

Mass.

Frit	50
Feldspar	35
Feldspar calcined at a gloss heat	35
China clay	75
Bone	75
Powdered glass	15

Ure gives the following account of the manufacture of Parian figures: "As the most direct method of illustrating the process of making these figures, let us suppose the object under view to be a figure or group, and this we will assume to be two feet high in the model. The clay, which is of the most perfect character, is mixed with flint, as in the case of manufacturing the finest stone china, and it is used in a semi-liquid state about the consistency of cream; this is poured into the moulds forming the various parts of the subject (sometimes as many as fifty); the shrinking that occurs before these casts can be taken out of the mould, which is caused by the absorbent nature of the plaster of which the mould is composed, is equal to a reduction of one inch and a half in the height. The moulds are made of plaster of Paris, which, when properly prepared, has the property of absorbing water so effectually that the moisture is extracted from the clay, and the ware is enabled to leave the mould, or 'deliver,' with care and rapidity. Prior to use, the plaster (gypsum) is put into long troughs, having a fire running underneath them, by which means the water is drawn off, and it remains in a state of soft powder; and if its own proportion of water be again added to it, it will immediately set into a firm, compact body, which is the case when it is mixed to form the mould. These casts are then put together by the 'figure-maker;' the seams (consequent upon the marks caused by the subdivisions of the moulds) are then carefully removed, and the whole worked upon to restore the cast to the same degree of finish as the original model. The work is then thoroughly dried to be in a fit state for firing, as, if put in the oven while damp, the sudden contraction consequent upon the great degree of heat instantaneously applied would be very liable to cause it to crack; in the process it again suffers a further loss of one inch and a half by evaporation, and it is now but one foot nine inches. Again, in the 'firing' of the bisque oven, its most severe ordeal, it is diminished three inches, and is then but eighteen inches high, being six inches, or one-fourth, less than the original. Now, as the contraction should equally affect every portion of the details of the work in order to realize a faithful copy, and as, added to this contingency, are the risks in the oven of being 'over-fired,' by which it would be melted into a mass, and of being 'short-fired,' by which its surface would be imperfect, it is readily evident that a series of difficulties present themselves which require considerable practical experience successfully to meet. Indeed, the difficulties which surround the manufacture of Parian prevent its being rendered to the public at such a price as those would desire who wish to secure the introduction, amongst the people, of all examples which are calculated to refine their tastes. A biscuit china is, by a somewhat similar process, employed in several of the porcelain-manufactories on the Continent for the production of statuettes, busts, etc., but in color and character they are all inferior to the English Parian."

Stoneware differs entirely from porcelain. It is dense,

sonorous, fine-grained, semi-fused, does not cling to the tongue. It is entirely opaque; is either white or colored. It may be made entirely of plastic clays, as in the case of the commoner kinds, or of a mixture of these, with fluxing materials, as kaolin, quartz, feldspar, etc., as in the case of finer varieties, such as granite ware, Wedgwood, etc. It may be unglazed, or glazed with a borax-and-lead glaze, or merely a salt glaze. Stoneware gradually passes into earthenware, so that it becomes difficult to draw a sharp line of division between the two classes of ware. Semi-fusion and an absence of porosity are the distinguishing characteristics of stoneware.

Fine Stoneware, Granite Ware.—The materials generally employed in England are (1) plastic clay (blue); (2) kaolin, Cornish china clay; (3) flint; (4) Cornish stone, pegmatite, feldspar, with some quartz. Some of the proportions in mixing the mass are as follows:

White stoneware bodies for jugs, etc.	I.	II.	III.	IV.
Cornish stone	80	40	100	30
Cornish clay	20	10	20	10
Blue clay	40	20	18	18
Flint	20	...	40	2

with the addition of a little blue cobalt to whiten. For colored bodies metallic oxides are added to the mass: (1) for sage, oxide of chromium and cobalt; (2) for drab, 15 per cent. of common marl and a little oxide of nickel; (3) for dove-color, 1 per cent. of oxide of manganese and ½ per cent. of oxide of cobalt. For American (New York City) granite or iron stone the mixture consists of (1) plastic blue clay from Woodbridge, N. J.; (2) kaolin from Spring Garden or elsewhere; (3) quartz from Middletown, Conn.; (4) feldspar from the same locality. These are ground up with water to slips till one pint of each weighs as follows: plastic clay, 24 ounces; kaolin, 26 ounces; quartz, 32 ounces; feldspar, 32 ounces. These are mixed and evaporated to the proper consistence. If the clay be in excess, the pieces shrink too much, and are not sound. If clay and feldspar are in excess, or quartz deficient, the ware cracks or "crazes," which is the worst fault. If feldspar is deficient, the mass hardly unites. It is thus apparent that granite ware is composed of the ingredients of hard porcelain, with a large admixture of plastic clay. The "C. C.," or cream-colored ware, consists of the same materials as the granite, except that only one-half as much of the porcelain mixture of kaolin, quartz, and feldspar is added to the plastic clay. The pieces are formed as described under *Hard Porcelain*, either on the wheel or in plaster moulds by moulding on the wheel, pressing, or casting. The ware is fired in seggars, either in a porcelain kiln or in simpler kilns, horizontal or vertical.

The Glaze.—"A good enamel is an essential element of fine stoneware; it should experience the same dilatation and contraction by heat and cold as the biscuit which it covers. The English enamels contain nothing prejudicial to health, as many of the foreign glazes do; no more lead being added to the former than is absolutely necessary to convert the silicious and aluminous matters with which it is mixed into a perfectly neutral glass. Three kinds of glazes are used in Staffordshire—one for the common pipe-clay or cream-colored ware; another for the finer pipe-clay ware to receive impressions, called *printing body;* a third for the ware which is to be ornamented by painting with the pencil. The glaze of the first or common ware is composed of 53 parts of white lead, 16 of Cornish stone, 36 of ground flints, and 4 of flint glass; or of 40 of white lead, 36 of Cornish stone, 12 of flints, and 4 of flint or crystal glass. These compositions are not fritted, but are employed after being simply triturated with water into a thin paste. The following is the composition of the glaze intended to cover all kinds of figures printed in metallic colors: 26 parts of white feldspar are fritted with 6 parts of soda, 2 of nitre, and 1 of borax; to 20 pounds of this frit, 26 parts of feldspar, 20 of white lead, 6 of ground flints, 4 of chalk, 1 of oxide of tin, and a small quantity of oxide of cobalt, to take off the brown cast and give a faint azure tint, are added. The following recipe may also be used: Frit together 20 parts of flint glass, 6 of flints, 2 of nitre, and 1 of borax; add to 12 parts of that frit, 40 parts of white lead, 36 of feldspar, 8 of flints, and 6 of flint glass; then grind the whole together into a uniform cream-consistenced paste. As to the stoneware which is to be painted, it is covered with a glaze composed of 13 parts of the printing-color frit, to which are added 50 parts of red lead, 40 of white lead, and 12 of flint, the whole having been ground together. The above compositions produce a very hard glaze, which cannot be scratched by the knife, is not acted upon by vegetable acids, and does no injury to potable or edible articles kept in the vessels covered with it. It preserves for an indefinite time the glassy lustre, and is not subject to crack and exfoliate, like most of the continental stoneware made from common pipe-clay. In order that the seggars in which the articles are baked after receiving the glaze may not absorb some of the vitrifying matter, they are themselves coated, as above mentioned, with a glaze composed of 13 parts of common salt and 30 parts of potash, simply dissolved in water and brushed over them." (*Ure.*)

Printing and Painting.—"There are two distinct methods of printing in use for china and earthenware: one is transferred on the bisque, and is the method by which the ordinary printed ware is produced, and the other is transferred on the glaze. The first is called 'press-printing' and the latter 'bat-printing.' The engraving is executed upon copper plates, and for press-printing is cut very deep, to enable it to hold a sufficiency of color to give a firm and full transfer to the ware. The printer's shop is furnished with a brisk stove having an iron plate on the top immediately over the fire, for the convenience of warming the color while being worked, also a roller-press and tubs. The printer has two female assistants called 'transferrers,' and also a girl called a 'cutter.' The copper plate is charged with color mixed with thick boiled oil by means of a knife and 'dabber' while held on the hot stove plate for the purpose of keeping the color fluid; and the engraved portion being filled, the superfluous color is scraped off the surface of the copper by the knife, which is further cleaned by being rubbed with a boss made of leather. A thick firm oil is required to keep the different parts of the design from flowing into a mass or becoming confused while under the pressure of the rubber in the process of transferring. A sheet of paper of the necessary size and of a peculiarly thin texture, called 'pottery tissue,' after being saturated with a thin solution of soap and water, is placed upon the copper plate, and being put under the action of the press, the paper is carefully drawn off again (the engraving being placed on the stove), bringing with it the color by which the plate was charged, constituting the pattern. This impression is given to the 'cutter,' who cuts away the superfluous paper about it; and if the pattern consists of a border and a centre, the border is separated from the centre, as being more convenient to fit to the ware when divided. It is then laid by a transferrer upon the ware and rubbed first with a small piece of soaped flannel to fix it, and afterward with a rubber formed of rolled flannel. This rubber is applied to the impression very forcibly, the friction causing the color to adhere firmly to the bisque surface, by which it is partially imbibed: it is then immersed in a tub of water, and the paper washed entirely away with a sponge, the color, from its adhesion to the ware and being mixed with oil, remaining unaffected. It is now necessary, prior to 'glazing,' to get rid of this oil, which is done by submitting the ware to heat in what are called 'hardening kilns,' sufficient to destroy it and leave the color pure. This is a necessary process, as the glaze, being mixed with water, would be rejected by the print, while the oil remained in the color. The printing under the stoneware glaze is generally performed by means of cobalt, and has different shades of blue according to the quantity of coloring-matter employed. After having subjected this oxide to the processes requisite for its purification, it is mixed with a certain quantity of ground flints and sulphate of baryta, proportioned to the dilution of the shade. These materials are fritted and ground, but before they are used they must be mixed with a flux consisting of equal parts by weight of flint glass and ground flints, which serves to fix the color upon the biscuit, so that the immersion in the glaze-liquor may not displace the lines printed on, as also to aid in fluxing the cobalt.

"The 'bat-printing' is done upon the glaze, and the engravings are for this style exceedingly fine, and no greater depth is required than for ordinary book engravings. The impression is not submitted to the heat necessary for that in the bisque, and the medium of conveying it to the ware is also much purer. The copper plate is first charged with linseed oil, and cleaned off by hand, so that the engraved portion only retains it. A preparation of glue being run upon flat dishes about a quarter of an inch thick, is cut to the size required for the subject, and then pressed upon it, and, being immediately removed, draws on its surface the oil with which the engraving was filled. The glue is then pressed upon the ware, with the oiled part next the glaze, and, being again removed, the design remains; though, being in a pure oil, scarcely perceptible. Color finely ground is then dusted upon it with cotton wool, and a sufficiency adhering to the oil leaves the impression perfect and ready to be fired in the enamel-kilns.

"The following are the processes usually practised in Staffordshire for printing under the glaze: The cobalt, or whatever color is employed, should be ground upon a porphyry slab, with a varnish prepared as follows: A pint of linseed oil is to be boiled to the consistence of thick honey,

along with 4 ounces of rosin, half a pound of tar, and half a pint of oil of amber. This is very tenacious, and can be used only when liquefied by heat, which the printer effects by spreading it upon a hot cast-iron plate. The printing plates are made of copper, engraved with pretty deep lines in the common way. The printer, with a leathern muller, spreads upon the engraved plate, previously heated, his color, mixed up with the above oil-varnish, and removes what is superfluous with a palette-knife; then cleans the plate with a dossil filled with bran, tapping and wiping as if he were removing dust from it. This operation being finished, he takes the paper intended to receive the impression, soaks it with soap-water, and lays it moist upon the copper plate. The soap makes the paper part more readily from the copper, and the thick ink part more readily from the biscuit. The copper plate is now passed through the engraver's cylinder press, the proof leaf is lifted off and handed to the women, who cut it into detached pieces, which they apply to the surface of the biscuit. . . . The stoneware biscuit never receives any preparation before being imprinted, the oil of the color being of such a nature as to fix the figures firmly. The printed paper is pressed and rubbed on with a roll of flannel, about 1½ inches in diameter, and 12 or 15 inches long. This is used as a burnisher, one end of it being rested against the shoulder, and the other end being rubbed upon the paper; by which means it transfers all the engraved traces to the biscuit. The piece of biscuit is laid aside for a little, in order that the color may take fast hold; it is then plunged into water, and the paper is washed away with a sponge. When the paper is detached, the piece of ware is dipped in a caustic alkaline ley to saponify the oil, after which it is immersed in the glaze-liquor, with which the printed figures readily adhere. . . . When the paper impression is applied to pieces of porcelain, they are heated before being dipped in the water, because, being already semi-vitrified, the paper sticks more closely to them than to the biscuit, and can be removed only by a hard brush.

"The impression above the glaze is done by quite a different process, which dispenses with the use of the press. A quantity of fine clean glue is melted and poured hot upon a large flat dish, so as to form a layer about a quarter of an inch thick, and of the consistence of jelly. When cold, it is divided into cakes of the size of the copper plates it is intended to cover. The operative (a woman) rubs the engraved copper plate gently over with linseed oil boiled thick, immediately after which she applies the cake of glue, which she presses down with a silk dossil filled with bran. The cake licks up all the oil out of the engraved lines; it is then cautiously lifted off, and transferred to the surface of the glazed ware which it is intended to print. The glue-cake being removed, the enamel surface must be rubbed with a little cotton, whereby the metallic colors are attached only on the lines charged with oil: the piece is then heated under the muffle." (*Ure.*)

Ornaments and Coloring.—"Common stoneware is colored by means of two kinds of apparatus—the one called the blowing-pot, the other the worming-pot. The ornaments, made in relief in France, are made hollow (intaglio) in England by means of a mould engraved in relief which is passed over the article. The impression which it produces is filled with a thick clay paste, which the workman throws on with the blowing-pot. This is a vessel like a tea-pot, having a spout, but it is hermetically sealed at top with a clay plug, after being filled with the pasty liquor. The workman by blowing in at the spout causes the liquor to fly out through a quill pipe which goes down through the clay plug into the liquor. The jet is made to play upon the piece while it is being turned upon the lathe; so that the hollows previously made in it by the mould or stamp are filled with a paste of a color different from that of the body. When the piece has acquired sufficient firmness to bear working, the excess of the paste is removed by an instrument called a *tournasin* till the ornamental figure produced by the stamp be laid bare: in which case merely the color appears at the bottom of the impression. By passing in this manner several vessels of clay liquor of different colors over each other with the blowing-pot, network and decorations of different colors and shades are very rapidly produced. The serpentine or snake pots, established on the same principle, are made of tin plate in three compartments, each containing a different color. These open at the top of the vessel in a common orifice, terminated by small quill tubes. On inclining the vessel, the three colors flow out at once in the same proportion at the one orifice, and are let fall upon the piece while it is being slowly turned upon the lathe, whereby curious serpent-like ornaments may be readily obtained. The clay-liquor ought to be in keeping with the stoneware paste. The blues succeed best when the ornaments are made with the finer pottery mixtures given above. . . . To produce yellow impressions upon brown stoneware, ochre is ground up with a small quantity of antimony. The flux consists of flint-glass and flints in equal weights. The composition for white designs is made by grinding silex up with that flux, and printing it on as for blue colors upon brown or other colored stoneware, which shows off the light hues." (*Ure.*)

Enamel colors for painting on granite ware, etc., are metallic oxides with a fusible flux, as borax, flint, oxide of lead, etc. They are applied with essential oils—turpentine or lavender. The ground is laid by applying boiled oil with a camel's-hair brush, then levelling, *bossing*, to secure a uniform coating, and finally applying the color in the form of powder with cotton wool. Gold is used in the form of an amalgam ground to powder with flux, and is applied either to the oiled surface or with a brush. After the ware has been baked in the muffle, the dead surface of gold is burnished with agate.

Metallic Lustres are applied to a surface of lead glaze, composed of 60 litharge, 36 feldspar, 15 of flint. Silver and platina are applied on a white ground, gold and copper on a colored ground. Gold and platina are applied to ware made on purpose, composed of 4 parts of clay, 4 of flint, 4 of china clay, and 6 of feldspar. To make brown figures in relief on a white body, this is mixed with water till it weighs 26 ounces per pint. Gold lustre is prepared by dissolving gold in aqua regia, adding tin, and pouring into balsam of sulphur a solution of sulphur in linseed oil. Platina lustre is obtained by a mixture of a solution of platina in aqua regia with *spirit of tar* (tar and sulphur boiled in linseed oil), or by applying the ammonia-chloride of platinum. Iron lustre is obtained with a solution of iron in hydrochloric acid, mixed with spirit of tar. These lustres are applied with a camel's-hair brush, burned in the muffle, and burnished if necessary.

Wedgwood Ware includes a variety of fine stonewares, mostly unglazed, which were introduced by Wedgwood. They are known as jasper, onyx, agate, porphyry, terra-cotta, basalt, etc. Owing to the peculiar composition of the mass, it is capable of receiving the most exquisite finish and delicacy of detail. Jasper or onyx ware consists of a porcelain-like mass, either white or colored throughout with metallic oxides. By a combination of white on a colored ground the most beautiful cameos, medallion portraits, etc., are produced. The following mixtures are characteristic for the white body:

	I.	II.	III.	IV.
Blue plastic clay	26	15	90	35
Kaolin, Cornish china clay	...	15	60	15
Flint	15	15	40	10
Feldspar, Cornish stone	15	30		
Sulphate of baryta	47	10	160	50
Sulphate of strontia	10			
Sulphate of lime	6	23	8	
Bone-ash	...	...	.....	25
	119	108	358	108

The colored bodies were produced by adding to these metallic oxides—0.25 to 1.5 per cent. of oxide of cobalt for blue; oxide of chromium or oxide of nickel with potash for greens; oxide of manganese for dark purple; gold precipitated by tin for rose; antimony for orange; oxide of copper for leaf-greens; oxides of iron and manganese or ochres for black; nickel and umber for brown. This paste is very plastic, and may be worked on a lathe or in moulds. The ornaments, in the same or different colors, are moulded separately, applied with gum-water, and carefully finished with tools. One firing is sufficient, unless the inner surface is to be glazed. Some of the most beautiful results were obtained with white medallions on a deep-blue ground. Wedgwood's copy of the Portland Vase is one of the most celebrated specimens of this ware. Basalt or black Egyptian ware is employed for the reproduction of ancient Egyptian vases, etc. It is made of the following mixtures:

	I.	II.	III.
Blue plastic clay	200	100	200
Red clay	.....	.....	300
Ochre, calcined	200	100	100
Iron scales, protosesquioxide	.....	35	
Oxide of manganese	60	40	100
	460	275	700

Encaustic Painting was introduced by Wedgwood as a revival of the work of the ancient Etruscans, whose ware shows none of the glossy lustre of enamels or vitrifiable colors. His colors were composed as follows, the "slip" being the body of his jasper ware:

White.		Black.	
Blue clay	20	Egyptian black slip	12
China clay	10	White slip	3
Flint	10	Blue slip	3
Feldspar	5		
Green.		**Blue.**	
White slip	12	White slip	25
Blue slip	1	Cobalt-oxide	1¼
Nickel-oxide	1		

Glazing or Enamelling is rarely resorted to with this kind of fine stoneware. The interior of the Wedgwood vessels is sometimes enamelled: for the black ware, for instance, a mixture of 6 parts of red lead, 1 of flint, and ⅛th part of oxide of manganese is used. A peculiar thin glaze, or rather gloss, is often given to stoneware by the process called *smearing*. The once-baked ware is placed in seggars which are smeared on the interior with more or less volatile mixtures, which assume the form of vapors during the second firing, and, reacting with the materials of which the ware is composed, produce thin glazes consisting of silicates or boro-silicates. Pieces of ware coated with the mixtures, called *refractories*, are often placed in the seggars with the articles to be glazed. The following are smears often used:

	I.	II.	III.	IV.
Litharge	6	...	...	4
Stone	3	...	...	1
Common salt	3	3	5	2
Bone-ash	...	5	5	
Flint	...	...	10	1
Nitre	...	...	3	
	12	8	23	8

The glazes used for porcelain or for granite ware may also be employed by immersion. Unglazed Wedgwood ware is sometimes made without sulphate of baryta. The following is a suitable mixture: plastic blue clay, kaolin, fireclay, together one-half; the other half feldspar, Cornish stone. This is more fusible and much cheaper than hard porcelain. It may be colored superficially, or ornamented with colored mixtures of a similar material in relief. *Mortar body* is composed of 6 parts of plastic blue clay, 1 of kaolin, china clay, 2 of flint, 3 of Cornish stone.

Lacquered wares, called also *terralite* and *siderolite*, are intermediate between fine and common stoneware, have no glaze, but a strong surface-color of varnish or lacquer. The color is mixed with varnish and applied to the baked ware, which is then heated in a slow oven to fix the surface. Another fine stoneware is known as lava, and extensively manufactured in Germany. The mass is plastic, and is often made into baskets in imitation of willow wicker-work.

Common Stoneware is made of certain plastic clays without the addition of any fluxing materials. Fine sand or pulverized fragments of stoneware are sometimes added when the clay is not sufficiently rich in quartz, to prevent undue shrinkage and cracking during the firing. The ware is semi-fused; the color is generally gray. The clay is merely kneaded in the pug-mill and worked by hand. Much of this ware is formed on the wheel; large vessels for chemical works, etc., are moulded. An agreeable color is often produced by a wash of ferruginous clay or ochre. For firing, horizontal kilns or furnaces are used, with no seggars. The mass being vitreous, glaze is unnecessary. Cheap glazes are, however, often used, such as iron slag ground with water, or usually the salt glaze. This glaze is secured by throwing salt into the kiln toward the close of the firing. The salt (chloride of sodium) being volatile, rises in vapor, and, in the presence of steam from the ware or fuel, is decomposed by the silica of the ware, forming hydrochloric acid, which escapes as gas, and a silicate of soda on the surface of the ware, which, uniting with the clay, forms a silicate of soda and alumina, an artificial feldspar like the glaze on hard porcelain. Muspratt gives the following analyses of stoneware:

Stoneware Glazed.

Place.	Silica.	Alumina.	Oxide of iron.	Lime.	Magnesia.	Alkali.	Loss.	Parts.	Description.
St. Amand	75.00	22.10	1.00	0.25	traces.	0.84	0.81	100.00	Common body; earthy glaze.
Helsingborg	74.60	19.00	4.25	0.62	traces.	1.30	0.23	100.00	Coarse grayish body, ill moulded; glazed with salt.
Voisinlieu	74.30	19.50	3.90	0.50	0.80	0.50	0.50	100.00	Fine whitish body, well moulded; salt glaze.
Vauxhall	74.00	27.04	2.00	0.60	0.17	1.06	0.13	100.00	Fine whitish body, well moulded, with a porous external surface; salt glazed.
Freehen	64.01	24.50	8.50	0.56	0.92	1.42	0.09	100.00	Dark brown body, fine, well moulded; covered with an earthy glaze.

Stoneware Unglazed.

Place.	Silica.	Alumina.	Oxide of iron.	Lime.	Magnesia.	Alkali.	Loss.	Parts.	Description.
Baltimore	67.40	29.00	2.00	0.60	......	0.60	0.40	100.00	Very fine whitish body.
Wedgwood	66.49	26.00	6.12	1.04	0.15	0.20	......	100.00	Very fine yellowish body, very sonorous, well moulded.
Saveignies	65.80	27.64	4.25	1.12	0.64	0.24	0.31	100.00	Clear brown body, coarse, very sonorous.
Japan	62.04	20.30	15.58	1.08	traces.	traces.	1.00	100.00	Very fine body, well moulded, of a deep brown-red color.
China	62.00	22.00	14.00	0.50	traces.	1.00	0.50	100.00	Very fine body, well moulded, of a deep brown-red color.

Earthenware includes those varieties of pottery which present an open, porous body, which is opaque, little sonorous, and generally pretty hard. It is sometimes unglazed for water-coolers, crucibles, bricks, tiles, etc., but its porosity makes it necessary to glaze it for holding liquids, and by glazing and decoration it can be made very beautiful. The peculiarities of the manufacture are (1) the use of clay and flint without any flux, or of clays alone; and (2) firing at a temperature so low as to preclude the fusion of any of the constituents. The glaze must necessarily be very fusible. This ware includes the fine English ware, Dutch or delftware, the majolica or faïence, ordinary pottery, terra-cotta, bricks, tiles, crucibles, etc.

Fine Earthenware is largely manufactured in England, the materials being the same as those for fine stoneware: (1) blue plastic clay; (2) kaolin, Cornish china clay; (3) flint; and (4) feldspar, Cornish stone. These two wares pass into each other by insensible gradations, the earthenware being distinguished by a smaller percentage of feldspar, Cornish stone, and by the lower temperature of the firing. The difference is shown in the following figures:

	Granite, or ironstone china ware.	Cream-colored ware.	Fine earthenware.
Blue clay	17.54	45	20.84
Cornish china clay	26.31	24	33.33
Flint	21.06	18	33.33
Cornish stone	35.09	23	12.50
	100.	100	100.

The material is very plastic, and readily formed on the wheel or by pressing in plaster moulds. The ware is fired in seggars. The glaze contains lead, and often borax, sometimes fritted, is ground to slip, and applied to the biscuit by immersion. A little cobalt oxide is added for whites, and other oxides for colors. The glazes for fine stoneware are all applicable. The following are a few examples:

	Cream-color.	Rocking-ham.	Printed ware.
White lead	300	...	60
Red lead	.....	42	
Cornish stone	150	6	100
Blue clay			
Kaolin	.....	4½	10
Flint	35	4½	60
Borax	4	...	70
Oxide manganese	.....	6	
Whiting	.....	...	25

Decorating is executed as in the case of fine stoneware.

Clay Pipes are made from extremely plastic clay, free from oxide of iron and lime. The ends are sometimes glazed to prevent adhesion to the lips. The glaze is composed of the oxides of lead and tin, with sand, salt, and soda-ash.

Delftware, Majolica, Faïence, are soft, porous, opaque earthenwares coated with an opaque enamel, the colors applied to the enamel by the brush, or by printing and transfer, and the ware subjected to a third firing in the muffle. The materials are plastic clay, calcareous clays, and quartz-sand. The Paris ware is composed of:

Plastic clay from Arcueil	8
Greenish clay marl	36
White calcareous marl	28
Yellowish marly sand	28
	100

The mass is very plastic, easily formed on the wheel, and, if subjected to a high temperature, fuses. The following is an example of a white enamel for this ware: Calcine together 77 parts of lead and 23 of tin; combine 44 parts of the resulting mixture of oxides with 44 of sand, 2 of red lead, 8 of salt, and 8 of soda. For colors use for yellow 9 parts of oxide of antimony; blue, 5 parts of oxide of

cobalt; green, 5 parts of oxide of copper; violet, 4 parts of oxide of manganese, with white enamel in each case to make 100 parts. Oxide of chromium may be used for green, and gold for rose and purple-red. Carnation-pink, a chromium compound of tin, is prepared by calcining 100 parts of oxide of tin, 34 of chalk, 4 of bichromate of potash, 5 of silica, and 1 of alumina, and washing with hydrochloric acid. Lustres, etc., are obtained as already described. Analyses of these wares from Muspratt:

Description of earthenware.	Silica.	Alumina.	Lime.	Magnesia.	Oxide of iron.	Carbonic acid and loss.
Italian from Lucca della Robbia	49.65	15.50	22.40	0.17	3.70	8.58
Majolica	48.00	17.50	20.12	1.17	3.75	9.46
Old Spanish	46.04	18.45	17.64	0.87	3.04	13.96
Manasses, near Valencia.	54.71	18.80	19.69	trace.	2.20	4.60
Delft	49.07	16.19	18.01	0.82	2.82	13.09
Persian	48.54	12.05	19.25	0.30	3.14	16.72
From Rouen	47.96	15.02	20.24	0.44	4.07	12.27
From Nevers	56.49	19.22	14.96	0.71	2.12	6.50
From Paris	61.50	12.99	16.24	0.15	3.01	6.10

Common Earthenware, or Pottery, is earthy, very porous, soft, colored, and easy of fusion. It is made of common plastic clays, with, when necessary, an addition of sand or refuse fire-brick or anthracite coal-ashes. The glaze is generally obtained by applying red lead or galena to the green ware and firing only once. The ware is formed on the wheel. To make the glaze, opaque oxide of tin is often added, and other metallic oxides for colors. As articles of food kept in such vessels are liable to become poisonous by dissolving the lead, a glaze free from lead may be prepared from 100 parts of borax, 50 of feldspar, and 50 of loam. *Terra-cotta* is a variety of earthenware. *Bricks* and *tiles* are prepared from common clays. *Fire-brick, stove-linings,* and *crucibles* are made from very refractory clays, free from iron, etc. Fragments of burned bricks are always added. (See article BRICKS, by GEN. Q. A. GILLMORE.)

Statistics.—Pottery is manufactured in all countries. Hard porcelain is made at the imperial factory at Berlin, the royal works at Meissen, Nymphenberg, Sèvres, and largely at private establishments in Germany, and especially at Limoges in France. In the U. S. its manufacture has been successfully introduced by T. C. Smith & Son at the Union Porcelain Works at Green Point, Long Island. Tender porcelain is largely manufactured in England. Granite ware, Wedgwood, Parian, and other varieties of fine stoneware and of fine earthenware, faïence, and majolica are most extensively made in England. The "Potteries" in Staffordshire many years ago employed 100,000 operatives, using 250 kilns. Trenton, N. J., and East Liverpool, O., are the seats of the largest industries in the U. S. These wares are also largely manufactured in Cambridge, Mass., New York, Jersey City, N. J., Philadelphia, Baltimore, Cincinnati, O., St. Louis, and other cities.

Literature.—See POTTERY; Brongniart, *Traité des Arts céramiques* (Paris, 1844); Arnoux, *Lectures on the Results of the Great Exhib.* (Lond., 1852); Marryat, *Pottery and Porcelain* (Lond., 1857); Birch, *Ancient Pottery* (Lond., 1858); W. Chaffers, *Marks and Monograms on Pottery* (Lond., 1863); R. W. Binns, *A Century of Pottery in the City of Worcester* (Lond., 1865); *Descript. Cat. of Majolica in S. Kensington Museum;* Treadwell, *Manual of Pottery and Porcelain* (N. Y., 1872); Jacquemart, *Hist. of the Ceramic Art* (Lond., 1873); Eliza Meteyard, *Wedgwood and his Works* (Lond., 1873); Champion, *Two Centuries of Ceramic Art in Bristol* (Lond., 1873); Beckwith, *On Pottery* (N. Y.); W. P. Blake, *Ceramic Art at the Vienna Exhib.* (U. S. Com., N. Y., 1875); Audsley and Bornes, *Keramic Art of Japan* (Lond., 1875); F. Knapp, *Technology* (vol. ii., Lond., 1848); ib., *Lehrbuch der chem. Technologie* (Braunschweig, 1874); Muspratt's *Chem.* (especially last Ger. ed.); B. Kerl, *Abriss der Thonwaaren-industrie;* R. V. Wagner, *Technologie* and *Jahresb. d. chem. Tech.* C. F. CHANDLER.

Pot'tinger (HENRY), BART., b. in county Down, Ireland, in 1789; went in 1804 as a cadet to India, where he rose through all the grades of the service; was political resident in Cutch and Scinde 1824–39; was made a baronet Dec., 1839; went to China as ambassador and superintendent of British trade 1841; co-operated with Admiral Parker in effecting the capture of Amoy and other places; concluded the treaty of peace of Aug. 29, 1842, which opened five Chinese ports to the commerce of all nations; was appointed governor of Hong-Kong Apr., 1843; became privy councillor on his return to England May, 1844; was governor of Cape Colony 1846–47, and governor and commander-in-chief of Madras presidency 1847–54. D. at Valetta, Malta, Mar. 18, 1854. Author of *Travels in Beloochistan and Sinde* (1816).

Pot'to, a name applied to the KINKAJOU (which see).

Potts (GEORGE), D. D., b. at Philadelphia, Pa., Mar. 15, 1802; graduated at the University of Pennsylvania 1819,

and was for more than two years a member of the class which graduated at Princeton Seminary 1822; was pastor of a church at Natchez, Miss., 1823–35, of the Duane street church, New York, 1836–44, and of the University Place church from 1844 to his death, Sept. 15, 1864. Author of a number of published sermons, addresses, and pamphlets, and had a controversy with Dr. (afterward Bishop) Wainwright (1844) of the Protestant Episcopal Church on the necessity of episcopal ordination.

Potts (STACY GARDNER), b. at Harrisburg, Pa., in 1800; edited the *Emporium* newspaper 1821; was admitted to the bar 1827; member of the legislature 1828–29; clerk of the New Jersey court of chancery 1831–41; judge of the supreme court 1852–59; one of the commissioners to revise the laws of New Jersey 1845; wrote frequently for periodicals; published *Village Tales* (1827), *Precedents and Notes of Practice in the New Jersey Court of Chancery* (1841). D. at Trenton, N. J., Apr. 9, 1865.

Potts'grove, tp., Montgomery co., Pa., includes the borough of Pottstown. P. 2895.

Potts'town, p.-b., Pottsgrove tp., Montgomery co., Pa., on Philadelphia and Reading R. R., 35 miles from Philadelphia, has 2 seminaries, good public-schools, 12 churches, 1 daily and 2 weekly newspapers, the works of the Pottstown Iron Co., the repair-shops and offices of the Pennsylvania and Reading R. R., a rolling-mill, and an anthracite furnace. It is located in a rich agricultural and mineral section. P. 4125.

DAVIS & BINDER, EDS. "POTTSTOWN DAILY LEDGER."

Potts'ville, city, cap. of Schuylkill co., Pa., situated on the N. bank of the Schuylkill River, 93 miles by rail from Philadelphia, at the terminus of the Philadelphia and Reading R. R., owes its importance to the anthracite coal-trade, being the emporium of the Schuylkill coal-region. Iron ore abounds, and two shafts are now being sunk to the depth of 1500 feet in order to reach the underlying coal-vein. It has 3 furnaces, 2 rolling-mills, several boiler, engine, and machine shops, stove and hollow-ware foundries, a spike-mill, 2 planing-mills, a pottery, a boat and stave factory, and other minor manufacturing interests. Pottsville contains 18 churches, 10 banks, an opera-house, a benevolent home for children, a free reading-room, 1 horse railway, 2 daily and 5 weekly newspapers. P. 12,384. H. C. SHEAFER, ED. "MINER'S JOURNAL."

Pouched Rat. See GOPHER.

Pouchet' (FÉLIX ARCHIMÈDE), M. D., b. at Rouen, France, Aug. 26, 1800; took his medical degree at Paris 1827; became professor of natural history in the museum of Rouen, and in 1838 a professor in the medical school and the upper school of science of Rouen; attained fame as an observer of the so-called spontaneous generation, upon which he published two memoirs (1857 and 1863); author of several botanical, zoological, physiological, and other works; published in 1865 a well-known popular scientific work called *L'Univers,* translated into English.

Poughkeep'sie, city and tp., on the eastern bank of Hudson River, 75 miles N. of New York and 69 miles S. of Albany, is the capital of Dutchess co., N. Y., is in lat. 41° 42′ 13″ N., lon. 73° 55′ 29″ W., and is the eastern terminus of Poughkeepsie Hartford and Boston R. R. Poughkeepsie was settled by the Dutch at the close of the seventeenth century. The first substantial building was erected not far from 1705. The legislature of New York met in Poughkeepsie in 1778 to give assent to the Articles of Confederation. Here also, on July 26, 1788, the national Constitution was ratified in State convention. The city is partly upon a hillside sloping to the river, but chiefly upon table-land, back of which is College Hill, whose summit is 500 feet above the town. It is one of the most delightful places of residence in the U. S. It is distinguished for its seminaries of learning, having 4 large boarding-schools for girls, 2 for boys, and a commercial college. Here also, 2 miles E. of the city, is the flourishing Vassar College for young ladies, founded in 1861 by Matthew Vassar. Poughkeepsie contains 20 churches, 6 national banks, 1 savings bank, a public library, orphan asylum, old ladies' home, hospital, and other charitable institutions. Outside the city limits, to the N., is the Hudson River Hospital for the Insane, occupying one of the finest sites on the river. There are many important and flourishing manufacturing interests in the city, among which are dyewoods, carpets, pins, iron, and shoes. The city has 2 gas companies, 5 weekly newspapers and 3 daily. A horse railroad connects the western and eastern extremes, running from the river to Vassar College. Among the corporate companies is the Poughkeepsie Bridge Co., having in contemplation a bridge across the Hudson as a connecting-link between New England and the coal-regions. The city has clean and finely-shaded streets, and many

beautiful residences. It has a good sewerage system, and an abundant supply of water from Hudson River, the water being forced by pumps to a large reservoir on College Hill, and thence distributed throughout the city. P. of city, 20,080; of tp., exclusive of city, 4009.

FRANCIS B. WHEELER.

Pouillet' (CLAUDE SERVAIS MATHIAS), b. at Cuzance, department of Doubs, France, Feb. 16, 1791; was educated at the normal school of Paris; became teacher of physical science to the sons of Louis Philippe, and in 1829 professor, afterward director, of the Conservatory of Art and Industry, but retired after the *coup d'état.* D. at Paris June 15, 1868. He wrote *Éléments de Physique expérimentale et de Météorologie* (2 vols., 1827) and *Notions générales de Physique et de Météorologie* (1850), besides several minor works.

Poujoulat' (JEAN JOSEPH FRANÇOIS), b. Jan. 26, 1808, at Lafare, department of Bouches-de-Rhône, France; studied at Aix and Paris; accompanied Michaud in 1830 to the Orient, and in 1839 to Italy, and participated in several of his publications; wrote *Histoire de Jerusalem* (2 vols., 1841), *Histoire de St. Augustin* (3 vols., 1844), *Le Cardinal Maury* (1855), and other works.

Poulp [Fr. *poulpe*], the generic name of the eight-footed dibranchiate cephalopods. (See CEPHALOPODA and OCTOPODA.)

Poul'son (ZACHARIAH), b. at Philadelphia, Pa., Sept. 5, 1761; edited and published the *American Daily Advertiser*, the first daily newspaper in the country, from Oct., 1800, to Dec. 28, 1839; published *Poulson's Town and Country Almanac* for many years, and was long printer to the State senate. D. at Philadelphia July 31, 1844.

Poul'tice, a soft composition of bread, flaxseed, meal, slippery-elm bark, or herbs, applied warm or at as high a temperature as the part to which it is applied will bear, in order to hasten inflammation and produce suppuration. Cold poultices or other cataplasms—for instance, of cotton-wool steeped in water—are applied to prevent inflammation or mitigate pain.

Poult'ney, p.-tp., Rutland co., Vt., 18 miles S. W. of Rutland, on Rutland and Washington division of Rutland and Saratoga R. R., has an academy and several schools, 18 churches, 1 bank, 1 newspaper, a foundry and machine-shops, hotels, wagon and carriage shops, an establishment for making cheese-factory apparatus, and slate-quarries. P. 2836. B. FRISBIE, ED. "JOURNAL."

Poult'ry [from the Fr. *poule*, "a hen"], all domesticated birds, Gallinaceæ, such as the common fowl, the Guinea fowl, the turkey, and the pigeon, and palmipeds, such as the duck and the goose, as far as they are reared for useful purposes. The rearing of poultry is generally considered as a subordinate branch of rural economy. In Northern France and in the Prussian province of Pomerania it is carried on with great energy, and yields a very handsome profit. One reason why the rearing of poultry has remained comparatively undeveloped on the farm is no doubt that poultry in large numbers may easily become not only a nuisance, but hurtful to the fields. To this objection it may be answered, however, that poultry can be reared with advantage in enclosures of comparatively small size. (See *The People's Practical Poultry-Book*, by D. T. Moore, New York, 1871.)

Pounce, the name for powdered cuttle-fish bone (so called). It is used in making moulds for delicate castings, for tooth-powder, for polishing, etc. Pounce is also powdered sandarach or rosin, used for blotting-sand, etc.

Pound. See AVOIRDUPOIS, PHARMACY, and WEIGHTS AND MEASURES.

Pound'ridge, p.-v. and tp., Westchester co., N. Y. P. 1194.

Pound Ster'ling, a denomination of English money, equal in value to 20 shillings, or 240 pence, into which a pound of silver was anciently divided, thus giving origin to the term "pound." The word "sterling" is of obscure origin, but is probably derived from *Easterling*, the popular name of the Baltic and German traders who visited London in the Middle Ages. The silver penny was first called Easterling. (See COINAGE, by E. B. ELLIOT.)

Poussin (CASPAR). See DUGHET.

Poussin' (NICOLAS), b. at Audely, in Normandy, 1594; d. 1665; studied art in Paris with Varin and Duchesne; went to Rome in 1624; attended the schools of Sacchi and Domenichino; was deeply interested in antique art and fascinated by Raphael; worked hard in obscurity and poverty; attracted the favorable regard of Cardinal Barberini, for whom he painted the *Death of Germanicus* and the *Capture of Jerusalem*; made his way to reputation and prosperity; was invited to Paris by Louis XIII.; received with distinction by Cardinal Richelieu; offered apartments at the Tuileries and the position of court-painter, with a salary of £120 a year. The jealousies of other artists made him uncomfortable; he went to Rome on the plea of bringing his wife to Paris, and never returned. Poussin was a careful and industrious painter, with great enthusiasm for his art, on which, however, he refused to set as high a market-price as his merit and popularity warranted; in consequence whereof he lived and died in moderate circumstances. Sir Joshua Reynolds warmly commended the accuracy and extent of his knowledge, and John Ruskin bestows on his landscapes an uncommon share of his usually reluctant praise. Poussin loved to paint subjects from classical mythology, landscapes with figures, buildings of stately architecture with classical accessories. He was a skilful draughtsman, a sober colorist, learned, but poetic and imaginative; he combined a devoted love of his art with literary habits and fondness for the society of cultivated men. Between 300 and 400 of his works are named in catalogues; the National Gallery in London has eight; the Dulwich Gallery, fourteen; the European galleries contain enough to make his style familiar to all who are interested in studying his work. Many of his finest pictures have been engraved. O. B. FROTHINGHAM.

Povo'a de Varzim', town of Portugal, province of Entre Minho-e-Duro, on the Atlantic, has a good harbor and valuable fisheries. Pop. 6200.

Powder. See GUNPOWDER, by COL. J. G. BENTON.

Pow'ell, county of Central Kentucky. Area, 200 sq. m. It is intersected by Red River, an affluent of the Kentucky. It is uneven and fertile. Corn is a leading product. Cap. Stanton. P. 2599.

Powell, tp., Craighead co., Ark. P. 1098.

Powell, tp., Scott co., Va. P. 2261.

Powell (BADEN), F. R. S., b. at Stamford Hill, near London, Aug. 22, 1796; graduated at Oriel College, Oxford, 1817; took orders in the Church of England, and was Savilian professor of geometry at Oxford from 1827 till his death, at London June 11, 1860. Author of many contributions to scientific periodicals, of several mathematical treatises, and published *An Historical View of the Physical and Mathematical Sciences* (1834), *The Connection of Natural and Divine Truth* (1838), *A View of the Undulatory Theory of Light* (1842), *Essays on the Spirit of Inductive Philosophy, the Unity of Worlds, and the Philosophy of Creation* (1855), *Christianity without Judaism* (1857), *The Order of Nature considered in Reference to the Claims of Revelation* (1859), and an essay *On the Study of the Evidences of Christianity*, in the celebrated volume entitled *Essays and Reviews* (1860).

Powell (CHARLES STUART), b. in England in 1749; was for some years an actor at the Covent Garden Theatre, London; was manager of the Haymarket; appeared on the stage at Boston, Mass., Aug. 13, 1792, being the first occasion that dramatic performances were represented in that city; opened the new Boston Theatre as manager Feb., 1794, with a prologue written by Robert Treat Paine, who was intimately connected with the undertaking; remained in Boston until 1796; was for some years manager of a theatre at Halifax, N. S. D. there Apr. 26, 1811.

Powell (JOHN HARE), b. at Philadelphia, Pa., in Apr., 1786; educated at Philadelphia College; was secretary of legation in London under William Pinkney, returning Dec., 1811; became brigade-major to Gen. T. Cadwallader Sept., 1814, and inspector-general Dec., 1814; was a successful merchant and a scientific agriculturist; one of the founders of the Pennsylvania Agricultural Society 1823; was instrumental in improving the breeds of horned cattle and sheep in the U. S.; was a good speaker and debater; wrote much for the agricultural journals, and author of *Memoirs of the Pennsylvania Agricultural Society* and of *Hints for American Farmers.* D. at Philadelphia June 14, 1856.

Powell (JOHN WESLEY), b. at Mount Morris, N. Y., Mar. 24, 1834; removed in childhood to Wisconsin, where he received a common-school education and became a teacher; spent two years at Oberlin College 1854–56; devoted himself to natural history; travelled extensively in the Western States collecting specimens; was a volunteer in the war for the Union; lost his right arm at Shiloh; rose to be major; became professor of geology in the Wesleyan University, Bloomington, Ill., 1865; undertook in 1867, under authority of Congress, a scientific exploration of Colorado Territory, upon which he has been engaged for several years with great success, consisting chiefly of a topographical survey of the valley of Colorado River, where interesting discoveries have been made by Maj. Powell's parties in geology, palæontology, archæology, and ethnology. The work is still (1876) in progress as the second division of the geographical and geological survey of the Territories.

Powell (LAZARUS W.), b. in Henderson co., Ky., Oct. 6, 1812; graduated at St. Joseph's College, Bardstown, Ky., 1833, and at the Transylvania Law School 1835; became a successful lawyer and agriculturist; governor of Kentucky 1851–55; U. S. Senator 1859–65. D. at Henderson, Ky., July 3, 1867.

Powell (SNELLING), brother of Charles S., b. at Caermarthen, Wales, in 1758; made his début as an actor at the opening of the Boston Theatre Feb. 2, 1794, and was subsequently a successful manager of that theatre. D. at Boston Apr. 8, 1821.

Powell (WILLIAM BYRD), M. D., b. in Bourbon co., Ky., Jan. 8, 1799; graduated at the Transylvania University 1820, at its medical school 1823; gave special attention to the physiology of the brain and of the temperaments, prosecuting this study among the Indian tribes, and professing to read the temperament from an examination of the cranium alone; became professor of chemistry in the Medical College of Louisiana 1835; organized the Memphis Medical Institute 1849, taking the chair of cerebral physiology; removed to Covington, Ky., 1851; was professor in the Eclectic Medical Institute at Cincinnati 1856–59; wrote largely for medical, scientific, and literary journals; published treatises on eclectic medical practice, and a work entitled *Natural History of the Human Temperaments* (1856), in which he laid down a method for the infallible measurement of the vital force. D. at Covington May 13, 1866.

Powells, tp., Etowah co., Ala. P. 122.

Powell's Ford, v., Johnston tp., Shenandoah co., Va. P. 704.

Pow'er [O. Fr. *pouvoir*]. The power of a quantity is the result obtained by taking that quantity a certain number of times as a factor. We may regard the number 1 as the basis of the powers of all quantities; and inasmuch as we have not yet introduced any other factor, we may consider it as the 0 power. Now, let us take a to represent any quantity, and let 1 be multiplied by it; the result may be written a^1; and because a is taken once as a factor, this result may be called the *first power*. If this power is multiplied by a, the result may be written a^2; and because a has been taken twice as a factor, this result is called the *second* power; and so on. After n successive multiplications by a, we reach a result which may be written a^n, and which is called the nth power of a. If we commence with 1, which is the 0 power of a, we have the series

$$1,\ a^1,\ a^2,\ a^3,\ \ldots\ a^n,$$

n being any positive whole number. This series is called the series of *ascending* powers. If we now commence with a^n, and divide successively by a, we have a series of descending powers, and when we reach the term 1, if we go on with the division, we shall have, in continuation, the series

$$\frac{1}{a},\ \frac{1}{a^2},\ \frac{1}{a^3},\ \ldots\ \frac{1}{a^n}.$$

From analogy, the terms of this new series may be written

$$a^{-1},\ a^{-2},\ a^{-3}\ \ldots\ a^{-n},$$

from which we see that the entire series may be placed under the form

$$a^{-n},\ \ldots\ a^{-2},\ a^{-1},\ a^0,\ a^1,\ a^2\ \ldots\ a^n,$$

a series such that any term may be derived from the preceding one by multiplying by the root a, or from the succeeding one by dividing by the root a. This series illustrates the relation between positive and negative powers. In each term the number written over the root a is an *exponent;* when the exponent is positive, it indicates that the term may be derived from 1 by continued multiplication; and when the exponent is negative, it shows that the corresponding term may be derived from 1 by continued division; these views illustrate the intimate relation that exists between the operations of algebraic multiplication and algebraic division.

In what precedes, the exponent is regarded as a whole number, but by an extension of the definition of the term *power* we are led to call any expression of the form a^n a power, whether n is entire or fractional, positive or negative, real or imaginary. This extension of the definition does not in any way affect the rules for operating on powers, but it necessitates a suitable interpretation of the results. These rules of interpretation are indicated in the following table of analytical equivalents, in which m and n are supposed to be positive whole numbers:

$$a^{-\frac{m}{n}} = \sqrt[n]{a^m} = \left(\sqrt[n]{a}\right)^m;$$

$$a^{-n} = \frac{1}{a^n} = \left(\frac{1}{a}\right)^{\frac{1}{n}};$$

$$a^{-\frac{m}{n}} = \frac{1}{\sqrt[n]{a^m}} = \frac{1}{a^{\frac{m}{n}}}.$$

It is to be remarked that a may be any quantity whatever, either numerical or algebraic, positive or negative, monomial or polynomial.

The following are some of the properties of powers that are of practical use in algebraic and arithmetical operations; the powers alluded to are supposed to be integral—that is, their exponents are positive whole numbers: (1) The difference of any like powers of two numbers is divisible by the difference of the numbers. (2) The difference of like even powers of two numbers is divisible both by the sum, and also by the difference of the two numbers. (3) The sum of like odd powers of two numbers is divisible by the sum of the numbers. (4) The expression $x^m + x^n$ is divisible by $x + 1$ when $m - n$ is an odd number. (5) The expression $x^m - x^n$ is divisible by $x - 1$, and also by $x + 1$ when $m - n$ is an even number. (6) Neither the sum nor the difference of any two like powers of a degree superior to the second is a perfect power of the same degree. (7) If m is a prime number, and x a number not divisible by m, the expression $x^{m-1} - 1$ is exactly divisible by m.

The last principle gives rise to the following conclusions:

All second powers are of the form $5n$, or $5n \pm 1$;
All third powers are of the form $7n$, or $7n \pm 1$;
All fourth powers are of the form $5n$, or $5n \pm 1$;
All fifth powers are of the form $11n$, or $11n \pm 1$;
All sixth powers are of the form $13n$, or $13n \pm 1$;

and generally, when m is prime, all mth powers are of the form $(m+1)n$; when $2m + 1$ is prime, all mth powers are of the form $(m+1)n + 1$. W. G. PECK.

Power (TYRONE), b. in Waterford co., Ireland, Nov. 2, 1797; removed to Wales in early life; made his début on the stage at the Cardiff theatre; played in the principal cities of England, including London; excelled in the delineation of Irish characters; made successful tours in the U. S. 1833–35 and 1840–41, and embarked for Europe Mar. 11, 1841, in the steamship President, which was never heard of afterward. Author of two novels and a work of travels in America.

Power (WILLIAM), M. D., b. 1814; graduated at Yale College, Conn., in 1834; was resident student of the Baltimore almshouse; took his medical degree in the University of Maryland, and went to Europe to continue his professional studies; in 1845 he was made professor of the theory and practice of medicine in his alma mater. D. Aug. 15, 1852.

Power-Loom. See LOOM, by W. E. A. AXON.

Pow'er of Attor'ney (law), a written instrument by the terms of which the person executing it constitutes another his agent or attorney, and authorizes such agent to perform the act or acts therein named in his name and on his behalf. In regard to the nature and extent of the agency created, powers of attorney are either general or special. They are general when the agent is empowered to represent the principal generally in some designated business or transaction, and to do all acts whatsoever in connection therewith—as, for example, a power given by a merchant to a clerk authorizing him to make and endorse all the notes or checks in the principal's business. They are special where the agent is restricted to the performance of some particular act or acts specifically mentioned and described in the instrument itself—as, for example, a power given by a merchant to his clerk authorizing the latter to sign some particular note or notes or to draw some check or checks specified and identified. They may in general be either sealed or unsealed, but by virtue of the technical rules of the common law in respect to the peculiar efficacy of a seal, an agent cannot be delegated to execute a conveyance of land or other writing required by law to be under seal, unless his power of attorney conferring the authority is also sealed. This ancient dogma, which attributed such efficiency to the seal, has, however, been abandoned in many of the States. With reference to the duration of the authority, powers of attorney are either revocable or irrevocable. They are irrevocable when the authority conferred is also coupled with an interest; that is, when the attorney is at the same time clothed with a personal and legal interest in the act or in the results of the act to be done by him. For example, if a debtor should give to his creditor a power of attorney to collect certain moneys owing to the principal, and to apply the proceeds when received toward the payment of the existing debt between the parties, the instrument being thus designed as a security, it would operate as an equitable assignment of the demand to the attorney, would confer an interest upon him, and would be irrevocable. In all other cases they are revocable. Powers of attorney are always to be strictly construed, so that the extent of the authority granted shall not be enlarged by implication. Thus, it is a settled doctrine that general expressions are

confined in their effect and operation to the particular subject-matter in connection with which they are found.

JOHN NORTON POMEROY.

Powers, in law. In its most important technical signification this term denotes the peculiar species of authority conferred upon a person by a will or a deed, which enables him to create and bestow some estate in lands greater than, or in addition to, the interest in the same lands held by himself. If an individual owns land in fee, he can by virtue of such ownership create and transmit any interest therein known to the law, and his authority to do so would not be a "power." And if he owns a life estate, he can by virtue thereof create and transmit any lesser interest; for example, he can execute a valid lease of the land which will endure as long as his own life—that is, until his own estate terminates. If, however, the holder of a life estate was authorized to give leases of the land which would endure after his death—that is, after his own estate had ended—or was authorized to transfer the land on his death to such persons as he might choose, he would plainly be able to create and bestow interests greater than, or in addition to, the interest which he holds; and this authority is termed a power. Powers as thus described form a part of the highly-artificial system of English real property law, which grew up in the interests of landed proprietors, and with the design of perpetuating family greatness. They are chiefly used in family settlements, and by their means the original proprietor, when framing his will or deed, can anticipate and guard against many contingencies, can provide for new and different dispositions on the happening of such events, and can thus retain, as it were, an active control over his property even after his own death. These doctrines have been incorporated into the jurisprudence of the American States, yet, from the great difference in our social customs, they are of comparatively little importance in this country. Resort is seldom had, except occasionally in some of the older communities and more artificial societies, to these means of regulating the succession to family estates. No department of the law is more intricate or presents greater difficulties to the student than that which relates to the doctrine of powers; it is full of exceedingly refined and subtle distinctions, and its rules present a most striking illustration of the artificial processes of logic in which the older lawyers and judges so much delighted. The limits of a single article will permit a very general outline only of the subject and a brief explanation of its most prominent features.

Powers may be created and conferred either by a will or a deed. The original proprietor who executes the will or deed, and thereby creates and confers the power, is termed the "donor," while the one upon whom it is bestowed is called the "donee." After having provided for such present or future estates in the land as he thinks proper, the grantor may reserve a power to himself to alter these dispositions, to revoke certain gifts, to substitute others in their stead, or to transfer them to other beneficiaries; or he may empower one or more of the persons to whom he has given estates to make dispositions out of or in addition to their interests; or, finally, he may authorize persons upon whom he has conferred no interests in the land to do acts in reference to the estates given to others—as, for example, to sell and convey them or to alter or revoke them. Powers are divided into several classes, the first and most important being collateral and those coupled with an interest. A power is collateral when held by a donee to whom no estate or interest in the land itself has been given. For example, where a testator has devised his lands in fee to specified individuals, but in the same will has authorized the executors under certain circumstances to sell and convey the same lands by deed, no estate is vested in the executors, and yet they may divest the interest of the devisees and transfer a perfect title to the property. This species of power is often used in order to raise money for the payment of debts and legacies. Powers coupled with an interest are those given to a donee upon whom some estate in the same lands is also conferred. They are subdivided into *appendant* and *in gross*. An appendant power is one which the donee must exercise out of the estate conveyed to himself. If land is given to A for his own life, with power to grant leases thereof for any number of years—say twenty-one—so that the leases would endure for their whole term although A might die before their expiration, such power would be appendant. A power in gross is one that enables the donee to create estates which do not take effect out of his own, but are in addition to it, not coming into enjoyment until it is ended. Thus, if land is conveyed to A for his life, but he is authorized to transmit it by will or by a deed taking effect at his death, the power is in gross, for the estate which he confers is not cut out of his own. Another classification is into those *of appointment* and those *of revocation*. A power is one of appointment when the donee is enabled to create and bestow new and different estates from those originally given in the deed or will; it is one of revocation when the donee is enabled to divest, abridge, or revoke estates already given. Either of the species may be collateral, appendant, or in gross. A power of appointment is said to be general when the estate may be conferred upon whomsoever the donee pleases; it is special when he is restricted to a specified class of persons. In general, the donee is not obliged to execute a power, but if it is held by him in trust for certain beneficiaries, they may compel a performance. A court of equity will sometimes interfere and perfect an incomplete performance. JOHN NORTON POMEROY.

Powers (HIRAM), b. in Woodstock, Vt., July 29, 1805. The first twelve years of the life of this remarkable man were passed in his native village, where he had abundant opportunity to cultivate his love of nature, but no stimulus whatever for his artistic genius. Occasions, however, were not wanting for the exercise of those mechanical gifts which almost always form a part of the peculiar endowment of the artist, and the skill of the youthful Powers in inventing ingenious toys, building dams and bridges, casting miniature cannon, etc. secured him an immense following of truant boys, while his wonderful talent of narrating with the most picturesque vividness not only strange adventures originated by his own imagination, but the simplest incidents of the daily walk to and from school, made him no less acceptable to his more quiet companions. In 1817 his parents, having lost a considerable part of their very moderate competence, removed with their large family to Cincinnati. Here the future artist remained till 1835, availing himself, in the mean time, of any honest employment that came in his way, and always giving more than satisfaction to his employer, both by his fidelity and by his extraordinary resources under difficulties. While in the workshop of a clockmaker he displayed such ingenuity and skill in the construction of a hand-organ with twelve automatic figures that his services were eagerly sought for by a certain Monsieur Dorfeuille, manager of one of the city museums. Powers accepted this offer in 1829, having in the mean time received from a Prussian acquaintance some valuable hints about modelling, and especially as to the method of taking casts from models. He had been already two years in the employment of Dorfeuille, preparing ever-fresh surprises for the manager and his public by new mechanical contrivances, new groups of wax figures, etc., when he beheld *for the first time in his life* a bust in marble. It was a portrait of Washington by Canova, on exhibition, and after gazing at it a long time, silent and motionless, Powers said, quietly and emphatically, as if to himself, "*That is what I shall do.*" But it was not till 1835 that he was able, through the encouragement and aid of his friend Mr. Longworth, to go to Washington, where he began his new career by constructing a revolving *jet d'eau* for the Capitol grounds, and by modelling the heads of several distinguished men—J. Q. Adams, Jackson, Van Buren, Webster, Calhoun, Preston, etc. The personal appearance of Powers was at this time very striking. He was tall and thin, his movements rather angular than graceful, and his manner and address showed an entire unfamiliarity with social conventionalities. But the uncommon beauty of his manly features was lighted up by large, dark, lustrous eyes, whose expression was at once frank, intelligent, and thoughtful, and his whole bearing indicated that respect for himself and for others which is the root of all true dignity and true courtesy. The contact with high artificial refinement into which he was afterward necessarily brought by a long life of artistic success, though it effaced everything like rusticity, never obscured this charming simplicity of manner, habits, and character—a simplicity which the high and truthful instincts of his nature never suffered to degenerate for a moment into vulgar affectation. At one period of his life a strong personal resemblance was noticeable between him and the English sculptor Gibson, but to those who saw him in his advanced years, when his noble features, marked by thought rather than by age, were softened by his long silver hair and beard—which seemed, on the contrary, to heighten the keen flash of his undimmed eyes—he was like no one else.

After spending two winters in Washington, Powers, with the assistance of Col. Preston and Mr. Longworth, removed with his family (he had married Miss Gibson of Cincinnati in 1833) to Florence, Italy, where he could have greater facilities for executing his works in marble, as well as for study. Here he settled in 1837, Greenough having preceded him and giving him a truly brotherly welcome. His busts soon acquired a worldwide reputation for fidelity to nature and the highest possible finish, and the insufficiency of his pecuniary resources obliged him to confine himself

to this branch of his art to the extent of his orders. But he devoted every spare moment to ideal work, and the *Greek Slave*—finished in 1843, and now in the possession of A. T. Stewart—secured for its author a position among modern sculptors which later criticism has in vain assailed. Many repetitions of this exquisite statue have been made, most of them for England. The lovely, graceful head of *Proserpine*, the *Fisher Boy*, and other large and small ideal works followed as the artist could spare the time from his more productive portrait-busts. In estimating the genius of this artist it should not be forgotten that the necessity of providing for a large family was always more or less imperative upon him, and was, in a greater or less degree, a constant restraint upon the free exercise and development of his highest gifts. It is true that Powers belonged both in theory and in practice to the so-called *naturalistic* or *realistic* school, but they who think this a defect should remember that the boyhood and youth of the artist were spent where Nature was his only teacher, and consequently he gave his whole soul to her lessons. Not only did he then never see a real work of art, but all that may be learned from books was almost equally out of his reach. When at last he found himself surrounded by the works of the great masters, his theories were already matured, and the circumstances alluded to above strongly tended to confine him to their practice. For all those who knew Powers intimately it would be as difficult to conceive that the character of his works was determined by the limitations of his native genius as to believe that the elegant repose which so distinguished his ideal creations, and which he held to be an essential quality in all high sculpture, was the result of a natural passivity of temperament. Powers returned no more to his native country—a circumstance which explains the fact that he never received an order for any national work—but he remained a thorough American to the last, and those who remember him during the years of our civil war will never forget the patriotic zeal which burned in him like a consuming flame, and which, upon provocation, broke forth so scathingly. In the winter of 1873 the already declining health of this eminent artist became so impaired that he was obliged to discontinue work; as the spring advanced he was more and more weakened by a distressing cough, his voice was reduced to a whisper, and on the 27th of June the sudden rupture of a blood-vessel closed his earthly life. Besides the above-named works, Powers executed a large number of portrait and ideal busts of great merit, as well as many statues; among the latter, those of Washington, *America*, *Eve Disconsolate*, *The Last of the Tribes*, etc. C. C. MARSH.

Powers, Mechanical. See MECHANICAL POWERS, by PROF. WILLIAM P. TROWBRIDGE, A. M., M. N. A. S.

Pow'eshiek, county of Central Iowa. Area, 576 sq. m. It is level and fertile. Products, live-stock, grain, and wool. Is traversed by Iowa Central and Chicago Rock Island and Pacific R. Rs. Cap. Montezuma. P. 15,581.

Poweshiek, tp., Jasper co., Ia., on S. Skunk River and on Chicago Rock Island and Pacific R. R. P. 1239.

Powhatan', county of Central Virginia. Area, 280 sq. m. It is bounded N. and S. by the Appomattox. Its soil is naturally very productive. Tobacco and grain are leading products. Cap. Powhatan Court-house. P. 7667.

Powhatan, p.-v., cap. of Lawrence co., Ark., 35 miles N. E. of Jacksonport.

Powhatan, tp., Pocahontas co., Ia. P. 180.

Powhatan, tp., James City co., Va. P. 1117.

Powhatan, the principal chief of several confederate clans or tribes of Eastern Virginia at the time of the settlement of Jamestown in 1607, usually called "emperor" by the early writers, though the number of his subjects was estimated at only 8000, was hostile to the English, with whom he repeatedly came into collision. Having taken Capt. John Smith prisoner, he was about to put him to death when his daughter, Pocahontas, interfered and saved the life of the captain. Powhatan's principal residence was at Werowocomoco on York River, within the present limits of Gloucester co., where he maintained considerable pomp, being always attended by a body-guard of four warriors. D. in Apr., 1618.

Powhatan Court-house, p.-v. in the v. of Scottsville, cap. of Powhatan co., Va., 30 miles W. of Richmond.

Powhatan Point, p.-v., Belmont co., O., on Ohio River. P. 201.

Pownal, p.-v. and tp., Cumberland co., Me. P. 981.

Pownal, p.-v. and tp., Bennington co., Vt., on Hoosick River and Troy and Boston R. R. P. 1705.

Pow'nall (THOMAS), LL.D., b. at Lincoln, England, in 1722; graduated at Cambridge 1743; became secretary to the commissioners for trade and plantations 1745; was employed in the commissariat department during the war in Germany; came to New Jersey as secretary of the province 1753; became lieutenant-governor 1755; was a member of the colonial congress which met at Albany in 1754 to devise measures of defence against the French; was governor of Massachusetts 1757–60, of South Carolina 1760–61, after which he became director-general of the office of control; sat in Parliament, where he opposed in many well-considered speeches the rash policy of the Crown toward the American colonies, and published *The Administration of the Colonies* (1766), *A Topographical Description of the Middle British Colonies* (1775), and other works on archæology and politics. D. at Bath, England, Feb. 25, 1805.

Powy, tp., San Diego co., Cal. P. 91.

Poydras' (JULIEN), b. probably in Louisiana in the latter half of the eighteenth century; accumulated a large fortune; was the first delegate in Congress from the Territory of Orleans (the present State of Louisiana) 1809–12; gave $100,000 to found a female orphan asylum and $20,000 for a college at Point Coupée. D. at Point Coupée June 25, 1824.

Poygan, p.-v. and tp., Winnebago co., Wis. P. 843.

Poyner, tp., Black Hawk co., Ia., on Cedar River. P. 1063.

Poynette', p.-v., Dekorra tp., Columbia co., Wis., on Madison and Portage R. R. P. 300.

Poy Sip'pi, p.-v. and tp., Waushara co., Wis. P. 612.

Pozoblanc'o, town of Spain, province of Cordova, in the Sierra Morena, has 8007 inhabitants.

Poz'zo di Bor'go (CARLO ANDREA), b. at Alata, in Corsica, Mar. 8, 1768; studied law at the University of Pisa, and settled as an advocate at Ajaccio, where he lived in great intimacy with Joseph and Napoleon Bonaparte. This friendship soon cooled, however, and the relation between the former friends assumed a very bitter character when Pozzo di Borgo espoused the cause of Paoli, who showed great confidence in him. In 1791 he represented Ajaccio in the National Assembly, and sided with the Girondists, but returned to Corsica in 1792; held a high position in the government of the island during its occupation by the English, and fled, after their expulsion, to London. Here he became the agent of the French *émigrés*, and began his flying missions from one court to another to form plots and coalitions against France. In 1803 he entered the Russian diplomatic service, and the interest which Alexander I. took in him gave him a rich opportunity of gratifying his truly Corsican hatred against the Bonapartes. The intimacy which sprang up between Napoleon and Alexander after the Peace of Tilsit brought him for a moment into great danger; Napoleon demanded his extradition, and he fled first to Austria, then to England. But he was soon able to resume his work, and he did it with increased energy and increased success. It was he who brought about the rupture between Alexander and Napoleon at the close of 1810, and it was he who seduced Murat and Bernadotte. Again, it was he who persuaded Alexander to continue the war in 1813, and it was he who determined the allies to reject Napoleon's offers of peace. He wrote the famous proclamation which preceded the entrance of the allies into France—that they waged war against Napoleon, not against the French people—and he had at last the triumph of signing the Treaty of Paris in 1815 as Russian ambassador. After the fall of Napoleon he remained in the Russian service, and enjoyed great esteem from the Russian court, though perhaps not always full confidence. In 1826 the emperor Nicholas made him a count and employed him as ambassador in Paris and London, where he was the oracle of the doctrinaires and detested by the radicals. D. at Paris Feb. 15, 1842.

Pozzuolana. See CEMENTS, by GEN. Q. A. GILLMORE, U. S. army.

Pozzuo'li [Gr. *Dicæarchia;* Lat. *Puteoli*], town of Southern Italy, province of Naples, on the seashore about 6 miles W. of the city of Naples. This town, which, when St. Paul landed here after his perilous voyage, was one of the great seaports of the world, is now reduced to comparative insignificance. The streets are narrow, irregular, ill paved, and many of them very steep. The public buildings are of little interest, except when, as in the case of the cathedral, they are transformed pagan temples. The large and safe harbor, which once swarmed with foreign ships from Egypt, from Phœnicia, and indeed from all the commercial world, is now so filled up as to be frequented only by small fishing-craft. Of the long line of porticoes, resting on piles driven beneath the water to protect the port on the S., and which served alike as a promenade

and an exchange, nothing whatever remains. Ten crumbling arches of the ancient mole may still be seen, as well as other ruins of more or less importance. The neighborhood of Pozzuoli, however, abounds in interest both for the antiquarian and the geologist. The famous temple of Serapis (which has supplied the museum of Naples with some of its choicest treasures, and given occasion for most curious observations upon the secular changes in the coast-level), the temples of Neptune, etc., the theatre, the amphitheatre, the Grotto of the Sibyl, the Solfatara, Lakes Lucrinus and Avernus—all are within a short walk of Pozzuoli. Indeed, it may be said that no corner of the earth offers a wider field for united artistic, historical, and scientific study than does this beautiful region, which, blooming as it were over volcanic fires, has witnessed such marvellous vicissitudes. The population, occupied chiefly with agriculture, fishing, soap-making, etc., is about 16,000.

Pradier′ (JEAN JACQUES), b. at Geneva May 23, 1792; studied sculpture at Paris under Lemot 1809–12, and at Rome 1812–16; lived afterward in Paris, and d. there June 4, 1852. The most celebrated of his works are *Philoctetes and Ulysses*, *Psyche*, *The Graces*, *Venus and Cupid*, *The Bacchante*, and *Phryne*.

Pradt, de (DOMINIQUE DUFOUR), generally known under the name of ABBÉ DE PRADT, b. at Allanche, department of Cantal, France, Apr. 23, 1759; was vicar-general to the archbishop of Rouen and member of the Constituent Assembly in 1789; fled in 1791 to Hamburg, and wrote violent pamphlets against the Revolution; returned to Paris in 1801; was appointed grand almoner to the emperor and archbishop of Mechlin as a reward for the willingness and talent with which he carried on the least honorable negotiations of the imperial polity; hastened in 1814 to join the Bourbons, and produced a matchless scandal by his denunciations of the fallen emperor, *Histoire de l'Ambassade dans le Grand-Duché de Varsovie en 1812*, but was nevertheless not very successful; renounced his see, in which he had not been confirmed by the pope, for an annuity; retired to his estates in Auvergne; wrote commentaries and memoirs on every event which attracted general attention; lastly, *Un Chapitre sur la Légitimité* (1830), but did not succeed in making another sensation. D. in obscurity Mar. 18, 1844.

Praed (WINTHROP MACKWORTH), b. in London in 1802; educated at Eton, where he was distinguished for the brilliancy of his classical scholarship, as well as by his literary talent; was the associate of John Moultrie and H. N. Coleridge in editing the *Etonian;* graduated at Trinity College, Cambridge, 1825; contributed to Knight's *Quarterly Magazine;* was called to the bar 1829; sat in Parliament as a Conservative for St. Germain, and subsequently for Great Yarmouth and Aylesbury; became secretary of the board of control 1834, and afterward recorder of Barnstaple and deputy high steward for the University of Cambridge; was noted for his opposition to the Reform bill, and wrote for the annuals, magazines, and other periodicals many scholarly essays and graceful "verses of society." D. July 15, 1839. His *Poems* were edited in New York by R. W. Griswold (1844), and with a *Memoir* by W. H. Whitmore (2 vols., 1859), and a complete edition, with a memoir by Rev. Derwent Coleridge, was issued by his sister, Lady Young (2 vols., 1864).

Præneste. See PALESTRINA.

Præ′tor [Lat.], in ancient Rome, the title of several high officials. The prætor (called after 246 B. C. *prætor urbanus*) was the third officer in rank in the state, inferior to the consuls only. He was first chosen in 366 B. C. No plebeian was ever a prætor until 337 B. C. The consuls themselves when at the head of armies were designated as prætors. The *prætor peregrinus* was a magistrate who had oversight of the relations between the *peregrini* and full citizens. In later times the number of prætors was very much increased, of whom some were assigned to the provinces. It was also customary to send prætors, after their regular term of service had expired, to the provinces, where they served as proprætors. The prætors were in fact judges of civil and criminal law, and their decisions greatly enriched and amplified the Roman law.

Præto′rians [Lat. *prætoriani* or *cohors prætoria*], the personal guard of the Roman emperors. During the time of the republic the general in command had a guard, a *cohors prætoria*, which consisted of picked soldiers from the legions, and which was paid better than the common soldiers. But at the end of a campaign this guard was always dissolved and its members returned to the legions. Augustus, however, transformed (in 27 B. C.) his *cohors prætoria* into a standing body of troops, consisting of ten cohorts, each numbering 1000 men (horse and foot), of which he kept three in Rome for service in the palace, while the rest were stationed in the neighborhood of the metropolis. Tiberius gathered all the cohorts to Rome for the sake of maintaining a better discipline, and built them a fortified camp in the north-eastern corner of the city, and Vitellius increased their number to sixteen cohorts. Originally, only Italians were employed in this guard, but later Macedonians and Illyrians. The term of service was sixteen years; the pay double that of the legions; the rank of a private of the guard equal to that of a centurion in the legions; and when the time of service expired each soldier received 20,000 sesterces. But besides these legal advantages the prætorians soon acquired others; indeed, they became one of the most important political bodies in the Roman empire, and played a part similar to that of the Janizaries afterward in Constantinople. In order to secure their favor every new emperor bestowed upon them new privileges and great dotations, and ere long they assumed the right of electing and deposing the emperor. At last they even sold the purple. After the death of Pertinax (in 193 A. D.) they put the crown up at auction, and Didius Julianus bought it. But in the same year Severus dissolved the whole corps and gave it another organization. Their power was not broken, however, and its frightful abuse continued until Constantine (in 312 A. D.) saw fit to dispense with them altogether.

Pragmat′ic Sanc′tion, a diplomatic term which originated with the Byzantine court, and denoted the highest and most solemn state ordinances issued by the emperor. It was early introduced into France, and has become historical as applied to four important instruments —namely, (1) that by which Charles VII. and the States General of France, assembled at Bourges in 1438, adopted those decrees of the Council of Bâle which authorized the election of bishops by cathedral chapters, and which were condemned by the pope. (See GALLICANISM.) (2) That by which the same decrees were adopted by the German Diet, assembled at Mentz in 1439. (3) That by which Charles VI., emperor of Germany, who had no male issue, settled the right of succession to his Austrian dominions on his daughter, Maria Theresa. It was accepted by the various peoples over which he ruled, consented to by the different members of his family, guarantied by all the European states, but immediately after his death (Oct. 20, 1740), the war of the Austrian Succession (see SUCCESSION WARS) broke out. (4) That by which Charles III. of Spain in 1759 settled the right of succession to the kingdom of the Two Sicilies on his third son, Ferdinand.

Prague [Bohemian, *Praha*], the capital of Bohemia, in lat. 50° 5′ N., lon. 14° 25′ E., nearly in the centre of the country, on both sides of the Moldau, presents a very picturesque and imposing aspect on account of the diversity of the surface on which it stands and its numerous towers, spires, and domes. It is surrounded with a wall 12 miles in circumference; outside the wall extend the two large suburbs, Karolinenthal and Smichow. The city proper consists of five parts—the Altstadt, Neustadt, and Josephstadt on the right bank of the Moldau, and the Hradschin and Kleinseite on the left—connected with each other by several bridges, of which the most remarkable is the Charlesbridge, built 1358–1503 of stone, 31½ feet broad, 1572 feet long, resting on sixteen arches and adorned with statues. The Altstadt, consisting of narrow, crooked streets lined with tall, queer-looking old houses, the Neustadt, of a more modern and elegant appearance, and the Josephstadt, the Jewish city, form the business part of Prague; the Hradschin and Kleinseite consist almost exclusively of palaces and public buildings. Here is the imperial castle, one of the largest and most magnificent royal residences in Europe, of an elegant architecture and overlooking from its elevated position the whole city, the plain of the Moldau, and the neighboring hills. The Hradschin Place, formed by the immense palaces of the primate, the ex-emperor Ferdinand, and Prince Schwarzenberg, extend in front of the castle. On the terrace in the rear of the castle stands the church of St. Veit, a beautiful Gothic structure built 1343–85, and containing the tomb of St. Nepomuk, the patron saint of the country, with his monument of solid silver weighing 30 cwts., and a splendid mausoleum of Carrara marble erected by Rudolph II. over the Bohemian kings. Among the most prominent buildings of the Kleinseite are the so-called Sachsenhaus, built in the thirteenth century; the gorgeous church of St. Nicolai, erected in 1628 by the Jesuits; the palaces of Waldstein with beautiful gardens, of Fürstenberg with a large library and a valuable picture-gallery, of Nostits with a collection of coins, a large library, and an art-gallery, etc. In the Altstadt is the beautiful church Am Teyn, the old Hussite church, founded in 1407, and containing the monuments of the two Bohemian martyrs, Cyrillus and Methodius, and of the Danish astronomer Tycho Brahe; the

two towers and the gable were erected by Georg Podiebrad, who was crowned king here in 1458. The most celebrated of the public institutions of the city is the university, with a library containing about 140,000 vols., a botanical garden, a laboratory, an observatory, and the faculties of theology, law, medicine, philosophy (which comprises also languages and history), and the exact sciences. It was founded in 1348 by Charles IV., and was frequented in the fifteenth century by about 20,000 students. Subsequently, its importance decreased, first on account of the Hussite wars, next on account of that general stagnation and repression which the house of Austria brought over Bohemia as over Hungary. In the present century, especially since its reorganization as a principal Czechish institution, its prosperity is again increasing. In 1873 it was frequented by 1811 students. The commerce and industry of the city are considerable. Three important annual fairs are held here, and leather, glass, liqueurs, rosoglio, chemicals, woollens, linens, metal ware, and machinery are manufactured. The suburbs are the industrial quarters. Prague was founded in the eighth century, and has ever since formed the leading centre of the Czech community. After the connection of Bohemia and Austria the country was often dragged into wars entirely foreign to its interests, and Prague, as its capital and a strong fortress, has several times suffered severely from sieges and bombardments. P., including the suburbs, 189,949. CLEMENS PETERSEN.

Prai′rie [Fr. *prairie*, a "meadow"], a tract of country in its natural state covered with grass. These are sometimes of great extent, and are characteristic features of the physical geography of the interior of all large continents. The most extensive prairies known are in the central part of the great continental mass which includes Europe and Asia. Here they are called *steppes*, and they cover all Southern Siberia, reaching far into European Russia. Toward the E. they pass into the great Desert of Gobi, which sustains almost no vegetation. The greater part of the Siberian plains is covered with grass, and they afford pasturage for the herds of a large nomadic population. In South America there are two great areas of prairie —viz. the plains bordering the river Orinoco, called *llanos*, which are more than 200,000 sq. m. in area, and the plains of Buenos Ayres, in the southern part of the continent E. of the Andes, locally known as *pampas*. Besides these there are great grass-covered areas on the tributaries of the Amazon. In North America it is estimated that fully one-half of the surface is prairie, the most extensive district of this character being that lying between the Mississippi and the Rocky Mountains, a belt 500 miles in width, reaching from the interior of Mexico far into the British possessions. That portion of this area which belongs to the U. S. is popularly known as the *Plains*. E. of the Mississippi most of the country was originally occupied by forest, but in Illinois, Wisconsin, and Indiana more than one-half of the surface is covered with grass to the exclusion of trees.

The origin of prairies has been a matter of considerable difference of opinion, and has given rise to much discussion. Mr. Leo Lesquereux, who has written much upon it, in the reports of the geological survey of Illinois takes the view that prairies have all been lake-beds, first occupied by aquatic plants, and then, as filled or drained, covered with grasses, which have excluded trees by complete occupation. Prof. J. D. Whitney, in the report of the geological survey of Iowa, attributes the prevalence of herbaceous and the absence of arborescent vegetation in prairie districts to the fineness of the soil. Prof. Alexander Winchel has suggested that the vegetation of prairies is pre-glacial; that when the ice and water of the Glacial period were withdrawn, the surface of the Drift deposits was covered with grasses which sprang from seeds that had retained their life from pre-glacial times. Other writers have contended that annual fires—which sweep over the prairies and burn the tops of the grass without destroying the roots, while fatal to young trees—afford a sufficient cause for the absence of trees from the Western prairies. There can be no question that all the influences mentioned above have had some local effect in creating, extending, and maintaining prairies, but they are each and all inadequate to explain the broader and more general facts in the distribution of herbaceous and arborescent vegetation. A large part of the diversity of opinion which exists in regard to the origin of prairies is due to the limited observation of many of those who have written on the subject; and it is probable that if the advocates of the different theories proposed could all traverse the great grass-covered plains of the West, and could study on the spot the phenomena they have discussed, they would be more harmonious than they now are. Any one who has seen much of the prairies of this continent, or who in the study of the subject has looked beyond the limits of a single State, can hardly have failed to discover that climatic influences have had more to do with the distribution of forest and prairie than all local causes combined. In passing from the Atlantic to the Pacific we find the surface presenting all sorts of topographical features, the soil of every diversity of physical or chemical composition, and underlain by all kinds of geological formations—in one district covered by unbroken forests, in another by continuous sheets of herbaceous vegetation. For example, the Atlantic slope and Alleghany Mountain belt, and all the southern portion of the Mississippi Valley, are covered with forests. Then along a line running N. E. and S. W. we find a belt of mingled forest and prairie, the prairie predominating toward the N. and W. Passing this belt, we enter the great prairie-region of the West, which stretches away over mountain and plain for hundreds of miles in every direction. The Rocky Mountain belt is, for the most part, forest-covered. Beyond this lies the arid region of the "Great Basin," where vegetation of all kinds is very scarce and the only true deserts of North America are located. Beyond this lies the great wall of the Sierra Nevada, covered with forest. The California Valley is prairie except where belts of magnificent trees border the draining streams. The Coast Mountains are, for the most part, wooded—densely so toward the N., more sparsely southward. If, now, the rainfall of the belts enumerated be examined, it will be found to be so directly and inseparably connected with the distribution of vegetation as to afford a satisfactory explanation of all its most important phenomena. The forest-covered area E. of the Mississippi is swept by the rain-bearing winds that come from the Gulf of Mexico with a north-easterly direction. The average annual rainfall in this district is about 45 inches. The grass-covered area of the Plains lies along the W. N. W. margin of the great Gulf Stream of our atmospheric circulation, and the rainfall there ranges from 10 to 30 inches, with an average of not more than 20 inches. No forest of mixed growth will flourish where the rainfall is less than 20 inches, and the variation of precipitation on the Plains sometimes carries down the annual rainfall to less than 10 inches over large areas. This produces a drought which, if continued through many months, would be fatal to all trees, except those growing along the margins of streams, while the grasses would not be materially affected by it. It should be noticed that the streams that cross the Plains rise in the mountains and are perennial. Their banks are generally lined with timber, showing that the local supply of water is there sufficient to maintain a forest growth, while the deficiency of moisture on the adjacent plains has through ages proved an insurmountable barrier to the spread of timber.

In the interval between the humid and dry regions just described the forests and prairies interlock, and here local peculiarities of soil seem to determine the prevalence of trees or grass. Where the soil is peculiarly fine and impervious it is with difficulty penetrable by the roots of trees, and during wet seasons or the rainy months of the year such surfaces are flooded with water, while in the dry season they are completely desiccated. Thus they become now too wet and again too dry for the growth of trees. On the contrary, where there are sandy or gravelly soils or sub-soils, these become deeply saturated with moisture, and, penetrated by the roots of trees, afford them a constant supply of water. Hence, the groves and belts of forest in prairie countries are generally limited to tracts of this kind of soil.

The Rocky Mountain belt is a great condenser of moisture, as is shown by the fact that nearly all the great rivers of the continent flow from it—viz. the Mississippi, Arkansas, Red River, Rio Grande, Colorado, and Columbia. As a consequence, most of this belt is covered with a forest-growth. In the Great Basin the rainfall is everywhere small—from 2 to 12 inches. For this reason, vegetation of all kinds is scarce, and trees are almost unknown there. The Sierra Nevada—which stretches across all our territory as an unbroken wall, with an average altitude of 7000 feet —by cooling the Pacific rain-bearing winds that blow upon it, causes a copious precipitation of moisture, and it is therefore clothed with luxuriant forests.

The great California Valley is excessively hot in summer, and almost no rain falls there between May and November. We there very naturally find all kinds of soil—fine, coarse, gravel, sand, and clay—covered with herbaceous plants, except along the streams, where there are belts of timber proportioned to their volume. The Coast Mountains are well watered and well wooded, especially toward the N. On the coast of Washington Territory the rainfall is greater than anywhere else within the area of the U. S., reaching 68 or 70 inches, and here we find the densest forests that exist in our country.

An examination of the distribution of forest over other continents will lead to the same conclusion. As the sea is the great evaporating surface from which the rains that

vivify the land are derived, those portions of the land nearest the sea are usually best watered, and the interiors of continents are generally dry and treeless. The distribution of forest, prairie, and desert in other districts than the interiors of great bodies of land will be found to depend upon the local atmospheric circulation, the tracts of the rain-bearing wind-currents being marked by forests, those avoided by them being left as deserts, while intermediate areas are more or less generally clothed with grass.

The question of the origin of prairies is not one of merely abstract and scientific interest, but is of great practical importance to the inhabitants of large portions of our own and other continents. If the rainfall chiefly controls the distribution of forest, any effort to propagate trees in prairie-regions will be only measurably successful. It is true that the area of forests is diminished by the annual fires that sweep over the prairies; and this cause of the limitation of forest-growth may be removed by art. It is also true that a forest, by excluding the sun and wind and checking drainage, retains in some degree the moisture that falls upon it; and this tends to create the conditions upon which its growth depends. But it should be remembered that along the line of junction between forests and prairies the variations of climate are not only extreme, but peculiarly calamitous. Observations made along our frontier show that droughts of months' and even years' continuance are liable to occur there; and when the forest has spread or has been extended to a line beyond which there is no reserve of moisture—no maxima of rainfall that can compensate for the minima—droughts are liable to occur which will destroy the forest-growth of many years. The life of a tree continues for centuries, and during its continuance, should a period of extreme drought occur, whether at the tenth or hundredth year, it would be fatal. Hence, it will require not less than 100 years to determine accurately how far the forest-growth can be carried by human aid into prairies from which it is excluded by natural causes. Fortunately, the value of the great grass-covered plains is not dependent on the solution of this problem, for they form the finest area for grazing and stock-raising which we possess. It is even probable that the higher and drier prairies will be more useful to the inhabitants of the country if devoted to stock-raising than though persistent efforts should be successful in covering them with forests or crops. J. S. NEWBERRY.

Prai′rie, county of Central Arkansas. Area, 800 sq. m. It is somewhat uneven, very fertile, and well timbered. Cotton, corn, and rice are among the leading products. Traversed by Memphis and Little Rock R. R. and navigable White River. Cap. Devall's Bluff. P. 5604.

Prairie, tp., Arkansas co., Ark. P. 1035.

Prairie, tp., Boone co., Ark. P. 1214.

Prairie, tp., Carroll co., Ark. P. 1568.

Prairie, tp., Drew co., Ark. P. 266.

Prairie, tp., Franklin co., Ark. P. 1440.

Prairie, tp., Madison co., Ark. P. 1251.

Prairie, tp., Newton co., Ark. P. 501.

Prairie, tp., Pulaski co., Ark. P. 1292.

Prairie, tp., Searcy co., Ark. P. 202.

Prairie, tp., Washington co., Ark. P. 3884.

Prairie, v., Sumpter tp., Cumberland co., Ill. P. 305.

Prairie, tp., Edgar co., Ill. P. 829.

Prairie, tp., Hancock co., Ill. P. 1380.

Prairie, tp., Shelby co., Ill. P. 1218.

Prairie, tp., White co., Ill. P. 1603.

Prairie, tp., Benton co., Ind. P. 278.

Prairie, tp., Henry co., Ind. P. 1623.

Prairie, tp., Kosciusko co., Ind. P. 1248.

Prairie, tp., Tipton co., Ind. P. 1547.

Prairie, tp., Warren co., Ind. P. 667.

Prairie, tp., White co., Ind. P. 1998.

Prairie, tp., Davis co., Ia. P. 600.

Prairie, tp., Delaware co., Ia. P. 474.

Prairie, tp., Keokuk co., Ia. P. 704.

Prairie, tp., Mahaska co., Ia. P. 1364.

Prairie, tp., Wyandotte co., Kan. P. 916.

Prairie, tp., Audrain co., Mo. P. 1191.

Prairie, tp., Chariton co., Mo. P. 1473.

Prairie, tp., Franklin co., Mo. P. 1502.

Prairie, tp., Howard co., Mo. P. 2476.

Prairie, tp., Jackson co., Mo. P. 3493.

Prairie, tp., Lincoln co., Mo. P. 1241.

Prairie, tp., McDonald co., Mo. P. 907.

Prairie, tp., Montgomery co., Mo. P. 1658.

Prairie, tp., Randolph co., Mo. P. 2863.

Prairie, tp., Schuyler co., Mo. P. 1653.

Prairie, tp., Franklin co., O. P. 1364.

Prairie, tp., Holmes co., O. P. 1413.

Prairie Bayou, tp., Hot Springs co., Ark. P. 859.

Prairie Bluff, p.-v., Wilcox co., Ala. P. 2960.

Prai′rieburg, p.-v. and tp., Linn co., Ia. P. 116.

Prairie City (MAJORITY POINT P. O.), v. of Sumpter tp., cap. of Cumberland co., Ill., near St. Louis Terre Haute and Vandalia R. R., has 1 newspaper.

Prairie City, p.-v. and tp., McDonough co., Ill., on Chicago Burlington and Quincy R. R., contains 1 seminary, 1 lyceum, 5 churches, 1 bank, 1 newspaper, 2 lumber-yards, a fine park, several mills, 3 wagon manufactories, and 2 elevators. P. of v. 1078; of tp. 1645.
CHARLES W. TAYLOR, ED. "HERALD."

Prairie City, p.-v., Des Moines tp., Jasper co., Ia., on Des Moines Valley R. R., has 1 weekly newspaper, and is a shipping-point for live-stock and agricultural products.

Prairie City, p.-v. and tp., Bates co., Mo., near Osage River. P. 1786.

Prairie Creek, tp., Logan co., Ill. P. 1164.

Prairie Creek, tp., Vigo co., Ind. P. 1236.

Prairie Creek, tp., Dubuque co., Ia. P. 1022.

Prairie-Dog, a species, or rather group of species, representing the genus *Cynomys* of the family Sciuridæ, peculiar to the plains of North America. They are not at all related to the dogs, as the popular name implies, but are very closely allied to the tree and ground squirrels, from which they only differ generically; the name has been obtained simply because the ordinary utterance of the animals is a chattering noise somewhat recalling the yelp of a dog. They are considerably larger than the squirrels, being generally about a foot in length, exclusive of the tail, which is short and about two to nearly five inches in length, according to the species. They affect the prairies of Western America, congregate in large numbers, and form communities designated as "villages." They burrow to a considerable distance in the ground, throwing up around the mouths of the burrows hillocks on which they are wont to mount and from thence survey the doings of the community. These burrows are quite close together, and constitute one of the elements of danger to travellers on the Western prairies, as horses are liable to stumble and fall into them unawares. The species now recognized are —(1) *Cynomys ludovicianus*, the common prairie-dog inhabiting the great plains E. of the Rocky Mountains; and (2) *C. columbianus*, or the short-tailed prairie-dog, which is peculiar to the parks and plains within and W. of the Rocky Mountains down to the plains of the Columbia River. THEODORE GILL.

Prairie du Chien, p.-v. and tp., cap. of Crawford co., Wis., on Mississippi River, near the mouth of the Wisconsin, and on Chicago Milwaukee and St. Paul R. R., situated on a long prairie, 1 mile wide, stretching from the river to a range of bluffs on the E., has 6 churches, 2 newspapers, 2 Catholic colleges (male and female), numerous mills, machine-shops, and manufactories, and a considerable river-trade. First settled by Americans in 1835. P. 2700.

Prairie du Long, tp., Monroe co., Ill. P. 1146.

Prairie du Sac, p.-v. and tp., Sauk co., Wis. P. 2258.

Prairie Green, tp., Iroquois co., Ill. P. 480.

Prairie-Hen, or **Pinnated Grouse** (*Cupidonia cupido*), a peculiar form of the grouse family, restricted to the U. S. and found chiefly on comparatively open plains and prairies. It inhabits from the Eastern States to the prairies of the Wisconsin Valley, and southward to Louisiana, but is now very rare or extinct in the eastern portion of its range, although a few are said to still remain on the island of Martha's Vineyard and some neighboring islands, as well as Long Island. It is found in great numbers on the plains of the Western States, and forms a favorite object of sport; it is also from those sections that birds are sent in considerable numbers to the Eastern markets. The species is at once recognizable by the extension of feathers to the lower end of the tarsus, the air-bladders, and the long and lanceolate feathers of the sides of the neck, and the short subtruncate tail; the generic name (*Cupidonia*) alludes to the long neck-feathers, which have recalled to the imagination of some the fabled Cupid; beneath these feathers on each side is a bare and distensible air-sac developed in the male, and connected with the organs of voice. During the love-season the male inflates the bladders, which then resemble small oranges, lowers his head

to the ground, and opening his bill gives utterance to a single sound, produced partly by means of the air contained in these bladders, which are alternately filled and emptied as he makes his booming noise. If these sacs are punctured they are no longer resonant. The species feeds chiefly upon berries of various plants, as well as upon the buds, and in some places encroaches considerably upon the domains of the farmer. THEODORE GILL.

Prairie Plains, p.-v., Grimes co., Tex. P. 642.

Prairie Ronde, tp., Kalamazoo co., Mich. P. 1163.

Prairie Spring, tp., Jackson co., Ia. P. 1161.

Prairie-Squir'rel, a name given to the species of *Spermophilus*, a genus of the family Sciuridæ, found in various parts of the U. S. These are simply squirrels, affecting the ground rather than the trees, and having a shorter tail than the tree-squirrels, and also provided with cheek-pouches. They live on the prairie-lands of the Western States and Territories, make burrows, and generally associate together in considerable communities. Eleven species are now recognized as inhabitants of various parts of the U. S.; the best known are the *Spermophilus 13-lineatus* (striped gopher and prairie-squirrel of Illinois, Iowa, and other of the more eastern Western States), and the *Spermophilus Franklini* (great gopher of Illinois and corresponding latitudes upward to the Saskatchewan region). (See also SCIURIDÆ.) THEODORE GILL.

Prai'rieton, p.-v. and tp., Vigo co., Ind., on Wabash River. P. 955.

Prai'rieville, p.-v. and tp., Barry co., Mich. P. 1280.

Prairieville, tp., Brown co., Minn. P. 214.

Prairie-Wolf. See WOLF.

Prâkrit [Sans., "natural," "unrefined"], a name applied to those obsolete tongues and dialects of India which were derived from the Sanskrit or kindred to it. There were many dialects of this class. Most of its literature is found in dramas and inscriptions. Prâkrit grammar has been elaborated by several native and European writers. Among these are the ancient grammarian Vararuchi, the German Lassen, and E. B. Cowell, an English scholar.

Prase [Gr. πράσον, a "leek"], a leek-green variety of quartz, containing hornblende, sometimes cut as a gem.

Pra'ti (GIOVANNI), b. Jan. 27, 1815, at Dascindo, Italian Tyrol; began his studies at Trent, and took his degree at Padua. His youthful poem, *Edmenegarda*, marks an epoch in modern Italian poetry, and his early *Canti Lirici*, *Canti per il Popolo*, *Memorie e Lacrime*, and the *Ballate* increased his popularity. In 1844 he established himself at Turin, and consecrated his poetic genius to the glory of the house of Savoy, for which he was named court-poet and loaded with honors. In 1847 appeared his two volumes of *Passeggiate Solitarie*; in 1849, *Canti Politici*. With other minor pieces followed three epic poems, *Rodolfo*, *Ariberto*, *Armando*. He has now ready a collection of sonnets entitled *Anima e Mondo*. Prati now lives in Rome.

Pra'to in Toscana, town of Italy, province of Florence, situated in a most fertile plain surrounded by hills, on the right bank of the Bisenzio, about 12 miles N. W. of Florence. It is a walled town, with five gates and a castle, and the public buildings are very respectable, though without special interest. Of the twenty churches the cathedral is the most noteworthy. Little is known of Prato earlier than the twelfth century, when it became a part of the Florentine territory. It is now a place of considerable manufacturing activity, the water of the Bisenzio being largely used to work machinery, and has important publishing establishments. The chief domestic industry is straw-plaiting, which is almost universal among the women. P. 39,594.

Prato'la Peligna, town of Italy, province of Aquila degli Abruzzi, on the left bank of the Connino, near its junction with the Pescara. P. in 1874, 6567.

Pratt, county of S. Dakota, traversed by Bad and White rivers, is a pastoral region, deficient in timber.

Pratt, county of S. Kansas, on the tributaries of upper Arkansas River, recently formed. Cap. Prattsville.

Pratt (BENJAMIN), b. at Cohasset, Mass., Mar. 13, 1710; was brought up a mechanic, but, having lost a limb in youth, devoted himself to study; graduated at Harvard 1737; became a lawyer; was distinguished for learning, eloquence, and love of liberty; was representative of Boston in the legislature 1757–59; wrote some fugitive verses and made extensive preparations for a history of New England; was appointed chief-justice of New York upon the nomination of Gov. Pownall. D. Jan. 5, 1763.

Pratt (CHARLES). See CAMDEN, EARL OF.

Pratt (DANIEL D.), b. at Palermo, Me., Oct. 26, 1813; removed in childhood to Central New York; graduated at Hamilton College 1831, went to Indiana 1832; taught school; became a clerk in the office of the secretary of state; studied law; settled at Logansport 1836; was a member of the legislature 1851 and 1853; elected to Congress 1868; chosen U. S. Senator before taking his seat, and on the expiration of his term of office was appointed by Pres. Grant commissioner of internal revenue 1875.

Pratt (DANIEL JOHNSON), PH. D., b. at Westmoreland, Oneida co., N. Y., Mar. 8, 1827; graduated at Hamilton College 1851; was for ten years principal of Fredonia Academy, after which he became assistant secretary of the regents of the University of the State of New York, and in 1869 recording secretary of the Albany Institute. He was one of the originators of the annual "convocation" of the professors in the colleges and academies of New York, an organization of eminent utility; is author of *Annals of Public Education in the State of New York from 1626 to 1800*, and (in greater part) of the *History of the Boundaries of the State of New York* (2 vols.), presented to the legislature as a report by the regents of the university. He has also prepared many reports upon educational subjects and other papers which have appeared in pamphlet form.

Pratt (ENOCH), b. at Middleborough, Mass., in 1781; graduated at Brown University 1803; was pastor of the Congregational church at W. Barnstable 1807–35; wrote a *History of Eastham, Wellfleet, and Orleans* (1844). D. at Brewster Feb. 2, 1860.

Pratt (MATTHEW), b. at Philadelphia, Pa., in 1734; studied painting several years at London under Benjamin West; returned to Pennsylvania 1768; painted portraits of the most prominent men of the times, including many members of the constitutional convention of 1787, and aided his schoolmate, Charles W. Peale, in forming his museum. D. at Philadelphia in 1805.

Pratt (ORSON), b. at Hartford, Washington co., N. Y., Sept. 19, 1811; was educated in common schools in Columbia co.; became a member of the Mormon Church, in which he is now (1876) one of the "twelve apostles;" professor of mathematics in Deseret University and Church historian, and has been for several sessions Speaker of the Utah house of representatives. Author of *Cubic and Bi-Quadratic Equations*, *The Great First Cause*, *The Absurdities of Immaterialism*, and many religious pamphlets; has in MS. *Lectures on Astronomy* and *Differential Calculus*, and is engaged in the preparation of a work to be entitled *A New System of the Universe*.

Pratt (PHINEHAS), b. in England in 1590; came to Massachusetts with Capt. Weston's colony June, 1622, settling at Wessagusset, afterward called Weymouth; abandoned that place Feb., 1623, on the failure of the colony, and made his way alone through the wilderness to Plymouth, pursued by the Indians; resided many years in Plymouth Colony; afterward removed to Charlestown, Mass. D. there Apr. 19, 1680. Author of a *Declaration of the Affairs of the English People that first inhabited New England* (1662), addressed to the general court, and ancestor of a numerous New England family.

Pratt (ZADOCK), b. at Stephentown, Rensselaer co., N. Y., Oct. 30, 1790, of poor parents; commenced business 1812 as a saddler and harness-maker; turned his attention to the tanning business 1817, by which he made a considerable fortune; located a tannery in 1824 among the Catskill Mountains on Schoharie Kill, Greene co., which became the largest establishment of the kind in the country and the nucleus of the thriving town of PRATTSVILLE (which see); was elected to Congress 1836, and again 1842; became noted for his advocacy of cheap postage; procured the establishment of the national bureau of statistics, and prepared the plans for the new post-office building at Washington; became colonel of militia 1823, State senator 1830, presidential elector 1836 and 1852; was an active Democratic politician, a delegate to the Baltimore convention of 1852; established a newspaper and a bank at Prattsville, and was president of the Mechanics' Institute of New York, as well as of many other industrial or benevolent institutions. D. at Bergen, N. J., Apr. 6, 1871.

Pratts'burg, p.-v. and tp., Steuben co., N. Y., on Rochester and Buffalo branch of Erie R. R., 14 miles N. of Bath, has a fine park, a union free school, 4 churches, 2 private banking-houses, 1 newspaper, 2 grist-mills, and 1 furniture manufactory. P. of v. 639; of tp. 2479. PAUL C. HOWE, ED. "NEWS."

Pratts'ville, tp., cap. of Pratt co., Kan.

Prattsville, p.-v. and tp., Greene co., N. Y., on Schoharie Kill, named from Col. Zadock Pratt, who established here the largest tannery in the world; has 3 churches, an academy, a weekly newspaper, and several manufactories. P. of v. 489; of tp. 1240.

Pratt'ville, p.-v. and tp., cap. of Autauga co., Ala., 15 miles W. of Montgomery, has a large academy, 3 churches, 2 cotton-factories, 1 gin-factory, 1 newspaper, 1 sash, blind, and door factory, 2 good hotels, a foundry, and a carriage and wagon establishment. P. of v. 1346; of tp. 3675. WM. C. HOWELL, ED. "AUTAUGA CITIZEN."

Pratz', du (LE PAGE), b. in Holland about 1690; entered the French army in early youth; was engaged in campaigns in Germany; became a member of a French "Western Land Company," which obtained the grant of a tract of land near New Orleans, La.; conducted an expedition thither 1718; made fruitless efforts at colonization; ascended the Mississippi 1720, and settled among the Natchez; explored Missouri and Arkansas rivers; was for several years treasurer of the land company at New Orleans; returned to France 1734; published a valuable *History of Louisiana* (3 vols., 1758). D. in 1775.

Prawn, a name applied to the long-tailed decapod crustaceans of the family Palæmonidæ, easily distinguished by the long and serrate-edged beak. There are many species. All have two pairs of antennæ and stout legs. They are often very richly colored and sometimes transparent. The ring-horned prawn (*Pandalus annulicornis*) is extensively taken in European seas. To the genus *Hippolyte* belong the beautiful Æsop prawns. The common prawn of Europe (*Palæmon serratus*) is a large species, prized for the table. It is caught in nets and baskets. It is sometimes four inches long. The common American prawn (*Palæmon vulgaris*) is too small for the table. Many of the species are tropical.

Praxit'eles, a Greek sculptor, head of the Attic school, b., it is thought, at Athens about 392 B. C. Of his life nothing is known; of his works we have an idea through tradition, descriptions, images on coins, copies, and fragments. His favorite material was marble, though he wrought also in bronze. His subjects were the gods and goddesses of the national religion, fauns, satyrs—all with few exceptions, as the *Rape of Persephone*, a group of mænads, and another of wild bacchanals, of a graceful, gentle, soft, and dreamy character. The *Cnidian Venus*, celebrated in antiquity, which travellers went to Cnidus expressly to see, which King Nicomedes is said to have offered in vain to buy at the price of the whole debt of the island, is feebly represented by the copies. Another famous Venus was at Cos. The *Cupid* of the Vatican, the *Satyr* in the Capitol, the *Apollo Sauroktonos* in Florence and the Louvre, the *Narcissus* in Naples, are familiar to visitors at the galleries and to lovers of art. Praxiteles has been called the sculptor of the beautiful, as Phidias was of the sublime. O. B. FROTHINGHAM.

Pray (ISAAC CLARK), b. in Boston, Mass., in 1813; graduated at Amherst College 1833; became a journalist at Boston and New York, and subsequently a successful theatrical manager and actor, and both in the U. S. and in England aided in the professional training of several theatrical celebrities, including Charlotte Cushman; published *Prose and Verse* (1835), *Poems* (1837), *Book of the Drama* (1851), *Memoirs of James G. Bennett* (1855); was author of several burlesques and other plays, including a tragedy, *Virginius;* edited several magazines and other periodicals, and conducted the Philadelphia *Inquirer* 1859–60. D. at New York Nov. 28, 1869.

Prayer [O. Fr. *preier*] is a principal branch of every kind and part of religious worship in every age and nation. It is the chief expression of religion and accompanies every state of feeling. In its fulness it brings every part of the soul, in every mood, into activity toward God. It is a necessity of humanity, prompted by nature and instinct, confirmed by reason, by man's moral nature and common sense, commanded by revelation, and commended by the highest examples. It may be secret, social, or public, mental or spoken, ejaculatory or continued, extemporaneous or studied, written and elaborate, simple or complex. Prayer includes address to God, adoration, acknowledgment of mercies, confession, contrition, supplication for temporal and spiritual good, thanksgiving, and intercession. It implies belief in, and dependence on, a Superior Being, a feeling of need and desire, and expectation of answer. It is offered while standing, bowing, kneeling, or prostrate; with lifted, outspread, or clasped hands; with eyes closed or turned toward heaven, toward the images of the gods, the holy place, or the East. The Bible describes it as bowing the knees, looking up, lifting or pouring out the soul or heart, calling on the name of the Lord, conversing with or crying unto God or to Heaven, drawing near to God, beseeching, making supplication, or seeking the Lord's face. Christian prayer is a duty to God, to our fellows, and ourselves. It is directed to a personal God, who is a Sovereign and Father; in Christ's name, and with relation to his atonement and intercession; by the help of the Holy Spirit; according to God's will; with understanding, definiteness, sincerity, simplicity, reverence, penitence, humility, dependence, submission, confidence, the forgiving spirit, frequency, faith, assurance, love, perseverance, gratitude, and with moderate desires.

The main *objections* to prayer rest on the notion of an inexorable general law, or of the stability of nature, or of an inflexible God who has predetermined all things, or of a divine wisdom that will act without our asking, or on the notion that man is master of his own destiny. The difficulty of comprehending prayer lies in the difficulty of understanding the relation between the human and Divine Will. But, in spite of all objections, men pray on as by a universal instinct. The *reply* to the objections is that we pray to a living, loving Person, near at hand, knowing our thoughts, able to control all things—One who has declared himself a hearer of prayer, and who has made it a condition on which it seems good to him to put forth his power. The essence of the belief in prayer is that the Divine Mind is accessible to supplication, and that the Divine Will is capable of being moved. Prayer depends on God's will, but does not determine it. Man applies, God complies; man asks, God grants. Prayer has a subjective value. It is necessary to individual piety, produces solemnity, enlightens and quickens the conscience, teaches dependence, gives true views of God, and produces such a change in us as renders it consistent for him to change his course toward us. In the family, prayer intensifies and exacts devotion, secures domestic order, strengthens parental government, and promotes religion. And, objectively, the Bible and Christian history abound in examples of answered prayer.

The main arguments for *forms* of prayer are, that they have been of almost universal use; that they guide the worshippers without forcing them to depend on the moods of the leader; where they are used, all know what is to be said and done; they secure provision for unlearned ministers; secure dignity, decency, harmony, and guard against excessive show, arbitrary freedom, improper, absurd, extravagant, confused, and impious utterance, and against weariness and inattention; they unite the hearts and tongues of all worshippers, so that they do not worship by proxy; they unite different ages of the Church and preserve true doctrine and discipline. *Extemporaneous* (though not rash and unstudied) prayer is claimed to be more particular than general forms can be; it secures freedom, fervor, spontaneity, and adaptation to the circumstances; it is less formal and monotonous; suits itself to changes in language and opinions.

As to the *language* of prayer, it is urged that the tongue known to the worshippers ought to be used, so that all may understand and join in the service, and that worship may come from the heart. When some dead tongue is used, as Latin in the Western Church and Greek in the Eastern, it is retained because it was the original language of the ritual, or to guard against change in form and innovation in doctrine or worship, or because of its extensive use among the learned of different countries.

The ancient Greeks offered prayers and vows together. The worshipper raised his eyes and hands toward Heaven or toward the images of the gods. He stood, or if in deeper earnest he and at times all the assembly knelt. Suppliants wore garlands on their heads or necks, and carried boughs of olive or laurel twined with wool, with which they touched the knees or cheeks of the images. Libations of wine, water, or oil were poured out. The Romans covered their heads, bowed to the ground, moved completely round from right to left, as if to meet the god from whatever direction he might approach; then, with the right hand on the mouth, looked toward the East or toward the altars or images. In higher devotion they knelt or were prostrate, and laid hold on the altar. Public prayers were offered by the priest or magistrate. The Mosaic law took prayer for granted; the temple was "the house of prayer" where public prayer accompanied the sacrifices and where private prayer was offered. Those who were absent from the temple prayed toward it. The chief hours for the duty were 9 A. M., 12 M., and 3 P. M. To these were added the beginning and end of night and the time of eating. According to the degree of his fervor, the Jew stood, bowed, knelt, or prostrated himself. Free prayers were constantly offered, though forms were used with tithe-offerings and certain blessings. But Solomon's prayer at the dedication of the temple seems to have been the beginning of a liturgy, which at the time of Christ had developed into a set service before, during, and after the sacrifice. A similar liturgy was used in the synagogue, from which the petitions of the Lord's Prayer were probably drawn. Prayer was accompanied by almsgiving and fasting, and was made in conspicuous places, with many vain repetitions, by formalists who loved dis-

play. Among the early Christians prayer was the chief service, and was counted the main bond of unity. In their methods they followed Jewish customs largely. The pastor led the congregation, using both free prayer and forms. A strong liturgical tendency appears early in both the East and the West. Worship was first simple, then intricate, then regulated, then liturgical. Liturgies were made first by the bishops, then by the metropolitans. Early Christians knelt in ordinary prayer, but stood on the Lord's Day and from Easter to Whit-Sunday, in honor of Christ's resurrection. Prayer at all times and in all places was commended, though the temple and other places of meeting, the Lord's Days, occasional appointed days, morning and night, times of eating, times of success or distress, and crises of every kind were deemed peculiarly appropriate.

Prayers to and for the dead rest on the idea of a close intercommunion of the two worlds. They have entered into the worship of Egypt, India, China, Greece, Rome, and the Jews. In the Christian Church they date definitely from the time of Origen—prayers to angels from the time of Ambrose. Protestants repudiate all prayer except that to God or the Christ and the Holy Spirit. Paulus, an Egyptian monk, early used stones to count his prayers; Godiva of England (1040) used a necklace; in the thirteenth century medallions and rings with knobs were used. Rosaries date from the fifteenth century. The Calmucks inscribe prayers on wheels, and offer worship by whirling the disk around. The Chinese write prayers on paper and burn them before the idols or on the graves of their ancestors. (See WORSHIP.) ISAAC RILEY.

Pre-Adamites. See PRE-HISTORIC REMAINS.

Preb'endary, an ecclesiastic who is supported by an income called *præbenda* ("that which is to be furnished") out of the revenues of a cathedral or other church.

Preb'le, county of S. W. Ohio, bounded W. by Indiana. Area, 432 sq. m. It is somewhat uneven and has a fertile limestone soil. Tobacco, grain, wool, and live-stock are largely produced. The manufactures include metallic wares, lumber, lime, clothing, brick, flour, etc. Traversed by Dayton and Western and Cincinnati Richmond and Chicago R. Rs. Cap. Eaton. P. 21,809.

Preble, tp., Adams co., Ind. P. 996.

Preble, tp., Fillmore co., Minn. P. 670.

Preble, p.-v. and tp., Cortland co., N. Y., on Syracuse Binghamton and New York R. R. P. 195; of tp. 1150.

Preble, tp., Brown co., Wis. P. 1108.

Preble (EDWARD), b. at Falmouth (now Portland), Me., Aug. 15, 1761, son of Gen. Jedidiah. In 1777 he embarked in a privateer, and in 1779 entered as midshipman in the provincial navy, serving on board the Protector in the Penobscot expedition, when taken prisoner; upon his release he joined the sloop-of-war Winthrop as first lieutenant, with which he remained until 1782, greatly distinguishing himself by boarding with four men an armed English brig off Castine, and capturing her under fire. From Dec., 1782, until 1799 he followed the merchant service, when appointed a lieutenant in the navy, and in June of the same year promoted to be captain, and placed in command of the Essex; in 1803 he took command of the frigate Constitution, and sailed in command of the squadron sent against Tripoli; arriving at Tangier, he concluded peaceful negotiations with the emperor of Morocco; after which proceeded to Tripoli, which he subjected to repeated vigorous bombardments; in Sept., 1804, having been relieved by Com. Barron, he returned home, and received the thanks of Congress and a gold medal. D. in Portland Aug. 21, 1807.

Preble (GEORGE HENRY), U. S. N., b. Feb. 12, 1816, in Maine; entered the navy as a midshipman Oct. 10, 1835; became a lieutenant in 1848, a commander in 1862, a captain in 1867, a commodore in 1871; served in Florida against the Seminoles, and in the Mexican war participated in the capture of Alvarado and Tampico; in several actions with Chinese pirates in 1854–55, and complimented for his services by both the American and English naval commanders-in-chief in the East Indies; commanded the Katahdin at the taking of New Orleans in 1862, and the fleet brigade in the battles of Honey Hill, Tullifinny Cross-roads, and De Vaux's Neck in 1864. Referring to the brigade in his general order No. 65, Rear-Admiral Dahlgren says: "At Boyd's Creek and on the Tullifinny the artillery and infantry of the naval brigade vied with the veteran troops, and drew the frank and appreciative recognition of the general." Com. Preble is the author of *Our Flag*, and has made several valuable contributions to history. FOXHALL A. PARKER.

Preble (JEDIDIAH), b. at Wells, Me., in 1707; served as lieutenant-colonel in Gen. Winslow's expedition against Acadia 1755; became colonel 1758, brigadier-general 1759; was representative for Portland in the Massachusetts legislature twelve years, councillor 1773, judge of common pleas 1778, member of the State senate 1780, and was appointed major-general by the Massachusetts congress during the Revolutionary war, but declined on account of age. D. at Portland Mar. 11, 1784.

Preble (WILLIAM PITT), LL.D., b. at York, Me., Nov. 27, 1783; graduated at Harvard 1806; became a lawyer and a leader of the Democratic party; was U. S. district attorney 1813; settled at Portland 1818; was a leading member of the convention which formed the State constitution of Maine 1819; on the inauguration of the new State government was appointed a judge of the State supreme court 1820; was minister to the Netherlands 1829; held many other public offices; was the first president of the Atlantic and St. Lawrence R. R. 1847. D. at Portland Oct. 11, 1857.

Prec'edents [Lat. *præcedens*]. This term is used in the law of the U. S. and of Great Britain to denote those decisions of the higher courts which are regarded as establishing some legal rule, and which are therefore to be treated as authoritative, and are to be followed in the determination of subsequent causes depending upon analogous facts and requiring the application of similar principles. Notwithstanding the theory of Blackstone and other superficial writers, that the common law of England always existed in a complete condition, but known only in some mysterious manner to the judges, and that their function consisted merely in declaring it from time to time as occasions arose, it is an evident truth that the courts have actually created a very large part of the English and the American jurisprudence, and have been, in the exercise of this creative function, by far the most important and fruitful sources of legislation for the two countries. Their work has been accomplished by the constant practice of treating prior decisions, when made by competent tribunals, as precedents to be adopted and followed in subsequent cases; and this simply means that each former expression of the judicial will is in fact the official statement either of a general doctrine applicable to a great number of related circumstances, or of a special rule applicable only to certain particular circumstances. From a very early period down to the present time the superior courts, when rendering a judgment, have accompanied it with the reasons for the final conclusion thus reached; and these opinions, preserved in the books of reports, form a continuous series of precedents, and are the original depositories of the law as it has been wrought out by judicial legislation. It is important, however, to distinguish that element of a decision which constitutes the precedent from those portions of it which do not possess this peculiar and binding quality. The former consists in the legal rule necessarily involved in the simple adjudication made upon the particular facts of the case—that is, the rule which must have been enforced in order that such a determination upon those facts should have been made; the latter include the mere arguments, the illustrations, and the incidental expressions of opinion used by the court in reaching the final result. These features of a judgment may be correct or may perhaps be erroneous; they do not acquire any efficacy as precedents from the connection in which they are found. Although precedents are generally acknowledged and followed by the courts, since otherwise the law could not be developed in a uniform and consistent manner, yet their authoritative character is not absolute. Prior decisions, and even long series of similar judgments, are sometimes expressly overruled when they are found to be departures from true principles; they are more often evaded and gradually abandoned, until at length by a succession of new adjudications the incorrect doctrine which they announce is completely modified. This power of disregarding and overthrowing a former precedent is a necessary incident of the legislative function possessed by the superior courts, and the caution with which it is exercised simply shows that the judges are conservative, and often permit a wrong doctrine or rule to remain in force in order that the public confidence in the certainty and stability of the law should not be disturbed by frequent and sudden changes.

JOHN NORTON POMEROY.

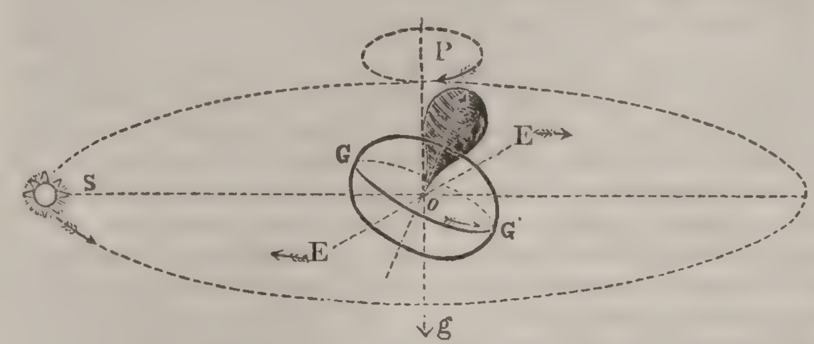
Precen'tor [Lat. *præcentor*], the leader, head, or director of a choir. More particularly, an officer holding such position in a cathedral, collegiate, or other large church. The office is not confined to laymen, but may be held by persons in holy orders who are qualified to perform its duties.

Preces'sion of the Equinoxes (see EQUINOX and EQUINOCTIAL POINTS), literally, the slow motion of the equinoctial points in the reverse direction to the earth's orbital motion, by which each semi-annual solar passage through those points is in advance of (*precedes*) the time

it would otherwise occur. This motion amounts to $50\frac{1}{10}$ seconds of arc per annum, and hence a period of 25,868 years is required for an entire revolution. "From the minute motions of the child's toy, the top, or of the *gyroscope*, to the grand phenomenon exhibited in the heavens —the *precession of the equinoxes*—there seems an incommensurable stride, yet as mechanical phenomena they are essentially identical. The earth is a rotating solid of revolution. It is *oblate*—that is, flattened at the poles—and protuberant around the equator. The ring of protuberant matter is more strongly attracted on the side nearest the sun or moon than on the more remote side; hence the tendency of solar or lunar attraction to *tilt* or pull down the equator into the plane of the sun's (or moon's) orbit. The result is just as in the case of the gyroscope, *gyration* around the direction of the disturbing force." (See GYROSCOPE.)

Were the directions of the sun's attraction upon the earth constant, the resulting gyration would be, as in the case of the gyroscope, *around that line of direction.* The direction, however, sweeps through an entire circumference in each annual revolution of the earth about the sun; at each instant there is an *elementary gyration* about this moving line; the *integral* (or actual result) is the slow motion of the earth's axis around the pole of the ecliptic, which is at the same time exhibited in the retrograde motion of the equator's intersection with the ecliptic.

The motions of an accurately made and finely-pointed "top" furnish the clearest ocular illustrations of precession.



Its spinning is always attended with gyratory motion of the axis of figure.* When nearly "asleep" (as it is termed) this gyration is extremely slow. In the figure an arrow represents the direction of the spinning rotation. The extremity P of the axis of figure (which may be called the *pole*) gyrates slowly about Q (*pole of the ecliptic*). If through the point O a plane perpendicular to O P be conceived (the *equator*), it will intersect the floor on which the top is spinning (ecliptic) in a line E E′ which will have the same angular motion as the axis O P. That the illustration should be perfect the sun's attraction on the earth should be the analogue of the gravity of the top; but gravity (indicated by the arrow *g*) acts downward (perpendicular to the floor), whereas the sun lies *in* the plane of the ecliptic (floor), and itself moves (relatively) about the object it attracts. In *all* its positions, however, it tends (just as gravity tends to pull down the top), with force fluctuating in intensity, but relatively small, to draw the equatorial protuberance G of the earth into the plane of the ecliptic,† other effects of its attraction being neutralized by the incessant change of direction of its action. Hence, as in the case of the top pulled downward by gravity, a gyration of the pole ensues, illustrated by the motion of P about Q. It is not, however, like its analogue, *uniform*. There are positions (the equinoxes) when the sun has no tilting action; others (the solstices) when the tilting effect is *maximum;* and the resulting *precessional* motion is *zero* and *maximum* at these points, respectively.‡ The moon, though its mass is very small compared to that of the sun, exerts, owing to its greater density and relatively small distance, a double influence in producing precession. The *combined* action of sun and moon produces the total mean annual precession of 50.1 seconds of arc already mentioned. But the moon moves in an orbit making a small angle (about 5°) with the ecliptic, and the precession *it* produces is about the axis *of its own orbit.* As this latter axis itself (from causes very analogous to those which produce the earth's precession) *gyrates* about the pole of the ecliptic in a period of $18\frac{2}{3}$ years, the phenomena of precession exhibit a minute periodical change in the inclination of the earth's axis called *nutation* (nodding), amounting in its aggregate to about 18 seconds of arc, the period of which is that of the revolution of the nodes of the moon's orbit ($18\frac{2}{3}$ years).

The longitude of the stars being counted on the ecliptic from the vernal equinox, it is affected by the precessional motion of the equinoxes. Hipparchus (140 B. C.), to whom the discovery of precession is attributed (though it appears to have been known before), observed that the stellar longitudes had increased about 2° in 160 years. In those times the first point of Aries and Libra corresponded to the vernal and autumnal equinoxes—of Cancer and Capricornus to the summer and winter solstices. There has since been a motion of 30°; the equinoxes are in Pisces and Virgo, the solstices in Gemini and Sagittarius. "The northern pole is now quite near the pole star, and is still approaching it. This approach will continue until the year 2120, when they will not be more than half a degree apart. This epoch passed, the pole will recede from Polaris, will pass the Little Bear to Cepheus, then over the borders of the Swan. In 12,000 years the bright star nearest to the N. pole will be Vega in Lyra, which will then play the part of pole star; Canopus in the southern sky will be equally found in the vicinity of the other pole."

Nutation was not discovered until A. D. 1747. Dr. Bradley detected it, and fixed its law and amount by observations prolonged, through a period of more than an entire revolution of the nodes of the moon's orbit, with the express view of determining some (at that time) puzzling irregularities in the apparent positions of the fixed stars. D'Alembert a few years subsequently gave us the theory which unites and makes one the so-long disassociated phenomena. He also deduced from *that* portion peculiar to the moon (*nutation*) an estimate of the comparative masses of the moon and earth ($\frac{1}{70}$th), which does not differ greatly from Laplace's determination founded on the moon's share in producing the tides ($\frac{1}{75}$th). More recent and exact determinations on the same basis (precession) reduce the estimate to $\frac{1}{81}$st.

The obliquity of the equator to the ecliptic causes, as is well known, the vicissitudes of the "seasons." The periods counted from equinox to equinox of spring and summer is greater by about eight days, owing to the ellipticity of the earth's orbit, than that of autumn and winter. Our winter solstice occurs when the earth is nearly (about $9\frac{1}{2}$°) from the perihelion or nearest point. From the precession of the equinoxes ensues a change in these relations, the cycle of which should correspond, and extend through 25,868 years. But the *form* of the orbit fluctuates, and the line of apsides (or major axis), moving *reversely* to precession and making a complete revolution in 110,000 years, abbreviates this period. At a date (B. C. 4089) nearly that assigned in the biblical chronicles to the creation (B. C. 4004) the passage of its perihelion by the earth was coincident with the autumnal equinox.§ A. D. 1248 the perihelion had reached the winter solstice, and it has now passed it $9\frac{1}{2}$°. The *cycle* of the seasons therefore occupies a period of about 21,000 years, and at intervals of one-half (or 10,500 years) the order of the seasons is reversed in reference to the principal points of the orbit. A French mathematician, M. Adhémar, on these facts bases a theory of "great deluges," the traces of which on the earth's surface in remote ages are so distinctly marked, attributing them to the vast accumulations of ice at the more remote pole during this long period, which breaks up when the relative positions are reversed. (See *Périodicité des Grands Déluges résultant du Mouvement graduel de la Ligne des Apsides de la Terre*, par le Capitaine le Hon, Paris, 1861.)

On the question of internal fluidity of the earth's substance in its relations to precession (*assuming* the crust to be perfectly rigid), the late William Hopkins of Cambridge, Eng., in a celebrated paper endeavored to prove the necessity of a solid crust (as opposed to the thin crust and internal molten fluid of geologists) of at least 800 or 1000 miles' thickness. The particular fallacy which vitiates his demonstration has been pointed out by the writer. (*Smithsonian Contributions*, vol. xix.)

On more substantial grounds Sir William Thomson has maintained that the close coincidence of *observed* with *cal-*

* In the figure the lower extremity of the top is supposed to be *fixed* at a point O in the plane or surface on which it rests; hence, this extremity, and not the centre of gravity, as in article GYROSCOPE (Fig. 7), becomes the centre of motion instead of describing the curve represented in the figure cited. The apparent *gyration* is the same in either case.

† In the figure the earth, G G′, is sketched with its axis coincident with that of the top. The sun acts most powerfully on the *nearest* half of the equatorial protuberance; hence, whether situated on the side represented or the reverse, it will have the effect imputed; which will be *nil* at E E′ (the equinoxes) when the upper and lower limbs of the earth's protuberance are equally near. It must be observed, however, that the sun's attraction *draws* together the poles P and Q; whereas, the gravity of the top tends to *separate* them; hence, that the gyrations (or motion of the equinoxes E E′) should be the same, the earth's rotation must be reverse to that of its analogue.

‡ Owing to this inequality of action there is theoretically a slight semi-annual solar and semi-monthly lunar nutation. Both are unobservable.

§ At the vernal equinox of this date the sun, in *apogee*, and the perihelion of the earth's orbit, passed the equator in conjunction, and the longitude of the latter was zero. *In this sense* the perihelion coincided with the vernal equinox, as it is expressed by Prof. Forbes (*Encyc. Brit.*, 6th Dissertation, notice of "Lagrange").

culated precession demands, in the earth's crust, *not only* solidity, *but* a rigidity "several times as great as that of iron throughout 2000 or more miles of thickness." The writer has in the paper above cited endeavored to illustrate and confirm this dictum.

As the phenomena of the "gyroscope" furnish the "most convincing proof of the absolute truth and adequacy to explain all purely mechanical phenomena" of the received (Newtonian) laws of dynamics, so do the analogous phenomena of precession and nutation furnish, along with confirmation of those laws, one of the strong proofs of the universality and perfect exactness of the Newtonian law of gravitation. J. G. BARNARD.

Pre'cious Met'als. This term is in common use to distinguish the uncommon, highly-valuable metals, such as gold and silver, from the common, easily-obtainable metals, such as iron, copper, and lead. Gold and silver have been prized through all ages as ornaments and as money. Platinum, which has also been used as money, may be included, as also palladium and the other metals of the platinum group. The precious metals do not rust and waste away by exposure to the air, and they do not oxidize in open fires. Hence, they are also known as "noble metals," in distinction from "base metals," which turn to dross when similarly heated. There are also many metals known to chemists which are both rare and valuable, but which do not exist in a native or uncombined state, and easily revert to their earthy condition. To these the term "precious metals" is not applied.

W. P. BLAKE.

Precious Stones, or **Gems, Natural and Artificial.** The term *gem* includes natural and artificial products whose beauty, rarity, and durability fit them for objects of personal ornament.

The *diamond* is the hardest known substance, being classified as 10 in the scale of hardness of minerals. Unaffected by chemicals, infusible, and only combustible after long exposure to a high temperature, it is the least destructible of gems, and being at the same time one of the rarest and most beautiful, it stands foremost among precious stones. It is pure carbon, and is of all colors, and also colorless and black. It only shows its beauty when cut, and then, owing to its extraordinary refracting powers, it throws back a very large proportion of the light falling upon it, whence results the unusual lustre of a well-cut diamond. Diamonds are cut by first cleaving the stones, and then rubbing two of them together until they are roughly shaped, when they are carefully finished by grinding on a revolving disk of soft steel smeared with diamond-dust and oil. Three-fourths of all diamonds are cut in the well-known form of brilliants; others are cut in the rose form, a flat bottom and the upper surface covered with little facets and rising to a point; a very few come from the East as table or flat diamonds, with scarcely any lustre. A well-cut, perfect brilliant of the first water, weighing a $\frac{1}{2}$ carat, is worth in New York at the present time about $50 gold; one of 1 carat (4 grains troy), $175; 2 carats, $550; 3 carats, $800. Larger diamonds are sold by agreement. A dull tint injures the value; a decided red, blue, or green adds immensely to it, but only as a rarity, and not in the ordinary market. The African diamonds lately discovered are frequently yellow, and being less lively command only a very low price. Diamonds lose $\frac{9}{20}$ths of their weight in cutting; hence the value of rough diamonds is estimated at one-half the above. Imperfect, thin, and black diamonds, called *bort*, are either crushed to powder or set in tools for dressing millstones and drilling rocks. Diamonds are found by washing alluvial deposits, chiefly in India, Brazil, Borneo, Australia, and South Africa. A diamond of 5 carats is a very large stone; above 100 carats few are known. The Koh-i-noor ("*Mountain of Light*"), uncut 793 carats, after twice cutting $106\frac{1}{16}$ carats, belongs to England, and is perhaps the finest diamond known. (See DIAMOND.)

Next in hardness to the diamond stand the members of the *sapphire* or *corundum* group, which are all composed of alumina. Foremost in value, exceeding even the diamond itself if larger than two or three carats, is the *ruby*. The best rubies are found in Siam, and stones of more than 10 carats are exceedingly rare. A ruby of 1 carat, if of the finest quality, is worth $150. The *sapphire* differs from the ruby in having a rich blue color. It occurs more abundantly and of larger size than the ruby or diamond, and while a sapphire of 1 carat is worth $100, one of much larger size would command a far less price in proportion than a large diamond. Asteriated rubies and sapphires, cut so as to show a six-pointed star, command a higher price as fancy stones. Other varieties of sapphire, different in color, and known as Oriental emerald, Oriental amethyst, Oriental topaz, and Oriental aquamarine, are of rare occurrence and little comparative value.

Chrysoberyl, composed of glucina and alumina, stands next to corundum in hardness. Although a very lustrous yellow stone, it is now rarely worn, but a variety known as chrysoberyl cat's-eye, or cymophane, is quite esteemed. The *spinel*, a compound of alumina and magnesia, hardness 8, is of all colors, but the pink or red variety, the Balas ruby, is the only one generally seen. Being a fine stone, it is sometimes sold for true ruby. *Topaz* (Brazilian topaz), silico-fluoride of alumina, varies from colorless to deep yellow, and sometimes is blue (Brazilian sapphire). Cut as a deep brilliant, it makes a handsome stone, but is quite cheap. The deep yellow topaz carefully heated assumes a permanent fine pink color, making a handsome stone called Brazilian ruby. *Emerald*, silicate of alumina and glucina, hardness 7.5 to 8, is a rich green stone, generally cut flat, and presenting a fine appearance when surrounded by brilliants. An emerald without a flaw is a *rara avis*, and a perfect stone of 1 carat has been sold in New York for $200, or more than a diamond. Ordinarily, the emerald ranks next to the ruby in value, but in this country at present it is next to the diamond. The finest emeralds are found in New Granada. *Beryl*, or aquamarine, is a pale green or blue stone of the same composition as emerald, but of trifling value. *Zircon*, silicate of zirconia, hardness 7.5, is a very lustrous stone, and the white varieties are sometimes sold as diamonds, but it is rarely met with. *Tourmaline*, silicate of alumina, magnesia, iron, etc., with a little boracic acid, hardness 7–7.5, occurs of all colors, and is of small value. The pink variety, called also Brazilian ruby (see *Topaz*), is sometimes mistaken for the burnt topaz. *Garnet*, comprising several varieties, silicates of alumina, lime, magnesia, with iron and manganese, hardness 6.5–7.5, although at times a very handsome stone, is so abundant as to be of comparatively little value. Fine red garnets, cut in tables, were once extremely fashionable. They are now often met with cut *en cabochon*, with curved faces, like a flat drop of tallow, and pass under the name of carbuncle. Fine garnets not unfrequently pass for rubies among the inexperienced.

Quartz, silicic acid with various coloring-matters, hardness 7, is known under different names. Clear and white, it is rock-crystal, a stone of some beauty, but very cheap. Yellow crystals are called cairngorms or false topazes. Amethyst (ἀμέθυστος, "not inebriating"), supposed to be a charm against intoxication, when set with diamonds or pearls, although cheap, is a handsome stone. It is the only stone that should be worn with mourning. Cat's-eye quartz, chrysoprase, plasma, chalcedony, onyx, sardonyx, carnelian, jasper, agate, and bloodstone are all varieties of quartz, distinguished by various markings. The last named is a favorite stone for rings, and tradition relates that the red spots arose from the blood which fell upon it at the foot of the Cross.

Opal, softer than quartz and differing from it in containing water, is one of the most precious gems. Its blending of soft hues and changing fire imparts to it a strange beauty which defies imitation. Opals are always cut *en cabochon*, and show their finest color on a warm day, but are liable to lose much of their brilliancy by contact with dust and dirt, and then cannot be restored. They come from Hungary and Mexico.

Turquoise, hydrated phosphate of alumina, when of a fine azure-blue color, is of high repute, and shows well in contrast with gold and diamonds or pearls. It is found in Persia. The turquoise was frequently given as a *gage d'amour* under the belief that its color would fade if the giver proved unfaithful. In reality its color is very liable to change in damp air.

Lapis-lazuli, a deep-blue silicate and carbonate of alumina, lime, and iron, with some sulphuric acid; *malachite*, hydrated carbonate of copper; *labradorite*, a feldspar showing changeable colors; *amber*, a fossil hydrocarbon; and *coral*, carbonate of lime secreted by living polyps in the ocean,—are frequently used as ornaments, although not commonly considered gems.

Pearls, carbonate of lime with organic matter, found in the shells of pearl-oysters and of certain mussels, are, when fine, among the most beautiful and valuable of gems. The best are found about Ceylon, Persia, and other Eastern coasts, and inferior ones on the tropical coasts of Central and North America. A perfect pearl must be round, pure white, translucent, lustrous, and free from flaws. Such a pearl of 1 grain in weight is worth $1.20, of 5 grains $25. Larger ones increase very rapidly in value.

Artificial gems of all kinds except opal can now be made so perfectly that by the eye alone even the most expert dealer cannot always detect the imitation. They are composed of vitreous pastes variously colored with metallic oxides. By applying physical tests as to hardness, specific gravity, optical and electrical properties, however, any gem can be identified and almost any fraud readily detected.

A very ingenious deception consists in filling a genuine stone of poor color—for instance, a pale ruby—with a paste which imparts a fine color to the whole, while the surface of the genuine stone is still presented to the file. Similarly, a pale stone or a simple piece of rock-crystal is faced with a slice of a genuine stone, or a stone genuine throughout, but of unequal color, is so cut as to appear of fine color. Pearls are very well imitated by the scales of certain fishes. H. B. CORNWALL.

Precoc'ity [Lat. *præcox*, "ripe before the time"], a rapid and abnormally early development of the mental powers, sometimes associated with a correspondingly early ripening of the functions of the body (called *prœotia*). The popular belief that precocious infants are usually destined to early decay of mental and physical powers, resulting in speedy death, idiocy, or at the best in mediocrity, is well founded, as can be established by abundant proofs. But there are exceptions to the rule. No doubt precocity is often associated with diseases of the nervous system, with scrofulous symptoms, and with rickets, but not a few instances can be adduced of precocity associated with apparently good health. Precocious children should be restrained from following their intellectual bent, and their physical culture should be encouraged.

Predestina'tion, in theology, the doctrine according to which God has foreordained from eternity and unchangeably whatever takes place, was first defined and debated during the controversy between PELAGIUS and ST. AUGUSTINE (which see). In the Roman Catholic Church the JANSENISTS (which see) became the champions of predestination. It was generally adopted by the earliest Reformers, but while in the Reformed Church it received a very strict and explicit development by Calvin (see CALVINISM), to which the Arminians (see ARMINIANISM) opposed a milder explanation, it was for some time entirely given up by the Lutheran Church until Schleiermacher revived it in a mitigated and somewhat mystical form.

Predicate. See LOGIC, by PROF. W. D. WILSON, LL.D., L. H. D.

Pre-em'ption [Lat. *præ*, "before," *emere*, "to buy"], the act of one belligerent in seizing upon the sea, and taking at a price, certain articles not strictly contraband intended for importation within the territory of his foe. (See INTERNATIONAL LAW.) T. D. WOOLSEY.

Pre-emption, p.-v. and tp., Mercer co., Ill., on Edwards River. P. 1161.

Pre-exist'ence, the doctrine that the human soul has had an existence in some past and nearly or quite forgotten state of being. This was the doctrine of the Pythagoreans and other transmigrationists; also of Plato, Philo, Origen, and many other ancients. The doctrine was condemned in 543 by the Council of Constantinople. It is defended by Kant, Schelling, and the younger Fichte, and among theologians by Julius Müller and Dr. Edward Beecher. Another theory assumes that all human souls were created at the time of the creation of man, and that the soul joins the body at the moment of conception.

Pre'fect [Lat. *præfectus*], the title of many officers and magistrates of ancient Rome. The *præfectus urbi* was the warden of the city, and was anciently an officer of great dignity and importance, but his duties varied much at different periods, and at times were almost nominal. The prætorian prefects commanded the imperial body-guard. The *præfectus annonæ* was an extraordinary magistrate of great importance who presided over the corn-market and the distribution of public charity. In modern France, a prefect (*préfet*) is an important official, the chief of police in each department, and a kind of justice of the peace.

Pre'gel, a river of Prussia, formed near Insterburg, East Prussia, by the confluence of the Angerap and the Pissa, flows westerly 90 miles to the Kurisches Haff. It is navigable for its whole course from Insterburg.

Pregnancy. See JURISPRUDENCE, MEDICAL, by PROF. JOHN ORDRONAUX, M. D., LL.D.; and OBSTETRICS, by PAUL F. MUNDÉ, M. D.

Pre-historic Man. See PRE-HISTORIC REMAINS.

Pre-historic Races. See PRE-HISTORIC REMAINS.

Pre-historic Remains. See AMERICAN ANTIQUITIES and CAVE, by PROF. J. S. NEWBERRY, M. D., LL.D., M. N. A. S.; ARCHÆOLOGY; KITCHEN-MIDDENS; PALEFITS; and MAN, by PRES. M. B. ANDERSON, LL.D.

Prel'ate [*prælatus*, "placed before"], a term applicable to all ecclesiastics of high rank, as well as some of the inferior dignitaries of the papal court. Prelates of the Great Mantle are the lowest in rank; those of the Small Mantle, of higher rank. In the Roman Catholic Church they have mostly the title of "monsignore."

Pre'lude [Lat. *præludium*; Ger. *Vorspiel*, a "preamble"], in music, an introductory strain or other movement intended to announce and prepare the hearers for a composition or performance immediately following. Pianoforte pieces, fantasias, sonatas, transcriptions, etc. are often thus preceded by a brief extempore effusion or prelude. Preludes also of considerable length and richness of thought are often written for the organ and other instruments, and are played as independent compositions.

Premise. See LOGIC, by PROF. W. D. WILSON, LL.D., L. H. D.

Premium. See INSURANCE, by J. WILDER MAY, and LIFE ASSURANCE, by PROF. J. H. VAN AMRINGE.

Premonstraten'sian Monks and **Nuns,** or **Norbertines,** were established at Prémontré, near Laon, in France, in 1120, by St. Norbert, afterward archbishop of Magdeburg (1080–1134). They followed the rule of St. Augustine, and were in part canons regular. The order (which had become very powerful and widespread) was divided in 1573 into two congregations, the new one having a stricter observance. In 1630 the whole order received the stricter rule; it is not very large, but it has convents of monks and nuns in continental Europe.

Prence (THOMAS), b. in England in 1601; was one of the Leyden Pilgrims; arrived at Plymouth, Mass., in 1621; was one of the first settlers at Nansett or Eastham; was chosen governor in 1634, 1638, and continuously from 1657 to his death; was assistant 1635–37 and 1639–57, and distinguished for religious zeal and the promotion of education. D. at Plymouth Mar. 29, 1673.

Pren'tice (GEORGE DENISON), b. at Preston, Conn., Dec. 18, 1802; graduated at Brown University 1823; was admitted to the bar in 1829; edited the *Weekly Review*, Hartford, Conn., 1828–30, and from 1830 to his death was editor of the *Louisville Journal*, which he made one of the leading Whig newspapers of the country; author of many fugitive poems, and of a *Life* of Henry Clay (1831); *Prenticeana* (1859), a collection of his witticisms, has gone through several enlarged editions. D. at Louisville, Ky., Jan. 22, 1870. His *Life* has been written by G. W. Griffin.

Pren'tiss, county of N. E. Mississippi. Area, 425 sq. m. It is nearly level and very fertile. Live-stock, cotton, and corn are important products. Is traversed by Mobile and Ohio R. R. Cap. Booneville. P. 9348.

Prentiss, p.-v. and tp., Penobscot co., Me. P. 387.

Prentiss (BENJAMIN MAYBERRY), b. at Bellville, Va., Nov. 23, 1819; removed with his parents to Missouri, and in 1841 settled at Quincy, Ill., where he learned the trade of rope-maker. In the war with Mexico he was adjutant of the 1st Illinois Vols.; captain subsequently, and distinguished at Buena Vista. Returning to Quincy, he was defeated for Congress in 1860. At the outbreak of civil war he was appointed colonel 7th Illinois Vols., and soon after brigadier-general of three months' troops. Appointed brigadier-general of U. S. volunteers May, 1861, he commanded in S. Missouri; at the battle of Shiloh, in Apr., 1862, while in command, he was surprised and captured with most of his division; released in October, and made major-general of volunteers Nov. 29, 1862. Member of court-martial to try Gen. Fitz John Porter Nov., 1862–Jan., 1863. Commanded at Helena, Ark., July 4, 1863, when he defeated Gen. Holmes, who attacked that place.

Prentiss (CHARLES), b. at Reading, Mass., Oct. 8, 1774; graduated at Harvard 1795; began in the same year the publication at Leominster of *The Rural Repository*; issued *A Collection of Fugitive Essays in Prose and Verse* (1797); afterward edited political, literary, and theatrical papers at Georgetown, D. C., Baltimore, Richmond, and Washington; visited Europe 1804; was for some years reporter of debates in Congress; published at Brookfield, Mass., *The Life of Gen. Eaton* (1813) and the *Life of Robert Treat Paine* (1812). Prentiss was one of the first Americans who relied for support exclusively upon his pen. D. at Brimfield, Mass., Oct. 20, 1820.

Prentiss (GEORGE LEWIS), D. D., b. at Gorham, Me., May 12, 1816; graduated at Bowdoin College 1835; was assistant in Gorham Academy 1836–37; studied theology at the universities of Halle and Berlin in Germany 1839–41; was settled over the South Trinitarian church, New Bedford, Mass., in Apr., 1845; became pastor of the Mercer street Presbyterian church, New York City, in Apr., 1851; resigned on account of ill-health in the spring of 1858, and went abroad for two years; on his return gathered a new congregation on Murray Hill (the Church of the Covenant), and was installed its pastor in the spring of 1862, and resigned in Apr., 1873, in order to accept a call to the Skinner and McAlpine professorship of pastoral theology, church polity, and mission-work in the Union Theological Seminary. During the civil war of 1861–65 he was an ardent champion of Union principles. Besides numer-

ous sermons and addresses, he has published *A Memoir of Sargent S. Prentiss* (2 vols., 1855) and *A Discourse in Memory of Thomas Harvey Skinner, D. D., LL.D.* (1871).—His wife, ELIZABETH PAYSON PRENTISS, youngest daughter of Dr. Edward Payson, b. in Portland, Me., Oct. 26, 1818, was married in Apr., 1845. Her three *Susy* books first brought her into notice as a writer. *Stepping Heavenward* (1869) has had a sale of more than 50,000 copies in the U. S., while many thousands have been sold also in Canada, Great Britain, and Australia. *Flower of the Family, The Percys*, and *Fred, Maria, and Me*, have all been translated into German, the two former into French. Among her more recent works are *Urbane and his Friends* (1874) and *Hymns and Songs of the Christian Life* (1873). Most of her books have been republished in England.

R. D. HITCHCOCK.

Prentiss (HENRY E.), b. in Maine Feb. 12, 1809; graduated at the U. S. Military Academy, and entered the army as second lieutenant of artillery July, 1831, but remained at the academy as assistant professor of engineering until 1833, and resigned in 1835 to practise law, settling at Bangor, Me., where he became an extensive lumber-dealer and manager. When ordered to Mobile, Ala., in 1833, he performed the journey on foot, and on resigning in 1835 walked the entire distance from Mobile to Bangor. D. at Bangor, Me., July, 1873.

Prentiss (SAMUEL), LL.D., b. at Stonington, Conn., Mar. 31, 1782; began the practice of law at Montpelier, Vt., 1803; achieved an eminent position at the bar; was chief-justice of the State supreme court 1829–31, U. S. Senator 1831–42, and U. S. district judge from 1842 until his death, at Montpelier Jan. 15, 1857.

Prentiss (SARGENT SMITH), b. at Portland, Me., Sept. 30, 1808; graduated at Bowdoin College 1826; went to Natchez, Miss., as a teacher 1827; was admitted to the bar 1829; removed in 1832 to Vicksburg, where he acquired great reputation, especially as a jury-lawyer; was elected to the State legislature in 1835; was sent to Congress 1837, but unseated by the casting vote of J. K. Polk, the Speaker; was returned in 1838 by an overwhelming majority; opposed the repudiation of Mississippi bonds; removed in 1845 to New Orleans. D. at Longwood, near Natchez, July 1, 1850. He was one of the most gifted men this country has produced. Senator Crittenden of Kentucky once said of him: "It was impossible to know Mr. Prentiss without feeling for him admiration and love. His genius, so rich and rare, his heart, so warm, generous, and magnanimous, and his manners, so graceful and so genial, could not fail to impress those sentiments on all who approached him. Eloquence was part of his nature, and over his private conversation, as well as his public speeches, it scattered its sparkling jewels with more than royal profusion."

R. D. HITCHCOCK.

Prenz'lau, town of Prussia, province of Brandenburg, on the Ucker, has a fine Gothic church of the thirteenth century, tanneries, breweries, and manufactures of stockings, hats, paper, and tobacco. Pop. 14,442.

Prepara'tion. In music, dissonances, especially sevenths, are said to be prepared when either their higher or lower term—*i. e.* the root or the dissonant interval—has formed a component part of the chord immediately preceding, and thus rendered the entrance of the dissonant chord more easy and natural. (See MUSIC.)

Preposi'tions are so named because in Latin, whence we have the word, they occur *before* the words which they influence; whence also the Greek name *prothesis*. They are not inflected, and in English they are simple, such as *in, out, at, by, for, on, up;* and compound, of which we have examples in *above, around, about, below, between.* Latin prepositions are prefixed in *ad-mit, ex-pose, in-duce, pro-pel, sub-merge;* and English ones are suffixed in *there-by, where-in, through-out.* Turkish has "postpositions," instead of prepositions, for both of which terms "perithesis" has been proposed. (Haldeman, *English Affixes*, p. 191.) Pott published a volume on the prepositions in 1859.

Pres'burg, one of the finest towns of Hungary, on the northern bank of the Donau, near the frontier of Lower Austria. From 1541, when the Turks conquered Buda, it was the capital of the country, until Joseph II., in 1784, once more transferred this dignity to its old possessor. It has a fine cathedral, built in 1090, but the splendid royal castle, which from a cliff on the bank of the Danube overlooks the city, was destroyed by fire in 1811, and has remained a ruin. Its educational and benevolent institutions are numerous and good; its manufactures of chemicals, leather, tobacco, and gold and silver ware extensive, and its transit-trade in corn and wine active. P. 46,540.

Pres'byter [Gr. πρεσβύτερος, "elder"], the title of an officer in the Christian Church, given at first on account of age, length of service, or dignity. It was a Jewish-Christian name, and came from the synagogue. In the New Testament the words "presbyter" and "bishop" are interchangeable. In each early church there was a board of presbyters. Their duties were to superintend the church order, discipline, and doctrine, to teach, preach, visit the sick, receive strangers, and preside at the meetings. They were appointed by the apostles or their representatives, or may have been elected or nominated by the people. They were ordained with prayer and the laying on of hands.

Clement (earliest of the Fathers), 96 A. D., makes no distinction between presbyters and bishops, and says they were appointed first by the apostles, then they were nominated by the whole college of presbyters, the church consenting. Ignatius, 115 A. D. (Syriac), speaks of bishops as distinct from presbyters. Irenæus, about 182–188, speaks of the episcopate in the congregational sense, and in some places distinguishes between bishops and presbyters. In Tertullian (160–240?) bishops and presbyters are kept distinct. Cyprian (200–258) says bishops are successors of the apostles, and all authority resides in them. They only can ordain. All bishops are equal, and are related to the whole Church, though laboring in their own dioceses. The Church of the apostles was plastic, appearing to have no inflexible order, and the growth of the episcopate was natural, even if the government had been presbyterian, just as within the last century the Methodist Episcopal Church has adopted the episcopate on account of its convenience and effectiveness. In places where the apostles had lived the chief of their successors were likely to inherit their authority. Hilary (350) shows that persecutions brought the strongest into prominence. In times of heresy, or under the need of regular instruction and government, or to make manifest the unity of the Church and to serve as the vehicle of tradition, the ablest teacher gained enlarged authority. And as the office of president or bishop grew in importance, men sought it and magnified it through ambitious motives, or in conformity to the centralizing and imperial tendencies of Church and State both for defence and aggression.

Special dignity, though at first apparently no superior authority, was attached to the bishops of Jerusalem, Rome, Antioch, Alexandria, Ephesus, and Corinth. Metropolitan dignity came to the chief men of the provincial synods. At the Council of Nice the patriarchate appears, and after a time the bishop of Rome secured the primacy. The episcopal form of government is found among three-fourths of the estimated 335,000,000 Christians in the world.

The episcopalian form of church government claims that there were three ecclesiastical orders among the Israelites —the high priest, priests, and Levites; three during the time of our Lord—Christ, the apostles, and the Seventy; three while the apostles lived—apostles, presbyter-bishops, and deacons; and three appointed for the Church permanently—bishops, presbyters, and deacons; that the New Testament interchange of "bishop" and "presbyter" ceased at the death of the apostles, the name apostle was used only for the Twelve, and the title bishop was appropriated to those whom the apostles had appointed to take their places as overseers of the churches and to inherit all that was possible of their office, or to those who with the apostolic sanction were chosen by the board of presbyters as their presiding officers; that bishops were always presbyters, and something more; that the power to ordain and confirm belongs alone to the bishops; that the three orders must have been appointed, or at least sanctioned, by Christ and the apostles, for the system appears fully developed in the second century; that Timothy, Titus, and others like them were diocesan bishops; that bishops, like apostles, are officers of the universal Church; that apostolic succession is that by which the apostles have transmitted their authority through an unbroken line of persons called to fill their place.

The presbyterian form rests on the parity of the clergy. It claims that there has been no continuance of an office that was from its nature for a temporary purpose; that the apostles were called to be eye and ear witnesses; that when they died their office ceased; that the titles presbyter and bishop in the New Testament both belong to the same office—presbyter is a title of age or dignity, bishop of office or duty; that every presbyter-bishop has authority to ordain, and that they are equal among themselves; that Timothy and Titus were not diocesan bishops, but representatives of the apostles for a peculiar, temporary duty, as evangelists and messengers; that if the apostles had appointed men to the diocesan episcopate, they would not have taken the inferior name of presbyter; that the true apostolic succession has been kept up through the Church

simply by the officers of one generation approving of those who were to follow; that bishop-presbyters have authority only in single churches or as their representatives; that the episcopate grew up from natural causes, without any divine institution; that the very small jurisdiction of the early bishops—as, *e. g.*, in North Africa—shows that they were over parishes rather than dioceses.

Since Calvin especially, a distinction has been made between teaching and ruling elders—a difference of duties, and in some sense of dignity, but not of authority. It rests on the New Testament distinction between "governments," "ruling," etc., and other gifts, and between those who (1 Tim. v. 17) "rule well" and those who "labor in word and doctrine;" though this may refer to the distinction not between those who rule and those who teach, but between those who are zealous and those who are not, the emphasis being on the word *labor*.

(See Schaff's and Neander's *Church Histories;* Hooker's *Works;* S. Miller, *Letters concerning the Constitution and Order of the Christian Ministry*, and *Presbyterianism the truly Primitive and Apostolical Constitution of the Church of Christ;* G. T. Chapman, *Sermons upon the Ministry, Worship, and Doctrines of the Protestant Episcopal Church; Commentaries on Phil. i. 1*, and *The Pastoral Epistles;* Prof. R. D. Hitchcock, *Origin and Growth of Episcopacy*, *Amer. Pres. and Theol. Rev.*, 1867, p. 133.) ISAAC RILEY.

Presbyte′rian Church. I. *Name.*—The distinctive title "Presbyterian," as descriptive of one division of the Church of God, is derived from the Greek word Πρεσβυτέριον, used in both the Septuagint and the New Testament to designate a body of officers to whom was committed the government of the Church. At its earliest appearance in the Septuagint the term is used to designate a council of elders, as, *e. g.*, in Lev. iv. 15, where is recorded a direction to the "elders of the congregation," as representing the people, to "lay their hands upon the head of the bullock before the Lord." In later writings the term is used to designate the officers of the synagogue. The title and the duties it implies were retained under the new dispensation, as the Christian Church was the outgrowth of the Jewish. Hence the name is the key to the system.

II. *Constitution.*—The visible Church is held to be an organized association of the people of God. Every such association must have its official representatives; and since an ecclesiastical organization is of necessity widespread, it must provide both for particular congregations and for congregations as related to each other. In the Presbyterian Church, as it now exists, a particular congregation is generally organized by some recognized authority, but is complete in itself. It elects its own officers, which are—(1) a pastor, (2) a bench of elders, (3) a board of deacons. A pastor, once elected, is installed by the ecclesiastical body called presbytery, with which the congregation is connected. In case no pastor is installed, an ordained minister may have charge of the congregation, subject to the oversight of the presbytery. The elders are elected by the people and ordained by the presiding minister or by presbytery. To them is committed the spiritual oversight and government of the congregation. Their number is determined by the wishes of the people; it is seldom less than three or greater than twelve. The *office* is for life, but in some congregations the term of active service is limited by vote. The board of deacons is also elected by the congregation, and its members are "set apart" by solemn ceremony, as are the elders. Their duty is to care for the poor of the congregation and for such temporal interests as may be committed to them. They have no governmental control. In many congregations in America pecuniary affairs are managed by a board of trustees, also elected by the people, but not ordained. In Scotland and in some parts of the U. S. the duties of trustees are discharged by the deacons; this is, in fact, most harmonious with the constitution of the Church. Governmentally, there are in the Presbyterian body four "judicatures," styled in order the session, the presbytery, the synod, and the General Assembly. The *session* consists of the bench of elders above described. Of this judicatory the pastor or minister in charge is *ex-officio* a member and its moderator. The *presbytery* consists of all the ministers or "teaching elders" (as they are sometimes distinctively called) and one "ruling elder" from each congregation in a limited district. Each minister in that district is, if received by vote, a permanent member of the presbytery. The ruling elders act at particular meetings, being elected by the sessions for that purpose. The duties of this body are "to receive and issue appeals from church sessions and references brought before them in an orderly manner; to examine and license candidates for the holy ministry; to ordain, install, remove, and judge ministers; to examine and approve or censure the records of church sessions; to resolve questions of doctrine or discipline seriously and reasonably proposed; to condemn erroneous opinions which injure the purity or peace of the Church; to visit particular churches for the purpose of inquiring into their state and redressing the evils that may have arisen in them; to unite or divide congregations at the request of the people, or to form or receive new congregations; and in general to order whatever pertains to the spiritual welfare of the churches under their care." (*Form of Gov.*) The *synod* consists of all the ministers and one elder from each congregation within a larger district, which must embrace at least three presbyteries. It stands to the presbyteries within its bounds in the same relation as each presbytery stands to its churches. It is empowered to receive and issue appeals from the presbyteries, to examine their records, to form or divide or unite these lower bodies, and generally to take proper oversight of presbyteries, sessions, and people under their care. The *General Assembly* consists of an equal delegation of ministers and elders from each presbytery. For the proportion and the functions of this judicatory see GENERAL ASSEMBLY.

Thus, the constitution of the Presbyterian Church is seen to be based upon the principle of representation. The will and the rights of the people are respected and guarded throughout. As related to the Church at large, the duties committed to the presbytery are the most important of all, yet they are duties in which each congregation and, representatively, each member of the Church has a share. The analogy between the constitution of the Presbyterian Church and that of the Jewish Church is evident. It is much closer than that of flower to seed. The Jewish synagogue had its rabbi, corresponding to the "minister" of to-day. It had its bench of elders, who watched over and ruled the flock, and who, with the rabbi, formed a court with the power of discipline and excommunication. It had its lower officers, corresponding to the deacons. It also admitted the right of appeal from its decisions in certain cases to the "great synagogue" at Jerusalem. It was but natural that the Christian Church should adopt the principal ideas of that church order to which it succeeded.

III. *History.*—Conformably to the view just stated, the history of the Presbyterian Church begins even before the apostolic age. The congregations of the apostolic Church were organized associations of the people of God, now assuming the title of Christians. The officers of these congregations were ordained elders. Appeals went up from one body of ecclesiastical rulers to another. Ordinations to the ministry, as in the case of Timothy, were performed by the "laying on of the hands of the presbytery." The whole visible Church was regarded as one body, and the decrees of the assembled apostles and elders at Jerusalem were, when sent down to the congregations, received as authoritative. It is claimed but by few that the present order of the Presbyterian Church is *precisely* that of the apostolic age; few claim a *jure divino* authority for the system; yet its principles are believed to have undergone little change. It is difficult to trace the historic line of development from the apostolic age downward. It is, however, well known that the Church of the Waldenses is very ancient, and has been from the first a Presbyterian body. The line does not, however, become distinct until we reach the Reformatory period of the sixteenth century. Modern Presbyterianism dates in Switzerland from the time of John Calvin, and in Scotland from that of John Knox. It can be shown that "all the Reformed churches in France, Germany, Holland, Hungary, Geneva, and Scotland were thorough Presbyterians, not only in principle, but also in practice." The Presbyterian Church became fully established in Scotland in 1560, when the first General Assembly was held. Since that period, in fact, the Presbyterian Church in Scotland has held the same relation to the state that the Episcopal Church has held in England since the reign of Henry VIII. It has, however, been divided into groups by subsequent events. In 1733, during the reign of Queen Anne, an act was passed vesting in certain individuals the power to nominate pastors for vacant churches. This led to a secession from the Established Church and the formation of the "Associated Presbytery." In 1752 another secession for the same reason occurred, and the "Relief Presbytery" was organized. In 1847 these two bodies became one under the title of the "United Presbyterian Church," and consisted then of more than 600 congregations. In 1843 nearly 500 ministers of the Established Church gave up their "livings" and formed the "Free Church of Scotland." Besides these principal groups, there is at present another, known by the name of the "Reformed Presbyterian Church," and claiming to represent Presbyterianism as it was before the Revolution. The Presbyterian Church in Ireland is an offshoot from that of Scotland, but has a General Assembly of its own. In England the first presbytery was formed at Wandsworth, a village near London, Nov. 20, 1572. There are now two Presbyterian bodies in England, one of which,

bearing the general title of "Presbyterian Church of England," is self-governed, but affiliated with the Free Church of Scotland; whilst the other, the "United Church," is a branch of the United Presbyterian Church of Scotland. Steps have been taken to make these two bodies one.

In Switzerland the Church remains substantially as it was organized by Calvin. In Germany the elements of Presbyterianism still exist in the "Reformed Church." In the Netherlands, Presbyterianism, brought from Switzerland in the time of William, prince of Orange, found a congenial soil, and at this time four-fifths of the Protestants of the Netherlands are Presbyterians. The historic members of this Church in France are the Huguenots, baptized by blood in the massacre of St. Bartholomew. In Austria, Hungary, Transylvania, Russia, many Presbyterians have found a home.

The Presbyterian Church in America owes its origin and cast principally to Scotland, although it has spread from three centres—established by the Dutch in New York, by the Scotch in Virginia, and by the Huguenots in Carolina. The first Dutch church was formed in New Amsterdam as early as 1619. Scotch Presbyterians settled on the Elizabeth River, Va., between the years 1670 and 1680. It is uncertain when their first church was formed, though it is known that a Presbyterian church was organized by Francis Makemie at Snow Hill, Md., in 1684. The Huguenots, banished from France by the Revocation of the Edict of Nantes in 1685, established their churches in this country at about this period. The first presbytery in America was formed in 1705, and was called the Presbytery of Philadelphia. The first synod, composed of four presbyteries, was formed in 1717. The first General Assembly met in Philadelphia in 1789, there being then twelve presbyteries and four synods. In 1837 the General Assembly was divided because of disagreement on certain questions of church polity and method. In 1869 the Church, thus divided, was happily reunited, and the first General Assembly of the reunited Church was held May, 1870, in the same city and under the roof of the same congregation which welcomed the Assembly of 1789. This is the outline of the history of the principal Presbyterian body in America. But, as in Scotland, there are several groups of Presbyterians in this country. At the time of our civil war the Presbyterians of the South became distinct, and, notwithstanding various overtures looking toward a reunion, so remain, having a large and influential membership, a vigorous and active ministry. The less prominent groups are these: (1) the United Presbyterian Church, formed in 1858 by a union of two bodies of Scotch affiliations known as the "Associate" and the "Associate Reformed" churches; (2) the Reformed Presbyterian Church, whose first presbytery was formed in 1774; (3) the Associate Reformed Synod of the South, originally one of the synods of the "Associate Reformed Church," alluded to above; (4) the Cumberland Presbyterian Church, which became a distinct body in 1810, and whose field is principally in the South and South-west; (5) the Reformed (German) Church, 1819; (6) the Reformed (Dutch) Church, dating from early in the seventeenth century, and having 10,000 adherents when New York was surrendered by the Dutch to the English. It has many strong congregations and two colleges and theological seminaries. All these different groups are practically one in doctrine and in polity. In the Dominion of Canada, Presbyterianism has had, until recently, more of a colonial character. A synod in connection with the Church of Scotland was formed about the year 1830. In 1861 the Canada Presbyterian Church was formed by a union of bodies representing the Free and the United churches of Scotland. Its first General Assembly was held in 1870. There has been also a separate synod in Lower Canada, but in May, 1875, these bodies were happily united, so that there is now but one Assembly. The united Church has 700 ministers and 1000 congregations.

IV. *Doctrines.*—These are practically embodied in the standards adopted by the famous Westminster Assembly, convened in London 1643 by order of the British Parliament. As to their local coloring, they are Calvinistic. Their principal points are: (1) God in three Persons, Father, Son, and Holy Ghost, these three "the same in substance, equal in power and glory." (2) Man morally depraved by nature. (3) Jesus Christ an atoning Saviour. (4) Justification by faith in the Redeemer. (5) Regeneration and sanctification by the Holy Ghost. (6) Eternal happiness in the other world for "believers," eternal suffering for the finally impenitent. (7) God in all his acts and purposes, including those of "election," sovereign—man in all his acts free. To the articles of the "confessions" of the various branches of the Church all officers are required to subscribe at their ordination. Nothing, however, is usually required for membership in a particular congregation except repentance from sin, faith in the Lord Jesus Christ, and an unreserved consecration to God. Thus, whilst this Church is strict in its instructions, it is one of the most liberal of all in its conditions of Christian fellowship.

V. *Federal Relations.*—In 1872 a movement was made in this country toward bringing the scattered families of Presbyterianism into at least a federative union. This movement was responded to in other lands. The result was a council held in London July, 1875, to agree upon a constitution of confederation, the first meeting of said confederation to be held at Edinburgh in 1876 or 1877. This union, wisely formed and heartily sustained, is expected to promote in a great degree the fellowship and the efficiency of the Church throughout the world.

VI. *Statistics.*—Rev. J. M. Porteous, author of a prize essay on *The Government of the Kingdom of Christ* (Edinburgh and London, 1873, 2d ed.), gives the following:

National branches.	Churches.	Ministers.	Members.	Population adherent.
Scotland	2,711	2,841	843,455	3,218,613
England	1,268	1,017	135,037	664,685
Ireland	566	656	116,656	558,238
America, U. S.	9,163	8,235	857,461	3,050,714
Canada	651	604	65,203	471,946
West Indies, etc	54	27	5,188	20,752
Africa, W. and S.	228	198	17,803	71,212
Australia	418	330	38,661	177,922
China and Japan	20	62	1,418	2.000
India	37	114	1,836	11,145
Syria	5	17	50	500
Belgium	10	10	500	12,500
Holland	1,826	1,826	2,096,146	2,100,000
Scandinavia	....	....	3,030	
Austria	2,050	2,050	1,912,153	2,000,000
Italy, Spain, etc	50	50	1,000	3,000
Russia				
France	1,060	721	630,000	1,000,000
Switzerland	....	....	1,567,003	1,567,003
Germany	....	....	18,415,876	18,900,000
Piedmont	16	16	26,920	30,000
Total	20,133	18,774	26,735,396	33,860,230

The following table will show the relative strength of the different families of the Presbyterian Church in America in the year 1874:

Churches.	Communicants.
Presbyterian Church in the U. S. (Northern)	495,634
Presbyterian Church in the U. S. (Southern)	109,956
Cumberland Presbyterian Church	99,832
United Presbyterian Church of North America	73,452
Synod of Reformed Presbyterian Church, O. S.	9,725
General Synod of Reformed Presbyterian Church, N. S.	8,487
Associate Reformed Presbyterian Church of the South	5,758
Welsh Presbyterian Church	9,101
French Evangelical Church	——
Canada Presbyterian Church	49,315
Church of Scotland in Canada and Lower Provinces	21,786
Presbyterian Church of Lower Provinces	18,802
Reformed Church in the U. S. (German)	134,792
Reformed Church in America (Dutch)	64,150

Z. M. HUMPHREY.

Presbyterianism. See PRESBYTERIAN CHURCH.

Pres'cot, town of England, in Lancashire, has manufactures of watches, watch-tools, files, and pottery. P. 6066.

Pres'cott, county of E. Ontario, Canada, bounded on the N. by Ottawa River and on the E. by the province of Quebec. It is associated with Russell co. for judicial purposes. Area, 475 sq. m. Cap. L'Orignal. P. 17,647.

Prescott, port of entry of Grenville co., Ont., Canada, on the St. Lawrence, opposite Ogdensburg, N. Y., with which it is connected by steam ferry-boats. It is on Grand Trunk Railway, 112 miles above Montreal, just above the junction of St. Lawrence and Ottawa Railway, of which the extensive car and locomotive works are situated here. Prescott has an active trade and 1 newspaper. Fort Wellington, a British fort, is near by. P. of sub-district, 2617.

Prescott, p.-v., cap. of Yavapai co., Ara., the military head-quarters of the State, has a fine public school, 1 church, and 1 newspaper. Principal occupation, gold and silver mining and grazing. P. 668.

T. J. BUTLER, ED. "WEEKLY MINER."

Prescott, p.-v. and tp., Hampshire co., Mass., on Athol and Enfield R. R. P. 541.

Prescott, v. and tp., Faribault co., Minn., on Southern Minnesota R. R. P. 532.

Prescott, p.-v., Pleasant Valley tp., Pierce co., Wis., 25 miles below St. Paul, at the confluence of Lake St. Croix and Mississippi River, has a graded school, 5 churches, 1 bank, 1 newspaper, 3 hotels, and several mills. P. 1138.

M. B. KIMBALL, ED. "CLARION."

Prescott (Oliver), M. D., b. at Groton, Mass., Apr. 27, 1731; graduated at Harvard 1750; studied and practised medicine; was a colonel of militia before the Revolution; appointed brigadier-general for the county of Middlesex 1776, and major-general of State militia 1778; served as a member of the board of war and of the supreme executive council; was influential in the suppression of the Shays rebellion, and was judge of probate for Middlesex co. from 1779 until his death at Groton, Nov. 17, 1804.

Prescott (Oliver), M. D., son of Gen. Oliver, b. at Groton, Mass., Apr. 4, 1762; graduated at Harvard 1783; studied medicine with his father; was surgeon of the expedition against the Shays rebellion 1787; frequently a member of the legislature; settled at Newburyport 1811; obtained an extensive medical practice; published a *Dissertation on the Natural History and Medicinal Effects of the Secale Cornutum or Argot,* and contributed valuable articles to the *N. E. Journal of Medicine and Surgery.* D. at Newburyport Sept. 26, 1827.

Prescott (Richard), b. in England about 1725; served in the British army in Germany during the Seven Years' war, attaining the rank of colonel of the 7th Foot 1772; came with that regiment to Canada, where he held the local rank of brigadier-general 1773; surrendered to the American invading army on the St. Lawrence Nov. 17, 1775; was exchanged for Gen. Sullivan Sept., 1776; participated in an expedition against Rhode Island Dec., 1776; remained in command of Newport; was surprised and captured at a country-seat on the island by a party under Lieut.-Col. Barton; was exchanged for Gen. Lee; resumed the command of the Rhode Island station until the evacuation of Newport, Oct. 25, 1779; was noted for his brutal treatment of American prisoners; became major-general Aug., 1777, and lieutenant-general 1782. D. in England in Oct., 1788.

Prescott (Robert), b. in Lancashire, England, in 1725; served in the British army in the expeditions against Rochelle (1757) and Louisbourg (1758); was aide-de-camp to Gen. Jeffrey Amherst in the campaign against Crown Point and Ticonderoga 1759; was with Wolfe at Quebec; participated in the capture of Martinique 1761, in the battle of Long Island and other engagements near New York 1776, and in the battle of Brandywine 1777; was sent with Gen. Grant against the French West Indies, with the rank of brigadier-general, 1778; became major-general 1781, lieutenant-general 1793; captured in 1794 the islands of Barbadoes and Guadaloupe, of which he became civil governor; succeeded Lord Dorchester as governor of Lower Canada 1796; was recalled 1799, and became full general 1798. D. near Battle, Sussex, England, Dec. 21, 1816.

Prescott (William), brother of Gen. Oliver, b. at Groton, Mass., Feb. 20, 1726; served in the expeditions against Cape Breton (1754) and Acadia (1756), attaining the rank of captain; became a farmer in the town of Pepperell, where he inherited a considerable landed estate; commanded a regiment of minutemen 1775; took part in the battle of Lexington, and commanded in that of Bunker Hill (according to the usual account); resigned from the army 1777, but took part as a volunteer in the campaign against Burgoyne in the same year, and sat in the Massachusetts legislature for several years. D. Oct. 13, 1795.

Prescott (William), LL.D., son of Col. William, b. at Pepperell, Mass., Aug. 19, 1762; graduated at Harvard 1783; taught school for some years; studied law at Beverly with Nathan Dane; settled at Salem; served in both houses of the legislature; twice declined a seat on the supreme bench of Massachusetts; removed to Boston 1808; was a delegate to the Hartford Convention 1814; a member of the governor's council for some years; judge of common pleas for Suffolk co. 1818; a member of the State constitutional convention of 1820. D. at Boston Dec. 8, 1844.

Prescott (William Hickling), D. C. L., son of Judge William and grandson of Col. William, the hero of Bunker Hill, b. at Salem, Mass., May 4, 1796; removed to Boston 1808; prepared for college at the private classical school kept by Rev. Dr. J. S. J. Gardiner; entered Harvard College as a sophomore 1811; suffered in the following year an injury to his left eye which rendered his subsequent studies through life a matter of extreme difficulty and delicacy; graduated 1814, taking high rank in classics and in general literature; spent several months (1815–16) at St. Michael's in the Azores Islands with his maternal grandfather, whose name he bore, who was U. S. consul on that island; visited England, France, and Italy 1816–17; founded a literary and social club at Boston (June, 1818), for which he edited several numbers of a short-lived periodical, *The Club-Room* (Feb.–July, 1820); married Miss Susan Amory May 4, 1820; devoted several years to an elaborate course of study of ancient and modern history and literature, performed with the disadvantage of being able to use his eyesight but a short time daily, and being therefore forced to employ a reader; published in the *North American Review,* as fruits of his researches, several elaborate and well-written studies upon Italian and French poetry and romance; selected Jan. 19, 1826, the subject of his first historical work, to which (residing alternately at Boston, Pepperell, and Nahant) he gave the patient labor of ten years, procuring from Spain extensive materials, both printed and in MS.; published Dec. 25, 1837 (dated 1838) his *History of the Reign of Ferdinand and Isabella, the Catholic* (3 vols.), which was soon translated into French, Spanish, Italian, German, and Dutch, and recognized both at home and in England as the most meritorious historical work produced in the U. S.; added to his reputation by the *History of the Conquest of Mexico* (3 vols., 1843), a brilliant work which had a popularity even greater than its predecessor; completed his cycle of Spanish-American history by the *Conquest of Peru* (3 vols., 1847); published a volume of *Biographical and Critical Miscellanies* (1845); was welcomed with great distinction by the literary circles of London, Edinburgh, Paris, Brussels, and Antwerp in the summer of 1850, receiving the degree of D. C. L. from Oxford University; published 2 vols. of a *History of the Reign of Philip the Second* in 1855, and a third in 1858; edited Robertson's *Charles the Fifth* in 1857, with a supplement on the life of the emperor after his abdication; and was actively at work upon his *Philip the Second,* which was intended to comprise 6 vols., when his labors were cut short by death at Boston Jan. 28, 1859. He had also written brief biographies of his friends John Pickering and Abbott Lawrence. A new edition of his complete works, superintended by his last secretary, John Foster Kirk, was published at Philadelphia in 1874–75 in 15 vols. By general consent, Prescott is associated with Irving at the head of the American authors of the nineteenth century, yet so diffident was he in regard to his literary merits that, although he had printed for his own convenience four copies of his *Ferdinand and Isabella,* he long hesitated to give it to the public, and was induced to publish only by the earnest solicitations of his friends, chief of whom through most of his life was the historian of Spanish literature, George Ticknor, author of the *Life of W. H. Prescott* (1864). Prescott's relations with Irving and Motley in regard to a possible competition in the same historical field were highly creditable to him and to them, Mr. Irving having abandoned in his favor a projected history of the conquest of Mexico, and Mr. Motley having received from Prescott substantial encouragement to prosecute his *Rise of the Dutch Republic,* notwithstanding the close relations of that subject with the history of Philip II. In private life Prescott is represented as one of the most lovable of men, and few have had such attached friends. The difficulties under which he labored from impaired eyesight, and the necessity of writing with his curiously-contrived "noctograph," furnish a strong title to the admiration and affectionate interest of his countrymen. (See the *Proceedings of the Massachusetts Historical Society in Memory of W. H. Prescott,* Boston, 1859, and for literary criticism the able and elaborate article in S. A. Allibone's *Dictionary of Authors.*) Porter C. Bliss.

Prescrip'tion [Lat. *præscriptio*], in law. In its widest sense this term denotes the acquisition of property in any kind of subject-matter by use and the lapse of time, but in the English and American law it is confined to such acquisition of incorporeal rights and interests—those denominated by Blackstone incorporeal hereditaments. This method of acquiring property is recognized by every enlightened system of jurisprudence, and is based upon the plainest principles of public policy. It was found in the Roman law as early even as the Twelve Tables, which fixed the lengths of time that must elapse at one year for movables, and two years for immovables; but these periods were gradually increased until, in the codification of Justinian, they were established at three and thirty years. In accordance with the doctrines of the common law, incorporeal hereditaments alone could be acquired by prescription, and they embraced all those interests which are said to issue out of land, the most important being rents, commons, and the numerous class of rights to the use of land and water which are now termed "easements." The theory maintained by the old judges based the notion of prescription upon the assumption that a grant had once been made and lost; and this particular species of conveyance was confined to the class of incorporeal interests and estates above mentioned. The theory itself was undoubtedly a mistaken one, but it explains the limitations which the ancient law placed upon this mode of acquiring property. To constitute a legal prescription several elements are requisite, and these relate both to the nature of the user and to the length of time during which it has continued. In the first place, the user of the right or interest in ques-

tion must have been open, notorious, peaceable, and adverse—that is, under a claim of right, and not in subordination to the right of the one who owns the soil. In the second place, this user by the claimant himself, his ancestors, or predecessors, must, at the common law, have been for a period of time beyond the memory of man, or, in the language of the old books, it must have lasted for a time "whereof no memory is to the contrary." This rule did not imply that the claimant must actually prove so long an enjoyment; it simply required the jury to find the existence of such fact, which they might do from a user lasting for a comparatively few years only if there was no evidence to the contrary. Modern statutes have changed this provision of the English law, and have established the period of thirty years as the duration of the adverse enjoyment which shall ripen into an absolute right. The same doctrine of prescription has been adopted in all its essential features by the several States of this country. The only material change is in the length of time during which the adverse user and enjoyment must continue in order that the title shall become perfect; and this has generally been fixed by statute, in analogy with the period required for acquiring an estate in lands by adverse possession, at twenty years. The title to an easement or other incorporeal right acquired by prescription is, from the very nature of the case, an absolute one, corresponding to the estate in fee arising from an adverse possession of lands continuing for the number of years fixed upon by statute. JOHN NORTON POMEROY.

Prescription [Lat. *præ*, "before," and *scribere*, to "write"], in medicine. A prescription is a written formula for the compounding and dispensing of medicines. Previous to the present century physicians dispensed their remedies, and the prescription was chiefly a record for the guidance of an assistant, who performed the manual work, and for the preservation of valuable or standard curative combinations. But with the separation as distinct vocations of physicians and apothecaries the prescription has become the medium of communication between them, the written instructions of the former to the latter. The ingredients of a prescription are necessarily designated in Latin; inasmuch as both the nomenclature of botany and of chemistry predetermines the names of vegetable and mineral remedies in that language, their technical names are the only ones by which they can be definitely known and correctly prepared. The enumeration of the several articles is preceded by the symbol ℞, an abbreviation of Lat. *recipe* ("take"). This symbol has also been regarded as a modification of the sign ♃, the symbol of Jupiter, with which the ancients prefaced their prescriptions to propitiate the gods and ensure a favorable action of their drugs. The several component parts of a prescription should be enumerated in the order—(1) of their chemical relation and pharmaceutical combination; (2) with reference to the object sought by each. The chief therapeutic or remedial agent should be prominent; co-operating remedies and those producing other and secondary effects, termed *adjuvantia*, receive the second position; articles intended to modify or correct the action of the preceding, termed *corrigentia*, come next; and, lastly, substances liquid or solid intended to secure definite quantity or consistency, to ensure solubility and uniform subdivision of doses, and variously known as the *vehicle*, *excipient*, or *menstruum*. The latter term arose from the superstition of ancient chemists and alchemists that dissolvents acted best at the time of the lunar changes. The quantities of the components are expressed by symbols. (See PHARMACY and PHARMACOPŒIA.) The prescription terminates with the abbreviation M. of Lat. *misce* ("mix"). Appended to the prescription the physician usually adds instructions of the dose and time and method of taking. These are usually in Latin, which the apothecary translates and transcribes on the label of the dispensed medicine. But the custom is growing of restricting the use of Latin to the prescription proper, and stating the direction for use plainly in English.
E. DARWIN HUDSON, JR. REVISED BY WILLARD PARKER.

Presentation. See PURIFICATION OF THE VIRGIN.

Presentation Nuns, an order of Roman Catholic ladies devoted to the work of instructing poor children and to the care of aged women. They were first established in 1777 at Cork, Ireland, by Honora Nagle (1728–84); received papal approbation 1791; were cloistered 1805; first came to the U. S. in 1854; have more than 50 houses in Ireland.—There is also an order of religious of the PRESENTATION OF MARY, whose mother-house is at Bourg in the diocese of Viviers, France. Its especial work is the education of young ladies. It has houses in Canada.

Preserva'tion of Food is an art which in modern times has received an immense development by the invention of more appropriate methods. Drying, salting, and smoking were the oldest methods known to mankind by which flesh and fish were preserved; to fruits were first applied the methods of drying and making into preserves, either jellies or jams. Pickling—that is, cooking and then immersing in some liquid which prevents fermentation and decomposition—seems to be of a more recent date; fruit was generally kept in brandy; flesh in a strong brine mixed with vinegar; fish in olive oil or melted lard. Pickling with vinegar was for a long time the only method by which vegetables, such as cucumbers, cabbages, etc., were preserved. The two methods which at present have acquired great commercial importance are those of canning and freezing. By the former, articles of food, flesh, fish, fruit, and vegetables, are prepared for eating in different ways, and then packed in air-tight cans; by the latter, they are kept in refrigerators at a temperature either below the freezing-point or a little above it. Both methods have been applied with great success, given rise to an immense trade, and conferred innumerable benefits on mankind, and yet they both seem capable of further development.

Preservation of Timber. No subject connected with national economy needs, and should have at this time, more earnest and anxious attention than this. The rate at which the forest-lands of America are denuded and the rapid rise in cost of timber are subjects which cannot be viewed without great and reasonable alarm by any one having an interest in or a regard for the future of the American people. All successful and efficient devices for rendering timber more durable are positive aids in arresting the progress of this wasting malady—remedies which, if they can be applied on a scale sufficiently large and wide, may even work an absolute cure. It is therefore greatly to be desired that the American people should sufficiently awaken to the vital importance of this great public matter to lead to some adequate provision for its *public* investigation. Hitherto, it has been left altogether in the hands of speculators in patent rights, with the natural result of great public dissatisfaction, discouragement, and even occasional skepticism as to the utility—or, at any rate, the economy—of chemical preparation of wood for the attainment of durability. It is certain, however, that the employment upon this problem of an adequate amount and quality of disinterested scientific skill and labor would tell a different tale. The complete preservation, even for centuries, of woods of a quite perishable kind, through accidents of nature, is among the familiar facts. But the resources of chemical science are nearly as wide as those of Nature herself, and accidental conditions, *if thoroughly understood*, may be reproduced and made perpetual.

Decay of wood proceeds from agencies both internal and external. *Cellulose*, which constitutes the great bulk of woody tissue, is by itself an exceedingly imperishable substance, but appears, when in contact with fermenting or putrefying nitrogenous matters, to be capable of entering into decomposition like its isomeres and congeners sugar and starch, forming humus-like substances, devoid of coherence. (See HUMUS.) The ferments in this case are the albuminoid matters, chiefly LEGUMINE (which see), which exist in the wood. It is evident that these should not enter into fermentation or putrefaction if perfectly devoid of moisture, and hence *perfect* seasoning of the wood is a powerful preservative. This process, however, is exceedingly consumptive of time and expensive; being nugatory, moreover, in case the wood is to be exposed to moisture. It has been thought that this internal destructive agency is best antagonized by the use of chemical agents which combine with the legumine and form imputrescible compounds. Other internal destructive agencies arise from the eggs of insects deposited in the wood or under the bark. This may be sometimes, though not always, remedied by stripping off the bark; impregnation with agents poisonous to the destroying worms is surer. External destructive agencies are many, the most powerful being when the wood is exposed to simultaneous action of air and moisture, which engender and foster a number of destructive processes. Under sea-water, and between high and low tide, the *teredo* is another destructive agent. In tropical countries *ants* are enemies of timber structures. Contact with *iron* also destroys cellulose rapidly, through a slow combustion set up between the carbon of the cellulose and the oxygen of ferric oxide.

Our scope allows little more than a brief statement of a few of the more prominent methods of treatment for rendering wood durable that have been practised and met with more or less approval. First among these we may allude to

The Method of Kyan.—Impregnation with a solution of *corrosive sublimate*, bichloride of mercury. This was the first method experimented with in the U. S., and great expectations were entertained regarding it. It is founded on the known property of corrosive sublimate to form insol-

uble compounds with albuminoid bodies. According to Col. Cram, U. S. engineers, kyanized railroad ties of chestnut, laid in 1838 near Baltimore, were sound after eleven years, the same untreated having rotted in seven years; but he also states that kyanized Michigan white oak ties had rotted after twenty years. It appears, therefore, that moisture probably removes the corrosive sublimate in time. It is stated, moreover, that the men employed in the operation became salivated, and the process has now been generally condemned.

The Methods of Boucherie.—Impregnation with *sulphate of copper*, also with *chloride of calcium.* Sulphate of copper has much preservative power, and is cheaper and far less dangerous to handle than corrosive sublimate. It is, however, removed gradually from the wood by moisture. Chloride of calcium renders the wood *fire-proof*, adding also great strength and toughness. The latter substance has never been sufficiently or fairly experimented with, considering its cheapness and the enormous advantages it holds out. Dr. Boucherie was also the author of a method of making the preservative liquids penetrate the tree while still standing. Notches are cut in the trunk near the roots, and caoutchouc bags holding the solutions bound on. The tree sucks up the liquid through the evaporation from the leaves above.

The Method of Burnett.—A solution of *chloride of zinc.* This agent, like *corrosive sublimate*, operates by combining with the fermentescible albuminoids, but is much cheaper and not noxious. It has come into use in the U. S. much more largely than any other, and large establishments exist for "burnettizing" timber, as it is called. For many uses burnettized timber is no doubt very valuable.

The Method of Bethell.—The impregnation of the wood with heavy oils of coal-tar, called in England "creosote oil"—in the U. S. "dead oil." This method has been largely used in Europe, and apparently with much success, even against the salt-water *teredo*, which other methods do not resist. The oil was forced into the pores of the timber in a strong receiver by a pressure of 13 or 14 atmospheres.

The Method of Seeley.—This is an improvement on that of Bethell, of American origin. Considering the fact that Bethell's mode of operation must necessarily be uncertain and imperfect by reason of the air and moisture remaining in the pores of the wood, Dr. Charles A. Seeley of New York devised the following method: The wood is immersed in the oil—a crude *carbolic acid* being used, which is believed to be much more efficient than the common dead oil —in a closed tank, and the temperature raised to 300° F. The air and moisture are thus expelled from the timber, which is then suddenly introduced into a bath of *cold* carbolic acid. By this very ingenious process an absolute impregnation is accomplished. This method has been employed in this country since 1868 on the St. Clair Flats Ship Canal, Mich., and elsewhere.

There are numerous other methods; indeed, it would be difficult to mention any cheap chemical agent which *has not* at some time or other been proposed for the preservation of wood. Our knowledge of the whole subject remains, nevertheless, largely empirical; and, as before remarked, it is more than time that a great and systematic scientific investigation were entered into which shall exhaust the subject of wood-preservation, and reduce it to one of the established arts of civilization, which may then be so regulated and enforced by legislation as to control that fatal consumption of our forest treasures which now rages throughout the land. HENRY WURTZ.

Presho, county of S. Dakota. Area, about 1600 sq. m. It has Missouri River on the N. E. boundary, and is intersected by Medicine Creek and White River. It was formed since the census of 1870.

President. See CONSTITUTION OF THE UNITED STATES.

Pres'ident, p.-v. and tp., Venango co., Pa., on Allegheny River and Oil Creek and Allegheny River R. R. P. 618.

Presi'dio, county of W. Texas, bounded on the S., and partly on the W. and E., by the Rio Grande, which separates it from Mexico. Area, 9000 sq. m. It is dry and mountainous, and affords pasturage for stock where there is sufficient water. Gold-quartz and copper ores have been observed, but the resources of the county are but little developed. Cap. Fort Davis. P. 1636.

Presidio del Norte, v. (PRESIDIO P. O.), Presidio co., Tex., on the Rio Grande, opposite the fort of the same name in Chihuahua, Mexico. P. 439.

Presque Isle, county of Michigan, bounded N. E. by Lake Huron. Area, 640 sq. m. It is densely timbered, and has been but recently settled. Cap. Rogers City. P. 355.

Presque Isle, p.-v., Aroostook co., Me., 40 miles N. W. of Houlton, has an academy, 3 churches, 2 newspapers, 1 grist and 1 saw mill, 1 steam shingle-factory, and a starch-factory. P. 970. DANIEL STICKNEY, ED. "SUNRISE."

Presque Isle, v., Rogers tp., Presque Isle co., Mich., on Lake Michigan, has a lighthouse. P. 66.

Press. See PRINTING, by W. S. PATERSON.

Pressensé', de (EDMOND), D. D., b. at Paris Jan. 7, 1824; was educated in Paris, Lausanne, Halle, and Berlin; became pastor of the chapel Taitbout, Paris (Evangelical or Independent Protestant), 1848; received the doctor's degree from Breslau 1863; an eloquent and earnest preacher, his whole energies have been devoted to the maintenance of the freedom of the Church from state interference and from dependence upon state aid, and to the presentation of Christianity as the means of solving the important moral and social questions of the day. After the proclamation of the Republic he was elected a member of the French Assembly, and was a strong supporter of Thiers. Among his principal works are *Conférences sur le Christianisme dans son Application aux Questions sociales* (1849), *Catholicisme en France* (1851), *Histoire des Trois Premiers Siècles de l'Église* (1858–61), *L'Église et la Révolution française* (1864), *Jésus Christ, son Temps, sa Vie, etc.* (1866).—His wife, a Swiss lady, is the author of several religious and educational works. Several of M. de Pressensé's volumes have been translated into English.

Press, Freedom of the, liberty of publication unrestrained by any official authority. As it is necessary, however, that this liberty of publication, like any other liberty, shall be followed by a corresponding responsibility, certain regulations must be provided for, such as the placing of the name and residence of the printer, publisher, or author on any publication; but such regulations, so long as they are laid down only for the purpose of establishing the necessary responsibility, while the definition and application of this responsibility are left to the decision of public opinion and its legal organs the courts, do not affect the freedom of the press. Formerly, however, it was thought necessary to define by law the responsibility of publication by excepting certain subjects altogether from public discussion, and to subject all works before publication to the inspection of a censor. The pope was the first inventor of such an instrument, and the Inquisition and the Jesuits the first to handle it. In 1496, Alexander VI. established a regular censorship. In 1515, Leo X. increased its power and enlarged its jurisdiction. The famous *Index Librorum Prohibitorum* was sanctioned—that is, officially opened—by the Council of Trent in 1562, and subsequently continued by the papal curia. The Roman Catholic clergy developed at that time great energy in Italy, Spain, France, Germany, and England in order to suppress all free discussion of religious subjects. Cardinal Chieregati demanded of the Diet of Nuremberg in 1522 that all books published without ecclesiastical permission should be seized and burnt, and the penalties imposed for reading or owning heretical books were very severe, as the annals of the Inquisition can testify. The secular governments were not slow in following the lead of the popes, and the censorship became one of the most effective, but also one of the most fatal, means which royal power could employ to stay the movements of the people. Perhaps it was nowhere exercised with such a barbarity and arbitrariness as in England. The unfortunate writers had their right hand, their nose, or their ears cut off. But England was, nevertheless, the first country in which freedom of the press was actually established, and it is still one of the countries in which this liberty is best understood and most advantageously practised. The censorship, established by Henry VIII., was first transferred from the Star Chamber to Parliament by the Long Parliament, and then abolished by the Commons in 1693. In Germany it was introduced as a law of the empire in 1529 by the Diet of Spires, but existed only in a loose form, different states at different times—such as Prussia under Frederick the Great—being exceedingly liberal. The Congress of Vienna promised to abolish it, but the Diet of 1819 re-established it in a more stringent and rigorous form than ever. Thrown aside in 1849, it reappeared in 1854, but with the dissolution of the old *Bund* in 1866 and the establishment of the German empire in 1870 it finally vanished, though on this point the state of affairs is still somewhat unsettled. In France freedom of the press was introduced in 1793, 1814, 1830, 1848, and 1871, but restrictive measures against newspapers and pamphlets were each time found necessary after the lapse of a very short period. The only country in Europe in which a censorship still exists in full vigor, though by no means illiberal, is Russia. The Constitution of the U. S. forbids its introduction.

Pressing to Death. See PEINE FORTE ET DURE.

Prester John. See JOHN, PRESTER.

Pres'ton, town of England, in Lancashire, on the Ribble, at the head of its estuary. It is an old town, well and substantially built, but without any remarkable edifices. It is important only as a manufacturing place. Breweries, distilleries, and malting establishments, iron and brass foundries, tanneries, ropewalks, and glassworks are in operation, but the principal branch of manufactures pursued here is cotton, no less than 90 mills being in operation and employing 27,500 hands. P. 85,427.

Preston, p.-v., Waterloo tp. and co., Ont., Canada, on Galt and Guelph branch railway, 3 miles from Galt, has good water-power and building-stone, and has manufactures of various kinds. Its mineral spring is quite celebrated. P. of sub-district, 1408.

Preston, county of West Virginia, bounded N. by Pennsylvania and E. by Maryland. Area, 750 sq. m. It is traversed by Cheat River and Baltimore and Ohio R. R. It is mountainous, but very fertile. Live-stock, grain, and wool are important products; lumber and leather are the principal articles of manufacture. Coal abounds and good iron ore is mined. Cap. Kingwood. P. 14,555.

Preston, tp., Sumter co., Ala. P. 1562.

Preston, p.-v. and tp., New London co., Conn., on Thames River. P. 2161.

Preston, p.-v., cap. of Webster co., Ga. P. 186.

Preston, tp., Richland co., Ill. P. 1083.

Preston, tp., Union co., Ill. P. 629.

Preston, p.-v. and tp., cap. of Fillmore co., Minn., near Southern Minnesota R. R., has 1 weekly newspaper. P. 1498.

Preston, p.-v. and tp., Jasper co., Mo. P. 1174.

Preston, tp., Platte co., Mo. P. 1692.

Preston, p.-v. and tp., Chenango co., N. Y. P. 957.

Preston, p.-v. and tp., Wayne co., Pa. P. 1400.

Preston, tp., Adams co., Wis. P. 161.

Preston, tp., Trempealeau co., Wis. P. 955.

Preston (ALEXANDER R.), M. D., b. in Washington co., Va., Dec. 8, 1805; received his medical degree from Transylvania University, Lexington, Ky., 1827; first practised at Bellefonte, Ala.; then returned to Virginia, and settled in Abingdon; subsequently attended lectures in both the University of Pennsylvania and Jefferson Medical College, Philadelphia; also represented his county in the legislature, and was president of the Abingdon Medical Society at his death, Mar. 5, 1874. PAUL F. EVE.

Preston (ISAAC TRIMBLE), b. in Virginia in 1793; graduated at Yale College 1812; studied law under Judge Tapping Reeve at Litchfield, Conn., and under William Wirt; was a captain in the war with England; became an eminent lawyer at New Orleans, La., and a judge of the supreme court of Louisiana. D. at New Orleans, from the effects of a steamboat accident on Lake Pontchartrain, July 5, 1852.

Preston (JAMES P.), b. in Virginia in 1775; studied 1790–95 in William and Mary College; became colonel 12th Infantry 1812; colonel 23d Infantry 1813; was disabled for life at Chrystler's Field by a wound; governor of Virginia 1818–19; long the postmaster of Richmond, Va. D. at Smithfield, Va., May 4, 1843.

Preston (JOHN S.), b. near Abington, Va., Apr. 20, 1809, brother of W. C. Preston; studied at Hampden-Sidney College, the University of Virginia, and the Cambridge (Mass.) Law School; married a daughter of Gen. Wade Hampton 1830; became a wealthy planter and leading orator of the extreme States Rights school, residing chiefly in Columbia, S. C.

Preston (MARGARET **Junkin**), b. about 1835, daughter of Rev. George Junkin, and wife of Col. J. T. L. Preston, professor in the Virginia Military Institute, is author of *Silver Wood, a Book of Memories* (1856), *Beechenbrook, a Rhyme of the War* (1866), *The Young Ruler's Question* (1869), and other writings in prose and verse, chiefly upon topics connected with the civil war. Her translation of the *Dies Iræ*, which appeared in 1855, has been highly commended.

Preston (THOMAS SCOTT), b. at Hartford, Conn., July 23, 1824; graduated at Trinity College, Hartford, 1843; entered the Protestant Episcopal ministry 1846; became a Roman Catholic 1849, a priest 1850; was appointed vicar-general and chancellor of the diocese of New York and parish priest of St. Anne's, New York; author of *Ark of the Covenant* (1860), *Life of St. Mary Magdalene* (1861), *Sermons for the Seasons* (1864), *Life of St. Vincent de Paul* (1866), *Christian Unity* (1866), *Purgatorian Manual* (1867), *Reason and Revelation* (1868), *Christ and the Church*, etc.

Preston (WILLIAM), b. at Louisville, Ky., Oct. 16, 1816; studied at the college at Bardstown, Ky., and at New Haven; graduated at the Cambridge Law School 1838; practised law at Louisville, Ky.; served as lieutenant-colonel in the Mexican war; was a Whig member of the Kentucky constitutional convention of 1850, of the State legislature 1850–51, and of Congress 1851–53; became a Democrat on the dissolution of the Whig party; took part in the convention which nominated Buchanan for the Presidency; was minister to Spain 1859–61; endeavored to induce the State of Kentucky to secede from the Union, which object was claimed to have been accomplished by a convention assembled at Russellville; proceeded to Richmond as a commissioner to negotiate the admission of Kentucky into the Southern Confederacy; became a brigadier-general in the Confederate army and aide-de-camp to his brother-in-law, Gen. A. Sydney Johnston; participated in the battle of Shiloh and in Bragg's invasion of Kentucky.

Preston (WILLIAM BALLARD), b. in Virginia about 1810; was a Whig member of Congress 1847–49, secretary of the navy in the administration of Pres. Taylor 1849–50, and a senator in the Congress of the Confederate States. D. in Montgomery co., Va., Nov. 14, 1862.

Preston (WILLIAM CAMPBELL), LL.D., b. at Philadelphia Dec. 27, 1794, son of Hon. Francis Preston of Virginia; graduated in 1812 at the South Carolina College; studied law under William Wirt and in Edinburgh; came to the bar in 1820, and in 1822 settled at Columbia, S. C.; entered Congress in 1824; U. S. Senator 1834–42; president of South Carolina College 1845–51; founder of the Columbia Lyceum; an able parliamentarian, legislator, and public speaker, and long a prominent expounder of free trade and the States Rights doctrine. D. at Columbia, S. C., May 22, 1860.

Preston (WILLARD), D. D., b. at Uxbridge, Mass., May 29, 1785; graduated at Brown University 1806; practised law several years at Providence; afterward studied for the ministry; was pastor of a Presbyterian church at St. Alban's, Vt., 1811–16, at Providence 1816–20; became president of the University of Vermont 1825; removed to Georgia for his health 1829; preached for a time at Milledgeville and other towns; became in 1831 pastor of a church at Savannah, where he remained until his death, Apr. 26, 1856.

Prestonburg, p.-v., cap. of Floyd co., Ky., on W. fork of Big Sandy River. P. 179.

Preston Corners, v., Preston tp., Chenango co., N. Y. P. 102.

Preston Hollow, p.-v., Rensselaerville tp., Albany co., N. Y. P. 284.

Preston Lake, tp., Renville co., Minn. P. 198.

Prestonpans', v. in Haddingtonshire, Scotland, is famous as the place where, on Sept. 21, 1745, the Pretender routed the royal troops under Cope.

Pres'tonville, v., Carroll co., Ky. P. 239.

Prestwich (JOSEPH), F. R. S., b. at Clapham, near London, England, Mar. 12, 1812; educated at University College, London; engaged in business pursuits in that city, but devoted much time to geological researches; was the first to show on geological evidence the contemporaneousness of man with the fossil Mammalia; received medals from the Geological Society 1849, the Royal Society 1865, and the Institute of Civil Engineers for his contributions to science published in their respective periodicals; has been repeatedly appointed by the government on scientific commissions; was president of the Geological Society 1870–72, vice-president of the Royal Society 1870–71, and became professor of geology at Oxford University June 29, 1874.

Presump'tions [Lat. *præsumptio*], in law. In its technical sense, as a word of legal nomenclature, this term denotes the inferences or conclusions that particular facts exist or have existed, derived by the law—that is, by force of a legal rule—from the existence of certain other facts which have been established in an independent and satisfactory manner; if the existence of facts *a* and *b* has been sufficiently proved by ordinary evidence, and the law, as a consequence thereof, and without the aid of any further proof, thereupon infers that facts *c* and *d* also exist, this conclusion is a presumption. The presumptions contained in our law are based partly upon the general experience of mankind, and partly upon motives of public policy; and their admission is absolutely necessary to an orderly and enlightened administration of justice. It is plain from the foregoing definition that the phrase "presumptions of fact," which is sometimes used to describe the inferences drawn from evidentiary or probative matter—not

by the operation of any legal rule, but by the ordinary processes of reasoning—is a misnomer. The very distinguishing feature in this class of cases is the absence of all presumptions; the mind is left free to act, and the reason pursues its logical methods, and thus reaches its results unaided and uncontrolled by any requirement or rule of the law. The correct classification of presumptions is twofold—"conclusive" (*juris et de jure*), and "rebuttable" (*juris, primâ facie*). Conclusive presumptions are those legal inferences from existing facts which, from motives of public policy, the law does not suffer to be contradicted or overthrown by any evidence. Rebuttable or *primâ facie* presumptions are those legal inferences drawn from existing facts which may be controverted and destroyed by opposing evidence, but which are effectual and conclusive until thus rebutted. The number of the former class is comparatively small, and the progress of the law in improvement is marked by a transformation of many conclusive into rebuttable presumptions. The number of the second class is very large, and without their existence an enlightened administration of justice would be impossible. JOHN NORTON POMEROY.

Pretender (THE OLD AND THE YOUNG), the names given by writers and other supporters of the Brunswick dynasty to the son and grandson of James II., the lineal heirs to the throne of England, which they respectively attempted to recover by means of the "Jacobite" insurrections in Scotland in 1715 and 1745. (See articles JAMES FRANCIS EDWARD STUART and CHARLES EDWARD.)

Preven'tion of Cruelty to Animals, Society for the. So late as 1865 there existed no statutory laws in any part of the U. S. for the protection of animals from cruelty. Until about that period they were regarded by the common law simply as property. Deeply impressed with the injustice and immorality of such neglect, Mr. Henry Bergh of New York at that time initiated a reform, the result of which is that at present thirty-two States of this Union have enacted similar laws to those of New York, and have chartered numerous societies, all of which have accepted and adopted the seal of the first or parent one. The movement inaugurated by him was begun by preparing a circular addressed to the citizens of New York in the following words: "The undersigned, sensible of the cruelties inflicted upon dumb animals by thoughtless and inhuman persons, and desirous of suppressing the same, alike from considerations affecting the moral well-being of society, as well as mercy to the brute creation, consent to become patrons of a society having in view the realization of these objects." Approving of this appeal, seventy of the leading citizens of New York appended their signatures to it; which document is carefully preserved by the society. Incorporating these names in the draft of a charter, the next step was to go to the legislature and ask for its adoption, which was promptly granted, and at the following session the first statutory laws were enacted. That the enforcement of these acts in the beginning was attended with much difficulty and some danger will readily be imagined when it is remembered that they seemed to invade the fundamental principle of property and ownership. Time and reflection have, however, dissipated this prejudice almost entirely, assisted, doubtless, by the discretion and forbearance of those to whom the exercise of authority has been confided. That the institution is productive of great moral as well as material results no reasonable person will deny. Its restraining influence over the passions of the violent and unreflecting is shared alike by mankind and the lower animals; and now that its benign operations are recognized, it is a source of wonder that it had not been organized before. HENRY BERGH.

Pre'vesa, town of European Turkey, eyalet of Janina, on the Gulf of Arta, has a good harbor, though it is not accessible to large vessels. P. 5000.

Prevost' (AUGUSTINE), b. at Geneva, Switzerland, about 1725, of an English father and French mother; entered the British army, serving under Wolfe at Quebec and in the war of the American Revolution; attained the rank of major-general in consequence of his capture of the fort at Sunbury, Ga., Dec., 1778; defeated Gen. Ashe at Brier Creek Mar., 1779; was foiled in an attempt to capture Charleston May, 1779, and successfully defended Savannah against the Americans Oct., 1779. D. at Bernett, Eng., May 5, 1786.

Prevost (GEORGE), son of Gen. Augustine, b. at New York May 19, 1767; entered the British army in youth; served in the West Indies; was made major-general and a baronet 1805; lieutenant-governor of Nova Scotia 1808; was second in command at the capture of Martinique, and in June, 1811, was appointed to the chief civil and military command of British North America, with the rank of lieutenant-general. In this capacity he had to provide for the defence of Canada against American invasion during the second war with England, and acquitted himself with credit, though defeated at Plattsburg Sept. 11, 1814, after which he returned to England. D. Jan. 5, 1816.

Prévost' (PIERRE), b. at Geneva Mar. 3, 1751; studied theology and law; travelled in Holland and France; was appointed professor of philosophy at Berlin in 1780; returned in 1784 to Geneva, where he was made professor first of philosophy in 1793, then of natural science in 1810. D. at Geneva Apr. 8, 1839. He was the inventor of the theory relating to radiant heat, called Prévost's theory of exchanges, and wrote *De Calorique rayonnant* (1809), besides other works.

Prevost d'Exiles, de (ANTOINE FRANÇOIS), b. at Hesdin, department of Pas-de-Calais, France, in 1697; was first monk, then soldier, then again monk, but broke his vows once more, fled to Holland, lived for some time in London, returned to France in 1734 as almoner to the prince of Conti. D. at St. Firmin, near Chantilly, in 1763. He was a very prolific writer, his *Œuvres complètes* comprising 170 vols. Much is simply translation—Richardson's romances, Cicero's letters, etc.—but most is original composition—historical, geographical, fiction, etc. His most remarkable production is the romance *Manon Lescaut.*

Prevost-Paradol' (LUCIEN ANATOLE), b. at Paris Aug. 8, 1829; became professor of French literature in Arx in 1855; was a frequent contributor to various Parisian journals, and wrote *Rêvue de l'Histoire universelle* (1854), *Du Rôle de la Famille dans l'Education* (1857), *Essais* (3 vols., 1859–63), *Quelques pages d'Histoire contemporaine* (4 vols., 1862–66), *La France nouvelle* (1868). In 1870 he went as ambassador to Washington, where he committed suicide July 19, 1870.

Pri'am, the last king of Troy, the husband of Hecuba, the father of Hector, Paris, Cassandra, etc., was, according to Homer, an old man when the Trojan war took place, and appeared only once in the battle-field. According to later Greek legends, he was killed by Pyrrhus when Troy was taken.

Price, tp., Monroe co., Pa. P. 259.

Price (BONAMY), b. in the island of Guernsey May 22, 1807; graduated at Worcester College, Oxford, 1829; became assistant master at Rugby School 1831, and professor of political economy at Oxford University 1868. Prof. Price is a distinguished representative of free-trade doctrines, which he presented to the American public in 1874 in a series of lectures. Author of *The Principles of Currency* (1869) and of many articles in reviews and magazines.

Price (RICHARD), D. D., LL.D., F. R. S., b. at Tynton, Glamorganshire, Wales, Feb. 22, 1723; educated at Talgarth and Coward's academy in London; became a Presbyterian minister; was chaplain to a Mr. Streatfield at Stoke Newington 1743–56, and pastor of churches at Hackney and Newington Green for the remainder of his life, acting also for some time as professor of mathematics in the Hackney academy. D. in London Apr. 19, 1791. Author of many papers in the *Philosophical Transactions*, and of numerous theological, economical, and political publications, among which were *A Review of the Principal Questions and Difficulties in Morals* (1758), *Observations on Reversionary Payments, Annuities, etc.* (1769), *An Appeal to the Public on the Subject of the National Debt* (1772), *The Nature and Dignity of the Human Soul* (1776), *Observations on the Nature of Civil Liberty, Principles of Government, and the Justice and Policy of the War with America* (1776), *Additional Observations, etc.* (1777), *An Essay on the Present State of Population in England and Wales* (1779), and *Observations on the Importance of the American Revolution* (1784). William Pitt was much indebted to Dr. Price's publications for his financial projects, especially that in regard to a sinking fund. The pamphlets on American affairs forcibly and eloquently advocated the claims of the colonists to an ample redress of grievances, and 60,000 copies of the first pamphlet on this subject were sold in a few months. It was reprinted at Boston, and led to an invitation from the American Congress, through Dr. Franklin, to settle in America (1778). Yale College conferred on him in 1783 the degree of LL.D. Dr. Price's various writings on the doctrine of chances, annuities, and the duration of life entitle him to a high place among the founders of the science of vital statistics, and his financial publications give him similar rank in regard to political economy. In religious opinions he was a precursor of the Unitarian movement, agreeing in many things with his friend Dr. Priestley, with whom, however, he maintained an epistolary controversy upon the doctrines of materialism and philosophical necessity, published by the latter in 1778. (See his *Memoirs*, by his nephew, William Morgan, F. R. S., 1815.)

Price (Rodman M.), b. in Sussex co., N. J., Nov. 5, 1816; educated at Princeton College; studied law; became purser in the U. S. navy 1840; was the first person who exercised judicial authority as alcalde under the American flag in California; was appointed navy agent on the Pacific coast 1848; was member of Congress from New Jersey 1851–53, governor of that State 1854–57; was instrumental in founding the New Jersey Normal School, and was a delegate to the "Peace Congress" of 1861.

Price (Sterling), b. in Prince Edward co., Va., in Sept., 1809; settled in Charlton co., Mo., 1830; served in the legislature; was member of Congress 1845–47; colonel of Missouri volunteers in the Mexican war; captured Taos, N. M.; commanded at the battle of Canada, N. M., Jan. 24, 1847; was made brigadier-general July 20, 1847, and appointed military governor of Chihuahua; gained the battle of Santa Cruz de Rosales Mar. 16, 1848; was governor of Missouri 1853–57; became a leader of the secession party; presided over the State convention of Feb., 1861; was appointed major-general of the State forces by Gov. Claiborne F. Jackson, and endeavored to precipitate the withdrawal of Missouri from the Union; was foiled in his purpose by the promptness and loyalty of F. P. Blair and Nathaniel Lyon in compelling the surrender of the State Guard at St. Louis; withdrew to Boonville and Carthage; recruited an army of nearly 10,000 men, and being joined by McCullough with 5000 from Arkansas, defeated Lyon and Sigel at Springfield Aug. 7; quarrelled with McCullough, who withdrew his forces; captured Lexington, with 3000 prisoners, after a four days' siege, Sept. 20, for which he was thanked by the Confederate congress; was soon forced to retreat into Arkansas; was appointed major-general in the Confederate service Mar., 1862; took part in the battles of Pea Ridge, Iuka, and Corinth; was in command of the department of Arkansas 1863–64, when he entered into a combination with Vallandigham and other Northern sympathizers, founding the secret organization known as Knights of the Golden Circle, of which he was "grand commander," and to which nearly 25,000 Missourians had associated themselves; invaded Missouri Sept., 1864, advancing with nearly 20,000 men as far as Pilot Knob, but failed to rally the Knights to his standard on account of the vigilant measures taken by Gen. Rosecrans in the discovery and repression of the plot; presented himself before Jefferson City and pushed westward to the Kansas border, but being closely pursued by Pleasonton and Curtis, had to retreat to Arkansas, thereby terminating in disaster a movement which had been expected to result in the conquest of Illinois and other loyal States. After the war Gen. Price went to Mexico, obtained from the archduke Maximilian a grant of lands near Córdova, and founded a colony of ex-Confederate officers; but the downfall of Maximilian having involved that of the colony, he returned to Missouri early in 1867 in poverty and broken health, and d. at St. Louis Sept. 27, 1867.

Price (Thomas), b. at Pencaerelin, Brecknockshire, Wales, Oct. 2, 1787; became curate of Llangenny 1812, vicar of Cwmdu 1825, and subsequently perpetual curate of Tretower until his death, at Cwmdu Nov. 7, 1848. Skilled in music and drawing, he was an enthusiastic investigator of Welsh history, literature, and antiquities; author of a *History of Wales* (in Welsh, 1836–42), and numerous essays collected in 2 vols. of his *Literary Remains* (1854–55), edited, with a *Memoir*, by Jane Williams.

Price (Uvedale), Bart., b. at Foxley, Herefordshire, England, in 1747; was educated at Oxford; published a translation of Pausanias (1780), and won celebrity by his *Essay on the Picturesque* (1794) as applied to the art of landscape-gardening. Made a baronet in 1828. D. at Foxley Sept. 11, 1829.

Price′town, p.-v., Salem tp., Highland co., O. P. 117.

Prich′ard (James Cowles), M. D., b. at Ross, Herefordshire, England, Feb. 11, 1786; resided in youth at Bristol, where he received an excellent education under private tutors; displayed an early predilection for the study of the varieties of mankind; studied medicine at Bristol, London, and Edinburgh; pursued a course of mathematics and theology at Trinity College, Cambridge, and other special studies at St. John's and Trinity colleges, Oxford; commenced practice as a physician at Bristol in 1810, and received medical appointments at the Clifton Dispensary, St. Peter's Hospital, and the Bristol Infirmary. In 1813 he published his chief work, *Researches into the Physical History of Mankind*, which was much enlarged in the 2d (1826) and 3d eds. (5 vols., 1836–47). Dr. Prichard then applied himself to philology, and produced his standard treatise on *The Eastern Origin of the Celtic Nations* (1831). In 1843 he issued his *Natural History of Man*; became in 1845 commissioner in lunacy; was for many years president of the Ethnological Society, and published several works on medical subjects. D. at London Dec. 22, 1848. Dr. Prichard was a leader in the science of comparative philology, and is regarded as the greatest of modern ethnologists. His *Natural History of Man* appeared in a 4th ed. in 1855, ably edited and enlarged by Dr. Edwin Norris, and his work on the *Celtic Nations* was edited by Dr. R. G. Latham in 1857.

Prick′ly Ash, or **Toothache Tree,** the *Xanthoxylum Americanum*, a large prickly shrub found in most parts of the U. S., and belonging to the Rutaceæ. The leaves have the smell of lemons. The bark is aromatic and stimulant, and is used as a remedy for toothache, for rheumatism, and other diseases. *X. Carolinianum*, the Southern prickly ash, has a more southern range. It becomes quite a large tree. Its bark is extremely pungent, and is armed with curious prickly warts. *X. Floridanum* and *X. pterota* grow also in Florida. China, Japan, South America, and the West Indies abound in species of this genus, nearly or quite all aromatic, pungent, and medicinal.

Prickly Heat, a popular name for eruptive skin diseases, occurring in hot weather and characterized by itching and sensations of stinging. In India there is quite a formidable variety of lichen called by this name. A popular remedy is the use of saline cathartics, which doubtless are sometimes advantageous. Frequent bathing and the avoidance of exposure to the sun's rays are recommended.

Prickly Pear, a name given the cactuses of the genus *Opuntia*, especially to *O. vulgaris*, a native of many places in the U. S. from Massachusetts southward and westward. It is naturalized extensively in the Old World. Its fruit is smooth and eatable, but not so good as that of *O. Ficus Indicus*, which is prickly. Some of the numerous species are used for forage in Mexico. The erect kinds are serviceable hedge-plants. One species is the official emblem of Mexico. Some prickly pears support the cochineal insect.

Prid′eaux (Humphrey), D. D., b. at Padstow, Cornwall, England, May 3, 1648; educated at Westminster School; graduated at Christ Church, Oxford, 1672; published a Latin account of the Arundelian marbles, *Marmora Oxoniensia* (1676); became rector of St. Clement's, Oxford (1679); prebendary of Norwich 1681, archdeacon of Suffolk 1688, and dean of Norwich 1702. D. at Norwich Nov. 1, 1724. Author of a *Life of Mahomet* (1697), once very popular, and of *The Connection of the History of the Old and New Testaments* (4 vols., 1715–18), which is still found useful.

Prideaux (John), b. in Devonshire, England, in 1718; entered the British army at an early age; took part in the battle of Dettingen 1743; served in America against the French; became colonel of the 55th Foot Oct. 28, 1758, and brigadier-general May 5, 1759; was in command of the expedition sent against Fort Niagara in the summer of that year; effected a landing July 7, and prepared for a regular siege, but was killed in the trenches by the accidental bursting of a gun July 19, 1759. The fortress surrendered four days later to Sir William Johnson, the successor of Prideaux in command.

Pride of China. See China, Pride of.

Prie′go, town of Spain, province of Cordova, is beautifully situated in the Sierra Morena, and has some tanneries, potteries, and silk manufactures. P. 8502.

Priess′nitz (Vincent), b. at Gräfenberg, Austrian Silesia, Oct. 5, 1799, of peasant parents; became the inventor of hydropathy and the founder of the Gräfenberg water-cure, which he administered till his death, Nov. 28, 1851. (See Hydropathy.)

Priest [Gr. πρεσβύτερος, "elder"]. In all nations of antiquity among whom a system of worship received any considerable development there existed also a system of priesthood, to whose care that worship was more especially committed. The priest stood in a sort of mediatorial relation between God and man, and under the Hebrew legislation this was divinely recognized and received the emphatic sanction of divine appointment. In earliest times the functions of the priest appear to have been discharged by the head of the family, who, as the recognized superior of all its members, was the fittest person to appear for them before God. Hence came what is called the "patriarchal priesthood." As the family multiplied into the tribe the duties of its head became too numerous for the proper discharge of the priesthood, as well as often incongruous, and persons were specially selected to fill the office, as in the case of Jethro, "the priest of Midian." When the tribe became a nation a class of men was set aside for the same purpose, although the monarch often remained at the nominal head of the priesthood thus established, as was the case in Egypt. Among the most ancient nations, India, Egypt, and the Hebrews, the priesthood was hereditary, and in the two

former constituted a class distinctly separated in their whole life from the rest of the nation, and in Egypt endowed with large landed estates and great wealth. Among the Hebrews, on the contrary, the priests were only allowed cities necessary for their residence, and were cut off from other inheritance in land among the tribes of Israel. They were only in so far a caste as was necessary for the discharge of their duties, and in all other respects were on the same footing as their fellow-citizens, it being especially noteworthy that all were entirely equal before the law. Their support was provided for by a tithe from the Levites of the tithes received by them from the whole body of the people, and also by assigned portions of most of the sacrifices. As there was no provision in the Hebrew law for the enforcement of the payment of the tithes, their income was dependent upon the general fidelity of the people. The especial function of the Aaronic priesthood was to come near to God—themselves of the people, yet specially sanctified on their behalf to approach God and obtain from him pardon and blessings for their brethren. Hence, their chief characteristic must be holiness, which was set forth in the Levitical law in every possible symbolical way, as well as directly commanded. The first of all their duties was the offering of sacrifice, thus "making atonement for the people." No sacrifice could be offered or incense burned without their intervention. They had also, as naturally connected with this, the general care of the sanctuary and the multitudinous duties flowing from this; and, as being themselves especially trained in the Law, to them was assigned the duty of teaching it to the people. They had, however, little or nothing of the *pastoral* relation toward the people; their duties were almost wholly official. Their qualifications were—Aaronic descent, perfect physical formation, and during their ministrations freedom from legal uncleanness and abstinence from wine and intoxicating drinks. There was no limitation of age. In marriage they were only restricted to virgins or widows of one of the tribes of Israel. When largely multiplied, in the time of David and Solomon, they were divided into twenty-four courses, which were placed on duty each one week in turn. When on duty, like the Egyptian priests, they wore linen robes and were unshod. The whole order culminated in the high priest, whose office was also hereditary, and who by the magnificence of his official robes was marked as very much elevated above his brethren. He was peculiarly the appointed mediator as a type of the promised Redeemer to come, and alone once in every year entered the Holy of holies. He could marry only a virgin within the priestly family. Later there was a "second priest" or vice high priest. The whole Hebrew priesthood, having its main function in the "making of atonement," necessarily ceased with the coming of Christ. Consult Kalisch, *Preliminary Essay to Lev. viii.*; Küper, *Das Priesterthum des alten Bundes*. FREDERIC GARDINER.

Priest'ley (JOSEPH), LL.D., b. at Birstal-Fieldhead, near Leeds, England, Mar. 24, 1733 (N. S.), was son of a cloth-dresser; lost his mother at the age of six years; was adopted by an aunt, Miss Keighley, by whom he was placed at a free grammar school; completed his education at the Presbyterian academy at Daventry (afterward Coward College, and now united with New College, London); obtained by private study a good knowledge of the classics and modern languages, to which he added Hebrew and the rudiments of Chaldaic, Syriac, and Arabic; rejected some points of the Calvinistic theology before entering college, but was ordained in 1755 assistant minister to an Independent congregation at Needham-Market, Suffolk; left that post in 1758 on account of having discarded the doctrine of the atonement and adopted Socinian (*i. e.* Unitarian) views; taught a private school at Nantwich, Cheshire, 1758–61, making there numerous experiments in physics, and writing his first published work, *The Scripture Doctrine of Remission* (1761); was teacher of languages and literature in an academy at Warrington 1761–67, during which period he married Miss Wilkinson; wrote several small treatises on grammar and educational method; made the acquaintance of Dr. Richard Price and of Dr. Franklin, and prepared, at the instance of the latter, his *History and Present State of Electricity, with Original Experiments* (1767), which procured him the degree of LL.D. from the University of Edinburgh and an election as member of the Royal Society; was pastor of Mill-Hill Chapel, Leeds, 1767–73; made there important researches in pneumatics and chemistry, which he gave to the world in his *Directions for Impregnating Water with Fixed Air* (1772) and *History and Present State of Discoveries relating to Vision, Light, and Colors* (2 vols., 4to, 1772); engaged to accompany Capt. Cook as chaplain on his second voyage, which he was prevented from doing on account of objection being made to his theological views; published his *Institutes of Natural and Revealed Religion* (3 vols., 1772–74), which he had begun eighteen years before; was from 1773 to 1780 librarian and literary companion to the earl of Shelburne, whom he attended in 1774 in a tour on the Continent; made in that year the discovery of oxygen (called by him dephlogisticated air), soon followed by that of nitrous, carbonic, and sulphurous oxide and other gases, besides many ingenious contributions to theoretical chemistry set forth in his *Experiments and Observations on Different Kinds of Air* (3 vols., 1774–77); published *An Examination of Dr. Reid's Inquiry into the Human Mind* (1774), *Hartley's Theory of the Human Mind* (1775), *A Harmony of the Evangelists*, in Greek (1777), *Disquisitions relating to Matter and Spirit* (1777), *The Doctrine of Philosophical Necessity* (1777), and *A Free Discussion of the Doctrines of Materialism and Philosophical Necessity in a Correspondence between Dr. Price and Dr. Priestley* (1778). The three latter works excited much controversy and elicited many replies, in which the author was, with some reason, accused of materialism; but it must be admitted that his doctrines, as has been well observed, tend quite as much to spiritualize matter as to materialize spirit. In 1780, Dr. Priestley retired from the service of Lord Shelburne with a life-pension of £150, became minister to the principal Independent congregation at Birmingham, and addressed to an eminent Frenchman his *Letters to a Philosophical Unbeliever*, in which he contended strongly for the doctrines of a revelation and a resurrection, which were followed by his celebrated *History of the Corruptions of Christianity* (2 vols., 1782), *History of Early Opinions concerning Jesus Christ, compiled from Original Writers, proving that the Christian Church was at first Unitarian* (4 vols., 1786), *Familiar Letters to the Inhabitants of Birmingham* (1790), *General History of the Christian Church* (2 vols., 1790), and *Letters to Burke, occasioned by his Reflections on the Revolution in France* (1791). The latter treatise procured him an honorary citizenship in the French republic, and was the cause of a riot at Birmingham (July 15, 1791), in which Dr. Priestley's house was pillaged and his library, manuscripts, and scientific apparatus scattered through the streets, he himself escaping personal violence by opportune flight. For three years he resided at Hackney as the successor of Dr. Price, instituted a suit for compensation for his losses, in which he was successful after nine years' delay, and in 1794 removed to the U. S., where his sons already resided. Arriving at New York June 4, he settled on his son's farm at Northumberland, Pa., where he passed the remainder of his life, wrote replies to Volney and Paine and several other works of little comparative importance, the most elaborate being *Notes on all the Books of Scripture* (Northumberland, 4 vols., 1803). He declined a professorship in the University of Pennsylvania, but occasionally preached at Philadelphia, and delivered there two series of *Discourses relating to the Evidences of Revealed Religion* (1796–97). D. at Northumberland Feb. 6, 1804. His autobiographical *Memoirs*, with a continuation by his son, appeared in 1806, and a collection of his *Theological and Miscellaneous Works* (26 vols., Hackney, 1817–32) was edited by John Towell Rutt, vols. i. and ii. being composed of his *Life and Correspondence*. Statues of Dr. Priestley have been erected at Oxford (1860) and at Birmingham, the latter on Aug. 1, 1874, the centennial of the discovery of oxygen. This anniversary was celebrated by a gathering of American chemists at Northumberland, Pa. A bibliography of Dr. Priestley's productions, prepared at Washington (1875), gives the titles of more than 300 separate publications. In character Dr. Priestley was irritable and somewhat vain, but he was unquestionably actuated by high motives and had the courage of his opinions. PORTER C. BLISS.

Priests of the Oratory. See ORATORY, CONGREGATION OF THE.

Priests of the Mission. See LAZARISTS, PAULISTS, PASSIONISTS, REDEMPTORIST FATHERS.

Priloo'ki, town of European Russia, government of Poltava, on the Udai, has 8771 inhabitants, who are mostly employed in the cultivation and manufacturing of tobacco.

Prim (JUAN), count of Reus and marquis of Castillejos, b. in Reus, Catalonia, Spain, Dec. 6, 1814; entered the Spanish army in boyhood; obtained rapid promotion during the first Carlist war; became colonel in 1837; was soon afterward elected to the Cortes, where he became prominent as a leader of the Progresistas against the administration of Espartero, was accused of conspiracy 1842, when he took refuge in France; headed insurrections in the following year at Reus; materially aided in the overthrow of Espartero by Narvaez, and in effecting the return of Queen Maria Cristina, who rewarded him with the title of count, the rank of general, and the military command of Madrid; fell into disfavor in the following year on account of his failure to act with energy against the rebels of Cata-

lonia; was accused of treason Oct., 1844, tried, and sentenced to six years' imprisonment; was soon pardoned; acted a short time as governor of Puerto Rico; served as a volunteer in the Turkish army on the Danube 1853–54; published an account of his experiences in the East; was commander-in-chief in the war against Morocco 1859–60, gaining a great military reputation and the title of marquis; was made commander of the Spanish contingent in the allied intervention in Mexico 1861, but soon withdrew his forces from that enterprise, much to the displeasure of Napoleon; visited the Army of the Potomac on his way back to Spain; successfully defended his conduct in the Cortes, denouncing the ambitious plans of the French emperor; was banished from Madrid Aug., 1864; devoted himself thenceforth to the overthrow of Isabella, for which object he entered into various combinations and headed several unsuccessful insurrections, especially that of Jan., 1866, in Aragon and Catalonia, but ultimately succeeded in organizing the movement which in Sept., 1868, through the aid of Serrano and Topete, resulted in the flight of the queen to France; was welcomed with enthusiasm at Madrid; became commander-in-chief, marshal, minister of war, and head of the cabinet in the new provisional government; conducted several negotiations for founding a new dynasty in Spain; furnished the pretext for the Franco-German war of 1870–71 by his offer of the crown of Spain to Prince Leopold of Hohenzollern, and in the autumn of 1870 obtained from the Cortes the election of the Italian prince Amadeus, duke of Aosta. On the day that the new king landed at Barcelona (Dec. 28) Prim was attacked by assassins in a street of Madrid, and received eight balls in his body, and d. two days later (Dec. 30, 1870). His memory was magnificently honored by the new king, and a fine monument was erected in 1875 over his remains in the Atocha church at Madrid.

PORTER C. BLISS.

Pri′mate [Lat. *primus*, "first"], originally, in the ecclesiastical system of the Roman Catholic Church and the Church of England, the first in rank of the archbishops in a country. Thus, in England the archbishop of Canterbury was long primate, but at present the archbishop of York is styled "primate of England," while Canterbury takes the higher title of "primate of all England." The Anglican archbishop of Dublin has the title of "primate of all Ireland," and the Anglican and Roman Catholic archbishops of Armagh are both called "primate of Ireland." Five or six French prelates are called primates, but the archbishop of Lyons is "primate of primates." Again, the archbishop of Braga is primate of Portugal, although inferior in rank to the patriarch of Lisbon. These facts indicate that the office of primate has to some extent become a titular one, or at least a mere indication of a comparatively unimportant precedence.

Pri′mates [Lat. *primus*, "first"], an order of monodelph mammals including man, the monkeys, and the lemurs. These are all externally distinguished by the fore as well as hind limbs being completely or almost entirely exserted outside of the common integument, and thus distinguished from the ordinary quadrupeds, in which the proximal joints are enclosed therein; the members have also generally five digits, developed on the hands as well as feet; the innermost or first of the hand or fore foot being the thumb, which is, however, frequently suppressed, and the corresponding and innermost digit of the foot being thickened and generally opposable like the thumb to the other digits, only in man assuming parallelism with them; this great toe is always furnished with a depressed nail; the teeth are not distinctive, being modified according to several types; they are, however, at least in one stage, incisors, canines, and molars; of the incisors there are in each jaw generally four, and never more, although they may be reduced to two, or all in the upper jaw may be suppressed; the clavicles are always completely developed and co-ordinated with the development of distinct shoulders and their distance from each other; the brain has a large cerebrum, which completely overlaps the olfactory lobes in front, and behind more or less covers the cerebellum; on the interior surface of each hemisphere behind a peculiar sulcus (the so-called calcarine) exists, which is co-ordinated with the development of a raised portion (the hippocampus minor) within the posterior corner of the ventricle by which the posterior lobe of the cerebrum is traversed. The order as thus distinguished includes two sub-orders —(1) Anthropoidea, comprising the families Hominidæ (man), Simiidæ (the large tailless apes), Cercopithecidæ (the Old-World monkeys, baboons, etc.), Cebidæ (the common New-World monkeys), and Mididæ (the marmosets, etc.); and (2) Prosimiæ, with the families Lemuridæ, Tarsidæ, and Daubentonidæ. The order, as thus limited and defined, is the result of studies of recent zoologists. Linnæus, who framed the name, embraced under it, in addition to the forms above indicated, all the Cheiroptera and *Galeopithecus*. By Cuvier and his numerous followers the true Primates were differentiated into two orders—Bimana (including man) and Quadrumana (including the monkeys and lemurs). The naturalness of the association of man with the monkeys is now almost universally conceded, and the main question in dispute at the present time is whether those forms (the anthropoids) should be associated with the lemuroids in a single order, or the two distinguished as independent orders. The differences between them are certainly great, and the recent discovery by Alphonse Milne-Edwards of the peculiarities of their placentas adds greatly to the arguments in favor of their separation, and the question is a very evenly balanced one. (See further the names of the sub-orders and families.) THEO. GILL.

Prime (BENJAMIN YOUNG), M. D., b. at Huntington, L. I., Dec. 20, 1733; graduated at Princeton 1751; was tutor there 1756–57; studied medicine at Leyden, Holland, where he also devoted much time to the acquisition of languages; settled as a physician at New York 1764; published a volume of poems, *The Patriotic Muse* (London, 1764); wrote political songs and ballads which were widely circulated during the war of the Revolution, and *Columbia's Glory* (1791), a poem on the Revolution. D. at New York Oct. 31, 1791. In 1838 a volume entitled *Muscipula Cambryomachia* was printed at Newburg, containing poems, translations, and miscellanies by Dr. Prime in several languages, including Hebrew.

Prime (EDWARD DORR GRIFFIN), brother of Dr. S. I. Prime, b. at Cambridge, N. Y., Nov. 2, 1814; graduated at Union College 1832 and at Princeton Seminary 1838; was pastor of a Presbyterian church at Scotchtown, N. Y., 1839–51; became associate editor of the New York *Observer* 1853; was American chaplain at Rome 1854–55; resumed his editorship 1855, and became one of the proprietors 1865. Author of *Around the World* (1871), a record of extensive travels, and editor of *Forty Years in the Turkish Empire, or Memoirs of Rev. William Goodell, D. D.* (1875).

Prime (NATHANIEL SCUDDER), D. D., son of Dr. Benjamin Young, b. at Huntington, L. I., Apr. 21, 1785; graduated at Princeton 1804; preached several years on Long Island; was pastor of a Presbyterian church at Cambridge, Washington co., N. Y. 1813–30; became principal of the Mount Pleasant Female Academy, Sing Sing, N. Y., 1830, of a similar institution at Newburg 1835, and subsequently taught and preached at several other places. D. at Mamaroneck Mar. 27, 1856. Author of a *Treatise on Baptism* and a *History of Long Island* (1845).

Prime (SAMUEL IRENÆUS), D. D., son of Dr. N. S. Prime, b. at Ballston, N. Y., Nov. 4, 1812; graduated at Williams College 1829; studied theology at Princeton; was ordained to the ministry of the Presbyterian Church, and preached several years, but on account of ill-health withdrew from the pulpit in 1840, when he became editor of the New York *Observer*, the leading religious paper of his denomination—a post he has since retained; has several times visited Europe, and has published some 40 vols., chiefly anonymous. Among his books are *Travels in Europe and the East* (2 vols., 1855), *Letters from Switzerland* (1860), *The Bible in the Levant* (1859), *Memoirs of Rev. Nicholas Murray* (1862), *The Alhambra and the Kremlin* (1873), and a *Life of Samuel F. B. Morse* (1874).

Prime (WILLIAM COWPER), brother of Samuel Irenæus, b. at Cambridge, N. Y., Oct. 31, 1825; graduated at Princeton 1843; became a lawyer in New York; wrote for the *Journal of Commerce*, of which he became in 1861 editor and one of the proprietors; travelled in the East 1855–56, and has published *The Owl Creek Letters* (1848), *The Old House by the River* (1853), *Later Years* (1854), *Boat-Life in Egypt and Nubia* (1857), *Tent-Life in the Holy Land* (1857), and *Coins, Medals, and Seals, Ancient and Modern, Illustrated and Described* (1860; new ed. 1864), besides a monograph on the origin of the familiar hymn "O mother dear, Jerusalem" (1865), and an edition in fac-simile of Albert Durer's *Little Passion* (New York, 1868).

Prime Mov′er. The term "prime mover" is employed to designate machines the office of which is to transform the energy expended in some natural source of power into useful or available work. For example, a quantity of water falling from one level to another represents an expenditure of energy due to the force of gravity, equivalent in foot-pounds to the product of the weight of the water multiplied by the height of fall in feet. In falling without obstruction or resistance the velocity of the water continually increases, and the accumulated energy represented by the living force is usually dissipated in the shock at the bottom of the fall. To render this source of power available, a water-wheel may be introduced, which, receiving the im-

pulses of the falling particles, causes a portion of the work to be transformed into useful work, and the water reaches the bottom of the fall with its energy diminished by precisely the quantity which has been so transferred or transmuted into the work absorbed by the water-wheel.

While prime movers generally have the characteristics of other machines in many respects, yet only a few machines can be classed as prime movers. The definition of a machine given by Ampère, and adopted by Poncelet, Willis, and other writers, is "an instrument by means of which the directions and velocities of given motions are changed;" forces being left out of consideration, because few machines, except the prime movers, are dependent in their construction on the nature or source of the power which drives them. Prime movers are exceptions to this general rule, because their construction and the arrangement of their parts are necessarily dependent on the nature or source of the energy which is to be utilized, their office being primarily that of receiving, transforming, and transmitting power from some natural source, by which means they drive or move other machines. This distinctive feature of this class of machines involves important considerations in the application of scientific principles to their construction. While the "principles of mechanism," based on the science to which Ampère gave the name "kinematics," or science of motion, suffice for the combination of parts of nearly all other machines, the construction of the various prime movers demands the application of nearly the whole range of the physical sciences, and notably of the fundamental theorems of the science of dynamics. Questions of *economy of power* are to be studied mainly in the construction of prime movers, and they are to be regarded from these considerations as something more than mere machines; they are "motors."

The sources of energy in nature which are made available for useful purposes by the aid of prime movers are heat, the energy of falling water, the motions of the atmosphere, and electricity or magnetism. The latter being, however, regarded as referable to heat, and the second and third sources mentioned being manifestations of the force of gravity, the ultimate sources of available energy may be considered to be *heat* and *gravitation*. As regards *muscular* energy, men and animals may be regarded as prime movers—perfect exhibitions, in this respect, of the imperfect results of human efforts in artificial constructions.

The heat-engine, under the form of the steam-engine, holds the first place in importance among all the prime movers. In the investigations and experiments connected with economy in its use and its adaptation to various purposes, especially to the propulsion of steamships, it has engaged the attention of scientific men, practical engineers, and artisans to a greater extent than all others combined; and the developments arising from its use have given rise to a special branch of engineering science. The use of the water-wheel in the form of the turbine, the second prime mover in importance, has been greatly extended through the new facilities afforded for its construction by steam machinery and the arts and industries developed by it. Hot-air engines, gas-engines, and electro-dynamic engines are prime movers more restricted in their applications, but they possess respectively peculiarities which render them advantageous under certain conditions. The windmill is another prime mover which in favorable localities is of great value. Water-engines, in which the construction of the apparatus is nearly identical with some form of the steam-engine, the pressure upon the piston being produced by a head of water, are also "motors" in common use.

W. P. Trowbridge.

Prime Num'bers. A whole number is said to be prime when it cannot be exactly divided by any other whole number except 1. Two numbers are prime with respect to each other when they cannot both be divided by any whole number except 1. Thus, 2, 3, 5, etc. are prime numbers; 6 and 7 are prime with respect to each other. No rule has been found for discovering prime numbers by a direct process. A method of sifting out numbers not prime was described by Eratosthenes, and for that reason is generally known as Eratosthenes's sieve. The method is as follows: Since every even number is divisible by 2, we may omit or sift out all such numbers, and remembering that 2 itself is prime, we write down the series of odd numbers up to any limit, say up to 99: 1, 3, 7, 11, 13, 17, 19, etc. etc. We begin with the first prime number after 2, which is 3, and counting from it, we strike out every third number, because all such numbers are divisible by 3, and therefore are not prime. We then begin with 5, and counting from it we strike out every fifth number, because all such numbers are divisible by 5. We then begin with 7, and counting from it, we strike out every seventh number. The remaining numbers are prime. In this way we find that the prime numbers less than 100 are 1, 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, 67, 71, 73, 79, 83, 89, and 97. The operation of sifting may be extended to any series of whole numbers, but beyond a certain limit the operation becomes tedious. In applying the method just described it is to be remembered that if a number cannot be divided by a prime number less than its own square root, that number must be prime. Thus, in the case supposed we need not go farther than 7, because 7 is the greatest prime number less than $\sqrt{100}$. From the nature of the process of Eratosthenes it is evident that the number of prime numbers in a given interval will be less the higher that interval commences. The number of prime numbers up to 10,000 is 1230; the number between 10,000 and 20,000 is 1033; between 20,000 and 30,000 it is 985; and so on. Many tables of prime numbers have been published of greater or less extent; those of Burckhardt extend to the number 3,036,000. The highest number that has been shown to be prime is $2^{31}-1=2,147,483,647$; this was found by Euler. Tables of prime numbers may be used for factoring. To resolve a given number in all its prime factors, we commence by dividing successively by 2 as many times as possible, then by 3, and so on till we see from the table that the quotient is a prime number; then will all the divisors used, together with the last quotient, be the required prime factors.

The following are some of the properties of prime numbers: (1) If a number cannot be divided by any prime number less than its own square root, it is a prime number. (2) All prime numbers except 2 are of the form $4n \pm 1$; those of the form $4n+1$ are each equal to the sum of two squares. (3) All prime numbers greater than 3 are of the form $6n \pm 1$. The converse of the 2d and 3d propositions is not true. (4) If n is a prime number, the expression $1+1 \times 2 \times 3 \ldots (n-1)$ is divisible by n. (5) If n is a prime number, and if r is any number not divisible by n, then will the remainder after dividing r^n by n be the same as that after dividing r by n. (6) The supposition remaining the same as before, the expression $r^{n-1}-1$ is divisible by n.

W. G. Peck.

Primitive Wesleyans. See Wesleyans, Primitive.

Primogen'iture [Lat. *primus*, "first," and *genitura*, "birth"], or the right of the eldest son to inherit the real estate of his father to the exclusion of his brothers and sisters, who inherit only part of the personal property the father may have accumulated, originated in Europe with feudalism. Vague traces of it can be found in antiquity and in the Eastern nations. Wherever there was a monarchy, there was at least an attempt at establishing the law of primogeniture in the royal family. But it did not receive its full development until feudalism became the general state of society.

Prim'rose [*prime-rose*, from its early flowering], a genus of handsome flowering herbs, largely European, of the order Primulaceæ and genus *Primula*. The true primrose is *P. grandiflora* of Europe. *P. officinalis* is the cowslip, of which the polyanthus is a cultivated form, all of these running into many varieties. The birdseye primrose (*P. farinosa*) belongs to a humbler division of the genus. This and the related *P. Mistassinica* are indigenous also to the northern parts of North America. *P. auricula*, the parent of the auriculas of the gardens, is a native of Southern Europe. The Chinese primrose (*P. Sinensis*), now one of the commonest house-plants, represents a different section of the genus, to which *P. cortusoides*, a choice Siberian species now coming into cultivation, also belongs. Two very handsome species of recent introduction, which are much thought of, are *P. Japonica*, Gray, from Japan, and *P. Parryi*, Gray, from the Colorado Rocky Mountains. The evening primroses are species of *Œnothera*, of a wholly different natural order, and took the name from a very superficial likeness of the corolla to that of the true primrose.

Asa Gray.

Primrose, p.-v. and tp., Dane co., Wis. P. 1015.

Primula'ceæ [from *Primula*, the typical genus], a natural order of oxogenous gamopetalous herbs widely distributed over the world, but chiefly in the cooler parts of the northern hemisphere. The order is readily characterized by having stamens of the same number as the lobes of the corolla, and opposite them on the tube or throat a single style and stigma, and a one-celled ovary with a free central placenta, bearing several or numerous ovules. To this must be added the herbaceous character, to distinguish them from the Myrtinaceæ, tropical trees or shrubs which have a similar floral structure. Except a slight acridity, Primulaceæ are nearly inert plants, of no economical importance beyond the beauty of their blossoms. Besides the Primrose (which see) and its near allies, the *Cyclamen*, our beautiful *Dodecatheon*, and one

species of *Anagallis* are familiar in ornamental cultivation. ASA GRAY.

Prince [Lat. *princeps*], a title which sprang from that of the Roman PRINCEPS SENATUS (which see). It became a title of the Roman emperors, and from them passed to mediæval and modern sovereigns. There are also sovereign rulers who have no higher title than prince. Nobles of the blood are in general called princes, whether they officially bear this or some inferior title. In continental Europe there are also princes who are not related to sovereign families (called in Germany *Fürst*, and not *Prinz*). Strictly, all English nobles of higher rank than viscount are entitled to be styled princes, but in practical use princes of the blood are the only ones so designated.

Prince, the north-westernmost county of Prince Edward Island, Dominion of Canada. It is exceedingly fertile and well cultivated. Chief town, Summerside. Cap. Princeton. P. 28,302.

Prince (HENRY), b. in Maine about 1814; graduated at the U. S. Military Academy, and became brevet second lieutenant of infantry Sept., 1835, captain 1847; engaged in the Florida war and war with Mexico; brevet captain and major for Contreras, Churubusco, and Molino del Rey, being severely wounded at latter; returned to duty 1850, and employed on Coast Survey until 1855, when appointed paymaster with rank of major; appointed brigadier-general of volunteers Apr., 1862, he participated in the battle of Cedar Mountain, Aug. 9, 1862, where captured and held prisoner until December; subsequently served in North Carolina, Virginia, Tennessee, and South Carolina. Returned to duty as paymaster Aug., 1866.

Prince (OLIVER H.), b. in Connecticut; moved to Georgia in early youth; studied law, and was admitted to the bar; was one of the first settlers in Macon, and one of the five commissioners who laid out that city; was the author of many humorous sketches; one of these, giving an account of a Georgia militia muster, was republished in several foreign languages; he was also author of *Prince's Georgia Digest*, a work compiled with great ability; was U. S. Senator 1828–29; was lost at sea in the wreck of the steamer Home on the coast of North Carolina Oct. 9, 1837, aged about fifty years. A. H. STEPHENS.

Prince (THOMAS), b. at Sandwich, Mass., May 15, 1687; graduated at Harvard 1707; visited the West Indies and the island of Madeira; went to England 1709; preached for several years at Combs, Suffolk, and elsewhere; returned to Massachusetts 1717; was ordained colleague of Rev. Dr. Joseph Sewall, pastor of the Old South church, Boston, Oct. 1, 1718; devoted many years to the collection of materials for the civil and religious history of New England, and gathered a valuable library, which he bequeathed to the Old South church. D. at Boston Oct. 22, 1758. When the Old South church was desecrated by British soldiery during the war of the Revolution, documents in the Prince library were stolen or destroyed. Of the remainder, still of extreme value, and now forming part of the Boston Public Library, a catalogue was published in 1868. Prince was eminent as a preacher and as a man of learning, published twenty-nine single sermons and many occasional writings, and undertook a work valuable from its extreme accuracy of detail, *The Annals of New England*, of which, however, only vol. i. (1736) and part of vol. ii. (1755) appeared, extending only to 1633. Many MSS. of Prince, including a *Diary*, remain unedited, but will probably be issued by the Prince Society of Mutual Publication, established at Boston, June, 1858.

Prince Ed'ward, a fertile county of Ontario, Canada, consisting of a peninsula and several small islands in Lake Ontario, having the Bay of Quinté on the N. Area, 334 sq. m. Cap. Picton. P. 20,336.

Prince Edward, county of Central Virginia. Area, 300 sq. m. It is a pleasantly diversified region, with picturesque scenery and a rich soil. Tobacco and grain are leading products. Good Triassic coal is mined to some extent. Traversed by Atlantic Mississippi and Ohio and Richmond and Danville R. Rs. Cap. Farmville. P. 12,004.

Prince Edward Island [named in 1798 in honor of Edward, duke of Kent, father of Queen Victoria], an island in the Gulf of St. Lawrence, constituting, since 1873, a province of the Dominion of Canada, British North America. It extends from lat. 45° 50′ to 47° 20′ N., and from lon. 62° to 64° 20′ W. It is crescent-shaped, the concavity toward the N. by E. Length, nearly 130 miles; average breadth, 34 miles. An isthmus 4 miles wide joins the western part to the principal body of land; 24 minor islands belong to the province. There are numerous bays, harbors, and promontories. Northumberland Strait, on the S. and W., separates it from the mainland of Nova Scotia and New Brunswick. The area of the island is 2131 sq. m., or 1,365,400 acres. The soil is wonderfully fertile. The surface is generally level, with some low hills. There are very few rocks or stones of any kind readily accessible. Lagoons and lakes are rather numerous. The climate is mild for the latitude, and remarkably healthful. The soil is deeply underlaid by Silurian sandstone. The forests, once magnificent, are now greatly reduced. They consist of birch, elm, maple, ash, beech, pine, spruce, fir, hemlock, cedar, juniper or tamarack, poplar, and willow. There are some peat-bogs, which are easily converted into hay-fields. Vast quantities of sea-manure are everywhere accessible. The main island has only 52,252 acres of uncultivated land. The small islands have 5979 acres of cultivated and 400 of waste land. The waters surrounding the province teem with fish—mackerel, herring, cod, and many other species; the fisheries are consequently very important. The manufacturing interests (except shipbuilding) are not extensive, and but few valuable minerals are known to exist. Copper and bog-iron ore are found. The agricultural interests have been injured by the former system of great landed estates, but since 1854 the provincial government has been buying these estates as fast as possible, and measures have been taken by the local authorities to compel the sale of such lands. In most cases the purchased lands have been resold to small and well-to-do farmers. Wheat, oats, barley, rye, potatoes, buckwheat, and garden vegetables are raised. Cattle, horses, swine, sheep, and poultry are bred extensively. The island is divided into three counties—King's, Queen's, and Prince. There has been a system of public schools since 1821. The system at present includes grammar or higher schools, and secondary schools. Normal schools for the training of teachers have been established. There are three denominational colleges, Roman Catholic, Anglican, and Wesleyan—all at Charlottetown. During the summer the island is visited by regular lines of steamers and by thousands of fishing vessels. During the winter the island is not accessible except by ice-boats, which run from Cape Traverse to Cape Tormentin, N. B., 9 miles, carrying the mails. There is also a submarine telegraph.

History.—This island (the Isle St. Jean of the French) was discovered by the Cabots in 1497. It began to be settled by the French in 1715, who increased quite rapidly for many years. In 1764, having come under English rule, many of the French left the country, and the island was parcelled out among 67 grantees, who agreed to furnish a numerous colony of Protestant settlers (not English) for the colony. But though these conditions were never fulfilled, the great estates were not broken up, the proprietors being sustained in their claims by the British government. This has always been a source of much popular discontent. The Roman Catholic religion was never fully tolerated till 1830. There is now a Roman Catholic bishop of Charlottetown, and that body is more numerous than any other denomination. The province sends four senators to the Dominion Parliament. Cap. Charlottetown.

Population.—The population in 1745 was 800; in 1752, 1354; in 1763, 4100. Soon afterward the greater part of the French abandoned the country. P. in 1797, 4500; in 1827, 23,266; in 1833, 32,292; in 1841, 47,034; in 1848, 62,634; in 1855, 71,496; in 1861, 80,857; in 1871, 94,021. Of these, 40,442 were Roman Catholics, 52,317 Protestants of various denominations, and the remainder of other faiths than Christian. There were 323 Indians, to whom in 1861 Lennox Island, a valuable island in Richmond Bay, was ceded. CHARLES W. GREENE.

Prince Fred'ericktown, p.-v., cap. of Calvert co., Md., 5 miles from Chesapeake Bay, contains 1 church, a court-house, jail, and 1 newspaper. P. 64.
I. H. C. WILLIAMS, ED. "JOURNAL."

Prince George, county of S. E. Virginia, bounded N. E. by James River and N. W. by the Appomattox. Area, 300 sq. m. It is nearly level, well wooded, and has a light productive soil. Corn is a leading product. Traversed by the Atlantic Mississippi and Ohio R. R. Cap. Prince George Court-house. Pop. 7820.

Prince George Court-House, p.-v., cap. of Prince George co., Va.

Prince George's, county of Maryland, bounded N. E. and E. by Patuxent River, and W. by the Potomac and the District of Columbia. Area, 500 sq. m. It is one of the best farming counties in the State. It is rolling and has a rich loamy soil. Tobacco, corn, wheat, and rye are leading products. The shad and oyster fisheries are important. Iron ore, marl, tripoli, bole, and rich sulphide of iron are found. Traversed by Baltimore and Ohio and Baltimore and Potomac R. Rs. Cap. Upper Marlborough. P. 21,138.

Prin'ceps Sena'tus, an officer of the Roman senate. Under the kings he was the first in rank of the *decem primi*, was *custos urbis*, and was appointed for life by the

king. After 487 B. C. he was appointed by the curies, but not for life, and might be chosen from the *patres minorum gentium*, who could not before receive the office. It was afterward given to the oldest ex-censor, and became independent of the prefecture of the city. It still later might be given to any senator, but, though a title of great dignity, no power belonged with it, not even the presidency of the senate. Finally, the Roman emperors took the title, and with it assumed at will an authority over the acts of the senate.

Prince Ru′pert's Drops are formed by throwing melted glass into water. They have an elongated, tapering form. A smart blow upon the large end makes no impression, but if the smallest part be picked off the small end, the whole falls into powder.

Prince's Feather. See AMARANTH.

Prince's Met′al [named from Prince Rupert] is a kind of brass, nearly the same as pinchbeck; but the term is vaguely used for other alloys.

Prin′cess Anne, county of S. E. Virginia, bounded N. by Chesapeake Bay, E. by the Atlantic Ocean, and S. by North Carolina. It has extensive forests and a light productive soil. Corn and live-stock are leading products. Area, 350 sq. m. Cap. Princess Anne Court-house. P. 8273.

Princess Anne, p.-v. and tp., cap. of Somerset co., Md., on Eastern Shore R. R., 116 miles S. of Wilmington, Del., has 4 churches, 1 steam grist and saw mill, 2 hotels, and 1 newspaper. P. of v. 805; of tp. 4120.

C. W. FONTAINE, ED. "HERALD."

Princess Anne Court-house, p.-v., cap. of Princess Anne co., Va.

Prince′ton, p.-v., Blenheim tp., Oxford co., Ont., Canada, on Great Western Railway, 8 miles W. by S. of Toronto, manufactures lumber and shingles, and has 1 weekly newspaper. P. about 600.

Princeton, p.-v., cap. of Dallas co., Ark. P. 1142.

Princeton, p.-v., Colusa co., Cal., on Sacramento River. P. 132.

Princeton, p.-v. and tp., cap. of Bureau co., Ill., on Chicago Burlington and Quincy R. R., 105 miles W. of Chicago, has 1 high and 3 excellent public schools, 14 churches, a public reading-room, 3 newspapers, 3 banks, 4 hotels, 2 flouring-mills, 2 grain-warehouses, a bread cracker-factory, a foundry and machine-shop, a plough-factory, gasworks, and a manufactory of farm implements. P. of v. 3264; of tp. 4363.

C. N. WHITNEY, ED. "BUREAU CO. HERALD."

Princeton, tp., Cass co., Ill. P. 348.

Princeton, p.-v., Patoka tp., cap. of Gibson co., Ind., on Evansville and Chicago and Louisville New Albany and St. Louis R. Rs., 27 miles N. of Evansville, has excellent schools, 2 weekly newspapers, a grain-elevator, 1 bank, 2 flouring, 2 woollen, and 2 planing mills, 3 wagon, carriage, and plough shops, and 2 magnificent dépôts. P. 1847. A. J. CALKINS, ED. "CLARION."

Princeton, tp., White co., Ind. P. 851.

Princeton, p.-v. and tp., Scott co., Ia., on Mississippi and Wapsipinicon rivers. P. 498; of tp. 1197.

Princeton, p.-v., cap. of Caldwell co., Ky., on Louisville Paducah and South-western R. R., has a college and several good schools, 7 churches, 1 bank, 2 hotels, 1 newspaper, a woollen-factory, and 2 mills. It is located in a rich coal, iron ore, and lead-bearing section. P. 1012.

C. T. ALLEN, ED. "BANNER."

Princeton, p.-v. and tp., Washington co., Me., on St. Croix and Penobscot R. R. P. 1072.

Princeton, p.-v. and tp., Worcester co., Mass., includes Mount Wachusett, the highest mountain in Massachusetts. P. 1279.

Princeton, p.-v. and tp., cap. of Mille Lacs co., Minn., on Rum River. P. 662.

Princeton, p.-v., Morgan tp., cap. of Mercer co., Mo., on Chicago Rock Island and Pacific R. R., 402 miles from Chicago, has excellent schools, 2 churches, 2 newspapers, 1 wagon-factory, a fine flouring-mill, and 3 lumber-yards. Fine water-power and an abundance of good timber exist here. It was incorporated in 1857. P. 389.

W. L. ROBERTSON, ED. "ADVANCE."

Princeton, p.-b. and tp., Mercer co., N. J., situated on Delaware and Raritan Canal, and on a branch of Pennsylvania Central R. R., 49 miles S. W. from New York City and 11 miles N. E. of Trenton, is beautifully located upon an elevated ridge commanding a fine prospect; is noted as the scene of the battle of Jan. 3, 1777 (see PRINCETON, BATTLE OF), has numerous fine residences, and is the seat of the College of New Jersey (see NEW JERSEY, COLLEGE OF) and the preparatory school of the college. The Theological Seminary of the Presbyterian Church is located here. There are 9 churches, 2 banks, 2 hotels, 2 public and several private schools, and 1 newspaper, besides periodicals connected with the college and seminary. The Continental Congress assembled here June 30, 1783. P. of b. 2798; of tp. 3986.

C. S. ROBINSON, ED. "PRINCETON PRESS."

Princeton, p.-v., cap. of Mercer co., West Va.

Princeton, p.-v. and tp., Green Lake co., Wis., on Fox River and on Sheboygan and Fond du Lac R. R., has 1 newspaper and an active trade. P. 705; of tp. 1709.

Princeton, Battle of, an important engagement of the war of the American Revolution, though the numbers of the combatants and the total losses were relatively small. A week after the battle of TRENTON (which see), Lord Cornwallis marched against Washington and encamped near Trenton, with the intention of attacking the Americans on the following day. Washington, perceiving that he would fight to a disadvantage at Trenton, and learning that only three British regiments and a few dragoons remained at Princeton, made a bold night-march upon that place, surprised the enemy at daybreak (Jan. 3, 1777) in the vicinity of the college, and routed and dispersed them within twenty minutes, inflicting a loss of 200 killed and wounded and of 230 prisoners. The American loss was not above 30 men, but included Gen. Hugh Mercer, 2 colonels, 1 major, and 3 captains. This result was of immense value in reanimating the courage of the colonists, who had been disheartened by a series of reverses, and the action was the precursor of a well-combined series of operations by which the British were driven from the greater part of the two Jerseys.

Prince′town, port of entry, cap. of Prince co., P. E. I. (Dominion of Canada), on the N. side of the island, 38 miles from Charlottetown. Malpique harbor, 3 miles distant, is deep enough for ships of 1000 tons. P. about 400.

Princetown, tp., Schenectady co., N. Y. P. 846.

Prince′ville, v. (STANFOLD P. O.), Athabasca co., Quebec, Canada, is the site of Princeville College, established in 1862. P. of sub-district, 511.

Princeville, p.-v. and tp., Peoria co., Ill., on Peoria and Rock Island R. R. P. 424; of tp. 1335.

Prince Wil′liam, county of Virginia, extending W. and N. W. from Potomac River. Area, 350 sq. m. It is somewhat uneven, and the soil is naturally fertile. Corn is the principal product. Traversed by Alexandria Virginia Midland and Great Southern R. R. Cap. Brentsville. P. 7504.

Prin′cipal [Lat. *principalis*], in an organ, the name of one of the chief stops or sets of pipes. The principal is a metallic stop, and is tuned one octave above the diapasons—*i. e.* above the ordinary pitch—and hence it is sometimes called the "octave" stop. In tuning an organ of several stops it is found convenient to commence with the principal, as it stands midway in pitch between the diapasons and the fifteenth, and by the clearness of its tone furnishes the best standard for the adjustment of most of the other stops. The name probably arose from this priority of the stop in the tuning of an organ, and not from any quality in itself implying superiority or precedence.

WILLIAM STAUNTON.

Pringhar, p.-v., cap. of O'Brien co., Ia., has a court-house, 1 newspaper, a good hotel, and a land-office. P. about 60. A. H. WILLITS, ED. "PIONEER."

Prin′gle (THOMAS), b. at Blaiklaw, Teviotdale, Scotland, Jan. 5, 1789; met with an accident in infancy which rendered him a cripple for life; graduated at Edinburgh University; became clerk to the commissioners on the public records of Scotland; began in 1811 to publish occasional poems; became in 1817 co-editor with James Cleghorn of the *Edinburgh Monthly Magazine*, which soon took the name of *Blackwood's Edinburgh Magazine;* was at the same time editor of the *Star*, a semi-weekly newspaper, and of *Constable's Magazine;* joined a company of twenty-four persons, including his father and brothers, with whom he emigrated to South Africa 1820; taught school at Cape Town; became librarian to the colonial government, and successively edited two newspapers, which were short-lived on account of the censorship; returned to England 1826; became secretary of the Anti-Slavery Society 1827; published several volumes of poems and miscellaneous writings, including *African Sketches* (1834), and left a posthumous *Narrative of a Residence in South Africa* (1835). D. at London Dec. 5, 1834. The *Poetical Works of Thomas Pringle, with a Sketch of his Life*, by Leitch Ritchie, appeared in 1838. Some of his sketches and poems descriptive of life in South Africa have obtained great favor with the public.

Prings'heim (Nathanael), b. at Landsberg, Silesia, Nov. 30, 1823; studied botany; was professor at the University of Jena from 1864 to 1868, and commenced in 1857 the publication of the *Jahrbücher für wissenschaftliche Botanik*. His principal works are—*Ueber die Befruchtung und Keimung der Algen und das Wesen des Zeugungsactes* (1855), *Grundlinien einer Theorie der Pflanzenzelle* (1854), *Beiträge zur Morphologie der Meeresalgen* (1862), *Ueber den Gang der morphologischen Differenzirung in der Sphacelarien-Reihe* (1873).

Print'ing [Lat. *premere*, to "press"], or **Typography,** the art of combining movable type, and from their surface, through the medium of coloring-matter and paper, multiplying copies by pressure.

The word "printing" has a wide application, and comprehends many modes of reproducing surfaces in relief, intaglio, or plane, some of which are noticed in this Cyclopædia under the titles Anastatic Printing, Calico-Printing, Carpets, Engraving, Lithography, Nature-Printing, Paper-Hangings, Photography, Pottery and Porcelain Manufacture, Telegraph, Zincography, and others.

History.—From the earliest historic period some mode of engraving and producing impressions or devices has been known, but seems not to have advanced beyond the form of seals until the time of the Babylonians and Assyrians. Their buildings were built of burnt brick generally, which were stamped with an inscription according to the character of the edifice, and bearing the name of the reigning monarch. These impressions in many instances show clearly that the stamp was engraved in relief and applied to the plastic clay. The Assyrians, unlike any other nation of antiquity, employed terra-cotta for all the purposes of writing and the preservation of their literature. This was of a fine and compact clay, made in the form of hexagonal prisms, cylinders, and rectangular tablets, of a pale-yellow color, sometimes covered with a vitreous silicious glaze or white coating, but generally unpolished or unglazed. The prism or cylinder was used for historical documents, and the square tablets, varying in size from one to many inches square, were employed for literary, official, and other purposes. The recent discovery of the royal libraries at Nineveh and Kouyunjik has brought to light many thousands of these cylinders and tablets, which have restored to modern history much of the vast literature of the Babylonians and Assyrians. The tablets seem to have been prepared and kept moist, rolled up like paste, and unrolled when wanted, incised with a metal stylus (a specimen of which was discovered by Mr. George Smith at Kouyunjik), and baked in a kiln. In the case of official documents the witnesses or other parties impressed their oval seals on the wet clay, and to prevent enlargement a cylinder was run round the edges or across, leaving its impression in relief. In the libraries the tablets were arranged according to their subjects. Each subject was commenced on one tablet and continued on other tablets of the same size and form, the number sometimes amounting to over 100. Each series of tablets had a title formed of the first phrase in the subject, and at the end of every tablet was written its number in the work, with the title, and also at the end a catch-phrase consisting of the first line of the following tablet. The cylinders and prisms, however, have attracted much attention, as they show in many instances that they were impressed from an engraved surface, and that the Assyrians must have first prepared a stamp, probably on wood, in order to multiply a large number of the cylinders and prisms, as these seem to contain the more important proclamations and laws of the kingdom. All these different forms were covered with cuneiform letters, the wedge-shaped character of which seems to have arisen from the material employed and the method of incising used. The celebrated cylinders of carnelian, chalcedony, jasper, and other substances, hundreds of which are preserved in European museums, were the official and private seals by which the integrity of these documents was attested, and show that the Assyrians had attained great skill in engraving. It may be observed that it is singular the Assyrians stopped so short of printing, when all that was necessary was to impress a baked tablet or cylinder on moist clay, bake it hard, and use that as a matrix to impress thousands of moist clay tablets; and a mode, too, simpler than attained by any nation till the discovery of printing with movable type. The Egyptians also used stamps to impress the bricks used for their buildings. In the British Museum are specimens of these Egyptian stamps, one bearing the name and title of Amenophis III., which was found in a tomb at Thebes, and is of wood, of an oval shape, 5 inches long by 2¼ inches wide, half an inch thick, fitted to an arched handle; the hieroglyphic characters are engraved in intaglio, an impression from which would show the characters in relief. There is also a square stamp for bricks for the granaries of the temple of Phtha. The Egyptian stamps appear to have been used to mark the destination of the bricks. The Chinese have used a simple mode of printing from an early date. A work supposed to have been written during the reign of Woo-Wang (1169–16 B. C.) mentions the blackening of engraved characters, but is a probable allusion to some mode of making inscriptions more legible by blackening the letters. According to their chronicles, the early attempts of their present mode of printing were made about 50 B. C., but no great advance was made till the reign of Ming-Tsong (927–934 A. D.), when Foong-Taou printed copies of the classical books by taking impressions from stone plates, the letters being cut into them, which thus showed white on a field of black. This mode is still employed in Chinese lithographic printing. Foong-Taou then printed an edition of the nine *King*, or classical books, for the imperial college at Peking, from wooden blocks engraved in relief, which edition was completed in 952. This process of printing has been practised to the present time, and is as follows: A calligraphist writes the separate pages of the intended work on fine tracing-paper; an engraver glues them face downward on a thin plate of hard wood, called *li*, resembling that of the pear tree, and with a sharp instrument cuts away the surface around the characters, leaving them in relief; the printer, with two fine brushes in the right hand, one dry, the other containing ink, blackens the letters with the latter, and passes the former gently over the paper which has been laid on them. The Chinese paper, being thin and transparent, is printed on one side only, two pages side by side, separated by a line down the middle as a guide to the binder, who doubles and fastens the open leaves together at the back, the fold being the outer edge. In 1041 a Chinese blacksmith, Pi-Ching, formed cubes of porcelain paste, upon which he cut the most frequently-used characters, and baked them until hardened. These, being of different heights and thicknesses, were placed in a kind of cement, pressed down evenly, and printed from; but this process seems not to have extended after his time. Various attempts have been made to substitute separate characters for the engraved blocks, but it is rendered difficult because every word in Chinese requires a new character, instead of each word being composed of elements resolvable into the simple alphabet so well known to the Western nations. The Chinese characters represent ideas or complete words, of which it is estimated there are not less than 80,000. For printing the New Testament and other works of a limited number of words an assortment of separate types has been successfully used. The National Printing-office at Paris, the Imperial Printing-office at Vienna, and English type-foundries have made very complete collections of Chinese characters, that of Paris reaching 43,000. A printing-office in Peking has used movable types of cast metal since 1776. The Greeks were early acquainted with engraving on metal, their maps being cut with lines below the surface, but seem never to have multiplied copies from them. The ancient Romans made use of metal stamps, with characters engraved in relief, to mark their articles of commerce and brand cattle. The old Roman potters appear to have possessed separate stamps for letters, as some of their clay lamps show that the inscriptions were made by impressing each letter separately. The British Museum contains several Roman stamps with the letters engraved in relief, which seem to have been used to print the owner's signature on documents. Although the Romans had no mechanical mode of multiplying literature, yet they had a well-organized system of slave-labor, which enabled books to be written cheaply, and nearly every one could boast of having one or more volumes. With the decline of Roman civilization literature was despised by all ranks of society, and a passion for military glory alone occupied their minds. Even emperors and kings could not sign their names, and Theodoric, Justin I., and Charlemagne used stamps engraved in wood to impress their signatures to public and private documents. During the following centuries the taste for literature was cultivated by a few, the Church through her scribes fostered the transcription of the Bible, the classics were multiplied, and gradually the people acquired a thirst for knowledge which was but poorly supplied. With the introduction of the art of paper-making, about the beginning of the eighth century, epistolary correspondence increased, books were multiplied more rapidly, and with the endeavor to supply the people more cheaply with religious reading wood-engraving was invented, first to disseminate scriptural scenes, and finally illustrations and texts in a large number of pages, imitating the manuscripts of the period.

Block-Printing and Block-Books.—Toward the beginning of the thirteenth century wood was engraved upon in Italy, Sicily, and Spain to produce designs with the aid

of ink on fabrics of linen and silk. Playing-cards were produced by the same method, and afterward colored by hand or by means of stencil-plates. Old manuscripts of this time are in existence which have initial letters, and sometimes pictures printed, while the text is in handwriting. There is in the library of Upsal, Sweden, a curious volume known as the *Codex Argenteus*, or *Silvered Book*, a translation of the four Gospels, so-called because the letters are in silver on leaves of purple vellum, supposed to have been made not later than the sixth century. From the indentation on the other side of the leaf, and the turned letters found occasionally, it seems to have been made by the separate stamping of each letter upon the leaf. About the beginning of the fifteenth century single prints appeared, of a religious character, from Germany and Holland. These pictures, or image-prints, were made of many sizes, generally engraved in outline, and highly colored. The earliest known with date is that of St. Christopher carrying the infant Saviour upon his back across a river, and having a legend of two lines at the foot, with the date 1423, of which three copies are known to be in existence. It is about 8 by 11 inches in size, printed on paper, and in ink almost black, differing thus from other image-prints, which are generally in a dull or faded brown ink. There are many other image-prints which are referred to about the same date. Manuals of devotion followed, of a limited number of pages, generally containing pictures with a few words beneath or in the interior, some having the pictures on one leaf and the explanation or text on the other. The most notable of these were the *Biblia Pauperum*, or *Bibles for the Poor*, or rather books for indigent preachers, consisting of a series of rude engravings, each occupying a page, on one side of the leaf only, and divided into compartments having pictorial illustrations of the most remarkable incidents mentioned in the Pentateuch, the Gospels, and the Apocalypse, and accompanied with explanations in Gothic characters. The two pages facing each other were engraved on one block of wood, and the book put together in sections of two leaves, two pages of illustrations being followed by two blank pages. It is a folio, printed on paper, in ink of a dull or rusty-brown color, and contains forty pages, each engraving being 10 inches long and 7½ inches wide, without folios; but the first twenty pages are marked in alphabetical order from *a* to *v*, and the last twenty with the same letters having a dot before and after, as, *.a.* to *.v.* Its date is referred to about 1420. At least four distinct editions from wood, two Latin and two German, have been discovered. Of the first edition there are known to be fifteen copies, varying in slight particulars, but tending to prove a common origin. This is the type of all the block-books, of which other notable examples of an early date are the *Apocalypsis Johannis*, three works on the *Virgin Mary*, the *Enndtkrist* or *Antichrist*, *Ars Memorandi*, *Ars Moriendi*, *Speculum Humanæ Salvationis*, etc. Sotheby in his *Principia Typographica* (1858) describes twenty-one block-books, all distinct works.

The Discovery of Typography.—For four centuries solemn jubilees in honor of the invention of printing have proclaimed the name of Gutenberg, and yet the clouds which surround that discovery and veil the personality of the inventor are far from dissipated. In vain the importance of the benefit and the recognition of the benefactor have multiplied in all time research in France, Germany, and all civilized countries in order to penetrate the mysteries in which it seems that Gutenberg wished to conceal both his name and his works. In attempting to deprive Gutenberg of the merit of his different impressions, one would attribute the impression of the great Bible of 36 lines to Pfister of Bamberg, a fabricator of images (image-prints) rather than a printer; and to another printer still more obscure the grand edition of the *Catholicon* of Janua. Holland, without any positive proof, pretends that Coster is the inventor of the engraving and founding of the characters, and even of the press; and Corsellis would have us believe that Gutenberg stole from Coster his invention and his printing-materials to transport them from Harlem to Mentz. Notwithstanding the pretensions put forth by these, and the diverse claims of seven cities to the honor of the discovery of printing, the public voice has ever coupled with the art the name of Gutenberg; and the lawsuits he sustained against his associates, first at Strasbourg and then at Mentz, and the testimonies of his contemporaries, show him as the statues erected to his memory at Strasbourg and at Mentz represent him, leaning on his press, whence streams forth the light, and discovering the secret of printing by the founding of movable characters. The ancient witnesses and contemporaries clearly state that the first inventor of typography is John Gutenberg of Mentz, and the first work most befittingly accomplished was the Latin Bible. The keynote to the proof is perhaps the statement of John Schöffer, grandson of Faust, in the *avis* placed at the head of the folio edition of Titius Livius, printed by him in 1505: "It was at Mentz that first the admirable art of printing was invented in the year 1450; it was afterward improved and propagated for posterity by the capital and labors of John Faust and of Peter Schöffer." This succinct statement, made by the son of Schöffer, the son-in-law of Faust, establishes the facts that the invention of the typographical art was at Mentz; that it is due, before all others, to John Gutenberg; that the capital was furnished by John Faust; and that the improvements appertain to Peter Schöffer. John Gutenberg (his mother's name; also known as Hans Gansfleisch, his father's name) was born about 1400 at Mentz. About 1420 he removed to Strasbourg, and was a constable in 1436. Here he associated with himself André Dritzehen, a noble of birth like Gutenberg, Hans Riffe, and André Heilmann, all Strasbourgers, and prosecuted certain work with the greatest secrecy at the convent of St. Arbogaste. This association, with others who were successively initiated into the secret work, hoped to obtain considerable benefits from the fair of pilgrims to Aix-la-Chapelle in 1440 by the preparation of a work of considerable sale, of which the transcription occupied thousands of scribes—a hope which could only be realized by the Bible. In 1438 the association was dissolved by the death of Dritzehen, and the judgment pronounced on Dec. 12, 1439, fixed the regulation of the account in the contribution made in money of each associate. The authentic legal documents relating to the *procès* are carefully preserved at Strasbourg, and they make mention of the *press* and of lead and other objects necessary in the trade. In the experiments for printing indicated, Gutenberg must probably have passed through the following phases: Engraving of movable letters in wood, and then in lead; casting of these letters by means of matrices in sand, earth, lead, or tin; retouching after the casting of these characters; engraving of the letters on brass not tempered, then tempered after engraving, and striking of the letters in the matrices in copper; moulds, of which the mechanism was probably similar at first to those with which the ancients were familiar for casting medallions, and which were successively perfected, especially by Peter Schöffer; composition of drying ink, and the preparation of leather skins of a nature convenient to spread it upon the characters without smudging; and finally, the PRESS. Little is known from this time till 1448, when Gutenberg is found at Mentz, where he established his printing-office in his uncle's house. John Faust, being assured of the success of Gutenberg's work, engaged himself to supply money for its prosecution in 1450, but the material furnished was assigned to him in guaranty. This continued for about five years, when Faust called Gutenberg before the tribunal at Mentz to render an account, the legal documents in the case being still preserved at Mentz; and, after the auditing of the accounts, the larger part of the printing-office and of the impressions fell into his hands. Gutenberg, however, established himself at his mother's house, and appears to have done as much work as was afterward accomplished by Faust. It is believed that at this house he printed the *Catholicon* of Janua in 1460. Although depressed by his poverty, he was in high esteem with the public, and in 1465, Adolphe de Nassau accorded to him, by a diploma, the title of gentleman of his court, with an ample endowment. About this time Gutenberg associated with himself Dr. Conrad Homery, who after the death of Gutenberg (in Feb., 1468) succeeded to the possession of the materials, etc., engaging to employ them only in the town of Mentz, and grant its citizens the first right to the works he might print. The inscription placed in 1507 in the house occupied by Gutenberg says he was the first to make printing letters in *brass*, and from other allusions scattered in various early books this can only be taken to indicate the making of type, with melted metal, in brass moulds, and hence the invention of topography.

The works printed by Gutenberg appear to be the following: (1) A little vocabulary called the *Catholicon*, printed perhaps at Strasbourg, but of which no copy remains. (2) One or more editions of the *Donatus*, printed perhaps at Strasbourg, with the characters which served later for the Bible of 36 lines, of which several fragments are in existence. (3) The *Letters of Indulgences*, printed from 1454 to 1455. (4) The *Calendar of 1457*, printed with the characters of the Bible of 36 lines, of which one page is in the Imperial Library of Paris. (5) The *Appeal against the Turks*, which appeared in 1454, printed with the characters of the Bible of 36 lines, a copy of which is in the Library of Munich. (6) The *Bible* of 36 lines, three vols. folio, 2 columns to a page, of which the first essays, begun perhaps at Strasbourg, may have determined John Faust to associate with Gutenberg for the execution of that great

work. (7) The *Psalter* of Mentz. The misfortunes of Gutenberg, which might well have disheartened him, and the trials he sustained, have effectually preserved his fame and prove his title as the discoverer of typography, so well set forth by Ambroise Firmin-Didot in his *Nouvelle Biographie*, of which the above is an outline. Faust afterward associated himself with Peter Schöffer, and with the material obtained from Gutenberg printed off a considerable number of copies of the Bible to imitate those which were commonly sold as MSS., and he undertook to sell them at Paris. The low price and the uniformity of the copies excited surprise, the red ink with which he embellished his copies was said to be his blood, and he was adjudged to be in league with the infernals. To save himself from burning he revealed his art. A few years after the sacking of Mentz (1462) the pupils and the workmen of Faust and Schöffer were dispersed, the discovery was made public, and the art spread over Europe. Before 1500 printing-presses had been set up in 220 places, which were mainly occupied in producing classical works. From Mentz the art was transplanted to Haarlem and to Strasbourg; from Haarlem to Rome in 1466 by Sweynheym and Pannartz; to Paris in 1469; to England in 1474; and to Spain in 1475. Santander, in his *Dictionnaire bibliographique* (1805), gives a chronological table of 200 places where the art was practised during the fifteenth century, with the names of the printers and of the first productions of their presses. Of the various editions of books published in the sixteenth century, one-half were Italian, of which one-half were Venetian; one-seventeenth were English. (For the early establishment of newspapers in various places see JOURNALISM and PERIODICALS, and of the Bible for early editions see BIBLE.)

Printing in America.—The date of the introduction of printing into America is uncertain, but from the record of three early Spanish authorities it is believed that the art was introduced into Mexico by Viceroy de Antonio de Mendoza, probably after his arrival, in Oct., 1535. The first printer's name was Juan Pablos, and the first work printed the *Escala espiritual para llegar al Cielo* of San Juan Climaco, a translation from the Latin into Castilian by the printer himself, who was one of the religious settled there from Spain. This, then, was the first book printed in the New World, but no copy of it exists. The first book with date establishes the fact that a press was working in the City of Mexico in 1540. It is called *Manual de Adultos*, dated Dec. 13, 1540, a quarto in Gothic letter, printed by Juan Cromberger, whose imprint is also on several other books printed from 1540 to 1544. This Cromberger was a celebrated printer of Seville, and books bearing his imprint at this place also appeared both before and after the dates of the Mexican works. It is suggested, to reconcile all the statements brought to light, that Juan Pablos may have been at Seville in the employ of Cromberger, who was charged by Mendoza with the establishment of a printing-press in the City of Mexico, and who sent Juan Pablos over to conduct the business in the name and for the benefit of his master; that after Cromberger's death Pablos became the owner of the establishment, and was in this way, although not the first owner of a printing-press, entitled to the honor of calling himself the first printer of Mexico. The next press established in the New World was at Lima, Peru, about 1584, the earliest known book being the *Doctrina Christiana*, a quarto in the Quichua and Aymara languages, printed by Antonio Ricardo in Lima in 1584. Several other religious works of 1585 and 1586 by the same printer are also in existence. Between 1540 and 1600, before the introduction of the art into North America, there is recorded the issue of ninety-three works in the City of Mexico and seven in Lima. In 1639 the first press was erected in the house of the president of Harvard College, Rev. Henry Dunster, at Cambridge, Mass., through the efforts of Rev. Joseph Glover, who died while bringing the press and materials to this place. It was placed under the direction of Stephen Daye, by whom the first work issued was *The Freeman's Oath*, followed by *An Almanack* in the same year. Daye was succeeded by Samuel Green about 1649, under whom, in 1660–63, was printed the celebrated Indian Bible of Eliot, and other of his works in the Indian language. This press is still active, and known as the "University Press." The next press was established in Boston in 1674, after which printing gradually extended throughout the colonies. The following list gives the places and the time when the art was first introduced into the colonies, etc., of North America:

Cambridge, Mass.	1639	Annapolis, Md.	1726
Williamsburg, Va.	1681	Charleston, S. C.	1730
Philadelphia, Pa. (near)	1685	Newport, R. I.	1732
New York, N. Y.	1693	Halifax, N. S.	1750
New London, Conn.	1709	Woodbridge, N. J.	1751
New Berne, N. C.	1754	St. Louis, Mo.	1806
Portsmouth, N. H.	1756	Vincennes, Ind.	1808
Wilmington, Del.	1761	Natchez, Miss.	1808
Savannah, Ga.	1762	Michigan	1809
Quebec, Canada	1764	Kaskaskia, Ill.	1809
Albany, N. Y.	1771	Detroit, Mich.	1815
Westminster, Vt.	1781	Green Bay, Wis.	1831
New Brunswick, B. A.	1783	Little Rock, Ark.	1834
Falmouth, Me.	1785	Galveston, Tex.	1834
Lexington, Ky.	1786	Burlington, Ia.	1836
Knoxville, Tenn.	1793	Columbia, Or.	1847
New Orleans, La.	1794	San Francisco, Cal.	1848
Cincinnati, O.	1795	St. Paul, Minn.	1849

In 1775 the whole number of printing-houses in the British colonies was fifty. In the census of 1870 there were reported in the U. S. 2177 printing establishments employing 30,924 persons, of whom 2800 were females, paying in annual wages $18,882,918, having in capital $40,304,727, using material valued at $24,729,407, and producing works of all kinds worth $66,862,447. Only six States had over 100 printing-houses—Missouri 105, Illinois 130, Massachusetts 162, Ohio 187, New York 303, and Pennsylvania 318—the other thirty-six States and Territories having an average of exactly twenty-seven. In 1875 there were reported 7870 newspapers in the U. S., showing that there must be a very large number of printing-offices.

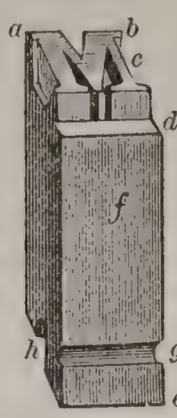
Early Printed Books.—It is interesting to note the peculiarities of the first printed works. An edition consisted of a limited number, for 200 or 300 was then esteemed a large impression. The size was either large or small folio, sometimes quarto. The leaves were without running title, direction-word, folios, or paragraphs. The character was a rude Gothic, mixed with secretary, imitating the handwriting of the time; the words were printed close together; abbreviations were numerous; the orthography was arbitrary; the sentences were distinguished only by the single or the double point, but subsequently the virgule (/) was used for the simple pause, answering to our comma. Capitals were not used, but titles and initial letters were left blank to be filled in by hand. In some works the embellishments surrounding the text were illuminated in colors, even gold and silver, and charged with saints, birds, flowers, etc. The printer's name, residence, and other information were either omitted or put at the end. The date was often omitted, sometimes obscurely indicated, or printed either at full length or by numerical letters, and sometimes in several ways together, as, "One Thousand cccc. and lxiiii.," etc., but always at the end. No variety of characters was used, a Gothic letter of the same size being used through the work. (See PUNCTUATION.)

Varieties of Type.—As already mentioned, the Gothic or old German text was used in the first printed works until 1465, when quotations in Greek characters were introduced into Cicero's *Offices*; but the first work in Greek type was the Greek grammar of Lascaris, printed by Paravisinus at Milan in 1476 in 4to. Many of the early printers prided themselves upon having superior fonts of Greek. The first work printed with Roman type was Cicero's *Epistolæ ad Familiares*, by Sweynheym and Pannartz, at Rome, in 1467. Italic type was invented by Aldus Manutius about 1500, who also introduced Roman type of a neater cut. The first Hebrew Bible was printed by two Jewish rabbins, named Joshua and Moses, in 1488, at Soncino in the duchy of Milan. The first book printed in the English language was a translation of *Le Recueil des Histoires de Troyes* of Raoul le Fèvre by Margaret, sister of Edward IV. of England, assisted by William Caxton, who also set up and printed it at Cologne in 1471. A few years after, Caxton set up his press in the monastery of Westminster Abbey, and in 1474 issued his *Game and Playe of the Chesse*, believed to be the first book printed with date in England. Toward the end of the sixteenth century various works were printed in Arabic, Armenian, Coptic, Persian, and Syriac type. Of late years complete fonts of nearly all written languages have been cast, and at the large printing-offices of Vienna, Paris, England, and America most of them may be had. The most complete collection is to be found at the Vienna Imperial Printing-office, which includes the difficult and rare languages of the Chinese, Hieroglyphic, Himyaritic, Assyrian, early Eastern inscriptions, and the Sanskrit series. This office has printed the Lord's Prayer in 206 languages and dialects in their appropriate characters. The National Printing-office at Paris has complete fonts for fifty-six Eastern languages and sixteen European languages which do not use the Roman character, the number of punches required being 361,000. American foundries can supply fonts for the more generally-known languages.

Type, the characters used in typography. The type itself is a thin metallic bar, like Fig. 1, which represents the letter M, and having the following characteristics: *c* is the face; *f*, the body; *g*, the nick; *a* to *b*, the width; *b* to *d*, the depth; *c* to *e*, the height to paper; *d*, the shoul-

der; from *d* to the face is called the beard; *h*, the groove left in dressing by cutting off the superfluous metal left by the mould, which leaves two parts for the bottom of the type, called the feet; the straight flat stroke of a straight letter is called the stem; the fine lines at the top and the bottom of a letter are the ceriphs; a projection over the body, as the top and the bottom of *f*, is a kern. This nomenclature is therefore similar to the names applicable to the human frame. Type are composed of type-metal, a composition of which the principal ingredient is lead. In the infancy of the art it was mixed with various hard metals to strengthen the lead and to bear pressure. The type-founders of the present day use alloys which each has determined will wear best, and they are generally trade-secrets. The alloy is, however, composed of certain proportions of lead, antimony, tin, and copper, so that the metal shall be hard, yet not brittle; ductile, yet tough; flowing freely, yet hardening quickly. This composition on solidifying expands slightly, thus ensuring the sharpness of the lines of the face; the antimony gives hardness, the tin toughness, and the copper tenacity. The proportion is 50 parts of lead, and equal parts of tin and antimony, with a little copper. Different sizes of type are made of varying qualities of metal, designated ordinary metal, hard metal, and extra-hard metal. Comparatively soft metal is used for spaces and large type, while small type is composed of hard metal. Type is made more durable by the electro-facing process of Dr. L. V. Newton, which deposits a thin film of copper over the face, as mentioned further on. Roman and Italic type are the letters most commonly employed in printing books in Europe and America, and these have undergone every change in form that taste or fancy could suggest, as will be noticed in the multitude of sizes, shades, and ornamentation exhibited in the display lines of books, papers, circulars, and posters. The various sizes of type have grown gradually into use, as the requirements of books and newspapers have dictated or the pride of punch-cutters has accomplished. Their names have generally been derived from the books upon which the type were respectively first employed. The following are the names of the thirteen usual sizes in the following languages:

FIG. 1.



Type.

English.	Dutch.	French.	German.	Italian.
1. Brilliant.				
2. Diamond.				
3. Pearl,	....	La Parisienne,	Perl,	Occhio di Mosca.
4. Agate.*				
5. Nonpareil,	Nonpareil,	La Nonpareille,	Nonpareille,	Nompariglia.
6. Minion.	....	La Mignonne,	Colonell,	Mignona.
7. Brevier,	Brevier,	Le Petit Texte,	Petit,†	Picolo Testo.
8. Bourgeois,	Bourgeois,	La Gaillarde,	Burgeois,	Gagliarda.
9. Long Primer,	Garmond,	Le Petit Romain,	Corpus,‡	Garamone.
10. Small Pica,	Dessendiaan,	La Philosophie,	Brevier,§	Filosofia.
11. Pica,	Mediaan,	Le Cicéro,	Cicero,	Lettura.
12. English,	Augustyn,	Le St. Augustin,	Mittel,	Silvio.
13. Great Primer,	Text,	Le Gros Romain,	Tertia,	Testo.

The following is a specimen of the sizes of type up to Great Primer, the numbers corresponding to the numbers and names above:

1.—abcdefghijklmnopqrstuvwxyz

2.—abcdefghijklmnopqrstuvwxyz

3.—abcdefghijklmnopqrstuvwxyz

4.—abcdefghijklmnopqrstuvwxyz

5.—abcdefghijklmnopqrstuvwxyz

6.—abcdefghijklmnopqrstuvwxyz

7.—abcdefghijklmnopqrstuvwxyz

8.—abcdefghijklmnopqrstuvwxyz

9.—abcdefghijklmnopqrstuvwxyz

10.—abcdefghijklmnopqrstuvwxyz

11.—abcdefghijklmnopqrstuvwxyz

12.—abcdefghijklmnopqrstuvwxyz

13.—abcdefghijklmnopqrstuv

These alphabets show clearly the difference in the depth and the thickness of the letters of the various fonts. Larger sizes, with a few exceptions, are named according to the number of pica lines in depth, as four-line pica, five-line pica, etc. Between nonpareil and minion there is a size in England known as emerald, but is used in America for the size of an ornamental border merely, under the name of minionette. Newspapers use minion, nonpareil, and agate extensively. Nonpareil was at one time called, from its extreme neatness and beauty, "silver type," a designation which has led some with more enthusiasm than knowledge to characterize works appearing in this character as books printed with type made of silver. Diamond is seldom used for entire works. The Oxford University Press issued in 1875 the "smallest Bible in the world," in English, printed on India paper, from diamond type, 72 lines long, including the head, 37 ems wide, containing 984 pages. The bound volume is 2⅝ inches wide, 4⅜ inches long, and half an inch thick. The American Bible Society issued in 1857 a diamond Bible, 72 lines long, 41 ems wide, containing 882 pages, which has the usual thin paper and leather binding. If presented in the English dress, it would be about a quarter inch wider and longer, but 100 pages thinner. Brilliant is rarely employed, except for references or side-notes to Bibles, etc. In 1874, Chatto & Windus of London issued *The Smoker's Textbook*, by J. Hamer, printed from brilliant type, 24 lines long and 20 ems wide (equal to 1 inch by 1¼ inches nearly), containing 155 words to a page, and 107 pages. The binding and paper make it 2⅞ by 2⅜ inches, and half an inch thick. Small as this type is, a type-cutter of Berlin has formed a type so minute as to be scarcely readable without a good magnifying-glass. More surprising still, as early as 1828, Henri Didot, of the Didot frères of Paris, had cut characters of almost microscopic fineness, with which he printed an elegant edition of Horace in 64mo, which was smaller than the liliputian editions by Janon of Sedan, France, or of Pickering of London, England, who issued some of the classics in type nearly like diamond.

* Or Ruby. † Or Jungfer. ‡ Or Garmond. § Or Rheinländer.

Height, Measurement, and Standard.—The height to paper, or the distance from the face to the feet of type, varies in the type made by the foundries of Europe and America, the height ranging from eleven-twelfths of an inch, or 0.9166 +, to over an inch, as in the Russian. Bruce's New York foundry makes it 0.92 inch, which is the standard adopted by American foundries. In measuring the thickness or width of type, the alphabet of lower case or small letters is calculated to make about thirteen ems, but foundries have no standard in this respect. The various fonts will measure from twelve ems to as high as sixteen ems to the alphabet, the same sized type being made to take in a larger number of words in the same space, or to spread out the words to fill a larger space, according to requirements. Book-compositors require fonts from pica to bourgeois to measure not less than twelve ems, and below bourgeois not less than twelve and a half ems; newspaper compositors require not less than thirteen ems; otherwise in either case extra compensation is allowed. The "standard of type" relates to the dimensions of the bodies of type and their relation to one another. The most exact standard is the French, in general use on the Continent, which divides pica, one-sixth of an inch deep, into twelve parts, called points, and conforms each size to a certain number of these points. The English and American standards vary, though generally, a pica being one-sixth of an inch, two nonpareils are equal to one pica, two pearls to one long primer, two diamonds to one bourgeois. The following table will give an idea of the proportions of type to space, etc., taking Bruce's standard of length, in which 201.58 lines of diamond are contained in a foot, every seventh size in the series being doubled, and every size being made 12.2462 per cent. smaller than the size following it:

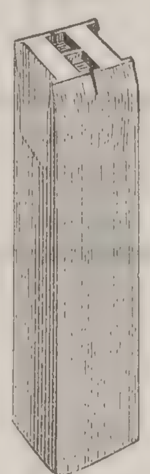
SIZE.	Lines in a foot.	Ems in a pound.	Square inches in 1000 ems.
Pearl	179.59	800	4.55
Agate	160	690	5.29
Nonpareil	142.54	520	6.93
Minion	126.99	360	10.10
Brevier	113.13	290	12.60
Bourgeois	100.79	270	13.86
Long primer	89.79	200	18.20
Small pica	80	170	21.16
Pica	71.27	130	27.72

One pound of average type occupies 3.5 square inches, or 800 ems pearl, etc.

Type-Founding.—From the discovery of printing to the beginning of the seventeenth century printers cast their own type, when it became a distinct business from printing. Nuremberg contained the best punch-cutters, and supplied Germany with punches. Bodoni (1740–1813) of Italy, the Didots of France, and Breitkopf (1719–94) of Leipsic are the most distinguished names in the subsequent history of type-making. Great Britain imported type from Holland until about 1720, when William Caslon became an excellent letter-cutter. The Caslon foundry, established in 1718 in London, is still in existence, and contains the original punches which Caslon cut. Baskerville and Alexander Wilson are other noted names. About 1735, Christopher Saur (or Sower) began printing at Germantown, Pa., and

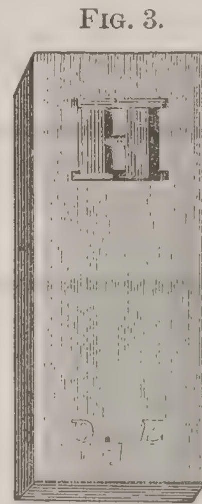
cast the type which he required, executing the second Bible printed in America, a quarto, in German, in 1743. Several unsuccessful attempts were subsequently made to establish type-foundries in America, among them one by Dr. Franklin. Binney & Ronaldson of Edinburgh commenced type-founding in Philadelphia in 1796, and, after a severe struggle and by State aid, were the first to establish a business, now known as the Johnson Foundry under MacKellar, Smiths & Jordan. Before the close of the century, David Bruce, from Edinburgh, established the same business in New York, and in 1813 the firm of David & George Bruce commenced the first stereotype-foundry in the U. S. There is evidence that at the beginning of the sixteenth century the apparatus for type-founding was much the same as up to the middle of this century. In devising a new font of type the first process is to make the model letter. Instead of cutting out the interior of the letter, a tool, called the counter-punch, is cut on steel to fit the hollow of the letter. The counter-punch is then struck on the end of a short bar of soft steel, which is the punch, and the outer edges of the letter are cut away. The punch is hardened, which then resembles Fig. 2, and is punched into a flat piece of cold-rolled copper like Fig. 3, which, after careful finishing, becomes the matrix, or mother-type. The letters on the bottom of the matrix indicate the size, double english, and the number of nicks, in this case one nick. Every letter requires a separate punch and a matrix. Matrices may also be made by electrotyping from the face of the type or an engraving. The matrix is now fitted to the mould to form the body of the letter. The hand-mould, used from the discovery of printing until recently, is composed of two parts, which fit exactly together. The external surface is of wood, the internal of steel. At the top is a shelving orifice, into which the metal is poured. The space within is of the size of the required body of the letter. The caster, holding the mould in the left hand, with a small ladle containing about a spoonful pours the metal into the orifice, then jerks up the mould higher than his head to expel air and condense the metal, lowers it, opens the mould, and casts out the type. The hand-mould is now seldom used, except to cast large metal or kerned type. The type, when first thrown out, has a piece of metal attached to its base, called the jet, represented at the bottom of the letter H in Fig. 4. In hand-dressing this jet is broken off by boys, the sides of the type are rubbed smooth on gritstone, and the type set up in long lines. They are then dressed and finished, a groove (Fig. 1, h) made in the foot of the type to remove the piece of the jet remaining, and, after examination with a microscope to pick out bad letters, are ready for use.

Fig. 2.



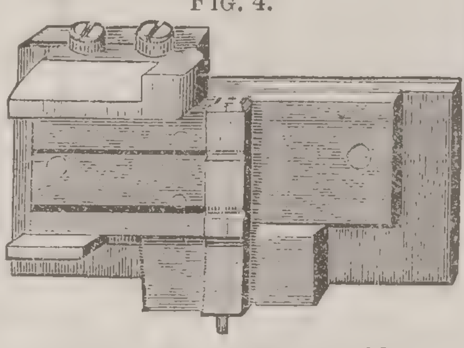
Punch.

Fig. 3.



Matrix.

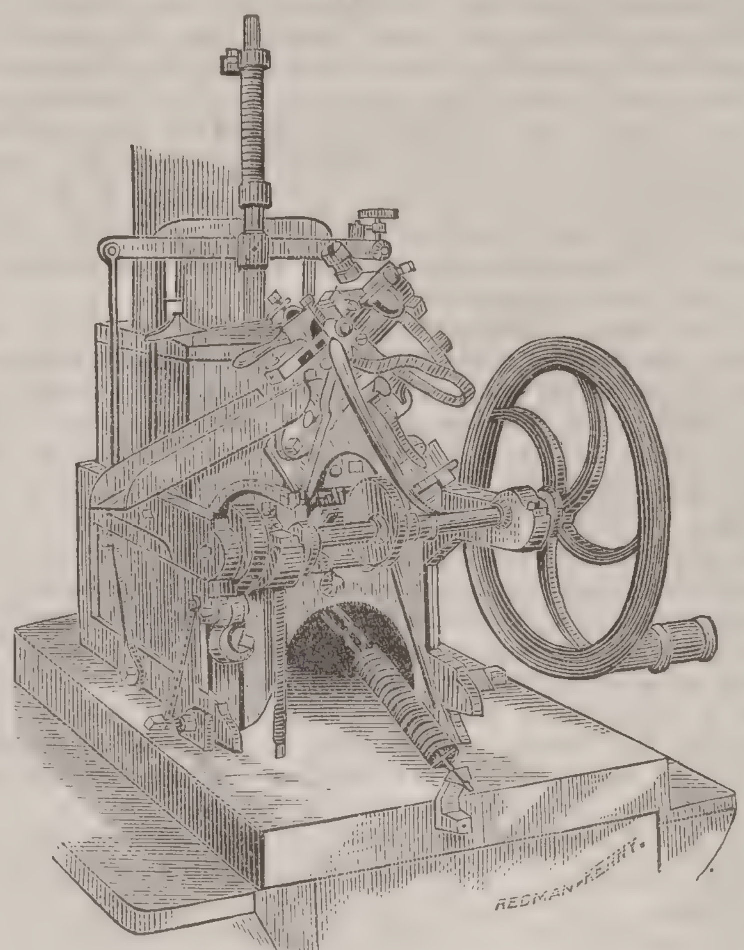
Fig. 4.



Half of Machine-Mould.
(*De Vinne.*)

Type-casting Machines.—About 1826, William M. Johnson of Long Island, not a founder, conceived the idea of casting type by machinery, but it resulted unfavorably, the type being light and porous. After several attempts by others, David Bruce, Jr., of New York, after years of study and experiment, patented the only thoroughly successful type-casting machine Mar. 17, 1838. Subsequently improved, it is now in general use in American foundries, and was slowly adopted, with modifications, by European founders. This machine is represented in Fig. 5. It consists of a small melting-pot to hold the metal, which is kept warm by a gas-jet or small furnace. In the interior of the pot is arranged a forcing-pump and valve for admitting the metal under the piston, and also for preventing the return of the metal into the mass in the pot when the piston is depressed, and thus securing the full force exerted upon the piston being transmitted by the piston to the molten metal under it, and forcing it through a narrow channel leading from the bottom of the chamber in which the piston works to the outside of the pot, where a nipple is inserted, with a small hole through it, communicating with the narrow channel. Against this nipple the mould in which the type is formed is pressed at the moment at which the piston descends, and it receives the molten metal that forms the type. The type-mould, of steel, is composed of two parts, each fitting the other with great exactness. Fig. 4 represents one-half of this mould, containing a letter just cast, which shows the nicks in the letter formed by wires in the other half-mould, and the jet of surplus metal attached to the bottom of the type. The face of the letter is shown without the matrix, Fig. 3, which is properly adjusted when in position, and the mould closed. A mould is made for each size of type, and is immovable in the direction of its depth (b to d, Fig. 1), but may be adjusted to suit the varying width (a to b, Fig. 1) of any letter when a matrix is in position, thus ensuring the same length for every type cast in each font. It is therefore only necessary to change the matrix for every character, instead of having a mould and matrix for the different letters. One-half of the mould is attached to an oscillating arm, which carries the mould to and from the nipple in the melting-pot. The other half of the mould is attached to another arm, which is connected to the first arm, so that the two halves open and shut upon each other. The machine operates as follows: The piston being raised in the chamber of the pump, and the chamber being supplied with metal through the valve, the mould is brought against the nipple; the valve closes to prevent the metal being forced back into the pot; the piston descends and forces the metal through the narrow channel into the mould; the mould recedes, the halves separate, and the type is cast out. A blast of cold air is directed upon the mould to keep it cool. The type are hand-dressed as before. This machine is worked by turning a small crank-wheel. It may also be worked by steam. David Bruce in 1868 introduced an apparatus adapted to the type-casting machine to receive the type as fast as cast, and break off the jet or stem of metal by a consecutive operation. The machine of Johnson & Atkinson of London, Eng., is worked by steam, and the type are dressed automatically. A double line of grooves is placed side by side. At the end is a reservoir of molten metal heated by gas, to which the mould is brought; a jet of metal is thrown into the mould, which then opens, and deposits the type on a travelling apparatus in the groove. As the groove fills it is impelled along, and in its progress the shanks are taken off. At the end the position of the type is reversed by the machinery into the returning groove, in which it is rubbed, dressed, has the bottoms planed, and the nicks cut. On arriving at the exit end of the groove it is received into a type-founder's stick, and with others of the same letter is ready for packing. The London Type-Founding Co.'s machine is heated by gas, the mould is cooled by a stream of cold water, and the type when made travel into small chambers, where they are planed, smoothed, nicked, and grooved, ready for use. Several machines were introduced at an early date into the U. S. to rub and dress type automatically. The most recent improvement is the type-casting machine of J. A. T. Overend of San Francisco, Cal., patented in 1875. A pump-cylinder is provided with a plunger, having a chamber in its lower end; a hole in the

Fig. 5.



Bruce's Type-casting Machine.

lower part of the cylinder allows the metal to flow in, and as the plunger closes this hole in descending, an opening in its upper part arrives opposite the discharge opening, and the liquid is forcibly ejected. A self-adjusting nozzle connects the pumps with the mould. Between the nozzle and the mould a carrier is interposed having several arms with holes. When the metal passes into the mould, it opens, and the carrier moves forward, holding the type by its stem, and places it on an inclined table. A clamp secures the type, and a sliding plate, breaking the type from its stem, forces it between rubbers, to smooth the rough edges, fitting the type for use. The stem left in the carrier is afterward forced out by a pin. A machine casts about 100 type a minute. By the hand-mould about 400 type were cast in an hour.

Wood Type.—The large letters used in handbills and posters are made of wood, usually maple or bay mahogany, which is prepared as for wood-engraving. The outline of the character is first carefully cut upon the face of the block, which is placed under a revolving drill, which cuts away the superfluous wood, when it is finished by an engraver. William Leavenworth of Allentown, N. J., in 1834 applied the pantograph to the cutting of wood type, in which a tracing-point at one end follows the outline of a large model letter, and is repeated at the other end by a revolving cutter, which cuts the letter from a block of wood, after which it is dressed with a graver. Wood type may be cut out by the SAND-BLAST (which see), by cementing the stencils on the ends of the blocks, and placing them together under a moving jet, after which they are ready for use and require no dressing.

Fonts.—A complete assortment of type of any one face or size is called a *font* or *fount,* which may be regulated to any extent. Type-founders have a scheme for the proportional quantity of every letter required for a font, and a peculiar scale is necessary for every language. English founders select a scale having 3000 of the small letter *m* for its basis. American founders adopt nearly the same scheme by weight, and proportion all fonts, large or small, accordingly, a font of 500 pounds containing 20 pounds 8 ounces of *a* and 28 pounds 4 ounces of *e*. The following table shows the relative proportion of every character required in a font of 800 pounds of pica for ordinary work in the English language:

A Font of Pica, weighing 800 pounds.

Small letters.		Points, etc.		Capitals.		Small capitals.	
a	8,500	,	4,500	A	600	A	300
b	1,600	;	800	B	400	B	200
c	3,000	:	600	C	500	C	250
d	4,400	.	2,000	D	500	D	250
e	12,000	-	1,000	E	600	E	300
f	2,500	?	200	F	400	F	200
g	1,700	!	150	G	400	G	200
h	6,400	'	700	H	400	H	200
i	8,000	(	300	I	800	I	400
j	400	[	150	J	300	J	150
k	800	*	100	K	300	K	150
l	4,000	†	100	L	500	L	250
m	3,000	‡	100	M	400	M	200
n	8,000	§	100	N	400	N	200
o	8,000	‖	100	O	400	O	200
p	1,700	¶	60	P	400	P	200
q	500			Q	180	Q	90
r	6,200	Figures.		R	400	R	200
s	8,000			S	500	S	250
t	9,000	1	1,300	T	650	T	325
u	3,400	2	1,200	U	300	U	150
v	1,200	3	1,100	V	300	V	150
w	2,000	4	1,000	W	400	W	200
x	400	5	1,000	X	180	X	90
y	2,000	6	1,000	Y	300	Y	150
z	200	7	1,000	Z	80	Z	40
&	200	8	1,000	Æ	40	Æ	20
ff	400	9	1,000	Œ	30	Œ	15
fi	500	0	1,300				
fl	200	Accents.		Spaces.			
ffi	150			3-em spaces	18,000		
ffl	100	é	200	4- " "	12,000		
æ	100	à	200	5- " "	8,000		
œ	60	â	200	Hair "	3,000		
—	150	ô	200	Em quads	2,500		
——	90	All other ac-		En quads	5,000		
———	60	cents, 100 each.		Large quadrats, 80 lbs.			

This is the proportion for Roman letters, etc. An Italic font to accompany this would be in the proportion of one-tenth of the Roman, but generally not including spaces and small capitals. To give an idea of the number of pages this will set, suppose the page of type to be $8\frac{3}{4}$ inches long by $5\frac{3}{4}$ inches wide, or 53 lines long by 35 lines or (ems) wide, of pica. This will give 1855 ems in a page; there being 130 ems in a pound, this will make the page weigh nearly $14\frac{1}{4}$ pounds, which, divided into 800 pounds, gives about 56 pages. Allowing for capitals, etc., not used, the font given above will set from 45 to 50 pages of the size mentioned. Fonts of type now vary from 50 pounds to 20,000 pounds.

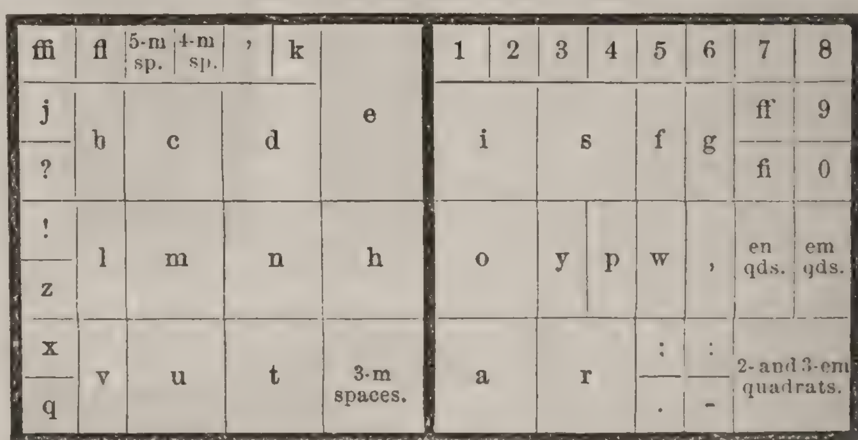
Case.—In the department of composition, or the art of composing or setting-up type, the type when received from the founder are arranged in a case containing boxes of various sizes for the different characters. The lower case has remained nearly the same as it was 200 years ago. It is a frame of wood, about $1\frac{1}{4}$ inches deep, $32\frac{1}{2}$ inches long, and $16\frac{3}{4}$ inches wide. Cases go in pairs, the upper case (Fig. 6)

FIG. 6.—*American Upper Case.*

*	†	‡	§	‖	¶	☞	℔	⅌	@	%	℅	′	°
¼	½	¾	⅛	⅜	⅝	⅞	$	£	2-em	3-em			
⅓	⅔	&	Æ	Œ	æ	œ	-	—	2-em	3-em	&	Æ	Œ
A	B	C	D	E	F	G	A	B	C	D	E	F	G
H	I	K	L	M	N	O	H	I	K	L	M	N	O
P	Q	R	S	T	V	W	P	Q	R	S	T	V	W
X	Y	Z	J	U	]	)	X	Y	Z	J	U	hair sp.	ffl

containing 98 boxes for capitals, etc., and the lower case (Fig. 7) containing 54 boxes for small letters, figures, and

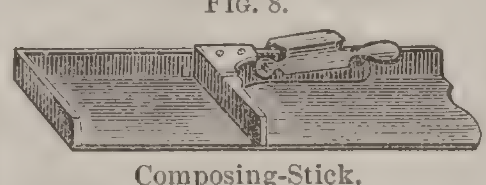
FIG. 7.—*American Lower Case.*



spaces. Fig. 6 shows the case adopted by American book-compositors, having the capitals on the left side and the small capitals on the right. Newspaper compositors prefer the capitals on the right side and the small capitals on the left. The lower case is so arranged that the letters most frequently used are placed in large boxes toward the middle and in front of the compositor. These cases are placed on a frame or stand about the height of the breast, and in a sloping position from the top to the bottom of the case, the capital case on the upper part of the frame, whence upper case, and the case containing the small letters on the lower part of the frame, hence called lower case. These cases contain only Roman letters. Italics and all other varieties are kept separately in similar cases. The spaces noticed in the cases are for equalizing the spacing. The *em* is a square space; *en,* two to an em; 3-em, 3 to an em; 4 to an em; 5 to an em; and hair-spaces, 6 to 13 to an em; 2- and 3-em quadrats are double or triple *ems*.

Composition.—The compositor in setting up type uses a small frame of steel, having three sides and a bottom, called the composing-stick. (Fig. 8.) It is usually from 6 to 12 inches long, 2 inches wide, and $\frac{5}{8}$ inch deep, and will hold about 20 lines of minion, the type in which this CYCLOPÆDIA is set. Larger sizes are occasionally used for wide measures.

FIG. 8.



Composing-Stick.

Two sides are immovable, the third side being movable to be adjusted to the width of the page, and then clasped, as in the Grover patent (Fig. 8), or secured with a screw. A setting-rule, type high, and of the required measure, is also used with the stick; it is made of a strip of steel or brass, having a short pointed projection at the top of the right end or on both ends. It enables the type to be put quickly in its place, and is used to empty matter from the stick, to lift matter, and to support matter in the left hand while distributing with the right. Having received a "take" or small portion of the copy of a work, which is placed conveniently on the upper case, the compositor holds in his left hand the stick, made up to the required measure, like a small trough, the rule resting against the back, and stands in front of the frame or the left of the middle of the case. Observing and remembering a few words of the copy, he looks to the proper box for the first letter, picks it up with the right hand so that the nick (Fig. 1, *g*) shall be outward and from him, and lays it in the stick with the nick looking toward the opening, which

brings the letter right side up. While putting the first letter in the stick, his eye at the same time looks toward the next box, and, his hand following immediately, he again picks up a letter with the nick from him, and places it by the side of the other. He does not look at the face of the letter, but glances at the nick (Fig. 1, *g*), and takes it for granted that if it come from the right box it must be the right letter. He secures every letter successively with the thumb of the left hand as the type are placed side by side in line from left to right. As nearly as the letters will allow in print, the type are set in the stick thus: ꓕʎdoƃɐɹdɥʎ. The compositor always reads the type in this manner, and does so as quickly as the ordinary reader comprehends the printed page. When he comes to the end of his line, and finds that he has a syllable or word which will not fill out the measure, he has to perform an operation which requires care and taste. This is called *justification*. The first and the last letter must be at the extremities of the line; and there must not be wide spaces between some words and thin spaces between others, but the distances between them must be made as nearly as possible uniform by changing the spaces, already explained, and thus getting in or driving out part or the whole of a word. The first line being justified, the rule is lifted to the front, and the compositor proceeds with the next line, and so on till the stick is full. If the matter is open, thin strips of metal (called "leads") are placed between the lines. Placing the rule at the front, he clasps the stickful with the thumbs on each upper corner, the fore fingers on each lower corner, and the side of the first and second joints of each middle finger at the left and right sides of the type, presses the corners and the sides toward the centre, and thus readily lifts the mass of separate letters; but it requires some practice to do this neatly. The stickful is placed on a galley, or oblong tray of wood or brass, having a raised edge of half an inch on two, three, or the four sides, but generally on the left side and top. Having completed his portion, the matter, as it is now called, is ready to be made up.

Distribution.—When the compositor has set most of the type out of the case, he distributes *dead* matter. The matter is first wet with water to hold the type slightly together. Placing twenty lines or so on the rule, held in the left hand and resting against the inside of the thumb and on the side of the third finger, he takes a few words between the thumb and middle finger of the right hand, separates the letters by the pressure of the fore finger, and, when his hand is over the proper box, lets the letter fall. This he continues till the case is full.

Composing and Distributing Machines.—Labor and ingenuity have been expended in efforts to substitute machinery for hand-labor in composing type, and perhaps have not been wholly fruitless. Nearly 100 patents have been granted for such machines in Europe and America, yet at the most perhaps no five printing-offices in the world use the same machine, and the number using machines is certainly small. Referring the reader to Ringwalt's *Encyclopædia of Printing* (1871) for a list of the patents heretofore granted, a few of these machines may be described briefly. The first attempt at machine-composing appears to have been made by Dr. William Church of Connecticut about 1820, but patented in England in 1822. It cast and set the type directly from the molten metal, requiring no distribution, but did not come into practical use. Christian Sörensen of Copenhagen invented a practicable machine, which was operated for a long time on a daily journal in that place. It was exhibited in 1855 at the Paris Exposition, and composed and distributed at the same time. The matter was placed in a kind of basin, from which the letters were picked and deposited properly in the composing part. In the distribution part, the type, each having a different nick, passed by their own weight along a channel in which were openings with projections corresponding to the respective nicks in the type. This machine would do the work of three compositors. Of English machines, the Hattersley and the Mackie are the latest examples. Robert Hattersley of Manchester, England, about 1856 brought out his machine. It does not require special nicks in the type. It comprises classed cells of type on two tables. When a key is touched, a piston is pressed against the lowest type in a cell, and causes the type to pass down a short inclined plane. This plane is furnished with conduits, along one of which the type travels to the composing-stick. The table with the lower-case types is removable, so that a full case may be supplied for the empty one. From 4000 to 6000 types may be set in an hour, about three men's work. A distributing machine accompanies this. A. Mackie of Warrington in 1871 exhibited at the International Exhibition at London a machine possessing peculiar features. It uses a perforated ribbon. The perforator, distinct from the composer, consists of keys acting on a series of punches; the punches are brought into action according to the letters or syllables which the keys represent, and the ribbon is perforated by them as it travels through the machine. The composer is a circular framework, having around its periphery a series of pockets, each divided into eight sections. Concentric within, and a little below this ring of pockets, is a revolving wheel, the periphery of which has a ring of pickpockets, each with eight vertical pins. When during the revolution of the wheel one of these pins rises above the level of the others, it draws out a type from one section of the pocket near it, and drops it on a receiving table, which carries it round to the point of delivery. The determination of which pin or pins shall be raised depends on the perforated ribbon. The ribbon is unwound from a drum or reel, passes over a small wheel, and enters the machine among the pockets and pickpockets. The perforations facilitate the action of little triggers which raise the pins. Two or more types may be drawn, or a large number of words may be formed, at the same time. This machine may be worked by steam. The perforated ribbon may be multiplicated, and different sizes of type may be set from the same ribbon, or different editions of the same work in different countries. After twenty years' labor, M. Delcambre of France produced a machine in New York in 1875 which has the keys placed in three rows, each key connected by a vertical lever with a cell of type placed over it. The lever, when the key is pressed, strikes off the lowermost type in each pile, and sends it along an inclined plane to a justifying apparatus. A distributer, forming a separate machine, has a sliding groove in which the types are placed in a long line. A key is pressed as each letter comes under the eye, and at the same time a cell is opened into which the type falls. William H. Mitchel of New York in 1853 produced a machine in successful operation. The compositor has a keyboard, each key of which strikes out a type from a brass slide placed on an incline. The type travels along an endless band to a spot where it is turned on end and pushed forward by a notched wheel. The apparatus comprises numerous bands, the lengths and velocities of which so vary as to enable the types, at different distances from the wheel, to reach it in the order in which the keys are struck. The words are built up in rows 30 inches long, and justified by hand. The distributer has a long channel in which the lines of type are placed, and pressed forward to a vibrating metal finger; this finger pushes the type aside separately, and causes them to drop down on a grooved wheel revolving horizontally. By means of pins in these grooves and nicks on the type each type falls into its proper receptacle, over which it is brought by the revolution of the wheel. John E. Sweet, an American, at the Paris Exposition in 1867 exhibited the matrix compositor. It is designed to form the mould or matrix for stereotype-plates, dispensing with setting and distributing movable type. Keys give to thick, soft, and dry paper impressions of the required letters to form words, lines, and sentences for a column or page. (See the elaborate report of this machine, and a similar machine invented by Pierre Flamm of France, and of other printing machines and processes exhibited, by Pres. F. A. P. Barnard in the *Reports of the U. S. Commissioners to the Paris Universal Exposition of 1867*, vol. iii.) O. S. Brown of Boston finished in 1870 a machine to set and distribute. The case, with an index showing the letters at the bottom, consists of channels to hold the type, standing on their feet, and the case is set at such an angle that they slide by their own gravity. A stick, consisting of a semicircular groove for receiving the type, and a lever for operating it, slides in front of the case. As the handle of the key is depressed, a type is thrust into the stick, and when full the type is placed on a justifier. The distributer is a rotating ring about ten inches in diameter. The channels radiate from the ring. The type, fed into the ring, is caught by certain levers according to the nick, and placed in its proper place. The operation is on the same principle as the common lever-lock: the levers with the type form a certain combination, which will move around until it arrives opposite its own key. The lock will then be unlocked and the letter forced out. The Alden machine, to set and distribute simultaneously, was first begun by Timothy Alden of Massachusetts in 1846, which after his death was further improved by his brother, Henry W. Alden. It had the type arranged in cells around the circumference of a horizontal wheel; as the wheel rotates, several receivers rotate with it, and these pick up the proper types from the respective cells. Several improvements have been made by different persons. A. C. Richards obtained patents for two machines in the latter part of 1875—one a compositor, and the other a distributer. The compositor consists of upright channels holding the type, and an endless band with belts at the two sides, which together conduct the type to the mouth of the re-

ceiving channel, where they are placed upright in a continuous line. The distributer is automatic, and with an excavated rim, by conveyers in a revolving cylinder, guides each type to its place. Following the idea of Dr. Church's machine, Charles S. Westcott of New Jersey made further improvements in his machine, patented in 1875. It casts directly from the molten metal, and sets the type in line for justification. The type-metal is contained in a tank, and heat applied below. The metal is forced into the matrix, and the conduit is then closed by a valve-rod, which, projecting slightly, forms a small cavity in the foot of the type, instead of the usual jet. The metal-pot has one nipple suitably arranged to meet the matrix. A matrix is provided for every character, and all the matrices rest on a stock away from the metal-pot. When a key is struck, the corresponding matrix is brought forward to a straight race, where a carrier lifts it from the stock and takes it to the nipple, where it receives a portion of metal. The matrix is carried to its stock, the mould opens, the type is seized by a hook and carried to cutters and rubbers, where it is dressed, and taken to a receiving-stick, whence it is justified. This dispenses with distributing, as the dead matter is melted when wanted.

Unit of Measurement.—The compositor is paid according to the number of *ems* he sets—a method found most just, owing to the great difference between the amount of type put together by a quick and clean compositor and that by a slow one or one who makes many errors. Difficult manuscript or intricate composition, however, is generally done at a certain price per week. The letter *m* was at one time perfectly square, and the square space—a space having the width (Fig. 1, *a* to *b*) equal to the depth (Fig. 1, *b* to *d*)—has since taken the name *em;* and half this space, an *n*, being equal to half of *m*, took the name of *en*. The reader may always know the *em* of the type in which a book is printed by observing the space left between a period and a capital letter—that is, the end and the beginning of sentences—or the space before the beginning of a paragraph. The *en* is used to measure the matter in England, and the *em* in America. In measuring the width of columns or pages, the letter *m* is placed sidewise in the stick, thus,

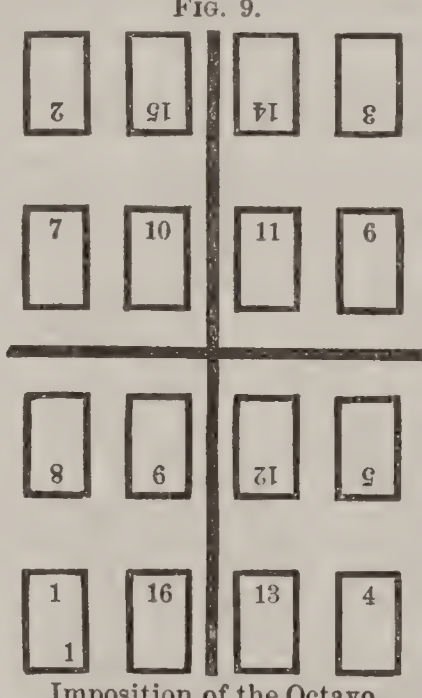
m m m m m m m m m m m m m m m m m m m m m m m m m m m;

and the number of these, multiplied by the number of lines in length, will give the number of ems; for instance, this Cyclopædia is set in minion type, 26 ems wide in a column, 91 lines long (not counting head- and foot-lines), and two columns in a page—$26 \times 91 \times 2$, making 4732 ems in a page. The average number of pieces of metal, spaces and letters, is 2.25 to an em, so that 1000 ems contain about 2250 pieces. In an average page of this Cyclopædia there are 1730 words, 9.5 words to a line, 5 letters to a word; in addition, the spaces average 2.25 ems in a line, and 409 ems in a page. Words, therefore, in the English language average 5 letters, and in type 2.5 ems each. The average number of ems a compositor will set in an hour is 1000, for which he is paid about 50 cents. He is not paid for distributing to fill his case, or for correcting the errors he makes in composition. Many compositors are reported to have set from 1500 to 2000 ems per hour, and a large number average over 1300 ems. The best authenticated case is that of George Arensberg, the "velocipede" in New York City, who in a match in Feb., 1871, set 2064 ems solid minion in one hour. An important element in judging of fast composition which has never been recorded is that of the measurement of the alphabet; for a compositor will certainly set more with an alphabet measuring 14 or more ems than he can with book-type measuring 12 ems or less. To ascertain what a manuscript work will make in print, count the number of words in a fair page of the manuscript, and multiply it by the number of pages. Take a printed page of the desired size and style of type, count the words, and divide the number of words in the manuscript work by the number of words in the printed page, and it will give the number of printed pages, nearly.

Make-up.—In newspaper-work or work requiring many corrections, or for other reasons, a proof is taken of the matter secured in a galley in long pieces, read, and corrected, sent to the author, and then made up, read, corrected, and sent to press or stereotyped. Usually, it is placed in the hands of the "maker-up," who, having set the appropriate headings, places a head-line at the top of the matter, containing the running-title of the book or the appropriate subdivisions of the work, divides the matter into pages with a gauge, affixes the foot-line—a blank line put at the bottom of a page—containing sometimes the signature or folio, and binds the page with cord. A proof, termed the "first proof," is taken, given to the proof-reader, who carefully compares it with the author's copy by the aid of a copy-holder, who reads aloud, and the errors noted are corrected by the compositor. It is not necessary to explain the symbols used by the proof-reader in noting the corrections for the compositor, nor expatiate on his requirements and education. The symbols, however, may be seen in Webster's *Dictionary* on page 1696, but as they are apt to be used wrongly, it is best for the author to mark out any wrong word or words entirely, and write plainly in the margin what he desires. If he wishes anything taken out, he should write in the margin *dele*, meaning "take out." A second proof, or "revise," is compared with the first, and sent to the author for his revision. His corrections are made, and the third or "press proof" is carefully read, generally by a more skilful proof-reader than the first, when the corrections are made, and the matter is ready for the press or for stereotyping or electrotyping.

Imposition.—This is the method of so arranging the pages that they will be in consecutive order when the sheet or section of a book is folded. When the pages are to be stereotyped or electrotyped, only a few pages in their regular order are secured together and cast; yet these cast pages are afterward imposed on the press in the same manner as described below. For over 400 years imposition remained merely a trial process, the few early modes having been handed down to the present time without any attempt at systematic explanation. George H. Bidwell of New York, in his *Treatise on the Imposition of Forms* (1864), was the first one to show the principles which govern imposition, giving the reasons, and the results to which they lead. The pages are laid upon a marble or iron table, called the *stone*. Any number of pages may be imposed in one form, from 2 to 128, according to the size. The first page in simple forms is placed in the left-hand corner, with the foot of the page toward the imposer, and when completed the last page is found at its side. The second page and the next to the last are together; the third and the third from the last, and so on, advancing one from the first folio and receding one from the last, until the two middle pages are reached, which are in the 4to the 2d and 3d; in the 8vo, the 4th and 5th; in the 12mo, the 6th and 7th; in the 16mo, the 8th and 9th; in the 24mo, the 12th and 13th, and so on. (The terms 4to, 8vo, etc. here refer to the number of pages in a form, the usual designation of printers.) The imposition of the octavo, Fig. 9, and of the duodecimo, Fig. 10, will illustrate the principle, the folio at one end of the page representing the head.

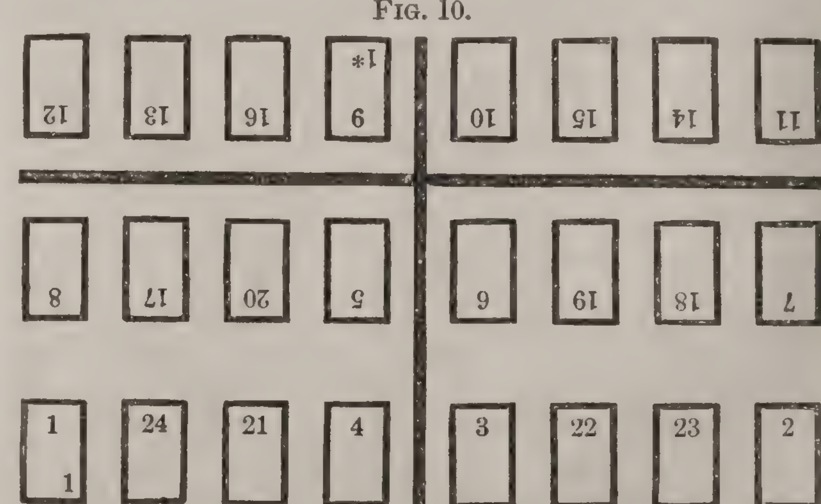
Fig. 9.



Imposition of the Octavo.

The pages are adjusted to the required distance apart according to the size of the paper, an iron "chase" or frame is placed around them, and wood or metal furniture, half an inch high, of various thicknesses, is placed, some at the head of the pages, called "head-sticks," some between the pages, called "gutters," and others at the sides and feet, called "side-" and "foot-sticks." The latter are larger at one end than the other, so that small wedges of wood, or "quoins," may be driven tightly between them and the sides of the chase, locking the type firmly, making it like a solid piece, which may be lifted and placed on the press. The general practice up to recent date was to place the pages which would appear on the outside of a sheet in a

Fig. 10.



Imposition of the Duodecimo.

single chase, and the inside pages in another chase, requiring every sheet to be printed from two forms for one copy. All the pages of a single sheet are now usually

placed in one chase, and the paper turned over on the press, making two copies at two impressions. The chase is crossed by two iron bars, represented by the long lines across Figs. 9 and 10, which support and keep the chase from springing.

Signatures.—The signature is a figure or a letter of the alphabet placed at the foot of the first page of every form, or a section or sub-section of a form, to denote the order of the sheets, and serves as a guide to the binder. In an edition of *Terence*, printed by Antonio Zorat at Milan in 1470, signatures were used, and it is the first book known to have them. Catch-words were once extensively used, placed at the foot of the page, to show the connecting word on the next page, and are said to have been first used by Vindeline di Spori in Venice. At the beginning of this article it is shown that the Assyrians used catch-words. The English generally use the letters of the alphabet, omitting J, V, W, which were not used in the Gothic letters of the early printers; and if the sheets extend beyond Z, the letters are doubled or preceded by a figure. The American practice, and that of most European nations, is to use figures, a section to be inset being distinguished by a star after the signature figure, and is the simplest and readiest for the binder. When it is desired to print the same book both as an octavo and as a duodecimo, or otherwise, figures are used to indicate the signatures of the one, and letters the signatures of the other. The position of the signature (1) and star signature (1*) is noted in Figs. 9 and 10. A star signature shows that that part of the sheet is cut off and placed inside the first part when folded. The following table shows on what page the signature is put in the octavo, duodecimo, and eighteenmo, and also the amount of paper required to print 1000 copies of every sheet, a ream counting 20 quires of 24 sheets, or 480 sheets:

Table of Signatures.

Octavo.			Duodecimo.			Eighteenmo.			Paper required for 1000 copies of a sheet.	
Signatures.	Signature pages.	Pages in sheet.	Signatures.	Signature pages.	Pages in sheet.	Signatures.	Signature pages.	Pages in sheet.	Rms.	Qrs.
1	1	16	1	1	24	1	1	36	1	2
2	17	32	1*	9		1*	5		2	4
3	33	48	2	25	48	2	13		3	6
4	49	64	2*	33		2*	17		4	8
5	65	80	3	49	72	3	25		5	10
6	81	96	3*	57		3*	29		6	12
7	97	112	4	73	96	4	37	72	7	14
8	113	128	4*	81		4*	41		8	16
9	129	144	5	97	120	5	49		9	18
10	145	160	5*	105		5*	53		11	
11	161	176	6	121	144	6	61		12	2
12	177	192	6*	129		6*	65		13	4
13	193	208	7	145	168	7	73	108	14	6
14	209	224	7*	153		7*	77		15	8
15	225	240	8	169	192	8	85		16	10
16	241	256	8*	177		8*	89		17	12
17	257	272	9	193	216	9	97		18	14
18	273	288	9*	201		9*	101		19	16

In the duodecimo, the inside eight pages, marked star, are cut off and placed in the middle of the sheet. In the eighteenmo, the sheet is cut into three sections of twelve pages; the inside four pages, marked star, of the different sections are cut off and placed in the middle of the section, and the three sections are placed side by side. Forms composed of several sections of eight, twelve, or sixteen pages are treated in a similar manner.

Sizes of Books.—The descriptive names of the sizes of books refer to the size of the leaves, and originated from the number of leaves into which a sheet of paper was folded after printing. The facility of paper manufacture has placed within the reach of printers any size of sheet, so that the size of the page of a book now depends only on the wish of the publisher. The book when bound is termed according to the nearest size of the regular sheets.

Size of book.	Pages in a sheet.	Size of leaf in inches.
Royal 4to	8	11×14
Medium 4to	8	9×12
Imperial 8vo	16	8×12
Superroyal 8vo	16	$7 \times 10\frac{1}{2}$
Medium 8vo	16	$6 \times 9\frac{1}{2}$
Crown 8vo	16	$5\frac{1}{2} \times 8\frac{1}{4}$
Medium 12mo	24	$5\frac{1}{8} \times 7\frac{2}{3}$
" 16mo	32	$4\frac{1}{2} \times 6\frac{3}{4}$
" 18mo	36	$4 \times 6\frac{1}{3}$
" 24mo	48	$3\frac{5}{8} \times 5\frac{1}{2}$
" 32mo	64	$3 \times 4\frac{3}{4}$

The size of paper called medium, 19 by 24 inches, is the standard by which all sizes of books, not otherwise specifically described, are classified; and quarto, octavo, duodecimo, etc., mean that the leaves of books of these sizes are nearly the fourth, eighth, twelfth, etc., of the medium sheet. The length of the American page is usually about one-half more than its width. The English is two or three lines of letter-press shorter. The preceding table shows the usual sizes.

Stereotyping.—This is the art of making plates cast in one piece of type-metal from the surface of one or more pages of type. To Firmin Didot of Paris is due the word *stereotype* (Gr. *στερεός*, "fixed," and *τύπος*, "impression") under which the editions printed by his process were known, and which is now a word used in literary as well as technical language. The necessity early arose for some means to preserve large works in type to be printed as occasion demanded, without requiring the expensive and inconvenient mode of using and resetting the ordinary type. Indeed, the first known instance was the Bible, which Van der Mey of Antwerp in 1698 printed from type which had been soldered at the bottom. Stereotyping proper was invented by William Ged, a goldsmith of Edinburgh, Scotland, about 1725, who used the plaster-of-Paris process, which is still the most efficient method. Certain Bibles and prayer-books were stereotyped by him for Cambridge University about 1731, but the jealousy of the printers prevented their use, and the process was abandoned for many years. Two plates escaped destruction, and are printed in Hansard's *Typographia* (1825). Ged, however, afterward successfully executed several editions of Sallust in Edinburgh by his process, the edition of 1739 being the first book correctly printed from stereotype plates. Firmin Didot, as already noticed, about the same time had hard type made, pages of which he impressed upon soft lead, which he laid upon molten lead just about to solidify, and obtained a cast. He believed this process more successful in obtaining a sharp cast of the type than by the plaster process; but it was not used to any extent. Other processes were tried, but were little used. In 1743, Dr. Cadwalader Colden explained a process of stereotyping to Franklin, and his nephew, Benjamin Mecom, cast plates for some pages of the New Testament. Dr. Alexander Tilloch of Glasgow rediscovered the art in 1781, and about 1810, Earl Stanhope introduced Ged's process with improvements, since which time it has extended widely and successfully. Through David Bruce stereotyping was introduced into the U. S. in 1813, as noticed previously. The *Larger Catechism of the Westminster Assembly* claims on its title-page to have been the first work stereotyped in America, dated June, 1813. Three processes are now in general use—the *plaster*, the *clay*, and the *papier-mâché* process.

Plaster Process.—For stereotyping the type is set with high spaces, etc., whereas for the press they are generally about one-third shorter. The type used to have the shoulders bevelled, until David Bruce, for greater facility, and to make the plates thinner, introduced type having the shoulders high and square, as in Fig. 1. Only a few pages are imposed at a time, in a chase thinner than that used for printing, the pages having guard-lines at the top, and bearers scattered through the larger blanks in the pages. The surface is cleaned, oiled with sweet oil, and a frame, called a "flask," put around the form to hold the fluid plaster. Through the corners of the flask are thumb-screws, to level the frame and gradually lift it from the type when the plaster is set. Fine plaster of Paris is used, mixed with water to a half-fluid state, and a little salt to aid the setting. Some of the plaster is poured over the face of the type, and with a buckskin roller slowly worked into the hollows to expel the air and fill the surface, when the rest of the plaster is poured on, levelled, and allowed to set. The screws are gently turned to raise the mould from the type, and the mould trimmed. The mould used to be baked to expel the moisture, but it is usual now to put it into the casting-pan, and by a crane allowed to float on the molten metal for about five minutes, which dries the mould and heats the pan. The metal is softer than type-metal, consisting of 91 parts of lead, 5 of antimony, and 4 of tin. The casting-pan is of iron, with sloping sides, about 20 by 15 inches, and $1\frac{3}{4}$ inches in depth, having a cover with the corners cut off and holes in the centre. In the bottom is a floater or iron plate, on which several moulds are placed face downward, leaving about an eighth of an inch between the cover and the moulds. The pan is attached to a crane by a movable handle. When the pan is heated, it is pressed into the molten metal, which enters through the corners, covers the floater, and finds its way between it and the moulds, filling up the interval and pressing upward against the face of the moulds, when the pan is removed, cooled with water, and, as the metal shrinks on cooling, more metal is poured in through the corners. The cast is removed from the pan, the plates freed from the plaster, and the backs shaved in a planing-machine to the thickness of about three-sixteenths of an

inch. The face is examined, any pieces of plaster or metal in the letters picked out, defective letters made perfect or cut out with a chisel and replaced with ordinary type soldered at the back, and the plate finished. Stereotype plates are used on the press with blocks of wood or metal to make them type-high, and having clamps to hold the plates. This process is used for book-work. A cheaper process is used for temporary work, as circulars, pamphlets, etc., by the clay process.

Clay Process.—For this process a composition of 2 parts of dry china clay and 1 part of powdered soapstone is sifted through fine bolting-cloth, mixed with water to the consistency of tough dough, and laid away for about a month before using. A small press is used like the copying-press, on the bed of which the form is placed, and the type brushed with benzene or kerosene oil. Some of the dried composition is mixed with a little gum-arabic water and with plaster of Paris, placed on an iron plate, and set in a frame attached to the bed of the press. This frame is turned down on the form, covered with muslin and paper, the bed run under the platen, and an impression taken to cause the clay to flow into the blank spaces and give the general outlines of the type. The frame is raised, the cloth and paper removed, and also any superfluous material thrown up by the pressure; the press is closed, and a complete impression taken, imbedding the type in the clay to the desired extent. This process is repeated one or more times to give depth to the cups of the letters. The plate carrying the mould is removed, dried, and heated on the metal. The mould is surrounded on three sides by an iron wire, another plate clamped over it, and the whole put into the trough of molten metal, the open edge of the mould upward, into which the metal is poured. When cooled, the plate is finished as before.

Papier-Mâché Process.—In 1848 the French introduced the papier-mâché process for books. It was afterward introduced into New York, and soon extensively used for newspapers on account of its great advantages both in saving type and time. For this process the spaces need not be high. With the matrix is used a paste formed of 5 ounces of flour, 7 ounces of white starch, a tablespoonful of powdered alum, and 4 quarts of water. The first three are mixed with a little of the water, cold, to the consistency of thick cream, and the remainder of the water, boiling, gradually added. It is put over a fire and stirred till it boils, then cooled. When about to be used, Spanish whiting is added till not too stiff, and passed through a fine wire sieve with a stiff brush. The paper matrix is formed by spreading the paste over a sheet of thick, unsized, and soft paper, and covering it successively with three sheets of tissue-paper, smoothly placed one over the other. It is saturated with water and laid away for use the next day. The face of the type is brushed with olive oil; the tissue side of the matrix is prepared with powdered French chalk, smoothed over with a preparing brush, and laid upon the type. A piece of damp linen is placed over the back, and the whole gently beaten on to the type with a large brush. The cloth is removed, and another sheet of matrix-paper placed on the back of the matrix, and both then beaten to perfect the impression and unite the two sheets. A blanket is put over the matrix and form, and placed under the drying-press, which is screwed down, and heated by steam till the matrix dries. The matrix is removed, warmed on the moulding-press, placed in a heated casting-mould, and a gauge, to determine the thickness of the stereotype plate, placed on it which extends around three sides of the matrix, the open fourth side serving to pour in the molten metal. A cover is screwed tight over the whole, the mould tipped to bring the mouth up, and the metal poured in. The plate is removed and finished. As may be observed, the paper matrix may be rounded to any curve by placing it in a mould having the required curvature. The cast does not destroy the paper matrix, and it may be used to furnish twenty or more duplicate plates. By this process plates may be made ready in twenty-five minutes, or may be finished in fifteen minutes if necessary. It is this process that enables the newspapers to print large editions by furnishing duplicates and printing on several presses, as well as saving the wear of the type, or setting the type in duplicate, as was necessary for some time on the London *Times*. Stereotype plates will print about 100,000 impressions, and up to 200,000 or more.

Electrotyping.—For large numbers of copies electrotyping is more durable than stereotyping. It is an outgrowth of electro-plating, which is explained in the article ELECTROTYPE. It originated with Joseph A. Adams, a wood-engraver of New York, in 1839–41, who reproduced an engraving, and afterward, in 1843, the various borders around the large engravings in *Harper's Illustrated Bible*. The process rapidly extended, and improvements were made by Wilcox, Filmer, Gay, Lovejoy, Knight, and others. This process requires high spaces. The form is coated with graphite with a soft hatter's brush. The mould is formed of the best pure yellow beeswax, which is melted and run into a shallow moulding-pan. This is secured to the head of a press, and the form placed on the bed, which is raised by toggle-joint or hydraulic pressure to deliver the impression of the type upon the wax. The pan is removed, and where there are large blanks some wax is run or "built" on them to make them deeper in the plate. That the electric current may deposit the copper on the mould, it is necessary that the surface should be made a conductor, which is obtained by working finely-pulverized graphite into the letters and lines. This has been done with the dry graphite. Silas P. Knight's wet process is expeditious, and prevents the dust flying around. The wax mould is laid face upward on the floor of an enclosed box, and a torrent of finely-pulverized graphite suspended in water is poured upon it by means of a rotary pump, a hose, and a distributing nozzle, which dashes the liquid equally over the whole surface. Washing removes the superfluous graphite. This process also coats the mould with graphite, wets it ready for the bath, and expels air-bubbles from the letters. After the dry process, the face of the matrix is wetted to drive away films or bubbles of air. The mould thus prepared is placed in a bath containing a solution of sulphate of copper, and is made part of the electric circuit, in which is also included the zinc element in the sulphuric acid solution in the other bath. The current deposits a film of copper on the graphitic surface of the mould, and when it is sufficiently thick it is taken from the bath, the wax removed, the shell trimmed, the back tinned, straightened, and filled in with an alloy of type-metal, and shaved to the proper thickness. A quicker process is that of Knight, which consists in dusting fine iron filings on the wet graphite surface, and pouring on it a solution of sulphate of copper, when the acid leaves the copper, forms a sulphate with the iron, and frees the copper, which is immediately deposited in a metallic form on the graphite. The film is afterward increased in the electric bath. Electrotype plates will print over 300,000 impressions with little wear.

In all the processes for stereotyping and electrotyping, machinery has been introduced to expedite the moulding and finishing, and may be run by steam and employ steam for the drying. These machines are furnished by R. Hoe & Co. of New York, descriptions of which may be obtained in their catalogues, and their machinery is now in use in every quarter of the globe.

Copper-faced Type.—In 1850, Dr. L. V. Newton of New York invented his process for copper-facing type, which permits the use of type for a longer time than can be obtained by any other methods, no practicable substitute for the ordinary type-metal having yet been found. Stereotype plates may also be copper-faced.

Printing Ink.—The requirements of printing ink are—intenseness of color, impalpability, covering the surface of the type perfectly, quitting the surface when the paper is pressed upon it and adhering to the paper, not smearing after printing, and retaining its appearance without change. (For its composition see INK.)

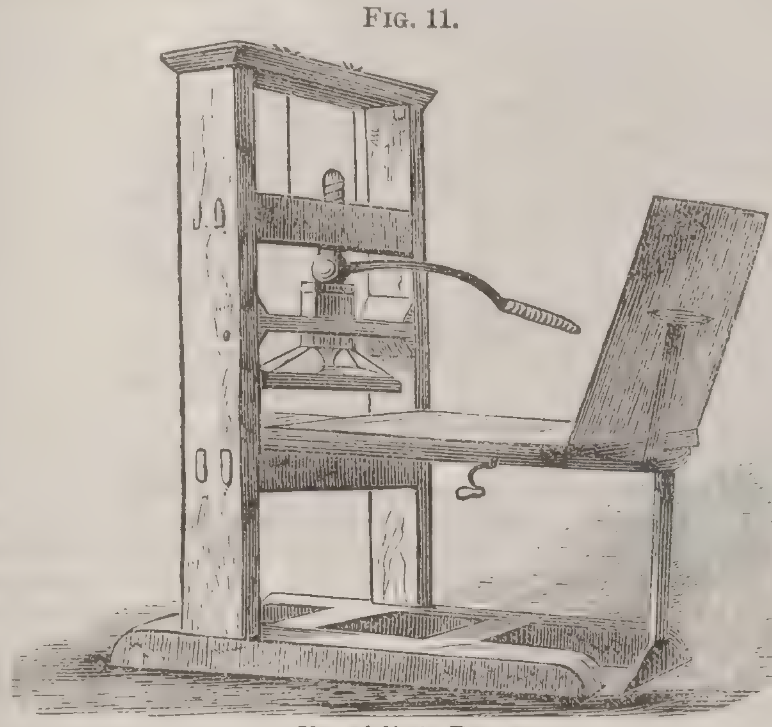
Printing Rollers.—In the early days of printing the ink was applied to the type by balls, made of a sort of wooden funnel with handles, the cavities of which were filled with wool or hair, and a piece of felt or leather nailed over the cavity, and made soft by soaking in urine and being well rubbed. One of these the pressman took in each hand, and, applying them to the ink-table, daubed and knocked them together to distribute the ink equally, and then blacked the form by beating the balls upon the face of the type. Rollers wound with cloth and covered with soft leather were next introduced; but to B. Foster of England is due the invention of the present roller. These rollers consist of a composition of glue and molasses, boiled together, and run on a cylinder of wood covering an iron rod, which works in a handle or in a proper frame for large presses. The cylinder is rolled over the type, and thus applied in a quick and even manner. Other compositions have been tried for rollers, but this is found the only practicable one on account of its peculiar softness, even retention of the ink, and cheapness. The balls, however, are the best means for inking fine wood-engravings and producing brilliant impressions.

Paper.—The paper used in printing is always dampened before use, as wet paper takes the ink better than dry, and is now generally wet by a wetting-press. Paper is usually supplied by the ream of 20 quires of 24 sheets, or 480 sheets per ream. For the perfecting-press paper is supplied from 3 to 5 miles long, a single web containing from 5000 to 10,000 sheets. (See PAPER.) After printing, for book-work the sheets are hung up to dry, placed between sheets of thin smooth mill-board, placed in an hydraulic

press, and subjected to great pressure, which smooths and restores the brilliant appearance of the paper. The sheets are afterward forwarded by the binder. (See BOOKBINDING.)

The Printing-Press.—The earliest form of the printing-press was an adaptation of the wooden screw-press. Copies of the earlier block-books seem to have been taken by a rubbing process, and perhaps afterward by beating a block of wood with a mallet on the paper, as proofs are yet taken of large forms before putting on the press. About 1620, Blaew of Amsterdam made some improvements. His press had a travelling bed, a platen depressed by a screw moved by a lever, and a spring to raise the screw and platen after the delivery of the impression. This press, with little alteration, was used for nearly a century and a half. In 1725 the press upon which Franklin worked in London was a Blaew press, with minor details, known as the Ramage press, and it is now preserved in the patent office at Washington. It was exhibited in the Centennial

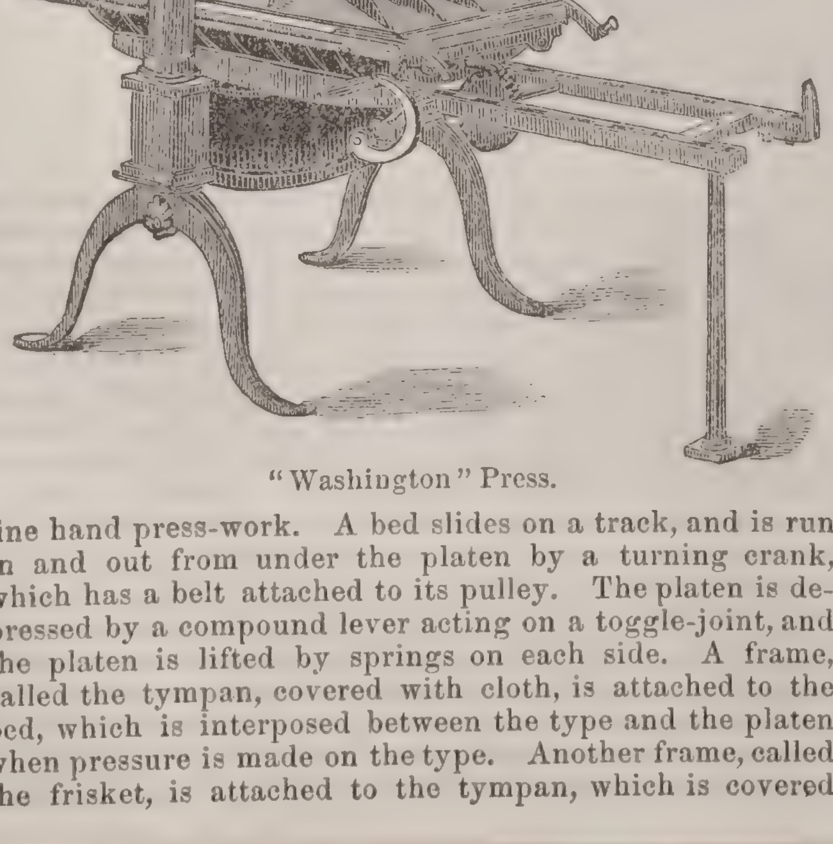
FIG. 11.



Franklin's Press.

Exhibition at Philadelphia in 1876, and is represented in Fig. 11. About the beginning of this century Earl Stanhope introduced a press, the frame of one piece of iron, operated by a lever and toggle-joint. George Clymer of Philadelphia made the first important American improvement in his "Columbian" press about 1817, using a compound lever to give the power to the platen. This was succeeded by Peter Smith's hand-press, which gave way to the hand-press, invented by Samuel Rust in 1829, now known as the "Washington" (Fig. 12). It is made of seven sizes by the Messrs. Hoe, and is in general use for

FIG. 12.

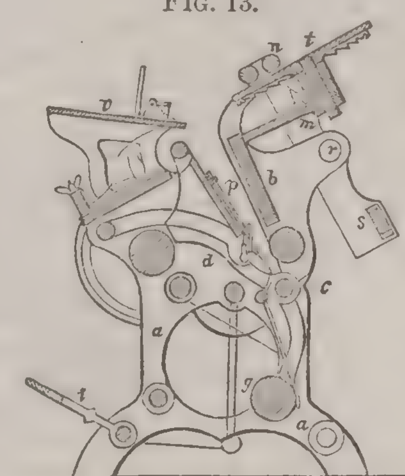


"Washington" Press.

fine hand press-work. A bed slides on a track, and is run in and out from under the platen by a turning crank, which has a belt attached to its pulley. The platen is depressed by a compound lever acting on a toggle-joint, and the platen is lifted by springs on each side. A frame, called the tympan, covered with cloth, is attached to the bed, which is interposed between the type and the platen when pressure is made on the type. Another frame, called the frisket, is attached to the tympan, which is covered with a sheet of paper, having only the part printed upon cut away, which prevents the blanks, etc., from printing on the sheet of paper. An automatic ink-roller is also attached to this press, which is operated by a weight raised by the pull of the pressman. The descent of the weight draws the roller over the type, and returns it to the inking-table while the pressman is placing another sheet upon the tympan and folding upon it the frisket. In hand-printing the form of type is placed on the bed, inked with a roller, damp paper placed on the tympan, the frisket folded over the paper, and the tympan turned down on the type. The bed is rolled under the platen, the lever-handle is turned, the bed rolled out, the tympan raised, and the sheet removed. A good pressman can print about 2000 impressions a day.

Job-Presses.—A great variety of handy job-presses are made in America, generally known from their makers or by some trade-mark, as the Hoe, Adams, Ruggles, Wells, Degener, Globe, Cincinnati, Universal, Gordon, and others, which print cards or sheets up to half medium. A large number of small presses are also in use specially to print cards, and also adapted to print cards in colors, number them consecutively, and print coupons with the tickets, the most celebrated of which are made by the Messrs. Hoe. The principle of the ordinary job-presses is shown in Fig. 13, a vertical section of the Gordon press. The form of type, secured in a chase, is clamped to the bed *b*, which rocks on the pivot *c*, and comes into parallelism with the platen *p* when the impression is about to be given. The platen rocks on the shaft *d*, propelled by pitman and gearing from the treadle *i*. The arm *m s* is the roller-carrier, which swings on a pivot *r*, and carries the rollers *n n* alternately over the form and over the revolving disk *t*, which distributes the ink; *g* is a counterweight to balance the swinging bed and attachments, and operates the movable fingers by a spring-bar *a*. A feed-board *v* rests on top of the frame of the press. It will print about 1000 copies an hour.

FIG. 13.



Gordon Press.

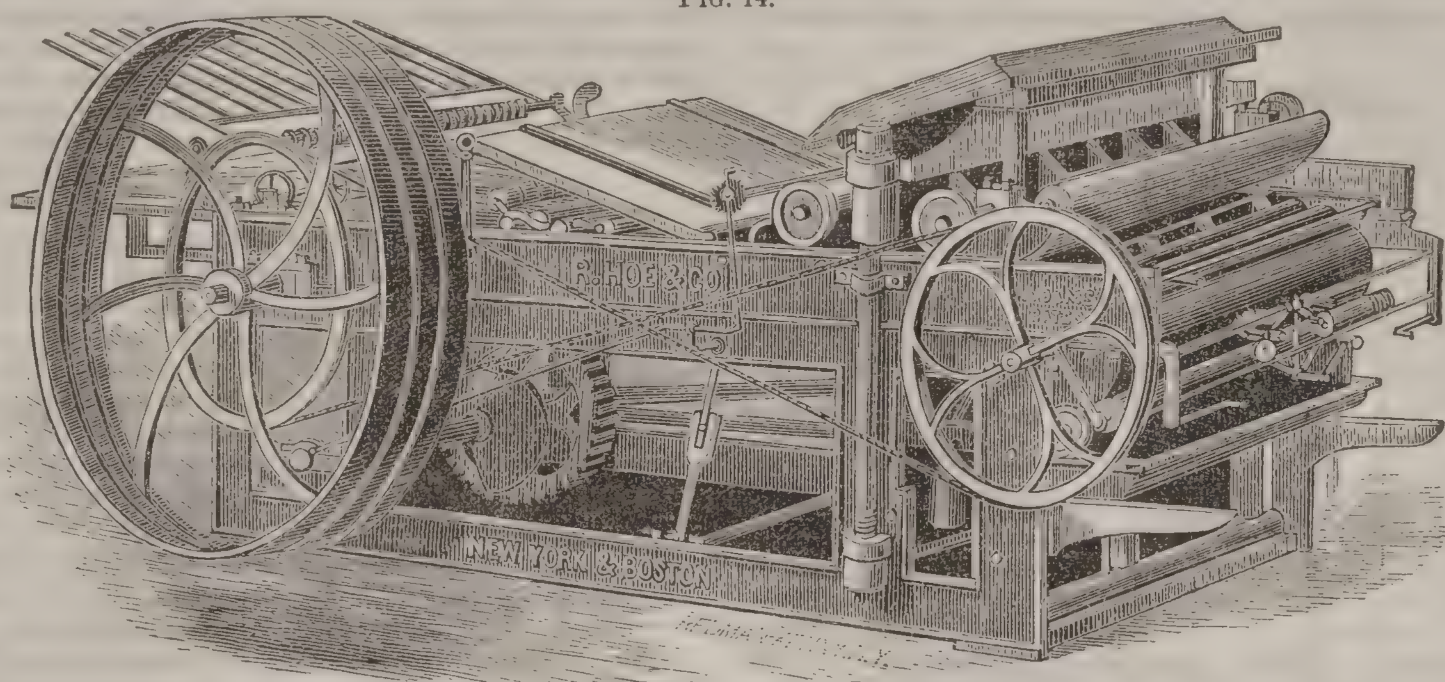
Power-Press.—The hand-press was deficient in speed, and attempts were made to print more rapidly. In 1790, W. Nicholson patented a cylinder press, which, though unsuccessful, contained the principles of all the modern presses. The first working press was invented by T. König, a native of Saxony, in 1814, for the London *Times*, the issue of Nov. 28 being the first newspaper printed by machinery. In this press the type on a flat bed passed alternately beneath the ink-rollers and the cylinder carrying the sheet of paper. Another cylinder, carrying the sheet, was afterward added, the type passing beneath both, between which were placed the ink-rollers. This printed 1100 impressions an hour. König in 1815 formed a press for printing both sides of the sheet; it resembled two single presses placed with their cylinders toward each other, the sheet being conveyed by tapes from the first to the second cylinder. It printed 750 sheets, both sides, an hour. In 1813, Donkin & Bacon furnished Cambridge University with a press in which the type were placed on the four sides of a prism, the paper being applied by another prism. It was unsuccessful, but in this press were first introduced inking-rollers of glue and molasses. Cowper of England in 1815 curved stereotype plates and fixed them to a cylinder, the remainder of which formed a distributing surface for the ink. Two plate-cylinders and two impression-cylinders were afterward worked together in one press by Cowper, printing both sides of the sheet at the rate of 1000 per hour. Applegath and Cowper's single cylinder retained the reciprocating bed, but was the first to have diagonal distributing-rollers to spread the ink by sliding on the reciprocating ink-table. They then constructed a press to print both sides of the sheet from type, conveying the sheet from one cylinder to the other by drums and tapes. In 1827 they applied four impression-cylinders to the reciprocating bed to carry the type for one side of the sheet, the sheets being fed from four feed-boards, and the impression-cylinders alternately rising and falling, so that two sheets were printed during the passage one way, and the other two on the return passage. A pair of inking-rollers between the impression cylinders obtained ink from the reciprocating table. This printed 5000 an hour on one side.

Bed and Platen Presses.—The first power-press used in America was a flat-surface press, made by Daniel Tread-

well of Boston in 1822; in which the platen came down on the type, two of which were used by the Bible and Tract societies, and one at Washington. The best press of this class is that of Samuel Adams of Boston, invented in 1830, improved by Isaac Adams, and now manufactured by Messrs. Hoe in fifty-four sizes. It is represented in Fig. 14, is widely used for book-work throughout the world, and is that upon which this CYCLOPÆDIA is printed. In this press a feed-board holds the paper, which is fed by hand to a second board, or tympan, having points to make holes in the sheet to register the second side. The type rests on a bed which is raised by straightening a toggle-joint against the upper platen. The ink-fountain is at one end of the press. The inking-rollers pass twice over the form. The paper is caught by grippers, carried on a frisket over the form, receives the impression, and is carried forward by tapes to a fly, which delivers it to the sheet-board. One thousand sheets an hour is a full speed for a large Adams press.

Cylinder Presses.—These have a reciprocating bed, and a cylinder to carry the paper and receive the impression. There are a great many kinds of cylinder presses, adapted to all work, from common posters to the finest cut- and book-work, known as Hoe's, Taylor's, Potter's, Campbell's, Cottrell & Babcock's, according to the makers. As a specimen of the refinements to which these presses have attained, an illustration of Campbell's cylinder is given in Fig. 15. It is controlled in its operation entirely by the sheet, so that it is impossible to print the sheet out of register. When the sheet is fed badly, it is thrown out unsoiled. The pointing of the sheet is operated by electricity, ensuring perfect register. Color is taken for every

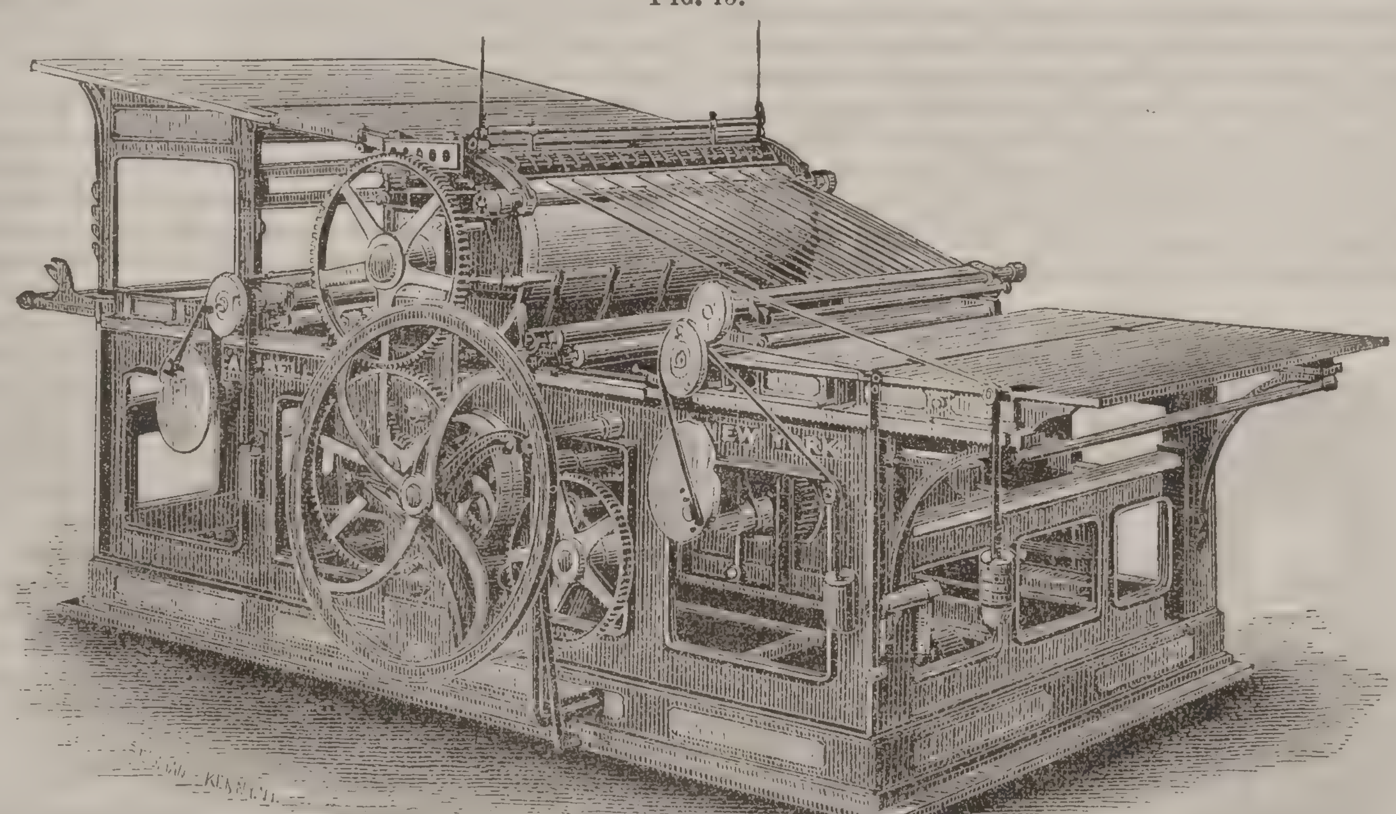
FIG. 14.



Adams Press.

successive sheet only. It has also a double fountain, having two sets of inking apparatus which distribute the ink on the form in two strata; these like two wedges overlap to form a single stratum of uniform thickness. There is one inking apparatus on each side of the cylinder, and as many as fourteen distributing and inking rollers may be

FIG. 15.



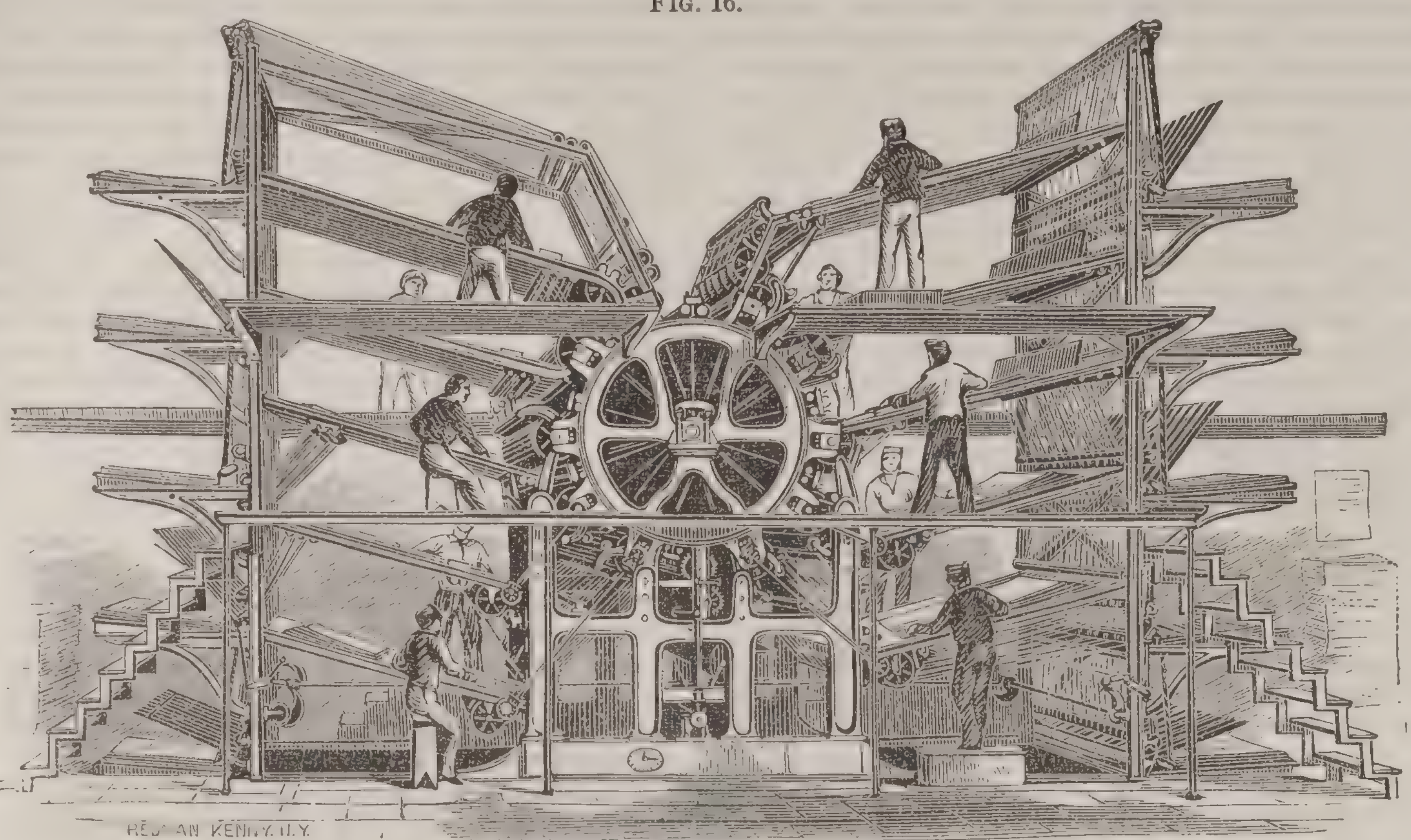
Campbell Cylinder Press.

used. The fly operates only when the sheet is fed. This press also has no springs or tapes, yet is simple in construction. A variety of cylinder press is known as the "stop cylinder," in which, after a sheet is printed, the cylinder remains stationary while the bed is running back, during which a fresh sheet is placed in position.

Rotary Presses.—Presses in which the cylinder carries the type or plates, from which another cylinder receives the impression on the paper, are termed rotary or type-revolving presses. Many attempts have been made to supply newspapers with a fast press, but the most practicable is found to be the cylinder carrying the type. The idea of the rotary press was suggested by Nicholson in 1790, but it was not put into successful operation, on account of the attempt to use bevelled type and for lack of the refinements of the more modern press. The first successful rotary press was invented by Col. Richard M. Hoe, put into operation in 1846, and had at first four impression-cylinders, and afterward six, eight, and ten. This press is represented in Fig. 16. The form of type is placed on the surface of a horizontal revolving cylinder of about four and a half feet in diameter. The form occupies a segment of only about one-fourth of the surface of the cylinder, and the remainder is used as an ink-distributing surface. Around this main cylinder, and parallel with it, are placed smaller impression-cylinders, varying in number from four to ten, according to the size of the machine. The large cylinder being put in motion, the form of types is carried successively to all the impression-cylinders, at each of which a sheet is introduced and receives the impression of the types as the form passes. Thus, as many sheets are printed at each revolution of the main cylinder as there are impression-cylinders around it. One person is required at each impression-cylinder to supply the sheets of paper, which are taken at the proper moment by fingers or grippers, and after being printed are carried out by tapes and laid in heaps by means of self-acting flyers, thereby dispensing with the hands required in ordinary machines to receive

and pile the sheets. The grippers hold the sheet securely, so that the thinnest newspaper may be printed without waste. The ink is contained in a fountain placed beneath the main cylinder, and is conveyed by means of distributing rollers to the distributing surface on the main cylinder. This surface being lower, or less in diameter, than the form

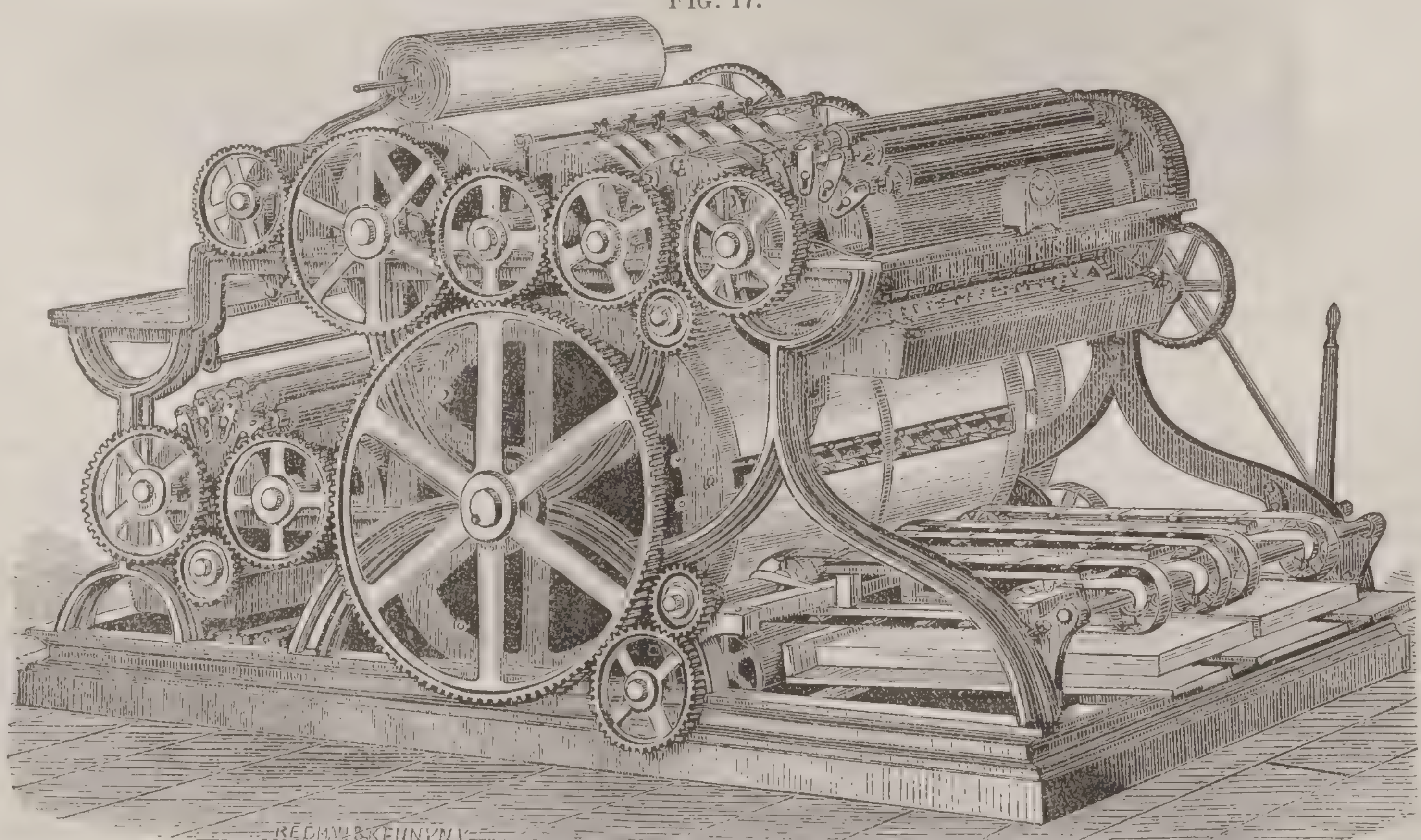
FIG. 16.



Hoe Ten-cylinder Rotary Press.

of types, passes by the impression-cylinder without touching. For each impression there are two inking-rollers, which receive their supply of ink from the distributing surface of the main cylinder: they rise and ink the form as it passes under them, after which they again fall to the distributing surface. Each page of the paper is locked up on a detached segment of the large cylinder, which constitutes its bed and chase, termed the "turtle." The column-rules run parallel with the shaft of the cylinder, and are consequently straight; while the head, advertising, and dash rules are in the form of segments of a circle. The column-rules are in the form of a wedge, with the thin part directed toward the axis of the cylinder, so as to bind the types securely. These wedge-shaped column-rules are held down to the bed by tongues projecting at intervals along their length, which slide in rebated grooves cut crosswise in the face of the bed. The spaces in the grooves between the rules are accurately fitted with sliding blocks of metal even with the surface of the bed, the ends of which blocks are cut away underneath to receive a projection on the sides of the tongues of the column-rules. The form of type is locked up in the bed by means of screws at the foot and sides, by which the type is held as securely as in the ordinary manner upon a flat bed—if not even more so. The speed of these machines is limited only by the ability of the feeders to supply the sheet. The ten-cylinder was first used by the *Public Ledger* of Philadelphia, and employed by the leading newspapers in America and Europe for many years. It will print about 20,000 impressions an hour. A. Applegath of London invented a rotary press, which he introduced in 1848, but in this case placed the type in separate vertical columns around a large vertical drum, forming, in fact, the sides of a polygon. On the vertical type-cylinder the type were arranged in upright columns, forming flat polygonal sides to the drum. Arranged around it were eight sets of inking apparatus alternating with eight impression-cylinders, and the paper, fed from eight *banks,* was delivered upon as many tables. The paper fed from each feed board was carried by tapes and rollers, and passed on edge to the type- and impression-

FIG. 17.



Bullock Web Perfecting-press.

cylinders, was carried off, thrown over flatwise, caught by a boy, and placed upon the table. It is used by the London *Times,* and will print 12,000 impressions an hour. In all respects it works as though the Hoe press were placed in a vertical position.

Web Perfecting-press, a press in which both sides of the sheet are placed on cylinders, usually by plates, and the paper fed automatically from a single web. The first practicable press of this kind was invented by William A. Bullock of Philadelphia in 1861, and patented in England in 1862, and completely revolutionized the printing-press. Fig. 17 represents the Bullock press. It carries the forms of stereotype plates upon two cylinders, requires no attendants to feed it, and delivers the sheets printed on both sides. The paper, in the form of an endless roll, is moistened by passing through a shower of spray. A single roll

will contain enough for several thousand sheets, and the printing operation, including the cutting of the paper into proper lengths, proceeds uninterruptedly until the roll is exhausted. The roll of paper having been mounted in its place, the machinery is started, and the paper unwinds. The paper is cut into sheets by a knife on a roller acting against a cylinder. The sheets are seized by grippers, carried between the impression-cylinder and the form, receiving the first impression. The printed sheet then follows the large cylinder to the second form, receiving its second impression from this form acting against the large drum. From the large cylinder the sheets are automatically delivered to the receiving-board at the rate of over 11,000 an hour. To the press is attached a counting device or arithmometer. The inking-rollers are shown above the inking-cylinders, beneath which are the ink-troughs. The starting-lever is shown on the right. This press was first used on the Cincinnati *Times* in 1861. A press has been ordered for the *Sun* of New York which will print 60,000 copies an hour. The *Sun* employs seven Bullock presses, and there are over fifty in use in the U. S.

In 1869, Mr. Walter of London, after some years' experimenting, brought out the Walter press, now used by the London *Times* and the New York *Times*. It is the same principle as the Bullock, with some minor details. A roll of paper three miles long reels off over a pulley which serves to keep it taut. It then passes by the wetting-rollers, and over a cylinder to the first plate-cylinder, between which and the blanket-cylinder it receives its first impression. Following the direction of the plate-cylinder, it passes between two blotting-cylinders, and is delivered to the second plate-cylinder, receiving the impression on the opposite side. It is carried forward to a pair of cylinders to cut the sheet, which is carried rapidly up an inclined plane and delivered downward to a vibrating frame, which piles the sheets alternately on two tables beneath. It will print about 11,000 copies an hour.

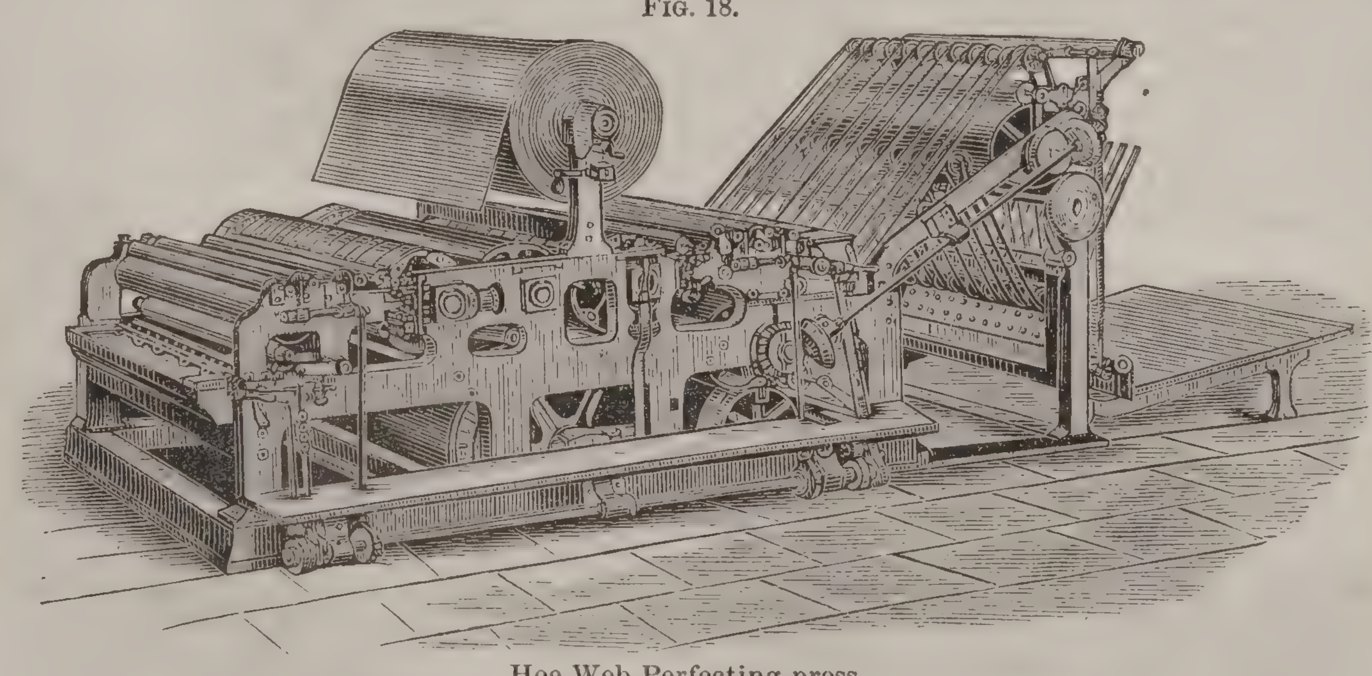
The *Maschinenfabrik* of Augsburg introduced about 1872 a press similar in construction to the Walter press. The principal difference is, that the paper is taken from the under side of the web-roll instead of the top, and is carried to the lower cylinders first, instead of passing to the upper portion of the machine and thence down; which allows the press to be lower. The paper passes through damping-rollers, then through rollers to regulate the tension to the first type-cylinder. The two type-cylinders and the two impression-cylinders lie in the same vertical plane, the middle ones being the impression-cylinders. Printed on one side on the lower cylinder, the paper is carried upward over the two impression-cylinders, receives the second side from the top cylinder, and is carried forward to the cutting-cylinders, when the sheet is led a little upward by tapes to give sufficient height for the delivery apparatus. The sheets are then led downward on an oscillating frame, and placed alternately to the right and the left on two tables. It will print 12,000 an hour.

About 1870, Messrs. Duncan & Wilson of Liverpool, England, invented the Victory press. The paper is led over two wetting-boxes, and then over two hot copper cylinders, and entered between the first type- and impression-cylinders. Here one side is printed, and it thence goes to the second type- and impression-cylinder, where it is backed. It then travels on tapes to the cutting- and folding-cylinders. Here it receives a transverse fold, and the doubled paper is passed to a serrated knife, which cuts the first printed sheet from the web. A second blunt knife again folds the double sheet, which is carried by grippers to a vibratory frame, entering each alternate sheet to the respective pairs of cross-folding rollers, which deliver the sheets to tapes, which carry them to a swinging delivery-frame, by which they are deposited in a pile on the table. This machine will damp, print, cut, fold, paste, and deliver 6000 to 8000 per hour of an eight or twenty-four page newspaper.

The Marinoni press was used in Paris and in London. It had two plate-cylinders, which printed and perfected paper supplied by six feeders, at the rate of 10,000 copies an hour. In 1873, at the Vienna Exhibition, it was improved and made a web perfecting-press. There are two rolls of 5000 yards each, one at each end of the press, the second to be set to work when the first is exhausted. The paper, uncoiling, passes over a wetting-cylinder on to the drum, carried by tapes between two cylinders, where knife-edges cut it into sheets; the sheets are conducted by other rollers and tapes to the two plate-cylinders, and when printed on both sides are deposited by flyers on four receiving-tables.

In the web perfecting-presses the Messrs. Hoe have made some improvements, and an engraving of their press is given in Fig. 18. The paper is printed from a roll containing a length of over four miles and a half, equal to 10,000 papers. The machine has three pairs of cylinders geared together. A roll, having been previously damped, is lifted into place by a small crane, and the paper from it passes between the first pair of cylinders, the circumferences of each of which are just equal to the required length of the sheet. One of these cylinders has its periphery covered with stereotype plates of the matter to be printed, and is supplied in the usual manner with an ink-fountain and distributing-rollers, which, as the cylinder revolves, apply the ink to the stereotype forms. The other cylinder is covered with a blanket, and as they revolve together, with the paper between them, they print its first side. The paper then passes on between the second pair of cylinders, and presents its blank side to the stereotype plates of the second type-cylinder. It next passes to the cutting-cylinders, the periphery of one of which has a vibrating and projecting knife that at each revolution enters a groove in the opposite cylinder and severs a sheet from the roll. The sheets are successively conveyed by two series of endless tapes to a revolving cylinder, which retains them until six (or any desired number) are collected upon it, when they are delivered in a body to the sheet-flyer. A circular cutter cuts the double sheets into single copies. A counter is attached which shows the number of sheets printed. The press is 20 feet long, 6 feet wide, and 7 feet high, and delivers 12,000 to 15,000 perfected sheets an hour. A number of these presses are in use in Europe and America, and a press was recently sent to England having a folding-machine attached.

FIG. 18.

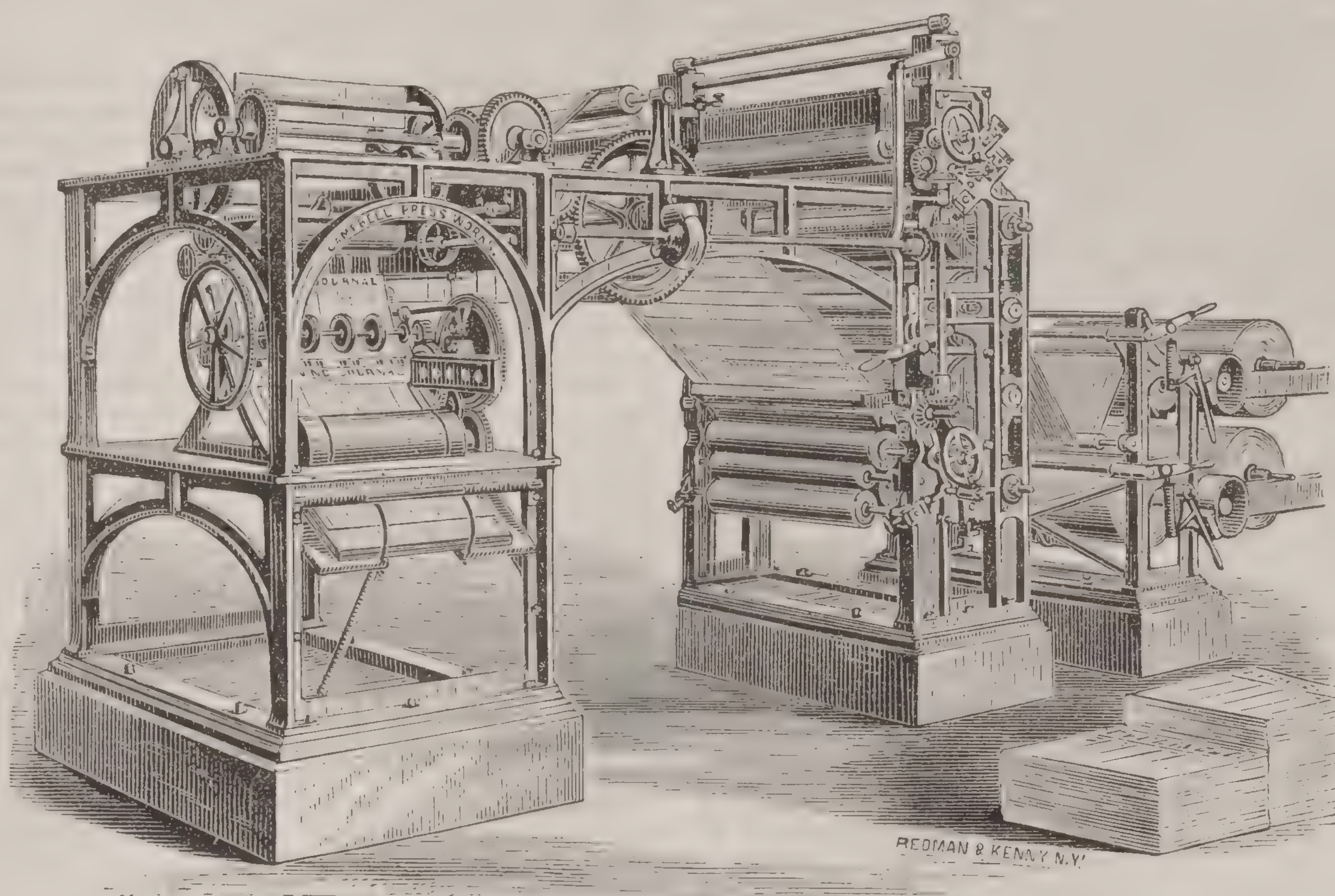


Hoe Web Perfecting-press.

The latest web perfecting-press was introduced about 1875 by A. Campbell, the inventor, and is represented in Fig. 19. It will print, inset, paste, and fold any number of pages up to twenty-four. To prepare and dampen the paper for the press, a machine for rewinding the roll is used to cause the paper to be wound on the press-roll under great tension with the edges even. Between the two rolls is placed an upright frame, which carries a water-trough and two upright shafts geared to run at a high speed. On each of these shafts is a metal disk or saucer supplied with water by means of two tubes connected with the water-trough above. While the paper is wound and unwound, the water is thrown out of these disks by the centrifugal force obtained by their high speed in the form of an invisible, impalpable spray upon the paper as it passes to the press-roll, thus thoroughly and evenly dampening it. As the press-roll increases in di-

ameter, a corresponding supply of water is admitted to the disks. The press resembles two upright stands connected overhead by a frame, one end carrying the cylinders, the other the cutting and folding machinery. The ink escapes from the ink-trough in rather a thick stream upon the first roller, and is afterward taken up by two or three successive rollers, the last of which, revolving very rapidly, throws it in the form of spray upon the roller which inks the cylinder, there being a set for each cylinder. Nearly all its movements are positive. Only one cam-motion revolves once to 144 revolutions of the cylinders. With this exception all its motions are rotary. One or two springs only are in some of the subsidiary parts. It is entirely free from tapes and similar annoying contrivances. The press has been driven up to a printing speed of 10,000 per hour, but with the paper thrown off it has been driven

FIG. 19.



Campbell Web Perfecting-press.

up successfully to 15,000, 20,000, 25,000, 30,000, and 35,000 revolutions per hour without the slightest injury to any of its parts. The cylinders are so arranged as to admit of each having one type-column, in addition to the stereotype plate, so that the "latest news" may be set in at any time. To record the number of revolutions, there is a glass tube, with graduated plate like a thermometer inserted in a metal disk or cup, in the sides of which are inserted three small upright iron tubes with enlarged caps on their upper ends. The disk and the tubes are geared up to the driving-shaft, and as it revolves the mercury by centrifugal force is drawn out from the disk and glass tubes into the caps on the upper ends of the iron tubes, causing a corresponding depression in the glass tubes, and indicating on the graduated plate the number of revolutions. This is the recent invention of Edward Brown of Philadelphia. This press is now used on the *Evening Journal* of Jersey City, and by Frank Leslie of New York and J. C. Ayer & Co. of Lowell, Mass.

Printing in Colors.—This is accomplished properly by having the page or pages separated into as many forms as there are colors. Presses are adapted to color-printing, but are modifications of the cylinder and Adams.

Polychrome Printing accomplishes the printing of one or more colors at the same time. Several attempts had been made to do this, but Congreve in 1820 was the first to carry it out successfully with metal plates. His plan was to outline the picture on a metal plate. If intended for two colors, the details of the chief color are completed on the plate, and all the parts for the other color are cut out. Into these parts other plates are fitted, like the portions of a child's puzzle-map, and on these the engravings for the parts of the second color are completed. When these are done, a thickness of type-metal is attached to the back of these interior pieces, so that they can be held separately, and pushed forward or drawn backward at pleasure. Then they are so adjusted to the machinery of the press that they are withdrawn when the first color-roller passes over the surface of the main plate, and are pushed forward beyond the face of the main plate so as to receive the color of the second roller, which then passes over them without touching the first or main plate. Having received their colored ink, the secondary plates are again moved back to a level with the other, so as to form an entire plate, carrying two colors, which are thus, in the ordinary way, imprinted on the paper. Many improvements of this have been made, but the principle remains the same, and it has now a wide application.

Laws relating to Printing.—Europe has many restrictive laws relating to the printing and publication of books and newspapers (for which see PRESS, FREEDOM OF THE). In the U. S. the Constitution by the first amendment prohibits the passage of any laws abridging the freedom of the press, which is sustained by the constitutions of the respective States. The law of LIBEL (which see) defines the limit of privileged communications and reports, and printers are protected in the necessary publication of charges, etc., demanded by Congress. Some States prohibit the publication of lottery advertisements and similar schemes and objectionable drugs or nostrums. Obscene illustrations and books are generally prohibited. It is the policy of the government to free the press from high postal rates for the public benefit, and for a long period newspapers were free through the post-office in the counties where printed. Newspaper exchanges are circulated free of postage to editors. Indeed, the U. S. enjoys the most unlimited freedom for its press and in the interest of the people. There is a government printer controlled by Congress, the laws relating to which may be found in Brightly's *Digest of the U. S. Laws*. The history of the patent laws will show that in early times grants were made to persons to print works exclusively. (See PATENT LAWS, HISTORY OF.) For the laws relating to copyright and literary property generally, see LITERARY PROPERTY.

Bibliography.—The bibliography of printing is voluminous, and but a few of the volumes containing lists of works on printing and the more prominent treatises can be given. The first extensive bibliographic publication on printing is the *Monumenta Typographica* of J. C. Wolfius (Hamburg, 2 vols., 1740), which contains forty-seven treatises and dissertations on the origin, history, and art of printing, nearly all the writings published anterior to that date; Bernard, *De l'Origine et des Débuts de l'Imprimerie en Europe* (Paris, 1853); Breitkopf, *Ueber die Geschichte der Erfindung der Buchdruckerkunst* (Leipsic, 1779); Dibdin, *Bibliotheca Spenceriana* (London, 1814–15); Didot (Ambroise), *Essai sur la Typographie* (in *Encyclopédie moderne*, Paris, 1851); Falkenstein, *Geschichte der Buchdruckerkunst* (Leipsic, 1840); Fournier, *De l'Origine et des Productions de l'Imprimerie* (Paris, 1759); Meermann, *Origines Typographicæ* (Hague, 1765); Maittaire (P.), *Annales Typographici* (Hague, 1819); Ottley, *Origin and History of Engraving* (London, 1816); Schaab, *Die Geschichte der Erfindung der Buchdruckerkunst, durch Gutenberg* (Mayence, 1830); Sotheby, *Typography of the Fifteenth Century* (London, 1845); Schoelhorn, *De Antiquiss. Latin. Bibliorum Editione, ceu primo Artis Typog. Fœtu* (Ulm, 1760); Wimpfeling, *Catalogus Episcop. Argentin.* (Strasbourg, 1660); Thomas, *History of Printing in*

America (Albany, 1874); J. F. Marthens, *Typographical Bibliography* (Pittsburg, 1875), which contains a list of all the works on printing in the English language: T. L. De Vinne, *Invention of Printing* (New York, 1876). (For materials and information the undersigned is indebted to Messrs. R. Hoe & Co., Mr. A. Campbell, Mr. W. H. Williams of the Bullock Printing Press Co., and Mr. Jonathan S. Green.) WILLIAM S. PATERSON.

Printing, Laws Relating to. See PRINTING.

Priocanth'idæ [from *Priocanthus;* Gr. πρίων, "saw," and ἄκανθα, "spine"], a family of fishes of the order Teleocephali and sub-order Acanthopteri, distinguished by their very large eyes and small rough scales. The body is oval and compressed; the scales small, closely adherent, and roughly ctenoid; the lateral line continuous with the back; the head compressed and scaly to the jaws; the opercula armed; the mouth with a large oblique lateral cleft; teeth villiform on the jaws as well as palate; gill-openings continuous below; branchiostegal rays seven; dorsal fin single, with its spinous portion longest; anal armed with three spines; pectorals with branched rays; ventrals each with a spine and five rays; the skeleton has $9 + 13$ vertebræ. Over twenty species are known from different tropical seas, in all of which some species are found. They are generally of a reddish color, and in addition to the large eyes are readily recognizable by the peculiarly rough scales which extend on the snout and jaws. THEO. GILL.

Pri'or [Lat. *prior*, the "first" of two], in the Augustinian and Benedictine orders of monks, a prelate of the second rank, one who is either the second officer of an abbey under the abbot, or the first officer of a priory, which is a monastery of the second class. The corresponding officer among nuns is the prioress.

Prior (MATTHEW), b. at Wimborne-Minster, Dorsetshire, England, July 21, 1664, the son of a joiner; was sent by an uncle to Westminster School, and gained the favor of the earl of Dorset, by whom he was enabled to complete his education at St. John's College, Cambridge, where he obtained a fellowship and formed an intimacy with Charles Montagu, afterward earl of Halifax, and with him wrote a poem, *The City Mouse and Country Mouse* (1687), intended as a travesty upon Dryden's *Hind and Panther*. Introduced at court by his patron, Prior was appointed in 1690 secretary to the embassy at the Hague; became a favorite with William III., by whom he was made gentleman of the bedchamber; was secretary of the commissioners who concluded the Treaty of Ryswick 1697; secretary of embassy at Paris 1698; under-secretary of state 1699; commissioner of trade 1700, in which year he published his *Carmen Seculare*, in praise of King William; entered Parliament 1701; became soon afterward a vehement Tory; was sent to Paris with Bolingbroke 1711 to make private proposals for peace; was charged with treason for his conduct in this negotiation on the accession of the Whigs to power in 1714; was imprisoned two years in his own house, during which time he wrote *Alma, or the Progress of the Mind;* gained 4000 guineas by the publication of his poems by subscription, and was presented by Lord Harley with a life-interest in the estate of Down Hall, Essex. D. at Wimpole, Cambridgeshire, a seat of the earl of Oxford, Sept. 18, 1721, and was buried in Westminster Abbey. The best edition of his poems, now little read, is that of Mitford (2 vols., 1835), preceded by a memoir.

Pris'cian, surnamed CÆSARIENSIS, probably because he was born at Cæsarea, flourished about 500 A. D., and lived as a teacher of Latin at Constantinople, where he received a salary from the court. Of his works are still extant *Commentariorum Grammaticorum Libri XVIII.*, edited by Krehl (Leipsic, 1819) and Hertz (Leipsic, 1855), and some minor essays and poems, edited by Lindemann (Leyden, 1818) and by Keil (Leipsic, 1856–60).

Priscil'lian, belonging to a noble family of Cordova, Spain, founded a sect whose doctrines were a blending of Manichæism and gnosticism. In 379 the existence of the sect became known, and in 380 the Council of Saragossa condemned its doctrines and banished its founder. The influence of Priscillian was too powerful, however, and his most zealous adversary, Bishop Ithacius of Assonuba, was compelled to fly. He sought refuge with the usurper Maximus, who had Priscillian brought to trial before the Council of Treves, condemned, and put to death in 385. It was the first instance of a Christian being put to death for heresy, and it aroused the indignation of St. Martin of Tours, St. Ambrose, and others. The sect spread subsequently from Northern Spain to Languedoc, and even into Northern Italy, but disappeared entirely in the sixth century, after the synod of Braga in 563. (See Lübkert, *De Hæresi Priscilliani* (Hafnia, 1840), and Mandernach, *Geschichte des Priscillianism* (Treves, 1851).)

Prism [Gr. πρίσμα], a polyhedron two of whose faces are equal polygons, having their sides parallel and all the remaining faces parallelograms. The first-named faces are called bases, and the remaining ones make up what is called the lateral surface of the prism. The distance between the bases is the altitude of the prism.

Pris'moid [Gr. πρίσμα and εἶδος], a polyhedron resembling a prism. It is a frustum of a wedge. The volume of a prismoid is equal to the sum of its parallel bases plus four times the section midway between the bases multiplied by one-sixth of the altitude.

Pris'on [Fr.], primarily, a place of detention for debtors or persons charged with political or other crimes until they were tried or adjudged guilty or innocent of the offences for which they were committed; later, and for the most part within 150 years, the prison has come to be, to some extent, the place and instrument of punishment. The idea of punishment by imprisonment itself does not seem to have entered into the minds of the rulers of ancient times, though the prison was often, from its crowded and filthy condition, its want of ventilation, the foul fevers and plagues engendered there, and the starvation inflicted on its hapless inmates, a place of cruel torture and often of speedy death; but the ancient idea of punishment was embodied in the stocks, scourging, beating with rods, the bastinado, the knout, the wheel, the rack, the thumb-screw, the iron boot, mutilation of the eye, the ear, the nose, the hand, the foot, etc.; the crown of thorns, walking over hot irons or coals, branding, whipping at the whipping-post or the tail of a cart, the pillory, the ball and chain, the treadmill, or the galleys; or, where the punishment was intended to be death, the stake, the terrible death by crucifixion, beheading, stoning, the administration of poison, or, in more modern times, hanging, the guillotine, or the garrote.

Detention of debtors and of political and other offenders was very early an admitted necessity. The earliest instances of its use are found among the Egyptians, whose superior civilization led them to devise measures of police of which other nations, less advanced, had not yet felt the want. Thus, we find in Gen. xxxix. 20 that "Joseph's master took him and put him into the prison, a place where the king's prisoners were bound; and he was there in the prison." This was primarily a place of confinement for political prisoners, and to it were committed such offenders as the chief butler and baker of Pharaoh, important officers of the royal household; and it was only because of the high position of Potiphar, Joseph's master, and perhaps also from some doubts of his guilt, that Potiphar committed him to this prison instead of putting him instantly to death on the grave charge preferred by his wife. There are numerous references to prisons in the Old Testament, as well as among profane writers contemporary with its later books, but always as a place of detention simply, though in the case of Jeremiah the dungeon connected with the prison (Jer. xxxviii. 6), from the depth of its miry bottom and its filthiness, seems to have been intended for the destruction of the prisoners who were cast into it. All the Oriental monarchies had their prisons; but though these were, as they are to this day, wretched, ill-ventilated, and filthy dens, in which it would seem to be impossible to support life, and where the poor culprit who had no money or friends was welcome to die of starvation and foul air as soon as he liked, still, the only theory of the prison was that it was simply a place of detention, and no length of endurance of its horrors was allowed to mitigate in any way the severity of the physical tortures or punishments inflicted on him if he was adjudged guilty of the offence with which he was charged. A recent description of several Chinese prisons demonstrates that they have changed very little in the last 3000 years. Debtors and criminals sentenced to death are their principal inmates, the latter usually wearing a *cangue* or broad heavy yoke around their necks, the head and neck being drawn forward in these by the executioner as he is about to behead them. The squalor of these prisons is said to be beyond all description.

Among the Greeks and Romans the prison, though more cleanly, was generally only a place of detention, though the "inner prison," low, close, and hardly ventilated at all, and containing often the stocks or other instruments of torture, was occasionally made a place of temporary torture. By the laws of Rome, a Roman citizen could not be cast into prison except by the direct command of the emperor and for some very grave offence; and the violation of this law was severely punished. The usual method of detention for Roman citizens was to chain their right arm to the left arm of a soldier, who was made responsible for their safe-keeping; sometimes each arm was chained to a soldier; this guard was changed every twelve hours. In the first century after Christ there was at Rome one prison,

and possibly more, intended for the confinement of prisoners condemned to death or awaiting a final hearing before the emperor. This was the Mamertine prison, or rather the Mamertine vaults—for there were two, and possibly three, distinct vaults, one below the other—to which Juvenal is supposed to refer in his third *Satire* as, in the good old time, having been sufficient to contain all the criminals in Rome. The two principal dungeons are constructed of huge blocks of tufa, and the lower is supposed to be of Pelasgic architecture and the oldest building in Rome. The upper is 16 feet in height, 30 in length, and 22 in breadth; the lower is smaller and lower, and the only access to it is by a hole in the middle of the ceiling, through which the prisoners were let down. This was originally the case also with the upper vault, called the dungeon of Ancus Martius. Many noted persons were imprisoned here, and some, as the Catiline conspirators, Jugurtha, Vercingetorix, Sejanus, and Simon Bar Gioras, were put to death. Tradition says that Sts. Paul and Peter were confined in this lower dungeon till their execution, but this is uncertain. There were houses of detention in Rome which were used for the safe-keeping of slaves. But even at a later period, the Code Justinian has very little to say of prisons; its penalties were scourgings, tortures, mutilations, and death. The punishments of the Roman empire for crimes were not wanting in severity, even to those who enjoyed the great privilege of citizenship; but they were either physical, like those just enumerated, or moral and political, such as the loss of family authority and position, the loss of citizenship and of liberty—*i. e.* compulsory enslavement—and did not ordinarily include, except for a brief period, incarceration. With the downfall of the Roman empire, and the assumption of power over small districts of territory by the feudal barons, there came a change. Constantly in conflict with each other, and holding their castles only by superior bravery or the right of the strongest, these doughty barons could not let their unsuccessful rivals or their captive foes escape from their hands. The great tower of every castle, the *donjon*, had its *keep* or strong-room, often underground, to which foe or rival was forthwith consigned, if he fell into the hands of his enemy. Our word "dungeon" is said to come from these donjon-keeps; and well it may, for more horrible places than some of them it would be hard to find. Damp, filthy, with no means of lighting, warming, or ventilating, and usually without egress or ingress except by being let down from or drawn up to an opening at the top, they were utterly unfit for the confinement of human beings, and the names *oubliettes* ("little places of the forgotten") or *vade-in-pace* ("go in peace") by which they were designated in grim jest by their builders or owners indicated but too truly their murderous purpose. Of a somewhat better character, though still cheerless and almost hopeless prisons, were those isolated fortresses where chiefs, nobles, and kings in the Middle Ages were so often incarcerated. Richard of the Lion Heart, as well as several other European monarchs, and nobles without number, languished in these prisons; and the Tower of London, which belonged to the same class, had its long succession of noble prisoners, many of whom went thence to the stake or the headsman's block. The prisons of the Inquisition in Italy, Spain, Portugal, France, Belgium, and Austria, though not in the main intended so much for punishment as for detention—the punishment (often within the prison-walls) consisting mainly in the racks, wheels, boots, thumbscrews, and other instruments of torture which a fiendish ingenuity exhausted itself in contriving, and in the *autos-da-fe* and other modes of inflicting the death-penalty—were yet, in some cases, places of protracted and cruel punishment, in which every idea of horror and apprehension which could torture the mind of the victim was suggested, to aggravate the distress of confinement. Even during the present century, the victims of this cruel imprisonment have died by slow torture. On the Continent, however, and even in Great Britain, the idea that imprisonment, except in the case of political offenders, constituted any part of the punishment of crime does not seem to have dawned upon the minds of statesmen, political economists, or penologists—if the latter class could be said to have existed—till within the last 150 years. There were jails, houses of detention, prisons—if they might be called such—both in Great Britain and on the Continent, but they were filled with debtors, persons arrested for crime and awaiting trial, and those who had been sentenced to banishment or transportation, to slavery, to the galleys, or to execution. The jails and prisons were so filthy and ill-ventilated that deadly fevers, the plague, and the black death would occur in them, and frequently spread over the adjacent country. At what was known as the "Black Assize" in England, in the seventeenth century, over 300 persons, including judges, jury, lawyers, and spectators, fell victims to a malignant jail-fever which was communicated by the prisoners brought out of the jail for trial. The moral pollution of these jails was as great as the physical: the grossest intemperance and licentiousness prevailed in all of them, and the fee for the prostitution of the female prisoners was a recognized perquisite of the keepers. No confinement in these pest-houses, however protracted, was accepted as in any degree diminishing the severity of the sentence to the galleys, the mines, to the treadmill, or the whipping, pillory, branding, ear or nose slitting, cropping, or transportation to distant colonies. Attempts were made to reform and improve the jails in England, as well as on the Continent, by John Howard in the latter part of the eighteenth century; they were attended with some success, though not so great as his philanthropic efforts and his final sacrifice of his life to the cause warranted. The reformation of great and old abuses is difficult, and makes slow progress at first; still, something was accomplished, and Beccaria in Italy, and Sir William Blackstone, Jeremy Bentham, and Mr. Eden took up the work and went forward with it. At this time, however, Great Britain was largely engaged in schemes of transportation, which her statesmen believed would rid them of their vicious population, and they were not inclined to give much heed to measures of prison reform. They had sent convicts to Virginia from 1619 to 1770, until they would no longer be received, and, after the beginning of settlements in Australia and the adjacent islands, had forwarded thousands to Botany Bay, Sydney, Tasmania, North and West Australia, and to British Guiana, till about 1850; but, contrary to their expectations, the number of criminals at home did not decrease. Most of the continental states had tried the same experiment of transportation, and with about the same success. France, while sending off large numbers of criminals, consigned very many to the galleys, where they learned only evil, and at their discharge became leaders in crime. Russia sent the greater part of her criminals, as well as her political offenders, to the mines in Siberia, and most of the other powers rid themselves of their criminals by transportation wherever they could find the opportunity, sometimes sending them to our frontier territories, to Mexico, and to South America. These efforts did not lessen the number of actual criminals. As yet the possibility of the reformation of criminals was not conceded. All efforts to keep down the number by transportation having failed, and the benevolent labors of John Howard, of Mrs. Elizabeth Fry, and of the aldermanic committee of London having proved ineffectual to remedy the evil, Sir T. Fowell Buxton, a member of Parliament, published in 1818 an *Inquiry whether Crime and Misery are produced or prevented by the Present System of Discipline.* In this work he laid down certain principles concerning the relative rights of prisoners and of society, and boldly took the ground that a majority of prisoners might be reformed and restored to society by a proper method of discipline. After a conflict of nearly thirty years the prisons and prison-systems of Great Britain and Ireland have been very thoroughly reformed; transportation has ceased, and the convict prisons, though more expensive than they should be, are on the whole well managed, and many of their prisoners are reformed. Many of the convicts are employed in the great naval shipyards at Dartmouth and Portsmouth. The jails are cleanly, well-ventilated, and for the most part have some employment for the prisoners, which keeps them from mischief and contributes a small sum toward the expense of their support. The reformatories for young offenders, which are generally well conducted, have, by reforming the young criminals, prevented the increase of the criminal class, and greatly diminished the number and magnitude of crimes in the country. In Scotland and Ireland, by a different application of the same principles, a still greater measure of success has been attained. What is known as the Crofton or Irish system of prison discipline has proved very successful in Ireland (more so, perhaps, than it would in some other countries), and the diminution in the number of great crimes has been highly gratifying.

In the U. S. transportation has never been attempted as a means of ridding the community of the dangerous classes. Before the Revolution the criminal code was very severe; death was the penalty of a great number of crimes; in one of the States 115 crimes punishable by death were enumerated; in other States the number was from 80 to 100. Burglary, horse-stealing, highway robbery, and even grand larceny, as well as forgery, counterfeiting, and many other crimes now punishable by a moderate term of imprisonment, subjected the criminal to the death-penalty. At the same time the prisons were in a wretched condition, hardly better than those of Great Britain. In 1786, Pennsylvania made the first effort at improvement of her prisons by the

erection of the Walnut street prison and the adoption of the *solitary* plan of discipline. The cell was larger than usual, but the prisoner was compelled to remain in it without work or books, and during his whole period of confinement was allowed to see no human face, to hear no human voice. The result was terrible. The prisoner, deprived of all opportunity of occupying either mind or body, and shut up to his own thoughts, soon became insane or fatuous, and the really humane men who had devised this system found that they had made a frightful blunder. The system was modified about forty years later by the adoption of what has since been known as the "separate plan." In this the prisoner, while still isolated from the sight or hearing of his fellow-prisoners, has a large cell and a small yard for exercise opening out of it; he has work, books, and moral and religious instruction from an instructor whom he can hear, but not see. He is allowed to converse in regard to his work with the instructor in that work. The two penitentiaries of the State are conducted on this plan, and we believe one or two local prisons have also adopted it. It is very expensive; the work is unprofitable, the proceeds of it not defraying more than one-sixth of the expenses of the prison; and, though there is not so much insanity or fatuity as under the solitary system, the prisoners fail in self-reliance, and are very seldom of any service to the community after their discharge. All the zeal of its advocates has failed to induce any other State to attempt it. The "solitary system" was tried in several States, but with uniformly disastrous results. In 1821–23 the "congregated or silent system" was adopted at Auburn, N. Y. (it had been previously tried in Holland), and soon attained such a reputation that it was adopted by other States, and with various modifications is now the prevalent system in the U. S. Since the first experiment of Capt. Elam Lynde at Auburn, the system has been so much modified that, as practised in some of the States, it is hardly recognizable. The original plan required congregated labor, but in perfect silence; no word must be uttered by the convict, nor must his eye ever be lifted to a human face. At night he was locked into his cell, the corridors watched, and no communication permitted with any one. No lights were allowed after going to his cell. These severities are now greatly mitigated; the cells are lighted at night, books allowed to the prisoner and instruction by the chaplain; he may converse with his keepers, his instructor, and the chaplain; as a matter of fact, he does converse with his fellow-prisoners; in many of the prisons an allowance is made of from one to five days on each month of good behavior, and thus the term of the sentence may be materially shortened; the avails of overwork are in some prisons allowed to the prisoner at his discharge, or are sent to his family at his request. In many of the congregate prisons the labor of the prisoners is let to contractors at a given sum per day; in several of the States the whole expenses of the prison are thus defrayed, and in some a surplus is paid into the State treasury. In some cases the State employs the convicts and disposes of the products of their labor, but these generally fail to defray the entire expenses. The number of prisoners who, on their discharge, prove to be really reformed varies greatly in different States. Where zealous effort is made by such agencies as the prison associations, to aid discharged prisoners in leading honest and upright lives, the number reformed is much greater than elsewhere. What is needed in the management of convict prisons in the U. S. is not so much the adoption of any new system as the entire divorce of the prisons from partisan politics; the appointment of honest, upright, and competent men, after a severe competitive examination, as wardens, keepers, inspectors, and other officers, and their retention in their places during good behavior; the inculcation of moral and religious, but not sectarian, principles to the prisoners in such a way as to reach their hearts; and the presentation of such motives to good conduct as shall make them more desirous of being good than of merely seeming to be so. If to these modifications in the present management of prisons there is added an efficient agency for aiding and directing them to employment on their discharge, there is no good reason why at least 70 per cent. of the convicts should not be reformed. Many objections have been made to the contracting of the labor of prisoners. If properly and honestly managed, it is hardly more objectionable than the employment of the prisoners by the State. Labor is a necessity both for the health and the reformation of prisoners, and the chief problem to be solved is so to regulate it that it shall do no injustice either to the prisoners or to the community.

The jails throughout the country need a radical reform. Very few of them are well or honestly managed, and they exert a deadly influence on young offenders, brought by their means into contact with older and depraved criminals. They, also, should be entirely divorced from partisan politics, and classification, labor, and moral instruction should be required to the utmost possible extent. But, after all, the great source of the increase of crime is in the demoralization of the young. The juvenile delinquents and vagrants make up in their turn the great mass of older criminals, and the increase and improvement of our reformatories, and if necessary—as it will probably be found to be—the gathering up, by some forcible legal process, of these viciously-inclined children, and placing them in institutions under circumstances favorable to their reformation and improvement, will prove the key to our greatest success in diminishing crime. L. P. BROCKETT.

Pris′on Dis′cipline, as a science, is, so to speak, but of yesterday. For ages public punishment appears to have had but one object—to terrify and deter through torture. The cruelties and horrors of the prison-house were almost past belief. It would seem as if the terrific personification of punishment in the Hindoo code had become there a living reality: "Punishment is the inspirer of terror; with a black aspect and a red eye, it terrifies the guilty." But Christianity has at length wrought a change which, sooner or later, was inevitable under its benign and refining influence; and the merciless scourgings, ponderous irons, torturing thumbscrews, underground dungeons, and chainings to dead bodies once inflicted on prisoners have given place, if not wholly, at least in great part, to looks and tones and acts of sympathy and kindness. Two eminent men, friends and colleagues in one of the most noted literary enterprises of modern times, in writings separated from each other by only a quarter of a century, have aptly given us the salient characteristics of the two systems. In an article printed in the *Edinburgh Review* in 1821, Sydney Smith maintained that for the looms then just introduced into Preston jail should be substituted the crank, the treadmill, or some other species of toil whose product the prisoner could not see; that this toil should be made as monotonous, irksome, and distasteful as possible; that irons and a particolored dress should be employed as instruments of disgrace and humiliation; that terror, pain, suffering—wanton, wasted, useless suffering—should be the foundation of every penal system; that reformation was not to be thought of; and that a prisoner committed for not more than three months should pass a part of that period in complete darkness, and the whole of it in complete solitude and idleness, because, forsooth! solitary idleness tends to repentance. In a paper communicated in 1856 to a meeting of prison reformers in Bristol, Henry Brougham, *per contra*, used this language: "The result, then, of our inquiry has led to this proposition, which I venture to lay down as resting on arguments wholly irrefragable—viz. that all punishment should be conducted mainly with a view to reforming the offender. I regard the culprit as our patient; I consider the judge who consigns him to punishment as the parent, or guardian, or master, who sends his child, or ward, or workman to a hospital; I look upon the state as the superintendent of that infirmary, and the governor with his assistants as the physician with his helpers occupied in bringing about a cure. The malady is rather chronic than acute, and it is always infectious; but the treatment is to be regulated by principles, guided by knowledge, tempered with kindness and tenderness, yet administered with a firm and unflinching hand. There is occasionally a fatal result, sometimes a long-protracted cure; but in the vast majority of cases the skill and the care of the physician prevail, and the result is happy for both the patient who recovers his health and the community which avoids the contagion."

Prison discipline, the science of public punishment, the philosophy which investigates the proper treatment of criminals, must have a profound interest for all lovers of the human race. It goes down to the foundations of public order. It touches the stability and security of the public peace. It affects the sacredness of human life. It is concerned with the protection of property and the safety of our homes and persons. It has a vital relation to the material well-being of communities, and a yet more vital relation to the purity of public morals and the redemption of multitudes of human beings, our brothers and sisters, from sin and suffering. In all the wide range of social science, in all the varied fields of inquiry which command the study of the friends of human happiness and progress, there is scarcely one more comprehensive, more complex, more important, or more abundant in the fruits which a wise culture will be likely to yield than this. We have neither time nor space to traverse the history of the past, but at the present moment three general systems of prison discipline divide the study and the suffrages of the civilized world—viz. the Auburn, or congregate silent system; the Philadelphia, or separate cellular system; and the system of progressive classification—sometimes called the

Irish system, because first applied in Ireland—sometimes the Crofton system, from the name of the gentleman who devised and applied it in the form it has there, though it might, perhaps, be more properly named the Maconochie system, from Capt. Alexander Maconochie of the British navy, the real author of the system and the most original, profound, and philosophical of all prison reformers. The essential principle of the Auburn system is that of absolute separation of the prisoners by night and associated silent labor by day. Outside of Philadelphia this system is found everywhere in the U. S., and has also a foothold, more or less extensive, in various European countries, where, too, the old system of common dormitories has far too wide a prevalence, though it has no defenders, and is destined, certainly, to give way, sooner or later, before the progress of sounder thought and wiser methods. One limitation, however, needs to be made here. We have characterized the Auburn system in the U. S., looking to one of the leading elements in the theory of the system, as that of "associated *silent* labor." The last of these epithets has become, in a degree, inapplicable. Some of our convict prisons do not even claim to conduct their discipline upon the strictly silent principle; in others, where the claim is made, the rule of silence has but a partial enforcement; while in comparatively few is the rigidity of the old discipline of absolute non-intercourse maintained in full force. The essential principle of the cellular system is that of a complete bodily separation of the prisoners in labor, recreation, and rest. In the U. S. this system is restricted to the State penitentiary in Philadelphia and a very few of the county prisons of Pennsylvania. In Belgium it has been adopted as the national system of prison discipline, and it is there applied under conditions suited to bring out all the reformatory and healing power which it is capable of exerting. In Holland there is a prevailing public opinion in its favor, but with many dissentients, and the system is steadily gaining ground. A strong, though perhaps not predominant, public opinion favors it in Germany, and in many other European states, particularly France, the cellular system has its partisans and supporters—enlightened, earnest, and able men. The two systems of prison discipline briefly characterized above are marked by important diversities; nevertheless, they have a common basis. Isolation lies at the foundation of both. It is a fundamental principle of both. The difference is one of application, not of essence—of mode, rather than principle. In one, the isolation is effected by an absolute physical separation by day as well as by night, and the labor is performed in the cell; in the other, the labor is done in common workshops, and the isolation, which is simply moral during the day, is effected by the enforcement of an unbroken silence. The bodies of the prisoners are together, but their souls are apart, and while there is a material society, there is a mental solitude. Such is the theory on which the two systems are founded, but in neither do the facts ever fully correspond to the ideal. In truth, if the congregate system could be carried out according to its ideal, it would be worse than the cellular, even in the point to which exception is chiefly taken to the latter; for nothing could be so torturing as for two men to stand or sit side by side for five, ten, twenty years, and never, by word, note, act, look, or token of any sort, exchange a thought or a sentiment; yet such is the theory of the Auburn system. This consideration called into action some forty years ago a rare and noble genius. Capt. Alexander Maconochie, whose name has already been mentioned above, was, on his own application in 1840, invested with the governorship of the British penal colony of Norfolk Island, at that time containing a criminal population of 1500 souls, made up of the worst convicts ever sent out by the mother-country. This great man (for such he truly was) there became the originator and founder of the system of progressive classification as an agent in prison discipline and the reformation of prisoners. The discipline inaugurated by him was called by its author the "social system of prison treatment," because of the play therein given to the social instincts of humanity; but it is commonly known among penologists as the "mark" system, because of the use which it makes of marks in recording the progress of the prisoner in industry, education, order, and virtue. His system rests on four fundamental principles: (1) Instead of a time-sentence, it imposes a labor-sentence, thus setting the prisoners to earn back their freedom by the sweat of their brow. (2) It teaches them self-denial, by enabling them to purchase a speedier liberation through the sacrifice of present gratification. (3) It appeals to their social nature, giving them an interest in each other's good conduct, and thus making them helpers in the maintenance of discipline. (4) It prepares them for a return to society by gradually relaxing restraint and strengthening their powers of self-control. To carry out these principles, Capt. Maconochie sought to make prison life an image of free life, as far as that could be done in consistency with its objects; in other words, to work *with* nature instead of *against* it, as most prison systems have hitherto done. He treated the convict as a laborer, with marks for wages. His marks were made to play the part of money, for with them the prisoner was required to purchase his food, clothes, schooling, etc., while only the surplus of these earnings counted toward his liberation. Under this system the prisoner is not to be sentenced to a certain number of months or years, but to earn a certain number of marks over and above his keep. Maconochie fixed on ten marks as a fair day's wages, the men being paid by piece-work, and not by time, and for every ten marks saved the convict shortened his imprisonment by a day. At the stores he purchased his daily supplies, paying for them in marks. The rations were served out at three rates. The coarsest cost three marks per day, the next four, and the best five. The self-denying prisoner might thus save seven and the self-indulgent five marks each day for the purchase of his liberty. As extra marks were allowed for overwork, it was possible to hoard at the rate of eight or ten a day as the fruit of diligence and self-denial. Moreover, the marks furnished the means of disciplinary punishment, a proportionate fine in marks being the penalty for every act of disobedience or failure in duty. And while, by this machinery of marks, Capt. Maconochie trained his convicts to habits of industry and frugality, he adopted different means to accomplish his other objects. He divided the convicts' sentences into three periods. During the first or penal stage the men worked under a sharp and stringent discipline. At the conclusion of this they were allowed to form themselves into companies of six each—the members of each company being left to choose their own companions—and then they entered into the second or social stage. In this stage the six prisoners forming a company had a common fund of marks, into which common stock the daily earnings of each member were paid, and from which the supplies and fines for the whole company were deducted. They were thus made responsible for each other's conduct, and naturally became watchful both over themselves and their companions; themselves, lest others should suffer through their fault—their companions, lest they should suffer through theirs. By this means, also, Capt. Maconochie, who knew the intense selfishness of criminals, hoped to implant kindly and generous feelings; that is, to cultivate their social affections. In the last or individualized stage the companies were broken up, and, though every man was still kept at work to earn his daily tale of marks, he was in other respects comparatively free. He had his own hut and garden, his own piggery and poultry-yard, the products of which he might sell to the officers of the colony or the ships that touched at the island. By thus giving the probationer property and rights of his own, Maconochie hoped to teach him respect for those of other people. Such is a brief sketch of this remarkable man's system of penal discipline. He was four years on Norfolk Island. He threw himself, heart and hand, into the work of regenerating the degraded beings who formed its population. He built a church, founded schools, imported a catechist, and on Sundays toiled as ministering deacon himself. Day and night his brain was busy devising new expedients to lift his fallen charge out of bestial lust and demoniacal malignity into self-respect, loyalty, and human affection. His success was wonderful, though he was never allowed by the British government to bring all the principles of his system into play, and so give it a full and fair trial. Nevertheless, his own testimony, confirmed by numerous witnesses, is: "I found the island a turbulent, brutal hell; I left it a peaceful, well-ordered community." A truly heroic soul! A few years after Maconochie's retirement from Norfolk Island, Capt. (now Sir) Walter Crofton, following in his footprints, though possessing a far higher organizing and executive genius, devised and established the new system of convict prisons for Ireland, now called after his own name; and rightly so called, for he took his predecessor's principles and moulded them into a practical scheme of prison discipline, capable of being successfully applied by the average grade of official intelligence. Sir Walter, in founding his prison system, adopted the mark system of Maconochie, with modifications which improved it in many important respects, but with curtailments also—resulting, no doubt, from restrictions imposed on him by the law—which in some measure detracted from its completeness and weakened its force. The Crofton system consists of three stages: A penal stage of separate imprisonment, continuing eight months; a reformatory stage, longer or shorter according to the length of the sentence, with separation at night and associated labor by day, in which the principle of progressive classification is applied with a gradual lifting of restraint and

enlargement of privilege, including an increased share in his earnings as the prisoner advances from class to class; and a testing stage, designed to verify the reformatory power of the preceding discipline, and also to serve as a period of natural training which shall gradually prepare the prisoner for full liberty. The Crofton system may be shortly defined as an adult reformatory, in which the will of the prisoner is brought into accord with the will of the prison-keeper, and held there for so long a time that virtue becomes a habit, and where the object is to teach and train the prisoner, during his detention, in such manner that on his discharge he may be able to resist temptation and inclined to lead an upright, worthy life. Now, this must be done by placing the prisoner's fate, as far as possible, in his own hands, and by enabling him, through industry and good conduct, to raise himself, step by step, to positions of increased freedom and privilege; while idleness and bad conduct, on the other hand, keep him in a condition of coercion and restraint. The public opinion of the civilized world is gradually—we think rapidly—taking shape in favor of a system of prison discipline substantially, though not perhaps in all its details, like that outlined above. It is indisputable that such is the direction of opinion in the U. S. England has now the same prison system as Ireland except the third stage. Denmark has adopted this system of progressive classification in its entirety within the last two years, and the other Scandinavian countries, Sweden and Norway, are following in the same wake. Several of the penitentiaries of Switzerland are already conducted upon this plan, and the current of opinion throughout the confederation sets strongly in that direction. The best thought of Spain and Italy favors the Crofton plan, which also counts in its support a strong and influential party in Germany, led by the distinguished Baron von Holtzendorff. Penologists of all shades of belief, the partisans of all systems, are to-day unanimous in the opinion that the foundation-principle of all reformatory prison discipline is *hope*, implanted in the breast of the prisoner the first hour of his incarceration, and kept there as an ever-present, ever-living, ever-active force. Hope is the great inspiration of all human effort in free life. But men remain men inside of prison bars the same as they were outside. Hope, therefore, is just as truly, just as vitally, just as essentially, at the root of all right prison discipline as it is of all free human life. As regards the agencies to be used in applying this fundamental principle, a branch of the subject which has almost endless ramifications, all we can say now and here—and we must say it without a syllable of enlargement—is that work, education, and religion are the three great forces to be employed in the reformation of criminals, as they are in the general progress of society. E. C. WINES.

Prisoners of War. See INTERNATIONAL LAW, *Summary*, by PRES. T. D. WOOLSEY, S. T. D., LL.D.

Prisrend′, fortified town of European Turkey, eyalet of Room-Elee, on the Rieka, contains 10 mosques, a Greek and a Roman Catholic church, and has 26,000 inhabitants.

Prist′idæ [from *Pristis*; Gr. πρίστις, "a saw"], a family of selachians of the order Raiæ, represented by the sawfishes. The body combines peculiarities of the sharks and rays, being elongated like the former, but with the pectoral fins developed and the branchial apertures inferior, as in the latter; the shagreen is very fine; the snout produced into a very long, flat, dagger-like appendage, which is armed on each edge with a row of strong, compressed, straight teeth. The nostrils are inferior; mouth small and transverse; teeth on the jaws minute; branchial apertures inward from the base of the pectoral fins; spiracles large, behind the eyes; dorsal fins two, unarmed, the first more or less behind the ventrals; pectorals with the front margins free, and not extending on the head. Such are the characters of the sawfishes. The teeth which are on the margin of the saw are of peculiar development, and must not be confounded with the true teeth of the jaws; the skeleton of the saw-like appendage has from three to five hollow subcylindrical tubes which taper toward the end, and are encrusted with a grain-like osseous deposit; these found in a detached state have been described before their nature was known as a peculiar animal under the name of *Myriosteon*. The sawfishes are found in all tropical seas, and one species (*Pristis antiquorum*) ascends occasionally high on the eastern coast of the U. S. An East Indian species lives in part in fresh water. THEODORE GILL.

Pristi′na, town of European Turkey, eyalet of Uskup, is beautifully situated among vine-clad hills, and contains several mosques, some of which are of noble architecture. P. 11,000.

Pristiophor′idæ [from *Pristiophorus*; Gr. πρίστις, "saw," and φορός, "bearing"], a family of selachians of the order Squali, in superficial characters closely resembling the sawfishes, but belonging to a distinct order. The body is elongated, but rather depressed forward; the scales very minute; the head with the snout produced in a very long, flat, dagger-like lamina, which is armed along each side with a row of teeth, as in the sawfishes; the nostrils inferior; the mouth small; the teeth small; branchial apertures five, and on the sides in front of the pectoral fins; the spiracles behind the eyes; dorsal fins unarmed, the first in front of the ventrals; no anal fin is developed; the caudal is well developed, and has its upper lobe larger than the lower. The family has but one genus of four species, which are confined to the seas of South-eastern Asia and Australia. Although agreeing with the Pristidæ in such a remarkable and exceptional character as the prolongation of the snout into a saw, it is related to the true sharks, while Pristidæ is related to the rays; this view is accepted without doubt by all naturalists. THEO. GILL.

Pristipomat′idæ [from πρίστις, "a saw," and πῶμα, "a lid"—*i. e.* operculum], a family of fishes established by Günther for a heterogeneous assemblage of perch-like forms, but properly limited to species agreeing in most characters with the Sparidæ. In all the body is compressed and oblong; the scales ctenoid; the lateral line continuous; the head compressed; the opercula generally more or less armed; the cheeks unprotected; the mouth a lateral cleft and terminal; the upper jaw moderately protractile; the supramaxillaries more or less closing under the preorbitals; teeth pointed on the jaws, absent on the palate; branchial apertures continuous beneath; branchiostegal rays generally seven in number; dorsal and anal fins generally folding in part into a scaly basal sheath; the dorsal single, formed by spinous and soft portions of nearly equal length; the anal like the soft portion of the dorsal, and armed with three spines; pectorals with the rays branched; ventrals thoracic, each with one spine and five rays; the vertebræ are developed in typical or nearly typical number $(9+14 \text{ to } 10+16)$; the stomach is cæcal; pyloric appendages developed in small or moderate number; the air-bladder is generally simple. The family thus defined is represented by genera whose species live, for the most part, in tropical waters. The typical genera are *Pristipoma*, *Hæmulon*, *Orthopristis*, and *Cinodon*. Others have been approximated to those whose systematic position is yet uncertain, and a number of those consigned to it by the founder of the family are now referred to other families. THEODORE GILL.

Privas′, town of France, capital of the department of Ardèche, at the confluence of the Ouvèze and Mezagon, was one of the Protestant strongholds until in 1629 Louis XIII. razed the fortress and expelled the Protestants; has a college, a normal school, and some manufactures of silk and cotton. P. 7836.

Privateer. See INTERNATIONAL LAW, SUMMARY, by PRES. THEODORE D. WOOLSEY, S. T. D., LL.D.

Privateer′, tp., Sumter co., S. C. P. 1679.

Priv′et [Scot. *privie*], or **Prim,** the *Ligustrum vulgare*, an oleaceous shrub of Europe, now naturalized to some extent in the U. S., is chiefly used as a hedge-plant, both in the Old and New Worlds. It makes a close, handsome hedge, though it is not thorny. Its wood, though small, is saved for tanners' use in Europe. Its berries yield a pink coloring-matter which is used by map-colorers. There are several rather ornamental species.

Priv′ilege [Lat. *privilegium*], denoted first a law made *against* a particular person, and afterward also a law in *favor* of a particular person. The last is the common use of our word "privilege." It is a power or right conferred on an individual which others or most others do not enjoy. It may be *positive*, like patents and monopolies, or *negative*, like exemption from taxes or from the jurisdiction of ordinary courts, or, as in the case of members of Congress, from arrest to a certain extent. The last furnishes an example of *political* privileges; of the same kind are nobility and suffrage founded on possession of property. Privileges may come from the act of the sovereign or be conferred by express law. They may be *personal* or *real*—that is, connected with a property, as the right of fishery on the border of an estate, or the political right of jurisdiction belonging to a feudal estate, whoever be the owner.

As in republics all are equal civilly, and, with certain qualifications, politically, before the law, privileges are naturally very few, if not entirely prohibited. In other countries they are growing continually fewer in number outside of the political sphere. Privileges in the first (Latin) sense of the word, as given above, are, we believe, now unknown. T. D. WOOLSEY.

Privileges and Immunities. This expression has recently assumed much importance in constitutional law. It is found in the U. S. Constitution in the following connections: "The citizens of each State shall be entitled to

all *privileges and immunities* of citizens in the several States" (Art. 4, § 2); "No State shall make or enforce any law which shall abridge the *privileges or immunities* of citizens of the U. S." (Art. 14 of Amendments).

I. The first of these clauses was first subjected to judicial construction, being found in the body of the Constitution itself. The same expression ("privileges and immunities") was found in the Articles of Confederation, but coupled with other language which led to obscurity of meaning. The intention of the clause in the fourth article of the present Constitution is to confer upon the citizens of one State in another all the general rights which a citizen of the latter would possess at home, such as to acquire and dispose of land and other property, to have recourse to the courts for redress of injuries, to pass through the State for the purposes of profit or pleasure, etc. In other words, the object of the clause was to give to the citizens of any State the same general rights throughout the country that they would have at home. Looked at from this point of view, the clause is of great importance as relieving a citizen from vexatious restrictions, impositions, or embarrassments which might otherwise attend him when absent from his home in other States. Its strong tendency is to give him the same advantages in these respects which he would possess if there was but a single government.

It is, however, true that the privileges and immunities herein referred to are those which are common to the citizens of the State wherein they are claimed. Special privileges enjoyed by citizens in their own State are not secured by this provision to citizens of other States. (See the case of *Paul* v. *Virginia*, 8 Wallace U. S. Reports, 180.) The Supreme Court declines to define or enumerate all the "privileges, etc.," embraced within this clause, but prefers to deal with each case as it comes up. An interesting instance of the application of the rule is to be noted in the case of a law of Maryland which prohibited persons not permanent residents in that State from selling or exposing to sale within specified territorial limits certain goods, either by card, sample, or trade-list or catalogue, without obtaining for a prescribed fee a license from the State authorities. A citizen of New Jersey having proceeded to sell in opposition to this law, and having been indicted, it was decided that the statute was unconstitutional as opposed to the provision now under consideration. The license-fee in such a case is substantially a tax, and it is well settled that while a uniform tax may be imposed by a State on all sales made within its borders, yet a tax discriminating against the commodities of the citizens of the other States of the Union is inconsistent with the clause concerning "privileges and immunities," and accordingly void. (See *Ward* v. *The State of Maryland*, 12 Wallace, 418; *Woodruff* v. *Parham*, 8 Wallace, 139.)

II. The clause in the fourteenth amendment differs in one important respect from that found in the U. S. Constitution. It refers to "privileges and immunities" of *citizens of the U. S.*, instead of those of the respective States. The whole clause of the amendment bearing upon this point for the sake of clearness will be stated: "All persons born or naturalized in the U. S., and subject to the jurisdiction thereof, are citizens of the U. S. and of the State wherein they reside. No State shall make or enforce any law which shall abridge the *immunities* or *privileges* of citizens of the U. S." This amendment plainly refers to another class of citizens, "citizens of the U. S." (See CITIZEN.) Though their "privileges and immunities" are not to be abridged, they are of the same general class as before, and the former construction is to be adopted in ascertaining the meaning of the expression. The rights referred to are fundamental in their nature, and embrace nearly every civil right for the establishment and protection of which organized government is instituted. Accordingly, any citizen of the U. S. would, for example, have the right to come to the seat of government to transact any business he may have with it, to seek its protection, to share its offices, to engage in its administration. So he has right of free access to its seaports, to the sub-treasuries, land-offices, and courts of justice. So he may demand the care and protection of the Federal government over his life, liberty, and property when on the high seas or within the jurisdiction of a foreign government. So he can use the navigable waters of the U. S., however they may penetrate the territories of the several States, or may of his own volition become a citizen of any State of the Union by acquiring a residence therein. It is to be observed that under the clause now under consideration the privileges of a citizen of *a State* are not guarantied, but only those of a citizen of the *United States*. If there is any difference between the two, the former must rest for security and protection where they have previously rested, on other provisions of the Constitution. As deductions from these principles, it has been held that the clause under consideration does not prevent the legislature of a State from granting to a corporation the exclusive rights of maintaining slaughter-houses and yards for enclosing cattle intended for sale or slaughter within a district embracing a large and populous city (New Orleans), and prohibiting all other persons from slaughtering or selling cattle within the prescribed district except at the corporation slaughter-houses and yards. Such an exclusive right as is here the subject of legislation is not one of those fundamental civil rights embraced under the term "privileges and immunities" (*Slaughter-house Cases*, 16 Wallace, U. S. 36). The same general result was arrived at in respect to the right of a woman to practise law in the courts of a State, it having been decided by the State court that women were not eligible to practise under the laws of the State. It was said that the right to practise law is not a "privilege or immunity" depending upon citizenship of the U. S. It has not been made to depend upon citizenship at all; and where it has any relation to citizenship, it rather refers to that of the State than of the U. S. (*Bradwell* v. *The State*, *ib.* p. 130–139). On similar grounds it has been adjudged that the usual and ordinary legislation of the States regulating or prohibiting the sale of intoxicating liquors is not unconstitutional on this ground. A right to sell such property is not one of the "privileges and immunities" within the purview of this branch of the Constitution. In this case the court was unanimous, while in the "slaughter-house cases," before referred to, three judges dissented. These concurred in the liquor case substantially upon the ground that in this instance the claimant was insisting upon his right to violate a mere police regulation, while in the matter of the slaughter-houses there was an attempt by the State under a thin disguise to restrain a citizen from pursuing a lawful avocation and to establish an odious and oppressive monopoly. Finally, in the case of *Minor* v. *Happersett* (21 Wallace, 162) it was decided that a law of a State conferring the right of suffrage exclusively upon males was not unconstitutional as abridging "the privileges or immunities" of female citizens of the U. S. While women born in the U. S. or naturalized here are unquestionably citizens, the right to vote is not one of the necessary privileges, etc., of a citizen of the U. S. It is clear that no such view prevailed when the Constitution was adopted, each State determining for itself who should have the power to vote, and under what restrictions as to age, sex, residence, and amount of property owned, etc., it should be exercised. If, when the fourteenth amendment was adopted, it was intended to reverse all these rules, there would have been clear evidence of intent, and the matter would not have been left to implication. Moreover, the adoption of the fifteenth amendment, setting forth that the right to vote should not be denied or abridged by the U. S. or any State on account of race, color, or previous condition of servitude, would have been unnecessary had the fourteenth amendment had any such sense as was contended for by the advocates of female suffrage. The general result of the discussion before the courts is, that the clause concerning privileges and immunities of citizens of the U. S., as found in the fourteenth amendment, is not intended to withdraw from the States matters that were previously under their control, but rather to secure to all citizens, without distinction of race or color, those great and fundamental rights which American theories of civil government assume as appertaining to citizenship. T. W. DWIGHT.

Privy Council. See CABINET.

Privy Seal, the minor seal of the British government, affixed to papers of minor importance, and also to important documents preparatory to the affixing of the great seal. The privy seal is in the care of a great officer of state, usually one of the cabinet, called the lord privy seal.

Prize [Fr. *prise*], something taken on the sea, as belonging to an enemy in war or to a neutral—*i. e.* to a person resident in a neutral state who is identified with such enemy. A vessel of a nation taken by its own cruisers, if engaged in illegal trade, may also be called a prize. A prize-court is one authorized by the laws of a nation to decide cases of prize. (See INTERNATIONAL LAW, SUMMARY.) T. D. WOOLSEY.

Priz'zi, town of Sicily, province of Palermo, situated near the sources of the river Termini. It is one of the most thriving and industrious towns of Sicily, the inhabitants being largely engaged in the manufacture of iron, copper, cotton, etc. P. in 1874, 8835.

Pro'a, or **Prahu** [Port. *proa*, a "prow"], a canoe-like sailing vessel of the Malays, Ladrone Islanders, etc. The lee side is straight and flat from stem to stern, the other rounded. Both ends are alike. The vessel carries a lug-sail of matting. A framework projects to windward, and counterbalances the effect of the wind upon the sail, which would otherwise upset the craft. Proas are commonly some

thirty feet long and very rapid sailers. They were once much used by pirates. The name is often applied to Malay vessels of other kinds, some propelled by oars and paddles, and some by sails also.

Probabil'ity [Lat. *probabilitas*], **Theory of,** or **Calculus of Probabilities,** as it is usually called, may be defined as the application of mathematical reasoning to the art of judging in cases where only probable evidence can be obtained. The mode in which the judgment may be thus assisted can be best seen if we begin with some simple examples before laying down any general principles. Suppose a die to have two of its six sides painted black, the remaining four being left white, and a person to be required to judge whether, upon the die being thrown, a white or a black side will be uppermost. Common sense will teach him to guess the white side, not because he can certainly say it will be thrown, but because it will be more likely to be thrown. In common language it would be said that the chances were two to one in favor of white. In mathematical language a slightly different expression is used, the probability of an event being a proper fraction of which the denominator is the entire possible number of chances or cases, while the numerator is the number of those cases which favor the proposed event. In the case just supposed, for instance, there are six sides to the die, of which one and one only must be thrown. Four of these sides being white, the probability of white being thrown is $\frac{4}{6}=\frac{2}{3}$, and that of black is $\frac{2}{6}=\frac{1}{3}$. If one of the four white sides were painted yellow, the probabilities would be white $\frac{1}{2}$, black $\frac{1}{3}$, yellow $\frac{1}{6}$. If the event is impossible, there are no cases which favor it, and in the notation just indicated its probability is 0. If all the cases favor it, and its occurrence is therefore certain, the probability is 1. As no degree of probability can exceed certainty, all degrees of probability are somewhere between the limits 0 and 1.

The mathematical solution of problems in probabilities consists, first, in dividing the possible processes or results into elementary and equally probable cases; and, secondly, in finding how many of these cases favor the proposed event. In the case just supposed of a single die, this is very simple, and no one could mistake the mode of arriving at a solution. But when the result depends on the concurrence of a number of circumstances, the reasoning becomes much more complex. Suppose, for instance, that two dice are thrown. Then, any one of the six sides of one die may be combined with any side of the other, making, in all, 36 combinations. To find the probability of any result from the throw of such a pair, we must find how many of these combinations will give rise to the combination in question, and divide the number by 36. In making this calculation there is great room for mistakes; indeed, the subject of probabilities is by far the most slippery one with which the mathematician or logician has to deal. Suppose, for instance, that a sharper should offer to a countryman to give him 3 cents every time two *ones* were thrown with two dice, provided the other would give him 2 cents every time a *one* and a *two* were thrown. At first sight, the countryman might consider the two results equally probable, and therefore feel sure, in the long run, of gaining. But he would be sure to lose, because two different numbers are twice as likely to be thrown as a pair of the same number. To have 2 *ones* each die must fall with *one* uppermost. But to have a *one* and a *two*, one may be a *one* and the other a *two*, or the first may be *two* and the second *one;* so that for this result there are two cases out of 36, while in the first there is but one. It cannot be doubted that an understanding of this calculus would afford a very material aid to the judgment in weighing and estimating the probabilities of events in the affairs of life; for, although these events, or the causes which give rise to them, cannot generally be made the subject of mathematical calculation, yet the examination and enumeration of the various combinations of circumstances which may give rise to an event affords our only means of judging of its probability. The longer a man's experience of worldly affairs and the sounder his judgment, the more nearly he will conform to the rules and methods of the mathematical calculus in estimating probabilities. An eminent writer happily described the calculus of probabilities as common sense expressed in numbers.

One of the most generally useful rules of this calculus is that although an event may be extremely improbable if it has but one opportunity to happen, yet if we increase the number of opportunities indefinitely it will be sure to happen in the long run. By the same principle, if the concurrence of a large number of circumstances is necessary to the production of an event, each of these circumstances may be, in itself, very probable, and yet their concurrence, and consequently the event itself, very improbable. The mathematical rule for determining probability in such a case is that the probability of the concurrence of all the events is equal to the continued product of the probabilities of all the separate events. As one example, suppose that a law requiring the concurrence of the two houses of Congress and the President were as likely as not to be rejected by any one of them, and that each one of the three authorities formed his own opinion independently of the other two. Then, the probability of each authority approving the law being $\frac{1}{2}$, the probability of its passing all three would be $\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}=\frac{1}{8}$. We can get at the same result in this way: Out of 8 laws introduced into the House only 4 would pass and go to the Senate. Out of this 4 the Senate would pass 2, and of these 2 the President would approve 1. On this principle an event which has to pass the ordeal of a great number of small dangers is sure to fail at last, though each separate danger may itself be small. Suppose, for instance, that a bridge has 100 holes in it, and that a person passing over this bridge has 9 chances out of 10 of going safely past each individual hole. Notwithstanding so many chances in his favor for any particular hole, the chance that he would escape them all is only 1 in 37,650. That is, if we take the fraction $\frac{9}{10}$, which expresses the probability of passing any one hole safely, and multiply it by itself 100 times, the result will be about equal to $\frac{1}{37650}$. So small is this probability that if a wild beast should attempt to cross the bridge for the purpose of devouring a man standing at the other end, the latter might wait in perfect composure with the moral certainty that the animal would fall through some hole before he got across. One of the principal marks of the practical wisdom of age and experience is the ability to recognize this principle, and there are plenty of proverbs which are really founded on it. When the young man stops up all the holes in his bridge, so that there is only a small chance of falling into any one of them, he feels comparatively safe. But the older one knows from experience that there are cases in which the mere number of possible mishaps will be very likely to result in the failure of a plan, though the plan may seem almost secure against each of them separately.

One of the most curious and important results of this calculus is seen in what is termed the law of averages, or the tendency of chance events which occur in great numbers to follow regular laws. The life of an individual is proverbially one of the most uncertain things in human affairs. But when we take large bodies, like the population of a State or great city, the deaths follow a law so exact that mathematical tables of their probable number can be formed, and on these tables life insurance companies can arrange their rates of premium with the moral certainty that the death-rate will not vary seriously from that calculated. Not only the total number of deaths, but the proportion of deaths from the most fortuitous causes, follow nearly their regular law. No doubt if we could learn how many men are killed by falling from houses, we should find it wonderfully constant from year to year. In cases like this the constancy of the result is the consequence of some widespread underlying cause, hidden by other accidental causes acting in different ways in individual cases. Thus, a table of mortality is the combined expression of a certain law of the human constitution and certain conditions of the climate. The number of deaths by falling from scaffolding expresses the degree of general carefulness or carelessness which characterizes men engaged in building. The general rule is, that in order that a law of averages may be closely followed it is necessary that the seemingly accidental events enumerated should be the result of two sets of causes, of which one is invariable throughout the whole period of time, while the other is entirely accidental in each individual case. When the variable or chance causes are not purely accidental, but affect large masses or vary from year to year, there is no longer any such exact law. For instance, if a large fraction of the population died from occasional epidemics, there could no longer be an exact law of mortality.

SIMON NEWCOMB.

Pro'bate [Lat. *probatus*], in law, a judicial proceeding before a court possessing the proper authority by which an instrument is established as the last will and testament of the deceased person whose act it purports to be. According to the practice which generally prevails in this country, the alleged will is produced by the executor or by a legatee, who is termed the "proponent;" notice of the application is given to the persons having an interest in the estate; at the hearing the evidence of the subscribing witnesses is taken, and other witnesses are examined if necessary, and the judge renders a decree, either declaring the will valid and admitting it to probate, or pronouncing it invalid and rejecting it. In England prior to 1857 the ecclesiastical courts possessed the sole jurisdiction in testamentary matters, but wills of personal property only could be proved therein; if a will of real estate was dis-

puted, its validity was decided in an action brought to try the title to the lands devised thereby. This jurisdiction was taken from the ecclesiastical courts and conferred upon a new tribunal created in 1857, styled the court of probate and divorce. Since ecclesiastical courts never have formed a part of the judicial system in this country, tribunals have been established in the several States, variously known as courts of probate, surrogates' courts, orphans' courts, and the like, with jurisdiction over the probate of wills, the settlement of decedents' estates, and kindred matters. Their powers and modes of procedure are wholly regulated by statute, and a very great diversity exists in the statutory provisions of the several States. A will of personal property may be proved, and the probate, if regular, is final and conclusive upon the parties interested in every State. Wills of real estate may also be admitted to probate in many if not most of the commonwealths, but such probate is not in general conclusive; it simply determines the *primâ facie* validity of the testament, and casts the burden upon those who dispute it.

JOHN NORTON POMEROY.

Proboscid'ea [from *proboscis*, a "trunk" or "snout"], an order of mammals distinguished by the extension of the nose into a proboscis and the columnar form of the legs and feet, and typified by the elephants of the present epoch. The brain is of the educabilian type—*i. e.* the cerebral hemispheres are comparatively large and overlap in great part the cerebrum behind and the cerebellum in front; the hemispheres are connected by a well-developed corpus callosum and by a reduced anterior commissure; the placenta is deciduate and zonary; the incisors variable in number —$\frac{2}{0}$, or in extinct forms $\frac{2}{2}$ or $\frac{0}{2}$—but always have persistent pulps, and are developed as long tusks curved outward; the legs are extensible in a straight line, and the proximal joints in great part exserted outside of the common abdominal integument; the feet have the palmar and plantar surfaces invested in extended pad-like integuments, which also underlie the toes; the carpal bones are in two regular (not interlocking) rows, and are broad and short; the cuneiform is extended inward, broad, and furnishes a large attachment forward for the ulna, which is antrorsely produced; the unciform is directly in front of the cuneiform, and the magnum directly in front of the lunar; the hind foot has the astragalus at its anterior portion very short, convex, and not deflected inward, articulating in front only with the navicular; the toes are in all the known forms five to each foot, and encased in shallow hoofs. The order is represented by one living family (Elephantidæ), and to it by almost all authors an extinct family (Dinotheriidæ) has been also referred; these are distinguished from each other by great differences in the structure of the skull, as well as in the development of the teeth, the peculiar dentition of the elephants not being shared by the Dinotheriids. (See also ELEPHANT and DINOTHERIUM.) THEODORE GILL.

Probus, b. at Sirmium, Pannonia, about 230 A. D.; entered the army very early; attracted the attention of the emperor Valerian by his valor; rose rapidly; commanded with success in Gaul, Germany, Africa, on the Nile, and on the Euphrates, and was made governor-general of all the Roman provinces of the East. On the death of the emperor Tacitus in 276 he was chosen emperor by the armies of the East, and his short reign was a series of brilliant exploits. He drove the Germanic tribes back into their own country, compelled them to give up the plunder they had carried away from Gaul, pacified the whole northern boundary from the Rhine to the Euphrates, and suppressed with great promptness several attempts at revolt in the interior. But having established general peace, he employed the army in works of public utility—the draining of swamps, the planting of vineyards, etc.; and the discontent occasioned thereby grew into an uncontrollable fury when he one day said that a standing army soon would be superfluous. The soldiers immediately turned from their work, attacked him, and killed him in his native city in 282.

Proced'ure (law). Although not a technical word of the common law, *procedure* is employed by modern writers as a generic term to denote all the formal steps and proceedings in the conduct of a judicial controversy, and the legal rules which control their use. Certain uniform principles seem to have determined the nature and moulded the history of procedure in every national jurisprudence that has made a completed progress from rude beginnings to a condition of philosophical and equitable perfection. The earliest stages are always characterized by an intense formalism; the law is almost wholly made up of the arbitrary, technical forms, each appropriate to a particular wrong or remedy, which must be followed with scrupulous exactness; the growth of the jurisprudence for a considerable period consists in the modification of these forms and their extension to new facts and relations; in time, the dominion of form is relaxed, the technical and arbitrary features gradually disappear; and at last the methods of administering justice become simple and are based upon equitable notions. This course of development marked the entire progress of the Roman law (see LAW, CIVIL); it has been exhibited no less clearly in the jurisprudence of England and of the U. S. The most striking feature of the procedure originally prevailing in England is the separation into two distinct and widely-differing systems, the common law and the equitable—the former exclusively used by the courts of law for the enforcement of legal rights in connection with the jury trial; the latter employed by the courts of equity for the enforcement of equitable rights alone without the jury. Of the two, the common-law methods were much the elder. From the earliest periods rights were enforced in the law courts by means of different actions, the most important of which, denominated "real actions," were solely used for the recovery of lands. Prior to Edward I. there existed but three actions for the recovery of money—debt, covenant, and trespass. By virtue of a statute passed in the reign of that king (13 Edw. I. c. 24) other forms were afterward invented. The highly technical real actions were subsequently abandoned, with a few occasional exceptions, and the following actions became established as the ordinary means of enforcing legal rights: "ejectment," to recover possession and to try the title of lands; "detinue" and "replevin," to recover possession of chattels; "covenant," to recover damages for the breach of a sealed agreement; "debt," to recover a fixed and certain sum of money owed by the defendant, not as damages; "assumpsit," to recover damages for the breach of a contract not under seal, whether written or verbal, express or implied; "trespass," to recover damages for a wrongful act of violence to person or property; "case," to recover damages for a wrong to person or property unaccompanied with violence, or when the injury was consequential; "trover," to recover damages for the wrongful detention and conversion of chattels. The rules which governed these actions were technical and formal, and the courts were more often employed in deciding whether the proper kind of action had been brought, or whether the correct formulas of words had been used, than in adjudicating upon the actual merits of causes and determining the real rights of the parties. Inseparably connected with this diversity of actions was the common-law system of pleading; the two reacted upon and supported each other, and the technicalities of the one brought out and strengthened the formalism of the other. The procedure in equity was based upon more simple and natural notions, and, however much it may have become encumbered by dilatory and unnecessary practices, these were not inherent and essential. No forms of actions existed, but a single method sufficed for all kinds of claims, defences, and reliefs. The complainant stated his case with great minuteness of detail in a "bill," the defendant set forth his version in an "answer;" and upon these pleadings and the proofs the chancellor rendered his decree. In this judgment the rights, claims, and liabilities of all the parties were adjusted, and relief could be granted alike to defendants or to complainants. It was, therefore, a cardinal principle of the equity procedure that all persons interested in the controversy and who could be affected by the decree should be made parties to a suit. All these principles, methods, and rules of the common-law and the equity procedure were incorporated into the jurisprudence of the American States; and although they have been modified in many of the commonwealths, in others they are retained to the present day substantially as they existed at the time when Blackstone wrote his *Commentaries*. A revolution has finally been effected in this country and in England in every respect identical with that which took place in the Roman law when the prætor's extraordinary jurisdiction was extended to all kinds and classes of litigations. In 1848 the legislature of New York adopted a code of civil procedure—chiefly planned and created by David Dudley Field—which entirely abandoned all former existing methods, and inaugurated a new system for the enforcement of rights and the recovery of remedies. Its central principle is the abolition of all distinction between actions at law and suits in equity, and of all forms of action, and the establishment of a single judicial instrument called the "civil action" by which all rights are maintained, duties enforced, and reliefs obtained. The barrier which had separated the administration of law and equity is thus broken down. Legal and equitable claims, defences, and remedies may be combined, and the single judgment of the court may determine and establish the final sum of all the rights and interests belonging to the litigant parties. With the common-law forms of action the common-law forms of pleading are also abandoned, and in their stead is substituted one simple and natural mode, adapted to all possible con-

troversies, for it merely requires the parties to state in ordinary language the actual facts which constitute their causes of action or defences. As a consequence of the fundamental principle above mentioned, the equitable doctrine of parties is preferred in place of the legal rules, which were in many instances peculiarly artificial and arbitrary. Finally, the equity doctrines prevail in the rendition of judgments and in the apportionment of relief among all the suitors. The system has been accepted, sometimes with unimportant modifications, but often without any change from the original type, in twenty-three of the States and Territories, and may be styled the "reformed American procedure." Passing beyond the limits of the U. S., it prevails in several of the British colonies, and has recently been adopted in all its essential principles in England itself, where it went into operation by act of Parliament during the fall of 1875. The history of jurisprudence does not present another so remarkable instance of legislation. JOHN NORTON POMEROY.

Procellar′idæ [*Procellaria, procella*, "a storm"—*i. e.* the storm-birds], a family of swimming birds, including the petrels or Mother Carey's chickens, albatrosses, and related forms. These have a gull-like body; the neck rather short; the bill moderate, and composed, apparently, of several pieces; the upper mandible having a decurved convex tip, separated from the rest of the sheath by a groove proceeding from the nasal region; the lower a lateral groove, deflected downward, and also leaving a terminal piece; the nostrils at the end of tubular processes, which are more or less immersed in grooves; the wings are generally elongated and pointed, rarely (as in *Pelicanoides*) short; tail also generally long and forked, sometimes (as in *Pelicanoides*) short and rounded; legs submedian; tibiæ exserted; tarsi variable, covered with small scales; toes three in front, connected together by a broad web, posterior rudimentary or wanting; the skull is schizognathous, and in most respects agrees with that of the gulls and loons, but exhibits some distinctive characters, and has been regarded by Streets as indicating a peculiar sub-family (Nectriomorphæ). The family is generally divided into three subfamilies: (1) Procellarinæ, including most of the small species; (2) Diomedeinæ, comprising the albatrosses; and (3) Pelicanoidinæ, represented by the single aberrant genus *Pelicanoides*. Prof. J. Reinhardt has recently (1873) based a new classification of Procellarinæ on the presence or absence of a sesamoid bone or bones in connection with the humerus, which, when present, have attachments with, and are mechanically subservient to, certain muscles of the fore arm and metacarpus. These sesamoids are present in the puffins, but absent in the fulmars and the typical petrels. By Gray 111 species are recognized. Some one or other of these are found in the high seas and along the coasts of all quarters of the globe, but they extend inland less than most other birds. They vary in size from the dimensions of a small swallow to those of a large goose. THEODORE GILL.

Proc′ess [Lat. *processus*], in law. A generic term, primarily used to designate all the means by which a defendant is compelled to appear and answer to an action brought against him, or to the judgment recovered therein against him, and also the means by which his property is secured or taken in satisfaction of such judgment. It is also sometimes applied to many other judicial writs or orders by which persons are summoned or directed to perform particular duties. In the criminal procedure it denotes the warrants or other writings authorizing and directing the arrest of persons charged with offences. In a more general sense it embraces all judicial writs commanding public officers or private individuals to do a specified act; and, finally, it is used, although not technically, as synonymous with "proceeding." Actions at law were formerly commenced in England by a process called the "original writ," which was issued in the king's name, contained a statement of the complaint, and was addressed to the sheriff, commanding him to summon the defendant. This writ was practically abolished in the reign of William IV., when it was enacted that all personal actions should be commenced by the writ of *capias* if the defendant was to be arrested, and by the writ of "summons" if he was not to be arrested. The former is an order issued from the court directing the sheriff to take the defendant and hold him to bail to answer the plaintiff's claim, or in default thereof to retain him in custody. The latter is a similar order addressed to the defendant himself, commanding him to appear in the suit. The corresponding process in chancery suits was the "writ of subpœna," while that in the ecclesiastical and admiralty courts was termed a "citation;" both were, like the summons, personal orders to the defendant. At present, all actions are commenced in England by a process in the nature of a summons. In the U. S., wherever the reformed procedure has been adopted, all actions in the superior courts are begun by a summons or notice to the defendant directing him to appear and answer within a specified number of days; in several of the States it is issued directly by the plaintiff or his attorney, in others by the clerk of the court in which the suit is brought. In those commonwealths which retain the common-law methods different forms of preliminary process are used, but, under whatever names, they are generally analogous to the writ of summons. A peculiar local practice prevails, however, in New England, of commencing all legal actions by attaching the defendant's property, or so much thereof as may be necessary to secure the expected recovery. Final process is the means by which a judgment is enforced and satisfied, and is of two kinds—that against the property, and that against the person. The former, which is now termed the "execution," but was once generally known as the *fieri facias*, or *fi. fa.*, commands the sheriff to make the judgment out of the debtor's goods and chattels, and if that is impossible, then out of his lands; the latter—the body-execution, *capias satisfaciendum*, or *ca. sa.*—directs the officer, in default of sufficient property, to take the debtor's body. The latter species of execution can only be resorted to in those cases in which the defendant may be arrested. In addition to these preliminary and final steps, there may be, under certain circumstances and in a special class of actions, intermediate proceedings in the nature of process against the defendant—namely, an order or warrant of arrest, by virtue of which he is taken and held to bail or detained, and a warrant or order of attachment, by virtue of which his property is seized and held to wait the final judgment. JOHN NORTON POMEROY.

Proces′sion of the Ho′ly Ghost. This term is based on John xv. 26, where Christ says of the Spirit whom he will send from the Father that "he *proceedeth* from the Father" (παρὰ τοῦ πατρὸς ἐκπορεύεται, hence ἐκπόρευσις, *processio*). It designates in the orthodox theology the characteristic individuality (ἰδιότης, *proprietas, character hypostaticus*) of the third Person of the Holy Trinity, as the eternal generation (γεννησία, *generatio*) is the characteristic property of the Son, and the unbegotten paternity (ἀγεννησία, *paternitas*) the exclusive peculiarity of the Father. There is an old difference between the Greek and Latin churches about the *single* procession (from the Father *alone*) and the *double* procession (from the Father *and the Son*). The Nicene Creed (381) asserts only the procession from the Father (*Sp. S. qui ex Patre procedit*), in verbal adherence to the passage in John, and the Greek Church understands this in an exclusive sense (from the Father *alone*). The Latin Church, after Augustine, taught the double procession, and afterward embodied it, without asking the consent of the Greeks, in the Nicene Creed by the insertion of *filioque* ("and from the Son"). This famous clause first appeared in 589, at a synod of Toledo in Spain (in strong opposition to Arianism), and in spite of the protest of Pope Leo III. (809) it was gradually adopted in the Latin Church, from which it passed into the Protestant churches. This difference has caused a great deal of bitter controversy since the days of Photius, patriarch of Constantinople (d. 891). The councils of Lyons (1274) and of Florence (1439) endeavored to settle it, but in vain. The Greek divines plead in favor of the single procession the letter of the Scripture, the original text of the Nicene Creed, and the dignity or monarchy (μοναρχία) of the Father as the sole fountain, cause, and root of the Deity; they also make a sharp distinction between the eternal metaphysical *procession* of the Spirit from the Father alone, and the historical *mission* of the Spirit from the Father and from the Son (John xiv. 26; xvi. 7). The former belongs to the Trinity of essence, the latter to the Trinity of revelation, and begins with the day of Pentecost. The Latin divines infer the double procession (taking this term in a wider sense) from the double mission and from the essential unity (or *homoousia*) of the Son with the Father, so that if the Spirit proceeds from the essence of the Father, he must proceed also from the essence of the Son, both being the same. A compromise was suggested by the formula that the Spirit proceeds from the Father *through the Son* (διὰ τοῦ υἱοῦ). When Pius IX. invited the Eastern patriarchs to the Vatican Council in 1870, they renewed the old protest against the heretical *filioque*. The Döllinger Union Conference between Old Catholics, Orientals, and Anglo-Catholics discussed this controversy at Bonn in Aug., 1875, and came to an agreement which surrenders the *filioque* as an unauthorized interpolation to the Creed, and endorses the single procession of the Spirit from the Father alone, but through the Son, as taught by John of Damascus, the last of the Greek Fathers. PHILIP SCHAFF.

Pro′cida, town of Southern Italy, province of Naples, on an island of the same name lying between Ischia and Cape Misenum. This little island, not more than 8½ miles

in circumference, is entirely composed of volcanic tufa, and the town of Procida, on the E. side, stands on a high and rugged rock which is itself almost surrounded by water. The principal edifice, besides the churches, is the royal palace of the Bourbons, who frequently came here for health or amusement. Procida was originally a Greek settlement, and it is said that, in spite of the long Roman domination, of the devastations of the Saracens, of Spanish and English occupations, the women still retain much of the Greek physiognomy and something of the Greek costume. The inhabitants are occupied partly in agriculture (the cultivable portions of the island being wonderfully productive), partly in tunny fishing, and about 400 men are annually employed in the search for coral. The whole population of the island is about 14,000, most of whom live in the town of Procida.

Pro'clus, b. Feb. 8, 412 A. D., at Byzantium; educated at Xanthus in Lycia, from which his family descended; studied at Alexandria and Athens, and became a celebrated teacher of philosophy in the latter city, where he d. Apr. 17, 485. He was the last member of the Neo-Platonic school who acquired any celebrity. In modern times he has not commanded any great interest. There is no complete edition of those of his works which are still extant. That by Cousin (6 vols., Paris, 1820–27) contains the treatises on *Providence and Fate*, the *Ten Doubts about Providence*, the *Nature of Evil*, and the commentaries on the *Alcibiades* and *Parmenides*. There are translations in English by Thomas Taylor of the *Commentaries on the Timæus*, the *Theology of Plato*, the first book of Euclid, and of *Five Hymns*.

Procon'sul [Lat.], a magistrate in the ancient Roman government who exercised consular authority over a province or an army, but not over Rome. In many cases he was a consul, who after the expiration of his term of service was sent to control a province, but sometimes the proconsul was not even of consular rank.

Proco'pius, b. at Cæsarea, Palestine, in the beginning of the sixth century A. D.; studied at Constantinople; accompanied Belisarius as his secretary on his campaigns in Asia, Africa, and Italy, and held after his return to Constantinople the highest dignities in the civil service of the Byzantine government. Of his works are still extant *Historia*, a representation of the history of his own time, clear, trustworthy, and interesting, translated into English by Henry Holcroft (London, 1653); *Ktismata*, a work on the public buildings erected during the reign of Justinian; and *Anecdota*, translated into English under the title of *The Secret History of the Court of the Emperor Justinian* (1674). His authorship of the last work is questioned, however. Complete edition by W. Dindorf (3 vols., Bonn, 1833–38).

Procopius the Great, to be distinguished from PROCOPIUS THE LESS (a friend and companion of his), b. of a rich and noble Bohemian family; received a careful education; travelled in Italy, Spain, France, and the Holy Land, and was ordained a priest after his return to Bohemia, but on the outbreak of the Hussite war he joined the army, and distinguished himself so greatly that after Ziska's death in 1424 he was chosen commander-in-chief by the Taborites. On the approach of the German armies of crusaders the different Hussite parties, among which were the Orphans under Procopius the Less, united under the leadership of Procopius the Great, and a war ensued (1427–32), remarkable at once for the eminent valor and the unheard-of cruelty which the Hussites evinced. They made campaigns into Saxony, Silesia, Moravia, Hungary, Austria, and Bavaria. The German armies which were sent against them were utterly defeated, towns and villages were burnt and their inhabitants massacred, and an immense amount of booty was carried back to Bohemia. The emperor's offers of concessions were rejected, but a momentary calm was produced when in 1432 Saxony bought a truce of two years for a large sum of money. In 1433 the Hussites consented to send eight delegates to the Council of Bâle. Procopius was one of them, and he took part with great energy in the debate, but after the lapse of fifty days the Bohemian delegates grew tired and returned to Prague. Papal commissioners followed them, and at last a compromise was brought about between the Roman Catholics and the Callixtines. The Taborites, however, refused to have anything to do with the pope, and thus arose a controversy between them and the Callixtines which soon grew into open warfare. At the battle of Bömishbrad (May 30, 1434) a sudden panic seized the Taborite army; it was utterly defeated, and both Procopius the Great and Procopius the Less fell.

Procrus'tes [from the Gr. Προκρούστης, the "stretcher"], a surname commonly given to the famous robber Polypemon or Damastes, who used to place all persons that fell into his hands on an iron bed, and cut off or stretched out their limbs until they fitted the bed. He was slain by Theseus on the Cephissus in Attica.

Proc'ter (BRYAN WALLER), familiarly known under his pseudonym of "Barry Cornwall," an imperfect anagrammatic combination of the letters of his name, b. in Wiltshire Nov. 21, 1789; educated at Harrow, with Byron, Lord Palmerston, and Sir Robert Peel as contemporaries; studied law in Wiltshire; removed to London, where he was admitted to the bar in 1831, but, though a diligent student, did not attain prominence as a counsel. The lucrative position of commissioner of lunacy, however, which he held for many years, supplied the means as well as sufficient leisure for the culture of his literary and poetic tastes; in 1819 published a volume entitled *Dramatic Scenes and other Poems*, which was the beginning of his literary career, and written, as claimed by him, to try the effect of a more natural style than that which had for a long time prevailed in our dramatic literature. In 1821 his tragedy of *Mirandola* was produced at the Covent Garden Theatre with much success. But it is as a writer of refined, melodious, and inspiring songs that he is best remembered and esteemed, and it is said that with the exception of Coleridge he was the most genuine poet of love that modern English literature has seen. Among his published works are *Marcian Colonna, an Italian Story; Three Dramatic Scenes and other Poems; A Sicilian Story*, with *Diego de Mantillo and other Poems*, both issued in 1820; *The Flood of Thessaly and other Poems and Poetical Works* (1822), *Effigies Poeticæ* (1824), *English Songs and other Small Poems* (1832), *Essays and Tales in Prose* (1851), *Lives of Edmund Kean* (1835) and of *Charles Lamb* (1866), and *Memoir of Shakspeare*. D. at London Oct. 5, 1874. His *Poetical Works* have had wide circulation in England and America.—His daughter, ADELAIDE ANNE PROCTER, b. at London Oct. 30, 1825; wrote 2 vols. of verse (1858 and 1860). D. at London Feb. 2, 1864. Her works were reissued in 1865, with an introduction by Charles Dickens.

Proc'tor [a contraction of the Lat. *procurator*, "a deputy" or "agent"], in law, an officer of the admiralty and ecclesiastical courts in England empowered to bring and conduct proceedings therein on behalf of suitors, corresponding to the attorney and the solicitor of the ordinary tribunals. From an early day a body of men were attached to these ecclesiastical and admiralty courts who had the exclusive authority to appear therein, and to bring or defend all causes in the same manner that actions at law and suits in equity are brought and managed by attorneys and solicitors. Admission to the body was obtained, after a long clerkship, by means of a commission issued in the name of the archbishop of Canterbury. The class of professional men who actually tried or argued the causes or performed other duties before the court itself—whose functions, in other words, were similar to those of the barristers or counsel—were termed "advocates." Proctors as a distinct branch of the legal profession have been almost if not entirely abolished in England by recent legislation. All jurisdiction over divorce, matrimonial, testamentary, and other kindred matters having been taken from the ecclesiastical courts and conferred upon a new tribunal created about 1857, and styled the "court of probate and divorce," it was then enacted that all attorneys and solicitors might practise as such in this tribunal; and in 1859 the same provision was adopted in reference to the admiralty courts. There are no proctors, as a separate order or class, in the legal profession of this country, although the designation is often assumed by attorneys in admiralty cases or when practising before surrogates or courts of probate. "Proctors of the clergy" in the English ecclesiastical law are the delegates or representatives of cathedral and other collegiate churches, and also of the common clergy in every diocese, appointed to sit in the convocation of the Church. JOHN NORTON POMEROY.

Proctor, tp., Crittenden co., Ark. P. 650.

Proctor, p.-v., cap. of Lee co., Ky., on Kentucky River. P. 100.

Proctor, tp., Wetzel co., Va. P. 2102.

Proctor (HENRY A.), b. in Wales in 1765; came to Canada in 1812 as colonel of the 42d regiment; repulsed Gen. Hull at Amherstburg; gained the victories of Brownston and the river Raisin; was repulsed from Fort Meigs by Gen. Harrison May, 1813, and from Fort Stephenson (Lower Sandusky, O.) by Major Croghan Aug. 2, and totally defeated by Harrison at the battle of the Thames, Oct. 5, 1813, for which misfortune he was court-martialled and suspended from the service, but was soon reinstated, and rose to the rank of lieutenant-general. D. at Liverpool, England, in 1859.

Proctor (RICHARD ANTHONY), b. at Chelsea, England, Mar. 23, 1837; entered King's College, London, in 1855,

and St. John's College, Cambridge, in 1857, taking the degree of B. A. from the latter in 1860. His first literary effort was an article on *Double Stars* in the *Cornhill Magazine* for Dec., 1863. Soon after this he published his first book, *Saturn and its System*, which was soon followed by his *Gnomonic Star Atlas*, and in 1866 by his *Handbook of the Stars*. In 1867 he published *Constellation Seasons;* in 1868, *Half Hours with the Telescope;* in 1869, *Half Hours with the Stars;* in 1870, his most celebrated work, *Other Worlds than Ours;* in 1871, *The Sun, Elementary Lessons in Astronomy*, and the first series of *Light Science for Leisure Hours;* in 1872, *The School Atlas of Astronomy, Essays on Astronomy, Orbs around us*, and *Elementary Lessons on Physical Geography;* in 1873, *Light and Science, The Moon, The Border Land of Science, The Expanse of Heaven*, and *The Universe and the Coming Transits*. In the winter of 1873–74, and again in 1875–76, he visited America, and lectured in the larger cities of the U. S.

J. B. Bishop.

Proc′torsville, p.-v., Cavendish tp., Windsor co., Vt., on Black River and Vermont Central R. R.

Proc′torville, p.-v., Caldwell co., Mo. P. 60.

Procyon′idæ [from *Procyon;* Gr. προκύων, "one who snarls like a dog"], a family of mammals represented by the raccoons and the coatimundis. They belong to the order of Carnivora and the section or super-family typified by the bears (Arctoidea). The teeth are in number 40 (M. $\frac{2}{2}$, P.M. $\frac{4}{4}$, C. $\frac{1}{1}$, I. $\frac{3}{3} \times 2$); the last molar of the upper jaw is more or less transverse and compressed forward; of the two molars in the lower jaw, the first is broadest; the last premolar of the upper jaw and the first molar of the lower are tubercular; the lower jaw is moderate or slender, and has a moderate symphysis, and the coronoid process is recurved and extended upward to the angles, which are near the condyles; the foramen lacerum posticum of the skull is introrse from the antero-posterior angle of the tympanic bone; the carotid canal nearly at or in advance of the middle wall of the auditory bullæ; the auditory bullæ are well developed, and there is a short bony floor to the auditory meatus; the paroccipital process is short and blunt, somewhat hooked, and generally contiguous to the bulla at the base; the alisphenoid canal is wanting; the snout is more or less slender; the feet elongated, and with separated digits capable of grasping in a hand-like manner. The family includes two sub-families: (1) Procyoninæ, with the genus *Procyon*, or the raccoons, and (2) Nasuinæ, with the genus *Nasua*, or the coatimundis. They are peculiar to America, and naturally to the warmer regions, although, as is well known, a species of raccoon ascends far to the northward in the U. S. (See also Raccoon and Coati.)

Theodore Gill.

Profert. See Oyer.

Pro′file House, p.-v., Franconia tp., Grafton co., N. H., near the celebrated Franconia Notch.

Prof′its [Fr. *profit*, from the Lat. *proficio, profectus*], an advantage which proceeds from effort. The term is popularly used in a loose way to express any benefit proceeding from any kind of exertion, as we speak of the profit of study, of exercise, of social intercourse, etc. More strictly, it stands for the proceeds of industry, the fruits of business enterprise. Its chief importance appears in its use as a term of political economy. Yet in the treatment of that science it is employed with much looseness and ambiguity. Most writers define profits to be the *remuneration paid for the use of capital*, which is equivalent to interest. At the same time they insist that, in estimating the cost of any product, interest at the current rate on the capital employed shall be reckoned in, thus confusing gross proceeds with net proceeds under the same term. It would simplify matters if the word *profits* was held strictly to mean the net proceeds, the surplus after the proper expenses of a business have been deducted. In this sense it is as applicable to the laborer and the manager or superintendent as to the capitalist. If a laborer whose wages are $30 per month can support himself on $25, he has a profit of $5, which he may, if he will, deposit in a savings bank as the nucleus of a capital. A man of acquired skill and executive ability may command a salary of $10,000 a year as superintendent of a factory. This gives him a large margin of profit, none the less really profit though he may choose to spend it for present gratification in a luxurious style of living. One who has accumulated a capital of $1000 may start a business independently, and be himself laborer, manager, and capitalist. In estimating the results, he should set down one portion of the proceeds as wages for his labor, another as interest for his capital, and another to cover taxes for the government and insurance on his risks. Whatever remains after deducting these is properly counted as his profits. The same rule is applicable to all the complicated arrangements of productive industry where different parties, representing different interests, are united. In agriculture, manufactures, commerce, banking, and joint-stock companies for railways, or whatever, in all alike, only the surplus of proceeds above outlays, including interest on capital, can properly be reckoned as profits. The ambiguity above referred to has perhaps arisen mainly from the prevalent usage in stock companies of making their dividends to stockholders cover both interest on capital and shares of the real profits. If actual proceeds are insufficient to cover all expenses, including interest on the capital, it is a sign of a losing business, and capitalists are ordinarily the first to feel the loss. In such a case the declaring of dividends unearned, to be paid with borrowed money, is simply a falsehood and a fraud.

Holding to this meaning of the term, it is evident that profits can be legitimately increased only by one or both of two means—*i. e.* by reducing expenses or by increasing production. Hence, the amount of profits will be varied by whatever affects favorably or unfavorably either the efficiency and fruitfulness of industry or the expenses of carrying it on. Absolute constancy can never be realized. It is customary to express the rate of profits in a business by a percentage on the capital invested. This comes naturally from the mistake noticed in the outset. But it is always an indefinite, almost unmeaning way of stating the matter. In many cases the labor is of more account than the capital. A laborer may realize a profit from his industry without any capital of his own. A retail grocer with a capital of $500 may, by close attention and untiring diligence, make his capital yield 100 per cent. each year, and yet get no proper return for his labor. His business yields really no profit. With 20 per cent. on $500,000, invested in a business done on a large scale, provision may be made for good wages to all employed, with a margin for large profits. Hence, often, so far as mere profit is concerned, an individual will find it better to work for wages in connection with a large establishment than to attempt an independent business. Whether, on the whole, it is for good or for evil, we must recognize it as truth that "it is in the nature of trade and manufacture that great capital drives small capital out of the field: it can work for smaller returns." The rate of interest on capital loaned is determined, in measure, by the general average of profits in a community. It is an accepted principle of political economy that profits tend to an equality in all places and in various employments, for self-interest prompts both capital and labor, when free, to flow into that locality or that form of industry which promises the largest gains. The proposition must be understood, however, as affirming a *tendency* rather than an actual fact. Many influences are continually counteracting the tendency, the most powerful of which are monopolies, whether natural or artificial. Great inequalities continue to exist despite the general law. Where the proceeds of a business are extraordinarily increased through the special sagacity and energy of its manager, the special advantage should mostly be set down as his, being in reality a larger remuneration for his genius, though incidentally the general profits of the establishment may also be increased.

A. L. Chapin.

Progres′sion [Lat. *progressio*], a series in which each term is derived from the preceding one by a uniform law.

An *arithmetical progression* is a series in which each term is formed from the preceding one by the addition of a constant quantity called the *common difference*. If the common difference is *positive*, each term is greater than the preceding one, and the progression is said to be *increasing;* if the common difference is *negative*, each term is less than the preceding one, and the progression is said to be *decreasing*. From these definitions we see that every increasing progression when taken in a reverse order becomes a decreasing progression, and that every decreasing progression when taken in a reverse order becomes an increasing progression. An arithmetical progression is said to be *given* when we know one term and the common difference: thus, if one term is 9 and the common difference 5, we have, by the continued addition of 5, the series 9, 14, 19, 24, etc.; in like manner, by the continued subtraction of 5, we have the series 9, 4, -1, -6, etc. These two series written in proper order, form a single progression, as follows:

$$\ldots, -6, -1, 4, 9, 14, 19, 24, \ldots$$

If this series is read from right to left, it is increasing; if read from left to right, it is decreasing; in either case the number of terms is infinite. Although the number of terms of every progression is infinite, we may regard a finite number of them as a progression, which may be called a *limited* progression. Any term of a limited arithmetical progression, whether increasing or decreasing, is equal to the first term *plus* the product of the common dif-

ference by the number of terms that precede the term in question. The sum of all the terms of such a progression is equal to half the sum of its extremes *multiplied* by the number of terms.

A *geometrical progression* is a series in which each term is equal to the preceding term multiplied by a constant quantity called the *ratio of the progression.* If the ratio is *positive* and greater than 1, each term is greater than the preceding one, and the progression is said to be *increasing;* if the ratio is *positive* and less than 1, each term is less than the preceding one, and the progression is said to be *decreasing;* if the ratio is negative, the terms of the progression are alternately positive and negative. In all cases if two consecutive terms are given, we can find the ratio by dividing the second by the first. The following series, extended to an infinite number of terms in both directions, is an example of a geometrical progression:

$$\ldots\ldots, \frac{1}{4}, \frac{1}{2}, 1, 2, 4, 8, 16, \ldots\ldots$$

In this progression the ratio is 2, and this being given, together with any term of the series, the progression may be extended to any desired limit. If we consider a finite number of terms as constituting a limited geometrical progression, the nth term of the series, n being any positive whole number, is equal to the first term *multiplied* by the $(n-1)$th power of the ratio; the sum of all the terms is equal to $\frac{lr-a}{r-1}$, in which l is the last term, a the first term, and r the ratio.

An *harmonical progression* is a series such that of any three consecutive terms the first is to the third as the difference between the first and second is to the difference between the second and third. The reciprocals of the terms of an arithmetical progression form an harmonical progression; thus, from the arithmetical progression, 2, 4, 6, 8, etc. we form the harmonical progression—

$$\ldots\ldots, \frac{1}{2}, \frac{1}{4}, \frac{1}{6}, \frac{1}{8}, \ldots\ldots$$

Taking the first three terms, we see that

$$\frac{1}{2}:\frac{1}{6}::\frac{1}{2}-\frac{1}{4}:\frac{1}{4}-\frac{1}{6}, \text{ or } \frac{1}{2}:\frac{1}{6}::\frac{1}{4}:\frac{1}{12}.$$

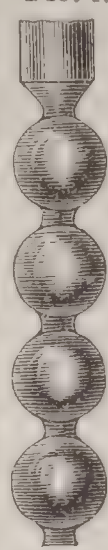
W. G. PECK.

Progression, in music, the same as onward movement, or the advance from one note to another. Progression is of several kinds: (1) *melodic,* or the progression of a single part or solo, or that of any one part in a harmonized composition; (2) *harmonic,* or the movement proper to two or more parts in harmony. There is a third kind of progression, usually called "motion," which has respect to the movement of any two parts or voices when compared together, as *equal* motion (sometimes called *direct* or *parallel*), when both parts move the same way, either upward or downward; *contrary* motion, when one part ascends while the other descends; and *oblique* motion, when one part moves either up or down while the other remains stationary. (See HARMONY, INVERSION, MELODY, and MUSIC.) WILLIAM STAUNTON.

Project'ile [Lat. *pro,* "forward," and *jacere,* to "throw"], a missile thrown from a weapon, instrument, or engine, generally for war-purposes, as the arrow from the bow, the dart from the catapult, stones from the ballista, and stone or iron bodies from cannon. A more modern and limited definition is, a body intended to be projected from a cannon by the force of an explosive agent, such as gunpowder. In the case of small-arms, as the musket or pistol, the projectile is called a bullet. A rocket, however, is a projectile which is set in motion by a force residing within itself. (See ROCKET.) "A projectile is intended to reach, strike, pass through, or destroy a distant object." The early history of this subject will be found sufficiently comprehended under the head of ARTILLERY, but it may be well to premise that after the general introduction of cast-iron projectiles in the sixteenth century, and up to within a period of thirty or forty years, although the art of gun-construction made considerable progress at times, little improvement was made in projectiles, which consisted mainly of spherical masses of iron called shot when solid, and shell when made hollow for the reception of a bursting-charge.

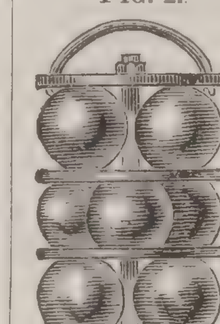
The most general classification of projectiles is into smooth-bore or spherical and rifle or elongated projectiles, the former being mainly intended for smooth-bores, and the latter more exclusively adapted to rifled guns. In many cases the spherical projectile may be fired with good effect from the rifle, but the elongated projectile cannot be used successfully in the smooth-bore gun, although attempts have been made in this direction. Smooth-bore projectiles are generally classified into shot, shell, and case-shot. *Spherical shot* are cast solid. American 15-inch shot are made of the best quality of gun iron, having a density close upon 7.300 and a tensile strength of at least 30,000 pounds per square inch. To ensure greater solidity and uniformity in casting them of so high a grade of iron, they are cast in vertical clusters of four or five, and afterward turned in a lathe. (Fig. 1 represents such a cluster of 15-inch shot.) *Spherical shell* are cast with a core of sand, which is afterward removed, leaving the projectile hollow. The thickness of the walls varies according to the character and uses of the shell. For the same calibre the mortar-shell is usually lightest of all, and contains the largest bursting-charge; the gun-shell is somewhat thicker; and the battering-shell, used against hard resisting objects, is little inferior to the solid shot in strength. When served in guns they are generally strapped with tin strips to a wooden "sabot" or circular block, the object of which is to prevent the shell from turning in the bore and thus exposing the fuze to the direct action of the discharge. The flame of discharge is intended to pass over the shell and to the front, thus igniting the fuze. The sabot is unnecessary in mortars. *Case-shot* are a collection of small projectiles enclosed or bound together in a case or envelope. There are three principal kinds of case-shot in use—*i. e.* grape, canister, and shrapnel. A *grape-shot,* or stand of grape, is composed of a number of cast-iron balls (in the U. S. service usually *nine,* disposed in three layers of three balls each), bound together in such shape as to fit the bore of the gun. Grape-shot are used in siege and sea-coast services, but are not adapted to field service; the effective range is moderate. A *canister-shot* (Fig. 3) consists of a large number of cast-iron or lead balls, enclosed usually in a tin cylinder, the interstices between the balls being filled with sawdust. A *shrapnel-shot* may be of spherical or elongated form, according as it is intended for a smooth-bore or rifled gun; in the former case it is generally called a spherical case-shot. Projectiles of a somewhat similar character were used by France during the seventeenth century, but spherical case-shot were first used successfully by the English in the Peninsular war, the credit of perfecting them being ascribed to Col. Shrapnel of the British army. Spherical case-shot (Fig. 4) consist of a cast-iron shell of sufficient strength and thickness to resist the shock of discharge, filled with musket-balls, and the interstices filled up by pouring in melted sulphur or resin, in order to solidify the mass. A hole is then bored through the mass of sulphur and bullets of a size to accommodate a bursting-charge just sufficient to produce rupture. Like the gun-shell, it is strapped to a sabot. The charge is ignited by a time-fuze, which is regulated to cause explosion at any desired point of flight. Shrapnel may be adapted to guns of any calibre, and has the longest "effective range" of any form of case-shot. Practically, its range is only limited by the power of the gun, since it is arranged to explode only when it strikes its object or arrives within close proximity thereto. *Carcasses* are shells filled with a burning composition, which escapes through holes bored for the purpose in the case; they are used for incendiary purposes. *Chain-shot* consist of two hemispheres or spheres connected together by a chain, formerly used for cutting, at short ranges, the spars and rigging of vessels. *Bar-shot* are similar to chain-shot, except the mode of connection, which is a bar instead of a chain: obsolete. *Grenades* are intended to be thrown from the hand or rolled down ramparts against troops in mass, and are simply light cast-iron shells containing a bursting-charge and provided with time or percussion fuzes. Ordinary gun-shells may be used for the purpose.

FIG. 1.



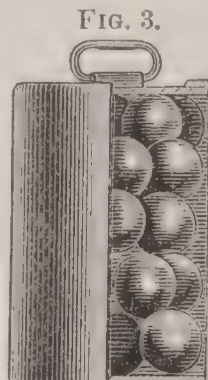
Solid Shot, in cluster.

FIG. 2.



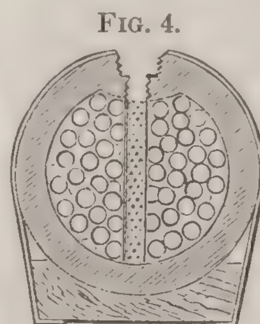
Stand of Grape.

FIG. 3.



Canister.

FIG. 4.



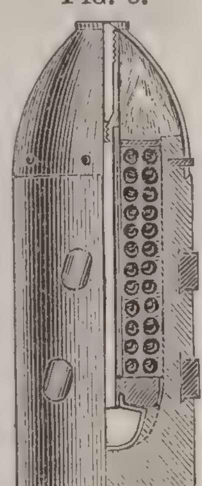
Spherical Case-shot.

An elongated projectile to be successful must keep point foremost throughout its flight. There are apparently two principal plans for attaining this end: (1) To so fashion the projectile that its centre of gravity will be much in advance of its centre of figure, as in the arrow; (2) to impart to the projectile a rapid motion of rotation about its longer axis. (See GYROSCOPE.) The first plan is considered of more than doubtful utility; the second plan, rotation

of the projectile, has been sought to be accomplished by three principal methods: *First*, in a smooth-bore gun to employ an elongated projectile having crooked channels or spiral webs or flanges upon its exterior, with a view to securing rotation by the powerful rush of the gases of the discharge past them during the passage of the projectile through the bore. *Second*, in a smooth-bore gun to provide the projectile with spiral-shaped wings or vanes which spring out from the body of the shot as soon as it has cleared the restraint of the bore, and are immediately operated on by the air. *Third*, to "rifle" the bore of the gun with spiral grooves or rib it with spiral bands, and by an appropriate device upon the projectile or by its form cause it to "follow" this spiral as it leaves the gun. The first and second methods have proved inadequate; the third only will be here considered.

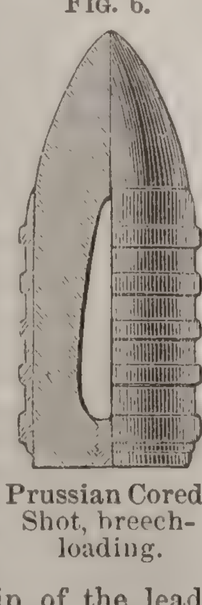
Rifle projectiles are classified into *shot, shell, battering-shell* or *cored shot*, and *shrapnel*. The shot are solid castings; the shell have full capacity for a bursting-charge; the battering-shell have small capacity, thick walls, and strong heads, and for large calibres may be stronger than solid shot, as the presence of a small interior cavity in the casting neutralizes in a measure the injurious strains of cooling. Shrapnel for rifled guns were until recently constructed similarly to spherical case-shot, but a prevailing plan is to confine the bursting-charge to the rear or bottom of the shell, to connect it by a small tube with the fuze at the head of the shell, and to dispense in some cases with the sulphur between the bullets, in order to prevent their separating into cemented clusters. (Fig. 5 represents an English shrapnel-shell in partial section and elevation.) A rifle projectile is usually associated with a particular form of rifling best adapted to it, and this association of the projectile and rifling is called a "system." There are three prominent systems of the present day—namely, (1) *The flanged system*, embracing all projectiles upon the cylindrical portion of which are projections, which, in loading, are intended to be inserted into corresponding grooves in the bore of the gun. These projections may be studs or buttons, ribs or flanges. In this system the rifling usually consists of a few deep grooves, which are rounded at their bottom edges with a view to "centring" the projectile, as rotation is imparted, by causing the studs or flanges to "ride" up the inclined side of the groove. Studded projectiles and rounded grooves constitute the present adopted system of England—a system almost identical with that employed by France when, at the battle of Solferino in the Italian campaign of 1859, the immense superiority of rifled over smooth-bored cannon was for the first time conspicuously shown. A number of bronze studs (Fig. 5) are disposed circumferentially about the projectile, both front and rear, and about equidistant from its centre of gravity. English battering-shells are usually of cast iron, with chilled heads, struck with a radius of 1½ diameters. The "ogeeval" head of this angle is claimed to be best adapted to penetration of iron plates. Guns for studded projectiles are rifled with from three to nine grooves (according to calibre), 0.15 to 0.25 inches deep. (2) *The compressive system*, embracing all projectiles which are loaded in a chamber, and then forced by the action of the powder through the bore of the gun, the diameter of which, across the lands (*i. e.* omitting grooves), is less than the superior diameter of the projectile. Projectiles for breech-loading guns have heretofore been of this class, the most prominent of which are those used in the well-known rifles of Krupp and Broadwell. These consist of the usual cast-iron or steel projectiles encased about their cylindrical portions with leaden jackets having a number of horizontal corrugations or ribs. The lead is secured to the projectile by a chemical solder, or it may be cast into under-cuts in the body of the shot. As the projectile is forced from the chamber into and through the rifled portion of the bore, an impression of the rifling is cut out of the ribs, and the lead thus displaced from the ribs finds room in the grooves between them. The character of the rifling best suited to lead-coated projectiles consists of a great number of grooves, shallow and smoothly cut. (Fig. 6 represents a Prussian breech-loading projectile of large calibre.) The bores of the large guns are rifled with 26 to 76 grooves, from .05 to .08 inches deep, and slightly narrowing toward the muzzle, to allow for the sheering or slip of the lead upon the bearing side of the grooves. Attempts are now making, with good promise of success, to substitute for the leaden jacket two or more narrow bands or rings of soft copper encircling the projectile, and in this country expansive projectiles similar to that illustrated below, but modified to suit the altered conditions, have been used in breech-loading guns with entire satisfaction. (3) *The expansive system*, embracing all projectiles which in loading are inserted in the gun without respect to the rifling, but which "take the grooves" by the action of the gases of discharge upon a device or feature of the projectile, which is readily expanded thereby into the grooves of the gun. This system requires for its rifling fewer grooves than the compressive (breech-loading) system, but a somewhat greater number perhaps than the flanged or stud system. It has been used so exclusively in the U. S. that it is sometimes called the "American system." Among the projectiles of the expansive class used during the civil war were the familiar Parrott, Dyer, Hotchkiss, Schenckle, James, Reed, Blakely, Stafford, and others.

FIG. 5.



English Shrapnel, muzzle-loading.

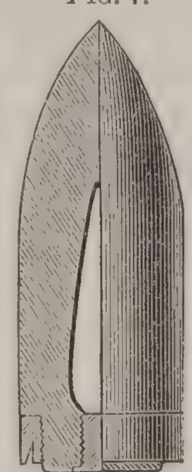
FIG. 6.



Prussian Cored Shot, breech-loading.

In the past few years marked improvement has been made, and a former objection—that expansive projectiles cannot sustain heavy charges—no longer obtains, heavy projectiles of this class being now fired with charges of one-fifth, instead of one-tenth, the weight of the projectile as formerly. Fig. 9 represents one of the large projectiles now used in the U. S. service. It consists of the usual cast-iron body, having a brass or copper ring or "sabot" attached to the base. A deep annular groove divides this otherwise solid ring into an upper and a lower flange or lip. The sabot may be cast or screwed upon the projectile. For experimental firing the screw-thread is preferred, as it affords an opportunity of attaching a new sabot and firing the same projectile several times. This projectile is inserted at the muzzle of the gun and rammed "home" to the charge; when the gun is fired the powder-gases enter the annular groove in the sabot, and while the lower or inner flange is pressed down upon the projectile, the upper or outer flange or lip is forced into the rifling of the gun, and is kept thus distended during the passage of the projectile through the bore. The depth of the rifling seldom exceeds a tenth of an inch (but little deeper than that in breech-loading guns). For 8-inch, 10-inch, and 12-inch rifles, fifteen, seventeen, and twenty-one grooves, respectively, have been employed, the lands and grooves being of about equal width. The length of rifle projectiles varies from two to three diameters, usually 2.50 diameters. The weight does not usually exceed three times the cube of the semi-diameter. The velocity with which they are projected varies in different calibres from 1100 feet to 1550 feet per second. (For a detailed description of various systems of projectiles and rifling, many of which are obsolete, others experimental, see *Ordnance and Armor*, by Holley; *Ordnance and Gunnery*, by Benton; *Reports of English Select Committee on Ordnance; Projectiles and Rifled Cannon*, by Butler, etc.) J. G. BUTLER.

FIG. 7.



U. S. Cored-Shot, muzzle-loading.

Projec'tion [Lat. *projectio*], the representation of a magnitude on a plane or other surface made in accordance with some geometrical law. There are two principal methods of projecting a magnitude on a plane; in the first method the projection is made by a system of parallel lines, and in the second it is made by a system of lines diverging from a common point. The former method is the one usually employed in descriptive geometry and its applications; the latter in perspective and in many kinds of spherical projections. In both methods the projecting lines are called *projectors*, and the plane on which the drawing is made is called the *plane of projection*. In descriptive geometry two planes of projection are used at right angles to each other, and the projectors are perpendicular to these planes. One plane is assumed to be horizontal, and the representation of the magnitude on this plane is often called the *plan;* the drawing on the vertical plane is then called the *elevation*. In perspective and spherical projections only one plane of projection is used, and then the point common to all the projectors is called the *point of sight*. We may regard the method of parallel projections as a particular case of radial projections, in which the point of sight is at an infinite distance—that is, at a distance so great that the projectors may be regarded as parallel to each other.

Spherical Projections.—This name is applied to the representation of the principal points and lines of a spherical surface on a plane. When the entire sphere is to be represented, the projection is usually made on the plane of a great circle; this circle is called the *primitive circle*,

and its plane is called the *primitive plane*. There are three principal methods of projecting the entire sphere: (1) When the eye or point of sight is taken in the axis of the primitive circle, and at an infinite distance from the centre of the sphere. In this case the projectors are perpendicular to the principal plane, and the projection is then said to be *orthographic*. In making an orthographic projection of the sphere the hemisphere nearest the eye is first projected, after which the other hemisphere is revolved around a tangent to the primitive circle through an angle of 180°, and from this position it is projected on the primitive plane. (2) When the eye is taken at the pole of the primitive circle; this is called the *stereographic* projection. In making a stereographic projection of a sphere the hemisphere farthest from the eye is first projected, after which the other hemisphere is revolved as before, the eye is taken at the opposite pole, and then the projection is completed. (3) When the eye is taken in the axis of the principal circle, and at a distance beyond the surface equal to the radius of the sphere into the sine of 45°; this is called the *globular* projection. A globular projection of a sphere is made in a manner entirely similar to that followed in making a stereographic projection.

In projecting a sphere by any of the preceding methods the principal circles are first projected to form the basis of the map or chart; these circles are the *equator*, the *tropics*, the *polar circles*, a certain number of *circles of latitude*, and a sufficient number of *meridians* or *hour circles;* for astronomical charts the *ecliptic* is also projected. The projections of the prominent points to be laid down on the chart or map are then determined, either by absolute projection or by reference to the lines already established.

In the orthographic projection, circles parallel to the principal plane are projected into equal circles, circles perpendicular to the principal plane are projected into straight lines, and all other circles are projected into ellipses whose principal axes are respectively equal to the diameters of the circles, and whose secondary axes are equal to these axes multiplied by the sines of the inclinations of the several circles. In the stereographic projection, circles whose planes pass through the eye are projected into straight lines, and all other circles are projected into circles. In the globular projection, circles parallel to the principal plane are projected into circles, those whose planes pass through the eye are projected into straight lines, and all other circles are projected into ellipses. In each of the three classes of projection there is a certain amount of distortion; that is, points that are equidistant on the surface of the sphere are not necessarily equidistant in projection. In the orthographic projection, points in the region of the poles of the primitive circle are fairly represented, but points near the primitive circle are crowded together. In the stereographic projection the points near the primitive circle are fairly represented, and those near its poles are crowded together. In the globular projection the crowding occurs in an intermediate zone. There is less distortion in the globular than in either of the other projections, but this projection is more difficult to make than the others, and for this reason it is less used than the stereographic, which is the easiest of all the projections to execute.

When only a portion of the surface of a sphere is to be projected other methods of projection are used, of which the following are some of the most important:

The *gnomonic projection*, in which the eye is taken at the centre of the sphere and the plane of projection is tangent to the sphere. This method gives a map of a limited portion of the sphere with but little distortion. Mr. Richard A. Proctor has constructed a series of star maps on this principle; he first circumscribed the sphere by a regular dodecahedron, and then projected the entire sphere gnomonically upon the several faces of the dodecahedron. (For an account of the method of making the projection see Proctor's *Star Maps on the Gnomic Projection*.)

The *polar projection*, in which the eye is at the centre of the sphere, and the plane of projection coincides with that of one of the polar circles. This method has been used to represent that portion of our earth which lies in the neighborhood of the Arctic circle.

The *conical projection*, in which the eye is at the centre of the sphere, and in which the projection is made on the surface of a cone tangent to the surface of the sphere, along the middle circle of the zone represented, or sometimes on a secant cone passing through two circles of the zone equidistant from each other and from the bases of the zone; after the projection is made the conic surface is developed, or rolled out, on a tangent plane.

The *cylindric projection*, in which the eye is taken at the centre of the sphere, and in which the projection is made on the surface of a cylinder which is tangent to the sphere along the equator; after the projection is made the cylinder is developed on a tangent plane. This method is applicable to the case in which a map of the equatorial regions is to be made.

The *polyconic projection*, in which each parallel of latitude is developed symmetrically from an assumed meridian by means of a cone tangent to the surface along that parallel. This is the method of projection used by the U. S. Coast Survey in projecting small maps and charts. (For a more complete account of the different kinds of projections consult Appendix 39 of *Annual Report of U. S. Coast Survey 1853*, by the late Maj. E. B. Hunt, corps of engineers, U. S. army.) W. G. PECK.

Projection, Method of, in geometry, by J. G. BARNARD. See APPENDIX.

Prolap′sus U′teri, falling of the womb or uterus, its descent below its normal position in the pelvis; in extreme cases a protrusion of part or the whole of the organ from the body. Enlargement of the uterus by inflammation, uterine and abdominal tumors, relaxation of the tissues which are the anatomical supports of the organ, rupture of the perineum by instrumental delivery, sudden violence in falling or jumping, are the chief causes of prolapsus.

E. DARWIN HUDSON, JR. REVISED BY WILLARD PARKER.

Prome, town of British Burmah, in Pegu, on the eastern bank of the Irrawaddi, is surrounded with a brick wall, has some manufactures, especially of paper, and carries on a considerable trade with Rangoon. P. about 30,000.

Prome′theus, one of the most interesting creations of Greek mythology, was a son of Japetus and Clymene, Themis, or Asia, the brother of Atlas, Menoitios, and Epimetheus, and father of Deucalion. The myths relating to him are very variously told by Hesiod, Æschylus, and later poets and philosophers, but there are nevertheless certain fundamental traits in which all the different versions agree. They all represent Prometheus as a benefactor of the human race. According to some, he was the creator of man; according to others, he only brought to him fire and the arts depending on the use of fire. Next, they all agree that those benefits which he conferred on the human race for some reason excited the wrath of Zeus, who chained him to a rock and sent a vulture to feed daily on his liver. From these sufferings, under which the Titan did not succumb, Hercules at last delivered him by shooting the vulture and unlocking the chains, after which Prometheus returned to Olympus. Of Æschylus's trilogy only the middle piece, *Prometheus Bound*, is still extant. The ancient myth received a most remarkable treatment in modern times from Shelley in his *Prometheus Unbound*.

Prom′ise [Lat. *promissum*], in law, a unilateral undertaking to do or not to do some specified act. Promise is to be carefully distinguished from agreement or contract, of which it is only the one half—the act of one party. An agreement or contract implies the assent of two parties—the promise by one of them, and something proceeding from the other which forms the consideration. A promise is the written or spoken formula by which the undertaking of one person is expressed, and it is a necessary element in the legal conception of a contract. A promise without a consideration—a naked promise—however morally binding, does not in general create a legal obligation; but when contained in a sealed instrument the common law did not permit the consideration to be denied. This doctrine has been modified in many of the States by statutes which make the seal presumptive evidence only of a consideration, and allow such presumption to be overcome by proof. The term *implied promises* is also used in the law, and is applied to a large class of legal obligations arising from various acts, omissions, and relations where there has been no express undertaking by the party, but he is considered liable in the same manner and to the same extent as though he had made an actual promise. This designation was invented by the judges at an early day in order that the class of obligations which it denotes might be enforced by the form of legal action known as assumpsit. (See CONTRACT.) JOHN NORTON POMEROY.

Prom′issory Notes. According to the general law-merchant, unaffected by statute, a promissory note is the written, unsealed, absolute promise of a person, called the "maker," to pay a certain sum of money at a certain time to a designated person, termed the "payee," or to his order or to the bearer. From this definition the following requisites are indispensable: The promise must be written, unsealed, and signed by the maker; it must be absolute, not depending upon any contingency; it must be to pay money in a certain amount, or in an amount capable of being made certain by computation; the time of payment must be certain, or such as will become certain, but when no time is expressed the law implies that payment is due immediately, and the time in such case is certain within the meaning of

the rule; lastly, the promise must be accompanied by words of negotiability—that is, it must be made payable to a designated payee or to his order, or to bearer. Contracts without some one or more of these requisites may be perfectly valid, but they do not possess the peculiar qualities which belong to promissory notes. These instruments came into use among merchants in connection with, but somewhat later than, bills of exchange, and had grown to be so common in England under the name of "goldsmiths' notes" that they attracted the attention of the courts and received a judicial construction in the time of Sir John Holt, who was lord chief-justice during the reign of William III. and a part of the reign of Anne (1689–1709). By the common law, things in action were not assignable so that the assignee could sue upon them in his own name. An exception to this rule had been established in the case of bills of exchange inland and foreign; but when the same indulgence was asked first for promissory notes, the courts under Lord Holt refused to sanction the innovation. Parliament, however, intervened (3 and 4 Anne, c. 9, 1705), and enacted that promissory notes should be placed upon the same footing as inland bills of exchange. It has been held, however, in several American cases that this declaratory legislation was unnecessary, and that notes, as well as bills, possessed all the qualities of negotiable paper at the common law, thus rejecting the opinion of Chief-Justice Holt. The most important attribute of promissory notes, bills of exchange, and other instruments of the same class, which distinguishes them from all other contracts, is their negotiability. Negotiability consists of two entirely distinct elements or branches—*first*, the power of transferring the paper from one owner to another, so that the assignee shall acquire a complete title and be able to sue in his own name; *second*, the effect upon the rights of the parties produced by such a transfer when made before maturity in the regular course of business for a valuable consideration to a purchaser in good faith and without notice of any defect or defence, whereby all defences of the maker (with a few exceptions) are cut off, and the holder becomes absolutely entitled to recover. The rules of the law pertaining to notes and relating to their indorsement and transfer, the time and place of payment, the demand for payment and notice to the indorsers of non-payment, the liability of the maker and indorsers, the rights of the holder, the defences between the original parties and in case of a transfer—in short, all the rules which determine the rights and liabilities of the parties and the measures by which they must be enforced are identical with those pertaining to inland bills of exchange; the same regulations apply to both kinds of negotiable paper with the single modification that the "maker" of the note is substituted for the "acceptor" of the bill, and with the single exception that there is no presentation of the note to the maker for acceptance, the note is identical in its legal condition with a bill after acceptance. As these various rules have been fully stated in the article on BILL OF EXCHANGE, they are not here repeated. These general doctrines have been variously modified by statute in a few of the American States, and a local derangement is thus produced in a branch of the law which ought to be uniform throughout all commercial communities. Among these changes are the abolition of days of grace, the alteration of the indorser's liability by rendering his contract absolute instead of conditional, or by requiring a judgment to be first recovered without effect against the maker, and the restricting the effect of "negotiability" upon the maker's liability to notes made payable at banks, so that in all other classes the defences are not cut off by a transfer to a *bonâ fide* holder. In the operations of modern finance a new form of negotiable obligation has come into general use, to which the legal qualities belonging to promissory notes have been given by the American courts—the ordinary coupon bonds issued by municipal and other corporations. (See BILL OF EXCHANGE.) JOHN NORTON POMEROY.

Prom'ontory, v., Box Elder co., Ut., at the highest point of Union Pacific R. R. P. 43.

Promp'ton, p.-b. and tp., Wayne co., Pa. P. 394.

Prong-Horn. See ANTILOCAPRA.

Pro'nouns, a class of words which derives its name from the Latin *pro*, "for," "instead of," because as parts of speech the pronouns take the place of the noun. They are divided into personal, relative, interrogative, demonstrative, and possessive pronouns, of which the first class is used exclusively as nouns, the last exclusively as adjectives, the others partly as nouns, partly as adjectives.

Pronuncia'tion [Lat. *pronunciatio*] treats of the spoken form of words and the mutual influence of their component parts. In condensing two words into one they are often modified, as in uniting *gĕntle* and *man* or *men*, which in Old English were the distinct words "gentille men," of which the adjective was pronounced *genteel'*, in accordance with the Latin *gentîlis*. At a later period, as in Chaucer,

> "For gentil men they wer, of gret estat," . . .
> "As longeth to a gentil man," . . .

the accent changed, but the word had not acquired its modern form, *gen'tleman*—

> "And one old gentleman stares and stands."—TH. HOOD.

Until recently, the laws of speech, apart from the laws of language, have not attracted much attention, and in the absence of science literary experimenters undertook to bring language into correspondence with the imperfections of the spelling-book, instead of investigating the living speech. Although căt-aract and plăt-itude are strictly English, as were Căt-o, Plăt-o, and Străb-o in the last century, it is said that Garrick (1716–79) changed these names to Cay-to, etc., according to some pretended analogy; for it is not according to English analogy to give the perverted power of the English alphabetic name in all such cases. It is not strictly correct to say that "*c* before *e* and *i* has the power of *s*," for *Celt* is pronounced "Kelt," and archæology has the term *cist-vaen* or *kist-vaen* (a coffin made of stones), of which the initial part, according to English analogy, would not become "sist," but *chist* or *chest*. Leigh Hunt has *Petrarcist* and *Petrarcian*, based on *Petrarca;* Waterton says that apes are "mimicers of man," and we find such newspaper forms as *ipecacing, picniced, mosaiced, scientificest*, where the addition of a suffix should not affect the original word. Mineralogists pronounced the *c* as *k* in *cyanite* to distinguish it from *sienite*, which induced the lexicographers to spell it with *k*.

There is a difficulty in English pronunciation due to the fact that it has two systems of accent—the Teutonic and the Romanic—the conflicting influences of which have not had time to produce uniform results. While Latin monumĕnt'um gives *monument'* to German, in accordance with Teutonic analogy, English treats *mon'ument* as an entire Latin word, and carries with it (dētrīmēntūm) *det'riment* and (dēspērātus) *des'perate*. Although a Latin word cannot have a final accent, we have a valid reason for saying *proceed'* and *decay';* and while that language cannot have an accent behind the antepenult, we have *elu'cidator*, where *crea'tor* should give *elucida'tor*, and (Lat. ōrâ'tor) *or'ator* should give *elucid'ator*. In long words the accent seems to be left to chance, as in *per'emptory* and *peremp'tory; per'egrinator, peregrina'tion; clas'sificatory* (*Webster*), *classifica'tory* (*Hyde Clarke*); *procura'tor* (*Knowles*), *procur'ator* (*Cull*), *proc'urator* (*Donald*). In the last century such un-English forms as *ac'ademy, rec'eptacle, ref'ractory*, and *pro'fessor* had their advocates. In many cases the accent on the first of four syllables (as in *nom'inative, ter'ritory, al'legory, an'timony*) has arisen from a secondary accent overpowering a primary; in other cases it is due to the preservation of the radical accent (as in *yel'lowishness, appro'priateness*)—a practice which is natural in the Teutonic tongues; but when the root and the primary accent are unknown the words may take a rhythmic form, as in *Memphremagog, Michilimackinac*.

Lecturers on anatomy use the words *cervī'cal* and *poplitē'al*, which the dictionaries pervert to *cer'vĭcal* and *poplit'eal*, as they pervert *capibâra* to *capib'ara*, and *spĭnel'* of the mineralogists into *spī'nel* and *spin'el;* while the tendency toward the antepenult accent is perverting *muse'um, lyce'um, pyrī'tes*, and Mr. R. W. Emerson has perverted *oppo'nent* into *op'ponent* in a public lecture.

As a Teutonic language, English tends to the preservation of the radical accent, which a false classicism and an incorrect view of syllabism have injured. *Cal'yx, chal'ice; pet'al, pet'iole; sep'al, sep'arate; pat'ent, pat'ulous, path'os; sen'ate, zen'ith* (Mod. Greek, ζενίθ), *a-men'able; min'im, min'us*, conform strictly to the genius of English, and the vowel of *want* must occur equally in *squal-id* and *squal-or*. The disagreeable clash of two *e*-sounds in *medieval* might have been avoided by using the root-vowel as it stands in *longevity* or in *a-ge*.

It was unfortunate that the English name of the universal *u* (oo) should have become *yoo* (spelled thus by Nares in 1784), and attempts have been made to force this power into places where English speech cannot accept it, particularly after *j, ch, sh, r, s;* and the endeavor to say s-yoo-gar, s-yoo-r, is-s-yoo, has caused the *s* and *y* to coalesce upon *sh* at the intermediate point of formation, resulting in the now legitimate pronunciation of *sugar, sure, issue*—ish'oo (*Donald*, 1868), is-sew (*Buchanan*, 1760), ish-yoo (*Knowles, Cull*). The attempt to make use of this spurious *y* throws some speakers upon "shootable" for *suitable*, and "prezhoom" for *presume*, while others avoid the difficulty legitimately by rejecting the parasite and producing *pursoo, sootable, prezoom*. Similarly, the traditional speech-words *tooter* and *dooty* are better than the factitious book-words *tshootor* and *dzhooty*.

When *ci, ti, si* become *sh* before a vowel, a syllable is lost, turning ad-vent-i-ti-ous and per-ni-ci-ous into ad-vent-ish-us and per-nish-us, where "iti" spells *ish*, and not *ishi;* and as that which has been *i* or *y* has been advanced up the palate to form *sh*, it cannot remain to represent a vowel, as when Mr. Cull puts two spurious elements in jyoo-dish-*i*-us (for joo-dish-us), partly under a false rule which states that *t, s, c* "have the sound of *sh* before *e* or *i* and another vowel." Under some such view he gives us gra-shi-us, a-shyoor, ex-pe-dish-i-us, o-she-an, col-li-er-y, ho-zhi-er, and the like. *The law of speech* in such cases is, that the presence of *sh* removes the *i* or *y;* and, reversely, the presence of *i* or *y* prevents the formation of *sh*. Hence, *i* and *y* in e-lec-trish-*i*-an of Cull, and e-lec-trish-*y*an of Donald are wrong, while e-lec-trish-un of Worcester and Knowles is proper.

By theory, Sheridan's pro-nun-sha-shun is better than Walker's pro-nun-shi-a-shun, Smart's pro-nun-si-a-shun being perhaps better than either; and in-gra-shate, ne-go-shate, pro-pish-ate of Buchanan are better than the forms in-gra-shi-ate, etc., based upon false spelling in the school-room. The practice of Knowles agrees very nearly with correct theory, and while he adopts some perversions like in-gra-shi-ate and of-fish-i-ate as probably too firmly established to be disturbed, he gives gla-seal or gla-shal, sa-she-ate or sa-shate, e-ma-se-ate, ex-pa-se-ate, in-is-e-ate, ap-pre-si-ate, and o-se-an-ic. To the word *satiety* (from the French *satiété*, with *ti* as *si;* Provençal, *sacietat;* Low Lat. *sacietas*) has been assigned the forms satī′ety, sasī′ety, sā-shi′ety, sāsh′ety, sāciĕty (*Chapman*); to which sashī′ety and sash′ety might have been added. The ĭ of *similar* (sĭmĭlĭs, sĭmŭl) some would pervert to ī in *simultaneous*, and we find *tru′culent* for *truc′ulent* (trŭcŭlentŭs), in which the natural form is adapted to the root and affixes. The Latin quantity has not much to do with modernized forms, and *pitu′itous* must conform to *gratu′itous*, although the third Latin syllable has *i* long in the former and short in the latter.

The lettered classes may know less about the laws of speech than the illiterate. Starting with a rule about "the article *an* before a vowel," and having been told that "*u* is a vowel," we find authors using such expressions as "an universal" (*Boyle*, 1675; *Swift, Ch. Kingsley, North Brit. Rev.*, 1865); "an uniform conduct" (*Gibbon*); "an European Field" (*Croly*); "an usurpation" (*Hallam*); "an euphonic vowel" (*Sir George C. Lewis*); "an unit" (*Byron*); "an usurper" (*Edin. Rev.*, 1856); "an eulogium" (*Th. Moore*); "an useless waste" (*A. H. Sayce*).

Where the letter *k* does not exist, some nations use *qu*, as in French *liqueur*, the meaningless *u* of which appears in writing *quay* (kee), *musquito, quinine* (kee-neen′), *coloquintida*, in which the lexicographers pronounce *u* without inquiring how *kyn* (kün) of the Latin *colocynthis* and Greek κολοκυνθίς could become *kwin*. The most agreeable and musical of all the vowels, that of *arm*, is assigned to *alms* and *almond;* and although this power is enforced by *h* in *dahlia*, this name has been perverted to *dalea* in ignorance of the fact that Dahl, a Swede, is commemorated in the former, and Dale, an Englishman, in the latter. The vowel of *arm* occurs in palâver, cantâta, sonâta, capibâra, banâna, cassâva, tomâto (Portuguese *tomâte*, whence *tomat′*), Tâtar (which fell into *Tartar*), yataghân, pâlm. Some use âmen, and strâta was used by American geologists until the year 1842, when some followed the practice of Mr. Lyell. The dictionaries join the incompatibles *z-h*, giving *egz-hort, egz-haust, egz-hibit*, where *egz-* requires the exclusion of *h*, or *h* requires the presence of *eks-*, giving either *egz-aust or eks-haust*.

Stability in English pronunciation cannot be attained until the alphabetism of the primer is replaced by a study of the laws of speech. Under the former an *e*-sound may be turned into an *i*-sound if the accidental spelling is of a certain kind. *Break* and *great* may be called *breek* with Buchanan and *greet* with Enfield. Buchanan (1766), probably on the "analogy" of *wear*, turns *weary* into *wary*, *meadow* into *mee-doo* (which would justify the *modern* rhyming perversion of mĕad to *meed*), *neigh* into *knee*, and *neither* into *nī-ther*. The pronouncing dictionaries are in most cases correct, and they are useful in a wide-spread language like English, with a vocabulary so extensive that the reader may be familiar with many book-words which he never heard from persons who had learned them as speech-words. (See the extensive work of A. J. Ellis, F. R. S., *On Early English Pronunciation, . . . from the Anglosaxon Period to the Present Day*, London, 1868–75.) S. S. HALDEMAN.

Pronunciation of Greek is allied to that of Latin, but differs in several particulars. The Greek long η and short ε are heard in *thêre* and *met*, the former being French *ê*. Greek wants the Latin *u* (*oo*), which has υ (French *u*) instead; and when the Latin sound was to be represented, the Greeks used their diphthong ου (*o-w* in *no-wonder* pronounced quickly), a sound which became that of *ooze* in later and modern Greek. The long ω as in *old*, short ο, the same pronounced quickly; θ as in *thin;* ρ a trilled *r;* ῥ a whispered aspirate *r*, like Welsh *rh;* σ, ς the hissing *s;* φ akin to *f*, but formed with the lips alone; χ like German *ch* in *doch;* ψ like *ps* in *ellipse* and *bs* in *Robson*. The sound of *n* in *anger* is represented by γ (gamma) before γ, κ, ξ, χ. In the diphthongs each element must be heard, but -υ is then slightly modified, so that αυ is heard as in Ger. *braun*, Eng. *brown;* ευ like *e-w* in *Edward*. The word υἱός (*son*, with υ long and ο short) is often perverted to *hwee-os*, but the proper sound is represented by the German elements in *hüj-os*, French *hu-yos*. With these points in view, the ordinary Greek grammars may be consulted for the general alphabet. (See GREEK LANGUAGE, by PROF. F. D. ALLEN, PH. D.) S. S. HALDEMAN.

Pronunciation of Latin is based upon the descriptions of the Latin grammarians, who have described every letter. With some variations in minor points, the following powers have been inferred. The long and short vowels differ only in length, and not in quality, and the English vowels of *fat, met, fit, not, hut*, are rejected. The Latin long and short vowels are heard in ārm, ărt; wēigh, wĕight; marîne, deceĭt; ōld, ŏ-bey; rūle, fŭll; *y* (in Greek words) is Danish *y*, French *u*, German *ü*. The diphthong *æ* or *ae* is like English *eye*, the affirmation *ay* or the *ae* of *Shanghae;* *œ* or *oe* like *o-y* in *showy*, or *oe* in *coequal* when pronounced in one syllable; *ei* much like *e-i* in *preying;* *ui* much as in *ruin;* *au* or *av* like *ow* in *now*, German *au;* *eu* much like *e-w* in *they-want*. Of the consonants, *c* is always like *k;* *g* as in *get, give, go;* *j* (*yay*) like English *y*, or *j* in *hallelujah;* *m* as in *may*, but when final it only nasalizes the preceding vowel, like final French *n* in *bon;* *n* as in *no*, but before *c* (*cay*), *g* (*gay*), *x* (*aiks*), like *n* in *anger* or *ng* in *singing;* *qv* or *qu* as in *quart* (Lat. qvârtŭs or quârtŭs, *fourth*); *r* distinctly trilled, as in French and German; *s* as in *hiss*, never as in *misery, mission;* *t* always pure, never as in *notion;* *v* as English *w;* *z* (in Greek words) like English *zd*, or *sd* in *wisdom*. When letters are doubled, as *ll* in pâllĭdŭs (pale), each must be heard, as in *all-loving*. (See Haldeman, *Latin Pronunciation* (1851); Richardson, *Roman Orthoëpy* (1859); Blair, *Latin Pronunciation* (1873); and the *Latin Grammars* of Roby (1872) and Bartholomew (1875).) S. S. HALDEMAN.

Propagan′da (*Congregatio de Propaganda Fide*), a congregation of cardinals at Rome, first fully established in 1622 by Gregory XV., for furthering the spread of the Roman Catholic religion among the heathen. The Congregation sustains a great college (Collegium Urbanum), often called The Propaganda, for training missionaries. It has also a library and printing establishment.

Proper′tius (SEXTUS AURELIUS), b. in Umbria near the frontier of Etruria; lost while still a youth most of his fortune by some agrarian law, and lived in Rome in rather pinched circumstances; devoted himself to poetry; attracted the attention of Mæcenas, and resided on the Esquiline in familiar intercourse, as it seems, with Mæcenas, Virgil, and Ovid. The exact dates of his birth and death are unknown. His *Elegies*, which appear to have been much appreciated in antiquity, have come down to us only in a very corrupt text, and are by themselves less enjoyable than the similar productions of Tibullus and Ovid on account of their style, which is cumbersome and obscure. There are editions by W. Hertzberg (Halle, 1843), Keil (Leipsic, 1850), and Haupt (Leipsic, 1853), and a translation into English verse by Charles Robert Moore (Oxford, 1870).

Propeller. See NAVIGATION, OCEAN STEAM.

Prop′erty [Lat. *proprietas*], in law, the right of ownership which a person may have in anything capable of being owned, as opposed to the mere possession or the mere right to the possession. In common discourse, and even in legal treatises of high authority, the word is often employed to describe the thing itself which is the object of ownership, so that the same term is made to denote the physical thing, the land or chattel which is the object of the right, and the very right itself. This double use even occurs in the definition of personal property given by Chancellor Kent in his *Commentaries*, and the confusion of thought which it indicates and produces is complete, while the definition itself is logically without meaning. Property is a right capable of various degrees or grades, and fully recognized and protected by the law. The speculations as to the origin of property have been numberless, and have engrossed the attention of many generations of juridical writers. The theory generally adopted by the jurists of the eighteenth century, formulated with great minuteness of detail by Blackstone, and repeated since his time by the ordinary legal text-writers, represents property as having its origin in the physical act of occupancy. It

pictures a so-called "state of nature," with no society and no law, when the earth gave its products alike to all, and everything was common to all. In this primeval condition an individual chooses a spot of land, occupies it, and from that act a suggestion of a transient right thereto arises, which gradually deepens into the conception of a permanent right; and finally the notion of complete property or absolute ownership is developed. This fanciful theory has been wholly rejected by modern scholars. It is utterly irreconcilable with two controlling facts—the physical condition of the earth itself before it was subdued by organized human labor, and the primitive condition of mankind as shown by the most ancient historical records and by all the traces which have been preserved of the earliest institutions and traditions. So far from property taking its origin in the occupancy of specific tracts of land by particular persons, it is certain that the notion of a separate, individual ownership arose at a comparatively recent date, as the result of great social changes, and as the termination of a progressive development reaching through vast epochs of time. Among the Aryan nations the earliest form of property was that of communities—groups of persons acknowledging a common kindred and possessing a common religious worship. Village communities owning in common still exist in Hindostan, and are mentioned in the earliest writings of the Hindoos. Evident traces of the same ownership have been preserved in Europe within the range of modern observation. Following this community property, came the property vested in the family. Whether this institution grew out of the former, or whether it sprang up on an independent basis as a modified product of the same causes, it may not be possible to determine; it is certain, however, that in the earlier stages of the Roman state, and in the corresponding periods of the Grecian cities, while the family was the social unit, property was considered as a right belonging to the family in its collective capacity. Although the head of the family, the *pater familias*, had the undisputed control, he was not the absolute owner in the modern sense of that term; he represented the household as its trustee, and at his death this right of representation devolved upon his successor. That the same institutions prevailed among the Saxons and other German nations, and among the Celts, has been demonstrated by modern research. From this stage of undivided property in the family, by gradual changes in social customs, by the abolition of inheritance by the eldest son and the admission of inheritance among all the children, by the growth of trade, and by all the other influences which tended to elevate the individual, the notion of private and personal property was developed, and finally became firmly established in the law, and has remained as one of the foundation-stones upon which the structure of modern society is erected.

Property is divided by the English and American law into various classes. The first capital division, which is one of the peculiar features of the common law, separates all property into real and personal, or that in lands, things real, immovables, and that in chattels, things personal, movables. Although many of the ancient distinctions have been removed by modern statutes, still, the differences which remain are very striking, the most important being the wholly dissimilar modes of succeeding to real and to personal property on the death of an owner, the former passing directly to his heirs or devisees, the latter passing to his administrators or executors for distribution among creditors, next of kin, and legatees. Property is also separated by an entirely different line of division into two classes, absolute and qualified. Absolute property is the complete and perfect right of ownership, free from any interest held by another, and with no limitation except that imposed by the law upon all owners for the public welfare. It involves the possession, the power to use in every lawful manner, and to transfer. When the object is land, it is termed an estate in fee simple. Qualified property embraces all species that are not absolute. The qualification may inhere in and result from the intrinsic nature of the right itself, or it may be connected with and result from the restricted length of time the right is to endure. The interest of the pledgor and the pledgee in an article pledged, that of an administrator or executor in the personalty of the decedent, and that of a trustee, are illustrations of the former species of qualified property. The qualification depending upon the element of time may consist either in the limited duration of an interest which has begun, or in the commencement of the interest at a future day, or in both, and may be either certain or contingent. The law recognizes two classes of qualified property limited in its duration—that for life, either of the holder or of some other person, and that which is to last for a specified and certain number of years or other period. The holder of qualified property is restricted in his use of the thing according to the nature of the qualification, and cannot transfer a higher interest than that which he himself has. JOHN NORTON POMEROY.

Proph'et [Gr. προφήτης], (1) he who speaks for another, *proclaimer*, preacher; or (2) one who predicts future events. We find in all nations from the most remote antiquity traces of men who claimed, and were believed to have, special and immediate intercourse with the Deity. The most remarkable and familiar instances of these phenomena appear in the nations of the East, more particularly among the Hebrews. In the Old Testament they are called נביא "speaker," "interpreter—*i. e.* revealer—of the divine will to man" (in no case does it mean predicter of future events), Ex. iv. 16; vii. 1. Comp. רֹאֶה, חוה, "seer;" שֹׁמר, צפה, מצפה, "look out," *i. e.* for the signs of the times; also, מטיף, עבד יהוה, "איש" מלאך.

In the earlier ages they appear chiefly as seers (ראה, 1 Sam. ix. 9), leading a contemplative life apart from the world. About the time of Samuel, with whom the prophetic age begins, they seem to have been organized into communities, known as בני אלהים (comp. *Darwîs* of the present day), established in various places under the charge of old and experienced prophets, devoting their time to the study of the sacred writings and ecstatical religious exercises. After the Exile we lose all trace of these organizations; the prophets appear separately and at intervals, and from Malachi to John the Baptist there arose no prophet in Israel. The prophets led in the main an ascetic life, supported by the contributions of the charitable (2 Kings iv. 42), by the gifts of those who sought counsel from them (1 Sam. ix. 7; 1 Kings xiv. 3; 2 Kings v. 15, 16 ff.; *ib.* viii. 8), or by fruits, herbs, etc. gathered by themselves (2 Kings iv. 38; Matt. iii. 4). Their costume was a mantle of skin (Zech. xiii. 4; 1 Kings xix. 13) girded around the loins (2 Kings i. 8; Matt. iii. 4).

The call to the prophetic office was an inward one from God, but those so called were not at all times in a state of inspiration, nor was this under control of their will. The divine revelations were not received in a state of ecstasy (Montanists, Hengstenberg), but in visions or in an elevated though entirely rational condition; so distinguished from μάντεις. The form in which the prophecies were communicated to the people depended entirely on the age and the individuality of the prophet, whether by verbal communication, symbolic actions which were mostly unreal, or by writings (Isa. xl. ff., and some of the later prophets). The prophets had mainly in view the reformation and elevation of the people, and but incidentally point out future calamity or deliverance as an aid to present guidance.

Prophets, Books of the. See BIBLE, by PROF. W. G. SUMNER, A. B.

Proph'etstown, p.-v and tp., Whitesides co., Ill., on Chicago Burlington and Quincy R. R., 12 miles S. of Morrison, has 2 school-houses, 1 church, 1 bank, 1 newspaper, 2 hotels, a grain-elevator, and Masonic and Odd Fellows halls. Principal business, farming and stock-raising. P. of v. 276; of tp. 1274. A. D. HILL, ED. "SPIKE."

Propion'ic Acid. This acid, which is $C_3H_6O_2$, was called *metacetonic acid* by Gottlieb, its discoverer—a name which is now, however, entirely lost sight of for reasons that are not apparent. Propionic acid is the third in the series of the "fatty-acid" homologues (see the article HOMOLOGY), whose homologic formula is $O_{2\cdot n}H_2C$. It seldom occurs in nature, though found in some wines. One point of interest is, that the English chemist Wanklyn succeeded in its synthesis directly from *carbonic acid*, the only case of the kind yet known. The substance called ethylide of sodium in acting upon CO_2 forms *sodic dipropionate* directly:

$$2(Na.C_2H_5) + 2CO_2 = Na_2O.2(C_3H_4O).H_2O.$$

It has been formed by several other methods. At normal temperatures it is a solid, soluble in water in all proportions. It melts readily, and boils at 140° C. Its smell is singular, but remotely resembles that of butyric acid. H. WURTZ.

Prop'olis [Gr. πρόπολις, "before the town," because it is used to close small approaches to the hive], a resin which the honey-bee collects upon its posterior tibiæ and carries to the hive, where it is used in filling crevices, finishing combs, and the like. In this country it is mainly collected from the buds of the birch, the horse-chestnut, and the balsam-poplar.

Propor'tion [Lat. *proportio*], in æsthetics, is one of the constituent elements of beauty. A lack of proportion in the form may be concealed by the brilliancy of the expression, but if the disproportion becomes so great as to approach to deformity, beauty is gone. During the latter part of the eighteenth century, and caused by the enthusiastic study of ancient Greek art, whose specimens

were found to be masterpieces of proportion, the question arose, What is, then, properly speaking, proportion in æsthetics? All people felt that it was not something arbitrary or merely conventional; but every attempt at reducing it to definite ideas, such as fitness, symmetry, harmony, etc., failed. Some passages in Plato's *Timæus*, and the singular, half-unintelligible speculations of the Pythagoreans concerning numbers, made people believe that the ancient Greeks had been possessed of some definite rule of proportion; but Greek literature contained no demonstration of any such rule—did even not mention its existence. Also, the Gothic church buildings astonished people. With respect to their proportions they were most wonderful. They looked as if they had shot forth from the ground, free creations of Nature herself, and at the same time they seemed to rise in proportions measured out with the rod. But the writings of the architects, speaking copiously of everything else, said not one word about proportions. At last, the German philosopher A. Zeising, in his *Æsthetische Forschungen* (Frankfort, 1855), succeeded in finding out and demonstrating the fundamental rule of proportion—that rule in obedience to which nature grows and art works; and, as might have been supposed, it proved to be as simple as universal. It depends on that elementary geometrical operation which Plato calls "the golden cut," and which consists in dividing a line into two unequal parts, so that the larger part forms the mean proportion between the whole line and the minor part. When A is the line, and a and b the two unequal parts into which it is divided, the proportion $A : a :: a : b$ is the proportion of beauty; and wheresoever this proportion is carried out, one of the essential elements of beauty is present; while, on the other hand, neither nature nor art can wholly disregard it without producing deformity. Take, for instance, the human body. At the navel it is divided into two parts, of which, with males, the lower part from the navel to the sole of the foot, and with females the upper part from the navel to the crown of the head, forms the mean proportion between the whole body and the remaining part. A glance at the Apollo Belvedere and the Medicean Venus will show what the most minute measurements have confirmed. And in exactly the same manner every single part of the human body is subdivided—the face, the arm, the hand, the finger, etc. The distance from the top of the forehead to the base of the nose is the mean proportion between the whole length of the face and the distance from the base of the nose to the tip of the chin; if the proportion is reversed, the expression of the face becomes extremely mean and cynical. And again, the distance from the top of the forehead to the base of the nose must be divided in the same proportion. If the nose and the forehead are equally long, the expression of the face is dead, petrified, or satanic; if the inequality is too great, the expression becomes idiotic. When once the eye becomes wholly familiar with this proportion, it seeks and finds it everywhere—in nature, in crystals, plants, etc.; and in art in statues, Greek temples, Gothic cathedrals, etc.; and it soon learns to distinguish between the slight deviations which are the cause of individual characterizations of the form and the real infringements whose effect is ugliness. CLEMENS PETERSEN.

Proportion, an equality of ratios. Four quantities are said to be in proportion when the ratio of the first to the second is equal to the ratio of the third to the fourth. A proportion may be written in either of two ways; thus, if the ratio of a to b is equal to the ratio of c to d, the equality may be indicated by either of the following expressions:

$$\frac{b}{a} = \frac{d}{c}, \text{ or } a : b :: c : d.$$

Either of them may be read *a is to b* as *c is to d*. The first and third terms are *antecedents;* the second and fourth terms are *consequents;* the first and fourth are *extremes;* the second and third are *means*. The first ratio is called the *first couplet*, and the second ratio is called the *second couplet*. Two varying quantities are said to be reciprocally proportional when their product is constant; thus, x and y are reciprocally proportional when $xy = m$, m being any constant quantity. A continued proportion is an expression of continued equality between three or more ratios; thus,

$$\frac{b}{a} = \frac{d}{c} = \frac{f}{e}, \text{ etc, or } a : b :: c : d :: e : f \ldots, \text{ etc.},$$

is a continued proportion. The terms of a geometrical progression form a continued proportion.

The principles of proportion are employed in comparing quantities either in algebra or in geometry. The primitive comparison lies between two quantities of the same kind, and the result of this comparison is a *numerical* ratio; if the quantities compared are commensurable, their ratio is *exact;* if they are incommensurable, their ratio is *approximate;* and in all cases of this kind the degree of approximation may be made as close as desirable. Taking this view, the operations for transforming proportions become purely numerical.

The following are some of the ways in which proportions may be transformed: (1) The antecedents may be made consequents, and the consequents antecedents; the proportion is then said to be transformed *by inversion*. (2) Antecedent may be compared with antecedent, and consequent with consequent; the proportion is then said to be transformed *by alternation*. (3) The sum of the antecedent and consequent of each couplet may be compared with either the antecedent or consequent of the corresponding couplet; the proportion is then said to be transformed *by composition*. (4) The difference of the antecedent and consequent of each couplet may be compared with either the antecedent or consequent of the corresponding couplet; the proportion is then said to be transformed *by division*.

The most important principles of proportions are the following: (1) If four quantities are in proportion, the product of the means is equal to the product of the extremes; *conversely*, if the product of two quantities is equal to the product of two other quantities, the first two may be made the means and the other two the extremes of a proportion. (2) If a couplet in each of two proportions is the same, the remaining couplets will form a proportion. (3) If four quantities are in proportion, they will also be in proportion by inversion, by alternation, by composition, or by division. (4) Equimultiples of two quantities are proportional to the quantities themselves. (5) In a continued proportion the sum of all the antecedents is to the sum of all the consequents as any antecedent is to the corresponding consequent. (6) If the corresponding terms of two or more proportions are multiplied together, the products will be in proportion; consequently, like powers or like roots of all the terms of a proportion are in proportion.

Harmonical Proportion.—Four quantities are in harmonical proportion when the first is to the fourth as the difference between the first and second is to the difference betweeen the third and fourth; thus, 24, 16, 12, and 9 are in harmonical proportion. Three quantities are in harmonical proportion when the first is to the third as the difference between the first and second is to the difference between the second and third; thus, 6, 4, and 3 are in harmonical proportion. W. G. PECK.

Propor'tional Representa'tion. The general term "minority representation" has been very commonly used in political debate in recent years as properly covering various plans proposed for the more full and complete representation in government of popular constituencies and electoral bodies. But it is inaccurate and misleading, because it fixes attention upon one feature only of the plans in question, and to the ignorant and unreflecting appears to antagonize those plans to the principle—accepted by all persons devoted to free, popular government—that the majority shall rule. Hence the word "proportional" or "proportionate," and other words indicating completeness or totality, have been preferred by many writers to the word "minority" as a generic designation to comprehend all of the plans proposed for representing electoral masses or bodies by *all* their principal divisions or parts. And by Mr. Hare of London and by others the term "personal representation" has been used as fitly characterizing a plan, or the results of a plan, intended apparently to emancipate voters from the despotism of political parties, and from being restricted to small district divisions in selecting candidates upon whom to bestow their votes.

Accepting the fact that political society and electoral bodies generally, in all free countries, are almost invariably divided by interest or opinion into separate or distinguishable parts, it seems to be the dictate alike of good sense and of justice that when any such society or body is to be represented in government, provision should be made for representing its parts or divisions, inasmuch as this is absolutely necessary to the representation of the whole. A representative house, convention, or board in theory, and properly, stands in the place of its constituency, and should embody in its composition all the essential elements of the constituent mass. But this result is not accomplished, and cannot be accomplished, upon the ancient plan of taking the sense of the electors at elections. By that, substantially, the largest division of the electors—whether a majority or a plurality—is alone regarded, and representation is assigned to it, not in proportion to its magnitude as a part of the constituency, *but as if it were the whole constituency*. It gets its own share of representative power, and in addition an unjust share or shares of power that

ought to belong to other electors. Need we feel surprised when we learn that elections based upon this plan become costly and corrupt? that the strong motive to grasp at unjust power which the plan creates operates to debauch electors and degrade elections?

Of the several plans of proportional representation by which amendment of electoral systems is sought to be effected, two only will be considered in this article, and they are selected simply because, beyond others, they have been subjected to trial in England and the U. S. What is said upon them will be mostly explanatory, and not argumentative. For the general reasoning in their support, and for answers to possible objections against them, the careful student is referred to the authorities cited at the end.

The Limited Vote.—The limited vote obtains where the voter is forbidden to vote for the whole number of persons to be chosen, but is authorized to give votes singly to each of a less number or a single vote to one. The most conspicuous instance of its application to popular elections is furnished by the English Reform bill of 1867, relating to the election of members of Parliament. The ninth clause of that bill, adopted after full debate in each house, is as follows: "At a contested election for a county or borough represented by three members no person shall vote for more than two candidates." The next following clause of the bill further provides that "at a contested election for the city of London" (which is entitled to four members) "no person shall vote for more than three candidates." In the U. S. the limited vote has been often resorted to in recent years, as affording the means of facilitating or securing constitutional or legal reforms. In the election of members of the New York constitutional convention of 1867, 32 members at large were by means of it divided equally between the two political parties of the State, a regulation in the convention act being that no voter should vote for more than 16 candidates, and that the 32 highest in vote should be chosen. This plan of electing was still more thoroughly applied in the Pennsylvania constitutional convention act of 1872. By that statute (*Laws*, 1872, p. 53) it was provided that 28 members of the convention should be elected by the voters of the State at large, and that in their election no voter should vote for more than 14; that 6 members should be chosen from the city of Philadelphia, in the choosing of whom no voter should vote for more than 3; and that 99 additional members should be chosen from the senatorial districts of the State (being three times the number of senators in the legislature) in manner following: In single senatorial districts each voter to vote for no more than 2 of the 3 persons to be chosen; in the Allegheny district (including Pittsburg) each voter to vote for no more than 6 of the 9 persons to be chosen; and in the Luzerne, Pike, and Monroe district, entitled to 6 members, no voter to vote for more than 4 persons. Thus, all the members of the convention, whether from the State at large, from Philadelphia, or from senatorial districts, were chosen upon the plan of the limited vote. The result was satisfactory. More complete representation of the people than would have been possible under the old plan of voting was secured, intelligent, independent men were mostly chosen for members, and party feeling and party debates were excluded from the proceedings of the convention. The constitution framed by the body thus constituted contained numerous new and important provisions, and upon being submitted to a popular vote was adopted by a majority of 145,000 on Dec. 16, 1873. The same convention act contained in its eighth section a novel but convenient provision for the filling of vacant seats in the convention caused by death, resignation, or otherwise, which was strictly conformed to the principle of proportional representation, and furnishes an example for imitation in future cases of like character. It was, that those members chosen from the State at large "who shall have been voted for by the same voters, or by a majority of the same voters, who shall have voted for and elected the member whose place is to be filled, shall fill such vacancy," and "the appointment to fill a vacancy shall be made by the members at large aforesaid, or by a majority of them, in writing; and all such written appointments shall be filed among the convention records." Under this provision seven or eight vacancies of membership in the convention were promptly and fitly filled without the inconvenience and expense of fresh elections, and with complete preservation of party representation in the convention as fixed by the people. The Pennsylvania constitution of 1873 applied the limited vote to the election of judges of the supreme court whenever two or three judges are to be chosen together for the same term of service (art. v. § 16); to the election of county commissioners and county auditors, three of each to be chosen every third year (art. xiv. § 7); and to inspectors of elections (art. viii. § 14), two of whom are chosen annually in each election district to constitute, with a judge, the election board of the district. This last-mentioned provision gave a constitutional sanction to a plan of choosing inspectors which had obtained in that State, under statute law, from the year 1839. The same constitution applied the limited vote to the choice of magistrates in Philadelphia; they are to be chosen for five-year terms, and in their election no voter is to vote for more than two-thirds the whole number (art. v. § 12).

By an amendment to the constitution of New York (art. vi. § 2), proposed by the convention of 1867, the court of appeals of the State was to consist of a chief judge and six associate judges, to be chosen by the voters of the State at large, and at the first election of judges each voter might vote for the chief and for four only of the associate judges. By means of that arrangement the political minority of the State, at the first election under the amendment, secured two of the six associate judges of the court. A similar provision was made by the Illinois constitution of 1870 (Schedule, § 7) for an election of judges for Cook county (including the city of Chicago), and another similar one by the Pennsylvania constitution of 1873 (Schedule, § 18) for the election of two common pleas judges in the city of Philadelphia.

The Free Vote.—This has been described as obtaining at plural elections, when the voter has assigned to him a number of votes equal to the number of persons to be chosen, and is permitted to distribute them among, or to concentrate them upon, one or more candidates, as he shall think fit. Mr. Lowe's amendment, proposed in the House of Commons to the Reform bill of 1867, and applicable to any county or borough whenever two or more seats of members of Parliament therefrom should be vacant, was in the following words: "Every voter shall be entitled to a number of votes equal to the number of vacant seats, and may give all such votes to one candidate, or may distribute them among the candidates, as he thinks fit." And in the bill reported by a select committee to the U. S. Senate Mar. 2, 1869, embodying a proposed plan for electing members of Congress, we have the free vote expressed as follows: "In elections for the choice of Representatives to the Congress of the U. S., whenever more than one Representative is to be chosen from a State, each elector of such State, duly qualified, shall be entitled to a number of votes equal to the number of Representatives to be chosen from the State, and may give all such votes to one candidate, or may distribute them, equally or unequally, among a greater number of candidates, and the candidates highest in vote upon the return shall be declared elected." But Mr. Droop of London has shown that it is by no means necessary to the plan that the voter shall be allowed a number of votes precisely equal to the number of persons to be chosen, and that it may sometimes be advantageous to allow a different number. For instance, when five persons are to be elected, it would be convenient to allow each voter to cast six votes instead of five, in order to avoid an awkward fraction in voting an equal support to three candidates. For, as will presently appear, the casting of fractional votes to a certain defined extent ought to be permitted in order to the complete operation of the free vote, though they are not indispensable to its use, and do not seem to have been contemplated in the earlier discussions of the subject either in this country or abroad.

The free vote is often spoken of as the "cumulative" vote, but the latter term is inaccurate, because the plan involves or permits the distribution as well as concentration of votes, and that, too, even *singly* among candidates. In the Illinois constitution of 1870 (art. iv. § 7), we have it, in an important application, exhibiting all its characteristic features. The section referred to is as follows: "The house of representatives shall consist of three times the number of the members of the senate, and the term of office shall be two years. Three representatives shall be elected in each senatorial district at the general election in the year 1872, and every two years thereafter. In all elections of representatives aforesaid each qualified voter may cast as many votes for one candidate as there are representatives to be elected, or may distribute the same, or equal parts thereof, among the candidates, as he shall see fit, and the candidates highest in vote shall be declared elected." This section, as rightly construed and applied by statute, permits the giving of one vote to each of three candidates, or of two votes to one candidate and one to another, or one vote and a half to each of two candidates, or three votes to one.

In the Bloomsburg act of Mar. 4, 1870 (*Pennsylvania Laws*, 1870, p. 343), which is believed to have been the first act ever passed applying the free vote to popular elections, we find more elaborate provisions. They are

contained in the 4th and 5th sections of the act, and are as follows: "*Section* 4. To the end that the electors of Bloomsburg may exercise their right of suffrage freely and without undue constraint, and may obtain for themselves complete representation in their local government, the plan of the free vote shall be lawful, and is hereby authorized, in the elections for officers of said town, and for all officers to be chosen by them exclusively. In any case when more persons than one are to be chosen in said town to the same office, for the same time or term of service, each voter duly qualified shall be entitled to as many votes as the number of persons to be so chosen, and may poll his votes as follows, to wit: *First,* when two persons are to be chosen, he may give one vote to each of two candidates or two votes to one; *second,* when three persons are to be chosen he may give one vote to each of three candidates, two votes to one candidate, and one to another, one vote and a half to each of two candidates, or three votes to one; *third,* when four persons are to be chosen, he may give one vote to each of four candidates, one vote and one-third to each of three, two votes to each of two, or four votes to one; *fourth,* when six persons are to be chosen, he may give one vote to each of six candidates, one vote and a half to each of four, two votes to each of three, three votes to each of two, or six votes to one. In every case the candidates highest in vote shall be declared elected. Whenever a voter shall intend to give more votes than one, or to give a fraction of a vote, to any candidate, he shall express his intention distinctly and clearly upon the face of his ballot; otherwise, but one vote shall be counted and allowed to such candidate. *Section* 5. Vacancies in any of the offices of said town may be filled by appointments to be made by the court of quarter sessions of the peace of Columbia county, except as herein otherwise provided; but any appointment so made shall be of an elector of the said town who shall have voted for the officer or person whose place is to be filled." These provisions of the Bloomsburg act have been, by subsequent statutes of Pennsylvania, applied to many other towns and boroughs in that State. They seem, however, to fall short of the principle of the free vote in not allowing the voter, in most cases, to give an *unequal* support to the candidates he votes for when he supports more than one. But upon the first trials of the new plan it was perhaps prudent to define specifically the manner in which votes might be cast, and not to extend the specifications too far.

In England the free vote has had an extensive trial in recent years under the act of Parliament which applied it to the election of school boards throughout the country; and we believe it has been used in this country in some cases in the choice of delegates to nominating bodies. A more conspicuous application of it has been to stockholder elections for choosing certain officers of incorporated companies. Several State constitutions of recent adoption have made provision for such application of it, beginning with that of Illinois of 1870. We quote from that constitution (art. xi. § 3): "The general assembly shall provide by law that in all elections for directors or managers of incorporated companies every stockholder shall have the right to vote, in person or by proxy, for the number of shares of stock owned by him, for as many persons as there are directors or managers to be elected, or to cumulate said shares and give one candidate as many votes as the number of directors multiplied by his number of shares shall equal, or to distribute them on the same principle among as many candidates as he shall think fit; and such directors or managers shall not be elected in any other manner." The same provision is to be found in the constitution of West Virginia (1872, art. xi. § 4); in that of Nebraska (1875, art. xi. Mis. Cor., § 5); in that of Missouri (1875, art. xii. § 6); and in condensed form in that of Pennsylvania (1873, art. xvi. § 4).

References.—Mill on *Representative Government,* ch. vii.; *Thoughts on Parliamentary Reform,* by same (2d ed.); Earl Grey on *Parliamentary Government* (ed. of 1864, p. 203); Buckalew on *Proportional Representation* (Phila., 1872); *Minority or Proportional Representation,* by Dutcher (New York, 1872); *Parliamentary Debates on Reform Bill of 1867,* under date of July 4 and Aug. 8 in the House of Commons, and July 30 in the House of Lords (Hansard, 3d series, vols. clxxxviii. and clxxxix.); *Cong. Globe* (1st Sess. 40th Cong., 575); *Report of Select Committee to U. S. Senate,* 1869 (*Cong. Globe,* 3d Sess. 40th Cong., Appendix, 268). These references are given upon the two plans of proportional representation presented above, rather than as references upon the general subject of representative reform, or as covering the whole field of inquiry and debate properly open under the heading of the present article. CHARLES R. BUCKALEW.

Proposition. See LOGIC, by PROF. W. D. WILSON, LL.D., L. H. D.

Prosecution. See PROSECUTOR.

Pros'ecutor [Lat.], in law, one who institutes and prosecutes a criminal proceeding against another in the name of the government. In England the enforcement of the criminal law, so far as it involves the trial and conviction of offenders, has been left, under all ordinary circumstances, to private prosecutors, there being no public officials specially charged with that duty. The injured party has generally been suffered, and indeed required, to make the complaint, procure the indictment, employ counsel to conduct the trial, and in fact to bear all the burden of vindicating the law against its violators. It is true that in the case of political offences, such as treason, sedition, and public libels, the government takes the initiative and maintains the prosecution, and that when the crimes are of peculiar magnitude and importance it will also sometimes defray the expenses; but these are exceptional instances. In the U. S. a very different and much wiser policy has been pursued. Under the national administration an official is appointed by the President for each judicial district, called the U. S. district attorney; and in the several States a similar officer is elected or appointed for each county, termed the district or prosecuting attorney; they have exclusive charge of prosecutions, and their special duties consist in overseeing the finding of indictments and the trying thereof when found within the limits of their local districts. Private prosecutions, except for petty offences and in the lowest courts, are almost unknown in this country. The injured person may lodge a complaint before the committing magistrate or the grand jury, and thus procure the suspected party to be arrested, examined, held to answer, or indicted, but there his functions end. The public officer alone can act with the grand jury in framing the indictment, and has entire control of all further steps in the prosecution. In particular instances he may admit the aid of private counsel employed by the injured person, and he may even surrender the actual control of the case into their hands, but they would still act as his delegates by virtue of an authority conferred by him, and not under an independent claim of right. Partial exceptions to these methods may exist in some of the States, but the course of proceeding thus described generally prevails throughout all the commonwealths. JOHN NORTON POMEROY.

Pros'elytes [Gr. προσήλυτος, a "new-comer"], among the post-exilic Jews, were Gentiles who conformed to Judaism. The rabbins speak of "Proselytes of the Gate," who simply observed the seven precepts of Noah; and "Proselytes of the Covenant" or of "Righteousness," who were circumcised, baptized, and allowed all the privileges of the Jews; but Lardner recognized only the latter.

Pros'erpine [Gr. *Persephone*], in classic mythology, a daughter of Zeus (Jupiter) and Demeter (Ceres); was carried off by Pluto to Hades, but afterward permitted by him to spend half of the year in the upper world. She was worshipped in all Greek towns, generally in connection with her mother, as the goddess of vegetation, and the myths relating to her seem to have formed the foundation of the Eleusinian mysteries. By classic art she is generally represented either as the wife of Pluto, the queen of Hades, sitting on a throne, severe and cold, or as the young daughter of Demeter.

Prosim'iæ [from *Prosimia,* a proper name], a sub-order of the order Primates according to most, but according to others an order of the class of mammals, containing the lemur, tarsius, and the aye-aye. These agree with the monkeys and lemurs in the development of a calcarine sulcus on the inner wall of the cerebrum, which gives rise to the hippocampus minor within the posterior corner of the ventricle; in the exsertion of the proximal joints outside of the common abdominal integument; the enlarged great toe of the foot; the scrotal testes; and pendulous penis; they differ, however, in that the cerebrum does not extend so far backward over the cerebellum, a considerable portion of the latter being uncovered, and the posterior corner of the lateral ventricles being very small; the skull is also quite different; the lachrymal foramen is situated in the cheek outside of the orbit; the orbits are open behind; the ears are more or less produced outward, pointed, angulated at their extremities, and without distinct lobules. The female has a two-horned uterus and the clitoris perforated by the urethra; the placenta is bell-shaped and the allantois very large. The group includes three well-marked families — Lemuridæ, Tarsiidæ, and Daubentoniidæ or Cheiromyidæ—which are represented by existing species. Pachylemuridæ, Limnotheriidæ, and Lemuraridæ are families based upon extinct forms that have also been referred to this group. The living forms are peculiar to Africa and Asia, and especially developed in the island of Madagascar. The Pachylemuridæ lived in the Tertiary epoch

in Europe, and the Limnotheriidæ and Lemuraridæ in the early Tertiary of North America. THEODORE GILL.

Pros′ody [Gr. προσῳδία] treats of the structure and laws of verse, which is to be studied like other physical phenomena within reach, and it is not to be adapted to ancient systems, the details of which are of difficult application. The prosody of Greek and Latin depends primarily upon the distribution of long and short syllables—that of English upon strong and weak effects, due chiefly to the presence or absence of accent; and in both systems the metric foot is composed of two or of three syllables. Emphasis upon monosyllables has the same rhythmic effect as the accent stress, and in a line of monosyllables the alternation of strong and weak effects becomes obvious to the listener if the longer or the more important words occupy the accentual points, as in—

"And smooth′ or rough′, with them′, is right′ or wrong′."—*Pope.*

In comparison with this the line of Keats—

"Where had he been, from whose warm head out flew"

has unaccented places occupied by the strong syllables *where* and *warm*, to the injury of the rhythm.

According to the classic system, "hăr′mōnȳ" and "pār mŏn′ĕy" are dactyls, having one long syllable followed by two short ones, and they could replace each other without spoiling the rhythm, which, however, would be injured by replacing either with the three short syllables of "pĭt′ĭfŭl." In Greek prosody, besides being a dactyl, "par mon′cy" is also a paroxytone, in having the accent next the end syllable, while "har′mony" is a proparoxytone, a word like "dĕcāy′" or "rĕfĭt′," with a final accent, being an oxytone; and these are the proper terms for the feet in English versification. But as oxytone and paroxytone are equally applicable to dissyllabic and trisyllabic feet, we should be able to distinguish them; and for this purpose we may prefix *di-* to the former and *tri-* to the latter. As two accents cannot occur together without destroying the rhythm or altering the metre, the feet here given as containing them are but hypothetic. The weak or unaccented place is indicated by a small circle:

°′ DI*oxytone.*—I thought′ | I heard′ | some min′ | utes past′. |
′° DI*paroxytone.*—Sounds′ as | of′ a | cas′tle | bell′.—*Coleridge.*
°°′ TRI*oxytone.*—I have found′ | out a gift′ | for my fair′. |
°′° TRI*paroxytone.*—I | have found′ where | the wood′-pi | geons breed′.
′°° *Proparoxytone.*—But | let′ me that | plun′der for | bear′.—*Shenstone.*
′°′ *Amphitone.*—Where′ through groves′ | deep′ and high′. |—*Scott.*

In the longer names, *tone* may be omitted. The following theoretic forms are added to complete the scheme of possible accentual feet. In their length some of these names recall the Greek names "proceleusmaticus" and "hegemoscolios:"

°′′ *Trioxyparoxy.*— | the broad′ wheels′ | . . .
′′° *Paraproparoxy.*—Like′ death′ at | tends thee on this fatal plain.—*Dryden.*

The foregoing lines from Shenstone are really alike; and, judged by the poem in which it occurs, Scott's line was intended to be:

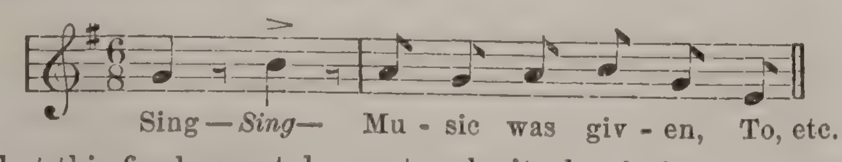
Where′ through groves | deep′ and high ; | —

but in this case strong words in weak places obscure the rhythm.

When the syllables seem to exceed three in a foot they may be disposed into shorter feet, or massed as bits of prose or as recitative groups, of which examples occur in songs, such as—

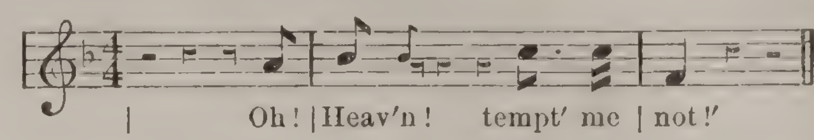
"I lov′d′ her, and′ she might′ have been′
The happ′iest in′ the land′,
But she fan′cied a for′eigner who play′d′ the flageolet′
In the mid′dle of a Ger′man band′."

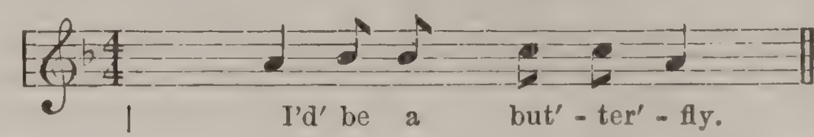
As prosody (πρός, "with," ᾠδή, "song") implies the union of words and music, the two require to be studied together, and obscurities in verse may often be explained by a comparison with a corresponding phase in music. Binary music is often adapted to triple verse, and triple music to binary verse, but in all adaptations the foot and measure must commence with an accented syllable, so that in oxytonic lyrics the first unaccented syllable is cut off as an anacrusis. (See METRE.) In rare cases the latter part of a measure is emphasized in our music, as in the first measure or foot of Moore's—



but this final accent does not make it what is falsely called iambic (˘ -), because the syllables have the same length, and would be (- -) spondaic.

Thomas H. Bayly's ambiguous "I'd be a butterfly" admits of a binary or a triple division, but the words are 3/4 adapted to 2/4 music, and agree note for note, but neither in accent nor rhythm, with "Oh! Heaven! tempt me not," in the opera of *La Sonnambula*—





This song of Bayly's is defective in wanting uniformity between corresponding lines of the stanzas, for, according to the *Leys d'Amors*, "it is a fault to commence with a rhythm, and not continue it." In the first stanza the final foot of the first line is completed in the second line, making these two lines *dependent:*

I'd′ be a | butterfly | born in a | *bower-*
Where | ro′ses, and | lilies, and | violets | meet, ‖
Roving for | ever from | flower to | *flower,-*
And | kissing all | buds that are | pretty and | sweet; ‖

while the corresponding first and second lines of the second stanza are *independent:*

Oh′ could I | pilfer the | wand of a | fairy, ‖
I'd′ have a | pair of those | beautiful | *wings:-*
Their | summer day's | ramble is | sportive and | *airy,-*
They | sleep in a | rose when the | nightingale | sings. ‖

The amount of poetic license in prosody should be little, and it is not to be judged from writers whose sense of rhythm is deficient. In the Greek theatre, although the general audience were ignorant of the rules of versification, if a line was offered to their ear with a single syllable too much or too little it was received with disapprobation from all parts of the house; and the very close correspondence of the Greek strophe and antistrophe demonstrates a high degree of rhythmic cultivation. Great excellence was attained by the Troubadours, as shown in the Provençal work on versification, *Las Leys d'Amors*, completed in 1356; and the Minnesingers of Swabia had a wonderful development of the rhythmic sense. (See *The Minnesinger of Germany*, by A. E. Kroeger, New York, 1873.) One of these, Ulrich von Lichtenstein, was a knight of great prowess, born about 1200–05, and being ignorant of the arts of reading and writing, after composing the words and music of his artistic productions he called upon his secretary to record them. According to Kroeger (p. 180), "Poetical composition was at that time held as a true art, requiring hard study and great experience—such a study of rhythm, language, and music as even the most thorough poets of modern times do not undertake. And Ulrich's songs are particularly distinguished by almost perfect purity of rhyme and great elegance of rhythmical construction."

Prosodic license is legitimate when used for an obvious purpose. In Dryden's *Virgil* (bk. 5, l. 359) a wounded snake is described in a narrative which glides into long quantities in the fourth line, then hurries through two lines with short neutral (unaccented) feet, to avoid the measured march of accent, and closes with a stately Alexandrine adapted to the change of subject:

"As when a snake, surpris'd upon the road,
Is crush'd athwart her body by the load
Of heavy wheels; . . .
In vāin, with lōosen'd cūrls, she crāwls alōng;
Yet, fiĕrce abŏve, she brăndishes her tŏngue,
Glares′ with her eyes′, and bris′tles with her scales′;
But, grov'ling in the dust, her parts unsound she trails."

Here the license extends to the use of an alliteration (*along, tongue*) instead of a rhyme, because the one line is better with a long vowel and the other with a short one. (For the principal subdivisions of prosody see HEXAMETER, METRE, QUANTITY, RHYME, RHYTHM, and SONNET, by the author of the present article.) S. S. HALDEMAN.

Pros′pect, p.-v. and tp., New Haven co., Conn. P. 551.

Prospect, p.-v. and tp., Waldo co., Me., on Penobscot River, opposite Bucksport. P. 886.

Prospect, p.-v., Trenton tp., Oneida co., N. Y., on W. Canada Creek, above Trenton Falls, and near Utica and Black River R. R. P. 312.

Prospect, p.-v. and tp., Marion co., O., on Scioto River. P. 1280.

Prospect, p.-v., Franklin tp., Butler co., Pa. P. 271.

Prospect, b., Taylor tp., Cambria co., Pa. P. 576.

Prospect Ferry, p.-v., Prospect tp., Waldo co., Me.

Pros′tate Gland [Gr. προστῆναι, to "stand before;" it stands before the bladder in man], a glandular mass

which surrounds the neck of the bladder and urethra in the male. It is about the size and shape of a horse-chestnut, and secretes a milky fluid. In old age it is liable to obstructive enlargement, which is often a cause of much distress.

Pross'nitz, town of Austria, in Moravia, on the Rumsa, manufactures brandy, rosoglio, linen and woollen fabrics, and has a large trade in grain, flax, cattle, and geese. P. 12,542.

Pro'tagon [Gr. πρῶτος, "first," and γονή, "procreation"], a phosphurreted fatty compound which, according to Liebreich, its discoverer, forms the chief constituent of nervous tissue. It is prepared from brain-substance, first washed with water and ether, by the action of warm alcohol, in which it is soluble. At melting ice the protagon precipitates from the alcoholic solution, and may be obtained crystallized by further purification and resolution. The composition assigned is $C_{116}H_{291}N_4PO_{22}$. *Neurine* is a derivative from it. H. WURTZ.

Protag'oras, b. about 480 B. C. at Abdera; was instructed by Democritus; lived afterward at Athens, where he was the first who taught philosophy and rhetoric for money, and assumed the title of *sophist*, "teacher of wisdom," but was banished on account of his frivolous statements concerning the existence of the gods, and d. in exile 411 B. C. None of his works are extant.

Protea'ceæ [named from the genus *Protea*], a natural order of exogenous trees and shrubs found chiefly in the dry and hot regions of Australia, Africa, and Chili. Not one is North American. They are mostly very handsome evergreens, and are allied to the laurels. For greenhouse shrubbery no plants are finer. Some are useful timber trees, and a few bear edible nuts.

Protec'tion, as a term in political economy, means the promotion of home industry by imposing duties on the importation of the products of foreign industry. It differs in *method* from the system of bounties, premiums, and subsidies on the one hand, and from the system of prohibition on the other. It differs in *principle* from free trade, which rejects all but the most general and indirect forms of governmental influence upon industry. The practice of protection is much older than the science of political economy, which took its place among the political sciences about a century ago. Nearly all the English economists, and many in America and on the continent of Europe, regard the science as having proved that protection is an unscientific and short-sighted policy. (See FREE TRADE.) But no nation, except England, has ever heartily assented to this view and accommodated its practice to it, while a minority among the English and a majority of the civilized and enlightened nations have always maintained the opposite view. This article is meant to be a summary of the reasoning by which the protectionists have defended their position.

(1) The industrial state consists of three classes—the agricultural, the manufacturing, and the commercial. When these are in a right or normal condition they are in a sort of equilibrium or balance of production and consumption. The first, which is also the fundamental class, provides for the most urgent physical needs. But all agriculture, except the very rudest, produces a surplus of food beyond what the farmer's household requires, and thus a part of the population is set free to produce by manufacture other necessities, comforts, and luxuries. With every improvement in agricultural methods the number needed to produce food for all is diminished; with every advance in manufactures there in an improvement in the quality and quantity of the commodities which the farmer gets in exchange for food. Between these two classes, and between the several sub-classes of each, stands the commercial class as exchangers of their products, and therefore as saving time and trouble to the producing classes. When the manufacturers and traders are numerous enough to consume the farmer's ordinary production of food, and the farmers are numerous enough to supply food for all, then there is a balance of the industries. By the operation of the laws of demand and supply these classes continually approximate toward this equilibrium. A bad education or a wrong state of public opinion may offer hinderances by drawing an undue proportion of young men to commerce or to other unproductive employments. But ordinarily the tendency, when undisturbed by foreign interference, is toward the right relation; and upon this fact Adam Smith based his argument that the sole duty of government toward industry is to "let it alone." For where this balance exists the prosperity of a people and their advance in all forms of industrial development are secured. The division of industry is promoted; its methods are perfected; the various forms of production fertilize one another; the individual members of the productive state enter into closer interdependence, and attain that mutual helpfulness which distinguishes civilization from the isolation of barbarism. As M. Chevalier says, "Combination of varied effort is the one and only condition of national progress."

(2) Were the world in an ideal state of harmony and equality, and were all its peoples equally strong in accumulation of industrial capacity and of capital, in intelligence, and in freedom from burdensome taxation, then the "let-alone" policy would be the right one. But the actual world is full of inequalities and disadvantages; and experience shows that unrestricted trade between its stronger and richer and its weaker and poorer countries puts very great hinderances in the way of the latter. For the former, by an undue concentration of their attention and resources upon manufacturing, can produce a surplus of articles which are easy of transportation, and can be sold in those other countries cheaper than if made there. The individual buyer goes to the cheapest seller; the interest present to his mind is that of spending to the best advantage the money he has in hand. And thus the foreign competition crushes out the home production of all but the rudest and coarsest articles of manufacture, and prevents the establishment of a varied industry, unless the government interfere, as the personification of the nation and its co-ordinating power, to restore the equilibrium by discouraging these imports. Especially is this difficulty experienced in new countries, whose settlers bring with them the Old World's appreciation of modern appliances, comforts, and luxuries, while the home industries needed to supply these wants are still undeveloped. Until such a country has attained a diversified industry, advanced at nearly all points to a full equality with that of the most advanced nations, its manufacturing class are, in the absence of protection, at the mercy of their foreign competitors. If we could consider the citizens of such a country merely as purchasers and consumers of such commodities, then it might seem that they simply gained by free access to the foreign producer. But they have also to produce something to be given in exchange, and find a market for that. "To buy in the cheapest and sell in the dearest market" accessible is the unreflecting instinct of everybody; but when the former is furnished by the foreigner, it is generally found that the home producer has no "dearest market" to sell in, but only a "cheapest" market for that purpose also. And when he reckons up his purchases and sales, or considers his transactions as an exchange of commodities, he will find that he has lost far more than he has gained, for "far fetched is dear bought" the world over. His country may be getting its commodities for the time at cheap rates, but it is bartering for them the very power to produce such commodities—the power to create on its own soil the home-markets whose relative cheapness or dearness will be in favor of all classes.

(3) Commerce between the richer and the poorer nations is little more than the exchange of raw materials and the precious metals for manufactured goods more or less elaborate. That the two former always go together, that the balance of trade is steadily in favor of the manufacturing countries, and that the gold and silver of the civilized world move on the same lines and in the same direction as the exports of wheat, wool, cotton, and the like, shows how unequal these exchanges are. There was an old saying that the English in trading with the Dutch "sold the hide for sixpence, and bought back the tail for a shilling;" and it has not yet lost all significance. The producers of raw materials send to the great centres of wealth, population, and industry the cotton to be spun and woven into cloth, and the food to feed the spinners and weavers, and they receive in return so small a proportion of the product that they must spend what money they have in purchasing more to supply their necessities. They had better have the work done at home, even though they had to send every web to Manchester before using it. For then they would save the heavy tax of transportation on bulky articles, and the profits of the long line of traders through whose hands these pass. The cost per yard would be greater, especially until the habits of manufacture are formed, but the exchange of raw cotton and wheat for chintzes and drillings would be on terms far more favorable to the producers of the former. For the prices of raw materials and of manufactured goods approach each other most nearly in the neighborhood where the one is converted into the other. At the paper-factory's door, for instance, a pound of rags is worth nearly a pound of paper; with every mile's distance their prices diverge more widely, until in Alaska paper is dear and rags nearly worthless. Free trade would, in a greater or less number of cases, remove to the other side of the Atlantic the points where the lines of price almost converge, and bring our whole country into the area of wide divergence. Now, without united and national action there is no possibility of correcting this state of things.

"It cannot be expected that individuals should at their own risk—or, rather, to their certain loss—introduce a new manufacture and bear the burden of carrying it on until the producers have been educated up to the level of those with whom the processes have become traditional." (*John Stuart Mill.*) But through their organ, the government, the people can say to the home manufacturer, "Build your factory and put in your machinery; we will buy of you. We choose to possess a varied industry on our own soil, and to destroy the monopoly now possessed by the foreigner, that we may have the choice between two markets, the home and the foreign. Our aim is to destroy a monopoly, not to create one; for this industry shall be open to all of us—to the foreigner himself if he choose to become one of us." By this decision, and by the tariff of duties for protection which embodies it as law, the nation refuses to exist on the low level of industrial uniformity; it resists the influences which might else prevent its industries from attaining the equilibrium which is their normal condition; it refuses to keep its farms and plantations on one continent and the workshops and factories which supply them on another. It lays the foundation of industrial and financial independence, without which political independence is unreal and unsatisfactory.

(4) Protection is a boon to the agricultural class as much as to that engaged in manufacturing. It aims at bringing the artisan and the farmer into neighborhood, and thus to secure to the latter an abundant, steady, and remunerative market for his crops. The farmer whose customers are in the far distance must spend a bushel of wheat in getting three to market, and the price he gets depends upon the double contingency of the character of the foreign harvests and of his own. He is forced to exhaust the fertility of his land by growing the same staple year after year, without having any means at hand to make adequate returns to the soil. He is an "earth-butcher," continually engaged in injuring or wearing a valuable instrument whose utility is capable of indefinite increase. The farmer whose market is at hand can keep up and increase the wealth of the soil by rotation of crops, and by the large returns to the soil which are rendered possible by the neighborhood of town and factory with their demand for dairy products. He can produce those lighter and finer staples which bring large and immediate returns. He has a steady market and steady prices, and little or no cost of transportation to pay. But the Western farmers, it is said, would be supplied with foreign manufactures of certain classes one-third cheaper under free trade than they can now buy them of the home manufacturer. Suppose this statement to be correct, what are the people now employed by the home manufacturer, and fed by the farmer, to do when the latter is supplied from abroad? They will have nothing to work at but farming; they will be transferred from the wheat-consuming to the wheat-producing class; and what will become of the home-market for Western wheat? In 1871, for instance, the West shipped 163,000,000 bushels of wheat, of which only 34,000,000, or between a fourth and fifth, went out of the country, and the rest was consumed by the manufacturing population at home. Will the promised reduction in the price of dry goods and hardware compensate the West for the loss of a considerable proportion of these home customers and their conversion into rivals? Will the West gain by selling one-fourth as much grain as now, and buying at two-thirds of present prices? The foreign market for breadstuffs is not only the most uncertain of foreign markets, but so long as the American farmer depends on it, so long as our agriculture produces more than our other classes consume, the prices received for the mere fraction that is sent abroad will keep down the price of what is sold at home. What wheat brings in our corn-exchanges depends on what it brings in Mark Lane, or rather what the exporters will pay for it, who will have to sell it at Mark Lane prices after paying for transportation. The remedy for this is manifestly to be found in the extension of our manufacturing industries by persistent protection until we attain such an equilibrium of those industries as will provide a home-market for all our breadstuffs.

(5) Protection is a boon to the working-classes, who have not commodities, but labor to sell. It creates for them alternative occupations, in the absence of which—as a British economist has observed—there is rarely any competition between employers for labor. As is shown by the contrast of Walloon with Flemish Belgium, of the midland and northern with the south-western shires of England, and of the three north-eastern counties of Ireland with the rest, even agricultural labor is poorly paid wherever there is no manufacturing. Wages are nearly twice as high a few miles S. of Liège as at the same distance N. of it. Between 1770 and 1850 farm-wages doubled in Lancashire and rose one-seventh in Wiltshire. In the former, two employers are running after every workman; in the latter, two workmen are running after every job of work. In a merely agricultural country, again, there is employment only for able-bodied men in the open air. The rest of the poorer classes—the sickly, the weakly, the crippled, women, and children—must live in idleness and dependence on the earnings of the few who have work. But a varied industry employs all sorts of labor. To find work for all is the chief economic problem for any nation. "If every man, woman, and child returned as a worker in the census had full employment at full wages for forty-eight weeks out of the fifty-two, England would be a perfect paradise for working-men. We should be in the millennium." (*Dudley Baxter.*) The amount of involuntary idleness is greatest in merely agricultural countries, while every approximation to an equilibrium of the industries brings us nearer to the solution of the problem. This is the very tap-root of Ireland's poverty—"the disproportion of the opportunities of employment to population." (*Lord Dufferin.*) "From the absence of alternative employments at least half the adult population are compelled by the coercion of hunger to agree to any terms which will secure them the use of the soil." (*The Spectator.*) The State of Maine was a byword for poverty when farming and lumbering were the sole employments of her people; since she began to make use of her matchless water-power, she has had work for all her people, and has outstripped many of her sister States. Similar was the condition of the poor whites in the South, even in the mountain-districts, where the virus of slavery had not reached the minds of the people and made work disgraceful. Furthermore, by establishing varied industry free play is given to varied gifts and capacities of the working-class. The man who could have lived by farming if there were nothing else to do, may do vastly better at an employment more to his liking. For instance, the mechanical ingenuity and audacity of the American people, which have added so greatly to the working power and the wealth of the world, would have been hid under a bushel, comparatively, if we had been content to be a nation of farmers and traders. Every protected industry, beginning with cotton-culture and Whitney's gin, has served to bring these powers into exercise; and it is a Manchester loom-lord that reminds us "in nearly every branch of manufacture and machine-making the most successful and serviceable inventions have for many years been American." (*Greg.*) And a Swiss writer says, "No nation can boast of having accomplished so much toward the general progress of industry as the American."

(6) It is objected that "on this theory we should restrict domestic as well as foreign trade by tariffs. Less-developed districts of our own country, such as Alabama, should be protected against the manufacturers of New England if the latter need to be protected against their British competitors." Every true protectionist shares in Colbert's hatred of restrictions on domestic commerce. He believes that nations are not "a necessary evil" (*Cobden*), but a part of the world's providential order, and that they are industrial as well as political wholes—that their industrial power and independence are essential to their political power and independence. National boundary-lines restrict the movements of capital and the capitalist as does nothing else; while, on the other hand, a nation's wealth ordinarily tends to diffuse itself over the whole country, and to create a certain equality of industrial condition and capacity. Under protection the newer and less developed portions of our country have come forward in manufacturing far more rapidly than the others. While the national increase between 1860 and 1870 was 124 per cent., that of the seven principal Western States was over 400 per cent. The South also exceeded the national average, in spite of the losses of the war and the political and social obstructions which still retard its progress. Both the West and the South might have done still better, and possibly they would, but for the impression created in some quarters—not by the protectionists—that the tariff was a law for the benefit of the North and the East.

It is objected that "the equilibrium of its industries would make every country self-sufficient, and put an end to commerce and to the beneficial intercourse between the nations which it fosters. It would build Bishop Berkeley's 'wall of brass' around each country." Protectionists want to see a whole, sound skin on the body politic, in order that the vital circulation may go on and complete itself within the body in a healthful way. Natural commerce, the commerce which moves along the meridians and exchanges the productions of different climates, they would not restrict; they urge the removal of all duties on the importation of commodities which cannot be produced at home. Equally natural is the commerce which supplies articles of manufacture to peoples devoid of any ability or

desire to produce them, or which furnishes fine goods to those whose capacity of production is for the coarser sorts only, or the like. But the transport of bulky articles along the parallels of latitude, between countries of the same productive capacity, is, on the face of it, an absurd and unnatural business, as well as a waste of human energies in the most laborious and the least humanizing of occupations. As to international intercourse, protectionists would gladly see perpetuated every sort of intellectual intercourse, and also the interchange of those highly elaborated products which carry with them the expression of the life and thought of a people; though even here there is a danger that excessive foreign influence may thwart or retard the national growth of art and literature, as did the Gallomania a century ago in half Europe.

"But the providential plan of the world is clearly not the protectionist plan, since some countries have been made dependent upon others for such articles of prime necessity as breadstuffs." Some countries, by destroying the balance of their industries at home, by rending the yeoman class from their holdings and crowding them into the towns, have made their agriculture unequal to the task of supplying food to their enormous manufacturing population. Were, for instance, the English and Welsh land now under cultivation, to be tilled as the small farms of Flemish Belgium are, it would feed 47,000,000 people; and over two-fifths of Great Britain is not cultivated, nor even enclosed as parks and game-preserves; 7,500,000 acres S. of the Scottish border lie idle, and much of it is in the most fertile parts of the island. Very little of it is as poor as Flemish Belgium, and hardly any is as bad as the mixture of peat and gravel which composes the Kempen, and which its people are steadily turning into a garden. There is no such waste of good land, and no such disproportion of the farming to the manufacturing class, in any other part of Western Europe. In 1500 the ratio was 2 to 1; in our times it is 1 to 3. England's necessities are her own work; she is "like a vast city, to which the less-peopled parts of the civilized world are an agricultural country, which is glad to send its overplus of provisions" and of raw materials "in exchange for the luxuries and conveniences of a manufacturing region." (*Thorold Rogers.*) "England's position is not that of a great landed proprietor, with an assured revenue. . . . It is that of a great merchant, who by immense skill and capital has gained the front rank and developed an enormous commerce, but has to support an ever-increasing host of dependants. He has to encounter the risks of trade and face jealous rivals. . . . The future rise of the U. S. into a great manufacturing and naval power appears the most probable and certain cause which will place a limit to our national increased prosperity." (*Dudley Baxter.*)

It is objected that "protection favors the producer at the expense of the consumer. All legislation should be for the benefit of the consumer, since his interest is that of society at large, while the interest of the producer is a class-interest merely." Society and the classes which compose it do not differ in identity, but this argument assumes a false antithesis between them. Society is organic; its members live in mutual interdependence, and whatever helps or hurts one member is a help or a hurt to all the rest. And in the industrial state the producing classes are fundamental; on their prosperity depends the welfare of the whole body. If, then, as we have shown, neither of the two great producing classes can prosper without protection, the prosperity of the whole industrial state demands its enactment.

It is objected that "everything should stand according to the life or energy there is in it, and not according as it is or is not bolstered up by acts of Congress. Let us be rid of hothouse industries, which cannot endure the free, fresh air of competition." It was a free trader who suggested that this argument applies with great force to the costly business of raising children in America—a business which is bolstered up by marriage laws, laws against infanticide, and school laws, although grown men could be procured so much cheaper from Europe. Children grow up into men, and become able to take care of themselves; protected manufactures do the same. There is not to-day in the possession of any civilized nation a great branch of manufacture competing for the markets of the world which does not owe its very existence to protection or some equivalent form of legal fostering. England persisted in protection for five centuries, and until 1845 her statute-books were burdened with enactments which either prohibited or heavily taxed the importation of foreign manufactures, and forbade the export of machinery and the emigration of skilled artisans to other countries. She crushed the industries and burdened the commerce of her colonies; she legislated out of existence the woollen and nearly all the other industries of Ireland, and also the vast and beautiful manufactures of cotton goods in India. She ruined the industries of Portugal (1701–1839), France (1786–89), Germany (1815–20), Russia (1815–20), and Turkey (since 1812); and she is now doing the same thing in Japan. Having by "immense skill and capital gained the front rank," she would fain discredit the methods by which she reached her present position.

And be it remembered that nobody asks that protection as a system shall be permanent. Its chief purpose is to give our manufactures a chance to show "what life and energy there is in them;" for when our industrial growth shall have brought us abreast with rival nations it will no longer be needed except in rare cases, such as Belgian competition with the English iron-men in the British market. Protection with this object has the sanction of the greatest free-trade economists. Adam Smith surlily concedes that a manufacture may sometimes be naturalized more readily in this way than in any other. Of his French disciples, Say, Blanqui, Rossi, and Chevalier make the same concession more fully and heartily. The last-named says: "Every nation owes to itself to seek the establishment of diversification in the pursuits of its people, as Germany, England, and France have already done; and this is not an abuse of power on the part of the government. On the contrary, it is the accomplishment of a positive duty. . . . Governments are, in fact, the personification of nations, and it is required that they should exercise their influence in the direction indicated by the general interest." John Stuart Mill says: "The superiority of one country over another in a branch of industry often arises only from its having begun it sooner. A country which has the skill and experience to acquire may, in other respects, be better adapted to the production than those earlier in the field. . . . A protecting duty, continued for a reasonable time, will sometimes be the least inconvenient mode in which a country can tax itself for the support of such an experiment." Prof. Thorold Rogers, scolding Mr. Mill for this mischievous concession, adds that the circumstances of the U. S. and the British colonies "exactly square with the hypothesis of Mr. Mill. The countries are young and rising—industries as yet nascent are thoroughly suited to the natural capacity of the region and of the people, the latter being of the same stock with the mother-country. . . . There is no reason, apparently, except that of priority in the market, why the industry of the old country should not be transplanted to the new."

Literature of the subject: Henry C. Carey's works, especially *The Harmony of Interests* (1851), *Principles of Social Science* (3 vols., 1858), and *The Unity of Law* (1872); Hon. E. Peshine Smith's *Principles of Political Economy* (1853); Dr. Wm. Elder's *Questions of the Day;* Horace Greeley's *Essays on Political Economy;* Joseph Wharton's *International Industrial Competition* (1870) and *National Self-Protection* (1875); John L. Hayes's *Protection a Boon to Consumers* (1867), *The Protective Question Abroad* (1870), *The Solidarity of the Industries* (1870); the collected speeches of Hon. Andrew Stewart and Hon. William D. Kelley; David H. Mason's *How Western Farmers are benefited by Protection* (1875); and Prof. R. E. Thompson's *Social Science and National Economy* (1876). Of foreign writers, see F. List's *Gesämmelte Werke* (3 Bde., 1850), and his *National System of Political Economy* (English translation, with Introduction by Stephen Colwell, 1853); Dr. E. Dühring's *National- und Socialökonomie* (Berlin, 1873); Dr. F. Stöpel's *Freihandel und Schutzzoll* (Frankfort, 1876); Judge Byles's *Sophisms of Free Trade* (10th ed. 1872), and John Maclean's *Protection and Free Trade* (Montreal, 1868). (See also TARIFF.) R. E. THOMPSON.

Protec'tor, a title several times conferred by the Parliament of England upon some individual other than the legitimate sovereign, usually accompanied with extraordinary powers to meet a crisis. Among those who have borne this title were Richard, duke of Gloucester, afterward Richard III.; Edward Seymour, duke of Somerset, uncle of Edward VI.; Oliver Cromwell, and Richard Cromwell, his son.

Prote'idæ [after *Proteus*, the changeable god], a family of amphibians of the order Gradientia, represented only in certain cave-streams of Southern Europe. The form is elongated and somewhat snake-like, with no contraction till near the end of the tail; the legs are very far apart and weak; the front feet have three toes, and the hinder two each; the eyes are very small; the gills well developed externally on three stalks on each side; in the skull the pterygoids are present; the orbito-sphenoids are elongated, and do not enter into the palate; the maxillary is wanting; carpus and tarsus cartilaginous; the vertebræ are biconcave. The family is composed of eel-like salamandroids peculiar to the regions already indicated, and which, according to some authors, form but one species,

and according to others as many as seven. Fitzinger has named seven, and has based his determination on 479 specimens. According to him, specimens of the genus have been obtained from not less than thirty-one localities in Carniola and Dalmatia. No two of the species are found in the same grotto, although the same species may be found in different ones. Six of the species come from grottoes of Carniola, and one from a cave of Dalmatia. They differ chiefly externally in size; the tint of the skin, whether rosy or yellowish; the shape of the head, whether pear-shaped, triangular, or sub-globular in form; and also as to the eyes, in some these being much larger than in others, and also differently placed. Prof. Cope has also pointed out some osteological peculiarities. The species vary in size from about nine to twelve inches when full grown. They are celebrated for the large size of the blood-globules; these are elongated and oval, measuring about $\frac{1}{727}$th of an inch in their long diameter and $\frac{1}{400}$th of an inch in their short diameter. In this respect, however, they really do not differ much from the allied forms *Amphiuma* and *Siren*. THEODORE GILL.

Proteids. See ALBUMINOIDS, by PROF. C. F. CHANDLER, PH. D., M. D., LL.D., M. N. A. S.

Pro'teine [Gr. πρωτεύειν, "to be the first"]. Mulder applied this term to a product of the metamorphosis of ALBUMINOIDS (which see) by the action of caustic potash, which he believed to constitute the basal molecule of all the proteids. Its formula, according to him, is $C_{36}H_{26}N_4O_{10}$. Although this theory has fallen, the name *proteids*, being very convenient, remains still in use. H. WURTZ.

Protel'idæ [from *Proteles;* Gr. πρό, "in front," τέλος, "extremity"], a family of mammals of the order Feræ, closely allied to the hyænas. They agree in form with the hyænas, and also in the structure of the skull and the development of the foramina at its base and about the auditory bullæ, but have very peculiar teeth; these are in number 32 (M. $\frac{1}{1}$, P. M. $\frac{3-4}{3}$, C. $\frac{1}{1}$, I. $\frac{3}{3}\times 2$), and are extremely small and remote from each other; no functionalized suctorial molar is developed. The family is represented by a single species, *Proteles cristatus*, the aard-wolf or gray jackal of the Cape of Good Hope colony. (See AARD-WOLF.) THEODORE GILL.

Protest'ant, a general name comprising all the various Christian denominations, in contradistinction to the Roman Catholic and Eastern churches, came into use after the second Diet of Spires, Germany, in 1529. The majority of the diet passed a resolution that all alterations in religious matters, especially in the celebration of the Lord's Supper and the mass, should cease until an œcumenical council could be convoked and decide the questions at issue. Against this resolution the elector of Saxony, the margrave of Brandenburg-Anspach, the duke of Brunswick-Lüneburg, the landgrave of Hesse, the prince of Anhalt, and fourteen free cities of the empire made a solemn "protest," hence the name. Subsequently, it was applied also to the non-German Reformers, and used collectively of all denominations which emancipated themselves from and protested against the authority of the pope.

Protestantism. See PROTESTANT.

Pro'teus [Lat.], a name applied to *Hypochthon anguinus*, a perennibranchiate batrachian of certain deep Austrian caves. It has rudimentary eyes, is a foot long, white or pinkish, and has four feeble legs. It is very active in its habits, and carefully shuns the light. It is possibly the permanent larval condition of some higher form. It has both lungs and gill-tufts. Several other species or varieties are described.—PROTEUS is also a name sometimes applied to some of the lowest of the microscopic PROTOZOA (which see).

Proteus, in classic mythology, a subject, or according to some versions a son, of Poseidon, whose flocks of seals he tended, was gifted with the power of foretelling the future, but as he disliked prophesying, he used to escape from those who succeeded in catching him when he came up from the depths of the sea to sleep among the rocks, by assuming the most horrible or disgusting shapes.

Protococcus, an ill-defined genus of unicellular algæ, under which Kützing includes a number of species placed by Rabenhorst and others in *Pleurococcus*. The species of *Protococcus* consist of collections of single cells of a spherical shape, which are detached from one another and do not adhere together in fours or in aggregated groups. There is reason to suppose that most if not all the species are nothing but states of Chlamydomonos and other related algæ, in which there is a conjugation of zoosphores. According to those who adopt Schwendener's view of the alo-fungal nature of lichens, it is the genus *Protococcus* which supplies the so-called gonidia of the lichen genera *Usnea, Cladonia, Parmelia, Leconora, Lecidea*, etc. W. G. FARLOW.

Protog'enes, b. at Caunus, Caria, in the middle of the fourth century B. C.; lived mostly at Rhodes, and was one of the most celebrated painters of his time, though he was a middle-aged man when Apelles brought him into notoriety. When Demetrius Poliorcetes besieged Rhodes he refrained from attacking one of the weakest points because here was found the masterpiece of Protogenes, *Ialysus*. This picture was still at Rhodes in the time of Cicero. When Pliny wrote it was in Rome. Another celebrated work of his was *The Satyr*.

Pro'togine [Gr. πρῶτος, "first," and γίνεσθαι, "to be born"], a kind of granite or gneiss in which the mica is wholly or largely replaced by talc. It is found in Cornwall and other parts of Europe, and affords feldspar for the porcelain-makers.

Protohippus. See HORSE, FOSSIL, by PROF. O. C. MARSH, A. M., M. N. A. S.

Protonops'idæ [from *Protonopsis;* Gr. πρότονον, "a cord," and ὄψις, "resemblance"], a family of salamandroids represented by several large species in North America and Eastern Asia. The species want an anterior axial cranial bone; teeth are developed on the anterior margin of the palatine bones; the prefrontals and pterygoids are both developed; the frontals are embraced by the prolonged parietals and prefrontals; the orbito-sphenoid is separated from the proötic by a membranous wall; the occipital condyles sessile; premaxillaries separated; the vertebræ biconcave; the carpus and tarsus cartilaginous. The family has been thus defined by Prof. Cope for the reception of the genus *Protonopsis* (=*Menopoma*) of North America, and the *Megalobatrachus* of Japan and China. The former has a gill-slit on each side of the neck, but in the latter, although nearly allied, there is none. The family embraces the largest of living salamanders, the species of *Protonopsis* (*P. Alleghanensis* and *P. fuscus*) sometimes attaining the length of about two feet, while the *Megalobatrachus maximus*, or gigantic salamander of Japan, exceeds three feet in length. The *Protonopsis Alleghanensis* is popularly known as "hellbender," and at Pittsburg as "alligator." It is destructive to the spawn of fishes. THEODORE GILL.

Pro'tophytes [*Protophyta*, the "first plants"], a name for a section of the lower grade of the cryptogamic portion of the vegetable kingdom, which includes the Algæ and Lichenes—plants of the simplest structure, and which draw their support directly from the air and water; the counterpart section being Hysterophytes, or Fungi, which live upon decomposing or lifeless or living organic matter. The term was introduced by Endlicher, but is now rarely used. A. GRAY.

Pro'toplasm [Gr. πρῶτος, "first," and πλάσμα, "form"], the fundamental living substance, the lowest form of life, is an albuminoid matter belonging to the class of protein compounds, varying considerably in its chemical composition according to circumstances, existing in forms of different degrees of density from fluid to solid, but exhibiting under the microscope in all its forms an almost perfect homogeneity, and possessing the power of spontaneous motion, of growing through the assimilation of matters from the surrounding media, and of reproducing its kind by separating into new individuals. (See HISTOLOGY, EVOLUTION, and COMPARATIVE ANATOMY; and Huxley, *Protoplasm* (1868); James Ross, *Protoplasm* (1874); John Drysdale, *Protoplasmic Theory of Life* (1875); H. C. Bastian, *Evolution and the Origin of Life* (1875). J. H. Stirling, *As regards Protoplasm* (1869), is a criticism of the theory.)

Protopterus. See FOSSIL FISHES.

Protozoa. See COMPARATIVE ANATOMY.

Protract'or [Lat. *protractum*], an instrument for laying off angles in plotting. It may be semicircular, circular, or rectangular.

Proudhon' (PIERRE JOSEPH), b. at Besançon July 15, 1809. His parents were very poor, and he had to break off his education at the college of his native city very early, and seek employment in a printing establishment in order to aid in the support of his family. The punctuality with which he discharged his duty as a workman, the energy with which he employed his spare time for his further education, and the noble independence he showed by declining in 1830 an offer of an editorship of a journal because its ideas did not coincide with his own,—every trait of his earlier life shows him to have been a man of great earnestness and integrity. In 1837 he became a partner in a printing business, and in 1838 the academy of Besançon gave him a stipend of 1500 francs yearly for three years as a reward for an essay on general grammar which he had written and added as an appendix to a new

edition of Abbé Bergier's *Eléments primitifs des Langues.* He went to Paris with his stipend, and sent in 1840 two essays to the academy of Besançon—namely, *La Célébration du Dimanche* and *Qu'est-ce que la Propriété?* In the latter he assumes that simply by being born into the world every man has a right to a share of what the world contains of necessaries, comforts, and enjoyments; and from this assumption he develops his famous definition of property: "La propriété, c'est le vol." The academy was, of course, utterly scandalized. It withdrew the stipend, and even threatened him with a prosecution, from which, however, it was restrained by M. Blanqui, who declared the essay to be perfectly innocent. From 1843 to 1847, Proudhon lived in Lyons as superintendent of some carrying business on the rivers Saone and Rhone, but his two large works from this time were published in Paris, *De la Création de l'Ordre dans l'Humanité* (1843), in which he gives a new theory of political organization; and *Système des Contradictions économiques* (1846), in which he criticises the different schools of political economists in France and England very severely. When the revolution of February burst out in Paris, he immediately repaired to that city, and (Apr. 1) began the issue of a daily paper, *Le Représentant du Peuple*, in which he set forth the most radical opinions, and which in a short time made him immensely popular. It was not his idea, as sometimes stated, to abolish capital, but to abolish interest on capital, and thereby transfer it from individuals, in whose hands it accumulates by impoverishing the mass, to the community. He was elected a deputy to the Constituent Assembly, but he soon discovered that he could do nothing there with his ideas, as nobody would hear him when he spoke, and he consequently returned to the press. He was fined for his outrageous sarcasms and personalities against his adversaries, but his readers paid the fines. His paper was suppressed for its anarchical tendencies, but he started a new one. But in Mar., 1849, he was sentenced to three years' imprisonment for illegal publications, and he fled to Geneva. Shortly after, however, he returned and delivered himself up to the police. During his imprisonment he wrote *Confessions d'un Révolutionnaire, Gratuité du Crédit*, and *La Révolution sociale démontrée par le Coup d'état*, in which latter book he showed that anarchy and Cæsarism were the two only alternatives which France had to choose between at the moment of the *coup d'état.* After his liberation he lived retired for a long time, but he had to flee once more after the publication of *De la Justice dans la Révolution et dans l'Église* (1858), for which book he was sentenced to three years' imprisonment and a fine of 4000 francs. In 1860, when Napoleon granted an amnesty for all press offences, he returned to Paris. D. at Paris Jan. 19, 1865. Proudhon was an eminently talented man, but, like many gifted men who have read much in a desultory way, but never enjoyed a systematic education, his powerful reasoning led him utterly astray, because his premises were wrong. If it were true that to be born in the world involves by itself a right to a share of the world, the conclusion that our present institution of property is only a sort of robbery would be perfectly valid. There is no break in Proudhon's reasoning. But the premise is wrong. How can natural existence give to man a right which it does not give to the tiger? Or if man shall begin society by giving to the tiger what is the tiger's due, how much will there be left to himself? Proudhon's style is striking and pithy, but never eloquent, and sometimes the singularly mechanical movement of his reasoning produces nothing but empty and almost absurd paradoxes.

CLEMENS PETERSEN.

Prout, Father. See MAHONY (FRANCIS).

Prova'na di Collegño (GIACINTO), b. at Turin in 1794; d. at Baveno in 1856. He made, as captain of artillery, the Russian campaign with Napoleon, and on the fall of the emperor he retired to Piedmont, where he devoted himself to physical and military science. Prince Carlo Alberto made him his equerry, and he endeavored to inspire the prince with those liberal ideas which were proclaimed in the movements of 1821. Being compromised in these movements, he was forced into exile, and, with other liberal Italians, fought in Portugal, Spain, and Greece. At a later period he was appointed professor of geology at Bordeaux; in 1841 established himself in Florence, where he pursued his geological researches till 1848, when he hastened to the battle-field in Lombardy. After acting some time as minister of war, he was elected senator of the Subalpine kingdom, and was one of the deputation which carried to Carlo Alberto, then in Oporto, the address of the Subalpine Parliament. In 1852 was appointed minister from Piedmont to Paris. On his return to Italy he took command of the military division of Genoa. Collegno wrote various papers on geology, which were published at Paris between 1838 and 1844. In 1847 appeared at Turin his *Elementi di Geologia pratica e teorica.*

Provençal' Language, called also **Langue d'Oc** (the "language of *oc*"), because *oc* was its word for "yes," instead of the *oui* (formerly *oïl*) of the Northern French, which was called the *Langue d'oïl.* The Provençal was the most important of the so-called Romance languages. It is still a spoken tongue. There are in France (*Gotha Almanach*, 1873) some 10,655,000 people who speak Provençal and its dialects, besides 35,000 Catalans in Rousillon and vicinity; and in Spain the languages called Catalan, Valencian, Mallorquin, and Minorquin are full of Provençal elements. It was once spoken in Northern Italy. It is a much softer and more flowing language than the true French, and abounds in Latinisms. Its extensive poetical literature is a thing of the past; at present it is chiefly a colloquial tongue. (See FRENCH LANGUAGE AND LITERATURE, and TROVÈRES, by PROF. J. R. LOWELL, D. C. L.)

Provence', an old province of France, bounded E. by the Alps and S. by the Mediterranean, and now divided into the departments of Var, Bouches-du-Rhône, Basses-Alpes, and Vaucluse, derived its name from the Latin *Provincia*, by which the Romans pre-eminently designated it. After the fall of the Roman empire Provence came into contact with the Goths and the Arabs, and during the Middle Ages it was ruled by independent counts. In the twelfth century this land, celebrated for its delightful climate, its beautiful air, its roses, and its fruits, produced the famous Provençal songs. In 1481 it was annexed to the French crown by Louis XI.

Prov'erbs [Lat. *proverbium*], popular sayings which give a general idea in a concentrated, pithy, and striking form. It is the form which makes a saying popular and establishes it as a proverb, not the idea. The idea is in many proverbs, even the most frequently used, rather trivial, a mere truism, but when the form is captivating by its witticism or suggestive by its queerness, people take pleasure in repeating the saying, though perhaps only in a humorous or ironical way. Thus, proverbs become invaluable as materials for the study of languages, and especially for that of style. There is no better means of ascertaining the inner psychological structure of a language, the turn of its imagination, the color of its feeling, its genuine power of expression, its idiom, its style, than the study of its proverbs; and to follow a proverb in its wanderings from one language to another gives the most curious hints with respect to the individual character of these languages. Nevertheless, as the idea of a proverb generally is the result of a long and frequently repeated or otherwise striking and decisive experience, the proverb is often used by the people as a moral or prudential rule, and thus it becomes an historical document of considerable interest. The proverbs referring to the Roman Catholic clergy in the fifteenth century, to the French physicians in the sixteenth and seventeenth, to the lawyers of the German imperial chancellery in the seventeenth and eighteenth, to the English game-laws, and to the officers of the Russian or American civil service in our days, are rough but powerful historical illustrations; and the study of a good collection—for instance, of Hebrew, Latin, French, Spanish, or Danish proverbs—gives a rich insight into the respective characters of those nations. It was Erasmus who in modern times brought proverbs into fashion. His *Adagia* were published in Paris in 1500, and were soon followed by collections of national proverbs almost in every country; as, for instance, Peter Laale, *Adagia Latino-Danica* (Copenhagen, 1506); Johan Agricola, *Gemeine Sprikwoerde* (Wittemberg, 1528); Ferdinand-Nuñez de Guzman, *Refranes y Proverbios* (Salamanca, 1555); Florio, professor in the Italian language at the University of Oxford, *Giardino di Ricreatione* (1591), containing about 6000 Italian proverbs, etc. From time to time these collections were enlarged and revised, or superseded by new ones, of which there exists a great number in French, English, and German literatures, and which at different times seem to have been favorite reading with many people. The paramount importance which the idea of nationality obtains in the civilization of the nineteenth century has made the proverbs of the different nations an object of special study, and called forth collections of proverbs not only from China, Hindostan, Persia, and Arabia, but from almost every nook and corner of the world. One of the most interesting of these collections is the Finnish, *Suomen kansan sanalaskuja* (Helsingfors, 1842); and one of the most useful results of the whole movement is the dictionary of German proverbs by Wander, *Deutsche Sprichwörter Lexicon*, of which the first volume was published in 1867, containing about 45,000 German proverbs, with about 15,000 corresponding proverbs from the Bohemian, Danish, English, French, and other languages. As,

however, passionate industry and abstract enthusiasm, mixed together into a sort of collector mania, are not enough to make a good collection of proverbs, it cannot be denied that most modern collections contain a great deal of trash, and the rich materials now gathered still wait for a new Erasmus to select, arrange, and illustrate.

CLEMENS PETERSEN.

Proverbs, Book of. This title comes through the Vulgate from its Greek equivalent, Παροιμίαι, in the Septuagint. The term proverb, however, as applied to the species of divine utterance which the book contains, must be taken in its widest acceptation in order to make it embrace all the varieties of expression comprised in the collection. The original Hebrew term (*mashal*) means properly a "comparison," and in this connection has reference to the relations which the various subjects touched upon have to divine or human truths or concerns, and which are most naturally expressed by comparisons. But as every utterance of a truth involves a comparison, we find included in the book apophthegms, maxims, enigmas ("dark sayings" in the English version), and sometimes longer connected discourses of the same didactic nature.

It is said in 1 Kings v. 12 that Solomon spoke 3000 proverbs. Those of them which, uttered under the guidance of the Spirit, were of essential and permanent spiritual and moral worth were compiled into one collection, including chs. i.–xxix. of the whole book. A superscription prefixed to each of their three main divisions assigns it to Solomon. The first division (chs. i.–ix.) is devoted to a description of wisdom and an exhortation to its pursuit. The second (chs. x.–xxiv.) contains individual proverbs, and in its latter part brief proverbial discourses. The third (chs. xxv.–xxix.), though written by Solomon, was not edited by him, but only compiled by a learned society under Hezekiah (ch. xxvi.). In chs. xxx. and xxxi. we have three appendices. The first is by an author known to us only by the name Agur given to him in ch. xxx. 1; the second (ch. xxxi. 1–9) contains precepts for a King Lemuel given by his mother. *Lemuel* ("one belonging to God") is clearly only a symbolical name, and a general resemblance in style would seem to indicate that this, as well as the final section (ch. xxxi. 10–31), was also written by Agur.

While the Psalms represented the inner religious experience of God's people under the Law, the Proverbs exhibit the results of reflection upon the moral and spiritual value of its precepts in the concerns of life. Their enforcement and manifold illustration of the practical bearings and utility of the previous portions of revelation account for the insertion of the book in the canon, and the selection and inspiration of Solomon as its chief author. This collection of proverbs differs from all others, national or individual, not merely in its more profound wisdom, but also in its exhaustive treatment of religious and moral themes, which it occupies as an exclusive field. J. F. MCCURDY.

Prov'idence [Gr. πρόνοια; Lat. *providentia*], in theology, the doctrine which teaches that God upholds, preserves, and governs the entire universe which he has created. Like the Latin word from which it is immediately derived, it implies not only foresight, but forethought, preparation, or provision for, and therefore control, government. The scriptural doctrine affirms at the same time the omnipotent power of God and the liberty and responsibility of man. It is removed equally, on the one hand, from Stoicism and the rigid doctrine of Fate, and on the other from the Epicurean affirmation that it is an unworthy condescension of the Deity to concern himself about the affairs of men. (Pliny, *Hist. Nat.*, ii. 4 *seq.*) It includes the two essential ideas of preservation and of government. Preservation is to be distinguished from a continuous creation, into which some resolve it, since (1) this would confound two ideas essentially distinct; (2) would deny the reality of second causes; (3) would logically destroy the responsibility of man; and (4) refer everything to the immediate act of God. The scriptural affirmation is, that God upholds all things by the word of his power—that his agency is everywhere seen in the continued existence of his creatures and in the operations of nature. "By him all things consist," Col. i. 17; "In him we live and move and have our being," Acts xvii. 28. The *extent* of providence is unlimited. It includes all the creatures of God, intelligent and non-intelligent, since nothing is so high as to be above his control, nor anything so minute as to be beneath his notice. The *end* of providence is the realizing of the divine plan in the universe. The end is infinitely wise, holy, and beneficent. The means are such as are best adapted for the certain accomplishment of this end. Instead of chance, or necessity, or inexorable fate, to which gods and men are equally subject, the doctrine of the Scriptures substitutes the intelligent control of the omnipotent and omnipresent Jehovah, in accordance with designs as gracious as they are vast and inscrutable. The *method* of providence—*how* it is that God governs the world consistently with the liberty of rational beings—is to us incomprehensible.

That there are powers, unseen and supernatural, operating to sustain and control both nature and man seems to be the instinctive faith of the race, aside from the special teaching of revelation. This imparts a deep significance to many fables of ancient mythology. The belief in a providence of some kind seems wellnigh universal. It is affirmed or implied in the writings of ancient classical poets and philosophers, although disfigured with crude and unworthy conceptions of the divine nature or character. Cicero in his dialogues, *De Nat. Deorum*, states at considerable length the speculations of the most distinguished philosophers among the Stoics and Epicureans on the existence, attributes, and providence of a Divine Being. In lib. ii., while allowing the principle of pantheism—that God is the Universe and the Universe is God—he affirms the existence of minor deities, and then argues in favor of the divine government and providence—(1) from the existence of the gods, which implies their actual control of the world; (2) from the laws of nature—nature, properly interpreted, being another name for God; and (3) from the order, harmony, beauty, and wisdom manifested in the works of creation. Although not very complete or satisfactory, the argument shows the tendency of philosophic thought unaided by revelation. (See also *Tusc.*, Disp. i. 49 *et al.*)

The doctrine of providence was affirmed with great unanimity by the most distinguished early Christian Fathers, and maintained with equal subtleness of discrimination and strength of argument. The objections, too, early brought against the doctrine, were nearly the same as those revived and reaffirmed in our day. By some it was held to be unnecessary, or an implication of imperfect work on the part of the Creator, rudely supplemented afterward. Others "maintained that God concerned himself only about the genus, but not about the species," distinguishing between a general and a special providence—*gubernatio generalis* and *gubernatio specialis*. Still others held it to be derogatory to the Supreme Deity to suppose that he would condescend to notice the small concerns of men. Origen represents Celsus as affirming that God interferes as little with the affairs of men as with those of monkeys and flies. The opposite and Christian view of this article of faith was eloquently maintained in the East and the West by Chrysostom and Theodoret, by Augustine and Salvian. Augustine especially objects to the comparison of God to a master-builder, whose work remains though he himself withdraws. "The world would at once cease to exist," he says, "if God were to deprive it of his presence." Nearly two centuries earlier, about A. D. 230, Minucius Felix, in his apologetic dialogue entitled *Octavius*, in a passage of singular beauty, says: "Nec nobis de nostra frequentia blandiamur; multi nobis videmur, sed Deo admodum pauci sumus; nos gentes nationesque distinguimus; Deo, una domus est mundus hic totus. Reges tantum regni sui per officia ministrorum universa novere; Deo indiciis non opus est. Non solum in oculis ejus, sed et in sinu vivimus."

The doctrine of providence is not inconsistent with the idea of a government of law. The Scriptures affirm that God is the creator of the universe. He is the author of what we call the laws of nature, and can surely change or suspend or overrule them. But he does not govern the world arbitrarily, but according to a fixed plan and for a great end. The laws of nature are the ordinances of God, but a man even may use some powers of nature to control or limit other powers. So, in a far higher sense, and with a method infinitely more perfect, may the Creator control that which he has made. Nor can we deny that he may act directly upon the rational mind, as one finite mind may seek to modify another; or upon both nature and spirit by methods to us now, and perhaps always, incomprehensible.

Some of the proofs of the doctrine are the following: (1) It is inferred from the idea of a personal God, infinite in intelligence, wisdom, goodness, and power; (2) from the evidence of intelligence and design in nature; (3) from the evidences in history of moral order and law. History would otherwise be a tangled skein without beginning or end, without significance, and incapable of harmony or intelligent interpretation. The story of races and nations, the epochs which seem to mark the movements of society and the progress of civilization, would lose their importance, and our hope for the world would vanish, if we destroy the reality and the end of providential control. (4) From the experience of individuals, which may be misinterpreted, but cannot be overlooked altogether. (5) The proofs from the Holy Scriptures: (*a*)

in the passages which indicate or declare the government of God over nature, over irrational animals, over men and nations; (*b*) in the lives of eminent men—*e. g.* Abraham, Moses, Elijah, Saul, David, Daniel, Paul; (*c*) in the Jewish history, conspicuously everywhere; (*d*) in passages which affirm the truth of prophecy; (*e*) and in those which affirm the efficacy of prayer.

New interest, if not importance, has been given to this subject by the tendency of modern speculative thought.

The literature of this subject is voluminous. Some of the most important works which treat of the history of opinion, are—(*a*) in philosophy: Ritter's *History of Philosophy* (12 vols.); *History of Ancient Philosophy* (4 vols.), translated from the first volumes of the general history by A. J. W. Morrison; Ueberweg's *History of Philosophy*, translated by Prof. G. S. Morris (2 vols.). (*b*) In theology: Neander's *General Histories of the Christian Religion and Church*, translated by Prof. Torrey (5 vols.); Hagenbach's *History of Doctrines*, translated by Prof. H. B. Smith (2 vols.); Van Oosterzee, *Christian Dogmatics* (2 vols.), in "Theological and Philosophical Library," edited by Profs. Smith and Schaff; Knapp's *Christian Theology*, translated by Pres. Leonard Woods; and Rev. Dr. Charles Hodge's *Systematic Theology* (3 vols.). S. G. Brown.

Prov′idence, county of Rhode Island, bounded N. and E. by Massachusetts and W. by Connecticut. Area, 413.3 sq. m. It is uneven, and in part not naturally fertile, but is in general well cultivated and productive. Market-garden products, potatoes, and hay are extensively raised. Limestone is obtained in some places, and a hard, stony anthracite was formerly mined. It has very extensive manufactures of cotton goods, clothing, flour, hardware, iron and castings, jewelry, leather, machinery, metallic wares, woollens, screws, carriages, saddlery, boots, shoes, furniture, worsteds, soap, candles, and many other kinds of goods. Traversed by Boston and Providence and Worcester, Hartford Providence and Fiskhill, Providence and Stonington, Providence Warren and Bristol, and other railroads. Providence, the capital, is also the seat of an extensive coastwise trade. P. 149,190.

Providence, p.-v., Pickens co., Ala. P. 775.

Providence, tp., Hardin co., Ia. P. 1335.

Providence, p.-v. and tp., Saratoga co., N. Y. P. 1155.

Providence, v., Mecklenburg co., N. C. P. 1936.

Providence, v., Pasquotank co., N. C. P. 520.

Providence, v., Rowan co., N. C. P. 1516.

Providence, tp., Lucas co., O. P. 863.

Providence, tp., Lancaster co., Pa. P. 1906.

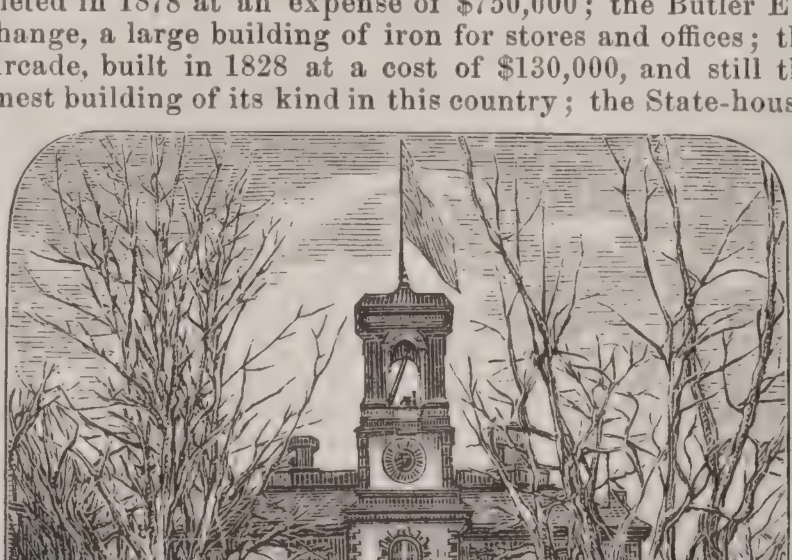
Providence, p.-v., Luzerne co., Pa., on Delaware and Hudson R. R., included in the city of Scranton.

Providence, a port of entry, the second city in New England, the seat of justice of Providence co., and one of the capitals of the State of Rhode Island, is at the head of navigation on Narragansett Bay, 35 miles from the ocean, about 178 miles N. E. from New York, and 44 S. S. W. of Boston, on one of the principal lines of railroad communication between those two cities; lat. 41° 49′ 22″ N., lon. 71° 24′ 48″ W. Two small rivers, uniting in the centre of the city, divide it into three portions—the E. side, the W. side, and the Tenth ward. The W. side and the Tenth ward contain, each, nearly 6 sq. m. of territory, and the E. side more than 3, making 14.76 sq. m. within the limits of the city. The surface of Providence is very uneven; the E. side rises, in some places quite abruptly, to a height of over 200 feet, and is generally considerably above tide-water; the W. side is mostly an extended sandy plain, its highest elevation about 78 feet above the harbor; the Tenth ward contains much farming land, with hills of considerable height and corresponding valleys. In the geographical centre of the city, forming the head-waters of Narragansett Bay, is the Cove, of an elliptical form, 1 mile in circumference, surrounded by a park filled with fine shade trees, and though sadly neglected, it is, in its situation and capabilities, one of the most attractive features of any city in this country.

The city is divided into 10 wards, and its government is vested in a mayor, with 1 alderman and 4 councilmen from each ward. Some of the most important expenses of the government for the year ending Sept. 30, 1875, were as follows: public schools, $217,160; school-houses and lots, $110,959; fire department, $128,665; lighting streets, $144,965; highways, $229,184; police, $228,630; opening streets, $181,892. Several hundred street gaslights in the central portion of the city are lighted simultaneously by electricity. Providence has no large public parks. The two most important are Roger Williams Park, and Field's Point. The former contains 102.6 acres, and came into the possession of the city in Nov., 1871, by the will of Miss Betsy Williams, a descendant of Roger Williams, as a public park and for the erection of a monument to her ancestor. Field's Point contains 37 acres, with salt water on both sides, and delightfully situated for health and recreation in the summer season. There are in Providence 10 lines of horse railroads radiating from Market Square, near the geographical centre, to every portion of the city and to the neighboring towns. They are all owned by one company, and are under excellent management. Providence began a new era of prosperity by the introduction of water from Pawtuxet River, 6 miles distant, in Nov., 1871. The waterworks up to Sept. 30, 1875, had cost $4,513,205, and the receipts to the same date had been $640,834. The water is excellent, and the supply ample for 2,000,000 people. At the present time (Jan., 1876) there are 903 hydrants distributed through the settled portions of the city, each capable of throwing from four to six large streams of water over the highest buildings, and enabling the fire department to dispense almost entirely with the use of steam fire-engines. Under the direction of the water commissioners the city is rapidly constructing

The City Hall.

a comprehensive and scientific system of sewerage. The sewer department has already expended $1,120,294 for this object. The city has long been well known for its elegant and spacious private residences, surrounded by beautiful and extensive grounds, but its public buildings have not been specially noteworthy. Recently, the spirit of progress is fast changing the aspect of the city in this respect. We may name the city hall, built of granite, to be completed in 1878 at an expense of $750,000; the Butler Exchange, a large building of iron for stores and offices; the Arcade, built in 1828 at a cost of $130,000, and still the finest building of its kind in this country; the State-house,



The State-house at Providence, R. I.

built in 1762; several very fine buildings erected by insurance companies; and the Narragansett Hotel, built of brick, seven stories high, and to be completed in 1876 at a

cost of about $800,000. The court-house and the library building of Brown University, now building, will be among the finest architectural ornaments of the city.

There are 79 church organizations in Providence, the four denominations having the largest number being—Baptist and Free Baptist, 18; Episcopalian, 12; Methodist and Roman Catholic, 10 each. Only a few of the church edifices are worthy of notice. The First Baptist, built in 1775, is noted for its beautiful spire; the First Unitarian, St. John's Episcopal, and the Beneficent Congregational are among the older and well-known church edifices, though some more recent are still more expensive. The charitable institutions of Providence are numerous and well supported. The Butler Hospital for the Insane, incorporated in 1844, with invested funds amounting to $90,000, and having about 150 patients at the present time, is delightfully situated, with extensive grounds, both cultivated and native woodland, on the W. bank of Seekonk River. From the beginning this hospital has maintained a high reputation for the treatment of the insane. The Rhode Island Hospital, opened for patients Oct. 1, 1868, at a cost of $450,000, had during the last official year 438 patients, at an expense of $33,298. The Home for Aged Women has a fine brick structure erected on a bluff overlooking the bay at a cost of $30,000. The Colored Orphan Shelter has about 30 inmates; the Children's Friend Society constantly cares for about 100 white orphans; the Providence Nursery and the Home for Aged Men are of more recent origin. The Dexter Asylum, for the use of the city poor, is a large brick edifice in an elevated situation and surrounded by 39 acres of land in the highest state of cultivation. It has about 125 inmates. This estate, with considerable other property, was given to the town of Providence in 1827 for the benefit of the poor by a benevolent citizen, Mr. Ebenezer Knight Dexter. The income from the property is sufficient to pay all the expenses of the Dexter Asylum. The Rhode Island Catholic Orphan Asylum, established in 1860, in charge of the Sisters of Mercy, has 175 orphans in a fine building on Prairie avenue. The incorporated educational institutions of Providence, as well as the public schools, are of a high character. Brown University, a Baptist institution, though under a very liberal charter and management, was established in Warren in 1764 and removed to Providence in 1770. It occupies extensive and highly eligible grounds on the high land E. of the centre of the city, has a valuable library of 45,000 volumes, and a large philosophical and chemical apparatus. An effort is now in progress to increase largely the endowment of the university. There are now 16 professors and 255 students. The Yearly Meeting Boarding School, under the control of the Society of Friends, has a large estate on the high land near the Dexter Asylum, is liberally endowed, and has 180 pupils, equally divided between the two sexes. The female academy of the Sacred Heart of Jesus, established in 1873, occupies a fine estate in the Tenth ward and has 35 boarders. Besides this, the Roman Catholics have 9 academies and free schools in the city, with 2759 pupils (1092 boys, 1667 girls) at this date (Jan., 1876). The public schools of Providence consist of one high school and another in progress, 11 grammar, 31 intermediate, and 36 primary schools. The number of pupils in the public schools in Nov., 1875, was 11,862, and the expense of the schools for the year ending Sept. 30, 1875, was $217,160, besides $110,959 spent during the year for school-houses and lots. The libraries in Providence render efficient aid in the cause of public education. The Athenæum was incorporated in 1836, and now has a capacious stone building with a well-filled reading-room and a valuable library of 35,100 volumes. The Friends' School, Brown University, the Franklin Lyceum, the Franklin Society, the Mechanics' Association, the Young Men's Christian Association, and other societies have each valuable libraries.

Providence has 4 daily, 1 semi-weekly, 6 weekly, and 2 monthly newspapers.

The penal and reformatory institutions of Providence are—the State prison, the Providence county jail, and the Providence Reform School. The prison and jail are in one building and under the same management, and had on Jan. 1, 1876, 56 State prisoners and 191 inmates of the jail. A new State prison is building at the State farm, 6½ miles from the city, to which these prisoners will be removed. The Providence Reform School, established in 1850, is a model institution of its kind. It is beautifully situated at Tockwotten, overlooking the bay, is under the control of a board of trustees elected annually by the city council, and has an average of nearly 200 inmates, of whom about 30 are girls.

There are 12 State banks in Providence, with an aggregate capital stock of $2,861,500; also 25 national banks, with a capital of $15,646,800. There are also 9 savings banks in the city, with deposits on Nov. 27, 1875, amounting to $25,098,684, divided among 46,174 depositors.

Providence is the centre of a large manufacturing district, and therefore has an extensive trade, especially in cloths, chemicals, dyestuffs, coal, etc. During the year 1875 the sales of print cloths alone in the city amounted to 3,324,780 pieces of 40 yards each, equal to 75,563 miles of cloth. This was a slight increase over the year 1874, but was only a little more than one-third the amount in 1869. The commerce of Providence is mostly coastwise. During the year 1875 there were 6464 arrivals at the port of Providence, of which 91 only were foreign. The amount of duties collected during the year was $203,671. Some of the receipts by vessels and by railroad were as follows: cotton, bales, 249,897; flour, barrels, 345,440; grain, bushels, 2,107,000; coal, tons, 691,847. Providence is largely a manufacturing city, and besides those within its own limits it is the head-quarters of a very extensive manufacturing district, particularly of cotton and woollen cloths, yarns, etc. For the year ending July 1, 1875, within the city limits, the value of the products of woollen manufactures was $4,291,573; of the cotton manufactures, $1,874,300; of calico prints, $3,850,828; and of iron manufactures, $8,488,402. The iron manufactures include steam engines and boilers, butt-hinges, screws, locomotives, muskets, iron castings, and others of less importance. Among the other manufactures of Providence there are 137 establishments for making jewelry and silver-ware. During the year ending July 1, 1875, these establishments employed 3068 hands, paying out $2,024,324 in wages; value of the materials used during the same period, $3,253,136, and the total value of the products, $7,177,131.

The registration of births, marriages, and deaths in Providence during the last 25 years has been complete and perfect, and the results show that it is a very healthy city. During the year 1875 the proportion of deaths to population was only 19.02 per 1000, or 1 death in 52.57, and the average for 20 years previous was 19.81 per 1000, or 1 in 50.47. During the same period 1 child was born to each 34.22 of the population, and 1 person was married in 38.33. The population of Providence at different periods has been as follows: in 1830, 16,836; in 1840, 23,172; in 1850, 41,513; in 1860, 50,666; in 1870, 68,904; in 1875, 100,675. Of the population in 1875, 71,438 were born in the U. S. and 29,237 in foreign countries.

Providence, settled by Roger Williams in 1636, was incorporated as a town in 1649, and as a city in 1832. During the first 140 years after its settlement the town increased very slowly, and in 1776 the population was only 4355, or considerably less than that of Newport. Since the close of the Revolution it has steadily increased in population. E. M. Snow.

Providence, v., Orangeburg co., S. C. P. 880.

Providence, v., Sumter co., S. C. P. 1485.

Providence, tp., Fairfax co., Va. P. 3136.

Providence Church, v., Baker co., Ala. P. 1024.

Providence Church, v., Lee co., Ala. P. 382.

Providence, Sisters of, a Roman Catholic sisterhood founded in 1828 at Montreal by Madame Émilie Tavernier; canonically established in 1844.

Prov′ince, in ecclesiastical geography, usually denotes that union of several dioceses which constitutes an archbishopric, and is consequently often conterminous with several states, with an entire country, or even with several countries. In the grand divisions of the Jesuit order North America is considered a province, all the members of the order therein resident being subject to a single superior.

Prov′incetown, p.-v., Barnstable co., Mass., on Old Colony R. R., at the extreme end of Cape Cod, has one of the finest harbors in the U. S. The Pilgrim Fathers first landed here from the Mayflower. Provincetown contains a public library, 5 churches, 2 banks, 4 fire and marine insurance companies, 1 newspaper, 4 hotels, and a paid fire department. The principal occupations are whaling, cod and mackerel fishing. P. 3865.

F. P. Goss, Ed. "Advocate."

Provins′, town of France, department of Seine-et-Marne, has cold mineral springs used for bathing, and manufactures of leather, tiles, and perfumeries from roses which are extensively cultivated in the vicinity. P. 7547.

Provi′so [Lat.], in law, a clause in a deed or contract, or in a statute, containing either a condition that something shall or shall not be done in order that the agreements comprised in the other clauses shall take effect, or a limitation upon the otherwise too general and comprehen-

sive terms of the instrument. It ordinarily commences with the words "Provided that," and when employed in a deed it implies a condition, unless the context clearly shows that it was intended merely to be a covenant. For example, the clause in a mortgage whereby the conveyance is declared to be void upon payment of the debt secured is strictly a proviso, and in the old forms of the instrument it began with the phrase "Provided that," etc. The object of a proviso when inserted in a statute is to limit, in specified contingencies, the otherwise too general and comprehensive terms of the enactment, by declaring that they shall not take effect under certain circumstances, or shall not apply to certain classes of persons or things. In this use it is analogous to, but not identical with, an exception; the latter takes something out of the statute absolutely—the former, if correctly employed, operates conditionally. In many instances, however, from carelessness or ignorance in the drafting of statutes, clauses appear in the form of provisoes which contain no condition, but are to all intents and purposes exceptions in their scope and effect.

JOHN NORTON POMEROY.

Proviso, p.-v. and tp., Cook co., Ill. P. 2091.

Pro′vo City, p.-v., cap. of Utah co., Ut., on Utah Lake. P. 2384.

Pro′voost (SAMUEL), D. D., b. in New York Mar. 11, 1742, of Huguenot ancestry; graduated at King's College, New York, 1758, and the University of Cambridge, England; entered the Church of England ministry 1766, and in the same year became assistant minister of Trinity church, New York; lived in retirement during the American Revolution; became in 1783 rector of Trinity church, and in 1787 was consecrated bishop of New York at Lambeth by the archbishops of Canterbury (Moore) and York (Markham), assisted by the bishops of Peterborough (Hinchliff) and of Bath and Wells (Moss). Bishop White of Pennsylvania was consecrated at the same time. In 1785, Bishop Provoost was chaplain of Congress, and in 1789 chaplain of the U. S. Senate. He resigned the care of Trinity church in 1800, and in 1801 received a coadjutor. D. in New York Sept. 6, 1815.

Prov′ost-Mar′shal, in the army and navy, an officer who attends to the execution of martial law, the fulfilment of sentences by courts-martial, and the like. He preserves order in towns and districts under military control, and has certain summary powers under the articles of war.

Pruden′tius (AURELIUS CLEMENS), b. in 348 A. D. at Cæsaraugusta, Spain; studied law; practised as an advocate; held several high positions, and was elevated into the patrician order by the emperor Theodosius, but retired afterward from public life and devoted himself exclusively to theological studies and religious poetry. Of his *Liber Cathemerinon* and *Liber Peristephanon*, two collections of hymns, several pieces became very popular, were translated into other languages, and are still in use in our times. Among his other books, all written in Latin verse, are *Hamartigenia*, on the origin of sin; *Psychomachia*, on the contest between good and bad in the human soul; *Contra Symmachum Libri Duo*, etc. There are complete editions of his works by Arevalus (Rome, 1788), by Obbarius (Tübingen, 1845), and by Dressel (Leipsic, 1860).

Prune [Lat. *prunus*, a "plum"], the dried fruit of certain kinds of plums. The finest sorts are called *prunelles*. Table-prunes are prepared by drying choice plums, like the greengage and the St. Catharine. The best prunes are from France, but Germany furnishes large amounts of a coarse kind. Turkey and Spain also export prunes. The greater part of the French prunes are dried St. Julien plums. They are used as a mild laxative for children, and are extensively employed in cookery. They are sometimes dried by artificial heat and sometimes in the sun, or perhaps more commonly are half dried by stoves, the process being finished in the sun.

Prun′ing consists in cutting off parts of a tree or shrub, either for the purpose of producing a certain shape or of increasing the production of fruit or timber. Forest trees are pruned in order to increase the quantity of timber in the trunk by diminishing the side branches, beginning at the lower part of the tree. In fruit trees the branches are thinned out in order to admit the air and light more freely to the leaves and blossoms, and to concentrate and increase the nourishment for the branches which remain. In pruning for the purpose of producing fruit it is necessary to know on what branches and buds the fruit grows. The grape generally appears on shoots of the current year, the peach on those of the preceding year, and the apple and pear on wood of two or three years' growth. The shoots are cut off close to the buds, or at a distance from them not greater than the diameter of the branch to be cut off, in order that the cut may be readily covered with bark the same or next year.

Prun′tytown, p.-v., cap. of Taylor co., West Va.

Pru′nus Virginia′na, the botanical name indicating the genus and species of the wild or choke cherry of the U. S., belongs to the natural order Rosaceæ, sub-order or family Amygdaleæ, is found chiefly on river-banks in the Northern States, is a tall shrub, with grayish bark, flowers in May, bears a reddish fruit which turns to dark crimson, has a smooth stone, and is very austere and astringent until fully ripe. It is the *P. obovata* of Bigelow, the *P. serotina* of several other botanists.

Pruri′go [Lat., "itching"], a skin disease characterized by intense itching and by the presence of small points filled with a watery liquid. It usually occurs in patients who are poor, ill-fed, and filthy. Cleanliness and abundant food should always be provided, but the cure by no means always follows. In fact, the disease may be palliated, but scarcely cured. It is especially bad in winter nights. Rubbing with the solution of calcium sulphide and bathing in alkaline, tarry, and salt washes are to be recommended. Arsenic is sometimes highly beneficial.

Prusa. See BRUSA.

Prus′sia [Ger. *Preussen*], **Kingdom of** (area, 348,337.89 quadrate kilomètres; pop. 24,693,487 in 1871), is divided into the following provinces: Prussia (area, 62,457.86 q. k.; pop. 3,137,545); Brandenburg (area, 39,893 q. k.; pop. 2,863,229); Pomerania (Ger. *Pommern*), (area, 30,119.63 q. k.; pop. 1,431,633); Posen (area, 28,951 q. k.; pop. 1,583,843); Silesia (Ger. *Schlesien*), (area, 40,289.16 q. k.; pop. 3,707,167); Saxony (*Sachsen*), (area, 25,240.89 q. k.; pop. 2,103,174); Sleswick-Holstein (area, 17,522.86 q. k.; pop. 995,873); Hanover (area, 38,478.9 q. k.; pop. 1,963,618); Westphalia (area, 20,199.10 q. k.; pop. 1,775,175); Hesse-Nassau (area, 15,895.48 q. k.; pop. 1,400,570); Rhenish Prussia (Ger. *Rheinland*), (area, 26,974.88 q. k.; pop. 3,579,347). To the Crown belong, furthermore, the estates of Hohenzollern and the duchy of Lauenburg. With respect to nationality, 2,432,000 of the inhabitants of Prussia are Poles, 50,000 Czechs, 83,000 Wends, 145,000 Danes, and the rest Germans. With respect to creed, 16,041,215 are Evangelical, 8,268,309 Roman Catholics, 325,565 Israelites, and about 60,000 belong to other denominations. The Roman Catholics are settled chiefly in Posen, Westphalia, and Rhenish Prussia. The country forms one continuous mass, comprising the whole of Northern Germany to the river Main. The northern part is flat, dotted with lakes, sandy in some places, fertile in others; the southern is traversed by the Riesengebirge, Sudetes, Rhön, Spessart, Taunus, and Weser mountains and the slate mountains of the lower Rhine. The coast has numerous bays, of which Kiel and Jade bays are used as naval stations, and some large inlets, of which the Kurische and the Frische Haffs are the most important. The principal rivers are—to the North Sea, the Elbe, with its affluents, the Havel, Spree, and Saale; the Weser, with its affluents, the Fulda and Werra; the Rhine, with its affluents, the Main, Mosel, Lahn, Sieg, Wupper, Ruhr, and Nahe; and to the Baltic, the Memel, Vistula (Ger. *Weichsel*), and Oder. (See GERMAN EMPIRE.)

The principal occupation of the inhabitants is agriculture; next follow cattle-breeding and mining; finally, manufactures and commerce. The productive soil is estimated at 126,000,000 acres, of which 69,000,000 are arable land and garden, 25,000,000 meadow and pasture-ground, and 31,000,000 forest. Agriculture is chiefly carried on in Sleswick-Holstein, Hanover, Pomerania, Posen, and Prussia. Rye, wheat, beet-root, tobacco, and hops are the principal products. The cultivation of the vine flourishes on the Rhine and its affluents. The forests of the state occupy about 10,000,000 acres. Prussia owns about 2,500,000 horses, most numerous in Holstein, Hanover, and Prussia, the finest studs being established at Trakehnen, Neustadt, and Graditz; about 8,000,000 cattle, 24,000,000 sheep, 5,000,000 swine. The mines and salines yield annually about 800,000,000 cwts., with a value of about 250,000,000 thalers; the most important products are coal, chiefly mined at Leuthen and Waldenburg in Silesia, on the Saar and the Ruhr, iron, zinc, copper, lead, and rock-salt. Much amber is found on the Baltic coast. The principal manufactures are metallic wares, cotton goods, silk, velvet, linen, and cloth. Westphalia, Rhenish Prussia, Silesia, and Saxony are in this respect the most important provinces. The trade is principally carried on in the produce of the country, though the transit-trade with Southern Germany is considerable. (See GERMAN EMPIRE.)

Popular education has reached a comparatively high standard, being maintained by the state and compulsory on the citizens. There are about 30,000 elementary schools, more than 500 middle schools, 195 gymnasiums, with 26 pro-gymnasiums, about 80 normal schools, 9 universities—namely, in Berlin, Bonn, Breslau, Göttingen, Greifswald,

Halle, Kiel, Königsberg, and Marburg; an academy of science at Berlin; academies of art at Berlin, Düsseldorf, Hanover, Kassel, and Königsberg; polytechnic and agricultural schools in several cities; schools of industry and art; and an academy of music at Berlin.

The organization of the army is very comprehensive, and regulated with the greatest care down to the most minute details. It is so closely connected with all the administrative institutions of the country, and plays so conspicuous a part, that the whole country may well be called one immense camp, in which the civil organization has to adjust itself to the military. Every Prussian capable of bearing arms belongs to the standing army for a period of seven years, generally from the twentieth to the twenty-seventh year of his age, serving the first three years in the ranks and the last four in the reserve. Then he belongs for a period of five years to the *Landwehr*, thus making military service for twelve years in all. Besides this, all men capable of bearing arms, but not serving in the army or navy, belong to the *Landsturm*. The number of the recruits annually levied amounts to about 143,000. The organization of the army is based on a territorial principle; that is, the divisions of the army correspond to those of the country into provinces, governments, etc., and in each village throughout the whole country tables are hung up by the government indicating to which regiment and battalion the men of the district belong. There is in this organization a remembrance of the ancient Germanic custom, according to which the army was composed of families and tribes—that is, kinsmen and friends. The number of army corps corresponds to that of provinces; only the guard is composed of picked men from the whole country, and has its head-quarters at Berlin. In consequence of military conventions concluded with the minor states, and the establishment of the German empire, the Prussian army has been combined with that of the rest of Germany, its organization being introduced throughout the army of the German Empire (which see). In peace the Prussian army, including the contingents of the minor states, but exclusive of the armies of Saxony, Bavaria, and Wurtemberg, consists of 212,993 infantry, 51,401 cavalry, 35,550 artillery, 7475 pioneers, and 3490 in the train. In war these figures are increased to 353,848 infantry, 14,364 chasseurs, 46,954 cavalry, 57,647 artillery with 1404 guns, 16,871 pioneers, and 30,031 in the train.

The state of finances is, according to the budget of 1875, as follows: Total receipts, 694,498,919 marks—namely, from direct taxation, 146,659,000; indirect taxes, 46,105,900; mines and salines, 114,346,868; railways, 172,616,210; domains, 71,751,564; expenses the same; public debt, 1,014,227,807 marks; interest, 38,927,635; amortization, 15,599,017 marks.

A Prussian country and a Prussian people first appear in history toward the end of the tenth century. The country comprised the present province of Prussia, and received its name from the Christian missionaries. The people were heathens, and became known to the rest of Europe through the attempts at Christianizing them. It is true that Phœnician and Greek sailors visited the coasts of this country in the remotest ages, attracted thither by the amber-trade, but the notices of the country which may be derived from those sources are fabulous. In the tenth century Bishop Adalbert of Prague endeavored to convert the Prussians, but was killed by them in 997. In the beginning of the eleventh century Duke Boleslaw Chrobry of Poland invaded and subjugated the country, and baptized a number of the inhabitants, but after a long and bloody contest the Prussians once more made themselves independent. In the beginning of the thirteenth century the Bernardine monk Christian arrived among them as a missionary. He understood that without extraordinary military exertions the people could never be converted; he gained the interest of Pope Innocent III. for the cause, was appointed bishop of Prussia in 1215, raised an army of crusaders, and penetrated into the country. Having been defeated by the heathens, he founded in 1225 the order of the Knights of Christ, also called the order of Dobrin, whose aim was the conversion of Prussia; and as this order also was defeated, he sought aid from the German order. This order had been founded in Asia during the Crusades, in 1190, for the double purpose of defending the Holy Land and taking care of sick and suffering pilgrims, and with the consent of the pope it now undertook the task of converting pagan Prussia. In the Orient the state of affairs was very difficult, and offered no prospects to the order of increasing its power, while in Prussia an opportunity of acquiring land presented itself. The German emperor, Frederick II., promised to invest the order with all the land they should conquer here, and to give to the grand master the dignity of a prince of the Roman empire. After a long and difficult contest, the order, supported by several zealous princes, subjugated the whole country, conquering it piece by piece, and covering it with fortified castles, around which it settled Christian and German immigrants. In 1283 the conquest was accomplished; the order ruled Prussia; the fortresses of Marienburg, Brandenburg, and Königsberg were built, and the whole country was divided into districts, which were governed by conventions of knights. In 1309 the grand master moved his residence from Venice to Prussia, and made Marienburg the head-quarters of the order. The national colors of the present kingdom were derived from the official dress of the order—a white cloak with a black cross. For more than 200 years the order ruled the country, and many names of valiant grand masters—such as Hermann von Salza, Winrich von Kniprode, Heinrich von Plauen, and others—became celebrated in the hot contests for the acquirement and maintenance of supremacy; but after that time the order broke down from the enmity of Poland and Lithuania and by its own internal deterioration and discord. The towns, which had grown rich, and the country nobility, would not submit to the egotistical rule of the knights; in 1440 they formed a league against the order, and in 1454 they offered the leadership to the king of Poland. The order carried on the war against united Poland and Lithuania by mercenaries, but by the Peace of Thorn (Oct. 19, 1466) it ceded the whole western half of its possessions, which was incorporated with Poland, and took the oath of allegiance to the Polish king for the rest. The order now endeavored to regain its former importance by electing for grand masters foreign princes, who added an independent power of their own to that of the order; but in this way it lost all, even its existence. In 1511 the margrave of Brandenburg, Albrecht, was elected grand master, and he dissolved the order and transformed the country into a temporal dukedom. His reasons for this extraordinary step were the personal advice of Luther, and, in general, the Reformation, which had spread widely in Prussia, and stood in glaring opposition to the monkish institution of the order. Most of the knights received large fiefs and married, the rest emigrated to Germany. Thus, the connection between Prussia and Brandenburg was introduced. It was not finally accomplished, however, until after the death of Duke Albrecht Frederick (Aug. 28, 1618). In the interval Prussia was held by a lateral branch of the electoral family of Brandenburg, but as this branch became extinct in the above year, it fell as a heritage to the principal line. It was, however, still a fief of the Polish crown, and continued so until 1656, in the time of Frederick William, the great elector—*Der Grosse Kurfürst*—whose long and successful reign (1640–88) denotes one of the most prominent stages in the development of the Prussian state. He was only twenty years old when he assumed the sway; nevertheless, he pursued with unflagging energy the plan of uniting all the loose and broken-up pieces of land which he inherited into a compact and well-ordered whole. His first task was to improve the state of the finances by strict economy, to encourage commerce and industry, art and science, and to form an effective army—not of mercenaries, but of the sons of the country. By the Treaty of Westphalia he obtained Further Pomerania and Kammin and the districts of Halberstadt, Magdeburg, and Minden. Next, he allied himself with the Swedes against Poland, gained the victory at Warsaw (July 20, 1656), and acquired by the convention of Labian the duchy of Prussia as an independent possession, not as a fief of the Polish crown. Immediately after he allied himself with the Poles against Sweden; defeated, in conjunction with Polish and imperial troops, the Swedes at Nyborg in 1657, and obtained Lauenburg and Bütow. He interfered in all affairs in which there was power or reputation to gain; supported the emperor and the Poles against the Turks, and opposed with great energy the intrigues of Louis XIV. by supporting Holland. With France he was compelled to make peace June 16, 1673, because French troops threatened his Westphalian possessions. Next year, however, when the French invaded the German Rhine countries, he advanced toward the upper Rhine with 20,000 men to support the imperial troops. Louis XIV. now caused the Swedes to march from Pomerania into Brandenburg, in order to arrest his march by threatening his own country. Nevertheless, the elector would not leave the imperial army, but asked the emperor to send relief to Brandenburg. As this was not done, he broke up his camp and hastened home with his best troops. June 15, 1675, he fell unexpectedly upon the vanguard of the Swedes at Rathenow, and on June 18 he attacked with 5600 horse the strong Swedish army at Fehrbellin, and drove it in wild flight out of the country. This victory caused a great sensation, and increased the fame of the elector very much. He pursued his victory with great energy; conquered Stettin in 1677, Stralsund in the fol-

lowing year, and occupied the whole of Pomerania at the close of 1678. But the emperor saw this growth of his power with dismay, and he stood alone against France and Sweden, so that he was compelled to conclude peace when a French army of 30,000 men invaded the duchy of Cleves. By this peace, concluded at St. Germain-en-Laye, June 29, 1679, he had to surrender to Sweden what he had conquered of Pomerania, but in indemnification he received from France 300,000 crowns, and he used the momentary good relations with this power to send a fleet to Spain in order to enforce the payment of a large sum due as subsidies. His relations with France became once more hostile when in 1685 he gave refuge to the Protestants who were driven out of France by the Revocation of the Edict of Nantes, and of whom more than 20,000 found a home in his states. Apr. 8, 1686, he entered into an alliance with the emperor and Holland, but he died Apr. 29, 1688, leaving to his son an effective army of 30,000 men, a treasure of 800,000 thalers, and a respected position among European powers. His son, Frederick III., made great sacrifices to obtain the royal dignity, and succeeded at last. Jan. 18, 1701, he was crowned at Königsberg as king of Prussia, under the name of Frederick I. (For the subsequent history of Prussia, see the biographies of her kings—FREDERICK WILLIAM I., II., III., and IV., FREDERICK II., WILLIAM I., and the articles on the history of the GERMAN EMPIRE, the SEVEN YEARS' WAR, and the FRANCO-GERMAN WAR.) AUGUST NIEMANN.

Prussian Blue. See BLUE.

Prus'sic Acid, or HYDROCYANIC ACID (which see).

Pruth, a river of Europe, rises in the Carpathian Mountains in Galicia, runs through Bukowina, forms the boundary between Moldavia and Bessarabia, and enters the Danube at Reni, after a course of 350 miles and 75 from the Black Sea. It becomes navigable at Jassy.

Prynne (WILLIAM), b. at Swanswick, Somersetshire, England, in 1600; studied at the Bath grammar school; graduated at Oriel College, Oxford, 1620; studied law at Lincoln's Inn, where he was successively barrister, bencher, and reader; was converted to Puritanism by Dr. John Preston, lecturer at that inn; began in 1627 to publish pamphlets attacking popery and Arminianism and denouncing the immorality of the age, and in 1633 issued his celebrated *Histrio-Mastix, the Player's Scourge,* which was construed into a libel upon the queen for having acted in a pastoral play at Somerset House. Prynne was consequently brought before the Star Chamber by Bishop Laud, fined £5000, expelled from the University of Oxford and from Lincoln's Inn, degraded from the bar, set on the pillory at Westminster and Cheapside, had both ears cut off, had his book burned before his eyes by the common hangman, and was sentenced to imprisonment for life. Having issued from his prison a tract entitled *News from Ipswich,* he underwent a repetition of the above punishments, had the letters S. L. ("Seditious Libeller") burned upon his cheek, was imprisoned in close confinement in Caernarvon Castle, and afterward in the castle of Mont Orgueil in the island of Jersey. Great crowds of Puritans witnessed the execution of this atrocious sentence, manifesting their sympathy with Prynne, who in 1640 was released by warrant from the House of Commons, had damages awarded him from his judges, and entered London almost in triumphal procession. Elected a member of Parliament for Newport, Prynne conducted the proceedings against Laud; became recorder of Bath 1647; took an active part in favor of the Presbyterians in their struggle with the Independents; advocated a reconciliation between Parliament and the king; was arrested for denying the supremacy of Parliament in a pamphlet entitled *A Brief Memento* (1648); was with others ejected from Parliament by the army Dec. 6, 1648; attacked Cromwell and the army in his writings; was again imprisoned in 1650 and 1651; advocated the restoration of Charles II.; was elected to the new Parliament 1660; was made keeper of the records in the Tower; was reprimanded by the House of Commons 1661 for new offences in his writings, and published a vast number of political, legal, and antiquarian treatises, some of considerable value, especially the *Collection of Records* (4 vols. folio) and the *Brief Register, Kalendar, and Survey of Parliamentary Writs* (4 vols. folio, 1659–64). D. in London Oct. 24, 1669.

Pry'or (ROGER A.), b. near Petersburg, Va., July 19, 1828; graduated at Hampden-Sidney College 1845, and at the University of Virginia 1848; studied law; became connected with the press at Petersburg 1851; was an editor of the Washington *Union* 1852 and of the Richmond *Enquirer* 1853; went as special commissioner to Greece 1855; was visitor at the University of Virginia 1856; edited a newspaper entitled *The South* 1856–67; sat in Congress 1857–59; was again elected in 1860, but did not take his seat on account of the secession of Virginia; was chosen to the provisional congress of the Confederate States at Montgomery, and to the first regular Confederate congress; entered the Confederate army as colonel of the 3d Virginia regiment; was made brigadier-general after the battle of Williamsburg; was taken prisoner Nov., 1864, and imprisoned in Fort Lafayette, but was soon released; was for a short time editor of a paper in Tennessee, and in the autumn of 1865 commenced the successful practice of the law in the city of New York, where he has since resided. Author of many published speeches and literary addresses.

Przem'ysl, town of Austria, in Galicia, on the river San, is the seat of the civil and ecclesiastical authorities of the district, and has many educational and benevolent institutions, and manufactures of leather, linens, and wooden articles. P. 15,184.

Przi'bram, town of Austria, in Bohemia, on the Litawka, near its influx in the Moldau, and has important lead and silver mines in its vicinity. P. 7665.

Psalmana'zar (GEORGE), the assumed name of a literary impostor whose real name and early history have remained unknown. He is supposed to have been born in the S. of France in 1679; received a good education under Jesuit instructors; led for some time a vagrant life, roaming through France, Germany, and the Netherlands in the garb of a pilgrim or pretending to some Asiatic nationality; ultimately attracted the attention of Mr. Innes, chaplain of a Scotch regiment at Sluys, Holland, who succeeded (as he supposed) in converting Psalmanazar to Christianity, took him to London, and presented him to Bishop Compton and others as a native of Formosa. It is uncertain whether Innes was a dupe or an accomplice in this affair, but he received promotion for his missionary zeal, and Psalmanazar was encouraged to draw up a *History and Description of the Island of Formosa off the Coast of China* (1704), illustrated with many engravings and with copious specimens of the pretended Formosan language, into which he also translated the Catechism of the Church of England. Psalmanazar was sent to Oxford, but soon repented of and confessed his imposture, applied himself to study, became skilled in Oriental history and literature, and spent nearly half a century in London, chiefly occupied in writing for the booksellers. He completed Palmer's *History of Printing,* wrote several volumes of the *Universal History,* led an exemplary and even pious life, was much visited by Dr. Johnson when young. D. at London May 2, 1763. His *Memoirs* appeared in 1764.

Psal'mody is usually defined to be the act, art, or practice of singing psalms. But it is often employed properly in a wider sense, which includes not only the vocal rendering of the songs used in public worship, but also their origin and history, as well as those of the tunes to which they are sung. Psalmody may be considered as ancient and modern. In the former the songs were all rhythmical and necessarily performed in the chanting or recitative style.

That God was worshipped publicly in song before David's time is clear, not only from the inherent probability of such praise, but also from the readiness and facility with which the responsive hymn of male and female voices was sung after the passage of the Red Sea. No direction, however, was given for such worship in the Law. It was David, the Psalmodist as well as the Psalmist of the Old Testament, who instituted the formal, stated, liturgical services of praise. He had a trained choir of 4000 Levites, who, however, came out in full force only on great occasions. Over these were three leaders—Heman, Asaph, and Ethan or Jeduthun—who directed them by beating time upon cymbals. The treble (*Alamoth,* 1 Chron. xv. 20) was led by the harps ("psalteries" in the English version), and the bass (*Sheminith,* 1 Chron. xv. 21), not in harmony, but simply an octave lower, by lyres or citharas ("harps" in our version). Many, though not nearly all, of the Psalms of David and his followers were composed partly for use in this service, and the superscriptions of a considerable number have reference to this design. In some of these we find allusion to the musical instruments by which they were to be accompanied; in others to the pitch (treble or bass) in which they were to be sung; and in a few to some familiar tune to which they were to be adapted. Some of the Psalms give evidence of adaptation to responsive singing, which was usually done by the two divisions of the choir, though sometimes, as in Ps. xxiv., the service was probably divided between the Levites and the people. The people, however, did not commonly join in the singing, except, apparently, in refrains and familiar formulas of praise, where they were enjoined to come out in full chorus. Some alterations in matters of detail were made in the service of praise in the Second Temple, the system being extended also, so as, for example, to have one psalm appropriated to each day of the week.

As to the musical system of the ancient Jews, nothing definite is known. The primary design of the accents in the Hebrew Psalter is that of musical notation, but these are no longer understood except in their secondary use of interpunction. It is possible that the synagogue-worship of later times and the old Christian chants retain traces of the simple recitative melodies of the ancient temple.

In the New Testament little is said of praise in public worship. The temple-service was of course maintained with gradual modifications until the Dispersion. Hearty and unrestrained singing, being a necessary part of Christian worship, is often enjoined in the Epistles. The services were no doubt a selection from the temple-psalms, with the old tunes, which held a place far into the history of the early Church. To these were gradually added Christian hymns, which were at first modelled after the psalms, and were doubtless set to the same simple music. The Syrian Church, however, had a larger hymnology and more elaborate music than its sister churches.

The development of psalmody in modern times in accordance with the needs of the Church has been due chiefly to two causes—the gradually-increasing and ultimately-predominant use of metrical songs as supplementing the old rhythmical forms, with a corresponding change in the tunes, which improved with the progress of musical science; and the growth of an hymnology in which the manifold experiences of Christians have found full expression. Still, many of the psalms have always been retained in essential substance, and have remained the best source of inspiration and culture for good hymn-writers. Music became a regularly-constituted portion of church-service in the fourth century. Its early development in the Western Church was largely due to Ambrose, bishop of Milan, and its progress during the Middle Ages to the improvements effected by Pope Gregory I. From them the names of the two old standard styles of chanting have been derived. Until the Reformation sacred music was under the control of the clergy. Metrical psalmody with harmony probably arose long before that era in Germany, but had not made much general progress. But the efforts of Luther and many of his helpers, by the adaptation of secular airs and the composition of new tunes, resulted in a widespread enthusiastic interest in sacred music among the Protestants in that country. Ever since then, also, it has been from Germany that the greatest influence and the healthiest tone have been given to the musical department of psalmody. We have but little space in which to speak of other parts of Christendom. In those lands where the influence of Geneva has had chief control, as most conspicuously in Scotland, this part of worship has been largely influenced by a tendency to plainness and severe simplicity in both words and music. In that country also the almost complete exclusion of modern hymns and of instrumental aid has helped to conserve this principle. Yet there congregational singing is hearty and general. In English-speaking countries generally there has always been a failure to attain to a psalmody which should be at once popular, solid, and artistically appropriate. In England there have been several revolutions in the public taste, and parochial singing has long been very degenerate in most of the country. Of late, however, there has been a decided improvement in this respect. In America, where true hymnology has been both appreciated and materially advanced, sacred music has been much influenced by a passion for lively, unsubstantial tunes, subserving a superficial emotion rather than profound edification. Many of the eminent composers who have done much to advance the general interest of psalmody in this country have too often consented to gratify this taste. J. F. McCurdy.

Psalms [Lat. *Psalmus, Psalma;* Gr. Ψαλμός, Ψάλμα, from ψάλλειν, to "play on a stringed instrument"]. This is the title given in the Septuagint version to the inspired songs of the Old Testament, which form one distinct book in the canon. They are sometimes called the Psalms of David, because so many of them were composed by that royal poet. As a collection they are also sometimes designated the Psalter, a term which in English-speaking countries is commonly but not exclusively employed in connection with their use in the act of worship. In the Hebrew Bible we find the whole collection divided into five books—(i.–xli.; xlii.–lxxii.; lxxiii.–lxxxix.; xc.–cvi.; cvii.–cl.)—a division which assumed its final shape before the completion of the Old Testament canon, but was only accomplished after several hands at various periods had helped toward the permanent arrangement. This partition is doubtless a designed correspondence with the five books of the Law. In the places assigned to the several psalms also there is evidence of careful arrangement according to principles more or less obvious, such as a tendency to place in the same group compositions of the same individual, or of the same period, or upon the same general subject, or written in the same style or for a similar liturgical purpose.

For the *authorship* of the several poems the superscriptions attached to many of them are in general our most reliable guide. Seventy-three of the psalms are thus assigned to David, and in nearly every case the correctness of the title is attested by strong evidence in their matter and style. The same criteria enable us to assign with great confidence a certain number of the anonymous psalms to the same author, making his whole contribution to be about eighty. We must remember, however, that much in many subsequent psalms was drawn from his compositions, and that, besides, his spirit greatly influenced all succeeding psalmists; so that we may say, in one sense, that almost the whole Psalter was the work of David. Twelve are ascribed to the singer Asaph, which designation also included certain of his descendants who inherited his poetical and musical gifts. Thirteen or fourteen proceeded from the "sons of Korah." (See Hengstenberg, *Comm. on the Psalms,* Appendix, p. xxi.) Two were written by Solomon (lxxii., cxxvii., in whose superscriptions we should read "of" and not "for," as in the English version). One, Ps. xc., is accredited to Moses. It is difficult or impossible to assign the remaining psalms with certainty to their true authors. Any apportionment which assumes the reliability of the superscriptions would approximate to the above distribution, whether it be assumed that these proceeded from the authors themselves or were inserted by later editors upon reliable tradition. It is probable that most of them are original, and all trustworthy. Classifications attempted by those who distrust their accuracy, resting mainly, as they do, upon subjective grounds, are at variance with each other, and commonly satisfactory only to the critics themselves.

The *dates* of the composition of most of the psalms may be determined by our knowledge of their authors or by their historical allusions. Thus it is easy to follow the course of the development and decline of this part of sacred literature, and its relations to the general religious life of Israel and to the inner experience of the writers themselves. Nearly all the psalms will be found to have been composed when such feelings were deepened and vivified by great national vicissitudes or religious commotions. In David's time these influences met in full measure. Many were indited under Hezekiah and Jehoshaphat, whose pious zeal for national religion and a pure worship naturally fostered such compositions among gifted and devoted men. The spiritual awakenings that followed the Exile also gave rise to many others; and it is to this date that many of the later nameless psalms must be assigned. In Solomon's time, on the other hand, though it was the period of highest literary cultivation, yet attention was given to didactic and reflective rather than to lyric poetry, in accordance with the political quiet and national prosperity that favored a broad culture and religious and philosophic meditation. Yet it must not be forgotten that a special divine direction, as well as national or individual experience, conditioned the appearance of these sacred poems as inspired productions and a permanent part of God's word. We agree with most modern critics in regarding as improbable the theory that some of the psalms were written as late as the Maccabæan period.

As to the *matter* of the Psalms, it must suffice here to say that they were the outflow of the spiritual life of the most highly-endowed natures of a long period of Israel's history. Thus, they contain a record of their adoration, confessions, petitions, and aspirations as these were conditioned, under the Spirit's guidance, on the one hand by their conceptions and knowledge of God and of his dealings with men, and on the other by their own inner history and outward circumstances. We find in the Psalms a vital appreciation of the ideas of God and Providence that had been unfolded in the teachings of the Law, and the most practical illustrations of the duty and privilege of worship and obedience. And so fresh, various, just and profound are their views of the spirituality, holiness, and goodness of God, and their representations of the yearnings, conflicts, and triumphs of the earnest soul, that the Psalter has not only prompted and made valuable all the hymnology of the Church, but has always been the chosen consoler and counsellor of the Christian heart. (See Psalmody.)

Literature.—The most valuable commentaries on the Psalms are those of Calvin and other Reformers, Hengstenberg (4 vols.), Tholuck, De Wette, Hupfeld (4 vols.; new ed. by Riehm), Ewald, J. A. Alexander (3 vols.), Moll (in the Lange series of Commentaries), and Delitzsch. J. F. McCurdy.

Psammet'ichus, the name of three Egyptian kings belonging to the twenty-sixth dynasty, according to Manetho. The name is written *Psemetek* in hieroglyphics,

but was altered by the Greeks, apparently without any reason, to *Psammis, Psammetichus,* and *Psammenitus.* Psammetichus I. (664–610 B. C.) subdued, by the aid of Greek mercenaries, the eleven other rulers between whom Egypt was divided at that time, and founded the dynasty. He opened Egypt to Greek commerce, and allowed Greek immigrants to settle on the eastern or Pelusiac mouth of the Nile, the Ionians on the one side and the Carians on the other. At the same time the Milesians settled at Naucratis on the western or Canopic branch of the Nile, and the intercourse which now sprang up between the Egyptians and the Greeks had the greatest influence on the prosperity of both nations. With Psammetichus III. the dynasty ceased to reign. He ascended the throne in 526 B. C., but was defeated, taken prisoner, and put to death in the following year by the Persian king, Cambyses, who now became the ruler of Egypt.

Pseudepig'rapha [Gr. ψευδεπίγραφα, "false additional writings"], in ecclesiastical bibliography, the general name of a vast number of books and fragments, great and small, of spurious works not usually reckoned in the Apocrypha, but like them designed to be foisted into the sacred canon. By some writers, the term Pseudepigrapha is applied to spurious writings claiming a place in the Old Testament canon. The term *Apocrypha* is applied to the spurious New Testament writings; while these writers call those books named APOCRYPHA (which see) by Protestants (but which are received by most other Christians) by the title of deutero-canonical books. While some of the so-called apocryphal and deutero-canonical books are in themselves genuine and valuable, the Pseudepigrapha as a rule are not. They are not even fictions. They are mostly self-evident forgeries—some ancient and others mediæval; some Jewish, others Gnostic, and still others Christian. The following is a partial list of the Pseudepigrapha, some few of which are considered canonical by the Abyssinian and perhaps other churches: The "History of Antiochus," the "History of Asenath," the "Epistle of Baruch," the "Book of Elias," the books called "Jasher" and "Jezirah," the third, fourth, and fifth of "Maccabees," the "Assumption of Moses," the "Preaching of Noah," the "Testament of the Twelve Patriarchs," the "Psalms of Solomon," the "Book of Zohar," of "Enoch," of "Jubilees," the fourth of "Esdras," the "Apocalypse and Vision of Esaias," the "Apocalypse of Zephaniah," a "Book of Lamech," an "Apocalypse of Adam" and one of "Abraham," a "Testament of the Three Patriarchs," a "Testament of Jacob," a "Prayer of Joseph," a "Testament of Moses," one of "Solomon," of "Noah," and of "Abraham," the "Mystic Words of Moses," the "Book of Eldad and Medad," "Jannes and Jambres," "The Repentance of Adam," "The Daughters of Adam," and numerous others. A large part of the mass is now happily forgotten or lost, and many are now known by name only. The number of spurious New Testament books is even greater. We may reckon the following spurious Gospels: the "Protevangel of James" (extant), the "Gospel of (Pseudo-) Matthias" (extant), the "Nativity of Mary" (extant), the "History of Joseph the Carpenter," the "Gospel of Thomas" (fragment), "Gospel of the Infancy" (extant), "Gospel of Nicodemus" (extant), "Gospel according to the Egyptians," "Gospel of Andrew," "of the Twelve Apostles," "of Apelles," "of Barnabas," "of Bartholomew," "of Basilides," "of Cerinthus," "of the Ebionites," "of Eve," the "Gospel according to the Hebrews," "Gospel of James the Greater," "of Judas Iscariot," "of the Manichees," "of Marcion," "of Matthias," "of Perfection," "of Peter," "of Philip," "of the Simonites," "of Valentine," "of Tatian," etc. The spurious books of "Acts," the false "Epistles" and "Apocalypses," are in number very great. A large proportion are not known to exist at present. Of those which are extant not one has any kind of claim to be recognized as a part of the canon.

Pseu'doscope [Gr. ψευδής, "false," and σκοπεῖν, to "see"], an optical contrivance invented by Prof. Wheatstone, which has the effect to cause depressions to appear as reliefs and reliefs as depressions.

Psittac'idæ [from *Psittacus,* or Gr. ψίτταχος, "a parrot"], a family of birds including the parrots and kindred types. The form is that familiar in the ordinary species; the bill is large, strong, and compressed, with the culmen rounded to the tip, which is more or less prolonged downward or hooked; the lower mandible is deep, and much shorter than the upper; at the base of the upper mandible is a cere or naked skin of varying extent; in this are placed the nostrils, which are generally small and oval, and not far from the base of the culmen; the wings are pointed; the tail varies in extent, but is in all more or less elongated; the tarsi are short and robust, and covered with granule-like scales, which extend upon the toes; the claws are arranged in pairs, two anterior and two posterior, the outer in each case being the longest. The species are very numerous, and are familiar under the name of parrots, parrakeets, maccaws, lories, lorikeets, and cockatoos. Finsch in his great work on the family (1867) described 350 species, and Gray in his *Hand-list of Birds* (1870) has enumerated 435. The family has been variously subdivided. On the one hand, by Finsch the family was divided into five sub-families—(1) Stringopinæ, characterized by the owl-like aspect, and represented by two species in New Zealand; (2) Plictolophinæ, including those in which the head is provided with a crest capable of erection; (3) Sittacinæ, comprising those species which have the tail elongated or graduated; (4) Psittacinæ, embracing those in which the tail is short or moderate, and straight or slightly rounded at the end; and (5) Trichoglossinæ, in which the tongue has a split, papillose apex, and the gonys of the mandible obliquely ascending. On the other hand, the latest classification—that of Mr. A. H. Garrod—is based upon the presence or absence of the left carotid arteries, and the presence or absence of an "ambiens" muscle, etc. This classification is very unlike previous arrangements. Two families are recognized, each having several sub-families—viz. (I.) Palæornithidæ (left carotid normal), with the sub-families—(1) Palæornithinæ, (2) Cacatuinæ, and (3) Stringopinæ; and (II.) Psittacidæ (left carotid superficial), with the sub-families (4) Arinæ, (5) Pyrrhurinæ, (6) Platycercinæ, and (7) Chrysotinæ. These combinations are in all respects different from those admitted by Finsch; it is therefore evident that the entire family must be submitted to a still more rigorous study than it has hitherto undergone before its classification can be considered as at all settled. The principal authority for the family is Finsch's great work *Die Papageien, monographisch bearbeitet* (Leyden, E. J. Brill, 1867, 2 vols., 8vo). The paper of Garrod alluded to is *On some Points of the Anatomy of the Parrots which bear on the Classification of the Sub-order,*" in *Proc. Zool. Soc. London* (1874, pp. 586–598). (See also COCKATOO, LORIKEET, LORY, PARROT, etc.) THEODORE GILL.

Pskov, government of European Russia, bounded N. by the governments of St. Petersburg and Novgorod, comprises an area of 17,845 sq. m., with 717,816 inhabitants. The surface is mostly flat, abounding in small lakes and rivers; marshes are numerous, forests extensive. Agriculture is almost the only branch of industry, with the exception of cattle-rearing; hemp and flax are staple products.

Pskov, or **Pleskov,** town of European Russia, capital of the government of Pskov, is the see of an archbishop, and has many educational institutions and considerable manufactures and trade. P. 12,981.

Psophi'idæ [from *Psophia;* Gr. ψόφος, "a shrill sound"], a family of birds represented by the trumpeters of South America. The form is heron-like; the neck comparatively short; the bill short, compressed, and curved toward the tip, which is prolonged over the lower mandible; the nostrils inserted in a membranous groove, large and oblique; the wings short, concave, and rounded; the tail very short; the tarsi long and slender, covered with transverse scales; the toes moderate, the three in front united at the base, the hind one small and somewhat elevated; the claws curved and acute. But a single genus is known (*Psophia*), containing five species, found in various parts of the Brazilian empire and the northern portions of South America. THEODORE GILL.

Psori'asis [Gr. ψωρίασις], a skin disease in which there are at first elevated red patches upon which large scales of epidermis appear, the skin between the patches often cracking and bleeding. There are many varieties distinguished by writers, but, except in the case of the syphilitic diseases called psoriasis, the causes are very obscure. Fortunately, syphilitic psoriasis can be readily distinguished from true psoriasis. For the former the appropriate remedies for the specific disease are to be employed. For the latter the best treatment appears to be the use of vapor-baths, followed by strong alkaline applications, and then by tarry ones. Arsenical preparations are also useful. These means will very much mitigate, but will scarcely cure, the disease.

Psy'che [Gr. Ψυχή, the "soul"], in a Greek legend preserved by Apuleius, was a lovely mortal, the daughter of a king. Venus was jealous of her beauty, and ordered Cupid, her son, to inspire Psyche with desire for the basest of men, but the god of love, on beholding her, himself loved her. Thenceforth he visited her every night, requesting her never to see him or inquire who he was. But from curiosity, and the dread lest he should prove to be a monster, as her sisters told her he was, she came to

him with a lighted lamp while he slept. Overcome with joy at his loveliness, she carelessly allowed a drop of hot oil from her lamp to fall upon his arm. Cupid therefore left her with reproaches. After many calamities she became the menial slave of the jealous Venus, who treated her with great cruelty. But her lover invisibly assisted her, and finally, having secured her immortality, made her his wife. The myth is plainly allegorical, and is a figure of the progress of the soul, by the aid of divine love, through the calamities of this life to a happier life hereafter.

Psychol′ogy [from ψυχή, "soul," and λόγος, "reason"], the science of the soul. From a very early date mankind, in speaking and writing, required to draw distinctions between the different exercises of the mind. The Eleatics distinguished between the senses and the reason, and had an intermediate operation, opinion. Plato proceeds on a threefold division of the mental powers—αισθησις, which makes known the fleeting; λόγος, which reveals the fixed; and διονοια, the discursive process which makes known the probable. But the founder of psychology as a science is Aristotle. He has a grand, twofold division of the faculties, which has ever since been acknowledged—the gnoetic or gnostic (in Latin the cognitive), and the orective (in Latin appetent or motive). With him the *psyche* is organic life, and he mentions (1) the nutritive power; (2) sense-perception, with its common percepts by all the senses—viz. motion, rest, number, figure, magnitude—motion by touch and sight, and all the rest by motion; and proper percepts, such as color by the eye and odors by smell; (3) the memory, divided into μνῆσις, spontaneous, and αναμνῆσις, with an effort: in speaking of this he has his famous classification of the laws of association—viz. contiguity, resemblance, and contrast; (4) the phantasy involved in memory and giving us imagination. Above these—indeed, above the psyche altogether—he places the νοῦς, which is represented by him as immortal. Plato had spoken of the νοῦς as the place of principles (τόπος ειδῶν); Aristotle adds, in capacity merely (ἐν δυνάμει). This classification of Aristotle's has been the foundation of every other. Psychology appears in every discussion on mental philosophy since that date, and is found in Augustine, the Schoolmen, Bacon, Descartes, Locke, and Kant. The Scottish school of Reid, Stewart, Brown, and Hamilton has paid great attention to it. It is diligently prosecuted in the modern German schools.

That mind exists, and is different from matter, can be established on two grounds: First, it is made known by a different mental faculty: body is made known by the senses; mind by self-consciousness. Secondly, we know the two as possessing different properties: mind has thought, feeling, will; matter has extension and powers of attraction, and can be weighed and measured. The science of psychology shows that mind follows laws of its own. Psychology is to be prosecuted mainly by self-consciousness looking within and marking what passes. As thus able to look into our own souls, we are able also to understand what takes place in those of others as manifested by their words and deeds and made known in biography, history, and poetry. Attempts are being made in the present day to show how physiology can explain mental phenomena. These have so far been successful, and should be encouraged. But no material forces can explain such phenomena as reason, conscience, will, or break down the distinction between mind and matter.

The common division of the faculties in the present day is a threefold one, adopted by Kant, and taken from him by writers in Germany and Great Britain: (1) the cognitive; (2) feeling; (3) the will. The following may be found a convenient distribution of the faculties:

First, Cognitive.	Second, Motive.
I. Simple cognitive, or presentative.	IV. Conscience, or moral faculty.
II. Reproductive, or representative.	V. Emotions.
III. Comparative, discovering relations.	VI. Will, or optative power.

The cognitive give us knowledge and ideas; the motive stir up feeling and prompt to action.

I. *The Simple Cognitive*, so called because they give us knowledge in the first and simplest form; called also presentative, because the object is now present. It embraces sense-perception and self-consciousness. In sense-perception we have a knowledge (not a mere idea) of things external to the mind—by taste, of a sapid affection of the palate; by smell, of odorous affections of the nostrils; by hearing, of a sound in the ear; and by touch proper or feeling, of the periphery of our bodily frame as subject to various sensations. So far, the infant's knowledge may not extend beyond its body; it knows the objects as extra-mental, but not as extra-organic. But by sight it knows a colored surface as affecting the eye, and by the muscular sense a body as resisting our locomotive energy. From the very beginning and all along we have with our knowledge of body, and indeed as associated with every mental operation, a consciousness of self in its present state—not of a mere phenomenon or appearance of self (as Kant maintains), or of a quality of self (as the Scotch school holds), but of self as acting—say as exercised in thought or feeling. By these two powers we have the knowledge with which the mind starts of things without and within us. Other powers may now work.

II. *The Reproductive or Representative.*—By these the knowledge gained comes up once more in old forms, in ideas of objects, not present, but thus represented. (1) The knowledge is kept; this is retention. The object is not present, the idea is not always present, but there is now a capacity to recall it. The power of retention depends mainly on the amount of energy expended in the original knowledge. (2) The object is actually recalled by an image, say, of a lily or of a state of grief or joy. The faculty which does this we call the phantasy, and the product an idea, a species, or more unambiguously a phantasm. (3) It is recalled according to the laws of association, which are of a twofold nature—primary and secondary. The primary are contiguity and correlation, whereby things which have been together in the mind, or between which there is a discovered relation, tend to recall each other. The secondary determine among a number of objects, any one of which might be called up, why one rather than another presents itself, the main law being that of energy, whereby things on which we have bestowed the greatest amount of mental energy, whether of intellect, feeling, or will, come up more readily and frequently. (4) Things are recognized as having been before the mind in time past; this is the recognitive power (overlooked by Kant and Hamilton), being the main element in memory, and giving us the idea of time, always in the concrete. (5) The compositive power, putting things known in new forms and combinations, and this both by increase and decrease. This is the essential element in imagination, which stretches away into the infinite, our belief in which implies that it is beyond our widest idea, while nothing can be added to it—that is, that it is perfect. (6) The symbolic power, which enables us to think by means of signs, and especially language.

III. *Comparison.*—The mind can discover relations between the objects thus made known and recalled. (1) Identity, whereby the mind perceives that the same is the same, noticed, it may be, in different modes and with different concomitants, as, that I am the same to-day when I am joyful as I was yesterday when I was sorrowing. (2) The faculty of whole and parts, called comprehension and abstraction, whereby we separate a part from the whole, and form abstract ideas. The mind can also discover (3) the relations of space, which gives locality and the science of geometry; (4) of time, which gives arithmetic and chronology; (5) of quantity, from which proceeds mathematics as the science of quantity; (6) resemblance, which enables us to classify, and reach general notions; (7) active property, which notices the correlation of forces; (8) cause and effect, which enable us to rise from effect to cause till we reach a first cause. These constitute the higher intellectual powers of man. Working with them, we have motive powers.

IV. *The Moral Faculty.*—(1) It is partly cognitive; it discovers not a new object, as the senses may do, but a quality in certain objects—that is, in voluntary acts: they may be good or evil—good, such as gratitude, godliness; evil, such as cruelty, deceit. (2) It is also motive. Its exercises are accompanied with emotion, with feelings of approbation and disapprobation. From this power we get such ideas as those of obligation, duty, prompting to good.

V. *The Emotions.*—These imply four elements: (1) an appetence or spring of action, such as the love of pleasure or sympathy with our fellow-men; (2) an idea of an object as appetible or inappetible—say, as about to bring pleasure to ourselves or others; (3) the actual emotion, an excitement of mind, with attraction toward an appetible object and repugnance from an inappetible. In these three processes appetence is the spring, the idea is the channel, and the excitement is the stream flowing out. (4) There is an organic affection of the brain and nerves.

VI. *The Will.*—The essential element here is the power of choice and its opposite, rejection. Two or more objects are presented, and we take the one, and not the other or others; or it is one object pressed on us, and we accept it. This power includes volition, or the final decision to act. But it includes more: it includes wish. It should be noticed that in love considered as a virtue or grace there is wish, there is benevolence, which is well-wishing, a desire of good to the person beloved. It should be resolutely

maintained that the will has an essential freedom of which it can never be deprived.

It should be observed that every one of these groups of powers gives us one or more new ideas. The senses give us the idea of extension and resisting power; self-consciousness, the idea of mind and mental operations; the reproductive, of time and the infinite; the comparative, of connections; the conscience, of moral good and evil; the emotions, of the lovely; and the will, of freedom.

J. McCosh.

Psychrolut′idæ [from *Psychrolutes;* Gr. ψυχρολούτης, a "bather in cold water"], a family of fishes established by Dr. Günther for a species of West American fish. The body is rather elongated; the skin naked and quite loose; the lateral line absent (?); the head large and depressed; the opercular unarmed; the mouth with the cleft oblique and of moderate width; the teeth small and confined to the jaws; branchial apertures of moderate width, the gill-membranes being attached to the isthmus; branchiostegal rays very slender, seven in number; dorsal and anal fins opposite each other, situated far backward on the tail, without spines, and nearly entirely enveloped in the skin; caudal free; pectorals entire; ventrals close together, thoracic, and composed of few (two) rays; there are three and a half gills, and pseudobranchia are well developed. The only known species is *Psychrolutes paradoxus*, Günther, based upon specimens found in the Gulf of Georgia near Vancouver's Island. It is placed by Günther near the Blennidæ and Cyclopteridæ. Theodore Gill.

Ptah, or **Phthah,** an important divinity of ancient Egypt, usually identified with the Greek Hephaistos and Latin Vulcan. His worship was traced to a remote antiquity, and was intimately connected with the adoration of the sun as the author of light and heat. Memphis was the principal seat of his worship, and the beetle (*Scarabæus sacer*) was his peculiar emblem.

Ptar′migan, the vernacular generic name for the species of grouse of the genus *Lagopus* which are distinguished by the legs being densely feathered to the claws, the nasal grooves closed over with feathers, and the development of sixteen or eighteen tail-feathers. The species are characteristic of the high northern regions of the globe, and, with the exception of one species, assume a white coat during winter; in summer they are of a more or less reddish or buff color. In winter they seek the shelter of thickets of willows, birches, etc., but in summer they frequent plains. When pursued in winter they frequently dive in the loose snow, in which they work their way with great ease. The female begins to lay her eggs about May or June, and deposits about eight or ten eggs in the nest. Six species have been recognized by recent authors, of which *Lagopus albus* inhabits both hemispheres, *L. rupestris* and *L. leucurus* North America, and *L. mutus*, *L. hemileucurus*, and *L. scoticus* the Old World. *L. scoticus* is extremely closely related to *L. albus*, and has been even regarded as the permanently dark insular form of that species. Theodore Gill.

Pteraclid′idæ [from Gr. πτερόν, "wing," and κλείς, "lock"—*i. e.* "fin-locked," on account of the extent of the fins], a family of mackerel-like fishes. The body is oblong or elongated and compressed; the scales of moderate size, and spinigerous or emarginated; the lateral line continuous; the head compressed, and with the snout obtuse and convex; the opercular unarmed; the mouth with the cleft wide and oblique; teeth on the jaws as well as palate; branchial apertures continuous below; branchiostegal rays seven; dorsal fin elongated, extending from the forehead to near the caudal, and composed chiefly of filiform spines; anal fin also enlarged, and extending from the breast nearly to the caudal; caudal distinct; pectorals with branched rays; ventrals jugular, with four to six slender rays; pyloric appendages developed in small number (about six in *P. Carolinus*). The family is based especially upon the genus *Pteraclis*, species of which are found in the Indian seas, the ocean about the island of Madeira, and along the coast of Carolina. To the family perhaps also belongs the genus *Pterycombus*. Theodore Gill.

Pterich′thys [Gr. πτερόν, "wing," and ἰχθύς, "fish"], the most remarkable member of the strange group of placoderm fishes, of which the remains are found in the Devonian rocks of Europe. It was of small size—the largest one foot in length—the body almost enclosed in a case or trunk of enamelled bone. From this projected a tail covered with angular scales and provided with a dorsal and a caudal fin. (See Fossil Fishes.) J. S. Newberry.

Pteri′idæ, a family of the Monomyria (which see), to which belongs the pearl oyster. (See Comparative Anatomy and Precious Stones.)

Pterocarpus. See Kino.

Pteroc′lidæ [from *Pterocles;* Gr. πτερόν, "wing," and κλείς, "hook"], a small family of birds peculiar to the Old World, containing the so-called sand grouse. The form is as much that of the pigeon as the grouse; the bill is short, compressed, and the culmen curved to the tip; the wings and tail are elongated and pointed; the tarsi moderately robust and covered with feathers; the toes rather stout, the three in front more or less united, the hinder rudimentary or wanting. In its anatomy this type is intermediate between the true gallinaceous birds and the pigeons; in some respects, however, they are much more nearly related to the latter than the former. Two genera are recognized by authorities—(1) *Pterocles*, with fourteen species, and *Syrrhaptes*, with two. They are found in Southern Europe, as well as in Africa and Asia, in dry sandy places or deserts, rocky plains, and wooded grounds. They feed chiefly upon hard seeds, bulbs, and insects. The females lay from two to four eggs on the bare ground. *Pterocles arenarius* and *P. alchata* are found in Southern Europe. *Syrrhaptes paradoxus*, although strictly an Asiatic species, sometimes makes incursions into Europe as far westward as the British islands. One of these visitations was made in 1863, in which year it made its appearance at 148 European localities, as recorded by Newton—"from Galicia to Donegal, and from Gascony to the Faröe Islands." The earliest date given is 6th of May in Moravia; by the end of that month the farthest point throughout the N. W. had been reached. The species is said to have appeared in Europe in 1853; in 1859 it reappeared; and in 1863 the unprecedented visitation recorded took place. Its subsequent incursions have been inconsiderable. Theodore Gill.

Pterodac′tyls [Gr. πτερόν, "wing," and δάκτυλος, "digit"], an extinct group of flying animals, confined to the Mesozoic or Reptilian age, and usually regarded as an order of reptiles. The anterior limbs were adapted for flight by the elongation of the fore arm and fifth or outer digit, corresponding to the little finger of the human hand. By this means an expanse of membrane was supported as in the bats, which these animals in some respects resembled. The head was large, the jaws long, and armed with teeth. In many other points the skull approaches that of birds. Nearly all the bones were pneumatic, with very thin walls, as in most birds. The skin seems to have been destitute of scales or feathers, as no traces of either have been discovered. Prof. Seeley, who has recently studied the pterodactyl remains of the English Upper Greensand, considers them a sub-class of vertebrates equal in value to the birds, and closely related to them. The earliest pterodactyl yet known is *Dimorphodon macronyx* from the Lower Lias of England. Many species occur in the Oolitic lithographic slates in Bavaria. A few fragments only are known from the Wealden, while the English Greensand has furnished many large species. Others from the Upper Cretaceous were the latest forms of this group known from the Old World, and were perhaps contemporaneous with the gigantic species lately made known from the Upper Cretaceous shales of Kansas. The largest of these (*Pterodactylus ingens*, Marsh) probably measured between the tips of the fully-expanded wings nearly twenty-five feet. Two smaller species occur in the same formation, but all are large in comparison with the common European forms. O. C. Marsh.

Pteroglossus. See Rhamphastidæ and Araçari.

Pterop′oda [Gr. πτερόν, "wing," and πούς, ποδός, "foot"], a group of mollusks formerly considered a separate class, but now generally regarded as of a sub-class of the class Gasteropoda. All living species are marine; all are characterized by a pair of swimming fins attached to the head. The right whales feed largely on shelless species. The shells of some are brought up by deep-sea dredges. They are comparatively little studied by scientists, because they are not often found alive near the shore.

Ptolemaic System. See Ptolemy.

Ptolemais. See Acre.

Ptol′emy, the name of thirteen kings of Egypt belonging to the Greek or Macedonian dynasty, of which the most remarkable were—Ptolemy I., Soter (323–283), the founder of the dynasty. His father's name was Lagus, and the dynasty is often called the Lagides, but his mother, Arsinoë, had been the mistress of Philip II. of Macedon, and he was generally supposed to be a son of the latter. He was one of the most prominent generals of Alexander the Great, after whose death (in 323) he was appointed governor of Egypt. The reigns of Alexander's half-brother, Philip Arrhidæus (322–317), and his posthumous son, Alexander II. (317–311), were merely nominal, however, and Ptolemy was in reality the ruler of Egypt, though he did not assume the title of king until 305. The surname *Soter*, "the preserver," was given to him by the Rhodians, whom he saved

when they were attacked by Demetrius Poliorcetes. The first part of his reign was occupied by wars with Perdiccas and Antigonus, in which he suffered a terrible defeat in the naval battle off Salamis in 306, but succeeded in baffling and defeating first Perdiccas, and subsequently Antigonus, when they invaded Egypt, and conquered Syria, Palestina, Cœlesyria, and Cyprus, which were added to his realm. After the death of Antigonus (in 301) he reigned in peace. Memphis was his capital, but Alexandria increased rapidly, and was even now the principal mart of the Mediterranean. Jews and Greeks gathered here in great numbers, and not only for the sake of commerce. A library was founded, and a school whose teachers were maintained at the public expense; and both institutions soon attracted the most renowned philosophers and scientists to the city.—PTOLEMY II., PHILADELPHUS (283–247), b. in 309; continued successfully the work which his father had commenced. He founded Arsinoë at the head of the Red Sea, and Berenice farther to the S. The former he connected with the Nile by restoring and completing the canal of Necho; the latter by constructing an excellent road to Coptos. He built the celebrated lighthouse on the island of Pharos; founded colonies and mercantile stations, such as Ptolemais on the confines of Ethiopia for the trade in elephants; concluded commercial treaties even with India; and brought the material prosperity of his country to its culmination. When he died he left 740,000 talents in his treasury, an army of 200,000 foot and 40,000 horse, besides chariots and elephants, and a fleet of 1500 vessels. The annual revenue of Egypt proper amounted to 14,800 talents. No less successful were his exertions for the establishment of the literary and scientific supremacy of Egypt. The number of rolls in the library increased to 400,000; its librarian was Callimachus. To the school were added botanical and zoological gardens. Among its teachers were Euclides, Aristarchus of Samos, and Aratus, Hegesias, and Theodorus. At the court lived Theocritus, Manetho, Apelles, etc., and a widespread tradition says that the Septuagint was undertaken at the command of the king.—PTOLEMY III., EUERGETES (247–222), was a brilliant warrior; made a victorious campaign from the Nile to the Indus, and brought back to Memphis the old Egyptian gods which Cambyses had carried to Babylon, whence he received the surname *Euergetes*, "the benefactor."—With PTOLEMY IV., PHILOPATOR (222–205), PTOLEMY V., EPIPHANES (205–181), and PTOLEMY VI., PHILOMETOR (181–146), begin the degeneration of the dynasty and the influence of the Romans—the two causes which soon brought about the downfall of the Egyptian empire. Ptolemy IV. sent large supplies of corn to Rome during the Second Punic war, and as a reward for his good offices the Romans interfered in the war between Antiochus of Syria and Ptolemy V. in favor of the latter. Under Ptolemy VI. the Roman commissioners played the part of mediators between him and his brother, Euergetes II., and under PTOLEMY VII. (146–117) they proved themselves a domineering power in the realm, in accordance with whose interests the polity of the state had to be directed. In the family of the Ptolemies it became common for the brothers to marry their sisters—a connection which was permitted by the Egyptian laws, but which was a horror to the Greeks. Ptolemy VII. married not only his own sister, but also the daughter of this sister by an elder brother. The later members of the family, although the men retained their eminent gifts for science and art, and the women their wonderful beauty, were seized with a sort of madness which burst forth in the most unnatural freaks of sensuality and cruelty. With Cleopatra the family lost its royal dominion; her son by Cæsar was sometimes called Ptolemy XIV., but died in childhood.

Ptolemy (CLAUDIUS PTOLEMÆUS), b. at Pelusium in Egypt; flourished at Alexandria in the middle of the second century after Christ. Of his personal life nothing more is known. Of his works are still extant the *Syntaxis Mathematica* and the *Geographia*. The former is a representation of the science of astronomy at the time of the author, based partly on his own researches, partly on those of Hipparchus. As it is the only authority we have for the views of astronomy entertained by the ancients, and as it formed the foundation of all astronomical science down to the time of Copernicus, the book is consequently of the greatest interest. Having disappeared during the Dark Ages, it again became known to the Europeans through the Arabs. About 827 it was translated into Arabic, and of this Arabic translation, the *Almagest*, a Latin translation was published in 1230 under the auspices of the emperor Frederick II. The best edition of the Greek text, accompanied by a French translation and notes, is by Halma (4 vols., Paris, 1813–28). The fundamental ideas of this system, the "Ptolemaic system," are the position of the earth in the centre of the universe and the revolution of the planets around the earth. Of the *Geographia* a Latin translation with maps was frequently reprinted at Rome in the latter part of the fifteenth century, and it was almost the only source of geographical knowledge until the voyages of discovery by the Portuguese made its information antiquated. Edition by Wilberg and Grashof (Essen, 1838–42).

Pto'sis [Gr. πτῶσις, a "fall"], a dropping of one or rarely both upper eyelids; an inability to open the eye. It may come from a degenerate or undeveloped condition of the muscle-tissue, or from palsy of the third nerve. It has been successfully treated by tacking the orbicular muscle to the occipito-frontal. It often passes away without surgical treatment, and there are cases which are not benefited by any treatment whatever.

Pu'berty [Lat. *pubertas*, "youth," from *pubes*, "hair"], the period of life at which the exercise of the reproductive function becomes possible. In males it usually takes place between the ages of thirteen and sixteen, and in females somewhat earlier; and it appears that in very warm and very cold climates puberty is reached somewhat earlier than elsewhere. There are also cases of *prœotia*, or precocious development in this respect. The period of puberty is attended in males by a more complete development of the larynx, a deepening of the voice, the first appearance of the beard, etc. In the female the contour becomes rounded and more graceful, the catamenia appear, and the mammary glands are developed. There is no doubt that to those who are inclined toward constitutional disease this is a period of some danger, and especially to the female. At this time, too, the mind and tastes are often rapidly developed, and the impressible nature of youth may now become, on the one hand, inspired by noble and generous sentiments, or may receive, on the other, a fatal bent toward that which is base.

Pub'licans [Lat. *publicani*], farmers of the public revenues of the Roman state. The various revenues which Rome derived from her subject provinces were let out or sold by the censors to the highest bidder. The immediate lessees or purchasers were of the wealthiest Romans, principally of the equestrian order, who often formed themselves into societies or stock companies to give the securities required by the government. The provinces were sublet by districts, and the actual collection of taxes was made by lower classes, sometimes even slaves. Oppression and extortion characterized the whole system, and in the provinces the publicans directly concerned in gathering the taxes were hated and despised, as we read in the New Testament. A. L. CHAPIN.

Public Health. See SANITARY SCIENCE.

Public Houses, Laws as to. See HOTEL, by C. G. LELAND, A. M., and INNKEEPERS, by J. N. POMEROY.

Pub'lius Sy'rus, a Syrian slave who attracted great attention in Rome in Cæsar's time as a writer of mimes. St. Jerome mentions that a collection of moral sentences extracted from the writings of Publius Syrus was used at his time as a school-book in Rome. There exists a compilation of this description, *Publii Syri Sententiæ*, edited by Orellius as an appendix to his edition of Phædrus (1832), but that collection has been compiled from various sources, though the most of the 1000 apothegms may belong to Syrus.

Puccoon', a general name applied in the U. S. to several dissimilar plants which yield a yellow or reddish juice, often utilized for dyestuffs. The best-known representative is the *Sanguinaria Canadensis* or BLOOD-ROOT (which see). Other puccoons are of the borage and crowfoot families (see RANUNCULACEÆ), the latter being medicinally used as a substitute for quinine, and being popularly regarded as a specific for cancer.

Pück'ler-Mus'kau (HERMANN LUDWIG HEINRICH), PRINCE OF, b. on the family estate of Muskau in Saxony Oct. 30, 1785; studied law at Leipsic; served in the army during the wars against Napoleon; travelled much, and became widely known both for his enthusiasm for landscape gardening and through his spirited travelling sketches. D. at Branitz Feb. 4, 1871. Under his direction celebrated gardens were laid out at Muskau and at his usual residence, Branitz, in the Prussian province of Brandenburg; he also wrote *Andeutungen über Landschaftsgärtnerei* (1834). Of his travelling sketches several have been translated into English—*The Travels of a German Prince in England*, by Mrs. Sarah Austin (3 vols., 1832), *Tutti Frutti*, by Edmund Spencer (5 vols., 1834), *Mehemet Ali and Egypt* (3 vols., 1848).

Puddling. See IRON MANUFACTURE, by JOHN B. PEARSE.

Pueb'la, state of the Mexican confederation, between lat. 16° 20′ and 20° 15′ N., and between lon. 97° and 99° 15′

W., and bounded by the states of Mexico, Vera Cruz, and Oaxaca. Area, 11,761 sq. m. Pop. 830,560. The surface is an elevated plateau from 5000 to 7000 feet high, which to the W. rises into a lofty mountain-range, comprising the famous volcano Popocatapetl. Agriculture is the principal occupation of the inhabitants, and excellent wheat is produced. Some manufactures of cotton fabrics and earthenware are carried on.

Puebla, or **La Puebla de los Angeles,** town of the Mexican confederation, capital of the state of the same name, in a fertile plain at the foot of Mount Popocatapetl. It was founded in 1531, and has broad and regular streets, lined with gayly-colored, substantially-built, and richly-ornamented houses, and many fine public squares provided with fountains. Its cathedral is a magnificent building of noble and imposing exterior, while its interior is most gorgeously decorated with paintings, statues, carvings, and ornaments of gold and silver. The educational and benevolent institutions are numerous and good; there are 3 hospitals, an ecclesiastical seminary with 9 professorial chairs, a theatre, museum, public library, and 15 elementary schools. Soap, pottery, and a peculiar kind of cotton shawl used all over Mexico, are extensively manufactured. P. 75,000.

Pueb'lo, county of Central Colorado. Area, 3000 sq. m. Traversed by Arkansas River and by Denver and Rio Grande R. R.; is in part composed of mountains and valleys; and in part of grassy plains. Products, live-stock and wool. Corn and wheat are extensively raised by irrigation. Cap. Pueblo. P. 2265.

Pueblo, p.-v., cap. of Pueblo co., Col., on Arkansas River and on Denver and Rio Grande R. R., 126 miles S. of Denver, has 4 newspapers, is rapidly growing, and is considered the metropolis of Southern Colorado, being situated in the midst of an agricultural and stock-raising region. P. 666.

Pueblos [Sp. *pueblo*, "village"], a class of semi-civilized Indians of New Mexico and Arizona, so named from their remarkable communal houses, sometimes of several stories in height, which serve as the habitations of entire clans. (See ARCHITECTURE OF THE AMERICAN INDIANS.) They now number about 7000, inhabiting 19 villages, have about 450,000 acres of land, and own property to the amount of $535,750. They have considerable skill in agriculture, raising grain, cotton, vegetables, and fruits by means of irrigation, manufacture pottery and cotton stuffs, and preserve the same grade of civilization which they had three centuries ago. Many are Roman Catholics, but the majority retain their original religious beliefs and practices, prominent among which is the maintenance of the sacred fire and the worship of Montezuma, a divinity who must not be confounded with his namesake, the Mexican emperor. The Pueblos constitute several tribes and speak different languages. There is little warrant for the wide-spread belief that they are closely connected by race with the Aztecs. By the treaty of Guadalupe Hidalgo, as interpreted by Chief-Justice Slough in 1857, the Pueblo Indians are citizens of the U. S., but that status has never been recognized by either the Federal or Territorial government. Their internal administration is carried on by themselves in accordance with their ancestral customs, each village having a governor and a court or council of three elders. The U. S. agency maintains 8 schools with about 300 pupils. Their religious supervision has been assigned by the Indian bureau to the Presbyterians, who as yet (1876) have done little for their improvement, while the virtual exclusion of the Roman Catholics, who have had missions among them nearly 200 years, led to dissatisfaction, which culminated in a protest from the governors of fifteen of the nineteen villages.

Puen'te de Genil', town of Spain, province of Cordova, on the Genil, manufactures earthenware and trades in oil. P. 7853.

Puer'peral Fe'ver, a fever occurring only to women, following childbirth, and characterized by acute metroperitonitis, or inflammation of the uterus and peritoneum. It may occur in isolated cases in private practice, but more commonly develops in hospitals and lying-in asylums, where numerous patients are aggregated, the air vitiated, and especially if unfavorable surgical cases—erysipelas, gangrene, suppurating wounds, pyæmia, or septicæmia—are present. Under such circumstances many cases coexist or occur consecutively, and often spread to individuals in the surrounding community. Such epidemics, and its spread by seeming contagion, have led some to regard it as a specific and contagious disease. But a counter-opinion has greater weight of authority, that it is indeed only a condition of blood-poisoning by the absorption of septic or purulent matter on the recently-exposed and often lacerated interior of the uterus, or the inflammation of that organ and the peritoneum by the presence of septic matter in the blood. Thus, sudden suppression of the lochia or discharge following labor, sewer-gas, the emanations from decomposing animal or vegetable matter are causes of puerperal fever in the best localities and in households where no surgical source exists. The modern discovery and use of disinfectants, the adoption of the plan of isolated or pavilion hospitals, the entire separation of lying-in wards from surgical wards, the use of free antiseptic injections during the period of convalescence from confinement, have all proved efficacious in lessening the frequency of puerperal fever. Puerperal fever is chiefly characterized by the symptoms of peritonitis—swelling, tympanitis, tenderness and pain in the abdomen, constipation, nausea and vomiting, marked elevation of temperature, and rapid, feeble pulse; the exhaustion varies with the case; the patient may die early of collapse or following typhoid symptoms of several days' duration. The treatment comprises veratrum viride to control the circulation, opium as a specific in peritonitis, and antiphlogistic local applications to the abdomen. Cold cloths or ice, sedulously employed at the outset, may abort the inflammation or lessen its severity, but when the disease is established warm anodyne fomentations are preferable. Nutritious liquid food, quinine, and alcoholic stimulus must be administered at regular intervals and in doses determined by the degree of prostration.

E. DARWIN HUDSON, JR. REVISED BY WILLARD PARKER.

Puerperal Mania, perversion of the mind in women immediately after childbirth and during the first week thereafter, exceptionally occurring before delivery, or developed weeks or months after labor by excessive and exhaustive nursing. It may therefore be considered as a derangement of the mind due to the influences of the childbirth upon the sympathetic nervous system and emotional nature of the mother. Puerperal mania may be characterized by mental agitation or excitability, or, reversely, the patient may sink into a state of mental apathy, moodiness, reticence, or despondency. There will be restlessness, inability to sleep, headache, impaired appetite, coated tongue—in some cases an increase of temperature. The bowels are usually constipated, the urine diminished in quantity. The secretion of milk is often lessened or suspended. Although the delirium in some cases is violent, no evidence of inflammation or other organic disease of the brain or its membranes has been detected as the lesions to which the symptoms would lead on post-mortem examination. In the delirious form and in the melancholic form there is equally an aversion to the father or the child. Suicide and murder of the child are occasional occurrences. Puerperal mania may be expected to occur in women of nervous temperament or those predisposed to insanity; in such also as are greatly reduced by previous ill-health, by hæmorrhage during or following delivery, or whose blood has been impoverished by absorption of malaria and putrescent effluvia. The prognosis is favorable; the mind in most cases is, in time, restored to a normal condition. The patient of puerperal mania may wholly escape it at subsequent childbirths if the system be fortified in advance by iron to correct anæmia, and care be taken to prevent unusual loss of blood during parturition. Where insanity or emotional excitability are family traits, mania may recur with successive labors despite all precautionary efforts. The treatment varies with the form of mania and severity of symptoms. The infant in most cases is to be removed, as it is unsupplied by the mother's breast-milk, and its influence is often pernicious; when left, it should have a constant attendant to guard it against injury at the hands of its mother. Firm but gentle control of the patient is essential, and often removal from husband, family, and familiar friends is essential to the quiescence of mind and body. Rest and sleep must be ensured by cerebral sedatives and soporifics, as bromide of potash, bromide of ammonium, hydrate of chloral, stramonium, hyoscyamus, or the preparations of opium when borne without excitement, as codeine and the deodorated tincture of opium. Even the hypodermic injection of morphine may be required in obstinate insomnia and delirium. The constipation is to be corrected, the diet must be nutritious, and the appetite, if deficient, stimulated by use of tonic elixirs and wine. The strength must be sustained and the blood enriched by cod-liver oil, quinine, and iron.

E. DARWIN HUDSON, JR. REVISED BY WILLARD PARKER.

Puerto de la Mar. See COBIJA.

Puer'to Cabel'lo, town of Venezuela, South America, province of Caraccas, on an island in the Gulf of Triste, has a most excellent harbor, large, commodious, and perfectly safe. It carries on a considerable trade, but its climate is unhealthy. P. about 8000.

Puer'to de San'ta Mari'a, or, simply, **El Puerto,** town of Spain, province of Cadiz, at the mouth of the Guadalete in the Bay of Cadiz. It is a handsome and well-built town, surrounded with fine promenades, and in communication with the great commercial centres, as it is the principal place for the exportation of the famous Xeres wine; over 1,500,000 gallons are annually exported from this place. Leather, soap, hats, brandy, and liqueurs are manufactured, and in May of each year one of the most famous bull-fights of Spain takes place here. P. 21,714.

Puer'to Prin'cipe, town of the island of Cuba, West Indies, was founded in 1514 by Velasquez on the site of the old Camaguei, close by the sea, but has since been moved twice farther inland, and is now situated 10 miles distant from its harbor, Nuevitas, on the northern coast of the island, with which it is connected by railway. P. 30,000.

Puff Ad'der, the *Clotho arietans,* a deadly serpent of South Africa, so called from its habit of puffing up the neck when irritated. It is very large and thick, and is ordinarily slow, but can move very quickly upon occasion. It is of most frightful appearance, and is frequently seen half buried in the sand. There is no known remedy for its bite.

Puff-Balls. These peculiar plants are placed in the order Trichogastres of the gasteromycetous group of Fungi, and are characterized by a single or double covering (*peridium*), with the spore-bearing interior (*hymenium*) at first spongy, but soon ripening into a dry, dusty mass of threads and spores. (For classification and definition of terms see FUNGI.) Like other fungi, the puff-balls are parasitic, living usually on decaying vegetable matter, and pass rapidly through their stages of growth. Among the most common of our puff-balls are some of the species of the genus *Lycoperdon,* recognized by the thin membranaceous peridium, easily breaking away when ripe, allowing the escape of the spores from within. *L. pyriforme* is the pear-shaped species seen growing almost everywhere, single or in clusters, on decaying logs and stumps. The peridium in this species is quite tough, and the greenish-yellow spores escape through a small opening at the top. Fig. 1 represents a member of this species, with the rotten wood removed from the base and *mycelium.* *L. giganteum,* the "giant puff-ball," is the largest species, often attaining the size of a large foot-ball, with a few of extraordinary dimensions, measuring two feet in diameter. When young its white fleshy substance is esteemed for food, but soon the interior in ripening is reduced to a brown powder, which is sometimes employed as an anæsthetic. Another quite large species, and much more common than the last mentioned, is *L. cœlatum.* The peridium is flaccid and collapses at maturity, forming the shape of a cup, with the spores escaping by a rupture at the side. While young the species is eaten to some extent. *L. saccatum* is an elongated species growing in woods, and is easily recognized by the plaited folds on the under side of the peridium. The spores are of an amber color and covered with minute spines. A small species of the size of a marble is *L. pusillum,* often found on old pasture-land. The peridium also becomes flaccid, while the spores are very small and olive-colored. A common, small, and warty species often seen on rich soil has received the name of *L. gemmatum.* In the genus *Scleroderma* the peridium is firm, with distinct veins throughout the interior, spores large and granulated, arranged in masses. The most common species is *S. vulgare,* with its outer covering thick and early breaking away, leaving the bluish-black mass of the interior. They grow on gravelly banks under shrubs and trees, the largest and most mature more or less covered with warts on the upper surface. A thin-coated species, called *S. Bovista,* is sometimes found. *S. verrucosam* is characterized by its warty exterior and thin stem. Like the last, it grows on sandy soil. The genus *Bovista* is known by having a persistent peridium, usually very thin, and a continuous outer covering, which breaks away. *B. nigrescens* is of a blackish color, with the spores brown, one or two inches in diameter, often growing in pastures. Because of its lead color a small species has taken the name of *B. plumbea.* In *B. cyathiformis* we have a large species, often four to six inches in diameter, with a papery peridium and brown spores. In the genus *Geaster* the peridium is distinct and double, the outer one bursting and dividing into several stellate lobes, which often become much reflexed, giving a star-like appearance, warranting the common name of "starry puff-balls" which these species have received. In *G. hygrometricus*—so named because of the influence moisture has upon this plant, closing the outer covering in wet weather to open again on becoming dry—the spores, which are within the inner coat, and make up the interior of the sphere in the centre of the star, find their way out through an opening at the top. Figs. 2 and 3 show the closed and open states of this interesting and somewhat peculiar species of puff-ball. Much like this species, though having the mouth for the escape of the spores furnished with teeth and the whole covering of a red color, is the species *G. rufescens.* *G. fimbriatus,* *G. Curtisii,* and *G. saccata* are other rare species, agreeing with those just mentioned in their general shape and appearance. In some species of this genus the outer wall is divided into two parts, and a peculiar appearance is produced by the inner portion becoming separated and reflexed, raising the puff-ball into the air while it rests itself by its tips upon the upturned laciniæ of the outer wall. *G. fornicatus,* or "vaulting geaster" (Fig. 4), has this peculiarity, as has also the smaller species, *G. minimum,* and a somewhat larger member, *G. limbatus.* These pedicillate species are not very common. In the genus *Polysaccon* the peridium is simple, with the interior divided by masses of threads into many cavities or chambers. The genus is not a large one, and the species is rare. A yellow dye is obtained from a species growing in Italy. The remaining genera, *Batarrea* and *Tulostoma,* are characterized by having a stem of considerable length, and their species serve to connect the puff-balls with the neighboring group of Phalloidei.

FIG. 1.

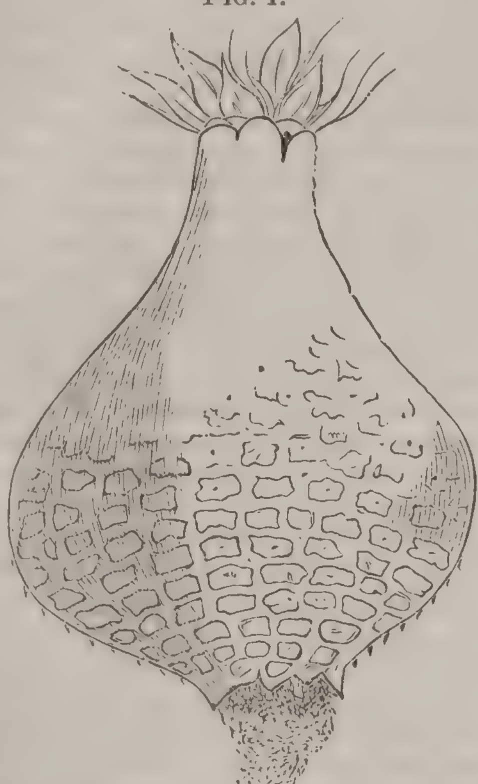
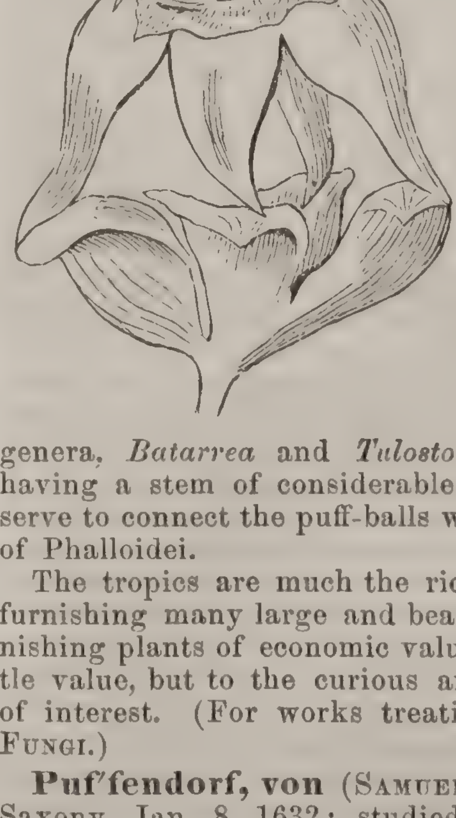


FIG. 2.

FIG. 3.

FIG. 4.



The tropics are much the richest regions in puff-balls, furnishing many large and beautiful specimens. As furnishing plants of economic value the puff-balls are of little value, but to the curious and scientific they are full of interest. (For works treating upon this subject see FUNGI.) B. D. HALSTED.

Puf'fendorf, von (SAMUEL), BARON, b. at Chemnitz, Saxony, Jan. 8, 1632; studied theology at Leipsic and mathematics at Jena; went as tutor to the son of the

Swedish ambassador to Copenhagen, where he wrote *Elementa Jurisprudentiæ Universalis* (published in Holland in 1660); was appointed professor of natural law at the University of Heidelberg in 1661; published in 1667, anonymously at Geneva, his *De Statu Imperii Germanici*, which contained a very severe criticism on the constitution and legislation of the German empire, and was burnt by the hangman in Austria; went in 1670 to Sweden, first as professor of law at Lund, afterward as royal historiographer at Stockholm; published in 1672 his celebrated work, *De Jure Naturæ et Gentium*, translated into English by Basil Kennet (London, 1749); returned in 1688 to Germany as historiographer to Frederick William of Brandenburg. D. at Berlin Oct. 26, 1694. As historiographer he wrote on Swedish and Prussian affairs, but his fame rests exclusively on his juridical works.

Puffin. See Auk.

Pugatcheff′ (Yemelyan), b. in 1726 at Simoweisk, a village on the Don, in the territory of the Cossacks; grew up as a member of a band of robbers; served in the Seven Years' war, first in the Russian, then in the Prussian, and at last in the Austrian army, and was imprisoned for some time after his return to Russia for attempts at sedition. A resemblance between him and the murdered emperor, Peter III., gave him an opportunity for one more adventure. A rumor was spread that Peter was not dead, but had escaped in disguise and was about to appear among his true Cossacks. In Aug., 1773, a proclamation from the emperor was issued. Shortly after Pugatcheff presented himself as the monarch, and was joined by a few other adventurers. The religious sect of the Raskolniks acknowledged him, and his party began to grow; the peasantry rose in his favor; he occupied several forts on the Ural and Don; some Tartar and Finnish tribes joined him, and he was on his march to Moscow with a considerable army when he was sold by his comrades for 100,000 rubles to Suwarow, and executed at Moscow Jan. 21, 1775.

Pu′get Sound, a large irregular bay in Washington Territory, forms one of the safest and best harbors on the Pacific coast. From it coal, lumber, fish, and fruit are exported. It is surrounded by a broken but fertile region, covered with dense and lofty forests.

Pugh (George Ellis), b. at Cincinnati, O., Nov. 28, 1822; graduated in 1840 at Miami University; served in the Mexican war as captain 4th Ohio Vols.; city solicitor of Cincinnati 1850; attorney-general of Ohio 1851; U. S. Senator 1855–61.

Pughe (William Owen), b. at Tyn y Bryn, Merionethshire, Wales, Aug. 7, 1759; was originally named Owen, but added the name of Pughe on receiving an inheritance; went to London in youth; engaged in the study of Welsh literature under the patronage of a tradesman named Owen Jones, with whom he published in 1789 the poems of the old bard Dafydd ap Gwilym, and with the assistance of Edward Williams issued the important work known as the *Myvyrian Archæology* (3 vols., 1801–07); edited various ancient Welsh books; published a Welsh and English dictionary (1793–1803), the *Cambrian Biography* (1803), and translated into Welsh Milton's *Paradise Lost*, Heber's *Palestine*, and other poems. D. in London June 4, 1835.

Pu′gilism [Lat. *pugil*, "a boxer"], the art of fighting with the fists in accordance with certain rules, usually practised as a public spectacle, and often for the interest of a wager or an honorary belt to be gained by the victor. Pugilism was practised on a vast scale in ancient Greece in connection with the Olympic and other national games, but was never popular under the Roman empire. It was revived in England in the middle of the eighteenth century, and soon became popular, many persons of the higher classes frequenting the exhibitions, and even taking part in them. In comparatively recent times prize-fighting has been sometimes practised in the U. S., but with all possible secrecy, it being prohibited by law. There is a considerable English and American literature of the subject.

Pugin′ (Augustus), b. in Normandy in 1769; is known as a draughtsman by works illustrating mediæval architecture—*Architectural Antiquities of Normandy, Specimens of Gothic Architecture in England, Architectural Illustrations of the Buildings of London, Gothic Ornaments from Buildings in England and France.* The works were elaborate and costly; letter-press by competent hands, Wilson and Britton the antiquary. D. in England Dec. 19, 1832. O. B. Frothingham.

Pugin (Augustus Northmore Welby), son of Augustus, b. in London, England, Mar. 1, 1812; inherited his father's tastes and talents, adding to them literary ability. Having been converted to Romanism, he devoted himself with zeal to the revival of ecclesiastical architecture in England, designing churches and religious houses, seldom building secular edifices, and never erecting sacred ones for Protestants. In his later years he wrote pamphlets in defence and commendation of his faith, his enthusiasm for which made him for months an inmate of an insane asylum. His influence was great in fostering a taste for Gothic forms in architecture and ornament. His principal works are—*Examples of Gothic Architecture, Principles of Pointed or Christian Architecture, An Apology for the Revival of Gothic Architecture, Glossary of Ecclesiastical Ornament.* (See *Blackwood's Magazine* for Dec., 1861.) D. at Ramsgate Sept. 14, 1852. O. B. Frothingham.

Pugin (Edward Welby), son of the preceding, b. Mar. 11, 1834; at the age of seventeen undertook the completion of his father's designs and contracts; a devoted Catholic, designed the cathedral at Queenstown; built churches in Liverpool, Kensington, Peckham, Barton, Sheerness, Stratford, Leeds, Cork, Dublin; also in Belgium—more than 100 churches in all—besides orphanages, colleges, priories, etc.; restored the archiepiscopal palace at Mayfield; finished a superb Gothic structure begun by his father at Scarisbrook Hall; claimed for his father the merit of designing the New Houses of Parliament, supporting the claim in a volume. D. Feb. —, 1876. O. B. Frothingham.

Pugwash, a seaport in Cumberland co., N. S., on Northumberland Strait, 50 miles W. of Pictou. It has quarries of gypsum, limestone, and sandstone. Deals are largely shipped to Great Britain. P. about 700.

Pujet′ (Pierre), b. at Marseilles Oct. 31, 1622; was apprenticed as a wood-carver in a shipbuilding establishment; visited Italy twice, studying art; practised painting for some time, but devoted himself subsequently to sculpture and architecture; resided for several years in Genoa, but was recalled to France in 1664 by Colbert as director of ship-decoration at the docks of Toulon; retired after a few years' service into private life. D. at Marseilles Dec. 2, 1694. His most celebrated works are *St. Sebastian*, in the church of St. Maria da Carignano in Genoa; *Milo devoured by a Lion* and *Perseus and Andromeda*, at Versailles. He belongs wholly to the school of Bernini.

Pujol′, de (Alexandre Denis **Abel**), b. at Valenciennes, France, Jan. 30, 1785; studied painting under David, and obtained distinction by historical and religious pictures. D. at Paris Sept. 28, 1861.

Pulas′ki, county of Central Arkansas. Area, 700 sq. m. Traversed by the Arkansas River and by Cairo and Fulton and Memphis and Little Rock R. Rs. It is undulating, fertile, well timbered, and produces live-stock, corn, cotton, and lumber. Iron, lead, and silver ores, kaolin, and some coal are found. Cap. Little Rock. P. 32,066.

Pulaski, county of Central Georgia. Area, 550 sq. m. It is somewhat uneven, but fertile. Cotton, corn, and live-stock are leading products. Traversed by Brunswick and Macon R. R. and Ocmulgee River. Cap. Hawkinsville. P. 11,940.

Pulaski, county of S. Illinois. Area, 190 sq. m. It is uneven, very fertile, and well timbered. On the S. E. Ohio River separates it from Kentucky. Tobacco, wheat, corn, and lumber are leading products. Traversed by Illinois Central and Cairo and Vincennes R. Rs. Cap. Mound City. P. 8752.

Pulaski, county of N. W. Indiana. Area, 434 sq. m. It consists partly of prairie and partly of oak-openings. Grain, wool, and hay are leading products. Traversed by Pittsburg Cincinnati and Chicago and Louisville New Albany and Chicago R. Rs. Cap. Winamac. P. 7801.

Pulaski, county of Central Kentucky. Area, 640 sq. m. It is hilly and very fertile. Tobacco, grain, wool, and live-stock are leading products. Coal is found, with other valuable minerals. Traversed by Cumberland River and its forks. Cap. Somerset. P. 17,670.

Pulaski, county of Central Missouri. Area, 500 sq. m. It is very hilly, with fertile valleys and great mineral wealth. Corn and live-stock are leading products. Traversed by Gasconade River and Atlantic and Pacific R. R. Cap. Waynesville. P. 4714.

Pulaski, county of S. W. Virginia. Area, 325 sq. m. It is mountainous, and contains coal and other minerals. Grain and tobacco are important products. Traversed by New River and by Atlantic Mississippi and Ohio R. R. Cap. Newbern. P. 6538.

Pulaski, p.-v., Indian Creek tp., Pulaski co., Ind., on Tippecanoe River. P. 123.

Pulaski, p.-v. and tp., Jackson co., Mich. P. 1165.

Pulaski, p.-v., cap. of Oswego co., N. Y., at the intersection of Oswego and Rome and Syracuse Northern R. Rs., has an academy, 4 churches, a custom-house, jail, paper and straw-board mills, 2 banks, 1 newspaper, 2 door, sash, and blind factories, 1 foundry, a carbon-pipe factory, a

butter-tub factory, 2 tanneries, 4 grist-mills, and a chair-factory. P. 1560. L. READE MUZZY, ED. "DEMOCRAT."

Pulaski, p.-v. and tp., Williams co., O., includes Bryan, the county-seat. P. 3547.

Pulaski, tp., Beaver co., Pa. P. 943.

Pulaski, p.-v. and tp., Lawrence co., Pa., on Erie and Beaver Canal and Erie and Pittsburg R. R. P. 1563.

Pulaski, tp., Oconee co., S. C. P. 653.

Pulaski, p.-v., cap. of Giles co., Tenn., on Nashville and Decatur division of Louisville Nashville and Great Southern R. R., has 1 newspaper and is the trade-centre for a large agricultural district. P. 2070.

Pulaski, tp., Iowa co., Wis. P. 1082.

Pulaski (CASIMIR), COUNT, called in Polish KAZIMIERZ PULAWSKI, b. in Lithuania Mar. 4, 1747, son of Count Joseph Pulaski, who in 1768 formed the Confederation of Bar for the preservation of the liberties of Poland; was educated for the law; saw some military service under Charles, duke of Courland, and in 1769 joined his father and two brothers in the national struggle against the despotism of King Stanislaus Augustus. His father and brothers having perished in the war, Casimir was for some time commander of the insurgents, and made a bold attempt to seize the king in Warsaw. Being outlawed on the failure of this attempt, he escaped to Turkey 1772; participated in a war against Russia; proceeded to France, where he made the acquaintance of Franklin, and offered his services to the cause of American independence. Arriving at Philadelphia in the summer of 1777, he joined the army as a volunteer; distinguished himself at the battle of Brandywine, and two days later was appointed by Congress brigadier-general (Sept. 13), and given command of the cavalry. He took part in the battle of Germantown, and in Mar., 1778, having resigned his command, he formed at Valley Forge an independent corps of lighthorse and infantry called "Pulaski's Legion," officered chiefly by foreigners. By a surprise at Little Egg Harbor, N. J., a large part of his infantry was bayonetted, but the legion was again recruited to 330 men. In Feb., 1779, he set out for the South; reached Charleston May 8; made a vigorous but unsuccessful attack upon the British advance-guard May 11; accompanied Count d'Estaing to the siege of Savannah, where he was given the command of the French and American cavalry; was mortally wounded in the assault of Oct. 9; was carried on board the U. S. brig Wasp in Savannah, where he d. Oct. 11, 1780, and was buried on St. Helen's Island. A monument to his memory was erected by the citizens of Savannah, and the cornerstone laid by La Fayette in 1825. (See his *Life* in Sparks's *American Biography*, 2d series, vol. iv.)

Pul'ci (LUIGI), b. at Florence in 1431; belonged to the circle of Lorenzo de' Medici and Poliziano, and d. in 1487. Of his epic, *Il Morgante Maggiore*, Lord Byron has translated one song.

Pulgas, tp., San Mateo co., Cal. P. 1438.

Pulley. See MECHANICAL POWERS, by PROF. W. P. TROWBRIDGE, A. M., M. N. A. S.

Pullman (JAMES MINTON), b. Aug. 21, 1836, at Portland, Chautauqua co., N. Y.; graduated at St. Lawrence Divinity School in 1860; pastor of the First Universalist parish of Troy, N. Y., same year; ordained in 1862; accepted the pastorate of the church of Our Saviour, New York City, in 1867; organized the Young Men's Universalist Association of the city of New York in 1869; has been secretary of the General Convention of Universalists since 1868, and chairman of the publication board of the New York State convention of Universalists, having in charge the *Christian Leader* since 1869.

Pulmonaria. See LUNGWORT.

Pulmona'ta, an order of gasteropodous breathing mollusks, deriving the name from the fact that the blood is exposed to the air while circulating though a vascular network lining the internal surface of the bronchial cavity. There are two genera, *P. terrestris* and *P. aquatica*, the former comprehending five and the latter six genera.

Pulmon'ifers [Lat. *pulmo*, "lung," and *fero*, to "bear"], the name of a sub-class of gasteropods adapted for aërial respiration by a peculiar lung-like modification of the walls of the pallial cavity. It includes the common inoperculate land and fresh-water shells and slugs. (See GASTEROPODS.) THEODORE GILL.

Pul'que [Mexican], the fermented juice of various species of AGAVE (which see). It is obtained by scooping out a cavity in the crown of the plant just as the flower-stalk is about to form. In this cavity the sap collects for many weeks, one plant furnishing a large amount of juice. At first the taste is pleasant and the liquor harmless, but after fermentation it acquires peculiarly intoxicating properties, and is very injurious in its constitutional effects. It is used in Mexico and other parts of Spanish America.

Pulsatilla. See ANEMONE.

Pulse [Lat. *puls, pultis*], a general name for such seeds of leguminous plants as are used for human food. All kinds of pulse abound in vegetable caseine, and all are highly nutritious, but as a rule they are not easy of digestion, and are best suited for hard-working men. Beans, pease, and lentils are the most important kinds of pulse.

Pulse [Lat. *pulsus*, from *pellere*, to "beat"], the result of the blood-wave sent through the arteries of the body by the ventricles of the heart. Each contraction of these ventricles sends into the arteries two to four ounces of blood, which, entering vessels already full but contracted, expands, elongates, and uplifts them, and produces a sudden lifting and impulse on the finger applied to them. This impulse is equal in all the arteries of equal size throughout the body, but the physician usually examines it on the thumb-side of the wrist (in the radial artery), because there the vessel is near the surface, resting on bone, and its varying movements can be best appreciated. These movements indicate, first, the particular action of the heart, and second, the state of contraction or relaxation of the artery-walls. The frequency of the pulse in a healthy adult, at rest, is 72 to 75 beats in a minute—in women a little more frequent than in men; more frequent while standing than while sitting, least frequent in the recumbent position. But a slow pulse is sometimes found in healthy, strong persons; 40 or 45 beats are not very uncommon; Heberden and Fordyce have found it as low as 30 and 26, the latter in one instance no more than 20. Muscular exertion increases the number of heart-beats in a given time, and consequently the frequency of the pulse, in proportion to its amount and duration. Certain mental states, as surprise, anger, or a sudden sense of danger, will produce great increase in its frequency.

The pulse in disease sometimes becomes very frequent, and sometimes very slow. In inflammation of the membranes of the brain in children it has been often found, toward the termination, beating at the rate of 180 for a day or more; it has sometimes reached 200. The latter number cannot be easily counted at the wrist; 160 is often with difficulty made out; but the heart-beats can be appreciated by the ear at almost any rate of possible frequency, except in the mere flutter of some conditions of heart disease. In some states of disease of the brain and liver the pulsations are no more than 40, or even 30, in the minute.

Dr. Guy, after numerous observations at different ages, gives the following as his results in regard to normal frequency: At birth, 140 per minute; in infancy, 120; in childhood, 100; youth, 90; adult age, 75; old age, 70. Dr. Guy and others have noted that it is more frequent in the morning than in the evening.

There is nothing more wonderful in physical life than the lively sympathy of the heart, expressed by the varying pulse, in the various diseases that afflict the body. It "speaks a various language" which the educated alone can properly interpret. It is small or full, rapid or slow, hard or soft, quick or prolonged, irregular in various ways, giving a varying number of beats in the different fractions of a minute, the beats tumultuous, frequent, and slow alternately, or is double (*dicrotic* or *bisferiens*). It is often intermittent; that is, a single beat is lost. This occurs both with and without disease of the heart; it is often caused by the use of tobacco. In some states of imperfect innervation of the heart its pulsations cease entirely, to be resumed after the lapse of a considerable fraction of a minute. In two such cases the writer found the period of absolute inaction of the heart to be fifteen seconds. It was attended by extreme paleness, complete loss of consciousness, suspension of the breathing; indeed, temporary death. An instrument has been invented by which many conditions of the pulse can be inscribed on paper attached to a revolving cylinder. It is called a "sphygmograph."

Venous Pulse.—The arterial pulsation reaches the very small arteries, but is lost in the smallest or capillary arteries and capillary veins, so that the blood returns to the heart in a continuous, steady stream; but when the tricuspid valve is insufficient, a wave of venous blood may be sent back into the venous trunks and produces a visible pulsation, mostly in the veins of the neck. Such pulsations will correspond, as those in the arteries do, with the contractions of the ventricles (systole). Hypertrophy of the right auricle of the heart may also produce venous pulsations. So may aneurism of the aorta when it obstructs the current of blood descending through the vena cava, the enlarged artery communicating its pulsation to the blood in the vein. In some instances of difficult breathing the veins of the neck are seen to become distended in a sort of wave, apparently from below, but really from above, be-

cause the outlet is obstructed at the heart. This filling occurs in expiration, and the veins are emptied in inspiration. Though this action has been called pulse or pulsation, it is very different from the movement to which the term is commonly applied.

Nysten (*Dictionnaire*, etc.) states that the arterial pulsations in the horse are from 32 to 38 in the minute; in the ass, from 45 to 48; in oxen and cows, 35 to 42; in sheep, 70 to 77; in the dog, 90 to 100. These countings were made when the animals were at rest. ALONZO CLARK.

Pul'te (JOSEPH HIPPOLYTE), M. D., b. at Meschede, Westphalia, Germany, Oct. 6, 1811; took his medical degree at Marburg, having studied also at the gymnasia of Berlin and Söst; settled in Allentown, Pa., 1834, and was one of the founders of a homœopathic college at Allentown; removed in 1840 to Cincinnati, O.; professor of clinical medicine in the homœopathic college at Cleveland 1852; of obstetrics 1853–55; afterward professor of the science of clinical medicine in Pulte Medical College, Cincinnati, O.; served as editor to various professional and other journals; author of various works in English and German, of which the best known is the *Homœopathic Domestic Physician* (1850), which has had an extensive sale.

Pult'eney (WILLIAM), earl of Bath, b. in England in 1682; educated at Westminster School and at Christ Church, Oxford; entered Parliament as a Whig 1705; took part in the prosecution of Dr. Sacheverell; defended Walpole in the prosecution made in 1712; became on the accession of George I. privy councillor and secretary at war 1714–17; became cofferer of the household under Walpole 1720, but went over to the opposition 1725, becoming the bitterest political enemy of his former friend, against whom he wrote several pamphlets; fought a duel with Lord Hervey, in which both combatants were wounded, 1731; became extremely popular as the leader of the general crusade against Walpole; associated with Pope and the "wits" of the day, who paid him extravagant compliments for his literary ability; was the real framer of the cabinet of 1742 on the downfall of Walpole, though the earl of Wilmington was the ostensible head; was created at this time earl of Bath; lost much political influence by his transference to the Upper House of Parliament, and was premier for two days in Feb., 1746, on the resignation of the Pelham ministry, but was unable to form a cabinet. D. in London July 8, 1764, his title expiring with him, as he left no male issue. Author of many political pamphlets, and chief assistant of Bolingbroke in writing the celebrated journal *The Craftsman*.

Pult'ney, p.-v. and tp., Steuben co., N. Y., near Crooked Lake. P. 1393.

Pultney, tp., Belmont co., O., on Ohio River, Central Ohio division of Baltimore and Ohio, and River division of Cleveland and Pittsburg R. Rs., includes the v. of Bellaire. P. 6319.

Pultneyville, p.-v., Williamson tp., Wayne co., N. Y., on Lake Ontario.

Pu'lu, or **Vegetable Silk,** a richly-beautiful fibre produced by a tree-fern of the genus *Cibotium*, growing in the Malay and other Pacific islands. The attempt to manufacture it has not proved successful, but it is a very useful styptic, and is considerably used as such by Dutch surgeons.

Pu'ma, or **Cougar** [*Felis concolor*, Linn.], a carnivorous animal found throughout South America and a great part of North America, known in Spanish American countries as the American lion, and in the U. S. as the catamount or wild-cat, and vulgarly as "painter" (a corruption of "panther"). The adult male is from four to five feet long, has a thick fur, brown above and grayish-white beneath, with the ears and tail nearly black, and sometimes partially striped along the sides. It climbs trees, lives chiefly upon deer, and has a shrill scream; is cowardly, and does not voluntarily attack man, but makes a desperate resistance to the hunter. It is easily tamed, and becomes quite docile.

Pum'ice [Lat. *pumex*], a light, porous mineral, a sort of soft trachyte, found near active or extinct volcanoes, and formed by steam in blast furnaces when water is poured over melted cinder. It is not unlikely that the admixture of gases in the lava from which it is formed is the cause of its porous nature. It is considerably used in the arts, in polishing hard materials, and in dressing parchment and fine leather. In the toilet it serves to remove stains and patches of thickened cuticle. It is chiefly exported from the Lipari Islands.

Pump. A pump is a machine for elevating water or other liquid. The height to which the water is raised is called the "lift." Pumps sometimes act not by raising water, but by forcing it into a vessel against a pressure, as in the case of the feed-pumps of steam-boilers. Such pressure may, however, be always represented by a head of water. The necessities of industry and the rivalry of inventors and manufacturers have given rise to innumerable varieties of this machine. The accompanying figures are examples of the types in most common use.

FIG. 1.

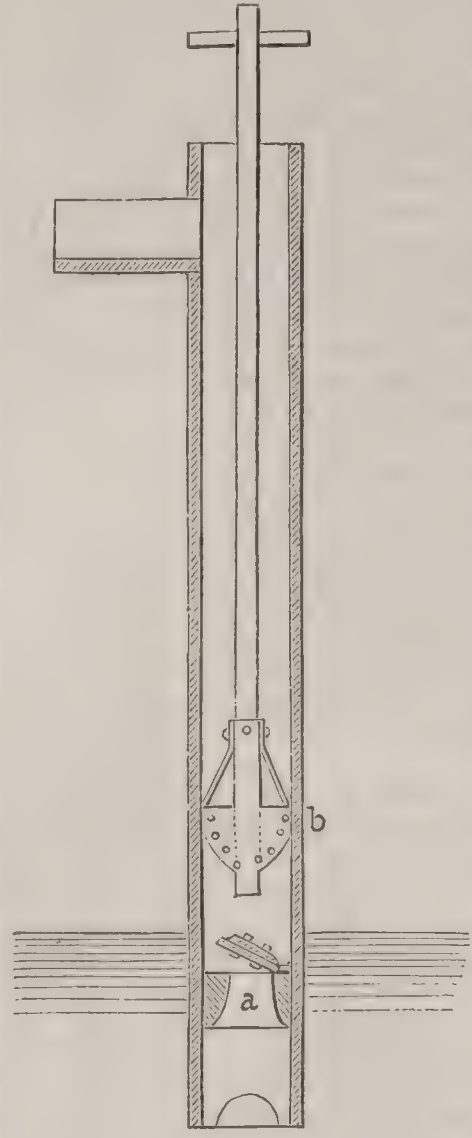


Fig. 1 shows the simplest form of this machine. It is used for lifts of but a few feet, for draining shallow pits and bailing flat-bottomed-boats. As it can be made by a carpenter in a few hours, it is frequently applied where there is but temporary need of a pump. It consists of a square wooden barrel, a foot-valve *a*, and a piston *b*. The foot-valve is a leather flap on a wooden seat; the flap has a leaden back to give it due stiffness and weight. The piston *b* is a leather cup attached to a wooden rod. On its downward stroke the water folds it together, and allows it to pass freely. In its upward movement the water distends or bags it out, causing it to press against the interior of the barrel, and making it tight. The water above the piston is simply lifted, while the water follows the piston and flows through the valve *a* in virtue of the atmospheric pressure. Pumps of this kind are sometimes arranged as at Fig. 2. The workman procures a tough sapling, and, fixing one end securely, attaches the other to the pump-rod. This acts as a spring to raise the piston. With this arrangement the workman throws his weight upon the spring at each stroke, pressing down the piston, which rises with but slight effort. He works in this manner with much less fatigue than in raising the water by a dead lift. Water is always poured into such a pump before starting it.

FIG. 2.

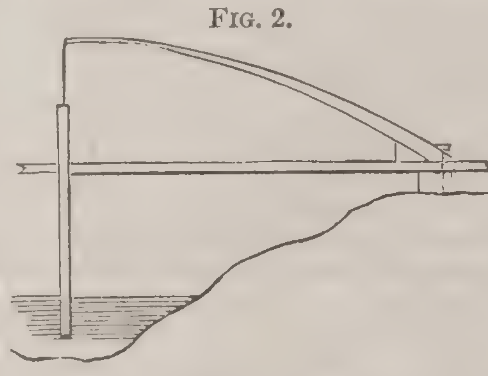


FIG. 3.

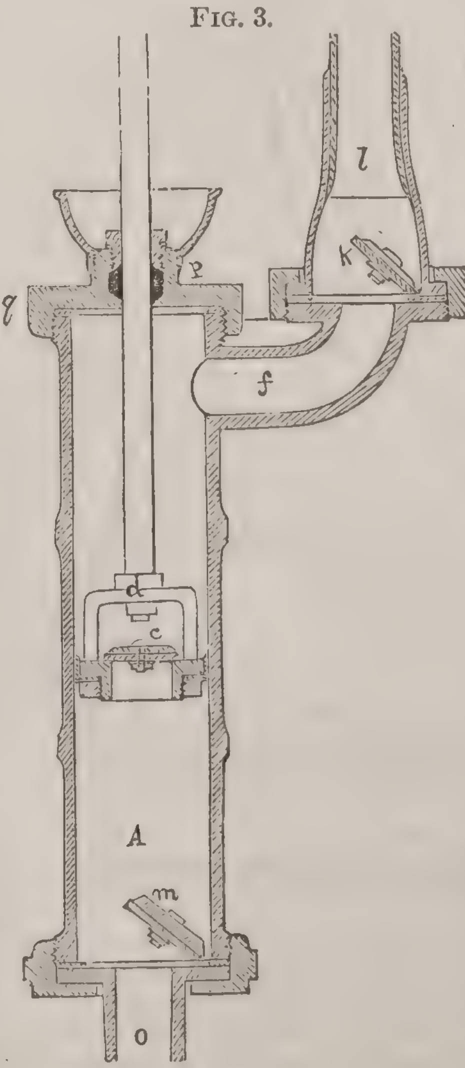
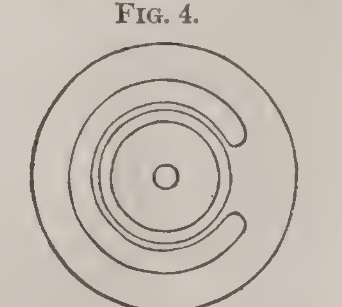


Fig. 3 is a section of a force-pump much used for domestic purposes. Fig. 6 is a general view of the same. The valves, the most important organs of the pump, are fully shown here and at Figs. 4 and 5. Fig. 4 is the valve *m* or *k*, which serves at the same time as a joint-packing. The outer ring serves as the joint-packing. The inner circle is the valve or flap. The neck between the two is the hinge. A backing of lead gives

FIG. 4.



weight and stiffness to the flap. The piston-rod passes through a stuffing-box *P* in the cover *q*, and is moved by a handle, as shown at Fig. 6. The action of the pump is readily understood. During the downward movement of the piston the valves *m* and *k* close, preventing the backward movement of the water. The pressure of the water raises the valve *c* in the piston, and allows the water to pass through the piston as it descends. During the upward movement of the piston the valve *c* is closed. The water above the piston is forced through the branch *f*, raising the valve *k* and passing into the ascending pipe *l*. The atmospheric pressure forces the water through the supply-pipe *o* into the pump-barrel A, raising the valve *m*. This pump differs from the ordinary domestic pump only in delivering the water above the pump. If the cover *q* and the branch *f* were removed, it would be the ordinary suction-pump discharging at *f*. The piston of the ordinary suction-pump is more commonly made as shown at Fig. 5. It has a joint at *c*, as the piston-rod does not move in a straight line. The leather packing is also differently applied from that shown at *d*, Fig. 3.

FIG. 5.

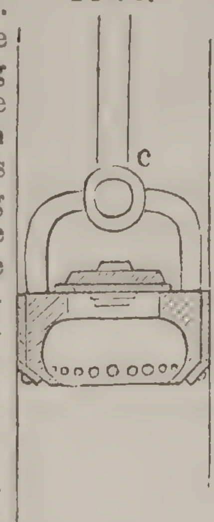
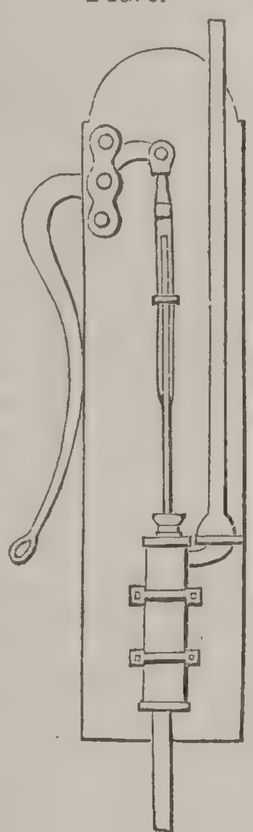
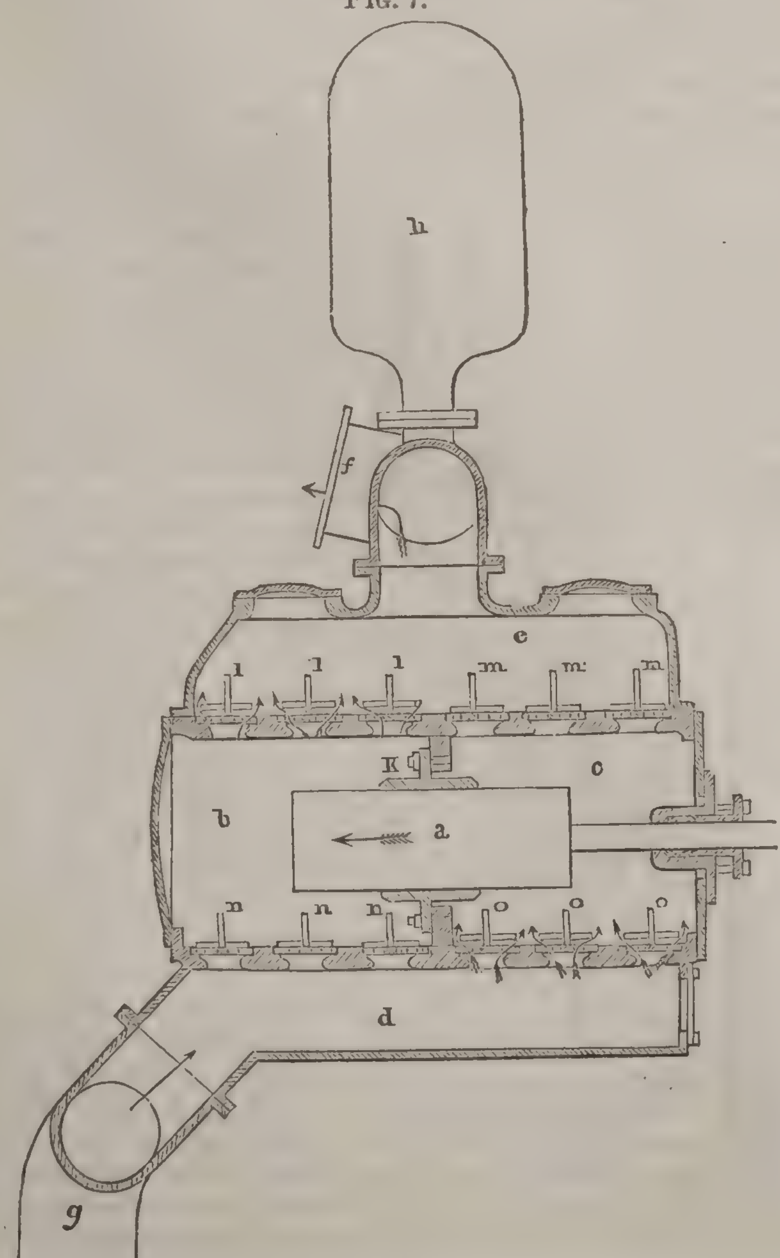


FIG. 6.



It will be noticed that the pumps shown at Figs. 1 and 3 are *single-acting*. They furnish a stream only during the ascent of the piston. Fig. 7 represents a double-acting pump driven by a powerful steam-engine. It is one of a pair of pumps constructed by Mr. Worthington of New York for the town of Brookline, Mass., intended to raise 2,000,000 gallons of water per day to a height of about 180 feet. The plunger *a* moves horizontally through water-tight packing. It is supposed, in the drawing, to be moving as indicated by the arrow. In so doing it diminishes the water-space in the chamber *b*, forcing the water through the valves *l l l* into the chamber *e* communicating with the force-main *f*. At the same time it tends to create a vacuum in the chamber *c*, which tendency causes the water to rise from the pump-well through the pipe *g* and chamber *d*, lifting the valves *o o o* and entering the chamber *c*. During the return stroke the

FIG. 7.



water enters the chamber *b* through the valves *n n n*, and passes from *c* to *e* through the valves *m m m*, the valves *l l l*, *o o o* remaining closed. This is called a *double-acting* pump, because it discharges an unintermittent stream. *h* is an air-chamber communicating with the force-main. Its use is explained under the head of PUMPING-ENGINES. Figs. 8 and 9 show the valves of this pump: *g* is the valve-seat, of iron with a brass face. It is leaded into a recess in the plate; *a* is the valve, of rubber; *f*, a spindle on which the valve slides in rising and falling; *b*, a plate forming a socket for the valve and a bearing for the spring; *d*, a spiral spring of brass wire; *c*, cap; *h h*, nuts. Each pump has twenty-four valves, there being two rows, only one of which appears in the drawing.

FIG. 8.

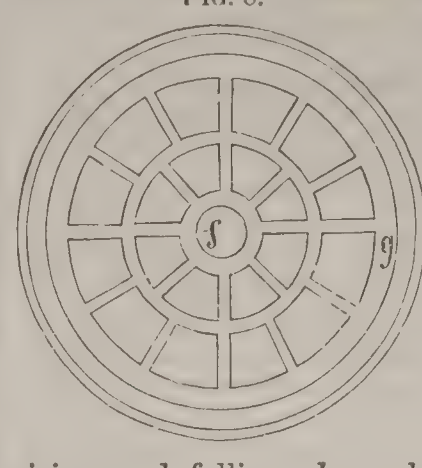


FIG. 9.

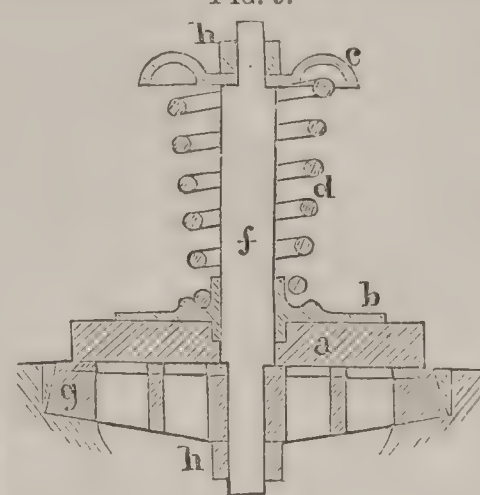


Fig. 10 is an outline sketch of a double pump for supplying the city of Brooklyn, N. Y. It is driven by an enormous steam-engine, and is capable of raising 10,000,000 gallons 170 feet in 16 hours. *a a* are the pump-barrels; *b b*, the pistons, each having a valve; *d d* are the piston-rods, each passing through a stuffing-box and attached to the opposite ends of the balance-beam of the steam-engine, so that one piston descends while the other rises; *c c*, *e e* are valves in the annular spaces around the pump-barrels. The operation of this pump is as follows: The upper piston while rising draws the water through the valve of the lower piston and the valves *e e*. The lower piston while rising forces the water through the valve of the upper piston and the valves *c c*. The traverse or stroke of each piston is 10 feet, and each stroke advances the column of water in the force-main by this distance. No attempt is made to show the construction of these valves; examples of such will be found under the head of VALVES.

FIG. 10.

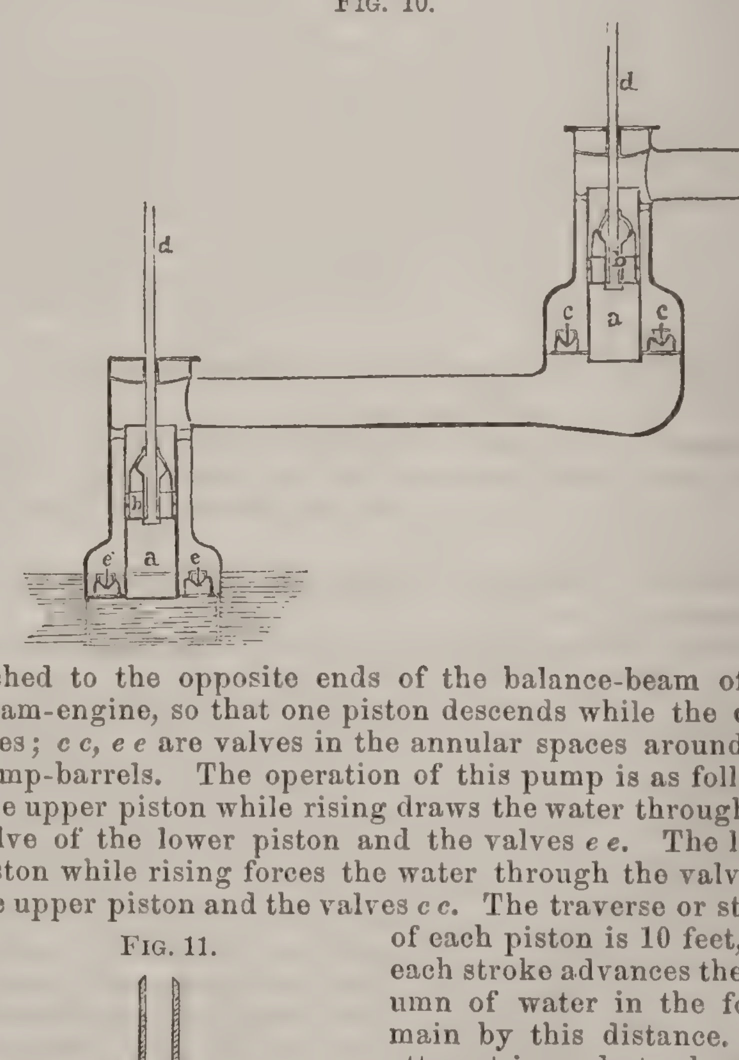
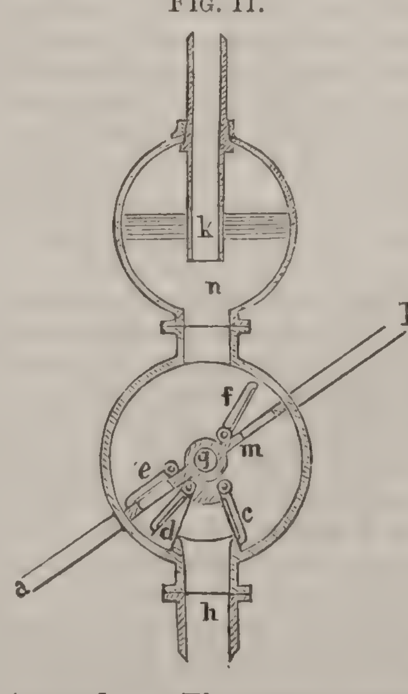


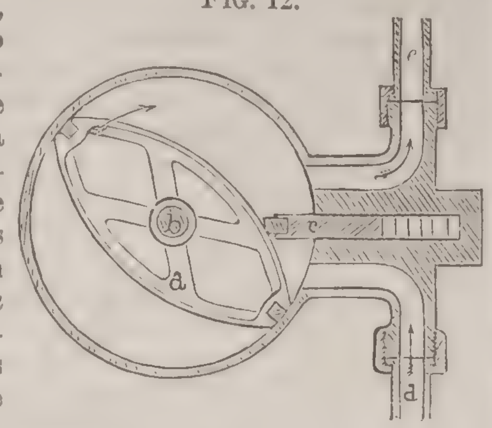
Fig. 11 is a pump devised by Bramah, and much used in the old-fashioned hand fire-engine. It is operated by giving a rocking movement to the shaft *g* by means of brakes on the ends of the arms *a b*. The shaft *g* carries a diaphragm *m* closely fitting the cylindrical pump-chamber. Upon pressing down the end *b* of the arm, the diaphragm revolves from *m* toward *c*. The valves *e* and *e* close, *d* and *f* open. The water is drawn through the pipe *h* and forced into the chamber *n*. When the diaphragm revolves in the oppo-

FIG. 11.



site direction, c and e open, d and f close, and the same movement of the water takes place. The chamber n is partly filled with air in a high state of compression, whose elasticity helps to maintain an uninterrupted stream through the pipe k. Fig. 12 is a pump also said to be invented by Bramah, to be operated by a continuous rotary movement. An elliptical diaphragm a fits the cylindrical pump-chamber tightly by means of suitable packing at the circumference and ends.

FIG. 12.



A sliding partition c is pressed by springs against this diaphragm, forming a tight connection in every position of the latter. The shaft b passes through a stuffing-box in the end of the pump-chamber, and is turned by a crank in the case of a hand-pump and by a belt and pulley in a power-pump. The diaphragm revolving in the direction of the arrow, the space communicating with the supply-pipe d enlarges, and draws the water through d, and the space communicating with the discharging pipe e diminishes, and forces the water through e.

We come now to the centrifugal pump, a machine much used in hydraulic constructions requiring the temporary removal of large volumes of water. The water is caused to revolve with great velocity in a circular chamber. The tendency which water, in common with all heavy bodies, has to move in a straight line causes a pressure upon the circumference of the chamber sufficient to make the water rise to a greater or less height, depending on the velocity. The simplest, most efficient, and most reliable form of the centrifugal pump is the one indicated by Figs. 16 and 17. It is placed at the lowest point of the pit to be drained, and being once put in position, cannot be readily changed. The water receives a rotary movement from arms attached to a vertical shaft. It enters the pump at the centre and rises through a pipe at the circumference. The shaft is driven by a steam-engine by means of a belt and pulley at the top. This form of pump requires no valves and is not readily deranged. The height to which the water will rise is the height due the velocity of rotation at the circumference—that is, the height from which a heavy body must fall to acquire this velocity. It is not always convenient to place the pump at the lowest point of the pit. Some excavations require pumping before reaching the lowest point. Some also require frequent changes of the position of the pump. For such cases a pump has been devised which can be placed at the top of the lift, raising the water by suction. Figs. 13, 14, and 15 show such a pump in detail, as constructed by Messrs. White, Clarke & Co. of Baldwinsville, N. Y. The cylindrical shell is made in two halves. Fig. 13 shows one-half with the arms. Fig. 14 is a vertical section showing the valves. a is the driving shaft passing through a stuffing-box b, and carrying the arms, which are not shown in the section. The shaft carries a pulley through which it receives motion from a portable steam-engine; c d are the valves. They are made of thick rubber, cut out as shown at Fig. 4, serving as joint-packing as well as valves. Fig. 15 is an auxiliary hand-pump attached outside the suction-pipe, between the valves, for the purpose of filling the latter and the pump before starting. It is a single-acting plunger-pump. When the plunger rises, the valve d is lifted, admitting air or water into the space between the valves. When the plunger falls, c rises, etc. While the pump is in operation the water flows continuously through the valves. These are not essential to the action of the pump while running, but only necessary in filling it and preventing it from emptying when it stops. The length of the suction-pipe is increased as the excavation progresses. This pump is of course subject to the same restriction as all suction-pumps. Its lift cannot exceed the height due to the pressure of the atmosphere. In fact, it cannot work efficiently with more than three-fourths of that lift.

FIG. 13.

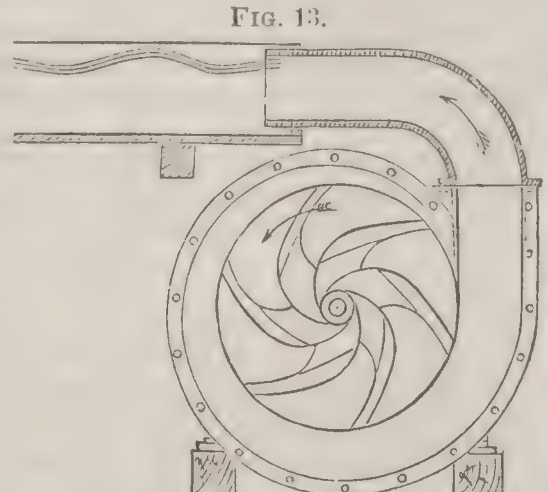


FIG. 14.

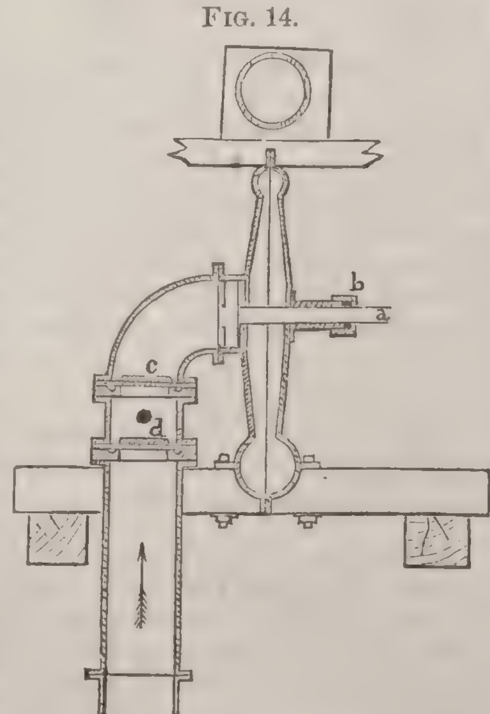


FIG. 15.

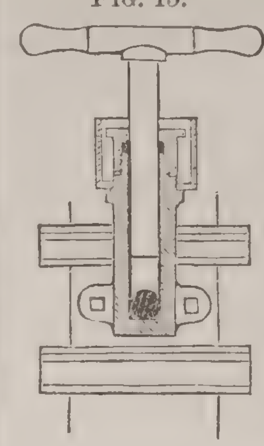


FIG. 16.

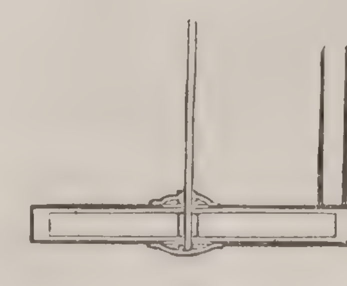
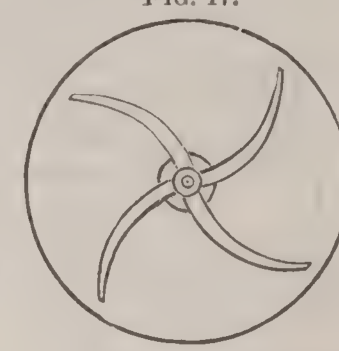


FIG. 17.



J. P. FRIZELL.

Pumpelly (RAPHAEL), b. at Owego, Tioga co., N. Y., Sept. 8, 1837; educated at Paris, Hanover, and Freiberg, Saxony, 1854–60; was engaged in mining operations in Arizona 1860–61; was employed by the government of Japan to explore the island of Yezo 1861–63; by the government of China to report upon the coal-supply of that empire 1863–64; returned to the U. S. over land through Mongolia, Siberia, and Russia; became professor of mining engineering at Harvard 1866; made a survey of the copper-region of the upper peninsula of Michigan 1870–71, and was State geologist of Missouri 1871–73. Author of articles in scientific journals in French, German, and English, of *Geological Researches in China, Mongolia, and Japan* (1867); *Across America and Asia* (1870), and of volumes of the *Geological Survey* of Michigan (1873) and of Missouri (1873), each accompanied by an atlas.

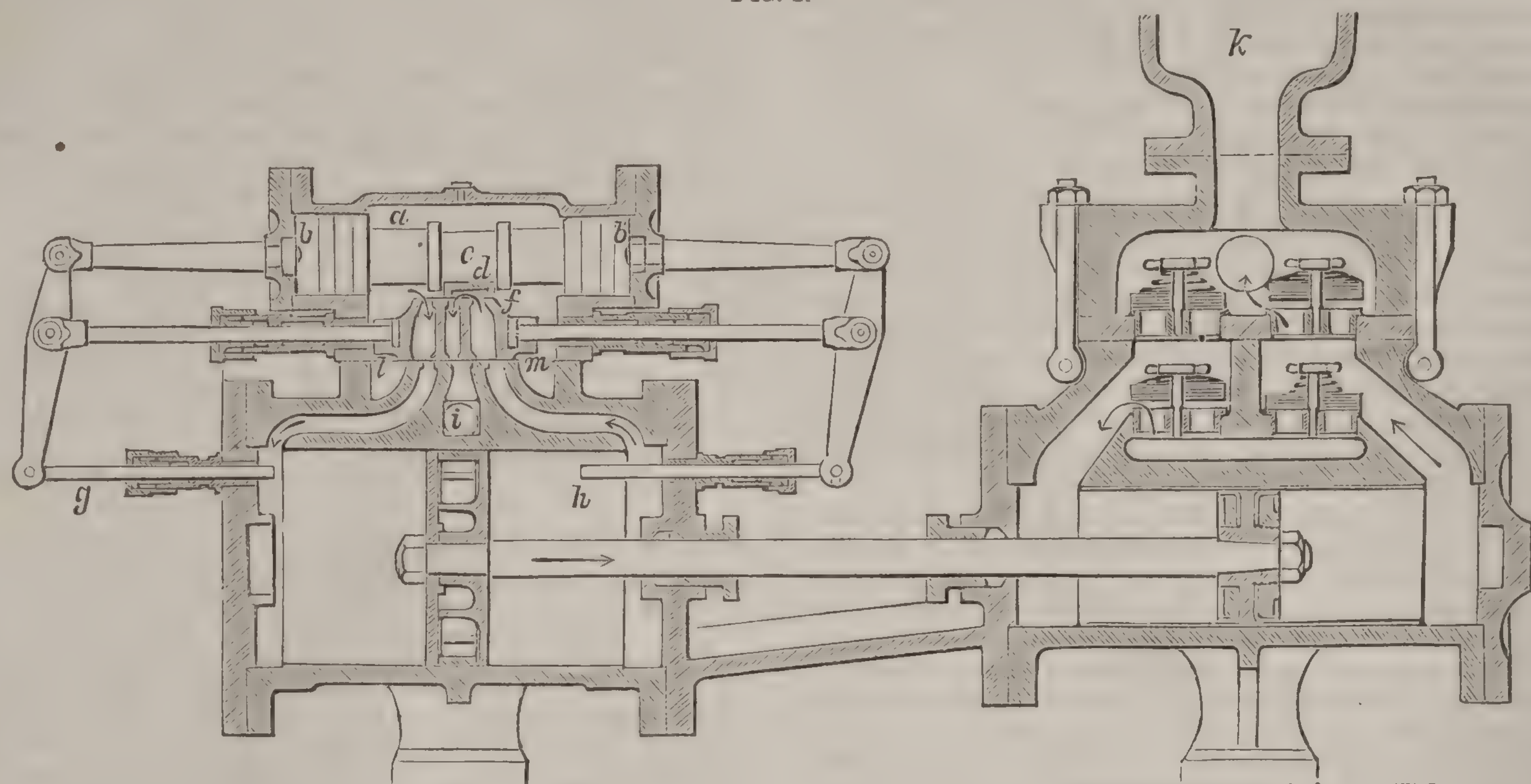
Pump'ing-En'gine. This term is applied to a steam-engine constructed specially for driving a pump, the engine and pump being inseparable from each other, and constituting together one machine. The general principles of the construction of the steam-engine will be found under the appropriate headings. Nothing more can be attempted here than a brief exposition of the distinctive principles applied in adapting the engine to pumping.

Pumping is almost always performed by the reciprocating rectilinear movement of a piston or plunger. Rotary pumps, properly so called, are but very little used. The centrifugal pump is used for temporary purposes, and is driven by an ordinary engine. Inasmuch as steam is almost universally applied by giving a reciprocating rectilinear movement to a piston and rod, the most simple and natural idea of a pumping-engine consists of a steam-cylinder in the same line with the pump-cylinder, the pistons being connected by the same rod. This is a common form of engine for dealing with small quantities of water. Such machines are called direct-acting engines. They have the advantage of great compactness and moderate cost. They are also free from an inconvenience belonging to crank-engines; viz. in certain positions of the crank called "dead points" the engine cannot be started. On the other hand, they have very serious disadvantages. The steam must be maintained at full pressure during the stroke, losing all the benefit of expansion. Moreover, to reverse the motion of the piston at the proper point without too much clearance requires valves and valve-gear of more complicated construction than the crank-engine. A clear understanding of the first disadvantage requires a few words as to the nature of expansion.

In unexpansive engines the "port" or orifice for the admission of steam from the boiler is kept open during the entire "stroke" or traverse of the piston. At the end of the stroke the cylinder is filled with steam of the same pressure substantially as that in the boiler. This is rejected through the exhaust-port on the return stroke of the piston. In an expansive engine the admission-port is closed when the piston has performed a part of its stroke, the remainder being performed by the expansion of the steam in the cylinder. The portion of the stroke performed with the admission-port open is called the "admission." The

point at which the admission-port is closed is called the "cut-off." If the cut-off occurs when the piston has performed one-fourth of its stroke, the engine is said to have a cut-off of one-fourth and a fourfold expansion. Steam used with twofold expansion gives 67 per cent. more power than when used without expansion, with threefold expansion more than twice as much, with fivefold expansion two and a half times as much, with tenfold expansion more than three times as much, and with twenty-fold nearly three and three-fourths times as much. It is at once apparent from these facts that no efficient pumping-engine can be constructed which does not avail itself of the expansive force of the steam, and its efficiency usually depends upon the extent to which it can use this agency. We accordingly recognize four general types of the pumping-engine, distinguished by the means employed for using expansion: (1) Simple direct-acting or non-expansive engines. It will readily be perceived that a simple direct-acting engine, as shown at Fig. 1, cannot use steam expansively. As soon as the steam is cut off, the pressure upon

FIG. 1.



the steam-piston commences to diminish, and if the degree of expansion is great, the pressure becomes very small toward the end of the stroke. On the other hand, the resistance to the movement of the water-piston is the same at all parts of its stroke, so that as soon as the steam-pressure falls below this latter the movement must stop. In this machine the advantage of expansion is sacrificed to compactness and simplicity. (2) Direct-acting engines with more than one cylinder of different capacities, the exhaust-port of the smaller cylinder communicating with the admission or "steam" port of the larger. No cut-off is used in such engines, but a limited degree of expansion is secured, combined with a nearly uniform pressure on the pump-piston or plunger. (3) The Cornish engine (so called from its having formerly been the leading type of engine employed for draining the mines of Cornwall, Eng.). In this type of engine the steam only acts upon one side of the piston. Its immediate effect is to lift, or rather to toss, an enormous weight, which in its descent acts upon the plunger of the pump. How such a movement can exert the expansive force of the steam will appear upon a little reflection. Let Fig. 12 represent a cylinder and piston, the piston being attached by means of its rod to a heavy weight. Suppose steam admitted through the port a, of pressure barely sufficient to raise the weight. It will rise as long as the steam enters the cylinder, and stops as soon as it ceases. No expansion can take place in this case. The steam must be discharged from the cylinder at the same pressure that it had when it came from the boiler. Let us now vary the supposition by assuming the steam to exert a pressure on the piston equal to two or three times the weight. The latter rises suddenly with a jump. Suppose the steam to be cut off when the bottom of the piston has reached the position $b\ c$, the piston continues to rise under the action of the expanding steam. When it reaches the position $k\ l$, where we may suppose the pressure of the steam, by reason of the expansion, to be equal to the weight, it has a velocity sufficient to carry it much higher. Now, above $k\ l$ the pressure of the steam is not sufficient to lift the piston were it at rest, but being in motion the pressure exerts its full effect in prolonging its movement. The piston passes the line $k\ l$ with a velocity sufficient to carry it to $d\ e$; the expansive force of the steam extends its movement to $f\ g$. It is evident that, supposing the steam to be always cut off at the same point, the greater its pressure the higher the weight will ascend. In this way any desired degree of expansion may be secured, and the pressure of the steam may be utilized after it has become far too attenuated to operate the pump directly. (4) Pumping-engines with fly-wheels. These expand their steam upon the same general principle of mechanics as the Cornish engine; that is, they employ the superfluous pressure of the early part of the stroke in imparting momentum to an immense weight, which makes good the deficiency of pressure in the latter part of the stroke. The weight consists of the rim of a wheel to which motion is communicated by the piston through its rod and a connecting-rod. The introduction of this member between the steam-cylinder and pump, with the requisite connections and appendages, makes this type the most elaborate and expensive of all the forms of the pumping-engine, while at the same time it has been found in this country the most efficient.

FIG. 2.

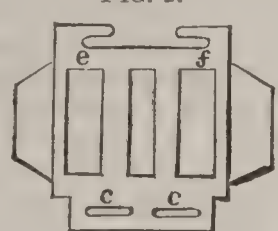
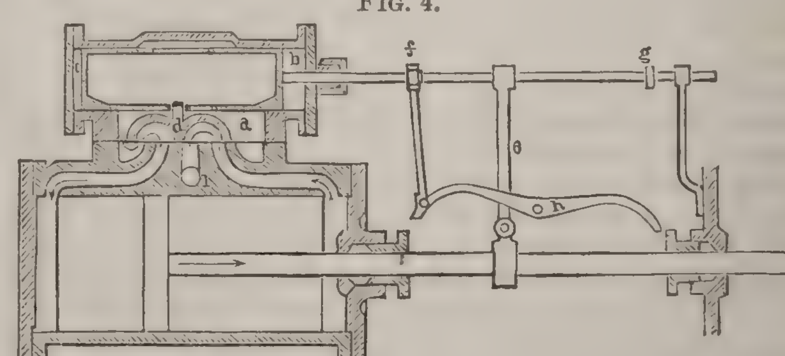


FIG. 3.

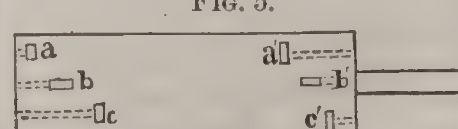
Figs. 1 to 6 are illustrations of the first type of engine. The most important feature of these engines is the mechanism for moving the valves. Let us first consider Fig. 4,

FIG. 4.



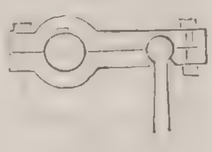
which represents in principle the pump invented and manufactured by Mr. L. J. Knowles of Warren, Mass. Here d is the main valve, which, when moved to the left, uncovers the passages for causing the piston to move to the right, and *vice versâ*. At first view, it would appear sufficient to attach to this valve a rod with tappets f and g, to be operated by the arm e on the piston-rod. A little reflection will show the unfitness of such an arrangement. The movement of the valve in that case would be barely sufficient to reverse the movement of the piston, but not sufficient for the proper working of the engine. With a heavy load the ports would be open less than with a light one, since less force would be required to arrest the movement of the piston. For this reason makers of these engines have recognized the necessity of introducing an arrangement for continuing the movement of the valve after the motion of the piston is reversed. This arrangement consists of an auxiliary cylinder and piston. The auxiliary cylinder (Fig. 4) is truly cylindrical at its ends $b\ c$. The central part is enlarged, forming the steam-chest a. The auxiliary piston reaches

FIG. 5.



nearly the whole length of its cylinder, fitting steam-tight at the ends. It is attached to the valve *d*, and carries the latter with it in its movement. At each end of the piston on its lower side are three minute openings or ports, each communicating with a passage which leads to the space at the end of the piston. A rod attached to the piston passes through a stuffing-box in the cylinder. It is called the valve-rod or valve-stem. An arm *e* is attached to the rod of the main piston. Its upper end has a hole through which the valve-rod passes freely. A tappet on this arm strikes the curved rocking-lever *h*, and gives it a tilt at each stroke of the main piston. The rocking-lever is connected with the valve-rod by an arm, as shown at Fig. 6, and the tilt has the effect of communicating a slight movement of rotation to the auxiliary piston. Near each end of the auxiliary cylinder, in the bottom, are two minute ports—one communicating with the steam-chest, the other with the exhaust-passage.

FIG. 6.



The consequence of this arrangement is that when one of the openings in the piston (as *b'*, Fig. 5) coincides with the exhaust-port in the cylinder, the steam escapes from the space *b*, Fig. 4. When it coincides with the steam-port the steam is admitted to *b*, etc. The operation of this mechanism is as follows: The main piston is moving toward the right in Fig. 4; the steam is entering the left end of the main cylinder, and escaping from the right end through the exhaust-passage *i*; when the main piston approaches the end of the cylinder the tappet on the arm *e* strikes the right end of the lever *h*, causing a slight rotation of the auxiliary piston. This rotation brings the port *b*, Fig. 5, opposite its steam-port, and the port *c'* opposite its exhaust-port. The auxiliary piston then moves to the right, carrying the valve *d* with it, admitting steam to the right, and allowing it to escape from the left of the main cylinder. The forward movement of the auxiliary piston closes the exhaust at *c'*, and brings *a'* in communication with its steam-port, bringing the auxiliary piston to rest. When the main piston reaches the left end of the cylinder the reverse action takes place. In such small engines it often happens that the water in the well or cistern falls till the pump sucks air. In that case the piston starts forward with great velocity. To prevent it from striking the cylinder-head, in such a case, before the auxiliary piston has time to act, the tappets *f g* on the valve-rod enable the piston and valve to be moved by the direct action of the tappet-arm *e*.

Fig. 1, taken from London *Engineering*, July, 1875, is a section of a steam-pump made by George F. Blake & Co. of Boston. It has an auxiliary piston *c* moving the main valve *d*, shown in section at Fig. 3. The distinctive feature of this engine is the auxiliary valve *f*. This is in fact a movable valve-seat. It slides upon the main valve-seat *l m*, but not far enough to close any of the ports. It also forms a seat on which the valve *d* slides. Fig. 2 shows the bottom of the auxiliary valve, and Fig. 13 its seat; *c c'* (Fig. 2) are recesses in the valve. On the seat (Fig. 13) five minute ports appear, in addition to the three large ports leading to the main cylinder and exhaust. The ports *d* and *f* lead to the space *b'* (Fig. 1), *a* and *e* lead to *b* (Fig. 1), and *b* leads to the exhaust. When the valve (Fig. 2) resting on the seat (Fig. 13) is moved to the right, the recess *c* covers the two ports *a b*, putting the space *b* (Fig. 1) in communication with the exhaust. The port *f* is uncovered, admitting steam to the space *b'*, Fig. 1, causing the auxiliary piston to move to the left. The action of the engine will now be apparent. The main piston, moving to the right as indicated, strikes the tappet-rod *h*, carrying it outward, moving the auxiliary valve, and bringing *g* into a position proper for the return stroke. The auxiliary piston moves to the left, as explained, carrying the main valve *d* into the position necessary for reversing the movement of the main piston. Should the main piston "run away"—that is, move so fast that the auxiliary piston cannot act, which occurs when the pump sucks air—the auxiliary valve is carried beyond the main valve, and takes steam for reversing the movement of the main piston. An improvement recently made in these pumps consists in using a single tappet-rod passing through the water cylinder-head, instead of the two shown here. The reverse movement is made by the water-piston.

FIG. 7.

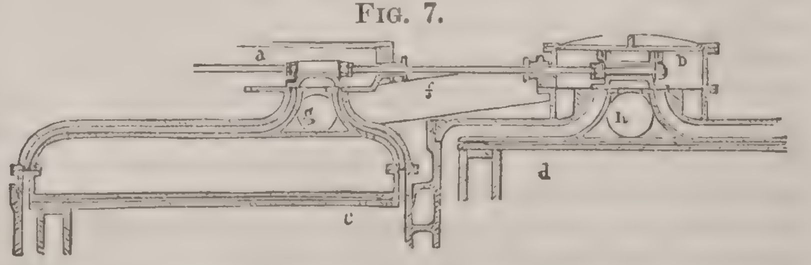


Fig. 7 indicates the construction of a pumping-engine of the second type, expanding the steam by means of two cylinders without cut-off. *c* is the small or high-pressure cylinder, *a* its steam-chest, *g* its exhaust-passage; *d* is the large or low-pressure cylinder, *b* its steam-chest, *h* its exhaust-passage. The steam passes from the exhaust-passage of the high-pressure to the steam-chest of the low-pressure cylinder through the pipe *f*. From the latter it passes to the condenser. In the figure a movement of the valve-rod to the right will put both valves in a position to admit steam to the left of each piston and release it from the right. The pistons may be fixed to the same rod, but the more usual arrangement is to provide the large piston with two rods passing outside the small cylinder. The rod of the small cylinder drives the pump, and the two rods of the large one are attached to it by a cross-head. These engines are often arranged in pairs, each actuating a pump delivering into the same main. Each engine in this case serves as an auxiliary cylinder to work the valves of the other.

It may be observed that the Cornish and fly-wheel pumping-engines may have more than one cylinder, but they use the cut-off in addition. A combination of cylinders without cut-off is the only means of working steam expansively used in direct-acting engines.

The general arrangement of the Cornish engine, as applied to mine-pumping, is indicated at Fig. 8. The weight to be lifted consists of the pump-rod and its attachments, called the "pit-work." The rod is composed of timbers placed end to end and fastened together by iron fish-plates and bolts. In its descent it actuates the pump-plungers. The total weight is often much greater than could be lifted by the engine; it is sustained, in part, by counterweights called "balance-bobs." The steam is admitted above the piston, lifting the weight by means of a balance or working-beam. In the figure P is the pump-rod, T is the "plug-rod" for working the valves. Two other rods are shown, one of which works the air-pump of the condenser, the other the feed-pump for supplying the boiler. B is one of a pair of heavy timbers called the spring-beams, to prevent the piston from overreaching its stroke and striking the bottom of the cylinder in case the pump-rod should break or the valves should not work as intended. In such case a projection on the end of the working-beam strikes these timbers. The same necessity exists in the Cornish as in direct-acting engines for an independent mechanism to control the movement of the valves. This mechanism is called the cataract, and is shown at Fig. 9. It consists of

FIG. 8.

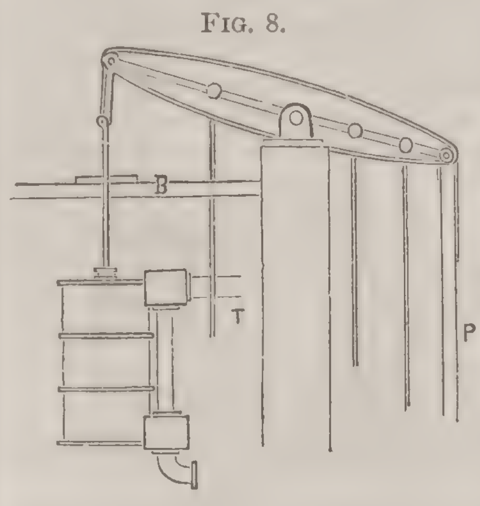
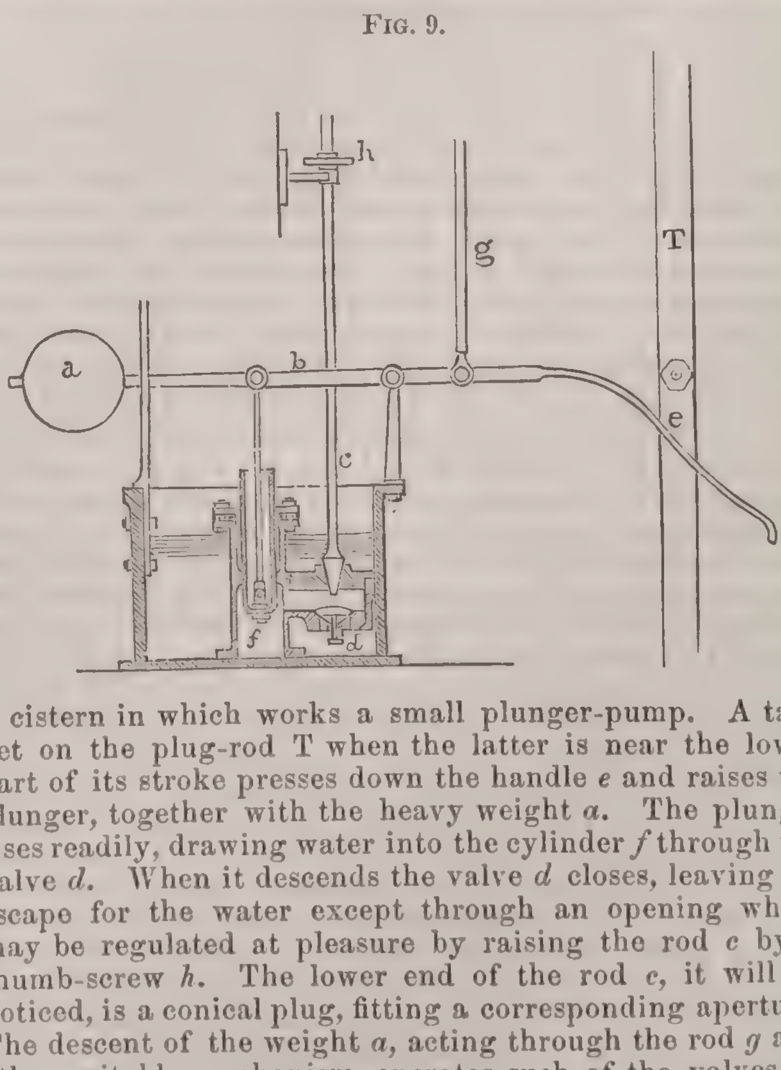


FIG. 9.



a cistern in which works a small plunger-pump. A tappet on the plug-rod T when the latter is near the lower part of its stroke presses down the handle *e* and raises the plunger, together with the heavy weight *a*. The plunger rises readily, drawing water into the cylinder *f* through the valve *d*. When it descends the valve *d* closes, leaving no escape for the water except through an opening which may be regulated at pleasure by raising the rod *c* by a thumb-screw *h*. The lower end of the rod *c*, it will be noticed, is a conical plug, fitting a corresponding aperture. The descent of the weight *a*, acting through the rod *g* and other suitable mechanism, operates such of the valves as cannot be moved directly by tappets on the plug-rod. By

means of the thumb-screw *h* the speed of the engine is regulated according to the quantity of water to be drawn from the mine. Fig. 10 shows a valve much used in Cornish engines: *c* is the cylinder, *b* the steam-port, *a a* the steam-chest, *d* the valve-rod. This is called a balanced valve. The pressure of the steam offers but slight resistance to its being opened. A slight movement of the valve-rod causes a large opening for the passage of the steam. It is never raised so much as appears in the figure.

FIG. 10.

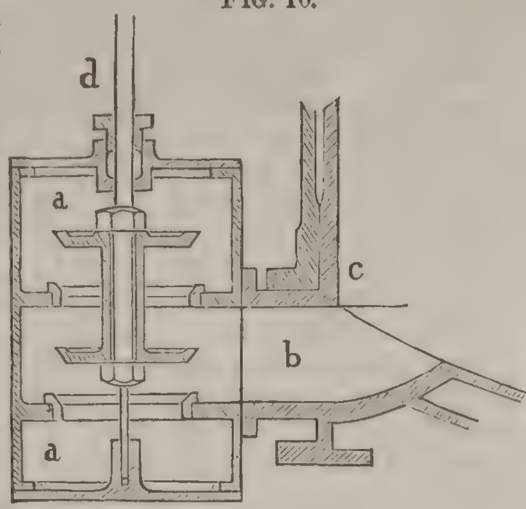
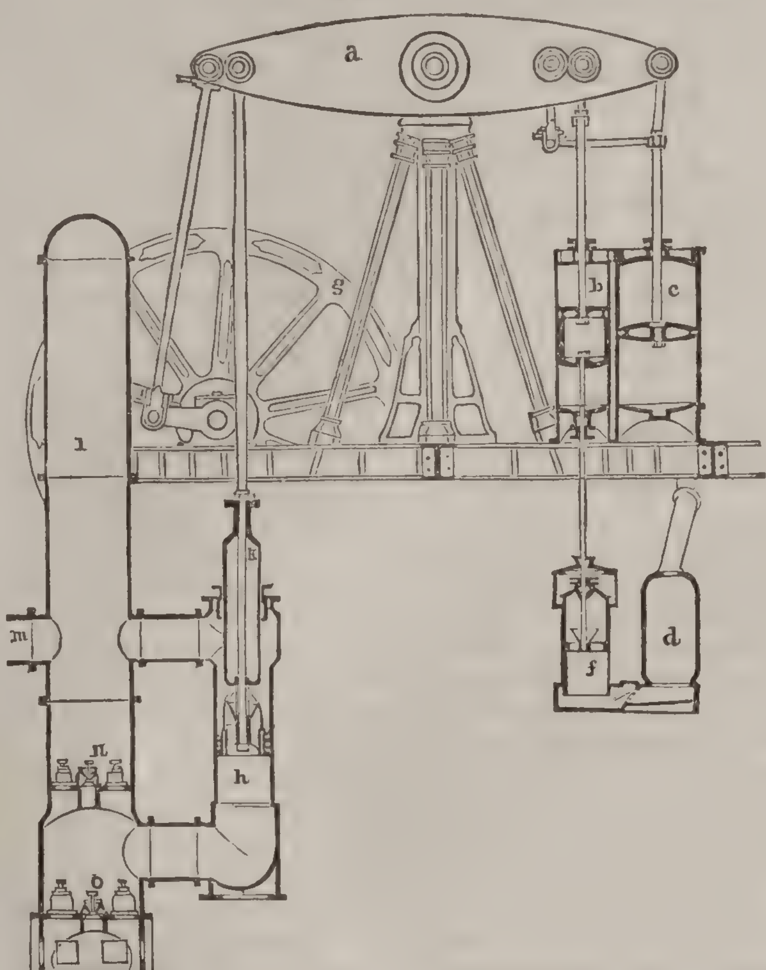


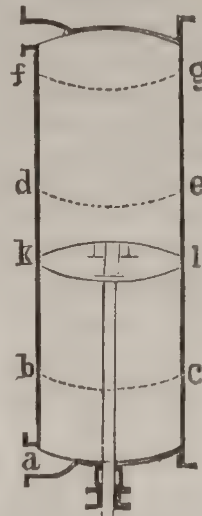
Fig. 11 is an engine of the fourth type, being one of a pair recently constructed for the Milwaukee waterworks. (The cut is taken from the report of the water commis-

FIG. 11.



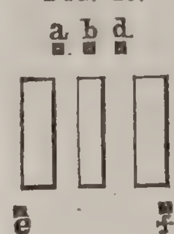
sioners of that city.) *a* is the beam, *b* the high-pressure cylinder, *c* the low-pressure cylinder, *d* the condenser, *f* the air-pump, *g* the fly-wheel, *h* the pump-barrel, *k* the plunger, *l* the air-chamber, *m* the force-main, *n*, *o* the valves. From a defect in the drawing it appears as if the pump-rod were rigidly attached to the plunger, which would be impracticable, as the upper end of the rod must have a slight lateral movement corresponding to the oscillations of the beam. The more usual construction is the one shown in the small plunger, Fig. 9. The steam from the boiler enters the high-pressure cylinder *b* on which the cut-off mechanism operates. The exhaust-passage of *b* communicates with the low-pressure cylinder *c*, where it acts at diminished pressure, but on a larger area of piston. From *c* it exhausts into the condenser, and is condensed by a shower of cold water. The piston of *b* is elongated, as from its connection with the fly-wheel its stroke cannot be equal to that of *c*. A second rod passes through a stuffing-box in the bottom of the cylinder *b*, and works the air-pump for extracting from the condenser the water used to condense the steam and the air disengaged from it under the influence of heat. The pump consists of the plunger and a bucket or piston with valves. All the valves allow the water to pass upward, but not downward. Upon the downward stroke of the pump the water is forced through the main *m* by the displacement of the plunger, which is forced into the water-space. Upon the upward stroke a column of water of the diameter of the pump-barrel is lifted, but this is diminished by the volume of the plunger, which is withdrawn from the water-space. The upper part of the chamber *l* is filled with air highly compressed. The purpose of this is as follows: At the commencement of the stroke, when steam is admitted to the cylinder, the fly-wheel is hurried forward. Toward the end of the stroke, when the pressure of the steam on the pistons is greatly diminished by expansion, the movement of the fly-wheel slackens. Now, without the air-chamber the acceleration of movement would take effect upon the whole force-main, often a mile or more in length. The air-chamber serves as a sort of reservoir to equalize the flow through the main.

FIG. 12.



Duty of Pumping Engines.—This is a conventional phrase, usually understood to mean the number of pounds of water raised 1 foot by the combustion of 100 pounds of coal. The first type of engine is expected to yield a low duty. It is only employed when simplicity and compactness are more desirable than economical working. Well-constructed engines of the second type give a duty of 50,000,000 or 60,000,000. The Cornish engine is capable of a high duty. In 1827 the average duty of eleven engines in Cornwall was reported as 64,000,000, one of which reached 87,000,000. In 1834 a maximum duty of 90,000,000 was obtained, and instances are more recently reported of 100,000,000, and even 120,000,000. These results for the Cornish engine refer to the combustion of 1 bushel of coal (84 pounds), instead of 100 pounds. At the present day, however, the average duty of Cornish engines is much less than the above, being not over 50,000,000 for 100 pounds of coal: they work with less expansion than formerly. It must be observed that in this engine the higher the degree of expansion the more violent must be the initial strain upon the pump-rods or "pit-work." In the course of time, as shafts have become deeper and pit-work more cumbrous, the frequency of breakage has made it advisable to diminish the strain upon the pit-work at the expense of a diminished economy in the use of coal. The engine shown at Fig. 11 yielded a trial duty of 75,000,000; a similar engine, tested at Lynn, Mass., gave something over 100,000,000 with 100 pounds of coal. J. P. FRIZELL.

FIG. 13.



Pump'kin, or **Pompion** [Lat. *pepo;* Fr. *pompon*], the fruit of *Cucurbita Pepo*, a coarse annual vine of the gourd family. It is much cultivated in the U. S. as food for cattle, and is often employed in making pies. Many varieties are known.

Pumpkinton, tp., Pickens co., S. C. P. 716.

Pun [perhaps from the local English *pun*, to "pound," and the Anglo-Saxon *punian*, to "bruise"], a kind of play upon words, in which a word is capable of being understood in two or more quite different senses, the combination of which, or the mental change from one to the other, presenting an odd idea, generally a ludicrous one. Punning is usually considered the lowest species of wit, bearing about the same relation to words which wit bears to things; that is, presenting an idea in some new and unexpected form. But not unfrequently a pun involves wit or humor of the highest order. Thus, when the poet Gay received a large sum of money from Rich, the manager, for his *Beggar's Opera*, from which the manager also gained a large profit, it was said by some one that "*The Beggar's Opera* made Gay rich, and Rich gay." Not unfrequently the point of a pun lies in the juxtaposition of two or more words similar or identical in sound, but different in spelling and signification; as when it is said that "It is not right to write rite wright." One of the best examples of this kind, in which the pun rises to the dignity of pathetic humor, is that of Hood, who speaking of a poor sempstress who was tearfully embroidering a costly veil, said, "The sewing-woman was sewing, in *formâ pauperis*, upon a veil, which to her was literally a vale of tears." A pun often gives point to an epigram; as when some one said that the famous utterance of Napoleon III., *L'Empire c'est la paix* ("The Empire is peace"), should have been *L'Empire c'est l'epée* ("The Empire is the sword"), the sound of the two phrases, when uttered, being hardly distinguishable. The wit in a pun is not unfrequently polyglot; that is, a phrase of one language is used which in sound or spelling closely resembles a phrase in another language, but which has a wholly different meaning; as, when a wealthy tobacconist was about to set up a carriage with a coat-of-arms on the panel, some one suggested that an appropriate motto would be *Quid rides*, which means in Latin "What are you laughing at?" but might be read in English "Quid rides." The figure of speech called *paronomasia* by writers on rhetoric, and defined by them as "the use of words in the same connection which are similar in sound, but dissimilar in sense," is simply punning. This was a favorite form of expression among the Hebrews, and the books of the Old Testament, in the original, abound in examples of it, although it is of course usually lost in

translating, and thus the precise point of many passages is necessarily missed in our version, unless the paronomasia is pointed out in a note. Among the best puns in the English language are the following: A man who had a very tall wife named Experience, said, "Long experience has taught me the advantages of the married state." In *The Merchant of Venice*, when Shylock is whetting his knife on his shoes, Gratiano exclaims, "Not on thy sole, but on thy soul, false Jew!" Some one was boasting that he had shot a hundred hares before breakfast. "Then you must have been firing at a wig," rejoined a listener—the pun lying in the identity of sound between "hares" and "hairs." "My dress is too short," said a lady. "Never mind that," replied her husband: "it will be long enough before you get another." Capt. Back was sent to the Arctic regions in search of Capt. Ross, who in the mean time returned. Some one said, "Back did not get Ross, but Ross got back."

Punch, tools for cutting hard materials. Most hand-punches are of hardened steel, and fitted to receive blows on the head with the hammer. Machine punches are much used for making holes in soft iron. The punch is of tough steel, and is thrust through the iron by means of a cam. Many kinds of punching-machines have been invented.

Punch [Hindoo, *pantsch*, "five," because once made of five substances—arrack, water, lemon-juice, sugar, and tea], a name applied at present to a great variety of mixed drinks having some alcoholic liquor as the basis.

Punch. See Printing, by W. S. Paterson.

Punch, Punchinello, or **Punch and Judy** [It. *pulcinella* or *policinella*; Fr. *polichinelle*], a kind of puppet-show frequently exhibited in the streets of European cities, especially of Italy. Its origin has been traced to the Atellan farces of ancient Rome, but in its present popular form the drama is ascribed to Silvio Fiorillo, an Italian playwright who flourished about 1600. The actors in the performance are wooden puppets, of whom the principal are Punchinello (in English Mr. Punch), his wife (called in English Mrs. Judy), and their dog Toby. The puppets are moved by the exhibitor by means of concealed wires, and he also supplies a comic dialogue, varying his voice to suit the different characters. As usually represented, Mr. Punch is a stout personage with protruding paunch, thin legs, hooked nose, and a chin which turns up so as almost to meet the point of the nose; Mrs. Judy is a thin, shrewish dame, grotesquely attired; and the dog Toby, who is the embodiment of cunning, and usually wears a hat, plays an important part in the action. The play is a domestic tragi-comedy, in which Mr. Punch is greatly berated by his wife, and finally comes to grief. Various explanations have been given of the origin of the name. Some suppose it to be a diminutive of the Italian *pulcino*, Latin, *pullicenus*, a "chicken;" others, that it comes from the Latin *pollice*, the "thumb," a common appellation of dwarfs, as in our "Tom Thumb;" but perhaps the most probable supposition is that the name comes from Puccio d'Aniello, a famous buffoon of Acerra, near Naples, whose humorous eccentricities were in the seventeenth century transferred to the Neapolitan stage, and made the vehicle of social and even of political satire, in which the vices and follies of the great could be lashed with comparative impunity in the persons of the grotesque puppets, and unpalatable truths enunciated in the squeaking voice appropriate to the senile Pulcinello. This character of public censor is that assumed by the famous Mr. Punch of the well-known English satirical and humorous journal. In some of its aspects the show of Punchinello reminds one of the so-called "moralities" of the Middle Ages and of the clown of the more recent comic drama; and the grotesque faces of the performers have their prototypes in the masks worn by the actors in the ancient Greek and Latin comedies. Puppet-shows of an essentially similar character, but often much more elaborate, are common in China and Japan.

Punctua'tion [Lat. *punctum*, "point"], the art of dividing literary composition by points or stops to show more clearly the sense and relation of the words (grammatical punctuation), and of noting the different pauses and inflections required in reading (rhetorical punctuation). Ancient inscriptions show that words were grouped together without break or pause-mark, the structure of the sentence being the only indication of the meaning, as shown in the Assyrian and the Egyptian; but names were often enclosed in rings or squares to distinguish them from ordinary words; and in the Behistun inscription an oblique wedge separates the words. The Chinese sometimes has a straight line at the right side of the column to indicate proper names; the names of places are in rectangles, authors or works cited in hexagonal or other surrounding lines, and sentences are divided by a small circle or comma and ended by a large circle. The Japanese also uses the circle as a period. Nearly all the Eastern languages, having a peculiar chirography, use a heavy colon and a double colon, or a line and a double line, for the comma and the period. The Ethiopian uses the colon to separate words, and the double colon to separate sentences. The early Hebrew Scriptures had no variation of the size of letters for capitals and small letters, and the words, verses, and chapters were not marked off in any way. Between 180 B. C. and 500 A. D. the words were separated by spaces, even the precise quantity of space ordained, and the verse-mark, or colon, introduced. The Masorah includes an elaborate system of accents, which correspond roughly to modern stops, and like them indicate the breaks or divisions in the sentences required by the meaning. The ancient Greek did not separate words or sentences, and probably about 370 B. C. the period was introduced and placed at the end of words in three positions, representing our comma, colon, and period. Greek codices up to the eighth century, although beautifully written and illuminated, show no spaces between the words, and the punctuation is merely a period placed at the end of a sentence and above the line. (See illustrations under Codex.) Aristophanes is credited with first using points. Early Latin inscriptions are usually without spaces between the words, but different marks were introduced at various times, a colon or a period being latterly used to separate the words. In the ninth century small letters were adopted, and the comma, the colon, and the Greek note of interrogation (;) came into use. Caxton (about 1474) used only an oblique stroke for commas and periods in his early works. The modern system of punctuation is due to Manutius, a Venetian printer of the beginning of the sixteenth century. The principal points indicating the grammatical construction are—the period (.), the colon (:), the semicolon (;), the comma (,), the dash (—), the curves, or marks of parenthesis ( ), the eroteme, or note of interrogation (?), and the ecphoneme, or note of exclamation (!). These are used in the European languages with the same meaning generally. In Greek the colon is represented by a period above the line, and the note of interrogation is our semicolon. The first four points suggest the parts of the sentence distinguished by them; as, the period is a complete round of words; the colon, the greatest division or limb of the period; the semicolon, the half limb or greatest division of the colon; the comma, a segment of the sentence. The dash is employed where the subject breaks off abruptly, where a series of clauses leads to an important conclusion, and before a word or clause repeated, termed the echo. The curves, or marks of parenthesis, enclose an explanatory remark or matter not directly connected with the sentence. The note of interrogation is placed after a question, and in Spanish is also placed, inverted, before the question. The note of exclamation follows a direct address or exclamation, whether of joy, sorrow, or invocation. This point is also inverted before an exclamatory sentence in Spanish. It may be interesting to note that Benjamin Franklin recommended the introduction into English literature of this Spanish practice of inverting the interrogation and exclamation points. There are other marks usually treated under punctuation, but serving merely to point out some particular fact; as, the apostrophe ('), to indicate the elision of a letter or letters and for the sign of the possessive case; the hyphen (-), placed between compound words and at the end of a line when a word is divided; the quotation-marks (" "), which enclose quotations from other books or a speaker's words; the brackets [ ], which enclose a remark made by an author within the remarks of another; and the reference-marks—star or asterisk (*), dagger (†), double dagger (‡), section (§), parallel (‖), paragraph (¶), which refer to foot-notes in connection with the reading; and also the index (☞), used to point out a remarkable statement. William S. Paterson.

Pun'go, tp., Princess Anne co., Va. P. 2120.

Pungoteague', p.-v. and tp., Accomack co., Va., on Pungoteague Creek. P. 4543.

Pu'nic Wars, the three great wars between the Carthaginians (*Punici*) and the Romans. The First Punic war lasted 23 years (264–241 A. D.). It was a contest for the possession of Sicily, which was finally won by the Romans. The finances of Carthage were crippled and the state involved in a bloody civil war, while Rome was strengthened and her naval supremacy established. The Second war lasted 16 years (218–202 B. C.). It was initiated by the capture of Saguntum by Hannibal, who thereupon made his great invasion of Italy. The war was closed by the Roman victory at Zama. The Third war was evidently undertaken by the Romans with the express intention of finally destroying Carthage, her long-humiliated and now scarcely-dangerous rival. The war lasted 3 years (149–146 B. C.). Carthage made a most heroic and persistent defence, but was at last utterly destroyed.

Pun'ishment [Lat. *pœna*, "penalty"]. In its most general sense, punishment is the suffering or deprivation of rights which the state inflicts upon the violator of the penal law. Publicists and legislators have differed radically and widely in respect to the nature and design of all punishment. Three principal theories have been maintained, and three corresponding systems of legislation have been constructed in accordance therewith. The first regards retribution, or the vindication of the law upon the offender, as the essential feature and object, and all other effects as accessory. According to the second, prevention is the only design of punishment, and the only motive which justifies its use by society—the prevention of the criminal from further wrongdoing, and the deterring of others by the example from similar infractions of the law. The third asserts that the only legitimate purpose of punishment is the amendment of the offender. The ancient methods of administering the penal law were chiefly based upon the first of these theories; the modern legislation of enlightened nations is mainly constructed upon the second, although the last enters largely into many systems as a modifying element. The various punishments now recognized by the penal codes of Christendom may be reduced to the following classes: death, perpetual imprisonment with or without labor, imprisonment for determinate periods, enforced labor in mines, galleys, and the like, banishment to penal settlements, pecuniary fines, and in certain special cases the infliction of the lash. As an accessory to these penalties the criminal is often deprived of political or civil rights belonging to citizenship, such as the electoral franchise, the ability to testify in courts of justice or to hold office. Whether the death-penalty should be retained, and whether confinement should or should not be solitary, are questions which engage the attention of the ablest publicists and the most experienced statesmen. John Norton Pomeroy.

Punjaub' (the land of the "five rivers;" by the Greeks called *Pentapotamia*), a territory of North-western Hindostan, bounded N. by Cashmere, E. and S. by the Sutlej, and W. by the Suliman Mountains, and since 1849 belonging to British India. Area, 102,001 sq. m. P. 17,596,752. The northern part of the country is mountainous, covered with spurs of the Himalaya from 17,000 to 20,000 feet high, and enclosing deep valleys. The southern and western part is a great plain around the Indus and its five powerful affluents, the Jhylum, Chenaub, Ravee, Beas, and Sutlej, hot, dry, and treeless, consisting of a hard clay or loam which in many places becomes sandy and arid. The average heat of the summer is 112°; the winter is cool, with frequent frosts. Rain is rare, but the large and numerous streams can easily be used for irrigation; and wherever the soil is well cultivated its productiveness is very great. Sugar, rice, cotton, wheat, and indigo are raised in large crops and of superior quality. The manufacturing industry of the country is highly developed in the large cities of Amritsir, Lahore, Multan, etc. The population is very much mixed, consisting of Afghans, Thibetan Mongolians, and different Hindoo races, such as Jats, Sikhs, etc. Two-thirds are Mohammedans.

Pu'no, town of Peru, South America, capital of department of the same name, on the shore of the Lake of Titicaca, at an elevation of 13,832 feet. The silver-mines of the vicinity are now filled with water, and the 6000 inhabitants of the town are mostly employed in agriculture.

Punshon (William Morley), D. D., b. at Doncaster, England, in 1824; became a local Wesleyan preacher in 1840; studied at the Wesleyan College, Richmond; became one of the most popular preachers in England; preached in London 1858–68; removed in the latter year to Canada for the purpose of marrying a sister of his deceased wife, which he could not legally do in England; has since the death of his second wife returned to England, and been president of the British Conference; author of sermons and discourses, *Life Thoughts* (1863), *Sabbath Chimes*, in verse (1867), the *Prodigal Son* (1868), etc.

Pun'ta Are'nas, p.-v. and tp., Mendocino co., Cal., on Pacific Ocean. P. of v. 956; of tp. 1406.

Punxataw'ney, p.-b., Young tp., Jefferson co., Pa., on Big Mahoning Creek. P. 553.

Pu'pa [Lat., a "doll"], a stage of transformation in insect life which follows the larva state, and precedes the *imago* or perfect insect. Many or most insects enter this stage through a semi-pupa state, and some leave it through a state called semi-imago. The pupæ of Lepidoptera are called chrysalides. These and many other pupæ are enveloped in a pupa-case, and exhibit few signs of vitality, but many pupæ are active and voracious, and considerably resemble the perfect insect; also a genus of land-snails.

Puppets. See Marionettes.

Puranas. See Sanskrit Language and Literature, by Porter C. Bliss, A. M.

Pur'beck Beds [from the isle of Purbeck, Dorset, England], in British geology, a group of three beds, upper, middle, and lower Purbecks, together constituting the uppermost member of the Oolite. The lower Purbeck rests on the Portland Oolite, and above the upper Purbeck comes the Wealden. The upper bed affords the Purbeck marble, and the whole group is singularly rich in organic remains.

Pur'cell (Henry), b. in London, England, in 1658; became in childhood a singer in the choir of the king's chapel; composed several anthems before reaching the age of eighteen, when he became organist of Westminster Abbey; was very successful as a composer of music for operettas and of dramatic music in general, to which he devoted himself for many years, composing also a great number of anthems, sonatas, choruses, odes, glees, comprising a complete service of church music. D. Nov. 21, 1695. His chief productions were published in 1697.

Purcell (John Baptist), D. D., b. at Mallow, Ireland, Feb. 26, 1800; was educated at Emmittsburg, Md., and the Sulpitian seminary, Paris; entered the Roman Catholic priesthood at Paris 1826; became a professor in Mount St. Mary's College, Emmittsburg, Md., and was its president 1829–33; was consecrated bishop of Cincinnati 1833, and in 1850 made archbishop of the same see, the first of the title. His public discussions with Alexander Campbell (1838), Thomas Vickers (1868), and others have been published, also a volume of *Lectures and Pastoral Letters*, a series of school-books, a *Life* of X. D. McLeod, etc.

Pur'chas (Samuel), b. at Thaxted, Essex, in 1577; educated at St. John's College, Cambridge; took orders in the Church of England; was presented by James I. to the vicarage of Eastwood, Essex, Aug., 1604; subsequently obtained the rectory of St. Martin's, Ludgate, London, and became chaplain to Archbishop Abbot. D. at London in Sept., 1626. Compiler of *Purchas his Pilgrimage, or Relations of the World*, etc. (folio, 1613), and *Purchas his Pilgrimmes* (4 vols., folio, 1625), a celebrated collection from the works of many hundreds of travelers, and author of *Microcosmos, or the History of Man* (1619), and *The King's Tower and Triumphant Arch of London* (1623).

Pur'chase (law). In its popular sense, this term describes the mode of acquiring property either in lands or chattels by a sale for money or other valuable consideration. In its technical and legal signification, it denotes the acquisition of property in lands alone by any mode known to the law except that of descent. The common law divided the means of acquiring real property into two general classes—descent or inheritance from an intestate ancestor, and purchase. The latter embraces the particular cases of obtaining ownership by escheat, prescription, adverse possession, forfeiture, devise, and conveyance by deed; the last including all modes of forced transfer in bankruptcy, insolvency, or by judicial sale. The popular meaning is given to the term by those rules and doctrines of equity which protect the *bonâ fide* purchaser of lands against many prior, outstanding, but to him unknown titles and claims. In the equitable doctrine referred to, purchase necessarily implies a transfer by way of actual sale for a pecuniary consideration, and is directly opposed to all acquisitions by gift, devise, or other voluntary methods not accompanied by a payment of value on the part of the one who receives the title and seeks the aid of equity in its support. John Norton Pomeroy.

Purchas Judgment, The, a judgment of the judicial committee of the privy council in the case of *Herbert* v. *Purchas* on appeal from the arches court of Canterbury, A. D. 1871. Briefly stated the charges before the committee were that the respondent had offended—(1) by the use of the mixed chalice; (2) by standing with his back to the people, between the people and the holy table, whilst reading the prayer of consecration; (3) by the use of wafer-bread; (4) by providing holy water for the use of the congregation; (5) by the use of certain unauthorized vestments; (6) by wearing or carrying in his hand a cap called a *biretta*. The dean of arches decided—(1) that to mix water with the wine at the time of the service is "an additional ceremony," and so forbidden; but that, provided that the mingling be not made at the time of the celebration, it is not unlawful. This decision was overruled, and all mixture, wherever made, was declared to be illegal. (2) The judge of the lower court believed that this charge had been settled by the privy council in the case of *Martin* v. *Mackonochie*. He also ruled that the words of the rubric, "before the people," "do not require that the people should see the breaking of the bread or the taking of the cup into the priest's hands." Their lordships reached a different conclusion on both points, and decided that "the prayer of consecration is to be used at the N.

side of the table, so that the minister looks S., whether a broader or narrower side of the table be toward the N." (3) The law has directed the use of pure wheat bread, and therefore wafer-bread is illegal. (4) The facts were not proved, and the appeal on this point was disallowed. (5) The dean of arches said: "The plain words of the statute, according to the ordinary principles of interpretation, and the construction they have received in two judgments of the privy council, oblige me to pronounce that the ornaments of the minister mentioned in the prayer-book of Edward VI. are those to which the present rubric referred. They are, for the minister . . . officiating at the communion service, the cope, vestment or chasuble, surplice, alb, and tunicle; in all other services the surplice only." Their lordships were of opinion that the question of vestments had never been before the court, and adjudged that the chasuble, alb, and tunicle are illegal. (6) With respect to the biretta, which the respondent was said to have carried in his hand, not worn, they did not feel justified in pronouncing that he did an unlawful act. It was directed that the respondent pay the costs in both courts. The case was heard *ex parte* by reason of the respondent's want of means to procure counsel. But before the judgment had been made final, being then enabled to take upon himself the expense of counsel, the respondent prayed for a rehearing of the case. His petition was refused. The judgment was followed by protests in every form, many who had little sympathy with the course of Mr. Purchas uniting with his supporters. Those whose practices were condemned, many of whom, it is said, had submitted to previous judgments touching ritual, considered themselves justified by what they denounced as "an outrage upon law, logic, and history" in counting as no ways binding on conscience the decisions of the highest court of appeal for ecclesiastical causes. The Purchas judgment settled definitely no disputed point. Underlying the matters adjudged and all like ritualistic questions there are others of a deeper nature which alone give them dignity—namely, Is the Church of England one and the same Church before and since her Reformation? Is the minister whom her formularies style priest a true priest? Is the table of the Lord, like to that so called by Malachi, an altar? Is the service thereat rendered a true commemorative sacrifice? Is the presence of the Lord in his sacrament a real presence, such as to constrain special outward marks of reverence? W. F. Brand.

Pur'dy, p.-v., cap. of McNairy co., Tenn.

Purdy's Station, p.-v., N. Salem tp., Westchester co., on New York and Harlem R. R.

Pur'gatives, in medicine, substances that produce more or less fluid discharges from the bowels. Very many drugs are purgative in sufficient dose, but those available in medicine as cathartics, and in common use at the present time, are castor oil, rhubarb, aloes, and calomel, forming a group of comparatively mild agents, causing only fluid feculent stools; certain salts, producing watery discharges, of which the most prominent are magnesium citrate and sulphate, sodium phosphate, acid potassium, tartrate and potassium and sodium tartrate; and, finally, a group of vegetable nature, producing again watery stools, but also being more or less irritant to the intestines. These are senna, jalap, podophyllum, scammony, colocynth, gamboge, croton oil, and elaterium. Setting aside senna, the others last mentioned are commonly spoken of as the *drastic* cathartics, from their highly irritant properties. Besides the foregoing, there are many substances which have a very mild effect upon the bowels, and are called *laxatives*. The more prominent of these are magnesia and magnesium carbonate and sulphur among inorganic substances, and manna, purging cassia, tamarinds, prunes, figs, and other fruits among vegetable. Purgatives operate partly by quickening the muscular contractions of the intestines, whereby the contents of the latter are hurried down to the rectum, and partly, especially with those causing watery stools, by determining an abundant secretion of fluid into the intestinal canal. Purgatives are used for the primary object of emptying the bowels, and also to relieve congestion of distant organs and to induce the absorption of dropsical collections of fluid. The properties of the individual purgatives mentioned above will be found described under the several headings. Edward Curtis.

Pur'gatory, a Roman Catholic doctrine, first clearly taught by Gregory the Great, who d. 604 A. D. (See Eschatology.)

Purifica'tion of the Virgin, Feast of, called also **Candlemas Day,** and the **Presentation of the Child Jesus,** is the celebration of the visit of the Virgin and her Child to the temple at Jerusalem, in accordance with the Levitical law for the ceremonial purification of puerperal women. It was introduced into the calendar in 494 by Pope Gelasius I. It occurs on Feb. 2.

Pu'rim [Hebrew-Persian, *pûr*, plural *pûrim*, a "lot," because Haman cast lots for the destruction of the Jews, Esth. iii. 7], a Jewish feast which falls on the 14th or 15th of the month Adar (February and March), in commemoration of the deliverance described in the book of Esther. The festival was in former times, as still in many places, celebrated in a noisy and tumultuous manner, with loud expressions of hatred at the reading of Haman's name in the synagogue.

Pur'itans. The Reformation in England under Henry VIII. was unsatisfactory to many, because, in their view, it accomplished only a partial elimination of the corruptions and abuses of the Church of Rome. Through the ecclesiastical alternations of the reigns of Edward VI. and Queen Mary these recusants grew in numbers and influence. They gave Queen Elizabeth no little trouble, and were in turn greatly harassed by the efforts made, through the high commission court, to force them to conformity. It was during her reign in 1564 that they were called in derision *Puritans*, because they were ever calling for a simpler, *purer* form of worship and insisting on a stricter, *purer* life. They were, however, staunch in their loyalty to the queen, supporting her most heartily in the part she took in sustaining the general interests of Protestants in Europe. They stood forth as a distinct party, leading the opposition to the despotic claims for the royal prerogative asserted by the first two Stuarts, and their influence culminated in a triumph when royalty was overthrown and the Commonwealth was established. The genuine Puritans were mostly of the commoners of England, men of strong minds, good judgment, and sterling character. They adopted the Calvinistic creed, and rigidly conformed their lives to its principles. This gave an aspect of precision to their manners and stern severity to their lives, but it made them strong in their integrity and persistent in the struggle for liberty and right. Much as they have been ridiculed and maligned, England owes to the Puritans some of the best features of her free constitution; and never before had her power in Europe been felt as it was under the Commonwealth, when, through Cromwell, they controlled the government. During the struggle with the Stuarts many of them emigrated to New England, and there embodied their principles in a framework of government on which, as a stable foundation, the great republic of the U. S. has been built up.

The term Puritans is applied loosely to embrace all who objected to the ceremonies of the Established Church, and advocated holy living, and resisted the royal prerogative. But, especially with reference to the early history of this country, a distinction of two classes should be recognized. The Puritans proper adhered to the Church, striving to mould it to their own views. The Independents, despairing of the needed reform in that way, insisted on an absolute separation from the Church for a new organization. The Pilgrims who established the first colony in New England at Plymouth were Independents. Those who subsequently established themselves on Massachusetts Bay were Puritans. (See Independents, by Leonard Bacon, D. D.) A. L. Chapin.

Purneah, town of British India, presidency of Bengal, on both sides of the river Kosi, in lat. 25° 45′ N. and lon. 88° 23′ E. It occupies an area of 9 sq. m., mostly single houses surrounded with gardens, orchards, and indigo-plantations. P. 50,000.

Purple, Aniline. See Aniline Colors, by Prof. C. F. Chandler, Ph. D., M. D., LL.D.

Pur'ple of Cas'sius, a substance precipitated, generally of a brown color, but sometimes purple, by adding solutions of stannous chloride to those of gold-salts. Its composition is yet uncertain. When dry and powdered it is dull blue. It is soluble in ammonia when fresh to a magnificent purple-colored liquid. It has been used in enamel-painting. H. Wurtz.

Purple, Tyrian. See Tyrian Purple.

Purple Wood, a beautiful plum-colored wood from Guiana, of very great strength and smoothness of finish. It is the product of *Copaifera bracteata* and *C. pubiflora*. It is adapted to a wide range of uses. The trees are of the order Leguminosæ, and produce a part of the balsam copaiba of commerce.

Pur'pura [Lat. "purple"], a disease in which spots of deep purple color appear in the skin, produced by the escape of blood from the vessels. Some cases are caused, apparently, by plethora; others by a degenerative change in the walls of the blood-vessels. Purpura spots often appear in typhus, scurvy, the plague, and the eruptive fevers. The approved treatment is by tonics, mineral

acids, rest, and attention to any untoward constitutional peculiarities.

Purpura, a genus of gasteropods of the whelk family. This genus furnished a part of the Tyrian purple dye of antiquity, hence the name. There are numerous living and extinct species. Some kinds are found on the U. S. coasts.

Purpurine ($C_{14}H_8O_5 = C_{14}H_5(OH)_3(O_2)''$; (*madder-purple* of Runge; *matière colorante rose* of Gaultier de Claubry and Persoz; *oxilizaric acid* of Debus; *oxyalizarine, trioxy-anthraquinone*), discovered by Robiquet and Colin in 1828. It exists in madder in the form of a glucoside, which is included in the *rubian* of Schunck, which is an amorphous mixture of several glucosides (see RUBIAN and ALIZARINE), but is distinct from the crystalline RUBERYTHRIC ACID of Rochleder (which see), which is the alizarine glucoside. The purpurine glucoside has not yet been isolated, being very unstable. It occurs also in MUNJEET (which see), associated with munjistine.

Preparation.—Purpurine is extracted from madder by the same processes as alizarine, and is usually separated from it by its greater solubility in a solution of alum. Robiquet and Colin clear the madder with strong sulphuric acid, extract the purpurine with a boiling 12-per cent. solution of alum, and precipitate it with dilute sulphuric acid. Runge allows the alum solution to stand and deposit a little alizarine present, and afterward purifies the purpurine by recrystallization from alcohol. Debus first prepares a lead lake from the madder, decomposes this with dilute sulphuric acid, dissolves the coloring-matters in alcohol, converts them into a zinc lake, decomposes this with acid, dissolves the product in ether, again forms a zinc lake, decomposes this, and separates the purpurine from the alizarine by alum. Kopp extracts the madder with aqueous sulphurous acid, and precipitates the purpurine free from the alizarine by adding 3 to 5 per cent. of sulphuric acid, and heating to 86° to 104° F.; this decomposes the glucoside of purpurine, but does not affect the ruberythric acid, which requires a much higher temperature. This process is carried out on a manufacturing scale by Schaaff and Lauth at Strasburg. Schützenberger and Schiffert examined this purpurine, and announced the discovery in it of three other coloring-matters. By treating the crude purpurine with lukewarm alcohol the orange body (hydrate of purpurine) and the yellow purpuro-xanthin are extracted, and may be separated by benzol, which dissolves the purpuro-xanthin. The portion insoluble in tepid alcohol is treated with boiling alcohol, which dissolves out the purpurine, leaving the pseudo-purpurine, which is insoluble. They find the crude purpurine to contain about 75 per cent. of pseudo-purpurine, 12½ purpurine, 12½ orange matter, one-fifth of 1 per cent. purpuro-xanthin. Schunck considers the existence of these three bodies more than doubtful, believing them to be mixtures of bodies previously known, especially the yellow substance, which resembles rubiacine. Rosenstiehl and others confirm their existence. (See *Am. Chemist*, vi. 53.) Stenhouse recommends munjeet as an excellent source for pure purpurine. He boils munjeet with alum solution, filters hot, precipitates coloring-matters with hydrochloric acid, dries, extracts with carbon disulphide, dries, washes out the munjistine with boiling water, and obtains the purpurine as the final residue, free from alizarine. F. de Lalande (*Compt. Rend.*, lxxix. 669) converts alizarine into purpurine by treating it with sulphuric acid and arsenic acid or manganese dioxide; pours into water, and purifies precipitate by alum, etc. He claims to have thus proved that the atom of oxygen by which it differs from alizarine does not belong to a hydroxyl group, and consequently that purpurine is oxyalizarine, and not trioxy-anthraquinone. The artificial formation of purpurine from alizarine sulphonic acid ($C_{14}H_5(SO_3H)(OH)_2O_2$) by fusion with potassic hydrate is not successful, as H not OH takes the place of (SO_3H), regenerating alizarine.

Properties.—Purpurine appears as a red powder in red feathery crystals (by sublimation), in orange-red needles (from boiling alcohol). It is slightly soluble in boiling water, giving a rose-colored solution. It dissolves in alcohol, ether, benzol, glycerine, concentrated sulphuric acid, and acetic acid. Its solution in sulphuric acid may be heated to 400° F. without decomposition, the purpurine being thrown down unchanged on pouring the solution into water. It dissolves in a boiling alum solution to a pink fluorescent liquid, and does not separate on cooling, even from concentrated solutions. It dissolves in alkaline hydrates and carbonates, forming cherry-red or poppy-red solutions, from which acids reprecipitate it in orange-yellow flocks. The solutions in alkaline hydrates lose color on standing in the air, the purpurine being oxidized and destroyed. Purpurine dissolves in ammonia, but on standing or on the application of heat, *purpuramide* or *purpureine* ($C_{14}H_5NH_2(OH)_2O_2$) is formed, which is precipitated by acids in deep-violet flocks. Boiling nitric acid converts purpurine into phthalic and oxalic acids. Heated with zinc-dust, it yields anthracene ($C_{14}H_{10}$). With bases it forms compounds; those with the alkalies are soluble in water. Sodic purpurate may be obtained in crystals by adding an alcoholic solution of caustic soda to one of purpurine, and then adding some ether. The basic, calcic, and aluminic lakes are soluble in boiling solutions of carbonate of soda. Bolley claims to have converted purpurine into alizarine by heating it in closed tubes to 410° F. (*Jahresb.*, 1866, 644.) Rosenstiehl (*Compt. Rend.*) failed to obtain alizarine, although he tried various reducing agents. He always produced purpuro-xanthin, a yellow body, isomeric with alizarine. Martin of Avignon says, however, that purpurine, pseudo-purpurine, the orange hydrate of purpurine, and even the purpuro-xanthin, are easily converted into alizarine by dissolving in sulphuric acid, adding zinc-powder and throwing into water when the alizarine separates. (See Calvert's *Dyeing and Calico-Printing*, London, 1876, p. 38.)

Optical Properties.—Stokes (*J. Chem. Soc.*, xii. 219) has shown that purpurine can be recognized by the peculiar absorption-bands which some of its solutions give when examined before the spectroscope. Solutions in alkaline carbonates give two dark bands in the green, as do also the solutions in ether and alum; the latter is also beautifully fluorescent. A square inch of dyed cloth furnishes sufficient purpurine for the solution in carbonate of soda for this optical reaction. Alizarine is easily distinguished from purpurine by forming violet solutions with the alkalies and alkaline carbonates, the former undergoing no change in the air (purpurine is destroyed), by its insolubility in alum solutions, by the solubility of its calcic, baric, and aluminic lakes in carbonate of soda, and by its optical properties, alizarine solutions giving different absorption-bands before the spectroscope.

Application to Dyeing and Calico-Printing.—Purpurine produces with alumina mordants bright reds; with iron, grayish violet. These tints resist cleaning with soap and nitro-muriate of tin tolerably well, but are not so permanent as those produced by alizarine, nor do they resist light as well. There is a difference of opinion as to the part played by purpurine when madder, garancine, etc. are used in dyeing calico. Some think the purpurine of little importance; others consider it essential to certain pinks and reds. (See Schützenberger, *Dingl. Pol. J.*, cxcvii. 438; Rosenstiehl, *Am. Chemist*, vi. 53.) According to Robiquet and Schunck, the finest and most perfect madder-colors are produced by alizarine, whereas Runge and Strecker are of opinion that the liveliest tints are produced by purpurine, and that this substance likewise plays the principal part in the manufacture of Turkey-red. According to E. Kopp, on the other hand, the real basis of Turkey-red is alizarine; and he further states that purpurine, though it dyes mordanted fabrics perfectly, does not yield colors of so great a degree of stability and has not so great a degree of affinity for oiled cloth as alizarine. Schunck says that the final result of dyeing with madder is simply the combination of alizarine with the mordants. Perkin confirms this, and finds no purpurine in finished prints.

Consult Robiquet and Colin, *Ann. Chim. Phys.*, xxxiv. 244; Gaultier de Claubry and I. Persoz, *Ann. Chim. Phys.*, xlviii. 69; Persoz, *Ann. Chim. Phys.*, li. 110; Runge, *Ann. Chim. Phys.*, lxiii. 282; Debus, *Ann. Chim. Phys.*, xxxviii. 490; Wolff and Strecker, *Ann. Pharm.*, lxxvi. 1, or *Q. J. Chem. Soc.*, iii. 243; Rochleder, *J. pr. Chem.*, lv. 385, and lxvi. 85; Schützenberger and Schiffert, *Bull. Soc. ind. Mulhouse*, 1864, 70; Schützenberger, *Bull. Chim. Soc.*, 1865, ii. 12. C. F. CHANDLER.

Purpurine, Anthra ($C_{14}H_8O_5$), a coloring-matter isomeric with purpurine, found by Perkin in artificial alizarine. It is separated from the alizarine by the solubility of its alumina lake in sodic carbonate. As a dye it resembles alizarine more than purpurine. The reds are much purer and less blue, while the purples are bluer and the blacks more intense than those of alizarine. In fastness against soap and light Perkin finds them equal to alizarine tints. (See Perkin, *J. Chem. Soc.* [2], viii. 143; x. 659; xi. 425; *Am. Chemist*, iv. 53.) C. F. CHANDLER.

Purpurine, Hydrate of ($C_{14}H_8O_5 + H_2O(?)$), or **Orange Matter,** discovered in Kopp's purpurine of Schützenberger and Schiffert. (See PURPURINE for mode of preparation.) It is obtained by the evaporation of its alcoholic solution as a crystalline conglomerated mass; is decomposed by dry heat, yielding purpurine; is insoluble in benzol, very soluble in alcohol. According to Rosenstiehl, the final result of dyeing is the same as with purpurine. (Consult authorities mentioned under PURPURINE, especially Rosenstiehl, *Am. Chemist*, vi. 53.) C. F. CHANDLER.

Purpurine, Pseudo ($C_{14}H_8O_6 = C_{14}H_4(OH)_4O_2$), discovered by Schützenberger and Schiffert in Kopp's purpurine (see PURPURINE for mode of preparation), of which it constitutes three-fourths. It is almost insoluble in boiling alcohol, crystallizes in fine brick-red acicular crystals from hot benzol. By sublimation or treatment with alcohol at 200° C. in sealed tubes it yields purpurine. According to Rosenstiehl (*Am. Chemist*, vi. 53), it does not dye mordanted cotton except in distilled water, when it gives shades approaching those of alizarine. In practice, the pseudopurpurine is found in the refuse of the dye-beck as a calcic lake. (Consult authorities mentioned under PURPURINE.) C. F. CHANDLER.

Purpuro-Xanthine ($C_{14}H_8O_4$), a yellow compound isomeric with alizarine, found by Schützenberger and Schiffert to the extent of one-fifth of 1 per cent. in the purpurine of Kopp. It is readily soluble in alcohol and benzol, sublimes without decomposition, dyes alumina mordants a dull and fugitive yellow, is readily produced by the reduction of purpurine or pseudo-purpurine by heating to 180° C. with aqueous PI_3, or by dissolving in sodic hydrate, adding stannous chloride till the red color changes to yellow, and precipitating with an acid. (See PURPURINE.) C. F. CHANDLER.

Pur′ree, or Indian Yellow, a yellow coloring-matter brought from India and China in lumps weighing three or four ounces, brown on the outside and deep orange-yellow within. Most writers consider it to be of animal origin, deposited from the urine of camels, elephants, and buffaloes, especially after they have eaten certain plants; others consider it an intestinal or biliary concretion of some animals; Stenhouse considers it to be a vegetable juice, evaporated down with the addition of magnesia. It is used for the preparation of Indian yellow, a fine, rich, durable yellow color, much used by artists, and often adulterated with chrome yellow. It consists mainly of euxanthate of magnesium. C. F. CHANDLER.

Pursh (FREDERICK), originally FRIEDRICH PURSCH, b. at Tobolsk, Siberia, in 1774, of German parentage; was educated in Dresden; resided as a botanist in the U. S. 1799–1811; published *Flora Americæ Septentrionalis* (London, 1814); went to Canada. D. at Montreal June 11, 1820. His MS. *Journal* still exists.

Purs′lane [a corruption of the word *porcelain*, from its appearance], a common garden-weed, *Portulaca oleracea*, found wild on sea-shores, etc. It is sometimes used as a potherb, and its shoots are pickled. To the same genus belong the showy flowering *Portulaca grandiflora* and *P. Gilliesii*.

Pur′suivant of Arms [Fr. *poursuivant*, a "follower"], the lowest order of officers in heraldry. Pursuivants are novices for the full rank of herald. They are maintained in the three British heraldic establishments, and from their number the heralds are usually appointed. In mediæval times nobles and other gentlemen might maintain pursuivants, or even full heralds. (For the present titles of the several British pursuivants see HERALD.)

Pu′rus, a river of South America, rises in Peru, in the mountains E. of Cuzco, about lat. 14° S., and traverses Bolivia and Brazil in a north-eastern direction, joining the Amazon in lat. 4° S., lon. 61° W. The regions it flows through are the least known in South America, covered with the most magnificent primeval forests.

Purva-Mímánsá. See HINDU PHILOSOPHY, by PROF. JOHN DOWSON.

Pus. See SUPPURATION.

Pu′sey (EDWARD BOUVERIE), D. D., b. in 1800, a nephew of the first earl of Radnor; was educated at Eton and Christ Church, Oxford; graduated with high honors 1822; became a fellow of Oriel College 1823; studied in Germany, and in 1828 became regius professor of Hebrew at Oxford and one of the canons of Christ Church cathedral. His contributions to the *Tracts for the Times* (1835 *seq.*), of which series he wrote Nos. 18, 66, 67, and 69, gave to the Tractarian movement the name of Puseyism. Newman's celebrated tract, No. 90, was in 1841 defended by Dr. Pusey in a published letter which excited much controversy. (See TRACTARIANISM.) He was (1843–46) suspended from preaching in the university for three years in consequence of the supposed utterance of heretical doctrine in a sermon on the real presence. Among the most important of his numerous works are—*On the Benefits of Cathedral Institutions* (1833), *On the Royal Supremacy* (1850), *On the Real Presence* (1855, 1857), *History of the Councils of the Church* (1857), *Commentary on the Minor Prophets* (1860 *seq.*), *Daniel, the Prophet* (1864), *Eirenicon*, etc.

Pusheta, tp., Auglaize co., O. P. 1290.

Push′kin (ALEXANDER SERGEIVITCH), b. at Pskov, Russia, June 6, 1799; studied at Tzarskoge Selo; entered in 1817 as clerk in the government office of foreign affairs, but was discharged in 1820 for an *Ode to Liberty*, and banished to his estates; was recalled in 1825 by the emperor Nicholas, and killed in a duel at St. Petersburg Feb. 10, 1837. By his countrymen he is considered the greatest poet Russia ever produced, and those of his works which have been translated into German, French, or English have attracted great attention outside of Russia. He wrote romantic epics—*Ruslan and Liudmila* (1820), *Plennik Kavkaskoi* (1822), etc.; one drama—*Boris Godunow;* several novels, under the pseudonym of "Belkin," of which some were translated into English in 1875 by Mrs. J. Buchan Telfer in *Russian Romance*. Collected works, 12 vols. (St. Petersburg, 1839).

Pustule, Malignant. See MALIGNANT PUSTULE.

Pu′tah, tp., Yolo co., Cal. P. 1412.

Puteaux′, town of France, department of Seine, on the Seine, opposite the Bois de Bologne, has some manufactures and contains villas and summer residences. P. 9375.

Puteoli. See POZZUOLI.

Putiglia′no (*Putignano*), town of Italy, province of Bari di Puglia, on the summit of a long hill and surrounded by a wall. The church of San Pietro Apostolo is very ancient, and there is a tradition that St. Peter preached in this town in the year 44. The inhabitants of Putigliano are very industrious, occupying themselves not only in agriculture, but in the manufacture of nails, of cotton cloths, of coarse woollen stuffs, etc. P. in 1874, 10,044.

Put-in-Bay, p.-v. and tp., Ottawa co., O., on South Bass Island in Lake Erie, 20 miles from Sandusky, is a noted place of summer resort. P. 1148.

Put′nam, county of N. E. Florida. Area, 610 sq. m. St. John's River traverses the S. E. part of the county, and then forms for some distance its E. boundary. The soil is varied; much of it is very fertile, while a large part is sandy and covered with dense pine forests. The hummock-lands are well adapted to sugar and cotton culture. Cap. Palatka. P. 3821.

Putnam, county of Central Georgia. Area, 350 sq. m. It is bounded E. by Oconee River and traversed by a branch of Macon and Augusta R. R. It is uneven and fertile. Cotton and corn are important products. Cap. Eatonton. P. 10,461.

Putnam, county of Central Illinois. Area, 180 sq. m. It is traversed and partly bounded on the N. by Illinois River. It is level and very fertile. Corn and wheat are leading products. Traversed by various railroads. Cap. Hennepin. P. 6280.

Putnam, county of Central Indiana. Area, 490 sq. m. It is hilly except in the N. E., and fertile. Cattle, grain, and wool are important products. Lumber, carriages, etc. are manufactured. Traversed by several railroads, centring at Greencastle, the capital. P. 21,514.

Putnam, county of Missouri, bounded N. by Iowa and on the E. by Chariton River. Area, 475 sq. m. It is somewhat uneven, and has coal and abundant timber. Cattle, grain, tobacco, and wool are important products. The soil is almost uniformly fertile. Cap. Unionville. P. 11,217.

Putnam, county of New York, bounded W. by Hudson River and E. by the Connecticut State line. Area, 234 sq. m. It is very mountainous and rocky, with fertile valleys. Dairying is one of the principal industries. Iron ore, granite, limestone, and other minerals abound. Iron castings, pig iron, paper, and brick are leading articles of manufacture. The county is a popular region for summer resort, and abounds in wild scenery. Traversed by Harlem and Hudson River R. Rs. and by several minor railroads. Cap. Carmel. P. 15,420.

Putnam, county of N. W. Ohio. Area, 594 sq. m. It is level and very fertile, though in part marshy. Cattle, grain, wool, and lumber are leading products. Traversed by Dayton and Michigan R. R. Cap. Ottawa. P. 17,081.

Putnam, county of Central Tennessee, chiefly on the N. W. slope of the Cumberland Mountains. Area, 500 sq. m. It is hilly, but generally fertile. Beds of coal are found. Cattle, corn, tobacco, and wool are leading products. Cap. Cookville. P. 8698.

Putnam, county in the western portion of West Virginia. Area, 450 sq. m. Traversed by Great Kanawha River and Chesapeake and Ohio R. R. It is hilly and has a variety of soils, mostly fertile. Grain and tobacco are leading products. Cap. Winfield. P. 7794.

Putnam, p.-v., Windham co., Conn., on Norwich and Worcester division of New York and New England R. R., about midway between Norwich and Worcester, has 7

cotton and woollen mills, 6 shoe-factories, 5 churches, 2 banks, 2 weekly newspapers, and mechanical shops. P. 4192. E. C. Stone, Ed. "Putnam Patriot."

Putnam, tp., Fulton co., Ill. P. 1654.

Putnam, p.-v. and tp., Fayette co., Ia. P. 766.

Putnam, tp., Linn co., Ia. P. 760.

Putnam, tp., Livingston co., Mich. P. 1361.

Putnam, p.-v. and tp., Washington co., N. Y. P. 603.

Putnam, p.-v., Springfield tp., Muskingum co., O., on Muskingum River, opposite Zanesville, of which it is a suburb, and on Cincinnati and Muskingum Valley R. R. P. 2050.

Putnam (Frederick Ward), b. at Salem, Mass., Apr. 16, 1839; was educated at home by his father, Eben Putnam (Harvard, 1813), until 1856, when he entered the Lawrence Scientific School as a special student under Prof. Agassiz, with whom he remained until 1864, when he returned to Salem; took an active part in the Essex Institute as superintendent of its museum; originated and conducted the *Naturalist's Directory*. On the foundation of the Peabody Academy of Science in 1867 he was elected director of the museum, which position he held until Oct., 1875, when he succeeded the late Prof. Wyman as curator of the Peabody Museum of Archæology and Ethnology at Cambridge. In 1867 he, with others, commenced the publication of the *American Naturalist*, of which he was editor and proprietor until 1875; was elected permanent secretary of the American Association for the Advancement of Science; was re-elected for five years in 1874, and was appointed in Dec., 1875, civilian assistant on the U. S. surveys W. of the 100th meridian (in charge of Lieut. Wheeler), being entrusted with the special duty of reporting on the archæological and ethnological material that had been collected.

Putnam (George Palmer), A. M., great-nephew of Gen. Israel, b. at Brunswick, Me., Feb. 21, 1814; became a bookseller's clerk at Boston 1826, and at New York 1828; prepared in early youth his useful book, *Chronology, or an Introduction and Index to Universal History, Biography, and Useful Knowledge* (New York, 1833), republished in 1850 and in later editions as *The World's Progress, a Dictionary of Dates;* edited *The Bookseller's Advertiser* (1834); visited Europe in the employ of Mr. John Wiley 1836–38, with whom he became a partner 1840; resided in London 1840–47, conducting the foreign business of the firm of Wiley & Putnam, which became increasingly important; wrote *The Tourist in Europe* (1838) and *American Facts* (1845); edited the *American Book-Circular* (1843), and prepared a *Pocket Memorandum-Book in France, Italy, and Germany* (1848). Returning to New York in 1847, he commenced business on his own account 1848, and soon became one of the most enterprising of American publishers; was noted for the high average excellence of his publications (which, among many others, included the works of Irving, Cooper, Bryant, Hawthorne, Lowell, Bayard Taylor, Asa Gray, and Tuckerman); edited the *Popular Library*, consisting of 24 vols. of choice English literature, the *Home Cyclopædia* (5 vols., 1850–53), and founded *Putnam's Magazine*, a first-class monthly which enjoyed great repute from its beginning in 1853 until its transfer to another publisher in 1856. Mr. Putnam was for some time forced to suspend business, but subsequently resumed, and the magazine was re-established in Jan., 1868, but in 1870 was merged into its younger rival, *Scribner's Monthly*. More than 300 volumes were issued by Mr. Putnam during his career as a publisher. His great services to American literature at home and abroad were doubly meritorious from the courtesy, kindliness, and generosity of his dealings with authors, who found in him a true friend. His business relations with Irving were especially honorable and satisfactory to both parties, as mentioned in the article under that title. Mr. Putnam held the position of collector of internal revenue in New York 1863–66; was a distinguished art-critic; became one of the founders and honorary superintendent of the Metropolitan Museum of Art, was chairman of the committee on art in connection with the universal exposition at Vienna, and was for many years a leader in the social literary circles of New York. D. in New York Dec. 20, 1872.

Porter C. Bliss.

Putnam (Haldimand S.), b. at Cornish, N. H., 1836; graduated at the U. S. Military Academy, and entered the army as brevet second lieutenant topographical engineers July, 1857, captain 1863; served principally in the West in explorations and surveys prior to 1861. In the civil war he served on the staff of Gen. McDowell at the battle of Bull Run and gained the brevet of major for gallantry. In October he proceeded to his native State and organized the 7th New Hampshire Vols., of which regiment he became colonel Dec., 1861. In command of his regiment he served in Florida and South Carolina, and in Apr., 1863, commanded a brigade in the Stono Inlet expedition, also in the capture of Morris Island, and in the assault on Fort Wagner, July 18, 1863, where he led the second assaulting column, and was killed on the parapet of the work while rallying his men. Brevet lieutenant-colonel and colonel for Morris Island and Fort Wagner.

Putnam (Israel), b. at Salem, Mass., Jan. 7, 1718. Denied the means of obtaining more than a very rude education, his natural vigorous mental endowments enabled him to exercise a wide influence upon the exciting events of his time, while his strong physical powers and daring disposition were displayed in the many romantic adventures related of him. In 1739 he married and removed to Pomfret, Conn., where he became a successful farmer and a large wool-grower. After having suffered severe losses in their flocks from the depredations of a she-wolf and her whelps, the neighbors turned out to destroy her, and after a vigorous hunt succeeded in driving her into her den, a rocky cavern. After exhausting all means to force the animal from her retreat, Putnam at midnight descended the cavern on his hands and knees, bearing a torch in one hand and a musket in the other, and shot the beast at the moment she was about to spring upon him. This incident added greatly to his already established reputation for courage—a reputation he subsequently maintained in the French war, in which he commanded a company of Connecticut troops with distinction at Crown Point and Ticonderoga. In Aug., 1756, while in command of a party, he was captured by the enemy and bound to a tree, where during the continuance of the action he was frequently exposed to the fire of both friend and foe, but miraculously escaped unhurt. He was, however, borne away by the enemy in their retreat, and at night the fire had been lighted to burn him alive when he was saved by the intervention of the French officer, Molang. Taken to Ticonderoga, and subsequently to Montreal, he was, by the influence of Col. Schuyler, himself a prisoner at the latter place on Putnam's arrival, exchanged in 1759, and promoted to be lieutenant-colonel. Returning to his farm on the restoration of peace, the news of the battle of Lexington reached him while ploughing. Turning his cattle loose, he left his plough, mounted his horse, and rode rapidly to Cambridge. After a brief consultation he returned to Connecticut, when he was made brigadier-general by the legislature, of which he was a member, and a week later was on his way back to Cambridge at the head of a regiment which he had raised. Spurning the offers of rank and money made to him by the British, he entered with zeal upon the great struggle for independence, and soon conducted several successful expeditions. At the battle of Bunker Hill he displayed his usual energy and bravery throughout the day, as well as in the subsequent endeavor to rally the overpowered and retreating troops. Upon the arrival of Washington to assume command (July 2) he bestowed upon Putnam one of the four major-generals' commissions he bore from Congress, but the other three were not then delivered. Upon the evacuation of Boston, Putnam was ordered to take command at New York, and after the battle of Long Island and evacuation of New York was sent to Philadelphia to complete the fortification of that city; subsequently stationed at Crosswick and Princeton, N. J., he was in May, 1777, assigned to command the army in the Highlands of New York. It was while here he sent his famous reply to the threatening demand of Sir Henry Clinton for the release of one Palmer, a Tory officer captured within the American lines. It was as follows: "Sir: Edmund Palmer, an officer in the enemy's service, was taken as a spy, lurking within our lines; he has been tried as a spy, condemned as a spy, and shall be executed as a spy. Israel Putnam. P. S. He has been accordingly executed." Owing to the dissatisfaction created by the surprise and loss of Forts Montgomery and Clinton in the summer of 1777, Putnam was removed from his command, although a subsequent court of inquiry acquitted him from blame in their capture, and he was restored to command. While in the Highlands he selected West Point as the site for a fortification; the ruins of the old fort bearing his name yet exist. In the winter of 1778, Putnam, while in command in Connecticut, was at Horseneck, one of his outposts, guarded by 150 men and 2 cannon, when attacked by Gen. Tryon with a force numbering 1500. After exchanging a few shots Putnam directed his men to a swamp out of reach of the enemy's cavalry, but being himself closely pursued, he turned his horse toward a steep hill, down which he dashed, escaping with a bullet through his hat. While on a visit to his home in Connecticut in 1779 he was stricken with paralysis, from which he only partially recovered. D. eleven years later at Brooklyn, Conn., May 19, 1790. G. C. Simmons.

Putnam (Mary **Lowell**), sister of James Russell Lowell, b. at Boston, Mass., Dec. 3, 1810; was early distinguished by her extraordinary attainments in languages, ancient and modern, including the Oriental, Slavonic, and Scandinavian groups; was married in 1832 to Samuel R. Putnam, a merchant of Boston (d. 1861); resided in Europe 1851–57; published a *History of the Constitution of Hungary and its Relations with Austria* (1850), *Records of an Obscure Man* (1861), *The Tragedy of Errors*, and *The Tragedy of Success* (1862), the latter two a dramatic poem in two parts, illustrative of slavery; has written a memoir of her son, William Lowell Putnam (killed at the battle of Ball's Bluff, 1861); has contributed largely to the *North American Review* and the *Christian Examiner;* translated from the Swedish Fredrika Bremer's novel, *The Neighbors*, and is understood to have been long engaged upon a *History of Hungary*.

Putnam (Rufus), b. in Sutton, Mass., Apr. 9, 1738; a millwright by trade, he abandoned his occupation to serve as a private in the French war of 1757–60; resuming his business on the return of peace, by diligent study during spare time he acquired a good knowledge of mathematics and surveying; in 1773 visited Florida, and was appointed deputy surveyor of that province. In the war of the Revolution, as lieutenant-colonel of a regiment, he superintended the defences of Roxbury, Mass.; was appointed chief engineer with rank of colonel, and charged with the defence of New York by fortifications; constructed the fortifications at West Point, and commanded a regiment in Wayne's brigade until the close of the war; in Jan., 1783, was appointed a brigadier-general; was frequently a member of the Massachusetts legislature, and aide to Gov. Lincoln during Shays's rebellion 1787; formed the Ohio Company, which purchased large tracts of land in that State and founded Marietta, the first permanent settlement in the North-west; was judge of the supreme court of the North-west Territory 1792; appointed brigadier-general 1792, he accompanied Gen. Wayne's army to Detroit against the Indians, and subsequently as U. S. commissioner negotiated an important treaty with numerous tribes. From 1793 to 1803 he was U. S. surveyor-general. D. at Marietta, O., May 4, 1824.

Putnam Valley, p.-v. and tp., Putnam co., N. Y. P. 1566.

Putnamville, p.-v., Warren tp., Putnam co., Ind., on Louisville New Albany and Chicago R. R. P. 219.

Put'ney, p.-v. and tp., Windham co., Vt., on Connecticut River and Vermont Central R. R. P. 1167.

Putrefaction. See Fermentation, by Prof. C. F. Chandler, Ph. D., M. D., LL.D., M. N. A. S.

Put'ty, a cement used by glaziers for fastening window-glass in place, and by painters for filling holes in wood over nail-heads, etc. It is composed of whiting (carbonate of lime) and linseed oil, often colored with different pigments. C. F. Chandler.

Putty Powder, oxide of tin, or a mixture of this oxide with oxide of lead, used for polishing glass, etc. It is prepared by calcining tin or a mixture of tin and lead. For the optician's use it is prepared by precipitating a solution of tin in aqua regia with ammonia, washing, drying, and igniting the product. C. F. Chandler.

Puy-de-Dôme, central department of France, comprises an area of 5070 sq. m., with 566,463 inhabitants. The ground is high and the surface mountainous, covered with branches of the Cevennes and the Auvergne mountains, whose conical peaks and their extinct craters (*puys*), together with the large masses of lava and basalt, show the volcanic character of the country. The soil is generally fertile, but agriculture is not in an advanced state. Wheat and wine are produced; on the fine pastures of the mountain-plateaus cattle and sheep are reared, the former of a good, the latter of an inferior breed. Iron, lead, and silver are found in small quantities; marble, granite, and millstones are quarried. Of 75,223 children of school age, 18,847 received no school education in 1857.

Puy, Le, town of France, capital of the department of Haute-Loire, is picturesquely built in terraces on the side of Mount Anis, near the left bank of the Loire. It has celebrated bell-foundries and manufactures of yarn, laces, linen, and woollen fabrics and cloth. P. 19,532.

Puzzolana, or **Pozzuolana.** See Cements, by Gen. Q. A. Gillmore.

Pyæ'mia [Gr. πῦον, "pus," and αἷμα, "blood"], a very fatal disease which occurs during the progress of suppuration in some part of the body, and believed to be due to the entrance of purulent matters into the blood. As it is most frequently met with in hospitals where there are many wounded persons, some surgeons regard the exciting cause in these cases to be a miasm which arises from unhealthy wounds and poisons healthy wounds. The disease is ushered in with a chill, followed by a febrile, and then by a sweating stage. The chills are often repeated and at irregular periods, sometimes as many as three occurring in a day. Toward the termination of the case they are less frequent. Though the surface feels cold during the chill, the temperature of the body rises, and in the hot stage may reach 105° to 108° F. There is loss of appetite, thirst, want of sleep, emaciation, sallow skin, and prostration. Acute cases run a course of from six to ten days, and in chronic cases from three to four weeks. Death results from exhaustion, due to the poisoning of the blood; secondary inflammations, as pleurisy; and the formation of abscesses in internal organs, as the lungs, liver, and spleen, or in the joints and cellular tissue. Stephen Smith.

Pyat' (Félix), b. at Vierzon, department of Cher, France, Oct. 4, 1810; studied law and was admitted to the bar, but devoted himself exclusively to literature; became a contributor to the *Siècle*, and afterward editor of the *National;* produced in 1832, in conjunction with Théodore Burette, the play *Une Révolution d'autrefois*, which was suppressed at the Odéon, but printed in *Revue des Deux Mondes;* composed several other plays which were performed with success; left in 1846 the *National* for the radical *Réforme;* was elected a member of the Constituent Assembly in 1848; sided with the Socialists; fled in 1850 to Switzerland; returned in 1869 to Paris; was arraigned and sentenced to imprisonment in 1870 for some articles in the *Rappel*, but escaped to London; returned again to Paris after the fall of the Empire; edited the *Combat* and the *Vengeur;* was elected a member of the Commune in 1871, and is generally made responsible for some of the most violent and arbitrary measures; escaped to London after the downfall of the Commune.

Pycnog'onum [Gr. πυκνός, "compact," and γόνυ, "joint"], a genus of marine organisms now considered to be spiders, but for a long time supposed to be crustaceans. Some regard them as pœcilopod entomostracans. They are placed, with some others, in a family, Pycnogonidæ, and are the types of a peculiar order.

Pydna, a Greek colony on the Thermaic Gulf, became after various vicissitudes a Macedonian possession during the reign of Philip II., and was the scene of the final overthrow of his empire, Perseus being totally defeated by P. Scipio Nasica in the plain before its walls (June 22, 168 B. C.). At present its exact site cannot be recognized.

Pygma'lion, a king of Cyprus, fell, according to ancient legends, in love with an ivory statue of a maiden he himself had made, and prayed to Aphrodite to make the statue living; which prayer was granted.

Pyg'my [Gr. πυγμαῖος, "one who measures a πυγμή," the length from the elbow to the hand], one of a race of dwarfs mentioned by Greek writers. Homer states that every year they waged war with the cranes. Many writers speak of them as living on the upper Nile; and the existence of a race of very small men near the upper Nile has been fully confirmed by recent travellers. But even if the ancient tales with regard to the pygmies had any reference to this people, they certainly overlaid the truth with a great amount of palpable fiction. The pygmy graves and bones found in Tennessee are supposed to belong to children.

Pyles'ville, p.-v., Dublin tp., Harford co., Md. P. 38.

Py'lus, town of Messenia, on the promontory of Coryphasium, and one of the last towns taken by the Spartans in the Second Messenian war. In 424 B. C. the Athenians built a fort on the site of the town, which became very famous in the Peloponnesian war. The present name, *Navarino*, is a corruption of *Avarino*, the Avars having settled here in the sixth century.

Pym (John), b. at Brymore, Somersetshire, England, in 1584, of an ancient and wealthy family which possessed large estates at Woolavington Pym, near Bridgewater; spent some years as a gentleman commoner at Pembroke College, Oxford, 1599–1602, but did not graduate; studied law at one of the inns of court; was elected to the Parliament of 1614, in which he became one of the leaders of the "country party;" was one of the twelve commissioners chosen in 1621 to confront James I. at New Market in behalf of the privileges of Parliament; was, with other leaders, at the expiration of the session of that year, imprisoned for his opposition to government measures; was returned to the first Parliament of Charles I., in which he was actively engaged in the impeachment of the duke of Buckingham 1626; was prevented by royal proclamation from emigrating to New England 1637; presented himself to the country, along with Hampden, in 1639 as the champion of the popular cause, and negotiated with the commissioners

of the Scotch Covenanters; was the recognized leader of the "Short Parliament" of 1640 and of the "Long Parliament," which assembled in 1641; managed the impeachment of Strafford and the trial of Laud; presented the "grand remonstrance," which set forth all the evils endured from the beginning of the reign of Charles I.; was the chief of the "five members" whose attempted seizure by the king precipitated the civil war (Jan., 1642); was the real head of the provisional executive established at London after the king's flight; issued a manifesto in 1643 defending himself in moderate language from the king's accusation of treasonable dealings with the Scots; was appointed lieutenant of the ordnance in November. D. suddenly at Derby House, London, Dec. 8, 1643. He was buried with pomp in Westminster Abbey, and having impoverished himself in the cause of his country, £10,000 was voted by the House of Commons to pay his debts. By the royalists he was nicknamed "King Pym," and Clarendon testifies that at the opening of the Long Parliament he was "the most popular man in that or any other age." Modern historians have confirmed this high estimate. (See Forster's *Arrest of the Five Members* (1860), *The Debates on the Grand Remonstrance* (1860), and *Statesmen of the Commonwealth* (1864); Goldwin Smith's *Three English Statesmen* (1867); and J. R. Green's *Short History of the English People* (1875).) PORTER C. BLISS.

Pymatu'ning, tp., Mercer co., Pa., on Shenango Creek, includes the village of Clarksville. P. 2549.

Pymosa, tp., Cass co., Ia. P. 2120.

Pyn'chon (JOHN), the only son of William (1590), b. in England in 1627, and brought to New England at a very early age; married Amy, the daughter of Gov. George Wyllys of Hartford; succeeded his father in the government of Springfield and in the management of the affairs of the Connecticut River Valley, the greater part of which, for himself and others, from Enfield and Suffield in Connecticut up to the line of New Hampshire and Vermont, he purchased from the natives; distinguished for his public spirit, and for his skill in the management of the Indians, by whom he was greatly beloved; was the first colonel of the Hampshire regiment, and assistant under the old Massachusetts charter; one of the governor's council for New England under Sir Edmund Andross, and a councillor under the new Massachusetts charter. D. at Springfield June 17, 1703.

Pynchon (JOSEPH), son of William Pynchon of Springfield and Catharine Brewer, and great-grandson of the preceding, b. at Springfield Oct. 30, 1737; graduated at Yale College 1757; married Sarah, daughter of Rev. Thomas Ruggles of Guilford, Conn.; prominent in the politics and affairs of that colony; a loyalist during the Revolution, and retired to Shelburne in Nova Scotia; after the war he returned to Guilford, and devoted the remainder of his life to scientific pursuits.

Pynchon (THOMAS RUGGLES), M. D., only son of the preceding, b. at Guilford in 1760; educated in the city of New York, and during the Revolution pursued his medical studies in the hospitals of the English army; after the war returned to Guilford, where he soon acquired great celebrity in his profession; married Rebecca, daughter of Abraham Tomlinson of Stratford. D. in 1796, in consequence of a fall from his horse.

Pynchon (THOMAS RUGGLES), D. D., grandson of the preceding, b. at New Haven Jan. 19, 1823; educated at the Boston Latin School and at Trinity College, Hartford, where he graduated in 1841, M. A. 1844; was tutor 1843–47; ordained deacon at New Haven June 14, 1848, and priest at Boston July 25, 1849; rector of Stockbridge and Lenox, Mass., 1849–55; elected Scovill professor of chemistry in Trinity College Oct. 2, 1854; received the degree of D. D. from St. Stephen's College, New York, in 1865; elected president of Trinity College Nov. 7, 1874; author of a treatise on the chemical forces and of various sermons and pamphlets.

Pynchon (WILLIAM), one of the original patentees of the Massachusetts Bay Company; b. in Essex, Eng., about 1590; came to New England in 1630 with Winthrop and other patentees, and settled at Roxbury; in 1636 removed to Connecticut River and founded Springfield, named after his own residence at Springfield, Essex, England; in 1650 published in England a book entitled *The Meritorious Price of Man's Redemption*. In consequence of the disfavor with which this book was received, and the persecution to which it subjected him, he returned to England in Sept., 1652, and purchased property at Wraisbury, Buckinghamshire, opposite Magna Charta Island in the Thames, near Windsor. D. Oct. 29, 1662. Was also author of a treatise on the Sabbath, and another upon the Jewish synagogue.—He left one son, JOHN, to whom he bequeathed all his vast landed estate in the valley of Connecticut River.

Pynchon (WILLIAM), son of William Pynchon of Springfield and Catharine Brewer, b. at Springfield in 1723; graduated at Harvard College in 1743; settled at Salem; until the Revolution one of the most distinguished lawyers in the colony of Massachusetts Bay; a staunch loyalist. D. Mar. 14, 1789.

Pynol (C_4H_5N), an oily base found in the products of the destructive distillation of all animal and vegetable substances, containing nitrogen. It occurs in tobacco-smoke. It is made from bone oil, and by distilling mucate of ammonia alone or with glycerine. Pynol-red is formed by heating pynol with hydrochloric or sulphuric acid. C. F. CHANDLER.

Pyr'amid [Gr. πυραμίς, πυραμίδος], a polyhedron having any polygon for a base, the remaining faces being triangles meeting at a common point called the *vertex*. The triangular faces taken together make up the *lateral surface* of the pyramid. A spherical pyramid is a portion of a sphere bounded by any spherical polygon, called the *base*, and by corresponding sectors of great circles. The vertex is at the centre of the sphere.

Pyr'amid. The pyramids of Egypt are collected into several groups at a considerable distance from each other. Looking out from the citadel of "El Karo," one can obtain a view of several of these groups, stretching far away to the southward along the western bank of the Nile. The whole number is variously reckoned, but not more than 38 are really entitled to the name, and of these many are in the most ruinous condition. They extend from 29° 59′ to 29° 26′ N. lat., a space measuring from N. to S. something over 50 miles. Thirty-three of these pyramids belong to the province of Memphites, as defined by Diodorus Siculus, and the several particulars concerning them are most concisely exhibited in the following table, abridged from the 13th vol. *Astronomical Obs.* (Edinburgh, 1872). Commencing at the most southerly, we find—

Pyramid or Pyramids.	Present height in British inches.	Ancient height in British inches.	Probable date of erection, B. C.
Two of Biamoo	360	x	1800
One of Howara (ruinous)	1270	x	1850
One of Illahoon (ruinous)	1580	x	1850
One of Meydoom (flat-topped)	1494	x	1850
Southern of Lisht (ruined)	822	x	1900
Northern of Lisht (ruinous)	1080	x	1900
Southern of Dashoor (brick)	1872	3208	1900
Small of Dashoor	816	1281	1950
Southern stone of Dashoor (2 slopes)	3834	4029	1950
Northern stone of Dashoor	3918	4111	1950
Northern brick of Dashoor	980	2586	1950
Base of Mustabet El Farahoon	650	720	1950
9th at Saccara (ruined)	900	x	2000
8th at Saccara (ruined)	1044	x	2000
7th at Saccara (ruined)	330	x	2000
6th at Saccara (ruined)	960	x	2000
5th at Saccara (ruined)	480	x	2000
4th at Saccara (ruined)	740	x	2000
3d at Saccara (the great)	2200	2405	2050
2d at Saccara	1300	1758	2000
1st at Saccara (ruined)	700	x	2000
Small of Abooseir	216	564	2050
Great of Abooseir	1970	2734	2100
Middle of Abooseir	1284	2056	2100
Northern of Abooseir	1400	1953	2100
Northern of Reegah (2 slopes)	500	1150	2100
Northern of Zowat El Arrian (ruined)	730	x	2100
Northern of Aboo Roash (ruined commencement)	480	x	2100
9th at Jeezeh	960	1221	2100
8th at Jeezeh	660	1332	2100
7th at Jeezeh	540	1332	2100
6th at Jeezeh	834	1440	2100
5th at Jeezeh	1000	1119	2100
4th at Jeezeh	834	1440	2130
3d at Jeezeh	2436	2616	2100
2d at Jeezeh	5370	5451	2130
The Great at Jeezeh	5410	5818	2170

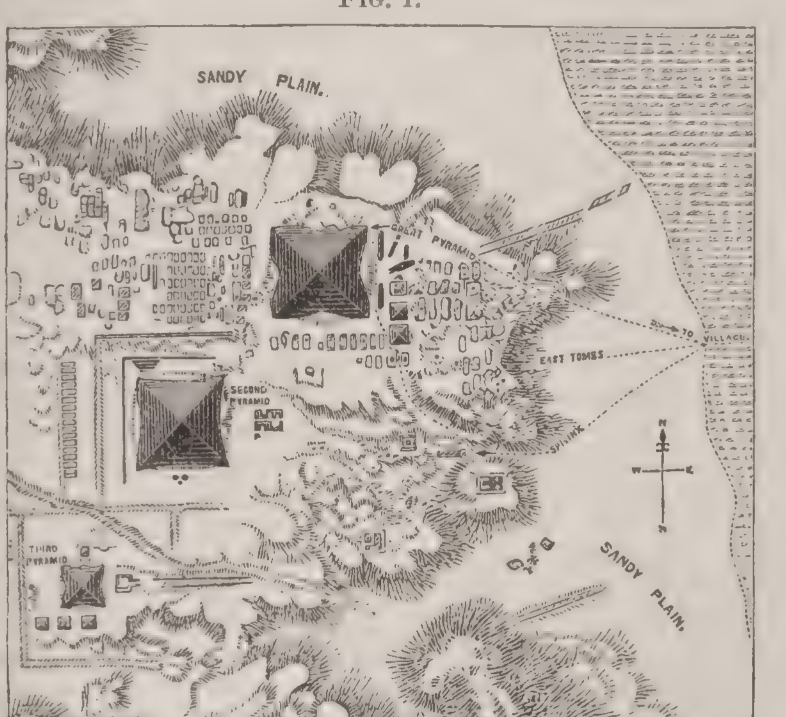
It will not be necessary to describe particularly all the pyramids mentioned in the above table. We select, therefore, a few of the more important. Fifteen miles S. of Cairo are the pyramids of Dashoor; very little is known of the history of this group. They are five in number—two of stone and three of crude brick. The two former exceed all the other pyramids in Egypt in size, except the first and second at Jeezeh. The northern one is partly cased, and has an entrance in the northern face, leading by a descending passage to the sepulchral chambers, which stand upon a level with the foundation. The southern stone pyramid of Dashoor has a peculiarity of form which strikes the eye disagreeably, and is in strong contrast with the symmetrical shape of the Jeezeh group. The lower

portion is at an angle of 54° 14′, but about halfway up the inclination suddenly changes to 42° 59′. Whether this was to gratify a whim of the builder or because it could not be completed on the original scale, cannot now be determined.

Two miles N. of Dashoor are the pyramids of Saccara, nine in number. The largest and most remarkable is called, from its peculiar construction, the Pyramid of Steps. It is not square at the base, like the Jeezeh pyramids. Beneath it are several passages, and a gallery supposed to have been made subsequently to the completion of the structure. In the centre, but below the surface-level of the ground, is a narrow, lofty chamber, and near it a small one lined with blue tiles. In the latter an inscription was found containing the name and titles of an early king, Ra-nub-rokee; if this be Manetho's Necerôchis, as some have supposed, and the head of the third dynasty, this pyramid would antedate those at Jeezeh; its ruinous condition has also been supposed to indicate its great age. This, however, it is far more likely, is due to wretched construction and poor material; and Dr. Lepsius, in the folio vols. of his *Denkmüler*, unhesitatingly places it as more recent than the Great Pyramid of Jeezeh. Two miles N. of the Saccara group are the pyramids of Abooseir, the largest of them about equal in size to the third of Jeezeh. These pyramids stand on an elevated ridge of the Libyan chain, 7 miles S. of the Jeezeh group, and are easily seen from the Great Pyramid hill. The group consists of three large and one very small. The northernmost is said to have been the work of Shura (or Sôris) of the fourth dynasty.

We come now to the well-known "memorials of the world's youth," ever fresh and the most familiar monuments on our globe, "the pyramids of Jeezeh." They are about 12 miles from Cairo and 7 from the banks of the Nile, at the southern apex of the Delta-land of Egypt, and the point of curvature of the northern coast. Belonging to the childhood of the human race, erected before history began, the questions, Who built them? And for what purpose? are not easily answered. The Jeezeh group of pyramids consists of nine, three of which, the so-called first, second, and third, are of great size; of the smaller ones, three are on the E. side of the first, or Great Pyramid, and three on the southern side of the third pyramid. The smaller ones are all in a ruined condition, and it will only be necessary to describe briefly the three larger. The accompanying map will show their relative positions:

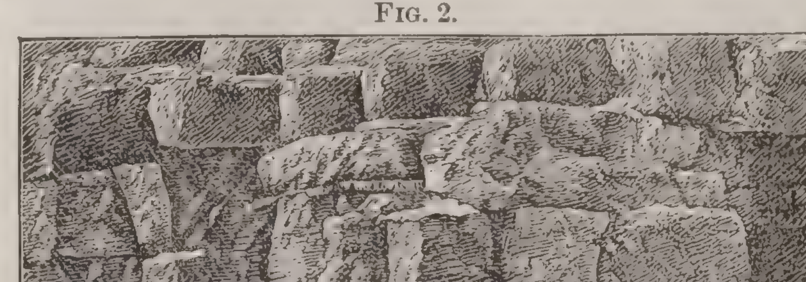
FIG. 1.



The Pyramids of Jeezeh.

The smallest and most southerly is the third pyramid, with three still smaller ones in a ruinous condition directly S. of it. When Col. Howard Vyse entered it in 1837 he found it had already been ransacked. There was in it, however, a very elaborately-carved sarcophagus (which was lost at sea near Carthagena on its way to England) and part of a mummy-case, bearing the name Ra-men-ka, which is now in the British Museum. Herodotus and Diodorus attribute the erection of this pyramid to Mykerînos, but Manetho makes it the work of Queen Nitôkus, the former the fourth ruler of Manetho's fourth dynasty, the latter ending the sixth. Bunsen supposes, from the fact of its having two chambers and its evident enlargement after completion, that it was the sepulchre of both. The two chambers are subterranean, and entered by inclined passages, but not at the same angle. This pyramid has been much lauded for its casing of red granite, now tumbled off and so badly weather-worn that the angle of slope can only be approximately obtained. In its construction it is inferior to the second pyramid, which is at a distance from it of about 700 feet in a north-easterly direction. With the exception of the Great Pyramid, this is the largest and best built of the Egyptian pyramids. On its E. side are the remains of a small temple; still farther eastward, and a little S., is the tomb of Cheops, near which, in a south-easterly direction, is the Sphinx, and still farther in the same direction the magnificent tomb of Shafre, the builder of this pyramid. The stones of the casing at the N. E. angle have been removed or broken, so that the ascent, though hazardous, is not unfrequently made by the Arabs, and sometimes by Europeans. It was the work of two architects, and the different style of workmanship shows itself in the most marked manner. There are two entrances to the pyramid on the northern side. Through the upper one Belzoni entered it in 1818, to find it had been already ransacked some 900 years before. A sarcophagus was found buried level with the floor; it had a tight-fitting lid, but the body, if one was ever in it, was gone. There is but one sepulchral chamber, and this is partly below the level of the base of the pyramid. The lower entrance was first opened by Col. Howard Vyse; it was closed by rectangular and rough blocks, and the inclination was some 4° less than that of the upper. Neither of these passages is finished like those of the Great Pyramid. Herodotus and Diodorus attribute the erection of the second pyramid to Chephren (or Shafre), whose statue in diorite was found by Mariette in the splendid tomb to which we have already alluded. It remains to describe the Great Pyramid, and to notice briefly the extraordinary claims that some have made in its behalf. It stands upon the extreme N. E. boundary of the hill, so near the margin of the cliff that the ancient builders have strengthened the hill in that direction by all the stone clippings, forming immense rubbish-heaps. The selection of this locality, when as yet no other pyramid had been erected on the hill, can only be explained on the supposition that an attempt was made to put it exactly in lat. 30° N.; and such is really the elevation of the pole if we disregard refraction. The true latitude, as determined by Prof. Smyth, is 29° 58′ 51″, and according to the French astronomer, M. Nouet, 29° 59′ 6″. Like all the other Jeezeh pyramids, it is oriented, but much more exactly. As the pyramid now stands, with its external polished limestone casing stripped off to build modern Cairo and the neighboring villages, it would have been impossible to determine the original orientation except for the fortunate discovery by the French engineers of two of the original sockets for the corner casing-stones. Subsequently, under the direction of the Scottish astronomer, all four were uncovered. The mounds of débris at the centre of the four faces of the pyramid are some 40 feet in height; through the northern one Col. Howard Vyse made a cross-cut, disclosing the ancient pavement and two huge casing-stones in place, with the fragment of a third still adhering to one of the others by the tough cement. He tells us that the masonry was unrivalled; not the thinnest paper could be anywhere inserted between the joints. These casing-stones were again covered, but they have since disappeared, coveted for the fine quality of the stone for burning into lime. On the E. side the variation of the line of sockets from true N. and S. was 4′ 44″ W. The entrance-passage on the northern side is still nearer to the

FIG. 2.



Socket of N. E. corner of Great Pyramid.

meridian—only 4′ 35′ W. The discovery of the sockets enables a measurement to be made of the original base-side

length, though indeed with some difficulty over the intervening mounds of rubbish. The view in Fig. 2 is of the socket at the N. E. corner, about 29 feet distant from the present corner of the pyramid; it is from a photograph by Piazzi Smyth.

Two of the 100-inch rods neatly measured the diagonal, and so accurately was the floor levelled that Mr. Inglis, the engineer who uncovered it, reported, "I have examined it all over the surface with a spirit-level and find no error in it." The measurements between the sockets for the base-side length are—

	British inches.
The French engineers in 1800	9163
Col. Howard Vyse, 1837	9168
Mr. Inglis for Mr. Aiton, 1865	9110
Royal engineers, direction of Sir H. James, 1868	9130
Simple arithmetical mean	9142

The base would therefore cover some 13 acres, and the huge structure is reared with the distinctive peculiarity that each layer is of uniform height throughout—a feature belonging to none of the other pyramids except the upper and better portion of the second. Attempts have been made from the base-side length to recover the ancient standard (or cubit) used by the builders. Thus, Sir H. James in 1869, adopting the smallest of the above measures, and conjecturing that the cubit was contained 500 times in one side of the base, obtained a length of 18.22 British inches, which he considered also as the length of the Greek-cubit. Piazzi Smyth, observing the frequent occurrence of a length exceedingly near to that of the British inch or its multiples, especially in 5s and 10s, supposes the standard employed to have been the same fraction of the polar radius of the earth that the French mètre was designed to be of the quadrant of the meridian passing through Paris—*i. e.* 25.025 British inches; in round numbers, 25 pyramid inches, as he calls them; and this length he considers that of the sacred Hebrew cubit. On this supposition, reducing the above 9142 British inches to pyramid inches—*i. e.* 9133—and dividing by the cubit, or 25, he finds the cubits in one side 365.3—very near the length of the tropical year. For reasons derived from the more accurately-measured interior he considers the true length as 9140 British inches, or 9131 pyramid inches, giving now 365.242 as cubit length of base side. The angle of slope of the pyramid was measured by Mr. Brettel for Col. Vyse when the casing-stones were uncovered. Two sets of measurements were made—the angle directly, 51° 50′; and the length of the several sides, giving by computation 51° 52′ 15.5″. The mean of the two is 51° 51′ 7.7″, differing only 6.4″ from the theoretical angle of a pyramid whose height is to the perimeter of the base as the radius of a circle to its circumference—a coincidence first noticed by the late John Taylor. In most of the views given of the Great Pyramid the Sphinx appears in the foreground, and of such magnitude as almost to eclipse the pyramid itself.

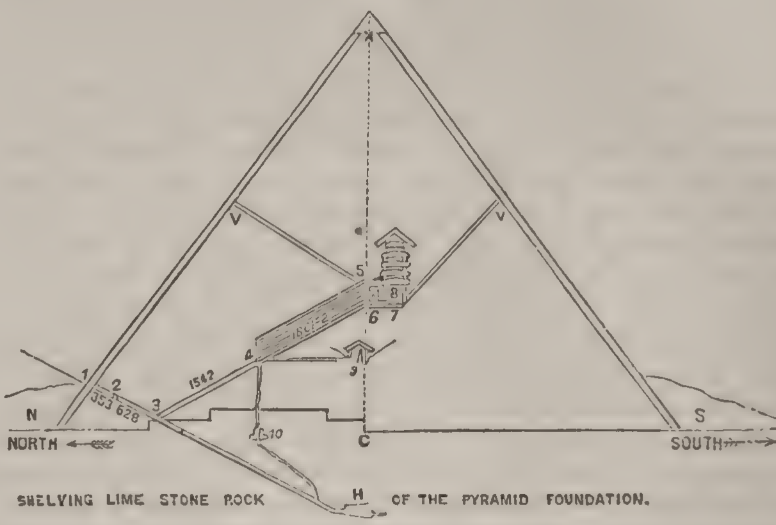
FIG. 3.

The Great Pyramid and the Sphinx.

The view here presented is from a photograph by the Scottish astronomer, and is taken from the southern hill, at such distance as to show more nearly the relative sizes of the pyramid and the Sphinx. The opening in the S. face of the pyramid is known as "Col. Vyse's hole," an attempted forced passage from the S.; the smaller pyramids are shown on the eastern side.

The true entrance to the Great Pyramid is by an inclined passage in the northern face, some 40 feet from the base and 25 feet E. of the centre. This passage is mentioned by Herodotus, and was the only one known to him. The angle of slope is 26° 27′, and it is lined with polished limestone with exquisitely fine joints. The passage ends in a subterranean chamber cut out of the living rock, but never finished. It is shown at H in the accompanying diagram, the commencement of the descending passage being at (1):

FIG. 4.



Plan of the Great Pyramid.

The ascending passage commences at (3), about 82 feet from the original face of the pyramid, and ascends at an angle of 26° 18′. Below (3) the descending passage is now blocked. Originally, the ascending passage was concealed, but the ceiling-stone fell during the attempt of the caliph Al Mamoun to force his way into the pyramid by cutting an entrance (A. D. 820), the true entrance being at that time unknown. The length of the ascending passage is about 128 feet; it is blocked above (3) by two granite stones, and is entered behind these stones through Al Mamoun's hole. At (4) is the commencement of the grand gallery, which is 157 feet in length, with a height of 28 feet, and breadth of 7 feet, nearly; a ramp, or stone bench, 2 feet high, is on either side, and by means of holes in these one is enabled to climb up the steep and slippery floor to the entrance of the ante-chamber at (6). A horizontal passage, the entrance, originally covered by the floor of the grand gallery, and just at its commencement near (4), conducts to the so-called queen's chamber (9), a distance of some 126 feet. This chamber is the only one that has an inclined roof; it is lined with polished white limestone. In the eastern side is a niche 15 feet high and 40 inches deep; its centre is 25 inches from the middle of the room. No explanation has been given of this niche upon the tombic theory. Just within the entrance of the grand gallery a small and tortuous passage, now closed, leads to a subterranean grotto (10) cut in the living rock, and thence descends until it meets the principal entrance-passage. Entering into the ante-chamber (6), by a small passage-way from the top of the grand gallery with its seven overlappings, we find ourselves in a remarkable little room with a floor mostly of granite, and two granite wainscots on either side. Four grooves are cut in these wainscots, as if to receive a stone portcullis, though there are now no remains of such, if any existed. The first groove was not cut down to the floor, and in it now rests, firmly cemented, a rectangular granite block, with another, either broken or partially finished, cemented above it; under this suspended granite stone or leaf one passes in fully entering the chamber. The total height of the chamber is 149.5 British inches, and the centre of the suspended granite leaf divides this into 91.4 and 58.1 inches, or the $\frac{1}{100}$th of the base-side length and height of the pyramid. The total length of the ante-chamber is 116.3 British inches, or 116.26 of Piazzi Smyth's pyramid inches—*i. e.* diameter of a circle with circumference 365.242—while the granite portion of the floor, and also height of E. wainscot, each 103.03 pyramid inches, is the side of a square having the same area as a circle with a diameter of 116.26. A low passage conducts to the king's chamber (8), with the so-called sarcophagus or coffer (7). This noble chamber is lined with polished granite—five courses of equal height, 47 inches each, except the lower, which is reduced to 42 inches by a rise of the granite floor of 5 inches. Very careful measurements have been made of this room and of the coffer, which is rectangular and cut out of a solid block of red granite, and very carefully polished. It is remarkable that the cubical dimensions of the exterior of the coffer are double those of the interior, and half the mean perimeter is the diameter of circle with circumference of 365.6 British inches. The astronomer-royal for Scotland finds in this coffer a standard of weight and measure, and traces a connection between it and the dimensions

of the king's chamber and sacred cubit, giving several earth relations and astronomical truths which our space will not permit us to notice. The ceiling of the king's chamber is composed of nine granite slabs carefully polished, and, like all the rest of the chamber, with exquisite joints. To remove the pressure of the superincumbent mass, five chambers of construction, so called, or rather hollows, are above it. A small passage leads from the upper portion of the grand gallery to the lower of these hollows, and forced passages have been made to the others; the roofs of all are carefully smoothed, but the floors are rough. In some of these, chalk or paint quarry-marks were found indicating the positions, and, roughly, the name of Cheops; these are the only ancient markings anywhere to be found in the pyramid. Two ventilating shafts *v v* regulated the temperature of the king's chamber, and in 1874, Mr. Dixon, an engineer resident at Cairo, discovered two for the queen's chamber, which, however, curiously enough, had never been opened in the walls of the finished room.

With regard to the date of erection, if we discard the theory proposed by Sir John Herschel, that the carefully-polished entrance shaft was directed to the then polar star at its lowest culmination, very little can be said. It has been placed by the Egyptologists at periods between 2000 and 6000 B. C. The astronomical theory gives for the date of erection 2170 years B. C., so that, if this be correct, the pyramid was about 700 years old at the date of the Exodus. At this time α Draconis was the polar star, at a distance of 3° 33′ from the pole, if we take the angle of slope of the descending passage as the correct elevation at the commencement of the structure; and 3° 42′ from the pole at the finishing of the grand gallery, corresponding to an interval of 25 years. At this date (2170 B. C.) it is found that when α Draconis was culminating below the pole, the Pleiades and vernal equinox were also culminating above. The angle of slope of the second pyramid is 52° 20′, somewhat near that of the Great Pyramid, of which it was probably, in external appearance, a copy. The Great Pyramid—differing from all the others in having upper ventilated rooms; in its superior construction; in its peculiar angle of slope, giving the π ratio; in its remarkable situation and careful orientation—was, it is claimed by Piazzi Smyth and others, built for higher purposes than sepulture, which was undoubtedly the object of the remaining pyramids, though, indeed, these have nothing of true Egyptian architecture about them as we find it in later temples and tombs. It has been asserted that the Sphinx is of older age than the pyramid on the strength of an inscription in very *mediocre style* on a stone found by Mariette near one of the small pyramids, E. of the Great Pyramid. This has since been pronounced by Brugsch to bear a lie on the face of it; he declares that the inscription is simply a legend scratched at a late date, and cannot be quoted as an authority. Mr. Proctor has, in one of his recent lectures, suggested that the Great Pyramid was erected for astrological purposes. The entire absence of hieroglyphs and planispheres forbids this assumption. Piazzi Smyth, in view of the difficulty of admitting at such an early date the mathematical and astronomical knowledge which he thinks may be found in the dimensions of the pyramid, and from what appears to be a prophetic indication of the number of years to elapse from the date of its erection to the commencement of the Christian era—this latter being two fine lines ruled on the polished walls of the descending passage near (2) in our diagram, and which are at a distance of 2170 inches (or an inch for a year) from the commencement of the grand gallery, supposed typical of the commencement of the Christian era—does not hesitate to attribute its erection to supernatural aid, and even names Melchizedek as the architect. Finally, we may note that the queen's chamber is situated on the 25th course of masonry, and the king's on the 50th; the height of the king's chamber floor above the base is such that the area of a cross-section of the pyramid there is one-half the area of the base. The rise of the pyramid, as shown by Sir H. James, being 9 of height to 10 of base at the corners (the angle of slope of arris line being 41° 59′ 18.7″), Mr. Petrie concluded that the height of the pyramid $\times 10^9$ represented the sun's distance, or 91,840,000 miles! Our space will not permit discussion of these claims, and we must leave our readers to judge for themselves. The prominent facts to be accounted for on any theory have been given. H. L. SMITH.

Pyramid Lake lies in Roop co., Nev. It receives Truckee River, and is among lofty mountains. It is 32 miles long and 10 miles wide. Elevation, 4000 feet. It abounds in large trout. It has no outlet.

Pyr′ene ($C_{16}H_{10} = C_{10}H_6(C_6H_4)$), or **Phenylene-Naphthalene,** a solid hydrocarbon occurring with chrysene in the last portions of the distillate obtained in distilling coal-tar to coke. The two bodies are separated by means of carbon disulphide, which dissolves the pyrene and leaves the chrysene. The carbon disulphide is distilled off, and the residue is repeatedly extracted with warm alcohol, and the cooled solution is mixed with an alcoholic solution of picric acid as long as a crystalline precipitate of pyrene picrate is produced. The precipitate is washed with alcohol, decomposed by ammonia, washed with water, and recrystallized from alcohol till the melting-point is constant at 142° to 144° C. Pyrene crystallizes from hot alcohol in laminæ resembling those of anthracene. It is usually yellow, from impurities, but may be decolorized by exposing the solution in benzol to sunlight. It is very soluble in benzol, ether, and carbon disulphide. It melts at 142° C., and distills at a temperature considerably above 360° C. With nitric acid of different strengths it forms mono-, di-, and tetra-nitro-pyrene. It forms a di- and tri-brom-pyrene, and with sulphuric acid a sulpho-acid. Pyrene quinone ($C_{16}H_8(O_2)''$) is obtained as a red powder by the action of chromic acid on a hot solution of pyrene in glacial acetic acid. Heated with hydriodic acid and amorphous phosphorus, it yields hydrides, among them the hexhydride ($C_{16}H_{16}$). (See Laurent, *Ann. Ch. Phys.* [9], lxvi. 136; Schorlemmer, *J. Chem. Soc.*, x., 1872, 445; Graebe, *Ann. Chem. Pharm.*, clviii. 285, 299; Morton, *Am. Chemist*, v. 115.) C. F. CHANDLER.

Pyr′enees, a lofty mountain-chain which forms the boundary between France and Spain, and stretches in one continuous range from the Mediterranean to the Bay of Biscay. Its entire length is 270 miles, its greatest breadth 90 miles. It is broadest and highest about midway, where the two almost parallel lines of which the range consists are connected with a number of wild, towering peaks, of which the highest are Pic Nethou, 11,168 feet; Mont Perdu, 10,950 feet; Vignemale, 10,820 feet; and Pic du Midi, 9540 feet. In their eastern course, toward the Mediterranean, the Pyrenees fall rapidly to an average height of 2000 feet, while the western part of the chain retains an average height of 5000 feet, with many peaks rising 8000 feet. Northward, toward France, the Pyrenees slope gradually, sending out forest-clad offshoots which enclose beautiful valleys; southward, toward Spain, they present steep, abrupt, and barren but bold and picturesque slopes. There are seven passes with carriage-roads leading over these mountains, all at an elevation of over 7000 feet. The most important are those of Bidassao, Pamplona, and Perpignan.

Pyrénées, Basses. See BASSES-PYRÉNÉES.

Pyrénées, Hautes. See HAUTES-PYRÉNÉES.

Pyrenées-Orientales, department of France, bounded S. by Spain and E. by the Mediterranean, comprises an area of 1571 sq. m., with 191,856 inhabitants. It is covered with offshoots of the Pyrenees, which slope gently down toward the sea. The soil is fertile and the climate exceedingly mild. Grapes, olives, mulberries, and oranges grow abundantly, but the summer is often extremely dry and scorchingly hot, and large tracts of land along the coast are very unhealthy. Of 22,948 children of school age, 10,582 received no school education in 1857.

Pyrenomy′cetes, an order of ascomycetous fungi, in which the asci are borne on the inner surface of cavities called perithecia, the walls of which are composed of a dense stroma, and not of a membrane consisting of a layer of polygonal cells, as in the Perisporiaceæ. Besides the spores contained in the asci, most of the Pyrenomycetes have several kinds of secondary fruit, known as conidia, stylospores, pycnidia, etc., which were supposed by the older mycologists to be distinct species of fungi, which they placed in the orders Mucedines, Sphæronemei, Sepedoniei, and Dematiei. (For illustrations of the different kinds of fruit of the Pyrenomycetes the reader is referred to vols. ii. and iii. of Tulasne's *Carpologia Fungorum Selecta.*) The process of fertilization by means of a structure known as an ascogone has been studied by Woronin in *Sphæria Lemancæ*, and by Gilkinet in the genus *Sordaria*. The Pyrenomycetes inhabit stumps, branches, and leaves, and several of them grow upon insects. Ergot is the sclerotium state of *Clavicepa purpurea*, found on rye and other grains. Most of the species are of slower growth, and are less affected by changes of temperature, than other fungi, and many of them, as the black-knot (*Sphæria morhosa*, Schw.), do not ripen their spores until mid-winter.

W. G. FARLOW.

Pyrheliom′eter [Gr. πῦρ, "fire," ἥλιος, "sun," and μέτρον, "measure"], an instrument to measure the heat of the sun, invented by M. Pouillet, consisting of a shallow circular silver vessel containing water or mercury, in which a thermometer is plunged. The upper surface of the vessel is covered with lampblack, and the thermometer enters

the under side, extending below. In use, the rays of the sun are caused to fall perpendicularly upon the surface of the vessel. The area of the exposed blackened surface and the amount of water raised through a certain number of thermometric degrees being known, the absolute heating effect of the sun, acting upon a given area under the conditions of the experiment, may be readily found.

Pyridine (C_5H_5N), an oily base found in bone oil, shale oil, peat-tar, coal-naphtha, and the products of the destructive distillation of cinchonine. It occurs in tobacco-smoke. It is produced artificially by the action of nascent hydrogen on azodinaphthyl-diamine, and by the dehydration of amyl nitrite. C. F. CHANDLER.

Pyri'tes [Gr. πυρίτης, "firestone," because it strikes fire with steel], in its widest sense a native mineral, massive or crystalline, composed of a metallic sulphide or arsenide, or both. Iron, copper, nickel, and cobalt pyrites are the ones generally mentioned. Iron pyrites is often found crystallized in cubes or in other forms. It is sometimes massive, and occasionally globular. From its bright yellow color it is sometimes mistaken for gold. It is a more or less pure iron-bisulphide. It is of great value for the manufacture of sulphuric acid and the sulphates and other commercial sulphur compounds. It also yields not unfrequently a handsome amount of silver, copper, or gold. Chemical reagents derived even remotely from it are apt to contain appreciable amounts of arsenic. Copper pyrites is an impure double sulphide of iron and copper. It is extensively employed, not only as a source of sulphuric acid, but of metallic copper.

Py'ritz, town of Prussia, province of Pomerania, is an old place, with some remembrances of its Wendish origin. It trades a little in corn and fish, and has some linen and cotton manufactures. P. 7521.

Pyrogallic Acid. See PYROGALLOL.

Pyrogallol, called also **Pyrogallic Acid** [Ger. *Brenzgallussäure*], discovered by Scheele by subliming gallic acid of gall-nuts, but held by him to be identical with the latter. Leopold Gmelin and Braconnot proved it to be a peculiar substance, and it was hence called *pyrogallic acid.* It forms a beautiful mass of snow-white crystals, extremely light and feathery. Having been held of late years to be a body belonging to the phenols—a triatomic phenol, and no true *acid* substance—the name has been changed to *pyrogallol.* Its formation from gallic acid by the action of heat is simply as follows:

$$\underset{\text{Gallic acid.}}{C_7H_6O_5} = \underset{\text{Pyrogallol.}}{C_6H_6O_3} + CO_2.$$

Pyrogallol is a highly remarkable body, and a useful reagent in the chemical laboratory, by reason of the fact that in the presence of alkaline substances it has an intense affinity for atmospheric oxygen at ordinary temperatures; and it was therefore proposed by Liebig as an agent in analysis of gaseous mixtures containing oxygen, a method now in universal use. During such oxidation it forms also, in presence of alkalies, colored bodies of very intense tinctorial power, and was proposed in 1872 by the present writer as a reagent for the detection and determination of oxygen in aqueous solutions—as in natural waters. This latter method has been appropriated and used, without credit, by French chemists in the determination of dissolved oxygen in urine and other liquids. HENRY WURTZ.

Pyro'la, in botany, a genus of the Pyroleæ, a sub-order of the Ericaceæ or breathwort family, characterized by a calyx free from the ovary; the corolla polypetalous; anthers extrorse in the bud; seeds with a loose and translucent cellular coat much larger than the nucleus; is nearly herbaceous and evergreen, with broad leaves. The sub-order contains three genera—*Pyrola, Moneses,* and *Chimaphila.*

Pyroleic Acid. See SEBACIC ACID.

Pyrolig'neous Acid, a name often applied to impure acetic acid, produced by the distillation of wood. It contains empyreumatic tarry matter, which gives it a dark color and peculiar smell. It may be completely freed from these impurities. C. F. CHANDLER.

Pyrom'eter, an instrument for measuring temperatures above the range of the mercury thermometer, or, as its name indicates, a measure of the temperature of fire (Gr. πῦρ, "fire," and μέτρον, "measure"). All the earlier instruments for this purpose depended on the change of dimensions of various refractory solids, which were measured usually in linear expansion, and converted into thermometric degrees either by a direct comparison at lower temperatures and estimating those of higher range as proportional, as in Daniell's pyrometer, or by an arbitrary scale, as in Wedgwood's instrument. Instruments of this description have given place to the more exact indications of Regnault's mercury and hydrogen pyrometers, Deville and Troost's iodine pyrometer, or the more recent one of Siemens, called the resistance thermometer. These several instruments are mentioned below.

Wedgwood's pyrometer was first described by him in 1782 in the *Philosophical Transactions* (vol. lxxii. p. 305; *Ibid.,* lxxiv. 358, and lxxvi. 390), and depended on the contraction of a cylinder of clay under heat, the dimensions of which were measured in a wedge-shaped groove in a plate of porcelain graduated on the edges by an arbitrary scale, the zero of which was taken to equal 1077½° F., being the temperature of a red heat visible by daylight. The extremity of Wedgwood's scale = 240° W. = 32,277° F. (!); each degree W. = 130° F. Daniell subsequently proved that Wedgwood's degrees were nearly ten times too high. Thus, his 240° W. = 32,277° F. were proved by Daniell to correspond actually to only 3300° F., the highest temperature of a good wind-furnace. Wedgwood's pyrometer had no scientific basis. It was soon found that a long-continued low red heat produced the same contraction in the dimensions of a clay cylinder as a much higher temperature for a shorter time; and there was no certainty of finding any two samples of clay having the same coefficient of expansion.

Daniell's Pyrometer.—The late Prof. J. Frederick Daniell of King's College, London, first described his "register pyrometer" in 1821 (*Quarterly Journal of Science,* vol. xi. p. 309), and in its later form in his *Introduction to Chemical Philosophy* (1839, p. 98–101). The figure he there gives is found in most works on chemical physics, and need not be reproduced here. This instrument is well considered, and depends on the accurate measurement of the difference in linear expansion between a rod of platinum and a solid bar of black-lead earthenware highly baked, and called the register. The scale by which the expansion is measured is independent of the register, and consists of two rules of brass accurately joined together at a right angle by their edges, and fitting square upon two sides of the black-lead bar. The motion of expansion is multiplied by a lever, which is also the radius of a circle graduated in degrees and thirds of degrees and read by a nonius. "This scale is connected with that of the mercury thermometer by immersing the register in boiling mercury, whose temperature is as constant as that of boiling water, and has been accurately determined. The amount of expansion for a known number of degrees is thus determined, and the value of all other expansions may be considered as proportional." Daniell's pyrometer furnished the first reasonably exact means of measuring high temperatures, and it is yet in vogue for a large number of observations. By it the melting-points of many metals and alloys were for the first time determined, but it is not adapted to meet numerous cases, as, for example, the interior of furnaces and other heated spaces. As by its means the melting-points of numerous metals and alloys have been determined, these may in turn be used to test, approximately, the temperature of heated spaces by exposing in them equal-sized portions of different metals and noticing their successive fusion, until, for example, it is found that a given space has a temperature below the fusion-point of copper, of gold, of silver, etc., when these are successively exposed for a definite time, as one minute, in the spaces to be measured for temperature. The temperature of gases escaping from a furnace is thus found with sufficient exactness by exposing in the flues metals of known melting-points until they soften or fuse; thus, bismuth fuses at 507° F., lead at 620°, zinc at 782°, and antimony at 842°, etc.

The Zinc Pyrometer of Whitwell is an application of this mode of observation, with the addition of limits of time, which he has experimentally fixed in the use of his well-known "stove" for heating the blast of the high iron furnace. He states that a rod of zinc five-eighths of an inch in diameter melts in 2½ seconds in a temperature of 1400° to 1450° F., in 6 seconds in a temperature of 1100°, and if the temperature is 1000°, the melting-time is 7 seconds. For each second added to 7, 33° are deducted from 1000°; thus, if 10 seconds are required to melt the zinc rod, the temperature is $1000° - 33° \times 3 = 901°$ F.

Mr. I. Lowthian Bell, in many of his experiments on the temperature of highly-heated spaces, employed a copper tube with walls only thick enough to stand the pressure of a volume of confined air, the amount of its compression being measured by a mercurial gauge, the temperature being deduced from the known coefficients of expansion. This instrument gave very prompt and uniform results—more so than were obtained from quenching a mass of copper of known weight, which had been exposed to the temperature of the heated spaces, in a known quantity of water, and estimating by the laws of calorimetry the temperature of the gases from the increased temperature of

the water. (Bell, *Chemical Phenomena of Iron-Smelting,* p. 36.)

Iodine Pyrometer.—Messrs. Deville and Troost have used in place of an air thermometer of glass (see THERMOMETER), which is limited to comparatively low temperatures, a globe of difficultly fusible porcelain of about 300 c. c. capacity, having a long neck, in which iodine by its volatilization replaces air, with the advantage that greater differences of weight may be had for corresponding differences of temperature. The flask or globe, charged with a sufficient quantity of iodine to expel all or nearly all the air, is placed in the furnace or other medium to be measured, and when it has attained the same temperature, its mouth, which is previously nearly closed by a loosely-fitting stopper of porcelain, is sealed hermetically by the oxy-hydrogen jet. It is, after cooling, completely cleaned and weighed, and its neck is then broken under water or mercury. The flask is then weighed again with the water or mercury which had entered. If a portion of air remains unexpelled, this will displace just its own volume at that temperature, and will require more water or mercury to be added, and a second weighing to determine this value. The empty flask is then dried and weighed. From the several weights obtained are calculated the capacity of the globe, the volume of air not expelled by the iodine vapor, and the excess of the weight of the flask and iodine vapor over the empty globe. Each experiment requires the following observations: (1) temperature of the balance $= t^\circ$; (2) the atmospheric pressure $= h$ mm.; (3) excess of weight of globe filled with iodine vapor, after sealing, over globe filled with air $= i$ grm.; (4) capacity of globe $= v$ c. c.; (5) residual air $= a$ c. c. To calculate the temperature at which the globe was sealed—*i. e.* the temperature sought—we must know (6) weight of 1 c. c. of air at 760 mm. pressure $= 0.001293$ grm.; (7) density of iodine vapor (air $= 1$) $= 8.716$; (8) coefficient of expansion of air for 1° C. $= 0.00366$; (9) coefficient of cubic expansion of Bayeux porcelain for 1° C. $= 0.0000108$. The temperature T may now be calculated thus: Let $I_w \left(= \frac{v - a.001293}{1 + .00366t} \cdot \frac{h}{760} + i\right)$ be the total weight of iodine vapor contained in the flask at the moment of sealing; then $\frac{I_w}{0.001293 \times 8.716}$. $\frac{(1 + 0.00366\,T)\,760}{h} = I_v$ will be the volume of this vapor at the same moment; but $I_v + \frac{a(1 + 0.00366\,T}{1 + 0.00366t} \cdot \frac{760}{h} = v$ $(1 + 0.0000108\,T)$. T, the temperature sought, being the only unknown quantity in this equation, is soon found. By this pyrometric method Messrs. Deville and Troost determined the temperatures of fusion and density of vapors of sulphur, tellurium, cadmium, zinc, mercury; chloride, bromide, and iodide of aluminium, chloride of zirconium, phosphorus, etc. The apparatus is figured and the method in full detail given in their memoir in *Ann. de Ch. et Phys.* [3], lviii. pp. 257–299, 1860—a memoir of great interest.

Hydrogen and Mercury Pyrometers of Regnault (*Ann. de Ch. et Phys.* [iii.], lxiii. 40–45, 1861).—To determine quickly and with precision the temperatures of the porcelain furnaces at Sèvres, M. Victor Regnault, at that time the director of these works, devised his hydrogen pyrometer, which depends on the conversion of pure hydrogen into water, and from the weight of the water thus obtained calculating the space it filled at the temperature to be determined. The simplicity and accuracy of the method are worthy the genius of Regnault, and in striking contrast to the want of scientific accuracy in the Wedgwood pyrometer. An iron tube of one to two inches diameter crosses the furnace whose heat is to be measured. Its ends are sealed save by capillary openings connected by capillary iron tubes with 3-way stopcocks, by means of which a current of pure and dry hydrogen can be passed through the apparatus until all air is removed, and any oxide of iron in its path reduced. The hydrogen gas is then shut off, while the open end of the tube is connected with a copper tube containing cupric oxide, to be heated to redness by gas-jets. By means of an aspirator dry air is then forced through the tube, chasing all the hydrogen over the hot cupric oxide, where it is burned to water, which is collected in a tarred U-tube containing pumice soaked in sulphuric acid. From the increase of weight in this U-tube the weight and consequent volume of hydrogen which filled the tube at the unknown temperature, T, is known, and from these data the value of T is easily obtained. This method is of course limited to temperatures at which wrought iron maintains its form unchanged.

The mercurial pyrometer of Regnault is a vessel shaped like a bottle of cast iron, of from half to one litre capacity, in which is placed a sufficient quantity of mercury—15 to 20 grammes—to expel all the air from the iron vessel. The temperature of the space is determined by weighing the residual mercury found in the vase after it is cooled. A simple ball-valve affords a sufficient stopper to shut out the dust and currents of the furnace. The constants of temperature and pressure-weight of 1 c. c. of mercury vapor at temperatures already known, the coefficient of expansion of the substance of the bottle and its capacity in c. c. at 0° C., being the needful elements of the calculation. This method of pyrometry is more simple than that by iodine, already described, but both fail to meet the case of the highest temperature of furnaces in which iron melts, and even the most refractory porcelain softens. Hence the necessity for a method which shall meet the conditions of very high temperatures, and this has been supplied by *Siemens' resistance thermometer.* This instrument depends on the circumstance that the electrical resistance of a metallic conductor conveying an electric current increases with an increase of temperature. The experimental data upon which this conclusion rests have been obtained, it is true, at comparatively low temperatures—0° to 350° C.—by observations of Matthiessen, Werner, Siemens, and others. But these have been lately extended by another set of experiments to 1000° C. by C. W. Siemens. In measuring furnace temperatures the platinum wire constituting the pyrometer is wound upon a small cylinder of porcelain contained in a closed tube of iron or platinum, which is exposed to the heat to be measured. If the heat does not exceed a full red heat—or, say, 1000° C.—the protected wire may be left permanently in the stove or furnace whose temperature has to be recorded from time to time; but for temperatures above 1000° C. the tube is exposed during a measured interval of, say, three minutes to the heat, sufficient for the protecting casing and wire to acquire in a given time the temperature to be measured, but not sufficient to soften the porcelain cylinder upon which the wire is wound. In this way heats exceeding the welding-point of iron and approaching the melting-point of platinum can be measured by the same instrument, by which slight variations at ordinary temperatures are told. A thermometric scale is thus obtained embracing without a break the entire range of temperature from the lowest to the highest. The usual methods of measuring electric currents in use by the system of Sir W. Thompson or Mr. Wheatstone are employed. But more recently Mr. Siemens has proposed a differential voltameter for the same purpose, the details of which are beyond our present limits. (For pyrometers to test petroleum, see PETROLEUM.) B. SILLIMAN.

Pyrometry. See PYROMETER.

Pyr'ope [Gr. πῦρ, "fire," and ὄψις, "appearance"], the precious garnet, a fine dark-red garnet, much used in jewelry, and incorrectly called hyacinth, ruby, and carbuncle. It comes from Ceylon, Germany, Scotland, etc.

Pyr'ophone [Gr. πῦρ, "fire," and φωνή, "sound"], or **Flame Organ,** the name given to a very curious musical instrument, first constructed by Kastner, in which the tones are produced by means of the flames of ordinary gas burning in tubes of different lengths. When the various jets of flame come together, as they do by touching a key, the sound ceases, and reappears on being separated by touching another key.

Pyroph'ori [Gr. πῦρ, "fire," and φέρειν, to "bear"], a term applied generally to some substances which kindle spontaneously and enter into combustion when exposed to the air, the term being confined, however, to *solid* substances, and not applied to spontaneously inflammable liquids. *Carbon, phosphorus,* and many easily-oxidable *metals* may be made pyrophoric by preparation in a state of extreme division. "Homberg's pyrophorus" is formed by mixing intimately *alum* and *sugar,* drying and charring first in an open pan, then igniting in a closed vessel. In this case the active ingredient is supposed to be *sulphide of potassium* in fine division. *Phosphorus,* when left by evaporation of its solutions in very volatile liquids, like bisulphide of carbon, is pyrophoric. *Iron* may be obtained in pyrophoric form by many methods, even by simple reduction of the oxide with hydrogen gas at a minimum temperature. A *lead* pyrophorus is obtained by charring dry tartrate of lead in a close tube. If, after cooling, the tube be crushed, a beautiful *shower of fire,* metallic lead and carbon in combustion, makes its appearance. The present writer has observed that some common *lignites,* very finely pulverized and thoroughly dried by heat, are pyrophoric when warm. Numerous other cases are described in chemical works. H. WURTZ.

Pyrophorus. See PYROPHORI.

Pyrophosphates. See PHOSPHATES.

Pyrophosphoric Acid. See PHOSPHORIC ACIDS.

Pyro'sis [from πύρωσις, a "burning"]. This name is applied to an affection of the stomach characterized by the regurgitation of a considerable quantity of liquid when the stomach is empty of food. The liquid expelled may be insipid to the taste or saltish, and it is sometimes acid. It is not vomited, but regurgitated, and the regurgitation is not accompanied by the sense of nausea which usually attends acts of vomiting. The popular name for the affection is water-brash. The regurgitation takes place especially in the morning, before food has been taken. A sensation of burning is generally felt in the region of the stomach, and frequently in the throat during and after the passage of the liquid. This burning sensation is implied in the name *pyrosis.* The regurgitations in pyrosis are to be distinguished from those which are incident to indigestion. The latter consist of food or drink which has been taken into the stomach, and which excites irritation in consequence of the chemical changes arising from defective digestion; whereas the liquid regurgitated in pyrosis is the morbid product of secretion from the glands of the stomach. Pyrosis may be associated with indigestion or dyspepsia, but not infrequently the digestive processes are but little or not at all disturbed. The affection occurs oftener in women than in men. It is an affection of middle or advanced life, being of extreme infrequency in young persons. It is of more frequent occurrence in some countries than in others. It is said to be a frequent malady in Scotland and Ireland. It has been attributed to the use of oat-meal largely as an article of diet. Persons living on a poor, insufficient diet are more likely to suffer from it than those who live well or generously. It is not a grave affection, nor does it denote a tendency to any important disease in the stomach or elsewhere. It is generally controlled very speedily by the carbonate or subnitrate of bismuth in doses of from 20 to 30 grains, given twice or thrice daily. The treatment, in other respects, embraces the use of tonic remedies, nutritious alimentation, and hygienic influences to invigorate the system. A. FLINT.

Pyroso'ma [Gr. πῦρ, "fire," and σῶμα, "body"], a genus of tunicates of the family Pyrosomidæ, remarkable for the intense light they emit by night. Each Pyrosoma is a compound mass of innumerable molluscoids. In the Mediterranean they often clog the fishermen's nets by their great numbers, and Humboldt says that they sometimes so illuminate the sea as to render fishes visible.

Pyrotech'ny, the art of making fireworks of different colors for the purpose of amusement or for signals at night, either on land or sea. The powder for fireworks is compounded upon the same principle as gunpowder—*i. e.* at least one of the ingredients contains much oxygen in combination, while the others are readily combustible, or when heated impart some characteristic color to the flame. The principal ingredients of all the fires are potassic chlorate, nitre or some nitrate, and sulphur, with which gunpowder is sometimes mixed. To obtain various colors the following are generally used: *Violet,* potassium salts, chlorate and carbonate mixed; *blue,* potassa salts, with ammonio-copper sulphate and antimony sulphide or copper carbonate and alum; *greenish blue,* zinc-filings, copper sulphate, with sal ammoniac; *green,* barium carbonate or nitrate, verdigris, with copper sulphate and sal ammoniac or boracic acid; *yellow,* sodium salts, resin, or amber; *orange,* lime salts, usually the carbonate; *red,* strontia nitrate or carbonate, or a mixture of lampblack and gunpowder; *rose-red or pink,* potassic chlorate and chalk, or other mixtures of potassium and calcium salts, or lampblack, gunpowder, sulphur, and nitre, or lycopodium. For *white* fire, nitre and sulphur; gunpowder is sometimes mixed with them. Iron-filings are frequently introduced into the mixtures to cause brilliant scintillations; long filings or those made with a coarse file are preferred. The famous Bengal lights are made with nitre, 7 parts; sulphur, 2; antimony sulphide, 1. Rocket and Roman-candle stars are compressed portions of the powder. They usually contain the same constituents as ordinary gunpowder, the proportion of charcoal being somewhat reduced; steel-filings are sometimes added. Camphor, gum benzoin, and storax are frequently mixed with the powders to give an aromatic odor and mask the unpleasant odors arising from the firing of the mixtures without such addition. (Ure's *Dictionary of Arts,* etc., vol. i. p. 727, and vol. ii. p. 531, articles "Fireworks," "Pyrotechny Fires;" Richardson and Watts, *Chem. Technology,* i. [4], 551, 611; Websky, *Lustfeuerwerkkunst* (6te Auf., Breslau, 1858).) E. WALLER.

Pyroxene. See AUGITE.

Pyroxylic Spirit. See METHYL ALCOHOL, by PROF. C. F. CHANDLER, PH. D., M. D., LL.D., M. N. A. S.

Pyrox'yline [Gr. πῦρ, "fire," and ξύλον, "wood"], the technical name for gun-cotton. (See EXPLOSIVES.) It is manufactured by steeping dry and clean cotton in a mixture of 3 parts nitric acid to 5 of sulphuric acid. The cotton is withdrawn after twenty minutes, and washed with water containing a little ammonia, then dried with great caution at a temperature not exceeding 200° F. It is extremely combustible, inflaming at a temperature of 277° F., and has an explosive force nearly four times greater than gunpowder. A solution of pyroxyline in a mixture of alcohol and ether forms COLLODION (which see), a substance largely used in photography. The chemical formula of the most explosive kind of pyroxyline is $C_{36}O_{30}H_{21}.+9NO_4$.

Pyrrha. See DEUCALION.

Pyr'rhic Dance, a famous Dorian war-dance among the ancient Greeks, represented in the non-Doric Greek states by a minuet—*i. e.* dance of the same name. The Pyrrhic dance was also very popular at Rome. It was a lively dance, accompanied by flutes and enlivened by gymnastic feats and the tricks of tumblers.

Pyr'rho, a native of Elis; was first a painter, but afterward studied philosophy, attracted by the writings of Democritus, and followed his teacher, Anaxarchus, in the expeditions of Alexander the Great, which brought him into connection with the Magians and the Indian gymnosophists. On his return he was elected high priest by the Eleans, and gathered a great number of disciples around him, but his teaching was oral only, and of his system we know nothing except that it was one of the earliest forms of skepticism. His most celebrated pupil was Timon of Phlius; he left written works, but they have perished.

Pyr'rhus, king of Epirus, b. about 318 B. C., a son of Æacides, who claimed to descend from Pyrrhus, the son of Achilles, and was a brother of Olympias, the mother of Alexander the Great. This latter relationship implicated Epirus in the Macedonian embroilments after the death of Alexander, and the Epirotes, disgusted at these disturbances, dethroned Æacides and expelled his family from the country. Pyrrhus, at that time only two years old, was brought to Glaucias, king of the Taulantians, who educated him well, and placed him on the throne of Epirus when he was about twelve years old. Once more, however, he was expelled from his native country, and he now joined his brother-in-law, Demetrius Poliorcetes, married to his sister, Deïdamia; by his side he distinguished himself so greatly in the battle of Ipsus (301) that his name became celebrated throughout the whole Grecian world. Nevertheless, the battle was lost, and he repaired to Egypt as a hostage for Demetrius. Here he married Antigone, the step-daughter of Ptolemy, and by his aid he returned to Epirus in 295 and established himself firmly on the throne of his ancestors. He immediately embarked in wars with Macedonia, with Greece, etc., achieved many brilliant successes, and was at one time even acknowledged king of Macedonia; but the permanent result of all his exertions was nevertheless very far from satisfying his ambition. Like all great military commanders of that age, he dreamt of playing over again the rôle of Alexander the Great and establishing a world-empire; and of the many competitors for this honor he seemed to be the one best fitted for the task. Besides his military genius, there was something in his personal character which reminded all of his great cousin. He had the same talent for discipline, the same power of concentrating the enthusiasm of the soldiery on his own person, a similar imperiousness and audacity, connected with lofty magnanimity, splendid liberality, and a most impressive personal appearance. Thus, when in 281 an embassy from Tarentum invited him to come to Italy to defend the Greek cities against the Romans, a brilliant prospect at once unfolded itself to his eyes—the conquest of Italy, Sicily, Africa—the world, and he embraced the opportunity with passionate eagerness. But this Western theatre was very different from that Eastern one on which Alexander had performed his exploits. Here was no colossal empire liable to tumble down from one or two well-directed blows, but three distinct powers, of which none could be conquered except by an alliance with the two others. This situation Pyrrhus misunderstood, and his expedition, although of such vast importance in the history of the world, brought to himself nothing but disappointment and failure. The Greek cities in Magna Græcia and Sicily formed no confederacy. Each community was a state by itself, jealously watching and rivalling its neighbors. Great wealth had been accumulated in these cities by the energy, versatility, and shrewdness characteristic of the Greeks; and it was freely enjoyed. The inhabitants, although very refined and still capable of brilliant heroism under some sudden emergency, were luxurious, licentious, and destitute of any kind of discipline. On his arrival at Tarentum, Pyrrhus had to employ force in order to compel the young men to serve in the army, and the order and discipline he introduced soon made him so hated among

the Greeks that they became his worst foes. The Romans formed a state of the most solid and compact organization. They could be defeated by the higher military art of Alexander the Great and the new weapon, the elephant, hitherto entirely unknown to them, but they could hardly be subdued. After the victories at Siris (280) and Asculum (279), Pyrrhus felt this. He determined to direct himself against the Carthaginians; crossed over to Sicily, and opened negotiations with Rome. But Carthage, too, was a well-organized state; she had immense resources, and she spent them on no dreams of a world-empire, but on simple, plain commercial purposes. When the brilliant progress of Pyrrhus threatened to drive her out of Sicily, she gathered her whole strength and took a firm stand at Lilybæum. Hardly was the check felt before all the Greek towns of Sicily which Pyrrhus had conquered or liberated rose in revolt in the rear of his army. Disgusted, he determined to return to Italy, and, the negotiations with the Romans having failed, he now opened negotiations with the Carthaginians. These too failed. Just after crossing the sound between Sicily and Italy in 276, his fleet was attacked and defeated by the Carthaginians, and in the following year his army was completely routed at Beneventum (275) by Curius Dentatus. His return to Epirus took place soon after, but it looked very much like a flight. Restless as he had become, he immediately plunged himself into wars with Macedonia and Greece—wars which led, and could lead, to nothing; but in 272 he was killed in the streets of Argos during a riot. CLEMENS PETERSEN.

Pyrus. See APPLE, ASH, and PEAR.

Pythag'oras, a Greek philosopher, supposed to have been b. at Samos about 582 B. C.; to have been the son of Mnesarchus; his earliest teacher to have been Pherecydes the Syrian, from whom he may have received Egyptian and Zoroastrian lore; his next teacher to have been Anaximander, who taught that the principle (ἀρχή) of things is the unlimited or indefinite (ἄπειρον); in early life to have travelled through Ionia, Phœnicia, and Egypt, where he was initiated into the mysteries by the priests. Some would have it that he was even carried away to Babylon, with other Egyptian prisoners, by Cambyses, who made his raid on Egypt in the year 525 B. C., but the weight of authority favors the view that he repaired to Crotona in Lower Italy, 529 B. C., and there established a society with ethical, political, and philosophic tendencies. His school was allied with the aristocratic party, and consequently incurred the animosity of the democratic party. This occasioned (about 510 B. C.) the retirement of Pythagoras to Metapontum, where he died soon after. His school spread rapidly, and, after the manner of Oriental systems, was semi-ethical and religious, semi-political and social, tending to produce a fusion of state and hierarchy. It has bequeathed to us a multitude of philosophemes on mathematics, music, and astronomy, as well as on ethics. The doctrines of metempsychosis, of the cyclic return of events, of contraries (ἐναντία)—according to which he added to the principle of his master, Anaximander (which was "the unlimited"), its opposite (περαίνοντα)—indicate Persian or Egyptian influence. This Oriental tendency may have had another origin than those named (his teachers or his travels), so far as the writings of his school are concerned (for no writing of the master has come down to us), in the Crotonian school of medicine, of whom Democedes, the celebrated physician, had resided at the Persian court under Darius. What belongs to the disciples and what to the master cannot be told. Pythagoras is said to have anticipated the Copernican doctrine, making the sun the centre of the cosmos; also to have discovered the numerical ratio existing between musical tones of the gamut (either by length of strings or by their degrees of tension). He laid the greatest stress on the discipline of the will into obedience, temperance, silence, self-examination, simplicity in personal attire, and self-restraint in all its forms. The original sources of information regarding him are Aristotle (*Met.*, i. 5; *Phys.*, iii. 4; *De Cœlo*, ii. 13 and 9; *Eth. Nic.*, v. 8), the writings of Aristotelian commentators, Herodotus (ii. 81; iv. 94–96, etc.), and the (mostly spurious) writings of his disciples, Philolaus, Ocellus Lucanus, Timæus Locrus, Archytes of Tarentum, Epicharmus, and the Neo-Platonists Iamblichus and Porphyry; Diodorus Siculus and Diogenes Laertius are to be added to this list.

WILLIAM T. HARRIS.

Pyth'eas, a native of Massilia, who in the time of Alexander the Great made two voyages of discovery along the western and north-western coasts of Europe, which he described in two works written in Greek, Περὶ τοῦ Ὠκεανοῦ and Περίπλους. Of these, only a few fragments have come down to us, preserved by other authors in the form of quotations. They were collected and published by Arvedson (Upsala, 1824). By many ancient authors, as Polybius and Strabo, the statements which Pytheas made were considered as fables, or even lies, but in the light of modern science most of them have proved true and very interesting. The most remarkable particulars of Pytheas's statements, as far as they have come down to us, refer to a land which he calls *Thule*, situated at a distance of six days' sail to the N. of Britain. Here, he says, the day and the night were each six months long—a phenomenon which the Greeks had heard of before—but he adds that in those regions there was neither earth, sea, nor air, but a sort of mixture of all these, like to the Mollusca, and that earth and sea were suspended in this mass, which was impenetrable to travellers; he affirms that he has seen this with his own eyes. What country he meant for Thule, whether Iceland or some part of the Scandinavian peninsula, is uncertain; nor is it easy to give his description any striking correspondence to reality. What he tells of the Guttones, on the contrary, bordering on Germany and dwelling along a gulf of the sea called Mentonomon, and of the island Abalus, whither amber was brought every spring by the waves, and used by the inhabitants as firewood or sold to the neighboring Teutoni, seems to be based on something actually seen and experienced. (See Bougainville, *Sur l'Origine et sur les Voyages de Pythéas*, in *Mémoires de l'Académie des Inscriptions*, vol. xix.; Ukert, *Bemerkungen über Pytheas*, in his *Geographie der Griechen und Römer;* and Straszewick, *Pythéas de Marseille et la Géographie de son Temps* (Paris, 1836).)

Pyth'ian Games, or **Pythia** [Gr. πύθια], one of the great national contests of the Greeks. (See GRECIAN GAMES.)

Pythias. See DAMON AND PYTHIAS.

Python. See BOA.

Pyx [Gr. πυξίς, "a box of boxwood"], a sacred vessel, having usually the form of a covered cup with a foot, used in the Roman Catholic Church to contain the sacred wafer when preserved after consecration.

Also the strong box used in the mint for the safe keeping of coins set apart from each successive coinage to be examined by a commission of experts for the purpose of testing their accuracy as to weight and fineness. The examination of these reserved coins is called the "trial of the pyx," and in Great Britain, by the latest coinage act, passed in 1870, it is provided that this trial shall take place "at least once in every year in which coins have been issued from the mint." The act requires a jury to be summoned by the queen, with the advice of her privy council, to consist of "not less than six out of the competent freemen of the mystery of goldsmiths of the city of London, or other competent persons." The jury must attend at the trial, "with the proper officers of the treasury, the board of trade, and the mint." Before the trial the jury are sworn. The reserved coins are then delivered to them, and tested by weighing and by assay; after which a verdict is drawn up in writing. Should the coins have been found accurate in weight and fineness within the limits allowed by law, commonly called *tolerance* or *remedy*, no further proceedings are taken; but in case the coinage in either or both these respects be found inexact, the officers of the mint are liable to censure or more serious penalties.

In the U. S. it is provided that a trial of the pyx shall be made at the mint in Philadelphia on the second Wednesday in February, annually. This takes place before the judge of the district court of the U. S. for the eastern district of Pennsylvania, the comptroller of the currency, the assayer of the New York assay-office, and such other persons as the President shall from time to time designate for the purpose. A majority of the commissioners constitute a competent board. Their examination is to be made in the presence of the director of the mint. The number of coins reserved for the assay from each delivery made by the chief coiner is prescribed by the director; and the reserved pieces, after being carefully sealed up and labelled, are deposited in the pyx provided for the purpose, which is kept under the joint care of the superintendent of the mint and the assayer, each of these officers securing it by an independent lock. The reserved coins from the coinage of other mints besides that at Philadelphia are transmitted quarterly to the Philadelphia mint; and in addition to these the director may at pleasure take any other pieces as tests. The commissioners are not put under oath, but after the examination they prepare a certified report of the result, which, if the coins are within the limits of tolerance in fineness and weight, is satisfactory, and is simply filed; but if deviation in either or both respects is discovered exceeding the limits of tolerance, the fact is to be certified to the President of the U. S., and "if, on a view of the circumstances of the case, he shall so decide, the officer or officers implicated in the error are thenceforward disqualified from holding their respective offices." F. A. P. BARNARD.

Q.

Q, a mute, in most languages is followed by *u*, which is often silent, as in Spanish and French. In Latin, Italian, and English *qu* has exactly the power of *ku* or *kw*. *Q.* is the abbreviation for *Question, Queen,* and *Quintus,* the proper name, and *q.* for *quart*.

Qua-Bird, or **Quawk.** See NIGHT-HERON.

Quack'enbos (GEORGE PAYNE), LL.D., b. in New York City Sept. 4, 1826; graduated at Columbia College 1843; taught school in North Carolina; studied law in New York; established there a private school 1847; edited the *Literary American* (1848–50); contributed to literary periodicals; edited Spier and Surenne's *French Dictionary,* and prepared numerous school-books, the most important being manuals of grammar, composition, rhetoric, and history. In 1876 he issued a popular *History of the United States.*

Qua'co (P. O. ST. MARTIN'S), thriving v., St. John co., N. B., on the Bay of Fundy, 30 miles E. by N. of St. John. It has important shipbuilding, and has some handsome buildings. At Quaco Head there is a lighthouse with a white revolving light. P. about 1000.

Qua'di, an ancient people of what is now Austro-Hungary. They were intimately associated with the Marcomanni, and were long among the most formidable enemies of Rome in this quarter. Tacitus supposed them to be Germans, but it is probable that they were either Slavic or Celtic. We read, in later times, of Quadi in Spain, where they were associated with the Suevi.

Quadrages'ima [Lat., "fortieth"], a fast called Lent, preceding Easter. Originally it was a fast of 40 hours only. In the beginning of the seventh century it had been extended to 36 days, and was afterward extended to 40, but whether by Gregory I. (d. 604) or Gregory II. (d. 731) writers are not agreed. The name is also applied to the first Sunday in Lent. R. D. HITCHCOCK.

Quad'rant [Lat. *quadrans,* the "fourth part"], in its common signification, a quarter of the circumference of a circle, or ninety degrees. In navigation and astronomy, an instrument for measuring angles, having a limb divided to ninety degrees. Astronomical quadrants of large dimensions were employed by the early observers for measuring meridian altitudes, being for this purpose firmly fixed in the plane of the meridian, in the manner since employed for securing the mural circles which have superseded them. The quadrant has the advantage over the circle in the respect that, within the same general dimensions, it may have a much larger radius, and therefore more ample divisions; but this advantage is greatly overbalanced by the inevitable errors of centering—errors which in the complete circle are compensated by the readings at the opposite extremities of the same diameter. It has on this account chiefly been disused in astronomical observations. The nautical quadrant, commonly called Hadley's quadrant, is an instrument in which, by an ingenious use of the principle of reflection, angular measurements of great accuracy are made practicable, notwithstanding that the observer and the instrument are both in motion. The limb is an octant rather than a quadrant, but each half degree of the division corresponds to an entire degree in the measurement, and the numbering on the limb accords with the real measurement. The sextant, which measures angles to 120° on a limb which is actually one-sixth part of a circumference (60°), has to a large extent taken the place of the quadrant for nautical purposes. The reflecting circle, an instrument of still higher accuracy, involving the same principles, is frequently employed in geodesy and astronomy. (For the construction of all these instruments see SEXTANT.) The invention of the quadrant is commonly ascribed to John Hadley, a friend of Newton, on the ground that the instrument was first described by him in a paper read before the Royal Society in 1731. But the invention was independently made in 1730 by Thomas Godfrey of Philadelphia, whose description was given to the same society in 1732; and the society decided the honor of the invention to belong equally to both. The real originator, however, of the ingenious idea on which the invention is founded was Sir Isaac Newton, who so early as 1727 communicated it to Halley, then astronomer-royal, in a paper which came to light only after the death of the latter in 1742. F. A. P. BARNARD.

Quadrat'ic Equation, an equation of the second degree, containing but one unknown quantity. Every quadratic equation may be reduced to the form

$$x^2 + 2px = q, \qquad (1)$$

in which p and q are known quantities; and when so reduced its two roots are

$$-p + \sqrt{q+p^2}, \text{ and } -p - \sqrt{q+p^2}. \qquad (2)$$

If $q < p^2$, the roots are both real; if q is negative, and numerically equal to p^2, the two roots are equal; if q is negative, and numerically greater than p^2, both roots are imaginary. If p is equal to 0, the equation is said to be incomplete, and its roots are then numerically equal with contrary signs; in this case the roots are real when q is positive, and imaginary when q is negative. The following properties are common to all quadratic equations, after being reduced to the form (1): (1) Every quadratic has two roots and only two. (2) If all the terms are transposed to one member, that member can be resolved into two factors of the first degree with respect to the unknown quantity, the first term of each factor being the unknown quantity, and the second terms being the two roots, each taken with a contrary sign. (3) The algebraic sum of the two roots is equal to the coefficient of the second term with its sign changed. (4) The product of the two roots is equal to the second member with its sign changed. (5) If the second term is negative, and numerically greater than the square of half the coefficient of the second term, both of the roots are imaginary.

A quadratic equation may be solved by the method of *completing the square,* or more expeditiously by the following rules: reduce the equation to the form (1); the *first root* is then equal to half the coefficient of the second term, taken with a contrary sign, *plus* the square root of the second member increased by the square of half the coefficient of the second term; the *second root* is equal to half the coefficient of the second term *minus* the square root of the second member increased by the square of half the coefficient of the second term. Many equations of a higher degree than the second may be reduced to the form of quadratics, and then solved. To this class belong all equations that can be reduced to the form

$$x^{2n} + 2px^n = q.$$

Such equations have $2n$ roots given by the expressions

$$x = \sqrt[n]{-p + \sqrt{q+p^2}} \text{ and } x = \sqrt[n]{-p - \sqrt{q+p^2}}.$$

W. G. PECK.

Quad'rature [Lat. *quadratura*], the operation of finding an expression for the area embraced within a curve and limited by the axis of abscissas and any two ordinates. The most expeditious method of finding an expression for an area of this kind is by means of the integral calculus. The formula for a plane area limited by a curve, the axis of x, and any two ordinates, is,

$$A = \int y\,dx. \qquad (1)$$

In applying this formula to any particular case, we first find the value of y in terms of x from the rectangular equation of the given curve, and substitute this value for y in equation (1); we then perform the indicated integration between proper limits. For example, let it be required to find an expression for the area of a common parabola whose equation is

$$y^2 = 2px, \text{ or } y = \sqrt{2p} \times x^{\frac{1}{2}};$$

This value in (1) gives—

$$A = \int \sqrt{2p} \times x^{\frac{1}{2}} dx = \frac{2\sqrt{2p}}{3} x^{\frac{3}{2}} + c,$$

or, by reduction,

$$A = \tfrac{2}{3} x\sqrt{2px} + c = \tfrac{2}{3} xy + c.$$

If we suppose the area to be estimated from the vertex of the curve, the value of c will reduce to 0, and we shall have—

$$A' = \tfrac{2}{3} xy; \qquad (2)$$

that is, the area is equal to two-thirds of the circumscribing rectangle. If we wish the area to terminate at the ordinate through the focus, we have $x = \frac{1}{2}p$ and $y = p$, which in (2) gives—

$$A'' = \tfrac{1}{3}p^2.$$

This is the area of the upper half of the parabolic segment; doubling it, we have for the entire area of the segment—

$$A'' = \tfrac{2}{3}p^2 = \tfrac{1}{6}(2p)^2;$$

that is, the area of the segment cut off by the double ordinate through the focus is one-sixth of the square described on the parameter of the curve.

The *method of quadratures* used by the ancients consists in drawing ordinates of the bounding curve at equal distances, and then uniting the extremities of these ordinates by lines, thus forming an inscribed polygon made up of trapezoids; by taking the sum of these trapezoids as the true area of the curve, they found an approximate result, which they caused to approach the true area by diminishing the distance between the consecutive ordinates. In many cases it is found that the areas of the trapezoid form a series whose law can be determined; and in those cases the area can be found by the known method of summing the series. A modification of the method just explained is often used by practical men. The distance between the extreme ordinates is divided into an *even* number of equal parts, and ordinates drawn through the points of division. The area is then found by the following rule: Add together the extreme ordinates, four times the sum of the even ordinates, and twice the sum of the odd ordinates; then multiply the result by one-third of the distance between any two consecutive ordinates. The nearer the ordinates are taken to each other, the more accurate will be the result. (For a demonstration of the preceding rule, as well as for an example of using it, the reader is referred to Bartlett's *Synthetic Mechanics*, pp. 52–54.) W. G. PECK.

Quadrature of the Cir′cle. The problem of the quadrature of the circle consists in the construction of a square equal to the surface of a given circle, or, what leads to the same result, a finite expression for the ratio between the diameter and circumference. One of the principal objects of mathematical science is the study of ratios, but in most cases the quantities compared have no common measure, and therefore their ratios cannot be expressed in finite numbers. Arithmetic gives numerous examples of the latter case in the so-called irrational quantities ($\sqrt{2}$, $\sqrt{7}$, $\sqrt[3]{4}$, etc.), which are all incommensurable with whole numbers or finite fractions. Geometry gives illustrations in the sides and the diagonal of the square, in the diameter and circumference of the circle, etc. The reason that the latter ratio is especially remarkable is its practical importance, causing many minds to occupy themselves with the same from time immemorial; and while the most eminent mathematicians have long ago solved the problem and demonstrated the nature of the ratio, persons utterly deficient in mathematical training labor even at the present day under the illusion that it is still unsolved.

The credit of having proved the peculiar nature of the ratio in question belongs to J. Bernouilli, who, while investigating the logarithms of the so-called imaginary quantities, found the following expression, in which, as customary, the Greek letter π stands for the value of the circumference, the diameter being $= 1$:

$$\frac{1}{2}\pi = \frac{\log\sqrt{-1}}{\sqrt{-1}}.$$

Wronski, in his *Introduction à la Philosophie des Mathématiques* (p. 26), remarks that in order to obtain an expression which will reveal the nature of a quantity, we must use only primitive functions; and as the expression of Bernouilli contains logarithms, which are derivative functions, he transforms it thus:

$$\frac{1}{2}\pi = \frac{\infty}{\sqrt{-1}}\left\{(1+\sqrt{-1})^{\frac{1}{\infty}} - (1-\sqrt{-1})^{\frac{1}{\infty}}\right\},$$

in which only primitive functions appear, and which, therefore, at the same time reveals the nature of the number π; for, since the equation is neither of the second, third, fourth, nor any definite degree, but is of an infinite order, the expression demonstrates that there can exist no finite algebraic formula, nor any geometrical construction, solving the problem, and that all that is possible in this respect are approximations. These have been accomplished in various ways with an accuracy far surpassing any other calculation ever performed in the whole field of mathematical science. The first approximation was made 480 years before our era, as Plutarch informs us, by Anaxagoras, highly praised by Plato as a great mathematician. That, however, at early periods, ignorant persons already meddled with this problem is shown by Aristophanes, who ridicules them in one of his plays. Eutocius (*Comm. in Librum de Dim. Circuli*) gives the details of the most ancient labor in this field of which we have any knowledge; it is that of Archimedes, who 220 years before our era calculated the peripheries of the inscribed and circumscribed polygons of 96 sides, and deduced from this that for the diameter 1 the circumference must be between $3\frac{10}{70}$ and $3\frac{10}{71}$; whence he concluded that the ratio 7 : 22 exceeds the truth only to a small extent. Apollonius (200 B. C.) and Philon of Gadara found other approximate ratios correct to within $\frac{1}{10000}$th part of the diameter; and then the investigation rested until the revival of mathematical sciences in the middle of the fifteenth century. The most remarkable approximation obtained in the sixteenth century was that of Peter Metrus in Holland, who by means of polygons of 1536 sides came to the ratio 113 : 355, which is correct to within $\frac{3}{10000000}$ths part of the diameter. Vieta, a French mathematician, carried the approximation even farther, but was in his turn eclipsed by Romanus, another mathematician of Holland, who calculated the peripheries of the inscribed and circumscribed polygons of 1,073,741,324 sides, and expressed the relation in numbers of 16 figures, until finally Ludolf van Keulen in 1590 demonstrated that if the diameter is expressed by 1, followed by 35 ciphers, the circumference is between the number 314,159,265,358,974,323,846,264,338,327,950,288 and the same number plus 1. This is the so-called Ludolphean number, and is engraved on the tombstone of Van Keulen in Leyden, Holland. It is so near the truth that if we make a circle of which the radius is equal to the distance of the nearest fixed star, it enables us to calculate the circumference correctly to within a space less than the thickness of a hair.

Various methods to facilitate these calculations were afterward given by Wallis in his *Algebra*, charta 86, and Nicole in the *Mémoires de l'Académie*, 1747. Snellius found other shorter and easier methods than the use of polygons, so as to obtain even closer approximations; his theorems were demonstrated by Huyghens, and led to a ratio expressed by 55 figures; while by a further investigation the latter found methods allowing an accuracy far surpassing all previous attempts. But this was again eclipsed by Lagny, a French mathematician, who in 1719 calculated this number to 121 decimal figures, while in the Radcliffe Library, at Oxford, the number of 155 decimals was found, for a long time supposed to be the most extreme approximation which would ever be attempted. However, in recent times the subject was taken up again, and Dr. Rutherford of Woolwich presented to the Royal Society a calculation of 200 figures. Dr. Clausen of Dorpat calculated 250 decimals, and proved that all the figures added by Dr. Rutherford to those of Lagny were erroneous; then Mr. Shanks of Durham extended them to 315 decimals, and Dr. Rutherford to 350; then a jealousy appears to have instigated Mr. Shanks, who continued the calculation to 527 decimals. Dr. Rutherford reviewed them, found them correct to 411 decimals, and then gave it up. Not so Mr. Shanks, however, who continued the calculation to 607 decimals, and published the results obtained in the *Contributions to Mathematics* (London, 1853). His decimals are the following:

π = 3.14159	26535	89793	23846	26433
83279	50288	41971	69399	37510
58209	74944	59230	78164	06286
20899	86280	34825	34211	70679
82148	08651	32823	06647	09384
46095	50582	23172	53594	08128
48111	74502	84102	70193	85211
05559	64462	29489	54930	38196
44288	10975	66593	34461	28475
64823	37867	83165	27120	19091
45648	56692	34603	48610	49432
66482	13393	60726	02491	41273
72458	70066	06315	58817	48815
20920	96282	92540	91715	36436
78925	90360	01133	05305	48820
46652	13841	46951	94151	16094
33057	27036	57595	91953	09218
61173	81932	61179	31051	18548
07446	23798	34749	56735	18857
52724	89122	79381	83011	94912
98336	73362	44193	66430	86021
39501	60924	48077	23094	36285
53096	62027	55693	97986	95022
24749	96206	07497	03041	23669
29133	32 +, etc.			

The limits of this approximation are so excessive as far to surpass the ratio of the distance of the farthest star seen with the most powerful telescope to the dimensions of the smallest object visible under the microscope.

We have no room for the many expressions for the ratio. They are of two kinds—infinite series and continued fractions. Among the first we notice that of Leibnitz:

$$\pi = 4\left(1 - \tfrac{1}{3} + \tfrac{1}{5} - \tfrac{1}{7} + \tfrac{1}{9} - \tfrac{1}{11} + \tfrac{1}{13} -, \text{etc.}\right)$$

That of Wallis:

$$\tfrac{1}{2}\pi = \frac{2,\ 2,\ 4,\ 4,\ 6,\ 6,\ 8,\ 8,\ 10,\ 10,\ \text{etc.}}{1,\ 3,\ 3,\ 5,\ 5,\ 7,\ 7,\ 9,\ 9,\ 11,\ \text{etc.}}$$

De Montferrier gives this expression:

$$\tfrac{1}{2}\pi = 1 + \frac{1}{2.3} + \frac{3}{2\times4\times5} + \frac{3\times5}{2\times4\times6\times7} + \frac{3\times5\times7}{2\times4\times6\times2\times9}, \text{ etc.}$$

Also—

$$\tfrac{1}{6}\pi = \tfrac{1}{2} + \frac{1\times1}{2\times3\times2^3} + \frac{1\times3\times1}{2\times4\times5\times2^5} + \frac{1\times3\times5\times1}{2\times4\times6\times7\times2^7} +, \text{ etc.}$$

The latter series converges so rapidly that by taking only ten terms we obtain the value of π correct to within eight decimal places.

The continued fractions expressing the ratio in question are quite remarkable in their nature. Breunker gives the following:

$$\tfrac{1}{2}\pi = \cfrac{1}{1 + \cfrac{1}{2 + \cfrac{9}{2 + \cfrac{25}{2 + \cfrac{49}{2 + \cfrac{81}{2 +, \text{ etc.}}}}}}}$$

De Montferrier found this:

$$\tfrac{1}{4}\pi = \cfrac{1}{1 + \cfrac{\frac{1}{1\cdot3}}{1 + \cfrac{\frac{4}{3\cdot5}}{1 + \cfrac{\frac{9}{5\cdot7}}{1 + \cfrac{\frac{16}{7\cdot9}}{1 +, \text{ etc.};}}}}}$$

which may be transformed and made more convergent thus:

$$\tfrac{1}{4}\pi = \cfrac{1}{1 + \cfrac{1}{3 + \cfrac{4}{5 + \cfrac{9}{7 + \cfrac{16}{9 + \cfrac{25}{11 +, \text{ etc.}}}}}}}$$

The latter fraction is so convergent that by only taking, for instance, eight terms, we obtain a number correct to within $\frac{1}{100000000}$th part of the diameter.

A remarkable peculiarity of these fractions is that, unlike the continued fractions expressing irrational quantities, there is no periodicity in them; but it is evident that this cannot be the case, while then they would be reducible to irrational expressions, which is proved to be contrary to the nature of the number π. It is by the latter means, the reduction of series and continued fractions, that modern mathematicians have obtained the high degree of accuracy described; while the principal stimulus which induced these exaggerated calculations has been the desire to prove the fallacy of the calculations of the ignorant circle-squarers, whose fruitless labors have been so extensive that a record of them would fill much more space than the labors of all the able mathematicians in the same field.

P. H. VANDER WEYDE.

Quadra'tus, a bishop of Athens, author of an *Apology* presented to the emperor Hadrian about 130 A. D. It is now no longer extant, though a manuscript copy of it was in existence in the seventh century. (See Eusebius, *Hist.*, iii. 37; iv. 3.) R. D. HITCHCOCK.

Quadrille' [Fr.], a dance originally performed by four couples or four persons; now essentially the same as the *cotillon*, which is a more antiquated style of the quadrille. —QUADRILLE in cards is a game nearly identical with the "ombre" described in Pope's *Rape of the Lock*. As a social game it is one of the very best.

Quadrivium, the four highest of the so-called "liberal arts." (See ARTS, DEGREES IN.)

Quadruma'na [Lat. *quatuor*, "four," and *manus*, "hand"], a name employed by Blumenbach (in 1791) as an ordinal designation for the monkeys, lemurs, and related types, man having been isolated as the representative of a peculiar order named Bimanus. The views thus expressed were for a long time predominant, but a closer study of the structure of the forms indicated by those names has convinced almost all living naturalists that they were erroneously separated, and the two types are now generally combined in one order named Primates, under which head man and the monkeys are combined together in one sub-order (Anthropoidea), and contrasted with the lemurs, which constitute another sub-order (Prosimiæ). (See PRIMATES.) THEODORE GILL.

Quadrum'ana, Fossil. Remains of Quadrumana or monkeys are rare in fossiliferous deposits, as might be expected from the habits of the animals. None of them are aquatic, and they do not usually frequent low and moist regions, but prefer the upland and rocky places. Most of the species are arboreal, and would thus escape destruction by floods that would overwhelm terrestrial and burrowing animals. Nevertheless, their remains have been found in both hemispheres, and in regions far beyond the tropical or sub-tropical zones to which existing species are now confined. The first quadrumanous fossils known were discovered in 1836 in the Pliocene (?) deposits of India, and the species were allied, more or less closely, to living monkeys, one of them closely resembling the orang. A full account of these discoveries, with illustrations, may be found in the *Fauna Antiqua Sivalensis*, Falconer and Cautley. Early in the following year M. Lartet announced to the French Academy the discovery of a fossil monkey in the Miocene lacustrine deposits of the S. of France. These remains are apparently allied to the gibbons. In Greece, near Athens, and at the base of Mount Pentelicus, famed in classical history for its marble, many bones of a fossil monkey have been found. These remains have been very ably discussed and figured by M. Gaudry, in his *Geology of Attica*. This genus, *Mesopithecus*, was regarded by Wagner as also related to the gibbons. From England two species of *Macacus* have been described by Prof. Owen, but their quadrumanous affinities have since been questioned by palæontologists. The bone-caves of Brazil have yielded several species closely allied to existing South American forms. Full descriptions of these species by M. Lund, their discoverer, were published in the *Memoirs* of the Royal Society of Denmark (1838 and 1839). The most interesting forms yet known are from the Eocene of Wyoming, where their remains occur in considerable abundance. The most common of these forms was named by Dr. Leidy *Hyopsodus*, under a misapprehension of its affinities. Later investigations upon more perfect specimens have shown that this animal was not an ungulate, but a monkey, allied, remotely, to living South American species, but possessing also many lemurine characters. The teeth of these Eocene forms are more numerous than in any other known Quadrumana. In *Limnotherium*, Marsh, the formula is, apparently, incisors $\frac{2-2}{2-2}$, canines $\frac{1-1}{1-1}$, premolars $\frac{4-4}{4-4}$, molars $\frac{3-3}{3-3}$—40 in all. In *Hyopsodus* the number seems to have been 42, while in *Lemuravus*, Marsh, there were 44 teeth, the so-called typical number in mammals. They were, moreover, in a continuous series, and the canines were small. The brain in these monkeys was small and nearly smooth, and the cerebellum mostly behind the cerebrum. The tail was elongated, and probably, in some genera at least, prehensile. The orbit was open behind, and the lachrymal foramen without the orbit, as in the lemurs. Besides the genera *Lemuravus* and *Limnotherium*, regarded as typical of two distinct families, several other genera are now referred to this order, as *Thinolestes*, *Telmatolestes*, *Notharctos*, *Hipposyus*, *Microsyops*, *Palæacodon*, *Mesacodon*, *Bathrodon*, and *Antiacodon*. The only known North American monkey of any later formation than that above mentioned is *Laopithecus robustus*, Marsh, from the Miocene Bad Lands of Nebraska. This animal was about the size of the coati, and the crowns of its molar teeth resembled those of some South American monkeys, or still more those of the Eocene Limnotheridæ. O. C. MARSH.

Quæs'tors [Lat. from *quæro*, to "inquire"], in ancient Rome were at first two inquisitors or state's attorneys (*quæstores parricidii*) who prosecuted those accused of capital crimes. They are not mentioned after 366 B. C. Their functions were transferred partly to the *triumviri capitales*, partly to the ædiles and *tribuni*. The *quæstores classici* were the officers commonly called quæstors. They

had charge of the treasury, the revenues, and the expenditure of moneys. There were originally two quæstors, afterward four, and still later, at times, even more. The first increase of the number of the quæstors took place in 422 B. C., when their number was doubled. The two new quæstors accompanied the consuls in their campaigns, and had at first only to superintend the sale of the booty, the produce of which was either divided among the legion or transferred to the *ærarium;* but subsequently they kept all the funds of the army, and became the paymasters. The number of these quæstors was increased by Sulla to twenty, and by Cæsar to forty. This increase was made necessary, partly at least, by the extension of the empire, but it had also a political reason, as the quæstors were entitled to take seats in the senate, and a law of 421 B. C. determined that at least one-half of the quæstors elected should be plebeians. The proconsuls and the prætors, who administered the provinces, were also accompanied by quæstors, whose office and duties corresponded exactly to those of a quæstor stationed with an army in the field. For Sicily two quæstors were appointed, corresponding to the old division of the island into a Carthaginian and a Greek portion. One of them resided at Lilybæum, the other at Syracuse.

Quagga. See ZEBRA.

Quahaug. See CLAM.

Quail. See ORTYGINÆ.

Quak'er Gap, tp., Stokes co., N. C. P. 1749.

Quak'ers, or **Friends,** called by themselves **The Religious Society of Friends,** a form of religious societies originating in England through the preaching of George Fox (1648–90), distinguished for a reliance on the inward teachings of Christ or the light within for guidance, an avoidance of forms and written creeds, a conscientious refusal to engage in war, and a dispensing with the aid of priests or a paid ministry.

The vigor and independence of religious thought in England was a remarkable feature of the period which gave birth to the Reformation, and which established Protestantism as the religion supported by the civil authority in England and Germany. The reform did not stop with the establishment of a Church, which, however decidedly it might protest against Romish power, commenced almost at the outset to exercise despotic power in enforcing conformity to its own creed: it went further, and renewed the higher forms of Protestantism itself in the Quakers and the Puritans. The relation which these dissenters held to the Church of England was only higher, in the relative advancement of their views, than that of the revolt against Rome. The same sturdy English love of liberty that rejected Roman Catholicism subsequently developed the Puritans first, and the Friends or Quakers next, without such original difference between them as would, at this distance of time, appear essential to keep them apart. Both were the natural protests of the free religious mind of the race against the despotic demand for conformity which religious authority at that time enforced. The Friends justly claim this difference, however—that the Puritan was often intolerant, and when in power was disposed to the severest persecutions; whereas Penn often interfered generously and successfully in behalf of every class persecuted for religious beliefs. Both the Puritans and the Friends attained a great measure of success and a conspicuous place in history. The reforms they advocated were more effectively urged and their permanence better secured by the singular ability and persistence of the Friends than by any or all other agencies. The history of the earlier labors of George Fox and Robert Barclay shows in a strong light the rightfulness of their claim to be regarded as the true representatives of the original spirit of Protestantism. In Scotland, where Fox preached with great success in 1657, some of the best of Cromwell's adherents were among his converts, among them John Swinton and Col. David Barclay; also his son, Robert Barclay, who subsequently became second only to Fox in the energy with which he preached that which he claimed was "the perfection of Protestantism," insisting that there was no middle ground between the doctrines he taught, on the one hand, and those of the Church of Rome, on the other. The founder of the Society of Friends, George Fox, was a native of Leicestershire, England, of humble origin. He began in 1647 a ministry of the most unpretending character, but which became very conspicuous and influential through his earnestness and zeal, united as they were with the highest ability. He found adherents among the wealthy and educated classes, as well as with the body of the people, and twice visited the Continent. He spent some time in Scotland, and twice visited America, spending two years here in effective ministrations. Though much persecuted and often imprisoned in the earlier part of his career in England, he gave so much force and dignity to his work as to command more respect from the civil authorities than was usually accorded to dissenters. In 1660, Thomas Loe, one of Fox's earliest converts at Oxford University, made an impression never afterward effaced on the mind of William Penn, then a student sixteen years of age at the university, and but few years elapsed before the zeal, devotion, and ability of William Penn made him the leading figure in the great struggle for religious reform. Penn was greatly aided by the high position of his family, and by the claims of his father, Admiral Penn, upon the government for distinguished services; and though imprisoned and persecuted at times, as all dissenters were, he regained his influence with the king, and obtained concessions of religious liberty, not alone for himself and his society, but for all other dissenters. As a part of these concessions, as well as in settlement of a claim due his father, he secured the grants of land out of which his great work grew of founding a state. Of the many attempts made during that period, this alone was entirely successful, and it was only just to call it by his name. But the great struggle that absorbed the chief attention of the early Friends was in England, where a succession of adverse as well as favorable events tried their strength to the utmost. In all these trials, however, they vindicated their rights with remarkable ability, and their courage when arraigned before the judges gave to the name *Quaker*, originally applied in disparagement, a significance which took from it all reproach. On several occasions they won substantial victories in these contests, and there are few essays or writings on any similar subject or drawn forth by like circumstances equal in strength and in dignified assertion of the right of conscience to the vindications put forth by William Penn and Robert Barclay: "We are a free people by the creation of God, by the redemption of Christ, and by the provision of our never-to-be forgotten honorable ancestors; so that our claim to these privileges, rising higher than Protestantism, could never justly be invalidated on account of nonconformity to any tenet or fashion it might prescribe. This would be to lose by the Reformation, which was effected only that we might enjoy property with conscience." (Penn's *England's Present Interest Considered*, 1674.) In the period extending from 1671 to 1685 the influence of the Friends was largely extended among the Protestants of Holland and Germany, where many notable persons embraced their views. Penn went to the Continent in 1671, and again in 1676, and both then and long afterward kept up an active correspondence with eminent persons there. In 1676 the acquisition of large interests in the colonies of East and West Jersey, both by himself and by other leading Friends, gave a new direction to Penn's energies, and, being restored in a great degree to the influence his family had formerly held at court, he formed extensive plans for establishing his views of liberal government in the New World. These movements gave to members of his society practical possession of most of Jersey, as well as the newer colony called by his name, and greatly enlarged their sphere of influence, as well as their responsibility. It is but just to ascribe to them the most complete success as colonists; their justice to the Indians, and the success which it secured to them in the peaceful acquisition of the Indian title to lands, was the most conspicuously honorable feature of colonial history. They committed no material mistakes, and never sullied their fame as protestants against despotic power in England by any exercise of similar tyranny in the colonies they controlled. They avoided war as a matter of conscience, and were rewarded by unbroken peace with the savages for more than half a century, and by entire exemption from the losses and horrors of savage warfare during the entire colonial period. Their principles and practice made a profound impression on the savage mind, and it is to the distinctive features of their form of religion and of their discipline as a society that these remarkable exemptions from the misfortunes of other colonies are to be ascribed. Almost a century of peaceful progress followed the active life of the founders, broken only by one severe struggle (1715–25) against an attempt to revive an old and most oppressive law against the Quakers and to extend its operation to Pennsylvania. The sturdy resistance of the colonists was again successful, and they obtained in 1725 full confirmation of their rights, not again to be disturbed. The growth of the settlements in America continued to draw from the parent societies in England so largely as to leave their numbers in that country with little change, while on the Continent the general tone of social and religious life was not favorable to the free growth of the society. Fewer striking events attended their condition after the death of Fox and Barclay than before. Both died in 1690, and there was less of despotic interference to oppress them, and perhaps less of the aggressive enthusiasm of their early history on their part.

No account of the numbers embraced in the society appears recorded during a long period of time following, and comparison on that point with the present is therefore impossible. The various transfers from one colony or locality to another in America were effected without collision, except partially in New England, where they were repelled, and for a time persecuted. Ultimately, they were distributed quite widely, Virginia and North Carolina receiving many, and Maryland, New England, and New York each a small number. When Western New York and Eastern Ohio were opened to settlement, a considerable number established themselves in each, and still later they removed in large numbers to Ohio, Indiana, Illinois, and Iowa. Of the North Carolina Friends, some have settled in Alabama, but the distribution has been small in the South—in part, because of their uniform testimony against slavery.

The distinctive religious belief of the Friends has been defined to be a reliance on the inward divine light for guidance, and an avoidance of written or formal creeds or of reliance on an established priesthood. This belief remains the same, and in defining it no other terms are still given than the language and words of the founders. It is a religion of inward experiences, as contrasted with one of outward forms. Believing that the Spirit of God does move and direct the truly religious man, they hold it to be man's first duty to seek that direction and to be guided by it. They establish and enforce a discipline which orders the conduct of life rather than asserts doctrines. "The society adopted no written creed, but received the gospel in the love of it, as free and unfettered as it was left by Jesus Christ and his apostles. . . . No systematic theory of religious opinions founded upon private views or the judgment of individuals was imposed upon one another by this society." (Cockburn's *Review.*) "They distinguish between imposing any practice that immediately regards faith or worship (which is never to be done, nor suffered, nor submitted to) and requiring Christian compliance with those methods that only respect church business in its more civil part and concern, and that regard for the discreet and orderly maintenance of the character of the society as a sober and religious community." (William Penn, *Preface to Fox's Journal.*) The discipline of the society was not to interfere with the faith of the members, but to superintend the practice. (*Cockburn.*) The unity which members of the society always earnestly sought was threatened only by the tendency, elsewhere universal, to reliance on written doctrines in matters of religious belief; and as a large number of the early accessions came to them from the Established Church, it required earnest and constant assertion of their principles to preserve the society in its purity. On the whole, its success in this respect was, for a century or more, most remarkable, but ultimately the growing tendency toward a discipline of doctrines became oppressive to many, and for some years previous to 1827 the discontent was general, particularly in Pennsylvania. Those in authority sought to impose a degree of restraint on the conscience and to exact a conformity to precise dogmas which was resisted as an infringement of the liberty secured by the founders. The result was, that a large majority of the members of the society in and near Philadelphia separated from the meetings and organized new ones, in a majority of cases retaining the meeting-house, but in others yielding it where the adhering number was greatest. They did not propose any departure from the teachings of Fox, Penn, and Barclay, but rather a return to them from a point to which they considered they had been removed. They had nothing new in doctrine or in practice to propose; they only felt that to permit the course of things then in progress to go on would be to lead the whole society into error, and would be an approach to the formalism which the early Friends had made great sacrifices to escape from. At the Philadelphia yearly meeting of 1827 a large number of members came to the conclusion to separate: they alleged that those in control of the society had "infringed on the religious liberty Friends had asserted and enjoyed." "Measures have been pursued which we deem oppressive, and in their nature and tendency calculated to undermine and destroy those benefits to establish and perpetuate which should be the purpose of every religious association." "It is under a solemn and deliberate view of this state of affairs that we feel bound to express to you, under a settled conviction of mind, that the period has fully come in which we ought to look toward making a quiet retreat from this scene of confusion; and we therefore recommend you to adopt such a course as truth, under solid and solemn deliberation, may point to in furtherance of this object, that our society may again enjoy the free exercise of its rights and privileges. And we think proper to remind you that we have no new gospel to preach, nor any other foundation to lay than that already laid and proclaimed by our forefathers, even Christ within, the hope of glory, 'the power of God and the wisdom of God.' Neither have we any other discipline to propose than that which we already possess, believing that whilst we sincerely endeavor to live and walk consistently with our holy profession, and to administer it in the spirit of forbearance and love, it will be found sufficient for the government of the Church." Immediately following this declaration active measures were taken to meet the emergency, and during the few months preceding the yearly meeting of 1828 the several quarterly meetings throughout New Jersey, Delaware, and Eastern Pennsylvania had separated, in most cases the old or orthodox division being much the smaller in numbers. Measures were taken to ascertain the relative proportion in each, and "so far as ascertained up to 1829," the numbers of each division in Philadelphia quarterly meeting were nearly equal, 2676 being attached to the new meeting and 2643 to the old one. But for the whole yearly meeting of Philadelphia it was estimated that 18,486 were attached to the new and 7344 to the old society,

The active ministry of Elias Hicks occurred during this period. He was a man of great earnestness and firmness of purpose, who visited many parts of the country distant from his own home near New York. It is not, however, conceded that he was in any proper sense the originator of the movement which resulted in separation. No new doctrines were advocated by him, nor was there any such unusual following of his ministrations as would render it proper to attach his name to the movement. The earnestness and frequency of his appeals to the original course of George Fox, as contrasted with the greater formality and restraint of the society as it had then become, led to much severity of criticism, for which no sufficient cause appears at this distance of time. While holding the teachings of Elias Hicks in great respect, the society has at all times declined to accept him as a distinctive leader.

The subsequent history of the Friends of both divisions in the U. S. confirms the view that the hasty exclusions and disownings of 1828 had no sufficient justification. Both have, however, been generally prosperous, and antagonism between them has long since ceased. Always foremost in great reforms and works of benevolence, the Friends have been especially prominent in public influence, furnishing a large number of representative men and women whose names are conspicuous as leaders of great reforms both in England and in the U. S. For more definite information as to the precise views held by those who participated in the great division the reader is referred to the writings of James Cockburn, Dr. William Gibbons, and Samuel M. Janney. Each of these has written the history of the separation with ability and candor. It is not easy to determine the exact differences between their views and those of Gurney, who, though one of the Orthodox, declares, that "were I required to define Quakerism, I should not describe it as the system so elaborately wrought out by Barclay, or as the doctrines and maxims of Penn, or as the deep and refined views of Penington, for all these authors have their defects as well as their excellencies. I should call it the religion of the New Testament of our Lord and Saviour Jesus Christ, without diminution, without addition, and without compromise." This is the essential point of liberty of interpretation which the most advanced representatives of the society claim.

The entire written law of the Society of Friends, other than the simple text of the Scriptures, is found in the *Rules of Discipline*, a code made up of rules which at intervals were adopted by the society as occasion arose for the correction of some irregularity or for provision against some known danger. "For the more regular and effectual support of this order of the society, besides the usual meetings for the purpose of divine worship, others are instituted subordinate to each other; such as, *first*, preparative meetings, which commonly consist of the members of a meeting for worship. *Second*, monthly meetings, each of which commonly consists of several preparative meetings. *Third*, quarterly meetings, each of which consists of several of the monthly meetings. *Fourth*, the yearly meeting, which comprises the whole. These meetings have all distinct allotments of service." Any person dissatisfied with the judgment of a monthly meeting may appeal to a quarterly meeting, and from a quarterly meeting to a yearly meeting, whose decision is final. Arbitrations are provided for in all cases of difference respecting property, and appeal to the usual course of law is permitted only when one party refuses to arbitrate or when the point at issue can be reached only by legal proceedings. Moderation is especially enjoined in all proceedings, forms, and ceremonies, avoiding ostentation and expense. Charity and unity among members are earnestly enjoined. The acceptance

of office in civil government is discouraged, especially where the functions of such office may conflict with entire freedom of conscience or may require participation in war. Fasts and feasts are discouraged; strict justice is enjoined; and "frequent waiting in stillness on the Lord for renewal of strength" is prescribed as the proper course in difficulty and the proper form of religious preparation. Gaming and diversions, including dancing and attendance on theatres, are forbidden, and those who persist in attending them after due remonstrance are to be disowned. "This is the extent of the society's censure against irreclaimable offenders: they are disowned as members of our religious community; which is recommended to be done in such a disposition of mind as may convince them that we sincerely desire their recovery and restoration." Marriages are regarded as contracts of a religious nature, to be considered and approved by the society, and marriages with members of other principles and professions of religion are discountenanced. Forms of notice and marriage certificates are prescribed in the rules of discipline, and violation of these rules and forms is to be treated as an offence. Elders and ministers are called by the society upon evidence of their gifts, and ministers receive a letter of testimony if visiting other societies, to be given by a monthly meeting, and confirmed by a quarterly meeting of ministers and elders. Women may become ministers equally with men, and none are to be paid a salary or for services as minister under any circumstances, though the expenses of those travelling by direction of the society may be paid. The most earnest testimonies of the society are recorded against slavery and against war, and members are positively forbidden to engage in either. The poor of the society are to be faithfully provided for within its own organization. Plainness of apparel is enjoined, and members are cautioned against secret societies. Many other recommendations and advisory provisions are made in the *Rules of Discipline*, most of which are closely observed by the members, and constitute the peculiarities by which they are distinguished. Some of these undoubtedly tend to limit the membership and retard the growth of the society, particularly those which exclude the families of members marrying out of the society from recognition as fully belonging to it, though agreeing in general sentiment and practice with the society.

The present numbers and organization of the Society of Friends are, so far as can be ascertained, nearly as follow: The original society first experienced a division during the Revolutionary war, at which time Samuel Wetherill, with about 1000 others, asserted in Philadelphia the duty of aiding in defensive war. A society of Free Quakers was organized, which was active and influential for the time, erecting a building at Fifth and Arch streets, Philadelphia, which is still owned by representatives of that society. Next was the separation in 1827, before referred to, and more recently the Orthodox branch has been divided between the adherents of John Wilbur and those of Joseph John Gurney, the former claiming the name of Primitive Friends. Another body of persons have called themselves Progressive Friends, but, though they are mostly descended from Friends, they are to be regarded as a voluntary association in aid of general reforms, rather than as a distinct religious body. They meet at Longwood, Chester co., Pa. Through careful recent inquiries the following statement of the number of yearly meetings and of members is made up, as being reasonably near to exactness. Of the Friends not called Orthodox there are seven yearly meetings: Philadelphia, with 15,000 members; New York, with 3600; Genesee, 2954; Baltimore, 3800; Ohio, 2509; Indiana, 3500; Illinois, 1500; total, 32,854. Of the Orthodox Friends there are in the U. S. eleven yearly meetings, with membership nearly as follows: Philadelphia, 3500; New York, 3300; New England, 4500; Baltimore, 650; North Carolina, 4200; Ohio, 3200; Indiana, 16,000; Western, 11,700; Iowa, 8650; Kansas, 3420; total, in the U. S., 59,120. In England and elsewhere there are the London meeting, with 14,200 members; Dublin, 2935; Canada, 1630; and Australia, 300. Grand total, 111,039. The Orthodox branch have separated in New England, New York, and Ohio; in the last named nearly one-half of the yearly meetings are distinguished as agreeing with Wilbur and the Primitive Friends, dissenting from the views of Joseph John Gurney and the regular Orthodox. The like division is smaller in New England and New York.

Any estimate of the influence which has been exerted by this society based upon a statement of their present numbers would be far from just or adequate. Independently of the important effect which the liberal legislation of the early period in Pennsylvania had upon other States, it is to be remembered that the rigid discipline of the society as to membership has thrown out of its technical circle a large number of capable persons imbued with its principles, and substantially representing them in the general society of the world. The number of eminent names so associated with Friends' teachings, and further impressing them on the general public both in England and the U. S., is very considerable. It has been the order of the Friends' society from the beginning that their poor should not become a charge on the civil authority or upon any other charity than their own. The Society of Friends has maintained a full proportion of charitable and educational institutions. Under Penn's instructions schools were founded and maintained in Pennsylvania for the education of the children of the society from the first settlement, and in 1790 a school of the most thorough course of instruction was established at Westtown in Chester co., at which great numbers of the children of the leading families have received instruction. Several similar schools have been established, and in 1870, Swarthmore College, a full collegiate institution, was established 10 miles from Philadelphia, in Chester co. It is liberally endowed, provided with able instructors, and confers the usual degrees on graduation from a course of four years in the classical and scientific departments. This institution was founded by the non-Orthodox branch of the society, and it represents a greater conformity with modern modes of instruction than was admitted previously. In Central New York and in some parts of Ohio the distinctive usages of Friends in regard to education, and also as to forms of religious services, are recently considerably modified. (For further information as to the views of the Orthodox branch see article FRIENDS of this work; and for the views of the other branch see Cockburn's *Review;* Janney's *History of Friends;* Gibbons's *Review;* Rupp's *History of Religious Denominations*, etc. And, generally, Clarkson's *Life of Penn; Select Works of William Penn;* Sewel's *History of the Quakers;* Besse's *Defense*, etc.) LORIN BLODGET.

Quakertown, p.-b., Richland tp., Bucks co., Pa., on the North Pennsylvania R. R. P. 863.

Quak′ing-Grass, a genus (*Briza*) of ornamental grasses. *B. maxima* and *media*, from Europe, are cultivated in gardens, and the latter is partly naturalized here. In Europe it is considered a good pasture-grass for poor mountain-lands.

Qual′itative Al′gebra. Common algebra has been regarded by Sir William Rowan Hamilton as the science of pure time in an essay published in vol. xvii. of the *Transactions* of the Royal Irish Academy. Any multiple algebra involves many different independent elements or units, each of which may be viewed as the representative of a peculiar quality. The various modes of the combinations of these elements give the especial characters of the different algebras. The most comprehensive algebra is that of logic, which combines every variety of element. A profound and penetrating algebra of logic has been presented by Boole in his *Laws of Thought*, the principles and relations of which have been discussed with many suggestive modifications and interesting applications by De Morgan, Ellis, Harley, and Mr. Charles S. Peirce. Another form of the algebra of logic has been introduced into his *Principles of Science* by Prof. Jevons, which treats the theory of the syllogism with singular simplicity. These algebras constitute the greatest addition to logic since the time of Aristotle. They are remarkable to the mathematician, because they do not involve numerical elements. A general investigation of the forms of multiple algebra was made by Hamilton in his *Theory of Sets*, published in vol. xxi. of the *Transactions* of the R. I. A. This theory contains special references to octonomial algebra, which terminated at length in the production of the wonderful algebra of quaternions. There are three principles of fundamental importance in the algebras—the distributive, the associative, and the commutative principles. The distributive principle refers to the distribution of the parts of the factors, and is represented by the formula—

$$(a + b)(c + d) = ac + bc + ad + bd.$$

There has been no algebra proposed in which this principle is not adopted, except, it may be, in the logical algebras. The associative principle refers to the multiplication of successive factors, and is represented by the formula—

$$a(bc) = (ab)c = abc.$$

This principle is adopted in quaternions, but rejected in the octades proposed by Cayley and Graves in the *Philosophical Magazine* for 1845 and 1848. The commutative principle refers to the order of the factors, and is represented by the formula—

$$ab = ba.$$

This principle is not retained in quaternions, nor in most of the proposed multiple algebras. Hamilton considered a variety of triple and quadruple algebras in his prelimi-

nary investigations which led to quaternions. De Morgan undertook the investigation of triple algebras in his *Memoir upon Triple Algebra*, published in *Transactions* of the Camb. Phil. Soc., vol. viii. In my *Linear Associative Algebra* (Washington, *lithog.*, 1870) I have undertaken the complete investigation of all possible algebras, subject to the distributive and associative principles, up to those of the sixth order. I found three double algebras, five triple algebras, eighteen quadruple algebras, seventy-one quintuple algebras, and sixty-five sextuple algebras, or in the aggregate one hundred and sixty-two algebras. Among them is one singularly simple class, which I have designated as quadrates, and of which quaternions is the simplest example. Mr. Charles S. Peirce had previously discovered this class of algebras by logical analysis, and has shown that all the other algebras are imperfect cases of this class, and has designed a very clear notation for its elementary units. In vol. iv. of the *Proceedings* of the Mathematical Society of London, Prof. Clifford has added a valuable element to quaternions, which practically doubles its original elementary units, and he calls the new algebra biquaternions, coinciding with me in the opinion that quaternions should legitimately include what Hamilton calls biquaternions. The same volume contains a learned analysis of the various multiple algebras in Mr. Spottiswoode's memoir on *Some Recent Generalizations in Algebra.* He especially describes Hankel's *alternate numbers*, which are the same with one of the forms of algebraic *keys* given by Cauchy in the *Comptes Rendus* of the French Academy for 1853. Among the elementary units, or, as they are perhaps better styled, the *vids* of the multiple algebras, the vids of inversion are of especial interest. These vids are in form square roots of unity—*i. e.* they are such that upon a repetition of their application they restore a quantity to its original value. The new primitive vid introduced by Prof. Clifford is an inverser. The vids of semi-inversion have ever been deemed as more important than those of inversion; they are such that upon a repetition or application any quantity is reduced to its own negative. All the units vector of quaternions are of this class, as well as the primitive octades of Cayley and Graves. The vids whose square is zero may be called nilpotents; they include all the vids of Hankel's alternate numbers, and their property becomes thereby a special case of the general defining property of these numbers, which is represented by the formula

$$ab = -ba.$$

BENJAMIN PEIRCE.

Qual′la Town, p.-v. and tp., Jackson co., N. C., inhabited chiefly by a remnant of the Cherokee Indians. P. 1697.

Quang-See′, province of the Chinese empire, between lat. 22° and 26° N. and lon. 105° and 112° 30′ E. Area, 78,260 sq. m. P. 7,313,895. It is mountainous, rich in metals, and produces grain and cassia. Cap. Kwei-Lin-Foo.

Quang-Tong′, province of the Chinese empire, between lat. 20° and 25° 30′ N. and lon. 108° and 117° E., bordering on the China Sea and the Gulf of Tonquin. Area, 79,451 sq. m. P. 19,174,030. The surface is mostly level and the soil is fertile. Rice, sugar, green tea of an inferior quality, cassia, betel-nuts, and cotton are produced. Cap. Canton.

Quan′tico, p.-v. and tp., Wicomico co., Md., on Nanticoke River. P. 1453.

Quantico, v. of Strafford co., Va., on Potomac River and Acquia Creek, is the southern terminus of Fredericksburg and Potomac R. R.

Quan′tity [Lat. *quantitas*], in mathematics, the property of substance which involves the capability of increase or diminution. *Continued quantity* is the equivalent of magnitude, and forms the object of geometry; while *discrete quantity*, of which the parts have a separate existence, is the equivalent of multitude or number, and forms the object of arithmetic. Quantity of *matter* is termed mass—quantity of *motion*, momentum.

Quantity, as a term in PROSODY (which see), is the length of syllables as employed in Greek and Latin versification. It is not adapted as a basis for verse in a language like English, where it would be overpowered by the strong accents, yet a careful poet can make efficient use of it, while many bad lines are due to its neglect. In Keats's distich—

> What I know not: but who, of men, can tell
> That flowers would bloom, or that green fruit would swell, . . .

there is no reason for the discrepant long quantities which dissimilate the second line from the first; as in the next by Pope, where, in accordance with the action described, the hurry of the first line is followed by the staid movement of the second:

> Sŏ tŏ thĕ fīght thĕ thīck băttălĭŏns thrŏng,
> Shīelds ūrg'd on shīelds, and men drōve men alōng.

In Milton's lines, *Paradise Lost*, book 3, l. 588–589—

> There lands the Fiend, a spot like which perhaps
> Astronomer in the Sun's lucent Orb, . . .

the short syllables of "Astronomer" are the correlatives of "There lands the Fiend." Here, as the second line is prose, it should have had such a quantitative correspondence as would have enabled the rhythmic line to carry it through without much observation. S. S. HALDEMAN.

Quar′antine [It. *quarantina*, "forty days"]. The word is designed to express the measures of *isolation* imposed upon persons or things susceptible, on account of their nature or from contact with contaminated persons or things, of transmitting an epidemic or contagious affection of exotic origin. As originally employed, it indicated the limit of time (forty days) which seemed necessary to subject to observation individuals suspected of conveying pestilential contagion. It no more expresses this duration, but isolation, sequestration, and sanitary inspection, without reference to their duration—a duration which must vary not only with the season, but with localities, or again with the degree of danger recognized in the vehicle of transmission. Regarded in this light, the word comprehends all measures of a sanitary character destined to obstruct or destroy the march of an epidemic or contagious affection, it matters not whether these measures have for their object to oppose the transmission of the morbid germ, or by strictly hygienic efforts prevent its development. This happy accord allows, then, the application of the one or the other element, as may seem to the sanitary officer best applicable, and does away with that blind, almost fanatical and necessarily imperfect, series of measures which marks the past history of this institution.

History.—For our purpose it is most desirable to study this under three divisions of time, very unequal, it is true, but still representing best the growth or decadence of certain principles pertaining to the institution. The first, comprising all the Middle Ages, may be styled the period of *leprosy*; the second, commencing at the end of the fourteenth century to end with the early part of the present, the period of quarantines against *plague*; the third, wholly modern, corresponding to the sanitary measures employed against *yellow fever* and *cholera*. A study conducted under these heads will enable us to appreciate that there can be no blind formalism in the administration either in places or people, as the latter may be modified through hygienic efforts or climatic influences; or, second, from conditions in the nature of the epidemic, so variable at each explosion of one or the other of these diseases—conditions, blind though they may be, whose influence we must still admit, since we see them at one time spread over the whole habitable globe or at another limit themselves as circumscribed epidemics; or, again, in following them through a succession of centuries we see, it may be, the plague or cholera or yellow fever play successively the principal rôle among devastating scourges.

First Period.—Leprosy is one of the oldest of known diseases, and still exists as an endemic over vast regions of Asia and Africa. It might for this reason be objected that the limitation of this period should not be made to the fourteenth century; but the fact is recognized that with the irruption of the plague into Western Europe at this date it began to diminish, and in most localities entirely disappear. The isolation of lepers was an early law of societies; prescribed by Moses, it is still adhered to in the East. It is not without interest to notice the variable manner in which those affected with leprosy, not only in different countries, but at different epochs, were isolated. The most primitive method was to drive them out from among the population, and they settled either in the suburbs of a town or in huts by the travelled waysides. Gradually, establishments were built to receive them, usually at certain distances from the cities. Those in Spain were exceptional, being often built in the thickly-settled portions of the towns—a custom derived, probably, from their Moorish predecessors. Ultimately, the sequestration was sought to be more effectual by subtracting them wholly from the population, and concentrating them on the island of Samos, in the Mediterranean Archipelago. Another circumstance, not less interesting, as illustrating not only the different estimation in which those affected were held in different countries, but also the demoralization and frauds which gradually crept into the system, was the conduct of these asylums and the character of the persons admitted. In certain countries, to the dread of contact and the sight of those affected was added the sentiment of religious aversion, inspired by the idea that leprosy was a divine punishment. Solemn ceremonies, characteristic of an interment, marked their separation from society. On the other hand, in other countries

the superstitions of the time and place surrounded the lepers with a certain halo of glory and martyrdom. They became objects of special veneration, even elevated to the first dignities of the state or army, with places of honor assigned to them in the temples, etc.; orders of chivalry were established consecrated to their cure. While, on the one hand, the most severe penalties interdicted all contact, designating for them a particular dress, on the other the sequestration partook of an honorary character—sò much so that the institutions in which they were established became the refuge of a crowd of lazy vagabonds, who, simulating the disease, found there a desirable home. To such an extent was this carried that in the seventeenth century several government commissions were formed to visit these asylums and diagnosticate critically those affected and those not with the disease.

Second Period.—It was not, however, until the appearance of the plague in 1348–50 that the régime of quarantine against pestilential affections was fully inaugurated. As for ages previous leprosy had been the principal disease in which isolation was ordered, we see, in looking over the regulations which existed in many of the places on the shores of the Mediterranean, that they were those adopted with regard to leprosy, save that the definitive isolation of the one was changed to the temporary sequestration of the other. About this time the recurrence of grave pestilential epidemics inspired the public, rather than physicians, with the notion of their transmissibility by those attacked. As a consequence, the restrictions were marked by the brutal and superstitious spirit which characterized the age. The murdering of physicians, the bloody persecutions against the Jews, self-imposed tortures by individuals to propitiate divine mercy, witness the superstition and barbarity of the epoch. Soon it was noticed that vessels and passengers coming from the East, though not attacked themselves, brought with them the morbid germ. Venice, rising from her lagoons, was then the most enterprising and the chief commercial city of the world. Covering the Mediterranean with her vessels, she made at the same time commerce and war; consequently, her port, more than any other, was subject not only to the black plague, but especially the Egyptian, then so frequent in its explosions. Induced by their frequent appearance, she proscribed the sale and destroyed the effects of those who had died. She created three protectors of health, a health bureau, and finally a lazaretto, which subsequently formed the models for all other ports. Her example was followed by all the smaller places on the Adriatic coast existing then as separate governments. It is probable that the terror inspired by the repeated visitations of the pestilence gave rise to that persistent hostility to strangers which still exists in many portions of Southern Italy. From this time, too, dates the period of *forty* days as necessary for the observation of suspected persons.

Another fact of interest in this connection is, that for the *first* time medical men, not only by the aid of scholastic arguments, but by the study of facts, interested themselves in the question, "How far contagion was concerned in the transmission of the plague?" About the middle of the sixteenth century the celebrated work of Fracastorius appeared. It is the first work which speaks of contagion as now understood. According to him, a specific virus rises by exhalation from the body of the sick, extends but a short distance, and attaches itself to certain substances, which thus become contaminated; this contamination remains, and may be transported unknown distances and infect entire communities. He recognizes also that certain other substances would not be contaminated. The public mind seized eagerly upon this distinction of contamination and non-contamination, the decision of which has been since then the source of so many discussions and such diversity of opinions. Independently of natural exaggerations, he wrought this double advantage: First, to show certain real dangers not before suspected, and recall to rational observation many minds misled by the belief in the influence of the stars or by their faith in the Galenist dogma of occult causes. Second, to dispel, on the other hand, that which was equally difficult—certain prejudices which exaggerated the property of transmission of such diseases, and admitted that they could be communicated by voice and expression of the sick. This opinion was still more fortified by a subsequent work by Masaria, who showed the immunity of persons who during an epidemic had remained shut up in their châteaux or in monasteries. He limited the ravages in isolating the sick outside the city. The success which followed this advice made his work an article of faith, and it was followed by the organization of similar establishments in all the Mediterranean ports.

From the beginning of the seventeenth century Europe found herself relative to the plague in analogous conditions to those in which we are relative to cholera. The disease had reached its maximum of diffusion through the civilized world, and was especially terrible in all the large capitals. Sanitary police were established in all or nearly all, and the most vigorous measures were adopted for the sequestration of those stricken. Both local and general authorities acted in concord—the one in defining the movements and restrictions of the inhabitants; the other in surrounding the infected city with troops to prevent ingress or egress except under definite regulations. The spirit of isolation was carried to such extremes that without doubt the scourge was intensified, by compelling the inhabitants to remain in the infected districts, and often by the inadequate supply of food to those so restricted. The eighteenth century was marked by the more decided use of lazarettoes. The effects were soon observed: the disease declined from the interior portions of Europe, and was chiefly confined to the maritime ports. The regulations assumed a more explicit and in some sense rational form, though the penalties were very severe and enforced with intense rigor. Explicit directions were given to all vessels trading with Egypt or the Levant, not with reference to passengers only, but also the cargo and the vessel itself. The increasing commerce of France with the East gave the port of Marseilles an especial prominence, and its lazaretto became the most celebrated in Europe, not only for the care manifested, but, as knowledge existed, for the best management. It enjoyed, too, the confidence of the citizens, by several times preventing the contagion from spreading to the city after its entrance into the lazaretto.

To one familiar with the history of the subject it is interesting to study the minute distinctions made not only with reference to the bill of health, but the measures of precaution taken with reference to passengers and merchandise—measures which, while they might protect the community, lost sight entirely of the rights and privileges of those suspected, and which, were there the least trace of fomites in the vessel or cargo, would be certain to attack the poor unfortunates, who were compelled to undergo an almost unlimited period of observation. During the latter part of this century observations were more carefully and systematically instituted, and the modes of propagation of the scourge more accurately noted. Chief among these was the great philanthropist John Howard. He visited successively the hospitals and lazarettoes of the Mediterranean where the plague prevailed; attacked energetically the defective appointments; established the importance of hygienic conditions in these establishments; sustained the inutility of quarantines imposed on merchandise, and really laid the foundation for the present English legislation on the subject. He dispelled the idea that corpses could communicate the disease—a point of great importance, since in many epidemics the dead were allowed to accumulate unburied, people flying from them in terror. He combated also the foolish and grotesque precautions taken by physicians and nurses to escape immediate contact with the sick, and dispelled the illusion that the contagion could be conveyed by their breath.

During the early part of the present century the doctrine of quarantine was affirmed with renewed energy, and the privileges accorded were if possible more decided; gradually, a more exact appreciation of facts induced a more eclectic tendency, preserving that which was useful and rejecting that which was exaggerated. We notice, too, in European governments the first steps taken to stifle pestilential maladies in their place of origin. The development of this idea resulted in the call of an international congress to consult upon the principles to be laid down in order to prevent their widespread diffusion.

An additional interest arises in the study of this subject from the modification of the list of diseases to which restrictive measures should be applied. Up to the commencement of this century no other disease than the plague had occupied the attention of quarantines. From 1821, however, the interest in this disease gradually subsided, to be replaced in a far greater degree by the questions of yellow fever and cholera. During the few years previous to this the anti-contagionists had inveighed severely against all restrictive measures in yellow fever, asserting that it could not be imported, and that those who thus affirmed were men without experience and of limited information. Scarcely had these positive opinions been enunciated, and even obtained some credence in public sentiment, when the terrible scourge of yellow fever which invaded Barcelona in 1821 appeared. Its transmission by sea was undeniable; reaching the quarantine of Marseilles, it was excluded from that city. For cholera a different order of circumstances presented itself. The danger to be apprehended here was not from the side of the sea, but from the land. For years European governments had watched the progress of the Indian scourge, the terror inspired by its ravages in Asia, and had hoped to arrest its progress

on the Russian frontier. It was thought that by creating a *cordon sanitaire* on the boundaries of each country its progress could be arrested. Various restrictions to intercourse were made, virtually establishing quarantines by land as well as by sea. We all know how useless were these efforts. The rapid march of the first cholera epidemic through Europe in 1831, and the fact that it did not appear in certain countries where no restrictive measures were applied, showed the utter uselessness of these *cordons sanitaires* in thickly-settled districts, and they were soon abandoned. It had the effect to revive the old discussions relating to its transmissibility from man to man, many asserting that it was wholly epidemic in its character—an argument which had a specious force from the rapidity and uncontrollability of its progress. Its contagion was treated by some as a chimerical belief; those who opposed the idea of contagion were considered truly men of progress, since they opposed restrictions to personal liberty, and their views were applied not only to cholera, but typhus and other diseases. These hesitations and differences more or less still continue among the different portions of Europe. Indeed, the futility of the effort to establish a uniform system of regulations for countries and seaports in different localities having different relations with countries from which malignant diseases are brought, is now acknowledged there—that which experience had long ago taught in this country. Matters remained very much in this unsettled state, both as to the principles which should govern the administration of quarantines and the varied action of different governments, when in 1850 a convention was called at Paris to decide if possible upon some uniformity of principle. It consisted of representatives from all the principal European powers. They were medical men, and with them were associated the consuls of the respective countries represented in France. Confining themselves to facts generally accepted, and by the aid of mutual concessions, they arrived at a code of international sanitary regulations which, though since modified in many particulars, has remained the basis of all subsequent quarantine legislation. This convention awakened a new interest in the subject, and was followed by another gathering in Constantinople in 1865. At this last the value of restrictive measures was recognized, and the still more important duty of applying if possible at the source of epidemics all the dicta of public hygiene was strenuously urged—to stifle them in their exotic cradles by removing the causes by which they are propagated, and thus diminish the zones over which they spread.

In looking over the quarantine legislation enacted at different times in New York, we are struck with the freedom from the prejudices and formalities which so long marked all European enactments. Each principle has seemed to spring from the necessity of the occasion, and, though greatly modified of late years, the working has been based on the experiences afforded by some epidemic just passed.

Prophylactic Value.—After this sketch of the origin and growth of the systems of quarantine, their prophylactic value may be considered. Various opinions exist on this point in Europe and this country—the one denying all sanitary value to their restrictions, the other claiming exaggerated benefits. On looking closer at the school opposing all sequestration, it will be found that its opinions are based on the surroundings and climate of their *particular localities*—where, from the nature of their position to neighboring countries, no restrictive measures could be applied; and on the other hand, countries situate in latitudes where the exotic pestilences, all of which find their endemic dwelling in the torrid zone, can, with the exception of cholera, find but a short season when temperature and hygrometric conditions favor their development. Such persons, studying alone from their own standpoint, attempt to apply general principles for all localities. Quarantines are not essential to the higher regions of the temperate zone, nor to the localities in the torrid where climate and temperature readily make cholera and yellow fever endemic.

Value of Sequestration.—Sequestration is only valuable in localities where a general supervision of the means by which disease may be brought is *easily made*, and which are separated by a natural zone from suspected districts. Such are localities on islands or in cities where the entrance of the disease would be almost wholly by sea. On the other hand, where topographical conditions are less favorable this isolation from contagious diseases is almost impossible, and consequently it is illogical to impose such conditions upon them. Still another series of conditions would modify the application of these measures. Such are countries situated in the endemic zone of the disease which it is desired to restrain. Before deciding upon its application for any given locality, it should be determined whether it does not already exist there, it may be in complete evolution or as a localized germ. To apply restrictive measures without first determining these facts is to establish useless barriers and renew under another form one of the principal abuses of the old system. If the general principles expressed are correct, it will not be difficult to make the particular application. Such application must be founded upon the natural history, the manner of transmission, and the period of incubation of the disease, and in shaping restrictive measures all incidental circumstances must be borne in mind. Wherever rational hygienic measures are faithfully pursued, not only at the source of the infection, but also on the vessels in transit, it should be a powerful modifying element in the restrictions applied to passengers, cargo, or vessel on their arrival in port.

Quarantine of the Port of New York.—The quarantine department of the port of New York consists of a boarding-station at Clifton, on Staten Island, a summer boarding-station on a station-ship anchored in the lower bay, 4 miles below the Narrows, and two artificial islands—viz. Hoffman Island, of about 3½ acres, and Dix Island, of about 3 acres. The burying-ground is at Seguin's Point, on the south-eastern part of Staten Island, about 1 mile N. of the Prince's Bay lighthouse. Besides these, the hospitals on Ward's and Blackwell's islands are used for the reception of certain patients, who are cared for under the law by the quarantine department. This quarantine was originally established to guard against the importation by shipping of yellow fever or any other infectious distemper in 1784. The diseases against which it now applies are "yellow fever, cholera, typhus or ship fever, and smallpox, and any new disease, not now known, of a contagious, infectious, or pestilential nature." In the management of these diseases, of which the four named are subject to treatment, smallpox patients are sent to the smallpox hospital on Blackwell's Island, typhus fever to the emigrant hospital for that disease on Ward's Island, and cholera and yellow fever to the quarantine hospital on Dix Island. If both the latter diseases are in the harbor at the same time, the station-ship is used as a hospital for the treatment of one of them. The two artificial islands of the department are wonders of artificial construction. They are built on the W. Bank, a shoal which forms the western limit of the ship-channel (E. Bank being on the other side of it), and at the time of their construction stood in water about 7 feet deep at low water. Dix Island, the most southerly, is covered by a hospital structure of wood one story high, containing eight hospital wards 100 feet long, and with room for beds on each side. Two additional buildings, of the same size, are used for attendants, for store-rooms and kitchen, and for the engine-house. The disinfection-chamber (where disinfection is practised with superheated steam, hot water, chlorine, or other gases, and liquid disinfectants as required), laundry, and workshop occupy another building about 100 feet long. The construction of the hospital is that known as the "American pavilion," of which style this is an improved and favorable specimen, the general plan being a long corridor, with doors along the sides opening into the wards, which are arranged passable to each other and at right angles with it, thus giving, by the windows and other means, the most unobstructed ventilation to a hospital built in a location where the surrounding conditions of hygiene are unexcelled. The record of this hospital shows the effect of these conditions in the unexampled recoveries from disease among those under treatment. Hoffman Island has three large brick buildings of full two stories each for the reception of well persons, including passengers and crew of vessels so infected with epidemic disease that their disembarkation is required before it can be stayed. The buildings are of brick, and the two larger ones not divided into rooms, each story being a large ward, in which berths can be placed for several thousand steerage, and the third building being divided into rooms for the other passengers. These islands were first recommended as possible by Gen. Benham, N. Y. engineer corps, in the New York assembly, Dec. 19, 1859, who furnished working estimate and plans, and their construction was commenced in 1867, and completed in 1874, at an expense somewhat above $1,000,000.

All vessels arriving from a foreign port during the entire year, and all vessels from any place in America in that ordinary range from which they pass S. of Cape Henlopen, arriving between the first day of April and the first day of November, and all vessels on board of which any person shall have been sick of quarantinable disease, are subject to the visitation, inspection, and decision of the health-officer of the port. After inspection they are permitted to proceed without detention if free from contagious diseases to the public health. In case of infectious disease being on board, the measures taken are based upon the circumstances surrounding each particular case. The sick are removed to one of the quarantine hospitals, and if there is no further danger apprehended the vessel is allowed to

pass. In summer, with yellow fever on board and from a port where yellow fever prevails, the vessel discharges her cargo in lighters in the stream before going to dock, and is cleansed carefully and her bilges washed, besides being thoroughly disinfected and ventilated.

The importance of deciding the detention and measures necessary in each case, upon an investigation of the circumstances surrounding it, is evident in the case of yellow fever and cholera. Under the process of quarantine practised formerly, and in the East still in use, the detention for a case of either of these diseases would be either for a month or perhaps the entire season. As it is at present, a single case of cholera having occurred before arrival, and a period elapsed equal to its time of incubation, and followed by no others, would only secure a detention long enough to furnish an accurate and thorough inspection of the vessel, her condition and that of the passengers. In case of an extensive and fatal epidemic of cholera occurring on a vessel arriving in warm weather, every person would be removed to Hoffman Island, and the vessel, after purification, permitted to proceed to the city. The people from her would be detained until no more disease appeared, those who became sick being at once removed to Dix Island in the steamboats which are kept for this purpose; and being under circumstances favorable for the suppression of the disease, and those attacked being treated for it in a place suitable for cure, there would result the least detention and fatality possible under the circumstances.

All the advances made in the New York quarantine have had for their motive the reduction of the detention and annoyance of delay in cases of disease which the fears and traditions of the populace would not permit ashore, and which were included in the meaning of the popular word "pest," while at the same time commerce should be as little embarrassed as possible. Naturally some evils crept into the management of affairs so delicate as the adjustment between business interest and sanitary requirement; but the march of improvement has at last placed this department in a position where the health-officer is sustained in all his official acts by the commercial interests of New York, which find in his pass a protection from the dangers to trade which would follow a commerce in which there was no sanitary restriction. Thus, the apparently incongruous interests, quarantine and commerce, are united at this port upon a system which is satisfactory to and adequate for both. S. Oakley Vanderpoel.

Quarles (Francis), b. at Stewards, Essex, England, in 1592; was educated at Christ's College, Cambridge; studied law at Lincoln's Inn; was a member of the suite of the queen of Bohemia, daughter of James I.; afterward secretary to Archbishop Usher in Dublin; was driven from Ireland with the loss of his property by the rebellion of 1641; was appointed chronologist to the city of London; espoused the royal cause in the great rebellion, joining King Charles I. at Oxford, and suffered sequestration of his property. D. in London Sept. 8, 1644. Author of *Divine Emblems* (1635), *The Enchiridion of Meditations* (1641), and other moral works filled with quaint conceits, which still procure them readers, and of *The Loyal Convert* (1644), a defence of the royal cause.—His son John, b. in Essex in 1624, was educated at Oxford, served in the royalist forces, and wrote books in a style similar to that of his father. D. of the plague in London in 1665.

Quar'ryville, p.-v., Eden tp., Lancaster co., Pa., at southern terminus of Lancaster and Quarryville Narrow-gauge R. R., ships vast quantities of lime.

Quartermas'ter-General, in the U. S. army, has the rank of brigadier-general, and is at the head of the quartermaster's department, which is charged with the duty of providing means of transportation by land and water for troops and for all material of war; it furnishes horses for artillery and cavalry; provides and supplies tents, camp and garrison equipage, forage and fuel, and all necessary material for shelter of troops; it builds barracks, hospitals, and storehouses; provides wagons, ambulances, and harness (except for artillery); constructs and repairs roads, military telegraphs, railroads, and bridges, docks and wharves; clothes the army; and is charged generally with all disbursements attending military operations not expressly assigned by law or regulation to other staff departments. The organization of the department, as now fixed by law, is as follows: 1 quartermaster-general, with rank of brigadier-general; 4 assistant quartermaster-generals, with rank of colonel; 8 deputy quartermaster-generals, with rank of lieutenant-colonel; 14 quartermasters, with rank of major; 30 assistant quartermasters, with rank of captain. There is also for each regiment of the line a regimental quartermaster, selected from among the lieutenants of the regiment, who is assisted in his duties by a quartermaster-sergeant. C. G. Sawtelle.

Quartet' [It. *quartetto*], in music, a composition written for only four instruments or voices, thus differing from a chorus of the same number of parts. The term is sometimes used in reference to the performers themselves.

Quar'to Sant' Ele'na, town of Sardinia, province of Cagliari, about 5 miles from the town of Cagliari. The houses are for the most part of a single story and built of crude bricks, the streets are in a bad condition, and the women perform both the agricultural and the domestic labor, the men being occupied in fishing, hunting, and lumbering. P. in 1874, 6117.

Quartz. See Geology, Chemical, by Prof. T. Sterry Hunt, LL.D.; and Silica, by H. Wurtz, A. M.

Quartz, tp., Plumas co., Cal. P. 810.

Quas'queton, p.-v., Liberty tp., Buchanan co., Ia., on Wapsipinicon River.

Quas'sia, in medicine, the wood of certain trees of the natural order Simarubaceæ. All the species of this order are noted for the intense bitterness of their wood, and until about the end of the last century quassia-wood was obtained from *Quassia amara*, a small tree or shrub native in Panama, Venezuela, Guiana, and Northern Brazil. But the wood of *Simaruba excelsa* being found to have the same properties, and the latter being a tree of much greater size, the quassia of commerce is now almost wholly obtained from this source. *S. excelsa* is a tree from fifty to sixty feet high, with small yellowish and greenish flowers, and the fruit a drupe, black and shining, and about as big as a pea. It is a native of Jamaica and the Caribbean Islands, where it goes by the name of *bitter ash*. The wood is whitish, but turns yellowish on exposure. It has no smell, but a most intense, though pure, bitter taste. The bitterness depends upon a neutral crystallizable principle called *quassine*. Commercial quassia-wood consists of pieces of the trunk and branches of the tree of various sizes. For use by the druggist it is supplied in the form of raspings or turnings. Quassia, like other pure vegetable bitters, tends in small quantity to excite appetite and promote digestion. In large dose it nauseates. It is sometimes used in medicine as a stomachic bitter, but other less harsh and disagreeable bitters are generally preferred. Cups turned out of the solid wood are sometimes employed to prepare a weak quassia infusion by simply allowing cold water to stand for a few minutes in them. The water speedily becomes impregnated with the bitter principle, and may then be drunk. Edward Curtis.

Quater'nions [Lat. *quaternio*, "a set of four"]. The calculus of quaternions is an algebra of four units, invented by the late Sir William Rowan Hamilton, Andrews professor of astronomy in the University of Dublin and royal astronomer of Ireland, for the purpose of expressing and investigating the relations of Space, directional as well as quantitative. The four units, in the common presentation of the subject, are the unit of number and three unit-lengths, denoted by i, j, k, taken in mutually perpendicular directions, and corresponding to the three dimensions of extension; but any four independent functions of these units may be substituted for them.

(1) The elements of quaternions are *numbers* and *directed right lines*. Hamilton calls numbers Scalars, regarding them as forming one continuous *scale*, which extends from $-\infty$ to $+\infty$. He refers the conception of number, in accordance with Kantian principles, to the intuition of Time, and calls common algebra the science of Pure Time, in contrast to geometry as the science of Pure Space. This view forms a part of a very interesting general theory of the nature of mathematics, but the principles of quaternions have no necessary dependence on it.

(2) A right line, regarded relatively to *both length and direction*, is called by Hamilton a Vector, because it represents that operator which *carries* a point from one definite position to another. A vector is the complete expression of the geometric *difference of position* of its extremities. Thus, we may write (using the signs in the geometric sense)—

$$\mathrm{AB} = \mathrm{B} - \mathrm{A}\,,\ \mathrm{B} = (\mathrm{B} - \mathrm{A}) + \mathrm{A} = \mathrm{AB} + \mathrm{A}\,;$$

and we have $\mathrm{BA} = -\mathrm{AB}$, as in Cartesian geometry, which may be regarded as only an imperfect form of quaternions. Two vectors are equal if they have the same length and the same direction.

Since a vector represents the relative position of two points, it involves three distinct numerical (or scalar) elements, answering to the three dimensions of space. These may be taken according to any system of Cartesian co-ordinates, or they may be left implicitly involved in a single symbol, such as α, used to denote a vector.

(3) Vectors are added *geometrically*. For if A, B, C are any three points in space,

$$\text{B} = (\text{B} - \text{A}) + \text{A},\ \text{C} = (\text{C} - \text{B}) + \text{B} = (\text{C} - \text{A}) + \text{A};$$
$$\therefore \quad (\text{C} - \text{A}) = (\text{C} - \text{B}) + (\text{B} - \text{A}),\ \text{or AC} = \text{BC} + \text{AB}.$$

This addition includes the *algebraic* addition used in Cartesian geometry as a special case. The theory of the parallelogram shows that the addition of vectors is *commutative;* that is, that $\alpha + \beta = \beta + \alpha$.

If $\alpha = \text{OA}$, and $\beta = \text{OB}$, then $\beta - \alpha = \text{AB}$. Again, $\rho = x\alpha + (1 - x)\beta$, where x is variable, is the equation of the line AB; $\rho = x\alpha + y\beta$ is the equation of the plane OAB; while *any vector* ρ may be written in the form $\rho = x\alpha + y\beta + z\gamma$, provided α, β, γ are not complanar, and (in particular) in the useful form

$$\rho = xi + yj + zk,$$

where i, j, k are the units already named, and x, y, z are the projections of ρ on the directions i, j, k, and represent the three scalar elements of ρ.

In general, $\rho = \alpha$ represents a point, $\rho = fx$ a curve, $\rho = f(x, y)$ a surface, and $\rho = f(x, y, z)$ any point in space, f in all these cases denoting a vector function.

(4) A vector α may be converted into any other vector β (or into a vector geometrically equal to β) either by *adding* to α the vector $\beta - \alpha$, or by *multiplying* it by a factor $\beta\alpha^{-1}$, which changes its length in the required ratio and turns it through the required angle in the plane $\alpha\beta$. This factor involves FOUR distinct scalar elements, which may be taken in various ways; for example, as the ratio of the lengths, the angle between the lines, and the two angles which determine the aspect of the plane. It is therefore called a QUATERNION.

(5) The *addition* of quaternions is defined by the formula $(q + r)\ \alpha = q\alpha + r\alpha$. Thus, if $\beta = q\alpha$, and $\gamma = r\alpha$, then $\beta + \gamma = (q + r)\alpha$; and we have, as for vectors, $q + r = r + q$.

The *multiplication* of quaternions is defined by the formula $pq\alpha = p.q\alpha$. Thus, if $\beta = q\alpha$, and $\gamma = r\alpha = p\beta = p.q\alpha$, then $r = pq$. In common algebra, multiplication is *associative, distributive,* and *commutative;* that is, it obeys the laws—

$$pqr = p.qr = pq.r,$$
$$(p + q)\ (r + s) = pr + ps + qr + rs,$$
$$pq = qp.$$

Quaternion multiplication is found to be associative and distributive, but in general NON-COMMUTATIVE. Hence, in quaternion formulas the order of the factors of any product must be carefully observed. But *scalar* factors are subject only to the rules of common algebra.

(6) If α and β are parallel, $\beta\alpha^{-1}$ is reduced to a single element; for it becomes a positive or negative scalar. Thus, scalars may be regarded as special forms of quaternions.

If α and β are perpendicular to each other, $\beta\alpha^{-1}$ involves only *three* arbitrary elements, since its angle is given. It occurred to Hamilton to consider a *vector,* perpendicular to the plane $\alpha\beta$, and bearing the same ratio of length to a unit-vector that β bears to α as a *multiplier,* equivalent to the quadrantal quaternion $\beta\alpha^{-1}$; and this procedure he justified by showing that it is consistent with the rules of addition and multiplication. It may be likened to the representation of a couple by its axis in mechanics. To the happy discovery of the possibility of this substitution, which makes a vector (as well as a scalar) a special form of quaternion, and enables us to express any quaternion in terms of the four units already named, and to combine scalars, vectors, and quaternions with perfect freedom, the simplicity and power of the system are largely due. The product of *any* two vectors, again, is a quaternion, by the principle $pq = r$, and, conversely, any quaternion may be represented by an expression of the form $\alpha\beta$, which is often preferable to the form $\beta\alpha^{-1}$.

Again, α and β being any two vectors, if β' and β'' are the resolved parts of β parallel and perpendicular to α, we have $\beta\alpha^{-1} = \beta'\alpha^{-1} + \beta''\alpha^{-1}$, of which the first term, being a scalar, is called the SCALAR of $\beta\alpha^{-1}$, $S\beta\alpha^{-1}$, and the second term, being a vector, is called the VECTOR of $\beta\alpha^{-1}$, $V\beta\alpha^{-1}$. Thus, any quaternion may be resolved by the formula

$$q = Sq + Vq,\ \text{or}\ q = w + xi + yj + zk,$$

a form which exhibits the four scalar elements of q as coefficients of the four units, 1, i, j, and k. We have also $S(p + q) = Sp + Sq$, $V(p + q) = Vp + Vq$.

(7) Any quaternion q may be resolved into the product of two factors—a stretching factor, called the TENSOR of q, Tq, which changes the length of the vector on which q operates; and a turning factor, called the VERSOR of q, Uq, which changes the direction of the vector; and these two factors may be regarded as operating in either order. The tensor of a vector is its length, and the versor is a unit-length in the direction of the assumed vector. We have then

$$q = Tq.Uq = Uq.Tq,\ \alpha = T\alpha.U\alpha = U\alpha.T\alpha,\ T\frac{\beta}{\alpha} = \frac{T\beta}{T\alpha},\ U\frac{\beta}{\alpha} = \frac{U\beta}{U\alpha},$$

and in general $T(pq) = Tp.Tq$, $U(pq) = Up.Uq$.

A tensor is always a positive, or more properly a *signless,* number. If α and β are equal in length, $T\alpha = T\beta$; if they are parallel, $U\alpha = \pm U\beta$; and for any two vectors, $TU\alpha = TU\beta = 1$. The tensor of a scalar is its arithmetical value; the versor of a scalar is ± 1. Again, $Sq = Tq.\cos \angle q$, $TVq = Tq.\sin \angle q$.

(8) A unit-vector, regarded as a quaternion, is a *semi-inversor,* and hence its square is an inversor. That is, if $T\alpha = 1$, $\alpha^2 = -1$; and, in general, $\alpha^2 = -T^2\alpha$. *Any unit-vector* (or any quadrantal-versor), then, is a representation of $\sqrt{-1}$, which thus has *an infinity of different real values;* but all these are to be distinguished from the symbolical *scalar* $\sqrt{-1}$, which is without interpretation, and which may present itself in quaternions, as in ordinary analysis. Hamilton calls scalars, vectors, and quaternions which involve the scalar $\sqrt{-1}$, *biscalars, bivectors,* and *biquaternions.* But the expediency of using these distinctive terms is doubtful, since the imaginary appears to be a necessary development of scalar number. This, however, is a branch of the subject which remains to be more fully investigated. Hamilton has generally refrained from the use of scalar imaginaries in his applications.

(9) If i, j, k are so taken that rotation from j to k is positive relatively to i as an axis, we have the following important relations:

$$ij = -ji = k,\ jk = -kj = i,\ ki = -ik = j,$$
$$i^2 = j^2 = k^2 = ijk = jki = kij = -kji = -ikj = -jik = -1.$$

(10) Any quaternion q may be written in the form $m\,(\cos\theta + \alpha\sin\theta)$, where $m = Tq$, $\theta = \angle q$, and α (a value of $\sqrt{-1}$) is a unit-vector perpendicular to the plane of q (and $= UVq$); or again in the form α^n, where $n = \frac{\angle q}{90°}$, $T\alpha = \sqrt[n]{Tq}$, and $U\alpha = UVq$. The analogy of these forms to those used in Cauchy's calculus of imaginaries will be immediately recognized. Since the angle of the product of two complanar quaternions is obviously the sum of the angles of the factors, we have at once the rule for the multiplication of imaginaries and De Moivre's Theorem; and the general formulas of plane trigonometry are readily deduced from the same simple principle.

(11) The CONJUGATE of a quaternion ($= Sq - Vq$) is an important form in the development of general equations and in effecting reductions in particular cases. But, within the limits necessarily allotted to this article, it is best to restrict the discussion to matters of general principle and a few of the most primary notations, without attempting to give any idea of the practical working of the calculus.

(12) Since the sum or the product of two quaternions is a quaternion, it follows that any algebraic function—and, by the doctrine of series, any transcendental function—of quaternions is a quaternion; and no more complicated orders of quantity can be introduced into the calculus, at least by *direct* functional operations.

We have considered equations of the forms $\rho = fx$, $\rho = f(x, y)$, $\rho = f(x, y, z)$. But the forms of equations most characteristic of quaternions are those which involve explicitly no scalar variables. The equation $\phi\rho = a$, where a is a given quaternion, is not generally possible, being equivalent to four *scalar* equations in three variables, unless the four elements of a are connected by one or more relations determined by the form of ϕ. If ϕ determines one relation, which a satisfies, the equation is determinate; if two, we have the equation of a curve; if three, the equation of a surface. Thus, a scalar equation in ρ is the equation of a surface; while a vector equation is regularly determinate, but may belong to either of the other classes. For example, $S\alpha\beta\rho = 0$ is the equation of the plane $\alpha\beta$; $\rho^2 = \alpha^2$, or $S(\rho + \alpha)(\rho - \alpha) = 0$, or $T\rho = T\alpha$ is the equation of a sphere; $\rho = \alpha$ and $V\alpha\beta\rho = \gamma$ give but one point each; $V\alpha\rho = \gamma$ is the equation of a straight line parallel to α, provided γ is perpendicular to α, and is otherwise impossible; $V.V\alpha\beta V\alpha\rho = 0$ is the equation of the plane $\alpha\beta$. The general solution of a quaternion equation of the first degree is treated fully by Hamilton in the *Elements,* and forms one of the most ingenious and profound sections of that great work.

(13) The *differential* of a function fq is a linear and homogeneous function of dq, but not generally reducible to the form $f'q.dq$, on account of the non-commutative character of quaternions. For example,

$$d(q^2) = dq.q + q.dq,\ \text{but}\ not = 2q.dq,$$
$$d(q^{-1}) = -q^{-1}.dq.q^{-1},\ \text{but}\ not = -\frac{dq}{q^2}.$$

In fact, $\frac{dfq}{dq}$ involves not only q, but also the arbitrary

ratios of the four scalar elements of dq. Hence, in quaternion differentiation the differential alone is sought; while the derivative has, in general, no meaning, unless the independent variable is a scalar. For the differentiation of an implicit or inverse function the solution of a linear equation is necessary.

For the sake of exhibiting the differential as a *finite function*, Hamilton has devised the following formula of definition, in which dq is an arbitrary finite quaternion:

$$\mathrm{d}fq = \lim_{n=\infty} n\left\{f\left(q+\frac{\mathrm{d}q}{n}\right)-fq\right\}.$$

This definition is not essential to quaternion differentiation, which may be simplified by the use of infinitesimals, but it exemplifies Hamilton's extreme devotion to rigor of demonstration, and it is by far the best form of the method of limits that has been proposed, and equivalent to the Newtonian conception of a fluxion.

(14) The calculus of quaternions may be regarded in two lights—as a contribution to mathematical philosophy, and as an instrument of research. Its value, in the former point of view, is probably undisputed; and it has had a strong influence in deepening the channel of mathematical thought, and in reducing many obscure questions in first principles to their true elements. Its utility as a method was long regarded with much skepticism. But the mathematical world has been coming more and more to acknowledge its value; and it no longer seems extravagant to maintain that Hamilton's profound calculus is the most powerful instrument of investigation that mathematicians have yet possessed, and that by which the next great advance in their science is likely to be made.

Among the practical merits of quaternions may be named—the directness with which this calculus seizes on the fundamental relations of geometry and mechanics, without reference to arbitrary axes; the ease and naturalness of its conceptions; its power of embodying in one simple equation all that is expressed by several (generally more complicated) equations of ordinary analysis; the variety and facility of its transformations, whereby the leading theorems, including those commonly esteemed the most difficult, readily emerge from the axioms; the natural prominence it is found to give to those conceptions which have proved themselves the most fertile as principles of research; and the readiness with which its equations can be translated at any time into common algebraic language. The whole trigonometry of the plane triangle is contained in, and easily deduced from, the single obvious equation $\alpha = \beta + \gamma$. Spherical trigonometry, likewise, is embodied in one simple equation. The tangent to a curve of which ρ is the variable vector is dρ, while the curvature of a curve and the velocity and acceleration of a moving point are equal, in amount and direction, to $\mathrm{D}_s{}^2\rho$, $\mathrm{D}_t\rho$, $\mathrm{D}_t{}^2\rho$; and $\mathrm{D}_t{}^2\rho = \mathrm{D}_s\rho\mathrm{D}_t{}^2s + \mathrm{D}_s{}^2\rho(\mathrm{D}_ts)^2$—which is one of the general formulas of the common differential calculus—gives at once the tangential and normal accelerations. The equations $\Sigma\beta = \Sigma\mathrm{V}\alpha\beta = 0$ are equivalent to the six general equations of statics; and $\Sigma(m\mathrm{D}_t{}^2\alpha - \beta) = \Sigma\mathrm{V}\alpha(m\mathrm{D}_t{}^2\alpha - \beta) = 0$ to the six general equations of dynamics. So compendious and so powerful is the quaternionic method that Hamilton has been able, in the compass of 270 pages, to treat the higher geometry very fully, and the leading principles of analytic mechanics, in such a way as to develop the great modern methods as natural outgrowths from what has happily been termed his "simple and symmetrical, yet massive," calculus.

The drawback to the use of quaternions lies in the necessity of forming new algebraic habits—of gaining the same command of quaternion transformations that the skilful analyst has of the ordinary methods. This difficulty is far less formidable than it seems at the first glance; but for its complete removal we must look to the study of quaternions by young mathematicians, which it is to be hoped the universities will soon more decidedly encourage.

(15) The first publication on the subject of quaternions was in a paper presented to the Royal Irish Academy in 1843 (*Trans.*, vol. xxi., 1848). Hamilton's *Lectures on Quaternions* (Dublin, Hodges and Smith) appeared in 1853, and his *Elements of Quaternions* (London, Longmans) in 1866. The former of these works is still valuable for its preface, containing an account of the researches which led up to the conception of quaternions, for its philosophical discussions, for the variety of interesting lights in which the fundamental principles of the subject are presented, and for its characteristic style, breathing the remarkable genius of its author, but made wearisome by its excessive fulness of expression and by a singular profusion of parentheses, italics, and capitals. As a systematic exposition it is wholly superseded by the later volume, which contains also many new developments (notably, the remarkable general solution of a linear equation and the physical applications), and is truly encyclopædic in the range and vastness of its learning. The author died just as this work was on the eve of publication, leaving it a few pages short of completion. Tait's *Elementary Treatise on Quaternions* (Clarendon Press, 1867; 2d ed. 1873) is much shorter than Hamilton's great volume, being limited, in the treatment of general principles, to matters of the first practical importance, and is invaluable to the student who wishes to gain a *working* knowledge of the new calculus. The principal original value of this work is in the physical applications (to electro-dynamics, etc.), where Prof. Tait has made important contributions to the development of the quaternionic method. Kelland and Tait's *Introduction to Quaternions* (Macmillan & Co., 1873) is meant for beginners. It closes with a valuable chapter by Prof. Tait, not included in his own treatise. The reader is further referred to an article by Hamilton in Nichol's *Cyclopædia of the Physical Sciences* (London and Glasgow, 1857); and, for an interesting account of Hamilton and of his various remarkable scientific achievements, to the *North British Review* for Sept., 1866; also to the *Proceedings of the London Mathematical Society* (vol. iv. p. 381) for a proposed extension of quaternions, under the name of biquaternions (not used in Hamilton's sense of the word), by Prof. W. K. Clifford, founded on a distinction between equal vectors not parts of the same line. (See also the article QUALITATIVE ALGEBRA.) J. M. PEIRCE.

Quatre Bras. See WATERLOO.

Quatrefages′ de Bréau, de (JEAN LOUIS ARMAND), b. at Berthezème, department of Gard, France, Feb. 10, 1810; studied medicine and natural science at Strasburg, Toulouse, and Paris; made extensive scientific voyages along the coasts of the Atlantic and Mediterranean, in Italy, and Sicily, and was appointed professor of natural history at the Lycée Napoléon in 1850, and in 1855 at the Historical Museum of anatomy and ethnology. Of his numerous writings, several have been translated into English: *Souvenirs d'un Naturaliste* (1854; London, 1857), *Métamorphose de l'Homme et des Animaux* (1862; London, by H. Lawson, 1864), *Histoire de l'Homme* (1869; New York, by Miss E. Youmans, 1875), *Charles Darwin* (1870), *La Race prussienne* (1871), *Crania Ethica* (1875).

Quatremère′ (ÉTIENNE MARC), b. at Paris July 12, 1782; studied Oriental languages; became professor of Greek at Rouen in 1809, of Hebrew, Chaldaic, and Syriac at the Collége de France in 1819, of Persian at the School of the Living Oriental Languages in 1827. D. at Paris Sept. 18, 1857. He wrote *Recherches sur la Langue et la Littérature de l'Égypte* (1808), *Mémoires geographiques et historiques sur l'Égypte* (1810), *Observations sur quelqués Points de la Géographie de l'Égypte* (1812); edited and translated Rashid ed-Din's *Histoire des Mongols en Perse* (1836) and Makrizi's *Histoire des Soultans Mamlouks* (1837–40).

Quatremère de Quincy (ANTOINE CHRYSOSTOME), b. at Paris Oct. 28, 1755; studied archæology and art; took part very actively, but always as a staunch royalist, in the various movements of the Revolution; was appointed superintendent of public monuments in 1815; professor of archæology in the Royal Library in 1818; censor in 1824. D. at Paris Dec. 28, 1849. His most remarkable works are *Le Jupiter olympien* (1814), *De l'Imitation dans les Beaux-Arts* (1823; translated into English in 1837 by C. Kent), *Raphaël* (1824), *Canova* (1834), *Michel-Ange* (1835), *Monuments et Ouvrages d'Art antique restitués* (1826–28).

Qua′ver, in music, a note which in point of duration is an eighth of a semibreve, a quarter of a minim, or the half of a crotchet.

Quebec′, Province of, formerly **Lower Canada** or **Canada East,** the second in population of the provinces of the Dominion of Canada, having an estimated area of 210,000 sq. m. It lies almost entirely in the valley of the St. Lawrence, extends indefinitely northward toward Hudson's Bay, is bounded E. by Labrador and the Gulf of St. Lawrence, S. E. by New Brunswick, Maine, and New Hampshire, S. for a short extent by the States of New York and Vermont, and S. W. by the province of Ontario, from which it is for the most part separated by the navigable river Ottawa.

Geology and Physical Geography.—The level country (the Champaign of Canada) on either side of the St. Lawrence is limited by a range of mountains—the Laurentides on the N. and the Notre Dame range on the S. The former are connected by transverse spurs with the Adirondack system; the latter are continuous with the Green and White mountains. The great northern hill-region is composed of Laurentian rocks, and is scarcely habitable except in low fertile valleys, but it affords immense supplies of timber. On the S. E. of the Champaign of the valley of the St. Lawrence occurs the wooded hill-country called the Seigniories; and still farther E. and S., the "Eastern

Townships," on the S. E. slope of the southern hills. The crystalline rocks of this region are softer than those of the Laurentides, and the country is a succession of fertile, prosperous valleys, with hills densely timbered and rocks bearing copper ores, iron, galena, small quantities of silver and gold, many varieties of marble and serpentine, and excellent granites, slates, and soapstones. The champaign country is for the most part productive, though much injured by generations of improvident and unskilful tillage. Bog-iron ore, sandstone, limestone, etc. are found. The Gaspé peninsula is a rocky but fertile region, much resembling the Eastern Townships, and having small amounts of gold, with petroleum from the Devonian limestone, and also sandstone, shell-marl, etc.

Crown and other Lands.—Three-fourths of the area of Quebec consist of crown-lands, the timber of which is sold by agents, who have also the power to sell lands to settlers and others, the settlers having easy terms granted them for payment. There are also limited areas of free-grant lands which are given away to actual settlers. Some lands settled under the French *régime* are held in fiefs and seigniories, other lands in free and common socage, and others still are held by letters patent. Since 1850 there has been an extensive colonization of new lands, mostly by French-speaking natives of the province. The newly-settled tracts are the valley of the upper Saguenay, the valley of the St. Maurice, that of the Ottawa, parts of the Eastern Townships, the Matapediac Valley and vicinity in the E. of the province, and the fertile but rocky peninsula of Gaspé.

Climate.—The climate of this province is severe in the long winter and warm in the summer, except on the lower St. Lawrence, where the summers are usually cool. The valley of the upper Saguenay is sheltered from the N. winds, and hence has a mild climate. The same is true of the south-eastern counties to the N. of Vermont, and of the Gaspé region. Wheat, oats, barley, potatoes, buckwheat, dairy products, fruit, and wool are extensively raised, and cattle and horses are largely exported to the U. S. Indian corn does well, but not in all parts.

Territorial Divisions.—Quebec is divided into 64 counties, inclusive of Saguenay, Labrador (the S. coast), and the Magdalen Islands, and exclusive of the proposed counties on the island of Anticosti. The counties are representative and registration districts, the province being for judicial purposes divided into 20 districts. Superior courts and courts of general sessions and queen's bench are held at Montreal and Quebec. The parts of the colony settled by the French are divided into seigniories and parishes, the latter established by the Roman Catholic bishops, but only on requisition of the majority of the inhabitants. The English-settled regions are divided into townships, which are, when practicable, ten miles square. Both the civil and the common law are administered in the courts. The provincial government has its seat at Quebec. It is administered by a lieutenant-governor and an executive council or ministry of seven members. The provincial parliament consists of a legislative council of 24 members, appointed for life, and a legislative assembly of 65 elected members. To the Dominion Parliament Quebec sends 20 senators and 65 members of the House of Commons.

Ecclesiastical Affairs.—The majority of the people of the province are Roman Catholics. In 1871 they numbered 1,019,852, the Protestants 169,232, Jews 549, and all others 1883. The Anglican Church has a bishop at Montreal (metropolitan of Canada) and another at Quebec. The Roman Catholics have an archbishop at Quebec and bishops at Montreal, Ottawa (diocese partly in Quebec), Three Rivers, St. Hyacinthe, and Rimouski. The Presbyterian Church of Canada is a branch of the Kirk of Scotland. The Canada Presbyterian Church is independent. The Baptists, Congregationalists, the various Methodist churches, and others have but little strength in this province as compared with Ontario.

Education is under a minister of public instruction, assisted by a council of 21 members—14 Roman Catholics and 7 Protestants. Public schools are maintained by a moderate tax, and in small municipalities are assisted by a government contribution. If a majority of the local school commissioners are conceived by the minority to manage the schools too decidedly in the interest of any particular sect or Church, they are allowed to establish dissentient schools. There are two Roman Catholic and one Protestant normal school supported by the province. The other public schools are called primary, model, and special schools (agricultural, high, commercial, industrial, classical, reformatory, etc.). The classical schools in 1869 numbered 15. There are two Protestant universities—the University of Bishop's College at Lennoxville, and the McGill University, to which are affiliated McGill College, Montreal, St. Francis College and Grammar School at Richmond, Morrin College, Quebec, and the Congregational College at Montreal. The Laval University at Quebec is a Roman Catholic institution. There are also a large number of Roman Catholic and a few Protestant schools known as colleges, some of them large and prosperous institutions, and others merely commercial or grammar schools. The religious of the various Roman Catholic orders of nuns sustain a large number of schools for young ladies, many of them of high order. There are 6 Roman Catholic seminaries for priests, and attached to the universities there are medical and law schools and Protestant divinity schools.

Industry and Commerce.—The accessible Dominion returns upon these subjects do not fully discriminate between the statistics of the various provinces. But the trade of Quebec is enormous, and in 1871 it afforded 50.26 per cent. of the whole customs revenue of the Dominion, although a large part of the goods dutiable at Quebec and Montreal are consumed in Ontario and the N. W. provinces. The exports (chiefly to Great Britain, the U. S., and British and Spanish West Indies) are manufactured forest products, fish and fish oils, horses, wool, furs, cattle, hides, shipping, grain, flour, and the ores of metals. A large proportion of these are produced in Ontario.

History.—In 1534, Jacques Cartier entered and named the Bay of Chaleurs and took possession of the Gaspé country for the French king. In the following year he entered and named the gulf and river of St. Lawrence, and sailed as far up as where Montreal now stands. In 1541 the French temporarily colonized the country, but the first permanent settlement was at Quebec in 1608. In 1627 the viceroyalty was abolished, Canada was granted to the "Company of One Hundred Partners," and the feudal system established. In 1629, Quebec was taken by the English, but in 1632 was restored by treaty to the French. Montreal was settled in 1642. From 1640 to 1701 the French colonists were engaged almost constantly in bloody warfare with the Iroquois, who were the allies of the English colonists in what are now the U. S., and the hereditary enemies of the Algonkins, allies of the French. The frequent wars between Great Britain and France during this period extended to the colonies, and the French in Canada gave and received many cruel blows in the contests with the English colonies to the southward—contests embittered by the religious bigotry of both parties. In 1759, Quebec was taken by Gen. Wolfe, and in 1760, Canada was surrendered to the British—a surrender confirmed by the Treaty of Paris (1763). The people were kept under military rule, which caused the greatest discontent, but in 1774 the "Quebec act" established the civil law and granted religious freedom to the Roman Catholics. The denunciation of this act by the Philadelphia Congress in that year effectually alienated the Canadians from any sympathy with the American Revolution, and the subsequent efforts of Franklin and others, who promised all that the Canadians had demanded, failed to accomplish anything toward drawing Canada into the union of the more southern colonies, and the invasion of the Revolutionists entirely failed (1775–76). In 1791, owing to jealousies between the English and French speaking colonists, the province was divided into Upper and Lower Canada, and representative governments were established. But the mutual jealousies caused by differences of race and religion still existed, and in 1837–39 numbers of the Catholic party joined with the republicans of Upper Canada in insurrection, the causes of French discontent being chiefly the establishment of Anglican rectories in Upper Canada upon government lands and the proposed reunion of the provinces. The union was accomplished in 1841, and Lower Canada took the name of Canada East, but the local government was abolished, and the seat of government of the province of Canada was established, first at Kingston (1840–43), then at Montreal (1843–50), then at Toronto (1850–52), and then at Quebec (1850–58); but in the latter year Queen Victoria named Ottawa as the permanent seat of government. Great discontent prevailed in Canada East, especially at the proposal of the English-speaking residents to establish representation according to population—a measure which would give great preponderance to Canada West. This discontent led to the division (in 1867) of the province of Quebec from that of Ontario, and the formation of the Dominion Government. (See CANADA, DOMINION OF.) This change has led to the happiest results. Local jealousies have been appeased and most unexpected commercial prosperity has followed.

The capital is at Quebec. White pop. in 1640, about 300; in 1661, less than 2500; in 1665 (first census), 3261; in 1698, 13,815; in 1719, 22,000; in 1744, nearly 50,000; in 1754, 55,000; in 1760 (at the conquest), 67,000; in 1770, 91,078; in 1791, 125,000 (120,000 speaking French); in 1806 (according to Bouchette), 250,000; in 1825, 450,000; in 1821, 397,000 (estimate of W. Kingston); in 1831,

548,214 (census); in 1841, 661,380 (W. Kingston); in 1851 863,860 (W. Kingston); in 1861, 1,111,566 (census); in 1871 (Dominion census), 1,191,575. Between the years 1861 and 1871, says Kingston, not less than 150,000 persons removed from Lower Canada to the U. S.

CHARLES W. GREENE.

Quebec, county of the province of Quebec, Canada, extending N. W. from St. Lawrence River and reaching far into the northern wilderness. Much of its surface is bold and broken, presenting remarkable scenery. Cap. Quebec. P. exclusive of city, 19,607; total p. 79,406.

Quebec,* city, capital of the province of the same name, was founded July 3, 1608, by Samuel de Champlain of Broccage in Saintonge, France, who became equally famous as a geographer, a navigator, and a discoverer. The city lies on the left bank of the river St. Lawrence, at its confluence with the St. Charles, 250 miles from the mouth of the St. Lawrence, at Point des Monts, 180 miles N. E. of Montreal, lat. 46° 48″ 17‴ 3. Mean temperature in winter, 10°; in summer, 68° F. Mean temperature of the year, 39°. Until 1791, Quebec was the capital of Canada, then known under the name of the province of Quebec; the confederation of the British provinces in 1867 restored it to its former honors in Eastern Canada; it then resumed its place as capital and seat of government of the old province of Quebec. The city is very picturesquely situated between the two rivers, at the N. E. extremity of a narrow but elevated table-land, which for about 8 miles forms the left bank of the St. Lawrence from Cape Rouge. Cape Diamond, the eastern end of this promontory, is 333 feet above the level of the river, to which it presents a nearly precipitous face; it slopes more gradually toward the little river St. Charles, so named from the grand vicaire, Charles de Boues. The Indians, says Layard, on account of the multitude of its windings, called it Cahir-Cantiat.† Opposite Cape Diamond the St. Lawrence is contracted to a breadth of 1133 yards 2 feet 9 inches from the Queen's to McKenzie's wharf, but immediately below, at the confluence of the St. Charles, it spreads out into a broad and beautiful basin more than 2500 yards wide, forming a capacious and excellent harbor, in which the spring tides rise 18 feet. Quebec is divided into the upper and lower town. The upper, which occupies the highest part of the promontory, is surrounded by high and massive walls, and until lately had five very picturesque gates—Prescott Gate, rebuilt by Gen. Robert Prescott in 1797; St. Louis Gate, which dates from the era of Frontenac (1694); St. John's Gate, of the same date, but rebuilt in 1869 by the municipality of Quebec according to plans sanctioned by the royal engineer department; Palace Gate, which existed in 1760, but was rebuilt about 1815; and Hope Gate, built in 1786 under the administration of Gen. Henry Hope. The lower town, the seat of wholesale commerce and shipping, is built around the base of Cape Diamond, on a narrow strip of land reclaimed from the St. Lawrence by the construction of wharves. On the St. Charles side the water at flood-tide until 1816 washed the very foot of the rock, but from time to time wharf after wharf has been projected toward low-water mark, and foundations made sufficiently solid on which to build whole streets where seagoing vessels formerly rode at anchor; at the end of some wharves there is as much as 50 feet of water at low tide, and the water in the harbor, if anything, is too deep, if such could be reckoned a fault.

The arrivals of ships from sea at Quebec average about 1200 to 1300, a large proportion of which are ocean-steamers of very large tonnage. Over and above the Allan line, one of which leaves the port in summer every Saturday at 10 A. M., there are two other English lines. The size of the harbor and its depth can be estimated from the fact that the Great Eastern rode securely in it for several days in 1861. Quebec is accessible all the year round by means of the Grand Trunk Railway and its magnificent Pullman cars. During the summer months the superb steamers owned by the Richelieu Co. bring every morning their myriads of wealthy tourists attracted by the unrivalled scenery of Quebec, its historical memories, and its fortifications, beautiful drives, and the sea-bathing in the lower St. Lawrence.

Quebec for more than a century was the Gibraltar of French power in America, until its capitulation by Chevalier de Ramsay to Brig.-Gen. Townsend on Sept. 18, 1759, five days after the defeat of the French under the chivalrous marquis of Montcalm on the Heights of Abraham, the 13th of that month, 1 mile from the city walls, where a small monument commemorates the death of his heroic rival. The fortress has played a remarkable part in the military annals of North America, both under its French and English masters. More than once under its frowning battlements some of the most warlike races of the Old World or proudest of the New have met in hostile array. The citadel, which occupies about 40 acres on the loftiest plateau of Cape Diamond, and its outlying fortifications, were originally designed by the famous French engineer Vauban, and several military strategists, De Levy, Levasseur, De Callières, etc., added much to them subsequently. The modern citadel and its surrounding walls, etc. are chiefly due to the imperial government of Britain, and are built on plans approved by the duke of Wellington in 1823. Quebec is one of the few walled cities on the continent; from its position, and especially since the erection of the new casemated forts at Levi in 1867–69, and its armament of rifled artillery, it is supposed to be the strongest fortress in North America. The place, though provided by nature with one of the finest harbors in the world, and enjoying rare facilities for a commercial emporium, was originally planned as a fortress and subsequently became a garrison-town: this character will always remain its distinctive feature. Dating long before the period when American cities were laid out with broad streets at right angles, squares, and boulevards, it had the circuitous paths of the forest for streets, the mountainous character of the lofty promontory on which it stands in some cases offering insurmountable obstacles to regularity of design and evenness of locomotion. Its founder and first governor, Champlain, built his "habitation," stores, and magazines at the foot of Mountain Hill, on a spot facing the river, where the present church of Notre Dame de la Victoire was erected 1691 in commemoration of the repulse of Admiral Sir William Phipps, who with a powerful fleet from the neighboring British provinces unsuccessfully bombarded the city, whilst a detachment under Maj. Walley was landed and defeated on the Beauport flats by Le Moine de St. Hélène, Duchesnay, and other colonists of note, and whilst De Marceaux pointed from the city walls the guns against Phipps's ships. More than once the solid walls of the city protected its inmates against the tomahawk of the savage Iroquois or the inroads of the neighboring English colonists.

Quebec is famous for the number of sieges it underwent, and more especially, for saving Canada to British rule when Montreal and other cities had accepted the yoke at the hands of Arnold and Montgomery in 1775. In its infancy in 1629 it was surprised and surrendered to Sir David Keith, who had anchored unannounced with a powerful fleet in the harbor; Champlain and all his colonists except five families returned to France; England held it three years, and returned it in 1632 by the Treaty of St. Germain-en-Laye, together with the Acadian peninsula and Cape Breton. In 1690 it stood a memorable siege on behalf of Sir William Phipps, governor of Massachusetts. In 1711 it had a providential deliverance from the armada of Sir Hovenden Walker, who had 8 transports, containing 881 officers and men, wrecked and lost on Egg Island in the lower St. Lawrence on Aug. 22, 1711. In 1759 the colony, deserted by France, and left to struggle against all the power of England, after successfully resisting Wolfe from June to September, succumbed, when the flag of St. George supplanted the Gallic lily on the ramparts of Quebec. In 1775 one of Wolfe's brothers-in-arms, Richard Montgomery, late captain in the 17th Foot, being well acquainted with the *locale*, seconded by a daring officer, the traitor Benedict Arnold, undertook to eject from British territory the British troops, whom, under Amherst, he had helped to lead. His devotion to his newly-adopted country brought him, at Près de Ville, beneath Cape Diamond, a soldier's grave at the early age of forty.

Quebec has ceased to be a garrison-town, and several portions of its works and defences have been handed over to the town council, which has already successfully obliterated a portion of its walls and gates and other landmarks of its warlike past, which by their memories were a source of so much interest to travellers. There are yet, however, beyond the city limits several interesting monuments, and picturesque scenery which is safe against municipal improvement and is well worthy of the attention of tourists.

Quebec, as a seat of learning, by its university, old foundations, religious as well as educational, deserves notice. The Laval University, founded in 1854, under an imperial charter, together with the Seminary of Quebec, founded in 1663, is a seat of learning and education of which the whole province feels proud. The Ursuline convent was founded in 1641; the Hôtel-Dieu in 1639; the General Hospital in 1690; the Jesuits' College, occupied since 1764 as a barrack for English troops, was founded by the marquis De Gamache in 1635; the Morrin College was

* According to the Père Lacombe (1874), *Quebec* is derived from the native word *kepâk* or *kepek* ("it is closed"), because the river appears to be closed by Cape Diamond in ascending, and by Ile d'Orléans in descending.—EDS.

† According to Major Graham, U. S. A.

endowed by the late Dr. Joseph Morrin in 1860, and opened Nov. 6, 1862; the Literary and Historical Society was founded by the earl of Dalhousie, then governor-general of Canada, in 1824; there are also a number of educational or religious institutions of a later date. A number of manufactures have sprung up of late years in the suburbs of the city, but the chief industry from the beginning of the century has been shipbuilding—in the vicinity of Quebec from 20 to 30 large ships, of from 500 to 2000 tons, being sometimes built in one winter, many being beautiful models of naval architecture.

The lieutenant-governor of the province, Hon. R. E. Caron, occupies the beautiful domain of Spencer Wood. There are 19 churches in the city, and 1 synagogue. Of these churches, some own many valuable old paintings of great European masters, purchased about the era of the French Revolution. There are 7 Roman Catholic, 7 Church of England, 1 Church of Scotland, 1 Presbyterian, 1 Baptist, 1 Congregational, 1 Wesleyan. Quebec returns three members to the House of Commons at Ottawa, and three to the provincial legislature, sitting at Quebec. It is the seat of an archbishop of the Church of Rome, and of a lord bishop of the Church of England. P. in 1871, 59,699, 52,337 of whom are Roman Catholics, Irish and French Canadians. J. M. Le Moine.

Qued'linburg, town of Prussia, province of Saxony, at the foot of the Harz Mountains, on the Bode. It is an old town, founded by Henry the Fowler in 920, and surrounded with walls surmounted by towers, and has large manufactures of damask, linen, and woollen, besides breweries, distilleries, and sugar-refineries. It is the birthplace of the poet Klopstock. P. 16,402.

Quee'chee, p.-v., Hartford tp., Windsor co., Vt., on Vermont Central R. R.

Queen Anne, county of E. Maryland, bounded E. by Delaware and W. by Chesapeake Bay. Area, 400 sq. m. It has a rolling surface and a rich soil. The chief industries are agriculture and stock-raising; the principal productions, corn, wheat, wool, and swine. Cap. Centreville. P. 16,171.

Queen Anne, tp., Prince George co., Md. P. 2276.

Queen Anne's Bounty. Previous to the Reformation the profits of every spiritual benefice in England for the first year of its possession by a new incumbent were paid to the pope. (See Annates.) The right was transferred to the Crown at the Reformation, and was enjoyed by all the British sovereigns previous to Queen Anne, in whose second year (1704) an act of Parliament gave the first fruits and annates to a fund called Queen Anne's Bounty, for the benefit of the poorer clergymen.

Queen Charlotte's Islands, a small group of islands in the N. Pacific Ocean, about 80 miles from the coast of British Columbia. Only four are of any considerable size—namely, Graham, Moresby, Prevost, and North, of which the former is much the largest, having a length of 80 miles and an area of 3000 sq. m. They are little known to civilized man, being inhabited only by Indians of several tribes, supposed to number about 5000.

Queen Charlotte Sound. See Vancouver Island.

Queen City, tp., Adams co., Ia., on Burlington and Missouri River R. R. P. 398.

Queen's, an inland county of Ireland, province of Leinster, comprises an area of 664 sq. m., with a pop. of 153,792 in 1841, 111,623 in 1851, 90,650 in 1861, and 79,771 in 1871, of whom 27,461 are unable to read and write; from May 1, 1851, to Dec. 31, 1872, 31,786 persons emigrated. The surface is mostly flat, rising in the N. W. into the Sliebhloom Mountains, whose summit, Arderin, is 1734 feet high. The soil is fertile; agriculture and dairy husbandry are the principal occupations; in the southern portion are large beds of coal. The principal towns are Maryborough and Mount Mellick.

Queen's, county of New Brunswick, traversed by the navigable rivers St. John and Washademoak, and containing Grand Lake. The county contains beds of coal. Cap. Gagetown. P. 13,847.

Queen's, county in the S. of Nova Scotia, bounded S. E. by the Atlantic Ocean, which sends in numerous inlets which afford excellent anchorage. The interior is finely diversified. Cap. Liverpool. P. 10,554.

Queen's, the central county of Prince Edward Island, is an extremely fertile and well-cultivated region, traversed by Prince Edward Island Railway. Cap. Charlottetown. P. 42,651.

Queens, county of S. E. New York, comprising most of the western part of Long Island, and extending from Long Island Sound on the N. to the Atlantic Ocean on the S. Area, 410 sq. m. Its surface is much variegated, but usually somewhat hilly, has many bays and inlets on both shores, and is traversed by numerous lines of railroads. Agriculture, market-gardening, dairying, and stock-raising are extensively pursued, and important manufactures are springing up in the larger towns, favored by their proximity to Brooklyn and New York. The capital is to be Long Island City, where a new court-house is erecting. Meanwhile, the county offices are divided between North Hempstead and Jamaica. P. 73,803.

Queensbury, p.-v. and tp., Warren co., N. Y., on Hudson River, includes the village of Glen's Falls. P. 8387.

Queen's Counsel. See King's Counsel.

Queens'land, a large division of Australia, comprises the whole north-eastern part of the continent, bordering E. and N. on the Pacific Ocean and the Gulf of Carpentaria, and bounded S. by New South Wales and South Australia. Area, 678,000 sq. m. Cap. Brisbane. P. 146,690.

Queen's Metal, the trade-name for a sort of britannia or pewter used for making teapots and the like.

Queens'town, Ireland, formerly **Cove,** 9 miles S. W. of Cork and on N. side of Cork harbor, a seaport-town well known to Transatlantic travellers by steamer as the harbor touched by the Cunard and other Liverpool steamers. About 60 years ago Cove was a mere village; its rapid increase has proceeded principally from its convenient situation for the shipping in Cork harbor. There are no manufactures in Queenstown, the importance of the place being entirely dependent on the military and naval establishments in its vicinity, although the beauty of the place and its equable and delightful climate make it a resort for visitors and invalids. Until 1849 the place was known as *Cove,* when it received its present name in honor of the queen's visit in that year. P. 10,039.

Queenstown, p.-v. and tp., Queen Anne co., Md., on Chesapeake Bay. P. 1683.

Queenstown, b., Perry tp., Armstrong co., Pa. P. 201.

Quek'ett (John Thomas), M. D., F. R. S., b. at Langport, Somersetshire, England, in 1815; studied medicine at London Hospital; became a member of the Royal College of Surgeons, by which he was elected to a studentship of human and comparative anatomy; became assistant conservator of the Hunterian Museum 1843; gained a distinguished position as a microscopist by his *Practical Treatise on the Use of the Microscope* (1848); published *Lectures on Histology* (2 vols., 1852–54); became conservator of the museum and professor of histology 1856, and prepared an *Illustrated Catalogue of the Specimens in the College Museum in Lincoln's Inn Fields.* D. at Pangborne, Berkshire, Aug. 20, 1861.

Quemaho'ning, tp., Somerset co., Pa. P. 1213.

Quenemo, p.-v., Agency tp., Osage co., Kan.

Quérard' (Joseph Marie), b. at Rennes, France, Dec. 25, 1797; was for some time engaged in the publishing business in Vienna and Paris, and became widely known as a bibliographer. D. at Paris Dec. 3, 1865. His principal works are—*La France littéraire* (10 vols., 1827–42), *Les Auteurs déguisés de la Littérature contemporaine* (1845), and *Les Supercheries littéraires devoilées* (5 vols., 1845–60).

Quercitron. See Quercitron Bark.

Quer'citron Bark, or **Quercitron Tinctoria,** a valuable dyestuff obtained from the *Quercus nigra* (see Black Oak), containing a yellow crystallizable principle called *quercitrin,* scarcely soluble in water, but readily solved by weak alkalies. It yields a very durable yellow, much used in calico-printing.

Quere'taro, one of the smallest states of the Mexican confederation, between the states of Mexico, Vera Cruz, San Luis Potosi, and Guanajuato, comprises an area of 2444 sq. m., with 153,286 inhabitants, of whom a great number are Indians. The surface is an elevated plateau, the soil fertile; maize and cotton, besides all kinds of European grain and fruit, are produced; gold, silver, copper, and lead are mined; and some cotton manufactures are carried on.

Queretaro, town of Mexico, capital of the state of the same name, is beautifully situated on a fertile plain surrounded by forest-clad hills, at an elevation of 6365 feet. It is well built, contains several richly-decorated churches, and has a fine aqueduct, 2 miles long and resting on arches 90 feet high. Its manufactures of woollen and cotton goods are very important. In its cotton-spinning mills 3000 hands are employed. Its wood-carvings are celebrated. The peace between Mexico and the U. S. was ratified here by the Mexican congress in 1848. Here, also, the emperor Maximilian was besieged and captured, and June 19, 1867, was shot on the Cerro de las Campanas, overlooking the town. P. 48,237.

Quern [Ang.-Sax. *cweorn*], the old-fashioned hand-mill for grinding grain in use in Asia at the present day, as well as in the Hebrides, in Ireland, and in various remote places. The quern was made of two stones, after the manner of millstones, or it was a rude mortar of wood or stone. Examples of undoubtedly pre-historic origin are by no means uncommon.

Quesada. See XIMENES DE QUESADA.

Quesnay′ (FRANÇOIS), b. at Mérey, department of Seine-et-Oise, France, June 4, 1694; studied medicine at Paris, and was appointed first physician to Louis XV. D. at Versailles Dec. 16, 1774. He is now chiefly known as the founder of the physiocratical school of political economy. He developed his views partly in articles in the *Encyclopédie*, partly in his *Tableau économique* (1758), and other writings, which were published in a collected edition in 1768 under the title of *La Physiocratie, ou Constitution naturelle du Gouvernement le plus avantageux au Peuple.*

Quesnel′ (PASQUIER), b. at Paris July 14, 1634; studied theology at the Sorbonne; entered in 1657 the congregation of the Oratory; became director of the Paris house of the order in 1662; commenced in 1671 the publication of his famous *Réflexions morales sur le Nouveau Testament*, for the use of the young men under his charge; left the congregation in 1681; repaired to Brussels, where he joined Arnauld, and finished in 1694 the *Réflexions*, which were translated into both German and English. The book was at first considered harmless by the Roman Catholic authorities, but soon it was discovered that it really contained all the most obnoxious doctrines of the Jansenists. A hot controversy arose, and the author was denounced to the Spanish police in Brussels, and his book was condemned by the pope 1708. He fled to Amsterdam, where he afterward lived in retirement. D. Dec. 2, 1719. He was a very prolific writer both on moral and historical subjects.

Quetelet′ (LAMBERT ADOLPHE JACQUES), b. at Ghent Feb. 22, 1796; was appointed a professor of mathematics in 1814 in his native city and in Brussels in 1819; superintended the erection of the observatory of that city in 1826, and was its director to his death, Feb. 17, 1874. His writings on physical science—*Positions de Physique* (1834), *Météorologie de la Belgique* (1864), *Sur la Physique du Globe* (1861), etc.—are valuable, but it is his statistical works—*Sur l'Homme, et le Développement de ses Facultés* (1835), *Sur la Théorie de la Probabilités* (1846), *Du Système social et des Lois qui le regissent* (1848)—which have procured for him a worldwide reputation.

Quetz′alcoatl [Aztec, "feathered serpent"], a mythical personage of great fame in the religious system of the ancient Mexicans, and also in that of the Mayas in Yucatan, where he is known as Cuculkan, a word having the same significance. The modern discovery of the family connection between the Mayas, Huaxtecos, and Natchez supplies illustration of the origin of this myth, which seems to have been foreign to the Mexicans proper. According to the legends, Quetzalcoatl appeared on the coast of the Gulf of Mexico, near the mouth of Pánuco River, dressed in a long white robe, adorned with feathers, accompanied by many followers, and assumed the religious and political leadership of the Huaxtecos, whom he guided first to the valley of Tula, and afterward to that of Cholula, where they erected the famous pyramid still existing there, and then disappeared to the S. W. to Huehue-Tollan or "ancient Tula," promising to return at a future day. When Cortes appeared on the coast in the same quarter in 1519, it is alleged that he was regarded by Montezuma and the Aztecs generally as Quetzalcoatl, and that this belief was the cause of their non-resistance to the strangers on their first advance to the Aztec capital. Be this as it may, the Spanish priests soon began to utilize the legend of Quetzalcoatl, building upon it a Christian superstructure, and so corrupting the primitive myth that it is difficult to restore its original form. According to the Christian theory, elaborately maintained by Siguenza y Gongora in the seventeenth century and by C. M. de Bustamante in the nineteenth, Quetzalcoatl was the apostle Thomas, and by him was introduced the use of the cross as a religious symbol, and many features of Aztec religion which bore a strange resemblance to Jewish and Christian rites. The probability is that the worship of Quetzalcoatl, admitted to be the tutelary divinity of a large ethnological family in Central America, was carried thence to the Huaxteca after the downfall of Palenque or some other of the now deserted cities of that region. This theory will also explain the origin of the Natchez, tracing them in a similar manner to a migration from Central America, and receives strong confirmation from the mythology of the Huaxtecos.

PORTER C. BLISS.

Quevedo′do y Ville′gas, de (FRANCISCO GOMEZ), b. at Madrid, Spain, Sept. 26, 1580; educated at the University of Alcalá de Henares; went to Naples in consequence of a duel; rose there to high civil and diplomatic posts; was concerned in the conspiracy of the marquis of Bedmar at Venice (1618), after which he returned to Spain; suffered two imprisonments for political causes; wrote several religious treatises and many satirical works in prose and verse, and edited the poems of Fray Luis de Leon (1631). D. at Villanueva de los Infantes Sept. 8, 1645. Quevedo is still the most prominent name in the annals of Spanish satirical literature, both prose and poetry, though the greater part of his works were never printed. Among his more popular works are the *History of the Great Sharper, Paul of Segovia* (1627), *The Letters of the Knight of the Forceps* (1635), and the *Visions* (1635). A partial collection of Quevedo's poetry appeared in 1648, and another in 1670, known as *The Spanish Parnassus.* A complete edition of his published works was issued by Sancho (11 vols., 1790–94), and a further collection was edited by Guerra y Orbe (1852). His *Visions* were translated into English by Sir Roger L'Estrange (1708), and a translation of the *Satires* was published at Edinburgh in 1798. Many of the writings of Quevedo are grossly indelicate, while others apparently reveal a highly cultivated and correct taste. He may be called the "Spanish Swift."

Quewhiffle, tp., Cumberland co., N. C. P. 954.

Quezaltenan′go, town of Central America, in Guatemala, on an elevated plateau in lat. 14° 51′ N., among beautiful, fertile, and well-cultivated surroundings, and enjoying a fine and healthy climate. It is well built, and contains, besides the fine cathedral, many handsome public and private buildings. It has some manufactures of woollen and cotton fabrics, and carries on a considerable trade. P. about 20,000, who are almost exclusively Indians.

Qui′che (or **Utlateca**) **Indians,** a race of American aborigines now found in Chiapas and Guatemala. Their language, still used, is related to the Maya, and by their traditions they are descendants of the old Toltecs. They fought the Spaniards desperately at the time of the Conquest, but were utterly overcome. They still retain much of their old semi-civilization, and are in every respect much superior to most of the tribes about them. The extensive ruins of the pueblo of Quiche attest their former prosperity.

Quichua (**Quichu, Qquichhua,** or **Quito**) **Indians,** one of the great Peruvian castes or races of the old civilization, the first in point of numbers and the second in social rank of the four families. Their ancient seat was more especially Cuzco, the capital. At present they are very numerous, and are found in Bolivia, Peru, and Ecuador, to the capital of which country, Quito, they give the name. Their language is very harsh. (See the grammars of Tomas (1560), of Holguin (1608), of Tschudi (1853), and of Markham (1864).)

Quicksilver. See MERCURY, COMPOUNDS AND NATURE OF, by PROF. HENRY WURTZ, A. M.

Qui′etism, a peculiar movement within the Roman Catholic Church, originating from the celebrated devotional work of the Spanish priest Molino, *Guida Spirituale* (1675), and found its most conspicuous spokesman in Fénelon. In opposition to the worldly tendencies of the monkish orders, the Jesuits and Dominicans, and the mechanical character of the Roman Catholic worship, quietism presents a somewhat mystical appearance, and consists in concentration of the soul in quiet prayer and contemplation. It is a sentiment, not a doctrine. It founded no sect, though it was met with much sympathy outside of the Roman Catholic Church, especially among the Pietists. In spite of its peaceable character, it awakened, nevertheless, the enmity of other parties, and was even exposed to persecution. Some of its disciples—as, for instance, Madame Bouvier de la Mothe Guyon—described their devotional feelings and exercises in a peculiar manner, which could not fail to call forth severe censure, and even caused the police to interfere. Moreover, the emphasis which the Quietists laid on the inner state of the soul made the ceremonies and rules of the Roman Catholic worship seem somewhat superfluous, and provoked the rigid churchmen. Bossuet attacked Fénelon, who, however, immediately submitted to the decision of the pope. The movement died out in the middle of the eighteenth century.

Quilima′ne, town of the Portuguese territory of Mozambique, on the eastern coast of Africa, in a swampy and marshy district at the mouth of the river Quilimane, in lat. 17° 51′ S. It was formerly one of the largest slave-markets; it now exports some gold-dust, ivory, and gums. Its population consists of 6000 slaves and 130 freemen, of whom 12 are Portuguese. The population of the surround-

ing district is stated to be 15,000; the soil is very fertile, but the climate very unhealthy.

Quillo'ta, town of Chili, 22 miles N. E. of Valparaiso, with which it is connected by railway, in a fertile valley on the river Aconcagua, surrounded with orchards and vineyards. It is one of the oldest cities of the country, but it has grown very much since the opening of the railway to Valparaiso. P. about 10,000.

Quills, the shafts of the large wing-feathers of birds, were formerly the almost exclusive material from which pens were made, and even now there is considerable commerce in them. Quills are obtained chiefly from geese, but also from swans, turkeys, and other birds. Crow-quills are valuable in some kinds of drawing. The so-called quills (spines) of the European porcupine have considerable commercial value. Quills are also used for making toothpicks and for various other purposes.

Qui'loa, or **Kilwa,** town of Eastern Africa, belonging to the sultan of Zanzibar, and on an island off the coast of Zanguebar, in lat. 8° 57' S., has become notorious as one of the principal ports from which slaves are exported. P. 7000.

Quilon', town of Hindostan, in the Travancore dominions, subsidiary to Great Britain, on the Malabar coast, in lat. 8° 53' N., has a good harbor, large barracks, and exports coffee, cotton, pepper, cardamoms, and timber. P. about 20,000.

Quimper', town of France, cap. of the department of Finisterre, on the Odet, near its mouth in the Atlantic, has extensive fisheries, potteries, tanyards, and manufactures of hats and porcelain, and an active trade in wheat, wax, hemp, butter, and fish. P. 13,159.

Quimperlé', town of France, department of Finisterre, among high mountains at the confluence of the Insolle and the Ellé, has manufactures of vinegar and paper and a trade in wheat, honey, wax, and wood. P. 6686.

Quin (James), b. in London, England, Feb. 24, 1693; was educated at the University of Dublin; studied law in London, but soon devoted himself to the stage; obtained great success in the rôles of Falstaff and Cato, and was considered the head of his profession prior to the rise of Garrick. He retired from the stage 1748; was the instructor of George III. in elocution, and received a pension from that monarch. D. at Bath Jan. 21, 1766. A compilation entitled *Quin's Jests, or the Facetious Man's Pocket Companion,* appeared at London shortly after his death, but it is doubtful whether any portion of it was the work of Quin.

Quinault' (Philippe), b. at Paris June 3, 1635; studied law, and bought an office in the court of exchequer, but devoted himself mostly to dramatic authorship. In comedy and tragedy proper he was not very successful, and he was sharply criticised by Boileau, but his operas, for which Lully furnished the music, achieved great success. They are printed in his *Théâtre* (5 vols., 1739), and are still read with pleasure. D. Nov. 26, 1688.

Quin'by (Isaac F.), b. in New Jersey about 1823; graduated at the U. S. Military Academy July, 1843, when appointed brevet second lieutenant of artillery; served two years as assistant professor of mathematics and of natural and experimental philosophy at West Point; in the war against Mexico, and on duty with his regiment and as acting assistant adjutant-general until Mar., 1852, when he resigned to accept the chair of mathematics and of natural and experimental philosophy in the University of Rochester. On the outbreak of civil war he was appointed colonel of the 13th New York Vols., which he led at the first battle of Bull Run, resigning in August to resume his professorship at Rochester. In Mar., 1862, he was appointed brigadier-general U. S. volunteers, and served in the South-west, participating in the battle of Champion Hills and in the assault of Vicksburg, May, 1863, but ill-health again compelled him to resign, Dec., 1863, and return to his former duties at the University of Rochester.

Quince [Fr. *coing*], the fruit of *Cydonia vulgaris*, the quince-bush, a shrub originally from the Levant, belonging to the Rosaceæ. Its fragrant fruit is valued for making conserves and marmalades. A liqueur is made of the juice, and the mucilaginous seeds are employed in pharmacy and the toilet. There are several varieties of the fruit. The wood is hard and is used by turners. The Japan quince (*Cydonia Japonica*) is an ornamental dwarf species with profuse and beautiful blossoms. Its fruit is hard and austere, with a strong balsamic odor.

Quin'cy, p.-v. of Plumas tp., cap. of Plumas co., Cal., about 110 miles N. E. of Sacramento, has an academy, a fine court-house, jail, 1 newspaper, 2 good hotels, and several mercantile houses. P. 208.

William E. Ward, Ed. "Plumas National."

Quincy, p.-v., cap. of Gadsden co., Fla., 24 miles W. of Tallahassee, on Jacksonville Pensacola and Mobile R. R., has 1 high school, 1 colored school, 4 churches, 1 hotel and several boarding-houses, 1 newspaper, and the usual stores. P. 743. M. B. Owens, Ed. "Journal."

Quincy, city, cap. of Adams co., Ill., on E. bank of Mississippi River, 160 miles above St. Louis, and 263 miles S. W. of Chicago, the second city of the State in size, is picturesquely situated upon a limestone bluff 125 feet above the river, of which it commands a fine view; is regularly laid out and well built, paved, watered, and lighted; has an extensive river-traffic and a splendid railroad bridge across the Mississippi; is the point of junction of 8 railroads—namely, Chicago Burlington and Quincy, Toledo Wabash and Western, Hannibal and St. Joseph, Missouri Kansas and Texas, Quincy Carthage and Burlington, Quincy Missouri and Pacific, Quincy Alton and St. Louis, and St. Louis Keokuk and North-western; has 4 parks, a fine fair-ground, many elegant public and private edifices, numerous manufactories, employing 3500 operatives and producing annually $10,000,000 worth of goods; has 30 churches, 10 periodicals (3 daily), a medical college, several academies and seminaries, 9 public graded schools, a good city library, 2 hospitals, 3 asylums, 7 banks, a fine grain-elevator, and a large business in pork-packing and ice-collecting. Among the manufacturing establishments are 13 of carriages and wagons, 9 of spirits, 8 iron-foundries, 11 brickyards, and 11 flouring-mills. The first settlement was made here 1822, and became a city 1839. P. in 1860, 13,718; in 1870, 24,052; in 1876, estimated at 37,000.

Quincy, p.-v. and tp., Adams co., Ia., on Burlington and Missouri River R. R., has 1 newspaper and a thriving trade. P. 283.

Quincy, p.-tp. and seaport of Norfolk co., Mass., 8 miles S. of Boston, on Old Colony R. R., was settled in 1625, and is one of the oldest towns in New England, being formerly a part of Braintree, but in 1792 was set off and named in honor of Col. John Quincy. The first railway in the U. S. was built here in 1827 for moving granite, the cars being drawn by horses. Quincy has a public library, an academy, 1 high school, and 27 common schools, besides several private ones, 12 churches, 3 banks, a national and a State home for infirm sailors, 1 newspaper, and an iron-foundry and machine-shop. Shipbuilding has been carried on here for more than a century and a half, and some of the finest ships built in this country have been launched from Quincy Point. Granite is the staple production of the town, about 1200 persons being employed in its preparation for market. Quincy is the birthplace of John Adams, and of his son, John Quincy Adams, both former Presidents of the U. S. P. 7442. G. W. Prescott, Ed. "Patriot."

Quincy, p.-v. and tp. of Branch co., Mich., on Michigan Southern and Lake Shore R. R., about 55 miles S. W. of Lansing, has excellent schools, 5 churches, 1 bank, 2 newspapers, an iron-foundry, a flouring-mill, 2 carriage-factories, 1 planing, sash, door, and scroll factory, a stave, heading, and cooper establishment, 2 lumber-yards, and 2 hotels. There is an efficient fire department. P. of v. 1092; of tp. 2586. E. Mudge, Ed. "Times."

Quincy, tp., Houghton co., Mich. P. 1117.

Quincy, p.-v. and tp., Olmstead co., Minn. P. 807.

Quincy, p.-v., Montgomery tp., Hickory co., Mo. P. 80.

Quincy, v. (Ripley P. O.), Ripley tp., Chautauqua co., N. Y., on Lake Shore and Michigan Southern R. R. P. 350.

Quincy, p.-v., Miami tp., Logan co., O., on Miami River and Cleveland Columbus Cincinnati and Indianapolis R. R. P. 320.

Quincy, p.-v. and tp., Franklin co., Pa. P. 3127.

Quincy, p.-v. and tp., Adams co., Wis., on Wisconsin River. P. 272.

Quincy (Edmund), b. at Braintree (now Quincy), Mass., Oct. 24, 1681; graduated at Harvard 1699; became judge of the supreme court 1718; was long a member of the house of representatives and of the council; was lieutenant-colonel of a militia regiment, and went to England 1737 as agent of Massachusetts in the controversy with New Hampshire upon the boundary question. D. at London Feb. 23, 1738. The general court of Massachusetts caused a monument to be erected to his memory in the burial-ground of Bunhill Fields. He was ancestor of a distinguished line of Massachusetts statesmen.

Quincy (Edmund), son of Pres. Josiah, b. at Boston Feb. 1, 1808; graduated at Harvard 1827; was prominent as secretary of the American and the Massachusetts anti-slavery societies; has contributed to magazines; is author

of *Wensley, a Story without a Moral* (1854), and of a *Life of Josiah Quincy* (1867), and editor of the *Speeches of Josiah Quincy* (1875).

Quincy (Eliza Susan), daughter of Pres. Josiah, b. about 1800, an accomplished student of the early history of Massachusetts; author of a *Memoir of Eliza Susan Morton Quincy* (privately printed 1861) and of *Memoirs of the Family of Edmund Quincy of Mount Wollaston, Mass.*, still in MS., the non-publication of which is (according to Allibone) much to be regretted.

Quincy (Josiah, Jr.), b. in Boston Feb. 23, 1744; graduated at Harvard University in 1763, and became an eminent lawyer. His father, Josiah (b. 1709), a merchant of Boston and a zealous patriot, d. at Braintree, Mass., in 1784; hence the term "Junior" was applied to the son to distinguish them. He had already by his writings and speeches obtained prominence as an ardent advocate of the cause of liberty when called upon, in conjunction with John Adams, to defend the soldiers implicated in the Boston Massacre. Although successful in securing the acquittal of their clients, popular feeling ran so high that, notwithstanding their established reputation for patriotism, they incurred much odium by their connection with the defence. In 1774 he went to England, where he was active in promoting the interests of his country. Embarking from London Mar. 16, 1775, upon his return trip, he declined rapidly during the voyage, and d., while in sight of the coast of Massachusetts, Apr. 26, 1775. In 1774 he published his *Observations on the Act of Parliament, commonly called the Port Bill.*

Quincy (Josiah), LL.D., son of the preceding, b. at Boston, Mass., Feb. 4, 1772; graduated at Harvard University 1790; studied law with Judge Tudor, and was admitted to the bar in 1793; member of the State senate in 1804, and member of Congress 1805–13, during which time he opposed the embargo law and the war with Great Britain; again State senator 1813–21; member of State legislature 1821–23, and Speaker of that body during his last term; appointed judge of the municipal court in 1822, but resigned the following year, having been elected mayor of Boston on the decease of the Hon. John Phillips, the first incumbent; continued in office until 1829, during which time many public improvements were inaugurated and completed under his auspices; in Jan., 1829, was elected president of Harvard University, and remained the efficient head of that institution until Aug., 1845; in 1840 published a *History of Harvard University;* in 1851 a *History of the Boston Athenæum*, of which he was president 1820–30; and in 1852 the *Municipal History of Boston, Life of John Quincy Adams* (1858); his *Speeches in Congress and Orations* have also been published, besides numerous *Memoirs*, including one of his father (1825). D. at Quincy, Mass., July 1, 1864.

Quincy (Josiah), son of Pres. Josiah, b. at Boston Jan. 17, 1802; graduated at Harvard 1821; became a lawyer at Boston; was a member of the city council 1833–37; president of that body 1834–37; president of the Massachusetts senate 1842; mayor of Boston 1845, and for many years treasurer of the Western R. R. and of the Boston Athenæum. During his mayoralty the Cochituate water was introduced into Boston, and he has been the originator of various other public improvements.

Quincy (Josiah Phillips), son of the preceding, b. at Boston in 1830; graduated at Harvard 1850; author of the dramatic poems *Lyteria* (1856) and *Charicles* (1856); edited *Manuscript Corrections from a Copy of the Fourth Folio of Shakspeare's Plays* (1854), and has contributed to magazines and literary periodicals.

Quincy (Samuel Miller), brother of J. P. Quincy, b. at Boston in 1833; graduated at Harvard 1852; became a member of the Boston bar; was for several years one of the editors of the *Monthly Law Reporter;* entered the volunteer service as captain of the 2d Massachusetts regiment May 24, 1861; became lieutenant-colonel of the 72d U. S. regiment (colored) Oct. 20, 1863, colonel May 24, 1864, and was subsequently brevetted brigadier-general. In 1865 he edited the *Reports of Cases* of his great-grandfather, Josiah Quincy.

Quincy, de (Quatremère). See Quatremère de Quincy.

Quincy College and Seminary, Quincy, Ill., established in 1856 under Rev. J. F. Jaquess, D. D., and Prof. C. W. Bowen, A. M. (partners); in 1862 under the charge of Rev. G. Andrews, A. M.; in 1867, E. W. Gray, A. M.; in 1873, again by Prof. Bowen. The two departments of instruction, with a graduating course of three years each, are open to women as well as to men, but the seminary course is designed more especially for women and the college for men. It is a Methodist institution, in healthy condition; with buildings and lot valued at $85,000. C. W. Bowen.

Quincy Point, p.-v., Quincy tp., Norfolk co., Mass., on Massachusetts Bay at the confluence of Weymouth and Town rivers.

Quindaro, p.-v. and tp., Wyandotte co., Kan., on Missouri River. P. 2139.

Quinet' (Edgar), b. at Bourg, department of Ain, France, Feb. 17, 1803; studied at Paris, Geneva, and Heidelberg; resided in the Morea 1828–30; was appointed professor of foreign literature at Lyons in 1839, and at the Collége de France in 1842, but was dismissed in 1846, because his opposition to the political and religious reaction of the age assumed too direct a form in his lectures; travelled in Spain; fought in the Revolution of 1848, and was reinstated in his chair as professor; was banished in 1852; lived in Holland and Switzerland, and did not return to France until after the fall of the Empire. D. at Paris Mar. 27, 1875. His *Œuvres complètes* (10 vols.) contain, besides several poetical or semi-poetical productions (*Ahasvérus, Merlin, Les Esclaves*, a drama, *Napoleon*, an epic, etc.), works on a great variety of subjects—literature and philosophy, history and politics—always interesting and suggestive, though often eccentric in their ideas; always striking and brilliant, though often somewhat profuse in their style. The most remarkable are—*Allemagne et Italie* (1839), *Le Christianisme et la Révolution française* (1846), *La Révolution* (1865), *De la Grèce moderne et de ses Rapports avec l'Antiquité* (1830), etc.

Quinia, or Quinine (which see).

Qui'nine [Fr., from *quina*, "Peruvian bark"], the most important medicinal ingredient of cinchona or Peruvian bark. It was discovered in yellow or calisaya bark in 1820 by Pelletier and Caventou. It exists in all the officinal barks, but is most abundant in the calisaya. To obtain it, it is first extracted from the bark as a sulphate by means of quite a complex process. By treating this salt with the solution of an alkali, the quinine is precipitated, and is then washed, dried, dissolved in alcohol, and reobtained by slow evaporation. As usually prepared, it is amorphous, but with care it can be obtained in silky crystals. Quinine is an alkaloid with strong basic properties, and forms with acids crystallizable salts. Its formula is $C_{20}H_{24}N_2O_2$. Quinine is without smell, but has an intensely bitter taste; is very insoluble in water, but dissolves freely in alcohol and moderately in ether. Solutions of the alkaloid or its salts, treated first with chlorine water and then ammonia, strike a brilliant green color. This test is very delicate, and distinguishes quinine from all other vegetable alkalies except quinidia. Quinine is used in medicine principally in the form of sulphate or hydrochlorate, the latter salt having the advantage of being more soluble. Quinine salts are locally irritant, and internally in small dose are stomachic; in large, powerfully disturbing to the nervous system, while also tending to nauseate and vomit. In medicinal doses the most prominent symptoms of "cinchonism" are headache and deafness, with buzzing or roaring in the ears, muscular debility, some reduction of the force and frequency of the pulse and of the body-heat. In poisonous dose the individual may become completely blind, deaf, and paralyzed, but death is rare. Quinine salts are powerfully antiseptic, a small percentage preventing or arresting putrefactive and fermentative processes. They also, in small percentage, arrest protoplasmatic movement, as in white blood-corpuscles, bacteria, etc., and even destroy permanently the vitality of the organisms. These salts are used in medicine in small dose as stomachic tonics, and in large to control the inflammatory process and help reduce the exalted body-heat in febrile and inflammatory diseases, and especially to cure malarial affections of all kinds, over which they have a well-known, unequalled, but wholly unexplained special power. The three other alkaloids of cinchona bark—namely, cinchonia, quinidia, and cinchonidia—have the same physiological properties as quinine, and the last two also equal quinine in power. Edward Curtis.

Quin'isext Council [Lat. *quinque*, "five," *sextus*, "sixth"], the Oriental Church council which was convened in 698 A. D. to supplement the acts of the fifth and sixth œcumenical councils. It is called also the Second Council *in Trullo*, because it was held in the imperial palace called Trullus at Constantinople. The Greeks consider it the seventh œcumenical council, but the Latins do not recognize it. It was convened by Justinian II., and gave 102 stringent canons on clerical discipline.

Quinisextum. See Quinisext Council.

Quinoa, the *Chenopodium quinoa*, a woody herb, which, with other nearly-related species, is cultivated in the high-

lands of Spanish America for its nutritious seeds. Its leaves are used as a potherb.

Quin′sy, acute suppurative tonsilitis, or inflammation of the tonsil, terminating in abscess. The term "quinsy" is a popular perversion of Lat. *cynanche*, the technical designation of a sore throat. It attacks adults, less often children; the two extremes of life, infancy and old age, being quite exempt from it. One attack usually leaves subacute or chronic disease of the tonsil, which predisposes the person to repeated attacks in subsequent seasons. Quinsy is most often unilateral, less frequently attacking the two tonsils successively, and rarely coincident upon both sides. It occurs in persons of full habit, often the plethoric, and especially when the diet has been excessive and luxurious. With such predisposing conditions must be superadded, as an immediate or exciting cause, some exposure of the body to wet or cold. Quinsy may follow checked perspiration, chilling the extremities, or wet feet. The attack is manifested by soreness of the throat, increased by swallowing and talking, soon actual pain, rigidity of the jaw, hypersecretion of saliva, coated tongue, labored breathing, and sense of obstruction, tension, and tumefaction in the throat. With the first development of pus, intense throbbing pain exists. The disturbance of the general system is variable. In mild cases only impaired appetite and sense of lassitude exist; in graver attacks there may be a slight or marked chill at the onset, and a succession of light chills; the temperature elevated to 102° or 104° F.; the pulse full and bounding; the mind delirious at night, and by day the face expressive of great fatigue from loss of sleep, of suffering, and of alarm and apprehension of impending suffocation. Internal examination discloses the tonsil symmetrically enlarged, extending to the median line of the throat and obstructing it. Palpation by the finger may detect the softness and fluctuation of pus. In from five to eight days the suppurated tonsil bursts, all the symptoms vanish, and recovery is speedy. In its formative or first stage quinsy may sometimes be aborted by scarification, by ice in the mouth, cold gargles or spray, and astringent gargles or applications, as of alum or tannin, and by internal administration of saline cathartics and arterial sedatives. Quinine boldly administered may abort it. When developed, the inhalation of steam, warm anodyne gargles, soothing poultices or fomentations externally, anodynes to secure rest, tonics and diet to sustain the strength, and early evacuation of pus with the knife, are the essentials of treatment.

E. Darwin Hudson, Jr. Revised by Willard Parker.

Quint, in large organs, a stop or set of pipes tuned a perfect fifth above the diapasons, or an octave below the twelfth.

Quint (Alonzo Hall), D. D., b. at Barnstead, N. H., Mar. 22, 1828; graduated at Dartmouth College 1846, at Andover 1852; was pastor of the Mather church at Roxbury 1853–63; member of Massachusetts board of education 1855–61; chaplain of the 2d Massachusetts Vols. 1861–64, and became pastor of the North Congregational church, New Bedford, July 21, 1864. Author of *Army Notes* (1864) and *A History of the Second Massachusetts Regiment* (1867); is one of the proprietors and editors of the *Congregational Quarterly*, and has contributed to the *New England Genealogical Register*.

Quin′tain, an object, often in the form of a man, designed to be tilted at with a lance. It was sometimes placed at the end of a crosspiece so balanced upon a pivot that if the rider were not very quick a bag of sand at the other end of the crosspiece would strike him in the back.

Quin′tal [Fr., remotely from Lat. *centum*, a "hundred"], a hundredweight, chiefly used in weighing fish, and usually pronounced *kentle*.

Quinta′na (Manuel José), b. at Madrid, Spain, Apr. 11, 1772; educated at the University of Salamanca; became a lawyer at Madrid; published a volume of poems 1802; produced in 1805 his tragedy of *Pelayo*, intended to stimulate the Spaniards to resist the encroachments of Napoleon; edited a selection of Spanish poetry with the same object (3 vols., 1808); published his *Odas á España Libre* (1808); was secretary to the Cortes and to the regency during the early part of the war of liberation; was imprisoned in the castle of Pamplona from 1814 to 1820, when he was released by the revolution; lived in retirement in Estremadura 1823–33; was then made preceptor of the infant queen, Isabella; was created a senator 1835, and received from the queen the honor of a laurel crown in 1855. D. at Madrid Mar. 11, 1857. His *Complete Works* appeared in 1852 in the *Biblioteca de Autores Españoles* of Rivadaneyra, the most important being his *Lives of Celebrated Spaniards* (3 vols., 1807–34), which are reputed among the modern Spanish classics.

Quintanar′ de la Or′den, town of Spain, province of Toledo, at an elevation of 2106 feet above the sea, manufactures blankets and other woollen fabrics. P. 6842.

Quin′tard (Charles Todd), M. D., D. D., LL.D., b. at Stamford, Conn., Dec. 22, 1824; graduated in medicine at the University of New York 1846; became a physician to the New York City Dispensary 1847; professor of physiology in the Memphis Medical College 1851; contributed to medical periodicals; took orders in the Protestant Episcopal Church 1855; was successively rector of churches at Memphis and Nashville; was a chaplain in the Confederate army, and was chosen bishop of Tennessee 1865.

Quintet′ [It. *quintetto*], in music, a composition written for five instruments or voices.

Quintil′ian (Marcus Fabius), b. at Calagurris, Spain, about 35 A. D.; educated at Rome, and gained there afterward the highest reputation as a teacher of eloquence; received a regular salary from the imperial treasury by order of Vespasian, and was loaded with the highest civil honors and titles by Domitian. D. under the reign of Hadrian. In 95 A. D. he published his *Institutio Oratoria*, a work in 12 books on the art of oratory, which, besides its great historical interest (bk. x.), may still be read for practical purposes. Best edition by Bonnell (Leipsic, 1854); of the 10th book, separately, by Krüger (Leipsic, 1861); English translations by Guthrie (1756), Patsall (1774), and Watson (1856).

Quin′tus Cur′tius Ru′fus, the author of an historical work in ten books on Alexander the Great, *De Rebus Gestis Alexandri Magni*, which was much read and much admired during the Middle Ages. Of the author nothing is known; some critics fix the date of his life in the age of Augustus, others much later. Of the work, the first two books have been lost, and some of the others considerably damaged. The narrative is very pleasant, but by no means accurate, and is full of fables. Best edition by Zumpt (Brunswick, 1864).

Quin′tus Smyrnæ′us, or **Quin′tus Cal′aber,** a Greek poet of uncertain age, though he is generally considered to have been a native of Smyrna and to have flourished in the fifth century A. D. His writings had long been lost, when in the fifteenth century they were discovered by Cardinal Bessarion in the church of St. Nicholas, near Otranto, Calabria, whence the name Calaber, incorrectly given to the author. His poem purports to be a supplement to or continuation of Homer's *Iliad*, and possesses no intrinsic merit, but is interesting as the only extant specimen of the so-called "cyclic poems," and as preserving a considerable number of mythological traditions from writers whose works are wholly lost.

Quir′inal, a celebrated hill at Rome, N. of the Palatine, and connected with the Esquiline and Viminal, was so named from its temple to the god Quirinus. According to Mommsen, it was the seat of an early commonwealth independent of the original Rome, which was confined to the Palatine, the inhabitants of the former town being distinguished as "hill-men" (*collini*) from the Romans proper, "mount-men" (*montani*). The origin of this early settlement is one of the most interesting but obscure problems of early Roman history (see Quirites), but there seems no reason to believe in a diversity of race or to accept the Sabine hypothesis. It is certain that there was on the summit of the Quirinal a "Capitolium" earlier than that which subsequently gave name to the Capitoline Hill; that it contained a joint sanctuary of Jupiter (Vejovis), Juno, and Minerva, temples of Sol, Salus, Flora, Semo Sancus or Dius Fidius, and of the goddess of Fidelity, in which latter building the Roman treaties were deposited. There were also guilds of the Salii and Luperci priesthoods, the latter being probably hereditary in the Fabian gens. The Tities, one of the three original branches of the Roman people, at whose head was the Valerian gens, seem to have had their original seat on the Quirinal, and were not improbably derived from the Faliscan city of Falerii, whence probably a confusion with the neighboring race of the Sabines. Titus Tatius, Numa Pompilius, and his son-in-law, Ancus Martius, mythical kings of Rome, usually assigned to the Sabine stock, had the chief seats of their power on the Quirinal, but the derivation of their origin from the so-called Sabine city of Cures seems to rest upon no better authority than an etymological hypothesis of the Sabine Varro, reproduced by Livy and most subsequent historians. It is probable that at that period the Sabines had not left the mountain-valleys around Reate and Amiternum, and it is certain that the towns on the Tiber and Anio N. W. of Rome for many miles were then peopled not by Sabines, but by Latins. The Roman institution of the Curies and the legends of the brothers Curiatii (etymologically connected with the Quirinus) point rather to the

Alban Mount and the primitive Latin confederacy, than to the city of Cures, which had no demonstrable connection with Rome for several centuries after its foundation.

In modern times the hill has been crowned by the Palazzo Quirinale, which was begun by Pope Gregory XIII., continued under Sixtus V. and Clement VIII. by Fontana, and finished under Paul V. by Maderno. It has often been occupied by the popes as a summer residence, was the seat of the last papal conclaves, and since the annexation of Rome to the kingdom of Italy has been the residence of Victor Emmanuel. PORTER C. BLISS.

Quiri'tes [early Lat. *quiris* or *curis*, "a spear"], the collective name of the early Romans, considered in their capacity as warriors, and consequently as citizens entitled to vote in the *curies* or assemblies of armed men. The name was closely connected with that of the Latin spear-bearing divinity Quirinus, a synonym of Mavors, Mamers, or Mars, who was the patron of the armed host, and had his temple on the hill which from him took the name QUIRINAL (which see). To a late period of the Empire the name Quirites enjoyed precedence as a synonym of the patrician order (*populus Romanus Quiritium*), and as a title of honor over the geographical name Romans, the senators being called *patres conscripti Quirites*. The identification of Romulus with Quirinus was merely a guess of the rationalizing writers of the declining Republic.

Quiros', de (PEDRO **Fernandez**), b. in Spain about 1550; accompanied Admiral Mendana on his second voyage of discovery in the Pacific Ocean 1595, and was himself entrusted with the command of an exploring expedition which sailed Dec., 1605; discovered the New Hebrides group of islands Apr., 1606, and explored many other islands subsequently visited by Capt. Cook. D. at Panamá in 1614.

Quit-Claim, a word often employed in deeds in which the grantor or seller undertakes no responsibility in regard to the validity of his own assumed right to the property in question, but merely conveys to the grantee or buyer his own interest, whether valid or the reverse.

Quit'man, county of S. W. Georgia, bordering on Alabama, from which it is separated by Chattahoochee River. Area, 190 sq. m. The surface is rolling, and the soil fertile, cotton and corn being the chief productions. It is crossed by a branch of South-western R. R. Cap. Georgetown. P. 4150.

Quitman, p.-v., cap. of Brooks co., Ga., on Atlantic and Gulf R. R., 174 miles W. of Savannah, has good schools, a large cotton and woollen factory, spinning, weaving, and dyeing, 2 steam sash and blind factories, a cigar manufactory, several wagon and carriage factories, 2 weekly newspapers, 1 bank, and an extensive warehouse. Pop. 784. J. C. GALLAHER, ED. "INDEPENDENT."

Quitman, p.-v., cap. of Wood co., Tex., near Lake Fork of Sabine River, has 1 newspaper. P. 320.

Quitman (JOHN ANTHONY), LL.D., b. at Rhinebeck, N. Y., Sept. 1, 1799; received a liberal education; became a lawyer, and was professor at the Mount Airy College, Pa., 1819; practised law at Chillicothe, O., 1820–23; removed to Natchez, Miss., where he became a successful planter and rose to distinction in his profession and in the politics of the State; was chancellor of the superior court 1828–31 and 1832–34; member of the State legislature 1828–32; president of the senate in 1835 and governor *pro tem.*; judge of the high court of errors and appeals 1839; distinguished in the Texan struggle for independence, he was on the outbreak of the war with Mexico appointed brigadier-general of volunteers; promoted to be major-general Apr., 1847; was distinguished at Monterey, Chapultepec, and assault and capture of the City of Mexico; for his services at Monterey, Congress presented him with a sword, and Gen. Scott appointed him governor of the City of Mexico. Returning home at the close of the war, he was elected governor of Mississippi in 1850, and from 1855 to 1858 was a member of Congress and chairman of the committee on military affairs. D. at Natchez July 17, 1858. His *Life and Correspondence* (2 vols.), by F. H. Claiborne, appeared in 1860.

Qui'to, city, cap. of the republic of Ecuador and of the province of Pichincha, in the district of Quito, in a valley between two parallel ranges of the Andes, is built on the declivities of several small hills on the E. flank of the volcano of Pichincha, at an altitude of 10,000 feet above the level of the sea, in lat. 0° 13′ S., lon. 78° 43′ W. from Greenwich, and was, during the colonial government, capital of the kingdom of Quito, which embraced most of the present republic of Ecuador. Picturesquely located between vast mountain-barriers on the E. and W., it can be approached only from the N. and W., and owing to topographical features is laid out with little regularity, most of the streets being narrow, uneven, and ill-paved. The city is traversed by two deep and precipitous ravines, which annually carry off abundant floods of melted snow from the slopes of the volcano, and which are crossed by several lofty arches covered with substantial edifices. Owing to the frequency of earthquakes, most of the houses are of a single story, but are solidly built around spacious courtyards adorned with rich tropical plants and flowers, and often display considerable taste in decoration. The healthful and equable climate, ranging from 45° to 75° F., at an average of 60°, is justly characterized as a perpetual spring. The view from the heights of Quito embraces a panorama of eight Andean summits covered with perpetual snow, among them the famous peaks of Cayambi (19,813 feet), Cotopaxi (19,500), Antisana (19,200), Iliniza (17,380), and Pichincha (15,960), and a beautiful view of the cultivated valley of Chillo, abounding in sugar-cane, cotton, maize, and fruits of many kinds. The public edifices of Quito are built of stone, and comprise the palace of government, the archbishopric, cathedral, and city hall, grouped around the handsome Plaza Mayor, 3 hospitals, 2 asylums, 2 colleges, a university, a mint, and many churches, usually with convents attached. The public (formerly the Jesuits') library contains 20,000 volumes, and there are several smaller collections. Education has of late years been under the control of the Jesuits, who have exercised a strict supervision over religious doctrine, but have given instruction in mathematics, astronomy, and some branches of natural science, in addition to the routine studies of former times. A polytechnic school was established in 1872. Quito has several times been nearly laid in ruins by earthquakes, the most destructive having been those of Feb. 4, 1797, and Mar. 22, 1859; on which latter occasion the government buildings and most of the churches, as well as many private residences, were nearly ruined, involving a loss of $3,000,000 and of many lives. Water is copiously supplied through pipes to the principal houses and to several handsome stone fountains in the public squares; the quality of the water is, however, far from satisfactory, it being impregnated with mineral elements which give rise to elephantiasis to such an extent that a special hospital is devoted to that disease. The only good road in the republic is that leading from Quito northward to Bogotá, but a carriage-road to Guayaquil is now (1876) under construction. Commerce is languid, owing to the difficulty of communication with seaports by mule-paths. The chief articles of exportation are the precious metals, indigo, and liquors. Coarse cotton and woollen cloths are manufactured by hand, also fine articles of jewelry, and the women are skilful in embroidery, needlework, and gold-lace. The cultivation of silkworms and manufacture of silk are of recent introduction. A telegraph-line to Guayaquil has been recently opened. Considerable talent in painting, the fine arts, and literature is ascribed to the Quiteños, and the women enjoy a high reputation for beauty. The city was from remote antiquity the capital of the Quitus, a semi-civilized race, kindred to the Quichuas or Incas of Peru, and the valley of Quito, next to the valleys of Mexico and Cuzco, was the seat of the earliest American civilization. The mass of the inhabitants are still of the same race, though they have adopted Christianity and the Spanish language. The modern city of Quito was founded by Sebastian Benalcazar in 1534; the history of the old and the new capitals is incidentally given in the article ECUADOR. P. about 75,000. PORTER C. BLISS.

Quit'tor, or **Quittor,** a fistulous abscess in the foot of the horse, is best treated by cutting away enough of the hoof to give free vent to the fetid pus which burrows there. The discharge may be facilitated for a day or so by poultices, and then the sore should be washed out with a solution of sulphate of zinc, two or three grains to the ounce.

Qui'ver, tp., Mason co., Ill. P. 893.

Quogue, p.-v., Southampton tp., on Shinnecock Bay, near Sag Harbor branch of Long Island R. R. P. 137.

Quoits [W. *coitan*, "quoit"], a game of strength and skill, in which the player strives to pitch a flattened ring of steel (called a quoit) in such a way as to land it as near as may be to a peg or hob of iron stuck upright in the ground, or, if possible, to make it ring the hob. The game is played by two parties, each striving to excel the other. This game differs from the discus-play of the ancients, in which the player threw a disk of metal or stone as far as he could, the longest thrower winning the prize.

Quo Warranto [Low Lat., "by what authority?"], in law, the name of a writ served upon a person by the attorney of the State or nation, requiring him to show by what title he holds a specified property, office, or privilege. Owing to the cumbrousness of the proceedings under the writ, it has been superseded in England by an "information in the nature of a *quo warranto*."

R.

R, a consonant of the liquid class, approaching the character of a vowel. Its sound is to some extent interchangeable with that of *l*, and even in some languages with *d* and *s*. It is often treated by the vulgar as a silent letter or a vowel, but it is never silent, and always has a consonantal character more or less marked. In Greek, Latin, and in most modern languages it is distinctly trilled. *R.* (*rex*, *regina*) stands for king or queen.

Raab, town of Hungary, at the influx of the Raab into a branch of the Danube, was formerly fortified, and has a fine old cathedral. Its manufactures of tobacco and its transit-trade are extensive. P. 20,035.

Raal'te, town of the Netherlands, province of Overyssel, has a large trade in horses and cattle. P. 5570.

Raba'nus Magnentius Maurus, descended from an ancient Roman family, and pronounced by Kurtz "the most learned man of his age," was b. at Mentz about 776; was teacher at the monastery of Fulda from 817; was made abbot in 822, archbishop of Mentz 847. D. at Winkel Feb. 4, 856. The name of MAURUS was given to him by his teacher, Alcuin, in remembrance of St. Maur, the disciple of St. Benedict. He opposed the doctrine of transubstantiation, first distinctly set forth by Paschasius Radbert in 831 (expanded in 844). His works fill 6 vols. of Migne's *Library*. (See Bach's *Rabanus Maurus, der Schöpfer des deutschen Schulwesens* (1835), and Kunstmann's *Rabanus Magnentius Maurus* (1841).) R. D. HITCHCOCK.

Rabat', town of Morocco, Northern Africa, at the mouth of the Bu-Regreb in the Atlantic, is well built and strongly fortified. It has manufactures of fine carpets, burnouses, woollen and linen fabrics, and an active trade with Genoa and Marseilles in wool, wax, almonds, and olive oil. P. 25,000.

Rab'ba, town of Central Africa, kingdom of Gando, on the Niger, in a highly-cultivated region among beautiful surroundings, in lat. 9° 15′ N. and lon. 5° 26′ E. It is a large and populous town, carrying on an extensive trade with Tripoli, Fezzan, etc. It was at one time the most important slave-market in this part of Africa. Its horses are celebrated. It is said to have suffered much during the last ten years from internal wars. P. about 40,000.

Rab'bah, the same as AMMAN (which see).

Rab'bi [Heb., "my master"], a title of honor anciently employed by the Jews to designate those learned in the law, in which sense it is frequently found in the Gospels, being sometimes used in addressing Christ. At the present time the term *rab* is applied by Oriental Jews in a manner similar to the American use of "esquire."

Rab'bit [O. D., *robbe*], the English name conferred on many species of the family LEPORIDÆ (which see), but more especially applicable to the *Lepus cuniculus*, or common rabbit of Europe. The species is too well known to need description; it is found generally distributed throughout Europe (except in its more northern portions), as well as the contiguous portions of Asia and Northern Africa, and is familiar as a semi-domesticated animal. Its habits are characteristic in that it lives in communities, burrows in the ground, and brings forth its young in a blind and naked condition. It is very prolific, commencing to breed at the age of about six months, and having several litters in the course of a year, and in each litter some four to eight young ones. The name "rabbit" is also generally given indiscriminately to American species, the best known of which is the common small rabbit of the Eastern and Middle States (*Lepus sylvaticus*); this species, however, as well as all the other species of the family, agrees with the hare in making forms, instead of burrowing, and in bringing forth its young provided with hair and able to see.
THEODORE GILL.

Rabelais' (FRANÇOIS), b. in 1483, or perhaps in 1495, in Chinon, Touraine, where his father had a farm and kept an inn and a drug-store. The widespread idea of Rabelais as an unruly, grotesque, half-dissipated jester is a coarse confusion of the author and his creations, and is contradicted by those facts of his life which are well ascertained. He was educated first in the convent of Senillé, then in the monastery of La Baumette, and, although he showed no taste for studies or devotional exercises, he was destined to enter some monastic order. After becoming a brother of the order of St. Francis, however, in 1511 or 1519, his talent and passion for studies and literary occupation awoke, and when he left Fontenay-le-Comte in 1524 he was a man of learning. His fellow-monks disliked and suspected his studious life. They ransacked his cell and confiscated his books, and such an ill feeling upsprang between him and them that the pope, Clement VII., found it advisable to remove Rabelais to Maillezais, and allow him to change the Franciscan order for that of the Benedictines. At Maillezais, however, he did not feel better satisfied, and in 1530 left the monastery without the permission of his superiors, not on account of any persecution, but from sheer dissatisfaction, as it would seem. He settled first at Montpellier, at that time the seat of the most celebrated school of medicine in France, but in 1532 he went to Lyons as a hospital physician. While in Lyons he published revised and annotated editions of the works of Hippocrates and Galen, and of Marliani's *Antiquitates Romæ*. He also published miscellaneous treatises on archæology, jurisprudence, and medicine, and the first two books (1533 and 1535) of his great satirical work, *Les Faits et Dicts du Géant Gargantua et de son Fils Pantagruel*. In 1536 he accompanied Cardinal du Bellay, an old schoolmate and friend of his, and now bishop of Paris, and by his influence he obtained from Pope Paul III. a release from the penalties which he had incurred by abandoning his order. In 1538 he entered the abbey of St. Maur des Fossés in the diocese of Du Bellay, and in 1551 he obtained the curacy of Meudon. D. in Paris in 1553. Rabelais was a man of great erudition. He understood Latin, Greek, Hebrew, Arabic, Italian, Spanish, English, and German. His knowledge in medicine, law, theology, history, philosophy, and art was comprehensive and exact. His scientific writings attracted much attention in his time, and commanded respect. But his fame was founded by, and rests now on, his satirical romance of *Gargantua and Pantagruel*. It consists of five books, of which he published the first two in Lyons, and the next two in Paris (1546 and 1552); the fifth was found unfinished after his death, and was printed in 1564. The subject-matter of this romance is often coarse and indecorous, but on these points the author differs only from our taste, not from that of his age, and the treatment, the form, show everywhere that ease, clearness, simplicity, and grace which cannot be obtained without great natural talent and consummate education. The satire of the book is now often obscure, or even irrecognizable, but its humor is still living, brilliant, and irresistible. Besides the fun which every reader can draw from it, it gives a picture of French civilization in the sixteenth century, of the strife between inherited dogmas and acquired views, which is most attractive and instructive to the student of history. There exist about 60 editions of the book, besides English, German, and Italian translations. CLEMENS PETERSEN.

Rabies. See HYDROPHOBIA, by CHARLES P. RUSSEL, M. D.

Ra'bun, county in N. E. Georgia, between Chattooga River on the E. and the Blue Ridge on the W., traversed by Tallulah (or Terrora) River. The surface is extremely mountainous, and abounds in picturesque scenery, including the celebrated Tallulah Falls and the Eastatoia or Rabun Falls, a succession of cascades in Rabun Gap, an important highway through which Knoxville and Charleston R. R. is to pass. The head-waters of Tennessee River are in the same vicinity. Agriculture and stock-raising are the only industries. Cap. Clayton. Area, 320 sq. m. P. 3256.

Ra'burn (WILLIAM), b. in Halifax co., N. C., Apr. 8, 1771; went to Georgia in childhood; received but a limited education, but became a judge, a leading member of both houses of the legislature, and governor of the State 1817–19. D. in Hancock co., Ga., Oct. 23, 1819.

Racahout, or **Racahout des Arabes,** is a starchy food prepared in Barbary from the acorns of *Quercus ilex* and *Q. ballota*, oaks of that region. It is flavored with herbs, and is sometimes prescribed for invalids' use. But the racahout of the confectioners' shops is a compound of starch with chocolate, vanilla, etc., sold as a sweetmeat.

Racalmu'to, town of Sicily, province of Girgenti, on the left bank of an affluent of the Platani, about 15 miles N. E. of the town of Girgenti. The neighboring country is very rich in grain, vines, olives, and fruits, and also abounds in sulphur, saltpetre, and gypsum. Racalmuto is

an old town, the name being of Arabic derivation, and it was long under the lordship of the Chiaramonti, whose family castle still stands on a rock about 2½ miles distant. The town was almost utterly depopulated by the plague in the thirteenth century, and its present site is not precisely the same as then. The inhabitants now carry on an active trade in the rich products of the district. P. in 1874, 12,250.

Racconi'gi, town of Northern Italy, province of Cuneo, on the right bank of the Maira, S. of Turin about 19 miles by rail. It is a walled town, and the three interesting old castles of Migliabruna, of Carpanetto, and of Bonavalle are in its remote neighborhood, but it is now chiefly known for the royal castle and park in its immediate vicinity. This castle was originally a fortress, was converted into something like a villa by E. Filiberto in 1681, and has been improved by successive princes until it is now one of the most sumptuous of the Italian royal palaces. The park, which is walled in, is 1¼ miles in length and ¾ of a mile in width, abounds in game, and is adorned with artificial lakelets, grottoes, hermitages, etc., and with much statuary. Racconigi is a favorite resort of King Victor Emmanuel during the hunting-season, and a large herd of chamois, kept here, is an object of interest to every visitor. P. 10,000.

Raccoon' [Fr. *raton*], the vernacular name of species of the genus *Procyon* and family Procyonidæ. These all

The Raccoon.

agree in having a rather stout body; the snout pointed, and the tail rather long and bushy, and annulated with dark-colored rings; their feet are provided with long and slender digits, and with the fore ones the animal is able to grasp its food and other objects. They are fond of playing in the water, and of soaking therein their food, and to this peculiarity the common American species (*Procyon lotor*) owes its specific name *lotor*—*i. e.* "washer." Two well-defined species are known—(1) *Procyon lotor*, found throughout almost all North America, and *P. cancrivorus*, characteristic of South America. THEODORE GILL.

Raccoon', p.-v. and tp., Marion co., Ill. P. 1139.

Raccoon, tp., Parke co., Ind. P. 1327.

Raccoon, tp., Beaver co., Pa. P. 1012.

Race-Horse. See HORSE.

Race'land, p.-v., La Fourche parish, La., on Morgan's Louisiana and Texas R. R.

Race'mic Acid [Lat. *racemus*, a "bunch" of grapes or fruit]; also called **Paratartaric Acid** and **Uvic Acid** [Ger. *Traubensäure*], ($C_4H_6O_6$), found with tartaric acid in grape-juice, and identical with it in composition. It differs from it, however, in its action on polarized light and in some other characters. It was discovered by Kestner in wines of certain vintages. It may also be formed artificially by several methods. Racemic acid itself has no action on polarized light, but by certain treatment may be separated into two isomeric constituents, one of which is ordinary dextro-rotatory tartaric acid, and the other is lævo-rotatory, the two being called *dextro-tartaric* and *lævo-tartaric* acid. Racemic acid itself has, according to Buignet, a density of 1.69, while Pasteur found for the dextro- and lævo-tartaric acids obtained from it the densities 1.7496 and 1.75, practically identical. While, therefore, these two substances, of different optical properties, have the same molecular volume, their compound, racemic acid, in which they optically neutralize each other, has a much larger volume. No relation, therefore, is apparent between these optical characters and the volumes of the molecules. Pasteur found, nevertheless, certain relations between the modifications of the crystals of the two acids and the action on polarized light, for which the reader must be referred to the textbooks. H. WURTZ.

Ra'chel [Heb. *rahel*, "ewe"], of Northern Mesopotamia, younger daughter of Laban, favorite wife of Jacob, and mother of Joseph and Benjamin. Her tomb, about 4 miles from Jerusalem on the road to Bethlehem, though of modern construction, undoubtedly marks the very site of her burial as described in Gen. xxxv. 19, 20.

R. D. HITCHCOCK.

Rachel' (ELISA RACHEL **Felix**), b. at Mumpf, Switzerland, Feb. 28, 1820, daughter of a wandering Jewish peddler. In Lyons, Paris, and other cities she, with her sister Sarah, helped the family income as a vagabond singer at the cafés and on the boulevards. Coron, of the Royal Institution, attracted by their voices, took them from the streets. Elisa, showing more dramatic talent than musical, was put in charge of M. St. Aulaire. In 1836 she was admitted to the Conservatoire; in 1837 made her first appearance at the Gymnase in *La Vendienne*, an unsuccessful play; went back to her studies under Samson, and in 1838 astonished and captivated Paris by her performance at the Théâtre Française of Camille in *Les Horaces*. Her fame and fortune were made. The classic tragedies of Racine, Corneille, and Voltaire were revived; her intensity, originality, naturalness, the singular expressiveness of her face, the skill of her declamation, made a new era in dramatic art. Her earliest and some of her latest triumphs were in Phèdre, Camille, Roxana, Hermione, Electra, and other parts in the older drama. Her fame being secure, she enlarged her repertoire, and played with great power Jeanne Darc, Marie Stuart, Adrienne Lecouvreur, and other characters by modern writers; the last mentioned was one of her famous personations. In 1855, in company with her brother, Raphael Felix, and her sisters, Sarah, Lia, and Dinah, with a complete theatrical troupe, she came to America; played in New York and Boston, but once only in Philadelphia, and once in Charleston; failing health compelled her then to desist. A visit to Havana brought no relief; she returned to France, spent a winter in Egypt, but gradually succumbed to pulmonary disease, and d. at Cannes, France, Jan. 3, 1858. Rachel was slender, graceful, not beautiful, of pale complexion, expressive features, brilliant eyes, and singularly fascinating presence. Margaret Fuller said of her: "Her range, even in high tragedy, is limited; she can only express the darker passions and grief in its most desolate aspects. Nature has not gifted her with those softer and more flowery attributes that lend to pathos its utmost tenderness. She does not melt to tears or calm or elevate the heart by the presence of that tragic beauty that needs all the assaults of Fate to make it show its immortal sweetness. On the dark side she is very great in hatred and revenge." Rachel was never married, but she left two sons—one, a son by M. Walewski, was made count of Etiolles by Napoleon III.—RAPHAEL FELIX, the brother, became in 1868 director of the Théâtre Porte Saint-Martin; SARAH was connected with the Gymnase, the Français, the Odéon, and was favorably known in the provinces; LIA, devoted to high tragedy, distinguished herself most at the Porte Saint-Martin; REBECCA d. in 1854, having been five years at the Comédie Française; DINAH found her place in vaudeville. All, though meritorious artists, have owed much to the fame of their sister, who made a name in her special order of genius along with which no other is mentioned. Her fame is purely dramatic, her personal qualities winning for her neither respect nor love. O. B. FROTHINGHAM.

Racine', county in S. E. Wisconsin, on Lake Michigan, is level and fertile, with abundance of limestone, is watered by Fox, Des Plaines, and Root rivers, and traversed by Chicago Milwaukee and St. Paul, Chicago and Northwestern, and Western Union R. Rs. Wheat, corn, oats, potatoes, hay, wool, and butter are the principal products. There are 12 manufactories of agricultural implements, 13

of carriages and wagons, 22 of clothing, and several tanneries, breweries, and flouring-mills. Cap. Racine. Area, 325 sq. m. P. 26,740.

Racine, tp., Mower co., Minn. P. 813.

Racine, p.-v., Sutton tp., Meigs co., O., on Ohio River. P. 560.

Racine, city and tp., cap. of Racine co., Wis., on Lake Michigan at the mouth of Root River, and on Milwaukee division of Chicago and North-western and Western Union R. Rs. It was incorporated in 1848, ranks fourth among the cities of the State, and contains 24 churches, 2 banks, 1 college, an orphan asylum, a city hospital, 4 newspapers, with manufactories of threshing-machines, wagons, fanning-mills, sash, doors, and blinds, trunks, silver-ware, leather, baskets, boots and shoes, pumps, and other commodities. Racine College is situated in Main street, in grounds of 10 acres in extent, was established in 1852, comprises a collegiate department and a grammar school, and in 1874–75 had 18 instructors, 180 students, and a library of 3000 vols. P. of city, 9880.
CHARLES JONAS, ED. "SLAVIC."

Racine (JEAN BAPTISTE), b. Dec. 21, 1639, at Ferté-Milon in Picardy; lost both his parents when four years old; was educated first by his grandfather at Beauvais, then by his grandmother and aunt in the monastery of Port Royal; in this celebrated institution and among its quiet almost solitary surroundings the fine, tender, and sensitive nature of the young poet developed with great rapidity and astonishing brilliancy. He was loved, admired, and watched over by all. When he was twenty years old he left the monastery to see the world, and an ode he wrote at the marriage of Louis XIV., *La Nymphe de la Seine*, brought him a little name and a little reward. In Paris, however, his friendships and habits soon became somewhat irregular, and his relatives began to feel great anxiety about him. As he was still, to some extent, under their control, he retired to one of his uncles, a priest, at Uzès in Languedoc, and began to study theology. But neither the study nor the life satisfied him. He returned to Paris, and, a friend of Molière and Boileau, he became a dramatic author. His first tragedies, *La Thébaïde* (1664), *Alexandre* (1665), and his comedy, *Les Plaideurs* (1668), had only a moderate success, but his following tragedies, *Andromaque*, *Britannicus*, *Iphigénie* (1669), *Bérénice* (1670), *Bajazet* (1672), and *Mithridate* (1673), won a great name for him; and when he brought his *Phèdre* on the stage in 1677 he was generally acknowledged to be the first tragic poet of France. The intrigues of a literary cabal succeeded, however, in slurring the success of the piece, and this circumstance hurt the pride and sensitiveness of Racine so deeply that he gave up writing for the stage. The religious influence of his education in Port Royal began also to become uppermost in his mind; he spoke of becoming a Carthusian monk. This idea he gave up, but, having married a very devout lady, he retired into private life as royal historiographer, and divided his time between his family, his labors in the service of the king, and religious exercises. At the solicitation of Madame de Maintenon he wrote *Esther* (1689) and his masterpiece *Athalie* (1691) for the pupils of St. Cyr, but neither of them made any great impression on the public. At her solicitation he also wrote a memoir to the king on the state of France, and this memoir offended Louis XIV. very much. The loss of the favor of the monarch Racine could not bear; he actually pined away, and d. Apr. 22, 1699, in Paris. In reading Racine it must be remembered that he wrote under the influence of certain views, or rather under the sway of certain rules whose authority no Frenchman at that time could dream of doubting. These rules did not concern merely the theatrical arrangement and external dramatic form; they exercised an influence on the poetical conception itself. French tragedy in its classic period was not allowed to paint men; it had to paint only educated men; and in the educated man it aimed less at his passions than at his ideas. Thus, in classic French tragedy we must not seek for human nature idealized only by being represented through an artistic form. Before human nature could become a fit subject for artistic treatment it had to undergo a sort of social idealization. But the reader who can familiarize himself with these peculiarities will in Racine find a most charming poet—passionate yet pure, tender yet never sentimental. He knew not all that can go through a human heart, but that which he did know he knew in all the depths of its sorrow and in all the freshness of its joy, in all its anguish and in all its sweetness; and he pours it forth in expressions which are models of precision and gracefulness. CLEMENS PETERSEN.

Racing. See HORSE-RACING.

Rack [Ang.-Sax. *ræcan*, to "stretch"], an engine of judicial torture formerly much employed in Europe to compel accused persons to plead their own guilt or to obtain satisfactory testimony from recusant witnesses. It was introduced into England in 1447 by the duke of Exeter as constable of the Tower of London. In 1628 it was pronounced illegal by the courts. It has been since disused there, and is now everywhere obsolete. The victim was stretched upon a platform of wood; cords were attached to his limbs, and then strained by pulleys until the sufferer yielded or had his joints dislocated.

Rack'et, or **Racquets** [Fr. *raquette*], a game played with ball and racket-bat in a closed or an open court, popular in England and Ireland, and lately introduced into the U. S., which though confounded with tennis is quite dissimilar. The closed court is usually adopted, and the front wall has two lines marked on it, the first two feet two inches from the floor (below which the ball must not strike), and the second seven feet nine inches from the floor. Partners being chosen, the second party, standing on the right side of the court about halfway, serves the ball so that it shall strike above the second line and rebound to the left side, when the first party is obliged to return the ball at its first bound off the floor, and so continue. An elaborate code of rules has been adopted by the Prince's Racquet Club of London, which is generally observed wherever the game is played. Several racket clubs have been organized in New York City, one of which has erected a fine court on Sixth avenue.

Racoon', tp., Gallia co., O. P. 1700.

Racoon (P. O. name of INDEPENDENCE), Preston co., West Va., on Baltimore and Ohio R. R.

Rad'cliffe (Mrs. ANN **Ward**), b. in London, England, July 9, 1764; married in 1786 William Radcliffe, subsequently editor of the *English Chronicle*; published several romances notable for their wild and fantastic plots, of which *The Mysteries of Udolpho* (1794) is the only one now remembered, and some poems. D. in London Feb. 7, 1823. Her writings had considerable influence upon the literature of the time, and even Byron was among her imitators. A *Memoir* by Talfourd appeared in 1826.

Radcliffe (JOHN), M. D., b. at Wakefield, Yorkshire, England, in 1650; graduated at University College, Oxford, 1669; studied medicine, which he practised at Oxford, and subsequently at London; acquired wealth and popularity; was noted for wit and plainness of speech; was appointed physician to the princess Anne 1683; attended Queen Mary in her last illness, and entered Parliament 1713. D. at Carshalton, near London, Nov. 1, 1714. By will he left a large sum to University College, Oxford, and also founded the Radcliffe Library in that city, devoted to medical literature. (See his *Life and Letters* (1736), by W. Pittis.)

Radcliffe Library, an institution at Oxford, England, connected with the university, founded by a bequest of £40,000 left by Dr. John Radcliffe. The building, which is circular in form, standing upon arcades and with a spacious dome, stands in the centre of Radcliffe Square, and was completed in 1747 by James Gibbs, the architect, who bequeathed to the library his collection of books. Intended originally for medical literature, it has received large bequests of legal, theological, and Oriental works, and since 1861 has been reorganized in combination with the Bodleian Library, the vast central room of the Radcliffe being transformed into a reading-room.

Ra'dersburg, p.-v., cap. of Jefferson co., Mon., near Missouri River, in the vicinity of gold-mines. P. 311.

Radet'zky (JOSEPH WENZEL), COUNT, b. at Trzebnitz, in Bohemia, Nov. 2, 1766; entered the Austrian army in 1784; fought with distinction at Aspern and Wagram in 1809, and at Kulm and Leipsic in 1815; was made commander-in-chief of the Austrian troops in Italy in 1831, and field-marshal in 1836; put down with uncommon energy the revolution in Milan and Venice in 1848, though now a man of eighty years; won the victories at Custozza and Novara over the Piedmontese, and governed the Austrian possessions in Italy to Feb. 28, 1857, when he resigned. D. at Milan Jan. 5, 1858.

Rad'ford (WILLIAM), b. Mar. 1, 1808, in Virginia; entered the navy as a midshipman Mar. 1, 1825; became a passed midshipman in 1831, a lieutenant in 1837, a commander in 1855, a captain in 1862, a commodore in 1863, a rear-admiral in 1866; retired in 1870; served on the W. coast of Mexico during our war with that country, and commanded the iron-clad division in both the Fort Fisher fights. In his commendatory report of Jan. 28, 1865, Rear-Admiral Porter writes: "Com. Radford has shown ability of a very high order, not only in fighting and manœuvring his vessel, but in taking care of his division. His vessel did more execution than any other in the fleet, and I had so much confidence in the accuracy of his fire that even

when our troops were on the parapet he was directed to clear the traverses in advance of them of the enemy. This he did most effectually, and but for this, victory might not have been ours." FOXHALL A. PARKER.

Radia'ta [Lat. *radiatus*, "rayed"], a name proposed by Cuvier for the last or lowest of the four primary groups or branches (*embranchens*) into which he divided the animal kingdom, and owing its name to the radiate plan or symmetry manifested in many of its representatives. (I.) By Cuvier the group was constituted to "include a number of beings whose organization, always evidently more simple than that of the three preceding divisions, also presents a greater variety of degrees than is observed in either of them, and seems to agree in but one point—viz. their parts are arranged round an axis and on one or several radii, or on one or several lines extending from one pole to the other." To this group were referred five classes: (1) echinoderms (including gephyrean worms), (2) entozoans, (3) acalephs, (4) polyps (including Polyzoa), and (5) infusorians. This system was adopted by many. The incongruity of the infusorians with the other classes of radiates, and subsequently that of the polyzoans and gephyreans, was in time appreciated, and the group was limited (by H. Milne-Edwards) to the classes echinoderms, acalephs, and polyps, which were themselves purified of the heterogeneous elements confounded under them by Cuvier. With these limits the branch or sub-kingdom has been accepted by a large body of naturalists, and especially the French and American ones. (II.) Special investigators of the several classes (*e. g.* Frey and Leuckart) had convinced themselves that even those thus retained together had no common bonds of agreement, and differentiated them into two branches: (1) Echinodermata, limited to the echinoderms (which have been by some distributed among several classes), and (2) Cœlenterata, proposed for the reception of the acalephs and polyps. The last view has been strongly opposed by American naturalists (*e. g.* L. Agassiz, A. Agassiz, H. J. Clark, A. E. Verrill), who have contended for the retention of the branch Radiata as limited by Edwards; but has received the approbation of most European naturalists, and appears to be gaining ground among the Americans. While a number of naturalists regard the Echinodermata and Cœlenterata as entitled to rank as primary divisions (sub-kingdoms or branches), others entertain different views. Thus, by Huxley and his followers the echinoderms and the scolecids (intestinal worms and allied forms) have been associated together in a sub-kingdom Annuloidea, and by Häckel the sponges have been united with the acalephs, ctenophores, and polyps under the name Zoophyta. As more or less exact synonyms of Radiata may be noted the names Radiaria (Lamarck), Actinomorpha or Actinozoaria (De Blainville), Racemifera (Ehrenberg), regular animals (Burmeister), and Zoophyta (H. Milne-Edwards, Von Siebold, and Stanius, etc.). THEODORE GILL.

Radiation. See HEAT.

Rad'ical [Lat. *radix*], an indicated root of a quantity; thus, $\sqrt{3}$, $\sqrt[4]{16}$ are radicals. If the quantity under the radical sign is a perfect power of the indicated degree, the quantity represented is essentially rational, though under a radical form; if the quantity under the radical sign is not a perfect power of the degree indicated, the quantity is called a *surd;* thus, $\sqrt[4]{16}$ is a radical form of the rational quantity 2, but $\sqrt{3}$ is a surd, and its value can only be expressed by approximation. A radical may be written in either of two ways: it may be expressed by means of the radical sign $\sqrt{\ }$, in which case the degree of the radical is indicated by a number written over the sign and called an *index;* or it may be written by the aid of a fractional exponent, in which case the denominator indicates the degree of the radical. Thus, the cube root of a may be written $\sqrt[3]{a}$, or $a^{\frac{1}{3}}$. The methods of transforming radicals depend on two fundamental principles: (1) the product of the nth roots of two quantities is equal to the nth root of their product, and the reverse; (2) the quotient of the nth roots of two quantities is equal to the nth roots of their quotient, and the reverse. By the aid of these principles operations on radicals are readily reduced to corresponding operations on rational quantities. W. G. PECK.

Rad'ical Ax'is. If the equation (in rectangular or Cartesian co-ordinates), reduced to its simplest form of one circle, be subtracted from that of another, the remainder, an equation of the first degree, will, *if the circles intersect*, be the equation of a right line passing through the points of intersection. But it is remarkable that, whether the circles meet in real or *imaginary* points (*i. e.* whether they really intersect or not), the equation obtained as above always represents a real line having important geometric properties in relation to the two circles. This is in conformity to a general principle (that of "continuity;" see PROJECTION, METHOD OF, in APPENDIX) that the line joining two points may preserve its existence and its properties when those points have become imaginary.

Whether or not there be real intersection of the circles, the real line of which the equation is obtained as above is called the *radical axis* of the two circles. In the latter case the position of this axis is determined geometrically by cutting the line joining these centres so that the difference of squares of the parts = difference of squares of the radii, and erecting a perpendicular at this point.

If from any point of the radical axis tangents to the two circles be drawn, those tangents will be equal. Given any three circles, if the radical axis of each pair be taken, these three lines will meet in a point called the *radical centre.* From these two relations many other important geometric properties are deduced. The two points of intersection of the two *pairs* of common tangents to two circles are called *centres of similitude;* and if three circles be given, the six centres of similitude will be so disposed that three of them will lie on the same straight line, called the *axis of similitude*, of which there are four. By the use of these axes and their *poles* (see POLE AND POLAR), and the *radical centre* of three circles, the famous problem of "tangencies" of Apollonius, which attracted the attention of Descartes, and even Newton,* of drawing a fourth circle touching the other three, is geometrically solved with a facility which proves that the progress of modern geometry has been commensurate with that of analysis. J. G. BARNARD.

Radicals, in chemistry, sometimes called **Radicles.** This term was first introduced by Guyton de Morveau, and adopted by Lavoisier, at the time when the foundation of our present chemical nomenclature was laid in 1787. It was, however, applied then in a much narrower sense than it has since acquired. Guyton used it as synonymous with *acidifiable base*, whether simple or compound; that is, to designate a substance which would unite with oxygen to form an *acid.* It is now, in its broadest sense, applied to all substances, simple or compound, which combine with any of the more electro-negative elements to form compounds either acid, neutral, or basic; but, more generally and narrowly, it is now used to designate only "compound radicals" like *ammonium* and *cyanogen*, compounds of elements which have themselves an elementoid nature and perform elemental functions. One class of such radicals which has played a great part in the history of chemistry is that known as the "alcohol radicals," invented by Berzelius and Liebig. The alcohols and ethers and other important classes of organic compounds were during a considerable period almost universally regarded as containing certain compound elementoid groups of carbon and hydrogen atoms called *methyl, ethyl, propyl, butyl*, etc. At present, another radical is supposed by many to be contained in the alcohols, called *hydroxyl* (HO), and many do not regard the existence of the former series as essential. A recent distinguished chemical writer has defined a *radical* as "a group of elements which is common to a more or less numerous series of allied compounds, and remains unaffected by the processes whereby these compounds are transformed one into another." (*George C. Foster.*) (See SALT-RADICALS and VOLUMES, MOLECULAR.) HENRY WURTZ.

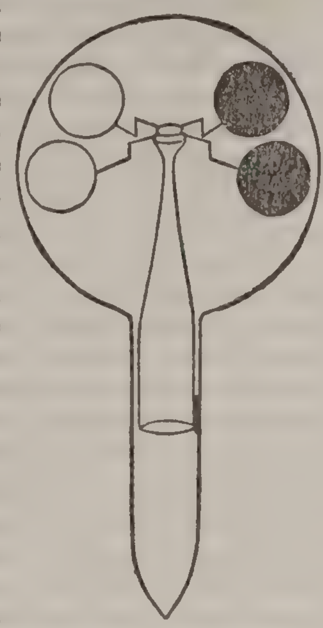
Radical Sign, the ordinary sign used for indicating a radical, $\sqrt[3]{\ }$, is a modified form of the letter r, with the addition of a number placed above it to indicate the degree of the radical.

Radiom'eter [Lat. *radius*, "ray;" Gr. μέτρον, "measure"], the name given to an instrument (Fig. 1) invented by Prof. William Crookes of London. It is formed of four or more delicate arms supported at their intersection by a needle-point, and carrying at their extremities thin disks of pith or of mica blackened on one side, the lamp-blackened surfaces all facing the same way. When the radiations from a luminous or a heated body fall upon this instrument, the vanes rotate, their blackened surfaces moving away from the source of radiation. Prof. Crookes was led to the discovery of this remarkable phenomenon by the minute study of the anomalous behavior of heated bodies when weighed in a vacuum. It is well known that a body when hot weighs less in air than when it is cold, the explanation usually given being that the ascending currents of hot air buoy up the body. To get rid of this action during a research on the atomic weight of thallium, Prof. Crookes used a balance enclosed in a case exhausted of air. He found that even in these conditions the

* The analytical solution was first successfully accomplished by Gergonne, *Annales des Mathématiques* (1820). B. Alvord (now paymaster-general U. S. A.) first gave elegant geometrical solutions of this and cognate problems. (*Smithsonian Contributions*, 1855, "Tangencies of Circles and Spheres.")

body appeared to weigh less when hot than when cold. He now suspended in an exhausted vessel a bar of pith, and in a similar vessel containing air he suspended another pith-bar, and found that a hot body repelled the pith-bar in the exhausted vessel, while it attracted the bar in the vessel holding air. To reach quantitative results, he constructed the apparatus shown in Fig. 2. It consists of a delicate horizontal rod suspended by a fine fibre of glass, and having disks of pith at each end coated with lampblack. The whole is enclosed in a glass case made of tubes blown together, and by means of a Sprengel pump the air is removed. In the centre of the horizontal rod is a mirror which reflects a beam of light on to a distant horizontal scale. The motions of this beam of light show the direction and amount of motion of the horizontal rod.

FIG. 1.



From the more interesting experiments made with this torsion-balance we select the following: A heliostat reflected a beam of sunlight in a constant direction, and it was received on an arrangement of slit, lenses, and prisms for projecting a pure spectrum. Equal areas of light from different parts of this spectrum were projected on to one of the blackened pith-disks of the torsion-balance. Experiments were made in the months of July, August, and September, and the results are given graphically in Fig. 3. The maximum effect is shown in the ultra red, and the minimum in the violet. Taking the maximum at 100, the following are the repelling actions on the disk of equal areas of the different colors of the spectrum:

FIG. 2.

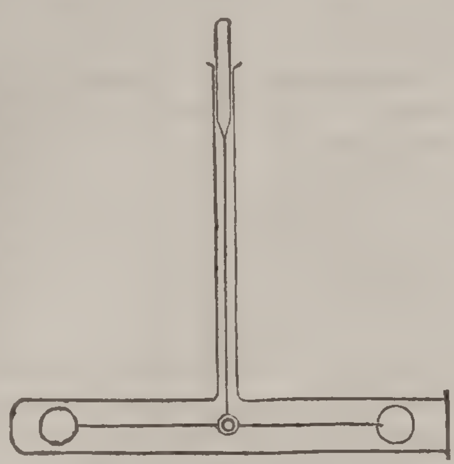
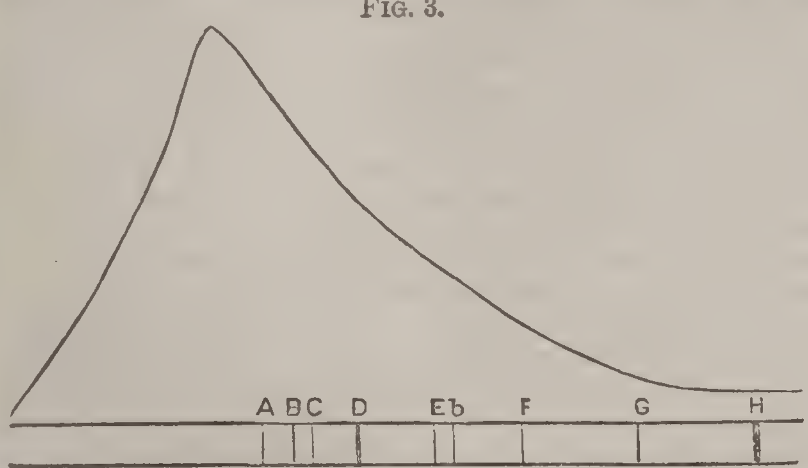


FIG. 3.



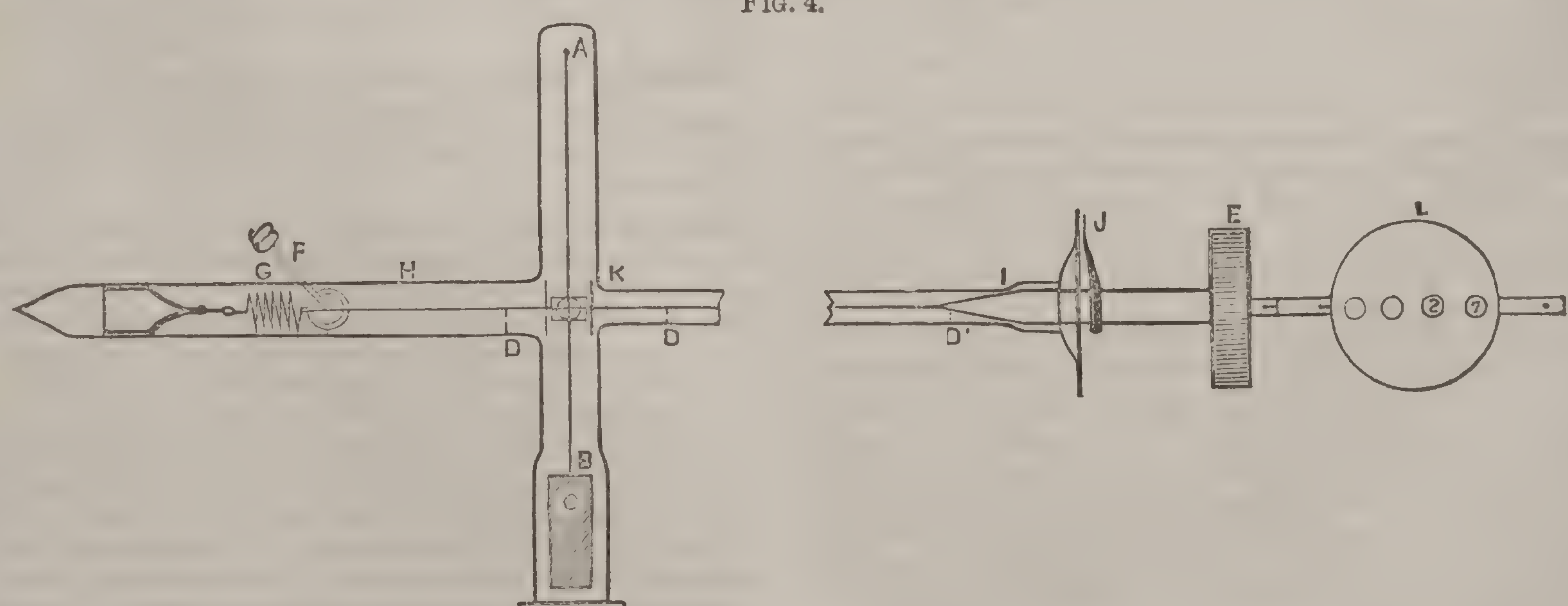
Ultra red	100°	Green	41°
Extreme red	85	Blue	22
Red	73	Indigo	8½
Orange	66	Violet	6
Yellow	57	Ultra violet	5

If Prof. Crookes had reduced these values to equal areas of the diffraction spectrum (see SPECTRUM and DIFFRACTION), his numbers would have approached equality, and his results would be similar to those obtained by Dr. J. W. Draper in his research on the distribution of heat in the solar spectrum. In subsequent experiments Crookes found that when a suspended bar of pith, having one half black and the other half plain, was exposed to the radiations from a candle, the blackened half of the bar was repelled five and a half times more than was the plain half of the bar. Prof. Crookes found that the action of the radiation on the torsion-balance (Fig. 2) diminished inversely as the squares of the distances of the source of radiation from the disk of the balance.

In the instrument described above the radiation acts on a pith-bar, one end of which is blackened on each side. But suppose the bar blackened on alternate halves, and a candle placed so near it that it drives the bar half round. The light will now have presented to it another black surface in the same position as the first, and the bar will be again driven in the same direction half round. This action will be repeated again and again, and the result will be *rotation*. If we now replace the suspended pith-bar by one supported on a point, we have a radiometer; which can be improved by substituting for the pith-bar several arms, each carrying a blackened disk of pith, and then we have the radiometer shown in Fig. 1. Prof. Crookes called this instrument a radiometer, because it can measure the intensity of the radiation falling on it by counting the number of its revolutions in a given time; the law being that the rapidity of revolution is inversely as the square of the distance between the source of radiation and the instrument. Prof. Crookes has constructed a radiometer with an attached electro-magnetic apparatus which registers the number of revolutions of the "light-mill," as some call it; and he proposes this instrument as a photometer, and as a meteorological instrument to measure the amounts of solar radiation received at different points of the earth.

Measure of the Pressure which Radiation exerts on a Blackened Surface.—In a lecture delivered by Prof. Crookes *On the Mechanical Action of Light*, before the Royal Institution on Feb. 11, 1876, and published in the April number of the *Quarterly Journal of Science*, the reader will find described many interesting experiments with this instrument. We here give an extract from this lecture: "I want to ascertain the amount of pressure which radiation exerts on a blackened surface. . . . The principle of the instrument is that of W. Ritchie's torsion-balance, described by him in the *Philosophical Transactions* for 1830. The construction is somewhat complicated, but can be made out on reference to the diagram (Fig. 4). A light-beam A B, having 2 square inches of pith C at one end, is balanced on a very fine fibre of glass D D′ stretched horizontally in a tube, one end of the fibre being connected with a torsion-handle E passing through the tube, and indicating angular movements on a graduated circle. The beam is cemented to the torsion-fibre, and the whole is enclosed in glass and connected with the mercury pump by the spiral tube F, and exhausted as perfectly as possible. G is a spiral spring to keep the fibre in a uniform state of tension; H is a piece of cocoon-silk: I is a glass stopper, which is ground into the tube as perfectly as possible, and then highly polished and lubricated with melted india-rubber, which is the only substance I know that allows perfect lubrication and will still hold a vacuum. The pith C represents the scale-pan of the balance. The cross-beam A B which carries it is cemented firmly to the thin glass fibre D, and in the centre is a piece of mirror K. Now, the cross-beam A B and the fibre D being rigidly connected together, any twist which I give to the torsion-handle E will throw the beam out of adjustment. If, on the other hand, I place a weight on the piece of pith C, that end of the beam will fall down, and I shall have to turn the handle E round and round a certain number of times until I have put sufficient torsion on the fibre

FIG. 4.



D to lift up the beam. Now, according to the law of torsion, the force with which a perfectly elastic body like glass tends to untwist itself is directly proportional to the number of degrees through which it has been twisted; therefore, knowing how many degrees of torsion I must put on the fibre to lift up the $\frac{1}{100}$th of a grain weight, I can tell how many degrees of torsion are required to lift up any other weight; and conversely, putting an unknown weight or pressure on the pith, I can find its equivalent in grains by seeing how much torsion it is equal to. Thus, if $\frac{1}{100}$th of a grain requires 10,000 degrees of torsion, $\frac{1}{50}$th of a grain would require 20,000 degrees; and conversely, a weight which required 5000 degrees torsion would weigh $\frac{1}{200}$th of a grain. Once knowing the torsion equivalent to $\frac{1}{100}$th of a grain, the ratio of the known to the unknown weights is given by the degrees of torsion.

"Having thus explained the working of the torsion-balance, I will proceed to the actual experiment. On the central mirror I throw a ray from the electric light, and the beam reflected on a particular spot of the ceiling will represent zero, and the counter which I fasten on at the end L stands at zero. I lift up my little iron weight by means of a magnet (for, working in a vacuum, I am restricted in the means of manipulating), and drop it in the centre of the pith; it knocks the scale-pan down, as if I had placed a pound weight on an ordinary balance, and the index-ray of light has flown far from the zero-point on the ceiling. I now put torsion on the fibre to bring the beam again into equilibrium. The index-ray is moving slowly back again. At last it is at zero, and on looking at the circle and counter I see that I have had to make 27 complete revolutions and 301 degrees, or $27 \times 360° + 301 = 10{,}021°$, before the force of torsion would balance the $\frac{1}{100}$th of a grain. I now remove the weight from the pith-pan of my balance, and liberate the glass thread from torsion by twisting it back again. Now the spot of light on the ceiling is at zero, and the counter and index are again at zero.

"Having thus obtained the value to the $\frac{1}{100}$th of a grain in torsion degrees, I will get the same for the radiation from a candle. I place a lighted candle exactly 6 inches from the blackened surface, and on removing the screen the pith scale-pan falls down and the index-ray again flies across the ceiling. I now turn the torsion-handle, and in much less time than in the former case the ray is brought back to zero. On looking at the counter, I find it registers 4 revolutions and the index points to 188 degrees, making altogether $360° \times 4 + 188 = 1628°$, through which the torsion-fibre has to be twisted to balance the light of the candle. It is an easy calculation to convert this into parts of a grain weight; 10,021 torsion degrees representing 0.01 grain, 1628 torsion degrees represent 0.001624 grain—$10021° : 0.01$ grain $: : 1628° : 0.001624$ grain.

"The radiation of a candle 6 inches off, therefore, weighs or presses the two square inches of blackened pith with a weight of 0.001624 grain. In my own laboratory, working with this torsion-balance, I found that a candle 6 inches off gave a pressure of 0.001772 grain. But this balance is capable of weighing to a far greater accuracy than that. You have seen that a torsion of 10,021° balanced the $\frac{1}{100}$th of a grain. If I give the fibre 1 degree more twist, the weight is overbalanced, as shown by the movement of the index-ray on the ceiling. Now, 1 degree of torsion is about the $\frac{1}{10000}$th part of the whole torsion required by the $\frac{1}{100}$th of a grain. It represents, therefore, the $\frac{1}{10000}$th part of the $\frac{1}{100}$th grain, or the millionth part of a grain. Divide a grain weight into a million parts, place one of them on the pan of the balance, and the beam will be instantly depressed!

"Weighed in this balance, the mechanical force of a candle 12 inches off was found to be 0.000444 grain; of a candle 6 inches off, 0.001772 grain. At half the distance, the weight of radiation would be four times, or 0.001776 grain. The difference between theory and experiment being only four-millionths of a grain, is a sufficient proof that the indications of this instrument, like those of the apparatus previously described, follow the law of inverse squares. An examination of the differences between the separate observations and the mean shows that my estimate of the sensitiveness of this balance is not excessive, and that in practice it will safely indicate the millionth of a grain. . . . But however fair an equivalent ten candles may be for a London sun in December, a midsummer sun in a cloudless sky has a very different value. Authorities differ as to its exact equivalent, but I under-estimate it at 1000 candles 12 inches off. Let us see what pressure this will give: A candle 12 inches off, acting on 2 square inches of surface, was found equal to 0.000444 grain; the sun, equalling 1000 candles, therefore gives a pressure of 0.444 grain—that is, equal to about 32 grains per square foot, to 2 cwt. per acre, 57 tons per square mile, or nearly 3,000,000,000 tons on the exposed surface of the globe—sufficient to knock the earth out of its orbit if it came upon it suddenly. . . . Whilst showing this experiment, I wish to have it distinctly understood that I do not attach the least importance to the actual numerical results. I simply wish to show you the marvellous sensitiveness of the apparatus with which I am accustomed to work. I may, indeed, say that I know these rough estimates to be incorrect. It must be remembered that our earth is not a lamp-blackened body enclosed in a glass case, nor is its shape such as to give the maximum of surface with the minimum of weight."

We here give an abstract from a paper on Crookes's radiometer by Dr. Arthur Schuster, published in the *Proceedings of the Royal Society* for Mar. 23, 1876. This paper, with the preceding facts, will give the reader all of the knowledge necessary to the understanding of the best explanation yet given of the phenomena presented by the radiometer: "Whenever we observe a force tending to drive a body in a certain direction, we are sure to find a force equal in amount acting in the opposite direction on the body from which the force emanates. It was with the view of finding the seat of this reaction that I made a few experiments. If the force is directly due to radiation, the reaction will be on the radiating body: if, on the other hand, it is due to any exterior action, the reaction will be on the enclosure of the moving bodies. I have been able to test this by experiment, and I have found that the action and reaction is entirely between the light bodies suspended *in vacuo* and the exhausted vessel. The radiometer was suspended by means of two cocoon-fibres, forming a bifilar suspension, from the top of a vessel which could be exhausted. A slight movement of the enclosure could be easily detected by means of a concave mirror attached to it. A beam of the oxyhydrogen lamp was concentrated on the light-mill, which then revolved about 200 times a minute. The light was cut off at the beginning of the experiment by means of a screen, and the position of rest of the glass vessel was read off by means of the dot of light on the scale. The screen was then suddenly removed, and in every case a large deflection of the glass vessel was observed. The vessel was deflected in the opposite direction to that in which the mill turned. When the velocity of the mill had become constant, the vessel returned to its original position. On suddenly cutting off the light, the vessel was again deflected, but in the opposite direction to that on starting the experiment. The vessel, therefore, now turned in the same direction in which the mill turned.

"These experiments are easily explained on the assumption that the force acting on the vessel enclosing the light-mill is exactly equal and opposite to that acting on the mill itself. While the velocity of the mill in one direction is increasing, a force acts in the opposite direction on the vessel. When the velocity has become constant, the force which tends to drive the mill around is exactly counterbalanced by the resistance which opposes the motion of the mill; the two forces acting on the vessel will therefore counterbalance, and the vessel will return to its original position of rest. When the light is cut off, the resistance will stop the motion of the mill. The reaction of the resistance will act on the enclosure, and the enclosure will turn in the same direction as the mill.

"By means of the reaction on the enclosure I have been able to calculate the strength of the force, and I have found that the pressure on a surface on which light of equal intensity to that used in my experiments falls is equal to that produced by the weight of a film of water on a horizontal surface equal in thickness to the length of a wave of violet light."

Explanation of the Motions of the Radiometer.—The most favorably-received explanation of the actions observed in the radiometer is that recently given by Prof. G. J. Stoney in the *Philosophical Magazine*, Mar., 1876. He bases his reasoning on the kinetic hypothesis of the constitution of a gas, according to which the molecules of a gas are in a constant state of vibration. The intensity of the vibratory motions is dependent on the temperature of the gas, and the degree of pressure which a gas exerts is due to the amount of these molecular motions. Prof. Stoney assumes that the pressure of the gas in a Crookes radiometer is about one-tenth of a millimètre of mercury; and he states that according to his own calculations and those of Sir W. Thomson and of Loschmidt, the number of molecules remaining in this so-called vacuum must be somewhere about one hundred millions of millions in every cubic millimètre. He then shows that to the peculiar character of the molecular motions in this rarefied gas is due the observed phenomena. He reasons thus: "Upon the blackened surface of the disks fall those radiations from the candle which are capable of passing through the glass. These will heat the blackened disk to a considerable degree, but not the transparent glass. I shall assume that the disk is heated one-tenth of a degree Centigrade more than the

glass. The disk in turn will warm a layer of air in contact with it. Throughout the thickness of a layer of this kind, if not interfered with, the temperature varies gradually, having on one side the temperature of the surrounding air, and on the other the temperature of the disk. If the chamber enclosing the apparatus contained air at atmospheric pressure and temperature, this layer would be thin. It would consist of air which has been expanded by the warmth of the disk, while the air in the rest of the chamber would by this expansion be in a trifling degree compressed. In other words, the molecules whose activity has been increased by contact with the heated disk would, in their encounters with other molecules, keep back some of them, and in this way reduce the number of molecules striking the heated disk, while this process would slightly crowd molecules into the rest of the chamber, and thus increase the number coming into collision with unheated surfaces. In this way the pressure everywhere is in a small degree raised, but everything is adjusted so that there is no excess of pressure anywhere; and this adjustment takes place in an exceedingly short period of time—so short that no sensible motion of the disk can establish itself while it is being effected. In fact, the number of molecules in a cubic millimètre of atmospheric air is known to be about a million of millions of millions; the molecules are dashing about with velocities of which the average is about 500 mètres per second; each meets with about a thousand millions of encounters with others in every second; and the adjustment accordingly takes place with what is promptitude as compared with visible motions.

"It is necessary for our purpose to form some estimate of the thickness of the layer of warmed air. In the absence of direct experiments, I assume that this layer of graduated temperature would in ordinary air be about as thick as a sheet of paper if the disk were 20° C. hotter than the air. This seems a very moderate estimate, judging from the copiousness of the convection currents which would quickly establish themselves if there were such a difference of temperature. And from this assumption it follows that if the temperature of the disk had been raised one-tenth of a degree before the chamber was exhausted—which I have assumed to be about the elevation of temperature that actually takes place in the radiometer—the thickness of the warmed layer of air would be about the wave-length of light of mean refrangibility, and about one-sixteenth the diameter of the disks which float in human blood. Let us suppose, then, that a layer of this thickness is heated, irrespective of convection, when ordinary air is inside the apparatus. On the foregoing assumptions we can compute what the state of things will be when the chamber is exhausted. When the pressure is made to vary, it appears from the doctrine of probabilities that the value of λ (using λ to designate the length of the average excursion of a molecule—*i. e.* the distance a molecule on the average travels in the intervals between two of its encounters with other molecules) will vary inversely as $\delta^{\frac{4}{3}}$, δ being the density. Now, the thickness of the layer of graduated temperature depends on λ, and will vary in the same ratio as it. We have supposed the density in our vacuum-chamber to be $\frac{1}{10000}$th of an atmosphere; it will follow that the thickness of the heated layer in this attenuated medium would be $10{,}000^{\frac{4}{3}}$ times what it is in ordinary air, and would therefore become half a sixth-mètre $\times 10{,}000^{\frac{4}{3}}$, which is more than a decimètre. It therefore reaches quite to the walls of our little vacuum-chamber; and this very materially alters the state of affairs. In fact, we have on one side glass at a temperature of, suppose, 15°, on the other a disk at a temperature of 15.1°, and between them a space which is only a part of what would be required to establish a complete gradient of temperature in the intervening air. This is equivalent to saying that some of the additional momentum communicated to molecules of air by the heated disk, instead of expending itself in interaërial collisions, and thus increasing the general temperature and pressure of the air, makes its way across the intervening stratum to the opposite walls of glass, where it occasions an increased pressure against them, of which the resultant is directed perpendicularly from the disk. The momentum of the accelerated molecules which reach the glass falls after the contact of the molecules with the glass to the feebler type corresponding to its lower temperature; and it is chiefly momentum of this feebler type which makes its way to regions behind the disk. An excess of force equal and opposite to that on the glass acts against the front of the disk, and is sufficient to account for the phenomena which Mr. Crookes has investigated. For its amount may be approximated to as follows: Instead of the actual condition of the molecules which come into collision with the heated disk, we may substitute one more convenient for calculation. The resulting pressure will be the same as if some moderate portion of the molecules, say one-third of them, had reached it with velocities corresponding to the temperature 15.1°, while the remaining two-thirds reached it with velocities corresponding to 15°. We may further regard the increased pressure on the disk caused by the former class of molecules as equal in amount to the portion which is compensated by the slight reductions of density in the neighborhood of the disk, and by the slightly-increased temperature and density elsewhere, which are due to the existence of a portion of the gradient. Under this hypothesis the effect of these molecules may be left out of account. There would, however, remain the augmented pressure arising from the other two-thirds of the molecules, uncompensated so far as regions behind the disk are concerned; and it is the amount of this pressure which we have now to estimate. The molecules in question reach the disk, according to the hypothesis, with velocities corresponding to 15°, and are thrown off from it with velocities corresponding to 15.1°. It is easy to see that the augmentation of pressure which they will produce upon the disk will be half what would arise if they had reached the disk as well as left it with velocities corresponding to the higher temperatures. This latter can be calculated by Boyle and Mariotte's law. It is two-thirds of a decigramme $\times \frac{0.1}{273 + 15}$, or 0.000023 of a gramme per square centimètre. The uncompensated excess of pressure on the disk will, upon the assumption we have made, be half of this, or 0.0000115 of a gramme per square centimètre, the amount as determined experimentally by Mr. Crookes being 0.00001. Accordingly, an elevation of the temperature of the blackened face of the disk to the extent of about one-tenth of a degree above the temperature of the glass and of the back of the disk is enough to account for the observed pressure."

Quite recently the writer of this article has discovered that a pressure, somewhat analogous to the above, exists between the front of a sounding organ-pipe and the interior of a neighboring resonator, so that the latter, when suspended from an arm of a torsion-balance, will be repelled from the sounding-pipe. ALFRED M. MAYER.

Rad'ish [Ang.-Sax. *rädic*], the *Raphanus sativus*, a cruciferous plant, a native of Asia, cultivated for its root, employed as a table relish. The root is stimulant, diuretic, and antiscorbutic. The seeds of some varieties yield an oil almost identical with rape and colza oil.

Ra'dius [Lat., "spoke"], the outer bone of the fore arm, on the same side with the thumb. It is parallel with the ulna, which is larger than the radius, and enters much more closely into the formation of the elbow-joint, while the radius forms the joint with wrist-bones. Thus the hand of man acquires its susceptibility of rotation.

Radius. The radius of a circle is the distance from the centre to any point of the circumference. The radius of a sphere is the distance from the centre to any point of the surface.

Radius of Curvature, the radius of an osculatory circle—that is, the radius of a circle passing through three consecutive points of a curve. (See OSCULATION.)

Radius Vector. In a system of polar co-ordinates the radius vector is the distance from the pole of the system to any point of a line or of a surface.

Rad'nor, tp., Peoria co., Ill. P. 948.

Radnor, p.-v. and tp., Delaware co., O. P. 1255.

Radnor, p.-v. and tp., Delaware co., Pa., on Pennsylvania R. R. P. 1431.

Rad'norshire, an inland county of South Wales, comprises an area of 425 sq. m., with 25,428 inhabitants. The surface is irregular and mountainous; more than one-half of the soil is bog and moorland. Barley, oats, and potatoes are grown; cattle and sheep are reared. Principal towns, Presteign and New Radnor.

Rad'noth, town of Transylvania, on the Maros, is noted for the splendid palace which Prince George Rakoczy I. had built here by the Venetian architect Augustino Serana. P. about 1200.

Ra'doboj, town of Austria, in Croatia, is noted for its sulphur-mines, which annually yield about 2500 cwts. of sulphur. P. about 1100.

Ra'dolfzell, town of Germany, in the southern part of the grand duchy of Baden, at the confluence of the Radolfzeller Ach with the Untersee, is noted for its fine Gothic church of the eleventh century, and for its cultivation of wine, fruit, and vegetables. P. about 2000.

Ra'dom, government of Poland, European Russia, bounded N. by the government of Warsaw, comprises an area of 4768 sq. m., with 532,466 inhabitants. It is the most elevated portion of the Polish plain, being traversed by the Sandomir Mountains, which rise to a height of

about 2000 feet. Forests abound; agriculture and breeding of horses and cattle are the principal occupations.

Radom, town of Poland, European Russia, the capital of the government of Radom, is situated on the Radomsk, and has some trade and manufactures. P. 10,944.

Ra'dowitz, von (Joseph Maria), b. at Blankenburg, grand duchy of Brunswick, Germany, Feb. 6, 1797; received his military education at Paris and Cassel; fought in the campaigns of 1813 and 1815; was subsequently appointed teacher of mathematics at the military school of Cassel; removed in 1823 to Prussia, and held various high military and diplomatic positions, for a short time in 1850 that of minister of foreign affairs. D. at Berlin Dec. 25, 1853. His influence, although very widely spread, was nevertheless small, and even his ideas, such as they appear in his *Gespräche aus der Gegenwart über Staat und Kirche* (i. 1846; ii. 1851), and *Gesammelte Schriften* (5 vols., 1852–53), derive their principal interest from the very intimate friendship, and, so to speak, community of ideas, between the author and Frederick William IV.

Rad'stadt, town of Austria, near Salzburg, on the road which crosses the Noric Alps through the depression called Radstädler Tauern, is encircled with walls surmounted with towers, and contains a convent and several old buildings of interest. P. about 3000.

Radu the Black, the first native prince of Wallachia (about 1280), celebrated for the negotiations which he carried on with the papal see for the introduction in his country of the Roman Catholic conception of Christianity. The Wallachians received Christianity very early, and were under the metropolitan of Ochrida in Macedonia. In 861 they adopted the alphabet introduced by Cyrillus among the Bulgarians, and the Slavonian language became their church language. When the schism took place between the Eastern and Western churches, they followed unhesitatingly the former, and the pope of Rome was to them an abomination. Radu nevertheless received some monks of the mendicant orders in the country, and it seemed as if a reconciliation were about to be accomplished, but under his successor the negotiations were again broken off, and the monks were partly expelled, partly put to death.

Rae (John), M. D., LL.D., b. in the Orkney Islands early in the nineteenth century; studied medicine at Edinburgh; entered the service of the Hudson's Bay Company as a surgeon 1833; made several explorations through British America; visited the shores of the Arctic Sea 1846–47; was a member of Sir John Richardson's expedition in search of Sir John Franklin 1848; conducted a similar expedition 1850; reached Repulse Bay; discovered a large river flowing into Chesterfield Inlet, and found the first traces of Franklin's fate. Author of *A Narrative of an Expedition to the Shores of the Arctic Sea* (1850) and other works.

Rae'burn (Henry), R. A., b. at Stockbridge, near Edinburgh, Mar. 4, 1756; educated in Heriot's Hospital; was apprenticed to a goldsmith; displayed such genius for miniature-painting that in his leisure hours he earned enough money to buy up his indenture; afterward devoted himself to oil-painting; studied some months under Sir Joshua Reynolds; spent two years in Italy; established himself as a portrait-painter in Edinburgh 1787; soon became the most eminent artist of Scotland; became president of the Society of Artists, Edinburgh, 1812, and was knighted 1822. D. at Edinburgh July 8, 1823. He has left portraits of nearly all the eminent Scotchmen of his time, and his pictures are now much valued. His style was formed upon that of Reynolds, and has been compared to that of Velasquez.

Raffadali, town of Sicily, province of Girgenti, situated on a hill about 8 miles from the town of Girgenti. This place, of Saracenic origin, exports grain, olive oil, and cheese in considerable quantities. P. 6700.

Raffaelle. See Raphael.

Raf'fles (Thomas), D. D., LL.D., b. in London May 17, 1788; educated at Homerton College; settled at Hammersmith in 1809, and in 1812 succeeded Thomas Spencer (who was drowned in the Mersey) as pastor of the Great George street chapel, Liverpool. D. Aug. 18, 1863. Some of his hymns have been very popular. He published *The Life and Ministry of the Late Thomas Spencer* (1813), *A Tour on the Continent* (1817), *Lectures on Christian Faith and Practice* (1820).—His son, Thomas Stamford Raffles, of the Inner Temple, published an admirable biography of his father in 1864. R. D. Hitchcock.

Raffles (Thomas Stamford), cousin of the preceding, b. at sea off Point Morant, Jamaica, July 5, 1781, son of a sea-captain in the West India trade; obtained at the age of fifteen an assistant clerkship in the East India House, where his talents procured him rapid advancement. In 1805, on the formation of a government at Pulo-Penang (or Prince of Wales Island), the court of directors gave him the appointment of assistant secretary, and in 1807 he was made principal secretary. By assiduous study of the Malay language, and careful researches among the numerous races of the Indian Archipelago, aided by a visit to Malacca in 1808, Raffles soon became a leading authority upon the ethnology of that little-known region; was secretary to the governor-general of India, Lord Minto, during the expedition against Java 1811; was made lieutenant-governor of the newly-acquired colony, and administered that important island and its dependencies with great judgment for five years, effecting the abolition of slavery and acquiring the good-will of the native princes. Returning to England on account of ill-health, he was knighted in 1817, and published his *History of Java* (2 vols. 4to, 1817), which is still the best English account of that island. Java having been restored to the Dutch, Raffles was in 1818 made lieutenant-governor of the settlement at Fort Marlborough, Bencoolen, on the coast of Sumatra, where he formed a fine collection of natural history, which was unfortunately lost by the burning of a ship in which he, with his family, had taken passage for England, Feb., 1824. While in Sumatra he emancipated the slaves, formed the new British settlement of Singapore (1819), endowed there a college for the study of Malay and Chinese literature, and published two vols. of *Malayan Miscellanies* (Bencoolen, 1820–22). On his arrival in England, Sir Stamford founded the Zoological Society of London, of which he was the first president, and devoted himself chiefly to its interests. D. at London July 4, 1826. A *Memoir* was published by his widow (4to, 1830).

Raffle'sia [named in honor of Sir T. Stamford Raffles (1781–1826)], a genus of remarkable rhizogenous plants of the order Rafflesiaceæ. (See Rhizogens.) The Rafflesias are natives of Sumatra and Java, parasitic upon stems and roots of *Cissus*. They are all stemless, rootless, and leafless, mere flowers, with a few scales for leaves; the seeds are of a rudimentary character, and once regarded as spore-like. The plant has a fungus-like, fleshy appearance, and an intolerable odor of carrion. *R. Arnoldi* is considered the largest flower in the world. It is some three feet in diameter, and has been known to weigh fifteen pounds. It is worshipped by the Javanese. *R. patma* has strong styptic power. *R. Horsfieldii* is but three inches across.

Rafinesque' (Constantine Smaltz), b. of French parents at Galata, a suburb of Constantinople, in 1784; was sent to the U. S. 1802, landing at Philadelphia; he soon developed a fondness for natural history; made many excursions for collecting botanical specimens; went to Leghorn 1805, and thence to Sicily, where he resided ten years, and published (in French) several scientific works; sailed for New York 1815; lost by shipwreck on the coast of Long Island all his effects, including valuable books, manuscripts, and collections; went to the West in 1818; was for some years professor of botany in Transylvania University, Lexington, Ky.; travelled and lectured in other States; settled finally at Philadelphia; wrote many monographs in various branches of natural history; published *Annals of Kentucky* (1824), *The American Florist* (1832), *Atlantic Journal and Friend of Knowledge* (8 numbers, 1832–33), *The American Nations* (2 vols., 1836), *Medical Flora of the U. S.* (2 vols., 1828–30), *A Life of Travels and Researches* (1836), and other works. D. at Philadelphia Sept. 18, 1842. The *Writings of C. S. Rafinesque on Recent and Fossil Conchology* have been edited by W. G. Binney and G. W. Tryon, Jr. (Philadelphia, 1864).

Rafn (Karl Christian), b. at Brahesborg, island of Fünen, Denmark, Jan. 16, 1795; studied at the University of Copenhagen; was appointed librarian of the university in 1821, and founded in 1825 the Society for Northern Antiquities. D. at Copenhagen Oct. 20, 1864. Besides a number of critical editions (*Krákumál* (1826), *Fornaldar Sögur* (3 vols., 1829), *Färeyinga Saga* (1832), and parts of *Fornmanna Sögur* (12 vols., 1828, *seq.*)) and minor essays, he wrote *Antiquitates Americanæ* (1837), *Grönlands historiske Mindesmærker* (3 vols., 1838–45), and *Antiquités russes et orientales* (3 vols., 1850–54). In his *Antiquitates Americanæ* he proved from geographical, astronomical, and nautical dates contained in the Scandinavian sagas that the Scandinavians discovered America in the tenth century, and between the eleventh and fourteenth centuries occupied parts of the coast of Rhode Island and Massachusetts —an hypothesis which local researches have since confirmed.

Raft'ing Creek, tp., Sumter co., S. C. P. 1585.

Rag'lan, tp., Harrison co., Ia. P. 334.

Raglan (Fitzroy James Henry **Somerset**), Baron, son of the fifth duke of Beaufort, b. in England Sept. 30,

1788; educated at Westminster School; entered the army as ensign 1804; attended Sir A. Paget to Constantinople 1807; accompanied the duke of Wellington in the Peninsula as a member of his staff, rising to the position of aide-de-camp and military secretary 1807; was wounded at Busaco 1810; distinguished at Badajoz 1812; lost his right arm at Waterloo; was knighted and made colonel; was secretary of embassy at Paris 1816–19; entered Parliament as a Conservative 1818 and 1826; was again military secretary to Wellington thirty-three years, from 1819 to the death of the latter; was appointed master-general of the ordnance Sept., 1852; made Baron Raglan Oct., 1852; commanded the British expedition to the Crimea with the rank of general Mar., 1854; defeated the Russians at the battle of the Alma, Sept. 20; fought the battles of Balaklava, Oct. 25, and Inkermann, Nov. 5, and was made field-marshal Nov., 1854. D. of cholera in the camp before Sebastopol June 28, 1855. His military papers formed the principal material for Kinglake's *History of the Crimean War.*

Rag'lesville, p.-v., Van Buren tp., Daviess co., Ind. P. 53.

Rag'stone, or **Rag,** a silicious limestone with a rough fracture, used for whetstones and for building material. The term is, however, quite loosely applied.

Raguet' (Condy), LL.D., b. in Philadelphia, Pa., Jan. 28, 1784; was educated at the University of Pennsylvania, and studied law; engaged in commercial pursuits; went to St. Domingo as supercargo of a vessel 1804; returned there 1805; published two small books giving an account of the state of that island and a history of the massacre of the planters; went into business on his own account 1806; accumulated a fortune; took an active part in several useful corporations and mercantile associations, and in taking measures for the defence of the city against an expected attack by a British fleet 1812; served in both branches of the legislature; became in 1822 consul at Rio de Janeiro, Brazil; negotiated a commercial treaty with that country, to which in 1825 he was appointed the first chargé d'affaires; returned in 1827, and wrote much in periodicals, especially in the *Portfolio,* in favor of free trade. D. at Philadelphia Mar. 22, 1842. Author of *Principles of Free Trade* (1835), *On Currency and Banking* (1839), and other works; editor of *Free Trade Advocate* (2 vols., 1829), *Examiner* (2 vols., 1834–35), and *Financial Register* (2 vols., 1837–39).

Ragu'sa, town of Austria, in Dalmatia, on a peninsula of the Adriatic, and built in terraces on the side of Mount Sergio, the upper streets communicating with the lower by flights of steps. It is strongly fortified with citadels and walls surmounted by towers. Of its two harbors, Porto Casson admits only small vessels, but Gravoso, on the N. side of the peninsula, 2 miles from the city, can accommodate the largest men-of-war. Ragusa was formerly one of the commercial centres of the Adriatic, and formed an independent republic; its fortifications and palaces bear witness to its past splendor. But in the last 100 years it has greatly declined. Soap, liquors, silk, and leather are manufactured, and a lively transit-trade is carried on. It suffers often from earthquakes. P. 8678.

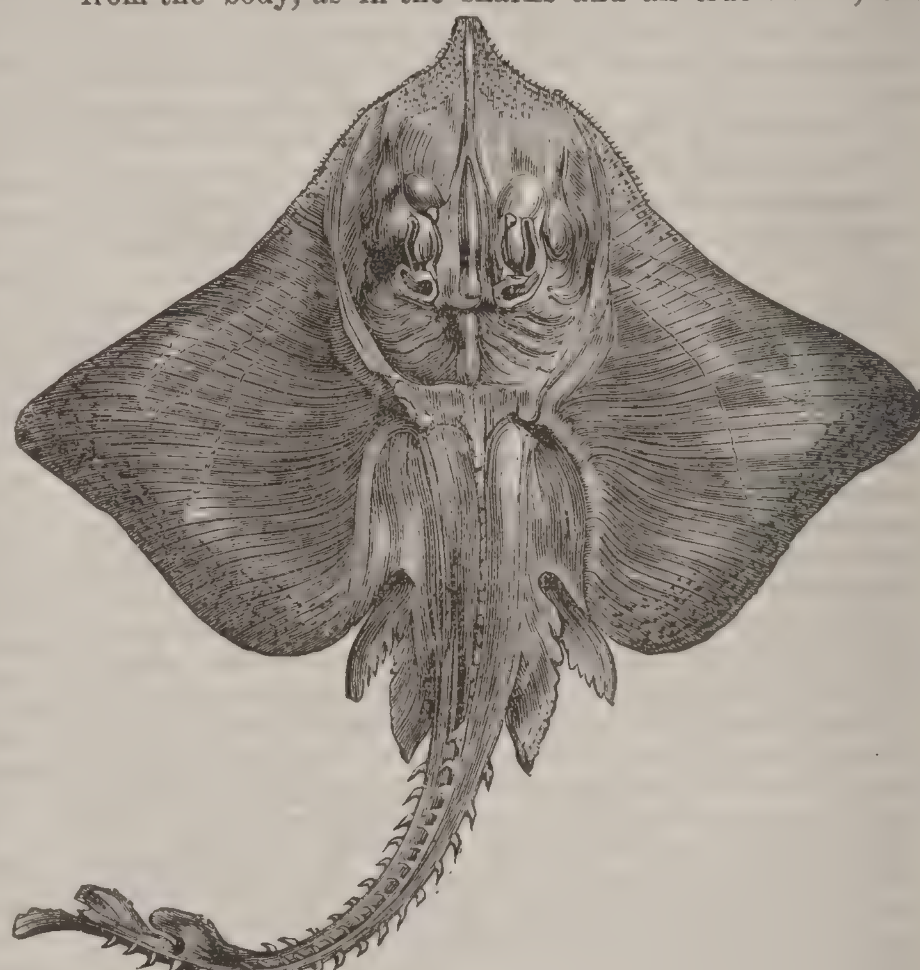
Ragusa, town of Sicily, province of Syracuse, about 9 miles N. N. W. of Modica. This city is now divided into Upper and Lower Ragusa, each having its own proper municipal organization. In the upper town, Ragusa Superiore, some interesting old churches escaped destruction in the earthquake of 1693, but they have been greatly injured by modern injudicious restorations, especially Santa Maria della Scala. The remains of mediæval buildings overthrown by earthquakes may still be seen in various parts of the city, near which are also the ruins of a large fortress in a strong position and provided with subterranean vaults. Many old cisterns exist outside the walls, and about a mile to the W. of the double town there is an ancient cemetery containing tombs, and by the side of this another in the form of a labyrinth. Ragusa is of very ancient origin, took part with Syracuse against the Romans, and was by the latter reduced to a colony. In 844 A. D. it was taken and sacked by the Saracens. It is now a place of considerable industry and commerce, the near landing of Mazzarelli serving as its port. P. of Ragusa Inferiore, 6800; of Ragusa Superiore, 21,550.

Rahdunpoor', town of Western Hindostan, in lat. 23° 52′ N. and lon. 71° 38′ E., the capital of a small state of the same name dependent on Great Britain. The whole dominion has an area of 850 sq. m., with 45,000 inhabitants, of whom about 15,000 live in the capital, chiefly employed in the manufacture of coarse cotton fabrics.

Rahn, tp., Schuylkill co., Pa. P. 1227.

Rah'way, city, Union co., N. J., on the river of the same name, navigable for boats of from 4 to 8 feet draught, about 20 miles S. W. of New York City. It contains 17 churches, 1 public and 1 circulating library, an opera-house, 2 public halls, 1 high school, and 5 public schools, with several private seminaries, 2 national and 2 savings banks, 2 weekly newspapers, 1 street railway, 2 insurance companies, 2 woollen mills, 1 hub and 2 spoke factories, a printing-press manufactory, 30 carriage-factories, and several other manufacturing interests. The city is supplied with water and gas, and has 2 cemeteries handsomely laid out. P. 6258. Ed. "Advertiser and Times."

Rai'æ [Lat. *raia,* "ray" or "skate"], according to some authors an order, and to others a sub-order, of the class of Elasmobranchiates, including the rays, torpedoes, and related types. The pectoral fins are much developed, and produced from the anterior margins forward, and connected with the rostral cartilages, thereby constituting an integral part of the form, and not abruptly differentiated from the body, as in the sharks and all true fishes; the



The Bordered Ray.

branchial openings are in two converging rows of five each on the inferior surface of the body; spiracles are well developed behind the eyes. In other respects the order essentially agrees with the Squali, and the two form a common super-order or sub-class—the Plagiostomi. The form varies considerably in the several members of the order; on the one hand, the sawfishes have an outline much like that of the sharks, and with a long caudal portion; and on the other hand, the eagle rays and certain stingrays have a disk extremely wide—much wider than long—and the caudal portion is reduced to a whip-like appendage. These two forms exemplify the extremes of the characteristics according to which the order is divided into two sub-orders—viz. (1) Pachyura (including the Raiidæ, Rhinobatidæ, Pristidæ, and Torpedinidæ); and (2) Masticura, including the eagle rays (Myliobatidæ), devil-fishes (Cephalopteridæ), and stingrays (Trygonidæ).
Theodore Gill.

Rai'idæ [Lat. *raia,* "ray"], a family of the order Raiæ, including the common skates or rays. In all these the disk is broad and more or less sub-rhomboid, and the tail slender, but fleshy, and rather longer than the disk; the skin covered with radiated spines or asperities; the head well defined, and with a more or less pointed snout; the internasal region furnished with a broad velum; the mouth transverse; the teeth small, generally varying according to the sex; the dorsals two in number, small and situated on the terminal half of the tail; the caudal reduced to a narrow seam. The female is oviparous, laying eggs provided with parchment-like cases furnished at each angle with a filamentous extension; these cases are known popularly as "sailors' purses," and are rather common on the sea-shore. Between thirty and forty species are known, some or other of which are found in all seas, but are more numerous in the northern than the southern hemisphere. Five species are known from the eastern coast of the U. S. (*Raia erinacea, R. ocellata, R. radiata, R. eglanteria,* and *R. lævis*), and two from the western coast (*R. Cooperi* and *R. binoculata*). Theodore Gill.

Raikes (Robert), b. at Gloucester, England, in 1735, became editor and publisher of the Gloucester *Journal;* founded a system of Sunday schools for poor children in 1781, and witnessed its extension to most of the towns of England. D. Apr. 5, 1811.

Rail [Fr. *râle*], the English name for various species of the family Rallidæ, but especially applied to species of the genus *Rallus* and *Porzana* in the U. S. The former has the bill comparatively slender and longer than the head; it embraces (1) the common or marsh rail (*Rallus elegans*), the largest species found in the U. S., whose total length is about seventeen inches; and (2) the clapper-rail or mud-hen (*R. crepitans*), whose length is about fourteen inches. The species of the latter genus have a comparatively thick bill, which is not longer, and even shorter, than the head; to it belong (1) the common rail or sora (*Porzana Carolina*), whose length is between eight and nine inches; (2) the little black rail (*P. Jamaicensis*), about five inches in length; and (3) the little yellow rail (*P. noveboracensis*), whose length is about six inches. These frequent more especially salt-water marshes, and are all sought after by the sportsman as game-birds.

Theodore Gill.

Rail Road, tp., Chicot co., Ark. P. 1008.

Rail Road, tp., Starke co., Ind. P. 532.

Railroad, tp., Elko co., Nev. P. 110.

Railroad Equipment. See Railroads, by Col. Julius W. Adams, C. E.

Railroad Junction, tp., Carlton co., Minn. P. 27.

Rail′roads, roads with parallel tracks of iron rails upon which the carriages run. The term is used as a synonym for "railway." The latter term is exclusively used in England, and is gaining ground in this country, but it would appear to be incorrect, from the fact that *way* may be regarded as the generic term for the path which a person chooses at pleasure for himself, while *road* specifies the kind of way: "Instead of keeping the high *road* to town, you may go a shorter *way* across the fields."

History.—The plan of facilitating the draught of carriages by forming a hard continuous surface for the wheels to run upon is old and simple, and the successive adaptation of flag-stones, pieces of timber, and finally strips of iron fastened to the top of the timbers, are the several improvements it has undergone. The use of iron was found to reduce the friction very sensibly, and to increase more than fourfold the amount which the horses could draw from the mines, where such tracks were mostly in use; a ledge or flange on the outer edge of the plate of iron forming the rail enabled the ordinary wagon to keep on the rails without difficulty. This kind of track was long in use, and was known as a tramway. The next improvement, growing out of the necessity for increased strength in the rails, was the introduction of the edge rail, formed by setting up a bar of cast or rolled iron in the form of a ⊤. This required special supports called "chairs," spiked to the timber rails or to cross-supports of timber called "ties," or at intervals to stone blocks. To produce uniform strength between the points of support, the iron rail was made of an elliptical profile—that is, the upper part of the ⊤ upon which the wheels rolled was a straight line, while the stem of the ⊤ varied in depth, being thinnest at the points of support and deeper intermediately. These constituted the "fish-bellied rail," for a long time considered the proper form for iron rails. In this rail the flange, which in the tramway was necessary to prevent the wheels from leaving the track, was removed, and in lieu of it a flange was cast on the inner edge of the wheel-tires. Railroads constructed upon this principle were in operation in the principal collieries in England and Germany toward the close of the last century, used for the transportation of coal or ores from the pit to the port of shipment, sometimes by the force of gravity; and where the acclivity had sufficient steepness the loaded wagons in descending drew up the empty wagons by means of an endless rope passing around a pulley at the summit of the incline; in others, horse or steam power was used.

In 1802, Trevithick took out the first patent for adapting a steam-engine to move upon a road, although Watt is said to have invented one previously. As early as 1804 steam was used as a means of propulsion on some of these roads, but the speed was not greater than that of horses, owing to the imperfect construction of the boilers of the engines; and on grades as low as 18 feet per mile they required to be assisted by auxiliary power of some sort; and, what is very remarkable, the progress of improvement in the engine used for roads was much retarded for many years by an imaginary difficulty which it would seem a single experiment would have sufficed to remove. This was in the opinion that the friction, or the adhesion of the driving-wheels of an engine to the rails, did not offer sufficient resistance to slipping to allow of the power of the engine being applied to the axles so as to produce locomotion. As late as 1811, Blinkinsop obtained a patent for the application of a rack-rail, laid on one side of the railway, into which a cog-wheel on the axles of the driving-wheels worked. Other patents are on record as late as

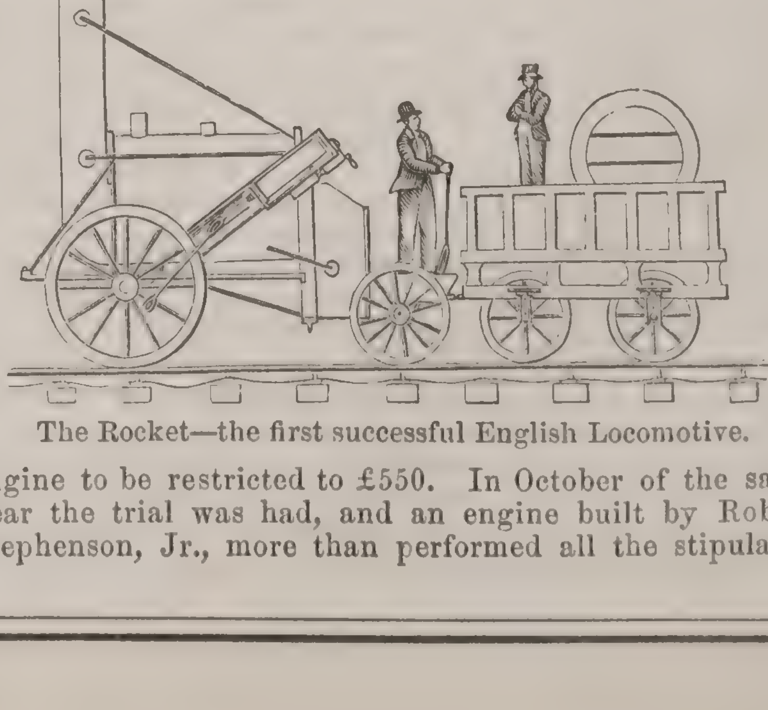
Fig. 1.

South Hetton Collieries Railway.

1815, looking to overcoming this fictitious difficulty—some by means of chains extending the whole length of the road between the rails, and others by means of jointed levers worked by steam. It was at about this date that the important discovery was made that the adhesion of the wheels of the engine to the rails furnished a sufficient fulcrum for the action of the propelling power, thus dispensing with all the cumbersome contrivances of racks, chains, etc.; and yet as late as 1825 we find the record of a patent for a locomotive requiring for its action a racked rail lying midway between the bearing-rails of the track.

This year (1825) the Stockton and Darlington R. R., 37 miles in length, was completed, and was the first railroad built for general traffic. It was the intention to operate it with horses, but locomotives were soon applied to it. The increased commerce between the manufacturing town of Manchester, England, and Liverpool, much hampered by the excessive tolls and uncertain movements on the canal between these points, led to chartering the Liverpool and Manchester R. R. in 1828, its main object being the transport of merchandise between the two places; and so little did its projectors appreciate the magnitude of the enterprise they had undertaken that the charter expressly stipulated that its owners might exact toll of all who might desire to put vehicles on the road for the transport of goods, looking to its general use by horse-power and its almost exclusive use for freight rather than passengers. The engineer, George Stephenson, however, advocated the use of steam exclusively; accordingly, in 1829, as it approached completion, an inquiry was instituted as to the respective merits of stationary and locomotive steam-power, and two of the four commissioners appointed for the purpose reported in favor of working the road by stationary engines, and two, including the engineer, were decidedly in favor of the use of locomotive engines; and the directors of the road were induced to offer a reward for a locomotive engine which should be able to take *three times* its own weight on a level road at a speed of *ten miles per hour*—such performance being then unknown—the price of the

Fig. 2.



The Rocket—the first successful English Locomotive.

engine to be restricted to £550. In October of the same year the trial was had, and an engine built by Robert Stephenson, Jr., more than performed all the stipulated

requirements; weighing but $7\frac{1}{2}$ tons, it drew 44 tons at the rate of 14 miles an hour.

But this success was not decisive as to the applicability of the locomotive to our American roads. An English road was virtually a straight road; an American road had curves sometimes of as small a radius as 200 feet. It was thought that this might debar the use of locomotives. To Peter Cooper, now justly venerated for so many other benefits to his countrymen, is due the construction of the *first American locomotive*, built for the Baltimore and Ohio road, to show that steam might be adapted to curved roads. A trip made to Ellicott's Mills, drawing a car filled with the directors and others, was the first *land-journey by steam* in America. (See Stuart's *Lives of American Engineers.*)

FIG. 3.

First American Locomotive.

Construction.—The principles of the construction of the accessory works of a railroad, such as embankments, bridges, tunnels, etc., differ in no essential save dimensions from those required for first-class turnpike-roads; but the location of the *curves*, or horizontal deviations from a right line; the *grades*, by which we understand the rise or fall in the direction of the length of the road; and the *gauge*, or width between the rails of the track, are the elements which determine the capacity or classification of a railroad as a machine for transport, and are matters requiring careful study. The first two are more or less dependent upon the nature of the country traversed by the road, which, of course, should be made to deviate as little from a straight line and level as the configuration of the ground and the means at command of the builders will permit. The perfection of a railroad would seem to be a straight line and a level; and yet there may be controlling circumstances which would render a level road not desirable, such as a heavy trade of coal, lumber, ores, etc. in one direction: in fact, the trade may be such as to render the weight of the empty return wagons alone the data for limiting the steepness of the grade. In general, however, let what will be the best grade in view of the weight of traffic or other circumstances, it is rarely that these conditions can be rigorously obtained, save at a cost which will defeat its own object; for it is undeniable that even a good road *may* cost too much. These considerations, as also the necessity of embracing, with a view to revenue, lateral points near the line not situated directly between the termini, render the proper location of a railroad a matter for the exercise of the greatest skill and judgment on the part of the engineer.

Curves.—The precise amount of resistance to locomotion occasioned by curves in a road has never yet been accurately determined. It is partly due to the effect of centrifugal force, causing the flange of the outer wheel of the cars to press against the rail; partly to the dragging of the wheels, which, being necessarily fixed on the axle, are obliged to perform an equal number of revolutions whether on the inner and shorter or outer and longer rail of the track; and partly to the axles being *fixed* parallel. In practice, curves of a mile radius offer but little impediment to rapid motion. In fact, the unavoidable irregularities in the line and levels of the respective rails of a straight track *may* produce an oscillating motion in the cars of a train productive of greater resistance to motion than would the continued pressure of the flanges of the wheels on a curved track of a radius of a mile, or even less, in length. The necessities of the locality very frequently call for curves of much less radius than this, and the expense of maintenance of both road and machinery is thereby much enhanced unless the curves be traversed at a reduced speed.

It is customary to reduce the rate of inclination on the inclined portions of such parts of the road as are curved at the rate of .025 feet per 100 for every degree of curvature, as also to raise the outer rail of the track a height proportioned to the speed of the trains; and it has also been customary to make the tread of the wheels a conic surface, that in traversing a curve the wheel on the outer rail may run on a longer diameter, and so cover a greater length of the track, than those on the inner rail, and thus assist the movement around the curve; but this latter method has been found to produce much oscillation and concussion on the straight portion of the track, and has in a great measure been discontinued, although a coning of the wheels to the extent of $\frac{1}{16}''$ is still practised.

The velocity of the train being an element in the calculation for the super-elevation of the outer rail of the track, what would be suitable for one speed of train would be unsuitable for another; hence a compromise has to be made, and the average speed of passenger-trains is usually taken from which to calculate this super-elevation:

If $v =$ speed of train in miles per hour,
$r =$ radius of curve, in feet,
$g =$ gauge of track;

then $g \times \frac{v^2}{15r} =$ elevation to be given to the outer rail of the track.

In practice it is customary to disregard the speed, and elevate the rail $\frac{1}{2}$ inch per degree of curvature for ordinary-gauge tracks, and $\frac{6}{10}$ inch per degree for 6-foot track. When the term "degree of curvature" is mentioned in speaking of curves, it is not to be understood as degrees of arc, but the degrees at the centre of a circle subtended by a given chord. Thus, a $\frac{1}{2}°$ curve is one of about 2 miles radius with a 100-foot chord; a 1° curve is of about a mile radius; a 2° is a half mile, or, more accurately—

Radius, feet.	Curvature, degrees.	Radius, feet.	Curvature, degrees.
22,918	$\frac{1}{4}°$	2,292	$2\frac{1}{2}°$
11,459	$\frac{1}{2}$	1,910	3
7,639	$\frac{3}{4}$	1,433	4
5,730	1	1,146	5
3,820	$1\frac{1}{2}$	955	6
2,865	2		

hence, the super-elevation to be given to the outer rail would be, in inches, for a 1° curve, $\frac{1}{2}$; for a 2°, 1; for a 3°, $1\frac{1}{2}$; for a 4°, 2; for a 5°, $2\frac{1}{2}$ inches, and so on.

Grades.—The additional resistance to motion occasioned by the various grades or inclinations in a road is susceptible of precise calculation, and is a constant quantity for the same inclination, let the state of the road or the machinery be what it may, and is as the sine of the angle of inclination; or, virtually, it is that fraction of the weight which is represented by dividing the height of a given inclination by its length. For instance, in a rise of 22 feet per mile it would be represented by $\frac{22}{5280} = .004$, which is 8 pounds for a ton of 2000 pounds, or $\frac{1}{250}$th of the weight. The relative capacity of roads for traffic is therefore limited by their grades; that is to say, only a certain number of trains can pass over the road yearly, and if the grades are such as to limit the load of the engine to a certain amount, the yearly tonnage, which is the total number of trains multiplied by the load of each, is limited in the same proportion. This constitutes the capacity of the road, and is a subject of but little popular appreciation, but one of great importance in projecting new lines of roads.

The principle which obtains in calculating the effect of grades on the movement and weight of trains is briefly illustrated as follows: If a locomotive engine be prevented from advancing on the track, and at the same time the proportions of the machinery be such that upon the application of the power to the wheels the latter will revolve by slipping on the rails (as is usually the case), the engine is said to work up to its adhesion, and the latter becomes the limit of its traction force. This adhesion varies, in different states of the rail-surface, from one-third to one-tenth of the weight on the driving-wheels, and may be taken ordinarily at one-fifth of the insisting weight. If, then, we know the resistance to motion occasioned by the friction at the axles of the wheels of the engine and train, as also of the rolling of their surfaces on the rails, by dividing the adhesion by this amount we shall have the weight which the engine will draw on a level under the assumed condition of the rails and the machinery. Thus, if it be found that 8 pounds per ton of the weight of the engine and train represents the resistance to motion on a level occasioned by all impediments to motion of whatever kind, as it does very nearly, then by dividing the adhesion expressed in pounds by 8, we obtain the gross weight in tons which the engine will draw upon a level; but where the train ascends a grade there will be, in addition to the resistance of friction on the level, the resistance arising from the gravity of the engine and its load, or its tendency if unresisted to move down the slope, explained above.

The resistance of gravity is the same on a given plane at all speeds, but is overcome twice as fast at 20 miles per hour as at 10 miles, and hence is said to vary with the speed. Friction is the same at all velocities, but varies with the load of the train; concussion, or resistance of the curves, varies both with the weight and speed of the train.

Atmospheric resistance varies with the speed and bulk of the train. If we disregard for the present the various resistances in detail occasioned by curves, concussions, and that of the atmosphere, and consider them as included in a single factor per ton of train, the formula expressive of the performance of an engine on different grades is very simple, and sufficiently accurate for relative comparison. Let E represent the weight on the driving-wheels of an engine in pounds; R represent the rise in feet per mile of a given grade; than the gross load, including engine and tender, in tons of 2000 pounds, which the engine will take up that grade will be represented by $\frac{.2\ E}{.3787\ R + 8}$, the adhesion being $\frac{1}{5}$ of the weight of the engine on the drivers. The following table shows the gross load which a first-class freight-engine weighing 66,000 pounds, 40,000 pounds on the driving-wheels, may be estimated to move on different grades in a good condition of the rails, by the above formula, in tons of 2000 pounds:

On a level.	20 feet per mile.	30 feet.	40 feet.	50 feet.	60 feet.	80 feet.	100 feet.	150 feet.	200 feet.	250 feet.
1000	513.8	413.2	345.6	290.3	260.4	208.9	174.4	123.4	95.5	78.

Inclined Planes.—Before the locomotive had been perfected, and before even the question of locomotive *vs. stationary*-engine power had been settled, it is not surprising that recourse was had to inclined planes (which were in fact the *first* form the railway assumed) for overcoming abrupt changes of level. Hence we find several examples, as that on the Mohawk and Hudson (Albany and Schenectady) road; the Columbia road (Philadelphia to the Susquehanna) had one at each end. The Alleghany Portage road, connecting two sections of the Pennsylvania Canal, had a number. The South Carolina road (Charleston to Augusta) had one near the latter place, and the Baltimore and Ohio had one at Parr's Ridge, Md. On the Liverpool and Manchester road there were two; on the railway near Liege, Belgium, was one; and others existed elsewhere in Europe. But the necessity was speedily felt for admitting much higher grades than had been supposed admissible, and of overcoming them by locomotive power. The Baltimore and Ohio road was constructed to admit grades of 116 feet, and even heavier grades, though unadvisable, are yet to be found. Mr. Ross Winans, as a constructor of engines for these steep grades on the Baltimore and Ohio road, did much to develop the American locomotive.

By experiments on a broad-gauge road the resistance at different speeds on a *level*, attributable to friction, concussion, and atmospheric resistance, which are the same at the same speed on levels or grades, was found to be:

20 miles per hour..........................14.5 pounds per ton.
30 " " " ....19.3 " " "
40 " " " ....25. " " "
50 " " " ....35.4 " " "
60 " " " ....39. " " "
100 " " " ....76.5 " " "

A formula expressing all the resistance to motion of an engine and train is a desideratum; perhaps the one conforming most nearly to experience, deduced from experiments on the broad gauge, but applicable to the prevailing gauge in this country, is as follows:

V = velocity of train in miles per hour;
E = weight of engine in tons;
T = weight of train, including tender, in tons;
B = bulk of tender and cars in cubic feet (180 cubic feet per ton);
$E(.5V + 5 + .00004TV^2)$ = resistance of engine in pounds;
$BV^2.00002$ = atmospheric resistance of train in pounds;
$\frac{VT}{15}$ = oscillating resistance on straight line or friction on curves;
6T = frictional resistance of train and tender.

Then the total resistance to engine and train in pounds per ton will be—

$$\frac{E(.5V + 5 + .00004T.V^2) + BV^2.00002 + \frac{VT}{15} + 6T}{E + T}$$

Gauge.—It is not known what, if any, principle governed the determination in the first instance of the gauge between the rails of 4.8½ inches. It was adopted in the roads from the collieries in the N. of England, believed to have arisen from the colliery-wagons in use on common roads having an outside width of axle of 5 feet, and the tram-roads having the flange on the outer edge of the rail admitted of their use also on the railroads; and when the tramway was replaced by an edge-rail the same width of track was continued, but, measured from the inner edge of the rail, resulted in the 4.8½-inch gauge. Be this as it may, Mr. Stephenson, engaged in these collieries, was selected to build the Liverpool and Manchester road, and seeing no reason to change the gauge with which he was familiar, it was adopted there. When once established on a line of road looking to future extension, it was apparent that unless some special advantage called for a change there was a manifest propriety in continuing its use; accordingly, the success of the Liverpool and Manchester road led to the general adoption of this gauge. As the weight of traffic increased, and a corresponding increase of power was called for in the locomotive-engine, the impression prevailed that this could be best arrived at by increasing the space within which the machinery was placed, and an increase in the width of track on many roads was the consequence. In 1846 the inconvenience resulting from this lack of uniformity in the width of the railroads in England led to the matter being brought before Parliament, and an inquiry was instituted as to the respective merits of the various proposed widths of tracks. The commotion which followed, known as the "battle of the gauges," led to experiments, investigations, and reports by a committee of Parliament, and every effort possible was made to arrive at a just conclusion in the premises, and the subject was exhaustively considered. The result was, that while Parliament declined to enact a law compelling all roads to adopt the narrow gauge, yet the evidence went to show that while for main-trunk lines of great traffic a wider gauge than the prevailing one of 4.8½ inches would probably prove advantageous, yet the advantages were not then so apparent as were the disadvantages resulting from a lack of uniformity with the prevailing gauge of the country; and the public mind settled generally to this belief, although the fact that the interest involved in 4000 miles of narrow track failed to secure their claim against 300 miles of broad-gauge is very significant to one acquainted with the spirit of legislation in that country. We have five different widths of track in this country—from 4′ 8½″ to 6 feet—and the advantages of uniformity of track is again forcing itself upon the attention of railroad proprietors, and the "battle of the gauges," fought and supposed to have been settled in England in 1846, will again be gone through with here, and with a like result—viz. the triumph of the 4.8½; and for the same reasons as formerly—not its mechanical superiority to any other, but the expediency of its adoption in view of the extent of roads in operation of that width of gauge, losing sight of the fact that the circumstances of the two cases are altogether dissimilar. In the present case the capacity of our grand trunk-lines crossing a continent, and aiming to transport the commerce not merely of a hemisphere, but of a world, should not be determined by the same standard of expediency which would be applicable to an isolated state of limited extent. But, further than this, it has been found that a gauge of 3½ feet, or even 3 feet or less, is amply sufficient for short branches to mines or factories, or to centres of trade of limited extension and in sections difficult of access, and where rapidity of transit is of secondary importance and the work to be done limited; and the economy of construction resulting therefrom has been so magnified, through interested motives or the ignorance of advocates, that this extremely narrow gauge is strenuously maintained as the true key for opening up our waste territory, on the ground of its greatly superior economy both in construction and management; and roads are now constructing on the broad plains of the West of this exceptionally narrow width of track. There cannot be a greater fallacy than to suppose that because the adoption of the broader gauge *permits* a greater cost and increase in non-paying load, it thereby renders such increase absolutely *necessary*. That lighter engines and cars can be profitably worked on the wider gauges, if the general wants of the traffic warrant their use, is shown by the experience of all railroads in use fifteen or twenty years since. The gross receipts on the Liverpool and Manchester R. R. the first six months after its opening, a length of 35 miles, were $328,465, the expenses of the same period having been $176,895, and in the succeeding 6 months showed an increase of over 30 per cent., the engines used weighing, as we have seen, but 7½ tons, whilst a palace-car of the present day weighs 10 tons, and the engine and tender frequently 50 tons. As before remarked, the grades, curves, and gauge of a railroad are the elements of its capacity for transport. The relative effects of the first two are well understood, but the precise effect of variations in the latter still remains to be investigated under the light of modern improvements.

The form, strength, and weight of rails; the mode of fixing them in the track; the weight, power, and proportions of the engines; the form, strength, and weight of cars; the magnitude of train, and the speed in use for freight and for passengers; the fixtures for watering the engines, for reversing them, shifting them from track to

track,—all these and many other items have been the subject of study and experimental development from the date of the opening of the Liverpool and Manchester road to the present time, and each of them would furnish material for a volume. Space will only permit a further notice of such points in the construction of railroads as are universal in their application and important in their economical bearing; and first is—

Drainage.—The history of all failures in earthwork shows that in almost all cases it arises from unskilful or inadequate drainage; and the expense of the maintenance on any line will, other things being equal, vary very nearly in the proportion in which its drainage is good or otherwise. Water lying or running on the surface soaks and softens the road-bed, washes away the earth, and chokes the ditches. When saturated with water the road-bed loses its firmness, and the bottom sinks and deranges the tracks, thus adding to the shocks of the train and to the wear and tear of both the machinery and the track. The surface-drainage of the slopes of excavations is equally important, to prevent the velocity of running water from tearing up the soil and choking the ditches, which should be kept open and of a sufficient depth to drain the bottom of the ballast. Of scarcely less importance to a railroad, and closely connected with a proper system of drainage, and equally neglected in road-building in this country, are the proper principles to be observed in the quality and application of—

Ballast, which should consist of porous material, on which the cross-ties rest, and in which they should be bedded. The cross-ties, of oak, chestnut, or other hard and durable wood, from 6 to 8 inches in depth, from 8 to 10 wide, and 8 feet in length, are laid usually upon the road-bed at intervals of about 2 feet between centres, upon which the iron rails are secured by brad-headed spikes ⅝ inch square and 6 inches in length. The material upon which the ties rest should be broken stone or gravel mixed with coarse sand free from loam or clay, and to a depth of at least 18 inches below the bottom of the ties, and the space between the latter should be filled in nearly to the level of the bottom of the rail. The effect of this, besides securing the cross-ties and rails in their places, permits by its porosity the thorough drainage of the track, resists the sinking of the ties, and enables them to be readily packed up, while it gives a proper amount of elasticity to the track, more conducive to durability than the plasticity of earth or the rigidity of rock, and secures them against the heaving action of the frost.

The expense of maintenance, growing out of imperfect or defective drainage and ballasting, is at least *four* times as great on roads in this country as on the roads in Europe, where, as a general thing, the roads are completed before being opened for use, which is not the case in this country, where nearly all our early roads, and many of our present new ones, are first built without ballast.

Rails.—In the early railroads much attention was paid to the quality of the iron of which the rails were composed, the weight of the rail then being light, but subsequently, when heavier rails were adopted, very inferior iron was worked into rails; recently, however, more attention has been paid to this matter. The use of the cheaper forms of steel has stimulated the iron manufacturers somewhat, but the enormous increase in the endurance of the steel rails—the latter lasting under the heaviest traffic "five or ten times as long as really good iron rails, fifteen or twenty times as long as those that pass for good rails, thirty or forty times as long as the common iron, and fifty or a hundred times as long as many rails made ten years ago or since imported from the cinder-heaps of Great Britain"—and the fact that the steel rail costs but about one-half more, will ultimately lead to their universal adoption on leading lines of road.

The form and proportion of the rail are found to be of more consequence than its weight. The heavy 80-pound iron rail wears out much faster than a properly-proportioned 60-pound rail, and the proper weight of a steel rail is about 53 pounds to the yard. In England and in Europe generally it is customary to make the rail double-headed, and when worn on one edge to reverse it, and thus double its duration; but this method, besides rendering an expensive cast-iron chair necessary, with its complication of fastenings (this item alone being estimated in England as amounting to over 1,000,000 tons), is of doubtful expediency, as the effect of the chair is in many cases to indent the lower face of the rail, which is subsequently liable to fracture. The system universally pursued in this country of dispensing entirely with a chair, and making the base of the rail some four inches in width, resting on the timber cross-ties without other support, and secured to the latter by two brad-headed spikes, is gradually gaining ground elsewhere as the most simple and efficient method of securing the rail.

The rails are rolled in lengths of thirty feet, and the joints secured by fish-plates of a length of 28 inches placed on each side of the joint under the head, and fastened by four screw-bolts, with slightly elongated bolt-holes to allow of the expansion of the rail by heat. Under no circumstances can it be economy to use a heavy iron rail of 80 pounds to the yard, for a lighter steel rail (say 53 pounds) will cost less and last longer, and it makes little difference whether a steel rail will last a half century or for ever, the present value of renewals every fifty years being less than 2 per cent. on the cost of the rails.

In France, the earliest railway was the Chemin de Fer de St. Étienne à Lyon, 34 miles in length, double track, commenced in 1826, finished in 1831. This was for a local freight purpose, St. Étienne being one of the principal sources of coal-supply to France. From St. Étienne to Givors it was worked by gravity, 23 miles of which on a down grade of 76 feet per mile. The roads connecting Paris with Lyons, Orléans, and Havre soon followed. In Austria, one of the earliest roads connected Budweis and Linz, and another Linz and Gmunden. These were single-track roads, worked by horse-power, with wooden rails covered with iron plates—the first giving access to the Danube, the interior of Bohemia, and the second to carry to the Danube the salt of the mines of Gmunden. The sketch shows a train on one of these roads (Fig. 4). In

FIG. 4.

Early Austrian road (worked by horse-power).

Switzerland, Italy, Spain, and Turkey, for obvious reasons, the development was less rapid. England soon recognized the importance to her Asiatic possessions of binding them together by railway connections. A similar need was felt by the Russian government. That her system had not in 1855 been extended to the Crimea is the reason why she was vulnerable there, and why with her exhaustless resources she could not cope with the (comparatively) small army of the allies, who by the great thoroughfare of the sea could reinforce and supply at will. It was not until the railroad had become pretty well extended over Eastern Europe and the U. S. that a real beginning to the great system of Russian roads was inaugurated; and then, owing probably to a belief that the peculiar methods developed in the U. S. were best suited to the needs of Russia, American engineers were invited to superintend. The road from St. Petersburg to Moscow was the first great road undertaken, and George W. Whistler, a graduate of the U. S. Military Academy, who had an experience on nearly all our earlier important roads, was appointed superintending engineer. He was succeeded in 1849 by Thompson S. Brown, also a graduate of the academy and once an officer of U. S. engineers, and (1842–49) chief engineer of the Erie R. R. In this connection the interesting fact may be stated that three months ago the semi-centennial anniversary of the first introduction of railroads into England was celebrated at Darlington; and the chairman announced that the second half century was

inaugurated by the rolling of rails for a railroad *in China;* and it is now stated that the *first railroad in China* (from Shanghai to Woosung, 20 miles distant) is opened to traffic.

Gridley Bryant, the inventor of the eight-wheeled car, the turn-table, and the switch (see Stuart's *Lives*), was the projector, builder, and engineer of the first railroad in America—the Quincy, in 1826. It is a matter of interest that it was built to supply the Quincy granite for the Bunker Hill Monument. It was 4 miles in length; near the quarry was an inclined plane of 315 feet length, rising 84 feet, worked by gravity. The Quincy was followed in 1827 by the Mauch Chunk road, 9 miles in length, a *coal* road, and so graded that gravity should do the work of bearing away the coal, horses being used to return the cars. This principle was subsequently applied to the Reading road, built for the carrying of coal from the mines to the place of shipment at Philadelphia. The New Orleans and Lake Ponchartrain R. R., the first in the U. S. laid with T rail, was built in 1830–31, under supervision of the *first graduate* of the U. S. Military Academy, the late Gen. J. G. Swift. It was a work of sheer necessity. An *impassable* swamp (a tedious navigation through Bayou St. John only qualifying the term) separated New Orleans from a lake from whence there was easy steam-navigation to Mobile and the Gulf coast and the routes which led northward. Until this barrier was broken New Orleans had no inland communication but by the tedious navigation of the Mississippi, from which there was no access to the Atlantic slopes.

Between the years 1828 and 1833 our actual system of railway communication may be said to have been inaugurated by the commencement of the Baltimore and Ohio, the Baltimore and Susquehanna, the Camden and Amboy, the New Castle and Frenchtown, the Hudson and Mohawk, the Charleston and Augusta, the Boston and Providence, the Boston and Lowell, and other roads. If we except the Baltimore and Ohio, it will be seen that there was little foresight of a future great connecting system; they were generally projected to supply an *immediate* necessity—to fill up a gap in an otherwise easily-available line of transit. And even now it may be said that in general our present great lines of communication with the Mississippi Valley and the West are made up of parts originally having little reference to each other. Indeed, the American roads, especially in the West, have been gradually called into existence to supply a need they themselves have created, and which did not in the beginning exist. The Baltimore and Ohio and (at a later date) the Pennsylvania roads, connecting the Ohio with Baltimore and Philadelphia, the Mobile and Ohio, connecting that river with the Gulf, may be called the first through lines. The imperious necessity of connecting our newly-developed Pacific States with the older body gave rise to the most extended system of reconnaissance and survey through a vast expanse of mountain-chain and desert for the determination of practicable routes, and finally to the rapid construction of the most remarkable *through line* of railway in the world.

The following table exhibits the lengths of railroads in operation in the U. S. at the dates named, in miles (see Poor's *Manual*):

Years.	Miles.	Years.	Miles.
1830	23	1855	18,374
1835	1,098	1860	30,635
1840	2,818	1865	35,827
1845	4,633	1870	47,254
1850	9,021	1874	69,273

The length and cost of the railroads of the world were estimated in 1871 as follows:

	Miles.	Cost.
Europe	61,110	$8,252,400,000
America	56,314	2,432,850,000
Asia	4,480	414,763,000
Africa	583	54,937,000
Australia and Islands	1,974	100,201,000
	124,461	$11,255,151,000

A general comparison for the last three years will show as follows for the U. S.:

	1872.	1873.	1874.
Length reported	57,323	66,237	72,623
Aggregate cost	$3,159,423,057	$3,784,543,034	
Capital stock	1,647,844,113	1,947,638,584	$1,990,997,486
Debt, chiefly funded	1,511,578,944	1,836,904,450	2,230,766,108
Percentage of debt to total capital	47.85	48.50	
Average cost per mile	55,116	57,134	60,425
Gross earnings	468,241,055	526,419,635	520,466,016
Gross earnings per mile	8,256	7,948	
Freight earnings	335,931,785	389,035,508	379,466,935
Passenger earnings	132,209,370	137,384,427	140,999,081
Working expenses	307,486,682	342,609,373	330,895,058
Proportion of working expenses to receipts	65.0	65.1	63.6
Net earnings	160,754,373	183,810,262	189,570,958
Proportion of gross receipts to cost	15.00	13.91	12.3
Proportion of net earnings to cost	5.20	4.85	4.5
Average dividend on stock	3.91	3.45	
Amounts divided	64,418,151	67,120,709	67,042,942

The mileage and average cost and earnings per mile in different sections of the country are, for the last year, as follows:

	Mileage.	Cost per mile.	Receipts per mile.
New England States	5,509	$42,862	$8,915
Middle States	14,291	47,356	14,486
Western States	34,482	54,329	6,103
Southern States	15,602	38,764	3,869
Pacific States	2,239	89,981	10,234

In this division of States, Maryland, the District of Columbia, and West Virginia are included with the four others more commonly called Middle States; the Western States begin with Ohio, and extend so as to include all the Territories having railroads except Washington, and as far S. as the Ohio River, and to include Missouri and Kansas. The Pacific States are those reaching the Pacific, together with Nevada, and the others are the Southern States.

Statement showing the Mileage, Cost, Earnings, Earnings per Mile and per Head of Population, etc. of the Railroads of the U. S., and of the different Sections of the U. S., compared with those of the Railroads of Great Britain and France, in 1872.

Groups for comparison.	Railroad mileage.	Cost of roads.	Cost per mile.	Earnings.	Earnings per mile.	Percentage of earnings to cost.	Percentage of net to cost.	Earnings per head of population.
New England States	4,574	$230,609,794	$50,418	$48,519,835	$10,636	21.10	6.26	$13.53
Middle States	11,617	922,700,774	79,427	169,205,702	14,565	18.30	6.40	15.86
Western States	28,778	1,472,625,232	50,550	193,826,252	6,735	13.10	4.57	13.76
Southern States	10,986	401,913,267	36,575	47,788,539	4,350	11.80	4.09	4.31
Pacific States	1,368	131,573,990	98,300	13,900,727	10,161	10.50	6.00	17.00
United States	57,323	3,159,423,057	55,116	473,241,055	8,256	15.00	5.20	11.76
Great Britain	15,376	2,763,400,535	178,720	244,463,900	15,900	8.49	4.65	7.70
France	11,061	1,327,320,000	120,000	149,322,500	13,500	8.81	4.40	4.31

The earnings for Great Britain are for 1871.

It has been computed that, notwithstanding the limited return in most cases to stockholders of railroads, the actual addition to the world's wealth yearly is not less than 10 per cent. upon the outlay for the construction of railroads.

We have in what precedes very roughly sketched the origin, development, and progress of that wonderful achievement in the art of overland transport which is so remarkable a feature of the present century, and which has extended its influence over all those portions of the habitable globe where civilization exists. Since the opening of the Liverpool and Manchester Railway (1831) there have been built over 160,000 miles of railroad, at an estimated cost of $16,000,000,000! The railroad may, therefore, justly claim to be one of the most—perhaps *the* most—signal instruments of civilization which the history of the world has yet developed. Mighty as has been its direct influence, its *indirect* has been scarcely less so. Such enormous application of the money capital of the world cannot be made without powerfully moving the minds of men. The influence exerted on the sciences—and especially on that practical application of the sciences to the development, working, and manufacture of the world's civilizer, *iron*, to investigating and applying the world's motive-power, *steam*—has been manifest. No less so the expansion given to the spheres of the civil, mechanical, and mining engineer. Indeed, nearly all the great engineer works of the present day, the great bridges, the tunnels, etc., owe their existence—nay, even the art by which they are created—to railroads. The oft-quoted words of the prophet, "Many shall run to and fro, and knowledge shall be increased," would almost seem to have been spoken in reference to *this* agent, by which the words seem to be accomplished.

J. W. Adams.

Railway, Atmospheric. See PNEUMATIC TRANSMISSION, by WILLIAM E. A. AXON.

Railways. See RAILROADS, by COL. JULIUS W. ADAMS, C. E.

Raimon'di (MARCO ANTONIO), b. at Bologna about 1480; was first apprenticed to a goldsmith; received afterward the instruction of Francesco Francia in drawing and engraving; made his first engravings after Albert Dürer at Venice; repaired to Rome, where he resided till 1527, and became very celebrated for his engravings of the works of Raphael. After the capture of Rome by the constable de Bourbon he returned to Bologna. The date of his death is unknown, but an engraving by him of a picture by Giulio Romano is dated 1539.

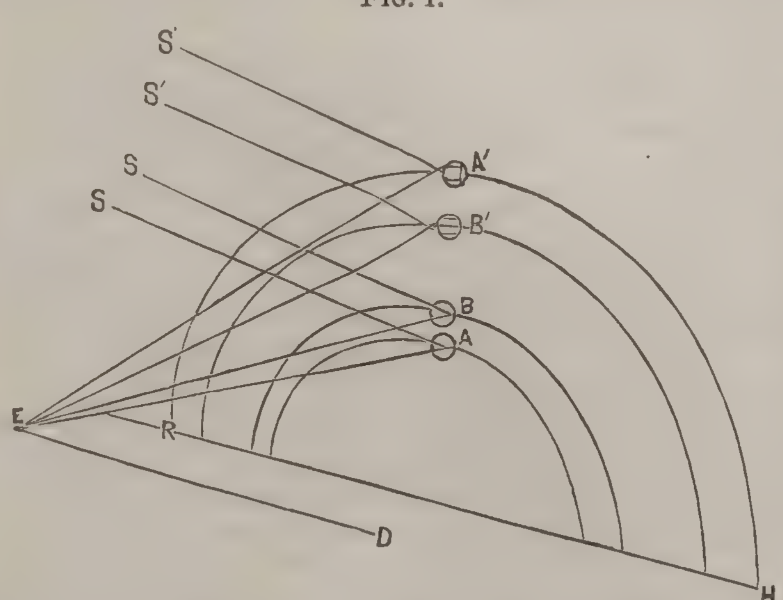
Raimundus Lullius. See LULL (RAMON).

Rain. See RAINS, by PROF. ARNOLD GUYOT, PH. D., LL.D., M. N. A. S.

Rain'bow [Ang.-Sax. *rênboga*], an arch of concentric colored bands arranged in the prismatic order, violet being innermost. It is sometimes simple, and sometimes accompanied by an outer, secondary bow, which is broader and fainter than the primary, and has its colors in the reverse order. A rainbow occurs when the sun or moon, not far above the horizon, throws its beams upon a sheet of falling drops on the opposite side of the heavens. A beam of light from the sun S falls upon a raindrop obliquely at R; a portion is reflected; the remainder, passing into a denser medium, is refracted toward the normal *n c* (see REFRACTION) and converged to a point; at A the portion not transmitted is reflected and diverges; at R' the beam is again refracted *from* the normal *n' c*, and reaches the eye at E. The rays of light emerging are usually so greatly dispersed as to be practically invisible. Calculation, however, proves that for certain angles of incidence the emergent rays form a beam of rays distinctly visible; such rays are called effective rays. These rays emerge, not as white light, but they are spread out by the drop into their component colored rays. (See UNDULATORY THEORY OF LIGHT.) The angle of incidence and emergence varies for each color; the angle of incidence for violet is 58° 40'. After one internal reflection and two refractions the deviation of the ray forms an angle of 40° 17'. The deviation of the red from the same cause is 42° 2'. After two internal reflections and two refractions the deviation of violet is 54° 9', and of red 50° 59'.

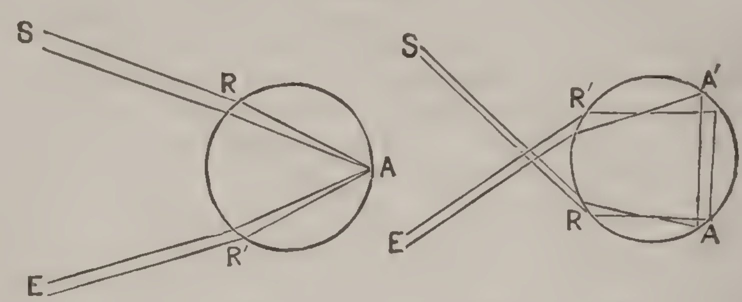
Draw a line E D parallel to the sun's rays S *a*, S *b*, etc. (they being practically parallel with each other). Let the eye E take such a position that the angle *a* E D shall equal 40° 17'—the angle of deviation of the violet ray after two refractions and one internal reflection. S *a* E equals *a* E D, being alternate angles. The eye E therefore receives from the drop *a* a violet ray, while the other colors of the same dispersed ray fall below it. The angle of deviation of red is 42° 2'—1° 45' greater than violet. A drop *b*, 1° 45' above *a*, sends to E a red ray; all the effective intermediate rays produce the intermediate colors in their order. Every other

FIG. 1.



drop in the sheet of falling water which has the same obliquity to the eye E as the drop *a* will also send to it a violet ray. The only drops which fulfil this condition are those which would define the base of a right cone whose apex is the eye, and the centre of whose base is in a right line passing through the sun and the spectator's eye. The violet rays, then, and all the other colors in their order concentrically arranged, form, when the sun is at the horizon, a semicircle, and when he is higher a proportionally smaller segment of a circle. The whole circle could only be visible to a spectator on the top of a very high and narrow peak, which elevated him while it did not obstruct the light. At a definite distance above the drop *a* and its series is another at such an angle to the eye E that a red ray, after two refractions and two reflections, is sent to E, and in the same way the other colors of the secondary bow. The angle of deviation of red, after two refractions and two reflections, is smaller than violet; red, therefore, is the innermost color of the secondary bow; the difference between the angles of the deviation of the extreme colors in this bow is 3° 10', while in the primary it is 1° 45'; it is therefore broader. The rays have been reflected one more time; it is therefore fainter. If the sun were a mere point, the primary bow would be 1° 45' wide from violet to red. The angular diameter of the sun is, however, 30', and each ray

FIG. 2.



of light proceeding from it forms a separate bow, which partially overlaps, the violet apparently projecting 15' beyond the inner, and the red 15' beyond the outer edge: the primary bow is therefore 2° 15', and the secondary 3° 40' wide. The colors, being intermingled in the myriads of superimposed bows, are much modified. Between the primary and secondary bows are sometimes seen concentric bands of red, growing fainter and narrower as they approach the secondary; this phenomenon is explained by interference. (See INTERFERENCE.) The lunar bow is like the solar except that the colors are less distinct—sometimes not at all distinguishable, when it appears as an arch of white light. S. B. HERRICK.

Rain-Gauge, the apparatus by means of which the rainfall is collected and measured. The exhaustive researches carried on under the direction of Mr. Symons of London during the past fifteen years have shown that for a standard gauge the collector may have any diameter from three inches up to three feet (eight inches is preferred); it must be of thin sheet metal, of cylindrical form, and have its axis truly vertical. The mouth of the collector should be horizontal, and not less than one foot nor more than three feet above the ground (a uniform height of one foot is preferred). The collected rain should flow at once, with the least possible loss, into a receiver or holder, where it will be kept safe from evaporation or other chance of loss, and the quantity should be measured as soon as possible, although some gauges placed in positions difficult of access have been so constructed as to allow of measurements once a month; while in others the rain runs directly into a graduated glass tube, where the rate of fall may be observed from minute to minute. Either the weight, the volume, or the depth of the collected water may be measured, according to convenience, the usual method of measurement being to give only the depth in inches to which the ground is covered by the rain which fell thereon. When snow falls it is considered best not only to melt and measure that which fell into the collector, but also to dip the inverted collecting cylinder into those spots where the snow has fallen evenly, and thus take up sections representing the average snowfall. By melting these, and taking the average resulting quantity of water, we deduce a better result than could have been given by a single gauging. The depth in inches of the unmelted snow as it lies fresh on the ground should also be noted. Rain-gauges should be as far as possible from trees, fences, buildings, etc.; and when the rainfall must be measured in a disadvantageous locality, it is necessary to establish numerous gauges in diverse positions, so as to study and perfectly estimate the local disturbing influences. C. ABBE.

Rains [Ang.-Sax. *regen*]. The distribution of rain is full of apparent anomalies. Here it is superabundant, and a luxuriant vegetation is the consequence. There it fails entirely, and the barrenness of the desert follows. In one place it falls at regular periods, in another at any time, without apparent rule. Now it is accompanied by terrific thunder and lightning, now it falls drizzling in gentle drops. The annual quantity of rain at a given place, again, is far from being the same; one year it may be double what it is another. To account for these phenomena, the law which governs the condensation of vapor into clouds and rain must be understood.

A column of air—a cubic foot, for example—at a given temperature can receive a definite amount of vapor, or humidity, as we call it, and no more. When it is thus filled with all the amount it can contain, evaporation ceases, and


Nº VIII
JOHNSON'S
WORLD
SHOWING THE DISTRIBUTION OF THE
RAIN
OVER THE GLOBE
BY
PROF. A. GUYOT.
ARCTIC OCEAN
POLAR ZONE
GREENLAND
Spitzbergen
Region of Low Clouds, drizzling Rains and prevailing fogs, with dry Winter.
Summer Rains - Dry Winter
NORTH
AMERICA
Siberia
Summer Rains - Dry Winter
REGION OF PERENNIAL RAINS
in all Months with maximum in the Summer
EUROPE
ASIA
Zone of Deserts
ATLANTIC
REGION OF SEMI-PERIODICAL RAINS
In the South Winter Rains and dry Summers; in the North Spring & Autumn-Rains prevailing
PACIFIC OCEAN
SAHARA
Rainless or dry
Central
Tropic of Cancer
NORTH REGION OF PERIODICAL RAINS
In Rainy Season, heavy Showers with thunder and lightning; Dry Season rainless
MONSOON
EQUATORIAL REGION OF ALMOST DAILY SHOWERS AND AFTERNOON THUNDERSTORMS
NO DRY SEASON
EQUATOR
SOUTH AMERICA
INDIAN OCEAN
RAINS
SOUTH REGION OF PERIODICAL RAINS
In Rainy Season, heavy Showers with thunder and lightning
Dry Season rainless
ATLANTIC OCEAN
Tropic of Capricorn
AUSTRALIA
REGION OF SEMI-PERIODICAL RAINS
In the North, Winter-Rains and dry Summers, in the South Spring & Autumn-Rains prevailing
Probable Equatorial limit of the fall of Snow at the level of the Sea
REGION OF PERENNIAL RAINS
C. Horn
ANTARCTIC OCEAN
Approximate yearly amount of Rain in various Latitudes
Inches
Arctic Circle
Explanation.
Great amount of Rain.
Lesser amount of Rain.
Rainless Districts.
Polar limits of the various Regions of Rain.
Explanation.
The Figures near the names like New York 42 indicate the amount of Rain in English inches.
Direction of the Winds bringing Rains.
DIAGRAM SHOWING THE DISTRIBUTION AND NORMAL ZONES OF RAIN
North Pole
Dry Winter
Perennial Rains
Semi-Periodical Rains in Winter
North Tropical Periodical Rains
South Tropical Periodical Rains
Semi-periodical Rains in Winter
Perennial Rains
South Pole
Position of the Sun June 21st
Position of the Sun December 21st
Equator
Explanation
Large amount of Rain
Lesser amount of Rain
Rainless Season
RELATIVE AMOUNT OF CLOUDINESS & SUNSHINE IN VARIOUS LATITUDES
Cloudiness to Clear Sky
Summer or heaped Clouds
Overcast Sky and Fogs
Entered according to Act of Congress, in the Year 1874, by A. J. Johnson, in the Office of the Librarian of Congress, at Washington.

the air is said to be saturated or perfectly moist. Increase, however, its temperature, it will be able to hold more; evaporation begins again, and the air has a certain degree of dryness. We must, therefore, distinguish the *absolute humidity*, or the actual amount of vapor present in the air, and the *relative* humidity, or the degree of dryness, which is simply the relation of that real amount to the quantity which would be necessary to saturate the air at the same temperature. This is made clear by the following table:

Quantity of Vapor in a Cubic Foot of Saturated Air at Different Temperatures.

Temp. of air.	Weight of vapor in saturated air, in grains troy.	Temp. of air.	Weight of vapor in saturated air, in grains troy.
20° F.	1.30	70° F.	7.99
32° "	2.13	80° "	10.95
50° "	4.09	90° "	14.81
62° "	6.15	100° "	19.79

If we call saturation 100, every other degree of humidity will be only a fraction of 100, or a fraction of saturation. Suppose the air has a temperature of 50° F., and contains only 2 grains of vapor, while it can contain 4, as shown by the table—there is room for 2 more; the fraction of saturation, therefore, will be $\frac{50}{100}$, and 50 per cent. will express the degree of moisture of the air. Two grains per cubic foot is the *absolute*, 50 per cent. the *relative*, moisture. Again, if the temperature is 70°, and the air only contains 4 grains per cubic foot, the temperature has to be reduced to 50° before the air is saturated, and condensation into dew, cloud, or rain begins. That temperature (in this case 50° F.) at which that process begins is called the temperature of the *dew-point*. When the air is saturated the temperature of the dew-point is that of the air, but when it is not saturated the temperature of the dew-point is lower than that of the air, and it is evident the greater the difference between the two the dryer the air is, and the less the chance for rain. The comparison of these two temperatures, therefore, gives the degree of the relative moisture of the atmosphere. Thus, condensation, fogs, clouds, and rains are mostly due to the cooling of a moist air.

The application of these principles in meteorology is easy to understand. A warm wind setting from the tropics clear and dry toward the temperate regions comes into cooler places, and losing at every step its capacity for holding vapors, soon becomes moist, cloudy, and, farther on, rainy. A cold wind moving from the poles toward warmer climes may start full of clouds, but its capacity for holding vapors increasing with the heat, it becomes gradually dryer, and its clouds dissolve in a clear, transparent sky. Warm winds blowing toward cold quarters bring rain; cold winds blowing toward warm quarters bring fair weather. When both meet and struggle together, as in our storms, the average temperature being lower, clouds and rain are the usual consequence. The same phenomena occur with vertical currents of wind. When the ground is powerfully heated, ascending currents carry the warm air into the cooler layers of the upper atmosphere, where its vapors are condensed and accumulate into clouds, soon to fall back in pouring rains. Such are the rains of the tropics and of our thunderstorms. When a mountain-chain opposes a horizontal wind, the air is forced up along the slopes, its vapors are condensed, and from the beclouded mountain-summits torrents of rain water the side exposed to the wind, while on the opposite slope the same wind descends dry and cloudless from the lofty mountain-crests. These principles prepare us to understand the following general facts. The greatest average quantity of rain falls in the tropical or warm regions of the globe, because of the increased amount of evaporation and a greater capacity of the air for holding vapor; and gradually decreases toward the cold regions, as shown in the following table:

Average Annual Fall of Rain in Various Latitudes.

Latitude.	Rain in Eng. inches.	Latitude.	Rain in Eng. inches.
0°.........Equator.........	100	50°.........Equator.........	30
20°......... "	80	60°......... "	20
30°......... "	60	70°......... "	10
40°......... "	40	80°......... "	5

It is the reverse with the amount of cloudiness and the number of rainy days. Both increase from the warm latitudes toward the cold temperate regions, where the number of rainy and cloudy days is greatest. In tropical regions the average number of rainy and cloudy days is from 80 to 90. It is double that amount in the middle latitudes, and three times in the N. temperate regions, as shown in the diagram of cloudiness and sunshine at the bottom of the Map of Rains.

The average height of the clouds is greatest in the warm latitudes and in the summer of the temperate regions, and lowest in the polar regions and the winter season of the middle latitudes. As raindrops constantly increase while falling from the clouds to the ground, the size of the drops depends upon the height of the clouds as well as upon the abundance of condensation. Tropical rains and summer showers, therefore, fall in large and heavy drops, while slight, drizzling rains and fogs are characteristic of the winter season and the high latitudes.

The distribution of rain throughout the year is fully as important as its quantity, for its usefulness for the crops depends upon its falling in the right season—that is, in connection with a temperature favorable to vegetable growth. In this respect the great climatic zones differ very much. The warm zones have usually seasons of rains and drought, the rains being *periodical* within the tropics, and *semi-periodical* in the warm temperate zones. Toward the colder temperate zones the rains become more and more continuous throughout the year, or *perennial*, each month having an equal share. The diagram at the bottom of the rain-chart shows at a glance the distribution of the normal zones of rain. By comparing it with the diagram showing the course of the winds one can readily see how intimate is the connection between the two. A few words on each of these rain zones will illustrate it still more fully.

Rains within the Tropics.—Within the tropics, where the course of the temperature and of the winds is regular, that of the rains is equally so; and instead of seasons of temperature, which are there unknown, the inhabitants distinguish a dry and a rainy season. Whenever the trade-wind blows with its wonted regularity the sky preserves a constant serenity and a deep azure blue, especially when the sun is in the opposite hemisphere; the air is dry, and even when moist, as on the ocean, the atmosphere is cloudless. But in proportion as the sun approaches the zenith the trade-wind grows irregular, the air assumes a whitish tint; clouds appear, first at the horizon, later in the season rising higher and higher; the sky becomes overcast, and sudden showers, accompanied by fierce thunder and lightning, ensue. These thunderstorms occur regularly in the hottest part of the day, and increase in frequency and duration as the rainy season advances, inundating the earth with torrents of water. The atmosphere is at this time so damp that the inhabitants are in an incessant vapor-bath; the air is heavy and stifling; the body becomes dull and enervated, but vegetation puts on a new freshness and vigor, and the desert itself becomes animated and clothed for a few months with a rich verdure, which furnishes pasture to thousands of animals. Ere long, however, the sun, in his annual progress, advances to pour down his vertical rays upon other places; the rains diminish, the atmosphere becomes once more serene, the trade-wind resumes its regular course, and the windows of heaven are again shut until the following season.

Such is the normal course of the tropical rains. They fall everywhere during the passage of the sun through the zenith. The heat of its vertical rays, being then greatest, causes a strong ascending current, which neutralizes the horizontal trade-wind. The warm air, hurried to the heights of the atmosphere, grows cool by expansion, and the abundant vapors it contains are condensed, and fall back in a deluge of rain. As the sun passes and repasses from one tropic to the other, there is, in most intermediate places, a twofold rainy season, the two periods of rain running more and more into one as the latitude is farther from the equator. Thus the time of the rains in each place can be easily remembered; when the sun shines vertically upon it the wet season is near its height.

The equatorial zone of calms, being the region of the constantly ascending current of air, is also one of almost daily rain throughout the year. In the morning the sun shines in all his brilliancy, but hardly a day passes without heavy clouds accumulating rapidly between the hours of twelve and two, when the heat is greatest, which burst into violent thunderstorms with torrents of rain, soon to give way to the returning sunshine. Thus, within the tropics we distinguish three zones of rain: *the N. and the S. zone of periodical rains*, corresponding with those of the trade-winds, separated by *the equatorial zone* of daily showers, corresponding with the zone of calms.

The quantity of water that falls from the atmosphere in the tropical regions during the few months of the rainy season is enormous. The yearly average in the tropical parts of the Old World has been estimated at 77 inches of water, and 115 in tropical America, but in some localities, under the influence of certain circumstances, it is much more considerable. At Paramaribo, in Dutch Guiana, it has been known to fall to the amount of 142; at St. Louis de Maranhão, at the mouth of the Amazon, 276 inches. At Mahabuleshwar, in the Western Ghauts, in India, at the height of 4200 feet, it rises to 254 inches. But the greatest quantity ever observed was in India, in the mountains of

Cossyah, N. E. of Calcutta, where 610 inches have been collected in a single year—enough to cover the ground with a sheet of 51 feet of water. At Cayenne, French Guiana, 21 inches of rain have been seen to fall in one day. This is nearly as much as falls during the whole year in northern latitudes. The effect of these copious rains, falling during a short season, upon the tropical rivers may be easily conceived. The regular and so long mysterious overflowings of the Nile we now understand, for all its sources are in the region of tropical rains, and we no longer wonder at those inland seas which in the season of rains cover for hundreds of miles the plains of the Orinoco, of the Amazon, and the Paraguay, to ooze away during the dry season.

The sub-tropical belt, which may be called the *dry zone*, extends from about the 24th to the 28th degree of latitude, near the limit of the trade winds. It forms an intermediate zone, in which the tendency to drought is strongly marked. Situated somewhat beyond the region of the tropical summer rains, and in latitudes too low to be reached by the descending return trades, which bring the copious winter rains of the following zone, it has no source of regular supply. It is a significant fact that all the great deserts of the globe are in a sub-tropical situation. In the northern hemisphere, the arid peninsula of Lower California, the dry plateaus of New Mexico and Arizona, the Great Sahara, and the deserts of Arabia and Northern India; in the southern hemisphere, the desert of Atacama in South America, that of Kalahari in South Africa, and the arid wastes of Central Australia, are all traversed by one or the other of these remarkable sub-tropical belts.

The rains of the temperate regions offer a perfect contrast to those of the tropics. Instead of falling at *regular* periods, they are *variable*, as are the winds and the temperature of these zones, and fall at all seasons. The cause of this difference is found in the fact that while the tropical rains are due almost exclusively to ascending currents in the hottest part of the year, those of the temperate latitudes are mostly the result of the conflict of horizontal winds—that is, of the cold polar winds—with the warm and moist return trades, which takes place throughout the year. In any given latitude, however, the season at which the descending return trades reach the ground is likely to have a maximum of rain, which will travel with the declination of the sun. Thus, in the warm temperate zone, in the belt extending from 28° to about 35° N. lat., the return trades reach the ground when the sun is far away, near the southern tropic. The winter, therefore, is the rainy season, while the long summers are usually rainless. In the northern hemisphere, California, Algeria, a part of Palestine, the old Babylonia, in the southern hemisphere, a part of Chili, the Cape Colony, and the greater part of Australia, belong to the zone of winter rains.

Belt of Equinoctial Rain.—The sun advancing to the equator, the return trades fall farther up, in the latitudes of 35° to 45°. In this belt the winter rains diminish, the summers cease to be entirely dry, and most abundant rains fall about the time of the equinoxes, especially in the autumn. This is the régime of the rains in Italy, Greece, and Asia Minor.

Belt of Perennial Rains.—At the time of the solstice the equatorial winds reach the high latitudes and bring copious rains, which cause a slight increase in the warm season. This is the region of perennial rains with a maximum in summer: Central and Northern Europe, France, Germany, and the surrounding countries. In the polar regions the summer is also the wet season, but the long, sunless winters are dry and clear.

These general laws, however, are often considerably modified by the structure of the continents, the local features, and the climatic situation of the various countries in each belt. California, for instance, and the Southern States E. of the Rocky Mountains, are on the belt of winter rains; and still the régime of their rains is entirely opposite. While California has the normal winter rains with rainless summer, the S. Atlantic States and the Valley of the Mississippi have their maximum of rain in mid-summer. The quantity of rain is no less different. Los Angeles has hardly 10 inches, while the lower Valley of the Mississippi, under the same latitude, has no less than 50 or 60 inches. San Francisco has 23 inches, against 42 in the Atlantic States in the same parallel. Moreover, the amount of rain on the Pacific coast increases northward, and the régime of winter rains goes far beyond its natural limits to the 40th degree of latitude; while in the E. the quantity of rain decreases toward the N., according to the general law. This remarkable anomaly in the rains of the Southern States is explained by that vast indentation forming the Gulf of Mexico, which, like a great boiler, supplies the return trades that prevail throughout the summer with a large amount of vapors. These fall in copious showers on all the eastern portion of the U. S., increase considerably the total amount of rain, and entirely obliterate the dryness of the summer, which usually characterizes the climate of these latitudes. If the régime of the winter rains and dry summers extends farther in California, it may be traced to the influence of the great heat generated by the south-western plateaus, which retards the condensation of the vapors from the Pacific until the winds have reached a higher latitude, and to the absence of polar winds, which are turned away by the Rocky Mountains.

The situation and altitude of mountain-chains, and especially their direction in regard to the winds bearing vapors, has a great influence on the distribution of rain. No better example can be given than the effect of the long chain of the Andes on the condensation of rain. In the equatorial part, as far S. as their great bend at Punta Parina, both slopes are plentifully watered and clothed with a dense vegetation of forests; for here the frequent showers of the equatorial zone of calms fall equally on both sides. From Punta Parina to the S. tropic the eastern side has an abundance of drenching rains and magnificent forests, while the Pacific slope is a rainless and parched district. This is the region of the regular trade-winds coming from the Atlantic, whose vapors are condensed on the eastern slope, leaving the western rainless. Farther S., in Chili, the return trades from the N. W. water again the western coast during the winter months, while the eastern coast remains dry. Beyond the 40th parallel, the cool westerly and south-westerly winds prevailing in these latitudes strike the western slope of the chain, which nearly all the year is enveloped in clouds, and receives a quantity of water full as great as the tropics, while on the other side the Patagonian plains receive but a scanty supply. In North America the high border-chains from Oregon to the Alaska peninsula, which bend like a gigantic arm, catching the return trade-winds of the Pacific, receive an amount of rain greater than any part of the continent, while the E. side of these highlands has but a stinted share of the precious element. It is a remarkable fact that the Appalachian system does not increase the condensation of rain, as mountains usually do. This is doubtless due to their extending parallel with, and not transversely to, the winds bearing rain. In Europe the mountains exposed to the onset of the S. W. return trades, as those of the British Isles and Scandinavia, condense an amount of rain often double that which falls in the eastern portions of the same countries. In India the western coast, in Malabar, has its rainy season during the S. W. monsoon, and the quantity of rain, as in Mahabuleshwar, is ten times greater than on the plateau E. of the mountains. On the coast of Coromandel the rain comes by the N. E. monsoon at the opposite season. Extensive plateaus, increasing the summer heat of their atmosphere, prevent, in a degree, the condensation of moisture. As a rule, therefore, they are scantily provided with rain, and, like our western highlands and the great plateaus of the Old World, are too often but dry and sterile wastes. ARNOLD GUYOT.

Rains, county of N. E. Texas, on Lake Fork of Sabine River, formed since the census of 1870. The surface is rolling prairie, with considerable timber. Agriculture is the leading pursuit. Area, 220 sq. m. Cap. Emory.

Rains (GABRIEL J.), b. in North Carolina 1805; graduated at the U. S. Military Academy, and entered the infantry as second lieutenant in 1827; served with distinction in Florida and in action with the Seminole Indians Apr. 28, 1840, where he was severely wounded; gained the brevet of major; in the war with Mexico he was engaged in the defence of Fort Brown, May, 1846; in 1860 he attained the rank of lieutenant-colonel, and in July, 1861, resigned to enter the service of the South; became brigadier and major general, and was distinguished at Wilson's Creek, Shiloh, Perryville, etc.

Rains (GEORGE W.), b. in North Carolina 1820; graduated at the U. S. Military Academy, and appointed second lieutenant of engineers 1842; transferred to the artillery in 1843, and professor of chemistry, mineralogy, etc. at West Point 1844–46; served with distinction throughout the war with Mexico from Vera Cruz to the capture of the City of Mexico, and brevetted captain and major; in 1856 he resigned and became associated with the Washington ironworks at Newburg, N. Y., where he remained until 1861, when he went South to enter the service of the Confederate States.

Rains'borough, p.-v., Paint tp., Highland co., O. P. 220.

Rainsburg, p.-v., Colerain tp., Bedford co., Pa. P. 250.

Rainy Lake, a large lake on the boundary between Minnesota and Canada, receives the waters of the Nameken and many other rivers, and discharges its own waters

through Rainy Lake River into Lake of the Woods. It is in a marshy region, with few inhabitants. It abounds in small islands, and contains a great supply of fish of several species. Elevation, 1035 feet.

Rai'sin [remotely from Lat. *racemus*, a "bunch of grapes"], dried grapes, the fruit of the sweeter sorts of grapes, dried on lines in the bunch or spread upon platforms in the sun, or over-ripened and allowed to wither on the vine, the stalk half cut off. They are dipped after drying into a ley of grape-wood ashes or soda and water, slightly salted and mixed with a little oil. Then they are drained and dried again. The sweet muscatel, the sultana, etc. are the varieties employed. Raisins are brought only from Spain, Turkey, Calabria, and Sicily, but California is finely adapted to the production of raisins. One kind of CURRANT (which see) is a small variety of raisin.

Raisin, tp., Lenawee co., Mich. (RAISIN CENTRE P. O.), on Jackson branch of Lake Shore and Michigan Southern R. R. P. 1645.

Rai'sinville, tp., Monroe co., Mich. P. 1793.

Ra'jah [Hind. *râjâ*, a "king"], a title of many princes in the East, assumed by many of the Rajpoot caste, and by the great landowners, even of low caste. Many princes have assumed the title *mahârâjâh*, or "great rajah."

Rajahmun'dri, town of British India, presidency of Madras, on the Godavery, in lon. 81° 54′ E., has large manufactures of linen, damask, and tablecloths. P. 15,000.

Rajmahal, town of British India, presidency of Bengal, on the Ganges, consists of twelve villages or market-places surrounded with miserable mud huts. It has no consequence except as a kind of inn, travellers in great numbers passing through the city. P. about 30,000.

Raj'poot [Hind. *rajaputra*, "king's son"], a name assumed in India by the Kshatriyas or warrior caste. Throughout India there are many families who claim to be Rajpoots, but their chief seat is in Râjputana, or the fifteen Rajpoot principalities S. and S. E. of the Punjaub. The Rajpoots destroy nearly all their female offspring and marry into other tribes; hence their stock, originally Aryan, is now mixed. The caste numbers several millions.

Rake, an agricultural implement used for gathering hay, and for smoothing the soil. A large part of the labor of raking hay is performed by horse-power.

Rakóc'zy, a celebrated Hungarian family, extinct in the male line. FRANCIS II., prince of Transylvania, b. in 1676, was a son of Francis I. and Helena Zrinyi. The father, early elected prince of Transylvania, never occupied the throne; he died a few months after the birth of his son. Francis II. was educated from 1688 at the Austrian court and in Prague by the Jesuits, but continued a Protestant. After his marriage with a daughter of the landgrave of Hesse he lived on his estates in Upper Hungary, but, suspected of entertaining connections with the discontented party in Hungary, he was carried to Vienna in 1701 and confined in a dungeon. He escaped, fled to Poland, and lived in retirement until in 1703 he joined the Hungarian revolutionists. In 1705 he was placed at the head of the Hungarian confederacy; in 1707 elected prince of Transylvania, supported by Louis XIV. and Peter the Great. Nevertheless, Count Palfy reconciled the Hungarians and the house of Austria by the Peace of Szathmár (1711). Rakóczy refused to accept the amnesty offered him by Austria. He went first to France, then to Turkey. D. at Rodosto Apr. 8, 1733. He wrote *Mémoires sur les Révolutions de Hongrie* (the Hague, 1738).

Rákóc'zy March, a fine national air of Hungary and Transylvania, named in honor of Francis Rakóczy II., or of some other prince of that family.

Rákos. See PESTH.

Râle [Fr. "rattle"] or **Rhonchus** [Gr. ῥόγχος, a "snoring"], names used in medical practice to denote certain noises heard in the air-passages, and caused by the presence of mucus or by other abnormal conditions. Râles are in general louder than the sounds called *bruit*, *fremitus*, and *souffle*. They are detected by auscultation, and their varied significance can be understood by the trained diagnostician. Among the numerous râles are mentioned "humid," "dry," "cavernous," "mucous," "crepitant," "sibilant," "sonorous," etc.

Rale (SÉBASTIEN), b. in Franche-Comté, France, in 1658; became a Jesuit and a teacher of Greek in a college at Nîsmes; went to Canada as a missionary 1689; labored at the Abenaki mission of St. Francis, near the falls of the Chaudière, and among the Illinois Indians, and settled in 1695 at Norridgewock on the Kennebec River, Me. He built a church, converted many of the Abenaki Indians, learned their language, and acquired so great an influence that he was believed by the English settlers to be the cause of the frequent border forays. A price was set on his head, and the Indian village of Norridgewock was several times attacked; Father Rale's church was burned by Capt. Hilton in 1705, and having been rebuilt, was again destroyed in 1722, when the missionary escaped to the woods, but his papers were carried off. A third expedition from Fort Richmond surprised Norridgewock Aug. 2, 1724, and Father Rale was shot. Among his papers carried off in 1722 was an Abenaki dictionary, preserved in the library of Harvard College, and edited with notes by John Pickering in the *Memoirs* of the American Academy of Arts and Sciences for 1833. A *Life* of Father Rale forms a part of vol. vii., series 2d, of Sparks's *American Biography*.

Ra'leigh, county in the southern part of West Virginia, between Kanawha River on the E. and Great Cherry Pond Mountains on the S. W. The surface is mountainous; agriculture and dairying are the chief industries. Cap. Beckley or Raleigh Court-house. Area, 380 sq. m. P. 3673.

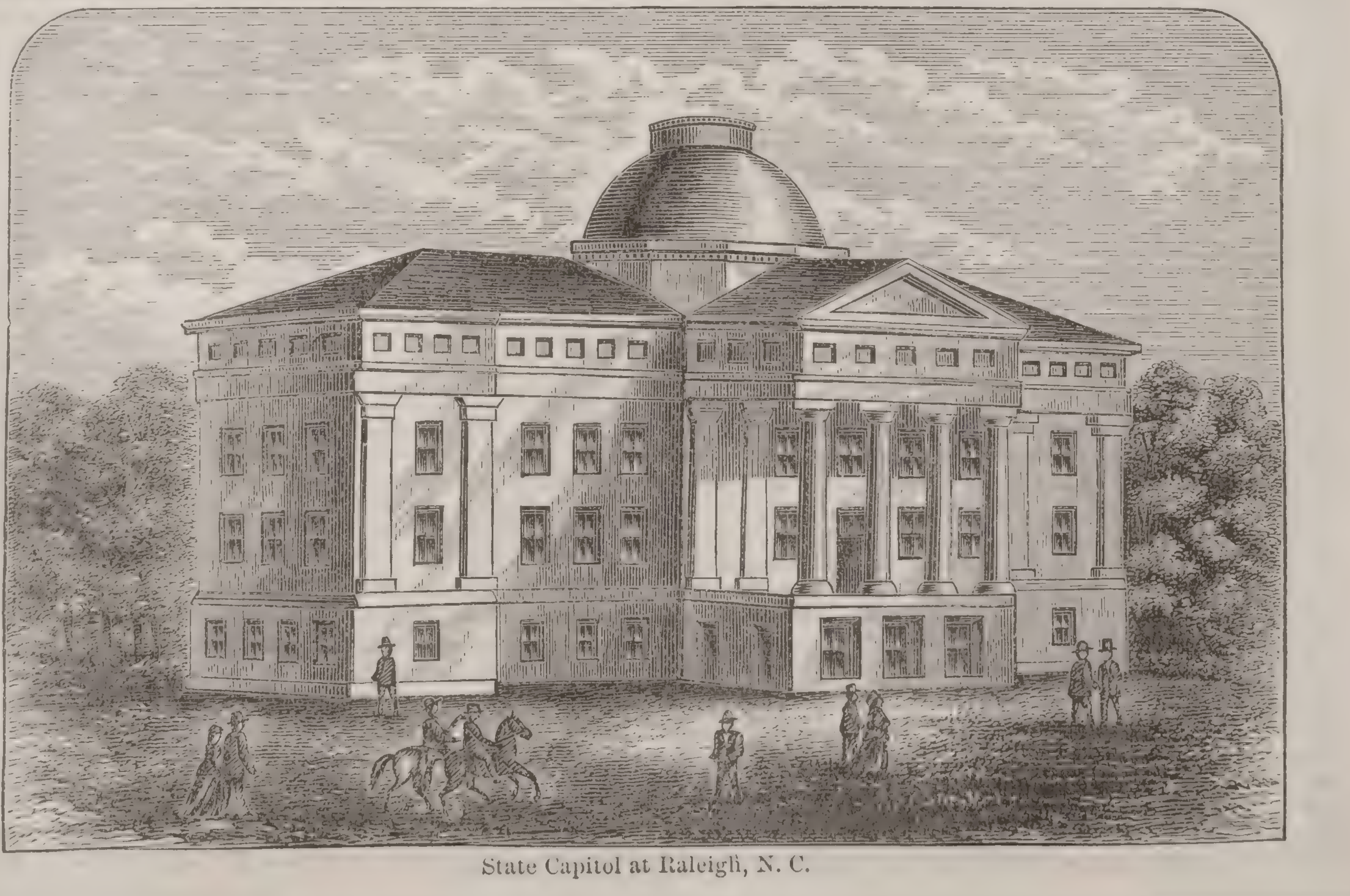
Raleigh, v., Pickens co., Ala. P. 476.

Raleigh, p.-v. and tp., Saline co., Ill. P. 2108.

Raleigh, p.-v., Washington tp., Rush co., Ind. P. 89.

Raleigh, p.-v., cap. Smith co., Miss. P. 111.

Raleigh, city and tp., cap. of North Carolina, and seat of justice of Wake co., situated 6 miles from the river Neuse,



State Capitol at Raleigh, N. C.

in about the geographical centre of the State (lat. 35° 47′ N., lon. 78° 48′ W.), upon Raleigh and Gaston, North Carolina, and Chatham R. Rs., which afford excellent commercial advantages. Raleigh was selected as the capital of the State in 1792, and possesses many fine streets shaded with native oaks, which, being wisely spared during the first settlement, and having attained a giant growth, have conferred upon the city the appropriate title of the "City of Oaks." It is the seat of all the principal public buildings of the State—legislative, penal, and charitable. The Capitol is a fine granite building located in the centre of a square of 6 acres densely shaded with oaks, while the institutions for the insane, the deaf, dumb, and blind, and the State penitentiary are all imposing works of architecture. The U. S. government is now erecting a court-house and post-office of the most approved style, of white granite which is quarried near Salisbury, N. C. Raleigh contains 2 Episcopal, 2 Baptist, 1 Presbyterian, 1 Roman Catholic, and 2 Methodist churches, with attendant chapels, while each of the above denominations, with the exception of the Roman Catholics, possesses its own institutions of learning, represented by costly buildings, with extensive and highly-improved grounds; 1 high school and a number of primary schools for both sexes and colors, and a series of buildings known as the Shaw Institute for the higher education of colored pupils, with a farm school under the charge of the Episcopalians, make up the list of educational advantages. There are 3 banks, 2 daily, 1 semi-weekly, 8 weekly, and 2 monthly newspapers, 2 foundries, a manufactory of steam-engines, an agricultural implement factory, several sash, blind, and planing establishments, several carriage-factories, 1 tobacco-factory, and several minor manufacturing interests. It is an extensive cotton-mart, handling about 40,000 bales annually. P. of city, 7790; of tp., exclusive of city, 2359. J. D. Cameron, Ed. "Raleigh News."

Raleigh, or **Ralegh** (Sir Walter), b. at Hayes, parish of East Budleigh, Devonshire, England, in 1552, second son of Walter Raleigh by his wife Catharine (Champernoun), widow of Otho Gilbert; was entered as a commoner at Oriel College, Oxford, about 1568; enrolled himself in a volunteer corps of auxiliaries commanded by his relative, Henry Champernoun, 1569, and passed several years fighting in behalf of the Huguenots in France; served under Sir John Norris, and afterward under the prince of Orange, in the Netherlands 1576–79. His half brother, Sir Humphrey Gilbert, having meanwhile obtained from Elizabeth letters patent dated June 11, 1578, empowering him to discover and possess any countries in North America not previously occupied, Raleigh sailed with him for Newfoundland 1579, but was forced by storms (and perhaps by an engagement with a Spanish fleet) to return without having landed in America; went to Ireland as captain of a company 1580; aided in suppressing the earl of Desmond's rebellion; was associated with Sir William Morgan in the government of the province of Munster; presented himself at court 1582; obtained the favor of Elizabeth; was employed in confidential negotiations with the French ambassador and the duke of Anjou; subscribed £2000 to the second expedition to Newfoundland under Sir Humphrey Gilbert, which resulted in the occupation of that island and the death of Sir Humphrey by shipwreck, 1583, and obtained from Elizabeth a new patent for discoveries and colonization in North America, by virtue of which an expedition headed by Philip Amidas and Arthur Barlow sailed from England Apr. 13, 1584, and explored Pamlico and Albemarle sounds in the summer of that year. Their enthusiastic accounts of the newly-discovered region being made known to Elizabeth, she bestowed upon it the name of Virginia, and conferred knighthood upon Raleigh 1585, who in the course of the year was made lord warden of the stannaries and seneschal of the counties of Cornwall and Devon; took his seat in Parliament for Devonshire; obtained the passage of a bill confirming his proprietary rights, and despatched to Virginia an expedition of 7 vessels and 108 colonists under Sir Richard Grenville, which made a settlement on Roanoke Island. Reinforcements were sent in the two following years, but the enterprise failed through the capture of two ships by the French, and from mismanagement on the part of the leaders of the colonists, some of whom returned home, and the remainder perished by starvation or massacre; the chief practical result being the introduction of tobacco and potatoes into England. After suffering a loss of $40,000, Raleigh transferred his patent to a company of merchants (1587), and was partially indemnified by a royal grant of the confiscated lands of Babington Mar., 1587, in addition to a similar earlier grant of a portion of the earl of Desmond's estates in Ireland. He took an active part in the preparations for repelling the Spanish Armada as captain of the queen's guard, member of the council of war, and lieutenant-general of the forces in Cornwall; commanded a vessel which rendered good service in the actions with the Armada July, 1588; accompanied Sir Francis Drake in his expedition to Portugal 1589; visited Edmund Spenser at Kilcolman Castle, Ireland, on his return, and in behalf of the poet presented to Elizabeth the first three books of the *Faerie Queene*. In 1590 he equipped a fleet of thirteen vessels, and with Frobisher cruised successfully against Spanish vessels in the West Indies. Imprisoned for two months in the Tower of London 1592, on account of his secret marriage with Elizabeth Throgmorton, one of the queen's maids of honor, and being forbidden to present himself at court, he organized an expedition of five vessels, with which he sailed from Plymouth Feb. 9, 1595, explored the coasts of Guiana, and ascended Orinoco River, and on his return published *The Discovery of the Large, Rich, and Beautiful Empire of Guiana* (4to, 1596). He served as rear-admiral at the taking of Cadiz, where he was wounded, June, 1596; was readmitted at court May, 1597; sailed with the earl of Essex to the Azores in the same year and took Fayal, but quarrelled with his commander and contributed to the ruin of Essex; obtained a grant of the fine manor of Sherborne, Dorsetshire; went as ambassador to the Netherlands 1600; became governor of Jersey 1601; lost favor at court on the accession of James I.; was accused of conspiring to raise Lady Arabella Stuart to the throne, committed to the Tower in July, and condemned to death at Winchester Nov. 17, 1603; suffered confiscation of his estates, which were given to Carr, the new favorite; was kept thirteen years in the Tower, during which time he wrote and published his principal work, *The History of the World* (1614); recovered his liberty, though not his pardon, through the influence of Villiers Jan. 30, 1616; obtained from James a commission as admiral, and sailed with a fleet of fourteen ships for the discovery of his promised El Dorado in Guiana Mar. 28, 1617; had several engagements with the Spaniards, in one of which he lost his oldest son; lost several vessels, and was foiled in his objects; landed at Plymouth on his return, June, 1618; was imprisoned on complaint of the Spanish ambassador, Gondomar, in consequence of his conduct in Guiana, and it having been decided by the judges that the sentence of death pronounced in 1603 was still valid, he was executed at the palace yard, Westminster, Oct. 29, 1618. Raleigh was a man of splendid genius and extensive attainments, wrote many miscellaneous, literary, and political essays, and a few poems of high order. His *Complete Works* were edited at Oxford in 8 vols. (1829). Biographies have been written by William Oldys, Arthur Cayley, P. F. Tytler, James A. St. John, and Edward Edwards, the two latter having appeared almost simultaneously in 1868. Porter C. Bliss.

Raleigh Court-house, or **Beckley,** p.-v., cap. of Raleigh co., West Va., on Piney Creek.

Ral'lidæ [Lat. *rallus*, "rail"], a family of birds including the rails, etc. They all have the form exemplified in the familiar rail; the neck is moderately elongated; the head rather small; the bill more or less elongated, compressed, and with the culmen advancing to a greater or less extent upon the forehead and decurved toward the apex; the nostrils are lateral, rather inferior, and in a membranous groove; the wings moderate and rounded, rather short, and with the humerus not passing beyond the acetabulum; the tail rather short, inclined upward, and rounded; the tibiæ are exserted; the tarsi rather long and slender, and in front covered with transverse scutellæ; the toes three in front, and well developed, the hinder comparatively short and rather elevated; the claws curved and acute. The family thus defined includes the common rails (Rallidæ) and gallinules (Gallinulinæ), the former containing 113 species, the latter 49. These are variously distributed through all parts of the world. They are aquatic birds, mostly frequenting the marshes and feeding upon worms and insects. (See Rail.) Theodore Gill.

Ralls, county of N. E. Missouri, on Mississippi and Salt rivers, has a rolling surface, with nearly equal extent of prairie and timber lands. Agriculture and dairying are the leading industries. Hannibal and St. Joseph and Missouri Kansas and Texas R. Rs. traverse the county. Cap. New London. Area, 525 sq. m. P. 10,510.

Ralph (James), b. in Philadelphia, Pa., about 1698; became a schoolmaster in his native city, where he made some pretensions to literary ability; was an early friend of Benjamin Franklin, with whom he sailed for England 1724, abandoning his wife and child; published in 1728 a poem entitled *Night*, which was sufficiently bad to merit notice by Pope in the *Dunciad;* sought favor with the Whig politicians by writing pamphlets and plays; was patronized by Frederick, prince of Wales, and received a pension on the accession of George III. D. at Chiswick Jan. 24, 1762. Author of *The Use and Abuse of Parlia-*

ments (2 vols., 1744) and of a *History of England during the Reigns of King William, Queen Anne, and King George I., etc.* (2 vols. folio, 1744–46), a work highly praised for its narration of facts by C. J. Fox and other critics.

Rals'ton, p.-v., McIntyre tp., Lycoming co., Pa., on Lycoming Creek and Northern Central R. R.

Râma. See RÂMÂYANA.

Ra'mah [Heb., *Ramah*, "height"], the name of several places in Palestine, two of which are historically interesting and important. One of these, first mentioned in Josh. xviii. 25, and identified by Robinson in 1838, is on the top of a high hill about 5 miles N. of Jerusalem. It belonged to the tribe of Benjamin. The other, where Samuel was born (1 Sam. i. 1), has not yet been identified with certainty. R. D. HITCHCOCK.

Ramapo', tp., Rockland co., N. Y. (RAMAPO WORKS P. O.), on Ramapo Creek and Erie R. R., includes ten villages and hamlets. P. 4649.

Râmâyana. The *Râmâyana* is undoubtedly the greatest Indian epic, not excepting the *Mahâbhârata*. Ample reasons for this opinion will be given subsequently, but the reader, before perusing this article, should consult the one under the heading MAHÂBHÂRATA. Much of that which will now be written of the *Râmâyana* will also be found to be applicable to the *Mahâbhârata*. In the first place, it will be interesting to place clearly before the reader's mind the circumstances under which the *Râmâyana* was penned; and the *Mahâbhârata* was composed under very similar conditions.

In the songs of the *Rig Veda* we are furnished with information concerning the state and the customs of the Aryans who first crossed the Indus and settled in Hindustan. When those songs were reduced to writing the Hindus dwelt in the *Panchanada*, or Panjaub, in the district called *Brahmavartta*, between the Sutlej and the Jumna. But this era of the Aryan invasion of India is decidedly anterior to that in which the *Institutes* of Manu were produced, and the *Mahâbhârata* and the *Râmâyana* written. These three later works point to a period when the Aryans had moved farther eastward and settled in the neighborhood of the Jumna and the Ganges and their tributaries. To speak generally, at least five centuries must have elapsed between the reduction of the Vedic hymns into written characters and the composition of the *Râmâyana*.

The dynasties which exercised unlimited sway over the northern portion of the Indian peninsula during the period referred to by the *Râmâyana* and *Mahâbhârata* were entitled the Solar and the Lunar. The Solar kings professed to be descendants of the god of the sun; the Lunar monarchs traced their origin to the god of the moon. Manu the lawgiver was said to be the son of the sun, and the progenitor of the Solar race; Manu's daughter and Budha, the son of the moon, were said to be the originators of the Lunar dynasty. Both of these royal lines increased and multiplied, became the heads of powerful families, founded states, conquered wide territories, and divided the best part of the immense continent of Hindustan between them. The *Râmâyana* is the epic which details the glories of the Solar dynasty. Kôsala, now called Oude, formed the principal territory owned by the Solar kings. The capital of Kôsala was Ayôdhyâ, which was situated on a tributary of the Ganges—a stream now known as the Gogra, but then called the Sarayu. The territory of the Lunar kings chiefly lay in the Doab, between the Jumna and Ganges, and in the time of the *Pândavas* the capital was Hastinâpura.

Neither the *Râmâyana* nor the *Mahâbhârata* can be fully understood unless attention is paid to the remarkable though gradual change of religious belief which had, at the time of the penning of those poems, come over the Aryan mind, primarily accustomed to the serene simplicity of Vedic teaching. The old religion, reflected in and inculcated by the *Rig Veda*, had in the process of time become elaborated and glossed over, if not sorely altered, even in its fundamental principles. The ancient worship of elements was superseded by the worship of heroes. The valiant Râma and the five noble sons of Pandu were extolled in the place of the cloud-compeller and the dispenser of warmth. If Indra were forgotten, Arjuna was remembered. The courtly poets vied with each other in their endeavors to tickle the ears of their princely patrons by recounting the exploits of their ancestors in the most extravagant manner. The deeds of any one hero were magnified just as it suited the purpose of the sûta or royal bard, and very frequently the most valiant exploits of a dozen warriors were boldly lumped together and ascribed in bulk to one favored hero. There is no limit to the fulsome adulation of an Oriental panegyrist. When laudation can go no farther, the Eastern poet simply declares the man praised to be an *avatâr* or incarnation; thus, Râma is exalted to be an incarnate Vishnu, and receives adoration accordingly. But there is art even in the wildest flattery of the professional Indian panegyrist: when a hero was said to be an incarnation of a deity, the deity singled out as the subject of this corporeal manifestation was generally that one held in highest esteem at the time when the panegyric happened to be penned. The author of the *Râmâyana* has been peculiarly fortunate in his adulation. The majority of Hindus at the present day are Vaishnavas, and throughout India there is no more common name by which the omnipotent Preserver is invoked than "Râma."

The *Râmâyana* means "The Sojourn of Râma." Hindus regard both the *Râmâyana* and *Mahâbhârata* as theological compositions, possessing divine authority. It must not be supposed, however, that either of the two poems is a *Purâna*. This is a common error, but the *Purânas*, exactly eighteen in number, are of later date, and constitute the recognized authority for the teaching and practice of that modern Hinduism which is much grosser and more debased than that sanctioned by the epics of the Solar and Lunar dynasties.

Much benefit will be gained by the student of Sanskrit literature who diligently compares the *Râmâyana* with the *Mahâbhârata*. The *Râmâyana* is pre-eminently an epic, or *Kâvya*; the *Mahâbhârata* is rather an *Itihâsa*, or ancient narration, since it is more a storehouse of ancient Hindu traditions than a connected poem. Here the opinion of an eminent Orientalist may be quoted—an opinion in which the writer of this article entirely coincides: "The *Râmâyana*, having but one single object in view—namely, the description of the deeds of Râma—having apparently, at least in the greater portion of it, been composed by one poet—and having a poetical and highly adorned style throughout—certainly appears to deserve the name of an epic better than the *Mahâbhârata*." It is a strange but true fact that outside of the small world of learned Sanskrit scholars the *Mahâbhârata* is much better known, at least in name, than is the *Râmâyana*, yet the latter is a poem which can only be placed side by side with the chief efforts of Milton, Goethe, and Dante.

Scholars seem to be agreed in considering the *Râmâyana* older than the *Mahâbhârata*. It may perhaps be conceded that a century and a half elapsed between the production of the two poems. The *Râmâyana* appears, however, to have been produced after the appearance of Buddhism in India. However, Buddhism at that time had not been embraced by the majority of the princes and peoples of India, as in time it was. Sanskrit was still a spoken language when the *Râmâyana* was composed. The date of its composition may perhaps be most safely placed at 250 B. C. Some portions of the *Râmâyana* may, however, have been added to the main work long after this early date. Yet the poem, as a whole, is undoubtedly the production of one poet, Valmiki, and not, as the *Mahâbhârata*, the work of many men and many times. Valmiki was a rishi of the Vedic period. His name is a very peculiar one. It signifies "white ant-hill." It is still a disputed question whether Valmiki was a real historical personage, just as everything about these ancient poems is disputed, especially their precise date. The *Râmâyana* is, as we know with considerable certainty from internal evidence, the work of one author; but it is a more difficult question to decide whether or no Valmiki was the strange name of that author. Anyhow, the personage is a more tangible being than the impossible "compiler," Vyâsa, the reputed author of the *Mahâbhârata* and a dozen other huge works. The *Râmâyana* itself states that it was first recited in public at an *aswamêdha*, or horse-sacrifice, by Kusalava (said to denote Kusa and Lava, sons of Râma), who had learned it from Valmiki. It may be remarked, however, that Kusa and Lava could not really have been Râma's sons. Kusalava (or Kusilava) means a *sûta*, or courtly panegyrist, and sûtas were accustomed to sing the *Râmâyana* at royal weddings, festivals, and public sacrifices from time immemorial. At the time when the *Râmâyana* was composed the art of writing was unknown amongst the Aryans of Northern India. So the poem was recited and sung from memory, and handed down from mouth to mouth. In the course of time, on account of this, several accretions added to the bulk of the poem, but as a whole the *Râmâyana* has wonderfully preserved its distinctive character intact. It contains 24,000 verses. It is divided into seven books. The poem is in no way disjointed. It has but one aim and end—namely, the history of Râma. The episodes it contains are few and far between, and do not seriously distract the attention of the reader. After the first portion of the work has been perused these episodes get still rarer, and the whole latter portion of the poem is one continuous, unbroken narrative. Throughout the *Râmâyana* we see the traces of the same skilful hand, the same poetical genius, the same facility of poetical expression. The

Râmâyana has been translated into each of the spoken dialects of India, and everywhere, from the Himalayas to Cape Comorin, enjoys unbounded popularity. Pre-eminent amongst the translations of the *Râmâyana* into Indian languages other than Sanskrit stands the Tamil version by the immortal Kamban. The elegant mellifluousness of this version is simply extraordinary; from every line of it it is apparent that a great poet, full of sympathy, enters heart and soul into the revelation to his Tamalian readers of the inner spirit of the masterpiece of a brother-poet. However, it is certain that at least 1300 years elapsed between the composition of the *Râmâyana* and its translation into Tamil. At this present day this truly Homeric poem, the *Râmâyana*, in the various vernacular dresses it has assumed throughout India, is undoubtedly the chief folk-song of the Hindus. The nomadic herdsmen of Scinde sing snatches of it in their tents; the wild Sonthal mountaineer croons verses of it over his fire as the chill night darkens over the Vindhyas; and the Tinnevelly Shânâr, as he climbs his palmyra, and the nude Tamil fisherman as he casts his net amongst the triple breakers of Cape Comorin, hum over to themselves the soft and silver-chiming quatrains of "The Sojourn of Râma." R. C. Caldwell.

Ram, Battering. See Battering-Ram.

Ram'bla, town of Spain, province of Cordova, has some manufactures of pottery and woollen stuffs. P. 5926.

Rambouillet', Hôtel de, the name generally given to a social circle which for more than half a century gathered around Catherine de Vivonne, marquise de Rambouillet, and her daughter, Julie d'Angennes, duchess de Montausier, and which exercised a very conspicuous influence on French language, literature, and civilization. Catherine de Vivonne, a daughter of the marquis of Pisani, French ambassador at Rome, by a Roman lady, was b. in 1588 at Rome, and married in 1600 to the marquis de Rambouillet. When she was presented at the French court she found its tone and manners so coarse and frivolous that she determined to form a court of her own. She succeeded; her house soon became the place where all who had genius, wit, learning, talent, or taste assembled, and from these reunions originated the French Academy, the highest authority of French literature, and the *salons*, the most prominent feature of French civilization. The influence of the Hôtel de Rambouillet on conversation and language, manners and morals, was very great, and must, generally speaking, be called highly beneficial; but it occasioned imitations which were merely ridiculous (see Molière, *Les Précieuses ridicules*), and in the latter part of the seventeenth century it became itself a sort of literary coterie, with its prejudices and its intrigues. (See Röderer, *Histoire de la Société polie en France pendant le 17 Siècle* (1835), and Charles Livet, *Précieux et Précieuses* (1859).)

Rameau' (Jean Philippe), b. Sept. 25, 1683, at Dijon, where his father was an organist; travelled from 1701 to 1717 in Italy and Southern France as violinist in the orchestra of a troupe of strolling actors; was appointed organist successively in Lille, Clermont, and Paris, and published in 1722 his *Traité de l'Harmonie*, in 1726 *Nouveau Système de Musique théorique*, and in 1732 *Dissertation sur les differentes Methodes d'Accompagnement*. Having acquired by these works a great name as a reformer of theoretical music, he began composing for the stage. In 1732 his opera *Hippolyte et Aricie* had complete success, and he now composed about twenty operas and ballets, besides minor pieces of music, which gave him rank beside Lully, who at that time reigned almost absolutely on the stage. D. Sept. 12, 1764.

Ram'eses, the name of several Egyptian monarchs, signifying the "nascent sun," and used principally by the kings of the nineteenth and twentieth dynasties. A prince named Rames (not Rameses) appears among those of the eighteenth dynasty invested with the title of king, but does not appear to have reigned independently. The next Ramses is Rameses I., the first monarch of the nineteenth dynasty, who restored the native rule in Egypt after the close of the eighteenth dynasty. He appears to have carried on war with the Khita or Hittites, with whom he made a treaty, and to have made a prison for the slaves or prisoners taken during his wars in the second year of his reign, dedicated to Khem or Amon Horus. He was buried in the Biban-el-Moluk, or "Valley of the Tombs of the Kings," at Thebes. His grandson, Rameses II., was one of the most remarkable of Egyptian monarchs, and the supposed Sesostris. He ascended the throne at an early age, and at the commencement of his reign directed his arms against Kush or Ethiopia on the S., which he reduced under his sway, imposing on it his viceroy and receiving considerable tribute. The great event of his reign was the campaign against the Khita or supposed Hittites in his fifth year, represented on the walls of the temples of Thebes, Abusimbel (or Ipsambul), and Beitonalli, and described in the panegyric of Pentaur, a scribe of the period. Rameses defeated a confederation of the Khita, the people of Carchemish, the Chalybes, Ilion, and the Dardani at the N. W. of Kadeshon (the Orontes), after alone in his chariot escaping from the midst of a corps of the enemy. Many of the principal officers of the Khita and one of the allied kings were drowned in the stream. The war seems still to have continued, for Rameses in his eighth year took Salem (or Jerusalem), Tapura (or Debir), Bethanah, and Kanana. In his twenty-first year he concluded an extraditionary treaty with the Khita, and married a daughter of the king of that country. He also appears to have been engaged in wars with the Amorites, Canaanites, the Libyans, including the Tahennu and the Maxyes, and the Syrians. The affairs of the S. attracted his attention, especially the arrangements for the gold-mines, and he built or enlarged the temples at Gerf Hussein, Sebna, and Abusimbel, fortifying the E. of Egypt with a great wall from Pelusium to Heliopolis, and the towns of Heroöpolis and Tanis with forts built in his name. He states 400 years intervened between the Shepherd kings and his rule. Thebes rose to great magnificence during his government. He reigned upward of sixty-six years, and was entombed in the Biban-el-Moluk at Thebes. Rameses III. (the Rhampsinitus of Herodotus) was the second king of the twentieth dynasty, the son of Setnecht, who overthrew the foreign petty princes who distracted the country, and once more restored the native sway. On his elevation to the throne, Rameses reorganized the kingdom and improved the discipline of the army, composed of Sardinians and Libyans, as well as native forces. In his fifth year he had to sustain an invasion of the Maxyes and Libyans, led by five kings; these he defeated with great slaughter. Three years later a confederation composed of Pelasgi, Teukrians, Sicilians, Daunians, and Oscans landed on the coast of Palestine, overran the land of the Khita, Carchemish, Aradus, and the Amorites, and advanced to the eastern frontier and mouths of the Nile. Rameses assembled an army at Taha in Palestine and a fleet on the Nile, and defeated the invaders with great slaughter. He also had a successful campaign against the Libyans, who again invaded Egypt. After the restoration of peace he had made a reservoir at Ainau or Beersheba, despatched fleets to Arabia, obtained copper from the foundries of Ataka or Athak, and turquoise from the Sarbit-et-Khadim at Mount Sinai. The South he had also subdued, and given during his reign magnificent donations to the temples of Heliopolis, Memphis, and Thebes. His later days were disturbed by domestic treason, and after a reign of above thirty-one years he was buried in the Biban-el-Moluk at Thebes. His successors, Rameses IV., V., VI., VII., and VIII., were insignificant rulers, and the most remarkable event known of the reign of Rameses IX. is a sacrilegious robbery of the tombs of the ancient kings in the sixteenth year of his reign. Rameses X. and XI. were unimportant monarchs. The reign of Rameses XII. has been recorded in the temple of Choris on account of his marriage with a daughter of the king of the Bakhten and the mission of the god Choris in his ark in the fifteenth year of Rameses to expel a demon from the body of the sister of the Egyptian queen. The ark and priests of the god, richly rewarded, returned to Thebes in the thirty-third year of the king's reign. Rameses XIII., the last of the Ramessids of the twentieth dynasty, was also an inglorious monarch. Their reigns are supposed to have ended about B. C. 1000.

The name of Rameses, or Ramessé, was that of the treasure-city built by the Hebrews, evidently named after one of these monarchs, and generally supposed to be Rameses II., the name of the monarch who oppressed the Israelites, and father of Menephthat, the Pharaoh of the Exodus. Owing to the discrepancy of opinion as to this period, whether it took place in the eighteenth or nineteenth dynasty, some have supposed the city to be named after Rames, the prince already mentioned, but the name was Ramessé, not Rames. It is supposed to have been Paramessu, or Rameses, better known as Tanis, on the Tanitic branch of the Nile, and the city whence the Exodus took place. In the campaign of Rameses III. a Migdol of Rameses is represented. Samuel Birch.

Ram'ie, or **China Grass,** the fibre of *Bœhmeria nivea*, an Asiatic plant of the order Urticaceæ. This fibre is stronger than hemp, more durable when woven than linen, and almost as lustrous as silk. The goods known as grass-cloth are made in China from this fibre. Experiments have fully shown the fitness of the soil and climate of our cotton States for the production of ramie-fibre, superior in quality even to that of Java. It can be harvested three times a year, producing in all some 1500 pounds of fully-prepared

ramie per acre. It is perennial, requires comparatively little labor and attention, has few insect enemies, and stands a rainy season or a drought with little injury. It is manufactured to some extent in Europe.

Rammac'ca, town of Sicily, province of Catania, about 17 miles from Caltagirone, in a district very rich in olives. In its neighborhood is the site of the ancient *Palica*, and some ruins of its famous temple still exist. The bituminous lake Nastia is also near this town. P. 5180.

Ram Mohun Roy, b. at Burdwan, Bengal, about 1774, belonged to a wealthy Brahmanical family; studied Sanskrit, Persian, and Arabic; resided for some time in Thibet; learned English; held for five years the office of revenue collector in the district of Rungpoor; edited the Bengal *Herald* in English; was in 1830 sent to the British court from the sovereign of Delhi. D. at Bristol Sept. 27, 1833. He was a great scholar and a man of powerful conception. He early renounced the Brahmanical faith, and exposed with great boldness its incongruity with human reason. Much attention was attracted in 1820 to his *Precepts of Jesus, the Guide to Peace and Happiness*, published in English, Sanskrit, and Bengalee, and written from a Unitarian standpoint.

Ramnod', town of British India, presidency of Madras, in lat. 9° 13′ N., lon. 78° 56′ E., on the Vayah. It is well built and strongly fortified, and its climate, though hot, is healthy. It has some manufactures of coarse woollen fabrics. P. about 13,000.

Ra'moth Gil'ead [Heb., "heights of Gilead"], first mentioned in Deut. iv. 43, a Levitical city and one of the three cities of refuge on the E. side of the Jordan. Ahab, seventh king of Israel, fell in battle there about 897 B. C., and his son Jehoram, ninth king of Israel, was severely wounded there about 884. As identified by Gesenius, *Es-Salt* (Arabic adaptation of *Saltus Hieraticus*, "sacred forest") occupies the old site. It is about 23 miles N. E. of Jericho, up the wady Shaib, only 2 or 3 miles from the summit of Jebel Osh'a, the view from which is considered the finest in Palestine. Es-Salt has a population of about 4000, of whom 500 are Christians. R. D. HITCHCOCK.

Ram'pion, the *Campanula rapunculus* (order Campanulaceæ), a perennial European herb cultivated in gardens for its white, carrot-shaped root, and for its leaves, which are used in salads. It is principally grown in Italy and France, but little if at all in the U. S.

Ram'say (ALLAN), b. at Leadhills, Lanarkshire, Scotland, Oct. 15, 1686; was in early life a wigmaker at Edinburgh; afterward became a bookseller, and printed many poems, Scottish and English, usually on "broadsides" or single sheets. He ultimately acquired considerable celebrity, and his bookshop having become a favorite resort of the literary men of Edinburgh, he enlarged his business, becoming a publisher, and started the first circulating library in Scotland. The first collected volume of his poems appeared in 1721; others were soon added, of which the most popular were *The Tea-Table Miscellany* (4 vols., 1724), *The Gentle Shepherd, a Scots Pastoral Comedy* (1725), and *A Collection of Thirty Fables* (1730). Ramsay was an industrious collector of old popular songs, and to him must be credited the preservation of many relics of ancient Scottish literature. D. at Edinburgh Jan. 7, 1758. The best edition of his poetical works is that of George Chalmers (London, 2 vols., 1800; new ed., Paisley, 1874).—His son, ALLAN, b. at Edinburgh in 1713, became an eminent portrait-painter at London; became principal painter to George III. 1767, and was at one time considered (though without reason) a rival of Sir Joshua Reynolds. He figured in literary circles as a friend of Dr. Johnson, and published a number of pamphlets and essays, chiefly political. D. at Dover Aug. 10, 1784.

Ramsay (ANDREW CROMBIE), LL.D., F. R. S., b. at Glasgow, Scotland, Jan. 31, 1814; educated at his native city; was appointed a member of the geological survey of Great Britain 1841; became a director of that work 1845; professor of geology at University College, London, 1848; lecturer at the Royal School of Mines 1851; was president of the Geological Society 1862–63, and became director-general of the geological survey, and also of the museum of practical geology 1872. Author of numerous memoirs on theoretical questions in geology, of works on the geology of Arran (1841), North Wales (1858), and Switzerland (1860), of *Physical Geology and Geography of Great Britain* (1863), and of a large *Geological Map of England and Wales* (1859).

Ramsay (ANDREW MICHAEL), LL.D., known as the CHEVALIER DE RAMSAY, b. in Ayrshire, Scotland, in 1686; was educated at the University of Edinburgh; was converted to Roman Catholicism by Fénelon during a residence at Cambray; became successively preceptor to the duke de Château-Thierry, to the prince de Turenne, and to the two sons of the "Pretender," Charles Edward and Henry, then residing at Rome; and was made a knight of the order of St. Lazarus, thus acquiring the honorary title by which he is usually known. Returning to Scotland in 1725, he lived several years with the duke of Argyll, and was afterward intendant in the family of the prince de Turenne until his death at St. Germain-en-Laye, France, May 6, 1743. He wrote numerous works in French, of which the best were the *Voyages de Cyrus* (2 vols., 1727), an imitation of Fénelon's *Télémaque*, and biographies of Fénelon (1723) and of Marshal Turenne (1735). In English he wrote *The Philosophical Principles of Natural and Revealed Religion explained and unfolded in a Geometrical Order*, which appeared after his death (Glasgow, 2 vols. 4to, 1748).

Ramsay (DAVID), M. D., b. in Lancaster co., Pa., Apr. 2, 1749; graduated at Princeton 1765; studied medicine at the University of Pennsylvania; settled as a physician at Charleston, S. C., 1773; served in the war of the Revolution as a field-surgeon, participating in the siege of Savannah; was a leading member of the South Carolina legislature 1776–83, and of the "council of safety" at Charleston, on the capture of which city he was treated by the British as a hostage and kept eleven months in close confinement in St. Augustine, Fla., 1780–81; was a member of the Continental Congress 1782–84, and again 1785–86; was acting president of Congress during most of the latter period, on account of the sickness of Hancock; published a *History of the Revolution in South Carolina* (2 vols., 1785), *History of the American Revolution* (2 vols., 1790), a *Life of Washington* (1801), a *History of South Carolina* (1808), and an abridgment of universal history, posthumously published (12 vols., 1819), besides medical and other essays. He married a daughter of Pres. Witherspoon of Princeton, and again Martha, daughter of Henry Laurens, of whom he published a memoir in 1811. During the last fourteen years of his life Dr. Ramsay was a member of the South Carolina legislature, and for much of the time president of the senate. D. at Charleston May 8, 1815, from a wound inflicted by a lunatic two days before.

Ramsay (EDWARD BANNERMAN), LL.D., b. at Balmain, Kincardineshire, Scotland, Jan. 31, 1793; graduated at St. John's College, Cambridge, 1815; took orders in the Church of England; was a curate in Somersetshire several years; became minister of St. John's church, Edinburgh, 1830, and dean of the Reformed Episcopal Church of Scotland 1841. D. at Edinburgh Dec. 27, 1872. Author of several popular works, including a *Manual of Catechetical Instruction* (1851), *Memoir of Dr. Chalmers* (1867), *Reminiscences of Scottish Life and Character* (1857; 2d series, 1861), *Diversities of Christian Character* (1858), *The Christian Life* (1859), and *Pulpit Table-Talk* (1868).

Ramsay (GEORGE D.), b. in Virginia in 1800; graduated from the U. S. Military Academy, and entered the artillery 1820; transferred to the ordnance corps, with rank of captain, 1835; in war with Mexico he served as ordnance officer of the army of occupation; was engaged in the battle of Monterey, and was Gen. Taylor's chief of ordnance June, 1847, to May, 1848. Subsequently commanded various arsenals, and in Sept., 1863, became chief of ordnance with rank of brigadier-general. Retired Sept., 1864, though continued on inspection duty and in command of Washington arsenal until 1870.

Ramsay (NATHANIEL), b. in Pennsylvania May 1, 1771, brother of David and son of James, who emigrated from Ireland and settled in Pennsylvania; graduated at Princeton, N. J.; studied law and became a member of the bar of Cecil co., Md. Soon after the breaking out of the Revolutionary war he entered the army, and was in active service for the greater part of the contest. At the battle of Monmouth he commanded a Maryland regiment. Gen. Washington arrived on the field at the juncture when the retreat of Gen. Lee threatened to terminate in a total rout, and calling to him Cols. Stewart (also of Maryland) and Ramsay, and taking the latter by the hand, said (as related by an eye-witness on Washington's staff, the late James McHenry, subsequently secretary of war), "Gentlemen, I shall depend on you to check with your two regiments the enemy till I can form the main army." "We shall check them," said Ramsay—a pledge fulfilled, but at the cost of their entire command. Stewart was early wounded and carried off the field; Ramsay maintained the ground till, left without troops, he was cut down in a hand-to-hand fight with some British dragoons, and left for dead on the field. This important service was ever gratefully remembered by Washington, who when President made Ramsay marshal, and soon after naval officer,

at Baltimore. By his second wife, Charlotte Hall, of Harford co., Col. Ramsay has left descendants in Maryland. He was a devout man, of singular modesty and simplicity, probity, and great benevolence. D. at Baltimore Oct. 23, 1817.

Ramsaytown, p.-v., Yancey co., N. C. P. 452.

Rams'den (Jesse), F. R. S., b. at Salterhebble, near Halifax, Yorkshire, England, in 1735; was at first a cloth-dresser, afterward became an instrument-maker, and exhibited great ingenuity in improving the construction of sextants and telescopes. Having married the daughter of Dollond, he acquired an interest in the letters patent for achromatic telescopes, and constructed instruments for several continental observatories, all of which were noted for the perfection of their object-glasses. D. at Brighton Nov. 5, 1800, leaving a sum of money to his workmen.

Ramseur (Stephen D.), b. in North Carolina 1837; graduated from the U. S. Military Academy, and entered the artillery July, 1860; resigned Apr. 6, 1861, and entered the service of the Southern Confederacy, in which he attained the rank of brigadier-general. At the battle of Cedar Creek, Oct. 19, 1864, while in command of a division, he was mortally wounded, and died Oct. 21, 1864.

Ram'sey, county of N. Dakota, formed since the census of 1870, borders on the line of British America, includes Pembina and Stump lakes and a portion of Miniwakan or Devil's Lake in the S. W. corner. The surface consists of rolling prairie, agriculture being the only industry. Area, about 1500 sq. m.

Ramsey, county of E. Minnesota, on Mississippi River, consists of an elevated table-land, partly prairie and partly forest; is crossed by several railroads. Agriculture, dairying, and stock-raising are important industries; also lumbering and manufactures, the latter being centred in St. Paul, the capital both of the county and of the State. Area, 200 sq. m. P. 23,085.

Ramsey, p.-v. and tp., Fayette co., Ill., on Illinois Central R. R. P. 1862.

Ramsey, tp., Anoka co., Minn., on Mississippi River and on Chicago Minnesota and St. Paul and Southern Minnesota R. Rs. P. 265.

Ramsey (Alexander), b. near Harrisburg, Pa., Sept. 8, 1815; was a Whig member of Congress from Pennsylvania 1843–47; appointed by Pres. Taylor governor of Minnesota Territory 1849, he negotiated treaties with the Dakotas and Chippewas, acquiring for the U. S. large tracts of land; was mayor of St. Paul 1855, governor of the State 1858–62, and U. S. Senator 1863–69.

Ramsey (Francis M.), b. Apr. 5, 1835, in the District of Columbia; entered the navy as a midshipman Oct. 5, 1850; became a passed midshipman in 1856, a lieutenant in 1858, a commander in 1866; served during the civil war with distinguished gallantry on the Western waters and in both the Fort Fisher fights, and commended for "skill, conduct, judgment, and bravery."

Foxhall A. Parker.

Rams'gate, town of England, county of Kent, on the E. coast of the Isle of Thanet, and celebrated as a watering-place. P. 11,838.

Ra'mus (Peter), (Pierre de la Ramée), b. at Cuth, department of Somme, France, in 1515, in humble circumstances; studied under great difficulties at the University of Paris, and published in 1543 his *Animadversionum in Dialecticam Aristotelis Libri XX.* and *Institutionum Dialecticarum Libri III.*, in which he attacked Aristotle and the scholastic method of philosophizing with great boldness. The university, the Church, the Parliament, took great offence; the books were condemned, and the author forbidden to teach. By the favor of the king he was nevertheless afterward appointed at the university, and continued till his death his opposition against the empty subtleties of the philosophy of his time. In 1561 he embraced Protestantism, and was killed during the massacre of St. Bartholomew, Aug. 24, 1572.

Ram, Water. See Hydraulic Ram, by J. P. Frizell.

Rancé, de (Dominique Armand Jean Lebouthillier), b. at Paris Jan. 9, 1626; enjoyed while yet a boy several large ecclesiastical benefices, and was ordained a priest in 1651, but led nevertheless a very dissipated life until in 1660 he gave all his property to the poor, renounced his benefices, and retired to the monastery of La Trappe, where he introduced rules of the severest asceticism and founded the order of the Trappists. D. Oct. 27, 1700. He wrote *Traité de la Sainteté et des Devoirs de la Vie monastique* (1683) and *Relation de la Vie et de la Mort de quelques Religieux de la Trappe* (4 vols., 1696). (See Marsollier, *Vie de Rancé*, 1703.)

Ranche [Sp. *rancho*], in the parts of the U. S. near Mexico is the name applied to large farms, especially those devoted to stock-raising. The term more correctly designates the buildings upon such an establishment. Some of the ranches comprise hundreds of thousands of acres.

Ranco'cas, p.-v., Willingborough tp., Burlington co., N. J.

Rand (Asa), b. at Rindge, N. H., Aug. 6, 1783; graduated at Dartmouth College 1806; was for some years pastor of a Congregational church at Gorham, Me.; edited the *Christian Mirror* at Portland, Me., 1822–25; afterward conducted at Boston the *Recorder* and the *Youth's Companion*; established in 1833 a book-store and printing-office at Lowell, where he published the Lowell *Observer*; lectured against slavery; was pastor of churches at Pompey (1837–42) and Peterborough, N. Y., and wrote several volumes of sermons and polemical theology. D. at Ashburnham, Mass., Aug. 24, 1871.

Rand (Benjamin Howard), M. D., b. at Philadelphia, Pa., in 1827; graduated at the Jefferson Medical College 1848; became professor of chemistry in the Philadelphia Medical College 1853 and in the Jefferson Medical College 1864; has written for several medical periodicals; edited Metcalfe's *Caloric* (2 vols., 1859) and published *Medical Chemistry for Students* (1855) and *Elements of Medical Chemistry* (1866).—His sister, Marion H. Rand (b. 1824; d. at Grahamville, S. C., 1849), wrote poems, of which specimens may be found in May's *Female Poets*.

Rand (Edmund Sprague), b. at Boston, Mass., Oct. 20, 1834; graduated at Harvard 1855, at Cambridge Law School 1857, and became a law-partner of his father, of the same name. Author of *Life-Memories and other Poems* (1859), *Flowers for the Parlor and Garden* (1863), *Garden-Flowers, How to Cultivate them* (1866); of works on *Green-house Plants* and on *Orchids;* editor of several volumes on botany and entomology, and a frequent contributor to periodical literature.

Rand (Isaac), M. D., b. at Charlestown, Mass., Apr. 27, 1743; graduated at Harvard 1761; accompanied Prof. Winthrop to Newfoundland in that year to observe the transit of Venus; studied medicine; became one of the most eminent physicians of Boston, and was president of the Massachusetts Medical Society 1798–1804. D. at Boston Dec. 11, 1822. Author of several medical essays and treatises.

Ran'dall, tp., Kenosha co., Wis. P. 533.

Randall (Alexander Williams), b. in Montgomery co., N. Y., in Oct., 1819; studied law; settled at Waukesha, Wis., 1840; became postmaster of that town and its representative in the legislature; was judge of the second district 1856; governor of Wisconsin 1857–61, in which capacity he rendered eminent service in raising volunteers for the war; minister to Italy 1861–65; assistant postmaster-general 1862–66, and postmaster-general 1866–69, after which he practised law at Elmira, N. Y., until his death, July 25, 1872.

Randall (Archibald), b. in Pennsylvania in 1800; was admitted to the bar 1818; became a successful lawyer; was appointed judge of common pleas 1834, judge of the U. S. district court 1842, and (in addition) of the circuit court of Eastern Pennsylvania 1844. In that capacity he was especially distinguished for his decisions in bankruptcy cases, reported in the *Pennsylvania Law Journal* 1842–46. D. at Philadelphia May 30, 1846.

Randall (George Maxwell), D. D., b. at Warren, R. I., in 1810; graduated at Brown University 1835; was for some years a Unitarian clergyman; afterward ministered to an Episcopalian church at Fall River; was rector of the Church of the Messiah 1844–65, during which time he became widely known as a champion of his Church, editing the *Christian Witness* and writing tracts which had a wide circulation; was in 1865 chosen missionary bishop of Colorado, having jurisdiction also in Wyoming and New Mexico, and organized many churches, schools, and seminaries, besides Jarvis Hall at Denver, the first collegiate institution in Colorado. D. at Denver Sept. 28, 1873.

Randall (Henry Stephens), LL.D., b. in Madison co., N. Y., in 1811; graduated at Union College 1830; studied law and was admitted to the bar, but never practised; became secretary of state and superintendent of public instruction of New York 1851; published several volumes on agriculture, sheep-husbandry, and education, besides official reports on education; was for some years one of the editors of Moore's *Rural New Yorker*, and is author of an elaborate *Life of Jefferson* (3 vols., 1857).

Randall (James Ryder), b. at Baltimore, Md., Jan. 1, 1839; received his education at Georgetown College, D. C. His health failing, he was compelled to leave this

institution before graduation, and sought its recuperation by travel. He visited several parts of South America, and returned not long before the outbreak of the late war. In this he cast his fortunes with the people of the South. As his constitution was still frail and delicate, he resorted to his pen in the promotion of the cause he had espoused. His "Maryland, my Maryland!" published in Apr., 1861, was set to music and sung at the hearthstone and in camp from the Potomac to the Rio Grande. It was the Marseillaise of the Confederate cause. Other poems from the pen of Mr. Randall were "The Sole Sentry," "Arlington," and "There's Life in the Old Land Yet." Shortly after the close of the war Mr. Randall became editor-in-chief of the *Constitutionalist* at Augusta, Ga., which position he still maintains (1876). A. H. STEPHENS.

Randall (SAMUEL J.), b. at Philadelphia, Pa., Oct. 10, 1828; received an academic education; became a merchant at Philadelphia; was for several years a member of the city councils; served in the State senate 1858–59; was elected to Congress as a Democrat 1862, since which time he has been continuously re-elected; is one of the leaders of his party, and was largely supported for the nomination as Speaker of the U. S. House of Representatives in Dec., 1875.

Randall's Island, in the East River, opposite New York City, contains the juvenile delinquents' reformatory, infant hospital, nurseries, and nursery hospital. P. 1710.

Randaz'zo, town of Sicily, province of Catania, in the Val Dèmone, near the right bank of the Alcantara, and on one of the most frequented routes to the summit of Etna. It lies about 32 miles N. W. of Acireale, in the midst of an almost tropical luxuriance of vegetation. The castle of Randazzo is of Norman architecture, and the adjacent church of Santa Maria has still a Norman exterior, though the interior has been barbarously restored, and is only redeemed by some fine pictures by Velasquez. There are several other churches of some interest, and many of the private buildings bear evident traces of Norman taste. About 6 miles from Randazzo there is a very curious old Byzantine chapel, quadrangular and surmounted by a cupola. The neighboring lake, Gurrida, is dry in summer, though in winter it sends its waters through a distance of 95 miles to the sea. The origin of this town is uncertain, but remains of baths, etc. prove it to be as old as the Roman period. Fazzello says that in his time (1550) it was a large, wealthy, and noble city. The inhabitants are mostly occupied in the cultivation and sale of the rich products of the soil, and now number only about 8000.

Ran'ders, town of Denmark, Jutland, on the Guden-Aa, at its entrance into the Randers Fjord, is celebrated for its glove manufactures and salmon fisheries. P. 9200.

Ran'dol, tp., Cape Girardeau co., Mo. P. 1534.

Ran'dolph, county of E. Alabama, on the Georgia boundary, traversed by Tallapoosa and Little Tallapoosa rivers. Wheat, corn, sweet potatoes, cotton, and butter are the staple products, and small quantities of gold are found. Cap. Weldonville. Area, 650 sq. m. P. 12,006.

Randolph, county of N. E. Arkansas, on the Missouri boundary, watered by Big Black, Little Black, and traversed by Arkansas division of St. Louis Iron Mountain and Southern R. R. Cap. Pocahontas. Area, 870 sq. m. P. 7466.

Randolph, county of S. W. Georgia, traversed by South-western R. R. of Georgia, has a level surface, and is largely covered with pine forests. Agriculture is the chief industry. Cap. Cuthbert. Area, 400 sq. m. P. 10,561.

Randolph, county of S. W. Illinois, on Mississippi River, watered by Kaskaskia River and several smaller streams, traversed by Iron Mountain Chester and Eastern and St. Louis Belleville and Southern Illinois R. Rs., has a broken surface and a very fertile soil, producing immense crops of wheat and corn and considerable quantities of oats, hay, sorghum molasses, wool, and butter, has 10 saw-mills and above 30 manufactories, chiefly of carriages, wagons, saddlery, harnesses, and agricultural implements. Cap. Chester. Area, 600 sq. m. P. 20,859.

Randolph, county of E. Indiana, on the Ohio boundary, traversed by White, Mississinewa, and Whitewater rivers and by four railroads, has a rolling surface and a fertile soil; produces wheat, corn, wool, and butter, is well supplied with stock, has 19 saw-mills, 7 flouring-mills, 4 tanneries, and several manufactories of carriages and furniture. Cap. Winchester. Area, 440 sq. m. P. 22,862.

Randolph, county of N. Missouri, watered by E. and Middle forks of Chariton River, and traversed by Missouri Kansas and Texas and St. Louis Kansas City and Northern R. Rs., has a level surface, partly prairie, with considerable timber, and produces immense crops of tobacco. Other staple products are corn, oats, sorghum molasses, honey, wool, and butter. There are mines of bituminous coal, and gold is found in quartz. Cap. Huntsville. Area, 450 sq. m. P. 15,908.

Randolph, county of Central North Carolina, traversed by Deep and Uharie rivers; has a rolling surface. Agriculture is the leading interest. Cap. Ashborough. Area, 725 sq. m. P. 17,551.

Randolph, county in the N. E. part of West Virginia, traversed by several parallel ranges of the Alleghany Mountains, of which the principal chain is the E. boundary; contains many streams, which unite to form Cheat and Monongahela rivers; abounds in mineral wealth, especially coal, iron, and salt. Agriculture is the leading industry. Considerable quantities of maple-sugar, wool, and butter are produced. Cap. Beverly. Area, 1200 sq. m. P. 5563.

Randolph, p.-v., Bibb co., Ala., on Selma Rome and Dalton R. R. P. 2038.

Randolph, p.-v. and tp., McLean co., Ill., on Illinois Central R. R. P. 1958.

Randolph, tp., Ohio co., Ind. P. 3475.

Randolph, tp., Tippecanoe co., Ind., on Louisville New Albany and Chicago R. R. P. 948.

Randolph, p.-tp., Norfolk co., Mass., 15 miles S. of Boston, on Old Colony R. R., was incorporated in 1793, and contains 3 churches and 1 chapel, 1 newspaper, a public library and building donated by the heirs of Col. Royal Turner, and built of Quincy and Randolph granite, 1 national and savings bank, 1 high school, maintained principally from a fund bequeathed by Hon. Amasa Stetson, with several grammar and primary schools, manufactories of boots, shoes, and woollen goods. P. 5642.
D. H. HUXFORD, ED. "NORFOLK CO. REGISTER."

Randolph, tp., Dakota co., Minn. P. 170.

Randolph, p.-v., in the village of Renick, Randolph co., Mo., on North Missouri R. R.

Randolph, tp., St. François co., Mo. P. 676.

Randolph, tp., Coos co., N. H. P. 138.

Randolph, tp., Burlington co., N. J. P. 450.

Randolph, tp., Morris co., N. J. P. 5111.

Randolph, p.-tp., Cattaraugus co., N. Y., on Atlantic and Great Western R. R., 18 miles W. of Salamanca, has 4 churches, the Chamberlain Institute and Female Seminary, 4 hotels, 1 newspaper, and repair-shops. Principal business, farming and dairying. P. 2167.
FRANK J. LOCKWOOD, ED. "REGISTER."

Randolph, tp., Montgomery co., O. P. 2077.

Randolph, p.-v. and tp., Portage co., O. P. 1564.

Randolph, p.-v. and tp., Crawford co., Pa. P. 1732.

Randolph, p.-v. and tp., Orange co., Vt., on Central Vermont R. R. P. 2829.

Randolph, tp., Cumberland co., Va. P. 2400.

Randolph, tp., Columbia co., Wis. P. 1157.

Randolph, v., Courtland tp., Columbia co., Wis. P. 61.

Randolph, p.-v., Dodge co., Wis.

Randolph (EDMUND), b. in Virginia Aug. 10, 1753, nephew of Peyton and son of John Randolph, attorney-general of Virginia, a leading royalist (b. 1728; d. in London Jan. 31, 1784); studied law; entered the Continental army at Cambridge as an aide to Gen. Washington Aug., 1775; represented Williamsburg in the Virginia convention of May, 1776; became attorney-general of the State in July; married a daughter of Robert Carter Nicholas; was a delegate to the Continental Congress 1779–83, and to the convention which formed the Federal Constitution 1787; presented to that body the so-called "Virginia plan," but without success; refused to sign the Constitution, though he advocated its ratification in the Virginia convention; was elected governor of Virginia 1788; was the first attorney-general of the U. S. on the organization of the Federal government 1789; succeeded Jefferson as secretary of state 1794, and resigned in Aug., 1795, in consequence of disapproval by his colleagues of his dealings with the minister of the French republic, on which subject he published a *Vindication* (1795). D. in Frederick co., Va., Sept. 12, 1813. An interesting description of his person, character, and public services was given by William Wirt in his *British Spy*.

Randolph (GEORGE WYTHE), son of Gov. Thomas M. Randolph and grandson of Thomas Jefferson, b. at Edge Hill, Va., about 1820; educated at the University of Virginia; was in early life an officer of the U. S. navy; became a lawyer at Charlottesville 1845, and subsequently at Richmond; entered the Confederate military service 1861; was made brigadier-general for gallantry at Big

Bethel; was secretary of war from Mar. to Dec., 1862, and resided in France as agent of the Confederate treasury department 1863–65. D. in Albemarle co., Va., Apr. 4, 1867.

Randolph (Jacob), M. D., b. at Philadelphia, Pa., Nov. 25, 1796; graduated in medicine at the University of Pennsylvania 1817; married a daughter of Dr. Physick 1822; became eminent in surgery, of which he was professor in the University of Pennsylvania from 1847 to his death, Feb. 29, 1848. Author of many medical and surgical papers, and of a *Memoir of Dr. Physick* (1839).

Randolph (John) **of Roanoke,** b. at Cawsons, Chesterfield co., Va., June 2, 1773, descended from Pocahontas; lost his father, from whom he inherited a large estate, in infancy; was educated by tutors through the care of his stepfather and guardian, St. George Tucker; manifested little inclination to study, but spent some time both at Princeton and at William and Mary College; studied law at Philadelphia under Edmund Randolph; was elected to Congress as a Democrat in 1799, and re-elected, with the exception of two terms, until 1825; was chairman of the committee of ways and means 1801; was the chief manager of the impeachment of Judge Chase 1804; became conspicuous for his wit and eloquence, no less than for the bitterness of his speech and his numerous eccentricities; was prominent as a champion of State Rights and as a partisan of Jefferson's administration until 1806, when he separated from his political associates, opposed the election of Madison, the embargo, and the war with England in 1812, in consequence of which he was defeated in that year in his candidacy for re-election, but was returned at the election of 1814; opposed the Missouri Compromise with great vehemence, fastening upon its Northern supporters the epithet "dough-faces;" visited England in 1822, and again in 1824; sat in the U. S. Senate 1825–27; had a duel with Henry Clay Apr. 8, 1826, growing out of his denunciation of the political alliance between the latter and J. Q. Adams; supported Gen. Jackson in the election of 1828; sat in the convention of 1829 for revising the constitution of Virginia; went as minister to Russia 1830, but spent most of his time in London; returning in 1831, was again elected to Congress 1832, but before taking his seat d. at Philadelphia, Pa., of consumption, June 24, 1833. He was never married. By his will he emancipated and provided for his slaves, numbering above 300. Several biographies have been published, of which the best is that of Hugh A. Garland (2 vols., 1850).

Randolph (Peyton), b. in Virginia in 1723, was the second son of Sir John Randolph; graduated at William and Mary College; studied law at the Temple in London; was appointed in 1748 royal attorney-general for Virginia; was elected to the house of burgesses; became chairman of a committee to revise the laws of Virginia; went to England as a commissioner to seek redress of grievances 1752; framed the remonstrance of the house of burgesses to the king against the passage of the Stamp Act 1764, but after its passage discountenanced Patrick Henry's celebrated "five resolutions" 1765; resigned the office of attorney-general in 1766, and was Speaker of the house of burgesses for several years thereafter; was chairman of the "committee of vigilance" chosen Mar. 10, 1773, and an efficient worker in promoting through correspondence a concert of action with the other colonies; presided over the Virginia convention at Williamsburg Aug., 1774; was chosen a delegate to the Continental Congress; was first president of that body upon its meeting at Carpenters' Hall, Philadelphia, Sept. 5, 1774, though from ill-health he soon resigned that post; presided over the second Virginia convention at Richmond Mar. 20, 1775; was again chosen Speaker of the Continental Congress when it re-assembled at Philadelphia May 10, 1775, but resigned May 24, returning to Virginia to preside over the house of burgesses; resumed his seat in Congress a few months later. D. of apoplexy at Philadelphia Oct. 22, 1775. He was buried in the chapel of William and Mary College.

Randolph (Theodore F.), b. in New Brunswick, Middlesex co., N. J., June 24, 1826; received a liberal education, and entered political life in 1860 as a member of the New Jersey legislature; in 1861 he was chosen State senator to fill an unexpired term, and was re-elected in 1862; in 1867 was chosen president of the Morris and Essex R. R. Co.; in 1868 was elected governor of New Jersey by the Democrats, and in 1874 was chosen by the same party U. S. Senator for six years. J. B. Bishop.

Randolph (Thomas Mann), b. in Virginia about 1770; married a daughter of Pres. Jefferson; served in the Virginia legislature; was a member of Congress 1803–07; was colonel of the 20th infantry during the second war with England, and governor of Virginia 1819–22. D. at Monticello June 20, 1828.

Randolph-Macon College, an institution of learning founded in 1832 by the Virginia conference of the M. E. Church. It was first located in Mecklenburg co., Va., near the North Carolina border; suffered severely during the war of the rebellion, and was removed in 1866 to Ashland, Hanover co., on Richmond Fredericksburg and Potomac R. R. Instead of the ordinary mechanism of a four years' course, the college consists of several separate schools, affording courses of one year each. There is a special school of biblical literature and Oriental languages for theological students. There are now (1876) 10 professors and upward of 200 students.

Range, p.-v. and tp., Madison co., O. P. 1367.

Range 43, tp., Otter Tail co., Minn. P. 376.

Rangeley, p.-v. and tp., Franklin co., Me., on Rangeley Lake. P. 313.

Rangeley Plantation, tp., Franklin co., Me. P. 45.

Rangoon', town of British India, capital of the Burmese dominions, Farther India, on the eastern branch of the Irrawaddi, 25 miles from the sea, in lat. 16° 47′ N. It is built almost exclusively of bamboo and mat-work, but carries on an important trade in wax, ivory, cotton, gems, bullion, and teak. About 2 miles N. of the city lies the curious Shoay-Dagon, a ludicrous and rather ugly monument, but stupendous in its proportions and dazzling with gold and brilliant ornamentation; around the principal monument, said to contain eight hairs of the head of Gautama, lie several other temples with statues of Gautama. P. 96,952.

Ran'idæ [Lat. *rana*, "frog"], a family of amphibians of the order Salientia or Anura, including the common frogs and kindred forms. As limited by Cope, the family is characterized by the presence of teeth on the maxillary and premaxillary bones; the ossification of the fronto-parietal bones, and want of a fontanelle; the presence of epicoracoids, and the presence of an osseous xiphisternum and manubrium; the sacral diapophyses are cylindrical; the coccyx simple and attached by cotyloid cavities; in some the extremities of the digits are dilated, but in most are simple. The family embraces about twenty genera, the best known of which is *Rana*, which includes the common frogs. Species of the family existed at least as early as the Miocene epoch, when the genus *Rana* was represented by species whose remains were preserved in the Braunkohle in Germany. (See also Frog.) Theodore Gill.

Ranie'ri (Antonio), b. in Naples in 1809. An exile at twenty, he went first to Tuscany, then to Paris, where he took part in the revolution of July. After this he studied in England, then in Germany, and finally returned to Tuscany, where he formed the closest friendship with Leopardi, whom he took back with him to Naples. (See Leopardi.) There Ranieri wrote the following works: *Storia d'Italia dal quinto al nono secolo* (Brussels, 1841), *Ginevra, o l'Orfana della Nunziata* (Capolago, 1839), *Frate Rocco, Frammenti Morali, Prolegomeni di una Introduzione allo Studio della Scienza Storica.* On Sept. 6, 1860, Ranieri was the foremost of the sixty patriots who went to invite Gen. Garibaldi to take possession of Naples. He was afterward appointed professor of history in the University of Naples, and elected deputy to the Italian Parliament, in which he still holds a seat.

Ranifor'mia [Lat. *rana*, "frog"], a sub-order of Amphibia, Salientia, or Anura, distinguished by Prof. Cope, and characterized by the coracoids abutting; the epicoracoids, when present, continuous, transverse, and abutting on the coracoids, but not connected with the latter by overlapping longitudinal cartilages; the maxillary and premaxillary bones are furnished with teeth; the fronto-parietal bones are ossified, and not separated by a fontanelle. To the group belong the families Ranidæ and Colostethidæ. Theodore Gill.

Ran'ke, von (Leopold), b. at Wiehe in Thuringia Dec. 21, 1795; studied at Leipsic; was appointed teacher at the gymnasium of Frankfort-on-the-Oder in 1818, and professor of history at the University of Berlin in 1825. He wrote *Geschichte der romanischen und germanischen Völker von 1494–1535* (1824), *Fürsten und Völker von Süd-europa im 16. und 17. Jahrhundert* (1827), *Die serbische Revolution* (1829), one of his most brilliant productions, *Ueber die Verschwörung gegen Venedig im Jahre 1688* (1831), *The Popes of Rome, their Church and State* (3 vols., 1834–37; translated into English by Mrs. Austin in 1840, by Scott in 1846, and by E. Foster in 1848), *History of Germany in the Time of the Reformation* (6 vols., 1839–47; translated into English by Mrs. Austin); *Memoirs of the House of Brandenburg, and History of Prussia during the Seventeenth and Eighteenth Centuries* (3 vols., 1847–48; translated into English by Sir A. Duff Gordon), *Jahrbücher des deutschen Reichs unter dem sächsischen Hause* (3 vols., 1837–40), *Französische Geschichte vornehmlich im 16. und 17.*

Jahrhundert (5 vols., 1852–55), *A History of England, principally in the Seventeenth Century* (6 vols., 1859–68), *Geschichte Wallensteins* (1869), etc. The complete edition of his works comprises 36 vols. His very first productions immediately attracted great attention, both on account of the high merit of their style and composition, and on account of the ingenuity evinced in gathering and sifting the materials. It is also to this latter point that the expression "the school of Ranke" principally refers—to the method of studying history rather than to the method of writing it.

Ran'kin, county of Central Mississippi, on Pearl River, traversed by Vicksburg and Meridian R. R., has a level surface largely covered with pine timber, and a productive soil, the chief staples being cotton, rice, and Indian corn. Cap. Brandon. Area, 800 sq. m. P. 12,977.

Rank'ine (W. J. MACQUORN), b. in Edinburgh July 5, 1820. In his early education his father, a retired lieutenant of the rifle brigade, was his chief instructor. He early displayed fondness for the natural sciences, and had the advantage of the eminent Prof. J. D. Forbes as his tutor in natural philosophy. To him he dedicated his earliest and a somewhat remarkable paper, advocating the use of cylindrical wheels for railway carriages. "A carriage, and especially a locomotive engine," he states, "with conical wheels never moves straight forward but for an instant at a time, so that whenever a small obstruction or an increase of speed beyond a certain limit causes it to leap higher than the depth of the flanges, it is almost certain to alight off the track." Civil engineering naturally attracted his attention, and from 1841 to 1851 he was employed on the railways of Scotland. But recognizing, as he did, engineering to be something more than a mere means of livelihood—viz. "the art by which the mechanical properties of matter are made to serve the ends of man"—he found his most congenial sphere in those investigations of physical facts and a reduction of their results to practice by which matter is made subservient to the needs of man. One of the most noticeable of his physico-mathematical researches was based on an hypothesis of "molecular vortices," by which was deduced the laws of elasticity, and of heat as connected therewith; by which he took at once prominent rank as an original investigator. His theoretical results, conforming closely to those subsequently obtained experimentally by Regnault and Dr. Ure, were in their ultimate form published in the *Philos. Mag.*, Dec., 1851 (*On the Centrifugal Theory of Elasticity as applied to Gases and Vapors*). Important papers on kindred subjects succeeded this—*e. g. On a General Law of the Transformation of Energy* and *Outlines of the Science of Energetics;* the latter of which is a masterly exhibit of what may be called the *modern* science of energy. In 1855, Mr. Rankine became regius professor of civil engineering and mechanics in the University of Glasgow. Soon after taking the chair he turned his attention to the production of a series of manuals for engineering students and practical men, which, taken together, constitute a monument of patient, persevering, and skilful original investigation, of brilliant literary workmanship—a monument which cannot fail to carry down to posterity the memory of their author. These manuals are thoroughly well known to, and appreciated by, American engineers. Laborious as were his occupations, rigidly mathematical as were the tasks to which his mind was daily subject, he had keen relish for music and literature, and was not only social, but convivial. "In imagination," says an appreciative biographer, "we still look upon his manly form and listen to the profound utterances of the philosopher, or we see him as one of the 'Red Lions' gathered round the social table after the sections at a British association meeting have adjourned for the day; and we hear him trill forth one of his admirable convivial songs, unwilling to realize that our intercourse with him is at an end, except through the work which has immortalized his name." D. at Glasgow Dec. 24, 1872. J. G. BARNARD.

Rank of States. Every State, as such, has the properties of a State to the full extent, and so is equal to every other. Rank, therefore, as far as States' rights are concerned, there can be none. The word has reference to the etiquette of courts, which is governed by nothing but custom. In general, the great powers take rank before smaller ones. Formerly, there were complicated rules for this, as there were for court-dress. Some of these are fixed by the regulations concerning grades of ambassadors, and the relative rank of ambassadors of the same grade, which were agreed to by the parties to the Congress of Vienna and at Aix-la-Chapelle in 1815 and 1819, and which have now passed extensively into the practice of nations. (Compare the author's *Elements of International Law*, § 94.) T. D. WOOLSEY.

Ran'som [Fr. *rançon*], the name given to an agreement by a master of a captured vessel with his captor to pay a certain sum as a ransom for his vessel on condition of its being allowed to go on its way, safe from all further capture by the same enemy's vessels or by those of its ally. (See INTERNATIONAL LAW.) T. D. WOOLSEY.

Ran'som, county of E. Dakota, recently formed, on Dakota and Cheyenne rivers, and consisting chiefly of rolling prairies.

Ransom, p.-v. and tp., Hillsdale co., Mich. P. 1624.

Ransom, p.-v. and tp., Luzerne co., Pa., on Pennsylvania and New York Canal and Lehigh Valley R. R., and on Susquehanna River. P. 603.

Ransom (MATTHEW W.), b. in Warren co., N. C., in 1826; graduated at the University of North Carolina 1847; was admitted to the bar the same year; became a planter and politician; was attorney-general of North Carolina 1852–55; member of the legislature 1858–60; peace commissioner to the Montgomery convention 1861; entered the Confederate service as lieutenant-colonel; rose to be major-general, serving through the war, and surrendering at Appomattox Court-house, and was elected as a Democrat in Jan., 1872, to the U. S. Senate for the term expiring in 1877.

Ransom (THOMAS EDWARD GREENFIELD), b. at Norwich, Vt., Nov. 29, 1834; educated at Norwich University, a military institute presided over by his father, Col. Trueman B. Ransom (killed at Chapultepec, Mexico, Sept. 13, 1847); became in 1851 a civil engineer in Lasalle co., Ill.; was subsequently a real-estate agent at Chicago; raised a company of volunteers in Apr., 1861; was elected major of the 11th Illinois Vols. (three months' service), and lieutenant-colonel of the same regiment on its reorganization in July; distinguished himself in the surprise of Charleston, Mo., on the night of Aug. 19, when he was severely wounded; was at the capture of Fort Henry; was made colonel for gallantry in the assault upon Fort Donelson, where he was again severely wounded; was distinguished at the battle at Shiloh; became chief of staff to Gen. McClernand and inspector-general of the Army of the Tennessee June, 1862; was afterward on Gen. Grant's staff near Vicksburg; was appointed brigadier-general to date from Nov., 1862; took part in the Red River campaign, commanding McClernand's corps during that general's illness; was dangerously wounded in the knee at the disastrous battle of Sabine Cross-roads, Apr., 1864; took part in the Atlanta campaign at the head of a division, and subsequently in command of the 17th corps, which he insisted upon accompanying in pursuit of Hood, notwithstanding a painful illness, which resulted in his death at Rome, Ga., Oct. 29, 1864. He was one of the officers of most unquestioned military ability and of estimable personal character.

Ran'son (GEORGE M.), b. June 18, 1820, in New York; entered the navy as a midshipman July 25, 1839; became a passed midshipman in 1845, a lieutenant in 1854, a commander in 1863, a captain in 1870; commanded the Kineo at the passage of Forts Jackson and St. Philip and battle of New Orleans, Apr. 24, 1862, and in many other engagements on Mississippi River during the civil war, in all of which he was distinguished, according to the official reports, for "bravery and skill." FOXHALL A. PARKER.

Rantoul', p.-tp., Champaign co., Ill., on Illinois Central and the Havana Rantoul and Easton R. Rs., has 5 churches, good school advantages, several warehouses and grist-mills, a large cheese-factory, 1 newspaper, and shops. P. 1628. CROSS & BULLOCK, EDS. "RANTOUL NEWS."

Rantoul, tp., Calumet co., Wis. P. 915.

Rantoul (ROBERT, JR.), b. at Beverly, Mass., May 13, 1805; graduated at Harvard 1826; was a successful lawyer at South Reading, Gloucester, and Boston; served in the Massachusetts legislature 1834–37, distinguishing himself by his efforts for the abolition of capital punishment; became in 1837 a member of the Massachusetts board of education, in which capacity he rendered important services; was collector of the port of Boston 1843–45; was appointed U. S. district attorney 1845; filled a portion of the unexpired term of Daniel Webster in the U. S. Senate 1851, in which year he was elected as a Free-Soil Democrat to the House of Representatives. D. at Washington, D. C., Aug. 7, 1852. Mr. Rantoul was by nature a reformer, and a radical one; took a prominent part in questions affecting the condition of the masses and humanitarian efforts; and was conspicuous in his earnest resistance to the Fugitive Slave law. A volume of his *Speeches*, with a *Memoir* by Luther Hammond, was published in 1854.

Ranuncula'ceæ, or **Crowfoots** [*Ranunculus*, the buttercup genus, affords its typical forms], an important natural order of exogenous herbs, or rarely shrubs, remarkable as affording some of the highest types of exog-

enous vegetation—that is, forms the most completely differentiated from the simple ideal of exogenous growth. The order produces aconite, pæony, larkspur, and many handsome garden-plants and medicinal herbs, many of which are active narcotic poisons.

Ranz des Vaches [for the Fr. *rangs des vaches*, "rows of cows;" Ger. *Kuhreigen*], the name of the melodies which the Swiss herdsmen play upon the alp-horn while driving their cows. It is often related that hearing a *ranz des vaches* played causes homesickness among the Swiss mercenary troops, and hence its performance is not permitted in the military bands of such corps.

Rapal'lo (anc. *Tigulli*), town of Italy, province of Genoa, E. of the city of Genoa, and 7½ miles W. of Chiavari, on a small bay to which it gives its name. The situation of Rapallo is extremely picturesque, and commands one of the finest views on the Riviera. The neighboring hills were once crowned with towers, castles, and convents, and here was the theatre of many a conflict between the Ligurians and the Romans long before the Christian era. Two only of its five mediæval gates are still standing. Remains of the old citadel, destroyed by the Lombards in the seventh century, still existed in the fifteenth, but they have now disappeared. The churches are old and interesting, and in the façade of the Duomo (consecrated 1118) there is a very curious stone, a fragment from the heathen temple originally occupying this site, the inscription upon which has given rise to much discussion among antiquarians. In a private palace there is an ancient Greek bas-relief with an inscription, said by Cavedoni to be one of the oldest and rarest objects of its kind in Italy. Rapallo is believed by many to have been founded earlier than Genoa. After the Lombard devastation it rose again to importance, and as an independent republic including several of the neighboring towns it often successfully resisted the Saracens, the Pisans, the Romans, the Venetians, but was at last forced to seek the alliance of Genoa, by which republic it was finally absorbed. There is now some activity in the harbor of Rapallo, considerable shipbuilding is going on, there are several soap and candle factories in the town, and large quantities of lace are made by the women. P. 10,400.

Rape. See JURISPRUDENCE, MEDICAL.

Rape [Lat. *rapa*, a "turnip"], the *Brassica napus*, a plant of the order Cruciferæ, and closely related to the Swedish turnip and colza, from which it may be distinguished most easily by the fact that its young leaves are smooth. The navew is of the same species with the rape. Rape is largely raised in Europe for the oil of its seeds. Its stalks are valuable forage, and are good to plough under for manure. Its oil-cake is used as sheep-food and as a fertilizer. The oil is used for machinery, for lighthouse lamps, etc., and the seed is fed to cage-birds.

Rape-Seed Oil. See OILS, by PROF. C. F. CHANDLER, PH. D., M. D., LL.D., M. N. A. S.

Raph'ael [It. *Raffaello*], called, in full, **Raffaello Sanzio da Urbino,*** by common consent the prince of painters, his name almost a synonym for perfection in his art, b. at Urbino, a ducal city of Umbria, Italy, Apr. 6, 1483.† His father's name was Giovanni Santi, an artist of repute, and also known as a poet. The mother's name was Magia Ciarla. She died in 1491, when Raphael was eight years old. Raphael's first master was his father, nor until Santi's death in 1494 did he have any other instructor. In 1494, Luca Signorelli visited Urbino, and the next year Timoteo della Vite came there, but there is no evidence of his having come under the influence of either of these artists. In 1495 he was placed by his guardian and paternal uncle, Bartolommeo, and with the consent of his maternal uncle, Simone di Battista Ciarla, in the studio of Pietro Vannucci, called "Il Perugino" from his living at Perugia. With him Raphael stayed until 1504, when he was twenty-one years old. He had, however, somewhat withdrawn from the studio as early as 1500, when he went to Città di Castello—it has been said with the intention of setting up for himself. While with Perugino he had submitted entirely to his master's instruction, and the few pictures we have of this period show him to have been a docile and sympathetic pupil. The *Resurrection of Christ*, now in the Vatican, and the two small pictures of the archangels Michael and Raphael, in the British National Gallery, belong to this time. While in Città di Castello he paid (in 1502) a flying visit to Siena, where Pinturicchio was painting the frescoes in the cathedral library. The story that Raphael assisted him in these frescoes is not now believed. Raphael made, however, a drawing from the fine but mutilated antique group of the three Graces recently discovered there, from which drawing he made in 1506 the picture belonging to Lord Ward. In 1503 he painted the *Coronation of the Virgin*, in the Vatican, and the *Connestabile Madonna*, painted for Count Staffa, constable of Perugia, which until 1871, when it was sold to the emperor of Russia, had always remained in the house for which it was painted. To this time also belongs the *Dream of a Young Knight*, in the British National Gallery. In 1504 he appears to have returned to Città di Castello, where he painted for the church of San Francisco the *Marriage of the Virgin*, now in the Brera Gallery, Milan. The composition of this picture is almost identical with that of Perugino, now in the museum at Caen, Normandy, but the changes in the architecture of the temple, and the grace and sweetness given to the figures and heads in Raphael's picture, make it essentially his own. In this same year we find Raphael revisiting Urbino, where he painted the *Christ on the Mount of Olives* which belonged to the late Fuller-Maitland, Esq., and also the two small pictures of St. George and St. Michael, belonging to the Louvre. Near the end of the year he went to Florence with a letter of recommendation to the gonfalonier Soderini from the duchess of Urbino. Here he found a fuller, richer life awaiting him, and made his entrance for the first time into the society of a great city, the intellectual and artistic head of Northern Italy. He remained at Florence, with the exception of short stays at Perugia, Urbino, and perhaps at Bologna, from 1504 to 1508. During these four years his talent reached its full maturity, and in our time there is a strong opinion that he never surpassed in beauty of execution, depth, and delicacy of feeling some of the pictures painted in what is called by distinction his "Florentine manner." In the first months of his residence he appears to have hesitated to enter the society of the famous men—Michel Angelo and Leonardo da Vinci chief among them—who were at that time in Florence. He preferred the society of younger men, though he was also strongly drawn to Fra Bartolommeo by a sympathy no doubt with his religious feeling and the character of his subjects, for Raphael came to Florence deeply imbued with the mysticism of the region where he had been born and bred; nor did he ever indeed entirely forsake it. Yet the style of Bartolommeo had been formed on other models, and he was able, therefore, to give a new direction to Raphael's manner without forcing him into wholly new ways of thinking. He became acquainted with Taddeo Taddei, at whose learned table he met an accomplished society, and by whom he was later introduced to some of the most distinguished names of Italy—to Castiglione, Bibbiena, and Bembo. He studied the frescoes of Masaccio in the Brancacci chapel, and the antiques which Lorenzo de' Medici had collected in the gardens of San Marco. But during the years 1504 and 1505 he painted few pictures of importance, the principal ones being the *Madonna* of the grand duke, in the Pitti, a small *Madonna* belonging to Lord Cowper at Panshanger, and a picture painted for the nuns of the convent of St. Antony of Padua at Perugia. The subject of the main picture is the Virgin with the child Jesus, and the infant St. John, St. Catharine, St. Dorothea, St. Peter, and St. Paul. In 1505 he painted at Perugia, in the church of San Severo, a fresco which is of importance, as its composition was almost textually repeated by the artist in his great fresco of the *Dispute*, in the Vatican. It represents the Trinity, with saints and angels. In 1521, the year after Raphael's death, Perugino painted a sort of predella to this fresco—six saints, three on either side of a central niche. From 1506 to the end of 1508, Raphael painted some of his most important works—the portraits of Agnolo Doni and his wife, in the Pitti; the *Portrait of a Lady*, in

* His name is variously spelled, but we have adopted the form more commonly accepted by English writers. The French also write it so, but the Germans generally follow the Italians in substituting the *f* for the *ph*. Raphael himself wrote his name *Raphael* and *Rafaele*, according to Mr. Dennistoun (*Dukes of Urbino*, vol. ii. p. 210), who says that he prefers the latter form, though he employs another—viz. *Raffaele*. He informs us that *Raffaelle* was a corruption introduced by Sir Joshua Reynolds, but it is of course no more a corruption than the one invented by Mr. Dennistoun. The name of *Sanzio* is said to have been contrived by Bembo from the name of Raphael's father—*Santi* or *Sanzi*—a patronymic formed from Sante, the name of Santi's father. Vasari, perhaps to flatter Raphael, writes it "*de' Santi*." Raphael is sometimes called, rather affectedly, the Urbinate, and the epithet "divine" is often added to his name.

† This is now the accepted date. Vasari and those who have followed him were probably wrong in saying that Raphael was born on Good-Friday. Vasari seems to have concluded that because Raphael died on Good-Friday, 1520, and because he died on the anniversary of his birthday, he must therefore have been born on a Good-Friday, which in 1483, however, fell on Mar. 28. But Bembo, in the epitaph which he wrote for his friend and caused to be set up over his tomb, says that he lived exactly thirty-seven years, *day for day*, and that he died on the anniversary of his birth, the 8th Ides of April. The 8th Ides of April is the 6th of the month, which in 1520 was Good-Friday. It seems conclusive, then, that the word "anniversary" must be understood as applying to the date of the month, and not to the movable feast which happened to fall on the day of the artist's death.

the "Tribune" of the Uffizi; the *Holy Family of the Palm*, in the possession of Lord Ellesmere; the *Madonna of the Casa Tempi*, in the Munich Gallery; the *Madonna of the Goldfinch*, in the Uffizi; the Orleans *Madonna*, belonging to M. Delessert; the portrait of himself, in the Uffizi; the *Three Graces*, belonging to Lord Ward; *St. Catharine of Alexandria*, in the National Gallery; the *Entombment*, of the Borghese Gallery;* the *Madonna of the Veil*, in the Louvre; the *Panshanger Madonna*, belonging to Lord Cowper; the *Madonna of the Casa Colonna*, at Berlin; the *Belle Jardinière*, and the *Madonna of the Canopy* (Baldachino), in the Pitti. In September of the year 1508, Raphael appears to have gone to Rome, summoned by Pope Julius II., who was of the ducal house of Urbino, at the instigation of Bramante, a compatriot and friend of Raphael. The work he was sent for to undertake was the decoration of some of the rooms in the Vatican. From 1508 to 1511, Raphael was engaged in painting the Chamber of the Signature (*Camera della Signatura*). On the four walls of this room he painted four of the great divisions of intellectual activity—Theology, Philosophy, Jurisprudence, and Poetry. On one side is the *Dispute concerning the Sacrament;* over it is Theology, and in the angle at the left, *Adam and Eve*. Opposite this is the *School of Athens*, with Philosophy above it, and a female figure in the angle looking at a starry globe, who perhaps represents Astronomy. Over the window at one end of the room is Mount Parnassus with Apollo, the Muses, and the poets, among them Homer, Horace, and Dante, with two other subjects in *grisaille* at the sides of the window—*Alexander collecting the Works of Homer* and *Augustus forbidding the Destruction of the Æneid*. Above is Poetry, and in the angle, *Apollo and Marsyas*. Over the other window is an allegory of Truth between Temperance and Strength, the whole symbolizing Jurisprudence, with two pictures at the sides—*Justinian giving his Digests to Tribonianus;* and *Gregory IX. publishing the Decretals*. Above is Justice, and in the angle *The Judgment of Solomon*. The *Parnassus* and the *Jurisprudence* were painted in 1511. In the same year Raphael painted the portrait of Julius II., now in the Pitti, a portrait of himself, now lost, but known by repetitions, together with the *Portrait of a Young Man leaning his head upon his hand*, in the Louvre, once thought to be his own portrait. Three important *Madonnas* of this year are the *Garvagli*, the *Maison d'Albe*, and the *Madonna di Fuligno*. In 1512, Raphael painted the portrait of Bindo Altoviti, the *Fornarina* of the "Tribune," the *Bridgewater Madonna*, and the *Virgin of the Fish*. In the next two years he was again busy at the Vatican. In 1512 he painted the chamber called "The Heliodorus" from his own fresco, one of four representing the power of the Church. First, he painted the *Heliodorus chased from the Temple*, and above it, *Moses and the Burning Bush*. Opposite it, *St. John arresting the March of Attila*, and over it, *Noah leaving the Ark*. Over one window, *The Mass at Bolsena;* above, the *Sacrifice of Abraham*. Over the opposite window, *St. Peter delivered from Prison*, with, above it, *Jacob's Vision*. In Feb., 1513, when he had just finished the *Mass at Bolsena* and the *Heliodorus*, Julius II. died, and the rest of the chamber was painted under Leo X., his successor. In 1514, Raphael was made architect-in-chief of the church of St. Peter by a papal brief dated Aug. 1. In this year he painted the *Prophets and Sibyls* of the church of Our Lady of Peace in Rome. The *Sibyls* were painted by his own hand—the *Prophets*, by Timoteo della Vite after his designs. He also painted the *Galatea* of the Farnesina Palace, the *St. Cecilia* of the Bologna Gallery, and the *Vision of Ezekiel* in the Pitti. From 1514 to 1517 he was again at work in the Vatican, where he painted *The Fire in the Borgo*. The other subjects in this room (called after this fresco) are not from Raphael's hand, though the designs no doubt were. In 1516 he painted the beautiful frescoes in the chapel of the Chigi family, church of S. M. del Popolo, and the Loggie of the Vatican. From 1515–16, Raphael made the designs for the tapestries intended to surround the Sistine Chapel. Seven of the cartoons remain, and are one of the great possessions of England. To 1516 belong the *Madonna della Seggiola*, Pitti; the *Madonna of the Candelabra;* the *Virgin of the Cloth*, Munich; *Lo Spasimo* and the Madonna called *The Pearl*, both at Madrid. In 1517 the great *St. Michel* of the Louvre was painted, and in 1518 the *Holy Family* of Francis I., also in the Louvre. Both these are signed and dated. To this year belong also the *St. Margaret* of the Louvre, the portrait of Leo X. in the Pitti, the portrait of Joanna of Aragon in the Louvre, the fresco of *Psyche* in the Farnesina, the *Violin-Player* of the Sciarra Palace, and the *St. John Baptist* of the Uffizi. The famous *Sistine Madonna*, painted in this year for the church of St. Sixtus at Piacenza, now in Dresden, was, all things considered, his greatest achievement. In 1519, Raphael made some of the designs for the Hall of Constantine in the Vatican, but died before the frescoes were commenced.

The last work of Raphael's life, and the one on which he was still employed when he was taken with his mortal illness, was the *Transfiguration*, now in the Vatican. It was finished by Giulio Romano. Raphael died of a malarial fever Apr. 6, 1520, on a Good-Friday, and was buried in the Pantheon at Rome. (*Life*, by Quatremère de Quincy; *Life and Works*, by J. D. Passavant; Kugler, *History of Italian Art;* Charles Clément, *Michel Angelo, Leonardo, and Raphael;* and Vasari, whose *Life*, corrected by the notes of later commentators, is, after all, the best.) CLARENCE COOK.

* To the period when the *Entombment* was painted belongs the very beautiful *Apollo and Marsyas*, the property of Mr. Morris Moore. This is one of the very few pictures of mythologic subjects painted by Raphael, and is not inferior in sentiment or execution to anything from his hand. The original drawing for it has long been owned by the Accademia delle Belle Arti of Venice. It is considered one of Raphael's most beautiful drawings. The beautiful fresco in the refectory of the former convent of S. Onofrio in Florence, which is generally believed to be by Raphael, is dated 1505. Authorities are disagreed about it, some giving it to Pinturicchio.

Ra'phall (MORRIS JACOB), PH. D., b. of Jewish parentage at Stockholm, Sweden, in Sept., 1798; educated in the Jewish college at Copenhagen and in England; studied at the University of Giessen 1821–24; settled in England 1825; began in 1834 the publication of the *Hebrew Review*, the first English periodical devoted to the interests of his race; went in 1840 to Syria as secretary to the chief rabbi of England to investigate the persecutions of the Jews; aided Dr. Sola in his translation of a large portion of the *Mishna;* became rabbi of the Birmingham synagogue 1841; aided in the foundation of the Hebrew national school; defended Judaism by his writings and lectures; supported Baron Rothschild in his successful candidacy for a seat in Parliament; settled in New York as pastor of the "Great Synagogue or Bnai Jeshurun" 1849, which position he retained until his death, June 23, 1868. Among his numerous works were translations from Maimonides and the Pentateuch, and *The Post-Biblical History of the Jews* (2 vols., New York, 1856; new ed. 1866).

Ra'pho, tp., Lancaster co., Pa. P. 3483.

Rapidan', tp., Blue Earth co., Minn. P. 449.

Rapidan, tp., Madison co., Va., on Rapidan River. P. 2306.

Rapid Ann Station, p.-v. in the village of Rapidan, Culpeper co., Va., on Orange Alexandria and Manassas R. R.

Rapidan' River rises by several head-streams at the base of the Blue Ridge, and flows between Green and Orange cos. on its right, and Madison and Culpeper on its left hand. Ten miles above Fredericksburg it joins the Rappahannock, after a course of 80 miles.

Rapides', parish of W. Louisiana, on Sabine River, which separates it from Texas, and traversed by Red and Calcasieu rivers, has a level surface covered with pine forests, and produces considerable quantities of cotton, sugar, and corn. Cap. Alexandria. Area, about 2000 sq. m. P. 18,015.

Rapides', tp., Halifax co., N. C. P. 2574.

Rapid River, tp., Kalkaska co., Mich. P. 424.

Rapids, tp., Linn co., Ia., on Cedar River. P. (exclusive of Cedar Rapids), 1068.

Ra'pier, a straight sword, without edge, some three feet long, and used for a dress-sword on state occasions. It is also employed by duellists. The thrust and lunge are its only effective methods of offensive use. Originally, the rapier was a long, sharp broadsword.

Rapin-Thoyras' (PAUL), b. at Castres, department of Tarn, France, Mar. 25, 1661; studied first law; then entered the army, but was compelled to leave France in 1685, being a Calvinist, on the Revocation of the Edict of Nantes; went to Holland; joined William of Orange; fought in the battle of the Boyne; became tutor to the duke of Portland, but left England in 1707, and settled at Wesel on the Rhine, where he d. May 16, 1725. His *Histoire d'Angleterre* (8 vols., the Hague, 1724) was translated into English and continued by N. Tindal.

Rapp (GEORGE), b. in Würtemberg, Germany, in 1770; founded in early manhood a communistic religious association intended to restore the practices of the primitive Christian Church; came into conflict with the authorities of his native country; emigrated to the U. S. in 1803 with a number of his associates; settled on Conequenessing Creek, Butler co., Pa., where they founded the town of Harmony; engaged successfully in agriculture and manufactures, and removed in 1815 to a tract of 27,000 acres on Wabash River, Ind., and built up there a settlement called New Harmony. The Harmonists having become involved

in pecuniary difficulties, the lands were sold in 1824 to Robert Owen, by whom the socialistic experiment was tried on another basis. Rapp and his followers removed to Beaver co., Pa., and founded the town of Economy (now Harmony) on the bank of Allegheny River, 17 miles N. W. of Pittsburg, where the community still exists in a comparatively prosperous condition, occupying itself with agriculture, as well as silk, woollen, and cotton manufactures, and deserving esteem for strict morality and the promotion of education. Rapp d. at Economy Aug. 7, 1847.

Rapp (Jean), Count, b. at Colmar, Alsace, Apr. 29, 1772; entered the army in 1788; was aide-de-camp to Dessaix in 1794 and to Bonaparte in 1800; became brigadier-general in 1804, and general of division after the battle of Austerlitz; was appointed governor of Dantzic, and held the city in 1813 for twelve months against the Prussians and Russians; joined Napoleon during the Hundred Days; retired to Switzerland after the second restoration; returned in 1818 to France. D. Nov. 8, 1821, on his estate, Rheinweiler, in Baden. His *Mémoires* were published in 1823; he has also given a description of the siege of Dantzic.

Rappahan'nock, county of N. E. Virginia, extending from Rappahannock River on the E. to the Blue Ridge on the W., consists largely of ranges of hills affording picturesque scenery. The soil of the valleys is fertile, the staples being corn, wheat, and tobacco. Cap. Washington. Area, 250 sq. m. P. 8261.

Rappahan'nock, tp., Essex co., Va. P. 3208.

Rappahannock, tp., Fauquier co., Va., the scene of the battle of Nov. 7, 1863. P. 3132.

Rappahannock River rises in the foot-hills of the Blue Ridge, near the N. W. border of Fauquier co., Va., and flows in a S. E. course, generally parallel to that of the Potomac, reaching Chesapeake Bay through a broad estuary. Its largest branch is the Rapidan. At its rapids at Fredericksburg a fine dam has been constructed, affording extensive water-power. Below Fredericksburg it is a noble tidal stream, the navigation of which is important. Above the dam it has been canalized for 35 miles. It is some 250 miles in total length.

Rap'pen [a local name for the raven, whose head it bore], a Swiss coin worth one centime in French money. It is made of copper, and was first struck at Freiburg.

Rapp's Barren, tp., Marion co., Ark. P. 480.

Rar'itan, a river in New Jersey, rising in two branches in Morris co., flowing S. E. through Somerset and Hunterdon cos., and falling into Raritan Bay at Perth Amboy. It is navigable for vessels of considerable size as far as New Brunswick.

Rar'itan, p.-v., Bedford tp., Henderson co., Ill. P. 201.

Raritan, tp., Hunterdon co., N. J. P. 3654.

Raritan, tp., Middlesex co., N. J. P. 3460.

Raritan, tp., Monmouth co., N. J. P. 3443.

Raritan, p.-v., Bridgewater tp., Somerset co., N. J., on Raritan River and New Jersey Central R. R., 1 mile W. of Somerville. P. 1009.

Rash, a popular name for the acute exanthematous or eruptive diseases, or more frequently for the eruption itself which attends such diseases. Nettle rash or urticaria, scarlet rash (roseola), and canker rash (scarlet fever) are the diseases generally called by this name, which, though convenient for nursery use, is of no scientific value, for the diseases have nothing in common with each other.

Rask (Rasmus Christian), b. at Brendekilde, near Odense, in the island of Fünen, Denmark, Nov. 22, 1787; studied at the University of Copenhagen, and even while a schoolboy occupied himself with linguistic researches. In 1808, when only twenty years of age, he published his *Introduction to the Study of the Icelandic Language*, which, together with his edition of the *Eddas* (1817), the first critical and complete one ever published, forms the foundation for the study of Icelandic literature and language. In 1813 he began his extensive travels, which lasted to 1823. He spent first two years in Iceland, the result of which was his celebrated *Researches concerning the Origin of the Icelandic Language*, in which the first observations of the transpositions of sounds in the Teutonic languages were given to the world. He next spent one year in Stockholm, where he published a grammar of the Anglo-Saxon language and studied Finnish, and then, in 1817, he proceeded by St. Petersburg to Astrakhan, through Persia, and to India, which he traversed in its whole length, returning home, by Ceylon, in 1823. He brought to Copenhagen a great number of rare manuscripts belonging to Hindoo literature, and which are considered one of the greatest treasures of the library; but incomparably greater was the wealth of knowledge which he carried within himself, being master now of most of the languages composing the Indo-Germanic family, from the English to the Mantchoo. But his health was broken, and the results of his enormous linguistic acquisitions were fragmentary. He wrote essays on the Zend language, the genuineness of the *Zend-Avesta*, the ancient Egyptian and Hebrew chronology, and gave grammars of the Cingalese, Frisian, English, and Spanish languages. His richest and most original work is his *Introduction to a Scientific Orthography of the Danish Language* (1826), a book in which he gave to the science of comparative philology a new and powerful impulse, and in which he foreshadowed many ideas which later efforts have established as truths. D. in Copenhagen Nov. 14, 1832.

Raskōl'niks. The Raskolniks of Russia are the members of the *Raskól'*, or "schism," the name being derived from *raskolot'*, to "cleave." The schism dates officially from the year 1666. During the long period of the Mongol yoke numerous errors crept into the ritual and liturgical books of the Russian Church. In the early part of the sixteenth century an attempt to correct them was made by Maxim the Greek, an Albanian monk from Mount Athos, who was invited to Moscow in 1518 by the czar Vassily Ivanovich, but it proved fruitless. In the seventeenth century, however, during the reign of Alexis Mikhailovich, the patriarch Nikon introduced numerous reforms. Greek and Slavonic MSS. were collected, monks were summoned from Mount Athos and Byzantium, the Slavonic versions were compared with the Greek originals, interpolations were effaced, and the corrected liturgies, having been printed, were adopted by a council. But the reforms were met by great opposition, which became an organized resistance. Nikon himself fell, but the council which deposed him in May, 1667, confirmed his reforms. From that time the schism in the Russian Church became established, and it still remains uncured. The Raskolniks objected to the alterations in, and the printing of, the church-books, to the form of the cross, as well as the method of signing the cross adopted by the authorities, to the double instead of triple repetition of the hallelujah in the church service, and to various other matters of equal importance. Thence they took the name of *Staroobriádts*, or Old Ritualists (from *stary*, "old," and *obriád*, "a rite"); but, as they professed to be the preservers of old faith, as well as of old rites, they called themselves also *Starovery*, or Old Believers (from *vera*, "faith"). When Peter I. introduced his reforms into Russia the *Raskol* waxed stronger, its old religious opposition being fortified by a political resistance to the new ideas imported from the West. Muscovite conservatism objected to the census, to military conscription, to shaving, to giving up the national dress. The Raskolniks denounced Peter as Antichrist, and some of their descendants have always maintained a like horror of his successors and their government. Peter I. vainly endeavored to crush their opposition. Since his time their treatment has fluctuated. Peter III. was their avowed protector, and some of their sects regard him as still alive and destined to appear as their Messiah. Catharine II. treated them leniently for a time, granting them the official designation of *Edinovertsy*, or "Like-Believers," and allowing them to retain their old ritual. But after the insurrection of Pugachef, an outbreak of schismatic and rebellious fury, they met with less favor. Paul and Alexander I. showed them much leniency in the early part of their reigns. Nicholas in vain tried severer measures. Toward the end of his reign advances were made to them by the Poles and the Russian socialists, but the only result was the installation in 1846, at Belokrinitsa in Bukovina, of a Raskolnik metropolitan, Ambrose, formerly metropolitan of Bosnia. His successor, Cyril, visited Moscow in 1863, and there held a Raskolnik council-general. But just then the Polish insurrection broke out, and the Old Believers sent him away and addressed to the throne an assurance of loyal devotion. They were rewarded by tolerant measures, and since that time large concessions have been made to them. Up to Oct., 1874, their marriages, as a general rule, were not legal, the law recognizing religious marriages only, and all marriage registers being kept by priests of the established Church. But now special registers for the Raskolniks are kept by the police, and their marriages are legalized.

Little is known as to the numbers of the Raskolniks. The last official census, that of 1871, admits 1,093,452, but it is said that as many as 10,000,000 really exist. What appears certain is that they form the most industrious, honest, and sober portion of the Russian community. They belong exclusively to "Great Russia," and are chiefly found among the most energetic of the Russian people. Those in Poland, Livonia, Little Russia, and White Russia are all colonists from Great Russia. Everywhere they

evince a truly Russian faculty of organization, forming readily into communities ruled by practical systems of self-government. At a very early period they split into two great bodies—the *Popovtsy*, or "Priestly," and the *Bezpopovtsy*, or "Priestless" (from *bez*, "without," and *pop*, "a priest"). The former were obliged to depend for their priests upon fugitive "popes" from the establishment; the latter dispensed with the services of ecclesiastics, using those of elders instead. For about a century neither body possessed any legalized establishments, but about 1771, after the great plague of Moscow, each branch was allowed to build in the capital a cemetery with a church and convent, and these still exist as the head-quarters of the Raskol. In addition to the main body of the Raskolniks, under their various names of "Old Believers," "Old Ritualists," or "Like-Believers," the Raskol comprises a number of minor sects, mostly of foreign origin. Some of these are respectable, such as the *Molokane* (said to be so called from *molokó*, "milk," because they do not abstain during fasts from milk and its products) and the *Stundists* (from the German *Stunde*), both of which bodies hold what may perhaps be called Protestant doctrines. The *Dukhobortsy*, or "spirit-wrestlers," seem to have been originally harmless mystics, but they afterward changed their character, and were in consequence mostly transferred to the Caucasus. But some of the sects are of a terrible nature. The worst have either been crushed by the police or are but rarely met with, such as the *Detoubytsy*, or "child-killers," who put new-born babes to death in order to ensure their salvation, or the *Dukhilshchiki*, who kill their friends and relatives when ill, or the *Sojigately*, who commit suicide by means of fire. Only one of the noxious sects flourishes to any extent. It is illegal, but still it exists. It is that of the *Skoptsy*, or "self-mutilators," a set of gloomy fanatics greatly addicted to money-getting. (The best information on the subject, independently of works in Russian, is contained in Leroy-Beaulieu's *Empire des Tsars*, published in the *Revue des Deux Mondes*; Dean Stanley's *Eastern Church*; Haxthausen's *Russian Empire*; and the histories of the Russian Church by Muravief and Filaret, archbishop of Tchernigof.) W. R. S. RALSTON.

Raso′res [Lat. *radere*, to "scratch"], an order of birds, including those which have strong feet, provided with obtuse claws for scratching up grains, etc., and the upper mandible vaulted, with the nostrils pierced in a membranous space at its base, and covered by a cartilaginous scale.

Rasp′berry [so named because the stalk *rasps* the hand], the common name of those species of *Rubus* (order Rosaceæ) which differ from blackberries in having a persistent receptacle, from which the ripe compound fruit slips off, while in the blackberries the receptacle is juicy and becomes a part of the fruit. The European and Asiatic raspberry is *Rubus Idæus*, and it is probable that our *R. strigosus*, or red raspberry, is but a marked variety of the same species. Our black raspberry, black-cap or thimbleberry, is the *R. occidentalis*. All the above are highly valuable in cultivation. There are many varieties. Raspberries are among the most valuable of our summer dessert-fruits, and are the foundation of many conserves, jellies, and other delicacies for the table and the sick-room.

Raspail′ (FRANÇOIS VINCENT), b. at Carpentras, department of Vaucluse, France, Jan. 29, 1794; studied botany and chemistry at Avignon; settled in 1815 at Paris, and became famous both as a scientific writer and as a political agitator. He fought in the streets in 1830 and 1848, and was connected with the Commune in 1870–71; edited various revolutionary papers, *Réformateur*, *Marseillaise*, *L'Ami du Peuple*, etc.; wrote a number of violent pamphlets; founded several revolutionary societies and clubs; was several times imprisoned, and lived in exile from 1853 to 1869. The most prominent of his works are—*Essai de Chimie microscopique* (1831), *Nouveau Système de Chimie organique* (1833), *Nouveau Système de Physiologie végétale et botanique* (1837), *Histoire naturelle de la Santé et de la Maladie chez les Végétaux et les Animaux* (1839–43), *Cigarettes de Camphre* (1839), *Nouvelles Études scientifiques* (1861–64).

Ras′tadt, town of the grand duchy of Baden, Germany, on the Murg, a small tributary of the Rhine, a few miles distant. It is one of the modern fortresses or "intrenched camps" of the former German confederation, commenced in 1841, and in that respect is interesting as illustrating the German systems as contrasted with those of the French school. The town is well built; was the residence of the last margraves of Baden, whose palace (planned after that of Versailles) still exists. The place is historically interesting from the treaty of peace (1714) which ended the war of the Spanish Succession, and of the congress of 1799, which terminated abruptly with the assassination of the French deputies. P. 11,559.

Rat [Ang.-Sax. *ræt*], a name applied to numerous species of the family Muridæ, being about the size of the familiar species known under that designation. The best known of these are the common brown rat (*Mus decumanus*), the black rat (*Mus ratus*), the Florida or cave rat (*Neotoma floridana*), and the cotton rat of the Southern States (*Sigmodon hispidus*). The common rat is too well known to need description. It was originally a native of India and Persia, but has become cosmopolitan within recent times, and its present distribution is almost coequal with that of man. It is generally believed not to have extended into Europe much before the middle of the eighteenth century, and to have been brought to America about 1775. It was anticipated in its incursions by the black rat, but its superior strength and aggressiveness have driven that species before it, and have now supplanted it in almost all countries. It is very prolific, breeding from four to five times during the year, and having about a dozen young each time. It is almost omnivorous, feeding upon grains, vegetables, and meat. The black rat (*Mus ratus*) is smaller than the brown species, and is much more timid. It also was originally peculiar to Asia, but in the course of time extended its range to many other countries; it is now, however, a not common animal, and its numbers are kept down by its antagonist, the brown rat. The Florida or wood rat (*Neotoma floridana*) is about the size of the brown rat, for which it is often mistaken, but it has much larger eyes, and the details of the structure at once define it; and it in fact belongs not only to a different genus, but to a different section of the family, from the common rat. Although found in the Middle and Western States, it is most abundant in the Southern Atlantic and Gulf States. It is mostly found in the woods, as one of its names indicates, and does not enter houses, as the common species do. It is chiefly granivorous. The cotton rat (*Sigmodon hispidus*) is much smaller than the others, its body being only about five inches long. It is quite abundant in the Southern States, where it lives mainly in waste fields and hedges. It often lines its nest with cotton, whence it has received its common name. THEODORE GILL.

Ratabur′idæ [from *Ratabura*, the corrupted Indian name of a species], a family of eel-like fishes. The body has the usual anguilliform shape, but, on account of the backward position of the anus, the tail is much shorter than the trunk; the heart is situated far behind the head; the skin is quite naked, the head small; the posterior nostrils open in front of the eye; the mouth has a narrow cleft; the teeth are uniserial; the branchial apertures narrow and inferior, and their pharyngeal slits are wide; the vertical fins are rudimentary and limited to the caudal portion; the pectorals but slightly developed or absent. The family is composed of some half dozen species, confined to South-eastern Asia and the neighboring portion of the Pacific Ocean. These have been combined under two genera—(1) *Ratabura* or *Moringua*; and (2) *Aphthalmichthys*; or even under a single genus (*Moringua*) by Günther.
THEODORE GILL.

Ratafi′a [a word of Malay origin], a name given to a large class of liqueurs, or sweet alcoholic drinks strongly flavored with aromatics. The term is a common one on the European continent.

Rath′bone, tp., Steuben co., N. Y. P. 1357.

Ra′thenow, town of Prussia, province of Brandenburg, on the Havel, has several spinning and weaving factories, tanneries, and manufactures of bricks, tiles, and spectacles. P. 6820.

Ra′tibor, town of Prussia, province of Upper Silesia, on the Oder, has manufactures of hosiery, linen and woollen stuffs, leather, and vinegar, and a large trade in flax, hemp, and wool. P. 15,323.

Ra′tio [Lat.], the numerical measure of the relation which one quantity bears to another of the same kind. The only way in which two quantities can be compared is by division. The operation of dividing one quantity by another of the same kind consists in dividing *the number of times* that any assumed unit is contained in the former by *the number of times* the same unit is contained in the latter. The operation of finding a ratio is therefore purely numerical, and the resulting ratio is consequently an abstract number. If the terms of the ratio are commensurable, their ratio is *exact*; if the terms are incommensurable, their ratio is only *approximate*; but it is to be remarked that the approximation to the true value may be made to any desirable degree of exactness. In comparing two quantities of the same kind, one is assumed to be known beforehand, and for this reason it is called the *antecedent*; the value of the other is then found by division, and for this reason it is called the *consequent*. Inasmuch as the measure of a quantity is the number of

times that it contains some quantity of the same kind taken as a unit, we say that the ratio of one quantity to another is *the quotient obtained by dividing the second quantity by the first.* It is to be observed that mathematical writers differ in their methods of using the term *ratio*, some adopting the rule above given, and some defining it to be *the quotient of the first quantity by the second;* all, however, agree in calling the first quantity the antecedent and the second quantity the consequent. From the meaning of these terms, as explained above, the former would seem to be the more natural definition of the term. It certainly has the advantage of *uniformity of meaning*, which is no minor quality, inasmuch as all writers regard the ratio of a geometrical progression as the quotient of the second term by the first. No error can arise from the adoption of either definition, provided the meaning of the term is fully understood and uniformly adhered to.

The term *arithmetical ratio* is used by some writers to denote the difference between two quantities. This would appear to be an incorrect application of the term *ratio*, inasmuch as a knowledge of the numerical difference between the quantities would not, in any proper sense, convey an idea of their relative value. To say that one line is an inch longer than another would impart no idea of the relative value of the two lines unless, perchance, the value of one of them should be known; in which case the idea of relation would resolve itself into the true idea of division. Euclid's definition of ratio is as follows: "Ratio is a certain mutual habitude of two homogeneous magnitudes with respect to *quality* or numerical composition." Peacock in his *Algebra* says that there is no geometrical definition of ratio by which the equivalence of different modes of representation may be ascertained as necessary consequences; and for this reason ratios in geometry are only considered in connection with each other as constituting, or as not constituting, a proportion.

Ultimate Ratio.—If two quantities, both functions of the same variable, vary in such a manner that their ratio shall continually approach to a fixed quantity, but cannot pass it, that quantity is said to be the ultimate ratio of the given quantities. The ultimate ratio of two quantities is nothing else than a limit, the term limit being used in the sense attributed to it in the modern calculus, in which it is synonymous with the differential coefficient, the fundamental element of the DIFFERENTIAL CALCULUS (which see). If we consider the case of an arc less than 90°, and its chord, it is evident that the arc is always greater than its chord; but as the arc decreases—that is, approaches 0—the ratio of the arc to the chord diminishes; and finally when the arc becomes infinitesimal, this ratio becomes equal to 1—that is, the ultimate ratio of a decreasing arc to its chord is a ratio of equality. In like manner, if we inscribe a regular polygon in a circle, and then increase the number of sides of the polygon by the process of continued duplication, the polygon will continually approach to an equality with the circle; and finally, when the number of sides becomes infinite, the two will become equal. In this case the ultimate ratio of an inscribed regular polygon to the corresponding circle is a ratio of equality—that is, the circle is a regular polygon with an infinite number of sides.

Prime and Ultimate Ratios.—The method of analysis used by Newton in his *Principia*. It is a simplification of the method of exhaustion as used by ancient geometers. To conceive an idea of this method, let us suppose two variable quantities whose values approach each other so that their ratio continually approaches a, and finally differs from a by less than any assignable quantity; then is a the ultimate ratio of the two quantities. Again, if two variable quantities simultaneously approach two other quantities, which on the same hypothesis remain constant, the ultimate ratio of the variable quantities is the same as that of the constant quantities. The ratios are called *prime* or *ultimate* according as the ratio of the variable quantities is receding from or approaching to the ratio of the constant quantities. W. G. PECK.

Ra'tionalism [Lat. *ratio*, "reason"], like naturalism, supernaturalism, and other terms expressive of the relation of reason and faith, was first used in its present sense by the philosopher Kant. Rationalism is that tendency in modern thought which claims for the unaided human reason the right of deciding in matters of faith. It asserts the prerogative of the intellect to be supreme arbiter in all departments of revealed truth. It requires certainty as the condition of its favor, and, with Wolf, promptly rejects what does not come before it with all the exactness and clearness of a mathematical demonstration. The scene where rationalism has exerted its chief sway is Germany. The sources were various, not only embracing different countries, but likewise different departments of investigation. The deism of England, one of the most polished and powerful of all forms of free thought, was industriously propagated in Germany, where the works of Lord Herbert, Hobbes, Shaftesbury, Tyndal, Woolston, and Wollaston were circulated in the language of the people and read by wide circles. In Holland the philosophy of Descartes and Spinoza was very powerful, and its influence was very decided east of the Rhine, particularly in the universities of Germany. The pantheism of Spinoza was very attractive to many minds, and was regarded as a welcome relief from the cold and heartless banishment of God from his own creation. France, however, was the chief foreign country which contributed to the rise and sway of German rationalism. The influence of Voltaire and the Encyclopædists was very great, and Berlin became as much a home to these men as Paris had ever been. The domestic causes were, first of all, the philosophy of Leibnitz, popularized and simplified by Wolf at Halle University; the destructive theology of Semler; the influence of the skeptical court of Frederick the Great, with its French surroundings; the *Wolfenbüttel Fragments*, published by Lessing; and the *Universal German Library*, issued by Nicolai. Rationalism was in the ascendant in Germany from 1750 to 1800, but with the beginning of the new century it began to lose its hold upon the best minds. Schleiermacher was the transitional theologian from the old rationalistic to the new evangelical faith of Protestant Germany. His *Discourses on Religion* diverted public attention from the rationalistic criticism to the necessity of feeling and a sense of dependence on God. Jacobi was really the first to introduce the sense of dependence into the domain of religious philosophy, but Schleiermacher was the first to apply it to the man of general culture. Neander, the Church historian, was the first positive theologian of the so-called "mediatory" school. His historical works breathe a fervent and devout spirit, at the same time that they evince the profound scholarship of the original student. In 1835 a new impulse was given to rationalistic criticism by Strauss's *Life of Jesus*—a work proceeding directly from the Hegelian school. It advocated the mythical origin of the Gospels. This work was promptly replied to by Neander, Ullmann, Tholuck, and many other representatives of evangelical thought. The most recent phase of rationalistic thought is materialistic. The views of Büchner, Carl Vogt, Moleschott, and others have gained a wide influence. Evangelical theology is, however, in the ascendant again in most of the German universities. The Broad Church of England, represented by Matthew Arnold and others, has affinities with the rationalism of Germany. (On the literature of rationalism compare Farrar, *Critical History of Free Thought* (Bampton Lectures, 1863); Lecky, *History of the Rise and Influence of the Spirit of Rationalism in Europe* (2 vols., London, 1865); Hurst, *History of Rationalism* (New York, 1865; London, 1866).) J. F. HURST.

Ration'al Quan'tity, a quantity which involves no radicals. Rational quantities are so called in contradistinction to radicals, which are then termed irrational.
W. G. PECK.

Rat'isbon, or **Regensburg,** an old and interesting town of Bavaria, formerly a free city of Germany, on the right bank of the Danube, opposite the influx of the Regen, is surrounded with walls pierced by six gates, and has a fine cathedral begun in 1275, but not finished till the middle of the seventeenth century; a town-house, in which the imperial diet assembled from 1662 to 1806; a magnificent stone bridge over the Danube, 1100 feet long; and a monument of Kepler, who was born here. Gold, silver, brass, iron, steel, earthen and porcelain ware, leather, tobacco, and glass are manufactured here. P. 29,224.

Rat'itæ [Lat. *ratis*, "logs fastened together," "raft," alluding to the disconnected barbs of the feathers], an order or sub-order of birds contrasting with all the other living forms of the class, and containing the ostriches, cassowaries, and kiwis. It is distinguished, according to Huxley, by the sternum being devoid of a crest, and ossifying only from lateral and paired centres, the parallelism or identity of the long axes of the adjacent parts of the scapula and coracoid, and the non-development of an acromial process to the scapula, and of a clavicular process to the coracoid; the vomer has a broad cleft; the hinder and posterior ends of the palatines and the anterior ones of the pterygoids are very imperfectly or not at all articulated with the basisphenoidal rostrum. It may be further added that in all the living representatives the feathers are characteristic, the barbs being disconnected. The group embraces the largest of birds, all of which are incapable of flight, and progress by running. The species, though comparatively few, represent several well-defined families—viz. Struthionidæ, embracing the African ostriches; Rheidæ, including the South American ostriches

or nandus; Casuaridæ, with the cassowaries and emus of the Papuan Archipelago, Australia, etc.; and Apterygidæ, including the kiwis of New Zealand; the order was also well represented in former geological epochs, especially in New Zealand, by the gigantic Dinornithidæ, which seem to have been destitute of true wings. THEODORE GILL.

Rat-Mole. See MOLE-RAT.

Ratram'nus, also called **Bertramus** by an error of copyists, a learned monk of the famous abbey of Corbey, near Amiens, best known by his treatise *De Corpore et Sanguine Domini*, written to confute the transubstantiation doctrine of Paschasius Radbert (about 844 A. D.). He d. after 868. His writings occupy about 170 pages in vol. cxxi. of Migne's *Patrologia*. R. D. HITCHCOCK.

Rattan' [Malay, *rôtan*, "cane"], the slender stem of various plants of the genus *Calamus*, many of them climbing and trailing plants, often many hundreds of feet in length, others quite short, all having a beautiful head of feathery leaves. *C. viminalis, rudentum, rotang, verus, scipionum*, and *draco* are among the species of this interesting genus. The third and the last mentioned yield a part of the dragon's blood of commerce. The young shoots of some of the species are used as a potherb; some produce good fruits; but the chief use is that of the stalks. From Borneo to Bengal great quantities are gathered for the Chinese, the European, and the American markets. In China they are used for a great variety of purposes; mats, sails, and cables are among the articles made from them. In this country they are used for making chairs, baskets, canes, umbrella ribs, etc., and splinters of rattan are used in carriage trimming and other ornamental work. Tropical America has numerous rattan-like palms of the genus *Desmoncus*, armed with strong thorns. They are locally used like the true rattans.

Rattaz'zi (URBANO), b. at Alessandria, Italy, June 29, 1808; studied law at Turin, and began to practise as an advocate at Casale; was elected a member of the Sardinian Parliament in 1848; opposed in the most decided manner the Austrian authority in Italy, and became a member of the cabinet of Gioberti, but retired immediately after the battle of Novara; entered the cabinet of Cavour (1853–58) as minister of justice, and carried the law for the dissolution of the monasteries; formed a cabinet in opposition to Ricasoli in 1862, and again in 1867, but held the place only for a few months. D. at Frosinone June 5, 1873. By the radicals he was accused of being subservient to France; by the clericals, of being in compact with Garibaldi; thus his position was often very difficult, but he was a man of eminent ability and in possession of great talent as a speaker.—In 1862 he married the princess MARIE STUDOLMINE DE SOLMS, a daughter of the princess Lætitia Bonaparte and Sir Thomas Wyse, who died as English minister at Athens. Miss Wyse, b. in 1830, married in 1850 M. Frédéric de Solms, a rich Alsatian, but separated from him in 1852, and devoted herself to literature. Several of her romances have made quite a sensation.

Rat'tlesnake, a name applied to all the species of the family Crotalidæ provided with a rattle to the tail. The rattle is composed of articulated horny segments in varying number—from two or three up to thirty or more. The popular belief that the number of segments indicates the age of the animal is erroneous. The species of the group are peculiar to America, and are especially numerous in the arid regions of the South-western Territories of the U. S. According to the identifications of Prof. Cope, fifteen species are found within the limits of the U. S.: of these, eleven belong to the genus *Crotalus*, one to *Aploaspis*, both of which have the head covered with small scales, and four to the genus *Caudisona*, which is characterized by having large plates upon the head similar to those of ordinary snakes. The common rattlesnake of the Northern and Eastern States is *Crotalus horridus;* in the Southern States, from North Carolina to Florida, *Crotalus adamanteus* is also found. A species of *Caudisona* (*C. tergemina*) is also found in the Western States, and extends as far southward as Western New York, although the other species of the group are confined to the Western and South-western States and Territories. The venom of the rattlesnake has been the subject of special investigation by Weir Mitchell (1860). This varies in intensity with the climate, season, and the condition of the animal itself. It is most to be feared in warm weather. No certain antidotes to the venom are known. The best are believed to be active stimulants, among which alcoholic liquors are the most esteemed.
THEODORE GILL.

Rauch (CHRISTIAN), b. at Arolsen, Waldeck, Germany, Jan. 2, 1777; received his first instruction in art at Cassel and Berlin; resided for several years at Rome and Carrara in intimate intercourse with Thorwaldsen, Canova, and W. von Humboldt; settled subsequently at Berlin as professor at the academy. D. in Dresden Dec. 3, 1857. His most remarkable works are the monument of Frederick II. at Berlin, the statue of Queen Louisa at Potsdam, of Kant at Königsberg, of Blücher at Breslau, of Scharnhorst and Bülow in Berlin, etc.

Rauch (FREDERICK AUGUSTUS), D. D., b. at Kirchbracht, Hesse-Darmstadt, July 27, 1806; educated at the universities of Marburg, Giessen, and Heidelberg; was for some time professor in the two latter institutions; came to the U. S. 1831; was ordained to the ministry of the German Reformed Church 1832; professor of German at Lafayette College, Pa.; principal of high schools and professor of biblical literature at York and at Mercersburg, and president of Marshall College from 1836 until his death at Mercersburg Mar. 2, 1841. Author of works in German and English, one of which was *Psychology* (1840).

Rau'hes Haus [Ger., "rough house"], a famous reformatory institution for boys, and latterly for girls also, established in 1831 at Hom, near Hamburg, Germany, by Dr. J. H. Wichern. The children live in a number of distinct families under the care of young men belonging to a sort of conventual institute of brothers of the Inner Mission of the German Evangelical Church. They are all taught useful trades, and hitherto more than 90 per cent. of the pupils have been permanently reformed. Of late, more than 100 similar schools have been established in Germany.

Rau'mer, von (FRIEDRICH LUDWIG GEORG), b. at Wörlitz, in the duchy of Anhalt, Germany, May 14, 1781; studied law at Berlin, Halle, and Göttingen; received employment in the civil service of the Prussian government in 1801; was appointed professor of history at Breslau in 1811 and at Berlin in 1819; was a member of the German Parliament at Frankfort in 1848, and afterward of the Prussian upper house. D. at Berlin June 13, 1873. His principal works are—*Geschichte der Hohenstaufen und ihrer Zeit* (6 vols., 1823–25), *Geschichte Europas seit dem Ende des 15. Jahrhunderts* (8 vols., 1832–50), *Herbstreise nach Venedig* (2 vols., 1816), *Briefe aus Paris* (2 vols., 1831), *England im Jahr 1835* (2 vols., 1836; translated into English by Sarah Austin and H. E. Lloyd), *America and the American People* (2 vols., 1845; translated into English by W. W. Turner), *Antiquarische Briefe* (1851), *Vermischte Schriften* (3 vols., 1852–54).

Raumer, von (KARL GEORG), brother of the preceding, b. at Wörlitz Apr. 9, 1783; studied geology at Halle and Göttingen, and at the mining school of Freiberg under Werner; was appointed professor of mineralogy in 1811 at Breslau, in 1819 at Halle, in 1827 at Erlangen, where he d. June 2, 1865. Most widely known are his geographical works, *Lehrbuch der allgemeinen Geographie* (1832) and *Beschreibung der Erdoberfläche* (both often reprinted), *Palästina* (1834), *Geschichte der Pädagogik* (4 vols., 1857–61), *Autobiography* (published after his death).

Ravaillac' (FRANÇOIS), b. at Angoulême, department of Charente, France, in 1578; was first clerk to a notary, then a schoolmaster; subsequently imprisoned for debt; entered the order of the Feuillants, but was expelled as a visionary and fool, and became noted for his fanatical hatred of the Protestants; which feeling by degrees concentrated itself on the person of Henry IV., their former leader. Several times he sought in vain to approach the king; at last he succeeded. On the afternoon of May 14, 1610, the king rode out to pay a visit to Sully, who was sick in bed. In the narrow street Laferronnerie his coach was stopped for a moment by some heavily-laden carts in front of it. Ravaillac jumped up on the hind wheel and plunged a dagger into the heart of the king, who died immediately. The murderer was captured soon after, confessed the crime, and was put to death May 27, having been subjected to cruel tortures without revealing the secret instigators of the deed.

Ravanu'sa, town of Sicily, province of Girgenti, near the bank of the Salso, 32 miles E. S. E. of the city of Girgenti. Grain, grapes, olives, almonds, and pistachios abound here, and the inhabitants are chiefly occupied in the cultivation and sale of these productions. P. 7650.

Ra'ven [Ang.-Sax. *hräfen*], a large species of the genus *Corvus* (*Corvus corax*, Linn.), which differs from the crow chiefly by its larger size and the lanceolate feathers of its chin and throat. It is found over the greater part of the northern part of the Old World, as well as North America, although it is quite rare on the Atlantic seaboard. It generally associates in pairs, but sometimes is to be seen in small flocks. It builds a rude nest, chiefly on cliffs, and deposits therein from four to six eggs of a light greenish-blue, blotched with brownish spots. It is capable to some extent of mimicking the human voice. It was formerly,

and is still by some superstitious persons, looked upon as a bird of evil omen. THEODORE GILL.

Raven'na, city of Northern Italy, chief town of the province to which it gives its name, near the Adriatic, in lat. 44° 24′ N., lon. 12° 10′ E. It is in more or less direct communication by rail with all the great towns of the Peninsula, and by water, through the canal Naviglio (constructed in 1747), with Venice, Trieste, etc. The city is about 3 miles in circumference, but nearly half the enclosed space is occupied by vineyards; the surrounding district is low and marshy, and both town and country are subject to malarious fevers, though in ancient times this region appears to have been remarkable for its salubrity. This unfavorable change is no doubt owing in a great measure to the deposits from the Po, these having so filled up the sea here that Ravenna, once on the very shore, now stands 3 or 4 miles inland. In the time of Augustus the city was intersected by canals, the houses, mostly of wood, were built on piles, and the intercourse between different parts of the town was carried on by means of boats and bridges, as now in Venice. The Roman fleet, of 250 or 300 sail, then rode at anchor in the Portus Classis, 3 miles S. E. of the town, where now stands a dark forest of already aged pines.

But curious and important as are these physical changes to the student of nature, the great attraction of Ravenna, that which makes her unique among the cities of Italy and the world, is the fact that here are preserved so many monuments of the dark and stormy ages of transition from the Roman to the Teutonic—monuments of the highest possible interest to the lover of early Christian art. The first Christian structures were unquestionably at the Portus Classis, but these have for the most part so utterly perished that only a column or a cross tells where they stood. The oldest now existing are the cathedral of St. Orso (Basilica Ursiana), founded toward the end of the fourth century by Bishop Ursus, and the baptistery (*S. Giovanni in fonte*), founded by Bishop Neo a very few years later. The cathedral was almost entirely rebuilt in the seventeenth century, but the old campanile still remains, and in the church itself are preserved many curious memorials, such as sarcophagi of saints and bishops of a very early date, a silver crucifix of the sixth century, marble bas-reliefs of the same and even of an earlier age, the ivory throne of St. Maximian, etc. Of a more modern interest are the celebrated frescoes by Guido Reni. The baptistery is an octagonal brick building, with cupola, which was never cased in marble; the interior is formed by two tiers of arches rising one above another, the columns of the lower tier having capitals ornamented with Greek foliage. The mosaics, probably the most ancient in Ravenna, are in the highest degree interesting. The font is of the fifth century. SS. Nazaro e Celso, the once magnificent mausoleum of Galla Placidia, was founded by that empress in 440, is in the form of a Latin cross, and contains beautiful mosaics of the fifth century representing the Saviour, evangelists, prophets, etc. In this church is the sarcophagus of the empress, in which she was to be seen, seated in her royal robes of cloth of gold, as late as the sixteenth century, when the drapery was accidentally consumed by fire. Here are also the tombs of Honorius and Constantius III., with two smaller ones bearing the names of tutors of the royal household. The church of San Francesco, first dedicated to St. Peter, is also of the fifth century, though now much disguised by restorations; Sant' Agatha is of about the same period, and not greatly changed; and there are several other more or less ruined churches of the same age. The archiepiscopal palace also contains a chapel of the fifth century, which remains almost without a change, and the archives in this palace are said to have numbered 25,000 parchment MSS., though these are now partially scattered. Of the sixth century should be mentioned St. Apollinare in Classe, outside the town, the most striking of the ancient Ravenna basilicas, as a specimen of the purest early Christian art; the basilica of St. Apollinare Nuovo, built by the Arian Theodoric, and containing, besides mosaics still very curious though much restored, a representation (not, of course, as old as the church) of the suburb of Classis and of the city of Ravenna itself, with the church of San Vitale, the palace of Theodoric, etc. This palace, afterward the residence of the exarchs and of the Lombard kings, has wellnigh disappeared. The noble basilica of San Vitale is of a somewhat later period, but still nearly as old as Santa Sophia, after which it was modelled. It contains gorgeous mosaics representing, besides divine subjects, the emperor Justinian, with the empress Theodora and her court. Outside the walls, about half a mile to the N. E., stands the mausoleum of Theodoric, now commonly called Sta. Maria della Rotonda. The marble statues of the apostles which once decorated this building are no longer there, but the huge stones of which it was composed, and the hugest of all, the cupola, 30 feet in diameter, hollowed out of a single block, still stand as if to bear witness that this was the last resting-place of one of the greatest of mortal men. It is impossible in this brief notice even to hint at the countless details of architectural, artistic, and religious interest furnished by these ancient edifices and others not even named here, and we must refer the reader to the works recommended at the end of this article. Ravenna is comparatively poor in mediæval monuments, the church of Santa Maria in Porto Fuori, of the eleventh century, being the most interesting, but it contains one memorial of that time which calls forth higher associations and more profound feeling than mere stone or brass, however venerable, can ever awaken—the ashes of the immortal Dante. They rest in a tomb by the church of St. Francesco, and in 1865 Florence entreated in vain for the bones of her banished son. The name of Ravenna is also connected with that of another great poet, Lord Byron, whose partiality for this place and the motives for it are well known, as well as the fact that some of his finest works were written here. The house occupied by the English poet has acquired additional celebrity by having been, for a time, the abode of Garibaldi, and near the present harbor is pointed out the last resting-place of his brave Anita, who died on that terrible flight from the Austrians in 1849. The Biblioteca Communale, in the old Carthusian monastery, contains upward of 50,000 volumes and 700 MSS., the most precious of which is an Aristophanes of the tenth century; there is also a MS. of Dante of the fourteenth century, and an inferior one a little older; a beautiful illuminated Officium on white vellum, and another on violet; among the printed volumes are many *princeps* editions of great rarity and value. The museum, besides being rich in vases, bronzes, majolicas, etc., contains a very choice collection of medals, ancient and mediæval, and some gold ornaments believed to have belonged to Odoacer. The Academy of Fine Arts possesses, among other things of interest, many old Byzantine pictures and a beautiful mosaic pavement found at Classe. An enumeration of even the leading objects of interest in and around Ravenna would be incomplete without a mention of the famous Pineta, or pine forest, so praised by poets and painters. This forest, growing on a sandy soil thrown up by the sea, begins not far from St. Apollinare in Classe, and extends for some 25 miles southward along the Adriatic, with a width varying from 1 to 3 miles, and affording views of extraordinary beauty.

Tradition gives Ravenna an origin greatly anterior to Rome itself. Strabo tells us it was founded by a colony from Thessaly, and afterward became subject to the Umbrians. Little, however, is positively known of its history until it was subdued by the Romans (187 B. C.), it being at that time the capital of Cisalpine Gaul. Augustus constructed a fine harbor, Portus Classis, near the town, and turned the waters of the Po into the canals which intersected the city, thus bringing in sweet water, which before this time is said to have been more expensive than wine. Ravenna is asserted to have had a Christian bishop as early as 44 A. D. In 404, Honorius retired to Ravenna, as being a safer stronghold against the barbarians than Rome itself. After the flight of Valentinian and the dethronement of Romulus Augustulus (476) it fell into the hands of the Herulian Odoacer, who in his turn was driven out by Theodoric in 497. Under the rule of the great Ostrogoth the city rose to its highest point of splendor, and proudly named herself *Ravenna felix.* But her glory as the city of the Goths was of short duration. In 552, Belisarius besieged and took Ravenna, which then became a part of the empire of Justinian, and for the next 200 years it was governed by an exarch in the name of the emperors of Constantinople. In 752 it fell for a short time into the hands of the Lombards, but was soon retaken by Pepin, who handed it over to the pope. In 1318, Ravenna became a separate dukedom, and in 1440 it passed under the rule of Venice and became once more highly prosperous. Pope Julius II. recovered it in 1509, but lost it three years after by the bloody battle in which the French troops under Gaston de Foix were victorious, but in which the youthful hero lost his life. (This battle is commemorated by La Colonna de' Francesi, a square pillar erected in 1557 about 2 miles outside the walls.) The pope, however, soon retook the town, and it afterward continued to form a part of the papal territory (with the exception of a few years) till 1860, when it was united to the new kingdom of Italy. The fresh life now flowing apace through the great centres of Italy has not yet made itself sensibly felt in Ravenna, and the stranger finds little with which to occupy himself except in her past. P. in 1874, 57,900. (See A. Ferdinand von Quast, *Die alt-christlichen Bauwerke von Ravenna*, with illustrations (Berlin, 1841); *Mosaic Pictures in Rome and Ravenna*, by John Henry Parker (1866); Conte Pietro Desiderio Pasolini, *Delle Antiche Relazioni fra Venezia e*

Ravenna (Florence, 1874); also, *The Goths at Ravenna*, in *British Quarterly Review* for Oct., 1872.)

CAROLINE C. MARSH.

Ravenna, p.-v. and tp., Muskegon co., Mich. P. 1035.

Ravenna, tp., Dakota co., Minn. P. 236.

Ravenna, tp., Mercer co., Mo. P. 1129.

Ravenna, p.-v. and tp., cap. of Portage co., O., at the intersection of Cleveland and Pittsburg and Atlantic and Great Western R. Rs., 38 miles S. E. from Cleveland, has 6 churches, 1 union graded public school, 2 national and 1 savings bank, 2 newspapers, 2 glass-factories, 2 extensive carriage-factories, 1 foundry, agricultural implement manufactory, 1 cheese-box factory, 2 lumber-yards, 2 flouring and 3 planing mills, 1 spoke and hub factory, 1 machine-shop, and 1 woollen-factory. P. of v. 2188; of tp. 3423.

L. W. HALL & SON, EDS. "PORTAGE CO. DEMOCRAT."

Rav'ensburg, town of Germany, kingdom of Würtemberg, manufactures cotton and linen fabrics, paper, leather, and articles of terra-cotta. P. 6817.

Ra'venscroft (JOHN STARK), D. D., b. at Blandford, Prince George co., Va., in 1772; was carried to Scotland in infancy; received there a good classical education; returned to Virginia 1788; studied at William and Mary College; was admitted to the bar, but ultimately studied theology; took orders in the Episcopal Church 1817; was a minister in Mecklenburg co., Va., 1817–23, when he became bishop of North Carolina and pastor of churches successively at Raleigh and at Williamsburg, Va. D. at Raleigh Mar. 5, 1830. Two volumes of his *Sermons* were edited by Dr. J. M. Wainwright in 1830, preceded by a memoir. (See biography in *Amer. Church Review.*)

Ra'venswood, v., Beardstown tp., Cass co., Ill., on Illinois River. P. 55.

Ravenswood, p.-v., forming part of Long Island City, Queens co., N. Y., on East River, being the E. terminus of a projected bridge from Seventy-ninth street, New York. P. 1536.

Ravenswood, p.-v., Jackson co., West Va., on Ohio River, has 1 newspaper, and is a shipping-point for the coal oil and minerals of the interior. P. 362.

Ravignan', de (GUSTAVE XAVIER DELACROIX), b. at Bayonne Dec. 2, 1795; studied law, practised as an advocate, and held a high position in the judicature, when, in 1822, he resigned his office, and entered the Jesuit novitiate at Montrouge. In 1828 he took holy orders, and subsequently became noted as a powerful and eloquent preacher, succeeding Lacordaire in 1836 in the pulpit of Notre Dame. His work in defence of the Jesuits, *De l'Existence et de l'Institut des Jesuits* (1855), and also his *Clément XIII. et Clément XIV.* (1854), gave rise to hot controversies. D. at Paris Feb. 26, 1858.

Ra'wal Pin'di, town of British India, capital of a dominion of the same name in the Punjaub, in lat. 33° 35′ N. and lon. 73° 15′ E., carries on a brisk transit-trade between Hindostan and Afghanistan. P. 15,013.

Raw'don, p.-v., Montcalm co., Quebec, Canada, has extensive water-power, a quartz gold-mine, and a large trade in grain, provisions, grass-seed, potash, and timber. P. about 600.

Rawdon-Hastings (FRANCIS), marquis of Hastings and earl of Moira, b. in Ireland Dec. 7, 1754, eldest son of the earl of Moira; was educated at Oxford; entered the army 1771; was sent to America in 1773, being known by the courtesy title of Lord Rawdon; was present at the battle of Bunker's Hill as captain in the 63d Foot; became aide-de-camp to Sir Henry Clinton; participated in the battles of Long Island and White Plains and the attacks upon Forts Washington and Clinton; was appointed adjutant-general with the rank of lieutenant-colonel 1778; soon afterward raised in New York a corps called the "Volunteers of Ireland," of which he took command; distinguished himself at Monmouth; was made general and sent to the Southern States with reinforcements for Cornwallis 1780; took a prominent part at the battle of Camden, Aug. 16; remained in the Carolinas after Cornwallis's return northward; attacked and defeated Gen. Greene at Hobkirk's Hill, Apr. 25, 1781; relieved Fort Ninety-Six; fortified himself at Orangeburg; incurred much obloquy on account of the execution of Col. Isaac Hayne July 31; sailed for England Aug., 1781, in consequence of ill-health; was captured by a French cruiser and taken to Brest; was made Baron Rawdon and aide-de-camp to the king 1783; became an intimate friend and associate of the prince of Wales, afterward George IV.; assumed the name of Hastings on succeeding to the title of his uncle, the earl of Huntingdon, Oct., 1789; succeeded his father as earl of Moira 1793; was promoted to major-general, and given command of a force of 10,000 men sent to the relief of the duke of York in Flanders 1794; was entrusted with the direction of the expedition to Quibéron 1795; was appointed commander-in-chief of the British forces in Scotland and constable of the Tower of London 1803; effected a reconciliation between the king and the prince of Wales, and was made lord lieutenant of Ireland 1805; became master-general of ordnance 1806; made an unsuccessful effort to form a cabinet on the assassination of Mr. Perceval 1812; was honored with the order of the Garter and appointed governor-general of British India 1813, being charged to pursue the "policy of non-intervention" in regard to the wars between the native princes, but quickly perceived the necessity of vigorous action; successfully conducted the Nepaul, Pindaree, and Mahratta wars, and thus laid the final basis for the greatness of England as a "continental power" in India; was created marquis of Hastings Dec., 1816; retired from the government of India after a wise and successful administration of nearly ten years 1823, and became governor of Malta 1824. D. on board the Revenge in the Bay of Baia, near Naples, Nov. 28, 1826.

Raw'hide, p.-v., Lauderdale co., Ala. P. 757.

Ra'wicz, town of Prussia, province of Posen, has large tanneries, dyeworks, breweries, and manufactures of linen and tobacco, and an active trade in wool and tobacco. P. 100,672.

Rawle (WILLIAM), LL.D., b. at Philadelphia, Pa., Apr. 28, 1759; studied law at New York, London, and Paris; commenced the practice of his profession at Philadelphia 1783; was distinguished for legal, classical, and scientific attainments; an active member of many learned associations; became in 1822 chancellor of the Philadelphia bar, and was the first president of the Pennsylvania Historical Society 1826. Though averse to politics, he for some time sat in the State legislature, and accepted from Pres. Washington in 1791 the appointment of district attorney, which he held until 1799. D. at Philadelphia Apr. 12, 1836. Besides numerous printed discourses and contributions to learned societies, he published *A View of the Constitution of the U. S.* (1825), and was the chief author of the new civil code of Pennsylvania. (See a *Memoir*, by T. J. Wharton, Philadelphia, 1840.)

Rawle (WILLIAM, JR.), son of William, b. at Philadelphia, Pa., in 1789; was a distinguished lawyer, and became reporter of the supreme court of Pennsylvania, in which capacity (associated with Thomas Sergeant, C. B. Penrose, and F. Watts) he published (between 1818 and 1836) 25 volumes of cases. D. at Philadelphia in 1858.

Rawle (WILLIAM HENRY), son of William, Jr., b. at Philadelphia, Pa., in 1823; published *A Practical Treatise on the Law of Covenants for Title* (1852), and edited John William Smith's *Law of Contracts* (1853), also Joshua Williams's *Law of Real Property* (1857).

Rawles, tp., Mills co., Ia. P. 781.

Raw'lins, new county of N. W. Kansas, on Republican fork of Kansas River, consists of fertile rolling prairies. Area, 900 sq. m.

Rawlins (JOHN A.), b. at East Galena, Ill., Feb. 13, 1831. The son of a farmer and charcoal-burner, he had but limited opportunities for obtaining an education, being obliged to assist his father. At the age of twenty he began to attend school; in Nov., 1854, commenced the study of law, and in 1855 was admitted to the bar, and began practice in Galena. He won success in his profession, and became a leading Democrat of the Douglas school. Though using his best efforts to avert war, he ardently espoused the cause of his government when it came. While engaged in raising a regiment Gen. Grant offered him a position on his staff as assistant adjutant-general, with the rank of captain, which was accepted, and with the exception of two months, during illness, he was with Gen. Grant in all his battles and campaigns until the close of the war. He won the warmest regard and fullest confidence of his chief, and was advanced in rank from time to time, until in 1865 he was appointed chief of staff to the lieutenant-general with rank of brigadier-general U. S. A., and later was brevetted major-general. When Gen. Grant was elected President he appointed him to a place in his cabinet as secretary of war. In the few months of his administration he displayed the same executive ability which led to his selection. D. at Washington, D. C., Sept. 6, 1869.

Raw'linson (GEORGE), brother of Sir Henry, b. at Chadlington, Oxfordshire, England, in 1815; educated at Swansea and at Ealing School; graduated first class in classics at Trinity College, Oxford, 1838; became fellow and tutor of Exeter College, moderator 1852, public examiner 1854, 1856, and 1868, Bampton lecturer 1859–61; elected Camden professor of ancient history at Oxford 1861, and appointed canon of Canterbury cathedral 1874. Author of several theological works; of *The Five Great*

Monarchies of the Ancient Eastern World (4 vols., 1862–67; 2d ed. republished in New York, 1871), *A Manual of Ancient History* (1869), *The Sixth Great Oriental Monarchy, or the Geography, History, and Antiquities of Parthia* (1873), and of *The Seventh Great Oriental Monarchy*, treating of the Sassanians, which is announced as in the press in 1876, as is also a 3d edition of the work to which it is a continuation. Canon Rawlinson has written the commentaries on the books of Kings and other portions of the Old Testament for the *Speaker's Commentary*, and in connection with his brother and Sir Gardner Wilkinson published a translation of Herodotus (4 vols., 1858–60), valuable for the notes and illustrations, but defective in elegance and in strictly classical scholarship.

Rawlinson (Sir Henry Creswicke), D. C. L., b. at Chadlington, Oxfordshire, England, in 1810; educated at Ealing School; entered the Bombay army 1826; became proficient in the modern Oriental languages, on which account he was sent to Persia Nov., 1833, to aid in the instruction of the army of that country; resided several years at Kermanshaw, near the celebrated rock inscription of Behistun (see Cuneiform Inscriptions), which he was the first to decipher 1838; was sent to Kandahar as political agent 1840; held that capital to its allegiance during the Afghan war; went as political agent to Turkish Arabia 1843; was appointed consul at Bagdad Mar., 1844, and was consul-general 1851–55; became lieutenant-colonel in Turkey 1850; returned to England Feb., 1855; was knighted and made a director of the East India Company 1856; was member of Parliament 1858; member of the council of India 1858–59; was envoy to Persia, with the local rank of major-general, 1859–60; again sat in Parliament 1865–68, after which he was reappointed a member of the council of India; was president of the Royal Geographical Society 1871–73, and again 1875–76, and president of the Society of Biblical Archæology from its foundation in 1873. He obtained wide celebrity by his translation of the Persian text of the inscriptions of Darius, first published in the *Transactions* of the Royal Asiatic Society for 1846; has since contributed to the same journal many memoirs on the same subject or illustrative of the history and geography of the East; has edited (with E. Norris and George Smith) 5 folio vols. of cuneiform inscriptions (1861–70); furnished valuable material to his brother's edition of Herodotus (1858–60), and has published a volume of essays on Oriental politics, entitled *England and Russia in the East* (1874), in which he advises the occupation of Herat by the British as a check to the advances of Russia in Central Asia.

Rawlin's Springs, p.-v., cap. of Carbon co., Wy. Ter., on Union Pacific R. R., has a hotel and railroad repair-shops. P. 612.

Rawson (Albert Leighton), b. at Chester, Vt., Oct. 15, 1829; became an artist; made four visits to Palestine and other Oriental countries; made in 1851–52 a pilgrimage from Cairo to Mecca with the annual pilgrim caravan in the disguise of a Mohammedan student of medicine; accompanied by his friend and tutor, explored the mounds of the Mississippi Valley and visited Central America 1854–55, publishing thereafter *The Crania of the Mound-Builders of the U. S. and of Central America*; travelled in the Hudson's Bay territories 1863; published several maps of Palestine; drew some hundreds of sketches, which have appeared in *Harper's*, *Lippincott's*, and other American magazines, and in books on Oriental subjects, and has made various translations from the Persian, Arabic, and Italian. Author of *The Divine Origin of the Holy Bible, Hand-Book for Sunday-Schools and Bible Readers, The Pronouncing Bible Dictionary, The Comprehensive Bible Dictionary, History of All Religions, Statistics of Protestantism, Antiquities of the Orient, Grammars of the Turkish and Arabic Languages, A Vocabulary of the Bedawin Languages of Syria and Egypt*, and *The Chorography of Palestine.*

Rawson (Edward), b. at Gillingham, Dorsetshire, England, Apr. 16, 1615; settled at Newbury, Mass., about 1636; represented that town in the general court; became clerk of that body, and was for many years secretary of Massachusetts Colony, most of the early records being in his handwriting. D. at Boston Aug. 27, 1693. Author of *The General Laws and Liberties concerning the Inhabitants of the Massachusetts* (1660), and one of the authors of *The Revolution in New England Justified* (1691). His mother, Margaret Wilson, was sister of the first pastor of Boston and grand-niece of Edmund Grindall, archbishop of Canterbury.—Rebecca Rawson, his daughter, was the heroine of a romantic episode in the history of the colony, commemorated by Whittier in *Leaves from Margaret Smith's Journal.*—Grindall Rawson, his son, b. Jan. 23, 1659, graduated at Harvard 1678, was many years minister of Mendon, was an accomplished scholar and writer, and preached to the Indians in their own language. D. at Mendon Feb. 6, 1715. A genealogy of the descendants of Edward Rawson, prepared by Reuben Rawson Dodge, was printed in 1849, and a revised edition appeared at Worcester, Mass., in 1875.

Raw'sonville, p.-v., Grafton tp., Lorain co., O., on Columbus division of Cleveland Columbus Cincinnati and Indianapolis R. R.

Ray [Lat. *raia*, "ray" or "skate"], the vernacular name of species of the family Raiidæ and kindred groups. (See Raiidæ.)

Ray, county of N. W. Missouri, on the N. bank of Missouri River, traversed by St. Louis Kansas City and Northern R. R., has a rolling surface, partly prairie and partly timbered, the chief products being corn, wheat, tobacco, wool, butter, and sorghum-molasses. Horses, cattle, sheep, and swine are numerous. There are many saw-mills and several mines of bituminous coal. The bottom-lands along Missouri River are noted for extraordinary fertility. Cap. Richmond. Area, about 570 sq. m. P. 18,700.

Ray, tp., Franklin co., Ind. P. 2070.

Ray, tp., Morgan co., Ind. P. 761.

Ray, tp., Macomb co., Mich. (Ray Centre P. O.). P. 1555.

Ray (Isaac), M. D., b. at Beverly, Mass., in Jan., 1807; graduated at Bowdoin College 1827; commenced the practice of medicine at Portland 1827; removed to Eastport 1829; devoted his attention to the subject of insanity; published *The Medical Jurisprudence of Insanity* (1838; 5th ed. 1871); became superintendent of the State insane asylum at Augusta 1841, and of the Butler Asylum at Providence, R. I., 1845, filling that post until Jan., 1866, after which he settled at Philadelphia, Pa. Author of *Conversations on Animal Economy* (1829), *Education in Relation to the Health of the Brain* (1851), and *Mental Hygiene* (1863), besides many contributions to professional journals and a valuable series of official annual reports.

Ray (John), F. R. S., sometimes written **Wray,** b. at Black Notley, near Braintree, Essex, England, Nov. 29, 1627, son of a blacksmith; graduated at Trinity College, Cambridge, where he became a fellow 1649, lecturer on Greek 1650, and mathematical instructor 1652; took orders in the Church of England at the Restoration; resigned his fellowship from conscientious scruples 1662; resided for some years with his friend and pupil, Francis Willoughby, at Middleton Hall, Warwickshire, and afterward at his birthplace; devoted himself to botany and zoology, making extensive tours with Willoughby in Great Britain and on the Continent; was one of the early fellows of the Royal Society 1667; published a *Catalogus Plantarum Angliæ* (1670), the most formal work of the kind which had then appeared; published his travels on the Continent 1673; proposed a new system of botanical classification in his *Methodus Plantarum Nova* (1682), which was substantially adopted by Antoine de Jussieu in the next century; edited (with an English translation of the former) the *Ornithologia* and *Historia Piscium* of his friend Willoughby, to whose children he became guardian and tutor 1672, and published his great work, the *Historia Plantarum* (in 3 vols., 1686–1704). He also prepared a *Collection of English Proverbs* (1670), which was reprinted with improvements by Henry G. Bohn (London, 1850), and valuable *Glossaries of North and South Country Words*, which has recently been carefully edited by Rev. Walter W. Skeat, for the English Dialect Society (1874). He also wrote *The Wisdom of God manifested in the Works of the Creation* (1691, often reprinted), *Discourses concerning Primitive Chaos and Creation, the General Deluge, and the Dissolution of the World* (1693), and a *Synopsis Methodica Animalium Quadrupedum et Serpentini Generis Vulgarium* (1693), which gave him a similar rank in the history of zoological classification to that he had previously gained in botany. He published many occasional treatises and contributed largely to the *Transactions* of the Royal Society. D. at Black Notley Jan. 17, 1705. His *Correspondence* appeared in 1718, his *Life and Select Remains* by William Derham in 1760. The Ray Society, organized in 1844 for the purpose of issuing new editions of rare books on zoology and botany, has issued some 30 sumptuous volumes, two of which (vol. ii. of 1844 and vol. ii. of 1848), devoted to the *Memorials* and the *Correspondence* of Ray, were edited by Dr. Edwin Lankester.

Ray (Joseph), M. D., b. in Virginia Nov. 25, 1807; was self-educated in his youth, but by acting as a schoolteacher was enabled to study at Washington College, Pa., Athens College, O., and at the Ohio Medical College, where he graduated; became surgeon in the Cincinnati hospital, professor of mathematics at Woodward College, Cincinnati,

1834–51, and its principal from its reorganization as a high-school; was also for many years president of the board of directors of the Cincinnati house of refuge, and author of a series of textbooks on arithmetic and algebra. D. at Cincinnati Apr. 17, 1855.

Rayer′ (Pierre François Olive), b. at St. Sylvain, department of Calvados, France, Mar. 8, 1793; studied medicine; practised as a physician at Paris; was appointed physician at the hospital of La Charité in 1832, and wrote, besides a number of minor works, *Traité théorique et pratique des Maladies de la Peau* (2 vols., 1826) and *Traité des Maladies des Reins et des Altérations de la Sécrétion urinaire* (3 vols., 1839). D. at Paris Sept. 10. 1867.

Ray′mond, tp., Champaign co., Ill. P. 323.

Raymond, p.-v. and tp., Cumberland co., Me. P. 1120.

Raymond, p.-v. and tp., Stearns co., Minn. P. 305.

Raymond, p.-v., cap. of Hinds co., Miss., about 30 miles E. of Mississippi River, has 6 churches, 1 female seminary, and 1 newspaper. Business, farming. P. about 800. George D. Harper, Ed. "Hinds Co. Gazette."

Raymond, p.-v. and tp., Rockingham co., N. H., on Concord and Portsmouth R. R. P. 1121.

Raymond, p.-v. and tp., Racine co., Wis. P. 1608.

Raymond (Henry Jarvis), LL.D., b. at Lima, N. Y., Jan. 24, 1820; passed his childhood on his father's farm; studied at the Lima seminary; graduated with honors at the University of Vermont 1840; gave lessons and wrote for Horace Greeley's *New Yorker* while studying law at New York 1840–41; became assistant editor of the New York *Tribune* at its commencement in Apr., 1841; attained great rapidity and skill as a reporter, employing a species of shorthand peculiar to himself, and developing a wonderful memory, which was conspicuously seen in his reports of Dr. Lardner's lectures, from which two volumes were published with the sanction of the lecturer, and exhibited great activity and enterprise in securing exclusive news. In 1848 he left the *Tribune* to accept the position of office-editor of the New York *Courier and Enquirer*, under Col. J. Watson Webb; maintained for some time a newspaper debate with Mr. Greeley on socialism, afterward published in a pamphlet; projected *Harper's Magazine*, for which he wrote the prospectus; contributed largely for several years to the periodical publications of the Messrs. Harper; was elected to the New York assembly as a Whig 1849; distinguished himself in debate; was re-elected 1850; chosen Speaker; devoted special attention to promoting legislation for the improvement of the school and canal systems; retired from the *Courier and Enquirer* 1850, on account of political differences with Col. Webb; spent the winter of 1850–51 in Europe, and on Sept. 18, 1851, issued the first number of the New York *Times*, which he made one of the leading journals of the country. Mr. Raymond took an active part in the Baltimore Whig convention of 1852; was elected lieutenant-governor of New York 1854; was prominent in the organization of the Republican party 1856, having been the author of the *Address to the People* issued by the Pittsburg convention; worked earnestly for the success of the Fremont ticket; declined a renomination as lieutenant-governor 1857; visited Europe 1859, and was an eye-witness of the Franco-Austrian campaign in Italy, gaining a journalistic triumph by the early publication in New York of his full account of the battle of Solferino; warmly urged Mr. Seward for the Presidential nomination 1860, but gave efficient support to Mr. Lincoln when nominated and during his administration, though often differing from him on questions of war-policy; was elected a member and Speaker of the New York assembly 1861; presided over the Union convention at Syracuse 1862; was defeated by Gov. Morgan in his candidacy for the U. S. Senate 1863; was chairman of the New York delegation in the national Republican convention 1864, in which year he was elected to Congress, in which body he separated from the majority of his party by giving a partial support to the policy of Mr. Johnson; took part in convoking the Philadelphia "Loyalists' convention" of 1866, and wrote its *Address and Declaration of Principles*; refused to be a candidate for re-election to Congress 1866; declined the mission to Austria offered him by Pres. Johnson 1867; made a third visit to Europe 1868, and had again devoted himself with great energy to journalism, which he considered his true vocation, when his career was suddenly terminated by an attack of apoplexy at New York June 18, 1869. Though a constant writer for thirty years, Mr. Raymond published but one book, a *History of the Administration of Pres. Lincoln* (New York, 1864), which in a revised edition was entitled *The Life and Public Services of Abraham Lincoln* (1865). As a journalist, an orator, and a debater Mr. Raymond occupied a position of acknowledged eminence, and had few competitors in the scope of his general attainments. Porter C. Bliss.

Raymond (Miner), D. D., b. in New York City Aug. 29, 1811; taught at Wilbraham Academy, Mass., and then as a Methodist preached in that State eight years. He was afterward principal of Wilbraham Academy from 1848 to 1864, then professor of systematic divinity in the M. E. theological seminary at Evanston, Ill.

Raymond (Rossiter Worthington), b. at Cincinnati, O., Apr. 27, 1840; graduated at the Brooklyn Polytechnic Institute 1858; studied mining engineering in Germany several years; became editor of the *American Journal of Mining* 1867; U. S. commissioner of mining statistics 1868; lecturer on economic geology at Lafayette College 1870; vice-president of the American Institute of Mining Engineers 1871, and president of that body 1872; has published extended annual reports of mining statistics since 1869; is author of two or three novels.

Raymund Lully. See Lull (Ramon).

Raynal′ (Guillaume Thomas François), b. at St. Geniez, department of Aveyron, France, Apr. 12, 1713; studied theology at the college of the Jesuits at Toulouse; entered their order and began to preach, but went in 1747 to Paris, and, enjoying the company of Diderot, Holbach, Helvetius, etc., he entered on an entirely opposite course. Of his numerous historical works, *Histoire du Divorce de Henri VIII. avec Catharine* (1763) attracted some attention, and his *Histoire philosophique et politique des Établissements et du Commerce des Européens das les Deux-Indes* (first published anonymously in 4 vols., 1770, then in an enlarged edition under his name, 5 vols., 1780) was condemned by the Parliament of Paris, and a warrant of arrest issued against the author. He fled to Switzerland, lived subsequently at the court of Frederick II., but was allowed to return to France in 1788; received several marks of distinction from the authorities. D. at Chaillot, near Paris, Mar. 6, 1796. He also wrote *Tableau et Révolutions des Colonies anglaises dans l'Amérique septentrionale* (2 vols., 1781), which was translated into English, but sharply criticised by Thomas Paine.

Rayne, tp., Indiana co., Pa. P. 1735.

Rayn′ham, p.-v. and tp., Bristol co., Mass., on Old Colony R. R. (Dighton and Somerset branch), noted for the first ironworks in America, established by James and Henry Leonard 1652, and maintained by the family more than 100 years. King Philip usually lived in the summer on Fowling Pond in this town. P. 1713.

Raynouard′ (François Juste Marie), b. at Brignolles, Provence, Sept. 18, 1761; took part in the political movements of the Revolution and the First Empire; wrote several essays and tragedies, *Caton d'Utique* (1794), *Les Templiers* (1805), which were successful, but acquired his great reputation as a philologist by his researches concerning the Provençal language and literature—*Choix de Poésies originales des Troubadours* (6 vols., 1816–21), *Lexique roman, ou Dictionnaire de la Langue des Troubadours* (6 vols., 1838–44), *Grammaire romane* (1816). D. at Passy, near Paris, Oct. 27, 1836.

Ray′ville, p.-v., cap. of Richland parish, La., on North Louisiana and Texas R. R., 52 miles W. of Vicksburg, has a union church, a Masonic hall, and 1 newspaper. P. 106. W. P. Mangham, Ed. "Richland Beacon."

Ray′wick, p.-v., Marion co., Ky. P. 160.

Ré, an island of France, department of Charente-Inférieure, in the Bay of Biscay, in front of the harbor of La Rochelle. It is 18 miles long, 4 miles broad, treeless, with steep coasts, and strongly fortified, and has about 18,000 inhabitants, who are mostly employed in fisheries, oyster-farming, wine-cultivation, and the manufacture of salt.

Read, p.-v. and tp., Clayton co., Ia. P. 840.

Read (George), b. in Cecil co., Md., Sept. 18, 1733; became a lawyer at Newcastle, Del., 1754; was attorney-general of Delaware and member of the Delaware legislature for many years; a member of the Continental Congress 1774–77, and one of the signers of the Declaration of Independence; president of the constitutional convention of Delaware 1776; member of the convention that framed the Federal Constitution; was appointed judge of appeals 1782; was U. S. Senator 1789–93; and chief-justice from 1793 to his death, at Newcastle Sept. 21, 1798.—His sons George and John were also lawyers of some eminence.

Read (George Campbell), b. in Ireland about 1788; came to the U. S. in childhood; entered the U. S. navy as midshipman 1804; became lieutenant in 1810; participated in several noted engagements during the war with England, especially that between the Constitution and Guer-

riere; became captain 1825, and rear-admiral 1862, when he was appointed governor of the Philadelphia Naval Asylum, where he d. Aug. 22, 1862.

Read (JOHN J.), b. June 17, 1842, in New Jersey; graduated at the Naval Academy in 1861; became an ensign in 1862, a lieutenant in 1864, a lieutenant-commander in 1866; served in the Hartford at the taking of New Orleans and in all of Farragut's battles on Mississippi River during the civil war, and commended for "courage and coolness." FOXHALL A. PARKER.

Read (JOHN MEREDITH), b. at Philadelphia, Pa., July 21, 1797, grandson of George Read, one of the signers of the Declaration of Independence, and through his mother of John Meredith, the first treasurer of the U. S.; graduated from the University of Pennsylvania 1812, and in 1818 was admitted to the bar; in 1823 was elected to the lower branch of the Pennsylvania legislature, where he served two terms; in 1833 was appointed U. S. district attorney for the eastern district of Pennsylvania, and held the office till 1841; in 1845 was nominated a judge of the Supreme Court of the U. S., but the Senate declined to confirm him on account of his opposition to the Southern construction of the Constitution; in 1846 was appointed attorney-general of Pennsylvania, resigning the office at end of six months. In 1858 he was elected judge of the supreme court of Pennsylvania, of which body he became chief-justice in 1872. D. at Philadelphia Nov. 29, 1874. J. B. BISHOP.

Read (JOHN MEREDITH, JR.), b. at Philadelphia in 1837; graduated at Brown University 1858, and at the Albany law school 1859; was adjutant-general of New York during the civil war; published *A Historical Inquiry concerning Hendrick Hudson* (1866); wrote much for periodicals; was appointed consul-general at Paris 1869, and minister to Greece 1874.

Read (NATHAN), b. at Warren, Mass., July 2, 1759; graduated at Harvard 1781; was tutor there 1783–87; settled at Danvers 1795; formed a company which established an iron-foundry at Salem 1796; was the first petitioner to the U. S. government for a patent, obtaining one for a method of cutting and heading nails by the same operation Jan., 1798; was an early experimenter upon the steam-engine; is said to have invented multitubular boilers and high-pressure engines, and to have placed upon Wenham Lake Aug., 1791, a boat propelled by steam with paddles instead of wheels; invented many kinds of agricultural implements and labor-saving machinery; was a member of Congress 1800–03, subsequently a judge of common pleas, and removed in 1807 to Belfast, Me., where he d. Jan. 20, 1849. His nephew, David Read, published a memoir in 1870.

Read (THOMAS BUCHANAN), b. in Chester co., Pa., Mar. 12, 1822; studied sculpture at Cincinnati, but soon turned his attention to painting, which he practised at New York (1841), and soon afterward at Boston; removed to Philadelphia 1846; went to Florence, Italy, in 1850, and resided there with few intermissions until 1872, when he returned to the U. S. D. at New York May 11, 1872. Author of several volumes of poems, and a successful portrait-painter. He will be best known by his picture and poem, both entitled *Sheridan's Ride*.

Reade (CHARLES), D. C. L., b. at Ipsden, Oxfordshire, England, in 1814; graduated at Magdalen College, Oxford, 1835; was elected to a Vinerian fellowship at Oxford 1842; was called to the bar at Lincoln's Inn 1843; published in 1852 *Peg Woffington*, a novel which gave him an immediate reputation, and has since issued many novels, among which are *Christie Johnstone* (1853), *Never Too Late to Mend* (1856), *Love me Little, Love me Long* (1859), *The Cloister and the Hearth* (1861), *Hard Cash* (1863), *Griffith Gaunt* (1866), *Put Yourself in his Place* (1870), and *A Terrible Temptation* (1871). Mr. Reade displays great skill in plot and incident, has a picturesque style, often writes with a social or political object in view, and may be considered, since the death of Dickens, as dividing with George Eliot the foremost place among British novelists. Most of his novels have been successfully dramatized by himself or by Boucicault, and he has written several independent plays. He has gained some note for his lawsuits on questions connected with the rights of authors and the limits of permissible literary criticism, also for his vigorous advocacy of international copyright with America, on which subject he published a number of letters in the New York *Tribune* in 1875.

Reade (WILLIAM WINWOOD), nephew of Charles, b. at Ipsden, England, in 1839; received a good education; published several novels, one of which, *The Veil of Isis, or the Mysteries of the Druids* (1861), displayed much ethnological knowledge, combined with a strong anti-theological bias; traveled on the W. coast of Africa 1862–63; published on his return *Savage Africa* (1863); made a journey from Sierra Leone to the sources of the Niger 1868–70; published *The Martyrdom of Man* (1872), an elaborate and learned impeachment of Christianity from an historical and ethnological point of view, and *The African Sketch-Book* (1873); accompanied the Ashantee expedition as correspondent of the London *Times* 1873–74, incurring thereby a constitutional disease, which resulted in his death at Wimbledon Apr. 24, 1875. His latest publications were *The Story of the Ashantee Campaign* and a novel, *The Outcast*, both of which appeared in 1875.

Read'field, p.-v. and tp., Kennebec co., Me., on Maine Central R. R. P. 1456.

Read'ing, town of England, capital of Berkshire, on the Kennet, 1½ miles from its junction with the Thames, has manufactures of silk, velvet, and ribbons, and has trade in corn, flour, malt, timber, wool, and cheese. P. 32,324.

Reading, p.-v. and tp., Livingston co., Ill., on Vermilion River. P. 70; of tp. 1503.

Reading, p.-v. and tp., Middlesex co., Mass., 12 miles N. of Boston, on Boston and Maine R. R., was incorporated in 1644, and contains 6 churches, 13 schools, a public library, 1 weekly newspaper, and a savings bank. Its manufactures of shoes, cabinet furniture, refrigerators, organ-pipes, etc. are important. Reading is the residence of many gentlemen doing business in Boston. P. 2664. HIRAM BARRUS.

Reading, p.-tp., Hillsdale co., Mich., on Fort Wayne Jackson and Saginaw R. R., 10 miles S. of Hillsdale, the county-seat. It has 4 churches, an academy, 1 bank, several manufactories, 2 hotels, and 1 newspaper. P. 1657. GEO. GRAY, ED. "READING PRESS."

Reading, p.-v. and tp., Schuyler co., N. Y., on W. bank of Seneca Lake and on Northern R. R. of Pennsylvania. P. 1751.

Reading, p.-v., Sycamore tp., Hamilton co., O. P. 1575.

Reading, tp., Perry co., O. P. 3334.

Reading, v. (HAMPTON P. O.) and tp., Adams co., Pa., has 1 newspaper. P. 1326.

Reading, city, cap. of Berks co., Pa., on the E. bank of Schuylkill River, 58 miles N. W. of Philadelphia and 128 miles W. of New York City, was incorporated as a borough in 1783 and as a city in 1847. The city is supplied with water of an excellent quality, and the streets are well laid out and kept scrupulously clean. Reading contains some very costly churches, representing all denominations, fine educational advantages, 2 handsome opera-houses, a number of fine hotels, 3 daily and several weekly newspapers, the repair-shops and rolling-mills of Philadelphia and Reading R. R., and numerous manufacturing interests. The city was laid out by Thomas and Richard Penn upon an original survey of 450 acres, taken in 1748 with the sanction of John and Samuel Finny. P. 33,930. JESSE G. HAWLEY, ED. "READING EAGLE."

Reading, p.-v. and tp., Windsor co., Vt. P. 1012.

Readington, p.-v. and tp., Hunterdon co., N. J., on S. branch of Raritan River and on Central R. R. of New Jersey. P. 3070.

Readsborough, p.-v. and tp., Bennington co., Vt., on Deerfield River. P. 828.

Readville Station, p.-v., Hyde Park tp., Norfolk co., Mass., on Boston and Providence and Boston Providence and Erie R. Rs.

Rea'gan (JOHN H.), b. in Sevier co., Tenn., Oct. 8, 1818; studied law; settled in Texas during its existence as an independent republic; became surveyor, judge, member of the legislature, and colonel of militia; was a member of the U. S. Congress 1857–61, and postmaster-general in the cabinet of the Confederate government 1861–65, after which he was for some time a prisoner in Fort Warren.

Re'al [Sp. for "royal;" Port. *rial*], in Spanish and Portuguese countries a coin and money of account. The old silver real (the eighth of the *piastre, peso*, or dollar) was long a familiarly current coin in the U. S., where it was worth 12½ cents, and bore various popular names. In Spain the rial is now about five cents. In Portugal 40 reis make one rial, but it is never coined. In Spanish America the real has various local values.

Real Estate. See REAL PROPERTY, by PROF. J. N. POMEROY, LL.D.

Real'gar [Fr.], mineral protosulphide of arsenic, a resinous-looking ruby-red or orange-yellow mass, transparent or translucent, and of conchoidal fracture. Its crystallization is monoclinic. It is not found in any American locality. It may be prepared artificially by

melting together 1 part of sulphur and 2 of arsenious acid. Realgar is sometimes used as a pigment. H. WURTZ.

Re′alism, as opposed to nominalism (see NOMINALISTS), is the doctrine that universals (notions of species and genera, such as *man, animal*) have real existences corresponding to them. In the Middle Ages the disputes of the SCHOOLMEN (which see) over the solution of some questions of Porphyry (see PHILOSOPHY) developed this doctrine into sharp contrast with nominalism. The dispute was not an idle one, but involved the all-important theological and metaphysical question of personal individuality. At an earlier period, Boëthius and St. Augustine had been decided Realists; so were all Platonists and Neo-Platonists. In the ninth century John Scotus Erigena and Remigius of Auxerre were Realists, while Hrabanus Maurus and Eric of Auxerre indicated nominalistic proclivities. Roscellinus in the eleventh century boldly announced nominalism, and applied it to the Trinity, making three Gods, but no unity. Realism prevailed against him, if not by argument, then by authority. The great Realists of the eleventh and twelfth centuries were Anselm, William of Champeaux, Gilbertus Porretanus, John of Salisbury; of the thirteenth century, Alexander of Hales, Bonaventura, Albertus Magnus, Thomas Aquinas, and Duns Scotus. Their doctrine was *universalia ante rem* (in God's mind), *in re* (in things), and *post rem* (in man's thought). Although in that age of authority we find most of the Schoolmen adopting and defending tenets with a blind zeal often devoid of any clear understanding, yet to the great thinkers here named must be conceded an insight into the true grounds of this doctrine as held by Plato and Aristotle. That universals are real in a different sense from individual things was held by all true Realists—a point not sufficiently considered by the Nominalists, who objected that one individual cannot be predicated of another individual, using in this the very language of Aristotle (*De Cat.*, cap. v.), who carefully distinguishes the reality of universals (*δεύτεραι οὐσίαι*) from that of individuals (*πρῶται οὐσίαι*). It was held by Realists that individual things are fleeting and transitory; each thing has its history; it originates in some former thing, runs its course of action and interaction with other things, and finally disappears, giving place to another, its successor. Hence, each individual thing is only a momentary phase of some process which has many potentialities; these potentialities it realizes in the series of individual things, each thing realizing some of them. Thus, the process, as embracing the rise and dissolution of many individuals, is generic or a universal; it possesses the potentiality of each thing, and at the same time possesses the reality of each; the reality of each thing is the reality of the universal process which causes it. Inasmuch as it —the process—annuls individual things, and likewise originates them, it includes in itself the total of reality, and is therefore real in a more complete sense than any individual thing. Again, it must be noted that what we call "individual things" are arbitrarily limited phases of processes. Each "individual," so called, is identified by nominalism with only a portion of its history, as it were, for it can be traced by degrees back into another thing, in which it originated, and forward into another, in which it finally disappears. Moreover, it is correlated in space with other things, and it is arbitrary in the Nominalist to assume that he has an individual thing before him when he has only a dependent part of a whole process of interrelated things. Thus, the word "process," to which natural science in our day has arrived (Darwinism teaching that things are to be studied in their history and development, "evolution" and the "correlation of forces" being doctrines of the supreme reality of universals in the shape of a law or "persistent force"), interprets realism, and reinstates it as a more advanced stage of thinking than nominalism. Realism may be (*a*) psychological, holding in regard to artificial things —*e. g. table* or *chair*—that the general notion or name conventionally signifies the purpose or design which creates such things, and therefore corresponds to what reality they possess; (*b*) natural, a realism which recognizes the natural objective processes in nature and mind. Mind is considered immortal as individual (not as a thing), for the reason that it is a total process within one reality; each thinking being has potentially in his mind the universal reason, and is able to realize the same by his own activity. In thus realizing his possibilities by culture and education he does not annul his individuality (as the process of forces annuls things), but rather intensifies his consciousness of self, and deepens his subjectivity by the same act in which he realizes his universality. This doctrine is expressed by Aristotle's "entelechies." First entelechy (self-contained being—"End-in-itself"—entire process in one reality) has all the possibilities and the power to develop them, but has not energized as yet (the man as infant or savage); second entelechy has developed its potentialities through self-activity (the man as cultured, civilized, and enlightened).—Realism, as contrasted with idealism in the school of "common sense," is the theory that we cognize external objects by direct perception instead of by means of interposed ideas. WILLIAM T. HARRIS.

Real Presence. See TRANSUBSTANTIATION.

Real Prop′erty. In the law of the U. S. and of England the term "real property" or "real estate"—for the two expressions are synonymous—is applied to all those species of property where the material objects over which the rights of ownership or of user extend are things real—that is, lands or articles regarded by the law as equivalent to land. (See PROPERTY.) It therefore includes two quite distinct classes of rights—namely, (1) those of ownership or dominion in the land itself, whereby the very corpus of the soil belongs either absolutely or qualifiedly to the proprietor—rights which are denominated by Blackstone and other text-writers on the common law "corporeal," and by the civilian jurists *jura in rem;* and (2) those to use in a certain prescribed manner, or to derive a certain benefit from, the land, which belongs to another as its owner—rights called by the common-law writers "incorporeal," and by the civilians *jura in re aliena.* The first of these classes embraces all estates held in the land itself. The term "land," however, includes not only the soil, but also all those objects which are either actually or constructively attached or affixed to it so as to become in contemplation of the law a part thereof. Thus, the growing trees and perennial plants, except those raised in nurseries for purposes of sale, are parts of the land; and also articles originally movable, but which have been so firmly attached to the soil as to become "fixtures;" and even certain movable articles which constitute necessary portions of buildings, such as door-keys, blinds, millstones, and the like. The manure which is produced on farms is also regarded as forming a part of the land. Annual crops while growing have a double character. They are so far a part of the land that they pass with it by a deed of conveyance which is silent in respect to them; while they are so far things personal that they may be separately sold, and may be seized and sold on execution; when harvested they of course immediately become chattels to all intents and purposes. The second of the classes above mentioned embraces rents, franchises, and the extensive group of rights in or over the land of another person which are collectively known as "easements" or "servitudes." (See EASEMENTS.) Real property is variously divided and classified by the American and English law. In respect to the extent and duration of the interest held by the proprietor, three grades are recognized in this country—estates in fee simple, estates for life, and estates for years; to these the English law adds estates in fee tail. An estate in fee simple is the absolute, unqualified property, and its distinguishing characteristic is its inheritable capacity or its descent to the heirs of the owner who dies intestate. An estate for years or leasehold estate, on the other hand, passes to the administrators or executors of the deceased holder, and in this particular resembles personal property. With respect to the time of its enjoyment, real property is either present or future, and the future interest may be vested or contingent; with respect to the number of the proprietors, it is either several, joint, or common. Finally, real property may be either legal or equitable. A legal estate is an interest of whatever nature or grade created by the common law and protected by the courts of law. An equitable estate is an interest unknown to the common law which courts of equity have created, and which they alone will recognize and protect as property.

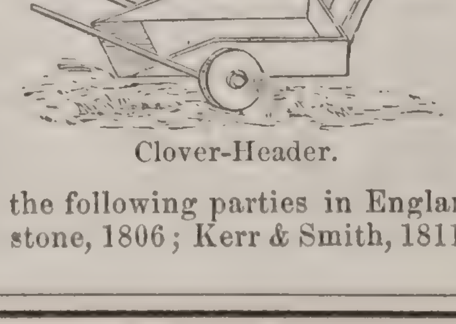
JOHN NORTON POMEROY.

Realschulen, or POLYTECHNIC SCHOOLS (which see).

Realty. See REAL PROPERTY, by PROF. J. N. POMEROY, LL.D.

Reaping and Mowing Machines. The first account of reaping-machines is given by Pliny the Elder (A. D. 23), who describes as used in Gaul a cart with a series of stationary projecting combs in front, which cut, or rather tore off, the heads of grain, only leaving the straw standing. An account of the continued use of the same kind of machine was given by Palladius (A. D. 391). This machine is similar to the modern clover-seed header, shown in Fig. 1. The first English patent for a reaping-machine was granted in 1799 to Boyce. Attempts were made to build reaping-machines by the following parties in England: Plucknett, 1805; Gladstone, 1806; Kerr & Smith, 1811; Dobbs, 1814; Scott, 1815;

FIG. 1.

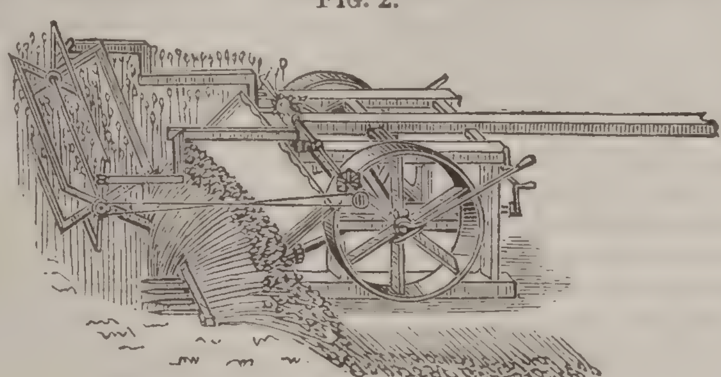


Clover-Header.

Ogle, 1822; Thomas and Joseph Brown, 1823; and in America by French & Hawkins, 1803; Comfort, 1811; Ten Eyck, 1825; Cope & Hoopes, 1825; Manning, 1831. Prior to 1832 there were granted in the U. S. only eight patents for machines for cutting grain. No inventor, however, succeeded in producing machines which possessed sufficient practical merit to be used otherwise than experimentally until we come to Bell, Hussey, and McCormick, whose machines are described below. The Hussey cutter is in universal use to this day. A modification of Bell's moving platform is still largely used in harvesters. McCormick's platform, arranged for delivery behind the horses, is also largely used with Seymour's improvement. Since the introduction of Bell, Hussey, and McCormick's machines the number of patents for harvesting-machines in the U. S. has constantly increased, and had reached in 1874 the number of 4500.

The first successful reaping-machines were so organized that the cut grain should be deposited in gavels on the ground. The essential parts of a reaping-machine are the gathering device, the cutting apparatus, the table or platform to receive the cut grain, and an arrangement for depositing the grain in gavels on the ground. In the order of invention and reduction to practical use reaping machinery preceded mowing machinery. The Rev. Patrick Bell built and tried a reaping-machine in Scotland in 1828 and 1829, composed of a reel to gather the standing grain to the cutters, a series of scissors projecting in front to cut the grain, and an inclined endless apron to receive the grain and carry it to the ground at one side. This machine was used from 1828 to 1832 in Scotland, and one was imported and tried by John B. Yates at Chittenango, N. Y., in 1835. Bell's machine again appeared in competition with Hussey & McCormick's in England in 1853. It is shown in Fig. 2.

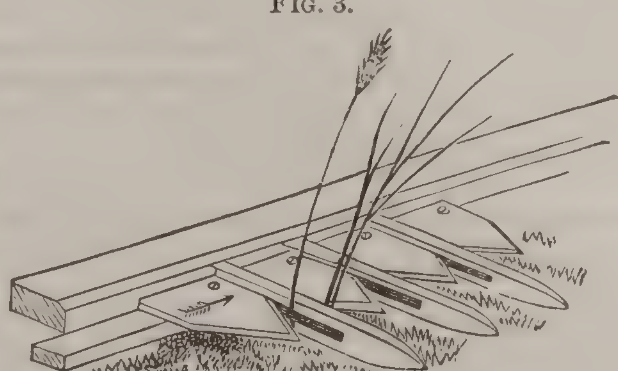
Fig. 2.



Bell Machine.

Obed Hussey in 1833 invented a cutting apparatus, which, with a slight improvement made by him four years later, has since been universally adopted in this country and throughout Europe. It consisted of a vibratory zigzag or scolloped sickle sliding through double fingers, which sustained the grain or grass above and below the sickle, as shown in Fig. 3. Hussey's first machine was

Fig. 3.



Hussey's Cutter.

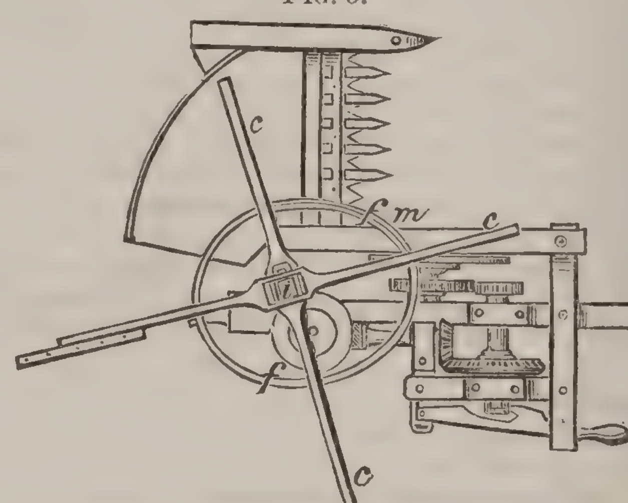
tried in Hamilton co., O., in 1833, and patented in the same year. C. H. McCormick, formerly of Virginia, but now of Chicago, patented in 1834 a reaping-machine which he further improved, as described in patents granted to him in 1845 and in 1847, and it came into large practical use. McCormick's machine, as thus improved, is shown in Fig. 4. The main features were the reel to gather the grain, in combination with the platform to receive it, and a raker's stand to support the man while he raked the grain off the platform at intervals. McCormick adopted Hussey's cutting device. Hussey's machine had a platform and support for the raker, but so arranged that the grain was raked directly backward. The next improvement in reapers was introduced by Seymour of Brockport and Palmer & Williams in 1851. This consisted in making the grain platform of a quadrantal shape and in adding a vibrating automatic rake, which discharged the grain automatically from the quadrant platform. In 1856,

Fig. 4.

McCormick's Machine.

Dorsey of Maryland dispensed with the old reel, and adapted to the quadrant-shaped platform a continuously revolving rake and a series of continuously revolving beaters, so arranged that while the beaters and rake brought the grain to the cutter and platform, the rake continued to follow the cut grain on the platform, and deposited it in gavels on the ground, as shown in Fig. 5.

Fig. 5.



Dorsey's Machine.

In 1865, Samuel Johnston of Brockport, N. Y., improved the Dorsey rake by pivoting each revolving radial-reel-arm separately, and placing rake-teeth in each arm; and by employing a double guideway, part of which was movable, the driver was enabled at pleasure to cause any one of the four revolving arms to descend on to the platform and rake off the grain. This machine is now largely adopted here and in Europe. It is shown in Fig. 6, ap-

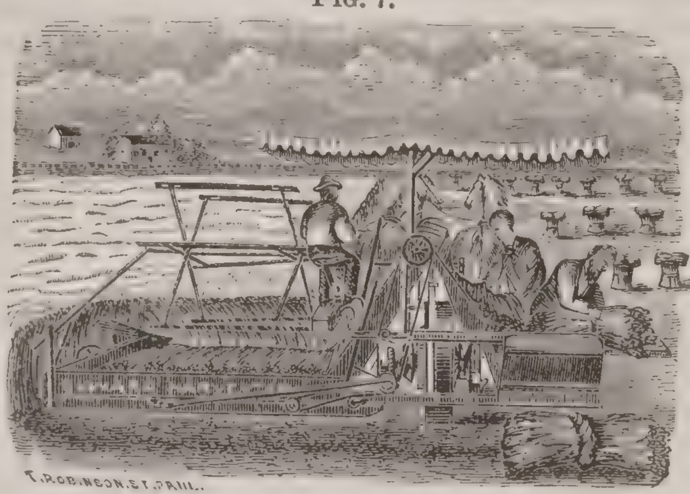
Fig. 6.

Johnston Rake.

plied to a Buckeye machine. Various modifications of Dorsey & Johnston's rake have been made within six years past, and several other forms of rake, known as Wood's chain-rake, Miller's table-rake, McCormick's rake, Osborne & Kirby's rake, Burdick's rake, have been introduced and largely manufactured for this country and Europe. The Champion machine is extensively manufactured with the Johnston rake, and with numerous improvements invented by W. N. Whitely. C. W. and W. W. Marsh invented and patented a machine in 1858 which carried upon it the

binder, and in which the cut grain was received on an endless apron and carried thereby to a secondary apron, which carried it to a stand on the machine, where the binders while riding along bound it into tight bundles and threw it off. (See Fig. 7, which represents Elward's improve-

Fig. 7.

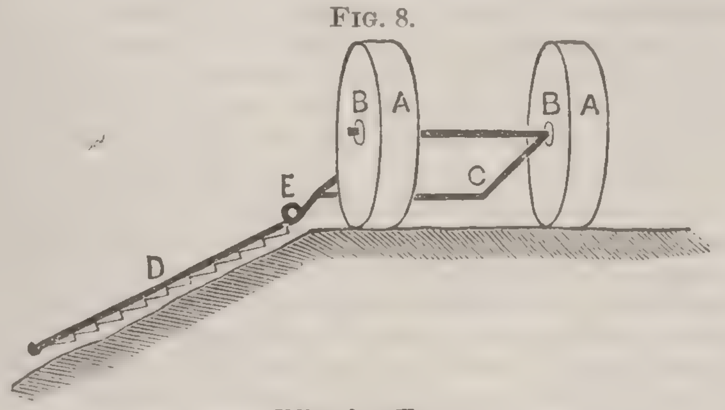


Elward Harvester.

ment built by St. Paul Harvester Co.) This and the Marsh harvester have gone into very extensive use in the Western States. A large number of patents have been lately granted for automatic attachments to the Marsh machines, which dispense with the necessity of the binder's riding, wire or cord being applied automatically. No one of these automatic binding-machines has up to 1876 gone into general successful use. Seiberling invented about 1856 a vibrating platform composed of slats which automatically dropped the grain at intervals on the ground behind the cutter known as the "dropper."

Mowing-machines employ the Hussey cutting apparatus, but have no receiving platforms or tables, the grass falling as cut. The three principal types of mowing-machines in use have two supporting wheels, and they differ as to the organization by which their cutting apparatus is conformed to inequalities in the surface of the ground. (1) Wheeler's type was invented in 1854, illustrated in Fig. 8,

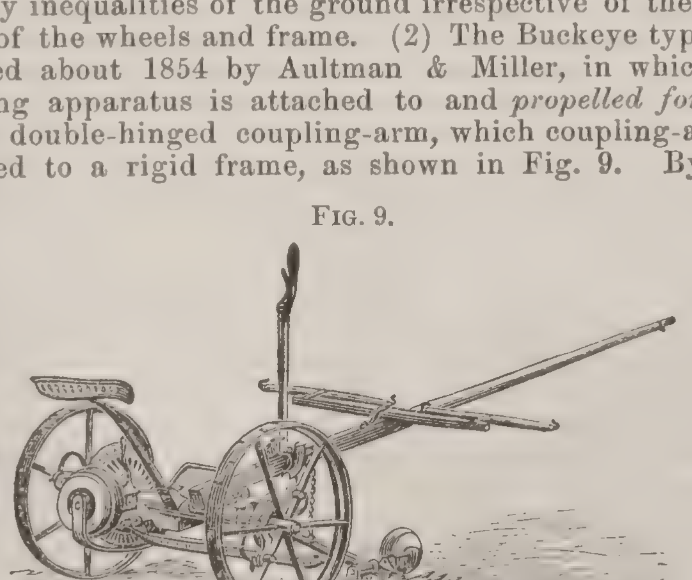
Fig. 8.



Wheeler Type.

by a vibrating frame C with a cutter D hinged to one corner of the said vibrating frame, by means of which double vibratory action the cutting apparatus can conform to any inequalities of the ground irrespective of the position of the wheels and frame. (2) The Buckeye type, invented about 1854 by Aultman & Miller, in which the cutting apparatus is attached to and *propelled forward* by a double-hinged coupling-arm, which coupling-arm is hinged to a rigid frame, as shown in Fig. 9. By this

Fig. 9.



Buckeye.

arrangement the cutting apparatus can freely follow the inequalities of the ground. (3) The Ball type, consisting of a double-hinged coupling-arm connection to the main frame, and a hinged or swivelling drag-bar to drag the cutter-bar forward. Ketchum & Kirby invented one-wheel mowers which have had much popularity. The latter continue to be largely made and sold.

George Harding.

Reappearance, the coming back to sensible perception of anything which had previously disappeared from it. That many physical phenomena wholly disappear to us, and yet reappear, or can be made to do so under certain conditions, is a fact of every day occurrence. The solar spectrum is a striking instance of reappearance; the different-colored rays in a beam of light lose their visible identity, and appear as one ray; but by means of a prism the colorless beam is resolved, and each ray reappears in its own hue. Hereditary physical and mental traits and tendencies not unfrequently disappear in one generation, and reappear in some succeeding one. So, what we call force is in many cases only the reappearance in another form of one, the manifestation of which had been interrupted or had escaped our observation. The vital force of a plant becomes latent in the seed, only to reappear in a succeeding plant and in successive generations of its kind. Philosophers have even gone so far as to affirm that no impression made upon matter or mind is ever obliterated—that, for example, every image thrown upon the retina of the eye always remains there. It is certain that innumerable mental impressions, of which the individual had apparently no after consciousness, or had wholly forgotten, reappear after intervals of indefinite duration. Sometimes they are called up by a chain of associations of which we can trace the several links, and sometimes by causes which utterly elude our observation. A very common example of this is in the case of aged persons, in whom the recollection of long-forgotten incidents of childhood reappears with the utmost vividness. Coleridge refers to a case where an aged peasant-woman, when suffering from severe sickness, would utter words and sentences in an unknown tongue, which were written down and found to be Greek and Hebrew. It was learned that in youth she had been a domestic in the service of a clergyman who was in the habit of reading aloud passages of the Scriptures in the original tongues as he walked up and down his study, and these had remained impressed upon the mind of the ignorant peasant-woman, to reappear after the lapse of years. Instances are upon record in which persons apparently on the point of sudden death have survived, who state that every incident of their past lives reappeared before them, as though seen in a mirror. The well-authenticated case of the Rev. William Tennent is a striking example of the disappearance and reappearance of mental impressions. He had nearly completed his theological studies when he fell into an illness which resulted in apparent death, but the somewhat singular appearance of the body caused the burial to be postponed for a week. He was finally brought back to life, but was in knowledge a mere infant; all that he had learned had disappeared, and he had to be taught to speak, to read, and to write. Suddenly occurred what he described as a shock in the head, and in a little time all his former knowledge came back to him, and he resumed existence as he was before he fell into the trance.

Rea'son [*ratio*, from *reor*, to "calculate" or think], in its first or most general signification, the conscious intelligence of man as contrasted with the instinct of brutes. In this sense stress is laid on the ability to adapt means to ends. From it are derived the expressions "reasonable" and "according to reason"—*i. e.* according to a proper regard for the adaptation to ends; "rational," meaning correct appreciation of this adaptation; "irrational," lacking such appreciation. Its second signification is that of ground—the "reason why anything is or is done." This includes (*a*) the ground as motive of action, (*b*) as efficient cause or "sufficient reason." Aristotle's formal cause (τὸ τί ἦν εἶναι), the ideal totality of the possibilities of a thing within which exists mutual adaptation of parts, is the distinction upon which rests this and the former use of the term "reason." The verb "to reason," in the sense of to argue or adduce grounds, also the noun "ratiocination," come from the second meaning. The third use of the words is as an equivalent of Aristotle's νοῦς: (*a*) νοῦς ποιητικός, *actus purus*, active or divine reason, the thinking occupied with creating and contemplating divine ideas; (*b*) νοῦς παθητικός, passive reason, including the activities of the mind in mere feeling or desire, sense-perception, imagination, and reflection. This "active reason" is nearly what Victor Cousin calls the "impersonal reason," that to which "we owe the knowledge of universal and necessary truths, of principles which we all obey and cannot but obey"—"the light that lighteth every man that cometh into the world." The fourth meaning of "reason" is akin to that of "active reason," and distinguishes it from "understanding." Kant, its author, makes the latter deal exclusively with the results of sense-perception, while reason deals with the supersensuous. With him, reason (*Vernunft*) is not a faculty of cognition, but only "regulative" of the practical conduct of life. Hegel and others restored it to its function of highest faculty of cognition, but preserved its function as practical, inasmuch as they make it to be the recognition of universal and necessary

principles, not in a mere abstract sense, but as realized in the institutions of civilization, including under this head family, society, state, art, religion, and science.

WILLIAM T. HARRIS.

Réaumur′, de (RENÉ ANTOINE FERCHAULT), b. at La Rochelle, France, Feb. 28, 1683; educated in the Jesuits' college at Poitiers; studied law at Bourges; settled in 1703 at Paris; devoted himself with great enthusiasm to the study of natural history, physics, and mathematics; attracted much attention by some mathematical essays; became a member of the Academy in 1708; received a pension of 12,000 livres a year from the government for his *L'Art de convertir le Fer forgé en Acier* (1722), by which he first made his countrymen acquainted with the art of making steel of iron. D. Oct. 18, 1757. Of his numerous discoveries and inventions, the thermometer (1731), dividing temperature from the freezing to the boiling of water by a scale of 80°, is still in use; also, the so-called Réaumur's porcelain is employed for many purposes. Of his works, the most remarkable is *Mémoires pour servir à l'Histoire naturelle des Insectes* (6 vols., 1734–42).

Re′bec, a musical instrument introduced by the Moors into Spain, whence its use spread over Europe. It was a sort of violin, and was of various sizes. From the neck it grew larger until the base was reached. It was played with a bow. It was one of the precursors of the violin. Similar instruments were anciently in use among the Celts, Slavi, and many Asiatic peoples.

Rebellion. See CONFEDERATE STATES, by HON. HORACE GREELEY, LL.D.

Récamier′ (JEANNE FRANÇOISE JULIE ADELAÏDE), b. Dec. 4, 1777, at Lyons; married in 1793 a Paris banker, M. Récamier, three times her age; bought in 1798 the Hôtel Necker, and gathered, during the time of the Directory and Consulate, a most brilliant circle around her, which even aroused the jealousy of Napoleon. On account of the sudden collapse of M. Récamier's business in 1804, she left Paris, and resided for some time at Coppet with Madame de Staël. Here she met with Prince August of Prussia, and his marriage proposals form a very curious episode in her life. In 1815 she returned to Paris, and although new pecuniary reverses compelled her to keep a rather modest establishment in the Faubourg St. Germain, her salon became nevertheless very soon the rendezvous of the most gifted and finest developed spirits of Paris, and continued so till her death, May 11, 1849. One of her most faithful worshippers was Chateaubriand, who, after the death of his wife in 1846, even proposed to marry her. (See his *Mémoires d'Outre-Tombe*, vols. viii.–x.) Personally, she was in the highest degree fascinating and perfectly blameless, but her salon was at various times the focus of political, religious, and literary intrigues which have occasioned some very severe criticism. (See Mad. Lenormant, *Souvenirs et Correspondance tirés des Papiers de Madame Récamier* (2 vols., 1860), and *Madame Récamier, les Amis de sa Jeunesse* (1872), both translated into English by Isaphene M. Luyster (Boston, 1867 and 1875).)

Recana′ti, town of Italy, province of Macerata, 8 miles S. W. of Loreto, on a hill about 900 feet above the sea. The adjoining country is very productive, the grapes and figs being of the finest quality. Picturesque fragments of the old town walls and gates are still standing, and the churches, convents, and other public buildings in and near the town—some of them very ancient—are well worthy of notice. The Palazzo Communale contains some important old lapidary inscriptions, and on the façade is a bronze representation of the translation of the Holy House to Loreto. The educational and charitable institutions of this town are very respectable. Recanati (*Recinetum*) was built in the fifth century on the ruins of the ancient *Recina*, which had been destroyed by the Goths, and it was a strong fortress in the time of Belisarius. It plays no unimportant part in Italian mediæval history, having been the theatre of long and desperate conflicts between popes and emperors. It was sacked by the French in 1799. P. in 1874, 19,570.

Recap′ture [Lat. *re*, and *capere*, "to take"] is recovery of a captured vessel by a cruiser of the same nation or of an ally before any sentence of a prize-court of the captor's sovereign has decided upon the validity of the capture. Before sentence, by which the ownership of the captured vessel is determined, if retaken, it goes to the owner; after such sentence, if retaken, it goes to the captor. The captor in the first of these two cases is entitled to a reward. (See SALVAGE.) T. D. WOOLSEY.

Rec′co, a pretty Italian town in the province of Genoa, on the Riviera. Its little harbor was formerly defended against the corsairs by two small castles, and it still serves for the immediate coast-trade. P. 5150.

Receipt′ [Lat. *receptum*, "received"], a written acknowledgment of the payment of money or the delivery of chattels executed by the creditor or the one to whom the payment is made, and given to the debtor or the one by whom it is made. A simple receipt may always be used as evidence against the person who gives it or his representatives, for it operates as an admission that the facts therein stated are true. It is not, however, conclusive evidence; it does not necessarily act as a release and discharge the pre-existing obligation; it is only *primâ facie* evidence of the payment or delivery which it relates, and, like any other mere admission by a party, it may be explained or contradicted by oral proof. It is not embraced within the operation of the general rule that a written instrument cannot be qualified or contradicted by verbal evidence, since it is not an instrument, but simply an admission. The party giving such a receipt may therefore always show the circumstances under which it was executed, and not only that it was obtained through mistake or by fraud, but also that no money was actually paid or property delivered to him according to its terms. A receipt which purports to be in full of all demands, or which acknowledges payment of a certain sum in full of all demands, or which contains language of like import, possesses a somewhat higher and more binding character. It implies an adjustment of accounts, a settlement of disputed claims, an ascertainment of the balance due and the payment thereof. Although such receipts are, in the absence of fraud or mistake, generally conclusive, yet their effect may be overcome by showing fraud or such a mistake as would invalidate the settlement itself which they presuppose. When a receipt is more than a simple acknowledgment of payment, and contains in addition thereto a contract between the parties, it comes within the operation of the general rule above mentioned in relation to all written instruments; it is an instrument in writing, and cannot be contradicted or qualified by oral evidence. The admission which it contains is absorbed in the agreement, and the entire writing is governed by the doctrines applicable to contracts in general.

JOHN NORTON POMEROY.

Receiv′ers. In a large class of equitable actions brought to determine the rights of the litigants in certain specific property, either real or personal, where it would be improper that either of the claimants should have the exclusive possession during the controversy, and especially where, from the nature of the subject-matter, it is necessary, or even expedient, that some indifferent person should be placed in charge thereof until the final judgment is rendered, the court theoretically assumes this custody and oversight; but since it is impossible for the judge to act personally in such a capacity, an agent or representative is appointed for that purpose, who, as a special officer of the court, takes possession of the fund, becomes vested with its ownership as a trustee, is empowered to do whatever may be necessary for its security and preservation, and finally disposes of it according to the directions given by the court in its decree. Such an officer is termed a "receiver," and he and his functions have long been recognized as ordinary features of equity procedure. Statutory legislation has also provided for the appointment of receivers under special circumstances which were beyond the ordinary jurisdiction of equity. One of the most familiar instances of receivers in equity occurs in suits brought by one partner against his copartners to obtain a dissolution of the firm and a winding up of its affairs. In such an action a receiver is appointed almost as a matter of course to take possession of the partnership assets, to collect the claims due, to ascertain and discharge the liabilities, and to distribute the surplus among the partners according to the directions given by the judgment. Another very common case is the "creditors' suit," brought to reach the property of a judgment debtor which cannot be taken on execution, in which a receiver is appointed to collect in and take possession of such assets in order that they may be applied in discharge of the judgment against the defendant. The principle of which these cases are illustrations is one of wide application, and extends to all equitable actions of which the subject-matter is a fund or property in which both parties are interested, and which cannot properly be left in the exclusive possession of either, nor in the joint possession of both. In these classes of suits the receiver is generally appointed by an order of the court made on the application of either party at the commencement of the litigation or at any time during its pendency. Of the special cases provided by statute for receiverships, the most important is the winding up of insolvent corporations. By a system of legislation adopted very generally among the different States, when a business corporation becomes insolvent any person interested therein as a stockholder or a creditor may apply to a specified court

by a summary proceeding and procure the nomination of a receiver, who thereupon becomes vested as a trustee with the corporate assets and all the powers necessary for the winding up and settlement of the company affairs. By the system of procedure which prevails in many States receivers may also be appointed over the property of judgment debtors against whom an execution has been returned unsatisfied, to the end that such property may be collected, converted into money, and applied in payment of the judgments. The functions of all these receivers are substantially the same, except that the powers and duties of those provided for by statute to wind up insolvent corporations are generally defined and regulated by the legislation itself with much care and precision. Every receiver is an officer of the court, and acts under its direction in all his proceedings. He obtains its authority to commence all actions, and no suit can be brought against him without its permission. He is a trustee for all the parties interested in the property or fund, and as such is bound to use the utmost good faith and reasonable care, diligence, and skill in all his transactions. As trustee he is vested with a legal estate in the assets over which the receivership extends, which in some instances arises by operation of law, and in others from an assignment made by the parties. By virtue of this ownership he takes possession of the fund, brings all actions in his own name necessary to secure it or to recover it or any portion of it from the possession of others, or to collect the demands owing to it; he settles and discharges the liabilities due from it; in short, he does any act which an owner may do so far as may be necessary for the purposes of the trust and to preserve the rights of all those who are ultimately interested. He is, however, in all these proceedings guided by and accountable to the court, and often must, and always may, procure its special authority before taking any important step.

JOHN NORTON POMEROY.

Recent Period, a geological term intended to designate that portion of geological history which includes the present time, and reaches back to the Quaternary, or Drift Period. Throughout the Recent Period the aspects of nature, both as regards the organic and inorganic worlds, have remained essentially the same, but minor changes have been constantly going on that serve well to illustrate and explain the manner in which the globe has been revolutionized in past ages. These changes consist in the elevation and depression of coast-lines, the scooping out of valleys, the draining and filling of lakes, the outbursts of volcanic matter, and the extinction of certain kinds of animal and vegetable life. Among the latter may be mentioned the dodo, the solitaire, the great auk, the gigantic turtles of Mauritius, etc. It has been said that no species of animals or plants have been known to originate in the Recent Period, but permanent varieties have been produced by derivation from other forms, and these, if their history had not been known, would have been regarded as species of independent origin.

Re′chabites [Heb., "horsemen"], descendants of Rechab, the father or ancestor of Jonadab, a branch of the Bedouin Kenites, who entered Palestine with the Israelites. The Rechabites were strict abstainers from wine. They built no houses and sowed no grain, but dwelt in tents. In recent times attempts have been made to identify them with the Beni Khaibir, an Arabian tribe. There is a secret society of total-abstinence men and women in the U. S. and Great Britain known as the Independent Order of the Rechabites.

Recife. See PERNAMBUCO.

Recip′rocal [Lat. *reciprocus*]. The reciprocal of a quantity is the quotient of 1 by that quantity; thus, $\frac{1}{2}$ is the reciprocal of 2. A *reciprocal equation* is an equation whose form remains unchanged when the reciprocal of the unknown quantity is substituted for the unknown quantity itself.

Recitative′ [It. *recitativo*], in oratorios, operas, etc. a kind of musical reading or declamation resembling ordinary speech in time and accent, but differing from it by a strict adherence to the tones of the musical scale. The recitative is usually confined to such words as pertain to narrative, description, passion, and declamation. In ordinary recitative the rate and style of utterance are chiefly dependent on the discretion of the vocalist, sustained by an accompaniment of only a few plain chords; but in recitative with full accompaniment a more strict observance of musical time is required, although the rhetorical or declamatory character of the recitation is still to be retained.

WILLIAM STAUNTON.

Reclus′ (JEAN JACQUES ELISÉE), b. at Ste. Foy la Grande, department of Gironde, France, Mar. 15, 1830; was educated in Rhenish Prussia, and studied in Berlin under Karl Ritter; travelled from 1852 to 1857 in England and America, and published after his return to Paris a number of valuable geographical works, partly in the *Revue des Deux Mondes*, partly in book-form, of which the most prominent are *The Earth* (2 vols., 1867) and *The Ocean, Atmosphere, and Life* (1872; translated into English by B. B. Woodward, New York, 1871 and 1872). Of his *Nouvelle Géographie universelle* the first part was published in 1875.

Recluse′ [Lat. *reclusus*, "shut up"], in strict language, designates a monk or nun who from choice is retired from communication even with members of the same order. The secluded person sometimes adopted this life by way of penance, sometimes as a means of spiritual progress. No one could be thus secluded without permission. The recluse was locked up and the door sealed in the presence of a superior officer, and could only be unlocked by the command of a bishop.

Reco′aro, town of Italy, province of Vicenza, near the sources of the Agno, on the border of the Trentino. The medicinal waters here have a great reputation, the various springs possessing different properties, and the number of annual visitors is from 8000 to 10,000. P. 5700.

Recog′nizance [Fr. *reconnaissance*], an obligation entered into before a court or an officer duly authorized, and made a judicial record, containing a condition or stipulation that some particular act therein specified shall be done. It resembles a bail-bond in its design, and partially in its effects, but differs from such an instrument in being a record of the court, so that upon default it can be enforced by a direct proceeding without any action brought and judgment recovered upon it, since it is itself a species of judgment. It should be observed, however, that in modern legal nomenclature the term "recognizance" is sometimes applied to ordinary bail-bonds, upon which suit must be prosecuted and judgment obtained. At the common law the recognizance, in its original and proper signification, was employed both in civil and in criminal cases, but in the U. S. its use is now chiefly confined to the criminal procedure. In civil cases the persons entering into a recognizance were the debtor himself or bail or sureties, who became thereby bound in a certain sum upon the condition that they should pay the debt and costs recovered by the plaintiff in the contingencies specified. In criminal cases the parties entering into it are also bail or sureties, who become bound in a certain amount with the condition that the person accused shall appear before the court at the proper time to answer the charges made against him, or that he will keep the peace. Upon a breach of the condition the recognizance becomes in effect a judgment against the parties who are bound, and is enforced by direct process against them without suit. In many States bail-bonds are now used in place of recognizances to effect the same objects through the means of sureties, who, upon default, become liable to suit and judgment as in the case of any other written undertaking. JOHN NORTON POMEROY.

Rec′ollet Friars and **Nuns,** a name usually applied to one of the congregations of Franciscans of the strict observance, but sometimes designating reformed bodies of other orders. A congregation of Augustinian Recollets dates from 1530. The Franciscans who bear this name are especially those of the French congregation, founded in 1592 by the duke of Nevers, Louis de Gonzaga (1539–95).

Recon′naissance [Fr. *reconnaissance*], a preliminary or rough survey of a portion of country. A reconnaissance may be geologic, civil, or military. A civil reconnaissance may be undertaken for the purpose of selecting suitable points for trigonometrical stations preparatory to a geodesic survey; for ascertaining the relative advantages and disadvantages of two or more routes preparatory to locating a line of railroad, canal, or aqueduct; or for the purpose of acquiring a general idea of the features of an unexplored country. A military reconnaissance may be undertaken to ascertain the military resources of a tract of country; for determining the best line of march for an army; or for obtaining information in regard to the military character of a defile, of a crossing, or of a position of defence. The information obtained by a reconnaissance is usually embodied in a map and an accompanying memoir. The map is intended to show the general topographical features of the country examined, and the memoir is designed to supply such information as cannot be presented by the map. Both the map and the memoir vary in character according to the object to be attained. In reconnoitring for the purpose of opening or extending a geodesic survey, one of the most important objects is to make a judicious selection of points to be used as points of reference, called triangulation points. These points are to be chosen so that the triangles formed by joining them shall be well conditioned—that is, shall have no very acute

angles; so that as many as possible shall be visible from each station; and for the primary triangulation the triangles should be as large as possible, their sides gradually increasing in length from the base up to the longest admissible line. In reconnoitring for the location of a railroad the objects to be attained are to find the most direct route between the points to be connected, with the most uniform grades and the fewest curves. Attention should also be paid to the facilities for construction and the convenience of operating the road. In locating a line of communication between two points due regard should be paid not only to the accommodation of the inhabitants at the extremities of the line, but also to the convenience of the greatest number of people along the general direction of the route. In reconnoitring for the purpose of determining the prominent features of an unexplored country two sets of operations are generally carried on by the same party: *First*, a system of astronomical observations for fixing the latitudes and longitudes of the principal points of the country; and *secondly*, a running survey, intended to fill in the astronomical outlines. To this class belong the numerous surveys that have been made during the last thirty years in the Territories of the U. S. lying to the W. of the Valley of the Mississippi. In reconnoitring for military purposes, the general object to be aimed at is to acquire a knowledge of the principal lines of communication, the obstacles which they present to military movements, the character of the roads to be traversed and of the streams to be crossed, the nature of the marshes, swamps, defiles, and mountain-passes, the general resources of the country; in fact, to gather all the information that may be of use to the commanding general. In all cases the materials from which the map is to be constructed are of the roughest character. Angles are usually measured with a pocket-sextant or a pocket-compass, distances are determined by estimation or by the time required to traverse them, distant points are laid down by intersection of lines whose directions are determined by the compass, and slopes are judged of by the difficulty of ascending them. In the more extended reconnaissances previously alluded to, distances are frequently determined or checked by a *viameter*, an instrument attached to a wagon-wheel, and so constructed as to record the number of times the wheel revolves in passing over a certain line. The information obtained is recorded in the field, and the principal features of the map are plotted down or sketched as the survey progresses. Of course the value of a reconnaissance depends in a great degree on the skill and ability of the person who makes it. W. G. PECK.

Rec'ord [Lat. *recordari*, "to call to mind"]. The term *record*, when used alone, primarily denotes the written account or history of the successive important proceedings had in an action or suit brought in some one of the higher courts, including the process by which the defendant is summoned, his appearance, the pleadings, the issue joined, the continuances or postponements (if any) from time to time, the summoning and empanelling of the jury, the submission of the issue to them, their verdict, and the judgment of the court thereon. In England the records of the three superior courts of law are kept upon long pieces of parchment, which are rolled up as fast as written over, and are therefore technically called the "rolls." The practice of entering the history of a suit by the clerks of the law-courts upon these parchment rolls commenced at a very early period of the English judicial history, and the language of their records still continues to be used in the present tense, as though the accounts were actually taken down in open court while the transactions themselves are going on. Such, at least, was the method in vogue down to the time when the radical changes in the procedure went into operation in the year 1875. The analogous proceedings in courts of equity are also records. In the U. S. paper has been universally substituted in place of parchment, and the external form of the judicial records in this country differs widely from that which existed in England; their substantial character, objects, and effects, however, are the same. In England and in many of our States the record is wholly made up and composed by officers of the court. In some of the States, however, a great laxity prevails in the practice; the process, pleadings, judgment, and other important papers in an action are simply attached together and filed in the proper office, and they constitute the entire record of the judicial proceeding. Even this careless and slovenly work is actually done by the attorneys, and not by the clerical officers. The effect of a record is remarkable. It is the highest species of evidence known to the law. It imports absolute verity, and is a complete proof, admitting no contradiction of the statements therein contained. A record is therefore said to prove itself; its own averments are taken as the best evidence of the facts which they narrate. Although commonly referring to judicial transactions, the term is also used in connection with legislative proceedings. The acts of Congress and of the State legislatures, duly authenticated and filed in the offices of the secretaries of state, are records of the highest character, possessing all the attributes which belong to the judicial records above described. The journals kept by the clerks of the national and the State legislatures also possess, to a certain extent at least, the same quality. By a system of legislation prevailing in all the States, deeds, mortgages of land, and other muniments of title may be made records for certain prescribed purposes. (See RECORD OF CONVEYANCES.)

JOHN NORTON POMEROY.

Recording of Deeds. See RECORD OF CONVEYANCES, by PROF. J. N. POMEROY, LL.D.

Rec'ord of Convey'ances. The practice of recording conveyances is a striking feature of the American law and social customs. It is true that certain English statutes have provided for a partial registration of deeds and mortgages in two or three counties or parts of counties, but the very principle of public records is opposed to all the tendencies of British society and the habits of thought of the British landed proprietors. By the system of legislation adopted by all the States an officer is appointed in every county whose duty it is to record all conveyances brought to him in books which are open to the public inspection, and which are provided with alphabetical indexes of the grantors and grantees, mortgagors and mortgagees, etc., so as to facilitate the examination thereof by persons interested. All deeds of conveyance, leases for more than a specified term, mortgages of land, assignments of mortgages, and other muniments of title may be recorded at the instance of the parties holding the same. In order that an instrument may be thus recorded, it is generally made a requisite that the same should have been duly acknowledged by the party executing it before some designated officer, and that his certificate of such acknowledgment should have been attached thereto. The object of the record is to protect the holder of the conveyance or incumbrance against other conveyances or incumbrances of the same premises made by the same owner, and to give notice to all persons having occasion to ascertain whether there has been any prior deed or mortgage of the same estate. In order to effect this purpose, the general provision of the legislation is that every conveyance or mortgage not so recorded shall be void as against any subsequent purchaser or incumbrancer in good faith and for a valuable consideration of the same real estate or any portion thereof, whose conveyance or incumbrance shall be first duly recorded. Between the immediate parties to a deed and their heirs and devises its validity is not at all affected by a failure to record. The same is generally true of mortgages, although in a very few States their lien is postponed unless they are left for record within a certain prescribed time after execution. It is also a general principle that the record is a constructive notice only to subsequent purchasers or incumbrancers of the same lands—that is, to all persons claiming the same land or a portion thereof or a lien thereon by means of a subsequent purchase or mortgage from the same grantor or mortgagor. It is not, therefore, a notice to persons whose rights accrued prior to the execution of the instrument recorded, but only to those whose rights accrued subsequent thereto. The result of this doctrine is that successive mortgages of the same premises made by the owner to different mortgagees, and by them put on record, take effect and become valid securities in the hands of such holders from the time of their recording, and according to the priority thereof, in the absence of any actual or constructive notice derived from sources other than the record itself. The same is true of successive deeds of the same land given by the same grantor to different grantees. No record of any instrument is a constructive notice unless it is authorized by law, nor unless all the requisites prescribed by law have been complied with, nor unless it is made in the manner and form provided by the statute; and the record itself also determines the extent of the notice which it conveys. In most of the States an instrument which has been properly recorded can be offered in evidence in any judicial trial without further proof of its execution, and in many of them the record itself has the same force and effect of evidence as the original would have were it produced. In construing the statutory language above described, and especially the words "in good faith," the courts have settled the doctrine in a very large majority of the States that an actual notice of a prior unrecorded deed or mortgage given to a subsequent purchaser or incumbrancer has the same effect on his rights of priority as the record of such prior instrument would have had. It follows that the party who first places his subsequent deed

or mortgage on record, having at or before the same time received notice of a prior unrecorded conveyance or incumbrance of the premises, does not acquire a precedence for his own, but is left in exactly the same situation as though the prior grantee or mortgagee had also obtained the prior record. This interpretation of the statute is highly just and equitable, and is based upon the plain intent of the entire legislation. What will amount to such a notice is a question which has been much discussed. The general principle may now be considered as settled, however, that the knowledge of any circumstances sufficient to put a reasonable man upon an inquiry, when such inquiry, if reasonably followed up, would lead to a discovery of the actual facts, is a sufficient notice to satisfy the requirements of the rule. Probably no single doctrine of the American law of real property has done so much to quiet titles, to render the transfer of land easy and inexpensive, and to prevent litigations between adverse claimants, as this system of recording, which to the American proprietors and lawyers is so simple and necessary, but which the English land-owners are so unwilling to adopt. JOHN NORTON POMEROY.

Record'er, an ancient form of the flageolet, having a rather wide open extremity, and a soft, agreeable tone of high pitch.

Recoup'ment [Fr. *recouper*, to "cut off"], a species of defence in actions brought to recover damages for the non-performance of a contract, whereby the defendant alleges that he has himself sustained damages by the plaintiff's breach of the same contract, or by the plaintiff's fraud in procuring him to enter into it, which he seeks to cut off or "recoup" from the amount that would otherwise be recovered against him. The doctrine of recoupment has become established by judicial decision both in England and in the several States of this country, although there are some slight differences in the extent to which it has been carried by the various courts. Like the defence of set-off, it is confined to actions upon contract, and must itself arise from contract, but here all resemblance ends. A set-off must be for a debt, a certain fixed sum; recoupment is of damages often entirely unliquidated: a set-off is necessarily a demand arising upon a different contract from the one in suit; recoupment is necessarily of damages arising from a breach of the very same contract sued upon; in set-off the defendant may sometimes recover a balance from the plaintiff; in recoupment this can never be done. The doctrine, as generally settled throughout the U. S., was clearly and briefly stated by an eminent judge in the following manner: "It cannot be denied but that, in an action for a breach of contract, the defendant may show that the plaintiff has not performed the same contract on his part, and may recoup his damages for such breach in the same action, whether they were liquidated or not, or may at his election bring a separate action." Recoupment, however, can only be used as a defence, and can do no more at most than defeat the plaintiff's recovery; even if the defendant's damages should exceed those of the plaintiff, he can have no judgment for such excess. In this last-mentioned particular the doctrine of recoupment has been greatly enlarged by the reformed American system of procedure prevailing in many of the States, which permits the defendant by means of a counter-claim to recover an affirmative judgment for damages against the plaintiff when the grounds for such recovery have been established by the proofs.

JOHN NORTON POMEROY.

Recov'ery, tp., Mercer co., O. P. 1118.

Recovery, Common, in law, a mode of assurance in the form of a fictitious action, by means of which conveyances were made by various tenants possessed of limited rights in real property (more particularly by tenants in tail), which has been generally abolished, and in the U. S. this mode of limitation is made equivalent to a conveyance in fee simple. (See FEE and FINE OF LANDS.)

Rectifica'tion [Lat. *rectus* and *facere*]. The rectification of a curve is the operation of finding an expression for its length. A curve is said to be rectifiable when the length of any portion of it can be expressed by a finite number of algebraic terms.

Rec'tum, Diseases of [Lat. *rectus*, "straight"]. The rectum is the third and last portion of the great intestine, receiving the fæcal matters from the colon, and opening outward by the anus. Not infrequently in new-born children occur congenital defects of the rectum; such are preternatural narrowness of the anus, imperforate anus, absence of the anus, with partial or complete non-development of the rectum. In childhood disease of the rectum is exceptional; atony and relaxation of its muscular coat may result in obstinate constipation and overloading of the rectum with fæces. Reversely, in strumous and delicate children continued diarrhœa may result in prolapse of the rectum or protrusion, usually of the mucous membrane only, less frequently of the muscular coat. Adults are subject to numerous rectal diseases. Dysentery is not infrequently limited to the rectum. (See DYSENTERY.) Chronic ulcer is a frequent sequel of the destruction of tissues in dysentery; ulcers may also arise from tubercular or syphilitic deposit. Irritable ulcer of the lower end of the rectum, especially just within the sphincter muscle of the anus, is termed a fissure. It causes intense pain when stretched by the passage of fæces, and the dread of suffering causes voluntary inaction of the bowels and habitual constipation. Fissure often can be detected only by use of the rectal speculum, the patient being anæsthetized by chloroform. Stricture of the rectum is often the result of former dysenteric inflammation, ulceration, sloughing, and the subsequent formation of dense scars of fibrous tissue. It results in obstruction, difficult and small stools, constipation, straining and bearing-down pain in the bowels, loins, and lower region of the back, with general depression of health. Stricture is often the result of cancer of the rectum, when, in addition to the symptoms and signs of stricture, exist also the cachectic facial appearance and progressive emaciation of the body indicative of cancer, and intense lancinating pains in the rectum, due to the malignant local growth. Hæmorrhoids or piles (see PILES) are the frequent result of congestions and inflammation of the abundant venous circulation of the rectum and anus. Polypus of the rectum is an attached tumor, originating in a relaxed fold of mucous membrane, or in a hæmorrhoidal mass, or redundant growth following the healing of ulcers; it may grow to such size as to obstruct the bowel, or by the dragging efforts of defecation be protruded from the body. Fistula in ano is the result of abscess adjacent to the lower bowel or verge of the anus, the purulent contents being discharged into the rectum, and leaving an unhealed passage or sinus. There may be an additional sinus opening on the surface without the anus; fistula may also be "blind," or terminating in a *cul-de-sac* adjacent to the bowel, but opening only externally. The origin of fistula is usually piles, constipation, or other disease of the lower rectum. Intense neuralgia of the rectum, though a frequent forerunner of malignant disease, is often present in persons reduced in health or of highly nervous temperament. Pruritus of the anus (obstinate itching) is often present associated with constipation, piles, the climacteric period, and old age. Eczema often affects the anus.

Preternatural narrowing of the rectum demands stretching by the fingers, aided by anæsthesia, and the use of rectal sounds. The imperforate anus is to be punctured or incised, and kept open by sounds while healing. Prolapse usually yields to improved diet, tonics, and internal and local use of astringents. Excision of a chronic prolapsed rectum is rarely demanded. Ulcers may be treated by astringent tonics, but more effectively by local use of suppositories or direct caustic applications through a speculum of considerable size. Fissure may be cured by keeping the bowels habitually open and by local use of anodynes, astringents, and mild caustics. A more certain cure is by rupture of the sphincter ani under anæsthetics, allowing the fissure or ulcer a period of rest. Stricture when not malignant may be relieved by cautious incision and subsequent use of large rectal sounds. The operation endangers peritonitis and portal phlebitis (inflammation of the portal vein), with abscess of the liver. Cancer of the rectum is incurable. The intense pain is modified by keeping the bowels open and by local and internal use of anodynes, opium and atropine being most efficacious. (See FISTULA and PILES for treatment.) Neuralgia, pruritus, and eczema demand local use of anodyne and emollient suppositories and ointments, while the constitution is improved by corrected diet and tonics.

E. DARWIN HUDSON, JR. REVISED BY WILLARD PARKER.

Recur'ring Series. A recurring series is one in which each term is equal to the algebraic sum of the products obtained by multiplying one or more of the preceding terms by certain fixed quantities. These quantities, taken in order, constitute what is called the "scale of the series." The order of a recurring series is determined by the number of terms in its scale. A geometrical progression is a recurring series of the first order. As an illustration of a recurring series of the second order, let us take the equation—

$$\frac{1-x}{1+x+x^2} = 1 - 2x + x^2 + x^3 - 2x^4 + x^5 + x^6 - 2x^7 +, \text{etc.}$$

The second member is a recurring series of the second order, whose scale is $(-x, -x^2)$. Every term after the second may be found by multiplying the preceding term by $-x$, the second preceding one by $-x^2$, and then taking the algebraic sum of the results. Recurring series may be of any order whatever. W. G. PECK.

Red. See COLOR.

Red Bank, p.-v., Shewsbury tp., Monmouth co., N. J., on Neversink River and on New Jersey Southern R. R., has 1 newspaper. P. 2086.

Red Bank, tp., Armstrong co., Pa. P. 1341.

Red Bank, tp., Clarion co., Pa. P. 1434.

Redbird. See CARDINAL BIRD.

Red Bluff, p.-v., cap. of Tehama co., Cal., on Sacramento River and on Oregon division of Central Pacific R. R., has 2 newspapers, a glove manufactory, a flourishing lumber-trade, and considerable river traffic. P. 992.

Red Bluff, v., Marlborough co., S. C. P. 1308.

Red Bud, p.-v., Union tp., Randolph co., Ill., on Cairo and St. Louis R. R. P. 880.

Red Cedar, tp., Dunn co., Wis. P. 648.

Red Cloud, p.-tp., cap. of Webster co., Neb., in the centre of a large and very fertile district, has three church organizations, excellent schools, 1 newspaper, 1 steam sawmill, a flouring-mill, 2 hotels, and a wagon-factory.
C. L. MATHER, ED. "RED CLOUD CHIEF."

Red Colony, tp., Sevier co., Ark. P. 463.

Red Creek, v., Perry co., Miss. P. 80.

Red Creek, v., Southampton tp., Suffolk co. (L. I.), N. Y. P. 46.

Red Creek, p.-v., Wolcott tp., Wayne co., N. Y., on Lake Ontario Shore R. R., has 3 churches, an academy, 2 grist-mills, several saw-mills, and a woollen-factory. P. 529.

Red′den (LAURA C.), b. in Somerset co., Md., about 1840; lost her hearing at the age of twelve years; became editorially connected with the St. Louis *Presbyterian* in 1860; has since been a contributor over the signature "Howard Glyndon" to several periodicals and magazines, including those of the Messrs. Harper & Bros., in which her poems attracted favorable notice. Author of *Notable Men of the Thirty-seventh Congress* (1862) and *Idylls of Battle and Poems of the Rebellion* (1864). Several poems from the latter volume have been included in *Loyal Lyrics* and in *Ballads of the War*.

Red′ding, tp., Jackson co., Ind., on E. fork of White River and on Jeffersonville Madison and Indianapolis R. R. P. 1525.

Redding, p.-v. and tp., Fairfield co., N. Y., on Danbury and Norwalk R. R. P. 1624.

Redding (CYRUS), b. at Penryn, Cornwall, England, in 1785; became editor of the London *Pilot* 1806; soon afterward founded and edited the Plymouth *Chronicle;* conducted at Paris *Galignani's Messenger* 1815–18; was joint editor with Thomas Campbell of the *New Monthly Magazine;* edited Liberal papers at Bath and Stafford; returned to London 1840, and was an industrious writer until his death in that city, May 28, 1870. Author of many works, the best known of which are a *History of Modern Wines* (1833), *Fifty Years' Recollections* (1858), *Reminiscences and Memoirs of Thomas Campbell* (1860), and *Past Celebrities whom I have Known* (1865).

Red′ditch, town of England, in Worcestershire, has manufactures of pins, needles, and fish-hooks. P. 5571.

Red′dle, or **Red Chalk,** an argillaceous oxide of iron brought from Germany and England, is used for carpenters' chalk, for marking sheep, for drawing on paper, and fine grades for polishing spectacle-lenses.

Redemption, Equity of. See MORTGAGE, by PROF. T. W. DWIGHT, LL.D.

Redemp′tionists, called also **Mathurins, Fathers of Mercy,** and **Trinitarians** (*Ordo Sanctissimi Trinitatis*), a brotherhood of the Roman Catholic Church founded by John de Matha and Felix of Valois at Cerfroi in France for the deliverance of Christian captives in Barbary. It was approved by Innocent III. in 1199.

Redemp′torist Fathers, or **Liguorians** (*Congregatio Sanctissimi Redemptoris*), a congregation of missionary priests founded in 1732 by Alphonso de Liguori at Scala in Italy. They are most numerous in Italy, Germany, Austro-Hungary, and the U. S. They devote themselves chiefly to the holding of "missions" for the increase of religious activity among the people.—The REDEMPTORIST NUNS were founded in 1732 by Alphonso de Liguori.

Red′field, p.-v. and tp., Oswego co., N. Y., on Salmon River and on a branch of Rome Watertown and Ogdensburg R. R. P. 1324.

Redfield (ISAAC FLETCHER), LL.D., b. at Weathersfield, Vt., Apr. 10, 1804; graduated at Dartmouth College 1825; practised law at Derby and at Windsor; became a justice of the State supreme court 1835; was chief-justice 1852–60; professor of medical jurisprudence at Dartmouth 1858–61; removed to Boston in the latter year, and resided in Europe 1867–69 as U. S. special counsel upon claims against England. Author of many esteemed treatises on legal subjects.

Redfield (WILLIAM C.), b. at South Farms, near Middletown, Conn., Mar. 26, 1789; was in early life a mechanic; conceived the fundamental idea of his famous "law of storms" as early as 1821; soon afterward established a line of steam towboats on the Hudson; issued many essays and pamphlets in favor of steamboat navigation; was subsequently an active promoter of railways, especially such as would connect the Hudson with the Mississippi; published at different times 40 essays upon meteorology; promulgated his *Theory of Storms* in 1831, and his views upon hurricanes in 1833; devoted much attention to fossil fishes from 1836 onward; issued a *Genealogy of the Redfield Family* (1839), and was the first president of the American Association for the Advancement of Science 1843. (See his *Biography*, by Denison Olmsted, 1857.)

Red′ford, p.-v. and tp., Wayne co., Mich., on Detroit Lansing and Lake Michigan R. R. P. 1872.

Redford (ALBERT H.), D. D., b. in St. Louis, Mo., Nov. 18, 1818; joined the Kentucky conference of the M. E. Church in 1837; performed efficient and successful service in missions, circuits, stations, and districts till he was made agent of the Louisville Conference Book and Tract Society; in 1866 became book-agent of the M. E. Church, South, at Nashville; wrote and published *Fred Brenning*, understood to be an autobiography; *History of Methodism in Kentucky*, in 3 vols.; and *Western Cavaliers*, a sequel to the history; is a member of the Louisville conference, which he represented several times in the General Conference.
T. O. SUMMERS.

Red Fork, p.-v. and tp., Desha co., Ark. P. 2078.

Red′grave (RICHARD), R. A., b. in Pimlico, England, Apr. 30, 1804; studied at the Royal Academy; became celebrated for his genre pictures, and subsequently for his landscapes; was head-master of the government school of design; was one of the most efficient promoters of the South Kensington Art Museum, inspector-general of art schools, and surveyor of Crown pictures. Author of *An Elementary Manual of Colors* (1863) and (with his brother Samuel) of *A Century of Painters of the English School* (1866). He was one of the art-jurors in the universal exposition of 1851; was commissioned to superintend the department of English art in the French universal exposition of 1857, and selected the English pictures which figured in the British universal exposition of 1862.

Red Hill, p.-v., Marshall co., Ala. P. 428.

Red Hill, tp., Ouachita co., Ark. P. 476.

Red Hill, p.-v., Mitchell co., N. C. P. 299.

Red Hill, tp., Marlborough co., S. C. P. 1505.

Red Hook, p.-v. and tp., Dutchess co., N. Y., on Rhinebeck and Connecticut R. R., 3 miles from Hudson River, has 3 churches, a good public school, 1 newspaper, a national bank, an extensive tobacco and cigar manufactory, and good hotels. It is located in the centre of an excellent farming section. Pop. of v. 861; of tp. 4350.
A. PIESTER, ED. "RED HOOK JOURNAL."

Red House, p.-v. and tp., Cattaraugus co., N. Y., on Allegany River and Atlantic and Great Western R. R. The best portion of the township forms a portion of the Allegany reservation of the Seneca Indians, whose councils are held at the school-house near the mouth of Red House Creek. A bridge here crosses the river. There are saw-mills and some indications of petroleum. P. 407.

Re′di (FRANCESCO), b. at Arezzo, Italy, Feb. 18, 1626; studied medicine, and settled at Florence, where he became physician to the grand duke and gained great celebrity as a poet, classical scholar, and scientist, attacking in a most decided manner the prevalent view of spontaneous generation, against which he produced many ingenious experiments and observations. D. at Pisa Mar. 1, 1698. His complete works were published in 6 vols. at Venice (1712), and at Milan in 9 vols. (1809). The most celebrated of his scientific works is his *Esperienze intorno alla Generazione degl' insetti* (1668; translated into Latin 1671).

Red Jack′et, the English name of SAGOYEWATHA, a famous chief of the Seneca Indians, b. at Old Castle, near the foot of Seneca Lake, N. Y., in 1752; did not originally rank as a sachem, but obtained that dignity through his activity on the British side in the war of the Revolution, being noted as a swift runner, and especially as an eloquent orator; derived his English name from a richly-embroidered scarlet jacket given him by a British officer; opposed the treaty of Fort Stanwix 1784; visited Pres. Washington,

from whom he received a silver medal; gave in 1809 to an agent of the U. S. government valuable information upon the hostile plans of the Ohio Indians under Tecumseh; visited Washington on the same subject 1810; was a useful ally of the U. S. during the war on the Niagara frontier 1812–14; visited New York and Washington 1829, on which occasion his portrait was painted by R. W. Weir. His last years were spent on the Seneca reservation near Buffalo, but he lost much of his influence on account of intemperance, and was once degraded from the chieftainship, but soon restored. He was an inveterate opponent of Christianity, of schools, and of missionaries. D. at Seneca Reservation Jan. 20, 1830. His *Life* was written by William L. Stone (Albany, 1867).

Red Land, tp., Bradley co., Ark. P. 997.

Red'land, tp., Hempstead co., Ark. P. 960.

Red Lead, or **Minium.** See Lead, by H. Wurtz.

Red Lion, p.-v. and hundred, New Castle co., Del., on Delaware River. P. 2604.

Red'man (John), M. D., b. at Philadelphia, Pa., Feb. 27, 1722; studied medicine at Edinburgh, London, and Paris, graduating at Leyden 1748; became eminent in his profession at Philadelphia; was one of the original physicians of the Pennsylvania Hospital and the first president of the College of Physicians. In 1759 he published a *Defence of Inoculation.* D. at Philadelphia Mar. 19, 1808.

Redman (William W.), b. in the North-west Territory Dec. 14, 1799; entered the ministry in the Missouri conference in 1820, and was one of the pioneers of Methodism in Missouri and Arkansas. D. in Missouri Oct. 31, 1849. T. O. Summers.

Red Oak, tp., Cedar co., Ia. P. 594.

Red Oak, p.-v. and tp., cap. of Montgomery co., Ia., on Nishnabatona River and Burlington and Missouri R. R., at junction of branch to Hamburg and Nebraska City, has 3 newspapers, several manufactories, and a rapidly-growing trade. P. 1315.

Red Oak, tp., Barnwell co., S. C. P. 1849.

Red Oak, p.-v., Ellis co., Tex. P. 2422.

Red Oak, tp., Brunswick co., Va. P. 3365.

Redon', town of France, department of Ille-et-Vilaine, on the Vilaine, carries on shipbuilding, manufactures of tiles and leather, and a lively trade in wax, honey, timber, iron, salt, and butter. P. 5943.

Redoubt' [It. *ridotto,* "reduced," "diminished"], a small fort or enclosed work (usually) without flanking defences, generally auxiliary to some larger work or defensive system. In permanent fortification the term is applied to small works or intrenchments *within* a larger member—*e. g.* "redoubt of the demilune," "of the re-entrant place of arms," etc. In this latter sense, however, the French more commonly use the word *réduit* (from Fr. *réduire*), of same essential meaning, but having a distinguishing intention.

Redpath (James), b. at Berwick-on-Tweed, England, Aug., 1833; came with his parents to Michigan 1848; became a printer, newspaper correspondent, and editor; was long connected with the New York *Tribune,* for which he reported the border warfare in Kansas 1855–57; visited Hayti; became emigration agent of the Haytian government in the U. S., and afterward consul at Philadelphia; was a war-correspondent during the civil war; became superintendent of education at Charleston, S. C., where he founded colored schools and an orphan asylum, and established at Boston in 1868 a lyceum bureau. Author of *The Roving Editor* (1859), *A Handbook to Kansas Territory* (1859), *The Public Life of Capt. John Brown* (1860), *Echoes of Harper's Ferry* (1860), and a *Guide to Hayti* (1860).

Red Ridge, v., Tallapoosa co., Ala. P. 520.

Red River, the last great tributary of the Mississippi, takes its name from the color of the sedimentary matter with which it is freighted at all times except in very low-water seasons. It takes its rise in the great Stake Plain in the Pan-Handle of Texas. Its remotest drainage-slope is in lat. 34° 40′ N. and lon. 103° 2′ W.; its mouth in Mississippi River is almost exactly on lat. 31°. The region of its source is a rainless and naked plain, marked by no channels or hills, but by a few isolated water-holes, which from time immemorial have been designated by stakes to guide even the Indian traveller. The imperceptible slopes converge at about lon. 102° on the same lat., and then enter a cañon of more than 100 miles in length amid broken mountains, and of such depth (200 or 300 to 1000 feet) and such steepness as to be inaccessible, so far as known, except at the two extremities. This remarkable chasm has a varying breadth of 5 to 20 miles, said to have a soil of great fertility. It is owned and held by the Comanches and Stake Plain Indians, who have great strength and effectually guard it against white intrusion or visitation. On emerging from the cañon the river runs E., with few and very feeble tributaries, receiving the S. (or Prairie Dog) Fork at lon. 100° 35′, and the N. Fork and Pease River from left and right a few miles W. of lon. 99°. At about lon. 98°, trending nearly due E., Red River receives the Wichita, from the Copper and Red Land regions on the right, and the valley widens from 1 to 3 miles, which it bears onward to lon. 96° 30′, the margin of the more humid regions; and it receives the False Washita on the left from the fertile prairies of the Chickasaw Nation. Here the valley still widens, and, bearing slightly southward and passing the lower Cross Timbers, it sweeps through the finest upland rolling country—of the Choctaws on the left and the best counties in Texas on the right—down to the Great Bend at Fulton, lon. 93° 40′, lat. 33° 36′. Here Red River turns abruptly to the S., and spreads its valley to a breadth of about 10 miles. This breadth, of the most fertile alluvion, it preserves for 100 miles S. to the mouth of the Cypress and the extensive lakes on the right, and thence about 150 miles it bears S. E. to its mouth, in lat. 31° and lon. 91° 36′. By its tortuous route, greatly increased in length after its deflection S., it has a total length of about 1550 miles.

Area of Basin.—Red River drains a basin of 91,000 sq. m., of which the whole area, except that lying W. of lon. 99°, is habitable, nearly all cultivated, and, excepting districts of valuable pine forest, it is of the very highest degree of fertility.

Settlements.—Red River basin was first explored and occupied by the Spanish and French missionaries in the early part of last century. As early as 1720 there were considerable French settlements at Sicily Island, Natchitoches, and Campti. The Spanish priests came from Texas and Mexico to Nacogdoches and Natchitoches, nearly 100 years before the French settlements. American settlers made but small beginnings until after the transfer of Louisiana to the U. S. in 1803–04.

Elevations.—The plain on which Red River takes its rise is about 2450 ± feet above the sea. Its route through the great cañon, and thence to the mouth of the N. Fork and the Wichita, is through the Wichita Mountains, and its descent is precipitous, having a fall in these 400 ± miles of near 1500 feet. Thence it flows through a sandy bottom of cottonwoods and shifting banks down to the railroad, crossing below the mouth of Washita, where its elevation is 555 feet above the Gulf. Still, with a rapid descent of 1 foot per mile, it is navigable in high water thence to the crossing of the International R. R., at Preston. Here its elevation is 260 feet above the Gulf, and its descent and channel hence are such as to give good navigation during a large portion of the year. From here plantations line its banks, and it is of gentle descent to Shreveport, say 4 inches per mile, where again the elevation is known by railroad levels, and amounts to 182 feet. At Grand Ecore the elevation is estimated at 127.5 feet, and at its mouth, in lat 31°, its high-water elevation is but 50 feet above the level of the Gulf. The total length of the river may be estimated, as above, at 1550 miles.

The navigable channels may be stated thus: Red River proper in high water, 1246 miles, and its own tributaries, not including Washita, 700 miles; Washita proper, 600 miles, and its own tributaries, 800 miles; the total navigable channels reaching the Mississippi through the mouth of Red River amount to 3346 miles.

Area of Alluvial Basin.—From 3 miles above Fulton the expansion to some 9 miles of average breadth is preserved down to its confluence with the great alluvion of the Mississippi, having an area of 2022 sq. m. This area is flanked by hilly country of 50 to 100 feet elevation, these hills gently sloping down and disappearing in the alluvion on the margins of the two confluent basins of Concordia and Avoyelles.

Geology.—The cretaceous and lignite beds prevail on all the Red River tributaries, from the Wichita Mountains (which are primary granite and limestone) down to the vicinity of Shreveport; and from thence to the vicinity of Alexandria, the Tertiary beds, generally overstrewn by the Diluvial or Drift strata, occupy the whole Red River basin. Excepting iron, limestone for building, and the sulphates of lime or gypsum, very few minerals characterize this great valley.

Washita River enters Red River near its mouth, and has a basin of its own, which has been treated in the delta survey as a part of Red River basin. It rises in lat. 34° 40′ and lon. 94° 15′ W., very near to the Arkansas, and flowing 100 miles eastward, turns S. and then S. E., and keeping parallel with Red River, joins its waters in the middle of the confluent alluvion only 40 miles above its mouth. The Washita receives at the same point the Tensas from the Mississippi alluvion on its left, and Little (or

Ocatahoola) River on its right, and with a doubled volume and breadth flows, under the name of Black River, the last 70 miles of its tortuous channel in crossing about 25 miles of latitude. The extraordinary fertility of the Tensas and Black River valleys is a matter of note. The Wachita and its left tributary, the Bartholomew, from the very S. bank of Arkansas River, bound the great Mississippi delta on the W. down to the Ocatahoola.

Navigation.—The mouth of Red River at low water can be entered only by boats of 2 feet draught, but during about eight months of the year it may be entered by vessels of all draughts needed for this river and its tributaries. It has eighteen navigable confluent rivers, in addition to a number of bayous, like canals, navigable in high-water seasons.

The junction of Red with Mississippi River has been menaced with final closure for the past thirty-five years. In 1831 the bend of the great river into which it discharged was cut off by Capt. Shreve, and the Old River Lake has been filling by continual deposits from both rivers. Red River has continued, however, to cut its channel through these deposits to the Mississippi, and at the same time to force more and more of its waters down the Atchafalaya. This outlet-river leaves the same bend or Old River Lake, and discharges its waters into the Gulf by a much shorter channel. The increase of the Atchafalaya, but for the toughness of its bed, would soon engulf the whole of Red River, which seems at one period of its history to have flowed wholly in this direction. Such result would seriously embarrass the commerce of this great tributary, but would, at the same time, greatly relieve the tendency to crevasses and floods upon Mississippi River hence to the Gulf of Mexico. C. G. Forshey.

Red River, parish of N. W. Louisiana, on both sides of Red River, bounded E. by Black River and intersected by numerous streams, has a soil yielding abundant crops of cotton and corn. It has been formed since the census of 1870. Cap. Coushatta Chute. Area, 325 sq. m.

Red River, county of N. E. Texas, separated from Indian Territory by Red River, and bounded S. by Sulphur River, on the (unfinished) northern branch of Texas Pacific R. R., has a rolling surface and a soil of great fertility. Stock-raising is the chief industry, and Indian corn the staple product. Some lumber is sawed. Cap. Clarksville. Area, 872 sq. m. P. 10,653.

Red River, tp., Lafayette co., Ark. P. 2131.

Red River, tp., Little River co., Ark. P. 1233.

Red River, tp., Searcy co., Ark. P. 2040.

Red River, tp., Van Buren co., Ark. P. 516.

Red River, tp., White co., Ark. P. 713.

Red River, p.-v. and tp., Kewaunee co., Wis., on Green Bay. P. 957.

Red River of the North rises in Becker co., Minn., from Elbow Lake, 1680 feet above the sea. It flows S. and then W. as far as Breckenridge, Minn., the head of steamboat navigation, 953 feet above the sea-level. Thence it flows northward through a wide, level, and fertile plain, and is the boundary between Minnesota and Dakota. Crossing the U. S. boundary (where its elevation is 792 feet), it traverses Manitoba, and finally flows into Lake Winnipeg. Its length is 750 miles; total fall, 1072 feet.

Red Rock, p.-v. and tp., Marion co., Ia. P. of v. 255; of tp. 1334.

Red Rock, tp., Douglas co., Minn. P. 145.

Red Rock, tp., Mower co., Minn. P. 602.

Red'ruth, town of England, county of Cornwall, has 7919 inhabitants, mostly engaged in the business of the rich copper, tin, and iron mines of the vicinity.

Red Sea, or **Arabian Gulf,** is a long, narrow inlet of the Indian Ocean, between Arabia on the E. and Abyssinia, Nubia, and Egypt on the W., separated from the Mediterranean by the Isthmus of Suez, which is only 80 miles across, and communicating with the Indian Ocean through the Gulf of Aden and the Strait of Bab-el-Mandeb, which is only 14 miles broad. The entire length of the Red Sea is 1450 miles; its greatest breadth is 230 miles; its depth varies from 1054 fathoms in lat. 22° 30′ N. to 3 fathoms in the harbor of Suez. It is called in the Old Testament "the sea of *suph*," a sea-weed resembling wool. Why, in later times, it was called the Red Sea, writers are not agreed. This sea is not, as some have said, tideless. Herodotus (*Hist.*, ii. 11) reports "a flow and ebb of the tide every day." Recent scientific surveys have shown a tide of 5 to 7 feet at Suez, but much less to the southward. Much, however, depends upon the strength of the wind, which blows from the S. S. E. from October to May, and is strongest in February; and from the N. W. the rest of the year, and is strongest in June and July. Near its northern extremity the sea forks into two branches—one, the Gulf of Akaba, length 100 miles and breadth 15, occupies a depression which is the continuation southward of the valley of the Jordan and Dead Sea; the other, the Gulf of Suez, length 200, breadth 20 miles. In the Sinaitic isthmus, lying between these arms, is Mount Sinai. The Israelites (see Exodus) are supposed to have crossed in April the Gulf of Suez, near the existing town of that name, the sea at that time extending with small depth some 30 miles farther N. On account of the violence of its winds, and the great number of islands, shoals, and coral reefs which lie along its shores, the navigation of the Red Sea has always been considered very difficult; nevertheless, from the very earliest times it has formed one of the commercial highways of the world, being the shortest and most convenient road between Europe and India. After the discovery of the route around the Cape of Good Hope the traffic which first the Egyptians and Phœnicians, and then the Greeks, the Romans, and the Venetians, had carried on with India over the Red Sea, declined greatly, but only for a time, and recently the construction of the Suez Canal has once more led this commerce back into its old channel.

Red Snow is real snow tinted by the presence of *Palmella nivalis* and other red protophytes, microscopic algæ kindred to the plant already named. In 1819, Ross found banks of red snow on the E. shore of Baffin's Bay extending for miles, and in some parts no less than 12 feet deep.

Red'stone, p.-v. and tp., Fayette co., Pa. P. 1152.

Red Sulphur Springs, p.-v. and tp., Monroe co., West Va., situated on Indian Creek, in a valley of the Alleghany Mountains, 38 miles S. W. of White Sulphur Springs, is a fashionable watering-place, the water having a mean temperature of 54°. P. 1904.

Reductio ad Absurdum. See Logic, by William D. Wilson, LL.D., L. H. D.

Reduction, in chemistry, a term generally used as synonymous with deoxidation, as of a metallic oxide by heating with carbon or with hydrogen gas. It is, however, applied also generally to the conversion of any metalliferous ore to the metallic or reguline form; thus we speak of the reduction of galena, the sulphide of lead, to metallic lead, a process which is really the exact reverse of deoxidation, consisting substantially in the *oxidation* of the sulphur of the galena, which leaves the lead free to melt down to a regulus. The case is nearly similar in the reduction of cinnabar, the sulphide of mercury, to metallic mercury by distilling in a current of air, which both burns the sulphur to sulphurous acid gas and volatilizes the mercury. Reduction is often accomplished in the laboratory, at or near ordinary temperatures, in liquid media by the use of agents having a strong affinity for oxygen. Thus, ferrous solutions and oxalic acid will reduce gold from its solutions. Sodium amalgam will reduce many substances, etc. H. Wurtz.

Reduction to the Centre. In trigonometrical surveying fixed objects, as steeples, towers, and the like, are often used as stations. In such cases it is impossible to place the theodolite over the centre of the station. The instrument is then placed over a neighboring point whose position with respect to the true centre is known, and the angles subtended by the other stations are measured; the angles that are subtended by these stations at the true centre are determined by computation. The operation of making these computations is called *reduction to the centre.*

Red Vermil'ion, tp., Nemaha co., Kan. P. 775.

Red Wil'low, county of S. Nebraska, on the Kansas line, intersected by Republican fork of Kansas River, has been formed since the census of 1870, and has few inhabitants. Cap. Indianola. Area, 720 sq. m.

Red'wing. See Blackbird.

Redwing, p.-v. and tp., cap. of Goodhue co., Minn., on the river division of Milwaukee and St. Paul R. R., 40 miles S. of the latter place, contains 12 churches, 1 opera-house, a music-hall, 1 collegiate institution, 3 banks, 3 newspapers, 2 flouring-mills, 2 steam saw-mills, 3 lumber-yards, 2 sash, door, and blind factories, and 2 large manufactories of boots and shoes. Large quantities of wheat are exported from here, amounting in 1874 to 2,418,622 bushels. P. of v. 4260; of tp. (in 1860), 1250.

Charles L. Davis, Ed. "Argus."

Red'wood, the *Sequoia sempervirens*, a noble coniferous timber tree of California, second in size to the *Sequoia gigantea*, or big tree, alone among North American trees. It occurs in great forests upon the coast-mountains of California, and often attains a height of 275 feet and a diameter of 15 feet. It is extensively sawn for

building purposes. When fresh its wood is of a fine red color, but it slowly fades when exposed to light. (See SEQUOIA.) The redwood sometimes used by dyers is from *Adenanthera pavonina*, a large leguminous East Indian tree.

Redwood, county of S. W. Minnesota, on Minnesota River, and drained by Redwood, Sleepy Eye, and Big Cottonwood rivers, has a broken surface, partly prairie. Agriculture is the chief industry. Cap. Redwood Falls. Area, 865 sq. m. P. 1829.

Redwood, tp., Santa Clara co., Cal. P. 1353.

Redwood, p.-v., Alexandria tp., Jefferson co., N. Y., has 4 churches and a glass-factory established in 1833. P. about 600.

Redwood (ABRAHAM), b. in Antigua, West Indies, about 1710; was a Quaker; settled at Newport, R. I., and founded there the excellent library still known by his name, being one of the first in New England. His gift was £500, and the edifice was completed in 1750. D. at Newport Mar. 3, 1788.

Redwood City, p.-v., cap. of San Mateo co., Cal., on Southern Pacific R. R., 28 miles W. of San Francisco, has 5 churches, good schools, and 2 tanneries. It has connection by water with San Francisco Bay, and is an important shipping-point for redwood lumber. The climate is very healthful. P. 727.

DUNCAN MCPHERSON, ED. "SAN MATEO CO. GAZETTE."

Redwood Falls, p.-v. and tp., cap. of Redwood co., Minn., on Redwood River, has 1 newspaper and some manufactures. P. about 500.

Reed [A.-S., *hreod*], a name proper to certain tall woody grasses smaller than canes and bamboos. The common reed (*Phragmites communis*) of North America, Europe, and Asia is employed on the Eastern continent as thatch, as a material useful in clay walls and floors, etc. The more extensively grown reed of Europe is *Arundo donax*, the woody stems of which are used for a great variety of purposes, especially by the horticulturist and in making musical instruments, fishing-rods, canes, etc. The smaller cane of the U. S. (*Arundinaria tecta*) is often called a reed. Its chief use is in making stems for tobacco-pipes.—REED is also the vibrating tongue or spring, fixed in a narrow slit, which produces musical tones in many wind instruments, such as the melodeon. It was once made of the reed (*Arundo donax*), whence the name. (See REED INSTRUMENTS.)

Reed, tp., Will co., Ill. P. 2771.

Reed, tp., Seneca co., O. P. 1334.

Reed, tp., Dauphin co., Pa. P. 353.

Reed (ANDREW), D. D., b. in London, England, Nov. 27, 1788, educated at Hackney College; became in 1811 pastor of the Independent congregation at New Road chapel, London; removed in 1831 with his congregation to Wycliffe chapel, Stepney; visited the U. S. in 1834 as commissioner of the Congregational body of Great Britain; published *A Visit to the American Churches* (1836); founded several asylums for orphans, idiots, and incurables, and wrote several religious works. D. at London Feb. 25, 1862. (See his *Memoirs*, by his sons Charles and Andrew, 1863.)

Reed (CALEB), b. at West Bridgewater, Mass., Apr. 22, 1797; graduated at Harvard 1817; practised law at Yarmouth for several years; became in 1827 a partner with Cyrus Alger in his celebrated iron-foundry at South Boston, and was for more than twenty years editor of the *New Jerusalem Magazine*, one of the principal exponents in America of the teachings of Emmanuel Swedenborg. In 1821 he published *The General Principles of English Grammar.*

Reed (Sir CHARLES), F. S. A., son of Dr. Andrew, b. in London, England, in 1819; wrote his father's biography 1863; was elected to Parliament for Hackney 1872; visited the U. S. as delegate to the conference of the Evangelical Alliance 1873; is president of the Sunday-school Union of England and Wales, proprietor of the London *Daily News*, and chairman of the London school board, in which capacity he has taken a leading part in advocating the phonetic reform of the English language. He married in 1846 a daughter of Edward Baines, M. P., of Leeds.

Reed (DAVID), b. at Easton, Mass., Feb. 6, 1790; graduated at Brown University 1810; was for some years principal of the Bridgewater Academy; was licensed to preach as a Unitarian 1814, and founded at Boston (Apr. 20, 1821) the *Christian Register*, a prominent Unitarian organ which wielded a great influence in New England. He was one of the founders of the American Anti-Slavery Society in 1828, and remained at the head of the *Register* until 1866. D. at Boston June 7, 1870.

Reed (DAVID BOSWELL), M. D., b. at Edinburgh, Scotland, in 1805; educated at the High School of Edinburgh, and in medicine at the university of that city, where he was an assistant to Prof. Sir John Leslie; distinguished for his brilliant attainments while still a student; was speedily elected president of the Royal Medical Society and member of the Royal College of Physicians and of the Royal Society of Edinburgh; became instructor in chemistry in the university, teaching that science also to private classes; erected in 1833 the best class-room and laboratory in Edinburgh, and for seven years averaged 300 pupils annually; studied the subject of ventilation with great care; superintended the improvements in ventilation made in the House of Commons 1836, in the House of Peers 1839, and had charge of the ventilation department in the construction of the new Houses of Parliament 1840–45; afterward applied his principles to public buildings in Liverpool and other large cities; visited Russia for a similar purpose; settled in the U. S. 1856; was for some time professor of applied chemistry in the University of Wisconsin; became a resident of St. Paul, Minn.; became medical inspector to the U. S. Sanitary Commission 1863, and d. at Washington, D. C., Apr. 5, 1863. Author of many books and publications upon chemistry and ventilation.

Reed (EDWARD JAMES), b. at Sheerness, England, Sept. 20, 1830; educated at the School of Mathematics and Naval Construction at Portsmouth; became editor of the *Mechanics' Magazine*; became a recognized authority on naval construction and secretary of the Institution of Naval Architects; submitted proposals to the admiralty for the speedy and economical building of iron-clads; was appointed chief constructor to the navy 1866; resigned on account of dissatisfaction with the construction of turret-ships July, 1870, a few weeks only before the sinking of the turret-ship Captain; has since visited the leading dockyards of Europe; was elected to Parliament as a Liberal Feb., 1874, and has again (1876) been consulted by the admiralty upon plans for naval construction. Author of several treatises upon practical shipbuilding, iron-cased ships, and coast defence.

Reed (HENRY), LL.D., grandson of Col. Joseph, b. at Philadelphia, Pa., July 11, 1808; graduated at the University of Pennsylvania 1825; studied law in the office of John Sergeant; was admitted to the bar 1829; was appointed in 1831 assistant professor of English literature and also of moral philosophy in the University of Pennsylvania, and in 1835 professor of rhetoric and English literature; married a granddaughter of Bishop White; wrote the *Life* of his grandfather for Sparks's *American Biography*; edited with valuable prefaces and notes Wordsworth's *Poetical Works* (1837), Arnold's *Lectures on Modern History* (1845), Alexander Reed's *Dictionary of the English Language* (1845), Graham's *English Synonyms* (1847), Lord Mahon's *History of England* (1849), Gray's *Poetical Works* (1850), and C. Wordsworth's *Memoirs of William Wordsworth* (1851), and contributed essays and reviews to several literary periodicals. On his return from a visit to Europe he was lost in the steamer Arctic, Sept. 27, 1854. After his death his brother, William B. Reed, edited his *Lectures on English Literature* (1855), to which he prefixed a biographical sketch, *Lectures on English History as illustrated by Shakspeare's Chronicle Plays* (1855), and *Lectures on the English Poets* (1857), all of which were republished in England, and were widely appreciated on both sides of the Atlantic. Two lectures *On the History of the American Union*, delivered at the Smithsonian Institution, were also given to the press in 1856.

Reed (HOLLIS), b. at Newfane, Vt., Aug. 26, 1802; graduated at Williams College 1826; studied theology at Princeton; was a Presbyterian missionary in India 1830–35; pastor at Derby, Conn., 1838–45, and at New Preston 1845–51. Author of *God in History* (2 vols., 1849–55), *India and its People* (1858), *The Coming Crisis of the World* (1862), *Negro Question Solved* (1864), and other works. With his companion, Rev. William Ramsey, he published a *Journal of a Missionary Tour in India* (1836).

Reed (JOSEPH), b. at Trenton, N. J., Aug. 27, 1741; graduated at Princeton 1757; studied law under Richard Stockton, and afterward at the Temple, London, 1763–65; became deputy secretary of New Jersey 1767; went to England 1770; married there Esther, daughter of Dennis de Berdt, agent for Massachusetts; settled at Philadelphia 1771; was a member of the committee of correspondence 1774; president of the first provincial convention of Pennsylvania Jan., 1775; delegate to the Continental Congress in May; became aide-de-camp and secretary to Gen. Washington; was appointed adjutant-general 1776; declined the chief-justiceship of Pennsylvania Mar. 20, 1777, and the rank of brigadier-general, with command of all the cavalry forces, tendered him by Congress, but served

as a volunteer at the battles of Brandywine, Germantown, and Monmouth; was elected to Congress Sept., 1777; signed the Articles of Confederation in 1778; was elected president of the supreme executive council of Pennsylvania; was an earnest opponent of slavery and of the proprietary system of government; visited England for his health, but without beneficial result, 1784. D. at Philadelphia Mar. 5, 1785. Author of two political pamphlets printed in 1779 and 1783, the latter of which elicited a *Reply* from Gen. Cadwalader, containing strictures upon Reed's conduct. According to a report made by the Hessian officer Count Donop to the British general, Grant, Reed received a British protection in 1776. This allegation, adopted by Bancroft in his *History*, has been vehemently controverted in several pamphlets by William B. Reed, who has also published the *Life and Correspondence of President Reed* (2 vols., 1847), as well as a *Life of Esther Reed* (1853), his wife, that lady (b. in London in 1747; d. at Philadelphia Sept. 18, 1780) having taken an active part for the relief of the suffering soldiers at Valley Forge as president of a ladies' association formed at Philadelphia. (See also a *Life of Reed*, by his grandson Henry, in Sparks's *Am. Biog.*, 2d series, vol. viii.)

Reed (William Bradford), LL.D., grandson of Col. Joseph, b. at Philadelphia, Pa., June 30, 1806; graduated at the University of Pennsylvania 1822; accompanied J. R. Poinsett as private secretary on his mission to Mexico 1825; became a distinguished lawyer; was attorney-general of Pennsylvania 1838, and minister to China 1857–58; negotiated with China the treaty of June 18, 1858 (ratified Jan. 26, 1860). Author of numerous addresses, essays, and pamphlets upon historical, literary, and political subjects; was the biographer of his grandfather, Col. Joseph Reed, and of his brother, Henry Reed, and editor of their writings, and was a regular contributor to the *Quarterly Review* and N. Y. *World*. D. at New York City Feb. 18, 1876.

Reedbird. See Bobolink.

Reed'er, tp., Anderson co., Kan. P. 702.

Reeder, p.-v. and tp., Missaukee co., Mich. P. 130.

Reed'er (Andrew H.), b. near Trenton, N. J., about 1808; studied law, which he practised many years at Easton, Pa.; becoming an influential Democratic politician, was appointed by Pres. Pierce the first governor of Kansas Territory; was removed from that office July, 1855, for declining to exert his official influence against the Free-State movement; was elected delegate to Congress, and afterward U. S. Senator, under the Topeka constitution, which, however, was not ratified by Congress, and declined an appointment as brigadier-general 1861. D. at Easton July 5, 1864.

Reeder's, v., Newberry co., S. C. P. 2290.

Reed Instruments, the generic name of a large class of musical instruments, of which the accordeon, the melodeon, the harmonium, and reed-organs are the most important. Their distinctive feature is a tube (technically called a *reed*), through which vibrations of air are transmitted by means of the pulsations of a tongue of wood or metal lying over the aperture. Instruments of this class are described as having been found among the Chinese several hundred years since, but most of them are comparatively modern inventions. The first reed-organs were constructed in the U. S. about 1818; they were improved in 1821, 1825, and 1835, since which time the modifications have been too numerous for separate mention. The accordeon was invented in Germany about 1829; the harmonium, first constructed in France soon afterward, was much improved by Evans in 1841, and has acquired great popularity since the final improvements introduced about 1859. Important inventions in the construction of reed instruments were made by Carhart about 1836, by Needham, and by Emmons Hamlin about 1848, the latter gentleman having, as a member of the Mason & Hamlin Organ Co., greatly contributed to the signal triumph gained by American reed-organs at the Paris exposition of 1855. More than 30,000 reed instruments are now annually manufactured in the U. S.

Reed Plantation, tp., Aroostook co., Me. P. 54.

Reeds'burg, p.-v. and tp., Sauk co., Wis., on Baraboo River and Madison and Wisconsin line of Chicago and North-western R. R., has 1 newspaper, and is the principal hop-market in the U. S. P. 547.

Reed's Creek, tp., Lawrence co., Ark. P. 811.

Reed's Landing, p.-v., Wabasha co., Minn., on Lake Pepin (Mississippi River) and St. Paul and Chicago R. R. P. 782.

Reed's Mills (P. O. name of the v. of Hamden), Clinton tp., Vinton co., O., at junction of Portsmouth branch with the main line of Marietta and Cincinnati R. R. P. 384.

Reeds'ville, p.-v., Brown tp., Mifflin co., Pa., on Mifflin and Centre co. branch of Pennsylvania R. R.

Reedville, p.-v., Olive tp., Meigs co., O., on Ohio River. P. 129.

Reed'y, p.-v. and tp., Roane co., West Va. P. 964.

Reedy, tp., Wirt co., West Va. P. 489.

Reedy Church, tp., Caroline co., Va. P. 3138.

Reel'town, v., Tallapoosa co., Ala. P. 1200.

Reem's Creek, v., Buncombe co., N. C. P. 1121.

Rees (Abraham), F. R. S., b. at Llanbrynmair, Wales, in 1743; studied for the ministry at Hoxton Academy, near London; was tutor in that institution 1762–84; was pastor of Presbyterian churches in Southwark (1768) and Old Jewry (1783); president of Hackney College 1786–95; edited Chambers's *Cyclopædia* 1776–86, and superintended the preparation of *Rees's Cyclopædia* in 45 4to vols. (1802–19). D. June 9, 1825.

Reese (Chauncey B.), b. in Canastota, N. Y., 1837; graduated at the U. S. Military Academy, and promoted brevet second lieutenant of engineers July 1, 1859; on the outbreak of the civil war in 1861 was sent to Fort Pickens as assistant engineer in the defence of that work; from thence transferred to the defences of Washington in Nov., 1861; in the Virginia peninsular campaign rendered valuable service in constructing bridges, building roads, etc., as in the Rappahannock campaign at Chancellorsville; engaged at Gettysburg, at the siege of Fort Wagner, S. C., and as chief engineer of the Army of the Tennessee during the Atlanta campaign and subsequent "march to the sea" and through the Carolinas; lieutenant-colonel U. S. volunteers June–Aug., 1865; brevet major, lieutenant-colonel, colonel, and brigadier-general for services during the war; promoted to the rank of major in the corps of engineers in 1867. D. of yellow fever at Mobile, Ala., Sept. 22, 1870.

Reese (David Meredith), M. D., LL.D., b. in Philadelphia, Pa., in 1800; graduated in medicine at the University of Maryland 1820; became a prominent practitioner in New York City and physician-in-chief to Bellevue Hospital, and was for some years superintendent of public schools in New York City. D. in New York in 1861. He wrote much for periodicals on religion, politics, and science, edited the *American Medical Gazette* (1850 *seq.*), Chambers's *Educational Course* (in 12 vols.), Cooper's *Surgical Dictionary*, Neligan *On Medicines*, and J. Mason Good's *Book of Nature*, and author of *Observations of Yellow Fever* (1819), *Epidemic Cholera* (1833), *Phrenology known by its Fruits* (1838), a *Medical Lexicon* (1845), and other works.

Reeve, tp., Daviess co., Ind. P. 1676.

Reeve, tp., Franklin co., Ia. P. 704.

Reeve (Henry), D. C. L., b. in Norwich, England, in 1813, a relative of the celebrated family of the Taylors of that city; educated at the Norwich grammar school and at Geneva, Switzerland; became registrar of the privy council 1837, a post he still (1876) occupies, and succeeded Sir G. C. Lewis as editor of the *Edinburgh Review* 1855. Translator of De Tocqueville's *Democracy in America* (2 vols., 1835) and *France before the Revolution* (1856), and of Guizot's *Washington* (1840); edited Bulstrode Whitelock's *Journal of an Embassy to Sweden* (1855) and Greville's *Journal of the Reigns of King George IV. and King William IV.* (1874), and author of a series of essays reprinted from the reviews under the title of *Royal and Republican France* (1873). He is one of the eight foreign members of the Institute of France, elected in 1865.

Reeve (Isaac V. D.), b. in New York 1813; graduated from the U. S. Military Academy, and entered the 4th Infantry July, 1835; with the exception of two years on the Northern frontier, he was almost constantly on duty in the South, being actively engaged in several campaigns against the Seminoles in Florida, up to the commencement of hostilities with Mexico in 1846, when he was engaged with Gen. Taylor's army in the battles of Palo Alto and Resaca de la Palma, and with Gen. Scott from the siege of Vera Cruz to the capture of the City of Mexico, winning the brevets of major and lieutenant-colonel for gallantry; subsequently commanded various Indian expeditions, and in 1861 was stationed near San Antonio, Tex., where, by the surrender of Gen. Twiggs to the Texan insurgents, he was taken prisoner; exchanged in Aug., 1862, he served as mustering and disbursing officer at New York and in command of the camp at Pittsburg, Pa., for drafted men. In 1864 he became colonel of the 13th Infantry, and in 1871 was retired from active service.

Reeve (Tapping), LL.D., b. at Brookhaven, Long Island, in Oct., 1744; graduated at Princeton 1763; married a sister of Aaron Burr; began to practise law at Litchfield, Conn., 1772, and commenced there in 1784 the

celebrated Litchfield Law School, long the only institution of the kind in the U. S., which he conducted alone until 1798, and with Judge James Gould until 1820, educating many persons who became distinguished at the bar and in politics, especially in the Southern States. He was a resolute Federalist in politics; was judge of the supreme court of Connecticut 1788–1814, and originated the movement for more equitable legislation concerning the property of married women. D. at Litchfield Dec. 13, 1823. Author of *The Law of Baron and Femme, of Parent and Child, of Guardian and Ward, of Master and Servant, etc.* (New Haven, 1816; 3d ed., Albany, 1862), and of *A Treatise on the Law of Descent in the Several United States of America* (New York, 1825).

Reeves, tp., Marion co., S. C. P. 1815.

Refin′ing of Met′als. Some metals are met with in commerce nearly pure, but none are perfectly so.

Antimony.—The raw antimony obtained by smelting contains more or less iron, lead, arsenic, copper, and sulphur. From these it is purified in the large way by an oxidizing and scorifying fusion with nitre or antimonious oxide, sulphide of antimony, sulphate of soda and charcoal, or carbonate of soda. As it is largely used in the arts, antimony should be especially freed from arsenic. This can be accomplished by fusing 32 parts of antimony with 4 of nitre, fusing the resulting metal with 3 of nitre, and again melting this product with 2 parts of nitre.

Bismuth.—Commercial bismuth may contain lead, copper, arsenic, iron, and sulphide of bismuth. In the large way it is refined by fusion in crucibles with nitre, and stirring, which removes sulphur and arsenic; but to obtain the metal quite pure it should be dissolved in nitric acid, the saturated solution allowed to settle, the clear liquid poured into much water, and the resulting basic nitrate of bismuth washed, dried, and reduced to metal by fusion with one-tenth its weight of charcoal in a crucible.

Copper.—The impurities of commercial copper are—arsenic and antimony, making it more or less brittle, even when only traces are present; lead, sulphur, tin, suboxide of copper, iron, and zinc, all of which injure its malleability and ductility. In the large way they are removed by a powerful oxidizing fusion, generally in small reverberatory furnaces, by which some, as antimony, arsenic, lead, and zinc, are removed, partly by volatilization, and some, as lead, zinc, and iron, by scorification. To remove the excess of suboxide of copper formed during this operation, the melted metal is toughened by stirring with a pole of green birch or oak under a cover of charcoal. Perfectly pure copper can be obtained by the decomposition of pure sulphate of copper by a voltaic battery.

Gold.—Gold can be separated from silver by "quartation." The alloy should contain 3 parts (according to some authorities 2½) of silver and 1 of gold. It is granulated, and heated with nitric acid, the gold being left as an insoluble powder, which is washed, dried, and fused. Gold containing palladium is alloyed with 2½ parts of silver, and then both the foreign metals dissolve in nitric acid. A more economical and usual way of "parting" gold and silver is by dissolving the silver with strong sulphuric acid. The operation may be conducted in platinum, porcelain, or cast-iron vessels, the latter being usually employed. There should not be over 25 nor under 3 to 6 per cent. of gold in the alloy, which should also not contain over 10 per cent. of copper. The less copper the better, owing to the slight solubility of its sulphate in sulphuric acid. Over 0.25 per cent. of lead also retards the process of solution. The granulated alloy can be partly purified by repeatedly heating it to redness and boiling it with dilute sulphuric acid in leaden vessels. When ready for parting it is boiled with 2½ times its weight of sulphuric acid of 1.84 specific gravity; after four hours, more acid of the specific gravity 1.69 is added, the liquid boiled a few minutes, and allowed to stand. The clear liquid is drawn off, and the gold again boiled with strong acid, after which it is washed, dried, and cast into ingots. As little as 0.1 per cent. of gold can be profitably extracted. If platinum is present, some silver is retained, and must be separated by fusing the finely-divided gold with bisulphate of potash, and washing. Gold of .999 fineness can be obtained. Gold containing osmium and iridium is alloyed with 2 to 3 parts of silver to lessen its specific gravity. On melting, the osmiridium sinks to the bottom, and the purified alloy is carefully ladled off. Parting by aqua regia is practised on gold poor in silver. The solution of chloride of gold thus obtained is evaporated with excess of hydrochloric acid, then largely diluted with water to precipitate some chloride of silver, decanted from the latter, and metallic gold thrown down as a fine powder by adding sulphate of iron (oxalic acid or terchloride of antimony can also be used). If perfectly pure gold is wanted, this precipitate is boiled three times with fresh hydrochloric acid of specific gravity 1.1, washed, dried, and fused with an equal weight of bisulphate of potash in a Hessian crucible. F. B. Miller has invented a process of refining gold by passing chlorine gas through it while melted by means of a small clay tube. Chloride of silver is formed, which rises to the top, and is kept from volatilization by a cover of fused borax. The base metals volatilize as chloride, but most of the copper chloride remains with the silver. Gold of 0.991 to 0.997 can be obtained, and the method is successfully applied in England.

Lead.—The most frequent impurities are antimony, arsenic, copper, zinc, iron, and sulphur. Moderately impure lead can be purified by stirring the melted metal with a green birch pole and skimming it. In England lead containing copper and arsenic is *improved* by calcining in reverberatory furnaces with cast-iron hearths, throwing on a little lime and small coal, and skimming from time to time. Antimony is most difficult to remove, and requires the aid of a blast after the other impurities are mainly oxidized. Pure lead is obtained by igniting the pure nitrate and reducing the resulting oxide with black flux.

Mercury.—To obtain pure mercury from quite impure metal it must be redistilled in an iron retort, which may be made of one of the wrought-iron vessels in which it is shipped. After distilling, the mercury is heated to 50° C. (112° F.) with nitric acid, diluted with 2 volumes of water, for a day, then well washed and dried with bibulous paper. The treatment with acid alone will remove a moderate quantity of impurities, which are generally lead, bismuth, zinc, tin, and oxide of mercury.

Platinum.—The separation of platinum by the wet way from the metals usually accompanying it is a complicated chemical process, but Deville and Debray procure a malleable, ductile alloy of platinum, rhodium, and iridium, admirably adapted for chemical apparatus, by treating it in a small reverberatory furnace, with a bottom of firebrick lined with clay. This is heated to redness; 2 cwt. of ore and as much galena added by degrees; a little glass and as much litharge as galena are added little by little, and the melted metal left at rest. Iridosmine settles, and the platiniferous lead is cautiously ladled off and cupelled. The platinum is then refined with the oxyhydrogen flame on a lime-bed.

Silver.—The impure silver from cupellation and "retorting" may contain lead, bismuth, copper, arsenic, antimony, sulphur, and nickel. It is usually refined in small reverberatory furnaces. At Freiberg the furnace-hearth is lined with new and old argillaceous powdered limestone or "marl." About 1 ton is charged, melted rapidly, a moderate blast turned on, the metal skimmed from time to time, marl thrown on to absorb the foreign oxides, and the silver when fine covered with charcoal and ladled out. It is from 0.996 to 0.998 fine. Refining in crucibles is done either in graphite crucibles, with charges of 50 to 100 pounds or more, or in cast-iron ones with still larger charges; 1 to 2 per cent. of nitre and glass or borax is added as a flux. Silver is obtained very pure for commercial purposes by dissolving standard silver in nitric acid, precipitating with chloride of sodium, reducing with zinc and sulphuric acid, and melting the washed and dried metal. To obtain perfectly pure silver this should again be dissolved in nitric acid, precipitated with hydrochloric acid, and the dry chloride fused in a clay crucible with half its weight of dry carbonate of soda. Silver precipitated on sheet copper by boiling it with a slightly acid solution of nitrate of silver, and digesting the washed silver with ammonia-water, is pure enough for ordinary purposes.

Tin.—Commercial tin is refined by melting it slowly on the hearth of a reverberatory furnace and collecting the melted tin in a basin, where it is stirred with poles of green wood and skimmed. After standing a while it is ladled off carefully, the upper part being purest. Perfectly pure tin can be obtained by cautiously pouring pure water upon a strong solution of tin in hydrochloric acid in a beaker, and then plunging a bar of tin into the liquids. Crystals of pure tin will form on the bar where the two liquids meet.

Zinc.—Commercial zinc may contain lead, iron, tin, copper, cadmium, arsenic, and antimony. It is purified at Swansea by melting it in cast-iron pots, stirring, skimming, and ladling off the top portions; the lead collects at the bottom. A similar operation is conducted by remelting it first in reverberatory furnaces slowly, and allowing it to run into a basin or *sump* at one end of the hearth. Perfectly pure zinc is obtained by igniting the pure carbonate, and distilling the resulting oxide from a porcelain retort with charcoal made from loaf-sugar, or by dissolving the carbonate in sulphuric acid and depositing the zinc by a voltaic current. Cadmium, when present in

somewhat large quantities in zinc, is best separated by the wet way. H. B. CORNWALL.

Reflec'tion [Lat. *re*, "again," and *flectere*, to "bend"] **of Light,** that bending of a light-ray from its rectilinear course in which the whole ray, both before and after bending, lies outside the deflecting body. When a light-ray falls upon an unpolished surface, it is irregularly reflected or scattered in consequence of the different inclinations of the innumerable facets of which such surfaces are composed, as may be seen under the microscope. Non-luminous bodies are made visible by the scattering of light from their surfaces. When a ray falls upon a perfectly smooth surface, it is regularly reflected, and a virtual image of the illuminating body is seen behind the reflecting surface. Most surfaces which reflect regularly also reflect irregularly to some extent. The two portions of a reflected light-ray, before and after bending, are called respectively the incident and reflected ray. If a perpendicular or normal be erected to the reflecting surface at the point of incidence, the angles made with this normal by the incident and reflected ray are called the angles of incidence and reflection. The law of reflection is: *The angles of incidence and reflection are equal, and lie in the same plane.* This plane is perpendicular to the reflecting surface, and the illuminating and illuminated points are mutually interchangeable. The intensity of reflected light varies with the nature and the position of the reflecting surface, the differences in the reflecting powers of various substances being greater for small angles of incidence than for large ones: only 0.018 of a beam of light falling perpendicularly on water is reflected, while about 0.666 of such a beam is reflected from mercury. When, however, the angle of incidence is $89\frac{1}{2}°$—or, in other words, the incident beam is almost parallel with the reflecting surface—these two substances reflect alike 0.721 of the whole incident light; but at no obliquity, however great, is the reflection of light which passes through a less highly refractive medium, and impinges upon the surface of a more highly refractive one, total. (For total reflection see REFRACTION OF LIGHT.)
S. B. HERRICK.

Re'flex [Lat. *reflexus*] **Ac'tion,** in physiology, applied to those involuntary movements caused by an impression or irritation conveyed to the spinal marrow by the afferent spinal nerves, in consequence of which an excitement or impulse is sent back by the reflex spinal nerves, producing the movements in question.

Reform', p.-v., Pickens co., Ala. P. 495.

Reforma'tion [Lat. *reformatio*], the name usually given to the religious revolution of the sixteenth century which divided the Western Church into the two sections known as Protestant and Roman Catholic. This movement was not an isolated event, but closely connected with the intellectual and social changes which marked the transition from the Middle Ages to the modern era of civilization. It was also long in preparation. The disaffection toward the papacy which disclosed itself in the rise of sects like the Waldenses, and within the Church in the reforming councils of the fifteenth century held at Pisa, Constance, and Bâle; the rise of radical reformers, forerunners of Protestantism, as Wickliffe and others; the spiritual doctrine of the Mystics; political opposition to the Roman see, dating from the old contests of the empire with the pope; and especially the influence of the revival of learning in promoting general culture, in hastening the downfall of scholastic theology, and in producing a diligent study of the Bible and of Christian antiquity,—are among the antecedents of Protestantism which deserve special mention. Under this last head the work of Erasmus is very important. Protestantism, as a religious system, had two main principles—viz. the exclusive authority of the Bible as the rule of faith, as opposed to the normal authority of the pope or the Church—a principle that involves the right of private judgment; and the doctrine of justification by faith alone, in contradistinction to salvation by works or human merit. Protestantism claimed for the individual a direct access to the blessing of the gospel, without the mediatorial intervention of the Church or priesthood.

I. *The Reformation in Germany.*—The movement began here by the posting of the theses of Martin Luther, an Augustinian monk and a professor in the University of Wittenberg, who also attacked the sale of indulgences, which in the hands of Tetzel and others was a source of flagrant abuses. A universal strife was kindled in consequence. Luther was excomunicated by Pope Leo X. in 1520, but he publicly burned the papal bull, with the book of canon law, which was almost equally obnoxious to him. By preaching and by numerous publications, with the aid of Melanchthon and other coadjutors, he gained numerous supporters among all classes. Political opposition to the encroachments of Rome seconded his efforts. At the Diet of Worms in 1521, however, he was put under the ban of the empire. Among his varied labors which contributed to build up his cause one of the most important was his translation of the Scriptures. His adherents were too powerful to be suppressed. The electors of Saxony were his staunch friends. At the Diet of Spires in 1529, when a majority declared against the Reformation, the "Protest" which gave rise to the name "Protestants" was signed by the elector of Saxony, the margrave of Brandenburg, the duke of Brunswick-Lüneburg, the landgrave of Hesse, the prince of Anhalt, together with fourteen cities, including Nuremberg, Strasburg, and Constance. At the Diet of Augsburg in 1530, in the presence of Charles V., the Protestants presented their famous Confession, but a decree was passed condemning their cause. The menace involved in this decree led to the formation of the Protestant Smalcaldic League. The execution of the Augsburg decree by Charles V. was long prevented by political complications, which often proved helpful to Protestantism. Especially was this true of the rivalship of Charles V. and Francis I. At length, in 1546, after the death of Luther, the Smalcaldic war broke out, which resulted disastrously for the party of reform, but their cause was restored after Maurice, duke of Saxony, turned against the emperor. The Peace of Augsburg (1555) was a virtual acknowledgment of defeat on the part of the emperor, and secured to Protestantism a legal recognition. After the terrible Thirty Years' war in the seventeenth century the Treaty of Westphalia (1648) once more established the legal privileges of Protestantism as one of the religions of the German empire. The final result was that Northern Germany was mostly Protestant, while Southern Germany, after the Catholic reaction and the labors of the Jesuits, became predominantly Roman Catholic.

II. *The Reformation in (German) Switzerland.*—The leader of the Protestant movement here was Ulrich Zwingle, who became pastor at Zurich in 1519. Imbued with the Erasmian culture, but a robust and fervent advocate of the distinctive doctrines of the Reformation, he was chiefly instrumental in inducing the city of Zurich to abolish the old system and become a separate Protestant Church (1524). Public disputations, as well as sermons from the pulpit, and books and pamphlets, were agencies employed in Switzerland, as elsewhere, for the dissemination of the Reformed doctrine. Bâle (1529), Berne (1528), St. Gall (1528), and Schaffhausen (1529) followed the example of Zurich. The ecclesiastical revolution was also a political one; the movement for reform in the Church was identified with republican principles and patriotic efforts for the improvement of public morals, and in opposition to the corrupting foreign influence which had drawn the Swiss away from their homes to serve as mercenary soldiers. As the consequence of dissensions between the Protestants and Catholic cantons, war broke out, and Zwingle himself fell in battle in 1531. The cause of Protestantism received a severe blow by its defeat in this struggle, but afterward, in a great degree, recovered its fortunes, especially after Geneva espoused the Reformed faith. The Zwinglians differed from the Lutherans on the doctrine of the Lord's Supper, the former considering it a mnemonic or memorial feast, intended to call vividly to mind the Saviour's death; the latter holding that while transubstantiation is to be denied, Christ is actually received in the sacrament, even by the unbelieving communicant. The division occasioned by this controversy, and by the vehement repugnance of Luther to the Zwinglian opinions, divided and weakened the Protestant power at a critical epoch.

III. *The Reformation in the Scandinavian Kingdoms.*—Protestantism spread northward, largely through the influence of Germans and of preachers sent forth from the great Protestant seminary of Wittenberg. Christian II., king of Denmark, first favored Protestantism, but afterward drew back from its support. Under Frederic I. (1523–33), by whom he was supplanted, the Reformation extended itself, and it acquired a legal establishment in Denmark under Christian III. The Lutheran doctrine and a constitution with bishops or superintendents, which Luther had approved, were accepted. Protestantism was introduced into Norway in 1537 in connection with the subjection of the country to Denmark. The Reformed doctrine was first preached in Sweden in 1519; it was favored by Gustavus Vasa (1523–60), and was formally adopted at the Diet of Westeras in 1527. The ecclesiastical property fell for the most part into the possession of the nobles. Subsequent efforts to restore Roman Catholicism proved abortive.

IV. *The Reformation in Slavonic Countries.*—Lutheranism was favorably viewed by the Hussites of Bohemia. Protestantism was strongly established in that country. The refusal of its adherents to join Ferdinand of Austria in

the Smalcaldic war brought upon them, especially after the defeat of the Protestants at Mühlberg, severe persecution. Toleration was continued only to the anti-Lutheran Hussites. Lutheranism early spread into Polish Prussia and Livonia, also into Poland. In this last country dissension broke out between the Lutherans and Calvinists, and further division was occasioned by the introduction of Unitarianism, which gained many adherents among the higher classes. The various evangelical parties formed a union of Sendomir in 1572. Sigismund II., the king, was favorable to the Reformed doctrine.

V. *The Reformation in Hungary.*—Numerous Germans were settled in this country, who brought in the Lutheran faith, and were aided in diffusing it by the Bohemian Brethren and by Waldenses. The new faith made rapid progress, especially in the cities and among the nobles. But the civil wars that arose, coupled with the doctrinal contests between Lutherans (mostly Germans) and Calvinists (mostly Magyars), checked its growth. It remained strong, however, until it was weakened and reduced by the labors of the Jesuits and the measures of the Catholic reaction.

VI. *The Reformation in Geneva.*—The pioneer in the work of introducing Protestantism into Geneva was William Farel, a Frenchman, who preceded Calvin, and by whose influence Calvin was induced to establish himself there (1536). The bishop of Geneva had been expelled and Protestantism legally accepted in 1535. The intellectual vigor, fine scholarship, and indomitable energy of Calvin, in connection with his systematic organizing genius, caused his name to become familiar and his influence to be powerfully felt, not only within the walls of the city, where his tenets were accepted, and where his will became, after long struggles with adversaries, predominant, but also in other countries, especially in France, his native land. He took the leading part in shaping the civil and ecclesiastical institutions of Geneva. His doctrine upon the Lord's Supper was intermediate between that of Zwingle and the theory of Luther, but it was one which the Zwinglian churches could accept. The two streams of Swiss Protestantism gradually mingled in one. Calvin asserted likewise the divine predestination and election—a doctrine on which the Reformers were at first united—in terms which went beyond the view which the Lutherans were inclined to adopt. His doctrines of the Lord's Supper and of election or divine "sovereignty" became the distinguishing features of Calvinism—a system which was defined with great clearness in Calvin's *Institutes of Theology*. These tenets, associated with the Presbyterian polity, which Calvin also founded at Geneva, were accepted by the Protestants of France, Scotland, Holland, and other countries. Thus, Protestants were divided under two great classes—the Lutherans and "the Reformed," this last term being specially applied to the adherents of the Swiss type of the Reformation. Numerous foreigners—most of them exiled from other countries for their faith—resorted to Geneva, many of whom were naturalized, and many others, having been instructed by Calvin, returned as missionaries to their own homes. Geneva became to the Romanic countries and to the lands which received Calvinism what Wittenberg was to the disciples of Luther and Melanchthon. The principal leader there, after Calvin, was his accomplished pupil, Beza.

VII. *The Reformation in France.*—A class of mystics, of whom Lefevre was the most conspicuous, and among whom were Margaret, sister of Francis I. and queen of Navarre, and Briçonnet, bishop of Meaux, sympathized with the doctrine of justification by faith, though they were not averse to the traditional doctrine of the sacraments. Humanism was favorable to reform, and Francis I., who was proud of being styled the "father of letters," encouraged innovation up to a certain degree when his interests prompted him to lend it assistance. On other occasions he was a cruel persecutor of Protestantism at home, even when, out of hostility to the emperor, he was giving help to Lutheranism in Germany. His vacillation was productive of great mischief. Yet Protestantism, mainly from the influence of Calvin and of Geneva, gained a foothold in France in his reign. His successor, Henry II., was inimical to the Reformed faith, especially after the Treaty of Château-Cambresis with Spain. Nevertheless, Protestantism in his reign made great progress. In 1558 it was estimated that there were 2000 places of Reformed worship scattered over France, and congregations numbering 400,000 organized after the German pattern. In 1559 they ventured to hold a general synod in Paris. The Huguenots, as they were called, became, by the force of circumstances, a political party. The family of Guise gained such ascendency in the government during the reign of the young Francis I., and eventually under Charles VIII., as to come into inevitable conflict with the great houses of Bourbon and Châtillon, and at the same time the Guises set themselves up as intolerant champions of the old religion. The consequence was that the political and religious elements of opposition coalesced. The Protestants found leaders in Condé and Coligny, who adopted their faith, and the latter of whom honored it by a signally pure and elevated career. Anthony of Navarre first espoused, but finally deserted, the Protestant cause. His heroic wife, Jeanne d'Albret, the mother of Henry IV., was their steadfast defender. The history of the Reformation in France would include a full narrative of the civil wars. The edict of St. Germains in 1562 granted to the Huguenots a measure of toleration. But the massacre of Vassy shortly after opened the long and bloody struggle which went on, with intervals of peace, down to the accession of Henry IV. and the Edict of Nantes (1598). The massacre of St. Bartholomew in 1572, when Coligny and thousands of his co-religionists were slaughtered, was due to Catharine de' Medici as its main contriver, and sprang out of the mingled motives of political, religious, and personal hostility. The Huguenots were always a minority of the nation, but besides the nobles who were attached to their side, they comprised a multitude of the sober and intelligent middle classes and of the inhabitants of towns. The Edict of Nantes, following upon the abjuration of Henry IV., reduced them to the condition of a stationary or declining party, but one furnished as a means of defence with political privileges of an extraordinary character, which they continued to hold until the time of Richelieu. There were times in the course of the sixteenth century when the Protestant cause seemed likely to triumph in France; its failure to achieve the victory in that country was the tragic event of the Reformation.

VIII. *The Reformation in the Netherlands.*—The inhabitants of the Low Countries were highly prosperous and intelligent. The contiguity of the country to Germany and France facilitated the incoming of Protestant opinions; merchants and emigrants brought them over from England. In 1523 two persons were put to death at Brussels as heretics—an event that called forth a stirring hymn from the pen of Luther. The persecuting edicts of Charles V. led to the destruction of a great number of Protestants in the Netherlands. Grotius makes the whole number who perished in this reign 100,000—probably an exaggerated estimate. Philip II., who was unpopular in this part of his dominions, set about the strict enforcement of the laws against heresy. The cruelties of the Inquisition, in connection with the evident purpose to destroy the liberties of the country and subject it to Spanish absolutism, provoked armed resistance. The hero of the great revolt, which was a struggle for political and religious freedom, was William of Orange. In the course of the protracted conflict a Protestant state grew up in the North under the lead of Orange, while the southern provinces finally submitted to Spain and retained the old form of religion. The Dutch republic confronted the whole power of Spain and achieved its independence. At first, Lutheranism had been introduced into Holland, but the Calvinistic type of doctrine and polity prevailed, and was incorporated in the ecclesiastical institutions of the country. The *Confessio Belgica* was composed in 1561, and was revised and adopted by a synod at Antwerp in 1566.

IX. *The Reformation in England and Scotland.*—The Lollards, a remnant of the followers of Wickliffe, were numerous in England at the beginning of the sixteenth century among the lower classes. The revival of learning prepared the ground for ecclesiastical change. The friends of the "new learning" had a spirited contest with the devotees of scholasticism. More, Colet, and Erasmus during his stay in England, exerted themselves in behalf of letters and against superstition. The writings of Luther found readers, especially among young men at the universities. Tyndale's translation of the Bible was eagerly perused, notwithstanding the efforts of the authorities to suppress it, and the martyrdom of its author. The Reformation in England had two distinct sources, which at times worked in conjunction with one another. The first was the moral and religious feeling, which was enlisted in favor of the Protestant movement. The second was the *quasi* political opposition to the foreign rule of the papacy, which was reinforced by the difficulties encountered by Henry VIII. in attempting to procure a divorce from Catharine of Aragon. The reluctance of Clement VII. to comply with the king's petition roused Henry to reduce the power of the clergy and to oblige them to declare him the head of the Church of England. Finally, he cut the knot by marrying Anne Boleyn without the papal permission in 1532. This was followed by the Act of Supremacy, which put an end to papal authority in England. In 1536 followed the act for abolishing the monasteries and confiscating their property. The king still professed the Cath-

olic dogmas. There was a Protestant and a Catholic party in the Church, the leader of the former being Cranmer, archbishop of Canterbury, a man of pure and upright intentions, but of a timid nature. The Protestants were led in the council by Thomas Cromwell, the king's vicegerent in ecclesiastical affairs. The Ten Articles (1536) were, on the whole, favorable to the Protestant side. But the bitter matrimonial experiences of the king, taken in connection with the Catholic rebellion in the North, led to the issuing of the Six Articles (1539), which were more in the Roman Catholic interest; and the same circumstances caused the fall of Cromwell (1540). Cranmer was saved from the vengeance of the opposing faction by the king's personal favor. On the death of Henry VIII. and the accession of young Edward VI. (1547) the Protestant party obtained complete control. In his brief reign, under the auspices of Cranmer and his associates, the Protestant Church of England received its constitution, liturgy, and creed. Evangelical theologians from the Continent filled the chairs of theology in the universities. Under Mary (1553–58), the successor of Edward, the old order of things, the papal supremacy included, was restored. Her matrimonial connection with Philip II. and subservience to Spain, and the popular sympathy excited by the martyrdom of Cranmer, Ridley, Latimer, and others, prepared the nation for the restoration of Protestantism under the auspices of Elizabeth in 1558. During her long reign the Protestant religion took firm root in English soil. The defeat of the Spanish Armada (1588) rendered it certain that the authority of the papacy could not be reinstated by foreign intervention. The conservatism of Elizabeth in matters of religion provoked into activity the Puritan sentiment, which was anxious to assimilate English Protestantism to that of the Continent, where numerous English exiles had lived during the preceding reign. The Puritans likewise demanded a greater independence for the Church in relation to the state than the Tudor love of power and a widespread feeling of repugnance to ecclesiastical control would allow. The result was the division of the Church of England into two great parties, whose contests fill many a page of English history for the century that followed the accession of Elizabeth.

In Scotland, at the outbreaking of the Reformation, the clergy were ignorant and vicious, and the Church was in possession of a great portion of the landed property of the kingdom. The evangelical doctrine, of which John Knox was the most effective apostle, gained a lodgment in the hearts of the people, and the co-operation of the nobles was founded partly in religious conviction and partly in the desire to appropriate to themselves the property of the Church. Protestantism in the Calvinistic and Presbyterian form was legally established by an act of the Scottish Parliament in 1560. The events of the reign of Mary Stuart proved that the new faith was too deeply rooted in the hearts of the middle class of the Scottish nation to be dislodged. The Presbyterian system was fully established in 1592.

X. The Reformation in Italy and Spain.—Protestantism in these countries had several peculiar characteristics. Its disciples were confined to the higher, cultivated classes, and the Reformed faith took no root among the people at large. Protestantism was also a thing of degrees. Many held the doctrine of justification in the sense of the Reformers, but felt little repugnance toward the old view of the sacraments and the hierarchical government of the Church. The societies of professed Protestants were secret. In Italy there was a widespread desire of Church reform, in which eminent Catholics—such as Caraffa, Contarini, and other members of the "Oratory of Divine Love"—participated. Some of them were subsequently leaders of the Catholic reaction, which aimed at the purification of morals and discipline, but at the same time crushed dissent and schism with an iron hand. In Naples, Venice, Florence, and other cities there were Protestant churches. Eminent preachers like Ochino and theologians like Peter Martyr privately espoused the Protestant faith. These were driven into exile, and Protestantism was extirpated in Italy by the instrumentality of the Inquisition, the *Index Expurgatorius*, and the other agencies of the strict and ascetic party which gained the ascendency in the Church, and which suppressed also the moderate evangelical Catholics of the school of Contarini. In Spain there were Protestant churches at Seville and Valladolid. Persons of distinction attached themselves to the Protestant cause. The writings of Luther and of other Reformers were secretly introduced into the country, as they were in large numbers into Italy. But in Spain also the Inquisition, with its *autos da fe* (1559–60), did its work thoroughly.

The Roman Catholic revival in the latter part of the sixteenth century, with the new orders to which it gave birth, especially the order of Jesuits, and through the agency of the Council of Trent, which defined the doctrine and reformed the discipline of the Church, was able to recover a portion of the territory which had been lost; and it was indirectly aided in this conquest by the internal contests of Protestantism. The final result was that the Teutonic nations were left predominantly Protestant, while the Latin nations continued in their adhesion to the old ecclesiastical system. The organization of Protestantism was not uniform in the different countries. The two prime characteristics of the Lutheran polity were superintendents and consistories composed of clerical and lay members. Circumstances led in Lutheran communities to the assumption of ecclesiastical power by civil rulers to an extent not warranted by the views of the Reformers. Calvinists were everywhere jealous of state control, and demanded freedom for the Church without desiring to dissolve the bonds that connected Church and State. In England, in all the changes of the sixteenth and seventeenth centuries under Protestant rulers, supreme control, in things ecclesiastical as well as civil, was kept in the hands of king and Parliament. Calvinists in France, Scotland, Holland, and wherever they were left free to shape their institutions, adopted the presbyterial and synodal system of Church polity.

Among the works on the Reformation in Germany the history of Sleidan (1555) and that of Seckendorf (1686–92), together with the modern work of Marheineke (1816–34), may be mentioned; on the Reformation in England, Burnet (1679–1714) and the various writings of Strype; also Hallam's *Constitutional History;* on the Reformation in France, the work ascribed to Beza (1580). As a critical history of the Reformation high merit belongs to the 4th vol. of Gieseler's *General Church History* (New York, 1858). Häusser's *Lectures on the Period of the Reformation* (transl. 1874) are valuable; also Seebohm's brief work on *The Era of the Reformation* (New York, 1874). The original edition of Dr. Merle d'Aubigné's *History of the Reformation* is a copious and readable narrative. We may be permitted also to refer to *The Reformation*, by G. P. Fisher (New York, 1873), to which is appended a full bibliography of the subject. GEORGE P. FISHER.

Reformatories. See JUVENILE OFFENDERS, by REV. B. K. PEIRCE, S. T. D.

Reformed Church in America (DUTCH), formerly **Reformed Protestant Dutch Church,** a religious body formed in the Netherlands early in the sixteenth century, which became known under the name REMONSTRANTS, and was introduced into the New Netherlands soon after its settlement. It became independent of the Church in Holland in 1771, and now has 76 churches, chiefly in New York and New Jersey, 2 theological seminaries, a general synod, 2 newspapers, boards of home and foreign missions, education, and publication, and a fund for church extension. The word "Dutch" was dropped from the corporate name at the General Synod held at Albany Nov. 20, 1867. (For statistics see PRESBYTERIAN CHURCH.)

Reformed Episcopal Church. There have always existed in the Protestant Episcopal Church two different parties or schools of thought, popularly known as the High Church party and the Low Church or Evangelical party. Their existence has manifested itself in various ways, and is pretty universally recognized. While the extreme High Churchman recognizes the validity of no ministry which has not received episcopal ordination, and considers the Church the mother whom he is bound in all things to obey—who not only directs his actions, but even prescribes his belief, demanding from him a surrender of his right of private judgment—the Low Churchman recognizes the orders of other denominations as equally valid with his own, and has little faith in the ecclesiastical declaration of baptismal regeneration.

For years these two parties existed side by side, each exerting upon the other a restraining influence. It seemed to be understood that within certain fixed limits both should be allowed to flourish under the protection of the liberal laws of the same general Church. But during the ten years previous to the formation of the Reformed Episcopal Church, as the originators of that movement claim, a change took place in the policy of the High Church party, the result probably of confidence in increased strength. It was attempted to restrain the evangelical men more strictly within ecclesiastical lines, and the Tyng trial in New York, the Cheney trial in Chicago, and the Hubbard trial in Rhode Island, were considered evidence that the cords which bound the Church together were experiencing a severe strain. The General Convention in 1868 passed canons prohibiting in positive terms the exchange of pulpit courtesies between Episcopalians and ministers of other denominations; and these legislative enactments, though claimed by the majority to be merely an assertion of the settled law of the Church, were looked

upon by the minority as an infringement of the unwritten compact between the two parties. In the fall of 1873 a meeting of the Evangelical Alliance was held in New York City, in which a few clergymen of the Episcopal Church participated. But their course in so doing, and in joining with ministers of other denominations in a communion service, drew on them the severe animadversion of many of their brethren; and the settled discontent then culminated in the formation of a separate organization.

On Dec. 2, 1873, a small number of clergymen and laymen, under the presidency of Rt. Rev. George David Cummins, D. D., previously assistant bishop of the Protestant Episcopal Church in Kentucky, assembled in the city of New York, and proceeded, after deliberation, to pass the following resolution: "That we whose names are appended to the call for this meeting, as presented by Bishop Cummins, do here and now, in humble reliance upon Almighty God, organize ourselves into a Church, to be known by the style and title of 'The Reformed Episcopal Church,' in conformity with the following Declaration of Principles, and with the Rt. Rev. George David Cummins, D. D., as our presiding bishop: I. The Reformed Episcopal Church, holding 'the faith once delivered unto the saints,' declares its belief in the Holy Scriptures of the Old and New Testaments as the word of God and the sole rule of faith and practice; in the creed 'commonly called the Apostles' Creed;' in the divine institution of the sacraments of baptism and the Lord's Supper; and in the doctrines of grace substantially as they are set forth in the Thirty-nine Articles of Religion. II. This Church recognizes and adheres to episcopacy, not as of divine right, but as a very ancient and desirable form of church polity. III. This Church, retaining a liturgy which shall not be imperative or repressive of freedom in prayer, accepts the Book of Common Prayer as it was revised, proposed, and recommended for use by the General Convention of the Protestant Episcopal Church A. D. 1785, reserving full liberty to alter, abridge, enlarge, and amend the same, as may seem most conducive to the edification of the people, 'provided that the substance of the faith be kept entire.' IV. This Church condemns and rejects the following erroneous and strange doctrines as contrary to God's word: *First*, that the Church of Christ exists only in one order or form of ecclesiastical polity; *second*, that Christian ministers are 'priests' in another sense than that in which all believers are 'a royal priesthood;' *third*, that the Lord's table is an altar on which the oblation of the body and blood of Christ is offered anew to the Father; *fourth*, that the presence of Christ in the Lord's Supper is a presence in the elements of bread and wine; *fifth*, that regeneration is inseparably connected with baptism."

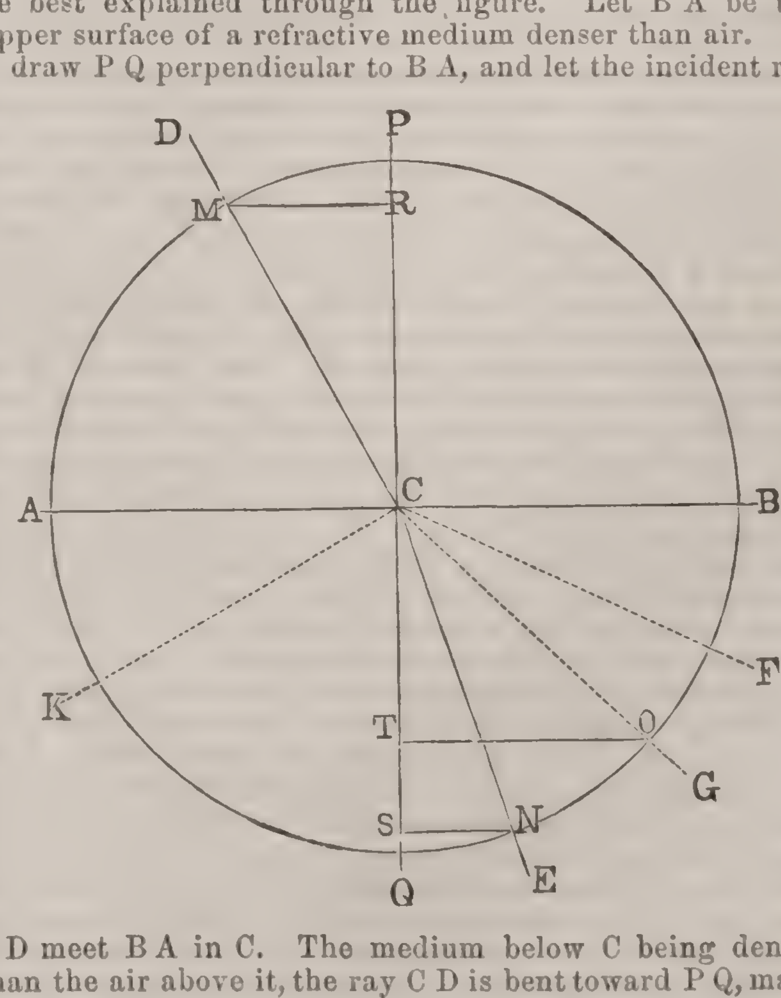
The members of the new Church then completed their organization by the appointment of officers and committees, and the adoption of provisional rules, and proceeded to elect the Rev. Charles Edward Cheney, D. D., of Chicago, as a missionary bishop.

The new Church grew gradually and steadily. Its leading men proceeded to revise the Book of Common Prayer, and this work was finally accomplished and the revised book adopted at the second General Council held at New York in May, 1874. At this time it also adopted its constitution and canons. The third General Council was held at Chicago in May, 1875, at which the articles of faith of the Church were adopted. At the present date (July 1, 1876) this Church has three bishops—Bishop Cheney, Bishop William R. Nicholson, D. D., of Philadelphia, and Rev. Edward Cridge of Victoria, British Columbia, the latter of whom is not yet consecrated. Bishop Cummins died very suddenly June 26, 1876. The Church has about seventy parishes and mission-stations, and is doing considerable work among the freedmen of South Carolina. Its strength is slowly but constantly increasing. A number of its ministers have come from the Methodist Church, and some from the Presbyterian, attracted by its order and liturgy. This Church is not bounded by any national or territorial divisions, nor are its parishes limited within any geographical lines. It has extended into Canada, and has a number of flourishing parishes in the maritime provinces. It has established a close federative union with the Free Church of England, and has two newspapers. The revised Book of Common Prayer allows liberty in extemporaneous prayer. The use of this book is obligatory at morning Sunday services, and optional at other times.

This Church repudiates the doctrine of the apostolic succession, but recognizes officially the orders of other Christian churches as equally valid with its own, considering the test of a Church's legitimacy to be the purity of its faith and the divine blessing on its work. In the words of its 24th Article, "This Church values its historic ministry, but recognizes and honors as equally valid the ministry of other churches, even as God the Holy Ghost has accompanied their work with demonstration and power." The bishop in this Church is simply *primus inter pares*, a presbyter, with the right to perform certain ecclesiastical acts—not a father, but an elder brother. The bishops in the council, which is the supreme legislative power, do not sit as a separate house, but vote with the presbyters. This Church rejects the hierarchical system, and all that is technically known as the sacramental theory. It has no earthly altar, priest, or sacrifice. Its position as to the Lord's Supper is fully set forth in the 27th Article, from which the following is an extract: "We feed on Christ only through his word, and only by faith and prayer; and we feed on him whether at our private devotions or in our meditations, or on any occasion of public worship, or in the memorial symbolism of the Supper." It is claimed that this Church has advanced a step beyond any other in making it obligatory upon every minister, in celebrating the Lord's Supper, to extend an invitation to all who love the Divine Lord and Saviour Jesus Christ to participate. In administering the elements the minister is directed to say to all the communicants kneeling around the table, "The body of our Lord Jesus Christ, which was given for you, preserve your bodies and souls unto everlasting life!" and then, when delivering the bread to each, "Take and eat this *bread* in remembrance that Christ died for thee, and feed on him in thy heart, by faith, with thanksgiving." A similar change from the Protestant Episcopal form is made in delivering the cup. The baptismal service contains no statement of the regeneration of the recipient. Baptism is merely the means whereby children and adults become members of the visible Church. HERBERT B. TURNER.

Reformed Presbyterians, a religious body in Scotland and the U. S., often called COVENANTERS or CAMERONIANS (which see), originating in 1680 in a secession from the national Church of Scotland, on the ground that Charles II. had forfeited his right to the crown by his repudiation of the Solemn League and Covenant. The first presbytery of Cameronians in America was formed in 1774 by missionaries from Scotland, and shortly after the Revolution (1782) they united with the "Associate Reformed Church," taking the latter name. (See PRESBYTERIAN CHURCH.)

Refrac'tion [Lat. *refringere*, *refractum*, from *re*, "again," "back," and *frangere*, to "break"] **of Light,** that deflection of a light-ray from its rectilinear course which is caused by its passage from one transparent medium into another of different density. When a ray of light falls obliquely upon the surface of a transparent medium, a portion of it is reflected (see REFLECTION); the remaining portion enters the medium, is bent aside at its point of entrance, but after that pursues a straight path through the transparent body. If the medium be homogeneous, the intromitted portion is single; this is also true of such crystals as have for their primitive form a cube, a regular octohedron, or a rhomboidal dodecahedron. In all other crystals the ray is divided into two portions. (See REFRACTION, DOUBLE.) The deflection of the light-ray is governed by fixed laws, and the amount of the bending is invariable for each refractive medium. These laws may be best explained through the figure. Let B A be the upper surface of a refractive medium denser than air. At C draw P Q perpendicular to B A, and let the incident ray



C D meet B A in C. The medium below C being denser than the air above it, the ray C D is bent toward P Q, mak-

ing D C E the refracted ray, P C D the angle of incidence, and Q C E the angle of refraction. To determine the amount of the deflection about C as a centre, describe a circumference cutting the incident and refracted rays in M and N, from which points draw M R and N S perpendicular to P Q. M R is the sine of the angle of incidence, and N S the sine of the angle of refraction. (See SINE.) Whatever the angles themselves be, or whatever the obliquity of the incident ray, it is found that for each refracting medium the sines of these angles bear to each other an invariable proportion. The *index of refraction* is the numerical expression for this proportion. When a light-ray passes from air into water, for instance, the proportion of the sines is 13358 — to 10003 —, or very nearly that of 4 to 3. The refractive index is therefore in this case expressed by the fraction $\frac{4}{3}$, or more exactly by the decimal 1.33582. Direct experiment, as well as the general law that *illuminating and illuminated points are convertible*, determine that if the ray passes from the more refractive medium, water, into the less refractive, air, the deflection will be from the normal P Q, and the refractive index will be $\frac{3}{4}$, the reciprocal of the index in the reverse case. The laws of single refraction are: (1) The angles of incidence and refraction lie in the same plane, which is normal to the surface separating the media, at the point of incidence. (2) The sine of the angle of incidence is equal to the sine of the angle of refraction multiplied by a constant quantity, which is invariable for each medium. The ray on entering the more refractive medium is bent toward the normal, and in entering the less refractive medium is bent from the normal by the same amount; the ray can therefore always return by the path of its arrival, the refractive index being in the one case the reciprocal of what it is in the other.

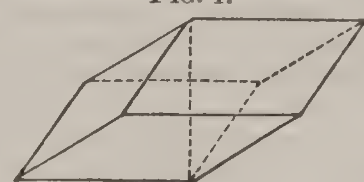
Looking at the figure, it will be seen that any ray, however oblique, which falls upon A B from the air above, will be refracted toward P Q. The reverse is not, however, invariably true. If a ray passes upward through the water, at certain angles refraction is impossible. Let the ray G C, following the law of the sines, just graze the surface of the water B A after being refracted from P Q; then any ray which enters the water between G and B from the direction F, as F C, cannot be refracted; for the portion after bending at its proper angle would be within the water, where no change of direction would be possible. The ray which cannot be refracted is, therefore, totally reflected. *Total reflection* at times causes the bottoms of very shallow ponds to be invisible to an eye at a certain angle from them. Every ray of scattered light, by which objects upon the bottom would become visible, reaches the surface of the water at an angle of total reflection, cannot emerge, and is turned downward again.

From what we have seen—viz. that the indices of refraction are reciprocals when the ray of light passes from one medium into another, and *vice versâ*—it is manifest that when a ray passes through a medium with parallel faces, as a pane of window-glass, its course after emergence is parallel to the original direction. All the rays which go to make up the image upon the eye of an object so viewed, therefore, assume their relative positions, and the proportions are perfect, though the whole object is slightly displaced, the amount of displacement being dependent upon the thickness of the glass. An object viewed through imperfect glass, where the faces are not strictly parallel, has its proportions altered, because the emergent rays which go to form it are not parallel, but diverge, or converge, or cross each other, at all sorts of angles. It will be found that the distortion becomes more striking as the eye recedes from the glass, the divergencies being more noticeable at a distance. When the faces of a refractive medium are perfectly smooth, though not parallel, the displacement of the object viewed is very great, though the proportions are perfectly retained. (See PRISM.) Most optical instruments are dependent upon refraction, and are constructed in accordance with its laws. When refraction takes place from one transparent medium into another in close contact with it, such as two liquids which are superimposed, but do not mix, or a solid and a liquid that wets it, the direction of the ray is the same as though a thin film of air were between them; and the relative refractive index is equal to the quotient of their absolute refractive indices. If the first medium be water, and the second plate-glass, whose indices are respectively $\frac{4}{3}$ and $\frac{3}{2}$, the relative index out of water into glass will be $\frac{3}{2} \div \frac{4}{3}$, or about $\frac{9}{8}$. (See LENS, MICROSCOPE, TELESCOPE, ABERRATION (SPHERICAL), etc. For the different refrangibilities of each colored ray in the spectrum see PRISM, ABERRATION (CHROMATIC), LENS, SPECTRUM ANALYSIS, UNDULATORY THEORY, and OPTICS.) The refractive index of air (1.0003, that of the luminiferous ether being taken as unity), though so small that in ordinary experiments it may be neglected, nevertheless produces some remarkable phenomena, even the change in the index produced by rarefaction and condensation in adjacent masses of air giving rise to many curious appearances. (See MIRAGE.) By aërial refraction the heavenly bodies suffer displacement to the eye of the observer; this is *nil* at the zenith, and at its maximum on the line of the horizon. (For history see OPTICS; for theory see UNDULATORY THEORY; for natural phenomena see RAINBOW.) Heat is refracted according to the same laws as light.

S. B. HERRICK.

Refraction, Double (see REFRACTION OF LIGHT), that case of refraction in which the intromitted portion of the light-ray is divided, at its deflection, into two rays, each of which pursues a different rectilinear course through the medium. Double refraction takes place in all transparent media except those bodies specified as singly refractive—viz. homogeneous bodies uniform in density, non-crystalline, or isometrically crystallized. (See REFRACTION.) At the point of entrance both rays into which the incident ray is divided are bent—one, the ordinary ray, being refracted in the plane of incidence and according to the law of the sines; the other, the extraordinary ray, except in special cases, deviating from the plane of incidence more or less as the inclination of this plane to the faces of the crystal varies, and being governed by the law of extraordinary refraction—a law much more complex than the law of the sines. (See UNDULATORY THEORY OF LIGHT.) It is only in the crystalline mineral commonly called Iceland spar (calcite), which occurs in large and beautifully-transparent rhombs, that the phenomenon in question is conspicuous enough to be detected by ordinary observation. In these crystals the two refracted rays into which a single incident ray is divided are so widely divergent as to produce two separate and distinct images of any object seen through them. Fig. 1 shows the form of one of these rhombs.

FIG. 1.



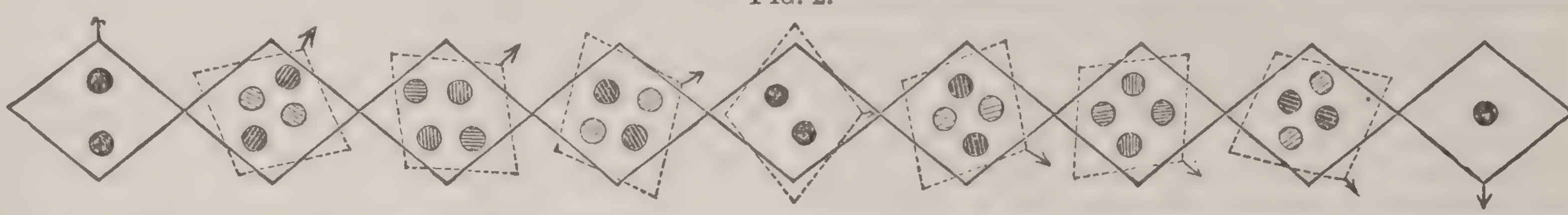
The angles of the plane faces are 101° 55′ and 78° 5′; the faces are inclined to each other in the angles 105° 5′ and 74° 55′. Three of the obtuse angles of the rhomboidal faces meet to form each of two equal and opposite solid angles, and the straight line connecting these solid angles is the crystalline axis of symmetry. From the relation (to be presently explained) of this axis to the property of extraordinary refraction within the crystal, this axis is also called the optic axis. But by optic axis is to be understood not one particular line determinate in position, but any line having the determinate direction of the axis in the figure. The rhomb, if fractured, breaks in planes parallel to the original faces, and innumerable minute rhombs may thus be formed, each one having its own axis. So, if the obtuse angles of the large crystal be truncated and replaced by planes perpendicular to the axis, a ray impinging at a determinate incidence on one of those planes will be affected in the same way at whatever point it meets it. If the incidence is perpendicular, the ray will proceed undivided and without deflection; in other words, in the direction parallel to the axis there is no double refraction in Iceland spar. If the other angles and edges of the rhomb be cut away and replaced by planes themselves parallel to the axis, a ray of light falling upon any one of these lateral planes in any plane of incidence will undergo double refraction, the energy of the manifestation varying with the position of the plane of incidence and of the ray in the plane. The most striking effects are observed when the plane of incidence is perpendicular to the axis; they diminish as this plane approaches coincidence with the axis; they are least when this coincidence is exact, and disappear altogether when, after such coincidence, the angle of incidence becomes 90°. For convenience, any plane coincident with (or parallel to) the axis is called a principal plane; any plane perpendicular to the axis, a conjugate plane. The index of refraction of the ordinary ray is 1.654 in every plane; that of the extraordinary, when at its minimum, which occurs in the conjugate plane, is 1.483. From this value it increases, as the plane of incidence and the angle of incidence in the plane are varied, until, in the principal plane and at the incidence 90° upon a surface normal to the axis, it becomes 1.654, equal to the ordinary index, and the two rays become one. In the conjugate plane, therefore, the two rays are most widely divergent; and they are both in the same plane of refraction, which is coincident with the plane of incidence. Both also for different incidences follow the law of Snellius, commonly called "the law of the sines." In other planes, however, or in any plane if the surface on which the ray is incident is oblique to the axis, the extraordinary ray departs from the plane of incidence and refraction which contains the ordinary ray; except only in the case in which the plane of incidence is also a principal plane of the crystal. As the natural faces of the crystal

are oblique to the axis, this circumstance gives rise to certain anomalous appearances when objects are observed through one of these.

If, for example, a natural rhomb of Iceland spar be placed so as to cover a portion of a straight black line drawn upon a sheet of white paper, two images of the line will in general be seen by an eye situated vertically over the crystal, of which one—that of the ordinary ray—will be continuous with the portion of the line seen outside the crystal, while the other—that of the extraordinary ray—will be discontinuous and laterally displaced. By rotating the crystal about the vertical, this second image may be made to change its place, and two positions will be found, differing in azimuth 180°, in which it will apparently coincide with the first, which remains motionless; but the two are nevertheless perceptibly different in distance from the eye, the ordinary image being nearest. If instead of the line there be merely a dot upon the paper, one image of the dot will appear to be in the vertical, and the other aside from the vertical; and as the crystal is rotated this one will revolve around the first, which remains at rest. This latter seems always nearest.

Reversing the experiment, let a slender cylindrical beam of common light fall, in a darkened apartment, at perpendicular incidence upon the rhomb, the emergent rays being received upon a screen. There will be two equal images,

FIG. 2.



one of which, if the rhomb be turned in azimuth, will revolve around the other, which latter is in the prolongation of the incident beam. If a second rhomb, equal and similar to the first, be applied to this conformably, so that the two may be equivalent to one of double thickness, the distance of the two images upon the screen will be doubled; but if the position of the second rhomb be reversed in azimuth, the rays separated by the first crystal will be reunited by the second, and a single image only will appear upon the screen, and will be in the line of the incident beam. If the two crystals are crossed on each other, there will still be two images, but neither of them will be in the prolongation of the incident beam; the ordinary ray of the first rhomb becoming the extraordinary of the second, and *vice versâ*. But if the azimuth of the second rhomb as related to the first is oblique, both the beams emergent from the first will undergo a second division by double refraction in the second, and four images will appear on the screen. At azimuths 45°, 135°, 225°, and 315° all these four images are equally bright. At all oblique azimuths the two members of each pair differ in intensity, each in turn varying from the maximum of brilliancy to absolute extinction. Fig. 2 shows these successive phases, beginning on the left, where the rhombs are supposed to be conformably placed, and proceeding by differences of 22½° of azimuth to the right, where the rhombs are reversed upon each other and the images are all reunited in one.

A ray of light which has undergone polarization by reflection (see POLARIZATION), when incident upon a doubly refracting crystal, deports itself in all respects as does light which has been modified by double refraction; that is to say, in a principal plane or in a conjugate plane it is refracted without being divided, but in every other azimuth it is separated into two rays, whose relative intensities vary with the azimuth. From this and from other evidences it is demonstrated that the effect of double refraction is always to polarize light.

Iceland spar belongs to a crystallographic system of three axes, two only of which are equal. The third, which is the axis of perfect symmetry, is that which joins the obtuse angles of the rhomb. It has been seen that a ray incident perpendicularly upon one of these truncated vertices, and coincident in direction with the axis, is not doubly refracted; but that if the incidence be oblique in whatever plane, double refraction occurs, the extraordinary index being less than the ordinary, and the extraordinary ray being therefore more distant than the other from the normal, which is the axis. If the incident ray be revolved about the normal, the angle of incidence remaining unchanged, the refracted rays will describe the surfaces of two cones having a common vertex, the surface described by the extraordinary ray being external to the other. This effect has been fancifully ascribed to an influence emanating from the axis, by which it would seem that this ray is repelled; and as an attractive force is naturally regarded as positive, repulsion must be esteemed negative. From this conception the term negative has been applied to all crystals of one axis of perfect symmetry in which the index of extraordinary refraction is less than that of the ordinary. Crystals in which the extraordinary index is the greater are called, on the other hand, positive. Of these, quartz is the most remarkable, for the singular optical properties of which see POLARIZATION.

Double refraction occurs in all transparent media when in a state of tension or strain, temporary or permanent, as in glass stretched, compressed, bent, or unequally heated, in indurated jellies, gums, resins, etc. etc. The whole subject of double refraction is so closely associated with polarization that the one cannot be considered without the other. (For many of the most remarkable phenomena of double refraction, therefore, see POLARIZATION; and for theory see UNDULATORY THEORY OF LIGHT.)

S. B. HERRICK.

Refraction, Index of, a term used to denote the abstract number expressing the constant ratio between the sine of the angle of incidence and the sine of the angle of refraction in a given substance; or the numerical quotient of the former divided by the latter. The indices of refraction afford a convenient means of comparing the refracting powers of different media. In the following table these indices are given for some of the more commonly-occurring or more interesting transparent bodies:

Indices of Refraction.

FLUIDS.		SOLIDS.	
Substance.	Index.	Substance.	Index.
Water	1.336	Tabasheer (Vellore)	1.111
Acetic acid	1.396	Ice	1.309
Ether	1.366	Cryolite	1.346
Alcohol	1.371	Fluorspar	1.435
Oil of turpentine	1.476	Quartz (amorphous)	1.453
Naphtha	1.475	Camphor	1.492
Linseed oil	1.485	Calcite (ord. ray)	1.654
Castor oil	1.489	" (extr. ray)	1.488
Florence oil	1.490	Glass (plate)	1.500
Honey	1.495	" (crown)	1.525
Canada balsam	1.540	" (flint)	1.576
Peru balsam	1.600	Selenite	1.530
Carbon bisulphide	1.678	Lead chromate	2.974

The varieties of crown, plate, and flint glass are very numerous, and these are equally various in refracting power. The indices of those most commonly met with are given above. All these determinations suppose the ray to pass from the air to the medium. The index of refraction of air itself, when light enters it from a vacuum, is 1.000294; by which number the index of the table must be multiplied in order to obtain the absolute refracting power of the medium.

F. A. P. BARNARD.

Refraction of Sound. A beam of sound—regarded as any very small segment of an advancing spherical wave-front—moves normally in a radial line, but it is bent from its rectilinear course whenever it undergoes an unequal acceleration or retardation, necessarily turning toward the side of least velocity and from the side of greatest velocity. In other words, the direction of acoustic impulse is always *perpendicular* to the wave-front of sound, whether it continues as an expanding spherical surface, or, by reason of unequal velocity, becomes in any way deformed.

There are four ways in which sound-waves may be subjected to an unequal disturbance of velocity, and the sound-beams become thereby "refracted." First, by variation of *elasticity* in the medium (sound moving more swiftly as the square root of the elasticity, the density being the same); second, by variation of *density* in the medium (sound moving more slowly as the square root of the density, the pressure being the same); third, by variation of motion or *current* in the medium (sound travelling by convection faster with the wind by a small percentage according to the velocity of the same, and *vice versâ*); and fourth, by variation of *temperature* in the medium (sound moving more swiftly in a heated atmosphere in proportion to the square root of the absolute temperature). The effect of heat on a gas is to increase its elasticity if confined, and to diminish its density if unconfined; in either case equally accelerating the waves of sound.

(1) Perhaps the only practical example of acoustic refraction by differences of *elasticity* is furnished by the passage of sound from water into air or from air into water. Sound moves more swiftly through liquids (and still more so through solids), not in consequence of their greater density, but in opposition to their density, and by virtue of their far greater energy of resilience or elasticity, measured in intensity, not in quantity. The concentric sound-

waves sent upward by a submarine explosion to the level surface of the water there suffer a large amount of internal reflection, with a reverse curvature, giving the sound-beams the same amount of divergence downward that they previously had upward. A portion of each of the sound-waves, however (with greatly diminished amplitude of vibration), is propagated into the air. These have their convex fronts very much flattened, by reason of being reduced to less than one-fourth of their previous velocity. The radii of these deformed surfaces, representing the directions of the sound-rays, are thus bent or refracted upward (or toward the vertical) at the surface of the air, and have a focus of divergence much more distant than the position of the origin of the sound-waves. In the case of an aërial sound, as the discharge of a gun, the descending sound-waves are largely reflected upward from the surface of the water; but a small portion of the impulse passing this plane, the convex wave-fronts, acquiring suddenly more than four times their previous velocity, are hurried into greatly-increased convexity, and the sound-rays are refracted toward the horizon, with a divergence representing a much lower or nearer focus than the origin of the sound. Those sound-rays which by refraction would coincide with the horizontal plane or water-surface would necessarily suffer total reflection.

(2) The refraction of sound resulting from differences of *density* was first demonstrated by Mr. Carl Sondhauss (in 1852) by means of a convex lens of carbonic acid gas confined in an envelope of collodion film. The ticking of a watch was heard, with the lens interposed, most distinctly at a focal point where it could not be heard on the removal of the lens. (*Poggendorff's Annalen*, 1852, lxxxv. 381.) In this case the wave-front on entering the convex surface of the lens is so far retarded by the denser gas (commencing at the axis of the lens) as to have a concave form impressed upon it, and on emerging from the second surface of the lens in reversed order becomes still more concave by being accelerated first at the outer annulus. The normals of these concave waves converge to a focal point.

(3) The refraction of sound by inequality of *wind* was first suggested by Prof. Stokes in 1857. (*Rep. Brit. Assoc.*, 1857, xxvii., Abstracts, p. 22.) Winds, being ordinarily more retarded near the earth than aloft, would act unequally upon the concentric sound-waves advancing against them, by retarding the upper portion of the wave-fronts more than the lower portion. Being thus tilted backward more and more as they advanced against the wind, these wave-fronts would have their lines of impulse, representing the acoustic beams, bent gradually upward from the surface, so as to leave a sound-shadow at no great distance on a plane. On the contrary, sound-waves advancing in the direction of the wind would, for the same cause, have their fronts more tipped forward above than below, and the line of acoustic effect would be bent downward, bringing continuously some of the upper sound-beams to the observer's ear at great distances. This explains why sounds are usually heard with so much better effect and to so much greater distance in the direction of the wind than in opposition to it. In those exceptional cases where the upper wind is moving with less velocity than the lower wind, sound will be heard to a greater distance against the wind. Prof. Henry in 1865—without knowledge of the theory—made the two capital observations that a sound-signal could be heard against the wind at the masthead of a vessel after having ceased to be audible on deck, and that the speed of the clouds as indicated by their shadows was several times that of the sensible wind.

(4) The refraction of sound from differences of *temperature* was first pointed out by Prof. Reynolds in 1874, who showed that during the heat of a still summer's day, when the lower air had a higher temperature than the upper air, loud sounds could be heard to but short distances, but that in the evening, when the lower air became cooler, the same sounds were heard distinctly several times the former distance. (*Proceed. Roy. Soc.*, 1874.) It is well known that the difference of sound-velocity due to the temperature is about 1 foot for 1° F. Hence, when the lower strata of air are the warmest (as is usually the case), the advancing wave-fronts are accelerated below, causing the sound-beams to curve upward, as in the case of adverse winds. This explains why the sound of waterfalls is heard so much farther and more distinctly at night than during the day, even in the most silent of rural districts. When the lower strata of air are colder than the upper (as more rarely occurs), the advancing sound-waves are tipped forward above, bending downward the sound-beams, and thus greatly favoring audibility at a distance. This explains the facility with which sounds (as of conversation, etc.) can sometimes be heard to unusual distances in Arctic regions. (See also ACOUSTICS.) W. B. TAYLOR.

Refrig'erants [Lat. *refrigerans*, "cooling"], a term sometimes used in medicine to designate collectively certain medicines given in fever which produce a grateful feeling of relief from the distress of the febrile symptoms. Such are cooling drinks in general—solutions of potassium salts, as the citrate or nitrate; effervescing draughts, acid mixtures, and solutions of purgative salts. The term has no proper scientific signification. EDWARD CURTIS.

Refrigeration. See FREEZING, ARTIFICIAL, by PRES. F. A. P. BARNARD, S. T. D., LL.D.

Refrigeration of the Earth. If the earth possessed no heat excepting that derived from solar radiation, we should expect to find at no great depth, on descending below its surface, a limit to the variation resulting from the yearly alternation of the seasons, and a region of uniform temperature representing the annual mean. Below this neutral line we should expect to find a uniform continuation of this mean temperature to whatever depth we penetrated, as this condition alone could be one of stable thermal equilibrium. This, however, is not the fact observed. Beneath the line of invariable temperature (about 50° F. or 10° C.), ascertained to be at a depth of from 50 to 100 feet, according to the latitude or the surface condition, we find in every part of the earth explored a steady increase of heat downward, differing considerably in different localities or according to geological formations, but showing no relation to terrestrial latitude. This rate of thermal increase has been generally estimated as on the average about 1° F. to every 50 feet (1° C. to 27½ mètres); and at the depth of about 10,000 feet (3048 mètres) the temperature of boiling water is ordinarily reached.*

The earth is therefore a cooling body. And a natural question is, Whence the origin of its interior heat? The heat derived from chemical and mechanical action, to which much importance has been attached by some, may be neglected as quite insignificant. The heat (like the light) received from the stellar depths bears so small a proportion to that derived from the sun that it may also be entirely neglected, excepting in very precise investigations. The fanciful hypothesis that our internal store of heat might possibly have been derived from a long presence of our solar system in a considerably warmer region of space is so entirely arbitrary that, but for the name of its propounder, the distinguished Poisson,† it would deserve no attention.

This warmer temperature of a cosmical region can mean nothing more than the nearer approach of heating bodies in space. But the present form and relation of our planetary orbits very clearly establish the fact that *since the original evolution of the planets themselves* our solar system has not been near enough to any star or cluster of stars to affect its general temperature by an appreciable amount. Sirius is estimated to have an illuminating (and therefore presumably a heating) value about 400 times that of our sun. Supposing that our system had ever approached Sirius within four times the distance of Neptune, then the amount of heat received by the earth from that blazing star would be but the thirty-sixth part of that received from our own smaller sun—a wholly insufficient amount to affect sensibly the average temperature of the interior, while under the condition supposed the planetary orbits would be utterly deranged and their organisms destroyed. Nor would the case be materially changed by substituting a cluster of smaller stars, or the Milky Way itself, as the source of heat.

No satisfactory conception, therefore, presents itself but that the phenomenon observed represents a residuum of aboriginal heat, mechanically derived from the action of gravitation. The manifest result of igneous action in the lowest Archæan rocks—the shrunken condition of the earth's superficial crust, evidenced in its contortions, corrugations, and enormous tangential thrusts capable of raising and upholding mountain-chains miles high—the very proportions of our flattened globe, so precisely representing those of a rotating liquid spheroid,—all conspire with cumulative force to impress the conviction that our planet was at one time a fused and incandescent mass. Nor is this conviction weakened by the contemplation of our own sun and the innumerable host of luminous bodies in space, all radiating heat in some proportion to their light, and all therefore cooling bodies.

* The constant increase of temperature inward, coupled with the fact of the comparatively small aggregate specific gravity of the globe (about six times that of water), has naturally inspired a belief that its central heat must be very high, even beyond that of fusion. The mathematical discussions of Mr. W. Hopkins and of Prof. W. Thomson appear to show that for the phenomenon of "precession" a degree of rigidity in the earth's mass is required not compatible with any considerable region of fluidity. The question of central fusion thus stands undecided.

† *Théorie mathématique de la Chaleur* (Paris, 1835).

Fourier, whose classic mathematical investigation in the *Théorie analytique de la Chaleur* is still authoritative after the lapse of nearly two-thirds of a century, has shown by a beautiful theorem the law of heat-distribution in a cooling body. He has also shown the extreme slowness with which the chilled radiating surface of any very large mass is affected by the decline of its interior heat. He has satisfactorily proved not only that the internal heat has exercised no sensible effect on the surface or climatic temperature of the earth for millions of years past, but that from its present known ratio of conduction through the upper rocks, whatever be the estimate of its central intensity, its continuous escape through, and radiation from, the surface does not raise the permanent temperature of that surface more than one-seventeenth of a degree F. or one-thirtieth of a degree C. In other words, whether the crust of the earth were filled with the glowing coals of a heated furnace or packed with the ice of a refrigerator, it would be very difficult for our most delicate instrumental measurement to ascertain the difference, unless by descent into a mine.

As a practical phenomenon, therefore, the indefinite cooling of our planet cannot have the slightest importance for us, excepting in its collateral effects of the continuous disturbance of geographical contours by the slow but inevitable contraction of the radius and the ceaseless displacement of both absolute and relative levels. It is in the retrospect of this great action (continued, doubtless, through so long a period) that the subject of the earth's cooling presents the most interesting topic of contemplation and suggestion. Through how many millions of years has this cooling process been going on? And what clues, if any, does it offer to the possible range of geologic chronology?

Sir William Thomson, by a fine application of Fourier's theorem, assuming certain probable values for the ratio of conductivity of ordinary rocks—their temperature of fusion and the ratio of existing heat-differences downward—arrived at the conclusion that "we may with much probability say that the consolidation cannot have taken place less than 20,000,000 years ago, or we should have more underground heat than we actually have; nor more than 400,000,000 years ago, or we should not have so much as the least-observed underground increment of temperature." (*Trans. R. S. of Edinb.*, vol. xxiii.; also *L. E. D. Phil. Mag.*, Jan., 1863, vol. xxv. p. 5.) Prof. Thomson regards 100,000,000 years as the most probable value of the time elapsed since a terrestrial crust was formed; and shows that for the last 96,000,000 years the ratio of descending increment has only been diminished to one-fifth, or from 10 feet to the degree F. to 50 feet for one degree.

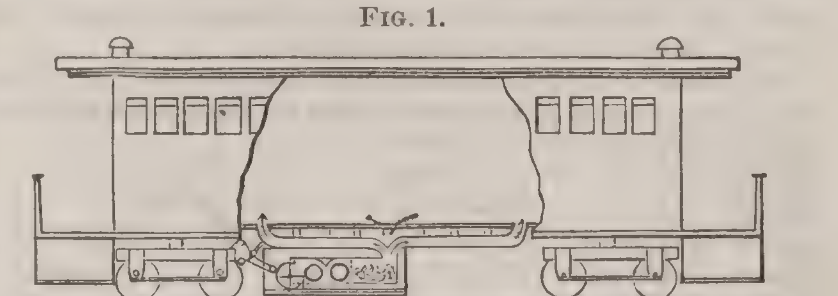
To the practical geologist a hundred million years appear utterly inadequate to permit the slow submarine deposit of 20 or 25 miles of stratified rock, including the innumerable unregistered intervals which certainly occurred in the progress of such deposition. To the experienced palæontologist no less insufficient does the time appear for the slow and solemn march of life upon our planet. And yet it is impossible to detect any flaw in the stern logic of this application of Fourier's theorem. It is true that the physical constants involved are but approximately ascertained; but, even doubling their coefficients, we shall not probably extend the time since telluric congelation to more than 1,000,000,000 years. This, therefore, would appear to be an extreme limit within which the whole of our geologic history must have been recorded.

The refrigeration of the earth has no connection whatever with the "glacial epoch." That great cosmical winter is but a phase of external climate, dependent, as Mr. Croll's theory has rendered so probable, on the planetary relations of eccentricity of orbit, compounded with the precession of the equinoxes. And through the ages of the past the glacial epochs have recurred in grand procession as curious illustrations of changes—not in the average temperature of the earth's surface, but—in the local distribution of its constant supply.

But if our earth is thus shown not to have had its average exterior temperature affected in any appreciable degree by its inner heat for so many millions of years, there is a source of slow decline in the great controller of climate itself; for the sun, to whom alone we are indebted for our entire supply of sensible warmth, is himself a cooling body. And though we are unable to determine at what period in the condensation of a gravitating mass the amount of heat radiated from its surface reaches a *maximum*, there are suggestions for supposing that our sun has passed that epoch, and that millions of years ago (possibly in the Jurassic period of the Mesozoic ages) its culmination was reached, and that cooler Cainozoic climates may be the witness of a fading sun. (See Fourier, *Theory of Heat* (*Ann. Chim. et Phys.*, 1816, iii. 350); *Secular Cooling of the Earth* (*Ann. Ch. et Ph.*, 1820, xiii. 418); *Théorie analytique de la Chaleur* (4to, Paris, 1822); *Remarks on the Temperature of the Terrestrial Globe*, etc. (*Ann. Chim. et Phys.*, 1824, xxvii. 136 and 236); *Theory of the Movement of Heat in Solid Bodies* (*Mem. Acad.*, 1824, iv., and 1826, v.); Laplace, *Diminution of the Length of the Day by the Cooling of the Earth* (*Ann. Ch. et Ph.*, 1820, xiii. 410); Poisson, *Distribution of Heat in Solid Bodies* (*Ann. Ch. et Ph.*, 1821, xix. 337); *Théorie math. de la Chaleur* (4to, Paris, 1835); *Temperatures of the Solid Portions of the Earth*, etc. (*Comptes rendus*, Jan., 1837, iv. 137); Dr. Gustave Bischof, *Natural History of Volcanoes and Earthquakes* (*Edinburgh New Phil. Jour.*, 1839, xxvi. 25, 347); W. Hopkins, *Researches in Physical Geology* (*Phil. Trans. R. S.*, 1839, cxxix. 381; 1840, cxxx. 193; 1842, cxxxii. 43); J. D. Forbes, *Account of Some Experiments on the Temperature of the Earth at Different Depths*, etc. (*Trans. Edinburgh Royal Soc.*, 1849, xvi. 189); *Inquiries about Terrestrial Temperature* (*Trans. Ed. R. S.*, 1861, xxii. 75); Sir William Thomson, *Secular Cooling of the Earth* (*Trans. Ed. R. S.*, 1862, xxiii.; *L. E. D. Phil. Mag.*, Jan., 1863, xxv. 1; Thomson and Tait's *Treatise on Nat. Phil.*, vol. i. p. 711); J. D. Dana, *Results of the Earth's Contraction from Cooling* (*Am. Jour. Science*, 1873, v. 423; vi. 6, 104, 161).) W. B. Taylor.

Refrig′erators. That fruits, vegetables, and fresh meats may be preserved for indefinite periods by reducing their temperature nearly to the freezing-point has long been known; to assure this, an abundance of ice is necessary, and hence refrigerators have been brought much nearer perfection in the northern portions of the U. S. than in any other part of the world. And the use of refrigeration in the transportation of perishable articles of food, both by rail and steamer, promises to initiate a most important change in this branch of traffic. There is but little doubt that a few years hence the fruits of California and the fresh beef of Texas and the West will be brought to Eastern markets almost wholly in refrigerating cars; and the movement, already successfully begun, to transport such articles to foreign ports will soon reach an extent now little anticipated. Although refrigerators for preserving perishable food were really of American origin, the first hint appears to have been given from the ventilation of the British Houses of Parliament by means of a fan-blast forced over masses of ice, which cooled the air; for this contact of the air with the ice itself is essential to the simultaneous drying and cooling of the air requisite in an effective refrigeration. This, so far as the knowledge of the writer extends, was first shown in a refrigerator in the car patented in 1855 by J. B. Barry. In this a driving-

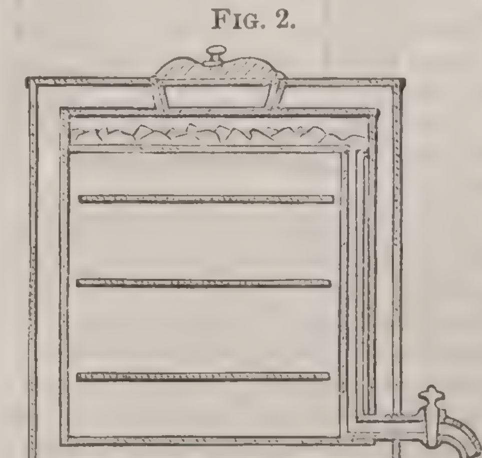
Fig. 1.



Barry's Refrigerating Car.

band from a pulley on the car-axle operated a fan, which drove a current of air in contact with a mass of ice. Barry's system was defective in the very slight contact of the air with the ice, and in the fact that he appears to have intended to take the air from the external atmosphere, passing it into and through the car, and thence out again; which would require an immense quantity of ice, even if the air-current was advantageously directed thereto. Previous to this, however, several refrigerators had been constructed in which the refrigerating chamber was cooled by the radiation, so to speak, of cool air from an ice-box through the sheet-metal sides or bottom of an ice-receiver. A primitive form of this is shown in the Union refrigerator of Job & Gold, patented thirty-two years ago. In 1848, Tough & Craddock patented another on the same principle, but in which the ice was placed in a sheet-metal cylinder which exposed a greater refrigerating surface than the one previously mentioned. In 1846, T. B. Smith patented a refrigerator

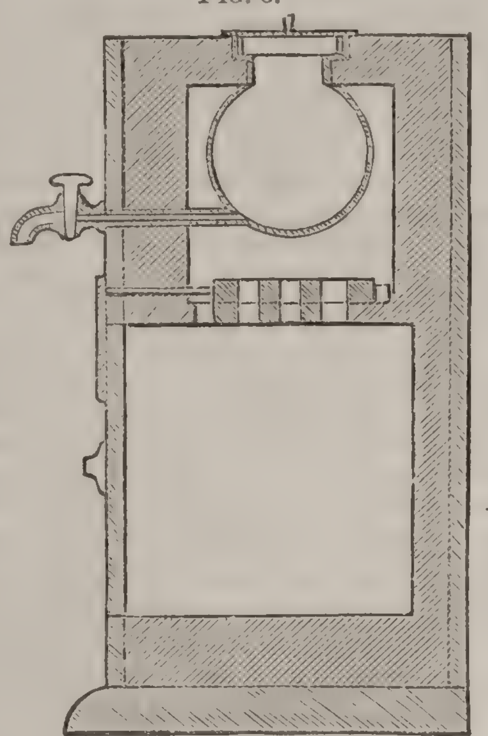
Fig. 2.



Job & Gold's "Union Refrigerator."

in which he proposed to connect two or more apartments (one of them provided with an ice-box) by means of tubes having valves, so that the cold air could be supplied to or shut off from one or more of the apartments, in order that the opening of one could not affect the temperature of another. It will be observed that in the apparatus of Job & Gold, Tough & Craddock, and of Smith, an outlet is provided at the bottom of the ice-box to drain off the water resulting from the melting of the ice. This is essential to all refrigerators using ice, the presence of the water in contact with the ice diminishing its refrigerating power.

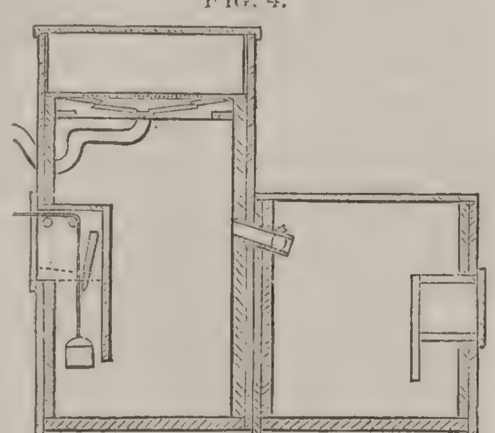
Fig. 3.



Tough & Craddock's Refrigerator.

In 1849, J. Lentell made a refrigerator in which he provided for the automatic circulation of the air within a closed chamber by the differences in its density. The air, cooled by contact with the sheet-metal bottom of the ice-box, descending at the centre of the refrigerating chamber, and becoming heated as it approaches the bottom of the chamber by contact with the articles to be preserved, is of course somewhat rarefied, and, descending at the sides of the chamber, is again brought in contact with the refrigerating surfaces; its surface is enlarged in this device by making the bottom of the ice-box of a deeply-corrugated form, in connection with the contact of the air with the ice. This natural circulation, so termed, of the air in a closed chamber, changed in its density, became the foundation of one of the most important improvements in refrigerators ever made, the invention of Fairbanks, afterward patented to Lyman, and hereinafter fully referred to.

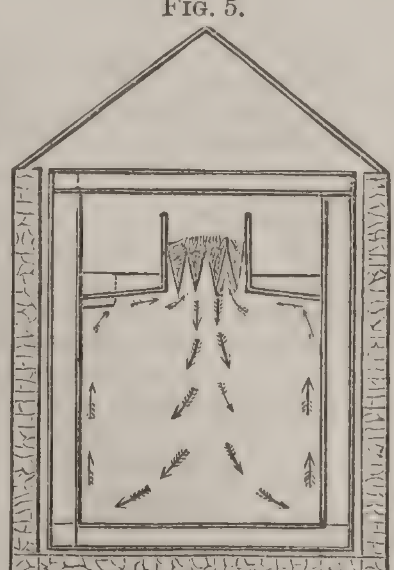
Fig. 4.



Smith's Refrigerator.

The circulation of air through a chamber, but *not* over and over again within it, was shown in the patent of William Mootry in 1855. In this apparatus the air entered through openings at the top, passed downward in contact with the cold sides of the ice-box, and being thus made denser, descending by its own gravity through the refrigerating chamber, and thence out through holes in the bottom of the latter. It is proper to explain in this connection that the preservation of fruits, vegetables, and meats depends not only upon a reduction of temperature, but upon a high degree of dryness in the refrigerated air; for if the cold be moist, a slime will gather upon the perishable articles, and in a short time destroy their flavor. When air is brought in contact with the ice, the moisture is condensed from the air upon ice, and carried off with the water through the drip-pipe. On the other hand, when the air is brought in contact with cold metal, the vapors are also deposited, but remain in the shape of moisture on the walls, floors, etc., with which the air is continually brought in contact, and which is therefore more or less reabsorbed. In practice, therefore, it is found that, as regards utility, metal refrigerating surfaces bear no comparison with the surfaces of the ice itself. The use of absorbents of moisture, such as sulphuric acid or bitumen, containing a large percentage of chloride of sodium, has been proposed, but none of them appears to have given satisfaction to meat-packers and others practically engaged in storage or preservation of perishable articles of food.

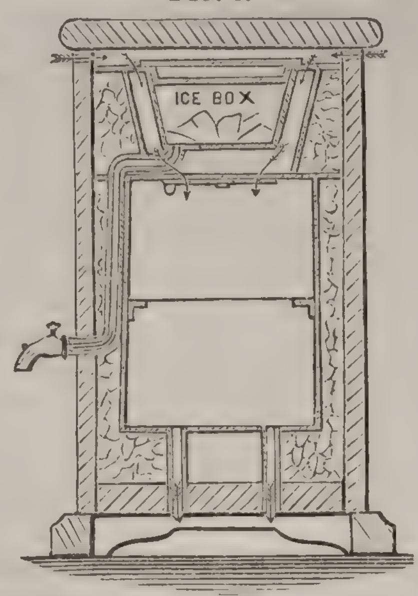
Fig. 5.



Lentell's Refrigerator.

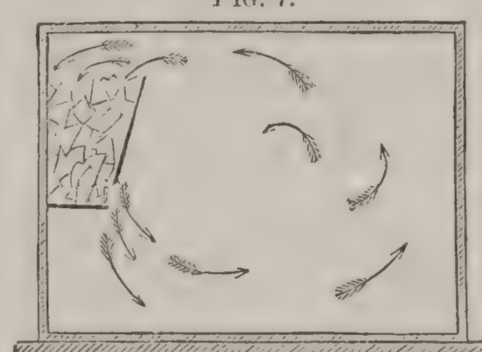
Somewhere about the year 1846, Thaddeus Fairbanks filed an application for a patent for a refrigerator, which consisted simply of an ice-box elevated at some little distance above the floor of the refrigerating chamber, and with an opening at the lower portion of its front. The chamber was closed against access of external air; the confined air of the chamber in contact with the ice became heavier, and, descending, displaced the air at the bottom of the chamber, which, being thus forced upward, passed to the top of the ice-box, and, in its turn becoming cooled, became denser, and, descending, of course thereby established a continual natural circulation of the air within the chamber. As has frequently occurred in the treatment of valuable inventions by the patent office, this application was rejected on grounds afterward shown to be frivolous. But Fairbanks subsequently abandoned his application; and an abandoned application, comprising merely the drawings and description neglected in the dusty archives of the office, being very properly held to be no valid basis for the rejection of an application subsequently made by another inventor in good faith, a patent covering the same ground was granted in 1852 to Azel S. Lyman. This last-named patent has been the subject of much litigation, and has called forth decisions that bear an important part in more recent interpretations of the patent laws. Lyman's apparatus showed substantially the same device as Fairbanks's, but he extended a partition from the bottom of his ice-box nearly to the floor of the refrigerating chamber, thereby, as he claimed, ensuring the more effective descent of the cold air to displace the warm, and consequently a more uniform and efficient circulation of the air confined in the closed chamber. Lyman also provided a slatted bottom to the ice-box, which facilitated the passage of the cool air therefrom; and he also devised certain special means ensuring the rapid drainage of the water resulting from the melting of the ice out of contact with the same. It is manifest that the degree of drying and refrigeration of the confined air will be in proportion to the quantity of ice employed, and that, owing to the relatively slow circulation of the air, a much larger proportion of ice will be needed than if the circulation were forced; hence, the most effective, practically, of refrigerators are those in which the air-blast is driven forcibly through and in contact with the ice. This use of a forced air-current, moreover, enables finely-broken ice, cheaper than that in large lumps, to be used; hence greater economy is secured. In a suit involving the question of the relative economy of ice in the two systems it

Fig. 6.



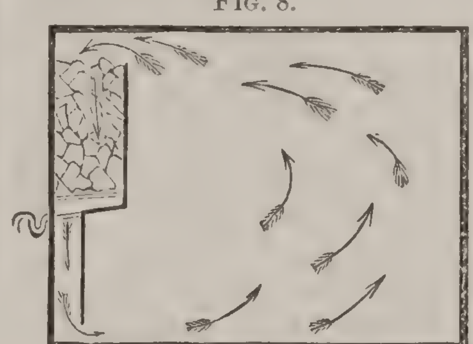
Mootry's Refrigerator.

Fig. 7.



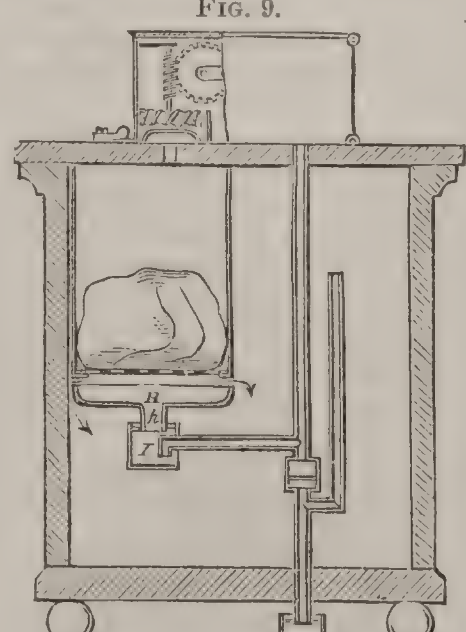
Fairbanks's Refrigerator.

Fig. 8.



Lyman's Refrigerator.

Fig. 9.



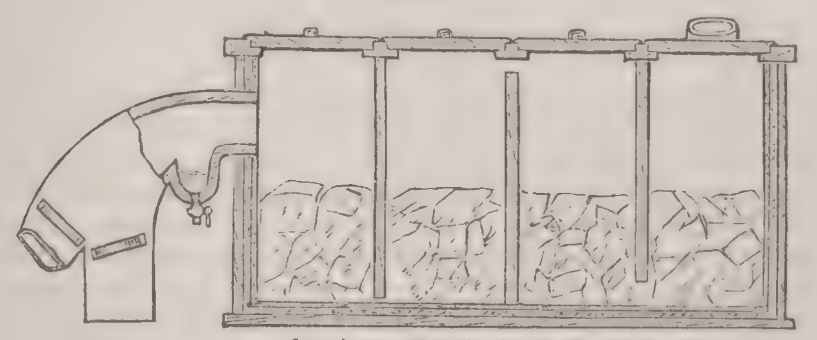
Fuller & Reichart's Refrigerator.

was stated by a sworn expert that the same results could be obtained from 2500 pounds of ice with a forced circulation as was provided by 9500 pounds with the other; the cost of the finely-broken ice was stated to be not more than one-third that of the large lump ice.

The use of a forced circulation of air in contact with the mass of ice within a chamber closed against access of external air is shown in the patent of Fuller & Reichart, 1868. In the same year W. Bray patented a refrigerator, the gist of which he describes as the forming or producing of a current of air within the provision-chamber; that is to say, the refrigerating chamber by means of a rotary fan or other mechanical device is so arranged as to force the air through an ice-box or other vessel surrounded by a freezing mixture, and also through a vessel containing charcoal or other absorbent, moisture, acid, or noxious gases. The use of a charcoal or equivalent filter for the air in connection with the ice-box, however, is hardly new, as something of the kind was projected by Lyman in his patent, previously referred to; but the utility of such a filter is not apparent.

The patent of L. Schulze, dated 1873, describes an ice-

Fig. 10.

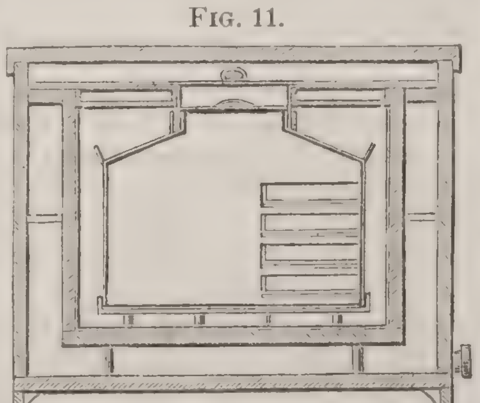


Ice-box of Schulze's Refrigerator.

box having vertical partitions open alternately at the top and bottom, so as to cause the air-current to pass alternately up and down through the mass of ice, to secure greater contact therewith. Schulze designed to use a powerful air-forcing device, known as the "cool blower," with the idea of compressing the air in the ice-box, this compression forming one of the leading features distinguishing his device from those in which the air is simply driven through or over the ice. He claimed that by compressing the air in and among the ice, and then letting it escape in a room or apartment to be cooled, the degree of cold is much greater, and is effected in a much shorter time and less space. Another important result claimed is that returned air which is loaded with impurity from the rooms or articles through or over which it has passed, the part being compressed into ice-chambers, has all noisome odors condensed and removed from the water which results from the ice as it melts. This makes it generally unnecessary to use any other means of purifying the air. It is perhaps to be doubted whether this system is as useful as it is ingenious. The air compressed in contact with the water would be more likely to absorb moisture, and the advantages resulting from the direct contact of air with ice would be lost. This apparatus, it should be mentioned, belongs to that class in which the water is conducted from the ice-box by tubes to be distributed to different buildings or apartments.

Another refrigerator, which departs measurably from the principles herein laid down as most advantageous, is that of Allegretti, patented in 1872, which is so constructed that ice or a cooling mixture wholly or substantially surrounds the entire refrigerating chamber, and provision is made for access to such chamber without exposing the ice or cooling mixture to the air. It does not appear that there is any circu-

Fig. 11.



Allegretti's Refrigerator.

lation of the air within the refrigerating chamber, or that the moisture would be eliminated from the air. By this apparatus, however, articles may be frozen, and kept in such frozen condition for an indefinite period of time. If, as has been frequently stated on apparently good authority, the keeping of organic substances in a frozen condition for an indefinite period of time impairs their flavor and nutritious qualities, this method may be defective, but it affects the merits no more nor less than belong to the congelation of the materials sought to be preserved.

To return to the forced circulation of air through an ice-box and closed refrigerating chamber, modifications of this principle are shown in the patents of J. J. Bate of 1874 and 1875. In one of these, a patented refrigerating car, the ice-box is provided with inlet and outlet pipes by which the efficient distribution of the cooled air throughout all parts of the chamber is provided for. In another the forced current is passed horizontally through the bottom of the ice-box, the ice being fed downward by its own gravity as fast as melted from its contact with the air. By this means a more uniform refrigeration of the air-inlet is secured, inasmuch as the quantity of ice in contact with the air remains the same, irrespective of the total quantity in the ice-box. The same inventor—one of the pioneers in the export of American fruits, meats, etc. in refrigerating vessels to foreign ports—has devised various other modifications relating to this class of refrigerators.

There is another class of refrigerators from which much has been hoped, but thus far very little gained, in which it has been designed to use ice-making machinery to secure the requisite reduction of temperature. The use of an ice-making machine to cool air in breweries, etc. was projected in Germany and applied to practical use a number of years ago; about 1870, Tellier, the inventor of the ice-making machine that bears his name, arranged a system of tubes made cold by the ice-making machine, and through which the air was forced. He simply applied the device in place of the ice-box of Fuller & Reichart. In 1872, Prof. Vander Weyde, a chemist of New York City, provided a similar system of tubes, cooled by the same agency, in a closed chamber, but depending upon the natural circulation, so termed, of the air, arising from the increase in density as the air came in contact with the refrigerating tubes. In 1875, C. H. Chennock of Brooklyn, N. Y., arranged an ice-making machine in connection with a chamber surrounding the refrigerating chamber and filled with water in such manner that the operation of the machine should freeze the water and form a solid mass of ice around the refrigerating chamber. The use of an ice-making machine in connection with the refrigerator seems plausible, and in many places it would appear to indicate greater economy than the use of ice, as this operation involves substantially the substitution of coal for ice. But owing, perhaps, to a lack of thorough trial of the system, its results thus far do not appear to have been better than those arising from the use of the ordinary refrigerators.

In the construction of a refrigerator it is manifest that economical results can be secured only by causing the confined air of a closed chamber to pass over and over again in contact with the refrigerating surfaces or material, inasmuch as the reduction of temperature of a constantly-renewed current of comparatively warm air would involve an excessive waste of ice. Moreover, the walls must be rendered so nearly non-conducting that practically no heat from the external atmosphere will be communicated through them. It is better, therefore, to make refrigerating chambers with walls filled in with boiler-felt or a similar non-conductor. The felt is probably as good as any other material for the purpose so long as kept dry, although various substitutes have been offered, among others a filling composed of paper cases or boxes, in order to provide absolutely dead air between the inner and outer walls.

Although this article embraces the salient features in the construction and *modus operandi* of refrigerators, many minor inventions have been omitted for lack of space, upward of 300 patents having been granted in the U. S. upon this class of apparatus. James A. Whitney.

Refuge, Cities of. See Cities of Refuge.

Refu′gio, county of S. Texas, on the Gulf of Mexico, bounded N. E. by Espiritu Santo Bay and San Antonio River, S. by Aransas River and Copano Bay, and traversed by Blanco River, has a low, level surface, largely prairie, and a fertile soil. The chief industries are cattle-raising and beef-packing; agricultural products, corn and sweet potatoes. Cap. Refugio. Area, 700 sq. m. P. 2324.

Refugio, p.-v., cap. of Refugio co., Tex., on Blanco River. P. 1053.

Regalbu′to, or **Ragalbuto,** town of Sicily, province of Catania, on a hill commanding a view of Etna. It stands near the left bank of the Salso, on the road leading from Catania, through Castrogiovanni, to Palermo, and was once a stronghold of the Saracens, who were driven out by Roger of Sicily, after which it was united to the diocese of Messina. P. 9450.

Regaldi (Giuseppe), b. at Novara in 1809; began the study of jurisprudence in the University of Turin, but failing in his first examinations he became disgusted, and, having heard the improvisatore Giustiniani, resolved to rival him. From 1836 to 1856 his course was a continual triumph; he improvised in all the principal cities of Italy, in France, in Switzerland, in Germany; visited Greece, Asia Minor, Mount Lebanon, and Egypt, and there gathered fresh inspirations. Many illustrious French and Italian

poets have written verses in his honor; among others, Lamartine. The creative impulse of improvisation having abated, he occupied himself in polishing his earlier verses and in composing new ones; a volume of these was published at Florence in 1874, and he has also written notes of his travels in prose; he was appointed professor of history in the Lyceum of Parma; then in the University of Cagliari, and finally, in 1866, in the University of Bologna.

Rega′lia [Lat., "royal," plural], the emblems of royalty, especially those used at coronations. Nearly all the British regalia, except those for Scotland, were destroyed during the Commonwealth, and most of those at present used date from Charles II.'s time.

Regat′ta [It.], used by the Venetians to signify a grand fête in which the gondoliers contested for superiority in rowing their gondolas. The term is now applied to all rowing or sailing matches indiscriminately, and especially to contests between yachts.

Regelation. See APPENDIX.

Regensburg. See RATISBON.

Reggel′lo, town of Italy, province of Florence, consisting of several small compact villages, one of which was strongly fortified by Florence in 1385. P. 11,000.

Reg′gio di Cala′bria [Gr. *Rhegion;* Lat. *Rhegium*], one of the most ancient and distinguished cities of Southern Italy, province of Reggio, situated near the right bank of the torrent Calopinace, on the seashore, in lat. 38° 7′ N., lon. 15° 40′ E. It lies S. E. of Messina, and commands a magnificent view of the Sicilian coast and of the mountain-range crowned by the fires of Etna. The Castor and Pollux, with St. Paul on board, waited there for a S. wind one day in Feb., 61 A. D. The town is compactly built on a gently-rising hill, and one broad street runs along the shore. Everything here is comparatively modern, as the earthquake of 1783 spared not a single house, but some of the churches are highly respectable architecturally, and possess fine pictures. Reggio, whose ancient name is said to signify "rending," and to refer to a physical convulsion which sundered Sicily from the mainland before the historic period, is believed to have been colonized by the Chalcidians, with whom were joined exiles of the Messenians about 723 B. C. It was the connecting link between Greece and her Magna Græcian colonies, and flourished accordingly. It was long and wisely governed by the code of Charondas, a Pythagorean, fragments of which are preserved by Stobæus, and which evince a strong and elevated religious sentiment. (For the legislation of Magna Græcia see Heyne, *Opusc. Acad.*, vol. ii.) Toward the end of the fifth century B. C., Reggio lost its republican organization, and in 387 B. C. fell, after a glorious defence, into the hands of Dionysius the Elder, tyrant of Syracuse. Under the Romans it rose again to wealth and magnificence. According to tradition, St. Paul himself formed the first Christian church here, and placed it under the pastorate of one of his own personal disciples, St. Stephen. The subsequent ecclesiastical history of Reggio is also of importance in the annals of the Church. In 410 A. D. it was burned by Alaric, and in 549 the renovated city was taken by Totila. Early in the eleventh century it was sacked by the Pisans, but, though constantly and cruelly suffering from the disasters common to all the large towns of Italy during the anarchy of the Middle Ages, yet it was an opulent and flourishing city in 1783, when a terrible earthquake laid it literally in the dust. Since then it has been only partially rebuilt, nor has it escaped being severely shattered by more recent earthquakes. There is at present some manufacturing activity here and a small maritime trade. P. in 1874, 35,250.

Reg′gio nell' Emi′lia, city of Italy, chief town of the province of the same name, situated in a most fertile plain, in lat. 44° 39′ N., lon. 10° 39′ E. Reggio is a walled town; the streets are broad, and many of them flanked by porticoes; the churches are imposing, and contain some precious objects of art, the solitary remnants of former riches. Here, over an altar in St. Prospero, once stood the world-renowned *Nativity* of Correggio, known as *La Notte*, now the glory of the Dresden gallery. Of the libraries of Reggio, once so celebrated, only about 70,000 volumes remain. The theatre of Reggio belongs to the first class of Italian theatres. The town has recently purchased and opened to the public a small house which was for a long time occupied by Ariosto, whose mother was born here. The Museum of Natural History is very interesting, and the Academy of Fine Arts deserves a visit. Outside the town there is a large asylum for the insane, said to be the best establishment of the kind in Italy. Reggio was a city of Cisalpine Gaul, but its origin is unknown, though it was probably founded or colonized under Æmilius Lepidus, from its name *Regium Lepidi* or *Forum Lepidi.* Frequent mention is made of *Regium* (*Forum Lepidi*) by Latin writers as a town of importance. Though, according to tradition, Christianity was preached here as early as 60 A. D., yet there is no evidence of the appointment of a bishop before the beginning of the third century. The town suffered severely from barbarians, from the exarchs of Ravenna, and afterward from the Guelph and Ghibelline factions. In the twelfth century, like so many other Italian communes, it formed itself into a commonwealth, and long maintained its independence. In the thirteenth century it was one of the prominent seats of mediæval learning. From the fourteenth to the nineteenth century, however, Reggio, with its neighboring towns, was generally under the dominion of the Este and Austro-Este house. In 1860 it united itself to the kingdom of Italy. Reggio is the commercial centre of a rich province, and there is considerable industry in the town itself. Sailcloth, leather, carriages, brooms, etc. are manufactured here on a large scale. P., including suburbs, 50,000.

Reg′giolo, town of Italy, province of Reggio nell' Emilia, about 7½ miles E. of Guastalla. The citadel, erected in 1242, still stands to recall the domestic factions and foreign assaults from which it suffered for ages. It is now a prosperous agricultural town. P. 6000.

Reg′iment [from Lat. *regere*, to "guide," "rule"]. The regiment of army organization has been compared to a *family*, over which the colonel exercises the paternal authority. It is, as its name denotes, a unit of administrative and governmental, rather than a tactical unit; which attribute belongs more properly to the *battalion* of infantry, the *battery* (or company) of artillery, and the *squadron* of cavalry. (See ARTILLERY, CAVALRY, INFANTRY.) In the British service the whole artillery *personnel* constitutes *one*, the Royal Regiment of Artillery. To regimental officers above the rank of captain the distinctive designation of *field* officers attaches; of which are, besides and inferior to the *colonel*, the lieutenant-colonels and majors. The lieutenant-colonel commands the regiment in the absence or disability of his superior, the duties of field officers being auxiliary to those of the colonel, and occasionally to command portions of the regiment, etc. J. G. BARNARD.

Regiomonta′nus (JOHANN MÜLLER), b. at Königsberg in Franconia June 6, 1436; studied mathematics under Purbach at Vienna, and astronomy at Padua; lived for some time at the court of Matthias Corvinus of Hungary, afterward at Nuremberg, and was invited to Rome in 1474 by Pope Sixtus IV. in order to reform the calendar. D. at Rome July 6, 1476—some say by the plague, others that he was assassinated by the sons of George of Trebizond, in whose writings he had demonstrated some glaring errors. His *Ephemerides ab Anno 1475–1506* (continued by Bernhard Walther) made him very famous among astronomers. Among his numerous other works are *De Reformatione Calendarii* (1489) and *De Triangulis Omnimodis* (1533). (See Alex. Ziegler, *Regiomontanus* (Langensalza, 1874).)

Registration. See RECORD OF CONVEYANCES, by PROF. J. N. POMEROY, LL.D.

Regnard′ (JEAN FRANÇOIS), b. at Paris in 1655; travelled, after finishing his studies, in Italy; was captured by Algerine pirates, and not ransomed until after a captivity of two years; made a journey of exploration to the Arctic Ocean; visited Germany and Hungary; settled in 1684 at Paris; wrote comedies for the Théâtre Italien and the Théâtre Française. D. in 1709. By French critics he is considered their best comic play-writer, next to Molière, and some of his plays, *Le Joueur* (1696), *Les Ménechmes* (1705), *Le Légataire universel* (1708), are still performed. Best edition of his collected works by Alfred Michiels (2 vols., Paris, 1855).

Regnault′ (HENRI VICTOR), b. at Aix-la-Chapelle July 21, 1810; studied at the École Polytechnique of Paris; was appointed professor of chemistry at that school in 1840, in physics at the Collége de France in 1841; chief engineer of mines in 1847, and director of the porcelain-works of Sèvres in 1854. The first work of his which attracted attention was his *Action du Chlore sur l'Éther chlorhydrique* (1840), but his physical researches, especially concerning heat, gained for him his great reputation. In 1848 he received the Rumford medal from the Royal Society of London for his *Experiments to determine the Laws and the Numerical Data which enter into the Calculation of Steam-engines.* His celebrated investigations in verification of the law of Mariotte and Boyle were communicated in vols. xxi. and xxvi. of the *Mémoires de l'Académie des Sciences.* His *Premiers Éléments de Chimie* (1850), an abridgment of his *Cours Élémentaire de Chimie* (1847–49), has been translated into several languages.

Regnault (Jean Baptiste), b. at Paris Oct. 17, 1754; led for some time a roving life as a sailor, and visited both Africa and America; entered in 1771 the studio of the painter Bardin, whom he accompanied to Rome; gained in 1774 the great medal for his *Alexander and Diogenes;* became a member of the Academy in 1782, subsequently professor in the School of Art, and stood by the side of David at the head of the French school of painting till his death, Oct. 29, 1829. Among his most celebrated pictures are *Perseus and Andromeda* (1782), the *Education of Achilles* (1783), and *Cupid and Psyche* (1829).

Regnier′ (Mathurin), b. at Chartres, France, Dec. 21, 1573; was educated for the Church; accompanied Cardinal Joyeuse in 1593 to Rome, and returned with the duke de Béthune, French ambassador; was appointed canon of the cathedral of Chartres in 1609. D. in Rouen Oct. 22, 1613. In spite of his ecclesiastical position, he led a very dissipated life, but acquired, nevertheless, the surname *le Bon*, on account of his kind and pleasant manners. His *Satires*, sixteen in number, bear the same character; they are coarse, but full of humor, witty and striking, but free from all malignity. Best editions by Barthélemy (1862) and L. Lacour (1867).

Reg′ular Cler′gy [from *regula*, a monastic "rule"], in the Roman Catholic Church, ordained clergy who live under a monastic rule, as distinguished from the secular clergy or ordinary parish priests, and other clergy free from monastic rules. The regular clergy may, however, be appointed to act as parish priests, and frequently assist the seculars.

Reg′ulus [Lat.], a term handed down from the ancient chemists, meaning a mass of metal reduced from its oxide or other ore in a furnace or a crucible. Such metal is said to have been converted into the *reguline* condition.

Regulus (Marcus Atilius), belonging to an old plebeian family in Rome; was consul the first time in 267 B. C., and the second in 256. In this year, the ninth of the First Punic war, Regulus and his colleague, L. Manlius Vulso Longus, transferred the war from Sicily to Africa, and even after the return of Manlius with his part of the army, Regulus achieved great successes against the Carthaginians, and compelled them to sue for peace. Fortune turned, however, when Xanthippus, a Lacedæmonian general, was put at the head of the Carthaginian army. Regulus was defeated, his army was routed and nearly destroyed, and he himself was taken prisoner and carried to Carthage. Here he was detained for five years, but in 250, fortune having once more turned against Carthage, he was sent to Rome with a Carthaginian embassy, in order to support the envoys in negotiating a peace. In Rome, however, Regulus set aside every regard for himself and his fate, and, considering the proposed peace disadvantageous to his country, exercised all his power to dissuade the senate and people from accepting it. He succeeded, and returned to Carthage. The stories of his subsequent execution by the Carthaginians under horrible tortures are generally considered fables, but his lofty self-sacrifice for the good of his country made his name one of the most celebrated in Roman history, and gives an idea of what it was that made Rome the ruler of the world.

Rehobo′am [Heb., "enlarger of the people"], son and successor of Solomon. His mother was Naamah, an Ammonite. His accession, about 975 B. C. (Usher) or 990 B. C. (Hales), was the signal for the revolt of the ten tribes and the dismemberment of the kingdom. He d. at the age of fifty-eight, after a reign of seventeen years.

R. D. Hitchcock.

Reho′both [Heb., "streets," "open places," "ample room"], the name of three biblical sites: (1) In Gen. x. 11, one of the four Assyrian cities founded either by Asshur or, as most modern interpreters understand the passage, by Nimrod. It may afterward have become a part of Nineveh. (2) In Gen. xxvi. 22, a well dug by Isaac, recently identified with an ancient well, now filled up, 12 feet in diameter, in the wady *er-Ruhaibeh*, about 20 miles S. of Beersheba. Robinson and Smith found the wady in 1838, but did not see the well. (3) In Gen. xxxvi. 37, the city of an early Edomite king named Saul, described as being "by the river"—*i. e.* the Euphrates.

R. D. Hitchcock.

Rehoboth, p.-v. and tp., Bristol co., Mass., on Palmer's River, has 6 churches, 2 cotton, 2 saw, 2 grist, and 3 shingle mills. Agriculture is the leading industry. Nearly 5000 acres are covered by two vast cedar swamps, in one of which is a curious cave underneath Annawon Rock, so called from one of the principal Indian leaders in King Philip's war, captured there Aug. 28, 1676. (See Leonard Bliss's *History of Rehoboth,* Boston, 1836.) P. 1895.

Rehoboth, p.-v., Clayton tp., Perry co., O.

Rehoboth, p.-v. and tp., Lunenburg co., Va. P. 1570.

Rei′chenbach, town of Germany, kingdom of Saxony, has a large cotton-spinning mill and manufactures of woollens, hosiery, nankeens, laces, and damask. P. 10,198.

Reichenbach, town of Prussia, province of Silesia, on the Pailbache, has manufactures of woollen, linen, and cotton fabrics, oil, and tobacco, and an active trade in corn and hemp. P. 5824.

Reichenbach (Karl), Baron, b. at Stuttgart, Germany, Feb. 12, 1788; studied at the University of Tübingen, where he formed a secret association for the foundation of a new German state in one of the South Sea Islands, which awakened the suspicion of the French police and brought the author for a time into prison; devoted himself afterward to the study of natural science, and achieved considerable practical results by his ironworks and beet-root-sugar factory in Blansko, Moravia, and also some scientific triumphs by his discovery of different useful compounds, such as creosote and paraffine, but became most widely known by his singular half-mystical works on a new natural force which he called *Od—Physikalisch-physiologische Untersuchungen über die Dynamide des Magnetismus* (3 vols., 1849), *Odisch-magnetische Briefe* (1852), both translated into English; *Der sensitive Mensch und sein Verhalten zum Ode* (1854). D. at Leipsic Jan. 19, 1869.

Rei′chenberg, town of Bohemia, on the Neisse, is one of the most important manufacturing places of the Austrian empire, linen, woollen, and cotton stuffs of various kinds being made here extensively, besides leather, shoes, hats, firearms, gold and silver ware, and musical instruments. P. 22,394.

Rei′chenhall, a small town of Bavaria, on the Saale, contains very rich salt springs, from which more than 12,000 tons of salt are produced annually.

Reichstadt, Duke of. See Napoleon II.

Reid (David S.), b. in Rockingham co., N. C., Apr. 19, 1813; was admitted to the bar 1833; served in the State legislature 1835–42; was a member of Congress 1843–47; governor of North Carolina 1851–55; U. S. Senator 1856–61, and a delegate to the "Peace Congress" of Feb., 1861.

Reid (James), b. in North Carolina Apr. 5, 1795; joined the Virginia M. E. conference in 1815, and labored extensively and successfully in Virginia and North Carolina; did much to promote the cause of education in North Carolina, and in 1872 was elected superintendent of public instruction for the State, but died before entering upon the office; was a patriarch of the North Carolina conference at the time of his death. D. in North Carolina Nov. 8, 1872. T. O. Summers.

Reid (John Morrison), D. D., b. May 30, 1820, in New York; graduated at the University of the City of New York in 1839, and at Union Theological Seminary, New York City. He was admitted to the New York M. E. conference in 1844, and has preached in Western Connecticut, on Long Island, and in New York City; in 1858 became president of Genesee College, N. Y.; in 1864 was chosen editor of *The Western Christian Advocate* at Cincinnati, O.; in 1868 was made editor of the *North-western Christian Advocate*, and in 1872 a corresponding secretary of the M. E. Missionary Society.

Reid (Mayne), b. in the N. of Ireland in 1818; came to the U. S. 1838; visited New Orleans; ascended Red and Missouri rivers in quest of adventure; travelled through most of the States; settled at Philadelphia, where he devoted himself to literature; was a volunteer in the Mexican war, and distinguished at Chapultepec, where he was wounded, and has since been a voluminous and popular writer in London and New York, chiefly of romances of American adventure. Among his books are *The Rifle Rangers* (1849), *The Scalp-Hunters* (1850), *The White Chief* (1855), *The Quadroon* (1856), *Osceola* (1858), *The Maroon* (1862), and *The Castaways* (1870). A collective edition of his works has appeared in New York (15 vols., 1868).

Reid (Samuel Chester), b. at Norwich, Conn., Aug. 25, 1783; entered the U. S. navy as midshipman at an early age; commanded the privateer brig Gen. Armstrong in a two days' engagement with the boats of three British men-of-war in the port of Fayal, Sept. 26 and 27, 1814, resulting to the British in a loss of 250 killed and wounded, while the privateer was scuttled by Reid with a loss of only 2 killed and 9 wounded. The violation of neutral waters by the British led to a prolonged diplomatic controversy, finally decided by Louis Napoleon as arbitrator adversely to the American complaint. Capt. Reid was soon afterward appointed sailing-master in the navy; became warden of the port of New York, where he regulated

the pilot-boat service and erected signal telegraphs at the Battery and the Narrows. He was also the designer of the present U. S. flag. D. in New York City Jan. 28, 1861.

Reid (THOMAS), b. at Strachan, in Kincardineshire, Apr. 26, 1710. His father was a minister, and his first instruction he received at home and in the parish school of Kincardine. In 1722 he was sent to Marischal College in Aberdeen, from which he graduated in 1726, and occupied a position as college librarian and studying mathematics and philosophy, until in 1737 he was appointed minister at New Machar in Aberdeenshire. His parishioners are said to have opposed his appointment very strenuously, and he had so little confidence in his own powers that he never himself composed the sermons which he preached, but used such as were published by English divines, especially Tillotson and Evans. Nevertheless, his life as a minister at New Machar turned out to the satisfaction of all. In 1740 he married, and in 1748 he published his first philosophical essay, *On Quantity*, in the *London Philosophical Transactions*—a criticism of the manner in which the mathematical terminology was used at that time in metaphysics and morals, especially by Hutcheson. In 1752 he accepted the position of professor of philosophy at King's College, Aberdeen, where he had to teach mathematics, natural philosophy, and moral philosophy; but in 1763 he moved to Glasgow as the successor of Adam Smith in the chair of moral philosophy. Here he published his *Inquiry into the Human Mind on the Principle of Common Sense*, in 1764, and read at the meetings of a philosophical society several papers, such as *Examination of Dr. Priestley's Opinion concerning Matter and Mind* and *Physiological Reflections on Muscular Motion.* In 1781, however, he resigned his office in order to devote himself exclusively to philosophical studies, and published *Essays on the Intellectual Powers of Man*, in 1785, and *Essays on the Active Powers of Man*, in 1788. D. Oct. 7, 1796. Originally, he was a disciple of Berkeley, but David Hume's *Treatise upon Human Nature*, published in 1740, showed him at once to what consequences idealism might lead, and roused him to independent speculation. In opposition to Hume's skepticism he tried in his *Inquiry into the Human Mind on the Principle of Common Sense* to establish a series of fundamental truths independent of experience and indisputable as primitive facts of the consciousness. On the Scottish school of philosophy, and more especially on the study of psychology, he exercised a considerable influence.

Reid (WHITELAW), b. at Xenia, O., Oct. 27, 1837; graduated at Miami University in 1856; after acting for a year or more as superintendent of the graded schools at South Charleston, O., bought the Xenia *News*, editing it for two years; joined the Republican party at its birth, speaking for Fremont; his newspaper was the first one in the West, outside of Illinois, to advocate the nomination of Mr. Lincoln; took an active part in the campaign; in the winter of 1860–61 went to Columbus as political correspondent for three daily newspapers; at the close of the session became city editor of the Cincinnati *Gazette*; at the outbreak of the civil war went to the front as war-correspondent of that journal; served on the staff of Gen. Morris in West Virginia with the rank of captain; at the close of the first West Virginia campaign returned to Cincinnati, and wrote for the *Gazette* until the beginning of the second campaign, and went again to the front, on the staff of Gen. Rosecrans; wrote letters under the signature of "Agate;" witnessed the entire battle of Pittsburg Landing, and his description of it gave him distinction among army correspondents; in the spring of 1862 went to Washington; was appointed librarian to the House of Representatives, and acted as correspondent of the Cincinnati *Gazette*, his despatches being duplicated for various other journals; was present at the battle of Gettysburg, and his description, written on the field, was a vivid narration of that engagement; in 1865 accompanied Chief-Justice S. P. Chase on a tour of the South, undertaken by the latter at the request of Pres. Johnson for the secret purpose of studying the condition and interests of the white and black races, and published *After the War, a Southern Tour*; during the next two years engaged in cotton-planting in Louisiana and Alabama, and published *Ohio in the War*; in 1868 returned to the Cincinnati *Gazette* and became one of its leading editors. Soon afterward Horace Greeley renewed his offer—made first in 1862—of a position on the *Tribune*. The invitation was accepted, and in 1869 he became managing editor. Upon the nomination of Mr. Greeley for the Presidency in 1872, Mr. Reid became editor-in-chief, and when the former died in the fall of that year he became proprietor as well as editor of the *Tribune*.

J. B. BISHOP.

Reid (Sir WILLIAM), F. R. S., b. at Kinglassie, Scotland, in 1791; served as an officer of engineers in the Peninsular and American wars; was at Waterloo; became governor of Bermuda 1838, of the Windward Islands 1846, and of Malta 1851; was an active promoter of the British universal exhibition of 1851, knighted in that year, and became major-general in 1856. In 1848 he was chief engineer at Woolwich. He published several valuable essays on meteorology. D. in London Oct. 31, 1858.

Reids'ville, p.-v., cap. of Tatnall co., Ga.

Reidsville, p.-v., Rockingham co., N. C., on Richmond and Danville R. R., has 3 churches, schools, 1 weekly newspaper, 4 warehouses, and 15 tobacco-factories. Business, manufacturing tobacco. P. about 2000. ED. "NEWS."

Rei'gate, town of England, in Surrey, 23 miles S. of London, carries on a considerable trade in fuller's earth and sand used in the manufacture of glass. Its church contains several costly monuments. P. 15,916.

Reign of Terror, in the first French Revolution, may be said to have begun Jan. 21, 1793. On that day Louis XVI. was executed and the Committee of Public Safety instituted. It lasted till July 27 (9 Thermidor), 1794, when Robespierre was guillotined and the committee broken up.

Reil'ly, tp., Schuylkill co., Pa. P. 1890.

Reima'rus (HERMANN SAMUEL), b. at Hamburg Dec. 22, 1694; studied at Jena and Wittenberg; travelled in Belgium and England; was appointed rector in Wismar in 1723, and professor of Hebrew and mathematics at the Gymnasium of Hamburg in 1727. D. Mar. 1, 1765. Author of the famous *Wolfenbüttelschen Fragmente*, which Lessing published in 1777.

Rein'deer [Icelandic, *hreindyr*], *Tarandus rangifer*, a species of the family Cervidæ, found in the northern parts of both hemispheres. The form is clumsier than that of the ordinary deer; the nose broad, covered with hair, and without a naked muffle; antlers are developed by the female as well as the male: these are very unsymmetrical, those of one side being more developed than those of the other, and are provided with an antero-basal snag, which is palmated at the end; the hoofs are spreading and adapted for progression over the snow; the young is uniformly colored, as in the adult, and not spotted, as in the young of most deer. In the Old World, especially in Lapland and some parts of Siberia, the species has been domesticated, and is raised for the milk afforded by the female as well as for purposes of draught. In Lapland it feeds especially upon a species of lichen. In the Glacial epoch the species extended much farther S. than at present, remains having been found as far southward as Italy in Europe and the Middle States in North America.

THEODORE GILL.

Rein'deer Moss, the *Cladonia rangiferina*, a lichen most abundant in arctic regions, where it forms the principal winter food of the reindeer. It is of a silvery-white color, even in summer. It is also used as an article of human food after having been boiled in reindeer's milk. It contains the nutritious lichenine, a form of starch. The reindeer digs it from beneath the snow with its horns, nose, and feet. It abounds in damp woods under evergreens in all the Atlantic States down to lat. 43°, and along the mountains much farther S.

Rein'er City, v., Porter tp., Schuylkill co., Pa., on Summit Branch R. R. P. 116.

Rein'kens (JOSEPH HUBERT), b. at Burtscheid, near Aix-la-Chapelle, Mar. 1, 1821; studied theology at Bonn; took holy orders; was appointed professor at Breslau in 1857, but was suspended by the bishop of Breslau as one of the leaders of the Old Catholic movement; was consecrated bishop in 1873 by the Jansenist bishop of Deventer, and acknowledged by the German government as bishop of the Old Catholic Church. He wrote *Papst und Papstthume*, *Ueber päpstliche Unfehlbarkeit* (1870), *Die päpstliche Decrete vom 18. Juli, 1870* (1871), etc.

Reis'siger (KARL GOTTLIEB), b. at Belzig, near Wittenberg, Jan. 31, 1798; educated at Leipsic; studied music at Vienna, Munich, and in Italy; appointed director of music in 1826, subsequently chapel-master at Dresden, where he d. Nov. 7, 1859. Several of his operas, *Adèle de Foix*, *Der Schiffbruch der Medusa*, and especially his melodrama *Yelva*, were received with applause; his songs and his oratorio *David*, are more widely known. He was acknowledged to be one of the best leaders of his time.

Reis'terstown, p.-v., Baltimore co., Md. P. 479.

Relaps'ing [Lat. *relabi*, *relapsus*, "to fall back"] **Fev'er,** also known as **Famine Fever,** and, technically, as **Febris Recurrens.** Its nature is undetermined—by some regarded as a form of typhus, by others as due to malaria. It occurs only at intervals of some years, and then during seasons of privation and insalubrity, attacking chiefly the lower classes, ill fed and

housed. It has been so prevalent in crowded communities, as Liverpool, as to be regarded an epidemic and contagious disease, but careful study connects it with dietetic and telluric causes, prevailing in the form of a non-contagious endemic. Its formative or incubating stage is from four to ten days; rarely it is spontaneous in its development. Its onset is sudden; the patient, having been perfectly well at the time, is able to fix the exact time of the attack. It begins with an abrupt and severe rigor, or chill with nervous tremor, and immediate sense of extreme weakness. There is sharp frontal headache, pain in the back and limbs; then follow flushed face, thirst, dry tongue, high pulse, and a steady ascent of body heat. The facial expression and temperature are characteristic. The mind is unaffected, and the conscious face, with the sunken but clear and full eyes, wears a pitiable, helpless, appealing look. The complexion has a bronzed hue, and may be slightly jaundiced. The temperature steadily ascends during four or five days to 105°, 106°, 107°, 108° F.—an unusual fever heat unaccompanied by brain symptoms or danger of death. Physical examination may detect enlargement of the liver and spleen; the urine may contain not only albumen and urea in excess, but blood and casts indicative of acute congestion of the kidneys. The fever and extreme depression last from five to seven days, when, with some critical evacuation, as profuse perspiration, diarrhœa, or urination, a sudden abatement and rapid convalescence sets in. Appetite and strength are slowly returning, and the invalid is about, when, on the fourteenth day from the first attack, he is seized by a second or relapse resembling the first. Very rarely, a third, fourth, and even a fifth relapse, occurs. Relapsing fever, however severe, is rarely fatal. During the epidemic in New York the cases were in the general hospitals with other patients, and no evidence of contagion followed. The treatment during the active period is essentially antiphlogistic and expectant—cooling drinks, gentle saline laxatives, sponging, light diet; during convalescence, free use of concentrated liquid diet, tonics, especially liberal use of quinine and brandy.

E. Darwin Hudson, Jr. Revised by Willard Parker.

Rel′ative Rank, of officers in the army and navy of the U. S.

Army.	Navy.
General	Admiral.
Lieutenant-general	Vice-admiral.
Major-general	Rear-admiral.
Brigadier-general	Commodore.
Colonel	Captain.
Lieutenant-colonel	Commander.
Major	Lieutenant-commander.
Captain	Lieutenant.
First lieutenant	Master.
Second lieutenant	Ensign.

The officers of the marine corps are of rank corresponding to that of those of the same titles in the army.

Release′, in law. This is either the act of giving up a claim or right to the person against whom the claim or right exists, or the relinquishment of an interest or right to one who has possession of property or some estate in it. It may be considered under two general divisions: I. As to the surrender of a mere right of action in the law of contracts or torts; II. As applicable to the law of real estate.

I. A release of a mere right of action may take place by express words or by operation of law. The rules of law require a consideration (see Consideration) for a release of this variety. This rule may be satisfied without any actual consideration by executing a written instrument under seal, since that mode of execution precludes all inquiry into the consideration. Much stress is laid by law-writers on the use of particular words where the design is to acquit the releasee wholly from any obligation to the releasor. The word "claims" is recommended by Lord Coke as being as comprehensive a term as can be employed. The word "demands" is one of significance, and may usefully be selected. The courts construe a release with reference to its purpose, and though words of a general nature may be used, they will be confined in their effect to the true scope and object of the transaction. It is quite common to commence an instrument of release with a recital setting forth the specific result to be accomplished. If in such a case words of a general nature follow, their meaning will be restricted to the specific intent of the parties, as shown in the recital. A release by operation of law is one where, without any express design to discharge a claim, a party has so conducted himself that it is in point of law deemed to be extinguished. An illustration is found in the case where a creditor releases one of two joint debtors. The ordinary consequence of such an act would be to release the other.

II. The subject of release is of much importance in respect to the law of real estate. Releases have been arranged by law-writers into five classes: (1) where they pass an estate, (2) where they pass a right, (3) where they operate by way of enlargement of an estate, (4) cases of extinguishment, (5) cases occurring by way of feoffment and entry. Each of these cases will be best understood by an illustration.

(1) This case is illustrated by that of a conveyance from one joint tenant to another. (See Joint Tenancy.) As each joint tenant in contemplation of law owns the whole estate, a conveyance by his co-tenant prevents the operation of the rule of survivorship, and gives the grantee the entire estate. The word "heirs" need not be used in this case, though it is indispensable in the absence of a statute in other cases to convey a fee.

(2) This consists in passing a right to one who has a defeasible estate. Thus, if an owner is disseised (see Disseizin), and his estate divested so that he has only remaining a right to sue, he may release this right, and the disseisor would thus become absolute owner in fee.

(3) Release by enlargement is exhibited in a case where a landlord gives up to a tenant in possession his own or so-called reversionary interest. In this case there is an existing relation between the parties known as "privity," and the tenant must have an estate in the land which is susceptible of being enlarged.

(4) Instances of a release by way of extinguishment are of an easement (see Easement), such as a right of way released to the owner of the land, or of a rent charged upon it relinquished to the owner. These are incorporeal rights belonging to one person and exercised over the land of another, and are capable of being extinguished by this form of release.

(5) An instance under this head is that of one of two or more disseisors receiving a release by the rightful owner of his claim. In this case he becomes owner in fee to the exclusion of his companion.

It is common in this country in all of these cases to make use of an ordinary deed, either with or without covenants as the parties may prefer. If no covenants are introduced, the instrument becomes a mere quit-claim deed or simple release. It is usual in a release of a wife's claim of dower to require a private examination before a magistrate or other official person, separate and apart from her husband, whereby she acknowledges that she executes the conveyance freely and without fear or compulsion of her husband. The officer makes a record of the acknowledgment, which must comply with a prescribed form. This release can only be resorted to in favor of some one having an interest in the land—*e. g.* the grantee of the husband—and he should unite with the wife. A release cannot be made to the husband. However, an agreement can be made before marriage creating a jointure (see Jointure), which will preclude a woman after marriage from claiming dower. These technical rules do not apply to a widow, and she can make a release of her rights to dower before it is set apart to her by the modes usually adopted in conveyances. In determining whether a transaction amounts to a release, reference need only be had to its effect, and the classifications above given are only useful from that point of view.

T. W. Dwight.

Relig′ion [Lat. *religio*], in the widest reach of the word, comprehends all frames of feeling, all forms of faith and acts of worship, to which man is impelled by his fears or drawn by his hopes toward superhuman beings and powers or their visible representatives. It originates in his nature and circumstances, and is as early in its manifestations, as constant in its character, as universal in its influence, as any sentiment or principle of action marking the history of man. Wonder, born of ignorance, fear, and weakness unite to produce veneration. The sense of dependence, the awe of power, the curiosity of a being to whom effects suggest causes, the play of imagination natural to man—above all, the suggestion of the existence of spirits greater than his own to a being who feels himself to be a spirit,—these are sufficient to account for the general phenomena of man's religious history. Outward Nature, with her illimitable sky, her sun and moon, planets and stars, her oceans and mountains, her dark forests full of weird voices, her monsters of sea and land with their roar and hiss—earthquakes, volcanoes, eclipses, fountains springing up in deserts, rivers running under ground, caves and cataracts, the change of the seasons, life and death,—these from the earliest times have prompted in man or forced upon him a faith in creative, mastering, invisible, or superhuman beings and powers, evil and good, demons and angels, for whom he has felt a shuddering reverence, a cowering dread, and an awestruck desire to propitiate their favor or their mercy. Conscience, the most important permanent factor in religion, is obviously weakest in the infancy of the sentiment. The exploration of the globe by modern curiosity under new conditions of locomotion

has laid open as contemporaneous facts the feelings and habits of races and tribes at different stages of development, answering generally to what may be supposed to have been the successive stages of the race in its natural religious history, so that anthropologists are not left wholly to inferences from imagined conditions to imagined results for their knowledge of the past. The study of comparative religion goes on now as the study of comparative philology goes on—not by guess and hypothesis, but by direct inquiry into positive facts lying open to competent scholars willing to take the pains to observe them. It is affirmed, as a part of this testimony, that tribes have been found among the lowest of known survivals of savage humanity in which religion either as a sentiment or as a custom is unknown. If the reported fact were verified, it would afford one of the strongest cases in which the exception proves the rule. Yet, as we not seldom find in the midst of the more advanced civilization not only individuals, but families and even neighborhoods, where both superstition and religion have ceased to have any apparent existence, it is not inconceivable that tribes may have existed, or may still exist, so nearly brutal in their habits and feelings as to be below the influence of either hopes or fears drawn from the inward nature or the usual and characteristic ideas and tendencies of humanity. We mainly study language not in the brogues and gibberish of tribes isolated and left behind, but in the tongues of historical peoples who have inherited the language of ancestors that have been in the line of one of the great branches of human progress, if not a part of the main stream. It is enough to say of religion that from a very low, if not the lowest, stage of known and recorded history, it has been a characteristic experience; that it seems inconceivable that man should advance many steps beyond the more intelligent brutes without developing a sentiment of religion; and it is certain that this sentiment has grown with the growth and strengthened with the strength of his more strictly human faculties. It covers a space in man's history not exceeded by that of any other interest. Religious prepossessions and customs have been a principal cause of the coherency of tribes and nations—have influenced man's choice of and submission to rulers, largely shaped his social and domestic customs, been his first impulse to the careful observation of natural phenomena, and his leading inspiration in the first and in the last endeavors of art. The path of the world's progress is retraceable to antehistoric times in the ruins of temples, shrines, and altars. Religion offers a clue—which is only exceeded in interest by that of language, itself a history of religion—into the deepest and darkest recesses of the past. A comparison of the mythology of ancient peoples develops the evidence of an extraordinary sameness in the religious needs and religious customs of humanity, due in part to like causes and conditions producing like effects; in part to survivals of early common traditions among widely-scattered peoples with some portion of their past in common; in part to conquest or invasion of weaker by stronger races, or more commonly of violent hordes occupying the country of races of more advanced thought and nicer feelings, who have conquered their conquerors by communicating their laws, customs, and faith to those who had taken away their political independence.

The characteristic feature of the present era is the adoption among all leaders of science and thought of the idea of unity in human fortunes and interests. The boundaries between ancient and modern history, or the classical and the romantic in literature and art, are nearly obliterated. One key, a common human nature in a common surrounding of terrestrial and celestial influences, is applied to all ages and races, and has opened gates that were thought permanently closed. Perhaps nothing has been more humane and helpful to the race than the falling of the fences that long separated religions from each other as having no common root and no common sap. In place of superstitions we now have mythologies; for *false* religions we now have imperfect developments of a common sentiment of religion; and the most advanced have, with the most backward, a more or less complete sense of the provisional or partial character of their forms of faith and worship. With a recognition of the superiority of some religions over others, when measured by a sense of the highest wants of man yet known to us and of the best civilization yet reached, there is an equal sense of the wisdom of the providential law which has accommodated religions, sentiments, and customs to the needs and capacities of different races and different regions, and a pause in the indiscriminate desire to force even better religions upon peoples who have not through commerce and culture yet reached a level on which they can advantageously be seen and felt. Thus, Christian missionaries have adopted commercial, educational, and social instrumentalities as necessary preliminaries for the successful teaching of their faith, and with much advantage to their cause.

To admit that the religious sentiment is an original, a universal, or a characteristic experience of humanity is to confess its vast importance and essential beneficence; but it is unscientific to assume that it is any less liable to abuse, exaggeration, or perversion than any other great sentiment or passion of the race. In proportion to their significance and indispensableness, human feelings are liable to be turned against the interests they are ultimately designed to nourish. If religion has been the nurse of imagination, the fountain of poetry, the cement of nationalities, the spur of spiritual speculation, the anchor within the veil which has held the vessel of our common fortunes with its head toward an unseen futurity, it has been also the fountain of debasing terrors, devastating hatreds, obstinate prejudices, paralyzing fatalism, narcotic dreams, and delirious fancies. Like the imagination, without which it cannot exist—the power by which man makes the future present and realizes the unseen, the most creative of human endowments, and the most prophetic among the elements of reason—religion is equally capable of illuminating the understanding or clouding its light; of stimulating the conscience or of inflaming it; of making the passions its useful servants or its mischievous emissaries. Like the beneficent sun, which draws pestiferous miasmas from the swamp and fruits and flowers from the drained hillsides, religion is wholesome or noxious in its influence according to the condition of the other faculties and the proportion in which other elements are present and operative in those whom it visits. The uncandid effort to escape this testimony of history by making a distinction among religions, as if a single one had any exemption from the rule, is now very generally abandoned. There is no one of the chief religions of the world which has not been found capable of sustaining or producing samples of exalted forms of human character, or of being either perverted or used to justify the fiercest cruelties, the most abject debasements, and the most injurious passions. It is now plain that religion is elevating or debasing, inspiring or intoxicating, favorable to real progress or retarding to it, according as it unites itself with other elements—with knowledge or ignorance, truth or falsehood, self-control or self-abandonment, civilization or barbarism, peaceful habits or warlike propensities, coarse tastes and brutal customs or refined feelings and softened manners. No form of religion, however primitive and crude in its original beginning, has ever failed to be interpreted and used for wholesome purposes when it has fallen into cultivated hands; and no form of religion, however pure and lofty its source, has ever failed to be corrupted and made tributary to lust, rapine, and ambition when it has fallen into the hands of ignorance, sensuality, and self-seeking. Polytheism in all its varied shapes seems the necessary form of earlier religion. Pure theism, scientifically speaking, is as impossible a beginning in religions as monarchy in government among scattered tribes, each with its own chief. As families were successively lost in tribes and *gentes*, and these in the *gau* or shire, and these again in the little kingdoms which were finally absorbed into great nations under a common government, so, inevitably, the imagined gods of the groves or caves or fountains, and of the separate interests and pursuits of earlier humanity, lessened or lost their places as men by acquaintance and comparison took more comprehensive views of space and events, saw better the connections of things, felt more the force of common laws and a common nature, and observed more order and less caprice in the seasons and the elements.

The independent development of social or personal morality has had a great influence on religion. The religious and the moral sentiments have neighboring but independent roots. It is not respect for right, nor a sense of justice, nor a love of excellence that first starts religion, but awe of power, the fascination of mystery, the dread of the unknown, and the indulgence of a terrified but exalted fancy. The conscience, now scientifically regarded as the least-suspected witness for the existence of a future life and of a personal God, was not the original guide to faith in the invisible. It was more the fear of power than the sense of wrong or the suggestion of an arbiter of duty. But whatever feeble function Conscience may have had in the early history of religion, her power in shaping and purifying faith and improving the form of religion cannot well be exaggerated. Nor can the power of purified and enlightened religion in improving morals be any more easily overstated. Positive religions must probably be rated in value by the declining proportion which the purely religious impulse of worship, dread, and awe bears to the less strictly religious element of moral obligation, the love of justice, respect for human rights, and personal purity. So long as the gods or the supreme god were considered as free from the obli-

gation of justice, truth, purity, and were chartered libertines in caprice, it is difficult to see how social or personal morality could have derived any strength or encouragement, any sanctity or support, from their worship; and until morality had developed itself in human experience, in its tendency to produce self-respect, peace, and order in society, it is hard to imagine how any pure conception of the gods or the chief divinity could have been possible to humanity. It is fortunate for the permanent interests of man that faith and morals have independent roots in his nature, and each original and permanent resources of power. It is not always that the most religious have been the most moral, or the most moral the most religious, for morality and religion are in a manner rivals, as well as allies, and each tends to hold its separate court and maintain its own sovereignty. It is, however, in the struggle of these two independent factors that the finest powers of both are developed, morality purifying faith, and faith exalting morality. Each has its own danger—one, the tendency to use only its wings; the other, only its feet. Together they walk the earth or soar into the skies. The virtues and graces of the most advanced humanity come at last to pass only as hints and suggestions of the holiness and mercy and grace of the gods, while the moral and spiritual ideals thus attained rebuke and exalt the practical actual morals of society and its purest leaders.

The vast function of personal genius, religious and moral, independently of all disputes about inspired men and inspired founders of religions—a topic on which in an article on religion in its universal form it would be impertinent to dogmatize—is now generally recognized. That individual men and women have had here and there, by birth and original constitution or by special inspiration, a genius for religion beyond their times and above their circumstances, and have been able to command the reverence and faith of disciples and to lift up by their own single souls the general level of the generation or race to which they belong, is certain. Excepting Brahmanism there is no great religion which has not had a personal founder.

Scientifically speaking, the prospects of a universal religion are much increased by the discernment of the common bond among all religions and the recognition of the basis of a common nature and common tendencies; for what has been taken up or imagined, not in caprice or by accident, but in the interest of human wants and needs, may again be laid down under an improved sense of these needs and wants when man is put into possession of the means of a better supply. So long as religions were considered capable of classification only into true and false, divine and human, nothing was possible but a conflict between them—a surrender on one part, a victory on the other. This does not seem to be the method of progress among the sects of the religion of Jesus. They do not conquer each other, but coalesce by a perception and adoption of what is good and helpful in each other's thought or experience; by meeting at points common to all, or by a common advance, or by uniting higher up than the plains on which their old battles were fought; and their method seems to be the type of the method likely to be pursued by the religions of the globe in their tendencies toward unity. As civilization seems to be slowly returning to the long-stationary seats of its earliest appearance, so it is indicated that the religion of the more civilized portions of the race will return, perhaps to find unexpected allies and increased breadth and power, to the regions near where it started. Other things being equal, the sceptre of power and influence in the world has never gone with quantity, but always with quality. It is not Chinese myriads that threaten universal empire, but the sway of the few smaller nations that have understood and conquered the elemental forces of nature and made living literature and high civilization.

It is in vain to offset the prospects of the ultimate spread of a religion which has won the love and trust of all highly-civilized peoples—though its roll may now contain less than a quarter of the population of the globe—with the dead weight of the religions which still hold so vast a majority in the effete or less energetic or unprogressive regions of the earth's populations. Apart from all supernatural assistance, Christianity, by the necessity of its more comprehensive, humane, and practical character; its power to assimilate social and political experience; its singular independence of race, place, and time; its hold on the past, its grasp on the future; the beauty and eloquence and historical value of its records; its survival and pacification of the strifes it has engendered, and its exceptional power to profit by its most trying experiences; the key it offers to the significance of other religions, and the hospitality with which it receives what survives their wreck; its identification with a civilization that is steadily claiming the whole world for its area,—by all these signs and claims Christianity shows itself to have the only fair chance ever yet possessed by any faith of becoming the religion of universal humanity.

The several modes of religious belief and worship are treated in this work under their appropriate heads. We add for convenience a tabular view of the adherents of the principal religions, reckoning the whole population (according to Prof. Schem):

Population of the globe	1,350,200,000
Greek Church	69,692,700
Six other Oriental churches	6,500,000
Roman Catholics	195,000,000
Protestants	97,139,000
Mohammedans	160,000,000
Booddhists	340,000,000
Other Asiatic religionists	260,000,000
Pagans	200,000,000
Jews	6,000,000

H. W. Bellows.

Religious Amendment to the Constitution of the U. S. It is a fact well known that the Constitution of the U. S. contains no acknowledgment of God as the ultimate Source of all legitimate civil authority, nor of the Scriptures as the supreme rule of national conduct, nor of the Lord Jesus Christ as Governor among the nations. A considerable number of Christian citizens have always considered this omission a prime defect in our otherwise admirable national charter, and at least one entire religious denomination—the Reformed Presbyterian—has for this reason refused to incorporate with the government. To remedy this defect is the avowed object of the "Religious Amendment" or "Christian Amendment" (or, as it is now more broadly designated, the "National Reform") movement. Its purpose, summarily stated, is to secure such an amendment to the Constitution as shall be an appropriate recognition of God, and at the same time furnish a constitutional guaranty for the existing religious elements of our national life. The advocates of this movement disavow all desire or intention of uniting Church and State; indeed, they are among the most strenuous opposers of such a union. They maintain that the proposed reform is so entirely unsectarian, of so broad and catholic a character, and that the proposed amendment so accurately defines the relation of the state to God, as to preclude the possibility of a union of Church and State so long as it should remain an integral part of the Constitution. This movement being the determined foe of "secularism" in all its protean forms, assumes a profoundly interesting and practical aspect as the defender of all the religious elements of our national life, now so openly and persistently assailed. It takes a determined stand in favor of the Christian Sabbath, the employment of chaplains in Congress, the army, navy, and other public institutions, the continuance of the oath as essential to the administration of justice, the maintenance of the "Bible in the public schools," the preservation of the law of Christian marriage, the appointment of days of fasting and thanksgiving under appropriate circumstances, etc. The advocates of this amendment ask nothing new; only the preservation of that which already exists. "We propose the adoption of no new principles and no radical change of customs. We propose only to recognize as a fundamental principle in the national written Constitution that which has been a universally-recognized principle of national life from the first. We aim not at change, but at conservation. We want to preserve through all coming time, and consistently carry out in all departments of law, the hitherto universally-admitted fact that Christianity is an element in the common law of the land." (*Speech of the Rev. A. A. Hodge, D. D., before the Pittsburg National Convention of 1874.*)

Reasons enforcing the Amendment.—Numbering as it does among its advocates many of the most profound thinkers of the country, this reform movement is based on fundamental principles, and urged by arguments drawn from every department of human thought connected with the science of government. A brief outline of the argument is all that can here be attempted.

I. Government is a divine and not a merely human institution. "There is no power but of God; the powers that be are ordained of God. Whosoever, therefore, resisteth the power, resisteth the ordinance of God." This doctrine, so clearly enunciated in Scripture, is in entire accordance with the deductions of reason. The state is an organic unity, an organism, not an organization—an organic unity composed of parts, and as these parts cannot determine the whole, the nation must proceed from a power higher than itself. The same view is confirmed by reference to the power with which the state is invested. "The state is a power claiming and exercising supreme jurisdiction over a certain portion of the earth. Here it acknowledges no superior unless it be God. It is the sovereign arbiter of life and death. It fixes the civil status; it regulates the social action; it determines, either directly or permissively,

either wholly or partially, according to its sovereign pleasure, the rights, duties, and relations of all human beings within its territorial sway;" and again, "It is, however, enough for us here to present the picture of an omnipotent earthly power, a power of life and death, claiming unlimited and illimitable control over millions of human beings, now existing, over generations yet unborn—determining, in fact, how they shall be born." (*Essay*, by Prof. Tayler Lewis, LL.D., read before the convention in Cincinnati, 1872.) It is urged that an institution wielding a power so vast must be amenable to the higher law of a higher power, and that this should find expression in the written Constitution.

II. Philosophical writers on the science of government make a distinction between the providential, real, and vital constitution and the verbal or written constitution. The former is the foundation of the latter, and that which gives it validity and vitality. The written constitution should therefore embrace and recognize all the more potent elements of the national life. But among these elements, in the U. S., Christianity occupies a foremost place. It pervades and permeates our institutions; it is the preservative element, the inspiring soul of the nation, and therefore has a right to recognition in the fundamental law, not as a compliment, but as a right, not as a theory, but as a fact and a necessity.

III. It is maintained that the U. S. is a *Christian* nation —not a pagan nation, nor a Mohammedan nation, nor an infidel nation, nor a nation indifferent to all religions, but a *Christian* nation. In proof of this position reference is made to our past history, as well as to the present administration of our government. "The fact that our government always has been connected with Christianity as it never has been connected with any other religion is so patent a fact of history as to need only to be stated. The men who came to this country and originally settled it were for the most part Christians. They acknowledged Almighty God and Christ and the Bible. The Christian religion was the religion by whose teaching they sought to regulate all their affairs. This connection between Christianity and the administration of our government still exists. Christian ministers are employed by the government in public institutions as chaplains; prayers are offered in our State legislatures and in the halls of Congress; the Bible is in our schools and the oath in our courts of justice." (Rev. D. McAlister, *Address at the N. Y. Convention 1873.*)

IV. Neutrality in religion on the part of the government is impossible. It must be for Christianity or against it. "Byron puts a truth in Satan's mouth: 'He that has not bowed to God has bowed to me.'" Professed non-religion sooner or later manifests itself as irreligion. Government is brought into contact with religion at too many points to admit of neutrality. The demand of secularism for the abolition of every religious feature of our national life demonstrates the utter impossibility of neutrality. Theistic or atheistic the nation must be from the necessary conditions of its existence.

V. Our present condition necessitates a movement of this kind. Vast numbers of persons holding secular, infidel, and socialistic theories of government have come to us, and are disseminating the poisonous leaven of their principles; political corruption of the most appalling character pervades almost every department of our public administration; the great question of education is before the nation as it never has been before, and its character as religious or irreligious must soon be determined. These and similar facts demand a constitutional guaranty for our religious institutions.

History of the Movement.—At a large meeting for prayer and Christian conference held in the town of Xenia, O., Feb. 3, 1863, and composed of delegates from eleven States, a paper embodying most of the fundamental principles of the movement was presented by John Alexander, Esq., and favorably considered. An association was subsequently formed. Various meetings were held in different parts of the country. The first general convention was held in Allegheny City, Pa., Jan. 27, 1864. *The Christian Statesman*, the special organ of the movement, was started in 1867. The first truly national convention was held in Pittsburg in 1870, the second in Philadelphia in 1871, third at Cincinnati in 1872, fourth at New York in 1873. The fifth was held in Pittsburg in 1874, and was by far the largest and most influential of the series, being composed of more than 1000 delegates from most of the States in the Union. The sixth national convention will be held in June of the present year (1876) in the city of Philadelphia, during the Centennial celebrations.

Organization.—Hon. Felix R. Brunot of Pittsburg, Pa., is president; Rev. D. McAlister of Walton, N. Y., is general secretary; Rev. T. P. Stevenson of Philadelphia is corresponding secretary; Rev. W. W. Barr, Philadelphia, is recording secretary; and Samuel Agnew, Esq., of the same city, treasurer. The society numbers among its vice-presidents many of the most eminent names in law, theology, science, and literature in the country.

Literature.—*The Christian Statesman*, published in Philadelphia, is the organ of the society. The proceedings of a number of the large conventions have been published in pamphlet form, and contain the addresses of the ablest advocates of the movement in full. Among works bearing directly or indirectly upon the questions discussed in the progress of this reform may be mentioned *The Nation*, by R. A. Mulford; *The American Republic*, by O. A. Brownson; *Divine Aspects of Human Society*, by Bishop Huntington; *The Oath*, Rev. D. X. Junkin, D. D.; *The Constitutional Convention*, by Judge Jamison; *Political Fallacies*, by Rev. George Junkin, D. D. Articles in various reviews by Dr. McIlvaine, Prof. Tayler Lewis, Prof. Charles Hodge, D. D., Hon. Prof. Seelye, discuss either the general or particular phases of the movement. J. R. W. SLOANE.

Religious Amendment to the Constitution. The argument in support of the proposed amendment necessarily assumes the following premises: That the supreme providence of God is exercised over all human affairs; that nations are organic societies possessing a distinct moral character; that by virtue of this moral character they rest under obligations toward God in addition to the obligations of their collective members, and that for a violation of such obligations penalties are incurred. These assumptions must be made, because the act of divine recognition which it is insisted should be performed is to be in every sense a national act, without any reference to the opinions, beliefs, or conduct of the individual citizens, and its necessity is wholly independent of such opinions, beliefs, and conduct. If the foregoing facts are accepted as true, still they do not support the argument, but on the contrary furnish its complete refutation. If the state is a moral entity, possessing a moral character, capable organically of doing right and wrong, the quality of its acts must depend upon their intrinsic nature, and not upon their outward appearance; it will be judged by what it really *is*, not by what it professes to be. The story of the Jewish people, as detailed in the Holy Scriptures, gives a conclusive answer to the inferences drawn by the advocates of the proposed measure from the moral quality and attributes of the state. That history shows that God, in his dealings with nations as with individual men, looks at the substance and not at the form. Public acknowledgments of him, professions the most absolute of accepting him as the supreme Ruler and Governor, even the establishment of his worship as the only national religion, are of no avail—on the contrary, they are an offence—unless the laws are enacted, the government is administered, and the people live in conformity with those principles of righteousness, holiness, and justice which find an expression in his divine law. The theory which underlies the advocacy of the suggested amendment presupposes that the relations of God toward all political societies are the same as those which he sustained to the Jews, although the Scriptures expressly declare that they were a peculiar people and that their condition was anomalous. We shall, however, for the present concede that the assumption is well founded, and admit that in the chronicles of that strange race are disclosed the essential obligations of nations to the Almighty and the universal methods of his providence toward them. What was the nature of the moral duties imputed to the Jewish commonwealth? For what and whose faults was it condemned and punished? The state was always identified with the people who composed it, as well as with the rulers who governed it. The duties of the people, not as an organic unit, but as a collective mass of individuals, and the duties of the rulers, also considered as persons, were treated as the national obligations. For the wrongful acts and omissions of people and rulers alike the direst punishments were inflicted, which fell equally on all classes of citizens, the guilty and the innocent. The entire history, from the Exodus and the first wanderings in the desert to the rejection and death of our blessed Saviour, demonstrates beyond the possibility of doubt that whatever of a moral character inheres in the state as a political society, whatever of a moral quality is attributed to its acts, is inseparable from the individuals who compose it, and depends upon the acts and defaults done by them or by those who represent them in administering the government. If all the people of a particular state—officials and private citizens—regulated their conduct in accordance with true Christian principles; if they all faithfully discharged their duties as Christian men; if all the laws were so framed and the government was so administered as to promote justice and equity; and finally, if all the intercourse with foreign powers was based upon the golden rule of Christian ethics,—that people and

state would be Christian, and any formal assumption and announcement of the Christian character could add nothing to the reality. But if the reverse of this pleasing picture be true—if a people are guided by no ethical principles in their personal conduct; if they habitually violate all public and private moral duties; if the laws are contrived to sustain wrong and injustice; if oppression, fraud, and corruption pervade all branches of the government,—it is plain that the most formal and explicit recognition of the divine sovereignty by such a state, the acknowledgment in its organic law of the entire Christian creed, could not in the slightest degree alter its moral and religious status—could not be other than a solemn mockery. These are, of course, extreme cases, but they show that, upon the very assumptions made by the advocates of the proposed measure, and upon the very theory of the divine providence which they maintain, the amendment of the Constitution can of itself work no change in the national character, no alteration in its moral quality, no effect upon its relations with the Deity. There must be something far more than this empty show; and when that required condition is attained, the mere profession is useless. To suppose that God would be pleased by such an empty form consciously enacted by the government, and that his favor would be propitiated by it, is a conception of him so low and grovelling as to be hardly less than blasphemous.

There is another ground, however, solid, rational, and truly Christian, upon which we prefer to place the matter, and to finally rest the case. Christianity first introduced into the world the true notion of religion. In defining the proper functions of the Church it also determined those of the State; it fixed their respective limits and marked out independent domains in which each may act without encroaching upon the other. This grand revelation, lost sight of when the early Church became triumphant, and hidden through many succeeding centuries, has reappeared in our own day; and the revival marks a distinct epoch in the progress of Christian civilization. In all ancient communities religion formed a part of the state. Laws, institutions, the very social fabric, were based upon it, and the Jewish commonwealth was not an exception to the universal principle. Religion was everywhere and at all times a matter of the state—of state policy and of state craft. With Christianity first came the conception that religion is chiefly concerned with the relations between the individual man and his Creator. To preserve its truths and to perpetuate its benefits a society was established having no connection whatever with the state, wholly independent and voluntary—the *Church.* The people of the U. S., in framing their organic law, returned for the first time in many centuries to this original and authentic plan, and placed the nation and the Church in exactly the same relations to each other in which they were left by Christ himself and his apostles. According to this system, the state cannot be fairly described as a godless society, since it forms an essential part of the divine order as truly as does the Church. It is appointed, however, to accomplish certain specific purposes, which it can best subserve by leaving to the Church alone the care and the propagation of the religious truths which were primarily confided to its sole custody. In this manner the State and the Church correlate each other, each fulfilling its own ends and acting within the sphere assigned to it by Divine Providence. The State gives to the Church all that it needs—protection and security, the support of equal laws, the power to develop its own resources, and the opportunity to accomplish with perfect freedom its high mission. On the other hand, the Church, as the depository of sacred truths, reacts upon the State; its teachings pervade and influence society, mould the characters of citizens, and elevate all legislation and administration to the lofty standard of Christian ethics, until the national jurisprudence becomes the expression of Christian thoughts and principles reduced to the form of practical rules for the regulation of human conduct. In this manner alone can the state, considered as an organic unit, be properly termed Christian. At the same time this absolute freedom granted to the Church, this releasing it from all legal connection with the civil authority and from all subjection to the civil power, necessarily involves a like freedom given to all other forms of religious belief—to Jewish, Mohammedan, and pagan creeds, and even to the denial of all beliefs. All these conflicting forces meet within the body politic; they are all left equally free to promulgate themselves, and thus the triumph of the truth is made certain. Such, in brief, is the theory upon which the U. S. has acted in constructing its organic law and its subordinate legislation; it is the theory upon which the relations of the primitive Church to the Roman empire were constituted; it is the theory which is being widely accepted by the wisest statesmen, jurists, and divines of Europe; and it is the theory which the advocates of the proposed amendment would now abandon. The history of Christendom from the time of Constantine to the present day shows in the clearest light the workings of the opposite principle, and its disastrous effects both upon the Christian Church and the religion which it was intended to perpetuate, and upon the State and the civil and political rights which it was designed to secure. The complete separation of these two societies, the absolute freedom with which each is left to fulfil its own special mission untrammelled by the other, was perhaps the greatest benefit conferred by the founders of this republic upon humanity. An alteration of the national Constitution, by incorporating with it the religious amendment, would be the surrender of a grand principle—a principle which has proved to be alike essential to the highest interests of religion and of the civil government. JOHN NORTON POMEROY.

Religious Liberty. See LIBERTY, RELIGIOUS, by PRES. J. L. M. CURRY, S. T. D., LL.D.

Religious Orders. See MONACHISM, by T. M. POST, S. T. D.

Rel'iquary [Lat. *reliquiæ*], in Roman Catholic churches, a case or shrine, often of costly materials and highly adorned, and containing the relics of some saint.

Remain'der [Lat. *remanere*, to "remain back"], in law. This is a technical expression to designate a future estate in land, created at the same time and by the same transaction as a prior estate, called a particular estate. An illustration is found in the following case: An owner of land grants it to A for a period measured by his life, and at the same time grants the residue of his interest to B. The former is said to have a particular estate, and the latter a remainder. It will be observed that the two estates in the case supposed, taken together, constitute the entire interest in the land. A remainder can only be an estate which remains after the grant of a prior estate less than the whole interest of the grantor. It accordingly follows that when the entire estate has thus been granted by way of remainder or otherwise no further estate can be created *by way of remainder,* although it might be sustained upon some other theory. Thus, if an owner should devise his land in fee, and further provide that if the devisee should die without issue surviving at his death the property should belong to B, the provision in favor of B would be void considered as a remainder, though it would be upheld for the purpose of effectuating the testator's intention, and be valid as a so-called "executory devise." Remainders are divided into two principal classes—vested and contingent. A remainder is said to be *vested* when the *right* to the future enjoyment is fixed, though the possession is postponed. It may be vested in right even though it never come into possession. Thus, if A have an estate for life, and B have a succeeding estate for his life, the remainder in B's favor is vested, though he may die before A, and thus never come into actual possession. A convenient test of a vested remainder has been suggested. Suppose that the prior estate should instantly terminate, is the person claiming the remainder entitled to immediate possession? If so, the remainder is vested; otherwise, it is contingent. A contingent remainder, therefore, is one where the *right* itself is not yet fixed and certain. An instance is found in the case of a remainder given to an unborn or unascertained person, or made to depend upon an uncertain event. Thus, if an estate were given to A for his life, and if B should survive C, then to B for his life, it is plain in this case that while all the parties named live the right of B is contingent and uncertain. If C dies during the life of A, leaving B surviving, the latter's right becomes fixed and the remainder is vested. A contingent remainder may thus become a vested one, and may subsequently become an estate in possession. The rules of law favor vested rather than contingent remainders, and a construction of doubtful words will be made in this spirit. Contingent remainders are subject to a number of technical rules which cannot be satisfactorily explained within the compass of this article. Some of them have been abrogated in a number of the States of this country. This is particularly true in the State of New York and a number of the States following its radical legislation in respect to real estate. In fact, the word "remainder" in that State has largely lost its original accurate meaning. The statute permits an executory devise as above referred to to be called a remainder in fee. It is quite doubtful whether any real advantage is gained by such a confusion in nomenclature. The common-law learning of remainders is subtle and highly technical, and at the same time severely logical. Distinctions are frequently made to turn upon the particular kind of instrument employed in creating the estate. A single instance may be mentioned. In a strict common-law deed no future estates can be created except the rules governing remainders are

followed. On the other hand, if other deeds are resorted to, such as are derived from the doctrine of uses and the statute regulating them (see USES), then future estates not complying with the law of remainders may be created, termed "springing and shifting uses," corresponding to "executory devises" in a will, and which need no particular estate to precede them. Such barren distinctions may profitably be abolished by statute. The law should require the same rules to be followed in all cases, without reference to the instruments employed. The law of remainders is solely applicable to real estate, future interests in personal property being assimilated to "executory devises." (Consult for further information Fearne on *Remainders* and the textbooks on real property.) T. W. DWIGHT.

Rembang′, the name of a Dutch residency of Java, East Indies, comprising an area of 2600 sq. m., with 631,668 inhabitants, of whom about 10,000 are Chinese. A peculiar feature of the island of Java, and especially of the residency of Rembang, is the black tiger. The capital, Rembang, on the flat, hot shore, in lat. 6° 40′ S. and lon. 111° 10′ E., has 15,000 inhabitants and some shipbuilding.

Rem′brandt van Ryn (PAUL HARMENS), b. at Leyden July 15, 1607, the son of a well-to-do miller; was first intended to become a scholar, but felt more inclination for the art of painting; studied under Jacob van Swanenburch at Leyden and Pieter Lastman at Amsterdam; produced in 1628 his first excellent picture, a portrait of his mother; settled in 1630 at Amsterdam; married Saskia van Ulenburgh in 1634; was soon recognized as the first master of the Dutch school, and gathered a great number of disciples around him, at the same time that his pictures and etchings commanded very large prices, but suffered his domestic affairs to fall into disorder, especially after the death of his wife in 1642, and when in 1656 he concluded a second marriage, and was compelled to pay his son his maternal heritage, he was declared a bankrupt and his collections of arms, vases, cameos, etc. were sold at auction; after which he lived in gloomy retirement, and d. Oct. 8, 1669. Of his pictures, comprising portraits, landscapes, historical and genre pieces, the most remarkable, the *Night-Watch, Nicholas Tulp,* etc., are still in Amsterdam and the Hague, but excellent specimens are found in all the larger galleries of Europe—the *Family of Tobias* in the Louvre, the *Sacrifice of Abraham* in the Hermitage at St. Petersburg, *Moses destroying the Tables of the Law* at Berlin, *Samson's Wedding* at Dresden, the *Blinding of Samson* in Schönborn at Vienna, etc. His peculiar manner, however—that wonderful blending and contrasting of light and shade in which forms of meanness and ugliness receive a poetical consecration without losing their striking expressiveness—may be enjoyed almost to the same extent in his numerous etchings, of which many—the so-called *Hundred Guilders,* the *Windmill,* the *Descent from the Cross,* etc.—are widely known. His *Life* has been written in French by C. Vosmaer (2 vols., the Hague, 1868).

Remey (GEORGE C.), b. Aug. 10, 1841, in Iowa; graduated at the Naval Academy in 1859; became a lieutenant in 1861, a lieutenant-commander in 1865, a commander in 1872; was in several engagements on the rivers of Virginia and South Carolina in 1861 and 1862, and commanded the naval battery on Morris Island from Aug. 23 to Sept. 8, 1863, when he was taken prisoner in a night-attack on Fort Sumter. Highly commended for "gallantry, skill, and judgment." FOXHALL A. PARKER.

Remi, SAINT. See REMIGIUS.

Remig′ius, the name of three eminent French ecclesiastics: (1) (St. Remi) the bishop of Rheims, who in 496 baptized Clovis, the founder of the French monarchy. He was b. at Laon in 437, became bishop in 459, and d. Jan. 13, 533. (2) The archbishop of Lyons, who sided with Gottschalk in the great anthropological controversy of the ninth century. He became archbishop in 853, and d. after 875. (3) A Benedictine monk of Auxerre, who was at the head of the bishop's school at Rheims in 882, and d. about 900. He wrote commentaries on the Psalms, the last eleven of the Minor Prophets, and the Epistles of St. Paul. R. D. HITCHCOCK.

Rem′ington, p.-v., Carpenter tp., Jasper co., Ind., on Indianapolis and Chicago division of Pittsburg Cincinnati and St. Louis R. R., has 1 newspaper. P. 390.

Remington Rifle. See SMALL-ARMS, by GEN. P. V. HAGNER, U. S. Army.

Remiremont′, town of the German empire, province of Lorraine, at the foot of the Vosges, on the Moselle. It has manufactures of woollen and linen fabrics, paper, and laces, and an active trade in corn, hemp, cattle, and cheese. P. 5668.

Remit′tent [Lat. *remittere,* to "send back"] **Fe′ver,** a non-infectious, non-contagious fever of malarial origin, but differing from intermittent fever in that it has no prolonged intermission or apyrexial period. Although there is at no period of the twenty-four hours a complete cessation of fever, there is daily a perceptible or marked abatement or diminution of the elevated temperature and associated symptoms. This period is termed the remission. The characteristics of this fever vary with the country and season in which it occurs. The ordinary autumnal remittent, the bilious remittent of England and the U. S., is comparatively mild. Reversely, the remittent of intensely malarial regions, as the borders of the Mediterranean, the Isthmus of Panama and of Suez, the African jungles, and of Bengal, is severe and fatal. When the invasion of the disease is mild there will have been a precursory period of *malaise,* languor, mental inaptitude, and sleepiness. When violent in its onset, often no such warning symptoms have pre-existed, but the initiatory chill has been speedily followed by intense delirium, changing to coma, internal congestions, and death. Such "congestive," "pernicious," "fulminating," or lightning-like attacks are rare in temperate climates. Usually, remittent fever is ushered in by a distinct chill or by general chilliness and sense of cold down the back. There is headache, giddiness, mental dulness, and confusion, a sense of oppression and lassitude; soon there is delirium. The face is flushed, the pulse full and frequent, the tongue dry and furred, the skin intensely hot, the temperature rising as high as 105° F. In the bilious form there are nausea and vomiting, pain at the epigastrium, with tenderness on pressure. Frequently, the fever thus runs at its height, without modification, during sixteen or eighteen hours, when the remission begins. Such a period of fever is accompanied usually by symptoms indicative of congestion of important internal viscera. Thus, with the first fever-period pulmonary congestions have been denoted by labored breathing, thoracic oppression, and livid face. With the remission these secondary congestive signs abate. The remission usually begins toward morning, though in grave cases postponed and irregular, succeeding a febrile period of twenty-four or even thirty-six hours. The remission may last from an hour or two to eight or twelve, the attack being mild in proportion as remissions are definite and prolonged. The return of fever may have a mild precursory chill, the temperature again rises, and new congestive symptoms develop, perhaps of the liver, as shown by hepatic pain and tenderness and vomiting of bile. Thus, in successive febrile periods various internal viscera are the seat of a determination of blood—the ovaries and uterus often, as shown by metrorrhagia. The duration of remittent fever may be seven, fourteen, or twenty-one days, seeming to observe a law of septenary crises. It may terminate abruptly in resolution by sweating, or lose its distinctive type and run into a low, typhoid fever. The person convalescent presents a noticeably dusky complexion, a depression of the health and strength for many months, and inactivity of the liver, with liability to jaundice. Percussion often demonstrates enlargement of the liver and spleen. In fatal cases autopsy reveals a characteristic "bronzing" or pigmentation of the liver and spleen. The treatment of this fever should keep in view to quickly shorten the exacerbations or febrile periods and relatively lengthen the remissions. Cold and effervescing draughts and saline aperients should be given at once and repeatedly, and the period of remission utilized by the free exhibition of quinine to anticipate and lessen the gravity and duration of the next period of fever. In critical cases quinine to act certainly must be administered in full doses hypodermically—ordinarily, in large repeated doses by the mouth. Congestion of special organs, the brain, lungs, liver, demands local measures, leeching, cupping, blisters, warm and anodyne fomentations. The usual antiphlogistic agencies are indicated, and supporting liquid food at regular intervals. Tonics, as bitter vegetable infusions and the mineral acids, hasten convalescence.
E. DARWIN HUDSON, JR. REVISED BY WILLARD PARKER.

Remon′strants [Lat. *remonstrare,* "to show back"], the name by which the adherents of Arminius were designated when in 1610 they addressed a remonstrance (*remonstrantia*) to the states of the province of Holland. Their adversaries, the adherents of Gomarus, answered with a counter-remonstrance, and were called Contra-Remonstrants, but both designations fell subsequently out of use.

Remote′ness [Lat. *removere,* to "remove"], in law. This expression is used to denote the fact that a provision in a will or deed, such as a marriage settlement, in favor of some person, is so long deferred as to its vesting, so as to be capable of alienation, that it is obnoxious to a rule of public policy requiring that estates should so vest within a fixed period. This doctrine is otherwise called the rule

concerning "perpetuities." The positive rule of the English law upon this point is that estates should thus vest in ownership within the compass of a life or lives in being and twenty-one years and a fraction afterward, the fraction being allowed in the case of the gestation of a child. The rule was derived from the provisions common in a marriage settlement. It is usual in this case to create life estates in favor of the parties to the settlement, and to give the fee to the unborn child or children of the marriage, who on their birth will have a remainder in fee (see REMAINDER), and on reaching their majority will be able to sell or convey it, and in conjunction with their parents may dispose of the entire fee. It is plain that the power to sell the property could only be withheld under such a provision during the lives of the parents and the attainment of majority on the part of the child. The rule thus derived came to be extended to every case of postponement of the power of sale, whether of real or personal property. The number of lives is not confined to two, but any number may be designated by the creator of the estate, since, after all, the postponement cannot be made to exceed the life of the longest liver. The term of twenty-one years may also be used as an absolute one without any reference to minority. Thus, a testator may give his estate to a non-existent corporation, provided that he directs that it shall only take on condition that it be chartered within twenty-one years after his death. It will be fatal, however, if the provision exceeds the period of remoteness, though in fact the person designated comes into existence within the prescribed time. The time in case of a deed is calculated from its delivery, and in case of a will from the testator's death. A provision offending against the rules of remoteness is void, though it does not necessarily destroy the effect of the entire instrument. Its influence in that respect will depend upon the closeness of its connection with other parts of the deed or will, and whether it can be rejected without defeating the main intent of the instrument. The rules governing this subject are frequently difficult of application, and only general principles can be stated. The rule itself is founded on a wise and solid principle—to prevent estates from being withheld from sale. The policy of the law properly requires that estates should be so far in the market that there is some person who can convey them in case a sale becomes desirable for the purposes of commerce. A testator should not be allowed to control by a fixed purpose the use of property long after his death when circumstances have so changed as to make his directions positively injurious. The great Lord Nottingham, in discussing as lord chancellor one of the cases involving this question, said: "They who would introduce perpetuities fight against God, as they would introduce fixedness and stability into human affairs where he has ordered instability." Some of the States have thought the common-law rule too liberal. In New York and some other States the power of alienation of real estate cannot be suspended beyond two lives in being at the creation of the estate. The term of twenty-one years is dropped off. A similar rule is applied to the suspension of the absolute ownership of personal property. The rule does not prevent a permanent investment of property devoted to charitable purposes. (See TRUSTS.) (Consult Lewis on *Perpetuities* and the textbooks on *Real Property*.) T. W. DWIGHT.

Rem'scheid, town of Rhenish Prussia, has very extensive manufactures of cutlery and all kinds of iron-ware. P. 22,017.

Rem'sen, p.-v. and tp., Oneida co., N. Y., on Black River and Utica and Black River R. R. The township has 12 churches, in 10 of which the services are in the Welsh language, there being a larger proportional number of Welsh residents than in any other town in the State. Dairying is the principal industry. P. of v. 289; of tp. 1184.

Remus. See ROMULUS.

Rémusat' (JEAN PIERRE ABEL), b. at Paris Sept. 5, 1788; studied medicine, took his degree, and served as a physician in the military hospitals of Paris during a typhus epidemic in 1813, but devoted himself principally to the study of the Tartar languages, especially Chinese, and was appointed professor of Chinese at the Collége de France in 1814, a chair which was established specially for him. D. at Paris June 4, 1832. His principal works are *Recherches sur les Langues tatares* (1820), *Eléments de la Grammaire chinoise* (1822), *Mélanges asiatiques* (2 vols., 1825), *Nouvelles Mélanges asiatiques* (2 vols., 1829), numerous translations from the Chinese and Thibetan languages, besides minor essays in various scientific periodicals.

Rémusat, de (CHARLES FRANÇOIS MARIE), COUNT, b. in Paris Mar. 14, 1797; educated at the Lycée Napoléon; entered public life as a journalist, belonging to the *doctrinaires;* was a frequent contributor to the *Globe* after 1824; member of the Chamber of Deputies from 1830 to 1848; minister of the interior for a short time in 1840 in the cabinet of Thiers, and minister of foreign affairs from 1871 to 1873. During the Second Empire he lived in retirement, devoting himself chiefly to literary pursuits. D. at Paris June 6, 1875. The most remarkable of his works are *Essais de Philosophie* (2 vols., 1842), *Abélard* (2 vols., 1845), *Passé et Présent* (2 vols., 1847), *L'Angleterre au XVIII. Siècle* (2 vols., 1856), *Bacon* (1857), *Histoire de la Philosophie en Angleterre depuis Bacon jusqu'à Locke* (2 vols., 1875), *Lord Herbert de Cherbury* (1875).

Renaissance' [Fr.], the name of a style of architecture which originated in Italy in the first half of the fifteenth century under the influence of the awakened enthusiasm for classical literature and art, and which in the following centuries wholly superseded the Gothic style all over Europe. It may be characterized generally as a return to the classical principle of building and decoration, and the course of its history may be described as beginning with the simple adoption of classical motives in ornamentation, and ending in the mere copying of antique buildings. In Italy—where the Gothic style never became fully at home, because to some degree it contradicted the genius of the people, while on the other hand the classical style never could die out entirely, because its monuments covered the whole soil—the return from Gothic to classical ideas in architecture was very easy, and followed of necessity the revival of the classical spirit in philosophy, in poetry, and in art generally. Three different schools of Renaissance are distinguishable here—the Florentine, the Roman, and the Venetian—and from these three schools resulted the so-called Italian style, which seldom sinks into mere copying, but generally is an application of ancient forms to modern requirements, often rather curious, but sometimes very successful. The cradle of the Renaissance was Florence, and the dome of her cathedral is generally mentioned as the first example of the style. In the original design of this building by Arnolpho di Lapo, in the latter part of the thirteenth century, a dome 130 feet in diameter was proposed over the crossing of the nave and the transepts, but this giant task was not accomplished until nearly 150 years later (in 1420) by Filippo Brunelleschi (1377–1446), who had made this achievement the aim of his life, and who thereby ushered in a new style. The Gothic avenue, sublime in its perspective and fascinating with its subdued light from the painted windows, disappeared and gave place to the broad, powerful dome which, bright and majestic, spread over the congregation. Still more characteristic of the new style and of the genius of Brunelleschi are the palaces of Florence, for which he gave the model by the erection of the Palazzo Pitti. Florence was at that time a very turbulent place. He who had anything to lose had to make his house a castle, and the famous Florentine palaces Riccardi, Strozzi, Gondi, Rucellai, etc. were actually built for defence. They consist of huge blocks of freestone, and present to the street an austere, almost gloomy, appearance. But the heaviness of the masses is lightened by the exquisite elegance of the proportions, and the noble simplicity of the forms makes an impression of strength and dignity which reminds one of the best classic architecture. Nevertheless, in all these buildings a connection is still traceable with the former mediæval architecture—the Gothic style, the castle of the baron—while in the Roman school this connection is wholly broken. The chief monument of Roman Renaissance is the church of St. Peter, commenced in 1506 by Bramante, continued by Raphael 1514–20, by Peruzzi 1520–46, by Michelangelo Buonarotti 1546–64, by Carlo Maderno 1605–29, and finally completed by Bernini in 1667. In this building, as in the cathedral of Florence, the dome, erected by Buonarotti, is the most prominent feature, and the weakest point is the front façade. The architects of the Renaissance never found the true connection between the dome and the portal. The front façade is generally nothing but an architectonic decoration, a screen of columns, behind which a low and entirely insignificant entrance is hidden. Of greater consistency in their construction, and of a more perfect harmony in their details, are the private buildings, such as Palazzi Farnese and Giraud, and the Cancellaria. The peculiar invention of the school, the connection of two stories in one order of columns or pilasters, with an attic or low story above, is in palace architecture of great effect, and has been used very extensively. In the Venetian school, however, which is very rich in palace architecture, this invention was never employed. Here each story is provided with its own tier of columns or pilasters, and separated from the other stories by conspicuous friezes or belts, often in the form of balustrades broken by pedestals and ornamented by figures. The windows are arched and ornamented with columns. The spandrels are filled with figures, and the whole has a rich, varied, and gay ap-

pearance. The most interesting examples of this architecture are the Palazzo Vendramin Calergi, built in 1481 by Pietro Lombardo, the Scuole di San Marco and di San Rocco, and the palace of the doges. France also is very rich in Renaissance architecture; she even gave the style an individual development, and it is chiefly in this its French shape that it was adopted by England, Spain, Germany, and Russia. To France the style was introduced during the reign of Louis XII. (1461–83), who invited the Italian architect Fra Giocondo to his court, and during the reign of Francis I. (1515–47) some of the most interesting buildings arose which the style ever produced. But while in Italy the classical element was predominant from the very beginning, a real contest took place in France between the Gothic and classical ideas. The ornamentation soon became purely antique, but the plan remained Gothic for a long while. That wilderness of turrets, gables, corners, chimney-tops, etc. which had such a fascinating power over the imagination of the Middle Ages, people would not as yet renounce; they retained the whole variety and multitude of forms, but dressed them all with the simple Greek ornaments, which on such a background produced a strange effect. To this class of buildings belong the castle of Chambord and the palace of Chenonceau, both built in the time of Francis I.—the former by Trinqueau, the latter by an Italian architect. The castle of Chambord is somewhat grotesque, but the palace of Chenonceau is a graceful structure. The church of St. Eustache in Paris, built in 1532, is also a handsome and interesting edifice, though its architecture is very much mixed. Soon, however, a closer study of the classical monuments led to the adoption of simpler plans and a better disposition of space. The Tuileries, begun in 1564 by Philibert de l'Orme, and large parts of the palace of Fontainebleau, built during the reign of Henry IV. (1589–1610), show this transition, but they also show signs of that exaggeration of ornamentation and that empty ostentation which afterward became the characteristic of the French Renaissance, and from which it received the name of Rococo. The most striking example of this style is the château of Versailles, built under Louis XIV. by Hardouin and Mansard. It is colossal, but not grand—pompous, but not imposing. Its most interesting feature is the ingenious combination of many buildings into one arrangement. But it is a city rather than a building. From the Rococo, which literally covered the walls with columns, pilasters, entablatures, friezes, cornices, and ornaments of every kind, the taste suddenly turned during the Revolution to a mere copying of antique buildings, of which the Madeleine in Paris is a striking example. This last phase of the Renaissance, which indeed is the dissolution of the style, was very predominant in Germany. Many of the most conspicuous buildings in Berlin and Munich belonging to this century are entirely devoid of originality, and are mere imitations of Greek conceptions. But neither in Germany nor in England did the Renaissance produce any great and interesting results. The royal palace of Dresden, the château of Heidelberg, and the church of St. Paul in London are fine structures, but, generally, the Renaissance architecture in these two countries has the meagreness of the plan without that abundance of graceful ornaments which, at all events, brings variety into the masses, even if it does not bring true life. A great number of princely residences in Germany are built in the Renaissance style, but they are cold and flat, and sparingly ornamented with flimsy Rococo. CLEMENS PETERSEN.

Renaix', town of Belgium, province of East Flanders, has breweries, distilleries, tanneries, salt and dye works, bleach-fields and manufactures of cotton, linen, tobacco, and chicory. P. 11,905.

Re'nal [Lat. *renes*, "kidneys"] **Diseases,** or **Diseases of the Kidneys,** are mostly of an inflammatory nature. According to the location and character, there are many different affections. Inflammation of the pelvis (see KIDNEYS) is called *pyelitis*, and is generally a continuation of catarrh of the bladder. The tissue of the kidney proper might be the seat of all kinds of inflammatory processes, from simple hyperæmia (and in consequence thereof bursting of blood-vessels and bleeding) to the most severe forms of hyperplastic action, with deposition of diphtheritic and croupous masses. The obsolete name BRIGHT'S DISEASE (which see) used to comprise the majority of these forms, which a more distinct knowledge now keeps asunder. The most important symptoms of the kidney troubles arise from the fact that the epithelium of the canaliculi is detached, thereby allowing the albumen to escape. (See BRIGHT'S DISEASE.) In more advanced cases the secretion of urine is hindered, and even suppressed, and the urea in the blood (uræmia) leads the affection to a fatal end. Of other renal disorders may be mentioned the formation of gravel and stone, giving origin to so-called renal colic and some new formations, especially cancer of the kidneys. Perinephritis is called the inflammation of the cellular tissue around the kidneys; large abscesses might take their origin therefrom, which can be cured by making an incision and thereby giving the pus a free outlet. FREDERICK ZINSSER.

Renan' (JOSEPH ERNEST), b. Feb. 27, 1823, at Tréguier, Côtes-du-Nord; trained in the parish school of his native town, at the age of sixteen he went to Paris to prepare himself for the Church. During his course in St. Sulpice he displayed remarkable ability in the Oriental languages, and his studies leading him to results unfitting him for the priesthood, he abandoned the seminary and devoted himself to linguistic studies. In 1847 he gained the Volney prize by his *Mémoire sur les Langues sémitiques;* in 1848 was crowned by the Institute for his *Étude de la Langue grecque au Moyen Age;* in 1849 was sent by the Académie des Inscriptions on a literary journey through Italy; in 1851 was appointed to a position in the MS. department of the Bibliothèque Nationale; in 1856 was elected member of the Académie des Inscriptions; in 1860 was sent on a scientific mission to Syria, and on his return in 1862 was appointed professor of Hebrew in the Collége de France, from which he was shortly afterward removed, owing to the publication of the *Vie de Jésus.*

Renan is best known by his *Origines du Christianisme,* a series of books in which he depicts with marvellous beauty the material surroundings of Christ and the early Church; but his work is superficial and lacks all critical value. The most deserving of his writings is his *Histoire générale des Langues sémitiques,* which is on the whole the best sketch of the Semitic languages. The following is a list of his works: *Histoire générale et Systèmes comparés des Langues sémitiques* (prem. part), *Histoire générale des Langues sémitiques* (1856), *Le Livre de Job* (1859), *Le Cantique des Cantiques* (1860), *Averroès et l'Averroïsme* (1852), *Origines du Christianisme: A. Life of Jesus* (New York, 1863), B. *The Apostles* (1866), C. *St. Paul* (1869), D. *L'Antichrist* (1873). He has been a frequent contributor to *Liberté de Penser,* the *Débats, Revue des Deux Mondes;* and the best of his essays are collected in *Études d'Histoire religieuse* (1867) and *Essais de Morale et de Critique* (1869). THOMAS C. MURRAY.

Renault', p.-v. and tp., Monroe co., Ill. P. 1617.

Ren'de, town of Southern Italy, province of Cosenza, at the foot of the Apennines, in the midst of fine pasture-grounds. The clay of the vicinity is admirably suited for pottery, in the manufacture of which the inhabitants are chiefly engaged. P. 5300.

Ren'del (JAMES MEADOWS), b. near Dartmoor, Devonshire, England, in 1799; became celebrated for his skill in the construction of colossal bridges; introduced a system of crossing rivers upon floating bridges, employed by several railways, and was the architect of the harbors of refuge at Holyhead and Portland. D. in London Nov. 21, 1856.

Rends'burg, town of Prussia, province of Sleswick-Holstein, on the Eider, is strongly fortified, and carries on some trade in timber. P. 11,514.

René (or **Renatus**) **I.,** count of Provence, duke of Anjou, titular king of Naples, b. at Angers Jan. 16, 1409, the second son of Louis of Anjou and Yolande of Aragon. Having married Isabelle of Lorraine, he laid claim to this country after the death of her father, Duke Charles, in 1431, but was opposed by a nephew of Charles, the count of Vaudemont; was captured and imprisoned for several years. In 1434 his elder brother, Louis III., who had been in actual possession of the throne of Naples, died and left to him Provence, Anjou, Naples, Sicily, and Jerusalem. In 1437, René succeeded in buying his liberty and the acknowledgment of his right to Lorraine for 400,000 pieces of gold, and he now led an army to Naples, where his claims were disputed by the king of Aragon. He was unsuccessful, and in 1442 returned to Provence, gave up all his ambitious schemes, and confined himself to the improvement of his beautiful family estates. He encouraged agriculture, manufactures, literature, and art. His subjects gave him the surname *the Good,* poets and artists gathered at his court, and he was himself a successful cultivator of literature. There is an edition of his writings (*Œuvres des Roi René*) by Quatrebarbes (4 vols., Paris, 1845). The crown of Aragon was offered him, but he refused it for himself and accepted it only for his son, who, however, died shortly after entering the country. At his death (July 10, 1480) most of his possessions fell to the French crown—Anjou, Bar, Maine, and Provence—his sons having all died before him.

Renews, a port of entry of Ferryland district, Newfoundland, 54 miles S. of St. John's. Its harbor is shallow.

The town is an ancient settlement, and has large cod-fishing interest. P. 859.

Ren'frew, county of Scotland, bordering N. and W. on the Clyde. Area, 225 sq. m., with 216,919 inhabitants. The western part is hilly and moorland; the eastern level and very fertile. Coal and other useful minerals abound; manufactures are important. Cap. Renfrew.

Renfrew, a large county in the N. of Ontario, Canada, bounded N. E. by Ottawa River. The leading interest is the cutting, manufacture, and export of lumber, which is carried on on a very large scale. Brockville and Ottawa Railway extends into this county. Cap. Pembroke. P. 27,974.

Renfrew, p.-v., Horton tp., Renfrew co., Ontario, at the falls of Bonnechère River, 100 feet high, which present a scene of great beauty and afford a fine water-power. Renfrew has a large trade, and is 9 miles from Bonnechère Point on Ottawa River. P. about 1000.

Re'ni, town of Moldavia, at the influx of the Pruth into the Danube, is fortified and trades in grain. P. 7300.

Reni (Guido). See Guido Reni.

Ren'nell (James), b. near Chudleigh, Devonshire, England, Nov. 3, 1742; early entered the British navy, from which he passed to the service of the East India Company; was distinguished in the campaigns of Lord Clive; was many years surveyor-general of Bengal; returned to England 1786; aided Mungo Park in his preparations for African travel; published an atlas of Bengal (1781), a map of Hindostan, with an elaborate *Memoir* (1783), *Elucidations of African Geography* (1793–98), *The Geographical System of Herodotus examined and explained* (1800), *Observations on the Topography of the Plain of Troy* (1814), and *Illustrations of the Expedition of the Younger Cyrus* (1816), *Comparative Geography of Western Asia* (1831), and *Investigation of the Currents of the Atlantic Ocean* (1832). D. in London Mar. 29, 1830.

Rennes [Roman, *Redones*], in France, the ancient capital of Brittany, now capital of the department of Ille-et-Vilaine, at the confluence of the Ille and Vilaine, 232 miles S. W. of Paris, consists of two parts—an upper or new town of an elegant and modern appearance, and a lower or old part, mostly built of wood, with narrow and winding streets. It has many good educational institutions, manufactures of sailcloth, linen, lace, and embroideries, and an active trade in honey, wax, butter, and poultry. P. 52,044.

Rennet. See Cheese.

Rennie (Sir John), b. in London Aug. 30, 1794. His father, a distinguished civil engineer (1761–1821), early introduced him to that profession as assistant in the construction of Southwark and Waterloo bridges. In 1821 he succeeded his father as engineer to the admiralty. The New London Bridge was completed by him, from designs of his father, in 1831, when he was knighted. The important works of Sheerness dockyard, Ramsgate harbor, and Plymouth breakwater, commenced by his father, were completed by Sir John, as well as the great system of drainage and land reclamation in Lincolnshire. Of the more important works designed and executed by himself are the Whitehaven and the Cardiff docks. With his brother George (1791–1866) the machinery for the mints of Bombay, Calcutta, and Mexico were designed and erected; also the Royal Clarence victualling yard at Plymouth. Sir John was considered the highest authority on all subjects connected with hydraulic engineering, harbors, canals, irrigation, storage of water, and the management of rivers. President of the Institution of Civil Engineers 1845–49; fellow of the Royal Society; author of *The Theory, Formation, and Construction of British and Foreign Harbors*, and many valuable professional papers. D. Sept. 3, 1874.

Re'no, county of S. Kansas, on Arkansas River, formed since census of 1870. Cap. Hutchinson. Area, 1512 sq. m.

Reno, p.-v. and tp., Leavenworth co., Kan., on Leavenworth and Kansas Pacific R. R. P. 946.

Reno, p.-v. and tp., Pope co., Minn. P. 254.

Reno, p.-v., cap. of Washoe co., Nev., on Truckee River and Central Pacific R. R., 11 miles E. of the base of the Sierra Nevada, is an important centre of mining and manufacturing interests, and has 2 newspapers. P. 1035.

Reno (P. O. name of v. of Laytonia), Sugar Creek tp., Venango co., Pa., on Allegheny River, on Franklin branch of Atlantic and Great Western and Allegheny Valley R. Rs., 3 miles S. W. of Oil City. P. 150.

Reno, tp., Preston co., West Va. P. 2536.

Reno (Jesse L.), b. in Virginia in 1823; graduated from the U. S. Military Academy, and entered the army as brevet second lieutenant of ordnance July, 1846; in the war with Mexico was engaged in the siege of Vera Cruz and in the battles of Cerro Gordo, Contreras, Churubusco, and Chapultepec, and brevetted first lieutenant for gallantry; subsequently served on duty with his corps, being in command of Mount Vernon Arsenal, Ala., at the time of its capture Jan., 1861; appointed brigadier-general of volunteers in Nov., 1861, he accompanied Burnside's expedition to North Carolina; was promoted to be major-general of volunteers July, 1862, and in August assigned to the command of the 9th army corps, which he led in the second battle of Bull Run and at Chantilly, Aug. 29–Sept. 1. At the battle of South Mountain, while at the head of his command, he was killed Sept. 14, 1862.

Reno (Marcus A.), b. in Illinois, 1835; graduated from the U. S. Military Academy, and entered the army as brevet second lieutenant of dragoons in 1857; captain 1st Cavalry Nov., 1861; prior to 1861 was on duty in Washington and Oregon Territories; in the civil war served with his company throughout the Virginia peninsular campaign of 1862, and in the battle of Antietam commanded his regiment; was engaged at Kelly's Ford, Va., Mar. 17, 1863, in the Richmond campaign of 1864, in the Shenandoah campaign of 1864, as chief of staff of the cavalry, and engaged in the battle of Cedar Creek and numerous minor actions; appointed colonel 12th Pennsylvania Cavalry Jan. 1, 1865, which commission he held until July; in Dec., 1868, became major of 7th U. S. Cavalry.

Renovo, p.-b., Clinton co., Pa., on Philadelphia and Erie R. R., 28 miles W. of Lock Haven, along the W. branch of Susquehanna River. It was incorporated as a borough in 1866, but its origin dates back to the establishment by Philadelphia and Erie R. R. of their boiler, repair, and foundry shops here in 1862. It has 3 churches, a public library, 2 large school buildings, a banking-house, 1 newspaper, several hotels, and 1 theatrical hall. Renovo has an efficient fire department and waterworks. It is a resort for summer tourists. P. 1940.

John U. Shaffer, Ed. "Renovo Record."

Rens'selaer, county of E. New York, extending from the frontiers of Vermont and Massachusetts on the E. to Hudson River on the W., traversed by Hoosick and Little Hoosick rivers and Kinderhook Creek, and by the Taghkanic and Petersburg ranges of mountains, is intersected by several railroads, has a hilly surface and a stony soil, best adapted to pasturage, but the valleys are well cultivated and produce large crops of corn, oats, potatoes, and hay. Hops, flax, maple-sugar, wool, butter, and cheese are staples. Manufactures form the leading industry, there being not less than 792 establishments, representing a capital of $12,000,000, and giving employment to 15,588 hands. The chief manufactures are iron and iron-ware, agricultural implements, bells, stoves, clothing, especially linen collars and cuffs, and hosiery, printing paper, and woollen goods. Annual products of manufactures above $28,000,000. Cap. Troy. Area, 690 sq. m. P. 99,549.

Rensselaer, p.-v., cap. of Jasper co., Ind., in the centre of a fine agricultural, dairying, and stock-raising region, has 5 churches, good schools, 2 newspapers, 1 grist-mill, a Catholic orphan asylum, and 2 hotels. P. 617.

James & Healey, Eds. "Rensselaer Union."

Rensselaer Falls, p.-v., Canton tp., St. Lawrence co., N. Y., on Oswegatchie River and Rome Watertown and Ogdensburg R. R. P. 395.

Rensselaerville, p.-v. and tp., Albany co., N. Y., 24 miles W. of Albany, contains 4 churches, a flourishing academy, a manufactory of felt for paper-mills and lung-protectors, an iron-foundry, 1 newspaper, and 1 hotel. Fine water-power exists; principal employment, farming and dairying. P. of v. 526; of tp. 2492.

Peter Winne, Ed. "Rensselaerville Press."

Rent [It. *rendita*; Sp. *renta*; Fr. *rente*—from Lat. *reddere*, to "give back" or "return"], money, service, or products paid for the use of land and its appendages, commonly called "real estate." Rent implies ownership of land. This is not the place to discuss the abstract right of property in land. (See Property.) It is enough here to say that the wealth which God has hidden in the vegetable and mineral resources of the earth cannot be developed without some exclusive possession and control of the land itself. When appropriated it must be reckoned as capital, partaking of the nature both of material to which labor may be applied and of an instrument of labor. As capital, its use, as well as its ownership, may be transferred, and rent is simply the compensation paid for the use of capital in this form. Several sorts of rent are indicated by different names, the distinctions having originated mainly in the peculiar features of the feudal system and the laws of entail and primogeniture to which that system gave rise. Thus, a *rent-charge* means a fixed sum paid annually as a commutation for military services or

other obligations due from the occupant of land to its feudal proprietor. *Quit-rent* is a definite reserve in grants of land, by the annual payment of which the tenant is quieted or quit from all other service to a feudal lord. *Metayer-rent* is an equal division of the actual products between the cultivator and the owner of land. *Rack-rent* is rent raised to the utmost by forced competition. *Cottier-rents* is a term applied chiefly to the usage in Ireland, where sub-tenants rent each a cottage and an acre or two of land from the small farmers, the amount of the rent being ordinarily paid in labor at a money valuation.

In Great Britain the influence of the old feudal system is still felt in the monopoly of the lands of the kingdom by a few families of the nobility and rich gentry, and in many restrictions on the transfer of titles. There, consequently, the problems of rent are many and complicated. In 1817, David Ricardo published a work on political economy which is taken up chiefly with a theory of rent designed to meet the condition of things in that country. Its leading idea is that rent advances with the progress of society from the first settling of a country, when, on account of the abundance of fertile land, there will be no rent, up to the time when the necessities of the growing population compel the bringing into cultivation, at the expense of greatly-increased labor, the poorest of the land. Then all the grades of land except the very poorest will yield rent proportioned to their fertility and situation. With the increase of rent the cost of food must steadily increase. And so, by inference, this theory was made to sustain the Malthusian theory of population, presenting general starvation and wretchedness as the certain result in a not distant future, unless some restrictions are laid on the natural increase of population. The elementary principle of this theory is true, and defines a law of rent which is good for all time and all countries. But the deduction from it can stand only on the assumption that the food of a people must be provided entirely from the culture of its own soil, limited in extent. The repeal of the corn laws and the adoption of the principle of free trade have shown that even England has little occasion to apprehend the sad consequences of the so-called Ricardo-Malthusian system, though she may have occasion to revise her laws concerning real estate, and give a chance for the cultivator to become the owner of the land he works.

In a country like ours, where real estate is held by an allodial title, unencumbered by entails and mortmain holdings, where the ownership and transfer of such property is free from burdensome restrictions, and powerful influences favor the acquisition of such property by all industrious and thrifty persons, the principles of rent are very simple and may be stated in few words. For agricultural purposes the rent of land is determined mainly by four considerations: (1) Its *fertility*, on which the amount of products depends. The crops must provide for rent by a surplus above what is necessary for the support of the laborer. (2) Its *location* with respect to a market, and somewhat also to beauty of situation. A home-market is always the best, as the expense of transportation is thereby diminished. Distance from a market may more than counterbalance the advantage of fertility. Increased facilities of transportation virtually bring remote lands nearer market, and so enhance the value of both the land and its products. (3) *The growth of population*, and especially its concentration in new centres. Agricultural and manufacturing industry have a most intimate relation to each other, and the free development of both in proximity to each other promotes the most general and genuine thrift. The value of land is also increased by the attractions of good society. (4) *Improvements* put upon the land, including drainage, fertilizers applied to the soil, fences, and buildings. These are indispensable to successful agriculture, and every addition adds value to the land. Very rarely, however, is the value of the land, as indicated either in rent or purchase-price on sale, increased in proportion to the expenditure laid out on these improvements, because no other can come fully into the interest which the original proprietor has in these things. We may fitly add that in this country almost invariably rented farms rapidly degenerate in respect to both fertility and improvements.

In cities, where population is condensed within narrow limits, rents for lots and buildings are determined almost entirely by *location* with respect to facilities for business, the social character of the neighborhood, and the freaks of fashion. With the growth of cities the eligible locations are subject to frequent change, occasioned often by the mere whims of fancy or bold speculation. The compensation paid for the use of capital in the form of real estate is, except in the favorite locations of great cities, generally less than the average rate of interest allowed for other forms of capital and the rate of profits from business. This is due mainly to the security of property in real estate entrusted to others' use. It cannot be run away with, nor destroyed, nor fraudulently disposed of. Meantime, while society is advancing, its bottom-value steadily increases. For this reason an owner of city lots is willing for a very moderate ground-rent to grant others the privilege of building on his land, since he runs no risk, and has the benefit of increased value from the use of the land at the end of the lease. (For the legal aspects of this subject, see LANDLORD AND TENANT; also RENT.) A. L. CHAPIN.

Rent, in law, as defined by the early common-law writers, is a certain annual profit issuing out of lands and corporeal tenements, which profit may be money, personal services, or products of the soil, as wheat or other grains, or animals, such as horses, cattle, sheep, and the like. The word is directly borrowed from the French noun *rente* and verb *rendre*, to "return," since the money or other articles due are something returned from the land and for its holding and use. In this original legal acceptation, however, the rent is not strictly the money, services, or articles paid, but the right of the holder to demand such payment, and the corresponding obligation of the one who owns or possesses the land to make it. In this sense rent is regarded at the common law as a species of real estate, an incorporeal hereditament, a right in the thing of another (*jus in re aliena*). It may be created and granted in fee simple, in fee tail, for life, or for years. When in fee, it is inheritable in the same manner as a similar estate in the land itself; it may be devised or conveyed. In England it has been very common, especially in family settlements and as a means of providing for daughters and younger sons, for landed proprietors to create by deed or will rents in fee or for life issuing out of their own lands, and to bestow such rents upon present holders for life, with future dispositions by way of remainder. It was also not uncommon for such proprietors, when conveying lands in fee, to reserve to themselves a rent in fee. In these and similar instances the rent was an estate, with all the incidents of real property, and it is of such kinds of rent that the older common-law writers chiefly speak in their discussions of the general subject. In the U. S. these ancient species of rent exist to a very slight extent, and are practically confined to one or two of the older commonwealths. In the great majority of the States the only rent actually known—whatever other forms may theoretically exist—is that arising between the landlord and tenant from the ordinary letting of land, and it may be properly defined as a certain pecuniary sum agreed upon between the parties, paid at fixed intervals by the lessee to the lessor, as a compensation or hire for the use and possession of the leased land. Even in England this species of rent, as the incident of leasehold estates, has in modern times become far more common and far more important than any other. The ancient common law, in respect of the varieties then in use and described above, divided rent into three classes—rent service, rent seck, and rent charge. The first was of purely feudal origin, and existed when the tenant, for the land held of his lord, owed the latter some corporeal service, at least that of fealty; as, for example, a holding by fealty and ten shillings annually, or a holding by ploughing the lord's land and five shillings annually, the personal services in each of these cases affecting the entire rent. The lord could always distrain for arrears as long as he held the reversion—that is, owned the final fee in the land. The second class was granted or reserved by deed without any clause in the conveyance authorizing the holder thereof to distrain, and was called seck or dry rent, because by the law, prior to alterations made by statute, such holder had no means of enforcing his claim. A rent charge was one where the owner thereof had no reversion or future interest in the land, but was still entitled, by virtue of a clause in the deed creating it, to distrain for any arrears. As illustrations, if the owner of certain land should convey the whole estate therein to A, and also a rent issuing therefrom in fee or for life to B, with a clause enabling B to distrain, or if an owner should grant a rent out of his own land to A in fee or for life, with the same power of distraining, or if the owner should convey his land in fee and reserve a rent to himself and his heirs with like power, each would be a rent charge. English statutes have removed some of the distinctions between these three classes by making distress a remedy in all sorts of rent; on the other hand, distress has been very generally abolished by the legislation of the American States. In Pennsylvania a variety of rent charge is still preserved in constant use under the name of ground-rent; that is, when the grantor of land in fee reserves a perpetual pecuniary rent to himself and his heirs. From such a conveyance the law of Pennsylvania recognizes two estates as coexisting—that of the landowner in fee, and that of the rent-owner in fee. The latter, being real property, is bound by judgments, may be mort-

gaged, conveyed, or devised. As ground-rent deeds are usually drawn, the owner of the rent has three remedies in case of non-payment—an action to recover the arrears, distress, and, for want of sufficient distress, the right to re-enter upon the land and resume in it the original estate of the grantor. In other States a ground-rent is simply that reserved by the lessor in a building lease, or one by which the lessee covenants to erect a building upon the land, and which is therefore given in most instances for a considerable term of years. In several eastern counties of New York a large quantity of land originally owned by patentees of the British crown was conveyed by them or by their successors and held by the grantees in fee, with a perpetual rent reserved to the grantors, either pecuniary or payable in products of the soil. After a bitter and protracted controversy these peculiar holdings, so inconsistent with the spirit of American law and institutions, have nearly if not quite all been converted into absolute estates, and the rents extinguished by arrangement between the owners of the land and the parties in whom the rights to the rents had become vested. (For the rules governing the relations of the parties in ordinary lettings of land see the articles LEASE and LANDLORD AND TENANT.)

JOHN NORTON POMEROY.

Ren′ville, county of N. W. Dakota, extending from the boundary of British America on the N. to the Plateau du Coteau du Missouri on the S. W., watered by Mouse River, a tributary of the Red River of the North, has a rolling surface and is well adapted to pasturage. It has been formed since the census of 1870, and has few inhabitants. Area, about 1800 sq. m.

Renville, county of S. W. Minnesota, on Minnesota River, on the line of Hastings and Dakota R. R., consists of fertile rolling prairies. The staple products are wheat, oats, hay, wool, and butter. Cap. Beaver Falls. Area, 836 sq. m. P. 3219.

Ren′wick (JAMES), LL.D., b. in New York City in 1792; graduated at Columbia College 1807; was professor of chemistry in that institution from 1820 to 1853; wrote biographies of Fulton, Rittenhouse, and Count Rumford for Sparks's series; wrote *Outlines of Natural Philosophy* (2 vols., 1822–23), the first work on the subject published in the U. S.; *Elements of Mechanics* (1832), and other scientific textbooks; prepared lives of De Witt Clinton (1834), Jay, and Hamilton; contributed to the reviews, and was U. S. commissioner on the N. E. boundary 1838. D. at New York Jan. 12, 1863.

Renwick (JAMES), son of Prof. James, b. in New York in 1819; graduated at Columbia College 1836; was for some years engineer on the Erie Railway; superintended the construction of the distributing reservoir of the Croton aqueduct; was the architect of Grace church and of St. Patrick's cathedral, New York, of the Smithsonian Institution, of Vassar College, and many other important edifices.

Reph′idim [Heb., "stays," "props"], a station in the Sinaitic peninsula, where the Israelites under Moses and Joshua gained a great victory over the Amalekites. Its identification depends upon that of Sinai, in whose immediate neighborhood it was. If, as Lepsius supposes, Serbal was the Mountain of the Law, Rephidim must have been in the wady Feiran. If Sufsafeh was the mountain—which can hardly be questioned—Rephidim must have been in the wady es-Sheikh, at the pass called el-Watiyeh.

R. D. HITCHCOCK.

Replev′in [L. Lat. *replevina*], one of the common-law forms of action, originally used for certain special purposes, but adopted and greatly enlarged in its scope and operation by those States of the U. S. in which the common-law methods have heretofore prevailed or are now existing. Its object is to recover the possession and very corpus of goods belonging to the plaintiff; but in England and in a portion of our States it could only be resorted to when the goods had been wrongfully *taken* by the defendant; in the other States it was, or is, employed whenever the goods had been improperly *detained*, as well as when they were originally taken in violation of right. The peculiar characteristic of the action is the right of the plaintiff at its very commencement, by furnishing the sheriff with security that he will prosecute the suit and will restore them in case he fails to recover judgment, to procure the goods to be at once seized by the sheriff and delivered into his own possession. The judgment in replevin is peculiar. If the chattels have remained in the defendant's custody, the plaintiff when successful recovers their possession, or in default thereof their value, which has been assessed by the jury, together with damages for their unlawful detention or taking; if the custody had been transferred to the plaintiff, his title is confirmed and he recovers the damages alone while a judgment in such case for the defendant restores to him the possession or the value instead thereof. In the reformed American procedure this action has been abolished, but a suit for the possession of personal property is permitted similar in its features, its object, and its relief. Replevin was originally confined in England to cases where cattle or other goods of the plaintiff had been taken in distress and he desired to try the legality of the distraint. Sir Henry Maine has shown in his *Early History of Institutions* that the proceeding is of great antiquity—that it can be traced among the Saxons prior to the Conquest, and in some of the primitive Germanic codes.

JOHN NORTON POMEROY.

Reports′, in law. These are collections of opinions given by courts in deciding cases brought before them for adjudication, and useful as forming a basis for other decisions involving similar questions. The distinction between the *record* and *report* of a case should be pointed out. A record is a collection or formal statement of all the papers essential to the progress of the cause, such as the writ or summons calling the defendant into court, the pleadings, order for trial, verdict, judgment. These are enrolled on paper or parchment, and, taken together, constitute the "record" of the case. The "report," on the other hand, is in the main a statement of the reasons which influenced the court in the decision of the cause, together with the argument of counsel and a brief account of the pleadings and facts, sufficient to make the decision intelligible. Recourse accordingly is had to the latter for principles of law, though it is frequently quite necessary to consult the record in order to ascertain precisely what questions were necessarily involved in the cause.

The value of reports consists in the fact that it is a well-settled rule in England and America that if a case has been deliberately adjudicated by a court of high authority and having appellate jurisdiction, the principle determined is binding upon inferior courts when another case arises involving the same facts; and it will in general be followed in the court itself which rendered the decision unless strong reasons can be given to the contrary. The law in this way consists in the main of a collection of principles evolved from the decisions of actual controversies disposed of by the courts, rather than theoretical propositions laid down by jurists and philosophers. It is, however, true, notwithstanding these doctrines, that many cases have been overruled and discarded as not containing a correct view of the law. Much skill is frequently necessary to determine the value of the cases in the reports. A few of the leading rules may be stated.

Rule I.—Decisions of the court of last resort in any State are to be treated as technically *authoritative* and binding on the inferior courts. It would be an act of insubordination for an inferior court not to follow them. They can only be properly set aside and rejected by the tribunal which rendered them.

Rule II.—Decisions of inferior courts may be referred to as evidence of the law, and will be binding, if they are appellate courts, upon those of a lower grade, and from which an appeal may be taken to them. They may be cited, though not as "authority," even in courts of last resort, as arguments to prove the validity of the position taken by the person who cites them.

Rule III.—Decisions of courts of one State of the Union are not binding as "authority" upon the courts of another State. They can be cited, however, and will receive respectful consideration, and, if their arguments are deemed to be sound, will in general be followed in a court not bound by the doctrine of "authority" already referred to. In case of a conflict between decisions in the higher courts of a State where an action is pending and those of a sister State, the former must in general be followed. The same principle prevails as to the decisions of the U. S. courts. Thus, a State court is not bound to follow the decisions of the Supreme Court of the U. S., except as to matters involving the construction of the U. S. Constitution and the laws and treaties made under it. As to these, that tribunal is made the final interpreter, and the State courts must surrender their opinion. A similar rule prevails as to decisions in the English courts, except so far as they were made before the time fixed upon in any State for the adoption of the English common law as the basis of its jurisprudence. The decisions rendered in England before that date have the aspect of authority, while those since given are to be regarded as arguments.

Rule IV.—A special rule prevails in the U. S. courts as to the weight to be attached to decisions in State courts upon matters having in them a local element, such as the construction of a State constitution or statute, or the exposition of the local law of real estate. In the first of these cases the U. S. courts follow the interpretation of the State constitution adopted by its own courts if that has taken place. Having once followed the view of the highest

State court, Federal tribunals will not be bound to change front though the State courts may adopt a new interpretation. This is particularly true as to transactions which have been entered into on the faith of the prior interpretation. On like principles the construction of State statutes by State courts is adopted, as well as the rules governing real estate. In commercial matters this special rule does not prevail, and the Federal court may consider a question on its merits, independently of the action of any State tribunal. The whole rule gives way when it leads to any conflict with the U. S. Constitution.

Rule V.—Distinctions must be taken as to the value of cases in the reports, depending upon the grade and standing of the court, the thoroughness of the discussion, and the ability of the reporter. (1) The grade of the court is of much consequence. Thus, the decisions of the House of Lords in England are of more weight, not only there, but even in this country, than those of inferior tribunals. As the inferior courts have in many instances reporters, this distinction must be carefully attended to. There is a class of cases known as *nisi prius* decisions. These are rendered in England by a single judge at a trial with a jury, and would not in general have the same value as those announced by an appellate court after careful consideration. However, in special instances they have an exceptional worth, owing to the pre-eminent ability of the presiding judge. (2) In all courts respect is paid to the decisions of particular judges whose capacity is superior to that of their associates. It is proper to urge in argument that a commercial question was decided by Mansfield, or a point in the law of evidence by Ellenborough, or a constitutional question by Marshall, or a rule of equity law was established by Hardwicke or Eldon in England or by Kent and Story in this country. (3) Much uncertainty is introduced into the law by hurried and incomplete arguments by counsel. The judges may confine their studies to the authorities presented to them. Inferior arguments beget worthless decisions, which will naturally be overruled after a more elaborate and complete discussion in a later case. (4) The ability of the reporter has much to do with the value of the decision. It is his office to prefix to the opinions of the judges a sufficiently full statement of the facts in the case, as well as a "head-note" containing an abstract of the points decided. He may readily err in both respects. If a person of moderate ability, he may fail to grasp the reasoning of the judges and to make an accurate abstract. In the early reports these defects were more manifest than at present. The judges delivered their opinions orally, and the reporters took such notes of what was said as they were able. These notes are frequently obscure and unintelligible. In modern times, as the judges write their opinions, this source of error is much diminished. It is, however, never wise to rely upon the reporter's head-note, but to consult the opinion itself. Care is usually taken in this note to indicate what points are really decided. For this purpose the word "*Held*" is resorted to. When the object is to show that a point has been discussed and not decided, the expression "*It seems*," or "*Semble*," an equivalent, is adopted. Such remarks thrown out in the course of a discussion are called *dicta* or *obiter dicta*. They have no weight as authority, and are only useful in subsequent cases as a matter of argument.

Reports have been preserved in England from an early day. They were at first called "Year Books," and were strictly official, the reporters being appointed by the government. These books are composed in Norman-French, with many abbreviations difficult to be deciphered. Only a few of them, recently published in England, have been translated. This method after a time fell into disuse, and the matter of reporting was left open to any one who might choose to follow it. Under this system some good reports were obtained, while others were simply execrable. Since 1866 reporting has been regulated by the action of the bar, and the reports are well systematized, and are of a high degree of excellence. In the U. S. the reporters are in general appointed by some public authority. Reports are of quite unequal value, and good judgment is required in order to know how and when to use them.

This whole subject is beginning to present quite a perplexing problem. Reports are multiplying with a truly alarming rapidity. They increase at the rate of more than 100 volumes per year. Various projects for codes and authoritative digests have been presented, but these meet as yet with but little favor from the profession. The spirit of development of English jurisprudence is to adopt case-law instead of the works of jurists. This course of development cannot well be arrested. Digests are, however, of the highest value when well prepared, as a means of consulting the reports, and are constantly in the hands of the profession. In the present state of jurisprudence the greatest security which the public has against uncertainty in decision is to establish the most perfect means for securing ability and independence in the judiciary, and learning, thoroughness, and candor on the part of the bar. We shall thus secure the greatest possible completeness of discussion and facility for accurate decision. The multiplication of reports may be endured when there is some sufficient guaranty that they will contain the matured conclusions of a wise and impartial judiciary. (Consult Wallace on *Reporters*; Marvin's *Legal Bibliography*; Bouvier's *Law Dictionary* (ed. 1862 and later, title "Reports").) Lists of reporters and the courts to which they belong can usually be found in the catalogues of leading law-booksellers.

T. W. DWIGHT.

Representation and **Representative System.** See DEMOCRACY, by CHARLES O'CONOR, LL.D.; GOVERNMENT, by HON. A. H. STEPHENS, LL.D.; and PROPORTIONAL REPRESENTATION, by HON. C. R. BUCKALEW.

Reprisals. See INTERNATIONAL LAW, SUMMARY, by PRES. T. D. WOOLSEY, S. T. D., LL.D.

Reproduction. See APPENDIX.

Rep'tiles [Lat. *reptare*, to "creep"], a class of vertebrates, the third in the descending series of the system of the animal kingdom, succeeding mammals and birds and preceding amphibians and fishes. They may be briefly defined as vertebrates with a trilocular (or imperfectly quadrilocular) heart, incomplete circulation, and cold blood, the lower jaw connected with the skull through the intervention of a quadrate bone, the skull with a single occipital condyle, and the tegumentary appendages developed as scales or plates. In form, as well as the development of limbs and modifications of the skeleton and other parts, they differ so much that it is impossible to contrast them as a homogeneous group with the other classes of the animal kingdom. The chief characteristics and modifications of parts, so far as they are of primary systematic importance, may be examined under the head of the tegumentary, osseous, muscular, nervous, dental, alimentary, circulatory, respiratory, and reproductive systems.

Tegumentary System.—The tegumentary appendages forming the exoskeleton are developed in the form of thin horny scales or bony plates, which, however, are generally readily distinguishable from those of fishes. In the rhynchocephalians, saurians (lacertilians), and ophidians the scales are generally imbricated on the back and sides, and often developed as transverse scutellæ on the abdomen; in the crocodilians, bony plates are developed; in the tortoises, the vertebral column and ribs are peculiarly modified, forming a shield which becomes superficial and curved, generally by a number of angular contiguous plates; certain extinct types appear to have had naked skins, and others a plated or scaly armature.

Osseous System.—The skeleton is always completely developed and ossified. The vertebral column in the quadrupedal forms is divided into four or five regions, less distinctly differentiated, however, than in the mammals: (1) the cervical in recent types has not more than nine vertebræ, but in certain extinct forms had very many; (2) the dorsal is also variable in development, and has but few (about 10) vertebræ in the tortoises, but numerous ones in some lizards; (3) the last dorsal vertebræ, like the others, generally bear ribs, but when they are deficient in such, as is the case in some lizards and all the crocodilians, they are distinguishable as lumbar; (4) the sacral region is composed at the most of two vertebræ, and is generally but little differentiated; (5) the caudal region is very diversiform, often being extremely elongated and composed of numerous vertebræ, and sometimes (*e. g.* Amphisbænidæ) having very few. In the apodal forms there is no definite differentiation of the vertebral column into regions. No epiphyses are developed. The vertebræ are generally concave in front and convex behind (procœlous), but not infrequently (*e. g.* the gecko lizards, rhynchocephalians, certain crocodiles) biconcave (amphicœlous), like those of fishes, and sometimes (certain crocodilians) they are concave behind (opisthocœlous). The ribs differ considerably in the mode of attachment to the vertebræ, and their several variations in this respect have been utilized for the combination of the orders into more comprehensive groups. In the saurians, ophidians, and rhynchocephalians, as well as extinct pythonomorphs and sauropterygians (Plesauria), "the dorsal vertebræ have transverse processes, which are either entire or only very imperfectly divided into terminal facets" (*Huxley*); *i. e.* they have the "tubercular and capitular surfaces united" (*Cope*), and hence have been grouped by Huxley as *Erpetospondylia*, and by Cope as *Streptostylica* and (including tortoises) *Synaptosauria*. In the crocodilians, as well as extinct Anomodontia, Dinosauria, and Ornithosauria, "the anterior dorsal vertebræ have elongated and divided transverse processes, the

tubercular being longer than the capitular division" (*Huxley*); *i. e.* they have the "tubercular and capitular surfaces separated" (*Cope*), and have been combined under the name *Sachospondylia* by Huxley and *Archosauria* by Cope. (1) In the extinct fish-like ichthyosaurians "the dorsal vertebræ have double tubercles in the place of transverse processes," and have been distinguished by Huxley as *Perospondylia.* Finally, in the "tortoises the dorsal vertebræ (which, like all the other vertebræ, are devoid of transverse processes) are not movable upon one another, nor are the ribs movable upon the vertebræ," and consequently they have been isolated by Huxley as *Pleurospondylia.*

The skull is quite diversiform in the several orders. Its sutures are generally well defined, and the bones usually readily homologized with those of the mammals. The occipital bones are well developed and completely ossified. The basioccipital has a single convex condyle, into the composition of which, however, the exoccipitals also assist to a greater or less extent. The proötic bone is completely ossified, and becomes united with the epiotic and opisthotic only after they have united with the adjoining elements, or remains separate throughout life. No median inferior element or parasphenoid is developed or retained in the adult. The lower jaw has compound rami, each ramus having several distinct bones—*e. g.* the dentary, containing the teeth; the articular, articulating with the upper jaw (quadrate bone); the angular, an elongated bone between the dentary and angular; the supra-angular, parallel with and above the angular; and the coronoid, above the supra-angular. The articulating surface is concave, and some distance in advance of the posterior limit of the ramus. Between the lower jaw and the skull intervenes an element, the quadrate bone, which is regarded by Huxley and some others as the homologue of one of the auditory ossicles (the malleus) of mammals. The hyoid apparatus is little developed in the mature animal.

The sternal apparatus is wanting or atrophied in the apodal and composite in the quadrupedal ones. Its modifications are to a considerable extent characteristic of the several orders.

The members are very diversiform in development. They are primarily fitted for running or walking in the limbed saurians, rhynchocephalians, crocodilians, and tortoises, as well as the extinct dinosaurians and dicynodonts; modified for swimming in the normally-limbed sauropterygians and fish-limbed ichthyopterygians; the anterior members are modified for flight in the ornithosaurians or pterodactyles; and limbs are completely wanting or atrophied in the ophidians and many saurians; sometimes the anterior and sometimes the posterior limbs are developed, and not the others. In the boas and pythons rudiments of the posterior limbs exist. A common character of the limbed species (shared, however, with the birds) is the division of the tarsal bones into two series, the proximal of which are connected more with the tibia, and the distal with the bones.

Muscular System.—This offers nothing specially noteworthy, save that it is developed more like that of the mammals, and especially the birds, than that of the amphibians or fishes. Its modifications correspond with the diversity exemplified in the saurians, ophidians, and tortoises.

Nervous System.—The brain is small compared with the size of the skull, but mostly fills the cranial cavity. The cerebrum is moderately developed, and is much the largest of the elements of the brain. The hemispheres are not connected by a corpus callosum, but a small anterior commissure is developed. The optic lobes are generally contiguous, and imposed over the mesencephalon; they have ventricles. The olfactory lobes are generally elongated, and are excavated by ventricles which are continuous with those of the hemispheres of the cerebrum. The cerebellum is moderately developed, and in the crocodilians is provided with a vermis with transverse fissures.

Dental System.—The teeth are extremely diversiform, and their modifications are characteristic of various groups, major and minor. They often (in most lizards) become ankylosed with the jaws in the old; and in many forms, besides being present on the jaws, they exist also on the palatine and pterygoid bones.

Alimentary System.—The intestinal tract is generally differentiated into an œsophagus, a stomach, a small intestine, and a large intestine. The terminal portion is a cloacal cavity.

Circulatory System.—The heart in the saurians, ophidians, rhynchocephalians, and tortoises is trilocular; in the crocodilians quadrilocular, a septum dividing right and left ventricles. Venous blood is in all, however, more or less commingled with arterial, and the temperature is low. The blood-corpuscles are rather large, distinctly nucleated, oval, and red. There are generally two or more aortic arches, but sometimes only one; in which case it is always on the right side.

Respiratory System.—Respiration is always performed by lungs, which are highly organized, but in which the bronchi do not branch dichotomously. A distinct trachea is developed. No diaphragm divides the lungs from the rest of the abdominal cavity.

Reproductive System.—The organs of generation differ according to the orders. There is always, however, a cloaca. In the saurians and ophidians the copulatory organs are paired; in the crocodilians and tortoises there is a simple organ, and in the rhynchocephalians there are no copulatory organs. The ova are large, and are in some hatched in the interior of the body, but in most expelled and left to the heat of the sun. The vitellus is very large. The oviduct is a Fallopian tube, which is dilated and forms a kind of uterus near its termination. The embryo has an amnion and an allantois.

(See further HERPETOLOGY and the different orders.)

THEODORE GILL.

Rep'ton (HUMPHRY), b. at Bury St. Edmunds, England, May 2, 1752; was at first a merchant, but having failed in that business, devoted his attention to landscape gardening, in which branch he soon attained the foremost position in England, and was employed by a large number of the nobility in laying out their country-seats. He also published works on landscape gardening, which were reprinted in 1830 with a *Memoir.* D. in Essex Mar. 24, 1818.

Repub'lic [Lat. *res publica,* "public concern," "commonwealth"], a political community in which the sovereign power is lodged in the whole body of the people or in a portion of them, and exercised through representatives or agents directly or indirectly elected by them for that purpose. Sometimes the word is used in its widest meaning, generally to designate a state which is not ruled by an hereditary monarch. It is called an *aristocratic* republic when the exercise of the sovereign power is confined to a nobility, a number of patrician families, or a privileged class of whatever description, to the exclusion of all others; a *democratic* republic when all classes of the people participate in the exercise of that power alike. The purest form of the democratic republic exists where all the people periodically assemble in general meeting to make their own laws and to appoint their agents for the execution and enforcement of those laws—a system which has been found practicable only in small or at least very compact communities, while in larger states the sovereignty of the people can act only through the instrumentality of representation, at present generally adopted.

Of the republics of ancient Greece, Sparta had a strictly aristocratic government, while Athens might have been called a democratic republic but for the circumstance that a majority of its population were slaves, and as such excluded from all political rights, at the time of its greatest prosperity the number of its free citizens being only 135,000, while that of the slaves rose to 365,000. The republic of Rome was, during the first centuries of its existence, aristocratic in its political organization, but in the course of time the patrician aristocracy found itself compelled to yield to the lower orders of the people, the *plebs,* access to the high offices of the government, which thereby acquired a more democratic character; all the while, however, as in all republics of antiquity, a large part of the population remaining slaves and without political rights. The Italian republics which became the most flourishing and powerful commercial communities of the Middle Ages—notably, Venice and Genoa—were strictly aristocratic; a number of patrician families, who chose from among themselves the head of the government, called the doge, enjoyed a monopoly of political power. The first important republic of the modern era, the United Netherlands—formed, after their separation from Spain, out of seven confederate provinces (1580), and recognized by Spain as an independent republic (1609)—was of a more democratic tendency, as was also the republic or "Commonwealth" sprung from the English revolution, which, however, after an existence of only eleven years (1649–60), was overthrown by the restoration of the Stuart dynasty. Of a similar character were most of the free cities and Hanse towns of Germany, only three of which—Hamburg, Bremen, and Lubeck—have to this time preserved their republican institutions as members of the German empire. Two miniature republics in the S. of Europe have survived to our day—San Marino in Italy and Andorra in the Pyrenees—remarkable mainly for their insignificance as independent states. Spain had, immediately after the abdication of King Amadeus (1873), a short period of democratic republican government, which, however, appeared only as a mere episode in a series of revolutions and reactions. At present there are only two re-

publics of importance in Europe—Switzerland and France. In Switzerland small communities of peasants had from time immemorial, and while the country was under the overlordship of the German empire, maintained among themselves republican institutions of a strongly democratic character, while in the larger towns aristocratic rule prevailed. In the Treaty of Westphalia (1648) the national independence of Switzerland was formally recognized, and in 1815 the great powers guarantied her existence as a federal republic consisting of twenty-two cantons and the neutrality of her territory. While Switzerland was under the influence of the French Revolution, and subsequently of the Napoleonic empire, the aristocracies ruling the Swiss towns were deprived of their power, but regained it in a great measure after 1815. Since 1830 the federal as well as the cantonal constitutions of Switzerland have undergone very important reforms, entirely eliminating their aristocratic features and making them more and more democratic. Several cantons have introduced in their constitutions the provision that certain classes of bills passed by their legislatures shall be submitted to a vote of the people to acquire the force of law (the *referendum*), in the same manner in which in the States of the American Union constitutional amendments are ratified by the people; and another provision, making it the duty of the legislatures to take into consideration and pass upon propositions submitted to them by a number of citizens fixed by the constitution (the *initiative*). Thus, the people are made to participate in legislative proceedings, and the element of direct popular action is infused into the representative system. The Swiss cantons here referred to may therefore be called the most democratic republican states now in existence. An attempt was made to engraft the same provisions (*referendum* and *initiative*) also upon the federal constitution, but failed (May, 1872). In France a republican form of government was adopted in 1792, which passed through violent convulsions and various transformations until in 1804 it was supplanted by the Empire under Napoleon I. The second attempt at republican government was made in Feb., 1848, after the overthrow of the Orleans dynasty, but already in Nov., 1852, it made room for the Second Empire under Napoleon III. On Sept. 4, 1870, when Napoleon III. had fallen into the hands of the German forces after the battle of Sedan, the Republic was proclaimed in Paris for the third time. The National Assembly has since passed a number of constitutional laws for the permanent organization of republican government resting upon universal suffrage, and the present condition of things seems to give promise of greater stability.

In America all states except Brazil and the colonial possessions of European powers have republican governments with democratic institutions. The largest and most powerful of them, the republic of the U. S., presents the realization of the democratic republican idea on the greatest scale.

In our days, the distinction between aristocratic and democratic republics has scarcely more than historical importance, inasmuch as there is at present not a single state with a republican form of government in existence in which a nobility or a privileged class of any description enjoys a monopoly of power; and since the abolition of slavery and the enfranchisement of the colored race in the U. S. there is none in which any considerable class of people is excluded from the exercise of political rights. But while all republics, with a uniform tendency, have drifted toward democracy as far as the equality of political rights among citizens is concerned, we find an essential difference between them as to the character of their political institutions in another respect. (1) The constitution of a republic may be such as to make the general government in its legislative and executive capacity the depository of the whole sovereignty of the people, so as to give it control not only of national affairs, but also of local administration; or (2) the general government of a republic may be one of strictly limited powers, being confined in its constitutional sphere of action to a certain class of things which concern the nation as a whole, while the administration of affairs of a local nature is left to the "self-government" of the people in their local organizations respectively, with entire independence of the central authority; or (3) these two systems may be so mixed as to leave to the local self-government of the people only a limited range, subject to supervision and interference by the central government. A government of the first description would be called a *centralized*, of the second a *decentralized* government, and of the third either one or the other as it more nearly approaches the first or the second standard. The French republic presents an illustration of the centralized system in a but slightly modified sense, while the so-called *federal* republics—and among them most conspicuously and on the greatest scale the republic of the U. S.—exemplify that which combines the independent administration of local interests by the people in their local organizations with a central government controlling affairs of national concern. For the system of centralization the advantage is claimed that it imparts to the government great power, energy, and rapidity of action by enabling it to employ the whole machinery of general and local administration for its purposes. It is therefore by many thought preferable in a country whose surroundings and international relations are such as to render the possibility of an instantaneous employment of all its resources desirable, or whose internal peace is threatened by a lawless and turbulent spirit, so as to require prompt and vigorous measures for the maintenance of order and security. But while the centralized system thus creates, in the common acceptation of the term, a "strong government" which may be used for good ends, it produces at the same time an accumulation of power which may become, and sometimes has shown itself, very dangerous to popular liberty and to the permanency of republican institutions. Elective governments are always apt to be governments by political parties, and political parties are, in the nature of things, not only greedy of power, but almost always unscrupulous in the use of it for their own advantage and to the prejudice of their opponents. To avert or lessen the danger of such partisan abuse of power encroaching upon the rights of the minority, and becoming generally oppressive, that power itself must be hedged in as narrowly as possible. But in a republic in which the system of centralization prevails the party in possession of the central government, being permitted to thrust its hands into local administration, controls almost every official influence of any importance and wields almost every instrument of power in the land, unchecked by any independent local authority. The very magnitude of the power is in itself a temptation to use it in an arbitrary manner, and history does not tell us of many political parties that were conscientious enough entirely to resist temptations of that kind. Another serious objection to the centralized system consists in the inducements and facilities it offers for sudden changes of government by means of force and surprise. The power of the government being omnipresent in the country in an immense number of agencies and influences so organized as to respond at all times to the impulse and direction given by one controlling will, he who has or obtains control of this central focus will be apt to have or obtain control at the same time of the whole country through that vast and potent machinery. Great revolutions may therefore be effected, and their results imposed upon the country, by bold and sudden strokes of force at the seat of government, whether the majority of the people be in sympathy with such movements or not. Such things may be done with an intention to serve the interests of popular liberty and progress, but history shows that they are done as frequently by daring factions or by unscrupulous rulers or military chieftains to advance selfish schemes of individual ambition, and in the latter case generally with disastrous effect. Thus, the centralized system holds out a tempting prize to popular insurrection at the seat of government, as well as to the *coup d'état* on the part of those in power; and what appears as an element of strength and energy in the government becomes thereby in reality an element of instability. This tendency is the more dangerous as the centralized system fosters among the people the habit of looking for all that is to be done for their interests not to themselves, but to the superior wisdom of those directing the machinery of power. Not being permitted to manage their own local affairs independently and on their own responsibility, the people are by the centralized system deprived of that most important school of political education which local self-government affords. It is essential to the success of democratic republican government that the political intelligence of the masses of the people be well developed, and this the centralized system fails to do. People who are not permitted to learn how to manage their local concerns by independent action cannot be depended upon to act with steady judgment and wisdom in exercising a directing and decisive influence upon the government of a great republic. The exercise of their suffrage in electing presidents or members of the national legislature will, therefore, where the centralized system prevails, be apt frequently to degenerate into a mere choice of tyrants. For this reason it is to be hoped that the French, in order to give true vitality and permanence to their republican institutions, will be able to throw off their traditional fondness for a strong centralization, and give as great as possible a measure of independence to popular self-government in their *communes*, and extend it to the *departements*.

In the so-called *federal* republics the *decentralized system* of government has been a thing of natural growth. They were formed by uniting in common political organ-

izations a number of already existing communities (cantons, colonies, states), and these pre-existing communities, after their union still preserving their identity, and also a degree of independence necessary to that end, remained, as to their local concerns, self-governing bodies, while within them the smaller units of local organization (municipalities, townships, counties) continued to stand in a similar relation, subject to certain necessary restrictions, to the respective cantons, states, etc. Of the nature, as well as of the practical working, of this complex system the republic of the U. S., where it has developed itself on a great scale and unhampered by external influences, furnishes the most instructive illustration and the fairest criterion. There local self-government exists, not as a concession granted from above, but as the original condition of society, and is firmly rooted in all the ways of thinking and the habits of the people; while the national idea, politically embodied in the general government, although a thing of later growth, has also developed itself to great moral potency. The national government is restricted by the Constitution to a limited sphere of action, covering matters of national concern, such as to provide for the national defence, to make treaties with foreign nations, to declare war and conclude peace, to levy taxes for its support, to organize a general postal service, to regulate commerce, to coin money and fix the standard of weights and measures, to establish rules of naturalization, to dispose of the national domain, to admit new States into the Union. The several States are left free to manage their own local affairs, being restrained, however, from doing anything that would encroach upon the constitutional sphere of the national government, and, by recent amendments to the Constitution of the U. S., from depriving any class of citizens of the equal protection of the laws or of the right of suffrage on account of race or color; while the national authority, on its part, is bound to guaranty to every State a republican form of government and to protect it against invasion, and, upon its own application, against domestic violence. Republican government on this plan has been carried on in the U. S. for nearly a century, and during that time shown its strong as well as its weak points. It might be supposed that a national government hedged in by such constitutional limitations would indeed not be able to endanger the liberties of the people, but would rather be hampered by the opposition of local interests and jealousies acting through the several State organizations, so that it might lack the strength and energy necessary at all times to enforce its will even within its constitutional sphere, and especially to meet great and sudden dangers from without or within. The history of a century, however, has demonstrated that the national government possesses vigor enough to accomplish all the objects for which it was instituted, and that it has been able successfully to carry on foreign wars of considerable magnitude, and also to overcome an insurrection supported by nearly one-third of the people, organized upon a tremendous scale, and commanding great resources. It has even now and then, when under the control of an ambitious party spirit or under the pressure of great emergencies, shown a tendency, for special ends, to break through its constitutional restrictions or permanently to enlarge the scope of its powers. It might also be apprehended that under such a system in some of the several States powerful interests may obtain control, wield an oppressive rule over a part of the people, and intrench themselves behind the right of the States to govern their local concerns. This was the case in the States in which slavery existed, and remained so until slavery was abolished in consequence of the rebellion. Since then that particular form of local oppression within State limits has been guarded against by constitutional provision. Attempts by political factions or party organizations to exercise an oppressive rule may be expected to find their remedy in the resources of popular government. There have been now and then conflicts of authority between the national government and individual States, but with the exception of that which gave rise to the rebellion of the slave States they have all been peaceably composed either by compromise or by decision in favor of one or the other side.

A republican government so organized is unquestionably less subject to certain dangers, to which centralized republics are apt to succumb. A *coup d'état* or an insurrection at the seat of the national government, set on foot for the purpose of effecting a general revolution by one stroke of force, would in a country like the U. S. be a mere blow in the air. Neither will a political party in possession of the national government be able to maintain itself or to oppress opposition by an arbitrary stretch of power, for the rights of the citizen are sheltered by the protection of local self-government. The people would find, with a proper exercise of vigilance, in their local organizations sufficient means to frustrate such attempts. If there is any real danger threatening the political institutions of the U. S., it is certainly not that of their overthrow by force, but it is their deterioration by the influence of corrrupt practices and habits. In this respect nothing can be more deplorable than the usage which has developed itself in the U. S. in the last forty years—to treat the offices of the government as the mere "spoils" of party victory, so that whenever the control of government passes from the hands of one party into those of another, all or nearly all the officers belonging to the outgoing party are removed, and their places are distributed among those members of the victorious party who have gained a title to reward by partisan zeal or service, or who are the favorites of influential politicians, especially the members of the national legislature. Persons being appointed to office not on account of their ability and character fitting them for the discharge of official duty, but on account of their usefulness in party warfare, the civil service of the government gradually sinks down to the level of a partisan agency. The pursuit of office becomes an organized trade, attracting to itself a class of political prolétaires who follow active politics mainly as a means to gain a living, and who, knowing that their tenure of office is likely to be short, are under a strong temptation to use their opportunities as much as possible for their own benefit, at the expense of the public interest. Fortunately, there are many men found among them conscientious enough to resist that temptation, but many others have yielded to it, relying upon their party service and the favor of influential men for their protection. The civil service, organized upon the "spoils" principle, has therefore proved the source of widespread demoralization and corruption. Moreover, this class of spoilsmen, stimulated by their selfish interest to great activity in political movements within the reach of their influence, are apt to become a very powerful, sometimes even a controlling, element in their respective party organizations, and are frequently found banded together to promote the elevation of men to places of power upon whose favor and protection they have reason to rely, and against those who may be expected to use their power with a single eye to the public good. The consequence is, that men of the highest character and ability are not unfrequently discarded as "too good" to be candidates for public employment, because they could not obtain the support of the lower class of politicians; that the moral tone of politics is becoming so low as to repel many of the best citizens from active participation in public life; and that political parties, especially when they grow old, show a tendency to resolve themselves into close corporations, to whom the possession of power and "public plunder" is the first, and the promotion of the public interest only a secondary object. The people of the U. S. are gradually becoming sensible of the dangers growing out of this condition of things, and several efforts have been made to effect a reform of the civil service, upon the principle that fitness in point of character and ability should be considered the only title to appointment and promotion, thus stripping the civil service of its partisan character, and by the abolition of the "spoils" system removing the most dangerous source of political demoralization and corruption. These efforts have to contend against the stubborn resistance of established usage and a selfish interest powerfully organized, but the reform appears so necessary to prevent the decline of public morals that it can scarcely fail ultimately to receive the support of an intelligent and patriotic people proud of their republican institutions.

But, on the whole, it will be admitted, even by those not partial to the republican theory, that in spite of temporary abuses and occasional jarrings the decentralized system of republican government with its "checks and balances" of power has not only proved itself entirely practicable, and very successful even in holding together in one national organization a very numerous population spread over a vast extent of territory, but that the people living under it, in Switzerland as well as in the U. S., have attained a social condition remarkably prosperous, progressive, and happy. This has undoubtedly been owing in a very great measure to the stimulus which active self-government imparts to popular education, enabling men to manage their own affairs, private and common, upon their own well-understood responsibility, giving them an opportunity to reap the benefit of their own wisdom, and to learn from their own errors and blunders, and thus signally advancing the standard of general intelligence and practical sense among the masses.

Experience shows, however, that even the best form of government is not alone sufficient to produce the same effects everywhere and under all circumstances. Under republican institutions very similar to those which in the U. S. and Switzerland are attended with such happy results, the other republics of the western hemisphere have been

disturbed by frequent revolutionary outbreaks, lawlessness, anarchy, and a generally disordered state of society. This must be in a great measure attributed to climatic influences and to the character of the populations inhabiting those tropical or semi-tropical countries. It has been observed that in latitudes where nature is so bountiful as to render assiduous and well-directed labor unnecessary to the support of life, and where the climate subjects human nature to an alternation of indolent lassitude and fitful excitement, and does not permit an even exercise of its energies, the exercise of reason and the sense of order easily yield to an inordinate activity of the imagination and the government of the passions; and that, therefore, whatever constitutional machinery may be devised, political life there is apt to vibrate between two extremes—liberty liable to drift into anarchy, and order maintained by means of despotism. It is also to be noted that those countries have been colonized and are permanently inhabited by nationalities most accessible to the peculiar influences mentioned. It may be stated as an historical fact that free institutions have conspicuously prospered only in the temperate zone, and are prospering most with people of industrious habits and an enterprising spirit, who need such institutions for their pursuits of daily life, and cannot well do without them. Aside from these industrious habits, the following seem to be the essential conditions to secure the success and permanency of republican government: A manly pride of individual independence among all classes; popular education; general respect for the sanctity of the law; patient submission to the will of the majority until the majority can be changed by legal means; a scrupulous regard for the rights of the minority; a conscientious observance of constitutional principles and forms; a moral sense abhorring corrupt practices; a patriotic national spirit, strong enough to keep under control the selfish impulses of partisanship. CARL SCHURZ.

Republic, county of N. Kansas, traversed by Republican River, consists of rolling prairie. Chief industry, agriculture. Cap. Belleville. Area, 720 sq. m. P. 1281.

Republic, tp., Republic co., Kan. P. 770.

Republic, p.-v., Scipio tp., Seneca co., O., has 1 newspaper. P. 481.

Repub'lican, tp., Jefferson co., Ind. P. 1125.

Republican, tp., Clay co., Kan. P. 856.

Republican Fork, the northern branch of Kansas River, rises in E. Colorado, flows through S. W. Nebraska, bends S., and joins Smoky Hill Fork in Davis co., Kan.

Republican Party. The first sign of political parties after the Declaration of Independence arose out of the attempt to form a constitution or frame of government. The colonies had gone on nearly to the end of the Revolutionary war following the advice of the Continental Congress, and it was not until 1781 that Articles of Confederation were finally agreed upon by all the States and set in operation. Still, the Confederation was in no sense a government, and the whole people of the U. S., though forming in some sense one people, and appearing to foreign nations as such, and answerable to them as such, were not by their own constitution a *state* in the philosophic sense of the term. They were a confederation. The feebleness of this system became more and more apparent, and all felt the necessity of some change. The convention called in 1787 was professedly for the purpose of amending and strengthening the Articles of Confederation. During the four months of its session opinions became developed and men took their sides. Those who finally prevailed were for giving up all attempts at improving the Confederation, and for substituting a republic which should be in the full sense of the term a state, a political organization with all the attributes of a government within the sphere of its operation. Washington favored this course, Hamilton was the chief constructive genius, and its chief supporters were Madison, Pinckney, Rufus King, Sherman, and Ellsworth. It was a bold and novel conception. The result was to be the constitution of a republic as a central state, sovereign and supreme in all matters coming within its jurisdiction, its powers derived from the people themselves, the ultimate sovereign—every person within its limits to be its subject, owing to it a direct personal allegiance, and liable to be coerced or punished by it through its own tribunals for any disobedience to its authority. The republic was not to act through the States in any things essential, but directly upon individuals. It was to have a complete organization of its own, legislative, executive, and judicial, to make its laws through a Congress, to adjudicate all questions through its own courts, and to execute its laws through its own executors. At the same time, the States were to be preserved. Each State was to be sovereign on all its internal questions not remitted by the Constitution to the jurisdiction of the republic.

The opposition to this Constitution was of two sorts. Some members were opposed to any constitution of government, and wished only to strengthen and improve the Articles of Confederation. Others, willing to have a constitution and a central state of some sort, were opposed to the provisions. They feared the single executive head as monarchical, the small Senate with long terms of office as oligarchical, and a judiciary appointed by the President and holding for life as still more oligarchical. They thought too many matters were brought within the jurisdiction of the republic, and too great powers given to its departments, and predicted the absorption of the States and the growth of the central power, which would be anything but democratic.

When the Constitution was adopted by the convention and submitted to the people, meeting by conventions in the several States, the division of opinion between the members of the national convention extended through the whole people. The discussions through the press and in the State conventions were long-continued, vehement, and able. A series of articles addressed to the people, entitled *The Federalist*, written mainly by Hamilton, with most valuable aid from Madison and Jay, constituting the most remarkable body of political discussion in American, and, it may fairly be said, in English literature, has come down to posterity side by side with the Constitution itself. By what seems an accident those who supported the Constitution were called "Federalists," and those who opposed it "Anti-Federalists." When the Constitution was adopted —which it was by very small majorities and after the utmost exertion of the influence of leading men—those who supported it, the Federalists, naturally formed the majority of the first Congress and undertook the administration. The known opinions of Washington gave that party a great advantage, which it held through his life. Those who had opposed the Constitution naturally but gradually formed themselves into an opposition. The Constitution being a fact, the title of Anti-Federalist was no longer applicable, and they gradually took to themselves the title of "Democrats." So the first acknowledged political parties after the adoption of the Constitution became the Federalists and the Democrats. The same reasons which made some opposed to any constitution of central government, and led others to object to its powers and scope, caused both those classes to unite in sustaining such constructions of the Constitution, and such methods and policies of legislation and administration, as should reduce its scope and powers to the minimum. There were two influences in this direction: first, the ultra-democratic opinion, which in the latter part of the eighteenth century was jealous of all conservative political institutions, and had all but unlimited faith in the capacity and willingness of the people themselves, not only to organize, but to administer government, looked to have all offices elective, tenures short, and no obstructions in the way of the instant action of public opinion for the time being; and secondly, what subsequently became known as the State-Rights feeling—that is, a jealousy of a central government, however constituted, and a determination to make the utmost of the State governments, however they might be constituted. Doctrinaire Democrats were naturally State Rights men, for a central government framed upon principles they objected to was more dangerous, in their view, to popular liberty, than State governments could be; and State-Rights men, however, conservative in their philosophy, naturally acted with the Democrats.

Jefferson, the head of the Anti-Federal party, its philosopher and instructor, always objected to the use of "Democrat" as the party name. He insisted upon calling it the "Republican party;" and that term was struggled for for some time, but not with success, though it often appeared in official titles and documents. Jefferson's reason was perhaps, partly, a bias against the name, but more largely his view of the policy of securing the title of Republican to his party, as creating an implication that the Federalists were something other than republicans, and so aiding in the attacks made upon them as being disguised friends of monarchical and oligarchical institutions. It may, therefore, be said that notwithstanding the occasional efforts of a few, there has been in the U. S. no party which established for itself the title recognized by its opponents in history of the "Republican party" until the middle of the nineteenth century.

The Federalists held the government for twelve years, through the administrations of Washington and Adams; the Democrats came in under Jefferson in 1801, and continued to hold the government until what is known as the "era of good feeling," when the Federal party as a distinct organization had dissolved, the old opposition to the Constitution did not appear in the new generation, the government had been carried on upon substantially Federal prin-

ciples, the old lines of demarkation had nearly disappeared. There was no opposition to the re-election of Mr. Monroe in 1820. The election of 1824 was mainly a personal contest between Jackson, Adams, Clay, and Crawford, in which Federalists and Democrats of the old generation and their descendants of the new were not discernible. The election of 1828 was a contest between Adams and Jackson, and no name indicating principle was adopted by the supporters of the two candidates. In the course of the eight years of Jackson's administration his supporters gradually organized themselves into what they claimed to be the Democratic party. Many Federalists and descendants of Federalists joined this party, and the opposition party contained a large number of Jeffersonian Democrats and their descendants, among whom Mr. Clay was conspicuous. There was some resistance to allowing the administration party the monopoly of the popular term "Democrat," but it soon subsided, and the Jackson Democrats of 1829–37 remained in undisturbed possession of the title.

The opposition to Jackson's administration organized themselves under the title of National Republicans in 1831, and Mr. Clay was their candidate in the election of 1832, when Jackson was re-elected. It is difficult to distinguish any general political principle dividing these parties, but the local, temporary, and more accidental causes of division were deeply felt at the time. Jackson and his party were opposed to the U. S. Bank, and the favorers of the bank were in opposition. Jackson and his supporters were opposed to any general plan of internal improvements under the direction and at the expense of the republic, and, with some local exceptions, to what was known as the "American system" of protection of manufactures by duties on imports laid for the purpose of protection. Thus, the National Republican party had for its active principles the support of the U. S. Bank, protection by tariff, and internal improvements; yet perhaps, after all, it was the personal character of Jackson and the line of party policy he pursued which most affected the opposition. He was thought to be arbitrary and passionate, but little suited to civil and constitutional government, and naturally to encourage and develop that form of democratic opinion which holds to the absolutism of the popular majority of the time being, and consequently of its elected agents. They argued that the process was simple from the popular majority of a party electing a President to the absolutism of that President as representing that majority during his term of office. And certainly the course pursued by Jackson gave countenance to this objection. He seemed to regard the majority that elected him as in possession of the government by right of political conquest, and himself as their designated agent for his term of office. He considered them as entitled to all the offices to be appointed by the government, however purely ministerial, and he proceeded to remove officers of the customs and post-office on the sole ground that they did not support his administration, and to fill their places with his friends. One of his chief supporters, a Senator from New York, avowed the doctrine in the memorable words, "To the victors belong the spoils of victory." The doctrine was, however, new to the American people, certainly in its application, and among its strongest opponents were men of the old Democratic school, who proved by the later writings of their great teacher, Jefferson, that he feared a tendency to the absolutism of a majority, quoting his well-known words, "An elective despotism is not the government we fought for." Still, it is not to be denied that Jefferson himself, at the opening of his administration, adopted the same principle, though with limitations and carried out to a low degree, for he removed a small number of Federal post-office and customhouse officers of admitted fitness upon the avowed ground that nearly all office-holders were then Federalists, and that the majority were entitled to a fair share of the offices. His course was earnestly opposed by the Federalists as resting on a principle fraught with great danger to public morality and safety. From Jefferson's inauguration till Jackson's there had been no such party revolution as called for an application of the doctrine of "spoils," but John Quincy Adams during his Presidency refused to remove any office-holders (except the few acknowledged political agents of the administration) for their political opinions. And Mr. McLean, Jackson's postmaster-general, refused on principle to remove postmasters solely for their opinions, and was himself displaced by Jackson.

At the same time there was a change taking place in the methods of legislation by Congress. The Speaker of the House had become the recognized agent of the majority. Every committee had its chairman and major part of its members from the ruling party; the chairmen of these committees were regarded as party representatives in intimate official relations with the heads of the departments to which their duties related. These various developments, and the frequent use of the veto-power by Jackson, led the opposition to drop the title of National Republican, and adopt the name of Whig, in imitation of that party in England, whose war-cry was that the power of the throne "had increased, was increasing, and ought to be diminished." In the great Presidential election of 1840, in which the Whigs gained their first national victory, they owed it in a great measure to a popular dissatisfaction with the extreme party government followed up by Van Buren, the disordered state of the finances after the rejection of the U. S. Bank, and to a widespread belief that the Whig party was more conservative and constitutional than the Democratic. This belief had countenance in the course of the Democratic party in the internal politics of the States. It was owing to that party that the State judiciaries were made on principle agents and representatives of the majorities for the time being by changing their tenures from appointments by the executive for life to tenures for a few years by popular elections, and that nearly all appointments were taken from the executive and made subjects of popular elections for short terms; and so the elections became frequent, complex, and gave rise to a class of electioneering managers acting through caucuses, whose powers and profits became enormous. But when the Whig party obtained power under Harrison, it appeared that its leaders in the forum and press had not the courage or the desire to reverse the party policy of Jackson, and resist the clamor for office, and a general removal of office-owners took place. Thus, both parties became committed to the "spoils" system, and it has been ever since the most exciting and demoralizing acting power in our elections.

The question of a U. S. Bank as a bank of discount, as well as a fiscal agent of the government, became settled against the Whigs; a practical line of distinction sufficient for application removed from party politics the question of internal improvements; a surplus revenue made duties for protection only indefensible; and although the Democratic party furnished most of the free-traders, the adjustments of the tariff became mostly local struggles of different interests for the advantage of duties laid professedly to raise the necessary revenue.

A new question, which was to dwarf and gradually absorb all others, was fast coming above the horizon. By the close of the last century all the Northern Middle States had abolished and prohibited slavery, and it had been prohibited in all the Territories belonging to the republic at the adoption of the Constitution; and the slave-trade was abolished. It had been hoped that these causes would lead to the gradual extinction of slavery throughout the Union, or at least to its becoming a feeble power confined to a small number of States. But the result had been far otherwise. The Louisiana purchase and the acquisition of Florida, to which no restrictions were applied, had more than doubled the number of slave States; the raising of cotton, rice, and sugar had become among the largest interests of the country; and the ownership of about 4,000,000 slaves was regarded as an enormous investment. The slave States had thus one paramount interest on which they would unite at any moment in disregard of every other political question. They had also the advantage of sectionalism, for the free and slave States were separated by a geographical line, and the slave States began to feel themselves a country divided from the rest of the republic by a geographical line and by a unity of domestic institutions—a country to which every inhabitant owed a kind of patriotic duty in the defence of an institution as to which they stood almost alone against the civilized world, and which, they acknowledged, required constant vigilance and was attended with great perils.

As a domestic institution within each State, it was acknowledged by all intelligent public men to be entirely a State matter. Not that the Constitution specially made it so in terms, but because it clearly came within that category of domestic institutions which were left to the control of each State, and not transferred by the Constitution to that of the republic. Abolitionism, therefore, in the free States, and as far as concerned the general government, was a moral and not a political question, and societies for promoting abolition or emancipation were at the North, as they would be in Europe, organizations for moral influence upon the slave States themselves. At first there were emancipation societies in some of the slave States, and many of their prominent statesmen in the early part of this century looked with some hope to gradual emancipation; but before the middle of the century the slave-holding community had become not only the apologists, but the advocates and propagandists, of slavery, seeking to extend slave territory everywhere, avowing that a substantial control over the administration and legislation of the republic was essential to their safety; and if there were any favor-

ers of emancipation in the slave States, they were silenced or had emigrated to free States.

There was one cause which removed the slave question from the category of domestic institutions, and made it necessarily a subject of national politics. Had the republic been confined to the original States, this cause would not have existed. But the republic possessed, and from time to time had acquired, a vast amount of unsettled territory lying beyond the limits of the States. Over this territory Congress had the exclusive legislative power. Part of it lay N. and part lay S. of the line dividing slave States from free States. It was rapidly filling up with population, and was to be made into new States which would have great wealth and numbers, and have a vast if not controlling influence on the politics of the country. Slavery had been prohibited under the Confederation in all the territory then possessed by the U. S.; and that prohibition was regarded as based on compact among the States. When new territory was added to the republic, as by the Louisiana purchase, the free States sought to prohibit slavery in those territories at the outset, and also to make it a condition to their admission as States that slavery should not exist within them. The slave States naturally resisted these efforts, and strove to secure for themselves as large a share of the expected States as possible. At first the right of Congress to legislate upon the subject of slavery within the Territories, as on all other questions of the Territories, was not seriously denied, and the struggle was limited to defeating any such proposed legislation, and leaving the subject to the control of each Territory through its legislature; and the South trusted to its own emigration with slaves into the southernmost Territories, and the practical establishment of slave interest, and to the political power of combined slave-holders, to securing these Territories as slave States. The struggle in Congress therefore was, that slavery should be prohibited in the Territories by Congressional legislation, and that each new State must be a free State.

But the emigration into the Territories was largely from the free States, and the foreign emigration was from countries in which slave-labor was unknown, and the balance evidently inclined to freedom if the subject was left to Territorial legislation. A doctrine then began to be promulgated from the South that there was no rightful authority anywhere to prohibit slavery in the common domain of the republic. This argument was drawn from a subtle construction of the general nature of the Constitution, and rested largely upon an extreme view of State sovereignty. It was contended that each State had an equal right in the public territory, and that where slavery was the system of any State, that State had the same right to have its system planted by its citizens in any Territory on transferring their slaves there as a free State had to a system which would enable its citizens to hold their property in such Territory. Answers to this argument seem plain enough now, but the doctrine gained great strength from its absolutely prohibiting all attempts to exclude slavery by law, and as a logical consequence requiring from the Territorial legislatures or from Congress such legislation as might be necessary to secure the rights of the slave-holders within the Territories. It derived an accidental advantage from the fact that, though unsound in its basis, it was more logical in its methods, and, if it could be carried out, more peaceful and dignified than the other policy, which proposed to leave the question of slavery or freedom to the Territorial legislatures themselves, without any interference by Congress, which came to be called "Squatter Sovereignty." Squatter sovereignty was indeed a mere expedient. All who did not adopt the doctrine just before stated of the absolute right of slavery in the Territories admitted that the control of the subject was within the legal authority of Congress, for the Territorial legislatures themselves were the mere creatures of Congress, and their legislation subject to its revision, and their existence dependent upon its will. But the argument for adopting it as a policy was that it would remove this exciting and dangerous subject from national politics and remit it to the inhabitants of the several Territories.

The first great struggle respecting slave and free territory arose out of the Louisiana purchase, which carried with it the delta of the Mississippi and its entire right bank until it reached the original territory. A portion of this new territory, of which St. Louis was the capital, had been largely settled by slave-holders, and applied for admission as a State under the name of Missouri, with a State constitution which not only established slavery, but prohibited emancipation. The people of the free States insisted upon the abolition of slavery as the condition of its admission. After a struggle of two years or more, the united delegations from the slave States, with the aid of a few sympathizers from the North, gained a clear victory. Missouri was admitted without condition, and an act was passed establishing what was known as the "Missouri Compromise," prohibiting slavery in so much of the new territory as lay N. of lat. 36° 30′, known as "Mason's and Dixon's line;" which was practically an extension of the line which separated the free and slave States, leaving territory S. of that line clear of prohibition.

The next struggle was on the annexation of Texas. It was an independent republic, with slavery, had very large territory, and lay S. of all our slave States. Its acquisition would add greatly to the political slave-power. By this time the slave States were principally in the Democratic party, while the Whig party had its main strength in the North, in the free States, although it still had an uncertain hold on Louisiana, Tennessee, Kentucky, North Carolina, and Maryland. The Whig party, as a general thing, was opposed to the acquisition of Texas, yet it did not dare to put it upon the ground of slavery, for that would alienate its Southern supporters. An attempt was made to insert the proviso that slavery should not exist within the State. But, although the slave-power failed to carry through the Senate the treaty of annexation between the U. S. and Texas, which required a vote of two-thirds, it accomplished its object by the extraordinary process of a joint resolution of the two houses of Congress—a mode of legislation intended only for the light and temporary subjects of jurisdiction—and the clause was introduced providing that Texas might be divided into four States as soon as it had sufficient population, and that the existence of slavery should be no objection to their admission.

The annexation of Texas with a disputed boundary brought on a war with Mexico, which resulted in the acquisition of the very large Territories of New Mexico and California, and a renewal over them of the struggle between slavery and freedom. In the course of the contest Mr. Wilmot of Pennsylvania moved the proviso to the acquisition of any territory from Mexico "that neither slavery nor involuntary servitude shall ever exist in any part of said territory." This struggle was so momentous that the term "Wilmot Proviso" stood to that generation to represent the prohibition of slavery in the public domain —the principle coeval with the republic. Although the proviso passed the House of Representatives more than once, it was always defeated in the Senate.

It will thus be seen that in respect to slavery in the Territories and new States there were three positions: first, the ancient one of its prohibition, secured by action of Congress in its legislation over the Territory and as a proviso to the question of admitting new States, popularly termed the "Wilmot Proviso;" second, the abstaining by Congress from all interference with the subject, leaving the decision to the Territorial legislatures, with the understanding that the existence of slavery should be no objection to the admission of a Territory as a State, the policy popularly known as "squatter sovereignty;" and lastly, the new doctrine that there was no power anywhere to prohibit slavery in any part of the public domain, but if slaves were taken into it all powers of master over slave must be enforced by the government of the Territory, aided, if necessary, by a legislation of Congress.

The device of squatter sovereignty was tried out in the Territory of Kansas, and its folly and dangers demonstrated. Kansas was a part of the Louisiana cession, lay N. of 36° 30′, and consequently by the act of 1820, called the Missouri Compromise, slavery was prohibited within its limits. But the slave-power had now become paramount in the politics of the country. It was determined in the councils of the Democratic party that the administration should take the Southern position that there was no power anywhere to prohibit slavery in a Territory. Accordingly, the act of 1854, establishing the Territory of Kansas, declared the Missouri Compromise inoperative and void, as inconsistent with the principle of non-intervention by Congress with slavery in States or Territories. The act provided that the existence of slavery should be no objection to the admission of the Territory as a State, and it confined the right of voting in the Territory to white inhabitants. On the same day a bill was passed organizing the Territory of Nebraska in the same terms. So the measure of Congress repudiating the Missouri Compromise, and leaving all the public domain open to slavery, became identified in popular speech with the Kansas-Nebraska bill.

As slavery could not be prohibited in Kansas while it was a Territory, the struggle turned upon the constitution it should adopt as a State, and was transferred to the soil of Kansas. In the free States emigrant aid societies were organized to assist Northern families in moving to Kansas and establishing themselves there. A small portion of Southerners moved in with their slaves, but a clear majority of the actual residents were free State men. But the

slave-power met this by invading the Territory from the adjacent slave State of Missouri with organized armed bands at the time of the elections, and by intimidating the free State inhabitants and fraudulent voting claimed to have carried the elections. These bands resolved to drive out of the Territory all inhabitants who came there under the emigrant aid societies. Every election was contested, each side claiming to have had a majority. Each side established a Territorial legislature, each had a constitutional convention, each submitted its constitution to vote, and each constitution was declared to have been adopted. The result was anarchy and civil war. There was a great deal of fighting, assassination, lynch law, burning of houses and towns, and violence of every description. Steadily through the whole contest the Democratic administration took the side of the slave State men. The Democratic Presidents appointed a succession of Territorial governors, and as any one showed signs of supporting the free State party as being the actual majority of *bonâ fide* residents, and rejected the alleged majorities of the slave State men as fraudulent, or otherwise recognized the proceedings of the free State men as legal, he was displaced and some one of whom more thorough obedience was expected substituted. But no governor could be there long without either siding with the free State men or resigning, unwilling to carry out the policy of the administration. The slave State legislature established slavery, made it a capital offence to assist a fugitive slave, a penal offence to deny the legal existence of slavery in Kansas, and required of every voter an oath to obey the Fugitive-Slave law of 1850. The U. S. marshals sided with the slave State men, took their organized bands into pay, and their grand juries indicted for treason men who supported the free State constitution. The seat of the free State conventions and legislature was at Topeka, from which their constitution took its name, while the constitution submitted by the slave State men was known as the Lecompton constitution. The Lecompton constitution was submitted in a way the free State men deemed grossly unjust and illegal, and they did not vote, but the constitution was declared adopted; and although the governor, Robert J. Walker of Mississippi, appointed by the President as a sure friend of the slave-holding cause, went in person to Washington to present to the President the fraud and outrage of the whole proceeding, the President approved it, and the Lecompton party was in the ascendant, and Gov. Walker resigned in disgust. This condition of anarchy and violence lasted from 1854 to 1858 with but little intermission. Congress at last ordered a vote upon the Lecompton constitution in Aug., 1858, and it was rejected by so overwhelming a majority of what were evidently legal voters that the slave-power was obliged to abandon it. But the slave State legislature submitted another slavery constitution, and declared it adopted, though the vote was very small. At the next election for a Territorial legislature, in 1858, the free State people abandoned their Topeka organization and constitution, despairing of sustaining it against the Democratic administration, and took part in the election. They carried the legislature, called a convention at Wyandotte, which adopted a free State constitution, known as the Wyandotte constitution, submitted it to the people, who adopted it, and petitioned Congress for admission into the Union as a State. That these proceedings were legal, and that the majorities were fairly given, admitted of no doubt, yet the State was not admitted until 1861, when the delegations from many of the slave States had left Congress and Pres. Lincoln had been elected.

This history of the struggle in Kansas has been given entire at this place, that it may be better understood, and as having had great influence in the formation and growth of the Republican party, hereafter to be described. In 1856–57 the slave-power obtained a great victory by the decision of the Supreme Court in the case of Dred Scott. That case might have been decided without passing upon any great question affecting slavery under the Constitution, and an opinion of that nature drawn by Judge Nelson was intended to be the opinion of the court. But after the Democratic party had carried the Presidential election of 1856 the members of that court from the slave States, who then as always were a majority, came to the conclusion that they could take advantage of that case to make a decision which would for ever remove from national politics the question of slavery in the Territories, make void all the prohibitions of slavery in the public domain, and give every citizen the right to carry slaves there, and make it the duty of the government of the republic, as well as of the Territory, to recognize the relation of master and slave therein, and enforce all the rights and powers connected with it. With this view, and in the belief that they could accomplish the purpose, they gave up the opinion prepared by Judge Nelson, and Chief-Justice Taney prepared a most elaborate opinion to the effect described, and took advantage of a plea in abatement which had been overruled and abandoned below to pronounce an opinion that a person of African negro descent could not be a citizen of the U. S. in the sense of entitling him to sue as such in the courts of the republic. The majority differed on some points of reasoning, and the two Northern judges, who were not Democrats, Justices McLean and Curtis, gave powerful dissenting opinions. But the doctrine of the chief-justice's opinion, to which the majority subscribed, was declared to be the law of the land, was adopted by the Democratic administration as the guide of its conduct, and the Democratic conventions throughout the country pledged themselves to sustain it.

There was another subject which brought slavery into national politics. This was the rendition of fugitive slaves. The Constitution provided that the fugitives from one State to another should not be discharged from the obligation of service by any law in the latter State, but should be delivered up on the claim of the person entitled to the service. It was always a serious question whether the intention of this clause was to make the apprehension and delivery the act of the general government, or was merely a prohibition upon liberation by State legislation which the courts would be obliged to respect, making the surrender to the claimant the act of the State officers. Still, a fugitive-slave law was passed by Congress in 1793, on the principle that the surrender was a national function, but the law was not effectual, and with the growth of the slave-power a demand was made for a new law, and in 1850 one was passed of the most extreme character, seeming to be devised for the purpose of irritating and outraging the Northern sentiment to the utmost. It broke down and set at naught the traditional guaranties of the common law for personal liberty, raised conclusive statutory presumptions against reason and fact, and gave decisive effect to the most untrustworthy of judicial proceedings. The pursuit of fugitives in the free States by hired slave-hunters, arrests, attempted rescues, and the enforcement of this new law with all its shocking provisions brought slavery home to the hearths and hearts of Northern people in its most repulsive features, and did more to educate and inflame the anti-slavery sentiment of the North than anything in our history.

There is one more topic to be considered before the structure of the Republican party can be properly understood. That is the subject of what is called State Rights, or, more properly, State supremacy. The feeling in the convention that formed the Constitution, and among the people, of jealousy of a central government and devotion to the power and dignity of the separate States, was always powerful. The Democratic party, after the Constitution was adopted against their votes, naturally took to close construction of its jurisdiction and authority and especially as between it and the States. These views culminated in Virginia and Kentucky in 1797, 1798, and 1799 under the great influence of Mr. Jefferson. Resolves were passed by the legislatures of these States in these years, drawn by Mr. Jefferson and by Mr. Madison, who had gradually passed under Mr. Jefferson's influence, substantially alike in sentiment, asserting doctrines which are generally described as the doctrines of the Virginia resolutions of 1798. They assert that the Constitution is a federal compact between sovereign States, and continues to be such; that as, in such compacts between sovereigns who are equal, there is no common arbiter, each State is the rightful judge, as a party to the compact, of the constitutionality of any measure; each may construe the compact for itself, and judge as well of infractions as of the mode and measures of redress; and the resolutions of 1799 say in terms, "A nullification by the sovereignties of all unauthorized acts done under color of that instrument [the Constitution] is the rightful remedy." Mr. Madison's report to the legislature of Virginia in 1800 asserts the right of each State to judge of the constitutionality of any measure of the general government. These resolutions became part of the platform of principles of the Democratic party, and were adopted with a kind of enthusiasm and unanimity by the slave-holding States. At the time they were passed the government had been solely in possession of the Federal party and there was a New England President, which gave them more currency at the South. But the slave States had already begun to look forward to this doctrine as the bulwark of their protection in case a majority of free States ever should do or omit to do what they should consider a violation of the rights of slavery. Still, as the Democratic party came into power in 1801, and held the administration—with the exception of Mr. J. Q. Adams's term of four years, from 1825 to 1829—under a succession of Southern Presidents from 1801 to 1836, there had been no occasion to appeal to the doctrine.

But in the struggle over the tariff in 1832, South Carolina, under the lead of Mr. Calhoun, planted herself on the doctrine of these resolutions, and declared void an act of Congress by a process which was called "nullification." This doctrine, now for the first time seen in operation, was met by Mr. Webster, in his famous debates with Hayne and Calhoun in 1830 and 1833, with a power of reason and logic which may now be pronounced conclusive. Fortunately for the country, there was a Democratic President in power, whose despotic nature and firm belief that he represented the sovereign people, aided by his intense personal hostility to Mr. Calhoun, threw him on the side of the general government with all the energy of his character. As he was the acknowledged representative of his party, his action placed that party in an awkward position, but it eventually rallied to the support of its chief, with the exception that Virginia, Georgia, and a few other Southern States took a neutral position, not questioning the abstract right of South Carolina to act as she had done, but treating her as exercising it unwisely in that instance.

This first attempt at nullification showed the practical absurdity of a State remaining in the Union, taking part in the government of other States, and receiving its benefits, yet taking an exception to one or more laws at its discretion, and resisting them as inoperative within its limits, though operative elsewhere. It put an end to the theory of nullification, and the extreme State Rights party at the South resorted to the doctrine of secession, contending that the lawful remedy of a State in case of what it considered a violation of the Constitution or an intolerable grievance was to secede from the Union. This was asserted to be the right of a State under the Constitution, the exercise of which by a State became binding on the republic and the other States, the seceding State being the final judge of the propriety of the exercise of the right. As the conflict between freedom and slavery became more imminent from year to year, the slave States committed themselves to the doctrine of the right of secession, and the general Democratic party of the country was committed to it, at least to this extent, that if a State chose to secede there was no authority in the general government to prevent it; or, as the theory was commonly expressed, the general government cannot coerce a State. So completely was this doctrine ingrained in the Democratic party that when the secessions took place in 1860–61, Pres. Buchanan, while he reproved the acts of secession as unpatriotic and without sufficient cause, announced himself as having no authority to resist it by force.

This history of the great questions which agitated the republic in the middle of this century prepares us to trace the rise of the Republican party.

As has been stated, the early anti-slavery societies looked solely to moral influence. As the subject of slavery began to press upon the national conscience, and the steady advance of the slave-power in national politics and the concentration of Southern feeling in favor of slavery and its propagation became apparent, these societies became political associations and nominated candidates for election. But there was a deep-seated cause of division in the anti-slavery societies which soon came to the surface with most serious results. A portion of its members came to the conclusion that it was wrong either to hold office or vote under the Constitution of the U. S. Their process of reasoning was simple: Slavery is not merely a wrong and an evil, but a sin. No man may voluntarily take part in a sin. The Constitution of the U. S. recognizes slavery, and to some extent protects it. It is a compromise with sin for advantages supposed to be received. No man, therefore, may voluntarily avail himself of the benefits of the Constitution or take part in executing it. It was soon seen that if this principle was adopted, it involved withdrawal from State political life, for every State officer is compelled to make oath to support the Constitution of the U. S. The consequences of this reasoning were honestly accepted and boldly avowed by its supporters. The struggle within the American Anti-Slavery Society was long and fierce, resulting at last in the victory of the extremists and the withdrawal of those who admitted political action. The former retained possession of the society, became known as abolitionists proper, or Garrisonian abolitionists from the name of the master-spirit and leading character among them, Mr. Garrison; while the latter ultimately organized themselves into a political party which eventually took the name of the "Liberty party," and entered into State and national elections with all the machinery of conventions and candidates. It was never a large party, never a majority in any State in the Union, or perhaps in any district of a State, but as a third party, well organized and earnest, it often exerted an indirect influence upon the two great parties of the country in the free States. Sometimes the term "Abolitionist" was applied to any person who made opposition to slavery in national politics a leading principle of action, but in strict logic it was applicable only to the Garrisonians. They insisted on the abolition of slavery within the slave States as the *conditio sine qua non* of any action under the Constitution, and, despairing of that, they urged secession of the free States; and while that was not attainable they held the position of personal seceders from the government, refusing all action under it. They also with but few exceptions were non-resistants, holding the doctrine that war or any taking of life or forcible resistance was against the law of God. The adoption of this principle gave more consistency to their position. When asked why they paid taxes to a government of sin, their reply was that as they would not resist the tax-gatherer by force, and he had a right to seize their property for taxes, they might as well pay him in the first instance. They were not quite so successful in answering the objection that they availed themselves of the post-office, custom-house, and peace and sanitary protections of the government, which were voluntary acts on their part. Taking no part in political action, and never very numerous, they still exerted a good deal of influence by constantly pressing the subject of slavery, its wrongs and perils, upon the people, and keeping a sharp watch over the action of such public men and newspapers as professed general anti-slavery sentiments. The two great political parties of the republic did not divide upon any question connected with slavery, and the Whig candidates, Harrison and Tyler, both natives and one a citizen of Virginia, were elected by a majority of nearly four to one, carrying a full proportion of the slave States. In the Presidential election of 1844, between Clay and Polk, slavery began to enter as an important element. The project before the country was the annexation of Texas, which if carried out would add greatly to the slave-power. The Democratic party throughout the country supported it, and it was declared by their national convention at Baltimore in 1844 "a great American measure which this convention recommends to the cordial support of the Democracy of the Union." The Whig party was nearly unanimous against it, though its national convention adopted no resolution on the subject. The objection of the Whigs in the free States was unwillingness to add to the slave-power, while the Whigs of the slave States put their opposition upon other grounds of expediency. Down to the day of the election there seemed scarce a doubt of the success of Mr. Clay, but he wrote a letter to a Whig in Alabama—a State in which a Whig majority was hopeless—which dissatisfied the Liberty party. New York, which cast 36 electoral votes, gave every sign of going for Clay, but on the publication of this letter the Liberty party suddenly and unexpectedly cast about 16,000 votes for Mr. Birney, a leader of their party, nearly all of which were withdrawn from the Whig party. This small local incident settled the Presidential election, and affected most seriously—it can never be guessed how seriously—the history of the country. The popular vote of New York out of nearly 500,000 votes gave a plurality of 5106 to Polk over Clay, while 15,812 were cast for Birney, none of which would in any event have been given for Polk, and most of which would have been cast for Clay but for his letter. The election in New York did not require a majority over all others, but only a relative plurality, and the vote was cast by general ticket, so that Polk received the 36 electoral votes of the State—more than one-eighth of the whole electoral college—by virtue of this small plurality of about 5000, while he was in an actual minority of over 10,000. The electoral vote throughout the republic was 170 for Polk to 105 for Clay, while the transfer of the 36 votes from New York to Clay would have given him 141 votes to 134 for Polk. This was the first indication of the importance of slavery in national politics. The popular vote throughout the country was 2,698,605; of these Polk received 1,337,243, Clay 1,299,062, and Birney 62,300; so that Polk just fell short of a majority, while he had 38,181 more votes than Clay. In Pres. Tyler's message to Congress (Dec. 4) he declared the election of Polk to be a decision of the American people in favor of annexing Texas, which the administration was bound to carry out, while not only did an inspection of votes show that Polk had not a majority if the contest could be construed to be solely on that issue, but in many parts of the North it had been declared by the Democrats that the election of Polk did not mean annexation.

The history of the annexation has been given in its general character. In the House of Representatives only four Whigs voted for the resolution, and they were from slave States; in the Senate but three Whigs, also from slave States. All other Whigs, from the North or South, voted against it. Every Southern Democrat in each house voted for annexation, and all but three or four of the North-

ern Democrats in the House. The passage of this act of annexation was a triumph of slavery over constitutional doubts, settled legislative practice, just apprehensions of war, and over anti-slavery sentiment in its most constitutional and reasonable aspect. The result was to bind the Democratic party more firmly to slavery, and to weaken the already feeble hold of the Whig party upon the slave States.

The war with Mexico which necessarily followed never roused the sympathy of the Whig party. Being a legal war, they made no factious opposition to it, and the Southern Whigs generally entered into it. Its success gave us the Territories of New Mexico and California and reopened the question of slavery in the Territories and of new slave States.

Between 1844 and 1848 the anti-slavery sentiment was developing itself rapidly in the Whig party at the North, especially in Massachusetts, the western part of New York, and the northern part of Ohio, and many Whigs took strong anti-slavery ground in Congress, especially Mr. J. Q. Adams of Massachusetts and Mr. Giddings of Ohio. The national convention of the Whig party at Philadelphia in June, 1848, took up Gen. Taylor of Louisiana for its candidate. It was adroit policy, for he was the popular hero of the war, as a large holder of slaves he would be trusted by the South, and his personal popularity and party allegiance were relied upon to carry the Northern Whig States. But this policy necessitated the suppression of all anti-slavery expressions. The Wilmot Proviso, to which nearly all the Northern Whig States had committed themselves, was rejected contemptuously, and no declarations of principles were adopted upon any subject whatever, and even the resolutions were rejected which required their candidate to accept the nomination as a Whig. A portion of the Massachusetts delegation refused to adopt the nomination and withdrew from the meeting—one of whom was Henry Wilson, afterward Senator and Vice-President. The Democratic convention of 1848 nominated Gen. Cass, and the whole spirit of its proceedings was so entirely pro-slavery that a good many Northern Democrats, who could not get over the effects of their early education in the principles of liberty and equality, withdrew from the support of Cass, professedly upon anti-slavery grounds. Their chief strength was in the State of New York, where they were known by the title of "Barnburners." The objections to both Presidential candidates resulted in the call of a political convention at Buffalo, N. Y., in June, 1848, in the hope of organizing a national political party based upon opposition, under the Constitution, to the further extension of the slave-power. As the Buffalo convention and Buffalo platform were the foundation of what was afterward the Republican party, and laid down the principles on which the struggle with slavery was at last successfully conducted, they require particular attention here.

In organizing the convention it was agreed that each State which took part should have six delegates at large and three from each Congressional district, with the understanding that they should be equally distributed between the three organizations which were to constitute the convention—viz. the old Liberty party, the anti-slavery Whigs, and the anti-slavery Democrats or Barnburners—and it is believed that this arrangement was on the whole fairly carried out. The country was surprised to find that Mr. Van Buren, who while President served the interests of slavery and had never exhibited any anti-slavery tendencies, with several of his political devotees, sustained the convention, and that he allowed himself to be put in nomination as its candidate. The candidate of the Liberty party was Mr. John P. Hale of New Hampshire, a tried member of their organization, while the Whigs agreed upon the support of Judge McLean of the Supreme Court. The platform asserted the following principles: (1) A common resolve to maintain the rights of free labor against the aggressions of the slave-power to a free people; (2) that Cass and Taylor had been nominated under slaveholding dictation, and could not be supported by the opponents of slavery extension without a sacrifice of consistency, duty, and self-respect; (3) that slavery in the several States is matter of State law alone, over which the general government has no authority, and for which it is not responsible, and therefore there can be no interference by Congress with slavery within a State; (4) that it was the settled policy of the nation at the beginning to exclude slavery from all the Territories, which never should have been abandoned; (5) the only safe means of preventing the extension of slavery into territory now free is to prohibit its extension by act of Congress; (6) no more slave States, no more slave territory; (7) no more compromises with slavery; (8) free institutions for California, New Mexico, and Oregon; (9) the motto "Free Soil, Free Speech, Free Labor, and Free Men." The platform was adopted unanimously, and the convention required that some friends of each candidate should give assurance that the candidate would accept the platform.

Just as the convention was about proceeding to vote for a candidate for President, Mr. Van Buren and Mr. Hale having been nominated by the Barnburners and the Liberty party respectively, the Whigs put in nomination Judge McLean. Mr. Salmon P. Chase of Ohio, afterward chief-justice of the U. S., who was elected to the convention as a Liberty party man, but had gone over to the support of Mr. Van Buren and the Barnburners, announced that he was authorized to withdraw the name of Judge McLean. As Mr. Chase was connected with Judge McLean, and intimate with him, and asserted the refusal of Judge McLean to stand, or rather his authority to withdraw his name, and as he possessed great weight in the convention as its presiding officer and otherwise, and there was no opportunity to communicate directly with Judge McLean at this late moment, the Whig members were obliged to submit to the result and to choose between Mr. Van Buren and Mr. Hale. It was scarce concealed that they had but little confidence in Mr. Van Buren's anti-slavery declarations or in the motives which led him and his personal friends to take part in the convention. But, on the other hand, it was plain that but little popular support from the body of moderate anti-slavery men of the old parties, from whom the votes must be drawn, could be expected for Mr. Hale, while the supporters of Mr. Van Buren proclaimed that his great influence with the Democratic party and his position as an ex-President gave a fair promise of carrying the State of New York and of revolutionizing the Democracy of the North, or at least of making a great inroad upon it. The result was that most of the Whigs voted for Mr. Van Buren, and he was elected, and, as the choice was fair and regular, it was made unanimous. But the choice was a misfortune to the party. It made very little impression on the Democratic party outside of New York, where it about equally divided the Democratic party and gave the State to Taylor; and Mr. Van Buren's name was not received by the country with respect, in its new and temporary connection.* In Massachusetts, where the strength of the new party was drawn almost entirely from the Whigs, it drew a large vote, notwithstanding the distrust of the candidate, and numbered a large proportion of men of education and character who have since become eminent.

The next struggle was in 1849–50, on the admission of California, which had adopted a free constitution. There were 15 slave States and 15 free States, and California would throw the balance for freedom. This was the real objection. The slave-power resisted it as matter of life or death, and made their yielding the occasion of securing great concessions for slavery. Many of the slave States threatened secession, and made preparations for it, if California should be admitted without some concessions of a security and equality of the slave States in the future. They demanded a recognition of the principle that slavery could not be prohibited in the Territories, or its permission be made an objection to the admission of a new State, a guaranty against the abolition of slavery in the District of Columbia, and a stringent fugitive-slave law. This contest lasted in Congress from Dec., 1847, to Sept., 1850. The chief feature in its party significance was the abandonment by Mr. Webster, the acknowledged head of the Whig party at the North, of his previous anti-slavery position, and his substantial concession of the demands of the slave-power in his celebrated speech of Mar. 7, 1850. This speech divided the Whig party of the North in sentiment, though not at once in organization, and made Mr. Seward the leader of the anti-slavery portion of the party. Pres. Taylor, who, though a large slaveholder, seemed determined to hold the balance fairly, and was a good deal roused by the attempts at intimidation upon him made by the extreme Southern men and their threats of secession, died at the height of the struggle, and the administration passed into the hands of Fillmore, the Vice-President. He put Mr. Webster at the head of the cabinet, and from this time the whole weight of the administration was given to carrying the Compromise measures, as they affected to call them, demanded by the South; and they were passed at the close of the session, Sept., 1850. Notwithstanding that the administration was Whig, it placed the party in an awkward position. By far the greater portion of the opposition to these measures came from the Whig party, and at the South what remained of the Whig party did not join in the secession demonstrations.

* An attempt was made to give this party the name of "Free Democracy," but the name did not hold, and it was popularly known as the "Free-Soil" party, especially after the hope of changing the front of the Democratic party at the North was abandoned.

In the Presidential canvass of 1852 the Whig party appeared for the last time upon the stage of national politics. It was divided in sentiment. The national conventions of the Democratic party in 1848 and 1852 had gone very far in surrendering it to the rule of the slave-power. They adhered to the rule requiring the two-thirds vote to nominate a President, never adopted by any other party, the purpose and effect of which was to give the slave States a veto, and so, practically, the designation of the candidate. They had adopted resolutions against the prohibition of slavery in the Territories, and in 1852 denounced all resistance to the Fugitive-Slave law, and all attempts to modify or repeal it as unpatriotic and dangerous to public peace. This attitude of the Democratic party gave it great strength at the South, and an attempt was made by a portion of the Whig party, led by Pres. Fillmore, Mr. Webster, and the remaining Southern Whigs, to put that party in a position which would give it a fair chance of Southern votes without the risk of losing much of its Northern anti-slavery element. The convention which was held at Baltimore in June, 1852, adopted with little opposition—212 against 70—a platform entirely acceptable to the Southern wing, and in fact previously arranged to its satisfaction. They declared the series of acts of 1850, known as the Compromise measures, to be a settlement; insisted upon the strict enforcement of the Fugitive-Slave law, and deprecated all further agitation of the slave question. Mr. Seward's policy controlled the greater part of the Northern vote. It was to let the pro-slavery section have the platform, but secure a President who would be not unacceptable to the anti-slavery section. His candidate was judiciously selected. It was Gen. Winfield Scott, who had gained a great reputation in the war with England (1812–15) and in the late Mexican war, and, though a native of Virginia, had made his home in the free States, and was generally thought to be a firm man of moderate opinions, who would adapt himself to the composition of his party and would not yield to the dictations of the slave-power. The anti-slavery portion of the convention united on Gen. Scott. The Compromise section was, unluckily for them, divided. Their principal candidate was Pres. Fillmore, who received during twenty-five ballots about an equal number of votes with Scott; but Mr. Webster was a candidate, and would not withdraw, although he represented the same principles with Fillmore, and although his vote never rose above one-tenth of the convention, and only prevented a choice. On the fifty-third ballot Scott was nominated.

The Democratic convention of 1852, besides affirming the Compromise measures, promising a faithful execution of the Fugitive-Slave law, and denouncing all attempt to revive the agitation of the slave question, promised faithfully to abide by the principles of the Kentucky and Virginia resolutions of 1797 and 1798 and Mr. Madison's report of 1800, the character of which has been previously described. Mr. Pierce of New Hampshire, who had no votes in the early part of the balloting, which lay between the acknowledged leaders, Cass, Marcy, Buchanan, and Douglas, was suddenly and unexpectedly, except to the managers, elected by all but a unanimous vote on the last ballot.

The Free-Soil party, which had organized at Buffalo in 1848, held its second national convention at Pittsburg in Aug., 1852. There were delegations from all the free States and from four of the border slave States, though the latter probably represented a very slight constituency. Their platform was substantially the Buffalo platform. It denounced the Fugitive-Slave act of 1850 as unconstitutional in many of its provisions, and cruel and perilous to freedom in its operation; it insisted on the right and duty of Congress to prohibit slavery in the Territories and to refuse the admission of any new slave States; adopted for its rule of practice that slavery should be sectional and freedom national; disclaimed any right to interfere with slavery as a State institution; and repeated the motto of Buffalo, "Free Soil, Free Speech, Free Labor, and Free Men." Its candidate was Mr. Hale of New Hampshire.

At the election of 1852 the popular vote stood thus: Pierce, 1,601,274; Scott, 1,386,680; Hale, 155,825. Although in a popular vote of over 3,000,000 Pierce had less than 30,000 majority, and but little more than 200,000 plurality over Scott, the result, taken by the electoral votes, gave Pierce every State in the Union except four, which gave their votes for Scott. Mr. Webster, notwithstanding that he was a candidate before the Whig convention and accepted its platform, withdrew from the support of Scott and gave his influence to Pierce. The result of the election so discouraged the Whig party that it never reorganized as a national party. This was not because of any paucity of its popular vote, but because it was demonstrated that it had lost the confidence of the slave States, and had not a sufficiently strong hold on the anti-slavery element of the North to enable it to carry the Northern States against the Democrats wherever the Free-Soil party was large. It is to be remarked, too, that the series of measures relating to Kansas (which have been already detailed) between 1852 and 1856 had greatly educated and aroused the anti-slavery sentiment of the North, and prepared to form a political party based substantially on the Free-Soil platform.

The leaders of the Free-Soil party and of the anti-slavery wing of the Whig party saw the propriety of not requiring either party to join the other, and agreed upon organizing a new party. They adopted the name of "Republican." As has been stated, this had never been the generally recognized title of a permanent political party. Jefferson and others attempted to secure it for their party at the end of the last century, but without success, and there was a short-lived National Republican party about the year 1832, which became the Whig party. By the time the Presidential canvass of 1856 began, the new party was well organized, and the country was divided into two camps—the Democratic and the Republican parties. The Democratic convention was held at Cincinnati in June, 1856. It reaffirmed the doctrines of 1852, the denunciation of all attempts to prevent slavery in the Territories or the District of Columbia by legislation, or to object to the admission of a new State on the ground that it established slavery; the affirmation of the Kentucky and Virginia resolves of 1797 and 1798; the recognition of a right to maintain slavery in any part of the public domain; a promise of a faithful execution of the slave law, and a denunciation of all attempts to alter the compromises of 1850. Their candidate was Mr. Buchanan, whose selection was determined, as usual, by the slave-power, under the influence of the two-thirds rule. It was a politic nomination, as they were sure of the votes of the slave States, while his being a Northern man would help them in the free States, and especially for the reason that he was a citizen of Pennsylvania, a State whose vote it was thought would be decisive in the contest.

The Republican convention met at Philadelphia, June 17, 1856, and nominated John C. Fremont as President on the first ballot; Mr. Dayton of New Jersey was the candidate for Vice-President. The platform was substantially that of Buffalo of 1848 and Pittsburg of 1852, adapted to the special questions of the day; but as it was the first platform of the Republican party, it deserves special attention.

The platform welcomed to the party, without regard to past differences, all who were opposed to the repeal of the Missouri Compromise and the extension of slavery into free territory, and who favored the admission of Kansas as a free State. The resolves may be condensed in the following form: (1) the prohibition of slavery in all Territories of the U. S., and the denial of the authority of Congress or of a Territorial legislature to give legal existence to slavery in any Territory, freedom being the public law of the national domain under the Constitution; (2) the right and duty of Congress to prohibit in all Territories "those twin relics of barbarism, polygamy and slavery;" (3) a detailed recital of the wrongs and frauds practised upon the people of Kansas with the knowledge, sanction, and procurement of the Democratic President, his cabinet, and supporters; (4) the immediate admission of Kansas as a free State into the Union.

In 1854–55 there suddenly rose into existence a party—or, more strictly, a vast secret political society—known as the "Know-Nothings," whose assumed name was the "American" party. Its principle was the exclusion of all foreign-born residents from citizenship until they should have lived twenty-one years in the country, and the selection of natives for all offices in preference to naturalized citizens. It swept the country in an astonishing manner in the State elections of 1854, carrying nearly every State in the Union. The next year the excitement somewhat abated, and by the year 1856 the slavery question had practically divided and destroyed the party, as it had the Whig party before it. Still, it held its convention in 1856, and nominated Mr. Fillmore for President, and a small remnant of the Whig party met and adopted the same nomination. The contest, which was practically between Fremont and Buchanan, was a geographical conflict between the slave States and free States. Mr. Fillmore received the vote of Maryland only; all the other slave States voted for Buchanan. Of the 16 free States, 11 voted for Fremont and 5 for Buchanan. In Pennsylvania and Illinois the popular vote was very close. In Pennsylvania, out of 459,756 votes, Buchanan had a majority of less than 10,000; while in Illinois he had a small plurality over Fremont, which gave him the electoral vote of the State, but he was 14,000 short of a majority; and, taking all the States together, in a popular vote of a little over 4,000,000, Buchanan was in a minority of 377,629; but his plurality

over Fremont and his sweeping of the slave States gave him a considerable majority in the electoral college.

The administration of Mr. Buchanan saw the slave question become the paramount subject of national politics, chiefly, as has been said, by reason of the contest over the Territories and new States, and from the exasperating attempts to enforce the Fugitive-Slave law in the free States. Immediately after the election became known, the Supreme Court gave its opinion in the Dred Scott case, and the judiciary, the administration, and the Democratic party became committed to the doctrine that there is no power anywhere to prohibit slavery in the Territories, that it exists there as of right, and that the national government, as well as the Territorial authorities, is bound to recognize and protect it. Kansas, as has been said, against every effort by force and fraud on the part of the slave-power, countenanced by the administration at Washington, adopted at last, in 1859, a free State constitution by processes which could not be objected to; but the Democratic party refused to receive it into the Union, and it had become generally understood that several of the slave States would secede if that was done. During the course of this administration the secession party at the South presented a bold front. They avowed that they remained in the Union only at their pleasure, and that they should retire whenever they chose to consider what they called their wrongs greater than their self-respect required them to endure. They claimed a legal right in each State to withdraw from the Union at its discretion, and that its decision was legally binding upon the Union. In support of this position they cited the Virginia and Kentucky resolves of 1797–98, which the Democratic party had pledged itself to sustain at successive national conventions. This doctrine was popularized in the phrase, "A State cannot be coerced." Mr. Buchanan considered himself bound by it, leading Democrats publicly assented to it, it was the logical result of the Virginia and Kentucky resolves of 1797 and '98, and there can be no reasonable doubt that it was generally believed at the South that they had a legal right to secede, and that if they did so, no attempt would be made to coerce them by a Democratic administration, and that if the Republican party should come into power, and should attempt to oppose secession by force, it would not be sustained by the Northern people.

In 1858 was the memorable contest between Abraham Lincoln and Stephen A. Douglas for the Senatorship of Illinois. It was becoming understood that the Presidential election of 1860 would depend upon the votes of Pennsylvania and Illinois. As the Democratic candidate would be sure of all the slave States, and would doubtless have the vote of some free States, the Republican party certainly would not succeed if it lost both, and probably could not succeed if it lost either of those two States. These two distinguished public men personally canvassed the State of Illinois in the summer and early autumn of 1858, and their speeches were read with great interest throughout the country. Mr. Lincoln advocated the right and duty of Congress to prohibit slavery in the Territories, while Mr. Douglas advocated the policy which has heretofore been explained, and which acquired the name of "squatter sovereignty"—the policy of abstaining from all legislation by Congress on the subject, leaving the people of each Territory to establish or prohibit it at their discretion. This was not the thoroughgoing slave-power doctrine, which was that slavery could not be prohibited in the Territories by any power whatever; but the pro-slavery people of course sustained Douglas against Lincoln, who advocated the duty of Congress to prohibit it in all the Territories, which would result in all the new States being free States. As Senators are elected by the legislature, the contest was for the election of members. In the aggregate popular vote of about 250,000, Lincoln had a plurality of nearly 4000, but the arrangement of districts by which members were elected was based upon an old census, which gave to the southern part of the State, where the slavery interest was the strongest, a representation disproportioned to the population in 1858; and in this way Mr. Douglas had a small majority of the members of the legislature. The formal victory was with the Democrats, but the result showed that the Republicans would probably carry the general ticket in the Presidential election.

The cowardly and brutal assault made upon Mr. Sumner, Senator from Massachusetts, in the Senate chamber, by two Southern members of Congress in May, 1856, and more especially the honors paid to the assaulters by the people, and even the legislators, of some of the slave States, and the unwillingness of the administration party to take any proper notice of it, had a great effect through the Northern States. It was one of those cases where the impersonating a great wrong, presenting it in the concrete to the minds and hearts of multitudes, ripens rapidly their opinions into action.

The critical election of 1860 was now approaching. The Republican party was well organized, unanimous, and hopeful. They felt reasonably sure of carrying the New England States, New York, Ohio, and a range of the North-western States. The large free States which were doubtful were Indiana, Illinois, and Pennsylvania. The whole number of electoral votes at this election would be 303, requiring 152 for a majority. The free States were entitled to 183 votes, so that the loss of 32 Northern votes would be a defeat of the Republican candidate. They could afford to lose Pennsylvania alone or Illinois alone, but not both those States, nor either of them and Indiana. The loss of New York alone would defeat the Republican party. Had the Democratic party been united, they would have gone into the contest with 120 votes from the slave States secure, and would have needed only 32 out of the 183 Northern electoral votes to carry the election. But the Democratic party was not united. Its public men and political managers had gone too far in the support of slavery, and the slave-power had presented itself too defiantly in the attitude of propagandists of slavery, and had made too great demands on the Democratic party, to secure entire co-operation. And the South itself was not united. There was a secession party and a Union party. The former was represented by South Carolina chief of all, and by Jefferson Davis in the Senate. There was a Union party, composed mostly of those moderate Southern Whigs who had not joined the Democratic party nor abandoned themselves to extreme pro-slavery opinions. A considerable portion of the Democratic party at the South were not prepared to go to the extreme length of secession. They felt that extreme doctrines put forth or an extreme candidate selected by the Democratic party might unite the Northern electoral vote on the Republican party and destroy the influence of the Democratic party in the free States, and that there was danger of breaking up the Democratic party in the national convention by proposing such measures or such a candidate. The Republican convention met at Chicago in May, 1860. The platform adopted denounced the new dogma that the Constitution of its own force carried slavery into the Territories; declared freedom to be the normal condition of the Territories; denied that there was any power either in Congress or a Territorial legislature to give legal existence to slavery; censured the course of the Democratic administration in the treatment of Kansas and Nebraska, and demanded the immediate admission of Kansas into the Union. The platform was adopted with unanimity and enthusiasm. The most prominent and probable candidate was Mr. Seward. Since the defection of Mr. Webster in 1850 he had been recognized as the great teacher of the Northern people on the political bearings of slavery, and as the Senatorial leader of the Republican party. At first he led largely in the convention, but the argument was used with great force that the nomination should be adapted to securing the vote of the three States which were lost in 1856—Pennsylvania, Illinois, and Indiana—and the delegates from those States made up their minds that Mr. Lincoln was more likely to carry them than Mr. Seward. The result of the convention was the nomination of Mr. Lincoln. He was born in the South, though not belonging to the slave-holding class, but to the class of poor whites; removed early to Illinois; had been a Whig until the organization of the Republican party, and was a man of moderate opinions. He was willing to be satisfied with securing the Territories to freedom, and thus all the new States, and did not propose any national action, even if it could constitutionally be had, against slavery in the slave States.

The most moderate class of the Southerners, with some of the Whigs of the North, who had supported Mr. Webster, but had not gone over to the Democratic party, met in convention at Baltimore in May, 1860, and organized what they called the "Constitutional Union" party. They adopted no platform except the single phrase, "The Constitution of the country, the Union of the States, and the enforcement of the laws." The last clause of the sentence was intended to refer to the Fugitive-Slave law. They nominated Mr. Bell of Tennessee for President and Mr. Everett of Massachusetts for Vice-President.

The Democratic convention met at Charleston, S. C., also in May. The popular candidate was Mr. Douglas. He was the only Democrat with decided pro-slavery inclinations who had any chance of carrying any Northern States. But, though he had done the work of slavery with great power and zeal, and had acknowledged abilities and extraordinary power of will and courage, and there seemed little doubt of his devotion to Southern interests, the extreme party of the South was not satisfied with him. He had not been willing to force the Lecompton constitution upon the people of Kansas, and his policy of squatter sov-

ereignty was not as acceptable to the extreme slavery propagandists as the new dogma that slavery existed by force of the Constitution in the whole public domain, and could not be prohibited while the Territory remained a Territory. The struggle was on the platform. The majority report asserted the dogma that slavery existed under the Constitution in all the Territories, and could not be prohibited, and recommended a resolution which was understood to intend the repeal of the laws prohibiting the maritime slave-trade and the protection of that trade. The principal minority report reaffirmed the Cincinnati platform of 1856, and further as to the Territories, declaring slaves to be property, and that all rights of property are judicial in their character, and pledged the Democracy to defer to the decisions of the Supreme Court on that subject. The difference between the two reports may seem slight when looked at from this distance of time, but it was sufficient to rend the Democratic party in twain, give the election to Mr. Lincoln, and to precipitate the war of secession. The slave-power was determined to force the Democratic party to abandon squatter sovereignty in the Territories, and to adopt the dogma that slavery existed in them by force of the Constitution, and could not be prohibited by any power whatever. The party had never adopted that dogma in terms in its national platform, but the Kansas-Nebraska bills of 1854, repealing the Missouri Compromise, declared prohibition by Congress to be void; to that the party was committed. The Supreme Court in the Dred Scott case in 1856 was claimed to have decided, and seems to have decided, in favor of the new dogma. When asked why the minority report was not sufficient, the answer of the extremists was that the Dred Scott case was but the decision of a majority, and might be reversed, and in that case the minority report would commit the party to the reverse doctrine, and, besides, many lawyers held that the majority of the court was not necessarily committed to the dogma, and if the Democratic party meant to sustain the dogma, they should do it explicitly as a part of its political creed, and not remit so vital a question to the chances of a majority of the Supreme Court. In the course of the debate the chairman of the committee admitted that the slave-power would be beaten if the policy of squatter sovereignty was allowed, saying, "The Southern men encumbered with slaves cannot compete with the emigrant aid societies at the North in a contest for the occupation of the Territories." After a very excited debate, in which the delegations from many of the slave States threatened to secede if the majority report was not adopted, the report of the minority was substituted for it by a vote of 165 to 138. Thereupon about half the delegations from the slave States withdrew and organized a separate convention. The original convention passed a resolve that two-thirds of a *full convention* should be required for the nomination of a President. This was a defeat of Douglas, for although in the balloting, which continued several days, he received a majority of a full convention, he could not attain to two-thirds, and the convention adjourned to meet at Baltimore on the 18th of June. The seceding convention adjourned to meet at Richmond in June. When the original convention met at Baltimore by adjournment, it admitted after a violent discussion new delegates favorable to Douglas who had been elected in the interval to supply the place of the seceders. Upon this vote the entire delegations of five slave States and portions of the delegations from three other States seceded and formed a convention, which was joined by Caleb Cushing of Massachusetts, who had been president of the regular convention, and was chosen president of the seceding convention, and by most of the delegates who had seceded at Charleston. This seceding convention acted with unanimity. It adopted the majority report made at Charleston, and nominated Breckenridge of Kentucky, an extreme pro-slavery man and secessionist, for President. The original convention, after the two secessions, nominated Douglas with but little opposition, but it nominated for Vice-President Mr. Johnson of Georgia, whose pro-slavery and secessionist principles were as extreme as those of any man in the South—who had declared himself in favor of the new dogma, the sacredness of slave property, and of the principle that capital everywhere should own labor. In fact, the Douglas section of the Democracy were unwilling to commit themselves to a dogma which would ruin the party at the North, but would go as far as possible short of that, and hoped to satisfy the South by nominating a Vice-President of the most extreme school.

In the canvass of 1860 the Republican party went before the country united on its platform and its candidate. The Democratic party was divided as to both. In every Northern State it had two organizations; and although Douglas in those States had a much larger vote than Breckenridge, yet the latter had votes enough to give the electoral vote of several States to Lincoln in which he had not an absolute majority, and Mr. Lincoln received the electoral votes of all the free States except three in New Jersey. Douglas received but twelve in all—three from New Jersey, a free State, and nine from Missouri, a slave State. The Bell and Everett ticket received the votes of Virginia, Kentucky, and Tennessee. Breckenridge received by great majorities the votes of all the other slave States. This result gave the Presidency to Mr. Lincoln. Still, in the popular vote, counting Douglas, Breckenridge, and Bell as against him, he was in a minority of nearly 1,000,000 votes, and the Republicans had failed to obtain a majority of the House of Representatives; the Democrats held the Senate by a very large majority; and there was but one Republican upon the Supreme bench, and the majority of the court were slave-holders.

As soon as the election of Lincoln was announced, South Carolina took steps for secession. On Dec. 17 her legislature adopted an ordinance of secession unanimously, and her course was followed rapidly by Georgia, Mississippi, Florida, Louisiana, Alabama, Arkansas, and Texas, who organized a confederation of sovereign States, and by the time of Mr. Lincoln's inauguration, on Mar. 4, 1861, all the Gulf States had seceded, and the remaining slave States were in a critical condition, acting upon the principle of State sovereignty and the right of secession, but doubting the policy or justification of exercising the right at this time.

There is, unfortunately, an interval of nearly four months between the popular election and the inauguration of the President elect, and during those four months, while the secessionists were organizing their military and political system with the utmost energy and seizing the forts, arsenals, navy-yards, and dépôts of the government within the slave States, the protection of the Union was left to Pres. Buchanan and his cabinet and a Democratic Senate and House, all whose sympathies were strongly with the South. Nothing can show more clearly the demoralized condition to which the slave-power had reduced the Democratic party than the action of the President and his cabinet. In his message to Congress of Dec. 4, 1860, he took the position that the government had no power to coerce a State by measures of war; that the republic executes its laws as a part of civil government, and has the aid of its militia and army and navy for that purpose in the way of suppressing insurrections and tumults and protecting public property; but that if the people of a State declared their independence and organized themselves with such force and numbers that war-measures became necessary, it was not competent for the republic by any form or method, legislative or executive, to make war upon one of its own States. His attorney-general, Mr. Black, gave him an official opinion to that effect previously to the message. This left the government in a ludicrous and contemptible position of helplessness; nor was this all. The secretary of war had been for many months transferring munitions of war of all descriptions from the arsenals at the North to those at the South, so that on the breaking out of the rebellion, the South by simply seizing these arsenals was fully supplied with the materials of war, while the arsenals at the North were nearly stripped; and the secretary of the navy had been playing into the hands of the secessionists by leaving a large number of the best ships in the Southern navy-yards, and sending nearly all the other available ships to remote stations at various parts of the world after the danger of civil war became imminent, and by accepting the resignations of Southern officers, who were openly engaged or about to engage in the rebellion, without any inquiry or any attempts to hold them, and allowing them to draw their full pay, some of these officers in their letters of resignation announcing their new positions. The secretary of war resigned and joined the rebellion; the secretary of the navy, being a Northern man, held office under censure until the end of the administration, and retired to private life. The secretary of the treasury was a secessionist, and resigned to join the rebellion, and his successor, a Mr. Thomas, disapproved of all coercive measures, and soon resigned. The secretary of the interior also resigned from disapproval of coercive measures. No attempts whatever were made to arrest persons who were openly at Washington engaged in the rebellion, and members of the Senate and House resigned their seats to go and take part in the rebellion, announcing themselves as no longer citizens of the republic, but of the new Confederacy in arms, and remained in Washington during their convenience without any objections on the part of the government.

In the period of time between the secession of South Carolina and the end of Buchanan's administration unceasing efforts were made to effect what was called compromise. These took various forms, and received a good

deal of support from the fears of people and the extreme reluctance to see either a severance of the Union or a civil war for its preservation. But all these proposed compromises which there was any chance of the South's accepting were surrenders on the part of the North and of the government. They received their chief support from the border State men, not quite ready for secession, from those who supported the Bell and Everett ticket, and from Northern Democrats. The few utterances from the President elect showed that he was immovable in the position that the republic must not purchase the right to go on, however slight might be the terms required, and the Republican party stood firm in the same position. The retirement of the members from the seceded States reduced the strength of the Democratic party so far that no measures could be carried through Congress favoring any concession to the slave-power. An article upon the Republican party only, does not justify the following out of the history of these various attempts at compromise made in Congress and by the peace conventions, none of which were carried out to success. It is sufficient to say that the position of the two parties in the country was this: The secessionists for the last six years had acted with the Democratic party, and received its highest honors. The whole political force which carried the first eight States into rebellion may be said to have been derived from the Democratic party, almost if not quite without an exception. In the States that finally seceded and formed the Confederacy which carried on the civil war, it is not known there was one man engaged who had ever professed to be a Republican. Those Southern men who opposed secession, and joined in it with the most reluctance, were for the most part members of the old Whig party, and voted for the Bell-Everett ticket in 1860. The Democrats in Congress during the four months' interval—which might almost be called an interregnum—between the election and inauguration of Lincoln almost without exception passed concessions to the slave-power as a means of drawing them back into the Union, and the Democrats in the cabinet, in Congress, and in leading posts of influence in the press and before the people, with very few exceptions, sustained the view of the President that war-measures could not be used to coerce a State, and acquiesced in, if they did not approve, the policy of the administration in taking no proceedings against individuals avowedly engaged in both military and civil measures for separating the republic. The Republican party, on the other hand, were substantially unanimous in refusing any concessions to the slave-power, and in asserting the right and duty of the government to put down the rebellion by force of arms, and, if the power of the rebels required it, by war-measures on sea and on land, and in insisting upon the unconditional inauguration of Mr. Lincoln and the institution of his government.

Mr. Lincoln was inaugurated on Mar. 4, 1861, under the protection of careful military preparations superintended by Gen. Scott. His inauguratory address was of the most conciliatory character. He called attention to the fact that before his nomination he had declared his conviction that the republic had no right under the Constitution to interfere with slavery within States in which it existed; that he had no desire to have such a right acquired; and that he believed in the right of reclaiming fugitive slaves, and was willing to support proper legislation for the purpose; and to the fact that the platform of the Republican party declared the inviolability of the right of each State to order and control its own domestic institutions. He made no threats of the use of war-powers, expressed his determination to execute the laws and protect the public property in every State, if resident citizens could be found to hold office and execute its duties, by aid of the militia and ordinary military force. He made an earnest and effective appeal to the States engaged in secession not to allow things to go beyond such a stage, without threatening what might be done if such a stage were passed.

When the State of South Carolina on Apr. 12, 1861, opened fire upon Fort Sumter and reduced it by siege of thirty-four hours, and the act was approved by the entire Confederacy, and the Confederacy adopted the policy of reducing to its possession every thing belonging to the U. S. government within its limits by military force, and had organized a complete civil and military government, declared its independence of the U. S., and its determination to treat any attempt by force to execute the laws of the U. S. or to reclaim the property of the U. S. within its limits as a hostile invasion and an act of war, the Republican administration came to the conclusion that war *in facto* existed in those parts of the U. S. possessed by the rebels, and that this state of war must be met by the necessary corresponding exercise of war-powers on our part.

The history of the war is recent and familiar. We deal here only with the political questions involved as they bear upon the history of the Republican party.

There was a small portion of the Republican party, represented by Mr. Greeley of the New York *Tribune*, which was willing to see the seceding States left to their independence. This feeling arose from no doubt as to the powers of the government, but from their humanitarian and peace principles, their reluctance to see the country subjected to civil war, and their inclination, as doctrinaire radicals, to yield to the expressed opinion of clear majorities in any section of the country. But after war began, and the country was completely embarked in it, they sustained the administration. The Garrisonian abolitionists, as peace-men, could not approve the war, and as it was not waged for the purpose of abolishing slavery within the States, they could not approve its object, and while between the contending parties their sympathies would be against the slave-holders, they for the most part denounced the administration. But their influence upon the politics of the country was small.

The position in which this state of things left the Northern Democrats was extremely embarrassing. The rebel leaders had been the leaders of their party, their political and personal friends, the controllers of their administrations, and their favorite candidates. They had asserted repeatedly, and were educated to believe as true, the doctrine of the Virginia and Kentucky resolves of 1797–98, and their inclination was to believe that the logical result of those resolves was a legal right in the State to secede, or at all events to throw great doubt upon the question whether the government could coerce by war-powers States which had acted with such vast majorities. For the last twelve or fifteen years the Democratic party had denounced the Free-Soil and Republican platforms as unconstitutional and unjust to the South and perilous to the Union, and had gradually slid into a practice of denouncing all anti-slavery action in politics and defending or apologizing for slavery and its political attitude. It was inevitable that great numbers of them sympathized a good deal with the rebellion, some openly and throughout, and others, disapproving the actual secession, considered it entirely natural and excusable in view of the accession of Republicans to power. It was still more difficult for them to reconcile themselves to an actual war levied by the government under Republican auspices against the seceding slave States. Not only they, but some leading men among the Republicans, found great difficulty in understanding how men whom we claimed as citizens of the republic, owing it allegiance and guilty of treason in their rebellion, should at the same time be public enemies, receiving the same treatment which belligerents and prisoners of war are entitled to in wars between different nations; and how it could be that territory which we claimed to be of right a part of the republic should at the same time be enemy's territory; and how a government could be engaged in an actual war, to be recognized as such by foreign powers, with its own citizens, and be blockading its own ports. So extensive was this mystification that although we had established the blockade in pursuance of the law of nations, and claimed the right to stop and search neutrals on the high seas—powers which can be only exercised in time of war—and the Confederacy had declared war to exist, there was widespread indignation when it became known that Great Britain and France recognized a *de facto* condition of belligerency between the two parties. These difficulties were a good deal cleared up by the decision of the Supreme Court of the U. S. in the prize cases (2 Black's Rep. 635). The court held unanimously that there might be a condition of war *de facto* between a government and an opposite belligerent power composed of its own citizens and contending for the possession of its own territory; that in the present case the state of things was not an insurrection or rebellion to effect any purpose within the government, but was the case of the organization of a complete government, capable of performing all the functions of a government, intended to be permanent and entirely independent of the U. S., and claiming rightful jurisdiction over the entire territory it had marked out for itself, and the rightful allegiance of all the inhabitants of that territory, and having numbers and territory and ports sufficient to enable it to carry on war in the fullest sense of the term by sea and on land; that war was a question of fact and not of law, and the state of things was one of war *de facto;* that war being an appeal to force, the status of persons and of territory was also a question of fact, and territory in the actual occupation of the enemy was for the time being, and in the sense of the laws of war, enemy's territory, and the property of persons residing in that territory was, for the time being, enemy's property; and that while the war existed the line of enemy's territory was not to be determined by the civil law of the

U. S., nor by the pretended ordinances of secession or the civil boundaries of the seceded States, but was simply the line of bayonets. Upon these principles they upheld the right of the republic to maintain a blockade valid under the law of nations of ports in the possession of the enemy, and to make capture on the high seas of vessels and cargoes belonging to persons residing within enemy's territory, as above defined, as prize of war, without inquiry into the opinions or conduct of the owners, and without civil or criminal processes of law. As six of the nine judges were Democrats, this opinion had great weight with the party; and the question upon which the court divided, five against four—the right of the President to use war-powers in a civil contest without an antecedent act of Congress—was no longer a practical question, the act having been passed.

The firing upon Fort Sumter, the call of the President for volunteers, and the instant march of the Massachusetts regiments through the great cities of New York and Philadelphia to the relief of the capital, and the attack upon those regiments as they went through Baltimore, in which many were killed, had an electric effect upon the country, and especially it may be said upon the very lowest classes in the great cities, and unexpectedly upon that vast Irish vote of New York which had given the great strength to the Democratic party. They rose with enthusiasm for the Union, compelled those Democratic newspapers which had been reluctant, to unfurl Union flags, and overawed those of their political leaders who had opposed the war.

During the early part of the war little was heard of party strife at the North, but the war dragged on, the Union forces gained few successes and met with many defeats, the expenses of the war over so vast a territory, and of the maintenance of the largest commercial blockade ever known in history, were enormous; the debt was rapidly increasing, taxation became onerous, and paper money, which had been made legal tender, was depreciating in an alarming manner; volunteering subsided, the use of the militia of the States was impracticable, the largest bounties failed to call forth sufficient recruits, and the government was obliged to have recourse to conscription; and the *habeas corpus* was suspended and disloyal citizens were held in imprisonment. The natural result of this state of things was censure of the government and dissatisfaction with the war. The Democratic party began to reorganize itself, and to fall into the posture of political opposition—not avowedly to the war itself, but to the method and motives of the government and of the Republican party. This spirit increased in the party until at last the contests at the ballot-box were a good deal to the same purpose with those upon the field—viz. to determine whether the war should be fought through and the national authority established by force of arms over the whole Union, or whether it should be abandoned, and either the independence of the seceding States be recognized, or such concessions be made to them by amendments to the Constitution and otherwise as would induce them to remain in the Union.

The act for conscription was passed in Mar., 1863. A suit was brought in Pennsylvania to test the constitutionality of the act. Three of the five judges of the State supreme court were Democrats, and united in an opinion that not only this conscription act, but conscription in any form for adding troops to the army, was unconstitutional. The ablest of these judges, Woodward, was nominated by the Democrats for governor, and it was perfectly understood that if he was elected the conscription would be resisted in Pennsylvania. The great importance of this central State, and the fear that New York and New Jersey, under Democratic governors, would take the same course, made the Pennsylvania election of 1863 the most important State election during the war. But after a very severe struggle, in which public speakers from all parts of the Union took part, Woodward was defeated by a decisive majority, and Gov. Curtin, an energetic and loyal man, was elected. At the same time a Republican was elected to the supreme court in the place of a Democrat whose term had expired, and the decision of the court was reversed. This result put an end to the attempts to nullify the conscription by judicial proceedings. But when the conscription was first put in force there were mobs in many of the cities, and in New York the mob held possession of large parts of the city for several days, threatening the offices of Republican newspapers and the houses and lives of leading Republican citizens, and was suppressed only after considerable slaughter, by U. S. troops and parts of the volunteer militia of the city. Democratic politicians and newspapers of the lower order were charged with inciting these mobs.

In the spring and summer of 1864 a portion of the Democratic party, known as the War Democrats, agreed to support the re-election of Lincoln and the prosecution of the war. They were not, however, very numerous, and when the Democratic national convention was held at Chicago in Aug., 1864, the policy of the party was clearly proclaimed. The platform declared the war to be a failure—that there must be an immediate cessation of hostilities with a view to calling a convention of all the States to amend the Constitution upon a new basis of a federal union of the States. Although the language was cautious there was no misunderstanding its meaning. The war must be abandoned as a failure and as having been unjust, and the rebel States, acknowledged to be victorious and in the right, were to take part in the convention which should alter the Constitution in such manner as should be acceptable to them. Such a platform proposed in 1861 or 1862 would have ruined at once all public men who supported it, but the state of affairs was very low, the conscription, the increasing debt, the heavy taxation, the depreciation of the paper-money, the dreadful waste of life in battle and by disease, the long period without any decisive military results for the Union, and the internal troubles arising from civil arrests for disloyal conduct and the suspension of the privilege of *habeas corpus*, all combined to give this platform a probable chance of uniting the entire Democratic party in its support. The candidate was Gen. McClellan.

The Republican executive committee, desirous to make the support of the war as little a matter of party as possible, and to include the War Democrats, called a convention at Baltimore under the name of the Union national convention, and invited to it all persons irrespective of party "who desired the unconditional maintenance of the Union, the supremacy of the Constitution, and the complete suppression of the existing rebellion, with the cause thereof, by vigorous war." The platform insisted that there should be no compromise with the rebels, and that the war should be prosecuted with the utmost vigor to the complete suppression of the rebellion; denounced slavery as its cause, and recommended an amendment to the Constitution abolishing and prohibiting slavery in all the States. Mr. Lincoln was renominated by a unanimous vote.

The course pursued by the Republican party on the subject of slavery was cautious and abstinent in the extreme. At the beginning of the war a resolution passed Congress by very large majorities to the effect that the war was not prosecuted for the purpose of abolishing slavery within the States, and the rebels were assured that if they returned to their allegiance, while we should insist upon the freedom of the Territories, the right of the States to settle the question for themselves should be respected; and when a voluntary return of the States in rebellion was no longer to be looked for, it was not until Apr., 1862, that slavery was abolished in the District of Columbia, nor until June, 1864, that the Fugitive-Slave laws were repealed. In our military operations great care was observed not to incite insurrections among the slaves, and it was some time before the policy was adopted of treating slaves who came into our possession as contraband of war, and so not to be restored to their masters. On Sept. 22, 1862, Pres. Lincoln issued his famous "proclamation of emancipation," as it was called. The emancipation was to take effect upon Jan. 1, following, and in the mean time he promised to recommend to Congress to grant compensation to any slave States not then in rebellion which should abolish slavery within their limits. It declared that on Jan. 1, following, all persons held as slaves in any State which should be then in rebellion should be then and for ever after free. On Jan. 1, 1863, no State having withdrawn from the rebellion, he issued his second proclamation, designating the States and parts of States in rebellion, and ordering and declaring that all persons held as slaves in such regions are and shall be free, and pledging the government to maintain their freedom; and on this measure, he said, "I invoke the considerate judgment of mankind and the gracious favor of Almighty God."

This celebrated proclamation professed to be "a necessary war-measure," and to be done "by virtue of the power in me vested as commander-in-chief of the army and navy of the U. S. in time of actual armed rebellion;" and the phrase was used, "I do order and declare." Still, both proclamations were signed by him as President and countersigned by the secretary of state. As an act by a President in his civil capacity it was of no effect. If it was an act of legislation, it was void, for the President has no power to make general laws, either in time of war or peace. The truth is, it was only a military order by the commander-in-chief of the armies of the U. S. As such it did not effect the emancipation of a single slave. Yet its language assumed to do that, as it declared all slaves in the rebel States to be free on the day named. As a military order it simply established a policy of emancipation, and

it effected emancipation only so far as our military power extended. From that time all slaves who were, or who should at any time come, within our lines, or should be within territory which was under our actual military occupancy and control, became free. But slaves within the enemy's territory and in the enemy's possession could not be emancipated by pen and paper. No doubt the positive character and language of the proclamation gave it a greater effect on the popular mind and in history, but its legal character was no more than has just been defined. As, in point of fact, at the close of the war the whole rebel territory came under the firm military occupation of the government, and the status of war was held to continue although the fighting had ceased, every slave did become emancipated at last, but only as our military power extended itself. The abolition of slavery as a State system and its prohibition in the future, as distinguished from the emancipation of individual slaves, was a matter of civil legislation ultimately effected by an amendment of the Constitution of the U. S.

The Presidential canvass of 1864 was the most important ever held in the country. On the one side was the continuance of the war to the full restoration of the Union, no compromise with the rebels, and ultimately the extirpation of slavery throughout the Union. On the other, was the abandonment of the war as a failure, and compromise with the rebels on terms which would give greater strength and security to the slave-power. All means of influencing public opinion were exerted to the utmost, but the election was determined as much in the field as in the forum. A series of successes of the Union troops, especially in the South-west, and the steady advance of Grant toward Richmond, raised the hopes of the people, and their hopes of success were Republican gains. Those that sustained the war took to themselves in common speech the title of "Union men," and they fastened upon their opponents the slang phrase of "Copperhead," of accidental origin, but indicating disloyalty to the Union. The result was the re-election of Mr. Lincoln by an unprecedented majority. He had the electoral vote of every State not in the rebellion except Kentucky and Delaware, which had been slave States, and New Jersey—212 electoral votes against 21, and a popular vote of 2,213,665 against 1,802,237. In the New England States, Lincoln had 337,073 votes against 193,846. The Western free States gave 978,446 for Lincoln against 754,793 for McClellan, being a majority of only 223,653 out of an aggregate of 1,733,239. The Middle States—New York, Pennsylvania, and New Jersey—whose loyalty to the war after the government had adopted a decided abolition policy always hung in a nearly even balance, gave Lincoln a majority of 19,530 out of an aggregate vote of 1,432,146. The strength of the Union war party lay in New England, which gave it much the largest majority, and in the most northerly of the Western States. At the same time, it is to be remembered that in the Middle States the native American rural population was largely in favor of Lincoln, while the Democratic vote was drawn very considerably from the Irish population of the great cities.

The successful termination of the war in the spring of 1865, and the kind and liberal policy proposed by Mr. Lincoln toward the rebels, seemed to instate the Republican party in the good-will and respect of the American people, promising it a long tenure of power. The Thirteenth amendment to the Constitution, prohibiting slavery in the U. S., passed the Senate in Apr., 1864, by a vote of 38 to 6, 2 Democrats voting in its favor and 6 against it, and the Republicans unanimously in its favor. When it came up in the House in June following it received 95 votes against 66—less than the necessary two-thirds—only 2 Democrats voting in its favor. It passed the House in Jan., 1865, by a vote of 119 against 56, all the Republicans voting for it, and the Democrats voting 16 in favor and 56 against. Its ratification by 27 States out of 36 was proclaimed on Dec. 18, 1865.

The assassination of Mr. Lincoln in forty days after his second inauguration threw the government into the hands of Andrew Johnson. Johnson was a native of the South, sprung from the lowest classes, without early education, but with great vigor of mind and strength of will. He had been greatly admired at the North for the courage of his loyalty during the rebellion and for his speech in the Senate in 1861, which was a powerful onslaught upon the secessionists. But his accession to power resulted, as it did with John Tyler, in a separation from the party which elected him. The cause was difference of opinion as to the mode of dealing with the rebel States, or, as it was then called, "reconstruction." There was quite an unsettled state of opinion as to reconstruction running through the country. The state of things to be dealt with was unprecedented in history, principally from the kind of sovereignty which attached to the States. One policy received its first scientific announcement from a meeting at Faneuil Hall, Boston, immediately upon the surrender of Lee. This has been called the "grasp-of-war" policy. It took the ground that the status of war which had existed for four years was not to be terminated by the will of the rebels, nor as matter of law by the cessation of actual fighting; and as there was no power with which the government could treat, the cessation of the status of war depended upon the will of the government; that the territory of the old rebel States was in our military occupation, and its inhabitants subject to military government until the authorities of the U. S. considered it safe to allow them to reorganize their State governments and resume their place and functions as parts of the republic; that the government had a right to make such terms and conditions upon their readmission into political government, not inconsistent with the Constitution, as the public safety and welfare required. In the interval these States were to be under military government, or such provisional civil government as Congress might permit. This was the view of the matter which a large majority of the Republican party adopted, and which became the basis of reconstruction. Another theory entirely rejected the policy drawn from the continued status of war. It rested upon the notion that the state of things which had existed was in the view of constitutional law only an insurrection, and that it was a war only in so far as its dimensions required resort to the methods of war; that all rights drawn from war ceased with the cessation of hostilities; that between the republic and the States lately in rebellion no powers accrued to the government which did not belong to it under civil administration; that each State when it ceased hostilities had a right to reorganize itself under a State constitution and resume its place in the public system as matter of right, and that its Senators and Representatives were entitled to take their seats in Congress, subject only to the power given to each branch of Congress separately to pass upon the qualifications of each new member as an individual. This theory, or some other substantially like it, was generally adopted by the Democratic party. The object of the politicians of that party was to reinstate the white man's government in the late rebel States, leaving them to deal with the negro population, the late slaves, as they saw fit in respect to political and civil rights, not violating the Thirteenth amendment prohibiting slavery.

In June, 1866, the resolution was adopted to submit Amendment XIV. to the people. This amendment was vital in its character. Passing by its forms of expression, the substance and immediate effect would be to make the freedmen citizens of the U. S. and of the several States in which they lived, and to prohibit any State from abridging or limiting the privileges and immunities of citizens. It left each State to regulate the right of voting, but if a State excluded a class of citizens, it lost its representative and electoral numbers proportionately. It provided that no person should hold office under the U. S. or any State who, having taken an official oath to support the Constitution of the U. S., joined in the rebellion; but Congress might remove this civil disability by a vote of two-thirds of each branch. And it provided that neither the U. S. nor any State should assume or pay any debt incurred in aid of the rebellion, or any claim for the loss or emancipation of slaves. The adoption of this amendment by the States went very slowly, and was generally opposed by the Democratic party, and it was not until July, 1868, that its adoption by the requisite number of States was proclaimed.

The Civil Rights act of 1866 defined who should be citizens, so as to include the freedmen, and provided severe penalties against any persons who under color of any law or ordinance should attempt to deprive them of equal rights or subject them to any different penalty or prohibition from those to which whites were subjected; gave the Federal courts full jurisdiction under this act, and authorized the employment of the land and naval forces and militia for its enforcement.

The struggle between Pres. Johnson and the Republican Congress was mainly over the Reconstruction acts of 1867. He vetoed the act of Mar. 2, 1867, but it was passed over his veto by the requisite two-thirds vote, the Republicans having more than two-thirds of each branch, the greater part of the former slave States not having been restored to their political rights. This act was opposed by the Democrats almost unanimously. The chief provisions were as follows: It declared that there was no legal government in ten of the States, and it divided their territory into military districts and put them under military government. It provided as a condition of restoration that a convention should be called in each State to adopt a constitution; that in electing delegates to the convention all male citizens of full age and a certain term of residence, and irrespective

of color, should be entitled to vote if they were not disfranchised for rebellion or felony. If the convention should adopt a constitution which should provide the same rights of suffrage and holding office irrespective of color, and it should be adopted by the people, and it should be approved by Congress, and the State organized under it should adopt the pending Fourteenth amendment, its Senators and Representatives should be admitted to Congress. It also provided that none should be delegates to this convention or vote for delegates who were excluded from the right of holding office by the proposed Fourteenth amendment. All State governments otherwise organized were permissive only by Congress, subject at all times to the paramount authority of the U. S. The amended act of Mar. 28, 1867, established a registration of voters in those States, and required every person before entering upon an office to make oath that he had not, after having taken an official oath to support the Constitution of the U. S., engaged in rebellion against it. Under this reconstruction system of 1867, and the Fourteenth amendment adopted the next year, the process of reconstructing the rebel States went slowly on. There was intense dislike and strong suspicion of Pres. Johnson with the greater part of the Republican party. A majority of the House of Representatives passed articles of impeachment against him, which were opposed by all the Democrats and a small but respectable minority of the Republicans. Johnson had not united with the Democrats in form, and his cabinet, in which Mr. Seward remained, was still composed of Republicans. The trial of impeachment before the Senate was long continued, severely contested, and produced great excitement throughout the country. The Republicans had more than two-thirds of the Senate, but a sufficient number of them, among whom Mr. Fessenden of Maine was the leader, refused to join in the vote for conviction, and the requisite two-thirds were not obtained. The popularity of the impeachment decreased, and at the end of Johnson's term the better opinion of the Republican party was that the impeachment was unwise and a conviction would not have been justifiable.

In Feb., 1869, the resolution was passed for the Fifteenth amendment. It provided that neither the U. S. nor any State should abridge the right of any citizen to vote, on account of race, color, or previous condition of servitude. This completed the process of putting the colored people throughout the country on the same basis with the whites as to political rights. The votes upon its adoption in the legislatures of the several States were almost strictly on the old party lines. Several of the rebel States had by this time become restored to the exercise of their functions as States, and in them the freedmen, almost without exception, were at first Republicans, and the late rebels were mostly disfranchised; so that with the aid of these States and of the Republican States of the North the amendment was ratified by the requisite majority, and its adoption proclaimed Mar. 30, 1870.

When the Presidential election of 1868 drew near, the Thirteenth and Fourteenth amendments had been adopted, the Reconstruction acts had been in force more than a year, and all the rebel States except three had regained their right to take part in the election. In those States the freedmen almost without exception voted the Republican ticket, and the Northern whites who had taken up their residence there were mostly of the same party, so that there was a fair chance for the Republicans carrying some of those States. The Republicans were in the main agreed upon their platform, whose chief feature was to secure the political and civil equality of the blacks with the whites by constitutional provisions; to carry out their reconstruction policy according to the acts of 1867, and to give the freedmen, by the Civil Rights acts, actual protection in defending their rights through the courts of the republic, with the aid of its marshals, and when necessary of its military force. The Democratic party was a good deal divided. Slavery having been abolished and a political slave-power become impossible, many of the Democrats were in favor of an entire change of policy—of accepting the situation, and confining themselves mostly to the defence of what they considered the State Rights, against the growing centralization caused by the war, and to the assertion of the policy of full amnesty at once for the rebellion, and easier terms of reconstruction founded upon a higher view of State Rights and the theory of insurrection rather than war. Another portion of the Democrats, unwilling to acquiesce in the state of things, wished to keep the party in an attitude of hostility to all the leading measures of the Republicans and of alliance with the whites of the South. The moderate party prevailed in the contest upon the platform. The Democratic candidate was Mr. Seymour of New York, and the Republican was Gen. Grant. In the canvass the Republicans appealed to the gratitude of the people for the great work they had achieved in carrying the country through the war successfully, restoring peace, preserving the national credit, abolishing slavery, and securing practical freedom and equality throughout the land; and they were greatly aided by the fact that their candidate was the successful general-in-chief of the war. Gen. Grant was elected by a popular vote of 3,012,833 against 2,703,249, being a majority of a little over 300,000 in an aggregate vote of more than 5,500,000. Of the former slave States, Alabama, Arkansas, North Carolina, South Carolina, and Tennessee voted for Grant; Delaware, Georgia, Kentucky, Louisiana, and Maryland for Seymour; Virginia, Mississippi, and Texas had no vote; and Florida chose electors by its legislature.

During the four years of Gen. Grant's first administration the Republicans had a decided majority in each branch of Congress. The foreign policy of the government, under the immediate control of Mr. Fish, had been peculiarly successful, especially in the great Geneva arbitration, whose decision, favorable to the U. S., was received some two months before the election. The domestic policy of the party was unchanged, but a great deal of uneasiness had been created by the state of things at the South. The late slaves, put suddenly in possession of political power by the disabilities resting upon nearly all the men of education, property, and political experience in those States, showed themselves ignorant, fickle, and to a great extent corruptible; and while there were some honest emigrants from the North, large numbers of Northern men of low morality had gone there for the purpose of obtaining high or lucrative office through the votes of the freedmen, whom they flattered and misled. These "carpet-baggers," as they were called, were causes of a great deal of trouble, and were charged by the Democrats and suspected by others of making the utmost of the hostility between blacks and whites, and of inventing or greatly exaggerating accounts of outrages, and so keeping employed the military forces of the government for the purpose of intimidation of the whites. On the other hand, some of the worst of the whites had entered into a horrible conspiracy known as the "Ku-Klux," having for its purpose the driving out, and if necessary the assassination, of the Republicans from the North, and the complete intimidation and silencing of the blacks by violence and bloodshed. The Democrats contended that the best remedy was universal amnesty and restitution, which would allow the whites to regain the political power their education and experience entitled them to, and charged the Republicans with attempting by their legislation to go beyond political and civil equality, and to force social equality of the blacks upon the whites. In some of the States the new régime of blacks and carpet-baggers, with their ignorance, extravagance, and corruption, had brought about intolerable taxes, debts it was impossible to pay, and political bankruptcy. The amended Civil Rights acts of 1870–71 were certainly extreme measures. Their purpose was to secure the civil rights given by the Fourteenth and Fifteenth amendments, but the methods adopted and the powers brought into use were of an unprecedented character. They were aimed especially at any attempts or conspiracies or combinations to deprive the freedmen of the full and free exercise of their rights of voting and holding office, or qualifying themselves for civil privileges and equal rights, to make contracts, and be parties or witnesses in suits. The penalties for such conduct were severe; the powers given to marshals and other executive officers were extreme, especially the authority given to subordinates to call in the aid of the troops of the U. S. or the militia. They also provided a system of supervision over all elections for Federal officers, more or less under the control of the Federal courts, and punished with severe penalties all violations of the act. The definitions of what might constitute intimidation or obstruction of any citizen in the exercise of his rights were certainly very comprehensive. The Republicans contended that these extreme measures were rendered necessary by the extraordinary state of things at the South, and the great peril in which the freedmen stood in their anomalous and unprecedented condition. The Democrats answered that these perils were exaggerated for party purposes, and were increased by the Republican policy of withholding amnesty and oppressing the white race for the benefit of the blacks, who were their political supporters.

A domestic question of great importance arose out of our financial condition after the war. The act authorizing the creation of the debt did not say in terms that the bonds should be payable in coin, and several politicians of the less scrupulous and more adventurous sort started the notion that it was sufficient to pay the debt in the depreciated paper-money which was legal tender within the U. S. It was supposed that this would be a popular policy, as the debt was mostly owned abroad or by capitalists

in our great cities. Some of the politicians were Republicans, and on the other hand many leading Democrats advocated the payment of debt and interest in the gold and silver money of the world; yet, comparing the two parties, it was evident that the Democratic party furnished much the greater portion of those who favored this scheme of partial repudiation. The Democratic platform of 1868 declared that the national debt, when not in terms made payable in coin, should be payable in the paper-money of the government, and resorted to the plausible phrase of "one currency for laborer and bondholder, soldier and capitalist." The Republican platform declared that honor and good faith required that the debt should be paid in accordance not only with the letter, but with the spirit, of the laws under which it was contracted, and denounced everything in the nature of repudiation. Yet it is observable that it did not say in terms that the dollars named in the bonds meant the gold or silver dollars of the world's currency. Still, the capitalists had more confidence in the Republican party than in the Democratic on this point, judging from indications.

Another domestic question, a good deal outside of party lines, was that of civil-service reform. The "spoils" system, treating the entire civil service of the country as the prize to the victors of the Presidential election, and as a means of maintaining at the public expense a body of working electioneerers for the party and the leading politicians, had thoroughly demoralized that service, was demoralizing Congress and high office, and sapping the foundation of our popular system. The war, the debt, the increased taxation, and the direct taxes and imposts had vastly increased this army of office-holders, and added to their political power and their opportunities for peculation and extortion. A strong public sentiment had arisen which demanded such a reform as should make the tenure of these offices independent of political opinions, and especially independent of the members of Congress within whose States or districts the offices lay, and secure the office to the holder during good behavior, though limited by time. In 1871, Congress passed a resolve authorizing the President to prescribe rules for admission to the civil service which should best secure fit officers and promote efficiency, and made an appropriation to enable the President to appoint a commission. But it was too much to expect that members of Congress would renounce this great patronage which was practically in their hands, and the control of which gave them so much political power in their States and districts; and accordingly Congress has done nothing upon the subject except to throw the responsibility of doing something upon the President, without the aid of any legislation. In this shirking of duty one party has been about as much in fault as the other. The "spoils" system had been the system of the country for forty years, and there was no interest in its overthrow except on the part of the citizens at large, who were what is called outside of politics. Pres. Grant in 1871–72 caused an investigation by a commission, and laid down certain rules, but the deep springs could not be reached without legislation, and the departments did not adhere to the rules in stress of politics or of strong personal favor.

Out of this state of things a convention of what was called Liberal Republicans was called to meet at Cincinnati in May, 1872. It was necessarily a mass convention, as it had no organized party behind it to elect delegates. Its platform was a pledge not to reopen the questions settled by the Thirteenth, Fourteenth, and Fifteenth amendments and the system of reconstruction, a demand for the immediate removal of all civil and political disabilities at the South, a thorough civil-service reform, and the speedy return to specie payment. The candidate the convention intended to put up was Mr. Charles Francis Adams, but at the last moment the convention, being a mass convention, was *captured* by adroit politicians who cared nothing about the platform, and they carried the nomination of Mr. Horace Greeley. This was practically a deathblow to the new party. But the Democratic national convention, conscious that they had little or no chance of carrying a candidate against both Grant and Greeley, took the extraordinary course of nominating Mr. Greeley, in the hope of securing the votes of the dissatisfied Republicans, although Mr. Greeley was not and had never been a Democrat, but the earnest advocate of opinions and measures as opposite to theirs as possible. Some leading Democrats, regarding this measure as unprincipled and dangerous, called a convention and nominated Mr. Charles O'Conor for President and Mr. John Quincy Adams for Vice-President. Although these candidates declined to stand, they received some votes, and the protest a good deal weakened the Democratic party at the polls. The Republican convention met at Philadelphia in June, 1872. It repeated its former resolutions on the subject of reconstruction and civil rights, advocated a reform in the civil service, so that not zeal for party or candidates but honesty and capacity should be the test of office, and declared that the people expected a speedy resumption of specie payments. The Democratic party pledged itself not to reopen the questions settled by the three amendments to the Constitution, but demanded immediate removal of disabilities, and denounced the Civil Rights bills and the whole course of the administration at the South as tending to the overthrow of State Rights, the centralization of power at Washington, and the substitution of military for civil government. The three parties agreed in demanding some sort of civil-service reform, but the Democratic resolve on that point was weak and equivocal. They all agreed in favoring a speedy return to specie payments. At the election Gen. Grant received 3,597,070 votes, and Greeley 2,834,079 votes, being a majority over Greeley of 762,991. Of the former slave States, Grant received the votes of 8, and Greeley of 6.

During the second administration of Gen. Grant the policy of what is called "inflation"—meaning the issuing of more paper-money and the indefinite postponement of a return to specie payment—was urged by certain politicians and editors and by popular conventions. The President committed himself thoroughly and earnestly against all such schemes and in favor of a specie basis for payment and business. And in this he has been sustained by his cabinet, a considerable majority of Republicans in Congress, and by, to all appearances, a decided majority of the Republican party. Still, a few leading Republicans have committed themselves to the paper-money theory. The position of the Democratic party on the subject of inflation is more equivocal. Of its State conventions in 1875, some committed themselves to the inflation policy, some equally to specie payment, and several were equivocal. No Republican State convention adopted resolves in favor of inflation, a few were equivocal, but far the greater part supported a return to specie payments in the strongest terms. These facts, the unequivocal position of Gen. Grant, and the appearance of an increased confidence on the part of the inflationists since the elections of 1875, which secured to the Democrats the House of Representatives, give rise to a general impression that a return to specie payments will be less certain under a Democratic than under a Republican administration hereafter. Yet it is by no means certain that the Democratic party may not return to the position respecting bullion which it held in the preceding generation.

No progress has been made in civil-service reform, for the working politicians of neither political party seem disposed to take it up. They prefer the simplicity and power of the "spoils" system, in which they were educated. A great deal of pecuniary corruption has been developed in public life, whether political or civil. This is attributed by many to the effects of the war upon the habits of society, and the fluctuations in the values of everything caused by the depreciated paper-money. On the other hand, it is fairly to be said that the Republican party has not attempted to conceal the misconduct of its officers, but has itself instituted more thorough and public researches and investigations into all branches of administration than have ever been known in our political history.

The Republican convention of 1876, for the nomination of President, met at Cincinnati on June 14. It was an assembly of great respectability in the character and distinction of its members. In respect to its modes of proceeding it made one change of value. This was, that after a State had announced its vote by its chairman, it should not be altered except to correct mistakes. This rule prevents the sudden rush that sometimes occurs, under excitement, in favor of an apparently gaining candidate. A vote of the convention, passed by a large majority, in the case of the Pennsylvania delegation, made a rule for that convention that a delegate had a right to have his vote announced by the chairman of his delegation and counted in the ballot when he differed from the majority of his delegation, although all the delegates from his State were chosen by a general convention of his State, and not by districts, and the general convention had ordered that the vote of a majority of the delegation should be the vote of the entire delegation as a unit. This rule, if adhered to in future conventions, will tend to diminish the vast power held by the leading political managers in the great States.

The important resolutions were adopted unanimously and without debate. The resolution on the subject of specie payment was as follows: "*Fourth.* In the first act of Congress signed by Pres. Grant the national government assumed to remove any doubts of its purpose to discharge all just obligations to public creditors, and solemnly pledged its faith to make provision at the earliest practicable period for the redemption of the U. S. notes in coin.

Commercial prosperity, public morals, and the national credit demand that this promise be fulfilled by a continuous and steady progress to specie payment." That on civil-service reform was as follows: "*Fifth.* Under the Constitution the President and heads of departments are to make nominations for office. The Senate is to advise and consent to appointments, and the House of Representatives is to accuse and prosecute faithless officers. The best interests of public service demand that these distinctions be respected—that Senators and Representatives, who may be judges and accusers, should not dictate appointments to office. The invariable rule for appointments should have reference to the honesty, fidelity, and capacity of the appointees, giving to the party in power those places where harmony and vigor of administration require its policy to be represented, but permitting all others to be filled by persons selected with sole reference to the efficiency of the public service and the right of citizens to share in the honor of rendering faithful service to their country." There were resolutions in general terms pledging the party to the permanent pacification of the South and the protection of all its citizens in the full enjoyment of all their rights. The only other resolution of much significance was on the public-school system: "*Seventh.* The public-school system of the several States is the bulwark of the American republic; and, with a view to its security and permanence, we recommend an amendment to the Constitution of the U. S. forbidding the application of any public funds or property for the support of any school or institution under sectarian control."

On the seventh ballot Rutherford B. Hayes, governor of Ohio, was nominated for President, and Hon. William A. Wheeler of New York was afterward nominated for Vice-President, both known to be thoroughly in favor of hard money and civil-service reform, to which, now, the Republican party is strictly committed.

The Republican party claims to have been the party which alone effectually resisted the progress of the slave-power and staked its existence upon that conflict. It claims to have saved the Territories and the new States for freedom; to have carried on successfully the largest civil war of modern (perhaps of any) times; to have abolished the most powerful and deeply-rooted system of slavery known since the Middle Ages; to have reconstructed the broken-up governments of ten States, preserved the public faith unbroken, organized the public debt and commenced its steady reduction, disbanded peacefully vast armies and navies and led back the country to the paths of industry and peace; and to have done all this often against the opposition of, and oftener without effectual aid from, their political opponents.

RICHARD H. DANA, JR.

Repudia′tion [Lat. *repudiare*, to "cast off"], an act by which an administration declines to be bound by the debts contracted by the governments which have preceded it. In European history there are numerous instances of a government annihilating a portion of its debt by converting it into a lower denomination, and similar instances have occurred in Mississippi and Pennsylvania.

Repul′sion [Lat. *repellere*, to "drive back"], that force or agency inherent in matter which prevents its particles from coming into absolute contact. The fact that all substances contract by cooling, or that certain fluids when mixed have less volume than in an unmixed state, can be explained only by supposing there is no absolute contact between the particles of which the substances are composed: this separating power is generally called repulsion.

Reque′ña, town of Spain, province of Valencia, is a handsome and prosperous place. P. 7709.

Re′quiem [Lat. accusative of *requies*, "rest"], the first word of the Introit of the mass "for the faithful dead" in the Roman Catholic Church. Hence, the term designates the whole mass or any solemn funeral music.

Requier′ (AUGUSTUS JULIAN), b. at Charleston, S. C., May 27, 1825, of French parentage; was admitted to the bar 1844; was district attorney for the southern district of Alabama 1853–61, and held the same office under the Confederate government. Author of the dramas *The Spanish Exile* (1842) and *Marco Bozzaris* (1846), of a romance, *The Old Sanctuary* (Boston, 1846), and of a volume of poems (1860).

Requisi′tions [Lat. *requirere*, to "seek again"] and **Contribu′tions,** in the international laws of war, have not always been distinguished. Calvo, after De Garden, draws this line between them: that a *contribution* is what the inhabitants of a country occupied by an invading army are forced to pay or give in order to secure themselves from pillage, while a *requisition* is the demand made by the military authorities that the inhabitants shall place things, and even persons, at their disposal. There is no absolute difference in the use of the words. A contribution is especially a payment in money, whether for the purpose of carrying on civil government in the occupied district or for general military uses; a requisition is something, as breadstuffs, wagons and horses, wood, etc., needed for the subsistence or for *special* uses of the invading army. We call them all requisitions, and lay no stress on any discrimination. To account for them, especially for contributions, as payments for exemptions from pillage, is absurd; for pillage is barbarous, and in modern warfare the principle is that war is not waged against a quiet private person, and that his property is in general safe. But the necessities of an army of occupation for food and clothing, as well as the immediate needs of war, and outrages done by *tirailleurs* and by people without any license, who yet are sympathized with by the district, have made summary and harsh impositions seem just and necessary. No absolute rule can without difficulty be laid down, and the temper of a commander, the false information he receives concerning the plots of the conquered province, will sometimes give rise to severities of a deplorable character.

The following rules will express what the regulations of war ought to be, except in circumstances of extreme necessity, or where severe punishment on towns or communes is called for by their conduct: (1) The private citizen, nowise concerned in the war, is not to be treated as an enemy, and his property is to be respected. (2) The civil government in occupied territory must go on, under control of the invading commander, at the expense of the inhabitants. For this end taxes must be raised as before. (3) Special services for the army, supplies of food, and other necessaries ought to be paid for sooner or later, and for this end receipts should be given. (4) It is an unjust rule to make war pay for war. Wrongs ought to be repaired at the making of a peace. (5) For penalties on a town or district in the way of fines, or of bodily inflictions on a principal inhabitant, or of burning, which has been threatened even in quite recent times, there is very seldom a sufficient justification. Nor do severe requisitions or wholesale punishments do any good. Napoleon in his *Memoirs* acknowledges that the excesses in the way of requisitions during the war with Spain contributed not a little to the French reverses in the Peninsula.

We close this article by citing some modern opinions on this important but, unhappily, somewhat indefinite subject: (1) In *The Instructions for the Armies of the U. S. in the Field* the rightfulness of seizing private property is limited to cases of necessity, and the spoliated owner is declared to be entitled to a receipt, that he may obtain indemnity. (Comp. vol. ii. of this *Cyclop.*, p. 1252, col. 2.) (2) Massé concedes to an enemy the right of forcing merchants or others to supply his army with the necessary provisions, but on condition of purchasing them at a certain price determined in advance. (3) Heffter is more harsh. According to him (§ 731 of his *Völkerr.*) the enemy can impose and exact contributions, demand products of the soil and personal services; in case of necessity or resistance can even take them by force, leaving all adjustments to the political arrangements of the future. A definite limit to the right of taking cannot be laid down, for there is no measure of rights in war. (4) Bluntschli (§ 653), after speaking of what the population of an occupied province ought to be required to do for an army of occupation, adds, "All these services furnish ground, according to circumstances, for compensation. We must distinguish between services which can be demanded simply on the score of war, and obligation of the population to pay taxes—the extent of which is either defined by legislation or by practice, and in regard to which, in these particulars, much must be left to the discretion of the commander—and services which go beyond this measure, and therefore, by natural law, are to be called for only as giving a right to compensation. But," he adds, "this duty of compensation is hard to be reduced to rule, and harder still to be carried through in practice." (5) Calvo (§ 905) admits, with most authors, that an army occupying an enemy's territory may demand from the communes or from the inhabitants that which is necessary for its support and movements, but these requisitions ought to be limited to things absolutely indispensable. (6) Gen. Scott in Mexico refrained from requisitions, paid for provisions, and took nothing by force without indemnifying those who held the property, except on rare occasions, when it was impossible to act otherwise. (Comp. esp. *Calvo*, § 903.) (7) The project of an international declaration concerning the rules and usages of war, adopted at Brussels in 1874, which differs somewhat from the project submitted by Russia at the same congress, but not, as we think, for the better in respect to requisitions, contains the following provisions: *Art. 40.* "As private property ought to be respected, the

enemy shall not demand from communities, nor from their inhabitants, articles or services except such as relate to the necessities of war generally acknowledged, and are proportionate to the resources of the country, and which do not imply for the population the obligation to take part in the war against their country." *Art. 41.* "The enemy levying contributions, whether as an equivalent to imposts or to objects to be furnished in kind, or by way of fine, shall proceed therein, as far as possible, only according to the rules of repartition and the plan of imposts in use in the occupied territory. For every contribution a receipt shall be given to the person making the payment." *Art. 42.* "Requisitions shall be made only with the authorization of the commander of the locality occupied. For every requisition an indemnity shall be granted or a receipt delivered." A part of the Russian project which was not accepted is worthy of notice: § lii. "The enemy can demand from the local population all the imposts, services, and dues, in kind or in money, to which the armies of the legal government have a right." (Comp. the *Introd. to Internat. Law*, by the author of this article, § 130.)

T. D. Woolsey.

Resa′ca de la Pal′ma, a ravine covered with palm trees in the immediate vicinity of Brownsville, Tex., noted for the battle fought May 9, 1846, by Gen. Zachary Taylor, who with 2000 American troops defeated a larger force of Mexicans under Gen. Mariano Arista. This was the first formal engagement of the Mexican war, and led to the claim that "war existed by the act of Mexico."

Resec′tion [Lat. *resectio*], or **Excision of Joints,** an operation devised to supplant amputation of a limb where a joint is hopelessly diseased by removing the diseased part only, and thus giving the patient a limb which, although of limited use, in the majority of cases is better than an artificial one. The operation, as a rule, is a much safer one than amputation, but there are various circumstances which must be considered before it is resorted to, else in many cases amputation would have to be performed secondarily. A large or important joint should never be excised while any chance of recovery without such surgical interference remains. Excision should always be preferred in the upper extremity when it promises motion of any of the joints. In the hip it should always be done, if possible. In the knee it is less often done, because of the stiff joint remaining, which is much inferior to one of the perfected artificial limbs; and besides, the injuries to the knee requiring operation are generally very extensive, and often after excision has been practised amputation has to be resorted to, thus subjecting the patient to two operations, both of them severe.

Edward J. Bermingham. Revised by Willard Parker.

Reserva′tion [Lat. *reservare*, to "keep back"], **Mental,** a form of speech by which the speaker conceals the truth by withholding some words which are necessary to convey his meaning fully; as, for instance, when a man to the question, "Have you seen that man before?" answers "No," though he is an intimate friend of his, adding by a mental reservation the words "not to-day." This form of casuistry, which, together with equivocation, was largely practised by the Jesuits and defended by their moral philosophers, is treated in a most brilliant manner and with crushing superiority by Pascal in his *Provincial Letters.*

Reserve′ [Lat. *reservare*, to "keep back"], a portion of an army kept back or so stationed that it may be used as a support or *reserve* to those portions immediately engaged in battle; or, more generally, a portion of the military force of a nation reserved from active operations in face of the enemy, in order to meet exigencies or to support, in case of need, armies actually engaged. (See War.)

Reserve, tp., Parke co., Ind. P. 1387.

Reserve, tp., Ramsey co., Minn. P. 429.

Reserve, tp., Allegheny co., Pa. P. 1600.

Reservoir′ [Fr.], an artificial basin for storing water. Atmospheric vapor precipitated in the form of rain or snow is the ultimate source of all supplies of water. The descent of water from the atmosphere is intermittent, occurring at comparatively rare periods, often with long intervals of dry weather. Without reservoirs, either natural or artificial, the flow of water-courses would be intermittent in an almost equal degree, and a continuous supply of water for motive-power or other uses would be unknown. Natural reservoirs consist of (1) Accumulations of snow, and, in elevated regions, of ice, which by gradually melting tend to equalize the flow of streams. (2) Natural lakes and ponds, which during violent rains receive more water than they discharge. (3) Swamps and extensive level areas, which by reason of their flatness retain the water falling on them or flowing from higher ground, allowing it to escape very slowly. (4) The vast layers of porous gravel and sand forming so large a portion of the earth's exterior, into which rain-water sinks and slowly reappears at lower levels in the form of springs.

Notwithstanding these equalizing agencies, the flow of streams varies between very wide limits, never remaining uniform for any considerable time. The greater part of the water of heavy rains finds its way directly into the water-courses, causing a useless and often destructive increase of their volume. During intervals of dry weather the natural reservoirs, except the first named, furnish a constantly-diminishing supply. Moreover, the progress of agriculture and the increase of population tend to impair the efficacy of natural reservoirs. The occupation of extensive districts by buildings and paved streets, and the drainage of swamps and fens, throw great volumes of storm-water directly into streams which would be otherwise held back for longer or shorter periods.

A manufacturing establishment depending entirely upon water for its motive-power must be proportioned in accordance with the least quantity of water that the stream can furnish. Without artificial reservoirs this is never more than a fraction, and often but a small fraction, of the average quantity conveyed by the stream. The minimum quantity of water carried by Merrimack River at Lowell, not counting the aid derived from artificial reservoirs, is not more than one-third the average flow. In the drainage-ground supplying the city of Brooklyn the minimum flow was less than one-fourth the total rainfall. On the Croton River, at the dam built for the New York waterworks, the minimum was not more than one-twelfth the total rainfall. Some streams in granite districts do not flow much longer than the rain lasts, being torrents at that time and practically dry at all others. The Weser in Germany carries 75 times as much water in extreme flood as in extreme low water, and the Ems 130 times as much. These fact exhibit in a striking light the utility of storage reservoirs. By retaining flood-water for use in times of scarcity they offer the means of increasing from twofold to tenfold the natural available water-power and water-supply of streams. Their application and extension will also be attended with results no less salutary as regards agriculture and inland navigation. Their tendency is ever to restrain the extravagance of nature, preserving lands from submersion, and maintaining streams in moderate flow—a condition so essential to the requirements of commerce.

Reservoirs are usually formed by constructing a dam across the valley or channel of a stream; the outlet of a natural lake often presents a favorable locality. Such localities are often very unfavorable to the construction of dams, the ground being composed of sedimentary or alluvial material to a great depth; and such works are often among the most difficult of engineering. When not founded upon rock, such dams are usually made of earth with a wasteway of stone for discharging superfluous water. The best construction consists in cutting a trench across the valley down to rock, and filling it with clay or impervious material called puddle, which is clay mixed with suitable gravel. In this country, from economical considerations, a row of sheet-piling is ordinarily substituted for the puddle trench. The body of the dam is composed of binding gravel, or gravel containing some mixture of clay. It has a central wall or else an inner facing of puddle carefully mixed and compacted. The water is drawn from the reservoir generally through iron pipes. They are sometimes laid in the earthwork of the dam, but preferably in a gallery excavated in the natural earth. They are sometimes laid over the top of the embankment and operate as syphons. The wasteway is arranged to let the water escape before it rises high enough to run over the earthwork. It is usually constructed of heavy stones, so as to conduct the water by a series of low falls down to the level of the stream.

There are in Massachusetts over 300 reservoirs in connection with water-power; many exist in other parts of New England. A large number also exist in the State of New York for supplying the canals. A vast system of reservoirs exists in India, constructed for purposes of irrigation. One is mentioned having a dam or embankment 12 miles in length; the Cummum Tank had an area of 8 square miles. Its embankment was upward of 100 feet high. The Lake of Minery is 20 miles in circumference. Its embankment is over a mile long, covered with lofty trees. It is 2000 years old, and still in use. These vast works were made of earth scraped up with rude instruments and carried on the heads of men, women, and children. Many years were occupied in their completion.

Terrible accidents have sometimes resulted from the breaking of imperfectly-constructed reservoirs. By the failure of the Dale Dyke reservoir at Sheffield, England, in Mar., 1864, some 300 lives and an immense amount of property were destroyed. This reservoir was constructed

for furnishing water to mills at Sheffield. It contained about 78 acres, and its embankment was some 95 feet high at the highest part. By the breaking of a reservoir at Williamsburg, in Hampshire co., Mass., May 17, 1874, over 150 lives were destroyed and more than $1,000,000 worth of property. This reservoir contained about 100 acres. The dam at Estrecho de Rientes, in Spain, gave way Apr. 30, 1802, laying waste a large extent of country, drowning some 600 people, and destroying property valued at $7,000,000. J. P. FRIZELL.

Reshd, town of Persia, cap. of the province of Ghilan, about 2 miles from the Caspian Sea, is well built and contains many bazaars and caravanserais. It is the chief entrepôt for the trade in silk, large quantities of which are sent from here to Russia, Persia, and Turkey; iron goods and metal ware are imported. Its port on the Caspian Sea is Enzelli, and the communication between this place and Reshd is the worst possible. There is no road, the soil is a swamp or a sheet of mire, and when in dry seasons this threatens to become too easy to pass, the inhabitants bring about an artificial inundation in order to extort a higher price from travellers. P. 23,500.

Reshid' Pa'sha (MUSTAPHA MEHEMET), b. at Constantinople in 1802; educated by his brother-in-law, Ali Pasha, and entered the civil service of the Turkish government, in which he subsequently held the highest positions and played a most conspicuous part. As a man of great attainments and a just appreciation of modern civilization, he became the leader of the party of reform, and allied himself closely with France and England against the stubborn old Turkish party and the influence of Russia. At the death of Mahmood II., in 1839, and the brilliant victory of Ibrahim Pasha at Nisib over the Turks, he was recalled from Paris, whither he had gone as ambassador, and placed in charge for the second time of the ministry of foreign affairs. By the hattisherif of Gulhane (Nov. 3, 1839), a sort of constitutional charter, he created considerable sympathy in Europe for the cause of the sultan, and shortly after he succeeded in forming the quadruple alliance which saved Turkey and compelled Mehemet Ali to give up all his conquests outside of Egypt. Nevertheless, he had to resign his office in 1841, baffled by the intrigues and machinations of the old Turkish party. He was grand vizier from 1846 to 1852, and was recalled to power in 1853 on account of the increasing difficulties with Russia. Again a brilliant epoch opened in his life, but toward the close of the Crimean war he was superseded by some of his own party; his partiality for England, his distrust of France, and the great vigor the latter power displayed overthrew him. By English influence he came into power a fifth, and even a sixth time, but he was not able again to impress his enemies and satisfy his friends, and his influence was wholly gone when he d. Jan. 7, 1858. Many of his civil reforms, especially the commercial treaties he concluded with England and France, have proved very beneficial to his country.

Resi'na, town of Italy, province of Naples, on the sea-shore between Portici and Torre del Greco, and enjoying the same enchanting climate, with similar advantage of position. In its neighborhood are many beautiful villas, the best known being La Favorita, the principal hall of which is encrusted with marbles from the palace of Tiberius at Capri; the luxuriant gardens extend to the water and are open to the public. Resina was one of the flourishing towns of Campania which shared the fate of Herculaneum and Pompeii. The ruins of the ancient theatre and a few statues and inscriptions are all that remains of its former greatness. P. 12,000.

Resinar', town of Austria, in Transylvania, carries on an active trade in grain, wool, wood, and all kinds of agricultural produce. P. 5700.

Resins. See GUM-RESINS and ROSIN, by PROF. C. F. CHANDLER, Ph.D., M. D., LL.D., M. N. A. S.

Resist'ance [Lat. *resistere*, to "withstand"] **of Fluids.** When a solid body floats or is immersed in a fluid, both being at rest as regards one another, the lateral pressure upon each side of the body is balanced by an equal pressure upon the opposite side. The pressure acting from B toward A (Fig. 1) is exactly equal to the pressure acting from A toward B. As soon, however, as the body commences to move this equality of pressures no longer exists. The pressure on the forward side A becomes greater than before; that on the rear becomes less. The particles of fluid in front of the body must be put in motion, and flow right and left to allow the body to pass. On the other hand, the movement tends to leave a void in rear of the body. Both of these actions operate as resistances to the movement. The resistance depends very much upon the form of the moving body. A form which requires sudden movement and abrupt change of direction in the particles of fluid meets with great resistance. A body shaped like Fig. 2 meets with greater resistance than one shaped like Fig. 3, which does not produce so abrupt a movement of the fluid, and still greater than Fig. 4, which pushes the fluid gently aside, and allows it to fall into its place in the rear without any abrupt change of movement.

FIG. 1.

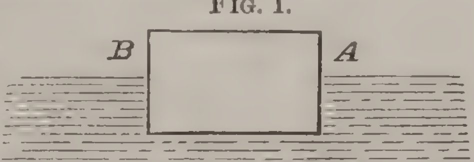


FIG. 2.

FIG. 3.

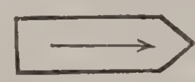
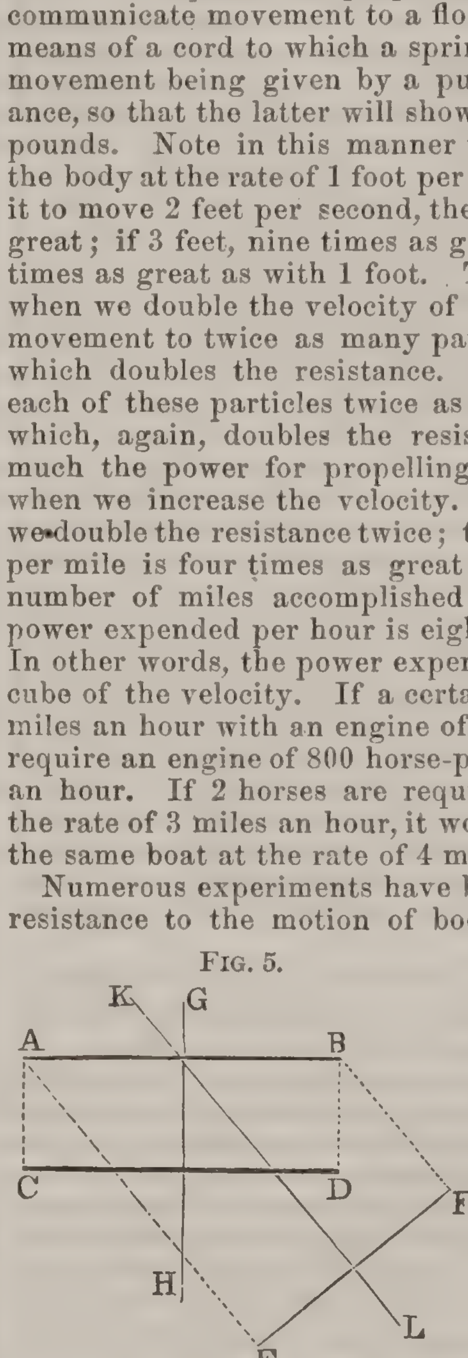


FIG. 4.

The resistance is proportional to the square of the velocity. To explain this proposition more fully, suppose we communicate movement to a floating body of any form by means of a cord to which a spring balance is attached, the movement being given by a pull on the hook of the balance, so that the latter will show the amount of the pull in pounds. Note in this manner the pull required to move the body at the rate of 1 foot per second. If, now, we cause it to move 2 feet per second, the pull will be four times as great; if 3 feet, nine times as great; and if 4 feet, sixteen times as great as with 1 foot. The reason for this is, that when we double the velocity of the body we communicate movement to twice as many particles of water as before, which doubles the resistance. We also communicate to each of these particles twice as great a velocity as before, which, again, doubles the resistance. We see here how much the power for propelling boats must be increased when we increase the velocity. By doubling the velocity we double the resistance twice; that is, the power consumed per mile is four times as great as before. But since the number of miles accomplished per hour is doubled, the power expended per hour is eight times as great as before. In other words, the power expended is proportional to the cube of the velocity. If a certain steamboat could run 10 miles an hour with an engine of 100 horse-power, it would require an engine of 800 horse-power to move her 20 miles an hour. If 2 horses are required to tow a canal-boat at the rate of 3 miles an hour, it would require 5 horses to tow the same boat at the rate of 4 miles an hour.

Numerous experiments have been made to determine the resistance to the motion of bodies of different forms in water. Some results, believed to be approximately correct, are given below. The resistance is given for a velocity of 1 foot per second. For any other velocity the resistance must be multiplied by the square of the velocity. It is expressed in pounds per square foot on the projection of the body upon a plane perpendicular to the direction of its motion. This phrase will be understood by reference to Fig. 5. Suppose the body to be a flat plate A moving in the direction G H. Thus, its projection on the plane perpendicular to the direction of its motion is C D. If it be moving in the direction K L, its projection is E F.

FIG. 5.



	Pounds.
For a thin horizontal plate rising vertically upward	2.72
" sphere	0.42
" right cylinder with height equal to diameter, moving endwise	1.77
" cylinder of the same proportions terminated by a right cone, the height of the cone being twice its diameter	1.39
About 4 times do.	1.03
" 8 " "	0.91
" 12 " "	0.84
Same cylinder with its forward end rounded spherically	0.77

Dubuat found for a thin vertical plate moving horizontally a resistance not more than half that given above. From very careful experiments made by Morin, an officer of the French engineer corps, the resistance to boats in a canal, the canal being three or four times the width of the boat, is about one-fifth of a pound per square foot of immersed section for a velocity of 1 foot per second. This shows that the width or depth of the canal affects the resistance, as vessels in the open sea do not meet with more than half as much. A curious fact in the towing of boats was observed by Morin. A wave always accompanies the boat, usually

spreading from the middle of the boat, or thereabouts. When the wave, by the slackening of the speed, moved forward and stood at the prow, the resistance was very much increased, being in most cases more than twice as great as when the wave was in its ordinary position.

The resistance of air follows practically the same law as that of water, the only difference being that which results from its elasticity. The movement of a body in air has the effect to condense the air, to some extent, in front, and to rarefy it in the rear. When, therefore, a body moving in air changes its velocity, the resistance changes in three ways: (1) By changing the quantity of air put in motion; (2) by changing the velocity with which it is put in motion; and (3) by momentarily changing in some slight degree its density or weight. Nevertheless, except for very rapid movement, as in the case of war-projectiles, it is for common purposes sufficiently accurate to say that the resistance is proportional to the square of the velocity. Experiments upon the resistance of air have been made by many investigators, especially, in later times, by M. Thibault, an officer of the naval service of France, and by Gen. Morin, above referred to. The former attached flat plates or vanes to the extremity of a long arm turning upon a vertical axis, to which a rotary movement was communicated by a cord and weight. Morin observed the time occupied by similar plates in falling from a considerable height. From these experiments it results that the resistance to a plain surface at a velocity of 1 yard per second is about 0.1295 pounds per square yard. For any other velocity this resistance must be multiplied by the square of the velocity in yards per second. To be very exact, we must add to this result one-fifteenth of a pound per square yard, whatever the velocity may be. This is correct when the surface is perpendicular to the line of its motion, as, for instance, when the surface A B (Fig. 5) moves in the direction of G H. It is also nearly correct when the surface is considerably inclined to the line of its motion—that is, when the surface moves quartering, as when the plane A B moves in the direction K L. In this case E F must be regarded as the width of the surface, since it displaces the same quantity of air as A B when moving in the line K L. When the surface is inclined to the direction of motion at an angle less than 45°, the resistance is less than indicated above.

The resistance on a convex surface is less than that on a plane surface, and that on a concave surface is greater than on a plane. For a hemispherical dish the resistance is two and a half times as great with its concavity in front as with its convexity. A very useful application is made of this property in the construction of an instrument for measuring the velocity of the wind. It consists of two hemispherical cups attached to the opposite ends of an arm which is mounted at the centre upon a light vertical axis. The cups are turned in opposite directions, so that the wind acts always upon the hollow of one and the back of the other, causing the axis to rotate with a greater or less velocity depending upon the velocity of the wind. The resistance on such a cup moving back foremost with a velocity of 1 yard per second is about one-tenth of a pound per square yard of area—in the opposite direction, one-fourth of a pound. The area is the projected area—that is, the area of the rim.

A parachute is a very large and strong umbrella designed to enable a man to descend from a great height. It meets with the same resistance as the cup moving with its rim in front. As its velocity increases by the action of gravity, the resistance increases until it becomes equal to the weight, after which the descent is uniform. A man dropped from a balloon at a great height and provided with a parachute, supposing man and parachute to weigh 160 pounds, would descend with an increasing velocity till the resistance of the air amounted to 160 pounds, after which he would descend uniformly till he reached the ground. Supposing the diameter of the parachute to be 12 feet, he would reach the ground with a velocity of 21¼ feet per second, and would receive no greater shock than in jumping from a height of 7 feet. J. P. FRIZELL.

Resolu'tion [Lat. *resolutio*], in musical harmony, the movement or progression of a dissonance into any one of the consonant harmonies for which it creates in the ear an expectation. (See MUSIC.)

Respira'tion [Lat. *respirare*, to "breathe"], the special function of the lungs, the process which has for its ultimate object the supplying of red blood-globules with oxygen for transmission to the various parts of the body. To accomplish this result, atmospheric air must be introduced frequently and continuously, an extensive surface of contact for air and blood must exist, and the effete products of the chemico-vital interchange must be exhaled. Respiration includes the physical acts of inspiration and expiration, but physiologically consists in the revivifying of the blood by the oxygen of atmospheric air, and the steadily reinforced nutrition of the body which results. Respiratory action of the lungs is involuntary, although it may be voluntarily modified. The *besoin de respirer*, or involuntary incentive to breathe, is the result of impressions received by the medulla oblongata from the several regions of the body, which constantly demand oxygen, and transmitted to the respiratory muscles of the thorax and abdomen. From eighteen to twenty respiratory acts take place per minute, at each of which an average of about 26 cubic inches of air is inspired and expired. This definite volume of air which ebbs and flows is termed *tidal air*. In addition, fully 100 cubic inches of air, unaffected by respiratory movements, remain in the smaller bronchi and air-sacs, and are termed *residual air*. Tidal inspiratory air is fresh and pure; it enters as far as the fourth bronchi, and becomes a part of the relatively impure residual air. Tidal expiratory air contains carbonic acid gas, which is exhaled and removed from the body. Each inspiratory act, therefore, adds an increment of oxygen to the bulk of air in the lungs; this oxygen, by the law of diffusion of gases, permeates the residual air and reaches the air-sacs. The air-sacs are thin-walled; indeed, their walls are essentially a network of capillary vessels held together by a film of elastic tissue. In the aggregate, the walls of the innumerable air-sacs constitute a surface of many hundred square feet, upon which the *rete mirabile* or delicate network of capillary blood-vessels is spread. The pulmonary artery brings impure or venous blood to this extensive surface, carbonic acid gas is exchanged for oxygen, and the purified, reddened, oxygenated blood is returned by the pulmonary vein to the left side of the heart, thence to be propelled through the entire circulation. The red blood-globules are the carriers of oxygen, and the full object of the preliminary respiratory efforts and the intermediate chemico-vital interchange is really attained as these red globules yield their quota of oxygen to the cells and tissues which constitute the body.

E. DARWIN HUDSON, JR. REVISED BY WILLARD PARKER.

Respiration in Plants, a term under which were formerly comprised two distinct groups of phenomena—viz. (1) the disengagement of oxygen from carbonic acid by green tissue in the sunlight; and (2) the formation of carbonic acid in plants by the process of oxidation. In some treatises the first is called *chlorophylline respiration*, and the second *general respiration*. The first is associated with assimilation, while the word *respiration* is best restricted to those processes which are characterized by the production and evolution of carbonic acid. It was formerly doubted by many botanists whether healthy plants ever give off carbonic acid, but it is now understood that plants have a true respiration analogous to the respiration of animals. (The phenomena of respiration in plants are described under VEGETABLE PHYSIOLOGY.) ASA GRAY.

Res'pirators, mouth-pieces of fine gauze and cloth, to be worn by patients with diseased or weak lungs to prevent the ingress of cold and damp air or foreign matter, as smoke, dust, or the grit of stone. But little used in this country, they are employed in England and in many vocations, as by grinders, stone-carvers, and wherever the air is permeated by impalpable particles.

E. DARWIN HUDSON, JR. REVISED BY WILLARD PARKER.

Respi'ratory Sounds, the sounds produced by inspiration and expiration, as heard by the method termed auscultation, the application of the ear to the chest directly, or indirectly through the medium of the stethoscope. If the entire period of a respiratory act be represented by ten, inspiration will occupy five-tenths of this period; expiration immediately follows during the succeeding four-tenths; and finally a period of silence and rest from breathing during the supplementary period of one-tenth. During the entire period of the inspiratory act the ear applied to the healthy chest detects a clear, full, breezy or blowing sound, gentle at its commencement, full and well defined at its middle, and graduated and faint as it is terminating. The inspiratory sound is soft and low-pitched in adults; in children is ruder and exaggerated, possessing tubular or friction quality. Expiratory sound is comparatively faint, occupying but a small part of the period of the expiratory act. It also is soft and low-pitched, but more feeble and distant than inspiratory sound, since the recedence of expired air from the chest-wall conducts the sound-waves away from the ear of the listener. Expiratory sound is loudest at its commencement, just as the transition from inspiration has taken place, and gently graduates until it ceases. Inspiratory sound is the result of air-friction with the system of bronchial tubes through which it passes. Hence inspiration is a compound sound, possessing an element of laryngeal origin, elements of

sound developed in the trachea, the large and small bronchial tubes, and especially where the tubes bifurcate; and finally an important element developed by the entrance of air into the numberless air-sacs or pulmonary vesicles. This "vesicular" element of inspiratory sound is a test of the healthy lung. Dr. Leaming further describes a continuous vesicular sound or murmur, which he terms the "true respiratory," the product of incessant expansion of pulmonary vesicles by calorified residual air, incident to the oxygenation of the blood and diffusion of gases—sounds which the trained ear detects as the most certain evidence of healthy functional lung-action. Departures from the normal respiratory sounds are evidences of bronchial, pleural, or pulmonary disease. The sounds are harsh in early bronchitis, replaced or accompanied by "râle" or musical sounds in advanced bronchitis; they are masked or completely obscured by pleurisy; their inspiratory and expiratory periods have changed relations and qualities in asthma and emphysema; and in pneumonia, tuberculosis, and other consolidations of the lung respiratory sounds are brought to the ear with increased intensity and clearness, and much raised in pitch. (For detailed description of respiratory sounds in health and disease see the works of A. Flint, Sr., on the *Respiratory Organs*.)

E. DARWIN HUDSON, JR. REVISED BY WILLARD PARKER.

Respiratory System, in animals. See COMPARATIVE ANATOMY, by PROF. E. D. COPE, A. M., M. N. A. S.

Responden'tia [Lat. *respondere*, "to promise again"], a contract for the loan of money on the security of a ship's cargo or some part thereof, made by the owner of the goods or by the ship's master, with the stipulation that if the goods are wholly lost during the voyage by any of the specified perils, the lender shall lose his entire claim; if not, then he shall receive the sum loaned with the agreed interest. Since this species of contract is in effect an insurance of the cargo by the lender, who takes upon himself all the risks of the voyage, the law permits him to bargain for and to recover more than the ordinary legal rate of interest; and the parties may agree upon any interest proportioned to the exigencies of the case and the risk assumed. This contract in many of its features resembles a bottomry bond, but differs therefrom in the following particulars: One is a loan on the ship, the other on the cargo; in one the money borrowed is payable on the arrival of the ship at her port of destination, in the other, upon the arrival of the goods. In a bottomry bond the vessel itself is always hypothecated, and there is thus created a maritime lien upon her which can be enforced in admiralty by a suit *in rem.* In a respondentia contract there is often no such hypothecation of the goods, and consequent lien, and the lender relies upon the personal credit of the borrower for his payment. By the form of the instrument commonly used in the U. S. the cargo is expressly hypothecated, so that the maritime lien upon it arises; and if it is in existence when the ship arrives at her destination, the creditor can proceed against it by a proper suit in admiralty. The master of a ship may under very special circumstances borrow money upon a respondentia bond, but in that case the necessity both for the loan and for the hypothecation of the goods must be clearly shown, or else the owners thereof are not bound by the master's act. JOHN NORTON POMEROY.

Restigouche' [an Indian word, indicating its division into five head-streams, like the fingers of a hand], a river which separates New Brunswick from the province of Quebec on the N. It is 200 miles long, drains 4000 sq. m., is navigable for large ships 16 miles to Campbelton, and reaches the Bay of Chaleurs at Dalhousie. It is a tidal estuary for some 24 miles. Its lower course is broad and majestic. It is a good salmon-stream, and its basin supplies much timber.

Restigouche, a large county of New Brunswick, the northernmost in the province, bounded N. W. and N. by the province of Quebec, from which it is partly separated by Restigouche River. On the N. E. it is washed by the Bay of Chaleurs. Along the rivers there is very fertile land, but the greater part of the county is an almost uninhabited wilderness. Cap. Dalhousie. P. 5575.

Restora'tionists [Lat. *restauratio*], a name applied to those Christians of whatever sect who entertain the belief that the wicked who die in an impenitent state will, after suitable punishment and repentance, be restored to divine favor, and that all the human race will at last become for ever holy and blessed.

Resurrec'tion [Lat. *resurrectio*, "rising again"]. The resurrection is the future general raising by the power of God of the bodies of the dead. It is a doctrine peculiarly of revelation. Hints of it appear in the Brahmanic and Stoical theories of "returning cycles," the "great year" of Plato, and the Egyptian mysteries. It was definitely taught by the Zoroastrians. It is implied, alluded to, or foretold in the Old Testament (Job xix. 26 (?); Ps. xvi. 10; xlix. 15; lxviii. 18; Isa. xxvi. 19; lxvi. 24; Ezek. xxxvii.; Hos. xiii. 14; Dan. xii. 2). It was believed by most of the later Jews, and appears in the Apocrypha (Wisd. iii. 7; 2 Macc. vii. 9, 14, 23, 29). It was a formal doctrine of the Pharisees, but was disputed by the Sadducees. It was clearly revealed in the New Testament by Christ and the apostles, has been accepted by all parts and ages of the Church, and is a prominent doctrine of Mohammedanism.

As held now, this doctrine rests on the incontrovertible historical fact of the resurrection of Christ. He rose on the third day after his death in the body, which, though changed as to its mode of being, was the identical body which was crucified. He was seen often in different places and circumstances by many witnesses. The proofs of Christ's resurrection rest on his predictions and references to it as a miraculous attestation of his truthfulness; on the testimony and assertions of the apostles, who had been intimate with him for three years, who were cool-headed, and showed their sincerity by dying for the truth of that which they asserted; on the testimony of disciples and friends, who were persons of the highest character and piety; of soldiers, and indirectly of Jews and enemies, who tried to hush up the facts, not to deny them. They rest also on the universal belief of the early Church, the gift of the Holy Spirit according to Christ's promise, the powers given to the apostles, the institution of the Lord's Day, and the Christian religion. It is impossible that in this matter there should have been invention, mistake, collusion, self-deception, or imposture. The fact is beyond doubt. It was the fulfilment of prophecies and promises, the vindication of the past, Christ's triumph over pain and evil, the divine seal, the consummation and confirmation of Christ's work on earth, part of his exaltation, the introduction to his heavenly work and mediatorial kingdom.

The New Testament teaches that all the dead are to rise at the last day to judgment—the good to bliss, the bad to punishment. It speaks of the resurrection of the dead, or from the dead, or of the *body* (σῶμα), not of the *flesh* (σάρξ, *caro*). The creeds and symbols of the Church have generally used the grosser form, the resurrection of the *flesh.* The Gnostics and Manichæans rejected the phrase, because, like the Oriental heathen and the Platonists, whom they resembled in a measure, they despised the body; they taught a merely spiritual resurrection. Most of the Fathers held the gross view, against which the early infidel attacks were directed. Origen first reaffirmed the distinction between the resurrection of the body and the flesh, between the essence and the phenomenal form. Augustine held at first to the spiritual view, afterward to the sensuous, though not in its grosser form. The Alexandrian and Eastern schools held the spiritualizing view—the Western schools, the literal. The Reformers mainly returned toward Origen's interpretation.

The doctrine is maintained by reference to Christ's rising—to the express words of Christ and his apostles (they were false if that was not a fact). It is confirmed by the fact that in a human person there is body as well as spirit. It has been illustrated by the analogies of the renewal of life in seeds and plants, the seasons, the morning, the waxing moon, and the butterfly, etc.

Opponents of the doctrine have maintained that (1) Christ's body was stolen; (2) was resuscitated from a swoon; (3) the belief arose from subjective visions, or (4) grew up as a myth, or (5) from the determination of the disciples not to be disappointed in their projects or hopes, or (6) to meet the prejudices of the Jews; or (7) it was a conscious imposture, or (8) an allegory of the soul after death, or (9) of the regeneration of society, or (10) of the rising from sin, or (11) of the rising of souls from Hades to judgment.

The resurrection of Christ is treated as the fountain, type, and power of a new life—the cornerstone of the Christian system, without which everything falls. It is related closely to every doctrine, and has always been a chief point of attack. The doctrine of the resurrection meets our desires and our intense belief in our indestructible personality. It is part of the antidote of the fall, from which, under the covenant of grace, the whole of human nature is to be redeemed and united to Christ. It gives dignity to the body which was created by God, redeemed by Christ, and is the "temple" and organ of the Holy Spirit. It gives hope and comfort—relief, in part, from the terror of death. It shows the power, love, and truth of God; fulfils the promises and prophecies; confirms the inspiration of the Scriptures; assures us of immortality; shows that the soul and body, united in sin and redemption, will be united in judgment and glory or shame. It confirms the divinity of Christ and his atonement, and is

intimately related to justification, faith, repentance, sanctification, and the whole Christian system. It is the foundation of the Christian week and year.

The resurrection implies the continued identity of the body—that the future body is in essence identical with the present body, one being the veiled germ, the other the glorious development. Concerning identity, it has been taught that (1) all the particles of matter that have ever been in the body are brought together again; (2) only the particles present at death; (3) certain more enduring parts are preserved, as an indestructible corporeal germ from which is made by divine power an organ of the soul adapted to its higher condition; (4) some of the particles remain, however few; (5) there is a "vital germ;" (6) a spiritual, "ethereal, luminous" body is evolved at the moment of death; (7) that the plastic formative principle of life (*anima, psyche*) is continually gathering and casting off the matter it needs for a body wherever it may be. The continuance of the vital principle constitutes identity, however the particles of matter may change, as in a flowing stream. In the case of Christ and those alive at his coming, the body then present supplies the material; in the case of the dead, the anima or psyche gathers in matter as it needs and makes the psychical body. The fundamental "form" or principle of bodily organism, which here appropriates earthly materials, shall in the resurrection appropriate higher materials. (8) That identity is in the spirit (*νοῦς*), the rational, immortal principle which shows itself in the body which it occupies and stamps with its own personality. Identity in an inorganic body—*e. g.* a stone—is in its substance and form; in an organic body, in the whole organism; in a person it rests in the consciousness.

The resurrection body is (1) spiritual (*soma pneumatikon*), as opposed to the "natural" (*soma psychikon*); (2) is like Christ's body; (3) is glorious, powerful, incorruptible, immortal.

The doctrine, held by some, of two resurrections at different times—one of the righteous, to which the New Testament specially refers, and the other of the wicked—rests on (1) the declaration Rev. xx. 5, 6; (2) the use of the phrase "resurrection *from* the dead," used fifty times, and always referring to the good; the phrase "*of* the dead," referring to the bad; (3) on the New Testament distinctions concerning the resurrection of the just and unjust, the resurrection to life or condemnation; (4) the longing of the apostle to attain the first; and (5) on the order given 1 Cor. xv. 23. ISAAC RILEY.

Resurrection, Congregation of the, a society of Roman Catholic priests founded in 1836 at Rome by Rev. J. Kajsiewicz, who d. in 1873. They have a few missions in the U. S.

Resuscita'tion [Lat. *resuscitatio*], or **Artificial Respiration,** consists in motion of the ribs and exchange of air produced by external instead of internal and vital force. The natural exchange of air in respiration is effected by a mechanical process; and when the muscles which conduct it are deprived of their nervous stimulus by poisoning of the nerve-centres, that mechanical process can be kept going or be recommenced by mechanical means, and thus life be rekindled from apparent death. By compression of the ribs the chest-cavities are diminished, and a proportionate quantity of foul air is forced out by the mouth. On relinquishing that compression, the ribs by their own elasticity bound back to their former position, the chest-cavities are enlarged, and the air (if that be the surrounding medium) is sucked in to prevent a vacuum. Whatever the method, it is upon this principle alone, with the observance of proper alternation and rhythm, such an exchange of air can be effected as to be a substitute for natural breathing. Its use is in suspended animation from suffocation, as in drowning and hanging, also from vapor of chloroform or other noxious gases, in which, death occurring from exclusion of air, a supply of air to the lungs is the one remedy.

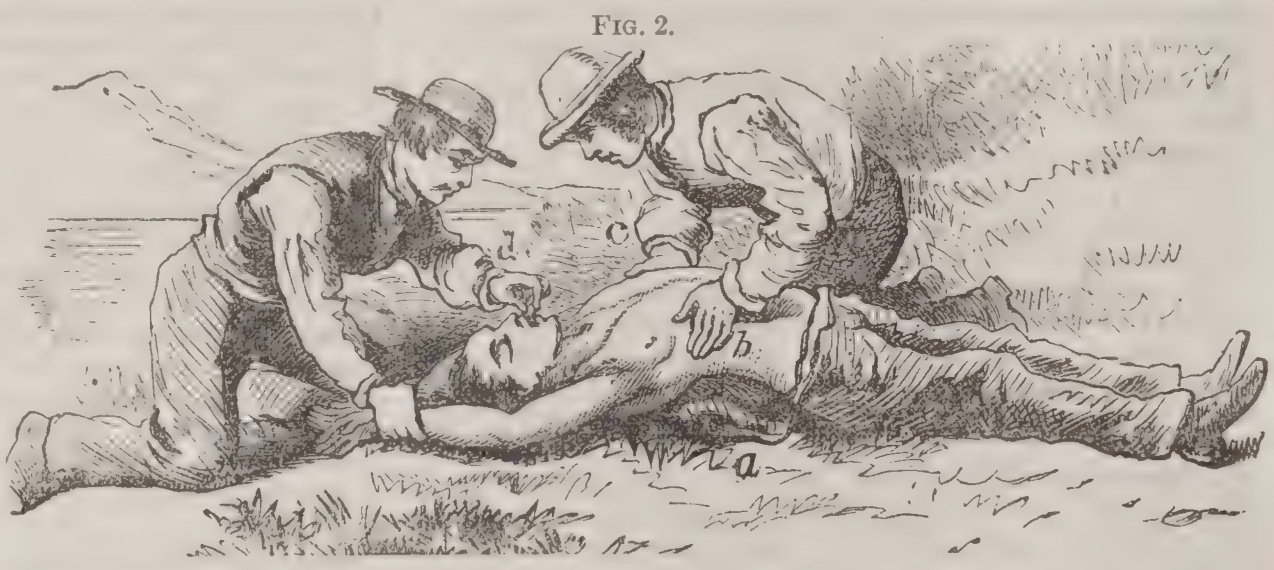
The following are the rules known as the "direct method" for artificial respiration, which have been awarded the first prize of the American Medical Association, and as published by it, by the National Lifeboat Institution of England, and also by the Life-Saving Society of New York. Rule 1, in suffocation from other causes than drowning, is superfluous:

Rule 1 (Fig. 1). *To drain off Water from Chest and Stomach.—Instantly* strip the patient to the waist. Place him face downward, the pit of the stomach being raised above the level of the mouth by a large, hard roll of clothing placed beneath it (*c*). Throw your weight forcibly two or three times, for a moment or two, upon the patient's back, over roll of clothing (*b*), so as to press all fluids in the stomach out of the mouth.

FIG. 1.

Rule 2 (Fig. 2). *To perform Artificial Breathing.—Quickly* turn the patient upon his back, the roll of clothing being so placed beneath as to make the breast-bone the highest point of the body (*b*). Kneel beside or astride patient's hips. Grasp front part of the chest on either side of the pit of the stomach, resting your fingers along the spaces between the short ribs (*b*). Brace your elbows against your sides, and, steadily grasping and pressing forward and upward, throw your whole weight upon chest *c*

FIG. 2.



and *b*, gradually increasing the pressure while you can count *one—two—three.* Then *suddenly* let go with a final push, which springs you back to your first position. Rest erect upon your knee while you can count *one—two:* then make pressure again as before, repeating the entire motions at first about four or five times a minute, gradually increasing to about ten or twelve times. Use the same regularity as in blowing bellows and as is seen in natural breathing, which you are imitating. If another person be present, let him with one hand (*d*), by means of a dry piece of linen, hold the tip of the tongue out of one corner of the mouth, and with the other hand grasp both wrists and pin them to the ground above the patient's head.

After-treatment.—After breathing has become natural, dry the patient briskly. Wrap him in blankets only, and let him be kept perfectly quiet. Provide free circulation of air. Give brandy and water—a teaspoonful every five minutes the first half hour, and afterward occasionally as may seem expedient.

(1) *Avoid delay.* A *moment* may turn the scale for life or for death. Dry ground, shelter, stimulants, etc., at this moment are nothing: artificial breathing is everything—is the *one* remedy; all other means are secondary. If the breathing has but *just ceased,* a smart slap on the face or stomach will sometimes start it again, and may be tried incidentally. (2) Prevent friends from crowding around the patient and excluding currents of air; also from attempting administration of any stimulant before patient is well able to swallow; the first promotes suffocation—the second, fatal choking. (3) Avoid impatience of results. Any time within two hours you may be on the very threshold of success without there being any sign of it.

Sylvester's method, used by the Royal Humane Society, is as follows: The body being placed upon the back, with the head slightly elevated, the arms, grasped just above the elbows, are carried outward and upward from the chest almost perpendicularly, and retained in their position for about two seconds. They are then lowered and brought closely to the sides of the chest, where they are held for the same length of time, in order to expel the air as during the act of expiration, the effort being aided by pressure applied to the inferior and lateral portions of the chest. These alternate movements of elevation and depression are repeated from twelve to fourteen times a minute, and are performed with all possible gentleness. Another method, by Leroy's compressor, is in use by the Royal Humane Society. A piece of flannel or muslin six feet by eight is divided for two and a half feet from each end into strips two inches wide. The untorn central portion is placed under the back of the patient, the ends interlacing being drawn in opposite directions by assistants. Mouth-to-mouth insufflation, in children especially, is easily practicable and very useful. The most effective course is by laryngotomy, an elastic tube and bellows to alternate compression with gentle but complete insufflation.

The length of time persons have been under water, or have remained apparently dead after leaving the water, and yet been resuscitated, is uncertain. The reported time is so remarkably long in some cases as to justify efforts for resuscitation for at least an hour, the patient having breathed within half an hour or perhaps an hour. In experiments by a committee of the Royal Medico-Chirurgical Society of London in 1862, dogs after complete submersion a minute and a half never recovered. After respiratory acts had ceased, the heart continued to act never more than four minutes. In the human subject these periods doubtless may be much longer, governed to a great extent by the continuousness of submersion, the rate of the circulation at the last moment of consciousness, the temperature of the water, the amount of it which enters the lungs, etc. As thousands of human lives have been saved from apparent death by this process, it is better to continue it after hope is vain than by any chance to relinquish it while success might perhaps have been possible. B. HOWARD.

Retaliation. See INTERNATIONAL LAW, SUMMARY, by PRES. T. D. WOOLSEY, S. T. D., LL.D.

Retene ($C_{18}H_{18}$), a hydrocarbon polymeric with benzene (C_6H_6), discovered in 1837 by Fikentscher and Trommsdorff, occurs in fossil pine-stems, in peat and lignite, and associated with fichtelite. It is found among the products of the destructive distillation of very resinous pine and fir wood, and is produced with other bodies when acetylene or the product of the distillation of rosin (colophony) is passed through a red-hot tube. It is extracted from fossil wood or lignite by means of alcohol, and is purified by solution in bisulphide of carbon, then in benzol, and in combination with picric acid. The picrate is recrystallized, decomposed with ammonia, and the retene recrystallized from alcohol. It may also be obtained from the semi-solid products of the latter part of the distillation of pine-tar. (*Zeit. f. Chem.* [2], v. 73.) Retene appears in soft, shining, unctuous laminæ, inodorous and tasteless. It melts at 98°–99° C. It evaporates at ordinary temperatures, and when melted gives off white fumes which condense to a woolly sublimate. It boils at about the boiling-point of mercury, and distils almost unchanged. It is insoluble in water, slowly soluble in cold, readily in boiling alcohol, easily in warm ether, in fixed and volatile oils, in benzol, and in bisulphide of carbon. With strong sulphuric acid in the cold it forms disulphoretic acid ($H_2C_{18}H_{16}(SO_3)_2$). It combines with picric acid, forming beautiful orange-yellow needles. By the action of bichromate of potassa and sulphuric acid it yields dioxyretistene ($C_{16}H_{14}O_2$), a brick-red powder, acetic acid and phthalic anhydride. (See Watts's *Dict.* and *Suppl.*) C. F. CHANDLER.

Reten'tion [Lat. *retentio*] **of Urine,** a condition in which the urine cannot be evacuated from the bladder at all, or only with great difficulty, the former being known as complete, the latter as incomplete, retention. It should not be confounded with *suppression*, in which the urine has not been excreted by the kidneys, and consequently the bladder is empty. The symptoms consist of a great and urgent desire to pass water, and partial or complete inability to so; this is accompanied by repeated straining efforts and violent pain, and extreme distress and restlessness; the countenance assumes an anxious expression, the pulse is quick, and the skin dry. The bladder is more or less distended according to the protraction of the trouble, and its position may be ascertained by percussion above the pubes. If this condition is not speedily relieved, it results in rupture of some portion of the urinary tract and extravasation of the contents of the bladder into the surrounding parts. Here the urine acts as a foreign body, and causes an inflammation which soon terminates fatally.

As the treatment of this condition varies with its cause, we shall have to consider them together. The causes are numerous, and may be classified as those due to—(*a*) mechanical obstruction; (*b*) paralysis of bladder, partial or complete; (*c*) hysteria; (*d*) miasm. The agents mechanically obstructing the flow of urine are numerous. Organic stricture of the urethra is a very common one, but it causes complete retention only when, after exposure of some kind or over-indulgence in spirituous liquors or sexual excitement, there is congestion or spasm added to it, and the urethral canal thus made impervious. The attempt should here be made to use a small catheter, but if this cannot be done, the warm bath, local abstraction of blood, and the administration of ether or chloroform should be superadded. Should these means fail, the only resource left is to "tap" the bladder, either through the rectum or above the pubes. This is done at the present time by means of the *aspirator*. The relief, however, is only temporary; the stricture still remains, and some operation must be resorted to for its relief. Spasmodic contraction of the muscle surrounding the neck of the bladder or of the muscular coat of the urethra sometimes exists as a cause of retention; when such is the case, the warm bath, purgatives, opium, and chloroform are the remedial agents. Inflammation along the urethral canal (gonorrhœa) often has retention of urine as a complication. Here it is caused by an intensely-congested and swollen mucous membrane, and the same treatment as for muscular spasm may be adopted. Amongst the other mechanical causes the most important are—(*a*) a small calculus impacted in the urethra; (*b*) small tumor in the urethra; (*c*) clotted blood in the urethra or bladder; (*d*) foreign bodies, as pieces of bougies, catheters, etc., in the urethra; (*e*) tumors of any kind, external to the urethra, which press upon it. This last cause operates quite frequently, and it embraces all those cases of retention due to chronic enlargement of the prostate, inflammation or acute congestion of the prostate, abscesses in the perineum, pressure of a loaded rectum, a displaced uterus, the head of the child during labor, or a pelvic tumor of any kind upon the neck of the bladder. The treatment should always be directed to the removal of the cause, and where this requires any great amount of time, we have the catheter and aspirator as palliative means. Paralysis of the bladder, causing retention, may be due to voluntary retention repeated and long kept up, apoplexy, injury to the spine, acute over-distension of the organ, shocks to the system from capital operations, and in certain high fevers, as typhoid, typhus, etc. The treatment in all these cases should be by the catheter. Hysterical retention is a disease of the mind, and depends wholly upon the volition of the patient. (See HYSTERIA.) Gross mentions a form of retention which is periodical in its nature, and which he ascribes to malarial influences, and accordingly adopts the treatment of miasmatic diseases, as quinine, etc.

EDWARD J. BERMINGHAM. REVISED BY WILLARD PARKER.

Rethel', town of France, department of Ardennes, on the Aisne, is an old city, but well built and handsome, and carries on a large trade and extensive manufactures of flannels, merinoes, and other woollen fabrics. P. 7312.

Re'thel (ALFRED), b. at Aix-la-Chapelle in 1816; studied at Düsseldorf under Schadow, and at Frankfort under Veitt; visited Italy in 1844–45; painted after his return the four great frescoes from the history of Charlemagne in the city hall of his native city, and produced several grand and very interesting designs—*Hannibal crossing the Alps*, *Dance of Death*, etc.—but became insane in 1852. D. at Düsseldorf Dec. 1, 1859.

Retina. See EYE and HISTOLOGY.

Retort' [Lat. *retortus*, "thrown or twisted back"], a chemical apparatus originally made of glass, and made by taking a globular or spheroidal vessel with a long tubular neck, and bending this neck, close to the spheroid, over to an obtuse angle; hence the name. Retorts are plain or tubulated, the latter being perforated at the upper side of the bend, and a glass neck fused fast, through which a tube may be introduced, and solid or liquid substances put in, and which may be closed with a stopper. The term is applied likewise in modern usage to almost any apparatus in which *solid* substances, such as coal, wood, bones, etc. are submitted to destructive distillation; for example, gas-retorts. H. WURTZ.

Retrograda'tion [Lat. *retro*, "back," *gradi*, to "step"], in astronomy, an apparent or real motion of a celestial object from E. to W., or contrary to the order of the signs in the heavens. Motion from W. to E. is called direct. The motion of all the bodies of the solar system

is direct, but that of some of the comets is retrograde. The planets, however, seem at times to have a retrograde motion, which is a consequence of the fact that their velocities in their orbits differ from that of the earth. The inferior planets move more rapidly than the earth, and the superior less rapidly. It happens, therefore, that the inferior planets have a motion apparently retrograde for some time before and some time after their inferior conjunctions. The apparent motion of the superior planets is retrograde for some time before and some time after their oppositions. Between the periods of direct and retrograde motion there are times when these bodies are apparently stationary, but the stations are of brief duration. The mean periods of retrogradation are—for Mercury, 22 days; for Venus, 42; for Mars, 73; for Jupiter, 120; for Saturn, 140; for Uranus, 152; for Neptune, 158½.

F. A. P. BARNARD.

Retrospec′tive [Lat. *retrospicere*, "to look back"] **Laws.** Those statutes which relate back in time, and affect rights, duties, capacities, conditions, relations, or circumstances which lie in the past, and have become established prior to their passage, are termed "retrospective" or "retro-active." They are so plainly opposed to justice and equity that in determining the general principles by which all legislation is to be construed the courts have firmly established the doctrine that all statutes shall be presumed to act prospectively only, and shall not be regarded as retrospective unless their clear and imperative intention, derived from their express terms, forbids such an interpretation. Retrospective laws, as a class, are not generally prohibited by the State constitutions, nor are they by the Constitution of the U. S., although in the organic law of Vermont and of one or two other commonwealths there is a provision forbidding such legislation. One species of retrospective laws, those which are criminal or penal in their nature, and are technically termed *ex post facto*, are interdicted by all the American constitutions. (See EX POST FACTO.) If a retrospective statute should interfere with vested rights of property or of personal security, or should impair the obligation of contracts already made, it would be void by the operation of other constitutional provisions, which declare that no person shall be deprived of life, liberty, or property without due process of law, and that no State shall pass laws impairing the obligation of contracts.

JOHN NORTON POMEROY.

Return′ [Fr. *retourner*], in law, is a highly technical term, and signifies the sending back of a writ or other process to the court from which it issued by the officer to whom it was addressed, according to the command contained in the instrument itself. It actually consists of a written account or history of what he has done in executing the process, made and signed by such officer, endorsed upon or attached to it, and filed with it in the office of the clerk of the court. In the common-law practice there were generally certain fixed days on which the ordinary writs were to be returned, but they have been abandoned by the procedure of most of the American States.

JOHN NORTON POMEROY.

Retz, de (GILLES DE LAVAL), SEIGNEUR, generally called **Marshal Retz,** b. in 1404 at Machecoul, department of Loire-Inférieure, France; distinguished himself in the wars of Charles VII.; fought at the side of the Maid of Orleans; was made a marshal of France, but retired subsequently from public life to his castle of Retz. Implicated in a process with the duke of Bretagne, the procedure disclosed the most hideous crimes committed by him in his castles. During fourteen years he had enticed several hundred children into his castle and sacrificed them to his lust and superstition, he being addicted to magic and a worshipper of Satan. He was strangled and burnt in 1440. He bore the surname *la Barbe Bleu.*

Retz, de (JEAN FRANÇOIS PAUL DE GONDI), CARDINAL, b. at Montmirail, France, in 1614; educated for the Church, though against his will, and led as a young abbé a very improper life. His brilliant gifts nevertheless enabled him to advance in his ecclesiastical career. In 1643 he took the degree of D. D. at the Sorbonne, and was appointed coadjutor to the archbishop of Paris, Henri de Gondi. He now began to preach, and soon became exceedingly popular among the Parisians. In the embroilments of the Fronde he appeared as one of the leaders of the revolution against Mazarin and the queen, and exercised great influence by his eloquence and audacity. But he seems to have been entirely reckless, without any fixed purpose. In 1650 he allied himself with the court, gained a cardinal's hat, and commenced to intrigue against the opposite camp. He had forfeited all confidence, however, and in 1652, Mazarin ordered his arrest. He was imprisoned first in Vincennes, then at Nantes, but escaped and fled to Spain, afterward to Italy. After the death of Mazarin he was permitted to return to France in 1661, on condition that he should give up his claims to the archbishopric of Paris. He received the abbacy of St. Denis, and here he lived in great splendor and gayety, but without participating in public life, occupied with studies and the payment of his enormous debts. D. at Paris Aug. 24, 1679. His *Mémoires* were first published at Nancy in 1717; the most complete edition is that by Aimé-Champollion (4 vols., Paris, 1859).

Retzsch (MORITZ), b. at Dresden Dec. 9, 1779; studied at the Academy of Art in his native city; was appointed professor of drawing in 1824. D. June 11, 1857. He acquired some reputation as a miniature portrait-painter, but his most celebrated works are his illustrations to Goethe, Schiller, Fouqué, and others, which were reproduced both in England and France.

Reuchlin′ (Hellenized CAPNIO), (JOHANN), b. at Pforzheim, Baden, Germany, Dec. 28, 1455; educated in the chapel of the margrave of Baden, and followed in 1473 the young margrave to the University of Paris, where he commenced his studies in Greek. During two years' residence at Bâle he wrote and published his Latin dictionary, *Breviloquus sive Dictionarium, singulas Voces Latinas breviter explicans;* and during a second visit to France in 1478 he studied law at Orleans. In 1481 he lectured on jurisprudence and belles-lettres at the University of Tübingen, received the title of imperial councillor from the emperor, and lived subsequently for several years at the court of the elector palatine, Philip, at Heidelberg. To this period belong his first studies of the Hebrew language and his satirical comedy, *Sergius, sive Capitis Caput,* which was much read, and whose satire against the clergy was heartily enjoyed. In 1498 he went to Rome, his patron, the elector palatine, having fallen under the papal ban, and he succeeded in procuring his absolution. After his return he was appointed president of the Suabian confederate tribunal, but he nevertheless found time to continue his studies of Hebrew, the results of which were his *Rudimenta Hebraica* (1506), *De Arte Cabbalistica Libri III.*, and *De Accentibus et Orthographia Hebræorum Libri III.* (1518). By these works he actually initiated the study of the Hebrew language, so important for a full and comprehensive conception of the Bible; and he exercised a similar stimulating influence by his handbooks, editions, and personal exertions in the study in Germany of Latin and Greek; that pronunciation of the Greek language known as Iotacism originated with him. But he was too liberal to escape clashing against the prejudices of his age. A converted Jew, Johann Pfefferkorn, proposed in 1510 that all Hebrew books, with the exception of the Bible, should be burnt. The Dominicans were in raptures over the proposition; the Inquisition immediately recognized it as a new weapon of persecution; the emperor acquiesced. Meanwhile, Reuchlin remonstrated, the emperor withdrew his consent, and the Inquisition and the monks flew into a fury. Reuchlin published *Speculum Oculare* (*Augenspiegel*), (1512) and *Defensio contra Calumniatores* (1513), while Ulrich von Hutten and Franz von Sickingen kept guard over his personal safety. In 1515 appeared the first part of *Epistolæ Obscurorum Virorum,* and when the Reformation soon after broke out the attention of the Roman Catholic clergy was attracted elsewhere. With Luther, Reuchlin felt a deep sympathy, but he declined an invitation to come to Wittenberg, sending in his stead Melanchthon, and maintained his connection with the Roman Catholic Church to the last. In 1520 he was appointed professor at Ingolstadt, but when the plague broke out in this city he determined to retire to Tübingen, but d. at Stuttgart June 30, 1522. His *Life* was written by Gehres (1815), Meyerhoff (1830), and Geiger (1871).

Reul′ing (GEORGE), M. D., b. in Darmstadt, Germany, Nov. 11, 1819; studied medicine in the University of Giessen, where he graduated with the highest honors; devoted himself as a specialist to diseases of the eye and ear, studying under Profs. Arlt, Jaeger, and Pollitzer in Vienna, Gräfe in Berlin, Wecker and Liebreich in Paris; and accepted in 1867 the position of first assistant to the eye hospital at Wiesbaden, which after one year he resigned to take charge of the eye and ear infirmary of Baltimore, Md. In 1869 he was elected professor of ophthalmology in the University of Baltimore, and is the author of contributions to the literature of his specialties.

PAUL F. EVE.

Re′us, town of Spain, province of Tarragona, has large spinning and weaving factories, and extensive manufactures of silk, ribbon, leather, soap, and pottery. The vicinity is very rich in wine and corn. P. 28,171.

Reuss, two small principalities of Germany, belonging to an elder and younger line of the family of Reuss, and consisting of several separate territories situated between Prussia, Saxony, and Bavaria. The dominions of the elder line, Reuss-Greitz, comprise an area of 148 sq. m., with

45,094 inhabitants; and those of the younger line, Reuss-Schleitz, 297 sq. m., with 89,032 inhabitants.

Reuss, a river of Switzerland, rises in the canton of Uri, near St. Gotthardt, descends in its upper course 4500 feet through a series of wild cataracts and magnificent cascades, enters the southern end of Lake Lucerne, issues from the northern end as a clear, deep-green, navigable stream, and joins the Aar in the canton of Aargau at Windisch, after a course of about 100 miles.

Reuss (Édouard Guillaume Eugène), D. D., b. at Strasbourg (then a part of) France, July 18, 1804; educated at the seminary of his native city; studied theology at Göttingen under Eichhorn, Oriental philology at Halle under Gesenius, and pursued the latter branch at Paris under Silvestre de Sacy; taught biblical criticism and Oriental languages in the theological school of Strasbourg 1829–34; became extraordinary professor there 1836, and ordinary (regular) professor 1838; declined a call to the University of Jena; published (in German) a *History of the Books of the New Testament* (Halle, 1842; 4th ed. 1864), *Histoire de la Théologie chrétienne au Siècle apostolique* (2 vols., Strasbourg, 1852; 3d ed. 1864; English translation Edinburgh, 1872), *Histoire du Canon des Saintes Écritures dans l'Église chrétienne* (1863), and has prepared a new French translation of the entire Bible, several parts of which have appeared. Prof. Reuss has edited for many years a German review which appears at Jena (*Beiträge*, etc.), has contributed largely to Colani's *Revue de Théologie*, and is considered as one of the most learned and liberal theologians of the French Protestant Church. He continues to reside at Strasbourg since its annexation to Germany, which measure he energetically condemned.

Reu'ter (Fritz), b. at Stavenhagen, Mecklenburg-Schwerin, Nov. 7, 1810; studied law at Weimar and Jena, but was arrested in Prussia in 1834 for political agitation and sentenced to death. The sentence was commuted to imprisonment for thirty years, but in 1840 he was pardoned and restored to liberty. He now devoted himself to literature, and his poems and novels (12 vols.), written in the Low German dialect, are distinguished by freshness, humor, and plastical power, and were received with great applause. He settled first at Trepton in Pomerania, afterward at Eisenach, where he d. July 12, 1874.

Reut'lingen, an old but well-built and handsome town of Würtemberg, is situated on the Echatz, in a fertile district rich in corn, wine, and fruit, and carries on a lively trade and extensive manufactures of woollen and linen fabrics, hosiery, leather, and cutlery. P. 14,237.

Rev'al, town of European Russia, government of Esthonia, on the southern side of the Gulf of Finland, has a good harbor and is strongly fortified. It was formerly a port of great commercial consequence, but of late its trade has greatly declined, being absorbed by that of St. Petersburg and Riga. P. 27,325.

Revalen'ta Arab'ica, a dealer's name for a dietetic preparation highly vaunted for the use of invalids. It is simply the meal of lentils, and its name *revalenta* is an imperfect anagram of *Ervum lens*, the botanical name of the lentil-plant. In reality, it is very nutritious, but much more suitable food for a well person than an invalid.

Reveille, tp., Scott co., Ark., has 1 newspaper. P. 882.

Revel', town of France, department of Haute-Garonne, manufactures woollens, oil, liqueurs, and earthenware. P. 5386.

Revela'tion. In the ordinary sense of the word, "revelation" means the religion of Israel and of the Church as it is set forth in the Hebrew books of the Old Testament and the Greek books of the New. This religion bears the name of revelation because its God has directly interfered in the history of mankind by apparitions and the incarnation of his Son, by visions and inspiration, and by miracles which he has either wrought himself or given his servants to work. The several aims of these different modes of revelation are —(1) to render faith in the invisible God vivid and firm in the heart; (2) to teach the truth to fallen humanity, which is incapable by itself of discovering it; (3) to guide mankind in its advance toward the goal which has been assigned to it; and (4) to deliver us from our spiritual bondage by taking away our sins and destroying the works of the devil (1 John iii. 5–8).

There can be no revelation of God to the materialist who denies him, or to the pantheist who confounds him with the world, or to the deist who makes him the slave of his own laws, the great drone of the universe, the great mute of the heavens. On the other hand, it is quite evident that the true God, the living and personal God, the God infinite in power as in wisdom and love, the God divinely free, can reveal himself to his creatures whenever he chooses. "This question" (to use an expression of J. J. Rousseau), "when seriously treated, would be impious if it were not absurd. But to punish him who should answer it in the negative would be to do him too much honor; it would suffice to lock him up." If the God of the theist reveals himself whenever he pleases, the Christian God does so in virtue of his very essence. According to the teachings of Jesus Christ and his apostles, which transfer us into a world of mysteries whose very existence reason alone would never have suspected, God, in the true sense of the word the Father, who dwelleth "in the light which no man can approach unto" (1 Tim. vi. 16), and whom even the archangels themselves cannot behold, has *with* him (John i. 1) two beings, equal to him, the Son and the Spirit, through whom he reveals himself eternally to the universe. Revelation is thus the normal mode of his activity. The Son is his objective and sensible revelation, his other self, the express image of his person (Heb. i. 3), his visible picture, his Word. Through him he spoke to nature in the time of the creation. Through him he speaks and shows himself in the heavens to the angels eternally—on earth to mankind at rare intervals until the time shall come whose light are God and the Lamb eternally (Rev. xxi. 23). The subjective revelation of the Father is the Spirit, the God by whom God explains to his creatures internally the words of his Son, and communicates to them substantially his "divine nature" (2 Pet. i. 4). Thus, the Spirit unites to the Father, and makes re-enter into his bosom the creatures which the Father made issue forth from thence through the Son; he is the final synthesis of the finite and the infinite.

I. This double revelation of God, objective and subjective, is necessary to man in his normal state before the Fall. Without it his faith would have been wavering and incomplete. A few words concerning the fundamental structure of human nature will justify this assertion. The physical and moral life of man is circumscribed by these three terms: the Ego, or the organs of the body and the faculties of the mind; the non-Ego, or the world in which man lives; and the appropriation of the non-Ego by the Ego. Thus, in the domain of physical life there is an organ of digestion within, materials of nutrition without, and finally the process of assimilation. In the field of the affections there is a heart with a craving for love, beings capable of being loved, and finally the feeling of love by which the heart gives itself to another heart, takes that heart up into itself and becomes one with it. In practical life there is on the one side a will seeking an object on which to exercise itself; on the other, nature and human society meeting this desire of activity; and finally, the labor by which the non-Ego is appropriated and transformed. In the same manner also the intellectual life of man remains incomplete until a thorough assimilation is added to its deduction and induction. It is not enough to deduct, like the spider, from the depths of one's own being the light and fragile tissues of abstract truth, or to accumulate, like the ant, by induction, an immense quantity of facts; man must, like the bee, transform his booty into his own substance, comprehend the external, concrete facts by the aid of his innate ideas, and taste that mysterious joy which is engendered in the human soul by the wedding of the Ego to the non-Ego—that is, by the discovery of the essence of things, of their laws, their final causes, their system, their history. The case is exactly the same in our religious life. From our instinctive need of a God, from our sense of the absolute, from our aspirations toward the infinite, from our imperious demand for unity, from our ideas of cause and order, two or three metaphysical proofs of the existence of God can be deduced. But such a deduction gives us only the logical evidence of the fact; of its reality it can tell us nothing. Leverrier demonstrated by his mathematical calculations the existence of the planet Neptune, but it did not enter the rank of actual facts until the telescope showed it glittering in the place which had been assigned to it. Induction only—that is, the senses, the direct observation, and the historical testimony—gives certainty. Thus, it was necessary that God should reveal himself to men (as he does to the angels) through his Son, and make himself seen and heard among them, in order that there should remain no doubt in their hearts of his existence, nature, and perfection. Nevertheless, the example of the Israelites at Sinai shows us that man can hear with unspeakable awe the Eternal promulgating his holy laws, and yet entertain profanity, rebellion, and idolatry in his heart. Induction with its certainty is not sufficient, either. Assimilation alone, which here is the work of the Holy Spirit, gives full understanding of the divine revelations, unshakable conviction, and that living faith which initiates the soul into the life of prayer, holiness, hope, and love.

II. To this proof of the necessity of a revelation, drawn from the fundamental nature of man, must be added another furnished by his intellectual and moral state after the Fall. Sin has so enslaved the spirit under the flesh, and

so degraded and blinded it, that, like a compass out of order, it cannot serve as a guide to man in his pursuit of truth. The whole human race, a forlorn traveller surrounded with the hallucinations of a diseased brain, denied the true God in order to adore myriads of imaginary beings, which, on account of their mischiefs and crimes, deserved better to fall under the axe of the executioner; and at last, when reason, tired out by so many impious and absurd myths, unchaste festivals, human sacrifices which were nothing but mere murders, endeavored to find their way back to truth, wise men arrived at the most different results, which contradicted and destroyed each other. The last word of this immense labor of the philosophers was—in India, Booddhism or the atheistic morality of charity; in Greece, the atheistic morality of the haughty and egotistical Stoics and the mean materialism of Epicurus; in Rome, the skepticism of Cicero; and in our days in the West, the positivism of Auguste Comte, which declares all that surpasses observation by the senses is inaccessible to reason. Thus reduced to his own resources, the fallen man ignores or doubts or denies God and his glory, no less than the soul and its future destiny, and with his best will he cannot possibly find the true God, or at least not acquire the certainty of having found him. Created by God in his image and called to become holy like him, our deeds, good or bad, draw down on us an exact remuneration from his justice, which is infinite, like his power and his love. Thus, in the dark night which our corrupted heart and bewildered reason have produced in us we feel persuaded that, since we have no master in heaven, but have sprung from earth like a plant or were sired by an ape, we can give to ourselves such laws as we please; that since we are nothing but matter, our liberty is an illusion and our moral responsibility a bad dream; and in this manner we spend our whole life in aggravating the frightful sentence of condemnation which one day the divine justice will certainly pronounce over us. But God, who is love, has had pity on the human race. Liberating our spirit from the slavery of the flesh, and leading us back to the road of holiness, he completed the primitive revelations to Moses and the Hebrew prophets by Jesus Christ and the apostles, and in the course of time he collected all these revelations into an inspired book in which all nations and all individuals can find those religious and moral truths which are necessary to salvation. In this book are laid down answers to all the questions which the philosophers have put in vain to themselves concerning God, man, the origin of all things, and the future destiny of the world. There is the source from which we can draw truth unmixed with error. There is the rock, not to be shaken, on which we can raise the building of our life, spiritual and practical.

III. We mentioned above the primitive revelations. Indeed, since the life of man is faith, and since faith is incomplete without revelation, God must have shown himself and spoken to the first man before the Fall and in the very moment of the Creation as Moses records it in ch. ii. of Genesis. Perhaps it was at this very time that Adam received from God the apocalyptic vision of the six days, which has been preserved in its authentic form on the first page of our sacred books, and of which remnants are found in the New World as well as in the Old, and with all races and tribes, savage as well as civilized. Everything seems to indicate that this revelation was the foundation of the primitive religion, as the Deluge was the foundation of the religion of the Noachides, the miracles of the Exodus and Sinai the foundation of the religion of Israel, and the expiatory death and resurrection of the incarnated Word the foundation of the Christian religion.

In the vision of the six days God made himself known to humanity as the God of progress interfering in the history of terrestrial nature by physical miracles, and revealing himself from epoch to epoch by creative words. He begins with chaos and ends with man, who was the first in his idea, though the last in reality. He lit the light in primordial darkness; separated the luminous and solar substances from the opaque and planetary; detached from these the materials which constitute our globe; and precipitated the waters of the universal sea into deep basins whence arose the land. Into this realm of the minerals, where reigned the mechanical and chemical forces, his word threw from on high the germs of organic life, animal and vegetable. Vegetable life predominated at first on all the firm land (during the Silurian period). Then, after the definitive organization of the solar system, the aquatic and atmospheric animals became the masters of our planet (during the Secondary period); and it was not until after them that, in virtue of the divine law of progress, the land animals began to multiply and reign (during the Tertiary period). At last, after sowing the germs of organic life on the fields of the physical and chemical forces, God implanted in a living soul (this is the Hebrew name of an animal) his own image, the sense of the absolute, the reason, the spirit (Gen. ii. 7; i. 27), and formed of these two elements humanity, which was given whole with the first man. On earth Adam was the eye which saw the God of revelation, the ear which heard him, the intelligence which comprehended him, the heart which loved him, the will which served him, and the lips which invoked and glorified him.

However, if Adam closes the history of the earth, he opens that of the world of freedom. By the aid of St. Paul we can distinguish behind and across the tragical vicissitudes of fallen humanity the peaceful wanderings of normal humanity. As the mineral rises toward the plant, the plant toward the animal, the animal toward man, so man aspires to God, and ought to reach him. But his nature, although psychical, is so inert that he would never advance or reach his goal if not urged by God. Thus, the miracles of the physical creation are succeeded by the miracles of the historical creation, and to the reign of man the Author of progress adds the reign of the God-man. The first Adam was the synthesis of animality and reason; the second or the latter Adam is the synthesis of humanity and the divine nature. The first was created in the image of God; the second is the image itself become man. The first was only a living soul; the second is the vivifying Spirit which descended in tongues of fire on his first disciples, and thus initiated them into the mysteries of spiritual life (1 Cor. xv. 45). Jesus Christ, the great revelation of God, can thus be considered as the last stage of this progression which through Adam, animal, plant, mineral, descends into the dark waters of the earth, yet without form and void.

Again, Jesus Christ opens a new era—that of spiritual humanity or the Church—and we know from prophecies that future revelations of God and his Son shall unite during the millennium into one holy organism, in which each of them, faithful, docile, and happy, still finds his place and his part. But the progress which God initiates in the history of mankind by his miraculous interventions will not stop at this point; eternity keeps in store for our race infinite felicities when "God may be all in all" (1 Cor. xv. 28).

Thus, the revelations and interventions of God connect by a geometrical progression of admirable regularity the history of man with that of the earth, the last days of our race with those of its origin, and the future eternity with the past eternity.

IV. The normal history of humanity before the fall was troubled and violently changed by the power of sin. We shall presently consider what are the revelations of God which became necessary on account of this our state of fall, and which all tend toward the redemption wrought out by the second Adam, who became our Saviour by being sacrificed on the cross.

Man had hardly issued from the hands of his Creator when, through a revelation full of wisdom and love, Jehovah gave full satisfaction to the legitimate cravings of our physical nature, our flesh, by inviting Adam to eat the fruit of all the trees in the garden with the exception of one. This restriction, which of all imaginable laws was the easiest to observe, purposed to give to the first man a consciousness of his moral nature and high vocation. His spirit rising above the appetites of the flesh, he would have learned to control himself, tasted the inner joy of the victory of the soul over temptation, and conquered his freedom for ever. Sooner or later he would have eaten the fruit of the tree of spiritual life (sacramental or symbolical), and the action of the Holy Spirit would have confirmed his native immortality and rendered it indestructible. But Satan intervened and seduced the ancestors of the human race. In the feeling of their degradation they fled from the holy God, and by their crime they drew down on themselves the punishment of the infinite justice. Their fall having broken their connection with the divine and only source of life, death was the punishment of their sin; diseases proceeding from the disordered passions of the flesh prepared death from afar; Nature added her plagues. Thus, earth became a hospital and a cemetery, and the human race fell into an abyss of unspeakable sufferings, from which it could never have been delivered by its own power. It was necessary that God should interfere in order to save it. Consequently, he revealed himself to Adam and Eve on the very day after their fall. As victims of the perfidy of Satan, God considered them more pitiable than criminal, and promised them a Saviour who should be born of a virgin (in accordance with numerous pre-evangelical myths of the demigods) and destroy the work of the devil, but who in bruising the head of the seed of the serpent should be bruised himself on the heel (Gen. iii. 15). This Saviour, who was

the first in the divine decrees, but should not appear in reality until the last times, became the final object of all the following revelations. The promise of his appearance, made to Adam and Eve, hovered, so to speak, like a bird over their descendants. After the Deluge it alighted on the head of Shem, for from him Japheth should one day learn to know and serve Jehovah (Gen. ix. 27). Among the Semites, God chose Abraham in order that He in whom "all families of earth shall be blessed" might issue forth from the people of Israel (Gen. xii. 3). On his deathbed Israel saw the Prince of Peace, unto whom "shall the gathering of the people be," issue forth from the tribe of Judah (Gen. xlix. 10); and subsequently Nathan announced to David, the descendant of Judah, that in his family should be born the Son of God, whose kingdom should last for ever (2 Sam. vii.). Meanwhile, having delivered by the most striking miracles his chosen people, the people of Messiah, from the servitude of the Pharaohs, Jehovah gave to it on Sinai a law which by its salutary discipline was suited to awaken a steadily-increasing longing for the great Liberator. At the same time the sacrifices and the feast of propitiation prefigured the atonement of Golgotha, the high priest the eternal sacrifice of Christ, and the tabernacle the spiritual constitution of the Church. To the Law were afterward added the prophets, who announced the divinity of Messiah (Micah, Isaiah); his birth by a virgin (Isaiah) at Bethlehem (Micah); the date of his appearance and the short duration of his ministry (Daniel); his entrance into Jerusalem on a colt the foal of an ass (Zechariah); his betrayal by Judas Iscariot for thirty silver coins; his crucifixion (David); his expiatory death and resurrection (Isaiah); his precursor (Malachi); the new covenant sealed by the sending down of the Holy Spirit (Joel, Jeremiah, Ezekiel); the admission of the Gentiles into the Church; and the final and universal kingdom of true faith, justice, and peace.

These magnificent promises of pity from the side of God were accompanied by frightful menaces of justice, menaces of captivity, dispersion, and cruel sufferings to the rebel Israelites, and still more terrible menaces, even of complete ruin, to the idolatrous nations contemporary with the chosen people. The first destroyer of these nations and of Israel was a Chaldean king. He opened the era of universal monarchies, which aspired to submit the whole earth to the same law and the same yoke. In his astonishing visions Daniel counted four such kingdoms—those of the Chaldeans, Persians, Macedonians, and Romans. They form "the times of the Gentiles" (Luke xxi. 24), which probably comprise a period of $2 \times 3\frac{1}{2}$, or 7×360, or 2×1260 years. The period will end with the return of the Jews to their own country, which will follow shortly after the establishment of the Christian kingdom over the whole earth.

If we examine more closely the revelations of God to the Israelites, we find that they conform from one age to another with the spiritual state of the race of Abraham. To the father of the faithful, to the pious Isaac, to Jacob, whose faith remained victorious in the world, Jehovah was, so to speak, the friend of the family: he appeared to them at night in their dreams, during the day in the guise of a traveller. But when the problem became to implant for ever the faith in the hearts of a nation gross, carnal, headstrong, and half idolatrous, this same Jehovah heaped miracles on miracles and surrounded himself on Sinai with the whole awful apparel of his power. In the same manner the oldest prophets—from the time of the Judges, when the faith of the Israelites was still very little introspective—were simply seers, hardly to be distinguished from the pagan diviners. After the time of Samuel, when the people had increased both in intellect and piety, the seers become *nabi*, from whose hearts flow inspired words, holy canticles, the first psalms. Afterward, when an awakened reason had produced a philosophy in Israel, the *nabi* became prophets with vast views, to whom God revealed the destinies of the nations—yea, of humanity. But at last prophecy ceases like the miracles, as if to put into stronger relief the divine figure of the Messiah, whose every word is in a certain sense a prophecy, and whose miracles are counted by thousands. The progress is evident from Moses, through Samuel and David, to Isaiah, or from the Law written on stone tablets, and miracles which through the senses overwhelm the spirit, to the inspiration of the psalmists springing from the depths of their pious souls, and the prophecy which addresses itself only to the heart and through the conviction.

But that which most specially strikes our attention are the intermissions of the revelations of the Eternal to the Israelites. The revelations are accumulated at the beginning of each period, like so many lessons given by the preceptor to his disciple, and then they cease entirely, in order that the disciple, having become of age, may put them in practice under his own responsibility. Thus, in the patriarchal age, or the infancy of Israel, Jehovah reveals himself a score of times to Abraham, Isaac, and Jacob; then he conceals himself to their descendants, who have to try their own moral power. Joseph glorifies him by his faith and chastity, and his age is for the Hebrews in Egypt a time of prosperity. But their piety weakens, idolatry creeps in among them, and for a whole age they are the miserable slaves of the Ramsessides. They would certainly have perished if they had not cried to their God. But Jehovah reappeared on their entering the age of youth in order to organize them into a religious and civil society; and we have already mentioned the profusion of miracles by which he compelled them to believe in him and in Moses. Then he remained silent after the conquest of Canaan, and the generation to which Joshua belonged served the Eternal faithfully. But the Israelites soon turned away from him, and during his long silence under the Judges they relapsed every now and then into idolatry. Thus, the second period of the history of Israel ended, like the first, with a captivity, that of the Philistines, which would probably have been their final ruin if the Eternal had not interfered a third time, raising up Samuel among them. Samuel is the Moses of a time in which the Israelites arrived at their age of maturity and the full development of their intellect. He is also much less a miracle-worker than the first of the great prophets, the founder of the school of the *nabi*. Without any striking miracles he leads the Israelites back to the observation of the Law of Sinai; he explains to them its spiritual meaning (1 Sam. xv. 22), and thus he calls forth a powerful and lasting revival throughout the whole nation. One of the fruits of this revival is the lyric poetry of the psalmists, in which the pious soul expresses its innermost experiences. Shortly after, with Solomon, the wise men appear, who represent in short sentences (*proverbs*, the *gnomes* of the Greek) such observations as the light of the divine revelation has led them to make on human life and character. The times of David and Solomon correspond to those of Joseph and Joshua, and mark the culminating point of the history of Israel.

In the last days of Solomon the decline of the people begins. It splits into two. Faith in the Eternal struggles hard against the hybrid worship of the ten tribes and against the idolatry of the Phœnicians. Jehovah interferes from time to time by several prophets, by a miracle, by a certain concourse of providential circumstances. But it is evident that the two kingdoms advance more or less rapidly toward their ruin. Under Ahab and Jehoshaphat the true believers, the pious residue of the chosen people, separate from the old Israel, which degenerates and perishes; and yet a divine and immortal Child shall issue forth from this womb attacked by an incurable disease. But as all creation presupposes a powerful intervention by God, we see Elijah and Elisha, by whom God created the invisible Church of the old covenant, work a multitude of miracles, and among them several rivalling those of Sinai. These wonders ceased with the death of Elisha, and the nascent Church found its nourishment in the symbolical visions of the prophets.

The kingdom of Judah was destroyed by the Chaldean Nebuchadnezzar, and the mature age of the chosen people ended, like its youth and infancy, in a captivity, that of Babylon—an event which to any other nation would have proved its sure ruin. Then the true God had no temple in which his worship was celebrated, no palaces in which reigned the princes of his choice, no free people serving him. The false gods seduced his people, and the sceptre of the earth passed from the hands of Israel and David to those of the pagan monarchs who oppressed Israel during the times of the Gentiles. Nevertheless, the empire of these idolaters was not founded without the Eternal predicting by Daniel the downfall of the symbolic statue, and convincing them by striking miracles of his sovereign power. Nebuchadnezzar himself, the winged lion, was nearly converted to Jehovah, and strove to assume the heart and shape of man—of the man bearing within himself the image of God (Dan. iv.). But in accordance with the law of the first revelations the miracles and prophecies ceased with the first empire.

At the close of the third age of Israel, as at that of its second and first ages, the Eternal interfered in order to deliver it from captivity. But it was not necessary for this purpose to have recourse to acts of power; it was sufficient to act in secret by the Spirit (Zech. iv. 6) on the heart of Cyrus, who voluntarily sent the Jews back to their country. Ripened through adversity, the Jews were able, at least to some extent, to restore by their own strength, together with Jerusalem and the temple, their worship and social institutions. Jehovah, giving his aid in proportion to their need, sent three prophets as auxiliaries to Ezra and Ne-

hemiah. Then, for the fourth time, he left the chosen people to itself, and from Malachi to John the Baptist, as from Jacob to Moses, there was no direct intervention by God in the history of Israel.

Under the persecutions of Antiochus the Jews proved themselves worthy of the confidence which their God put in them by their heroic courage in suffering martyrdom, and in defending, arms in hand, their faith and their liberty. The times of the Maccabees correspond to those of Solomon, Joshua, and Joseph. But soon after the hypocritical formalism of the Pharisees and the incredulity of the Sadducees took hold of all hearts, and as in the time of the Deluge faith had disappeared from the earth, so, when the precursor of Messiah appeared, God counted only a few in Judah as his—Zacharias and Simeon, Anna and Elisabeth.

The Messiah is at once—(1) the incarnate Word, or the absolute revelation of God to man; (2) the last Adam, or the vivifying Spirit toward which the normal humanity aspired; and (3) the Saviour of fallen humanity, the great expiatory Sacrifice which on the cross and by his life and blood has purified man from his degradation, and atoned for his crime by the three hours of darkness and unspeakable sufferings—the victor of the serpent, sin, and death, the resurrection of all the children of Adam.

The supreme word by Jesus Christ to his apostles was, "Go ye, therefore, and teach all nations, baptizing them in the name of the Father, and of the Son, and of the Holy Ghost" (Matt. xxviii. 19). It was the third command from God to humanity: (*a*) Adam received the order to subdue nature (Gen. i. 28) by agriculture, industry, commerce, etc., and his posterity acquits itself of this task by inventing the steam-engine, the electric telegraph, etc. (*b*) To this order was added that given to Noah, of punishing the murderer (Gen. ix. 6)—that is to say, of establishing judges and creating a state—and the nations issued from Noah are still busy up to this very day with the solution of the problems of political science. (*c*) While thus psychical humanity devotes itself to the various works of civil society, following the example of Noah and Adam, spiritual humanity labors, by preaching the gospel, to gather all the nations into the holy Church of Jesus Christ, uniting them spiritually into one body by the bands of one common faith, while the universal monarchies endeavored to accomplish the same by arms and violence.

The creation of the Church, effected by the effusion of the Holy Spirit on the first Pentecost, demanded the miracle and the prophecy, as did the creation of the people of Israel on Sinai, and the creation of the invisible Israel at the time of Elijah. Nor were these gifts lacking among the apostles and the first Christians. But the Church soon lost again the supernatural gifts of the Spirit. The prophetic inspiration ceased in the second generation; the miracles lasted longer, but became less frequent. Having mixed itself up with the pagan world in the time of Constantine, the history of the Church is a long struggle between contradictory powers, not evincing the same rhythm as that of Israel, and we do not find here the renewal of the supernatural phenomena at the opening of each age which we have noticed in the times of the patriarchs, of Moses, Samuel, Elijah, and Ezra.

The prophecies of Jesus Christ and his apostles contain a history of the Church foreshadowed. The meaning of the book of Revelation is much disputed, however, and we shall not try here to impose our interpretation on the reader. We confine ourselves to the statement that two classes of martyrs are discovered here (Rev. xx. 4)—those of pagan Rome (Rev. vi. 9) and those of the papacy (Rev. xii. 11)—and that the actual history will terminate with a general apostasy under the most sanguinary of the Antichrists. Then once more there shall be no faith on earth (Luke xviii. 8), and Jesus Christ shall appear in his glory to destroy his enemies and save his Church. His arrival in his glory shall open the millenary era of his universal reign, when Israel shall be the heart, the centre, the sanctuary of the Church—when war shall cease to stain the earth with blood, and each family shall sit happily under "its own vine and its own fig tree" (Mic. iv. 4). The thousand years passed, the powers of darkness shall make a last effort in order to destroy the city of God. But the Eternal shall save it by a last intervention. At last the earth shall be consumed by fire, all the souls shall appear before the tribunal of God and Jesus Christ, and the work of redemption shall be accomplished by the eternal felicity of the redeemed.

If we view the revelations of the God of Adam, Abraham, and Christ as a whole, we must acknowledge that they supplement and presuppose each other, forming a true system of transcendental doctrines on Trinitarian divinity, creation, man, and the history of mankind; that they consist less of teachings than of acts of power, and work out rather than narrate the education and redemption of our race; and, finally, that they force themselves on our conviction by their unity, originality, and holiness, and by the full satisfaction they give to the innermost needs of our soul. It is moreover very remarkable that the records of these revelations have come down to us through about forty writers who succeeded each other during the thousand years from Moses to Malachi, and of whom the last were the disciples of Jesus Christ. They are all animated by the same spirit, which could not proceed from the finite and corrupted nature of man. They aim not at their own glory or that of their nation, but solely at that of God; and in their judgments they censure with complete impartiality the chosen people and the idolatrous nations, the priests and the kings, the poor and the rich. Let us add that they work, each by himself, on the construction of an edifice whose plan is so little clear to themselves that they seek in vain to comprehend it (1 Pet. i. 11).

The infidels object that the historic nations have all had their divine revelations like Israel, their prophets and their miracles, and that their sacred books have the same authority as the Bible. But the contrast between the chosen people and the Gentiles is so complete that it is difficult to establish a comparison between them with that seriousness which all scientific discussion demands. Thus, the miracles of the Old Testament are always announced in advance, in order that the witnesses should not attribute them to chance, and they form a necessary part of the whole work of the redemption of the world by Jesus Christ, succeeding each other according to a certain rhythm which testifies to the wisdom of their invisible Author. On the other hand, the wonders of the pagan world follow each other without rhythm or reason; they appear *ex improviso*, like falling stars, and amuse us by their puerility. They are monsters such as are exhibited to the curiosity of the public in our market-places or preserved in the jars of our museums. Now it is an aërolite with a Latin inscription, comets, rains of blood; then, again, it is statues which cry, laugh, refuse to be moved; sometimes it is apparitions of ghosts, voices issuing from the temples, not to speak of the absurd tales of the Chinese annals. One must have lost entirely his sense of truth in order to find the slightest resemblance between these wonders and the biblical miracles. Furthermore, to place in the one scale the oracles from the Egyptian temples, whose ingenious acoustic tricks have been discovered, or the answers, so shrewdly equivocal, by the Pythia of Delphos, or the art of the haruspices and augurs, of whom Cicero says that they could not look at each other without laughing—and on the other scale the biblical prophecies, extending from the pre-evangelical times down to the book of Revelation by St. John—would that not be to weigh imbecility against genius? The sixteen books of the Hebrew prophets contain not one single prediction which finds a rival in any other literature in its spirit of divine holiness, in understanding of the ways of providence, in its picture of the moral state of the people, and in truly sublime poetry. The only book which in any way can be compared with them is the *Invariable Mean* of the school of Confucius. But it does not pretend to possess the gift of prophecy. On the contrary, of all the historic nations of the Orient, the Chinese is the only one which confesses that it has received no revelations of its gods. This book, of all pagan books the most astonishing, contains an ideal and fantastic picture of the final establishment of peace and order on earth by the saint of the last days, the Son of Heaven and born of a virgin, like all the pre-evangelical saints from the primitive and mythical times of China.

Who can, without smiling, compare the incarnation of the Word in Jesus Christ with those of Vishnu in a fish, a turtle, a lion, a dwarf, or a frivolous libertine called Krishna? If Hercules resuscitated Alceste and rose to heaven from his funeral pile, did he still live at the time of Tiberius? and where are the eye-witnesses who have written his biography? Some one may mention Apollonius of Tyana, the contemporary of Jesus Christ. But the rhetorician who related his miracles 150 years after his death, does he deserve any credit when he invents the most absurd fables concerning the countries which his hero visited?

Furthermore, what resemblance is there between the Bible and the sacred books of the pagans? Those of the Chaldæan Oannes, the Egyptian Thoth, the Phœnician Taauth, the Etruscan Tagés, the Druids, have all perished. We possess not one line of them; time has pronounced its legitimate verdict of eternal oblivion on them. The Chinese *King* is neither revealed nor inspired; we may skip that. There remain, then, the sacred books of the Hindoos, the Zend-Avesta, and the Koran. But in the songs of the *Rig Veda* what do the Aryans of the Indus demand of their gods but terrestrial boons (Matt. vi. 32)?

and the *Laws of Manu*, what do they aim at but to strengthen the power of the Brahmans? The Zend-Avesta is much superior to these laws. Zoroaster educates his pupils to purity of thought, word, and action; but what absurd rites! what perpetual fear of the devs! and with the faithful what a high idea of his own justice! what entire absence of any feeling of culpability and repentance, of any need of expiation, pardon, and regeneration! what glaring contradiction between our reason, with its imperious claim on unity, and the dualism of Ormuzd and Ahriman! Moreover, this religion lies now in its death-throes, while Christianity is still going on conquering the whole world by its missions.

As for the Koran, in this book Mohammed preaches to the Orientals a deism fatalistic, enthusiastic, warlike, and poetical, just as in his *Profession de Foi du Vicaire Savoyard* Rousseau preaches to the Occidentals a deism logical, cold, prosaic, very pacific, and a little hypocritical. The founder of Islam confessed openly that he had not the gift of miracles, and when he pretends that the *suras* or chapters of his book were brought to him by the angel Gabriel, they prove their human origin only too plainly by their excessive poverty of ideas and the entire absence of any new view of God, man, and his history. The truths which Mohammed proclaims he owes to the Jews and Christians, and when he suppresses the mysteries of the Trinity, the atonement, and regeneration, it is, according to his own confession, in order to make Islam more easily accessible to the vulgar intelligence; and he gives voluptuous pictures of a merely sensual paradise in order to inspire his partisans with contempt of death. And when that which has been borrowed is left out of consideration, what a contrast between the Koran, the work of one single man, often exhausting us by its monotony, and the Bible, the work of a multitude of inspired writers, which the greatest geniuses have never grown tired of searching; between the Koran, which, born under a burning sky, makes proselytes only under the equator, and the Bible, the book of all humanity, translated into all languages, propagating itself in all zones and among all races, the joy of young and old, of the young girl and the soldier, of the mechanic and a Pascal, of a Leibnitz and the Hottentot; between the Koran, which escapes the control of science by not containing one page of history, and the Bible, which sees its cosmogonic revelations confirmed by geology, its annals by the inscriptions of the Nile and the Tigris, its old prophecies by the grand events of our century; between the Koran, which keeps the spirit of man within the narrow limits of the finite and the mischievous prejudices of a half-paralyzed conscience, and the Bible, which, commanding us to become holy as God is holy, raises us toward the ideal, the absolute!

But the only irrefragable proof of the divinity of the biblical revelations is the inner experience which the Holy Spirit gives us of their perfect harmony with all the needs of our primitive nature and of our state after the Fall. We owe to them the knowledge of the true God, the certainty of our moral dignity, the vivid feeling of our culpability and degradation, the grace which fills our heart with indestructible peace, a divine life which makes us victor over the world and over sin, a glad patience under afflictions, a steady hope of a better existence, and that love of God and man which alone gives our life its full worth. But in order to experience the truth of the gospel it is necessary to follow the method which Jesus Christ himself has defined when he says, "If any man will do his will, he shall know of the doctrine, whether it be of God, or whether I speak of myself" (John vii. 17). FRÉDÉRIC DE ROUGEMONT.

Revela'tion, Book of. The word "revelation" (in Gr. *apocalypsis*) signifies properly the removal of a veil. To know the present, man has his senses; to know the past, he has the study of history; but the future is hidden from him by a thick curtain; and if the human eye is to penetrate into this new world otherwise than through vague and uncertain presentiments, if the future is to be disclosed to man like the present and the past, it is necessary that this curtain should be removed, and that at the same time an inner sense be created through which he can enter into contact with the new sphere. Thus a revelation takes place. In psychological respects such a process does not involve anything impossible, or even improbable. We pass our thoughts into the spirit of our fellow-man by the aid of a sound, the word. Why should not God, the Father of spirits and a spirit himself, have a means by which to pass his plans into the spirit of his privileged creature? This means we learn to know through the prophecies of the Old Testament. It is the prophetic picture. God places before the inner eye of the prophet, opened by the Spirit, a vision—that is, a picture—in which the future presents itself under a certain aspect. The prophet looks at the picture, and although he does not always succeed in comprehending it, he can at least describe it as he sees it, while the future itself, as it enters into reality, furnishes the commentary to the prophecy. What Jew could have understood the admirable picture described by Isaiah (ch. liii.) of the Servant of Jehovah growing up before him as a tender plant, then bruised for the iniquities of the world, but at last triumphing over death and realizing the plans of the Eternal? Without the life and death of Christ for an explanation the meaning of this picture cannot be understood. Thus, God placed before the inner eye of John (compare i. 10, "I was in the Spirit on the Lord's day"), in a picture comprising a series of scenes and forming a complete drama, the future of the Church viewed under a certain aspect. In the fourth Gospel John describes the first appearance of his Master, the apparition in the weakness and poverty of the flesh; in the book of Revelation he describes the second appearance of his Master, the apparition in the divine power and glory. People often imagine this second apparition of the Lord as a sudden act. But if so, how could Jesus say to the Sanhedrim, just about to condemn him, "Hereafter shall ye see the Son of man sitting on the right hand of power and coming in the clouds of heaven" (Matt. xxvi. 64)? The very moment of the ascension of Jesus is the starting-point of his return; in that moment begins his second appearance. But it is necessary here, as in the question of any voyage, not to confound the coming with the arrival. The arrival is the last moment of the coming; it is instantaneous; and so it will be in the case of Jesus. He says himself, "For as the lightning that lighteneth out of the one part under heaven shineth unto the other part under heaven, so shall also the Son of man be in his day" (Luke xvii. 24). The coming, on the contrary, may occupy a very long time. It may be accelerated or deferred by human freedom, which may accomplish or neglect the conditions demanded by the arrival. It resembles in this respect an elastic substance expanding and contracting according to the state of the temperature.

The coming of the Lord, thus comprehended, presents itself under a double aspect. Jesus returns to the world and to his Church. Under the first view he appears to John as the Judge who approaches—under the second, as the Bridegroom who comes to find his bride. The Judge announces himself by a series of chastisements of a steadily-increasing severity. The Bridegroom prepares his arrival by a series of graces, in like manner steadily increasing; and these two modes in which the coming Lord manifests himself alternate in the apocalyptic picture as they do in the real history, so that the picture is composed of a constant succession of sombre and terrible scenes—the procession of the Judge; and of bright and joyful scenes—the procession of the Bridegroom.

There are in a voyage three points to observe: (1) the moment of departure; (2) the way; and (3) the arrival. Such is also the general division of the book of Revelation. (I.) After indicating the subject by these words, "I am Alpha and Omega, the beginning and the ending, saith the Lord, which is, and which was, and which is to come" (i. 8), John fixes the point of departure in the first three chapters; it is the state of the Church at the moment in which he writes. The state is depicted in the letters which he addresses from the Lord to the seven chosen churches of Asia Minor. (II.) From ch. iv. to xix. 10 he describes the coming itself—that is, the chastisements of the Judge, who calls the world to repent before the final judgment, and the graces of the Bridegroom, who elevates his Church to perfection for the wedding-day. (III.) Finally, from xix. 11 he describes the arrival with all its consequences, both for the world and for the Church, and he finishes with a proper conclusion, intended to make the reader feel the importance of the book.

(I.) In the picture of the appearance of the Lord in ch. i. all the emblems may be noticed of those divine attributes which he manifests during the course of his coming and at the moment of his arrival. He is surrounded with seven candlesticks, representing the various churches which have succeeded the one candlestick of the ancient people of God, now rejected. The seven churches are chosen, as the symbolical number *seven* makes one suspect, to represent the totality of the Church. For this purpose they must correspond to all the spiritual states which a Church of Jesus Christ can present on earth—from the state of equilibrium between good and evil to the almost complete triumph of the one or the other. In the first, Ephesus, good and evil balance each other. In the third, Pergamos, evil excels. In the fifth, Sardis, death reigns in spite of the noise of her life. In the seventh, finally, Laodicea, her state is such that the Lord is about to vomit her out of his mouth. To these four churches there is said, "Repent, or—" There is a similar gradation in the second, fourth, and sixth churches. In Smyrna, the second, faithfulness reigns; at Thyatira, the fourth, it not only reigns,

but progresses. At Philadelphia, finally, the sixth, her state is such that she seems ready to be crowned. The second series is distinguished by the absence of the announcement, "Repent, or—"* There is not, and there never will be, in Christendom a Church which does not conform to one of these divisions, and find a place somewhere in these moral statistics traced out by the very hand of the Lord himself.

(II.) The opening of the second part, in which the glance of the prophet begins to turn from the present to the future, is given in chs. iv. and v. in two pictures—that of the glory of God and that of the glory of the Lamb. In the first may be noticed the four animals or living beings which support the throne of God, and the twenty-four elders who surround it. The former represent the forces of nature under the emblem of the four beings which are at the head of the living world. In the pagan world these forces, deified by human folly, were on the throne. Here they are reduced to their proper place, bearing the throne, and they serve in executing the orders which emanate from it. The twenty-four elders represent the Church already triumphant—twelve for the faithful among the Jews, and twelve for the faithful among the pagans. A sea of glass extends around the throne; it is perhaps the emblem of the luminous immensity of the divine plans. An emerald rainbow environs the throne; it is the emblem of the grace which mitigates the awful aspect of the divine majesty. Then appears the Lamb on the throne, "as it had been slain. In the right hand of Him that sits on the throne is a book written within and on the back side, sealed with seven seals." It is the symbol of the decree of God with respect to the world and the Church. This decree must be understood and executed by some one, which is the meaning of the act of breaking the seals. No one is able to accomplish this act until the Lamb itself, endowed with the seven eyes of all science and the seven horns of all power, seizes the book and commences to break the seals. Then the execution of the divine plan shall begin. This whole scene is the dramatic representation of the idea that it is Jesus Christ, glorified after his elevation, by whom God rules the universe. What a joy for the Church! what a consolation for the faithful in their sorrows! In ch. vi. the seals are finally opened. At the opening of the first, a white horse comes forth, mounted by the angel of victory: it is the emblem of the victories which the gospel shall achieve over the whole world. At the second, a red horse appears, bearing the angel of war, recognizable by the great sword which is in his hand. At the third, a black horse comes forth, and the angel whom it carries holds in his hand a scale for measuring food: it is the symbol of famine. From the fourth, a pale horse issues, and on him sits the angel of Death, and hell follows with him. It is the symbol of pestilence and of epidemic diseases in general. These three plagues, war, famine, and pestilence, shall destroy one-fourth of humanity. On the opening of the fifth seal the departed souls of the martyrs raise a loud cry, calling for judgment. A superior degree of glory is accorded them, but new persecutions (those of the last days) are announced. With the sixth seal an earthquake wakes the world, and gives to all human beings a presentiment of the approach of the judgment. Here the first series of chastisements ends. But it seems to us that the calamities announced by the opening of the seals cannot be applied simply to one war, one famine, one earthquake, any more than the victory of the gospel, represented by the white horse, can be applied to one particular victory. They are more properly the categories of the ordinary chastisements which God uses in order to call the world to repentance, at the same time that he orders the gospel to be preached on earth. Jesus had said previously (Matt. xxiv. 7), "For nation shall rise against nation, and kingdom against kingdom, and there shall be famines and pestilences and earthquakes in divers places." The second, third, fourth, and sixth seals are pictures embodying these abstract expressions. With respect to the first seal, it corresponds to the following words of the same chapter (verse 14): "And this gospel of the kingdom shall be preached in all the world for a witness unto all nations." The fifth seal corresponds to the following prophecy from verse 9: "Then shall they deliver you up to be afflicted, and shall kill you." The meaning of this picture of the six seals seems thus to be clear. After the establishment of Christianity in the whole empire the earth shall be visited by plagues destined to break the stubbornness of the pagans and dispose them to receive the promises of grace. The seals represent the measures of general severity by which God supports from time to time the preaching of the gospel among the nations of pagan origin. To this sombre picture of the plagues of God corresponds in ch. vii. a bright picture of assistance and grace. It comprises two scenes. The one relates to the Jewish people; the express enumeration of the twelve tribes does not permit us to take the word Israel in this passage otherwise than in its proper sense. Twelve thousand persons of each tribe are marked with the seal of God. For what purpose? That is sealed which one wishes to set aside as his private property. Thus, it is here the flower of Israel which God keeps in reserve in order to employ it for some important purpose in the struggles which shall follow. And indeed, in ch. xiv. we find these one hundred and forty-four thousand men on Zion's hill surrounding the Lamb—that is, they have been converted to Christ in the interval, and are now ready to put themselves at the head of the Church in the battle against Antichrist (ch. xiii.). For the present (ch. vii.) they are simply set aside as Jews, to perform this function when the proper time comes. In the second part of ch. vii. the prophet witnesses the arrival at the celestial glory of an innumerable multitude of faithful from among the Gentiles, "of all nations, and kindreds, and people, and tongues," verse 9. They have traversed the furnace of persecution victoriously by their faith. John celebrates here the establishment of the gospel in the world of the Gentiles, and shows the radiant crown to the believers in order to sustain their hope during the bad days which shall follow. The book, however, containing the decrees of God is composed of seven leaves closed by seven seals, and of these the seventh has not yet been opened. In ch. viii. it is broken, but it does not contain any particular event. It encloses the whole subsequent vision of the seven trumpets. There is an apparent gradation from the image of the seal to that of the trumpet, and from the image of the trumpet to that of the vial. The seal represents simply the divine decree as inevitable. The trumpet announces the execution as very near; it is a signal. The vial introduces the decree as identical with its execution. The six trumpets which are heard in the eighth and ninth chapters call down on the inhabitants of the earth a second series of plagues still more frightful than the first one: (1) a rain of hail and fire on the productions of the soil; (2) the corruption of the waters of the sea by a volcano precipitated into it; (3) the fall of a star which makes all the fresh waters of the earth bitter; (4) the eclipse of the stars and the waning of light on earth. The third of that population which still remained on earth after the first series of plagues shall perish. An allegorical explanation of these plagues leads very easily into empty subtleties. It must be remembered that the vision represents a world which itself approaches its dissolution while its inhabitants move toward the judgment. Jesus thus describes the period which shall precede his return (Matt. xxiv. 29): "Immediately after the tribulation of those days shall the sun be darkened, and the moon shall not give her light, and the stars shall fall from heaven, and the powers of the heavens shall be shaken," which words cannot be taken figuratively; indeed, the first four trumpets just mentioned are only an amplification of these words. The last three trumpets are distinguished by a particular name, and are called the three woes (ix. 12), as if all the preceding did not deserve such a name. There is first (5) a cloud of locusts of a strange nature which rises from the bottomless pit and covers the earth for five months, rendering life intolerable to man; next, (6) an invasion by a hostile army coming from the extreme east and ravaging the countries of the west. The first of these plagues can hardly relate to anything but the spiritual world, since the locusts rise from the depths of the abyss and represent an invasion of the earth by diabolical spirits. The five months are borrowed from a circumstance well known in the East; it is exactly the time which the great invasions of locusts ordinarily occupy. But that which proves conclusively that the question is here of a fact relating to the spiritual world is the circumstance that this trumpet corresponds with the fifth seal, which also relates to a scene from the spiritual but celestial world. With respect to the invasion represented by the sixth trumpet, it reminds us of the great migrations of the Eastern people, which the world has witnessed so often, and which could very well be repeated once more before the close of history. The extreme Orient conceals in its interior masses of population still fresh, which on a signal from God may rise and throw themselves over Europe, which is weakened physically and morally by its vices. The sounding of the seventh trumpet, which shall call up the last and most terrible plague, Antichrist, is preceded, as was the opening of the seventh seal, by a bright and joyful picture. It concerns especially the Jews (ch. xi.), like the first of the two scenes of ch. vii.

* It is very remarkable that the churches of the second series, Smyrna, Thyatira, and Philadelphia, have never ceased to exist as Christian churches; while since the second century there does not exist a trace of the others, with the exception of Pergamos.

This introductory picture is presented under the image of a small book—that is, a small vision by itself enclosed in the grand prophecy of the Revelation. John is commanded to eat this book—that is, to appropriate wholly its contents. He sees Jerusalem occupied by the Gentiles; even the fore-court of the temple is in their power. But the temple, properly speaking, is withheld from them, and here are kneeling the true worshippers of Jehovah. In the city itself two prophets preach repentance to Israel. They are gifted with the power of miracles, as formerly Moses and Aaron. But the Pharaoh of the last times is also here, the beast—that is, Antichrist (verse 7)—which proves clearly that this vision of the little book is an anticipation of the great prophecy itself; also the words, "I will give power" (verse 3), "the beast shall overcome" (verse 7), etc., are to be explained in this way. This master of the world kills them, but in the lapse of three days they are resuscitated and raised to heaven, while an earthquake destroys a tenth part of the holy city, and a part of the inhabitants perish; the survivors give the glory to God. If we are not wholly mistaken, this vision relates to the grand and decisive event of the final conversion of the people of Israel. Jerusalem crowded with Gentiles, even in the fore-court of the temple, represents the Jewish people in its present state of dispersion and subjection, for not only politically, but also in religious respects, this people identifies itself more and more with other nations. It renounces its ancient peculiar customs; it abandons even the faith of its ancestors in the revelation and miracles of Jehovah. Our rationalism has crept into it; the great defection broods in it as in us. But the temple is guarded by God himself. It is the faithful portion of Israel which remains attached to the faith of their ancestors, and shall continue so until this Jewish piety shall be transformed into faith in Christ. Among the infidel Israel powerful agents of God shall fill the ministry of prophecy. They shall succumb to the hatred of Antichrist, but their defeat and their glorification shall be the signal of the conversion of the whole people, which from that moment shall be the great force of the Christian army. This is what the vision announces to the Church in order to encourage its faith in the moment in which the last struggle shall begin.

This is opened by the sounding of the seventh trumpet, which calls forth Antichrist, the last of the three woes (compare xi. 14 and 15), the establishment of his dominion. But this supreme apparition of evil is still preceded by a picture relating to the Church during this great crisis (ch. xii.). One Church is here represented under the image of a woman travailing in childbirth. A dragon is waiting for the child in order to devour it, but the child is taken away into heaven and the woman flees to the desert, where she is miraculously fed—as formerly Israel under similar circumstances—for three years and a half. Then the archangel Michael, the celestial champion of monotheism, whose name signifies "Who is like God?" struggles with the dragon, and precipitates him from the heavens to earth, where he causes to issue forth from the womb of the ocean —that is, from among the mass of the people—a monster, the beast with the seven heads, which represents Antichrist. This beast is followed by another, of a less terrible form, having the horns of a lamb; it is the false prophet. The first beast exercises a royal power over the whole world; the second employs his spiritual ascendency over mankind in order to allure them to render homage to the power of the first (ch. xiii.). The Son about to be borne by the Church is the Lord himself, as the King and Judge of the world. His removal to heaven signifies that his reign, which seemed so near its realization, is still deferred for a time, in order to make room for that of his rival, Anti-Messiah, to whom is accorded the short period of three years and a half. The Church itself shall be externally suppressed during the reign of this adversary, but it shall nevertheless be miraculously preserved during this time of trial, as was the Protestant Church of France during the century of persecution which followed the Revocation of the Edict of Nantes. This external destruction of the Church shall take place simultaneously with another event, of a directly opposite character, the fall of idolatry over the whole world, which is the grand fact represented by the victory of the archangel Michael over Satan. And, singular to say, this very fact shall be the occasion of the arrival of Antichrist; for it is in order to avenge the destruction of his worship among the pagans that Satan calls forth this person and endeavors to suppress the worship of Christ in Christendom. This is, no doubt, the meaning of the words of the angel in xii. 10–12.

There are two leading opinions of the person of Antichrist. Some consider him merely as a poetical personification of a principle, of the spirit of rebellion against God and Christ, which shall go on increasing till the final triumph of the gospel. Others recognize in him a real man, who shall concentrate in his own person to the utmost extent the spirit of apostasy. The second chapter of the Second Epistle to the Thessalonians, in which his apparition is described, speaks decidedly in favor of the second explanation. Antichrist is here designated as the man of sin, who shall place himself as a god in the temple of God; he is called the wicked man whom the Lord shall destroy by the breath of his mouth. His theological system may be summed up in the three following theses: (1) there is no personal God without and above the universe; (2) man is himself his own god—he is the god of this world; (3) "I am the true representative of humanity; by worshipping me mankind worships itself." But even from this general point of view there still remain certain differences of opinion. According to some, this person has already appeared on the stage; he is the pope. It is evident, however, that the pope has never actually substituted himself for God or Christ; on the contrary, he rests his authority on that of Christ and God. The pope may be said to be on the way which ends with the arrival of Antichrist, but he is not yet Antichrist himself. Others hold that the Antichrist announced in the Revelation is only an empty supposition, which has never been revealed. The author of the prophecy, they say, thought of the emperor Nero, that matchless monster, the first persecutor of the Church, whose death the world could not believe in, and whom the terrified Church feared to see return suddenly and assume the part of the man of sin and the universal suppressor. The number 666, which, according to xiii. 18, is the number of the beast, was explained in accordance with this view. The letters of the two words K A I S A R N E R O N, when taken as ciphers and counted in Hebrew, give indeed the sum of 666. This fear was never realized, however, and thus the Revelation became an unfulfilled prophecy on this capital point. But it is difficult to understand how under such circumstances the book can have survived in spite of the discredit which fell on it immediately after its appearance, and how the author, if he was a serious man, could suffer it to circulate without retraction. It must also be noticed that in order to obtain the sum of 666 from this name, it must be written *Kesar*, and not *Kaisar*, which is against custom and orthographical rules. Finally, it would be somewhat strange if the name which was to be figured out of the number had been put down in Hebrew, while all the rest of the work is in Greek. In speaking of the man of sin, St. Paul, far from identifying this person with the Roman emperor, hints that, on the contrary, it was the imperial power which prevented Antichrist from appearing. "Ye know," he says (2 Thess. ii. 6), "what withholdeth that he might be revealed in his time." The apostle considers Antichrist as the realization of the false Messiah, the terrestrial king, the new Solomon, whom the carnal Israel expects. And what was it that prevented the Jews of that time from putting forth this false Messiah, the object of their hearts' longings? It was the Roman legions, which on the mere nod of the emperor would have invaded the Holy Land and put down any attempt at insurrection. It is the powers instituted by and inherited from the Roman empire, which up to this very day have prevented Antichrist, the false Messiah of the Jews, from appearing; but he will not fail to come forth as soon as these powers fall; the Jewish people will then have acquired that preponderance in all civilized states which is necessary before it can give its insatiable ambition the reins. In continuing our study of the Revelation we shall see whether this explanation, borrowed from the Second Epistle to the Thessalonians, is in harmony with the rest of the book. With respect to the number 666, numerous solutions of this enigma have been given, but none which is thoroughly satisfactory. A peculiar fact has lately attracted attention. The Greeks do not designate numbers by particular signs called ciphers, but by the letters of the alphabet, to which a numerical value is assigned. Thus, 600 is expressed by the letter χ (*ch*), 60 by ξ (*x*), and 6 by ς (*s*). The name of Christ (*Christos*) is represented by the first and last letters, χς, and these two letters represent the two numbers 600 and 6. If between these two letters the letter ξ, which signifies 60, is introduced, the sum of 666 is obtained; and the three letters, χξς, represent the abridged form of the name of Christ, but in such a manner that the first and third letters are separated by the ξ, the emblem of the serpent. Thus, in Greek 666 is the emblem of the Messiah, of Satan, or of Antichrist. It may also be noticed that, according to the symbolism of numbers employed in the Revelation, the number 7 always expresses the divine plenitude, and that God, as the Father, the Son, and the Holy Spirit, must consequently be represented in ciphers by 777. Thus, the number 666 would signify the creature's highest though still impotent effort at attaining divine glory and power, and the representation would comprise the three persons which form the diabolical trinity—namely, Satan,

or the dragon, the beast, or Antichrist, and the second beast, or the false prophet. Satan cannot become God, nor can Antichrist attain the dignity of the Son-Messiah, or the false prophet equal the Holy Ghost. Nevertheless, it is no doubt wise to apply to our age that which in the second century the pious Irenæus said to his: "If the author of the prophecy would have made the name known to this time, he would have designated it more plainly." Irenæus mentions several explanations propounded in his time, of which the least improbable is the word *Lateinos*—that is, Latin, Roman, the Roman emperor. The Greek letters of which this word is composed give, indeed, when added together as ciphers, the exact sum, 666.

As for the false prophet, he is evidently the personification of worldly wisdom, natural inspiration. There is, says St. Paul (1 Cor. ii. 12), a spirit of the world which, like the Divine Spirit, can exalt by his breath such as make themselves his organs, and communicate to them a power by which they allure the multitude and rule their time. History affords instances enough. The most striking would be that second beast, with the lamb's horns, which knew how to assume the most alluring forms of piety, but which employed all its gifts to draw men to the feet of Antichrist. Jesuitism in the service of the papacy is a fact which throws some light on such a combination.

It is impossible to pass by a striking analogy which presents itself at this point. The false prophet works only in order to exalt the false Messiah, and the false Messiah only in order to make the power and reign of Satan triumphant on earth; it is the accomplished mystery of iniquity. Human wickedness has spoken its last word. And certainly, when commencing with the fall of man, history could not end before this supreme explosion had taken place. But, on the opposite side, what do we see here? The Holy Ghost works only in order to glorify Christ, and Christ only in order to make the power and reign of God triumphant on earth; it is the mystery of piety in its perfection. Its splendor cannot manifest itself fully unless by its victory over the opposite mystery. The whole revelation, as the whole history, is only the sum-total of this antithesis.

After this dark picture presented in ch. xiii. the Lord encourages the Church by a bright picture in ch. xiv. It is the aspect of the one hundred and forty-four thousand Israelites who were sealed in ch. vii., and who now have been won over to the faith, and surround the Lamb as a picked guard just as the battle draws near. Then an angel, flying across the heavens with the gospel in his hand, announces the extension of the mission to all the nations of the earth; the promise of the fall of Babylon, the capital of the empire of Antichrist; the promise of an immediate celestial felicity to the martyrs who prefer death to infidelity; and finally, the promise and the threat of the near judgment under a double aspect—namely, as a harvest, God gathering in his fruits, and as a vintage, his adversaries being trodden in the wine-press of his wrath. As the seventh seal enclosed the seven trumpets, thus the seventh trumpet, which occasions the appearance of Antichrist, encloses the seven vials, or the last plagues reserved for the ruin of the empire of the false Messiah. They are announced in ch. xv. and enumerated in ch. xvi. In an introductory picture the faithful Church appears traversing the sea of the fire of persecution, but singing in the midst of the flames the hymn of Moses, which formerly Israel sang after the passage of the Red Sea, and to which the Church adds the hymn of the Lamb. Then the vials are poured: (1) A malignant sore falls on the worshippers of the beast; (2) the waters of the sea become foul; (3) the waters of rivers and springs become corrupted; (4) the sun changes into a devouring fire; (5) thick darkness invades the empire of the beast; (6) the Euphrates is dried up in order to allow free passage to the kings of the East, who are united by a diabolical instigation and come to associate with the beast; (7) an earthquake, accompanied by a tremendous hailstorm, destroys Babylon, the capital of the beast. In this way God redeems the promises of brilliant prosperity and a new golden age by which the beast has seduced the world. One-fourth of mankind perished by the seals, one-third of the remainder by the trumpets, one-half by the vials. And while thus the plagues of God are going on increasing in intensity, what are men doing? After the first six seals they trembled and cried, "Mountains, fall upon us!" It looked like the commencement of repentance. But after the first six trumpets obstinacy seized them, and they did not repent of their murders and poisons and impurities and robberies (ix. 21). After the vials are poured the obstinacy becomes madness (xvi. 9); "They blasphemed the name of God; they gnawed their tongues for pain, and blasphemed the God of heaven."

In ch. xvii. Babylon appears personified. It is a queen arrayed in purple and gold, the great whore. She is sitting on the beast. This beast has seven heads, of which five have fallen, the sixth is still alive, and the seventh shall come, but only for a short time, after which the beast itself, which "was" and "is not," and who "is of the seven, and goeth into perdition," shall appear as the eighth head. The seven heads of the beast are seven hills, on which Babylon, considered as a city, is built. Then suddenly the beast turns against Babylon with the kings, his allies, pillages her, and burns her; ch. xviii. is a song of triumph chanted over her ruins. With respect to the explanation of ch. xvii., one of the most important passages of the Revelation, it seems to us that there can be a choice only between two different meanings. According to the explanation which considers the emperor Nero as the Antichrist, expected as the last persecutor of the Church, the seven heads of the beast are the first Roman emperors. The five sovereigns already dead, Augustus, Tiberius, Caligula, Claudius, and Nero, are the five heads which have fallen. Galba is the sixth; it *is* now, and the book of Revelation must consequently have been composed during the short reign of that prince in the year 68. The seventh shall be an emperor as yet unknown, but whose reign shall be very short. Finally, Nero, restored or resuscitated, shall reappear as the beast itself. It "has been" as far as Nero has reigned; it "is not" as far as he has disappeared; it is of the seven, and returns only in order to go to perdition. But in order to sustain this very ingenious explanation it would be necessary to demonstrate that the book of Revelation was composed in the year 68, two years before the destruction of Jerusalem; and that is an opinion which seems to us to present insurmountable difficulties. How can we suppose that in 68, hardly ten years after the foundation of those churches in Asia Minor to which the letters of the second and third chapters are addressed, these churches could have had a religious history of considerable length, and could have developed such a distinct moral character as the letters present to us? How can we believe that in these few years, and after such a powerful spiritual creation, Sardis could have become "dead," Laodicea lukewarm and exciting the disgust of the Lord, and four among them so depraved that they deserved to have their candlesticks overthrown? Such a fall and such threats—do they not presuppose an existence of at least one generation from the foundation? Let us add that the letters of St. Paul and St. Peter, addressed to these countries about the year 63 (Ephesians, Colossians, Philemon, 1 Peter), do not give the least hint of any such decline. It should consequently have taken place in the course of five years. Moreover, the ministry appears to be already constituted otherwise in these churches than in the apostolical churches, and in a manner in which it does not appear in the history of the Church until about the beginning of the second century. There is a bishop (the angel of the church), whom the Lord makes responsible for the state of the church. Furthermore, the council of elders which, according to Acts and the Epistles, governed the Church at the time of the apostles, have already a permanent president at its head. Finally, we find in the first chapter the expression the "day of the Lord" used to designate Sunday, but this designation, which was in common use during the whole course of the second century, would have been entirely inappropriate, on account of its technical character, in times preceding the destruction of Jerusalem. The name of Sunday was then still the Jewish term, "the first day of the week."

These traits suffice to show that the book of Revelation could not have been composed until toward the close of the first century; and this conclusion is positively confirmed by Irenæus, who came from Asia Minor, and had known Polycarp and other presbyters who had seen John. "The vision of the Revelation," he says, "belongs almost to our time, the reign of Domitian" (81–96). Hence it follows that we have to seek for another explanation of the beast and its seven heads.

The beast does not represent the Roman power exclusively. The image is taken from the animal world, as are the images employed by Daniel, in order to characterize the brutal nature of the pagan state. The beast represents the political power, as far as it is hostile to God, through the whole course of history, from its first appearance in Egypt, where it held the people of God captive and tried to exterminate it at its birth, to Antichrist, its supreme apparition, who will try finally to annihilate the reign of God, just approaching the last state of its development. In depicting the beast for the first time in ch. xiii., John gives it the form of the leopard (the emblem of the Greek empire with Daniel), the feet of the bear (the emblem of the Medo-Persian empire with the same prophet), and the mouth of the lion (the image of the Babylonian empire). The beast of the Revelation is not only a peculiar

phase of the anti-divine power, but at the same time the complete manifestation of the same principle; and that is the reason why it combines in itself all the emblems of the preceding monarchies. What are the seven heads which preceded Antichrist? The holy history must answer, for it is not proper to seek for the solution of apocalyptic questions outside of Scripture. The first state which came in hostile contact with the reign of God, manifesting itself through his chosen people, was Egypt, which endeavored to destroy it in its cradle. The second was the Assyro-Babylonian empire, which suppressed it for a time—first, by the destruction of the kingdom of the ten tribes, then by the destruction of Jerusalem. During the Babylonian captivity Israel, and with it the reign of God, disappeared for a time from human view. The third was the Persian empire, which held the restored Israel under its authority; and the fourth the Greek monarchy, or more especially that among the states originating from this monarchy which made Israel feel the yoke the heaviest, the kingdom of Syria. During this period Antiochus Epiphanes (the little horn of ch. viii. of Daniel) tried to suppress in Israel the worship of God and substitute that of Zeus and the pagan Olympus. Antiochus is the Antichrist of the old covenant. The fifth—and on this point the book of Revelation seems to us to have been misunderstood up to this moment—is the Jewish state, degenerating under the sceptre of the Herods and the pontificates of Annas and Caiaphas, and repeating against the Church, as St. Paul makes us understand it in Rom. ix., the crime of the Pharaohs against Israel. The representatives of the theocracy, Herod and the Sanhedrim, tried to annihilate first the person of Jesus, then his Church, and to suppress the preaching of his gospel. Thereby the Jewish state ranked itself among the powers hostile to the reign of God, and it became by its unexpected attack one of the heads of the beast. It is the fifth; and that is the reason why John, who wrote after the fall of Jerusalem, can say, "five have fallen." He adds, "the sixth is." It is the Roman empire, which in the moment when John wrote stood in its full power—a circumstance which explains how so great a number of interpreters can have taken it for the beast itself. The seventh, which shall last only for a short time, is the political power which is called to put an end to the Roman dominion. Is this power the barbarians who in the Middle Ages destroyed the empire? It seems more probable to us that the Roman power is considered in this prophecy, as with Daniel, as comprising the whole political order up to our day. In the vision of the statue (Dan. ii.) the European states are nothing but the iron toes of the colossus, the Roman empire; and in the vision represented in Dan. vii. nothing but the ten horns of the beast without name, which swallows all, and which also represents the Roman empire. The seventh head is that power of short duration which shall destroy the whole political system of Europe and prepare it for the arrival of Antichrist. This conforms to the teachings of Paul (2 Thess. ii.). The apostle announces here that the Roman empire, which for the moment prevents the power of Antichrist from appearing, shall be thrown down in order to give room for the man of sin. The seventh head, then, shall destroy the last remnants in the actual world of the Roman order of things.

And who shall be Antichrist himself, the eighth head? John says (xiii. 3) of one of the heads of the beast that it was wounded to death by a thrust of the sword, but its wound shall be healed, and its restoration shall astonish the world and bring it before the feet of the beast. This wounded head, is it not the people of Israel, mortally hit by the Roman sword, but which shall rise again as the last but highest anti-divine political power? In xvii. 10 it is said of the beast that it "was," that it "is no more," and that it shall return, but only to disappear. Israel *was* once an independent political power; it *is* no more a nation organized as a power, but it shall reappear as the last monarchy, and after so many powers have succeeded each other the astonished world shall see the Jewish empire unite once more. This idea is in harmony with that of Paul (2 Thess. ii.), who, as we have seen, considers the man of sin as the realization of the terrestrial and carnal Messiah whom Israel is still expecting. Any one who knows Europe knows also what a peculiar aspect matters have there begun to assume. The Jews are not only the bankers of the kings and the directors of the commerce of the whole world, but they have become the governors of the ideas of the century, the spiritual kings of the European peoples. The greater number of influential journalists are Jews; and, as Mr. Heman, who knows thoroughly the aspirations of this people, says, "The distinctive feature of the Jews is their indefatigable tendency to place themselves at the head of modern life." Not long ago a Jewish journal called Judaism the "lighthouse of the future." To believe in humanity, which is God, and do good toward our brethren, that is the religion preached by these Jews, who reject their old monotheism at the same time they trample on the divinity and mediation of Christ. They exult already in seeing so great a number of Christians follow them, and they will soon proclaim this doctrine as the true religion of humanity. Then the throne of the man of sin shall be decked, and nothing remains but that the new Solomon shall be seated. How will he use his powers? He shall persecute the Church, the true spouse; then he shall turn his power against Babylon, the whore, those Gentiles to whom Christianity has been only an external varnish, not a new nature, and whose centre shall still be the city of the seven hills. Judaism has a debt to pay to Rome, the old agent of its ruin, and it will not fail to take revenge. Finally, it will turn its fury against those two preachers of repentance who shall rise among Israel (ch. xv.) and by their miraculous power make the plagues of the seven vials described in ch. xvi. shower down over its empire.

III. We approach the moment when Christ shall arrive and free his Church from the hands of the enemy. It is described in all its magnificence in ch. xix. It is this event which St. Paul announces (2 Thess. ii. 8): "And then shall that Wicked be revealed whom the Lord shall consume with the spirit of his mouth, and shall destroy with the brightness of his coming." It shall be the termination of that long coming which the biblical writers could not predict, because, as Jesus said to his apostles, God held the moment at his own free disposal. This supreme act is accompanied with the resurrection of those among the faithful who have died, and the glorification of those who are still alive; and it is followed by a state of affairs in which the reign of God can be perfectly realized among mankind, and Christianity develop all its blessings, spiritual and terrestrial. It is the reign of a thousand years, the sabbath of humanity on earth after its long week of work. Nothing in this apocalyptic picture compels us to assume that the Lord himself shall be visibly present on earth during this whole epoch; it is his Spirit that shall reign and glorify him. At the end of this period Satan, who as yet is only bound, shall try once more to destroy the work of God, but he shall only give the signal of his own final punishment, which is accompanied by universal judgment (ch. xx.). The terrestrial state founded on the day of creation (Gen. i.) now gives place to the new heavens and a new earth (Rev. xxi.), in which God is all in all. Anticipating the sight of this admirable spectacle, John prostrates himself and invites all the faithful to cry with the Spirit and the spouse, "Lord, come—come soon!" (ch. xxiii.). What a vast drama! What a magnificent conclusion to the Scriptures opening with the Genesis! The first creation made man free; the second shall make him holy, and then the work of God is accomplished.

The question is now, Who is the man to whose eyes the whole plan of God has been thus unveiled and the book with the seven seals unfolded? He calls himself simply John (chs. i. and xxii.). But could any other than the apostle of this name designate himself in this manner, especially in Asia Minor, where the apostle had ended his life? The difference of style between the Revelation and the fourth Gospel is objected. It is not so great, however, as pretended. There are even profound affinities in this as in all other respects between the two works; and if there exists a relative contrast, it may be explained by the fact that in the book of Revelation John continually imitates the prophets of the Old Testament, and reproduces to some extent, verbally, the most striking of their pictures, while in the Gospel he pursues with entire freedom his own manner of writing. The keen critic Winer has observed the same difference in the writings of the historian Josephus. As long as he reproduces the history of the Old Testament his style has an Aramaic tint, but it becomes purely Greek as soon as he begins to narrate independently of the biblical text. The difference of tendency is another objection. In the Gospel, it is said, the author is distinguished by an insurmountable aversion to the Jews, while the author of the Revelation turns his whole animosity against the pagans. But it is overlooked here that these two works are the two halves of one complete drama—the first representing the struggle of the Lord with the Jews during the times of his humiliation, the other describing his struggle with the world of the Gentiles from the realm of his glory. Israel has had its times, which terminated with the coming of the Son of God (Luke xix. 42). When Israel rejected the Saviour the times of the Gentiles commenced (Luke xxi. 24). In the Gospel the end of the times of Israel is narrated; the Revelation describes the end of the times of the Gentiles, which is also the end of the whole. There is, indeed, nothing surprising in the circumstance that in the apocalyptic picture the Gentiles play precisely the same part as the Jews in the Gospel—namely, that of resisting God. In the same manner, the Church corresponds in the

Revelation to the disciples in the Gospel, and the glorified Christ to Christ in his humiliation. In both cases the struggle is between Christ, faith, and infidelity; and this observation suffices to prove that both works emanated from the same idea.

The Fathers tell us that toward the close of his life, during his residence in Asia Minor, the apostle John was exiled to the isolated rock of Patmos by Domitian, who had a fancy for that kind of punishment. Here, alone, on a Sunday which well deserved to be called by him the "day of the Lord," the inner veil was removed from before his soul, and the second coming of Him whose first apparition he had seen with the eyes of his body was revealed to him. He had seen the tomb of his Master empty and the Lord after he had risen, thus drawing from death itself his greatest triumph. He had seen the mustard-seed, deposited in the earth by the hand of Jesus, how it grew and became a tree under whose foliage many nations already sought shelter, and from Patmos he saw how the branches of this marvellous tree spread far to the East and to the West. He had seen the threats of his Master fulfilled, as well as his promises: Jerusalem had fallen, and the people of Israel had been dispersed like a cloud of dust over all the countries of the earth, while the Judæo-Christian Church, taking refuge on the other side of the Jordan in accordance with the order of its Master, had escaped the catastrophe. He had seen the pagan world rise against the nascent Church, and the purest blood which ever ran through human veins shed in streams in the streets and places of the capital of the world. He had seen how famines, pestilences, and earthquakes, accumulated in this epoch by Providence, succeeded each other like so many scourges by which God chastised the corrupted world and supported the work of redemption. He had seen eight sovereigns seated on the throne of the Roman empire, which was the actual representative of the beast, of the terrestrial power hostile to God, and the man who reigned just now combined in his government all the atrocities of his predecessors. It is in the midst of such experiences and such remembrances we must imagine the apostle in order to comprehend the intuitions which the prophetic spirit awakened within him on that day of profound internal concentration, when he worshipped alone on the desert rock and saw the action on the world of the Gentiles, of the Lord in his glory, and of his gospel; the threefold series of plagues which God holds in reserve in order to break the revolt; the increasing obstinacy of the incurable portion of mankind; the double part played by the dispersed Israel, which at the same time becomes the kernel of the army of Christ and the powerful instigator of the final revolt; the humbling of paganism; the birth of the beast; the persecution of the Church; the refuge which the Lord has prepared for it during its days of distress, and the manna with which he nourishes it in the desert; and then suddenly the suppression making place for the triumph, and the throne of the beast tumbling down before the Spirit of Christ appearing on the clouds. Thus, the ray of revelation, transforming the past and the present into one sublime picture, announces to John the things to come, in accordance with the promise of Jesus preserved by John himself (John xvi. 13).

This book of mysteries has received various explanations, and some of them very different from that which we have traced out here. The traditional interpretation seeks in the vision for a detailed picture of all the events of the history of the Church from the first century to the return of Christ. Faber, Bengel, Elliot, Gaussen, De Rougemont, and many others have in this way produced wonders of exegetical ability and historical learning. But the method carries along with it a signal of warning in its character of arbitrariness. The same vision—that of the locusts, for instance, in ch. ix.—designates, according to one, the great invasion by the Arabs in the seventh century; according to another, the invasions by the Persians under Chosroes; according to a third, the introduction of the Talmud among the Jews; according to a fourth, the introduction of monachism, etc. Such a diversity rises simply from the imagination having been set free and working without any fixed rule. It is, moreover, inadmissible that it should be necessary to possess the whole treasury of learning belonging to a professor of history in order to understand a book which God has given to his people for the purpose of edification. The modern rationalists have broken with this method of interpretation for many reasons, good and bad: first, no doubt, because it presupposes divine inspiration, but also because their whole system leads them to seek the key to the interpretation of a book in the circumstances under which it was written. Hence, the interpretation of the beast as the Roman empire, and of the head wounded to death, but reappearing as Antichrist, as the emperor Nero. But we have already seen what insurmountable difficulties this method of explanation involves; and it seems very singular that a book so holily conceived and so severely planned should be a mere tissue of fancies and hallucinations.

There remains the method which we have followed, and which recognizes in the Revelation a picture of the general progress of the Church, to whose understanding no other premises are necessary than such as may be drawn from the Scriptures themselves. There is still room for individual views. Thus, Bossuet saw in the destruction of the beast the fall of the Roman empire; Hengstenberg considers the reign of a thousand years as the predominance of Christianity from Charlemagne to our days; Mr. Darby holds that the whole history of the Church from the apostolic age up to that preceding the return of Christ is omitted in the picture, and must be placed in the interval between the third and fourth chapters, so that the whole vision (iv.–xix.) relates exclusively to the future, to that which precedes immediately the coming of the Lord. We cannot here enter into a discussion of these individual points of view, but we hope that the reader, following the outline which we have given, will find in the Revelation points sufficiently precise to indicate the course of the religious progress of humanity, and at the same time sufficiently elevated to enlighten and fortify his heart under all the various events of his life. There is the same power in this vision as in that through which God revealed to Moses in six successive pictures the origin of the world. At every moment of our life we find ourselves in contact with the religious bearing of this vision in Genesis. At every moment, too, but especially when we are under the cross, our soul gathers new life from the spirit of the apocalyptic expectations. And it is solely for this purpose of edification, and not in order to satisfy our curiosity, that God has permitted us to see, on the one hand, through the eyes of Moses, the stream of the times issuing forth from eternity, and on the other, through the eyes of John, the times returning to the sea of eternity. Christ is coming (the Old Testament); Christ has come (the gospel); Christ shall come again (the Revelation),—such is the sum of the history of mankind. FRÉDÉRIC GODET.

Revel′lo, town of Italy, province of Cuneo, at the foot of Mombracco, about 8 miles from Saluzzo. It was strongly fortified in mediæval times, and the lords of Saluzzo frequently took refuge here. Many old churches, castles, towers, palaces, etc., more or less ruinous, but of much historical and architectural interest, may still be seen in and near the town, and even remains of the Roman period are not wanting. P. 5400.

Rev′enue [Fr. *revenu;* Lat. *revenio*, to "return"], income or annual proceeds from land or other property. In modern usage the term is confined more specifically to the income of a state or nation derived from duties, taxes, and other sources for public use. The general principles pertaining to the subject are presented under FINANCE and TAXATION (which see). The following statements embody facts concerning the revenues of some leading nations:

Argentine Repub..	$23,996,893	Honduras	$3,000,000
Austria, fl	393,677,697	Hungary	$7,943,000
Belgium, fr	205,985,000	Italy, lire	1,364,147,325
Bolivia	$2,929,574	Japan, rios	53,000,000
Brazil	$64,886,326	Mexico	$14,333,926
Chili	$13,594,410	Nicaragua	$1,200,000
China	$300,000,000	Paraguay	$412,000
Colombia	$4,000,000	Persia, tomans	4,912,500
Costa Rica	$2,812,585	Peru	$23,511,408
Denmark, rix dols.	24,944,985	Portugal, milreis..	22,278,070
Ecuador	$1,500,000	Russia, rubles	519,349,834
Egypt	£10,571,048	Sandwich Islands..	$1,136,524
France, fr	2,563,460,624	Spain, pesetas	588,000,000
Germany, reichs-marks	449,428,000	Sweden, crowns	99,249,939
Greece, drachmas..	35,882,000	Turkey, purses	4,961,484
Guatemala	$2,615,677	United States (1874–75)	$288,000,000
Great Britain	$386,678,284	Uruguay	$6,756,000

A. L. CHAPIN.

Reve′re (GIUSEPPE), b. at Trieste in 1812; studied thoroughly the ancient classical languages, and among other Oriental tongues Hebrew and Arabic. He has written vigorous sonnets and several well-known historical dramas in prose—*Lorenzino dei Medici, Piagnoni ed Arrabbiati Sampiero, Il Marchese di Bedmar;* also two volumes of humorous prose, which remind one of the *Reisebilder* of Heine, and which are entitled *Bozzetti Alpini* and *Marine e Paesi*. Revere lives in retirement in Rome.

Revere′ (PAUL), b. at Boston, Mass., Jan. 1, 1735; served in the campaign on Lake George as lieutenant of artillery 1756; became a goldsmith, and afterward a copper-plate engraver; produced prints illustrative of the repeal of the Stamp Act, of the "Boston Massacre," and the landing of the British troops at Boston; was a member of the "tea-party," and at the instance of Gen. Warren ren-

dered an important service to his country by secretly leaving Boston at ten o'clock on the night of Apr. 18, 1775, and riding through Charlestown to Concord to announce the British expedition of the following day, which was resisted at Lexington and Concord. (See Longfellow's poem, *The Midnight Ride of Paul Revere.*) In the same year he engraved the plates and printed the bills of the paper-money of Massachusetts; afterward set up a powder-mill; became lieutenant-colonel of State artillery; participated in the Penobscot expedition of 1779; established a foundry of cannon and church-bells; erected extensive works for rolling copper at Canton, Mass., still maintained by his successors as the "Revere Copper Co.," and became grand master of the Masonic order, in which capacity he assisted in laying the cornerstone of the Boston State-house 1795. D. at Boston May 10, 1818. In his honor the town of North Chelsea, Mass., took the name of Revere, Mar. 24, 1871.—His grandson, Paul Joseph Revere, b. at Boston Sept. 10, 1832; graduated at Harvard 1852; became a colonel in the Army of the Potomac. D. at Westminster, Md., July 4, 1863, of a wound received at Gettysburg.—His brother, E. H. R. Revere, b. July 23, 1827, surgeon of a Massachusetts regiment, was killed at Antietam Sept. 17, 1862.

Rev'erend [Lat. *reverendus*, "venerable"], a title bestowed upon Christian ministers and often upon Jewish rabbis. Archbishops are called "most reverend;" bishops and inferior mitred prelates, "right reverend;" deans, archdeacons, and vicars-general are styled "very reverend;" and other clergy are styled "reverend."

Rever'sion [Lat. *revertere*, to "turn back"], in law, is the residue of an estate in certain land left in the grantor or his heirs, or in the heirs of a testator, when a lesser estate in the same land has been granted or devised, and the right to the possession of the land by virtue of it commences at the termination of such prior and particular interest. When an estate is created by deed or by will out of a greater one, leaving in the original owner or his heirs an ultimate estate immediately expectant on the one so created, this ultimate estate is a reversion. For example, if an owner of land in fee should lease it for a term of years, or should convey it for the life of the grantee, an ownership would still remain in him, and he or his heirs or assigns would be entitled to possession as soon as the lease or the life-interest should end. By the operation of an ancient English statute a similar reversion is left in the absolute owner who has conveyed his land in fee tail; but after the whole interest in fee simple has been conveyed it is plain that no estate is left in the grantor. A reversion always results, therefore, by operation of the law, and is never created by the provisions of a conveyance; it is an interest *left* in the owner, and not conferred upon him. As long as the prior and lesser estate exists, the reversion, although vested in respect of interest, is future in respect of possession; but when such prior estate terminates, the reversioner is at once entitled to the possession, and his ownership is in fact no longer a reversion. A reversion being a vested estate, it may be conveyed or devised, and if in fee it will pass to the heirs of an intestate owner. When land has been leased, not only may the covenants of the lease be enforced by and against the original lessor and lessee, but by virtue of ancient English statutes, which have been generally enacted in this country, they may also be enforced by and against the assignees of the reversion and of the term or lease. John Norton Pomeroy.

Reviews. See Periodicals.

Revilee', v., Sarber co., Ark.

Réville' (Albert), D. D., b. at Dieppe, France, Nov. 4, 1826; became a leading minister of the French Protestant Church at Nimes and Luneray, and in 1851 pastor of the Walloon church at Rotterdam, Holland. He has published many translations of religious works from the English and the German; is author of *De la Rédemption* (1859), *Essais de Critique réligieuse* (1860), *Études critiques sur l'Evangile selon S. Matthieu* (1862), *La Vie de Jésus de M. Renan devant les Orthodoxes et devant le Critique* (1863), *Notre Christianisme et notre Bon Droit* (1864), *Histoire du Dogme de la Divinité de Jésus Christ* (1869), several volumes of sermons, and many essays in theological reviews.

Revolv'ers [Lat. *revolvere*, to "return"], breech-loading small-arms, usually pistols. Revolver rifles of Colt's pattern have been in service in the U. S., and the Gatling Gun (which see) is also a revolver. Samples of revolvers made in the early part of the seventeenth century are known, but the Colt's revolver was the first of practical value. (See Small-Arms.) P. V. Hagner.

Re'wah, state of India, subsidiary to Great Britain, presidency of Bengal, comprises an area of 10,300 sq. m., with 1,200,000 inhabitants, and extends between lat. 24° and 42° N., and between lon. 81° and 82° E. The soil is not very productive, but well cultivated. The capital, Rewah, has about 7000 inhabitants, but is utterly decayed.

Reward' [L. Lat. *rewardum*], a recompense or compensation, generally a specified sum of money, offered either by a public officer or by a private person for the performance of some act in which the public is interested in the first case, and the private individual in the other, and payable to the one who does the prescribed act. By far the most common example is that of a pecuniary payment offered to the person who shall discover the perpetrator of some crime, or shall apprehend the criminal, or shall furnish evidence sufficient for his conviction, or shall procure the return of property that has been lost or stolen. Many classes of statutes have provided for the payment by the State of a certain sum, or sometimes a fixed portion of the penalty, in all cases to the informer through whose means a conviction of the offender is obtained; and in the criminal prosecutions based upon such statutes the informer may generally be a witness, although he expects, and will be entitled to receive, a reward upon a conviction. Other statutes authorize the offer of rewards by sheriffs or other administrative officers in special cases of aggravated offences when evidence is difficult to be obtained, the facts obscure, and the criminal or his whereabout is unknown. If a private individual offers in a public manner to pay a certain sum upon the performance of a designated act—as, for example, the recovery of lost or stolen property or the arrest or conviction of a criminal—any person who complies with the terms of the offer, except the criminal himself, becomes entitled to the payment, and can enforce it by action against the party making the offer; the offer and the performance constitute an executed contract. John Norton Pomeroy.

Reybaud' (Marie Roch Louis), b. at Marseilles Aug. 15, 1799; educated for commercial business; travelled much in India and other Eastern countries; settled in 1829 at Paris, and devoted himself to literature; became a contributor to the *Constitutionnel, Corsaire, Némésis*, and other papers; edited *Histoire scientifique et militaire de l'Expédition française en Égypte* (10 vols., 1830–36); published from 1836 to 1840, in the *Revue des Deux Mondes*, his *Études sur les Réformateurs, ou Socialistes modernes*, which in 1841 received the great Montyon prize from the Academy; published in 1843 *Jérôme Paturot à la Recherche d'une Position sociale*, a romance in 1 volume, which made a great sensation; became a member of the Academy in 1850, and continued to write a multitude of romances, economical essays, political pamphlets, and literary and social criticisms, which, however, did not attract much attention.

Reyk'javik, the capital of Iceland, on the south-western coast of the island, in lat. 64° 8′ N., lon. 21° 55′ W., at the head of Faxafjord, is the seat of the government, has a college with a library of 10,000 volumes, an important annual fair, and regular steam communication with Leith and Copenhagen. It was founded in 874. P. about 1400.

Rey'nard the Fox, a satirical epic published in the Low German dialect at the close of the fifteenth century (*Reynke de Vos*, Lubeck, 1498). It gives in rhymed verses a humorous account of the adventures of the Fox at the court of the Lion, and became very popular in Germany and the adjacent countries. Of its relation to earlier fictions of a similar character Jacob Grimm has given a very interesting account in his *Reinhart Fuchs* (Berlin, 1834). Translations into High German have been made by Soltau (1803) and Simrock (1845–52). Goethe gave in 1794 a version of the poem in hexameters, to which Kaulbach made a series of illustrations in 1847.

Reyn'olds, county of S. E. Missouri, on head-waters of Big Black River, has a rough and broken surface, abounding in iron, lead, limestone, and granite; products, corn and tobacco. Cap. Centreville. Area, 700 sq. m. P. 3756.

Reynolds, v., Dale co., Ala. P. 560.

Reynolds, tp., Lee co., Ill. P. 742.

Reynolds, tp., Montcalm co., Mich. P. 457.

Reynolds, tp., Randolph co., West Va. P. 657.

Reynolds (George Greenwood), LL.D., b. at Amenia, N. Y., Feb. 7, 1821; graduated at Wesleyan University in 1841; was admitted to the bar in 1844; has practised law in Milton, Poughkeepsie, and Brooklyn, N. Y.; was a judge of the city court, Brooklyn, N. Y., 1860–66; elected again in 1872 to the same office for fourteen years.

Reynolds (Ignatius Aloysius), D. D., b. near Bardstown, Ky., Aug. 22, 1798; educated at St. Mary's College, Baltimore, Md.; became a Catholic priest; was succes-

sively vicar-general of Kentucky, rector of St. Joseph's College, and president of the Nazareth Female Institute of Kentucky, and was consecrated bishop of Charleston Mar. 18, 1844. D. at Charleston Mar. 6, 1855.

Reynolds, or **Rainolds** (John), D. D., b. at Pinhoe, Devonshire, England, in 1549; studied at Merton College, Oxford, 1562; was admitted to Corpus Christi College 1563; became fellow 1566; lectured on Aristotle; was appointed reader of the theological lecture founded by Sir Francis Walsingham 1586; was dean of Lincoln 1593; refused a bishopric in order to accept the presidency of Corpus Christi College 1598; was eminently distinguished as a Hebraist, regarded as the leader of the Puritan party, and was said by Hallam to have been "the most eminently learned man of Queen Elizabeth's reign;" was often called a "living library" and a "third university;" took a prominent part in the Hampton Court Conferences of 1603, where he maintained the necessity of a new version of the Bible; executed a small portion of King James's version, and revised much more in the weekly meetings of the translators held at his chambers. D. at Oxford May 21, 1607. His works consist chiefly of separate sermons, controversial treatises against the Church of Rome, academical discourses, and some writings upon biblical criticism, the most elaborate being one successfully directed against the admission of the Apocrypha as part of the Old Testament canon—*Censura Librorum Apocryphorum Veteris Testamenti*, posthumously printed (Oppenheim, 2 vols., 1611).—His brother, William Reynolds, b. at Pinhoe about 1540; was educated at Oxford; became a Catholic; was professor of divinity and Hebrew at Douay and Rheims; took an important part in the translation of the Rheims Testament; translated from English into Latin all the works of Thomas Harding; wrote several theological and controversial treatises, and became chaplain to the Beguin nunnery at Antwerp, where he d. Aug. 24, 1594.

Reynolds (John), b. in Montgomery co., Pa., Feb. 26, 1789; removed in childhood to Kaskaskia, Ill.; served in campaigns against the Western Indians 1812–13; became a lawyer at Cahokia; was appointed a justice of the supreme court of Illinois 1818; was frequently a member of the legislature; governor of the State 1830–34; commanded the Illinois volunteers during the Black Hawk war in May and June, 1832; sat in Congress as a Democrat 1835–37 and 1839–43, and was Speaker of the Illinois house of representatives 1852–54. For some time he edited the Belleville *Eagle*, a daily paper; published *The Pioneer History of Illinois* (1848), *A Glance at the Crystal Palace and Sketches of Travel* (1854), and *My Life and Times* (1855). D. at Belleville, Ill., May 8, 1865.

Reynolds (John F.), b. in Pennsylvania, 1820; graduated at the U. S. Military Academy, and appointed brevet second lieutenant of artillery July, 1841; in garrison until the war with Mexico, in which he served with Gen. Taylor's army in the defence of Fort Brown and in the battles of Monterey and Buena Vista, winning the brevets of captain and major for gallantry in both actions. After the close of the war he continued to serve in garrison and on frontier duty until Sept., 1860, when he was selected as commandant of cadets at West Point; in May, 1861, was transferred to the infantry with rank of lieutenant-colonel (colonel June, 1863), and in August appointed brigadier-general of volunteers, and assigned to command of a brigade of the Pennsylvania Reserve Corps, which he commanded in the Virginia peninsular campaign of 1862 at Mechanicsville, Gaines's Mill, and Glendale, where taken prisoner; exchanged in August, he commanded a division in the second battle of Bull Run, and in Maryland campaign of Sept., 1862, was selected to command the Pennsylvania militia for the defence of the State, for which he received, through the governor, the thanks of that State. In Nov., 1862, was promoted to be major-general of volunteers, and placed in command of the 1st corps of the Army of the Potomac, which was engaged on the left in the battle of Fredericksburg, Dec. 13, 1862. At Chancellorsville his corps was held in reserve, along with the 5th, and not allowed to engage the enemy, though both were anxious to do so. At the battle of Gettysburg, on the opening day (July 1, 1863), and at a moment when, having made the disposition of his troops in person, and after "urging on his men with animating words, he saw the successful charge under way, he was struck with a rifle-shot that caused almost instant death—a grievous loss to the Army of the Potomac, one of whose most distinguished and best-beloved officers he was; one whom, by the steady growth of the highest military qualities, the general voice of the whole army had marked out for the largest fame." (*Swinton.*) G. C. Simmons.

Reynolds (Joseph J.), b. in Kentucky 1822; graduated at the U. S. Military Academy, and entered the army as brevet second lieutenant of artillery July 1, 1843. After serving in garrison and in Texas, he was in 1846 selected as assistant professor of geography, history, and ethics at West Point, and the following year became assistant professor of natural and experimental philosophy, and from 1849 to 1855 was principal professor. In 1857 he resigned to accept the chair of mechanics and engineering in Washington University, St. Louis, Mo., which he held until 1860. In 1861 he was appointed colonel and brigadier-general of Indiana volunteers, and June, 1861, was commissioned brigadier-general of U. S. volunteers, serving in West Virginia. He again resigned in Jan., 1862, but was reappointed Nov. 10, and Feb. 2, 1863, was promoted to be major-general of volunteers, serving with the Army of the Cumberland in numerous actions and in the battle of Chickamauga. At the battle of Chattanooga he was chief of staff of that army. Subsequently, he held various important commands in the South-west, and from Nov., 1864, to Apr., 1866, commanded the department of Arkansas. On July 28, 1866, he was appointed colonel of the 26th U. S. Infantry; transferred to 25th Infantry Jan., 1870, and to 3d Cavalry Dec. 15, 1870; brevet brigadier and major general for gallantry in the field.

Reynolds (Sir Joshua), D. C. L., b. at Plympton, Devonshire, England, July 16, 1723; educated at the free grammar school of his native place; studied painting under Hudson at London; settled at Plymouth as a portrait-painter 1743, and at London 1746; obtained the patronage of Capt. (afterward Lord) Keppel, who gave him a passage to the Mediterranean in his vessel 1749; spent nearly four years in professional studies in Italy; formed his style chiefly upon that of the great Venetian masters; returned to London 1753; soon took the first rank among British artists; attained an annual income of £6000; was chosen president of the Royal Academy at its creation 1768, at which time he was knighted; was intimate with Dr. Johnson, Garrick, Burke, Goldsmith, and other literary celebrities, with whom he was associated in founding the celebrated "Literary Club," 1764; delivered at the Royal Academy annual or biennial discourses on the fine arts, which were published in 2 vols., and was appointed principal portrait-painter to the king 1784. D., unmarried, at London Feb. 23, 1792. He figures largely in the numerous works illustrating the career of Dr. Johnson, and has had several biographers, of whom the best are Northcote (1813), Farington (1819), and C. R. Leslie, completed by Tom Taylor (2 vols., 1865).

Reynolds (William Morton), D. D., b. in Fayette co., Pa., in 1812; graduated at Jefferson College 1832; became a clergyman of the Lutheran Church; was professor in Pennsylvania College 1833–50; president of Capital University, O., 1850–57, and of Illinois State University 1857, and was ordained in the Protestant Episcopal Church 1864. Author of *Discourse on the Swedish Churches*, of several occasional essays, addresses, and pamphlets; edited the *Captivi* of Plautus (1846); founded and conducted the *Evangelical Magazine* (1840), the *Literary Record* (1845), and the *Evangelical Review* (1849–62).

Reyn′oldsburg, p.-v., Truro tp., Franklin co., O. P. 457.

Reyn′oldson, p.-v., Gates co., N. C. P. 988.

Reyn′oldsville, p.-v., Winslow tp., Jefferson co., Pa., on Allegheny Valley R. R.

Reze′, town of France, department of Loire-Inférieure, manufactures linseed oil, spirits, ivory-black, soap, and artificial manures. P. 7209.

Re′zin [Heb., "firm," "stable," or "prince"], the eighth and last of a line of kings of Damascus, beginning with Hadad, contemporary with David. He began to reign about 745 B. C., and was slain by Tiglath-Pileser of Assyria (732 B. C.). R. D. Hitchcock.

Rhabdoste′idæ [Gr. ῥάβδος, a "rod," and ὀστέον, a "bone"], a family of mammals based upon extinct remains of Cetaceans, and supposed to be related to the Iniidæ and Platanistidæ of the present epoch. The type is chiefly known from the jaws; these formed a long rostrum, somewhat like the bill of the swordfish, the intermaxillary and maxillary bones being much produced and elongated, and forming a cylinder bearing teeth only on its proximal portion. The only known species is from the Miocene beds of Maryland. Theodore Gill.

Rhachitis. See Rickets.

Rhadaman′thus, in Greek mythology, a son of Zeus and Europa, the brother of Minos, king of Crete, settled in Bœotia, where he married Alcmena, and became after his death, on account of his supreme justice, one of the three judges of the lower world, the two others being Minos and Æacus. He was pre-eminently the judge of people who came from Asia.

Rhæ'tia, an ancient province of the Roman empire, was bounded N. by Vindelicia, E. by Noricum, S. by Gallia Cisalpina, and W. by Helvetia, and corresponded to the modern Tyrol and the Swiss canton of Grisons. Its inhabitants, the Rhæti, who lived as shepherds, were probably of Etruscan descent, and were subdued by the Romans 15 B. C. During the last days of the Roman empire, when the barbarian hordes swarmed around its frontiers and devastated its provinces, Rhætia became nearly depopulated. The language is ROMANSCH (which see).

Rhamphast'idæ [Gr. ῥάμφος, "crooked beak"], a family of carinate birds, including the toucans. They are distinguished by their bill, which is long, high, and com-

The Ariel Toucan.

pressed, decurved at the tip, and with the lateral margins serrated; the nostrils are inconspicuous, superior, and at the base of the upper mandible; no bristles are developed; the wings are rather short and rounded; the tail is moderate and more or less convex; the tarsi are rather robust and covered with broad scales; the toes in pairs, two being directed forward and two backward; the inner toes anteriorly and posteriorly, shorter than the outer; the claws strong and curved. They are somewhat related to the cuckoos. The species are peculiar to America, especially the tropical regions; a few, however, extend northward into Mexico, but none are found within the limits of the U. S. They are generally combined under two genera—*Rhamphastos*, in which the nostrils are concealed, including seventeen species; and *Pteroglossus*, with the nostrils exposed, comprising forty-five species. They frequent lofty trees, feeding upon various fruits, especially the banana, but also live partly upon insects, and even reptiles, as well as young birds and eggs. The female makes her nest in holes in the trunks of trees, and generally deposits therein two eggs. (See ARAÇARI.) THEODORE GILL.

Rhaph'ides, or Raphides [Gr. ῥαφίς, "a needle"], the crystals, often needle-shaped, of salts found within certain plant-cells. The phosphates, oxalates, and other salts of lime are those most commonly found.

Rhap'sodists [Gr. ῥαψῳδοί, from ῥάπτειν, to "stitch," to "string together," and ᾠδή, "song"], a class of wandering minstrels in ancient Greece whose occupation was the recital of the Homeric and other poetry. After these poems were reduced to writing these rhapsodists ceased to be the honored singers of the early days of Greece.

Rhat'any [Peruvian, *rataña*], a drug, being the root of *Krameria triandra*, a small woody shrub of a genus generally referred to the natural order Polygalaceæ, growing in the Bolivian and Peruvian Cordilleras. Rhatany-root is in pieces of various sizes, composed of a dark, reddish-brown bark and a central lighter-colored, woody portion. It has no smell, but a bitter, somewhat sweetish, and very astringent taste. The medicinal principle is a form of tannin, called rhatani-tannic acid. This is found only in the cortical part of the root, where it exists in the proportion of about 20 per cent. The physiological effects of rhatany are simply those of the tannin it contains, and preparations of the root are used in medicine almost exclusively as astringents in diarrhœal affections.
EDWARD CURTIS.

Rhea, in Greek mythology. See CYBELE.

Rhea, in ornithology. See RHEIDÆ.

Rhe'a, county of S. E. Tennessee, bounded E. by Tennessee River and W. by the Cumberland range of mountains, produces corn, tobacco, sorghum-molasses, and wool. Cap. Washington. Area, 507 sq. m. P. 5538.

Rhea Silvia. See ROMULUS.

Rhegium. See REGGIO DI CALABRIA.

Rhe'idæ [from *Rhea*, Ῥέα, a mythological name], a family of birds of the order or sub-order Ratitæ, containing the South American ostriches, and differing externally from the African ostriches simply by the three-toed feet, the more slender bill, and the want of caudal plumes. The bill is comparatively short, depressed gradually, and narrowed toward the tip; the nostrils large, oval and nearly in the middle of the bill; the wings are furnished with long, soft feathers; the tail is not apparent; the tarsi are long and covered in front with broad transverse scales; toes three, the lateral shorter than the middle; the claws compressed and curved. They are distinguished anatomically by the number of characters: as determined by Huxley, these are as follows: the maxillary processes of the palatines are short, and united with the inner and posterior edges of the maxillo-palatines; the latter are thin lamellar bones, which do not articulate with facets on the vomer; the vomer is normally long, and articulates behind with the palatines and pterygoids; the prefrontal processes are little ossified; the sternum is short and narrowed posteriorly, and presents a notch in the middle of its posterior edge; the humerus exceeds the distance between the shoulder-girdle and the ilium; the manus has three digits, two of which have claws; the sacral vertebræ do not unite by their bodies with the pubes or ischia, and their centra ossify late, and are elongated and slender; the pubes are free. The species of this group are confined to South America, where they inhabit the open plains and exhibit habits analogous to those of the ostriches of Africa. They are generally seen alone; they run with considerable fleetness, and generally against the wind, expanding their wings in starting to assist in making headway. They feed chiefly upon grass and roots. The females lay their eggs in combination, sometimes depositing together as many as eighty eggs; these are collected together by the male bird, who hatches them and attends for a short time to the young. Three species are now known to ornithologists: (1) The *Rhea Americana*, extending from Southern Brazil on the N. to the Straits of Magellan on the S.; (2) *R. Darwinii*, from the Straits of Magellan to the Rio Negro, or the boundary between Patagonia and Buenos Ayres; and (3) *R. macrorhyncha*, whose habitat is uncertain. (See NANDU.) THEODORE GILL.

Rheims [Lat. *Durocortorum*, afterward called *Remi*, the name of the people], a large old city of France, department of Marne, on the Vesle, is surrounded with walls and ramparts planted with trees and affording beautiful promenades; it is generally well built, and has many fine streets, squares, and public buildings. The cathedral, 466 feet long, 99 feet broad, and 144 feet high, built in the first part of the thirteenth century, is one of the finest Gothic edifices of Europe; its western front is especially magnificent. In this church most of the kings of France from Philippe Auguste (1180) to Charles X. (1824) were consecrated. St. Remigius, the apostle of the Franks, is buried in one of the suburbs. Rheims has very extensive manufactures of woollen fabrics and a large trade in champagne wines. P. 71,994.

Rhen'ish Confedera'tion. By the Peace of Presburg (Dec. 26, 1805) Bavaria and Würtemberg were erected into kingdoms, and their princes received sovereignty independent of the German emperor. Thus, the dissolution of the German empire was prepared, and on Aug. 1, 1806, sixteen princes of Southern and Western Germany threw off their allegiance to the emperor and formed a confederacy, the *Rheinbund*, under the protectorate of Napoleon. Aug. 6 the emperor, Francis II., abdicated the imperial dignity and crown of Germany, and assumed the title of emperor of Austria, and after the war between France and Prussia most of the princes of Central and Northern Germany entered the confederacy, which continued valid to the downfall of Napoleon.

Rhen'ish Prus'sia, the westernmost province of Prussia, bounded W. by Belgium and the Netherlands, comprises an area of 10,230 sq. m., with 3,579,347 inhabitants, of whom 2,628,173 are Roman Catholics and 906,867 Protestants. The surface is mountainous, covered by the Hundsrück, Eifel, and Westerwald; the northern part, however, is flat, and produces much corn and cattle. The mountains, with the exception of Eifel, which is rough and barren, are covered with fine forests and are rich in lead, copper, iron, and coal; and the valleys, especially those of the Rhine, Mosel, and Lahn, belong to the richest and most beautiful regions of Europe, famous for their excellent wine and for their enormous manufacturing industry.

Rhenish Wine, or **Rhine Wine,** a name for the wines of Germany, produced chiefly in the Palatinate and the Moselle valley, but especially in the Rheingau. The white Rhine wines are better than the red Rhine wines, have a peculiar, delicate bouquet and fragrance, and are dry, clear, and very durable; ripening in three years, they are at their best in four or five years, but will often keep sound for twelve years. The best red wine is the Asmannshäuser, the finest of all Johannisberger; the strongest is the Steinberger. Hochheim, Kloster-Erbach, Gräfenberg, Bacharach, Rüdesheim, and many other places produce, in dry seasons, excellent and costly vintages. The ordinary wines of the Rhine are often harsh and of a slaty flavor, derived from the soil; but they have greatly improved in both respects of late years.

Rheom'eter and **Rhe'ostat,** instruments for measuring and regulating the force of a current of voltaic electricity. (See Electricity.)

Rhet'oric [Gr. ῥητορική, sc. τέχνη], according to Aristotle, "the art of persuasion;" according to Whately, "the art of conviction;" according to Campbell, "the art of discourse." Campbell's definition is to be preferred, as more comprehensive than either of the others, although Aristotle justly emphasizes the highest end of all rhetorical study. All writers on the subject agree in regarding rhetoric as an art (that is, a body of practical precepts), rather than a science; but precepts imply underlying principles, and there has been much question with reference to the science or sciences on which rhetoric is founded. Some—notably, Whately—have said logic; others—of whom Blair may be taken as an example—would seem to say æsthetics; still others—following Theremin—would say ethics. If rhetoric is founded upon any single science, it is unquestionably logic; but in so far as rhetoric is founded upon logic it is only mediately, through grammar. Grammar receives the material of thought elaborated into concepts, judgments, and reasonings, expresses them with *correctness* (that is, with due regard to purity, propriety, concord, and precision), and turns them over to rhetoric to be woven into discourse with clearness, energy, and elegance, and in adaptation to the special ends that the writer or speaker has in view. Grammar has to do with the sentence, rhetoric with the discourse. Grammar regards correct expression as an end in itself; rhetoric regards expression as merely a means to an end. Instead of regarding rhetoric as founded on a single underlying science, it is perhaps preferable to recognize three departments of rhetoric, corresponding to the three "nomological sciences" recognized by Sir Wm. Hamilton: I. *Inventive rhetoric,* founded on logic, having to do with the matter of discourse, and helping us to attain to the true; II. *Æsthetic rhetoric,* founded on æsthetics, having to do with the "form" of discourse, and helping us to attain to the pleasurable; III. *Ethical rhetoric,* founded on ethics, having to do with the purpose of discourse, and helping us to attain to that which we esteem good. In this classification it will be seen that we recognize a department of rhetoric corresponding to each of the three divisions which are ordinarily made of the human faculties—the intellect, the sensibilities, and the will—while yet, as these faculties are but so many manifestations of the unit of consciousness, we have a sufficient basis of unity.

Rhetoric, taken as a whole, may be viewed either as constructive or critical. Critical rhetoric embraces the study of rhetorical precepts and the study of literary models. Constructive rhetoric consists in the practical application of rhetorical precepts and the imitation of literary models. Objections have been made to the study of either branch of the art, but they are trivial in themselves, and inconsistent with the practice of the best writers and speakers. The precepts of rhetoric are not the arbitrary enactment of any man or any body of men, but simple deductions from the generalized experience and observation of generations of writers and speakers, with which all who propose to write or speak will do well to familiarize themselves.

Rhetoric recognizes three forms of discourse:

1. *Representative discourse,* in which the matter is presented for its own sake, without especial purpose or especial regard to form. Under this head we treat of—(1) things—description; (2) facts—narration; (3) truths—exposition. Clearness, accuracy, and completeness are the prime essentials of representative discourse.

2. *Poetry,* in which the matter and the purpose are subordinate to the form. Under poetry the following classification may be recognized:

- (1) The poetry of thought, or "didactic poetry."
  - descriptive
    - objective.
    - subjective.
  - satirical.
- (2) The poetry of feeling, or "lyric poetry."
  - ode.
  - song
    - secular.
    - sacred.
  - sonnet.
  - elegy.
- (3) The poetry of action, or "epic poetry."
  - proper epic
    - heroic.
    - mock-heroic.
  - drama
    - tragedy.
    - comedy.

The prime essentials to poetry are—first, a poetic thought; secondly, poetic diction—to characterize either of which would fall under the province of a special discussion.

3. *Oratory,* which proposes an end to be attained, to which the matter and form of discourse are merely ancillary. The ancients recognized three kinds of oratory—the demonstrative, the judicial, and the deliberative. Blair proposes to recognize, instead, the eloquence of popular assemblies, the eloquence of the bar, and the eloquence of the pulpit. If we attempt a classification of oratory at all, it is better to make our basis of classification the *purpose,* rather than the *occasion,* of its exercise. Oratory is commonly regarded by rhetoricians as the normal type of discourse, embodying the fullest and loftiest ideal of the art. The orator generally seeks to bring something to pass; hence he appeals not to the intellect or to the feelings alone, but to the will. He must sway the whole man, or he must fail in the object which he has in view. It is especially necessary for him to study adaptation, and his discourse, while not deficient in clearness and not offensive to the taste of his hearers, must excel in energy.

Inventive rhetoric has to do with the choice of themes, the accumulation of material, and the disposition of material. It was much more fully treated by the ancient rhetoricians than by those of the present day, many of whom ignore it altogether, regarding it as a mere department of ethical rhetoric, which does, in fact, greatly limit it.

Ethical rhetoric has especial reference to the purpose contemplated in discourse. This purpose may be either—(1) *Enlightenment—i. e.* to develop in the mind a new cognition; (2) *Conviction—i. e.* to lead the mind to adopt a given opinion; (3) *Excitation—i. e.* to move the feelings; or (4) *Persuasion—i. e.* to determine the will to action. Excitation is not regarded as a distinct end of discourse by many rhetoricians, since, ordinarily, we seek to excite emotion only that through emotion we may influence the will. But the distinct recognition of excitation is essential to a complete analysis of ethical rhetoric; the methods of excitation may be separately studied; and excitation is sometimes (as in demonstrative oratory and in certain kinds of poetry and fiction) an end in itself. In all discourse—but especially in oratory—some one of the purposes mentioned above dominates. It is the function of rhetoric to show how discourse may, in matter and manner, be made subservient to that purpose. Rhetoric teaches us how best to enlighten, convince, move, or persuade our fellow-men. It is, then (since this is largely essential to success in any calling), of practical import not merely to the professional orator, but to mankind at large.

Æsthetic rhetoric has reference to "style," or the art of expressing, clearly, energetically, and elegantly, the products of inventive rhetoric in adaptation to the ends of ethical rhetoric. Under the head of style we recognize, as of prime importance—(1) naturalness; (2) adaptation; (3) clearness; (4) energy; (5) elegance. These characteristics of style are discussed, with greater or less fulness, in all rhetorical treatises. Clearness, which is the most important attribute of a good style, is admirably treated in a little manual entitled *How to Write Clearly,* by Prof. E. A. Abbott of the City of London School.

Figurative language (or language which deviates from the plain and ordinary method of describing an object or stating a fact) may be included under the head of "style," since it tends to promote clearness by associating the object or fact under discussion with more familiar objects or events; energy, by associating the object or fact under discussion with more exciting objects or facts; elegance, by associating the object or fact under discussion with more pleasing objects or facts. Under the head of "figurative language" we recognize *figures of speech,* which consist in a mere modification of the form of expression; and *figures*

of thought, which involve an essential modification of our conception. And these figures depend on three principles —(1) the principle of similarity; (2) the principle of dissimilarity; (3) the principle of association. Under the head of "figures of speech" we recognize—(1) alliteration, or the repetition of similar sounds at the beginning of successive words; *e. g.*

"Apt alliteration's artful aid."—CHURCHILL.

(2) Paronomasia, or the use of words in the same connection which are similar in sound, but dissimilar in sense; *e. g.*

"Not on thy *sole;* but on thy *soul*, harsh Jew."—SHAKSPEARE.

(3) Meiosis or Litotes, which consists in the representation of an object as less than it really is; *e. g.* "A citizen of *no mean* city."—PAUL. (4) Pleonasm, which consists in the use of more words to express one's meaning than are strictly necessary, and which should be sharply discriminated from "tautology," or the meaningless reiteration of our thought. (5) Hyperbole, which consists in representing an object as larger than it really is, or stating a fact more strongly than is consistent with literal truth; *e. g.* "The English gain two hours a day by clipping their words."—VOLTAIRE. (6) Climax, which consists in gradually rising, by more and more emphatic statements, to the fullest and most expressive utterance of our thought; *e. g.* "Jesus of Nazareth pours forth a doctrine beautiful as light, sublime as heaven, and true as God."—THEODORE PARKER.

Under the head of "figures of speech" fall also ellipsis, asyndeton, polysyndeton, aposiopesis, epizeuxis, epanalepsis, and interrogation—carefully to discriminate which would hardly fall within the scope of an article of this nature.

Under the head of "figures of thought" that are *founded on the principle of similarity* we have—(1) The simile, which is an expressed comparison; *e. g.* "*Like as* a father pitieth his children, *so* the Lord pitieth them that fear him." (2) The metaphor, which is an implied comparison; *e. g.* "I am the Good Shepherd, and know my sheep." Similes are more conducive to clearness, metaphors to energy. Either may be made conducive to elegance. The metaphor may be tested by reducing it to an equation of ratios; *e. g.* "The ship ploughs the sea" equals The ship is to the sea as the plough is to the land. Any metaphor which will not submit to this test is radically defective, introducing more than four terms or suggesting an unreal similarity. Under this head we recognize also (3) The allegory, which is an extended metaphor. Bunyan's *Pilgrim's Progress* is the best example. (4) The fable, which is essentially similar to the allegory, although briefer, more obviously didactic, and characterized by the free endowment of the brute (and even the inanimate) creation with the attributes of reason and speech. The fables of Æsop will at once suggest themselves. (5) The parable, which is a religious allegory. (6) Personification, which regards things inanimate as if they were animate; *e. g.* "The pyramids, doting with age, have forgotten the names of their founders."—FULLER. Under this head, too, are included prosopopœia, vision, and apostrophe.

Under the head of "figures of thought" that are *founded upon the principle of dissimilarity* we have contrast, antithesis, irony, which hardly require to be characterized or exemplified.

Founded on the principle of association we have metonymy, or a transference of names (Gr. μετά and ὄνομα), under which we recognize the substitution of—(1) The cause for the effect and *vice versâ;* *e. g.* "The Lord is *my song*. He is become my salvation." (2) The container for the thing contained; *e. g.* "He is a slave to the *bottle*." (3) The sign for the thing signified; *e. g.* "*The sceptre* shall not depart from Judah." (4) The instrument for the agent; *e. g.* "*The pen* is mightier than the sword."—BULWER. (5) The author for his works; *e. g.* "They have *Moses and the prophets*."

We must class under the combined heads of similarity and dissimilarity synecdoche, which includes objects that are similar in kind, but dissimilar in extent or degree. By synecdoche we put a part for the whole, as a "sail" for a ship, or a "blade" for a sword, etc. More specifically, synecdoche consists in the substitution of—(1) the concrete for the abstract; (2) the species for the genus; (3) the individual for the species; (4) the member for the individual; (5) the material for the thing made. Its employment is highly conducive to energy.

It falls within the province of rhetoric accurately to discriminate between the figures of speech which have been mentioned, and to give rules which shall facilitate their effective use.

The great masters of rhetoric among the Greeks were Aristotle and Longinus. Aristotle, indeed, may fairly be regarded as the father of the art. The second book of his *Art of Rhetoric*—in which he embodies a subtle analysis of the mental and moral characteristics to which the orator must adapt his discourse—is still of capital significance. The best modern commentator on Aristotle is Cope. Among the Romans the most eminent names are those of Cicero, Quintilian, and Horace. Of all the ancient rhetoricians, Quintilian is the most useful, and Horace the most attractive. Horace's *Epistle to the Pisos* (the material of which is largely borrowed from Aristotle) has been imitated by Vida in his *Poetics*, by Boileau in *L'Art Poétique*, by Pope in his *Essay on Criticism*, and has thus exerted a widespread influence on modern style. Volckmar, *Die Rhetorik der Griechen und Römer*, is a valuable compend of the results attained by the ancient rhetoricians.

Of English authors, mention should be made of Whately (best on conviction and persuasion), Blair (best on style), Kames (best on figurative language), and Campbell (best on the grammatical properties of style). De Quincey (*Historical Essays*, vol. ii.) has valuable essays on rhetoric and style; and Herbert Spencer's essay on style must not be overlooked. Vinet's *Homiletics*, Theremin's *Rhetoric* (admirably translated and edited by Dr. Shedd), Broadus, on the *Preparation and Delivery of Sermons*, Beecher's *Yale Lectures on Preaching*, though specifically devoted to sacred rhetoric, are full of suggestive hints to the general student. J. H. GILMORE.

Rhett (ROBERT BARNWELL), b. at Beaufort, S. C., Dec. 24, 1800; was originally named SMITH; adopted in 1837, with the other members of his family, the name of RHETT, in memory of an ancestor; was liberally educated; studied law; was elected to the State legislature 1826; became attorney-general of South Carolina 1832; was one of the most pronounced advocates of State rights, nullification, and secession; was a member of Congress 1838–49, and U. S. Senator 1850–51; expressed himself openly in favor of a dissolution of the Union, both in Congress and in the columns of the Charleston *Mercury*, the organ of the so-called "fire-eaters," which he owned and conducted; was a leader in the State convention of South Carolina which passed an ordinance of secession Dec. 20, 1860; was chairman of the committee which reported the constitution of the Confederate States to the Montgomery convention Feb., 1861, and subsequently a member of the Confederate congress.—His son, bearing the same name, now (1876) conducts a newspaper at New Orleans, La.

Rheum. See RHUBARB, by PROF. E. CURTIS, M. D.

Rheu'matism [Gr. ῥευματισμός], a shifting inflammation or neuralgia which attacks fibrous structures in various parts of the body, and most commonly those of the joints. It presents itself under various forms, but they may all be embraced under the following: acute rheumatism and chronic rheumatism.

Acute rheumatism may be defined as an idiopathic inflammation of the synovial capsule of one or more joints, which is accompanied by slight exudation into the joint and œdema of the connective tissue surrounding it. There seems to be an hereditary predisposition to the disease, and the attacks are very liable to recur in the same individual. It occurs in healthy persons between the ages of ten and forty. The exciting cause is generally found to be a "cold" or a residence in damp places; it usually occurs in the winter and spring, and is oftenest met with in the temperate zone. Before the onset of the disease there is at times a feeling of *malaise* lasting for a few days; sometimes the malady is ushered in suddenly by a chill, which is immediately followed by a high fever and pain in one or more of the larger joints. This pain soon becomes unbearable, and the patient cannot allow the slightest motion, nor even the weight of the bed-clothes. The affected joint will be found swollen, and at times red. The joints most commonly affected are the knee, foot, shoulder, elbow, and hand. When a number of joints are affected at one time the patient's condition is indeed pitiable, as it is impossible for him to make the slightest movement without suffering the most intense agony. The complications liable to be encountered are inflammations of the fibrous structures of the heart, lungs, brain, and spinal cord, and the duration of the disease is from two to five or six weeks. It generally ends in recovery, except in those cases which have a severe complication. The treatment should consist of purgatives, diuretics, narcotics, and colchicum; locally, either evaporating lotions or warm applications, the latter best secured by warm water and alcohol (2 parts to 1), and surrounding the limb with flannel.

Chronic rheumatism is a chronic idiopathic inflammation of the fibrous tissues of the body, which produces very little change in the structures of the affected part. The predisposing causes may be congenital or acquired. It may follow the acute variety, or exist from the beginning as a chronic affection; one attack predisposes to another. The exciting causes are those of acute rheumatism and

damp weather and an easterly wind. There are several varieties of chronic rheumatism. In one there is a constant pain, lasting for a long time in certain single joints, which is aggravated by pressure or motion. In another a series of mild attacks of rheumatism, simulating greatly the acute variety, generally occurs at every change of weather or upon the slightest exposure. When once established it is generally hard to get rid of. *Muscular rheumatism* is a chronic rheumatism of the fibrous sheaths of the muscles, and is known as *lumbago* when occurring in the back, where it occasions ludicrous contortions of the body when the patient attempts to move, in order to spare the affected parts; *wry neck* is a similar affection in the neck; and *pleurodynia* is a chronic rheumatism of the muscles of the side and chest. As to the treatment of chronic rheumatism, we have no specific. Probably the nearest to it is the iodide of potassium, which should be given. Sedatives are also useful to relieve pain and procure sleep. Particular attention should be paid to the digestive organs, as derangement always aggravates the trouble. The various mineral springs possess no virtue except from the diuretic action of their waters. EDWARD J. BERMINGHAM.

Rheydt, town of Rhenish Prussia, manufactures yarn, hosiery, shawls, leather, paper, glue, and vinegar. P. 9792.

Rhind (A. C.), b. Oct. 31, 1821, in New York; entered the navy as a midshipman Sept. 3, 1838; became a passed midshipman in 1845, a lieutenant in 1854, a commander in 1863, a captain in 1870; served with heroic gallantry in the waters of Virginia and the Carolinas during our civil war, and was highly commended by Rear-Admirals Du Pont, Porter, and Lee in their official despatches. FOXHALL A. PARKER.

Rhine [Lat. *Rhenus;* Ger. *Rhein*], an important river of Europe, rises in Switzerland in the Alps, where it is formed at Reichenau, in the canton of Grisons, at an elevation of 1922 feet, by the union of two small streams, the Vorder and Hinter Rhein, the former of which, rising on the north-eastern side of the mountain group of St. Gothard, at an elevation of 7600 feet, is generally considered as the principal source of the river. Immediately after its formation the Rhine is navigable for rafts and small craft, but during its whole upper course, from Reichenau to Bâle, through Switzerland, the Lake of Constance, and along the frontier between Switzerland, Bavaria, and Baden, its navigation is difficult, and in many places entirely interrupted by rapids and cataracts, of which that of Schaffhausen, where the water suddenly leaps from a rock 70 feet high, is the most remarkable. During its middle course, from Bâle to Cologne, it winds its way through a broad and fertile valley between the Vosges and the Schwartzwald—the Rheinthal, often called the "garden of Germany;" thence it forces its way, by a narrow gorge, through the plateau of the lower Rhine. In this latter part the Rhine is not only an important route of traffic, but it also presents some of the finest and loveliest scenery in the world, flowing along between vineclad hills, which now and then hem it in between steep, towering rocks crowned with old castles, and then again open into long, beautiful cross-valleys through which smaller streams come rushing. Its lower course, from Cologne to the North Sea, leads through low and level ground, and is uninteresting; it branches off into the Waal, Yssel, Leck, and Vecht, and reaches the ocean as a small stream, almost disappearing among the sandbanks of the shore. The entire length of the Rhine is 960 miles; its breadth at Bâle is 750 feet; at Mentz, 1500 feet; at its entrance into the Netherlands, 2150 feet; its depth varies from 5 to 28 feet; its elevation is 814 feet at Bâle, 121 feet at Cologne. Its principal affluents are the Aar in Switzerland, the Neckar and Main in the Rheinthal, the Lahn and Moselle in the highlands of the lower Rhine. A. GUYOT.

Rhine, p.-v. and tp., Sheboygan co., Wis. P. 6672.

Rhine'beck, p.-v. and tp., Dutchess co., N. Y., on Hudson River and on New York Central and Hudson River R. R., opposite Kingston, has 11 churches, 2 newspapers, a bank, a paper-mill, carriage-factories, and is a shipping-point for the products of the surrounding agricultural region. P. 1322; of tp. 3719.

Rhinehart's, v., Edgefield co., S. C. P. 1438.

Rhine, Province of the. See RHENISH PRUSSIA.

Rhinobat'idæ [from *rhinobatus;* Gr. ῥινόβατος, the ancient name of a fish—ῥίς, ῥινός, "nose," and βάτος, "ray"], a family of selachians intermediate between the sawfishes (Pristidæ) and the typical rays. The body in front is a subcordate disk pointed forward, and ends behind in an elongated caudal portion resembling that of the Pristidæ; the skin is armed with spines, especially in a median dorsal row; the head is produced into a pointed snout; the mouth is rather small and transverse; the teeth small and obtuse; dorsals two, on the middle or posterior portion of the tail; the caudal fin is a heterocercal fold at the extremity of the tail. The family, chiefly distinguished by the form, is composed of species inhabiting the tropical and sub-tropical seas. According to some authors, there are five, and according to others, three genera—viz. *Rhinobatus, Rhynchobatus,* and *Trygonorhina.* THEODORE GILL.

Rhinoceros. See RHINOCEROTIDÆ.

Rhinocerot'idæ [from *rhinoceros,* ῥινόκερως, of the Greeks, from ῥίς, ῥινός, "nose," and κέρας, "horn"], a family of ungulate mammals embracing the various species combined under the popular name rhinoceros. They are distinguished by their massive form; short neck; long head; the presence in all the living forms of one or two horns on the middle of the nasal region, and the broad clavate feet, each of which has three toes. The skull has the basioccipital comparatively well developed behind and narrowed forward; the tympanic and periotic bones are ankylosed and wedged between the squamosal, exoccipital, and other adjacent bones; the nasal bones are produced forward and more or less arched, and meet an upward extension of the supramaxillary bones; the teeth are M. $\frac{3}{3}$, P. M. $\frac{4}{4}$, C. $\frac{0}{0}$, I. variable—*i. e.* entirely wanting, $\frac{1}{2}$, or, in extinct forms, $\frac{3}{3}$; the upper molars have a continuous outer wall, are without complete transverse crests, and are excavated by a deep valley extending obliquely inward from the median portion of the inner wall and (in P. M. 4, M. 1–2) a shallow one extending from the posterior wall; the lower molars (P. M. 2, M. 3) have two curved transverse crests. The family embraces but few recent species, which have been variously grouped, but appears to represent but two genera—(1) *Rhinoceros,* including the Asiatic species, which are distinguished by the elongate and free intermaxillary bones, the long upper incisor teeth, the produced nasal bones, and the skin corrugated by well-marked folds; and (2) *Rhinaster,* embracing the African species, in which the intermaxillary bones are very small and free, the upper incisor teeth wanting, the nasal bones broad and rounded, and the skin smooth and not corrugated. In former geological epochs other forms flourished, and one of these (*Cœlodonta*) survived long after the appearance of man on the globe: this form was distinguished by the union of the nasal and intermaxillary bones into one mass, and the ossification of the nasal septum. The existing species of the family are peculiar to Asia and Africa, but formerly the range of the family extended far northward into Europe and Siberia, and at a still earlier period the group was represented in North America. THEODORE GILL.

Rhinodont'idæ [from *rhinodon;* Gr. ῥίνη, "file," and ὀδούς, "tooth"], a family of sharks (order Squali) distinguished by their small teeth, in combination with other characters. The body has the usual shark-like form, the head flat and with a broad, short, and flat snout; spiracles very small; the nostrils have triangular flaps, and are nearly at the front of the snout; the mouth also is nearly terminal; the teeth extremely small, in numerous rows, and with conic recurved points; branchial apertures five, and moderately large, the last situated above the pectoral fin; dorsals two, unarmed, the first in advance of the ventrals, the second opposite the anal; anal rather small; caudal with the lower lobe well developed, with a pit at the root, but with no keels at the sides of the tail. The family has but two known species—(1) *Rhinodon typicus,* found at the Cape of Good Hope and Seychelles; and (2) *Micristodus punctatus,* known from the figure and the teeth of an individual twenty feet long found off the coast of California. Nothing is known of the habits of these fishes, but it is probable that, like the great basking shark (*Cetorhinus* or *Selache*), it is herbivorous. THEODORE GILL.

Rhinoloph'idæ [*rhinolophus;* Gr. ῥίς, ῥινός, "nose," and λόφος, "crest"], a family of insectivorous bats (Chiroptera) provided with nasal appendages. The ears are moderate, separate, and destitute of a tragus; the tail is well developed, and produced to the end of the interfemoral membrane; the intermaxillary bones are but little developed; teeth $\frac{4}{5}$, $\frac{5}{5}$, or $\frac{5}{6}$; canines $\frac{1}{1}$, incisors $\frac{1}{2} \times 2$; the molars have W-shaped ridges and are of large size; the middle finger is composed of two phalanges; the stomach is sac-like, and its extremities incline toward each other. The family is characteristic of the eastern hemisphere, and four species of the genus *Rhinolophus* ascend more or less toward the N. in Europe; two of them reach the British Islands. THEODORE GILL.

Rhinophrin'idæ [*rhinophrynus;* Gr. ῥίς, ῥινός, "nose," and φρῦνος, a "toad"], a family of amphibians of the order Salientia or Anura, distinguished by the imperfect ear and the attachment of the tongue in front. According to Cope, the ethmo-septal walls are ossified to the end of the muzzle and separate the prefrontals; its superior plate is covered by the completely-ossified fronto-parietal; the fronto-

nasals are well developed, entirely in contact with the fronto-parietals, separated by a median point of the latter and by the ethmoid septum; no pterygoid bone nor wing of ectopterygoid is developed; the ectopterygoid itself is straight, with a short maxillary suture; the coracoid and epicoracoid divergent, connected by a narrow single cartilage; the former not dilated, and in contact with or slightly separated from that of the opposite side; the sacral diapophysis dilated. As understood by Cope, it embraces two genera—*Rhinophrynus* and *Hemisus*—the former of which is a Mexican, and the latter an African genus; but by other authors (*e. g.* Mivart) it has been restricted to the American genus, *Rhinophrynus*. THEODORE GILL.

Rhinoplas'tic [Gr. ῥίς, ῥινός, "nose," and πλάσσειν, to "mould"] **Operations** are performed with the view to re-establish a lost nose or a part thereof, or to bring to a normal shape a deformation of this organ. The methods applied are very different. The flap for the new formation in the majority of cases is taken from the forehead, and is cut out so that a pedicle of it remains in connection until it is healed into the new place, thereby allowing the access of blood without interruption. In other cases the flap is taken from the cheeks and from the lip, transplanted in the same manner. Even from more remote parts of the body, especially the arm, the material has been taken successfully to replace a defect of the nose. This last method, as well as the employment of a second individual to supply the wanted flap for new formation, is not much in favor with the surgeons of the day, and is only made use of in very exceptional cases, where the material cannot be obtained otherwise. F. ZINSSER.

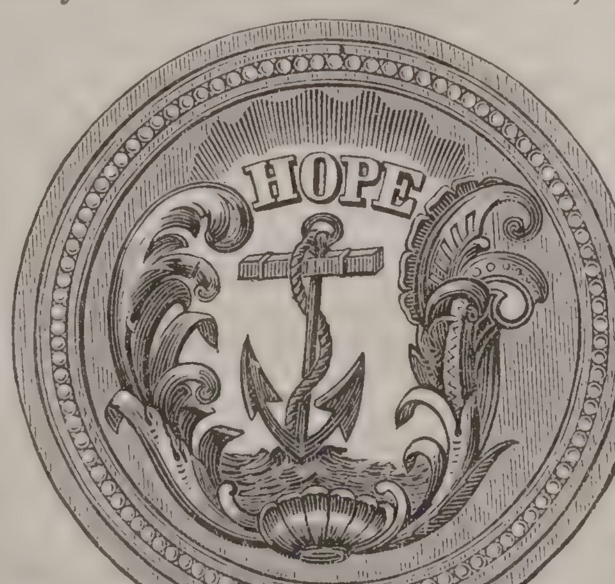
Rhiptoglos'sa [Gr. ῥίπτειν, to "dart," and γλῶσσα, "tongue"], a group or sub-order of saurians or lizards, distinguished by the very elongated worm-like and extensible tongue; the toes are united into two opposing groups; the teeth are on the edge of the jawbones. With these are coincident some osteological characters. The group has been formed for the reception of the family Chameleonidæ. THEODORE GILL.

Rhizogens [Gr. ῥίζα, "root," and γένειν, to "produce"], a proposed class of plants, comprising the Rafflesiaceæ, Balanophosaceæ, and Cytinaceæ, all parasitic, all fungus-like in growth, all phanerogamous, and nearly all having obscure and spore-like seeds. The better opinion seems to be that the two orders first mentioned are exogenous and the last endogenous. They seem to share in the qualities of cryptogamous and phanerogamous plants.

Rhizoph'aga [Gr. ῥίζα, "root," and φαγεῖν, to "eat"], a group or sub-order of marsupial mammals distinguished by the dentition, the incisor teeth being two in number ($\frac{1}{1}\times 2$) in each jaw, and renewable from the roots, as in the placental rodents; in the hind feet the second, third, and fourth toes are connected together. The group has the same position among the marsupials as the rodents among the placental mammals, but the dental characters are not accompanied with modifications of the other parts of the organization equal in value to those which are co-ordinated with the gliriform dentition in the rodents, and consequently the value of the group, even as a sub-order, among the marsupials, is doubtful. It only includes the family of wombats or PHASCOLOMYIDÆ (which see).
THEODORE GILL.

Rhizopoda. See COMPARATIVE ANATOMY.

Rhode Island, one of the original thirteen States of the Union, belonging to the New England division; it is territorially the smallest State in the Union, and at the



Seal of Rhode Island.

same time perhaps, in proportion to the number of its inhabitants, the wealthiest. It lies between the parallels of 41° 18′ and 42° 3′ N. lat., and between the meridians of 71° 8′ and 71° 53′ W. lon. from Greenwich. It is bounded on the N. and E. by Massachusetts, on the S. by the Atlantic Ocean, and on the W. by Connecticut. Its extreme length from N. to S. is 47.5 miles, and its extreme breadth from E. to W. 40 miles, though its average breadth does not exceed 35 miles. Its area, if the waters of Narragansett Bay are counted as a part of it, is 1306 sq. m., or 835,840 acres; but its land-surface does not exceed 1054.6 sq. m., or 674,944 acres.

Face of the Country.—The surface of Rhode Island is considerably diversified, portions of it being hilly and broken, while other portions are level and sandy or marshy. There are no mountains in the State, and only a few eminences which are sufficiently elevated to be called hills. Of these the most noteworthy are the Woonsocket Hills in the N., Mount Hope, near Bristol, and Hopkins Hill, near the centre of the State. Narragansett Bay, extending inland about 30 miles from the ocean, divides the State into two unequal parts. Providence River (or estuary) and Bay are merely continuations of Narragansett Bay to the N., as Mount Hope Bay and Taunton River (or estuary) are to the E. The direct shore-line of the State fronting on the ocean is but about 45 miles, but the numerous sinuosities and islands in Narragansett Bay give a coast-line of about 350 miles washed by tide-water in the State. The southern coast of the State has extensive salt marshes and ponds of salt water. There are numerous islands belonging to the State, of which the best known are Rhode Island, with its three towns of Newport, Middletown, and Portsmouth, Canonicut, Prudence, Block Island, Patience, Perry, Hope, Dyer's, Dutch, and Goat islands. The State has three considerable rivers, which, though none of them navigable for any great distance, afford valuable water-power; these are—the Pawtucket, called above the town of that name the Blackstone, the Pawtuxet, which flows S. E. and forms the boundary between Kent and Providence cos., and the Pawcatuck, which flows through the western portion of the State and forms a part of the boundary between Rhode Island and Connecticut.

Geology.—Small as the State is in territorial extent, there is much variety and interest connected with its geology, and the legislature is making arrangements for a very thorough geographical and geological survey, from which valuable results in the way of economic geology may be expected. The western half of the State and a small tract along the eastern shore of Narragansett Bay are Eozoic, belonging to the same formation as that of Eastern Connecticut and Central and part of S. E. Massachusetts; but a tract covering all the islands of Narragansett Bay and part of its western shore, and extending N. E. into Bristol co., Mass., belongs to the Carboniferous era, and forms the easternmost bed of anthracite in the U. S. The coal has not been esteemed as equal to the Pennsylvania anthracite in quality, though perhaps even more extensive in quantity, but it improves in quality as lower strata are reached. About 10,000 to 15,000 tons are annually mined, and as a result of the geological survey it will probably be much more thoroughly explored and used. Excellent iron ore is found in various parts of the State, and lime of the best quality is burned from the limestones at Lime Rock, which belong to the coal-measures and abound in fossil plants. Sandstone, serpentine, and marble abound in several parts of the State, and excellent brick are made from the clay of Providence co. Block Island belongs to the Tertiary era.

Soil and Vegetation.—The soil of the State is for the most part moderately fertile, though the gravelly and pebbly soil of the western part and the sand-dunes and salt marshes of the S. W. are exceptions; but much of it is broken, rocky, and difficult of cultivation. The islands of Narragansett Bay and the region drained by Pawtucket and Pawtuxet rivers is the most arable. The vegetation does not differ materially from that of Massachusetts and Connecticut, though, from the presence of a large body of landlocked water like Narragansett Bay, the temperature is somewhat milder than that of either of the adjacent States. About one-fourth of the surface was in woodland in 1870. The flora and fauna also of the State are almost without exception those of Massachusetts and Connecticut. Narragansett Bay is a favorite resort for the duck, brant, and teal families, and the swamps and marshes adjacent for snipe, woodcock, and grouse.

Climate.—This, though somewhat modified by the influence of the bay, is not materially different from that of the adjacent States. The summer climate of Newport is delightful; the E. winds are tempered by the breadth of land over which they come, and the S. winds become mild by the influence of the Gulf Stream. The mean annual temperature of the State ranges from 47° to 51°. The average mean of Providence for 43 years was 47.94°, and the aver-

age annual range seldom exceeds 100°. The rainfall in the eastern part of the State averages about 40 inches, and in the western part sometimes reaches 44 inches. The average of Providence for 43 years was 44.81 inches.

Agricultural Productions.—Rhode Island is not an agricultural State. Her population is too dense, and her best lands too valuable for town-sites, to make farming, except in the way of market gardening, largely profitable. The area of farming-lands in the State, as in Massachusetts and Connecticut, has been gradually diminishing for the past twenty-five years, and mainly because the lands were becoming too valuable to be cultivated as farms; yet in 1870, 502,308 acres of her nearly 675,000 acres of area were in farms; of these, 289,030 were under cultivation, against 356,487 acres in 1850, while 213,278 acres were in woodland or other unimproved farm-lands. The value of these farms was in 1870, $21,574,968, and of farming implements and machinery, $786,246. The value of all farm productions for the year 1869–70 was $4,761,163; of animals slaughtered or sold for slaughter, $755,552; of market-garden products, $316,133. The crops of cereals are never large enough for home consumption. In 1869–70 the wheat crop was 784 bushels; rye, 20,214; Indian corn, 311,957; oats, 157,010; barley, 33,559; buckwheat, 1444; wool, 77,328 pounds; hay, 89,045 tons; a mere trifle of hops and tobacco; 669,408 bushels of potatoes; 9920 bushels of peas and beans; 498 pounds of beeswax, 6290 pounds of honey, and 765 gallons of domestic wines; clover and grass seed, 2892 bushels. The value of the live-stock the same year was $3,135,132. It consisted of 11,113 horses, 43 mules and asses, 40,105 neat cattle, 23,938 sheep, and 14,607 swine. The agricultural department's report for 1875 gives the following statistics of the produce of some of these items for that year: Indian corn, 281,000 bushels; rye, 21,000; oats, 145,000; barley, 25,500; potatoes, 560,000; hay, 96,100 tons; and an aggregate value for these crops of $3,316,228. The statistics of live-stock were as follows: horses, 14,700; milch cows, 20,400; oxen and other cattle, 16,000; sheep, 25,300; swine, 16,500; total value of live-stock, $3,673,485.

Manufacturing Industry.—Rhode Island ranks tenth among the States in the amount of her manufacturing products, but in proportion to her population and area she has a larger interest in manufactures than any other. In 1870 almost one-fourth of her entire population were employed in manufactories, and the annual product of her mills was about $530 to each inhabitant. Her statistics of manufactures were—1850 establishments, employing 49,417 hands (28,804 men, 14,752 women, and 5861 children); the capital invested was estimated at $66,557,322; the wages paid, at $19,354,256; the raw material used, at $73,154,109; and the annual product, at $111,418,354. Her most prominent industries were connected with the production of cotton, woollen, and worsted goods; the annual product of cotton goods was $22,139,203; of bleaching and dyeing these goods, $15,138,723; of printing cotton and woollen goods, $17,842,480; of the manufacture of woollen goods, $12,558,117; of the production of worsted goods, $2,835,950; and of cotton and woollen machinery, $4,316,376; making 315 establishments employed and nearly $75,000,000 produced, directly or indirectly, in the manufacture of these classes of goods. The other industries which yielded the largest products were—jewelry, $3,043,846; screws, $1,882,318; leather tanned and curried, $1,828,264; india-rubber and elastic goods, $1,804,868; iron and iron manufactures, $2,619,793; clothing, $1,448,066; molasses and sugar refined, $1,600,980; flouring-mill products, $1,281,887; silver and plated ware, $1,212,240. The statistics of the manufactures of the State in 1875 are now (Mar., 1876) tabulating, and if practicable some of them may be given in our article.

Railroads.—There were Jan. 1, 1876, 220.33 miles of railroad-track in the State in operation; the capital stock of these roads was $37,247,313.35; the total indebtedness, $15,427,385.83; the total receipts, $3,743,554.17; the total earnings, $2,131,002.62; the number of passengers, 20,575,973; total tons of merchandise carried, 2,748,267; total number of locomotives, 229, and of cars, 4823. About 57 miles more of railroad were to be completed during 1876. There are some canals for manufacturing purposes in the State, but none for navigation.

Finances.—The bonded debt of the State amounts to $2,563,500, less $181,000 in sinking fund. The habit of making semi-annual reports to the legislature, which sits twice a year, makes it a little difficult to ascertain the exact amount of receipts and expenditures for the entire year. For the year ending Apr. 30, 1875, they were $763,276.07; for the year ending Apr. 30, 1876, it was known on Jan. 11, 1876, that they would exceed $910,000. The payments for the year ending Apr. 30, 1875, were $581,731.92; for the 8 months and 11 days ending Jan. 11, 1876, they were $908,258. The valuation of property by the State board of assessors for 1875 was $328,538,559; that of the town assessors for the same year was $270,415,023.

Commerce.—The following table gives the statistics of the imports, domestic and foreign, exports, entrances, and clearances and tonnage belonging to the three customs districts of Rhode Island, at the dates specified:

Customs Districts.	Imports for year ending June 30, 1875.	Domestic exports, year ending June 30, 1875.	Foreign expo'ts, year ending June 30, 1875.	Imports for year ending Sept. 30, 1875.	Domestic exports, year ending Sept. 30, 1875.	Foreign exports, year ending Sept. 30, 1875.	Entrances of shipping for year ending June 30, 1875, including coastwise trade.			Clearances of shipping for year ending June 30, 1875, including coastwise trade.			Total entrances and clearances, including coastwise trade.			Registered, enrolled, and licensed tonnage for year ending June 30, 1875.	
							Vessels.	Tonnage.	Crews.	Vessels.	Tonnage.	Crews.	Vessels.	Tonnage.	Crews.	Vessels.	Tonnage.
	$	$	$	$	$	$											
Bristol and Warren..	....	5,100	....	....	5,100	....	39	5,471	216	62	50,752	843	101	56,223	1,059	19	1,105.25
Newport...	1,750	11,632	....	326	11,632	....	336	892,565	28,576	332	806,659	29,045	668	1,609,224	57,921	137	6,842.65
Providence	312,950	22,850	238	208,248	30,305	238	992	771,355	23,747	282	132,659	3,505	1,274	904,014	27,252	132	34,232.84
Totals...	314,700	39,582	238	208,574	47,037	238	1,367	1,579,391	52,839	676	990,070	33,393	2,043	2,569,461	86,232	288	42,180.74

Banks, National, State, and Savings.—There were in Jan., 1875, 62 national banks in the State, having an aggregate capital of $20,504,800 paid in, $14,718,400 in bonds on deposit, and an outstanding circulation of $13,269,820. On Nov. 27, 1875, there were 15 State banks in operation, having an aggregate capital of $5,091,697.20, an outstanding circulation of $20,589.50, and net profits on hand of $252,350.63. There were at the same date 38 savings banks in the State (2 of them in the hands of receivers), having 101,635 depositors and $51,311,330.62 of deposits—an average of about $500 to each depositor.

Insurance Companies.—The statements of the insurance companies are to Jan. 1, 1876. There were at that time 6 joint-stock fire insurance and 18 mutual fire insurance companies organized in the State; the 6 stock companies represent a paid-up cash capital of $1,300,000; gross assets, $2,210,045; liabilities, including reinsurance, $690,816; surplus as regards policy-holders, $1,519,228. Four of these companies also did a moderate marine business. The 18 mutual fire companies show cash assets of $1,226,207; liabilities, including reinsurance, of $712,940; surplus, $513,267. There are no life insurance companies in the State.

Population.—In 1730, the population was 17,935; in 1755, 40,414; in 1770, 59,678; and in subsequent years as follows:

Census-year.	Total pop.	Males.	Females.	White.	Free colored.	Slaves.‡	Natives.	Foreigners.	Density.	Ratio of increase.	Illiteracy.	Of school age, 5 to 20.	Of military age, 18–45, males.	Of voting age, 21 and upward, males.	Citizens.	Number of dwellings.	Number of families.	Number of persons in a family.
1790	68,825	33,397	35,428	64,470	4,355	952	......	......	52.70	....	......	......	14,244	18,134				
1800	69,122	33,517	35,605	65,438	3,684	381	......	......	52.93	.02	......	......	14,295	18,199				
1810	76,931	37,610	38,321	73,214	3,717	108	......	......	58.91	11.44	......	......	16,041	20,422				
1820	83,059	40,101	42,958	79,413	3,602	48	......	......	63.60	7.83	......	......	17,103	21,774				
1830	97,199	46,881	50,318	93,621	3,578	17	......	......	74.42	17.02	......	......	19,995	25,456				
1840	108,830	52,775	56,055	105,587	3,243	5	......	......	83.33	11.97	......	......	22,508	27,765	15,789			
1850	147,545	72,078	75,467	143,875	3,670	1	124,299	23,246	112.97	†35.57	3,607	45,993	31,775	39,082	29,863	22,379	28,216	5.23
1860	174,620	84,133	90,487	170,649	*3,971	....	137,226	37,394	133.71	†18.35	6,112	53,355	35,885	45,738	34,472	27,056	35,209	4.96
1865	184,965	88,263	96,702	180,878	4,087	....	145,262	39,703	141.62	5.92	14,763	57,389	36,089	48,071	37,381	28,666	39,208	4.72
1870	217,353	104,756	112,597	212,219	*5,154	....	161,957	55,396	166.43	17.51	21,921	64,727	44,377	58,752	43,996	34,828	46,133	4.71
1875	258,239	125,602	132,637	251,968	*6,271	....	186,609	71,630	197.73	18.81	......	......	......	......	......	38,875	55,245	4.67

* Including 19 Indians in 1860, 154 in 1870, and 79 in 1875. † Increase in ten years.
‡ The slaves, being so few in number, are included with the free colored in making up the totals.

Education.—Public Schools. The report of the commissioners of public schools for the State gives the following particulars in relation to the public schools Jan. 1, 1876: There were 38,554 different pupils entered upon the roll in the day schools and 4600 in the evening schools. The average number of pupils in attendance upon day schools was 30,102, and upon evening schools, 2256; whole number of day schools, 737, of which 436 were graded and 301 ungraded; whole number of evening schools, 39. Average length of schools, 8 months 18 days; number of different teachers who taught during some portion of the year, 1056—viz. males 195, females 861; number of teachers regularly employed, 822; amount paid male teachers, $93,617.70; average monthly wages of male teachers, $85.18; amount paid female teachers, $289,666.44; average wages paid female teachers per month, $46.17. The total receipts from all sources for school purposes were $761,796.92, including State, town, and district appropriations, registry taxes, etc.; the total expenditures for the year 1875 were $764,643.74, which included school buildings, furniture, apparatus, etc., as well as teaching and supervision. The number of schoolhouses was 426; estimated value of the same, $2,360,017. Number of children between 5 and 15 years of age in the State, June 1, 1875, 53,316. Thirteen cities and towns have high-schools as a part of their graded system. The total expenditure per head of school population is $8.85; for the average number belonging to the schools, per head, $15.68; for the average attendance, $18.04; and for each pupil's instruction per month, $1.92. The permanent school fund is $265,142.51. There is a State normal school at Providence, founded in 1871, which in 1875 had 159 students and 13 teachers and special instructors. Its course of instruction is very thorough and practical. The high schools of the larger cities and towns are admirably conducted, most of them being endowed to a greater or less extent, and their course of instruction extends to the second year of college. There are also 5 or 6 academies and seminaries of excellent reputation, and 5 preparatory schools, having 43 instructors and 607 pupils. The only college in the State is Brown University at Providence, organized in 1765, and having, aside from its undergraduate course, a course of practical science in agriculture, chemical technology, and civil and mechanical engineering. The university has 15 professors, 253 students in the collegiate course, and about 30 in the scientific. Its grounds, buildings, and apparatus are valued at $1,500,000; its productive funds at $687,814 (including $50,000 from the proceeds of the agricultural land-grant); its income from productive funds, $41,470, and from all sources $64,479. Its scholarship funds amount to $55,000, and it has a library of 40,000 volumes.

Charitable and Special Education.—The State has no asylum for deaf mutes, the blind, or the feeble-minded. It had Jan. 1, 1876, 7 State beneficiaries at the American Asylum for the deaf and dumb at Hartford, 10 at the Perkins Institution and Massachusetts Asylum for the blind in Boston, and 2 at the Massachusetts School for idiotic and feeble-minded youths at South Boston.

Charitable and Penal Institutions.—The Butler Hospital for the insane is a private or chartered institution, but receives State patients to a limited extent; 42 such were in that hospital Jan. 1, 1876. The State farm near Providence has an insane hospital, which had Jan. 1, 1876, 173 patients; a workhouse and house of correction, with 279 inmates; and an almshouse, with 164 inmates. There is a reform school at Providence, which had Nov. 1, 1875, 217 children (175 boys, 42 girls), with 4 teachers. The State prison has the reputation of being well conducted, but was very much crowded, and the State is erecting a new one on the State farm. On Jan. 1, 1876, there were 57 prisoners. The Providence county jail is a large and well-managed prison, to which about 2000 prisoners are annually committed, and about the same number discharged. The other 4 county jails are better than the average of such institutions in other States.

Vital Statistics.—The births for the year ending Jan. 1, 1875, were 6466; the marriages 2541, the deaths 4229. Of the births, 3311 were males, 3155 females; 2703 were of American and 2948 of foreign parentage, while 815 were of mixed parentage. The marriages were 1495 of Americans, 695 of foreigners, 351 mixed. The deaths were 2111 males, 2118 females—2282 of American parentage, 1947 of foreign parentage. The age of 2105 males and 2111 females was known; the average age of males was 28.03, of females 31.66, of both sexes 29.86.

Newspapers.—In 1870 there were 32 newspapers of all classes in the State, having an aggregate circulation of 82,050, and annually issuing 9,781,500 copies. Of these, 6 were dailies, with 23,250 circulation; 1 semi-weekly, with 1200 circulation; 19 weeklies, with 43,950; 6 monthlies, with 13,650 circulation. In 1872 only 26 newspapers were reported, of which 6 were dailies, 15 weeklies, and 5 monthlies. We believe subsequent accessions have brought the number up to that of 1870, with a moderate increase of circulation.

Churches.

Denominations.	Number of church organizations, 1870.	Number of church edifices, 1870.	Number of sittings, 1870.	Amount of church property, 1870.	Number of church organizations, 1875.	Number of church edifices, 1875.	Number of ministers, 1875.	Number of church members, 1875.	Adherent population, 1875.	Church property, 1875.
All denominations	295	283	125,183	$4,117,200	336	323	311	40,404	236,060	$5,141,400
Regular Baptists	75	73	23,695	719,400	65	65	69	10,080	51,000	1,007,800
Free-Will, Seventh-Day, and Six-Principle Baptists	34	34	11,191	158,000	46	44	47	5,906	29,500	239,500
Christian Connection	12	12	3,050	33,500	14	13	12	2,040	9,000	57,000
Congregationalists	27	27	18,500	620,000	28	27	32	4,442	22,000	750,000
Protestant Episcopalians	42	39	17,155	735,100	42	40	41	5,481	20,000	760,000
Friends	17	17	5,514	58,600	18	18	.....	3,615	14,000	81,500
Methodists (Episcopal)	33	30	14,605	371,300	45	41	36	5,089	25,400	581,600
Presbyterians	.....	.....	....	....	2	2	2	232	1,160	25,000
Roman Catholics	22	20	19,108	910,100	48	36	43	....	50,000	1,086,000
Second Adventists	17	14	3,370	28,700	17	15	14	1,920	6,800	39,000
Unitarians	4	4	3,450	229,000	4	4	4	750	3,600	256,000
Universalists	4	4	2,770	220,000	4	4	8	549	2,500	250,000
Union churches	.....	4	700	6,500	3	4	3	300	1,500	8,000

There were also in the State in 1870, 1 Jewish synagogue; 1 Lutheran church, with one church edifice, 400 sittings, and $1500 of church property; 1 Reformed Presbyterian or United Presbyterian church, with 1 church edifice, 500 sittings, and $10,000 of church property; 1 Spiritualist assembly; and one local mission, with 1 church edifice, 500 sittings, and $10,000 of church property.

Constitution, Courts, Representatives in Congress, etc.—The State, like the colony, of Rhode Island has always been liberal in its privileges and franchises to its citizens, but eminently conservative in its form of government. By the skill and tact of its founders and leaders, Roger Williams, John Clarke, William Coddington, Benjamin Arnold, and others, there was secured from King Charles II. in 1663 a charter guarantying to the colonists a much larger measure of liberty and self-government than any other granted to an American colony; this charter was suspended from 1686 to 1690 under the Andros administration, but was then revived, and proved so good an organic law that it was continued in force not only throughout the Revolutionary war, but up to the year 1843. A State constitution was, after several efforts and some disturbance, adopted in 1842, ratified by the people, and finally went into operation in May, 1843. This constitution, with three or four not very important amendments, has continued to be the organic law of the State from that time to the present. It provides that voters, in addition to the ordinary qualification of residence and the usual exceptions of disqualification, must either have real estate of the value of $134 or property renting for not less than $7 per annum, or must pay a tax of at least $1, or have done military duty during the year. The legislature consists of a senate, now having 36 members (1 from each town), and a house of representatives, not exceeding 72 members. They hold two sessions annually, the principal one at Newport, and an adjourned one at Providence in October. The executive power is vested in a governor and lieutenant-governor, both annually elected by the people. The secretary of state, attorney-general, and general treasurer, and since 1856 a State auditor, who is also bank and insurance commissioner, are also chosen by the people. The commissioner of public schools was for many years appointed by the governor and senate, but is now chosen by the board of education. The judicial power is vested in a supreme

court, consisting of 1 chief-justice and 4 associate justices, which holds its sessions twice a year in each county, and has both appellate and original jurisdiction; of courts of common pleas, presided over by one of the associate justices of the supreme court, also holding sessions twice a year in each county; of justices' courts, presided over by a trial justice, of whom those for Providence, Newport, Woonsocket, and Pawtucket are elected by the general assembly, and in the other 32 towns by the town councils; and of probate courts for each town, the judges of which in Newport, Providence, Pawtucket, East Providence, and Cranston are elected by the general assembly, and in the remaining cases the town council is the court of probate. The State is entitled under the apportionment of 1872 to two members of Congress.

Counties.

Counties.	Pop. in 1875.	Males in 1875.	Females in 1875.	Pop. in 1870.	Assessed valuation in 1875.	State valuation in 1874.
Bristol.........	11,019	5,142	5,877	9,421	$10,774,005	$11,720,253
Kent...........	20,348	9,881	10,467	18,595	16,814,922	17,512,556
Newport.......	21,887	10,612	11,275	20,050	37,501,436	39,044,754
Providence	184,924	89,981	94,943	149,190	189,129,860	242,124,912
Washington ...	20,061	9,986	10,075	20,097	16,194,801	18,136,084
Totals........	258,239	125,602	132,637	217,353	$270,415,023	$328,558,559

Principal Towns.—The two capitals of the State are—Providence, which had a population in 1875 of 100,675, and Newport, which had the same year 14,028 inhabitants. The other principal towns are—Pawtucket, which had in 1875, 18,464; Woonsocket, 13,576; Warwick, 11,614; Lincoln, 11,565; Bristol, Burrillville, Cranston, Cumberland, Johnston, and Westerly, each between 5000 and 6000; Coventry, East Providence, Scituate, South Kingstown, and Warren, each between 4000 and 5000; and North Kingstown and East Greenwich, each between 3000 and 4000.

History.—There seems to be convincing evidence that the Northmen, who visited the North American coast in the tenth and eleventh centuries and planted their colonies there, explored the waters of Narragansett Bay and established one of those colonies on Aquetneck (or Rhode) Island, near the present site of Newport, and that the Vinland, of which they speak so often, was that island. It is the belief of many antiquarians that the round stone tower at Newport, which now forms so picturesque a ruin, was built by these colonists, and the inscriptions on Dighton Rock in Taunton River are also said to be Icelandic or Norse runes. In 1524, Verazzano visited Narragansett Bay, and remained there about two weeks trading with the Indians, who were then very numerous. The founder of the present State of Rhode Island was Roger Williams, an eminent English clergyman and scholar, who emigrated to the Massachusetts Bay Colony and became pastor of the church at Salem. A vigorous and original thinker, of logical mind and great moral courage, he soon startled the leading ministers, who were the ruling spirits of that colony, by the avowal of his doubts (which soon ripened into disbelief) of the propriety of infant baptism, and his conviction that immersion was the only scriptural mode of baptism. He had come to these conclusions by no instruction from others, but solely by his own investigations and logical reasoning. When called to account by the ministers and magistrates for these departures from their faith, he boldly enunciated a doctrine which seemed to them more heretical and pestilential than those he had previously avowed; it was this: that the civil power had no authority to bind men to the belief or maintenance of any religious doctrine—that the human conscience in all these matters was responsible to God alone; and while he admitted the right of the civil magistrates to punish any violation of the moral code, he contended earnestly for "soul-liberty." These doctrines were deemed by the clergymen and civil magistrates subversive of all the purposes for which they had left their native land: they had come to escape persecution and to maintain their own religious views, not to establish a place of refuge for others who differed from them as much as they differed from the dominant party in England; and they would not hear anything in favor of Mr. Williams's views. They labored very earnestly with him to induce him to give up these doctrines, which they regarded as heretical, but finding him fixed in his opinions they notified him in the winter of 1635–36 to leave the colony within six weeks, under penalty of being sent to England by the first vessel. He left Salem, and plunged into the wilderness in what is now Bristol co., Mass., and after six weeks of extreme hardship eventually came in the early spring of 1636, in a canoe, to the present site of Providence, and was greeted on landing by an Indian with the words, "What cheer, Owannux?" the last being the Indian word for "Englishman." He pitched his tent at this point, where he was presently joined by others who, like himself, had been banished for their religious belief. He founded the town of Providence, giving it that name in acknowledgment of "God's good providence in directing him thither;" and when, two years later, his friend, William Coddington, followed him into the wilderness, he advised him to purchase from the Indians the island of Aquetneck or Rhode Island and start another colony there. The towns of Providence, Newport, Portsmouth, and Warwick remained independent of each other, though in most friendly accord, until 1647 (though Newport and Portsmouth were united under the government of Mr. Coddington), when the four towns united under a patent or charter granted by Parliament in 1643. In 1651, for some reason, Providence and Warwick separated from the other two, and had a government of their own for three years, when they reunited, and were from 1654 to 1657 under the presidency of Roger Williams, who was succeeded by Benedict Arnold, subsequently, for ten years in all, governor of the colony. In 1663, John Clarke, aided by Roger Williams, obtained from Charles II. a remarkably liberal charter, under which the colony and State were governed for 179 years. Williams and his friends and coadjutors carried out consistently their principles of religious and civil liberty, and the young colony, notwithstanding the jealousies of its neighbors, grew rapidly. From Massachusetts, Connecticut, and New York numbers came to this colony to find shelter from persecution and intolerance; and it is not greatly to the credit of the Massachusetts Bay colony (Plymouth was more just) that, notwithstanding Williams's great services to that colony in mediating between it and the Indians, and repeatedly preventing Indian raids and massacres, it never reversed or repealed its sentence of banishment. The great Indian war of 1675, from which Rhode Island suffered severely, might have been averted had the counsels of the Rhode Island leaders been heeded. As it was, it cost the colony largely in blood and treasure, and terminated only by the death of Philip of Pokanoket on Rhode Island soil. Rhode Island was not even consulted or informed of the great battle in the "Narragansett country" on her own soil in Dec., 1675, in which 1000 Indians perished or were captured, 300 of them being burned to death by the setting of their camp on fire by the colonial troops. In Jan., 1686–87, Sir Edmund Andros suspended the charter of the colony and made Rhode Island a county of his extensive domain; but in Feb., 1689–90, Andros having been deposed, the colony was reorganized under the charter. For the next 80 or 90 years the colony grew into prominence for its commerce and naval importance. In the wars between Great Britain and France the little colony was particularly active. In 1756 she had 50 privateers at sea, manned by about 1500 men. In the war of the Revolution her citizens were active and prominent both on sea and land. Commodore Hopkins, Paul Jones, the most daring of naval heroes, and Commodores Whipple and Talbot, as well as many of their crews, were Rhode Islanders. Gen. Nathaniel Greene, one of the most conspicuous names among the heroes of the Revolution, was a Rhode Islander and commanded Rhode Island troops during a part of his battles. The little State was in several particulars more prompt in her actions in matters looking to independence of Great Britain than even Massachusetts, which has usually been supposed to have led in these matters. Newport was occupied and held by the British forces from Dec., 1776, to near the close of 1779. In 1780 the count de Rochambeau of our French allies made it his head-quarters. After the war, Newport for some years contended successfully with Boston and New York for the commercial supremacy of the new republic. The State was the last of the thirteen to ratify the Constitution of the U. S., and delayed her admission to the Union till May 29, 1790. In the war of 1812 some of the best naval actions of the war were fought by Rhode Islanders. The naval battle of Lake Erie, under the leadership of Commodore O. H. Perry, was essentially a battle between Rhode Islanders and the British, the commodore, captains, and most of the men being from Rhode Island. The privateers of the State also won many victories. In the period subsequent to that war the only noteworthy event in the State was what was known as the "Dorr rebellion." Repeated efforts had been made for a number of years to replace the charter by a State constitution. One was framed in 1824 and rejected by the people. In 1841 a convention called the "People's convention" met and framed a constitution, which was submitted to the people. Their action was wholly irregular, and the general assembly took no notice of their proceedings. The friends of the new constitution claimed that it was ratified by the people, and proceeded to organize a government under it, electing Thomas Wilson Dorr governor. The general assembly ordered a convention to be held in Nov., 1841, and this convention prepared a constitution which was rejected

by the people in Mar., 1842. The general assembly and the regular State government were, however, elected, and a collision seemed inevitable. Mr. Dorr led his forces, but they were overpowered without bloodshed, and Dorr was compelled to flee. After his flight a new convention was called, and the constitution under which the State is now governed was prepared in Nov., 1842, ratified by the people, and went into operation in May, 1843. Mr. Dorr, who had escaped first into Connecticut and afterward into New Hampshire, voluntarily returned and gave himself up to the authorities. He was tried for the crime of high treason, convicted, and on the 25th of June, 1844, sentenced to imprisonment for life at hard labor. A few years convinced the statesmen of the State of the unwisdom of this action, and in 1851 Mr. Dorr was restored to his civil and political rights. At the commencement of the late civil war the State sent off a body of troops for the defence of Washington, and the governor of the State accompanied and commanded one of her regiments, while another of its citizens, subsequently a governor of the State, was one of the most distinguished of the Union generals, and for a time the commander of the Army of the Potomac.

Governors.—The State originally consisted of four towns. Two of these, Portsmouth and Newport, had at first judges independent of each other, but from 1640 to 1647 united on William Coddington as their governor. Providence and Warwick had no governor or judge until 1647, when the four towns were united under letters patent.

I. Colonial.

(1) *Presidents under the Patent.*

John Coggeshall............1647–48
William Coddington......1648–49
John Smith...................1649–50
Nicholas Easton............1650–51

(2) *The Division* (1651–54).

(*a*) *Providence and Warwick.*

President John Smith...1652–53

President Gregory Dexter.............................1653–54

(*b*) *Portsmouth and Newport* (1651–54).

President John Sanford, Sen...........................1652–54

(3) *Reunion of Towns* (1654–63), *Presidents.*

Nicholas Easton............1654–54
Roger Williams.............1654–57
Benedict Arnold............1657–60
William Brenton...........1660–62
Benedict Arnold............1662–63

(4) *Royal Charter Governors.*

Benedict Arnold............1663–66
William Brenton...........1666–69
Benedict Arnold............1669–72
Nicholas Easton............1672–74
William Coddington......1674–76
Walter Clarke...............1676–77
Benedict Arnold *..........1677–78
William Coddington,* Aug., 1678–Nov., '78
John Cranston,* Nov., 1678–Mar., '80
Peleg Sanford...............1680–83
William Coddington, 2d..1683–85
Henry Bull....................1685–86
Walter Clarke,† May, 1686–June, '86
Henry Bull..Feb., 1690–May, '90
John Easton.................1690–95
Caleb Carr *..................1695–95
Walter Clarke...............1696–98
Samuel Cranston *......1698–1727
Joseph Jencks..............1727–32
William Wanton *.........1732–33
John Wanton *..............1734–40
Richard Ward...............1740–43
William Greene............1743–45
Gideon Wanton.............1745–46
William Greene............1746–47
Gideon Wanton.............1747–48
William Greene............1748–55
Stephen Hopkins..........1755–57
William Greene *..........1757–58
Stephen Hopkins, 1758–62, 1763–65, and 1767–68
Samuel Ward, 1762–63 and 1765–67
Josias Lyndon...............1768–69
Joseph Wanton ‡...........1769–75

II. State Organization, but under the Charter.

Nicholas Cooke.............1775–78
William Greene, Jr........1778–86
John Collins..................1786–90
Arthur Fenner *.........1790–1805
Paul Mumford (acting)*.1805–05
Henry Smith (acting).....1805–06
Isaac Wilbur (acting).....1806–07
James Fenner................1807–11
William Jones...............1811–17
Nehemiah R. Knight.....1817–21
William C. Gibbs...........1821–24
James Fenner...............1824–31
Lemuel H. Arnold.........1831–33
John B. Francis............1833–38
William Sprague...........1838–39
Samuel W. King...........1839–43

III. Governors under the Constitution of 1843.

James Fenner...............1843–45
Charles Jackson............1845–46
Byron Diman................1846–47
Elisha Harris.................1847–49
Henry B. Anthony.........1849–51
Philip Allen..................1851–52
William B. Lawrence (acting).......................1852–52
Philip Allen..................1852–53
Francis M. Dimond (acting)..........................1853–54
William W. Hoppin.......1854–57
Elisha Dyer..................1857–59
Thomas G. Turner.........1859–60
William Sprague...........1860–61
John R. Bartlett (acting).1861–62
William C. Cozzens (acting)...........................1863–63
James Y. Smith.............1863–66
Ambrose E. Burnside.....1866–69
Seth Padelford..............1869–73
Henry Howard..............1873–75
Henry Lippitt................1875–

Electoral and Popular Votes for President and Vice-President.

Year of election.	Candidates for whom the electoral vote of the State was cast.	Electoral vote.
1792	George Washington P.. John Adams V.-P......	4
1796	John Adams P.......... Oliver Ellsworth V.-P..	4
1800	John Adams P............	4
	C. C. Pinckney V.-P......	3
	John Jay V.-P...........	1
1804	Thomas Jefferson P..... George Clinton V.-P....	4
1808	C. C. Pinckney P....... Rufus King V.-P.......	4
1812	De Witt Clinton P...... Jared Ingersoll V.-P....	4
1816	James Monroe P......... D. D. Tompkins V.-P...	4
1820	James Monroe P......... D. D. Tompkins V.-P...	4

Year of election.	Candidates for whom the electoral vote and popular majority were cast.	Electoral vote.	Pop. vote.	Opposition or minority party candidates.	Pop. vote.	Other candidates.	Pop. vote.
1824	John Quincy Adams P...... John C. Calhoun V.-P......	4 3	2,145	William H. Crawford P.. Nathaniel Macon V.-P...	200	Andrew Jackson P.......	No report.
1828	John Quincy Adams P.... Richard Rush V.-P.......	4	2,754	Andrew Jackson P....... John C. Calhoun V.-P...	821		
1832	Henry Clay P............. John Sergeant V.-P.......	4	2,810	Andrew Jackson P........ Martin Van Buren V.-P..	2,126		
1836	Martin Van Buren P...... Richard M. Johnson V.-P..	4	2,964	William H. Harrison P.. Francis Granger V.-P...	2,710		
1840	William H. Harrison P... John Tyler V.-P..........	4	5,278	Martin Van Buren P..... Richard M. Johnson V.-P.	3,301	James G. Birney P....... Thomas Earle V.-P......	42
1844	Henry Clay P............. T. Frelinghuysen V.-P....	4	7,322	James K. Polk P......... George M. Dallas V.-P...	4,867	James G. Birney P....... Thomas Morris V.-P.....	107
1848	Zachary Taylor P......... Millard Fillmore V.-P.....	4	6,779	Lewis Cass P............. Wm. O. Butler V.-P......	3,646	Martin Van Buren P..... C. Francis Adams V.-P..	730
1852	Franklin Pierce P......... William R. King V.-P.....	4	8,735	Winfield Scott P......... Wm. A. Graham V.-P...	7,626	John P. Hale P........... George W. Julian V.-P..	644
1856	John C. Fremont P........ William L. Dayton V.-P...	4	11,467	James Buchanan P...... J. C. Breckenridge V.-P.	6,680	Millard Fillmore P....... A. J. Donelson V.-P.....	1,675
1860	Abraham Lincoln P...... Hannibal Hamlin V.-P...	4	12,244	Stephen A. Douglas P.... H. V. Johnson V.-P......	7,707	John Bell P.............. Edward Everett V.-P.....	No report.
1864	Abraham Lincoln P....... Andrew Johnson V.-P.....	4	13,692	George B. McClellan P... George H. Pendleton V.-P.	8,470		
1868	Ulysses S. Grant P........ Schuyler Colfax V.-P.....	4	12,993	Horatio Seymour P....... Francis P. Blair, Jr., V.-P.	6,548		
1872	Ulysses S. Grant P........ Henry Wilson V.-P.......	4	13,665	Horace Greeley P......... Benj. Gratz Brown V.-P..	5,329		

(For many valuable statistics, documents, and suggestions embodied in this article the writer is indebted to Edwin M. Snow, M. D., superintendent of the State census and health-officer of the city of Providence. Dr. Snow is also author of the article Providence in this work.)

L. P. Brockett.

Rhodes [Lat. *Rhodus*], an island in the Mediterranean, belonging to Turkey, 10 miles off the coast of Asia Minor, having an area of 420 sq. m., with 35,000 inhabitants, of whom 10,000 are Turks, 3000 Jews, and the rest Greeks. It is mountainous—the highest peak, Atairo, the ancient *Atabyris*, rising 4560 feet—but the soil is fertile and the climate most delicious. Forests of fir cover the mountains; in the valleys figs, oranges, grapes, and olives ripen to perfection. The coral fisheries are an important branch of industry.

Rhodes, the capital of the island of Rhodes, on the north-eastern extremity of the island, rising in terraces around its two fortified harbors, and surrounded with walls and defended by citadels, was founded in 408 B. C., and rose very soon to eminence among the Greek cities, both as a commercial port and as a seat of learning. At the entrance of one of its harbors stood the so-called Colossus of Rhodes, a brazen statue of Helios, one of the seven wonders of the world, and 300 other statues adorned the city. This splendor was to some extent destroyed by Cassius, who defeated the Rhodians in a naval battle in 42 B. C., and sacked their capital; but the island and the city rose once more into importance and prosperity in the period from 1309 to 1522, while in the possession of the Knights of St. John. It was made a very strong fortress and its commerce flourished. After its conquest in 1522 by the Turks, it greatly declined, and having suffered severely in 1851, 1856, and 1863 by earthquakes, and in 1856 by a fearful powder-explosion which destroyed all its principal buildings, large parts of it are now only heaps of ruins. Its commerce is carried on by Greeks, who live in the suburbs outside the walls, but its harbors are nearly spoiled, and the Turkish government is doing nothing to help it. P. about 20,000.

Rhodes (Robert E.), b. at Lynchburg, Va., in 1826; graduated at the Virginia Military Institute 1848; was professor there for several years; afterward settled at Mobile, Ala.; entered the Confederate service as colonel 1861; was soon made brigadier-general; fought in most of the great battles in Virginia; was made major-general for good services at Chancellorsville 1863; was at Gettysburg, and afterward commanded a corps under Early in the Valley of Virginia, and was killed at the battle of Winchester, Sept. 19, 1864.

Rhodes, Inner and **Outer.** See Appenzell.

Rhodes'ville, v., Lincoln co., N. C. P. 872.

Rho'dium [Gr. ῥόδεος, "rose-colored," from the colors of some of its compounds], a metal found in 1804 by Wollaston associated in small quantity with native platinum. The process of obtaining it from the "platinum residues" is complex, and will be found in the chemical textbooks.

* Died in office. † Charter suspended till 1689. ‡ Displaced.

It is whitish-gray and very hard; highest density when fused, 12.1; equivalent, about 104. It is one of the most infusible metals, but may be fused in the oxyhydrogen quicklime furnace of Deville. Pure, it is not acted on by the most powerful acids, but in alloy with some of the other metals may be dissolved in *aqua regia*. Fusion with saltpetre oxidizes it easily, and even fusion with sulphate of potash converts it into a soluble double salt. Chlorine combines with it at a red heat, forming a soluble chloride. It forms four oxides (RdO, Rd_2O_3, RdO_2, and RdO_3). The first two are absolutely insoluble in the strongest acids, and the third almost so. A native alloy of rhodium and gold from Mexico has been reported by Prof. del Rio as containing 34 to 43 per cent. of rhodium. Dana regards this as requiring confirmation. HENRY WURTZ.

Rhodium, Oil of, a balsamic volatile oil obtained from Canary Island rosewood, the woody root of *Rhodoriza scoparia* and *florida*, convolvulaceous plants. The oil is employed as a perfume, and to attract fishes and game to traps of various kinds. Horses are very fond of the odor.

Rhododen'dron [Gr. ῥοδόδενδρον, "rose tree"], a large genus of plants of the natural order Ericaceæ, comprising trees, shrubs, and rootlet-climbing epiphytes, with entire, alternate evergreen, or rarely deciduous leaves, and showy flowers in terminal clusters; these with funnel-form 5-lobed corollas and usually ten declining stamens. Passing S. of the equator only into Java and the neighboring islands, the rhododendron is found throughout the mountainous districts of the northern hemisphere. The greatest number of species occurs in the high mountain-regions extending from Java and Borneo on the S. to the Sikkim Himalaya in the N. Several are found in China and Japan, two reach Kamtchatka, and one of them Alaska. The arctic *R. Lapponicum* of Lapland and Greenland occurs in the alpine region of the White Mountains of New Hampshire. The only two other European species are *R. ferrugineum* and *R. hirsutum*, the *Alpenrosen* of the Swiss Alps. The species peculiar to America are, on the Atlantic side, *R. maximum*, which occurs sparingly as far N. as Canada, and abundantly throughout the whole length of the Alleghany Mountains; *R. Catawbiense*, a lower and earlier-flowered species on the higher mountains from Virginia southward; and *R. punctatum*, a graceful but less showy species of the middle country of the Southern States E. of the mountains. In the higher Northern Rocky Mountains is a peculiar deciduous-leaved species, *R. albiflorum;* in Oregon, *R. macrophyllum*, apparently near our *R. maximum;* in California, *R. Californicum*, nearer *R. Catawbiense*, but taller, and with more showy blossoms. The contrast in the size attained by the different species of this genus is as remarkable as its geographical range is extensive. The arctic *R. Lapponicum* is but a few inches high, while *R. Rollissonii* of Ceylon attains a height of thirty feet, with a stem over a foot in diameter. The useful properties of this genus are few and unimportant; the Siberian *R. chrysanthum*, however, supplies a narcotic sometimes used medicinally. Horticulturally, rhododendrons play a more important part. Several of the South Asiatic species are conspicuous inhabitants of our conservatories, the best suited for such cultivation being *R. arboreum*, *R. Dalhousiæ*, *R. argentium*, *R. Hodgsoni*, *R. Javanicum*, and *R. jasminiflorum*. Of hardy species, the most so at the North is the Siberian *R. Dauricum*, with small deciduous leaves and rose-colored flowers, appearing very early in the spring. But to the patient skill of the hybridizer we owe a race of hardy rhododendrons with showy flowers and foliage, and of greater horticultural value than any of the original types. These hybrids, the result of crossing the Alleghany *R. Catawbiense* with the Eastern *R. Ponticum*, are deservedly more generally planted than any other rhododendrons. A moisture-loving plant and unable to withstand the severe summer droughts so common in many parts of the U. S., and not thriving in soils strongly impregnated with lime, the rhododendron as a garden-plant can only be successfully cultivated in the Atlantic States from Massachusetts to Virginia. To develop its greatest beauty the rhododendron should be planted in well-drained peat or in soil largely composed of decaying leaf-mould, and situations should be selected for it somewhat protected from the winter sun, the greatest enemy, with the summer droughts, to all evergreens in the U. S. The following hybrid varieties, abundantly tested in the Northern Atlantic States, can be confidently recommended as hardy and beautiful garden-plants: viz. *R. Everestianum*, *R. roseum*, *R. album grandiflorum*, *R. purpureum*, *R. grandiflorum*, *R. coriacem.* C. S. SARGENT.

Rhodora, a genus of plants of the order ERICACEÆ (which see).

Rhomboganoi'dea [from *rhombus*, "a four-sided figure," and *Ganoidea*], an order of fishes belonging to the sub-class Ganoidea and super-order Hyoganoidea. (See FISH.) The skull is in most respects like that of the typical fishes; the pterotic is simple; a symplectic bone is present; the mandible is complex, and in addition to the articular, angular, and dentary bones a coronoid and opercular are developed; the maxillary is broken up into a number of pieces; the vertebræ are opisthocœlian—*i. e.* with a convex articulating surface in front and concave behind; the scapular arch has a simple internal cartilaginous piece (the coracoid) connected with the pectoral fin, representing the three bones of the typical osseous fishes; the pectoral member has, in addition to the actinosts supporting the bones of the pectoral fin, two elements—the metapterygium, bounding it above, and the pro- or mesopterygium, bounding it below. The scales are generally rhomboid and covered with enamel. The order includes a number of ganoid fishes which have survived from the Mesozoic period to the present time, being represented by the living Lepidosteidæ of North America. THEO. GILL.

Rhone, a department of France, bordering E. on the Saone and Rhone, comprises an area of 1066 sq. m., with 670,247 inhabitants. It is mountainous, covered with offshoots of the Cévennes, but with the exception of some very fine valleys the soil is mediocre. Copper, iron, and lead are found; excellent wine is produced, and the manufactures of silk and muslin are of the greatest importance. Of 59,601 children of school age, 3079 received no school instruction in 1857.

Rhone, the ancient *Rhodanus*, a river of France, rises in Switzerland, in the Alps, on the western side of St. Gothard, flows through the Lake of Geneva, crosses the Jura Mountains, turns at Lyons, where it receives the Saone, to the S., and falls, 644 miles distant, into the Mediterranean, through two branches which form the island of Camargue. Its lower course is through swampy and unhealthy districts, but its whole middle one leads through beautiful and fertile regions producing some of the finest wines of France. Throughout it is very rapid and its navigation is often difficult, but it has been made highly available as a route of traffic by a most magnificent system of canals which accompany it and connect it with the Seine, the Loire, and the Rhine.

Rhu'barb [Fr. *rhubarbe*]. A well-known and valuable drug, being the root of some species of *Rheum* growing in China, Chinese Tartary, and Thibet. A good deal of uncertainty still obtains as to the exact species from which different specimens of rhubarb are derived. In the U. S. Pharmacopœia officinal rhubarb is defined as the "root of *R. palmatum* and other species of *Rheum*." A specimen of *Rheum* was obtained through French missionaries in 1867 and sent to France, where it flowered at Montmorenci in 1871. It seemed to correspond in all respects with the descriptions of the true rhubarb-plant, such as they are, and the root was apparently identical with the Asiatic rhubarb of commerce. This species has been described by Baillon under the name of *R. officinale*, and is probably one source, at least, of rhubarb. Rhubarb has been known as a drug from a remote period. It was first brought to Europe by land from China to the Levant ports, whence the name "Turkey" rhubarb, or was shipped directly from China or by way of India, whence the variety called "China," "Canton," or "East India" rhubarb. Later, a direct trade between Russia and China was established, and under supervision of the Russian government rhubarb was transported overland through Central Asia to Russia. With the establishment of this commerce the trade by way of the Levant disappeared, and the name *Turkey rhubarb* came to be applied to that imported direct to Russia. This Russian or Turkey rhubarb was highly esteemed for its unvarying good quality, the Russian officials exercising the utmost strictness in their inspection of the rhubarb brought for exportation. But in 1863, from the depressing influence on trade caused by the opening of a number of ports in the N. of China, the Russian rhubarb office was abolished, and the old fine quality of Turkey rhubarb no longer exists. Chinese rhubarb is now shipped direct from China. Certain species of rhubarb are also cultivated in England and Europe—namely, *R. Rhaponticum*, *R. undulatum*, and *R. compactum*—but the roots are different from those of Asiatic rhubarb, and have not come into general use as a drug. Chinese rhubarb is in variously-shaped pieces, evidently cut and trimmed from a massive root. Many pieces have a hole through them, pierced for the passage of a string by which to hang up the pieces for drying. The color is a rusty brown, and the texture is finely veined and marbled. Rhubarb has a peculiar smell, and a disagreeable, bitter, and astringent taste. A bit of the root if chewed feels gritty, from the presence of crystals of calcium oxalate. The composition of rhubarb is complex, and has not yet been thoroughly worked out; it

contains, among other things, a variety of tannic acid. In small dose rhubarb behaves as a stomachic bitter, but in larger quantities is an active purge, producing liquid mucous evacuations. By reason of the tannin it contains it is also secondarily astringent. It is used in medicine as a stomachic and a laxative or purge, and is especially useful in summer diarrhœas from relaxation of the bowels or improper diet. The pharmaceutical preparations are very numerous. Among the most commonly used is the *spiced* or *aromatic syrup*, which is a tincture of rhubarb, cloves, cinnamon, and nutmeg diluted with six times its measure of syrup. The proportion of rhubarb is small, the preparation being intended as an aromatic astringent stomachic in the bowel complaints of children. *Warner's gout cordial* is a compound tincture of rhubarb, senna, coriander, fennel, liquorice, and raisins. EDWARD CURTIS.

Rhumb [Fr. *rumb*]. In navigation, the track of a ship sailing on a given course is called a *rhumb*. A rhumb-line cuts all the meridians at the same angle, and when this angle is acute the rhumb is a species of spherical spiral, continually approaching the pole, but reaching it only after an infinite number of turns. The angle under which a rhumb-line cuts any meridian is called the *angle of the rhumb*, and the angle that it makes with the prime vertical at any point is called the *complement of the rhumb*. The projection of a rhumb on the plane of the equator is a logarithmic spiral, and the rhumb itself is the same as the LOXODROMIC CURVE (which see). W. G. PECK.

Rhus, the botanic name of the sumach, a genus of the Anacardiaceæ or cashew family, includes not only the common sumach of the U. S. (four species), but the dogwood (*R. venenata*) and the poison-ivy (*R. toxicodendron*).

Rhyme [properly **Rime;** Ang.-Sax. *rîm*, "number"] is a certain agreement in the sound of strong syllables, which, next to accent, is the most important regulator of English verse, and without it it would be difficult to indicate the metre in some of the best specimens of versification, except in an inferior degree by the use of non-metric expedients, such as punctuation and the restriction of an idea to each line. Rhyme enables the audience to distribute rhythmic discourse into lines and stanzas, and it is the chief guide of the listener through examples like Pope's *Ode on St. Cecilia's Day*, Dryden's *Alexander's Feast*, the *Passions* of Collins, or stanzas such as—

"O Sorrow!
Why dost borrow
The lustrous passion from a falcon-eye?—
To give the glow-worm light?
Or, on a moonless night,
To tinge, on siren shores, the salt sea-spray?"—*Keats.*

While the metre of Virgil's hexameter becomes evident before half a dozen lines are heard, the heroics of Milton or of Thomson cannot be thus recognized, and in some passages we may alter successions of a dozen lines without offending the ear of the listener, as in Milton's

"Man's first disobedience, and the fruit of
That forbidden tree, whose mortal taste brought
Death into the world, and all our woe, with
Loss of Eden," etc.,

or

"Whose mortal taste brought death into the world,
And all our woe, with loss of Eden till
One greater Man restore us and regain
The blissful seat," . . .

the limping parts of which are not due to the unauthorized division, but to the original, which has three strong syllables ("taste brought death") followed by three weak ones ("into the").

In relation to rhyme, alliteration is a consonant identity with a vowel difference, the latter in a strong syllable, as in "means—veins," "terrible—horrible;" it is also a consonant and vowel identity in weak syllables, as in the lines of Keats—

"Make not your rosary of yew-berries, . . .
A partner in your sorrow's mysteries;" . . .

or of a strong ending with a weak one, as in Bryant's association of "spring" with "wel′coming." Assonance is an identity of sound, as in "told—toll'd;" or a vowel agreement in strong syllables, with a consonant difference, as in "drawn—scorn," "voice—noise."

Rhymes are strong syllables which are unlike before the vowel and alike in the vowel, and in any consonants or weak syllables which may follow it, as in "owe—hoe—go," "rose—grows," "hour—power" (both of which are dissyllabic); "lightness—brightness," "pli′ableness—reli′ableness." Pairs like "rough—plough," "privacy—eye" (Keats), are without phonetic resemblance. "Again" may rhyme with "men" and "pain," and "said" with "head" and "paid," but such changes are inadmissible when they suggest a different word, as in saying "wīnd" (a twist) for "wĭnd," which is worse than "hos" for "horse" (as rhymed with "cross" by Bloomfield), because there is no suggestion of a different word, as there is in

"So with resistless haste the wounded ship
Scuds from pursuing waves along the deep."—*Falconer.*

"By art, the pilot through the boiling deep,
And howling tempest, steers the fearless ship."—*Pope.*

A writer in *Scribner's Monthly* (July, 1873, p. 332) uses "wind" correctly—

"So' too our own nests are toss'd,
Ruthless, by the wreaking wind,
When, with stiffening winter's frost,
Woods we dwelt in, green, are thinn'd." . . .

Barham says truly, in genuine rhyme, that, "A fastidious ear

Will be more or less always annoy'd with you, when you
Insert any rhyme that's not perfectly genuine;" . . .

and the present tendency is against such pairs as "howl—soul" (*Wordsworth*), "height—weight" (*Dryden*), "bliss—quits" (*Cowper*), "really—freely" (*Emerson*), "snores—nose" (*Alex. Smith*).

The collected poems of Sir William Jones were published in 1772, and according to Felix Ago (*Rhymes of the Poets*, Philadelphia, 1868) in three of his poems, extending to 588 lines, the rhymes are perfect; his *Seven Fountains*, of 542 lines, has the single exceptional rhyme of "afford—lord;" and the *Palace of Fortune*, of 506 lines, has only "shone—sun," and "stood—blood." Strict rhyming accuracy is not to be expected in translations, and in humorous verse the effect is often heightened by eccentric rhymes. The troubadours and minnesingers brought rhyming to a high degree of excellence, and the modern Persians excel in the art. S. S. HALDEMAN.

Rhy′mer (THOMAS), **The,** the name by which the earliest poet of Scotland is usually mentioned. There is reason to believe that his real name was Thomas Learmount, of Ercildoune, Berwick co., who flourished under the reign of Alexander III. (circa 1283), whose death he is said to have foretold. He was popularly believed to be possessed of magical powers derived from the queen of the fairies, who had carried him away in childhood and kept him in Fairyland seven years, after which he was permitted to come back to earth on condition of returning to his mistress when summoned by the appearance in the village of a hart and doe, which, of course, is related to have occurred. The ballads of Thomas the Rhymer were long preserved by memory, the earliest edition bearing date 1603.

Rhynchocepha′lia [Gr. ῥύγχος, "beak," and κεφαλή, "head"], an order of reptiles, first recognized by Dr. Günther, distinguished, in common with the crocodilians, from the saurians or lizards by the quadrate bone being firmly and immovably united with the cranial bones (opisthotic, proötic, and jugal). The temporal region has two horizontal bars; the ali- and orbito-sphenoid apparatus are in part cartilaginous; the maxillaries are united by suture with the palatine bones; premaxillary is divided; the mandible has its rami united by a fibrous ligament; the vertebræ are amphicœlian—*i. e.* concave or flat before and behind; the sacrum composed of two vertebræ; the limbs are adapted for walking, and typical in structure; the clavicles, episternum, and xiphisternum present and united; no copulatory organs are developed; the anus has a transverse cleft. The typical genus of this order (*Sphenodon*, Gray, *Hatteria*, Gray, and *Rhynchocephalus*, Owen) has a singular external resemblance to certain lizards, especially to those of the family Agamidæ, but its structural characters are eminently different from those of the forms simulated and from all other lizards. The only known existing species (*Sphenodon punctatus*) is found in New Zealand. In former geological epochs, however, the order seems to have been well represented by species in various quarters of the globe. Remains of extinct reptiles found in the Carboniferous and Triassic beds of Europe, as well as of America, have been identified by Prof. Cope as belonging to this order, although by Prof. Huxley some of them had been referred to the order of saurians. THEODORE GILL.

Rhynchops′inæ [from *rynchops*; Gr. ῥύγχος, "beak," and ὤψ, "face"], a sub-family of Laridæ, peculiar in having the lower mandible longer than the upper; both the mandibles are much compressed, and the cutting edges are rapidly contracted toward the nasal region, whence they are parallel to the extremity, presenting trenchant edges; in other respects the form is similar to that exhibited by the terns (Sterninæ), and is naturally associated with that group in contradistinction to the Larinæ and Lestridinæ. The species are known under the English names cutwater and black skimmer; but three species are known, all of which belong to the single genus *Rynchops:* one of these

(*R. nigra*) occurs along the eastern coast of North America; another (*R. albicollis*) in India; and a third (*R. flavirostris*) is based upon specimens found in the Red Sea. The American species is quite abundant along the Southern coast, and is subject to considerable variation. Its note has a characteristic deep guttural intonation. It also differs from its allies, the terns, according to Dr. Coues, in associating in true flocks, as distinguished from the gathering of the terns and gulls. In the daytime it is wont to repose on sandbars. It is supposed to feed by skimming over the surface of the water with the bill open and the lower mandible in the water, but this requires confirmation. THEODORE GILL.

Rhythm, in music [Gr. ῥυθμός, "measure" or "proportion"], such an arrangement or grouping of notes and measures as gives to the ear a sense of relative proportion and conduces to the development of sentiment and beauty. The first or elementary stage of rhythm—viz. the arrangement of notes in measures or bars—has already received attention under the head of MEASURE, to which article the reader is referred. Musical notes when thus grouped into form and measure may possess a certain degree of meaning and connection; but neither melody nor harmony can give adequate expression to musical sentiment and feeling without a further grouping into portions equal to each other and marked by accent. This constitutes a higher kind of rhythm, to which the name of "compound rhythm" is sometimes given. Almost any succession of musical sounds will win attention and interest when the ear recognizes at certain intervals the pulsations of accent and the indications of a regular rhythmical division. A series of sounds without these periodical divisions, with their necessary cadences, would be as difficult to comprehend as a series of words without clauses, sentences, periods, and grammatical connection. In all regular compositions, therefore, we find an orderly succession of periods, formed of groups of two, four, eight, or more measures, as the case may be, with subdivisions into phrases, strains, or clauses. Of these periods, those consisting of four or eight bars are the most simple and agreeable to the ear. Periods of three, six, or nine bars are also in use, but those consisting of five or seven are irregular and less satisfactory. In the use of terms to designate these divisions there is great diversity among musical theorists, and much obscurity in their definitions. In the present article we use the term "period" as denoting one of those larger symmetrical divisions which contains within itself the full expression of some musical sentiment. Such periods may terminate with cadences of various kinds, but the closing period must always end with the perfect final cadence. A period, as already said, is susceptible of division into several parts or members. Thus, a period of eight bars is readily divisible into two "phrases" or "strains," and each of these phrases also admits of division into two "clauses." A period of six bars may be similarly divided either into two or three portions, and each of these portions may be regarded as a phrase or a clause. The chief difference between a phrase and a period lies in the cadence. This should be less conclusive in the phrase than in the period, even though formed of the same chords. The term "section" is applied to those still larger divisions which comprehend several periods. In many cases it is not easy to define the boundaries of these several divisions of section, period, and phrase. Sometimes a shortened or lengthened period occurs which breaks in upon the uniformity of the movement; sometimes also periods overlap each other, as when a new one commences before the former one has terminated; and in numerous cases periods and phrases are broken up into irregular forms for the production of special effects, thereby suspending for a time all regard to rhythmical symmetry. Notwithstanding these irregularities, which occur even in the highest works of art, the study of rhythm is of essential importance as the foundation of all regularity and excellence in musical composition. WILLIAM STAUNTON.

Rhythm [Gr. ῥυθμός, "measured motion or time"], according to Cicero, "is that, in all voices and sounds, which causes impressions, and which we can measure by equal intervals." In prosody rhythm marks out the feet which constitute metre, and the term is equally applicable to verse, music, dancing, and the movements of machinery, whether affecting the ear or the eye; and the term is often used to indicate the more regular kinds of prose. In music and in verse rhythm divides the measures into binary or triple parts, with a recurrence of accent according to this division; but in verse a mixed binary and triple rhythm is more common than in music. When the successive ticks of a clock are not quite alike in sound or in length (that is, when the clock is not in beat) the effect is rhythmic, but when they are alike they produce monotony, which is not rhythm. S. S. HALDEMAN.

Rhytina. See RHYTINIDÆ.

Rhytin'idæ [*Rhytina*, a generic name from ῥυτίς, "wrinkle"], a family of mammals formed for the reception of a species belonging to the order of Sirenia, now extinct, but abundant up to the latter half of the last century. The form was fish-like, with a small head and a horizontal forked tail; the vertebræ, except the terminal, were depressed and provided with transverse processes; in the skull the intermaxillary bones were produced at the apices, and the edge simulated incisive teeth; true teeth were entirely absent, manducation being effected by the very large corneous plate on the palate, and by another opposite it and covering the very large and elongated symphysis of the lower jaw: in this respect this form differed from all other known types of the order. The history of the only known species (*Rhytina borealis*) is peculiar. It was discovered about 1741 by the Russian naturalist Steller on an island in Behring's Strait, on which he and some sailors were shipwrecked, and the castaways depended chiefly upon these animals for food. At that time they were very abundant, and for some time continued to be so, and were killed in large numbers by the adventurers who visited the islands in search especially of sea-otters. In 1768, however, the last known specimen was killed. Steller published quite a detailed account of the animal in 1751, and gave a figure of the external form. It has recently been the subject of a number of elaborate investigations, especially by Dr. J. F. Brandt of St. Petersburg, who has published a number of contributions, two of which are considerable volumes, illustrated by numerous plates. The animal reached a length of about twenty-two to twenty-four feet, being thus much larger than the species of the allied forms Halicoridæ and Trichechidæ or Manatidæ. Like other members of the family, it was herbivorous and fed in great part on algæ. THEODORE GILL.

Riad, or **Riyad,** city of Arabia, capital of the dominion of the Wahabees, in lat. 24° 38′ N., lon. 46° 41′ E., in a large plain, is enclosed by a wall varying from 20 to 30 feet in height, and is surrounded by well-cultivated fields and gardens. The most prominent buildings are the palace of the sultan and the great mosque, forming the two sides of the principal public square, the market-place occupying the centre of the city. After the destruction of Derayeh by Ibrahim Pasha in 1818, Riad became the capital of the Wahabees, and is furthermore important as a station on the route of pilgrims from Persia to Mecca and Medina. P. estimated at 40,000.

Riall (Sir PHINEHAS), b. in England about 1775; entered the British army as ensign 1794; became brevet lieutenant-colonel 1800; commanded a brigade in the West Indies 1808–10; became major-general 1813; commanded on the Niagara frontier at the battles of Chippewa and Lundy's Lane 1814; became governor of Granada in 1816, and was promoted to full general 1841. D. in Paris Nov. 10, 1851.

Riazan′, government of European Russia, bounded N. by the government of Moscow, comprises an area of 16,253 sq. m., with 1,477,433 inhabitants. N. of the Oka the country is low and flat, and the soil generally sandy and little productive; the southern part is higher, more diversified, and fertile. Wheat, rye, hops, hemp, and fruits are produced. Cattle and a fine breed of horses are reared. Iron ore abounds, but mining or any other kind of industry than agriculture is not carried on with energy.

Riazan, town of European Russia, capital of the government of the same name, on the Trubesh, an affluent of the Oka, is the see of an archbishop, has many educational institutions, and carries on an important trade in grain. The city received its present name in 1777 from Catharine II. In its vicinity is the village of Grishina, with a large steel factory in which knives, scissors, surgical instruments, and mechanics' tools are produced in considerable quantity and of good quality. P. 22,279.

Ribaut′ (JEAN), b. probably at Dieppe, France, about 1520; was bred to the sea, and, being a staunch Protestant, was selected by Admiral Coligny as leader of the colony he proposed to establish in North America; sailed from Havre Feb. 18, 1562, in two vessels, with a band of veteran soldiers and several young nobles; landed May 1 at the mouth of St. John's River, Fla., called by him "river of May;" set up a pillar with the arms of France; sailed northward, giving the names of the rivers of France to the streams he discovered; entered Port Royal harbor May 27; built there a block house, which he called Fort Charles; left twenty-six colonists, and returned to France to report progress and send reinforcements, but the distracted state of affairs in France prevented aid being sent, and the survivors of the colony, after nearly perishing by starvation, were picked up at sea by an English vessel. A new expedition under René de Laudonnière having founded a settlement called

Fort Caroline on the river of May in 1564, Ribaut was commissioned governor of the colony, and sailed from Dieppe May 22, 1565, with seven vessels and 300 men; landed at Fort Caroline Aug. 28; had to flee with his vessels Sept. 4 from a Spanish fleet of five vessels under Menendez de Avila, who had established a colony at St. Augustine; sailed to attack the Spaniards, but had his squadron wrecked by a tempest near Cape Cañaveral; set out by land with 500 men to return to the fort, but was intercepted by Menendez, induced to surrender under false pretences, and put to death with most of his companions early in Oct., 1565. The settlement at Fort Caroline had been previously attacked by Menendez, and most of its inhabitants suffered a like fate, though two vessels escaped, one being commanded by a son of Ribaut. The news of this massacre created great excitement in France, and it was partially avenged two years later by Dominique de Gourgues, who in turn surprised the Spanish fort in Florida and massacred the settlers. A curious account of Ribaut's first voyage was published in English May 30, 1563, in a pamphlet of 42 pages, now very rare, entitled *The Whole and True Discoverye of Terra Florida*, etc., translated from the French of Ribaut. (See also French's *Historical Collections of Louisiana and Florida*, and Parkman's *Pioneers of France in the New World* (1868).)

Rib'bon [Fr. *ruban*], a narrow band of woven silk, used chiefly as an ornament of female attire. Though employed in many nations from remote antiquity, the manufacture of ribbons as an important article of commerce dates only from the seventeenth century, and has flourished chiefly in France, the cities of Tours, Lyons, and Avignon being largely engaged therein. At the present time the chief seats of the ribbon manufacture are St. Etienne, France, Bâle, Switzerland, Crefeld in Rhenish Prussia, and Coventry in England. The French articles have an admitted superiority, owing to the employment of hand-looms instead of power-looms.

Ribbon-Fish, a name given to various fishes, chiefly belonging to the family Trachypteridæ. They are so called on account of their much compressed, elongated, and band-like bodies. (See TRACHYPTERIDÆ.)

Ribbon-Worms, an English name sometimes given to the species of the family Nemertidæ, belonging to the order TURBELLARIA (which see).

Ribeauvillé' [Ger. *Rappoltsweiler*], town of the German empire, province of Elsass, manufactures spirits, paper, leather, dyestuffs, and dress articles, and is celebrated for its excellent wines. P. 7181.

Ribe'ra, town of Sicily, province of Girgenti, on an elevated plateau about 4 miles from the sea. The district is extremely fertile, abounding in rice and other grains, in vines and choice fruits, and in rare plants interesting to the botanist, but miasma prevails extensively. The inhabitants are distinguished for their daring character. P. 7200.

Ribera (JOSÉ). See SPAGNOLETTO.

Ribs [Ang.-Sax. *rib*]. The ribs are the curved bones which form the lateral framework of the thorax or chest. They serve as substantial points of attachment for the thoracic muscles, which perform the respiratory motions, and by their resistance and elasticity protect the lungs, heart, and great vessels from external violence and injury. The ribs, in man, are usually twenty-four in number, twelve on each side, but may be one or two more or less in exceptional cases. They are articulated to the spine behind, but in front only the upper seven are connected with the sternum or breast-bone by intervening costal cartilages. Of the remaining five, three connect with the cartilage of the seventh, while the lower two are unattached and termed *free* or *floating* ribs. The ribs are elastic, and being articulated in front and behind move freely upward and outward in inspiration, and reversely downward and inward in expiration. The ribs, like other bones, may be inflamed and thickened from contusion or from blood disease; they are often distorted by collapse of a part or whole of a lung and external atmospheric pressure. The chief injuries to the ribs are separation from their attachments to the spine or sternum, and fracture. The fractured rib is detected by local crepitation of the fragments in respiratory movement, and by the severe local "stitch" or pain it gives the patient. The treatment consists in application of a firm bandage or broad adhesive band around the body to suspend thoracic movement until the rib is united; respiration meanwhile is conducted chiefly by motion of the diaphragm. In advanced age and in rickets the cartilages may be ossified, the ribs become "fixed" or rigid, and lead to secondary lung disease—emphysema.

E. DARWIN HUDSON, JR. REVISED BY WILLARD PARKER.

Ricar'do (DAVID), b. of Jewish parentage in London Apr. 19, 1772. His father, a native of Holland, came to England, and as a member of the stock exchange gained a fortune. The son was a partner with his father till in 1793 he embraced the Christian faith and formed a marriage connection contrary to his father's wishes, which caused the partnership to be dissolved. Through the aid of other members of the stock exchange the younger Ricardo started in business by himself, and succeeded in a few years in securing an independent fortune. He then gave his time to the study of mathematics, chemistry, mineralogy, and geology, and was active in securing the organization of the London Geological Society. In 1809 he published a tract entitled *The High Price of Bullion a Proof of the Depreciation of Bank-notes;* in 1817 published his most important work, on *The Principles of Political Economy and Taxation.* Its leading feature was a theory of rent, which, though embodying ideas before announced by others, was received by the public as a new and important theory, especially in connection with the theory of Malthus on population, then much discussed. (See RENT.) He subsequently became a member of Parliament, where he took a prominent part in the discussion of economic questions. D. at his home in Gatscomb Park, Gloucestershire, Sept. 11, 1823. A collection of his works, edited by J. R. McCulloch, was published in 1846.

A. L. CHAPIN.

Ricarees. See RICKAREES.

Rica'soli (BETTINO), BARON, b. in Florence Mar. 9, 1809, of an old noble Florentine family; promoted liberal reforms in Tuscany in 1847 by signing an address to the grand duke, and founded the journal *La Patria;* was sent as minister to the court of Carlo Alberto, and there urged the union of Piedmont, Tuscany, and the pope against the Austrians; in Dec., 1847, was chosen gonfaloniere of Florence; was then elected to the Tuscan Parliament, and a place in the ministry was offered him, but as the grand duke had turned against the democratic movement, he declined it. Under the dictatorship of Guerrazzi he held himself aloof from public affairs. After the defeat of Novara, hoping to prevent the entrance of the Austrians into Tuscany, he took the initiative in recalling the grand duke, but when the latter withdrew the constitution, Ricasoli retired from the court to his castle of Brolio, where he devoted himself to the improvement of his estates. In 1859 he again put himself at the head of the Tuscan liberal movement, and doubtless aided essentially in the expulsion of the grand duke, and, as head of the provisory government, in the union of Tuscany with Piedmont. This being accomplished, he was appointed governor-general of Tuscany, an office which he held till Mar., 1861. The city of Florence elected him deputy to the Italian Parliament, and after the death of Cavour he became president of the council in the new ministry which was afterward overthrown by the opposition of Rattazzi. In 1866, when General La Marmora was about to take the field, Baron Ricasoli returned to power and resumed the direction of public affairs, in which position he maintained himself until again overthrown by the Rattazzi party. Since then he has taken no active part in politics. The journal *La Nazione*, published in Florence, is the special organ of Ricasoli and of his political friends.

Ricaut (Sir PAUL). See RYCAUT.

Ric'ci (MATTEO), b. at Macerata, Italy, Oct. 6, 1552; studied law at Rome; entered the society of Jesus 1571; went to India as secretary of Father Valignan, inspector-general of the Eastern missions, 1577; was soon afterward appointed to found a Jesuit mission in China; studied Chinese several years at Macao; obtained permission to settle with his companions at Tchao-king-fu 1583; quickly perceived the necessity of adapting his teachings to the condition and tastes of the Chinese; published a *Map of the World* in Chinese, and a small *Catechism* containing only the elementary principles of Christianity; gained a high position among the Chinese *literati*, whose distinctive dress he was at last permitted to assume; set out for Peking in the train of a mandarin; was turned back from Nanking; composed an *Art of Memory* and a *Dialogue of Friendship*, which so pleased the Chinese that he was at last permitted to visit Peking, but, being unable to gain an interview with the emperor, settled at Nanking, the second city of the empire. In 1600 he again went to Peking; was allowed to remain; built a church, and acquired great influence over the emperor in the capacity of teacher of mathematics and other sciences, and caused the establishment of missions in the principal cities of China. D. at Peking May 11, 1610. His *Mémoires* were published by Father Trigault (1615).

Ric'cia, town of Southern Italy, province of Campobasso, on a rocky hill about 25 miles N. N. E. from Ben-

evento. At the foot of the hill, near the torrent Sucida, are the ruins of an old castle, the abode of the feudal lords of Riccia for many centuries. The plague of 1656 reduced this once large town to a few families. Present p. 8200.

Ricciar'di (GIUSEPPE), COUNT, b. in 1808. His father, Francesco, count of Camaldoli, was minister under King Joachim Murat. His mother, a woman of rank, early taught him to hold in horror the despotism at Naples. In 1832, Ricciardi established a review, *Il Progresso*, compromised himself, and was arrested. Through the influence of his father he was liberated, after which he travelled through Italy and the principal countries of Europe. After eighteen months he returned to Naples, where he was again arrested in 1834, and the police, to complete his ruin, threw him into an insane hospital. He was finally released, and went at once to Spain, thence to France, and there he wrote for several reviews, especially for the *Revue Indépendante*, combating the Guelphic ideas of the followers of Gioberti. In 1848 he was elected deputy of the Neapolitan Parliament, and he favored the insurrection in Calabria. In June, 1849, he was again in Paris; in 1860 elected to the Italian Parliament. His literary works are numerous—poems, dramas, political articles, biographies, an autobiography, a *Martirlogio Italiano*, a work on ethics, *L'Arte di viver felice*, *Histoire de la Révolution d'Italie*. His works were published at Naples in 10 vols.

Riccio (DAVID). See RIZZIO.

Rice (*Oryza sativa*). Theophrastus (350 years B. C.) gives the origin of the name *oryzon*, *oryssa*, or *oryza*. It is the rice of the markets of the world. It was known to the ancients, as we find it grew most luxuriantly in those regions where man is first known to history. As above, we find it classified and named by the Greek "father of botany," Theophrastus, who was, in turn, the pupil of both Plato and Aristotle, three and a half centuries before the Christian era. From the Arabic we have it *aruz*. In modern Europe, it is *riz*, *reis*, or *rice*. *Oryza sativa*, the common rice, has the culm or stem from one to six feet in length, annual, erect, simple, round, jointed; leaves subulate linear, reflex, embracing, not fleshy; flowers in a terminal panicle, calycine; leaflets lanceolate; valves of the corolla equal in length, the inner valves even and awnless, the outer twice as wide; four grooves, hyspid, awned; style single, two-parted. This is one of the two grand species of rice, and is known as the *lowland* rice. It grows on natural wet lands or is cultivated with excessive irrigation. The *Oryza mutica* is the dry or mountain rice, cultivated in Ceylon and Java, and lately in Hungary. It has the culm or stem three feet high, and more slender than the former; fruits longish; awns longest of all. It is sown on mountains and in dry soil, rots with long inundation, and perishes in sea-water.*

Of each of these two species there are almost numberless varieties, the result, in great part, as in other grains, of the difference in soil and peculiarities of cultivation. The Chinese and inhabitants of the East Indies—in fact, of most tropical and semi-tropical countries—comprising a large majority of mankind, have been from our earliest knowledge of them in great measure subsisted upon rice. The favorite grain of the Orientals seems to be a Bengal rice, called "cargo rice." It is large and sweet, but coarse and red. That preferred in the European markets is known as the "Patna rice," brought from the East. It is small-grained, but very white. But by all accord the large, white, and sweet grain now known as the "Carolina rice," and comprising all the merits of the other kinds, is superior to anything known in the rice-market. The rice now obtaining farther W., in Louisiana and the Mississippi alluvion, is very much like the Carolina rice—as yet hardly equal to it, probably more from unfamiliarity with its cultivation than from any intrinsic difference in its character.

Introduction into America.—We have accounts of it as early as 1694. At that date a vessel from Madagascar which put into the port of Charleston in distress had on board a little sack of the rough rice. It was given to one Landgrave Thomas Smith, who planted it first in a low place in his garden. It yielded admirably, and by him was disseminated as seed among the neighboring planters, and by them to others along the rivers farther in the interior, till it became after a few years of careful culture the staple commodity of the colony.† From this it has extended through all the Southern States of America, and has found quite a successful cultivation far up into the interior and Western States of Tennessee, Illinois, and Missouri. The Carolina is the lowland rice, and the method of culture is by extreme irrigation. At first the swamp-lands were considered best adapted, but the greater ease of irrigating on tide-lands subsequently gave them the preference, and its cultivation is now chiefly confined to the coast and lands subject to tidal overflow, while the interior swamps have been gradually abandoned.

Louisiana Rice-Culture.—This is also of the lowland character or water-culture, and is mainly the same as the Carolina. The planter seeks a tract of alluvial land, which he divides into sections in proportion to the declination of the land from the river, as these lands always have an inclination from the stream backward. If, as in the case of the Mississippi River, the water during the summer period rises above the fields it irrigates, and is only protected from overflowing by the levees, the planter is allowed to cut openings, called "flumes," through the levee to get water. He does this, however, with every precaution against a possible crevasse. These flumes have valves or gates which are opened or closed at pleasure, regulating the discharge of water. This water is conducted into main ditches with laterals. These laterals separate the various sections of the fields, and convey the water to them as required, being arranged with dams for the purpose. These sections are laid off in drills from eight to ten inches apart; the seed is sown in them, and the water turned on profusely. It lies thus till the plant is seen above the water. It is then drained off, and remains dry until the stalk forms a joint. The water is then again turned on, and allowed to stand until the grain has matured, which is in about six weeks. The business of the cultivator is to see that this water is freshened every other night, or oftener if necessary, and to wade round through the crop and pull up or destroy all weeds, grasses, and such persistent growths as have not been killed by the water. At the proper stage of maturity, which is indicated by its turning yellow, the water having been drained off for a few days, the grain is ready for the sickle or cradle. It is cut and laid on the stubble for another day or two to dry; it is then bound into bundles and shocked, similar to the method with wheat. It then, as may be preferred, is either threshed out in the field or gathered into the stack-yard, there to await convenience and the state of the markets. After threshing it is winnowed and put into sacks for the mill or for market.

Rice has a very long and harsh beard, more so than that of wheat, which is a prolongation of the outer hull or gloom of the rice. The threshing and winnowing therefore become a necessity before carrying to mill. Rice, unlike wheat, is not rid of its inner hull by the simple threshing process; it adheres with a tenacity that requires special treatment. For this purpose machinery is provided which is of necessity elaborate and expensive—too much so to be adapted to the plantations, but becomes the business of large manufactories. To these the producer carries his crop for the hulling. The milling process develops three results—the first, or prime rice, the seconds, or broken rice, and the flour of rice. Of the whole weight, it is a pretty fair estimate, based upon the best authorities, that a little more than half comes out in prime rice. The remainder is between broken rice and flour, after a third allowed for chaff. This completes the process, and the rice is ready for market. It may be added that about 8 per cent. of the crop is usually reserved for seed and home consumption.

Dry-land Culture.—It has been contended by some that the "upland rice," or dry cultivated, is better than the lowland. It is smaller of grain, harder and drier, which is considered an advantage. It grows upon high and dry land, and is cultivated much after the manner of other small grain. The yield is less than that of the former kind, though it is sufficient to reward the planter for his pains and to be considered a valuable crop. It is a noticeable fact that this lowland species of rice, as proved by the identical grain brought to America, is capable of both these kinds of cultivation, showing a most kindly adaptation to the necessities of soil and circumstances; so that the lowland and upland rices of this country are of the same species, the differences being but modifications of the varied cultures, which are almost as various as the soil and localities; while the *Oryza mutica*, as a dry or mountain species of Oriental countries, admits of little or no modification of soil or culture, but, as mentioned above, rots with inundation and perishes in sea-water.

Amount of Production of Louisiana.—After the results of the recent war cut off the supply of rice from the Atlantic States the crop of Louisiana very materially increased. For instance, the product in 1863–64 was but 21,461 sacks; in 1869–70 it reached 100,748 barrels; in 1871–72 it had fallen off to 25,000; then it rose again, and in 1873–74 it was 33,780; and the estimate for 1875 is 104,963 barrels, making a crop of 24,141,490 pounds—second only to South Carolina itself.

* Rees's *Encyclopædia*. † Ramsay's *History of South Carolina*.

Rice Production of the Various States.

	1850, pounds.	1860, pounds.	1870, pounds.	1875, pounds.
South Carolina......	159,930,613	119,100,528	32,304,825	28,077,000
North Carolina......	5,445,868	7,593,976	2,059,281	
Alabama	2,312,252	493,465	222,945	
Georgia	38,950,691	52,507,852	22,277,380	
Florida..................	1,095,090	222,704	401,687	
Mississippi...........	....	809,082	374,627	
Louisiana.............	4,424,349	6,331,257	15,854,012	24,141,490
Texas....................	88,203	26,031	63,844	
Virginia................	17,154	8,825		
Tennessee.............	258,854	40,572	3.399	
Missouri................	700	9,767	9,706	
Kentucky..............	5,688			
Arkansas	63,179	16,833	73,021	
Michigan	....	716		
Minnesota.............	....	3,286		
California..............	....	2,140		
Totals................	212,592,641	187,167,034	73,644,727	52,218,490

Exports of Rice.

Total Export		
In 1850.	In 1865.	In 1870.
76,241,400 lbs.	60,407,756 lbs.	43,125,739 lbs.

Exports from the United States.

Year.	Tierces.	Value.	Per Tierce.
1800	112,056		
1810	131,341	$2,626,000	$20.00
1820	71,663	1,714,923	23.00
1830	130,697	1,986,824	15.00
1840	101,660	1,942,076	19.20
1850	127,069	2,631,557	23.00
1860	84,163	2,567,399	30.00
1870	25,351	454,316	18.00

*Value of the Rice-crop.**—This is derived from examining the net revenue of six different planters for ten years, from 1830 to 1840; it yielded $140 per annum to the hand. The rice for the same time averaged as follows:

In 1830 = $2\frac{5}{8}$	In 1836 = $3\frac{7}{16}$
" 1831 = $2\frac{3}{8}$	" 1837 = $3\frac{11}{16}$
" 1832 = $2\frac{13}{16}$	" 1838 = $4\frac{1}{17}$
" 1833 = $2\frac{5}{8}$	" 1839 = $2\frac{1}{2}$
" 1834 = $3\frac{3}{16}$	" 1875 = $7\frac{1}{2}$
" 1835 = $3\frac{1}{4}$	

The Drill-Plough.†—About the year 1812, Dr. Robert Nesbit introduced a new implement in the economy of rice-planting which excited great interest. Its offices and uses were to open the trenches and deposit the seed. It was found to be a labor-saving machine. The drill-plough was borne by a carriage on two wheels very much resembling in size and height an ordinary dray, and was drawn by one horse between shafts. It consisted of a long box parallel with the axle and above it, in which the given quantity of seed-grain was placed and locked up. From this box the grain was distributed by means of regulators into and through tin tubes descending almost to the earth at the required distance from each other for planting. The tubes or cylinders were guided in their descent and sustained in their respective positions by rods of iron fixed firmly into the frame, but so as to yield to an obstacle when pressed hard against. The rods, on their part, were each furnished at bottom with a sort of shoe protruding a little beyond the tube for the purpose of marking and opening the trench into which the seed was to be conveyed by its corresponding tube. Drawn by a good horse over ground in high tilth, and managed by a judicious hand, the drill-plough would trench seed for from eight to twelve acres of ground in a day, in proportion as it was furnished with a greater or less number of trenching-shoes or tubes. One of these ploughs, used by the inventor, having four tubes, would on long beds trench and sow ten acres in a day; another, furnished with six tubes, could accomplish fifteen acres under like circumstances in the same time.

Threshing-Mill.—The same gentleman, Dr. Nesbit, imported, introduced, and used upon his plantation a Scotch threshing-mill, which was moved by the wind in suitable weather. This machine would thresh and winnow 500 bushels in a day.

Milling.—In the year 1830 a machine was introduced, the beaters of which were shod with sheet iron and serrated with iron wire. This invention is now in very general use, yielding, when worked by animal power, from 200 to 300 bushels per day, and when propelled by steam-power 450 to 700 bushels each day. This is due to the ingenuity and mechanism of Dr. Calvin Emmons.

After having been threshed the rice should be "rayed"—*i. e.* the broken and imperfect grains separated from the full, the small and light from the large, so that a parcel of rice to be milled be made up of grains as nearly equal as practicable.

The grinding is the most important part of the process; it is between the stones that the rice is most apt to break. Each grain revolving probably on its shortest axis, according to a well-tested principle of philosophy, the stones should be set in proportion to the length of the grain. From these stones, with every hull, if possible, broken if not shelled off, the rice passes under the pestle. The proper degree of pounding can only be found by inspection of a practised eye. On being discharged from the mortar the rice must be thoroughly separated by rolling screens and fans from the flour and broken grains. It should then be passed spirally through the brushing-screen, which revolves with great rapidity (the longer the screen the better, provided the velocity be not diminished) until it is delivered into the barrel, clean, bright, and pearly, fully prepared and ready for market.‡

Hygiene.—Rice-culture on the Atlantic coast has proved to be very deleterious to the health of the white man. Malarious fevers are a general consequence, which, however, very rarely affect the negro. The cultivation on the Mississippi River, on the Lafourche, the Terre Bonne, and other interior streams on the Mississippi alluvion, however, has proved no more injurious to his health than the cultivation of any other crop in the same sections. This is a very important feature for consideration in the future rice-cultivation of the Mississippi Valley. Ten years' experience since the manumission of the slaves has shown the labor of the black man to be in rapid decadence; consequently, the agriculture of the South must depend upon the industry of the white man. Caleb G. Forshey.

Rice, county of Central Kansas, on Arkansas River, traversed by Atchison Topeka and Santa Fé R. R., consists of fertile rolling prairies. Cap. Atlanta. Area, 900 sq. m. In 1870 it had a population of only 5, but has since been settled.

Rice, county of S. E. Minnesota, on the head-waters of Cannon River, intersected by Milwaukee and St. Paul R. R., has a broken surface and a productive soil, the staples being wheat, Indian corn, oats, hay, wool, and butter. Domestic animals are somewhat numerous, and important manufactures are springing up. Cap. Faribault. Area, 575 sq. m. P. 16,083.

Rice, tp., Jo Daviess co., Ill. P. 570.

Rice, tp., Sandusky co., O., on Sandusky River. P. 927.

Rice (Alexander Hamilton), LL.D., b. at Newton Lower Falls, Mass., Aug. 13, 1818; graduated at Union College 1844; became partner in a paper-manufacturing firm at Boston, and was active in municipal affairs; president of the common council 1857; mayor of Boston 1857–59; member of Congress 1859–67, filling during the rebellion the post of chairman of the naval committee, and known as an accomplished scholar and orator. Governor of Massachusetts Jan., 1876.

Rice (David), b. in Hanover co., Va., Dec. 20, 1733; graduated at Princeton 1761; was a Presbyterian minister in Virginia 1763–68, and in Oct., 1783, settled in Kentucky, where he was the pioneer preacher. D. in Kentucky June 18, 1816. Author of several religious treatises and of a speech published in 1793 entitled *Slavery inconsistent with Justice and Policy* (2d ed. 1863).

Rice (Harvey), b. at Conway, Mass., June 11, 1800; graduated at Williams College 1820; settled in 1824 at Cleveland, O., where he was at first a teacher; was admitted to the bar 1826; established the Cleveland *Plain-Dealer* 1829; was an unsuccessful Democratic candidate for Congress in 1834 and 1836; was a State senator 1852–53, and drew up the school legislation then enacted. Author of *Mount Vernon and other Poems* (1859) and of many miscellaneous contributions to magazines and periodicals.

Rice (James Clay), b. at Worthington, Mass., Dec. 27, 1829; graduated at Yale College 1854; taught school, edited a paper and studied law at Natchez, Miss., 1855–56; settled in New York City 1856; enlisted as a private in a New York regiment 1861; was rapidly promoted for gallantry and intelligence in many battles in Virginia; became colonel of the 44th New York Vols.; commanded a brigade at Gettysburg; was made brigadier-general Aug. 17, 1863. D. from wounds received at the battle of Spottsylvania Court-house, Va., May 11, 1864.

Rice (John Holt), D. D., b. at New London, Bedford co., Va., Nov. 28, 1777; graduated at Washington College, Va.; was a tutor at Hampden-Sidney College 1796–99; became a Presbyterian clergyman and a pastor in Richmond, Va.; labored much among the slaves; was eminent as a pulpit-orator; founded in 1824 the Union Theological Seminary, and presided over it until his death in Prince Edward co., Va., Sept. 3, 1831. Author of several works.

* De Bow's *Industrial Resources.*
† Condensed from De Bow's *Industrial Resources.*
‡ Col. Allston of South Carolina.

Rice (LUTHER), b. at Northborough, Mass., Mar. 25, 1783; graduated at Williams College 1810; entered Andover Theological Seminary; was one of the five students who addressed themselves to the general association of Massachusetts announcing their desire to become foreign missionaries; was ordained at Salem Feb. 6, 1812, along with Messrs. Judson, Newell, Hall, and Nott; sailed for Calcutta with the two latter; became a Baptist on the voyage, as did also Mr. Judson, who sailed in another vessel; was baptized at Calcutta according to the Baptist ritual; returned to the U. S., and succeeded in effecting the organization of a Baptist missionary society 1814, for which he successfully undertook the financial agency; was the projector of Columbian College at Washington, D. C., becoming its agent and business-manager. D. in Edgefield district, S. C., Oct. 25, 1836.

Rice-Bird. See BOBOLINK.

Rice Bunting. See BOBOLINK.

Rice City, tp., Meeker co., Minn. P. 359.

Rice, Indian, or **Water Rice** [Lat. *Zizania aquatica*], an annual aquatic grass, from five to ten feet high, which abounds in marshy regions of the U. S., especially in Minnesota. Its grain was formerly much employed by the Dakota and Chippewa Indians, and forms an important portion of the food of the game-birds of the North-west. Its stem is now employed as a paper-stock.

Rice Lake, p.-v., Claremont tp., Dodge co., Minn. P. 51.

Rice Lake, tp., St. Louis co., Minn. P. 36.

Rice Lake, p.-v., Barron co., Wis., on Rice Lake, has fine water, manufactories, 1 saw and 1 grist mill, 1 lath and 1 shingle factory, a brewery, 3 hotels, 1 newspaper, and a court-house, etc. It is the centre of a lumbering district. A. DEWEY, ED. "BARRON CO. CHRONOTYPE."

Rice'land, tp., Freeborn co., Minn. P. 633.

Rice Paper Tree. See ARALIA.

Rice'ville, p.-v., cap. of Pearl co., Miss., near Pearl River.

Riceville, p.-b., Bloomfield tp., Crawford co., Pa. P. 301.

Rich, tp., Cook co., Ill. P. 1539.

Rich, tp., Union co., Ill. P. 1432.

Rich, tp., Lapeer co., Mich. P. 499.

Rich, county of N. E. Utah, on Bear River, adjoining Idaho and Wyoming Territories, is mountainous and well timbered. Cap. Randolph. Area, 850 sq. m. P. 1955.

Rich (CLAUDIUS JAMES), b. of English parents near Dijon, France, Mar. 28, 1787; educated at Bristol, England; devoted himself from childhood with enthusiasm to Oriental languages; obtained at the age of seventeen years a cadetship in the service of the East India Company; resided for a time at Bombay; became secretary to the British consul-general in Egypt; travelled through Palestine, Syria, and Mesopotamia disguised as a Mameluke; was appointed by the East India Company resident at Bagdad 1808, remaining there six years; explored the site of Babylon 1811, and again 1816; published a *Memoir on the Ruins of Babylon* (1812) and a *Second Memoir on Babylon* (1818); travelled in Koordistan 1820. D. at Sheeraz, Persia, Oct. 5, 1821. His posthumous *Narrative of a Residence in Kurdistan* (1829) was edited by his widow, a daughter of Sir James Mackintosh. He made a valuable collection of Oriental MSS., which was purchased by Parliament for the British Museum.

Rich (EDMUND), SAINT, b. at Abingdon, Berkshire, England, about 1195; received a bias toward an ascetic life from his mother, Mabel; was sent to school at Oxford, where he made a vow of celibacy, or, in his own language, "wedded the Virgin Mary;" studied theology at Paris, and lectured there on the Scriptures; became an instructor at Oxford, where the university was then developing a revival of scholarship; was the first who taught there the Aristotelian logic and the scholastic philosophy, having among his pupils Roger Bacon; was prebendary and treasurer of Salisbury cathedral 1219–22; distributed its revenues to the poor; acquired fame as a preacher, especially in urging a new crusade, 1227; became rector of Calne; was appointed in 1233 archbishop of Canterbury; exhibited energy as a reformer in the face of opposition from the clergy; presided over two councils 1234, which by threats of excommunication induced King Henry III. to dismiss his foreign favorites; acquired an ascendency over that monarch; negotiated a peace with Llewellyn, prince of Wales, 1234; officiated at the marriage of Henry III. to Eleanor of Provence, and at the coronation of the latter Jan., 1236; had his authority superseded by that of the legate, Cardinal Otho, who held a council Nov., 1237; opposed the marriage of Simon de Montfort with Eleanor, countess-dowager of Pembroke, and excommunicated them 1238, thereby incurring the royal displeasure; went to Rome to negotiate a settlement of the controversy about the appointment of English bishops 1238, but, being unsuccessful, retired to France 1240, where, the fame of his sanctity being general, the queen-mother came to meet him and solicit his blessing; took up his residence in the abbey of Pontigny, and afterward went for his health to the priory of Soissy, where he d. Nov. 16, 1642. His remains were taken back to Pontigny, and having been canonized by Innocent IV. (known in France as *St. Edme*), in 1246, his shrine became a place of pilgrimage. Archbishop Manning and Lord Edmund Howard, with 500 English pilgrims, went thither to invoke his intercession in behalf of the Roman Catholic Church Sept. 3, 1874. He wrote a volume of *Constitutions* in 36 canons (1236), *Speculum Ecclesiæ*, and left MS. treatises, now in the Bodleian Library. There is a MS. biography by his brother Robert in the Cottonian Collection. Another, written by his secretary, Bertrand, was published in Martenne's *Thesaurus Anecdotorum*.

Rich (OBADIAH), b. at Boston, Mass., in 1783; went in youth to Spain; was for many years employed in the American consular service at Valencia, Port Mahon, and Madrid; formed valuable collections of Spanish books which were of great use to Washington Irving, Ticknor, and Prescott, and ultimately became a bookseller in London, where he d. Jan. 20, 1850. Author of several valuable catalogues of American books.

Richard' (GABRIEL), b. at Saintes, France, Oct. 15, 1764; educated at the College of Angers; became a Roman Catholic priest; came to the U. S. 1792 as teacher of mathematics in the college at Baltimore; soon went as a missionary to Kaskaskia, Ill.; settled at Detroit, Mich., 1798; acted there as vicar-general of the bishop of Ohio; published a periodical and several books in French; was taken prisoner by the English in 1813, and was delegate to Congress 1823. D. at Detroit Sept. 13, 1832.

Rich'ard I. (PLANTAGENET), surnamed CŒUR DE LION ("lion-hearted"), king of England, third son of Henry II. and Eleanor of Aquitaine, b. at Oxford Sept. 13, 1157; was noted from youth for rash valor and a turbulent disposition, qualities which he shared with his elder brother, Henry, and his younger brother, Geoffrey; received the duchy of Aquitaine by the treaty of Montmirail (Jan. 6, 1169), under the feudal supremacy of King Louis VII. of France, to whose youngest daughter, Adelaide, he was at the same time betrothed; went to the court of France, where he was knighted by King Louis; joined his mother and his two brothers in rebellion against his father 1173; was reconciled to him Sept., 1174, relinquishing Aquitaine, but acquiring a territory in Poitou, for which he did homage to the French king; distinguished himself in a campaign against the rebels of Aquitaine; refused to recognize the feudal supremacy of his brother Henry over that duchy, which had at last been given him, and, aided by his father, successfully defended it against an invasion which terminated by the death of Prince Henry, June, 1183; maintained another brief war with his brothers Geoffrey and John, and ravaged Brittany, but was reconciled to them at London Nov. 30, 1184; inherited Geoffrey's titles on his death, Aug., 1186; made war upon the count of Toulouse; aided his father against Philip Augustus 1187; took a vow to go on a crusade 1187; did homage to Philip Augustus, king of France, for all his continental territories Nov. 18, 1188; waged successful war on his father in alliance with the king of France; succeeded to the throne by the death of his father July 6, 1189; immediately liberated his mother from the prison where she had remained several years, and appointed her regent of England; received possession of the duchy of Normandy July 20; arrived in England Aug. 13; was crowned at Westminster Sept. 3; appointed Willim de Longchamp guardian of the realm, and returned to Normandy Dec. 11; joined his forces at Vezelay with those of the king of France for the third crusade, July, 1190; embarked at Marseilles Aug. 7; touched at Naples and at Messina; captured the latter city Oct. 4; remained there six months while he built the castle of Mategriffon; quarrelled there with Philip; formed a close alliance with Tancred, king of Sicily, to whose infant daughter he betrothed his nephew and presumptive heir, Prince Arthur, son of Geoffrey; released himself by treaty from his engagement to the French princess, influenced by a passion for Berengaria, daughter of King Sancho of Navarre, who had arrived in Sicily with her mother; embarked for the East Apr. 7, 1191; touched at Rhodes Apr. 20; landed in Cyprus in May; was ill received, and conquered that island in a few days, dethroning and imprisoning King Isaac Comnenus; married Berengaria at Limesol, Cyprus, May 13; presented the island to Guy of Lusignan; arrived be-

fore Acre June 8; took part in the siege, but soon quarrelled again with the French king; was attacked by the plague; was present at the surrender of Acre July 12, after which Philip returned to France; put his Saracen hostages to death; advanced immediately toward Jerusalem; defeated the Saracens at Arsuf Sept. 6; took and fortified Jaffa; advanced on Askalon, which he took Jan., 1192; set out twice for Jerusalem, but was called back each time by hostilities in his rear; lost and regained Jaffa; performed many brilliant exploits of personal valor, but being obliged by the state of affairs in England to return, made a truce with Sultan Saladin, and sailed from Acre Oct. 9; was shipwrecked at the head of the Adriatic; endeavored to make his way by land through Austria; was seized and imprisoned Dec. 20 by Leopold, duke of Austria, with whom he had quarrelled in the Holy Land; was handed over to the emperor of Germany, by whom he was detained more than a year; was liberated on pledge of a heavy ransom Feb. 4, 1194; landed at Sandwich Mar. 13; found his brother John assuming the functions of king, but speedily forgave him; was crowned at Winchester Apr. 17; sailed for Normandy May 2; engaged in a war with Philip Augustus of France, whom he defeated and forced to sign a disadvantageous truce, and renewed the war three years later with a similar result, but was mortally wounded Mar. 26 by an arrow shot from the petty castle of Chalus-Chabrol, which he was besieging, and d. Apr. 6, 1199, leaving no legitimate children. His fame as a soldier was magnified by tradition, by poetry, and by romance, which attributed to him incredible feats of valor, and he was reputed to be highly accomplished as a troubadour. He was a representative Provençal prince of the age of chivalry, having, beyond the accidents of birth and inheritance, little connection with England. He was ignorant of the English language, and spent almost his whole life in his hereditary provinces of Southern France. Much new light has been cast upon his career by the publication of the *Chronicles and Memorials of Richard I.* (1864), a volume of the Rolls Series, edited by Rev. W. Stubbs from MSS. in the library of Corpus Christi College. PORTER C. BLISS.

Richard II., king of England, son of Edward the "Black Prince" and Joanna of Kent, b. at Bordeaux, France, Apr. 3, 1366; was presented to Parliament as heir-apparent on the death of his father, June 25, 1376; was created prince of Wales Jan. 26, 1377; succeeded to the throne on the death of his grandfather, Edward III., June 22 of the same year; was crowned at Westminster July 16; was under the tutelage of a council of twelve nobles, from which his three uncles were excluded, the government being, however, really controlled by one of them, John of Gaunt, duke of Lancaster, then a claimant of the throne of Castile in right of his wife; maintained a feeble warfare with France; encountered a vigorous opposition from Parliament and from the common people in the imposition and collection of a capitation-tax, which gave rise to the insurrection of Wat Tyler, June, 1381; married Anne of Bohemia, daughter of the emperor Charles IV., Jan. 14, 1382; renewed the war with France; invaded Scotland with slight result beyond the burning of Edinburgh, Aug., 1385; attempted to emancipate himself from the council of regency, which was reorganized under the duke of Gloucester Nov. 19, 1386, but without success, his leading supporters being defeated and put to death with the sanction of Parliament 1387–88; succeeded by a sudden display of vigor in assuming the government May 3, 1389; concluded a truce with France May 27, 1394; lost his queen the same year, and held a Parliament in Ireland; married Isabella of France Oct., 1396; summoned a new Parliament 1397, by whose aid he caused the arrest of Gloucester, who was carried to Calais and died there under suspicious circumstances, and the banishment or execution of his principal adherents; quarrelled with his cousin, Henry of Bolingbroke, duke of Hereford, whom, along with Mowbray, duke of Norfolk, he banished for ten years, 1398; seized the estates of his uncle, John of Gaunt, on the death of that prince Mar. 18, 1399; sailed for Ireland in May, but, being deserted by his troops, returned to Conway, Wales, Aug. 6; found the country in rebellion, Henry of Bolingbroke (now duke of Lancaster) having landed at Ravenspur, Yorkshire, in July and gathered a formidable army; was taken prisoner Aug. 20 by Bolingbroke, and sent to the Tower Sept. 2; was compelled to abdicate Sept. 29; was declared by Parliament Sept. 30 to be deposed in favor of Bolingbroke (who seized the throne under the title of Henry IV., to the exclusion of the legitimate heir, Roger Mortimer, earl of March); was kept a prisoner at Pontefract Castle, but soon disappeared, having been murdered, as was believed, by his keeper, Sir Piers Exton, about 1400. A corpse, alleged to be his, was exhibited at St. Paul's Mar. 4, 1400, and buried in Westminster Abbey. It has been maintained by some writers that he escaped to the Hebrides, lived there many years in concealment, died in 1419, and was buried at Stirling. The reign of Richard is a remarkable period in the constitutional history of England, and still more so in religion and literature, from the eminent names of Wycliffe, Chaucer, and Gower, who were patronized by him. The modern English language is usually dated from this reign. PORTER C. BLISS.

Richard III., last king of England of the Plantagenet line, b. at Fotheringay Castle Oct. 2, 1452, was the youngest son of Richard, duke of York, and Cecily Neville, daughter of the earl of Westmoreland, his father being the legitimate heir to the throne by descent (in the female line) from Lionel, duke of Clarence, third son of Edward III., and consequently the head of the Yorkist faction in the "war of the Roses," then in abeyance. The duke of York, having renewed the struggle for the crown against the imbecile Henry VI., was defeated, captured, and executed near Wakefield, Yorkshire, Dec. 31, 1460. Richard, then eight years of age, was taken prisoner on this occasion, and shortly afterward sent, with his brother George, by his mother to Utrecht, Holland, where he was under the protection of the duke of Burgundy; returned the following year (his eldest brother having become king under the title of Edward IV.); was created duke of Gloucester, knight of the Garter, and lord high admiral, and endowed with large estates from the spoils of war; resided (as is supposed) for several years at Middleham Castle under the tutelage of his relative, the earl of Warwick, called the "king-maker," against whom, however, he fought in 1470 during the rebellion which for a time restored Henry VI. to the throne; fled with King Edward to Flanders Sept., 1470; was attainted and outlawed by Parliament; accompanied Edward on his return to England early in 1471; was influential in effecting the reconciliation of the latter with his brother, the duke of Clarence; commanded the van of the Yorkist army at the battles of Barnet (Apr. 14) and Tewksbury (May 4); has been accused, without evidence, of having murdered Prince Edward, son of Henry VI., after the latter battle, and King Henry himself in the Tower a few days later; was created lord high chamberlain of England, earl of Dorset and of Somerset, placed in possession of numerous forfeited estates, especially those which had belonged to Warwick, the "king-maker," whose daughter, Anne Neville (his own cousin, previously betrothed to Prince Edward), he married Mar., 1472; quarrelled with his brother, the duke of Clarence (married to Isabel Neville), about the inheritance of Warwick, their common father-in-law, 1473; was made a second time lord high constable Feb., 1472, and soon afterward keeper of the king's forests beyond the Trent, justiciary of North Wales, and seneschal of the duchy of Lancaster, in which capacity he resided some years at Pontefract Castle; accompanied his brother in the invasion of France 1475; inherited the offices and estates of his brother, the duke of Clarence (executed for treason Feb., 1478); was made lieutenant-general of the kingdom upon the breaking out of war with Scotland 1480; took possession of Berwick; penetrated to Edinburgh, and dictated terms of peace July, 1482; was made warden of the W. marches of England and lord of Carlisle early in 1483; learned of the death of Edward IV. while still in Scotland, Apr., 1483; took and imposed upon his generals an oath of allegiance to his nephew, Edward V.; met the duke of Buckingham at Northampton Apr. 29; forcibly assumed the guardianship of the young king the following day, imprisoning Lords Rivers, Grey, and other nobles of the queen's party; proceeded to London; was appointed by the council of state and confirmed by Parliament "protector and defender of the realm" early in May; ordered the seizure and instant execution of Lord Chamberlain Hastings on a charge of conspiracy June 13; asserted his own title to the throne on the ground of illegitimacy of his nephews June 22–24; obtained from Parliament a favorable decision, and assumed the throne June 26; was crowned with his queen at Westminster July 6, and again at York Sept. 8; was soon suspected of having caused the princes to be murdered in the Tower (see EDWARD V.); repressed a conspiracy in behalf of the earl of Richmond as head of the Lancastrian party, putting to death the duke of Buckingham (his own former partisan); convoked a Parliament, which declared him lawful king Jan., 1484; lost his only son, Edward, prince of Wales, Apr. 9; named his nephew, Edward, earl of Warwick (son of Clarence), heir to the throne, but soon substituted for him John de la Pole, earl of Lincoln, son of his sister, the duchess of Suffolk; made a truce with Scotland, and negotiated a marriage between his niece, Anne de la Pole, and the Scottish prince, James, Sept. 21; lost his queen Mar. 16, 1485; became unpopular on account of forced loans; marched with a large army to encounter the earl of Richmond, who had landed at Milford Haven Aug. 7; was defeated at Bos-

worth through the desertion of the Stanleys; killed while gallantly fighting Aug. 22, 1485, and buried by the nuns of Leicester in their chapel, Richmond, the victor, becoming king under the title of Henry VII. Being the last of his line, Richard III. has been loaded with more obloquy than any other king of England, but most of the crimes attributed to him have long since been disproved.

PORTER C. BLISS.

Richard of Cirencester (sis'eter) [Lat. *Ricardus Coronensis*], b. at Cirencester, Gloucestershire, England; entered the Benedictine monastery of St. Peter at Westminster; resided there during the remainder of his life; visited Rome about 1391, and d. about 1402. Author of a Latin history of England to the year 1348. A work entitled *De Situ Britanniæ* was published under his name by Dr. C. J. Bertram of Copenhagen in 1757, and would be of great value if its minute geographical and ethnographical data upon Saxon Britain could be trusted; but no original MS. has been produced, and the work is now generally believed to have been written by Bertram.

Rich'ard of St. Victor, a Scotch mystical schoolman, the date of whose birth is not known. At an early age he appears to have entered the Augustinian abbey of St. Victor in Paris, where he was a pupil of Hugo of St. Victor (d. 1141). In 1159 he became sub-prior, and in 1162 prior, of the abbey, and d. Mar. 10, 1173. As an interpreter of Scripture his method was largely though not exclusively the allegorical. He wrote also doctrinal and practical treatises. He was named *Magnus Contemplator.* The earliest edition of his works was printed at Paris in 1528, but the best appeared at Rouen in 1560. (See monographs by Liebner (1837–39) and Engelhardt (1838).)

R. D. HITCHCOCK.

Rich'ard Plantag'enet, earl of Cornwall and titular emperor of Germany, b. at Winchester, England, Jan. 5, 1209, was a younger son of King John; commanded an expedition to Guienne 1225; took the cross 1236; set out for Palestine 1240; returned to England Jan., 1242; accompanied his brother, Henry III., in his French campaign of that year, but soon lost the province of Guienne and escaped to England; married a princess of Provence 1243; was chosen emperor of Germany by a faction 1256, and crowned king of the Romans at Aix-la-Chapelle May 17, 1257, but was unable to obtain general recognition, and was more than once driven to take refuge in England; was taken prisoner by Simon de Montfort at the battle of Lewes, May 13, 1264; held a diet at Worms 1269; returned to England in that year. D. Apr. 2, 1272.

Rich'ards (JAMES), D. D., b. at New Canaan, Conn., Oct. 29, 1766; studied at Yale College; became pastor of a Presbyterian church at Morristown, N. J., 1794, at Newark 1809, and professor in Auburn Theological Seminary 1823. D. at Auburn Aug. 2, 1843. A selection of his *Lectures,* with a memoir by S. H. Gridley, was published in 1846, and a volume of his sermons, with an essay on his character by Rev. Dr. W. B. Sprague, appeared in 1849.

Richards (JOHN), D. D., b. at Farmington, Conn., May 14, 1797; graduated at Yale College 1821, and at Andover 1824; was for three years agent of the Board of Foreign Missions; was ordained as a Congregational minister at Windsor, Vt., 1827; was one of the editors of the *Vermont Chronicle* 1830–39; was settled at Hanover, N. H., 1841; became agent for the New Hampshire Education Society; was a frequent contributor to periodicals, and began a series of biographical sketches of the graduates of Dartmouth College, which was completed and published by Dr. Chapman. D. at Hanover Mar. 29, 1859.

Richards (WILLIAM), b. at Plainfield, Mass., Aug. 22, 1792; graduated at Williams College 1819; at Andover 1822; went in that year as a missionary to the Sandwich Islands, where he ultimately became interpreter and chaplain to the king; was sent as minister to England and other countries, and was appointed in 1845 minister of public instruction. D. at Honolulu Dec. 7, 1847.

Richards (WILLIAM C.), b. in London, England, in 1817; came to the U. S. in 1831; graduated at Madison University, Hamilton, N. Y., 1848; labored as a Baptist minister in Georgia and South Carolina until 1853, when he settled in New York City; edited in Georgia the *Orion Magazine,* in South Carolina the *Southern Literary Gazette* and the *Schoolfellow;* has contributed to various periodicals, written several juvenile books, and a *Memoir of George N. Briggs* (1866).—His wife, MRS. CORNELIA H. (BRADLEY) RICHARDS, b. at Hudson, N. Y., in 1822, has aided him in his editorial duties, and published several juvenile books under the *nom-de-plume* of "Mrs. Manners." She is a sister of Mrs. Alice B. Haven.

Rich'ardson, county of S. E. Nebraska, on Missouri River, adjoining Kansas, watered by Nemaha River and traversed by Atchison and Nebraska R. R., consists of rolling prairies diversified with timber. Staple products, Indian corn, wheat, hay, wool, and butter. Swine are numerous. Cap. Falls City. Area, 550 sq. m. P. 9780.

Richardson (ALBERT DEANE), b. at Franklin, Mass., in 1833; went to Pittsburg, Pa., 1850; became a schoolteacher, and afterward a reporter for the press; went to Kansas as correspondent of the Boston *Journal* during the Border troubles; became secretary to the Kansas legislature and adjutant-general; was a war-correspondent of the New York *Tribune* during the rebellion, and was for twenty months a prisoner of the Confederates, escaping Dec. 18, 1864; visited California as a correspondent 1865, and published *Field, Dungeon, and Escape* (1865), *Beyond the Mississippi* (1867), and a *Life of Gen. Grant* (1868), all which were very successful. He was shot in the *Tribune* office, New York, Dec. 2, 1869, by Daniel McFarland, on account of jealousy, and was married to Mrs. McFarland on his deathbed by Rev. Henry Ward Beecher.

Richardson (BENJAMIN WARD), M. D., F. R. S., b. at Somerby, Leicestershire, England, Oct. 31, 1828; graduated in medicine at St. Andrew's 1854; became an eminent physician at London; was chosen a member of the Royal College of Physicians and Surgeons 1856; founded and edited the *Journal of Health and Sanitary Review* (1855 *seq.*); gained the Astley Cooper prize of £300 by his treatise *On the Cause of the Coagulation of the Blood* (1856), and the Fothergillian gold medal by a disquisition *On the Diseases of the Fœtus* (1856); originated the use of ether spray for the local abolition of pain in surgical operations (1866); introduced methylene bi-chloride as a general anæsthetic (1867); has been president of the Medical Society of London; has contributed to the *Social Science Review,* published several medical works, and gained a high position by original experiment.

Richardson (CHARLES), LL.D., b. in England in July, 1775; studied but never practised law; devoted himself to literature at London; published *Illustrations of English Philology* (1815); undertook the lexicographical articles in the *Encyclopædia Metropolitana,* for which he also prepared his great work, a Dictionary of the English Language, which (the first part appearing in 1818) was suspended soon afterward by the failure of the proprietors, and completed (as a separate work) in 1837. The complete work appeared in new editions in 1837, 1838, and 1839; was reprinted in the U. S., met with great favor, and still maintains its position as the best work on English etymology, the words being conveniently arranged under the roots. Richardson also published a *Supplement* to his dictionary (1855), a work *On the Study of Languages* (1854), and an *Historical Essay on English Grammar and English Grammarians,* several philological papers in the *Gentleman's Magazine,* and some comments on Shakspeare; was a contributor to *Notes and Queries,* and received a pension from 1852 until his death, at Feltham, Middlesex, Oct. 6, 1865.

Richardson (CHAUNCEY), A. M., b. in Vermont Oct. 10, 1802; licensed to preach in his twenty-first year by Dr. Wilbur Fisk; had charge of a literary institution in Tuscumbia, Ala., and in 1839 became president of Rutersville College, Tex. He was one of the nine ministers who constituted the first Texas conference, in which he rose to eminence, and was an indefatigable worker. D. in Texas Apr. 11, 1852.

T. O. SUMMERS.

Richardson (ISRAEL B.), b. in Vermont 1815; graduated at the U. S. Military Academy, and entered the infantry July, 1841; served in Florida against the Indians and on frontier duty until the threatened hostilities with Mexico, when ordered to Texas with our army of occupation, and in the war served under Gen. Taylor in the battles of Palo Alto, Resaca de la Palma, and Monterey, and under Gen. Scott from the siege of Vera Cruz to the fall of the City of Mexico, receiving the brevets of captain and major for gallantry. Continuing on frontier duty from the close of the war until 1855, at which date he had risen to be captain, he resigned to devote himself to farming pursuits in Michigan. On the outbreak of civil war in 1861 he accepted the colonelcy of the 2d Michigan Vols., which regiment he led to Washington, and May 17, 1861, was commissioned brigadier-general of U. S. volunteers. At the first battle of Bull Run he led his brigade, and in the Virginia peninsular campaign of 1862 commanded a division in Sumner's corps; promoted to be major-general of volunteers July 4, 1862, he commanded with great bravery and distinction at South Mountain and Antietam, where he was fatally wounded Sept. 17. D. at Sharpsburg, Md., Nov. 3, 1862.

Richardson (JAMES), b. at Boston, England, Nov. 3, 1809; became a correspondent of a London journal; visited

Morocco, Algeria, and some portions of the desert of Sahara 1845–46; published his *Travels* in 1848, which led to his appointment as the head of a new expedition into Central Africa, in which he was accompanied by Barth and Overweg. They set out from Tripoli in 1850, visited the stony desert of Hammadah, and penetrated to Bornoo, but Richardson d. at Ungurutua Mar. 4, 1851. Overweg also d. near Lake Tchad Sept. 27, 1852, but Barth successfully accomplished the exploration of vast regions, returning in 1855. He also preserved and sent to England the papers of Richardson, which were edited by Bayle St. John under the title *A Narrative of a Mission to Central Africa* (1853). His earlier *Travels in Morocco* (1859) were edited by his widow.

Richardson (Sir John), M. D., F. R. S., LL.D., b. at Dumfries, Scotland, Nov. 5, 1787; studied medicine at the University of Edinburgh; entered the navy as assistant surgeon 1807; was present at the taking of Copenhagen 1807; was surgeon and naturalist to Sir John Franklin in his Arctic expeditions of 1819–22 and 1825–27; explored on the latter occasion the shore of the Arctic Ocean between the mouths of Mackenzie and Coppermine rivers; published *Geognostical Observations*, etc. as an appendix to the narrative of Franklin's first voyage (1823); edited, along with Swainson and Kirby, the *Fauna Boreali-Americana* (4 vols. 4to, London, 1829–37); was physician to Melville Hospital, Chatham, 1828–38, physician to the fleet 1838–48; was knighted 1846; commanded an expedition in search of Sir John Franklin 1848–49; published *The Arctic Searching Expedition* (2 vols., 1851) and *The Polar Regions* (1861); retired from public service 1855, and devoted his closing years to his favorite studies in philology and ethnology. D. at Lancrigg, near Grasmere, June 5, 1865.

Richardson (Richard), b. near Jamestown, Va., in 1704; was a land-surveyor in Virginia; became a planter in Craven co., S. C.; took part in the border wars with the Indians; was a member of the South Carolina council of safety 1775; suppressed a Tory revolt on the frontier, for which he received the thanks of the provincial congress; was a member of the legislature 1776; aided in forming the constitution of South Carolina; rejected overtures from Lord Cornwallis; was imprisoned at St. Augustine, Fla., after the capture of Charleston, losing his health. D. almost immediately after his release, at Salisbury, S. C., in Sept., 1781.—His son, James B. Richardson, was governor of South Carolina 1802–04; and his grandson, John Peter Richardson, b. at Hickory Hill Apr. 14, 1801, graduated at South Carolina College 1819, was a member of Congress, governor of South Carolina 1840–42, and a leader of the Union party.

Richardson (Samuel), b. in Derbyshire, England, about 1689; learned the printing trade; became a publisher at London, printer of the journals of the House of Commons, master of the Stationers' Company, and purchased in 1760 a half-interest in the office of king's printer. D. in London July 4, 1761. Author of several exceedingly popular novels, which were among the earliest of the modern school, though now considered tedious: *Pamela* (2 vols., 1741), *History of Clarissa Harlowe* (8 vols., 1748–49), and *History of Sir Charles Grandison* (6 vols., 1753–54). His *Correspondence* was edited by Mrs. Barbauld (6 vols., 1804).

Richardson (William A.), b. in Fayette co., Ky., about 1810; graduated at Transylvania University; was admitted to the bar at the age of nineteen; settled soon after in Illinois, where he became State attorney 1835, member of the legislature 1836, 1838, and 1844, being chosen Speaker in the latter year; served in the Mexican war as captain in Hardin's regiment; was promoted to major by vote of the regiment on the battle-field of Buena Vista, Feb., 1847; was member of Congress 1847–55, governor of Nebraska 1858; again elected to Congress 1860, and chosen U. S. Senator on the death of Stephen A. Douglas, 1861. D. at Quincy, Ill., Dec. 27, 1875.

Richardson (William M.), b. at Tyngsborough, Mass., Nov. 2, 1821; graduated at Harvard 1843; was admitted to the bar at Boston 1846; practised law at Lowell; was one of the revisers of the *General Statutes of Massachusetts* (1860) and of the *Supplement* to the same (1863–64); became judge of probate 1856, assistant secretary of the treasury 1872, and was secretary 1873–74.

Richardson (William Merchant), LL.D., b. at Pelham, N. H., Jan. 4, 1774; graduated at Harvard 1797; practised law some years at Groton, Mass.; was member of Congress from that district 1811–14; removed to Portsmouth, N. H., 1814; was chief-justice of the State from 1816 to his death; was author of *The New Hampshire Justice of the Peace* (Concord, 1824) and *The Town Officer;* coreporter (with L. Woodbury) of vols. i. and ii. of the *New Hampshire Superior Court Cases* (1816 *seq.*), and sole reporter of vols. iii.–v. D. at Chester, N. H., Mar. 23, 1838.

Rich Bar, tp., Plumas co., Cal. P. 200.

Richelieu', county of Quebec, Canada, bounded N. W. by the St. Lawrence and traversed by river Richelieu. Cap. Sorel. P. 20,048.

Richelieu, de (Armand Jean Duplessis), Duke and Cardinal, b. at Paris Sept. 5, 1585; was educated for the military profession in the Collége de Navarre, but having a prospect of succeeding to the bishopric of Luçon, gave up the military career, studied theology, and was consecrated bishop Apr. 16, 1607. Elected a deputy of the clergy to the States General in 1614, he allied himself with the queen-mother and regent, Maria de' Medici; was appointed her almoner, and became a member of the council of state. When, shortly after, dissensions broke out between the king (Louis XIII.) and his mother, Richelieu accompanied the latter to Blois, and retired subsequently to his diocese, but succeeded, nevertheless, in bringing about a reconciliation between mother and son; was rewarded with the cardinal's hat in 1622; re-entered the council of state, and was soon after made prime minister, which office he filled uninterruptedly and with absolute power to his death, exercising a most decisive influence on the history of France, externally and internally. His foreign policy centred in the idea of humiliating Austria. For this purpose he encouraged the rising of the Protestant princes in Germany, the revolution of the provinces in the Netherlands, and even the revolt in Catalonia. He subsidized Gustavus Adolphus, and after his death in 1632 he took the duke of Saxe-Weimar and his army into the French service, and carried on the war against the emperor with great vigor. He also declared war against Spain, and, although his plans in the Netherlands failed, succeeded in separating Portugal from Spain in 1640, and conquered Perpignan in 1642. The final results of these wars he did not live to see, but by the Peace of Westphalia (1648) the progress of the house of Austria was effectually checked and its dream of establishing a world-empire was destroyed. By his internal policy he finished what Louis XI. had begun—the establishment of the absolute authority of the royal power. His government was marked by an almost uninterrupted series of conspiracies among the feudal nobility of the realm, headed by the queen-mother (whose favor had turned into a deadly hatred), by the queen herself, Anne of Austria, by Gaston of Orleans, the brother of the king, and by the royal princes. But, a master in intrigue and the very genius of detective police superintendence, he was always well informed and fully prepared, and punished the conspirators with merciless severity. The king felt a deep antipathy toward him, and on this circumstance the first conspiracies based their hope of overthrowing him. But with the king this almost physical aversion was wholly overawed by a mixture of admiration and fear of the towering spirit of his minister, and on Nov. 11, 1630 (*la Journée des Dupes*), when the king had consented to his dismissal and the whole court exulted, Richelieu forced himself into the presence of Louis, turned him around in a moment, and reappeared with great dramatic effect among his enemies, stronger than ever. Afterward the conspirators sought and found support in foreign countries, especially in Spain, and Richelieu needed armies to maintain himself. But he proved unconquerable. Maria de' Medici fled from place to place in foreign countries; Gaston of Orleans was made utterly contemptible by his cowardly and treasonous submission; Montmorency, Marillac, Cinq-Mars, and a hundred others were beheaded. The scaffold, the dungeon, and exile were the end of all resistance to him who wielded the royal power. Besides the feudal nobility, there was another political power in France at the time when Richelieu took the reins—namely, the Huguenots—and to crush this young but steadily increasing influence was one of his first undertakings. He laid siege to their principal stronghold, La Rochelle, and this siege is one of the most memorable events in the history of France, both with respect to the besieged and to the besieging parties. On Oct. 28, 1628, the city surrendered, four-fifths of its inhabitants having perished by the sword and by famine. By the fall of La Rochelle the political power of the Huguenots was wholly broken, but Richelieu's further measures concerning them were moderate and even magnanimous. In his personal appearance the cardinal loved magnificence; he built the Palais Cardinal, afterward the Palais Royal, which entirely outshone the royal residence. He showed great interest in literature and art. He founded the Jardin des Plants, enlarged the Sorbonne and the royal library, and gave substantial encouragement to many scholars, poets, and artists. His interest in literature, however, was not only a merit, but also a foible with him. He wrote *Mirame* and *La Grande Pasto-*

rale. He was jealous of Corneille, and the foundation of the French Academy was, as far as he was concerned, simply a miserable literary intrigue. His *Lettres, Instructions diplomatiques, etc.* were edited by Avenel (6 vols., Paris, 1853–68). Of the *Mémoires du Cardinal de Richelieu, Testament politique du Cardinal de Richelieu,* and *Journal du Cardinal de Richelieu,* the last is spurious, and the two former of doubtful authenticity. D. in his palace in Paris Dec. 4, 1642.—From his brother descended the MARSHAL RICHELIEU (b. Mar. 13, 1696; d. Aug. 8, 1788), the protégé of Madame de Pompadour, commander in the Seven Years' war, and equally notorious for his scandalous robberies in Hanover and for his matchless debaucheries; and the DUKE OF RICHELIEU (b. Sept. 25, 1766; d. May 17, 1822), who in Sept., 1815, succeeded Talleyrand as minister of foreign affairs under Louis XVIII., in which office, as well as at the Congress of Aix-la-Chapelle in 1818, he rendered great services to his country. In Feb., 1820, he once more took charge of the ministry, but, although a noble and disinterested character, of great moderation and considerable political skill, he was unable to sustain himself between the radicals and the ultras, and resigned in Dec., 1821. CLEMENS PETERSEN.

Richerand′ (ANTHELME), b. at Belley, department of Ain, Feb. 4, 1779; studied medicine at Paris, and was appointed professor of surgical pathology at the School of Medicine in 1807. D. Jan. 25, 1840. Wrote *Nouveaux Éléments de Physiologie* (1802), *Leçons sur les Maladies des Os* (1805), *De l'Enseignement actuel de la Médicine et de la Chirurgie* (1816), *Des Officiers de Santé et des Jurys Médicaux* (1834), and *De la Population dans ses Rapports avec la Nature des Gouvernements* (1837).

Rich′field, p.-v. and tp., Adams co., Ill. P. 1496.

Richfield, p.-v. and tp., Genesee co., Mich., on N. branch of Flint River. P. 1421.

Richfield, p.-v. and tp., Hennepin co., Minn., on Mississippi River. P. 930.

Richfield, p.-v. and tp., Otsego co., N. Y. P. 1831.

Richfield, tp., Henry co., O. P. 396.

Richfield, tp., Lucas co., O. P. 822.

Richfield, p.-v. and tp., Summit co., O. P. 1018.

Richfield, p.-v., Fayette tp., Juniata co., Pa. P. 131.

Richfield, p.-v., cap. Sevier co., Ut., on Sevier River.

Richfield, tp., Adams co., Wis. P. 266.

Richfield, p.-v. and tp., Washington co., Wis., on Northern division Milwaukee and St. Paul R. R. P. 1654.

Richfield Springs, p.-v., Richfield tp., Otsego co., N. Y., near the head of Schuyler Lake, on a branch of Utica Chenango and Susquehanna R. R., has 1 newspaper, 4 churches, a sulphur spring celebrated for the cure of cutaneous disorders, and has lately become a fashionable summer resort. P. 696.

Rich′ford, p.-v. and tp., Tioga co., N. Y., on Southern Central R. R. P. 1434.

Richford, p.-v. and tp., Franklin co., Vt., at the confluence of Missisquoi and Clyde rivers and N. E. terminus of eastern division of Vermont Central R. R., has 1 newspaper, good water-power, and several manufactories. P. 1481.

Richford, p.-v. and tp., Waushara co., Wis. P. 428.

Rich Grove, tp., Pulaski co., Ind. P. 315.

Rich Hill, tp., Muskingum co., O. P. 1404.

Rich Hill, tp., Greene co., Pa. P. 2470.

Richibuc′to (formerly LIVERPOOL), a port of entry, cap. of Kent co., N. B., at the mouth of Richibucto River, which is navigable for 15 miles. Lat. of entrance, 46° 43′ N., lon. 64° 50′ W. Lumber and fish are largely exported, and shipbuilding is a leading pursuit. P. about 800.

Rich′land, new county of E. Dakota, on Red River of the North, adjoining Minnesota, consists of rolling prairies and fertile river-bottoms. Area, 1400 sq. m.

Richland, county of S. E. Illinois, watered by affluents of Wabash River and intersected by Ohio and Mississippi R. R., has a level surface and a fertile soil, and raises sheep and swine. Staples, Indian corn, wheat, oats, hay, tobacco, sorghum-molasses, wool, and butter, and has several saw-mills and furniture manufactories. Cap. Olney. Area, 375 sq. m. P. 12,803.

Richland, parish of N. E. Louisiana, watered by Bayou Bœuf and other streams, and intersected by North Louisiana and Texas R. R., produces sweet potatoes and cotton and raises cattle and swine. Cap. Rayville. Area, 550 sq. m. P. 5110.

Richland, county of N. Ohio, on the head-waters of Walhonding River, traversed by several railroads, has a hilly surface. Staples, wheat, Indian corn, oats, hay, maple-sugar, wool, and butter; raises large numbers of cattle, sheep, and swine; has many flouring and saw mills, several tanneries, iron-foundries, and brick-kilns, and numerous flourishing manufactories of agricultural implements, woollen goods, carriages and wagons, iron ware, machinery, and furniture. Cap. Mansfield. Area, 450 sq. m. P. 32,516.

Richland, county of Central South Carolina, lying between Congaree and Wateree rivers, has a hilly surface largely covered with pine forests, and is traversed by several railroads. Chief staples, cotton, rice, Indian corn, and sweet potatoes; has several flouring and saw mills and manufactures of machinery and iron ware. Cap. Columbia, which is also the State capital. Area, 465 sq. m. P. 23,025.

Richland, county of S. W. Wisconsin, on Wisconsin River, drained by Pine River and other streams, and traversed by Chicago Milwaukee and St. Paul R. R. Staple products, Indian corn, wheat, oats, hay, potatoes, hops, wool, butter, and cheese, and raises considerable numbers of cattle, sheep, and swine. It is in the centre of the most important hop-growing region of the U. S.; has several mills and manufactories. Cap. Richland Centre. Area, 576 sq. m. P. 15,731.

Richland, tp., Crawford co., Ark. P. 927.

Richland, tp., Desha co., Ark. P. 445.

Richland, tp., Jefferson co., Ark. P. 933.

Richland, tp., Madison co., Ark. P. 1362.

Richland, tp., Monroe co., Ark. P. 899.

Richland, tp., Newton co., Ark. P. 161.

Richland, tp., Phillips co., Ark. P. 1929.

Richland, tp., Searcy co., Ark. P. 471.

Richland, tp., Washington co., Ark. P. 1156.

Richland, tp., La Salle co., Ill. P. 730.

Richland, tp., Marshall co., Ill. P. 920.

Richland, tp., Shelby co., Ill. P. 1053.

Richland, tp., Benton co., Ind. P. 546.

Richland, tp., De Kalb co., Ind. P. 1825.

Richland, tp., Fountain co., Ind. P. 1759.

Richland, tp., Fulton co., Ind. P. 1314.

Richland, tp., Grant co., Ind. P. 1065.

Richland, tp., Greene co., Ind. P. 2143.

Richland, tp., Jay co., Ind. P. 1342.

Richland, tp., Madison co., Ind. P. 1065.

Richland, tp., Miami co., Ind. P. 1600.

Richland, tp., Monroe co., Ind. P. 1486.

Richland, p.-v. and tp., Rush co., Ind. P. 917.

Richland, tp., Steuben co., Ind. P. 653.

Richland, tp., Whitley co., Ind. P. 1723.

Richland, tp., Adair co., Ia. P. 292.

Richland, tp., Chickasaw co., Ia. P. 566.

Richland, tp., Decatur co., Ia. P. 849.

Richland, tp., Delaware co., Ia. P. 874.

Richland, tp., Fayette co., Ia. P. 405.

Richland, tp., Guthrie co., Ia. P. 218.

Richland, tp., Jackson co., Ia. P. 1141.

Richland, tp., Jasper co., Ia. P. 749.

Richland, tp., Jones co., Ia. P. 794.

Richland, p.-v. and tp., Keokuk co., Ia., on Skunk River. P. 1585.

Richland, tp., Mahaska co., Ia. P. 1561.

Richland, tp., Tama co., Ia. P. 888.

Richland, tp., Wapello co., Ia. P. 1451.

Richland, tp., Warren co., Ia., on Des Moines River. P. 1381.

Richland, tp., Labette co., Kan. P. 1744.

Richland, tp., Miami co., Kan. P. 844.

Richland, p.-v. and tp., Kalamazoo co., Mich. P. 1381.

Richland, tp., Montcalm co., Mich. P. 88.

Richland, tp., Saginaw co., Mich. P. 466.

Richland, tp., Rice co., Minn. P. 773.

Richland, tp., Gasconade co., Mo. P. 1099.

Richland, tp., Macon co., Mo. P. 1180.

Richland, tp., Morgan co., Mo. P. 1785.

Richland, tp., Ozark co., Mo. P. 635.

Richland, p.-v., Pulaski co., Mo., on Atlantic and Pacific R. R., 164 miles S. W. of St. Louis, has an academy and a newspaper. Business, stock-raising and farming. P. about 500. D. FRAZER TOMSON, ED. "PULASKIAN."

Richland, tp., Putnam co., Mo. P. 720.

Richland, tp., Scott co., Mo. P. 1080.

Richland, tp., Stoddard co., Mo. P. 438.

Richland, tp., Vernon co., Mo. P. 547.

Richland, tp., Washington co., Neb. P. 221.

Richland, p.-v. and tp., Oswego co., N. Y., on Oswego and Rome and Rome Watertown and Ogdensburg R. R. P. 3975.

Richland, tp., Beaufort co., N. C. P. 2097.

Richland, tp., Onslow co., N. C. P. 2133.

Richland, tp., Randolph co., N. C. P. 713.

Richland, tp., Allen co., O. P. 2139.

Richland, tp., Belmont co., O. P. 4170.

Richland, tp., Clinton co., O. P. 1854.

Richland, tp., Darke co., O. P. 1105.

Richland, tp., Defiance co., O. P. 1194.

Richland, tp., Fairfield co., O. P. 1517.

Richland, tp., Guernsey co., O. P. 1404.

Richland, tp., Holmes co., O. P. 1242.

Richland, tp., Logan co., O. P. 1401.

Richland, tp., Marion co., O. P. 1146.

Richland, p.-v. and tp., Vinton co., O. P. 1814.

Richland, tp., Wyandot co., O. P. 1271.

Richland, tp., Allegheny co., Pa. P. 707.

Richland, tp., Bucks co., Pa. P. 2111.

Richland, tp., Cambria co., Pa. P. 868.

Richland, tp., Clarion co., Pa. P. 1015.

Richland, tp., Venango co., Pa. P. 1023.

Richland, v., Barnwell co., S. C. P. 987.

Richland, tp., Ohio co., W. Va. P. 1389.

Richland, tp., Richland co., Wis. P. 1572.

Richland Centre, p.-v., Richland tp., Bucks co., Pa.

Richland Centre, p.-v., cap. of Richland co., Wis., on Pine River, 13 miles from Milwaukee and St. Paul R. R., has 3 churches, good schools, 1 bank, several flouring-mills, and a bedstead and stove factory. P. about 1500. FOGO & LAWS, EDS. "REPUBLICAN."

Richland Grove, p.-v. and tp., Mercer co., Ill. P. 1444.

Rich'man, tp., Wayne co., Ia. P. 374.

Richman, tp., Raleigh co., W. Va. P. 389.

Rich'mond, town of England, county of Surrey, on a hill on the right bank of the Thames, among beautiful surroundings, 10 miles S. W. of St. Paul's, London. Its original name was Sheen, and under Edward I. and Edward II. it was a royal residence. In 1498 the palace was burnt down, but was rebuilt by Henry VII., who changed the name to Richmond. Elizabeth was imprisoned here for a short time by Mary; she afterward often resided here, and d. here in 1603. Under the Commonwealth the palace was partially destroyed, and in the next century was pulled down. P. 15,113.

Richmond, the southernmost county of the island of Cape Breton, including also Arichat and other islands. It has an extensive and much-broken coast-line, and the county is intersected by St. Peter's Canal, half a mile long, which leads from the Bras d'Or to St. Peter's Bay. Maritime pursuits are extensively followed. Cap. Arichat. P. 14,268.

Rich'mond, county of Quebec, Canada, traversed by the river St. Francis and by Grand Trunk Railway. Copper ores, slate, and building-stone abound. There are important and varied manufactures, and water-power is abundant. Cap. Richmond. P. 11,213.

Richmond, county of Georgia, on Savannah River, adjoining South Carolina, has a broken surface intersected by many small streams, and is traversed by several railroads. Staples, cotton, Indian corn, sweet potatoes, and rice; has several flouring and saw mills and some manufactures of cotton goods, iron castings, and machinery. Cap. Augusta. Area, 350 sq. m. P. 25,724.

Richmond, county of New York, comprising Staten Island, Shooter's Island at the entrance of Newark Bay, and several small islands in Staten Island Sound; is traversed by a railroad, abounds in villa residences of citizens of New York City, and has a number of manufactories and shipyards. (See STATEN ISLAND.) Cap. Richmond. Area, 59 sq. m. P. 33,029.

Richmond, county of North Carolina, adjoining South Carolina, between Lumber and Yadkin rivers, traversed by the Carolina Central R. R.; has a rolling surface and a productive soil; raises cotton, sweet potatoes, and Indian corn, and swine in considerable numbers. Cap. Rockingham. Area, 730 sq. m. P. 12,882.

Richmond, county of Virginia, on Rappahannock River, has a level surface abounding in pine timber, a fertile soil, and abundant oyster-beds in the Rappahannock. Staples, Indian corn, cotton, and wheat. Cap. Warsaw. Area, 175 sq. m. P. 6503.

Richmond, p.-v., cap. of Richmond co., Quebec, Canada, on St. Francis River, at the junction of Grand Trunk Railway with its Quebec and western branches, 221 miles N. W. of Portland, Me. It has important copper-mines, is the seat of St. Francis College (Scottish Kirk), has a grammar school, a mechanics' institute, and a weekly newspaper, and is connected by a bridge with Melbourne. P. 715.

Richmond, tp., Cass co., Ill. P. 1115.

Richmond, p.-v. and tp., McHenry co., Ill. P. 1404.

Richmond, city, cap. of Wayne co., Ind., lat. 39° 47′ N., lon. 84° 47′ W., 700 feet above tide-water, 4 miles from the eastern border of the State, 68 miles E. of Indianapolis and the same distance N. W. of Cincinnati, O. The country is undulating, and the E. branch of Whitewater River has cut for itself a channel through the soil and limestone rock about 200 feet deep, with abrupt and in many places almost perpendicular sides. The ground is rolling, and all its descents tend ultimately toward the deep valley of the river. A soil mostly loam, resting on a subsoil of gravel, and this on the horizontal limestone rock, affords superb drainage, which, with other things, has given to Richmond, and maintained for it, a sanitary condition rarely if ever equalled by that of any other city. It is situated in the midst of a rich and well-cultivated agricultural country, and enjoys the healthy trade naturally pertaining to such a situation. Whole number of mercantile and industrial establishments in 1875, other than manufactories, was 248, with a capital of $2,001,444, employing 941 hands, paying wages $257,302, and making gross sales amounting to $5,262,457. Its manufactures are important and flourishing; number in 1875, 127, with an aggregate capital of $1,807,785, consuming raw material to the value of $795,684, employed 1507 hands, paid wages $654,459, and sold goods amounting to $2,729,346. The principal articles manufactured are caskets and burial-cases, threshing-machines, engines, saw-mills, mill-machinery, school and church furniture, cigars, galvanized iron-work, ploughs, woollen goods, etc. It has 3 national banks, with an aggregate capital of $1,000,000, and 1 savings bank. Its common schools in 1875 occupied 37 rooms and employed 37 teachers, whose salaries aggregated $16,574. Earlham College, under the control of the Society of Friends of Indiana Yearly Meeting (Orthodox), had 14 professors and 221 students. Denominational schools of Friends (Hicksite), Lutherans, and Catholics had 906 pupils and employed 16 teachers. It has also 1 business college. It has 19 churches, and 2 congregations without edifices, 23 Sabbath schools, an orphans' home, a home for friendless women, and 2 organizations of women to look after the poor and distribute alms. It has 43 mutual benevolent associations under various names, 3 daily and 5 weekly newspapers, and 1 monthly magazine, a public library and a scientific association with a museum, 2 theatres, and a number of halls and lecture-rooms. It has street railroads, and a steam fire department, and is equipped in every quarter with the wires and apparatus of the national fire-alarm company. Richmond is one of the Indiana railroad centres, 3 principal lines E. and S. ramifying to all important cities in these quarters, and 3 principal lines to the W. and N. ramifying to all important cities in those quarters. It has a large, commodious union dépôt which receives and despatches 40 passenger-trains daily. Aggregate value of railroad tickets sold in 1875, $82,991; total number of freight-cars handled in 1875 in the freight-yard, 255,235; total amount of freight, 1,452,144,070 pounds P. 9445.

JOHN O. HARDESTY, ED. "DAILY INDEPENDENT."

Richmond, p.-v. and tp., Washington co., Ia.

Richmond, tp., Nemaha co., Kan. P. 2153.

Richmond, p.-v., cap. of Madison co., Ky., at the terminus of Richmond and Louisville R. R., 20 miles W. of Lexington, contains 7 churches, the Central University, and the Madison Female Academy, 3 national and 1 savings bank, 1 large steam flouring-mill, 1 newspaper, and 2 hotels. The village is lighted with gas. P. 1629.

T. M. GREEN, ED. "KENTUCKY REGISTER."

Richmond, p.-v. and tp., Sagadahoc co., Me., on Kennebec River and on Portland and Kennebec R. R. P. 2442.

Richmond, p.-v. and tp., Berkshire co., Mass., on Boston and Albany R. R. P. 1091.

Richmond, p.-v. and tp., Macomb co., Mich. P. 2181.

Richmond, tp., Osceola co., Mich. P. 653.

Richmond, p.-v. and tp., Winona co., Minn. P. 219.

Richmond, tp., Howard co., Mo. P. 2988.

Richmond, p.-v. and tp., cap. of Ray co., Mo., on St. Joseph line of St. Louis Kansas City and Northern R. R., has 2 newspapers, a foundry, some flouring-mills, and a considerable trade. P. 1218; of tp. 5581.

Richmond, p.-v. and tp., Cheshire co., N. H. P. 868.

Richmond, tp., Ontario co., N. Y. P. 1622.

Richmond, p.-v. and tp., cap. of Richmond co., N. Y., beautifully situated and contains many fine villa residences.

Richmond, tp., Ashtabula co., O. P. 883.

Richmond, tp., Huron co., O. P. 880.

Richmond, p.-v., Salem tp., Jefferson co., O. P. 405.

Richmond, v. (Hale P. O.), Jefferson tp., Ross co., O., on Scioto River. P. 227.

Richmond, tp., Berks co., Pa. P. 2874.

Richmond, tp., Crawford co., Pa. P. 1399.

Richmond, tp., Tioga co., Pa. P. 1558.

Richmond, tp., Washington co., R. I. P. 2064.

Richmond, tp., cap. of Fort Bend co., Tex., on Brazos River and Galveston Harrisburg and San Antonio R. R., has 1 newspaper. P. 816.

Richmond, p.-v. and tp., Chittenden co., Vt., on Vermont Central R. R. P. 1309.

Richmond, city, capital of Virginia, and seat of justice of Henrico co., on the N. side of James River and 151 miles from its mouth, in lat. 37° 32′ 17″ N., lon. 77° 27′ 28″ W., at the Great or Lower Falls, the head of tidewater. The site is a cluster of picturesque hills, of which the principal are Church and Shockoe. A settlement was made on what is now the lower portion of the city as early as 1609. "Fforte Charles" was erected there as a protection against the Indians in 1644–45, and in 1679, Col. Wm. Byrd built a mill there, and afterward a warehouse. The place was known as "Byrd's Warehouse" till May, 1742, when it was made a town by act of assembly. It was not until 1779 that it was created the capital of the State, being then but a small town. The population in 1800 was only 5737; by the census of 1870 it was 51,038; and by a census taken in 1874 by the city board of health it was 60,705, of which 33,492 were whites and 27,163 negroes. At the beginning of the year 1875, Richmond contained 7779 houses, of which 3846 were brick and 3933 wooden; assessed value of taxable real estate, $29,142,655; personal property, $11,315,838; city taxes, $668,338.17; State taxes (in city), $333,925.40; city debt, $4,323,591, of which $1,030,700 are 8 per cent. bonds, and the remainder 6 per cent. The city has an excellent police, and its efficient fire department has 5 steam-engines. The city owns and operates its own gas and water works, the former lighting over 1125 street lamps, and supplying annually for private and public consumption 90,000,000 feet of gas; and the latter supplying an average of over 350,000,000 gallons of water a day from capacious reservoirs, into which it is pumped by steam from the river above the city. The waterworks are enlarging by the addition of another reservoir and the further extension of mains and pipes. In 1874 there occurred 529 marriages in the city, of which 255 were white and 274 colored; total deaths, 1583—whites 727, colored 856; still-births, 191—whites 64, colored 127. In 1874 the manufactured products of the city were estimated at $17,746,720, of which the flouring-mills produced $2,214,683 (with the Columbian mills destroyed by fire during the year), ironworks $2,946,760, and tobacco-factories $8,327,581, a great variety of manufactories producing the remainder. The tobacco-factories were 57, cigar-factories 36, producing 23,803,189 pounds manufactured tobacco and 4,072,200 cigars, the U. S. internal revenue for the year in the city, paid almost exclusively on tobacco, being $3,801,761.56. Value of direct importations (chiefly coffee and salt), $296,036; exports, $3,031,686, of which over $1,500,000 was flour, and nearly the same amount tobacco, principally leaf and stems. Vessels entered from foreign countries, 10 American, tonnage 2477; 24 foreign, tonnage 7705; clearances, 39 American, tonnage 12,178; 51 foreign, tonnage 13,866. There are a chamber of commerce, corn and flour exchange, tobacco exchange, and stock exchange. A street railway traverses the city from its eastern to its western extremity. The railroads centring at Richmond are Richmond and Petersburg, Richmond Fredericksburg and Potomac, Richmond and Danville, Chesapeake and Ohio, and Richmond York River and Chesapeake. The Chesapeake and Ohio has a tunnel under Church Hill to its own wharves on the river. The James River and Kanawha Canal, connecting by dock with the navigable river below the falls, extends up the James to Buchanan, 196 miles from Richmond. The vast coal and iron veins of the State are within easy reach of the city, with both rail and water transportation. The James River Improvement, in which the city is assisted by the Federal government, has greatly increased the navigability of the river, removing obstructions and deepening the channel, so that now, at mean high tide, there is 14 feet depth to the wharves at Rocketts (as the lower portion of the city is called), with a promise of 18 feet at an early day. The water-power afforded by the falls is immense and easily utilized, but comparatively little of it has yet been taken advantage of. There are 2 bridges for vehicles and pedestrians across the river to the little city of Manchester on the S. side, 1 of them being free. Near the city are inexhaustible quantities of fine granite, and several large quarries are actively worked. Opposite Rocketts is a U. S. government granite-works, where much of this stone is prepared for public buildings at Washington City. Richmond has a fine system of public free schools, including a high school. There are 93 of these schools, of which 60 are for white pupils and 33 for colored. Some of the public school-houses are very handsome and well equipped. Private schools for both sexes are also numerous, including Richmond College for males and Richmond Female Institute for girls and young ladies. Richmond Medical College, with an able faculty, is taught in a fine structure remarkable as a specimen of the Egyptian style of architecture. The Roman Catholics have several excellent schools under their control, and for the higher education of the colored people there are the Richmond Normal School and the Colver Theological Institute. Not far from the city, at Ashland, is now located Randolph-Macon College. The city has 51 churches—16 Baptist (8 colored and 8 white), 12 Methodist (2 colored), 8 Episcopal (1 colored), 4 Presbyterian, 2 Lutheran, 3 Roman Catholic, 3 Jewish, 1 Disciples, 1 Friends, and 1 Universalist. Some of the churches are very elegant in appearance. Besides the State Central Lunatic Asylum (for colored insane), and the city almshouse, there are a number of orphan asylums, homes, etc. sustained by the various denominations and private charity, including a refuge for abandoned women. Societies of all orders are numerous among both white and colored, and Masonic Hall, on lower Franklin street, was dedicated in 1783, and is one of the earliest edifices in America thus set apart for Masonry, if not the earliest. There are several fine cemeteries, of which the principal are Hollywood, Shockoe, and Oakwood. In Oakwood over 16,000 Confederate soldiers are buried who died in the city hospitals during the war; and nearly as great a number is interred in Hollywood, where a high pyramidal monument of rough granite stones is erected to their memory. Hollywood is noted for its picturesque beauty and the distinguished dead whose dust is garnered there. There are 12 banks, of which 4 are national, and 12 home insurance companies. The State penitentiary is here, and on Shockoe Hill, visible from all quarters of the city, is the capitol, a handsome structure, with a noble pillared portico toward the river. It is surrounded by a square of 12 acres, finely shaded and adorned by trees, and beautified by shrubbery and flowers. In it are three fountains, Hart's marble statue of Henry Clay, Foley's bronze statue of Gen. Thomas J. (Stonewall) Jackson (a gift from English gentlemen to Virginia), and Crawford's equestrian statue of Washington. The last is the finest statue in America, and was inaugurated Feb. 22, 1858. The main pedestal is 42 feet high, and the equestrian statue (of bronze) 25 feet high. On sub-pedestals around and below the principal statue are statues in bronze of Henry, Jefferson, Lewis, Mason, Marshall, and Nelson—all illustrious Virginians. The first three of these statues are by Crawford and the others by Rogers. On an outer and still lower circle of pedestals are six symbolical figures in bronze, representing War, Peace, Justice, etc. The total cost of this monument was $260,000, of which $47,000 was from private donations. In the capitol itself are Houdon's statue of Washington, a bust of La Fayette, and a great many portraits of eminent Virginians. The State library contains many valuable books and records, together with a variety of curious and interesting relics, etc. The office of the governor and the halls and offices of the executive and legislative branches of the State government are in the capitol, where also the Southern Historical Society has its chief office and keeps its archives. The governor's mansion is located in the north-eastern corner of Capitol Square. Richmond and vicinity possess many interesting things and scenes for the visitor. Among these may be mentioned Bacon's Quarter Branch, reviving recollections of Bacon's rebellion in early colonial times; Bloody Run, said to have been so called in commemoration of a bloody defeat of the Indians by Bacon; the old Stonehouse, credited with being the oldest house in the city, and with having entertained Washington, Madison, Jefferson, and other Revolutionary heroes and worthies beneath its roof; St. John's church, of the colonial period, in which Patrick Henry is said to have made his famous speech,

State Capitol at Richmond, Va.

wherein he said, "Give me liberty or give me death!" St. John's ancient graveyard; the waterworks; the falls and isles of the river, including Belle Isle, where many Federal prisoners were kept; the Libby prison; the Tredegar ironworks, etc.; the flouring-mills, the largest in the world; the State fair-grounds ("Camp Lee" of the Confederacy); the Jefferson Davis mansion (now a public school-house); the U. S. custom-house and post-office, etc.

Richmond has been noted for its calamities. Among the principal of these are the following: 1781, taken and burned by the traitor Arnold; Dec. 26, 1811, Richmond Theatre burned, over 70 persons perishing in the flames, including Gov. G. W. Smith and many other distinguished citizens (Monumental Episcopal church now commemorating the disaster and its site); the burning of the city in Apr., 1865, at the evacuation by the Confederate government; the capitol disaster, in which, on Apr. 27, 1870, over 60 persons were killed or mortally wounded by the yielding of the floor of the court-room of the court of appeals beneath the weight of the multitude gathered to hear the decision of the court in the contested election for mayor of the city between Chahoon and Ellyson; the great flood in James River, in Sept., 1870, which inundated a great portion of the city; the Spottswood Hotel fire, in which a number of persons perished, etc.

In June, 1861, Richmond was made the capital of the Confederate States, and there the Confederate congress met on the 20th of July following. All the departments of the Confederate government were established in the city, and it became not only the heart and head of the effort to establish separate Southern independence, but the principal point of Federal invasion and attack. Owing to these facts, the city became prominent and important to the people of both sections of the Union, and the name and fame of Richmond familiar to the civilized world. The historical associations of both the Revolutionary and Confederate eras thus clustering about Richmond will always lend it a peculiar interest, and the beauty and advantages of its location will yet enable it to overcome adverse fortune and take a high rank among the foremost cities of the country. Richmond has now 5 daily newspapers, 3 morning and 2 evening, a number of religious and secular weeklies, and a medical, an agricultural, and an educational monthly, etc. M. P. Handy, Ed. "Enquirer."

Richmond, tp., Wise co., Va. P. 743.

Richmond, tp., St. Croix co., Wis. P. 875.

Richmond, tp., Shawano co., Wis. P. 539.

Richmond, p.-v. and tp., Walworth co., Wis. P. 1017.

Richmond (Dean), b. at Barnard, Vt., Mar. 31, 1804; removed in childhood to Salina, N. Y.; had few educational advantages, but became well informed by private studies; was first a manufacturer of salt, afterward a provision-dealer at Buffalo; became wealthy and an active Democratic manager, wielding a vast influence in the counsels of his party, but would never accept any office. He was a director of several railroads; became vice-president of the consolidated New York Central R. R. 1853, and president 1864. D. in New York City Aug. 27, 1866.

Richmond (Legh), b. at Liverpool, England, Jan. 29, 1772; graduated at Trinity College, Cambridge, 1794; took orders in the Church of England 1797; became curate of Brading and Yaverland in the Isle of Wight 1798, chaplain to the Lock Hospital, London, 1805, and was presented in the same year to the rectory of Turvey, Bedfordshire, which he held until his death, May 8, 1827. Author of several popular tracts, which have been circulated by millions in many languages, especially *The Dairyman's Daughter*, *The Negro Servant*, and *The Young Cottager*. He also edited *The Fathers of the English Church, or a Selection from the Writings of the Reformers and Early Protestant Divines of the Church of England* (8 vols., 1807–11).

Richmond (Margaret Beaufort), Countess of, daughter of Edmund Beaufort, duke of Somerset, and granddaughter of John of Gaunt, duke of Lancaster, b. at Bletsoe, Bedfordshire, England, about 1438; married Edmund Tudor, earl of Richmond (son of Owen Tudor by his wife, the queen-dowager Catharine of Valois, widow of King Henry V.), in 1455; lost her husband the following year shortly after the birth of her son, Henry Tudor (afterward King Henry VII.); resided some years at Pembroke

Castle under the protection of her brother-in-law, Jasper Tudor; married Sir Henry Stafford 1459; was again left a widow 1481; married Thomas, Lord Stanley, 1482, and assisted at the coronation of Richard III. July, 1483; was attainted with her son, in consequence of the conspiracy of Buckingham in favor of the latter, Oct., 1483; was known as countess of Derby during the reign of her son, her husband having been created earl of Derby as a reward for his defection from Richard III. on Bosworth Field; had no children by her later marriages; was noted for charity and devotion, and also for her patronage of letters and her own literary taste; translated *The Mirroure of Gold for the Sinfull Soule*, from a French version of the *Speculum Aureum Peccatorum* (printed by Pynson), and the fourth book of the *Imitation of Christ* (1504), and endowed Christ's College 1505, and St. John's College by bequest 1511, founding in each a "Lady Margaret professorship of divinity," still maintained. D. June 29, 1509. The principal title of the Tudor, Stuart, and Brunswick dynasties to the English throne was derived through this lady's descent from Edward III. through John of Gaunt, which was by no means free from objection from a heraldic point of view.

Richmond College, Richmond, Va., began its existence in 1830 as a seminary organized by the Baptist general association for the education of candidates for the ministry. In 1844 the seminary expanded into a college with a regular faculty of instruction and the power to confer degrees. Robert Ryland, D. D., was made president. The college steadily grew in favor and influence until the war shut its doors and destroyed its endowment. In 1866 the college was reorganized on a new basis, with T. G. Jones, D. D., as president. The university system is adopted, and studies are elective. There are now 7 independent academic schools, a school of law, and a commercial department, with 197 students. In 1869 a president was dispensed with as unnecessary under the new system. The faculty of instruction and government consists of coequal professors, one of whom is annually chosen to be chairman and chief executive officer. Each professor is responsible for the efficient conduct of his own school, and graduation in that school is determined by the professor after rigid written examinations. The degree of bachelor of arts is conferred upon such students as have graduated in a prescribed number of schools—the degree of master of arts upon such as have graduated in all the schools. Attendance on religious exercises is voluntary. A course of weekly lectures on the Bible, free of cost, is given every session. New and enlarged buildings, an ornament to the city, are in process of construction, and a vigorous effort is making to raise an endowment of $300,000, and with every prospect of success.

Richmond, Dukes of (1675), dukes of Lennox (Scotland, 1675) and of D'Aubigny (France, 1683), earls of March and of Darnley (1675), barons of Settrington and of Methuen (1675), a family of the English nobility descended from CHARLES LENNOX, natural son of King Charles II. by a French woman, Louise Querouaille, made duchess of Portsmouth, b. May 29, 1672; received the Lennox estates in Scotland and assumed that surname Aug. 20, 1680; resided several years in France, returned to England and supported the revolution of 1688; served in the army in Flanders under William III.; sold the Lennox estates 1702. D. at Goodwood May 27, 1723.—His son, CHARLES LENNOX, second duke, b. in London May 29, 1701; entered Parliament 1722; was lord high constable of England at the coronation of George II. 1727; made master of the horse and privy councillor Jan., 1735; brigadier-general July, 1739, major-general June, 1742; attended George II. at the battle of Dettingen, June, 1743; made lieutenant-general, and served against the rebels in Scotland 1745, and became colonel of the horse guards Feb., 1750. D. Aug. 8, 1750.—CHARLES LENNOX, third duke, b. Feb. 22, 1735, a man of talent and of liberal principles; entered the army; served with credit as general at the battle of Minden, 1759; was ambassador to France 1765; was principal secretary of state May, 1766; was dismissed from office in July of the same year; favored the recognition of American independence 1778; headed the Reform party in the House of Lords 1781, and was master-general of the ordnance 1782–95. D. Dec. 29, 1806.—His sister, SARAH LENNOX, married Col. George Napier, and was mother of the Napiers of Peninsular fame.—His nephew, CHARLES LENNOX, fourth duke, b. in 1764, served in the army; inherited the title 1806; was appointed lord lieutenant of Ireland 1808 and governor-general of British North America July 29, 1819. D. in Canada of hydrophobia Aug. 28, 1820. —His son, CHARLES GORDON LENNOX, b. in London in 1791; became a member of the privy council and of the Reform ministry of Earl Grey 1831. D. Oct. 21, 1860.—His son, CHARLES HENRY GORDON LENNOX, b. Feb. 27, 1818; educated at Christ Church, Oxford; sat in Parliament for West Sussex 1841–60; was aide-de-camp to the duke of Wellington 1842–52, and to Viscount Hardinge 1852–54; became president of the Poor Law board and member of the privy council 1858; succeeded to the dukedom 1860; was president of the board of trade in the Disraeli cabinet 1867–68; became the leader of the Conservative party in the House of Peers Feb. 26, 1870, and lord president of the council on the accession to power of the second Disraeli ministry in Feb., 1874. The dukedom of Gordon was conferred upon him in 1876.

Richmond Hill, p.-v., York co., Ont., Canada, near Northern Railway, 16 miles N. of Toronto, has 1 weekly newspaper. P. about 80.

Rich'mondville, p.-v., Forester tp., Sanilac co., Mich., on Lake Huron. P. 83.

Richmondville, p.-v. and tp., Schoharie co., N. Y., on Albany and Susquehanna R. R., has 1 newspaper and some trade and manufactures. P. of v. 630; of tp. 2307.

Rich Moun'tain, v., Cleveland co., N. C. P. 751.

Rich'ter (JEAN PAUL FRIEDRICH), generally called JEAN PAUL, b. at Wunsiedel, in Bavaria, Mar. 21, 1763. His father was a country minister, but very poor, and when he died, in 1779, he left to his family nothing but debt. The son, nevertheless, went to Leipsic in 1781 to study at the university, and he contrived to stay there four years, though he lived in the most pinching poverty, often having nothing to eat for two or three days. In 1784 he fled from Leipsic in order to escape imprisonment for debt, and for three years lived, together with his poor mother, at Hof. But from 1787 to 1789 he was private tutor in a family at Töpen, and from 1790 to 1794 a schoolmaster at Schwarzenbach. Compared with his life in Leipsic and at Hof, these positions offered him affluence, and in the mean time he had become a celebrated author. He had originally gone to Leipsic to study theology, and had read much of this science, as of everything else; but he was incapable of systematic and exhaustive study. There was something roving and diffuse in his intellect, as in his talent. He could concentrate his powers for one moment on one point, and a brilliant spark would be the result, but he could not keep them collected and lead them in a steady direction for any length of time. Thus, by his studies at Leipsic he had only prepared himself for a miscellaneous literary activity, and his first attempts were not successful. His *Grönländische Processe* ("Lawsuits in Greenland," 2 vols., 1784) and *Auswahl aus des Teufels Papieren* ("Selections from the Papers of the Devil," 1788) were not read; their satire is narrow, their humor forced, their form unripe. But in 1793 his romance, *Die Unsichtbare Loge* ("The Invisible Lodge," 2 vols.), turned the scales of fortune, and now followed in rapid succession, and with decided success, *Hesperus* (4 vols., 1794), *Biographische Belustigungen unter der Gehirnschale einer Riesin* ("Biographical Recreations under the Cranium of a Giantess," 1796), *Leben des Quintus Fixlein* (1796), *Blumen-, Frucht- und Dornenstücke, oder Ehestand, Tod und Hochzeit des Armenadvocaten Siebenkäs* ("Flower, Fruit, and Thorn Pieces, or Marriage, Death, and Wedding of Lawyer Siebenkäs," 4 vols., 1797), *Der Jubelsenior* (1797), *Das Kampaner Thal* (1797). These writings made Jean Paul the literary fashion of Germany. In 1794 he gave up his position as a schoolmaster, and began a life of visits to the different literary centres—Leipsic, Weimar, Dresden, and Berlin. He was everywhere well received, and made many intimate friends, among whom, however, Goethe and Schiller were not. It was especially the fair sex which was enthusiastic for him. In Berlin the most distinguished ladies sent their footmen when he had his poodle trimmed in order to get a lock of its hair. Many of them fell in love with him, some proposed to him, and one committed suicide when rejected. In 1801 he married in Berlin the beautiful and spirited Caroline Mayer, and removed first to Meiningen, then to Bayreuth. The king of Bavaria gave him an annual pension of 1000 florins, and the University of Heidelberg made him a doctor. In 1803 he published his *Titan*, and in 1804 *Die Flegeljahre* ("Wild Oats," 4 vols.), which two romances, together with his first philosophical attempt, *Vorschule der Æsthetik* ("Introduction to Æsthetics," 3 vols., 1805), may be considered as indicating the culmination of his talent. In 1807 he wrote another philosophical book on education, *Levana oder Erziehungslehre*, and in the following years he published a great number of political and satirical pamphlets, sermons, humorous sketches, etc. D. in Bayreuth Nov. 14, 1825. His collected works (Berlin, 1826–38) comprise 65 vols., and the general character of these is that of a collection of "gems." No writer has made such brilliant remarks, and no ten have made so many. He wrote in

"gems." And this is the reason why a book of Jean Paul's is the most captivating reading for the first half hour and the most provokingly tiresome for the next. It has been said that when he read a book he noted down on small slips of paper every striking fact or idea he met with, and that when he wrote a book he had these slips arranged before him as prompters of his imagination. The miserable style in which his books are written proves the tale to be true. But beneath this utterly inartistic manner of composition there are genuine poetical inspirations, and although these inspirations are not very elevating, as they are not of any high order, they are very charming on account of the originality and peculiarity of their character. Jean Paul is alternately sentimental, grotesque, and gloomy. But his sentimentality is generally airy and graceful, like "woven wind;" his grotesqueness is often witty and sportful; and his gloom sometimes rises into true pathos.

CLEMENS PETERSEN.

Rich Square, p.-v., Northampton co., N. C. P. 3133.

Rich Valley, tp., McLeod co., Minn. P. 527.

Rich Valley, p.-v. and tp., Smyth co., Va. P. 3572.

Rich View, p.-v. and tp., Washington co., Ill., on Illinois Central R. R., has 1 newspaper. P. 1080.

Rich′ville, p.-v., De Kalb tp., St. Lawrence co., N. Y., on Rome Watertown and Ogdensburg R. R.

Rich′wood, tp., Izard co., Ark. P. 280.

Richwood, tp., Sharpe co., Ark. P. 722.

Richwood, tp., Calhoun co., Ill. P. 1111.

Richwood, tp., Peoria co., Ill. P. 1239.

Richwood, tp., McDonald co., Mo. P. 833.

Richwood, tp., Miller co., Mo. P. 1361.

Richwood, tp., Washington co., Mo. P. 760.

Richwood, p.-v., Union co., O., on Atlantic and Great Western R. R., 100 miles N. W. of Cincinnati, has 3 churches, a public library and reading-room, 2 banks, 1 newspaper, 2 large grain-elevators, a flax-mill, 1 steam chair-factory, and 2 hotels. Principal business, farming. P. 436. J. H. VAUGHAN, ED. "GAZETTE."

Richwood, tp., Richland co., Wis. P. 1378.

Rich Woods, tp., Jackson co., Ark. P. 261.

Richwoods, tp., Prairie co., Ark. P. 280.

Richwoods, tp., Pulaski co., Ark. P. 409.

Ric′imer, a general of the Western Roman empire, of barbarian descent, noted as much for his cynical unscrupulousness as for his political craft and military talent; ruled the Western Roman empire for about twenty years through puppet emperors, whom he set up and put down entirely at will—first Avitus, whom he dethroned in 456 and made a bishop; next Majorianus, whom he caused to be assassinated in 461; then Vibius Severus, who died in 465; next Anthemius, who was murdered in 472; and finally Olybrius, who died in the same year as Ricimer (472).

Ricinus. See CASTOR OIL.

Rickarees′, Arickarees, or **Rees,** a tribe of Indians of the Pawnee stock living on the upper Missouri River, separated from the Pawnees in the Platte Valley toward the close of the eighteenth century; suffered severely from smallpox 1791; were further reduced in numbers by wars with the Dakota tribes; were for many years hostile to the whites; were defeated and dispersed by U. S. troops 1823; made a treaty 1825; were driven up the Platte Valley 1831; returned to the Missouri some years later, and united with the Mandans and Minnetarees, with whom they located at Fort Berthold 1862; and were assigned to a vast joint reservation in N. W. Dakota and E. Montana by executive order of Apr. 12, 1870. No Protestant mission or school has yet been established among them, but the American Board of Commissioners for Foreign Missions has recently accepted the care of their religious education. They number somewhat less than 1000.

Rick′ets, a term applied to a distortion of the bones, especially those of the extremities, which is the result of a diseased condition arising from mal-assimilation of the ingredients which properly form the bone-substance, and by which they are deprived of the proper supply of earthy materials. It is a disease of early life, occurring as a rule in infants from twelve to eighteen months of age. The predisposing causes are the influence of an impure or poisonous atmosphere, improper food and clothing, and poorly ventilated, damp apartments, especially if they be deprived of sunlight. The symptoms are not well marked and characteristic in the early stages; they develop gradually and almost imperceptibly. The little patient seems to lose his spirits, and his general health fails; indigestion sets in, and is accompanied by swelling of the abdomen and colic. As a consequence, we have emaciation taking place to a marked degree, the muscles becoming soft and flabby, the face sallow, and the skin dry, and there is scanty and turbid urine and thin fœtid evacuations. The fontanelles and sutures remain open until a late period, and there is often noticed a profuse sweating of the scalp, and a rolling of the head upon the pillow which results in a baldness of the back of the head. The teeth are very late in making their appearance, and decay rapidly after doing so. As the disease advances the bones grow softer and softer, and become distorted by the superincumbent weight and muscular contraction. The bones of the extremities are bent, shortened, and twisted, and the ends enlarged. The ribs become flattened by atmospheric pressure, and drawn inward by the contraction of the diaphragm, and as a consequence we have the sternum pushed forward in front, and the deformity known as pigeon or chicken breast. As a disease of the bones, rickets is never dangerous. It is from the deformities resulting, and their interference with the action of the lungs and other viscera, that the danger arises. The treatment can be summed up in a few words —fresh air, sunlight, good food, bathing, and *cod-liver oil.* The deformities may be remedied to a certain extent by the use of splints. In after life, when the bones have become hardened, a wedge-shaped piece may be taken from the convex side and splints applied.

EDWARD J. BERMINGHAM. REVISED BY WILLARD PARKER.

Ricketts (JAMES B.), b. in New York 1816; graduated at the U. S. Military Academy, and entered the artillery July, 1839; served in the Mexican war and on frontier duty up to 1861; commanded a battery in the capture of Alexandria May 24, as in the battle of Bull Run July 21, 1861, from which date he was made brigadier-general of volunteers; was engaged in the battle of Cedar Mountain, at the second battle of Bull Run, and at Chantilly commanded a division, as at South Mountain and Antietam; participated in the final Richmond campaign in command of a division from the battles of the Wilderness to the investment of Petersburg; recalled to Washington July, 1864, to aid in the defence against Early's threatened attack, and engaged in the subsequent pursuit of Early's army, participating in the battles of Monocacy, Opequan, Fisher's Hill, and Cedar Creek; brevetted from lieutenant-colonel to major-general for gallantry. In Jan., 1867, was retired on the full rank of major-general.

Ricks, tp., Christian co., Ill. P. 414.

Ricord′ (PHILIPPE), M. D., b. at Baltimore, Md., of French parentage Dec. 10, 1800; went to Paris 1820; received his medical degree 1826; was surgeon-in-chief of the Hôpital du Midi at Paris; acquired a wide reputation by his treatment of venereal diseases; obtained the Monthyon prize 1842, and was appointed consulting surgeon to the emperor Napoleon III. Oct., 1869. Author of numerous surgical works in his special department.

Ricot′ti (ERCOLE), b. at Voghera in 1816; took his degree in the University of Turin, and at the age of twenty-one presented to the Academy of Sciences of that city his *chef-d'œuvre, Storia delle Compagnie di Ventura.* For this he was honored with a prize, although the work only appeared completed in 1843–44, when it was published in Turin in 4 vols. This was followed by other works—*Corso di Lezioni sopra la Storia d'Italia dal Basso Impero ai Comuni* (Turin, 1848), *Breve Storia d'Europa e specialmente d'Italia* (2 vols., Turin, 1850–51), *Storia della Monarchia Piemontese* (6 vols., Florence), *Della Vita e degli Scritti di Cesare Balbo* (Florence), *Storia della Costituzione Inglese* (Turin). At first a civil engineer, then a lieutenant in the army, he was in 1846 appointed professor of modern history in the University of Turin; was a deputy of the Subalpine Parliament 1848–53; rector of the University of Turin, etc., and is senator of Italy. A recent work of his is *Della Rivoluzione Protestante.*

Rid′dell (JOHN LEONARD), M. D., b. at Leyden, Mass., Feb. 20, 1807; graduated at the Rensselaer Institute at Troy, N. Y., and received the degree of M. D. from the Cincinnati Medical College in 1835, where he became professor of botany and adjunct professor of chemistry; subsequently held the professorship of chemistry in the medical department of the University of Louisiana from 1836 to 1865. Author of a *Flora of the Western States* (1836) and of many contributions to botany; discovered the microscopical characteristics of the blood and black vomit in yellow fever; first brought to notice the botanical genus named from him *Riddellia;* was melter and refiner of the U. S. mint at New Orleans, and inventor of the binocular microscope and magnifying glass. D. at New Orleans, La., Oct. 7, 1867. PAUL F. EVE.

Riddle. See ENIGMA.

Rid′dle (ALBERT GALLATIN), b. at Monson, Mass., May 28, 1816; was taken in infancy to Northern Ohio; educated at Painesville Academy and at Western Reserve

College; studied law; was prosecuting attorney for his county 1840–46, and again 1854–56; served in the Ohio legislature 1848–50, and in Congress 1861–63; was for some time consul at Matanzas, and afterward settled as a lawyer at Washington, D. C. Author of *Students and Lawyers, Bart. Ridgley, The Portrait*, and *Alice Brand.*

Riddle (George Reade), b. at Newcastle, Del., in 1817; graduated at Delaware College; became a contractor for the construction of railroads and canals; admitted to the bar 1848; member of Congress 1851–55; commissioner of Delaware to verify Mason and Dixon's line 1849; U. S. Senator 1864–67. D. at Washington Mar. 30, 1867.

Riddle (Joseph Esmond), b. in England about 1804; educated at St. Edmund Hall, Oxford; took orders in the Church of England 1832; was for some years curate of Harrow; became incumbent of a church at Leckhampton, near Cheltenham, 1840, and was Bampton lecturer 1852. D. at Cheltenham Aug. 27, 1859. Author of a valuable *Latin-English Dictionary* (1836), an *English-Latin Dictionary* (1838), a *Manual of Christian Antiquities* (1839), *Natural History of Infidelity* (Bampton lectures, 1852), and many other works, theological and educational; was a contributor to the *Encyclopædia Metropolitana*, and published (with Rev. T. K. Arnold) *A Copious and Critical Latin-English Lexicon, founded on the German and Latin Dictionaries of Dr. W. Freund* (1849), and *English-Latin Lexicon* (1849), based on that of Dr. C. E. Géorges; also labored with Rev. John T. White in the preparation of another *Latin-English Dictionary*, which appeared in 1862, and upon a new edition of Passow's *Greek Lexicon.*

Ridenhouse, v., Stanley co., N. C. P. 656.

Ridge, tp., Monro co., Ala. P. 1190.

Ridge, tp., Jackson co., Ill. P. 1056.

Ridge, tp., Shelby co., Ill. P. 1139.

Ridge, tp., Union co., Ill. P. 940.

Ridge, tp., Van Wert co., O. P. 1406.

Ridge, tp., Wyandot co., O. P. 584.

Ridge, tp., Williamsburg co., S. C. P. 1426.

Ridge'bury, p.-v. and tp., Bradford co., Pa. P. 1476.

Ridge'field, p.-v. and tp., Fairfield co., Conn., on Ridgefield branch of Danbury and Norwalk R. R. P. 1919.

Ridgefield, tp., Huron co., O. P. 2533.

Ridge'ley, tp., Bullock co., Ala. P. 2080.

Ridgeley, p.-v., Platte co., Mo. P. 121.

Ridge'ly (James Lot), b. at Baltimore, Md., Jan. 27, 1807; educated at St. Mary's College, Baltimore, and at Mount St. Mary's College, Emmittsburg; studied law; was admitted to the Baltimore bar June, 1828; member of the city council of Baltimore 1834–35; of the house of delegates 1838, and of the constitutional conventions of 1849 and 1864; was 12 years register of wills for Baltimore county, several years president of the board of education, and inaugurated the present public school system 1848; was appointed by Pres. Lincoln collector of internal revenue, and has been since 1855 president of the Mutual Fire Insurance Company; was initiated into Odd Fellowship in 1829; became a member of the grand lodge of Maryland in 1830, and of the grand lodge of the U. S. 1831; in the latter was elected in 1836 grand sire, and since 1842 has been grand corresponding and recording secretary; is the chief author of the various rituals now in use; edited the *Covenant*, the official magazine of the order; wrote *Odd Fellowship—What is it?* and numerous other publications, including *The Odd Fellow's Pocket Companion* (Philadelphia, 1853). Theodore A. Ross.

Ridge'ville, tp., McIntosh co., Ga. P. 413.

Ridgeville, p.-v., Franklin tp., Randolph co., Ind., on Pittsburg Cincinnati and St. Louis R. R. P. 716.

Ridgeville, tp., Henry co., O. P. 764.

Ridgeville, tp., Lorain co., O. P. 1477.

Ridgeville, p.-v. and tp., Monroe co., Wis. P. 829.

Ridge'way, p.-v., Lincoln tp., Winneshiek co., Ia., on Milwaukee and St. Paul R. R.

Ridgeway, p.-v. and tp., Osage co., Kan. P. 1141.

Ridgeway, p.-v. and tp., Lenawee co., Mich. P. 992.

Ridgeway, p.-v. and tp., Orleans co., N. Y., on Erie Canal and on New York Central R. R. P. of v. 118; of tp. 5096.

Ridgeway, p.-v., Warren co., N. C., on Raleigh and Gaston R. R., has 1 newspaper.

Ridgeway, p.-v., Hale tp., Hardin co., O., on Cleveland Columbus Cincinnati and Indianapolis R. R. P. 177.

Ridgeway, p.-v., Fairfield co., S. C., on Charlotte Columbia and Augusta R. R.

Ridgeway, p.-v. and tp., Henry co., Va. P. 3171.

Ridgeway, p.-v. and tp., Iowa co., Wis. P. 2489.

Ridge'wood, p.-v., Franklin tp., Bergen co., N. J., on Erie R. R.

Ridg'way, p.-v. and tp., cap. of Elk co., Pa., on Philadelphia and Erie R. R., 118 miles from Erie and about 120 miles from Williamsport, has 4 churches, 2 banks, 2 newspapers, 2 tanneries, 4 hotels, 1 grist and 3 saw mills, and a foundry and machine-shop. Principal business, lumbering and tanning. P. 800.

Rid'ley, tp., Delaware co., Pa. P. 1142.

Rid'ley (Nicholas), D. D., b. at Unthank, Northumberland, England, about 1500; educated in the grammar school at Newcastle-upon-Tyne; graduated at Pembroke Hall, Cambridge, 1522; obtained a fellowship and was ordained priest 1524; studied theology at the Sorbonne, Paris, and at the University of Louvain, 1527–29; became on his return to Cambridge under-treasurer to the university, and soon afterward senior proctor (1533) and public orator, in which capacities he protested against the usurpations of ecclesiastical jurisdiction by the papacy, procuring a decree of the university to the same effect; was appointed domestic chaplain to Archbishop Cranmer 1537, vicar of Herne, Kent, 1538, master of Pembroke Hall and chaplain to the king 1540; was accused of heresy at the instigation of Bishop Gardiner, on account of having preached against the "Six Articles," but acquitted by Cranmer 1541; became prebendary of Westminster 1545, bishop of Rochester Aug. 14, 1547; bore an important part in all the ecclesiastical measures of the reign of Edward VI.; assisted Cranmer in compiling the Liturgy (1548) and framing the forty-one "Articles of Religion;" induced the king to change Greyfriars and St. Bartholomew's priories into charitable institutions; converted his own house of Bridewell into a workhouse; was instrumental in founding Christ's, St. Thomas's, and Bethlehem hospitals; was a member of the commission which deposed Bonner, and was his successor as bishop of London Apr., 1550; aided in the deposition of Gardiner, bishop of Winchester; visited the princess Mary at Hunsdon, desiring to gain her acquiescence in his views of Church reform, but was unsuccessful, 1552; concurred in the proclamation of Lady Jane Grey as queen, and was induced by the duke of Northumberland to preach a sermon at Paul's Cross in defence of her title July 16, 1553; was committed to the Tower on the accession of Mary a few days later; was taken to Oxford Apr., 1554, to participate in a discussion with the court theologians on the Real Presence; was formally tried for heresy with Cranmer and Latimer by a commission named by Cardinal Pole, and condemned to death as an obstinate heretic Oct. 1, 1555, and, after several efforts to induce him to recant, was burnt at the stake with Latimer in front of Baliol College, Oxford, Oct. 16, 1555. His *Life* was published by his descendant, Dr. Gloucester Ridley (1763), and his *Works*, chiefly tracts in favor of the Reformation, were edited by Rev. Henry Christmas for the Parker Society (1841).

Ridol'fi (Cosimo), Marquis, b. in Florence in 1794; was brought up in the country, and became particularly skilled in agricultural and physical science. He founded on his estate of Melato an agricultural institute and created a model farm; took an active part in the *Giornale Agrario* and in the labors of the Accademia de' Georgofili, of which he was named president. The grand duke Leopold confided to him the education of his two sons. In 1847 he presided over the ministry which bore his name, he himself taking the portfolio of the interior; was afterward sent by the grand duke as minister plenipotentiary to Paris, London, and Brussels. After the flight of the grand duke he retired from public affairs, but returned to political life again in 1859 with Baron Ricasoli. He was appointed senator of the kingdom in 1861. His principal work is *Lezioni Orali di Agricoltura* (2 vols. 8vo; 2d ed., Florence, 1866). D. in Florence in 1864.

Ri'dott, p.-v. and tp., Stephenson co., Ill., on Chicago and North-western R. R. P. 1915.

Rie'desel, von (Friedrich Adolph), Baron, b. at Lauterbach, Hesse, June 3, 1738; studied at the College of Marburg; was an officer of a Hessian regiment in the British service during the Seven Years' war, distinguishing himself at the battle of Minden; became adjutant-general of the Brunswick army 1767, colonel of carbineers 1772, and major-general 1776, in which capacity he was sent to America in command of the division of 4000 Brunswickers hired to Great Britain; arrived at Quebec June 1; spent a year in Canada exercising his troops in the Indian methods of warfare; joined Burgoyne in his campaign against Albany 1777; was at Ticonderoga and Hubbardton July 6–7, and at the first battle of Saratoga, Sept. 19; advised a retreat after the second battle,

Oct. 7; surrendered with Burgoyne Oct. 17; was taken to Albany with his wife and children, who were entertained with great courtesy by Gen. Schuyler; was sent to Cambridge, Mass., Nov., 1777; transferred to Virginia 1778; was exchanged in the autumn of 1780; was placed by Sir Henry Clinton in command of Long Island; was transferred to Canada Sept., 1781; returned to Germany Aug., 1783; became lieutenant-general Mar., 1787; commanded the Brunswick contingent in Holland (1788–93), and became commandant of the city of Brunswick 1794. D. at Brunswick Jan. 6, 1800. His *Memoirs, Letters, and Journals during his Residence in America*, edited by Max von Eelking, were translated by William L. Stone, and published by Joel Munsell (2 vols., Albany, 1868).—His wife, FRIEDRIKE CHARLOTTE LUISE, daughter of the Prussian minister Masson, b. in Brandenburg in 1746; married about 1763; d. at Berlin Mar. 29, 1808. She wrote to her mother an interesting series of letters descriptive of life in Canada, of the incidents of Burgoyne's campaign, and of her residence as a prisoner at Cambridge and elsewhere. They were edited by her son-in-law, Count Reuss. *Voyage de Mission en Amérique, ou Lettres de Madame de Riedesel* (Berlin, 1799), were published in an incomplete English version at New York in 1827, and in a complete translation by William L. Stone: *Letters and Journals, etc.* (Albany, 1867).

Rie'gelsville, p.-v., Durham tp., Bucks co., Pa., on Delaware River.

Rie'go y Nuñ'ez, del (RAFAEL), b. at Oviedo, Spain, Oct. 24, 1785; was a volunteer in the national uprising against the French invasion of 1808; taken prisoner and detained in France 1808–14; visited Germany and England; became an officer in the Spanish army; headed the triumphant movement for the restoration of the constitution of 1812, which was commenced by a single battalion in the Isla de Leon Jan. 1, 1820; was chosen president of the new Cortes at their first session, Feb., 1823; was taken prisoner after the French intervention of that year, which he had strenuously opposed; conveyed to Madrid Oct. 2; condemned to death as a traitor and executed at Madrid Nov. 7, 1823. His limbs were sent to different parts of the Peninsula, and his head was kept at Las Cabezas (Isla de Leon), where he had proclaimed the constitution. Under subsequent liberal administrations his memory has been highly honored, and the so-called *Hymn of Riego* was the national hymn of Spain under the republic.

Rien'zi, p.-v., Alcorn co., Miss., on Mobile and Ohio R. R.

Rienzi, di (COLA), b. about 1312 at Rome, where his father was a tavern-keeper and his mother a water-carrier, although he himself claimed to descend, illegitimately, from the imperial house of Luxemburg. The first twenty years of his life he spent among the peasants of Anagni, but on his return to Rome he began to prepare himself for the office of a notary by studying grammar and rhetoric and reading the old Latin poets and historians. He was by nature a man of great eloquence and of a vivid imagination, and the study of ancient literature highly developed his natural power of speech, while at the same time it filled his imagination with a dazzling vision—that of the greatness of Rome. The state of the city was miserable. The pope resided at Avignon, and with him the last means of order and justice were lost. The noble families had their fortified castles in the streets, and feuds among the lords and violence and cruelties against the people were the general features of life in Rome. One of the nobles assassinated Rienzi's brother, and the impossibility of bringing the murderer to punishment gave his visions at once a practical bearing; from a dreamer he became a reformer. In 1343 he was chosen a member of the deputation which was sent to Avignon to congratulate Pope Clement VI. on his accession to the papal throne, and to urge him to return to Rome and protect the people against the oppression of the nobles. Rienzi is said to have made a great impression on the pope, and he received many favors from him; but as he failed to induce him to take any action, he returned to Rome in 1344 and began the work of reform himself, well knowing that he could not carry it through without a revolution. On May 20, 1347, the revolution was accomplished. It was preceded by no conspiracy; it was accompanied by no violence; it looked more like a pageant. From the church of St. Angelo, Rienzi and his twenty-five confederates issued forth in grand attire, and, accompanied by the bishop of Orvieto, they walked in a solemn procession to the capitol, when Rienzi read to the assembled people the constitution which purposed to usher in the new era—*il buono stato.* The constitution was accepted with enthusiasm, and Rienzi was invested with dictatorial power under the title of "tribune of liberty, peace, and justice." The nobles, who had paid no attention to his public harangues, because they considered him mad, were taken completely by surprise, and were compelled to surrender their strongholds and take oaths to support the constitution; and in a very short time such a change took place in Rome and in the dominions belonging to her that not only other Italian cities, but foreign monarchs, sent deputations and embassies to congratulate the tribune. Unfortunately, however, for Rienzi, although he had become a reformer, he had not ceased to be a dreamer. He had restored order and peace to Rome; he next attempted to restore her old supremacy over the world, and summoned Ludwig of Bavaria and Karl of Bohemia, who contended for the imperial crown, to repair before him. The attempt failed utterly. The foreign princes were disgusted and offended at his arrogance. The Roman populace grew tired of his magnificent processions and of his taxes. And in such a moment of general distemper the nobles attacked him and compelled him to flee in disguise from the city Dec. 15, 1347, seven months after his accession to power. Once more he returned to Rome. After living concealed among the Franciscan monks in Southern Italy for two years, he went to Prague, to the emperor Karl IV. A monk had prophesied that he should deliver Rome and inaugurate a new era in the history of the world, the era of the Holy Ghost, by the aid of the emperor. Rienzi believed in the prophecy, but the emperor did not. He sent him to Avignon, and the pope kept him in prison. Innocent VI., however, the successor of Clement IV., thought that Rienzi could still be used with advantage as a means of restoring peace and order in Rome, where, during the rule of the nobles, things were worse than ever. He sent him with Cardinal Albornoz to Rome in the quality of a senator, and in Aug., 1354, Rienzi made a sort of triumphal entry into the city. He was received with enthusiasm. But very soon it became apparent that the man's character had changed sorely under his misfortunes. His fantastic arrogance was the same, but now it was accompanied by caprice, suspicion, and cruelty. The nobles never acknowledged his government, and he had to besiege them in their castles; and the populace became so infuriated by his arbitrary measures that a wild crowd surrounded him on the stairs of the capitol and killed him, Oct. 8, 1354. CLEMENS PETERSEN.

Rie'sengebirge ("Giant Mountains"), a mountain-range which for a distance of about 50 miles forms the boundary between Bohemia and Prussian Silesia, is congruous to the Erzgebirge in the W., and is continued eastward by the Sudeten. The highest peak is Schneekoppe, 5253 feet.

Rie'si, town of Sicily, province of Caltanisetta, about 17 miles N. W. of Terranuova, in one of the richest and most healthy districts of the island. Besides grain, oil, fruits, nuts, etc., valuable minerals abound here. There is an active trade in agricultural products, and the chemical manufactures of Riesi are much esteemed. The inhabitants enjoy an enviable reputation, according to the Sicilian standard, for industry, honesty, and intelligence. P. in 1874, 11,500.

Rie'ti [anc. *Reate*], town of Italy, province of Perugia, on the Velino, about 50 miles N. E. of Rome. A large part of the adjoining plain was once a lake, the draining of which was begun nearly 300 years before our era, and only fully completed in the seventeenth century. The walls which still surround the town, now divided into the old and the new city, were reconstructed on earlier foundations in 1250. The streets and squares are not inconvenient, and of the 15 churches, some are very old, and not so entirely remodelled as to destroy their interest. The cathedral and Santa Scolastica are particularly noteworthy. The communal buildings and private palaces are very respectable. Fifteen monastic edifices became public property on the recent partial suppression of convents in Italy. Rieti is enumerated by Roman writers as among the first of the Sabine cities, and after its submission to Rome it continued to prosper even through the barbarian invasions, which it had the rare fortune to escape, coming at last peaceably under the Lombard rule. In the ninth century, however, it suffered greatly from the Saracens, and from this time calamity after calamity succeeded—sieges, sacks, fires, and plagues. Nevertheless, it managed, for the most part, to preserve its independence, even against the arms of the popes, until 1500, when it lost its autonomy and became a portion of the papal territory. In 1785 it was greatly damaged by an earthquake, and in 1799 it endured the horrors of fourteen days' sack at the hands of the troops of the Santa Fede. The first bishop of Rieti is said to have been Prosdocimus, a disciple of St. Peter. Some traces of the magnificent Roman villas mentioned by Varro as in this neighborhood may still be seen. The fruits and other

agricultural products of this plain are of a very superior quality, and it furnishes seed on a large scale for other parts of Italy. P. 14,500.

Riet'schel (Ernst Friedrich August), b. at Pulsnitz, Saxony, Dec. 5, 1804; studied at the Academy of Art in Dresden, under Rauch in Berlin, and in Italy; was appointed professor in Dresden in 1832, and d. there Feb. 21, 1861. His principal works are—*Mary weeping over the Body of Christ*, a group in natural size, in Potsdam; the statue of Thaer in Leipsic; of Lessing in Brunswick; the Goethe-Schiller group in Weimar; the Luther monument in Worms; the busts of Luther and Augustus II. of Saxony for the Valhalla.

Ri'fle, a firearm (large and small) having the barrel grooved to give a rotatory movement to the projectile. (See Cannon and Small-Arms.)

Ri'fling of Ord'nance. Rifling is the device by which a cannon is made to give its projectile a movement of rotation about an axis coinciding with the axis of the gun. It is in consequence of this rotation that the elongated projectile moves in the direction of its longer axis, and hence is far less resisted by the atmosphere than a spherical shot of equal weight. The rifling is, in fact, making the gun a nut or female screw, while the projectile has upon it, or is made by force of the explosion to take, projections which cause it to turn in the gun according to the pitch of the screw cut therein.

Mechanically, the rifling of a gun consists in cutting grooves in the bore, and is generally effected by a tool fastened to the end of a bar and forced down the bore. By giving to the gun or to the bar a movement of rotation the groove cut by the tool will take a screw-like form, according to the degree of rotation, or what is termed the "twist" of the rifling. We do not propose to follow out any particular method of effecting the rifling; any desired peculiarity can be readily obtained. Rifling of cannon may be divided, first, into rifling for muzzle-loading guns; and, second, rifling for breech-loading guns.

The rifling for muzzle-loaders consists of a certain number of grooves, usually varied according to the calibre. In the case of "studded" projectiles the grooves must admit the studs to go down freely in the gun; and if more than one row of studs is placed on the shot, the non-bearing side of the studs in the front row must be partially removed in case of the increasing twist which is now used in the heavy Woolwich gun of England. The expanding projectiles adopted in the U. S. service are loaded without regard to the grooves, and only take the impression of them from the force of the powder at the time of firing. The yielding qualities of the expanding material permit its accommodating itself to the increasing twist if used in the gun. In each gun the grooves are of equal width and depth. The "lands" or portions between two grooves are consequently equal. For expanding projectiles the grooves should be of an unequal number, so that a land should always be opposite a groove. In regard to the number of grooves for muzzle-loading guns, the Woolwich practice is from three to nine, increasing with the calibre. The 81-ton gun is stated to have eleven grooves, each 1.5 inches wide and .2 inch deep. The rifling of the Parrott guns is made on the following plan: The circumference of the bore is divided into an even number of equal parts, each as near an inch as practicable; one is made a groove, and the adjacent one a land; each groove is .1 inch deep. The twist is increasing from 0 at the seat of the shot to a final twist at the muzzle, as given below:

Rifling of Parrott Guns.

Size of gun.	Diameter of bore, inches.	Number of grooves.	Number of lands.	Depth of grooves, inches.	Width of grooves and lands in parts of circumference.
3-inch............	3.00	3	3	0.1	$\frac{1}{6}$
20-pounder......	3.67	5	5	0.1	$\frac{1}{10}$
30 "	4.2	5	5	0.1	$\frac{1}{10}$
60 "	5.3	7	7	0.1	$\frac{1}{14}$
100 "	6.4	9	9	0.1	$\frac{1}{18}$
200 "	8.00	11	11	0.1	$\frac{1}{22}$
300 "	10.00	15	15	0.1	$\frac{1}{30}$

In regard to the twist, it may be assumed that it must be greater in proportion to the length of the projectile, but opinions as to the degree of twist are not precise. The converted 8-inch rifle lately subjected to a very successful trial in our service has a twist of 1 turn in 40 feet, and uniform. The heavy Woolwich guns have been rifled as follows:

7-inch gun, uniform twist, 1 turn in 35 calibres.
8 " increasing 0 to 1 turn in 40 "
9 " " 0 1 " 45 "
10 " " from 1 turn in 100 to 1 turn in 40 calibres.
12-inch gun, increasing from 1 turn in 100 to 1 turn in 50 calibres.
35-ton gun, " " 0 to 1 turn in 40 calibres.
81 " " said to be from 0 to 1 turn in 35 calibres.

The increasing twist is supposed to be attended with certain advantages, which are—that the projectile is not compelled to turn at the moment of starting from its place, but takes up its rotation gradually in its passage through the bore, and thus the strain upon the gun near the seat of the charge is diminished; also, that expanding projectiles, which must take the grooves, if at all, at the first movement of the shot, will do it more readily when the rifling is without twist in the lower portion of the bore. It is also probable that the increasing twist is favorable to the communication of a rapid rotation to the projectile.

There are also peculiar modes of rifling, some of which have been found practicable, but it is doubtful whether any of them will supersede the more familiar plans to which we have adverted. Among these peculiarities are the Whitworth guns, which have bores hexagonal in section, but so turned round as to give the desired twist to the bore itself. The shot, being so formed as to conform to the bore with a slight windage, is of course projected from the gun with the desired rotation. The Lancaster gun was constructed at first in a way somewhat similar to the Whitworth. The bore was oval in cross-section, but the longer axis of the oval changes in position so as to give a twist to the bore, by which the projectile acquires its rotation. Rifling by means of ridges left in the bore running through its length, but with a twist, has also been tried. In this case the projectile has grooves to suit the ridges left in the gun, and on being fired takes up the rotation due to the guiding ridges.

Rifling of Breech-loading Cannon.—In this case the grooves extend from the muzzle to the chamber which receives the projectile. This chamber is made by removing the grooves, and the projectile, thus filling the chamber, is actually larger than the bore of the gun, is forced through it on firing, and so made to take the grooves. The grooves of breech-loading guns are usually quite numerous, and made to narrow slightly in width toward the muzzle of the gun. The Sutcliffe breech-loading 9-inch gun, for example, has 32 grooves and 32 lands. Each groove is .09 inch deep, and is made to narrow 0.1 inch from the chamber to the muzzle of the gun. The twist is uniform—1 turn in 45 feet. R. P. Parrott.

Ri'ga, the capital of Livonia, next to St. Petersburg and Odessa the most important port of Russia, on the right bank of the Düna, about 8 miles from its mouth in the Gulf of Riga, where is situated the fort of Dünamünde, erected for the protection of the harbor. The fortifications of the city have been razed and the walls converted into promenades which surround the old city, separating it from its three suburbs—those of St. Petersburg, Moscow, and Mietan. Among the public buildings the most notable are St. Peter's church, built in 1406, with a tower 470 feet high; the palace of the governor-general, built 1494–1515 by Walter von Plettenberg; the city hall, the new exchange, etc. The city has a polytechnic institute, a school of navigation, several other schools for special purposes, and numerous charitable institutions. It contains about 100 manufactories of cotton, woollen, linen, and iron goods, and its shipbuilding industry is very flourishing; it owns over 100 vessels, of which one-fourth are steamers. But it derives its greatest importance from its commerce: 3177 vessels entered the harbor in 1873, and 3181 cleared it. The value of the imports, comprising coal, salt, iron, and colonial produce, amounted to 19,611,660 rubles; that of the exports, consisting of flax, hemp, timber, and grain, to 20,153,453 rubles. The city was founded in the beginning of the thirteenth century, and belonged to the knights of the Teutonic order. Its prosperity began when it became a member of the Hanseatic League under the protectorate of Poland. It was conquered by the Swedes in 1621, and incorporated with Russia in 1710. P. 102,043, of which 47,000 are Germans, 25,000 Russians; the rest Letts, Jews, etc.

Riga, p.-v. and tp., Lenawee co., Mich., on Lake Shore and Michigan Southern R. R. P. 1540.

Riga, p.-v. and tp., Monroe co., N. Y. P. 2171.

Riga, Gulf of, an inlet of the Baltic, 100 miles long, 80 miles broad, and bounded by the Russian governments of Curland, Livonia, and Esthonia. It receives the Düna. Oesel is a large island at its entrance.

Rigault' de Genouilly' (Charles), Admiral, b. Apr. 12, 1807, at Rochefort, Lower Charente, France; educated at the Polytechnic School, and entered the navy 1827; captain of a corvette 1841, and in command of La Victorieuse when she was lost in the China seas, but his conduct was vindicated; in 1848 captain of a frigate; rear-admiral 1854, and sent to the Crimea, where he commanded a de-

tachment of marines. Commanded a squadron which bombarded and occupied Canton, China (1857), in conjunction with an English naval force; promoted vice-admiral 1858 and admiral 1864; senator 1860, he voted in favor of maintaining the temporal power of the pope; succeeded M. Chasseloup-Laubat as minister of marine 1867, and remained on the formation of a new cabinet 1870. In 1864 he received the grand cross of the Legion of Honor. D. at Paris 1874.

Rig'don (SIDNEY), b. in St. Clair tp., Allegheny co., Pa., Feb. 19, 1793; received a fair English education, and was working as a printer at Pittsburg when about 1812 a manuscript was offered for publication by an eccentric preacher named Solomon Spaulding. It was entitled *The Manuscript Found, or The Book of Mormon*, and pleased Rigdon so much that he made a copy before it was returned to Spaulding, who died soon after. About 1817, Rigdon became a preacher; and though at first professing orthodoxy, soon began to propagate singular doctrines connected with the "manuscript" in question. In 1829 he became acquainted with Joseph Smith, and with him devised the publication of the *Book of Mormon* as the basis of a new sect. He accompanied Smith to Kirtland, O., to Missouri, and to Nauvoo, where he was one of the presidents of the Church; was one of the originators of the "new revelation" permitting polygamy; was twice tarred and feathered, several times imprisoned, and was a candidate for the succession to the leadership on the death of Smith. On the election of Brigham Young, Rigdon refused to acknowledge his authority, was excommunicated, returned to Pittsburg, Pa., and lived in obscurity. D. at Friendship, N. Y., July 14, 1876.

Riggs (ADAM), b. in Tennessee June 6, 1816; joined the Tennessee conference of the Methodist Episcopal Church in 1839; filled important stations, and several times represented the conference in the highest court of the Church. D. in Tennessee Oct. 29, 1871. T. O. SUMMERS.

Riggs (ELIAS), D. D., LL.D., b. in New Providence, N. J., Nov. 10, 1810; graduated at Amherst College 1829, at Andover Theological Seminary 1832, and went immediately to his work abroad. He was in Athens, Greece, 1832–34, in Argos 1834–38, in Smyrna 1838–53, and since 1853 has been in Constantinople, except in 1857–58, when he taught Hebrew and the cognate languages in Union Theological Seminary, New York City, while he superintended the electrotyping of his own Armenian translation of the Bible. He has also translated the Bible into Bulgarian, and is now (1876) engaged, with others, in revising the translation into Turkish. Most of his work has been done in the modern Greek, Armenian, Bulgarian, and Turkish languages, but he is acquainted with upward of twenty more. He received the title of D. D. from Dartmouth College in 1853, and of LL.D. from his alma mater in 1871. He has published—*A Manual of the Chaldee Language* (1832; 2d ed. 1858), *Brief Grammar of the Modern Armenian Language* (1847), *Vocabulary of Words used in Modern Armenian, but not found in the Ancient Armenian Lexicons* (1847), *Notes on the Grammar of the Bulgarian Language* (1847), *Outline of a Grammar of the Turkish Language as written in the Armenian Character* (1856), *Suggested Emendations of the Authorized English Version* (1873).
R. D. HITCHCOCK.

Riggs (STEPHEN R.), D. D., many years a missionary of the American Board to the Dakota Indians; author of several elementary books for his Indian pupils, and of a *Grammar and Dictionary of the Dakota Language* (1852), published by the Smithsonian Institution, which has the reputation of being one of the most valuable contributions to American philology ever made. Aided by Dr. Williamson, he has given the Dakotas a translation of almost the entire Bible. He received the degree of D. D. from Beloit College in 1873.

Right, in law. See RIGHTS, by PRES. T. D. WOOLSEY, S. T. D., LL.D.

Rights [Ang.-Sax. *riht*]. In law and political science this word denotes powers of free action rightfully, or by right reason, belonging to an individual, with which, therefore, others are bound not to interfere. The word presupposes that there is something *objectively* right and objectively wrong in feeling, purpose, or act; and this we here assume. Rights may be said to be such *subjectively*—that is, an individual is the *subject* of rights; he is one to whom powers of action belong. And these powers of action belong to him as being necessary for the development of his nature, for fulfilling the ends which are pointed at by his bodily, mental, and moral powers, by his position, needs, and relations in a community or world of like beings. Thus, the general nature and destination of man in the world is the foundation of rights. And yet we deny the full exercise of rights to immature children, because they are as yet *undeveloped* human beings; and for this reason, in order to protect them against fraud and childish folly, if they have property bequeathed to them, law prevents them from having the control of it, that it may be preserved for their use when they can use it in the exercise of manly reason. Law also, for the time or altogether, takes away, as a mode of inflicting punishment, one or more of a man's rights—his liberty, or property, or even his life. The grounds for such limitations or deprivations of rights cannot here be unfolded; we only remark in this place that for the security of moral order certain wrongdoers must suffer evil; that this is felt by men of ordinary moral sensibilities to be deserved; and that there is no punishment possible, unless in the act former rights are taken away.

So intimately are rights connected with the destination and needs of human beings on earth that they would be changed or cease with an alteration of our nature. Thus, suppose men grew up out of the ground without the intervention of others, full-grown and mature in their powers: there would then be no family rights. Or suppose the earth so contrived as to supply them with all the food and shelter they needed, and that the seasons were such that no clothing were wanted: in this case all labor, property, protection of property, contract, and, to a great extent, association, would disappear. Thus, rights would be but a very small fraction of what they now are.

The use and the end of the conception of rights point toward society. It is for the reason that men may develop their nature and exercise the powers pointed out by their nature and destination, that they are driven toward the recognition of the rights of others as well as their own, so that they may not in society invade each other. Social instincts thus, and obligation, the necessary concomitant of rights, are the two poles of human life in communities. The one draws men into fellowship, the other secures and preserves that fellowship against force. The desires of property and of other things, if not balanced by the feeling that the thing coveted belonged to a particular individual—or, in other words, by the moral feeling or obligation—would be the scourges of society, and in fact would render its existence, at least the existence of industrial communities or of anything above barbarism, impossible. Obligation, then, is the moral element in the theory of rights. Rights themselves, or free powers of acting in certain ways, involve nothing but power and desire; but men recognize the fact that others like them have the same power and desire; and thus a common, equal rule is acknowledged for all beings on account of their common nature. Here we advance to the observation that rights are equal and obligations reciprocal. There is no reason why I should have rights, and my fellow-man not be admitted to have them. And, as before said, obligations are correlative. Thus, every man, being a subject of rights, has cords running from him to every other member of his society, to every fellow-man.

But rights and correlative obligations, after all, are but the underpinning of the social fabric. They deal simply with *acts* and with *intention as embodied in acts*. When a man labors in order to acquire property, they do not ask him whether he is covetous or benevolent; and when he spends property, they do not ask him whether it was best for him so to use his property. He may get the best in a bargain, but he is not obligated—however right and proper for him it may be—to see to it that the other party should have an equal benefit. He may marry for love or for money, but the marriage is lawful in either case. Thus, there is a wide difference between the province of morals (which pertains chiefly to the conscience, and only in a subordinate sense to social order and law) and that of rights and obligations. The principal discriminations between the two are the following: (1) The moral comprehends the other, which we shall call, with the Germans and some English writers, as Lieber, Whewell, Wildman, *the jural*. Granting that an individual has rights, it does not follow that this fact of his freedom to act in one way discharges him from the duty of acting in another. Duty is universal, absolute, all-comprehensive. I have a right to acquire property, but it may be wrong for me to do so; I may have duties which prevent it—for instance, the duty of watching by the side of a sick parent. But no one save him who has the right determines in the particular case how he shall act. The duty goes with him, and the sin, but others have no right to keep him from the sin. Of course we do not mean to deny that some sins *in act*, when they seriously harm society or prevent the fulfilment *of obligations*, may sometimes be noticed by organized society—that is, by the state. (2) Rights and obligations *pertain only to the act;* the department of morals has to do as much with the disposition, the state of the will, the feelings, as with the act. It is true that an important discrimination is made in law between mere injury and intended wrong—between injury caused

by *culpa levis* or *lata* and that caused by malice prepense. But this applies to criminal law, and the obligation to repair an injury may exist where there is neither malice nor negligence, as when a scared horse overturns another man's wagon loaded with crockery. (3) Rights may be *waived* by the subject of them. He is free to say, for instance, whether money due on contract shall be collected or a debt be forgiven. If it were not so, the performance of many humane or benevolent acts would be impossible, which consist in self-renunciation. But when we say that rights may be waived, we mean that this may be done in *particular cases*, not that there may be a free waiver of the exercise of them *in all future cases*. Rousseau was entirely right in maintaining, against Grotius, that a man had no right to surrender all his rights—that is, to make a slave of himself, slavery being the negation of rights. For if he could do this, he could abridge his power of doing good, which is greatly dependent on his power of exercising his rights. That is, he could sink himself freely below the condition where his nature puts him, and renounce the place given him by God in the world; which would be flagitious. All, however, that Grotius meant was, we believe, that a nation could submit to superior power and lose its liberties, or, in other words, could come *jurally* under the absolute power of a conqueror. (4) The *negative side* in the sphere of rights and obligations is the most important, but it is not necessarily thus in the moral sphere. Most laws are prohibitions of acts affecting the rights of others or general social order. There may be some pretext for saying that a laborer shall not be compelled to work for more than ten hours, but when did law force a free man to work any given number of hours, even if he had bargained to do so, or when did it forbid him to bargain to work more than a certain amount of time *per diem?* As it respects duties, some are positive, as the duty of helping the poor; others are negative, as the duty of not wounding the feelings of others without cause; others may be put either into the positive or the negative form. The commandments of the Decalogue—all of them which relate to men—are statements of obligation in the negative form, except that which requires obedience to parents. And the reason why this commandment is positive lies in the nature of the family life, where rights and obligations are wonderfully blended with moral claims and duties. (5) Rights, and therefore obligations, can be sharply defined, while moral claims and duties as a class cannot be. Thus, the former can be made the subject-matter of law, while the latter lie beyond the reach, in a great measure, of human legislation. This is, indeed, not true of those *acts* of outward morality, and especially those immoral acts, which can be seen and heard, and which are detrimental to the community. Thus, not going to church on Sunday was long finable in England and other countries, and even *neglect* implying ingratitude toward parents (which, however, may in its outward manifestations be held perhaps to be a violation of obligation), has been punished. But the vast majority of duties hide beyond the eyesight of human law, and the attempt to measure and weigh them is impossible. In the end, when classified by moralists, they must be left to the individual conscience; and even these general rules of duty, without a purification of the internal moral sense, cannot be applied to the government of the conduct with much success.

It results from all this that rights and obligations are the principal subject-matters of which private law takes cognizance; immoral acts may be regarded as injuries to the state, but the same act which violates obligation to a fellow-man may be taken notice of by law as an injury to society also. It is shown by the above discussion that there ought to be as many forms or heads of rights as there are natural divisions growing out of our destination in society. It is not our province here to mention them in detail. They may be classified as derived from our bodily, social, moral, and religious nature. They may be enumerated rudely as the rights of life and limb, property, contract, association, free speech, worship, and the family rights. The rights are called *natural* rights, as deducible from our nature, and not as derived from an imagined state of nature and carried down into a state of society. As such, again, they are called primitive or *original* rights, as distinguished from acquired rights—that is, from those which have come to us by gift or political privilege. Whether political rights can be properly called rights may be questioned, but this is not the place to give the due answer to that question. We observe, in closing, that certain somewhat vague yet most real relations of man to man may be called duties, and yet have some analogies to rights. Thus, the treatment of our fellow-men, which is prescribed by a sense of propriety, by the feeling of the gentleman, by honorable sentiments, may be arranged with rights and obligations under the head of justice. The proprieties of life are due to and owed by fellow-men in society; gentlemanly conduct is dictated by both kindness and the rights of others not to have their feelings wounded; and honor or honorable feeling is a nice sense of justice, as the poet Wordsworth calls it. And thus the apostle Paul beautifully stretches the line of rights and obligations when he says, "Owe no man anything, but to love one another."

THEODORE D. WOOLSEY.

Rights, Bill of. See BILL OF RIGHTS.

Rights of Man. See RIGHTS, by PRES. T. D. WOOLSEY, S. T. D., LL.D.

Ri'gi, a mountain of Switzerland, in the canton of Schwytz, is isolated between the lakes of Zug and Lucerne, and rises 5902 feet above the sea, 4500 feet above the lake. Several carriage-roads and a railway lead from the base of the mountain to the top, which offers a very extensive view.

Ri'gor Mor'tis [Lat.], the condition of muscular rigidity developing shortly after the death of the body. The muscular fibres are found to be firm and shortened, as if in a state of chronic contraction. It is due to suspended nutrition of the tissues, and begins when their response to artificial irritation and electricity ceases. Rigor mortis develops at a variable period after death, and when established lasts a variable time. In persons who die suddenly, as by accident or by heart disease, and in whom the muscles are well developed and nourished, rigor mortis may be postponed for many hours—twelve or twenty-four—and may then persist for two or three days. Reversely, when death is the result of exhaustive disease, the blood is impoverished and the muscles are wasted and flabby, rigor mortis develops speedily—within an hour, or even a few minutes—and is incomplete and of brief duration. As soon as rigor mortis passes off, the relaxed body begins to decompose. Rigor mortis was formerly explained as a state of contraction, the death-act of the muscular fibre. It is now believed to be due to the separation and coagulation of the albuminoid substance in the fluid of the muscle, following the cessation of nutrition.

E. DARWIN HUDSON, JR. REVISED BY WILLARD PARKER.

Rig Veda. See SANSKRIT LANGUAGE AND LITERATURE, by PORTER C. BLISS, A. M.; and VEDA.

Ri'ley, county of N. E. Kansas, between the Big Blue and the Kansas and Republican rivers, skirted on its S. border by Kansas Pacific R. R., has a broken surface and a fertile soil. Staples, Indian corn, hay, wheat, and butter. Cap. Manhattan. Area, 654 sq. m. P. 5105.

Ri'ley, tp., Yell co., Ark. P. 545.

Riley, p.-v. and tp., McHenry co., Ill. P. 882.

Riley, p.-v. and tp., Vigo co., Ind., on Wabash and Erie Canal. P. 1492.

Riley, p.-v. and tp., Clinton co., Mich. P. 1139.

Riley, p.-v. and tp., St. Clair co., Mich. (RILEY CENTRE P. O.), on Belle River. P. 1664.

Riley, tp., Butler co., O. P. 1612.

Riley, tp., Putnam co., O. P. 1084.

Riley, tp., Sandusky co., O. P. 1461.

Riley (BENNET), b. at Baltimore, Md., in 1786; entered the U. S. army in youth; served against the Indians on the Plains and in Florida; commanded a brigade in Mexico under Twiggs; was brevetted brigadier-general for gallantry at Cerro Gordo and major-general for Contreras, and in 1849–50 commanded the military department of Upper California. D. at Buffalo, N. Y., June 9, 1852.

Riley (CHARLES VALENTINE), b. in London, England, Sept. 12, 1843; came to the U. S. 1860; worked on a farm several years; became editor of the entomological department of the *Prairie Farmer* at Chicago 1863–68; became State entomologist of Missouri 1868, in which year he began, with Benjamin D. Walsh, State entomologist of Illinois, the publication of a monthly magazine, *The American Entomologist*. He has published annual reports on the entomology of Missouri, and has rendered valuable services to science and to agriculture by tracing the history of the Colorado potato-beetle (1863), the discovery of a thirteen-year brood of the "seventeen-year locust" or periodical cicada (1868), of the phylloxera insects on American grapevines, and establishing their identity with the French species; by his recommendation to use diluted Paris green against the Colorado potato-beetle (1871) and the cotton-worm (1873); and the discovery of the yucca-moth (*Pronuba yuccasella*) by which the yuccas are fertilized. The French government presented him in 1873 a gold medal "for services rendered to French grape-culture."

Riley (JAMES), b. at Middletown, Conn., in 1775; became a sea-captain; commanded the brig Commerce when she was wrecked on the W. coast of Morocco Aug., 1815, and kept for some time a prisoner by the Moors,

from whom he was ransomed by the British consul at Mogadore, Mr. W. Wiltshire, as was set forth in an *Authentic Narrative* drawn up from his rough notes by Anthony Bleecker, which was published in 1816, and obtained a wide circulation. Capt. Riley subsequently traded for many years to the port of Mogadore, resided in Van Wert co., O., 1821–28, and was a member of the Ohio legislature 1823. D. at sea Mar. 15, 1840. His later history was written by his son, W. Wiltshire Riley, under the title *A Sequel to Riley's Narrative* (Columbus, O., 1851).

Riley (Joshua), M. D., b. in 1800; was a practitioner of medicine for half a century in Georgetown, D. C., where he d. Feb. 11, 1875. From 1844 to 1859 he occupied the chair of materia medica in the medical department of Columbian College. Paul F. Eve.

Riley Plantation, tp., Oxford co., Me. P. 32.

Ri'ma-Szom'bath, town of Hungary, on the Rima, manufactures wooden articles and linen fabrics, and trades in hides. P. 8300.

Ri'mersburg, p.-b., Toby tp., Clarion co., Pa. P. 324.

Ri'mini [anc. *Ariminum*], town of Italy, province of Forli, lying very near the Adriatic, in lat. 42° 4′ N., 12° 34′ E. It is a walled and well-built town, and the streets and squares are fine and regular, but there is everywhere an air of decay. The Corso, the main street, passes through the centre of the town, and the two principal squares, Piazza Cavour and Piazza Giulio Cesare, open upon it. The latter is named from the tradition that Julius Cæsar here harangued his troops after the passage of the Rubicon. The structures of interest still remaining from the Roman period are—the remarkable bridge of Augustus over the Marecchia, begun by that emperor, finished by Tiberius, and still in good preservation; the arch of Augustus, now the Porta Romana, one of the most striking monuments of Roman architecture still to be seen in Eastern Italy; the Fontana Publica, which has undergone endless changes. The great mediæval attraction is the cathedral, founded in the fourteenth century, but restored in the fifteenth by Sigismund, the most renowned of the celebrated Malatestas. It is one of the finest existing specimens of Italian Gothic, and is extremely interesting to the student of architecture and of the sepulchral monuments of the Middle Ages. Several other churches and the Palazzo Communale contain admirable pictures. The house of Francesca da Rimini, the lady so pathetically immortalized by Dante, is still pointed out. The Gambalunga Library (seventeenth century) consists of about 25,000 vols. The site of Rimini has been successively occupied by an Umbrian, Etruscan, and Roman city, the latter being improved and adorned by Julius Cæsar, Augustus, and other Roman emperors. It was Christianized very early, and here in 359 A. D. was assembled the celebrated Council of Rimini, consisting of more than 400 Western bishops, who wellnigh substituted Arianism for orthodoxy as the creed of the Latin Church. Though Rimini escaped the sword of Attila, it suffered cruelly from succeeding invasions. Narses made it the chief city of the maritime Pentapolis, the other four towns being Pesaro, Fano, Sinigallia, and Ancona, and the whole territory was governed by an exarch from Constantinople. In 1200 the first of the great Ghibelline family Malatesta was made military governor of the Marches, and his descendants assumed the lordship of Rimini, which they retained (except during Rimini's brief union with the Venetian republic) until it became a portion of the papal territory in 1509, when it was included in the so-called legation of Ravenna. In 1860 it was united to the kingdom of Italy. The chief industry of Rimini is connected with the fisheries, which are abundant, and the old harbor, now nearly filled up by sand brought in by the torrent Marecchia, serves for little else than a shelter for fishing-smacks. The Porto Canale, however, receives vessels of 120 tons. Rimini is a favorite resort for sea-bathing, the arrangements being excellent and the climate favorable. P. about 16,000; of commune, 34,000.

Rimous'ki, an extensive county of Quebec, Canada, bounded N. by the estuary of the St. Lawrence and S. partly by New Brunswick. It is to a very large extent a wilderness. It is traversed by Grand Trunk Railway. Cap. Rimouski. P. 27,418.

Rimouski, p.-v., cap. of Rimouski co., Quebec, Canada, on the S. E. shore of the St. Lawrence, 180 miles below Quebec. It is the seat of the Roman Catholic bishop of St. Germain de Rimouski, has several large buildings, including the cathedral church, a college, 2 convents of nuns, a bishop's palace, and a court-house. There is a costly government wharf, a good trade in lumber, and 1 semi-weekly newspaper. Rimouski is a favorite summer resort, having fine scenery and good trout-fishing. P. 1186.

Rin'derpest [Ger.], or **Steppe Murrain,** a contagious eruptive fever among cattle, endemic or nearly so in Russia, and occasionally sweeping as a most destructive epizoötic throughout Europe. It considerably resembles smallpox in its symptoms and progress. It is not confined to neat cattle, but attacks nearly all other ruminant mammals, and even some others. Man, the horse, swine, and fowls are quite exempt from it, so far as is known. It has thus far not been known in North America. The best treatment is the "stamping-out" process—that is, the prompt destruction of all diseased animals. The only other treatment advised is the use of strong disinfectants and occasional stimulation; but it is found very difficult by any system of isolation and treatment to prevent the spread of the disease. From 30 to 90 per cent. of the diseased animals die under any treatment.

Rindge, p.-v. and tp., Cheshire co., N. H., on Monadnock R. R. P. 1107.

Rine'hart (William H.), b. Sept. 25, 1825, in Frederick co., Md., where he spent his childhood and youth (receiving a simple education) in ordinary rustic sports, and in labor on his father's farm. Prior to his manhood he seems to have given no promise of his subsequent career. In his maturity he used to say that the most impressive hours of his youth were when, as a teamster on a lonely mountain-road, he would check his horses (with their jangling bells) while he paid silent homage to the beauty and mystery of forest, stream, and firmament. A simple accident guided this spiritual quality into a permanently happy path. A quarry opened on his father's farm led to a shop for rustic gravestones. Shortly afterward, Rinehart, then twenty-one years old, came to Baltimore, where he apprenticed himself to a marble-worker. Determined to excel, he rapidly acquired skill of hand and eye, and within two years was made chief of the ornamental work. His nights were now devoted to self-directed study. In 1850, with no instruction, and having seen no sculpture except a few public monuments, he began modelling in clay the human figure or parts of it from such subjects as chance enabled him to use. In 1855, then thirty years old, he sailed for Italy, determined to be an artist, and rarely has determination been so resolutely kept or its aim so firmly won. He remained in Florence two years, with means so narrow as to verge on absolute privation, but with such success in artistic growth that he brought back to Baltimore in 1857 two bas-reliefs (*Night* and *Morning*) of such sentiment and execution as won attention to him as unquestionably a real artist. For a year thereafter he occupied a studio in Baltimore, modelled several busts, a fountain figure for the U. S. general post-office, two supporting figures (*Indian* and *Backwoodsman*) for the clock in the new House of Representatives, Washington. In 1858, then thirty-three years old, he went to Rome, which from that time became the settled habitation of his heart. His success now was immediate and continuous till his death. At the instance of Crawford's widow, Rinehart completed the modelling of the bronze doors of the U. S. Capitol, which Crawford had left unfinished at his death. Rinehart now produced his life-size *Angel of the Resurrection* and *Jesus* ("I am the resurrection and the life"), also his *Woman of Samaria* (a noble figure) listening to Jesus; a lovely group of two *Sleeping Children*. Of this there are replicas in Greenmount Cemetery, Baltimore, in a drawing-room of that city, and in the palace of an Italian duchess at Palermo. One of Rinehart's very highest works was of this period—*Love Reconciled with Death*—bronze, life-size, for the tomb in Greenmount of his early and ever-helpful friend, Mrs. Walters. For pure womanly beauty, unconscious grace of limb and vesture, and a subtle blending of sorrow, love, and spiritual peace, this figure is a masterpiece. In 1866, Rinehart paid a brief visit to America. Returning to Rome, he did not leave there until 1872, except for brief vacation. His portrait-busts had now become so widely recognized, not only as admirable likenesses, but for their distinction and repose, that commissions came to him so liberally that he had usually two or three years of such work ahead. He made upward of 100 of them. Some of our loveliest countrywomen and some of the strongest of our men were thus perpetuated by him in a style that may challenge the best work of any period. The State of Maryland having commissioned him to make an heroic statue in bronze of the late U. S. Chief-Justice Taney, Rinehart unveiled this work in the State-house grounds, Annapolis, Dec. 10, 1872, amid a distinguished company. It was regarded at once as not only a living likeness, but in manner and expression as the ideal of a lawgiver upright, wise, and calm. On this visit to America, Rinehart brought with him what he considered the *chef d'œuvre* of his life—the work on which he said he was content to rest his fame—his statue of *Clytie*, sweetheart of the sun, when just for-

saken by Apollo. The figure is entirely nude, but unconscious of anything save the bitter-sweet of a just-vanished joy. For pathetic loveliness in body, limbs, and countenance, and for spontaneous union of all the figure in showing a woman's soul in the shadow of love's eclipse, this work has won the highest praise. While it charms all beholders with its beauty and its spiritual power, it may safely await the world's recognition as a work of the highest order. *Clytie* was bought by a gentleman of Baltimore, who gave it to the Peabody Institute of that city in perpetual trust as a free exhibition to all citizens and strangers. A replica is owned by an American lady resident in Rome. Besides the works already named, Rinehart's early years in Rome produced *Leander, Hero, Indian Girl,* and *St. Cecilia;* his later years, a monumental figure for a lady's grave at Troy, N. Y.; the group of *Latona and her Children* (the infants Diana and Apollo), *Antigone, Atalanta,* and *Endymion.* Widely different in treatment, these latter works all show a signal union of loveliness and power. The style of Rinehart was original, deeply imaginative, and profoundly infused with the old Greek feeling; his invention striking, yet full of truth; his modelling tender, strong, and patient; but the crowning excellence of his work lay in a dramatic singleness of conception and expression, which, hiding design, is the highest art, and which gives to each of Rinehart's mature works a true poetic life. A man of strong affections, he had a notable power of winning friends and holding them. His manner was conspicuously open, hearty, and cheerful; his figure, of medium height, compact and sinewy; his head remarkably fine, and he wore a full tawny beard. With a press of orders he remained in Rome at work so far into the summer of 1874 that he was attacked with disease, which in a trip too late to Switzerland and Germany ran rapidly into pulmonary consumption, of which he died in full consciousness and peace, surrounded by devoted friends, Oct. 28, 1874, ten days after his return to Rome. Rinehart was never married. By will (after providing properly for his kinsmen) he left the whole remainder of the savings of his art-career ($45,000) in trust in Baltimore for the help of struggling art-students and to found a lectureship on sculpture. His remains were buried in the Protestant cemetery, Rome; afterward disinterred and, Jan. 4, 1875, laid at rest in Greenmount Cemetery, Baltimore. JOHN W. MCCOY.

Ring [Ang.-Sax. *hring*], an ornament worn on the finger, frequently invested with symbolical meaning. From the remotest antiquity the finger-ring (usually connected with a seal) was an emblem of an authority which could be delegated by the simple process of delivering it to an agent. The cases of Pharaoh and Ahasuerus are instances in point. Precious stones of great value were employed in rings by the Hebrews and Persians, and later by the Greeks and Romans. They have long been in almost universal use in Christendom as tokens of marriage or betrothal, and are often engraved with mottoes. The "fisherman's ring" is an indispensable article of the papal chancery, and the custom has been imitated by the bishops of some Christian churches. Magical virtues have often been ascribed to rings both by pagan and Christian nations, and traditions of poison concealed in rings have played a large part in the criminal annals of the Middle Ages.

Ring (BERNARD JACQUES JOSEPH MAXIMILIEN DE), b. at Bonn in Rhenish Prussia May 27, 1799, of Alsatian parents; received a completely French education; devoted himself from his sixteenth year to the study of archæology; resided from 1815 to 1848 in various places of Germany, investigating German antiquities, and wrote: *Vues pittoresques des Vieux Châteaux du Grand-duché de Bade* (folio, 1829), *Description du Château du Tubingue* (1835), *Établissements celtiques dans le Sud-ouest de l'Allemagne* (1842), *Histoire des Germains depuis les temps les plus reculés jusqu'à Charlemagne* (1850), *Établissements romains du Rhin et du Danube* (2 vols., 1852–53, crowned by the Academy), *Essais sur la Rigsmaal-Saga et sur les trois Classes de la Société germanique* (1854), and *Histoire des Peuples opiques, de leur Législation, de leur Mœurs, de leur Langue, etc.* (1859).

Ring (MELCHIOR), was school-master in Hersfeld, Hesse; removed in 1523 to Eckardtshausen in Saxony; met here with Thomas Münzer, and became immediately one of his most ardent disciples. In 1524 he went with Knipperdolling, Melchior Hoffmann, and other Anabaptist leaders to Stockholm, where he caused a great commotion and violent riots, but returned in the same year to Saxony to take part in the Peasants' War. After the battle of Frankenhausen, he fled to Switzerland, where he preached with great success, especially at St. Gallen, but in 1527 he was obliged to leave the country because one of his most intimate friends and disciples, Thomas Schugger, committed wilful murder at an Anabaptist meeting, and declared the deed to be a divine inspiration. Returning to Hersfeld, he preached partly in Hesse, partly in Saxony, explaining that by baptism infants were sacrificed to Satan; that Luther, although originally a God-awakened man, had now become the very Antichrist, etc. Persecuted by the civil authorities, he repaired in 1528 to East Friesland, and made a great impression both in Emden and Bremen, but was finally expelled in 1530, and returned to Hesse. Here he was imprisoned, but escaped to Münster, where he probably found his death during the Anabaptist war. All his writings have perished.

Ringat, the principal town of Indragiri, a state of Sumatra, dependent on the Netherlands, stands in lat. 0° 21′ S., on the river Indragiri, 60 miles from its mouth, and has between 2000 and 3000 inhabitants. In 1838 the Dutch took possession of the country, and added it, under an assistant resident, to Riom; but in 1843 England objecting to this arrangement, the relations between the country and the Dutch government became somewhat looser.

Ring′bone, an exostosis or bony tumor on the coronet of the horse, most common on overworked horses, but sometimes seen on colts, or even newly-dropped foals. Ringbone may stiffen and spoil a horse for the road, although not unfrequently there is no practical trouble from it; but it injures a horse's market-value, and is practically incurable.

Ring′genberg, village of Switzerland in the canton of Berne, on the south-western shore of Lake Brienz, contains some interesting ruins of the castle of Ringgenberg, which was destroyed in 1352 in a war between the feudal lords and the inhabitants of the village.

Ring′gold, county of S. Iowa, on Platte and Grand rivers, adjoining Missouri, has a rolling surface and a fertile soil. Staples, Indian corn, hay, wool, and butter. Sheep and swine are numerous. Cap. Mount Ayr. Area, 576 sq. m. P. 5691.

Ring′gold, p.-v., cap. of Catoosa co., Ga., on Western and Atlantic R. R., 115 miles N. W. of Atlanta, has a Masonic educational institute, several churches, a handsome court-house, with offices for the county officials, 1 newspaper, dry-goods, grocery, and drug stores, abundant water-power, rich deposits of iron ore, and grist and flouring mills. The famous Catoosa and Cherokee Springs are located in the county. P. of v. 316.

W. H. WALKER, ED. "CATOOSA COURIER."

Ringgold, p.-v. and tp., Washington co., Md. P. 763.

Ringgold, p.-v., Union tp., Morgan co., O. P. 79.

Ringgold, v., Walnut tp., Pickaway co., O. (EAST RINGGOLD P. O.). P. 121.

Ringgold, p.-v. and tp., Jefferson co., Pa. P. 1006.

Ringgold (CADWALADER), b. in Maryland in 1802, son of Gen. Samuel Cadwalader; entered the U. S. navy as a midshipman 1819; became captain 1856, commodore 1862, and rear-admiral 1867; was for a time in command of a surveying and exploring expedition in the North Pacific and China seas; was employed upon the blockade of Southern ports during the civil war, and retired Dec., 1864. D. in New York City Apr. 29, 1867.

Ring′kjöbing-fjord, lagoon of Denmark, on the west coast of Jutland, 28 miles long from N. to S., and 9 miles broad from E. to W., is separated from the North Sea by a narrow strip of land hardly one mile across and covered with sand-banks, and contains the fertile island of Holmsland, with 1920 inhabitants. On its north-eastern shore stands Ringkjöbing, a well-built little town with about 2000 inhabitants, and a harbor at Haurvig, 10 miles distant, among the sand-banks.

Ring′-Money. In rude and low stages of civilization the use of rings of the precious and other metals for personal adornment is, as is well known, very much more prevalent than in enlightened society. The great value attached to such rings gave them an early value for purposes of exchange. This use of rings, even of iron and copper, both for decoration of the person and for money, is still prevalent in Africa. In ancient Egypt ring-money of silver and gold prevailed. From the old Gauls and Norsemen its use descended to mediæval Europe. Curious pre-historic ring-money may be seen in the large museums, some designed to be worn as bracelets and bangles, others fit for wearing on the fingers. In mediæval times the weight and value of ring-money were fixed by statutes.

Ring′sted, town of Denmark, in the island of Sealand, on the railway from Copenhagen to Korsör, was a place of considerable importance in the twelfth and thirteenth centuries, and has an interesting old church containing several royal tombs and other monuments. P. about 2000.

Ring′worm, a parasitic cutaneous disease occurring most frequently among children and upon the face and neck. It was formerly described as *herpes circinatus,* and

regarded as a vesicular disease. It is more properly *tinea circinatus*, being analogous to *tinea sycosis*, or barber's itch, and *tinea decalvans*, or bald spots of the head. These diseases are due to a parasitic growth, consisting of innumerable sporules which find a nidus in the hair-follicles and excite secondary inflammation of the skin. Ringworm is contagious, not only from person to person by close contact, but in the uncleanly is transplanted from spot to spot on the head and hands or wrists. The treatment is by "parasiticides," or remedies destructive to parasitic life. Local application of tincture of iodine, iodine and ammonia, sulphurous acid, sulphur dry or in ointment, carbolic acid, creosote, oil of cade, mercurial ointment, oleate of mercury, solution of corrosive sublimate, and cantharidal collodion.

E. Darwin Hudson, Jr. Revised by Willard Parker.

Rin'mann's Green, Cobalt Green, or **Zinc Green,** a beautiful green pigment, consisting of the oxides of cobalt and zinc, prepared by (1) precipitating a mixture of the sulphates of cobalt and zinc with carbonate of soda, washing, and igniting; (2) evaporating and igniting a mixture of the nitrates of the two metals; (3) mixing moist carbonate of cobalt with oxide of zinc in the proportion of 1 to 1.5 CoO to 9 or 10 ZnO, drying and igniting; (4) the finest color is obtained by mixing moist phosphate, arsenite, or arseniate of cobalt with oxide of zinc, drying, and igniting. C. F. Chandler.

Ri'o, p.-v. and tp., Knox co., Ill., on Rockford Rock Island and St. Louis R. R. P. 1133.

Rio, p.-v., Otsego tp., Columbia co., Wis., on La Crosse division of Milwaukee and St. Paul R. R. P. 300.

Ri'o Arri'ba, county of N. W. New Mexico, on the Arizona frontier, traversed by the Rio Grande and San Juan River, is crossed by several mountain-ranges. Sheep-raising is the chief industry. Cap. Los Luceros. Area, about 5500 sq. m. P. 9294.

Riobam'ba, town of Ecuador, South America, on the eastern slope of Chimborazo, at an elevation of 8616 feet above the sea, enjoys a very mild and healthful climate. It was entirely destroyed by an earthquake in 1797, which killed 30,000 people in a few minutes, and the new town is rather indifferently built. It has some manufactures of sailcloth, covers, and gloves. P. about 16,000.

Ri'o Bran'co, a river of Brazil, rises in lat. 3° N., lon. 64° W., flows E. and S., and joins the Rio Negro after a course of about 700 miles. Its navigation is much impeded by rapids and falls.

Ri'o de Jane'iro, province of Brazil, extends along the Atlantic from lat. 21° 15′ to 22° 23′ S., bounded by the provinces of São Paulo, Minas Geraes, and Espiritu Santo. Area, 18,060 sq. m. P. 556,080 in 1850; 1,400,000 in 1869; which latter figure, however, is considered to be too high. The coast-land is generally low, marshy, and unhealthy, while the interior of the country is elevated, mountainous, and healthy. The soil is extremely fertile, and sugar, coffee, cotton, and rice are the common productions; coffee is the most important and the most extensively cultivated.

Rio de Janeiro ("river of January"), the largest city of South America, the capital of Brazil, in lat. 22° 54′ S., lon. 43° 10′ W., on the western shore of the Bay of Rio de Janeiro. The bay, entered from the S. through a passage not more than 1700 yards wide, between steep hills rising more than 1000 feet, extends inland about 15 miles, with a width of from 2 to 9 miles, and forms one of the safest, most spacious, and most beautiful harbors in the world. The entrance, girded on both sides with lines of impregnable fortifications, can be made without the aid of pilots, and the largest vessels can anchor immediately at the quays of the city and enter its magnificent docks. The city, stretching for about 6 miles along the bay in a plain whose surface is diversified by several low conical hills, presents a most picturesque aspect with its gayly-colored houses among the luxuriant tropical vegetation, but when entered it proves somewhat disappointing. The older part consists of narrow, ill-arranged streets lined with insignificant houses; in the newer parts the streets are broader and the houses larger and more elegant; but the city has no buildings or public squares of any architectural merit. The churches, numbering about 60, are often decorated very richly, even gaudily, in the interior, but the exterior is generally bare and unimpressive. The imperial palace, the government buildings, the post-office are utterly insignificant. The finest buildings are the military barracks, the opera-house, and the national museum. The only architectural monument of any interest is the aqueduct, 12 miles long, commenced in the middle of the seventeenth and finished in the middle of the eighteenth century, built of huge blocks of granite, and conducting the water from Mount Corcovado, across a valley 740 feet wide and 90 feet deep, on two tiers of arches into the numerous fountains of the city. The public squares, of which that of Campo Santa Anna is the largest, are unadorned and neglected, and almost the only charm of the city is the view on the bay, with the exception of the adjacent botanical garden, containing the celebrated avenue of palm trees. Nevertheless, as the residence of the emperor, the seat of the government, and a commercial emporium of first rank, the city develops a vigorous life in many directions. Its educational institutions are numerous and good, especially the medical school and the polytechnic institute. Its hospitals and other charitable institutions are well arranged and effective. Several branches of industry are carried on to a considerable extent, such as shipbuilding and the manufacture of soap, cotton goods, machinery, cigars, etc. But it is chiefly from its commerce that the city derives its importance; the custom-house is its largest building. In 1873 the harbor was entered by 4431 foreign vessels of 2,639,362 tons burden, and 6421 Brazilian vessels of 1,051,928 tons burden; and cleared by 3358 foreign vessels of 2,807,299 tons burden, and 7203 Brazilian vessels of 1,345,648 tons burden. The value of the imports amounted in the same year to $36,511,450; that of exports to $52,643,275. The principal article of exportation is coffee, the value of which in 1873 amounted to $48,048,725; about 50 per cent. was shipped to the U. S. The Bay of Rio de Janeiro received its name from Juan Diaz de Solis, who entered it Jan. 1, 1515. The first settlement was made by the Portuguese in 1531, but it was afterward abandoned. In 1555 some French Huguenots settled here, but they were expelled in 1565 by the Portuguese, who in 1567 formed a permanent settlement. In 1763 the city became the capital of the Portuguese vice-royalty, and in 1822 of the independent Brazilian empire. P. about 260,000.

Rio de la Plata. See Plata, Rio de la.

Ri'o Gran'de, new county of S. W. Colorado, on the river of the same name, is mountainous; includes the San Juan range and the gold-mines of the San Juan Valley. Cap. Del Norte. Area, 1200 sq. m.

Rio Grande City, p.-v., cap. of Starr co., Tex., on the Rio Grande, 100 miles above Brownsville.

Rio Gran'de del Nor'te, or **Rio Bra'vo,** a large river which rises in S. W. Colorado, flows first E. and then S. through New Mexico, flows thence S. E., forming for several hundred miles the boundary between the U. S. and Mexico, and falls into the Gulf of Mexico after a course of more than 1500 miles. It is navigable for but a small portion of its lower course, is generally shallow, frequently interrupted by rocks and cataracts, and is subject to periodical inundations near its mouth. Its principal tributary is the Rio Pecos, 700 miles long. The important towns of Brownsville, Tex., and Matamoras, Mexico, are situated on opposite sides of the Rio Grande, 35 miles above its mouth.

Rio Grande do Norte, province of Brazil, extends along the Atlantic from lat. 4° 30′ to 6° 45′ S., and is bounded by the provinces of Parahiba and Ceara. Area, 16,842 sq. m. P. 50,000 in 1815, of whom one-half were Indians, and the other Europeans, negroes, and mestizoes; in 1846 the number of inhabitants was given as 147,513, and in 1864 as 200,000. The coast-land is low and unhealthy; the interior is higher, and eminently suited to agriculture and the rearing of cattle, which form the two principal branches of industry. Cotton and sugar are the chief crops. Cap. Natal.

Rio Grande do Sul, or **São Pedro do Rio Grande do Sul,** the southernmost province of Brazil, bounded S. and W. by the Argentine Republic, N. by the province of Parana, and E. by the Atlantic. Area, 85,239 sq. m. P. 341,755 in 1858, and 370,446 in 1863, of which many are Europeans (including about 40,000 Germans), and very few Indians. This province is better adapted to agriculture than any other part of Brazil. Wheat, beans, maize, and potatoes are now cultivated in regular crops, and agricultural products form a large portion of the exports, though hides, tallow, smoked and salted beef are still the principal items, but the progress of the province has been so rapid as to double the amount of exports between 1856 and 1861. Chief towns, Porto Alegre and Rio Grande do Sul.

Rio Grande do Sul, town of Brazil, in the province of the same name, has a good harbor on the mouth of the river of the same name, whence were exported, in 1872–73, hides, $5,037,312; horse-hair, $247,200; wool, $149,544, etc.; total, $5,534,611. P. about 18,000.

Riom', town of France, department of Puy-de-Dôme, is beautifully situated on a hill at the river Ambène, and

has fine broad streets provided with fountains; large distilleries, tanneries, manufactures of linen, and an active trade in corn, wine, hemp, and wax. P. 10,770.

Ri′o Ne′gro, a river of South America and the principal affluent of the Amazon on its northern side, rises in an unexplored region of Colombia, where it is known as the Rio Guainia, flows in a south-eastern direction, and joins the Amazon, after a course of about 1000 miles, at Manaos, in Brazil, in lat. 3° 10′ S. and lon. 59° W. Through its affluent, the Cassiquiare, communication has been established by canals between the Amazon and the Orinoco.

Rio Negro, a river of South America, rises in the Andes in Chili, flows eastward, forming the boundary between the Argentine Republic and Patagonia, and falls into the Atlantic in lat. 41° 3′ S., after a course of about 700 miles. It is unfit for navigation 4½ miles from its mouth, as its current is very rapid and its bed narrow and obstructed with shoals and sandbanks. Its banks are fertile and covered with willow trees.

Rione′ro in Voltu′re, town of Southern Italy, province of Potenza, pleasantly situated about 7½ miles S. of Melfi, well built, not without the comforts of life. Inhabitants, industrious and thriving. P. 12,000.

Ri′ot [O. Fr. *riote*]. As defined by a writer of high authority, a riot at the common law is a tumultuous disturbance of the peace by three or more persons assembling together of their own authority, with an intent mutually to assist one another against all opponents in the execution of some enterprise of a private nature, whether lawful or unlawful, and afterward actually executing the same in a violent and turbulent manner, so as to excite terror among the people. Its exact nature may be better understood by comparing it with the minor grades of the same genus of offences. In a *riot* there is a turbulent meeting of persons upon some common purpose, which they actually execute in a violent manner; a *rout* is a similar meeting for a similar purpose, which is not executed, but where a motion merely is made to carry it into effect; while an *unlawful assembly* is a meeting for a similar purpose, but for the execution of which no motion even is made. It is essential to a riot that the object for which the persons are collected, and to accomplish which the violence is used, should be of a private nature;-as, for example, it should relate to some private wrong to be remedied or to some private quarrel to be settled. When the purpose is of a public nature—as, for example, when the assembly is designed to prevent by violence the enforcement of a general law, or to compel its repeal, or to do acts of mischief and destruction under pretence of reforming a public grievance —the crime would formerly have been treason, and at the present day would be sedition or treason-felony in England. From the comprehensive definition above given it is plain that several elements must coexist in order to constitute a riot. The assembly itself must be unlawful. If among a number of persons innocently collected a sudden quarrel arises, and results in a fight between divers individuals, or even a general conflict, this would be an affray, and the parties actually engaged would be guilty of assault and battery. It is possible, however, that a lawful assembly may by the acts of its members be converted into an unlawful one, and thence into a riot. Three persons at least are required by the common law to constitute such an assembly. In the second place, there must be a common intent in this assembly to accomplish some private object or enterprise in a violent manner. It is entirely immaterial whether this object be in itself lawful or unlawful. For example, it is lawful to abate a nuisance in a peaceable manner, but if three or more should unite to do it by violence and with a breach of the peace, and should proceed to accomplish their purpose, they would be rioters. The common intent to use violence is indispensable, for three or more persons may join in doing a great variety of unlawful acts, and even trespasses, and no riot ensue. Finally, the common enterprise must be accomplished, and that in a violent and tumultuary manner, so as to inspire terror among the people. It has been said in some cases and by eminent judges that if the assembly is actually armed, it is not necessary that it should proceed to the extremity of carrying out its design in the manner above stated, since the possession of arms alone is sufficient to inspire the popular terror which seems to be the essence of the crime. The foregoing common-law features have been generally preserved in the law of this country, although slight modifications have been made by statute or by judicial decision in some of the commonwealths. It is provided in a few States that two persons may constitute a riot, and in one or two an unlawful assembly is unnecessary. When a riot actually exists, all those who form a part of the assembly, and aid, abet, or encourage its object or design, are alike guilty, since a common intent unites the whole, and each must be held responsible for whatever is done in accomplishing that purpose. JOHN N. POMEROY.

Riouw′, or **Rhio,** a Dutch residency in the Malay Archipelago, consisting of several groups of islands, such as the Riouw, Lingga, Tambilan, Anambas, and Natuna, which lie in the China Sea between Banca, Sumatra, and Malacca to the W. and Borneo to the E. The entire area of these island groups is 3120 sq. m.; their population, about 75,000. They are high, covered with dense forests which yield many varieties of excellent timber, and produce rice, sago, pepper, gambir, gutta-percha, cotton, and fruits. Edible birds' nests abound. Distilling of arrack, weaving of silk, brickmaking, and fishing are the principal branches of industry besides agriculture and shipbuilding.

Ri′o Vir′gin, formerly a county of Utah, united to Washington co. since the census of 1870. P. 450.

Ri′o Vis′ta, p.-v. and tp., Solano co., Cal., on Suisun Bay, at mouth of Sacramento River. P. 319; of tp. 888.

Ripa′rian Rights. This term, derived from the Latin *ripa*, "the bank of a stream," denotes, in the technical nomenclature of the law, the rights to the water and the soil held by the proprietors of land abutting upon rivers and all other natural water-courses. The nature and extent of these rights are determined by the character of the stream itself—whether it is navigable or not navigable. At the common law—because in England the geographical or topographical fact is invariably consistent with the legal rule—a navigable stream is one in which, and as far as, the tide ebbs and flows. The absurdity of applying this narrow doctrine to the great rivers of the U. S. was admitted by our courts at an early day, and the principle is now settled by the State as well as by the national tribunals that all those streams which are navigable in fact for vessels customarily used for the operations of commerce, or which can be made so by the removal of temporary obstructions without changing their natural character, are navigable in law. The bed of navigable rivers up to high-water mark if tidal, and to the average water-mark if not tidal, belongs to the State. While the public possesses the rights of navigation and of fishing, the State has the exclusive ultimate control of the shore below the line of its jurisdiction, and the sole power to permit and regulate the construction of wharves and other erections thereon; it may grant this authority to private persons or to municipalities, as is the case in New York City. The doctrine of riparian rights has special reference to non-navigable water-courses. The owner of land abutting on such a stream, unless restricted by the conveyances under which he claims title, owns the bed thereof up to the middle line between the permanent banks, and a deed of land described as bounded by such stream includes that portion of the bed, unless the terms of the description sufficiently indicate an intent that the premises conveyed shall extend no farther than the bank. The proprietor of land lying on the opposite sides—that is, of land through which the stream runs —owns the entire bed thereof within the limits of his property. The rules of law applicable to such water-courses are based upon the principle that all the successive owners through or by whose land the stream flows have, in the absence of any different arrangements among themselves, the same rights; that while each owns the whole bed or the half of it in the manner before stated, he does not own the running water; that each has only the usufruct of the flowing water as long as it is entirely within his own territory, but cannot appreciably lessen its amount, and must permit it all to flow in its natural channel to the land immediately below his, and cannot interfere with its similar use by other proprietors either above or below him. It follows that an owner through whose land an unnavigable stream runs may use the water for mills, for irrigation, and for any other economic purpose, as long as it is completely within his bounds: he may divert it into artificial channels, but must restore it to its natural channel, so that it will flow therein out of his premises; he may erect a dam and set back the water within its natural banks, but cannot cause it to overflow upon the lands of proprietors above him. It is provided by statute, however, in a few States, that the owners of certain kinds of mills and manufactories may acquire the right of flowing the lands of others through proceedings instituted under the power of eminent domain; but the validity of such laws is denied by the courts of many States. Where there are different owners upon the opposite sides of a stream, neither possesses the rights as above described to use the water without the consent of the other, since both, while owning their respective halves of the bed, are entitled to undivided shares of the entire mass of flowing water. These common-law rules may be changed in various modes. Exclusive rights to use the water, to

permanently divert it into artificial channels, to discharge it in such manner upon the land below, or to overflow the land above, may be, and often are, obtained by express grant from the proprietors whose lands are thus burdened by an easement, or by prescription or adverse user for a period of time regulated by statute; which period in most of the States is twenty years. If the soil of one riparian proprietor is gradually increased by the deposits of the current, the addition, under the name of alluvion, becomes his own, even though the stream should slowly encroach upon his opposite neighbor; but if the water-course should suddenly desert its ancient bed, and form for itself a new channel, the original boundary-line between the opposite proprietors running through the middle of the old bed is still preserved unchanged. JOHN NORTON POMEROY.

Ripatranso'ne, town of Italy, province of Piceno, about 20 miles S. S. E. of Fermo, occupying the summit of five hills. The churches, palaces, etc. are well worthy of attention in themselves, and contain many objects of artistic and archæological interest, especially in the way of ancient inscriptions disinterred near this town. There is a curious old labyrinthine cavern in this neighborhood, known as La Santità, supposed to have been a place of retreat for the early Christians. P. 6000.

Rip'ley, county of S. E. Indiana, on Laughery Creek, has a level surface and a fertile soil, is intersected by the Ohio and Mississippi and Indiana Cincinnati and Lafayette R. Rs. Staples, Indian corn, wheat, hay, tobacco, hops, sorghum-molasses, wool, and butter. Sheep and swine are numerous. There are several manufactories, especially of carriages, saddlery, and harness, and many tanneries and flouring and saw mills. Cap. Versailles. Area, 450 sq. m. P. 20,977.

Ripley, county of S. E. Missouri, on the Arkansas frontier, traversed by Current River and many other streams, has a rugged surface. Chief products, Indian corn and butter. Cap. Doniphan. Area, about 600 sq. m. P. 3175.

Rip'ley, tp., Bond co., Ill. P. 972.

Ripley, p.-v. and tp., Brown co., Ill. P. 593.

Ripley, tp., Montgomery co., Ind. P. 1433.

Ripley, tp., Rush co., Ind. P. 1841.

Ripley, tp., Butler co., Ia. P. 299.

Ripley, tp., Somerset co., Me. P. 584.

Ripley, tp., Dodge co., Minn. P. 294.

Ripley, p.-v., cap. of Tippah co., Miss., on Ripley R. R., in the extreme N. portion of the State, contains 5 churches, 3 schools (2 for whites and 1 for colored pupils), Freemason and Odd Fellow lodges, organizations of Good Templars and Grangers, 1 newspaper, 1 furniture establishment, a first-class flouring, grist, and saw mill, 3 hotels, and a printing-office. Large quantities of cotton are annually shipped from Ripley. P. 422.

R. F. FORD, ED. "RIPLEY ADVERTISER."

Ripley, p.-v. and tp., Chautauqua co., N. Y., on Lake Erie and on Lake Shore and Michigan Southern R. R., is the extreme western township of the State, and includes the thriving village of Quincy. P. of tp. 1946.

Ripley, p.-v., Union tp., Brown co., O., on Ohio River, has 2 newspapers and considerable interest in manufacturing and in river-trade. P. 2323.

Ripley, tp., Holmes co., O. P. 1101.

Ripley, tp., Huron co., O. P. 1089.

Ripley, p.-v., cap. of Lauderdale co., Tenn., on Memphis and Paducah R. R., has 4 churches, a female college, 1 academy, 1 newspaper, and 1 steam saw and flouring mill. Large forests of excellent timber abound and the soil is very productive. P. 532.

JAMES L. SPARKS, ED. "RIPLEY NEWS."

Ripley, tp., Jackson co., West Va. P. 226.

Ripley (ELEAZER WHEELOCK), b. at Hanover, N. H., Apr. 15, 1782, a nephew of Pres. John Wheelock and a son of Sylvanus Ripley, D. D., professor of divinity at Dartmouth (d. Feb. 5, 1787); graduated at Dartmouth College 1800; practised law some years in Maine, residing chiefly at Portland; was a member of the Massachusetts legislature 1810–11; Speaker and elected State senator 1812; was appointed colonel of the 21st Infantry 1813; was wounded in the attack upon York (now Toronto), Canada, Apr. 24, 1813; became brigadier-general Apr. 14, 1814; commanded the 2d brigade under Gen. Brown on the Niagara frontier; took part in the battles of Chippewa and Niagara, being severely wounded in the latter, in which he won the brevet rank of major-general; was conspicuous for gallantry in the defence of Fort Erie, Aug. 15, and in the sortie of Sept. 17, when he was shot through the neck; was the recipient of a gold medal from Congress; resigned from the army 1820; settled in Louisiana, where he practised law; served in the State senate, and was a member of Congress 1835–39.

Ripley (GEORGE), LL.D., b. at Greenfield, Mass., Oct. 3, 1802; graduated at Harvard 1823, and at Cambridge Divinity School 1826; was pastor of a Unitarian church in Boston 1828–31; resided several years in Europe, where he made a careful study of French and German literature; wrote *Discourses on the Philosophy of Religion* (1839), *Letters to Andrews Norton on the Latest Form of Infidelity* (1840), and edited *Specimens of Foreign Standard Literature* (14 vols., Boston, 1838–42); was associated with Emerson and Margaret Fuller in conducting the *Dial* 1840–41; contributed to the *Christian Examiner* and other magazines; was the chief promoter of the celebrated socialistic experiment at Brook Farm, Roxbury, Mass., 1844–46; was one of the editors of the *Harbinger*, a Fourierite organ, 1844–48; removed to New York 1847; became literary editor of the New York *Tribune* 1849; published (with Bayard Taylor) *A Handbook of Literature and the Fine Arts* (1852), and edited (with Charles A. Dana) Appleton's *New American Cyclopædia* (New York, 16 vols., 1858–63), of which a new edition, under the title *The American Cyclopædia*, appeared 1873–76. Dr. Ripley received the degree of LL.D. from Lawrence University in 1874.

Ripley (HENRY JONES), D. D., b. at Boston, Mass., June 28, 1798; graduated at Harvard 1816, at Andover 1819; was for several years pastor of a Baptist church in Liberty co., Ga.; was from 1826 to 1860 professor at the Baptist Theological Institute at Newton, Mass., and author of numerous works upon biblical intepretation and theology. Among them are—*Notes on the Four Gospels* (2 vols., 1837–38), on the *Acts of the Apostles* (1844), on the *Epistle to the Romans* (1857), on *Hebrews* (1868), *Christian Baptism* (1833), *Sacred Rhetoric* (1849), and *Church Polity* (1867). D. at Newton Centre, Mass., May 21, 1875.

Ripley (JAMES W.), b. in Connecticut in 1794; graduated at the U. S. Military Academy, and promoted second lieutenant of artillery 1814; was advanced through grades of first lieutenant and captain, and, upon its formation in 1832, was transferred to the ordnance department, and therein promoted as major and lieutenant-colonel; chief of ordnance of the department of the Pacific 1855–57, and brigadier-general and chief of ordnance U. S. A. Aug. 3, 1861, in which capacity he continued until Sept., 1863, when he was honorably retired from active service. He served in the war with Great Britain 1814–15, against the Seminole Indians 1817–18. In 1860–61 he was sent on special duty to Japan. Brevet major-general Mar. 13, 1865. D. at Hartford, Conn., Mar. 15, 1870.

Ripley (ROSWELL S.), b. in Ohio in 1824; graduated at the U. S. Military Academy, and commissioned brevet second lieutenant of artillery in 1843; served throughout the war with Mexico, and brevetted captain and major for gallantry. In 1853 he resigned to engage in business in Charleston, S. C. In Apr., 1861, he directed the fire upon Fort Sumter, was made brigadier-general C. S. A., and wounded at Antietam; subsequently served in South Carolina. Author of a *History of the War with Mexico* (1849).

Rip'on, town of England, in Yorkshire, has a fine cathedral of the twelfth century, several tanning, malting, and founding establishments, and 6805 inhabitants.

Ripon, city and tp., Fond du Lac co., Wis., 84 miles N. W. of Milwaukee, is the site of Ripon College, containing about 400 students, and possesses in addition excellent schools, several churches, 2 banks, 2 newspapers, 2 public halls, an industrial exhibition, several large mills, 3 hotels, a pickle-factory, and a well-organized fire department. The city is supplied with gas, and stages run to all important points. It is the central point of 4 lines of railroad, affording the city excellent communication with places in every direction. P. of city, 2976; of tp. 4119.

W. H. BAILHACHE, ED. "COMMONWEALTH."

Ripon (GEORGE FREDERICK SAMUEL **Robinson**), D. C. L., MARQUIS OF, long known as Earl de Grey and Ripon, b. in London, England, Oct. 24, 1827, only son of Frederick John Robinson, first earl of Ripon (who under the title of Viscount Goderich was premier for a few months 1827); became attaché to the English legation at Brussels 1849; sat in Parliament as Viscount Goderich from 1852 until he succeeded to the earldom on the death of his father, Jan. 28, 1859; inherited the earldom of De Grey on the death of an uncle Nov. 14, 1859; became in the same year undersecretary for war, and in Feb., 1861, under-secretary for India; became secretary for war, with a seat in the cabinet, on the death of Sir G. C. Lewis, Apr., 1863; was made secretary of state for India Feb., 1866, and lord

president of the council Dec., 1868; was chairman of the high joint commission which negotiated the Treaty of Washington 1871; was rewarded with the title of marquis on his return, June 23; was installed grand master of the Freemasons of England Apr. 23, 1870, but resigned that position Aug., 1874, and was received into the Roman Catholic Church at Brompton Sept. 4, 1874.

Ripos′to, town of Italy, province of Catania, on the Ionian Sea, about 26 miles N. N. E. of Acireale. It is the emporium for the exportation of the favorite wine of Mascoli, as well as of other rich products of the vicinity; and here also are embarked the frozen snows of Etna for the ice-supply of Malta. P. 8000.

Rip′ple-Marks, so-called, in geological strata, appear in some instances to have been indeed formed on sea-beaches or river-banks, though not always on the surface. Other so-called ripple-marks are unquestionably wind-marks made in drifting sand. Many deep wave-marks were undoubtedly made by the vibration of sands beaten by waves, and it is believed that such marks may be formed at the depth of even 500 feet.

Ripp′ville, v., Chambers co., Ala. P. 709.

Rip′ton, p.-v. and tp., Addison co., Vt. P. 617.

Ris′er's, v., Talladega co., Ala. P. 1488.

Ris′ing Sun, city, cap. of Ohio co., Ind., situated upon Ohio River, 34 miles below Cincinnati, O., has communication three times a day with Ohio and Mississippi R. R., and contains 7 churches, fine educational advantages, 2 newspapers, a steam-tannery, 2 furniture-factories, 1 plough and 3 carriage factories, 1 planing-mill, and 2 flouring-mills. P. 1760. F. J. Waldo, Ed. "Recorder."

Rising Sun, p.-v. and tp., Cecil co., Md., on Philadelphia and Baltimore Central R. R. P. 277; of tp. 2618.

Risto′ri (Adelaide), b. in 1821 at Cividale, in Friuli, Italy, the daughter of humble comedians, who introduced her even in infancy upon the stage. When but four years old she played childish parts; at twelve, those of soubrette; at fifteen she was connected with a fixed troupe; at twenty she had attained distinction at Parma, and later at Leghorn. At this period her talent was in comedy; her favorite pieces were the plays of Goldoni. From comedy she passed, through drama, to tragedy. In 1847 her marriage with the young marquis Capranica del Grillo withdrew her from the profession for about two years. Her success in a performance given for charity revived her ambition, overcame the scruples of her husband's family, and she reappeared as a tragedienne. Again her career was interrupted, this time by the siege of Rome, which closed the theatres. Ristori left the stage for the hospitals, and there labored as a Sister of Charity. In 1850 she reappeared, and for several years played in the Italian cities, as Myrrha, Francesca di Rimini, Pia dei Tolomei, and Maria Stuarta. In 1855 her career began in Paris with great éclat. She was invited to establish herself at the Comédie Française, but declined. From this date her reputation was European. In 1857 she was triumphantly received in Spain; in 1860–61 her triumphs were repeated in Holland and at St. Petersburg; in 1862, King William at Berlin bestowed on her the medal of science and art; in 1864 she visited Constantinople; in 1866 came to the U. S., going thence to South America, Brazil, the Argentine Republic, and Havana; in 1874 was again in America. The popular pieces here were *Queen Elizabeth, Marie Antoinette, Mary Stuart.* She played also Judith, Medea, La Theresa, Lucrezia Borgia, Pia dei Tolomei—in fact, all her famous pieces. The circumstance that Ristori appeared in Paris during the reign of Rachel forced comparisons between them which otherwise would not have been thought of. They had little in common. Rachel was a woman of singular genius—Ristori was a woman of fine talent and most accomplished in her art. She had beauty, as Rachel had not, and she was a good woman, an excellent wife and mother, generous and sincere. At this writing Ristori has not finally abandoned the stage, though her retirement has been several times predicted. According to last advices, she was to play in London with Tomaso Salvini.

O. B. Frothingham.

Rit′chie, county of N. W. West Virginia, on Hughes River, a tributary of the Little Kanawha, has a mountainous surface, is largely covered with forests, and is crossed by Parkersburg division of Baltimore and Ohio R. R. Staples, Indian corn, oats, sorghum-molasses, tobacco, wool, and butter. Cap. Harrisville (Ritchie Court-house P. O.). Area, about 450 sq. m. P. 9055.

Ritch′ie, tp., Ohio co., West Va. P. 4126.

Ritchie (Anna Cora **Mowatt**), b. in Bordeaux, France, about 1818, being the daughter of a New York merchant, Mr. Samuel G. Ogden; returned to the U. S. when six years of age; exhibited in childhood great proficiency in private dramatic representations; married at the age of sixteen Mr. James Mowatt, a lawyer of New York; published an epic poem in five cantos, *Pelayo* (1836), and a play, *Gulzara* (1840); subsequently wrote several novels and dramas; made a successful début as an actress in New York June 13, 1845; made professional tours in England and the U. S.; lost her husband in 1851; married Mr. W. F. Ritchie, editor of the Richmond *Enquirer*, 1854, on which occasion she retired from the stage, but made several subsequent contributions to literature, including *The Autobiography of an Actress* (1854). D. in England July 28, 1870.

Ritchie (Thomas), b. at Tappahannock, Va., Nov. 5, 1778; received a good education; taught school for some time, and studied, but never practised, medicine, and founded in 1804 at Richmond a Democratic newspaper subsequently called the *Enquirer*, of which he was editor and proprietor more than forty years, wielding an immense political influence both in local and national politics. In 1845 he left the management of the *Enquirer* to his two sons, and at the request of Pres. Polk founded and edited the Washington *Union* as the organ of the administration, retiring from that post on the accession of the Whig adminstration of Gen. Taylor in 1849. D. at Richmond July 12, 1854.

Ritchie Court-house, P. O. name of Harrisville (which see), cap. of Ritchie co., West Va.

Rite [Lat. *ritus*, a "usage"] designates not merely a religious ceremony, but the aggregate of such ceremonies or the ritual system of any Church. Thus, the Roman Catholic Church is divided into the Latin and the Eastern Rite (which see), and the Latin rite has some minor rites. Thus, the Ambrosian rite in Northern Italy had 1,115,964 followers in 1861; the Mozarabian rite in Spain has a limited use, etc. (See Ritualist.)

Rites, Congregation of, a department of the constitution of the Roman Catholic Church, was first organized by Pope Sixtus V., and consisted originally of six cardinals and a corresponding number of secretaries and consultors. All belonging to the liturgy, the rites of the administration of the sacraments, the ceremonies of the Church in the beatification and canonization of saints, and in other public functions, fall under its jurisdiction. It consists of 17 cardinals, 25 consultors, and 11 secretaries.

Rit′ner (Joseph), b. in Berks co., Pa., Mar. 25, 1780, of German parentage; received in youth only six months' training in school, but while a young man working on a farm had access to a good library of German books, by which he profited richly; entered public life in 1820; ran three times for governor of Pennsylvania on the Anti-Masonic ticket, and in 1835 was elected and held the office till 1839; was one of the fathers of the Pennsylvania school system, a decided enemy of slavery and every form of intemperance. He became blind, but his sight was in a good degree restored by an operation. In 1849 he was for a time director of the mint in Philadelphia. D. at Carlisle, Pa., Oct. 16, 1869.

Ritschl (Friedrich), b. at Grossvargula, Thuringia, Apr. 6, 1806; studied the classical languages and literatures at Leipsic and Halle, and was appointed professor at Breslau in 1833, at Bonn in 1839, and at Leipsic in 1865. His principal works are—*Parerga Plautina et Terentiana* (1845); an edition of Plautus (3 vols., 1848–54), with critical annotations and an introduction on the Plautine metres; *Priscæ Latinitatis Monumenta Epigraphica*, containing on 100 large folio plates fac-similes of Latin inscriptions from the period before Augustus; and among his minor works, *Die alexandrinischen Bibliotheken und die Sammlung der homerischen Gedichte durch Pisistratus* (1838). A new edition of his *Plautus* was begun with the *Trinummus* (1871).

Rit′son (Joseph), b. at Stockton-on-Tees, England, Oct. 2, 1752; studied law; became a conveyancer at London and deputy high bailiff of the duchy of Lancaster; devoted most of his time for many years to antiquarian researches; edited a vast number of reprints of old and rare books; was noted for industry and integrity, and for a quarrelsome disposition, which rendered him an enemy to all his fellow-workers in the antiquarian field. D. at Hoxton Sept. 3, 1803. Among his works were *Observations on Warton's History of English Poetry* (1782), *Ancient Songs from the Time of King Henry III. to the Revolution* (1790), *A Collection of Scottish Songs* (1794), *Robin Hood Ballads* (1795), *Bibliographia Poetica* (1802), and *Ancient English Metrical Romances, with Dissertation and Glossary* (3 vols., 1802). (See his *Letters*, edited, with a memoir, by Sir N. Harris Nicolas (2 vols., 1833).)

Rit′tenhouse (David), F. R. S., LL.D., b. Apr. 8, 1732, at Paper-mill Run, Roxborough tp., near Germantown, Pa.,

where his great-grandfather, William Rittinghuysen, a Hollander, established about 1690 the first paper-mill in America; worked in boyhood on his father's farm at Norriton, during which time he came into possession of a set of tools and some mathematical books left by a deceased uncle; made himself master of Newton's *Principia;* discovered for himself the method of fluxions when in his nineteenth year; made a clock at a still earlier age, and undertook clockmaking as a profession 1751; soon afterward made an orrery, which was purchased by Princeton College 1768, and subsequently a larger one for the University of Pennsylvania; was employed, in connection with Messrs. Mason and Dixon, in 1763 to determine the initial point of their survey, which he did with instruments of his own construction; fixed the boundaries of Pennsylvania with New York and New Jersey, and performed similar tasks for other States; was appointed by the American Philosophical Society to observe the transit of Venus June 3, 1769, which he did successfully in his private observatory at Norriton, though he fainted from excitement at the moment of apparent contact; published his observations in the *Philosophical Transactions;* calculated correctly the elements of the (future) transit of Dec. 8, 1874; settled at Philadelphia 1770, continuing there the manufacture of clocks and mathematical instruments; was elected to the provincial legislature 1775, in which year he published an *Oration on Astronomy* delivered before the American Philosophical Society, of which body he was an active member, and became president on the death of Franklin 1791; was a member of the convention which formed the State constitution of Pennsylvania; was State treasurer 1777–89, director of the U. S. mint 1792–95, and was chosen a fellow of the Royal Society 1795. D. at Philadelphia June 26, 1796. His papers on astronomical, physical, and mathematical subjects are found in the first 4 vols. of the *Philosophical Transactions.* A *Eulogium* upon him was delivered by Dr. Benjamin Rush 1796; his *Life* was written by his nephew, William Barton (1813), and by Prof. James Renwick in Sparks's *American Biography,* 1st series, vol. vii.

Rit'ter, tp., Moore co., N. C. P. 1524.

Rit'ter (Heinrich), b. at Zerbst in 1791; studied theology and philosophy at Halle, Göttingen, and Berlin, and was appointed professor of philosophy at Berlin in 1824, at Kiel in 1833, at Göttingen in 1837, where he d. Feb. 3, 1869. His principal work is his *Geschichte der Philosophie* (12 vols., 1829–53), ending with Kant; the most prominent of his other works, all relating to the history of philosophy, are—*Versuch zur Verständigung über die neueste deutsche Philosophie* (1853), *Die Halbkantianer und der Pantheismus* (1827), and *Ueber Unsterblichkeit* (several times reprinted).

Ritter (Karl), b. at Quedlinburg, Prussian province of Saxony, Aug. 7, 1779; studied at Halle; travelled much, and was appointed professor of geography at the University of Berlin in 1820. By his lectures, as well as by his works, he exercised a decisive influence on the study of geography, remodelling the whole science and attracting general attention to its problems and results. D. at Berlin Sept. 28, 1859. His principal works are—*Die Erdkunde im Verhältnisse zur Natur und Geschichte des Menschen* (1st ed., 2 vols., 1817–18; 2d ed., 19 vols., 1822–59, comprising only Africa (i.) and Asia (ii.–xix.)), *Europa, ein geographisch-historisch-statistisches Gemälde* (2 vols., 1807), *Die Stupas* (1838), *Einleitung und Abhandlungen zu einer mehr wissenschaftlichen Behandlung der Erdkunde* (1852). After his death were published—*Geschichte der Erdkunde* (1861), *Allgemeine Erdkunde* (1862), and *Europa* (1863). Parts of his works have been translated into English by W. L. Gage: *Comparative Geography* (1865) and *The Comparative Geography of Palestine and the Sinaitic Peninsula* (4 vols., 1866). His *Life* was written by W. L. Gage.

Rit'ualist, Ritual, Rite [Lat. *ritus*]. A rite is an outward act in divine worship, intended to assert doctrine or to express, and so strengthen, the frame of mind—the emotions which should accompany adoration. Ritual is an appointed system of rites. Worship may be as bare as the fear of error or the love of simplicity can devise, yet there can be no public worship without ritual. A purposed absence of form is formal. They who assert that all forms are counter to the teaching of Jesus forget that Jesus worshipped as a Jew. They who maintain that many forms must hinder spiritual religion forget that God, who does not change, himself ordered all the minutiæ of the Jewish ritual; and they have failed to perceive how ritualistic is the worship of heaven as revealed to John the divine. No amount of outward observances can beget the state of heart which gives worth to worship, but as little can absence of form secure it. In the New Testament may be found intimations of ritual, but not commands, even concerning the rites attending the sacraments. We know that not long after the Church ceased to be persecuted its ritual in essential matters was what it has continued to be in the greater part of the Christian world—in principle everywhere the same, without uniformity. Various explanations of this fact are offered by those who consider it to mark a change from primitive simplicity. As Divine Wisdom has taught with regard to public worship, "Let all things be done decently and in order," so is it the teaching of common sense, as well as of the Book of Common Prayer: "Different forms and usages may without offence be allowed, provided the substance of the faith be kept entire." A Ritualist is one who has made the rites and usages of the Church a matter of study. But the term, within a few years past, has been used to designate a party in the Anglican Church. In this Church there could not but be great variety of opinion touching doctrine and discipline. Apart from the rejection of the papal supremacy, and of some practices which had been abused, the Church of England at the time of her Reformation made authoritatively few changes; her constitution remained the same, and her Book of Common Prayer was, by those who framed it, asserted to be substantially identical with the old. There was no severance from the past, nor was there a separation from those churches which continued in subjection to Rome, until the anathema by the pope in the eleventh year of Elizabeth's reign. But while this is true of the Church as represented by her authorized exponents, there has been always a party in sympathy with ultra-Protestantism and hating the semblance of popery; and, on the other hand, those who care for the Church only because catholic. There have long been in the Church, and more especially among its rulers, the followers of Leiber of Baden, who consider the national Church as co-extensive with the nation, and its administration a department of the State; while others believe the Church to be older than the State, to have always maintained its divine origin, and to have had its liberties guarantied by law, and notably by Magna Charta. Against the increasing oppression of the Church by the State through Erastian views, a protest was raised by a small body of clergy. By this "Oxford movement" an Anglo-Catholic party have gained influence. A younger generation have not been content with the position of the earlier Tractarians—with asserting the apostolic character of the ministry, which derives none of its authority from association with civil government, and with setting forth the doctrines of the Fathers as the heritage of the Church—but seek to minimize the effect of the Reformation, which they stigmatize as a deformation; and, in order to show sympathy with the ante-Reformation Church, and to make prominent doctrines not accepted by the Protestant party, they have revived rites and practices which are to many, not familiar with history, simply popish. They say that some of these usages they follow in obedience to the letter of church law; others as conformable to Catholic practice, and not forbidden. From their attention to ritual this outgrowth of the Tractarians are called Ritualists, and their system ritualism, while they style themselves simply Catholics. To point out what they have reintroduced, it may be enough to say that the fling of the Puritan against the English service, "'Tis but an ill-mumbled mass," would have no meaning if spoken of a ritualistic service. As a body, the Ritualists have shown much zeal and self-denial, and in some respects resemble the early Methodists. Said an English bishop to an American bishop, "These men seem alone to have found out that the poor have souls to be saved." Denounced as Romanizers and betrayers of their Church, an association powerful through the money it commands has been formed for their prosecution; and it has done its work effectively. Suit after suit has been brought; and whatever points have been decided in favor of any Ritualist in the lower ecclesiastical court have been overruled by the committee of privy council. The Ritualists yield to force, but they do not accept as otherwise binding any decision given, as they say, by a secular court in violation of the rights of the Church. It is too soon to say whether anything has been gained or lost by these suits. Particular acts have been declared to be unauthorized. Their condemnation was obtained not because they are violations of law, but because they are supposed to symbolize popish doctrine. But the very opposite of the thing forbidden may be made to express the thing pointed out. For instance: in the English Church the table of the Lord must be "an honest table" of wood; stone symbolizes the popish doctrine of sacrifice. But a Russian will have wood only for his altar, because stone cannot betoken the tree on which the sacrifice was offered. If all symbolism were put aside, yet what is gained? It has been decided in the highest court that in the English Church it is not forbidden to "teach the people to adore Christ present in the sacrament under the form of bread and wine."

From the Church of England ritualism has extended to

her daughter in the U. S., and has occupied the attention of more than one general convention. Warm controversy has been excited, and some clergymen, distinguished both by their learning and worth, have had hard usage because of fears of ritualism. No clergyman could introduce any change in services without the consent of his congregation; and where clergy and people are of one mind, they are not likely to be disturbed in their peculiarities. Moreover, if existing laws being violated be enforced, or if they be interpreted or modified, it can only be by the authority of the Church, which all its members must acknowledge. (Art. of Relig. xx.) And even if legislation be deemed unfair as the result of prejudice and haste, it yet is submitted to when not touching faith. W. F. BRAND.

Rivan'na, tp., Albemarle co., Va. P. 4697.

Rivaro'lo Canavese, town of Italy, province of Turin, on the right bank of the torrent Orco, which often causes great damage by its inundations. The churches and the public and private buildings generally are respectable; the great campanile of San Giacomo was originally the military tower of the citadel. Ancient medals, inscriptions, and other objects of the Roman, and even of still earlier times, are often found near this town. P. 6500.

Rivarolo Ligure, town of Italy, province of Genoa, on the torrent Turbella, which divides it into Upper and Lower Rivarolo. This town is so near the city of Genoa as to command much the same enchanting sea-view, and it has been selected by the families Doria and Pallavicini as the site of magnificent rural palaces. Important Roman inscriptions have been found here. The inhabitants are distinguished for activity and courage. P. 7000.

Ri'vas (ANGEL DE **Saavedra**), DUKE OF, b. at Córdova, Spain, Mar. 1, 1791; educated in the School of Nobles at Madrid; entered the royal guards 1807; fought with gallantry during the war of independence; was severely wounded at the battle of Ocana; was taken prisoner at Malaga; escaped to Gibraltar; passed thence to Cadiz; became lieutenant-colonel and chief of staff to a division of the army; left the army with the rank of colonel 1815; settled at Seville; acquired reputation as a poet by his *Ensayos Poéticos* (2 vols., Madrid, 1813); took part in the revolution of 1820 in favor of the constitution of 1812; was elected to the Cortes, and became secretary of that body 1821; was driven into exile by the counter-revolution of 1823; resided several years in England, where he published *Florinda* (1824–25), an epic poem on the Moorish conquest of Spain; went to France 1830; supported himself by giving lessons in drawing at Orleans and Tours; returned to Spain after the amnesty of 1834; inherited the dukedom of Rivas on the death of his elder brother; was made secretary of the chamber of peers 1835; was appointed minister of the interior in the cabinet of Isturiz May, 1836; was exiled by the regent Espartero 1837; returned with Queen Maria Christina 1843; was ambassador at Naples 1843–48; was a member of the Conservative "cabinet of forty hours" overthrown by O'Donnell and Espartero July, 1854; was for several years thereafter a member of the senate, but took little part in politics; was for some time ambassador to Paris, and was appointed president of the council of state Nov., 1863. He acquired great reputation as head of the "national school" of Spanish writers, whose object was to return to the older literary style, abandoning imitation of French models. Author of many dramas, of *El Moro Exposito* (1844), a national epic, of *Romances Historicos* (1846), and of histories of Masaniello (1860) and of the Neapolitan revolution of 1848.

Rive-de-Gier', town of France, department of Loire, on the Gier, an affluent of the Rhone, has large silk-mills and glassworks, extensive manufactures of iron and steel ware, and in its vicinity very important coal-fields, in which over 50 mines are worked. P. 14,202.

Riv'er, tp., Dallas co., Ala. P. 1457.

River, tp., Warren co., N. C., on Roanoke River. P. 1500.

River Bend, tp., Gaston co., N. C., on Catawba River. P. 2248.

Riv'erdale, tp., Douglas co., Minn. P. 155.

Riverdale, tp., Watonwan co., Minn. P. 259.

Riv'er Falls, p.-v. and tp., Pierce co., Wis., 12 miles N. E. of Prescott and 12 miles S. E. of Hudson, contains the fourth normal school of the State and River Falls Institute, 4 churches, 3 newspapers, 4 flouring-mills, abundant water-power, and 1 grist-mill. Principal business, farming and flour manufacturing. P. of v. 741; of tp. 1217. A. MORSE, ED. "JOURNAL."

Riv'er Head, p.-v. and tp., cap. of Suffolk co., N. Y., at the head of navigation in Suffolk co., L. I., has 7 churches, good schools, a savings bank, woollen, cloth, and organ manufactories, chocolate, moulding, paper, and grist mills, 1 newspaper, 5 hotels, the county clerk's office and court-house. There exists direct water-communication with New York City. P. of v. 1296; of tp. 3461. JAMES B. SLADE, ED. "WEEKLY NEWS."

Riv'er Heads, p.-v. and tp., Augusta co., Va. P. 886; of tp. 4380.

Riv'er Point, p.-v., Warwick tp., Kent co., R. I., on Pawtuxet River and Hartford Providence and Fishkill R. R., has extensive manufactories of cotton and other goods.

Riv'ers. Before people attempted to connect the various phenomena with each other and rise to general ideas, every river, brook, or spring appeared to them an individual being. Their ideas of these beings were often vague and wholly unaccounted for. It might be a god, or it might be an elf, terrible when the swelling of the waters caused danger, helpful when the waves fecundated the parched soil. Subsequently, those who sought after truth were led by simple reflection to the establishment of a general cause as the origin of the innumerable streams which flow on the surface of the continents. The Chinese, the Hindoo, the Greek, saw the inexhaustible sea expanding along the coasts, and the rivers, even the mightiest, losing themselves in it like slender threads of water. Was it not natural, then, that he should consider this gulf, "without bottom and without bounds," as a reservoir whence all the streams issued through subterraneous channels? True, it was difficult to comprehend such a rotatory movement of the waters through the hidden abysses of the earth; but by this supposition one pressing difficulty, at least, was removed—that of the origin of the springs, and the mystery of the formation of rivers seemed to have been solved. It must also be remembered that subterraneous rivers were frequent in the calcareous and much-fissured rocks of Greece. The sudden disappearance and reappearance of streams were phenomena familiar to all. Every peasant-boy knew that beneath the network of streams which appeared on the surface there existed another hidden from sight; and through that it was believed the oceanic currents rolled their billows. The greatest scientists of antiquity shared in these illusions. Aristotle believed that the waters of Pontus Euxinus passed beneath the Scythian plains and gushed out in the Hyrcanean Sea.

No doubt, the water of the sea can penetrate for some distance into the land below the surface. Instances are found on the coasts of Louisiana where the so-called *prairies tremblantes* float on the waves like a carpet. In the Bahama Islands and in most other coral formations the salt water becomes so infiltrated in the rock that wells dug to a certain depth, and not too far from the coast, reach a sheet of sea water. In the Greek island of Cephalonia, near the town of Argostoli, the unique phenomenon occurs of salt-water streams which turn several factory-wheels before they finally are swallowed up by the caverns of the island. But all these waters seek their level; they descend or they spread horizontally; none of them ascend toward the mountain-peaks.

Bernard Palissy, the celebrated potter of the sixteenth century, was probably the first who demonstrated the falsity of the ancient hypothesis with respect to the oceanic origin of rivers and brooks. "If it were so," he says, "the sea should be higher than the highest mountains, . . . for it is a rule, certain and universal, that water never rises higher than the source whence it issues. . . . Furthermore, as the tides which advance on the shores follow the movement of the great body of the sea, so, too, should the springs, brooks, and rivers, receding and drying up in their turn. . . . I will give still another proof. The sea has the same height summer and winter. . . . If, then, the sea nourished the springs of the universe at its own breasts, they should never become dry in summer, at which season, however, we find an infinite number of wells exhausted."

What, then, is the first source of all the streams which flow on the surface of the earth? Well, it is the ocean, as the ancients supposed; but the way which its waves take in order to reach the summits of the mountains and other points of efflux is not that which the ancients traced out. The water of the sea, transformed into vapor, journeys through the atmosphere, and falls again in the form of snow and rain. However trifling these precipitations of moisture may seem, when compared with the "moving seas" of the Mississippi and the Amazon, they suffice to account for the formation of all the rivers—yea, these latter would even have a liquid mass, on an average, two or three times larger if parts of the water of the snow and rain did not return to the atmosphere in the form of vapor. All streams being thus produced by atmospheric agencies, it would

seem quite logical to consider the study of rivers simply as a branch of meteorology; and, indeed, the course of the aërial water-streams, of which the terrestrial are only the counterparts, must be studied in the direction and intensity of the winds, in the formation and dissolution of the clouds, etc. That part of the great circulatory movement which takes place in the atmosphere may be considered as the arterial system, while the rivers form the venous. Nevertheless, the appearance of these phenomena and the parts they play in the terrestrial economy differ so much that the hydrology of the rivers must be treated apart from meteorology proper, and in connection with the lands which they bathe.

We have said that not all the water which is precipitated finds its way to the beds of the rivers. A considerable part returns to the air, while another enters into the circulatory current of vegetable and animal life. In all seasons, but especially in spring, when the foliage is formed, the plants absorb a great quantity of the water poured down by the sky. In the summer, during the great heats, the evaporation is very rapid, and the whole superficial layer of lakes and rivers escapes into the air. No less active than the sun are the great winds in reducing the rains to the form of vapors. And, finally, not all the water which through the pores of the earth and the fissures of the rock penetrates to deep beds, rebounds through springs to the surface; myriads of liquid threads descend into the crust of the earth lower than the level of the seas.

In the eyes of a physicist there is no essential difference between a pool and a brook, a lake and a river. The pool without efflux is formed, like the brook, by rains which do not escape immediately after their fall, but gather together in a common cavity. Water enters, and spreads laterally in all the lower parts of the ground. A stream tends to form toward the least elevated point of the circumference of the pool. But in proportion as the surface of the pool extends the evaporation increases. An equilibrium is established between the instalments of rain and the escape of vapors, and the reservoir of water, pool, lake, or interior sea, remains a locked basin. Now, it is well known that these waters, having thus become dormant, cannot retain the same purity as those which are incessantly renewed. The earth contains almost everywhere a certain amount of salts which dissolve in the water, and by degrees accumulate in it. This is the origin of the numerous salt lakes with which the steppes and other great plains are dotted. But when the waters of the rain are sufficiently abundant, and the geological strata easy to break through, and when the general slope of the ground aids the work of erosion, the lake bursts open at some weak point the reservoir which encloses it, and changes into a stream. Countries which have emerged in a recent period from the bottom of the sea, such as Sweden, present thousands of lakes which move in this manner from valley to valley. The stream which descends from the mountain to return to the sea has not yet had at its disposal a sufficiently large number of centuries in order to carve out its bed and give it its regular parabolic curve; it has not yet discarded its lakes either by filling them up with alluvion or by breaking down the bars at the outlet; it still journeys by a succession of leaps, instead of following a normal course, decreasing gradually in rapidity and increasing in width and liquid mass.

In moist regions and on surfaces of marked inclination, where one stream can join another, the river always terminates by reaching the sea. But there are other countries where the streams evaporate during their course under the scorching sun, until at last the small balance of water which remains is sucked in by the sands, and the river ends in a marsh, generally saline, or in a series of pools. The length of a river increases and decreases by the abundance of rain and the heat of the sun. Many a stream reaches the main river or the sea only during a few days or weeks or months; then it ceases to flow, partly or perhaps completely: it is a temporary apparition only, changing its appearances according to the course of the seasons. The coasts of Texas and the great plains of the Far West present numerous instances of such intermittent streams. But such locked basins, or basins which open only during a part of the year, are exceptional; the open basins whence streams descend with a continuous flow to the rivers, and these again to the central veins of the hydrographic system, are the rule. An idea may be formed of the multitude of watercourses which compose the system of a river-basin from the fact that the Isar, in Bavaria, receives from its source to its influx into the Danube 103 secondary rivers, which again are fed by 1293 rivers of the third rank, and 130 lakes; yea, if all rivulets and brooks were counted, and only the temporary trenches left out of consideration, it would be necessary to compute the number of affluents by hundreds of thousands. And yet the Isar, which Karl Ritter has chosen as an example in his *Einleitung zur Begründung einer mehr wissenschaftlichen Behandlung der Erdkunde*, is only one of the 34 great tributaries of the Danube, which itself is a river of small consequence when compared with the great streams of the globe. An estimate of the basin of the Amazon, in accordance with the proportions of that of the Isar, would give 325,000 minor affluents as the number of its proper tributaries.

What is, in each river-basin, the proportion between the water drained off and the water precipitated? If it were possible to answer this question with complete exactness, most problems relating to the climate and geology of a country would thereby be solved; but few rivers are known, even approximately, in their double dominion, aërial and terrestrial. Exceedingly delicate operations must be continued for a long series of years, at different and judiciously-selected points of the territory, in order to fix the annual average of rain in a basin. Udometers, sinimeters, anemometers must be compared, verified, studied incessantly, in order to gauge, even vaguely, the annual volume of the aërial river of the rains, while in the bed of drainage, width, depth, rapidity of current, oscillations between high and low water, must be constantly noted in order to calculate as exactly as possible the approximate amount of the surplus of rain transformed into a watercourse. These comparative observations have been started with great zeal in several countries of Europe, in the U. S., in Hindostan, and they have already yielded approximate results of the highest interest. When more precise measurements once permit us to press closer to the truth, the circulatory movement of the waters will reveal itself to our eyes in all its details, like the movement of the water which flows in the pipes of a machine, and which is directed and regulated by the art of the engineer.

Denys de Papin, a man of genius, who, like Bernard Palissy, had the honor of being persecuted and the glory of remaining firm during adversity, was the first who, while seeking new paths for the human intellect, observed in a methodical manner the quantity of water brought down in a river-basin by the rains, and again carried away by the river itself. He studied the Seine from 1669 to 1674. But although at that period the dimensions of the basin were not exactly known, and although the rain could not be measured in the different parts of the region where its average fall is very different, the approximation which the illustrious physicist attained is, nevertheless, very remarkable. According to him, the annual discharge of the river represents one-third of the water precipitated by the rains, while the more precise measurements obtained during the last years at different stations in the basin of the Seine give to the drainage of the river an average of a little above two-fifths. Followed up subsequently with the most rigorous precision, the method of observation inaugurated by De Papin has led to general results with respect to tolerably extensive regions of the earth. The estimates by different physicists of the rain which falls in France and the water drained from her soil vary very little, and the total discharge of the French rivers amounts to about 5400 cubic mètres, or a little more than one-fourth of the average discharge of the Mississippi, for each second. The admirable researches made under the direction of Humphreys and Abbot on the physics and hydraulics of the great river of the U. S. are also well known. When all these details are added together, and verified by a comparative study of all the movements which take place on the surface of the planet, the time will perhaps soon come when it will not be too hazardous to give a valuation of the relation between the humble watercourses on the surface of the earth and the immense reservoir of the ocean. At present, however, only hypotheses, approaching more or less to truth, can be given on this point. The valuation which seems most plausible is that according to which the average rainfall on the whole surface of the continents amounts to about half a mètre, and the average drainage to about one-half of the rain received; in this case the sea would receive 1,000,000 cubic mètres a second. By adding together the masses of water poured into the ocean by rivers which have already been gauged by engineers and geographers in the different parts of the world, the total average drainage of the whole of these river-basins, comprising an area of about 29,000,000 quadrate kilomètres, is found to be approximately 265,000 cubic mètres a second; which is very near the proportion presumed with respect to the whole earth. In accordance with results well ascertained, a classification of the rivers after their importance can now be attempted; and, as was to be foreseen, it is the rivers of the zone of the tropical rains, the Amazon, the Parana, the Congo, and the Mekong, which occupy the foremost rank on account of the amount of water which they pour into the sea. As for the Mississippi, a river of the temperate regions, and receiving only a comparatively small amount

of rain in the western part of its basin, it is, in spite of the length of its course, only a river of the second order. Estimating, with Humphreys and Abbot, its discharge at 17,440 mètres a second, it carries on an average only half as much water as the Mekong, one-third as much as the Congo, one-fifth as much as the Amazon.

Considering what good or evil man may expect from the running waters, the action of the rivers on their shores interests us more than the amount of water which they pour into the immense abyss of the ocean. Continual changes take place in the river-basins in accordance with the ever-varying phenomena of climate and soil. Everywhere the geological strata bear traces of rivers which have had a different course from that of those which now traverse the country, or which have carried a different amount of water, either greater or less. Thus, in the Sahara, in Toorkistan, large river-beds are seen, with their shoals, meanderings, *accores, battures,* banks, and islands; only the running water is wanting. In France, in the valley of the Seine, which M. Belgrand has studied, the height of the cliffs and the extension of the alluvion prove the existence of an ancient stream which at high water discharged nearly 50,000 cubic mètres of water a second—that is, about three times as much as the Mississippi. Furthermore, in Westphalia traces are seen of an ancient delta formed by a powerful river whose basin occupied a large part of the basin of the present German Ocean, and whose sources were situated in the present Great Britain. Finally, the observations of De Verneuil and Collomb, corroborated by those of several other geologists, have led them to believe that the vast Tertiary plains of Central Spain are alluvial deposits from rivers coming from the N. W.—that is, from a continent which has now disappeared, but which must have been the Atlantis of the ancients. It is known that the Red River did not join the Mississippi until within a comparatively recent geological period, but flowed directly to the Mexican Gulf through the large bed now occupied by Bayou Teche. According to Ellet, the Washita also was an independent river, and descended to the sea through the depression in which Bayou Atchafalaya now flows. These changes of course, which united the Red River, the Washita, the Mississippi, and the Atchafalaya in one system, form a recent phenomenon, and are the work of flood and erosion. But what are they in comparison with those modifications which have taken place in the upper course of the Mississippi, above its junction with the Ohio? The cliffs which range here on both sides of the river, and bear on their walls perfectly plain traces of ancient lines of erosion, prove that the Mississippi formerly flowed 50 mètres above its present level. At that time these rocks no doubt formed a dam from above which a cascade plunged down, similar to that of Niagara, and, like that, constantly eating into the geological strata which formed its bed. Above this barrier of rocks the waters of all the larger affluents were purified in a lacustrine reservoir whose vast surface, situated 180 mètres above the ocean, extended N. to the mouth of the Wisconsin, united E. with Lake Michigan, and covered the immense prairies of all the intermediate peninsulas. Perhaps there was a period in the history of the earth when the great mediterranean fresh-water sea poured forth the surplus of its liquid mass over two Niagaras, forming, on the one side, the Mississippi, on the other the St. Lawrence.

The great hydrological changes are the work of centuries. In our short lives, however, mere moments though they are in comparison with the life of the globe, we see very considerable modifications taking place. Thus, the rivers of Germany, from the Rhine to the Vistula, have all decreased regularly since the commencement of the century. In France the Doubs was recently on the very point of disappearing entirely in the fissures of its calcareous bed, and the manufacturers along the shores were compelled to guard their river by closing the clefts with solid masonry. In Italy all the streams which enter the northern extremity of the Gulf of Venice change their outlet with every new flood. The Timavus of Virgil, which the ancients considered one of the mouths of the Ister or Danube, on account of the great mass of its waters, and which gave the name of Istria to the peninsula of Monte Maggiore, flows through a subterranean channel to the Isonzo, and is now only a modest rivulet. And who has forgotten the wonderful changes which the Yellow River or Hoang-Ho in China has undergone? This stream, which justly bears the name of the "scourge of the children of Ham," has continued for at least 2500 years to change its outlet in the sea from the right side of the peninsula of Shantoong to the left, and back again from the left to the right, a distance of 550 kilomètres. During historical time it has changed its bed nine times, each time devastating a territory as large as Great Britain. The last change took place from 1851 to 1853, a short distance above the city of Kai-Foong. The river made a gap in the dam on its left side, and threw itself, first in parts, then with the whole mass of its waters, across the plains which extend toward the Gulf of Pe-Chee-Lee. In many places it resembles a permanent inundation, not yet having had time to carve out a bed; in other places it borrows the natural and artificial canals, which it enlarges and deepens in order to make them fit. In the lower part of its course it has taken possession of the bed of the Tat-Sing, formerly an independent river, but now a mere tributary, lost in the waters of the large stream. The displacement of the course of the Hoang-Ho was a double disaster. On the one side, the waters have inundated fertile regions; on the other, they have relinquished fields which can produce nothing without being irrigated, and which owed their population and richness to the fertilizing canals fed by the Hoang-Ho. The direct injury which the inundation has done in the regions now traversed by the river is small in comparison with that it has done indirectly by turning its course away from sandy wastes which derived all their fertility from it.

It is sufficient, however, simply to look at any great river with a rapid current and earthy banks in order to notice the incessant mobility of the bed under the action of the running water. Along the hollow of the creeks where the current sets with force, the sandy molecules become loose, detach themselves, sometimes in large masses, and, spreading in the muddy water, pass on to deposit themselves down-stream, especially at the mouth, where the current, retarded at the bottom, has not sufficient rapidity to hold the sand or clay suspended. Islands, pitched at their front point and elongated at their base-line, are formed, and then carried away to be formed again farther down: they are incessantly displaced, changing form and aspect according to the size of the river and the power of the current.

Besides the continual displacements of the bed caused by the sinuosities of the current, which undermines on the one side, sanding up on the other, there is the normal displacement caused by the rotation of the earth from W. to E. Some of the greatest physicists, however—as, for instance, the celebrated hydrologist Lombardini—have doubted the existence of this normal pressure of running waters from left to right in the northern hemisphere, and from right to left in the southern; but the laws of mechanics make a movement necessary, and thousands of facts prove its reality. In the plains of Russia and Siberia, where the uniformity of the ground both in topographical and in geological respects allows the running water full liberty in choosing its course, there is not one river which does not, from year to year, encroach on its right bank, generally known as the "high bank," because the current incessantly saps the cliffs; and there is not one river which does not at the same time retreat from its left bank, its "basis," which has been levelled by the waters and made straight by the regular deposition of alluvions. Even when traversing regions which he has never seen before, the Siberian knows what aspect the rivers which he is to cross must have. In the same manner, travellers who journey in a direction parallel with the ranges over the plateau of débris carried down by the ancient glacier-torrents at the base of the French Pyrenees will notice that at every river-crossing they must descend to the eastern bank, which is here also the right, through a steep declivity, while they ascend the opposite western bank gradually through long slopes. In this part of France, the right banks are eroded and crumble down, the left stretch out large and level. Nevertheless, several rivers present a striking exception to this law, and the North Americans may quote as an instance the Mississippi. This powerful stream, rising in the northern regions, where the angular rapidity of the terrestrial rotation is less than under a more southerly latitude, should, according to theory, gradually deviate in a western direction—that is, retreat incessantly to the W.—on account of the movement of the earth. But it does not. On the contrary, it abandons its old beds in the Western plains, which are transformed into annual lakes, such as Lake Tensas, Lake Providence, etc., and throws itself to the E. against the cliffs on which stand the cities of Memphis, Natchez, and Port Hudson. Farther on, when issuing from its middle course into a region where it is not restrained by the rising eastern ground, but can choose what direction it likes toward the sea, it flows to the S. E., instead of taking the shortest way directly S. or deviating to the W. But all natural phenomena are complex, and controlled at the same moment by several laws. While the Mississippi is pressed to the W. by the movement of the rotation of the earth, it may be thrown back to the E. by another power; and, indeed, it seems that the whole North American continent slopes from W. to E., toward the Atlantic coast. This would be, according to a hypothesis which still awaits the support of scientific ob-

servation, the cause of the easterly movement of the waters of the Mississippi. The rivers of Texas—the Sabine, Trinity, Colorado, and Rio Grande—flow in the same direction, probably under influence of the same causes.

The geographers who quote the Mississippi as an exception to the law of normal deviation may, on the other hand, characterize it as the greatest artisan among the rivers. In the present geological period no stream has thrown out into the sea a peninsula of a more extraordinary form. The long channel enclosed by narrow banks, which are bathed on the one side by the waters of the river and beaten on the other by the waves of the sea, resembles an arm thrust far out into the sea, and the beds of the various passages spread like the fingers of a hand. As is well known, the estimates of different geographers with respect to the average advance of the mouth of the Mississippi are far from agreeing. Kohl, who is a geographer of merit, declares that the delta is now nearly stationary—an assertion which certainly sounds strange, since Élie de Beaumont—who, however, had not all necessary documents at his disposal—estimated the advance of the mouth at 350 mètres per annum. Humphreys and Abbot confine themselves in their great work on the river to a comparison between the hydrographic maps of Calcott (1839) and the Coast Survey (1851), which gives an advance of the alluvial peninsula of 79 mètres per annum, whereby it must be remembered that the rapidity of the advance decreases necessarily from year to year. Soundings have shown that the mouth of the Mississippi will soon reach the brink of the deep abyss where the coast-current of the Gulf of Mexico passes. At a distance of 18 kilomètres from the South-West Passage the bottom of the sea is only reached at a depth of 270 mètres below the surface; and this depth increases rapidly to 1500 mètres. Incapable of filling up such gulfs, on whose surface the rapid waters of the current will carry away its alluvions to the open sea, there will be nothing left for the Mississippi but to fill up its side bays. The Po, one of the most active rivers of Europe with respect to the filling up of the sea, has a much greater facility in continuing its work. The increase of its peninsula of alluvions has been calculated with precision during the last two centuries, and amounts to about 70 mètres per annum. As the sea in front of it is not very deep, it would require only 1000 years in order to form a peninsula 10 kilomètres broad across the Adriatic, and to meet the banks of the Istria. But it must not be taken for granted that the existence of abundant alluvion in a river-current necessarily results in a considerable encroachment of the land on the ocean. The Amazon, for instance, which carries such great quantities of débris that it could fill up vast and deep gulfs, retreats, nevertheless, from century to century before the sea. The entrance into the delta widens steadily, and, consequently, the salt water penetrates farther and farther. Formerly, the different rivers of the Brazilian provinces of Ceara and Maranhão were tributaries of the Amazon, while now they flow directly to the sea. Even the river Tocantins has ceased to unite directly with the great current of fresh water, and the island of Marajo decreases little by little, eaten into by the sea. There is a general sinking of this part of the American coast, which compensates, and more than compensates, for the effect of the alluvions, which, moreover, are partially caught by the coast-current and deposited on the shores of Guiana. In nature all phenomena are complex, and depend on many causes which may cross each other in many ways.

This cross-action of laws manifests itself in the most curious manner in the annual history of the rivers—that is, in the changes of their level and discharge according to the seasons. The rivers of the temperate zone, which descend from high mountains, offer a striking instance. At the time of the great autumn rains which fall in the river-basins of Western Europe, only one part of the moisture swells the current and finds its way to the sea; another is carried away by the winds to the slopes of the mountains, and remains there bound up under the form of snow and ice. Thus, the height which might be expected for the floods is considerably diminished, and it is in the summer, in the season when the waters of the rivers should be at their lowest, that the mountains deliver up to the rivers their treasures of liquefied snow. The mass of the current is thus sustained. The Rhone, the Rhine, the Danube, and the Po regulate their discharge in this manner: they fall when their tributaries from the plains swell, and they rise when these affluents decrease.

A similar contrast between the different affluents of the same river is produced in other basins by the alternation of the rains in the different parts of the surface drained. The Amazon is the most remarkable instance of this hydrological phenomenon. When the sun, on its annual round, is N. of the terrestrial equator, a belt of rain-clouds cover the lands below with their shade and inundate them daily by their showers. The rivers which receive the surplus of these rains, the Pastaza, Tapura, Rio Negro, etc., become filled to the very brim, and soon after flood the adjacent fields. The Amazon is thus sustained in its course by its great northern affluents. But when the sun again crosses the equator, and journeys toward the boundary of the southern tropical zone, the rains fall in the other part of the basin, and it is the Huallaga, Ucayati, Purus, Madura, Tapajoz, and all the other great southern tributaries which flow with full current and bring to the Amazon that liquid mass which the northern affluents have ceased to offer. Spix and Martins were the first to demonstrate—and they did it in a most elegant manner—this movement of oscillation, so similar to that presented by the plates of a balance in motion, never ceasing to raise or lower alternately the levels of the rivers on the two sides of the "visible equator" formed by the immense river of the Amazon. In other basins the phenomenon of alternation between the affluents is not produced by the seasons, but the general management of the affluents, although less regular, presents, nevertheless, as a whole, oscillations of the same kind. When the pluvial winds bear toward one side of the basin, it is the heights of this side which receive the abundant rains, and whose watercourses rise in floods, while on the opposite side the upper torrents remain dry and the permanent streams fall or stand at a low level. When, then, the moist winds change their direction, and the waters which feed the principal current of the river consequently change, the rivers of the one side fall, while those of the other suddenly rise. This phenomenon is easily observed in the valley of the Rhone. Now, it is the rivers descending from the Cevennes, the Gardons, Ardèche, Doux, Erieux, which raise the level of the Rhone; then, again, it is those which originate in the Alps, the Durance, Drome, and Isère. But a flood of all the affluents from both the opposite slopes never occurs. If all these rivers delivered at once the highest floods of which they are capable, the Rhone would precipitate as much water over the low plains of its delta as the Amazon carries to the sea; for, however strange the fact may seem, it is nevertheless incontestable that the Ardèche carries during its periods of flood as much water as the Mississippi, and rivers like the Doux and Erieux, which are visible only on large maps, may reach, and even surpass, the average discharge of the Ohio.

The geological difference of the regions produces also a difference in the management of the watercourses which traverse them. The impermeable strata, solid rocks, stiff clays, etc., do not allow the rain-water to penetrate into the depths of the soil; it hurries immediately to the beds of the rivulets, and thence to the common river. The permeable strata, on the contrary, such as the cracked layers of limestone, permit the water to penetrate into hidden grottoes: its course is retarded by a thousand obstacles; it wanders through long subterraneous galleries; and when at last it reappears in abundant springs, the superficial waters have been drained off days and weeks before. In this way the volume of the navigable rivers is maintained by the tributary waters arriving in succession: when one affluent has discharged its surplus, another is in its period of swelling, and then a third, issuing from a subterranean cavern, will rise in its turn. The Seine, which is one of the most remarkable rivers of the world on account of its equable carriage, presents a striking equilibrium between its tributaries from the permeable and the impermeable strata.

The overflowing river tends itself to regulate and moderate its course. While the exceeding rapidity of the current hurries the billows of the flood down-stream, the waters which expand laterally over the regions inundated slacken little by little on account of the innumerable obstacles which they meet. In regions not yet under cultivation or defended by levées the river generally finds natural reservoirs—lakes, swamps, etc.—in which it can store up a large part of the surplus of the flood, which then afterward flows back to the principal river when this has lowered its level. Any great river presents instances of such reservoirs, in which the surplus of the inundated liquid mass is temporarily gathered up, and which, in their turn, supply the fluvial volume in times of drought. Thus, before the Danube carries its waters across the slightly-elevated threshold of the Iron Gate it fills the swamps of Lower Hungary to the left and the right; which waters it receives back through the Save and the Tisza. In the same manner the Mississippi changed, before it was dammed in laterally, the whole marshy region to the W. of New Madrid, the deltas of the White River, the St. Francis, and the Arkansas, and the low plains of the Yazoo, into an interior sea; yea, even now it inundates immense regions on both sides of its principal bed, though to a smaller extent. It is said that the liquid mass which the river carries diminishes steadily down-stream. Sometimes the Mississippi carries 3000 or 4000 cubic mètres more at Cairo than between the

levées of New Orleans. It is the same phenomenon, though on a smaller scale, as that of the regulation of a river by traversing a lake. Thus, at the point where the Rhone enters the Leman its discharge sometimes amounts to 1100 cubic mètres; and yet at its exit from the lake, under the bridges of Geneva, it carries only about 400 cubic mètres. On the other hand, while it sometimes is only a small rivulet at its entrance into the lake, at Geneva it always continues to be a noble river.

The intervention of man may aid in regulating the management of watercourses, but it may also contribute to spoil; and the latter has frequently been the case. The best means which can be employed to reduce the floods is that used by the agriculturists in the hot regions, where abundance of water is indispensable for the cultivation of plants. They divide the current into secondary canals, and these again into other threads, which finally branch off into innumerable trenches. The water, thus divided into a multitude of beds, each of which is regulated with embankments and locks, is retarded in its course, and the loss by evaporation is increased. The river does not gush forth afterward with that frightful suddenness which characterizes streams not yet brought under control. The agriculturist must also, in order to secure the necessary quantity of water to his fields at any season, establish reservoirs, which during the periods of flood receive the superabundant liquid mass. The utilization of streams for industrial purposes has the same consequences with respect to their management as the employment of their waters to irrigate fields. The lateral basins formed beside the works, the canals which pass through the establishment over wheels perpetually in motion, the dams which change the river into a series of terraces, and finally the discharge-channels which open at times of inundation, result, so to speak, in the domestication of the river, and man, if not able to regulate it according to his fancy, can at least control its course. Unless under very exceptional circumstances, it is rare that great inundations occur in basins in which agriculture and manufacturing industry have taken hold of the streams. The considerable changes which human labor accomplishes in these river-basins may be realized from the very aspect of the country. In many instances, the river, utilized to the last drop, ends by disappearing long before it reaches the term of its normal course; in others it arrives half exhausted at the sea. According to Antonio de la Mesa, the Ebro carried formerly 200 cubic mètres of water per second to the Mediterranean, while now, bled by irrigations, its discharge has decreased to about 100 cubic mètres. The Po furnishes about 1000 cubic mètres to the fertilization of Lombardy, which is one-third of its liquid mass.

Along the great rivers the principal occupation of man, while yet only half civilized, is not to utilize its waters, but to secure himself against its wrath. He then often happens to act with imprudence, and in many cases the very means of safety which he chooses become causes of disaster to him. It seems at first glance a very simple matter to heighten the river-banks by means of a levée in order thereby to protect the adjacent fields and restrain the waters to their bed; but in the construction of these artificial banks what obstacles are to be overcome, what constant care is to be taken, what foresight is to be exercised! They must be sufficiently large in order to resist the most violent pressure of the water, and sufficiently high in order to command the most exceptional level of the floods; at the most exposed points they must be strengthened by transverse supporters, which again lean against secondary dams; the maintenance of these levées must constantly be watched; their slopes must be consolidated; any subsidence of the ground must be repaired; all burrowing animals must be hunted out. If wars, lack of money, rivalry between states or proprietors, cause any neglect in the maintenance of the dams at any point of their immense length, one day, one hour, will suffice, and a disaster may occur: the fluvial current will make a breach, and carve for itself a new bed in the fields. The selfishness of the inhabitants of the river-banks is generally the first cause of the evil. "Your death is my life," says an old Italian proverb, which exhibits the battle for existence in all its ferocity. Padua and Venice were at war with each other for centuries; the former wished to throw the rivers of its territories into the neighboring lagunes; the latter wanted to maintain the depths of their marine waters even with a risk of inundating the firm land.

Avarice creates dangers of another kind by narrowing the river-bed for the profit of cultivation. Almost all the levéed rivers occupy a part only of their original bed of inundation, and consequently the flood must gain in height what it loses in width; it rises instead of spreading; reaches the level of the levées, overflows them if it has not broken them, and expands far away across cities and fields. The Loire, so very dangerous a river, has only a width of 400 mètres, or even of 300 mètres, at certain points of its course where it formerly had a width of 3 kilomètres, and it is of course at these points of compression that the river begins its ravages. The town of St. Cyprien, which was razed by the Garonne in 1875, while several hundreds of the inhabitants lost their lives, was built just opposite Toulouse, at a point where the quays and houses had encroached on the bed of the river from both sides; in order to gain more room, the inhabitants had even closed a canal which surrounded the town to the W., and was designed to carry away the surplus water.

In all the countries in which cultivation does not profit directly from the waters of the inundation, as is the case in the valley of the Nile, the system which ought to be followed is evidently that applied by the inhabitants along the Po. The original bed of inundation is here carefully maintained in its whole width, and the principal dam, the levée which is called insubmergible, is raised along this line. The space between this dam and the low-water marks of the current can be cultivated, but the levées which protect it should be two feet lower than the principal dam. They do not arrest the flood; the inundation spreads over this whole territory, depositing its fertilizing mud, but retarded by a thousand obstacles. With respect to towns and villages, it is safest to construct them on a large basis of embankments above the level of the floods, as the ancient Egyptians did, as has been done with the modern Sacramento, and as every prudent engineer will do when he has to build a railway-station or a factory in a place exposed to the erosion of floods. The art of preserving human constructions is sufficiently well known, and when it is not applied by the inhabitants along the rivers, the reason is either lack of foresight or avarice.

When the bars formed by the deposit of alluvion, in so many cases obstructing the entrance to river-mouths, have often proved incorrigible, as Vauban said of the Rhone, the reason is not any fault of science, but human carelessness and often the conflict between various influences. Two thousand years ago Alexander demonstrated that the deep waters which the isle of Pharos protects are the true port of the Nile; Claudius and Trajan turned the bar of the Tiber by constructing a lateral canal whose depth it was much more easy to regulate; finally, the Canal of St. Louis, from the Rhone to the Gulf of Fos, proves that it is possible to open an entrance for vessels into the interior of a river if the sea at any point in the neighborhood presents a deep gulf.

A river must be considered as an individual. Our ancestors looked at it as a god; we must at least look at it as a living organism, and treat its details with regard to the effect produced on the economy of the whole. In nature and in the controlling works made by human action this organism holds its parts closely connected. The rains which fall from the clouds in the river-basins, the trees which cover the slopes of the mountains, the swamps which border the river, and the reservoirs which accompany it along its course, the canals of irrigation distributing portions of the waters for agricultural purposes, the dams and levées which serve to shield the cities and fields, the piers, moles, and stockades of the outlet, all taken together constitute one whole, a living body whose organs react on each other and cannot be touched without affecting the whole body. And the prosperity of men, does it not partly depend on the work which nature accomplishes in the fluvial basins? Are they not all interested in the changes which may take place in the economy of the running waters? Let them, then, after learning to appreciate the improvements which science teaches, also learn to lay aside small private interests in order to occupy themselves with general interests, and associate in a spirit of honesty for the common work. Let them cease to be each other's enemies, and in the other strides of progress which they make let them learn how to defend their fields against the invasions of the rivers, how to make the running waters their most active helpers, and how to transform the streams into the chief ornaments of the earth they inhabit. ELISÉE RECLUS.

Riv'ers (ANTHONY **Wydeville,** or **Woodville**), EARL OF, son of Sir Richard Wydeville by his wife, Princess Jacqueline of Luxemburg, widow of the duke of Bedford, b. in England about 1442; accompanied his father on an expedition against the earl of Warwick at Calais, and was there taken prisoner 1459; married the heiress of Lord Scales and assumed that title 1467; succeeded his father as Earl Rivers 1469; was made a knight of the Garter, chief butler, and captain-general by King Edward IV., who had married his sister Elizabeth; attended him to Holland 1470; became governor of Calais about 1471, governor of Prince Edward, the heir to the throne, 1482; possessed a good education, and was the principal patron

of Caxton in the introduction of printing into England; translated from the French *The Dictes and Sayinges of Philosophers*, printed in folio by Caxton at London in 3 eds., all bearing date 1477; *The Morale Proverbes of Crystyne of Pise* (1478), and *The Booke named Cordyale, or Memorare Novissima* (1480), and is said by Caxton to have "made divers balades agenst the seven dedely synnes." On the death of Edward IV., Lord Rivers assembled a body of troops for the purpose of proclaiming his nephew, but was seized by the duke of Gloucester (Richard III.) at Stony Stratford Apr. 30, 1483, confined in the castle of Pontefract, and there beheaded without trial about June 13, 1483.

Rivers (RICHARD H.), D. D., b. Sept., 1814, in Tennessee; graduated at La Grange College, Ala., under Pres. (now Bishop) Paine in 1835, and elected assistant professor of languages, and in 1836 professor of languages in that institution; was president of the conference school at Athens, Ala., in 1843; vice-president and professor of moral science in Centenary College, La., in 1848, and president in 1849; was called to the presidency of La Grange College in 1854, and remained in that position after the removal of the institution to Florence, Ala., and the change of the name to Wesleyan University, until it was broken up by the war; was subsequently president of Centenary Institute, Summerfield, Ala., Somerville Female College, Tenn., and Logan Female College, Ky.; then took charge of Broadway church, Louisville, Ky.; is now president of Martin Female College, Pulaski, Tenn., and a member of the Tennessee conference of the M. E. Church, South; has published a volume on mental science and another on moral science, and has written largely for periodicals. T. O. SUMMERS.

Riv′ers, Hydrau′lics of. A large river illustrates upon a grand scale the modern theory of conservation of energy. The heat of the sun's rays, acting upon the surface of the ocean, induces evaporation, thus raising in endless succession ton after ton of water into the atmosphere. The normal currents of the latter, due also primarily to the sun's heat, sweep this vapor over the land, where, condensed by polar counter-currents, ranges of mountains, and other heat-absorbents, it assumes the form first of clouds, then of rain or snow, and ultimately is precipitated upon the surface of the earth. A certain portion of the original heat has thus been returned in kind to other colder bodies, but a part has been transformed into the potential energy represented by the height of the deposited water above the sea-level. This portion again changes into other forms of energy, as, overcoming friction, the water gathers into rivulets, unites in brooks, increases by aggregation into larger streams, and finally, bearing a rich burden of sedimentary matter for the making of alluvial lands, sweeps in the majestic curves of a great river back to the sea. In the lapse of centuries mountains are thus degraded and lowlands are built up by the energy contained in the sun's rays. Hydraulics of rivers explain how the potential energy represented by height above the ocean-level undergoes transformation in overcoming the resistances that impede the downward flow of the water. In other words, they treat of the physical laws which govern the phenomena presented in natural channels.

Historical Notes.—So long as the fundamental principles of the mechanics of solids were unknown, but little could be discovered respecting the more intricate theory of water in motion. Nevertheless, gigantic works of construction, like the Roman aqueducts, and hydraulic inventions of great value, like that of the canal-lock, were made by a system of tentative experiment. In the early part of the seventeenth century Castelli and Torricelli, pupils of Galileo, applied the principles of that master to hydraulics. The latter discovered the law governing the issue of fluid-veins from small orifices in the sides of a reservoir—viz. that, neglecting resistances, their velocities are in the subduplicate ratio of the pressures due to the head of water. He suggested this law as applicable to the flow of rivers. Near the close of the century Guglielmini elaborated this theory, which was generally adopted by the scientific world because no one attempted to verify its consequences by actual experiment. In 1732, Pitot, by observing sub-surface changes of velocity with the tube which bears his name, overturned this school of hydraulics. Attention being thus called to the importance of a practical treatment of the problem, experiment was multiplied; and finally, in 1786, Dubuat laid the foundation of the modern school by announcing his great principle that the flow is due to gravity acting through the slope of the surface, and that the true method of enunciating in mathematical language the law of motion is to equate expressions for the accelerating and retarding forces. During the present century many investigators have attacked the problem upon this general basis, but their observations have generally been made upon artificial troughs or small canals. Even when rivers have been subjected to measurement—as, for instance, those of Holland by Kräyenhoff, in 1813; the Neva by Rancourt, in 1824–26; the Rhine by Defontaine, in 1820–33; the Neva by Destrem, in 1835; the upper Rhine by Hennocque, in 1839; the Garonne by Baumgarten, in 1837–46; the Mississippi by Marr, in 1849–51—either the observations were so restricted in number and scope, or attention was so exclusively directed to the construction and effect of practical works of improvement, that no sufficient data for a scientific discussion of general river-hydraulics were secured prior to the observations conducted upon the Mississippi between the years 1850–60 by Capt. A. A. Humphreys (now brigadier-general and chief of engineers of the U. S. army). These investigations will soon receive further notice. Since their date a few observations have been made by Mr. Révy upon the La Plata and its chief branches; the rivers draining the great American lakes have been subjected to measurement by the U. S. Lake Survey parties; the Connecticut River has been gauged by Gen. Ellis, assistant to Gen. Warren, U. S. engineers; the flow of the Irrawaddi has been elaborately investigated by Mr. Gordon; and the upper Mississippi has been gauged by Col. Farquhar of the U. S. engineers. The two last-named surveys are as yet unpublished; the others in a theoretical point of view have tended to confirm the results announced in the *Physics and Hydraulics of the Mississippi*, by Humphreys and Abbot.

Two advantages may be expected to attend the selection of a very large river for hydraulic investigations. The energy represented by a great volume of water in motion reduces to insignificance the minor and exceptional disturbances which may mask the laws of flow in a small stream; while the magnitude of the pecuniary interests involved will provide the funds requisite for extended and thorough measurement. The following is a brief resumé of the system of river-hydraulics which resulted from the investigations conducted for ten years upon the Mississippi:

Distribution of Velocity.—These measurements established experimentally the law under which the effect of resistances applied to the exterior layer is transmitted through the fluid-mass—in other words, the law by which cohesion regulates motion among the fluid particles. This law was shown both in horizontal and vertical planes to be parabolic, the abscissæ representing velocities, and the ordinates distances from the exterior layers. The axis of the curve is parallel to the direction of the motion, and marks the place where the retarding effects of the exterior resistances transmitted inward become equal. As the mean velocity changes, the parameter of this parabola varies inversely with its square root. In horizontal planes this law is usually masked by variations in depth and in the direction of the motion of the mass of water; but at one station, Columbus, Ky., the entire curve from bank to bank constituted a single well-marked parabola at all stages of the river, the parameter varying as stated above. In vertical planes the parabolic law appears to be universal, but it is often masked by a rapid oscillation of the axis, occasioned by variations in surface-resistance. The cause of this latter resistance in calm weather is obscure. It is clearly proved not to be wholly or chiefly due to friction against the air, but probably is largely a secondary effect transmitted from the bottom through the agency of upward currents. Upon the Mississippi in calm weather the mean depression is about three-tenths of the depth; upon the Connecticut it is about one-tenth; probably it is largely influenced by the rugosity of the bed. An up-stream wind depresses and a down-stream wind raises the axis, the amount of the change being directly proportional to the force of the wind; indeed, in a natural channel the axis seems rarely to be at rest. The parameter of these vertical parabolas varies with the square root of the mean velocity and with a small function of the depth. The absolute variation of velocity in a vertical plane is small, usually but little exceeding 10 per cent. of the maximum. The ratio between the mid depth and mean velocity is sensibly constant, being about 0.96, and it is independent of wind effect. The great value of this last discovery in reducing the labor of gauging streams is apparent.

In algebraic language, the most important of these laws for sub-surface velocity are expressed as follows: D, $d_{,}$, and d denoting, respectively, the total depth, the depth of the axis, and the depth of any particular point; and v, V, V_0, $V_{d_{,}}$, V_m denoting, respectively, the mean velocity of the river, the velocity at any depth d, the surface velocity, the maximum velocity, and the mean of the whole vertical curve:

$$(1) \qquad b = \frac{1.69}{\sqrt{D + 1.5}}.$$

(2) $$V = V_{d_{\prime}} - \sqrt{b\,v}\left(\frac{d - d_{\prime}}{D}\right)^2.$$

(3) $$V_m = \tfrac{2}{3}V_{d_{\prime}} + \tfrac{1}{3}V_D + \frac{d_{\prime}}{D}\left(\tfrac{1}{3}V_0 - \tfrac{1}{3}V_D\right).$$

(4) $$V_{\frac{1}{2}D} = V_m + \tfrac{1}{12}\sqrt{b\,v}.$$

Mean Velocity of Rivers.—The general principles which govern a constant flow of water through the channel of a river are next to be considered. The motion is opposed by three distinct resistances: first, that due to the adhesion of the fluid to the materials forming its bed, and to the cohesion of the different particles to each other; second, that due to inequalities of cross-section, which occasion eddies, whirls, and in general loss of *vis viva;* third, that due to bends, which like dams directly oppose the flow, and check it until a certain head is acquired sufficient to restore the lost motion. The potential energy transformed during the flow from one station to another—measured by the product of the weight of the water into the difference of level of its surface at the two stations—may therefore be considered as divided into three parts; and if it were possible to frame three practically useful formulæ based on the corresponding resistances, the whole circumstances of the flow might be algebraically expressed. Unfortunately, the second expression would be excessively complex, and would require a knowledge of the conformation of the bed more precise than could usually be obtained at any reasonable cost. Accordingly, Humphreys and Abbot framed only two formulæ—one to represent the flow in straight portions of the river, and the other to determine the portion of the head expanded in overcoming the resistance of the bends between the terminal stations. The second class of resistances necessarily affected the constants deduced for both of these formulæ; and for this reason the authors insist that their first formula must never be applied to smooth artificial channels; nor, on the other hand, to rivers which include bends between the terminal stations, without first subtracting from the observed fall in water-surface the amount indicated by the bend formula. Indeed, this treatment of the problem assumes a normal inequality of bed in rivers; and if the formulæ be applied to channels smoother or rougher than those from which the constants were derived, the computed discharge must be respectively too small or too great. This difficulty is unavoidable in all river formulæ; but by correcting for bend resistance, Humphreys and Abbot have narrowed the usual limits of the error. The following are their formulæ, expressed in English feet: v denotes the mean velocity per second; a, the area of cross-section; p, the wetted perimeter; W, the width; b, the value given in Eq. (1); s, the sine of the slope corrected for bends—its numerical value is the quotient of the total fall in water-surface between the terminal stations, less the value of h in the bend formula, by the total distance between them measured on the middle line of the channel; N represents the number of angular changes each 30° of the latter line. The value of v in the bend formula is found by successive approximations. The quantity z is equal to $0.93\,v + 0.167\sqrt{bv}$; and when p is not known by measurement, it may be assumed at 1.015 W.

(5) $$v = \left(\sqrt{0.0081b + \left(\frac{225\,a\sqrt{s}}{p + W}\right)^{\frac{1}{2}}} - 0.09\sqrt{b}\right)^2.$$

(6) $$h = \frac{v^2\,N\sin^2 30^\circ}{134} \quad \text{(bend formula).}$$

(7) $$s = \left(\frac{(p+W)z^2}{195a}\right)^2.$$

(8) $$a = \frac{(p+W)z^2}{195\sqrt{s}}.$$

(9) $$p + W = \frac{195a\sqrt{s}}{z^2}.$$

These formulæ were restricted by Humphreys and Abbot to natural channels having an area exceeding 100 square feet and a slope less than 0.0008. From additional data, chiefly derived from an important report by MM. Darcy and Bazin, published after the *Physics and Hydraulics of the Mississippi*, the slope-limit was shown to admit of considerable extension, and the following approximate term was added to the mean-velocity formula for the case of natural channels less than 100 square feet in cross-section: v', denoting the value of v as first deduced:

$$-\frac{2.4\sqrt{v'}}{1 + p}.$$

The following are other mean-velocity formulæ recently proposed for rivers by hydraulic engineers:

Darcy and Bazin: $$v = \frac{a}{p}\sqrt{\frac{1000\,s}{0.08534\frac{a}{p} + 0.35}}.$$

Hagen: $$v = 4.39\sqrt{\frac{a}{p}}\sqrt[6]{s}.$$

Ganguillet & Kutter: $$v = \frac{\left(23 + \frac{0.00155}{s} + \frac{1}{n}\right)\sqrt{\frac{as}{p}}}{0.5521 + \left(23 + \frac{0.00155}{s}\right)\frac{n}{\sqrt{\frac{a}{p}}}}.$$

In the latter n is a coefficient depending on the rugosity of the bed. Its value for earthen beds is 0.025, and for mountain-torrents sweeping over boulders, 0.030.

Measurements upon Natural Channels.

Number.	Stream.	Original. Number.	Original. Series.	Cross-section. Area.	Cross-section. Width.	Cross-section. Wetted perimeter.	Cross-section. Mean radius.	Slope.	Observed mean velocity per second.
				sq. ft.	ft.	ft.	ft.		ft.
1	Feeder Chazilly..	1	37	9.5	....	9.9	0.96	0.000,792	1.234
2	....	2	..	14.9	....	12.3	1.21	0.000,808	1.667
3	....	3	..	19.4	....	13.8	1.41	0.000,858	1.815
4	....	4	..	22.9	....	14.7	1.56	0.000,842	1.998
5	....	1	38	9.3	....	9.7	0.96	0.000,957	1.244
6	....	2	..	14.1	....	11.9	1.18	0.000,929	1.703
7	....	3	..	18.8	....	13.3	1.41	0.000,993	1.798
8	....	4	..	22.2	....	14.4	1.54	0.000,986	1.959
9	....	1	41	11.3	....	10.8	1.04	0.000,445	0.962
10	....	2	..	18.1	....	13.1	1.38	0.000,450	1.296
11	....	3	..	22.9	....	14.6	1.57	0.000,455	1.401
12	....	4	..	27.2	....	15.9	1.71	0.000,441	1.510
13	Feeder Grosbois..	1	47	11.8	....	10.8	1.09	0.000,464	0.820
14	....	2	..	17.2	....	12.5	1.38	0.000,450	1.326
15	....	3	..	23.0	....	14.1	1.63	0.000,479	1.434
16	....	4	..	26.8	....	15.7	1.71	0.000,493	1.683
17	....	1	48	10.1	....	10.2	0.98	0.000,555	0.984
18	....	2	..	15.4	....	11.8	1.30	0.000,555	1.480
19	....	3	..	20.9	....	13.4	1.56	0.000,525	1.575
20	....	4	..	25.9	....	14.1	1.71	0.000,515	1.746
21	....	1	49	10.9	....	11.4	0.96	0.000,250	0.886
22	....	2	..	17.1	....	12.9	1.32	0.000,275	1.336
23	....	3	..	24.2	....	15.5	1.57	0.000,246	1.362
24	....	4	..	30.8	....	17.3	1.78	0.000,275	1.467
25	....	1	50	11.8	....	11.3	1.05	0.000,310	0.817
26	....	2	..	18.0	....	12.7	1.42	0.000,290	1.260
27	....	3	..	25.4	....	15.4	1.69	0.000,330	1.296
28	....	4	..	32.0	....	17.3	1.85	0.000,330	1.411
29	Canal Marseille..	7	1	66	....	23	2.9	0.000,430	2.536
30	Seine at Paris....	1	..	1,978	....	349	5.7	0.000,127	2.094
31	... .	2	..	2,570	....	363	7.1	0.000,133	2.264
32	....	3	..	3,176	....	377	8.4	0.000,135	2.418
33	....	4	..	3,692	....	390	9.5	0.000,140	3.370
34	....	5	..	4,421	....	405	10.9	0.000,140	3.741
35	....	6	..	5,108	....	419	12.2	0.000,140	3.816
36	....	7	..	6,372	....	439	14.5	0.000,140	4.232
37	....	8	..	6,929	....	461	15.0	0.000,140	4.512
38	....	9	..	8,034	....	504	15.9	0.000,172	4.682
39	....	10	..	8,668	....	516	16.8	0.000,131	4.800
40	....	11	..	9,522	....	518	18.4	0.000,103	4.689
41	Seine (Meulan)...	1	..	5,982	....	842	7.1	0.000,090	2.310
42	....	2	..	6,488	....	845	7.7	0.000,087	2.313
43	Seine (Triel).....	3	..	5,640	....	502	11.2	0.000,057	2.363
44	....	4	..	6,375	....	513	12.4	0.000,060	2.359
45	Seine (Poissy)....	5	..	7,475	....	551	13.6	0.000,050	2.372
46	....	6	..	7,952	....	560	14.2	0.000,054	2.595
47	....	7	..	8,996	....	567	15.9	0.000,062	2.911
48	....	8	..	9,733	....	578	16 8	0.000,067	3.101
49	....	9	..	10,400	....	582	17.8	0.000,075	3.330
50	Mississippi River.	1	..	193,968	2653	2693	72.0	0.000,020,5	5.929
51	....	2	..	195,349	2656	2696	72.4	0.000,017,1	5.887
52	....	3	..	180,968	2421	2461	73.6	0.000,003,4	4.034
53	....	4	..	183,663	2429	2469	74.4	0,000,003,8	3.977
54	....	5	..	148,042	2214	2247	65.9	0.000,068,0	6.957
55	....	6	..	178,137	2729	2779	64.1	0,000,063,8	6.949
56	....	7	..	179,502	2732	2782	64.5	0.000,043,6	6.825
57	....	8	..	78,828	2507	2530	31.2	0.000,022,3	3.523
58	....	9	..	134,942	2556	2589	52.1	0.000,030,3	5.558
59	....	10	..	150,354	2580	2621	57.4	0.000,048,1	6.319
60	B. Plaquemine...	11	..	5,560	292	303	18.3	0.000,206,4	5.198
61	....	12	..	4,259	268	278	15.3	0.000,143,7	3.959
62	B. La Fourche...	13	..	3,738	223	238	15.7	0.000,044,7	3.076
63	....	14	..	3,025	223	232	13.0	0.000,037,3	2.843
64	....	15	..	2,957	223	231	12.8	0.000,036,6	2.807
65	....	16	..	2,868	223	230	15.7	0.000,043,8	2.789
66	C. and O. C. feeder	17	..	121	23	32.7	3.7	0.000,698,5	3.032
67	....	18	..	119	23	32.5	3.7	0.000,698,5	2.723
68	Ohio River.......	19	..	7,218	1073	1074	6.7	0.000,093,3	2.515
69	River Haine......	20	..	248.5	48	50.5	4.9	0.000,165,3	2.495
70	....	21	..	306.4	50.5	53.4	5.7	0.000,155,9	2.558
71	Canal	22	..	50	18	20.6	2.4	0.000,063,1	1.134
72	River Rhine......	23	..	19,135	1155	1163	16.5	0.000,097,7	3.575
73	....	24	..	6,304	557	563	11.2	0.000,099,9	3.277
74	River Waal.......	25	..	14,782	1328	1334	11.1	0.000,104,4	3.165
75	Rhine............	26	..	5,341	700	704	7.6	0.000,117,4	2.917
76	Yssel............	27	..	1,930	321	324	5.9	0.000,116,6	2.773
77	Tiber............	28	..	2,355	243	249	9.4	0.000,130,6	3.413
78	Neva.............	29	..	43,461	1218	1227	35.4	0.000,013,9	3.230
79	Great Nevka.....	30	..	15,554	881	893	17.4	0.000,014,9	2.049
80	River Schwarza..	1	..	46.7	56.6	58.3	0.80	0.009,000	2.528
81	....	2	..	52.3	50.8	52.9	0.99	0.005,200	2.544
82	Hockenbach, I.–II.	..	..	10.5	11.1	12.0	0.87	0.000,778,3	1.440
83	" II.–III.	..	..	10.3	11.0	11.8	0.88	0.000,796,6	1.463
84	Speyerbach	..	..	30.2	16.1	19.7	1.54	0.000,466,6	1.814
85	Hübengraben.....	..	..	3.8	4.8	6.4	0.59	0.001,300,0	1.424
86	Salzach...........	1	..	4,005.6	375.9	377.8	7.00	0.000,360,0	4.118
87	Saalach..........	2	..	86.9	60.4	61.2	1.38	0.001,035,7	2.155
88	"	3	..	96.7	71.3	71.8	1.34	0.001,136,4	1.970
89	Isar..............	5	..	300.1	153.7	161.6	1.85	0.002,500,0	3.997
90	"	6	..	1,063.4	172.2	176.0	6.04	0.002,500,0	7.212
91	Rhine............	1	..	4,650.1	590.5	606.3	7.67	0.001,250,0	4.921
92	"	2	..	13,725.5	590.5	633.8	21.65	0.001,000,0	8.858
93	"	3	..	14,149.8	1440.0	1458.3	9.72	0.000,112,0	2.910
94	Lauter Canal.....	4	..	56.4	29.6	31.0	1.82	0.000,664,0	2.106
95	Upper Mississippi	..	..	5,010.1	462.0	467.0	10.85	0.000,028,9	1.509
96	" "	..	..	3,441.0	773.0	778.0	4.42	0.000,222,7	2.611
97	" "	..	..	15,911	1607	1612	9.87	0.000,074,34	2.941
98	" "	..	..	51,610	3160	3172	16.27	0.000,074,34	3.898
	Sum	..	..	......	....	....	....	....	282.183

As the ultimate test of formulæ of this character rests upon their accordance with standard observations, the preceding carefully-prepared list is given to serve as a criterion for these and others which may appear hereafter. The data include nearly all published observations of value upon rivers, being compiled from good modern authorities to represent a great variety of natural channels. The first forty-nine were published by Darcy and Bazin; the next thirty by Humphreys and Abbott; the next fifteen by Grebenau; the remaining four by Warren.

Mr. Robert Gordon, who has recently conducted a very extensive, but as yet unpublished, series of experiments upon the Irrawaddi, has proposed, in a paper published at Milan in 1873, to reject the general theorem of Dubuat, and to revert to the Guglielmini basis in a modified form. As the constants of his formula are not as yet definitely announced, it is not given here.

Tested by these standard observations, the Humphreys-Abbot formula gives a mean discrepancy of 8.2 per cent.; the Darcy-Bazin formula, 16.3 per cent.; and the Hagen formula, 13.5 per cent. Two-thirds of these data were not available in framing the first-named formula. The investigations of Francis have shown that the most careful measurements are liable to an error of from 1 to 5 per cent.

Gauging of Rivers.—For practically gauging the discharge of a large river the following plan is recommended: Select a locality in a straight portion where the current is regular. Lay out a base-line 200 feet long parallel to the direction of the flow, and determine accurately the cross-section in front. Establish two theodolites, and, for numerous floats well distributed between the banks, note the angular distance from, and the time of transit past, each end of the base. These floats should be made double, the surface float being a tin ellipsoid or other light body bearing a little flag. The lower float may be a large open keg, ballasted with lead so as to hang vertically. The connecting cord should be as small as practicable. The rate of movement of the whole will thus be essentially that of the lower keg. The centre of this keg should be placed at the mid-depth of the stream in each vertical plane of transit, because the wind will there have no influence upon the rate of movement. With a regular cross-section the average mid-depth may be adopted for all floats without sensible error. The exact level of the water upon a gauge-rod should be noted when the observations begin and end. The following is the method of reducing the observations: Upon a sheet of section-paper the base-line and two perpendiculars to mark the lines across which the times of transit were noted are laid down. From the recorded angles and a table of natural tangents the paths of each float are plotted, and upon each is written the seconds of its transit past the base. The total width of the river is next divided into as many equal "divisions" as show sensibly unvarying velocity. The mean of all the seconds of transit in each division is then reduced to feet per second, and adopted as the true mid-depth velocity in that division. A mean of all these mid-depth velocities, interpolations being made if any are missing, closely approximates to the true velocity of the river. Two errors which nearly balance each other are involved in this method—viz. the inequality of the areas of the divisions, and the difference between the mid-depth and mean velocity in any vertical plane. The correction ratios for these errors are, respectively, about 0.93 and 0.98 for large rivers, giving a mean resulting velocity $\frac{0.93}{0.98} = 0.95$ of its true value. If a very exact computation is required, the "divisions" are laid down on the plot of the cross-section of the river, and the area of each is computed for the stand on which the gauging was made. The different division mid-depth velocities—including interpolations if any are wanting—are those substituted for $V_{\frac{1}{2}D}$ in the expression

$$V_{\frac{1}{2}D} - \tfrac{1}{12}\sqrt{bv}.$$

Each result is multiplied by the corresponding area of cross-section; and, finally, the sum of these products is equated with va. The lesser root of this equation is the true mean velocity. A value for v less exact than the last, but involving only a small error, may be found with little labor by the following computation: Substitute for $U_{\frac{1}{2}r}$ in the following equation the grand mean of the different "division" mean velocities, including interpolations if any be missing. The value of b is that given in Eq. (1), with $\frac{a}{p}$ substituted for D:

$$(10) \qquad v = (\sqrt{1.08U_{\frac{1}{2}r} + 0.002b} - 0.045\sqrt{b})^2.$$

The theory of these different computations is explained in the *Physics and Hydraulics of the Mississippi*.

In gauging small streams various forms of meters are often employed for observing the velocity. They consist essentially of a submerged wheel, with apparatus designed to record the number of its revolutions; and the accuracy of the result, of course, depends entirely upon the precision with which these revolutions can be translated into feet per second. Quite recently electricity has been skilfully applied by Mr. Henry, Gen. Ellis, and others to record the number of revolutions of the wheel.

Oscillations of Rivers.—As the volume of water in the channel increases, the surface-level of the river rises. The amount of this rise varies greatly in different parts of the course, especially when the stream discharges into the sea or a large lake. In such cases the oscillation is insignificant near the mouth, and the range between high and low water regularly increases for a certain distance until the influence of the sensibly unchanging level of the recipient of its waters disappears. Above this point the range becomes more uniform for the main river, but ultimately diminishes as the sources are approached. The mathematical laws governing this oscillation were first experimentally studied upon the Mississippi, and with the following results: (1) The local slope at any station is far from constant, since the measured discharge exhibits extraordinary but normal changes at different epochs for any given reading of the gauge, when the other conditions upon which the flow depends must be identical. Near the mouth of the Ohio these variations at high stages exceed 30 per cent., the discharge being much larger with a rising than with a falling river. (2) This variation is not the same in all rises, the difference being greater in high than in low stages, and larger in the upper river than near its mouth. (3) The local slope in any particular rise increases regularly as the river rises, and more rapidly in large than in small oscillations; it attains its maximum value when the surface still lacks a few inches of extreme height. In falling, the slope is always much less than at corresponding levels in rising. (4) During any given oscillation the rate of the increase of local slope in rising is usually the same as that of the loss in falling.

The following theory explains these observed facts: When a tributary discharges a sudden flood into the main river, causing a rise, the water moves downward in the form of an immense wave, of which the convexity depends upon the volume added and upon the stage of the river above and below the point of influx. The local slope at any place is governed by this convexity. Hence, as the front of the wave moves past, the slope and discharge are great; when the crest arrives they both diminish; as the rear of the wave is passing they fall below their values at corresponding levels during the rise. Finally, since the general form of the wave is regular, the rate of change in local slope during the rise and fall is normal and similar. This experimental theory suggested the basis of a mathematical analysis of the problem, which, applied to the Mississippi, resulted as follows: If in any locality an equation showing the increase of slope between the foot and the top of a rise can be framed, it may be applied to any part of that rise (except near the top and near the bottom, where inflections occur), since the rising and falling branches are sensibly parallel. If, then, a general equation can be framed showing the increase of slope between the foot and top of rises at all stages of the river at any locality, the problem is solved for that locality. Such an equation was deduced for one gauging-station on the Mississippi, and was ultimately proved to be general for the whole river. It is the following, in which $s_{,}$ denotes the primitive, and $s_{,,}$ the new slope; e the elevation in feet above extreme low-water mark of the primitive surface of the river; P, a constant for each locality; and x, the rise or fall of the water-surface in feet:

$$(11) \qquad s_{,,} = s_{,} + \frac{1}{2P}(e + x)^2 x.$$

The value of P at any locality can readily be found from this equation when the numerical values of the other variables are known, the slopes being computed by equation (7) from known cross-sections and discharges when the river is rising or falling uniformly. To apply this method to the computation of the change of level in water-surface which will be caused by a given variation in discharge at a locality where P is known, compute the primitive slope by Eq. (7). Assume a value of x, and find $s_{,,}$ from equation (11); and next the first member of the following equation, in which letters marked ($_{,}$) denote values already defined corresponding to the primitive stage, and those marked ($_{,,}$) those for the new stage:

$$(12) \qquad \frac{a_{,,}}{p_{,,} + W_{,,}} = \frac{a_{,} + W_{,}x}{p_{,} + W_{,} + 2x}.$$

With these values compute $v_{,,}$ from the following equation, which is a simplified form of Eq. (5):

$$(13)\quad v_{\prime\prime} = \left(\left[225\sqrt{s_{\prime\prime}}\,\frac{a_{\prime\prime}}{p_{\prime\prime}+W_{\prime\prime}}\right]^{\frac{1}{4}} - 0.0388\right)^2.$$

With this value of $v_{\prime\prime}$ find the value of x in the following equation, in which $\phi_{\prime\prime}$ denotes the new discharge:

$$(14)\qquad x = \frac{\phi_{\prime\prime} - a_{\prime} v_{\prime\prime}}{W_{\prime} v_{\prime\prime}}.$$

If this value be identical with that assumed, it is the true value sought; if not, repeat the computation until such accordance is obtained; which by a few approximations is readily accomplished. This method, applied to twenty-four measured oscillations upon the Mississippi varying from 2 to 25 feet, gave results showing a mean error of only about 5 per cent.

Mechanical Work of Rivers.—The boulders, large and small, which in general form the beds of mountain-torrents resist any but secular changes, but their smooth and rounded forms and abraded surfaces sufficiently mark the effects of the continued flow of water. As the stream increases in size, bars of coarse gravel begin to appear, forming a succession of pools and rapids, which regulate the velocity of the current by dams constructed through its own agency. The gravel becomes sand, and the sand, mudbanks and other fine alluvial deposits as the stream gradually assumes the characteristics of a great river. While thus pushing along the bottom the materials too heavy for more rapid transportation, the water, at first clear, gradually becomes turbid from earthy matter held in suspension. In fine, a great river is constantly performing an immense amount of mechanical work in pulverizing and moving forward solid material. Its capacity for this work is proportional to the *vis viva* of its waters, but the amount actually performed depends in great measure upon the nature of its bed and upon the geological formations through which it flows. The Mississippi annually transports in suspension to the sea a mass of alluvion 1 square mile in area and 241 feet in height, weighing over 400,000,000 tons, while at the same time it is pushing over the bars at its mouth an additional amount equal to one-tenth of this enormous quantity.

The fact that, in general, under the moving waters lies a moving bed, presents in a forcible light the difficulties encountered by the hydraulic engineer in attempting to permanently improve the navigable channel of a great river. The experience of ages has shown that a bar removed at one point often reappears, perhaps in an aggravated form, below. The river is always at work, and to oppose it or modify its action usually exacts continuous labor. On many rivers the banks, especially in the bends, are abraded by the current; and this action, occurring in the sinuous course which is characteristic of large volumes of water in motion, often results in cutting off a bend, thus violently changing the regimen of the stream for long distances, and entailing difficulties not easily foreseen or prevented. The general effect of such "cut-offs" is the following: Immediately above the site the water-surface is lowered by the full amount of the bend resistance (Eq. 6) and by one-half of the fall of the river in a straight portion of its course equal in length to the shortening effected by the cut-off. Immediately below the site the water-surface is raised by the latter quantity. In receding from the site, both above and below, these effects become less, and ultimately disappear. Where the banks are liable to erosion by the river a cut-off is always a misfortune. Any immediate benefit above is compensated by injury below, and the ultimate effects upon the channel are liable to be disastrous to both sections.

When a sediment-bearing river flows through a district below the level of its floods other peculiar phenomena are presented. The water escaping over the natural banks loses its velocity and deposits the matter held in suspension. The heavier particles drop first, and the result is to gradually raise the level of the banks near the river, and thus cause it apparently to traverse a low ridge sloping in both directions from the main channel. If the banks are sufficiently tenacious to resist erosion, this action, continued for a long period, may result in confining the stream between natural embankments. Such cases, however, are rare, but artificial works are often employed to assist nature when the fertility of the region to be thus reclaimed offers sufficient pecuniary inducements. Many of the chief rivers of Europe, and some of those of America, Asia, and Africa, are thus more or less perfectly confined to their channels throughout their alluvial regions. The Po is a well-known example of this kind, and is often cited as proving that the ultimate effect of levees is to raise the bed of the main river by preventing the escape of the sediment brought down by the floods. This is an error of fact, as has been fully demonstrated by Lombardini, the most eminent hydraulic engineer of Italy now living. Indeed, no effect of this kind has ever been established as occurring upon any river. In this country the Mississippi is the most conspicuous example of the application of levees to the prevention of inundations. A gigantic system has been inaugurated, extending from the mouth of the Ohio to the Gulf, and, although imperfect in its details and execution, it has added immensely to the wealth of the region. Similar artificial embankments upon a grand scale are now in progress of construction upon the Irrawaddi in British Burmah. Upon the Nile a different plan has been in operation for centuries. The surplus flood-water is drawn from the river by artificial canals, and employed for irrigating a narrow strip of country thus reclaimed from the surrounding deserts; but even here the river is never permitted to cause a general inundation of the country, as has often been erroneously asserted.

Bars at the Mouths of Rivers.—Experience has shown that whenever a river discharges into a body of still water large enough to be acted upon by winds and waves, and having a shore and bottom of movable materials, a bar invariably is formed at the mouth. Such bars owe their origin to one or more of three primary causes, which usually act in combination. In the case of a sediment-bearing stream, if the recipient be fresh, its inertia will oppose the river-current, and the inflowing water will be checked in velocity and spread out over a wider channel. The result will be a partial dropping of the matter held in suspension, which at first will simply increase the amount pushed along the bottom. As the velocity continues to diminish, a point will be reached at which it is no longer sufficient to keep this matter in motion, and a bar will begin to form. As more matter reaches this point, it will accumulate; the incipient bar will give an upward motion to the water, and thus the obstruction will retrograde until the reduced cross-section of discharge so increases the velocity as to enable the current to roll up and distribute in layers the new material brought down by the river. Ultimately, a bar of sensibly equal depth will thus form around the point of efflux. As the channel becomes contracted by lateral deposits the current over the middle of the bar will increase, and will there cause a gradual erosion and advance. Beyond the bar the remainder of the matter held in suspension will be gradually dropped as the moving water loses its inertia and comes to rest. The permanency of the form and position of the bar will depend upon the constancy of flow of the river, and upon the exterior influences due to winds, waves, and foreign material moved thereby in the recipient.

When the river discharges into the ocean, the conditions of the problem are complicated by the introduction of a new force, the lifting power of the salt water due to its greater specific gravity, and the bar-formation will be modified accordingly. When the fresh water encounters the salt it will rise and spread out over it, thus leaving the matter rolled along the bottom sooner than in the case already considered. The angle of rise will be a function of the reciprocal of the velocity and of the difference in specific gravity; hence, at different stages of the river the point of deposit and the inner slope of the bar will vary, the low-water contribution being the innermost. Subsequent floods will erode the latter and (as the banks extend) the whole bar, thus pushing the matter forward and giving rise to an annual advance which will be governed by the amount of the material brought down by the river, and by the distributing effects of storms and littoral currents. Ultimately, an equilibrium between the erosive force and depositing action will be established, and the bar will assume a sensibly constant form, depth, and annual rate of advance.

The mouths even of clear-water rivers are often obstructed by bars occasioned by an entirely different cause from the foregoing. Where the sea breaks upon a low sandy shore the oscillation of the waves becomes transformed into a motion of translation, which rolls up the sand into a long *cordon littoral*, thus partially closing the entrances of bays, harbors, and rivers. The currents of the latter and of tidal basins tend to break through and erode these deposits, thus opening certain channels to navigation. The Southern Atlantic coast of the U. S. offers many examples of this class of bars. HENRY L. ABBOTT.

Rivers, Regulation of. See RIVERS and RIVERS, HYDRAULICS OF.

Riv'erside, p.-v. and tp., Burt co., Neb., on Missouri River. P. 139.

Rivers, Rights on. See RIPARIAN RIGHTS.

Riv'ersville, v., Marion co., Va. P. 63.

Riv'erton, p.-v., Litchfield co., Conn.

Riverton, tp., Floyd co., Ia. P. 953.

Riverton, p.-v. and tp., Mason co., Mich. P. 438.

Rives, tp., Montgomery co., Ala. P. 1800.

Rives, tp., Jackson co., Mich. (RIVES JUNCTION P. O.), at junction of Jackson Lansing and Saginaw with Grand River Valley division of Michigan Central R. R. P. 1345.

Rives, p.-v. and tp., Prince George co., Va. P. 1723.

Rives (JOHN C.), b. in Kentucky about 1796; educated himself; became cashier of a bank at Edwardsville, Ill.; removed in 1824 to Washington, D. C., where he was clerk in the office of the third auditor, and was connected with Francis P. Blair in founding the *Congressional Globe*, of which he ultimately became sole proprietor. He exercised great influence during the Jackson administration; was highly esteemed for impartiality, for benevolence and patriotism, having given large sums during the civil war for the equipment of regiments and the support of the wives of soldiers. D. near Georgetown, D. C., Apr. 10, 1864.

Rives (WILLIAM CABELL), b. in Nelson co., Va., May 4, 1793; educated at Hampden-Sidney and William and Mary colleges; studied law under Jefferson; served as a volunteer in the war with England 1812–15; became prominent in Virginia politics; was a member of Congress 1823–27; minister to France 1829–32, and again 1849–53; U. S. Senator from 1832 to 1845, with a brief interruption; a member of the peace conference of 1861, and of the Confederate congress at Montgomery. D. near Charlottesville, Va., Apr. 26, 1868. Author of *The Life and Times of James Madison* (Boston, 3 vols., 1859–69) and other works.

Rive's Ring. See POLARITY.

Rivière' du Loup (EN BAS), p.-v. (called also FRASERVILLE), Temiscouata co., Quebec, Canada, on the S. E. shore of the river St. Lawrence, 125 miles below Quebec, and on Grand Trunk Railway, at the mouth of the picturesque stream of the same name. It is the seat of Fraserville Institute, a convent, and an academy, and has a good trade. It is a place of summer resort. P. 1541.

Rivière du Loup (EN HAUT), p.-v., cap. of Maskinongé co., Quebec, Canada, on the N. shore of Lake St. Peter, 66 miles below Montreal. It has a good trade and manufactures of leather. P. about 1500.

Riv'ington (JAMES), b. in London, England, about 1724; became a bookseller in London; acquired and lost a fortune; settled at Philadelphia 1760 and in New York 1761; established the New York *Gazetteer* Apr. 22, 1773, which became so obnoxious to the patriots that Capt. Isaac Sears with 75 horsemen from Connecticut destroyed the press and melted the types into bullets Nov. 23, 1775. Rivington, who had been confined by order of Congress May, 1775, went to England at the close of that year; was appointed king's printer for New York; brought over a new press, and commenced Oct., 1777, the publication of *Rivington's New York Loyal Gazette*, a title which he exchanged Dec. 13 for that of *Royal Gazette.* In 1781 he began to act as a spy for the patriots, furnishing Washington with important information on the British movements; remained in New York after the evacuation 1783, changing the title of his paper to *Rivington's New York Gazette and Commercial Advertiser*, but soon suspended its publication, and his remaining years were passed in obscurity and comparative poverty. D. at New York in July, 1802. He was well-informed, witty, and of elegant manners.

Ri'voli, town of Italy, province of Turin, on a hillside about 7½ miles W. of the city of Turin. On the top of the hill stand two castles—one ancient, the other modern—the former being very ruinous, though even now containing fine frescoes; the latter, begun in 1633, is still more rich in pictures, statuary, etc. The old collegiate church (founded 1304) and the present collegiate church, still older (1287), have been almost entirely rebuilt, and are remarkable for rich marbles, wood-carvings, and *intarsiatura.* The mediæval history of Rivoli was very stormy—a succession of civil broils and foreign sieges and sackages, followed by famine and pestilence. It is now a favorite country retreat for the Turinese aristocracy, and their beautiful villas are everywhere conspicuous in its picturesque vicinity. P. 6000.

Rivoli, tp., Mercer co., Ill., on Chicago Burlington and Quincy R. R. P. 1298.

Rix-Dol'lar [Sw. *riksdaler;* Da. *rigsdaler;* Ger. *Reichsthaler*], a silver coin formerly used in the Scandinavian countries, and formerly in Germany. Its name signifies a dollar of the realm, and its value varied in the different countries from a little less than 40 cents to a little more than one dollar.

Riyad. See RIAD.

Ri'zah, a small town, capital of a fertile district of the same name in Asiatic Turkey, on the Black Sea, 35 miles E. of Trebizond. Flax is extensively cultivated in this district, and the linen manufactured in Rizah obtained the first prize at the exhibition in Paris in 1855. The district contains 27,891 male inhabitants, most of whom are Mohammedans.

Riz'zio, or **Riccio** (DAVID), b. at Turin, Italy, in 1540, his father being a dancing-master; was brought up in France; became an accomplished musician, excelling especially on the lute; obtained favor at the court of Savoy, where he was selected on account of his skill in languages to accompany an embassy sent to Scotland about 1563. Having attracted the attention of Mary, queen of Scots, by his musical talent, she appointed him one of the pages of her chamber, and soon afterward (Dec., 1564) made him her secretary for foreign languages. He acquired great influence over her, and was accordingly hated by less fortunate courtiers; was an advocate of the marriage to Darnley, after which he was appointed keeper of the privy purse to the king and queen; was bitterly denounced by Knox and the Reformers on account of his Roman Catholicism; has even been regarded by some writers as a secret papal legate, and was regarded by many as the Queen's paramour and father of Prince James, the future founder of the Stuart dynasty of English monarchs. Several of the most powerful nobles, especially Morton, Ruthven, Lindsay, and Maitland, formed a conspiracy to assassinate him, and obtained the written concurrence of the weak Darnley by working upon his jealousy and by promising him the title of king. Introduced by Darnley into the queen's chamber, Ruthven and George Douglass struck down Rizzio in her presence, dragged him into the adjoining room, and despatched him with 56 wounds, Mar. 9, 1566. It has been charged that Knox and other Reformers were privy to this murder. This is improbable, but Knox wrote of it in his *History of Scotland* as "a just act, and most worthy of all praise." The hatred of Darnley which Mary then conceived led to the tragedy of Kirk o' Field (see DARNLEY) in the following year, and indirectly to the long series of crimes which stained the annals of Scotland for the remainder of the century.

Roach [Ang.-Sax. *hreoce*], a species of fish (*Leuciscus rutilus*) of the family Cyprinidæ, and the type of the genus *Leuciscus.* It is placed with its associates in a group distinguished by the pharyngeal teeth being in single series of five or six each, with crenate ridges and slightly hooked tips, the presence of twelve to fourteen anal rays, and the position of the dorsal fin opposite to the ventrals; the body is silvery, and the lower fins tinged with red, at least in the adult; the mouth is terminal. The species generally attains a length of about seven to nine inches, and sometimes reaches as much as ten or twelve. It is distributed throughout Europe N. of the Alps, and, although insignificant as a game-fish, it is generally included in European works on angling. In America the same name is applied to several species belonging to the same or related genera, and even, in some places, to the sun-fish (*Pomotis aureus*). THEODORE GILL.

Roach'ester, v., Salem tp., Warren co., O., on Little Miami River. P. 155.

Road [Ang.-Sax. *râd*], **Law of the,** *including Rules to avoid Collisions at Sea.* In England the law of the road consists of three well-settled rules—namely, (1) when two vehicles meet, each must bear to the left; (2) when one vehicle overtakes another, the foremost gives way to the left, and the other passes by on the off side; (3) a vehicle crossing the direction of another keeps to the left and crosses in its rear. In the U. S. two vehicles meeting turn to the right instead of to the left, but with this modification the law of the road is the same as in England. It has been decided in several States that the foregoing rules do not apply to pedestrians nor to equestrians, nor are they so peremptory in their nature that they must always be observed by drivers of wagons and carriages. The true doctrine is that all persons traversing a highway, whether walking, riding, or driving, must use reasonable care and diligence to avoid collision, even though it should be necessary, in order to effect that object, to turn in exactly the opposite direction from that prescribed by the customary law of the road; and what is such reasonable care must depend, in great measure, upon the circumstances of each particular case. The method of avoiding collisions at sea is now a matter of international concern. Different rules have hitherto been prescribed by different states, but at the present day the tendency is toward the adoption of a single system by all maritime countries. To this end the U. S. Congress and the British Parliament have enacted the same code of regulations for the government of all steam or sailing vessels at sea, of which the following is an abstract:

I. *Steering and Sailing Rules.*—It should be observed that the position of the two vessels contemplated in all these rules must be such that a risk of collision arises.

(1) When two sailing or steam vessels are meeting end on, or nearly so, both helms must be put to port, so that each may pass on the port side of the other. (2) When two sailing-vessels are crossing, and have the wind on different sides, the one with the wind on the port side shall keep out of the way, except that when the one with the wind on the port side is close-hauled and the other is free, the latter must keep out of the way: if both have the wind on the same side, or one has it aft, the windward vessel shall keep out of the way of the leeward one. (3) When two steam-vessels are crossing, the one which has the other on her own starboard side shall keep out of the way. (4) When a steam-vessel and a sailing-vessel are proceeding in such a direction as involves the risk of collision, the steam-vessel shall keep out of the way. (5) Every steam-vessel when approaching another vessel shall slacken speed, and if necessary stop and reverse, and in a fog shall go at a moderate speed. (6) Every vessel overhauling another shall keep out of the way of the latter. (7) Whenever by any of the foregoing rules one of two vessels is to keep out of the way, the other shall keep on her course, subject to the general limitation contained in the next rule. (8) In construing and obeying these rules due regard must be had to all dangers of navigation, and to any special circumstances which may exist in any particular case rendering a departure from them necessary in order to avoid immediate danger.

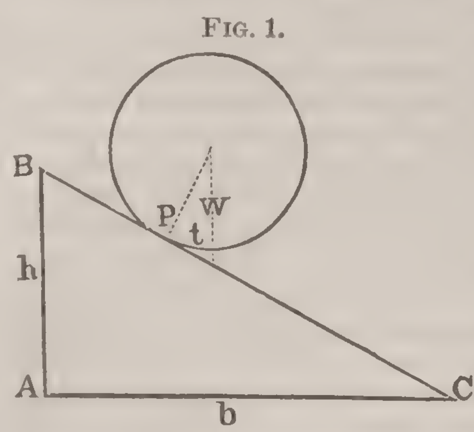
II. *Rules in regard to Lights.*—The following-described lights are required to be carried by sea-going vessels between sunset and sunrise, and by means thereof, and of their relative position as seen from two approaching vessels, the course upon which each of such ships is proceeding can be easily determined. In all the following cases except that mentioned in Rule 4 the vessels are to be under way: (1) Steamers must carry at the foremast head a bright white light, on the starboard side a green light, on the port side a red one; and these two side lights must be so arranged with inboard screens that they cannot be seen across the vessel's bow. (2) Steamers towing other vessels must carry two white masthead lights vertically, instead of one. (3) Sailing-vessels shall carry the two sidelights as above described, but none at the masthead. (4) All vessels, whether steam or sailing, when at anchor in roadsteads or fairways, shall show, not more than 20 feet above the hull, a white light in a globular lantern 8 inches in diameter. In addition to the foregoing regulations for vessels at sea, the U. S. statutes prescribe the following for coasting and inland steamers: Those plying upon the rivers flowing into the Gulf of Mexico and their tributaries shall carry a red light on the outboard side of the port smoke-pipe, and a green one on the outboard side of the starboard smoke-pipe; while coasting steamers, and those navigating the bays, lakes, and other rivers of the U. S. (except ferryboats), shall carry the red and green lights prescribed for sea-going vessels, and also a central range of two white lights, the after one of which is to be at least 15 feet higher than the one at the bow. Special rules are also provided for pilot-boats, ferryboats, and other small craft.

III. *Fog-Signals.*—In fogs, either by day or by night, steamers under way shall sound a steam-whistle at intervals of not more than one minute; sailing vessels under way shall sound a fog-horn at least every five minutes; and both steamers and sailing-vessels at anchor shall ring a bell at intervals of not more than five minutes. (For the foregoing code in detail see *Rev. Stat. of U. S.*, tit. "Commerce and Navigation," ch. v., and 25 & 26 Vict. ch. 63 (1862), schedule C.) JOHN NORTON POMEROY.

Roads and Pavements. A road [Ang.-Sax. *rad*, *rade*, "a ride," "a passing on horseback"] is an open way or public passage appropriated for travel, and generically includes highway, street, and lane. A pavement (Lat. *pavimentum*) is a covering of stone, bricks, or other hard and solid material laid firmly on a road or street in order to give a smooth and convenient surface for travel and traffic. The limit assigned to this article will not admit of any discussion of the considerations governing the location of country roads, or of the details of their construction with respect to excavations, embankments, side-ditches, cross-drains, culverts, the protection of earthen slopes, and the building of bridges, etc. Our remarks will be restricted to a description of the methods of treating the surfaces of roads and streets in order to adapt them to the requirements of traffic, assuming that in other particulars they have been properly constructed.

The *grade* of a road or street is the angle which the axis makes with a horizontal line. It should never, except for very short distances, be steeper than the angle of repose, or that angle upon which a loaded wheeled vehicle of the kind in common use would not be set in motion by its own weight, but would slowly descend if a slight motion be imparted to it. The *tractive force* is the power required to move a vehicle and load on a horizontal road. At the angle of repose the force acting parallel to the grade to sustain the vehicle in its position on the incline is equal to the tractive force. Assume, for simplicity, that the load W rests on one wheel, that p = the pressure in pounds normal to the road, t = the tractive force in pounds, that h = the perpendicular, and b = the base of a right-angled triangle of which the hypothenuse B C (Fig. 1) represents the slope of the angle of repose. In the smaller similar triangle the tractive force t is the perpendicular, the normal pressure p the base, and the load W the hypothenuse.

FIG. 1.



$$t : p :: h : b,$$

and by substitution $$\frac{t}{\sqrt{W^2 - t^2}} = \frac{h}{b}$$

But t is so small in proportion to W that it may be omitted in practice, and we have

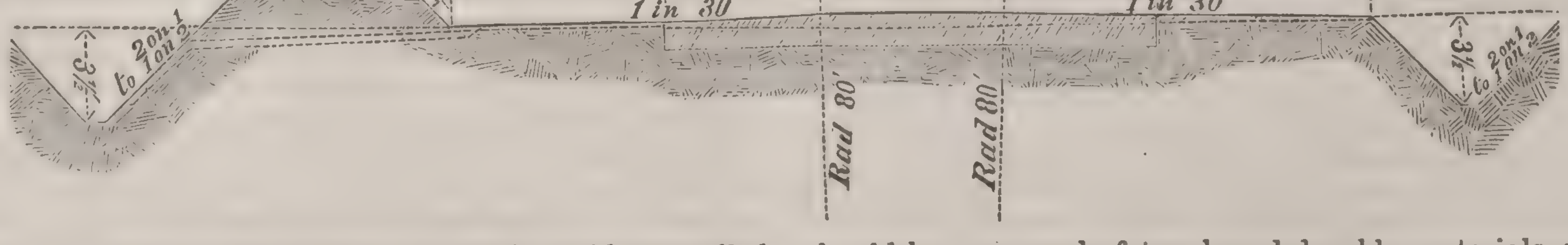
$$\frac{t}{W} = \frac{h}{b}.$$

But $\frac{h}{b}$, or the perpendicular divided by the base, represents the angle at the base or the slope of the angle of repose—that is, the steepest admissible grade. Hence, the proper grade in any case is found by dividing the tractive force by the weight of vehicle and load. A suitable grade for a good gravel or broken-stone road is $\frac{1}{34}$, or at greatest $\frac{1}{30}$. For short stretches $\frac{1}{25}$ will answer, and if very short, $\frac{1}{20}$.

The width of roads will depend largely on local circumstances. A width of 27 to 30 feet prepared for vehicles will amply suffice for the principal route between cities, which must be increased within or near the suburbs to 40 or 50 feet, or more. For branch roads, or roads connecting small towns, the width may be much less, the metalled portion not exceeding 16½ to 17 feet, while the wings may be left as earth-roads. In order to carry off the rainfall the surface slopes from the centre toward the side-ditches or gutters. This inclination may be 1 in 20 for rough roads, 1 in 30 for good broken-stone or gravel roads, 1 in 40 to 50 for streets paved with blocks, and 1 in 50 to 60 if covered with asphalt.

The best transverse form is secured by two planes sloping gently toward the side-gutters, and connected in the middle of the roadway by a short convex surface, as shown

FIG. 2.



in Fig. 2, where the road is shown 30 feet wide, metalled in the middle for a width of 16 feet, with a footpath on one side, and side-ditches.

Road-coverings have for their object the reduction of the tractive force to the lowest possible limit at the least cost for construction, maintenance, and repairs, and they should be composed of tough and durable materials, such as the basaltic, the doloritic, and other trap-rocks, the sienitic granites, and some of the limestones, laid upon a firm bed suitably drained. For country roads the material is generally used in the form of coarse gravel, or broken stone of all sizes up to pieces of 2½ inches in longest di-

mensions, applied in successive layers, each of 3 to 4 inches in thickness, well compacted by ramming, rolling, or traffic. During the consolidation of the top-layer the material must be kept moist, and men with rakes should be in constant attendance to fill in ruts and depressions, so as to give the finished surface the required form and secure uniform density in the covering. The aggregate thickness of the covering need not exceed 10 to 12 inches. When composed of broken stone only, it is sometimes called a Macadam road. A Telford road (Fig. 3) is made with layers of broken stone, aggregating 6 to 7 inches in thickness, resting on a sub-pavement of stone blocks, from 6 to 7 inches in depth and 4 to 5 inches in thickness, set on their broadest edges in contact in courses across the roadway. All the irregularities in the upper surface of the sub-pavement are broken off, and the joints are filled by wedging in small pieces of stone with a hammer. When finished, its top is parallel to the required road-surface, and the layer of broken stone which surmounts it should therefore be of uniform thickness. It is consolidated in the same manner as for a road of all broken stone. In soft soils a layer of rubble-stones is sometimes first laid as a foundation for the Telford sub-pavement, or the latter may be omitted entirely and rubble-stones, varying in thickness from 3½ to 5 inches and in width and length from 8 to 18 inches, substituted therefor. Such a foundation should be constructed with great care, the larger stones being laid down first, side by side, upon the road-bed, and firmly set to their places by rammers. The interstices are then levelled up with smaller stones, and the superstructure, whether of gravel or broken stone, placed thereon. The first layer, of broken stone, should not exceed 2 inches in thickness, and it should be thoroughly compacted by ramming or rolling, in order that it may penetrate and thoroughly unite with the foundation, so as to prevent subsequent movement among the parts. When the soil is quite soft, it is well to set the rubble-stones in contact on their edges in lines across the road, although they may vary greatly in shapes and sizes, as shown in plan in Fig. 5, and in vertical section across the road in Fig. 4. In very soft clayey soils, especially where constantly saturated with water, cases have occurred where it was necessary to resort to a concrete foundation about 6 inches thick to prevent the road-material from sinking into and mixing with the clay. Rubble-stones on edge, but not in contact, with the interstices filled in with concrete, as shown in Fig. 6, would be equally good.

FIG. 3.

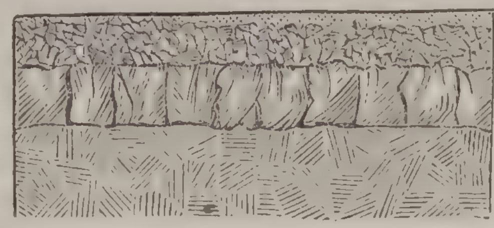
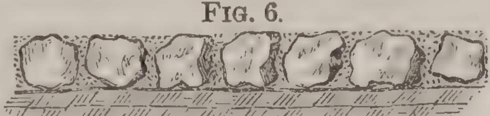


FIG. 4.

FIG. 5.

FIG. 6.



The value of a good road, and the importance of keeping it in good condition in districts where the road-traffic is large, cannot well be overstated. It may be remarked, by way of comparison, that if 50 horses are just sufficient to conduct a given traffic upon a given length of a very dry and smooth broken-stone road, it will require 71 horses to conduct the same traffic upon an equal length of the same road in a moist and dusty condition; 112 horses if the road be covered with ruts and mud; 192 horses if it be covered with deep ruts and thick mud; while upon the same length of solid earthen causeway covered with gravel 1½ inches thick 240 horses would be necessary to accomplish the same work. In France two methods of maintaining broken-stone roads are practised. The first method is one of minute daily repairs, by which the road-covering is preserved at a constant thickness by filling in the ruts and depressions as fast as they begin to appear, and thus systematically restoring fresh material in the place of that removed as dust or mud by sweeping and scraping. This method is applicable to roads upon which the average daily traffic does not exceed 600 tons upon a road-covering 18 to 20 feet wide. The other method is one of partial repairs, accompanied by periodical additions of fresh material, by which the diminished thickness of the covering is restored at stated intervals, applicable to roads upon which the daily traffic exceeds 600 tons on a road 18 to 20 feet wide. In practice, this method consists in allowing the broken stone to wear down gradually and evenly, limiting the repairs to a preservation of the unity of surface by filling in holes and ruts until the depth of the road-metal is reduced to 4 or 5 inches, when a thorough repair is made to the extent of restoring the original thickness, by layers of new material suitably compacted by rolling and by traffic. The wear of road-material is not in direct ratio to the tonnage passing over it, but, other conditions remaining the same, it augments more rapidly than the tonnage.

A street-pavement ought to be smooth and hard in order to give a secure foothold for animals; not become slippery from use; be as noiseless and as free from dust and mud as possible; be easily and cheaply cleansed; and be of such material and construction that it can be readily taken up and relaid in places at all seasons of the year. Economy of maintenance also requires that the material at the surface shall be durable. A good foundation is as necessary for the stability of a pavement as for that of any other structure, and a street-surface which satisfies all the foregoing conditions will inevitably fail as a pavement if it rests upon a yielding foundation. The following are among suitable foundations—viz. (1) hydraulic concrete 6 to 8 inches thick; rubble-stones set on edge, but not in contact, with the voids filled in with concrete, as shown in Fig. 6; (2) rubble-stones set in contact on edge, as in Figs. 4 and 5; cobble-stones firmly set in a form of sand or gravel, as for a cobble-stone pavement; small rubble-stones of random sizes in a well-compacted bed 7 to 8 inches thick; or a layer of broken stone of about the same thickness laid as for a broken-stone road. A form of compacted sand or gravel is the foundation in most common use for all pavements except those of asphalt applied in a continuous sheet, and it answers tolerably well when it is not over 5 or 6 inches deep, is underlaid by firm soil, and cannot escape laterally. Road-surfaces of broken stone or gravel, although they give a secure foothold for animals, are comparatively noiseless, and are well adapted to park-drives and suburban streets, require such constant supervision to arrest the formation of ruts, and are so infested with either dust or mud, as to render them entirely unsuitable for thickly-settled districts in cities or large towns.

The best stone pavement is one of rectangular blocks set in contact on their longest edges, in lines across the street, and resting on a foundation of concrete, or rubble-stone filled in with concrete. The blocks should be 3½ to 4½ inches broad, measured along the street; 9 to 12 or even 15 inches long, measured across the street; and 8 to 10 inches in vertical depth. The Belgian pavement, of which the form of the blocks more nearly resembles a cube varying from 5 to 7 inches on each side, is but little inferior to the one last named if the foundation be equally good. When the blocks, whether rectangular or cubical, rest on a sand foundation, they should all be equal in bed-area, to prevent as far as possible unequal settlement from the blows of passing vehicles. The layer of cobble-stones in common use for street-coverings scarcely deserves the name of pavement. It is noisy, rough, difficult to clean, severe upon animals and vehicles, and unpleasant to travel over, while an animal cannot draw upon it when in its best condition more than one-third his ordinary load upon a good surface of stone blocks.

The most valuable wooden pavement is composed of rectangular blocks set on their longest edges close together in courses across the street, with an open joint about ¾ inch wide between the courses. The blocks are 3 to 4 inches wide, 8 to 14 inches long, and 6 to 8 inches deep, and they should rest on a well-compacted bed of sand or a layer of boards. Wood-blocks would soon be destroyed by crushing if set upon a rigid, inelastic foundation. The wood should be creosoted to prevent early decay. The open joints are filled with a mixture of prepared coal-tar and gravel. Many of the details of construction are covered by patents, but a combination of the best features of them all will not produce a durable pavement.

A good asphalt pavement requires a solid foundation, preferably either the first or second of those mentioned above. The asphalt covering may be the natural asphalt rock derived from the Jurassic region on the confines of Switzerland, or it may be composed of asphaltic cement suitably prepared by refining natural bitumen, to which is added a calcareous powder to take the place of the amorphous carbonate of lime contained in the natural asphalt rock. It is usually applied upon the foundation in a continuous sheet 2 to 3 inches thick, although it may be used in the form of a rectangular block prepared under heavy pressure. Its application in this form is of quite recent date, and its value not yet well established. No description of the process of laying these pavements can be given here, but it should be mentioned that a capital distinction must be made between pavements of genuine asphalt, properly prepared, and all those patented imitations of or substitutes for it composed of wood-tar, coal-tar, pitch,

resin, etc., mixed with either sand, gravel, ashes, scoriæ, sulphur, lime, etc., or with two or more or all of them. They are unfit for carriage-way pavements.

The advantages of a good monolithic asphalt pavement are—(1) that it produces no dust, and therefore no mud; (2) it is comparatively noiseless; (3) it does not absorb and retain noxious liquids; (4) it is impermeable to moisture, and neither emits nor allows the emission from the subsoil of unwholesome and poisonous vapors; (5) it reduces the force of traction, and consequently the wear and tear upon animals and vehicles, to a minimum; and (6), although furnishing a somewhat less secure foothold for animals than blocks of stone or wood, it does not become polished and slippery from continued wear. It is adapted to all streets not steeper than 1 in 48 or 50, except perhaps those that are thickly crowded with heavy loads and are kept constantly wet from urine, and where the vehicles are subjected to the inconvenience of frequent and sudden halts, starts, and sharp turns. In other localities, where there is more room or the traffic is lighter, or where a large portion of it is pleasure-driving, and especially where the streets are lined with residences on either side, the many advantages of a good asphalt pavement, its cleanliness, its noiselessness, and its imperviousness to noxious fluids—important features in which it stands unrivalled—should not be lost sight of.

The comparative merits of wood, stone, and monolithic asphalt pavements may be briefly stated as follows:

1. *Durability.*—Stone possesses the longest life, and wood very much the shortest, while asphalt lies between the two, and very near to the stone. Unless the stone be of excellent quality for paving purposes, it takes the second place, and asphalt the first.

2. *First Cost.*—At present prices a good asphalt pavement on a concrete foundation can be laid for $3.50 per square yard, with 30 per cent. profit to contractor. This somewhat exceeds the first cost of a wooden pavement, but is less by at least $1 per square yard than one of stone set on a concrete foundation. In economy of first cost wood, therefore, stands first, asphalt second, and stone third.

3. *Cost of Maintenance and Repair.*—Under this head the life or endurance of the pavement must be considered, and the total expense must cover a period representing that endurance, and leave the pavement as good as new at the end of that time. The order of merit will be—first stone, second asphalt, and third wood, and the stone must be both hard and tough in order to maintain the first place.

4. *Facility of Cleansing.*—Mud and dust adhere more tenaciously to wood than to stone, especially after the fibres of the former begin to crush and abrade. They are also more easily removed, by either sweeping or washing, from a continuous surface than from one traversed by numerous joints. The order of merit under this head will therefore be asphalt first, stone second, and wood third.

5. *Convenience.*—The asphalt pavement is the most pleasing to the eye, and is the smoothest and cleanest of the three. Stone is the most noisy of all pavements. The noise produced by wood is a constant rumble—that by asphalt an incessant clicking of the horses' feet, with very little noise from the carriage-wheels; while stone gives out a deafening din from feet and vehicle combined. If the surface be clean, the difference in slipperiness between wood, stone that does not polish, and asphalt is not great, although enough to place asphalt last, while a horse falls more frequently and recovers himself less often and less easily upon it than upon the others. Mud will render either of the pavements slippery, but asphalt the most so, although it is not slippery when dry or if free from mud when wet. As usually kept up, a slight rain adds to the slipperiness of each, with this difference, that upon asphalt and stone this state begins with the rain, while the worst condition of the wood ensues later and lasts longer. With regard, therefore, to the safety of the animals and the convenience and comfort of those using the street, as well as those living upon it, the weight of opinion places asphalt first, wood second, and stone third for all except very crowded business-streets, in which case stone rises to the first place and asphalt sinks to the third.

6. *Hygienic Considerations.*—Among the hygienic objections to stone are its constant noise and din and its open joints, which collect and retain the surface-liquids and throw off noxious vapors and filthy dust. In populous towns there is scarcely a moment of silence, night or day. The writings of eminent medical practitioners are full of testimony to the pernicious influence of street noise upon the health of the population, particularly upon invalids and persons with sensitive nerves. The noisome and noxious exhalations emanating from fæcal and other putrescent matter collected and held in the joints of block pavements, whether of wood or stone, constitute another sanitary objection to their use in populous towns. The joints comprise, after enlargement by wear, fully one-third the entire area of the carriage-way, and under the average care the surface of filth exposed to evaporation covers three-fourths of the entire street. This foul organic matter, composed largely of urine and the excrement of different animals, is held in the joints, ruts, and gutters, where it undergoes putrefactive fermentation in warm, damp weather, and becomes the fruitful source of noxious effluvium, or it floats in the atmosphere and penetrates the dwellings in the form of unwholesome dust, irritating to the eyes and poisonous to the organs of respiration. These objections apply in common to wood and stone. There are others peculiar to wood alone arising from its rapid decay, its porosity, and the spongy and absorbent character conferred upon it by crushing and wear. M. Fonssagrives, the eminent professor of hygiene at Montpellier, France, says: "The hygienist cannot look favorably upon a street-covering consisting of a porous substance capable of absorbing organic matter, and by its own decomposition giving rise to noxious miasma, which, proceeding from so large a surface, cannot be regarded as insignificant. I am convinced that a city with a damp climate paved entirely with wood would become a city of marsh-fevers. . . . The absence of dust, the abatement of noise, the omission of joints—permitting a complete impermeability, and thus preventing the putrid infection of the subsoil—are among the precious benefits realized by asphalt streets." Upon hygienic grounds, therefore, asphalt conspicuously stands first, stone second, and wood third in order of merit.

It will be inferred from the foregoing that in order to obtain the best pavement for any given locality a judicious balancing of characteristic merits is generally necessary. The most suitable pavement for the busiest streets of a city, where the traffic is dense, heavy, and crowded, is one of rectangular stone blocks set on a concrete foundation, while for streets of ample width, or those largely devoted to light traffic or pleasure-driving, or lined on either side with residences, asphalt is the best for all grades not steeper than 1 in 48 or 50.

Objection is sometimes made to the concrete foundation that it is difficult to take up in order to reach the gas and water pipes. This is true only in the sense that good work is not easily taken to pieces. The fact is, that such a foundation affords a thorough protection to the pipes against frost, and were it otherwise they should, of course, be laid deeper. A concrete foundation when torn up or deranged from any cause can readily be restored to its former condition, and the surface-covering relaid upon it with all its original smoothness, firmness, and stability—conditions which do not obtain with any kind of pavement laid upon a form of sand or gravel. (See Prof. Gillispie on *Roads and Railroads;* Gen. Gillmore on *Roads, Streets, and Pavements;* Prof. Mahan, *Civil Engineering* and *Constructing and Repairing Common Roads,* in Weale's series.)

Q. A. Gillmore.

Roane, county of E. Tennessee, intersected by Holston and Clinch rivers, which here unite to form the Tennessee, bounded W. by a spur of the Cumberland Mountains and traversed by East Tennessee Virginia and Georgia R. R., is largely devoted to stock-raising, produces Indian corn, sorghum-molasses, wool, and butter, and has several tanneries and wool-carding establishments. Cap. Kingston. Area, about 600 sq. m. P. 15,622.

Roane, county of the western part of West Virginia, on Pocotaligo River, is mountainous and abounds in iron and coal. Chief staples, Indian corn, hay, flax, tobacco, sorghum-molasses, wool, and butter, and raises considerable numbers of sheep and swine. Cap. Spencer. Area, 450 sq. m. P. 7232.

Roane, tp., Lafayette co., Ark. P. 1150.

Roanne′, town of France, department of Loire, on the Loire, which here becomes navigable and is crossed by an elegant bridge. It is a handsome town, with large manufactures of cotton, muslins, jewelry, and paper, and considerable importance as an intermediate station of the traffic between Southern and Northern France. P. 20,037.

Roanoke′, a river formed by the union of the Dan and Staunton rivers at Clarkesville, Va. It flows 250 miles in an E. S. E. course, and finally flows into Albemarle Sound near Plymouth, N. C. It is a tidal stream to Halifax Falls, N. C., 75 miles from its mouth, is navigable 75 miles farther to Weldon by steamboats, and throughout its course by bateaux. Its valley is picturesque and fertile.

Roanoke, county of S. W. Virginia, intersected by Staunton River, and lying across the "Valley of Virginia" from the Alleghany Mountains to the Blue Ridge, has an extremely fertile soil, and is crossed by the Virginia and Tennessee division of Atlantic Mississippi and Ohio R. R. Chief staples, wheat, tobacco, and butter. Cap. Salem. Area, 200 sq. m. P. 9350.

Roanoke, p.-v. and tp., Randolph co., Ala. P. 1750.

Roanoke, tp., Randolph co., Ark. P. 1614.

Roanoke, p.-v. and tp., Woodford co., Ill., on Chicago Pekin and South-western R. R. P. 998.

Roanoke, p.-v., Jackson tp., Huntington co., Ind., on Wabash River, Wabash and Erie Canal, and Toledo Wabash and Western R. R. P. 627.

Roanoke, p.-v., Howard co., Mo. P. 220.

Roanoke, tp., Northampton co., N. C. P. 1778.

Roanoke, tp., Charlotte co., Va. P. 4830.

Roanoke, tp., Halifax co., Va. P. 6182.

Roanoke College, a Lutheran educational institution located at Salem, Roanoke co., Va., chartered as a college by the legislature of Virginia in 1853, and was the only one within the bounds of the Southern Confederacy that kept up its regular sessions during the civil war. Up to 1868 its graduates were few in number, but have increased to 133 in 1875, in which year there were 167 students and 9 instructors. More than half its graduates have entered the Christian ministry. The curriculum of studies is extensive and peculiar. It is peculiar (1st) in the embodiment of Christianity in the course, the connection of religion and the sciences in the departments of ethnology, geology, natural theology, and the evidences of Christianity; (2d) it is peculiar in the extension of the department of metaphysics: Haven's *Mental Philosophy*, Hickok's *Psychology*, and Morell's *History of Philosophy*, together with Mahan's *Logic*, are thoroughly studied as textbooks, and written examinations conducted upon them. A normal department has lately been introduced in connection with the college, in which scientific lectures are delivered upon the art of teaching. The college library has 9000 vols., many costly and scarce books, and has a cabinet of 11,000 specimens of minerals, with apparatus and facilities for the study of the natural sciences. The location of the institution is upon the line of the Atlantic Mississippi and Ohio R. R., in a most picturesque and fertile valley of Upper Roanoke River. The climate of the locality is remarkable for mildness and salubrity. From the productiveness of the Roanoke Valley, *cheapness* is a prominent feature of the college. D. F. Bittle.

Roar'ing [Ang.-Sax. *rârian*], in the horse, is the noise made by some horses while drawing in the breath, especially while travelling fast. It is a sign of unsoundness. It depends upon a kind of wasting disease of the muscles of the larynx, and is incurable. Nevertheless, some of the best of horses, like the great Eclipse, have been confirmed roarers. In England tracheotomy and the continued use of the tracheotomy-tube have been successfully employed for its relief.

Roaring Creek, p.-v. and tp., Columbia co., Pa. P. 486.

Roaring River, p.-v. and tp., Barry co., Mo. P. 667.

Roaring Spring, p.-v., Trigg co., Ky. P. 120.

Roark', tp., Gasconade co., Mo. P. 3033.

Roasting. See Metallurgy, by Prof. J. A. Church, E. M.

Roast'ing [D. *roosten*] of meats should be at first rapid, so as to seal up the albuminous juices in a rather strong crust; and the dredging on of flour is useful as entirely completing this crust. After this is formed the cooking process should be more slow. Baking is a more economical form of roasting, but there is a decided impairment of the flavor.

Robb, tp., Posey co., Ind. P. 1781.

Robbery [O. Fr. *roberie*]. At the common law *robbery* is the felonious taking of money or goods from the person of another, or in his presence and against his will, by violence or by putting him in fear. It is distinguished from mere larceny from the person by the indispensable ingredients of either violence used against the person robbed, or such threats, gestures, or other accompanying acts and circumstances as will naturally put a reasonable man in fear of his life, or of bodily injury, or of loss or destruction of his property; and this violence or intimidation must precede or be simultaneous with the act of taking. It is not necessary that the money or goods should be actually taken by the robber; if, under the influence of the fear produced by his threats or by a sufficient show of force, the person surrenders up the property to the one thus unlawfully demanding it, the offence is committed. In the U. S. the several States have generally legislated in respect of this and other crimes, and have defined it in precise statutory terms, sometimes separating it into degrees, but they have all preserved the essential elements of a taking from the person or in his presence, with violence or by means of fear aroused in his mind through threats or other species of intimidation. The following instances are given as illustrations of this legislation. In New York and some other States it is enacted that the felonious taking the personal property of another from his person or in his presence and against his will, by violence to his person or by putting such person in fear of some immediate injury to his person, shall constitute robbery in the first degree; while the felonious taking the personal property of another in his presence or from his person, which shall have been delivered or suffered to be taken through fear of some injury to his person or property, or to the person of any relative or member of his family, threatened to be inflicted at some different time—which fear shall have been produced by the threats of the person so receiving or taking such property—shall constitute robbery in the second degree. The punishment imposed for the first degree as thus described is imprisonment in the State prison for a term not less than ten years, and for the second degree a like imprisonment for not more than ten years. The statutes of Massachusetts, Maine, Michigan, Wisconsin, Vermont, and Iowa also make a distinction unknown to the common law with two grades of the crime, and provide (1) that if any person shall assault another, and shall feloniously rob, steal, and take from his person any money or other property, such robber being armed with a dangerous weapon, with intent if resisted to kill or maim the person robbed, or if being so armed he shall wound or strike the person robbed, he shall be punished, in Massachusetts and in Maine, by imprisonment for life, in Michigan for life or any number of years, in Wisconsin for not more than ten nor less than three years, in Vermont for not more than twenty years, and in Iowa for not more than twenty nor less than ten years; and (2) if any person shall by force and violence, or by assault or putting in fear, feloniously rob, steal, and take from the person of another any money or other property, such robber not being armed with a dangerous weapon, his punishment shall be, in Massachusetts and in Maine, imprisonment for life or for any term of years, in Michigan for not more than fifteen years, in Wisconsin for not more than three years nor less than one year, in Vermont for not more than ten years, in Iowa for not more than ten nor less than two years. In several other States a statutory distinction is also made, and two grades of the offence are created, depending upon the use of actual force and violence by the robber, or the use of mere threats and intimidation without violence, the punishment being apportioned to the degrees, and always consisting of imprisonment in the State prison or penitentiary, although the period of such confinement varies in different States from that for life down through the decreasing terms of twenty, fifteen, ten, seven, five, four, three, and two years, and in a few instances even one year. In all these statutes, even when degrees are established, the essential elements which entered into the notion of the crime at the common law, as described above, are plainly preserved. Property must be taken of some value, which might be the subject of larceny. The taking must be from the peaceable possession of the individual robbed, but if the goods are taken from his immediate presence and under his eye they are regarded as abstracted from his person. The taking, however, may be constructive, for if the one robbed is induced to surrender his property by his own manual act through fear, the law declares this a taking. There must also be actual violence, or a reasonable putting in fear before or at the time of the taking. In respect of what shall constitute a sufficient violence, the courts have refined and drawn very nice distinctions between acts which are robbery and those which only amount to larceny from the person. Finally, the fear, which is the alternative of violence, may be either of injury to the owner's own person or to the person of his wife or child, or of injury to his property; and a few special cases have held that a fear of injury to his character is sufficient when a prosecution for some peculiarly heinous or abominable crime was threatened by the robber.

John Norton Pomeroy.

Rob'bins (Ashur), LL.D., b. at Wethersfield, Conn., in 1757; graduated at Yale College 1782; was tutor in Rhode Island College (now Brown University) 1783–90; became a lawyer at Newport, where he attained high professional distinction; served in the State legislature 1818–25; was U. S. district attorney 1812, and U. S. Senator 1825–39. D. at Newport Feb. 25, 1845.

Robbins (Chandler), D. D., b. at Lynn, Mass., Feb. 14, 1810; graduated at Harvard 1829, and became pastor of the Second church (Unitarian) at Boston 1833, which position he has since retained. Author of many addresses, sermons, and occasional publications, of a *History of the Second Church* (1852), of memoirs of Maria E. Clapp (1858) and William Appleton (1863), and one of the editors of the *Proceedings* of the Massachusetts Historical Society, of which he is an active member.

Robbins (Royal), D. D., b. at Wethersfield, Conn., Oct. 21, 1788; graduated at Yale College 1806; was ordained (June 26, 1812) pastor of the Congregational church at Kensington parish, Berlin, Conn., and filled that post until June 26, 1859. D. at Berlin Mar. 26, 1861. Author of *The World Displayed*, of a popular manual for schools entitled *Outlines of Ancient and Modern History* (1839), of a *History of American Literature* (1837), intended as a supplement to the work of Chambers on English literature, of brief biographies of the poets Percival and Brainerd prefixed to editions of their writings, of many published sermons and contributions to the theological reviews.

Robbins (Thomas), D. D., b. at Norfolk, Conn., Aug. 11, 1777; graduated at Yale College 1796; was pastor of a Congregational church at East Windsor 1809–27, at Stratford 1830–31, and at Rochester, Mass., 1832–42; afterward resided at Hartford, Conn.; was one of the founders of the Connecticut Historical Society, and its secretary and librarian from 1844, and bequeathed to it his valuable library. D. at Colebrook, Conn., Sept. 13, 1856. Author of a *Century Sermon* preached at Danbury, Conn., Jan. 1, 1801, and other published sermons, of *An Historical View of the First Planters of New England* (Hartford, 1815), and of a *View of all Religions* (1824), and editor of Tytler's *Elements of General History*, revised and continued to 1815 (1820).

Rob′bins Plantation, tp., Washington co., Me. P. 4.

Rob′binston, p.-v. and tp., Washington co., Me., on St. Croix River. P. 926.

Rob′binsville, p.-v. and cap., Graham co., N. C.

Rob′ert II., surnamed the Devil, succeeded his brother as duke of Normandy in 1027. He humiliated his vassals and kept order in his realm; conquered districts from his neighbors and regulated his frontiers; supported Count Baldwin IV. of Flanders against his sons; King Henry I. of France against his mother; his nephews, Alfred and Edward of England, against Canute of Denmark; and was the very image of mediæval energy, audacity, unscrupulousness, and cruelty (hence his surname). From the height of his success he suddenly fell into melancholy. He repaired to Rome with a magnificent retinue; thence he went next year to Constantinople with a more modest train; and from Constantinople he journeyed on foot to Jerusalem. At the Holy Sepulchre he found consolation, but on his return d. suddenly at Nicæa July 2, 1035. His only child, borne to him by a mistress, was William the Conqueror, who succeeded him. The text of the famous opera by Meyerbeer, *Robert le Diable*, is based on a romance of 1496, and has very little to do with history.

Robert I., king of Scotland. See Bruce (Robert).

Robert II., king of Scotland, founder of the Stuart dynasty, b. in Scotland Mar. 2, 1316, son of Lord Walter Stewart by Marjory, daughter of Robert Bruce; succeeded his father in 1326 as seventh high steward of Scotland (whence the family surname); distinguished himself at the battle of Halidon Hill (1333); became joint regent with the earl of Murray 1334, and sole regent 1338–41, during the minority and absence in France of his nephew, King David II.; was again regent with the earl of March from the capture of the king at the battle of Nevill's Cross, Oct., 1346–57; opposed a successful resistance to the project of imposing Lionel, duke of Clarence, upon Scotland as king, and renewed his oath of fealty to David II. 1363; was imprisoned 1363–69; declared king after the death of David, Feb., 1371; was crowned at Scone Mar. 26, 1371; conducted two wars with Richard II. of England, in the second of which took place the successful forays of Richard II. and the duke of Lancaster, into Scotland, and of the "doughty Douglas" into England, and his victory and death at Otterburn (or Chevy Chase) July 21, 1388; suffered much from the disorders of his turbulent barons and the border wars with England. D. at Dundonald Castle May 13, 1390.

Robert III., king of Scotland, son of Robert II. by his first wife, Elizabeth Mure of Rowallan, b. in Scotland about 1340; was first known as John Stuart, earl of Carrick; succeeded to the throne May 13, 1390; was crowned at Scone Aug. 14, 1390; renewed the war with England 1399; was an imbecile ruler, and left the administration in the hands of his ambitious and unscrupulous brother, Robert Stuart, earl of Menteith, by whom the heir to the throne, David, duke of Rothsay, was imprisoned and starved to death in Falkland Castle 1402 (see Scott's *Fair Maid of Perth*); suffered the invasion of Henry IV. of England 1400, and the terrible defeat of Homildon Hill 1402; sent his surviving son, Prince James, to France for safety against the designs of Menteith, and became the victim of incurable melancholy on learning the imprisonment of his son by the English, May, 1405. D. at Rothsay, Bute, Apr. 4, 1406.

Robert′ (Louis Léopold), b. at La Chaux-de-Fonds, near Neufchâtel, Switzerland, May 13, 1794; went to Paris in 1810 to learn engraving under Girardet; studied painting under David; went in 1818 to Italy; attracted great attention in 1822 by his *Neapolitan Improvisator*, and subsequently by other representations of Italian life—*The Reapers* (1831), *The Fishermen of the Adriatic* (1834), etc., and committed suicide in Venice Mar. 20, 1835.

Robert′-Fleury′ (Joseph Nicolas), b. at Cologne Aug. 8, 1797; studied painting in Paris under Girodet, Gros, and Horace Vernet; travelled in Italy; began to exhibit in 1824; was appointed professor at the Academy of Fine Arts in Paris in 1855, and director of the French Academy in Rome in 1865, whence he returned in 1866. His most celebrated pictures are—*Une Scène de la St. Barthélemy* (1833), in the Luxembourg; *L'Entrée de Clovis à Tours* (1837), in Versailles; *Charles V. in Yuste* (1857).

Robert Guiscard. See Guiscard.

Robert of Gloucester, probably a monk of Gloucester Abbey, supposed to have been born early in the reign of Henry III., but nothing whatever is known of his personal history except that he was living at the time of the battle of Evesham (1265). He was author of a metrical chronicle of England from the time of the fabulous Brutus to his own times, chiefly based upon Geoffrey of Monmouth. It extends to 10,000 lines, and is valuable as one of the earliest specimens of the English language when assuming its final form. It was printed by Thomas Hearne (1724), reprinted 1810.

Rob′erts, tp., Marshall co., Ill., on Illinois River and Lacon branch of Chicago and Alton R. R. P. 883.

Roberts, tp., Beaufort co., S. C. P. 1771.

Roberts (Benjamin S.), b. at Manchester, Vt., in 1811; graduated at the U. S. Military Academy in 1835; served in the army till 1839; civil engineer 1839–42; admitted to the bar, and practised 1843–46; served in the Mexican war, and brevetted lieutenant-colonel; on frontier duty 1848–61; served during the civil war in various capacities, and was brevetted brigadier-general U. S. A. and major-general U. S. V. D. Jan. 29, 1875.

Roberts (David), R. A., b. at Stockbridge, near Edinburgh, Scotland, Oct. 24, 1796; was in early life a house-painter, afterward a scene-painter for the London theatres; visited Spain 1832–33, painting many pictures, from which he prepared a lithographic collection of *Picturesque Sketches in Spain* (1837); travelled in the East 1838–39; published a splendid series of drawings under the title, *The Holy Land, Syria, Idumæa, Arabia, Egypt, and Nubia* (4 vols. folio, 1842–48), and became an academician 1841. D. at London Nov. 25, 1864. He left in his studio 73 oil-paintings and 800 water-color pieces, the sale of which realized a sum of $80,000. His *Life* was written by James Ballantine (1866).

Roberts (Ellis H.), LL.D., b. at Utica, N. Y., Sept. 30, 1827; learned the printing trade; graduated at Yale College 1850; became in 1851 editor and proprietor of the Utica *Morning Herald*, an influential newspaper of Whig, and subsequently of Republican principles; was a member of the Presidential conventions of 1864, 1868, and 1876, of the State legislature 1867, and of Congress 1871–75.

Roberts (George C. M.), b. in Baltimore, Md., June 29, 1806; received the degree of M. D. from the medical department of the University of Maryland 1826; was soon afterward offered the chair of obstetrics in one of the colleges of Philadelphia, and accepted the same professorship in the University of Baltimore; was one of the organizers of the American Medical Association and a zealous Methodist minister. D. in 1868 or 1869. Paul F. Eve.

Roberts (George Washington), b. in Chester co., Pa., Oct. 2, 1833; graduated at Yale College 1857; became a lawyer in Chicago, Ill.; entered the Union army as major of the 42d Illinois Vols.; distinguished himself by spiking Confederate guns on Island No. 10, also at the battle of Farmington and at the siege of Corinth; became colonel 1862; commanded a brigade of the Army of the Mississippi, and was killed while heading a successful bayonet-charge of his own regiment Dec. 31, 1862.

Roberts (Robert Richford), D. D., b. in Frederick co., Md., Aug. 2, 1776; emigrated with his father's family in 1785 to Ligonier Valley, Western Pennsylvania, then the frontier of that State, where he was found "in the woods" by the earliest Methodist itinerants, "a stalwart youth in hunting-shirt of tow linen, buckskin breeches, and moccasin shoes." They supplied him with Methodist books, licensed him to "exhort" in 1800, and to preach in 1802. In the latter year he joined the Baltimore conference, which then stretched over the Alleghanies. He soon became pre-eminent by his natural talents and studious habits. After itinerating in Western Virginia and Pennsylvania some

years, he was appointed to important churches in Baltimore, Philadelphia, etc., and in 1816 was elected bishop. He immediately removed his family to his old log cabin in Western Pennsylvania, and thence to Indiana, then "the far West," where with his own hands he built another cabin as his "episcopal palace," made his rude furniture from the forest wood with such tools as he had carried in his emigrant wagon, and ate his first meal in it of roast potatoes only. His subsequent history is interwoven with that of his whole Church. For many years he was one of its most powerful preachers and most judicious administrators, influential alike in the Eastern and Western States—a man of noble presence, of considerable self-culture, of great native talents and characteristics, and of admirable Christian simplicity and charity. He did much for Western missions, and the Indians called him "the grandfather of all the missionaries." D. in Lawrence co., Ind., Mar. 26, 1843, mourned by his denomination throughout the nation. ABEL STEVENS.

Rob'ertson, county of N. E. Kentucky, between Shannon Creek and Licking River, has a mountainous surface and a fertile soil. Staples, Indian corn, tobacco, and butter. Cap. Mount Olivet. Area, 175 sq. m. P. 5399.

Robertson, county of N. Tennessee, adjoining Kentucky, watered by Sulphur and Terrapin creeks and other affluents of Cumberland River, traversed by Edgefield and Kentucky division of St. Louis and South-eastern R. R., is mountainous, and well adapted to grazing and cattle-raising. Staples, Indian corn, wheat, oats, tobacco, sweet potatoes, wool, and butter. There are several flouring and saw mills and distilleries. Cap. Springfield. Area, 490 sq. m. P. 16,166.

Robertson, county of Central Texas, between Navasota and Brazos rivers, intersected by Little Brazos River, and traversed by International and Great Northern R. R., whose two lines meet at Hearne in this county, constituting it an important railroad centre; has a broken surface, partly forest and partly prairie, with rich bottom-lands along the streams. Staples, Indian corn, cotton, cattle, sheep, and swine. Cap. Calvert. Area, 500 sq. m. P. 9990.

Rob'ertson, tp., Madison co., Va. P. 2280.

Robertson (CHARLES FRANKLIN), S. T. D., b. in New York City Mar. 2, 1835; graduated at Yale College 1859, at the General Theological Seminary of the Protestant Episcopal Church 1862; took orders in that Church; officiated as rector of several churches, and was consecrated bishop of Missouri Oct. 25, 1868.

Robertson (FELIX), M. D., b. at Nashville, Tenn., Jan. 17, 1780, being the first male child born in that city; studied medicine in the University of Pennsylvania, where he graduated in 1806. Returning home, he soon obtained an extensive practice, which was retained for more than forty years, when ill-health and declining days compelled him to relinquish it. Dr. Robertson was twice mayor of the city of his nativity, president of the Bank of Tennessee, and long the presiding officer of the trustees of the University of Nashville. Between himself and Gen. Jackson there existed a cordial intimacy. D. at Nashville Sept. 10, 1865. PAUL F. EVE.

Robertson (FREDERICK WILLIAM), b. in London Feb. 3, 1816; abandoned the plan he had formed of entering the army; entered Brasenose College, Oxford, 1837, and graduated 1840; was settled in Winchester 1840–42, in Cheltenham 1842–47, in Oxford 1847, going that year to Brighton, where he d. Aug. 15, 1853. Of his works, there have been published—*Sermons preached at Trinity Chapel, Brighton* (five series, 1855–64), *Lectures and Addresses on Literary and Social Topics* (1858), and *Expository Lectures on St. Paul's Epistles to the Corinthians* (1859). (See his *Life and Letters*, edited by Stopford A. Brooke (2 vols., 1865).) R. D. HITCHCOCK.

Robertson (GEORGE), LL.D., b. in Mercer co., Ky., Nov. 18, 1790; studied at Transylvania College and at Finley's Classical School at Lancaster; was admitted to the bar 1809; member of Congress 1817–21; Speaker of State legislature 1823 and 1825–27; secretary of state 1828; judge of the court of appeals 1828; chief-justice of Kentucky 1829–43, and professor of law in Transylvania University twenty-three years. He published a *Biographical Sketch of Hon. John Boyle* (Frankfort, 1838), and many of his speeches, addresses, and other writings were collected by him in a *Scrap-book on Law and Politics, Men and Times* (1856). Judge Robertson declined the governorship of Arkansas and the missions to Colombia and Peru. D. May 17, 1874.

Robertson (JAMES), b. in Fifeshire, Scotland, about 1725; served as deputy quartermaster-general in the campaigns against Louisbourg and Ticonderoga 1758–59; was appointed lieutenant-colonel of the 55th regiment; exchanged into the 16th; was stationed at New York 1763–75, becoming colonel 1772; went to Boston July, 1775; was appointed major-general Jan. 1, 1776; commanded a brigade in the battle of Long Island; went to England 1777; returned with a commission as royal governor of New York 1779; took the oath of office Mar. 23, 1780; exerted himself with Gen. Greene to procure the exchange of Major André; became lieutenant-general Nov. 20, 1782; returned to England Apr., 1783; and d. Mar. 4, 1788.

Robertson (JAMES), b. in Brunswick co., Va., June 28, 1742; settled at Watauga, Tenn., 1769; was the founder of the settlements on Cumberland River; became brigadier-general and commander of the Tennessee militia 1790, and during the later years of his life was U. S. agent to the Chickasaw Indians. D. at the Chickasaw Agency, Tenn., Sept. 1, 1814. A volume on his *Life and Times* was published by A. W. Putnam (1859), and constitutes a history of the settlement of Middle Tennessee.

Robertson (JAMES CRAGIE), D. D., b. at Aberdeen, Scotland, in 1813; graduated at Trinity College, Cambridge, 1834; became vicar of Bekesbourne, Kent, 1846, canon of Canterbury 1859, and professor of ecclesiastical history in King's College, London, 1864. Author of a *History of the Christian Church from the Apostolic Age to the Reformation* (new ed., 8 vols., 1874–75), of a biography of Becket (1859), and of various other treatises on ecclesiastical history and antiquities.

Robertson (J. P.), b. Dec. 4, 1840, in Pennsylvania; graduated at Naval Academy in 1861; became lieutenant in 1862, lieutenant-commander in 1866, commander in 1875; served in the Wabash at bombardment of Forts Hatteras and Clarke in 1861, and at the battle of Port Royal, Nov. 7, 1861, "and by his efficient service did honor to the Naval School." FOXHALL A. PARKER.

Robertson (THOMAS WILLIAM), b. in England in 1829; became an actor in a travelling company of which his father was manager; produced a play, *A Night's Adventure*, in 1851; settled at London and devoted himself to literature 1860, and wrote several very successful dramas—*David Garrick, Society, Ours, Caste, Play, School, M. P.*, and *War*. D. at London in Feb., 1871.

Robertson (WILLIAM), D. D., b. at Borthwick, near Edinburgh, Scotland, Sept. 19, 1721; graduated at the University of Edinburgh 1741; became a minister of the Scottish Church at Gladsmuir 1743; became principal of the University of Edinburgh and minister of Greyfriars church 1762, and was appointed historiographer of Scotland 1764. D. at Grange House, Edinburgh, June 11, 1793. Author of a *History of Scotland during the Reigns of Mary and James VI.* (2 vols., 1759), *History of the Reign of the Emperor Charles V.* (3 vols., 1769), a *History of America* (2 vols., 1777), and an *Historical Disquisition concerning the Knowledge which the Ancients had of India* (1791). During his lifetime and long afterward his name was ranked with those of Gibbon and Hume, and his complete *Works* have been often reprinted, but are now little read. His *Life* was written by Dugald Stewart (1801), and by Lord Brougham, who was a family connection.

Rob'eson, county of Southern North Carolina, adjoining South Carolina, watered by Little Pedee and Lumber rivers and their tributaries, and traversed by Carolina Central R. R., has a generally level surface, and a fertile soil, with extensive pine forests. Staples, Indian corn, sweet potatoes, rice, cotton, wool, honey, cattle, sheep, and swine. There are 15 establishments for the production of tar and turpentine. Cap. Lumberton. Area, 780 sq. m. P. 16,262.

Robeson, p.-v. and tp., Berks co., Pa. P. 2458.

Robeson (GEORGE M.), b. in Warren co., N. J., in 1827; graduated at Princeton College 1847; studied law; was admitted to the bar 1850; practised with success at Newark for several years, and afterward at Camden, where he became in 1859 prosecuting attorney for the county; was appointed a brigadier-general by the governor of New Jersey early in 1861; took an active part in the organization of the State volunteers; served in the war of the rebellion; was attorney-general of New Jersey from 1867 to June 22, 1869, when he resigned to accept the position of secretary of the navy in the cabinet of Pres. Grant, a post which he held during the latter's administration.

Rob'eson (HENRY B.), b. Aug. 5, 1842, in Connecticut; graduated at the Naval Academy in 1860; became master in 1860, lieutenant in 1862, lieutenant-commander in 1866, a commander in 1874; served in the New Ironsides in her many fights with Fort Sumter, and in the Colorado during both the Fort Fisher fights, commanding the boats of the former in the capture of the outer end of Morris Island, and the detachment of seamen sent from the Colorado to engage in the naval assault on Fort Fisher. Highly commended in official reports. FOXHALL A. PARKER.

Robespierre′ (Maximilien Joseph François Isidore), b. at Arras May 6, 1758. His father, who was a lawyer in poor circumstances, abandoned the family and went to the U. S. His mother died early, and the four children, of whom Maximilien was the eldest, were educated by the grandfather in decent but hard and hopeless poverty. Maximilien distinguished himself at the college of Arras, so that the bishop sent him to the college of Louis le Grand at Paris, where he went through the preliminary course with great honor. He then studied law, still living in deep poverty, and thus early contracted those regular, almost abstemious habits which were all that he had of a character, and imbibed that abstract sympathy for people whose lot is resignation, which was all that he had of a heart. After finishing his studies he returned to his native city and began to practise law. He wrote verses, and became a member of the academy of Arras. He was passionately devoted to the philosophy of the age, especially to its morals, which were nothing but philanthropy, and he succeeded in making a sort of sensation by putting its doctrines into cheap practice. He was also a smart lawyer, and made a good living. But now, as afterward, he was slow in making an impression, though it must be added that the impression he made was peculiarly valuable, because it referred not to his talents, which were not great, but to his character, which was "incorruptible;" and it became singularly powerful, because he confided in it himself and used it. He was a theorist. But his theory was not a brilliant speculation, still less a fanciful dream; it was a conviction, and it put him to work. This peculiarity explains at once the cold-bloodedness with which he employed terror and cruelty as the means of carrying out his plans, and the sentimental yearning after peace from which these plans sprung; the matchless audacity and energy with which he strove toward the realization of his ideas, and the singular hesitation and exhaustion which overcame him the moment he and his theory became victorious. In the Constituent Assembly, to which he was returned by Artois, Robespierre did not play any very conspicuous part. It was outside the assembly he first made himself noticed as a successful popular speaker and energetic revolutionary leader. In the Jacobin Club he soon acquired a predominant influence by his radicalism, fanaticism, and "incorruptible" character, and he grew in importance with the club. Mirabeau noticed him, and after the death of that most powerful parliamentary leader he began to make himself felt even in the assembly. Some time before its dissolution, in May, 1791, he proposed that no member of the Constituent Assembly should be eligible to the first Legislative Assembly; and for this decree, which was not carried without some opposition in the assembly, but which was received by the nation with great enthusiasm on account of the noble disinterestedness of which it bore witness, Robespierre was greatly applauded. He did not lose anything by it himself, however. It prevented him from being elected to the Legislative Assembly, but it did not prevent him from being the head of the Jacobin Club, and by composing the Legislative Assembly merely of political novices it weakened this body to such a degree as to deliver it up wholly to the guardianship of the club. At the close of the session, Oct., 1791, he made a visit to Arras, and was received by his constituents with military parades, illuminations, fireworks, and banquets, from which he returned to his work in the club. What part Robespierre really took in the insurrections of June 20 and Aug. 12, and in the September massacres of 1792, is doubtful, but from his entrance into the National Convention (Sept. 21, 1792), to which he was returned by the city of Paris, and in which he took his seat as the head of the radical party, the so-called Mountain, his career was unmistakable. It was he who brought first the king, then the Girondists, then the opponents of the radical party, Camille Desmoulins and Danton, and at last his own tools, Hébert and Chaumette, to the scaffold. Against the king he argued that the question was not one of legal procedure, but of public safety, as Louis Capet was not simply a criminal, but an enthroned king, and the members of the Convention were not judges, but statesmen. By this sophistry fell the king's head Jan. 23, 1793. Oct. 24, 1793, the trial of the Girondists before the Revolutionary Tribunal began. They were accused of having conspired against the Republic with Louis XVI., the emigrants, the duke of Orleans, La Fayette, and Pitt. The accusation was utterly false, but at a time of convulsive action it was possible to ascribe any kind of crime to people like the Girondists, whose principal characteristic was that they could not act at all; and it is probable that Robespierre, although he seems to have felt a sort of envy against men like Vergniaud, Gensonné, Roland, and Condorcet, actually misunderstood their deliberations and hesitations, and considered their conduct as traitorous. Their defence was nevertheless so brilliant and impressive that the Committee of Public Safety, of which Robespierre was the president, felt compelled to order the investigation stopped and the sentence given without any further argument. On the 31st followed the execution. Robespierre's wrath against Hébert is very characteristic. No doubt he was afraid of him, as he was of Danton. The influence which Hébert exercised over the lower classes was enough for Robespierre to wish him removed. But there was something more in the relation between them. Hébert had collided with Robespierre's theory, and that was probably much worse than to collide with his ambition. At the instigation of Hébert and Chaumette the bishop of Paris, Gabel, and with him a great number of priests, solemnly renounced their offices Nov. 7, 1793, and three days after, the first festival of Reason was held with great splendor in the cathedral of Notre Dame. This was more than abominable in the eyes of Robespierre. He was a strong deist. His theory was based on deism, and he was entirely blind as soon as he came outside of this philosophy. Hébert was accused of ultra-revolutionism, and guillotined Mar. 22, 1794. After the execution of Danton (Apr. 5, 1794), Robespierre actually stood alone, without a rival or adversary, the dictator of France; and now came the grandest moment of his life. On May 23, 1794, he made the Convention decree that faith in the Supreme Being was a law for the French people, and June 8 he ordered a great festival, at which he appeared in the Tuileries and on the Field of Mars with an immense bouquet in his hand and making speeches in honor of the Supreme Being. In view of this scene a sense of the ludicrous overpowered the terror in which people lived. It is difficult to say what it was that turned away the masses from Danton, but it is probable that it was the ridiculous which overtook Robespierre. People began to laugh at him, and soon they ceased to fear him. When the Convention were made aware that Mademoiselle Catherine Théot worshipped him as Messiah and had a throne consecrated to him, people did not feel so much afraid that he would overthrow the Republic and establish a despotism. They laughed, and in this laughter his power and his prestige were dissolved.

The last days of Robespierre have been minutely described by Thiers, Mignet, Carlyle, Lewes, and Hamel, and are very interesting to study. The same proceedings that he had employed against Danton and the Girondists were now employed against himself. He was accused, and not allowed to defend himself. The decree of his arrest was carried in the Convention in the midst of a complete uproar. He howled like a hyæna, but nobody would hear him. After being arrested he was rescued by his friends, and a general insurrection was proposed in order to save him. But he had lost his own balance, and while he hesitated the Convention acted. He was guillotined the day after his arrest, July 28, 1794. Clemens Petersen.

Robideaux′, tp., Pulaski co., Mo. P. 677.

Rob′in, the name applied in England to several well-known singing birds of the family Erythacinæ, and improperly given in the U. S. to a species of thrush, the *Turdus migratorius*. There are fifteen genera of robins in Europe, Western Asia, and Northern Africa, most of them widely spread, resembling each other in their chief characteristic, the short tapering bill, curved at the extremity and partly covered with bristles. They all feed on worms, insects, and fruits, generally living on cultivated grounds, and having but slight fear of man. The best-known species is the robin redbreast (*Erythacus rubecula*), whose song is familiar to every English country household.

Robin′ (Charles Philippe), b. at Jassiron, department of Ain, France, June 4, 1821; studied medicine at Paris; was appointed professor of general anatomy in 1847, of histology in 1862; became very celebrated for his microscopical researches in physiology. His principal writings are—*Du Microscope et des Injections dans leur Application à l'Anatomie et à la Pathologie* (1849), *Tableaux d'Anatomie* (1851), *Traité de Chimie anatomique et physiologique* (1853), *Histoire naturelle des Végétaux parasites* (1853), *Anatomie microscopique* (1868).

Rob′in Good′fellow, a famous personage in English folk-lore, reputed to be a son of Oberon, king of the fairies, by a mortal mother, noted for his roguish tricks, his fondness for disturbing the peace of families, and his power of assuming various shapes, the "shrewd and knavish sprite" whose characteristics are fully given by Shakspeare in a well-known passage of *A Midsummer Night's Dream*. A popular volume entitled *The Mad Pranks and Merry Jests of Robin Goodfellow* appeared in 1628, and was reprinted by the Percy Society 1841.

Robin Hood. See Hood (Robin).

Rob'ins (Benjamin), b. at Bath, England, in 1707; was self-educated; obtained an extraordinary knowledge of mathematics, which he taught at London, and on which he published a series of tracts (2 vols., 1761); made experiments on the resisting force of the air to projectiles, and studied fortification in Flanders; became engineer-in-chief to the East India Company 1749; fortified Madras, and d. there of fever July 29, 1751. He prepared for the press in the name of Rev. Richard Walter, chaplain of the Centurion, the narrative of Anson's *Voyage around the World* (1748), and was author of *New Principles of Gunnery* (1742), besides other scientific writings.

Rob'inson, p.-v. and tp., cap. of Crawford co., Ill., on Paris and Danville R. R., has 2 churches, an academy, and a fine graded school (public), 2 newspapers, and a banking-house. P. 1851. G. W. Harper, Ed. "Argus."

Robinson, tp., Posey co., Ind. P. 1683.

Robinson, p.-v. and tp., Ottawa co., Mich. P. 406.

Robinson, tp., Greene co., Mo. P. 2419.

Robinson, tp., Allegheny co., Pa., on Allegheny River and on Pittsburg and Steubenville R. R. P. 2275.

Robinson, tp., Washington co., Pa. P. 937.

Robinson, tp., Wise co., Va. P. 769.

Robinson, tp., Mason co., West Va. P. 1145.

Robinson (Beverley), b. in Virginia in 1723; was a major under Wolfe at Quebec 1759; married a daughter of Frederick Phillipse, thereby coming into possession of immense tracts of land on the Hudson; was opposed to the despotic measures of the British ministry, but was loyal to the government; removed into New York City at the outbreak of the Revolution; recruited and commanded the Loyal American regiment, of which he was colonel; was concerned in the negotiations preliminary to the treason of Arnold (who at that time occupied Robinson's country-seat); lost his property by confiscation; at the conclusion of the war went to England, and d. at Thornbury in 1792.—His son Beverley, a graduate of Columbia College 1773; settled near St. John, New Brunswick; became a lieutenant-colonel in the British army. D. at New York in 1816.

Robinson (Edward), D. D., LL.D., b. in Southington, Conn., Apr. 10, 1794; graduated at Hamilton College 1816; was tutor there 1817–18, when he married Eliza, youngest daughter of Rev. Samuel Kirkland, missionary to the Oneidas, who died the year following, her father having died some years before; remained in Clinton, engaged in classical studies, till the autumn of 1821, when he went to Andover, Mass., to publish an edition of eleven books of the *Iliad* (the first nine, the 18th, and the 22d); was instructor in Hebrew in Andover Seminary under Prof. Stuart, whom he assisted in preparing the 2d ed. (1823) of his *Hebrew Grammar* from 1823–26, publishing meanwhile (1825) his translation of Wahl's *Clavis Philologica Novi Testamenti;* studied in Europe, mostly at Halle and Berlin, 1826–30; in 1828 married Therese Albertine Luise von Jacob, daughter of a distinguished professor at Halle; returned to the U. S., and was professor extraordinary at Andover 1830–33; broke down in health, and resided in Boston 1833–37, and in 1837 accepted a professorship in Union Theological Seminary, New York City, which he held till his death, Jan. 27, 1863. In 1838, and again in 1852, he travelled in Palestine with the learned missionary Rev. Eli Smith, doing more for biblical geography than any other one man that has ever lived. Besides the works already mentioned, he published Taylor's *Calmet* (1832), *A Dictionary of the Bible for the use of Schools and Young Persons* (1833), Buttman's *Greek Grammar* (1833; 2d ed. 1839; 3d ed. 1851), Gesenius's *Hebrew Lexicon* (1836; 5th ed. 1854), *Greek and English Lexicon of the New Testament* (1836; 2d ed. 1847), *Greek Harmony of the Gospels* (1845; 2d ed. 1851), *English Harmony of the Gospels* (1846), *Memoir of the Rev. William Robinson* (1859). He also wrote much for reviews and newspapers. In 1831 he founded the *Biblical Repository,* which he edited for four years, and in 1843 the *Bibliotheca Sacra,* for which he continued to write till 1855. But the great work of his life was the *Biblical Researches* (1841, 3 vols.; compressed into 2, and a 3d added 1856), for which in 1842 he received the gold medal of the Royal Geographical Society of London. He also received the degree of D. D., previously (1831) conferred by Dartmouth College, from the University of Halle in 1842, and LL.D. from Yale College in 1844. His *Physical Geography of the Holy Land* was edited by Mrs. Robinson in 1864, and published in 1865. The original manuscript of the *Researches* is now in the library of the Union Theological Seminary, to which he gave also many volumes. What remained of his library was purchased after his death for Hamilton College. (See *The Life, Writings, and Character of Edward Robinson,* by R. D. Hitchcock, with *Remarks* by H. B. Smith (New York, 1863).) R. D. Hitchcock.

Robinson (Ezekiel Gilman), D. D., LL.D., b. at Attleborough, Mass., Mar. 23, 1815; graduated at Brown University 1838, at Newton Theological Seminary 1842; was pastor of Baptist churches at Norfolk, Va., 1842–45, and at Cincinnati, O., 1849–52; was professor of Hebrew in the theological seminary at Covington, Ky., 1846–52; became professor of biblical theology in the seminary at Rochester, N. Y., 1852, and president of that institution 1860, remaining until 1872, when he was chosen president of Brown University, a position which he still holds (1876). Author of various discourses, addresses, and review articles; was editor of the *Christian Review* 1859–64; in 1864 published a careful revision of Ryland's translation of Neander's *Planting and Training of the Christian Church,* and *The Relation of the Church to the Bible* (1866).

Robinson (Sir Frederick Phillipse), son of Col. Beverley, b. on the Phillipse Manor, N. Y., in Sept., 1763; became an ensign in his father's Loyal American regiment Feb., 1777; was wounded and taken prisoner at Stony Point; served in the West Indies, and with great distinction under Wellington in the Peninsular war, rising to be general; was commander-in-chief of the British forces in Canada 1812; participated in the campaign on Lake Champlain Sept., 1814; was knighted 1815, and made governor of Upper Canada, and became full general 1841. D. at Brighton, England, Jan. 1, 1852.

Robinson (Henry Crabb), F. S. A., b. at Bury St. Edmund's, England, May 13, 1775; was articled to a lawyer at Colchester, and afterward at London; studied several years (1800–05) at Jena and other German universities, where he acquired a very thorough knowledge of modern German literature and philosophy; enjoyed the intimate friendship of Goethe, Wieland, Schiller, the Schlegels, and other eminent poets; furnished data to Madame de Staël for her work on Germany; was correspondent of the *Times* in Spain at the beginning of the Peninsular war, 1808–09; was engaged on his return to London as a regular writer for that journal; was thus introduced to the acquaintance of the literary circles of London; was called to the bar at the Middle Temple 1813; became a highly successful and prosperous lawyer on the Norfolk circuit, from which he retired with a fortune 1828, and for the remainder of his life devoted himself to society and literary leisure, being prominently known as the intimate friend of Wordsworth, Blake, Clarkson, and Flaxman, as he was also of Lamb, Coleridge, Southey, and their compeers. He was one of the first members of the Athenæum Club, one of the founders of University College, London, and of the Flaxman Gallery, to which latter institution he left liberal bequests. D. unmarried at London Feb. 5, 1867. He published little, but left a copious *Diary and Correspondence,* from which very entertaining selections were published in 1869.

Robinson (Horatio Nelson), LL.D., b. at Hartwick, N. Y., Jan. 1, 1806; received an ordinary common-school education until the age of sixteen, when his mathematical talent led a wealthy gentleman to assist him in entering Princeton College; was professor of mathematics in the U. S. navy 1825–35; was afterward principal of academies at Canandaigua and Genesee; removed to Cincinnati 1841, to Syracuse, N. Y., 1850, and to Elbridge 1854, where he d. Jan. 19, 1867. Author of *University Algebra, Differential and Integral Calculus,* and other mathematical textbooks of high merit.

Robinson (James S.), b. near Mansfield, O., Oct. 14, 1828; enlisted in the 4th Ohio Vols. June, 1861; participated in the Rich Mountain campaign; became major Oct., 1861, lieutenant-colonel Apr., 1862, colonel Aug., 1862; served in the Shenandoah Valley under Fremont; was at the second battle of Bull Run, at Chancellorsville, and at Gettysburg, where he was severely wounded; commanded a brigade in Sherman's Atlanta campaign and march to the sea; became brevet brigadier-general Dec. 12, 1864, full brigadier-general Jan. 12, 1865, and brevet major-general Mar. 13, 1865.

Robinson (John), b. in England, probably in Lincolnshire, 1575; entered Cambridge University 1592; pursued his studies either in Emanuel or Corpus Christi College, and there became attached to Puritan doctrines; took preliminary orders in the Church of England; obtained a benefice near Great Yarmouth, Norfolk; was suspended by the bishop for non-conformity in ecclesiastical ceremonials 1602; gathered an Independent congregation at Norwich; formally separated from the Church of England 1604; resigned his fellowship at Cambridge; became assistant, and soon after sole pastor, of a dissenting congregation (1604) gathered at Scrooby, Nottinghamshire (near the borders of Yorkshire and Lincolnshire), where the

Brewsters, Bradfords, and Mortons were among his flock; suffered a persecution which led many of his congregation to emigrate with him to Amsterdam, Holland, 1608; removed to Leyden 1609; gathered there a numerous church, constantly reinforced by arrivals from England; attended lectures at the university, of which he afterward became a member; held a notable public discussion with the Dutch professor Episcopius, the successor of Arminius, upon the Calvinistic doctrine of free-will, 1613; entered into the plans for colonization in New England about 1617; was active in promoting the negotiations, through Cushman, Carver, and Brewster, with the Plymouth Company of capitalists; dismissed a portion of his congregation with a memorable farewell sermon on their embarkation for America July 22, 1620, intending to follow them the next year, but before the negotiations were completed he d. at Leyden Mar. 1, 1625. He was buried in St. Peter's church, the members of the university and the ministers of the city attending his funeral. The remainder of his church emigrated to Massachusetts soon afterward, with his sons John and Isaac, through whom his American descendants are numerous. He was well versed in the classics, a skilled debater, and a ready writer. Among his numerous controversial publications were—*A Justification of Separation* (1610), *Of Religious Communion* (1614), *Apologia Justa et Necessaria* (1619), *A Defence of the Doctrine propounded by the Synod of Dort* (1624), *Essays or Observations, Divine or Moral* (1628), *A Treatise of the Lawfulness of Learning of the Ministers in the Church of England* (1634), and *An Apology for Certain Christians no less contumeliously than commonly called Brownists or Barrowists.* His complete *Works,* with a memoir by Robert Ashton, secretary of the Congregational board, appeared in London and Boston in 3 vols., 1851. Vol. i. also contains an account of his American descendants, from the pen of Pres. William Allen of Northampton.

Robinson (Sir John Beverley), Bart., D. C. L., a relative of Col. Beverley, b. at Berthier, Lower Canada, July 26, 1791; studied law; was clerk of the assembly 1811; attorney-general 1812, being only twenty-one years of age; served as a volunteer under Gen. Brock at Detroit; was solicitor-general 1815–18; again attorney-general 1818–29; was appointed chief-justice of Upper Canada July 15, 1829, and held that office until his death at Toronto Jan. 30, 1863. He was created a baronet 1854; was eighteen years a member of the legislature of Upper Canada, chancellor of Trinity College, Toronto, and author of several miscellaneous publications on Canada.

Robinson (John Cleveland), b. in Binghamton, N. Y., Apr. 10, 1817; entered the U. S. Military Academy 1835, but without graduating commenced the study of law in 1838. In 1839, however, he accepted a second lieutenancy in the 5th Infantry, and served in the war with Mexico and in Florida against the Indians. In Sept., 1861, he was appointed colonel of the 1st Michigan Vols., and in May, 1862, brigadier-general of volunteers, serving in command of a brigade with the Army of the Potomac in the Virginia peninsular campaign of 1862, at the second battle of Bull Run, Chantilly, and Fredericksburg. At Gettysburg and in the Richmond campaign of 1864 he commanded a division with great bravery, losing a leg on the third day of fighting in the latter campaign, at Todd's Tavern. Brevet brigadier and major-general for gallantry. In 1866 he attained the colonelcy of the 43d Infantry, and in 1869 was retired from active service on the full rank of major-general. In 1872 he was elected lieutenant-governor of the State of New York.

Robinson (Robert), b. at Swaffham, Norfolk, England, Oct., 1735; studied in the grammar school at Scarning; was apprenticed in his fifteenth year to a London hair-dresser, who, however, gave up his indenture to enable him to prepare for the pulpit; commenced preaching as a Calvinistic Methodist 1755; soon became a Baptist and formed a congregation at Cambridge, eking out his small stipend by selling corn and coals; applied himself to the study of languages; acquired a deservedly high reputation for eloquence, wit, goodness, and liberality (being the Sydney Smith of the time); made a translation of Saurin's *Sermons* (5 vols., 1775–84); published *A Plea for the Divinity of our Lord Jesus Christ* (1776), popular hymns and tracts, and left a learned *History of Baptism* (1790), posthumously published. D. at Birmingham June 8, 1790. He was said to have become a Socinian (*i. e.* Unitarian) in his later years. His *Life,* by George Dyer (1796), is a valuable work.

Rob'inson (Solon), b. near Tolland, Conn., in 1803; wrote in early life for the *Albany Cultivator;* was for many years agricultural editor of the New York *Tribune;* wrote agricultural articles for other journals; was author of a popular novel, ***Hot-Corn, or Life-Scenes in New York*** *Illustrated* (1853; 50,000 copies sold), *How to Live, or Domestic Economy Illustrated* (1860), *Facts for Farmers* (1864 *seq.*), a work published by subscription which had an immense circulation, and *Me-won-i-toc* (1867). About 1870 he settled on a farm at Jacksonville, Fla.

Robinson (Stuart), D. D., b. at Strabane, about 10 miles S. of Londonderry, Ireland, Nov. 26, 1816; graduated at Amherst College 1836; studied theology at Union Theological Seminary, Prince Edward, Va.; taught two years, and then spent part of a year (1840) at Princeton, N. J.; was settled at Kanawha Salines, West Va., 1841–47, at Frankfort, Ky., 1847–52, at Baltimore, Md., 1852–56; was professor of ecclesiology at Danville, Ky., 1856–58, and since 1858 has been pastor of the Second Presbyterian church in Louisville, Ky. In 1852 he declined the degree of D. D. offered him by Centre College, Ky. He has published *The Church of God an Essential Element of the Gospel* (1858) and *Discourses of Redemption* (1866), reprinted in Edinburgh. He established and edited in Baltimore the *Presbyterial Critic* (1855–56), and in Louisville *The True Presbyterian,* suppressed during the war, and then revived under the name of *The Free Christian Commonwealth* (1861–68). He has also put forth many pamphlets on various issues between Northern and Southern Presbyterians. In 1873 he visited Egypt and the Holy Land, and since his return has preached 100 *Discourses on the Pentateuch,* which have been published in the *Courier-Journal* of Louisville, Ky. R. D. Hitchcock.

Robinson (Thérèse Albertine Louise von **Jakob**), daughter of Prof. L. H. von Jakob, b. at Halle, Germany, Jan. 26, 1797; resided with her father in Russia 1807–16, becoming acquainted with the Slavic languages; returned to Halle 1816; became known as a poetess; enjoyed the friendship and correspondence of Goethe, the Humboldts, Grimm, Savigny, and Ritter; translated Scott's *Old Mortality* and *Black Dwarf* into German (1822); published *Psyche, Original Tales* (1824), under the *nom de plume* of "Talvi" (the initials of her name), and *Servian Songs* (2 vols., 1825–26); married Prof. Edward Robinson 1828; translated John Pickering's essay *On Indian Languages* into German (1834); contributed largely to the *Biblical Repository,* edited by her husband, in which periodical appeared several essays constituting an *Historical View of the Slavic Languages;* resided in Germany during her husband's exploration of Palestine; published there her *Characteristics of the Popular Songs of the German Nations* (1840) and a treatise *On the Authenticity of the Poems of Ossian* (1840); wrote in New York two small works on American history for circulation in Germany, and several novels which were translated into English by her daughter. In 1850 appeared her chief work (in English), *An Historical View of the Languages and Literature of the Slavic Nations.* After her husband's death she resided at Hamburg, where her son was American consul. D. at Hamburg Apr. 13, 1869. A posthumous work has appeared under the title *Fifteen Years, a Picture from the Last Century.*

Robinson (William E.), b. near Cookstown, co. Tyrone, Ireland, May 6, 1814; received a good English and classical education; came to the U. S. 1836; studied for a time at Yale College, from which he received the degree of A. M. 1841; graduated at the Yale Law School; was a frequent writer upon the New York *Herald* 1838–44; afterward was well-known by his writings in the New York *Tribune* over the signature "Richelieu;" edited a weekly paper, *The People,* 1848–49; practised law in New York 1853–62; travelled in Europe 1859; was appointed U. S. assessor of internal revenue 1862, and sat in Congress 1867–69. Author of many poems published in newspapers, and of numerous lectures and literary addresses.

Robinson (William S.), b. at Concord, Mass., Dec. 7, 1818; was editor of the Lowell *Courier* 1842–48, of the Boston *Daily Whig* 1849, afterward of the *Republican,* the *Commonwealth,* and the *Telegraph;* represented Lowell in the legislature 1852–53; was clerk of the constitutional convention of Massachusetts 1853, and clerk of the Massachusetts legislature since 1862. Under the *nom de plume* of "Warrington" he was the Boston correspondent of the Springfield *Republican* and of other journals. Author of *Warrington's Manual* (1875). D. Mar. 11, 1876.

Robinson's Roads, tp., Montgomery co., Ala. P. 2639.

Rob'ison (John), LL.D., b. at Boghall, Stirlingshire, Scotland, in 1739; graduated at the University of Glasgow 1756; was employed as tutor in the navy; accompanied the expedition to Quebec 1759; became professor of natural philosophy in Glasgow University 1766; went to Russia as secretary to Admiral Sir Charles Knowles 1770; was made inspector of the corps of marine cadets at

Cronstadt, with the rank of lieutenant-colonel, 1772, and was professor of natural philosophy in the University of Edinburgh from 1774 to his death, Jan. 30, 1805. Author of *Lectures on the Elements of Chemistry* (2 vols., 1803), *Elements of Mechanical Philosophy* (1804), and of numerous contributions on natural science to the *Encyclopædia Britannica* (3d ed., 1793–1801), which were edited by Sir David Brewster under the title *A System of Mechanical Philosophy* (4 vols., 1822).

Robison's Springs, tp., Elmore co., Ala. P. 774.

Rob Roy, the popular name of a Scotch outlaw (*Roy* meaning "red" in Scotch), whose true name was ROBERT MACGREGOR, b. in Scotland about 1660; changed his name to CAMPBELL on the outlawry of the clan MacGregor 1693; became a partisan of the Pretender in 1715, and for many years thereafter continued to make depredations, chiefly upon the retainers of the duke of Montrose. D. near Aberfoyle about 1738. His exploits, long traditional in Scotland, formed the basis of a novel by Sir Walter Scott.

Ro'by (HENRY JOHN), b. at Tamworth, England, Aug. 12, 1830; graduated at St. John's College, Cambridge, 1853; became fellow there 1854; was assistant tutor 1855–56, and reappointed 1860; was university examiner in law, classics, and moral sciences 1859–61; member of, and secretary to, the local examination syndicate 1858–59; took a prominent part in urging university reform; was under-master of Dulwich College Upper School 1861–65; professor of jurisprudence at University College, London, 1866–68; was appointed by the Crown secretary to the schools inquiry commission Dec., 1864, to the endowed schools commission Aug., 1869, and was a member of that body 1872–75. He edited the *Report* of the school commissioners and the numerous volumes of documents thereto appended (Mar., 1868); author of an *Elementary Latin Grammar* (1862) and a valuable *Grammar of the Latin Language, from Plautus to Suetonius* (2 vols., 1871–74).

Roc'ambole [Fr.], the *Allium Scorodoprasum,* a plant of the garlic family, much resembling garlic, but larger and milder. It is cultivated in European kitchen-gardens, and is a native of northern regions.

Roccabian'ca, town of Italy, province of Parma. Its old *rocca* or castle (1460) is still standing and contains some interesting frescoes. After countless changes of ownership this castle has once more returned to the Pallavicino Trivulzio family. P. 5500.

Roccadas'pide, town of Southern Italy, province of Salerno, situated on a hill on the eastern slope of Monte Calimarro. The climate is healthy, and the inhabitants are mostly engaged in raising swine, which are fed in the oak forests of the neighborhood. P. 6000.

Roccasec'ca, town of Southern Italy, province of Caserta, on a high hill N. of Pontecorvo. The episcopal palace, not occupied since Sora became capital of the diocese, is a fine building, and some remains of the old and very strong feudal castle still exist. The adjoining country is famous for rare plants from which the inhabitants make a medicinal powder known as *roccasecca.* This town was the birthplace of the celebrated Thomas Aquinas. P. 5500.—ROCCASECCA is also the name of a village near Rome.

Roccastra'da, town of Italy, province of Grosseto, on a lofty hill about 15 miles N. of the town of Grosseto. Roccastrada is surrounded by castellated walls, and portions of the old feudal stronghold which once sheltered the banished Ghibellines of Siena are still remaining. This half-ruined castle stands on a rugged rock which is commanded by still higher crags in its rear, and which is cut almost vertically down on the front face, thus presenting an aspect of great strength as well as wildness. The buildings in the town are insignificant. P. 8200.

Roccel'la Ionica, town of Southern Italy, province of Reggio di Calabria, near the mouth of the Calamizze, almost upon the sea-shore. It is surrounded by crenated walls, and the adjacent country is of astonishing fertility, abounding in all the richest productions of Southern Italy. The small harbor suffices for the coast-trade. P. 6300.

Rochambeau', de (JEAN BAPTISTE DONATIEN DE **Vimeur**), COUNT, marshal of France, b. at Vendôme, France, July 1, 1725; entered the French army 1742; was distinguished in the campaigns of the Seven Years' war; became field-marshal 1761; was made lieutenant-general Mar. 1, 1780; commanded the French forces in the U. S. during the war of independence 1780–82; took a prominent part in the campaign of Yorktown 1781; became governor of Picardy 1782; was a member of the second "Assembly of Notables" 1788; became marshal 1791; commanded the Army of the North Mar. to June, 1792; was imprisoned during the Reign of Terror, and escaped the guillotine only through the death of Robespierre; was appointed by Napoleon, when First Consul, grand officer of the Legion of Honor (1804). D. at Thoré May 10, 1807. He wrote *Mémoires,* published in 1809 (2 vols.), translated into English by M. W. E. Wright (Paris, 1838).—His son, DONATIEN MARIE JOSEPH, b. in 1750; served in the U. S. 1780–82; took part in the wars of the French Revolution, Consulate and Empire; became lieutenant-general 1792; was governor of Santo Domingo 1796; was taken prisoner there by the English 1803; distinguished himself at the battle of Bautzen, and was killed at that of Leipsic, Oct. 18, 1813.

Roch'dale, town of England, in Lancashire, is built on both sides of the Roch, and has large manufactures of woollen goods, such as baize, flannels, blankets, and kerseys; cotton goods, especially calicoes, and iron and steel ware. In 1844 a co-operative association was founded here by a few flannel-weavers with a capital of £28. In 1870 the association numbered 5560 members, with a capital of £81,232, a library of 7000 volumes, prosperous sick and burial societies, and large investments in cottages for members. P. 44,559.

Rochdale, p.-v., Leicester tp., Worcester co., Mass., on Boston and Albany R. R.

Rochefort', or **Rochefort-sur-Mer** [anc. *Rupifortium*], town, port, and one of the great naval arsenals of France, department of Charente-Inférieure, on the Charente, is surrounded by walls and ramparts planted with trees, and defended by forts at the entrance into the river. Outside is a spacious roadstead protected by the islands of Ré, Oléron, and Aix. Its two harbors are safe and large, able to accommodate the largest ships of war, and lined with extensive wharves, docks, arsenals, ropewalks, cannon-foundries, schools of navigation, magazines, hospitals, and necessary naval establishments of every kind and of excellent description. P. 30,212.

Rochefort (VICTOR HENRI DE ROCHEFORT-LUÇAY), COUNT, b. in Paris, France, Jan. 30, 1830; educated at the college of St. Louis, and at the age of twenty-one began contributing to the Paris press, writing mainly on the drama, art, and society. He became one of the editors of *Figaro,* and was removed from that position by the imperial government because of his liberal opinions. In June, 1868, he founded *La Lanterne,* in which he so bitterly attacked the Empire that in August of the same year the journal was suppressed and its editor condemned to one year's imprisonment and $2000 fine. He fled to Belgium before the sentence was pronounced, and there resumed the publication of *La Lanterne,* which was circulated surreptitiously in France. In Nov., 1869, he was elected a member of the Corps Législatif. Later in the same year he founded a radical journal, *La Marseillaise,* and in Jan., 1870, was sentenced to six months' imprisonment and fined $600 for violent language. He remained in prison until the fall of the Empire at Sedan, when he became a member of the government of national defence and member of the committee on barricades. In Feb., 1871, he founded another journal, *Le Mot d'Ordre,* devoted to sustaining the official policy of M. Gambetta. At the same time he was chosen a member of the National Assembly, when he voted against the proposed basis of peace, and then resigned. He declined to be a member of the Commune, but violently opposed the government. On the entrance of the national troops into Paris he fled toward Belgium, but was arrested, tried for complicity in the acts of the Commune, sentenced to imprisonment for life in a fortress, and sent to the penal settlement of New Caledonia, whence he and several of his associates escaped in the spring of 1874, and returned to Europe by way of the U. S. He has since resided at Geneva. J. B. BISHOP.

Rochefoucauld. See LA ROCHEFOUCAULD.

Rochefoucauld-Liancourt', de la (FRANÇOIS ALEXANDRE FRÉDÉRIC), DUKE, b. in France Jan. 14, 1747; was grand master of the robes to Louis XV. and XVI.; deputy to the States General, where he was one of the leaders of the party of reform; was president of the National Assembly after the taking of the Bastile, July, 1789; sat in the Constituent Assembly; spent the period of the Reign of Terror in travelling in the U. S.; published a *Voyage dans les États Unis* (1795–97) and an *Account of the Prisons of Philadelphia* (1796); established the first savings bank in France; introduced vaccination there, and was twenty-three years inspector-general of the School of Arts and Trades at Chalons. D. at Paris Mar. 27, 1827.

Rochejacquelein. See LA ROCHEJACQUELEIN.

Rochelle, p.-v., Flagg tp., Ogle co., Ill., at intersection of Chicago and Iowa with Omaha line of Chicago and North-western R. R., has 1 newspaper and a thriving trade in grain. P. 1607.

Rochelle', La, town of France, department of Charente-Inférieure, on an inlet of the Atlantic formed by the

two islands Ré and Oléron. It is fortified, well built, with handsome streets and many fine edifices, and has a large, deep, perfectly safe, and commodious harbor, a great arsenal, extensive manufactures of glass, earthenware, cotton twist, sugar, and brandy, and considerable trade in wine, corn, and colonial products. It played a very conspicuous part during the religious wars as a stronghold of the Huguenots. P. 19,506.

Rochelle Salt [first prepared at La Rochelle in 1672], the double tartrate of soda and potassa, an efficient cathartic, considered more palatable than most preparations of the kind. It is chiefly used in preparing seidlitz powders.

Roche'port, p.-v., Boone co., Mo., on Missouri River, has 1 newspaper and a thriving river-trade. P. 823.

Roch'ester, city of England, in the county of Kent, on the Medway, between Chatham and Strood, with which it forms one continuous town. It has a fine cathedral, some trade in coal and hops, and 18,352 inhabitants.

Rochester, p.-v. and tp., Sangamon co., Ill., on Sangamon River and Springfield and Illinois South-eastern R. R. P. 1440.

Rochester, p.-v. and tp., cap. of Fulton co., Ind., 97 miles N. of Indianapolis, near Lake Manitou, has 6 churches, graded schools, 2 banks, and 2 newspapers, ships flour, grain, and produce. P. of v. 1528; of tp. 3726.
J. MAJOR BITTERS, ED. "UNION SPY."

Rochester, p.-v. and tp., Cedar co., Ia., on Red Cedar River. P. 174; of tp. 797.

Rochester, p.-v., Butler co., Ky., on Green River. P. 228.

Rochester, p.-v. and tp., Plymouth co., Mass., engaged in farming and lumbering. P. 1024.

Rochester, p.-v., Oakland tp., Oakland co., Mich., on Bay City division of Michigan Central R. R.

Rochester, city and tp., cap. of Olmsted co., Minn., on Winona and St. Paul R. R., 50 miles from Mississippi River. Zumbro River flows through the city, affording fine water-power. It has 12 churches, a public library, 3 national banks, 2 weekly newspapers, a handsome court-house, schools, grist and flouring mills, 2 foundries and machine-shops, 3 hotels, and a public hall; in the centre of the best grain-raising county in the State, it ships annually about 1,000,000 bushels. P. of city, 3953; of tp. 591. BLAKELY & HILLMAN, EDS. "RECORD AND UNION."

Rochester, p.-v. and tp., Andrew co., Mo., on Platte River. P. 218; of tp. 2672.

Rochester, p.-v. and tp., one of the capitals of Strafford co., N. H., on Salmon and Cocheco rivers, at junction of Conway division of Eastern and Maine Central, Dover and Winnipiseogee branch of Boston and Maine, and Portland and Rochester R. Rs., has fine water-power, extensive woollen-factories, and 1 newspaper. P. 4103.

Rochester, city and port of entry, cap. of Monroe co., N. Y., 229 miles W. of Albany; lat. 43° 8′ 17″ N., lon. 77° 51′ W. The first house was erected in 1812; incorporated as the village of Rochesterville 1817, as a city 1834. P. in 1820, 1500; 1830, 10,863; 1840, 20,191; 1850, 36,403; 1860, 48,204; 1876, 82,500. The site is upon a level plain on both banks of Genesee River, 7 miles from and 263 feet above Lake Ontario. In the course of the river through the city there are three falls, of 96 feet, 26 feet, and 83 feet respectively, below the last of which the stream becomes navigable for all lake vessels. From the upper fall, near the centre of the city N., nearly to the lake, the river-banks are of precipitous rock, varying in height from 100 to 210 feet. The immense water-power afforded by these falls is the foundation of the prosperity and rapid growth of the city, the water being thrice used in its course through its limits. The main stem of New York Central R. R. crosses the town at the upper fall, and there are three branches of the road centring here—one to Syracuse *viâ* Auburn, one to Niagara Falls, and one to the mouth of the Genesee. Other railroads having termini here are Genesee Valley, running S. and connecting with the Erie R. R.; Northern Central, running to Baltimore; and Rochester and State Line, completed to Le Roy, and now finishing to Salamanca on Atlantic and Great Western R. R. The Lake Ontario Shore R. R. crosses the river at its mouth, and is to be brought to the city by a branch. Erie Canal crosses the river by a fine stone aqueduct, 848 feet long, on 7 arches, and Genesee Valley Canal, coming from the S., ends here. The city has an average length of 4 miles by about the same breadth. It is laid out in broad streets, generally well paved and lighted, and abounding in fine shade trees. There are also numerous and spacious parks. The dwellings are, to a much greater degree than is usual in cities of its size, detached and stand back from the streets, and are surrounded with lawns and shrubbery. The business portion is notably well built. Among the public buildings, the city hall, court-house, Free Academy, and savings bank form a conspicuous architectural group, while in their immediate neighborhood is Powers's Commercial Fireproof Building, one of the finest in the country, recently erected at an expense of over $1,000,000. The churches are 60 in number, including the Roman Catholic cathedral, a fine edifice of moderate size, but effective and correct in style. Other examples of good taste in architecture are afforded in the First Presbyterian, the Temple street, St. Peter's, and the First Baptist churches. In the matter of education Rochester has for many years been prominent among the cities of the land. The University of Rochester, established 1850, has taken high rank among the colleges of the U. S., and has 10 professors and 160 students. It possesses a spacious building, containing the chapel, cabinet, and recitation-rooms, 100 × 60 feet, constructed of red sandstone, and Sibley Hall, of similar material, costing $125,000, and containing the university library of 13,000 vols., both situated in a campus of 23 acres finely laid out. The endowment (including buildings) is about $600,000. The Theological Seminary (Baptist) is located in a fine four-story brick edifice on East avenue, and was established 1850. It has 8 professors and 77 students, is the largest of that denomination in the U. S., and has besides a German department in a separate building; value of real estate, $100,000; of endowment, $250,000, with a library of 8500 vols. There are 23 public schools, generally of fine size and proportions, divided into primary, intermediate, and grammar schools, and the Free Academy (cost $125,000), which affords instruction in the higher branches; 200 teachers are engaged in these various schools in the tuition of about 10,000 pupils. The value of the buildings and furniture is $500,000. Connected with this system is the Public Library of 8000 vols. It is estimated that 6500 pupils attend the parochial and other private schools. The Athenæum, a literary association, has been in existence some forty years, and possesses a reading-room and a library of 18,000 vols.; and the Law Library, located in the court-house, has 10,000 vols.

There are two hospitals (City and St. Mary's), well located in airy situations, with spacious buildings capable (together) of providing for 500 patients, and each is under the care of a competent corps of physicians. The other benevolent institutions are St. Mary's, St. Patrick's, St. Joseph's, and the Protestant orphan asylums; the Church Home of the Episcopal Church; the Home for the Friendless; the Industrial School, and the Home for Truant Children—all possessing fine buildings. The House of Refuge for juvenile delinquents (a State institution) is located in an enclosure of 42 acres in the N. part of the city. The buildings are 382 feet front, with two large wings at right angles therewith, and several large workshops, etc. in the rear and detached. About 430 boys are confined here, and are instructed in some useful trade. They are sentenced for no fixed period, but are dismissed when by correct behavior and proficiency in work they are deemed by the trustees reformed and capable of earning a support. There has recently been established by the State a department for the correction of female juvenile delinquents, and a large and beautiful building, capable of accommodating 200 inmates, has been erected near the house for males. Both are under the same supervision, and receive prisoners from the central and western parts of the State. The Monroe co. penitentiary, almshouse, and insane asylum, located S. of the city, are a spacious, new, and imposing group of buildings, well constructed with a view to heating and ventilation, and vastly superior in all respects to such institutions in general. The penitentiary receives convicts from many of the counties of Western New York, and is admirably conducted.

Mount Hope Cemetery, one of the oldest of its kind in the U. S., was established 1838, and possesses 200 acres of land on the southern boundary of the city. It is agreeably diversified with hill and dale, and many of the original forest trees have been preserved. The grounds are laid out in a picturesque manner, and are admirably kept and cared for. A tower on the highest summit affords a fine view of the city and vicinity, and there is a substantial granite chapel in the grounds, and a beautiful keeper's lodge at the entrance. The Roman Catholic Cemetery of the Holy Sepulchre, established 1872, is located N. of the city on a fine site of 140 acres, upon which a stone chapel is to be erected. There are 2 gas companies, one on each side of the river, with a total capital of $1,200,000, and with 60 miles of mains. A street railway company operates 7 different routes, radiating from the centre of the city and having 14 miles of track. The 4 savings banks have an aggregate deposit of $13,000,000, and there are 6 banks of discount, with a combined capital and surplus of $1,800,000, and 4 private bankers, all with a total deposit of $3,500,000.

A magnificent system of waterworks has recently been constructed at a cost of $3,250,000, with two sources of supply—one from the river, the water being forced through 8 miles of mains in the business centre by the Holley patent, and is used for suppressing fires and running light machinery; the other is from Hemlock Lake, 29 miles S. and 400 feet above the city. There is a receiving reservoir of 85,000,000 gallons capacity, and a distributing of 45,000,000 gallons, from which the water is sent through 60 miles of mains along all the principal streets. The water is of the first quality for softness and purity, and 10,000,000 gallons can be distributed daily from this source. The two systems can be connected in case of accident to either, and thus a certain supply is guarantied. The pressure on the mains is such as to throw from the hydrants a stream 130 feet perpendicularly, and no city is more perfectly guarded from fire. The nursery business, owing to a singular adaptation of soil and climate, has assumed vast proportions. There are 3500 acres under cultivation in the city and vicinity, yielding an average yearly product of $1,000,000.

The manufacturing interests of the city, owing to its fine waterpower, are both immense and diversified. In earlier years flour was the chief product, and although now dwarfed by other branches it is still of great importance, there being 18 mills, grinding annually, with 75 run of stone, 2,500,000 bushels of wheat. Ready-made clothing is by far the largest manufacture; capital $2,500,000, with 6500 employés, and annual sales of $5,500,000. Boots and shoes rank next—$1,250,000 of capital, annual product of $3,500,000, and 2000 hands. The Leighton Iron Bridge Works employ 300 men and sell $1,000,000 yearly; 18 breweries make nearly 100,000 barrels of beer and ale per year; 5 tobacco-factories produce 1,250,000 pounds, and 70 cigar-makers 9,000,000 cigars; $500,000 is employed in furniture-making, with 1000 hands, annual product $800,000; the Stewart Rubber Co., recently established, with 100 employés makes 1500 pair of shoes daily, and has ordered machinery which will increase this product to 10,000 pair per day. The largest carriage-factory in the U. S. is located here, and has a capacity for 800 hands. Among the other larger branches of manufactures are optical instruments, perfumery, steam-engines, blast furnaces, fruit-canning, glassware, bank locks, agricultural machinery, and two immense establishments for garden and flower seeds.

The city is becoming a great distributing centre for coal, which is loaded from railroads on the banks of the river directly into vessels, which convey it to all points on the lakes in yearly increasing quantities. The business centre of the fertile Genesee Valley, Rochester exhibits a steady growth in wealth and population, which has never been seriously checked since its foundation. It is divided into 16 wards, and its assessed valuation is over $60,000,000.

FRED. A. WHITTLESEY.

Rochester, tp., Ulster co., N. Y. P. 4088.

Rochester, tp., Lorain co., O. (ROCHESTER DÉPÔT P. O.), on Cleveland Columbus Cincinnati and Indianapolis R. R. P. 691.

Rochester, p.-b. and tp., Beaver co., Pa., at the confluence of Beaver with Ohio River, here crossed by a bridge, and at junction of Pittsburg Fort Wayne and Chicago with Cleveland and Pittsburg R. R. P. 2091; of tp. 620.

Rochester, p.-v. and tp., Windsor co., Vt. P. 1444.

Rochester, p.-v. and tp., Racine co., Wis., on Fox River, on Western Union R. R. P. 392; of tp. 876.

Rochester (JOHN **Wilmot**), EARL OF, b. at Ditchley, Oxfordshire, England, Apr. 10, 1648; succeeded to the title 1659; became a favorite at the court of Charles II.; wrote poems in accordance with the prevailing taste; was noted for intemperance and profligacy, and also for his conversion from infidelity on his deathbed. D. July 26, 1680. His *Poems* and *Familiar Letters* were posthumously published. Biographies were written by Bishop Burnet and by Dr. Johnson.

Rochester (LAWRENCE **Hyde**), EARL OF, second son of the earl of Clarendon, the celebrated historian, b. in England about 1635; was carefully educated; entered Parliament for Oxford University 1661; was sent on various diplomatic missions to Poland and Germany; was plenipotentiary at the Congress of Nymwegen 1666; became first lord of the treasury and privy councillor 1679; was made baron of Wootton-Bassett and Viscount Hyde 1681; succeeded to the earldom of Rochester 1682; became lord president of the council 1684, lord treasurer and prime minister on the accession of James II., 1685; was deprived of his offices from unwillingness to become a Roman Catholic 1686; took part in the revolution of 1688; was leader of the High Church party in the reign of Anne, and became president of the council 1710. D. May 2, 1711.

Rochester (NATHANIEL), b. in Westmoreland co., Va., Feb. 21, 1752; served in North Carolina during the war of the Revolution with the rank of major and of commissary-general; became a merchant and manufacturer at Hagerstown, Md.; bought large tracts of land in Genesee Valley 1800, and settled in 1818 in Rochester, N. Y., which had been named after him in 1812. D. there May 17, 1831.

Rochester, University of, a college established in 1850 by the Baptists of Western New York in co-operation with their brethren in other parts of the State, who felt the need of an institution of this nature. Though under the effective control of the Baptist denomination, both the faculty and the board of trustees embrace members of other religious denominations, and about one-half the undergraduates are from other than Baptist families. The university opens to students three courses of study—the classical, the scientific, and the eclectic. In 1876 it had eight professors, 160 students, $212,016.49 in invested funds, and $378,662.27 in real estate, a library, cabinet, and buildings. The geological cabinets of the university (collected by Prof. Ward) have been pronounced by competent judges among the best in the country. The alumni of the university numbered in 1876 about 600, of whom an unusually large proportion had devoted themselves to mercantile pursuits and to journalism. In 1853, Martin B. Anderson assumed the presidency of the university, a position which he still holds. J. H. GILMORE.

Roch'et (*rochettus*), in the Roman Catholic Church costume, a garment of lace or lawn resembling a surplice with tight sleeves. It is worn by bishops and others.

Rochet' (LOUIS), b. at Paris Aug. 24, 1813; studied under David d'Angers, and began to exhibit in 1835, his first statue being a *Boy extracting a Thorn from his Foot.* Among his most prominent works are *Napoléon*, at Brienne (1853); *Madame de Sévigné*, at Grignan (1857); a colossal equestrian statue of Pedro I., at Rio de Janeiro (1861); and a similar statue of Charlemagne (1867).

Rochette' (DESIRÉ RAOUL), b. at St. Amand, department of Cher, France, in 1789; was appointed professor of history at the normal school of Paris in 1815, keeper of the cabinet of metals in 1818, professor in archæology at the Collége de France in 1820. D. at Paris July 5, 1854. His principal works are—*Histoire critique de l'Etablissement des Colonies grecques* (4 vols., 1815), *Monuments inédits d'Antiquité* (1828), *Sur les Antiquités chrétiennes des Catacombes* (1839). His *Letters on Ancient Art* were translated into English by H. M. Westropp (1854).

Rock [Fr. *roche*, "a rock"], in technical language, any considerable aggregation of mineral matter, whether hard and massive like granite, marble, sandstone, etc., or unconsolidated like clay, sand, and gravel. Incoherent mineral aggregates, as sand, clay, etc., only receive this name when they form some definite portion of a geological series. The science which has been formed by the combination of facts observed in regard to rocks is called *lithology*, or sometimes *petrology*. Rocks may be divided into three classes—*igneous*, *sedimentary*, and *metamorphic*. Of these the igneous rocks are such as have derived their distinguishing characters from the action of fire. They form two groups—*volcanic* and *plutonic* rocks—of which the first are the immediate product of volcanic eruption, have generally consolidated under no greater pressure than that of the atmosphere, and are usually porous, cellular, or friable. They include trachyte, lava in its various forms, volcanic tufa, obsidian, pumice, etc. Plutonic rocks are more massive and compact, and are supposed to have cooled from fusion at great depths and under heavy pressure. They include igneous granite, porphyry, igneous diorite, sienite, dolerite, etc. The sedimentary rocks are such as have been deposited from water. They form three groups—viz. *mechanical*, *chemical*, and *organic* rocks. The mechanical sediments are those which are composed of fragments of pre-existing rocks triturated and distributed by aqueous agency. This group includes gravel, sand, and clay, or the same materials consolidated into conglomerate, sandstone, and shale. Organic stratified rocks are such as have been formed through the agency of animal or vegetable life. They are limestones, which are mostly derived from the hard parts of marine animals, Foraminifera and mollusks; diatomaceous earths, composed chiefly of the silicious shields of diatoms; shell-marl, which accumulates at the bottoms of bodies of fresh water; coal and peat, etc. Chemical rocks are those which have been precipitated from chemical solutions, and among these are to be enumerated rock-salt, gypsum, the ores of iron and other metals, vein-stones, travertine, etc. Metamorphic rocks are aqueous sediments which have been changed from their original condition and made

more compact and crystalline by heat—which has baked or vitrified them—by steam, or hot or cold chemical solutions. By these agents shale is converted into slate, sandstone into quartzite, limestone into marble.

The classification of the igneous and metamorphic rocks is yet incomplete and confused, as it has been mainly based on superficial observation and speculation. The composition, relations, and history of the different varieties can only be accurately determined by laborious and patient microscopic and chemical study—an investigation as yet but fairly begun. This subject is, however, now receiving the attention of many eminent mineralogists, and such progress has been already made in it that it is confidently expected not only that the igneous rocks will ultimately be accurately classified, but that by such study much new light will be thrown on the early history of the earth. (See VOLCANO.) The metamorphic rocks are always much disturbed and folded, and compose all mountain-chains (while isolated cones are made up of fused and ejected material), and it is probable that the heat that has changed them has been derived from arrested motion. (See METAMORPHISM.) The formation of sedimentary rocks may be seen in progress in the ocean off any coast. Here we find, as the effect of shore-waves, rain and rivers, frost and sun, the land constantly worn away, and the débris spread over the adjacent sea-bottom. Just along the shore a belt of beach sand or gravel is usually formed; outside of this a belt of fine mechanical sediment (fine sand and clay); still farther out, and beyond the reach of the wash of the land, a calcareous mud or "ooze," derived from the hard parts of marine organisms. When consolidated by solutions of silica or lime, the materials of these belts form respectively sandstone or conglomerate, shale, and limestone. On coasts composed of limestone rock and about coral islands calcareous sands and gravels are formed instead of the more common silicious fragmental rocks. In any submergence of the land and advance inland of the shore-line sheets of these materials would be spread over all the area invaded and for some time occupied by the sea—first, the beach deposit, conglomerate and sandstone, then the off-shore fine mechanical sediments, shale or earthy limestone, and finally, pure limestone. As the sea shallowed and retreated, mixed fine mechanical and organic sediments would be deposited from it, completing a "circle of deposition." Such sequences of sedimentary rocks, formed by advances and retreats of the sea, compose all the great "systems" into which the "geological column" is divided. J. S. NEWBERRY.

Rock, county of Minnesota, at the S. W. angle of the State, adjoining Iowa and Dakota, intersected by Rock and Big Sioux rivers and their tributaries, has a rolling prairie surface, well adapted for stock-raising. Cap. Luverne. Area, 432 sq. m. P. 138.

Rock, county of S. Wisconsin, adjoining Illinois, on Rock River, traversed by Chicago and North-western, Milwaukee and St. Paul, and Western Union R. Rs., consists largely of fertile prairie. Staples, Indian corn, oats, wheat, hay, tobacco, hops, butter, and wool; has large numbers of horses, cattle, sheep, and swine, and numerous manufactories of carriages, agricultural implements, and furniture. Cap. Janesville. Area, 750 sq. m. P. 39,030.

Rock, tp., Mitchell co., Ia. P. 474.

Rock, tp., Jefferson co., Mo. P. 2896.

Rock, tp., Mercer co., West Va. P. 1240.

Rock, tp., Rock co., Wis. P. 1062.

Rock'away, p.-v. and tp., Morris co., N. J., on Rockaway River and Morris Canal, and on Morris and Essex and Hibernia Mine R. Rs., has foundries and rolling-mills, and is in the vicinity of iron-mines. P. 6445.

Rock Bluff, p.-v. and tp., Cass co., Neb. P. 756.

Rock'bridge, county of W. part of Virginia, in the Valley of Virginia, bounded S. E. by the Blue Ridge, intersected by James and North rivers, and crossed in its N. W. corner by Chesapeake and Ohio R. R. The celebrated "Natural Bridge," from which the county derives its name, is on Cedar Creek, near the S. extremity. Staples, wheat, Indian corn, hay, tobacco, wool, and butter. There are 16 flour-mills and several tanneries and manufactories. Cap. Lexington. Area, 700 sq. m. P. 16,058.

Rock'bridge, p.-v. and tp., Richland co., Wis. P. 994.

Rock Cas'tle, county of Central Kentucky, bounded S. E. by Rock Castle River, drained by its branches, intersected by Louisville Nashville and Great Southern R. R., and has a mountainous surface. Staples, Indian corn, tobacco, sorghum-molasses, wool, and butter. Some coal is found. Cap. Mount Vernon. Area, 350 sq. m. P. 7145.

Rock Castle, p.-v., Trigg co., Ky., on Tennessee River. P. 80.

Rock Creek, p.-v. and tp., Carroll co., Ill., on Western Union R. R. P. 2056.

Rock Creek, tp., Hancock co., Ill., on Toledo Peoria and Warsaw and Toledo Wabash and Western R. Rs. P. 1201.

Rock Creek, tp., Hardin co., Ill., on Ohio River. P. 856.

Rock Creek, tp., Bartholomew co., Ind. P. 1203.

Rock Creek, tp., Carroll co., Ind., on Wabash River. P. 1316.

Rock Creek, p.-v. and tp., Huntington co., Ind., on Wabash River. P. 1639.

Rock Creek, tp., Wells co., Ind., on Wabash River. P. 1326.

Rock Creek, tp., Jasper co., Ia. P. 480.

Rock Creek, tp., Cowley co., Kan. P. 441.

Rock Creek, p.-v. and tp., Jefferson co., Kan. P. 441.

Rock Creek, tp., Nemaha co., Kan. P. 740.

Rock Creek, tp., Guilford co., N. C. P. 1082.

Rock Creek, tp., Wilkes co., N. C. P. 960.

Rock Creek, v., Morgan tp., Ashtabula co., O., on Ashtabula Youngstown and Pittsburg R. R. P. 491.

Rock Creek, tp., Dunn co., Wis. P. 267.

Rock-crys'tal, a name for the purest and most transparent forms of quartz. Some of these are of great beauty, and the crystalline forms are often very fine. Rock-crystal is sometimes used for spectacle lenses, for a gem cut like the diamond, etc. It is harder than ordinary glass.

Rock'dale, new county of N. Georgia, on South River, traversed by Georgia R. R.; has a rolling surface and a productive soil. Iron and gold have been found. Cap. Conyers. Area, 200 sq. m.

Rockdale, p.-v., Randolph co., Ala. P. 624.

Rockdale, tp., Crawford co., Pa. P. 1664.

Rockdale, p.-v., Milam co., Tex., on International and Great Northern R. R., 324 miles from Galveston, has 3 banks, 1 newspaper, good schools, machine-shops, and extensive stock-yards. Large numbers of cattle are shipped from this place, and the soil is well adapted for the production of cotton. P. about 500.
McGREGOR & MUIR, EDS. "MESSENGER."

Rock Dell, p.-v. and tp., Olmsted co., Minn. P. 837.

Rock Elm, p.-v. and tp., Pierce co., Wis. P. 554.

Rock'et [It. *rocchetta*], a projectile known from remote antiquity in China and India, but first introduced into Europe about A. D. 900, the distinguishing characteristic of which is that it is set in motion by a force within itself, and therefore combines the functions of gun and projectile. Rockets were employed at first chiefly in fireworks for popular amusement; were subsequently utilized in war for igniting an enemy's citadel; and were also used for signals. About the beginning of the nineteenth century Sir William Congreve gave them greater precision, and prepared them for extended military employment as weapons of offence. They are now falling into disuse.

Rock Falls, p.-v., Whitesides co., Ill., on S. bank of Rock River, 110 miles W. from Chicago and the terminus of Chicago and Rock Falls branch of Chicago Burlington and Quincy R. R., has 1 church, a good public school, 1 bank, 1 newspaper, 2 hotels, 1 paper and 2 flouring mills, 1 machine-shop, 1 planing-mill, 1 table and 1 wagon manufactory, and fine water-power. P. 471.
W. H. CADWELL, ED. "PROGRESS."

Rock'field, p.-v. and tp., Carroll co., Ind., on Toledo Wabash and Western R. R. P. 289.

Rock'fish, a name under which the *Roccus lineatus*, or striped bass of New Jersey, is known along the Atlantic seaboard from Southern New Jersey southward to Virginia. (See STRIPED BASS.)

Rock Fish, tp., Cumberland co., N. C. P. 2982.

Rock Fish, p.-v. and tp., Duplin co., N. C. P. 1380.

Rock'fish, tp., Nelson co., Va. (ROCKFISH DÉPÔT P. O.). P. 3841.

Rock'ford, p.-v., cap. of Coosa co., Ala. P. 1068.

Rockford, city and tp., cap. of Winnebago co., Ill., on Chicago and North-western R. R., and on both sides of Rock River, 92 miles W. of Chicago, the seat of Rockford Female Seminary, an institution closely allied in its origin and history with Beloit College. The city is adorned by rows of natural trees, whence it has received the name of "Forest City." Located in an agricultural district unsurpassed in beauty, in the fertility of its soil, and in the intelligence of its people, possessed of one of the

most extensive water-powers of the West, and blessed with religious and educational advantages of a high order, it is not to be wondered at that there has grown up a city occupying the front rank of the inland cities of the "Prairie" State. Water-mains extend through the principal streets both in East and West Rockford—one pipe crossing the river from the works, the other at the foot of Morgan street, South Rockford, making now about 21 miles of pipe laid throughout the city. The water now used is wholly accumulated from springs, though a large main extends to the river which can be immediately utilized if a larger quantity is needed. The pumping power is the "new pumping engine and automatic pressure regulator." The pumps are 9 inches in diameter and 24 inches stroke, and the four deliver, at one revolution of the engine, 51.4 gallons of water, or 431.76 pounds. This set of machinery will pump 3,000,000 gallons of water in twenty-four hours, when running at the rate of 39 revolutions per minute. The motion of the machinery is put under the control of the pressure of water in the street-mains supplied by it, and the movement is thus increased or diminished in exact ratio to the increase or diminution of the draughts from these mains. The water-pressure regulator is provided with a piston placed within a piston-chamber, and having a rod extending outward, which is connected with a crossbar, having heavy weights attached to prevent a sudden or spasmodic movement. A small pipe connects the piston-chamber with the water-mains, so that any change in the pressure of the water is at once communicated to the piston, causing it to rise or fall as the pressure is increased or diminished. The water-pressure regulator is usually set at a pressure of 45 pounds, and in case of non-action the water safety-valve, at a pressure of 55 pounds, is the next exhaust, the water-regulator being so connected with the steam-power that as the water-pressure rises equal to that of steam, the engine stops. Rockford has a fine museum, containing collections of stuffed birds, rare old coins, precious stones, geological specimens, shells, etc. The manufacturing interests are mainly confined to agricultural implements. In 1844 the Rockford Hydraulic Co. was organized, and built a dam across the river about 800 feet long, the power being under a six-foot head. There are 2 furniture-factories, 1 extensive watch manufactory, 1 woollen and 1 cotton mill, several flour-mills, 2 insurance companies, 5 weekly newspapers, 1 oatmeal-factory, and 8 banks of savings and deposit, with an aggregate capital of over $1,500,000. P. of city, 11,049; of tp. 1383. A. E. SMITH, ED. "ROCKFORD GAZETTE."

Rockford, p.-v. and tp., Floyd co., Ia., on Shell Rock River and on Burlington Cedar Rapids and Minnesota R. R., has 1 newspaper. P. 732.

Rockford, tp., Pottawattamie co., Ia. P. 623.

Rockford, tp., Sedgwick co., Kan. P. 197.

Rockford, p.-v., Algoma tp., Kent co., Mich., on Grand Rapids and Indiana R. R. P. 582.

Rockford, p.-v. and tp., Wright co., Minn. P. 782.

Rockford, tp., Caldwell co., Mo. P. 870.

Rockford, p.-v., Surry co., N. C. P. 890.

Rock Gap, tp., Morgan co., W. Va. P. 635.

Rock Grove, p.-v. and tp., Stephenson co., Ill. P. 1096.

Rock Grove, tp., Floyd co., Ia. P. 1289.

Rock Hill, tp., Bucks co., Pa., on North Pennsylvania R. R. P. 3363.

Rock Hill, p.-v., York co., S. C., on Charlotte Columbia and Augusta R. R.

Rock Hill, tp., Stafford co., Va. P. 1105.

Rock'ingham, county of S. E. New Hampshire, extending along the Atlantic coast from Maine to Massachusetts, bounded N. E. by Piscataqua River, watered by Squawscot, Lamprey, Cocheco, and other rivers, and traversed by Manchester and Lawrence, Concord and Portsmouth, Boston and Maine, Eastern, and Nashua and Rochester R. Rs., has a broken surface, well adapted to pasturage. Staples, potatoes, hay, wool, butter, and cheese. Manufactories, especially of ironware, of clothing, and of boots and shoes, are very numerous. There are above 20,000 milch cows, many other cattle, and sheep. Caps. Portsmouth and Exeter. Area, 700 sq. m. P. 47,297.

Rockingham, county of North Carolina, adjoining Virginia, intersected by Dan and Haw rivers, and traversed by Richmond and Danville R. R., has a broken surface and a fertile soil. Staples, Indian corn, sweet potatoes, tobacco, honey, and butter. There are several manufactories of chewing tobacco. Cap. Wentworth. Area, 600 sq. m. P. 15,708.

Rockingham, county of N. Virginia, stretching across the great Valley of Virginia from the Shenandoah Mountains on the N. W. to the Blue Ridge on the S. E., intersected by both forks of Shenandoah River, traversed by Winchester Potomac and Harrisonburg division of Baltimore and Ohio R. R., and has a very fertile soil. Staples, wheat, Indian corn, oats, hay, sorghum-molasses, wool, and butter. Horses, cattle, sheep, and swine are numerous. There are 14 flouring-mills. Cap. Harrisonburg. Area, 850 sq. m. P. 23,668.

Rockingham, tp., Scott co., Ia. P. 280.

Rockingham, p.-v., cap. of Richmond co., N. C., on Carolina Central R. R., has 1 weekly newspaper. P. 454.

Rockingham, p.-v. and tp., Windham co., Vt., on Rutland division of Vermont Central R. R. P. 2854.

Rockingham (CHARLES WATSON **Wentworth**), MARQUIS OF, b. in England May 13, 1730; became earl of Malton 1750, and succeeded to the marquisate in December of the same year; became premier in 1765, acquiring popularity in the American colonies on account of the repeal of the Stamp Act Mar., 1766; retired from office July 12, 1766, and again became premier on the resignation of Lord North, Mar. 22, 1782. D. at Wimbledon, Surrey, July 1, 1782.

Rock'ing Stones, or **Logan Stones,** large rocks which are so balanced upon other stones that they can be rocked by the hand. They abound in many parts of the world, and in not a few cases are evidently boulders which have been dropped by glaciers or icebergs.

Rock Island, county of N. W. Illinois, extending along Mississippi River, and intersected by Rock River, traversed by numerous railroads, which centre at Rock Island, has a rolling surface and a fertile soil, and abundant deposits of coal and limestone. Staples, Indian corn, wheat, oats, potatoes, hay, and butter. Manufactories of saddlery and harness, carriages, agricultural implements and other hardware, flouring and saw-mills. Cap. Rock Island. Area, 350 sq. m. P. 29,783.

Rock Island, p.-v., Stanstead co. and tp., Quebec, Canada, adjoining the village of Derby Line, Vt., and on a branch of Massawippi Valley R. R., 20 miles from Island Pond, Vt. Here are 3 large boot and shoe manufactories, a fine hotel, mineral springs, an iron-foundry and machine-shop, and 1 weekly newspaper. P. about 800.

Rock Island, city, cap. of Rock Island co., Ill., on Mississippi River, 180 miles W. of Chicago, is one of the principal railroad centres of the West, and steamboats leave daily for St. Louis and St. Paul during the season of navigation. Rock Island contains 11 churches, St. Augustana College (founded by the Swedish Lutheran denomination), excellent public and private schools, 3 national and 1 private bank, a large public library, and 2 newspaper establishments, issuing daily and weekly editions. It is lighted with gas, and supplied with water from the Mississippi River by means of the Holly pressure system. Among its manufactories are the Rock Island Glass Co., an extensive plough-factory, the Rock Island Co.'s stove-foundry, and several other establishments. There are 3 lumber and 2 flouring mills, 4 sash, door, and blind factories, 1 distillery, machine-shops, etc. The railway and river shipping facilities are excellent, affording wholesale dealers direct communication with all points N., W., and S., while the water-power at Moline, 2 miles distant, and at Milan, 3 miles away, makes it the centre of an extensive manufacturing region. Connected with the city is Rock Island, from which the municipal name was derived. Previous to and during the Black Hawk war a garrison was kept at Fort Armstrong, a series of block houses on this island, and during the civil war many Confederate soldiers were kept in its famous prison. The national government is now building the most extensive armory and arsenal in the country here. Motive-power is to be supplied from the Moline waterworks, which were improved in the most durable manner at government expense, and the right thus acquired to three-fourths of the power. The city is connected with Davenport, Ia., by an iron bridge with a passage for railway trains above and vehicles below. This bridge was built by the government as an approach to Rock Island arsenal, the Chicago Rock Island and Pacific R. R. Co. defraying a portion of the cost of construction. P. 7890. WALTER JOHNSON, ED. "DAILY UNION."

Rock Island, p.-v., Troy tp., Perry co., Ind., on Ohio River. P. 241.

Rock'land, county of S. E. New York, bounded E. by Hudson River and S. W. by New Jersey, crossed by Hackensack and Ramapo rivers, and intersected by Erie and Northern New Jersey R. Rs., consists largely of the Highland range of hills skirting the Hudson, has extensive quarries of red sandstone, and manufactures vast quantities of lime and brick. Agriculture is very limited. Cap.

New City (CLARKSTOWN P. O.). Area, 208 sq. m. P. 25,213.

Rockland, city, seaport, and cap. of Knox co., Me., on the western shore of Owl's Head Bay, which forms its harbor, and on Knox and Lincoln R. R., 60 miles E. N. E. from Portland and about the same distance S. S. W. from Bangor. The city was incorporated in 1854, and contains 8 churches, excellent public schools, 1 savings and 2 national banks, besides a bank of discount and deposit, 4 weekly newspapers, and a well-organized fire department. Rockland is supplied with water and gas, and is extensively engaged in the manufacture of lime, producing 1,000,000 casks annually; also in commerce, trade, and to some extent shipbuilding. Its territorial limits embrace about 7000 acres, and it has a water-front of about 4½ miles, affording ample facilities for commerce. P. 7074.

Z. POPE VOSE, ED. "ROCKLAND GAZETTE."

Rockland, p.-v., Plymouth co., Mass., on Hanover branch of Old Colony R. R., 19 miles S. of Boston, has good schools, a savings bank, 1 newspaper, and 1 hotel. The manufacture of boots and shoes forms an extensive industry. P. about 4278.

J. SMITH, ED. "ROCKLAND STANDARD."

Rockland, p.-v. and tp., Ontonagon co., Mich., on Ontonagon River. P. 1479.

Rockland, p.-v. and tp., Sullivan co., N. Y., on New York and Oswego Midland R. R. P. 1946.

Rockland, tp., Berks co., Pa. P. 1451.

Rockland, p.-v. and tp., Venango co., Pa., on Allegheny River and Allegheny Valley R. R. P. 2068.

Rockland, tp., Brown co., Wis. P. 753.

Rockland, tp., Manitowoc co., Wis. P. 889.

Rockland Lake, a beautiful sheet of water 4 miles in circumference, in Clarkstown tp., Rockland co., N. Y., opposite Sing Sing, 36 miles N. of New York, 1 mile W. of Hudson River, and 160 feet above its surface. Here some 200,000 tons of ice are annually cut for market by about 1000 men. The post-village of Rockland Lake extends from the Hudson (Slaughter's Landing) to the lake. It has some manufactures. P. 510.

Rock'lin, p.-v., Placer co., Cal., on Central Pacific R. R., is the location of the machine-shops of that railroad, and has fine quarries of granite. P. 542.

Rock Mart, p.-v., Polk co., Ga., at W. terminus of Cherokee R. R., has 1 newspaper, fine slate-quarries, and a considerable trade in cotton and grain.

Rock Mill, p.-v., Randolph co., Ala. P. 929.

Rock'port, p.-v., cap. Hot Spring co., Ark., on Cairo and Fulton R. R., and on Washita River, which is navigable to this point.

Rockport, p.-v. and tp., cap. of Hanson co., Dak., on W. bank of Dakota River.

Rockport, p.-v., cap. of Spencer co., Ind., on Ohio River and Cincinnati Rockport and South-western R. R., has 7 churches, 3 public-school buildings, 2 newspapers, 1 bank, several mills and manufacturing shops, and 5 hotels. Rockport is surrounded by a fine farming country, abounding in timber and coal. P. 1720.

G. E. BULLOCK, ED. "REPUBLICAN JOURNAL."

Rockport, p.-v., Ohio co., Ky., on Elizabethtown and Paducah R. R. P. 173.

Rockport, p.-v., Camden tp., Knox co., Me., on Penobscot Bay.

Rockport, p.-v. and seaport of Essex co., Mass., 32 miles N. E. of Boston, on Gloucester branch of the Eastern R. R., has 5 churches, a public library, a national and savings bank, a large cotton-mill, 1 newspaper, good schools, 2 hotels, an organ-factory, and 3 isinglass manufactories. Principal business, quarrying granite, fishing, and farming. P. 3904.

L. CLEAVES & CO., EDS. "ROCKPORT GLEANER."

Rockport, p.-v., Tarkio tp., cap. of Atchison co., Mo., 5 miles E. of Rockville, a station on Kansas City St. Joseph and Council Bluffs R. R., has 2 weekly newspapers. P. 490.

Rockport, p.-v. and tp., Cuyahoga co., O., on Rock River. P. 2001.

Rockport, city and seaport, cap. of Aransas co., Tex., on Aransas Bay, in direct communication with New Orleans by water, has 4 churches, an institute, good schools, and 1 newspaper. Rockport is one of the largest cattle-marts of Texas. C. F. BAILEY, ED. "TRANSCRIPT."

Rock Rapids, p.-v., cap. of Lyon co., Ia., on Rock River, 22½ miles W. of St. Paul and Sioux City R. R., has abundant water-power, a rich soil, good schools, 1 newspaper, and 2 hotels. Principal business, farming, trading, and real estate. P. about 200.

MOULUX & DICKINSON, EDS. "ROCK RAPIDS REVIEW."

Rock River rises in Fond du Lac co., Wis., flows through Horicon Lake, receives its W. fork, and traverses Lake Koshkonong; passing southward into Illinois, its course becomes south-westward. After a somewhat rapid course of 350 miles, it reaches the Mississippi 2 miles below Rock Island. It is not navigable except at high water, but affords much water-power. Its valley is picturesque and fertile. Its total fall is 379 feet, and if desirable slack-water navigation might easily be perfected throughout a large part of course.

Rock Roe, tp., Prairie co., Ark. P. 277.

Rock Run, p.-v. and tp., Stephenson co., Ill., includes the village of Rock City on Western Union R. R. P. 2242.

Rock-Salt. See SALT.

Rock'ton, p.-v. and tp., Winnebago co., Ill., at confluence of Rock and Pecatonica rivers and on Western Union R. R. P. 1827.

Rock Vale, p.-v. and tp., Ogle co., Ill. P. 757.

Rock'ville, p.-v., Tolland co., Conn., at the terminus of Rockville branch of Hartford Providence and Fishkill R. R., 15 miles E. of Hartford, contains 6 churches, excellent schools, 2 national and 2 savings banks, 1 newspaper, 2 hotels, a job-printing establishment, 8 woollen-mills, manufactories of warps, sewing silk, stockinet, envelopes, and ginghams. The water-power for these mills is supplied by Hockanum River, which has a fall of 286 feet. It is furnished with water and gas. P. about 5000.

F. H. STICKNEY, ED. "JOURNAL."

Rockville, tp., Kankakee co., Ill. P. 1112.

Rockville, p.-v., Adams tp., cap. of Parke co., Ind., on Logansport Crawfordsville and South-western R. R., in a rich agricultural district, has 2 newspapers. P. 1087.

Rockville, p.-v. and tp., cap. of Montgomery co., Md., on Metropolitan branch of Baltimore and Ohio R. R. P. 660.

Rockville, p.-v. and tp., Stearns co., Minn. P. 403.

Rockville, v., Greene tp., Adams co., O., on Ohio River. P. 937.

Rockville, v., Middle Paxton tp., Dauphin co., Pa. (SUSQUEHANNA P. O.), on Susquehanna River, here crossed by a railroad bridge, on Schuylkill and Susquehanna division of Philadelphia and Reading R. R., and on Pennsylvania R. R. P. 259.

Rockville, tp., Anderson co., S. C. P. 871.

Rockville Centre, p.-v., Queens co., N. Y., 16 miles from Brooklyn, on Southern R. R. of Long Island, has 4 churches, an academy, 1 newspaper, and a planing and moulding mill. It is a summer resort for residents of New York City and Brooklyn.

C. L. WALLACE, ED. "SOUTH SIDE OBSERVER."

Rock'wall, new county in Texas, set off from Kaufman since 1870, is watered by branches of Trinity and Sabine rivers, has a rolling prairie surface and a fertile soil. Cap. Rockwall. Area, about 170 sq. m.

Rockwall, p.-v., cap. Rockwall co., Tex.

Rock'well (JOHN ARNOLD), b. at Norwich, Conn., Aug. 27, 1803; graduated at Yale College 1822; became a lawyer at Norwich; was a member of the State senate 1838–39; judge of the New London co. court 1840; member of Congress 1847–51; was principally instrumental in procuring the establishment of the court of claims at Washington, D. C.; practised much before it, and was author of *The Mexican Law of Mines and Real Estate* (2 vols., 1851–52), a standard work. D. at Washington, D. C., Feb. 10, 1861.

Rockwell (JULIUS), b. at Colebrook, Conn., Apr. 26, 1805; graduated at Yale College 1826; studied law at the New Haven Law School; was admitted to the bar in Litchfield co. 1829; settled at Pittsfield, Mass., 1830; was a member of the Massachusetts legislature 1834–38, being Speaker 1835 and 1838; was bank commissioner 1838–41; member of Congress 1847–51; of the Massachusetts constitutional convention 1853; was U. S. Senator 1854–55, filling the unexpired term of Edward Everett, and was a judge of the Massachusetts superior court 1859–71.

Rock'wood, p.-v., Eramosa tp., Wellington co., Ontario, Canada, on river Speed and on Grand Trunk Railway, 41 miles W. of Toronto, has an academy and important manufactures. P. about 600.

Rocky Bar, p.-v., cap. of Alturas co., Id., on Lewis fork of Columbia River.

Rocky Bayou, tp., Izard co., Ark. P. 720.

Rocky Comfort, p.-v., cap. of Little River co., Ark.

Rocky Fork, tp., Boone co., Mo. P. 1870.

Rocky Gap, p.-v. and tp., Bland co., Va. P. 1000.

Rocky Grove, tp., Orangeburg co., S. C. P. 697.

Rocky Head, tp., Dale co., Ala. P. 800.

Rocky Hill, p.-v. and tp., Hartford co., Conn., on Connecticut River. P. 971.

Rocky Hill, p.-v. and tp., Somerset co., N. J., on Raritan River and Delaware and Raritan Canal, at W. terminus of Rocky Hill R. R.

Rocky Mount, p.-v. and tp., Edgecombe co., N. C., on Tar River, at junction of Wilmington and Weldon R. R. with Tarborough branch of the same road, has 1 newspaper. P. of v. 357; of tp. 2158.

Rocky Mount, p.-v. and tp., cap. of Franklin co., Va., on Richmond and Trans-Alleghany Narrow-gauge R. R. (proposed), has 2 churches, 1 savings bank, 1 newspaper, and 2 hotels. P. 2034.

W. A. AND C. J. GRIFFITH, EDS. "VIRGINIA MONITOR."

Rocky Mountain Locust, the *Caloptenus femur-rubrum*. See LOCUST, by PROF. A. S. PACKARD, JR., M. D.

Rocky Mountains, all the mountains of North America between the great plains and the Pacific Ocean. The term "Stony Mountains" was originally applied, but was finally replaced by the name "Rocky Mountains." This name, which has become fixed by popular usage, is very appropriate. On the mountains and plateaus of the greater part of the region naked rocks are seen to an extent rarely known elsewhere on the globe, as the region is largely destitute of soil and timber. A variety of climatic and geologic causes conspire to this end. Chief among these are extreme aridity and great elevation, the lack of moisture preventing the growth of vegetation, and great elevation promoting rapid denudation of the rock-material disintegrated at the surface. The mountains are composed of crags and peaks of naked rock, and the mountain-streams run at the feet of towering cliffs in deep gorges beset with rocks. The hills, unprotected by vegetation, are swept clean of sands and soil by the winds. The watercourses rarely have flood-plains, and the steep sides of the valleys are strewn with fragments of rock. In the plateau region the streams run in deep cañons, whose walls rise hundreds, or even thousands, of feet above the waters, and the channels below are choked with rocks which tumble from the cliffs. By reason of unequal erosion of the general surface, due to petrologic structure under conditions of great aridity, long lines of cliffs or towering escarpments of rock stand athwart the plateaus. These cliffs are often for scores or even hundreds of miles almost or quite impassable barriers to travel.

In very late geological time the whole region has been the scene of much volcanic activity. Great mountain-ranges have extinct volcanoes on their flanks; high plateaus have dead volcanoes on their backs; broad mesas are covered with sheets of lava; great valleys have been filled with extravasated matter, and scoria and ashes are scattered over the land. Some of this extravasation is so recent that the congealed floods are yet preserved with all their forms of stream and wave, and these naked rocks appear without soil and without even mosses and lichens. The land is well characterized as the Rocky Mountain region. But extreme aridity is not a characteristic of the entire region. Those ranges that are near the Pacific coast N. of the 42d parallel of N. lat. are abundantly supplied with water, and here the indurated beds are greatly masked by dense forests.

This great mountain-system extends through the U. S. from its southern border, through British America and Alaska to the Arctic Ocean, or from the 30th to the 70th parallel of N. lat. Its greatest development in longitude is between the 38th and 42d degrees of N. lat.; here the grand system has a breadth of about 1000 miles. Its highest peak is Mount St. Elias, lat. 60° 20′ 45″ and lon. 141°, which rises to an altitude of 19,500 feet above the level of the sea, as determined by Dall.

In the same grand system may be included the mountains of Mexico and Central America, though the term Rocky Mountains has rarely been applied to them. The mountains of Central America are composed of cordilleras and volcanoes, the geological characteristics of which are yet unknown. The system is separated from the Andes of South America by the narrow Isthmus of Panama, where a pass is found from Atlantic to Pacific waters having its summit not more than 100 feet above the level of the sea. The mountain-region of Central America is separated from the mountain-region of Mexico by the Isthmus of Tehuantepec, where a pass is found from the Gulf of Mexico to the Pacific, its summit not more than 700 feet above the level of the sea. The mountains of Mexico are usually termed by geographers the Mexican Cordilleras, but locally the term "cordilleras" is applied only to certain ranges; the other great mountain-masses, whether their origin be by extravasation or upheaval and degradation, have their special names. Too little is known of the topography, and especially of the geological structure, of the mountains of Mexico to warrant any classification or sub-grouping, and we are not able to separate the more northern mountains of Mexico from the more southern mountains of the U. S.

Passing from Mexico to the U. S., we reach the Rocky Mountains proper; and here the geography and geology of the region have been studied to such an extent as to warrant a partial classification of the grand system into minor groups or systems; but such classification cannot be carried into British America. In the U. S. are the following systems: the Desert Ranges, the Park Ranges, the Plateaus, the Basin Ranges, the Sierra Nevada, the Coast Ranges, the Cascade Mountains, and, provisionally, the Geyser Ranges.

The Desert Ranges extend through Southern California, Southern Arizona, and South-western New Mexico southward into old Mexico; the limits of the group in this direction are unknown. They are bounded on the N. by the Basin Range region and the Plateau region; on the E. by the N. and S. mountains of the Rio Grande; on the N. W. they coalesce with the spurs of the Sierra Nevada and Coast Ranges; and here, at present, no definite line of demarcation can be drawn. Nor do we know with which group the mountains of the peninsula of California should be classed. These mountains have a N. W. trend, varying from 30° to 60° W. of N. So far as their geological structure is known, they are of the Basin Range type—*i. e.* a monoclinal ridge of displacement, or a displacement due to a fault on one side and a flexure on the other, which may otherwise be described as the half of an anticlinal fold. The typical ridge is composed of strata dipping one way, the front or face of the range being the escarped edges of the strata, and the back of the ridge conforming to some extent with the dip of the strata. Very few of the ranges are as simple as the type described, as they are complicated by secondary faults, and flexures transverse, oblique, and sometimes even longitudinal, with the principal structure. Simple anticlinals are rarely found. The ridges described are composed of granites, schists, and Palæozoic sandstones and limestones; but these rocks and the monoclinal structure are often masked by extravasated beds found on the flanks, or sometimes partly burying the ranges, and many of the mountains are chiefly of eruptive origin. Usually, these mountains rise as island ridges from a desert sea of sand, the most inhospitable region of North America, but near their north-eastern limits in Arizona and New Mexico, the general altitude being greater, there is more precipitation of moisture. The Colorado River divides the system. On the E. the mountains are drained by Bill Williams' Fork and the Gila; on the W. there is no living stream tributary to the Colorado, but the ranges that extend to the coast are drained by streams that fall directly into the Pacific. Of the age of the dry land there is no certain knowledge, but the mountain-forms due to upheaval and atmospheric degradation, and also the mountain-forms due to extravasation, are of very late geological origin—much later than the dry land from which they rise.

Principal Mountains of the Desert Range System.—The Park System extends from Southern Wyoming through Central Colorado into New Mexico, bounded on the N. by the Laramie Plains, on the E. by the Great Plains, and on the W. by the Plateaus; the southern limits cannot yet be defined. There are a great number of ranges in New Mexico on either side of the Rio Grande del Norte having a N. and S. trend, the general structure and geological relations of which are unknown. They may constitute a system or sub-system by themselves, or they may be considered as a part of the Park System. The general trend of the Park Ranges is a few degrees W. of N., but there are exceptions. These mountains are drained by the Platte and Arkansas, which flow into the Mississippi; by the Rio Grande del Norte, which flows into the Gulf of Mexico; and by the Colorado River of the West, which flows into the Gulf of California. The axial ridges of the system—*i. e.* those which separate the Atlantic from the Pacific drainage—constitute a part of the continental divide. The system is composed of ranges and irregular groups which stand as walls about the great parks. In North Park heads the North Platte; in Middle Park heads the Grand, a tributary of the Colorado; in South Park heads the South Platte, and the Rio Grande del Norte drains the San Luis Park. These parks are broken valleys nearly or completely surrounded by mountains. Besides the larger parks mentioned, there are many of smaller extent, mountain-valleys of great beauty in midsummer,

but mantled with snow during many months of the year. Most of the ranges are known to be of the Uinta type—*i. e.* broad plateau-like masses carved from blocks upheaved in part as integers, and in part as bodies of many parts—a structure more fully described below. Many of the park-spaces are zones of diverse displacement. These mountains are composed of granites, schists, Palæozoic, Mesozoic, and Tertiary sediments, and the sedimentary groups are separated by many and well-defined unconformities, giving evidence of alternating periods of dry-land condition and oceanic sway; but the last great orographic movement which upheaved the great masses from which the mountains have been carved began in Tertiary time. The following are the principal ranges and groups of this system in succession from E. to W.: Rising from the plains in full view of Denver is the Colorado Range, which on the N. is nearly continuous with the Medicine Bow Range, and the latter is the eastern wall of North Park. To the S. it trends westward toward Mount Lincoln. W. of the Plains, S. of the South Platte, E. of Trout Creek and the head-waters of the Fountain River, is a low plateau-like range which Dr. Hayden has considered a part of the Colorado Range, and has called them as combined the Colorado or Front Range; but both for geographic and geological reasons it may be better to separate the ranges, and to call the high snowy mountains W. of Denver the Colorado Range, the inferior southern mountains the Front Range. Between North and Middle Parks is the Park View Mountain, the culminating peak of a range with an E. and W. trend, but not well defined. Next in order to the westward is the Park Range, which extends from Buffalo Peaks northward nearly to the junction of the Sweetwater with the North Platte River. This range forms the western wall of South, Middle, and North Parks. The Colorado Range in its western trend toward Mount Lincoln abuts against the Park Range, and thus is formed the southern wall of Middle Park and the northern wall of South Park. From the N. end of this range, W. of North Park and the northern end of Middle Park, long spurs and irregular mountains extend westward to the Plateaus. To the S. of these ranges there is a great mass of mountains without apparent structure as a range; this is the Pike's Peak Group. W. of the S. end of the Park Range is the valley of the Arkansas, and W. of the valley is the Sawatch Range, with the Mount of the Holy Cross as its northern extremity. This range trends 30° W. of N. Still farther W. is the Elk Mountain Group, which consists of a series of short, parallel ranges closely massed, trending in the same direction as the Sawatch Range.

Returning to the border of the Plains, the first range S. of the Arkansas is the Wet Mountain. Its trend is the same as the last. To the W., and parallel with this range, is the Sangre de Cristo, called in one portion of its course the Sierra Blanca. This range trends westward in its southern prolongation, and breaks up near Santa Fé. To the W. of it lies San Luis Park, and beyond the park is the enormous irregular rugged mass known as the San Juan Mountains, and beyond are the Plateaus.

Many spurs and smaller detached masses of this system have received names, and the feats of many adventurous travellers in scaling the towering peaks of these ranges have been chronicled. Everywhere throughout the region the mountain-climber sees a wilderness of crags and peaks, and a scene wild, grand, and desolate, and many a clear, cold, emerald lake embosomed on the mountains.

Principal Mountains of the Park Range System.

		Feet.	
Gray's Peak,	Colorado Range,	14,341,	Gannett, U. S. G. G. S.
Torrey's Peak,	"	14,336,	"
Mount Evans,	"	14,330,	"
Long's Peak,	"	14,271,	"
Mount Guyot,	"	13,565,	"
Cheyenne M'n,	Front Range,	9,948,	"
Platte Mountain,	"	9,343,	"
Park View M'n,	Park View Range,	12,433,	"
Mount Lincoln,	Park Range,	14,297,	"
Buffalo Peak,	"	13,541,	"
Mount Powell,	"	13,398,	"
Pike's Peak,	Pike's Peak Group,	14,147,	"
Mount Harvard,	Sawatch Range,	14,375,	"
Mount Elbert,	"	14,351,	"
La Plata Mountain,	"	14,311,	"
Massive Mountain,	"	14,298,	"
Mount Autoro,	"	14,245,	"
Mount Princeton,	"	14,196,	"
Mount Yale,	"	14,187,	"
Holy Cross Mountain,	"	14,176,	"
Mount Shavano,	"	14,093,	"
Mount Ouray,	"	14,043,	"
Grizzly Peak,	"	13,956,	"
Castle Peak,	Elk Mountain Range,	14,115,	"
Narrow Mountain,	"	14,003,	"
Capitol Mountain,	"	13,997,	"
Snowmass Mountain,	"	13,970,	"
Pyramid Peak,	"	13,885,	"
White Rock Mountain,	"	13,357,	"
Italian Peak,	Elk Mountain Range,	13,350,	Gannett, U. S. G. G. S.
Treasury Mountain,	"	13,200,	"
Mount Daly,	"	13,193,	"
Lopus Peak,	"	12,823,	"
Gothic Mountain,	"	12,570,	"
Custer Butte,	"	12,052,	"
Greenhorn M'n,	Wet Mountain,	12,230,	"
Garland Peak,	Sangre de Cristo,	14,300, (approx.)	"
Crestone,	"	14,233,	"
Mount Rito Alta,	"	12,989,	"
Hunt's Peak,	"	12,333,	"
Mount Thomas,	Sierra Blanca,	11,496,	Wheeler.
Mount Wilson,	San Juan M'ns,	14,280,	Gannett, U. S. G. G. S.
Unkarpagri,	"	14,235,	"
Mount Sniffels,	"	14,158,	"
Mount Eolus,	"	14,054,	"
Handie's Peak,	"	13,997,	"
Rio Grande Pyramid,	"	13,773,	"
Mount Osa,	"	13,640,	"

The Plateaus.—The great plateaus stretch from Southern Wyoming through Western Colorado and Eastern Utah far down into New Mexico and Arizona. They are bounded on the N. by the Wind River and Sweetwater Mountains, on the E. by the Park Mountains, on the S. by the Desert Range region, and on the W. by the Basin Range region. The region is chiefly drained by the Colorado River of the West; on the S. W. by the Sevier and Virgin rivers, and a small portion on the S. E. by the Rio Grande del Norte. The general elevation is about 7000 feet above the level of the sea. The ascent from the low desert plains on the S. is very abrupt, in many places by a steep and almost impassable escarpment. Geologically, the plateaus are separated into blocks by faults or their homologues, monoclinal flexures—a structure to which the name "kaibab" has been given, where the blocks are displaced as integers. These geological features serve in part to divide the region into many topographic blocks. The streams which traverse the plateaus have their sources in the Wind River Mountains on the N. and in the Park Mountains on the E., and in their courses through the plateaus they run in profound gorges or cañons, further dividing the area into blocks; and this division is completed by lines of cliffs due to the unequal erosion of harder and softer beds under conditions of aridity. Thus, by faults and monoclinal flexures, by deep cañons, and by lines of cliffs this region is cut into a great number of plateaus. Some of the larger or more important of these plateaus are as follows: The Colorado Plateau, lying S. of the Grand Cañon of the Colorado—general elevation, 7500 feet; Shiwit's Plateau, N. of the Grand Cañon, W. of the Grand Wash, E. of the Hurricane Cliffs, and S. of the Vermilion Cliffs—general elevation, 6000 feet; Uinkaret Plateau, N. of the Grand Cañon, E. of the Hurricane Cliffs, W. of Kanab Cañon, and S. of the Vermilion Cliffs—general elevation, 6000 feet; Kaibab Plateau, N. of the Grand Cañon and W. of the Marble Cañon—general elevation, 7500 feet. The three last plateaus extend from Northern Arizona into Utah. Farther to the N., on the W. side of the Sevier River, the Mar-ka-gunt Plateau—general elevation, 8500 feet; on the E. side of the Sevier the Pauns-a-gunt Plateau—general elevation, 8000 feet; the Aguarius Plateau, N. of the Pauns-a-gunt—general elevation, 11,000 feet. S. W. of the Paria River, near the head of Marble Cañon, are the Paria Plateau—general elevation, 6000 feet; the Kai-pai-owits Plateau, N. of the Paria and E. of the Pauns-a-gunt—general elevation, 7500 feet. The Ta-va-puts Plateau is in Eastern Utah, bounded on the N. by the Uinta and White River valleys, and on the S. by the Book Cliffs, and is cut in twain by the Green River—general elevation, 7000 feet. There are many others of the plateaus of nearly equal importance.

On these plateaus stand buttes, lone mountains, and groups of mountains. The buttes are of cameo structure—*i. e.* mountains of circum-denudation, with horizontal strata and escarped sides. The mountains, composed in whole or in part of extravasated matter, exhibit many interesting types of structure. The grand structure-lines of these plateaus have a N. and S. trend, but with important and diverse exceptions. In addition to the plateaus proper, there are many mountains due to upheaval and degradation, some of which are found in zones of diverse displacement, others are of simple anticlinal structure, and still others of the Uinta structure. The more important of these mountains of diverse type is the Zuñi Range, far to the S., and the Uinta Range, far to the N. The Uinta Range is carved from a broad upheaval having an E. and W. axis. On either flank of the upheaval there is a line or zone of maximum displacement, where the upheaval is by flexure or by faulting. Between these zones there is a gentle flexure either way to the axis. Thus, the upheaval is in part by general flexure from the axis as an anticlinal, and in part by faulting and monoclinal flexure, as in the Kaibab structure; thus behaving in part as an integer, and in part as a body of many parts. The Uinta Range,

as before mentioned, has been taken as a type of this structure.

The Plateaus have been continuously above the sea since the close of the Cretaceous period, but during earlier Tertiary times the region was an area of lacustrine sedimentation, and during late Mesozoic and early Tertiary time the Basin Province was the dry land that fed the sea and lakes of the Plateau Province. The great displacements by which the region was broken into blocks began in early Tertiary time, and is probably yet in progress. The Plateaus are composed of Tertiary, Mesozoic, and Palæozoic sediments. Crystalline schists and granites are found in some of the deep cañons.

Principal Mountains of the Plateaus.

		Feet.		
Mt. San Francisco,	Colorado Plat.,	12,052,	Whipple.	
Mt. Dellenbough,	Shiwits's Plat.,	6,650,	Thompson,	U.S.G.G.S.
Mount Trumbull,	Unikaret Plat.,	8,187,	"	"
Mount Logan,	"	7,950,	"	"
Mount Emma,	"	......	"	"
Mount Brian,	Mark-a-gunt Pl.,	11,178,	"	"
Little Creek Peak,	"	9,971,	"	"
Bear Valley Peak,	"	9,274,	"	"
Monroe Mountain,	Sevier Plateau,	11,240,	"	"
Blue Mountain,	"	11,071,	"	"
Mount Dalton,	"	10,480,	"	"
Marysvale Peak,	"	10,359,	"	"
Adam's Head,	"	10,181,	"	"
Musinia Peak,	Musinia Plat.,	10,764,	"	"
Kaiparowits's P'k,	Kaiparowits's P.,	9,095,	"	"
Mount Ellen,	Henry Group,	11,389,	"	"
Mount Pennell,	"	11,335,	"	"
Mount Hillers,	"	10,645,	"	"
Mount Ellsworth,	"	8,280,	"	"
Mount Marvine,	Unkarpagu R'ge,	11,598,	"	"
Fish Lake Mountain,	"	11,578,	"	"
Mount Hilgard,	"	11,453,	"	"
Terrill's Ridge,	"	11,380,	"	"
Gilson's Crest,	"	11,000,	"	"
Emmons's Peak,	Uinta Mount's,	13,694,	King.	
Mount Hodges,	"	13,500,	"	
Mt. Tokurwana,	"	13,500,	"	
Dawes's Peak,	"	13,300,	"	
Gilbert's Peak,	"	13,250,	"	
Wilson's Peak,	"	13,235,	"	
Barro Peak,	"	12,834,	"	
Marsh's Peak,	"	12,410,	"	
Leidy's Peak,	"	12,400,	"	
Pa-ri-kaiv,	La Sal Group,	12,980,	Gannett,	U. S. G. G. S.
Thousand Lake Mountain,	"	11,229,	Thompson,	U.S.G.G.S.
Navajo Mountain,	"	10,308,	"	"
Escudilla Mountain,	"	10,691,	Wheeler.	

Basin Ranges.—These ranges occupy South-eastern Oregon, Southern Idaho, Western Utah, Nevada, and the north-eastern corner of California. The region is bounded on the E. by the great plateaus, on the W. by the Sierra Nevada, and on the S. by the region of the Desert Ranges; their extent to the N. is unknown. They are N. and S. ridges of comparatively low altitude and narrow bases. The desert-valleys separating them are filled with subaërial gravels and sands, completely masking the underlying formations. The general type of structure is that previously mentioned as characteristic of the Desert Ranges, but here the structure is better exemplified, and hence has been called the Basin-Range structure. Such are the characteristics of these mountains so far as they are due to upheaval and atmospheric degradation; but many of the ranges are complicated by extravasated masses that mask the general structure to a greater or less extent. It is probable that this region has been above the level of the sea since Jurassic time, and some portions of it longer, but the great orographic displacement which produced the present ranges is of very late date, and it is probable is yet in progress. One of the characteristics of these ranges is, that they usually rise abruptly from the desert plain without intervening foot-hills, and rarely do the ranges coalesce. The region occupied by these mountains has no drainage to the sea except to a limited extent on the N. side, where some of the mountains stand near the Shoshone River, and on the south-eastern corner, where a few of the ranges are drained by the Virgin River, a tributary of the Colorado River of the West. Some of the streams that head on the mountains find their way into salt lakes, and others disappear in sinks—*i. e.* they are lost in the desert sands, where their waters are evaporated.

Three general basins may be designated: (1) The Salt Lake Basin, in which lies Salt Lake, Utah Lake, and Sevier Lake. During glacial times there was a large expanse of fresh water in this great basin, in which was included the sub-basins of the lakes above mentioned. To this ancient body of water Mr. Gilbert has given the name Lake Bonneville. (See Sevier Lake.) (2) The second great basin is that of the Humboldt, which lies E. of the Sierra Nevada, and is separated from the Salt Lake Basin by the Humboldt Mountains. A number of smaller lakes are included in this general depression. (3) The third is the Amargosa Basin, which lies to the S. of the Humboldt Basin and S. W. of the Salt Lake Basin.

There are about 100 ranges in this group. The highest is the Wasatch Range. In this range are found the principal geological formations of the other ranges of the system, and also some of the sedimentary beds of the Plateau System. The escarpment of the range faces the W., and the highest peak, Mount Nebo, is found at the southern extremity. The streams which are used to fertilize the Great Salt Lake and Utah valleys have their sources in these lofty mountains.

Principal Mountains of the Basin Range System.—The Sierra Nevada is one great range stretching from the 35th parallel of N. lat. to about 41° 35′, where the range topographically terminates at Mount Shasta, or perhaps S. of this, at Lassen's Peak. These mountains are carved from a great plateau more than 400 miles in length and 100 miles in breadth. The axis of the range is near the eastern side, and trends about 30° W. of N. Here the streams head, the greater number running westward into the Pacific, the less number running eastward and rapidly descending into desert valleys, where they are lost in the sands. On the eastern side a bold front rises abruptly from the desert plains, presenting a grand façade of storm-carved rocks. On the western side, though the descent to the Sacramento and San Joaquin rivers is greater, the general slope is more gentle, but is broken by many profound gorges or deep cañons, some of which, according to Whitney, are due to faults; others are cut by streams and fashioned by glaciers. At the southern extremity the range is broken into small subsidiary ranges and spurs. At the northern end, from Lassen's Peak to Mount Shasta, the plateau-like character is much broken by volcanic masses, and here the general topographic characteristics are greatly changed. On the western flank of the range there are many table-mountains covered with sheets of lava. This broad massive range is crowned with peaks which rise to higher altitudes than any other in the U. S., excluding Alaska. The structure of this range is probably the same as that of the Uinta Mountains.

According to Whitney, the region appeared as dry land in late Jurassic time, but it is probable that the last great orographic movement which under conditions of degradation produced the present mountain-forms began in late Tertiary time, and may yet be in progress.

Principal Peaks of the Sierra Nevada System.

Name.	Height.	Authority.
Mount Whitney	14,887,	Whitney.
Mount Shasta	14,442,	"
Mount Tyndall	14,386,	"
Mount Kaweah	14,000,	Toner's *Dict. of El.*
Mount Brewer	13,886,	Whitney.
Mount Dana	13,297,	"
Mount Lyell	13,217,	"
Castle Peak	13,000,	Petermann's map.
Mount Silliman	11,623,	Whitney.
Lassen's Peak	10,577,	"
Pilot Peak	7,500,	Petermann's map.

The Coast System is composed of the low, narrow ranges near the Pacific Ocean, and separated from the Sierra Nevada by the valleys of the Sacramento and San Joaquin rivers, which, often uniting, burst through the ranges, dividing them into two sub-systems, the Northern and Southern Coast Ranges. To the N., beyond the head-waters of the Sacramento, the Coast Ranges topographically coalesce with the Cascade Mountains, and to the S., beyond the head-waters of the San Joaquin, with the Sierra Nevada; but here the geological separation is plain, as shown by Whitney. The general trend of these ranges is 30° W. of N. The Coast Ranges are composed of more or less closely-appressed folds of strata degraded by rains and rivers; *i. e.* they have the Appalachian structure, but complicated and more or less masked by extravasated matter. The summits or axial planes are in general tipped westward or toward the Pacific. The Appalachian type is not known to occur elsewhere in the Rocky Mountain region. The upheaval of these mountains began in late Tertiary times, and may be yet in progress.

Principal Mountains of the Coast Range System.

Name.	Height.	Authority.
San Carlos Peak	4977,	Whitney.
Mount Hamilton	4440,	"
Mount Diablo	3856,	"
Mariposa Peak	3700,	"

The Cascade Mountains stretch from Southern Oregon northward far into British America. On the E. they are bounded by the great valley of the Columbia River, and on the W. by the Pacific Ocean. The Columbia River where it bursts through this zone of mountains plunges to the level of the sea in a series of great cascades, and from these the mountains take their name. They cannot be separated topographically, nor have we yet sufficient data to separate

them geologically from the northern extremity of the Coast Ranges and Sierra Nevada. But little is known of their general topography and geology, except that the group is characterized by many lofty volcanoes now extinct. The trend of this zone of mountains is a little W. of N.

Principal Mountains of the Cascade System.

Name.	Height.	Authority.
Mount St. Elias	19,500,	Dall.
Mount Jefferson	15,500,	Humboldt (quoted).
Mount Ranier	14,444,	Coast Survey.
Mount Adams	13,258,	Vansant.
Chuchulum Mountain	11,700,	Petermann's map.
Mount Hood	11,225,	Williamson.
Mount Baker	10,760,	Petermann's map.
Mount St. Helen's	9,750,	" "
Skomekan	8,400,	" "
Shalahum	7,400,	" "
Tchopahk Mountain	7,200,	" "
Checolsum Mountain	5,706,	" "

To the N. of the Park Mountains and great plateaus beyond the Laramie Plains and the head-waters of the Shoshone River, are many mountains drained on the S. by tributaries of the North Platte, on the E. by the Missouri River and its tributaries, and on the W. by the Columbia River and its tributaries. No accurate geographic or geological surveys have been made of these mountains, and they may constitute one or more systems, but at present it is proposed to call them provisionally the Geyser Mountains. An outlying range, known as the Black Hills of Dakota, are of the Uinta structure, as shown by Newton.

Too little is known of the Rocky Mountains of British America and Alaska to warrant any description, though Canadian geographers and geologists are rapidly extending their researches westward into the region.

In the U. S. the Rocky Mountains, together with the Great Plains that stretch westward, constitute the great arid region where irrigation is necessary to agriculture. In Northern California and Western Oregon and Washington the precipitation of moisture from the Pacific currents is very great, and hence this region is not embraced in the arid district. The arid region is nearly one-half of the area embraced in the U. S., excluding Alaska. From actual surveys and careful comparative estimates it is shown that it will not be possible to redeem more than 2 per cent. of the entire region by irrigation when every brook, creek, and river is utilized. About 3 per cent. of the region is forest-clad. These forests are on the sides of the high mountains, and extend over the more elevated plateaus. This does not include large districts of country covered with a scant growth of dwarf cedars and pines which can be used for fuel, but are of no value in mechanical industries. Some portion of this forest-region may eventually be cultivated without irrigation, but only such crops can be raised as may mature in the short summers of a subarctic climate. Over the remaining lands a large portion is covered with grasses and other plants which may be utilized to some extent for pasturage. The land to be cultivated lies along the streams, and is principally confined to the little valleys nestling among the mountains. In these patches grain-fields, vineyards, orchards, and gardens will eventually be planted, and receive most careful and elaborate culture. The mountains, hills, and plains will furnish nutritious but scant pasturage for herds and flocks, but altogether the agricultural resources of the region are very limited. Gold, silver, iron, copper, salt, coal, and many other minerals are found in great abundance, and the region will be chiefly valuable for its great mines. At the present state of rapid progress in mineral discovery it is not safe to generalize on the geographic distribution of the minerals of the region. J. W. POWELL.

Rocky River, tp., Cabarrus co., N. C. P. 1521.

Rocky Run, tp., Hancock co., Ill., on Mississippi River. P. 656.

Rocky Spring, tp., Montgomery co., N. C. P. 320.

Rocky Springs, tp., Lexington co., S. C. P. 458.

Rocky Station, p.-v. and tp., Lee co., Va. P. 2304.

Roco′co, a style of debased and extravagant ornamentation for buildings, interiors, furniture, etc., which has several times prevailed in various parts of Europe.

Rodentia. See APPENDIX.

Rod′eric, the last king of the Visigoths in Spain, ascended the throne in 709 in consequence of a revolution by which King Witiza was overthrown, and fell in the battle of Xeres de la Frontera (July, 711) against the Arabs under Tarik, who then took possession of the southern and central parts of Spain. The Spanish and Arab historians disagree very much both with respect to the events which raised Roderic to the throne, his death, and his character, and with respect to the causes which brought about the Arab invasion; but it seems most probable that an insurrection of the Roman and Celtic elements of the population of Spain took place against Witiza, followed by a rising of the partisans of Witiza against Roderic, and that the Arabs, after conquering Mauritania, would have crossed over to Spain, even if they had received no invitation from any dissatisfied party there.

Rodez′, town of France, capital of the department of Aveyron, on the Aveyron, is irregularly built, with narrow and winding streets, but is surrounded by pleasant promenades, and its vicinity is noted for its fertility. Woollen fabrics of different descriptions and excellent cheese are manufactured. P. 11,856.

Rodg′ers (C. RAYMOND P.), b. Nov. 14, 1819, in New York; entered the navy as a midshipman Oct. 5, 1833; became a passed midshipman in 1839, a lieutenant in 1844, a commander in 1861, a captain in 1866, a commodore in 1870, a rear-admiral in 1874; served in "the mosquito fleet" in its operations against the Seminoles, and on the E. coast of Mexico during our war with that country; commanded the Wabash at the battle of Port Royal, and Battery Sigel at the reduction of Fort Pulaski, and acted as Rear-Admiral Du Pont's fleet-captain in the attack on Fort Sumter of Apr. 7, 1863; chief of the bureau of yards and docks from 1871 to 1874, when he became superintendent of the Naval Academy, which position he now fills; complimented in official despatches throughout his whole naval career, and thus spoken of by Rear-Admiral Du Pont in his report of Apr. 15, 1863: "On this as on all other occasions I had invaluable assistance from the fleet-captain, Commander C. R. P. Rodgers, who was with me in the pilot-house directing the movements of the squadron. For now over eighteen months in this war this officer has been afloat with me, and, in my opinion, no language could overstate his services to his country, to this fleet, and to myself as its commander-in-chief. Uniting the highest sense of personal honor to great administrative ability, determined will, and a character above reproach, no man has done more to raise the *morale* of the navy than Raymond Rodgers; and his good works in it will be remembered with gratitude long after his body shall have been consigned to the grave." FOXHALL A. PARKER.

Rodgers (GEORGE W.), b. Oct. 30, 1822, in Brooklyn, N. Y.; entered the navy as a midshipman Apr. 30, 1836; became a passed midshipman in 1842, a lieutenant in 1850, a commander in 1862; during the civil war commanded the iron-clad Catskill in various actions with the forts in Charleston harbor, and was killed in battle Aug. 17, 1863; spoken of by Rear-Admiral Du Pont as an officer "of the highest professional capacity and courage," and thus mentioned by Rear-Admiral Dahlgren in his official report of Aug. 18, 1863: "It is but natural that I should feel deeply the loss of Capt. Rodgers. Brave, intelligent, and devoted to his duty and to the flag under which he had passed his life, the country will not, I am sure, omit honor to the memory of one who has not spared his life in her hour of trial." FOXHALL A. PARKER.

Rodg′ers (JOHN), b. in Harford co., Md., in 1771; entered the U. S. navy as a lieutenant Mar. 9, 1798; was executive officer of the frigate Constellation when she captured the French frigate L'Insurgente, Feb. 9, 1799; was thereupon made captain Mar. 5; succeeded Com. Barron in command of the squadron operating against Tripoli and Tunis 1805; commanded the President when that vessel had an encounter with the British man-of-war Little Belt, May 16, 1811; rendered various services during the war of 1812–15, especially in the defence of Baltimore; was president of the board of navy commissioners 1815–24, acting secretary of the navy 1823, and commanded the Mediterranean squadron 1824–27, after which he was again on the board of navy commissioners until 1837. D. at Philadelphia, Pa., Aug. 1, 1838.

Rodgers (JOHN), b. Aug. 8, 1812, in Maryland; entered the navy as a midshipman Apr. 18, 1828; became a passed midshipman in 1834, a lieutenant in 1840, a commander in 1855, a captain in 1862, a commodore in 1863, a rear-admiral in 1869; served in the everglades of Florida during the Seminole war, on the E. coast of Mexico during our war with that country, and as a volunteer aide to Rear-Admiral Du Pont at the battle of Port Royal, Nov. 7, 1861; in 1862 commanded the Galena in the severe battle at Drury's Bluff, and in 1863 the monitor Weehawken in the first Fort Sumter fight, and in the short action with the Confederate iron-clad steamer Atlanta, which resulted in the Atlanta's capture; distinguished for calm, cool courage and superior ability, and regarded by his brother-officers as one of the foremost naval men of the age.

FOXHALL A. PARKER.

Rodi, town of Southern Italy, province of Foggia, situated on a rocky promontory rising above the waters of the Adriatic. The adjoining district is very fertile, and

the sea here abounds in fish. The coasting-trade is considerable. P. 5200.

Rö′diger (EMIL), b. at Sangerhausen, Thuringia, Oct. 13, 1801; studied theology and Oriental languages at Halle; was appointed professor of Oriental languages there in 1835, and removed in 1860 to Berlin. D. June 15, 1874. He published an edition of Lockman's *Fables* (1830), a *Syrische Chrestomathie* (1838), *Versuch über die himjaritischen Schriftmonumente* (1841), and after Gesenius's death finished his *Thesaurus Linguæ Hebraicæ* and edited his Hebrew grammar from the 14th to the 20th editions (1845–66).

Rod′man, p.-v. and tp., Jefferson co., N. Y. P. 1604.

Rodman (ISAAC PEACE), b. at South Kingston, R. I., Aug. 28, 1822; became a merchant and a woollen manufacturer; was in 1861 a member of the Senate and a colonel of militia; resigned his seat to raise a company of volunteers; participated as captain of the 2d Rhode Island Vols. in the battle of Bull Run, and as colonel of the 4th Rhode Island Vols. in the capture of Roanoke Island; was made brigadier-general for gallantry at Newberne Mar. 14, 1862, taking the enemy's works at the point of the bayonet; was in command of Gen. Parke's division at Fredericksburg, and displayed high military genius at South Mountain and Antietam. He was mortally wounded in the latter battle in the terrible conflict for the possession of the stone bridge. D. near Hagerstown, Md., Sept. 29, 1862.

Rodman (THOMAS J.), b. in Indiana in 1818; graduated at the U. S. Military Academy and commissioned brevet second lieutenant of ordnance July, 1841. His whole life was devoted to the interests of his profession in experimenting upon iron, gunpowder, and cannon, which produced invaluable results. To him is due the honor of inventing the 15-inch and 20-inch smooth-bore guns, and of the method of *hollow casting*, by which alone their manufacture became practicable, with their projectiles, adopted for our military and naval service; also the improvements made in the mode of manufacture of gunpowder for large cannon. The "mammoth powder" and "perforated cake" were made by him, since adopted by foreign nations for use in their heavy rifle guns. Author of a valuable *Report of Experiments on Metals for Cannon and Cannon Powder* (1861). D. at Rock Island, Ill., June 7, 1871.

Rod′ney, p.-v., Jefferson co., Miss. P. 573.

Rodney (CÆSAR), b. at Dover, Del., about 1730; inherited a large landed property; was sheriff of Kent co. 1758; member of the legislature many years, its Speaker 1769–74; delegate to the Stamp Act congress at New York 1765; was chairman of the Delaware popular convention 1774; elected to the Continental Congress Mar., 1775; was soon afterward elected brigadier-general; signed the Declaration of Independence; served under Washington in the New Jersey campaign 1776–77; defended Delaware from British invasion; was made major-general of Delaware militia; was president or executive officer of Delaware 1778–82, and was twice elected to Congress, but did not again take a seat in that body. D. at Dover in 1784.

Rodney (CÆSAR AUGUSTUS), nephew of Cæsar, b. at Dover, Del., Jan. 4, 1772; graduated at the University of Pennsylvania; studied law; was a prominent member of Congress 1803–07, attorney-general of the U. S. 1807–11; commanded an artillery company 1813; went to South America 1817 as member of a commission to report upon the insurrection against Spain; was a member of Congress 1821–22, U. S. Senator 1822–23, and in the latter year appointed first minister to the Argentine provinces. D. at Buenos Ayres June 10, 1824. He was author, with J. Graham, of *Reports on the Present State of the United Provinces of South America* (1819).

Rodney (GEORGE **Brydges**), BARON, b. at Walton-upon-Thames, Surrey, England, Feb. 19, 1718; entered the British navy in childhood; was governor of Newfoundland 1748, member of Parliament 1752, rear-admiral 1761, in which year he captured the French West India Islands; vice-admiral 1762, baronet 1764, master of Greenwich Hospital 1765, commander-in-chief in Jamaica 1771, admiral and commander-in-chief at Barbadoes in Dec., 1779, when he sailed from England with a fleet of 30 vessels; defeated a Spanish squadron off Cape St. Vincent Jan. 16, 1780, and broke through the French fleet near Martinique Apr. 17, 1780, for which achievement he received the thanks of both houses of Parliament and a pension of £2000. In the war against Holland (1781) he captured Dutch Guiana; was made vice-admiral of England, and commander-in-chief of the West India squadron; engaged the French fleet under Count de Grasse Apr. 9, and again Apr. 12, 1782, capturing 7 ships of the line and 2 frigates; thanked and pensioned by Parliament, and created Baron Rodney of Rodney Stoke, Somersetshire, 1782. D. in London May 23, 1792. (See his *Life*, by Gen. G. B. Mundy, 1830.)

Rodos′to, town of European Turkey, on the Sea of Marmora, 77 miles from Constantinople, is surrounded with beautiful gardens and orchards, and sends to the metropolis large quantities of vegetables, fruit, and fish. P. 18,000.

Rodri′guez (ALFONSO), b. at Valladolid, Spain, in 1526; graduated at Salamanca 1545; entered the order of Jesuits; taught theology at Salamanca and in the college of Monterey, of which he became rector; acquired great fame as a casuist; wrote a work entitled *Practice of Christian Perfection*, which was translated into many languages; for the last thirty years of his life resided at Valladolid and Montilla, being the most noted Spanish master of novices. D. in Seville Feb. 21, 1616.

Roe (AZEL STEVENS), b. in New York City in 1798; received an academic education; became a merchant in New York, but failing in business through lending his name to other persons, he retired to Windsor, Conn., about 1848, and has since devoted himself successfully to literature. Author of numerous novels, among which are *James Montjoy* (1850), *To Love and to be Loved* (1852), *A Long Look Ahead* (1855), and *True to the Last* (1859).

Roe (FRANCIS A.), b. Oct. 4, 1823, in New York; entered the navy as a midshipman Oct. 19, 1841; became a passed midshipman in 1847, a lieutenant in 1855, a lieutenant-commander in 1862, a commander in 1866, a captain in 1872; served as executive officer of the Pensacola at the passage of Forts Jackson and St. Philip and battle of New Orleans, and commanded the Katahdin in numerous battles and skirmishes on the Mississippi; commanded the Sassacus in the action between our squadron of wooden gunboats under Capt. Melanchthon Smith and the Confederate iron-plated ram Albemarle, May 5, 1864; highly commended in the official despatches for "coolness, judgment, and skill." FOXHALL A. PARKER.

Roe (Sir THOMAS), b. at Low Layton, Essex, England, about 1580; educated at Magdalen College, Oxford; was knighted 1604; explored the river Amazonas in Brazil 1609; was sent as envoy to the Great Mogul, Shah Jehan, and penetrated to Delhi 1614–18; entered Parliament for Cirencester 1620; was ambassador to Constantinople 1621–28, to Poland and Sweden, charged with negotiating a peace between those kingdoms, 1629; sat in Parliament for Oxford University 1640; was ambassador to the Diet of Ratisbon 1641, and made chancellor of the order of the Garter and privy councillor the same year. He brought from Constantinople a valuable collection of Oriental MSS., which he presented to the Bodleian Library, and procured the celebrated Alexandrian MS. of the Greek Bible, now in the British Museum. It was by his advice that Gustavus Adolphus intervened in the Thirty Years' war in Germany. D. in England Nov., 1644. Author of *A True and Faithful Relation of what hath lately happened in Constantinople* (1622), and of a *Journal of Voyages to the East Indies, Turkey, Egypt, Palestine, and Persia*, first published posthumously in French 1663, and in English in the same volume with Della Valle's *Travels* (London, 1664). It was proposed in 1730 to publish this work by subscription under the title, *The Negotiations and Embassies of Sir Thomas Roe from 1620 to 1644*, in 5 vols., but only 1 vol., comprising *The Negotiations with the Ottoman Porte* (1740), ever appeared. Roe's *Journal* is reprinted in the collections of Kerr (vol. ix.), Churchill (vol. i.), and Pinkerton (vol. viii.).

Roe′bling (JOHN A.), b. at Mulhausen, Prussia, June 12, 1806; received the degree of C. E. from the Royal Polytechnic School at Berlin, the subject of his graduating thesis being suspension bridges—a subject which was destined to gain for him enduring fame. In 1831 he emigrated to this country, locating near Pittsburg, Pa., and after a brief interval commenced the practice of his profession, his first employment being on the slack-water improvement of the Beaver River, followed by similar engagements in other localities, until called into the service of the State of Pennsylvania to make surveys for a railroad route across the Alleghany Mountains from Harrisburg to Pittsburg. One of the routes located by him is that now followed by the Pennsylvania R. R. In 1844, having previously commenced the manufacture of wire rope, he obtained the contract for replacing the wooden aqueduct of the Pennsylvania canal across Allegheny River by a suspension aqueduct, which was opened in May, 1845. This aqueduct consisted of seven spans, each 162 feet in length, the wooden trunk which held the water being supported by two continuous wire cables 7 inches in diameter. The construction of the Monongahela suspension bridge next followed, and in 1848–50 four suspension aqueducts were completed on the line of Delaware and Hudson Canal. In the mean time, Mr. Roebling had established his works at Trenton, N. J., where he took up his residence. In 1851 the great suspen-

sion bridge at Niagara River was commenced, and in Mar., 1855, the first locomotive crossed, since which no interruption to travel has occurred. (See article BRIDGE; also ELLET, CHARLES.) The work of constructing a bridge over Kentucky River with a span of 1224 feet was commenced in 1851, but, owing to the failure of the company, was not completed. The elegant bridge over the Allegheny at Pittsburg, and that over the Ohio at Cincinnati, were his next works. But his last and grandest undertaking was the bridge across East River, connecting Brooklyn and New York. (See EAST RIVER BRIDGE.) The reports, plans, and specifications for this work were all completed and operations begun when, while directing the work, he was severely injured in the foot; lockjaw succeeded amputation, and he d. in Brooklyn July 22, 1869.—His son, WASHINGTON A. ROEBLING, is the able and worthy successor under whose direction the work is progressing favorably. G. C. SIMMONS.

Roe'buck [Ang.-Sax. *râh*], a small species of the deer family (Cervidæ), representing the genus *Capreolus* (*C. capræa*), found in Europe. It is more nearly related in some respects to the small common deer (*Cariacus*) of the U. S. than to any other of the European forms, agreeing with the former in the structure of the legs. It is characteristic, however, in the antlers being destitute of an anterior basal snag, the first branch arising considerably above the burr, and the tail being very rudimentary or wanting; the muffle is broad and naked; the color in summer is reddish-brown, and in winter olive; there is a large white spot surrounding the anus; the height is about two and a quarter to two and a half feet at or near the shoulder; the length about four feet. The species is generally distributed throughout Europe, and frequents woods and copses. It is very agile in its movements. The species is represented in Central Asia and China by a related species, the *Capreolus pygargus*. THEODORE GILL.

Roebuck (JOHN ARTHUR), b. at Madras, India, in Dec., 1802; resided in Canada during his youth and early manhood 1815–24; was called to the bar in London 1832; entered Parliament the same year as a radical reformer; was London agent for the assembly of Lower Canada 1835; lost his seat 1837, and again in 1847, but was returned in 1841; and for Sheffield in 1849, continuing to represent that borough until 1868, and being once more elected there Feb., 1874. Author of a *Plan for the Government of our English Colonies* (1849) and of a *History of the Whig Ministry of 1830* (2 vols., 1852); was a leader of the parliamentary opposition during the Crimean war; was chairman of a committee appointed on his motion to inquire into the state of the army in the Crimea, and was the prime mover in the Administrative Reform Association, organized in 1856. He lost his seat at Sheffield 1868 in consequence of his denunciation of trades unions, and is noted for the oratorical ability he has frequently displayed, more especially in criticism of Mr. Disraeli.

Roemer (OLE). See RÖMER.

Roermond', town of the Netherlands, province of Limburg, at the influx of the Roer into the Maas, is the seat of a bishop, has a fine cathedral and manufactures of cotton and woollen goods. P. 9000.

Roeville, tp., Henry co., Ala. P. 890.

Roga'tion Days [Lat. *rogare*, to "implore"], the Monday, Tuesday, and Wednesday of Rogation Week, the week which contains Ascension Day. In the Roman Catholic Church the recital of the Litany of the Saints is a special feature of these days, and public processions are held in some countries. The second and third Rogation Days are *feriæ*, but not holy days of obligation. Tuesday is a *feria* of the first, and Wednesday of the second class.

Rog'er, the name of the first two rulers of the Norman dynasty in Sicily. ROGER I., the twelfth son of Tancred of Hauteville, b. in Normandy about 1031; joined in 1058 his elder brother, Robert Guiscard, who had made large conquests in Southern Italy; participated in the conquest of Calabria, and received a part of the country; crossed over to Sicily; took Messina in 1060, Palermo in 1072, and succeeded in expelling the Saracens from the island in 1089, and establishing himself as sovereign under the title of count of Sicily. His other great exploit was the abolition of the Greek Church in Sicily and the introduction of the Roman, for which the pope, Urban II., rewarded him by making him apostolic legate, with permission to appoint bishops, etc. D. at Mileto, Calabria, in 1101.—During the minority of his son, ROGER II., b. about 1095, his widow, Adelaide of Montferrat, carried on the government. In 1127, on the extinction of the elder line, Roger II. became duke of Apulia and Calabria, and in 1130 received the title of king of Sicily, and was crowned at Palermo by his brother-in-law, Anacletus, whom he established in Rome as antipope and sustained against Innocent II. The latter excommunicated him, collected an army, and advanced into his territory in 1139, but was defeated and captured, and only restored to liberty on condition of removing the excommunication. Subsequently, Roger II. made war successfully on the Greek emperor, and on the Saracens in Africa. His internal administration was also successful. Commerce and industry, poetry, art, and science, flourished, and Sicily was one of the richest and happiest states of Europe. D. Feb. 26, 1154.

Roger of Wendover, an early Latin chronicler of English history, of whom little more is known than that he was a monk in the abbey of St. Alban's, where he d. May 6, 1237. Author of *Flores Historiarum*, which was recast under the same title by Matthew Paris.

Rog'ers, tp., Ford co., Ill. P. 593.

Rogers, tp., Presque Isle co., Mich. P. 355.

Rogers (FAIRMAN), b. at Philadelphia, Pa., Nov. 15, 1833; graduated at the University of Pennsylvania 1853; was lecturer on mechanics in the Franklin Institute of Pennsylvania 1854–65, and professor of civil engineering in the University of Pennsylvania 1855–70; served as a volunteer in the cavalry and as an officer of engineers 1861; completed for the U. S. Coast Survey in 1862 the survey of the portion of Potomac River northward from Blakiston Island, and was one of the original members of the National Academy of Sciences 1863. He resigned his professorship in the University of Pennsylvania, and was chosen a trustee of that institution in 1870.

Rogers (HENRY), b. in England about 1810; educated at Highbury College; was for some years pastor of an Independent church; was chosen professor of the English language and literature in University College, London, 1839; was afterward professor of philosophy in Spring Hill Independent College, Birmingham, and became in 1858 president of the Lancashire Independent College at Manchester. Author of *Life and Character of John Howe* (1836), *General Introduction to a Course of Lectures on English Grammar and Composition* (1838), *The Eclipse of Faith, or a Visit to a Religious Skeptic* (1853), *Vindication of Bishop Colenso* (1863), *Reason and Faith* (1866), and two series of *Essays*, reprinted from the *Edinburgh Review* and from *Good Words*, besides various other works.

Rogers (HENRY DARWIN), LL.D., F. R. S. E., brother of J. B. Rogers, b. at Philadelphia, Pa., in 1809; became professor of physical sciences in Dickinson College, Carlisle, 1830; many years professor of geology in the University of Pennsylvania; was employed on the geological survey of New Jersey, of which he published a report and geological map 1836, and the final report 1840; was occupied from 1836 to 1855 as director of the geological survey of Pennsylvania, making five annual reports (1836, 1838, 1839, 1840, 1841), and issued his final report under the title *The Geology of Pennsylvania, a Government Survey, with a General View of the Geology of the U. S., Essays on the Coal Formation and its Fossils, and a Description of the Coal-Fields of North America and Great Britain, with seven Large Maps and numerous Illustrations on Copper and on Wood* (3 vols. 4to, with portfolio of maps, Edinburgh and London, 1859). This magnificent work, one of the most elaborate of its class, was published at the expense of the State of Pennsylvania, the maps and illustrations being executed by the eminent geographer A. Keith Johnston, with whose assistance he also published an *Atlas of the U. S.* (1857; new ed. 1861). In 1858, Prof. Rogers, after residing some years at Boston, Mass., was appointed regius professor of natural history in the University of Glasgow, and was chosen a fellow of the Royal Society of Edinburgh. He prepared other American maps for the atlases of the Messrs. Johnston, published many papers in the *Transactions* of learned societies, and was one of the editors of the Edinburgh *New Philosophical Journal*. D. at Glasgow May 29, 1866.

Rogers (JAMES BLYTHE), M. D., b. at Philadelphia, Pa., Feb. 22, 1803; educated in medicine at the University of Maryland; was professor of chemistry in medical colleges at Baltimore and Cincinnati, in the Franklin Medical School at Philadelphia, and in the University of Pennsylvania; was chemical and geological assistant in the surveys of Virginia and Pennsylvania; contributed many papers to medical and scientific periodicals, and (with his brother, R. E. Rogers), edited Dr. E. Turner's *Elements of Chemistry*. D. at Philadelphia June 15, 1852.

Rogers (JOHN), b. at Deritend, a suburb of Birmingham, England, about 1505; graduated at Pembroke Hall, Cambridge, 1525; was rector of the church of the Holy Trinity, London, 1532–34; subsequently for several years chaplain to the Merchant Adventurers at Antwerp and pastor of a Dutch congregation at Wittenberg, Saxony; embraced

Protestant opinions; became intimate with Tyndal and Coverdale; prepared, by the aid of the former's manuscripts, a revised edition of the English Bible, based on Coverdale's translation, with elaborate marginal notes and an index, which he published under the assumed name of "Thomas Matthew," probably at Hamburg or Lubeck (folio, 1537); translated Melanchthon's *Waying and Considering of the Interim* (1548); returned to England 1548; was presented to the rectory of St. Margaret Moyses and the vicarage of St. Sepulchre's, London, May 10, 1550; was made by Bishop Ridley prebendary of St. Paul's, St. Pancras, and rector of Chigwell Aug. 24, 1551; was soon after appointed divinity reader; preached a sermon at St. Paul's Cross on the Sunday after the entry of Queen Mary into London (Aug. 3, 1553), in which he denounced Romanism and exhorted the people to adhere to the doctrines promulgated under Edward VI.; was cited before the privy council, where he made an able defence; was ordered to remain a prisoner in his own house Aug. 18, 1553; was removed to Newgate prison about Feb., 1554, tried for heresy before Gardiner, bishop of Winchester, condemned to death Jan., 1555, and burnt at the stake at Smithfield, the first of the "Marian martyrs," Feb. 4, 1555. Throughout his protracted imprisonment, at his several examinations, on his trial, and at the stake he comported himself with admirable serenity. His wife, probably a Dutch woman, with her "ten small children and one at the breast," met him on the way to Smithfield—a fact which has been impressed on the memory of millions by the rude illustrations in Foxe's *Book of Martyrs* and in the New England editions of the *Westminster Catechism*. It was formerly supposed that one or more of his great-grandchildren were among the early settlers of New England, this being especially alleged of Rev. Nathaniel Rogers of Ipswich, Mass., through whom his American descendants were believed to be numerous; but the careful researches of Col. Joseph L. Chester, in his biography of Rogers (London, 1861), have shown this statement to be incorrect.—DANIEL ROGERS, eldest son of the martyr (b. at Wittenberg about 1538; d. 1591), became a learned scholar and an elegant Latin poet, known in Germany as Albimontanus. He assisted Camden in preparing his *Britannia*.

PORTER C. BLISS.

Rogers (JOHN), b. in England about 1565; became a Puritan; was vicar of Hemmingham 1592, minister of Haverhill 1603, and afterward minister of Dedham, England, where he d. 1630. Author of *Sixty Memorials of a Godly Life, A Treatise of Love, The Doctrine of Faith*, and *A Godly and Fruitful Exposition upon all the First Epistle of Peter* (folio, 1650)—works which were held in high repute among the English non-conformists. He has been erroneously called a grandson of the Marian martyr.—His son NATHANIEL, b. at Haverhill, England, in 1598; educated at Emanuel College, Cambridge; preached at Bocking, Essex, and at Assington, Suffolk; was driven by persecution to New England, where he arrived Nov. 16, 1636; was a member of the synod of 1637, and was settled Feb. 20, 1639, as colleague with Mr. Norton over the church at Ipswich, Mass., where he d. July 3, 1655. Author of a *Letter discovering the Cause of God's Wrath against the Nation* (London, 1644), and left in MS. a Latin *Vindication of Congregational Church Government*. Hubbard, the historian, married his daughter.

Rogers (JOHN), son of Rev. Nathaniel, b. at Coggeshall, England, Jan., 1631; came in childhood to Massachusetts; graduated at Harvard 1649; studied divinity, and aided his father in his pastoral duties at Ipswich; afterward became a physician, and was president of Harvard College from Apr. 10, 1682, to his death, July 2, 1684.

Rogers (JOHN), b. at Salem, Mass., Oct. 30, 1829; left school at the age of sixteen; was two years a commercial clerk at Boston; then made a trip to Spain; commenced the study of civil engineering at Boston, but having strained his eyes, went into a machine-shop at Manchester, N. H., 1848, as an apprentice; worked up through all the branches of the business, including the drafting-room, and was ultimately put in charge of a railroad repair-shop at Hannibal, Mo., 1856. Having amused himself at spare intervals with modelling in clay, he acquired a thirst for art, which led him to make a tour in Europe in 1857, spending some time at Paris and at Rome. On his return he became draftsman in a surveyor's office at Chicago, and soon afterward, learning of a peculiar mode of casting intricate figures, he modelled the groups of the *Checker-Player* and the *Slave Auction*, with which, in Dec., 1859, he came to New York, where they attracted notice. Learning the art of casting from an Italian, he produced in 1861 his *Picket Guard*, followed by a succession of groups of war-subjects, which soon gained popular favor, critical approval, and ultimately brought him decided success in his new industry. Among them were—*Taking the Oath, One More Shot, The Wounded Scout, Union Refugees* (1864), *The Camp-Fire, The Home Guard, The Returned Volunteer, The Country Post-office*, and *The Town Pump*. Mr. Rogers has a studio in New York City, and has recently devoted himself to larger statuary for gardens and lawns, executed in artificial stone. Among his later works are *The Fugitive's Story* (1869), *The Favorite Scholar* (1872), and a series illustrative of Irving's *Legends of Sleepy Hollow* and *Rip Van Winkle* (1868–71).

Rogers (NATHANIEL PEABODY), b. at Plymouth, N. H., June 3, 1794; graduated at Dartmouth College 1816; became a lawyer, but abandoned the profession in 1838 to establish at Concord, N. H., the *Herald of Freedom*, one of the pioneer anti-slavery papers in the U. S. He also wrote for the New York *Tribune* over the signature "The Old Man of the Mountain." D. at Concord Oct. 16, 1846. A volume of his fugitive pieces appeared at Concord, 1847, with a memoir by Rev. John Pierpont. (See also Bartlett's *Modern Agitators*, and an article by M. J. Motte in the *Christian Examiner*, vol. xliv.)

Rogers (RANDOLPH), b. in the State of New York about 1825; was in early life engaged in mercantile pursuits; became a sculptor at Rome; returned to New York after a few years with the statues of *Nydia, A Boy and Dog*, and others, which procured him a deserved reputation; designed and modelled the bronze doors representing scenes in the life of Columbus, for the eastern entrance to the Capitol extension at Washington (1858); was several years engaged in finishing the designs for the Washington monument at Richmond, Va., including statues of Mason, Nelson, and the two Marshalls; executed a notable statue of John Adams, now in Mount Auburn Cemetery; *The Angel of the Resurrection*, for Col. Colt's monument at Hartford, Conn.; a colossal memorial monument, 50 feet high, for the State of Rhode Island, erected at Providence 1871, and one still larger for Michigan, erected at Detroit 1873, surmounted respectively by statues representing America and Michigan. He executed the colossal bronze statue of Lincoln unveiled at Philadelphia 1871; has made many good busts and attractive ideal figures, among which those of *Isaac* and *Ruth* merit especial notice. He now (1876) resides at Rome.

Rogers (RICHARD), b. in England about 1550; became a Puritan minister 1575, and preached at different towns of the eastern counties forty-three years, frequently undergoing molestation from the authorities, but acquiring by his pastoral labors and his theological writings a very prominent position among the dissenting divines of England. His *Seven Treatises* (London, folio, 1605; also 1610, 1616, 1627, and 1630) constituted a kind of theological manual much used by the "Brownists," and highly esteemed by Wilson, Hooker, and the early divines of New England. D. at Weathersfield, Essex, Apr. 21, 1618. Calamy and other writers stated that he was a grandson of the Marian martyr, but this assertion is disproved by J. L. Chester's *John Rogers* (1861).

Rogers (ROBERT), b. at Dunbarton, N. H., about 1730; commanded during the "old French war" (1755–63) the celebrated corps of frontiersmen known as "Rogers' Rangers," distinguishing himself in the campaigns on Lake George, and taking a prominent part in the defence of Detroit against Pontiac; published *A Concise Account of North America* (London, 1765), *Journals of Major Robert Rogers* (1765), and *Ponteach, or the Savages of America* (1766), a tragedy now extremely rare; was appointed governor of Michilimackinac; was soon accused of plotting to deliver that post to the French; was sent in irons to Montreal and tried by court-martial; went to England 1769; was presented to the king, and imprisoned for debt; went to North Africa, where he "fought two battles in Algiers under the dey;" was in Philadelphia 1775, and imprisoned by order of Congress; was paroled, but again arrested by Washington Jan., 1776; was sent to New Hampshire, where he took sides for the Crown, and raised a company of loyalists known as "The Queen's Rangers," of which he became colonel. He went to England about 1777, and his subsequent history is unknown. His *Diary of the Siege of Detroit* was first published by F. B. Hough (Albany, 1860).

Rogers (ROBERT EMPIE), M. D., brother of W. B. and H. D. Rogers, b. at Baltimore, Md., in 1814; graduated in medicine at the University of Pennsylvania; was professor of chemistry in the University of Virginia 1844–52; aided his brother, J. B. Rogers, in preparing his edition of Turner's *Chemistry*, and on his death became his successor as professor in the University of Pennsylvania. He has edited the American reprint of C. G. Lehmann's *Physiological Chemistry* (1855), contributed to the *Journal of the Franklin Institute*, taken part with his brothers in the geo-

logical surveys of Virginia and Pennsylvania, and been for many years dean of the faculty of the University of Pennsylvania.

Rogers (SAMUEL), b. at Newington Green, near London, July 30, 1763, son of a London banker, whose counting-house he entered in boyhood; published some poetical trifles in the *Gentleman's Magazine* about 1780, and issued a small volume of verse 1786, but attracted no attention until the appearance of his best poem, *The Pleasures of Memory*, in 1792. Succeeding to his father's large estate 1793, he soon retired from active business, remaining, however, a partner; published another volume of verse 1798, and in 1803 established himself in the house No. 22 St. James's Place, which he made for half a century a kind of head-quarters of London literary society. Though not in any high sense a poet, he was the intimate (and often the useful) friend of nearly all the great names of English literature, and his wealth, liberality, and social qualities gave his productions a vogue to which they intrinsically had no claim. He formed a magnificent collection of pictures, books, and vases, and issued editions of his own works which are much prized for their artistic illustrations. Among them were *The Voyage of Columbus* (1812), *Jacqueline* (1813), *Human Life* (1819), and *Italy* (1822). D. at London Dec. 18, 1855. (See his *Table-Talk* (1856), by Rev. A. Dyce, and *Recollections of Rogers* (1859), by his nephew, William Sharpe.)

Rogers (WILLIAM BARTON), brother of H. D. Rogers, b. at Philadelphia, Pa., in 1805; gave scientific lectures at the Maryland Institute 1827; succeeded his father, Dr. P. K. Rogers, as professor of natural philosophy and chemistry at William and Mary College, Va., 1829; filled a similar post in the University of Virginia 1835–53; organized the Virginia geological survey 1835, and conducted it until its discontinuance in 1842; removed to Boston, Mass., 1853; lectured before the Lowell Institute on the application of science to the arts; aided in founding the Massachusetts Institute of Technology, and was its first president 1862–68, and was president of the American Association for the Advancement of Science 1875–76. Author of *Strength of Materials* (1838), *Elements of Mechanical Philosophy* (1852), and of many scientific papers.

Rogers (WOODES), b. in England about 1660; served many years in the English navy; was entrusted by the merchants of Bristol with the command of an armed expedition to the South Sea in two vessels 1708; took Dampier with him as pilot; arrived in Feb., 1709, at the island of Juan Fernandez, off the coast of Chili, where he found and carried away Alexander Selkirk, the prototype of Defoe's *Robinson Crusoe;* skirted the Spanish settlements as far N. as the coast of California; crossed the Pacific; returned to England by way of the Cape of Good Hope Oct., 1711, and was afterward employed against the pirates of the West Indies. D. in England in 1732.

Rogers City, p.-v., Rogers tp., cap. of Presque Isle co., Mich., on Lake Huron.

Rog'ersville, p.-v. and tp., Lauderdale co., Ala. P. 435; of tp. 1501.

Rogersville, p.-v., cap. of Hawkins co., Tenn., at the head of navigation on Holston River, and on East Tennessee Virginia and Georgia R. R. (Rogersville branch), has 1 newspaper and fine quarries of variegated marble. P. 657.

Roget' (PETER MARK), M. D., F. R. S., nephew of Sir Samuel Romilly, b. in London, England, Jan. 18, 1779; graduated in medicine at Edinburgh 1798; travelled on the Continent; practised several years at Manchester, where he became physician to the infirmary 1804; became private physician to Lord Lansdowne the same year; settled in London 1808; exerted himself in the establishment of the Northern Dispensary, of which he was long the physician; was an esteemed lecturer in several scientific institutions; was the first Fullerian professor of physiology at the Royal Institution; for twenty years secretary of the Royal Society, 1827–47; became a member of the senate of London University 1826; was president of the Medical and Chirurgical Society 1829–30, and became examiner in physiology to London University 1839. D. at Malvern Sept. 12, 1869. Author of *Animal and Vegetable Physiology* (Bridgewater Treatises, No. v., 1834), *Physiology and Phrenology* (1838), *A Thesaurus of English Words and Phrases* (1854), and other works.

Rohan'-Guémenée', de (LOUIS RÉNÉ ÉDOUARD), PRINCE, CARDINAL, b. Sept. 25, 1734; was educated for the Church, and sent in 1772 to Vienna as ambassador, but recalled in 1774 on the demand of Marie Theresa on account of the scandalous life he led; was made grand almoner to Louis XV. and bishop of Strasbourg in 1779, and finally cardinal. One of the principal figures in the necklace intrigue (see LAMOTTE), he was arrested in 1785 and arraigned before the tribunal of the Parliament, which, however, considered him a dupe rather than a criminal, and acquitted him. He returned to his diocese, and seems from this moment to have conducted his life on a more serious plan. He was a member of the States General in 1789; refused in 1791 to carry out the new ecclesiastical constitution in his diocese; retired to that part of his bishopric which was situated on the right side of the Rhine and belonged to the Empire; resigned his bishopric in 1801. D. at Ettenheim Feb. 17, 1803.

Rohilcund', territory of British India, bounded E. by Oude, W. by the Ganges, comprises an area of 11,500 sq. m., with 5,435,550 inhabitants, and forms an independent administrative division. It received its name from the Rohillas, an Afghan tribe, which settled here in the middle of the eighteenth century.

Rohlfs (GERHARD), b. at Vegesack, near Bremen, Apr. 14, 1834; studied medicine at Heidelberg, Würzburg, and Göttingen; served in the foreign legion of the French army in Algeria; went in 1861 to Morocco, which he explored in several directions; joined in 1867 the English expedition against Abyssinia, and made in 1873 an expedition into the Libyan desert with the support of the khedive of Egypt. The results of his travels he has communicated in his *Reise durch Marokko* (1869), *In Abessinien* (1869), *Von Tripolis nach Alexandria* (1871), *Aufenthalt in Marokko* (1873), *Quer durch Afrika* (1874), *Drei Monate im libyschen Wüste* (1875). His *Adventures in Morocco* were edited by Winwood Reade (London, 1874).

Rohtuk, town of British India, in the presidency of Agra, 42 miles N. W. of Delhi, has 13,237 inhabitants.

Rokitans'ky (KARL), b. at Königgrätz, Bohemia, Feb. 19, 1804; studied medicine at Prague and Vienna; was appointed professor of pathological anatomy in the University of Vienna in 1834, and retired in 1874. His *Handbuch der pathologischen Anatomie* (3 vols., 1842–46; 2d revised ed. 1851–61) was translated into English at the expense of the Sydenham Association, and is considered the foundation of the science of pathological anatomy.

Ro'land, the name of one of the principal representatives of mediæval chivalry, but whether he is an entirely fictitious personage, or whether he was one of Charlemagne's paladins and fell at Roncesvalles in 778, is doubtful. His life and exploits form the subject-matter of numerous ballads, epics, romances in prose, rhymed and unrhymed chronicles in French, Spanish, English, Italian, German, and Danish.

Roland' de la Platière' (JEAN MARIE), b. at Villefrance, department of Rhone, France, Feb. 18, 1734; was destined and educated for the Church, but felt a decided aversion to an ecclesiastical career; left his father's house when about nineteen years old; traversed France on foot, and found employment at Rouen with a relative of his who was inspector of manufactures. He now began to study the exact sciences; travelled in Switzerland, Italy, and England; became an author on subjects relating to manufactures and the useful arts (see *Letters from Switzerland* (6 vols., 1782), *Dictionnaire des Manufactures et des Arts* (3 vols., 1785)), and was inspector-general of Lyons at the outbreak of the Revolution. In 1780 he married Manon Jeanne Phlipon (b. at Paris Mar. 17, 1754). She had received a careful education, became the partner of all her husband's studies and plans, and spread over his life a lustre of heroism which even the most unfavorable criticism has not succeeded in fully destroying. In 1791 he removed to Paris, having been elected a member of the National Assembly, and the saloon of Madame Roland soon became one of the principal centres of the fermentation of the capital. On Mar. 23, 1792, Roland became minister of the interior in the cabinet of Dumouriez, but offended the king by his straightforwardness and disregard of the usual forms of etiquette, and was dismissed in June. After the fall of the throne (Aug. 10) he re-entered the ministry, whose business proper he administered with admirable insight and promptness, but his intimate connection with the Girondists made him obnoxious to the Jacobins, and on May 31, 1793, he was arrested and confined in his own house. Meanwhile, the somewhat fantastical ideas and undertakings of Madame Roland—which with many another woman would have been considered as resulting from a dangerous lack of discretion, but which assumed a much graver aspect from the positive vigor and energy of her character—had caused her to be arraigned before the Convention. She appeared Dec. 7, 1792, and defended herself so brilliantly that she was acquitted. But after the arrest and escape of her husband she was accused of maintaining treasonous correspondence with the Girondists; was arrested, refused a hearing before the Convention, and guillotined Nov. 9, 1793. When Roland, who had escaped

to Rouen, heard of her execution, he stabbed himself, Nov. 15, 1793. During her imprisonment she wrote her *Mémoires*, which, together with her *Lettres*, were edited by Dauban in 1864 and 1867; he also wrote an interesting *Étude sur Madame Roland et son Temps* (1864).

Rolette′, new county of N. E. Dakota, adjoining British America, consists chiefly of rolling prairies and has several lakes. Area, about 1850 sq. m.

Rolfe, p.-v. and tp., cap. of Pocahontas co., Ia., on Des Moines River, has 1 newspaper, and is a new and thriving settlement.

Rolfe (Robert Monsey). See Cranworth.

Rol′la, p.-v. and tp., cap. Phelps co., Mo., on Atlantic and Pacific R. R., 113 miles from St. Louis, has 5 churches, good schools, 2 weekly newspapers, 1 bank, 2 wagon-factories, 3 hotels, and 2 flouring-mills. P. of v. 1354; tp. 4184. Ulrich Z. Liddy, Ed. "Express."

Rol′land, tp., Isabella co., Mich. P. 210.

Rolles′ton (George), M. D., F. R. S., b. at Maltby, Yorkshire, England, July 30, 1829; educated at Gainsborough Grammar School, Sheffield Collegiate School, and Pembroke College, Oxford, where he was chosen fellow 1851; studied medicine at St. Bartholomew's Hospital, London; was assistant physician to the British Civil Hospital at Smyrna during the Crimean war 1855–56, and to the Children's Hospital, London, 1857; became physician to the Radcliffe Infirmary and Lee's reader in anatomy at Christ Church, Oxford, 1857; Linnæan professor of anatomy and physiology in Oxford University 1860, and fellow of Merton College 1862. Prof. Rolleston is author, among other works, of a profound treatise on the *Forms of Animal Life* (1870), and is reputed one of the ablest modern investigators of comparative physiology.

Rol′lin, p.-v. and tp., Lenawee co., Mich. P. 1515.

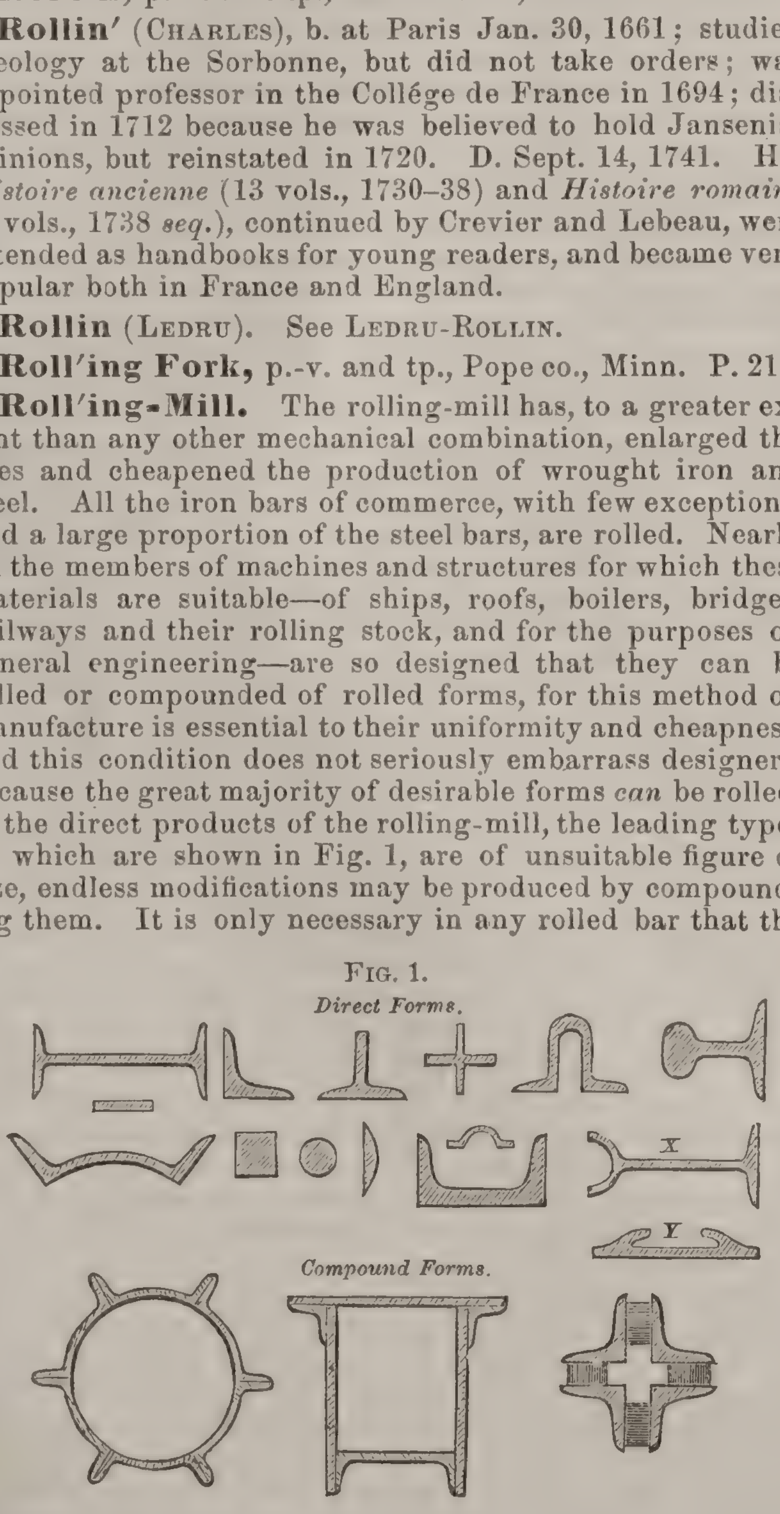
Rollin′ (Charles), b. at Paris Jan. 30, 1661; studied theology at the Sorbonne, but did not take orders; was appointed professor in the Collége de France in 1694; dismissed in 1712 because he was believed to hold Jansenist opinions, but reinstated in 1720. D. Sept. 14, 1741. His *Histoire ancienne* (13 vols., 1730–38) and *Histoire romaine* (9 vols., 1738 *seq.*), continued by Crevier and Lebeau, were intended as handbooks for young readers, and became very popular both in France and England.

Rollin (Ledru). See Ledru-Rollin.

Roll′ing Fork, p.-v. and tp., Pope co., Minn. P. 211.

Roll′ing-Mill. The rolling-mill has, to a greater extent than any other mechanical combination, enlarged the uses and cheapened the production of wrought iron and steel. All the iron bars of commerce, with few exceptions, and a large proportion of the steel bars, are rolled. Nearly all the members of machines and structures for which these materials are suitable—of ships, roofs, boilers, bridges, railways and their rolling stock, and for the purposes of general engineering—are so designed that they can be rolled or compounded of rolled forms, for this method of manufacture is essential to their uniformity and cheapness, and this condition does not seriously embarrass designers, because the great majority of desirable forms *can* be rolled. If the direct products of the rolling-mill, the leading types of which are shown in Fig. 1, are of unsuitable figure or size, endless modifications may be produced by compounding them. It is only necessary in any rolled bar that the

Fig. 1.



cross-section shall be uniform throughout its length, that none of the grooves used in the rolling shall be wider at the bottom than at the top, and that all of them shall open at right angles to the axis of the roll. The chair-bar *Y*, and the form *X* (Fig. 1) could not be rolled directly; the flanges must be folded down by a subsequent operation. In fact, bars of varying width and cross-section can be rolled; and this practice is likely to be largely extended.

It would be interesting to trace the development of rolling-mill machinery, and to observe how one improvement led to another, and how new requirements and their associated difficulties were met. It is possible, however, to glance here only at the general character of these improvements, to consider the more important of them in detail, to refer briefly to the different forms and uses of rolling-mills, and to illustrate the general arrangement of modern mills by the most common and highly organized type—the rail-mill.

The leading features of improvement have been—(1) Increased capacity, due to larger size, better proportions, stronger materials, and notably to better workmanship—notably, because the early mills were made up of rough castings thrown together without any accurate fitting whatever, excepting only on a few wearing parts. They were wasteful of power, costly of maintenance, and noisy beyond endurance, while the best modern mills are as well fitted as marine engines, and as quiet and powerful. (2) The next marked improvement was the arrangement of the rolls so as to work both ways. In a simple two-high mill (Fig. 2) running constantly in one direction, the bar, after passing between the rolls, must be drawn back by hand over the top roll, and entered again for another compression; and thus half the time and a considerable amount of heat are wasted, and unproductive labor is performed. The first remedy was to reverse the motion of the rolls after the bar had passed through, to stop them and start them in the other direction, so that they would draw the bar back again, and in so doing compress it. This plan is still largely used in England, especially for heavy work, such as armor-plates. The reversing is usually effected by gearing and clutches, and sometimes by reversing suddenly a double engine running without a fly-wheel. In any case the reversing machinery is costly to construct and expensive of power and repairs. The three-high mill (Fig. 3) is a much better means of doing work on a bar while moving in both directions. The bar is entered at the front of the train, between the middle and bottom rolls, and at the rear of the train between the middle and top rolls. The engine runs constantly in one direction, thus avoiding the shock and delay of reversing; and the additional labor, as compared with the reversing mill, is the lifting of the bar on the back of the train through the height of the middle roll. In light work, such as rails, which are in any case passed to and fro by the workmen on "hooks" or swinging levers, this additional labor is very small, while heavy work is raised by tables moved by steam-power. The American three-high mill, as arranged for heavy work by the Fritz Brothers, is a remarkable adaptation of means to ends, and it will be examined in detail.

Fig. 2.

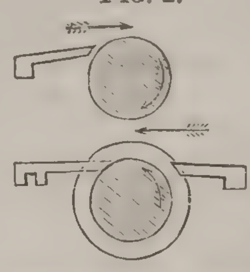
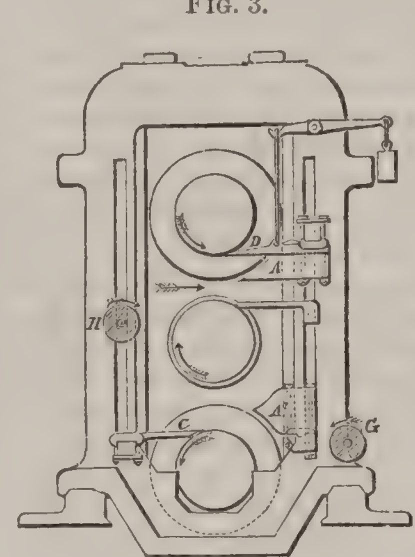
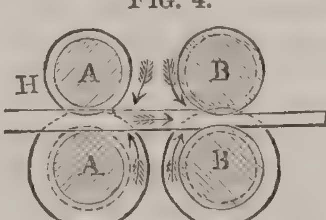


Fig. 3.



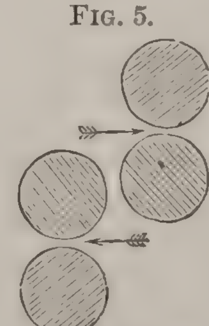
The other notable means of performing work on the bar at both passes is Brown's double mill (Fig. 4), recently introduced in England. It consists of two complete and distinct sets of two-high rolls in double housings, the two sets moving in opposite directions. The bar being entered at H, passes between the rolls A A without touching them, deep grooves being cut in the rolls for the purpose. The bar is caught and reduced by the rolls B B. Before the return pass the bar is moved laterally, and then it is entered in another groove and passes between the rolls B B without touching, and is caught by the rolls A A. Brown's mill avoids the shock of reversing and the necessity of raising the bar. It is, however, very costly, requiring on many kinds of work more aggregate length of rolls and more bearings than the three-high mill in the proportion of $2\frac{2}{3}$ to 1. It also requires more gearing, and more expensive and less convenient housings and minor features.

Fig. 4.



Brown's Patent Mill.

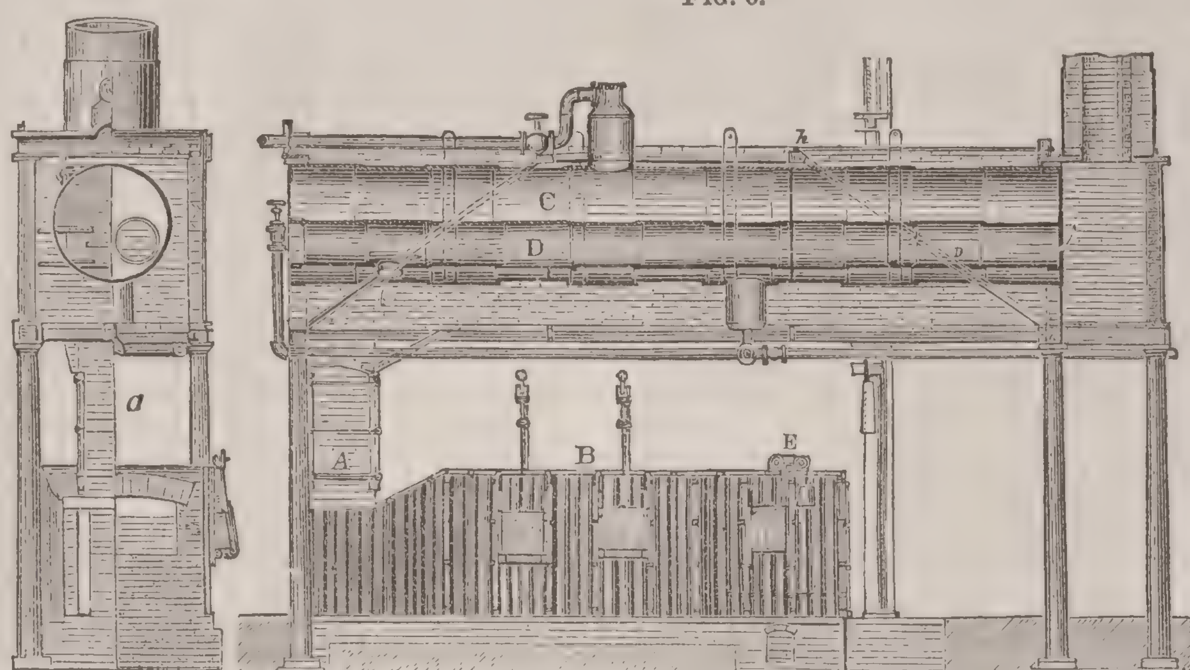
Fig. 5.



Four-high Mill.

Two other means of making the mill work in both directions have been the subject of experiment. The one was no less a structure than a four-high mill (Fig. 5), the passes being between the two upper rolls and between the two lower rolls, in order to keep the bar constantly the same side up. We shall presently observe the need of this, and how ingeniously the Fritz three-high mill accomplishes it. The other experiment was a three-high mill set on end, with no very obvious advantages and some defects.

FIG. 7. FIG. 6.



Re-heating Furnace and Boiler at the Pennsylvania Steel-works.

The third improvement in rolling-mill practice was the utilization of the waste heat of the iron-heating furnaces for making steam to drive the machinery. The early mills were mostly driven by streams from charcoal-yielding hills, and when steam was introduced in order to reach mineral coal and wider transportation facilities, iron-makers were a long time in finding out the importance of using waste furnace heat instead of throwing it away, and then burning coal under boilers to supply steam. A plain cylinder boiler, communicating with the chimney-flue of a heating furnace, will furnish steam-power enough to roll all the iron that the furnace will heat. The temperature of steel-heating furnaces is much lower, their object being merely to soften the steel, and not to partially fuse the metal for welding, so that multitubular boilers and the highest economies of steam transmission and application are necessary to furnish the required power.

One of the best forms of boiler-setting in American mills is shown by the Figs. 6 and 7. The reverberatory heating furnace is of such size and form as to receive six or seven rail piles or blooms. The flame from the flue A of the furnace B passes under the boiler C and through the flues D to the chimney, which is placed outside of the building to save space and avoid danger to the roof by fire. This is a 50-inch by 30-foot boiler, with two 17-inch flues. Smaller boilers, without flues, are often employed. Sometimes, however, the chimneys go through the roof in order to better utilize the heat, which then passes underneath the boiler and returns through the flues. The fire-box end E of the furnace is placed next to the wall of the building, and the ash-pit opens out of doors, to avoid dust and cinders inside the mill. A corrugated cast-iron furnace shell yields to expansion by heat without cracking, and is rather lighter than a plain or a perforated shell. The method of supporting the boiler deserves notice. It consists of six light cast-iron columns, and two trusses *h h*, each made of three rails. These support the entire brickwork casing and the bottom plates, and upon four of the posts are placed two cast-iron frames, from which the boiler is suspended by hooks. The earlier mill-boilers were set on the ground behind the furnaces, thus occupying much valuable room and preventing the convenient arrangement of other things. English mill-boilers are generally vertical; and this system presents some economies in space and construction, but the more rapid and dangerous accumulation of sediment on the small bottom end, as compared with the whole lower side of a horizontal boiler, is a serious objection.

The fourth radical improvement, not yet fully appreciated, but rapidly becoming standard—and which is to some extent a substitute for the third, already mentioned—is the twofold improvement of the Siemens gas furnace. (See article FURNACE.) (1) In this the coal, instead of being wastefully burned in each individual furnace, is converted into gas in a system of "producers." The gas is led to the furnace, and there properly mixed with air and perfectly burned. (2) The waste heat of the furnaces is employed in regenerators, to heat the air and gas before they mingle in the furnace, and it is thus fully utilized; 300 pounds of coal will by this means heat a ton of ingots or rail piles, while 800 pounds of coal are used for the same work in the best practice with an ordinary furnace. A serious drawback to this economy of the Siemens furnace is the fact that steam-power must be furnished by separate firing under boilers, because the heat from the waste gases is entirely absorbed by the regenerators. With good engines, however, the gas-furnace still effects an important saving in fuel, and it must be credited with still greater economy—viz. the reduction of oxidation, and the consequent saving of metal while heating. This is due to the practicability of maintaining a neutral or carburizing flame during the heating in a gas-furnace, while much free air will work through the fire in the ordinary furnace.

The fifth grand improvement in rolling-mill arrangements was the application of independent and direct-acting steam-engines, not only to the different trains of rolls, but also to the other machines, such as saws, punches, and shears. For these smaller engines the necessity of carrying steam-pipes all over the mill involves the difficulty of excessive condensation in the pipes; but a more serious objection to the old practice of driving everything by a single engine is the costly maintenance of long lines of belts and shafting. Another objection is the expense of running all this shafting and a large engine in order to drive a single machine if the other machines are not working. Some modern iron rail-mills have eleven distinct steam-engines, one for each of the following machines: puddle-train, top and bottom and scrap train, rail-train, saws, two straightening presses, two punches, blower, boiler-feed, and general water-supply. The driving of the separate roll-trains by independent engines is an immense improvement for these and other similar reasons. In the old practice, still standard in some parts of England, and not entirely abandoned here, a ponderous, slow-moving engine is connected by large and complicated spur-gearing, pinions, and shafting to two, four, and sometimes even to six, trains of rolls, and to all their supplementary machines. The strains and shocks due to multiplying speed, and to the inevitable looseness of the numerous connections, induce breakdowns and heavy repairs. This whole system of gearing must be run at maximum speed to drive properly even a single machine, and in case of a disaster to any one part the whole mill is stopped. In the modern system the engine-shaft is coupled directly to the roll-train. The fewest parts are then needed; there is the least lost motion and the greatest smoothness of running; and there is also the highest economy of room, especially when the vertical engine is employed. Then, when a particular train is lying still its engine and all its connections are also at rest for cleaning or for any needed attention. But this is not all. Steamship men were long enough in finding out—and rolling-mill men were longer—*that high speed of piston* is a grand element in steam-engine economy. Just as the heavy and wasteful paddle-engine of former times has given place to the compact, high-speed screw-engine of the present day, so has the rolling-mill practice been changed. Instead of 6-foot stroke, 25 revolutions, and 300 feet per minute piston-speed in an engine, we now see 4-foot stroke, 80 revolutions, and 640 feet per minute; and even 180 to 250 revolutions are made by the direct engines of small merchant-bar trains.

A common and successful variety of American rolling-mill engine, the Fritz engine, is shown by Figs. 8 and 9, as used in the Bethlehem Iron Co.'s rail-mill at Bethlehem, Pa. The cylinder is 48 inches diameter, the stroke 48 inches, the fly-wheel 26 feet, weighing 55 tons, for a 24-inch three-high train. The framing is low and very steady, and all the wearing parts have the ample area of surface which is required to ensure durability.

In addition to these principal changes, many valuable improvements have been made in shaping the roll-grooves to do a greater variety and better quality of work. Improvements have also been made in devices for feeding the bar into the mill, in guides and guards for promoting the smooth delivery of the bar out of the mill, and in the arrangements of these and their associated parts, which will be further referred to.

Let us now analyze the chief machine of a rolling-mill—viz. the roll-train—considering first, and in its simplest form, a two-high mill with plain rolls for making plates, as shown by Figs. 10 and 11. There are first laid down two bed-pieces or shoes for supporting the housings. These are bolted to masonry foundations, a strip of oak being laid beneath them to give a close continuous bearing, and to provide a slight but most helpful elasticity. A

FIG. 8.

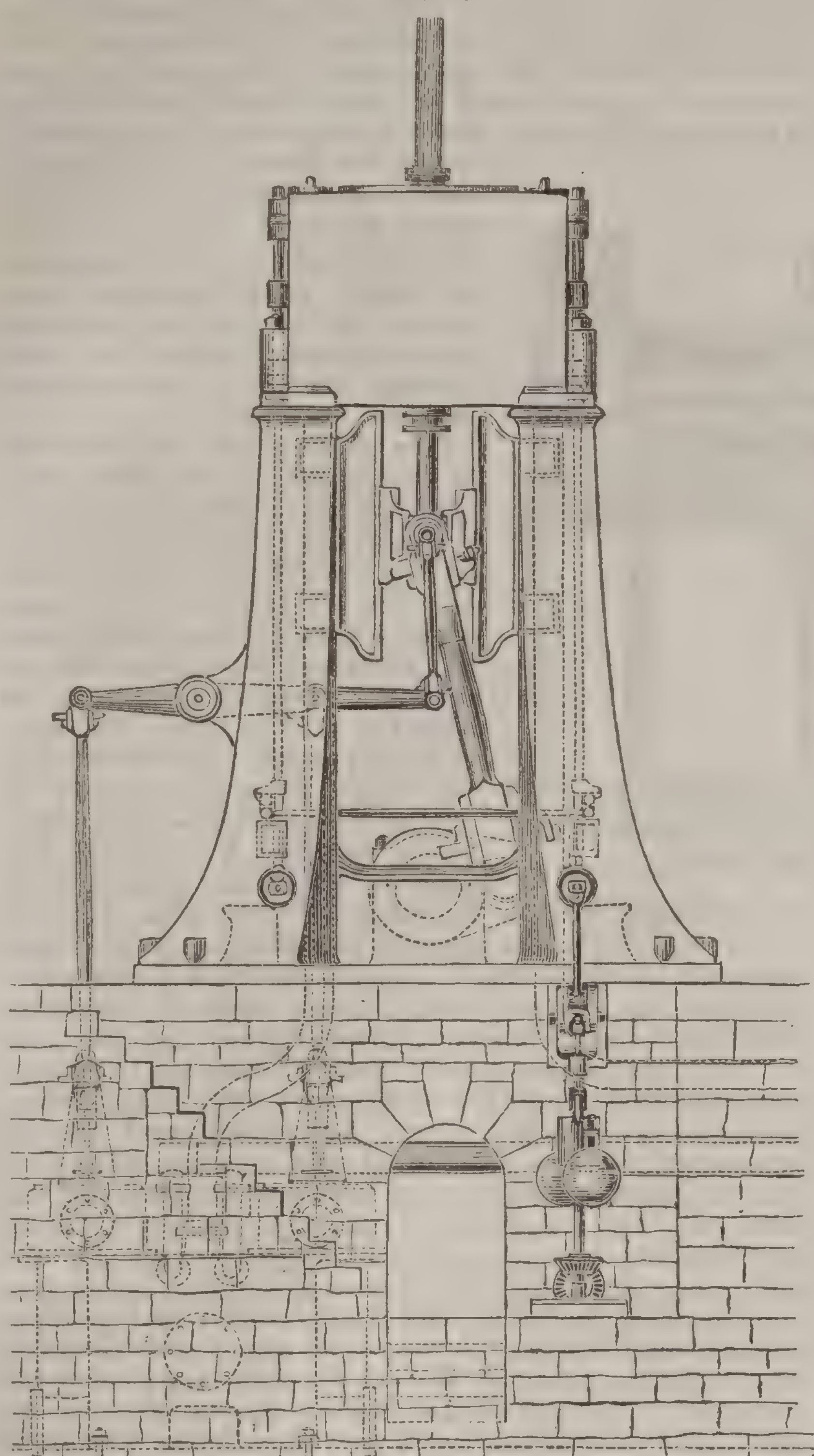
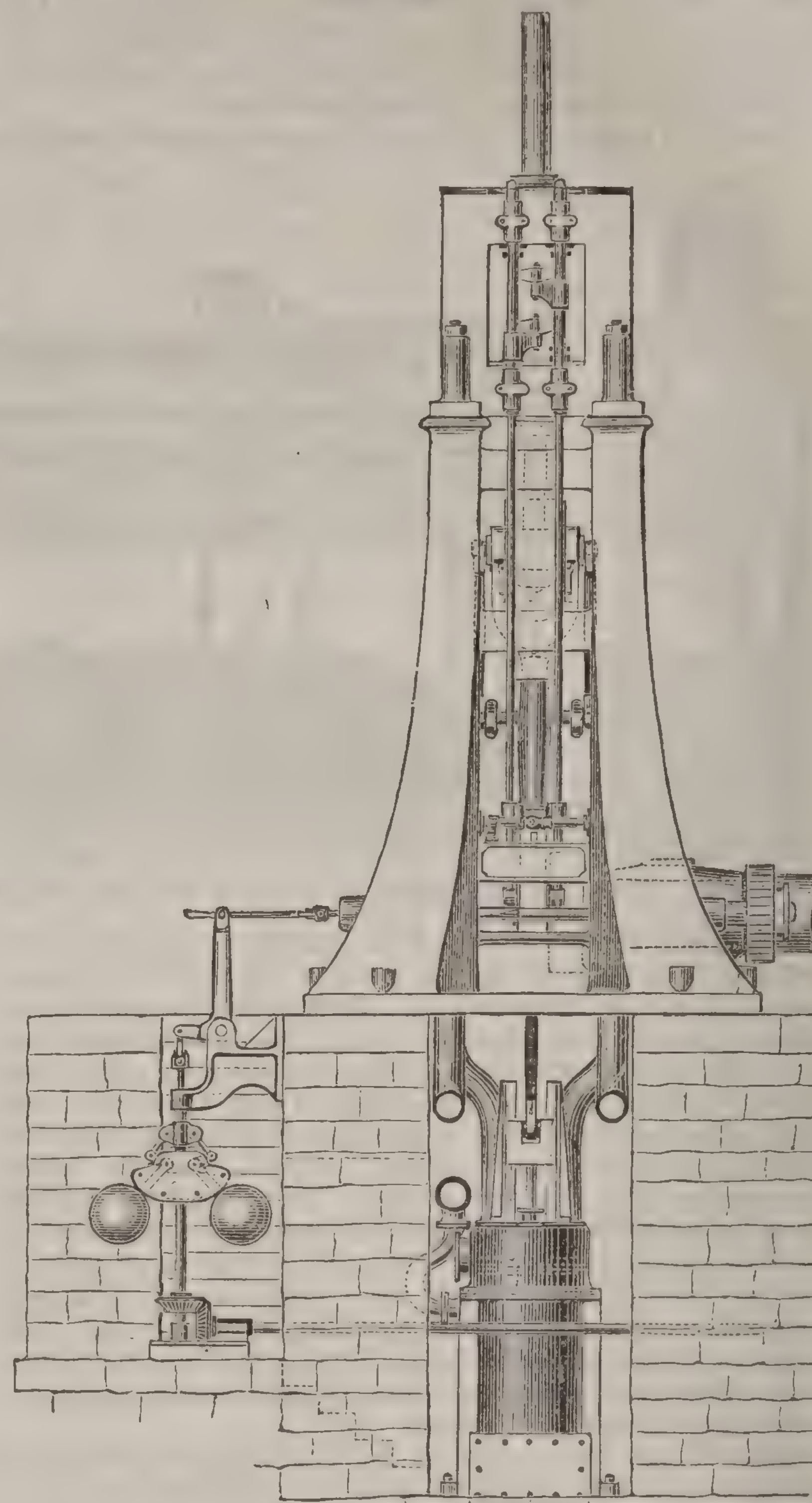


FIG. 9.



stratum of oakum $\frac{3}{4}$ inch thick, driven between the shoe and the masonry, is sometimes used, and it makes a better fit and is more durable. In the old practice the housings were set directly on timber or masonry, and were ill-adjusted and unstable. In the new practice the shoes and housings are accurately planed together. The proper arrangement and proportioning of housings has required years of experimenting. In the older forms the top was removable, to facilitate the changing of the rolls, but this prevented the needful strength and solidity. The housings must be of sufficient height and width to permit changing rolls from front or rear; they must be accurately fitted to the movable bolsters that hold the rolls, and must give them firm lateral support; they must be furnished with the screws to receive the thrust of the top-roll and to vary the distance between the rolls; they must sustain the various guiding and feeding machinery; and, while they give room for all these parts and their functions, they must be strong enough to resist all strains and the heavy shocks of rolling. If the top-roll is subject to constant vertical adjustment, as in the gradual reduction of boiler-plates from thick slabs, it must be counterweighted, as shown, so that it may be held up in contact with the screws. When one roll only is coupled to the engine, the other is turned by the friction of the bar passing between the two. This, however, is practicable only for planishing or finishing rolls, where the work is extremely light. In reducing all ordinary shapes the resistance of the uncoupled roll bends the bar and interferes with smooth working; and for this reason the two pinions, one of which is coupled to the engine, are interposed between the engine and the rolls to impart to them a perfectly uniform rotation. The coupling between a pinion and a roll, or between two stands of rolls—seven or eight stands of rolls being often coupled end to end from one set of pinions—is a form of clutch, consisting of a cast-iron spindle and two cast-iron rings or boxes, fitting partly over the spindle and partly over the roll-necks. Internal projections on the boxes fit into corresponding grooves in the spindle and necks, and the whole is usually so proportioned that a box will break in case an unusual and dangerous strain is brought upon the rolls. It has been customary to lighten the breaking-block or some easily replaced part, so that it will burst and let the roll rise instead of breaking. In the best practice, however, all parts of the train are made so strong that the engine will stop if it cannot reduce the bar. The train is made to stand, and not to break under any circumstances. The coupling

FIG. 10.

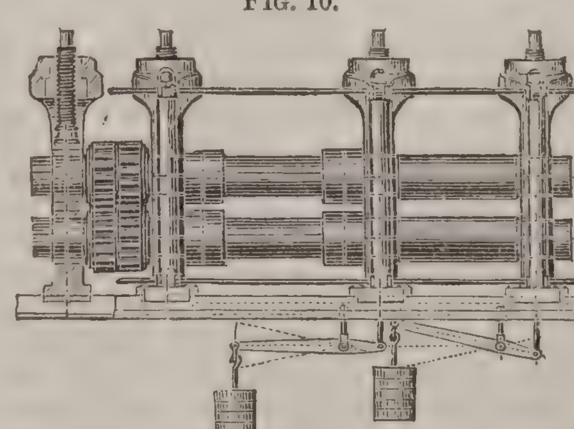
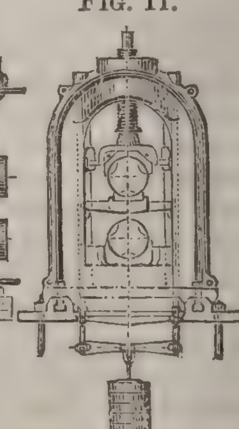


FIG. 11.



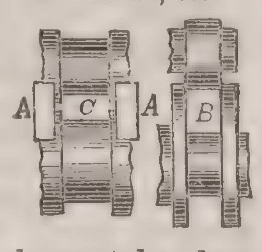
Two-high Plate-mill.

is a rude affair, somewhat loose-jointed and noisy, and quite out of keeping with the other fittings of a modern mill. Mechanical refinements have been attempted in it, but great simplicity is required to permit rapid disconnection, and to allow the rolls to rise and fall, and thus the old crude coupling has been retained. This is one of the few cases in which refinements cost more than they save.

Having now considered the principal features of all roll-trains, let us examine some further details and other types. Fig. 3 is an end view of a three-high mill, the general operation of which has been described; and in this the rolls are held at fixed distances apart. In form-

ing a bar it is often necessary to compress one side more than the other, and this and some other causes tend to bend the bar laterally as it leaves the rolls. The side-guards A are employed to bend it back and deliver it straight. The side-guard A′ enters the bar properly, and there are similar guards on the back side of the rolls. They are all rigidly fastened to heavy bars extending between the housings, and are adjustable laterally to suit grooves of different widths. In the plate-mill, the rolls being of uniform diameter, the same part of the rolls may be used for all the passes, the reduction in thickness being produced simply by decreasing the space between the rolls vertically at each pass, and the edges of the plate are not finished at all. In rolling bars, however, it is necessary to preserve a uniform width and a smooth finish on the sides or edges of the bar, and hence the work must be done in grooves. An open groove, like C (Fig. 12), would allow the metal to squeeze out laterally and form fins. In order to prevent this by fully closing the pass, one roll has a deep groove B (Fig. 13), while the second or companion roll has a collar projecting into the groove of the first. The friction of the sides of this groove is so great, the bar being crowded and spread out into it by the whole force of the engine, that it would not release the bar, but would wind it round and round the roll unless a remedy were provided. That remedy is the guide C (Fig. 3), which is a sharp iron chisel lying in the top of the groove and peeling the bar out of it and off from the roll. The guide D performs the same function for the top roll, and it is held up in contact with the roll by means of a lever and weight. This apparently insignificant system of guides, which would hardly be noticed by an ordinary observer, is, in its various adaptations, one of the most highly-refined features of the rolling-mill, and light bars of complex section could not be produced at all without it. When a guide breaks—in a rail-mill, for instance—the bar instantly winds round the roll until something gives way and stops the train; and millmen consider themselves fortunate if in such a case they escape serious breakage of the rolls.

FIGS. 12, 13.



We have now arrived at a point where we are prepared to examine the most notable feature of the American three-high mill, and its advantage over the English three-high mill. We have seen the necessity of the closed pass formed by a single groove with a lid or collar fitting into it, and of the guide for peeling the bar out of the groove; but even the closed pass is not enough to prevent the formation of a fin. The collar on the opposite roll, which projects into the groove, will wear, and the hot metal will squeeze out by the side of it. Hence the position of this collar must be changed with each pass, so that the incipient fin formed in one groove will be smoothed down in the solid body of the roll in the next groove. Fig. 14 is a section of the American three-high rail rolls at the last three passes. In Pass No. 1 a fin can squeeze out toward the middle roll. In No. 2 this fin is smoothed down in the solid-bottomed groove of the top roll, and another fin may form at the bottom edge of the rail-flange. The position of the fin is again reversed at Pass No. 3, for if it were not, the fin would so increase from one pass to another as to prevent the entrance of the bar, bend it, and spoil its finish. In the English three-high mill (Fig. 15) the opening for the fin is reversed at each pass, but so is the rail. In Pass No. 1 the rail-flange is on the left, in Pass No. 2 on the right, and in No. 3 on the left again. The bar must thus be turned over at every pass, at a considerable expense of time and labor, and the rolls are longer than the American rolls and have more complex collars. Why this difference? It will be noticed that the rolling grooves of the English mill are all in the bottom and middle rolls, while those of the American mill are all in the bottom and top rolls. The English grooves all open upward, and the American grooves alternately upward and downward. But why is this? The English middle roll (Fig. 16) is grooved, simply to allow the old-fashioned guide to lie in it by its own weight and peel out the bar. The guide would of course drop out of any groove in the top roll, and so the top roll, it was supposed, could not be grooved. But by counterbalancing the guide, so that it will stay up, the top roll instead of the middle roll may be grooved, and all the advantages of the alternating fin, the unturned bar, and the short roll, may be gained. The American rail-finishing rolls, as shown in elevation in Fig. 17, have seven grooves in the same length that five occupy in the English rolls, as shown in Fig. 18.

FIG. 14.

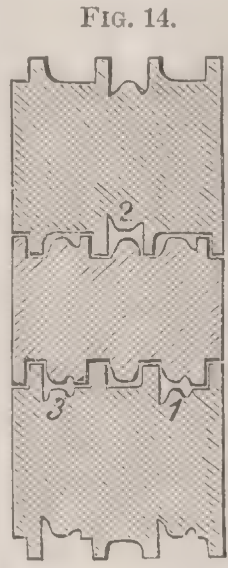


FIG. 15.

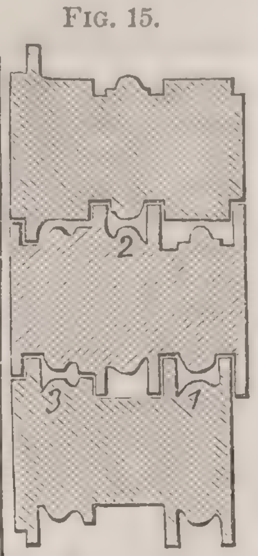


FIG. 16.

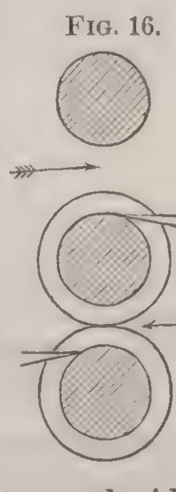
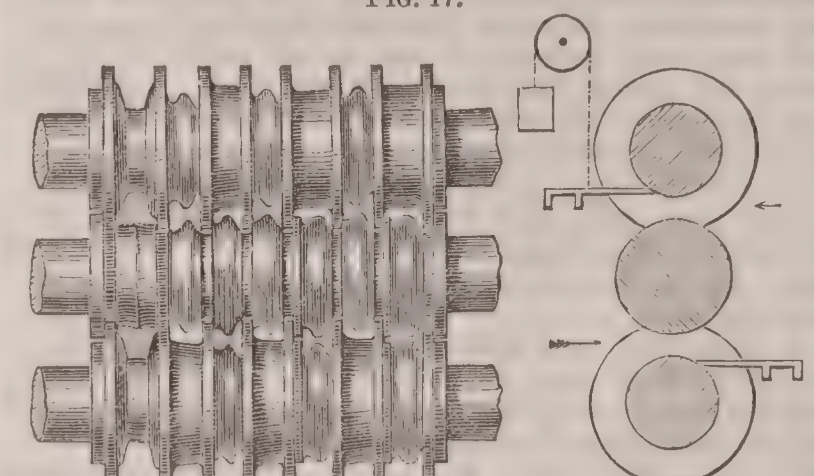
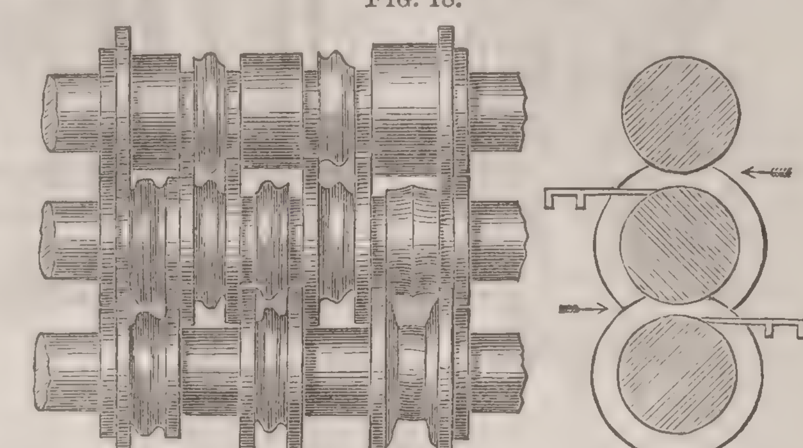


FIG. 17.



Three-high Rail-finishing Train (grooves in top and bottom rolls).

FIG. 18.



Three-high Rail-finishing train (grooves in middle and bottom rolls).

Another important improvement is the carrying roller or carrier G (Fig. 3), for feeding the bar into the rolls. To move a rail-bloom weighing 700 pounds or more, especially a pile for a beam or a 2000-pound ingot for three rails,—to push and pry this mass into a mill so that the rolls will catch it requires much labor and time. The carrier G is run constantly in the direction of the bottom roll, and the carrier H in the direction of the middle roll, by means of a belt from some suitably revolving part of the train. It is only necessary to drop the end of the bar upon the carrier, for it will at once be pulled forward and entered by friction.

The simplest form of plate mill (Fig. 19) is a pair of plain rolls, one of which is adjustable vertically by means of a screw, so that the pile may be reduced definitely in thickness at each pass. This mill wastes time and heat, as we have previously observed, by requiring the plate to be drawn over the top roll after each pass, without receiving any work. A very ingenious means of reducing the plate at both passes is Lauth's system, in which a small roll (Fig. 20) is interposed between the top and bottom rolls. This roll requires no pinion, because it is powerfully driven by the friction of the roll against which it bears, while the plate passes alternately under and over it. It requires no transverse strength, for that is provided by the large roll, against which it bears from end to end. It may thus be of small diameter, and the plate need only be lifted through its diameter, instead of through the diameter of the large top roll.

FIG. 19.

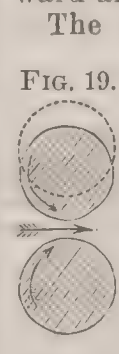
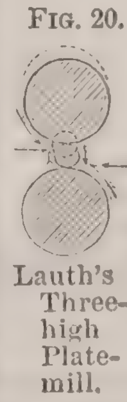


FIG. 20.

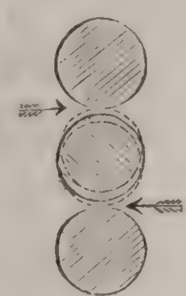


Lauth's Three-high Plate-mill.

We have now examined two distinct systems of rolling—the fixed roll with closed grooves, one for each pass, and the plain rolls screwed together at each pass. For some kinds of work these systems may be combined. In the rail-finishing trains (Figs. 17 and 18) the rolls must be rigidly fixed at a definite distance apart, for to screw them together would change only the thickness of the bar, and not its outline. In rolling blooms, however, and some other rectangular or nearly rectangular forms, the same groove may be used over and over again by screwing the rolls together, and a considerable economy in machinery is thus effected. The groove C, for instance (Fig. 12), of a

two-high mill, is 12 inches wide and 11 high. By screwing the rolls together until the groove is but 8 inches high, a 12-inch ingot can be reduced in four passes to 8 by 12 inches. Another groove, 8 inches wide and 11 high, will in like manner reduce it to 8 by 8 inches. Now, if the rolls were held a fixed distance apart, a separate groove would be needed for each pass, and the eight grooves would require four distinct sets of rolls of a given length and transverse strength, with their housings and couplings, instead of one set of rolls where the passes are used over and over. But this two-high mill with a vertically-moving roll involves the loss of passing the ingot over the top roll after each pass, so that a three-high mill with fixed distances between the rolls, and separate grooves for each pass, would, on the whole, be cheaper for heavy work.

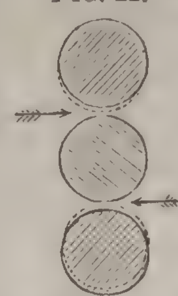
FIG. 21.



Three-high Mill (middle roll movable).

A three-high mill with vertically-moving instead of fixed rolls for this class of work and for plate rolling has long been wanted, but the difficulties have appeared so serious that mill-owners have but lately begun to cope with them. The first machine of this class, with fixed top and bottom rolls, and a middle roll raised and lowered by screws (Fig. 21), was erected at the Bessemer steel-works in Troy, N. Y., in 1870, and has since run constantly with entire success. Another form (Fig. 22), with a fixed middle roll and vertically-moving top and bottom rolls, was erected shortly afterward at the Cambria steel-works at Johnstown, Pa., and has since run day and night with equal success.

FIG. 22.



Three-high Mill (top and bottom rolls movable).

Having observed the principal types of the rolling-mill, and the general features common to all of them, let us now examine the details of the three-high adjustable mill just referred to, and more especially the labor-saving improvements which are applicable to other types of mill, and which promise to largely decrease the cost of manufacture and to increase the production of heavy work. The bolster *a* (Figs. 23–25) that holds the middle roll is a heavy iron casting fitted with an adjustable brass box, and held vertically by two 6-inch steel screws. A shoulder near the top of each screw bears upward, through a removable wearing-piece, against the top of the housing, and the foot of each screw rests on the bottom of the housing. The four screws, two

FIG. 23.

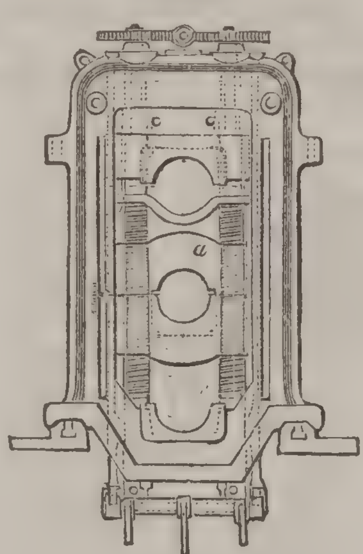


FIG. 24.

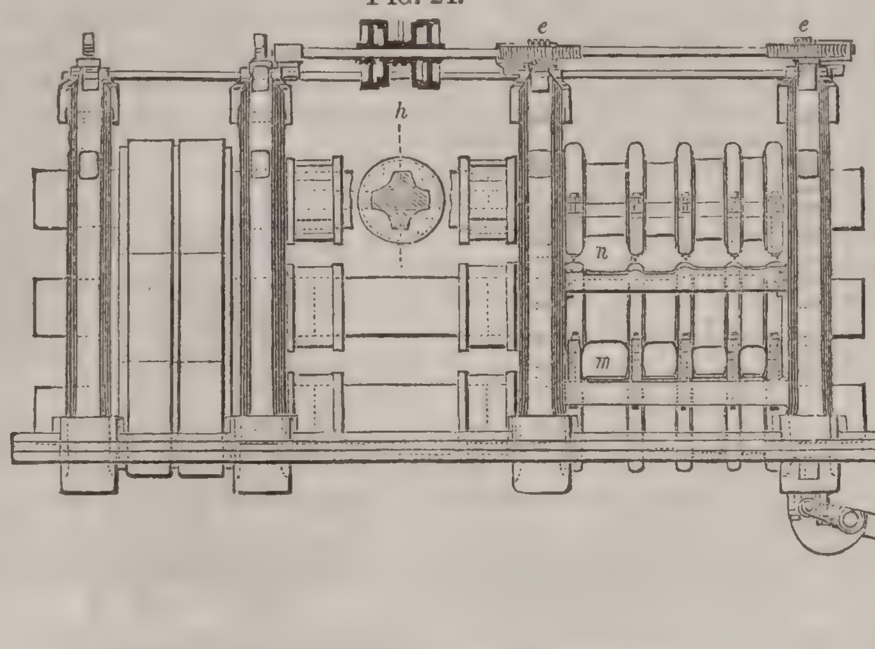
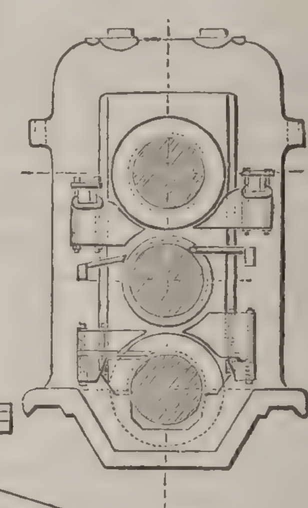


FIG. 25.



Blooming Train at the Troy Steel-works.

in each housing, thus form four posts, which take the upward and downward thrust of the middle roll. By revolving all the screws in one direction, the bolsters which form the nuts climb up on the screw, carrying the roll with them, and *vice versâ*. The guides and guards of the middle roll are attached to the bolsters, and rise and fall with the roll, which is an important feature. The screws are revolved simultaneously and at equal speeds by means of four right and left hand worm wheels *e*, and by two worms on a common shaft. Two loose pulleys *h* on this shaft are driven in opposite directions by belts from the engine. A friction-clutch between the pulleys is fast on the shaft, and by moving the clutch into contact with one of the pulleys the shaft and screws are revolved and the roll raised, while its contact with the other pulley lowers the roll. The first lower groove in the rolls *m* is 12 inches wide. The screwman raises the middle roll until the groove is 11¼ inches deep, which he observes accurately by means of a pointer on the bolster and a scale on the housing. A 12-inch ingot may then be passed through and reduced to 12 by 11¼ inches. The middle roll is now lowered until the first upper groove *n* is 10½ inches deep, when the ingot is passed through the other way and reduced to 10½ by 12 inches. In this manner it is reduced to 9 by 9 inches in the second set; then to 9 by 6 inches in the third set, and to 6 by 6 inches in the fourth, thus receiving, in

FIG. 26.

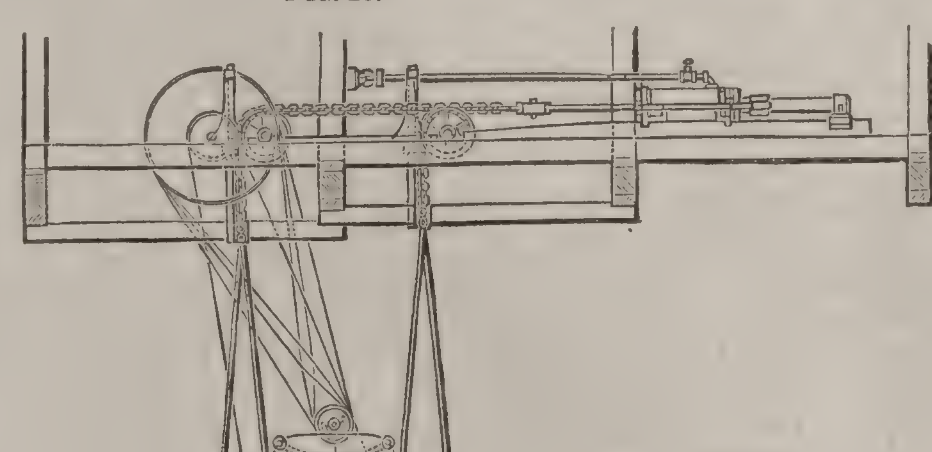
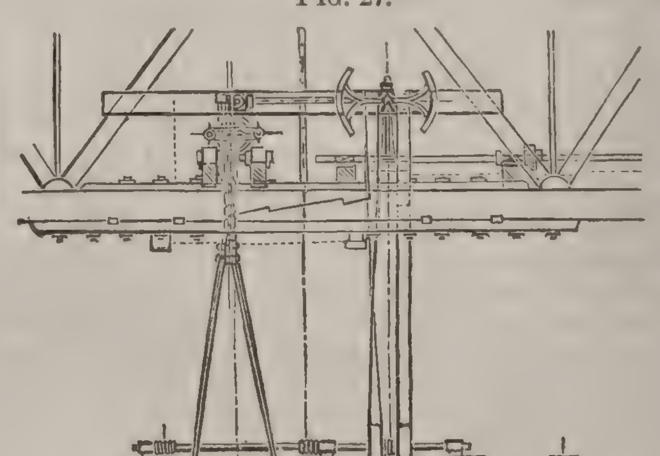


FIG. 27.



Rolling-mill at the Troy Steel-works.

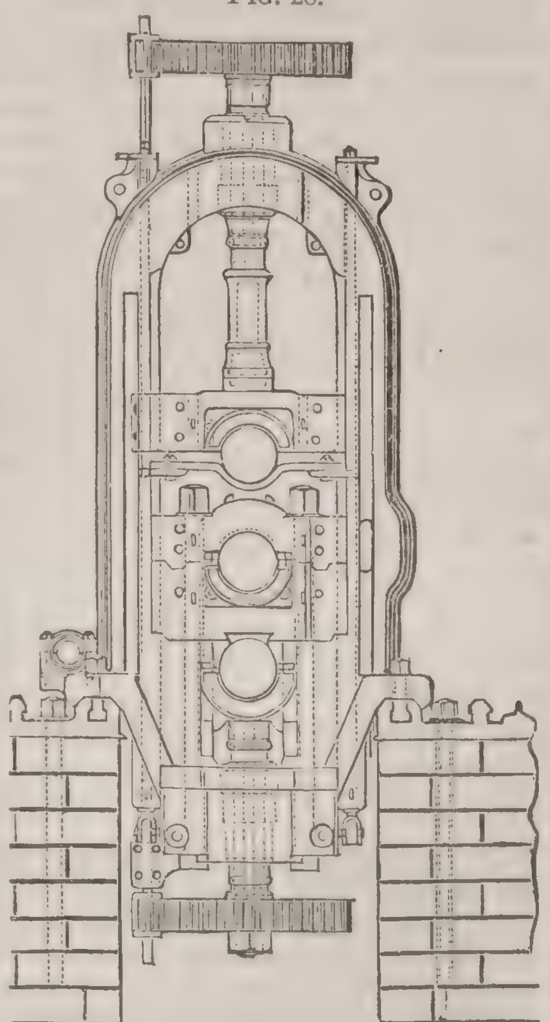
all, sixteen passes through eight grooves. The number and reduction of the passes may be varied indefinitely to suit the size, heat, and hardness of the steel, and an ingot weighing 2000 pounds is thus reduced to one-fourth its original area and drawn out to nearly four times its original length in three to three and a half minutes. Such a mill is capable of rolling 200 tons of steel ingots for rails in twenty-four hours.

The compression of a 2000-pound ingot is chiefly a question of the strength of parts, but the handling of the ingot so that the rolls can get hold of it, and the quick adjustment of the middle roll after each pass, involve some

new and complex combinations. In Figs. 26 and 27 are shown two elevations of the Troy mill as first arranged, with the lifting and adjusting machinery in its simplest form.

A brief mention only can be made of the other improvements in the three-high mill recently worked out by Mr. John Fritz in the splendid establishment at Bethlehem, Pa. The principal roll-train is 125 feet long, and consists of eight stands of 24-inch rolls, with a vertical condensing engine at each end. It is intended to roll beams and heavy merchant shapes up to 900 pounds per yard, and rails and smaller bars up to 100 feet long, and in it the bars are all raised and lowered by a feeding carriage. In the ordinary three-high mill the bearings or necks of the top roll rest on those of the middle roll, and these again rest on those of the bottom roll, so that the lower necks have the constant weight of all the rolls. All the necks are thus under pressure at every pass, and the distance between the rolls is not adjustable while working. In the mill shown in Fig. 28 the bearing-box of the middle roll is securely fastened in the housing. The top roll bears against the upper screw, and the lower roll against a bottom screw, so that the rolls may be adjusted while running, and the same grooves used over and over again; and also so that each neck sustains only the weight and strain on its own roll. There is also an ingenious system of counterbalancing all these rolls; and for changing them an hydraulic crane travels back and forth on the shoes. This will probably be the most perfect mill in the world for heavy miscellaneous work.

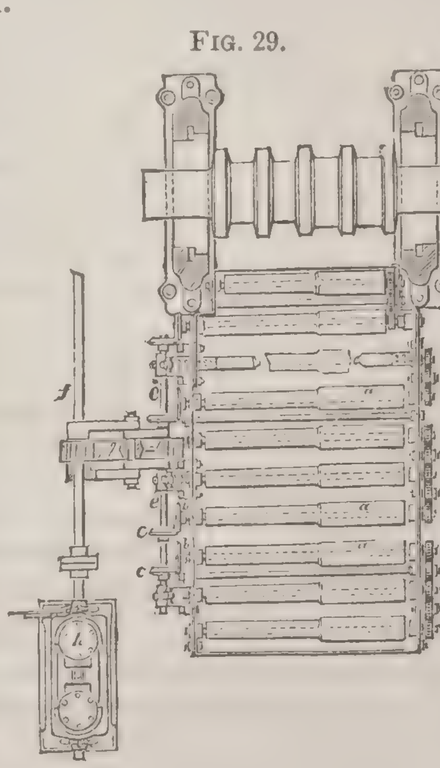
Fig. 28.



Three-high Rolling-mill, constructed from the designs of Mr. John Fritz.

Fig. 29 shows the arrangement of the feeding rollers *a a a* on the blooming-mill lifting-tables, as recently fitted at the Troy steel-works. Each roller has a bevel gear *b* on the end of the spindle, which is driven by the gear *c* on the side shaft *e*, which is attached to the table. This shaft *e* rises with the table, but is driven from the fixed shaft *f* through the intermediate idler gear *g*; the whole system of table-rollers receiving their motion by this means from the engine *h*. The shafts *e* and *f*, and the idler gear *g*, are shown more fully in Fig. 30.

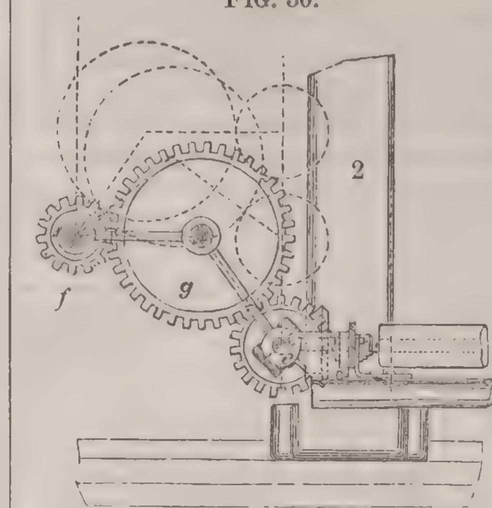
Fig. 29.



Mr. Ramsbottom's blooming-mill is shown in Figs. 31, 32, and 33. It consists of a pair of reciprocating cams or segments of rolls, and the operation will be readily observed from the engraving. The blooms must be short unless the mill is excessively large, and the continuous rotary mill would appear to be the more economical machine.

The universal mill is a comparatively new development of great promise for special kinds of work. It consists of an ordinary two-high mill standing horizontally, and another two-high mill standing vertically, so that the four rolls press the bar on all four sides at once. In some cases there are two vertical sets of rolls—one at the front and the other at the rear of the horizontal rolls. This mill is very useful for making uncommon sizes of flat and square bars, for which it would not pay to make special grooved rolls. The details of the universal mill, of the tire rolling-mill, and of several other special adaptations of rolling machinery, can hardly be considered at all in the present paper.

Fig. 30.



f, Reversing-engine attached to this shaft; 2, housing.

Having now examined the more important details of the rolling-mill, it remains to observe their grouping in a consistent whole. This depends, of course, largely upon the locality, the available space, and the direction in which raw materials arrive and finished products depart. These conditions, however, should rarely prevent a good internal arrangement. The grand feature to be observed is economy in *handling* the materials used; but in many mills, especially those rambling structures which have grown up little by little, and in which no provision was made for future enlargement, the materials are rehandled three or four times when once should suffice. Another point is to leave room enough for each operation without embarrassing any other. These are very important elements, and they are often too little considered. A frequent and very bad method of designing rolling-mills is to lay down simply the general outline of the walls, the position of the furnaces, train, and engine, and to allow about so much room for the rest. When the mill is done some of the doors are found to be in the wrong place; the cranes do not reach anything; the saws will not take extra long bars; the presses and punches interfere with the hot and cold beds; things are in the way of each other, and there is not quite room enough for anything. The only reasonable and proper way is to lay down everything on paper, and after getting it just right, to make the plan a little larger in those places where additional operations seem likely to be carried on. In a well-arranged mill all materials should be received and all the heating done at one end, the rolling machinery should be near the middle, and the finishing and shipping should take place at the other end; the product thus passing as nearly as possible in a direct line. The all-important point to be observed is that in designing works provision can be made for the minimum amount of rehandling and manual labor only by going over all the operations by means of a drawing on paper, by different arrangements again and again, and not by trusting to general ideas to be worked out when it is too late to move perhaps a building that may prove to be in the way.

Fig. 33.

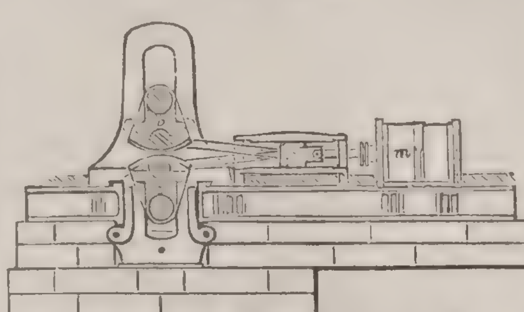
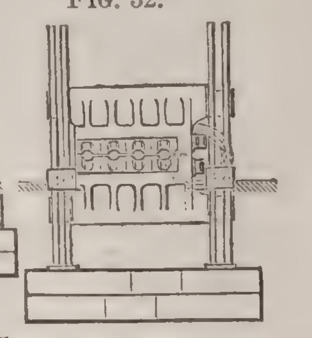


Fig. 32.



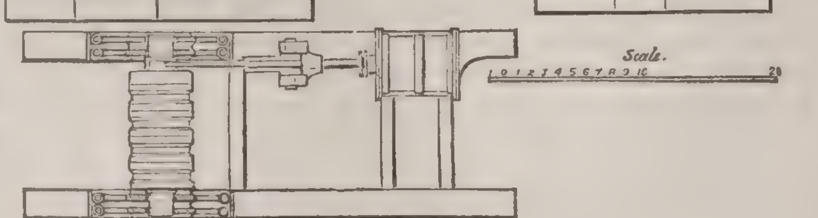


Fig. 31.

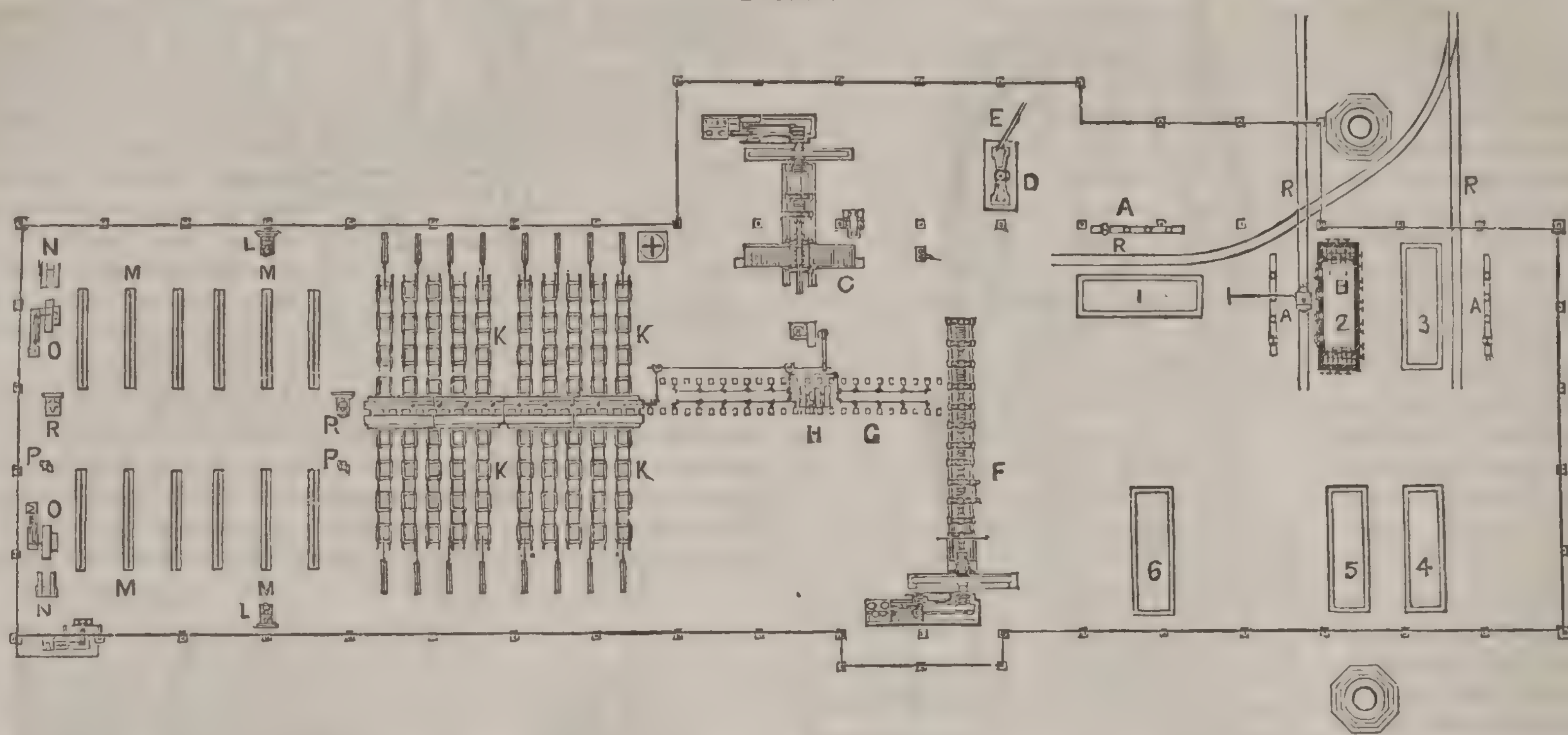
Ramsbottom's Blooming-mill.

Fig. 34 shows the rail-mill at the Edgar Thomson Steel Co.'s works near Pittsburg, Pa. This was completed in 1875, and it has proved to be a well-arranged mill. The building is 100 feet wide and 380 feet long, and in it six Siemens gas-furnaces (1, 2, 3, 4, 5, 6) are placed near one end. The steel ingots are brought to three of them on a 30-inch gauge railroad track R R R from the converting works. These furnaces (1, 2, 3) are fitted with hydraulic gear A for pushing in the ingots B, and for drawing them out after they have been heated. The other furnaces (4, 5, 6) have a lighter gear for handling the blooms only.

From the furnaces 1, 2, 3 the ingots are taken to the blooming-mill C, in which they are rolled in eighteen passes from 14 inches square to 7 inches square, their length being proportionately increased. The ingot is

then cut into two pieces or "blooms" (each being long enough to make two rails) under the steam-hammer D, and by it also the slight cracks that sometimes appear on the surface are chipped out. The blooms are then picked up by the crane E and taken on a wagon to the furnaces 4, 5, 6, in which they are reheated, and from which they go to the rail-train F. In this each bloom is rolled into a rail in thirteen passes, and it issues from the last groove directly upon a line of moving rollers G G in front of the hot saw H. By this saw the 60-foot piece is cut in two in the middle, and the man who controls the saw sends the pieces along by the rollers G and I to the hot bed K K. Here the rail, while lying upon the rollers, is curved between a set of moving arms and fixed stops, and is pushed out on either side to cool. The amount of curvature given to the hot rail is such that when it has become entirely cold the longer continued cooling and contraction of the thick head shall not have caused that face of the rail to become con-

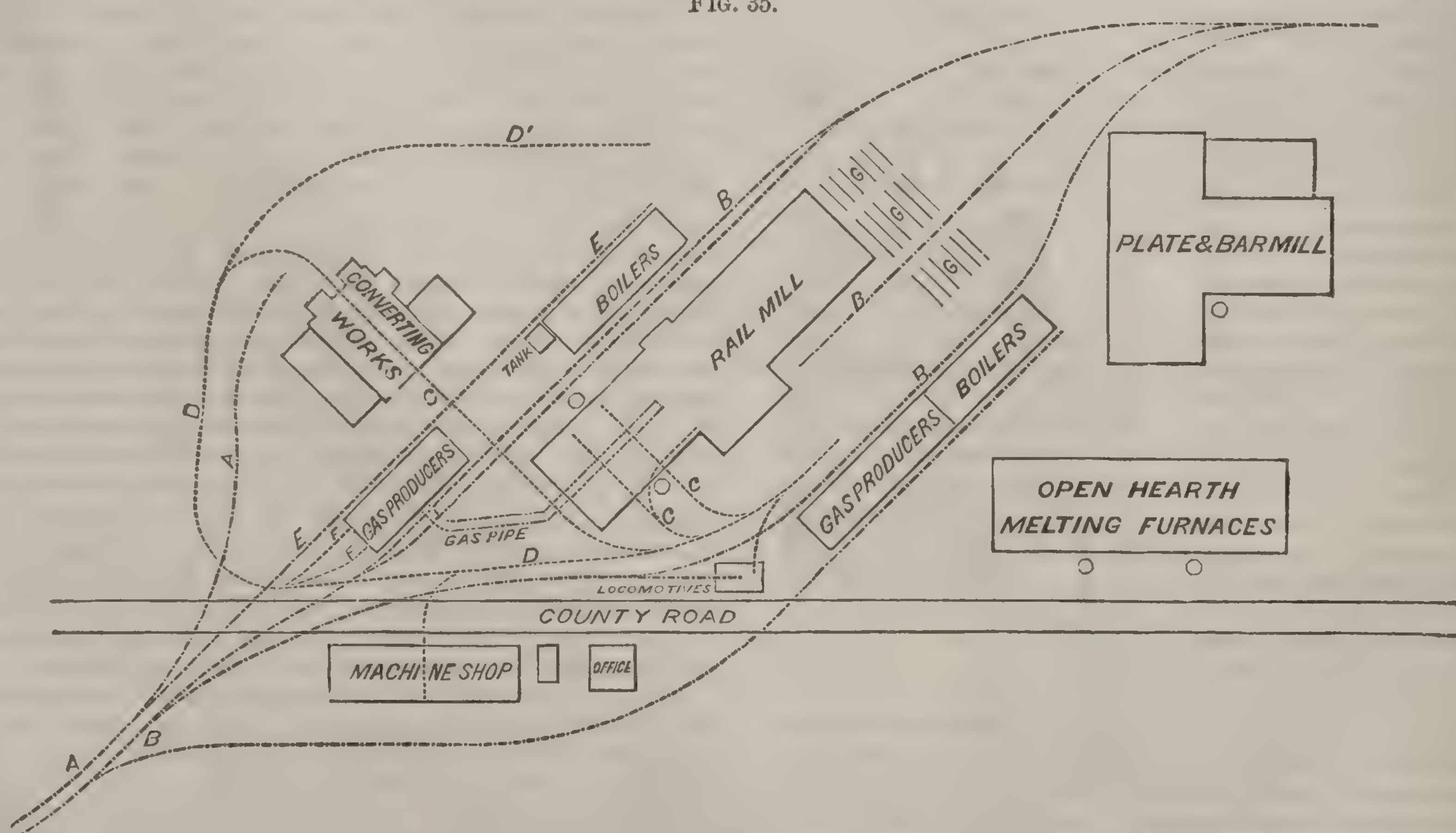
Fig. 34.



cave, but so that it shall be left as straight as possible. The cold rail is then passed through a press L L for an exact and final straightening, and is laid on the cold bed M M. One ragged end still remains to be cut off, however, and for this purpose cold saws N N are used, running at 2000 revolutions per minute, and by them the rails are brought to an exact length. These saws are plain iron disks without any teeth, driven by the high-speed engines O O, and by their rapid rotation the steel is quickly abraded, and thus the end is cut off. The holes for the fish-plate bolts are then drilled or punched in the machines P P or R R, which, with the straightening presses, are run by the engine. The rails are then run outside of the mill and piled on the stock-beds for inspection.

It is evident that in this mill there is ample room for rolling pieces even more than 60 feet long, while at the same time the furnaces, being placed at the sides of the mill, may stand quite near to the train without interfering at all with the passing of the shorter pieces through the roughing rolls. The fixtures for curving the rails are placed in the centre of the mill, between the two hot beds, so that the rails may be pushed out toward either of the two straightening presses. It is also evident that all the finishing tools, the presses, the punches, and the drills, can be at work at the same moment on either long or short rails, and that no interference can occur between them, as the rails move wholly in a direction parallel to the length of the building, excepting as they are pushed across the hot or cold beds. It has been fully proved that by thus placing the finishing machinery at one end of the mill, with the furnaces at the other end, and the rolling machinery across the mill in the centre, the whole is most advantageously located for both efficiency and economy of operation. This establishment, and rolling-mills generally, have elevated tanks or some other ample water-supply, with a sufficient head for filling the boilers after they may have been blown out, for the feed-pumps, and for various other purposes.

Fig. 35.



The great rail and beam mill at Dowlais in Wales was not long since considered the model English mill. In it two large and three small trains and all the sawing machinery are driven by one immense double engine by means of a complex and ponderous system of gearing. There are no less than seventeen bevel and spur wheels, not counting the train pinions, and 200 feet of ponderous shafting. The engine and first countershaft fixtures alone occupy a ground space of 40 by 75 feet. Some of the furnaces are a very great distance from the rolls; some of them are in the finishing end of the mill; and the trains and furnaces generally are not conveniently arranged, simply in order to keep them out of the way of the engine. By using independent engines each train could have been put just where it was wanted, without reference to anything but the convenience of that particular train and its furnaces, and in case of a breakdown in the engine department the delay would be local and not general.

Fig. 35 shows the general arrangement of the works of the Edgar Thomson Co., and from it may be seen the position of the rail-mill referred to, with reference to the convenient delivery to it of the steel ingots. The coke and pig iron, as the raw materials for the manufacture of the steel, are brought in on the high-level track A to the yard in front of the converting-house, and the coal for the supply of the gas-producers and for the boilers on the high-level track E, so that all these supplies are dropped at the most convenient possible point for their use, and repeated handlings thereby rendered unnecessary. The ingots are carried from the converting-house by the 30-inch low-level track C C to the heating furnaces in the rail-mill. The rails are loaded upon cars at B B on the common-gauge, low-level tracks directly from the mill or from the stock-beds G G, as may be required. Additional tracks are provided, giving ample standing-room for cars if they are waiting to be loaded. The narrow-gauge system of tracks is extended into the machine-shop, into the ash-pits F F, at the gas-producers, and along the edge of a bank at D′ for unloading débris of all kinds. From the producers the gas is led toward the furnaces in the rail-mill by a pipe which is carried under ground into the mill, and from which it is distributed to the furnaces as required. From the boiler-house the steam for supplying all the engines is led in suitable pipes to the different parts of the works, and the water-supply is in the same way distributed from the water-tank. The tracks A and B B connect directly with the Pennsylvania R. R., which lies on one side of the works, and also with the Baltimore and Ohio R. R., lying on the other side. The open-hearth melting-plant, with the plate and bar mill, is shown as a part of the plan for the future extension of the works.

In reference to the construction of large and costly works like these, it may be said that the history of the iron manufacture shows that the perfection and the new adaptations of machinery are the last resort among the older establishments when all other sources of profit fail, when fuel becomes costly, and when rival works spring up in better mineral regions and in better markets. Two features are found to be of vital importance: (1) Iron and steel making machinery must be thoroughly strong, well built, and trustworthy, and in some parts even duplicated, so that it will stand crowding to the utmost limit of endurance. (2) In order to save manual labor in handling the materials—for this is the trying element in nearly all manufacturing—an establishment must be large enough to keep the maximum amount of steam-power employed. Hydraulic feeding-tables and other similar machines, steam-hoists and locomotive engines, and all kindred appliances must be kept at work in order to be profitable; and this can be done only in extensive works.

The subject of quality of product as affected by treatment in different kinds of mills and by hammers is worthy of brief attention. It is found that certain kinds of iron cannot be successfully rolled in a two-high mill which revolves constantly in one direction. The pile will tend to split apart or to crack and splinter in some places as it leaves the rolls. This splitting becomes increased at each pass, and is sometimes so great that the end of the pile will not enter a second time in the same direction. In the three-high mill, however, and in the reversing mill, the entering end of the pile is changed at each pass, and the end split by the first does not enter at the second, the difficulty being thus constantly corrected. The splintering at one pass is smoothed down rather than increased by the next.

It has been supposed that soft structural steel is improved by hammering. This impression is founded on the fact that iron is improved by hammering, and that the highest-priced steel, such as tool steel, is hammered rather than rolled. It is true that the pressure of the hammer is greater and more concentrated than that of the light rolls usually employed, and that the hammer may expel more cinder in the early stages of the iron manufacture. The real reason why the hammer is used in iron mills, however, is because it will work large and hard puddle-balls and piles, for which there is no adequate rolling machinery at hand. That rolls are preferred to hammers, even for iron, in the most improved practice, is shown by the introduction of very heavy squeezers instead of hammers for reducing the large puddle-balls of the Danks furnace. The hammer certainly increases the density of an iron or a steel bar as compared with rolling. The rolls crowd the fibres back, as well as toward the centre; the action of the hammer is exclusively toward the centre. This is conspicuously shown in treating large steel ingots. The velocity of the hammer is greater than that of the periphery of the roll; hence the effect of its impact is greater on the surface of the ingot, while that of the rolls is more distributed throughout the thickness of the ingot. It would therefore be supposed that the hammer would draw the surface of the ingot so much as to leave concavities in its ends. The fact is precisely the reverse; the rolled bloom is cup-ended, although it is more uniformly condensed than the hammered bloom. The result of this must be, and the fact is, that the rolled ingot is less dense; it weighs less per cubic inch, but at the same time it is more uniform in structure.

It may occur to persons who have not frequented rolling-mills that there is nothing very remarkable in the machinery thus described—that the automatic operations of machines for working textile fabrics and the complex functions even of wood-working and machine tools indicate a higher order of engineering construction. The reply to this is, that more money has probably been sunk in iron-making machinery that would not work than in any other branch of mechanical engineering. The problem is an exceedingly difficult one, for ingenuity alone will not suffice, but it must be supplemented by extensive observation and experience. It is comparatively easy to make a complex machine perform its functions under a uniform load in a constant and ordinary temperature, and in a room protected even from the dust of the street. The work of a rolling-mill, however, is a series of tremendous shocks. It deals with red-hot metal in large masses, and must adjust itself to constantly-varying expansion by heat. These masses from their unequal temperature, structure, and compression really seem constantly trying to go wrong and to get into trouble, and the manner in which they are compelled to tumble about from roll to table, and from table back to roll again, is wholly destructive to second-class machinery. In addition to all this there are showers of dust and slag flying into places where they are not wanted, and many other embarrassments have to be provided for simply because they cannot be avoided. At the same time, the product must be of accurate size and finish, and also large in amount and constant, in order to yield a profitable return. A. L. HOLLEY.

Rolling Prairie, p.-v., La Porte co., Ind., on Lake Shore and Michigan Southern R. R.

Rolling Prairie, p.-v. and tp., Dodge co., Wis., on Northern division of Milwaukee and St. Paul R. R.

Rolling Stone, p.-v. and tp., Winona co., Minn. P. 595.

Rollins (ALPHONSO), b. in Hallowell, Me., Nov. 3, 1816; graduated at Wesleyan University, Conn., 1844; became a preacher of the Methodist Episcopal Church and principal of the high school at Sheffield, Mass.; was principal of Hempstead Seminary, N. Y., 1845–49, and afterward professor of languages in Delaware College, Newark, Del.; was zealous in the cause of education, a man of singular simplicity and purity of character, and an exemplary Christian. D. May 29, 1854.

Rol′linsburg, p.-v., Monroe co., West Va.

Rol′linsford, tp., Strafford co., N. H. P. 1500.

Rollo, or **Rolf.** See NORMANS, by E. MUNROE SMITH.

Rolls, Master of. See MASTER OF THE ROLLS.

Romagno′si (GIAN DOMENICO), b. at Salso Maggiore, near Piacenza, Dec. 13, 1761; in 1786 took his legal degree at Pavia; at thirty years of age published his *La Genesi del Diritto Penale,* which was not less applauded in Germany than in Italy. In 1791 he occupied important civil offices in Trent, where he continued to practise as an advocate; in 1802 was appointed professor of law at Parma, a position which he retained till 1806, when he was called to Milan to assist in digesting a code of penal procedure, which was afterward adopted. Later a chair was expressly created for him in Milan. Upon the fall of the Bonaparte kingdom of Italy he had to endure poverty and imprisonment. Being set at liberty, he continued his labors under great privations, supporting himself by private lessons. Cattaneo, Ferrari, Maestri, and other eminent Lombards visited and venerated him as their master. D. at Milan June 8, 1835. An edition of the works of Romagnosi in 19 vols. 8vo was published in Florence between 1832 and 1840; other editions have since appeared.

Roma′ic, a name sometimes applied to the language of the modern Greeks. (See GREEK LANGUAGE, MODERN, by PROF. A. N. ARNOLD, S. T. D.)

Roma′na, de la (PEDRO **Caro y Sureda**), MARQUIS, b. in Palma, island of Majorca, Spain, in 1761; served in the Spanish navy; participated in the defence of Gibraltar 1782; entered the army during the war with France 1792; became lieutenant-general 1795, captain-general of Catalonia 1800, and soon afterward member of the supreme council of war; was sent in 1807 to Pomerania in command of the force of 15,000 Spanish auxiliaries furnished to Napoleon, and withdrew these troops, by embarking them on the English fleet at the island of Fünen, Aug. 17–

20, 1808, on learning the treacherous imprisonment of his sovereign by Napoleon, and co-operated with the English in their operations in Denmark. In the Peninsular war he rendered efficient service as commander-in-chief in Northern Spain 1809–10 by organizing the guerilla warfare. D. at Cartaxo, Portugal, Jan. 23, 1811. His *Diary and Letters* were published at Paris (1825).

Ro′man Archæol′ogy. THE DEVELOPMENT OF ART IN ROME.—I. *The Pre-Hellenic Period.*—Before the establishment of the Greek colonies in Southern Italy the site of Rome was occupied by a Latin settlement in a very low state of culture. This is evinced by the fragments of vases and objects in bronze that have been found upon the Esquiline in the lowest stratum of earth yet examined, and in part under the portion of the Servian city-wall which defended that hill. The vases of Latian clay found in this stratum, which may be considered with certainty as products of native industry, are roughly moulded by the hand without the use of the wheel, are badly burned, and entirely without ornamentation. Of similar style also are the vessels found in the grove of the *Dea Dia*, which were employed by the Arvales in their sacred ceremonies, and in which, even if the existing examples belong to a later time, the Roman *ritus* certainly maintained the type in use at the institution of the worship of the Dea Dia. On the contrary, other vessels, fragments of which were found under the Servian city-wall, show an advanced process of manufacture, since they are made of a fine foreign clay, turned on the wheel, and painted on the light clay-colored ground with brownish or blackish stripes. The difference between these and the native pottery, together with the fact that similar vessels have been found in the eastern portions of the Old World, on the island of Cyprus, and in Nineveh, lead to the conclusion that these manufactures were imported from the East into Italy, probably by means of the Phœnicians. The few objects in bronze discovered in the same stratum also show a primitive Asiatic character; the most remarkable of these are large *fibulæ* from which little bells were suspended.

II. *The Period of the Hellenic and Hellenico-Etruscan Influences.*—Roman culture first received a higher impulse when the colonies from Magna Græcia began to extend their civilizing influence toward Latium and Etruria. This was felt by Rome, partly in a direct and partly in an indirect way, through the coast-towns of Southern Etruria, where in early times a rich industrial art, inspired by Greek models, had been developed. That the Latians had learned much from the Greeks in the development of their architecture in stone is evident, since many of the Latin words relating to materials and implements belonging to this art are derived from the Greek. Thus, *cal(e)x*, "mortar," is from χάλιξ; *machina* from μηχανή; *gnoma*, the "rule," from γνώμων, γνῶμα. It was also the Hellenic form of temple, modified by Etruscan influence, that was adopted by the Romans. The Etruscan temple, the *templum Tuscanicum*, followed, as far as our knowledge extends, the Doric type. The ground-plan, however, approached more to a square, the pediments were higher, the intercolumniations wider, and the building rested upon a high, oblong terrace, up to the front of which led an open flight of steps. The oldest temple in Rome, the temple of Jupiter upon the Capitol, built by Tarquinius Priscus, was in the Tuscan style. Also, the clay image of the god placed in the temple, and the *quadriga* of the same material over the pediment, were works by an Etruscan artist. The statue held the thunderbolt in its right hand, and in its left probably a sceptre. The flesh was painted red, and the color was renewed from time to time. The costume of the figure consisted of a removable wreath, probably of gold, and of the *toga palmata*, a garment decorated with Asiatic designs, in which the statue was draped on festal occasions. On the other hand, the wooden image of Diana placed in the temple dedicated to this goddess by Servius Tullius, on the Aventine Hill, appears to have been a Greek work, or at least a copy of one, for it exactly resembled an idol that the Phocæans had brought with them to *Massilia* (Marseilles).

Only a few examples of building in stone remain to us from this ancient period. First among these is the Servian city-wall, built of colossal blocks of tufa, without cement—a work in which the tendency of the aspiring Roman spirit to construct everything not provisionally, but for all time, finds a remarkable monumental expression: then the reservoir (*Tullianum*), at the foot of the Capitol, the covering of which is formed with layers of stone placed over each other, gradually projecting inward as they rise—a mode of construction that precedes the development of the true arch, and appears in Greece in the treasuries of Orchomenus and Mycenæ, as also in Etruria in tombs at Cære, Alsion, and Orvieto (*Volsinii?*); and finally in the Cloaca Maxima, built by Tarquinius Priscus in order to collect the subterranean springs that percolated through the Roman soil, as well as to drain and dry the morasses of the Velabrum and Forum. The original form, however, of this gigantic work has been greatly modified by later restorations.

Of the first centuries of the republic several evidences remain, showing an increase of the direct Greek influence. When it was decided to decorate the temple of Ceres (dedicated 485 B. C.) near the Circus Maximus, two Greeks, Damophilus and Gorgasus, distinguished both as modellers in clay (*plastæ*) and as painters, were called to Rome. The types of the Roman copper coinage (which begins under the Decemvirs, 451–449 B. C.) are formed after Greek patterns. The statue erected upon the Comitium to the interpreter of the Decemvirs, the Ephesian Hermodorus, appears also to have been the work of a Greek hand.

Especially indicative of the physiognomy of Rome, as it appeared in the fifth, fourth, and in some quarters of the city also during the two following centuries, is the known fact of the employment of Damophilus and Gorgasus as architects. The manner of ornamentation employed by these artists was that of a polychrome, terra-cotta style, early abandoned in Greece, but which, on the contrary, remained long in vogue in Latium and Etruria. The walls, whether of brick or of timber, were incrusted with plates of terra-cotta, upon which were painted ornamental, and sometimes also figurative, representations. At the eaves of the roofs were *antefixæ* of terra-cotta, in the field of which was introduced in high relief the head of a Silenus, a satyr, or of a woman, and around it ornaments in low relief, the whole painted in brilliant colors. Polychrome figures in terra-cotta adorned the pediments of the temples. Fragments of stucco decorations made in this manner have been found as well in the Etruscan cities as in Rome upon the Esquiline. They show the vast extension, and, since they represent a succession of different stages of style following each other, the long duration as well, of this method of ornamentation.

The picture that presents itself to our fancy, if we imagine the façades of a series of buildings decorated in this style, is far removed from poverty; on the contrary, it is exuberant with plastic and pictorial motives. A restful contrast to this gay variety was offered by the dark gray blocks of peperino, of which the substructions of the temples and of the public buildings generally were formed, although there is every probability that even of these the most prominent architectural members were rendered more conspicuous by the addition of color or of metallic incrustations.

A fact of much significance, in reference to the diffusion of Hellenic views of art among the Romans, occurs at the end of this period. In the year 301 B. C. a Roman patrician, C. Fabius, executed with his own hand paintings in the temple of Salus; and the branch of this distinguished family that descended from him received the surname of "the painters" (*Pictores*). The forms of the designs, however, assumed in many respects a peculiarly Italic character—a different stamp from the true Greek art. The ornamentation upon the peperino sarcophagus of Cornelius Scipio Barbatus (beginning of the third century before Christ—Vatican) consists of motives from the Doric style. Yet its *ordonnance*, which produces a calm and dignified impression, is due to the Roman artist. The group upon the cover of the celebrated Ficoronian *cista* in the Kircherian Museum, executed by Novius Plautius in Rome, represents Dionysus (Bacchus) supported by two satyrs. It thus introduces figures of Grecian mythology, and is very probably moulded after a Greek model. The forms, on the other hand, are completely Italic, and suggest involuntarily the Etruscan influences that had so thoroughly wrought themselves into the earliest phases of Roman development.

The Hellenic Period.—The extension of the Roman dominion over Magna Græcia, Sicily, and finally over Greece itself, was productive of most important results. By this means the Romans were brought into intimate relation with Grecian culture. The taking of Syracuse by M. Marcellus (B. C. 212), and the wars waged against Macedonia and Greece, successfully terminating in the conquest of Corinth (B. C. 146), opened the way for the transportation of numerous works of Greek art to Rome. First the public squares and buildings, then the town and country-houses of prominent Romans, were adorned with these treasures of Greek sculpture and painting. Moreover, this new capital of the world offered a better opportunity for remunerative labor than the declining cities of Greece proper and the hopelessly-shattered empires of Alexander's successors, and consequently there began at this time an extensive immigration of Greek artists to Rome. As early as the middle of the second century we find some of them engaged upon important public works. After the

triumph of Q. Metellus over Macedonia (B. C. 146), Hermodorus of Salamis erected a portico which bore the name of that general, and the same architect was commissioned ten years later, by Brutus, to build the temple of Mars lying in the vicinity of the Circus Flaminius. The temples connected with the portico of Metellus were adorned with sculpture by the Greek artists Polycles, Dionysius, Timocles, and Timarchides. Thus, Rome became gradually the centre of activity for Greek art. In comparison with the high degree of development attained in art in former times, there was now clearly a decline in the creative power; still, Greek art had enough of vitality, even upon Roman ground, to bring to maturity a beautiful after-growth. As at this period Roman civilization became, as a whole, more thoroughly Hellenized, as the literature almost universally assimilated itself to the Grecian type, so also in the realm of the fine arts Greece had almost completely crowded the Italic element out of the field. We have here, in fact, the spectacle of essentially pure Greek art carrying out on Italic soil the same tendency in its exercise which had prevailed in Greece and in the Hellenic East in the third and second centuries before Christ. Its course of development had not changed, but only the scene of its activity.

Architecture and Architectural Ornamentation.—In architecture the Romans seem to have better preserved their originality against Greek influence. This is easily to be understood, since that exact knowledge and that practical insight which are the fundamental requirements of architecture were precisely those features of national character for which the Romans were most conspicuous. Of this period comparatively few sculptors and painters with Roman names are known, and these few are by no means of great importance. But we have strong evidence that even in Greece the merit of Roman architects was acknowledged, in the remarkable fact that when the Syrian king, Antiochus Epiphanes (B. C. 176–169), determined to finish the temple of the Olympian Jupiter at Athens, he entrusted the direction of this undertaking to the Roman knight Cassutius. On the other hand, however, it is difficult to decide how far in architecture the Romans were really creative in the highest sense—how far they invented new elements in construction and ornamentation. There is a hiatus in the history of art for this period which renders impossible the satisfactory investigation of this interesting question. No period of Greek development was better adapted to influence the Romans, either as to architecture or in other directions, than that of the Diadochi (*i. e.* successors of Alexander), which was nearest to them in point of time and best suited to their views and requirements. Cities like Alexandria in Egypt, Antioch on the Orontes, Seleucia on the Tigris, founded with the direct object of establishing great centres of intercourse and commerce, must certainly have furnished the Romans with the most suitable models for the reconstruction of their own capital in a manner adapted to its newly-attained position of power. But, unfortunately, we know very little concerning the architecture of these Hellenic cities. It cannot, therefore, be positively decided whether the Romans acted independently in the construction of the arch, the vaulted roof, and the dome, which were favorite elements in their architecture, or whether they followed Greek models. The arch particularly became a conspicuous feature in the construction of gigantic aqueducts. These were not, as in former times, wholly subterranean, but by a succession of arches the water was carried above ground wherever the character of the surface required it, especially in the vicinity of the city. Thus, the Marcian aqueduct (built B. C. 142) was a subterranean structure for a distance of 528 Roman paces, while 6935 paces of its length rested on arches. The double purpose of use and ornament was served by the arch and vaulted roof in the construction of the *fornices*, or covered archways, which stood at certain important points as monuments to mark the direction of the main avenues of intercourse. From the time of the Republic are known to us the two *fornices* erected by L. Stertinius (B. C. 196), one on the Forum Boarium, and one in the Circus Maximus; a third was erected by Scipio Africanus (B. C. 190) on the Capitoline Hill; and besides these the Fornix Calpurnius on the slope of the same hill, and the Fornix Fabianus in the Forum. The motive of these structures was Hellenic. A passage-way of this kind existed at Antioch as far back as the time of the Seleucidæ. But at the beginning of the time of the emperors this originally Hellenic idea underwent a peculiar ornamental change. It was an old Roman custom on festal occasions to decorate temporarily the façades of the buildings, sometimes even the *fornices*, near where festivals were to be celebrated. Traces of this custom may be found in Italy on church-festivals even at the present day. For such decoration paintings on linen were made use of, which represented scenes appropriate to the festival. These were arranged in suitable places on the buildings to be adorned. During the time of the emperors art gave this temporary decoration a monumental character by substituting relief for painting. In this manner, out of the fornices, decked in their festive attire, grew the triumphal arches of the imperial age. The reliefs upon these clearly show, in their pictorial effects, a relation to the sister art of painting—a relation which becomes all the more apparent when our imagination supplies the polychromy, of which many traces still remain. The Tabularium, a building used for the state archives (finished B. C. 78), is a most majestic combination of the vaulted roof and the arch. This building was situated on the W. side of the Forum, directly upon the ashlar walls which surrounded the Capitoline Hill. It rested on a fivefold row of vaults, the outermost of which, still visible, faced the Forum as an open corridor with half columns of the Doric order. The main feature in the construction of the theatre and amphitheatre was likewise the arch and vault. It would not have been well to provide so impatient and restless a public as that of ancient Rome with no other opportunity of ingress and egress than a few doors; and consequently the whole lower wall of these structures was composed of a series of vaulted entrances. The upper stories were a repetition of the lower one, for the sake of harmony in the architectural effect, although openings for windows would have been all that was absolutely required. Engaged columns, entablatures, and attics served as a frame for the arches, these simple forms producing an impressive effect by their manifold repetition. Of the most ancient stone theatre in Rome, that of Pompey (built B. C. 55), all that is left is a portion of the substructure and the direction of the semicircular plan of the building, followed by the modern street S. Maria di Grote. Of the theatre of Marcellus, which Augustus completed B. C. 13, and which was named from his nephew, the son of Octavia, there are still magnificent remains of the exterior, showing the Doric order in the lower and the Ionic in the upper stories. Of this style of building the grandest structure is the Colosseum, built A. D. 80 under the reign of Titus, and capable of holding 87,000 spectators. In fact, the pilgrims of the Middle Ages saw in it the most emphatic monument of Roman greatness. The building is four stories in height. The three lower stories are composed of arcades, the piers of which are ornamented with engaged columns—on the first story of the Doric, on the second of the Ionic, and on the third of the Corinthian order. In the fourth story the wall is pierced by windows, between which are Corinthian pilasters. The architectural arrangement being so very simple, variety was secured by means of statues, which originally stood within the arches of the second and third stories.

Among the buildings with domes, the Pantheon (erected B. C. 27) stands foremost as probably the most beautiful, and certainly the best preserved, structure of ancient Rome. It is a circular building surmounted by a dome, and has a height equal to its diameter. A portico, with sixteen granite columns crowned by splendid Corinthian capitals, adorns the front. In order to form an idea of the original aspect of the exterior, it is necessary to suppose the absence of the tasteless belfries erected by Bernini; we must fancy the adjacent level much lower than it now is, as anciently five steps led up to the portico. On the pediment should be imagined a relief with statues at the summit and side angles, while the brick of which the circular portion of the edifice was constructed was faced with marble and painted stucco. The roof should be supposed to be covered with tiles of gilded bronze, which were carried off to Constantinople by the emperor Constans II. (A. D. 655). The original form of the interior is in many respects a matter of uncertainty. Under several of the later emperors, especially Septimius Severus and Caracalla, the building underwent restorations and alterations, while the popes introduced further modification by the construction of chapels. In spite, however, of all this maltreatment and of the removal from the ceiling of the bronze plates, which must have produced a wonderful effect of color, the mighty rotunda, flooded with light pouring down from a great circular opening in the centre of the dome, still produced a most powerful impression. The domed roof was also especially employed in the construction of the vast swimming-halls in the baths of ancient Rome. It is noticeable that in the construction of the Roman temples the massive substructure and the steps leading up to the front, which were characteristics of the Tuscan temple, were retained. The architectural and ornamental parts of the temple proper, on the other hand, were thoroughly Greek, although very variously, and not always appropriately, modified. In the construction of the more ancient peperino or travertine buildings the Greek forms were simplified. This arose clearly from the

character of the material, which did not admit of delicate ornamental finish. But in the marble structures of a later period these Greek forms were loaded with excessive ornament and intermingled one with another, the ornate Corinthian taking the precedence over the simpler Doric and Ionic orders. Still greater richness was thought to be attained by adding to the acanthus-leaf ornament of the Corinthian the spiral volutes and the egg-and-bead mouldings of the Ionic capital.

It is impossible to form an adequate conception of the innumerable public edifices, vying with one another in magnificence, which sprang, as it were, out of the ground, from the time of the first Cæsar down to that of Hadrian. The quarries of Luni (Carrara), from which marble began to be taken in the last century of the Republic, furnished a choice material for this purpose. But both before and after this time, blocks and columns of marble were imported from Greece. Augustus, even in his time, could boast that he found Rome a city of brick and left it one of marble.

From the time that Rome became the metropolis of the world it was evident that the old Forum was not adequate to the demands of public intercourse. The older Cato, in order to attract the public to the N. side, erected there the Basilica of Portia (B. C. 184); the Basilicas of Æmilia (B. C. 179) and that of Sempronia (B. C. 169) soon followed. Cæsar carried out the task most energetically, and erected on the S. side of the Forum the Basilica Julia, consisting of five aisles, but of this building little more than the pavement and the bases of several piers remain. On the N. side the Forum Julium was erected. Adjoining this stood the Forum of Augustus. The ruins of the enclosing wall, and the three beautiful Corinthian marble columns of the temple of Mars Ultor, forming the centre of the Forum, are striking proofs of the majestic grandeur of this structure. The imperial forums had, however, strictly speaking, nothing in common with those of the time of the Republic except their name. The latter were characterized by an open space in the centre, where it was customary for the people to assemble. The imperial forums, on the contrary, were a collection of public buildings, chiefly temples and basilicas, connected by walls or porticoes. The basilicas served not only as places for public intercourse, but also for judicial and administrative purposes. At this period the Campus Martius was adorned with a number of magnificent buildings, among which is worthy of notice the marble Septa, commenced by Cæsar and finished by Agrippa, and which was intended for the use of the *comitia tributa*.

A vast deal was done under Augustus to supply the city with water, and that in a most sumptuous manner. The Aqua Virgo and the Aqua Alsietina were led into the city, and the volume of the Aqua Marcia was increased. Agrippa during his ædileship constructed in a single year (B. C. 33) 700 basins, 500 fountains, 130 reservoirs, and employed in the decoration of these works 400 marble columns and 300 bronze and marble statues. The Palatine, on which Augustus had dwelt, was adorned on the S. side with the palace of Tiberius, of which hardly more than the foundations remain. Caligula extended the work in the direction of the Forum, and constructed a bridge to the Capitoline Hill, in order to have the readiest access to the Capitoline Jupiter, whose vicar on earth he considered himself. As is evident from the remains still existing, the hill was enlarged by extensive substructions in order to obtain a larger area for the imperial buildings. Farther to the W. the Flavian emperors erected their palace, the ruins of which, still standing, witness to the simple grandeur of the work.

Meanwhile, the terrible conflagration under Nero (A. D. 64?) had occurred. Of the fourteen city precincts, three were entirely, and seven wellnigh entirely, destroyed. A countless number of Roman monuments venerable for age, as well as many masterpieces of Greek art, were sacrificed. And yet this misfortune was not without its advantage to the city; for after the city was burned by the Gauls (B. C. 390), it had been reconstructed in a hasty manner. Consequently, the parts of the city dating from that period were built irregularly, and the streets were narrow and crooked. But the government in rebuilding the city after the conflagration in Nero's time took measures to remedy these defects. In consequence of the destruction of entire quarters of the city, room was obtained for the erection of large public buildings. Nero's Golden House, on the S. side of the Esquiline Hill, with its surrounding houses and parks extending into the valley between the Esquiline and Cœlian hills, requires only a passing notice as an illustration of the vicissitudes of earthly grandeur; for immediately after the emperor's death (A. D. 68), the whole establishment, with all its luxurious appointments, fell into decay. On the site of the artificial lake within the gardens of the Golden House, Vespasian began to build the Colosseum. The palace itself was made use of by Titus, in part, as a foundation for his baths. Of the Forum Transitorium, on the E. side of the Forum of Augustus, which was erected by Domitian, the last of the Flavian emperors, and finished by Nerva, there are still left remains of the wall of enclosure and two Corinthian columns with an entablature adorned with reliefs.

Architecture received a new impulse under Trajan, who employed an excellent Greek architect, Apollodorus of Damascus. Under the direction of this artist the Forum of Trajan was erected to the N. of that of Augustus, an extensive cut having been made between the Capitoline and Quirinal hills in order to obtain a sufficient area for that purpose. The principal building of the Forum of Trajan was the Basilica Ulpia, having five aisles, the central one being uncovered. This edifice has recently been partially excavated. Trajan's Column, with its gilded reliefs on a colored ground, was embraced within this gigantic structure, and enclosed in a court, as it were, formed by two wings projecting from the basilica. The constructive activity of the emperor Hadrian is exemplified in the double temple of Venus and Roma on the Velia, the plan of which the emperor designed with his own hand (A. D. 135). It was composed of two temples, having a single roof covered with tiles of gilded bronze. The cellæ of the two temples adjoined each other, and the whole was surrounded by a double portico of granite columns. All that remains, besides a number of shattered columns, is a portion of the immense foundations, the ramp, and fragments of the brickwork of the two cellæ. The imperfection of the brick, however, makes it improbable that this latter was a part of the original building, but rather leads to the conclusion that it was a restoration after a fire, by Maxentius (A. D. 307). The Mausoleum of Hadrian (Castle of St. Angelo), begun by that emperor and completed (A. D. 140) by Antoninus Pius, consisted of a square substruction, upon which stood a terrace-like superstructure covered with marble and adorned with statues. The substructure is buried in débris, and only portions of the terrace-like interior mass or core of travertine have stood the wear of the centuries. From the time of the Antonines, besides the column in honor of M. Aurelius, we have only the temple of the elder Faustina (erected A. D. 141), on the N. side of the Forum, and which was afterward likewise dedicated to the memory of Antoninus Pius. The portico, with its ten columns of costly Eubœan (cipollino) marble, left unfluted, is still standing, besides a portion of the cella, which is, however, wellnigh robbed of its marble facing. The back part of the cella has been turned into the church of St. Lorenzo in Miranda. After the Antonines, even at the time when the downfall of the Empire was becoming more and more evident, many sumptuous buildings were erected in Rome. Caracalla strove to surpass all his predecessors in the colossal baths, capable of holding 1600 bathers, which he commenced on the S. E. side of the Aventine Hill, near the Via Appia, but which were not completed until the time of Alexander Severus. These were incrusted with costly stones and peopled with an army of statues. This magnificence has all disappeared, leaving only the brick walls which formed the main body of the building. The city-wall of Aurelian presents itself to us—a *memento mori*, as it were, of the following period. It was constructed in view of the constantly-increasing danger from the encroachments of the barbarians. The Baths of Diocletian, on the Viminal, were still more extensive than those of Caracalla, and, it is said, were capable of accommodating 3000 bathers. Two large dome-covered halls, which once formed a portion of the Baths of Diocletian, are now included in the churches of St. Bernardo and St. Maria degli Angeli. The basilica on the Velian, with its three aisles, was built by Maxentius, and remodelled by his successful rival, Constantine. Three of the arches still stand, though robbed of their original ornamentation. They are of an enormous span, and have served as models to many architects of modern times. Constantine presented the city of Rome with baths which were situated on the Quirinal; but, as was to be expected, the architectural energy of that emperor was mainly expended upon his new capitol in the East.

A close inspection of the above series of buildings proves that architecture, down to a very late period, preserved the indications of a strong feeling for grandeur in plan and in the arrangement of the interior, as well as of masterly mechanical skill. These valuable features were transmitted by declining paganism to the Christian architecture of the East and West. On the other hand, the decline in art showed itself especially in two directions. The first of these was the loss of a feeling for the significance of the component parts of the architectural whole. The column was no longer used in its appropriate office as a support to

the building, but chiefly for the sake of its pleasing effect. The Corinthian columns, for example, in the Basilica of Maxentius, placed against the main piers, served only apparently to support the building, and therefore the eye scarcely perceives that they are now lacking. The other direction in which the decline manifested itself was in the treatment of the ornamentation. The passion for costly material worked most disastrously in this respect. The first traces of this taste may be found as early as the time of the Julian emperors. In still later times the custom prevailed of using brittle kinds of stone, such as porphyry and jasper, in which any delicate treatment of the ornamentation was impossible. Thus, the contractor and polisher came in time to be of more importance than the designer. This taste could not fail to exercise, also, a most pernicious influence upon works in marble, for the artist naturally strove to supply (by an excess of ornament) the color and brilliancy which were lacking in his material. The same causes and consequences are alike apparent in the ornamentation of the interior and the exterior of buildings. In the earlier stages of the period under consideration the decoration of interiors was chiefly fresco, and in private houses the Greek manner of the time of Alexander's successors was, for the most part, followed. During this period the spoliation of the Grecian republics, partly by plunder and partly by purchase, brought into the possession of the conquerors a considerable collection of panel-paintings, and the custom was then introduced of using these pictures as the central ornament of the wall. Not every one, however, was able to obtain a sufficient number even to meet the demands of a moderately-sized dwelling. It was necessary, then, to call in the aid of the fresco-painter, who supplied the lack of the actual panels by imitations executed on the stucco of the walls. This mode of decoration, originating on the eastern shores of the Mediterranean, was imitated by the Romans even in the third century before Christ, and continued among the less opulent down to the period of the decline of classical culture. We are supplied with abundant material for becoming familiar with this mode of decoration by the excavations of Rome and Pompeii. The pictures which occupy the centre of the walls are clearly imitations of panel-paintings, as may be seen from the simulated frames which surround them. Where more extensive compositions were to be represented, the imitation of panel-paintings would have given a heavy, cumbersome effect; to avoid this, they resorted to the ingenious device of representing the walls with imaginary openings, so that they resembled the scenes of a modern theatre, the pictures appearing as if seen through these openings. The painting now no longer burdens the wall, but appears entirely distinct, and as something seen through a window or door. In this manner, for instance, the pictures of Io and Galatea on the Palatine Hill were treated. More extensive spaces, such as corridors, courts, and garden-porticoes, were sometimes decorated in fresco with imaginary outlooks upon parks, grounds, and seaports. In this style of painting, which is also traceable to a Greek origin, a certain Ludius in the time of Augustus became distinguished. The unpoetical but forcible representation of a park on the basement wall of the Villa Livia, situated on the Via Flaminia, is most probably to be ascribed to that artist.

Fresco-decoration, however, in the houses of the wealthy, soon found a rival in the practice of encrusting the walls with costly stone. In this, too, the Romans followed in the footsteps of the Greeks of the time immediately succeeding Alexander, carrying the original idea still farther, and that to excess. Marble facings for walls were first introduced by Mamurra in his house on the Cœlian Hill in the time of Cæsar. Under Claudius and Nero, as we learn from Seneca, the practice of adorning walls with facings of parti-colored stones had become not unfrequent in Rome. Costly marbles finely cut and polished, varying in color in the different architectural divisions, shone in the state apartments of the emperors and of the Roman aristocracy. The ceiling as well, in order to harmonize with the walls, was made brilliant with gold and enamel, and the floors with mosaics. In the time of Claudius the covering of the divisions of the walls with one simple marble was thought too plain; whereupon it became customary to cut out portions of the marble slabs, and then to insert stones of a different color. In this way ornaments, and even figures, came to be represented in stone intarsia. Variously-colored glass, adorned with ornaments and figures, was frequently used for these mural incrustations, and for the same purpose metallic plates were also sometimes employed. In Nero's Golden House these ornaments were composed of gold inlaid with precious stones and mother-of-pearl. Very little of this luxurious mural ornament has come down to us, since later generations have carried off all that was of value. In the triclinium of the palace of the Flavian emperors on the Palatine Hill, in several places pieces of the parti-colored incrustation that covered the walls still remain. From these, by the aid of the imagination, we are able to form a faint idea of the former magnificence of the two halls. Two fragments of mural incrustation were discovered on the Palatine Hill which explain the methods invented during the time of Claudius. They show rich ornamental forms produced by the combining and inlaying of many-colored marbles collected from the various parts of the ancient world. The innumerable fragments of diversely figured and cut glass with which the surface of Rome is literally strewn witness to the extent to which this material was used for incrusting the walls. From the third century red porphyry became the favorite material, the destructive influence of which we have already discussed.

IV. *Sculpture and Mural Decoration.*—In the Roman sculpture of this period two tendencies, the idealistic and the realistic, may be distinguished. The first occupies itself specially with the mythological department, but also sometimes takes to the portrait and to the representation of scenes from daily life. It does not work *originally,* in the highest sense of the word, but is limited, in a greater or less degree, to models from the preceding Greek development. This already shows itself among the artists employed in the service of Metellus Macedonicus. (See above.) Several evidences lead to the conclusion that these artists sometimes re-treated archaic Greek types in the spirit of free art. The statue of Athene, by Timocles and Timarchides, held a shield copied from the Athene Parthenos of Phidias. Through a series of works that have been preserved we are made acquainted with a group of Athenian artists who lived in the last century before Christ. The most distinguished among these are—Apollonius, son of Nestor, the sculptor of the Hercules torso in the Vatican (probably identical with that Apollonius who, after the burning of the Capitoline Jupiter in the time of Sulla, executed the statue of the god designed for the new building); Cleomenes, son of Apollodorus, the artist of the Medicean Venus; Cleomenes, son of Cleomenes, author of the fine portrait-statue in the Louvre mistakenly called Germanicus. This last statue repeats the motive of an archaic type of Hermes. The Medicean Venus belongs to those figures which through a series of intermediate stages are gradually derived from the Cnidian Aphrodite of Praxiteles. Glykon, one of the latest artists of the group referred to, in the execution of his statue of Herakles (Farnesian Hercules, Naples) followed a type probably designed by the second Attic school in the fourth century B. C. The naturalistic treatment and the exaggerated expression of physical strength belong only to the artists of the imperial times. The reliefs on marble vases by two other sculptors belonging to this group, Sosibius (Louvre) and Salpion (Naples), are derived throughout from earlier motives. Since the dependence of these *New Attics,* as they are generally called, upon older productions is clearly recognizable in nearly all their known works, the few sculptures respecting which—as, for example, the Hercules torso of Apollonius—our imperfect sources of information authorize no such conclusion, prove little to the contrary. We may, then, with entire certainty formulate our judgment concerning these artists, that for the conception they were substantially dependent upon ancient works, but that in the execution they showed independence, and thus lent a new charm to the motives reproduced.

A peculiar direction was taken by the school of Pasiteles, himself a versatile and also literary artist of the last century before Christ. We know the statue of an Ephebus, with an inscription (Villa Albani), executed by a scholar of Pasiteles, Stephanus; also a marble group (Villa Ludovisi) generally considered to represent the meeting of Orestes and Electra, and shown by the inscription to be the work of Menelaus, a pupil of Stephanus. Both sculptures are eclectic works, in which the artists aimed to unite the excellencies of different epochs of style. Stephanus has placed an archaic type at the foundation, but treats the nude with the fine naturalism to which the chisel in his day had attained. Menelaus, who was inspired by a motive from the flourishing period of Greece, added to it heterogeneous elements of every kind, and treated the whole with the elegant finish of his time. Eclecticism, then, which presupposes, in all cases, a dependence upon earlier works, must be considered the essential characteristic of the school of Pasiteles, while the kind and degree of that dependence may in some instances be disputable. The manner of treatment, however, remains as the unquestioned merits of these artists. The same is true of Arcesilaus, who wrought the statue of the goddess for the temple of Venus Genetrix, dedicated by Cæsar in 46 B. C. No mention is anywhere made of the ideal purport of his works, but Varro dwells with great praise upon the care-

ful treatment of his models. In the creation of a marble group representing a lioness surrounded by sporting Cupids, and of the statues of centaurs bearing nymphs, the artist seems to have transferred to sculpture motives originating with the Greek painting of the Diadochi period.

In other works of art also, belonging to the epoch under consideration, the authors of which are unknown, recent investigations have shown the same dependence upon ancient models. The well-known group representing Venus and Mars, and probably connected with a work placed in the temple consecrated by Augustus to Mars Ultor (2 B. C.), is strictly derived from two types of the earlier development. One is the well-known figure of Aphrodite holding a shield; the artist of the imperial period, omitting the shield, made the arms of the goddess rest upon the shoulders of Mars, who stands before her; this last figure probably originating in a Peloponnesian school. From the same type, the shield-bearing Aphrodite, is derived the Victory writing upon a shield, of which we have examples in an excellent statue in Brescia and in the reliefs of the Column of Trajan. The celebrated statue of the Nile (Vatican) is the reproduction of an original from the Ptolemaic period. We come to a similar conclusion from the investigation of the portrait-statues, of which the early imperial period presents several very prominent examples, as for instance, that of Augustus from the Villa ad Gallinas (Vatican), that of the older Agrippina (Capitol), etc. From a considerable series of these portrait-statues it is evident that the clearly thought-out and beautifully-expressed motives of the figures belong, in fact, to the earlier development of art which took place on Greek soil. The merit of these portrait-sculptors of the imperial period is essentially limited to the skill with which they managed to impress the personal likeness upon the heads.

In view of these facts we are justified in saying that the plastic art of this period was rather reproductive than original—that when called to poetic creation in the higher sense, it found itself incapable, and fell back upon older productions. On the other hand, it possessed to the fullest extent the power of delicately seizing and reproducing with artistic correctness the forms presented by nature. A considerable decline in this power is first perceptible in the time of Hadrian. Under this emperor arises a peculiarly dry and smooth modelling of forms, and also the custom of brilliantly polishing the surface of the marble—a treatment which compares very disadvantageously with the less elegant but far more lifelike characteristics of the preceding development. To this early stage of decline belongs the last important type to be seen in the history of classic art, the type of the favorite of the emperor Hadrian, the Bithynian Antinous, with whose statues and busts the museums are filled. Since, in the immediately preceding and contemporaneous development, this type stands as completely unique, we may conclude with certainty that the creative merit of art in its formation is to be estimated as very small. Antinous must have been one of those gifted beings in whom Nature herself presented, as it were, an ideal of physical perfection. Art had, in fact, only to enlarge the wondrous form into the colossal, and represent it in the attitudes and with the attributes of the traditional types of the divinities. Were the artistic power here exhibited truly creative, why should this power have manifested itself only in the Antinous, and in no other instance?

After the age of the Antonines the decline in plastic art was most precipitous, at least, in so far as it dealt with ideal themes. An eloquent proof of this is the anonymousness which covers with silence almost the whole art of the third and fourth centuries. So far as our positive knowledge of the monuments extends, there exists of this period no representation of any god from the classic Olympus worthy of mention. On the other hand, the statues of Mithras, of the shocking Æone, the repulsive figures of the Ephesian Artemis, are everywhere prevalent. A most pernicious influence was exerted by the richness of the material, since the costliness of this came to be considered the principal thing, and the artistic treatment was regarded as only secondary. For important and enduring monuments the kinds of stone selected offered, from their very hardness, insuperable obstacles to the development of true form. In the hard, unyielding red porphyry, for example, from which the sarcophagus of Helena, the mother of Constantine, and that of Constantia, the sister of the emperor (Vatican), are wrought, it would have been impossible even for a skilful artist familiar with anatomy to bring the human form to any seeming of organic development. Colossal dimension, as well as richness of material, was a great object of admiration. Alexander Severus caused a multitude of gigantic statues to be erected in Rome. A bronze figure, representing the emperor Gallienus as the Sun-god, measured about 240 feet, and the marble statues of the emperor Tacitus and his brother Florianus at Terni, about 30 feet. It is evident that the defects in an art which cannot come up to its task in the small must show themselves much more conspicuously in the colossal.

The most pleasing, comparatively, and certainly for the history of art the most interesting, productions of this age of decline are the sarcophagi, adorned with figures in relief, which came into vogue from Hadrian's time. The reliefs, mostly mythological subjects, scenes from the story of Bacchus, the myths of Meleager, Hippolytus, etc., repeat motives from the older Greek art, especially from that development of painting which began in the time of Alexander. It would seem that the stonecutters had at hand books of designs from which they compiled these motives as occasion required. In this way many mistakes may have occurred, the representation may have almost always violated the rules of relief, and often been overloaded or confused; still, these sarcophagi show, at least in some of the figures or groups, a reflection, however feeble, of the prominent works of Greek art; and since the originals, especially the paintings, are irrevocably lost, they are of the greatest importance to us in the history of art.

The realistic tendency, which was fostered together with the ideal one of which we have spoken, does not appear at all in the foreground during the last century before and the first after Christ, but remains secondary and limited to a lower sphere, at least as far as regards portrait and *genre* representations. The realistic portrait of this period is distinguishable from the ideal by certain mechanical methods of producing expression. In the latter, the eyelids are elaborated with a strong feeling for style, and there is no intimation of the eyebrows; the realistic school makes the edges of the lids rest upon the eye, as is the case in nature, and marks the form of the brow. Sometimes the pupils are indicated by grooved outlines, a practice which first became general in the third century after Christ. Traces of a similar tendency in portraiture are already perceptible in the time of Alexander the Great and of the Diadochi. While, however, judging from the few monuments remaining, art at that time reproduced the elements offered by Nature with a certain reserve, and distinguished between that which she intended and that which was accidental, the Roman tendency was to copy faces exactly as they appeared to the eye, impressing upon the stone every accidental imperfection, every wrinkle of the skin, and every wart. This confirms the supposition that this unreserved realism was encouraged by the Roman custom of fabricating waxen images of their ancestors (*imagines majorum*), in which usage, as well as the material, demanded a precise copy of nature. Still, the portrait-statues, especially those made in the capital during the first century of the imperial time, adhere, as a whole, to the principle of ideality, and during this period the exclusively realistic manner was limited to an inferior style of art—namely, to the busts wrought in high relief for Roman funeral monuments. It was not till a later time, when the reaction toward the smooth, academic manner of the Hadrianic period began, that it assumed its place as an equal of the ideal, and preserved its vital force even longer. During the whole of the third century this school produced admirable works, as is proved, among others, by the busts of Caracalla which represent in a masterly manner the brutal nature of this emperor. The same phenomenon appears in the province of *genre* representation. In the earlier portion of this period we encounter a realistic tendency only in the reliefs on the monument of the baker Eurysaces of the time of Sulla—a work of very plain, not to say coarse, execution, representing the various processes in the preparation of bread.

Unlimited, on the other hand, is the sway of the realistic tendency in the historical representations with which triumphal arches and other similar monuments were adorned in the imperial ages. Already, during the period of Alexander the Great and of the Diadochi, may be seen in the representations of contemporary events—battles, festal processions, hunts, etc.—an endeavor to portray characteristic scenes from real life. Yet in so doing they, with correct feeling, made special use of painting, and while they proceeded to represent the facts offered by the real, they at the same time sifted and refined them, brought the best into prominence, and arranged the composition according to æsthetic rules. The historical reliefs of the imperial times appear as a further development of these works—a development in which the endeavor to be true to the real emancipates itself more and more from artistic fetters. The band of figures winding up the triumphal columns narrates, chronicle-wise, the principal events of the campaign according to the imperial bulletins, and can be compared to nothing more analogous than to a parchment roll upon which is inscribed an abridgment from the Roman general-staff records. It was clearly impossible to portray complete compositions in this manner. Then follows

another peculiarly picturesque mode of treatment, explained by the fact that the historical relief of the imperial times stands in close relation to a preceding development of painting, and was, in fact, used for decorative purposes in much the same way as the sister art has since been employed. (See above.) By the multiplication of the planes of relief an attempt was made to obtain an effect corresponding to perspective in painting. Bold foreshortenings, intimations of landscape detail, and other means of expression properly belonging to the pictorial art, became, with the advance of this development, more and more frequent, and more prejudicial to the plastic clearness of the representation. On the other hand, as late as under Trajan it continues to be characterized by a freshness and energy which reconcile us, in a certain degree, to the violation of the rules of plastic composition that frequently occurs in these monuments. As Trajan was the last emperor who with a strong hand secured and strengthened the Roman dominion both within and without, so the historical representations describing his achievements received an upward impulse which justifies us in regarding the age of Trajan as the last brilliant period of classic art. After his time there is a rapid decline even in this form of art. The defects, which in the Trajan monuments appear in isolated cases and without exaggeration, are now multiplied. The reliefs of the Arch of Septimius Severus show a multitude of planes piled one above another, and upon each of these a crowd of figures which completely confuse the eye. Under these circumstances we must be grateful to the Roman senate, which, when the arch in honor of Constantine was to be erected, assigned a subordinate place to the inferior sculptures of his time, and borrowed the chief ornaments for the new structure from a monument of the age of Trajan.

The pictorial art shows, in every respect, a development analogous to that of the plastic. It is true that the writers preserved to us make very little mention of the painting of this period. We are told that in the last century of the Republic the portrait-works of Sopolis, Dionysius, and of a female painter named Ia or Laia, were esteemed—that in the same period a certain Avellius painted goddesses with the features of his mistresses. In the Augustan age we hear of the decorator Ludius or S. Tadius. (See above.) Under Vespasian, Cornelius Pinus and Attius Priscus decorated with paintings the temple of Honos and of Virtus, the restoration of which was then completed. Moreover, in writers of the first imperial century passages are extant which speak very disparagingly of the state of contemporaneous painting. Petronius, the best art-connoisseur among the Roman authors whose works are preserved, and who probably lived under Nero, says in plain terms that painting was entirely a thing of the past, and Pliny characterizes it as a "dying art." These individual statements are supplemented and corrected by an examination of the wall-paintings found in Rome and in the Campanian cities that were buried under the eruptions of Vesuvius. These place us at once in a position to estimate rightly the severity of the contemporaneous criticisms. The execution of the frescoes, however hastily sketched they may have been, is on the whole excellent. In accordance with the conditions required in fresco-painting, they represent only the essential, but this they do with great energy and freshness. Since, then, the execution of decorative fresco maintained itself at so considerable an elevation, we have a right to suppose the same to be true in a greater degree of the contemporaneous pictorial panel-painting. Thus, the condemnatory verdict of competent contemporaries does not refer so much to the execution, of which there was no reason to complain, as to the conception; and this supposition is strikingly confirmed by an investigation of the originals reproduced by the mural painters. The compositions occurring in these frescoes, representing scenes from Grecian mythology and from ancient daily life ideally depicted, are by no means conceptions of the imperial period, but rather creations of true Greek art, reproduced here with more or less freedom. Some of these compositions have been traced back with certainty, or at least probability, to known Greek masters. A series of frescoes representing Io guarded by Argos (Rome, Palatine—Pompeii), and another series showing Perseus leading the released Andromeda down the rock to which she had been chained (Pompeii), are probably reproductions of two celebrated paintings by Nikias, a master who flourished in the time of Alexander the Great and of the first Ptolemy. The wall-paintings representing Danaë with the boy Perseus upon the shore of Seriphos (Pompeii) seem to be traceable to an original by Artemon, a contemporary of Demetrius Poliorcetes. And, finally, those representing Medea about to kill her children, yet still restrained by the conflict between the passions of maternal love and jealousy (Herculaneum, Pompeii), repeat a grand composition by Timomachus, an artist probably of the Diadochi period. We can easily understand that the selection of the compositions to be reproduced in fresco should fall especially upon those of the Greek school, beginning at the Alexandrian period; for this development lay nearest the Romans in respect to time, and exercised also in other directions a manifold influence upon their civilization. Very few wall-paintings can, with any probability, be traced to originals earlier than the time of Alexander. Among the examples found in Rome we may only reckon as properly belonging to these the Nozze Aldobrandini (Vatican Library), the composition and forms of which do not show the artistic principle which was brought to full development in the time of the Macedonian hero. On the other hand, the art of the Alexandrian and Diadochi age occupied itself less with grand subjects of a monumental character (megalographia) than with those suited for cabinet pictures intended for private enjoyment. As these cabinet pictures were not rich in figures, and were of proportionally small dimensions, and as they did not so much attempt powerfully to strike the spectator by the grandeur of the subject as to impress him agreeably by graceful representations of situations easily understood, they were excellently well adapted for reproduction in Roman mural painting. In Roman dwellings these pictures, being placed in the centres of walls generally very limited as to space, satisfied all the demands which could reasonably be made upon such a style of decoration, and afforded an agreeable resting-point for the eye, without absorbing the attention. The subject of the scenes represented, and the sentiments associated with them, whether of an idyllic character (as, for example, in the frescoes representing Paris upon Ida surrounded by his flocks), or sentimental (as, for example, in the pictures of Ariadne forsaken upon Naxos), or of a sensual, wanton nature, were as perfectly comprehensible to the Roman, even if he did not understand the Greek language, as to the Greek of the Diadochi period; for the Latin poetry of the Augustan age had borrowed its themes from the Alexandrian poetry which had inspired these very pictorial compositions, and they treated the same subjects as their predecessors had done, and in the same spirit.

In Roman fresco-painting an important place is occupied by the landscape, a province of art which also came into independent development during the age of the successors of Alexander. The most beautiful extant paintings of this kind are the landscapes discovered on the Esquiline, with scenes from the *Odyssey* (Vatican Library). As Vitruvius mentions landscapes with such staffage (*Ulixis errationes*, etc.) as among the motives of the wall-decorations of the "ancients," and as it is evident from the connection of the passage that these "ancients" were none other than the Alexandrian Greeks, it is therefore certain that the Esquiline pictures are taken from originals of the Diadochi period. The observer must expect in these landscapes no peculiarly harmonious representation of atmospheric effects, in the expression of which modern landscape-painting is so brilliantly successful. The poetry of such scenes is brought out in a far less degree in ancient than in modern art, nor did the limited means of decorative fresco-painting permit it to be made very intelligible. The essential merit of the artist who originated the Odyssean pictures lies in the plastic development of the landscape, in the clear arrangement of the planes, the harmony of the proportions, and the nobility of form in the figures introduced.

An exclusively realistic tendency manifests itself only in the mural painting of a very inferior kind. In Pompeii this class of pictures are almost entirely confined to houses of a very poor, or even of a decidedly questionable, character. They depict the manners and habits of artisans and wagoners, who are drinking or making merry with dissolute women, and other scenes from the daily life of the provincial towns of Campania, always represented with a low, sometimes even brutal, feeling, and almost without exception of very coarse execution. After the year 79 A. D., in which the Campanian towns were buried by the unexpected eruption of Vesuvius, and which also cost the life of Pliny, to whom we are indebted for most of our information upon ancient painting, we can no longer follow with any certainty the history of this art. However, the few frescoes of later date which are preserved to us show that then, as before, they repeated the traditional mythological motives transmitted from the earlier antiquity, but that at the same time the execution deteriorated from generation to generation. The paintings of a tomb on the Via Latina, belonging to the Hadrian period, show already a considerable decline, as far as the freshness and energy of the work are concerned, when we compare them with the average of the mythological pictures of Pompeii. The rise of Christianity did not tend to arrest this decline, but rather hastened its downward course. It is true that the Chris-

tian Church—since sculpture not only answered very imperfectly to its needs, but also retained for a long time a suspicion of heathenism—had a decided preference for painting, and assigned to it, or to the intermediate art of *relief*, the task of proclaiming artistically the new creed. In the first place, unlike paganism, which in all times had permitted a high degree of independence in the treatment of the forms of the gods and of all mythological subjects, the Church kept art closely hampered by the bands of an orthodox discipline, which could not but be detrimental to it. In the second place, the *Ecclesia triumphans*, when it entered upon the inheritance of heathenism, adopted also the pernicious use of rich material. The programme of the Christian faith was especially announced by means of dazzling mosaic, a species of art which makes any individual rendering of the outlines difficult, but which answered admirably the purpose of the Church, to bring before the eye sacred forms and histories under orthodox types and clothed with great external brilliancy.

W. HELBIG.

RESULTS OF RECENT EXCAVATIONS.—The works for the extension and embellishment of the city of Rome executed during the last five years have been the occasion of a great number of archæological discoveries, which we propose to describe as briefly as possible in order to show what immense progress our knowledge of the history and topography of the ancient metropolis of the world has recently made. Properly, our description should classify the new monuments according as they belong to architecture, to painting, to sculpture, to epigraphy, but as most of the discoveries relating to the three latter classes must necessarily be mentioned in connection with the edifice to which they belong, our object may be obtained more simply by giving a topographic description of the architectural monuments.

(*a*) *Fortifications.*—Rome has been defended at three different periods by three different walls—that attributed to Romulus, which surrounds the Palatine; that of Servius Tullius, which encircles the Seven Hills; that of Aurelian, which forms the enclosure of the city at the present day. Four fragments of the wall of the Palatine have been discovered, as well as the site of the gates Mugonia and Romanula. As to the wall of Servius Tullius, it may be traced to-day at forty-two different points, the most considerable remains being those discovered in the Villa Torlonia, upon the Aventine, near the railway-station. The site of the gates Ratumena (1865), Fontinalis (Nov., 1875), Sangualis, Collina (1873), Viminalis, Esquilina, and Capena (Mar., 1871) has also been recognized. In Dec., 1875, were discovered some vestiges of the citadel, or *arx*, which occupied the N. E. summit of the Capitoline, and which seems to have been defended by a double enclosure, the one contemporary with the wall of Romulus, the other with that of Servius.

(*b*) *Temples.*—The number of temples, either standing or uncovered, which in 1870 was twenty-one, has now risen to thirty. Among those recently discovered we should mention—the temple of Cybele, discovered in 1870 on the Palatine, with the statue of the goddess; the temple of the Flavians, discovered 1872 in laying the foundations of the new ministry of finance, with a colossal head of Titus; the temple of the Dea Dia (Ceres), discovered in 1868 outside the Porta Portese, at the station of the Magliana, with 1750 lines of the *Acta Fratrum Arvalium* engraved on marble; the temple of the Fortuna Primigenia, discovered in 1873 between the Baths of Diocletian and the Prætorian Camp, with many inscriptions and a statue representing the Roman lady Claudia Fusta, with the attributes of the goddess; the temple of Julius Cæsar, discovered in 1873 at the S. extremity of the Forum, with many fragments of the *Fasti Consulares et Triumphales*, which were engraved on the basement wall; the temple of Jupiter Capitolinus (1865–76), on the W. summit of the Capitoline; the temple of the Palmyrene Sun (1857), outside the Porta Portese; and, finally, the temples of Bellona and of Honor and Virtue, discovered in 1873 in the foundations of the ministry of finance. Also, the temples of Castor and Pollux, of Jupiter Victor et Stator, of Trajan, of Venus, and of Rome, already in great part known, have lately been entirely uncovered.

(*c*) *Basilicas.*—The whole of the surface covered by the Basilica Julia, which occupied the entire W. side of the Forum, has been completely laid open. The pavement, enlivened by polychrome marbles, is tolerably well preserved, but the triple range of porticoes which surrounded it has almost completely disappeared.

(*d*) *Theatres.*—In Jan., 1876, in the course of some restorations of the palace Savelli-Orsini, which occupies the site of the theatre of Marcellus, there was discovered a considerable portion of the lower portico, filled with architectural fragments of every kind. An imperfect imperial inscription, found in the same place, mentions a restoration of the stage of the theatre by Antoninus Pius.

(*e*) *Amphitheatres.*—During the whole of the year 1874 excavations were making in the interior of the Colosseum. Thus, we have been able to study the system employed for raising and lowering the cages of the wild animals; we have found the small cells in which they were kept before the commencement of the games; in short, all the details of the service of the amphitheatre have been revealed with the greatest minuteness. Almost all the architectural fragments found in these excavations belong to a portico or gallery which crowned the interior of the edifice. Some inscriptions have also been found indicating the place reserved at the games for personages of the court and for the higher order of magistrates.

(*f*) *Circuses, Stadia.*—The palace of Augustus on the Palatine was separated from the palace and the Septizonium of Septimius Severus by a stadium built by Domitian and restored by Hadrian. This stadium was mostly uncovered in 1872; the portico which surrounds it is composed of columns of brick cased with marble, but the imperial tribune was decorated with surprising richness, if we may judge by the shattered columns of Oriental marble, the fragments of sculptured frieze, and other ornamentation found in the excavations.

(*g*) *Thermæ.*—Rome in the period of her splendor counted eleven large thermæ, some of which could receive as many as 2000 bathers at a time, and 856 baths of an inferior order, for the use of the lower classes. These last have almost totally disappeared, but many of the thermæ still exist, and several of them have been explored since 1870. M. Scellier de Gisors, a French architect, has made excavations in the Baths of Titus, bringing to light certain details of the plan hitherto unknown. The Baths of Antoninus Caracalla have been cleared under the direction of the government. The superb mosaic pavements of the halls are nearly all preserved, as well as many fragments of architectural decoration. In the *cella tepidaria* several pieces of columns in porphyry and other stone have been found. The first are three feet in diameter, the others five. Several capitals adorned with representations of divinities have also been found, as well as three mutilated statues whose perfection is worthy of the place from which they were taken—the Farnese Bull, the Hercules, and the Flora. In the piazza of S. Eustachio and in the neighborhood of the Pantheon several halls and chambers of the Baths of Agrippa, filled with fragments of columns, entablatures, and bas-reliefs, have been discovered. The open space paved with travertine in front of the Pantheon has been uncovered to an extent of 120 square mètres. In the Aldobrandini and Rospigliosi gardens, on the Quirinal, some considerable remains of the Baths of Constantine have just been brought to light—the theatre, or *hexedra*, and the rooms which formed the S. E. angle of the baths. The pavements here are composed of very rare marbles, but the circumstance most worthy of observation is, that all the foundations of these baths are constructed from the spoils of older monuments, such as columns, capitals, broken statues, friezes, marble roofings, etc. Among the baths which have just been discovered, the existence of which was before almost unknown, we shall mention two—those of Neratius Cerialis, on the Piazza di Santa Maria Maggiore, in which have been found many statues and inscriptions of exceptional value; those of Heliogabalus, between the Palatine and the temple of Venus and Rome. These last had been used in the seventh century as Christian chapels.

(*h*) *Forums.*—The exploration of the Roman Forum may now be considered as complete. It has the form of the trapezium, and is bounded on the E., W., and S. by streets, on the N. by the Rostra. The pavement is composed of blocks of travertine. Along the W. side—that is, in front of the Basilica Julia—may be seen seven pedestals of honorary columns; the S. side, facing the temple of Cæsar, was shut in by a line of shops, the destruction of which is unfortunate, because among the materials employed in their construction were some interesting inscriptions. In the centre of the Forum may still be seen the pedestal of the equestrian statue of Domitian described by Statius; and farther to the N. the two *plutei*, or parapets, discovered in Jan., 1873, the sculptures of which are regarded as the most perfect that have been found in this locality. These *plutei* indicated the place where all the citizens on their way to the elections were to go and present their *tesseræ*, or tickets of admission. The bas-reliefs on the two interior sides represent the *suovetaurilia*, or sacrifice of a pig, a sheep, and a bull—a sacrifice which was celebrated exclusively on occasion of the census. One of the exterior bas-reliefs represents the institution of the gratuitous education of children (*pueri et puellæ alimentarii*) established by Trajan; the other represents the destruction, by the command of the same emperor, of the fiscal registers in

which were recorded all the arrears due from the tax-payers of the empire. Very recently—that is, in Feb., 1876—while carrying on the excavations of the Forum on the side of the temple of Faustina, were found two bases of statues restored (according to the inscription) by Gabinius Probianus, prefect of the city, after they had been overthrown by an earthquake. The pavement of the Forum Olitorium has been uncovered for an extent of 360 feet between the Theatre of Marcellus (Piazza Montanara) and the Temple of Piety (San Nicolà in Carcere). While continuing the excavations on the S. side, we were able to trace the whole length of the *via* (*triumphalis?*) which connected the Forum Olitorium with the Forum Boarium.

The excavations consequent upon the building of the new quarters upon the Esquiline have led to the discovery of the Forum Esquilinum, and of the public markets (Macellum Liviæ) which surrounded it. In the centre of the square lay the pedestal of a statue, with an inscription relating to the embellishments of the forum executed by order of Flavius Epitynkanus, prefect of the city, in the fifth century. Some of the market-shops preserved traces of their original destination; as, for example, in one was found a collection of mineral colors; in another, a number of small bottles for perfumery; in a third, some wine-measures, and amphoræ once containing the produce of the vines of Chios. The centre of the market was occupied by a large fountain, converted, during the barbarous ages, into a lime-kiln, and still half filled with statues and marbles calcined by fire.

(*i*) *Honorary Monuments.—Triumphal Arches.*—The narratives of the sixteenth century had preserved the memory of a triumphal arch erected in honor of Gordian the Pious at the entrance of the Prætorian Camp, and demolished by Bramante in order to use the material in constructing the palace Della Cancellaria. Some very important remains of this arch were discovered in 1872 in digging a drain in the Via Gaeta. These remains comprise, especially, portions of the entablature, as well as fragments of the inscriptions relating to restorations made by Diocletian. *Columns.*—We have already mentioned the seven pedestals of honorary columns found on the W. side of the Roman Forum. We should add that three of these columns have also been discovered. They measure 26 feet in length, and, judging from the deep holes with which the shafts are pierced, they must have been covered with plates of bronze ornamented with historical reliefs. *Obelisks.*—Among the ruins of the temples of Isis and Serapis, which we know stood near the church Della Minerva, had already been found the obelisks erected afterward in the open squares of the Pantheon, of the Minerva, and in the grounds of the Villa Mattei. Recent excavations in the same place have given us fragments of a *fourth* obelisk, entirely covered with hieroglyphics.

(*k*) *Military Establishments* (*Castra*).—The military garrison of Rome comprised the corps of the *prætorians* and of the *urbani;* the seven battalions of the *vigiles*, who exercised the police of the city; also several battalions of less importance, such as the marine infantry (*misenates*, *ravenarates*), the imperial guard of honor (*equites singulares*), etc. Their barracks were sumptuous edifices, built, or rather rebuilt, by Septimius Severus, except that of the prætorians, which dates from the reign of Tiberius, and which was restored under the Gordians. Of this latter it was already known that three sides were incorporated into the city-walls by Aurelian. The fourth—that is, the W. side—has just been discovered in consequence of the works in the new quarter of the Viminal (*Castro Prætorio*). It contains 78 small chambers, each capable of lodging six or eight soldiers. A little beyond was found a small apartment, reserved perhaps for the superior officers, the pavement of which was in mosaic representing scenes of combat, the names of the warriors or the gladiators being marked by the side of each figure. The site of the Castra Equitum Singularium—that is, of the barracks of the imperial horse-guards—has been made known by the discovery of a monument erected to Sylvanus at the expense of certain soldiers. The images of Sylvanus generally marked the entrance of every edifice; consequently, we now know that the access to the cantonments of the singulares corresponded with the Via Merulana, near the church of Sts. Peter and Marcellinus. The seven battalions of the vigiles, or policemen, were distributed through the city in such a way that each one occupied the boundary-line between two *regions*. Recent discoveries established the fact that the barrack of the first cohort (or battalion) was situated below the Palace Savorelli, on the boundary between the VII. (Via Lata) and IX. (Circus Flaminius) *regions*. That of the second has been found on the Esquiline, very near the Arch of Gallienus; that of the third at the S. E. angle of the Baths of Diocletian; that of the fifth in the Villa Mattei, by the church of the Navicella; that of the seventh (which is the best preserved) in the Piazza Monte de' Fiori, in the Transtevere. The site of the stations IV. and VI. is still unknown.

(*l*) *Palaces and Houses.*—In a *résumé* so limited as ours it would be impossible to describe the topography of the Palace of the Cæsars on the Palatine as it has been determined by the latest excavations. Let it suffice to say that the imperial palace has no unity of plan or of decoration, but that it is composed of a suite of palaces, the one differing from the other, built at different epochs, and separated by streets and squares always accessible to the public. The most ancient portion is the House of Augustus, situated on the side of the Circus Maximus. Then follow the House of Tiberius, at the N. W. angle of the hill, on the Velabrum; the House of Caligula, at the N. E. angle upon the Forum; the House of Nero, at the S. E. corner, toward the Colosseum; the House of Vespasian, which occupies the very centre of the hill; and finally, the House of Septimius Severus, at the S. W. angle, toward the Porta Capena. Although the condition of these remains is in general very ruinous, yet every room, so to say, preserves sufficient traces to enable us to decide or to divine what was its decoration and its primitive destination; and the whole plan of the entire group has been reconstructed with as much precision as can be obtained in a house of Pompeii. Among the palaces and private houses of which the position or new details have been discovered should be mentioned—the Palace of the Laterans, considerable portions of which have been explored, especially in the garden of the Hospital of St. John, where fragments of an imperial statue in porphyry and several mosaic pavements have been found; the House of Germanicus, on the Palatine, in perfect preservation, the pictures which decorate the walls being considered as the best among those thus far found at Rome; the House of Asinius Pollio, discovered in the Vigna Guidi, at the S. E. angle of the Baths of Caracalla; the House of Q. Fabius Cilo, the site of which is occupied by the church and convent of S. Balbina, and where have been found two superb busts of Caius and Lucius, nephews of Augustus; the house of the Cornelii, discovered in 1873 under the new ministry of finance. In the House of Avidius Quietus, governor of Galatia under Domitian, discovered Mar., 1876, near S. Antonio all' Esquilino, bronze tablets have been found on which are engraved the decrees in honor of Quietus awarded by the cities of the province which he had administered. On one of the walls of the vestibule of the House of Memmius Vitrasius Orfitus, a consul of the fourth century, are found certain inscriptions dedicated to their master by the officers of his house. This building was also discovered near the railway-station. Similar inscriptions preserved on the spot have determined the position of the palace of Neratius Cerialis, prefect of the city in the fourth century, on the piazza of Santa Maria Maggiore; of Numicius Pica Cæsianus, quæstor under Trajan, on the Via Strozzi; and finally of the senator Q. Octavius Felix, near the church of S. Bibiana.

(*m*) *Villas and Gardens.*—The gardens of Mæcenas, on the Esquiline, have been in a great measure excavated, from the church of S. Eusebio as far as the Via Merulana. The most interesting monument as yet found is a magnificent conservatory in the form of a small oblong theatre, the walls of which are decorated with beautiful landscapes. In the neighborhood of this conservatory have been found six caryatides of Pentelican marble, as well as three *hermes* of fauns, which were generally placed at the intersections of garden avenues; two fountains, one of which is in the form of a rhyton, or drinking-horn, marvellously sculptured by Pontios of Athens; three busts of philosophers; and several other fragments of sculpture of a beauty fully worthy of the age of Augustus and of the artistic taste of Mæcenas. Still more important are the discoveries made on the site of the Horti Lamiani, which adjoined those of Mæcenas, occupying the whole of the rectangle comprised between Viæ Labicana, Merulana, S. Croce, and S. Matteo. In the very centre of these gardens the remains of a palace have been found, the E. and W. sides of which were adorned by porticoes with columns of *giallo antico*. On the two other sides—that is, on the N. and S. of the rectangle—were found bath-rooms of extraordinary splendor. The floors were paved with slabs of precious marble, such as *occhio di pavone*, fleece-alabaster (*a pecorelle*), jasper, agate, etc. Some of the walls were covered with slate ornamented with arabesques in gold; others were encrusted with *opus sectile marmoreum*, or what is now called "Florentine mosaic." It was in one of these rooms that on Dec. 24, 1874—a day memorable in the annals of art and science—there was discovered in the space of a few minutes the group of sculptures which forms the principal ornament of the New Museum of the Capitol. This group comprises a statue of Venus, a Greek work anterior to the type of that goddess

created by Praxiteles; two statues of the Muses Terpsichore and Polymnia; two figures of tritons, unique types and of remarkable beauty; a bust of Commodus, represented as the Roman Hercules, perhaps the most perfect work of the kind which antiquity has bequeathed to us; a statue of Faunus bearing a basket of grapes on his shoulders; a head of Diana, another of the young Commodus, and twenty-four fragments of other statues. In the same room was found an inscription relating to the improvement of the gardens and the reconstruction of the palace by the emperor Alexander Severus—that is, by the same who restored the gardens of Sallust, as is proved by another inscription found Apr. 2, 1876, in the Villa Spithöver on the Quirinal.

Recent researches also show that almost the whole surface of the Esquiline was occupied by gardens, which, laid out at first for private use, had fallen by degrees into the hands of the emperors, who opened them to the public; so that Rome became perhaps as rich in parks and delightful promenades as is London or Paris to-day. Among the gardens recently discovered we should mention those of Vettius Agorius Prætextatus, the site of which is very near the Porta San Lorenzo. Nearly all the foundations of the buildings belonging to these gardens are composed of fragments of statues. A single one of these walls, scarcely 100 feet in length, has given us 2500 pieces of sculpture, which, united with infinite patience, have already furnished the Museum of the Capitol with seventeen statues and two sculptured vases. It is enough to say that the single statue of a Hercules carrying off the mares of Diomed has been recomposed out of nearly 250 fragments.

(*n*) *Tombs.*—The burial-place of the ancient inhabitants of Rome was not confined to the borders of the great consular highways, but outside every gate were found vast necropolises called *campi*, which took their name from the gate nearest them. Thus, we know already the Campi Viminalis, Esquilinus, Cælimontanus, Aventinensis, etc.; another is found between the Viæ Aurelia and Campana in the present enclosure of the Villa Pamphily Doria; still another between the Viæ Appia and Latina, in which are the celebrated *columbaria* of Hylas and Vitaline, as well as the *hypogæum* of the Scipios. Our space would not permit even a simple enumeration of the tombs discovered during these last years. We must therefore confine ourselves to the principal, and especially to those laid open in the Aventine necropolis. These may be divided into two groups—the one contemporary with the first centuries of Rome, the other belonging to the age of the emperors. The first occupy the whole of the space included between the churches of S. Antonio, S. Eusebio, and S. Vito; the most ancient of the tombs are excavated in the rock according to Etruscan usage; the disposition of the bodies is also Etruscan, each being placed on the funeral couch with the feet toward the entrance of the sepulchre; the manufacture of the objects found in these tombs, such as household utensils, vases, personal ornaments, etc., is also Etruscan. All these details carry us back to the first three centuries of Rome. The second system of burial, which dates from the beginning of the fourth century, is that of sarcophagi and cinerary urns in volcanic stone; several hundreds of these have been found, with a large quantity of objects, the manufacture of which, departing from the Etruscan type, begins to show the progress of the native art of Latium. The third method is that of sepulchral chambers, either isolated or united in groups, built of square blocks of stone, without cement, but already possessing inscriptions and pictures. One of these inscriptions says that the tomb belonged to the college of flute-players (*tibicines*); another is described as the property of the family Æbutia. Among the frescoes discovered in this cemetery two are especially interesting: the first represents the scourging and execution of a criminal performed by six lictors under the orders of the prætor; the other relates to the history of the 300 Fabii and their glorious defeat in the war against Veii. On the opposite side of the Esquiline—that is, in the neighborhood of Porta Maggiore—fourteen columbaria of the first century of the Empire have been discovered. The most important contains 150 inscriptions referring to the domestics of Statilia Messalina, the wife of Nero. From the others more than 400 inscriptions have been taken.

In conclusion, we may announce the discovery of a Rome anterior to the Rome of history. Her existence has been revealed to us not by constructions public or private, but by objects in stone, such as arrow-heads of silex, axes of bluish jadéite, knife-handles of deer-horn, necklaces of burnt clay, pottery made by hand, etc. All these palæoethnological objects belong to the Neolithic period, or the age of polished stone. In comparing these discoveries with those which are being carried on at the same time on the Alban Hills, where a pre-historic town or village has just been exhumed from beneath three volcanic layers produced by eruptions from the crater of Monte Cavo, our knowledge of the origin of the most celebrated city of the world may be completely established. But as it is only a few months since men of science have occupied themselves with this interesting subject, it will be a long time before we shall be able to propose theories likely to be accepted with confidence by the scientific world. While we write, an important publication on archæological discoveries just made has issued from the press—*Pitture e Sepolcri scoperti nell' Esquilino dalla Compagnia Fondiaria Italiana, nell' anno 1875* (Romæ, 1876, 4to, illustrations). R. LANCIANI.

Roman Architecture. See ARCHITECTURE and ROMAN ARCHÆOLOGY.

Ro′man Arith′metic is a system in which numbers are represented by letters, which do not vary in value with their position. The Hindoo-Arabic system uses 1 equally for 1, 10, 100, according to its position; the Roman system (see NOTATION) employs I, *one*, V, *five*, X, *ten*, L, *fifty*, C, *hundred*, D (originally IↃ), *five hundred*, M (originally CIↃ), *thousand*, to which several expedients were added for higher numbers. Here I and X, or X and I, represent eleven; forty-nine must have the awkward extension of XXXXVIIII; and should a form like XLIX occur in an operation, it must be read as (L) fifty, (I) one, and (XX) twenty, or seventy-one, as in the following example of addition:

```
        X
VIIII  XX     VII
I      XX  I  III
-----------------
X      L   I  X = LXXI.
```

It is evident that much confusion would arise if IX could be read as *nine*, or IV as *four*.

Conforming to modern mechanical arrangements, we proceed to show how operations may be performed with the Roman figures. We first multiply XXII by XVII, adding the modern equivalents:

```
  X   X  II          10 +  10 +  2 =  22
      X  VII               10 +  7 =  17
-------------       --------------------
LXX LXX XIIII        70 +  70 + 14 = 154
C   C    XX         100 + 100 + 20 = 220
-------------       --------------------
CCCLXXIIII          170 + 170 + 34 = 374
```

In the next place we divide 2660 by 7:

```
VII) M   M   DCLX (CC           7) 2660 (200
                                   1400
                                   ----
VII) CCC CCC DCLX (C            7) 1260 (100
                                    700
                                   ----
VII)         D  LX (LXX         7)  560 ( 70
                                    490
                                   ----
VII)         X  LX (X           7)   70 ( 10
                                     70
                 -------                ---
                 CCCLXXX                380
```

Here we say, the seventh of (M) ten hundred is (C) one hundred, which we set to the right as quotient, and (CCC) three hundred remains, which we set in a new line: we repeat this for the second M, when we bring the undivided part of the first line (DCLX) into the second as part of a second dividend. Here we observe seven (C's) hundreds, a seventh of which gives the second quotient. Bringing down the remainder (DLX) for a third dividend, we count the (D) five hundred as fifty tens, the seventh of which gives the third quotient of (LXX) seven tens and a (X) ten over to be carried down (it stands under D), with the remainder of the third dividend, to form the fourth. Here we have two tens and (L) five tens, the seventh part of which is (X) ten of the fourth quotient.

In this system cancellation can be more extensively used than in the ordinary methods. It occurs in the following example of the subtraction of 263 from 342, where, in the first statement, CC and X of both numbers are omitted in the second statement as cancelled:

```
CCCXXXXII           300 + 40 +  2
CCLXIII             200 + 50 + 13
---------           -------------
  C XXXII           100 + 30 +  2
  L III              50 +  3
----------          -------------
  L VIIXXII          50 + 27 +  2
 ---------          -------------
= LXXVIIII         = 79
```

As these numeral characters have the same value in all positions, the solution may be commenced at the left, the interior or the right of the lines or aggregates of the numbers. This system should have a place in educational treatises; it would give enlarged views of the nature of numbers and processes; it would correct false ideas of notation, as when a figure is written and spoken of as (3) three in the ordinary notation, but appears as III, XXX, CCC, or MMM in the other; and it would show that certain curiosities of numbers (see NINES) disappear when the process is represented in a different notation. The Roman adaptations of high numbers being awkward, they may be replaced in

modern practice by the addition of small letters, as in ^{x}M for 10,000, ^{c}M for 100,000, and ^{m}M for 1,000,000.

S. S. Haldeman.

Roman Catholic Church, that body of Christians which acknowledges the authority of the pope of Rome. It styles itself the "Holy, Catholic, Apostolic, and Roman Church." It is the largest and most powerful denomination of Christians, numbering nearly 200,000,000 souls, or more than one-half the Christian population of the globe, though in general intelligence, energy, and enterprise the Protestant nations are far in advance. The Roman Church is scattered all over the world, but has its chief hold on the Latin races in the south of Europe and America, and over the Celtic portion of the Irish. It stretches in unbroken succession back to the palmy days of heathen Rome, it has outlived all the governments of Europe, and it is likely to live when Macaulay's New Zealander, "in the midst of a vast solitude, shall take his stand on a broken arch of London Bridge to sketch the ruins of St. Paul's." In our age Romanism has furnished the singular spectacle of corruption and decay in its roots and new life in its topmost branches. Undermined by its own children in Italy and Spain, it has reaped a rich harvest of learning, culture, and piety from the Tractarian school of Oxford, and is marshalling its forces for the conquest of the Saxon race, which must chiefly control the future destinies of the Church.

I. *History*.—The earliest record of a Christian church in Rome we have in Paul's Epistle to the Romans (A. D. 58). Though not founded by Peter or Paul, who came to Rome after the year 60, it may possibly be traced to those "strangers of *Rome*, Jews and proselytes," who witnessed the Pentecostal miracle of the birthday of the Christian Church (Acts ii. 10). The metropolitan position of the city which for so many centuries had been the mistress of the world, and the martyrdom of Peter and Paul, the two leading apostles, who closed their labors there, together with the widespread belief that Christ (Matt. xvi. 18) has instituted a perpetual primacy of the Church in the person of Peter and his successors in office, supposed to be the bishops of Rome, are the chief causes of the rapid growth of that congregation to the highest influence. It inherited the ambition and prestige of empire, and simply substituted the cross for the sword as the symbol of power. For fifteen centuries the fortunes of Western Christendom were bound up with the papacy, which even now, in the decrepitude of old age and shorn of its temporal power, exercises a more unlimited control over the consciences of its subjects than any government on earth. We may distinguish three stages in the development of Roman Catholicism.

(1) The age of ancient *Græco-Latin Catholicism*, from the second to the eighth century, before the final rupture of the Greek and Latin communions. This is the common inheritance of all churches. It is the age of the Fathers, of œcumenical creeds and councils, and of Christian emperors. Many of the leading features of Roman Catholicism, as distinct from Protestantism, are already found in the second and third centuries, and have their roots in the Judaizing tendencies combated by St. Paul. The spirit of traditionalism, sacerdotalism, prelacy, ceremonialism, asceticism, monasticism, was powerfully at work in the East and the West, in the Nicene and post-Nicene ages, and produced most of those doctrines, rites, and institutions which are to this day held in common by the Greek and Roman churches. There is scarcely a dogma or usage of modern Rome which may not be traced in embryo to the Greek and Latin Fathers, from Ignatius and Cyprian down to John of Damascus. But alongside with these Romanizing tendencies we find also in St. Augustine the evangelical doctrines of sin and grace which were, next to the Bible, the chief propelling force of the Reformation.

(2) The age of *Mediæval Latin Catholicism*, as distinct and separated from the Greek, extends from Gregory I. or Charlemagne to the Reformation of the sixteenth century. It is the missionary age of Catholicism among the Latin and Teutonic races in Europe. Here we have the conversion of the barbarians in the North and West of Europe under the fostering care of the bishops of Rome; here the growth of the papal hierarchy, though in constant conflict with the secular power, especially the German empire; here the scholastic theology, but in opposition to it also the various forms of mysticism and a more liberal biblical theology; here an imposing theocracy, binding all the nations of Europe together, yet with strong elements of opposition in its own communion urging forward toward a reformation in head and members. The Middle Ages cradled the Protestant Reformation as well as the papal counter-reformation. Wickliffe in England, Hus in Bohemia, Wesel in Germany, Savonarola in Italy, the Waldenses, the Bohemian Brethren, the Councils of Pisa, Constance, and Bâle, and the revival of letters, prepared the way for the great movement of the sixteenth century which emancipated for ever at least one-third of the population from the tyranny of Rome.

(3) The age of modern *Romanism*, dating from the Reformation, or rather from the Council of Trent (1563). This is Latin Catholicism, not only in distinction from Greek Catholicism, but also in opposition to evangelical Protestantism. In some respects it was an advance upon the Middle Ages, and shows clearly the wholesome moral effect of the Reformation. No Alexander VI., who was a monster of wickedness, nor Julius II., who preferred the sword to the staff, nor Leo X., who had more faith in classical art than in the "*fabula de Christo*," could now be elected to the chair of Peter. On the other hand, the papacy gave formal sanction to those scholastic theories and ecclesiastical traditions against which the Reformers protested; it expressly condemned their doctrines, and by claiming to be infallible it made itself irreformable.

In modern Romanism we must again distinguish two periods, which are divided by the reign of Pope Pius IX.

(*a*) Tridentine Romanism is directed against the principles of the Protestant Reformation, and fixed the dogmas of the rule of faith, original sin, justification by faith and works, the seven sacraments, the sacrifice of the mass, purgatory, invocation of saints, the veneration of relics, and indulgences. The "Old Catholics," who seceded and were excommunicated after 1870, took their stand on the Council of Trent in opposition to the council of a Vatican, and charged the latter with apostasy and corruption, when in fact it is only a legitimate logical development.

(*b*) Vatican Romanism is directed against modern infidelity, and against liberal Catholicism within the Roman Church itself. It created, or rather brought to full maturity and exclusive authority, two new dogmas, and two corresponding heresies, concerning the Virgin Mary and the power of the Roman pontiff. These questions were left unsettled by the Council of Trent, and a considerable difference of opinion continued to prevail in the Roman communion. Gallicanism flourished in France during the golden age of its literature, but gradually the Ultramontane school, which defends papal absolutism, gained the ascendency, and accomplished a complete triumph—first in 1854, when Pius IX. proclaimed the immaculate conception of the Virgin Mary to be a divinely-revealed dogma of faith, and in the Vatican Council in 1870, which declared the pope to be the infallible bishop of bishops. The same pope in 1864 issued the "Syllabus of Errors," which must be considered by Romanists as an infallible official document, and which arrays the papacy in open war against modern civilization and civil and religious freedom.

II. *Catholicism and Romanism*.—These should not be confounded, as little as we should confound the people of Israel at the time of Christ with the Jewish hierarchy which crucified him and expelled his apostles. Catholicism is the general Christianity which is held in common by the Greek, the Roman, and the Protestant churches. Romanism is the papal system, which, it is true, identifies itself with *the* Church of Jesus Christ, and regards all other Christians as schismatics and heretics. But this is the fundamental error of Romanism, against which both the Greek and the evangelical churches have always protested. Christianity existed before the Church of Rome, and has since lived independent of it. The very name of Romanism implies sectarian exclusiveness, which, as far as it goes, is opposed to the spirit of true Catholicity. "Romanism is the weakness of Catholicism—Catholicism is the strength of Romanism." Romanism, like Phariseeism of old, accumulates a mass of traditions over the Catholic foundations, and makes them almost ineffectual.

III. *Romanism and Protestantism*.—Romanism makes all of the Church—Protestantism makes all of Christ. The one measures Christianity by Catholicity; the other measures Catholicity by Christianity. The one knows only a visible Church ruled by the pope; the other puts the invisible Church ruled by Christ above all visible churches. Romanism obstructs man's relation to God by interposing traditions and saints; Protestantism brings man into direct communion with God through Christ the only Mediator. Romanism appeals to the voice of popes and councils; Protestantism to the word of God. Romanism overrules the Bible by the traditions of men, and restrains its circulation; Protestantism spreads it in all languages over the world. Romanism makes justification dependent on faith and good works; Protestantism, solely on the grace of God as apprehended by a living faith, which manifests its power by good works. Romanism in its worship appeals to the senses and the imagination; Protestantism, to the intellect and the conscience. Romanism is a religion of priests; Protestantism, the religion of a self-governing Christian people. Romanism is a religion of authority, and at heart opposed to civil and religious liberty; Protestantism is a religion of freedom and the pio-

neer of modern Christian civilization, especially in all Western lands, whither "the star of empire takes its course." The contrast between Roman Catholic and Protestant civilization can be best seen by comparing the Roman Catholic with the Protestant cantons of Switzerland, the southern with the northern part of Ireland, Western with Eastern Canada, Italy with Prussia, Spain with England, Portugal with Scotland, Mexico with the United States. France and Belgium, which are both Catholic and prosperous, make an exception. (Comp. *Protestantism and Catholicism in their bearing upon the Liberty and Prosperity of Nations*, by Émile de Laveleye, with an introduction by Hon. W. E. Gladstone, 1875.)

IV. *Doctrines.*—The doctrines of the Roman Catholic Church are laid down in the œcumenical creeds, the acts of nineteen or twenty œcumenical councils, the bulls of the popes, and especially the Tridentine and Vatican standards. The principal authorities are the canons and decrees of the Council of Trent (1563), the Profession of the Tridentine Faith, commonly called the Creed of Pius IV. (1564), the Roman Catechism (1566), the decree of the Immaculate Conception (1854), and the Vatican decrees on the Catholic faith and the infallibility of the Pope (1870). The best summary of the leading articles of the Roman faith is contained in the Creed of Pope Pius IV., which is binding upon all priests and public teachers, and which must be confessed by all converts. It consists of the Nicene Creed and the following eleven articles:

1. Ego, ——, firma fide credo et profiteor omnia et singula, quæ continentur in symbolo fidei, quo sancta Romana Ecclesia utitur, videlicet:	1. I, ——, with a firm faith believe and profess all and every one of the things contained in that creed which the holy Roman Church makes use of:
Credo in unum Deum, Patrem omnipotentem, etc. [Symbolum Nicenum.]	I believe in one God, the Father Almighty, etc. [Here follows the Nicene Creed.]
2. Apostolicas et ecclesiasticas traditiones, reliquasque ejusdem Ecclesiæ observationes et constitutiones firmissime admitto et amplector.	2. I most steadfastly admit and embrace apostolic and ecclesiastic traditions, and all other observances and constitutions of the same Church.
3. Item sacram Scripturam juxta eum sensum, quem tenuit et tenet sancta mater Ecclesia, cujus est judicare de vero sensu et interpretatione sacrarum Scripturarum, admitto; nec eam unquam, nisi juxta unanimem consensum patrum accipiam et interpretabor.	3. I also admit the holy Scriptures, according to that sense which our holy mother Church has held and does hold, to which it belongs to judge of the true sense and interpretation of the Scriptures; neither will I ever take and interpret them otherwise than according to the unanimous consent of the Fathers.
4. Profiteor quoque, septem esse vere et proprie sacramenta novæ legis a Jesu Christo Domino nostro instituta, atque ad salutem humani generis, licet non omnia singulis, necessaria: scilicet baptismum, confirmationem, eucharistiam, pœnitentiam, extremam unctionem, ordinem et matrimonium; illaque gratiam conferre; et ex his baptismum, confirmationem et ordinem sine sacrilegio reiterare non posse. Receptos quoque et approbatos Ecclesiæ Catholicæ ritus in supradictorum omnium sacramentorum solemni administratione recipio et admitto.	4. I also profess that there are truly and properly seven sacraments of the new law, instituted by Jesus Christ our Lord, and necessary for the salvation of mankind, though not all for every one, to wit: baptism, confirmation, the eucharist, penance, extreme unction, holy orders, and matrimony; and that they confer grace; and that of these, baptism, confirmation, and ordination cannot be reiterated without sacrilege. I also receive and admit the received and approved ceremonies of the Catholic Church, used in the solemn administration of the aforesaid sacraments.
5. Omnia et singula, quæ de peccato originali et de justificatione in sacrosancta Tridentina synodo definita et declarata fuerunt, amplector et recipio.	5. I embrace and receive all and every one of the things which have been defined and declared in the holy Council of Trent concerning original sin and justification.
6. Profiteor pariter, in missa offerri Deo verum, proprium et propitiatorium sacrificium pro vivis et defunctis; atque in sanctissimo eucharistiæ sacramento esse vere, realiter et substantialiter corpus et sanguinem, una cum anima et divinitate Domini nostri Jesu Christi, fierique conversionem totius substantiæ panis in corpus et totius substantiæ vini in sanguinem; quam conversionem Catholica Ecclesia transsubstantionem appellat.	6. I profess, likewise, that in the mass there is offered to God a true, proper, and propitiatory sacrifice for the living and the dead; and that in the most holy sacrament of the eucharist there is truly, really, and substantially, the body and blood, together with the soul and divinity, of our Lord Jesus Christ; and that there is made a change of the whole essence of the bread into the body, and of the whole essence of the wine into the blood; which change the Catholic Church calls transubstantiation.
7. Fateor etiam, sub altera tantum specie totum atque integrum Christum, verumque sacramentum sumi.	7. I also confess that under either kind alone Christ is received whole and entire, and a true sacrament.
8. Constanter teneo, purgatorium esse, animasque ibi detentas fidelium suffragiis juvari. Similiter et sanctos una cum Christo regnantes venerandos atque invocandos esse, eosque orationes Deo pro nobis offerre, atque eorum reliquias esse venerandas.	8. I firmly hold that there is a purgatory, and that the souls therein detained are helped by the suffrages of the faithful. Likewise, that the saints reigning with Christ are to be honored and invoked, and that they offer up prayers to God for us, and that their relics are to be had in veneration.
9. Firmissime assero, imagines Christi ac Deiparæ semper Virginis, nec non aliorum sanctorum habendas et retinendas esse, atque eis debitum honorem ac venerationem impertiendam. Indulgentiarum etiam potestatem a Christo in Ecclesia relictam fuisse, illarumque usum Christiano populo maxime salutarem esse affirmo.	9. I most firmly assert that the images of Christ, and of the perpetual Virgin the Mother of God, and also of other saints, ought to be had and retained, and that due honor and veneration are to be given them. I also affirm that the power of indulgences was left by Christ in the Church, and that the use of them is most wholesome to Christian people.
10. Sanctam Catholicam et Apostolicam Romanam Ecclesiam omnium ecclesiarum matrem et magistram agnosco, Romanoque pontifici, beati Petri apostolorum principis successori ac Jesu Christi vicario, veram obedientiam spondeo ac juro.	10. I acknowledge the holy Catholic Apostolic Roman Church for the mother and mistress of all churches; and I promise and swear true obedience to the Bishop of Rome, successor to St. Peter, Prince of the Apostles, and Vicar of Jesus Christ.
11. Cætera item omnia a sacris canonibus et œcumenicis conciliis, ac præcipue a sacrosancta Tridentina synodo tradita, definita et declarata indubitanter recipio atque profiteor; simulque contraria omnia, atque hæreses quascumque ab Ecclesia damnatas, rejectas et anathematizatas ego pariter damno, rejicio et anathematizo.	11. I likewise undoubtingly receive and profess all other things delivered, defined, and declared by the Sacred Canons and General Councils, and particularly by the holy Council of Trent; and I condemn, reject, and anathematize all things contrary thereto, and all heresies which the Church has condemned, rejected, and anathematized.
12. Hanc veram Catholicam fidem, extra quam nemo salvus esse potest, quam in præsenti sponte profiteor et veraciter teneo, eundem integram et inviolatam usque ad extremum vitæ spiritum constantissime, Deo adjuvante, retinere et confiteri, atque a meis subditis vel illis, quorum cura ad me in munere meo spectabit, teneri, doceri et prædicari, quantum in me erit, curaturum. Ita ego idem —— spondeo, voveo ac juro. Sic me Deus adjuvet, et hæc sancta Dei Evangelia.	12. I do, at this present, freely profess and truly hold this true Catholic faith, without which no one can be saved; and I promise most constantly to retain and confess the same entire and inviolate, with God's assistance, to the end of my life. And I will take care, as far as in me lies, that it shall be held, taught, and preached by my subjects, or by those the care of whom shall appertain to me in my office. This I, ——, promise, vow, and swear, so help me God, and these holy Gospels of God.

To complete the doctrinal system two more articles of faith must be added, which have been defined in these words: (1) That "the blessed Virgin Mary, by a singular grace and privilege of Almighty God, in view of the merits of Christ Jesus the Saviour of mankind, has been preserved free from all stain of original sin" (in other words, that Mary was absolutely sinless, and hence in no need of redemption); and (2) that "the Roman pontiff, when he speaks *ex cathedrâ*—that is, in discharge of the office of pastor and doctor of all Christians, by virtue of his supreme apostolic authority, he defines a doctrine regarding faith or morals—is possessed of that infallibility with which the divine Redeemer willed that his Church should be endowed, and that therefore such definitions of the Roman pontiff are irreformable of them-

selves, and not from the consent of the Church." It is against the last of these new dogmas that the Old Catholics, led by some of the ablest divines of the Roman Church (Döllinger, Reinkens, Schulte, etc.), revolted and organized a Church similar to the Jansenist communion in Holland.

V. *Government and Discipline.*—The Roman Church is an absolute monarchy, which culminates in the pope. The people are excluded from all participation even in temporal matters; they must obey the priests, as the priests must obey their bishop, and the bishops the pope, who claims to be the universal bishop, the successor of Peter, the vicar of Christ, and the visible representative of Almighty God on earth. This system is the growth of ages, and has only reached its maturity in the Vatican Council. The claim of the bishop of Rome to universal dominion over the Christian Church, and even over the temporal kingdoms professing the Catholic faith, goes back to the days of Leo I. (440–461), and was renewed from time to time, by Nicholas I., Gregory VII., Innocent III., and Boniface VIII. But this claim was always resisted by the Greek Church, which claimed equal rights for the Eastern patriarchs, and by the German emperors and other princes, who were jealous of their sovereignty. The conflict between the pope and the emperor, between priestcraft and statecraft, goes through the whole Middle Age, and has been recently revived under a new aspect by the papal syllabus of 1864 and Bismarck's determination "not to go to Canossa." The Papal Syllabus of 1864 reasserted the most extravagant claims of the mediæval papacy and threatened the sovereignty of the state and the peace of modern society. But the stream of history cannot be turned backward.

VI. *Worship and Ceremonies.*—They are embodied in the Roman Missal, the Roman Breviary, and other liturgical books for public and private devotion. The Roman Church accompanies its members from the cradle to the grave, receiving them into life by baptism, dismissing them into the other world by extreme unction, and consecrating all their important acts by the sacramental mysteries and blessings. Its worship is the most elaborate system of ritualism, unless we except the Greek and Russian service. It is chiefly addressed to the eye and the ear. It draws all the fine arts into its service. Gothic cathedrals, altars, crucifixes, Madonnas, pictures, statues, and relics of saints, rich decorations, solemn processions, operatic music, combine to lend their great attractions for the common people and for cultured persons of prevailing æsthetic tastes, especially among the Latin races. But while the external splendor dazzles the senses and pleases the imagination, the mind and heart, which crave for more substantial spiritual food, are often left to starve. Converts from Rome usually swing to the opposite extreme of utmost simplicity. Catholic worship is the same all over the world, even in language, the Latin being its sacred organ, and the vernacular being only used for sermons, which are subordinate. Its throne is the altar, not the pulpit (which usually stands away off in a corner). It centres in the mass, and this is regarded as a real though unbloody repetition or continuation of the atoning sacrifice of Christ on the cross. At the moment when the officiating priest pronounces the words, "This is my body," the elements of bread and wine are believed to be changed into the very substance of the body and blood of our Saviour, and these are offered to God the Father for the sins of the living and the dead in purgatory. This must be either an awful truth or an awful error or a pious illusion. The Reformers saw in the mass a relapse into Judaism, a refined form of idolatry, and a virtual denial of the one sacrifice of Christ, who "by one offering hath perfected for ever them that are sanctified" (Heb. x. 14). There are, however, eminent Roman divines who so spiritualize and refine the doctrine of the mass as to make it only a dramatic commemoration and renewed application of the one and ever-living sacrifice of Christ.

(For particulars compare PAPAL STATES, POPE, JESUITS, GALLICANISM, ULTRAMONTANISM, IMMACULATE CONCEPTION, INFALLIBILITY, TRENT, VATICAN COUNCIL, etc.)

Literature.—The standard writers in explanation and defence of the doctrinal system of Romanism are Bellarmine, Bossuet, Möhler, John Perrone, Klee, Dieringer, Friedhof, Wiseman. The chief historical works by Roman Catholics are the *Annals* of Baronius, the *Church Histories* of Rohrbacher, Möhler, Alzog, Hefele (*Conciliengeschichte* down to the Council of Constance), and Döllinger (before 1870). In England and America the Roman Church has found its ablest advocates among converts, such as Dr. John Henry Newman, Cardinal Manning, Dr. Orestes Brownson, and others who, wearied and tired of Protestant liberty, have sought rest in absolute submission to an infallible pope. PHILIP SCHAFF.

Romance. See NOVEL, by MRS. S. B. HERRICK.

Roman Cement. See CEMENTS, by GEN. Q. A. GILLMORE.

Romanesque Architecture. See ARCHITECTURE, by CLARENCE COOK.

Roma'ni (FELICE), b. at Genoa in 1798. Among his instructors was Galliuffi, the celebrated improvisatore of Latin verse. Romani took his legal degree, but literature attracted him more strongly than the law, and he began his career as composer of *libretti* for the theatre of Milan, a position which he ennobled by the verses written for the *Sonnambula*, the *Norma*, the *Pirata*, the *Straniera*, the *Beatrice di Tenda* of Bellini, and for the *Elisire d'Amore* of Donizetti. He has also left a volume of fine lyric poems. Carlo Alberto appointed him editor of the *Gazetta Piemontese*. D. at Turin 1865.

Roma'nia, or **Rouma'nia,** a quasi-independent European state, comprising the former principalities of Moldavia and Wallachia, with a part of Bessarabia ceded by Russia in 1856, has a total area of 46,637 sq. m., and lies between 43° 38′ and 48° 50′ N. lat., and 22° 30′ and 30° 5′ E. lon. It is bounded N. and W. by Austro-Hungary, E. by Russia, the Black Sea, and Turkey, and S. by the Danube, which divides it from Turkey. Its territory is of a crescent shape, and its surface rises gradually from the Danube and the Pruth to its N. and W. frontier, the crest of the Carpathian Mountains, the loftiest of whose peaks, the Ciacleul or Pion, rises to the height of 8900 feet above the Black Sea. Romania is drained wholly by affluents of the Danube. The principal rivers are—the Olto, which rises in Transylvania, cuts through the Carpathians, and after a course of more than 200 miles empties into the Danube at Islar; the Sereth, of about the same length, which joins the Danube below Galatz; the Dumbovitza, on which lies the capital, Bucharest; and the Pruth, which empties into the same river between Galatz and Reni. Fresh-water lakes are numerous in the interior, and the Black Sea coast is skirted with salt and brackish lagoons. Romania is divided into 33 districts, comprising 2965 communes, which contain above 30,000 villages or hamlets. The largest towns are—Bucharest, pop. 121,754; Ployesti, 26,468; Braila, 25,467; Giurgevo, 10,554; Crajova, 25,521; Jassi, 90,236; Bolochani, 37,594; Galatz, 36,107; Ismail, 20,869; Bolgrad, 13,937. The total population, which in 1841 was 3,519,000, is reported to have risen to little less than 5,000,000 in 1874, including about 50,000 foreign residents. The proportion between the sexes was 516 males to 484 females in 1000. There are 274,000 Israelites, 45,000 Roman Catholics, 29,000 Protestants, 8000 Lipovans, 8000 Armenians, and 1300 Mohammedans. The remainder of the inhabitants are of the dominant or national Church, which professes the orthodox Oriental faith, but claims to be independent of all foreign spiritual control. The law promises protection to the worship as well as to the persons of dissenting religionists, but even in recent years the Jews have been treated with great intolerance and cruelty. The national Church has 8 dioceses, 2 of which are archiepiscopal—the metropolitan sees of Bucharest and Jassi. There are 8 seminaries for the orthodox clergy, and 6858 churches administered by 9702 priests. There are 2 Roman Catholic bishops with the title of apostolic vicar, and 63 Roman Catholic churches.

Along the lower course of the Pruth and the Danube are extensive alluvial tracts; the soil of the upland plain between the mountains and the Danube is of Quaternary formation; the foot-hills of the Carpathians are of Tertiary formation, containing Pliocene, Miocene, and Nummulitic deposits; the summits of the mountains represent the Secondary, Primary, and Metamorphic or Azoic rocks. About one-half of the territory is fit for cultivation and pasturage, one-sixth part is occupied by forests, and about one-third is waste.

Romania abounds in animals of the chase, as well as in the smaller quadrupeds, and its fauna appears to include all the mammals which occur in other European regions of similar climate, though we do not find mention of the ibex or of the beaver. Its woods and its waters are frequented by the same birds as those of Central Europe, including the cock of the woods, and even the ibis and pelican are enumerated as occurring. The rivers and the lakes abound in fish of every European species, but the fisheries do not seem to be actively pursued. The climate varies according to elevation and position. The extremes noted in 1866 are + 101° F. and − 11°. The principal agricultural products are wheat, maize, rye, barley, oats, millet, colza, flax, hemp, and tobacco, the average crop of wheat being estimated at 25,000,000 bushels, that of maize at 33,000,000 bushels. All the garden vegetables and all the fruits known to European horticulture grow in perfection in Romania. The grapes and some of the wines, which are little known abroad, are of excellent quality.

Manufacturing industry can hardly be said to exist in Romania, except in the fabrication of coarse household tissues and the simple handicrafts of rustic life. All finer wares are imported from abroad. Numerous varieties of marble are found on the right flank of the valley of the Olto; millstones, gypsum, and alabaster abound; fuller's earth and hydraulic lime are common; carbonate and sulphate of soda, azotate of potassa, and the sulphates of alumina and magnesia occur, and native sulphur is found in various localities. Gold, iron, copper, rich lead ores, cobalt, and arsenic exist, and there are large salt-works, as well as numerous petroleum-wells, the product of which has importance. Grain and other seeds, black cattle, swine, sheep, and the products of these animals, horses, and vegetable and mineral raw material, including lumber, are exported. The imports consist almost entirely of manufactured articles, sugar, coffee, spices, and objects of luxury. The monetary system of Romania is assimilated to that of France, the unit of computation being the *leu* (pl. *lei*), which is equal to one franc. The foreign commerce is almost wholly carried on by ships under foreign flags at the ports of Galatz and Braila, both on the Danube, but the construction of railways from Tschernawoda and Ruschtschuck to the Black Sea ports of Kustendschi and Varna, combined with the difficulty of the navigation of the lower Danube, has diverted much traffic from that channel. In 1812 upward of 3800 foreign vessels entered the Romanian ports, about half being Greek; the English were 245, the American 5. The Danube is navigable for vessels of several hundred tons burden from the Austro-Hungarian boundary quite to the sea, and hence, though a frontier stream, it facilitates commerce between the river provinces; but the other rivers are not available for much internal transport. In 1875 there were above 800 miles of railways in operation, and about 100 in course of construction. Until 1869 there were no postal establishments in Romania, except those conducted by the commercial agencies of Russia and Austria; but at that date a regular postal service was organized, and has since been administered by the government. In 1874 upward of 3,000,000 private and 1,000,000 official letters passed through the 274 post-offices of the state. There were in 1874, 2510 miles of telegraphic lines in operation, generally with two wires.

Public instruction is obligatory for both sexes. There are 1975 rural primary schools (1891 for boys, 84 for girls), with 56,000 pupils and 1900 teachers, and 246 city primary schools, with 26,160 pupils and 570 teachers. There are 14 gymnasiums or colleges, several lyceums, 3 central female schools, and 3 secondary female day schools at Bucharest, Jassi, and Braila. Bucharest and Jassi have each a university with the usual faculties, and there are various special schools. The budget of 1875 fixed the army, including the gendarmerie and other corps charged with civil duties, at 1613 officers and 62,758 rank and file, chiefly provided with improved small-arms and ordnance, and 15,000 cavalry. The navy consists of 3 armed steamers, 6 gunboats, and 400 seamen. The national flag is blue, yellow, and red, arranged as in the flag of France.

Romania claims to be a completely independent political state, enjoying, by virtue of ancient capitulations with Turkey, by the Treaty of Paris of 1856, and by the Convention of Paris of 1858, all the rights of sovereignty, including that of negotiating treaties of commerce and making war and peace. Her publicists maintain that the annual contribution to the Porte—the sole *indicium* of Turkish suzerainty—is not technically a tribute, but a compensation for the obligation of Turkey to defend the Romanian soil. Turkey contests this opinion, and in 1872 the question of sovereignty was debated with an acrimony which threatened serious complications. The throne is hereditary in the male line of the ruling family, a branch of the house of Hohenzollern; but the chief of the state does not assume the title of king, and is called prince-regnant, or, in Romanian, *domnu* or *domnitor*. The constitution is liberal, guarantying to all citizens equality before the law and liberty of conscience, of the press, and of public meetings. Legislative power is exercised by a senate and chamber of deputies, both elective. The civil and judicial system is based on the Code Napoléon. There is a court of errors or cassation; 4 courts of appeal, each having an inferior court, with a jury, for criminal cases; and there are 48 courts of civil jurisdiction, besides commercial tribunals.

The Roman province of Dacia, as established after its conquest by Trajan, embraced all Moldavia W. of the Pruth and the whole of Wallachia. Its native population had been almost wholly destroyed or dispersed by war, and Eutropius informs us that Trajan repeopled the province with colonists *ex toto orbe Romano.* The Romans, after a possession of about 170 years, were expelled by the Goths. The country was subsequently overrun by the Gepidæ, the Slaves, the Huns, and other barbarous tribes; but, according to native historians, the territory between the Olto and the Carpathians, called Little Wallachia, was never occupied by any of these invaders, and it became ultimately a centre from which the Daco-Latin race and their language spread over a great extent of adjacent country. After the conquest of Constantinople by the Ottomans, Moldavia and Wallachia became Turkish provinces, but enjoyed a practical independence under Christian rulers until the reorganization of the territory by the allied powers in 1856.

The Romanian language, now spoken with great uniformity of dialect throughout Romania, and by a nearly equally numerous population in the adjacent provinces, belongs substantially to the Italic stock, though its vocabulary embraces a considerably larger proportion of foreign words, chiefly borrowed from remotely-allied tongues, than most of the Romance dialects, and it has consequently an unfamiliar aspect and accent to the eye and the ear of the Germanic and Latin races. The mixed character of its colonial population and other considerations render it highly improbable that classical Latin ever became the general vernacular of Dacia. The military and foreign jargons introduced by the colonists doubtless coalesced under the influence of the official and ecclesiastical tongue into a common dialect much resembling that now spoken, though numerous Slavic, Magyar, Greek, and Turkish words have been introduced into it at later periods. There is but a very small number of words believed to be Dacian, and native philologists deny that there are any traces of ancient Gothic, all words of that stock now occurring being late importations from German commerce and literature. This, if accurate, seems a singular fact, when we consider that Mœso-Gothic was so extensively employed in the fourth century in Mœsia, and doubtless in Dacia also, as to induce Ulfilas to translate the Scriptures into that tongue; and that, as we learn from Busbequius, a Gothic dialect continued to be spoken in the Crimea down to the sixteenth century. The most numerous class of foreign words are Slavic. The Cyrillic alphabet was introduced with the liturgy, and continued in general use until very lately. The Roman character, encumbered by inconvenient diacritical points and accents, is now almost universally employed. The orthography and pronunciation have a general resemblance to Italian, and the only very marked grammatical distinction between Romanian and other Romance dialects is that, as in the Scandinavian languages, the definite article is a suffix in all the cases except the ablative. No Romanian writer can be said to have acquired a European reputation, though several native authors are in high repute in Romania. The only literary productions of much interest to foreigners are the popular ballads and the native chronicles edited by Michael Cogolnichan, of which a second edition, in 5 vols. royal 8vo, is now in course of publication at Bucharest under the title of *Chronicele Romaniei seŭ Letopisetzele Moldaviei si Valahiei.* Two volumes of the *Istoria Critica a Romanilorŭ*, by B. P. Hasden, a very learned work, have been issued, in an improved ed. in 4to, at Bucharest, and we must notice the *Dictionariulu Limbei Romane,* compiled under the patronage of the Romanian Academy, and now advanced to letter S, as an important contribution to the lexicography of the languages of the Latin stock, though the adoption of puristic principles, which have led to the exclusion of almost all words not of Latin or Greek etymology, greatly detracts from its usefulness. F. A. P. Barnard.

Romanic Languages, or **Romance Languages,** the common name of those languages which developed from the ancient Latin tongue, either by direct transition or by amalgamation of other elements—Germanic, Celtic, etc. They comprise the Italian, Spanish, Portuguese, French, Provençal, Romansch, and Wallachian.

Roman Law. See Law, Civil, by Prof. J. N. Pomeroy, LL.D.

Romano (Giulio). See Giulio Romano.

Romanoff. See Russia, by Clemens Petersen.

Romans', a handsome old town of France, department of Drome, on the Isère, here crossed by a bridge of the ninth century, has manufactures of silk. P. 11,814.

Romansch, Romaunsch, Romonsch, or **Rhæto-Romansch,** is the language of about half the population of the Swiss canton of the Grisons, and is spoken in some other Alpine valleys comprised, like that canton, in the ancient Roman province of Rhætia. The local varieties of speech in the Romansch language are numerous; and Ascoli groups under the general name of *dialetti Ladini* both these and the allied dialects used along an irregular curve extending, though with some interruptions, from the upper valleys of the Vorder-Rhein on the northern to the lower course of the Tagliamento on the southern slope of the Alps. Popularly, however, the appellation *Ladino* has long been restricted to the two vernaculars of the Upper

and Lower Engadine, or valley of the Inn, while the local dialects of the Grisons, spoken in the upper basin of the Rhine and the neighboring valleys, are called by the general name of *Romansch.* This latter appellation embraces various subdivisions, the most important being known as *Subsilvan* and *Suprasilvan.*

The differences between the Romansch and the Engadine or Ladino are rather in articulation than in inflexion or in grammatical construction. There are, nevertheless, in the conjugation of the verbs and in some other points dialectical differences of a certain importance. Thus, the Romansch has a greater richness of inflexion in the subjunctive mood; the Engadine, on the other hand, has three forms of the future expressive of distinct shades of meaning. It is a curious fact that though the Protestant and Roman Catholic parishes, as well as the communes using respectively the German and the Romansch languages, are so confusedly intermixed that a general fusion in language would seem to be inevitable, still the Romansch Roman Catholics are plainly distinguishable in speech from their Protestant neighbors, who use a dialect, grammatically speaking, substantially the same. The differences are probably due to the influence of the Latin employed in the church services among the Roman Catholic population.

The vocabulary of the various dialects does not show a great range of difference in etymology, though the orthography is so capricious and unsettled as to create an impression of greater discrepancy than really exists. The proportion of German vocables is everywhere considerable, and they occur in all the parts of speech, even the particles. There is also a certain number of words of obscure origin and formation apparently not belonging to either the Gothic or the Italic family of languages.

As a whole, the Romansch in all its dialects very decidedly belongs, both by its vocabulary and by its grammatical structure, to the Italic stock; and though not distinguished from its sister tongues by any very striking peculiarities, it is nevertheless a valuable source of illustration of the etymological processes by which what are called the modern Romance languages have been formed. Its most ancient written memorials are from the fifteenth century. Its literature is almost exclusively ecclesiastical, and consists chiefly of translations of the Scriptures and other works of religious instruction and edification. The first translation of the Bible into any of the Romansch dialects appeared at Scuol in 1679, under the title of *La sacra Biblia quai ais tuot la sancta Scrittüra . . . vertida e stampada in lingua Romanscha d'Engiadina Bassa, di Jac. Ant. Vulpi e Jac. Dorta a Vulpêra.* This translation was republished by Nott da Porta in 1743, and there are several later editions. Another translation of the Bible, in the Suprasilvan dialect, by Stephen Gabriel, appeared at Coire in 1719, entitled *La sacra Bibla quai ei tut la Soinchia Scartira.* One of the chief works in Romansch literature is the *Martyrologium Magnum oder il Cudesch Grand dels Martyrs,* translated by Conrad Riola into the Lower Engadine dialect, of which the first part was issued at Strada in 1718 in a quarto volume of 556 pp. The second part was never published. The infusion of the German element is much more conspicuous in the diction of this volume than in most older Romansch works, and especially than in the compositions of the present century, during which puristic principles have been in vogue. The secular prose literature of the Romansch language is not extensive, the only works of much interest being—Nott Aporta, *Chronica Rhætica, l'Historia del origine, guerras, alleanzas, etc. de la Rhetia* (Scuol, 1742), and Ant. Vulpius, *Historia Rhætica translatada e scritta in lingua vulgar Ladina,* a narrative of the religious wars of the seventeenth century in the Grisons, written about 1680, but first published at Coire in 1866. Travers wrote in the fifteenth century a rhymed chronicle entitled *La Chanzun della Guerra dalg Chiasté d'Müsch,* and Gioerin Wietzel is the author of a poetic account of the war of the Valtelline. There are in these dialects a few essays in dramatic composition, and many short descriptive, didactic, and lyrical poems, among which those of Z. Pallioppi are very popular. The *Poesias Umoristicas Populeras, etc.* da S. Caratsch (Turin, 1865) are also much esteemed. Several well-conducted weekly journals in the native tongue are published in the Engadine.

The special interest of the Romansch lies in its relations to the ancient Italic languages. It has been maintained by some that the Etruscans, in their original emigration across the Alps into Italy, left a portion of their tribe, and of course their language, in Rhætia, which took its name from that by which the Etruscans called themselves, *Rasena,* and that the modern Romansch is a lineal descendant from the Etruscan. Others hold that Rhætia was occupied by Etruscans driven out from their seats in Lombardy by the Gauls, or from Etruria by the Romans; and it is at least well established that the Etruscans embraced Rhætia, as well as other countries in and beyond the Alps, in the wide range of their commerce. (See Genthe, *Ueber den Etruskischen Tauschhandel nach dem Norden* (Frankfurt-am-M., 1874), and Steub, *Ueber die Urbewohner Rhætiens* (München, 1843).) Others, again, believe that Rhætia was Romanized by its conquest about fifteen years before the time of Christ, and that its language has been formed by the same process as the other Romance dialects of the ancient Roman provinces. Diez and Fuchs have elucidated the grammatical character of the Romansch dialects, and their phonology has been most fully and ably treated by Ascoli, *Glottologia* (vol. i., Turin, 1873). Among the many native grammars we may mention those of Carisch (Coire, 1852 and 1859); Bühler, *Grammatica elementara del Lungatg Rhæto-Romansch* (first part, Cuera, 1864); Pallioppi, *Ortografia e Ortoepia del Idiom Romauntsch de Engiadina ota* (1857), and *La Conjugaziun del Verb* (Samedan, 1868). Carisch published a Romansch-German dictionary at Coire in 1848, and a grammar in 1852. The death of Pallioppi (1870) prevented the completion of an important general Romansch lexicon on which he had long been engaged. To those whose curiosity is satisfied with such a view of the language as can be obtained by a comparison of texts we recommend, besides the translations of the Bible, Bühler, *Guglielm Tell, drama de Frideric Schiller, vertius e publicaus en lungatg Rhæto-Romonsch* (Cuera, 1865).

GEORGE P. MARSH.

Ro'mans, Epistle of St. Paul to the, was probably written from Corinth. It is one of the most important of the Pauline books, and affords so many fine examples of the noble and altogether peculiar style and reasoning of the great apostle that its authenticity has never been seriously called in question. Its contents are largely doctrinal, but it contains fine hortatory passages and directions for practical conduct. Its exegetical literature is extensive. The Epistle contains a thorough and comprehensive statement of the theology of Paul. He wrote the epistle to the church at Rome, which had been already established, probably by some of his own disciples, in order to prepare the way for a visit which he was anxious to make to them (xv. 23). At the time of writing he was under the necessity of going to Jerusalem (xv. 25–27). He therefore stood at the point described in Acts xx. 3; that is, about the year 58.

Romantic School. See APPENDIX.

Romayne' (NICHOLAS), M. D., b. at Hackensack, N. J., in Sept., 1756; studied medicine under Dr. Peter Wilson, also at Edinburgh, Paris, and Leyden; commenced practice at New York about 1782; gave private lectures on anatomy and other medical topics; was the first president of the New York Medical Society 1806; was one of the founders and the first president of the College of Physicians and Surgeons (1807), in which he lectured on anatomy and the institutes of medicine. D. in New York July 21, 1817.

Rome [Lat. *Roma;* Gr. Ῥώμη]. *Heathen Rome, History of.*—According to legends, Romulus, the son of Mars and of Rhea Silvia, the daughter of the king of Alba, founded the city and the kingdom of Rome, which grew rapidly in size and power by the establishment of an asylum on the Capitoline Hill and by the union with the Sabines and other Etruscan dwellers on the Cœlian Hill. Niebuhr in his *Roman History* proved the thoroughly mythical character of these legends, but so far the true history of the foundation of Rome has not yet been ascertained. Several kings, probably of Etruscan origin, seem to have ruled the young state some 600 years before Christ. In the days of Servius Tullius (578–534) Latium became part of the state, and a new constitution was given to the monarchy. The people consisted of three tribes, representing the Latin, Sabine, and Tyrrhenian elements, which constituted the *patricians,* free-born members of the original families or *gentes,* with their clients or dependants. The *plebeians* were also free, but had originally no political rights, being generally of Latin origin, and only admitted into the state by favor. By a change of laws under Servius they became entitled to equal rights, but for centuries the struggle between the conservative patricians and the more or less republican plebeians was the cause of great trouble and endless strife. The kings, elected for their lifetime, had by their side a senate, while the priests, forming a college of *pontifices,* and the *augurs,* employed in explaining the will of the gods as manifested in sacrifices and the flight of birds, controlled the will of the people largely through their religious influence. Regal Rome ruled the whole Latin coast, and treaties made with powerful Carthage, with Massilia in France, and with the Greeks of Southern Italy bear witness to the respect it enjoyed abroad, while imposing structures, still extant, recall its greatness at home. Servius fell through the misdeeds of his daughter

Tullia and her husband, the seventh king, Tarquin the Proud. With him ended the monarchy, and Rome was conquered by the Etruscan Porsenna. When the latter was slain at Aricia, Rome recovered her independence, though much curtailed in power and territory, and became a republic, ruled by two consuls, chosen annually from the patricians. Inner dissensions long retarded the growth and the prosperity of the commonwealth. In 494, however, the plebeians, constantly increasing in number and power by new acquisitions of territory, obtained by threatened secession the right to choose tribunes and ædiles to protect their liberties against the tyranny of the patricians. Chosen from among themselves, the tribunes were sacred and inviolable in their person, and possessed the veto power annulling any law or decree of the senate. Thus, they had tried and banished already in 491 the patrician Coriolanus because he had violated their rights; the incensed general appeared at the head of a Volscian army at the gates of Rome, but by his own generosity the city was saved from imminent ruin. An agrarian law, which was to secure to plebeians also a share in the public lands, became a source of long-continued strife at home, while almost incessant wars with neighboring tribes prevented a more rapid growth of the state. To this period belong the legends of the elder Brutus, of Lucretia, Horatius Cocles and Mucius Scævola, of Cincinnatus and the Fabii. Cincinnatus, however, was really for a time a stern ruler of Rome, and the Fabii were actually employed in the wars against Veii. In 457 the supreme power was vested in ten men, the decemviri, but two years later lost by the latter through the legendary insult suffered by Virginia. The plebeians seceded a second time, whereupon the old constitution was restored, and the Twelve Tables, the basis of all subsequent Roman law, were publicly acknowledged and exhibited. An appeal to the people was secured to every citizen, plebeians and patricians were allowed to intermarry, the tribes obtained legislative power, and military tribunes as well as censors were appointed. These offices, as well as the quæstorship, were thrown open to the plebs, and soon they were admitted to the senate also.

Hardly, however, had Veii been conquered by Camillus (395) when a more formidable enemy, the Gauls, appeared, defeated the army, and burnt Rome, the citadel, called the Capitol, alone escaping their fury. Through the heroism of Manlius and Camillus the barbarians were driven out, but the former paid with his life for an effort to assist the impoverished and ill-treated plebeians, and for ten years Rome was once more the scene of a fierce struggle between the plebs and the patricians. The latter succumbed, and by the Licinian Rogations (376) debtors were relieved, the public domain was partly thrown open to the plebs, and one of the two consuls left to be chosen by them. The return of peace led to the gradual relief of the latter; step by step they obtained access to all the higher offices of state, and when in 300 even the colleges of priests and augurs became accessible to them, there was virtually no longer any political difference existing between the two classes. L. Sextus was the first plebeian consul, but a *prætor urbanus* was invested with the judicial powers formerly wielded by the consuls, and curule ædiles were invested with great prerogatives, though members of both orders were eligible for the office. Thus, the patricians lost ground, and gradually gave way to a new nobility formed by high officials irrespective of their origin. The end of civil contests enabled Rome, with the aid of newly-formed legions, to carry on the war against rivals and enemies with increased energy, and gradually to conquer the whole of Italy. With wise moderation and great political foresight Rome treated the vanquished with kindness, incorporated them into the state, and admitted them to citizenship. The Samnites, the bravest and freest of Italian tribes, were not subdued till after three long and bloody wars (290), when the Gauls and Etruscans also were defeated. King Pyrrhus of Epirus, called by the Tarentines to assist them against Rome, at first obtained several victories by superior military skill and the use of elephants, but was finally defeated by Curius Dentatus near Beneventum (275), and compelled to leave Italy. The various tribes of Gauls had been previously subjugated; now Tarentum also was conquered (272), and with this conquest of the most powerful of Greek communities in Italy, and a victory over the last of the hostile Umbrians (266), the subjugation of the whole of Italy from Cisalpine Gaul to Sicily was accomplished (264).

Sicily, however, was still in the power of Carthage, and when a body of mercenaries, called Mamertines, who had obtained possession of Messina, asked for help against Hiero, king of Syracuse, the Romans eagerly seized the opportunity to weaken the power of Carthage. Thus began the First Punic war (264–242), which resulted in the conquest of the larger part of Sicily—leaving Hiero independent in his small kingdom—and the formation of the first Roman fleet. Misfortunes like the defeat of Regulus in Africa, and his well-known tragic end, only led to more energetic efforts, but also, after peace was made and Sicily had become the first Roman province, to the unwarranted occupation of Sardinia and Corsica, which Carthage, prevented by domestic broils, could not defend. In 235 the temple of Janus was closed, indicating that for once Rome was at peace with the world, but soon afterward new wars commenced and new victories were obtained against the Ligurians and the Illyrians. The Gauls, who had invaded Italy, were driven out, but Cisalpine Gaul was lost almost as speedily as it was won, when the Second Punic war threatened the very existence of Rome. Carthaginian generals—Hamilcar, the dreaded adversary of the Romans in the First Punic war, and Hasdrubal—had conquered portions of Spain, and soon after, Hannibal completed the conquest to the S. of the Ebro and the Douro, taking Saguntum, a Greek colony in alliance with Rome. War was declared 219, and Hannibal marched through Spain and Gaul, aided by the Gauls, reaching Italy with a small but enthusiastic army, with which he defeated the Romans in two pitched battles at Lake Thrasymenus, where the consul Flaminius fell, and at Cannæ, where both consuls were defeated with immense slaughter (216). Rome was in imminent danger, but her senate calmly and courageously exerted every means to prepare resistance, and the dictator, Fabius Cunctator, with great skill husbanded his forces while exhausting those of his adversary. Southern Italy having risen in favor of Hannibal, the latter with his army went to Capua, but could obtain reinforcements neither from home nor from Spain, where his brother Hasdrubal was hard pressed by the Romans. The latter gradually recovered ground; they retook Capua; then Syracuse and the rest of Sicily were conquered by Marcellus (212); in Spain Scipio avenged the death of his father and his uncle by brilliant victories; and finally Hannibal himself was defeated by Scipio on his native soil at Zama (202). Peace was made and the power of Carthage for ever destroyed. Massinissa, king of Numidia, an ally of the Romans, was liberally rewarded.

These victories only increased the desire of Rome to become the mistress of the world, while the rich booty acquired in these wars inspired the armies with thirst for new conquests. The alliance of Philip of Macedon with Carthage gave a pretext to Rome for turning her weapons next against the East. War was declared, Philip's army routed at Cynoscephalæ (197), and by a nominal acknowledgment of the liberties of the Greeks a foundation was laid for the supremacy of Rome in Greece. Antiochus the Great, king of Syria, who had invaded this country, was promptly driven out, and at Magnesia in Phrygia defeated by the younger Scipio (190). Thus the Romans entered Asia, granting the provinces which they had obtained from Antiochus to their near allies, Eumenes of Pergamus and the Rhodians. Almost at the same time Cisalpine Gaul was reconquered and created a province, and nearly the whole peninsula of Spain subjected to Roman dominion. A second Macedonian war, against Perseus, Philip's son, and his ally, Gentius, king of Illyria, ended with the capture of the latter at Scodra and the brilliant victory of L. Æmilius Paulus at Pydna (168). Perseus and his sons were carried captive to Rome, and with them such immense booty that the citizens were for ever relieved of the burdensome tribute paid heretofore. Macedonia and Illyria were declared free; the Rhodians were stripped of their possessions on the peninsula; Antiochus IV. of Syria was compelled to admit the supremacy of Rome; and 1000 Achæans were carried as hostages to Italy. When the 300 survivors, after their return, induced in 150 the Achæan League to declare war against Sparta, Rome's ally, they were defeated by Q. Cæcilius Metellus at Scarphæa, and later by Mummius at Leucopetra, whereupon Corinth was destroyed, and Greece, with the exception of Sparta and Athens, became a Roman province under the name of Achaia. The same fate befell Macedonia and Illyria, and Rome was now virtually mistress of the East and the West; for in the same year Rome, incited by Cato, had declared war once more against Carthage, and the third Punic war, under the second Scipio (Africanus), led to its conquest and its organization as a Roman province (146). This great general also took Numantia, a Spanish city, after a noble defence of ten years (133), reducing Spain also to a dependency—a fate which the Asiatic kingdom of Pergamus shared (133) when Attalus, its last king, bequeathed it in his will to Rome.

In the mean time, Rome had undergone great changes at home. The constant wars, the vast booty flowing from all sides into the capital, the lawless habits of life contracted by a victorious soldiery in foreign parts, and the vast admixture of foreign elements produced boundless

self-indulgence and general faithlessness and corruption. New vices were imported, mainly from Greece and Asia—new creeds from all parts of the world. The stern simplicity and strict morality of former times disappeared; manly virtues and noble self-sacrifice were supplanted by intrigues and vile cunning. In vain did the censor Cato inveigh against the sad innovations; in vain were all attempts to check extravagance and vice by sumptuary laws and strict prohibitions. The influence of Greece, first felt in the development of a Roman literature after the First Punic war, and then in the almost universal adoption of Greek philosophy and Greek manners, exercised a baneful influence. Simultaneously with this corruption of morals, the political institutions of ancient Rome also were fatally undermined. The new aristocracy, almost exclusively in possession of the higher offices, and hence immensely rich, developed a hostile antagonism to both the old aristocracy of the patricians and the people at large. Their wealth, amassed in the administration of provinces and the oppression of allies, contrasted all the more painfully with the poverty of the mass of the people as the rich gradually possessed themselves of almost all landed property and cultivated the soil exclusively by countless slaves. The poor congregated in vast numbers in Rome, where food had to be distributed in incredible quantities—first for a small price, and after 50 B. C. gratuitously. To remedy this crying evil, to relieve the poverty of the masses, and to increase the number of small land-owners, the tribune T. Gracchus proposed a new agrarian legislation (133). He succeeded, not without violating existing laws, but the optimates, the ruling party, resisted violently, and both he and his brother Caius paid with their lives for their noble though injudicious efforts to benefit the people (121). His followers were cruelly put to death, and henceforth, legal reform becoming impossible, a revolution could clearly be foreseen. The utter corruption of Rome became manifest in the war against Jugurtha, king of Numidia (111), who succeeded in bribing Roman consuls. At last C. Marius was elected consul—a triumph of the people over the optimates—and he opened the ranks of the legions to a lower class of men, thus making the army a readier instrument in the hands of great political leaders. He not only conquered Jugurtha, who was starved to death, but, being frequently re-elected, defeated also the Cimbrians and Teutons, who had destroyed two Roman armies at Noricum (113) and in Gaul (105). The Teutons were routed by C. Marius at Aquæ Sextiæ—the Cimbrians in Cisalpine Gaul (101). A short servile war in Sicily prevented him for a time from turning against the senate, but a social war in Italy itself between the Romans and the various allies, in which the former were victorious, led to the great rivalry between Marius and Sulla and the breaking out of a bloody civil war. The latter had as consul obtained the supreme command of the army in a war against Mithridates, king of Pontus, who had risen in Asia against Rome. Marius endeavored to deprive him of this place, but Sulla returned with his whole army, defeated Marius, banished him and his adherents, and was appointed perpetual dictator. As such he reconstructed the government of Rome in favor of the aristocracy, ended the war against Mithridates victoriously, and then resigned his honors. During his absence, however, Marius had been recalled by Cinna, and Rome had been taken and fearfully devastated, but both Cinna and Marius died before Sulla returned to Italy. In 83 he landed at Brindisi; Pompey brought him additional troops, and after a number of victorious battles Sulla remained sole master of Italy (82). He became dictator, avenged himself by merciless proscriptions on his adversaries, bestowed on his vast army rich gifts in land and money, and increased his party by granting citizenship to large numbers of freedmen. In 79 he abdicated and died in retirement; with him fell nearly all the changes he had made in the government of Rome. In the mean time, Lucullus and Pompey had conquered Armenia, made Syria a Roman province, subjugated Judæa, and subdued the Mediterranean pirates. Another servile war, in which Spartacus, a Thracian gladiator, proved at first victorious against several Roman armies, ended with his defeat (73) by M. Crassus; and Spain also, where Sertorius had ably maintained the banner of Marius, was finally pacified. Pompey found himself on his return from Asia (61) the most powerful man in Rome, with no rival but Julius Cæsar, and no danger but the conspiracy of Catiline. The latter was defeated by the matchless eloquence of M. T. Cicero, who had already rendered most eminent services to the commonwealth. The rivalry with Cæsar and the enmity of that stern republican, the younger Cato, he cunningly anticipated by forming with Cæsar and Crassus the triumvirate. Crassus, whose great wealth and brilliant talents would have made him most formidable, fell soon afterward in a war against Parthia. Cæsar went, after Cicero had been banished from Rome, into Cisalpine Gaul, completed the conquest of that province, and invaded Germany and Britain. Strong in the great renown which he had thus acquired, and supported by enormous wealth and the enthusiasm of a large, well-disciplined army, he returned to Italy; and when Pompey, on the plea of supporting the senate, took hostile measures, he defeated his rival and gained victory after victory. His crossing the Rubicon, the boundary-line of his province, began the civil war, in which he defeated all his enemies. He compelled Pompey's adherents to leave Spain, and took Massilia; Rome was forced to make him dictator, and the next year saw him land in Illyria. At Pharsalus (48) he defeated Pompey, who was soon after killed in Egypt. After the Alexandrian war and the victory over Pharnaces of Pontus he returned to Rome, where he was re-elected dictator and invested with almost unlimited power. Equally successful in the African war, which ended with the battle of Thapsus (46), and in the final annihilation of Pompey's party by the battle of Munda, he was now made imperator (45), and the senate ordered divine honors to be paid to him. The desire to add to royal power the name of king led to a conspiracy which resulted in his assassination through M. Brutus (44). This murder did not save the republic, but caused a fearful civil war between the republican party, led by Cassius and Brutus, and Cæsar's nephew, Octavianus, who, united with Lepidus and Antony, triumphed at last. The battle of Philippi made an end to the republic, and henceforth Rome became a monarchy. Lepidus was soon set aside, but Antony, by preferring Cleopatra, the queen of Egypt, to his wife, the sister of Octavianus, offended the latter, and open war broke out between the two triumvirs. Antony had gone to Greece. Agrippa pursued him and defeated him in the great naval battle of Actium (31), whereupon Antony and Cleopatra fled to Egypt, and killed themselves when pursued by Octavianus. After having settled matters in the East, the latter returned to Rome, which Mæcenas had ruled during his absence, and under the title of Augustus became master of the Roman empire (30). During his reign his stepsons, Drusus and Tiberius, conquered parts of Germany, but his general, Varus, was ingloriously defeated and perished there.

For a time the emperors maintained the legal fiction of a lifelong magistracy, causing all military and civil offices to be conferred upon them in the prescribed legal way. In the days of Diocletian and Constantine, however, this apparent respect for the ancient liberties of Rome also passed away, and the emperors became absolute monarchs. Augustus was succeeded by Tiberius (14–37), who at once deprived the people of certain rights, established his body-guard, the prætorians, in the city of Rome, and at a later period of his life abandoned the government to his favorite Sejanus, and retired to Capri. After him followed Caligula, Claudius, and Nero, all three at least distantly related to the founder of the dynasty. Tyranny and fearful moral corruption increased steadily, till insanity was admitted as a plea in behalf of the bloodthirsty Cæsar. Under Nero the first persecution of Christians took place. The emperors Galba, Otho, and Vitellius followed each other in rapid succession; then came Vespasianus, proclaimed Cæsar by his victorious legions, and the founder of the Flavian family. His son Titus conquered Jerusalem, and then ruled with wisdom and moderation (79–81). His brother, Domitianus, was the only cruel emperor among those who for nearly a century gave peace and prosperity to Rome. Under him Britain was finally conquered by Agricola. He was succeeded by the humane Nerva, and he by Trajan (98–117), who conquered Armenia, Mesopotamia, and Assyria, and found in the younger Pliny a worthy chronicler. Hadrian abandoned the most distant provinces on the Persian Gulf again, and took wise measures for the administration of justice and the restoration of prosperity throughout the vast empire, through which he travelled assiduously. The two Antonines followed in his footsteps—the latter better known as Marcus Aurelius (161–180)—but with him end the better times of the empire. Under his cruel and dissolute successor, Commodus, began the period designated by Gibbon in his great work as the period of decline. Commodus was assassinated by conspirators, and his stern successor, Pertinax, by the prætorians, who sold the empire to Julian; he was in his turn murdered upon the arrival of Septimius Severus. Under this emperor, who ruled Rome with power and great success, Roman law reached its perfection by the aid of Ulpian, Paulus, Papinian, and Modestinus. He was succeeded by his sons, Caracalla and Geta, whose vicious and cruel rule was surpassed by that of Heliogabalus. Alexander Severus restored for a short time peace and prosperity to the empire; Aurelian destroyed Palmyra and captured Zenobia (273); but under their successors Rome became the scene of ruinous confusion. Rival emperors

contended for the supreme power, provinces rose in rebellion, and at the frontiers appeared new races of barbarians. The Goths devastated Asia Minor and the coasts of Greece; Alemanni penetrated through Helvetia into Italy, and reached Milan; Franks overran Gaul, and even entered into Spain. In vain were the victories of Claudius over the Goths (270), in vain the success of Aurelian against the Marcomanni and Alemanni (275). Already in 286 the empire had been divided in two, and soon after in four parts; then Constantius took the West, and Galerius the East, as separate empires. Constantine the Great, the son of the former, and the first Christian emperor, formally transferred the seat of government to Byzantium, now called Constantinople, and completely changed the constitution of the empire (330). From that time Rome ceased to be the mistress of the world, and sank till it finally became the capital of a mere province. The emperors became despots, exacting not only obedience, but adoration, their court-officers were at the same time state officers, civil and military powers were carefully kept separate, and the beautiful municipal system of ancient Rome was utterly destroyed. After the death of Constantine the empire was divided among his three sons, of whom, however, one, Constantius, soon became sole ruler (353). His successor, Julian, drove out the barbarians who had invaded Belgium and Alsace, restored paganism (hence his title, "Julian the *Apostate*"), and fell fighting against Persia. The army chose Jovian, who restored Christianity, but died soon, and was succeeded by Valentinian, who gave the East to his brother Valens. The latter fell in an attempt to resist the Visigoths, who fled before the Huns and sought refuge on Roman soil (378). His whole army was destroyed, and the Goths ravaged the country up to the walls of Constantinople. Gratian was summoned from distant Treves to come to the rescue of the imperilled empire, and he chose Theodosius, a renowned general, as his colleague, causing him to be proclaimed emperor of the East (379). The latter succeeded in restoring peace, defeated several rivals and usurpers, and as Theodosius the Great was acknowledged sole master of the whole Roman empire (394). After his death, however, the empire was once more divided between his two sons, Arcadius and Honorius, the former ruling over the Byzantine empire, which henceforth remained separate from Rome, and continued as such till it fell in the middle of the fifteenth century into the hands of the Turks. Honorius assumed the rule over the Western empire, which comprised, besides Italy, Illyria and Africa, Gaul, Britain, and Spain, but he resided first in Milan and then in Ravenna. The government was virtually in the hands of Stilicho, who defeated Alaric the Visigoth in Greece and in Italy (403), and Radagasius with his German hosts at Florence (406), but was murdered soon after (408). Now the barbarians began to press closer and closer upon the crumbling empire. Alaric laid Italy waste and took Rome (410). Vandals and Suevi, who had passed with the Alani through Gaul, conquered Spain (409). Franks, Alemanni, and Burgundians took possession of Gaul, while in the S. the Visigoths established a kingdom which extended into Spain. Britain was abandoned in 421; Africa fell into the hands of Vandals (429); and although the Romans under Aëtius defeated the Huns on the Catalaunian plains, Attila could not be kept from invading Italy (452). The widow of the emperor Valentinian, Eudoxia, to avenge personal injuries, called in the Vandals under Genseric, who plundered Rome. The unfortunate emperors were either mere puppets in the hands of ambitious generals, or paid promptly with their lives for their efforts to be independent, till Romulus Augustulus (as he was contemptuously called) abdicated in 476 at Ravenna. Odoacer, a barbarian, was proclaimed ruler of Italy as a simple patrician, and thus ended the Western Roman empire in name as well as in power.

Literature.—There is no lack of works to be consulted on the history of Rome, although a really scientific treatment of the subject was unknown till the last century. Up to that time fable, myth, and legend were so closely interwoven in all accounts of the great empire as to make them worthless to the historian. The first valuable work on the subject is the *History of the Emperors* by Sebastien le Nain Tillemont (Paris, 1701), a book of immense research and full of most valuable authentic information. Written at Port Royal, it bears a strong religious impress, but the author's uncompromising faith never interferes with his clear judgment and conscientious statements. Gibbon's great work on the *Decline and Fall of the Roman Empire*, finished in 1787, is written from the opposite point of view, but invaluable by the thorough study of all available sources of information and its matchless eloquence of style. The attention paid by him not only to documents and annals, but also to inscriptions and coins, led to a valuable work by Eckhel on the *Doctrine of Ancient Coins* (in Latin), which appeared in 1792, and was of invaluable assistance to Niebuhr. This great German writer opened in his *Roman History* (1842) and his *Lectures on Roman History* (1846) entirely new views on the political record of the republic, on the value of authorities, and the critical distinction between legend or myth and real facts. Drumann also, like Niebuhr, dwelt mainly on the history of republican Rome in his *History of Rome* (1844), and wrote exclusively from the standpoint of an ardent monarchist. English authors, since Gibbon, have preferred the history of Greece, and hence the principal recent authorities are H. F. Clinton's *Fasti Romani* (Oxford, 1850) and Charles Merivale's admirable work, *The History of the Romans under the Empire* (1862). Of the 7 large vols. the first two end with the fall of Cæsar, the two next treat of the Augustan age, and the last three of the period from Tiberius to the death of Marcus Aurelius. The work lacks originality, but is always instructive, very attractive in form, and popular in its general treatment of the subject. By far the most important contributions to Roman history have of late been made by Theodor Mommsen, a German historian, whose *Oscan Studies* and *Dialects of Southern Italy* opened entirely new views on the philology and archæology of ancient Rome, while his researches in Roman law met with similar success. His *History of Rome* abounds in new and valuable information and in striking views of great interest. Of other German works, C. Hoeck's *Roman History* (1850) is unfortunately incomplete, but invaluable for its clear and complete exposition of the inner administration of the empire under Augustus. In France, where the history of Rome has always been treated with special preference, Count Champigny has presented us in three independent works (*Les Césars*, 1843; *Rome et la Judée*, 1850; *Les Antonins*, 1853) with a continuous history of the empire from the fall of the republic to the death of Marcus Aurelius. An ultra Roman Catholic, the author is led to see all the light on the side of Christianity, all the shadows on the side of paganism, and thus the work, in spite of its attractive style and profound erudition, loses much of its value as an historical work. Very different is M. Beulé's famous work, *Auguste et sa Famille*, 1868 (4th ed.), in which the former minister employs the history of Rome with great skill and infinite tact as a mirror reflecting the image of modern imperialism. The historical portraits, the detailed descriptions, and the astute guesses at character with which the book abounds make it of great interest and no small value to the philosophic student of history. Recent researches have here, as elsewhere, been mainly directed to special subjects, such as inscriptions, coins, and monuments. For the first, the *Corpus Inscriptionum Latinarum*, published since 1863 by the Academy of Berlin, is invaluable. Ancient monuments have been most successfully studied by Rossi, especially as far as the oldest Christian records are concerned, while the Germans Mommsen and Henzen, and Renier and Waddington in France, have co-operated with the Italians Borghesi and Rossi in happy unanimity and with brilliant success. (See ROMAN ARCHÆOLOGY.) SCHELE DE VERE.

Rome (CHRISTIAN). Upon the ruins of the ancient Roman empire there arose gradually a new empire, which soon became all the more powerful as it claimed control over the souls of men as well as over their bodies, and extended its dominion beyond this life into eternity. Rome became, after a short interregnum, once more the seat of the central power in Europe, and thus earned its historic name of the "Eternal City." It owed this supremacy to the gradual development of Christianity. At first the new Church consisted simply of priests and laymen. Among the former, however, external circumstances soon produced a certain hierarchy. The heads of large and wealthy congregations naturally enjoyed advantages which raised them above the great mass of clergymen. Out of this number a few, again, rose to special eminence because they controlled the churches of great provincial centres, such as Ephesus, Antioch, Alexandria, and Rome. They claimed, and gradually obtained, superior powers, presided at great councils, and enforced obedience to their decrees. The bishop of Rome not only inherited the prestige of the former capital of the world, but skilfully enhanced it by claiming supreme spiritual authority as successor to St. Peter, the presumed first bishop of Rome. As the Founder of the new faith had declared, "Thou art Peter, and upon this rock I will build my Church," and "Whatsoever thou shalt bind on earth shall be bound in heaven, and whatsoever thou shalt loose on earth shall be loosed in heaven," the same special prerogatives were claimed for his successors, and the bishop of Rome assumed, as vicegerent of Christ on earth, supreme power in this world over all Christendom, and the keys of heaven and hell for the world to come. The patriarchs of Antioch, Alexandria, and Constantinople, who had long been his equals in rank and authority, were gradually led to acknowledge him as

their superior, till in 1054 a great schism divided Christendom into a Roman Catholic and a Greek Church independent of the pope of Rome. The full supremacy of Rome as the capital of the new Church-empire may be referred to the time of Pope Gregory I. (590–604), through whose great energy and matchless political wisdom the authority of the Church was everywhere established upon a solid and permanent foundation.

Rome itself—and with Rome the whole of Italy—had in the mean time been the easy prey of the new races which at that time broke forth from their unknown home in the East, overran the whole of Europe, and gradually obtained the supreme power in Europe. Under various names, as Goths and Germans, as Longobards, Franks, and Avares, they conquered one province after another. Large portions of Italy were laid waste, cities were sacked and razed to the ground, and whole populations butchered or carried into captivity. The surviving inhabitants remained in possession of the land, which they were forced to cultivate for the benefit of the conquerors. The ancient laws of Rome ceased to be enforced, the municipalities became extinct, the country was divided into duchies and governed by foreign masters. Although the Longobards at no time were masters of the whole of Italy, their influence was powerful enough to give a new German character to the whole peninsula. Repeated efforts, made by the Roman emperors at Constantinople, to recover possession of Italy led to bloody wars, but remained unsuccessful. A greater danger threatened Rome when the Church was violently agitated by a great schism between the followers of Arius, who denied the divinity of Christ, and the Roman Catholics, who condemned Arianism. Thanks to the skilful management of Gregory the Great and his influence over Theodelinda, the queen of the Longobards, the latter were won over to his side, Rome was saved from destruction, and Roman Catholicism became supreme in Italy. This great triumph not only relieved the Church in Rome, but enabled it to increase its strength at home and to extend its power abroad, untrammelled by the irksome authority of Greek emperors or the barbarous interference of German invaders. About the same time that the laws of the Longobards were collected (644) the decrees of councils and the canons of the Church also were codified.

The influence of Rome grew with the power of the popes. The Germans were converted by St. Boniface, and even the Eastern nations of the Slavonic race began to acknowledge the authority of the Church, but the appeal of the Frankish king, Pepin, first established the claim of the popes to judge in secular matters as well as in matters of faith. Pepin rewarded the pope's assistance by a grant of land in Italy, and thus the foundation of the secular power of the popes was firmly laid. Pepin's successor, Charlemagne, relieved the pope of great danger, defeated his enemies the Longobards, and after several bloody campaigns entered Rome, where he accepted at the hands of Pope Leo III. the dignity of emperor of Rome and protector of Christendom (800). It was little more than a restoration in name of the old Roman empire; Charlemagne acquired no new provinces and no new powers, but the deep-rooted reverence felt all over the world for ancient Rome was silently transferred to the new Cæsar. Thus, the emperors gained much by this consecration of their power, while Rome resumed once more its sway over the world as the fountain-head from which all authority flowed.

Italy was, however, not long to enjoy this newly-won greatness in peace. New enemies arose on all sides, and already in 846 the Saracens invaded the country and threatened Rome. Leo IV., a Roman by birth and a man of extraordinary vigor, enclosed that part of the city which has ever since been known as the Leonine City with strong walls, and made it for a time impregnable. After a period of turbulent warfare an appeal was made by John XII. to Otho, the German emperor, and the journey of the latter to Rome inaugurated a series of expeditions made by the emperors of Germany into Italy. Otho was, like Charlemagne, crowned in Rome, and confirmed and enlarged the donations made by his predecessors, but reserved to himself and his successors the sovereignty of Rome. Unfortunately, this divided authority led to the commission of atrocious political crimes by the popes and the three Othos, and this period of Roman history is full of shame and disgrace. The papal party and the imperial party —later known as the Guelphs and the Ghibellines—were in constant conflict, and Italy was the bloodstained battlefield on which the war was waged. At times the popes triumphed, as when the celebrated Hildebrand compelled the emperor Henry to do penance at Canossa, a fortress in Lombardy, and, kissing the pope's foot, to swear a formal oath of submission. Then, again, he saw himself deposed, Rome devastated by Norman troops under Guiscard, the city burnt, the inhabitants slaughtered or sold into slavery, and he himself driven to seek refuge at Salerno, where he died. Crusaders, German armies, and lawless bands of soldiers ravaged Rome by turns, and in the thirteenth century, a period of unbroken faction and fighting, the city suffered fearfully. Ancient tombs and monuments were transformed into fortresses, towers were built everywhere, and the houses of the tyrannical nobles were so many impregnable strongholds. Within the walls vast districts were lying waste, gardens were planted where once stood the proudest temples and loftiest palaces, and the inhabited portions of the city were filled with perpetual tumult. "Peace had abandoned Rome," says W. W. Story in his *Roba di Roma*, "and Desolation wandered in the streets." The popes were confined to their castle, and yet their power abroad was greater than ever. Emperors, kings, and princes bowed before Innocent V., who claimed the government of the whole world, basing his rights upon divine ordinance and sustaining them by the fearful weapons of excommunication and interdict. When, however, by a turn of fortune, his successors were compelled to abandon Rome and to reside in France at Avignon (1309–77), the city became a prey to complete anarchy, a fate which the adjoining country shared. Rome was virtually left without a government, the Guelphs and the Ghibellines, Neapolitan and German armies, and the noble families of the Orsini and the Colonna being alternately masters. The provinces were ravaged by robbers and freebooters, and commerce and industry ceased to exist. For a time peace was restored, order secured, and law resumed by the marvellous success of Cola di Rienzi, a man of the people, who by the rare power of genuine enthusiasm made himself master of Rome, and even of most of the Italian states (1347). But this last "tribune of the people," as he called himself, was murdered, and when he fell Rome had been so depopulated by wars and tumults that it counted less than 20,000 inhabitants. Herdsmen pastured their cattle on the Forum, flocks of wild-fowl haunted the streets, and beasts of all kinds roamed through the deserted quarters. The ancient tombs alone were alive, being still held as fortresses by the nobles. The record of this period is one of unbroken violence, murder, and battle. The family of the Borgia, which furnished two popes, became identified with the most shameful crimes and fearful abominations. Fortunately, the return of Gregory IX. after the termination of the great schism (1378–1417) had begun a new era, during which vast wealth accumulated in Rome, and all Italy bloomed forth in the so-called renaissance of ancient art and science. Popes like Julius II. and Leo X., one of the Medici, encouraged these efforts by their liberality, and thus Rome was enabled to recover from a terrible calamity —the pillage of the city by the infuriated troops of the constable of Bourbon (1527). But still the popes were either unable to restore peace and order or were held in subjection by foreign powers; for in the mean time the end of the long wars between France and Spain had secured the supremacy in Italy to the latter power. Milan and Naples, Sicily and Sardinia, were Spanish provinces, and the other princes of Italy willingly yielded to the paramount influence of Spain. The increasing power of Protestantism absorbed all the energies of the popes; Pius V. in vain persecuted heretics with increased rigor, and Gregory XIII. was rendered almost powerless by the overwhelming number of banditti. His reform of the calendar, known henceforth as the Gregorian, though at first rejected by Protestant nations and never adopted by the Greek Church, gave him unusual eminence in the annals of Rome. At last the papal sceptre fell into the hands of a really strong man, a born ruler. This was Sixtus V., whose restless energy and stern administration of justice once more restored peace to Rome. From this time the aspect of the city was changed, the reckless power of the nobles was broken, brigandage was rooted out, and property and life were once more safe. Law and justice reigned again where tumult and violence had so long been supreme. Unfortunately, the next epoch in the history of Rome, the seventeenth century, is a period of political death in Italy. Complete apathy succeeded the fierce turmoil and the fire of passions which had so long desolated the Eternal City. The popes lost their influence in the world; their home rule was such that the people preferred to suffer in silence; inveterate libertinage took the place of political strife, and nepotism prevailed in the Church. At last, the French Revolution broke out, and the overflowing current of loosened passions found its way to Rome also. A French army entered Italy (1796), conquered the northern provinces, and threatened Rome. For a time the payment of large sums of money averted the storm, but soon after Gen. Berthier invaded the papal states and took possession of Rome. The pope, Pius VI., became a prisoner—first at home, and then in France—and Rome was formally an-

nexed to France (1806). It was not until 1814 that the city became free once more and saw the pope return to his palace. In 1848, however, the people rose in rebellion, drove out Pius IX., and established a republic under the triumvirate of Mazzini, Armellini, and Saffi. An appeal to France brought once more a French army to the gates of the city, and a siege was begun. Garibaldi was in the open field with his soldiers, and the Romans within fought with the valor of their ancestors—so bravely that the French were disgracefully defeated. Overwhelming numbers, however, soon put an end to the short-lived republic. Rome was taken, the assembly, convened at the Capitol to meet the invaders, was dispersed, and the pope brought back to Rome. For twenty years French troops garrisoned the Eternal City, and when they were at last withdrawn (1870) Italy had become one great nation. Soon afterward Rome, having been made the capital of the new kingdom, saw the temporal power of the Holy See abolished and Victor Emmanuel enter as its new master. It presents now the strange anomaly of being the residence of two sovereigns, the king of Italy and the pope—the one ruling over the whole peninsula from the Alps to the island of Sicily, the latter ruling in undiminished authority over the consciences of all the members of the Roman Catholic Church.

Literature.—On the mediæval history of Rome few books of value have been written since Gibbon published his *Decline and Fall of the Roman Empire.* The German work of Dr. Gregorovius, *History of Rome in the Middle Ages* (1863), refers mainly to the city; T. Dyer's *History of Rome* (London, 1865) is more comprehensive. The Very Rev. Dr. Donovan's *Rome, Ancient and Modern* (Rome, 1842), is specially rich in matters of interest to English students and in information on Christian edifices and worship in early times. M. Letarouilly's *Édifices de Rome moderne* mentions incidentally much of the history of the great noble families whose palaces form the subject of the work. Valuable information may also be obtained from the works of Sir G. Head, Burgess, and Burton, while the *Beschreibung der Stadt Rom*, by Bunsen and others (1842), gives the fullest description of the city. By far the most valuable contribution made to the subject in our day is A. de Reumont's *Geschichte der Stadt Rom* (1869). W. W. Story's (the sculptor) admirable *Roba di Roma*, and A. Hare's *Walks through Rome*, are of great value, though more confined in their purpose. (For additional information see the articles on ITALY, PAPAL STATES, POPE, ROMAN ARCHÆOLOGY, and ROME, THE CAPITAL OF THE KINGDOM OF ITALY.) SCHELE DE VERE.

Rome (THE CAPITAL OF THE KINGDOM OF ITALY). On Feb. 26, 1861, the Parliament of the kingdom of Sardinia unanimously resolved to confer on King Victor Emmanuel II. and his successors the title of king of Italy, and on the 27th of the same month the Chamber of Deputies resolved that, the dignity, decorum, and independence of the pope and the full liberty of the Church being duly secured, the principle of foreign non-intervention ought to be applied in concert with France, and that Rome, proclaimed as capital by the national opinion, should be annexed to Italy. The continued occupation of Rome by France prevented the carrying out of this resolution, but the events of the Franco-German war induced that power to withdraw her troops from the city, and on Aug. 19 the last detachment of the French garrison evacuated Rome. On Sept. 11 a corps of the Italian army entered the pontifical territory and marched directly upon Rome. On the 16th of that month Civita Vecchia, which the French still held, was surrendered to an Italian force under Gen. Bixio, and a foreign flag no longer floated over Italian soil. After a brief resistance by the pontifical troops, which cost the Italian army 138 killed and wounded, Rome capitulated to the royal army on Sept. 20. A provisional government was forthwith organized, and a popular vote on the question of annexation to the kingdom of Italy decreed. The vote in the city of Rome was 40,785 in the affirmative, 46 in the negative; in the whole pontifical territory the affirmatives were 133,681, the negatives 1507. On Oct. 9 a royal decree for the annexation of the Roman territory was promulgated, and Gen. La Marmora was charged with the civil government *ad interim.* On Nov. 1, Pope Pius IX. issued an evangelical letter excommunicating all who had taken part in the establishment of the kingdom of Italy. On Dec. 21 the Chamber of Deputies of the Italian Parliament, then in session at Florence, voted their acceptance of the popular vote of the Roman people, and that the seat of government should be transferred to Rome at the end of June of the following year. On May 13, 1871, Parliament passed what is called *la legge delle guarantizie*, granting to the pope the most ample liberties, immunities, and privileges, together with a perpetual income of 3,225,000 *lire* or francs; all which the pope refused to accept by an evangelical letter of May 15, 1871, in which he protested against the acts of the Italian government, and appealed to the powers of the world to restore him to his rights and sustain him in the exercise of them. Preparations were now made for the transfer of the ministries and other governmental agencies, and on July 2, King Victor Emmanuel, accompanied by the great officers of state and the members of the foreign diplomatic corps, made his solemn entry into the new capital of Italy. On Nov. 27, 1871, the king opened the first session of the Italian Parliament in Rome, and the transfer of the seat of government was now complete.

The transfer of the capital being decided upon, the work of material improvement was commenced and prosecuted with alacrity. The most urgent need was that of suitable buildings for the accommodation of the royal household, the ministries, and other public officers. For the former purpose the Quirinal Palace was selected, and apartments were arranged in it both for the king and for the royal princes. Several of the departments of the national government were established in old official buildings of the papal administration, some in suppressed convents fitted up for the reception of different bureaus; halls for the legislature of united Italy were extemporized; and when the removal of the seat of government was completed, it was found that the necessary facilities for the transaction of the affairs of a great kingdom had all been provided. The only important new public construction which it has yet been found indispensable to undertake is an office for the ministry of finance, which is now nearly finished on a scale commensurate with the extent of the functions of that department. The completion of this important structure happily coincides with the final triumph of a financial policy which has at last succeeded in establishing the *pareggio* on equality between the income and the outgoes of the state.

In the mean time, private enterprise and the municipal administration of the new capital, encouraged and aided by the national government, have vied with each other in the material improvement and embellishment of the city. A large extent of unoccupied ground has been covered with new and commodious dwellings; old and unsightly houses have been repaired, raised, and enlarged; spacious and convenient hotels built for the accommodation of the many thousands of visitors who annually flock to Rome; new streets have been cut and old thoroughfares widened, straightened, and reduced in grade; street-lights immensely multiplied, by which and by the creation of a new and efficient police the public security has been greatly advanced; the system of drainage, formerly most imperfect, has been thoroughly reformed by the construction of new sewers of enlarged capacity; the aqueducts repaired; and the accumulated filth of centuries, which from time immemorial had made Rome the foulest of European cities, has been swept away.

The material difficulties which have retarded the progress of these improvements have been most serious. The soil of Rome is a mass of rubbish consisting to an almost incredible depth of the débris of old buildings and other refuse. To reach the natural undisturbed soil—and none other is safe for foundations—it is very frequently necessary to go to a depth of more than thirty feet. The substructure of the new Protestant church of St. Paul-within-the-Walls is laid at 40 feet below the level of the adjacent streets, and that of the ministry of finance from 15 to 20 feet lower still. The removal of such masses of loose and often polluted earth is not only very costly, but prejudicial to the health of the laborers and of the neighborhood; but, happily, improved drainage and other sanitary arrangements have so far obviated this latter difficulty that the general condition of the city in this respect has not been sensibly impaired, and there can be no doubt that even independently of the adoption of the contemplated measures for restoring the healthfulness of the environs of Rome by draining the Campagna and preventing the inundations of the Tiber, the mere cessation or diminution of operations which involve the disturbance of large bodies of impure soil will of itself much ameliorate the salubrity of the local climate.

In the course of the extensive excavations referred to very numerous archæological discoveries have been made. The municipality has wisely provided for the preservation of the ancient monuments now brought to light as far as possible, and for the collection of the statuary and other lately-found transportable works of art in a new museum at the Capitol, which is already an important addition to the attractions of Rome and to its facilities for the study of ancient art. The ministry of public construction, under the enlightened administration of Signor Bonghi, has contributed much to the same end by bringing together at the Collegio Romano various collections and deposits of ob-

jects illustrative of ancient and mediæval history and art; and hence, in spite of the illiberal partial withdrawal of the Vatican museums from public use, Rome still offers unrivalled advantages for archæological study. The libraries of the suppressed convents have been collected in a general deposit at the Collegio Romano, and, though pillaged of many rare and valuable books and manuscripts before they came into the hands of the Italian government, still form a very valuable nucleus for a great national library.

But public authority and private patriotism have not confined themselves to mere material improvements. The university has been reorganized on a wise and liberal basis; the number of schools has been vastly augmented; numerous institutions for the increase and diffusion of knowledge in all its branches have been opened; and it may fairly be said that few cities now surpass emancipated Rome in opportunities for the acquirement of the widest and soundest culture. Several new Protestant churches have been constructed and old buildings adapted for Protestant religious services within the walls of Rome; and in this old retreat of bigotry and intolerance every man may now freely worship God without let or hinderance according to the dictates of his own conscience.

The population of the city has been increased by many thousands, partly in consequence of the removal of official persons and their families to the new capital, partly from the enterprise of merchants and artisans seeking a new field for the employment of their funds and the exercise of their industry, and partly from the unsurpassed attractions which Rome now offers, both as an eminently cosmopolite centre and as a residence uniting advantages which are elsewhere to be found only in wide dispersion. The present population of the city is stated at 263,000, and there is little doubt that Rome will in the course of a few years approximate the other European capitals in the number of its inhabitants, even if it does not again rise to the overshadowing extent and magnificence of the ancient mistress of the world.

The modern city occupies the same site as the ancient, in lat. 41° 5′ 54″ N., lon. 12° 28′ 40″ E., on both sides of the Tiber, 14 miles from its entrance into the Mediterranean. It is surrounded by a wall 12 miles in length, constructed of brick, 50 feet high on the outside, generally less than 30 feet on the inside, surmounted with 300 towers and pierced by 12 gates, several having been walled up; but by far the largest part of the area enclosed by this wall is covered with gardens, vineyards, and ruins. The wall itself dates from various periods; that part of it which is situated on the left side of the river was commenced in 271 by Aurelian, and completed by Probus; the principal restorations belong to Honorius, Theodoric, Belisarius, and several popes. Of the gates, the most remarkable is the Porta del Popolo, situated on the left side of the Tiber, through which the route to Northern and Eastern Italy leads, crossing the Tiber by the Ponte Molle, 1½ miles distant.

The Tiber traverses the city from N. to S., and is spanned by five bridges—Ponte Sant' Angelo, the ancient Pons Ælius, built by Hadrian opposite the castle of the same name; Ponte Leonino, a new suspension bridge, crossing from the Longara; Ponte Sisto, built by Sixtus IV. in 1474 on the ruins of the ancient Pons Janiculensis, and crossing from the Trastevere; Ponte San Bartolommeo, the ancient Pons Cestius, connecting Trastevere with the Isola di San Bartolommeo, an island of the Tiber, and Ponte di Quattro Capi, the ancient Pons Fabricius, leading from the island to the left shore of the river; and, finally, Ponte Rotto, below the island. By the river the city is divided into two unequal parts. The smaller and more modern part, situated on the right bank, consists of a northern and southern portion. The former contains the Vatican palace and the church of St. Peter, both of which are separately described in this work, and the castle of Sant' Angelo. This last structure (*Molis Hadriani*), commenced by Hadrian and finished in 140 by Antoninus Pius, was intended for a mausoleum for Hadrian and his family, and connected with the Monte Pincio by the Pons Ælius. When the Goths conquered Rome under Vitiges, the structure was used as a fortress, and during the feuds of the early Middle Ages it constantly formed a stronghold in the hands of the ruling faction. Urban V. constructed the outworks; in 1500 the covered passage which connects it with the Vatican palace was built; and in 1527, Clement VII. sustained here a long siege, in which the constable of Bourbon was killed. The later popes used the structure principally as a dungeon. The southern portion, Trastevere, occupies the ancient Mons Janiculus. Here was in the oldest time a fortified outpost against the Etruscans, and in the time of Augustus a populous suburb. At present the quarter is mostly inhabited by workingmen, who claim to be the true descendants of the old Romans. The most remarkable points here are the church of S. Pietro in Montorio, erected in 1500 by Ferdinand and Isabella of Spain on the spot where St. Peter is said to have suffered martyrdom, and the magnificent fountain Acqua Paola, built in 1611, under Paul V., by Fontana and Maderno, after the restoration of the ancient Aqua Trajana, an aqueduct erected by Trajan and carrying the waters of the Lago di Bracciano, 35 miles distant, into the city. These two portions of the western part of the city are connected by the Via della Longara, ¾ of a mile long, constructed by Sixtus V., and containing the Villa Farnesina, which was built in 1506 by Bald. Peruzzi, came into the possession of the Farnese family in 1580, and was lately occupied by the ex-king of Naples, and the Palazzo Corsini, in which Queen Christina of Sweden died Apr. 19, 1689; the former containing a celebrated series of frescoes after designs by Raphael, the latter an excellent picture-gallery, one of the largest collections of engravings in the world, and a valuable library.

The larger, eastern part of the city, situated on the left bank of the Tiber, occupies the far-famed seven hills; the modern city, however, is mostly crowded together in the low plain between the hills and the river, the ancient Campus Martius. Farthest to the N., near the Porta del Popolo, rises Monte Pincio (*Collis Hortorum*), 175 feet above the level of the sea, which in ancient times was covered with gardens and not reckoned a part of the city; the famous gardens of Lucullus were situated here. Separated from Monte Pincio by the Piazza Barberini extends the Esquiline Hill in a long curve, forming three buttresses toward the plain—the Quirinal, 157 feet, the Viminal, 170 feet, and the Esquiline proper, 188 feet. Farther to the S. rises the Cœlius, 160 feet, and between this and the river the Aventine, 155 feet. In the southern part of the plain, between this range of hills and the Tiber, rise, insulated, two other hills—the Palatine, 170 feet, and the Capitoline, 161 feet. The last formed the most prominent point of ancient republican and imperial Rome, the principal part of which extended over the Capitoline, Aventine, Cœlius, and the southern part of the Esquiline. These districts are now almost deserted, but covered with the grandest ruins, and at present the Capitoline Hill forms the boundary-line between ancient and modern Rome. It contains the church of Santa Maria in Araceli, which occupies the site of the ancient temple of Juno Moneta, and was erected before the tenth century; the Piazza del Campidoglio, designed by Michael Angelo, and begun in 1536 by Paul III., with a bronze equestrian statue of Marcus Aurelius in its centre; the Palace of the Senators, erected by Boniface IX.; the Palace of the Conservatory and the Capitoline Museum, containing collections of sculptures and antiquities of the greatest interest. From the Capitoline, toward the Palatine, extends the ancient Forum Romanum. The Palatine contains the ruins of the ancient imperial palaces. Between the Palatine and the Aventine lay the Circus Maximus; to the S. E. of the Aventine the Baths of Caracalla. In the depression between the Palatine, Esquiline, and Cœlius stands the COLISEUM (which see). The Thermæ Antoninianæ were begun by Caracalla in 212, extended by Heliogabalus, and finished by Alexander Severus. The establishment could accommodate 1600 bathers at the same time, and was arranged throughout with surpassing splendor; only the bare walls, showing the outlines of the building, have been preserved. Between the Cœlius and the Esquiline stand the church of San Giovanni in Laterano and the Museum Gregorianum Lateranense, which are described under the head of the LATERAN; and beyond the southern slope of the Esquiline the ruins of ancient Rome become scarcer and the monuments of mediæval and modern Rome more frequent. Here are the church of Santa Maria Maggiore, also called the Basilica Liberiana, erected by Pope Liberius 352–366, altered in 432 by Sixtus III., enlarged in 1292 by Nicholas IV., and restored in 1575 by Gregory XIII.; the Palazzo Rospigliosi, founded in 1603 by Cardinal Scipio Borghese, and containing many fine frescoes and pictures; the Palazzo Apostolico al Quirinale, described under the head of the QUIRINAL; the Palazzo Barberini, begun by Maderno, finished by Bernini, with a library containing 7000 manuscripts of Latin and Greek authors; the Villa Albani, built in 1760 by Cardinal Albani, and now belonging to Prince Torlonia, with excellent art-collections; the railway dépôt, opposite the Thermæ Diocletiani; and the Porta Pia, designed by Michael Angelo in 1564, and restored by Pius IX. 1861–69. Through the Porta Pia the Italian army entered Rome Sept. 20, 1870.

The modern city, occupying the space between the river and the hills, is by the Corso divided into two parts, of which that situated between the Corso and the hills is elegant

and mostly inhabited by foreigners visiting Rome, while that situated between the Corso and the Tiber forms a bewildering maze of narrow and crooked streets and alleys inhabited by the lower classes. The Corso, running in a straight line for a distance of nearly a mile from the Piazza del Popolo to the Piazza Venezia, is the finest and gayest street of the city. Among the many elegant buildings which line it on both sides are the Palazzo Doria, one of the most extensive and most magnificent palaces of Rome, containing large and rich art-collections; the Palazzo Colonna, and the Palazzo di Venezia. The portion of the city situated between the river and the Corso, although mostly inhabited by the lower classes, and not of a very inviting aspect, contains, nevertheless, many admirable monuments, among which are the Mausoleum of Augustus, erected by that emperor as a burial-place for himself and his family, consisting of an immense substructure containing the burial-chambers, and covered with a terraced mound of earth adorned with cypresses and a statue of the emperor, used in the Middle Ages as a stronghold, now fitted up as a day theatre and circus, the burial-chambers being empty; the Palazzo Borghese, built in 1590 by the elder Longhi, and containing an excellent picture-gallery; the church of Santa Maria Rotonda, or the PANTHEON (which see), the only ancient edifice in Rome which has been preserved entire. Here is also the Palazzo Farnese, one of the finest palaces of Rome, begun under Paul III. after the designs of Da Sangallo, continued under the direction of Michael Angelo, and completed by Della Porta. It afterward came into the possession of the kings of Naples, and many of the beautiful sculptures and interesting antiquities which it contained were removed to Naples. It still contains a series of fine frescoes by Annibale Caracci, and other pictures.

The commerce and industry of Rome are not very important. Woollens, silks, and velvets, leather, glass, mosaics, jewelry, and articles connected with the fine arts, hats, gloves, stockings, and artificial flowers, are manufactured, but not on an extensive scale; progress has been made, however, in this respect since the city came under the Italian government. Similar progress may be observed with respect to public education; the number of pupils in the new elementary schools in 1873 amounted to 14,389. (See Robert Burn, *Rome and the Campagna* (London, 1871); Augustus J. C. Hare, *Walks in Rome* (London, 1871); Francis Wey (*Rome,* 1872); Charles Isidore Hemans, *Historic and Monumental Rome* (1874.) See also ROMAN ARCHÆOLOGY.) F. A. P. BARNARD.

Rome, tp., Tallapoosa co., Ala. P. 1026.

Rome, city, cap. of Floyd co., Ga., on Coosa River and on Selma Rome and Dalton, at W. terminus of Rome R. R., has 5 newspapers, and is an important business-centre for the N. W. of the State. P. 2748.

Rome, p.-v. and tp., Perry co., Ind. P. 221.

Rome, tp., Jones co., Ia. P. 1067.

Rome, p.-v. and tp., Kennebec co., Me. P. 725.

Rome, p.-v. and tp., Lenawee co., Mich. P. 1454.

Rome, tp., Faribault co., Minn. P. 396.

Rome, city and cap. of Oneida co., N. Y., on New York Central and Hudson River, Rome Watertown and Ogdensburg, and Rome and Clinton branch of Delaware Lackawanna and Western R. Rs., at the junction of Erie and Black River canals and Mohawk River, 110 miles W. of Albany. The city is built upon a level plot of ground at the head of Mohawk Valley, at the former site of old Fort Stanwix of Revolutionary fame. Rome occupies the site of what in those early days was called the "carrying-place," it being then the only strip of land-interruption in a continuous water-communication between the Atlantic and the great lakes of the West. The city contains 13 churches, a public library, a free academy, excellent schools, 3 national, 1 State, and 2 savings banks, 2 newspapers, and the Central New York institution for deaf mutes. Rome is the centre of the dairy interest, the cheese-factory system having originated here. Its manufactures embrace puddled and railroad iron, merchant iron, locomotives, railroad rolling-stock, knit goods, lumber, builders' wood-work, fishing tackle, agricultural implements, cigars, and patent medicines. The city is supplied with waterworks, reservoir, and direct-pumping system combined, erected in 1873. The Mohawk River furnishes water and water-power. P. 11,000. A. C. KESSINGER, ED. "SENTINEL."

Rome, v., Greene tp., Adams co., O. (STOUTS' P. O.), on Ohio River. P. 471.

Rome, p.-v. and tp., Ashtabula co., O. P. 669.

Rome, tp., Athens co., O. P. 1972.

Rome, tp., Lawrence co., O., on Ohio River. P. 2096.

Rome, p.-v. and tp., Bradford co., Pa. P. 230; tp. 1333.

Rome, tp., Crawford co., Pa. P. 1274.

Rome, tp., Adams co., Wis. P. 143.

Rome, Archæology of. See ROMAN ARCHÆOLOGY.

Rome City, p.-v., Orange tp., Noble co., Ind., on Grand Rapids and Indiana R. R. P. 351.

Ro'meo, p.-v., Washington tp., Macomb co., Mich., on Michigan Air-line R. R.

Rö'mer (OLE), b. at Aarhuus, Jutland, Sept. 25, 1644; studied mathematics and astronomy at the University of Copenhagen; attracted the attention of Picard, who came to Denmark to visit Uranienborg, formerly the residence of Tycho Brahe; was invited to Paris by him and Colbert in 1672; appointed teacher in mathematics to the dauphin, and made a member of the Academy of Sciences; assisted Picard in his meridional measurements, invented the transit instrument, and determined the velocity of light by observations of the eclipses of the satellites of Jupiter; was appointed professor of mathematics and astronomy at the University of Copenhagen in 1681; subsequently director of the mint, inspector-general of the arsenal and the port, and burgomaster of Copenhagen; regulated the weights and measures of Denmark and improved the harbor of Copenhagen. D. in 1710.

Ro'meyn (JOHN BRODHEAD), D. D., son of Dr. Theodoric D., b. at Marbletown, N. Y., Nov. 8, 1778; graduated at Columbia College 1795; was pastor of Dutch Reformed churches at Rhinebeck (1799–1800) and Schenectady (1800–04), of the Presbyterian church at Albany, N. Y., 1804–08, and from 1808 to his death of the church in Cedar street, New York. He published a collection of *Sermons* (2 vols., 1816). D. in New York Feb. 22, 1825.

Rom'illy (JOHN), BARON, son of Sir Samuel, b. in London in 1802; graduated at Trinity College, Cambridge, 1826; was called to the bar at Gray's Inn 1827; sat in Parliament as a Liberal 1832–35 and 1846–52; knighted and made solicitor-general 1848, attorney-general and privy councillor 1850, and was master of the rolls 1851–72, in which capacity he was instrumental in causing the publication of the very valuable "Rolls Series" of *Calendars of State Papers* and other documents illustrating the earlier history of England. He was raised to the peerage as Baron Romilly of Barry in the county of Glamorgan Jan. 3, 1866. D. at London Dec. 23, 1874.

Romilly (Sir SAMUEL), b. in London, England, Mar. 1, 1757; entered Gray's Inn May 11, 1778, where he was called to the bar 1783; enjoyed the friendship and patronage of Lord Lansdowne; became eminent as a chancery lawyer; was appointed king's counsel 1800, chancellor of Durham about 1805; knighted and made solicitor-general 1806; attempted the reform of English criminal law 1807; urged in Parliament, with great eloquence, the abolition of the slave-trade, Catholic emancipation, and electoral reform. D. by suicide, consequent on the loss of his wife, Nov. 2, 1818. His *Speeches* were published in 1820, and his autobiographical *Memoirs* in 1840.

Romine, tp., Marion co., Ill. P. 893.

Rommany (Gypsy) Language. Though the first conjecture ever made by a scholar in Europe as to the origin of the tongue spoken among themselves by gypsies declared it to be Indian, and though a full specimen of it appeared in Vulcanius in 1597, the world, and even the learned, long believed that this language was only a jargon or cant, and under this impression more than one work has been published as a dictionary of gypsy which contained no gypsy words whatever. In Italy, Laurentio Hervas mistook the Italian thief-jargon for gypsy. In England, Capt. Grose made the same mistake, and in *The Life and Memoirs of Bampfylde More Carew* (London, 1789), there is a slang dictionary given as "gypsy." So desirous, however, are gypsies to keep their language a secret that they often encourage this error. The late Lord Lytton (E. Bulwer) once passed while a young man several weeks among gypsies, and believed he had learned their language (see introduction to *Pelham,* later editions), but the specimens which he gives in *Pelham,* such as *patter-cove* (the gypsy for a clergyman), are merely cant, the true gypsy or Rommany for a clergyman being *rashai* (Sansk. *rishi*). It is, however, a curious fact that in every country the gypsies have carefully excluded the current "slang" words from their own tongue, and when they find that a Rommany word has become known beyond themselves they discontinue its use. Thus, the writer has heard gypsies say that a certain word has *gone out* of use or is going out, because the "tramps" have got hold of it or has become "canting." Yet, as their object is to have a *secret* language, they have not scrupled when migrating from one country to another to use many of the words which belonged to the language of their last home, since these an-

swered every purpose and replaced those which had been eliminated because they were becoming known. These facts should be borne in mind as necessary to understand the gradual formation of this curious tongue in its dialects, for it is by these additions to the original "new Indian" language, whatever it was, which the first gypsies spoke when they came to Europe, that their wanderings have been accurately traced by Miklosich. (See GYPSIES.) Great interest has of late years been taken in the Rommany language, as gypsies themselves call their tongue, owing (1) to the extraordinary number of curious words, both ancient and modern, from different languages, which abound in it; (2) because it is possible that even if it be in the main a new Indian tongue formed with Urdoo, its germ may still have existed originally as an obscure but very ancient Aryan language; (3) because, while the origin of every *word* in Rommany is known, and with it the grammar of the languages from which it comes, that of the Rommany grammar itself is as yet a mystery, nor is it ascertained whether it was formed in India previous to the great migration between the tenth and thirteenth centuries, or during the early travels of the race. And though there is one Indian element common to Rommany wherever spoken, and many words the same in all its dialects—*e. g. churi*, "a knife"—yet much of this may be found in one country which is not known to gypsies in others. The universal dissemination of Rommany, the great unwillingness of all who speak it to have it made known, and finally the number of words which it has contributed to English slang, are also causes which invest it with interest. Little was known regarding it until J. C. C. Rüdiger (*Neuester Zuwachs der Sprachkunde*, Halle, 1782) announced that the gypsy language, apart from its Slavonic and German additions, consisted of Hindoo words. At the same time, Büttner (see GYPSIES) published his views regarding the Rommany and collected several of its grammatical forms. In the following year H. M. G. Grellmann cleverly availed himself of the labors of these his predecessors, and published a work (see GYPSIES) from which the public for many years inferred that he was the first to discover the Indian origin of Rommany. The subsequent labors of George Borrow, A. F. Pott, A. G. Paspati, G. J. Ascoli, and others have done much to show that each word of the language, *so far as they have collected them*, is respectively of Sanskrit, Persian, Slavonian, Greek, or other character. It has not as yet, however, been pointed out by any writer through what *media* of more recent Indian tongues the Sanskrit words have passed, nor have any philologists (C. G. Leland, *English Gypsies*) shown to what degree the Slavonic and Greek words in Rommany are really Indian, but simply Slavonized or Græcized. This process is continually going on in Rommany. It is but a few hours since the writer overheard a girl say to a boy in a street of London, "You'll get *lelled*"—(*i. e.* "taken" or "arrested"). This was the Rommany word *lello*, "taken," from the Hindoo *lena*, to "take," but Anglicized with the *-ed* participial termination. In this case the English element is limited. When a gypsy, however, calls a fist a *puncher*, it would naturally be assumed that he uses an entire English slang word, when in reality he claims it as Rommany, as coming from *punj*, "five;" and with justice, since in Hindostani *punja* means the hand (with the five fingers extended).

Thirteen dialects have been given (see GYPSIES) as characteristic of the principal European tribes, but several of these are so corrupt that those speaking them would not comprehend the others, although a great number of isolated words are common to them. With little effort or practice Turkish, Hungarian, and German gypsies could talk together, and the few Rommanies in England who have still preserved the grammar of their tongue could join them in mutual intelligence. But the majority of English gypsies, with all the Spanish and their Scandinavian and Egyptian brothers, would find themselves no nearer than a Spaniard and an Italian. It is impossible to assume with certainty any dialect as the type, but the Turkish, as set forth by Dr. Alexander G. Paspati, may be taken for a basis, since its grammar is the most perfect known. Its main features are as follows: The articles are *o* (masculine) and *i* (feminine), as *o rakló*, "the boy," *i raklí*, "the girl." *A* or *an* is generally expressed in all gypsy dialects by *yeck*, "one," as in French, *l'une*. In the declined cases *o* becomes *e*, except when the accusative of the noun is the same as the nominative. *Nouns.*—These are masculine or feminine. Abstract nouns are formed in Hindoo by the termination *pan*, like the English "-ship" or "-hood." In English Rommany this termination is still *pen* or *ben*; in Turkey it is *pé* or *be*. Thus, *kushto*, "good," becomes *kushtopen* or *kushtopé*. In English Rommany, and to a certain extent in other dialects, an active agent or person doing anything is ingeniously expressed by the termination *engro*. Thus, from *giv*, "wheat," we have *givengro*, "a farmer;" *saster*, "iron," *sastengro*, "a smith," corresponding to the generally applied *walla* of India. The origin of *engro* is to be found in the *koro*, genitive termination of all nouns, which is itself derived from the verb *ker-ava* (Sansk. *kāra*, m. rad. *kri*, *faciens*, factor). (Bopp, *Glos. Skr.*) This is so general that it may be said that almost every adjective and active verb yields an agent. English gypsies make nouns by changing *engro* to *engrī* ("a thing"), thus *mui*, "a face," becomes *muiengree*, "a pillow" (lit. "a face-thing," also "a portrait"); *wast*, "a hand," *wast-engrī*, "a hand-cuff." The regular declension is

Rakló = "a boy."

	Singular.		Plural.
Nom.	*o rakló*,	the boy,	*o raklé*.
Gen.	*e rakléskoro*,	of the boy,	*e rakléngoro*.
Acc.	*e raklés*,	the boy,	*e raklén*.
1st Dative,	*e rakléste*,	to the boy,	*e raklénde*.
2d Dative,	*e rakléske*,	in the boy,	*e raklénghe*.
Instr.	*e raklésa*,	with the boy,	*e rakléndja*.
Ablat.	*e raklestar*,	from a boy,	*e rakléndar*.
Voc.	*rakleya*,	O boy!	*raklale!*

Nouns ending in *i* take *a* after it and before the inflection, as *raklí*, "a girl," *rakliákoro*, *raklia*, *rakliáte*, *rakliáke*, *rakliása*, *rakliatar*, and *raklie*. Feminine nouns ending in consonants are declined similarly: *len*, "a river," gen. *leniákoro*. *Eskoro* is commonly used to form adjectives; in England it is used like *engro*; *e. g. wardo*, "a wheel," *wardomescro*, a "wheelwright" or "cooper." The genitive is of wonderful extension in Rommany, and sometimes difficult to seize. These cases are not all *pure* inflections; several are formed with *post-positions* (as occurs in the Ural-Altaic groups and in Dakota). Thus the Rommany instrumental is formed by adding the Sanskrit *saha*, "with" or "together." The ablative sing. term. *ato* (*tar*) is the Sanskrit particle *tas*. "The gypsy noun has properly only four cases." (*Paspati.*) In English Rommany the plural and sing. *ia* has been corrupted into *yor*, sometimes into *yas*, as *lav*, a "word," which should be *lavya*, becomes *lavyor* or *lavyas*. Nouns ending in *o* are generally masculine—those in *i*, feminine. Diminutives are formed by *oro* or *tso*. Adjectives are formed in *o* (masc.) or *i* (fem.). *O* is kept in the nom.; it becomes *e* in the other cases, as *kálo manush* (Eng. Rom. *kālo mūsh*), "a black man;" gen. *kalé manusheskoro*, "of a black man;" plural adj. termination for all cases, *e*. Many adjectives applicable to living beings end in *no* or *ni*, more in *lo*; *e. g. bākht*, "luck," *bakhtalo*, "lucky." From many verbal adjectives in Rommany lost verbs have been recovered. Whether these indicate an ancient Rommany language, or some early tongue merged in it, no one can say. But it is very certain that there is no language so very simple, and yet so rich—so capable of expressing thought, and yet so easy to learn. The comparative degree is formed in Turkey by adding *po* ("more"), as *lachó*, "good," *polachó*, "better." Also by *der*, as *baro*, "great," *baroder*, "greater." In England it is formed by *dir* or *diro*; *e. g. bāro*, "great," *bordir* or *borodiro*, "greater." No superlative exists. A false superlative is formed in England (*C. G. Leland*) by *irus*; *e. g. borodirus*. Pronouns are formed in the singular like nouns plural; *e. g. me*, "I," *mangoro*, *man*, *mánde*, *mánghe*, *mándja*, *mandar*; plural, *amén* ("we"), *améngoro*, *amén*, *aménde*, *aménghe*, *améndja*, *améndar*. *Tu* ("thou") is formed thus: *Tu* (gen. wanting), *tut*, *túte*, *túke*, *túsa*, *tutar*; plural, *tumen*, *tumengoro*, *tumen*, *tumende*, *tumenghe*, *tumendja*, *tumendar*. In England *tu* and *tute* are generally used for "you" in all cases, as "you" is used in English; *tukey*, "to you," rarely. *Ov* ("he," Eng., and Ger. *yov* or *yuv*) becomes *leskoro*, *les*, *leste*, *leske*, *lesa*, *lestar*; fem. *oi*, *ai* (Eng. *yoi*), *lakoro*, *la*, *láte*, *láke*, *lása*, *latar*. *Ol* ("they," Eng. Rom. *yúl*), *lengoro*, *len*, *lende*, *lenghe*, *lendja*, *lendar*. All of these inflections are commonly known in England, but are greatly confused and corrupted. *Mo*, "my," simply becomes *me* in all other cases, and *me* in the plural; also *minro* ("mine"), *tinro* ("thine"). *Amaro*, "our," is in Eng. *moro*. *Tumaro*, "your," is unchanged. Hindoo *pes* is the reflective pronoun "self," taking in Germany the form *peskro*, also very rarely in England, where the common form is *kokero* (*i. e.* "alone"). *Lester kokero*, "his self." In Turkey, *po* and *pi*, plural *po*, are the common possessive pronouns; *e. g. po drom*, "his road," evidently from the Hindoo. *Aka* and *avaka* ("this" and "that") exist in English Rommany as *akovo*, *'covo*, and *kavakoi*; *e. g. 'covo*, "that man" (slang, *cove*, *covey*). Also in T. G. *okovka*, *odova*, "this" or "that," is in English Rommany *odova* or *dovo*, "that." *Verbs.*—All simple verbs are of Indian origin, to which is added *ava*; *e. g. avava*, "to come," which may be conveniently assumed as a general form. "To come" suggests the idea of the future in time, and *kamar*, "to desire, love, or wish," suggests the same as to mental ac-

tion. Thus, *kamavao*, "I shall be," and from *chinava* ("cut") comes *kamachinava*, "I shall or will cut," expressing both intention and time. This influence of *avava* ("to come") on *all* verbs, affirmed by the first writers on Rommany grammar, and denied by the later, is, however, convenient as a means of simply learning the language. Paspati (*Tchingianes*, p. 80) advances *uvava* (Turkish Rommany) "to become," *devenir*, as one hitherto confounded with *avava*, "to come," as the true type. *Avava*, "to come," is thus conjugated:

Indicative.		*Imperfect.*	*1st Aorist.*
Me avava,	I come,	*Me avâvas,*	*Avilom.*
Tu aveka,	Thou comest,	*Tu avênas,*	*Avilan.*
Ov avella,	He comes,	*Ov avélas,*	*Avilas.*
Amen avása,	We come,	*Amen averas,*	*Avilomas.*
Tumen avêna,	Ye come,	*Tumen avênas,*	*Avilonas.*
Ol avenas,	They come,	*Ol avenas,*	*Avilas.*

In German Rommany the indicative present of this verb gives *avaka, avena, avena* in the plural, and in the aorist *eveiom, eveial, eveias, eveiam, eveian, eveien.* The second aorist (Turkish Rom.) is formed by adding *as* to the first and second persons singular and plural. The future is given as *avava, avesa, avela, avasa, avéna, avêna;* imperative, 1, *av*, 2, *me avel;* subjunctive, same as future; gerund, *avindos;* participle, *aló*. Paspati recognizes two classes of verbs—the first including Indian roots with *ava* termination, or verbs simple, and the verbs causative ending in *avava*. Thus, *asava* (verb simple), "to laugh," becomes *asávava*, "to make laugh;" *piava*, "to drink," becomes *piavava*, "to make drink." Paspati makes these and other merely superficial differences the basis for five separate conjugations, which are, however, *grammatically* but one. The second class of compound verbs consists of a simple verbal root combined with another verb, such as *dava*, "to give," *kerava*, "to do or make," and *lava*, "to take." One division of these consists of verbs in which the root is placed either before or after the verb. This and every other variation is made by Paspati into a separate conjugation, giving thereby to the simplest language in the world eleven conjugations, while it possesses in reality but one. All participles in Turkish Rommany end in *to* or *do, lo, no*, and these are derived directly from the aorist. Thus, *avava, avilom, avilo, anava* ("to carry"), *andom, ando.* We can trace in Rommany verbs a class formed with an Indian root and the auxiliaries "I am to be," or *uvava*, "to become," which is or was probably in reality the same with *avava*, "to come." "I am" is conjugated—

Me isam,	I am.	*Me isamas,*	I was.
Tu isan,	thou art.	*Tu isanas,*	thou wert.
Ov isi,	he is.	*Ov isas,*	he was.
Amen isâm,	we are.	*Amên isâmas,*	we were.
Tumen isan,	ye are.	*Tumên isânas,*	ye were.
Ol isi,	they are.	*Ol isas,*	they were.

In Sanskrit *asmi, asi, asti*, plural *sma, stka, santi.* It is remarkable that in England gypsies use commonly several Oriental forms of the verb not known in Germany. Thus, the English Rommany verb runs *me shom*, "I am," *tu shan*, "thou art," *yuv se*, "he is," *men shom, tute shan, yul see.* In fact, the verb is nearly the same with the Turkish, while in Germany it is *hom, hal, hi, ham, ham shi.* The future of *isam* is *kamovav-es, el, vasa, vena, venas.* (For a criticism of Paspati's grammar see Ascoli, *Zigeunerisches*, Halle, 1865; for the German Rommany forms see Pott; also GYPSIES.) This future, *kamovav*, as Ascoli indicates, is merely from *avava*.

There is as yet wanting a grammar which shall reduce Rommany to its original simple elements. Pott and Ascoli have collected the material and cleared it, but no one has distinctly set forth in paradigms this curious tongue, which with the simplest elements is capable of as much expression as English. Even in its present popular and corrupt form, English Rommany is only unmusical where the English grammar intrudes, as may be seen in the following verses by Miss Janet Tuckey, who was the first to write *poetry* in this dialect:

"I tāni mūllos 'pré ó dóeyav
Shān sār i sāni chūmor fon o báv;
O lūllopen apré i pābor chám
Li se i tátti chūmor ó the kám;
Te dóvo rinkeni hév pré tíri mūi,
Shán mīri chūmor, o mi kāmeli."

"The little bubbles floating on the wave
Are all soft kisses which the west wind gave;
The luscious glow upon the peach's face
Bears blushing witness to the sun's embrace;
And those two dimples, sweet, that come and go,
Tell tales of true-love kisses: is it so?"

No writers have as yet sufficiently indicated the influence of Persian dialects on the Rommany. A few words, with their origin, drawn from English gypsy and taken down by the writer in gypsy tents, are as follows: *Sakkū*, "a swan," Persian and Arabic, *sakka; purser*, "to ask," P. *pursidan; pusht*, "the back" (also *dūmo*), P. *pusht; pish*, "before," P. *pish; shock*, "a bough," P. *shakht; rushni*, "bright," P. *rūshân; bunner*, "to build," "shape," etc., the foundation of a house, P. *bunyad; sikar*, "a clothes-line," Hind. *sikhar; sig-tud*, "milk-weed," H. *sij; sim*, also *rupp*, "silver," both the same in Hindoo; "*Yeck sim mery covva se yeck ruppeny covva*," *i. e.* "a silver thing is a silver thing;" *bero*, "a ship," H. *buhr; sirni*, "sacred," "magical," H. *sihr.* The transposition of Oriental words through a Slavonic medium may be seen in *sivety*, "people" (as in French *le monde*), which the gypsies are supposed to have picked up in Slavonic, as *sweti*, "the world," but which they probably had originally as *saraswati* in Hindoo. All Rommany dialects are extremely corrupt, and even in Turkey and Romania it has been almost impossible to determine their grammar, simple as it is. The English gypsy generally uses *tute* for *you* in all cases, and will say *mandy avella* for *man avava* ("I go"), and *yoi wellas* for *yoi avilas.* In Germany the language is spoken with very little admixture of German words, and with a great exercise of ingenuity English gypsies often contrive to do this. To do this one word must do duty for many. Thus, *chiv* means to "put," "place," "throw," "lay," and in fact almost any positive *action;* while *hatch* expresses "resting," and *kér* to make, do, cook, cause. Most words for the different kinds of trees, animals, minerals, fish, and insects are wanting in Rommany, showing that they have recently come from a land where nature is different; and in many cases they have applied the name of a similar animal, etc.; *e. g. sakku*, "a swan" (E. R.), is the P. Arabic *sakkâ*, "a pelican." No language in the world is so easy as Rommany; most persons can learn it in three months, and when learned it is of incredible assistance in acquiring Hindostani and Persian. In fact, a proficient in Rommany can within a month make himself readily intelligible in Hindostanî. In pronunciation Rommany resembles the soft Latin tongues; *e. g. kūshto* or *cōōshto*, "good;" *mās* or *mawhs*, "meat;" *tūte* or *tooty*, "thy;" *mán kamāva*, "I love." The English Rommany pronounce *sīg*, with *i* as *ee*, and the *g* very soft (between the German *ch* and *g*, inclining to the latter strongly accented). It is not impossible that the thousands of Rommanies of every kind reuniting in the U. S. may in time originate an American Rommany dialect. If the more intelligent among them would take the pains to publish among themselves a journal or work in pure Rommany, they would have no difficulty in rehabilitating their beautiful and expressive old language. CHARLES G. LELAND.

Rom'ney, p.-v., Randolph tp., Tippecanoe co., Ind., on Louisville New Albany and Chicago R. R. P. 104.

Romney, p.-v. and tp., cap. of Hampshire co., West Va., on S. branch of Potomac River, has 1 newspaper. P. of v. 482; of tp. 1031.

Romney (GEORGE), b. at Furness, Lancashire, England, Dec. 15, 1734; left school at the age of eleven to enter the workshop of his father, a wealthy cabinetmaker; displayed such genius in drawing likenesses that he was apprenticed to a portrait-painter at Kendal; married against his parents' will 1756; commenced painting on his own account at York 1758; acquired a simple and natural style of portraiture, which procured him favor among the gentry of the North; set out for London 1762, leaving his wife and two children at Kendal; obtained a prize of 50 guineas from the Society of Arts for a picture of the *Death of Wolfe* (1763), and a year or two later a similar premium for his *Death of King Edmund;* began his metropolitan career by painting heads for four guineas; met with rapid success; soon raised his price; obtained patronage among the members of the bar; soon took a studio at the West End; removed to Great Newport street 1767 and to Cavendish Square 1776, having then greatly improved his style by studies at Paris, Rome, and Venice; was efficiently patronized by the duke of Richmond and many of the nobility, becoming a formidable rival to Sir Joshua Reynolds; attained a professional income of £4000 per annum; painted a number of striking scenes from Shakspeare's plays; is said to have been the original projector of Boydell's *Shakspeare Gallery*, and at a later period devoted his best energies to a fine series of works of fancy, among which the best were *Milton and his Daughters* and *Newton making Experiments with the Prism.* He obtained from Rome, through Flaxman, a magnificent collection of casts from antique statuary; built a house and gallery at Hampstead after his own plans, and settled there 1797, but soon felt the effects of age upon his head and hand, which obliged him to stop painting. In 1799 he suddenly returned to Kendal to his wife and children, whom he had neglected for thirty-seven years; was received with kindness; sold his estate at Hampstead and bought a house at Kendal, but had scarcely become accus-

tomed to his new life when he fell into a state of utter imbecility, and after lingering two years died at Kendal Nov. 5, 1802. He was never a member of the Royal Academy, and never sent works to its exhibitions in consequence of an early and lasting rivalry with Reynolds. An elaborate biography was written by the poet Hayley (1809), a briefer one by his son, Rev. John Romney (1830), and a sufficiently full account is given by Allan Cunningham in his *Lives of British Painters.* PORTER C. BLISS.

Romorantin′, town of France, department of Loir-et-Cher, at the confluence of the Sandre and Rantin, manufactures cloth, oil, and sword-blades. P. 7642.

Rom′ulus, in Roman mythology, the founder of the city of Rome, was the twin-brother of Remus and a son of Mars by Rhea Silvia, a priestess of Vesta. Her father, Numitor, king of Alba Longa, was dethroned by his brother, Amulius, and her two sons were thrown into the Tiber by the order of her uncle. But the river landed them safely at the foot of the Palatine Hill; a she-wolf carried them to her den and suckled them, and a shepherd afterward found them and educated them together with his own children. The legend goes on narrating how the two brethren discovered their descent, reinstated Numitor, emigrated from Alba Longa, determined to build a city on the Palatine Hill, but then fell out with each other; how Romulus killed Remus, built the city, procured wives for the citizens, established all the fundamental institutions of the Roman state, and finally was removed to Olympus, where he took a seat among the gods as the god Quirinus. In many of its details, however, the legend is by no means mere fancy, but the imaginative explanation of real facts whose true origin was unknown or forgotten.

Romulus, p.-v., Tuscaloosa co., Ala. P. 540.

Romulus, p.-v. and tp., Wayne co., Mich., on Huron River. P. 1463.

Romulus, p.-v. and tp., Seneca co., N. Y., extends across the county from Cayuga Lake to Seneca Lake. P. 2223.

Romulus Augustulus. See WESTERN EMPIRE.

Ro′nald, tp., Ionia co., Mich. P. 1353.

Roncade, town of Italy, province of Treviso, about 8 miles S. E. of the town of Treviso. Its chief ornament is the fine palace of the Giustiniani, the work of the celebrated architect Sansovini. It contains an active and robust pastoral population of 5300.

Roncesval′les [Fr. *Roncevaux*], a small Spanish village, province of Navarre, in a narrow valley enclosed by lofty mountains, through which one of the principal roads leads from France across the Pyrenees into Spain. Here Charlemagne was attacked in 778 by the Basques, and his whole rear-guard destroyed. In honor of those who had fallen he built a chapel on the spot where the battle took place, and among the names enumerated in the inscription was that of Roland. By some incident this event and this name became the centre of all the romantic poetry which sung of Charlemagne and his paladins, and many fantastical alterations and additions took place, behind which the simple historical facts are hardly recognizable. In the modern French-Spanish wars several bloody encounters (in 1793, 1794 and 1813) occurred in the same valley, and in 1833, Don Carlos was first proclaimed king here.

Ronciglio′ne, town of Italy, province of Rome, about 30 miles N. W. of the city of Rome. The town is well built, and the inhabitants are remarkable for industry and thrift. The iron and copper works here are extensive and flourishing, and powder, soap, cotton cloths, etc. are largely manufactured. Education, too, is much better cared for than is usual in this part of Italy. P. 6100.

Ron′da, town of Spain, province of Malaga, at an elevation of 2300 feet above the sea, on a precipitous promontory of the Sierra Nevada, at the Guadiaro, which here is crossed by lofty bridges built by the Moors. The city is celebrated not only for its romantic and picturesque location, but also for the salubrity of its climate, and for its large annual fair, held in May, attended by a great number of merchants, and enlivened by bull-fights and other national entertainments. Elegant arms, fine woollen fabrics, and saddlery are the principal manufactures of the city; the vicinity is rich in wine and possesses an excellent breed of horses. P. 19,334.

Ron′deau Har′bor, p.-v., Kent co., Ontario, Canada, on Lake Erie, has a safe but shallow harbor, and a weekly newspaper. Its harbor is protected by Pointe aux Pins. P. about 150.

Ron′do [It.], in music, a composition in which the theme, as it is given in the first strain, returns upon itself in the last, after passing through various expansions and elaborations.

Rondout′, p.-v., Kingston tp., Ulster co., N. Y., on Rondout Creek, 1 mile above its confluence with Hudson River, is the E. terminus of New York Kingston and Syracuse R. R., and also of Delaware and Hudson Canal, by which it receives immense quantities of coal from the anthracite region of Pennsylvania, has 8 churches, 2 banks, 2 newspapers, 1 Roman Catholic orphan asylum, 22 steamers on the Hudson, and does a large business in shipping building-stone and cement to New York City. P. 10,114. Since 1872 it has formed the central portion of the city of KINGSTON (which see).

Rong′e (JOHANNES), b. at Bischofswalde, Prussian Silesia, Oct. 16, 1813; studied theology at Breslau, and was appointed a chaplain at Grottkau in 1840, but quarrelled with the ultramontane clergy on account of his liberal views, and was suspended in 1843 because of an article, *Rom und das breslauer Domkapitel*, which he published in the *Sächsische Vaterlandsblätter*. Next year he was excommunicated on account of his letter to Bishop Arnoldi of Oct. 1, 1844, denouncing as idolatrous the exhibition at Treves of the "holy coat." Through a number of pamphlets, and by travelling from town to town preaching and lecturing, he exhorted people to secede from the Roman Catholic Church, and, supported by the general irritation against the ultramontane hierarchy, he succeeded in forming several congregations of the so-called German Catholic denomination. By degrees, however, he was himself attracted by the political fermentation, sided in 1848 with the radicals, and fled in 1849 to England. Returning in 1861, he settled in Frankfort, where he founded a reform association in 1863.

Ron′neburg, town of Germany, duchy of Saxe-Altenburg, has manufactures of cloth, woollens, tobacco, porcelain, and earthenware, and a large trade in horses and cattle. P. 6402.

Ronsard′, de (PIERRE), b. at the Château de la Poissonnière, Vendômois, France, Sept. 11, 1524; was educated at the French court as page to the duke of Orleans; lived for nearly three years at the court of James V. of Scotland (1538–41), but having become almost entirely deaf, he determined to devote himself to literature, and retired shortly after his return to France to the Collége de Coqueret, where he spent five years studying the Latin and Greek literatures and languages. Among his companions here were Baïf, Remi Belleau, Muret, Jodelle, and Du Bellay, and among them sprang up that new literary ideal whose first representative Ronsard became, and which for centuries reigned not only in the French, but in all European literatures. It broke at once and absolutely with the romantic ideals of the Middle Ages, and substituted the classical models of the Greek and Latin literatures. Ronsard was not a prolific writer himself. In 1550 appeared his *Amours* and *Quatre Livres d' Odes*; in 1555, his *Hymnes*; in 1572, the four first books of his grand epic, *La Franciade*, which was never finished; his collected works in 1 vol., 1584. But his influence was decisive, and the enthusiasm he awakened was most extraordinary. The kings of the house of Valois loaded him with honors and benefices; Elizabeth and Mary Stuart sent him presents; the city of Toulouse presented him with a Minerva of solid silver; Tasso came to Paris to show him his poems. In France he founded the classical school, which reigned absolutely up to the second or third decade of this century, and in other European countries he also exercised a great influence, directly or through his school. D. at St. Cosmus, Tours, Dec. 27, 1585.

Rood, the fourth part of an acre, forty square rods. The square perch of masonry, $272\frac{1}{4}$ square feet, is often called the rood.

Rood (OGDEN N.), b. Feb. 3, 1831, in Danbury, Conn.; graduated at Princeton 1852; studied at the Sheffield Scientific School of Yale College and in the universities of Munich and Berlin; was elected professor of physics and chemistry in Troy University 1858; professor of physics in Columbia College, New York, 1863; member of the National Academy of Sciences 1864; vice-president of the American Association for the Advancement of Science 1868; has contributed largely to the transactions of scientific associations and to scientific journals. His original investigations have been numerous, embracing many interesting questions in mechanics, optics, acoustics, and electricity. He was among the first to apply photography to the microscope, and the first to construct fluid prisms of highly dispersive power for the study of the spectrum. His studies of the nature of the electric spark and of the duration of the flashes are particularly interesting, involving the determination of intervals of time greatly more minute than

any ever before measured. His methods of photometry are also extremely ingenious, as well as his investigations of phenomena dependent on the physiology of vision. His published papers number about forty. F. A. P. Barnard.

Roodhouse, p.-v., Greene co., Ill., at the junction of Missouri division of the Jacksonville branch of Chicago and Alton R. R., 21 miles S. of Jacksonville, has 3 churches, 2 graded schools, 1 bank, 1 flouring-mill, 2 coal-shafts, 2 hotels, 1 newspaper, engine-house and waterworks, railroad shops and stock-yards, and 1 elevator. P. about 1200. Thomas McEwen, Ed. "Roodhouse Signal."

Roof [Ang.-Sax. *hrof;* Gr. ὀροφή], the covering of a building. As generally used, the term includes the covering and the framing which supports it, though in carpentry the use of the word is restricted to the latter meaning. Roofs vary greatly in form and material, and require a higher degree of skill and more science than any other part of a building. Greek temples were covered with long thin pieces of marble; the roofs of the halls of the ancient Assyrians and Babylonians consisted of exceedingly large stones, some of them so big as to cover a whole room singly. Remains of buildings belonging to pre-historic times have been discovered in the East of a circular shape, in which a column standing in the centre was evidently intended to support rafters whose outer ends rested upon the enclosing wall.

Fig. 1.

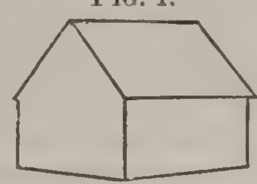
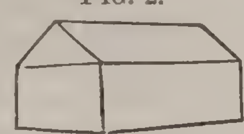


Fig. 2.



The inclination or pitch of a roof is most generally a matter of taste alone, and not of climate, though with some coverings a certain inclination is necessary; the curious theory has been advanced that it should vary with the latitude, being zero at the equator, and having three degrees added for every climate as we advance northward. In England and in France in the later times of mediæval architecture the roof took a very different growth; in the former country, though of a higher latitude, it became flatter; in France and in Germany it grew high and steep. To the flat roofs were added parapets, and the church-towers were built without spires and furnished also with parapets. In France the roof grew with the rest of the building, and particularly on the tower, when spires had fallen into disuse, it assumed almost the inclination if not the place of the spire. In Persia and Arabia the roofs are flat; in Greece invariably sloping, made on an angle of about 16° with the horizon; in Rome on an angle of about 24°. In hot climates the chief reason for the flatness of the roofs is, that they may serve as terraces in the cool of the evening and morning, and for this purpose are covered with concrete or cement carried on joists like a floor.

Fig. 3.

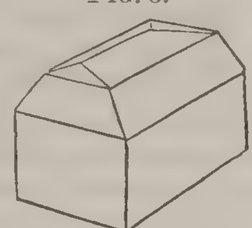


Fig. 4.

When the base is a circle, an ellipse, or a polygon, and its vertical section a curved line concave toward the interior, the roof is termed a dome or cupola. Different names are given to roofs according to their forms; thus, Fig. 1 is a gabled roof; Fig. 2 a hipped roof; Fig. 3 a gambrel, curb, or Mansard roof (the term Mansard is from a celebrated French architect who died in 1666); Fig. 4 a conical roof. Fig. 5 shows a very simple frame for a roof, consisting of two rafters resting at their lower ends upon the wall or frame of the house; sometimes the rafters are prevented from spreading by a collar-beam uniting them near their lower ends. Fig. 6 is a king-post frame or truss, suitable for a span of 35 to 40 feet, where A is the ridge; B, purlin (a beam at right angles to the rafters); C, king-post; D, strut; E, tie-beam; F, pole-plate; G, wall-plate; H, common rafter; I, principal rafter. Fig. 7 is a Norman roof. Fig. 8 is the celebrated roof of Westminster Hall, completed in A. D. 1399, of which the span is 68 feet. The horizontal pieces resting upon the walls are termed hammer-beams. This span is unusually large, as the span of the Gothic roofs seldom exceeded 35 feet. The builders of these roofs aimed to construct them of very short pieces of timber, always oak or other hard wood, which were very strongly fastened together. The thrust of this roof against the walls is prevented to a great extent by the rigidity of the frame, which causes it to act somewhat as a beam. The woodwork of the Gothic roofs was very elaborately carved and ornamented. In the roof of St. Paul's, Rome (Fig. 9), destroyed by fire during the present century after having stood over 400 years, the king- and queen-posts are not framed into the tie-beam, but attached by iron straps. This is one of the earliest instances where iron has formed a feature in the construction of roofs. The span of this was 78 feet 4 inches.

Fig. 5.

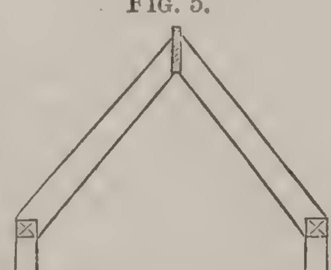


Fig. 6.

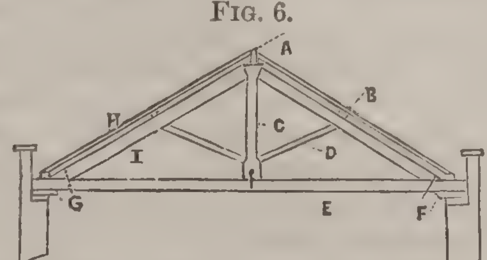


Fig. 7.

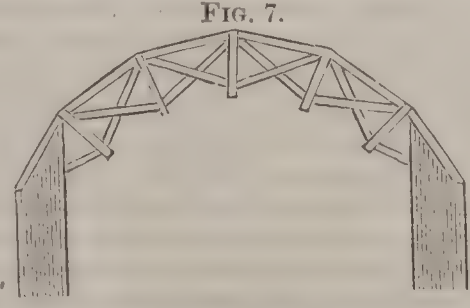


Fig. 8.

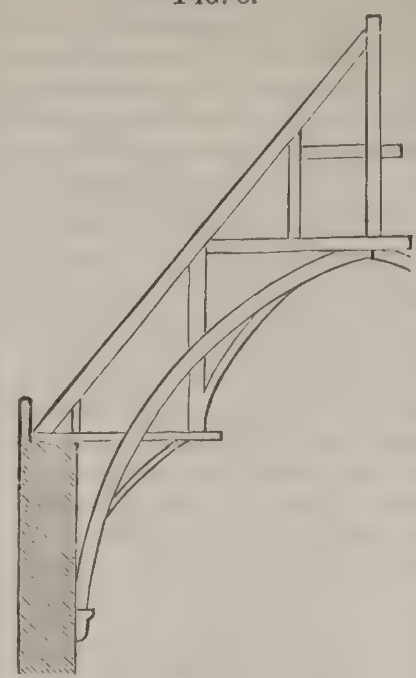
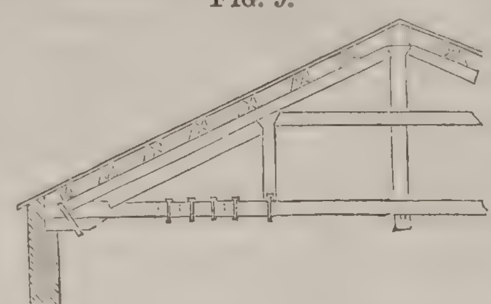


Fig. 9.



The use of iron for roofs has become very general in the present day, on account of the many advantages which it possesses, such as economy, lightness, and facility of transportation and erection. Figs. 10, 11, 12, 13, and 14 illustrate some of the simpler and more generally-used forms of trusses made of iron; they are so tied as to prevent any outward thrust against the walls. The roof over the central transept of the Crystal Palace, Sydenham, England, is arched and composed of two semicircular ribs connected by double-lattice bracing. The whole of the roof is of wrought iron, the covering being entirely of glass on the ridge-and-furrow principle. The span is 120 feet, and the arch is of such depth that it exerts but little horizontal thrust upon the supporting walls. The roof of the Royal Albert Hall, Kensington, is oval, with four centres; the half of one of the trusses is shown in Fig. 15. The span is 219 feet 4 inches by 185 feet 4 inches. The roof of the rotunda of the Vienna Exhibition of 1873 is conical. The span is 343 feet 9 inches. The lower edge is supported and strengthened by a heavy wrought-iron curb or continuous circular box-girder. At the top there is a circular aperture 95 feet 8 inches in diameter, which is stiffened by another curb, and on this curb is erected a lantern from which the whole space below is lighted. To prevent sagging between the upper and the lower curbs, the whole structure is stiffened by heavy girders of plate iron running from curb to curb, while to prevent distortion in any other way, ring-girders at right angles to the rafter-girders run round the roof. All the girders have been put outside the roof, instead of inside. The trusses of the roof of St. Pancras Station are latticed iron arches of 240 feet span. This roof springs virtually from the ground, the side walls being merely screens to hide the springings. The main ribs are tied

Fig. 10.

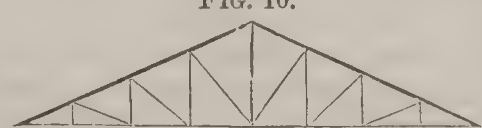


Fig. 11.

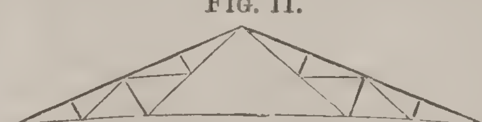


Fig. 12.

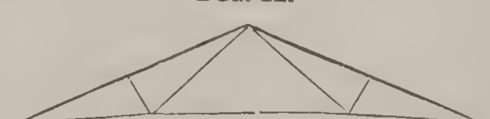


Fig. 13.

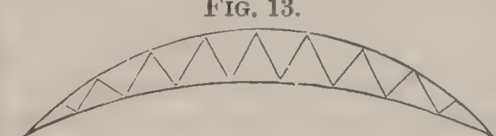
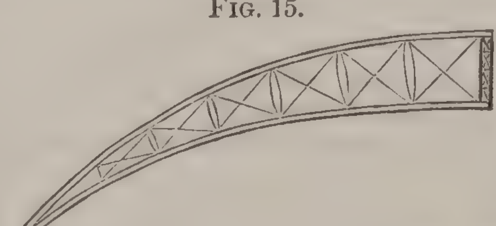


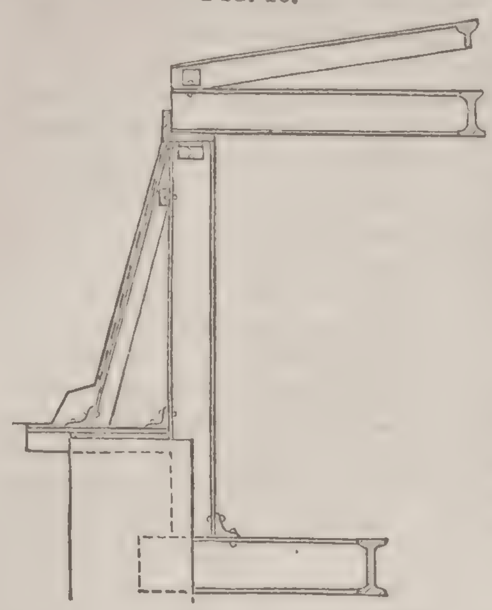
Fig. 14.

Fig. 15.



underneath the platform by a system of wrought-iron girders, for the purpose of counteracting the outward thrust of the roof. These girders support the floors of the building as well as act as ties. Fig. 16 shows the iron framing of a Mansard roof. These roofs (which have since their invention formed so common a feature of French architecture) of different styles, slopes, and coverings have recently been very generally adopted for all classes of buildings both in the city and in the country. They were at first built almost exclusively of wood and covered with slate, but the great liability to taking and communicating fire has caused the use of iron for framing purposes.

FIG. 16.



The coverings for roofs are made of various materials, among which may be mentioned the following: Thatch of straw, reeds, and heath, used probably in primitive times, and even in the present age abroad, in rude dwellings; tiles of various shapes, which have been used from the Roman period to the present day, and which probably covered the Saxon buildings; thin slabs of stone or flag; slate; lead, which was always used on mediæval roofs; tin, iron, zinc, copper; asphalted felt coated with a hot preparation of tar on which gravel is spread; shingles; canvas covered with cement and glass.

SAMUEL H. SHREVE, A. M.

Rook [Ang.-Sax. *hrôc*], (*Corvus frugilegus*), a species of the family Corvidæ congeneric with and closely related to the common crow, which it also resembles nearly in size (it is a little smaller), as well as black color; but it is distinguished therefrom by the bill being little longer than the head, and in the adult naked at the base; the first primary is shorter than the eighth, the second shorter than the fifth, and the third and fourth are the longest. It is generally distributed throughout Europe and Eastern Asia. It lives in considerable communities, and their nesting and gathering places are known as rookeries; these sometimes are very populous, occasionally containing as many as 2000 to 3000 nests, and a corresponding number of birds of different ages and sizes. In England by many they are considered as an attractive feature in the landscape, and are therefore protected. The nests are generally made in tall trees. The female lays, early in the spring, about four or five greenish-blue and spotted eggs. The species is quite omnivorous in feeding, but does not trouble the farmer like the crow. It is capable, like its congeners, of mimicking the sounds of other animals. The young are to some extent used as food in England and on the Continent.

THEODORE GILL.

Rooke (Sir GEORGE), b. near Canterbury, England, in 1650; became post-captain in the navy 1680, and vice-admiral 1692; headed a daring and successful night-attack in boats upon the French squadron off Cape Lattogue, burning 13 French vessels, May 19, 1692, for which exploit he was knighted and received a pension of £1000; entered Parliament 1697; was appointed commander-in-chief of the navy at the commencement of the war of succession in Spain 1702; made an unsuccessful attack upon Cadiz; destroyed the Spanish "plate fleet" of 17 vessels in the harbor of Vigo 1702; participated in the capture of Gibraltar Aug. 3, 1704, and engaged the French fleet off Malaga Aug. 24, 1704, but that fleet having escaped in the night, he was severely blamed, and was dismissed the service Feb., 1705. D. near Canterbury Jan. 24, 1709.

Rooke (LAWRENCE), b. in 1623; was educated at King's College, Cambridge, and Wadham College, Oxford; became professor of astronomy and geometry in Gresham College, London, and was considered one of the most learned men of England. Besides many astronomical and other papers, he published *Observationes in Cometam qui mense Decembri Anno 1652 apparuit* (1653). D. in 1662.

Rooks, new county of N. W. Kansas, on the S. fork of Solomon River, has a rolling prairie surface and very few inhabitants. Area, 900 sq. m.

Rook's Creek, p.-v. and tp., Livingston co., Ill. P. 945.

Room'-Elee, the old metropolitan province of the Turkish empire, consisting of the ancient Thracia and parts of Macedonia, and comprising the land bordering on the Black Sea, the Strait of Constantinople, the Sea of Marmora, and the Dardanelles. It is now divided into the eyalets of Constantinople and Adrianople.

Roon, von (ALBRECHT THEODOR EMIL), COUNT, b. Apr. 30, 1803; entered the Prussian army in 1821; attended the military school of Berlin 1824–27; was appointed teacher to the cadets in 1828, member of the topographical survey of the staff in 1833, teacher in the military school in 1835, and captain on the staff in 1836. In 1842 he was made a major, and subsequently took charge of the military instruction of Prince Friedrich Charles. During the campaign in Baden he was chief of the staff of the 8th army corps; was made a colonel in 1851, commander-in-chief of the 20th brigade of infantry in 1856, and commander-in-chief of the 14th division at Düsseldorf in 1858. On Dec. 5, 1859, the prince-regent called him to take charge of the ministry of war, and (Apr. 16, 1861) also of the ministry of the marine. During the struggle between the government and the Diet (1861–66) he took a very decided position, and succeeded in carrying through the reorganization of the army, which made him a favorite with King William. After the war of 1866, which gave evidence of his talent for organization, he received from the king the cross of the Black Eagle and a dotation, and after the war with France (1870–71), which made his merits still more apparent, he was made a count and received a new dotation. The office of minister of the marine he resigned Dec. 31, 1871. In the Prussian government he represented a specific Prussian tendency in opposition to the German and progressive policy of Prince Bismarck, and (Dec. 21, 1872) having handed in his resignation, he was made president of the cabinet, and a few days afterward field-marshal. The development of affairs, however, made it necessary for Bismarck to combine the position of president of the cabinet with that of imperial chancellor, and (Nov. 9, 1873) Roon resigned and retired to his estate. AUGUST NIEMANN.

Roop, county of Nevada, in the N. W. corner, bordering on California and Oregon, has a broken surface, but embraces a portion of the fertile Surprise Valley lying between Warner's Range and the Granite Mountains, has several boiling springs, and includes the famous Pyramid Lake. Some gold has been found. P. 133.

Roosevelt (JAMES I.), LL.D., b. in New York Dec. 14, 1796; graduated at Columbia College in 1815; studied law, and practised many years; in 1835 and 1840 was a member of the State legislature, and in 1842 was elected a Representative in Congress. Declining a re-election, he travelled several years, and on his return devoted himself to the care of his large estates, but in 1851 accepted the appointment of judge of the supreme court, which he held eight years. D. in New York Apr. 5, 1875.

Roosevelt (ROBERT B.), b. in New York in 1829; studied law, and was engaged in active practice for many years, but finally devoted himself to literature, rural sports, and politics, and in 1871 was elected a Representative in Congress. He is president of the New York Sportsmen's Club; one of the State commissioners of fisheries; for several years edited the *Citizen*, a weekly journal devoted to literature and politics, and has published *The Game Fish of North America* (1865), *Lake Superior Fishing* (1865), *The Game Birds of the Coasts and Lakes of the Northern States* (1866), *Five Acres too Much* (1869), and edited, with a biographical sketch, *The Poetical Works of Charles G. Halpine*.

Root, in botany. See ROOTS, by PROF. G. L. GOODALE, A. M.

Root [allied to Lat. *radix*]. In algebra, a *root* of an equation is any quantity, whether real or imaginary, which being substituted for the unknown quantity will satisfy it; that is, make the two members equal. Every equation containing but one unknown quantity, and whose exponents are whole numbers, can be reduced to the form

$$x^n + px^{n-1} + qx^{n-2} +, \text{etc.}, + u = 0, \qquad (1)$$

in which n is a positive whole number. The ground on which it is *assumed* that every equation of the nth degree has n roots, real or imaginary—or, in other words, that every analytical expression, such as the first member of (1) may be dissolved into as many factors as the number n which denotes its degree—has been set forth under heading IMAGINARIES (which see). It is there also shown why all *irrational* roots, and consequently all imaginary roots (which result from assignment of such *quantitative values* as make negative the quantities under the radical sign) must occur *in pairs*. Equations may be *transcendental* (*i. e.* involve *logarithms* and *exponential* or circular functions, as *sines*, *cosines*, etc. of the unknown quantity) as well as algebraic; in which case the number of roots (including imaginaries) is infinite. The general subject of roots is too abstruse to be treated here.

Root, in philology. See LANGUAGE, by PROF. W. D. WHITNEY.

Root, tp., Adams co., Ind., on St. Mary's River and Cincinnati Richmond and Fort Wayne R. R. P. 1252.

Root, tp., Montgomery co., N. Y., on Mohawk River and Erie Canal. P. 2492.

Root (GEORGE FREDERICK), b. at Sheffield, Mass., Aug. 30, 1820; became a professor of vocal music, and in 1860 a member of the firm of Root & Cady, music-publishers at Chicago. Author of many popular songs and of several manuals for teaching music, and compiler of numerous collections of sacred music.

Root of a Quantity, a quantity which, taken a certain number of times as a factor, will produce the given quantity. A root of a quantity is one of its equal factors. If a quantity is resolved into two equal factors, one of these is the *square root;* if into three equal factors, one of these is its *cube root;* and so on. Every quantity has *two* square roots, *three* cube roots, *four* fourth roots, and so on. If the quantity is positive, both of its square roots are real; if it is negative, both of its square roots are imaginary. In like manner, if a quantity is positive and the index of its root is even, two of the roots will be real and the rest imaginary; but if the quantity is negative and the index even, all of its roots will be imaginary. If a quantity is either positive or negative and the index of its root is odd, one of the roots will be real and have the same sign as the quantity, and all the rest will be imaginary. The two square roots of 1 are $+1$ and -1; the three cube roots of 1 are 1, $\frac{1}{2}(-1+\sqrt{-3})$, and $\frac{1}{2}(-1-\sqrt{-3})$; the four fourth roots of 1 are $+1, -1, +\sqrt{-1}$, and $-\sqrt{-1}$; and so on. In the foregoing sense the root of a quantity is the root of the equation $x^n - q = 0$; and if q is unity, the above and other roots are found under IMAGINARIES.
W. G. PECK.

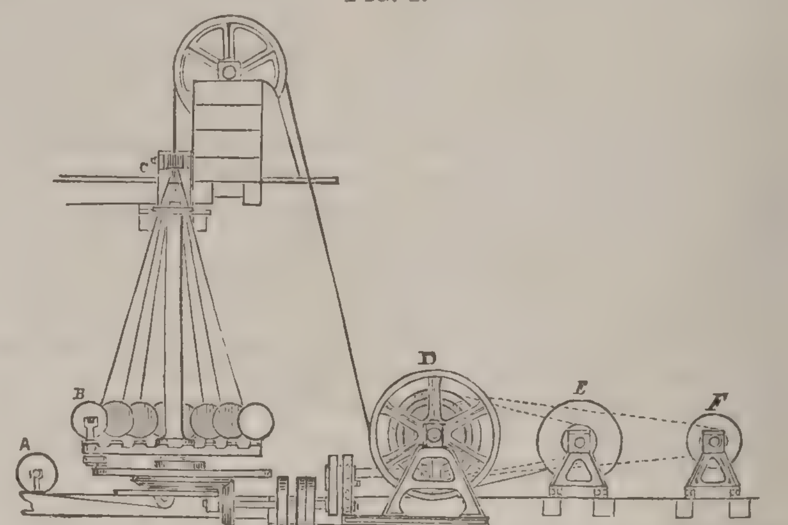
Roots, the organs of plants, by which absorption from the soil mainly takes place, are outgrowths covered at their tip by a cap of peculiar tissue. From the lower end of the rudimentary stem in the embryo the *primary* root strikes down. This may branch more or less, according to the kind of plant, and remain fibrous or become woody or fleshy. The advancing tip, made up of a cluster of multiplying cells protected by the root-cap above mentioned, can work its way past obstructions and through interstices in the soil. The parts of the plant above the radicle may give rise to *secondary* roots. These in some cases never reach the ground, and are therefore *aërial.* The aërial roots of some plants, like the ivy, serve as grapples for the stem to climb by; others, called *epiphytic,* are attached to the surface of other plants. The secondary roots of the banyan swing free in the air for a time, but ultimately reach the soil. Roots which strike into the tissues of other plants and therefrom abstract nourishment are *parasitic.* The smaller roots, or root-branches, are in most cases clothed near the tip with elongated cells, or root-hairs, which constitute the chief means by which liquids are absorbed. Roots seldom contain chlorophyll, and therefore do not share in the work of assimilation. They never directly produce leaves, but may, under certain conditions, give rise to buds and leafy stems, as they do in various trees.
G. L. GOODALE.

Roots'town, p.-v. and tp., Portage co., O., on Cleveland and Pittsburg R. R. P. 1169.

Rope- [Ang.-Sax. *rāp*] **Making** is the art of combining vegetable or other fibres by twisting so as to form a durable and flexible rope. The hemp, the material commonly used, is first *hackled* or combed out to remove the dust and tow. The *hackle* consists of a strong board holding in a vertical position long steel prongs sharply pointed and polished. The hackling is done by hand.

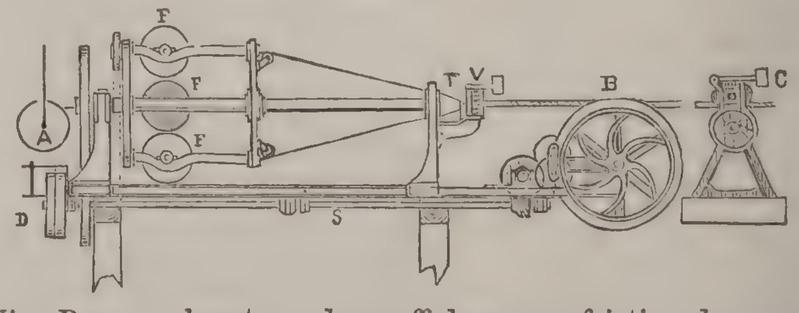
The preparation machines prepare the hemp still further for spinning into yarn by a finer process of hackling. First is the *spreader,* a machine having two endless chains fitted with gill-bars and gill-pins (steel teeth), which combs or straightens out and evens the fibres. The spreader is fed with the hackled hemp at one end, and throws it out in a *sliver* from the other. From the spreader the sliver is passed through two or more *drawing-frames,* by which it is drawn down still more and the fibres still further combed out straight, the size of the sliver being reduced at each step. The drawing-frame is similar to the spreader, but has only one chain. The sliver is now passed to the spinner, where it is spun into yarn, and at the same time reeled upon a bobbin. A recent improvement in the spinner, the invention of Mr. John Good of Brooklyn, N. Y., *tubes* the yarn, rendering it smoother and more even than any process yet devised, leaving little to be desired in the manufacture of rope. The yarn is spun right handed. The size of the yarn varies according to the kind of rope for which it is intended. *Forties*—so called because 40 yarns will just fill a half-inch tube—are for the finer kinds of rope; *twenties,* requiring 20 to fill the tube, are for cables, hawsers, etc. From the spinning-room the bobbins containing the yarn are taken to the tar-house, where they are placed in frames conveniently arranged with reference to the tar-box. This is a long box filled with tar kept during the operation of tarring at a temperature of 220° F. by means of steam heaters. The yarns are led from the bobbins in the frame through two or more guide-plates working in a vertical plane over the tar-box, and convenient for lowering into the tar; thence to the further end between metal rollers, which press out and return to the box the superfluous tar, on to a large wooden drum to cool them; through fair-leaders, and finally to a fresh set of bobbins, where they are wound up with the utmost regularity. The bobbins containing the tarred yarn now go to the *laying-ground,* where they are placed in frames, when the yarns are ready for *hauling down,* or making into strands. The laying-ground, where the rope is laid up, occupies the entire length of the ropewalk. The yarns for the strands, generally three in number, are led from the bobbins in the frame through holes bored on concentric circles in a metallic plate, thence through a tube adapted to the size of the strand, and attached to a hook on the end of a spindle in a movable machine like a car, called the *former.* There is a plate, tube, and hook for each strand; and the number of yarns to a strand is regulated by the size of the intended rope. All being ready, the machinery is put in motion, when the *former* is drawn down the walk, and the yarns as they are hauled through the tubes are formed into left-handed strands. *Closing* the strands is the next step, for which two machines are used. The lower one—the *layer*—lays up or closes the rope, and is movable; the upper one, which keeps the proper twist in the strand while laying, is stationary. Each strand being secured to its proper spindle, the machinery is put in motion and the strands *hardened.* A press attached to the layer prevents too much drawing up as the strands shorten in by the additional twisting. After hardening, the strands are placed together on a central spindle of the layer and closed, a *top* inserted between them preventing too rapid closing. The top is a wooden cone with grooves cut to hold the strands, while *tails* of soft rope attached to it, by being applied to the rope as it is made, still further prevent, by the additional friction, the too rapid closing of the rope. The layer makes two revolutions to one of the upper machine. The skill of the rope-maker consists in knowing how to gear his preparation machines so as to draw a clean and uniform sliver, in giving the proper degree of twist to the yarn and strand, the amount of hardening, and the speed of the top in closing. The foregoing process gives right-hand tarred rope of three strands (*plain laid*). If the yarns are not tarred, we should have *white rope,* the strongest, though when exposed to the weather not the most durable, of all in common use.

FIG. 1.



A twelve-flyer-Machine, for forming the strands: A, heart; B, bobbins; C, top and tube; D, draw-off drum; E, bobbin for larger sizes; F, bobbin for smaller sizes.

FIG. 2.



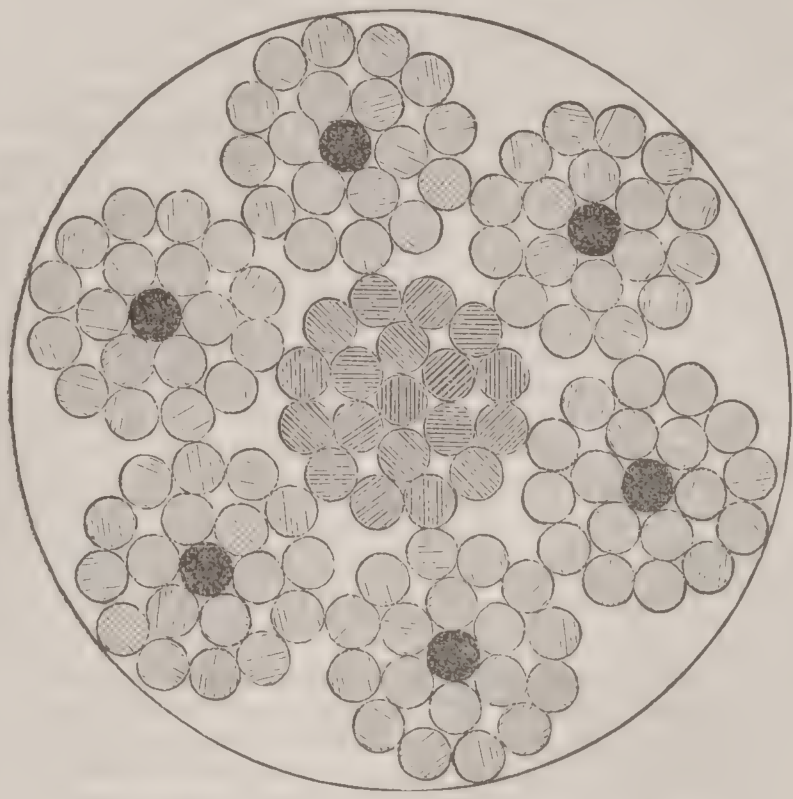
Wire Rope: A, heart; B, draw-off drum; C, friction drum; D, driving pulley; F, bobbins; T, top; V, tube; S, driving-shaft.

In the manufacture of manila rope the first step in the

foregoing description, hackling by hand, is omitted, as unnecessary; the manila is oiled to enable the harsher fibre to pass the more readily through the preparation machines, and the yarns are not tarred; the remainder of the process is the same in both cases. The size of rope is designated by its circumference; when smaller than 1¼ inches it goes under the general name of *small stuff*. Three ropes laid up together form a cable or hawser of nine strands.

Wire rope may be made either of 49 coarse wires or 133 fine wires, put in six strands, and seven or fourteen *hearts*.

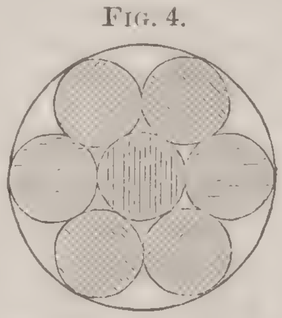
Fig. 3.



Cross-section of wire rope of 133 wires (full size).

To make a 7.8-inch fine wire rope, as in the annexed diagram, fill the bobbins of a *six-flyer* machine, similar to Fig. 1, with No. 8 wire, Birmingham gauge, and for the heart lead a single wire from its bobbin up through the vertical shaft. This will form a seven-wire heart for the strands. Next fill the bobbins of a twelve-flyer machine (Fig. 1) with the same size wire, placing the heart just made as in the figure. Pass all the wires up through holes past the *top*, arrange the wires through the grooves of the top, twist them together by hand, splice in a piece of rope, and pass it five or six times around the *draw-off drum*. Friction-straps attached to the bobbins preserve an equal tension on the wires. Putting, now, the machine in motion, the seven-wire heart is drawn up the shaft, and at the same time the twelve single wires are wrapped about it as the disk revolves, each separate bobbin turning on its own centre in an opposite direction, so as to avoid twisting the wire. As the strand is formed it is reeled upon a bobbin. Having filled seven bobbins, six are placed in a machine similar to Fig. 2, and one in the rear for a heart. The heart, on motion being given to the machinery, is drawn through, and the six strands wrapped about it, giving six outer and one central strand of 19 wires each. In making strands for wire rigging it is the practice to substitute hemp for the single wire of the heart, and to make a hemp heart for the rope. It is plain from the preceding diagram that the diameter of the required rope, divided by 15, will give the diameter of the single wire; from which, by tables in common use, the proper gauge may be found.

Fig. 4.



A single strand of a 49-wire rope.

The annexed diagram shows the cross-section of a single strand of a 49-wire rope, the six strands and the heart all being of the same size. The size of the required rope being given, divide the diameter by 9 to find the diameter, and from the tables the gauge of the wire to be used. Knowing by the old rules the proper size to make a piece of hemp rigging, the corresponding size of wire rope may be found from tables giving the comparative strength of ropes of the two materials. S. B. Luce.

Roqueplan′ (Joseph Étienne Camille), b. at Mallemort, department of Bouches-du-Rhône, France, in 1803; studied painting at Paris under Gros and Pujol; began to exhibit in 1822; attracted great attention in 1827 by a couple of pictures for which he had chosen the subject from Walter Scott's romances, and became soon one of the leaders of the modern French school of painting. The most remarkable of his pictures are the *Amateur Antiquary*, and his genre pieces and landscapes from the Pyrenees, among which is *The Well near the Tall Fig Tree*. For several years during the latter part of his life he suffered much from ill-health. D. at Paris Sept. 29, 1855.

Ro′ree, or **Lohuree,** town of Sinde, in lat. 27° 42′ N. and lon. 68° 53′ E., on the left bank of the Indus, is a filthy, decaying, and unhealthy place, with some manufactures and trade. Close by is a temple to which a large body of men is attached as a guard; in the temple is a box of wood inlaid with silver; in this box is another of gold inlaid with rubies, and in this still a third of amber; in the amber box is one hair of Mohammed's whiskers. P. about 8000.

Roric Figures [Lat. *ros*, "dew"], the name by which are designated the curious images seen upon polished solid surfaces after breathing upon them, and also applied to a class of related phenomena produced under very various conditions, but agreeing in being considered as the effect of either light, heat, or electricity. A scientific explanation was first attempted by Dr. John W. Draper of New York in the *Philosophical Magazine* of Sept., 1840, who called attention to the fact that a roric figure may be preserved intact for an indefinite period, and again brought out by the breath; suggesting that an insensible molecular change had been effected on the surface by the first breathing. The subject was taken up by Möser of Königsberg (July, 1842), who developed the idea of a latent light, and by Mr. R. Hunt, who has given (in his *Photography*, New York, 1852) interesting experiments of what he calls *thermography*, the figures being in his opinion caused by the action of heat. Karsten made many interesting experiments demonstrating the action of electricity in the production of similar figures, and later experiments have been made by Grove, Herschel, and C. A. Seely, the theories of which are still in a transitional stage.

Ror′qual, the Norwegian term of the largest of the whale family; also called Finback (which see).

Ro′sa (Euphrosyne **Parepa**), b. in Edinburgh, Scotland, in 1836, daughter of Georgiades de Boyescu, a Wallachian nobleman, and his wife, Elizabeth Seguin, who, left a widow at the age of twenty-one years, devoted herself to music as a profession; was carefully trained by her mother; made her début on the operatic stage at Malta as a soprano singer; appeared with success at London 1857; married Capt. Carvell of the East India service 1863; became a widow 1865; came to the U. S. with the Bateman troupe 1865, and again 1866–67; obtained great popularity, singing chiefly in oratorios, but occasionally in operas; married the violinist Carl Rosa 1867; organized with her husband an English opera troupe, with which they sang in the principal cities of the U. S. 1869–72; was at the khedive's court in Egypt during the winter of 1872–73, and afterward made another tour (1873) in the U. S. D. in London, England, Jan. 21, 1874.

Ro′sa (Pietro), b. at Rome about 1815; began his career as an architect in the employment of Prince Borghese. His chief merit consists in having resurveyed and reconstructed the topographical map of Latium. The restoration of the Appian Way and other ancient localities of Rome to their original levels are truly historical lessons. In 1860, Napoleon III. gave him the charge of several restorations, especially of the prætorian camp at Albano; in 1861 he appointed him conservator of the Palace of the Cæsars, now the property of the Italian government. Rosa is now director of excavations in Rome and senator of the kingdom of Italy.

Rosa (Salvator), b. at Renella, near Naples, June 20, 1615; received a liberal education; was designed for the Church, but preferred art; studied music; was led to painting by his brother-in-law, who was an artist; became a pupil of Spagnoletto; went to Rome in 1635, and with occasional interruptions resided there, and won fame by his various and surprising talents. His works are in every style—altar-pieces, battle-pieces, sea-pieces, landscape, history, portraits; he was a writer of satires, too, a wit, and a hearty companion. His best pictures are landscapes, which are remarkable for wildness, loneliness, and gloom. He painted Nature in her roughness and desolation, with accessories of savage or ascetic life, more effectively than in her sweeter aspects, for his genius was impetuous, his imagination audacious and original. He painted swiftly, and his works are numerous. They are found in all the large collections in Europe. Private galleries in England contain good examples of his style. His portrait of himself is in the church of S. Maria dei Angeli, at Rome, where he is buried. D. in Rome in 1673. O. B. Frothingham.

Rosa′ceæ [from the typical genus, *Rose;* Lat. *rosa*], an important natural order of polypetalous exogenous trees, shrubs, and herbs, comprising over 1000 species, mostly belonging to northern temperate regions. The

rose, apple, pear, quince, cherry, plum, peach, apricot, almond, blackberry, raspberry, strawberry, etc. belong here. The nearest affinity of the order is, on the one hand, with the Leguminosæ or pulse family, although this might not appear from a superficial comparison of the common representatives of the two; on the other, with the saxifrage family. In general, the rose family is distinguished by having alternate leaves with stipules, along with regular flowers, generally in definite or numerous perigynous stamens and definite seeds without albumen. It divides into marked sub-orders, of which the three following are the principal: (1) Amygdaleæ, or the almond family, with a single simple and free pistil, becoming a stone fruit, such as that of peach, plum, and cherry. (2) Rosaceæ proper, with dry or berry-like fruits, from numerous or few (seldom single) free pistils, and stipules joined with the petiole. To this belong the small fruits above mentioned, and a great variety of useful and ornamental plants, both herbs and shrubs. (3) Pomæ, the apple family, with two or more pistils combined with each other and with a fleshy calyx-tube, which forms the edible fruit. The fruits of the order are all innocent, except that of the cherry-laurel, but the kernels of the stone fruits contain a poisonous principle identical with or analogous to prussic acid, along with a bitter essential oil; and these qualities extend more or less to the bark and foliage. The most active article of the materia medica furnished by this order is from *Hagenia Abyssinica* (or *Brayera anthelmintica*), the koso tree of Abyssinia, the flowers of which are a powerful vermifuge. Astringency generally prevails in the herbage of the order. It yields many useful products, but is most important for its fruits and its ornamental flowers. ASA GRAY.

Rosa, de la (FRANCISCO MARTINEZ). See MARTINEZ DE LA ROSA.

Rosa (SAINT) **of Lima,** b. at Lima, Peru, in 1586, of wealthy Spanish parents, but they having lost their property she supported them by her labor while living as a recluse in the habit of the third order of St. Dominic. D. at Lima Aug. 24, 1617. She was canonized by Pope Clement X. in 1671, being the only saint of American birth in the Roman calendar.

Rosa, Monte. See MONTE ROSA.

Ros′amund, a Lombard queen. (See ALBOIN.)

Rosaniline, and its compounds. See ANILINE COLORS, by PROF. C. F. CHANDLER, Ph. D., LL.D., M. D., M. N. A. S.

Rosa′rio, city of the Argentine Republic, province of Santa Fé, on the W. bank of Paraná River, at E. terminus of Central Argentine and Rio Cuarto R. Rs., and chief port of entry for all the interior provinces, has deep water close to the shore, forming a commodious port, which is accessible to seagoing vessels of the largest draught; is a new city, having acquired nearly all its population and importance since the commencement of the railroad in 1863; is well laid out, paved, lighted with gas, has street-cars, docks, wharves, several hotels, banks, churches, theatres, and newspapers. It has been declared the capital of the republic, but the government has not as yet (1876) been removed thither. P. about 40,000.

Rosa′rio de Cucu′ta, town of New Granada, South America, in a fertile valley which produces much cacao, sugar, coffee, and tobacco. P. about 5000.

Ro′sary [Lat. *rosarium*, a "garden of roses," probably referring to the Virgin Mary as the mystical rose]. (1) A series of prayers prescribed by the Roman Catholic Church. The Greater Rosary is a synonym for the whole series, and is made up of three lesser rosaries. Each of the three lesser rosaries contains five decades or mysteries. Each decade contains one meditation upon one of the fifteen mysteries of the faith, one Pater Noster, or repetition of the Lord's Prayer, ten Ave Marias, and one Gloria Patri. (2) The name rosary also designates the chaplet or string of beads used in the repetition of the rosary. The Pater Nosters are marked by large beads, and the Ave Marias by smaller ones. The beads are of various materials, and are blessed by the pope or by some duly-authorized ecclesiastic. The beads serve as counters during the recitation. They are also in use among Arabs and Hindoos.

Ro′sas, de (JUAN MANUEL ORTIZ), b. at Buenos Ayres about 1793; was the son of a wealthy landowner; spent his youth among the "Gauchos" of the Pampas, receiving little education, but acquiring great influence by his skill in horsemanship and his daring exploits on the Indian frontier, and had figured actively in several revolutions, and was military commander of the Pampas, when in 1829 he headed the movement which overthrew Lavalle and the "Unitarian" party, proclaiming "Federal" principles; became governor and captain-general of Buenos Ayres Dec. 8, 1829; displayed great severity against political opponents; negotiated with the governors of the interior provinces the establishment of the "Argentine Confederation" Jan., 1831, on the basis of local independence, the direction of foreign affairs being entrusted to the governor of Buenos Ayres; retired from office, declining a re-election, Jan. 24, 1832; acquired fresh popularity by leading a successful expedition against the Indians of the desert; was again chosen governor with nearly absolute authority Mar. 7, 1835, and maintained himself in power by successive re-elections for eighteen years, which period was passed in constant civil and foreign wars, in which he displayed great energy and ability, but stained his name with acts of savage cruelty which have throughout South America rendered his name a synonym of tyranny. His success was largely due to the arts of a demagogue in making constant appeal to the "holy principle of federation," denouncing his enemies as "savage Unitarians" intent upon selling independence and republican institutions to Brazil, France, and England; with which countries he also maintained a protracted contest, more useful to him than the most brilliant victories could have been, since the only means of aggression consisted in a blockade of the rivers and ports. Four great uprisings of the Argentine liberals were quenched in blood, the suspected partisans of rebellion being massacred in their houses in Buenos Ayres by the secret society of the "Mazhorca," composed of the tools of Rosas; and Montevideo, the stronghold of the "Unitarians," though capital of a nominally independent republic, had been nine years besieged by his armies, in alliance with the titular president Oribe, when in 1851 his most trusted officer, Gen. Justo José de Urquiza, becoming wearied of the trammels imposed upon him, combined with Brazil and with the liberals or "Colorados" of the Argentine provinces and Uruguay to cast off the yoke of the dictator. Defeated at the great battle of Monte Caseros, near Buenos Ayres, Feb. 3, 1852, Rosas escaped in disguise on board an English vessel, proceeded to England, and with his celebrated daughter, Manuelita, has since resided at Southampton, without having (so far as is known) made the least effort to recover power, or even to propitiate the new public opinion in Buenos Ayres, where he was promptly outlawed and condemned to death and his vast landed property confiscated. PORTER C. BLISS.

Rosch′er (WILHELM), b. at Hanover Oct. 21, 1817; studied at Berlin and Göttingen, and was appointed professor of political economy at Göttingen in 1843, and at Leipsic in 1848. Besides a number of works on special subjects, he wrote *System der Volkswirthschaft* (4 vols., 1854–59, often reprinted) and *Geschichte der National-ökonomie in Deutschland* (1874).

Ros′cius (QUINTUS), a celebrated Roman actor, a contemporary of Sulla and Cicero, who in his youth received instruction from him, and subsequently defended him in a civil lawsuit by an oration which is still extant. He was equally great in tragedy and comedy, and carried his art to the highest degree of perfection which the Roman stage ever witnessed, accumulating an immense fortune. Cicero speaks often of him, and always with enthusiasm for his art and respect for his character. D. 62 B. C.

Ros′coe, p.-v. and tp., Winnebago co., Ill., on Madison division of Chicago and North-western R. R. P. 1135.

Roscoe, tp., Davis co., Ia. P. 570.

Roscoe, p.-v. and tp., Goodhue co., Minn. P. 811.

Roscoe, p.-v. and tp., St. Clair co., Mo., on Osage River. P. 302; of tp. 922.

Roscoe, p.-v., Jackson tp., Coshocton co., O., on Muskingum River and Ohio and Erie Canal.

Roscoe (HENRY ENFIELD), F. R. S., son of Henry and grandson of William, b. in London, England, Jan. 7, 1833; studied at Liverpool high school; graduated at University College, London, 1852, and at Heidelberg University, where he was distinguished for his attainments in the physical sciences; was associated with Wilhelm Bunsen in his measurement of the chemical action of light 1853–57; was appointed professor of chemistry in Owen's College, Manchester, 1857; has published many papers in the *Philosophical Transactions* and other scientific periodicals; is author of *Lessons in Elementary Chemistry* (1866), *Lectures on Spectrum Analysis* (1869), and of the *Chemistry Primer* in Macmillan's *Science Series* (of which he is associate editor with Profs. Huxley and Balfour Stewart), and received in 1873 the royal medal of the Royal Society "for his chemical researches, more especially for his investigation of the chemical action of light and of the combinations of vanadium."

Roscoe (THOMAS), son of William, b. at Allerton Hall, near Liverpool, in 1791; translated several important works from the Italian, German, and Spanish writers, among which were the *Memoirs of Benvenuto Cellini* (1822), *Sismondi's History of Literature* (1823), *Specimens of Euro-*

pean Novelists (11 vols., 1825–32), and Lanzi's *History of Painting in Italy* (1828). D. at Liverpool Sept. 24, 1871.

Roscoe (William), b. near Liverpool, England, Mar. 8, 1753; was admitted to the bar 1774; commenced practice at Liverpool; wrote several pamphlets against the slave-trade; published in 1796 *The Life of Lorenzo de' Medici*, and in 1805 a *History of the Life and Pontificate of Leo X.*; sat in Parliament 1806–07; edited Pope's works (10 vols., 1824), and was author of many political and miscellaneous treatises. Retiring from practice at the bar in 1796 with a competent fortune, he formed a valuable library and art-collection at Allerton Hall, near Liverpool, and was honorably distinguished for his labors in the cause of philanthropy and his encouragement of younger literary aspirants; but having embarked his fortune in a banking firm, he lost it all by a failure in 1816, and his library was dispersed at auction. D. at Toxteth Park, Liverpool, June 27, 1831.—His *Life* (2 vols., 1833) was written by his youngest son, Henry (1799–1836), who was distinguished at the bar, wrote numerous legal works, and was author of the *Lives of Eminent British Lawyers* (1830; often reprinted).

Roscom'mon, an inland county of Ireland, province of Connaught, bordering E. on the Shannon, comprises an area of 949 sq. m., with a population of 140,670, of whom 47,643 can neither read nor write. The surface is level, with exception of the northern parts, where ranges of low hills are found; the soil is light but fertile, affording excellent pasturage in many places. Agriculture and the rearing of sheep are the principal occupations. From 1851 to 1872 no less than 52,299, or 30 per cent. of the whole population, emigrated. Chief town, Roscommon.

Roscommon, an unorganized county of N. Michigan, on Au Sable, Muskegon, and Titibawasee rivers, includes several lakes, has a broken surface, and no population in 1870. Area, 625 sq. m.

Roscommon (Wentworth **Dillon**), Earl of, nephew of Wentworth, earl of Strafford, b. in Ireland about 1633; educated at Caen under Bochart; obtained several offices about the court of Charles II.; went to Ireland as captain in the Guards; squandered his estate by gaming; returned to England; reformed his habits; married a daughter of the earl of Burleigh; devoted himself to literature in conjunction with Dryden, and produced some poems, the best being the *Essay on Translated Verse* and a version of *Dies Iræ*. D. at London Jan. 17, 1684, and was buried in Westminster Abbey.

Rose [Gr. ῥόδον; Lat. *rosa*], a genus of flowering plants giving its name to the large and important natural order Rosaceæ, and consisting of shrubs, usually prickly, natives of the northern hemisphere from the Arctic zone to Mexico in the New World, and to Abyssinia and the Indian Peninsula in the Old. The genus is characterized by unequally pinnate leaves with serrate leaflets, or rarely simple leaves, which in one species (*R. berberifolia*, Pall.) are entirely wanting, adnately stipulate petioles, and single or corymbose terminal flowers, with five foliaceous sepals imbricated in æstivation, five petals readily multiplying under cultivation, indefinite stamens, and numerous one-seeded carpels enclosed in the receptacular calyx-cup, which becomes fleshy when ripe. Nearly 300 species of the rose have been enumerated, but later botanists (Bentham and Hooker, *Genera Plantarum*) reduce to 30 the number affording real specific distinctions. Twelve species are described as native of North America, the most widely distributed being *R. setigera*, Mich. (Michigan prairie rose), with high-climbing branches, armed with stout, straight prickles, showy corymbose pink flowers, and globular fruit—a native of the Western and Southern States from Michigan to Louisiana and Georgia; *R. Carolina*, L. (swamp rose), with stems four to eight feet high, armed with stout hooked prickles, corymbose pink flowers, and bristly, depressed globular fruit—a frequent inhabitant of low swampy ground from Canada to Florida and westward to the Mississippi; *R. lucida*, Ehrhart (dwarf wild rose), with stems one or two feet high, armed with unequal bristly prickles, mostly deciduous flowers, solitary or in clusters of two or three, and smooth globular fruit—common through Canada and the U. S. east of the Rocky Mountains.

R. rubiginosa, L. (sweet-brier), a native of Europe, has escaped from cultivation, and become widely naturalized in the Atlantic States. *R. Sinica*, Ait. (Cherokee rose), a native of China, with high climbing branches, armed with stout hooked prickles, coriaceous evergreen leaves, and large white flowers, has been naturalized in the Southern States for over 100 years, where it is also extensively cultivated as a hedge-plant. Where sufficient room can be given it, few plants equal the Cherokee rose for winter-blooming in Northern conservatories, where its pure white flowers, produced throughout the winter, make a charming contrast to the shining evergreen foliage. *R. bracteata*, Wend., a native of China and Northern India, with erect branches, armed with stout recurved prickles and large, white, solitary flowers surrounded by conspicuous bracts, has also become naturalized in some of the Gulf States, where it is successfully employed as a hedge-plant, especially in deep rich soils.

From the dried petals of *R. Gallica*, L., an Old-World species of doubtful geographical limits, an infusion is made which is employed as an agreeable vehicle for tonic and astringent medicines. From the petals of *R. centifolia*, L., a native of the Caucasus, and *R. Damascena*, Mill., whose native country is unknown, rose-water, the principal ingredient in astringent collyria, is distilled. During the process of distillation a butyraceous oil of delicious fragrance separates from the rose-water, which, under the name of "attar of roses," is employed in perfumery and largely for scenting snuff. The commerce of Europe and the U. S. is almost entirely supplied with this perfume from the Turkish province of Room-Elee, where roses, cultivated for the purpose of its manufacture, form the principal field-crop, the town of Kizanlik being the chief seat of the trade, which amounts annually to several hundred thousand dollars. In the S. of France, Egypt, and other Mediterranean countries, and in India, roses are also largely cultivated for the manufacture of rose-water. *R. canina*, L. (dog rose), a species widely distributed throughout Europe, Northern Africa, the Canary Islands, Persia, and Siberia, is also of some importance to man. The pulp of its fruit, mixed with twice its weight of sugar, constitutes the *confectio rosæ caninæ*, which is employed as an astringent antiseptic preserve; an infusion of its young leaves has been used as a substitute for tea; its seeds are a vermifuge; while the root was formerly considered a specific against hydrophobia (whence its name).

From the earliest history of gardening to the present day the rose has been the most generally cultivated and popular of all flowers. To this fact, and to its tendency to assume new forms under cultivation, must be ascribed the difficulties of classifying or referring to original types the innumerable races and forms of the rose with which gardens abound. A classification dividing garden roses into two sets—the first, of summer or once-blooming, the second, of autumnal or ever-blooming—although open to several objections, is the most convenient for the horticulturist.

To the first section belong the Provence or cabbage roses, double forms of *Rosa centifolia*, favorite garden-plants from the time of the Romans, and of which the pompon roses are dwarf varieties; also moss roses, descendants from a sport or accidental bud-variation of the Provence rose, with the glands and bristles of the calyx and peduncle developed into a mossy substance. The original moss rose, now vastly increased in the number and variety of its forms, was introduced into England nearly three centuries ago from Holland, but the garden where it originated and the name of its discoverer are lost. Hybrid China roses, a race owing its origin to crossing the Provence and other summer roses with the Chinese rose and its offspring, the tea-scented, Noisette, and Bourbon roses. China roses are remarkable for vigor of growth, often surpassing both parents in this respect, splendid blooms, and great hardiness. They are particularly adapted for growing on pillars or over arbors, and in similar situations. Scotch roses, descendants of *R. spinosissima*, L., of dwarf stature and great hardiness, producing early in the season an abundant crop of red, white, and yellow flowers. Austrian briers, descendants of *Rosa lutea*, Mill., and which in Harrison's Yellow give us our best yellow rose for general cultivation. Prairie roses, descendants of *R. setigera*, Michx., and all of American origin and climbing habit. Queen of the prairie and Baltimore belle (a hybrid with evident traces of the blood of one of the tender Noisette group), are the most generally cultivated.

To the class of summer roses also belong the sweet-brier (*R. rubiginosa*, L.), of which many forms and varieties are in cultivation; the Bursault rose, a descendant of *R. alpina*, L., the evergreen rose, of which many varieties, descendants of the European *R. sempervirens*, L., are in cultivation. Barely hardy at the North, the evergreen roses are worthy of cultivation in the Middle and Southern States. The many-flowered rose, *R. multiflora*, Thunb., a native of China and Japan, of which several double forms are in cultivation in the Southern States, where it is alone hardy. The Banksian rose, generally cultivated only in its double state, having its origin in the Chinese *R. Banksiæ*, Brown, is well suited to the climate of the Southern States, and occasionally finds a place in Northern conservatories.

To the second section (ever-blooming roses) belong Chinese roses, descendants of *R. Indica*, L., and *R. semperflorens*, Curtis. Hardly hardy at the North, they are now

rarely cultivated, other ever-blooming roses having taken their place. Tea roses, descendants of *R. Indica*, L., two varieties of which with sweet-scented flowers, the blush tea and the yellow tea, were introduced into England from China early in the nineteenth century. From the intermingling of these two varieties has sprung the whole race of tea-scented roses. Hardy and highly esteemed in the Southern States, the tea rose is more extensively grown under glass during the winter months by Northern florists than any other flower. The demand for this rose in the Northern States for purely æsthetic purposes has within a few years increased this culture until its products are annually sold for several million dollars, Eastern Massachusetts being the chief seat of this business. The musk roses, double forms of *R. moschata*, Mill., a native of the Mediterranean basin, are occasionally cultivated, but are only hardy in the Southern States. Noisette Roses: this race of generally climbing roses, with flowers in clusters, was originated by M. Noisette, a French florist of Charleston, S. C., by crossing the China and the musk roses, the offspring being again crossed with the tea-scented roses. The noisette is one of the most beautiful of all the hybrid roses, but, unfortunately, it is only hardy in the Southern States. At the North it is often cultivated as a conservatory climber, Lamarque being the best known variety for this purpose. Bourbon Roses, a race of hybrids introduced into Europe from the Isle of Bourbon, where it was produced by crossing the China rose with some other rose of Eastern origin naturalized in that island. Bourbon roses are valuable for their habit of blooming late in autumn, although too tender for general cultivation at the North. Hybrid Perpetual Roses, a race of comparatively recent development, but of such merit as to have already nearly superseded all the older hardy roses. To a French cultivator, M. Laffroy of Bellevue, near Paris, is due the honor of having first, in 1840, produced the hybrid perpetual rose, which has as a basis some hardy once-blooming rose, often the hybrid China, with which has been mingled in sufficient quantities to impart their ever-blooming qualities the blood of the China, tea, or Bourbon rose, or a combination of all three. Hardy in the most severe climates, with flowers unsurpassed in form, color, and perfume, and with the ever-blooming qualities strongly developed, the hybrid perpetual rose is at once the most conspicuous example of the success which rewards the intelligent efforts of the hybridizer, and the most beautiful inhabitant of the garden.

Roses should be cultivated in situations fully exposed to the sun, in deep strong loam well drained and heavily manured. Indeed, too much rich food can hardly be given them to develop their greatest beauties. The soil in which they grow should be constantly stirred and kept free from other plants, and especially from the roots of neighboring trees, while a careful watch must be kept for the many insects which find a favorite food in their leaves and petals. Next to the selection of soil and situation, pruning is the most important operation in the culture of the rose. Strong-growing roses must be pruned slightly, that they may not be stimulated to excessive growth at the expense of the flowers; weak-growing roses must be pruned severely, to encourage more vigorous growth, or, in the words of Francis Parkman, a master in rose-culture, "Roses should be pruned in inverse proportion to the vigor of their growth." (In the following works precise instructions for the cultivation and propagation of the various garden roses, and carefully selected lists of the best varieties, can be found: *The Book of Roses*, Francis Parkman (Boston, 1866); *The Rose Amateur's Guide*, Thomas Rivers (London, 1872); *A Book about Roses*, S. Reynolds Hole (London, 1870); *Le Rosier*, J. Lachaume (Paris, 1874); *Hedging and Hedging Plants in the Southern States*, Thomas Afflick (Houston, 1869).) C. S. SARGENT.

Rose, tp., Shelby co., Ill., on Indianapolis and St. Louis R. R. P. 1494.

Rose, p.-v. and tp., Oakland co., Mich., on Flint and Père Marquette R. R. P. 1169.

Rose, tp., Ramsey co., Minn., on Mississippi River and St. Paul and Pacific R. R. P. 750.

Rose, p.-v. and tp., Wayne co., N. Y. P. 2056.

Rose, tp., Carroll co., O., on Tuscarawas branch R. R. P. 1106.

Rose, tp., Jefferson co., Pa., on Red Bank Creek, includes Brookville, the county seat. P. 1058.

Rose, tp. Waushara co., Wis. P. 397.

Ro'se (GUSTAV), b. at Berlin Mar. 28, 1798; took his degree of Ph. D. at Berlin 1820; studied with Berzelius; was connected with the University of Berlin as an instructor of mineralogy from 1823 till his death; in 1829 visited the Ural Mountains with Humboldt and Ehrenberg. D. at Berlin July 15, 1873. He published many papers on mineralogy, crystallography, and kindred subjects, mostly in Gilbert's and in Poggendorff's *Annalen;* also *Elemente d. Krystallographie* (1829; 2d ed. 1838), *Mineralogisch-geognost. Reise nach d. Ural, d. Altai u. d. Kaspischen Meere* (1837–42), *Das Krystallo-chemische Mineralsystem* (1852). C. F. CHANDLER.

Rose (HEINRICH), brother of Gustav, b. at Berlin Aug. 6, 1795. His grandfather, Valentin Rose, Sr., and his father, Valentin Rose, Jr., were distinguished chemists. He studied with Berzelius at Stockholm, and took his degree of Ph. D. at Kiel 1821. D. at Berlin Jan. 29, 1864. He devoted his attention chiefly to analytical chemistry, and contributed more than any other chemist to advance this branch of the science. His *Handbuch der analytischen Chemie* (Berlin, 1829) has run through many editions, and is still the standard authority. He published more than 200 papers on chemical subjects, mostly in *Schweigger's J., Gilb. Ann.*, and *Pogg. Ann.* In 1851 he read before the Berlin Academy of Sciences his *Gedächtnissrede auf Berzelius.* He was an instructor in the University of Berlin, from 1822 till his death. C. F. CHANDLER.

Rose (HENRY JOHN), brother of Hugh James, b. in England in 1801; graduated at St. John's College, Cambridge, 1821; became fellow there 1824; took orders in the Church of England; was Hulsean lecturer 1833; became rector of Houghton Conquest 1837, and archdeacon of Bedford 1866. D. at Bedford Jan. 31, 1873. He became in 1839 editor of the *Encyclopædia Metropolitana;* commenced the publication of *Rose's Biographical Dictionary* (12 vols., 1839–47), projected by his brother; translated Neander's *History of the Christian Church* (1831); was one of the contributors to the *Replies to Essays and Reviews* (1861) and to the *Speaker's Commentary;* author of a volume of Hulsean lectures (1834) and of a *History of the Christian Church from 1700 to 1858.*

Rose (HUGH HENRY). See STRATHNAIRN.

Rose (HUGH JAMES), b. at Little Horsted, Surrey, England, in 1795; graduated at Trinity College, Cambridge, 1817; became curate of Uckfield 1818, vicar of Horsham 1821, select preacher to the University of Cambridge 1825; was Christian advocate at Cambridge 1829–33, professor of divinity in the University of Durham 1833–38, rector of Fairstead 1833–36, rector of St. Thomas's, Southwark, 1833–38, chaplain to the archbishop of Canterbury 1834–38, and principal of King's College, London, from 1836 to his death, which occurred at Florence, Italy, Dec. 22, 1838. Author of many sermons and theological treatises; founded the *British Magazine* 1832; became editor of the *Encyclopædia Metropolitana* 1836; was joint-editor (with Archdeacon W. R. Lyall) of the *Theological Library*, and projected *Rose's New General Biographical Dictionary*, a design carried into effect after his death by his brother, Henry John, and other writers.

Rose Aca'cia, the *Robinia hispida*, a beautiful ornamental shrub of the order Leguminosæ growing wild in the mountainous parts of the Southern States. It has large, very showy, inodorous flowers of a deep rose-color in drooping loose racemes. It is common in cultivation.

Rose-Apples. See EUGENIA.

Rose Blanche, a port of entry of Newfoundland, in the S. W. part, on the S. coast, 225 miles by water from St. John's. Fishing and mercantile interests are important. It is in a mountainous and barren region, but has ledges of beautiful granite. P. 452.

Rose'boom, p.-v. and tp., Otsego co., N. Y., 4 miles from Cherry Valley, has 2 churches, a cheese-factory, 1 grist and 2 saw mills, 1 hotel, a wagon-factory, and 1 planing-mill. P. 1589. HERBERT D. ELWELL, ED. "CAUSE."

Rose-Bug, the *Macrodactylus subspinosus*, a very common coleopterous insect of North America, belonging to the family Scarabeidæ. It is a small dusky-yellow beetle, very destructive, not only to the rose, but to other vegetation.

Rose'burg, p.-tp., cap. of Douglas co., Or., on Oregon and California R. R., has good schools, 1 daily and 2 weekly newspapers, 2 wagon-shops, 9 distilleries, 2 hotels, 1 mill, and a U. S. land-office. P. about 1000.
W. H. BYARS, ED. "PLAINDEALER."

Rose'crans (WILLIAM S.), b. in Kingston, O., Sept. 6, 1819; graduated at the U. S. Military Academy, and promoted brevet second lieutenant of engineers July 1, 1842. With the exception of four years (1843–47), when he was at West Point as assistant professor of engineering and of natural and experimental philosophy, he was engaged in the construction of fortifications until Apr. 1, 1854, when he resigned from the army and established himself in Cincinnati, O., as civil engineer and architect; was president of a coal company in Virginia 1855–57, and engaged

in the manufacture of kerosene oil in Cincinnati 1857–61. In the early days of the civil war, as volunteer aide to Gen. McClellan, then in command of the department of the Ohio, he served in organizing State troops; was appointed colonel and chief engineer of Ohio June 9, and colonel 23d Ohio Vols. June 10, 1861. He was now commissioned brigadier-general in the regular army, and in the West Virginia campaign commanded a brigade at Rich Mountain, July 11, and on the 21st July succeeded to command of the department of the Ohio, and of the department of West Virginia in Sept., 1861; appointed major-general of volunteers Mar., 1862: in May he commanded a division of the Army of the Mississippi at the siege of Corinth; succeeding to command of that army in June, he fought the battles of Iuka (Sept. 19) and Corinth (Oct. 3–4); transferred to the command of the Army of the Cumberland Oct. 27, the battle of MURFREESBORO' (which see) was fought Dec. 31, 1862–Jan. 3, 1863, where, as at Corinth, his own personal exertions did much to secure success after temporary reverse on the first day. Advancing on Tullahoma June 24, he occupied Bridgeport and Stevenson July 24; crossed the Cumberland Mountains, and Sept. 19–20 fought the battle of CHICKAMAUGA (which see), where, defeated and falling back on Chattanooga, he was relieved Oct. 30, 1863; was placed in command of the department of the Missouri Jan., 1864; repelled the invasion of Missouri by Price; was mustered out of the volunteer service in 1866; again resigned from the army 1867; was for a short time (1868–69) U. S. minister to Mexico, after which he became a resident of San Rafael, Cal., where he possesses a large tract of land, and was in Mexico 1871–73, engaged in an unsuccessful effort to negotiate the construction of a vast system of narrow-gauge railways.

Rose Creek, tp., Perry co., Ark. P. 241.

Rose′dale, v., Van Buren tp., Pulaski co., Ind., on Columbus Chicago and Indiana Central R. R. P. 88.

Rose′field, p.-v. and tp., Peoria co., Ill., on Galesburg division of Chicago Burlington and Quincy R. R. P. 1108.

Rose Grove, p.-v. and tp., Hamilton co., Ia. P. 68.

Rose Head, p.-v. and tp., Johnson co., Mo. P. 199; of tp. 1439.

Rose Hill, p.-v. and tp., Lee co., Va. P. 3023.

Roselli′ni (IPPOLITO), b. at Pisa Aug. 13, 1800; was appointed professor of Oriental languages at the university of his native city in 1824; joined Champollion in an examination of the Egyptian monuments in Italy 1824–26, and again in 1827 in an exploration of the monuments in Egypt itself. After his return from this journey he was made librarian of the University of Pisa, but resigned and devoted himself exclusively to the editing and publication of his great work, *I Monumenti dell' Egitto e della Nubia* (9 vols. 8vo, and 3 vols. fol. of plates, 1832–43). D. June 4, 1843.

Rose-Mallow. See HIBISCUS.

Rose′mary [Lat. *ros*, "dew," and *marinus*, "of the sea"], the *Rosmarinus officinalis*, a labiate evergreen shrub of Europe and Asia, having fragrant aromatic leaves which yield a pungent volatile oil, valued as a stimulant medicine, and sometimes used as an ingredient in perfumery, in hair-dressings, and in liniments. Off the Spanish coast the rosemary may sometimes be smelt for many leagues at sea. It affords excellent bee-pasture.

Rosemary, tp., Barnwell co., S. C. P. 618.

Rose′mond, p.-v. and tp., Christian co., Ind., on Indianapolis and St. Louis R. R. P. 1107.

Rose′mount, p.-v. and tp., Dakota co., Minn., on Milwaukee and St. Paul R. R. P. 681.

Ro′sen (FRIEDRICH AUGUST), PH. D., b. at Hanover, Germany, Sept. 2, 1805; educated at Göttingen, Leipsic, and Berlin; began in 1824 the study of Sanskrit with the aid of his father; returned to Berlin soon after and devoted himself entirely to that language, which Bopp had just begun to teach; published, on the occasion of taking his degree as doctor of philosophy in 1826, his *Corporis Radicum Sanscritarum Prolusio*, expanded in the following year into his useful work *Radices Sanscritæ* (Berlin, 1827), which contributed largely to extend and facilitate Sanskrit studies in Germany; studied Arabic and Persian; prepared for the press several large episodes of the *Shah Nameh*, and was about to visit the East with the position of attaché to the Prussian embassy at Constantinople (1829) when he was offered and accepted the professorship of Oriental languages in the University of London (now University College), then just established. After studying a few months at Paris, where he enjoyed the friendship of De Sacy and Remusat, Rosen entered upon his duties at London, where, though disappointed in the small number of students of comparative philology, he made himself very useful as a teacher of Hindustani, having mastered that language in a few months; but ultimately resigned that post and accepted the professorship of Sanskrit. Becoming honorary foreign secretary to the Royal Asiatic Society and secretary to the recently-established Oriental Translation Committee, he became intimate with H. T. Colebrooke, by whose advice he published the Arabic text (with English translation and notes) of Mohammed ben Musa's *Algebra* (1831); prepared for publication Ibn Khallikan's great *Biographical Dictionary*, and undertook a work (never completed) on *Indian Jurisprudence*; wrote all the articles on Oriental literature, and some of those on Eastern geography, in the earlier volumes of the *Penny Cyclopædia* (1833–37); revised the work on the Hindoos which appeared in the *Library of Entertaining Knowledge*; published in the *Journal of Education* able reviews of the philological works of Bopp and Pott; edited Sir Graves Houghton's *Dictionary, Bengali, Sanscrit, and English* (1833–34), and 2 vols. of his friend Colebrooke's *Miscellaneous Essays* (1837); maintained an active correspondence with the principal European philologists, and contributed advice or material assistance to nearly every important publication on Eastern history or philology during the last ten years of his life. Among so many important services he will be chiefly remembered as the first European scholar who undertook to edit the Vedas. Having early perceived the necessity of concentrating his attention upon that vast subject, of which he never lost sight, he published his *Rig-Vedæ Specimen* in 1830, and began in 1836 to print the Sanskrit text with a Latin translation and explanatory notes. He had not completed the first volume when he suddenly d. at London Sept. 12, 1837. The Oriental Translation Committee issued the work under the title *Rig Veda Sanhita Liber Primus, Sanscrite et Latine* (1838). His posthumous papers and collections were utilized by Prof. Lassen of Bonn. Rosen attained a distinguished position in English society, and was sincerely mourned for his eminent private virtues.—His brother GEORGE, b. at Detmold Sept. 24, 1821, is a distinguished Orientalist; has been dragoman to the Prussian embassy at Constantinople, consul at Jerusalem 1852–67, and at Belgrade, and has made valuable discoveries concerning the Caucasian group of languages. PORTER C. BLISS.

Ro′senau, town of Hungary, on the Sajo, has copper, lead, and iron mines and manufactures of stone and earthen ware and leather. P. 5053.

Ro′sendale, p.-v. and tp., Ulster co., N. Y., on Rondout Creek and Delaware and Hudson Canal. P. 3625.

Rosendale, p.-v. and tp., Fond du Lac co., Wis. P. 1298.

Rose-Noble, or **Gold Penny,** an ancient English gold coin, first current in the reign of Edward III., and last coined under Henry V. It bore a rose on one side, and was worth one noble—6*s*. 8*d*. sterling.

Ro′senkranz (JOHANN KARL FRIEDRICH), b. at Magdeburg Apr. 23, 1805; at the age of nineteen took up his residence in Berlin, pursuing his studies there, and making the acquaintance of many distinguished scholars and thinkers. He studied the doctrines of Schleiermacher, and afterward those of Hegel, being assisted by Von Henning and Hinrichs. He completed his university course at Halle, receiving the degree of doctor of philosophy in 1828. In 1833 he married and entered upon the duties of professor of philosophy at Königsberg, having now (1876) occupied for forty-three years the chair held for twenty-four years previously by the celebrated Herbart, and for thirty-four years by the still more celebrated Kant. Rosenkranz is the best living representative of the "centre" of the school of Hegel, and has done much valuable work in rearranging and reclassifying the several parts of the system. His chief works are a *History of German Poetry in the Middle Ages* (1830), a *Handbook of the General History of Poetry* (Halle, 1833), *Encyclopædia of Theological Sciences* (Halle, 1831), *Critique of Schleiermacher's Glaubenslehre* (Königsberg, 1836), *Psychology, or Science of Subjective Mind* (Königsberg, 1837), *Critical Explanations of Hegel's System* (1840), *History of Kant's Philosophy* (Leipsic, 1840), *Life of Hegel* (Berlin, 1844), *Modifications of Logic* (Leipsic, 1846), *Goethe and his Works* (Königsberg, 1847), *Pedagogics as a System* (Königsberg, 1848), *System of Science* (Königsberg, 1850), *Æsthetics of the Ugly* (Königsberg, 1853), *Science of the Logical Idea* (Königsberg, 1859), *On Vera's Translation of Hegel's Philosophy of Nature* (Berlin, 1868), *Hegel as the National Philosopher of Germany* (Leipsic, 1870), *From Magdeburg to Königsberg: Autobiography* (Leipsic, 1873), *New Studies*—vol. i. *The History of Culture*; vol. ii. *The History of Literature* (Leipsic, 1875). WILLIAM T. HARRIS.

Ro'senmüller (Ernst Friederich Karl), b. at Hessberg, near Hildburghausen, Germany, Dec. 10, 1768; studied theology at the University of Leipsic, where he became professor of Oriental languages in 1795. D. Sept. 17, 1835. His principal works are—*Scholia in Vetus Testamentum* (11 vols., 1788–1835), *Scholia in Vetus Testamentum in compendium redacta* (5 vols., 1828–35), *Handbuch der biblischen Alterthumskunde* (4 vols., 1823–31).

Rose of Jericho, or **Rose of the Virgin,** the *Anastatica Hierochuntica*, a cruciferous herb of the Levant and of Arabia. After flowering it dies, the branches incurve, so that the plant assumes a globular form, and becoming detached from the ground, is blown about by the winds. If it rests at last upon a moist place, it expands hygrometrically and sheds its seeds, which there germinate. This curious hygrometric property and this seeming abeyance of life are sometimes protracted for several years. It is fabled that the rose of Jericho first bloomed at the Nativity, and that it remains in flower from Christmas till Easter. Others say that it sprang up wherever the Virgin alighted during the journey to Egypt.

Rose of Sharon, the popular name of the *Hibiscus Syriacus*. (See Hibiscus.)

Rose'ola, a name rather loosely applied to a class of rather unimportant febrile diseases, sometimes contagious, and often simulating scarlatina or measles. Indeed, there is no doubt that mild cases of the two latter diseases are often mistaken for roseola, and severe roseola is not unfrequently taken for one of the more formidable diseases. The infantile disease called rose-rash is one of the roseolas.

Rose Quartz, a fine variety of quartz, sometimes crystallized, and usually translucent or transparent. It is colored of a pink, rose, or flesh tint. It is valued for ornamental work, and is often cut as a gem.

Roses, Attar of. See Attar of Roses.

Rose's Bar, tp., Yuba co., Cal. P. 1191.

Roses, War of the, the name given to the civil war lasting thirty years (1455–85) between the princes of the rival houses of York and Lancaster, each claiming the throne of England by right of descent from Edward III. The Lancastrian family occupied the throne on the death of Richard II. (1399) in the person of Henry IV., son of John of Gaunt, duke of Lancaster, third son of Edward III., to the exclusion of the true heir, Roger Mortimer, earl of March, grandson of Lionel, duke of Clarence, second son of Edward III. The princes of the house of York were fraternally descended from Edmund Langley, duke of York, fourth son of Edward III., but derived their claim to the throne from the marriage of Richard, son of Edmund Langley, to Anne Mortimer, heiress of the duke of Clarence; the contest might therefore with more propriety be described as one between the houses of Clarence and Lancaster. The name given to this war is said to have been derived from the badges worn on either side, and the respective colors may be remembered by the aid of the following stanza addressed to a lady:

> "If this white rose offend thy sight,
> It in thy bosom bear;
> 'Twill blush to find itself less white,
> And turn *Lancastrian* there."

(See Edward IV., Henry VI. and VII., and Richard III.)

Rose Tree. See Rhododendron.

Roset'ta [Arab. *Rasheed*], a town of Egypt, on the delta of the Nile, on the western branch of the river, in lat. 31° 25′ N. and lon. 30° 28′ E. It was formerly an important commercial city, but has now greatly declined. Here was found the celebrated Rosetta Stone (which see). P. about 15,000.

Roset'ta Stone, a celebrated inscription found in 1799 at Rosetta by M. Boussard, a French officer of engineers, in digging the foundation of a house at Fort St. Julien. It appears to have been originally set up in the temple of Tum or Tomos. When complete it was a tablet of black basalt more than 3 feet 1 inch high, 2 feet 5 inches wide, and 10 inches thick. This tablet is of a trilingual character, and in its present broken condition has 14 lines of hieroglyphs, 32 of cursive Egyptian, the so-called demotic or enchorial writing, and 54 lines of Greek. It appears from the last that it was an act of the priests assembled in synod at Memphis B. C. 196–97 in honor of the King Ptolemy Epiphanes in the ninth year of his reign; and after reciting the events of the period—the birth of the king, the troubles in higher Egypt, the inundation of the Nile, the decease of Ptolemy Philopator, the attack of Antiochus, the suppression of rebellion, the remission of taxation, and the gifts to the bulls Apis and Mnevis and the sacred animals—proceeds to order that a figure of the king should be placed in the temples; that a shrine should be placed with a gilded figure of wood of the monarch in the adyta with the other shrines, and be carried in procession on a special festival in honor of the king on the 30th Mesori, his birthday; and, above all, that a copy of this synodical act should be engraved on a tablet of hard stone and set up in every temple of the first, second, and third rank throughout the country. About one-third of the hieroglyphic portion, and almost the whole of the demotic and Greek inscriptions, have been preserved. The stone at the capitulation of Alexandria was sent to England, and presented by George III. to the British Museum, and on its publication it was at once discovered to be the key to the decipherment of the hieroglyphs. In 1802, Silvestre de Sacy and Akerblad deciphered some of the names and words in the demotic or enchorial, and prepared the way for the subsequent discoveries in the hieroglyphic portion. In 1814, Young commenced the investigation, and in 1818 arrived at the conclusion that the cartouche or oval which contained the name of Ptolemy was composed of hieroglyphs used for *sounds*, not *ideas*, tracing the hieroglyphic name in a peculiar way through the demotic and hieratic, and deciphering on another document the name of Berenice. Subsequently, Champollion (in 1822) deciphered from the Rosetta Stone the name of Ptolemy, and that of Cleopatra from an obelisk removed from Philæ to England in 1822. It was but another step to discover from this inscription that the *phonetic* hieroglyphs, or those used for sounds, entered extensively into the other portions of the text. In the mean time, the principal Greek scholars, Porson, Villoison, and Letronne, had corrected, interpreted, or restored the Greek portion of the inscriptions. The other two versions are not literal translations, but paraphrases of the Greek, in which the original document appears to have been drafted; but it was not till many years after the first attempts that a complete translation of the hieroglyphic text was given by Brugsch-Bey in 1851, and Chabas in 1867, and the demotic text has not up to the present date been entirely translated. Considered as a key, the Rosetta Stone was at the time invaluable, but it has of late been surpassed by the discovery by Lepsius in 1866 of another trilingual inscription at San. This is a synodical decree passed by the priests at Canopus in the ninth year of Ptolemy Euergetes I. (B. C. 238), having 37 lines of hieroglyphs, 76 lines of Greek, and 72 of demotic writing, and is nearly complete, being in an excellent state of preservation. It completes the circle of hieroglyphical discovery, and proves the accuracy of the interpretations previously made. The Rosetta Stone had indeed been the key to the discovery of the meaning of many words, and gave the clue to the phonetic value of the hieroglyphs, and independent of its philological value is an inscription of great historical interest, and one of the most important of the Greek hitherto discovered. It was repeatedly published by the Society of Antiquaries of London, about 1802; by Brugsch-Bey, Lepsius, Young, Salvolini, and others either in part or entirely; while explanations of the hieroglyphical text have been given by M. Brugsch and M. Chabas, and of the demotic by M. Brugsch. Although it is to be regretted that the Rosetta Stone was found so incomplete, its defects are more than supplied by the subsequently discovered inscription of San or decree of Canopus, now in the museum of Boulag at Cairo.

S. Birch.

Rose'ville, p.-v., Franklin co., Ark. P. 92.

Roseville (P. O. name of junction), Placer co., Cal., on Central Pacific R. R., at the junction of Oregon division of the same road. P. 115.

Roseville, p.-v. and tp., Warren co., Ill., on Rockford Rock Island and St. Louis R. R. P. 1153.

Roseville, tp., Monongalia co., Minn. P. 322.

Roseville, p.-v., Clay tp., Muskingum co., O. P. 426.

Rose'wood. (1) The beautiful and fragrant wood of several leguminous Brazilian trees of the genera *Machærium* and *Triptolomea*, highly valued as a veneer for furniture, pianos, etc. (2) The almost equally beautiful wood of *Dalbergia latifolia*, an East Indian leguminous tree. (3) Canary Island rosewood, the fragrant woody root of *Rhodorhiza scoparia* and *florida*. It is a delightful incense, and its powder is mixed with snuff. From it is obtained the oil of rhodium, so much vaunted as a charm for horses and so highly prized by trappers. (4) Burmese and African rosewoods are the timber of species of *Pterocarpus*, leguminous trees.

Rosiclare', p.-v. and tp., Hardin co., Ill., on Ohio River. P. 533.

Rosicru'cians. In 1614 appeared at Cassel an anonymously published book, *Fama Fraternitatis des löblichen Ordens des Rosenkreuzes*, and next year another, *Confession oder Bekandtnuss der Societat und Bruderschaft R. C.*, in which the most wonderful stories were told of a certain

secret society, the Rosicrucians, founded in the fourteenth century, possessed of the deepest wisdom, and most potently at work for the weal of mankind. Concerning the founder of the society, Christian Rosenkreutz—his residence among the Arab and Egyptian magicians, his life in Spain and Germany as head of the new order, his death and burial—the most stirring revelations were made in a third book, *Chymische Hochzeit Christian Rosenkreutz'*, which appeared in 1616. These books made an enormous sensation. People rushed forward—some to become members of the society, others to fight against it. Some theologians considered it a means of salvation, others the organ of a foul scheme. Some physicians thought that it would give the fulfilment of the golden prophecies of Theophrastus Paracelsus concerning an elixir of life; others, that it was only an impudent opposition to Galen. The alchymists crowded around it, sure that it had found the philosopher's stone and could make gold. For several years the secret society of the Rosicrucians was the all-absorbing topic of the day. Nevertheless, there existed no such society. The whole affair was a mystification—by whom and for what purpose is uncertain. Some think that the books were written by Johann Valentin Andreä, and simply as a satire; others have other opinions and offer other explanations. But of the real existence of such a society there never was found the slightest trace. Soon, however, there arose a multitude of Rosicrucian societies, and at the end of the eighteenth century Cagliostro pretended to be a Rosicrucian.

Rosier (JAMES), b. probably at Winston, Norfolk, England, about 1575; graduated at Pembroke Hall, Cambridge, 1593; was engaged by Lord Arundel of Wardour to accompany Captain George Waymouth on his voyage to "Virginia," during which he explored the coast of Maine and Penobscot River, and published on his return *A True Relation of the most prosperous voyage made this present year 1605 by Captain George Waymouth, in the discovery of the land of Virginia, where he discovered sixty miles up a most excellent river; together with a most fertile land.* This rare tract, of which extracts were given by Purchas, was reprinted in the *Collections* of the Massachusetts Historical Society, 3d series, vol. viii.

Rosigna'no Maritti'mo, town of Italy, province of Pisa, situated on the summit of the Livornese Mountains, about 24 miles S. of the city of Pisa. The earliest historical record referring to this town is a Lombard document dated 762 A. D., and for many centuries Rosignano Marittimo formed a part of the territory of Pisa. There are medicinal springs of some reputation in this immediate neighborhood. P. 7000.

Ros'in [Lat. *resina*], or **Col'ophony,** the residue which is obtained by distilling off the water and volatile oil from the crude turpentine from pine trees. The yield is from 70 to 90 per cent. of the whole. (See TURPENTINE.) It is largely manufactured, together with oil of turpentine, at Wilmington, Newberne, and Beaufort, N. C. When entirely freed from water it is translucent. The color depends upon the purity of the original turpentine and the care taken to distil at a low temperature. Rosin was formerly supposed to consist of a mixture of isomeric acids—pinic, sylvic, pimaric, and colopholic ($H_2C_{20}H_{28}O_2$)—but the researches of Maly (*Am. Ch. Pharm.*, cxxix. 94; cxlx. 244; and clxi. 1151) show that it is composed chiefly of abietic acid ($H_2C_{44}H_{62}O_5$), with a small quantity of some other acid, probably of the composition $H_2C_{20}H_{28}O_2$. The conversion of oil of turpentine ($C_{10}H_{16}$) into rosin may occur according to the following equation:

$$5C_{10}H_{16} + O_{25} = H_2C_{44}H_{62}O_5 + 8H_2O + 6CO_2.$$

Colophony is pale yellow and transparent ("virgin rosin," *C. album*), or brownish-yellow and translucent (*C. commune*), according to the care taken in its preparation. It may be obtained nearly colorless by distillation with steam or some inert gas, as H, Co_2, or N, under a pressure of ten atmospheres at a temperature not higher than 600° F. (*Hunt and Pochin's English Patent*, 1858, No. 925.) It has a peculiar lustre, called *resinous*, is brittle when cold, and breaks with a conchoidal fracture; sp. gr. 1.07 to 1.08. It is insoluble in water, soluble in alcohol, ether, wood-spirit, and in fixed and volatile oils; partially soluble in petroleum. Nitric acid dissolves it, forming chiefly isophthalic acid, together with trimellitic acid and a resinous acid. (Schreder, *Deut. Chem. Ges. Ber.*, vi. 413.) It dissolves in caustic alkalies and alkaline carbonates. On adding sodic nitrate to the solution in caustic soda the sodic abietate ($Na_2C_{44}H_{62}O_5$) separates as a snow-white flocculent precipitate. From this various insoluble metallic salts are obtained by double decomposition. Colophony softens at 160° F., and melts at 275° F. At higher temperatures it gives off volatile oils, acquiring a dark color. By continuing the distillation it yields, besides CO, CO_2, a little ethylene, tetrylene, and marsh-gas, and about 74 per cent. of liquid distillate. The first portion of this distillate is a yellow, mobile, strong-smelling liquid, known as essence of rosin, and consists of colophonone ($C_{11}H_{18}O$) and an optically indifferent camphene ($C_{10}H_{16}$), boiling at 338° F. (See *Chem. News*, xx. 38, 39.) Later in the distillation a viscid fluorescent "rosin oil" ("pinolin") passes over. By treating this with quicklime a product is obtained having the composition $C_{30}H_{40}O$, and by rectifying this, and again treating with lime, an oil is obtained having the composition $C_{20}H'_{28}O$, which is not fluorescent. (Schiel, *Ann. Ch. Pharm.*, cxv. 96.) By allowing melted rosin to flow into a red-hot retort it is converted into a very rich permanent "rosin-gas," which was at one time used for lighting cities. (See GAS-LIGHTING.)

Colophony is extensively used in making varnishes and cements, in the calking of ships, in the preparation of plasters and ointments, and as a reducing agent in the soldering of metals. Large quantities are consumed in the manufacture of yellow soap. A well-known use of it is for covering the bows of violins to prevent the bow from slipping over the strings without producing vibration. Before the introduction of petroleum, rosin oil was used to some extent for burning in lamps. The rosin spirit is sometimes used as a substitute for oil of turpentine. The viscid oil is used in paints, for the manufacture of printer's ink, in soapmaking, in cheap lubricators, etc.

C. F. CHANDLER.

Rosi'ni (GIOVANNI), b. at Lucignano, Tuscany, June 24, 1776; studied at Leghorn, Florence, and Pisa, where he became professor of Italian literature in 1803. D. May 16, 1855. His works comprise several dramas, 2 vols. of poems, historical romances, *Monaca di Monza* (1829), *Luisa Strozzi* (1833), *Ugolino* (1843), and a *Storia della pittura Italiana* (7 vols.).

Ros'kilde, town of Denmark, island of Sealand, on a hill on a branch of the Isefjord, and received its name, "Roar's Springs," from the numerous springs which burst forth from the sides of the hill. In the early Middle Ages it was a great city, the royal residence, with 100,000 inhabitants, 27 churches and monasteries, but conflagrations, the plague, and the growth of neighboring Copenhagen destroyed its prosperity. It contains a magnificent cathedral, built 1047–84, and containing many splendid monuments; the Danish kings are buried here. P. about 5000.

Ros'lyn, p.-v., North Hempstead tp., Queens co., N. Y. (L. I.), at the head of Hempstead harbor, and on Glen Cove branch of Long Island R. R., has daily communication with New York by steamer, and is largely occupied by the villas of wealthy citizens of that metropolis. Residence of William Cullen Bryant, who named the village and presented it with a public hall. P. 655.

Rosmar'idæ [*Rosmarus*, Latinized from the Norwegian name *rosmar*, "sea-horse"], a family of mammals belonging to the order Pinnipedia, containing the walruses and related to the families Phocidæ, or true seals, and Otariidæ, or eared seals. The form is peculiar, but resembles that of the Phocidæ more than that of the Otariidæ; the hinder legs are flexible forward; no external ears are developed; the skull is oblong and truncated in front; it has strong and salient mastoid processes, whose surfaces are continuous with the auditory bullæ; no post-orbital processes are developed; distinct alisphenoid canals exist; the dentition is very peculiar, the canine teeth of the upper jaw being enormously developed and specialized as tusks, while those of the lower jaw are atrophied; the incisors, except the external of the upper jaw, are early lost; the molar teeth are $\frac{4}{4} \times 2$, but the posterior are generally cast in the adult; the anterior limbs are about as large as the posterior; in the anterior feet the toes decrease in a curved line, and are destitute of claws; in the posterior feet the five digits scarcely increase toward the inner, and all are provided with claws; the skin is very thick. The family is represented by the WALRUSES or MORSES (which see), which are found only in the high northern seas. Two species appear to exist—one (*R. obesus*) inhabiting the northern Atlantic, and the other (*R. Cookii*) the northern Pacific. The species attain a large size, sometimes reaching, or even exceeding, twelve or thirteen feet in length, and their girth is nearly as great; they are, therefore, very obese, and consequently inefficient on land, but in water their movements are easy and not ungraceful. They swim entirely under water, rising only occasionally to breathe, when they blow somewhat like a whale. They feed chiefly upon shellfish—clams, mussels, etc.—but also on the bulbous roots of plants which grow in the lagoons and bays. It is chiefly by means of their tusks that they unearth the clams and drag them from their holes. In former times the eastern walrus extended much farther S. than at present, but now it is rarely found S. of Labrador. The Pacific walrus ap-

pears to have extended still less to the southward: it is, however, abundant on an island of the Prybilov group, which has been called therefrom "Walrus Island."

THEODORE GILL.

Rosmi'ni (ANTONIO), ABBÉ, b. at Roveredo in 1797; at an early age devoted himself to philosophical studies, and in his first youth wrote an *Esame della Ragione* and a *Classificazione delle Scienze;* after these followed a *Lettera sul Cristiano Insegnamento,* the *Storia dell' Amore, Saggio sulla Felicità, L'Educazione Cristiana, Saggio sulla Providenza, Sull' Unita dell' Educazione, Galateo dei Letterati;* in 1827 formed a friendship with Manzoni, and in 1830 went to Rome to obtain the sanction of the pope to his Instituto dei Preti della Carità, an order founded by himself; in the same year published his principal work, *Nuovo Saggio sull' Origine delle Idee;* in 1834 returned to Roveredo as archdeacon, and there gave himself entirely to philosophy, producing the following works: *Ontologia, Aristotelismo, Pedagogica, Antropologia Sovranaturale,* and many other works, which in all form 30 volumes. The *Cinque Piaghe delle Chiesa, Il Progetto di Costituzione* are applications of his philosophical doctrines to politics. He carried on long polemical controversies with Gioberti and Mamiani. D. at Stresa in 1855.

Rosny', de (LÉON), b. at Loss, department of Le Nord, France, Aug. 5, 1837; studied Oriental languages, history, and geography at Paris; was attached as interpreter to the Japanese embassy which visited Europe in 1863, and became professor of Japanese at Paris in 1868. He published *Dictionnaire japonais-français-anglais* (1858), *Les Écritures figuratives et hiéroglyphiques des Différents Peuples, anciens et modernes* (1860), *Dictionnaire des Signes idéographiques de la Chine* (1864–67), *Études asiatiques de Géographie et d'Histoire* (1864), *Aperçu de la Langue coréenne* (1867).

Rosolic Acid, Coralline, Pseudo-Coralline, or **Aurine.** These names have been applied to red coloring-matters which have been supposed to be identical, but have been recently shown to be distinct. *Rosolic acid* was obtained by Runge in 1834 (*Pogg. Ann.,* xxi. 70) from coal-tar naphtha. He treated coal-tar naphtha with milk of lime, neutralized the solution with an acid, and thus obtained a mixture of phenol and rosolic and brunolic acids. This he distilled with water to remove phenol, obtaining a brown pitchy residue. This he dissolved in alcohol, and treated with milk of lime, obtaining a brown precipitate of calcic brunolate and a rose-colored solution of calcic rosolate. From this solution he precipitated, with the aid of acetic acid, the rosolic acid, containing some brunolic acid. This he continued to treat with alcohol, lime, and acetic as long as calcic brunolate could be separated, and then collected the rosolic acid on a filter, dried it, dissolved it in alcohol, and allowed the solution to evaporate to dryness, obtaining the new acid as a yellowish-red brittle resin. He says that this acid gives, with proper mordants, beautiful red lakes, and dyes fabrics. In 1859, Hugo Müller (*Q. J. Chem. Soc.,* xi. 1) found, on leaving a quantity of crude carbolate of lime in a warm drying chamber for several months, that it was converted into a red calcic rosolate. On boiling this with dilute ammonic carbonate, and evaporating the solution nearly to dryness, the crude rosolic acid separated as a dark resinous body. This he purified by Runge's method, treating the alcoholic solution with lime, filtering, diluting, distilling off the alcohol, and precipitating with acetic acid, repeating this several times. He finally dissolved in alcohol, added a minute quantity of hydrochloric acid, and poured it into a large quantity of water, thus obtaining the acid pure. Tschelnitz (*J. f. pr. Ch.,* lxxi. 416) mixes coal-tar naphtha with slaked lime, exposes the mixture to the air for several months, and then extracts the rosolic acid by Runge's method. R. A. Smith (*Chem. Gaz.,* 1858, 20) dissolves phenol in caustic soda, boils with MnO_2, and precipitates the rosolic acid with an acid. Jourdin (*Rép. Chim. app.,* iii. 217) substitutes HgO for MnO_2. He also obtains rosolic acid by heating phenol with $HgCl_2$. Caro (*Phil. Mag.* [4], xxxii. 126) finds that pure phenol or pure cresol does not yield a trace of rosolic acid with MnO_2, $HgSO_4$, As_2O_5, or iodine, but that some body like cresol, oxalic acid, etc., which contains carbon in the form in which it exists in the fatty series, must be present. A mixture of phenol (C_6H_6O) and cresol ($C_6H_5(CH_3)O$) always yields it with these reagents. Rosolic acid, previously boiled with water, appears as a dark greenish, amorphous substance, with the greenish metallic lustre of cantharides. Its powder is red, and assumes a bright gold-like lustre when rubbed or pressed with a hard body. Thin films are orange-red by transmitted, and metallic by reflected light. When precipitated from alcohol by water, it is a bright-red powder, At 170° F. it cakes together, and in boiling water melts. It is not volatile; dissolves readily in alcohol, ether, wood-naphtha, phenol, creosote, concentrated acetic, hydrochloric, and sulphuric acids. From all of these solvents, which are miscible with water, it is precipitated unchanged when it is added. It is insoluble in chloroform, benzol, bisulphide of carbon, essential and fixed oils. It is not decolorized by sulphurous acid. Its acid properties are very feeble; it is even weaker than carbonic acid. It forms dark-red compounds with ammonia, caustic alkalies, and caustic alkaline earths; soluble in alcohol and in water, with a magnificent red color. Carbonic acid decomposes them, and the prolonged action of air and light destroys the rosolic acid completely. The calcic compound, evaporated *in vacuo* over quicklime, leaves a red crystalline powder resembling carthamine. The magnesia salt is most stable. Rosolates give no precipitates (lakes) with salts of alumina or other oxides, nor with the acetate or basic acetate of lead; this is contrary to Runge. The composition of rosolic acid has not been fixed with certainty. Hugo Müller proposed $C_{23}H_{22}O_4$, R. A. Smith $C_{12}H_{12}O_3$, Dusart $C_6H_6O_2$.

	Müller's analysis.	$C_{23}H_{22}O_4$.	$C_{12}H_{12}O_3$.	$C_6H_6O_2$.
Carbon	75.92	76.27	70.59	65.45
Hydrogen	5.83	6.05	5.88	5.45
Oxygen	18.25	17.68	23.53	29.10

Rosolic acid has been suggested as an indicator in Pettinkofer's process for determining carbonic acid and in nitrogen determinations with standard acid.

Coralline was first prepared by Persoz in 1859, by treating 3 parts of phenol, 2 of oxalic acid, and 2 of sulphuric acid for several hours. The mass effervesces, becomes thick, and acquires a deep-red color. The process is terminated when a drop of the mixture is found to dissolve in dilute ammonia with a deep-red color. The mixture is then poured into hot water. A resinous mass, with the lustre of cantharides, separates. The whole is boiled till the unchanged phenol is expelled. On cooling, orange-red flocks separate from the liquid; these with the resinous mass are separated and washed. Persoz's process was not published till after Kolbe and Schmitt in 1861 announced their discovery of a similar process. They use 3 parts of phenol, 2 of oxalic acid, and 4 of sulphuric acid, and heat to 285°–300° F. four to six hours, in a vessel furnished with a cohobator. The product is treated as in Persoz's process. Fresenius (*J. f. pr. Ch.,* v. 184) purifies coralline by rubbing it with calcined magnesia, extracting with boiling water, and adding to the solution ammonic chloride, by which a brilliant crimson precipitate is obtained. By three or four repetitions of the process the product is obtained pure. The magnesia compound is finally decomposed by hydrochloric acid, and crystallized from alcohol or glacial acetic acid. The sulphuric acid acts merely as a dehydrant, and may be replaced, though not with advantage, by B_2O_3, As_2O_3, or As_2O_5. Fresenius deduces the formula $C_{40}H_{38}O_{11}$, but Kolbe suggests that it is formylated phenol ($C_6H_4(COH)OH = C_7H_6O_2$), produced by the action of carbonic acid on phenol, thus:

$$(\underset{\text{Phenol.}}{C_6H_5OH} + CO = \underset{\text{Coralline.}}{C_6H_4(COH)OH}).$$

	Analysis.	$C_{40}H_{38}O_{11}$.	$C_7H_6O_2$.
Carbon	69.07	69.16	68.85
Hydrogen	5.38	5.48	4.92
Oxygen	25.55	25.36	26.23

Coralline, as purified by Fresenius, crystallizes from alcohol in long, slender, lustrous scarlet needles—from glacial acetic acid, in dark-red rhombic prisms, trimetric. It melts at 313° F., is slightly soluble in cold water, more so in boiling water; is soluble in alcohol, ether, acetic acid, phenol, boiling chloroform, or benzol; insoluble in carbon bisulphide. Alkalies, alkaline earths, or their carbonates, added to water, cause it to dissolve to a beautiful purple-red solution. When ferricyanide of potassium is added to an alkaline solution of the pure coralline, no change occurs; if it be impure, it is darkened. Coralline gives fine red shades in dyeing, which are easily modified by the use of proper reagents. The liability to change renders it somewhat difficult to fix. It may be printed with albumen or lacturine: 8 ounces of coralline solution, 2 pounds of lacturine in 7 pints of water at 80° F., and 1 pint of ammonia give good results. After printing the pieces must be steamed twenty minutes. The calcic carbonate lake of coralline is largely used by paper-stainers.

Red Coralline, Pæonine, or *Pœonine* (J. Persoz, 1859) is obtained by heating 9 parts of crude coralline with 22 parts of concentrated ammonia to 270° F. for three hours in a strong iron vessel. A thick solution with a golden-crimson reflection is obtained, from which acids precipitate the new dye as a deep-red powder, the composition of which is not determined. It is probably an amide or imide of

coralline. It is almost insoluble in water, soluble in alcohol (red), and in alkalies (red, turning brown in the air). Pæonine is much used for dyeing wool, although it has the disadvantage of being changed to yellow by acids. This can be prevented by the use of magnesia, dissolving the dye in alcohol. It produces a rich Turkey red, the intensity of which is retained for years, at a cost of two-thirds that of cochineal, and possesses the advantage of not turning blue on washing in water containing bicarbonate of lime. A bath for dyeing may be prepared by dissolving the dye in alcohol, adding a little caustic soda, pouring into it a large quantity of lukewarm water, and nearly neutralizing with tartaric acid. The goods are worked for one and a half hours. Cotton must be mordanted with tin and sumac or galls. The color obtained is between that of cochineal and magenta. It resists washing, but is affected by soap and by exposure to sunlight. For printing, use a mixture of 320 grammes pæonine in 1 litre of water, 250 gms. glycerine, 560 gms. magnesia in 1 litre of water, and 3 litres gum-water (500 gum per litre). Print, steam, and wash. For printing on cotton use a mixture of the color with starch or albumen and magnesia. To print an orange-red, prepare a lake by dissolving 2000 gms. of pæonine in caustic soda (10° B.) dilute, precipitate with stannic chloride, and heat the mixture. Mix this lake with 100 gms. of magnesia, 260 of oxalic acid, 2000 of gum, and 10 litres of water.

Azuline, or *Phenyl Blue*.—This compound, the first blue obtained from aniline, was discovered by J. Persoz. It was prepared by heating 5 parts of pæonine and 8 parts of aniline for several hours at 356° F. The product is washed with dilute HCl to remove aniline, then with coal-tar naphtha, and finally with dilute caustic soda. It appears as a violet powder with a golden iridescence, is insoluble in water, soluble in alcohol. It is said by Willm to be $C_{12}H_{12}NO_2 = NH_2(C_6H_5O)_2$. It is not now manufactured, having been displaced by triphenyl-rosaniline, etc. (See ANILINE COLORS.)

Aurine, or *Yellow Coralline*, is prepared by heating phenol(commercial), oxalic acid, and sulphuric acid for a long time at 230° F. The product is poured into water, the unchanged phenol distilled off by a current of steam, the aurine dissolved in caustic soda, and reprecipitated. It constitutes a brittle, resinous body, with a beetle-green lustre, and yields a red powder. It may be purified (see Dale and Schorlemmer on aurine in *Am. Chemist*, iv. 142) by adding alcoholic ammonia to a cold concentrated alcoholic solution of crude aurine. A crystalline compound of aurine with ammonia separates out. This is washed with alcohol, and dried, when it appears as a dark-red crystalline powder with a bluish lustre. It loses its ammonia completely on long exposure to the air. By boiling it with dilute acetic, or HCl, it is obtained as a brownish-red crystalline powder with a green lustre. It must be purified by repeated crystallization from strong acetic acid. The crystals obstinately retain acetic and hydrochloric acid. Instead of extracting aurine from the commercial aurine, which is made from phenol containing cresol, it may be made directly from pure crystallized phenol by heating it with oxalic acid five or six days at 230° F., pouring into water, dissolving the precipitate in caustic soda, precipitating with HCl, and crystallizing from alcohol. The crystals are needles or prisms, trimetric, with a greenish-blue lustre; they contain:

	Analysis.	$C_{20}H_{14}O_3$.	$C_{21}H_{16}O_3$.
Carbon	79.73	79.47	79.75
Hydrogen	5.16	4.63	5.06
Oxygen	15.11	15.90	15.19

$C_{20}H_{14}O_3$ is the more probable formula. The formation of aurine is thus explained:

$$\underset{\text{Phenol.}}{3C_6H_6O} + 2CO = \underset{\text{Aurine.}}{C_{20}H_{14}O_3} + 2H_2O.$$

Pure aurine does not melt at 428° F.; the crystals assume a darker color, which disappears on cooling, with no apparent change in the substance. At a higher temperature aurine melts, emits an odor of phenol, and solidifies on cooling to an amorphous bottle-green mass. It dissolves in alkalies with a magenta-red color, and is precipitated by acids as a crystalline powder. When sulphur dioxide (SO_2) is passed into a hot concentrated alcoholic solution of aurine, the dark yellowish-red solution assumes a lighter color, and on cooling a compound separates out in brick-red crystalline crusts, or in garnet-red crystals with a bottle-green lustre, containing $(C_{20}H_{14}O_3)_2SO_2 + 5\frac{1}{2}H_2O$. By adding potassic bisulphite to a solution of aurine, an aurine-potassic-bisulphite was obtained: $C_{20}H_{14}O_3.KHSO_3$. Similar sodium and ammonium compounds can be obtained. On treating aurine with zinc-dust, phenol is obtained. If zinc-dust is added to a hot alkaline solution, it becomes colorless, and hydrochloric acid precipitates a colorless body called *leucaurine* ($C_{20}H_{16}O_3$). Other reducing agents produce the same result. Leucaurine dissolves in alkalies and in acetic acid, and crystallizes readily from the latter. Alkaline solutions absorb oxygen from the air and become red on the addition of ferricyanide of potassium. Leucaurine contains three hydroxyls (OH), the hydrogen of which can be easily replaced by acid radicals. Triacetyl-leucaurine is $C_{20}H_{13}(C_2H_5O)_3O_3$. Aurine yields fine orange shades on wool by printing a lake, prepared by dissolving five pounds of aurine in 2 gallons of caustic soda (10° B.), heating to 140 F., diluting to 20 gallons, and precipitating with $1\frac{1}{2}$ pints of stannic chloride (55° B.), diluted with 1 gallon of water. The lake is drained till it measures 4 gallons. Mix aurine lake, wet, 2 gallons, with powdered gum 4 pounds, oxalic acid 11 ounces, and heat till the gum and acid are dissolved. Print as usual. An orange-red may be obtained by dissolving aurine in dilute ammonia till the solution marks 32° Twd.; mix with 4 pounds of starch paste (14 pounds to the gallon). Print, dry, and steam one hour. With the aid of aniline red, aurine yields good scarlets. A blue color may be obtained from aurine similar to azuline. When aurine is gently boiled with aniline and a little acetic acid, the solution soon assumes a pure blue color. On boiling the product with dilute hydrochloric acid, in order to remove an excess of aniline, a blue resinous substance is obtained, consisting of a mixture of different bodies, which are partly soluble in alcohol and acetic acid, and partly insoluble in them. By heating the above mixture on a water-bath, a blue solution is formed in sixteen to twenty hours, which, however, also contains several bodies. A portion of the product is readily soluble in caustic soda, with a purple color, and precipitated by acid from this solution in blue flakes, which dissolve in alcohol and acetic acid. The portion which is insoluble in alkalies dissolves completely in acetic acid and alcohol, with a fine blue color, but ether takes up only a part of it, forming a dark-red solution, which on evaporation leaves a blue resinous body behind. The portion not dissolving in ether forms a dark-blue powder with a golden reflection.

Pseudo-Coralline.—Caro and Wanklyn in 1866 (*Chem. News*, xiv. 37) obtained a substance from rosaniline which they supposed to be rosolic acid. Fresenius has shown (*J. f. pr. Ch.* [2], v. 184–206) that it is a distinct compound, and has proposed for it the name of "pseudo-coralline." It is prepared by dissolving aniline red in hydrochloric acid, so as to have 3 equivalents of HCl for 1 of the base. On adding potassic nitrate, and boiling as long as nitric oxide is evolved, the rosaniline is converted into azorosaniline. On adding dilute hydrochloric acid in excess, and boiling, nitrogen is evolved, and red flocks separate, which melt together to a brown resinous mass with a golden lustre. Fresenius obtained this body in crystals, and found it to be $C_{26}H_{28}O_{10}$. It differs from coralline in not being decolorized by acid sodic sulphite. It melts at about 316° F. When boiled with aniline and a little benzoic acid, it forms a splendid and very permanent blue dye.

Poisonous Properties of Woollens dyed with Coralline, etc.—Much has been written on this subject, but it appears that the irritation of the skin, etc. which results from wearing red and scarlet flannel dyed with these colors is due not to the coralline, but to the picric acid, phenol, etc., which are often associated with them. Washing removes those substances. (See Guyot, *Comptes Rendus*, Aug. 6, 1869.)

C. F. CHANDLER.

Rosoli'ni, town of Sicily, province of Syracuse, on a hill near the left bank of the torrent Sido, about 10 miles S. W. of Noto. The adjacent country is highly fertile, and, besides the more common products of the island, tobacco and cotton are grown in considerable quantities. P. 6400.

Ross, county of Scotland. See ROSS AND CROMARTY.

Ross, county of S. Ohio, on Scioto River and Paint Creek, intersected by Marietta and Cincinnati R. R. and by Ohio and Erie Canal, has a surface partly level, partly hilly, with fertile soil in the bottom-lands of the valleys. Staples, Indian corn (over 2,000,000 bushels), wheat, butter, and wool. Cattle, sheep, and swine abound. Manufactories of carriages, leather, and saddlery are numerous, and there are several flour and woollen mills. Cap. Chillicothe. Area, 650 sq. m. P. 37,097.

Ross, tp., Edgar co., Ill. P. 731.

Ross, tp., Vermilion co., Ill. P. 1738.

Ross, tp., Clinton co., Ind. P. 1741.

Ross, p.-v. and tp., Lake co., Ind. P. 1625.

Ross, tp., Fremont co., Ia. P. 1314.

Ross, tp., Taylor co., Ia. P. 531.

Ross, tp., Cherokee co., Kan. P. 449.

Ross, tp., Kalamazoo co., Mich. P. 1397.

Ross, p.-v. and tp., Butler co., O., on Great Miami River. P. 1705.

Ross, tp., Greene co., O. P. 1076.

Ross, tp., Jefferson co., O. P. 685.

Ross, tp., Allegheny co., Pa. P. 1623.

Ross, tp., Luzerne co., Pa. P. 990.

Ross, tp., Monroe co., Pa. P. 734.

Ross (Alexander), b. in the parish of Kincardine-O'Neil, Aberdeenshire, Scotland, Apr. 13, 1699; graduated at Marischal College, Aberdeen, about 1716; engaged in teaching, and became in 1732 parish schoolmaster at Lochlee, Forfarshire (or Angus), which humble occupation he followed more than fifty years, until his death at that place May 20, 1784. He wrote verses from his childhood, but was sixty-nine years of age when he first appeared as an author, through the advice of Dr. Beattie, by the publication of *Helenore, or the Fortunate Shepherdess, a Pastoral Tale in the Scottish Dialect, to which are added a few Songs by the Author* (Aberdeen, 1768), a poem which in the N. of Scotland has rivalled in popularity the writings of Burns and Allan Ramsay, and passed through numerous editions, some being on cheap coarse paper. Ross left in MS. 8 vols. of miscellanies, of which an account is given in the new *Life* prefixed to the best edition of *Helenore* (1866), edited by John Longmuir, LL.D. (See also A. Campbell's *Introduction to the History of Poetry in Scotland*, 1799.)

Ross (Alexander), b. in Scotland in 1742; entered the British army as ensign of the 50th Foot Feb., 1760; distinguished himself in the campaigns in Germany; came to America as captain May, 1775; was engaged in the principal battles of the Revolutionary war; became brevet major 1781; was aide-de-camp to Lord Cornwallis and commissioner on his part to arrange the details of the surrender at Yorktown; was subsequently deputy adjutant-general in Scotland; accompanied Lord Cornwallis to India as adjutant-general; became governor of Fort George, Madras, and was distinguished in all the campaigns during the administration of that nobleman, to whom he was closely attached, and became general Jan. 1, 1812. D. at London Nov. 29, 1827.—His son, Charles Ross, edited from family papers the *Correspondence of Charles, First Marquis Cornwallis, with Notes*, etc. (3 vols., 1859), a work which throws much light on the history of America and India during eventful periods.

Ross (Alexander), b. in Scotland early in the nineteenth century; was for fifteen years a resident in the territories of the Hudson's Bay Company. Author of *Adventures of the First Settlers on the Oregon or Columbia River, being a Narrative of the Expedition fitted out by John Jacob Astor to establish the Pacific Fur Company* (London, 1849), *The Fur-Hunters of the Far West, a Narrative of Adventures in the Oregon and Rocky Mountains* (London, 2 vols., 1855), and *The Red River Settlement, its Rise, Progress, and Present State* (1856).

Ross (Alexander Milton), M. D., b. at Belleville, Ontario, Dec. 13, 1832; studied and practised medicine; collected specimens of all the birds of Canada; made an entomological collection of 10,000 species, and a botanical one of similar extent, and is author of *Birds of Canada* (1871) and *Butterflies and Moths of Canada* (1872).

Ross (George), b. at New Castle, Del., in 1730; settled at Lancaster, Pa., as a lawyer 1751; sat in the Pennsylvania assembly 1768–76; was elected a member of the first Continental Congress 1774; signed the Declaration of Independence; resigned his seat Jan. 1, 1777; was afterward commissioner to treat with the Indian tribes, and judge of the court of admiralty. D. at Lancaster in July, 1779.

Ross (James), b. in York co., Pa., July 12, 1762; was admitted to the bar in Philadelphia 1784; was prominent in the State constitutional convention of 1790 as a defender of the lately-formed national Constitution and a leader of the Federalists; was U. S. Senator 1794–1803, and a commissioner from Congress to negotiate with the whisky insurgents. During one session he was president *pro tem.* of the U. S. Senate. D. near Pittsburg Nov. 27, 1847.

Ross (James), an excellent teacher of Greek and Latin, whose early history is unknown; was at the head of schools at Chambersburg, Pa., 1796–1801, subsequently at Lancaster and at Philadelphia, and became professor of classical languages at Dickinson College, Carlisle, Pa. Author of a *Latin Grammar*, published at Chambersburg 1796, at Lancaster 1802, and in several later editions at Philadelphia, revised and enlarged by N. C. Brooks; of a *Greek Grammar* (1813; 2d ed. 1817) in Latin, founded on the Westminster grammar; of editions of the *Colloquies of Erasmus* (1818), *Æsop's Fables, Selectæ e Profanis Scriptoribus Historiæ*, and *Ciceronis Epistolæ*; wrote Latin poems in newspapers, and translated the Presbyterian *Shorter Catechism* into Latin.

Ross (Sir James Clark), b. in London Apr. 15, 1800, nephew of Sir John; entered the navy in 1812, and accompanied his uncle on his first voyage in search of a N. W. passage, and was also with Capt. Parry (1819–27) in the latter's several expeditions having the same object in view, being on one occasion wrecked in the Fury; in 1827 was appointed commander, and in 1829 again sailed with his uncle as second in command, and was absent four years (see Ross, Sir John), during which time he discovered a spot which he believed to be the northern magnetic pole. Promoted to be post-captain on his return, he was engaged in a magnetic survey of Great Britain and Ireland 1835–38; in Apr., 1839, was appointed to the command of the Erebus, and in September of that year, in company with the Terror, sailed for the Antarctic seas for the purposes of magnetic and meteorological observations and investigations, reaching lat. 78° 10′ S. A volcano was discovered in lat. 77° 32′ S., 12,000 feet in height, which was named Mount Erebus, besides which much valuable knowledge was gained of that region. In 1844 the honor of knighthood was conferred upon him, and in 1847 he published *A Narrative of a Voyage in the Antarctic Regions*. He was a fellow of the Linnæan Society, of the Royal Society, of the Royal Astronomical and Geographical societies, and of many foreign scientific bodies. The founder's gold medal of the London Geographical Society was bestowed upon him in 1841, and the gold medal of the Royal Geographical Society in 1842. D. at Aston Abbots House, near Aylesbury, Apr. 30, 1862.

Ross (Sir John), K. C. B., b. at Balsarroch, Wigtonshire, Scotland, June 24, 1777; entered the navy in 1786, midshipman 1799, lieutenant 1805, and in 1806 was wounded four times under the batteries of Bilbao, receiving a pension of £150 per annum; promoted to be commander in 1812, he rendered valuable services in the war of 1812–15; in Jan., 1818, received his commission as commander of the Isabella, and Apr. 25, in company with the Alexander, Lieut. Parry, sailed from London "to ascertain the existence or non-existence of a N. W. passage," returning in Nov., 1818 (see Polar Research); in May, 1829, again sailed in the steamer Victory, equipped by Sir Felix Booth, then sheriff of London, but in Sept., 1830, became ice-bound in the Gulf of Boothia, making but little subsequent advance, and May 29, 1832, the Victory was abandoned. In Aug., 1833, the party was rescued by the Isabella, formerly commanded by Capt. Ross, but then engaged in the whaling business. Arriving in London Sept. 19, 1833, he was knighted the following year, and admitted to the companionship of the Bath. From 1839 to 1845 he was consul at Stockholm; in 1850 departed, in command of the Felix, 90 tons, in search of Sir John Franklin, returning the following year; in July, 1851, attained the rank of rear-admiral. D. at London Aug. 30, 1856. He published (1819) *A Voyage of Discovery, made under the Orders of the Admiralty for the purpose of exploring Baffin's Bay, and inquiring into the probability of a N. W. Passage*, and in 1835 a *Narrative of a Second Voyage, including the Reports of Commander James Clark Ross, and the Discovery of the Northern Magnetic Pole*; also published a treatise on steam navigation and numerous other papers.

Ross (John), a Cherokee chief, b. in Georgia about 1790, was a half-breed; received a good English education; became principal chief of his tribe 1828; successfully conducted an appeal to the U. S. Supreme Court upon the validity of Cherokee land-titles in Georgia as against the government of that State; protested energetically against the treaty of New Echota 1835, but was compelled to remove to the Indian Territory; and was a reluctant ally of the Confederate States during the civil war. D. at Washington, D. C., Aug. 1, 1866. Political questions originating in the sale of the Georgia lands have for many years divided the Cherokees into two parties, between which bitter enmity exists, frequently culminating in a kind of vendetta or blood-feud. One of the factions has always been known as the "Ross party," and is now headed by William P. Ross (son of John), who in Feb., 1876, was nominated by Pres. Grant U. S. agent to the confederated tribes of the Indian Territory.

Ross (Robert), b. at Ross Trevor, Devonshire, England, about 1770; graduated at Trinity College, Dublin; was an officer of the British army in Holland and Egypt; commanded a brigade under Wellington in the Peninsula; headed the British forces which gained the battle of Bladensburg and burned the city of Washington, D. C., Aug. 24, 1814, and was killed at North Point, Md., Sept. 12, 1814.

Ross (Sir William Charles), R. A., b. in London, England, June 3, 1794, son of a miniature-painter and teacher of drawing, from whom he received an early artistic training; was admitted a student at the Royal Academy

at the age of ten; gained a prize from the Society of Arts at the age of thirteen; had equal good fortune for the four years following, and again, in 1817, became an assistant to Andrew Robertson, an eminent miniature-painter, and ultimately stood at the head of that profession; was appointed miniature-painter to Queen Victoria on her accession to the throne 1837; was knighted 1842; was patronized by all the court circle, and occasionally executed historical and imaginative pieces, having obtained a premium of £100 in the great "cartoon competition" for his *Angel Raphael discoursing with Adam* (1842). D. unmarried at London Jan. 20, 1860.

Ross and Crom′arty, county of Northern Scotland, bordering on the German Ocean, comprises an area of 3157 sq. m., with 80,909 inhabitants. The surface is wild and mountainous, but the soil affords good pastures, on which large herds of sheep and cattle are fed; agriculture and fishing are carried on. Chief town, Dingwall.

Rossa′no, town of Southern Italy, province of Cosenza, on a hill near the Gulf of Taranto, which it overlooks. Fish are abundant, and silk and cotton are raised in the vicinity, as well as grain, olives, grapes, etc. The town, still walled and defended by a castle, was once a very strong fortress. Belisarius placed a large garrison here, but the place was a theatre of much bloodshed during the Lower Empire. It is now the seat of an archbishop. P. of commune, 15,000.

Ross′bach, village of Prussia, province of Saxony, celebrated for the brilliant victory which Frederick the Great gained here over the allied French and Austrian armies, Nov. 5, 1757.

Rosse (William Parsons), third Earl of, b. at York June 17, 1800; studied first at Trinity College, Dublin, and then at Magdalen College, Oxford, where he graduated in 1822; sat in the House of Commons as Lord Oxmantown, representing King's county from 1821 to 1831; succeeded to the peerage in 1841, and was elected a representative peer of Ireland in 1845 and chancellor of the University of Dublin in 1862. He took an active part in different social and political movements, and wrote *Letters on the State of Ireland* (1847) and *A Few Words on the Relation of Landlord and Tenant in Ireland* (1866). But it was principally by his scientific researches and discoveries that he made his name famous. From an early age he studied astronomy and optics with great interest, and concentrated his attention more especially on the improvement of the telescope. For several years he was engaged in experiments referring to the construction of fluid lenses, the results of which researches are communicated in the *Philosophical Transactions* (1840); but although he failed in this particular object, he succeeded at last, after a long series of experiments, in constructing a speculum of a reflecting telescope in which the spherical aberration and the absorption of light were reduced to a minimum, at the same time that his process of construction did away with that cracking and warping of the surface of the speculum while cooling after the casting which so often had proved fatal under the old method of operation. In 1842 a monster telescope was successfully constructed on his plan, and mounted at his residence near Parsonstown, and in 1845 no less than 40 nebulæ were reduced by the aid of this powerful instrument into groups of stars, and it became probable that all nebulæ would become reducible in the same manner. D. Nov. 1, 1867.

Rosseau, p.-v., Union tp., Morgan co., O. P. 49.

Rosser (Leonidas), D. D., b. at Petersburg, Va., July 31, 1815; graduated at the Wesleyan University in 1838, and began his ministry in the Virginia M. E. conference, 1841. Author of *Baptism, Experimental Religion, Recognition in Heaven, Reply to Howell's Evils of Infant Baptism, Class-Meetings*, and *Open Communion.* Abel Stevens.

Ross′erville, tp., Sumter co., Ala. P. 1154.

Rosset′ti (Christina Gabriella), sister of D. G. Rossetti, b. in London, England, Dec., 1830; has acquired some popularity as a poetess, having published *Goblin Market* (1862), *The Prince's Progress* (1866), *Commonplace and other Short Stories in Prose* (1870), *Sing-Song, a Nursery Rhymebook* (1872), *Speaking Likenesses*, and *Annus Domini* (1874).

Rossetti (Dante Gabriel), son of Gabriele, b. in London, England, in 1828; educated at King's College, London; early manifested an inclination to art, of which he became an earnest student; was led by the writings of Ruskin and the example of Turner to found, in connection with Holman Hunt, Millais, Madox Brown, and other personal friends, what is known as the "Pre-Raphaelite" school of painting, of which his *Girlhood of the Virgin* (1849) was one of the earliest specimens; has become widely known through his designs for illustrated works, beginning with Tennyson's poems (1848), and has won approval as a poet by his *Early Italian Poets* (1861), containing translations from Dante and his predecessors; *Dante and his Circle* (1874), a revised edition of the preceding; and a volume of *Poems* (1870). Like his brother William, he is closely connected with Swinburne and Morris as a member of an influential literary circle of poets of the romantic school.

Rossetti (Gabriele), b. at Vasto Mar. 1, 1783; began very young to improvise and to cultivate drawing; in 1804 went to Naples to study painting, and was there employed in the museum; there also began to write *libretti*, sonnets, songs, and musical airs, still continuing to improvise; under Murat was appointed keeper of the Royal Museum; during the political agitations of 1820 distinguished himself as a writer of patriotic songs, and composed the hymn which, commencing with the words, "Sei pur bello con gli astri sul crine," flashed like a meteor through the whole Peninsula. The reaction triumphing, Rossetti hid himself in Naples for three months, until, disguised as a British naval officer, he found refuge on board an English vessel, and thus escaped (1822) to Malta; thence in 1824 went to England; gave Italian lessons, commented upon the *Divina Commedia*, and continued to write poetry; in 1831 was appointed professor of the Italian language and literature in King's College; in 1840 published in 5 vols. *Il Mistero dell' Amor Platonico Svelato*; in 1852 a commentary in 3 vols. on *La Beatrice di Dante.* Several volumes of his poems have appeared under different titles—*Il Salterio, L'Arpa Evangelica*, etc. D. at London Apr. 26, 1854.

Rossetti (Maria Francesca), sister of Christina, b. in London Feb. 17, 1827; was for many years a teacher of languages and history. Authoress of *Idiomatic Italian Exercises* (1867) and *A Shadow of Dante, being an Essay toward studying Himself, his World, and his Pilgrimage* (1871).

Rossetti (William Michael), brother of D. G. Rossetti, b. in London about 1832; known as a poet and art-critic; author of *Dante's Comedy—The Hell, translated into Literal Blank Verse, with Introduction and Notes* (1865), *A Life of Percy Bysshe Shelley, with a Revised Edition of his Poetical Works* (2 vols., 1869), *Poems and Ballads, a Criticism* (upon A. C. Swinburne, 1866), and editor of Walt Whitman's *Poems* (1868).

Ros′si (Ernest), b. at Leghorn in 1829; began to study law at Pisa, but joined in 1846 one of the better Italian troops of actors; played at Milan 1847, at Turin 1852, at Paris, with Madame Ristori, 1855, subsequently at Vienna, especially in the comedies of Goldoni; returned to Paris in 1866; appeared in the *Cid* at the Théâtre Français on the anniversary of the birthday of Corneille; performed several of the principal characters of Shakspeare—Hamlet, Othello, etc.—in Lisbon in 1869, and visited afterward other of the European capitals. He has also written several plays.

Rossi (John Charles Felix), R. A., b. at Nottingham, England, in 1762, son of an Italian physician; was apprenticed in boyhood to a sculptor named Luccatella, with whom he subsequently worked as a journeyman; went to London while still a youth and entered as a student at the Royal Academy; obtained the silver medal of that institution 1781, and the gold one 1784, the latter entitling him to three years' maintenance at Rome, where he studied 1785–88; returning thereafter to London, became A. R. A. 1800, and R. A. 1802; became sculptor to the prince-regent and afterward to William IV.; was employed in decorating Buckingham Palace, and obtained both in classical and monumental sculpture a considerable popularity, which, however, declined toward the close of his career. D. at London Feb. 21, 1839. His best-known works are the monuments of Lords Heathfield, Cornwallis, and Rodney in St. Paul's cathedral, a statue of Thomson the poet, and the figure of *Britannia* at the Liverpool Exchange.

Rossi (Pellegrino), Count, b. at Carrara, grand duchy of Modena, July 13, 1787; studied law, and was appointed professor of jurisprudence at the University of Bologna in 1812, but left Italy in 1815 after the downfall of the French authority, and settled at Geneva, where in 1820 he became professor of jurisprudence, member of the city council, etc. In 1834 he removed to Paris on the invitation of Guizot; was made professor of political economy at the Collége de France, peer in 1839, and sent in 1845 as French ambassador to Rome. In 1848 he lost this position on the outbreak of the February revolution, and he now appeared as an Italian liberal and patriot. Pius IX. made him prime minister, and he promised to save Rome and Italy from the revolution without the intervention of foreign powers, but he was assassinated Nov. 15, 1848, on his way to the Parliament. He wrote *Traité de Droit pénal* (3 vols., 1829) and *Cours d'Économie politique* (1840).

Rossi, de' (Giovanni Battista), b. at Rome Feb. 23, 1822; under Father Marchi devoted himself to the study of archæology and of the Christian inscriptions of the first centuries of the Church, and was complimented by being made a member of the Berlin Academy of Sciences and also foreign member of the French Institute. Most of his works are published in the *Annals* and in the *Bulletin* of the Institute for Archæological Correspondence at Rome. The discoveries made by him in the Catacombs are of special importance, particularly those in the cemetery of St. Calixtus. His two great works are—*Inscriptiones Christianæ Urbis Romæ septimo sæculo antiquiores* (Rome, 1857–61), *Roma Sotterranea Cristiana* (Rome, 1864).

Ros'sie, p.-v. and tp., St. Lawrence co., N. Y., on Indian River. P. 149; of tp. 1661.

Rossie'na, town of Russia, government of Kovno, on the Dubitza, has 12,465 inhabitants.

Rossini (Gioacchino), b. at Pesaro, Italy, Feb. 29, 1792; received a rather desultory and superficial musical education. His father blew the first horn in the orchestra, his mother was a tolerable prima donna in the lighter kind of opera buffa, and he himself sang in the chorus or played in the orchestra as circumstances demanded. In 1807 he became a pupil in the musical school of Bologna, studying counterpoint under the Abbate Mattei, and in 1810 he produced his first opera, *La Cambiale di Matrimonio,* which was performed in Venice with some success. Other operas, now forgotten, followed, and in 1813 his *Tancredi* excited an immense enthusiasm, first in Venice, and soon on every stage on which Italian opera was given. In 1815 he went to Naples as director of the opera, and here he composed among other operas—*Elizabetta* (1815), *Otello* (1816), *La Gaza Ladra* (1817), *La Donna del Lago* (1818), and *Zelmira* (1820). But his most celebrated production of this period is *Il Barbieri di Seviglia,* first performed in Rome in 1816, and generally considered the masterpiece of the whole genre of opera buffa—irresistibly gay, and as characteristic as graceful and brilliant. After a visit to Vienna in 1821, the cool reception which was given his *Semiramide* in Venice in 1823 provoked him; he went to London, and next year to Paris, where he was made successively director of the Italian opera, inspector-general of song in France, and first composer to the grand opera. In bringing out his old compositions on the Paris stage he felt compelled to make considerable alterations: the melodies required a greater simplicity and more character, the chorus a deeper connection with the whole organism and a fuller significance, the instrumentation greater variety and elaborateness. He made a penetrating study of his task before he ventured to represent any new composition, but when at last, in 1828, he made the attempt with *Count Ory,* and shortly after with *William Tell,* his success was astonishing. A few days after the performance of the last work he left Paris and retired to his villa near Bologna, where he lived to 1847, declining all offers, even the most tempting, made in order to induce him to compose a new opera. In 1847 he removed to Florence, in 1856 to Paris, where he d. Nov. 13, 1868. In the last forty years of his life he published only a *Stabat Mater,* and a *Messe solennelle,* which latter was performed at his burial. (See Edwards's *Life of Rossini,* 1869.)

Rossiter (Thomas P.), b. at New Haven, Conn., Sept. 29, 1818; studied painting under Nathaniel Jocelyn, and commenced the practice of his profession in his native city in 1838, devoting himself chiefly to portraits; sailed for Europe June, 1840, with Durand, Kensett, and Casilear; studied a few months in London; travelled through England and Scotland; spent a year at Paris in company with Kensett, copying pictures at the Louvre and studying in the life-schools; accompanied Thomas Cole to Italy, passing through Switzerland, in the autumn of 1841; took a studio in the Via Felice, Rome, and passed there five consecutive winters, spending his summers at Florence, Venice, Naples, and other cities notable for their art-treasures. Returning to America in 1846, he established himself in New York, painting portraits occasionally, but chiefly occupied with historical pieces and a series of large scriptural pictures; had a studio on Broadway built expressly for his use and that of Kensett and Lang; again made an extensive European tour 1853, and in December of that year opened a studio at Paris, where he remained three years, taking a gold medal in the Exposition of 1855; returned to the U. S. 1856; resided in New York until 1860, when he removed to Cold Spring, Hudson Highlands, into a house built according to his own designs with a view to artistic convenience. He became an associate of the National Academy of Design 1840, and academician 1849. His last years were devoted to a series of compositions representing the life of Christ. D. at Cold Spring May 17, 1871. He was distinguished as a colorist.

Rosslyn (Alexander Wedderburn), Earl of. See Wedderburn.

Ross'lyn (James St. Clair **Erskine**), Earl of, eldest son of Lieut.-Gen. Sir Henry Erskine, b. in Scotland in 1762; succeeded his father as baronet 1763; entered the army 1778; was elected to Parliament 1782; became major 1783 and lieutenant-colonel of dragoons 1792; served at the siege of Toulon 1793; was subsequently adjutant-general to the British forces in the Mediterranean; became colonel and aide-de-camp to George III. 1795, brigadier-general 1796; served in Portugal as adjutant-general 1796–97; was appointed major-general Jan. 1, 1798; succeeded his uncle, the first earl of Rosslyn (see Wedderburn, Alexander), Jan. 3, 1805; became lieutenant-general in the same year; served again in Portugal 1806; was at the siege of Copenhagen 1807, and in the Zealand expedition 1809; became full general June, 1814; keeper of the privy seal and member of the privy council June, 1829, and lord president of the council during Peel's brief administration 1834–35. D. at Dysart House, Fifeshire, Jan. 18, 1837. He was noted in both houses as one of the firmest partisans of Tory principles, and was for many years the especial friend of the duke of Wellington.

Ross'ville, p.-v., Vermilion co., Ill., on the Chicago Danville and Vincennes R. R., 19 miles N. of Danville, 105 miles S. of Chicago, has 3 churches, good schools, 2 elevators, 1 newspaper, a brewery, 1 hotel, and abundant water-power. Coal deposits exist. P. about 900.

J. H. Moore, Ed. "Observer."

Rossville, p.-v., Ross tp., Clinton co., Ind. P. 389.

Rossville, p.-v., Westfield tp., Richmond co., N. Y., on Staten Island, 2 miles N. W. of Huguenot Station on Staten Island R. R.

Rossville, v., Spring Creek tp., Miami co., O., on Great Miami River, opposite Piqua. P. 91.

Rossville, p.-v. and tp., Chester co., S. C. P. 1600.

Rost (Reinhold), Ph. D., b. at Eisenberg, Germany, Feb. 2, 1822; studied in the gymnasium at Altenburg; graduated in 1847 at Jena, where he devoted himself to theology and Oriental languages; went to England 1847; was appointed Oriental lecturer in St. Augustine's College, Canterbury, 1850, and professor there 1852, giving lessons in ten Oriental languages; became secretary to the Royal Asiatic Society 1863; and succeeded Dr. Fitz-Edward Hall as librarian to the India office June, 1869. He prepared a descriptive catalogue of the palm-leaf MSS. in the Imperial Library of St. Petersburg 1852; edited Dr. H. H. Wilson's *Essays on the Religion of the Hindus and on Sanskrit Literature* (5 vols., 1861–65) and Sir H. M. Elliot's posthumous *Memoirs on the History, Philology, and Ethnic Distribution of the Races of the North-West Provinces of India* (2 vols., 1866), and has contributed largely to the German Oriental reviews and to Prof. Summer's *Chinese and Japanese Repository.*

Rost (Valentine C. F.), b. at Friedrichsroda, near Gotha, Oct. 16, 1790; studied theology and philology at the University of Jena; appointed instructor in 1814 in the gymnasium of Gotha, and director 1842; devoted himself to classical literature; published a Greek grammar (1816; 6th ed. 1841), a Greek-German lexicon (Gotha, 1820, 2 vols. 8vo; 4th ed. 1851), a German-Greek dictionary (Göttingen, 1818; 8th ed. 1860); began a comprehensive lexicon of classical Greek, of which only the first part appeared (Leipsic, 1840, 4to), a smaller German-Greek lexicon; edited Duncan's Damm's lexicon to Homer and Pindar (Leipsic, 1836, 4to); engaged with Fr. Jacobs, in the *Bibliotheca Græca,* a series of Greek classics, in which appeared, among others, Stallbaum's Plato and Wunder's Sophocles; with Palm and Kreussler prepared a much enlarged edition of Passow's Greek lexicon (Leipsic, 1841–57, 2 thick vols. royal 8vo). D. Aug. 6, 1862, in Gotha. H. Drisler.

Rostan' (Louis Léon), b. at St. Maximin, department of Var, France, Mar. 16, 1796; studied medicine, and was appointed professor in 1833; retired in 1864. D. Oct. 3, 1866. Wrote *Récherches sur le Ramollissement du Cerveau* (1819), *Traité élémentaire de Diagnostic* (3 vols., 1825–27), *Cours élémentaire d'Hygiène* (2 vols., 1828), besides a number of valuable essays in the *Journal de Médécine.*

Ros'tock, town of Northern Germany, in Mecklenburg-Schwerin, on the Warnow, 9 miles from its mouth in the Baltic. It has a university, founded in 1419, with a library of 90,000 volumes; many other good educational institutions; manufactures of linen, leather, and tobacco, and a lively trade. Vessels which draw more than 9 feet must load and unload at Varnemünde, its port at the mouth of the Warnow. P. 30,980.

Rostoptchin (Fedor), b. in the government of Orel, Russia, about 1765; was educated at the court as a page

of Catharine II.; became minister of foreign affairs under Paul I., and was governor-general of Moscow in 1812, when Napoleon approached the city. In his *La Verité sur l'Incendie de Moscow* (Paris, 1823) he denies having planned and prepared the conflagration of the city, but it is nevertheless certain that he put fire to his own palace and made preparations for the burning of the magazines. The rest of his life he spent mostly in travels. D. at Moscow Feb. 12, 1826. (See Schnitzler, *Rostoptchine et Koutousof, ou la Russie en 1812* (Paris, 1863).)

Rostov′, town of European Russia, government of Yaroslaw, has 33 churches and large manufactures of linen and candles, and holds an annual fair from Feb. 21 to Mar. 11, in which transactions to the amount of about 2,000,000 rubles are made. P. 11,157.

Rostov, town of European Russia, government of Yekaterinoslav, on the Don, at the beginning of its delta, was founded in 1749 as a fortress, and is rapidly growing into one of the commercial centres of Southern Russia. Ropes, linen, leather, soap, and tobacco are extensively manufactured. P. 39,129.

Ros′tra [Lat. for "beaks," so called because it was decorated with the beaks of the galleys of Antium, taken in the Latin war], in ancient Rome, a stage for public speaking which stood between the Comitium and the Forum, so that a speaker could be heard in either. Julius Cæsar erected new rostra in the Forum, known afterward as the Julian rostra. Both were adorned with statues of famous Romans.

Rostra′ver, p.-v. and tp., Westmoreland co., Pa. P. 2786.

Ro′ta, town of Spain, province of Cadiz, at the entrance of the Bay of Cadiz, is celebrated for its wines. P. 6972.

Rotary Press. See PRINTING, by W. S. PATERSON.

Rotary Steam-Engine. See STEAM-ENGINE.

Rotation, in agriculture. See AGRICULTURAL CHEMISTRY, by PROF. S. W. JOHNSON, A. M., M. N. A. S.

Rotation, in magnetism. See ELECTRICITY, by PRES. HENRY MORTON, PH. D., M. N. A. S.

Rota′tion [Lat. *rotare*], in mechanics, motion of a solid body about an axis—*i. e.* some geometrically conceived straight line within or without its mass, but which, for the instant at least, is in the relation to the body as an axle to the wheel. Angular velocity (of rotation) is measured by the length of arc described in a unit of time by a point at unit's distance from the axis. All motion of a solid body may be resolved into motion *of translation* (which may be along rectilinear or curved paths) and motion *of rotation;* and any point of its mass may be taken as the centre to which *rotation* is referred, and whose own motion in space is the exponent of the translatory motion. In general, the centre of inertia (or gravity) is taken as the centre of reference. Taking a carriage-wheel as example, its entire motion is made up of the *translation along the road* (which is that of its axle, and this, we know, follows all the ups and downs and crooks of the road itself) and relative *rotation* about this axle. If we scrutinize, however, the wheel's motion more closely, we shall recognize that there is *at each instant* one single element of the wheel which is motionless; *i. e.* the linear element which *touches the ground. For the instant* the *entire* motion of the wheel consists in rotation about *this* line, which constitutes its *instantaneous axis* of rotation. As the wheel turns, and at the same time moves forward, each elemental portion of the tire comes successively in contact with the ground, and *becomes* the instantaneous axis; while on the other hand the *local position* of that axis advances along the road *pari passu* with the centre and axle of the wheel. Should the road make a bend, the shifting of the instantaneous axis involves change of *direction* too. The above may give an idea of what, in mechanics, is meant by the phrase *instantaneous axis.* In general, the motions of whatever character of any solid body are susceptible of like resolution as those presented by the simple case of the wheel, which may either be resolved into a relative rotation and a *translation,* or into rotation alone about shifting *instantaneous axes.* All rotations about any axis may be conceived as made up of component rotations about other arbitrarily chosen axes. This latter conception, due to Euler, is fundamental to the modern analytical treatment of rotation. The "composition of rotary motions" is dealt with by the same rules that apply to the composition of simple forces and of linear velocities (or motions of translation); hence, "if by two distinct causes a body tends to turn about two sides of a parallelogram with two distinct angular velocities, measured by the lengths of those sides, the body will actually turn about the diagonal with an angular velocity measured by the length of that diagonal; . . . and hence, also, rotations about different axes which pass through the same point combine by precisely the same law as simple *forces* applied to that point." While the idea of translatory motions is in the utmost degree simple, and that of rotation about a permanent axis (*e. g.* that of a stationary wheel) scarcely less so, there are few more difficult objects of conception in mechanics than that which the general subject of rotary motion presents—few more obscure problems than those of its manifestations offer.

Though too abstruse for general discussion, a few elementary principles may be here mentioned. Premising that by "moment of inertia," in reference to an axis, is meant the sum of products of the elementary masses into, respectively, the square of their distances from the axis (a function which is the measure of the bodies' "inertia" in reference to rotation), suppose the body to be free to move about any point, supposed fixed; from that point three rectangular axes may be drawn called "principal axes." (The moment of inertia is maximum for one of these three, and minimum for another, in reference to all axes drawn through *this point.*) About each of these axes the mass is so disposed that the CENTRIFUGAL FORCES (which see) developed by rotation generate no "couple" or tilting effect on it, and hence rotation once developed about that axis is permanent; and if the axis chosen be either that of maximum or minimum moment of inertia, it is likewise stable (*i. e.* if diverted from it momentarily by a slight shock, it will tend to *return* to it). If the initial rotation be imparted about any other than these three *principal* axes, such other can only be an *instantaneous* axis; the ensuing rotation-axis continually shifting in space and in the mass of the body in a manner of which M. Poinsot (see work cited below) has enabled us to form a clear geometric conception. If the fixed point chosen be the centre of inertia (or gravity), the centrifugal forces developed by rotation not only balance, but absolutely *destroy,* one another, and that centre is unmoved, requiring no force to hold it *fixed.* A force *now* applied to that centre simply puts it in motion without interfering with existing rotation. Hence, as before remarked, the entire motion of bodies resolves itself into *translation* of the centre of inertia, and *rotation* about "permanent" or "instantaneous" axes through that centre. Motion *of translation* may always, therefore, be computed as if the entire mass were concentrated in the centre, and subjected to the impulse, *of rotation,* as if the mass were held fixed at the centre and rotation alone were communicated by the impulse.*

Bodies projected from the surface of the earth are, after projection, subjected to the disturbing forces of gravity and of the resistance of the air. The resultant of the former passes through the centre of inertia and deflects the path of translation, while it has no influence upon rotation. The latter *checks,* gradually, velocity of translation, and unless the projectile be symmetrical in reference to the direction of its action, deflects it, and at the same time disturbs rotation. Hence the spherical form once so universally given to rifle and cannon balls. When this form gives place to the oblong, the direction of the axis of figure could not be maintained were it not for the artificially-imparted (by the "rifling") rapid rotation about that axis; which is a "principal" one about which rotation is *stable,* as has been stated. (See GYROSCOPE.) Though terrestrial gravity has its resultant through the centre of inertia, *gravitation* in its "universal" sense has it (in general) not so. The sun's and moon's attraction, *not* acting through the centre of inertia of the earth, causes a disturbance in the earth's diurnal rotation which exhibits itself as the PRECESSION OF THE EQUINOXES (which see). The gyroscope affords an interesting study as exhibiting curious phenomena of rotary motion closely allied to the *precession of the equinoxes* in astronomy, and as affording a visible test of the rotation of the earth. (See *Problems of Rotary Motion, Smithsonian Contributions,* vol. xix., and *Théorie nouvelle de la Rotation,* by M. Poinsot.) J. G. BARNARD.

Roth (RUDOLF), b. at Stuttgart Apr. 3, 1821; studied Oriental languages at Tübingen, Berlin, Paris, and London, and was appointed professor at Tübingen in 1848. His principal work is a great *Sanskrit-Wörterbuch* (7 vols.), edited in conjunction with Böhtlingk, and published by the Academy of St. Petersburg (1853–67). He also wrote *Zur Literatur und Geschichte des Veda* (1846), *Ueber den Atharva-Veda* (1856), *Ueber den Mythus von den fünf Menschengeschlechtern* (1860), *Ueber die Vorstellung vom Schicksal in der indischen Spruchweisheit* (1866).

Roth′e (RICHARD), b. at Posen Jan. 28, 1799; studied theology at Heidelberg, and was appointed preacher to the

* This is the ordinary phraseology: the qualifications to it cannot here be stated. If by *impulse* be meant a force of given intensity acting a *given* (very minute) time, it is unqualifiedly true.

Prussian embassy at Rome in 1823, professor at Wittenberg in 1828, at Heidelberg in 1837, at Bonn in 1849, and again at Heidelberg in 1854, where he died Aug. 20, 1867. His principal work is *Theologische Ethik* (3 vols., 1845–48), edited, with his posthumous notes, by Holtzman (5 vols., 1867–71). But he also occupied a most prominent place in the historical and dogmatic divisions of his science—*Die Anfänge der christlichen Kirche* (1837) and *Zur Dogmatik* (1863). See his *Life*, by Neppold (Wittenberg, 1873).

Roth′erham, town of England, county of York, on the Don, has manufactures of different kinds of iron goods, and its vicinity is very rich in iron and coal. P. 6325.

Roth′ermel (Peter F.), b. in Luzerne co., Pa., July 8, 1817, of German extraction; was educated in Philadelphia for the profession of land-surveyor; opened a studio as a portrait-painter, but soon adopted historical painting as his branch of art; visited Europe in 1836–37, and painted in Italy. With the exception of his *Columbus before Queen Isabella, The Martyrs of the Colosseum, Cromwell breaking up Service in an English Church,* his best-known pictures are suggested by American themes—*De Soto discovering the Mississippi, Patrick Henry before the Virginia House of Burgesses, The Battle of Gettysburg.* Rothermel belongs to the class of "sensational" artists, but his talent for composition and color gives him a high rank among these. O. B. Frothingham.

Rothe′say, town of Scotland, the capital of the county of Bute, on the eastern coast of the island of Bute, is a favorite watering-place; considerable fishing is carried on. P. 7800.

Rothesay (David Stewart), Duke of. See Stewart.

Roth′schild (Meyer Anselm), b. at Frankfort-on-the-Main 1743, and founder of the family celebrated for their great wealth. He was intended for the Jewish priesthood, but was placed in a counting-house at Hanover, from whence he returned to Frankfort and started in business for himself on a small scale as a banker and broker. Devoting himself closely to his new business, he obtained a reputation for ability and integrity, and was entrusted with the money affairs of William Landgrave, afterward elector of Hesse, who during Napoleon's possession of Germany confided to Rothschild the keeping of his immense private fortune without interest. D. in Sept., 1812, leaving a large fortune to his five sons, Anselm, Solomon, Nathan, Charles, and James, who established themselves respectively in Frankfort, Vienna, London, Naples, and Paris. With the exception of the one at Naples, these houses are still existing.—The third son, Nathan, b. Sept. 16, 1777, went to London in 1800, where he employed the immense sums confided to his father with great judgment, and on the death of the latter became the leader of the house, being consulted by his brothers on all matters involving financial speculation or investment. He introduced the business of negotiating foreign loans in England. An act of denization was passed in his favor in England in 1821, and in 1822 Austria conferred on him the title of baron, which, however, he never adopted, preferring the distinction which he had gained for himself as a financier.—Lionel Nathan (b. Nov. 22, 1808), eldest son of Nathan, succeeded to the title on his father's death July 28, 1836, and was repeatedly elected to Parliament, but declining to take the prescribed oath, "on the true faith of a Christian," was not admitted until the "act for removing the disabilities of the Jews" was passed in 1858, when he took his seat, being the first Jew admitted to Parliament.

Rotif′era [Lat. *rota*, "wheel," and *ferre*, "to carry"], a class of highly-organized infusorial animals of the articulate type, distinguished by ciliated appendages at the anterior part of the body, which seem to move in a rapid rotary manner. They are commonly termed "wheel animalcules."

Rotrou′, le (Jean), b. in 1609 at Dreux, department of Eure-et-Loire, France; was civil governor of his native city, and died there in 1650 from the plague. He wrote twenty-three tragedies and comedies, of which the best known are *Venceslav* (1647) and *Chosroes* (1649), and which form a transition in the history of the French drama from Jodelle to Corneille.

Rot′teck, von (Karl), b. at Freiburg, Baden, July 18, 1775; studied law, afterward history; travelled much; was appointed professor of history at the university of his native city; took part with much energy, though with moderation, in the opposition against the political reaction which set in after 1815, and received his share of persecution. D. Nov. 26, 1840. By his *Allgemeine Geschichte* (9 vols., 1813–27) and the minor compendium of it, *Allgemeine Weltgeschichte* (4 vols., 1830–34), he exercised a great and beneficial influence on the German middle classes. The materials are well arranged, the representation vivid and impressive, and the spirit sound and liberal. Both books were often reprinted, and have been translated into several European languages.

Rot′tee, an island of the Malay Archipelago, S. W. of Timor, in lat. 10° 40′ S. and lon. 123° E., is 36 miles long, 11 miles broad, mountainous, though the mountains are not high, and produces millet and maize, ebony and mahogany, sheep, buffaloes, horses, swine, and fowls, edible birds' nests, and wax. P. 35,000, most of whom are Christians. The Netherlands have made a settlement here.

Rot′tenburg, town of Würtemberg, on both sides of the Neckar, on a plain covered with orchards, vineyards, and hop-plantations. It has breweries and distilleries, and manufactures pottery and musical instruments. P. 5996.

Rot′ten Stone, a fine earth or softened aluminous stone, much employed in polishing glass and metals. True rotten stone comes from Wales and Bakewell, Derbyshire. The name is also extended so as to include tripoli and the infusorial earths.

Rot′terdam, the second commercial town in Holland, situated on the right bank of the Maas, about 14 miles from the North Sea and 36 miles S. W. of Amsterdam, occupies a site in the form of a nearly equilateral triangle, the base of which is the Maas and the vertex the Delft Gate. The city is intersected by numerous canals (*grachten* or *havens*), and is traversed by the Rotte, a small stream, at the junction of which with the Maas there is a large dyke or dam; whence the name Rotterdam. The numerous vessels lying in the canals and harbors, which are deep enough to accommodate those of heavy tonnage, and admit of their discharging their cargoes in the very heart of the city, always present a busy and picturesque scene. Along the river, which opposite the town is 30 to 40 feet deep, is a fine quay 1¼ miles long, called the *Boompjes* ("Little Trees"), from a line of elms planted in 1615, now grown to a large size. Here is the birthplace of Erasmus (which see), to whom a bronze statue is erected in the great market-place. Rotterdam is the entrepôt of a large cattle-trade with England, and the point of departure of numerous lines of steamships, and besides being the seat of an extensive commerce with the East Indian possessions of Holland and with Europe and America, has important manufactures. The great railway-route between Belgium and Holland, connecting the cities of Brussels, Antwerp, Rotterdam, the Hague, and Amsterdam, crosses the Holland Deep (*Hollandsche Diep*) by the great bridge at Moerdijk. (See Bridge.) (For the recent improvement of navigable connection with the sea see Harbor; also *Professional Papers Corps of Engineers U. S. A.*, No. 22.) P. in 1871, 121,027. J. G. Barnard.

Rotterdam, tp., Schenectady co., N. Y., on Mohawk River, Erie Canal, and New York Central R. R. P. 2355.

Rott′weil, town of Germany, kingdom of Würtemberg, on the Neckar, has a fine church, several good educational institutions, and manufactures of silk and cotton stuffs, chicory, powder, and tiles. P. 5447.

Rotun′da [Lat. *rotundus*, "round"], the name of any architectural structure which is round and domed. The oldest and most celebrated construction of this kind is the Pantheon of Rome. Generally, a rotunda forms only part of an architectural whole. We give below the measurements of some of the most celebrated domes:

	Internal diameter, feet.	Internal height, feet.
Pantheon at Rome	142.6	143
Baths of Caracalla	112	116
Sta. Maria del Fiore	139	310
St. Peter's	139	330
St. Sophia's, Constantinople	104	201
St. Paul's, London	112	215
Chapel of the Medici	91	199
Baptistery of Florence	86	110
Madonna delle Salute, Venice	70	133
Ste. Geneviève, Paris	67	190
Duomo at Siena	57	148
Duomo at Milan	57	254
Val de Grace at Paris	55	133
St. Mark's, Venice	44	150
Halle aux Blés, Paris	131	150
St. Isaac's, St. Petersburg	96	150
Capitol of Washington	96	300

Roubaix′, a large manufacturing town of France, department of Nord, has risen to its present prosperity only within the last thirty years. It has extensive manufactures of woollen and cotton fabrics, furniture cloth, carpets, and twists, large dyeworks and tanneries, and carries on a very active trade. Its working-classes are said to be more intelligent and prosperous than those of any other large manufacturing city. P. 75,987.

Roubidoux, p.-v. and tp., Texas co., Mo., on Roubidoux Creek, a tributary of Gasconade River. P. 617.

Roubiliac' (Louis François), b. at Lyons, France, about 1695; became a distinguished sculptor; settled in England (probably) during the reign of George I., and executed many important works of art, among which were the celebrated monument of the Nightingale family, that of John, duke of Argyle, and the statue of Handel in Westminster Abbey, the statue of Shakspeare in the British Museum, and of Sir Isaac Newton at Cambridge. He was noted for absence of mind, but was amiable and attained great popularity. D. at London Jan. 11, 1762.

Rou'ble, or **Ru'ble** [Russ. *rubl, rublyn,* "cut off," because it was originally cut from a silver bar], the principal Russian silver coin and money of account, now worth 73.4 cents U. S. money. The ruble is equal to 100 kopecks. It was first struck in 1654 at Moscow.

Rouen' [anc. *Rotomagus*], city of France, the ancient capital of Normandy, at present the capital of the department of Seine Inférieure, on the right bank of the Seine, 67 miles N. W. of Paris, and connected with its suburb, St. Sever, on the opposite bank, by three bridges. The quays along the river and the boulevards occupying the site of the former ramparts are new and elegant; the central part of the city is old and more interesting than beautiful. Of the many remarkable public buildings the most noticeable are the cathedral, a Gothic structure of great beauty, 434 feet long, 103 broad, 89 high at the nave, with a tower and spire over the crossing of the nave and the transept rising 470 feet, and two elegant towers flanking the front, built by Philip Augustus (1200–20), and containing, besides a number of other interesting monuments, the tomb of Richard Cœur de Lion; the church of St. Ouen, of nearly the same dimensions as the cathedral, built in the fourteenth century, and considered one of the finest specimens of Gothic architecture; the Palais de Justice, of the fifteenth century, etc. In the Place de la Pucelle stands a statue of the Maid of Orléans, who was burnt here in 1431. Monuments have also been raised in honor of Corneille and Boieldieu, who were born here. The city has a public library of 120,000 vols., a very valuable collection of pictures, an excellent botanical garden, a theological seminary, an academy of science and art, and numerous other educational and benevolent institutions; and it is one of the most important manufacturing centres of France. The principal manufactured articles are cotton and cotton velvet, mixed silk and woollen fabrics, flannels, blankets, and hosiery, chemicals, paper, etc. Its commerce is also very extensive; the river forms an excellent harbor, and vessels of 400 to 500 tons burden can enter it. P. 102,470.

Rouge [Fr., "red"], a powder used for adding an artificial bloom to the complexion. Rouge is finely powdered talc, colored with safflower by an elaborate process. It is quite harmless to the skin. Much of the so-called rouge is, however, colored with carmine and other pigments. These are considered injurious.—Rouge is also a name given to fine and carefully-prepared peroxide of iron, used by jewellers, glass-workers, and others as a polishing-powder, and sometimes also as a pigment. It is also called English red and colcothar.

Rougé', de (Olivier Charles Camille Emmanuel), Viscount, b. at Paris Apr. 11, 1811; studied law and prepared himself for a political career, but retired in 1830 to his estates, devoting himself to philological studies, especially Hebrew and Arabic, and concentrated himself finally on the archæology and hieroglyphics of Egypt. He first became known as an Egyptologist in 1846 by his review of Bunsen's work on Egypt; was appointed keeper of the Egyptian collections in the Louvre in 1849; elected a member of the Institute in 1853, and professor of archæology at the Collége de France in 1854; visited Egypt in 1863; translated the *Tale of the Two Brothers;* published a *Chrestomathie égyptienne* (1867–68) and a number of monographs in the *Transactions* of the Institute and in the *Revue archéologique.* D. at Paris Jan. 25, 1873.

Rouge et Noir [Fr. for "red and black"], also called **Trente-et-Un** ("thirty-one"), or **Trente-et-Quarante** ("thirty and forty"), a game of chance played with six packs of cards. The *tailleur* (dealer or banker) deals first for black, and places the cards in a row until the number of pips amounts to more than thirty, the face cards numbering 10 each. He then deals for red in the same manner, and that row whose value is nearest to 31 has won. If the value of the two rows is equal, a *refait* takes place and a new dealing commences. In 1789 this game and roulette were invented in Paris, and superseded faro and biribi, but both were forbidden by law in 1838. In 1873 they were also forbidden in Germany, but they are still very popular in Italy.

Rouget' (Georges), b. in Paris in 1781; studied painting in the Academy of Art and in the studio of David, in the execution of whose pictures he often assisted; began to exhibit in 1812; achieved great success both by his portraits and historical pictures. D. in 1869. The best known of his works are the *Marriage of Napoleon and Marie Louise* (1838), at Versailles, the *Death of Napoleon* (1846), and the portraits of Napoleon, Marshal Soult, Louis XVIII., and Charles X.

Rouget de Lisle. See Marseillaise.

Rough and Ready, p.-v. and tp., Nevada co., Cal., near S. fork of Feather River. P. 1210.

Rough and Ready, p.-v., Anderson co., Ky., near Kentucky River. P. 160.

Rouher' (Eugène), b. at Riom, France, Nov. 30, 1814; was admitted to the bar in 1838, and represented the department of Puy-de-Dôme in the Constituent Assembly in 1848 and in the Legislative Assembly in 1849, in which latter year he was made minister of justice by Louis Napoleon. In July, 1851, he resigned, but was reappointed Dec. 2, 1851, the day of the *coup d'état.* Upon the confiscation of the Orleans property (Jan. 22, 1852) he again resigned, but a few days later was made vice-president of the council of state; in Feb., 1855, was appointed minister of agriculture, commerce, and public works, among the important acts of his administration being the negotiation, with Mr. Cobden, of the commercial treaty of 1860, when the grand cross of the Legion of Honor was bestowed upon him. He was raised to the rank of senator in 1856, and in 1863 succeeded M. Billault as minister of state, which position he resigned on the occasion of the celebrated letter of the emperor's of Jan. 19, 1867, announcing a more liberal policy, but was immediately reinstated, when the additional portfolio of minister of finance was confided to his charge. Following the election of May, 1869, the ministry resigned July 13, M. Rouher being nominated president of the senate a week later. During the Franco-German war he was prominent, but on the downfall of the Empire fled to England. Returning to France, he was arrested and held for a brief time, and in that year was returned to the Assembly, of which body he is yet (1877) a member.

Roulers', town of Belgium, province of West Flanders, has large manufactures of linen and lace, and trade in flax, which is extensively grown in the vicinity. P. 12,433.

Roulette' [Fr., a "little wheel"], a game of chance played on a table in whose centre is a cavity. The sides of the cavity are firm and painted at equal distances with the first thirty-six numbers, which are repeated along the edge of the table. The bottom of the cavity is movable by the aid of a handle in the form of a cross. When the *tailleur* puts the bottom in motion he throws down in the cavity a small ivory ball, and when the movement stops the ball drops into one of the painted compartments. The number which the ball strikes wins, and is paid thirty-six times the stake which was put on it. (See Rouge et Noir.)

Roulette, p.-v. and tp., Potter co., Pa., near the head of Allegheny River. P. 525.

Roumania. See Romania.

Rouma'nian Rite, a branch of the United Greek (Roman Catholic) Church, found in Austria and parts of Turkey. There is one archbishop (at Fougaras in Transylvania) and three bishops (Szamos-Ujvar, Gran Wardein, Lagos).

Roumelia, or **Roum-Ili.** See Room-Elee.

Round Grove, tp., Livingston co., Ill. P. 640.

Round Grove, tp., White co., Ind. P. 401.

Round Grove, tp., Marion co., Mo. P. 1379.

Round Head, p.-v. and tp., Hardin co., O., on Scioto River. P. of v. 117; of tp. 759.

Round'heads, a nickname applied in 1641 to the London apprentices and their associates of the lower class, who circulated and published a petition against popery and prelates, assaulted the bishops on their way to Parliament, and had daily street-encounters with the gentlemen who had volunteered to form the king's body-guard, hence called "Cavaliers." The "Roundheads" were probably so styled from having their hair clipped closely around the head, and the epithet, having obtained currency, was extended to all the Puritans or supporters of Parliament, who, two years later, undertook the memorable contest with the Crown, usually designated in history as the "Great Rebellion."

Round Pond, p.-v., Bristol tp., Lincoln co., Me.

Round Prairie, tp., Benton co., Ark. P. 3443.

Round Prairie, tp., Jefferson co., Ia. P. 1085.

Round Prairie, tp., Todd co., Minn. P. 202.

Round Prairie, tp., Callaway co., Mo., on Jefferson City branch of Chicago and Alton R. R. P. 1211.

Round Table. See Arthur.

Round Towers, a class of remarkable stone towers found chiefly in Ireland, but also seen in Scotland, Switzerland, Corsica, and other countries. It has been customary to assign these structures to the pagan and even the pre-historic period; another opinion is that they were attached to churches and other ecclesiastical buildings of a very remote period.

Round Valley, tp., Mendocino co., Cal. P. 444.

Round Worms. See Nematelmia.

Rouquette′ (Adrien Emmanuel), b. in New Orleans, La., 1813; educated at the College of Nantes, France, where he studied law; was afterward ordained a Roman Catholic priest, and was for many years professor in the Roman Catholic seminary at New Orleans, and subsequently chaplain to that institution, being known as the Abbé Rouquette. He has written with equal elegance in French and English, his chief works being *Les Savanes, Poesies américaines* (Paris and New Orleans, 1841), a book highly praised by Sainte-Beuve; *Wild Flowers, Sacred Poetry* (1848), *La Thébaïde en Amérique* (1852), *L'Antoniade, ou la Solitude avec Dieu* (1860), and *Poëmes patriotiques* (1860).—His brother, François Dominique, b. at New Orleans Jan. 2, 1810, was also educated at Nantes; studied law in the office of William Rawle in Philadelphia; published in Paris two volumes of poems, *Les Meschacébéennes* (1838) and *Fleurs d'Amérique* (1857); has resided much in France, and has written a work in French and English on the Choctaw Indians.

Rouse's Point, p.-v., Champlain tp., Clinton co., N. Y., on Lake Champlain, at the mouth of Richelieu River, at the N. E. extremity of the State of New York, half a mile S. of the Canadian boundary, is the point of junction of a branch of Grand Trunk with Central Vermont R. R., which here crosses Lake Champlain on a floating bridge 5000 feet long, built at a cost of $300,000; is an important port for the lake-commerce with Canada, 2000 vessels arriving and departing annually, and the customs receipts averaging $500,000; is protected by Fort Montgomery, which is situated on the frontier at the outlet to the lake; is divided into upper and lower villages; has 3 churches, a considerable lumber-business, and an extensive publishing-house, situated here for the convenience of the international book-trade with Canada. P. 1266.

Rouse′ville, p.-v., Cornplanter tp., Venango co., Pa., on Oil Creek and Oil Creek and Allegheny River R. R., in a petroleum-producing region, has 1 newspaper. P. about 1500.

Rousseau′ (Jean Baptiste), b. at Paris Apr. 6, 1670, the son of a shoemaker; received a liberal education, and very early attracted attention by his verses, epigrams, and odes, which opened the most brilliant circles of Paris to him. Exceedingly vain, he was ashamed of his humble descent, and when his dramatic attempts were received somewhat coldly, he ascribed their bad success to the intrigues of other dramatists, whom he persecuted with epigrams and satires. Some of these products were full of infamous calumnies, and, although Rousseau denied having written them, he was banished from France in 1712. His authorship has never been proved, but his other works contain religious *cantates* and erotic odes side by side, and the witnesses who testified that the calumnies in question were written by Saurin were bought by Rousseau. He afterward wandered in Switzerland, Vienna, England, Brussels, etc., wherever he could find a princely patron, and d. at Brussels Mar. 17, 1741. He was considered the greatest lyric poet of his age, but since the days of Sainte-Beuve his works are read no more. Complete edition in 5 vols. (1820) by Amar Durivier.

Rousseau (Jean Jacques), b. June 28, 1712, at Geneva. Losing his mother at his birth, he grew up uncared for, eagerly devouring a Bible, a copy of Plutarch, and a number of wretched novels which he found in his father's workshop. While this strange medley filled his immature mind, his feeble health prevented all serious occupation and regular study. Work was distasteful to him, and all control intolerable. A few faint efforts at gaining a livelihood failed; either his masters found him unfit for work or he rebelled against their authority. He fled, abjured his faith to become a Roman Catholic, wandered restlessly through Switzerland and Northern Italy, became a servant, an interpreter, a seminarist, and the favorite of a charitable but ill-advised lady, Madame de Warens. Thirty years old, he went to Paris, hoping to succeed there by his fair musical talents; he failed, and supported himself by copying music and collecting plants for botanists. In 1750, through a chance acquaintance with some Encyclopédistes, he learnt that the academy at Dijon had offered a prize for the best answer to the question, Has the revival of science and art helped to corrupt or to purify morals? He wrote an essay proving that men had been demoralized by science and art, obtained the reward, and, elated by this unexpected success of his first sophism, devoted himself henceforth to literature. The startling boldness of his opinions and the almost magic beauty of his style won for him great admiration and ready access to leading men in Paris. In 1753 he published his famous *Discourse on the Inequality among Men*, in which he made the first violent attack upon the throne and the altar, thus striking the keynote of his whole literary career. His propositions—that all men are born equal; that property is a crime; that the soil belonged to no one, and the fruits of the soil to all men alike; that monarchy means tyranny and religion superstition—became very popular among certain classes of men and powerfully prepared the Revolution. Between his greater works he published several musical works, of which a pastoral opera, *The Village Prophet*, written and composed by him, was the most successful. His reputation rose rapidly; the first men of France sought his society, although he affected lofty contempt for such signs of higher civilization as becoming dress, courteous manners, or even respect for the decencies of life. Having no home and no family ties, he lived now with one and now with another of his friends. In 1759 appeared his *New Héloïse*, the most generally known of his works, which has done incalculable harm, for here also the beauty of his diction and the eloquence of his style serve to teach doctrines subversive alike of morality and religion. It is a novel in letters, written after the model of the famous letters of Abelard and Héloïse, full of glowing descriptions of the beautiful scenery on the Lake of Geneva, and abounding in graphic and most seductive appeals to the passions. The *Social Contract*, a political work, became the catechism of the French Revolution, and his *Émile*, published in 1762, the leading handbook on education. Its moral tone and excellent lessons stand in striking contrast with the life led by the author in the company of an unlettered, ignorant servant-woman, whose children he regularly handed over to the foundling hospital. At last public indignation became clamorous; his *Émile* was burnt by order of the government, and Rousseau banished from France. His native land refused to shelter him; for years he wandered as a fugitive from town to town, and when Hume took him to England and gave him a home at Wootton, he showed such ingratitude and groundless suspicion that his friends sought an excuse for his eccentricities in the plea of partial insanity. In 1770 he returned to Paris, being tacitly allowed to live there, and supported himself, as of old, by copying music and publishing botanical works. Here he began his *Confessions*, an autobiography, in which fact and fiction are strangely mixed. Kind friends procured for him a quiet home in the forests near Paris, and here he died (July 3, 1778), so suddenly as to give rise to suspicions that he had committed suicide. His matchless style and masterly eloquence, his ardent love of nature, and his powerful instincts in favor of liberty,—all these gifts, as all his genius, were misapplied for want of moral principle and religious faith. He stands indisputably in the front rank of the classic writers of France, but the influence of his works has been baneful and destructive in proportion to their beauty and attractiveness. See *Œuvres de J. J. Rousseau* (Firmin Didot, Paris); *Rousseau, sa Vie et ses Ouvrages*, par St. Marc Girardin (*Revue des Deux Mondes*, 1856); Brougham, *Voltaire and Rousseau* (1845); Zeller, *Pestalozzi and Rousseau* (1851); Morley, *Rousseau* (1873). Schele de Vere.

Rousseau (Lovell H.), b. in Lincoln co., Ky., Aug. 4, 1818; received but little early education, but subsequently studied law at Louisville and at Bloomfield, Ind.; admitted to the bar in 1841; member of the Indiana legislature 1844–45, and of the State senate 1847. In the war with Mexico, as captain in the 2d Indiana Vols., he served with gallantry at Buena Vista; returned to Louisville in 1849; became a successful criminal lawyer, and in 1860 was a member of the State senate, where he boldly stood by the government, and on the outbreak of war raised the 5th Kentucky Infantry, of which he became colonel Sept., 1861; appointed brigadier-general U. S. volunteers Oct. 1, 1861, he was distinguished at the battle of Shiloh Apr. 7, 1862; in command of division and conspicuous for gallantry at Perryville, Ky., Oct. 8, 1862, for which he was made major-general of volunteers; participated in the battle of Murfreesboro', Dec. 31, 1862; commanded the district of Tennessee from Nov., 1863, till the close of the war. Resigned Nov. 30, 1865; member of Congress 1865, and in Mar., 1867, was appointed a brigadier-general in the regular army and brevetted major-general. Assigned to command the department of Louisiana July 28, 1868, he died at New Orleans Jan. 7, 1869.

Rousseau (Philippe), b. at Paris about 1808; studied painting under Gros and Victor Bertin; began to exhibit in 1831, and acquired a great reputation as a painter of animals and still life. His *Rat de Ville* (1845), *Chevreau broutant* (1855), and *Singe photographe* (1866) became most widely known.

Rousseau (Théodore), b. at Paris in 1812; studied painting; began to exhibit in 1834; painted mostly landscapes, which were much appreciated, such as *Après la Pluie* (1852), *Groupes de Chênes* (1855), *Le Chêne de Roche* (1861), *Clairière dans la haute Futaie* (1863). D. in 1867.

Rousset' (Camille Félix Michel), b. at Paris Feb. 15, 1821; was appointed professor of history at Grenoble in 1843, at the Lycée Bonaparte in 1845, and historiographer to the ministry of war and keeper of its library in 1864. His *Histoire de Louvois* (4 vols., 1861–63) was crowned by the Academy. In 1865 he edited the *Correspondance de Louis XV. et du Maréchal de Noailles* (2 vols.).

Rout [O. Fr. *route*, "troop"]. This offence consists in an unlawful assembly of three or more persons with a common intent to accomplish a purpose which if carried out would constitute a riot, and their actually making a motion toward the execution of this design. It closely resembles a riot, and in fact agrees with that higher grade of crime in all its features except the final one of executing and accomplishing the intended object of the assemblage. (See Riot.) John Norton Pomeroy.

Routh (Martin Joseph), D. D., b. at South Elmham, Suffolk, England, Sept. 15, 1755; graduated at Oxford 1774; became a fellow 1776, college librarian 1781, senior proctor 1783, college bursar 1791, and in the same year president of Magdalen College, which post he retained nearly sixty-four years, dying at Oxford in his one hundredth year, Dec. 22, 1854. In 1810 he was presented to the living of Tylehurst, Berkshire. He published an edition of Plato's *Euthydemus et Gorgias* (1784); edited Burnet's *History of his Own Times* (1823) and a volume of *Scriptorum Ecclesiasticorum Opuscula* (1832; 2d ed. 1840), but was best known by his valuable collection of the fragmentary writings of the Christian Fathers of the second and third century under the title *Reliquiæ Sacræ, sive Auctorum fere jam perditorum secundi tertiique Sæculi Fragmenta quæ supersunt; accedunt Epistolæ Synodicæ et Canonicæ Nicæno Concilio antiquiores* (4 vols., 1814–18; new ed., 5 vols., 1846–48). He bequeathed his library of 20,000 volumes to the University of Durham.

Rouville', county of Quebec, Canada, which extends S. E. from the river Richelieu. It is generally productive. It is traversed by Grand Trunk and Stanstead Shefford and Chambly railways. Cap. Marieville. P. 17,634.

Rova'ni (Giuseppe), b. at Milan 1818; d. there in 1874. His critical essays in the *Gazzetta di Milano* had a wide currency, and among his romances, which contain some magnificent pages, may be mentioned *Lamberto Malatesta, Valenzia Candiano, Manfredo Pallavicino,* and his two best works, *I Cento Anni* and *La Giovanezza di Giulio Cesare.* Lombard *Bohemian* literature acknowledges Rovani as its head.

Rova'to, town of Italy, province of Brescia, at the foot of Mont' Orfano, about 5 miles N. E. of Chiari. It is a well-built town, and the ancient castle, to which five turrets were added in 1470, is still standing. The churches contain old pictures of much interest. In the chapel of the ex-convent on the summit of Mont' Orfano, which commands one of the finest views in Italy, there are two pictures said to be by Mantegna, and the old church adjoining contains some very good frescoes of the fourteenth and fifteenth centuries. The neighborhood abounds in Roman antiquities. The inhabitants are chiefly occupied with agriculture, and the wine made here, known as Monte Santo, stands high among Italian wines. P. 7400.

Rove Beetles, the Staphylinidæ, a family of coleopterous insects, of which there are many species. They are generally small, and inhabit wet moss, leaves, dung-heaps, etc. They are often found in ant-heaps and under stones. They devour vegetable and decaying animal matter, often exhale a strong odor, and some are popularly believed to have a poisonous bite. There are many American species.

Ro'ver, p.-v., Yell co., Ark. P. 394.

Rovere'do, town of Austria, in the Tyrol, is picturesquely situated on the Leno near its junction with the Adige. It is the chief seat of the Tyrolean silk manufactures, and carries on an extensive transit-trade. P. 8110.

Rovi'gno, town of Austria, in Istria, on a rocky promontory in the Adriatic, has two harbors, shipbuilding yards, ropewalks, manufactures of sailcloth, tunny fisheries, and an active trade in wine and oil. P. 10,500.

Rovi'go, town of Italy, province of the same name, lying between the Po and the Adige on the Adigetta, an emissary of the Adige. Hygienic considerations have compelled the demolition of three out of six picturesque gates, but the town is well built, with broad, regular streets, fine churches containing works of art of some interest, and other imposing public and private edifices. Rovigo was harshly governed by Austria, but still made some progress during the latter years of her dominion. The neighboring district, commonly known as the Polesine, was once entirely covered with water, and cannot now be said to be healthy, but it produces good crops of grain, especially of rice, and the grape thrives well, though sometimes injured by dampness. Mediæval Rovigo belonged sometimes to Venice, sometimes to the house of Este. P. 10,800.

Rowan', county of N. E. Kentucky, bounded S. W. by Licking River, drained by Triplett's Creek and other streams, and has a mountainous surface, largely covered with forests. The staples are Indian corn and dairy products. Cap. Morehead. Area, 500 sq. m. P. 2991.

Rowan, county of Central North Carolina, bounded N. E. by Yadkin River and drained by its tributaries, has a broken surface and a productive soil; is traversed by Richmond and Danville and the Western R. Rs. of North Carolina, which intersect at Salisbury; produces Indian corn, wheat, oats, tobacco, wool, and butter. There are several manufactories, including 1 of railroad cars. Cap. Salisbury. Area, about 700 sq. m. P. 16,810.

Rowan (John), b. in Pennsylvania in 1773; went with his parents to Kentucky 1783; was educated at Bardstown; became a lawyer; was a member of the State constitutional convention 1799; secretary of state 1804; sat for many years in the legislature, distinguished himself by his extensive fund of information, his eloquence, and his readiness in debate; was the acknowledged leader of the Kentucky bar in criminal jurisprudence; sat in Congress 1807–09; was judge of the court of appeals 1819–21; U. S. Senator 1825–31, making notable speeches on the judiciary system and on imprisonment for debt; was commissioner of claims against Mexico under the treaty of Apr. 11, 1839, and president of the Kentucky Historical Society from 1838 to his death, at Louisville July 13, 1843.

Row'an (Stephen C.), b. Dec. 25, 1808, in Ireland; entered the navy as a midshipman Feb. 1, 1826; became a passed midshipman in 1832, a lieutenant in 1837, a commander in 1855, a captain in 1862, a rear-admiral in 1866; distinguished for capacity, conduct, and courage during the civil war in the rivers of Virginia, the sounds of North Carolina, and at Charleston, S. C.; and for his long, honorable, and gallant service made vice-admiral of the navy Aug. 15, 1870. Foxhall A. Parker.

Rowan Tree. See Mountain-Ash.

Rowanty, tp., Dinwiddie co., Va., on Petersburg R. R. P. 3274.

Rowe, p.-v. and tp., Franklin co., Mass., on Deerfield River, adjacent to the Hoosac Tunnel, is a mountainous farming town, with beautiful scenery. P. 581.

Rowe (Nicholas), b. at Little Barford, England, in 1673; was educated at Westminster School; studied law; became a successful courtier and politician, but is best known as a dramatic author and as translator of Lucan's *Pharsalia* (1718). He published an edition of Shakspeare (1709), preceded by the first biography of that poet; became under-secretary of state under Queen Anne (1708–11), and was made poet-laureate by George I. D. Dec. 6, 1718, and was buried in Westminster Abbey. Among his plays the most successful were the tragedies *Tamerlane* (1702), *The Fair Penitent* (1703), *Jane Shore* (1714), and *Lady Jane Grey* (1715).

Row'ell, tp., Marion co., S. C. P. 891.

Row'ing [Ang.-Sax. *rówan*], "to impel a boat or vessel in water by oars at the sides." (*Worcester.*) In the more strict application of the word, the verb to "row" is used only where each oarsman works a single oar; where two are used, one in each hand, the oars are properly called *sculls,* and the oarsman becomes a *sculler.* (See Sculling.) The oar is known to exact science as a lever of the second order, the work being performed at a point between the fulcrum and the power. It is of course merely a more highly-organized paddle, naturally enough evolved, and has been known for thousands of years in every maritime nation that has emerged from barbarism. For large craft it has long been abandoned, and it is in the galleys of the ancients that rowing attained its most important practical development. It is, however, only within a very recent period, and as an amusement in the Anglo-Saxon countries, that the art of rowing has come to be thoroughly understood. Its progress dates, in England, from about 1829, the

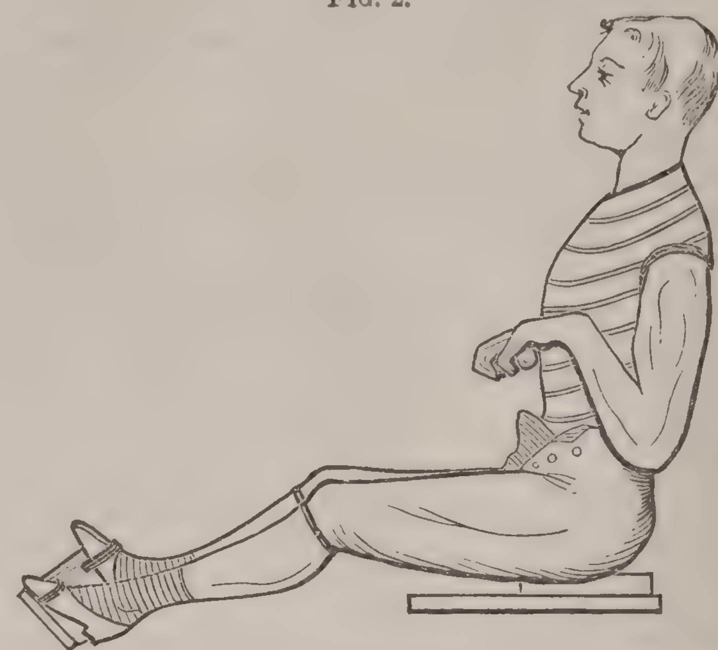
year of the first Oxford and Cambridge match; in America, from a few years later. Since then the continued stimulus of frequent boat-races in an inventive and scientific age has induced the most careful study of methods and materials, until at the present day it may be safely said that the art of rowing can no further go. After years of discussion and experiment and careful observation, the authorities are substantially agreed upon the best make of boats and oars and the true style of rowing. The canons of that style are derived from the immutable principles of mechanics and anatomy; they are the empirical solution of the problem, how to apply human strength in a given way so as to effect the greatest amount of work in the shortest possible time with the least possible distress. It is essential to dismiss at the outset the idea, so common among the public, of an "English stroke," an "American stroke," a "Yale stroke," a "Harvard stroke," and so on, *ad nauseam*, whose respective merits are still open to debate. There is one universal "stroke," which we proceed briefly to explain.

The oarsman in the modern racing-craft sits upon a seat elevated some 6 or 7 inches from the floor, his feet strapped up against a board or "stretcher," which is solidly fixed to the main timbers of the boat. The seat itself is a mere square of wood, fitted upon its lower surface with grooves which slide upon two rails about 18 inches in length running parallel with the keel of the boat. At the beginning of the stroke, just before the oar enters the water, the oarsman is in the position represented in Fig. 1. The legs are

FIG. 1.

bent to about a right angle at the knee, with the knees well apart to admit of the free movement of the trunk, the feet pressed firmly against the stretcher, the body reaching forward from the hips, with the vertebral column perfectly straight and rigid, the head erect, the shoulders back, chest open, arms straight, and hands grasping the oar about four inches apart. The blade of the oar is of course perpendicular to the plane of the water. The essential points to be observed in this position are, *first*, the long forward reach from the hips; *second*, the entire rigidity of every muscle. The oarsman being in the position indicated, the hands are quickly thrown upward, driving the oar-blade like a knife into the water. This motion is accomplished solely from the shoulder, the arms remaining, as before, perfectly straight and rigid, though moving freely at the shoulder-joints. The instant the blade is covered, the great muscles of the back, the strongest lifting muscles of the body, come into play, dashing back the head, shoulders, and trunk until the body is nearly erect. The power of the stroke depends chiefly upon the sudden nervous energy of this "catch of the water." The legs still remain in precisely the same position. The arms, during this portion of the stroke, answer solely the purpose of connecting ropes between the shoulders and hands, and still remain perfectly straight, but turn slightly in the shoulder-joints, so that the hands preserve a uniform level and the blade continues at a uniform depth in the water. As the body reaches the perpendicular, the legs straighten, the knees still remaining well apart, driving the seat back upon its slides; at the same time the arms are bent downward at the elbow, the hands being still kept at the uniform height, until the thumbs touch the chest. The oarsman is now in the position represented in Fig. 2, and the oar is ready to be taken out of the water for a new stroke. The "finish," or the taking of the oar from the water, is perhaps the most difficult and important part of the stroke, for on it depend the ease and precision of the forward swing of the body, and the consequent power of endurance. It is an apparent paradox, but an unquestionable truth, that the greatest exertion and distress in rowing a fast stroke are incurred while the oar is *out* of the water. The reasons are, that the powerful contraction of the stomach muscles, which is essential to a long reach, is an extremely fatiguing movement, and also that the forward rush of the body necessarily tends to empty, and so distress, the lungs. Therefore it is most important to attain a steady *slow* movement forward of the trunk, contrasting strongly with the backward dash while the oar is in the water. Now, as the trunk cannot conveniently swing forward until the hands are away, it is necessary that the hands should be instantly shot away from the body when the stroke is ended, thus securing without exertion the two minor advantages of leaving the legs free to bend up at the proper time, and of allowing the hands to be kept at a uniform height with the oar-blade clear of the water. The hands, then, are dropped vertically downward, still touching the body, from the position shown in Fig. 2 until they nearly reach the lap, thus throw-

FIG. 2.



ing the oar-blade—which still remains perpendicular to the plane of the water—clean out into the air. As the hands reach their lowest point, the wrists are dropped, so that the oar-blade, revolving through a right angle, is turned parallel with the plane of the water, or "feathered." The arms are then instantaneously straightened and stiffened. All three motions—dropping the hands, turning the wrists, and shooting out the arms—should be so rapid as to appear simultaneous. We repeat, that in the machine-like regularity and rapidity of this movement lies the secret of all good rowing. Having got the hands out of the way, the body now reaches steadily forward with a uniform rotation from the hips, until the proper angle is attained for the beginning of a new stroke. The legs at the same time are bent upward and the seat slides forward, partly under the pull of the legs, partly under the forward impetus acquired by shooting out the hands. Body, legs, and arms are now again in the position of Fig. 1.

The important elements of a good style are therefore, *first*, a long, slow reach forward with the body; *second*, a rapid dash of the oar through the water; *third*, a neat and extremely quick finish with the hands. The first point is one too seldom seen in America, owing solely to the prevalent neglect of a sharp finish. The Oxford crew that rowed against Harvard in 1869 were particularly noticeable for their reach—the more so from the marked inferiority in this respect of the Americans. The dash through the water is a less uncommon merit. The Cornell and Yale crews of 1875 were conspicuous examples—the former of excellence, the latter of lamentable deficiency in this respect. A sharp finish, as it is the most difficult and important, so it is the rarest accomplishment. The Columbia College crew of 1874, though far from perfect, finished better than any American crew we can recall.

The art of rowing can only be acquired by the most patient and assiduous practice under the direction of a competent instructor. It can never be taught in a gymnasium or learned from a book; to excel in it requires not only sound health and strong limbs, but care and attention and experience; it is an art, like another, to be mastered only by those who unite to a natural aptitude the capability of taking infinite pains.

To those who wish to examine the theory further we can recommend but two books, the rest being wholly trash—*Boat-Racing*, by E. D. Brickwood (London, 1876), and Woodgate's *Oars and Sculls* (London and New York, 1874). To these we may add Macmichael's *Oxford and Cambridge Boat-Races* (London, 1870), which contains an admirable account of the actual preparation of some very famous crews. G. L. RIVES.

Rowlandson (MARY **White**), b. about 1636. She was the wife of Rev. Joseph Rowlandson, first minister of Lancaster, Mass.; on Feb. 10, 1676, the Indians surprised the town of Lancaster, burned it, and carried her and her

children into captivity, which lasted nearly three months. She was finally ransomed by some ladies of Boston, and in 1682, four years after the death of her husband, published a pathetic *Narrative of the Captivity and Removes of Mrs. Mary Rowlandson among the Indians*, which has been several times reprinted, last in 1828.

Rowles'burg, p.-v., Preston co., West Va., on Cheat River and Baltimore and Ohio R. R.

Row'ley, p.-v. and tp., Essex co., Mass., on the Atlantic Ocean and Eastern R. R. P. 1157.

Rowley (William), b. in England early in the reign of Elizabeth; was a dramatic author of little merit, but was associated with Middleton, Decker, Ford, Massinger, and Heywood in the authorship of some of their dramas. D. about 1625.

Row'no, or **Rovno,** town of Russian Poland, government of Volhynia, on the Ustja, has some manufactures. P. 5406.

Row'son (Susanna **Haswell**), b. at Portsmouth, England, in 1762; came to Massachusetts with her father, a British naval officer, in 1767, when they were wrecked on Lovell's Island in Boston harbor; resided at Nantasket until 1776; returned to England; married William Rowson, a musician, 1786; became an actress; performed successfully in Baltimore and Boston 1795–96; taught school at Medford, Newton, and Boston; published several educational works and comedies, and many novels, among which *Charlotte Temple* was very popular. D. at Boston Mar. 2, 1824. (See her *Memoirs*, by Rev. E. Nason, 1870.)

Roxana. See Alexander.

Roxa'na, p.-v., Baltimore hundred, Sussex co., Del. P. 114.

Roxana, p.-v. and tp., Eaton co., Mich. P. 1144.

Rox'borough, p.-v., cap. of Person co., N. C., near the source of the Neuse River. P. 1117.

Rox'burgh, county of Scotland, bounded S. by the English counties of Northumberland and Cumberland, comprises an area of 715 sq. m., with 53,965 inhabitants. Its southern and western parts are hilly, covered with the Cheviots and Lauriston Hills; in the northern and eastern parts the surface is generally level, and the fertile and productive soil is cultivated with the utmost care. Large herds of sheep are kept on the pastures of the hills; manufactures of woollens are carried on; coal, lime, marl, and freestone are found. Principal towns, Jedburgh and Kelso.

Roxburgh (William), M. D., b. at Underwood, Ayrshire, Scotland, June 29, 1759; received a medical education at Edinburgh; settled as a surgeon at Madras, India, where he devoted himself to botany, and afterward at Calcutta, where he was associated with Sir William Jones as a leading member of the Asiatic Society and contributor to its publications; became keeper of the botanical garden at Calcutta, and received three gold medals from the Society of Arts for important discoveries, especially those in regard to the coloring-matter of the lacca insect and the cultivation of hemp in Bengal. D. at Edinburgh Apr. 10, 1815. His chief work is the *Plants of the Coast of Coromandel* (3 vols. folio, 1795–1819).

Roxburghe (John **Ker**), Duke of, b. at Bristol, England, in 1746; succeeded to the title 1755, and d. at London Mar. 19, 1811. He spent a large fortune in accumulating an immense collection of rare and curious books, which was sold by auction 1812, some of them bringing enormous prices. In memory of the event the "Roxburghe Club" was formed in that year for reprinting rare books.

Roxburghe Club, an association of gentlemen in Great Britain, organized in 1812, for the purpose of printing valuable MSS. and reprinting rare books. The number of copies of any one book from the Roxburghe Club is always small, and none are put into the market. The club was named in honor of John, duke of Roxburghe (1746–1811), a famous bibliophile.

Rox'bury, p.-v. and tp., Litchfield co., Conn., on Housatonic River and Shepaug R. R. P. 919.

Roxbury, p.-v. and tp., Oxford co., Me. P. 162.

Roxbury, formerly a city of Norfolk co., Mass., now a part of Boston, situated 3 miles from State street, Boston, was the earliest settlement inland, the only communication to Boston by land being through it. It was settled in 1630, and had such famous men among its first inhabitants as John Eliot, the Indian apostle, Thomas and Joseph Dudley, afterward governor, and Robert Williams, the progenitor of the race bearing his name. In Revolutionary times it contributed much to our country's history, being the birthplace of Gens. Warren and Heath. The patriot army occupied the heights of the town to invest Boston, and Gen. Washington moved at its head on their march into the city on Evacuation Day, Mar. 17, 1776, a century ago. It founded a free school in 1642, endowed afterward with money and lands by Thomas Bell in 1645, and others. It is now one of the first Latin schools for the preparation of boys for college, and is supported by the income of its funds. In 1846, Roxbury was made a city, with a population of 17,000. It had but 3 churches till 1820; now it has 36, of which 6 are Roman Catholic; 1 nunnery, and 5 institutions for the reformation of wayward and orphan Roman Catholic children; a charitable society, which has an invested fund of $150,000, the income of which is dispensed to the poor; 2 national banks, 2 savings banks, 2 weekly newspapers, 1 musical society, 2 Masonic lodges and a commandery. Its manufactures embrace soap and candles, beef-packing, rubber-making (which received such an impetus from the inventions of its townsman, Goodyear), rope and cordage, organs, locomotives, painted floor-carpets, woollens, watches, lead, and fire-engines; the phosphate-works, the Roxbury gasworks, the Whittier Machine Co.; the extensive breweries have acquired great distinction for their excellence. On its streams are established mills, tanneries, and foundries. The salt water is navigable, and hundreds of cargoes of coal, wood, hay, etc. are landed annually on its wharves. Here the first omnibus line was run, and the first horse railroad in New England in 1855, between Roxbury and Boston, now an immense corporation. The original territory now embraces a population of 60,000, but a portion was set off in 1851 as a new town. In 1868 the whole was annexed to Boston. Absorbed in one great city, its identity is lost. Multitudes doing business in the city find its hillsides a pleasant abiding-place, abounding in beautiful drives, and from among its citizens the last chief magistrates, Mayors Gaston and Cobb, were taken. It has always been noted for the patriotism and public spirit of its citizens, and measures are on foot to erect a monument to Gen. Joseph Warren.

F. Williams, late Ed. "Suffolk Co. Journal."

Roxbury, tp., Cheshire co., N. H. P. 174.

Roxbury, tp., Morris co., N. J. P. 3320.

Roxbury, p.-v. and tp., Delaware co., N. Y., on New York Kingston and Syracuse R. R. P. 2188.

Roxbury, p.-v. and tp., Washington co., Vt., on Central Vermont R. R. P. 916.

Roxbury, p.-v. and tp., Dane co., Wis., on Wisconsin River. P. 1207.

Rox'obel, p.-v., Bertie co., N. C. P. 1384.

Rox'ton Falls, p.-v. of Shefford co., Quebec, Canada, 60 miles E. of Montreal, has manufactures of leather and dyestuffs, and a fine stone church. It is on Black River. P. 992.

Roy (William), R. A., F. R. S., b. near Lanark, Scotland, May 4, 1726; was employed as colonel in the army in a military survey of the Scottish Highlands 1746–55; rose to the rank of major-general, and made the first trigonometrical survey in Great Britain, being the line from Dover to Greenwich, 1783–88—a work which proved the germ of the Ordnance Survey. D. in London July 1, 1790.

Roy'al, tp., White co., Ark. P. 732.

Royal Academy. See Academy, by Prof. J. Thomas, M. D., LL.D.; and Society, by Porter C. Bliss, A. M.

Royal Centre, p.-v., Boone tp., Cass co., Ind., on Indianapolis and Chicago division of Pittsburg Cincinnati and St. Louis R. R. P. 306.

Royal Geographical Society. See Society, by Porter C. Bliss, A. M.

Royal Geological Society. See Society, by Porter C. Bliss, A. M.

Royal Oak, p.-v. and tp., Oakland co., Mich., on Detroit and Milwaukee R. R. P. 1520.

Roy'all (Isaac), b. in Massachusetts early in the eighteenth century; was a wealthy resident of Medford, which town he long represented in the general court; was for twenty-two years a member of the executive council; took part in the French war; was appointed brigadier-general 1761, being the first resident of New England who bore that title; adhered to the Crown in the preliminaries of the Revolutionary contest, for which reason he left the country Apr. 16, 1775; was proscribed and his estate confiscated 1778, and d. in England Oct., 1781, taking a noble revenge upon his persecutors by leaving 2000 acres of land in Worcester county as the endowment of a law professorship in Harvard College, now known by his name. There were other bequests equally liberal and patriotic. The town of Royalston, Worcester co., of which he had been one of the original proprietors (1752), commemorates his name. One

of his daughters married Sir William Pepperell, the younger.

Royal Society. See ACADEMY, by PROF. J. THOMAS, M. D., LL.D.; and SOCIETY, by PORTER C. BLISS, A. M.

Roy′alston, p.-v. and tp., Worcester co., Mass., on Miller River and Vermont and Massachusetts R. R. P. 1354.

Roy′alton, p.-v. and tp., Berrien co., Mich., on Lake Michigan and Chicago and Michigan Lake Shore R. R. P. 1040.

Royalton, p.-v. and tp., Niagara co., N. Y., on Tonawanda Creek and New York Central R. R. P. 4726.

Royalton, tp., Cuyahoga co., O., on Rocky River. P. 1089.

Royalton, p.-v., Amanda tp., Fairfield co., O. P. 158.

Royalton, tp., Fulton co., O. P. 871.

Royalton, p.-v. and tp., Windsor co., Vt., on Vermont Central R. R. P. 1679.

Royalton, p.-v. and tp., Waupaca co., Wis., on Wolf River. P. 953.

Royer-Collard′ (PIERRE PAUL), b. at Sompuis, department of Marne, France, June 21, 1763; studied law, and practised as an advocate in Paris when the Revolution broke out. In the beginning he took part with enthusiasm in the political movements, but being a moderate and a royalist, his position soon became dangerous, and after the fall of the monarchy (Aug. 10, 1792) he fled from Paris, and lived concealed at Sompuis during the Reign of Terror. Elected a deputy from the department of Marne, he took his seat in 1797 in the Council of Five Hundred, but in the same year, by the revolution of Sept. 4, he was expelled from the Assembly as a royalist. He still remained in Paris, participating in the various schemes of the royalists, but after the crowning of Napoleon as emperor he retired from political life, returned again to Sompuis, and devoted himself wholly to the study of philosophy. From 1811 to 1814 he was professor of philosophy at the University of Paris, and in spite of the short duration of his term he exercised a decisive influence. He had studied and partially adopted the system of the Scottish philosophers, and from this standpoint he raised a successful opposition to the sensualism of Condillac. Jouffroy, Cousin, Guizot, etc. became his disciples. After the Restoration he was made director of the Royal Library and president of the department of public education, in which position he developed great activity; but when, in 1820, the ultra-royalist party came into power, he resigned his office and became the leader of the liberal opposition in the Legislative Assembly, the creator of a new party, the *Doctrinaires*, comprising the moneyed and educated middle class of the people, and the champion of the constitutional monarchy in France. He was exceedingly popular, and contributed, no doubt, more than any other person to the revolution of July, 1830, which may be considered as a realization of his ideas. Nevertheless, after that period he took part less and less in public life, and it was no secret that he felt disappointed at his party and his disciples, including Guizot. D. at Châteauvieux, Loir-et-Cher, Sept. 4, 1845. His philosophical writings remained mere fragments. His *Life* has been written by Barante (1861) and Lacombe (1863).

Roy′er's Ford, p.-v., Upper Providence tp., Montgomery co., Pa., on Schuylkill Canal and Philadelphia and Reading R. R.

Royle (JOHN FORBES), M. D., F. R. S., b. in England in 1800; acquired a fondness for botany while studying medicine; became a physician in the service of the East India Company; spent much time in the Himalayas, where he was superintendent of the company's botanic garden at Seharunpoor; published his great work, *Illustrations of the Botany and other branches of the Natural History of the Himalaya Mountains* (1833–40); wrote many valuable scientific papers upon India; was one of the promoters of the culture of tea, cotton, and other foreign plants in India; became lecturer on materia medica at King's College, London, secretary of the British Association, and took an active part in the preliminaries of the Universal Exposition of 1851. D. at Acton, near London, Jan. 2, 1858.

Rshev, or **Rzhev,** town of Russia, government of Tver, on both sides of the Volga, is well built, has many educational and benevolent institutions, and carries on a lively trade in fish, hemp, and linens. P. 19,660.

Ruatan′, or **Roatan,** an island of the Caribbean Sea, in the Bay of Honduras, belongs to the republic of Honduras. It is 30 miles long, 9 miles broad, and has about 2000 inhabitants, employed in the cultivation of the soil and catching the fine turtles which abound along the coasts.

Rubasse, a variety of crystallized quartz, charged with specks of iron oxide, which give it a fine red color. It is very handsome, and quite valuable when really perfect. There are artificial rubasses of all colors made from rock-crystal.

Rubefa′cients [Lat. *rubefacere*, "to make red"], in medicine, agents capable of producing congestion, and thus *redness* of the skin, by local contact. Such irritant applications have in some unknown way often the power of relieving congestion, pain, spasm, or undue irritability of deep-seated organs, and are much used for the purpose in therapeutics. Very many drugs have the property of reddening the skin, all blistering agents producing simple hyperæmia as the initial effect of their irritation, but the means most employed strictly as rubefacients are the following: *heat*, by means of hot baths, cloths wrung out in hot water, bottles of hot water, or heated solids, as earthen platters, bricks, bags of sand, etc.; *mustard*, in the form of prepared mustard-paper moistened or thick poultices of mustard-meal mixed with *cold* water; *oil of turpentine*, applied by means of flannels first wrung out in hot water and then in the oil previously warmed; *capsicum* (cayenne pepper), in the form of poultice, or, better, as a lotion mixed with hot spirits; and *ammonia*, in the form of liniment of ammonia (volatile liniment). Plaster of Burgundy pitch and resin cerate are also feebly rubefacient.

EDWARD CURTIS.

Ru′bens (PETER PAUL), b. at Siegen, Westphalia, June 29, 1577. His father, a wealthy citizen of Antwerp, who had left his native country on account of the political and religious troubles under which it suffered, settled in Cologne, where he died in 1587. The widow returned to Antwerp, and here young Rubens received his first instruction in the art of painting from the landscape-painter Verhaagt and the historical painters Van Noort and Van Veen. In 1600 he went to Italy with letters of recommendation from the viceroy of the Netherlands, the archduke Albert and his wife, the infanta Isabelle; and Vicenzio di Gonzaga, the duke of Mantua, invited him to his court and appointed him court-painter. He stayed here eight years, making frequent journeys to Rome and Naples, studying the Italian masters with energy and success, and painting several fine pictures himself, which made him quite famous. On the death of his mother, in 1608, he returned to his native country, and was appointed court-painter by the viceroy. He settled in Antwerp, built an elegant mansion, and lived in great style. His masterpieces, the *Descent from the Cross* and the *Elevation of the Cross*, belong to this period. The duke of Mantua sent him on a diplomatic mission to the Spanish court, and in Madrid he not only painted the portraits of the king and many of the grandees, but he won their esteem and fulfilled his mission with success. The infanta also employed him in diplomatic negotiations, and it was actually he who brought about and concluded the treaty of peace between Philip IV. of Spain and Charles I. of England. His fame as a painter was, of course, vastly increased by his success as a diplomatist, and he was soon unable to fill all the orders he received. He worked very rapidly, and his talent was as rich and energetic in execution as in conception. But he has left over 1800 pictures, most of which are very large, and even the quickest eye and the swiftest hand could not have performed such a task unaided. In many of his works, executed after 1620, only the outlines and the finishing touches are his; the rest is by some of his pupils, of whom he gathered a great number around him, and among whom many became great painters themselves; as, for instance, Van Dyck, Jordaens, and Van Thulden. In his last days he could not paint at all, suffering very severely from the gout. D. at Antwerp May 30, 1640. He was immensely rich, and left large and valuable art-collections, which were sold partly to Spain, partly to England. He worked in all the different branches of the art. He painted Madonnas, historical, mythological, and allegorical subjects, landscapes, animals, genre pieces, portraits; he painted everything. And in most branches he not only excelled, but exercised a considerable influence. His ideas are often coarse, but they are always powerful; his execution is often mannered, but it is always brilliant. The exuberant animal spirits, the passion for stirring action and full enjoyment, which characterized his time, characterize also him. The general tone of his pictures is vigorous and joyful. But not a few of his characters represent that stage of mental development in which voluptuousness ceases and cruelty begins, and instances of that shy tenderness and unconscious dignity which are traits of human beauty belonging to its highest ideal are exceedingly rare in his pictures. Of the technicalities of his art he was a perfect master, and the effect of his coloring is generally very exhilarating and joyful on account of the strong and

powerful contrasts which he blends into harmony. But sometimes these brilliant contrasts, this vigorous harmony, are exceedingly untrue, and there are pictures of his which make rather a puerile impression, solely on account of the reckless audacity with which forms and colors are used. CLEMENS PETERSEN.

Ruberyth′ric [Lat. *rubia*, "madder," and ἐρυθρός, "red"] **Acid** ($C_{20}H_{22}O_{11}$), a crystalline glucoside found in madder-root by Rochleder. It forms yellow prisms having a silky lustre. It has a faint taste; is sparingly soluble in cold, readily in hot water; gives a golden-yellow solution in alcohol and in ether, and a blood-red solution in alkalies. It gives red precipitates with baryta-water, with an alum solution after the addition of ammonia, and with basic acetate of lead after addition of a little alcohol. Schunck did not find this acid in madder, and considers it a product of the decomposition of rubian. Rochleder considers rubian to be impure ruberythric acid. He obtained from 25 pounds of madder only 1 gramme of this acid. This acid is converted by acids, alkalies, and *erythrozyne* (madder ferment) into alizarine and glucose.

$$\underset{\text{Ruberythric acid.}}{C_{20}H_{22}O_{11}} = \underset{\text{Alizarine.}}{C_{14}H_8O_4} + \underset{\text{Glucose.}}{C_6H_{12}O_6} + H_2O.$$

(See RUBIAN, ALIZARINE, MADDER, etc.)

C. F. CHANDLER.

Rubia′ceæ [from *Rubia*, the madder genus, so named on account of the red roots], a large natural order of exogenous gamopetalous plants, herbs, shrubs, and trees found in all parts of the world, but largely tropical. It is briefly defined by having opposite entire stipulate leaves, and regular flowers with an inferior ovary, and stamens borne on the corolla, as many as its lobes, and alternate with them. The exceptions to this relate to a tribe most numerously representing the order in temperate regions, the Stellatæ, to which *Rubia* itself belongs, and in which the leaves are in whorls without stipules; but here the accessory leaves are supposed to represent the latter. The order is rich in medicinal and economical products, furnishing as it does Peruvian bark (*Cinchona*), ipecac, one kind of catechu (or gambier), madder, and coffee. One or two tropical trees of the family yield edible fruits. A. GRAY.

Rubian [Lat. *rubia*, "madder"] ($C_{16}H_{16}O_8$), a glucoside discovered in madder-root by Schunck in 1847. It is obtained by treating a hot decoction of madder with bone-black, washing this to remove chlorogenine, extracting it repeatedly with boiling alcohol, and evaporating to dryness. It is then dissolved in water, precipitated with acetate of lead; the lead compound is decomposed by sulphuretted hydrogen, and the filtrate is evaporated to dryness. As thus obtained, it is a brittle, amorphous mass, resembling gum-arabic, deep yellow in thin layers, dark brown in masses. It is very soluble in water, less soluble in alcohol, and insoluble in ether, which precipitates it from alcohol in brown drops. It is very bitter. Boiled with dilute acids or caustic alkalies, or treated with *erythrozyne* (madder ferment), it is resolved into glucose, alizarine, and perhaps other products:

$$\underset{\text{Rubian.}}{2C_{16}H_{16}O_8} + 6H_2O = \underset{\text{Alizarine.}}{C_{14}H_8O_4} + \underset{\text{Glucose.}}{3C_6H_{12}O_6}.$$

Others consider the reaction as follows:

$$\underset{\text{Rubian.}}{C_{26}H_{32}O_{16}} = \underset{\text{Alizarine.}}{C_{14}H_8O_4} + \underset{\text{Glucose.}}{2C_6H_{12}O_6}.$$

It is not yet determined whether there are several glucosides in madder which are decomposed by the ferment, one yielding alizarine, another purpurine, etc., or whether there is but one, from which all the coloring-matters are developed. Schunck favors the former view, while the investigations of Kopp, Schützenberger, and Bolley favor the latter. (See ALIZARINE, MADDER, RUBERYTHRIC ACID, etc.) C. F. CHANDLER.

Ru′bicon, a small river of Italy, flows into the Adriatic, and formed in the time of the Roman republic the boundary between Italy and Gallia Cisalpina. Thus, it became actually a declaration of war when Cæsar, who was proconsul of Gallia, marched his army beyond the Rubicon. When he arrived at its banks he hesitated, and the exclamation with which he then passed the river and pushed forward, *Jacta est alea*, has since become a common expression whenever an important decision is made.

Rubicon, tp., Huron co., Mich., on Lake Huron. P. 746.

Rubicon, p.-v. and tp., Dodge co., Wis., on Northern division of Milwaukee and St. Paul R. R. P. 1995.

Rubid′ium [Lat. *rubidus*, "red"], one of the alkali-metals, discovered by Kirchhoff and Bunsen in 1860 as one of the first fruits of spectroscopic investigation. It occurs in extremely minute proportions in some saline mineral waters, in association with LITHIUM and CÆSIUM (which see). The water of Bourbonne-les-Bains contains in 1,000,000 parts 19 parts of chloride of rubidium. Some lepidolites contain it, associated with lithium and cæsium. Among these are the lepidolite of Hebron in Maine, which contains about $\frac{1}{400}$th of its weight. The ashes of some plants show it, the tea and the coffee plant being among these. It is a white metal with a yellowish-tinge and silvery lustre. Density = 1.52. It is as soft as wax, melts at 101.5° F., and yields even below a red heat a vapor of a greenish-blue color. It is more easily oxidized by the air than potassium, and is more electro-positive than the latter. It kindles on water, and burns just like potassium. Rubidium has much the largest *molecular volume* of any known metal, though in this respect it might be surpassed by cæsium, whose density has not yet been discovered. The molecular volume of metallic rubidium is 55.921, that of potassium, which ranks next to it in this respect, being but 45.22. (See VOLUMES, MOLECULAR.) HENRY WURTZ.

Ru′binstein (ANTON), b. at Vechvotynez, village in the Russian province of Bessarabia, near the Roumenian frontier, Nov. 30, 1830, of Jewish descent; was educated at Moscow in the Greek faith; received his first musical instruction from his mother; studied in Paris 1840, and in Berlin, under Dehn, 1845; settled in 1848 at St. Petersburg, where he produced his first compositions and founded in 1850 a conservatory of music, of which he was the director to 1860; afterward made extensive concert-tours in Europe and America. As a pianist he ranks among the first. His compositions comprise several operas—*The Demon* (St. Petersburg, 1875), *Kinder der Haide* (Vienna, 1861), *Die Maccabäer* (Berlin, 1875); several symphonies, of which the *Ocean Symphony* has become very celebrated; and a number of minor compositions.

Ruble. See ROUBLE.

Ru′bric [Lat. *rubrica*, as being originally written with red earth], any writing or printing in red ink. In MS. and printed missals the directions to the prayers and offices were usually in red ink; hence rubric commonly signifies the order of the liturgy in church services. As the date and place on a titlepage were sometimes printed in red ink, and the place where the book was sold was given instead of that where printed, the word "rubric" has also come to signify the false name, as many books printed at Paris bear the *rubric* of Genoa, London, etc.

Ruby. See PRECIOUS STONES, by PROF. H. B. CORNWALL, E. M.

Ru′by Valley, p.-v., Elko co., Nev. P. 153.

Ruck′ersville, p.-v. and tp., Greene co., Va. P. 1514.

Rück′ert (FRIEDRICH), b. at Schweinfurt, Bavaria, May 16, 1788; studied philology and belles-lettres at Jena; engaged in journalism at Stuttgart 1815–17; spent a year in Rome 1818; settled for several years at Coburg, occupied in philological and poetical pursuits; was appointed professor of Oriental languages at Erlangen in 1826, at Berlin in 1841, and retired in 1849 to his estate, Neuses, near Coburg, where he d. Jan. 31, 1866. He is generally considered as one of the greatest lyrical poets of Germany, and his lyrical poems, *Deutsche Gedichte* (1814), *Kranz der Zeit* (1817), *Oestliche Rosen* (1822), *Gesammelte Gedichte* (6 vols., 1834–38), are often very impressive, though rather on account of their gorgeous imagery and brilliant reflections than their sympathetic power. But their most striking characteristic is the astonishing power over the German language which they exhibit. There is hardly any metrical form ever employed in any literature which is not represented in these volumes by some masterly specimens; and the more difficult, entangled, and artificial the verse-form becomes, the more delicate, easy, and natural becomes the poet. His translations from Arabic, Persian, Sanskrit, etc., *Die Verwandlungen des Abu-Seid* (2 vols., 1826), *Nal und Damajanti* (1828), *Hamasa* (2 vols., 1846), *Amrilkais* (1847), *Sakuntala* (posthumous), are also considered masterpieces. His large didactic poem, on the contrary, *Die Weisheit des Brahmanen* (6 vols., 1836–39), is somewhat cold, and his dramas have no interest. A complete edition of his poetical works was published in 15 vols. (Frankfort, 1867 *seq.*). His *Life* has been written by Fortlage (1867) and by Beyer (1868).

Rud′dell, tp., Independence co., Ark. P. 1656.

Rud′der [Ang.-Sax. *rôdher*], in boats and ships, is that part of the helm or steering apparatus which is in immediate contact with the water, is hung to the stern-post by pintle and brace hinges, and is governed by the tiller. (See HELM.)

Rud′diman (THOMAS), b. at Raggel, Banffshire, Scotland, Oct., 1674; graduated at King's College, Aberdeen; was tutor in a private family and parish schoolmaster at Laurencekirk until Dr. A. Pitcairne procured him the post of assistant keeper of the Advocates' Library at Edinburgh, when he turned his attention to philology and prepared his

Rudiments of the Latin Tongue (1714)—a work which still keeps its place in the Scottish schools, and entitles its author to be considered the greatest of Scotch grammarians. He published a fine edition of Buchanan's works (2 vols., folio, 1715); afterward became himself a publisher and printer to the University of Edinburgh; issued his *Grammaticæ Latinæ Institutiones* (part i., Etymology, 1725; part ii., Syntax, 1732); brought out a magnificent edition of Anderson's *Diplomata et Numismata Scotiæ* (folio, 1739); and produced his celebrated "immaculate" edition of Livy (4 vols. 12mo, 1751), in which no typographical error could be detected. D. at Edinburgh Jan. 19, 1757.

Ru'dolph, the name of two German emperors. Rudolph I., of Hapsburg, founder of the house of Austria, German emperor 1273–91, b. May 1, 1218, was the oldest son of Albert IV., count of Hapsburg and landgrave of Alsace, which countries he inherited after the death of his father in 1240. He was successful in enlarging his possessions, but it was, nevertheless, not the importance of his political position, but the righteousness and valor of his personal character, which gained for him the imperial crown, Sept. 30, 1273. In order to strengthen his authority among his vassals and procure the necessary support, he married his daughters to the two most powerful among them, the count-palatine, Louis, and Duke Albert of Saxony, and then marched against two others who refused to do homage, King Ottocar of Bohemia and Duke Henry of Bavaria. The latter was easily defeated; the former too, but Ottocar broke the truce concluded in 1276, and in the new war he was killed in the battle of the Marchfield, Aug. 26, 1273. Of his possessions, Rudolph gave Bohemia and Moravia to his sons, but Austria, Styria, Carinthia, and Carniola he separated from the heritage and gave to his own son, Albert, thus founding the state of Austria. Against his external enemies, the count of Savoy, the duke of Burgundy, etc., he was also successful, and his internal government was distinguished by justice and love of order and peace. He travelled from place to place in the empire, and sat in court on all important occasions, for which reason his people called him the living law—*lex animata.* D. Sept. 30, 1291, and was buried at Spires. His *Life* has been written by Lichnowski (1836) and Schönhuth (1843).—Rudolph II. (1576–1612), b. July 18, 1552, a son of the emperor Maximilian II. and Marie, daughter of Charles V., was educated at the Spanish court; crowned king of Hungary in 1572, of Bohemia in 1575, and elected emperor of Germany after his father's death, Oct. 12, 1576. He was superstitious, weak, and entirely in the hands of the Jesuits. Immediately after his accession to the throne the Protestant worship was forbidden throughout his Austrian dominions, the Protestant schools were closed, and the preachers and teachers banished. In the empire he espoused the cause of the Roman Catholic Church with violence, and the formation of the Protestant Union (May 4, 1608) and the Roman Catholic League (July 10, 1609) brought Germany to the very verge of civil war. Meanwhile, the Hungarians arose and Bohemia revolted. The house of Austria seemed near its ruin when Matthias, a younger brother of the emperor, took the lead in the affairs of the family, and compelled Rudolph to cede to him all his hereditary possessions (1611). Unable to maintain his authority in the empire, and embittered by his misfortunes, the emperor retired into private life, and d. at Prague Jan. 20, 1612. He felt some interest in science and literature, and several great scholars and scientists—as, for instance, Tycho Brahe—lived at his court. His *Life* has been written by Gindely (1863).

Rudolph, p.-v. and tp., Wood co., Wis., on Wisconsin River. P. 317.

Ru'dolstadt, town of Germany, capital of the principality of Schwarzburg-Rudolstadt, is beautifully situated on the Saale, and has a fine palace with a picture-gallery and a library, and manufactures of woollens, porcelain, and dyestuffs. P. 7084.

Rud'ra, in the Vedic mythology of India, was the name of the father of the Maruts or Storm-gods, and subsequently extended to embrace the Maruts themselves as a collective appellation. In the Puranas (see Sanskrit Literature) the conception had become so modified that Rudra was identified with Siva, the Destroyer, a non-Aryan divinity adopted into the Hindoo pantheon from the indigenous black races of India.

Rue, the *Ruta graveolens*, an herb of the Old World (order Rutaceæ), having a strong smell and powerful stimulant, and even poisonous qualities. It was once used as an aspergil for sprinkling holy water. It was believed by the superstitious to be a powerful charm against witches. It is used in some places for flavoring food.

Ruff (*Philomachus pugnax*), a wading bird of the subfamily Tringinæ, or sand-pipers, formerly very common in the fens and marshes of England, but which has nearly disappeared since its favorite haunts have been so largely reclaimed and cultivated. It is still found throughout Northern Europe and Asia, migrates southward in winter, has recently been introduced into the U. S., being found chiefly on the Atlantic coast in New Jersey and Long Island, and feeds on worms and insects. The ruff derives its name from a circlet of long, closely-set feathers upon the neck of the adult male, which he raises or lowers at pleasure. The male ruff is polygamous, courageous, and pugnacious, is about ten inches in length, with the head and shoulders of a dark purple, barred with chestnut, the back chestnut spotted with black, the wings brownish-black, each feather having a white shaft, and the tail brown mottled with black. No two male birds are colored exactly alike. They are taken alive in great numbers in Holland with a net, are fattened for market, feeding on bread and milk with bruised hempseed, and esteemed a great delicacy for the table. The female is called a reeve.

Ruffed Grouse (*Bonasa umbellus*), a species of the family Tetraonidæ, recognizable at once among all the other grouse by the absence of feathers on the lower half of the tarsi; it has also, on the sides of the neck, a ruff of soft, broad, and truncate feathers, to which the name refers; the tail is somewhat convex, and about as long as the wings; the color of the cervical tufts is a glossy black or brown, with a semi-metallic steel-blue or greenish border; the tail has two bands of gray, and between them a broad black one. The species, as understood by Messrs. Baird, Brewer, and Ridgway, is generally distributed throughout the N. temperate parts of North America, but is differentiated into several varieties—viz. (1) *Umbellus*, inhabiting the country E. of the Rocky Mountains; (2) *umbelloides*, inhabiting the Rocky Mountains and the interior of British America up to Yukon River; and (3) *Sabini*, found in Oregon, Washington Territory, British Columbia, etc.; these are distinguished by slight differences of color. The species in some sections (New England and the West) is known under the name of partridge; in others (the Middle States) as the pheasant; and in some of the British provinces as the birch partridge. It is chiefly found in hilly and woody countries and along the borders of water-courses, but also in the lowlands and canebrakes, as in Kentucky, rarely or never, however, on open plains. Its movements when walking are quite graceful and stately. When disturbed it runs into the bushes, squats, and remains close to the ground. It is difficult to shoot on the wing, on account of its unsteady flight. It rarely wanders far from its nest and abiding-place during the nuptial season. Theodore Gill.

Ruf'fin (Edmund), b. in Prince Edward co., Va., in 1794; was for many years president of the Virginia Agricultural Society; edited the *Farmer's Register* 1833–42, and other agricultural papers; published several treatises on scientific methods of agriculture; was the editor of Col. William Byrd's *Westover Manuscripts* (1841); was an ardent secessionist; fired the first gun at Fort Sumter, Apr. 14, 1861, and committed suicide near Danville, Va., June 17, 1865, because he was unwilling to live under the U. S. government.

Ruffi'ni (Giovanni), b. at Tagia, in Liguria, in the second decade of this century; lived some time in Switzerland, then in England, and afterward for many years in Paris, occasionally visiting his native place. While an exile in London he gave lessons in Italian, wrote for journals, and published his romance, *Lorenzo Benoni.* After this followed his *Doctor Antonio*, and these two works are still considered his *chefs-d'œuvre.* His novels have been translated from English into German and Italian. In 1848 his fellow-citizens elected him deputy to the Subalpine Parliament.

Ruff'ner (Henry), D. D., LL.D., b. in Virginia about 1788; became a Presbyterian clergyman, and was president of Lexington College, Va., 1837, and for many years thereafter. D. at Kanawha Dec. 17, 1861. Author of *Judith Bensaddi*, a romance, *The Fathers of the Desert, or an Account of the Origin and Practice of Monkery* (2 vols., 1850), a work of great research, and of many miscellaneous addresses and essays, the latest (1860) being an argument against the continuance of slavery in Virginia.

Rug'by, town of England, county of Warwick, on the Avon, 83 miles N. W. of London, has important horse, cattle, wool, and cheese fairs. Its celebrated grammar school, founded in 1567 by Lawrence Sheriff, of which Dr. Thomas Arnold was head-master 1828–42, has 14 teachers and about 500 students, and an income from endowment of nearly £5000. P. 8385.

Ru'ge (Arnold), b. at Bergen, island of Rügen, Sept. 13, 1803; studied philology and philosophy at Halle, Jena, and Heidelberg, but was sentenced in 1824 to five years'

imprisonment in the fortress of Colberg as a member of a secret political society; published in 1830 a translation of *Œdipus Coloneus*, a tragedy, *Schill und die Seinen*; was appointed professor of æsthetics at the University of Halle in 1831, and attracted much attention as a philosophical critic in the *Hallischen Jahrbücher* (1838–43); joined Karl Marx in Paris, and published with him the *Deutsch-französische Jahrbücher* (1843–45); published in 1845 *Zwei Jahre in Paris*; at Zurich and Leipsic published *Poetische Bilder* (2 vols.) and *Politische Bilder* (2 vols., 1847); was elected a member of the German Parliament in 1848, and founded in the same year the *Reform* at Berlin. This paper was soon suppressed, however, and, after some attempts at revolutionary intrigue in Dresden and Carlsruhe, he went in 1849 to London, where he formed a revolutionary committee with Ledru-Rollin and Mazzini. He soon separated from the committee, and since 1850 has lived at Brighton, mostly engaged in literary pursuits. Besides a number of translations and products of fiction, he has published *Unser System* (1850), *Aus früherer Zeit* (4 vols., 1862–67), *Manifest an das deutsche Volk* (1866), etc.

Rü'gen, an island in the Baltic, 1 mile off the coast of Pomerania, comprises an area of 361 sq. m., with 47,539 inhabitants, and belongs to Prussia. The scenery, with its bald promontories and cliffs covered with forests, is picturesque and romantic, the soil is fertile, and the fisheries along the coasts very rich. Cap. Bergen.

Ru'ger (THOMAS H.), b. in New York in 1833; graduated at the U. S. Military Academy 1854; practised law at Janesville, Wis., 1856–61; in June, 1861, entered the army; was appointed brigadier-general U. S. vols. 1863, and at the battle of Franklin, in command of a division, he won the brevet of major-general; in command of department of North Carolina until June, 1866; appointed colonel 33d Infantry July, 1866; transferred to the 18th in 1869; superintendent of the U. S. Military Academy at West Point since 1871.

Rug'gles, p.-v. and tp., Ashland co., O. P. 758.

Ruggles (DANIEL), b. in Barre, Mass., Jan. 31, 1810; graduated at West Point 1833; served in the Seminole and Mexican wars; was brevetted major and lieutenant-colonel for gallantry at Churubusco and Chapultepec, and served in the Confederate army, becoming major-general.

Ruggles (SAMUEL BULKLEY), LL.D., b. in Conn. in 1800; graduated at Yale College 1814; studied law; was admitted to the bar in New York City 1821; was elected to the State legislature 1838; became canal commissioner 1839; president of the canal board 1840 and 1858; was U. S. commissioner to the Paris Exposition 1866, to the international monetary conference at Paris 1867, and to the international statistical conference at the Hague 1869; and has published since 1831 a long series of pamphlets on subjects of political economy, law, and education. He has served upon many honorable public commissions, and is a member of numerous scientific organizations.

Ruggles (TIMOTHY), b. in Rochester, Mass., Oct. 11, 1711; graduated at Harvard 1732; became a lawyer at Sandwich and at Hardwick; was brigadier-general and second in command at the battle of Lake George, 1755; became a judge of common pleas 1756; chief-justice 1762; was Speaker of the assembly 1762–63; delegate to the Stamp Act congress at New York 1765; accompanied the British troops to Nova Scotia, and became a founder of the town of Digby. D. at Wilmot, N. S., Aug. 4, 1795.

Ruhr'ort, town of Rhenish Prussia, at the influx of the Ruhr in the Rhine, has a large trade in coal, timber, corn, shipbuilding, and shipping business. P. 7773.

Rule Britannia, a British national song or hymn, the words of which were composed by David Mallet (1700–65), and the music by Arne. It was first performed in 1740 as part of *Alfred* by Mallet and James Thomson.

Rule Ni'si, in law, is an order made by a court, generally on the *ex parte* application of one party to a pending suit, directing the other party to show cause against the granting of some relief specified therein. It is served upon or notice of it is given to the party against whom it was obtained, and it is then argued before the court like any other motion. The one showing cause is entitled to begin and to reply. The court in rendering its decision "makes the rule absolute"—*i. e.* grants the relief—unless (*nisi*) good cause has been shown, and in that case the rule is "discharged"—*i. e.* the relief is refused. In the English practice the term is principally used to designate the order which a party against whom a verdict has been given obtains from the court in bank, calling upon the successful party to show cause why such verdict should not be set aside for some error at the trial or because it is contrary to the evidence. JOHN NORTON POMEROY.

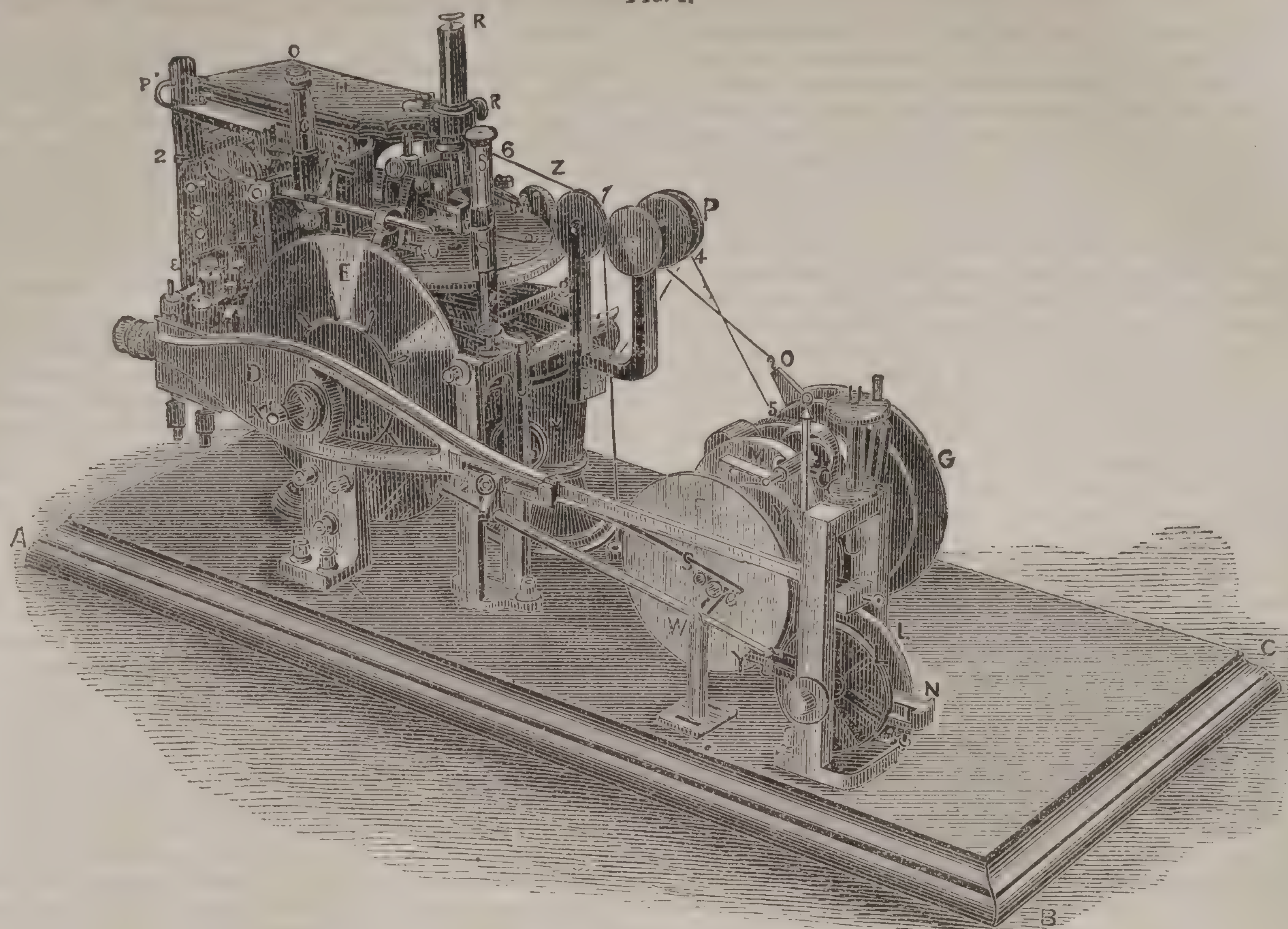
Rules of Practice. See PROCEDURE, by PROF. J. N. POMEROY, LL.D.

Rule to Show Cause, in law, is an order made by a court, usually upon an *ex parte* application, directing the party against whom it is obtained to appear at a time designated before the court and show cause why some particular thing should not be done or relief granted. In this country it is chiefly used as one method of making a litigated motion, the moving party supporting his application, and the other showing cause against it, by means of affidavits. JOHN NORTON POMEROY.

Rul'ing-Machine. Of late years the art of ruling lines upon glass or metal, which shall be parallel, equidistant, and at the same time shall present sufficient uniformity of tint and breadth, when viewed with powerful optical means, to suffice either for delicate measurements, or the diffraction of a ray of light to obtain a spectrum, or to serve as test-objects for microscopes, has received considerable attention. Among the most successful attempts may be mentioned those made by F. A. Nobert of Barth in Pomeranian Prussia, who has ruled lines of exquisite beauty which have been resolved up to 112,600 lines to the inch. Nobert has ruled, he says, one band which is so fine as to contain 240,000 lines to the inch; but our present optical power is not sufficient to enable these lines to be counted by microscopists. Specimens of these plates are in possession of Dr. F. A. P. Barnard of Columbia College, New York, and of Col. Dr. J. J. Woodward of the Army Medical Museum, Washington, D. C. L. M. Rutherfurd of New York has ruled a number of diffraction gratings, both in speculum metal and on glass, varying in fineness, with the end in view of lines equally spaced and uniform in width for diffraction-gratings. These gratings are justly celebrated for the fine definition they give to the spectrum formed by their means and the extreme precision of the spacing. Still more recently, W. A. Rogers of the Harvard College Observatory, whose aim has been to produce lines of extreme fineness for reticules in optical instruments, and for the more delicate tests for microscopic objectives, has been able to rule lines 60,000, 80,000, and even 120,000 to the inch. Mr. Fred. Habirshaw of New York has in his possession two plates of this last degree of fineness. The following is a brief description of the machine used by Mr. Rogers in his rulings.

It consists essentially of the following parts: (1) A mahogany base, A B C, on which the metallic parts of the machine rest. (2) A steel screw 10 inches long and $\frac{3}{4}$ of an inch in diameter, which is cut with 24 threads to the inch. This screw has a circle 11 inches in diameter, and graduated into 100 equal parts on its circumference for its head. The graduated circle is shown at E, and the screw itself is concealed under the horizontal circle I. This screw carries a nut which is attached to the under side of a plate, to which is affixed the centre around which the horizontal circle I may be made to move. The circle E is read by the microscope O O′, which contains in its field of view a scale divided into 100 equal parts, whose terminal points are made to coincide with two of the consecutive divisions in the circumference of the circle E, and since this circumference is divided into 100 equal parts, it is obvious that by revolving this circumference so that one of its divisions shall pass over the space included between two divisions in the reticule of the microscope O O′, we shall have turned the screw $\frac{1}{10000}$th of an entire revolution, and consequently have moved the nut which carries the horizontal circle I a space equal to $\frac{1}{240000}$th of an inch. By estimating fractional parts of the distance between two consecutive divisions of the scale in the field of view of the microscope, the circle E might be revolved through even a smaller portion of its own circumference than the $\frac{1}{10000}$th part. (3) A heavy iron plate H supported on two ways, which are carefully ground, and permit the plate to move in a direction perpendicular to the axis of the screw before described. This iron plate carries an upright bar R R′, to the lower extremity of which is attached the mechanism for holding the diamond used in ruling. At R′ and at 1 cords are attached acting over pulleys at 2 and 7, and carrying weights at their other ends, so that if one of these weights be lifted, the other weight will act to move the iron plate H with its attachments in one direction, and the plate H may be made to move in the opposite direction by lifting the second weight. Thus, it will be seen that the plate H may be made to move forward and backward in the most equable manner, provided there are some means of causing these two weights to be alternately lifted at the proper times. This is accomplished by belting the wheel G to a small water-motor engine. Two eccentrics, placed 180° apart, revolve with the wheel G, and by an ingenious arrangement, of which the pulleys at 7, 4, 9 are a part, the weights which move the plate H are alternately lifted

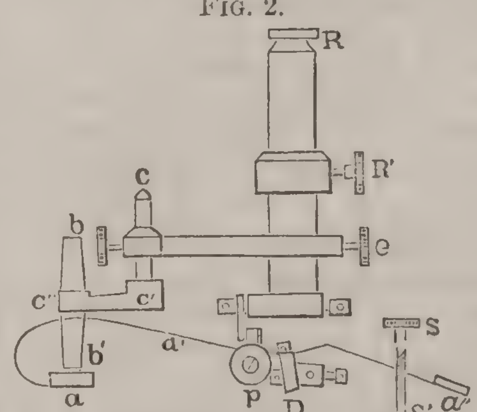
Fig. 1.



Rogers's Ruling-machine.

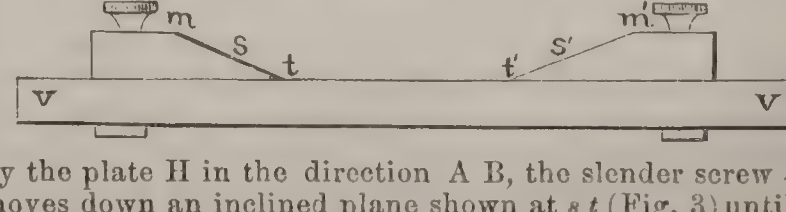
at the proper times. Instead of the water-motor engine applied at G, there is an arrangement by which magneto-electricity may be used through the revolving magnets shown at 5 M. Below E small spokes are shown by which the circle E may be moved by hand, but in the nicest ruling it is desirable that the screw should be moved automatically. (4) An arm D*d* moving on a centre at X′, and carrying at J two electro magnets swinging on pivots, so that their motion is in the direction of the arm D*d*, and consequently the magnets may be swung close against the circumference of the circle E, whose outer edge is made of soft iron, and constitutes the armature to the electro magnets. If now we pass an electric current through the magnets at J*z*, the magnets will swing upon their pivots, owing to their attraction of the soft iron in the rim of the circle, and will, by their pressure against the rim, produce enough friction to hold the rim immovably against the magnets while the bar D*d* is moved through any desired distance. Thus, a means is provided of moving the circle E a distance which may be made uniform for any consecutive number of times by simply allowing the end *d* of the arm D*d* to move between limits, the upper limit being the end of the screw whose head is shown at U, and the lower limit being a wheel L so arranged as to have one entire revolution in the same time as the large circle E. A revolving wheel is chosen in order to permit the screw to correct its own errors in the following manner: The electro magnets J receive the current through a wheel F S W, which revolves with the wheel G. Half its circumference is covered with ebonite, and the circuit is only complete when the projecting arm M, to which is attached the battery wire, is in contact with the *metal* half of the circumference of the wheel F S W; consequently, during one half a revolution of the wheel F S W the electro magnets J are attracting the soft iron circumference of the wheel E, and therefore the wheel E is firmly attached to, and may be moved by, the arm D*d* during one-half of the revolution of the wheel F S W. When the projecting arm M is no longer in contact with the metallic surface, but has broken the circuit by coming in contact with the ebonite half of the circumference, the eccentric *e* touches the spring S, and completes the circuit from a second battery through the wheel F S W, the spring S, the arm D*d*, and another electro magnet J′. This magnet now acts as did the former magnets J; but being attached to the base A B C by metal uprights, and swinging on horizontal pivots, it acts to hold the wheel E firmly during the half revolution of the wheel F S W when the magnets J are not exerting their power. Connected to the arm D*d* at V is a bar V W, pivoted at W, and as the point V is raised and lowered, the point Y′ is also moved, and in its motion carries a disconnected arm *down*, which is connected with the wheel L′ by an arrangement which permits the arm to move the wheel L′ in one direction, but not in the opposite one. The wheel L′ is permanently fixed to the same axis as the wheel L. The wheel L supports on its circumference the lower side of the arm D*d*. It will be seen from what has been stated that the screw should carry the plate which supports the circle I, and consequently the plate to be ruled, which is firmly held upon the circle I, a distance exactly proportional to the space between the lower end of the screw U and the uppermost point of the circumference of the wheel at L, provided that the revolution of the circle E through the same arc has the same value in the movement of the plate which carries the circle I in a direction parallel to the axis of the screw; but owing to various causes it is found that this value is not the same for different parts of the screw. To compensate for this irregularity, the amount of motion of D*d* for various positions of the circle E is found by observation, and the circumference of the wheel L is then so filed that its form will be such that the distance between the lowest point of the screw U and the upper surface of the wheel's circumference will be such that the arm D*d* shall be made to move through varying distances, which shall be so adjusted that a greater movement of the arm will compensate an irregularity of the screw which tends to shorten the value of a particular part of the circumference of E, and *vice versâ*. (5) A graduated circle I, which may be rotated, and its position noted by means of the microscope *ss*′. This circle carries the plate to be ruled, and it is made to rotate so that lines may be ruled making any desired angle with each other. (6) An apparatus for carrying the diamond while the line is being cut, and for raising it from the plate during the motion of the plate H in the opposite direction.

Fig. 2.



This apparatus is partly sketched in Fig. 2, where R R′ is the upright piece shown in Fig. 1, which is connected to the movable plate H by a collar and binding-screw R′. *a a′ a″* is a spring about 7 inches long, pivoted at *p*, so as to swing freely and to raise or lower the diamond held in any position by the screws at D. At *a* and *a′* two cups are fixed to hold any small weights added to give greater depth to the diamond cut. As this whole apparatus is carried

Fig. 3.

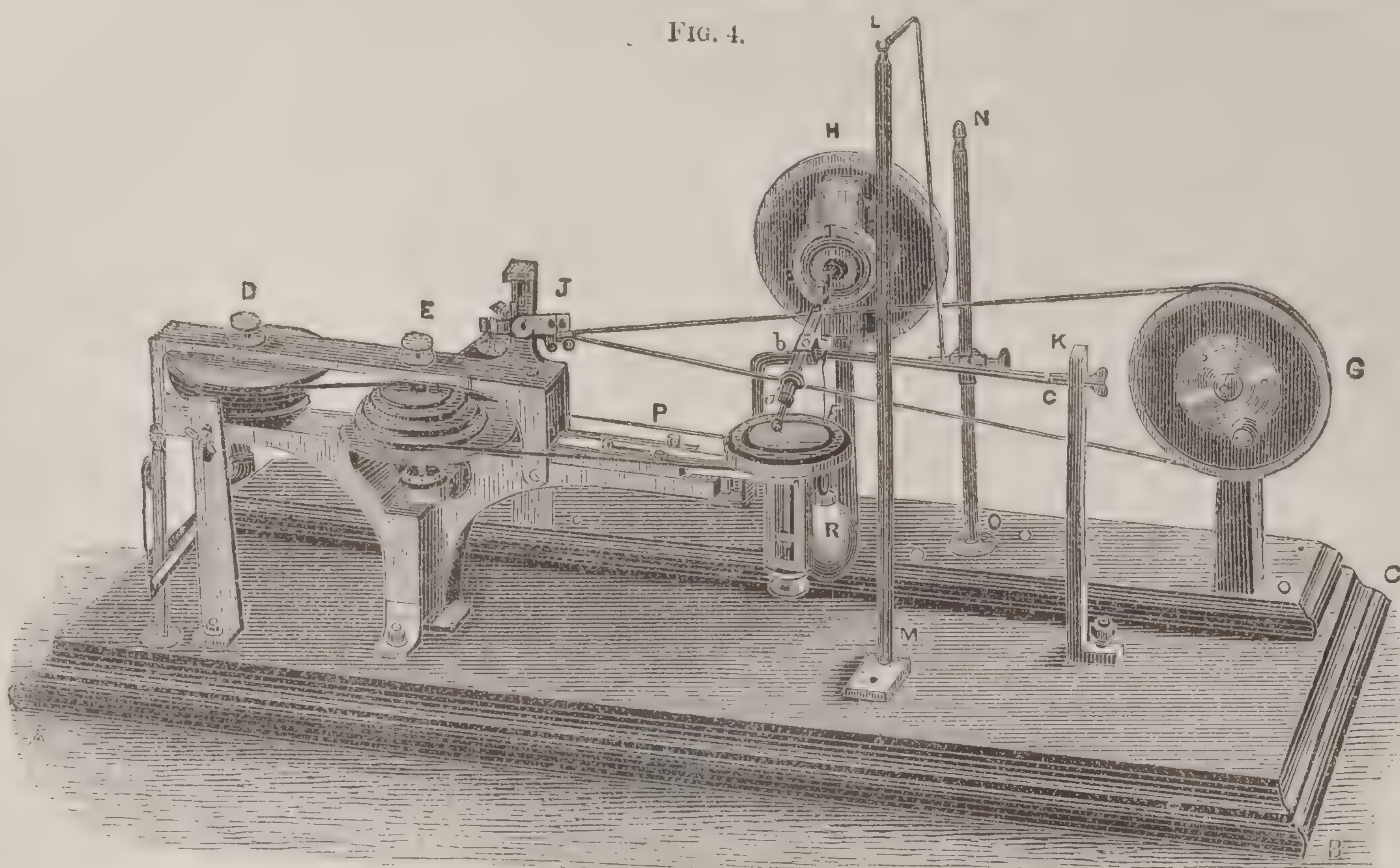


by the plate H in the direction A B, the slender screw *s s*′ moves down an inclined plane shown at *s t* (Fig. 3) until it

reaches the point t, when the screw glides into a channel cut in the bar $v\,v$, and the diamond is thus let fall gently upon the glass surface contiguous to the piece $v\,v$ on the circle I. So too the diamond is as gently raised from the glass by the surface $t'\,s'$. To prevent the diamond cutting as it is carried back to its first position for the next line, when the screw $s\,s'$ (Fig. 2) has just reached the upper surface of the plane m', a screw presses against the top b of an arm pivoted at c'' (Fig. 2), so that the lower end of the arm b' presses against the spring and holds it in the position in which it is when the diamond is lifted from the glass, until it reaches the point from which it started, and then another screw presses against b', and so releases the spring $a\,a'\,a''$, which now has the screw $s\,s'$ resting upon the plane m (Fig. 3), ready to be carried down the inclined plane $s\,t$, and thus rule the next line.

One of the greatest impediments to fine ruling is the difficulty of getting a diamond point which shall present a cutting edge sufficiently sharp. The following figure shows the arrangement in use by Mr. Rogers. The dia-

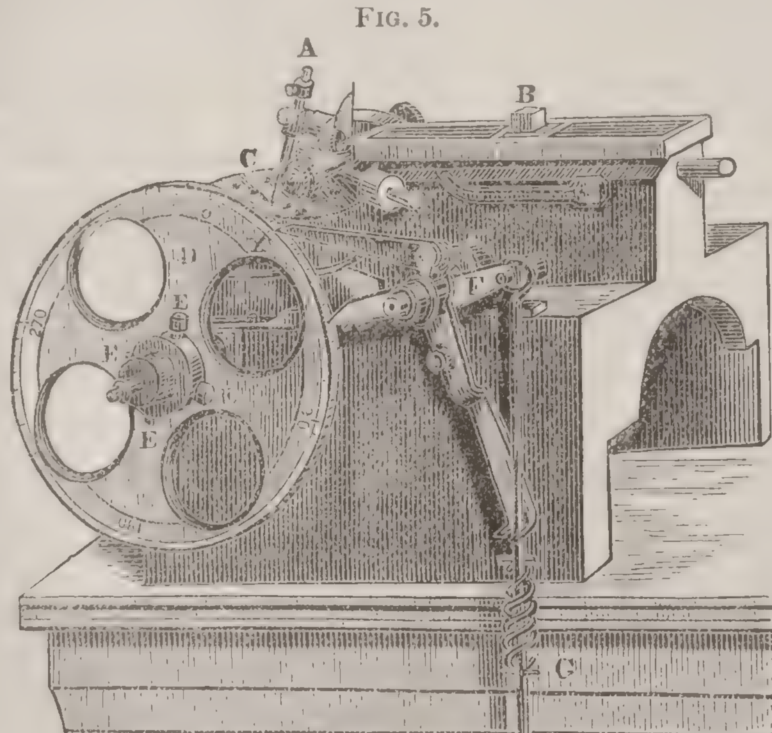
FIG. 4.



mond to be ground is held by an arm $a\,a'$ upon the hard iron surface at F. By a system of pulleys at J, and belts, shown in the drawing, which connect two eccentrics at D and E, the diamond may be ground either to a conical point or to a knife edge, or to a point which shall have any desired number of faces. The diamond rests upon the plate F by simple gravity, but any additional pressure may be given to it by simply suspending a weight R from the arm which carries the diamond. This arm has a combination of a ball-and-socket and a hook joint, which permits motion in every direction.

The ruling-engine of Mr. Rutherfurd, referred to above, is simpler in construction than that just described, but performs its work with a truly wonderful precision. It is represented in Fig. 5. In this figure C represents a plate carrying the glass or speculum plate to be ruled, which is made to advance in short successive steps in a direction parallel to the axis of a screw with 48 threads to the inch. The head of this screw is formed of a circular plate D whose rim is notched with 360 equally-spaced teeth. In the drawing the pawl is shown pressing against one of these notches at X. The oscillating motion of the lever F causes the pawl to fall into a notch of the wheel D, and by its push to rotate the wheel by a definite fraction of its circumference, then to lift the pawl, and to retract it for another forward motion on the wheel D. While the screw is thus advancing the plate C, the diamond-pointed tool A is raised and carried forward above the surface of the glass or speculum plate. After the screw has ceased its rotation, the diamond point falls gently upon the glass or speculum plate on C, and then retracts and cuts a line. The above reciprocating motion of the tool A is caused by the action of the vertical arm of a lever which is attached to the same shaft which carries the lever F. A driving-wheel, revolved by a small turbine from which leads a cord, carries a crank-pin, which is jointed to the rod below G. The errors in the thrust of the screw caused by its eccentricity, or want of coincidence of the axis of figure of the screw and its axis of rotation, are corrected by giving to the feed-wheel D an eccentricity opposed to that existing in the screw. The screws at E E E serve to alter the position of the centre of the feed-wheel D, and thus to give it the required eccentricity. L. WALDO.

FIG. 5.



Ruling-engine of L. M. Rutherfurd.

Ru'lo, p.-v. and tp., Richardson co., Neb., on Missouri River and Atchison and Nebraska R. R., has 1 newspaper. P. of v. 611; of tp. 1326.

Rülsk, town of Russia, government of Kursk, on the Seine, has several educational and benevolent institutions and some manufactures. P. 7029.

Rum, a spirituous liquor distilled from molasses. It is largely produced on the sugar-plantations in the West Indies, that from Jamaica being considered the best. The wort is prepared by mixing about 100 gallons of molasses, 300 gallons of skimmings from the clarifiers, 200 gallons of lees from previous fermentations, called *dunder*, and 400 gallons of water. This mixture averages about 15 per cent. of sugar. The fermentation is complete in from nine to fifteen days. It is then distilled, and molasses or caramel is added to color and flavor it. The peculiar flavor of rum is chiefly due to butyric ether, produced during the fermentation. Acetic and other ethers are also present. Pineapples and guavas are often thrown into the still. Rum is greatly improved by age. Rum was formerly largely manufactured in New England, especially at Newport, R. I., and was a prominent article of exportation to Africa in connection with the slave-trade. Great quantities of rum are produced by flavoring and coloring rectified proof spirit. C. F. CHANDLER.

Ru'ma, town of Austria, in the Serbian waywodeship, on an affluent of the Save, has fine horses. P. 7800.

Rum'beke, town of Belgium, province of West Flanders, manufactures linen, lace, and chicory. P. 5625.

Rum'ford, p.-v. and tp., Oxford co., Me., on Androscoggin River. P. 1212.

Rumford (BENJAMIN **Thompson**), COUNT, b. at Woburn, Mass., Mar. 26, 1753; received a common-school ed-

ucation at Woburn and Medford; became a merchant's clerk at Salem 1766, and subsequently at Boston; devoted his leisure to the study of natural science, attending the lectures of Prof. Winthrop of Harvard; taught an academical school at Rumford (now Concord), N. H., 1771–72; married there a wealthy widow lady, Mrs. Rolfe; was appointed by the royal governor major of New Hampshire militia; sympathized with the early movements for resistance to British oppression, but was soon involved in rivalries and jealousies on the part of some of his brother-officers, who accused him of lack of patriotism; was unsuccessful in an application for a commission in the Continental service; found it expedient to leave Rumford, and afterward Woburn, on account of charges of disaffection; went within the British lines around Boston Oct. 10, 1775; went to England with Lord Howe's despatches after the fall of Boston 1776; obtained a position in the colonial office under Lord George Germaine; continued his scientific researches; was chosen F. R. S. 1778; became under-secretary 1780; went to New York 1781; raised a regiment of loyalists called "the King's American Dragoons," of which he became lieutenant-colonel; served in the Carolina campaign against Marion 1782; returned to England 1783; entered the service of the elector of Bavaria the same year; settled at Munich as aide-de-camp and chamberlain, and was knighted 1784; reorganized the Bavarian military service; acquired great influence with the elector, who took his advice on nearly every subject, made him major-general, councillor of state, lieutenant-general, commander-in-chief of the general staff, minister of war, and count of the Holy Roman empire 1790, on which occasion he chose as his title the name of the town in New Hampshire where he had resided and married. Many vigorous reforms were effected by Count Rumford in the Bavarian administration, as well as improvements in military training, in methods of agriculture, in the practice of mechanic arts, and in the introduction of improved breeds of stock; beggary was extirpated, and a handsome park improvised for the people of Munich out of an old hunting-ground in the vicinity. He travelled in Italy and England 1795; became president of the Bavarian council of regency 1796; published in separate pamphlets accounts of a large number of scientific experiments, which he collected under the title *Essays, Political, Economical, and Philosophical* (London, 3 vols. 8vo, 1796), which were reprinted in Boston (3 vols., 1798), and soon passed through 5 eds.; left the Bavarian service on the elector's death, 1799; was chiefly instrumental in founding the Royal Institution at London in that year; settled at Paris and published his *Philosophical Papers* (vol. iv. of his *Essays*, 1802); married the widow of Lavoisier 1804, and spent the remainder of his life in quiet prosecution of his scientific studies at his wife's villa of Auteuil, near Paris, where he d. Aug. 21, 1814. He contributed to science a considerable number of valuable observations and discoveries, especially upon his favorite subject, that of heat, of which he came near discovering the mechanical equivalent; made a series of experiments which directly conducted at a later period to the discovery of the correlation of forces; was also one of the pioneers of modern researches in optics and magnetism; left prizes to be awarded by the Royal Society of London and the American Academy of Sciences at Boston for discoveries on light and heat, and was himself the recipient of the first Rumford prize from the Royal Society; and endowed in Harvard College the Rumford professorship of the "physical and mathematical sciences as applied to the useful arts." (See his *Life*, by Rev. Dr. George E. Ellis, 1871, and his *Works*, edited by the same gentleman, London, 4 vols., 1876.) PORTER C. BLISS.

Rum'ley, tp., Harrison co., O., on Pittsburg Cincinnati and St. Louis R. R. P. 1158.

Rum'ney, p.-v. and tp., Grafton co., N. H., on Boston Concord and Montreal R. R. P. 1165.

Rump Parliament, the popular name applied in English history to a remnant of the Long Parliament, consisting of 60 members, who, after the expulsion of three-fourths of that body, Dec. 6, 1648 (known as "Pride's Purge"), were allowed by Cromwell to represent the farce of legislation, and co-operated with him and with the army in effecting the trial and condemnation of Charles I. The Rump, having attempted to resist certain encroachments of the army, was dissolved by Cromwell Apr. 20, 1653; was restored by a military movement during the protectorate of Richard Cromwell; was a second time expelled by the army Oct. 13, 1659; reassembled on the advance of Gen. Monk from Scotland 1660, and decreed its own dissolution Mar. 16, 1660.

Rum'sey, p.-v., McLean co., Ky., on Green River. P. 216.

Rumsey (JAMES), b. at Bohemia Manor, Cecil co., Md., about 1743; became a machinist; made several improvements in the mechanism of mills, and in Sept., 1784, exhibited on the Potomac River, in the presence of Gen. Washington, a boat which ascended the stream by mechanical appliances. Two years later he introduced a steam-engine of his own construction into his boat on the Potomac; obtained a patent for steam navigation from the State of Virginia 1787; published at Philadelphia his *Short Treatise on the Application of Steam*, which involved him in a controversy with John Fitch; organized at Philadelphia a "Rumsey Society" for the promotion of steam navigation 1788; went to England soon afterward; organized there a similar society; built a new steamboat; obtained patents in England, France, and Holland, and made a successful trip on the Thames Dec., 1792. D. suddenly a few days later at London, Dec. 23, 1792. The legislature of Kentucky presented in 1839 a gold medal to a son of Rumsey, "commemorative of his father's services and high agency in giving to the world the benefit of the steamboat."

Run'corn, town of England, county of Chester, on the estuary of the Mersey, has extensive shipbuilding yards, collieries, and quarries of slate and freestone. P. 10,434.

Ru'neberg (JOHAN LUDWIG), b. at Jakobstad, in Finland, Feb. 5, 1804, and studied, supported by a public subscription, at the University of Åbo from 1822 to 1827. In 1830 he became lector of æsthetics at the University of Helsingfors, but removed in 1837 to Borgo, and in 1842 became professor of Greek literature at that gymnasium. Although he was born in Finland and spent his whole life in that country, he wrote Swedish; and although he was liberally supported by the Russian government, he sung the valor and perseverance of his countrymen in resisting the invading and conquering Russians. These peculiarities of his position contributed, of course, their part to the immense popularity which his poems acquired both in Finland and Sweden, but his success was principally due to his talent. His genius was essentially lyrical; in that respect he resembled all other Swedish poets. But his lyrical faculty was delicately harmonious, not loud and exuberant, and it was accompanied by considerable plastic power. His numerous minor poems evinced a strong sense of reality. His idyls, *Hanna* (1836) and *Julquällen* (1841), and his tales in verse, *Elgskytterne* (1832) and *Nadeschda* (1841), are true epics, only with a lyrical swing in the outlines. His dramas, of which *Kungarne pa Salamis* (1863), a tragedy in antique form, is the most remarkable, contain real characterization. The most celebrated of his works is *Fänrik Ståls Sägner* (1844), a collection of ballads treating subjects taken from the war between Sweden and Russia, when Finland was conquered by the latter. The tone of these ballads is very varied, ranging from the highest pathos to an almost gossiping humor. But the rhythm is always harmonious and delicate, the picture striking and impressive, the feeling sound and strong. The book is read in Denmark, Norway, and Sweden by all who read books, and it contains some of the highest ideals which modern literature has created, in some of the simplest forms which modern art has produced.

CLEMENS PETERSEN.

Runes [Ang.-Sax. *rûn*, "secret letter"], the alphabet used by the Teutonic races of Northern Europe before their intercourse with the Romans and adoption of the Roman characters. The word *runa* means "a secret," and the name signifies the use to which in the earliest days the runic letters were chiefly applied—namely, as a depository of secrets. There existed three different systems—the Scandinavian, comprising 16 characters, the German, 22, and the Anglo-Saxon, more than 30—but they resemble each other so closely that they evidently were simple developments of the same original type. At what time this primitive alphabet first came into use is not known. The Scandinavian myths say that Odin was the inventor of the runes. But a similarity which exists between some of the runic characters and the corresponding ones of the Phœnician alphabet has occasioned the hypothesis that the runes were first brought to the peoples around the Baltic by Phœnician merchants. The runes were never used for literary purposes. In the earliest times they were cut on swords, utensils, ornaments, etc. as mystical—or, rather, magical—signs, and they were generally believed to exercise a latent but powerful influence. Later, they were much used for inscriptions on sepulchral monuments. They were, however, also used as a means of communication; a man would cut a message on a stick in runic characters and send it round to his friends. Still more extensive was the use which was made of the runic characters for the direct purpose of witchcraft. Tacitus tells us that the old Germans cut runes on sticks, mixed them together on a cloth, and endeavored to make discoveries or extract

revelations from the accidental combinations which the runes might form; and the old popular songs contain many stories of the magical power which runes exercised over the hearts and minds of men. With the introduction of Christianity the Roman alphabet was generally adopted and the runes fell into desuetude—in Scandinavia and England about the year 1000; in Spain they were condemned by the Council of Toledo in 1115. The most prominent among those who have studied the runes and written about them are the Icelanders Bynjulfsen and Finn Magnusen, the Swede Liljengren, the Danes Worsaae and Thortsen, the Englishmen Kemble and Stephens, and in Germany Wilhelm Grimme.

Rungpoor′, district of British India, presidency of Bengal, between 25° 16′ and 26° 21′ N., and bounded E. by the Brahmapootra. Area, 4112 sq. m. Pop. 2,559,000. The surface is very low, and in the wet season entirely inundated. Cotton does not succeed. Indigo is the principal product; 50 large factories are in operation.

Runjeet′ Singh, maharajah of the Punjaub, commonly known as the king of Lahore, b. at Gugaranwalla Nov. 2, 1780; lost his father, who was chief of one of the military organizations of the Sikhs, when he was only twelve years old. His mother, who governed during his minority, endeavored to spoil him and make him effeminate, but she failed, and when he was seventeen years old he poisoned her and assumed the reins of government himself. He was energetic and ambitious, and, although entirely uneducated, developed great tact and insight in all his undertakings. Unlike other Hindoo chiefs, he was faithful to treaties, and, unlike other Asiatic despots, he was bent not only on conquest, but also on raising his people to a higher standard of civilization. By the aid of French officers he organized and disciplined his army and subjugated the neighboring Sikh chiefs. Those, however, whose dominions were situated between the Sutlej and the Jumna asked for help from the British East India Company in 1809, and obtained it. An English army was sent against Runjeet Singh, but a friendly agreement was concluded by which the Sutlej was established as the boundary of his dominions. He then attacked the Afghans, conquered Cashmere in 1819 and Peshawer in 1829, and at his death at Lahore (June 27, 1839) he left an empire comprising more than 20,000,000 inhabitants and a disciplined army of 70,000 men. (See H. T. Prinsep, *Origin of the Sikh Power in the Punjaub, and Political Life of Runjeet Singh* (1839), and W. L. Macgregor, *Runjeet Singh*.)

Run′kle (John Daniel), LL.D., b. at Root, Montgomery co., N. Y., Oct. 11, 1822; graduated at the Lawrence Scientific School at Cambridge, Mass., 1851; developed a remarkable talent for mathematics and astronomy; was employed in 1849, while still a student, to assist in preparing the *American Ephemeris and Nautical Almanac*; has continued to take part in editing succeeding editions of that work; edited the *Mathematical Monthly* (1869–71); became professor of mathematics in the Massachusetts Institute of Technology 1865, and president of that institute 1870. Author of *New Tables for determining the Values of the Coefficients in the Perturbative Function of Planetary Motion* (*Smithsonian Contrib.*, 1856).

Run′nels, county of W. Texas, on N. fork of Colorado River, had no inhabitants in 1870. Area, about 750 sq. m.

Run′nymede, a long slip of green meadow stretching along the right bank of the river Thames, near Egham, in Surrey, England, memorable as the spot where the signature of King John to Magna Charta was extorted by the insurgent barons June 19, 1215. Charter Island, in the river close at hand, is sometimes claimed as the locality of this event, it being alleged that the river has since then changed its channel. Runnymede has also been from times immemorial noted for the annual Egham horse-races in August, whence some authorities derive the name (*i. e.* "Running-mead").

Rupee′ [Skr. *rûpya*], a silver coin current in India, usually estimated as equivalent to 2*s*. English. There have been a large number of rupees struck by different Indian princes, varying considerably in weight and value. The best known are the Sicca, Dacca, Furruckabad, Bombay, Madras, and East India Company's rupees.

Ru′pert, p.-v. and tp., Bennington co., Vt., on Rutland and Washington branch of Rensselaer and Saratoga R. R. P. 1017.

Rupert, or **Robert,** Prince, b. at Prague, Bohemia, Dec. 17, 1619, son of Frederick V., elector palatine and king of Bohemia, by his wife, Elizabeth, daughter of James I. of England; took part in the Thirty Years' war from childhood, having become a colonel of cavalry in active command at the age of eighteen years; was placed in command of a regiment of cavalry at the beginning of the civil war in England, and distinguished himself in nearly all the battles as the most dashing leader of the royalists. At the Restoration he was made a privy councillor and admiral of the fleet; was one of the founders of the Royal Society; first governor of the Hudson's Bay Company 1670; governor of Windsor Castle during the later years of his life; spent much of his time in painting and engraving, in experiments in mechanics, chemistry, and alchemy, and has been credited with the invention of mezzotint, of pinchbeck or "prince's metal," and of the glass bubbles called "Rupert's drops." D. at Spring Gardens, London, Nov. 29, 1682, and was buried in Westminster Abbey.

Rupert's Drops. See Prince Rupert's Drops.

Rupert's Land. See North-west Territories.

Ruphia, or **Rouphia,** river of Greece. See Alpheus.

Ru′pia [from the Gr. ῥύπος, "filth"], a severe and chronic skin disease, usually, but not always, syphilitic in its origin. It generally begins in blebs filled with a sanious fluid. These finally become ulcers covered by a thick scab. The disease appears in broken-down patients, and is to be met with tonics, good food, cleanliness, the use of iodide of potassium, etc. Locally, the ulcers may be poulticed and then touched with caustic.

Rupp (Isaac Daniel), b. near Harrisburg, Pa., July 10, 1803; author of *History of the Religious Denominations of the U. S.* (1844), *Early History of Pennsylvania and the West* (1846), and histories of nearly all the counties of Eastern Pennsylvania, in 6 vols. (1844–47).

Rüp′pell (Wilhelm Eduard Peter Simon), b. at Frankfort Nov. 20, 1794; visited Egypt in 1817, Nubia, Kordofan, and parts of Arabia 1822–27, Abyssinia 1833–34, and communicated the results of his researches in his *Fundgruben des Orients* (5 vols., 1818), *Reise in Nubien, etc.* (1829), *Neue Wirbelthiere zur Fauna Abyssiniens gehörig* (1835–40), *Reise in Abyssinien* (2 vols., 1838–40), *Systematische Uebersicht der Vögel Nord- und Ostafrikas* (1845). His collections of coins, antiquities, manuscripts, etc. he sold to the city of Frankfort.

Ruppin′, Neu, town of Prussia, province of Brandenburg, has tanneries, spinning-mills, manufactures of cloth and chicory, and several large cattle-markets. P. 10,303.

Rupture. See Hernia, by E. J. Bermingham, M. D.

Ru′ral, tp., Shelby co., Ill. P. 909.

Rural, v., Franklin tp., Clermont co., O., on Ohio River. P. 119.

Ruremonde. See Roermond.

Ru′rik, founder of the first Russian dynasty. See Russia.

Ru′schenberger (William S. W.), b. in Cumberland co., N. J., Sept. 4, 1807; educated at New York and Philadelphia; became a surgeon in the U. S. navy about 1826; made repeated voyages in the Pacific and the East Indies; was fleet surgeon 1835–37; director of the U. S. naval hospital, Brooklyn, 1843–47; wrote much on medical, scientific, naval, and literary topics, and retired from the service with the rank of commodore Sept. 4, 1869. Author of *Three Years in the Pacific* (1834), *A Voyage round the World* (1838), *Elements of Natural History* (1850), *A Lexicon of Terms used in Natural History* (1850), and *Notes and Commentaries during a Voyage to Brazil and China* (1854).

Rus′cumb Man′or, tp., Berks co., Pa. P. 1408.

Rush [Lat. *ruscum*], a common name for the Juncaceæ, a natural order of endogenous herbs, of which the genus *Juncus* is the type, and of various Cyperaceæ (mostly species of *Scirpus*), with naked, tough, and flexible stems. There are many species, mostly in wet and cold regions. They are employed in making chair-bottoms, mats, etc. Rushes are used in Europe for strewing the floors of cottages, instead of carpets. The pith of some kinds is used sometimes for a candlewick; hence the name "rushlight." Most of our numerous U. S. species are also European and Asiatic. *Juncus bulbosus* is the black grass of the salt marshes. This makes excellent hay. *Scirpus lacustris* and some nearly-related species are the bulrushes, of which the tule of California, Peru, etc. is one of the most important.

Rush, county of E. Indiana, watered by Big Blue, Little Blue, and Flat Rock rivers, and traversed by Cincinnati Hamilton and Dayton R. R., which intersects Columbus branch of Jeffersonville Madison and Indianapolis R. R. at Rushville. The surface is broken, consisting largely of table-land. The chief industries are agriculture, stock-raising, and lumbering, the staple products being Indian corn, wheat, wool, butter, maple-sugar, and sorghum-molasses. There are 3 woollen-mills, 5 flour-mills,

10 brick-kilns, and 15 wagon manufactories. Cap. Rushville. Area, 410 sq. m. P. 17,626.

Rush, a new county of Central Kansas, intersected by Big Timber and Walnut creeks, tributaries respectively of Smoky Hill Fork and Arkansas rivers, consists of fertile rolling prairies. Area, 720 sq. m.

Rush, p.-v. and tp., Jo Daviess co., Ill. P. 1036.

Rush, tp., Shiawassee co., Mich., on Shiawassee River and on Saginaw division of Michigan Central R. R. P. 683.

Rush, tp., Buchanan co., Mo. P. 1629.

Rush, p.-v. and tp., Monroe co., N. Y., on Genesee River and New York Central R. R. P. 1654.

Rush, tp., Champaign co., O., on Atlantic and Great Western R. R. P. 1789.

Rush, tp., Scioto co., O., on Scioto River. P. 638.

Rush, p.-v. and tp., Tuscarawas co., O., on Stillwater Creek. P. 977.

Rush, tp., Centre co., Pa., on Moshannon Creek and Pennsylvania R. R. P. 1963.

Rush, tp., Dauphin co., Pa., on Schuylkill and Susquehanna R. R. P. 105.

Rush, tp., Northumberland co., Pa., on Susquehanna River. P. 1324.

Rush, tp., Schuylkill co., Pa., in the Lehigh coal-basin, and on Lehigh Valley and Philadelphia and Reading R. Rs. P. 2291.

Rush, p.-v. and tp., Susquehanna co., Pa. P. 1418.

Rush (Benjamin), M. D., LL.D., b. at Byberry, near Philadelphia, Pa., Jan. 4, 1746 (N. S.); graduated at Princeton 1760; studied medicine at Philadelphia, Edinburgh, London, and Paris; commenced practice at Philadelphia Aug., 1769, being at the same time chosen professor of chemistry in the medical college of that city; was a member of the provincial conference of Pennsylvania 1776, in which he moved the resolution to consider the expediency of a declaration of independence; was chairman of the committee thereupon appointed, and as such presented a report in favor of the measure; was chosen to the Continental Congress to fill a vacancy in June, and was one of the signers of the Declaration of July 4, 1776. In the same year he married Julia, daughter of Richard Stockton of New Jersey, one of his fellow-"signers;" was appointed in Apr., 1777, surgeon-general, and in July physician-general, of the military hospitals for the middle department, in which capacity he attended the wounded after the battles of Princeton and Brandywine; resigned that post Feb., 1778, on account of dissatisfaction with the mismanagement of the hospital stores; established in 1785 the first dispensatory in the U. S.; was a member of the Pennsylvania convention of 1787 for the ratification of the Federal Constitution; published four letters to the people of Pennsylvania pointing out the defects of the State constitution of 1776, and sat in the convention which formed the constitution of 1780; exchanged his professorship for that of the theory and practice of medicine on the death of Dr. John Morgan, Oct., 1789, to which he added that of clinical practice on the change of title of the medical college in 1791 to that of the University of Pennsylvania, and that of the practice of physic 1796; rendered eminent services to humanity during the yellow-fever epidemic of 1793, which were subsequently recognized by testimonials from the king of Prussia (1805), the queen of Etruria (1807), and the emperor of Russia (1811); participated in the professional education of above 2000 medical students; attended to a wide private practice; was one of the founders of Dickinson College, vice-president of the Philadelphia Bible Society and of the American Philosophical Society, president of the Philadelphia Medical Society and of the Society for the Abolition of Slavery, and was treasurer of the U. S. mint from 1799 until his death, at Philadelphia Apr. 19, 1813. From his nineteenth year he was a frequent writer upon professional, scientific, political, religious, social, and ethical topics. Selections from his productions were republished under the title *Medical Inquiries and Observations* (5 vols., 1789–98; 2d ed., 4 vols., 1804; 3d ed., 4 vols., 1809), and the best of his other miscellaneous works were collected by himself into three vols., *Medical Inquiries and Observations upon the Diseases of the Mind* (1812; 5th ed. 1835), *Sixteen Introductory Lectures to Courses of Medicine* (1811), and *Essays, Literary, Moral, and Philosophical* (1798; 2d ed. 1806). He had published an early volume of *Medical Tracts*, and left unfinished a treatise on *The Medicine of the Bible*. Porter C. Bliss.

Rush (James), M. D., son of Dr. Benjamin, b. at Philadelphia, Pa., Mar. 1, 1786; graduated at Princeton 1805; studied medicine with his father, also at the University of Pennsylvania, and in Edinburgh; practised his profession some years; acquired by marriage a large fortune; published his valuable *Philosophy of the Human Voice* (1827), *Hamlet, a Dramatic Prelude* (1834), *An Analysis of the Human Intellect* (1865), and *Rhymes of Contrast on Wisdom and Folly* (1869). D. at Philadelphia May 26, 1869. By will he bequeathed above $1,000,000 to found the "Ridgway Branch of the Philadelphia Library," upon certain eccentric conditions, one of them being that no bound volumes or other collections of newspapers should ever form part of the library.

Rush (Richard), son of Dr. Benjamin, b. at Philadelphia, Pa., Aug. 29, 1780; graduated at Princeton 1797; studied law with William Lewis; was admitted to the Philadelphia bar 1800; quickly gained a leading position; became attorney-general of Pennsylvania Jan., 1811; comptroller of the State treasury Nov., 1811; was attorney-general of the U. S. Feb. 10, 1814–Dec. 15, 1817, having temporarily acted as secretary of state in the latter year; was minister to England 1817–25; negotiated treaties respecting the fisheries (1818), the N. E. boundary, the Oregon question, and the slaves carried from the U. S. in British vessels after the Treaty of Ghent; was secretary of the treasury under Pres. J. Q. Adams 1825–29; was a candidate for the Vice-Presidency on the ticket with Adams 1828; negotiated in Holland a loan for the corporations of the District of Columbia 1829; was a commissioner to adjust the boundary between Ohio and Michigan 1836; went to Great Britain in 1836 as commissioner to lay claim in the chancery court to the Smithsonian legacy (see Smithson, James); returned with the money Aug., 1838; was minister in France 1847–49, after which he spent his closing years in retirement at Sydenham, near Philadelphia, where he d. July 30, 1859. He wrote much in periodicals in support of the war of 1812 and against the U. S. Bank and on other subjects; superintended the publication of an edition of the laws of the U. S. (5 vols., 1815); wrote a *Narrative of a Residence at the Court of London from 1817 to 1825* (vol. i. 1833; vol. ii. 1845; new ed. of both vols. 1873), and edited a pamphlet, *Washington in Domestic Life, from Original Letters and Manuscripts* (1857). His sons published in 1860 his *Occasional Productions, Political, Diplomatic, and Miscellaneous.*

Rush Creek, tp., Fairfield co., O., on Pittsburg Cincinnati and St. Louis R. R. P. 1752.

Rush Creek, tp., Logan co., O., on Cleveland Columbus Cincinnati and Indianapolis R. R. P. 2044.

Rusheba, tp., Chisago co., Minn., on St. Croix River and on Lake Superior and Mississippi R. R. P. 706.

Rush'ford, p.-v. and tp., Fillmore co., Minn., at the confluence of Root River and Rush Creek, on Southern Minnesota R. R., has fine water-power on both streams, utilized for important manufactories of iron, machinery, woollen goods, and carriages, and for flouring and saw mills. There is 1 weekly newspaper. P. of v. 1245; of tp. 1973.

Rushford, p.-v. and tp., Allegany co., N. Y., on Caneadea Creek, has 4 churches, an academy, and several flouring-mills and manufactories. Several sulphur springs are found within the town. P. of v. 543; of tp. 1636.

Rushford, tp., Winnebago co., Wis. P. 2019.

Rush Lake, tp., Palo Alto co., Ia., near W. fork of Des Moines River. P. 245.

Rush Lake, p.-v. and tp., Otter Tail co., Minn., near Northern Pacific R. R. P. 167.

Rush River, tp., St. Croix co., Wis., on West Wisconsin R. R. P. 549.

Rushsylva'nia, p.-v., Rush Creek tp., Logan co., O., on Indiana division of Cleveland Columbus Cincinnati and Indianapolis R. R. P. 310.

Rush'ville, p.-v. and tp., cap. of Schuyler co., Ill., at the S. terminus of Buda and Rushville branch of Chicago Burlington and Quincy R. R., has 2 newspapers, several manufactories, and is the centre of an agricultural and grain-growing region. P. 1539; of tp. 3021.

Rushville, p.-v. and tp., cap. of Rush co., Ind., at the crossing of the Jeffersonville Madison and Indianapolis and the Cincinnati Hamilton and Indianapolis R. Rs., contains a large woollen-factory, 2 newspapers, 2 hardware and agricultural implement stores, a furniture-factory, and 2 planing-mills. It is situated in the most fertile section of the State. P. of v. 1696; of tp. 3327.

F. T. Drebert, Ed. "Republican."

Rushville, p.-v., Potter tp., Yates co., N. Y. Part of the v. is in Gorham, Ontario co.

Rush'worth (John), b. in Northumberland, England, about 1607; educated at Oxford; studied law at Lincoln's Inn; began in 1630 to take notes of proceedings in the

higher courts and in Parliament; was assistant clerk to the Long Parliament; became secretary to Lord Fairfax; took an active part in negotiations during the civil war; was for many years a member of Parliament, and afterward secretary to Lord Keeper Bridgman, but becoming involved in debt spent his last years (from 1684) in the King's Bench prison, London, where he d. May 12, 1690. In 1659 he commenced the publication of *Historical Collections of Private Passages of State, Weighty Matters in Law, and Remarkable Proceedings in Five Parliaments* (from 1618 to 1648); issued vols. ii. and iii. in 1680, and in the same year his *Tryall of Thomas, Earl of Strafford.* He left in MS. the materials for vols. iv. and v., which were issued in 1692, and for vols. vi. and vii., completing the work, which appeared in 1701. A new and better edition of the whole, together with the *Tryall*, was reprinted in 1721 (7 vols. folio). Rushworth's *Collections* are among the principal sources of information for the reigns of James I. and Charles I., but must be received with caution on account of his partisanship in behalf of the Long Parliament.

Rusk, new county of W. Central Dakota, on Missouri River, intersected by Moreau River, has Elk Ridge on the W., and consists largely of prairie. Area, about 1600 sq. m.

Rusk, county of E. Texas, bounded N. by Sabine River, and traversed in its N. part by the International R. R., has an undulating surface and a highly productive soil. There are several mineral springs and deposits of iron ore. Cattle and swine are numerous. The staple products are Indian corn, cotton, sweet potatoes, and butter. Cap. Henderson. Area, 500 sq. m. P. 16,916.

Rusk, p.-v., cap. of Cherokee co., Tex., has 1 weekly newspaper. P. 545.

Rusk (Thomas Jefferson), b. in South Carolina in 1802; became a lawyer in Georgia; went to Texas 1835; was a member of the convention that declared Texan independence Mar., 1836; was the first secretary of war; took command of the army at San Jacinto after Gen. Houston was wounded; became chief-justice of Texas; was president of the convention which effected annexation to the U. S. 1845, and U. S. Senator 1846–56. D. at Nacogdoches July 29, 1856.

Rus'kin (John), LL.D., b. in London, England, in Feb., 1819, only son of a wealthy wine-merchant, from whom he derived in childhood a fondness for art; gained the Newdegate prize for English poetry at Oxford 1839; graduated from Christ Church 1842; wrote while an undergraduate a series of articles in a London magazine on *The Poetry of Architecture* (1837–38) under the signature "Kata Phusin;" devoted himself to art, taking lessons in water-color painting from Copley, Fielding, and J. D. Harding; issued in 1842 an anonymous pamphlet in defence of Turner and his school, under the title *Modern Painters, their Superiority in the Art of Landscape Painting to all the Ancient Masters,* signed "A Graduate of Oxford," which was much admired for the brilliancy of its style and provoked great controversy by the novelty of its ideas. In 1846 a new and much enlarged edition appeared in 2 vols., entitled simply *Modern Painters,* the second volume being a new treatise, *Of the Imaginative and Theoretic Faculties,* which exhibited the results of a lengthened residence in Italy in the form of an elaborate survey of the works of the "old masters" and discussion of their respective merits. The third and fourth volumes of the series, entitled, respectively, *Of Many Things* and *Mountain Beauty,* were published in 1856; the fifth and last volume (composed of treatises, *Of Leaf Beauty, Of Cloud Beauty, Of Ideas of Relation, etc.*), in 1860, the last 3 volumes containing many illustrations by the author. The seventeen years which elapsed between the first and last volumes were spent in an industrious study of art, including a long residence in Venice and visits to the principal European capitals. As the result of a careful study of mediæval architecture, Ruskin published *The Seven Lamps of Architecture* (1849) and *The Stones of Venice* (vol. i., 1851; vols. ii. and iii., 1853), a pamphlet on *Pre-Raphaelitism* (1851), *Lectures on Architecture and Painting* (1854), *Giotto and his Works in Padua* (1854–55), *The Political Economy of Art* (1857), *The Elements of Drawing* (1857), several series of *Notes* on the exhibitions of the Royal Academy and the Society of Painters in Water-Colors (1855–59), *Notes on the Turner Gallery at Marlborough House* (1856–57), and several other little books, all of which were collected into the edition of his *Complete Works* published at New York in 15 vols. He delivered lectures on Gothic architecture at Edinburgh 1853; was appointed professor at the Cambridge School of Art 1858; became Rede lecturer at Cambridge 1867; was elected to the Slade professorship of fine arts at Oxford 1869, and re-elected Mar., 1876; and gave £5000 for the endowment of a mastership of drawing in the Taylor Galleries, Oxford, 1871. The artistic movement known as "Pre-Raphaelitism," which was developed among British artists, such as Millais, Holman Hunt, and the Rossettis about 1850, was largely due to the study of Ruskin's earlier works. He issued a revised edition of his *Modern Painters* (5 vols.) in 1860–67, and has since published a large number of pamphlets and small books under fanciful titles, many of which are professedly addressed to workingmen and advocate peculiar theories in political economy and ethics, but have apparently not attracted the notice of the class of readers for which they were designed. In 1871 he commenced the publication of a monthly letter, *Fors Clavigera,* also addressed to workingmen, inviting them to join him in establishing a fund for rescuing English country-life from the tyranny and defilement of machinery, and devoted a tithe of his fortune (about £7000) for that purpose, forming the "St. George's Company," of which he was to be grand master. The monthly letters are still issued (1876), but in the latest numbers Mr. Ruskin complains bitterly of lack of appreciation and co-operation. He possesses a picturesque Saxon style, which is justly considered one of the glories of modern English literature, and describes himself (justly enough) as a "violent Illiberal" in politics. Several entertaining volumes of selections from his works have been published, the latest being *Frondes Agrestes* (1875), under his own editorship.

Porter C. Bliss.

Russ (John Denison), M. D., b. at Chebacco (now Essex), Mass., Sept. 1, 1801; graduated at Yale College 1823; studied medicine in Europe; began to practise in New York 1826; went to Greece with a cargo of provisions for the patriots 1827, and resided there until 1830, rendering medical services to the insurgent army; devoted himself in New York to the instruction of the blind, for whose use he invented a phonetic alphabet of 41 characters with 22 prefixes, suffixes, etc., and devised several other educational expedients; became superintendent of the New York institution for the blind 1832; was one of the founders of the New York Prison Reform Association, superintendent of a juvenile asylum 1851–58, and an active promoter of other benevolent associations.

Rus'sell, county of E. Ontario, Canada, bounded N. by the river Ottawa. Area, 360 sq. m. It is connected with Prescott co. for judicial purposes, and the courts are held at L'Original in the latter county. P. 8666.

Russell, county of S. E. Alabama, bounded E. by Chattahoochee River, which separates it from Georgia, and drained by its tributaries; has an undulating surface, partly consisting of sandy ridges and barren plains, and is traversed by Mobile and Girard R. R. The staple products are Indian corn, cotton, and sweet potatoes. Cap. Seale's Station. Area, 650 sq. m. P. 21,636.

Russell, county of Central Kansas, watered by Smoky Hill Fork and Saline rivers and their numerous affluents, and traversed by Kansas Pacific R. R., has a level surface and a fertile soil. Cap. Russell. Area, 900 sq. m. P. 156.

Russell, county of S. Kentucky, traversed in its S. part by Cumberland River and drained by its branches, has a rugged surface and little soil available for agriculture, which is nevertheless the leading industry, the staples being Indian corn, tobacco, oats, sorghum-molasses, wool, and butter. Swine and sheep are reared to some extent. Cap. Jamestown. Area, 244 sq. m. P. 5809.

Russell, county of S. W. Virginia, bounded S. E. by the Clinch Mountains and traversed by the upper Clinch River, has a mountainous surface, with several deposits of iron ore, coal, and marble. The staples are Indian corn, wheat, oats, tobacco, maple-sugar, sorghum-molasses, butter, and wool. Cap. Lebanon. Area, 500 sq. m. P. 11,103.

Russell, tp., Lawrence co., Ill., on Wabash River. P. 1181.

Russell, tp., Putnam co., Ind., on Raccoon Creek. P. 1246.

Russell, p.-v., Washington tp., Lucas co., Ia., on Burlington and Missouri River R. R. P. 175.

Russell, p.-v., cap. of Russell co., Kan., on Kansas Pacific R. R., 263 miles W. of Kansas City, has several business-houses and 2 newspapers. The surrounding country is fitted for agriculture and stock-raising. P. about 500. A. B. Cornell, Ed. "Plainsman."

Russell, p.-v. and tp., Hampden co., Mass., on Westfield River and Boston and Albany R. R. P. 635.

Russell, tp., Camden co., Mo., near Osage River. P. 1141.

Russell, tp., Macon co., Mo. P. 1658.

Russell, p.-v. and tp., St. Lawrence co., N. Y., on Grass River. P. 335; of tp. 2688.

Russell, p.-v. and tp., Geauga co., O. P. 805.

Russell, tp., Sheboygan co., Wis. P. 623.

Russell (Alexander Jamieson), b. in Glasgow, Scotland, Apr. 29, 1807. With his parents he settled in Megantic co., Canada, in 1822, where his father was crown-lands agent. In 1829 he became deputy provincial surveyor, and in 1830 entered the commissariat department, serving two years on the Rideau Canal during its construction, when he was called to head-quarters, Quebec, where he was engaged for eight years in the extra staff of that department. In 1841 he resigned and entered the service of the provincial government as civil engineer in charge of public works in the eastern or maritime counties of Lower Canada, being engaged for five years in projecting and constructing roads and bridges, etc. In 1846 he was transferred to the crown timber office at Ottawa to settle difficulties between lumbermen and to grant licenses to cut timber on Ottawa River and its tributaries, to which has been added the collection of the timber revenues from them and the inspection of the other crown timber agencies in Lower and Upper Canada.

Russell (Benjamin), b. at Boston, Mass., Sept. 13, 1761; learned the printing trade under Isaiah Thomas; was a soldier in the Revolutionary war; established at Boston, Mar. 24, 1784, a semi-weekly newspaper, *The Columbian Centinel*, to which many eminent writers contributed, and which became an influential political organ of Federalist doctrines; was twenty-four years representative of Boston in the general court; was several years member of the State senate and of the executive council. He retained the editorship of the *Centinel* until Nov. 1, 1828. D. at Boston Jan. 4, 1845.

Russell (David Allen), b. at Salem, N. Y., Dec. 10, 1820; graduated at the U. S. Military Academy, and entered the infantry in 1845; served in the war with Mexico, and brevetted first lieutenant for gallantry; was subsequently actively engaged on the frontier against the Indians; in Jan., 1862, accepted the colonelcy of the 7th Massachusetts Vols., which he led through the Virginia peninsular campaign of 1862, gaining the brevet of lieutenant-colonel, and in the battle of Antietam; appointed brigadier-general U. S. volunteers Nov., 1862, he commanded a brigade in the 6th corps at the battles of Fredericksburg and Chancellorsville, at Gettysburg, and minor actions of that corps. In the Richmond campaign of 1864, in command of a division (6th corps), he participated in all the battles of that corps from the Wilderness to Petersburg; in July, 1864, his corps was called to Washington to resist the threatened attack of Early upon the capital, and in the subsequent pursuit of Early he was killed at the battle of Opequan, Sept. 19, 1864. At the time of his death he held the rank of major in the 8th Infantry, brevet colonel, brigadier-general, and major-general for gallantry.

Russell (John), Earl, third son of the sixth duke of Bedford, b. in London, England, Aug. 18, 1792; educated at Westminster School and at the University of Edinburgh; travelled in Spain and Portugal during the Peninsular war 1809–10; entered Parliament as a Whig 1813, representing the family borough of Tavistock; displayed great zeal in his opposition to the Tory ministry and in advocacy of Roman Catholic emancipation and parliamentary reform; became intimate with the literary men of the time; published *Lives* of his ancestors, William Lord Russell (1819) and Lady Rachel Russell (1820), *An Essay on the History of the English Government and Constitution* (1821), *The Nun of Arronca, a Tale* (1822), *Don Carlos, a Tragedy* (1822), *Memoirs of the Affairs of Europe from the Peace of Utrecht* (2 vols., 1824–29), of which the first volume was republished with the title *History of the Principal States of Europe, from the Peace of Utrecht* (2 vols., 1826), *The Establishment of the Turks in Europe* (1827), and *Causes of the French Revolution* (1832), with many other occasional literary productions; was the parliamentary leader of the great movement which effected in 1828 the repeal of the Test and Corporation acts, in 1829 the emancipation of the Roman Catholics, and in 1832 laid the foundation of the modern era of English history by the long-delayed victory of the Reform bill. In 1830–34, Lord John Russell was paymaster of the forces in the Grey administration; was secretary of state for the home department 1835–39, and afterward for war and the colonies (1839–41) in the second Melbourne ministry, of which he was the leader in the House of Commons, and carried several important measures of reform in regard to ecclesiastical and municipal affairs, education, marriage, and civil and criminal law; was returned to Parliament in the election of 1841 for the city of London, which he continued to represent for many years; was the leader of the opposition to the Peel ministry 1841–45; declared in favor of the immediate repeal of the Corn laws Nov., 1845, upon which basis he was invited to form a ministry Dec., 1845, but failed through the dissensions of Earl Grey and Lord Palmerston, and had to yield to Sir Robert Peel the honor of procuring the enactment of the repeal. Upon the dissolution of the old Tory party in 1846, Lord John Russell became prime minister and first lord of the treasury, and conducted the affairs of state through the difficult period embracing the Irish famine, the Chartist agitations, and the continental revolutions of 1848–49. His ministry was overthrown in Feb., 1852, but Earl Derby having been unsuccessful in his attempt to carry on the government, the Aberdeen cabinet was formed Dec., 1852, in which Lord John Russell accepted the position of secretary of foreign affairs. He introduced a new Reform bill 1854; became colonial secretary in the first Palmerston ministry Feb., 1855, and soon afterward went as commissioner to the Vienna Conference, intended to put an end to the Crimean war, but lost public favor by his support of the Austrian programme, and retired from the cabinet July 16. In June, 1859, he returned to office as secretary of foreign affairs in the second Palmerston ministry; was elevated to the peerage as Earl Russell of Kingston-Russell July, 1861; incurred severe criticism by his unfriendly course toward the U. S. during the civil war, especially in the Trent and Alabama affairs, as also by his fruitless manifestations of sympathy for Poland and Denmark in their struggles with Russia and Germany. On the death of Lord Palmerston, Earl Russell again became prime minister, Oct., 1865, Mr. Gladstone being, however, the real leader of the cabinet, which resigned in June, 1866. Since that period he has not accepted office, but has taken an active part in the debates of the House of Lords and devoted himself anew to literature. He edited the *Correspondence of John, Fourth Duke of Bedford* (3 vols., 1842–46), the *Memorials and Correspondence of C. J. Fox* (4 vols., 1853–57), the *Memoirs, Journal, and Correspondence of Thomas Moore* (8 vols., 1852–56), and selections from his own *Speeches and Despatches* (2 vols., 1870), and wrote the *Life and Times of C. J. Fox* (3 vols., 1859–66), *The Rise and Progress of the Christian Religion in the West of Europe* (1873), and an autobiographical work, *Recollections and Suggestions 1815–73* (1875).

Russell (Rev. John Fuller), b. in England about 1817; graduated S. C. L. at St. Peter's College, Cambridge, 1837, and B. C. L. 1838; rector of St. James's, Enfield, and since 1856 of Greenhithe, Kent; wrote works on the doctrine and discipline of the Church of England; among them, *Exclusive Power of an Episcopal Ordained Clergy to Administer the Sacraments*, etc. (1834), *Strict Observance of the Rubric recommended* (1839), and *Anglican Ordinations Valid* (1846); also *Life of Dr. Johnson* (1847), articles in the *Encyclopædia Metropolitana;* edited *Hierurgia Anglicana* (1848), being documents illustrative of the ritual; and was co-editor with Dr. Hook of *Selections from the Writings of Anglican Divines* (1840), and with Dr. Irons, of *Tracts of the Anglican Fathers*. He was examined as expert by the royal commissioners on ritual in 1867.

Russell (John R.), b. Jan. 4, 1827, in Maryland; entered the navy as a midshipman Sept. 14, 1841; became a passed midshipman in 1847, a lieutenant in 1855, a lieutenant-commander in 1862, a commander in 1867, a captain in 1874; commanded the boat expedition which succeeded in burning the Confederate privateer Judith alongside the navy-yard at Pensacola Sept. 14, 1861, and the gunboat Kennebec at the bombardment of Forts Jackson and St. Philip in 1862. Commended for "gallantry."

Foxhall A. Parker.

Russell (John Scott), F. R. S., b. in the Vale of Clyde, Scotland, in 1808; studied at the universities of Edinburgh, St. Andrew's, and Glasgow, graduating at the latter 1824; devoted himself to applied mechanics, engineering, and natural philosophy; delivered a course of lectures on the latter subject in the University of Edinburgh in 1832 upon the death of Prof. Leslie; engaged at Edinburgh in the construction of small steamboats for canal and river navigation, and of steam carriages which ran upon the common roads between Paisley and Glasgow; introduced the "wave system" into the construction of ocean steamships 1835; was for some years manager at Greenock of one of the largest shipbuilding yards in Scotland; presented memoirs on the "wave system" to the British Association 1835, and to the Royal Society of Edinburgh 1837, being honored with a gold medal by the latter body; established himself in London 1844 as a builder of the largest class of steamships, including the Great Eastern, which was designed by Brunel upon his system; read in 1857 to the British Association a paper upon *The Mechanical Structure of the Great Ship;* was one of the nine original promoters of the great exhibition of 1851, and joint secretary of the royal commissioners for the management of that enterprise;

was one of the founders of the Institution of Naval Architects, of which he is vice-president, and has contributed largely to its *Transactions;* is also vice-president of the Institution of Civil Engineers, and an active member of several scientific societies. Author of an elaborate and costly illustrated work, *The Modern System of Naval Architecture for Commerce and War* (1864) and of *Systematic and Technical Education for the English People* (1869). He is well known as a philanthropist, and in 1871 brought forward an unsuccessful scheme for founding a "New Social Alliance" for the improvement of the condition of the working-classes by facilitating their means of access to the legislative and executive departments of the government.

Russell (JONATHAN), LL.D., b. at Providence, R. I., in 1771; graduated at Brown University 1791; studied law, but exchanged its practice for commercial pursuits; was an accomplished and effective writer and an active politician; was several years U. S. minister to Sweden; signed the Treaty of Ghent 1814 as one of the five American commissioners, and was member of Congress 1821–23. D. at Milton, Mass., Feb. 16, 1832.

Russell (MICHAEL), LL.D., D. C. L., b. at Edinburgh, Scotland, in 1781; educated at Glasgow College; was ordained in the Episcopalian Church; became minister of St. James's chapel, Leith, 1809, a post he retained through life, adding to it in 1837 the bishopric of Glasgow and Galloway. D. at Leith Apr. 2, 1848. He possessed extensive erudition; was for twenty-five years one of the principal contributors to the *Encyclopædia Metropolitana*, and author of several valuable works on education, history, sacred and profane, and polity, and doctrinal subjects. His best work was *The Connection of Sacred and Profane History, from the Death of Joshua until the Decline of the Kingdoms of Israel and Judah* (3 vols., 1827–37).

Russell (WILLIAM), LORD, son of the fifth earl of Bedford, b. in England Sept. 29, 1639; educated at Cambridge and at Augsburg; entered Parliament 1660; married Lady Rachel, daughter of Thomas Wriothesley, earl of Southampton, and widow of Lord Francis Vaughan, 1669; first became prominent in 1673 as one of the leaders of the Protestant or "country party," which carried on a vigorous opposition to the unscrupulous measures of the court; proposed in Nov., 1678, the removal of the duke of York from the royal councils, and on June 16, 1680, appeared before the king's bench in Westminster to present that prince as a recusant, and headed the deputation of 200 members of the House of Commons which carried up to the House of Lords the bill for the exclusion of James as a papist from the succession. When a reaction had set in against the Protestant alarmists the court determined to be revenged upon Russell, Sidney, and other prominent Whigs, who were accordingly accused by suborned witnesses of participation in the "Rye-house Plot." Arraigned for treason at the Old Bailey July 13, 1683, Russell was refused counsel, but his wife was permitted to act as his secretary during the trial; was condemned to death and attainted July 14, and beheaded in Lincoln's Inn Fields July 21, 1683. His attainder was reversed after the revolution of 1688, and in 1694 his father was made duke of Bedford, to which title Lord William's son, Wriothesley, succeeded. Lady Russell, b. 1636, survived her husband forty years, and d. at Southampton House Sept. 29, 1723. Her *Letters* to her husband were published 1773, became widely popular, and have been often reprinted. (See *Life of Lord Russell*, by Lord John Russell, 1819.)

Russell (WILLIAM), LL.D., b. in Selkirkshire, Scotland, in 1741; learned the printing trade; was corrector of the Strachan press at London 1767–87, after which he settled on a farm in Dumfriesshire, where he d. Dec. 25, 1793. Author, among other works, of a *History of America* (2 vols., 1779), a *History of Modern Europe* (4 vols., 1779–84; frequently reprinted), and a *History of Ancient Europe* (2 vols., 1793). He left unfinished a *History of England from the beginning of the Reign of George III.*

Russell (WILLIAM), b. at Glasgow, Scotland, Apr. 28, 1798; was educated at the university of his native city; settled at Savannah, Ga., 1817; became principal of an academy there 1819; was instructor in the New Haven Grammar School 1822–28; taught classes in elocution at Andover, Cambridge, and Boston; edited the *American Journal of Education* 1826–29; was at the head of schools for young ladies at Germantown, Pa., and afterward at Boston and Andover; founded a seminary for teachers in New Hampshire 1840, and removed it in 1853 to Lancaster, Mass., where he subsequently became director of the normal institute. Author of many treatises on educational subjects and of several textbooks in reading and elocution.

Russell (WILLIAM HOWARD), LL.D., b. at Lily Vale, co. Dublin, Ireland, Mar. 28, 1821; studied at Trinity College, Dublin; became a lawyer at London, but is best known as a correspondent of the London *Times*, in which capacity he obtained a considerable reputation during the Crimean war, the Indian mutiny, the American civil war, the Austro-Prussian war of 1866, and the Franco-German war of 1870–71. He founded in 1858 the *Army and Navy Gazette*, which he still conducts. He has republished his letters to the *Times* descriptive of the military operations above mentioned, and written several other works.

Russell's, tp., Fayette co., Ala. P. 247.

Rus'sellsburg, p.-v., Pine Grove tp., Warren co., Pa., on Conewango River.

Rus'sellville, p.-v. and tp., cap. of Franklin co., Ala., on Cedar Creek. P. 180; of tp. 1484.

Russellville, p.-v., Pope co., Ark., on Little Rock and Fort Smith R. R., has 1 newspaper and some manufactures.

Russellville, p.-v., Russell tp., Lawrence co., Ill., on Wabash River. P. 311.

Russellville, p.-v., cap. of Logan co., Ky., on Louisville Nashville and Great Southern R. R., has 1 newspaper. P. 1843.

Russellville, p.-v., Jefferson tp., Brown co., O. P. 359.

Russi, town of Italy, province of Ravenna, about 10 miles W. S. W. of the city of Ravenna. It is a pretty town, surrounded by a wall, with castle and citadel still in good condition. Russi was long an object of bitter contention between the lords of Ravenna and Ferrara. P. 7700.

Rus'sia, the largest empire of the world, occupying about one-sixth of the firm land of our globe, extends in Europe and Asia from lat. 38° 20′ to lat. 77° 30′ N., and from lon. 17° 38′ E. to lon. 170° W.; bounded N. by the Arctic Ocean; E. by the Pacific; S. by China, Independent Toorkistan, Persia, Asiatic Turkey, the Black Sea, and Roumania; and W. by Austria, Prussia, the Baltic, and the Scandinavian peninsula. Area, 8,351,004 sq. m. Pop. 85,685,945, of which Asiatic Russia, consisting of Caucasus (area, 172,837 sq. m.; pop. 4,893,332), Siberia (area, 4,826,329 sq. m.; pop. 3,428,867), Kirgheez territories (area, 868,793 sq. m.; pop. 1,803,708), and Toorkistan (area, 408,408 sq. m.; pop. 1,996,920), comprises 6,279,352 sq. m., with 12,122,827 inhabitants; while European Russia, consisting of Russia proper (area, 1,881,216 sq. m.; pop. 65,704,559), Poland (area, 49,157 sq. m.; pop. 6,026,421), and Finland (area, 144,269 sq. m.; pop. 1,832,138), comprises 2,071,642 sq. m., with 73,563,118 inhabitants. European Russia is divided for administrative purposes into the following governments:

Russia Proper.

	Area.	Population.
Archangel	331,503	281,112
Astrakhan	86,668	601,514
Bessarabia	14,046	1,078,932
Courland	10,537	619,154
Don Cossack Territory	61,911	1,086,264
Esthonia	7,818	323,961
Grodno	14,965	1,008,521
Kaluga	11,938	996,252
Kazan	24,600	1,704,624
Kharkov	21,040	1,698,015
Kherson	27,522	1,596,809
Kiev	19,686	2,175,132
Kostroma	32,700	1,176,097
Kovno	15,692	1,156,041
Kursk	17,936	1,954,807
Livonia	18,158	1,000,876
Minsk	35,272	1,182,230
Moheelev	18,550	947,625
Moscow	12,857	1,772,624
Nizhnee-Novgorod	19,795	1,271,564
Novgorod	47,234	1,011,445
Olonetz	57,436	296.392
Oofa	47,031	1,364,925
Orel	18,040	1,596,881
Orenburg	73.885	900,547
Penza	14,996	1,173,186
Perm	128,246	2,198,666
Podolia	10,222	1,933,188
Poltava	19,264	2,102,614
Pskov	17,068	775,701
Riazan	16,253	1,477,433
St. Petersburg	20,760	1,325,471
Samara	60,197	1,837,081
Saratov	32,622	1,751,268
Simbeersk	19,108	1,205,881
Smolensk	21,637	1,140,015
Tambov	25,683	2,150,971
Taurida	24,537	704,997
Tchernigov	20,231	1,659,600
Toola	11,955	1,167,878
Tver	25,223	1,528,881
Viatka	59,114	2,406,024
Vitebsk	17,438	888,727
Vladimeer	18.862	1,259,923
Volhynia	27,738	1,704,018
Vologda	155,498	1,003,039
Voronezh	25,437	2,152,696
Vilna	16,411	1,001,909
Yaroslav	13,750	1,000,748
Yekaterinoslav	26,146	1,352,300

Poland.

	Area.	Population.
Kalisz	4,392	669,261
Kielce	3,897	518,730
Lomza	4,667	489,699
Lublin	6,501	707,089
Piotrkov	4,729	682,495
Plock	4,200	471,938
Radom	4,769	532,466
Siedlce	5,534	504,606
Suwalki	4,846	524,489
Warsaw	5,622	925,639

Finland.

	Area.	Population.
Åbo-Björneborg	9,332	306,331
Knopio	16,498	226,130
Nyland	4,584	173,141
St. Michael	8,819	159,348
Tavastehuus	8,324	193,477
Uleåborg	63,955	185,890
Vasa	16.146	310,937
Viborg	16,611	276,884

The old names, Great Russia or Muscovy (comprising the whole of the northern and central part of the country), Little Russia or Ukraine (Kiev, Tchernigov, Poltava, and Kharkov), New Russia (Bessarabia, Kherson, Taurida, Yekaterinoslav, and the Don Cossack Territory), Red Russia (Lithuania, Volhynia, Podolia, and parts of the present Galicia), White Russia (Vitebsk and Moheelev), Black Russia or Minsk, and the Baltic provinces (Courland,

Livonia, Esthonia, and Ingria), have now only an historical signification.

Asiatic Russia is described in the articles on CAUCASUS, KIRGHEEZ, SIBERIA, and TOORKISTAN. European Russia, including FINLAND and POLAND (which see), forms one vast plain, bounded E. by the Ural chain; S. by the Caucasian Alps and the Yaila Mountains, an isolated chain occupying the Crimean peninsula and rising to the height of about 5000 feet; S. W. and N. W. by spurs of the Carpathians and the Scandinavian Alps. Through the central part of this plain stretches an elevated plateau, the Valdai Hills, rising about 1000 feet, connecting to the E. with the Ural Mountains, and presenting an undulating surface covered with large forests of beech. From this plateau the ground slopes N. to the Arctic Ocean and the White Sea, traversed by the Onega, Dwina, Mezen, and Petchora; W. to the Baltic, drained by the Neva, Düna, Niemen, and Vistula; and S. to the Black and the Caspian seas, watered by the Pruth, Dniester, Dnieper, Don, Volga, and Ural. The northern slope terminates along the Arctic Ocean in frozen swamps, where all vegetation ceases; the western is dotted with numerous lakes, and is often marshy, but favorable to vegetable life; the southern presents many large, woodless tracts of steppes, unfit for agriculture. On an average, 20 per cent. of the surface of European Russia is arable land, 11 meadow, 27 pasture, and about 40 forest, but the ratio varies very much in the different parts of the empire. Finland has only 1.2 per cent. arable, but 53.3 forest; Russia proper has respectively 20.9 and 40.3, Poland 50 and 25.20. Rye, oats, barley, wheat, and maize are raised, and although the method of cultivation is still very primitive, the product far exceeds the home demand in quantity; the value of exported cereals amounted in 1872 to 134,600,000 rubles. In the Baltic provinces flax, hemp, and hops are much cultivated; in the above year the value of exported flax amounted to 37,900,000 rubles, of flaxseed to 22,300,000, of hemp to 11,900,000, of tow to 2,800,000, of cordage to 1,500,000. In Bessarabia and the Crimea the vine is grown with success, and about 54,000,000 gallons of good wine are annually produced. Tobacco is cultivated along the Volga, the Don, and in Bessarabia, and yields about 70,000,000 rubles annually. The potato is raised throughout the country, and the cultivation of beetroot is steadily increasing. Excellent fruits —apples, pears, apricots, peaches, but especially plums and cherries—are grown in Bessarabia, the Crimea, and Taurida, and the immense forests, consisting mostly of fir, spruce, and pine N. and E. of the Valdai Hills, and oak to the S., contain excellent timber for building purposes, and are administered with great care; the value of timber exported in 1872 amounted to 22,400,000 rubles. Cattle-rearing is extensively carried on in the western and southern provinces. Russia possessed in 1874 about 28,500,000 horned cattle; in 1872 the value of the export of cattle amounted to 10,200,000 rubles, that of hides to 3,300,000. Horses, numbering 20,000,000 in 1874, are numerous in the southern provinces and of a good breed; the annual export to Prussia and Austria is very large. Of sheep (64,500,000 in 1874) there are several species. The common Russian sheep yields only 4 pounds of wool a year, and, the wool being coarse, the pood (36 pounds) commands only 3 rubles in the market; but the animal requires no care and thrives on the scantiest and meagerest food. The Kirgheez sheep, introduced from the Kirgheez territories in Asia, where it still forms the fundamental unit in all valuations, is numerous in the steppes of the Volga and the Don, and is distinguished by its immense fat tail. It generally weighs from 4 to 5 poods, and yields often 2 poods of tallow; in 1872 the value of the export of tallow amounted to 2,900,000 rubles. Of improved breeds of sheep there are about 14,000,000, half of which belong to Bessarabia. Swine (11,000,000 in 1874) are reared in immense herds in the Lithuanian oak forests; in 1872 the value of the export of hogs' bristles amounted to 5,700,000 rubles. Bee-culture is general in Poland and on the Volga; about 7,000,000 pounds of wax and 21,000,000 of honey are annually produced. The silk-culture, which formerly was quite extensive in the southern provinces, has suffered much of late, partly from disease among the silkworms, partly from the emigration of the Mennonites, who principally carried it on. Reindeer are kept in large herds in the N.; camels are bred in the S. Of wild animals, the ermine, sable, marten, bear, etc. are found in the N.; the elk, aurochs, and boar in the W. (Poland and Lithuania); the wolf, deer, and fox everywhere; the value of the export of furs amounted in 1872 to 3,200,000 rubles. The fisheries form a very important source of wealth—cod and herring in the White Sea; herring and flounder in the Baltic; mackerel, sardine, and herring on the Crimean coast; sturgeon in the Caspian; salmon, trout, and a great variety of delicious fresh-water fish in the lakes and rivers. In the circle of Kem, a subdivision of the government of Archangel, at the mouth of the Kem in the White Sea, 91,147,600 poods of salt-water fish and 58,793 poods of fresh-water fish were caught between 1847 and 1851, and several thousand people are steadily employed in the fisheries of the Volga and the Caspian Sea. The preparation of *caviare* from the roe of the sturgeon is a peculiar Russian branch of industry. The product was known to the rest of Europe as a delicacy in the time of Shakespeare. "'Twas caviare to the general," says Hamlet. It is now largely consumed.

Mining and manufacturing are carried on in Russia extensively, and with great success. Large deposits of coal and an abundance of salt are found in all the southern provinces: 402,300 tons of coal were raised in 1868, and 538,800 tons of salt were produced—250,000 tons alone from the brine springs of Taurida. The produce of coal is rapidly increasing. All the metals are found in the Ural and Altai mountains, some of them in great abundance and of excellent quality. In 1869, 61,700 pounds of gold were produced, and 39,300 pounds of silver. In 1868 the produce of copper was 4310 tons, and of iron 319,000 tons. Platinum is found only around Yekaterinburg; 8060 pounds were produced in 1861. The governments of St. Petersburg, Moscow, Nizhnee-Novgorod, Vladimeer, Saratov, Warsaw, Plock, and Kalisz are the principal seats of manufacturing industry, which is steadily increasing and receives much encouragement from the government. Peter the Great founded 21 large factories, besides some smaller ones; in 1820 the number had risen to 3724, in 1854 to 18,100, in 1870 to 19,431, exclusive of distilleries and breweries, employing 410,225 workmen, and producing goods to the value of about 373,000,000 rubles. The principal branches are the cotton and woollen manufactures. In 1870 about 122,000,000 pounds of raw cotton were imported, and 1508 factories produced goods to the value of 220,000,000 rubles. In the same year 1831 woollen manufactories, employing 105,135 hands, produced goods to the value of 63,000,000 rubles. In spite of recent disturbances, there are still 518 silk manufactories, employing about 12,000 workmen. In 1871 there were 325 beetroot-sugar manufactories, employing about 70,000 workmen. For its internal traffic Russia possesses excellent water-ways in its great rivers and extensive canal system, connecting the Baltic with the White, Black, and Caspian seas. For a large part of the year, however, from three to seven months, these roads are closed by frost, but in 1874 the country had 10,725 miles of railroad, and 2400 miles were under construction. In 1873 the receipts of the railways amounted to 122,800,000 rubles, but the government, having guarantied a certain interest, had in the same year to pay 14,590,000 rubles. In 1872 the length of telegraph lines was 44,692 miles, of wires, 90,430 miles; number of stations, 1333; of telegrams forwarded, 3,259,552; the revenue was 17,120,000 rubles; the expenses 14,957,000. In 1874 the commercial fleet numbered 2504 vessels of 520,584 tons burden; 227 were steamers. The total imports were valued in 1872 at 242,320,000 rubles, the exports at 272,870,000.

The population of Russia is very various; it comprises about 100 different nationalities, more or less distinct, and about 40 different languages are spoken in the empire. The Slavic element, however, is absolutely predominant in European Russia, numbering 61,000,000 out of 73,000,000. The principal non-Slavic races are the Finns in Finland, the Letts in Courland, the Germans in the Baltic provinces and Southern Russia, the Tartars, Cossacks, and other Mongolian tribes in the S., and the Jews, numbering 2,647,000, of whom 1,829,000 are in Russia proper and about 800,000 in Poland. The Slavic race falls into two very distinct and very antipathetic groups—the Russians, 56,600,000, and the Poles, about 5,000,000. The Russians, again, comprise a great number of subdivisions, of which the Ruthenians form one of the most prominent, but all these subdivisions centre in the Great Russians, whose religious creed, political sympathies and antipathies, and literary language have been adopted by them. With respect to the Poles and the non-Slavic nations, it is the policy of the government to Russianize them, and the measures employed for this purpose are in some cases, especially with respect to the Poles, really shocking. In 1869 the budget of the University of Warsaw was raised from 182,000 to 211,780 rubles, but at the same time the professors were informed that in the course of three years they were to make themselves masters of the Russian language, so as to be able to deliver their lectures in Russian; the Russian double eagle appeared over the front door of the building; all Polish inscriptions were replaced with Russian; all communications to the students were issued in Russian; and the officials belonging to the administration of the institution were ordered not to answer any question which was not


MAP OF
RUSSIA
Drawn, and Engraved on Copper-Plate
EXPRESSLY
FOR
JOHNSON'S UNIVERSAL CYCLOPÆDIA
Scale of Miles
50 100 150 200
Longitude East from Greenwich
Longitude East from Washington
ARCTIC OCEAN
KARA SEA
NOVA ZEMBLA
WHITE SEA
GULF OF BOTHNIA
GULF OF FINLAND
BALTIC SEA
BLACK SEA
SEA OF AZOF
CASPIAN SEA
LAPLAND
FINLAND
ARCHANGEL
OLONETZ
VOLOGDA
PERM
VIATKA
KOSTROMA
NOVGOROD
PETERSBURG
ESTHONIA
LIVONIA
KOURLAND
KOVNO
VILNA
GRODNO
MINSK
VITEBSK
SMOLENSK
MOSCOW
VLADIMIR
NISHNI NOVGOROD
KASAN
SIMBIRSK
ORENBURG
SAMARA
SARATOV
PENSA
TAMBOV
RIAZAN
TOULA
KALUGA
OREL
KURSK
VORONESH
LITTLE RUSSIA
POLTAVA
CHARKOV
TSCHERNIGOV
KIEV
VOLHYNIA
PODOLIA
BESSARABIA
CHERSON
EKATERINOSLAV
SOUTH RUSSIA
TAURIDA
CRIMEA
ASTRACHAN
CAUCASIA
CAUCASIAN PROVINCES
GEORGIA
DAGHESTAN
PRUSSIA
AUSTRIA
POLAND
SWEDEN
KIRGHIZ
TOORKOMANIA
URAL MOUNTAINS
SEA OF ARAL

made in the Russian language. In 1872 six professors, who declared themselves unable to use the Russian language, were discharged.

The GREEK CHURCH (which see) is the official religion of the state, professed by the imperial family and a large majority of the inhabitants—namely, 53,139,000 in Russia proper, 2,875,000 in Siberia, 1,930,000 in Caucasia, 42,000 in Finland, and 30,000 in Poland. In doctrine the Russian Church agrees with the other branches of the Greek Church, but with respect to its administrative organization it is entirely independent. At the head stands the emperor; next to him the Holy Synod, composed of seven bishops. Feodor I. appointed a Russian patriarch in 1589, after the flight of the Greek patriarch from Constantinople, and the four Oriental patriarchs recognized the new dignity. But Peter the Great found it too difficult to rule the empire with a patriarch at the head of the Church. He abolished the office and instituted the synod; and his successors have followed the same policy, never allowing the Church to become a state within the state. In 1870 the Russian Church comprised 62 archbishops and bishops, 385 monasteries with 5750 monks, 154 nunneries with 3226 nuns, 1334 arch-priests, 40,852 priests, 11,852 deacons, 70,280 clerks; 33,100 church buildings, among which were 59 cathedrals; 4 theological seminaries of the highest order, in St. Petersburg, Moscow, Kiev, and Kazan, with 106 professors and 410 students; and 51 theological seminaries of a lower order, with 15,585 students. Sects are very numerous, and some of them—as, for instance, the Raskolniks—are said to be very powerful. The Roman Catholic Church numbers 4,326,000 members in Poland, 2,883,000 in Russia proper, 25,000 in Siberia, 18,000 in Caucasia, 830 in Finland; the Reformed churches 2,234,000 in Russia proper, 1,797,000 in Finland, 331,000 in Poland, 10,600 in Caucasia, and 5700 in Siberia; the Mohammedans 2,843,000 in Central Asia, 2,359,000 in European Russia, 1,960,000 in Caucasia, 61,000 in Siberia. Roman Catholics and Protestants have equal civil rights with the members of the Greek Church, but not the Jews and Mohammedans. Only the Greek Church has the right to proselyte and to carry on missions among the non-Christian population. She also claims all the children of mixed marriages.

For science and art there is much done in Russia. The scientific societies, universities, libraries, art-galleries, theatres, and other institutions of learning and talent are of a high order; the higher educational institutions, general and special, male and female, are also excellent. Many features, however, indicate that as a whole the nation occupies a comparatively low stand-point of civilization. Both in religion and politics the Russian people are still liable to fall into extremes of fanaticism and superstition or coarse infidelity, of slavish submissiveness or revolutionary ideas of the most reckless and fantastic character. The cruel and widespread persecutions of the Jews in 1872 originated in Odessa from a rumor that a Jewish boy had thrown a dead cat into a Greek church. The conspiracy of the Nihilists in 1871 presented an equally singular aspect; they aimed at the abolition not only of despotism, but of government of whatever kind. Popular education is still utterly insufficient. In 1869 there were only 15 elementary schools in the government of St. Petersburg, and only 3 per cent. of the population could read. It was intended to establish 300 more in the course of the year, but it was necessary to use old pensioned soldiers for teachers. In 1872 the number of popular schools in the whole empire was 19,658, with 761,129 pupils—625,784 male and 135,345 female. In 1868 there were published 219 newspapers in the country—117 in Russian, 30 in German, 20 in Finnish, etc.—but against the full effect of this organ of popular instruction and enlightenment the censorship, particularly severe in the Polish and non-Slavic regions, acts as a heavy and vicious impediment.

The government is a pure despotism. There are no constitutional checks whatever to the power of the emperor. The army, which now is formed by universal conscription, consists of an active body numbering about 750,000, and a reserve of about the same number, with 1424 guns and 300,000 horses. Fleets are kept in the Baltic, the Black Sea, and the Caspian, squadrons in the Arctic and Pacific, comprising altogether 225 steam-vessels of 172,501 tons burden and 31,978 horse-power, with 521 guns and about 25,500 sailors. According to the budget of 1874, the revenues of the empire were estimated at 539,851,000 rubles, the expenses at 536,683,000. Up to 1871 the expenses considerably exceeded the revenue every year for a long period, and the country has a debt of 2,277,081,564 rubles.

The history of Russia, as a member of the political system of Europe and a constituent in the development of modern civilization, begins with Peter the Great (1689–1725), of the house of Romanoff, which ascended the throne in 1613, and still reigns over the country. The previous period, comprising the history of the house of Rurik (862–1588), is merely a struggle to form a fixed establishment, a state, among the multitude of nations which moved to and fro in the plain, and by degrees settled down in a rather chaotic form. The first part of this earlier period is very obscure. When the Greeks founded their commercial stations along the northern coast of the Black Sea, in the Crimea, and on the shores of the Sea of Azof, they found the interior occupied by roving tribes of a fierce and savage character. They called them Scythians and Sarmatians, and for about eight centuries these two nations continue to be mentioned in the history of Greece and Rome as inhabiting the same country, pursuing the same occupations, maintaining the same habits, and exhibiting the same character—just as if they had lived through eight centuries without undergoing any changes at all. Then came, during the migration of nations beginning in the fourth century, the Goths, Avars, Huns, Alans, etc., rolling over them, wave after wave. In the sixth century the name of the Slaves first appears. They founded Kiev and Novgorod, and each of these cities became the capital of a Slavic empire. E. and S. of Kiev were on the Caspian Sea the Petchevegs, and on the Black Sea the Khazars, who held very intimate intercourse with the Byzantine empire. N. and W. of Novgorod were the Tchudies, the Finns, and on the Baltic some Scandinavian tribes, the Varangians and the *Russians;* which latter name is first met with in the ninth century. Rurik, a Varangian chief, came to Novgorod in 862, not as a conqueror, but invited, and henceforth his family reigned in the country till it became extinct, and the people received the name of Russians, though they were Slaves. His successor, Oleg (879–912), conquered Kiev, defeated the Khazars, and even attacked the emperor of Constantinople. Under Olga, who governed during the minority of her son, Christianity began to be introduced among the Russians; she herself was baptized at Constantinople in 957. It became the official religion of the state under Vladimeer the Great, who was baptized in 988, and the same day married the sister of the emperor of Constantinople. He divided his realm between his sons; and these divisions of the country, which continued to take place during the next three or four centuries, were in many respects highly conducive to the establishment of a regular government and the development of trade and other fundamental elements of civilization. They occasioned the foundation of many new cities, among which were Tver and Moscow, the latter in 1147. But, on the other hand, they weakened the power of the nation by the perpetual feuds between the princes which followed. A sort of confederacy was intended and attempted, but it had no authority, and when, in the beginning of the thirteenth century, the Mongols under Genghis Khan broke in from Asia, the Russians were unable to withstand them. Most of the princes were wholly subdued; even the prince of Novgorod had to pay tribute, and the brilliant victories of Demetrius Donski, prince of Moscow, in 1378 and 1380, only caused the Mongols to return in larger hordes; in 1382, Moscow was burned to the ground and 24,000 of its inhabitants were slain. At last, the dissolution and decay of the Mongolian and the concentration and increase of the Russian power reversed the relation. Ivan III. the Great (1462–1505), who united Novgorod, Perm, and Pskov to Moscow, refused to pay the tribute, defeated the Mongols when they attempted to enforce their claims by arms, and commenced extending the Russian power to the E., conquering Kazan in 1469 and parts of Siberia in 1499. He married a princess of the imperial house of Constantinople, now in exile, adopted the double eagle in his escutcheon, and assumed the title of "lord of all the Russians;" and under him became visible that line of policy which subsequently has run like a thread through the whole history of the Russian empire. To the Russian people and their princes Constantinople was the sole representative of civilized life, the model after which they shaped themselves—the source whence they drew their religious creed and their military organization, their civil institutions, and the comforts and ornaments of private life, their dishes and wines, their silks and fashions, their architecture and literary tastes; and when Constantinople fell into the hands of the Turks (in 1453), the prince of Moscow, the czar of all the Russians, felt himself the heir and the avenger of the Byzantine empire. This idea fills to this very day the hearts of the Russian princes and the Russian people as a duty and as an ambition; and there is only one means of keeping them away from Constantinople, the Dardanelles, and Asia Minor—namely, to make the king of Greece emperor of Byzantium. Ivan IV. the Terrible (1533–84) conquered Astrakhan in 1554, the land of the Don Cossacks in 1570, Siberia in 1581; opened a road to Archangel in 1553; concluded a commercial treaty

with England; invited German and English settlers to Russia; established a printing-office in Moscow in 1569; and organized in 1545 a body-guard, the famous *strieltzi* (the "archers") His energy was only surpassed by his cruelty, which gave him his surname. Novgorod was at that time the largest, and in commercial respects the most important, city of the empire. Its fairs, visited by thousands of merchants, and its commercial connections extending in a northerly curve across the world from the cities of Hindostan to the cities of Amsterdam and London, engendered ideas of political freedom and necessitated institutions of civil liberty which collided with the policy of Ivan. The city revolted, and the czar put down the revolution by killing 60,000 of its inhabitants. With his son, Feodor I. (1584–98), the house of Rurik ceased to exist, and after a protracted and severe struggle between Boris Godunoff, Basil V., and the two pseudo-Demetriuses, who were supported by the Poles, Michael Feodorovitch Romanoff, the founder of the present dynasty, ascended the throne in 1612, elected czar by the boyars ("noblemen"). Peter the Great (1689–1725) discovered Western Europe. The Russian people had hitherto rested on their Asiatic descent and the Byzantine traditions. He introduced a new element in their life—modern civilization; and there is perhaps no other example in history of a ruler thus taking a whole nation, obtuse and refractory, and moulding it between his fingers like a piece of wax. The Russians saw annually a dozen Dutch and English vessels in the White Sea. The Swedes and the knights of the Teutonic order they met with in the regions of the Baltic, but only indirectly, in their wars with the Finns, Esthonians, Letts, etc.; and they were generally unsuccessful in these wars. The Poles had of late shown themselves a couple of times in Moscow, enthroning or dethroning the rulers, but their appearance had been as short as high-handed. The German emperors took no notice of the Russians, and France, Spain, and Italy, the bearers of European civilization at that period, were as foreign to them as the moon. Anecdotes of Peter's first travels (in 1697–98) show what Russia was, and how it was considered by the rest of Europe—his astonishment and delight when he first saw a watch, the embarrassment of the foreign monarchs whose countries he visited, and who did not know whether he was an actual king with a real crown or only some immense camel-driver. His royal dignity did not become thoroughly intelligible to Western Europe until after the battle of Poltava, the flight of Charles XII., the downfall of Stanislaus Leczinski, etc. He, however, understood both Europe and Russia very well, and the idea he formed as to the method by which these two powers could be brought together gives him a place among the first statesmen that ever lived. He saw that it was necessary for the people occupying these vast inland plains to break through to the sea in order to breathe freely. The White Sea was not enough; the Baltic, the Black Sea, and the Caspian were needed. In 1696 he took Azof from the Turks, and in spite of subsequent military reverses he kept it. As soon as he deemed his newly-organized army large enough and sufficiently well drilled, he attacked the Swedes, who held the whole eastern shore of the Baltic. His soldiers were terribly routed (Nov. 30, 1700) on the Narva. "I shot them down like ducks," wrote Charles XII. to Stockholm. Nevertheless, while the Swedish hero was busy in Poland, Peter pushed onward to the Gulf of Finland, founded in 1703 the city of St. Petersburg, compelled the boyars to build palaces and the merchants to establish offices in his new city, and sailed out with gorgeous array to receive the first merchant-vessel which entered the new harbor, a Dutch schooner which returned loaded with riches. By the Peace of Nystad (Nov. 1, 1721) he incorporated Ingria and parts of Karelia, Esthonia, and Livonia with Russia. In 1723, Persia ceded the provinces of Ghilan, Mazanderan, and Astrabad, situated along the Caspian Sea. No less energetic and successful were his internal reforms. Canals were dug, roads built, schools founded, manufactures established, and large numbers of skilled mechanics, engineers, artists, and scholars were invited to Russia and treated well, though the manners of their host were sometimes a little rough. A pattern of European dress, after which the boyars were commanded to cut their clothes, was hoisted over the gates of Moscow; they were also ordered to shave off their long beards, and the czar is known to have rushed into the street, caught a man by the throat, and cut off his beard with an imperial pair of scissors. He died Feb. 8, 1725, from a cold he caught by springing into the water and helping to rescue some shipwrecked persons. His greatest merit, however, was that the immense machine which he had put in motion did not stop when he died. Some progress was made under each of his successors—Catharine I. (1725–27), Peter II. (1727–30), Anne (1730–41), Elizabeth (1741–62), his daughter, who founded at Moscow the first Russian university; and especially under Catharine II. (1762–76). After the Peace of Nystad, Peter the Great had assumed the title of "emperor of Russia," but in spite of Anne's signal success against the Turks and Elizabeth's prominent participation in the Seven Years' war, on her accession to the throne Catharine found some difficulties in getting her title recognized and respected by foreign powers. Before her death, however, they had wholly disappeared. Her talent for show and her coquetry with the French philosophers, with Voltaire, D'Alembert, Diderot, etc., gave her great prestige, and her successful wars with Persia, Sweden, and Turkey, from whom she conquered the Crimea, and still more her marvellous diplomatic successes, by which she acquired Courland and the half of Poland, gave her weight. Her internal reforms bore sometimes a resemblance to the cities through which Potemkin conducted her on her journey to Taurida: they were paper only. Nevertheless, she brought a great number of good settlers, German and Swiss, to Russia, founded some excellent educational institutions, and gave to Russian life in general many impulses of freedom and refinement. Under her son, Paul I. (1796–1801), the intercourse between Russia and Europe became still more frequent and intimate, and under Alexander I. (1801–25) Russia appears not only as one of the great powers, but as the true arbiter in European politics. Alexander was a gifted man, imaginative, enthusiastic, and easily carried away through his great impressibility. In the Napoleonic wars he sided first with Austria, and was beaten at Austerlitz; then with Prussia, and was beaten at Friedland. There seems to have been no definite policy behind these alliances. But after his first personal meeting with Napoleon, who completely overwhelmed him by the vastness of his plans, his policy became fixed for several years. In the interior no change took place. Alexander was never a liberal, but in the beginning of his reign he was a philanthropist. The secret court for political cases, police supervision by spies, confiscation of property as a criminal punishment, and other similar mischievous or revolting practices, were abolished; a vast educational system was inaugurated, and industrial and commercial enterprises were encouraged. But his foreign policy had received a new goal. He had divided the world with Napoleon, and given up the western part. He only intended to regulate his frontiers in this direction, and was then prepared to advance to the East and meet the English in Bengal—an idea which, however, not Napoleon, but Catharine II., had infused into the Russian policy. By the Peace of Frederikshamn (1809) he obtained Finland from Sweden; by the Peace of Bucharest (1812), Bessarabia and Moldavia from Turkey; and the war with Persia—that is, the advance toward Bengal—was successfully progressing when his friendship with Napoleon suddenly began to wane. He could not fulfil the conditions which Napoleon had stipulated—namely, the introduction of the continental system—and the war with Turkey had shown him that, on the other hand, Napoleon by no means thought of keeping his part of the compact. A rupture took place, and now followed with fearful rapidity the invasion of Russia by Western Europe, the destruction of the grand army, and the overthrow of Napoleon. In 1814, Alexander stood as the liberator of Europe, received with enthusiasm by the nations and the kings, flattered and adored; after witnessing a review of the Russian troops in the Champs de Mars, Madame de Krüdener told him that she had thought all the while of the reign of Christ on earth. His treatment of France was noble and magnanimous; of Poland, liberal and wise; of Germany, although so utterly unsatisfactory to the German people, yet the best he could do. But from his tour in Western Europe he returned home another man, perplexed and seduced by some of the most eccentric movements of European civilization, disenchanted and polluted by the vile and depraved egotism of the European princes. Soon his whole internal policy was changed, and he became the founder of the Holy Alliance and the chief support of the European reaction. Suppression became the principle of his government—the censorship, the police, and an army of spies its organs. He was hated at home and abroad; and he knew it. A few hours before he died he learned that a widespread and powerful conspiracy against the house of Romanoff was about to explode. Under his brother, Nicholas I. (1825–55), and his grand-nephew, Alexander II., Russia continued to occupy the same position in European politics—at the head of the reaction, the stern and proud representative of the absolute monarchy, based partly on a bureaucratic, partly on a military organization. But in the interior an entirely new development took place of the greatest consequence to the empire itself and to the world at large—perfectly just and highly

beneficial in its general idea, though often terrible and shocking in the practical measures it has called forth. Under their frequent intercourse with foreign nations the national consciousness of the Russian people awoke, and under the reign of Nicholas I. a national party was formed both in literature and politics, representing those ideas and passions which compose the popular character of the Russians. As the most prominent results of this movement may be mentioned the Russianizing of the non-Russian nations belonging to the empire, and the closer and closer grasp of the heritage of the Byzantine empire. Nicholas claimed to be the patron and natural defender of the Greek Christians in Turkey. But Napoleon III., whom he would never call "Monsieur mon frère," and England, whose merchants have invested very largely in Turkish oppression and misrule, could not allow this patronage. The Crimean war ensued, and by the Peace of Paris (1856) Russia lost its supremacy in the Black Sea. It only bided its time, however, and Oct. 31, 1870, when neither England, France, nor Turkey was able to resist, Prince Gortschakoff informed the various cabinets that Russia felt compelled to deviate from the stipulations of the Treaty of Paris, and keep a fleet of sufficient capacity in the Black Sea. Between Nicholas I. and the national party there existed a deep sympathy; not so between Alexander II. and certain shades of the party, the Old Russians. The present emperor pursues a progressive policy—progressive toward liberty—which sometimes crosses the prejudices and passions of the Old Russians. The abolition of serfdom in 1861 seemed at one time liable to call forth serious complications. No disturbances took place, however. The censorship has been also mitigated, and great improvements have been introduced into the administration. (See Schnitzler, *Les Institutions de la Russie depuis les Réformes de l'Empereur Alexandre II.* (2 vols., 1867); also Gurowski, *Russia as it is* (New York, 1854); Eckardt, *Modern Russia* (translated from the German, London, 1870); Hepworth Dixon, *Free Russia* (London, 1870); Barry, *Russia in 1870* (London, 1871); Ralston, *Early Russian History* (London, 1874).)

CLEMENS PETERSEN.

Russia, p.-v. and tp., Herkimer co., N. Y., on Canada Creek, including E. portion of the celebrated Trenton Falls. P. 2220.

Russia, tp., Lorain co., O., on Lake Shore and Michigan Southern R. R., includes v. of Oberlin, seat of the college of the same name. P. 4207.

Russia, p.-v., Loramie tp., Shelby co., O., on Cleveland Columbus Cincinnati and Indianapolis R. R. P. 53.

Russia Leather. See LEATHER, by PROF. C. F. CHANDLER, PH. D., M. D., LL.D., M. N. A. S.

Russian America. See ALASKA.

Rus'sian Lit'erature. Ancient as is the Russian language, the most flourishing section of the Slavonic branch of the Aryan family of speech, neither its name nor its literature can boast of any great antiquity. The former dates from the period in which, during the second half of the ninth century, the Varangian princes laid the foundations of what became the Russian empire. The latter is still more modern; for what is generally styled "Old Russian literature" was for a long time little more than a branch of that Church-Slavonic literature which was introduced into Russia after the conversion of the country to Christianity toward the end of the tenth century. Not that the Russian language is descended from the Church-Slavonic, the Old Bulgarian dialect of Slavonic speech employed by Cyril and Methodius for their translation of the Scriptures. The two languages are independent branches of the same stem. But the earliest literary productions of Russia, being due to ecclesiastics versed in Church-Slavonic, evince, so far as their diction is concerned, at least a strong Church-Slavonic influence. As regards their style, they are for the most part copies of Byzantine models, many of them, indeed, being direct translations from the Greek. Their contents, except in the case of the *Chronicles*, are mostly of a religious character. Of the *Chronicles*, the earliest is that of Kief, generally known under the name of its first compiler, the monk Nestor, of whom little is known except that he was received into the Lavra at Kief in 1073, when he was about seventeen years old, and that he probably died after the year 1113. Before his time, no doubt, records were kept in the monastery, but he seems to have been the first to digest them into a continuous narrative. It was followed by other works of a similar nature, such as the *Chronicles* of Novgorod, Volhynia, Tver, Moscow, etc., which run on almost without a break from the eleventh to the seventeenth century. Besides these invaluable foundations of Russian history and the religious works already mentioned, the first period of Russian literature, dating from the introduction of Christianity to the first defeat of the Russians by the Tartars (A. D. 988–1223), produced little that has been preserved. Certain political fictions of a Byzantine origin, as well as numerous moral writings and "apocryphal books" treating of heaven, hell, the creation, etc., came into Russia from the South Slavonic countries. Among the works of this period which may be referred to a Russian source the principal are—(1) the *Instructions* of the grand prince Vladimeer Monomachus to his children, written in 1099; (2) a *Memorial*, attributed to the twelfth century, in which one Daniel Zatochnik (or the "Prisoner") begs a Russian prince to restore him to liberty; (3) a poem, also attributed to the twelfth century, describing the expedition of Igor, prince of Novgorod, against the Polovtsy. Russian scholars generally ascribe the composition of this poem to one of the bards who in those days were attached to the courts of the numerous princes of Rurik's race. It was discovered in 1795 by Count Mussin Pushkin, and edited by him, but the MS., which is supposed to have been copied toward the end of the fourteenth century, was unfortunately burned in the great fire of Moscow in 1812. To this day there have been preserved by oral traditions among the peasantry numerous "metrical romances," some of which are supposed to be relics of a great cycle of semi-epic poetry narrating the exploits of the early princes and their "drujinas," or bands of military companions. Although these "builinas" are chiefly found in the N. E. provinces, the scene of their action is generally laid in Kief, the ancient capital of Russia, before the cities of Vladimeer or Moscow became pre-eminent. After the transfer of the principality of Kief to Poland, one of the consequences of the Mongol invasions, its language underwent a considerable change. The tongue now spoken in the S. W. provinces of Russia is known by the name of "Little Russian," as that of some of the north-western provinces is designated "White Russian." But at present we have to deal only with the "Great Russian" language, originally that spoken in the principality of Moscow, now the official and literary speech of the whole Russian empire and the native tongue of about 35,000,000 of its inhabitants.

The Mongol conquest suddenly stopped the development of Russian literature. For more than two centuries scarcely anything of note was written, and it was not till the Moscow princes established their independence that any improvement took place. Even then little attention was paid to education except by the monks, and very little was written that was not of an ecclesiastical nature. A few records of travel were produced, and some semi-historical tales, two of which narrate the defeats of the Mongols under Batu and Mamai, and the *Chronicles* were sedulously carried on. In the sixteenth century the printing-press was introduced into Russia. Its first production was the *Acts of the Apostles and Epistles of Paul*, which appeared at Moscow in 1564; the most important of its early fruits was the Bible, printed at Ostrog in 1581. Among early Russian MSS., it may be observed, the most important are the Ostromir Gospels, written in Novgorod A. D. 1056–57 for the burgomaster Ostromir, the *Izbornik* (*Sbornik* or "Collection"), written in 1073 for the grand prince Sviatoslaf, and a similar work written for him in 1076. The introduction of printing was due to the czar Ivan the Terrible. His writings, especially his correspondence with Prince Kurbsky, together with the *Domostroi*, a treatise by the priest Sylvester on the management of a household, form the most interesting of the secular literary productions of that period. During the "troublous times" which followed Ivan's death but little attention could be paid to education or its results, and it was not until the reign of Peter the Great that any decided impulse was given to literary activity. Seven centuries had passed away since the introduction of letters into the country, but as yet no national literature had sprung into life, for that title cannot be given to the religious utterances of the clergy, the historical compilations of the monks, or the various codes of laws—invaluable as are to the historian and the jurist the rich collections of *Chronicles*, such records of ancient jurisprudence as the eleventh-century *Russkaya Pravda* (or "Russian Right") of the grand prince Yaroslaf, or the *Code of Laws* founded upon it by his grandson, Vladimeer Monomachus, and such memorials of fifteenth and sixteenth century lawgivers as the *Sudebniki* (or "Codes") of Ivan III., his son, Vassily III., and his grandson, Ivan IV.—czars whose reigns cover the period from 1462 to 1584—or the *Sobornoe Ulozhenie* (or "General-Assembly Code") which was adopted by the "general assembly" or "states general" convoked for the purpose by the czar Alexis Mikhailovich in 1648. Certain religious dramas or mysteries, it is true, had been composed in Russian, notably by the ecclesiastical dignitaries Simeon of Polotsk and Demetrius of Rostof, and an unwritten literature existed

in the memories of the common people, among whom a number of songs and stories had been handed down from generation to generation. But as the latter have only recently been collected, and their present forms are, for the most part, not very old, it is impossible to ascertain the period to which their origin should be referred.

With the reign of Peter the Great begins the history of the modern literature of Russia. That great reformer, so anxious to introduce into his realm all that had given life and progress to the West of Europe, made an attempt to improve the neglected education of his subjects. Russian printing was encouraged, the Russian alphabet was simplified and rendered more apt for typographical uses, and by means of translations and imitations foreign culture was brought to bear upon the new empire. As Peter, however, was always in a hurry, and insisted, above all things, on what was practical and serviceable to his ends, neither literature nor science could fairly develop itself. Still, many books were printed. Not only such religious works appeared as those of Theophan Prokopovich and Stephen Yavorsky, but secular literature began to assert itself. Among its first representatives during the period which followed Peter's death was Prince Antiochus Kantemir (1708–44). A Russian by education, though not by birth or descent, a man of the world, a politician and a diplomatist, he wrote in Russian verse such satires as were natural to a period of transition. Founded upon those of Juvenal and Boileau, they attacked the faults and follies of the aristocracy and the various abuses which Peter had attempted to reform. Another was Vassily Tatishchef (1685–1750). Long in the public service, engaged in all kinds of official work, he gave his leisure to geography and history. His chief literary production was the *Russian History*, which was published about thirty years after his death. It was, for its time, a remarkable work, as also was a moral treatise which he wrote in 1733, entitling it his *Testament*, and giving in it his idea of what a Christian man in Russia should be. A third was Vassily Trediakovsky (1704–69). The son of a priest, he completed his education in Holland and France, returning to Russia in 1729. Receiving a professorial appointment, he translated much. The appearance of the guide to versification which he published in 1735 forms an epoch in the history of Russian poetry. His own verses, however, failed to do justice to the correctness of his theories on the subject. But the first lay writer of real mark was Michael Lomonosof (1711–65), the son of a serf engaged in fishery in the province of Archangel. Taught to read and write by his mother, he fled from his home to Moscow in 1729. Having completed his education in Germany, he returned to Russia, where, after enduring many hardships and meeting with much opposition from the German administrators of the Academy of Sciences, he at length achieved success, and produced many works, mostly of a scientific nature. But his chief merit was that he laid down the laws of Russian grammar, and rescued the literary language of his country from the state of anarchy into which it seemed to be falling under the pressure of many forces from without. The long-maintained influence of the Church-Slavonic over the real Russian language has already been mentioned. A great influence also was exercised on the language by Polish, especially during the considerable period throughout which the Polish-Lithuanian power extended over the S. and W. of what is now Russia. With the introduction of Western culture a third foreign element appeared in the shape of words and idioms belonging to other tongues, especially the German, and there seemed to be no small danger of a language becoming hopelessly corrupted which had no classic literature, no recognized laws or models on which to fall back. The services, therefore, rendered by Lomonosof as a linguistic reformer were very great, though his literary merits were less conspicuous than his scientific. From his time the Russian language, no longer cramped by the archaic stiffness of the Church-Slavonic, and to a great extent freed from the danger of being corrupted by alien influences, served as a fit interpreter of the ideas of the fast-increasing school of thinkers and writers who illustrated the brilliant age of Catharine II. —a monarch who greatly contributed by her influence to the development of Russian literature, besides adding to its stock several dramas, essays, etc. of her own composition. But although the written language became more natural, the spirit of Russian literature remained foreign to the land. Not only were translations numerous, but Russian authors turned for their models to other countries, and their productions were seldom marked by anything like originality. This was the age of the literature of the *salon*, marked by much culture, grace, and vivacity, but wanting in anything like depth or earnestness of thought; almost the sole exception being Radischef's *Journey from Petersburg to Moscow* (1790), in which appears an unusual seriousness, as well as such a strong feeling on the subject of serfdom as led to the author's exile. Of other writers the most remarkable were—Alexander Sumarokof (1717–77), who wrote twenty-six dramas of the "pseudo-classic" kind, his models being Corneille and Racine, besides numerous essays, satires, poems, etc.; Denis von Wizin (1744–92), scion of a knightly German family, a dramatist, satirist, and miscellaneous writer, best known by his comedies, *The Minor* and *The Brigadier*; Ivan Khemnitser (1744–84), also of German extraction, a fabulist of renown; Michael Kheraskof (1733–1807), the author of an immense number of dramas and poems, including two epics—the *Rossiad*, describing the capture of Kazan, and *Vladimir*, the theme of which is the conversion of Russia to Christianity; Ippolit Bogdanovich (1743–1803), a Little Russian, a prolific poet, best known by his *Dushenka*, an imitation in irregular verse of the tale of Cupid and Psyche, which La Fontaine adapted from Apuleius; and Gabriel Derzhavin (1743–1816), by far the most notable of all, who held various important government appointments, and wrote much poetry of various kinds. His fame, which is very great among his countrymen, chiefly rests upon his lyrical poems, one of which, the *Ode to God*, has acquired an immense reputation, confirmed by the critical opinion of an emperor of China. Many other Russian writers of renown illustrated the eighteenth century, for during the reigns of the three empresses literature became creditably represented in Russia in almost every branch. The drama from the year 1746, in which the first Russian theatre was founded in the provincial town of Yaroslaf, throve vigorously, and rooted itself in the affections even of the common people. Journalism had begun to make its way, though slowly, its first appearance being due to the activity of Gerhard Friedrich Müller (1705–83), a writer who also commenced the historical researches in which Russian literature has since distinguished itself so honorably. Like August Ludwig Schlözer (1735–1809) and many other fosterers of science in Russia, he was a German, but his studies were carried on in Russia, and greatly to the advantage of that country. The study of Russian history was greatly favored by Catharine II., and ample materials were gradually prepared for the work of the first Russian author who made his name known in the West of Europe. Nicholas Karamzin (1765–1826) may be taken as the first representative of the new school of writers which prevailed throughout the reign of Alexander I. and a considerable part of that of Nicholas. During those reigns Russian literature attained its full development, and it was illustrated by the greatest names of which it as yet had to boast. For their success the way was to a great extent prepared by Karamzin, who rendered to Russian style a service like that which Lomonosof had already rendered to Russian grammar, freeing it from the heavy and complicated forms of construction into which it had been led under Latin and German influences, rendering it far more fit than it had previously been for the expression of simple and natural ideas. His early works, including a number of tales in the sentimental vein then beginning to be in vogue, are of no great value, but after a time the historical studies, which obtained for him the title of "historiographer to the emperor," led him to compose (1803–16) the *History of the Russian Empire*, to which he owes his cosmopolitan reputation. Between those years the great events which rendered so memorable the first half of the reign of Alexander I. brought Russia into close contact with the rest of Europe, but at the same time evoked a strong national feeling. A genuine Russian literature, dealing not merely with courts and nobles, but broadly based upon the land and its people and reflecting their ordinary thoughts, feelings, and avocations, gradually made its way and held its ground. By influences from abroad it was still much moulded, but that which began to assert itself most, the English, produced upon it a salutary effect. During the reign of Nicholas, it is true, a severe censorship greatly fettered the press, rendering impossible the discussion of many questions, especially of those of a theological or philosophical nature. But by forcing the expression of thought into certain channels it may have added to the force, while it narrowed the range, of the current of printed speech. In verse this period was especially rich. The Russian language lends itself readily to versification; a genuine poetic feeling is widely diffused among the Russian people, the peasantry having from time immemorial been devoted to song. No poet of the first order, it is true, has as yet arisen among them, but, on the other hand, the number of their poetical writers is very great. For a considerable period a false classicism chilled the native glow of Russian poetry, but during the reign of Alexander I. a romantic school of poets arose. Among the first was Vassily Joukovsky (1783–1852), who took

the modern German poets, and especially Schiller, as his models. His poems, which, like those of the majority of Russian poets, were somewhat of the nature of imitations or adaptations, together with his numerous and excellent translations, exercised a great influence over the literature of his day, which became freed from the frigid classicism introduced from France. A healthy taste for the Greek classics, on the other hand, began to spring up at this time, and was fostered by such translations as that of the *Odyssey* by Joukovsky, of the *Iliad* by Gniedich, those from Sophocles, Pindar, and Anacreon by Martynof, and from Theocritus by Merzliakof; as well as by the poems which Konstantin Batyushkof (1787–1855) wrote under the influence of the Greek lyric poets, or at least of their French imitators. But the foreign influence which had the greatest effect upon Russia's chief poet came from a different quarter. Alexander Pushkin (1799–1837) owed much of his early inspiration to the genius of Byron. Endowed with true poetic fire, and with a power of expression unmatched among his countrymen, his best works reached the highest point to which Russian poetry has as yet attained. He wrote much in prose as well as in verse, his principal work being the poem called, after its hero, *Eugene Onegine*, which ranks as one of the chief masterpieces of Russian literature. Dealing with the Russian society of the period in which it appeared, that comprising the last portion of Alexander's reign and the first of his successor's, it had the great merit of offering a series of pictures carefully drawn from life, and yet sufficiently idealized to fascinate every eye. Readers familiar with its themes—such as the influence of Western ideas upon Russian society, the effect of romantic fancies upon the younger members of the upper classes in Russia—could recognize the accuracy of its portraiture, the subtlety of its analysis of character; while even those totally unacquainted with them could appreciate its poetic charm. Pushkin met with an untimely death, being killed in a duel, and a similar fate befell the second of Russia's poets. Michael Lermontof (1814–41), who also was killed in a duel, resembled Pushkin in some respects, as well in his Byronic scorn and *ennui* as in his healthy love of nature and his remarkable power of describing scenery. As several years of his unquiet life were spent in the Caucasus, he has been able to enrich his chief works with graphic descriptions of the romantic beauties of that grand mountain-range, as well as of the wild life then led by its picturesque inhabitants—scenes attractive to all eyes, but especially to those of a people inhabiting so flat and tame a land as Russia. These charms partly account for the immense popularity of his *Demon*, a poem in which is described the love of the chief of the fallen angels for a Circassian maiden; of his *Mtsyri*, another poem descriptive of the feelings of a young mountaineer who has been brought up in the peaceful seclusion of a monastery, but who cannot withstand his inborn craving for a free and open life—feelings with which those of the ardent youth of that oppressive period were in complete sympathy; and of his *Hero of Our Time*, a prose novelette, which has been translated as often and into as many languages as Pushkin's tale of *The Captain's Daughter*. One of the most vigorous of Lermontof's poems is one in which, imitating the style of the "metrical romances" current among the Russian peasantry, he tells a story of the time of Ivan the Terrible. It is when they fall back upon the popular poetry of their native land that the Russian poets evince most power. This is especially manifest in the writings of Alexis Koltsof (1809–42), a poet belonging to the *bourgeoisie*, his father having been a small trader in Voronezh. Endowed with rare poetic feeling and keenly appreciating the romantic side of country life, he has to a great extent borrowed his imagery as well as his versification from the rich store of national song, and his lyrics therefore bear a thoroughly Russian stamp. His fellow-townsman, Ivan Nikitin (1826–61), who also belonged to the class of small traders, has produced a number of poetic sketches of humble life, which foreign critics, who naturally lay more stress on an author's ideas than on his diction, may sometimes prefer to the more ambitious productions of his aristocratic contemporaries. Nikitin, however, belongs to the realistic school, which followed the romantic, the change being principally due to Gogol, the writer whom Russians put forward as their truly national representative, to whose influence the direction and tone of Russian fiction has for the last forty years been chiefly due. Satire has always been popular in Russia, where there is one instance of a great reputation being founded upon a single work of a satirical nature. This is the *Gore ot Uma* of Alexander Griboyedof (1795–1829), another of Russia's short-lived poets, killed in his thirty-fifth year during a riot at Teheran, whither he had gone as Russian plenipotentiary. The comedy to which he owes his fame, and which is regarded in Russia as one of the few acknowledged masterpieces of native literature, was completed in 1823. Its title expresses the misfortune of being too intellectual or *spirituel*, and its principal theme is the contrast between the old and new schools then existing in Russian society, the struggle going on between the past and present ideas, the obstructive party being represented by the elderly Famousof, and that of progress by the young Tchatsky. The immense success achieved by this drama in Russia may to some extent be accounted for by the love which the Russians have for seeing themselves held up to ridicule so long as the operation is performed by a native hand; and this creditable feeling partially explains, likewise, the unrivalled popularity of Gogol's principal works, the *Revizor* and *Dead Souls*. Nicholas Gogol (1806–52), a native of Little Russia, after trying and abandoning official and professorial life, devoted himself to literature, which by his time had become capable of being considered a profession. Naturally of an enthusiastic nature, he at first wrote stories of a romantic kind, but about 1834 he became the leader of the realistic school, to which so much of Russian literature has since that time belonged. In his shorter tales, such as the *Cloak*, etc., there is pathos mingled with the humor on which his reputation is mainly based, and some of them, especially two sketches of country life as led by the smaller Russian landowners, are from every point of view admirable. But the two works by which he seems destined to be immortalized are realistic studies of ridiculous, often repulsive, social types, into which little enters that is romantic or pathetic or ideal. Their influence on subsequent Russian fiction has been very great, and it to some extent accounts for the fact that Russian novels often prove distasteful to readers who are not sufficiently familiar with Russian society to recognize their fidelity to life. In Gogol's comedy of the *Revizor* a picture is drawn of the evils inherent in the official life of the time—evils which the author intended to be not only laughed at, but sorrowed over. The whole of the dramatic action is concentrated around the impatiently-awaited arrival of a government reviser or inspector, who is coming to examine into the state of provincial administration. The various types of chinovniks, or members of the civil service, are truthfully though grotesquely portrayed, and inexhaustible laughter is provided for a Russian audience by the errors into which they are led when mistaking an ordinary new-comer for the dreaded official. The subject of the play was suggested to Gogol by Pushkin, who exercised over him a great influence, as was also that of his most famous work, the novel, if it may so be styled, entitled *Dead Souls*. Its hero, Chichikof, ex-holder of a small post under the government, wanders about Russia buying "dead souls"—that is to say, having transferred to him the pretended ownership of such "souls" or male serfs as have died since the last census, but who still exist on paper, and are therefore capable of being pledged to the government and thereby turned to pecuniary uses. The real aim of the story is to introduce a number of types, mostly covetous and ignoble, under cover of whom the author may attack some of the social abuses of the day. The work obtained, and still enjoys, an immense success, but its reputation is never likely to become cosmopolitan. During the last ten years of his life Gogol sank into a state of despondency, devoting himself to mysticism, and no longer entertaining those ideas about the art of authorship which have had so powerful an influence upon modern Russian literature. His great merit, to a foreign eye, seems to be the thoroughly Russian character of his work. So much in Russian literature has been borrowed from abroad —if not in thought, at least in style—that the few writers who have shown themselves truly national stand out in clear relief from the host of imitators. Gogol is one, Koltsof another, and as a third may perhaps be mentioned the fabulist, Ivan Krilof (1768–1844). It is true that the form of Krilof's fables was borrowed from La Fontaine, as were the subjects of his earlier productions, but in his later and best works his ideas, his style, and his peculiar vein of humor were original and thoroughly Russian. He wrote much, especially as a journalist and dramatist, but it is to his fables that he is deservedly indebted for a fame which is as widespread as it is likely to be lasting. Beginning by paraphrasing La Fontaine, he eventually produced thoroughly original works, often employing his apologues as a vehicle for such sarcastic attacks upon official abuses as it might have been dangerous to publish in a more serious form. The terseness of his diction, the simple neatness of his versification, can be fully appreciated only by Russians, but numerous translations have enabled foreign readers to judge of the keenness of his insight into human nature, the sparkle of his wit, and the fresh brightness of his humor. His is one of the very few names of Russian authors which are at all familiar to foreigners, many of the writers who have considerably assisted in the development of Russian

literature being all but unknown beyond the Russian frontier. Such is the fate, for instance, of Byelinsky (1801–48), the prince of Russian critics, who during the last third of his life was the experienced guide, the enlightened appreciator, of every literary movement in Russia.

During the second half of the reign of Nicholas several writers of mark began to appear. Among those who made their names most known abroad was Alexander Herzen, whose remarkable abilities, however, were soon transferred from literature to politics. He may be taken as the representative of that revolutionary spirit which has since produced a literature of its own. Had he devoted himself to fiction, he might have achieved the success of which his novel *Whose Fault?* (published in 1847) gave promise. But founding a "free Russian press" abroad, he and his fellow-workers, of whom the poet Ogaref was, from a literary point of view, the most remarkable, turned their whole attention toward publishing, in England and in Switzerland, in the form of books, journals, and pamphlets, ceaseless attacks upon the government of the land from which they were exiled. Until the death of Nicholas this Russian revolutionary press exercised great power, but the sweeping reforms introduced by Alexander II. almost annihilated its influence. Freed from the crushing weight by which, in the time of Nicholas, it was kept down, Russian literature under the milder rule of his successor gained greatly in strength and in activity. In one department, indeed, that of poetry, it manifested a falling off, but in almost every other branch it throve rapidly and bore fruits both plentiful and rich. So numerous, indeed, have become the productions of the Russian press since the Crimean war, and so varied their subjects, that in speaking of them here it is barely possible to do more than to mention the leading representative of each of the classes into which they may be divided. In poetry the first place is due to Nicholas Nekrasof. Born in 1822, he began to write as early as 1838, and since that time his works have been as numerous as popular. A bitter satirist and an ardent reformer, he took as his early themes many of the evils of Russian life, laying especial stress upon the sad condition of the peasantry before the emancipation. Fully in earnest, at least theoretically, often hot with a generous indignation, and gifted with a great power of vigorous expression, he has drawn a series of pictures of village life, as well as of city sufferings, which are singularly clear and impressive. Many other subjects also have been treated by him, chiefly from the point of view of the social satirist, but his genius appears to the greatest advantage when he deals with such themes as are most truly Russian, and avails himself in handling them of the peculiar ideas and quaint expressions which have been preserved in the songs forming the poetic heritage of the common people of Russia. How great is the store of poetry which Russian literature possesses may be judged from the fact that the *Chrestomathy*, published by N. Gerbel in 1873, contains biographies and specimens of upward of 120 Russian poets. Among the best known of Nekrasof's rivals may be mentioned Leo Mei (1822–62) and Apollo Maikof and Afanasius Fet, both of whom were born in 1821. Among the younger generation there is not much poetic promise, Russian literature showing a tendency of late years to run more in the channel of prose than in that of verse. Of dramatic literature the leading representative is Alexander Ostrovsky, who was born in 1824. Besides carrying on the work begun by Griboyedof and Gogol in their satirical comedies, dealing with the sins of public functionaries and the weaknesses of the social circles in which they move, he created a special field of his own in representing on the stage the manners and customs of the Russian mercantile class, long an exclusive caste, of the private life of which other ranks knew little. Thus, in his *Lucrative Appointment* he has depicted the contrast between the old and the new school of officials, portraying in glowing colors the young *chinovnik* or civil servant, full of generous ideas, shocked at the thought of bribery, and standing out in bright relief against a background dark with the cynical corruption of bygone days. And so his *Groza* (or "Storm"), the best of his dramas devoted to commercial life, describes the tyranny with which a mother rules the house of her married son, a young Moscow merchant, and the infatuation with which his wife spurns his affection for that of a lover—the despair to which she ultimately yields herself after a thunderstorm has awakened her conscience to a sense of her guilt. Ostrovsky has also produced several historical dramas, as have some other of his contemporaries, among whom may be mentioned Count Alexis Tolstoi (1817–75), whose trilogy of *The Death of Ivan the Terrible*, *Tsar Fedor Ivanovich*, and *Tsar Boris*, deserves special notice on account of the careful study devoted to its representation of a very troublous period of Russian history. Among the numerous novelists of Russia several men of mark are to be found, but by far the first is Ivan Turgenief, the solitary Russian writer whose fame is cosmopolitan, whose works are widely read out of Russia for the sake of their artistic merit, and not merely on account of the information they convey or the light they may throw upon Russian history or manners. Born in 1818, he began his literary career as a poet, publishing numerous poems between 1841 and 1846. In 1843 appeared his first prose work, a dramatic sketch, and in 1844 his first tale, *Andrei Kolosof*. His principal works, most of which have been translated into many languages, are the *Zapiski Okhotnika* ("A Sportsman's Notes"), a series of exquisitely finished tales and sketches illustrating country life in Russia, with especial reference to the peasants and their sufferings from serfdom; the novels entitled *Dvoryanskoe Gnyezdo* (translated into French under the title of *Une Nichée de Gentilshommes*, and into English under that of "Liza"), *Fathers and Children*, *Smoke*, *Spring Floods*, *On the Eve*, *Roudine*, etc.; and numerous novelettes and tales, some of which, such as *Faust* and *Moomoo*, for instance, may rank with the best specimens of their class which the literature of any country has ever produced. Among other modern Russian novelists of note are Count Leo Tolstoi, whose *Peace and War* is by many Russian critics considered the best of Russian novels; Goncharof, whose chief work is *Oblomof*, in which the downward career is traced of the hero from whom the story takes its name, and in whom a weak will annuls many good qualities; Dostoefsky, best known by his *Crime and Chastisement*, which contains a careful psychological study of the effect of crime on the mind of the criminal, and by his *Notes from the Dead-House*, a series of sketches of convict-life in Siberia; Pisemsky, the author of many most realistic novels descriptive of modern society in Russia, such as *The Whirlpool*, *A Thousand Souls*, etc.; Saltykof, who, under the pseudonym of "Shchedrin," has produced a number of satirical fictions, such as the *Provincial Sketches*, the *Tashkentians*, and other works, in which he describes, or rather caricatures, the official and social faults and follies of the day; and a number of other writers, many of whom have deservedly obtained a considerable reputation in their own country.

It is not, however, so much in the field of imagination as in that of serious study that Russian literature has of late most distinguished itself. In no country has more been done than in Russia, during the last twenty years, toward investigating and editing national records. Besides producing many histories of Russia, of which the principal are those of Solovief, Ustrialof, Kostomarof, Pogodin, and Bestujef-Rymin, the literary activity of late years has given rise to the publication of an immense number of historical, archæological, and ethnographical books, essays, and pamphlets. To the popular mythology and literature of Russia more serious attention has been paid than has been given to similar subjects anywhere except in Germany, the collections of popular tales by Afanasief, of proverbs by Dahl, and of popular songs and metrical romances by Rybnikof, Hilferding, Shein, the brothers Kirievsky, and many others being all but unrivalled. Much similar work, moreover, has lately been excellently performed in Little Russia by Kulish, Rudchenko, Chubinsky, Dragomanof, Antonovich, and others, but their labors have not been fostered by the Russian authorities. Almost every department of science, indeed, is now creditably represented in Russian literature, special attention having been paid of late years to philosophy and jurisprudence. The publications of the great learned societies, such as the Academy of Sciences and the Geographical Society, may fairly compete with the best of similar works issued in other countries. But it is not so much a literature as the materials for a literature that the Russian press is now making public. Russian literary energy is at present restless, eager, and impatient, and lends itself more readily to the rapid exploration of what is new and practical than to the slow acquirement of wisdom or the steady polish of style, or to attempting prolonged flights in the regions of fancy and imagination. Journalism in Russia has had much to contend with, the censorship having of old been tyrannical, and being now somewhat capricious. But such newspapers as the *Vyedomosti* (or "News") of Moscow, edited by Katkof, the leading Russian journalist, and the *Golos* (or "Voice"), the *Russian Invalid*, and the *Exchange Vyedomosti* of St. Petersburg deserve to rank high if tried by any other standard than that of newspapers printed in English. Until quite recently the *St. Petersburg Vyedomosti* also occupied a distinguished position. Among magazines or reviews the principal are the *Vyestnik Evropui* (or "Messenger of Europe") and the *Russky Vyestnik* (or "Russian Messenger"), both of which are excellent; the former, indeed, being inferior to no European journal of the same kind except the *Revue des Deux Mondes*. Unfortunately for Russian literature, the reading class in

Russia forms but a very small section of the population, the masses of the people being quite illiterate. With the spread of education may come a greater demand for books, and the national literature may be able to boast of a development commensurate with that of the practical resources of the Russian empire. W. R. S. RALSTON.

Russian River, tp., Sonoma co., Cal., on the river of the same name, so called from a Russian settlement made there early in the nineteenth century.

Rust, Smut, Blight, Brand, and **Bunt** are diseases of plants produced by the growth of microscopic vegetation (fungi) upon the plant. (See MILDEW and UREDINES.)

Rus'tige (HEINRICH), b. at Werl, Westphalia, Apr. 12, 1810: studied painting at Düsseldorf under Schadow; settled in 1836 at Frankfort, and was appointed professor at the Academy of Stuttgart in 1844. He has painted genre pictures—*The Golden Wedding*, Leipsic; *The Inundation*, Berlin; *The Gueuex Sermon*, America; *Soldiers in Camp*, Russia—and historical pictures, most of which are in Stuttgart. He also wrote art-criticisms, dramas, and songs, one of which, *Deutscher Marsch*, was set to music by Kücken and became very popular.

Rüs'tow (WILHELM), b. at Brandenburg, Prussia, May 25, 1821; entered the Prussian army in 1838; was arrested and indicted in 1850 for his *Der Deutsche Militärstaat vor und während der Revolution* (1850), but escaped; settled at Zurich; became a celebrated military author; found practical employment in the Swiss army, and took part with distinction in the campaigns of Garibaldi in Sicily and Naples in 1860. Besides his *Geschichte des Griechischen Kriegswesens* (1852) and *Heerwesen und Kriegführung Cäsars* (1855), he has given critical representations of all the recent European wars, and a number of theoretical works on tactics, strategy, elementary military organization and education, etc.

Rustschuk', town of European Turkey, eyalet of Silistria, is built on several hills along the Danube and surrounded with extensive fortifications. It is the see of a Greek archbishop, and has several fine mosques and extensive manufactures of leather, muslin, silk, and tobacco. P. about 30,000.

Ru'ta Ba'ga, the Swedish turnip, a highly important crop-root, believed to be an artificial variety of *Brassica campestris*. It has many sub-varieties, some of which are among the most valued of the turnips. (See TURNIP.)

Ruta'ceæ [from *Ruta*, one of the genera], a natural order of exogenous trees, shrubs, and herbs. Rue, buchu, and the prickly ash (*Xanthoxylum*) are representative plants of the order. Recently, botanists have attached the Aurantieæ (orange, lemon, citron, etc.) to this family, which now numbers some 500 species.

Ru'te, town of Spain, province of Cordova, has 6345 inhabitants.

Ruter (MARTIN), D. D., b. at Charlton, Mass., Apr. 3, 1785; received a common-school education; was licensed as a Methodist preacher when seventeen years of age; gained by private study a competent knowledge of several languages and sciences; presided at one time over the Wesleyan academy at Newmarket; became agent of the Western book establishment at Cincinnati 1820; was president of Allegheny College, Meadville, Pa., 1834–37, after which he went to Texas as superintendent of Methodist missions. D. there May 16, 1838. Author of a *Hebrew Grammar* and several theological treatises.

Rut'gers (HENRY), b. in New York about 1746; graduated at Columbia College 1766; was a captain during the war of the Revolution, and subsequently a colonel of militia. He was a wealthy citizen of New York, a prominent member of the Reformed Dutch Church, a philanthropist, and an active politician; was several times a member of the New York assembly and a regent of the University of New York from 1802 to 1826. D. in New York City Feb. 17, 1830. Rutgers College took his name in consequence of a donation of $5000, and several important charities in New York City were recipients of his bounty.

Rutgers College, originally called **Queen's College,** chartered in 1770 by Gov. William Franklin of New Jersey, was located in 1771 at New Brunswick, N. J., Rev. Dr. J. R. Hardenburgh being the first president. It was the outgrowth of a desire on the part of its Dutch founders to perpetuate their distinctive theology and forms of worship. During the Revolutionary war it was closed for six years, and on account of financial embarrassments again closed twice, being reopened in 1825 under the care of the General Synod of the Reformed Dutch Church, and the name changed to Rutgers College "in consideration of the character and services of Col. Henry Rutgers." The number of professors was increased, a residence for the president erected, and the endowment enlarged to $50,000. During the civil war over $100,000 in $100-scholarships was raised by the Reformed Church through the energetic labors of the present president, Rev. William H. Campbell, D. D., and the General Synod transferred its entire right to the trustees, rendering the college independent. In 1864 the State college for the benefit of agriculture and mechanic arts provided for by an act of Congress became attached to Rutgers College. Since Dr. Campbell assumed the presidency in 1863 the endowment has been increased from $50,000 to $500,000; an astronomical observatory, a noble geological hall, and a united chapel and library edifice have been erected. The number of professors is 12, and the number of students in the grammar school and college is about 400. T. SANDFORD DOOLITTLE.

Ruth, Book of, one of the Hebrew Hagiographa, a canonical book of the Old Testament. It is a beautiful pastoral story, relating the love of Ruth, a young Moabitess, the widow of a Hebrew, for her mother-in-law, Naomi, and of the subsequent marriage of Ruth to Boaz, a rich husbandman of Bethlehem-Judah. It is a picture of domestic virtue and happiness amidst the troubled times of the Judges, when might was right. Ruth was the great-grandmother of King David. The date and authorship of the book are quite unknown, but it must have been written after the time of David and before the time of Ezra. Goethe pronounces the book of Ruth "the loveliest thing in the shape of an epic or idyl which has come down to us."

Ruthe'nian Rite, a branch of the Roman Catholic Church, consisting of the United Greeks of Austria, Hungary, and Poland, who as a rule speak the Russniak language, a Slavic tongue resembling the Polish. They have an archbishop (Lemberg) and five bishops (Premizl, Kreuz, Eperies, Maukacz, Chelm). (See EASTERN RITE.) The Ruthenian Bible was first published in 1581.

Ruthenians, or **Russniaks,** a branch of the Slavic family of nations, inhabiting the eastern part of Galicia, the north-western part of Hungary, and the adjacent regions of Poland and Russia. Their number is estimated at from 5,000,000 to 13,000,000, according as a greater or smaller number of nearly-related tribes is comprised under the same appellation. They are agriculturists, and belong to the Greek Church. Their cities are inhabited by Poles and Jews, and their general standard of civilization is low, though they do not lack natural intelligence. Their language forms an intermediate link between the Russian and the Polish. They translated the Bible in 1581. Specimens of their rich folk-lore are found in Vaclav, *Piesni Polskie i Ruskie* (1833). A grammar was published by Levicki in 1833, *Grammatik der russinischen Sprache für Deutsche*. For centuries the Ruthenian territory belonged to the Polish crown, but the endeavors of the Polish Jesuits to convert the people to the Roman Catholic Church, and the systematic suppression of the Ruthenian idiom by the Polish government, engendered a deep hatred. During the Polish revolutions the Ruthenian peasantry butchered the Polonized nobility with great cruelty, and since the nation began to rise in civilization it has allied itself closely in literature and politics to the Russians.

Ruthe'nium, a metal discovered in association with native platinum by Claus in 1846. It occurs chiefly in the hard grains of iridosmine in small proportion, not above 6 per cent. Its extraction is difficult, tedious, and even very dangerous, owing to the deadly fumes of osmium. The metal is obtained as a white spongy mass, density 8.6, by calcining the ammonio-chloride. Next to osmium, it is the most infusible known metal, but Deville and Debray fused it, and found a density of 11.4. It is scarcely attacked by *aqua regia*, but easily oxidized by fusion with hydrate of potash, more easily with saltpetre. Chlorine attacks it at incandescence. It forms three chlorides, $RuCl_2$, $RuCl_3$, and $RuCl_4$; five oxides, RuO, Ru_2O_3, RuO_2, RuO_3, and RuO_4; and two sulphides, Ru_2S_3 and RuS_2. Its fumes are not poisonous. H. WURTZ.

Ruth'erford, county of S. W. North Carolina, on the head-waters of Broad River, has a rugged surface, but the valleys are extremely fertile, the staples being Indian corn, sweet potatoes, tobacco, butter, honey, and sorghum-molasses. Cap. Rutherfordton. Area, 850 sq. m. P. 13,121.

Rutherford, county of Central Tennessee, watered by Stone River and other tributaries of the Cumberland, has an undulating surface and a very productive soil, and is traversed by Nashville Chattanooga and St. Louis R. R. The staple productions are Indian corn, wheat, oats, cotton, sweet potatoes, sorghum-molasses, wool, and butter. Sheep

and swine are raised in considerable abundance. There are 4 wool-carding establishments and several flouring and saw mills. The battle of Stone River, one of the most important of the late civil war, was fought here Dec. 31, 1862, to Jan. 2, 1863. Cap. Murfreesboro'. Area, 550 sq. m. P. 33,289.

Rutherford, tp., Martin co., Ind., on E. fork of White River. P. 1030.

Rutherford (Daniel), M. D., b. at Edinburgh, Scotland, Nov. 3, 1749; graduated in medicine at the University of Edinburgh 1772, announced in his graduation thesis, *De Aere Mephitico*, the existence of the gas since called azote or nitrogen; became professor of botany and keeper of the botanic garden 1786. D. at Edinburgh Nov. 15, 1819.

Rutherford (Griffith), b. in Ireland about 1730; was one of the pioneers in the "Locke Settlement" in Western North Carolina; was a member of the North Carolina convention at Newberne 1775; commanded an expedition which penetrated into the Cherokee country 1776, in which year he was appointed a brigadier-general by the provincial congress; was taken prisoner at Camden Aug., 1780; took command at Wilmington upon its evacuation by the British; was a State senator 1784; removed soon afterward to Tennessee, where he was president of the legislature in Sept., 1794. The date of his death is unknown. Counties in North Carolina and Tennessee bear his name.

Rutherford (John), M. D., b. at Yarrow, Selkirkshire, Scotland, Aug. 1, 1795; was apprenticed to a surgeon at Edinburgh; afterward studied at London, at Rheims, and at Leyden under Boerhaave, and, returning to Edinburgh, was associated with Dr. Munro and others in founding the famous medical school of Edinburgh, in which he lectured on medical practice for forty years. D. at Edinburgh in 1779.

Rutherford (John), nephew of the earl of Stirling, b. in New York City 1760; graduated at Princeton 1776; became a lawyer; was a Presidential elector 1798, 1813, and 1821, and U. S. Senator 1791–98; retired early from public life to devote himself to the management of his immense landed estates in New Jersey; was an efficient promoter of scientific agriculture and of internal improvements, and was the last survivor of the Senators who sat in Congress during the administration of Washington. D. at Ederston, N. J., Feb. 23, 1840.

Rutherford (John), b. at Richmond, Va., in 1794; graduated at Princeton; became a successful lawyer; sat in the Virginia general assembly twelve consecutive years; was fourteen years a member of the executive council; was lieutenant-governor for several years, and at one period acting governor; organized the Fayette Artillery at Richmond, which he commanded with the rank of colonel; was from 1836 the principal agent (a post equivalent to president) of the Mutual Assurance Society of Virginia, the oldest institution of the kind in the State, and long a member of the executive committee of the Democratic party. D. at Richmond Aug. 3, 1866.

Rutherford (Samuel), b. in Roxburghshire, Scotland, about 1600; graduated M. A. from the University of Edinburgh 1621; became minister of Anwoth 1627; was deprived by the high commission court of Galloway 1630, and silenced for preaching against the "Articles of Perth" 1636; was a delegate to the general assembly Nov., 1638; professor of divinity in New College, St. Andrew's, Oct., 1639; principal of that college and rector of the university 1649; was commissioner to the Westminster Assembly 1643–47, but was deprived of his posts 1660. D. at Edinburgh Mar. 20, 1661. He was prominent among the Presbyterian divines of his time, and author of a large number of theological treatises, which were highly esteemed; among them was a reply to Rev. Thomas Hooker's *Summe of Church Discipline*.

Rutherford Dépôt, p.-v., Gibson co., Tenn., on Rutherford fork of Obion River and on Mobile and Ohio R. R.

Rutherfordton, p.-v., cap. of Rutherford co., N. C., near Broad River, W. terminus of the proposed Wilmington Charlotte and Rutherford R. R., has 2 newspapers and is the centre of important mining interests. P. 4079.

Ruth'erforth (Thomas), D. D., b. at Papworth-Everard, Cambridgeshire, in 1712; educated at and fellow of St. John's College, Cambridge; became regius professor of divinity at Cambridge 1745; rector of Barrow in Suffolk, Shenfield in Essex, and Barley in Hertfordshire, and archdeacon of Essex in 1752; besides sermons and charges to the clergy, wrote *Ordo Institutionum Physicarum, in privatis suis Lectionibus* (1743), *Essay on the Nature and Obligations of Virtue* (1744), *A System of Natural Philosophy, being a Course of Lectures on Mechanics, Optics, Hydrostatics, and Astronomy* (2 vols., 1748), *A Letter to Dr. Middleton in Defence of Bishop Sherlock on Prophecy* (1750), *A Discourse on Miracles* (1751), and *Institutes of Natural Law, being the Substance of a Course of Lectures on Grotius' De Jure Belli et Pacis, read in St. John's College, Cambridge* (2 vols., 1754–56). (See also Watt's *Bibliotheca Britannica.*) D. Oct., 1771.

Ruth'erfurd, p.-v., Bergen co., N. J., on Delaware Lackawanna and Western and Erie R. Rs., 8½ miles from Jersey City, has 4 churches, good schools, a large summer hotel, and 1 newspaper. P. about 3100.

Jas. N. Bookstaver, Ed. "Herald."

Rutherfurd Ruling-Machine. See Ruling-Machine.

Rutherglen (rug'len), town of Scotland, county of Lanark, on the Clyde, was formerly a place of great importance, but is now dependent on its connections with Glasgow both for its trade and manufactures. P. 9451.

Ru'ther Glen, p.-v. (P. O. name of Chester), Caroline co., Va., on Richmond Fredericksburg and Potomac R. R.

Rutiglia'no, town of Italy, province of Bari di Puglie, situated on a hill N. W. of Conversano and about 12 miles from Bari. The neighborbood is healthy, and fertile in grain, wine, oil, and fruits. P. 7000.

Ru'tile [Lat. *rutilus*, "red"], a ferruginous oxide of titanium, valued in coloring porcelains yellow. It is very widely distributed.

Rut'land, county of W. Vermont, on the New York frontier, at the head of Lake Champlain, watered by Otter Creek and its branches, and by Pawlet, Poultney, and Castleton rivers, is bounded on the E. by the Green Mountains, has a productive soil in the lowlands, abounds in iron ore, is celebrated for its quarries of excellent marble, is traversed by four railroads, which centre at the county-seat, and produces large quantities of wool, maple-sugar, butter, and cheese, besides a considerable yield of hay, potatoes, oats, and Indian corn. Marble is extensively worked; manufactories are numerous, as also saw and flouring mills. Cap. Rutland. Area, 950 sq. m. P. 40,651.

Rutland, tp., Kane co., Ill., on Freeport line of Chicago and North-western R. R. P. 960.

Rutland, tp., La Salle co., Ill., at the confluence of Illinois and Fox rivers. P. 1499.

Rutland, p.-v. and tp., Humboldt co., Ia., on W. fork of Des Moines River. P. 422.

Rutland, p.-v. and tp., Montgomery co., Kan. P. 485.

Rutland, p.-v. and tp., Worcester co., Mass., on Massachusetts Central R. R. P. 1024.

Rutland, tp., Barry co., Mich., on Grand Rapids division of Michigan Central R. R. P. 1156.

Rutland, p.-v. and tp., Martin co., Minn. P. 196.

Rutland, p.-v. and tp., Jefferson co., N. Y., on Black River and on Carthage Watertown and Sackett's Harbor R. R. P. 1903.

Rutland, p.-v. and tp., Meigs co., O., on Leading Creek. P. 2471.

Rutland, p.-v. and tp., Tioga co., Pa. P. 1157.

Rutland, p.-v. and tp., cap. of Rutland co., Vt., on Otter Creek and on Rutland R. R.; lat. 43° 37′, lon. 40° 4′. It is the northern terminus of Harlem Extension R. R., the eastern terminus of Rutland and Washington and of Rutland and Whitehall R. Rs., and is the principal station on Rutland R. R., the car and machine shops and engine-houses being located here. The town was chartered by New Hampshire in 1761, settled in 1770, and again chartered as "Socialborough" in 1772 by the royal government of New York. During the contest known as the "New York controversy" Rutland was an important point, and in 1774 three of her citizens were proclaimed "outlaws" and a price set on their heads by the royal governor and council of New York. During the Revolutionary war it was a frontier-town, and two forts were erected here, and it was the most northern town of the State that was not depopulated by the advance of Burgoyne after the capture of Ticonderoga in 1777. It was made the capital of Rutland co. in 1781, and since the admission of Vermont into the Union, in 1791, has been one of the places for holding U. S. courts. From 1784 to 1804 it was *one* of the capitals of the State; the State-house erected in 1784 is still standing, being, with one exception, the oldest public building in the State. In Nov., 1786, the courts were dispersed by a mob, and the court-house possessed by them, but the militia were ordered out, the mob overawed, and the courts resumed business after only a few hours' interruption. Prior to 1791 one of the four State post-offices was established here; there are now four under the general government—namely, Rutland, West Rutland, Centre Rutland, and Sutherland Falls. There are 11 churches, 18 school districts, a "graded school," 25 school buildings, 60 teachers, and about 2500 pupils. In addition to several private schools, the Rutland Military Institute has 75 students, and there are also 2 Roman Cath-

olic convents. There are 2 daily and 2 weekly newspapers, an amateur monthly paper, 3 national banks, with an aggregate capital of $1,000,000, a savings bank, with about $650,000 deposits, a fire department with 3 engine companies, 3 hose companies, and a hook-and-ladder company.

Post-Office and U. S. Court-house, and Congregational Church.

The public buildings are the U. S. court-house and post-office, the county court-house, and the town and village hall, all built of brick. There are 4 small public libraries and an extensive free public reading-room. The town is something over 6 miles square, the soil presenting all varieties, from a heavy loam to a light sand, the principal mineral being limestone, the chief variety of which is Rutland marble. When marble was first worked in Rutland is uncertain, but quarries were opened at Sutherland's Falls—where Otter Creek passes through and falls over a solid bed of marble—as early as 1830, and have been worked more or less extensively ever since. The principal seat of the marble interest, however, is at West Rutland, where the first quarry was opened in 1838, but which received its real impetus in 1843, when William F. Barnes commenced work on the rich deposit now owned by the Rutland Marble Co. He then bought for a yoke of oxen quarries now worth millions of dollars. There are 16 quarries and 12 mills now in operation, employing some 750 men, and producing annually 2,500,000 square feet of 2-inch marble. Blocks are also transported for manufacture elsewhere. The machines of the Steam-Cutter Co., Wardwell's patent, are manufactured here, and the introduction of their channelling machines has cheapened as well as increased the production of marble. The population of the town in 1870 was 9834, being the largest in the State, while the village is second only in importance.

CHAUNCY K. WILLIAMS, ED. "GLOBE."

Rutland, p.-v. and tp., Dane co., Wis. P. 1139.

Rut'landshire, an inland county of England, traversed by the river Wash, comprises an area of 150 sq. m., with 22,070 inhabitants. S. of the Wash the surface is hilly; N., it is level. The soil is rich and well cultivated. Rearing of cattle is the chief branch of industry. Principal town, Oakham.

Rut'ledge, p.-v., cap. of Crenshaw co., Ala., on Patsaliga River.

Rutledge, p.-v., Morgan co., Ga., on Georgia R. R. P. 235.

Rutledge, tp., De Witt co., Ill. P. 664.

Rutledge, p.-v., cap. of Grainger co., Tenn., near Holston River. P. 107.

Rutledge (EDWARD), b. at Charleston, S. C., Nov. 23, 1749; studied law in the office of his brother John and at the Temple in London; commenced practice in Charleston 1773; was elected a member of the first Continental Congress 1774; was one of the signers of the Declaration of Independence, a member of the first board of war (June, 1776) of the committee appointed to draft Gen. Washington's commission (1775) and to draw up the first Articles of Confederation; also of that sent to confer with Lord Howe on Staten Island; commanded a company of artillery during the siege of Charleston, where he was taken prisoner 1780, and detained eleven months a prisoner at St. Augustine; sat in the legislature 1791, when he drew up the act for the abolition of the rights of primogeniture; became U. S. Senator 1794; governor of South Carolina 1798. D. at Charleston Jan. 23, 1800.

Rutledge (FRANCIS HUGER), D. D., son of Chancellor Hugh, b. at Charleston, S. C., in 1799; graduated at Yale College 1821; studied at the General Theological Seminary of the Protestant Episcopal Church; was ordained deacon 1823, and priest Nov. 20, 1825; became rector of Trinity church, St. Augustine, Fla., 1839, of St. John's church, Tallahassee, 1845, and was ordained bishop of Florida Oct. 15, 1851. D. at Tallahassee Nov. 6, 1866.

Rutledge (HUGH), brother of Edward, b. at Charleston, S. C., about 1740; became judge of admiralty 1776; was Speaker of the legislative council 1777; imprisoned at St. Augustine 1780–81; Speaker of the house of representatives 1782–85, and chancellor of the State from 1791 until his death, Jan., 1811.

Rutledge (JOHN), brother of Edward, b. at Charleston, S. C., in 1739, was son of Dr. John, who came from Ireland about 1735; studied law at the Temple, London; commenced practice at Charleston 1761; attained a leading position at the bar; was a prominent member of the "Stamp Act Congress" at New York 1765, of the South Carolina convention of 1774, and of the Continental Congress 1774–75; sat in the South Carolina convention of 1776, in which he was chairman of the committee which drew up the State constitution; was president of the new government and commander-in-chief of the State; resigned, through dissatisfaction with the new State constitution, 1778; was chosen governor with extensive powers 1779; took the field at the head of the militia against the invaders; retired to North Carolina on the fall of Charleston, May, 1780; accompanied the army of Gates until 1782, when he was elected to Congress; became chancellor Mar., 1784; was a member of the convention which framed the Federal Constitution; was appointed a justice of the U. S. Supreme Court Sept., 1789; resigned that office 1791 to accept the chief-justiceship of South Carolina; was appointed by Washington chief-justice of the Supreme Court of the U. S. July, 1795, and presided at the succeeding term, but having lost his reason (which he never recovered) shortly afterward, the Senate declined to confirm the appointment. D. at Charleston July 23, 1800.—His son, GEN. JOHN, b. at Charleston in 1766, was member of Congress 1797–1803, and d. at Philadelphia Sept. 1, 1819.

Rütli. See GRÜTLI.

Ru'tuli, a people of ancient Italy, inhabiting the coast of Latium, where they built the city of Ardea. They figure very conspicuously in the legendary fictions about Æneas, etc., but they were subdued by the Romans before the overthrow of the monarchy, and they are not mentioned in history after that time.

Ru'vo di Pu'glia, town of Italy, province of Bari di Puglie, on a chalk hill commanding a wide view. It is surrounded by a wall, outside of which are extensive suburbs, and it is entered by four gates. The town is irregularly built, and the churches, though numerous, are not of special interest. The adjacent country is productive, grain, vegetables, and choice fruit being abundant. P. in 1874, including suburbs, 15,000.

Rux'ton (GEORGE FREDERICK AUGUSTUS), b. in Kent, England, in 1821; studied in the military college at Sandhurst; volunteered in the British Legion, which served against Don Carlos in Spain 1838; went to Canada as lieutenant in the British army 1839; travelled extensively in remote Western regions; published *Adventures in Mexico and the Rocky Mountains* (1847) and *Life in the Far West* (1849); travelled also in North Africa, and, returning for fresh explorations in the Rocky Mountains, d. at St. Louis, Mo., Aug. 30, 1848.

Ruys'broek (JOHN), the patriarch of the Dutch and German Mystics, b. about 1293, taking his name from the place of his nativity, a village between Brussels and Hall. About 1316 he became vicar of a church in Brussels; about 1352 joined the monastery of Grünthal. D. Dec. 2, 1381. He advocated oneness with God and assimilation to him, to be achieved by contemplation. He avoided the antinomianism of the pantheistic Mystics, and had the spirit of a reformer. (See Engelhardt's *Richard v. St. Victor u. Joh. Ruysbroek* (1838) and Ullmann's *Reformers before the Reformation* (1841; Eng. tr. 1855), vol. ii. pp. 36–55.) R. D. HITCHCOCK.

Ruysbroek [Lat. *Rubruquis, Rubruk*], **William of,** a distinguished Franciscan monk and missionary, b. near Brussels about 1230; was sent in 1253 by Innocent IV. (1243–54) to the court of Mangu Khan, the grandson of Genghis Khan, to attempt his conversion to Christianity; returned in 1255. D. after 1293. Roger Bacon speaks of him, and may very likely have seen him; and, as gunpowder was then in use among the Tartars, it has been conjec-

tured that Rubruk may have given Bacon a clue to the discovery. (For Bacon's recipe see his *Opera Inedita* (1859), p. 551. For a translation of the *Itinerarium* of Rubruk see *Purchas his Pilgrimes*, vol. iii.) R. D. HITCHCOCK.

Ruys'dael (JACOB), b. in Haarlem in 1625. Of his life little is known; there is controversy on nearly every point. He was the pupil and friend of Nicholas Berghem, and was a man of imagination and feeling, a nice observer, and an accomplished artist. It is not probable that he ever left Holland, for his pictures, evidently studied from nature, represent Dutch scenery and landscape on or near the Rhine. The variety of subject is not great, but the treatment is varied by the art and sensibility of the master, who imparted to his work an effect of openness, airiness, breeziness, and reach of vision that saves them from monotony and gives them a singular charm. The catalogues ascribe to him 448 pictures of undoubted genuineness. They are familiar to visitors in all continental galleries. D. at Haarlem 1661. O. B. FROTHINGHAM.

Ruys'selede, town of Belgium, province of West Flanders, is the seat of a celebrated reformatory founded by the government in 1849. The institution, which admits boys from seven to eighteen years of age and employs them during the summer in farm-labor, during the winter at different trades, numbered 522 boys in 1872, and was entirely self-supporting. P. about 7000.

Ruy'ter, van (MICHAEL ADRIAENZOON), b. at Vliessingen, Zealand, in 1607, of humble parentage; went to sea as a cabin-boy in 1618; was made a captain in the Dutch navy in 1635, and a rear-admiral in 1645. In the war between Spain and Portugal he sunk in 1647 an Algerine piratical squadron off the port of Salé, and subsequently distinguished himself still more in the war between Holland and England and in the Danish service. But his greatest deed he achieved in 1667, when he sailed up the Thames, destroyed the shipping at Sheerness, burnt a number of English men-of-war, and compelled England to conclude the Peace of Breda. In the war with France he commanded in the Mediterranean, but was defeated off the eastern coast of Sicily by Admiral Du Quesne. He succeeded in conducting his fleet safely into the harbor of Syracuse, where he d. next day, Apr. 29, 1676.

Ry'an, tp., Schuylkill co., Pa., on Lehigh Valley and Mauch Chunk R. Rs. P. 600.

Ryan, tp., Edgefield co., S. C. P. 836.

Ryan (STEPHEN VINCENT), D. D., b. Jan. 1, 1826, in Upper Canada; removed to Pennsylvania in infancy; was educated at St. Charles's Seminary, Philadelphia, Pa.; completed his theological studies at St. Mary's Seminary, Barrens, Mo.; was ordained priest June 24, 1849, in St. Louis, Mo.; was prefect and professor for some years at St. Mary's Seminary, and afterward at St. Vincent's College, Cape Girardeau, Mo., of which institution he became president about the year 1856; was named provincial visitor of the Congregation of the Mission in 1857; appointed by the Holy See second bishop of Buffalo Mar. 3, 1868, and was consecrated Nov. 8 of the same year.

Ryan Glade, tp., Garrett co., Md., at head-waters of Potomac River. P. 851.

Rybinsk', town of European Russia, government of Yaroslav, on the Volga, carries on an immense transit-trade in corn, flour, tallow, timber, and metals between the interior of Russia and St. Petersburg. P. 14,192.

Rycaut' (Sir PAUL), b. in London, England, about 1630; was secretary to the earl of Winchelsea during his embassy at Constantinople 1661–69; published *The Present State of the Ottoman Empire* (1668); was consul at Smyrna about 1670–81; secretary to the earl of Clarendon when lord lieutenant of Leinster and Connaught 1685, in which year he was knighted and made judge of the court of admiralty and privy councillor for Ireland; lost his offices at the revolution of 1688; was English resident at the Hanse Towns 1690–1700. D. in England in 1700; published *The History of the Turkish Empire from 1623 to 1677* (1680), edited Knolles's *History of the Turks*, with a continuation (1679; best ed. 3 vols., 1687–1700), translated Garcilaso de la Vega's *Royal Commentaries of Peru* (1688), and brought out in 1700 an appendix to his great work, entitled *A History of the Turks from 1679 to 1699.*

Ryde, town of England, on the northern coast of the Isle of Wight, is beautifully situated at the Spithead. It is an elegant and flourishing watering-place, and communicates every hour with Portsmouth. P. 11,234.

Ry'der (JAMES), D. D., b. at Dublin, Ireland, in Oct., 1800; came to the U. S. in boyhood; became a novice in the Jesuit order 1813; was educated at Georgetown College; studied theology at Rome 1820–25; was ordained priest 1825; taught theology at Spoleto 1825–28; was for some time vice-president of Georgetown College, was its president 1840–45, and again 1848–51; pastor of churches at Philadelphia and at Frederick, Md., 1839–40; president of the college of the Holy Cross at Worcester, Mass., 1846–48; was superior of the order of Jesuits in North America; published several lectures and discourses, and contributed articles relating to the doctrines of his Church to the *Encyclopædia Americana*. D. at Philadelphia Jan. 12, 1860.

Ryder (WILLIAM HENRY), D. D., b. July 3, 1822, in Provincetown, Mass., and ordained to the ministry (Universalist) in 1843; in November of that year became pastor in Concord, N. H.; in Dec., 1845, in Nashua, N. H.; in 1848 went to Europe and Palestine, and studied in Berlin; in Jan., 1850, became pastor in Roxbury (now Boston Highlands), Mass.; in Jan., 1860, of St. Paul's church (First Universalist), Chicago, Ill., where he still remains.

Rye (*Secale cereale*), a cereal grain belonging to the sub-tribe Hordeineæ, which flourishes in the higher latitudes of the temperate zone, thrives upon poor soil, and yields a straw which is in great request for stuffing beds, saddlery, etc. and for braiding mats. The grain is wholesome, but darker and less nutritious than wheat. Whisky is extensively distilled from rye in the U. S., gin in Holland, and a liquor called *quass* in Russia. The annual production of rye in the U. S. is about 20,000,000 bushels, the States producing the largest quantities being Pennsylvania, New York, and Illinois.

Rye, p.-v. and tp., Rockingham co., N. H., on Atlantic Ocean, at the mouth of Piscataqua River, adjoining Portsmouth, is famed for its extensive beach, a place of summer resort. P. 993.

Rye, p.-v. and tp., Westchester co., N. Y., on Long Island Sound and on New York New Haven and Hartford R. R., includes the village of Port Chester. P. 7150.

Rye, tp., Perry co., Pa., on Susquehanna River and on Pennsylvania R. R. P. 703.

Rye'gate, p.-v. and tp., Caledonia co., Vt., on Connecticut River and Connecticut and Passumpsic Rivers R. R. P. 935.

Rye-Grass, the *Lolium perenne*, a European grass naturalized in the U. S. In Europe it is highly esteemed both for hay and pasture, and is the most important of all forage-plants, but in the U. S. it is not very highly valued. The Italian rye-grass (*L. Italicum*) is also greatly valued in Great Britain. (For the *Lolium temulentum* see DARNEL.)

Rye'house Plot [so called from the Rye-house, a farm near Newmarket, where the murder of the king was to be undertaken], was a scheme devised by some English Whigs to kill King Charles II. while on his way from Newmarket, and to give the crown to the duke of Monmouth. The plot was discovered, and many leading Whigs, including Algernon Sydney and Lord Russell, were sent to the block, and many others were severely punished.

Ry'erson (ADOLPHUS EGERTON), D. D., LL.D., b. at Charlotteville, Upper Canada, Mar. 24, 1803; was ordained to the (Wesleyan) Methodist ministry 1825; became editor of the *Guardian*, the organ of the M. E. Church in Canada, 1829; became principal of the University of Coburg (Victoria College) 1841; was superintendent of public schools for Upper Canada 1844–50; travelled in the U. S. studying systems of education, and prepared the legislation for a new scheme of public instruction. Author of a *History of the United Empire Loyalists.*

Rye, Spurred. See ERGOT.

Ry'mer (THOMAS), b. at North Allerton, Yorkshire, England, about 1639; educated at Sydney College, Cambridge; studied law at Gray's Inn; became historiographer to William III. 1692; now chiefly remembered for the vast Latin collection of English historical and diplomatic documents known as *Rymer's Fœdera* (20 vols. folio, 1704–35), of which 15 were edited by himself and the remainder by Robert Sanderson. D. in London Dec. 14, 1713. Rymer left 58 MS. vols. of important historical documents, now in the British Museum. A *Syllabus* (in English) of the *Fœdera* was published in 1869 by Sir Thomas Duffus Hardy.

Rys'ingh (JOHN CLAUDE), the last Swedish governor of the colony on the Delaware, was sent out in the ship Aren in 1654, having previously been secretary of the chamber of commerce at Stockholm. He was commissioned as vice-governor of New Sweden, and received orders not to molest the Dutch, but at once surprised and occupied the Dutch fort Casimir, assumed the title of director-general, and concluded a treaty with the Indians; but in 1655 the Dutch attacked New Sweden and put an end to the Swedish authority, which had been sustained for seventeen years.

Rys'wick, v. of the Netherlands, province of South Holland, is famous as the place in which the treaty of peace between France and the allies, Germany, Holland, England, and Spain, was signed Sept. 20, 1697.